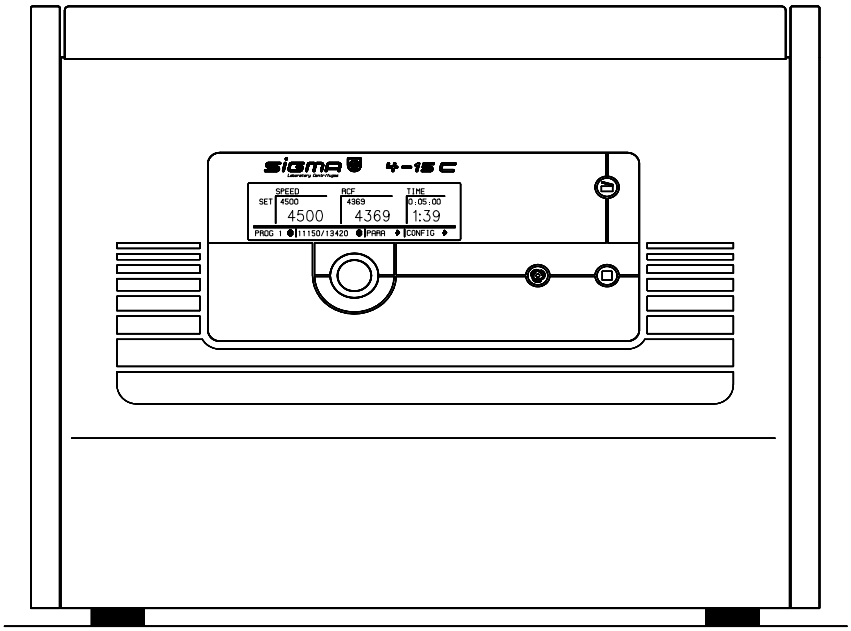
sigma®



Centrifuge

4-15C
Operating Manual

Dear customer,

Congratulations for purchasing a SIGMA laboratory centrifuge. You have selected a device which combines many advantages.

A wide spectrum of programming options and an electronic operation control allow a trouble-free use of the centrifuge. With its 3-phase drive, maintenance-free, quiet operation without any carbon dust pollution is guaranteed.

Your device is equipped with user-friendly options which make the operation and standard settings easier for you. Built-in error-detecting functions keep the user from entering incorrect values and check the complete operation.

A special advantage is the storage capacity the centrifuge offers. The instrument has a program memory which can store up to 50 data sets and is capable of keeping the last run program in its memory for an unlimited amount of time allowing the program to be restarted at any time - even if the centrifuge was turned off in between. All important operation parameters can be seen at a glance.

The settings are executed via the knob in the control panel which has a coated surface protecting the device against moisture and dust. In addition, the interior of the centrifuge is also easy to clean. We are able to offer you a device that combines functional variety with practical applications.

We thank you for your confidence and wish you a successful application of the centrifuge.

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Konformitätserklärung

(73/23/EWG; 89/336/EWG; 98/37/EWG)

Statement of Conformity

(73/23/CEE; 89/336/CEE; 98/37/CEE)

Déclaration de conformité

(73/23/CEE; 89/336/CEE; 98/37/CEE)

Die nachfolgend bezeichnete Maschine wurde in Übereinstimmung mit den Richtlinien 73/23/EWG; 89/336/EWG und 98/37/EWG hergestellt und geprüft.
The following machine is manufactured and tested in compliance with directions 73/23/CEE; 89/336/CEE and 98/37/CEE.
La machine désignée ci-dessous est produit et examiné conforme aux directives 73/23/CEE; 89/336/CEE et 98/37/CEE

Bezeichnung der Maschine: Machine: Désignation de la machine:	Laborzentrifuge Laboratory Centrifuge Centrifugeuse de laboratoire
Maschinentyp : Type: Type de la machine:	4 - 15
Bestell Nr. : Part No.: Réf. usine:	10750, 10751, 10752, 10753, 10730, 10731, 10732 10733
Normen: Standards: Normes :	EN 61010-2-020 EN 61000-3-2 ; EN 61000-3-3 EN 61326

Sigma Laborzentrifugen
An der Unteren Söse 50
D-37520 Osterode

01.02.2002 Geschäftsführer
Managing Director
Directeur Gérant

.....
Fabr. Nr. Serial No. Numéro de fabrique

General Information

Description of the Centrifuge

Installation and Start-up

Operating Elements

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5.1.1 Selection and alteration of the parameters and activation of the start delay and the automatic lid opening after end of run
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6.1.1 Load a program
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Notes for Centrifugation

Care and Maintenance

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1.1 Technical Data

Manufactuer:	S I G M A Laborzentrifugen GmbH D-37520 Osterode Germany
Type:	4-15C
Electr. connection: Protection class:	see nameplate I
Power consumption (kVA): Rated power (kW): Max. current (A):	1,5 1,2 6,5 (230 V/50 Hz) respectively 13,0 (120 V/60 Hz)
Power data:	
Max. speed (rpm): Max. capacity (l): Max. gravitational field (x g): Max. kin. energy (Nm):	13 500 2 20 376 50 487
Further parameters	
Time range: Programs: Acceleration curves: Deceleration curves: Radius: Rotor part no.:	9 h, 59 min/continuous operation 50 No. 1 - 50 10 linear No. 0 - 9 10 quadratic No. 10 - 19 10 freely programmable No. 20 - 29 9 linear No. 1 - 9 1 brakeless No. 0 10 quadratic No. 10 - 19 10 freely programmable No. 20 – 29 max./min. s. 1.2 s. chapter 1.2
Dimensions:	
Depth (mm): Width (mm): Height (mm): Weight (kg): EMC (acc. to EN 55011): Noise level (dBA):	685 490 405 82 kg Class B 75 (at max. speed)
Notes of user: Serial number: Supply date: Inventory number: Location: Responsibility:	 ....

The figures are valid for an ambient temperature of 23 °C +/- 2 °C and nominal voltage +/- 5 %.
(Allowable ambient temperature +4 °C - +40 °C; max. humidity 80 %.)
Subject to technical alterations.

1.2 Accessories Suitable for SIGMA 4-15C

Part No.	Description	Max. speed (rpm)	Max. gravitational field (x g)
11150	Swing-out rotor for 4 buckets 13215, 13220, 13221, 13231, 13234, 13235, 13236, 13350		
13220	Bucket , aluminium, for microtitre plates, max. allowed data with rotor 11150: radius edge 16.6 cm, radius max. 16.0 cm, radius min. 11.3 cm, max. plate height 54 mm	4 100	3 120 3 007 2 124
13221	Bucket , aluminium, for microtitre plates, max. allowed data with rotor 11150: radius edge 16.6 cm, radius max. 16.0 cm, radius min. 10.0 cm, max. plate height 56 mm, incl. plate holder 17979	4 500	3 758 3 622 2 264
13231	Bucket, aluminium, for 1 pointed bottom bottle 150 or 200 ml e.g. 15175, approx. Ø 61.5 x 140 mm, incl. adapter 13175, suitable for 11150, max. radius 19.0 cm, min. radius 8.7 cm,	4 500	4 302
13175	Adapter for pointed bottom bottle 15175, suitable for 13231, 17347		
13233	Bucket, aluminium, for 50 RIA-tubes Ø 12.5 x 70 - 90 mm, e.g. 15060, suitable for 11150		
13234	Bucket, aluminium, for 4 tubes 100 ml, Ø 45 x 100 mm, e.g. 15100, 15102, 15103, 15106, incl. rubber cushion 16051, suitable for 11150, max. radius 17.8 cm, min. radius 7.8 cm	4 300	3 680
13235	Bucket, aluminium, for 7 culture tubes 50 ml 15151, suitable for 11150, max. radius 19.0 cm, min. radius 9.3 cm	4 500	4 302

Part No.	Description	Max. speed (rpm)	Max. gravitational field (x g)
13236	Bucket, aluminium, for 12 culture tubes 15 ml 15115, suitable for 11150, max. radius 18.8 cm, min. radius 9.6 cm	4 500	4 246
13350	Round bucket, aluminium, with thread, incl. O-ring 482840, for the 500 ml bottles 15500, 15501 and for the round carriers Æ 85 mm 17350 up to 17402, sealable with caps 17134, 17135, suitable for 11150, max. radius 19.0 cm, min. radius 8.7 cm	4 500	4 302
17134	Aluminium sealing cap for 13350		
17135	Polysulfone sealing cap, clear, for 13350		
17350	Round carrier for 24 reaction vials 0.5-0.75 ml, Æ 7.9/10 x 28/31 mm, e.g. 15005, polypropylene		
17351	Round carrier for 12 Monovettes, max. Æ 15.5/18 x 50 - 75 mm, polypropylene		
17352	Round carrier for 25 RIA-tubes 5 ml, max. Æ 12.5 x 65 - 80 mm, e.g. 15060, polypropylene		
17353	Round carrier for 16 reaction vials 1.5-2.2 ml, max. Æ 11 mm, e.g. 15008, 15040, polypropylene		
17354	Round carrier for 16 glass tubes 7 ml, max. Æ 12.5 x 85 - 115 mm, e.g. 15007, 15027, polypropylene		
17355	Round carrier for 12 tubes with screw cap 10-12 ml, max. Æ 16.2/19 x 65 x 90 mm, e.g. 13026 plus 17126, 15000, 15010, 15039, polypropylene		
17356	Round carrier for 16 Vacutainer/hemolyse/ RIA-tubes 5-6 ml, max. Æ 13.5/17.5 x 70 - 90 mm, polypropylene		

Part No.	Description	Max. speed (rpm)	Max. gravitational field (x g)
17358	Round carrier for 12 tubes 10-15 ml, max. Æ 17.2/19.5 x 90 - 115 mm, e.g. 15015, 15020, 15022, 15023, 15024 and Monovettes 9 ml and 10 ml, polypropylene		
17359	Round carrier for 9 culture tubes 15 ml, max. Æ cap 23 mm, e.g. 15115, Greiner or Corning tubes, polypropylene		
17360	Round carrier for 10 culture tubes 15 ml, max. Æ cap 22 mm, e.g. 15115, Greiner or Corning tubes, polypropylene		
17362	Round carrier for 5 sterilin tubes 30 ml, graduated up to 20 ml, with skirt, incl. cap, max. Æ 25/31 x 65 - 95 mm, polypropylene, see www.bibby-sterilin.co.uk, no. 03008		
17370	Round carrier for 5 tubes 25-30 ml, max. Æ 25.4/29 x 85 - 115 mm, e.g. 15025, 15026, 15029, 15030, 15032, 15033, polypropylene		
17375	Round carrier for 3 tubes 50 ml, max. Æ 35/38 x 90 - 110 mm, e.g. 15049, 15050, 15056, polypropylene		
17376	Round carrier for 4 tubes with screw cap 40-50 ml, max. Æ 29/34 x 85 - 110 mm, e.g. 13055 plus 17054, 15051, 15052, 15054, polypropylene		
17377	Round carrier for 4 culture tubes 50 ml 15151, polypropylene		
17378	Round carrier for 4 culture tubes 50 ml with skirt, polypropylene		
17385	Round carrier for 1 tube with screw cap 78-85 ml, max. Æ 38/40 x 85 - 115 mm, e.g. 13085 plus 17185, 15074, 15075, 15076, 15080, polypropylene		

Part No.	Description	Max. speed (rpm)	Max. gravitational field (x g)
17390	Round carrier incl. rubber cushion 16051 for 1 tube 100 ml, max. Æ 45/50 x 85 - 110 mm, e.g. 15100, 15102, 15103, 15106, polypropylene		
17395	Round carrier for 1 bottle with screw cap 125 ml, max. Æ 51 x 90 - 115 mm, e.g. 15125, polypropylene		
17400	Round carrier for 1 bottle with screw cap 200 ml, max. Æ 57 x 90 - 115 mm, e.g. 15202, 15203, polypropylene		
17401	Round carrier incl. rubber cushion 16250 for 1 round bottom tube 175-250 ml, max. Æ 57.5 x 90 - 137 mm, e.g. 15201, 15206, 15250, 15251, 15254, polypropylene		
17402	Round carrier for 1 tube with pointed bottom 150-250 ml, max. Ø 60 x 120 - 140 mm, polypropylene		
17347	Round carrier for 1 bottle with screw cap 250 ml, max. Ø 61.5 x 90 - 125 mm, e.g. 13255, 15247, 15248, 15249 and for 15175 with adapter 13175 (suitable for bucket 13350 without screw cap 17135), polypropylene		
13215	Rectangular bucket, aluminium, sealable with cap 17112, for the system of rectangular carriers, max. tube length 115 mm, suitable for rotor 11150, max. radius 18.2 cm, min. radius 8.8 cm	4 500	4 120
11156	Swing-out rotor for 6 buckets for the following accessories,		
	data with 13115: max. radius 18.2 cm, min. radius 9.5 cm	4 500	4 120
	data with 13127: max. radius 19.1 cm, min. radius 9.7 cm	4 500	4 324
11140	Swing-out rotor for 4 buckets for the following accessories	5 000	4 668/4 416

Part No.	Description	Max. speed (rpm)	Max. gravitational field (x g)
13115	Rectangular bucket, aluminium, suitable for the system of rectangular carriers, max. tube length 110 mm	5 000	4 416
13127	Rectangular bucket, aluminium, incl. polysulfone sealing cap 17112, suitable for the system of rectangular carriers, max. tube length 115 mm	5 000	4 668
18000	Rectangular carrier, undrilled, for tubes 85 - 110 mm, polyallomer		
18002	Rectangular carrier for 20 reaction vials 1.5-2.2 ml, max. Æ 11 mm, e.g. 15008, 15040, polypropylene		
18003	Upper part for 18002 for 20 reaction vials 1.5-2.2 ml, max. Æ 11 mm, e.g. 15008, 15040 (can be used together with 18002), polypropylene		
18005	Rectangular carrier for 20 RIA-tubes 5 ml, max. Æ 12.2 x 60 - 75 mm, flat and round bottom, e.g. 15060, polyallomer		
18007	Rectangular carrier for 20 glass tubes 7 ml, max. Æ 12.3 x 80 - 105 mm, flat and round bottom, e.g. 15007, 15027, polyallomer		
18009	Rectangular carrier for 20 hemolyse tubes, max. Æ 12.8 x 70 - 90 mm, polypropylene		
18010	Rectangular carrier for 12 tubes with screw cap 10-12 ml, max. Æ 16.8/17.5 x 60 - 85 mm, e.g. 13026 plus 17126, 15000, 15010, 15039, polyallomer		
18012	Rectangular carrier for 12 Vacutainer-tubes Æ 13.5/18 x 65 - 90 mm, polypropylene		
18015	Rectangular carrier for 12 tubes 10-15 ml, max. Æ 17 x 90 - 105 mm, e.g. 15015, 15020, 15022, 15023, 15024, polyallomer		

Part No.	Description	Max. speed (rpm)	Max. gravitational field (x g)
18016	Rectangular carrier for 4 culture tubes 15 ml 15115, polypropylene		
18017	Rectangular carrier for 10 tubes 15 ml and tubes with cap, max. Æ 17.2/18 x 80 - 112 mm, e.g. Monovettes 9 ml and 10 ml, polypropylene		
18025	Rectangular carrier for 5 glass tubes 25 ml, max. Æ 24 x 85 - 105 mm, e.g. 15025, 15026, polyallomer		
18022	Rectangular carrier for 4 sterilin tubes 30 ml, graduated up to 20 ml, with skirt, incl. cap, max. Æ 25/31 x 65 - 95 mm, polypropylene, see www.bibby-sterilin.co.uk, no. 03008		
18030	Rectangular carrier for 5 tubes with screw cap 27-30 ml, max. Æ 25.4/27.5 x 80 - 110 mm, e.g. 15029, 15030, 15032, polypropylene		
18050	Rectangular carrier for 2 tubes 50 ml, max. Æ 35/38 x 85 - 110 mm, e.g. 15049, 15050, 15056, polyallomer		
18051	Rectangular carrier for 2 tubes with screw cap 40-50 ml, max. Æ 29/35 x 80 - 110 mm, e.g. 13055 plus 17054, 15051, 15052, 15054, polypropylene		
18052	Rectangular carrier for 2 culture tubes 50 ml 15151, polypropylene		
18053	Rectangular carrier for 2 culture tubes 50 ml with skirt, max. Æ 29.5/38 x 85 - 118 mm, polypropylene		
18085	Rectangular carrier for 1 tube with screw cap 78-85 ml, max. Æ 38/40 x 85 - 112 mm, e.g. 13085 plus 17185, 15074, 15075, 15076, 15080, polyallomer		

Part No.	Description	Max. speed (rpm)	Max. gravitational field (x g)
18100	Rectangular carrier for 1 tube 100 ml, max. Æ 45.5/48 x 85 - 110 mm, e.g. 15100, 15102, 15103, 15106, polyallomer		
18105	Rectangular carrier for 20 RIA-tubes 5 ml, max. Æ 12.2 x 60 - 75 mm, flat and round bottom, e.g. 15060, decantable, polyallomer		
18107	Rectangular carrier for 20 glass tubes 7 ml, max. Æ 12.3 x 80 - 105 mm, flat and round bottom, e.g. 15007, 15027, decantable, polyallomer		
18115	Rectangular carrier for 12 tubes 10-15 ml, max. Æ 17 x 90 - 105 mm, e.g. 15015, 15020, 15022, 15023, 15024, decantable, polyallomer		
18125	Rectangular carrier for 1 bottle with screw cap 125 ml, max. Æ 51 x 90 - 115 mm, e.g. 15125, polypropylene		
18200	Rectangular carrier for 1 bottle with screw cap 200 ml, max. Æ 57 x 90 - 115 mm, e.g. 15202, 15203, polypropylene		
13201	Round bucket for 1 glass tube 200 ml 15201, 15206, incl. rubber cushion 16250, sealable with aluminium cap 17121		
11141	Swing-out rotor 48 x 15 ml complete, consisting of rotor 11140, 4 rectangular buckets 13115, 4 carriers 18015 and 48 polystyrene tubes 15020, max. radius 15.7 cm, min. radius 6.1 cm	5 000	4 416
11157	Swing-out rotor 72 x 15 ml complete, consisting of rotor 11156, 6 rectangular buckets 13115, 6 carriers 18015 and 72 polystyrene tubes 15020, max. radius 18.2 cm, min. radius 9.5 cm	4 500	4 120

Part No.	Description	Max. speed (rpm)	Max. gravitational field (x g)
11144	Swing-out rotor for microtiter plates, incl. 2 buckets 13145 and plate holder 17977, radius edge 12.85 cm, radius max. 10.7 cm radius min. 6.3 cm, max. plate height 64 mm	5 000	3 592 2 991 1 761
11118	Swing-out rotor for microtiter plates, incl. 2 buckets 13218 and plate holder 17978, radius edge 15.15 cm, radius max. 13.8 cm radius min. 5.8 cm, max. plate height 80 mm, buckets sealable with cap 17108	5 500	5 124 4 667 1 961
17108	Rectangular sealing cap, polysulfone, clear, incl. 4 clips 17118, for bucket 13218		
17978	Plate holder for bucket 13218		
12165	Angle rotor 6 x 78-85 ml for sealed tubes, e.g. 13085 plus 17185, 15074, 15075, 15076, 15080, incl. hermetic aluminium lid, max. radius 9.8 cm, min. radius 2.7 cm, angle 25°	12 500	17 119
12166	Angle rotor 8 x 40-50 ml for sealed tubes, e.g. 13055 plus 17054, 15051, 15052, 15054, incl. hermetic aluminium lid, max. radius 9.6 cm, min. radius 3.3 cm, angle 25°	12 500	16 770
12172	Angle rotor 12 x 27-30 ml for sealed tubes, e.g. 15029, 15030, 15032, incl. hermetic aluminium lid, max. radius 11.0 cm, min. radius 5.1 cm, angle 30°	12 500	19 216
12168	Angle rotor 20 x 10-12 ml for sealed tubes, e.g. 13026 plus 17126, 15000, 15010, 15039, incl. hermetic aluminium lid, max. radius 9.8 cm, min. radius 5.8 cm, angle 25°	12 500	17 119
12130	Angle rotor 30 x 1.5-2.2 ml for reaction vials, e.g. 15008, 15040, incl. hermetic aluminium lid, max. radius 10.0 cm, min. radius 6.7 cm, angle 45°	13 500	20 376

Part No.	Description	Max. speed (rpm)	Max. gravitational field (x g)
11148	Swing-out rotor 32 x 1.5-2.2 ml, incl. 8 buckets, for reaction vials, e.g. 15008, 15040, incl. hermetic aluminium lid, max. radius 8.4 cm, min. radius 4.4 cm	12 000	13 523
12200	Angle rotor 100 x 1.5-2.2 ml for reaction vials, e.g. 15008, 15040, incl. aluminium lid 17824, 2 lines, max. radius 16.3/15.18 cm, min. radius 13.11/11.9 cm	9 000	14 761/13 747
12169	Angle rotor for 8 culture tubes 50 ml, e.g. 15151, incl. hermetic aluminium lid, max. radius 10.4 cm, min. radius 4.3 cm, angle 25°	12 500	18 168
13060	Adapter for 1 culture tube 15 ml 15115, suitable for 12169, polypropylene		
12170	Angle rotor for 12 culture tubes 15 ml, e.g. 15115, incl. hermetic aluminium lid, max. radius 10.0 cm, min. radius 4.6 cm, angle 25°	12 500	17 469
12256	Angle rotor for 6 bottles 250 ml, e.g. 13255, 15247, 15249, incl. aluminium lid 17801, max. radius 14.5 cm, min. radius 3.9 cm, angle 30°	8 000	10 375

Adapters, tubes and steel tubes

13000	Adapter , POM, for reaction vials 0.25-0.4 ml 15014, suitable for 11148, 12130, 12200, 17353, 18002, 18003
13002	Adapter, POM, for reaction vials 0.5-0.75 ml, 15005, Æ 7.9/10 x 28/31 mm suitable for 11148, 12130, 12200, 17353, 18002, 18003
13021	Adapter for PCR-tube 0.2 ml, Ø 5.85/6.95 x 20/23.4 mm, suitable for 11148, 12130, 12200, 17353, 18002, 18003

Part No.	Description
13079	Bottom adapter for 1 tube 40-42 ml 15051, 15052, 15054, suitable for 12169, polypropylene
13080	Adapter for 1 culture tube 50 ml 15151, suitable for 12165, polypropylene
13081	Adapter for 1 culture tube 15 ml 15115, suitable for 12165, polypropylene
13082	Adapter for 1 tube 40-50 ml, max. Æ 28.8 x 105 - 110 mm, e.g. 13055, 15051, 15052, 15054, suitable for 12165, polypropylene
13083	Adapter for 1 tube 27-30 ml, max. Æ 25.5 x 90 - 110 mm, e.g. 15029, 15030, 15032, suitable for 12165, polypropylene
13084	Adapter for 2 tubes 10-12 ml, max. Æ 16/17.5 x 75 x 90 mm, e.g. 15000, 15010, 15039, suitable for 12165, polypropylene
15005	Reaction vials 0.5 ml, Æ 7.9/10 x 28/31 mm, 1 pack contains 100 pcs., suitable for 13002, 17350
15008	Reaction vials 1.5 ml, 1 pack contains 100 pcs., suitable for 11148, 12130, 12200, 17353, 18002, 18003
15040	Reaction vials 2.2 ml, 1 pack contains 100 pcs., suitable for 11148, 12130, 12200, 17353, 18002, 18003
15014	Reaction vials 0.4 ml (Beckman system), polypropylene, 1 pack contains 100 pcs., suitable for 13000
15060	Polystyrene tube 5 ml (RIA-tube), Æ 12 x 75 mm, suitable for 13233, 17352, 17356, 18005, 18009, 18105
13026	Stainless steel tube 10 ml, Æ 15.7 x 76 mm, closeable with cap 17126, suitable for 12168, 17355, 18010

Part No.	Description
17126	Stainless steel sealing cap for 13026
15000	Teflon tube with screw cap 12 ml, Æ 16.1 x 81.1 mm, suitable for 12168, 13084, 17355, 18010
15010	ditto, polycarbonate
15039	ditto, polypropylene
15020	Polystyrene tube 15 ml, Æ 17 x 100 mm, suitable for 17358, 18015, 18115
15021	Polypropylene stopper for 15020, 15023
15023	Polypropylene tube 15 ml, Æ 17 x 100 mm, suitable for 17358, 18015, 18115
15115	Falcon tube with screw cap 15 ml, pointed bottom, polypropylene, suitable for 12170, 13060, 13081, 13236, 17359, 17360, 18016
15029	Teflon tube with screw cap 28 ml, Æ 25.3 x 96 mm, suitable for 12172, 13083, 17370, 18030
15030	Polycarbonate tube with screw cap 30 ml, Æ 25.3 x 98 mm, suitable for 12172, 13083, 17370, 18030
15032	Polypropylene tube with screw cap 27 ml, Æ 25.3 x 97 mm, suitable for 12172, 13083, 17370, 18030
15049	Polycarbonate tube 50 ml, Æ 34 x 100 mm, graduated 0 - 50 ml in steps of 1 ml, suitable for 17375, 18050
13055	Stainless steel tube 50 ml, sealable with cap 17054, Æ 29 x 101.5 mm, suitable for 12166, 13082, 17376, 18051
17054	Stainless steel sealing cap for 13055

Part No.	Description
15051	Teflon tube with screw cap 42 ml, Æ 28.5 x 107 mm, suitable for 12166, 13082, 17376, 18051
15052	Polypropylene tube with screw cap 42 ml, Æ 28.8 x 107 mm, suitable for 12166, 13082, 17376, 18051
15054	Polycarbonate tube with screw cap 40 ml, Æ 28.8 x 107 mm, suitable for 12166, 13082, 17376, 18051
15151	Culture tube with screw cap 50 ml, pointed bottom, polypropylene, suitable for 12169, 13080, 13235, 17377, 18052
13085	Stainless steel tube 85 ml, sealable with cap 17185, Æ 38/40 x 100/107 mm, suitable for 12165, 17385, 18085
17185	Stainless steel sealing cap for 13085
15074	Polycarbonate tube with special screw cap made of aluminium with seal for high speeds 72 ml, Æ 38 x 109 mm, suitable for 12165, 17385, 18085
15075	Polycarbonate tube with screw cap 82 ml, Æ 38 x 112 mm, suitable for 12165, 17385, 18085
15076	Polypropylene tube with screw cap 78 ml, Æ 38 x 112 mm, suitable for 12165, 17385, 18085
15080	Polyflor tube with screw cap 81 ml, Æ 38 x 112 mm, suitable for 12165, 17385, 18085
15102	Polypropylene tube 100 ml, Æ 45 x 100 mm, suitable for 13234. 17390, 18100
15103	ditto, polycarbonate, graduated 2 - 100 ml in steps of 2 ml
15125	Polypropylene bottle with screw cap 125 ml, Æ 51 x 99 mm, suitable for 17395, 18125

Part No.	Description
15175	Polypropylene bottle with pointed bottom 200 ml, Ø 61.5 x 139 mm, graduated up to 175 ml (N-3143-0175), suitable for 13231 with 13175, 17347 with 13175
15202	Polypropylene bottle with screw cap 190 ml, Æ 56 x 112 mm, suitable for 17400, 18200
15203	Polycarbonate bottle with screw cap 200 ml, Æ 56 x 113 mm, suitable for 17400, 18200
13255	Stainless steel bottle 250 ml, sealable with cap 17256, Ø 61.4 x 125 mm, suitable for 12256, 17347
17256	Stainless steel sealing cap for 13255
15247	Teflon bottle with screw cap 250 ml, Ø 61.4 x 122 mm, suitable for 12256, 17347
15248	Polycarbonate bottle with screw cap 250 ml, Ø 61.4 x 125 mm, suitable for 12256, 17347
15249	ditto, polypropylene
15500	Polycarbonate bottle 500 ml, incl. screw cap, Ø 85 x 135 mm, suitable for 13350
15501	ditto, polypropylene

Glass tubes

15007	Glass tube 7 ml, Æ 12 x 100 mm, suitable for 17354, 18007, 18107
15027	ditto, graduated 0 - 5.5 ml in steps of 0.1 ml
15015	Glass tube 10 - 12 ml, Æ 16 x 100 mm, suitable for 17358, 18015, 18115
15024	ditto, graduated 0 - 10 ml in steps of 0.1 ml

Part No.	Description
15022	Special glass tube 15 ml, Æ 17 x 110 mm, suitable for 12166 with 16018 and for 12165, with 16019, max. permitted speed 7 000 rpm
15025	Glass tube 25 ml, Æ 24 x 100 mm, suitable for 17365, 18025
15026	ditto, graduated 5 - 25 ml in steps of 1 ml
15033	Special glass tube 30 ml, Æ 24 x 105 mm, suitable for 12166 with 16030 and for 12165 with 16031, max. permitted speed 7 000 rpm
15050	Glass tube 50 ml, Æ 34 x 100 ml, suitable for 17375, 18050
15056	ditto, graduated 4 - 50 ml in steps of 1 ml
15100	Glass tube 100 ml, Æ 44 x 100 mm, suitable for 17390, 18100
15106	ditto, graduated 1 - 100 ml in steps of 1 ml
15201	Glass tube 200 ml, Ø 56 x 112 mm, suitable for 13201, 17401
15206	ditto, graduated 15 - 175 ml in steps of 5 ml
15250	Glass tube 230 ml, Ø 56 x 135 mm, suitable for 17401
15254	ditto, graduated 15 - 200 ml in steps of 5 ml

Further accessories

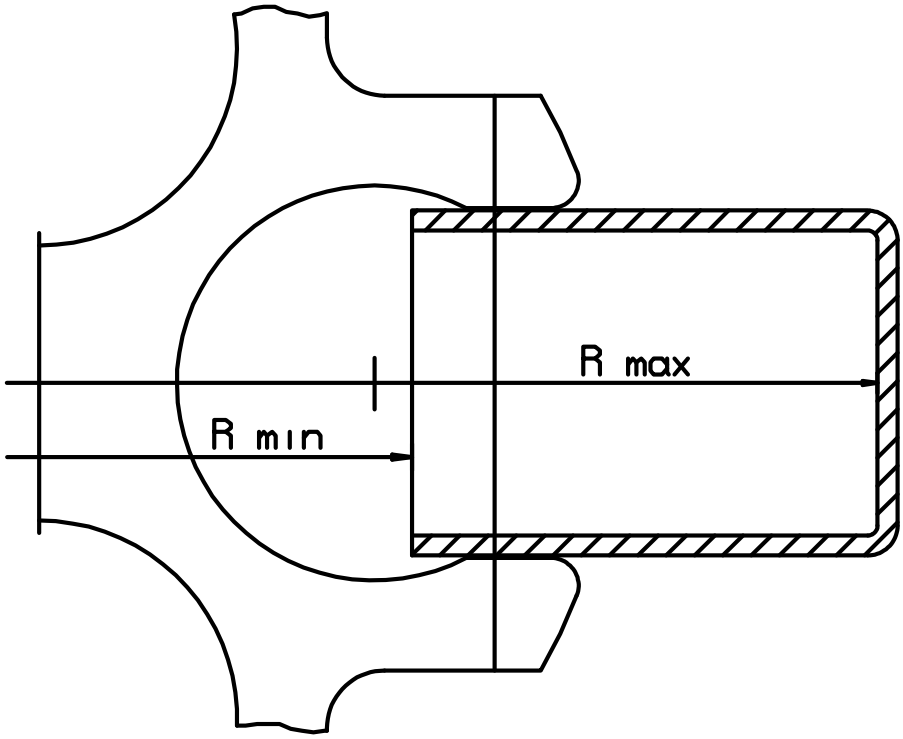
16018	Rubber adapter for 15 ml glass tube 15022, suitable for 12166
16019	Rubber adapter for 15 ml glass tube 15022, suitable for 12165
16030	Rubber adapter for 30 ml glass tube 15033, suitable for 12166

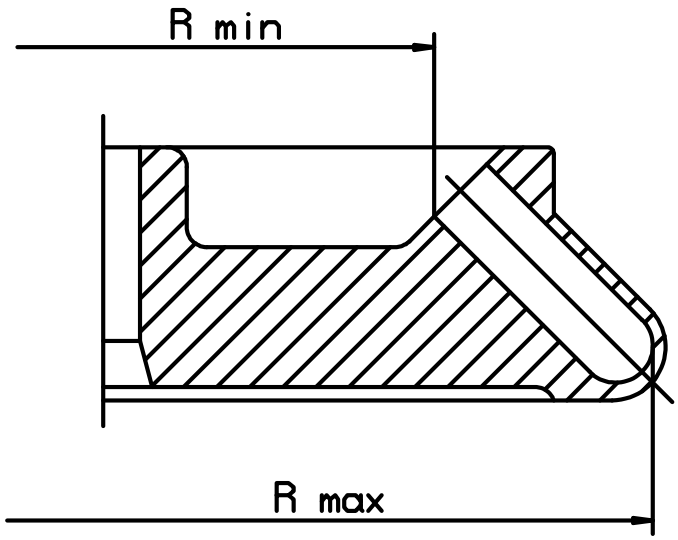
Part No.	Description
16031	Rubber adapter for 30 ml glass tube 15033, suitable for 12165
16906	Rubber plate for 18025
16907	ditto, only for 18050
16908	ditto, only for 18100
16909	Rubber plate for rectangular carriers
16250	Rubber cushion for 13201
17112	Rectangular polysulfone sealing cap, clear, incl. 2 clips 17118, for 13215 and spare for 13127
17118	Sealing clip for caps 17108, 17112
17801	Lid for rotor 12256
17919	Table for centrifuge made of varnished sheet steel with 2 doors and space for accessories, movable on lock-type castors, dimensions: w 490, d 635, h 490 mm
17913	Fasteners for table 17919

Further accessories are available on request.

Maximum speed for tubes

Some tubes, e.g. centrifuges glass tubes, microtubes, culture tubes, Teflon tubes and especially high volume tubes can be used in our rotors, buckets and adapters at higher speeds than their breaking limit. We recommend to always fill up the tubes and to follow the recommendations of the manufacturer.


R max
R min


R min
R max

1.3 Scope of Supply

The following belongs to the centrifuge:

1 Rotor wrench SW 13	Part No. 930 102
1 Square wrench “Emergency lid release“	Part No. 80 054
1 Tube grease for rotor trunnion pins	Part No. 70 284
20 ml slushing oil	Part No. 70 104

Documentation:

1 Short operating instructions
1 Operating Manual
1 "Rotor and Accessories, Operation and Use"
1 EU-Statement of Conformity
1 Equipment Decontamination Certificate

Accessories according to your order, our order confirmation and our delivery note.

Rotor Part No.	Rotor No.
.....	.....
.....	.....
.....	.....
.....	.....
.....	.....
.....	.....
.....	.....

1.4 Standards and Regulations

Please refer to the enclosed EU-Statement of Conformity.

1.5 Safety Instructions

regarding operation of centrifuges with rotors of different max. speed, e.g. angle rotors and swing-out rotors.

According to the German trade association regulation BGR500 chapter 2.11 part 3 the owner of the instrument is advised to take care of the following points:

1. According to BGR500 the owner has to provide operating instructions based on those of the manufacturer and to inform the employees accordingly.

2. For safety reasons these operating instructions must clearly state that the max. speed engraved on the rotor and/or the bucket and the max. allowable filling quantity must not be exceeded.

3. If the density of the material exceeds 1.2 g/cm^3, the max. speed of the centrifuge must be reduced.

4. Operation of the centrifuge in hazardous locations is not allowed.

5. During operation the centrifuge must not be moved. Leaning against or resting on the centrifuge is not allowed.

6. Do not spin explosive or highly inflammable materials.

7. Substances which could damage the material of the centrifuge, the rotors or the buckets anyhow must not be centrifuged or only under consideration of special safety measures. Infectious, toxic, pathogene or radioactive substances must be centrifuged in certified rotors only.

8. Keep a clearance of at least 30 cm around the centrifuge. Dangerous materials of any kind must not be put down or stored in that area.

9. Attention!
   Keep your hand away from the danger zone when closing the centrifuge lid. Risk of bruising!

10. Attention!
    Defective lid relieving devices could cause the centrifuge lid to fall down (contact Service). Risk of bruising!

1.6 Symbol Table

International symbols used for the centrifuge:

Symbol	Title
	Gefährliche elektrische Spannung Dangerous voltage Courant haute tension
	Achtung, Bedienungsanleitung beachten Attention, consult accompanying documents Attention, consulter les documents joints
I	Ein (Netzverbindung) On (Power) Marche (mise sous tension)
O	Aus (Netzverbindung) Off (Power) Arrêt (mise hors tension)
	Schutzleiteranschluß Protective earth (ground) Liaison à la terre
	Erde Earth (ground) Terre
	Netzstecker ziehen Unplug mains plug Tirer la fiche de prise
	Vorsicht Quetschgefahr Caution! Risk of bruising Attention! Danger de blessure
→	Drehrichtungspfeil Arrow direction of rotation Flèche sens de rotation
	Heiße Oberfläche Hot surface Surface chaude

2.1 General Outlay

The new generation of SIGMA laboratory centrifuges is equipped with two microprocessors which guarantee independently the control of the rotor recognition and the overspeed signal. A further optimization and increase of the instrument's safety could be maintained. The long-life asynchronous motor is silent and brushless. The problem of carbon brush change is no longer existent, and as there is no carbon dust pollution, operation in clean rooms is possible if the appropriate accessories are used.

2.2 Construction and Constructive Safety Measures

The centrifuge is built into a sheet steel housing. The armoured chamber, the sheet steel lid, the motorized lid lock device and the hinge system are providing optimum safety. At the back the lid is secured by solid hinges and at the front twice by a motorized lid lock. Due to these elements there is a solid safety case around the rotor chamber.

The centrifuge stands on elastic feet.

2.3 Drive

The drive motor is a well dimensioned asynchronous motor.

2.4 Operation and Display

The grafical LCD display is hermetically sealed. A single knob only allows any data input. The backlit display indicates any operating status and guides the operator through the wide range of applications.

Option:
A connection for a serial interface is possible so that an external personal computer with printer can be connected for control or recording.

2.5 Electronic Control

The electronics controlled by two microprocessors allows extensive adaptations of the centrifuge to the different tasks. The following parameters can be programmed and displayed among others:

- Speed (by activation of FINE steps of 1 or 10 rpm possible)
- RCF in steps of 1 or 10 x g
- Time preselection (9 h, 59 min max.), in steps of 1 min or 1 sec
- Continuous operation
- Short-time operation
- Fixed deceleration and acceleration curves
- Free creation of deceleration and acceleration curves
- Saving, recalling and alteration of programs
- Input and measurement of the time integral
- Start delay
- Continuous self-monitoring and recognition of errors which are displayed and saved for service

2.6 Safety Devices

Apart from the passive safety devices due to the instrument's mechanical design there are the following active precautions for your safety:

2.6.1 Lid Lock, Cover Closing Device

The centrifuge can only be started when the power switch is switched to "ON“ and when the lid is correctly closed. After closing the lid the motorized lid locks are automatically locked. **Attention! Please do not leave your fingers between lid and upper edge of the centrifuge housing when closing the lid.** The lid can only be opened when the rotor has completely stopped. If the lid is opened by the emergency release during operation, the centrifuge will immediately switch off and decelerate brakeless up to standstill of the rotor. If the lid is open, the drive is completely separated from the mains supply, that means starting of the centrifuge is impossible (refer to chapter 9.5.4 "Emergency lid release").

2.6.2 Imbalance Monitoring System

In the event that uneven loading leads to imbalance, the drive is switched off and an imbalance warning message is displayed.

2.6.3 Rotor Monitoring

During programming the rotor part no. and if required the bucket part no. must be entered. Two microprocessors check, if the entered speed or the gravitational field is allowed for the rotor. Input errors are impossible (refer to point 9.3 "Entry limitations"). After starting, during the start-up phase, the computer additionally checks the identification of the rotor.

Attention: Please take care to enter the correct bucket part no. as the max. allowable speed could be exceeded by entering an incorrect bucket. This is not allowed.
If the rotor doesn`t correspond to the programmed rotor no., STOP is carried out and an error message is displayed. Restarting the centrifuge is only possible after reset and when the correct rotor number has been selected.

2.6.4 Standstill Monitoring

Opening of the centrifuge lid is only possible, if the rotor is at standstill. This standstill is checked by the computer and also by an additional hardware circuit.

2.6.5 System Check

An internal system check monitors data transmission and the sensor signals with regard to plausibility. In the event of an error, malfunctions are recognized with utmost sensitivity, displayed as error message together with an error number, and saved for service.

2.6.6 Ground Wire Check

For ground wire check there is a ground screw at the rear panel of the centrifuge. A ground wire check can be carried out using an appropriate measuring instrument.

3.1 Unpacking of the Centrifuge

Open case. Take out the box containing accessories. Remove packaging material. Lift centrifuge upwards with a lifting device or with several persons. When lifting or carrying the centrifuge please always reach under the instrument from the side.

Attention: The instrument is heavy!

Please keep case for possible transport of centrifuge later.

3.1.1 Transport Safety Device

The SIGMA 4-15C has a transport safety device which must be removed before start-up. The transport safety device blocks the drive system.

The transport safety device screws are accessible from the outer underside.

Lift the left or front side of the centrifuge to put a suitable object –for example a block of wood- between the table and the bottom of the centrifuge.
Attention: Danger of injuries!

The star grip transport safety device screws become apparent. Unscrew by hand and totally remove.

After that, line centrifuge up and continue start-up.

The transport safety device screws should be stored for possible despatch (service, repairs).

3.2 Installation

3.2.1 Site

All energy consumed by the centrifuge is converted into heat and emitted into the ambient air. Therefore, sufficient ventilation is important. The air-ducts in the unit must be open. Also, the centrifuge shouldn`t be positioned near radiators and should not be directly exposed to sunshine.

A clearance of at least 30 cm around the centrifuge is necessary.

For normal operation the ambient temperature should not fall below 10 °C and not exceed 35 °C. The max. humidity of air is 80 %. During transport from cold to warmer places water will condensate inside the centrifuge. It is important that there is enough time for drying before the centrifuge can be started again.

3.2.2 Connection/Fuse

The operating voltage on the name plate must correspond to the local supply voltage!

SIGMA laboratory centrifuges are units of safety class I, DIN VDE 0700, and include a three wire power cord 2,5 m long with shockproof right angle plug. The instrument has thermal fuses. In case of a disconnection through the thermal fuses, allow a cool-down phase of two minutes, after which they could be reactivated by a switch.

3.2.3 Fuses / Emergency Circuit Breaker on Site

The centrifuges must be protected typically with at least 16 A slow acting fuses.

An emergency circuit breaker to cut the power to the centrifuge in the event of a malfunction is required on site. This switch should be located away from the centrifuge, preferably outside the room where the centrifuge is used or at the exit of this room.

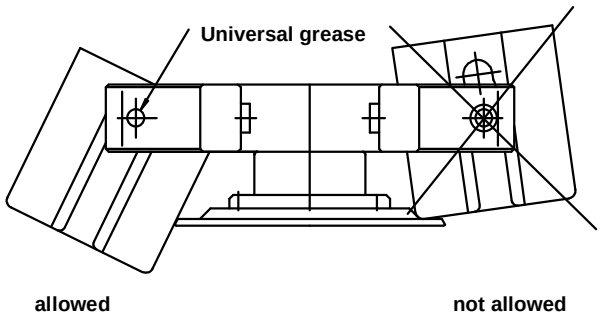
3.3 Installation of Rotors and Accessories

1. Open centrifuge lid by pressing Lid-key.
2. Unscrew rotor tie-down screw from motor shaft (anticlockwise).
3. Lower the rotor straight down onto the motor shaft.
4. Tighten the tie-down screw (clockwise) with the rotor wrench so that the disc spring is pressed together.

Fastening torque:	1-6/1-15/2-5/1-15K/2-16/2-16K/2-16KC:	approx. 5 Nm
	3-16/3-16K/3-18K/3K 30:	approx. 7,5 Nm
	4-15/4K15/6-15/6K15:	approx. 10 Nm

In the event of frequent use the tie-down screw must be loosened by some turns and fastened again. **This should be done once a day or after approx. 20 cycles (please refer to chapter 5.1.4 "Alteration of the Configuration" – Cycles).** This ensures a proper connection between rotor and shaft (please refer to chapter 8.2 "Care and cleaning of accessories" as well).

5. Fill all positions of swing-out rotors with buckets. Make sure that all buckets are inserted correctly.
6. Use only appropriate vessels for the rotor (please refer to chapter 1.2 "Suitable accessories" as well).



7. Fill vessels external to the centrifuge.
8. Put or screw on covers of vessels.
9. Opposite places of the rotors must always be loaded with same accessories and same filling.
10. **Attention** when using microtiter rotors: It is important <u>not</u> to run the plate holders without plates inserted.
11. In angle rotors the plastic vessels must always be totally filled to avoid cracks of vessels and leakages or loosening of the caps in case of partial filling.

Attention, follow the special comments of chapter 1.5.

12. **Attention**: The centrifuge will absorb smaller differences in weight when loading the rotors. But it is recommended to balance the vessels as accurately as possible in order to ensure a run with minimal vibrations. Should the centrifuge be operated with very uneven load, the imbalance monitoring will switch off the drive. An imbalance warning would be displayed.

13. Rotors with lid should always be run with their lid. The rotor lid is tightened by hand. Correct fastening must be ensured. **Attention: The lid screw serves for fastening of the lid onto the rotor only, not for fastening of the rotor onto the drive!** Before installation of the lid, the correct fastening of the rotor fixing screw must always be checked using a wrench.

3.3.1 Fastening of Angle Rotors with Hermetically Sealed Lid

(Please refer to drawing on next page.)

1. Screw rotor lid (2) onto rotor and tighten it.

2. Lower rotor with lid (2) onto motor shaft.

3. Put rotor tie-down screw (1) onto motor shaft and tighten using the wrench.

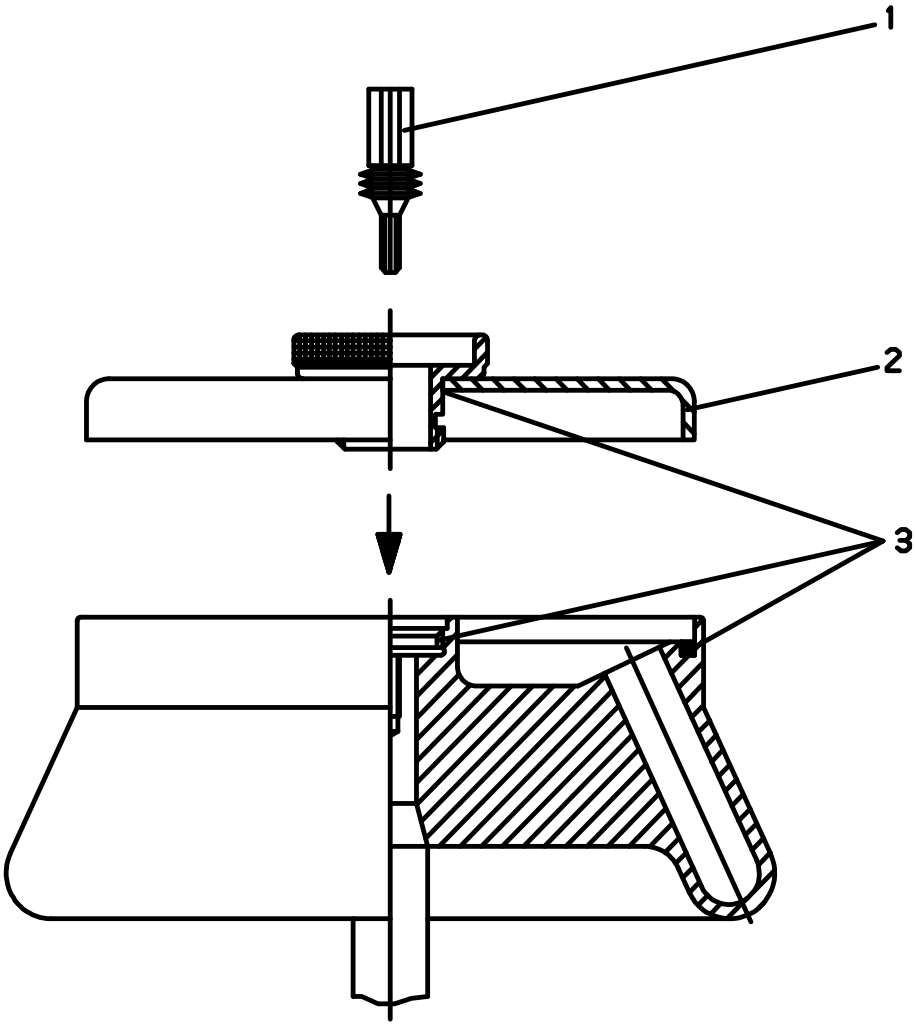
4. The rotor can be run without lid (2) as well.

5. The rotor and lid seals (3) must be greased after cleaning.

6. Special instructions for the use of hermetically sealed rotors:

   All rotors can be installed or removed with closed lid after loosening the rotor tie-down screw. All rotors are autoclavable (refer to chapter 8.6 "Sterilization and disinfection of rotor chamber and accessories").
   To increase life of rotors and seals the rotors must be cleaned with slushing oil and the seals and thread areas with vaseline or grease after cleaning.

   Attention!
   Please follow the special comments of chapter 1.5.


1
2
3

3.4 Initial Start-Up

Attention!

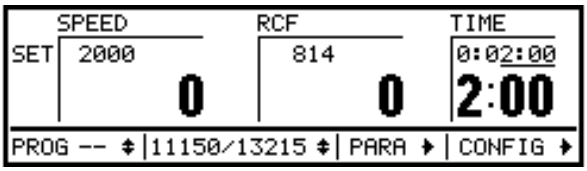
Before initial start-up please take care that your centrifuge is orderly installed (refer to chapter 3.2 "Installation").

3.4.1 Switching on of the Centrifuge

Press mains switch (at the back of the centrifuge). When power is applied the first time, default values will be displayed:

- The command panel illuminates.
- The speed display indicates "2000".
- The time display indicates "2“.
- The program display indicates "--", i.e.

  - the centrifuge will accelerate to 2000 rpm,
  - the centrifuge operation is terminated after 2 minutes,
  - no program number has been allocated so far.



3.4.2 Opening Lid

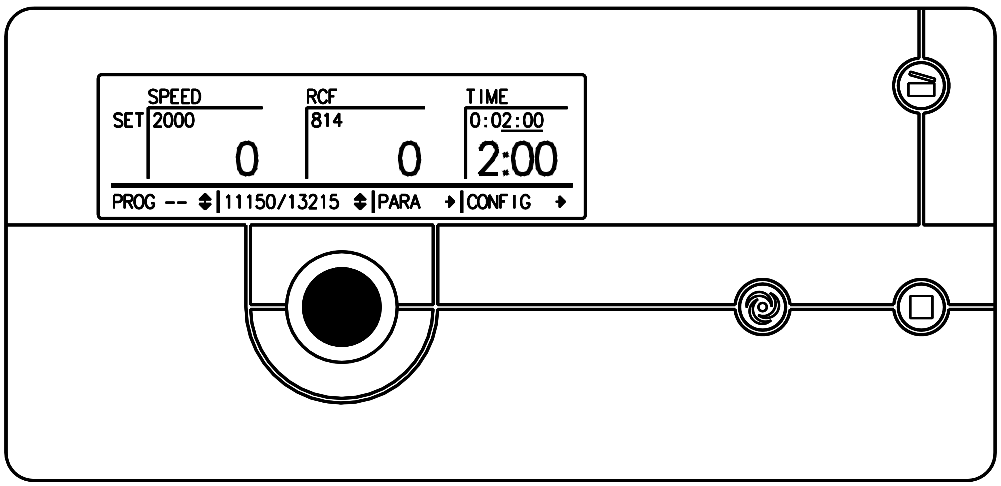
Press Lid-key

- The lid opens.

3.4.3 Installation of a Rotor

Put a rotor onto the shaft and fasten it by screwing the rotor tie-down screw clockwise onto the drive shaft. Please use the supplied rotor wrench (refer to chapter 3.3 "Installation of rotor and accessories"). Please pay attention to the fact that during tightening the disc spring of the rotor tie-down screw is pressed together and the screw is tightened.

4.1 Operating Panel



Operating panel

The centrifuge can be operated via the operating panel. Keys can be pressed when their LED is on.

4.1.1 Start-key

This key can be used for the following:

- starting centrifuge operation,
- terminating a previously started deceleration process and restarting centrifuge,
- shifting into short-run at preselected speed. Pressing Start-key continuously for longer than one second leads to acceleration to the maximum speed with the maximum acceleration curve and after release deceleration with the maximum deceleration curve.

The centrifuge can be started when

- the lid is closed
- the Start-key is illuminated.

4.1.2 Stop-key

This key can be used

- to early terminate a run: The centrifuge decelerates with the preset curve to a complete stop. Deceleration can be terminated by pressing the Start-key again.

- to carry out a faststop: Push Start-key for longer than one second. The centrifuge decelerates with the maximum deceleration curve.

4.1.3 Lid-key

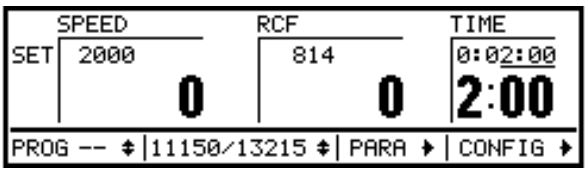
This key is used to open the lid. This can only be executed if

- the centrifuge has come to a complete stop
- the Lid-key is illuminated.

4.1.4 Knob

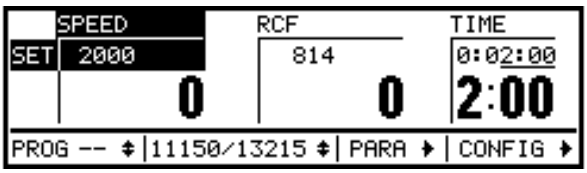
This knob can be used for selecting and alterating parameters and figures/ numbers.

4.2 Display



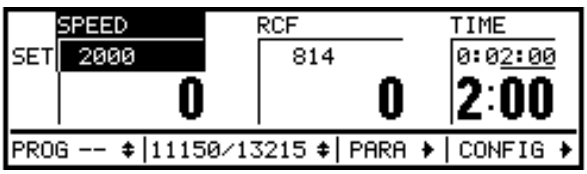
Default values

4.2.1 Set



If this area is illuminated, you are in the change mode which you can exit by pressing the knob (here in combination with the speed).

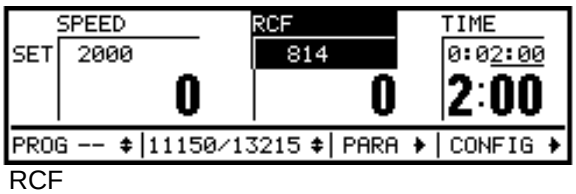
4.2.2 Speed



Speed

In the upper section of the area the set speed of the centrifuge is displayed. Underneath is the actual speed. The maximum speed values are rotor dependent.

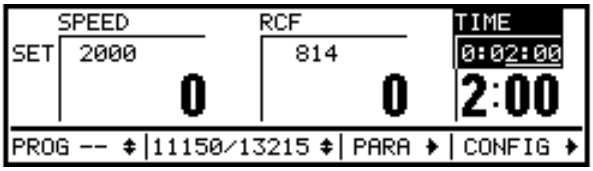
4.2.3 Relative Centrifugal Force (RCF)



RCF

The relative centrifugal force is the acceleration which the sample is exposed to. The set value of this parameter is in the upper section of this area, underneath is the actual value. The maximal RCF-values are rotor dependent.
(Refer to chapter 9.4 "Mathematical relations")

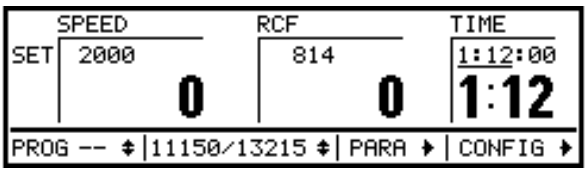
4.2.4 Time



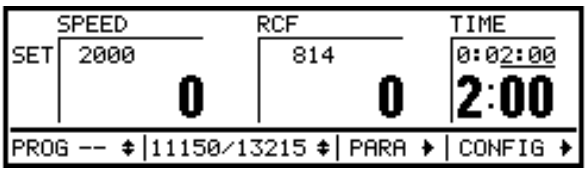
Time

The set run time is displayed in the upper section of this area, underneath the remaining run time is displayed. Time is defined as the period from the start of the centrifuge to the beginning of deceleration, maximum value is 9 h 59 min. The set time is underlined (here: 2 minutes).

The set value is indicated in hours, minutes, and seconds. The actual value has the same units as the set value and is displayed in hours : minutes or in minutes : seconds if the set value is below 10 minutes.

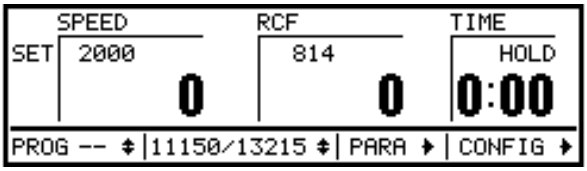


h:m



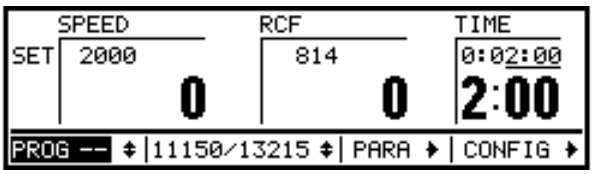
m:s

If the highest possible time of 9 h 59 min is exceeded or below the minium adjustable time range, continuous operation is activated. The word "HOLD" is displayed instead of the set value. After the start of a continuous run, the elapsed time is displayed instead of the remaining run time. By entering a specific run time the continuous mode is deactivated. It can be terminated by pressing the Stop-key as well.



Continuous run

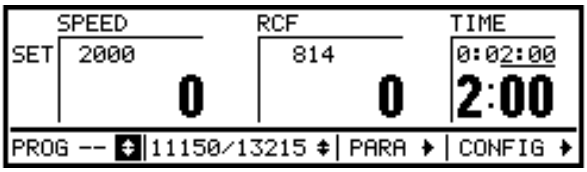
4.2.5 Program (PROG)



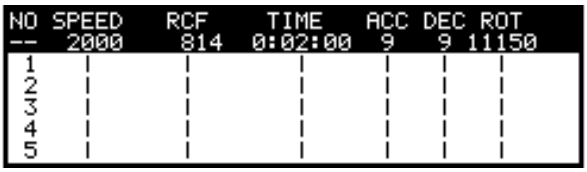
Program

In this area the number of the actual program is displayed. If the program is not saved yet, "--" is displayed.
By activating this area you are able to load stored programs without calling the selection list.
The program used last is automatically loaded after restarting.

Program Selection List (⇕)

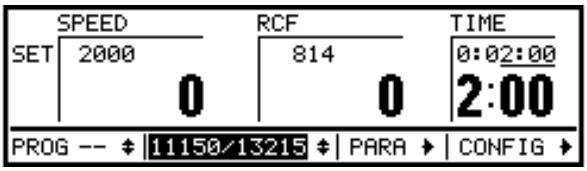


Program selection list



The area marked with arrows for the program selection list presents the view of the programs already saved. Storage space for fifty programs - No. 1 – 50 - from which you can select and load a program is at your disposal. The actual loaded program is indicated by "--".

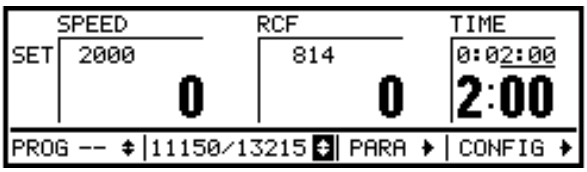
4.2.6 Rotor (here: 11150/13215)



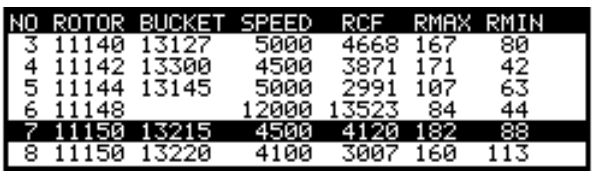
Rotor

In this area the actually selected rotor or a rotor/bucket combination are displayed.

Rotor Selection List (⇕)

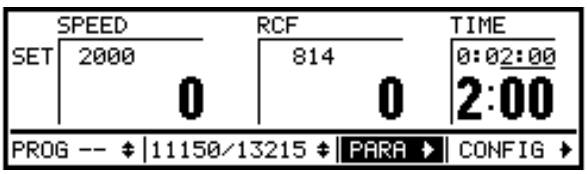


Rotor selection list



The area marked with arrows for the rotor selection list offers all available rotors which can be selected via the knob.

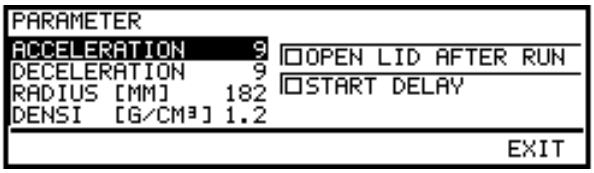
4.2.7 Parameters (PARA)



Parameters

If this area has been selected, parameters can be changed and the start delay and the automatic lid opening after end of run can be activated or deactivated.

4.2.7.1 Acceleration



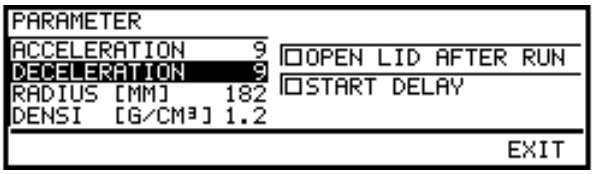
Acceleration

The acceleration number selects an acceleration curve which the centrifuge will follow. Two different versions are available:

0 - 9	linear
10 - 19	quadratic up to 1000 rpm, then linear

Their shape is further explained in chapter 9.1 "Slope of the specified curves, linear curves" and 9.2 "Quadratic curves".

4.2.7.2 Deceleration



Deceleration

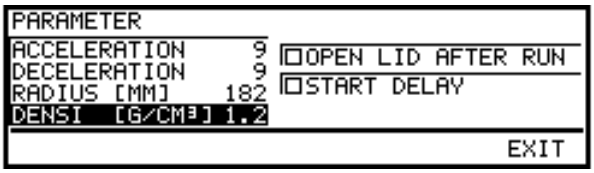
The deceleration number selects a deceleration curve that decelerates the centrifuge down to standstill. The deceleration curves are inverted images of the acceleration and are labelled with identical numbers. Curve no. 0 represents brakeless deceleration.

4.2.7.3 Radius

Radius

The set radius will determine the displayed RCF-value. If the radius is not changed, the max. RCF-value will be displayed.

4.2.7.4 Density



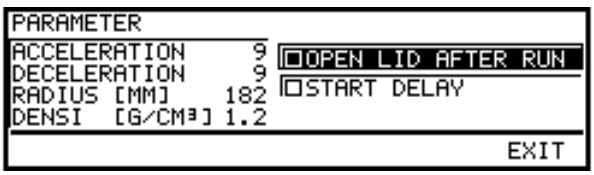
Density

If the density of a sample exceeds 1.2 g/cm^3, the maximum final speed will reduce (refer to chapter 9.4.2 “Density”). A value between 1.2 and 9.9 g/cm^3 is possible.

4.2.7.5 Start Delay

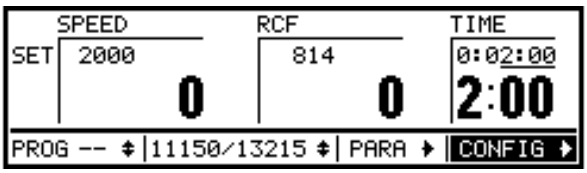
With this function a start delay can be set.

4.2.7.6 Automatic Lid Opening after End of Run



If this parameter has been set the lid will automatically open after standstill of the rotor.

4.2.8 Configuration



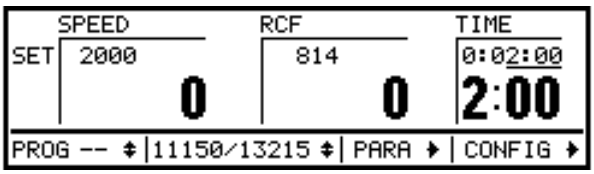
Configuration

Selection of configuration (CONFIG) opens a menu where Code, Language, Screen, Fine, Buzzer, Sensor, Info, Reset and the creation of freely programmable curves can be chosen. Furthermore, the cycles and run times of the individual rotors can be read.

5.1 Selection, Display and Alteration of Program Parameters

The value of each area can be changed as follows:

- This display shows the default values. No area is inverted.



Default values

- One area can be activated by pressing the knob once. It is then inverted. Being in the selection mode now, you can select other areas by turning the knob.

- Activate a selected area by pressing the knob. You are now in the alteration mode, "SET" and the selected area are inverted.

- Select the new value of the selected area by turning the knob.

- Confirm the entry by pressing the knob. You then leave the alteration mode. "SET" and the selected area are deactivated. The alteration mode is left automatically after 20 seconds. The areas are no longer inverted, the actual values are taken over.

- Now, you can select other areas by turning the knob or you can operate the start key. Then, the centrifuge starts with the selected values.

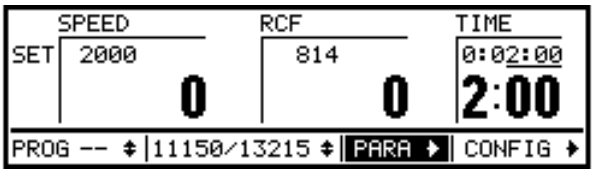
Notice:

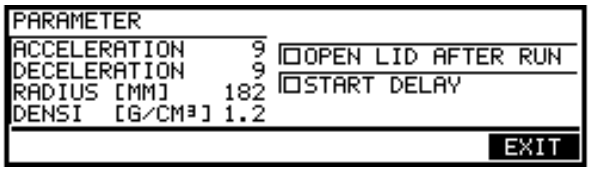
All entry limits are automatically checked. When reaching a limit, the counting operation is stopped (refer to chapter 9.3 "Entry limitations").

5.1.1 Selection and Alteration of the Parameters and Activation of the Start Delay and the Automatic Lid Opening after End of Run

Selection and alteration of the parameters

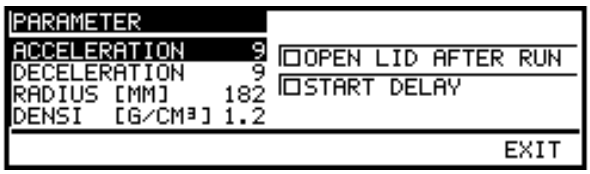
- Select the area "Parameters" (PARA) by turning the knob (selection mode) and confirm by pressing the knob.

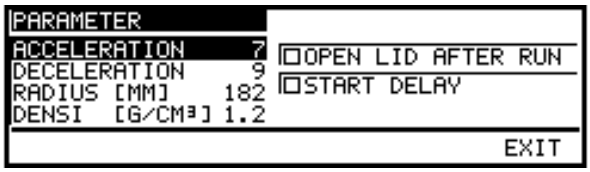




- The parameters to be changed, e.g. acceleration, deceleration, radius, density and the start delay and automatic lid opening after end of run can be selected (here: acceleration).

- Confirm the selected parameter by pressing the knob (here: acceleration). The parameter is activated. Select the desired acceleration curve by turning the knob.





Deceleration, radius and density are changed in the same way.

Activation of the start delay and/or the automatic lid opening after end of run

- Select ”START DELAY” by turning the knob.

- Activate the “START DELAY” by pressing the knob.

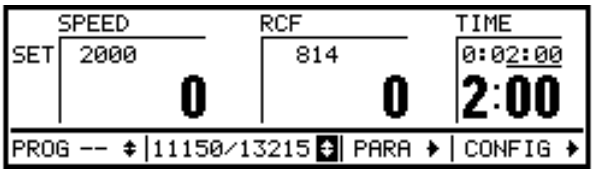
- Select time delay (here: 10 seconds) by turning and confirm by pressing the knob.

- Change the set time by turning the knob and deactivate the start delay by pressing the knob.

The automatic lid opening after end of run is activated or deactivated in the same way.

5.1.2 Selection and Alteration of the Rotor Part Number

- Select the area of the rotor selection list (⇕) by turning the knob.



- After pressing the knob, you get a view over all available rotor types.

NO	ROTOR	BUCKET	SPEED	RCF	RMAX	RMIN
3	11140	13127	5000	4668	167	80
4	11142	13300	4500	3871	171	42
5	11144	13145	5000	2991	107	63
6	11148		12000	13523	84	44
7	11150	13215	4500	4120	182	88
8	11150	13220	4100	3007	160	113

Rotor selection list

- Select the number of the actual rotor/bucket combination by turning the knob and confirm the entry by pressing the knob.

<u>Attention:</u> Please take care that the correct rotor/bucket combination is entered as otherwise the max. allowable speed could be exceeded. This is not allowed.

5.1.3 Alteration of Program Parameters during the Centrifuge Run

During the run, the following values can be altered.

- Speed
- RCF
- Run time
- Switching into the continuous run mode/time mode
- Acceleration curve
- Deceleration curve
- Start delay

Alter the Set values as usual by activating the Alteration mode (refer to chapter 5.1 "Selection, Display and Alteration of Program Parameters").

You cannot change:

- Rotor
- Program
- Radius
- Density

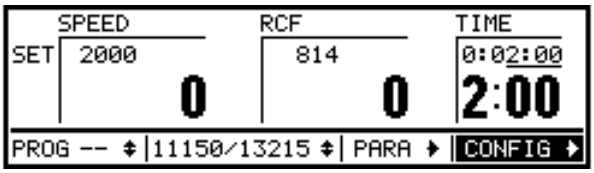
The following functions can be activated/deactivated:

- Start delay
- Automatic lid opening after end of run

5.1.4 Alteration of the Configuration

In the configuration mode, several background functions can be changedand data can be read.

- Select the configuration mode by turning the knob.



- After pressing the knob, the configuration menu appears.

- Select by turning the knob the desired area and activate the function by pressing the knob.

- **CODE:** Protection of specific functions by a code, deactivation of the protection and changing of the code
- **LANGUAGE:** Selection of the language of the operation
- **SCREEN:** Magnification of the speed or the RCF display
- **FINE:** In this function it is possible to preselect the set speed in steps of 1 or 10 min^{-1}. The set time can be preselected in steps of 1 min or 1 sec. Exeption: Curve input in 1/10 sek.
- **CYCLES**: For each bucket/rotor combination cycles and run time are stored. The data of the used rotors are displayed.
- **BUZZER:** An acoustic signal can be activated for a preselected time after termination of a run or in the event of an imbalance or an error message. In the event of "IMBALANCE" or "ERROR" the acoustic signal is already activated.
- **SENSOR:** The sensor menu displays different signals. In case of a failure of the instrument this makes the diagnosis of errors and their fast repair through the service easier. Values can neither be entered nor altered.

- **INFO:** The Info menu displays information like the type of centrifuge and the EPROM version, the number of cycles, the total run time and the software version and date. In case of a failure of the instrument this helps to find reasons for the fault. Values can neither be entered nor altered.

- **RESET:** The "Reset"-function offers the possibility to delete all programs, parameters and configurations to get the original settings again.

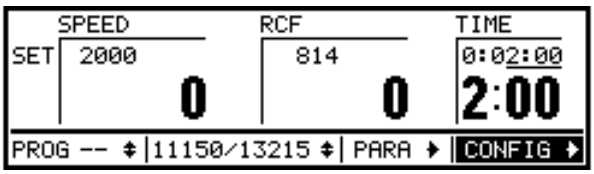
- **CURVES:** Creation of user defined accelerations and decelerations**.**

The procedure of alteration of the basic functions shall be explained by an example (Alteration of the screen).

- You can choose between three display versions:

- RCF and speed at normal size
- Speed magnified -Zoom- (no RCF display)
- RCF magnified -Zoom- (no speed display)

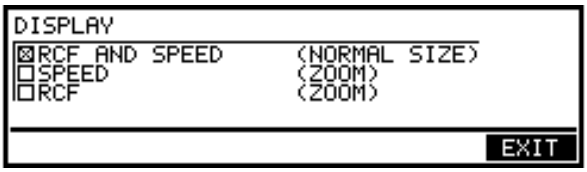
- Select the configuration mode by turning the knob.



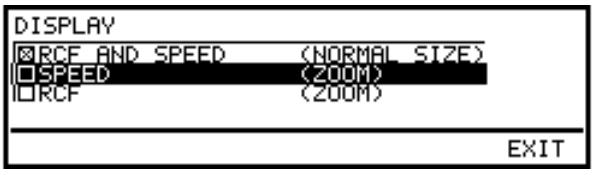
- After pressing the knob the configuration menu appears.

- Select "SCREEN" by turning the knob.

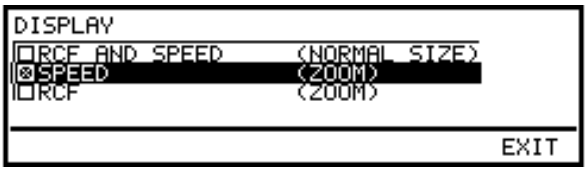
- By pressing the knob you get into the screen menu. The screen marked with a cross is activated. If you want to select the screen "SPEED - (ZOOM)" you proceed as follows:



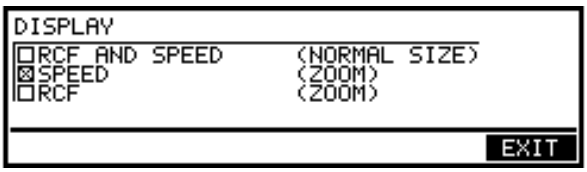
- Select "SPEED - (ZOOM)" by turning the knob.



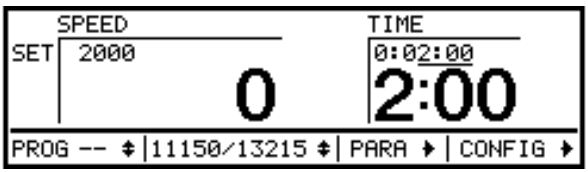
- Activate the Speed-Zoom-screen by pressing the knob.



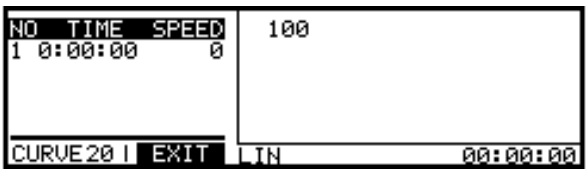
- Select "EXIT" by turning the knob. Confirm it by pressing the knob. You get into the configuration menu again.



- By pressing the knob you return to the main display. The areas "SPEED" and "TIME" are displayed magnified. The area "RCF" disappears.



5.1.4.1 Curves



With the “curve function” user defined accelerations and decelerations can be created. Curve numbers 20 – 29 are available. The intervals no. 1 – 10 of each curve consist of fix points which are defined by time and speed. In the event that the speed of one interval is higher than the set speed for the run, the curve speed can be limited or allowed or starting can be prohibited.

CUT ⇒	Speed in one interval is automatically limited to the set speed for the run.
ADMIT ⇒	Chosen speed in one interval is allowed.
CANCEL ⇒	A stop occurs. Starting is not possible without to a change of the curve speed in one interval.

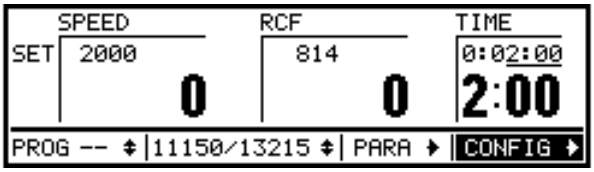
For interval no. 1 a linear (LIN) or quadratic (QUAD) acceleration can be chosen. All further accelerations are linear.

Furthermore, run profiles can be created. The following conditions must be fulfilled:

- The max. preset final speed of one interval corresponds to the set speed of the run.
- The total time corresponds to the set time of the run.
- The final speed of the last interval is 0.

5.1.4.2 Creation of Curves for Variable Accelerations and Decelerations

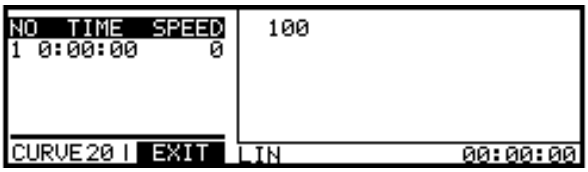
- Select the configuration mode by turning the knob.



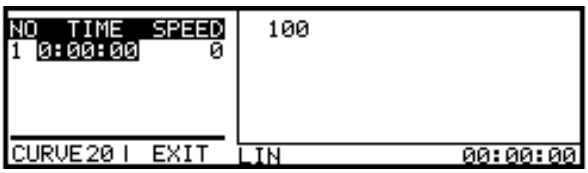
- After pressing the knob the configuration menu appears.

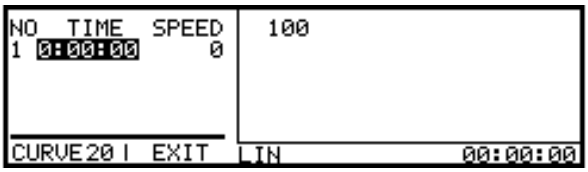
- Select "CURVES" by turning the knob.

- After pressing the knob the curve menue appears.

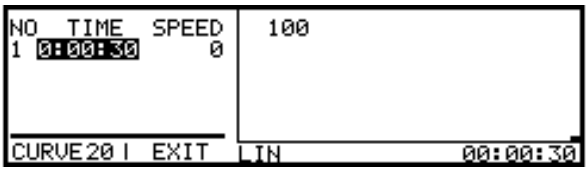


- Select “0:00:00” by turning the knob. You are now creating interval no. 1. Activate “0:00:00” by pressing the knob.

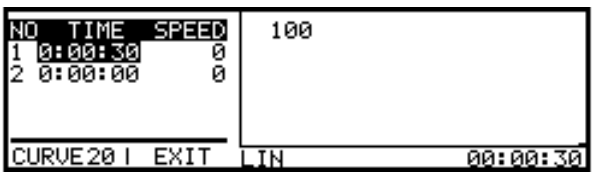




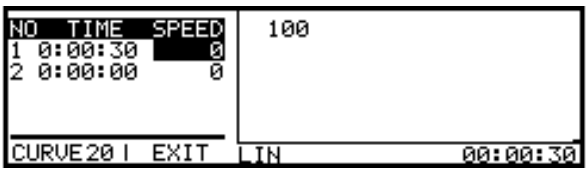
- Set the time by turning the knob.



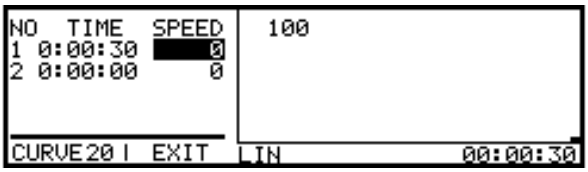
- Save the time value in interval no. 1 by pressing the knob.



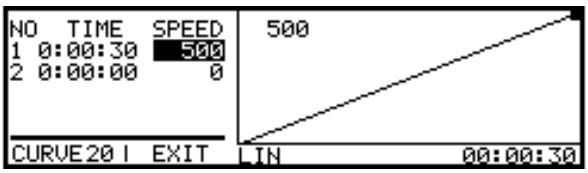
- Select “SPEED” by turning the knob.



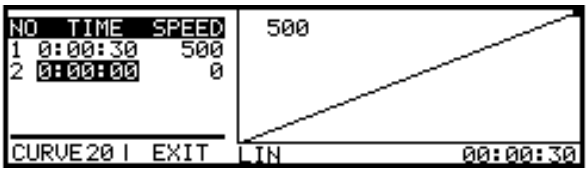
- Activate speed value “0” of interval no. 1 by pressing the knob.



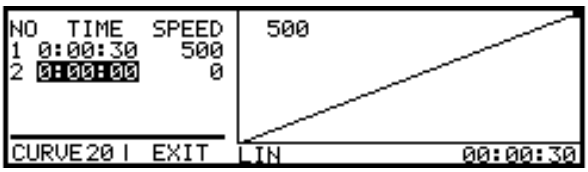
- Change the speed value by turning the knob. The created curve with the max. curve speed appears.



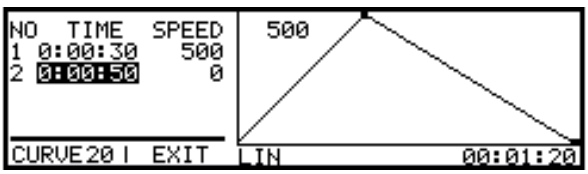
- After pressing and turning the knob the time value of interval no. 2 appears.



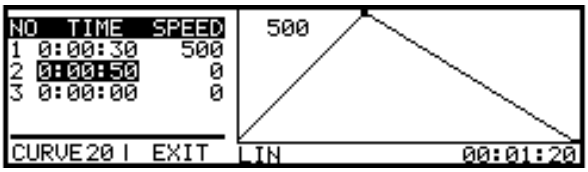
- Activate “0:00:00” of the second interval by pressing the knob.



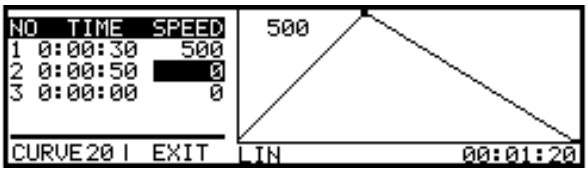
- Set the time by turning the knob. The extended curve appears.



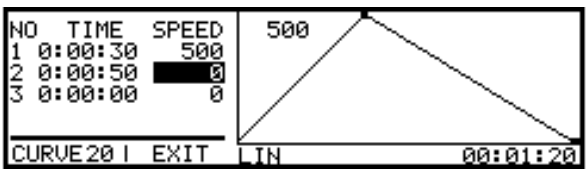
- Save the time value no. 2 by pressing the knob.



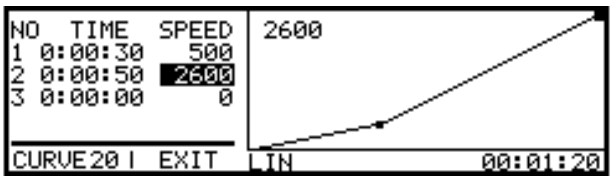
- Select “SPEED” by turning the knob.



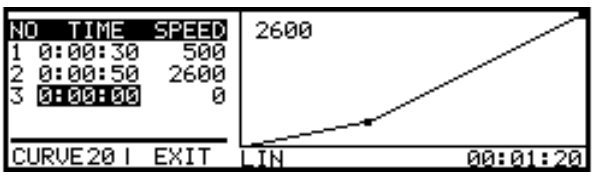
- Activate the speed value “0” by pressing the knob.



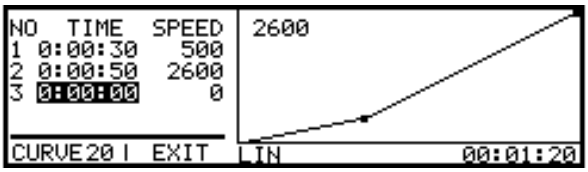
- Change the speed value by turning the knob.



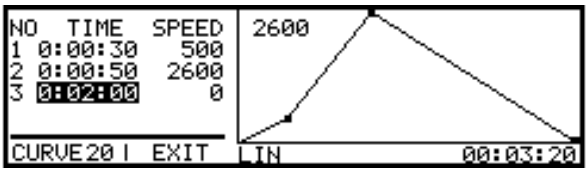
- After pressing and turning the knob the time value of interval no. 3 appears.



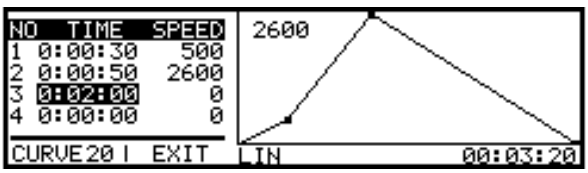
- Activate “0:00:00” of the third interval by pressing the knob.



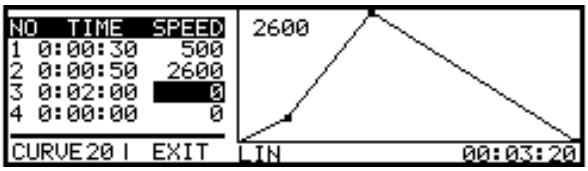
- Set the time by turning the knob. The extended curve appears.



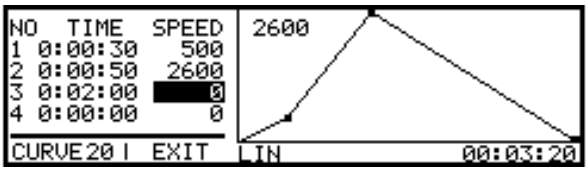
- Save the time value no. 3 by pressing the knob.



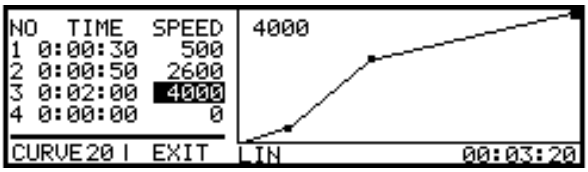
- Select “SPEED” by turning the knob.



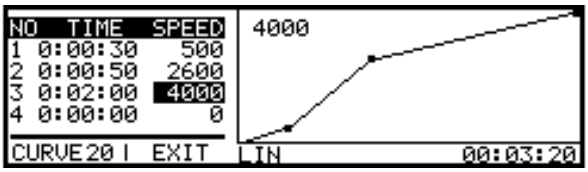
- Activate “0” by pressing the knob.

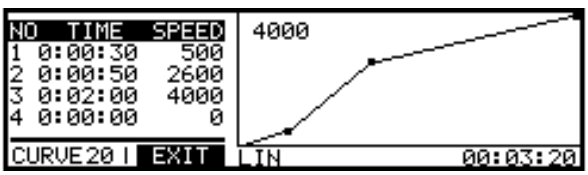


- Change the speed value by turning the knob. The curve appears and can be programmed as acceleration or deceleration curve under no. 20.



- Select “EXIT” by pressing and turning the knob and leave the curve mode by pressing the knob again.





- The created curve no. 20 is saved and can be recalled when programming the parameters.

5.1.4.3 Alteration of Existing Curves

After activation of the area “CURVES” in the configuration menu you can analogous to the procedure discribed in 5.1.4.2 select already existing curves and alter them.

5.1.5 Alteration of the Contrast

If you press the knob for longer than a second, a dialogue window appears. Now you can select the contrast by turning the knob. By pressing the knob again, you confirm the entry, the new contrast remains.

5.1.6 Imbalance Monitoring

An imbalance dialogue window indicates an excessive imbalance during operation.

Run cannot be continued (imbalance > cut-off limit). Run is terminated with max. deceleration.

Reason:
Improper loading or malfunction during operation (e.g. glass breakage) resulting in an uneven run.

Note!

Additional information and a detailed description of errors and their correction is given in chapter 9.5 “Error correction“.

5.1.7 Shortrun and Faststop

- Shortrun

  By pressing the Start-key continuously the shortrun function is activated. The instrument accelerates to the maximum speed with the maximum acceleration curve and after release decelerates with the maximum deceleration curve until standstill.

- Faststop

  Pressing the Stop-key during operation for longer than a second leads to maximum deceleration until standstill.

6.1 Load, Save and Delete Programs

What is considered a program?

A program contains all data that are required for a centrifuge run.

The advantage is that special sedimentation results can be repeated under equal conditions without a change of data caused by entry errors.

Programs can be loaded, operated, altered, and deleted any time.

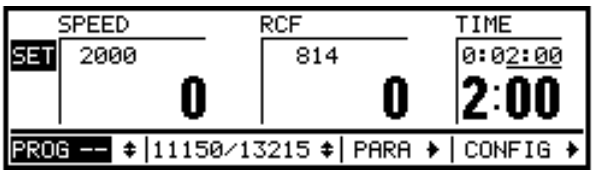
All programs can be protected against unauthorized use by a personal Code.

6.1.1 Load a Program

There are two possibilities of loading a program:

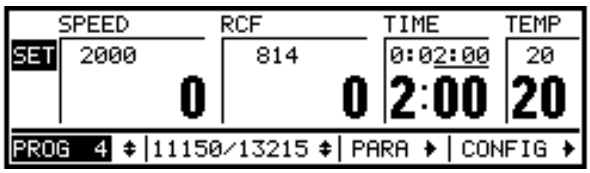
1. Loading by program number

- Select the program area (“PROG --“) by turning the knob, and activate it by pressing the knob.



Activated program area

- By turning the knob, all programs saved and the actual program ("--") appear one after the other.

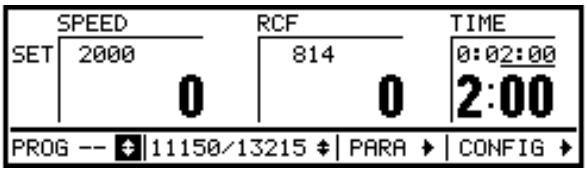


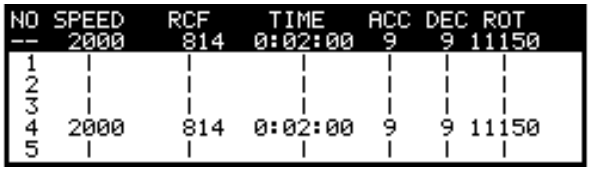
Changed program

- Load desired program by pressing the knob.

2. Loading from the list of programs

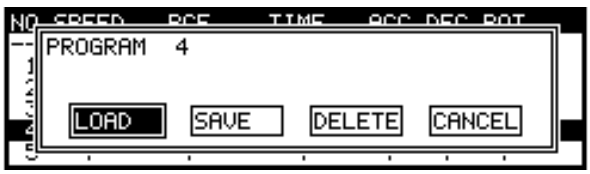
- Select the program selection list (⇕) by turning the knob and activate this area by pressing the knob. You are able to see all programs in the memory, "--" indicates the actual program.





Program selection list

- Select the program you want to load by turning the knob. After pressing the knob a dialogue window appears. Select the instruction "LOAD" and confirm it by pressing the knob.

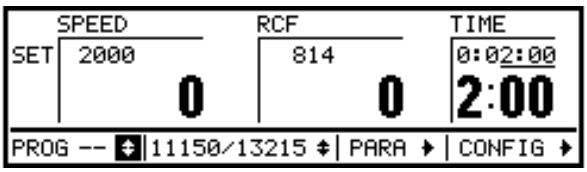


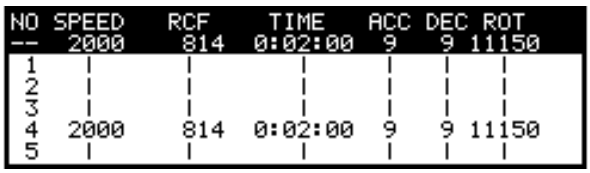
Dialogue window

6.1.2 Save a Program

If you want to save an actual program:

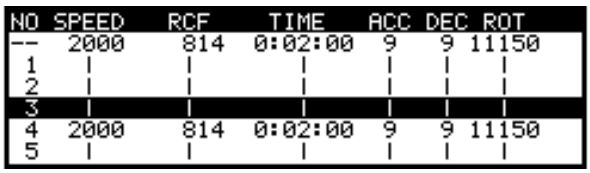
- Select the program selection (⇕) list by turning the knob and activate it by pressing the knob to get a view over all programs in the memory and the free positions in the list.



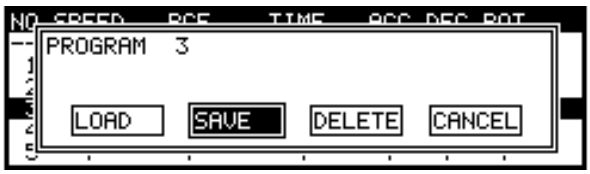


Program selection list

- Select the desired program position in the list by turning the knob.



- After pressing the knob a dialogue window appears. Select "SAVE" and confirm it by pressing the knob.

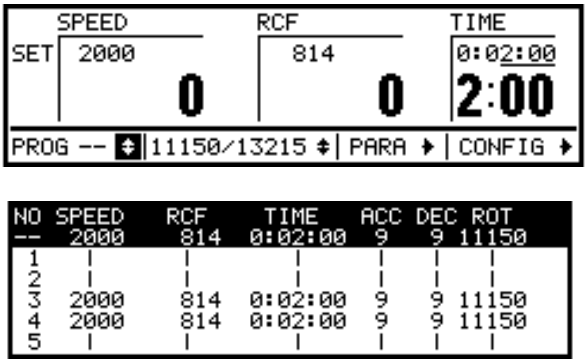


Dialogue window

6.1.3 Delete a Program

If you want to delete a program from the list:

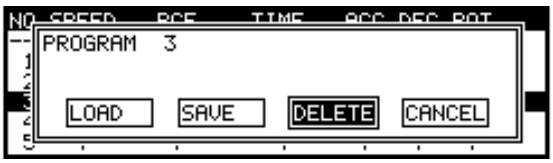
- Select the program selection list (⇕) by turning the knob and activate this area by pressing the knob to see the list of programs.



NO	SPEED	RCF	TIME	ACC	DEC	ROT
--	2000	814	0:02:00	9	9	11150
1						
2						
3	2000	814	0:02:00	9	9	11150
4	2000	814	0:02:00	9	9	11150
5						

Program selection list

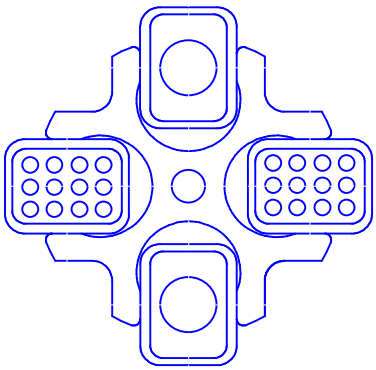
- Select the program you want to delete by turning the knob.
- A dialogue window appears after pressing the knob. Select "DELETE" and confirm it by pressing the knob.



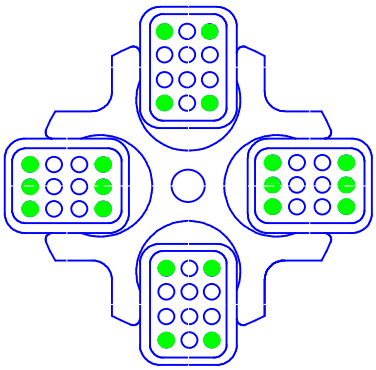
Dialogue window

7.1 Practical Notes for Centrifugation

1. Locate centrifuge horizontally on a level surface.
2. Ensure safe location.
3. Keep at least 30 cm free space around the centrifuge.
4. Provide for sufficient ventilation.
5. Tighten rotor firmly onto motor shaft.
6. Avoid imbalance.
7. Load opposite buckets with same accessories.
8. Centrifugation with low capacity: The vessels should be placed symmetrically so that the buckets and their suspensions are loaded evenly. Loading an inner or outer position of the bucket only is not allowed (see illustration). Even angle rotors should be loaded symmetrically to same weight.



   Centrifugation with different tubes: Working with different tube sizes is possible. Opposite places must be loaded with the same vessels (see illustration).



9. Load all positions of swing-out rotors.
10. Load vessels outside the centrifuge.
11. Please pay attention to the max. speed of glass tubes. At speeds over 4 000 rpm there is an increased breaking glass hazard.
12. Fill vessels carefully to same weight. Imbalances would result in increased wear of bearings.
13. Grease joints of buckets and rotor pins in swing-out rotors.
14. Use perfect accessories only.
15. Avoid corrosion to accessories by careful maintenance.

16. Spin infectious material in sealed rotors and buckets only.

17. Do not spin explosive or highly imflammable materials.

18. Record all program data, refer to forms of appendix chapter 9.8.

19. When centrifuging substances with a density > 1,2 g/cm^3 the allowable max. speed must be reduced (refer to chapter 9.4.2 "Density").

7.2 Forbidden Centrifuging Operations

1. Operation of not carefully installed centrifuge.

2. Operation without front or back panels.

3. Operation by non authorized personnel.

4. Operation with rotor not installed properly (refer to chapter 3.3).

5. Operation with incompletely loaded drum rotor, swing-out rotor or angle rotor with interchangeable buckets.

   A rotor must always be loaded completely, empty places are not allowed! Opposite buckets or carriers may nevertheless be empty. Mixed loading is allowed, if opposite places are loaded with same buckets and carriers of same weight.

6. Operation with overloaded rotors.

   he load for a rotor is limited by its design and the max. speed (see rotor/bucket engraving) and must not be exceeded. The rotors are intended for liquids of max. homogeneous density of 1.2 g/cm^3 if centrifuged at max. speed. If liquids of higher density are used, the speed must be reduced accordingly (refer to chapter 9.4 "Mathematical relations").

7. Operation with rotors, buckets and carriers showing corrosion or other defects.

8. Operation of very corrosive substances which can cause damages to material and affect the mechanical strength of rotors, buckets and carriers.

9. Operation of rotors and accessories not allowed by the manufacturer. The use of poor commodity goods is not recommended. At high speeds breaking glass or bursting vessels can cause dangerous imbalances.

10. Operation in hazardous locations.

11. Operation with vessels of improper size.

12. Centrifugation of improper material.

13. Operation with partially filled plastic tubes in high-speed angle rotors.

14. Lifting or moving of the centrifuge during operation. Leaning against or resting on the centrifuge is not allowed.

15. Do not place potential dangerous material - eg. glass vessels containing liquids - near the centrifuge.

16. Attention: Do not open cover and/or reach into rotor chamber unless the rotor is at standstill. Never attempt to override the lid interlock system while the rotor is spinning.

17. Such materials are prohibited which chemically interact vigorously.

18. Do not spin explosive or inflammable materials.

19. Substances which could damage the material of the centrifuge, the rotors or the buckets must not be centrifuged. Infectious, toxic, pathogene or radioactive substances must be centrifuged in certified rotors and vessels only and all necessary safety precautions are taken.

8.1 Care and Cleaning of the Centrifuge

Please use water-soluble, mild detergents for cleaning. Avoid corroding and aggressive substances. Do not use alkaline solutions or solvents or agents with abrasive particles. Before using detergents or decontamination agents which had not been recommended by us, the user has to contact us to make sure that such procedure would not damage the centrifuge.

Remove product particles from the rotor chamber using a cloth or paper towl. It is recommended to open the cover when the centrifuge is not in use so that moisture can evaporate. Increased wear of the motor bearings will thus be avoided. **If there is the risk of toxic, radioactive or pathogene contamination, special safety measures must be kept.**

8.2 Care and Cleaning of Accessories

For care of accessories special safety measures must be considered as these are measures ensuring operational safety at the same time.

Buckets, trunnions and also synthetic buckets are produced exactly in order to withstand the permanent high stress with high gravitational fields.

Chemical reactions as well as stress-corrosion (combination of oscillating pressure and chemical reaction) can affect or destroy the metals. Hardly detectable cracks on the surface expand and weaken the material without visible signs. When detecting a visible damage of the surface, a crack, a mark or any other change, also corrosion, the part (rotor, bucket etc.) must be replaced immediately.

In order to avoid corrosion, rotor incl. tie-down screw and cover seal, buckets and carriers must be cleaned and greased regularly with the supplied slushing oil (SIGMA part no.: 70104 for 20 ml slushing oil). Before using detergents or decontamination agents which had not been recommended by us, the user has to contact us to make sure that such procedure would not damage the centrifuge. The rotor tie-down screw must be greased using the supplied grease (SIGMA part no.: 70284).

Cleaning of accessories should be done outside of the centrifuge once a week or preferably after every use. The rubber cushions should be removed from buckets and carriers. After this the parts should be dried with a soft cloth or, alternatively, in a drying chamber at approx. 50 °C. **If there is the risk of toxic, radioactive or pathogene contamination, special safety measures must be kept.**

Especially aluminium parts are extremely corrosive. A neutral cleaning detergent with a pH-value between 6 and 8 should be used for such parts. Alkaline agents exceeding pH 8 must be avoided. Especially aluminium parts must be greased regularly with slushing oil. This procedure essentially increases life time and reduces corrosion.

Careful maintenance increases life time and avoids premature failure of the rotor. Corrosion or resultant damages which are caused by insufficient care do not constitute a warranty claim.

8.3 Rotor Pins

The trunnion pins of the rotor should always be greased as only this ensures evenly swinging of buckets and thus quiet run of the centrifuge (part no. 70284 Grease).

8.4 Glass Breakage

In case of glass breakage all glass particles must be carefully removed. Rubber inserts have to be cleaned carefully and possibly be replaced. If a problem has occured, the following has to be considered:

Glass particles in the rubber cushion will cause glass breakage again.

Particles on the rotor pins prevent buckets and carriers from swinging evenly which will cause an imbalance.

Glass particles in the centrifuge chamber will cause metal abrasion due to the strong air circulation. This dust will not only pollute the centrifuge chamber, the rotor, the buckets, the carriers and the material to be centrifuged but also damage the surfaces of the accessories, the rotors and the centrifuge chamber.

In order to totally remove the glass particles and the metal dust from the rotor chamber, it is advisable to grease the upper part of the centrifuge chamber with e.g. Vaseline. Then the rotor should rotate for some minutes at a moderate speed. The glass and metal particles will now collect at the greased part and can easily be removed with a cloth together with the grease. If necessary repeat this procedure.

8.5 not applicable

8.6 Sterilization and Disinfection of Rotor Chamber and Accessories

All usual disinfectants like e.g. Sagrotan, Buraton or Terralin (to obtain at chemist's shops) can be used. The centrifuges and the accessories consist of different materials. A possible incompatibility must be considered. Before using detergents or decontamination agents which had not been recommended by us, the user has to contact us to make sure that such procedure would not damage the centrifuge. For sterilization by steam resistance to temperature of the individual material must be checked (refer to point 8.6.1 "Autoclaving"). Please contact your laboratory safety officer regarding proper methods to use**. If dangerous materials are used, the centrifuge and the accessories must be disinfected.**

Principally we want to point out that for centrifuging of e.g. infectious material certified and hermetically sealed accessories have to be used in order to avoid that the centrifuge is contaminated.

8.6.1 Autoclaving

The life of the accessories essentially depends on the frequency of autoclaving and use. When the parts are showing changes in colour or structure or in the event of leaks etc., the accessories have to be replaced.

During autoclaving the caps of the tubes must not be screwed on to avoid deformation of the tubes. It can not be excluded that plastic parts, e.g. lids or carriers, would deform during autoclaving.

Autoclaving:

Accessories	max. temp. °C	min. time min	max. time min	max. cycles
Glass tubes	134-138	3	5	-
Polycarbonate tubes	115-118	30	40	20
Polypropylene tubes	115-118	30	40	30
Teflon tubes	134-138	3	5	100
Aluminium rotors	134-138	3	5	-
Polypropylene rotor 12034	115-118	30	40	20
Polypropylene rotor 12124	115-118	30	40	20
Polycarbonate/Polyallomer lids for angle rotors	115-118	30	40	20
Polysulfone lids for angle rotors	134-138	3	5	100
Aluminium buckets	134-138	3	5	-
Polycarbonate caps for buckets	115-118	30	40	50
Polypropylene caps for buckets	115-118	30	40	50
Polysulfone caps for buckets	134-138	3	5	100
Rubber adapters	115-118	30	40	-
Rubber cushions	115-118	30	40	-
Round carriers for 13104/ 13117, Polypropylene	115-118	30	40	-
ditto, Polyallomer and Polycarbonate	115-118	30	40	-
Round carriers for 13350/ 13550, Polypropylene	115-118	30	40	-
Rectangular carriers, Polypropylene	115-118	30	40	-
ditto, Polyallomer and Polycarbonate	115-118	30	40	-

8.7 Checks by Operator

The operator has to ensure that no important part of the centrifuge is damaged.

This especially refers to:

1. Motor suspension
2. Concentricity of the motor shaft
3. Fastening of the trunnions in the rotor
4. Rotors and accessories have a limited life. For safety reasons a regular check is recommended after 50.000 cycles. Any changes like e.g. corrosion, cracks, material abrasion etc. require special attention.
5. Screw connections have to be tight.

Furthermore, the earth wire must be checked regularly.

9.1 Slope of Specified Curves, Linear Curves

- The slope of a specified acceleration curve is defined as the time required to accelerate the rotor to 1000 rpm.
- With linear and quadratic slopes, curves are numbered in the direction of increasing acceleration (from right to left).
- The deceleration curves are inverted images of the acceleration curves with the same numbers (exception: curve 0).
- Curve 0 decelerates brakeless.

Comment: The acceleration time depends on the moment of inertia of the rotor.

Linear Curves (0 - 9)

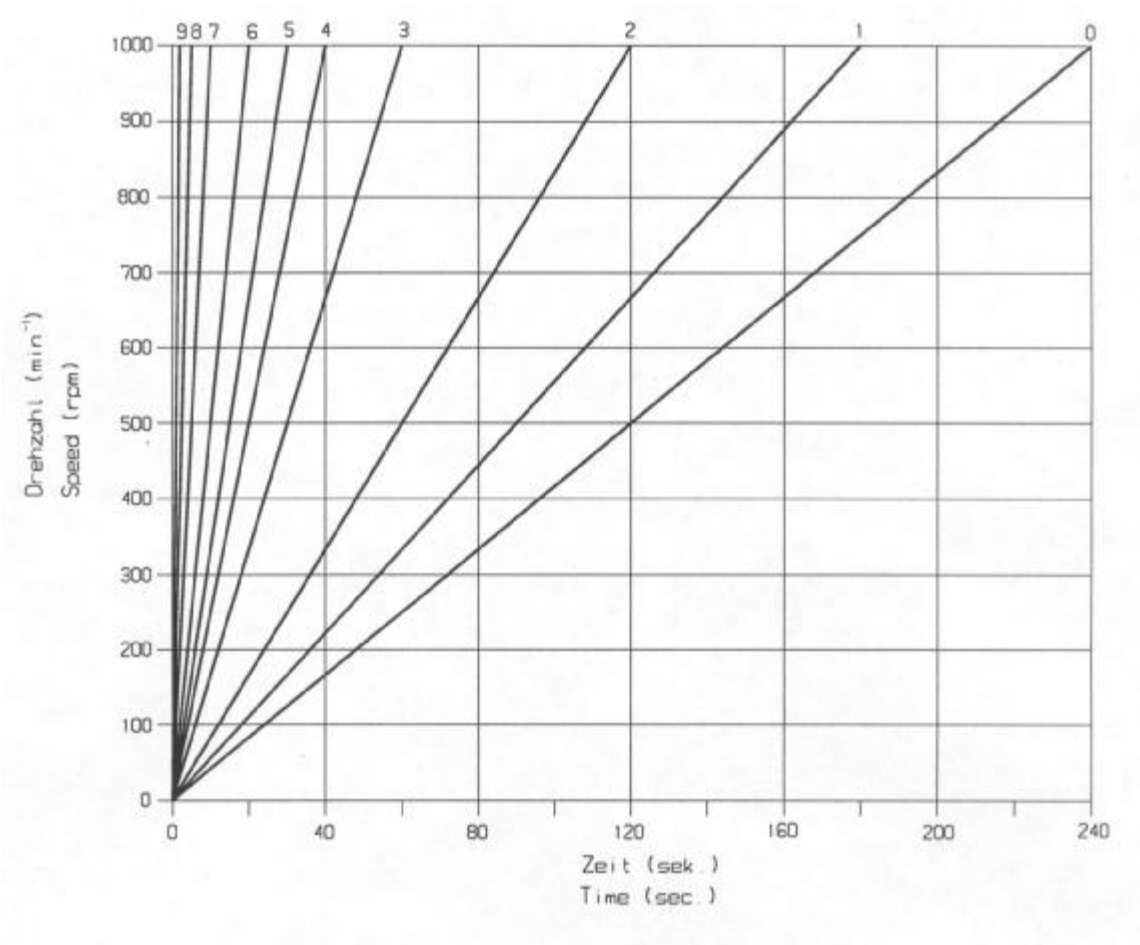


Figure 2

The curve 9 is a special case compared with the other curves. The centrifuge accelerates with max. torque. The acceleration time only depends on the moment of inertia of the rotor.

Linear curve no.	Slope	
0	240	sec./1000 rpm.
1	180	sec./1000 rpm.
2	120	sec./1000 rpm.
3	60	sec./1000 rpm.
4	40	sec./1000 rpm.
5	30	sec./1000 rpm.
6	20	sec./1000 rpm.
7	10	sec./1000 rpm.
8	5	sec./1000 rpm.
9	0,9	sec./1000 rpm.

9.2 Quadratic Curves

– The deceleration curves are inverted images of the acceleration curves with the same numbers.

Quadratic Curves (10 - 19)

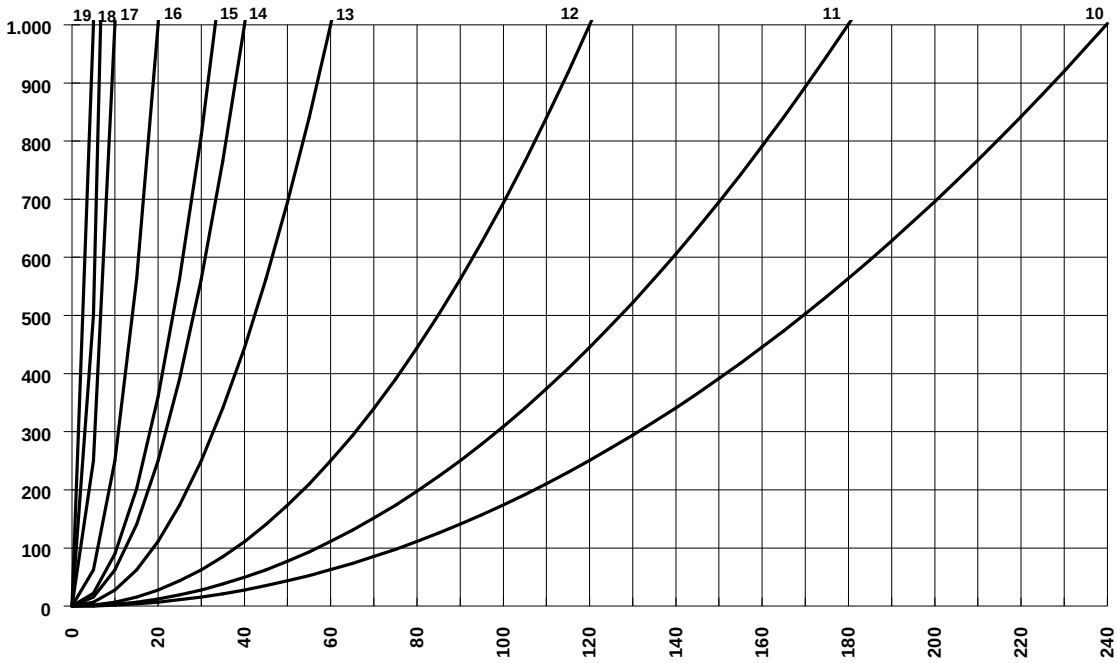


Figure 3

The curve 19 is a special case compared with the other curves. The centrifuge accelerates with maximum torque. The acceleration time only depends on the moment of inertia of the rotor.

Quadratic curve no.	Time up to 1000 rpm	Slope from 1000 rpm linear	
10	240	120	sec./1000 rpm.
11	180	90	sec./1000 rpm.
12	120	60	sec./1000 rpm.
13	60	30	sec./1000 rpm.
14	40	20	sec./1000 rpm.
15	30	15	sec./1000 rpm.
16	20	10	sec./1000 rpm.
17	10	5	sec./1000 rpm.
18	5	2,5	sec./1000 rpm.
19	0,9	0,5	sec./1000 rpm.

9.3 Entry Limitations

Valid entries or area limits could depend on:

- Type of centrifuge
- Rotor
- Interdependent parameters

All entry limits are automatically checked. When reaching a limit the operation is stopped.

Interdependent parameters are limited further with a change of the corresponding parameter. With the alteration of a parameter, the corresponding parameter is recalculated. If the changed parameter is selected, the recalculated value is displayed.

9.4 Mathematical Relations

9.4.1 Relative Centrifugal Force (RCF)

The parameters speed, RCF and the diameter of the rotor are interrelated via the following formula:

$$RCF = 11{,}18 \times 10^{-6} \times r \times n^2$$

If two values are given, the third value is determined by the equation. If the speed or the rotation radius is changed, the resulting RCF will be recalculated. If the RCF is altered, the speed under consideration of the radius is adapted accordingly.

r = radius in cm
n = speed in rpm
RCF without dimension

9.4.2 Density

If the density of the liquid is higher than 1.2 g/cm^3, the allowed maximum speed of the centrifuge is calculated according to the following formula:

$$n = n_{max} \times \sqrt{(1{,}2 / Rho)}$$

Rho = density in g/cm^3

9.5 Error Correction

Most of the errors can be reset by power off/on. In the event of a short power failure during a run, this run is interrupted and can be continued by pressing the Start-key.

No indication on the command panel:	**Actions:**
– No power in the socket?	• Check fuse in mains supply.
– Power cord plugged in and line voltage present?	• Plug in power cord correctly.
– Input fuse ok?	• Switch on thermal fuse.
– Power switch on?	• Switch on power.
– Contrast?	• Change contrast.

9.5.1 Centrifuge cannot be Started

a) Start-key LED not illuminated:	• Close lid. Motorized lid locks must close.
b) Start-key LED illuminated:	• Power off/on. If error occurs again, call service.

9.5.2 Centrifuge Decelerates during Operation

Imbalance dialogue window is active:

– Rotor is loaded unevenly.	• Balance loading.
– Centrifuge tilted.	• Align centrifuge.
– Drive error (mechanical damage).	• Call Service.
– Centrifuge was moved during operation.	• Restart after opening and closing lid.
– Centrifuge displays an error 73 to 77 after power on.	• These error numbers indicate an error in the internal program storage. This error is e.g. generated when a power failure occurs during a storage procedure.

9.5.3 Lid cannot be Opened/Closed

When first trying to open the lid the locks are not released. Press the Lid-key to activate the motorized lid locks again (refer to chapter 9.6 “Error codes“, ERROR 79). Call Service.

9.5.4 Emergency Lid Release

In the event of a power supply failure it is possible to manually open the lid.

Remove stopper at the upper right side front panel using e.g. a screw driver.

Unlock the motorized lid lock using the supplied square wrench. Put in wrench and turn to the right. The lid is unlocked and can be opened.

Attention!

The lid may only be unlocked and opened when the rotor is at standstill.

9.5.5 Problems with the Centrifuge?

Please contact your supplier for support or in the event of malfunctions and for supply of spare parts.

9.6 Error Codes

Error no.	Kind of error	Measures	Comment
1-62	Internal error	• let slow down • power off/on	
69-77	EEPROM error	• let slow down • power off/on	ATTENTION: Saved curves and programs could have been deleted.
78	Lid does not close	• power off/on • remove impurities	
79	Faulty log identification	• press lid key • close lid rapidly • check log opening for impurities	
80	Lid electronics defective	• contact Service	
81	Rotor spins with open cover	• let slow down • close lid • power off/on	
82-83	Lid does not open	• power off • emergency lid release	
84	Excess temperature heat sink	• let cool down • provide for better ventilation • power off/on	
85	Excess temperature centri-fuge chamber (> 50 °C)	• let cool down • provide for better ventilation • power off/on	
87	Actual temperature > 45 °C resp. < -20 °C	• provide for better ventilation	
90-96	Sensor defective	• power off/on	
98	Faulty rotor identification	• check rotor	
99	Incorrect rotor	• check rotor and set rotor resp. bucket identification	

Should it not be possible to repair the failure, please contact Service.

9.7 Speed-RCF-Diagram

An additional help is the enclosed Speed-RCF-Diagram.

9.8 Declaration of Decontamination / Return Declaration

The following declarations serve for keeping safety and health of our employees. Fill in the forms and attach them when returning centrifuges, accessories and spare parts. Please understand that we cannot carry out any work before we have the declarations. (We recommend to make **several copies of this page.**)

" ----------

SIGMA Laborzentrifugen
Laboratory Centrifuges

!!! Attention – This form must be glued on outside of the box !!!

Return declaration

	YES	NO
Decontamination declaration inside :		
Unit / component contaminated :		
Unit / component unused (new) :		

!!! Attention – This form must be glued on outside of the box !!!

" ----------

Please make some copies before removing this page.

" ----------

Declaration of Decontamination of Centrifuges, Accessories and Spare Parts

This declaration may only be filled in and signed by authorised staff.

SIGMA Laborzentrifugen
Laboratory Centrifuges

Repair Order dtd. : _____

Order No. : _____

Type of unit : _____ Serial No. : _____

Type of unit : _____ Serial No. : _____

Type of unit : _____ Serial No. : _____

Type of unit : _____ Serial No. : _____

Accessories : _____

_____

Is the equipment free from harmful substances ? YES **O** NO **O**

If not, which substances have come into contact with the equipment?

Name of the substances : _____

_____

Remarks (e.g to be touched with gloves only) ; _____

_____

General characteristics of the substances :

Corrosive	**O**	Explosive	**O**
Biologically hazardous	**O**	Radioactive	**O**
Toxic	**O**		

In combination with which substances may hazardous mixtures develop?

Name of the substances : _____

_____

Has the equipment been cleaned before shipment? YES **O** NO **O**

Is the equipment decontaminated and not harmful to health? YES **O** NO **O**

Prior to repair, radioactively contaminated components must be decontaminated according to the valid regulations for radiation protection.

Legally Binding Declaration

I / we hereby declare that the information on this declaration are correct and complete.

Company / Institute : _____

Street : _____

Postcode, City : _____

Tel. : _____ FAX : _____

Name : _____

Date : _____ Stamp :

Signature : _____ _____

" ----------

Please make some copies before removing this page.

9.9 Program No.:

Used for .....

.....

.....

.....

Alteration: .....

.....

by: .....

Date: ....

Speed ....

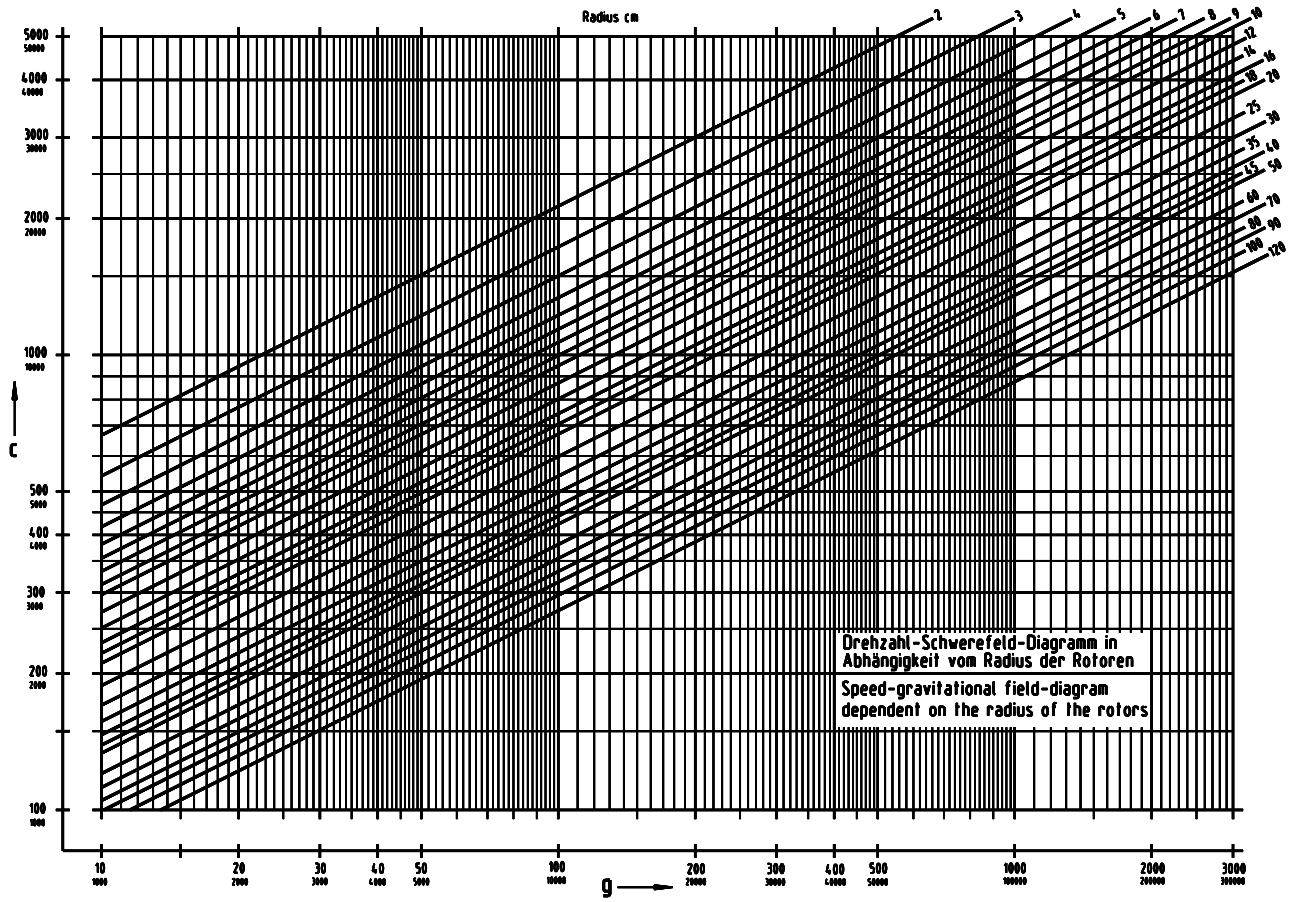
Gravitational field ....

Rotor ....

Bucket ....

Made on: .....

by: .....


Radius cm
1
2
3
4
5
6
7
8
9
10
12
14
16
18
20
25
30
35
40
45
50
60
70
80
90
100
120
5000
50000
4000
40000
3000
30000
2000
20000
1000
10000
500
5000
400
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50
5000
100
10000
200
20000
300
30000
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40000
500
50000
1000
100000
2000
200000
3000
300000
g
Drehzahl-Schwerefeld-Diagramm in Abhängigkeit vom Radius der Rotoren
Speed-gravitational field-diagram dependent on the radius of the rotors