

Serial number

Production year



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OPERATING INSTRUCTION

Catalogue number 20351R/Eng



REFRIGERATED LABORATORY CENTRIFUGE

MPW - 351 R



Read these instructions before using the equipment!

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Warning signs and hazard icons.



WARNING

Warning of potential injury or health risk.



DANGER

Risk of electric shock with potential for severe injury or death as a consequence.



DANGER

Biohazard with potential for risk to health or death as a consequence.



DANGER

Risk of explosion with potential for severe injury or death as a consequence.

1. Application.

The MPW-351R centrifuge is the table top laboratory centrifuge for *in vitro* diagnostic (IVD) equipped with cooled rotating chamber. Its construction ensures easy operation, safe work and wide range of applications in laboratories engaged in routine medical analyses, biochemical research works etc. It is intended for separation of mixtures, suspensions and systemic fluids into constituents of different densities under influence of the centrifugal force. This centrifuge is not biotight and therefore during centrifugation preparations requiring biotightness one has to use closed and sealed containers and rotors. In the centrifuge it is prohibited to centrifuge caustic, inflammable and explosive preparations.

2. Technical data.

Manufacturer: *“MPW Med. instruments” Co-operative of Workers
46 Boremlowska Street, Warsaw/Poland*

Type: *MPW-351R*

Mains	L1+N+PE V/Hz $\pm 10\%$	230 V/50 Hz, (230 V/60 Hz),(115 V 50/60 Hz)
Maximum power consumption		980 W
Rotational speed range		100÷18000 rpm
Maximum capacity		1 l
Maximum acceleration		30065 x g
Maximum kinetic energy		8800 Nm
Time range		0÷99 min, 0÷59 s or ∞ (resolution 1 sec.)
Time counting:		from the start or from the maximum speed
Number of programs		99
Acceleration mode		10 linear characteristics
Deceleration mode		9 linear and 1 subterfuge characteristics
Temperature control range		-20° ÷ + 40° C
SHORT- short duration operation and initial cooling		0 ÷ 10 min,
AUTO COVER function		automatic cover opening after end of centrifuging
Precooling		with spinning (2500 rpm, 4° C) or without spinning (4° C)
COOL AFTER function		cooling after the end of centrifuging
Computer interface		RS-232
Interference level		PN-EN-55011
Noise level		56 dB
Refrigerating agent without CFC and HCFC		R-507, 210 g

Physical data:

Depth	680 mm
Width	430 mm
Height	420 mm
Weight	62 kg

Environmental conditions:

Ambient temperature	PN-EN-61010-1 p. 1.4.1. +5° ÷ 40° C
Relative humidity at ambient temperature	< 80 %
Installation category	II PN-EN 61010 -1
Degree of pollution	2 PN-EN 61010 - 1
Protection zone	300 mm

Statement of Conformity:

The following machine is in accordance with the regulations of the EU Directive 98/79/EC and with the harmonized standards PN-EN 61010-1 and PN-EN 61010-2-020.

2.1. Accessories.

2.1.1. Basic accessories (being enclosed to every centrifuge).

Cat. No.	Type of accessories	
17664	Complete clamp	pcs 1
17665	Spanner for the rotor	pcs 1
17863	Fuses WTA-T 10 A 250 V	pcs 2
17864	Fuses WTA-T 15 A 250 V (optionally)	pcs 2
17866	Power cord 230 V	pcs 1
17867	Power cord 115 V (optionally)	pcs 1
20351R/Eng	Operating Instruction	pcs 1

2.1.2. Optional accessories.

Depending on customer's needs the MPW-351R centrifuge can be provided with below specified accessories:

ANGLE ROTORS

Cat. No	Type of rotor	Angle	Rotor capacity	Max rpm	RCF	r _{max} [cm]	r _{min} [cm]
11199	Angle rotor HSL	45°	12 x 2,2/1,5 ml	18000	24088	6,65	3,5
11210	Angle rotor	30°	24 x 15 ml	5000	3996	14,3	6,0
11211	Angle rotor	30°	10 x 50 ml Falcon	5500	4498	13,3	8,7
11213	Angle rotor	30°	8 x 50 ml	5500	4227	12,5	7,9
11259	Angle rotor HSL	45°	30 x 2,2/1,5 ml	15000	24400	9,7	6,5
11273	Angle rotor HSL	30°	8 x 30 ml Nalgene	12000	14000	8,7	5,4
11456	Angle rotor	30°	36 x 15 ml	5000	3996	14,3	6,0
11457	Angle rotor HSL	30°	6 x 50 ml Falcon	10000	10732	9,6	5,5
11458	Angle rotor HSL	30°	6 x 30 ml Nalgene	15000	19621	7,8	4,8
11459	Angle rotor HSL	30°	12 x 10 ml	15000	21381	8,5	4,4
11460	Angle rotor HSL	45°	36 x 0,5 ml	18000	29703	8,2	5,8
11461	Angle rotor HSL	45°	24 x 2,2/1,5 ml	18000	30065	8,3	5,0
11462	Angle rotor HSL	45°	36 x 2,2/1,5 ml	18000	30065	8,3	4,0
11465	Angle rotor	30°	30 x 15 ml	5200	4020	13,3	5,5
11466	Angle rotor HSL	30°	10 x 15 ml Falcon	10000	10732	9,6	3,5
11467	Angle rotor HSL	30°	12 x 10 ml	12000	15133	9,4	4,2
11468	Angle rotor HSL	45°	6 x 8 x 0,2 ml PCR strip	12000	15294	9,5	8,4
11469	Angle rotor HSL	30°	6 x 50 ml Nalgene	12000	14490	9,0	5,2
11496	Angle rotor HSL	30°	4 x 85 ml	10000	10621	9,5	2,7
11718	Angle rotor	30°	4x100 ml	6300	5014	11,3	5,0
11739	Angle rotor HSL	45°	24x2 ml/filtr	15000	23142	9,2	6,4
11740	Angle rotor	30°	12 x 15 ml	5500	4058	12,0	4,6
11741	Angle rotor	30°	8 x 15 ml	6000	4226	10,5	4,0
11743	Angle rotor	30°	12 x 30/25 ml	5500	4058	12,0	7,8
11746	Angle rotor	30°	6 x 50 ml	6000	4427	11,0	4,9

[HSL – hermetically sealed lid]

SWING-OUT ROTORS

Cat. No	Type of rotor	Rotor capacity	Max rpm	RCF	r _{max} [cm]	r _{min} [cm]
12172	Swing-out drum rotor	6 adapters 20 x 0,4/0,2 ml or 10 x 2,2/1,5ml	14500	16450	7,0	3,0
12177	Swing-out rotor	4 x 250 ml	5000	4724	16,9	12,4
12285	Swing-out rotor	2 x 3 microtiter plates and blocks	4300	2397	11,6	5,5
12300	Hematocrit rotor	24 capillary tubes 75mm	13000	16816	8,9	1,4
12436b	Swing-out rotor	4 x 200 ml	5200	4413	14,6	3,6
12451	Swing-out rotor	2 x 3 microtiter plates and blocks	3000	1036	10,3	5,5
12452	Swing-out rotor	4x2 ml cyto	2500	768	11,0	-
12464	Swing-out rotor HSL	24 x 2,2 ml	14000	15996	7,3	3,4

[HSL – hermetically sealed lid]

BUCKETS

<u>Catalog no</u>	<u>Application</u>
13042	Bucket ϕ 30x120 mm for 2x50 ml Falcon test tubes for rotor 12436b;
13044	Hanger for 4 buckets 13080 for 15 ml Falcon test tubes for rotor 12436b;
13045	Bucket ϕ 30x120 mm for 50 ml Falcon test tube for rotor 12436b;
13080	Bucket ϕ 17,7x87 mm for 15/10/7/6 ml test tubes for rotor 11210, 11740, 11456, 11465, 11741;
13081	Bucket ϕ 17,7x65 for 10/6/5 ml test tubes for rotor 11210, 11740, 11456, 11465, 11741;
13129c	Hanger for 2 buckets 13080 for 15 ml Falcon test tubes for rotor 12436b;
13174	Round bucket ϕ 62x107 mm for 250 ml bottles for rotor 12177;
13178c	Round bucket ϕ 62x107 mm for 250 ml bottles with cap for rotor 12177;
13180	Bucket ϕ 30x99 mm for 2 x 50 ml Falcon test tubes for rotor 12177;
13275	Bucket ϕ 30x99 mm for 50/30/25 ml Falcon test tubes with thread or cap for rotor 11211, 11213;
13276	Bucket ϕ 30x96 mm for 50/30/25 ml Falcon test tubes without thread for rotor 11211, 11213, 11746;
13277	Round bucket ϕ 45,5x89,5 mm for 100 ml PP test tubes for rotor 11718;
13286	Bucket 85x130x60 mm for 1-3 microtiter plates and block for rotor 12285;
13307	Bucket 85x130x60 mm for 1-3 microtiter plates for rotor 12451;
13329	Bucket ϕ 25,5x86 mm for 30/25 ml test tubes for rotor 11743;
13437	Round bucket ϕ 57x94 mm for 200 ml bottle No. 15440 and round carriers 14441-14450, 14104, 14106, 14108, 14109, 14110, 14112, 14113 for rotor 12436b;
13438	Round bucket ϕ 57x98 mm with cap for 200 ml bottle No. 15440 and round carriers 14441-14450, 14104, 14106, 14108, 14109, 14110, 14112, 14113 for rotor 12436b;
13483	Hanger for 4x2,2/1,5 ml test tubes for rotor 12464;
13606	Hanger for CYTO container for rotor 12452;
13719	Round bucket ϕ 45x96 mm for 100 ml test tubes for rotor 11718;

ROUND CARRIERS

<u>Catalog no</u>	<u>Application</u>
◆◆14000	Adapter 20x0,4 ml for rotor 12172;
◆◆14002	Adapter 10x2,2/1,5 ml for rotor 12172;
14071	Round carrier for 30 ml test tubes nr 15055 (ϕ 25x100 mm) for rotor 11457;
14082	Round carrier ϕ 17,3 for 7/5 ml test tubes (ϕ 13,3x100 mm) for bucket 13080 and 13081;
14084	Round carrier ϕ 11,0 for 0,5 ml test tubes (ϕ 8,0x30 mm) for rotor 11259, 11461, 11462, 11739;
14089	Round carrier ϕ 29,0 for 15 ml Falcon test tubes (ϕ 17x120 mm) for rotor 11457 and bucket 13275, 13276;
14104	Round carrier ϕ 56,5 for 1x100 ml test tubes (ϕ 46x100 mm) for bucket 13437, 13438;
14106	Round carrier ϕ 56,5 for 7x7 ml test tubes (ϕ 13x100 mm) for bucket 13437, 13438;
14108	Round carrier ϕ 56,5 short for 7x10 ml test tubes l (ϕ 17,1x85mm) for bucket 13437, 13438;
14109	Round carrier ϕ 56,5 short for 7x5 ml test tubes (ϕ 13x85 mm) for bucket 13437, 13438;
14110	Round carrier ϕ 56,5 for 7x14/10 ml test tubes (ϕ 17,1x113 mm) for bucket 13437 i 13438;
14111	Round carrier ϕ 56,5 for 5x15 ml test tubes (ϕ 16,7x100 mm) for bucket 13437 i 13438;
14112	Round carrier ϕ 56,5 for 3x30/25 ml test tubes (ϕ 25,5x100 mm) for bucket 13437 i 13438;
14113	Round carrier ϕ 56,5 for 50 ml Falcon test tubes (ϕ 30x120 mm) for bucket 13437 i 13438;
14126	Round carrier ϕ 11 for 0,4 ml test tubes (ϕ 5,8x46 mm) for rotor 11259, 11461, 11462, 11739;
14133	Round carrier ϕ 10,8 for 0,2 ml test tubes (ϕ 6,2x21 mm) for rotor 11259, 11461, 11462, 11739;
14134	Round carrier ϕ 7,8 for 0,2 ml test tubes (ϕ 6,2x21 mm) for rotor 11460;
14151	Round carrier ϕ 61 for 1x100 ml test tubes (ϕ 46x100 mm) for bucket 13174, 13178;
14152	Round carrier ϕ 61 for 1x50 ml Falcon test tubes (ϕ 30x120 mm) for bucket 13174, 13178;
14153	Round carrier ϕ 61 for 5x15 ml Falcon test tubes (ϕ 17/22x120 mm) for bucket 13174, 13178;
14154	Round carrier ϕ 61 for 9x 5 ml test tubes (ϕ 13,5/17x81 mm) for bucket 13174, 13178;
14155	Round carrier ϕ 61 for 12x7/5 ml test tubes (ϕ 13/14,5x100 mm) for bucket 13174, 13178;
14156	Round carrier ϕ 61 for 8x14/10 ml test tubes (ϕ 17/17,7x113 mm) for bucket 13174, 13178;
14157	Round carrier ϕ 61 for 4x15 ml test tubes (ϕ 17/22x120 mm) for bucket 13174, 13178;
14158	Round carrier ϕ 61 for 12x2,2 ml Eppendorf test tubes (ϕ 11x43 mm) for bucket 13174, 13178;
14159	Round carrier ϕ 45 for 1x50 ml test tubes (ϕ 35,5x100 mm) for bucket 13174, 13178 and round carrier 14151;
14160	Round carrier ϕ 61 for 3x30/25 ml test tubes (ϕ 25,5x100 mm) for bucket 13174, 13178;
14188	Pad under 100/50 ml test tubes for bucket 13719;
14189	Round carrier ϕ 44,5 for 50 ml Falcon test tubes (ϕ 30x120 mm) for bucket 13719;
14192	Round carrier ϕ 44,5 for 50 ml test tubes (ϕ 35,5x100 mm) for bucket 13719;
14248	Round carrier ϕ 29,8 for 30/25 ml test tubes (ϕ 26x100 mm) for bucket 13275 and 13276;
14255	Round carrier ϕ 25 for 7 ml test tubes (ϕ 13x100 mm) for bucket 13329;
14256	Round carrier ϕ 25 for 15/10 ml test tubes (ϕ 17x120 mm) for bucket 13329;
14441	Round carrier ϕ 56,5 for 12x7/6 ml test tubes (ϕ 12,3x100 mm) for bucket 13437 and 13438;
14444	Round carrier ϕ 56,5 for 1x50 ml test tubes (ϕ 35,2x100 mm) for bucket 13437 and 13438;
14446	Round carrier ϕ 56,5 short for 12x5 ml test tubes (ϕ 12,5x75 mm) for bucket 13437 and 13438;
14447a	Round carrier ϕ 56,5 for 12x1,2 ml S-Monovete test tubes (ϕ 8x66 mm) for bucket 13437 and 13438;
14448	Round carrier ϕ 56,5 for 7x5 ml Vacutainer test tubes (ϕ 13,1/16x60/100 mm) for bucket 13437 and 13438;
14449	Round carrier ϕ 56,5 for 4x12 ml Monovete test tubes (ϕ 17,1/19,4x60/107 mm);
14450	Round carrier ϕ 56,5 for 9x2,2/1,5 ml test tubes (ϕ 11x38,5 mm) for bucket 13437 and 13438;

TEST TUBES

<u>Catalog no</u>	<u>Specification</u>
15015	Polypropylene test tube 2 ml with cap (ϕ 10,8x41,2 mm);
15040	Polypropylene test tube 100 ml with cap (ϕ 44,5x103 mm);
15046	Polypropylene test tube 14 ml with cap (ϕ 16,8x113 mm);
15048	Polypropylene test tube 15 ml Nalgene (ϕ 16x113 mm);
15050	Polypropylene test tube 15 ml Falcon (ϕ 17/21x120 mm);
15051	Polypropylene test tube 50 ml Nalgene (ϕ 28,8x106,7 mm);
15052	Polypropylene test tube 50 ml Falcon (ϕ 30/35x120 mm);
15053	Polypropylene test tube 10 ml with cap (ϕ 16/19x100 mm);
15054	Polypropylene test tube 6 ml with cap (ϕ 11,5x92 mm);
15055	Polypropylene test tube 30 ml with cap (ϕ 24,8x100 mm);
15056	Polycarbonate test tube 30 ml Nalgene with cap (ϕ 25,5x94 mm);
15067	Polycarbonate test tube 85 ml Nalgene with cap (ϕ 37,8x106 mm);
15098	Capillary tube stoppers;
15100	Microhematocrite capillary tubes, heparinized (1,4x75mm);
15102	Micro titer plate with cap (85,5x127 mm);
15115	Glass tube 100 ml (ϕ 45x100 mm);
15116	Glass tube 50 ml (ϕ 35x100 mm);
15117	Glass tube 25 ml (ϕ 25x100 mm);
15118	Glass tube 10 ml (ϕ 16x100 mm);
15119	Glass tube 7 ml (ϕ 12x100 mm);
15120	Glass tube 5 ml (ϕ 12x75 mm);
15121	Polypropylene test tube 10 ml with stopper (ϕ 17x70 mm);
15123	Polypropylene test tube 2,2 ml with cap (ϕ 10,8x43 mm) to the deposit CYTO;
15124	Polypropylene test tube 0,4 ml (ϕ 5,7x46 mm);
15125	Polypropylene test tube 0,2 ml PCR (ϕ 6x21 mm);
15127	Polypropylene test tube 0,5 ml with cap (ϕ 7,8x30 mm);
15128	Polypropylene test tube 1,5 ml with cap (ϕ 10,8x39 mm);
15130	Polypropylene PCR test tube 8x0,2 ml (ϕ 6x21 mm);
15131	Polypropylene PCR test tube 4x0,2 ml (ϕ 6x21 mm);
15175	Polypropylene bottle 250 ml Herolab (ϕ 61,5x125 mm);
15176	Polycarbonate bottle 250 ml Herolab (ϕ 61,5x135 mm);
15419	Polypropylene test tube 5 ml (ϕ 12x75 mm);
15424	Polypropylene test tube 30 ml Nalgene with cap (ϕ 25,5x94 mm);
15440	Polypropylene bottle 200 ml (ϕ 56,5x113 mm);

OTHER ACCESSORIES

<u>Catalog no</u>	<u>Specification</u>
◆◆16594	Data recording set of working parameters by serial RS 232 pin;
◆◆16595	Thermal printer of working parameters by serial RS 232 pin;
16610	Cyto-container complete for hanger No. 13606;
16614	Microscope slide for cyto-container No. 16610;
16615	Filter card ϕ 7 mm for cyto-container No. 16610;
16616	Filter card ϕ 9.5 mm for cyto-container No. 16610;

16617 Filter card ϕ 12.5 mm for cyto-container No. 16610;

17111 Polycarbonate cap for bucket No. 13438;

17151 Polycarbonate cap for bucket No. 13275;

17179 Polycarbonate cap for bucket No. 13178

◆◆ **CAUTION!** Optional accessories marked by: “◆◆” are manufactured for individual order.

2.2. Exploitation materials.



For operating in centrifuge one should use only original company's buckets comprised in the specification of accessories as well as test-tubes for centrifuges of proper diameter, length and strength. Utilization of test-tubes of other makes shall be agreed upon with manufacturer of the centrifuge. For cleaning and disinfecting one should to use agents generally used in the health service, such as e.g. *Aerodesina-2000*, *Lysoformin 3000*, *Melseptol*, *Melsept SF*, *Sanepidex*, *Cutasept F*.

3. Installation.

3.1. Unpacking of the centrifuge.

Open the package. Take out the cardboard box containing the accessories. Take out the centrifuge from the package. Keep the package and packing materials at hand for service transport.

3.2. Location.



The centrifuge shall not be located near the radiators and shall not be subjected to direct sunlight. The table for the centrifuge shall be stable and shall have flat-leveled table top. It is necessary round the centrifuge to ensure the safety zone of the minimum 30 cm from every direction. Normal operating conditions ambient temperature is from 15° C to 35° C. Passed parameters of the spinner are referring to above named temperatures. At the change of the place from cold for warm condensation of water will occur inside the centrifuge. It is important then that sufficient time shall be provided for drying the centrifuge prior to repeat starting the centrifuge (minimum 4 hours).

3.3. Connection to mains.



Supply voltage given on the rating plate has to be consistent with local supply voltage. MPW Med. instruments laboratory centrifuges are in I safety class devices and they are provided with the three-core cable with the plug resistant to dynamic loadings. Mains socket shall be provided with the safety pin. It is recommended to install emergency cut-out that shall be installed far from the centrifuge, near the emergency exit or beyond the room.

Supply voltage 230 V 50 Hz, optionally 230 V 60 Hz, 115 V 60 Hz.



***Before switching on check whether the centrifuge is connected to power supply correctly.
Check centrifuge before usage whether she is installed correctly.***

3.4. Fuses.

The centrifuge has standard protection with the WTA-T 10 A 250 V fuse for centrifuge supplied by 230 V 50/60 Hz and WTA-T 15 A 250 V fuse for centrifuge supplied by 115 V 60 Hz. Fuse is situated in the plug-in socket unit at back wall of the centrifuge.

4. Description of the centrifuge.

4.1. General description.

New generation of MPW Med. instruments laboratory centrifuges is provided with the modern microprocessor control systems, very durable and quiet asynchronous brushless motors and accessories consistent with the modern requirements of user.

4.2. Service elements.

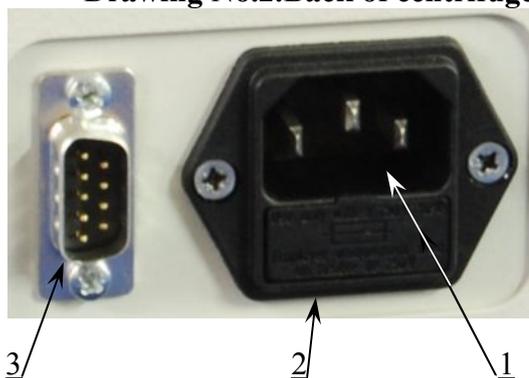


- 1. Power - switch
- 2. Control panel
- 3. Cover
- 4. Inspection glass
- 5. Emergency cover open

Drawing No.1. General view

- 1. Plug-in socket
- 2. Fuse base
- 3. RS 232 socket

Drawing No.2. Back of centrifuge



- 1. Motor axle
- 2. Rotor
- 3. Rotor cover
- 4. Complete clamp

Drawing No. 3. Unit elements of the angle rotor

5. Safe working conditions.

5.1. Servicing personnel.

The MPW-351R laboratory centrifuge can be operated by laboratory personnel after getting acquainted with Operating Instruction.



***Operating Instruction shall be held all the time near the centrifuge.
Operating Instruction must be kept close always at hand!!!***

5.2. Guarantee and operational use period.

Guarantee period for the MPW-351R centrifuge amounts to minimum 24 months. Principles are specified in guarantee certificate. The service life of the centrifuge specified by the manufacturer amounts to 10 years.



After termination of guarantee period it is necessary carry out yearly technical inspection of the centrifuge by service authorized by manufacturer.

The manufacturer reserves the right to make modifications at produced goods.

5.3. Safekeeping period.

Maximum period of storage of not used centrifuge amounts to 1 year. After this period one should carry out technical inspection of the centrifuge by service authorized by manufacturer.

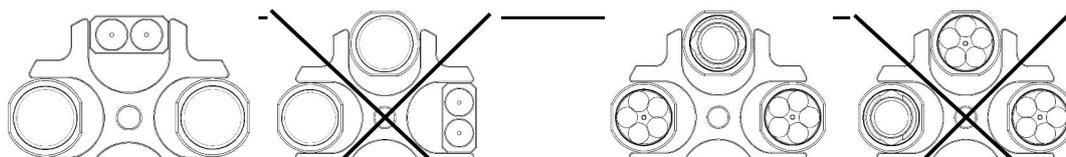
5.4. Hints on centrifuging.



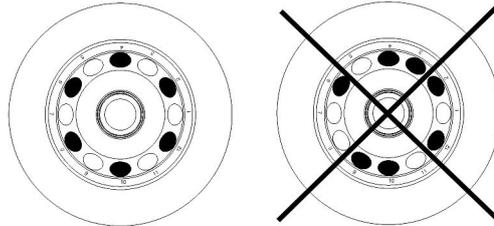
- Set the centrifuge in horizontal position on rigid base.
- Ensure safe positioning location.
- Ensure free space around the centrifuge (amounting to at least 30 cm left free).
- Ensure sufficient ventilation.
- Fix the rotor on the motor axis firmly.



- Avoid unbalance.
- Load opposite buckets with the same accessories.
- Centrifugation of the test tubes of different dimensions.
The possibility to centrifuge test tubes of different dimensions is existing; however, it is absolutely necessary in such cases that opposite buckets and round carriers have to be the same. Mass of different containers with test tubes spun at the same time has to be comparable.



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- The test tubes shall be not only inserted symmetrically but round carriers and their hangers shall be equally loaded. It is not allowed to operate centrifuge with asymmetric loads applied to rotors and buckets.
 - It is necessary to insert test tubes on opposite it symmetrically.



- Fill test tubes beyond the centrifuge.
- Please pay special attention to the quality and proper thickness of the glass test tubes walls. Those shall be test tubes for centrifuges of proper strength up to 5000 x g.
- Fill in the test tubes with the same weight, in order to protect the centrifuge against unbalance.



- Lubricate the swing-out rotor journal pins with the technical petroleum jelly.
- Use only accessories kept in good condition.
- Protect equipment against corrosion using accurate preventive maintenance.



- Infectious materials could be processed in closed buckets only.



- It is prohibited to centrifuge explosive and inflammable materials.
- It is prohibited to centrifuge substances prone to reacting in result of supplying high energy during centrifugation.

5.5. Hazards and precautions



- Prior to starting the trial of switching the centrifuge on, one shall read exactly all sections of this instruction in order to ensure smooth run of operation, avoiding damages of this device or its accessories.

- Centrifuge shall not be operated by unqualified personnel.



- Centrifuge must not be transported with the rotor mounted on the shaft.

- One must use original rotors, test-tubes and spare parts only.



- In case of faulty operation of the centrifuge one shall ask of assistance of service of MPW Med. instruments Company or its authorized representatives.
-



- It is prohibited to switch the centrifuge on if it is not installed properly or rotor is not fitted correctly.
-



- The centrifuge must not be operated in places where explosion hazard appears as it is not explosion-proof make.
 - It is prohibited to subject to centrifugation materials, which subjected to action of air, could generate inflammable or explosive mixtures.
-



- It is prohibited to subject to centrifugation toxic or infectious materials with damaged leak proof seals of the rotor or test-tube. Proper disinfections procedures have to be carried out when dangerous substances contaminated the centrifuge or its accessories.
-



- It isn't allowed to open the cover - manually in emergency procedure, when rotor is still turning.
-



- It isn't allowed to exceed load limit set by the manufacturer. Rotors are intended for fluids of average homogeneous density equal to 1.2 g/cm³ or smaller when centrifugation is carried out at maximum speed. When fluids of higher density shall be used, then it is necessary to limit speed (see point 7.3.3 "Maximum load").
-



- It isn't allowed to use the rotors and round carriers with signs of corrosion or other mechanical defects.
 - It isn't allowed to centrifugation substances of high corrosion aggressiveness, which could cause material impairment and lower mechanical properties of rotor and round carriers.
 - It isn't allowed to use rotors and accessories that one not admitted by the manufacturer. Let to use commercial glass and plastic test tubes, which are destined to centrifuging in this laboratory centrifuge. It is distinct warning against using poor quality elements. Cracking of vessels could result in dangerous unbalance.
-



- It isn't allowed to carry out centrifugation with the rotors with taken off or not tight driven caps.
 - It isn't allowed to lift or shift the centrifuge during operation and rest on it.
 - It isn't allowed to stay in the safety zone within 30 cm distance around the centrifuge neither leave within this zone some things, e.g. glass vessels.
 - It isn't allowed to put any objects on the centrifuge.
-

6. Operation of the centrifuge.

6.1. Mounting of the rotor and accessories.

1. Connect the centrifuge to the mains (master switch at right wall of the centrifuge).
2. Open the cover of the centrifuge by pressing the **COVER** key. Prior to putting the rotor in one has to check if rotating chamber is free of impurities, e.g. such as dust, glass splinters, residues of fluids that must be taken away.
3. One shall fit the rotor on the motor shaft driving it home on the cone.
 **Caution! Too shallow fitting the rotor will result in lack of identification of the rotor after start of the centrifuge, displaying of the ERROR ROTOR VER. message and stopping the centrifuge.**
4. Screw-in the bolt for fixing the rotor (clockwise) and screw it tightly home with the supplied spanner for the rotor.
5. Swing-out rotors have to be provided with the buckets in all seats. One should to remember that every buckets swings individually. Bucket suspension studs should be lubricated periodically with technical petroleum jelly.
6. In the case of rotors designed with the cover they must not be used without it. Rotor covers must be closed exactly. Rotor covers ensure smaller drags of the rotors, proper setting of the test-tubes and airtight sealing.
7. One should use only buckets intended for selected types of the rotor - see p. 2.1. "Accessories".
8. Fill test tubes beyond the centrifuge.

9. Put on or screw the caps on vessels and rotors (when they have such).
10. In case of centrifuging in angle rotor, test tubes (buckets) have to be filled properly in order to avoid overflows.
11.  **CAUTION:** *Centrifuge will tolerate small weight differences occurring during loading of rotors. However it is recommended to equalize vessels loads as much as possible in order to ensure minimal vibrations during operation. When the centrifuge will be started with large imbalance then unbalance control system will switch-off the drive system and error signal will be transmitted. On the monitoring panel will be displayed **ERROR UNBALANCE** message.*
12. In order to prolong lifetime of the rotor and gaskets rotors shall be lubricated with the maintenance oil, while gaskets and threaded parts shall be lubricated with the technical petroleum jelly.
13. For replacement of the rotor one shall unscrew clamping and then using both hands grab the rotor at opposite sides taking it away from drive shaft by pulling it up.

6.2. Construction and safety measures.

The centrifuge has rigid self-supporting structure. Housing was made of sheet aluminium, back made of steel sheet. Front and cover was made of ABS type plastic. Cover is fixed on steel axles of hinges and from the front is locked with electromagnetic lock blocking possible opening during centrifugation. Rotation chamber casing was made of thick steel sheet. Bowl forming the rotation chamber is made of stainless steel sheet.

6.3. Drive.

Drive constitutes induction motor of low noise level.

6.4. Data input and output.

Data setting and read-out system forms hermetically closed keyboard with distinctly accessible operation points. Easily readable displays signaling individual performed operations facilitate to operator programming and recording of parameters and condition of the centrifuge.

The centrifuge is provided with the RS 232 serial interface that enables connection of the centrifuge to external PC unit with the printer and recording the centrifugation parameters.

6.5. Controls.

The microprocessor setup of the control applied to the centrifuge is ensuring broad chances to give and of the realization of work parameters, it is:

- selection of the spin setting 1÷99;
- selection of the rotor according to the accession number;
- selection of rotational speed within 100 ÷ 18000 rpm at 100 rpm interval;
- centrifugation time within 0÷99 minutes range, 0÷59 sec., ∞ with assigning parameter by resolution at 1 sec interval;
- selection of **SHORT** – short duration operation,
- selecting of the **AUTO COVER** function - automatic opening of the cover after end of centrifuging (choice is signalling by the wheel between **SPEED** and **TIME** inscriptions);
- counting the time at moment pressing the **START** key or from reached the set speed;
- selecting acceleration characteristics from 0 - quickest to 9 - slowest (e.g. for rotor No. 12436b accelerating time to 5200 rpm value for characteristic curve No. 0 is 41 s., and for No. 9 is 173 s.),
- selecting deceleration characteristics from 0 – quickest to 8 - slowest (e.g. for rotor No. 12436b deceleration time from 5200 rpm value for characteristic curve No. 0 is 37 s., and for No. 8 is 220 s.).
deceleration characteristic number 9 is subterfuge characteristics (**with time of free stopping of the rotor** e.g. for rotor 12436b is 270 s.)
- selecting the RCF with automatic calculation of the rotation speed with accuracy to 100 rpm.
- cooling the rotation chamber -20° ÷ + 40° C
- choice of the **COOL AFTER** option – cooling the rotation chamber after the end of centrifuging (choice is signalling by the star between **SPEED** and **TIME** inscriptions)

→ choice of the **PRECOOLING** program behind means **0** key:

- single-time pressing makes choosing preliminary cooling with spinning with constant parameters: speed: 2500 rpm, temperature: 4°C, time: to 15 minute, (this function is recommended by MPW);
- double pressing makes choosing preliminary cooling without spinning with parameters: speed: 0 rpm, temperature: 4°C, time: to 15 minute.

6.6. Safety devices.

Apart from the above described passive devices and safety measures there exist as well active devices and elements as follows:

6.6.1. Cover lock.

The centrifuge can be started only with properly closed cover (display will display the  symbol). In turn the cover can be opened only after stopping the rotor. In the case of emergency opening of the cover during operation the centrifuge will be immediately switched-off and the rotor will brake till complete stopping. With opened cover (display will display the  symbol) drive is completely disconnected from the power that makes impossible to start the centrifuge.

6.6.2. Unbalanced load checking system.

Drive is switched-off during acceleration or operation of the centrifuge when loads of opposite buckets or carriers in rotors are unbalanced – will display **ERROR UNBALANCE** message.

6.6.3. Setup of the verification of installing the rotor and compatibility with the program.

Directly after starting centrifuging setup is verifying the type of the rotor put on and the process located in the application or defect of the rotor in case of incompatibility with the type of spinning is remaining stopped with simultaneous with displaying on the display of the **ERROR ROTOR VER.** error. It is being signaled by identifying of conformity of the type of the rotor with the single audible signal.

6.6.4. Rest state inspection.

Opening of the centrifuge's cover is possible only with the rotor in the state of rest. This state is being checked by the microprocessor which recognizes and signals the rest state prior to opening the cover.

6.6.5. Checking of excessive temperature.

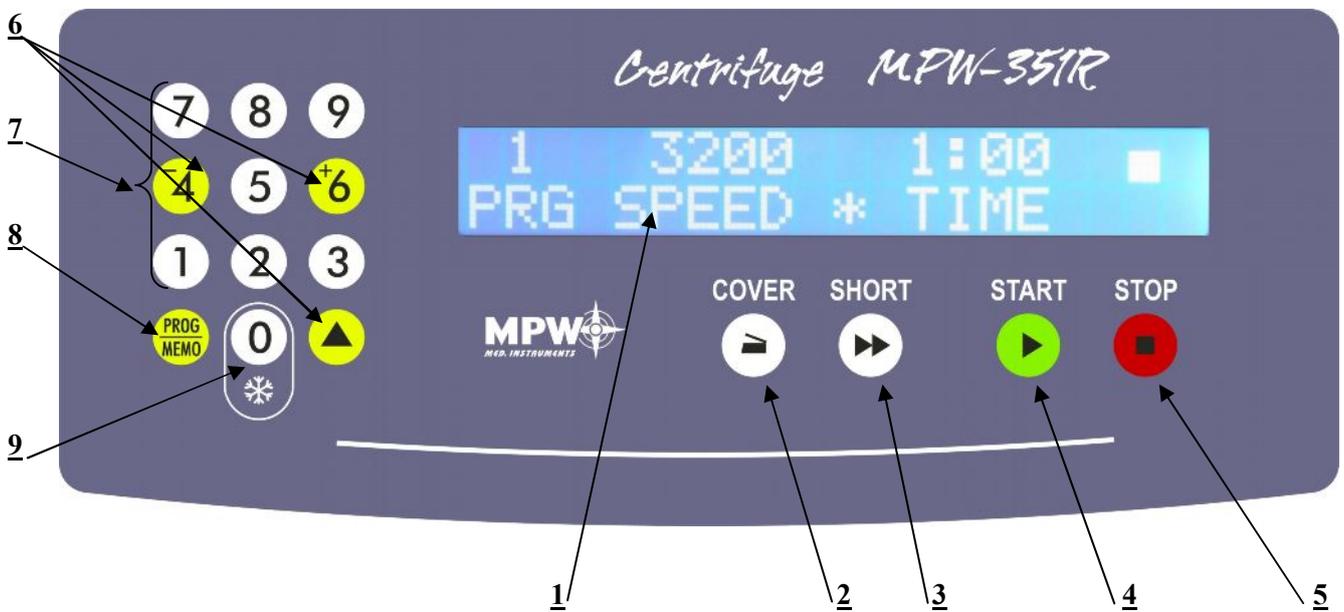
If temperature in rotation chamber exceed 50° C caused by, for example, malfunction of cooling system, drive will be switched off and message **ERROR OVER TEMP** will be displayed. The reboot is only possible after chilling the device.

7. Description of the centrifuge operating elements.

Power switching ON/OFF is carried out with master switch situated on right wall of the centrifuge. All settings on the centrifuge are done by means of the control panel. Panel comprises control keys, display and signaling LED's.

7.1. Control panel - Drawing No. 4.

For controlling centrifuge operation serves control panel placed on front casing wall.



Drawing No.4. Control panel

- | | | |
|---------------|--------------------|-----------|
| 1. Display. | 5. STOP key. | 9. 0 key. |
| 2. COVER key. | 6. Function keys. | |
| 3. SHORT key. | 7. Numeric keypad. | |
| 4. START key. | 8. PROG/MEMO key. | |

Control panel comprises following elements [Drawing No.4]:

1. Rotor status signalling behind means of arrows on the display (arrow upwards - accelerating of the rotor, arrow directed at the direction of the indicator of the speed – the rotor reached the set speed, down arrow - slowing down of the rotor)
2. Signalling of the choice of the option COOL AFTER behind means of star on the display
3. Signalling of the choice of the option AUTO COVER behind means of wheel on the display
4. Function key START [4]

5. Function key STOP [5]

6. Function key COVER [2]

7. Function key SHORT [3]

8. 0 key [9] – **PRECOOLING** program (with spinning or without spinning)

9. Numeric keypad digits 0 – 9 [7]

10. Two-function key PROG/MEMO [8]

11. Two-function keys 4⁻; 6⁺; ▲ [6]

- ◆ Sound signal serves for signalling function recording and determination of the centrifuge status,
- ◆ **START** key can be used for starting centrifugation program with parameters presented on display,
- ◆ **STOP** key serves for:
 - interrupting centrifugation program in any program phase and braking the rotor,
 - interrupting of programming of centrifugation parameters without saving them,
 - clearing the errors
- ◆ **COVER** key serves for opening of the cover,
- ◆ **PROG/MEMO** key serves for:
 - scrolling of programs,
 - switching to programming mode,
 - saving pre-programmed program,
 - scrolling of programs at down,
- ◆ **▲** key serves for:
 - rolling of parameters list when in programming mode
 - scrolling of programs
 - introducing of the double digit number of the program
- ◆ **SHORT** key serves for short duration operation,
- ◆ “0” key serves for activate **PRECOOLING** program with spinning or without spinning
- ◆ Yellow key 4⁻ serves for changing of parameter value at down
- ◆ Yellow key 6⁺ serves for changing of parameter value at up.

12. Display field [1]

On the top of display are contains the parameters of the centrifuging, lower part are displayed messages of the state of work.

I.



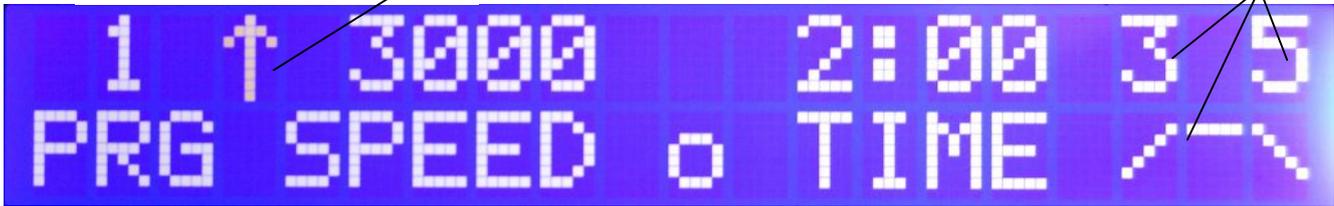
II. symbol of the choice of the option AUTO COVER



III.

symbol of the rotor status

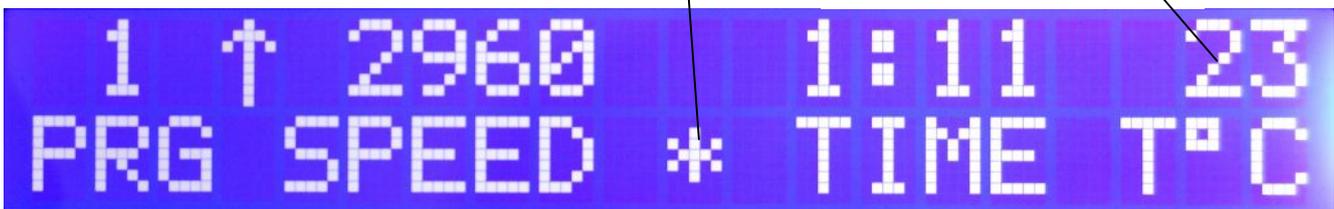
values and symbols of acceleration/deceleration characteristics



IV.

symbol of the choice of the option COOL AFTER

value of the temperature



13. ERRORS:

⇒ ERROR USER STOP



⇒ ERROR ROTOR VER.



⇒ ERROR UNBALANCE



⇒ ERROR T. SENSOR



⇒ **ERROR POWER FAIL**



⇒ **ERROR MOTOR FAIL**



⇒ **ERROR OVER TEMP.**



7.2. Switching on the centrifuge.

After switching power ON control system calls recently implemented program and displays program number, rotational speed, duration of centrifugation and cover opening status. Provided that rotor in the centrifuge is stopped, and then it is possible to open the cover by means of **COVER** key.

7.2.1. Selection of the program.

Control panel can save up to 99 programs preset by the user. Selection of the program consists in selection of its number by means of numeric keypad as follows:

for 1 digit number press digits on numeric keypad

for 2 digit number press ▲ key [-] symbol will be displayed
press ▲ key [- -] symbol will be displayed
press tens digit, digit will be filled-in in tens place [4-]
press units digit, digit will be filled-in in units place [4 7]

Program "0" is reserved for the **PRECOOLING** function (preliminary cooling of the rotation chamber). The choice of this function is occurring after pressing the "0" key:

- one time: with spinning



- two times: without spinning



After selecting program number in relevant fields will be displayed parameters of this program. In order to make calling easier were introduced functions increment program number ▲ key and decrement program number – **PROG/MEMO** key. Those functions are active for 3 seconds from last program selection.

7.2.2. Start of the program.

After selection of program number and checking if proper rotor was mounted consistent with requirements of this program, we can start centrifugation process with single pressing of **START** key.

The centrifuge can be started provided that:

- cover is closed
- symbol ■ is on
- **ERROR** message is not displayed.

7.2.3. Verification of installing the rotor and compatibility with the program.

It is impossible to set rotor speed above maximum rotational speed preset for it. It is impossible as well to centrifuge without the rotor or with the rotor with the other number than preprogrammed because system will verify correctness of installing the rotor and compare number of the installing rotor with programmed at low rotational speed range. In case of incompatibility centrifuge will be stopped and **ERROR ROTOR VER.** message will be displayed. Repeated start of centrifuge is possible only after cancellation of the **ERROR ROTOR VER.** message pressing the **STOP** key, then introduction of proper speed correction or mounting proper rotor with preset number.

7.2.4. ERROR UNBALANCE fault.

The centrifuge is provided with the rotor unbalance sensor and when it will be activated centrifugation process will be stopped through fast braking and at the same time **ERROR UNBALANCE** fault message is displayed in red. Cancellation of this error is possible only through pushing **COVER** key after stopping of the rotor. One must check if rotor was correctly loaded, close the cover and once more start the program. In order to protect the rotor against run-out opposite located places have to be provided with identically filled buckets, carriers, test-tubes etc. for getting the best balance possible. Unbalance causes noise and vibrations during operation, and adversely affects power transmission system (motor, shock absorbers). The better balance, the smoother will be the centrifuge operation and therefore longer useful life of driving system. Moreover ideal separation level is obtained, as already separated constituents would not be moved up by vibration.

7.2.5. Emergency stop.

In any centrifuging moment is possible interrupting of the process and fast stopping of the rotor with single pressing of **STOP** key. The **ERROR USER STOP** message will be displayed as a result of that the application wasn't ended correctly.

7.2.6. End of the centrifuging.

After ending the time of centrifuging given in the program is occurring braking of rotations in accordance to chosen characteristics in the program. At end of deceleration rotational speed drops slower in order to ensure soft settling of rotor carriers. After stopping, follows audible sound signal and displayed ■ symbol and message **CYCLE FINISH O.K.** (clearing this message is occurring after pressing the **STOP** key or after opening the cover). After pressing **COVER** key cover opens and □ symbol is displayed.



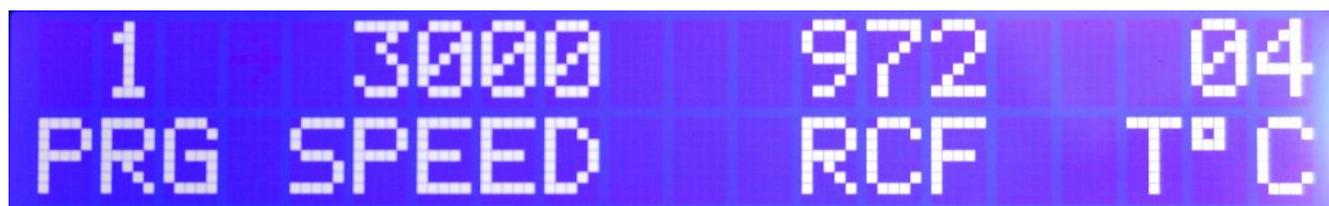
7.2.7. Parameters monitoring during centrifuging.

For easy finding in the course of centrifuging in order to check preset parameters monitoring function was introduced, that is called with pressing any key on numeric keypad. Single-time pressing will make them be displayed speed, time, acceleration characteristic and deceleration characteristic. Double pressing will display the programmed temperature and RCF value. After 3 seconds display comes back for displaying current measurements of rotational speed and time.

Single time pressing



Double pressing



7.2.8. Programming.

Programming mode is activated with pressing **PROG/MEMO** key after previous selection of number of the program, which we would like to introduce or change. On the display occurs **PARAM EDIT** message that means transformation into programming mode.



Using ▲ key we press forward list of parameters subjected to edition as follows:



(rotor)



(rotational speed)



(acceleration)



(time of rotation in minutes, symbol - - - - which is before “0” is for infinity centrifuging)

```
1  __SEC  2:00
PRG                EDIT
```

(time of rotation in seconds)

```
1  ACCEL  3
PRG                EDIT
```

(acceleration mode)

```
1  DECEL  5
PRG                EDIT
```

(deceleration mode)

```
1  BEGIN  START  On
PRG                EDIT
```

(is for selection time counting begins when **START** key is pressed)

```
1  BEGIN  SPEED  UP
PRG                EDIT
```

or
(is for selection time counting begins when rpm of the rotor rich rotational speed set up in the program)

```
1  AUTO   COVER  ON
PRG                EDIT
```

(automatic opening of the cover after end of centrifuging)

```
1  AUTO   COVER  OFF
PRG                EDIT
```

```
1  T °C   04
PRG                EDIT
```

(temperature of cooling)

```
1  COOL  AFTER  ON
PRG                EDIT
```

(possibility to cooling of the spin chamber after the end of program)

```
1  COOL  AFTER  OFF
PRG                EDIT
```

and so on in round – robin algorithm.

After setting on selected parameters there is possible change of the parameter values:

up 6+ key

down 4- key

After setting required parameters program is being recorded in the memory by means of **PROG/MEMO** key. Confirmation of the program recording is prolonged sound signal. It is possible at any moment to resign from the changes introduced and leave programming mode without recording pressing **STOP** key.

7.2.9. Cancellation of the programs.

Centrifuge program enables complete cancellation of the programs being recorded. After pressing **PROG/MEMO** and No. 9 keys is displayed **clear** message. Pressing **PROG/MEMO** keys cancels all programs recorded up to now, while use of **STOP** key causes withdrawal from this option.

```
          CLEAR
PRG                  EDIT
```

7.2.10. Version of the centrifuge.

Pressing **PROG/MEMO** and No. 7 keys will cause displaying the centrifuge and software versions, e.g. _351R _0844 522, and total time of work of the centrifuge in hours and minutes.



7.3. Mathematical relations.

7.3.1. RCF – relative centripetal force.

RCF acceleration this is the acceleration generated by the rotor rotary motion acting upon tested product and it can be calculated according to the formula:

$$\text{RCF} = 11,18 \times r \times (n/1000)^2$$

$$\text{RCF} \quad [\times g], \quad r \quad [\text{cm}], \quad n \quad [\text{rpm}]$$

Depending on the distance of particles of the tested product from the axis of rotation one can find from above formula minimum RCF, average RCF or maximum RCF. On the basis of preset RCF value and given radius of the bottom in the bucket one can calculate from the formula rotational speed to be set in the program of centrifuging. Selection of the time of sedimentation and the RCF value shall be carried out experimentally for a given product. Once every 100 rpm electronic circuit automatically calculates and displays RCF value. In order to program required RCF value one shall use nomogram (Drawing No. 5) or change rotational speed matching displayed value to required acceleration value.

7.3.2. Nomogram of relationship - rotational speed/centrifuging radius/RCF – Drawing No. 5. page 30

7.3.3. Maximum load.

In order to avoid overloading of the rotor one shall observe maximum load which is recorded on every rotor. Maximum permissible load is reached when all test-tubes are filled with the fluid with 1.2 g/cm³ density. If density of the centrifuged liquid is higher than 1.2 g/cm³, then test-tubes could be filled only partially or one shall limit operation speed of the centrifuge that is being calculated from the formula:

$$n_{\text{perm}} = n_{\text{max}} * \sqrt{\frac{1,2}{\gamma}};$$

$$\gamma = \text{specific gravity} \left[\frac{G}{\text{cm}^3} \right];$$

$$n_{\text{max}} \quad [\text{maximum rotational speed - rpm}]$$

7.4. Temperature in rotational chamber.

Centrifuge is equipped in ecological refrigerating system with temperature control. During centrifugation may appear differences in temperature onto display and temperature of the samples in the rotor. It depends on thermal conductivity of the rotor, and samples and centrifugation time.

In order spinning preparations about the lowered temperature (deposited in the outside refrigerator) it is necessary to make initial refrigerating of the chamber, the rotor and containers to the assigned low temperature in order minimizing the difference of temperatures. We are recommending in order obtaining of lower temperatures of the chamber PRECOOLING:

- *with spinning setting the program 0. In centrifuge will be spinning rotors with maximum speed 2500 rpm in 15 min obtaining the temperature 4° C.*
- *without spinning setting the program pressing 2 times the 0 key. Chamber will be cooling to temperature 4° C without spinning.*

The setup of cooling is permitting to refrigerate every of available rotors with the equipment at maximum revolving speeds for 4°C.

Obtaining of low temperatures is dependent on the kind of the rotor and the revolving speed.

8. Cleaning, disinfection, maintenance.

CAUTION! It is necessary to use protective gloves during following work.

8.1. Cleaning of the centrifuge.

For cleaning shall be used water with soap or other water soluble mild detergent. One should to avoid corrosion inducing substances and aggressive substances. It is prohibited to use alkaline solutions, inflammable solvents or agents containing abrasive particles. Using wiping cloth remove from the rotor chamber condensate or residues of the products. It is recommended to keep the cover opened when the centrifuge does not work in order to expel the moisture.

8.2. Cleaning of the accessories.

In order to ensure safety operation one shall in regular way carry out periodical maintenance of the accessories. Manufactured rotors, buckets and round carriers have to withstand steady high stresses originated from the field of gravitation. Chemical reactions as well as corrosion (combination of variable pressure and chemical reactions) can cause corrosion or destruction of metals. Hard to observe surface cracks increase gradually and weaken material without visible symptoms. In the case of observation of surface damage, crevice or other change, as well the corrosion, given part (rotor, bucket, etc.) shall be immediately replaced. In order to prevent corrosion one has to clean regularly the rotor with the fastening bolt, buckets and round carriers. Cleaning of the accessories shall be carried out outside of the centrifuge once every week or still better after each use. Then those parts shall be dried using soft fabric or in the chamber drier at ca. 50° C.

Especially prone to the corrosion are parts made of aluminium. For cleaning them one should use very neutral agent of pH value from 6 to 8. It is forbidden to use alkaline agent of pH above 8. In this way substantially is increased useful service life and diminished susceptibility to corrosion. Accurate maintenance increases as well service life and protects against premature rotor failures. Corrosion and damages resulting from insufficient maintenance could not be object of claims lodged against the manufacturer.

8.3. Lubrication.

The rotor pins shall be always lubricated with technical petroleum jelly. In this way is ensured uniform deflection of the buckets and quiet centrifuge operation.

8.4. Glass tube cracking.

In the case of glass tube cracking all debris shall be accurately removed. Rubber inserts shall be exactly cleaned or possibly replaced. Otherwise one has to take into account following possibilities:

- Glass particles left in the rubber cushion (pad) will cause once more glass cracking.
- Glass particles left in containers make impossible uniform deflecting of the buckets and round carriers resulting in unbalance.
- Glass particles left in the rotor chamber cause metal abrasion because of strong air circulation. This dust will not only contaminate the centrifuge chamber, rotor, buckets, carriers and centrifuged material but will cause as well damages of surfaces of the accessories, rotors and the rotation chamber. For complete removal of glass particles and metal dust from the rotor chamber it is recommended to place on the bowl strip of vaseline (from the top down to bottom). Then rotor shall operate for several minutes at moderate speed. Glass and metal particles will collect on lubricated area and could be easily removed with the piece of cloth together with the grease. This operation can be repeated in case of need.

8.5. Sterilization and disinfections of the rotating chamber and accessories.

One can use all standard disinfectants. The centrifuges and accessories are constructed from various materials and one should to take into account possible variety of materials. During sterilization by means of steam one should to consider temperature resistance of individual materials.

STERILIZATION

	Sterilization* temp. 121 °C, time 20 min	Radiation – β/γ 25 kGy	Gas (ethylene oxide)	Chemical compounds (formalin, ethanol)
PS	no	yes	no	yes
SAN	no	no	yes	yes
PMMA	no	yes	no	yes
PC	yes ¹⁾	yes	yes	yes
PVC	no ²⁾	no	yes	yes
POM	yes ¹⁾	yes	yes	yes
PE-LD	no	yes	yes	yes
PE-HD	no	yes	yes	yes
PP	yes	yes	yes	yes
PMP	yes	yes	yes	yes
ECTFE/ETFE	yes	no	yes	yes
PTFE	yes	no	yes	yes
FEP/PFA	yes	no	yes	yes
FKM	yes	-	yes	yes
EPDM	yes	-	yes	yes
NR	no	no	yes	yes
SI	yes	no	yes	yes

* Laboratory vessels have to before the sterilization in the autoclave be exactly cleaned and rinsed with the distilled water. It is always necessary to remove closures from containers!

1) The frequent steam sterilization is reducing mechanical durability! PC test tubes are able to become useless.

2) Except PCV hose who are resistant to the steam sterilization in the temperature 121 °C.

Abbreviations of names of characterized plastics

PS: Polystyrene

SAN: Styrene-acrylonitrile

PMMA: Polymethyl methacrylate

ECTFE: Ethylene/chlorotrifluoroethylene

ETFE: Ethylene/tetrafluoroethylene

PTFE: Polytetrafluoroethylene

PC:	Polycarbon	FEP:	Tetrafluoroethylene/perfluoropropylene
PVC:	Polyvinyl chloride	PFA	Tetrafluoroethylene/perfluoroalkylvinylether
POM:	Acetal polyoxymethylenel	FKM	Fluorcarbon rubber
PE-LD:	Low density polyethylene	EPDM:	Ethylene propylene diene
PE-HD:	High density polyethylene	NR:	Natural rubber
PP:	Polypropylene	SI:	Silicon rubber
PMP:	Polymethylpentene		



We would like to add that for centrifuging for instance infectious materials it is necessary to use hermetically closed buckets in order to protect their migration into the centrifuge.

Rotors, buckets and round carriers can be sterilized in autoclave with temperature 121° – 124° C and pressure 215 kPa during 15 min. Disinfectants and cleaning agents generally used in medical care should be used in this centrifuge (e.g. *Aerodesina-2000, Lysoformin 3000, Melseptol, Melsept SF, Sanepidex, Cutasept F*).



*User is responsible for proper disinfections of the centrifuge, if some dangerous material was spilled inside or outside of the centrifuge.
During above mentioned works one must wear safety gloves.*

9. Emergency conditions – service.

9.1. Fault finding.

Majority of faults could be cancelled by switching the centrifuge **OFF** and then **ON**. After switching the centrifuge **ON** shall be displayed parameters of the recently implemented program and audible sound signals consisting of four successive tones. In the case of short-duration power failure the centrifuge terminates cycle and displays **PROGRAM ERROR** code.

Please find below the most frequent faults and their repair methods.

1. Lack of display and check sound:	Remedies:
• <i>Is mains socket live?</i>	<i>Check mains socket fuse.</i>
• <i>Is supply cable plugged into mains?</i>	<i>Plugs correctly supply cable.</i>
• <i>Is input fuse good?</i>	<i>Replace input fuse (rated data on rating plate).</i>
• <i>Is master switch switched ON?</i>	<i>Switch ON power supply.</i>
• <i>Above was checked and still there is not display active and check sound.</i>	<i>Call service.</i>
2. Centrifuge does not start	Remedies
<i>P message and ERROR MOTOR FAIL is displayed</i>	<i>Call service</i>
<ul style="list-style-type: none"> • <i>START key pressing does not generate reaction or single tone only</i> -<i>Rotor stopping symbol, (■) is not displayed yet</i> -<i>Cover opening symbol (□) displayed</i> -<i>arrow on the display is blinking:</i> 	<ul style="list-style-type: none"> -<i>Wait till rotor stops and displaying the rotor stopping symbol (■)</i> -<i>Close cover. There shall be displayed square symbol that means stop.</i> -<i>Centrifugation cycle in progress, press STOP key or wait till cycle end.</i>
• <i>Indications are proof for cycle in progress and motor does not start</i>	<i>Switch power supply OFF/ON. If fault still persists then call service.</i>

3. Centrifuge starts but not accelerates	Remedies
<ul style="list-style-type: none"> • After stopping ERROR UNBALANCE message is displayed -Unequal rotor load -Inclined centrifuge -Faulty drive (mechanical damage) -Centrifuge was displaced during operation 	<ul style="list-style-type: none"> -Centrifuge load shall be balanced -Centrifuge shall be leveled -Call service -Switch ON the centrifuge afresh after opening and closing the cover
<ul style="list-style-type: none"> • After stopping ERROR ROTOR VER. code is displayed 	Check: <ul style="list-style-type: none"> -if rotor number in started program is consistent with the number of the rotor installed in the centrifuge -rotor status (if there are inserted coding magnets)
<ul style="list-style-type: none"> • Centrifuge does not recognize the rotor and does not stop 	Switch the centrifuge OFF , then ON and check correctness of called program
<ul style="list-style-type: none"> • Centrifuge still does not recognize the rotor 	Call service
4. It isn't possible to open cover.	Remedies
<ul style="list-style-type: none"> • Rotor stopping symbol (■) not displayed yet, after pressing COVER key single tone is audible 	Rotor is still rotating. Wait for stopping of the rotor and displaying of the square symbol
<ul style="list-style-type: none"> • Nothing is displayed 	Check the centrifuge power supply
<ul style="list-style-type: none"> • Rotor stopping symbol (■) is displayed, but cover can not be opened 	Call service
5. Centrifuge is working and mains failure	Remedies
<ul style="list-style-type: none"> • ERROR POWER FAIL message is displayed 	Wait for stopping of the rotor, clear the error by pressing the STOP key.
6. Damage the temperature sensor.	Remedies
<ul style="list-style-type: none"> • ERROR T. SENSOR message is displayed 	Check whether the sensor is connected to the steering plate correctly.
<ul style="list-style-type: none"> • The sensor is connected correctly, and the error is applying still 	Call service
7. Error of the exceeding the temperature in the chamber	Remedies
<ul style="list-style-type: none"> • ERROR OVER TEMP. message is displayed 	Call service

Emergency cover release

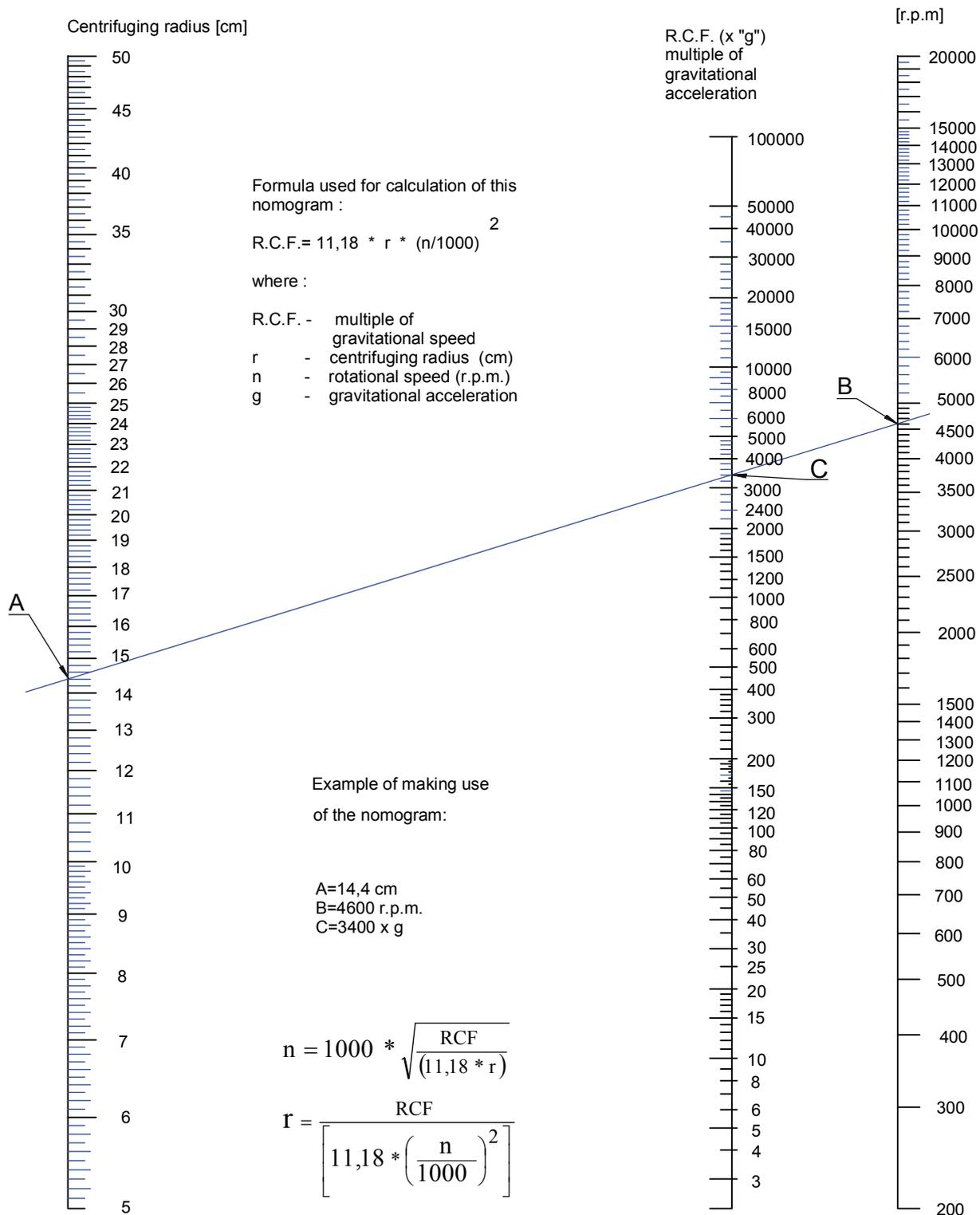
In the case of e.g. mains failure it is possible to open the cover by hand. On the left side of the casing there is lock witch it is necessary to turn to the right with the coin or the flat screwdriver to the moment unblocking cover.



The cover can be unlock and opened only when the rotor is in the rest state.

9.2. Work safety inspection.

It is necessary for safety reason to inspection the centrifuge carried out by the authorized service at least once a year after the period of warranty. The reason for more frequent inspections could be corrosion inducing environment. Examinations should end with issuing "Report of validation, the check on the technical state of the laboratory centrifuge". Is being recommended to establish "Technical passport" or "Log of the apparatus", whom



Drawing No. 5 – Nomogram.

13. Short Operating Instruction

IMPORTANT!!!

One should to take special attention for points described in detail Operating Instruction.

1. Put on the centrifuge on the stable table with flat leveled top. Ensure protective zone around the centrifuge with at least 30 cm left free (see at p. 3.2 Operating Instruction).
2. Check on rating plate correctness of the voltage and power frequency.
3. Plug in the power cord to plug-in socket located on the back wall of the centrifuge.
4. Plug in the plug of power cord to main socket.
5. Turn on the supply pushing power switch located on the back wall.
6. Open the cover.
7. Take the transport's protective insert off the motor.
8. Mount the motor according to detailed Operating Instruction.
9. Introducing the operational parameters (Programming).

Select the program number pressing one of the keys with number from 1÷9.

If the number is binary, one should to press twice the ▲ key – two horizontal dash will occur on the display – then choose the required program number with keys within range from 1÷9.

On display will display the accel/decel characteristic symbol with set the program number, press the **PROG/MEMO** key – message **PARAM PRG EDIT** occurs on the display.

Press the ▲ key – message **ROTOR** occurs on the display. Then pressing the 4⁻ or 6⁺ key search the **rotor number**, which will be use. The number is placed on rotor.

Press the ▲ key – message **SPEED** occurs on the display. Pressing the 4⁻ or 6⁺ key set required **rotational speed**.

Press the ▲ key – message **RCF** occurs on the display, and value which result from required speed. Set required **RCF** pressing the 4⁻ or 6⁺ key.

NOTE! Entering the value of RCF – the speed establishes automatically, and by analogy, setting speed the value of RCF enters automatically.

Press the ▲ key – message **ELAPS** occurs on the display – pressing the 4⁻ or 6⁺ key set required **operation time** in minutes within the range from 0 to 99 min.

Press the ▲ key – message **__ SEC** occurs on the display – pressing the 4⁻ or 6⁺ key set required **operation time** specifying the measuring value in seconds (e.g. 54 min, 32 s).

Press the ▲ key – message **ACCEL** occurs on the display – pressing the 4⁻ or 6⁺ key – search required **acceleration characteristic** within the range from 0 to 9.

Press the ▲ key – message **DECEL** occurs on the display – pressing the 4⁻ or 6⁺ key – search required **deceleration characteristic** within the range from 0 to 9.

Press the ▲ key – message **BEGIN** occurs on the display – pressing the 4⁻ or 6⁺ key – set the start moment of time counting:

begin start On = from the moment pressing the **START** key;

begin speed Up = from the moment of reaching the setting rotational speed.

Press the ▲ key – message **AUTO COVER** occurs on the display – pressing the 4⁻ or 6⁺ key – set **ON** or **OFF**

Press the ▲ key – message **T° C** occurs on the display – pressing the 4⁻ or 6⁺ key – set the temperature value.

Press the ▲ key – message **COOL AFTER** occurs on the display – pressing the 4⁻ or 6⁺ key – set **ON** or **OFF**.

Recording into memory the set program will be done by pressing the **PROG/MEMO** key.

The program stays in memory. Once more switching the centrifuge on will displayed recently realized program. It is possible select the other program pressing its number on keyboard.

10. Starting of the centrifuge:

- a. Close the cover.
- b. Press the **START** key.
- c. After ending of centrifuging open the cover by **COVER** key.
- d. Take the centrifuged preparation out.

- parameters. Close the centrifuge cover.
- Start the centrifuge pressing “Start” key.
 - When the centrifuge recognize the rotor, the first part of the report with pre-selected parameters (PROGRAM DATA) is automatically printed (if centrifuge is directly connected to the serial interface printer) or displayed on the computer screen.

selected program number:	MEMO	7
rotor number:	ROTOR	11457
rotational speed:	SPEED	9000 RPM
pre selection of time:	TIME	13 MIN 14 SEC
temperature	TEMPERATURE	+4C DEG
acceleration characteristic:	ACCELERATION	0
deceleration characteristic:	DECELERATION	0
moment when time counting begins:	BEGIN AT	START ON

- When the centrifugation cycle is finished the achieved parameters (ACHIEVED DATA) and the remaining part of report are printed or displayed on the screen:

properly performed program:	END CYCLE: OK	0
achieved parameters:	ACHIEVED DATA:	
rotational speed:	SPEED	9000 RPM
centrifugation time:	TIME	13 MIN 14 SEC
temperature	TEMPERATURE	+4C DEG

and blank space provided for user write out.

14.3.2. Information about errors, during centrifuging, added to the report.

- In case of the interruption of the centrifugation cycle instead of the command “END CYCLE: OK” the command: “END CYCLE: FAIL” plus error number and the achieved parameters are printed or displayed on the screen.

Error types:

- interrupting centrifugation program by pressing “STOP” button.
error number: “FAIL 3” and description: “STOP”;
- interrupting centrifugation program by imbalance sensor switching on.
error number: “FAIL 2” and description: “UNBALANCE”;

14.3.3. Date and time of centrifuging.

- Real date and time for the thermal printer is set up by the manufacturer for his local time.
- In case of printing incorrect date and time one should connect printer directly to the PC computer and using installation software program (CD delivered with the printer) adjust proper date and time.

14.4. Obtaining Centrifugation Parameters Protocol by computer.

Report can be obtained by connecting centrifuge directly to the computer.

14.4.1. Obtaining printouts.

To print out the report follow the steps set forth bellow:

- Connect the centrifuge directly to the computer serial interface RS 232 with the cable (RS 232) provided as accessory of Assembly for recording of working parameters through RS 232 port (see Fig. 3.). Socket is situated at the back of the centrifuge.

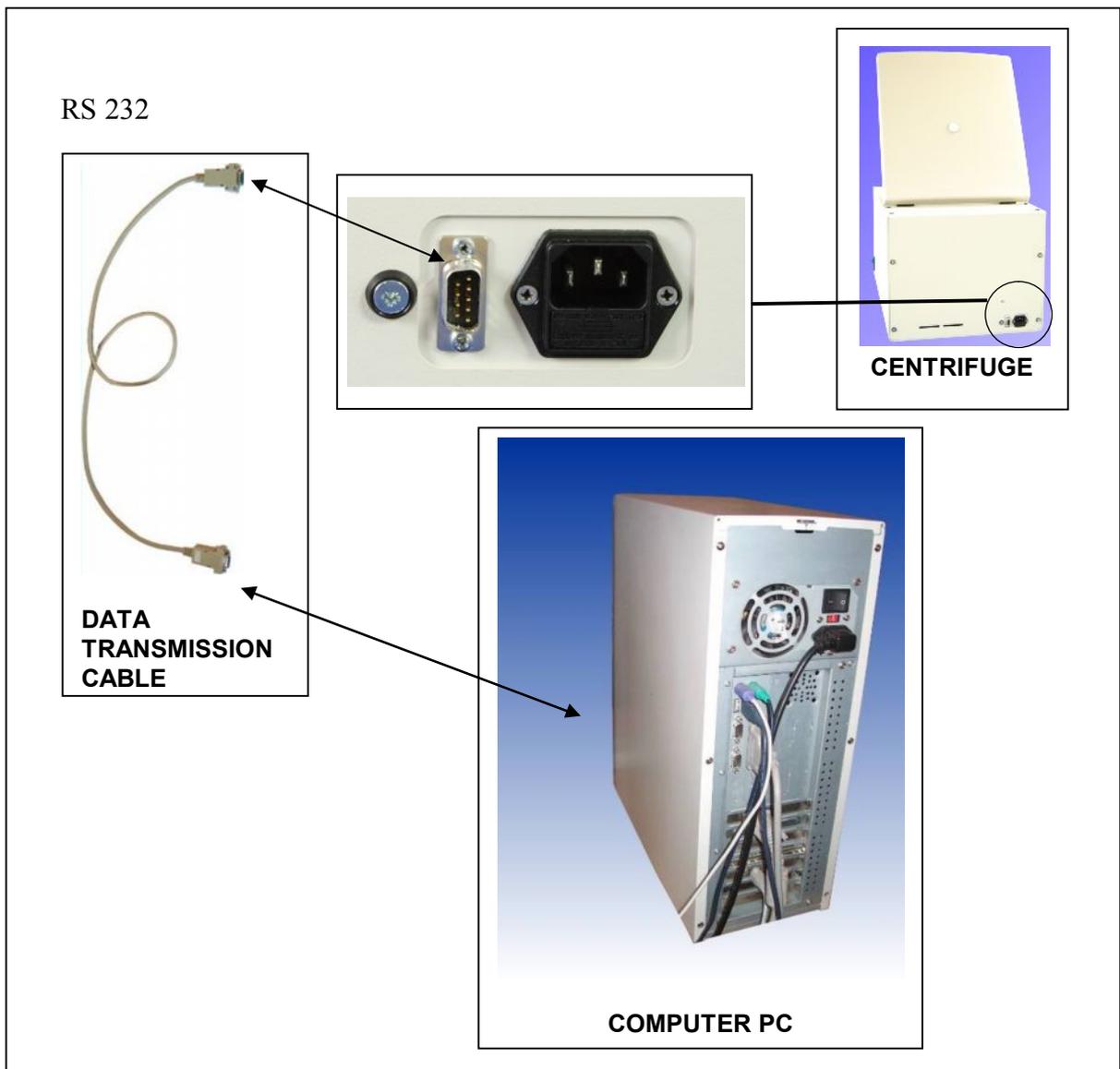


Fig.3. Connecting computer to the centrifuge.

- Prepare the centrifuge for the centrifugation. Program the necessary parameters. Close the centrifuge cover.
- In case of connecting the centrifuge to the computer, download the suitable installation program,

e.g.: Norton Commander – Term 95 (DOS)

CRT 5.5.2 (Windows Vista, 2003, XP, 2000) – Program available for purchase at www.vandyke.com

Transmission parameters send out of the centrifuge are constant and the following:

9600,8,n,1

Bound rate = 9600

Parity = none

Stop bit = 1

Data length = 8

- Start the centrifuge pressing **START** key.
- Report content is in accordance with sections: 14.2.; 14.3.1.; 14.3.2.
- The complete report displayed on the screen can be saved, printed out by means of any printer or transferred to the word processor e.g. : Word, Excel, filled in and then printed.

15. Table of chemical resistance to the interaction of various categories of reagents of plastics

Groups of the substance in temp. 20°C	PS	SAN	PMMA	PC	PCV	POM	PE-LD	PE-HD	PP	PMP	ECTFE ETFE	PTFE FEP PFA	FKM	EPDM	NR	SI
Aldehydes	-	-	o	o	-	o	-	+	+	o	+	+	+	+	o	o
Cyclic alcohols	+	+	+	+	+	+	+	+	+	+	+	+	-	+	+	+
Esters	-	-	-	-	-	-	+	o	o	o	+	+	-	o	o	o
Ether	-	-	-	-	-	+	+	o	o	-	+	+	-	-	-	-
Ketones	-	-	-	-	-	+	o	o	o	o	o	+	-	o	-	-
Strong or concentrated acids	o	-	-	-	+	-	+	+	+	+	+	+		+	-	-
Weak or diluted acids	o	o	o	o	+	-	+	+	+	+	+	+	+	+	o	o
Oxidizing acids or oxidizing substances	-	-	-	-	-	-	-	-	-	-	+	+	o	o	-	-
cyclic hydrocarbons	-	-	o	o	+	+	+	+	+	o	+	+	o	-	-	-
Ahs	-	-	-	-	-	+	+	o	o	-	+	+	o	-	-	-
Haloid hydrocarbons	-	-	-	-	-	+	+	o	o	-	+	+	o	-	-	-
Alkalis	+	+	-	-	+	+	+	+	+	+	+	+	o	+	+	o

+ = very good chemical resistance

Permanent action of the substance isn't causing damage through 30 days. The material is able to be resistant through years.

o = chemical resistance of good to limited

Continuous action of the substance is causing insignificant damage through the period of 7-30 days, partly reversible (e.g. puffing up, softening, reduced mechanical durability, discoloring).

- = limited chemical resistance

The material isn't able to have the continuous contact with the substance. The immediate occurrence of damage is possible (e.g. the loss of mechanical durability, the deformation, discoloring, bursting, dissolving).

Abbreviations of names of characterized plastics

PS: Polystyrene

SAN: Styrene-acrylonitrile

PMMA: Polymethyl methacrylate

PC: Polycarbon

PVC: Polyvinyl chloride

POM: Acetal polyoxymethylenel

PE-LD: Low density polyethylene

PE-HD: High density polyethylene

PP: Polypropylene

PMP: Polymethylpentene

ECTFE: Ethylene/chlorotrifluoroethylene

ETFE: Ethylene/tetrafluoroethylene

PTFE: Polytetrafluoroethylene

FEP: Tetrafluoroethylene/perfluoropropylene

PFA: Tetrafluoroethylene/perfluoroalkylvinylether

FKM: Fluorcarbon rubber

EPDM: Ethylene propylene diene

NR: Natural rubber

SI: Silicon rubber

