



# ***RM300 Operating instructions***





## LAMYRHEOLOGY

\_ viscosimètres

\_ rhéomètres



### CE CERTIFICATE OF CONFORMITY

Directive CEM 2004/108/CEE

Conformity of viscometers and rheometers :

BLACK ONE – FIRST RM – RM100 – RM200 – RM300

Verified according to the EN 55011 standard.

Champagne au Mont d'Or , date : 05/07/2012

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## 1- Including parts in RM300 Rheometer

- 1- Electronic measuring head
- 2- Power supply with cable
- 3- Plastic case with foam-rubber setting
- 4- All parts listed in the customers order (joined to this package)
- 5- All accessories listed in the including accessories listed hereafter (pages 13-18 )
- 6- Dimensions of the complete installed instrument:
  - L = 300 mm
  - l = 200 mm
  - h = 800 mm (+ ST100 stand)
  - Weight of instrument on his stand = 17 Kg (+ ST100 stand)



## 2. INTRODUCTION





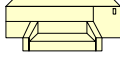

The RM300 is used for the determination of viscosity and yield value for a wide range of substances in the lab.

The display shows you the following data :

- The sample temperature, in °Celcius
- The torque, in mN.m,
- The shear rate  $D$ , in  $s^{-1}$ ,
- The calculated  $\eta$  (eta), in Pa.s
- The measuring system eg. 11,

The RM300 can store 20 measurements of step programs.

## 3. KEYPAD RM300

KEYS	ENTER	FUNCTION
<b>0,1....9</b>	Figure	Entry the numeric values
<b>E</b>	enter	enter
<b>0 « zéro »</b>		Select zero adjustment, simultaneously press this key when switching « ON »
	Modify/return	clear data , simultaneously press  and « ON »
		Move on menu
		Move on menu
	printer	Print point measurements
	computer	Drive the RM300

**4. Front view / rear view**

LCD Display



USB port

RS232 port



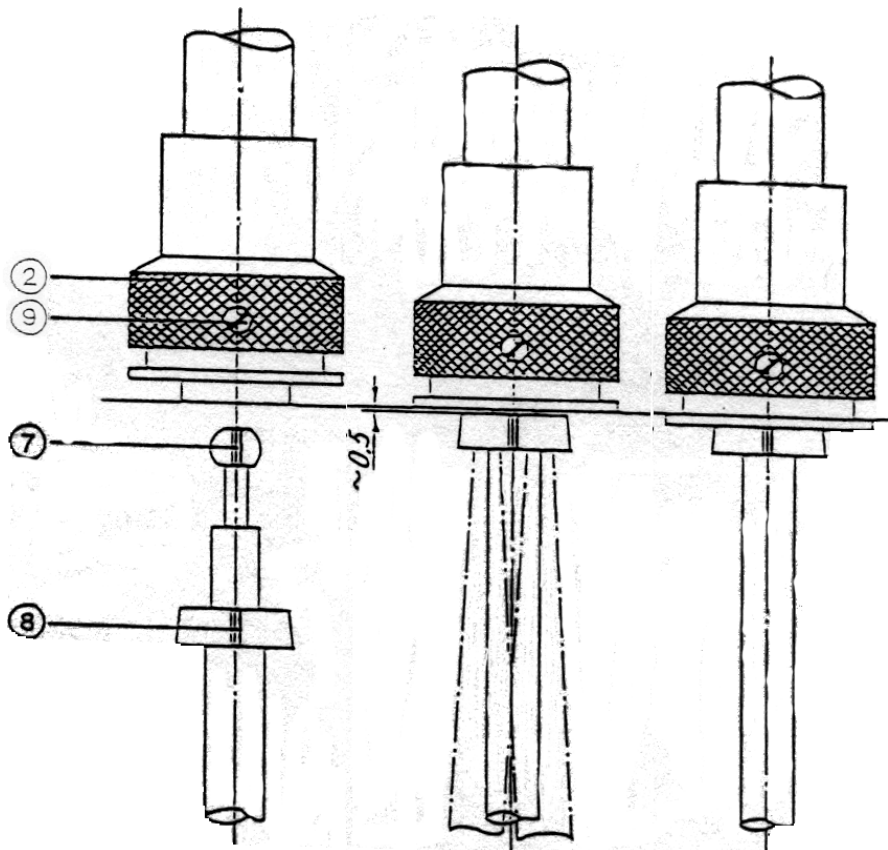
centronics port

Power supply

coupling



**5- Universal coupling system AC115 :**



The knurled coupling sleeve (2) controls the vertical position of the ball and socket joint. It can be vertically moved and has 3 lockable positions.

In the upper position (-a-), the coupling is open so that the ball of the measuring head can be moved in and out.

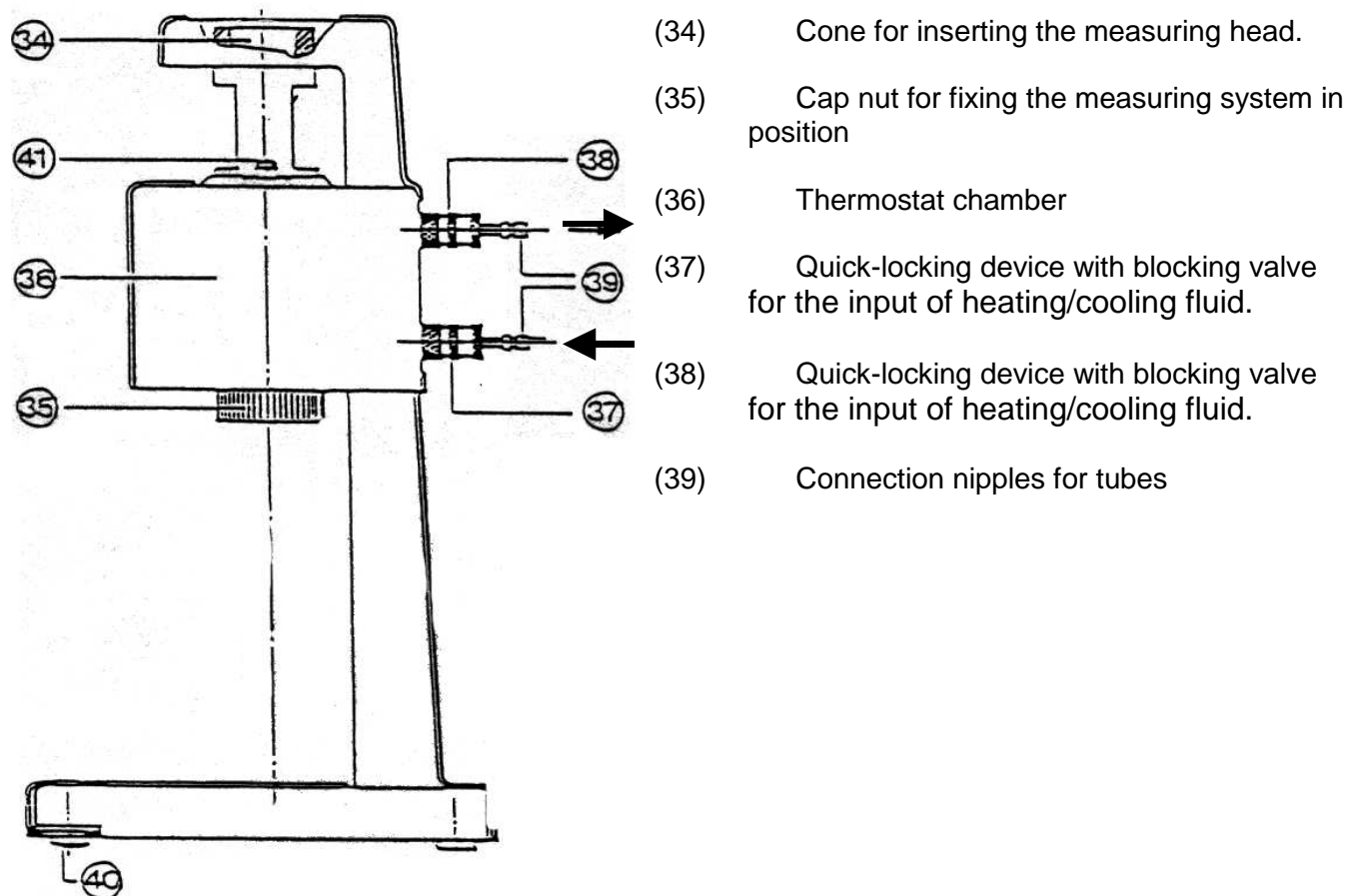
**When pushing the ball in, make sure the groove on the ball (7) or the notch on the axis of the measuring head (8) is aligned with the large screw (9) of the coupling sleeve.**

In the intermediary position (-b-), the coupling is closed, but the axis of the measuring bob (8) is freely hanged. (**Unlocked position**)

In the lower position, (-c-), the axis of the measuring system (8) is fixed up (**Locked position**).



**6- Thermostat unit stand Old stand of RM115 or New ST100:**



The stand supports the measuring head to the measuring system. It is provided with a double-walled thermostatic chamber (36) which can be controlled by a recirculation thermostat.

**To connect the recirculation thermostat:**

Push back the coupling sleeves of the quick-locking devices (37) and (38).

Attach the two water tubes to the connection nipples (39).

Push the nipples on to the quick-locking devices.

The blocking valves are opened and the heating/cooling fluid (water) can flow in or out.

When the connection nipples are pulled out of the quick-locking devices, the blocking valves are closed so that no fluid can flow in or out.

Secure the water tubes with hose clamps.





### **Measuring system with coaxial cylinder :**

The measuring system complies with the DIN 53019 / ISO 3219 standard. There are several measuring systems which are defined according to the diameter of the measuring bob: so the diameter of the measuring bob MS-DIN 25 is 25 mm.

In order to make easier the cleaning of the measuring system, you have to unscrew the measuring tube at the bottom of cup, in which the Pt100 sensor is fixed up.

The waterproof joints can resist to the most current solvents.

### **Setting :**

- Fill the cup out with the product (about 2/3 of depth),
- Insert the measuring bob into the cup, by gravity,
- Place the whole measuring system into the nut à chapeau of the stand (35).
- Hold the unit in one hand,
- Insert it at the bottom of the thermostatic chamber and screw the cap nut
- Make sure that the ball (7) goes easily into the coupling (2).
- Gently turn the axis of the measuring bob by sliding towards the top into the coupling.

## **7. Measurements**

### **zero adjustment : without measuring system !**

You can perform a zero adjustment every day or after a transport.

**ZERO ADJUSTMENT MUST BE MADE OBLIGATORY WHEN RM300 IS CONNECTED TO A Pt100 SENSOR.**

**IF ZERO ADJUSTMENT IS MADE WITHOUT Pt100 CONNECTION, PLEASE DO IT AGAIN WITH Pt100 CONNECTED AND SWITCH ON AND RE-START THE RM300.**

-Switch on the RM300 and simultaneously press the key « on ».

The display shows :

**« zero adjustment in the air please wait »**





## **8. MANUAL measuring mode:**

display shows :

Measure mode ? <b>MANUAL</b>
---------------------------------

- Press **E**
- Choose the different parameters and press **E** every time.

### **Measuring time :**

The measuring time is entered in seconds. At the end of this time, the measurement stop and keep the last value on the display.

This function is use for thixotropic products.

**If you enter 0 « zero » : measuring time is infinite until you stop the rheomat.**

### **Print interval: (optional)**

<b>TO SELECT IT PRESS SIMULTANEOUSLY “E” and “ON”, ENTER THE CODE “↑” “E” “↓” “←” AND SELECT “menu impression”, THEN “YES”:</b>
---

If you connect a centronics/parallel printer, the values of the measurement are printed with the predefined interval

## **9. DIRECT measurement:**

for measuring directly with all parameters you entered at the last measure you made.

Measure mode ? <b>direct</b>
---------------------------------



**10- RAMP:**

<p>Mode de mesure ?</p> <p><b>Rampe</b></p>
---

<b>Program</b>	<b>Définition</b>
1 to 10	Enter the mini and the maxi shear rate ( <i>D MIN, D MAX</i> ) . <i>D MIN</i> et <i>D MAX</i> are in memory for every program. You can modify the programs .

The measurement is made at 8 different shear rates up and down and the 15 values are memorised. You can transfert theses values on “rheomatic” T software and make rheograms.you can also make an automatised curve fitting at the end of the measure and memorise it or print it.

- Press **E**,
  - Choose the measuring system you want and press **E**.
  - Choose the number of the program you want.
- the RM300 displays the last used program ; for an other program, choose with  $\uparrow \downarrow$  and enter the number of the program you want .
- To modify the program , press  $\leftarrow$  and enter the new values.

**- Curve fitting**

for a curve fitting press YES.

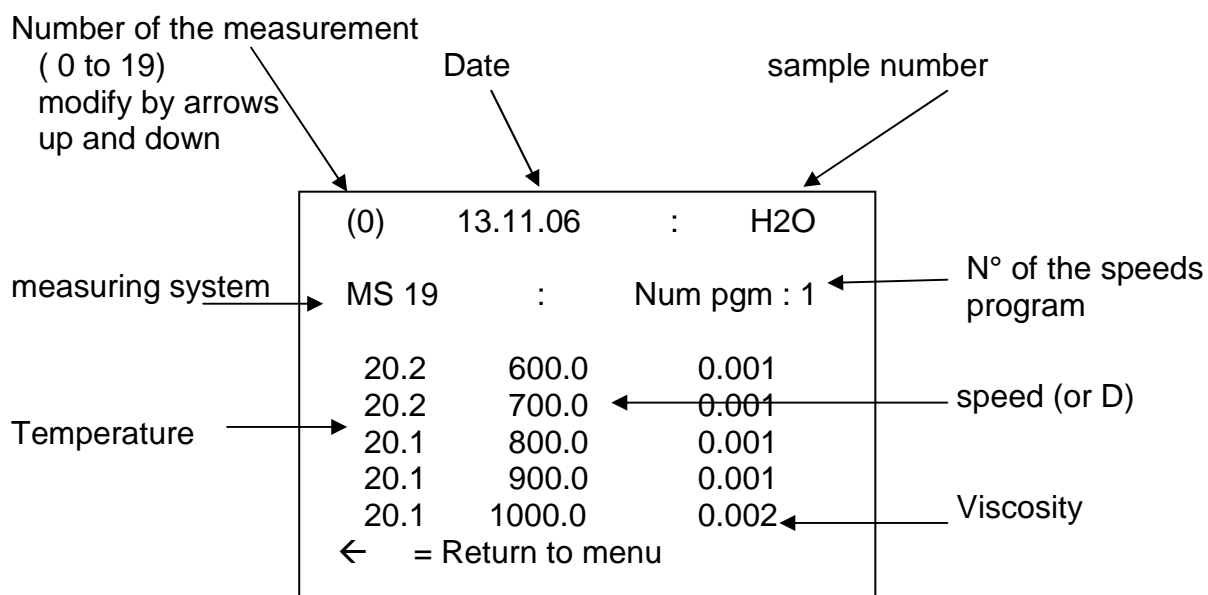
-choose the model in the list : **Newton, Bingham, Casson, Chocolate**, with  $\uparrow \downarrow$  and valid with **E**.

select **Dmin** and **Dmax** for the curve fitting.  
Select ascending , descending or average .

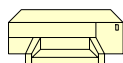
### 11- Data measurements :

The 15 points files made by the ramp mode, are available after the end of measurements :

Sélect on principal menu : « Data measurements »,  
The display shows :



for printing, push the « printer » button.



### To erase the memory :

Switch of the RM200. Push on arrow (←), and switch on the RM200

« clear » appears on the screen.



**12 . DIN / ISO 3219 systems :**

measuring system	cup φ mm	bob φ mm	Range of shear rate [ s-1 ]	Viscosity range [Pa.s]	quantity [ml]
<b>DIN 145</b>	48.8	45	<b>0.13 – 1936</b>	<b>0.010 - 5.0</b>	<b>100</b>
<b>DIN 140</b>	43.4	40	<b>0.13 – 1936</b>	<b>0.010 - 5.0</b>	<b>50</b>
<b>DIN 125</b>	27.1	25	<b>0.13 – 1936</b>	<b>0.020 - 70</b>	<b>20</b>
<b>DIN 114</b>	15.2	14	<b>0.13 – 1936</b>	<b>0.050 - 100</b>	<b>5</b>
<b>MS-0</b>	43.4	42.4	<b>0.45 - 6000</b>	<b>0.001 - 0.20</b>	<b>18</b>
<b>MS-C</b>	20	13.6	<b>0.029 - 427</b>	<b>0.05 - 800</b>	<b>15</b>
<b>MS-C2</b>	20	17.6	<b>0.082 - 1230</b>	<b>0.03 - 250</b>	<b>15</b>
<b>MS-C4</b>	20	19	<b>0.21 - 3000</b>	<b>0.01 - 150</b>	<b>15</b>
<b>MS-C3</b>	20	18	<b>0.1 - 1500</b>	<b>0.02 - 350</b>	<b>15</b>
<b>HS - 25/36</b>	27.1	26.9	<b>1.4 - 19500</b>	<b>0.001 - 0.050</b>	<b>5</b>
<b>HS- 25/5</b>	27.1	26.9	<b>1.4 - 19500</b>	<b>0.01 - 0.40</b>	<b>3</b>
<b>HS- 25/2.5</b>	27.1	26.9	<b>1.4 - 19500</b>	<b>0.05 – 0.60</b>	<b>2</b>
<b>MS-VHS 25</b>	48	47.95	<b>10 - 150000</b>	<b>0.001 - 0.030</b>	<b>1</b>

**13 .RT300 Oven system :**

USE OF THE TEMPERATURE REGULATOR OF FURNACE RT-300

To the startup, the display indicates the temperature of the furnace.

To read the setting value, to press key FUNC;  
The setting value appears during 10 seconds.

Caution: the instruction is regulated at the origin by defect with 100°C To modify the instruction, to press the key A (to increase) or V (to decrease) during a few seconds, until the right value, then to continue to support to increase or decrease the value. (pressure successive for a smooth scrolling or maintained for one Fast run).

The temperature of the furnace is posted after a few seconds.



#### **14. CP100 Cone-plate stand:**

CP-100 stand thermostated by “Peltier” effect without circulating fluid is ideal for measurements rheological requiring fast variations of temperatures and small quantities of sample. The beach of adjustment is between 5 and 80° Celsius.

#### **INSTALLATION :**

To install the CP100 on a stable and solid support.  
To connect the electric cable sector.

To position Rheomat on the CP100, to unscrew the screw M3 initially located under the base plate of the viscometer (indicated by a paper that it is necessary to remove).

To install Rheomat on the CP100 then to screw up the screw M3.

To connect the gray connecting cable for the temperature between Rheomat and support CP100. (located at the back).

#### **Adjustment of Gap:**

The gap is regulated in factory with the cone of measurement which you choose.  
To modify this adjustment, it is necessary to unscrew the screw located on the side of the bracket of CP100 stand, to make turn the brass cylinder knurled in a direction or the other in order to up and down the Rheomat so that the cone of measurement is in contact with the plate.  
Then to tighten the screw of with dimensions one.

#### **Adjustment of the setting temperature:**

To the startup, the bill-poster indicates in top the temperature of the furnace and lower part the temperature of instruction.  
Caution: the instruction is regulated at the origin by defect with 25.0°C change of the instruction of temperature:

To modify the instruction, to press the key “set “: Choose with the key the figure to be modified which becomes more brilliant.

Then to modify the value with the keys and after press on the key “set” to validate.

## 15. technical Characteristics

Principle: Imposed shear rate rotative rheometer

### speeds

- Range 0.1 to 1500 rpm/min (accuracy  $\pm 0.5\%$ )

### Torque Range

0 to 30 mN.m (accuracy  $\pm 1\%$ )

### Accuracy

+/- 1% of full scale

### Reproducibility

+/- 0.2%

### Temperature

- sensor type : Pt100
- Range -20 to 120 °C (accuracy +/- 0.2°C)
- Resolution 0.1 °C

Surrounding temperature range :

+10 to +40 °C

### Output data :

- printer Interface Parallel (Centronics)
- computer serial Interface (RS232) and USB

### Power supply :

- voltage 90 to 240 Vac 50/60 Hz

### Viscosity range of different measuring systems :

MS-DIN RM300 + MS-0 + MS-HS	1 mPa.s to 53 000 Pa.s
MS-C,C2,C4	5 mPa.s to 74 000 Pa.s
MS-Cone-plate CP100	1 mPa.s to 150 000 Pa.s
MS-RT300 Oven	5 mPa.s to 280 000 Pa.s

### Made by :

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16. Name and Reference of accessories for RM300:

ST-100 SPECIFICATIONS

<b>Measuring principle</b>	Stand for coaxial measuring systems thermostated by Peltier effect.
<b>Temperature</b>	With ambient air: 10 – 65°C +/- 0.2°C With cryostat bath (not include): -10 – 100°C +/- 0.2°C
<b>Digital display</b>	Regulation set-up and actual temperature of cell
<b>Supply voltage</b>	90-240 VAC 50/60 Hz
<b>Other detail</b>	ST-100 coul be associated to all coaxial geometries of RM 300
<b>Dimensions (WxLxH) and weight</b>	Electronic box: 257 x 267 x 200 mm Stand: 197 x 280 x 485 mm

15 kg



	Name	Reference	Dimensions	Volume	Viscosity range
	MK-DIN 145	112504	∅ 45 mm	–	3 - 900 000 mPa.s
	MK-DIN 125	112503	∅ 25 mm	–	5 - 5 000 000 mPa.s
	MK-DIN 114	112502	∅ 14 mm	–	15 - 30 000 000 mPa.s
	MK-DIN 108	112501	∅ 8 mm	–	80 - 150 000 000 mPa.s
	MB-DIN 145T cup	112512	∅ 48.5 mm	100 ml	–
	MB-DIN 125T cup	112511	∅ 27.5 mm	20 ml	–
	MB-DIN 114T cup	112510	∅ 15 mm	5 ml	–
	MB-DIN 108T cup	112509	∅ 8.5 mm	2 ml	–
	MK-MS0	112702	∅ 46.5 mm	–	1 - 28 000 mPa.s
	MS-0 cup	112701	∅ 50 mm	20 ml	
	MK-C	112525	∅ 13.6 mm	–	50 mPa.s - 50 000 000 mPa.s
	MK-C2	112550	∅ 17.6 mm	–	20 mPa.s - 20 000 000 mPa.s
	MK-C4	112552	∅ 19 mm	–	2 - 900 000 mPa.s
	MB-C cup	112524	∅ 20 mm	20 ml	–






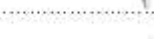



## CP1 – CP100 PELTIER SYSTEMS

<b>Measuring principle</b>	Aluminium plate thermostated by Peltier Effect (stainless steel possible)	
<b>Temperature</b>	CP100: 5 to 80 °C +/- 0.2 °C CP1: 5 to 60 °C +/- 0.2 °C PELTIER LIQUID OPTION: -20 to 120 °C according associated bath temperature (not include)	
<b>Digital display</b>	Regulation set-up and real plate temperature	
<b>Supply voltage</b>	90-240 VAC 50/60 Hz	
<b>Other detail</b>	CP1 and CP100 could be associated to all viscometers and rheometers of our range, except BLACK ONE	
<b>Dimensions (WxLxH) and weight</b>	CP1 Electronic box: 255 x 265 x 205 mm Stand: 237 x 285 x 650 mm	16 kg
	CP100 297 x 490 x 628 mm	22 kg



### Cones for RM 300













	<b>MK-CP 2020</b>	432020	Ø 20 mm α 2°	0.075 ml	100 - 13 000 000 mPa.s
	<b>MK-CP 4020</b>	434020	Ø 40 mm α 2°	0.60 ml	15 - 1 500 000 mPa.s
	<b>MK-CP 5020</b>	435020	Ø 50 mm α 2°	1.15 ml	10 - 1 000 000 mPa.s
	<b>MK-CP 2005</b>	432005	Ø 20 mm α 0.5°	0.018 ml	40 - 3 000 000 mPa.s
	<b>MK-CP 5005</b>	435005	Ø 50 mm α 0.5°	0.30 ml	3 - 250 000 mPa.s



## RT3 –RT300 ELECTRICAL OVENS

<b>Measuring principle</b>	Electrical oven	
<b>Temperature</b>	T° amb. to 300 °C (RT-300) T° amb. to 200 °C (RT-3)	
<b>Supply voltage</b>	90-240 VAC 50/60 Hz	
<b>Other detail</b>	Possibility to use a ramp temperature controller to realise ramps or successive steps of T°C	
<b>Dimensions (WxLxH) and weight</b>	RT-3	20 kg
	Electronic box: 255 x 265 x 205 mm Stand: 240 x 284 x 655 mm	
	RT-300	20 kg
	297 x 490 x 628 mm	



	Name	Reference	Dimensions	Volume	Viscosity range
	 MK-RT II B	112570	∅ 30 mm	–	10 - 5 500 000 mPa.s
	 MK-RT II C	112572	∅ 13.6 mm	–	50 - 27 500 000 mPa.s
	 MK-RT II D	112573	∅ 7.5 mm	–	2000 - 500 000 000 mPa.s
Co axial measuring system	 MB-B alu cup	114318	Lot of 100	70 ml	–
	 MB-C alu cup	114306	Lot of 100	20 ml	–
	 MB-D alu cup	114319	Lot of 100	8 ml	–
	 B ring	112611	–	–	–
	 C insert	112612	–	–	–
	 D insert	112614	–	–	–
Cone-plate measuring systems	 KP insert RT 300	112613	–	–	–
	 KP cone RT 2020	312020	∅ 20 mm α 2°	0.075 ml	100 - 8 000 000 mPa.s
	 KP cone RT 5020	315020	∅ 50 mm α 2°	1.14 ml	10 - 1 000 000 mPa.s



**SOFTWARE**

	<p>Rheomatic-P</p>	<p>Drive and rheological data treatment</p>	<p>311002</p>	<p>RM 200, RM 300, RM 300i</p>
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**VERIFICATION OILS**

Name	Reference	Volume	Viscosities
Oil 50 mPa.s	250050	250 ml	50 mPa.s to 23 °C
Oil 100 mPa.s	250100	250 ml	100 mPa.s to 23 °C
Oil 500 mPa.s	250500	250 ml	500 mPa.s to 23 °C
Oil 1000 mPa.s	251000	250 ml	1000 mPa.s to 23 °C
Oil 3500 mPa.s	253500	250 ml	3500 mPa.s to 40 °C
Oil 5000 mPa.s	255000	250 ml	5000 mPa.s to 23 °C
Oil Chocolate	250750	250 ml	750 mPa.s to 40 °C