



RM200

**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 RM200 Rheometer

- 1- Electronic Measuring Head
- 2- Stand including:
 - Basis heavy feet with 1 screw for the rod
 - Stainless steel Rod (length 400 mm)
 - Aluminium arm with 2 fixation screws for the rod and the Head
- 3- Power supply with cable
- 4- Plastic case with foam-rubber setting
- 5- All parts listed in the customers order (joined to this package)
- 6- All accessories listed in the including accessories listed hereafter (pages 17-22)
- 7- Dimensions of the complete installed instrument:
 - L = 300 mm
 - l = 200 mm
 - h = 600 mm
 - Weight of instrument on his stand = 7 Kg



1. INTRODUCTION





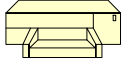

The RM200 is used for the simple determination of viscosity of a wide range of substances in the lab.

The display shows you the following data :

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

The RM200 can store 20 measurements of step programs.

2. KEYPAD RM200

KEYS	ENTER	FUNCTION
0,1...9	Figure	Entry the numeric values
E	enter	enter
0 « zéro »		Select zero ajustement, 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 RM200

4. Front view / rear view





5. Measurements

5.1 zero ajustement

You should perform a zero adjustment when you transport the machine, or after non-using period or before a verification.

It must be made on the air and without spindle.

-Switch on the RM200 and simultaneously press the key « on ».

The display shows :

« zero adjustment in the air please wait »



6. MANUAL measuring mode:

display shows :

Measure mode ?
MANUAL

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

Measuring time :

The measuring time is entered in secondes. 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 « zéro » : measuring time is infinite until you stop the rheomat.

Print intervall : (optional)

TO SELECT IT PRESS SIMULTANEOUSLY “E” and “ON”, ENTER THE CODE “8” “6” “2” “4” AND SELECT “menu impression”, THEN “YES”:

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

7- DIRECT measurement:

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

<p>Measure mode ?</p> <p>direct</p>

8- RAMP:

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

Program	Définition
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 RM200 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.

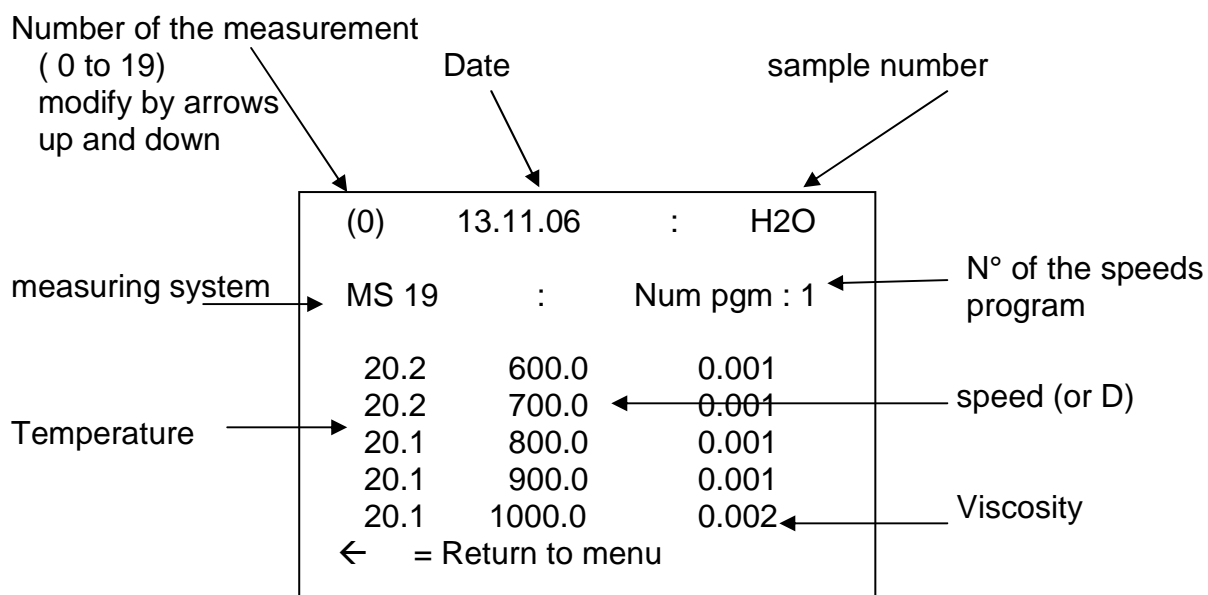
-choose the model in the list : **Newton, Bingham, Casson, Chocolate**, with $\uparrow \downarrow$ and valid with **E**.

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

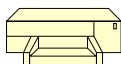
9- Data measurements :

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.



10. Measuring system TV MS-R 1 à 5 :

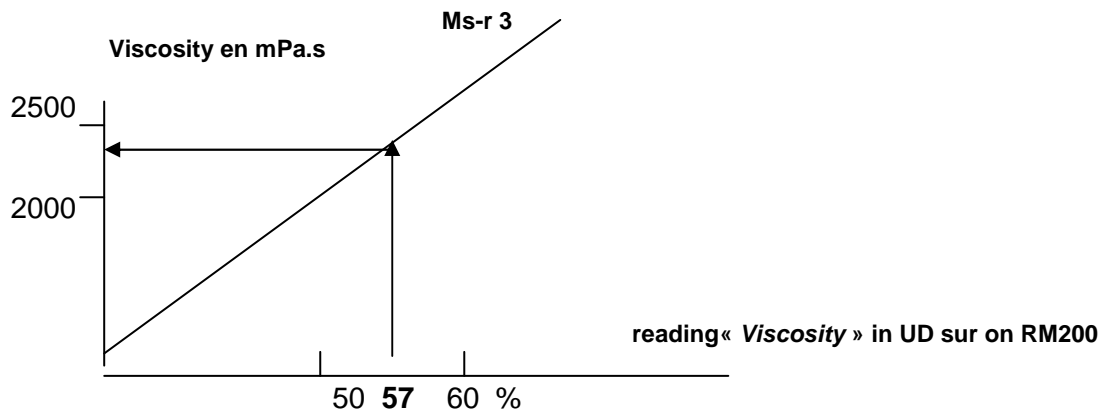
- select speed : **200 rpm/min**
- the scale of reading is **0 to 100 (UD or %)** and the same of **TV viscometer of Contraves.**
- if you want to know the viscosity in **mPa.s**, see the calibration curves for every mobile choosen.
- these calibration curves are only made at 200 rpm/min.**



Measuring system	Shear rate range at 200 rpm	Viscosity range	Filling volume
MS – R1	100 s ⁻¹	1 - 200 mPa.s	320 ml
MS – R2	70 s ⁻¹	0.040 - 4 000 Pa.s	60 ml
MS – R3	60 s ⁻¹	0.200 - 20 000 Pa.s	25 ml
MS – R4	50 s ⁻¹	1 - 180 000 Pa.s	25 ml
MS – R5	20 s ⁻¹	5 - 510 000 Pa.s	25 ml

Example with MS-r3

Every system have a curve for determination of the **Viscosity** :



for example if the reading is 57 (with MS-r3).the viscosity will be 2400 mPas.

For measuring systems MS-r 3, 4 and 5, you can enter coefficients in the memory in the RM200, for a direct determination of the viscosity in mPa.s. in this case don't choose MS 75, but MS R3, MS R4, or MS R5.

11. CONTROL of RM200 with water at 20°C with MSR1

- 1- Fill the cup n° 1 with 320 ml of water at 20° C
- 2- select speed 200 rpm/min and read the value after 30 secondes.
- 3- the value must be between **29** and **30** UD +/- 1 UD



12. Measuring system ASTM / ISO 2555

With this system , the speed N is expressed in rpm and not in s-1 because a shear rate can't be calculated.

$$1 \text{ Pa.s} = 10^3 \text{ cP}$$

MS ASTM-ISO2555 n°1 -7

MK -ASTM n°1
Réf. 111000+111001



MK -ASTM n°2
Réf. 111000+111002



Disque ASTM n° 3
Réf. 111003



Disque ASTM n° 4
Réf. 111004



Disque ASTM n° 5
Réf. 111005



Disque ASTM n° 6
Réf. 111006



MK -ASTM n° 7
Réf. 111007

You must choose the spindle in function of the viscosity you would to measure:

- For a low viscosity measurement, choose the ASTM 2, and turn at a high speed 100 rpm for example.
- For a High viscosity measurement, choose the ASTM 7, and turn at a low speed 1 rpm for example.

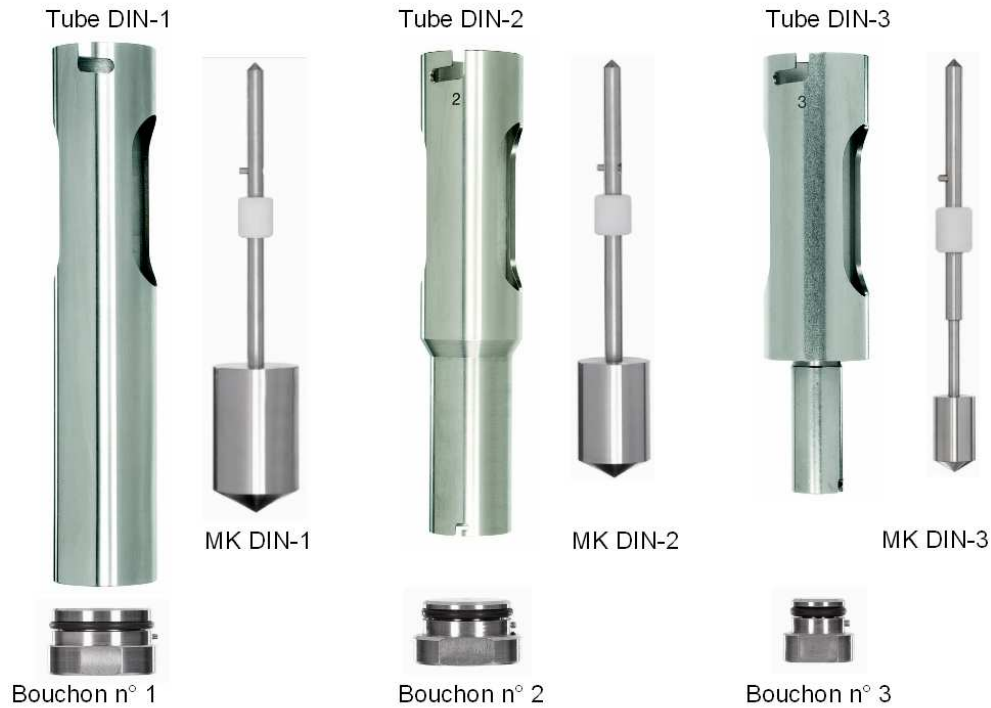


Maximum Viscosity (Pa.s) value according to speed and ASTM /ISO 2555 spindle

Speed rpm	Spindle number						
	Astm1	Astm2	Astm3	Astm4	Astm5	Astm6	Astm7
1500	0.278	1.113	2.782	5.564	11.13	27.82	111.3
1400	0.298	1.192	2.980	5.961	11.92	29.80	119.2
1300	0.321	1.284	3.210	6.420	12.84	32.10	128.4
1200	0.347	1.391	3.477	6.955	13.91	34.77	139.1
1100	0.379	1.517	3.793	7.587	15.17	37.93	151.7
1000	0.417	1.669	4.173	8.346	16.69	41.73	166.9
900	0.463	1.855	4.636	9.273	18.55	46.36	185.5
800	0.521	2.086	5.216	10.43	20.86	52.16	208.6
700	0.596	2.385	5.961	11.92	23.85	59.61	238.5
600	0.695	2.782	6.955	13.91	27.82	69.55	278.2
500	0.834	3.339	8.346	16.69	33.39	83.46	333.9
400	1.043	4.173	10.43	20.86	41.73	104.3	417.3
300	1.391	5.565	13.91	27.82	55.65	139.1	556.5
250	1.669	6.678	16.69	33.38	66.78	166.9	667.8
200	2.086	8.347	20.86	41.73	83.47	208.6	834.7
100	4.173	16.69	41.73	83.46	166.9	417.3	1669
60	6.955	27.82	69.55	139.1	278.2	695.5	2782
50	8.346	33.39	83.46	166.9	333.9	834.6	3339
40	10.43	41.73	104.3	208.6	417.3	1043	4173
30	13.91	55.65	139.1	278.2	556.5	1391	5565
20	20.86	83.47	208.6	417.3	834.7	2086	8347
12	34.77	139.1	347.7	695.5	1391	3477	13912
10	41.73	166.9	417.3	834.6	1669	4173	16695
6	69.55	278.2	695.5	1391	2782	6955	27825
5	83.46	333.9	834.6	1669.2	3339	8346	33390
4	104.3	417.3	1043	2086	4173	10432	41737
3	139.1	556.5	1391	2782	5565	13910	55650
2.5	166.9	667.8	1669	3338	6678	16692	66780
2	208.6	834.7	2086	4173	8347	20865	83475
1.5	278.2	1113	2782	5564	11130	27820	111300
1	417.3	1669	4173	8346	16695	41730	166950
0.6	695.5	2782	6955	13910	27825	69550	278250
0.5	834.6	3339	8346	16692	33390	83640	333900
0.3	1391	5565	13910	27820	55650	139100	556500

13. DIN / ISO 3219 systems :

MS – DIN 11, 22, 33



System No.	tube		bob		D (s ⁻¹)	Viscosity range (Pa•s)	Filling (ml)
	Ø mm	N.o	Ø mm	N.o			
11	32.54	1	30	1	0.39- 1936	0.006 - 154	32
22	26.03	2	24	2	0.39 - 1936	0.02 - 300	26
33	15.18	3	14	3	0.39 - 1936	0.05 - 1500	17
19	32.54	1	31.5	9	0.97 - 3230	0.003 – 58.5	26
MS-0	28		25.81		0.39-1291	0.001 - 4.8	38



14. Relatives systems

bobs 2, 3, and 4 with TUBE 1

System No.	tube		bob		D (s ⁻¹)	Viscosity range (Pa•s)
	Ø mm	N.o	Ø mm	N.o		
12	32.54	1	24	2	0.106 - 531	0.02 - 91
13	32.54	1	14	3	0.045 - 228	0.14 - 820
14	32.54	1	14	4	0.045 - 228	0.27 - 1640

Système de Mesure No.	Mobile No.	Plage de Viscosité (Pa•s)
1	1	0.05 - 60
2	2	0.1 - 140
3	3	0.2 - 1000
4	4	0.4 - 1500

Speed in rpm

You must choose the spindle in function of the viscosity you would to measure:

- For a low viscosity measurement, choose the MS 11 or 19, and turn at a high speed 500 s⁻¹ for example.
- For a High viscosity measurement, choose the MS 13, and turn at a low speed 5 s⁻¹ for example.



Maximum Viscosity (Pa.s) value according to speed and Systems DIN / ISO 53 019

Speed rpm	Spindle number					
	DIN11	DIN22	DIN33	DIN19	DIN12	DIN13
1500	0.2	0.4	2	0.075	1.09	8.47
1400	0.215	0.43	2.15	0.08	1.17	9.08
1300	0.23	0.46	2.3	0.09	1.26	9.78
1200	0.25	0.5	2.5	0.097	1.37	10.59
1100	0.275	0.55	2.75	0.106	1.5	11.56
1000	0.3	0.6	3	0.117	1.64	12.71
900	0.33	0.67	3.35	0.13	1.83	14.12
800	0.375	0.75	3.75	0.146	2.05	15.89
700	0.42	0.85	4.25	0.167	2.35	18.16
600	0.5	1	5	0.195	2.74	21.18
500	0.6	1.2	6	0.234	3.29	25.42
400	0.75	1.5	7.5	0.29	4.11	31.78
300	1.0	2	10	0.39	5.48	42.37
250	1.2	2.4	12	0.47	6.57	50.84
200	1.5	3	15	0.58	8.22	63.55
100	3	6	30	1.17	16.44	127.1
60	5	10	50	1.95	27.4	211.8
50	6	12	60	2.34	32.9	254.2
40	7.5	15	75	2.92	41.1	317.8
30	10	20	100	3.9	54.8	423.7
20	15	30	150	5.85	82.2	635.5
12	25	50	250	9.74	137	1059.2
10	30	60	300	11.7	164.4	1271
6	50	100	500	19.48	274	2118
5	60	120	600	23.4	329	2542
4	75	150	750	29.22	411	3177
3	100	200	1000	38.97	548	4236
2.5	120	240	1200	46.76	657	5084
2	150	300	1500	58.45	822	6355
1.5	200	400	2000	78	1096	8473
1	300	600	3000	117	1644	12710
0.6	500	1000	5000	195	2740	21184
0.5	600	1200	6000	234	3288	25421
0.3	1000	2000	10000	390	5480	42368



15 . 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.



16. 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.



17. technical Characteristics

Princip: Imposed shear rate rotative rheometer

Speeds Range 0.3 to 1500 rpm/min (accuracy $\pm 0.5\%$)

Torque Range 0 to 30 mNm (accuracy $\pm 1\%$)

Accuracy: +/- 1% of full range

Repeatability: +/-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

Digital display: Temperature (°C), speed (rpm/min) or shear rate (s-1),
Torque (mN.m), Dynamic viscosity (mPa.s or Pa.s) or UD .

output data :

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

Power supply :

- voltage 110 to 230 Vac 50/60 Hz

Viscosity range of different measuring systems :

MS ASTM ISO 2555	3 mPa.s to 470 000 Pa.s
MS-R 1 à 5	1 mPa.s to 510 000 Pa.s
MS-DIN 11,22,33,19	1 mPa.s to 42 000 Pa.s
MS-C,C2,C4	20 mPa.s to 14 000 Pa.s
MS-Cone-plate CP100	5 mPa.s to 150 000 Pa.s
MS-RT300 Oven	5 mPa.s to 70 000 Pa.s

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