GEL INSTRUMENTE AG

KHUSHBOO SCIENTIFIC SINCE 1984
Exclusive Distributors for India

GELNORM® – Geltimer with PTC-3 and PTT-3

3 Channel System: Control Unit with Temperature Measurement, incl. Software

GELNORM®- Geltimer PTC-3 is an instrument for the automatic determination of the gel time of reaction resins. The design is based on DIN 16 945, DIN 16 916, DIN EN 14022 method 5 and DIN EN ISO 9396.
The test with GELNORM® - Geltimer is very easy to perform and gives exceptionally good reproducibility. The automatically measurement can be per-formed for any reaction resin, for example:

- **Unsaturated polyester resins**
- **Phenolic resins**
- **Epoxy resins**
- **Polyurethane resins**
- **Acrylic resins**
- **Silicone resins**

Successor of ST-3, Thermbox III and 3 x TC-4, for Online and Offline measurements

Description

The GELNORM®– Geltimer PTC-3 evaluates all factors which influence the gel time of reaction resins such as type and quantity of hardener, accelerator, inhibitor, filler, pigments, as well as temperature and moisture. The instrument is extremely easy to operate and normally needs no maintenance.
The principle of measurement of GELNORM®– Geltimer is simple: A stamper made of aluminium or stainless steel performs an up-down cycle in a test tube filled with resin. When the point of gelation is reached, the test tube is pulled up by the stamper. This stops the clock which was started at the beginning of the experiment and the gel time can be read of. With the probe temperature system the exothermic reaction can be measured. With the optional temperature controller PTT-3 and electric heating Block GT the sample mixture can be heated up and controlled.

The GELNORM® - Geltimer PTC-3 and optional PTT-3 consists of:

- 3 x Gel time test units with optical sensor and control unit PTC-3

Options:

- 3 x Sample temperature measurement system
- 3 x Temperature control for the electric heating
- 3 x Heating block GT
- Software for capturing and recording of all relevant data’s

The device has a USB port and will be delivered with software. The system and the measurement can be configured directly on the PC. The recorded data are displayed graphically and can be processed as a csv file in other programs.
The device can be used online or offline. In online mode, the measurements can be carried out comfortably, record and compare the measured data.

Front view PTC-3
Base unit for geltime measuring

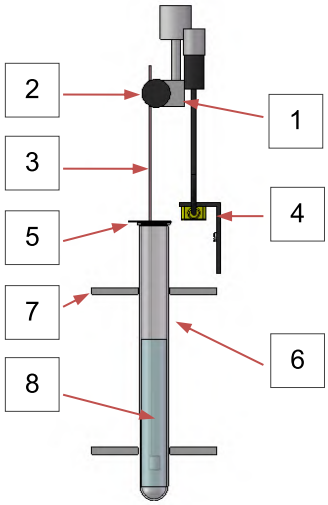
- 3 x timer, LCD display with HH: MM: SS resolution
- 3 x Start button for the Geltimer

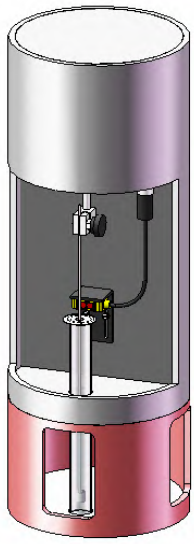
Rear view PTC-3

- 1 x power connector with 2 fuses and main switch
- 1…3 connection for the test unit
- Connection to PTT-3

System Test Unit with optical Sensor

1 Friction clamp
2 Machine screw
3 Measurement stamper
4 Optical sensor
5 Foam ring
6 Test tube
7 Test tube holder
8 Sampler mixture





Stampers made of aluminium wire with a coiled head are used. This design provides the same gel time measurement as the glass stamper specified in the specification of DIN 16 945 but is more economical. The design of the aluminium stamper moreover provides a minimum of surface area, which leads to minimized air inhibition which is especially important for unsaturated polyesters.
It is also possible to use a glass stamper (Ø 3 mm, length 230 mm with fused base) according to DIN 16 945. (Please notice that another stamper attachment clamp is used in this case.) Test tubes are of 160 x Ø 16 mm with lip.

Time Measurement and Measuring Cycles

The control units are provided with digital LCD clock-modules. The automatic digital time measurement gives a reading of 1 second for test durations up to 99 hours. By starting a new measurement the clock is automatically reset to zero.
The continuous up-down motion cycle of the stamper is set to 10 seconds as our standard. For individual needs, test units with other motion cycles are available upon request.

Required periodic calibration work

- Timer with reference stopwatch
- Sensing distance 6mm with reference scale
- Heating block with reference thermometer
- Thermocouple input with type K thermocouple simulator

Variants of Geltimer Test Units:

The modular housing system is available in three variants:

1 Electric Heating Block GT (Model - left)

With the electrical heating, the sample can be heated without interfering vapors, and without oily residue

2 Standard (Model - middle)

With red holder of the sensor from the Geltimer is placed directly on the table. For extremely exothermic samples an acrylic tube is available so there is no risk of glass splinters may arise. The sample can be easily observed.

3 Built-in oil or water bath. (Model - right)

The glass tube is fixed in chrome-plated steel holder. So the hot medium can act directly on the glass tube. According to DIN EN ISO 9396 the use of the bath requires, a coating weight of 10 g and 20 g for liquid resins for solid or powder resins.

1

Test Unit with electric heating block

2

Standard

3

Test Unit for Water- / Oilbath

Option PTT-3 – Temperature Control / -Measurement

The PTT-3 is the option for a 3-channel temperature control with the heating block GT, a 3 channel sample temperature measurement and for the configuration and data acquisition with a Windows PC.

Front view PTT-3

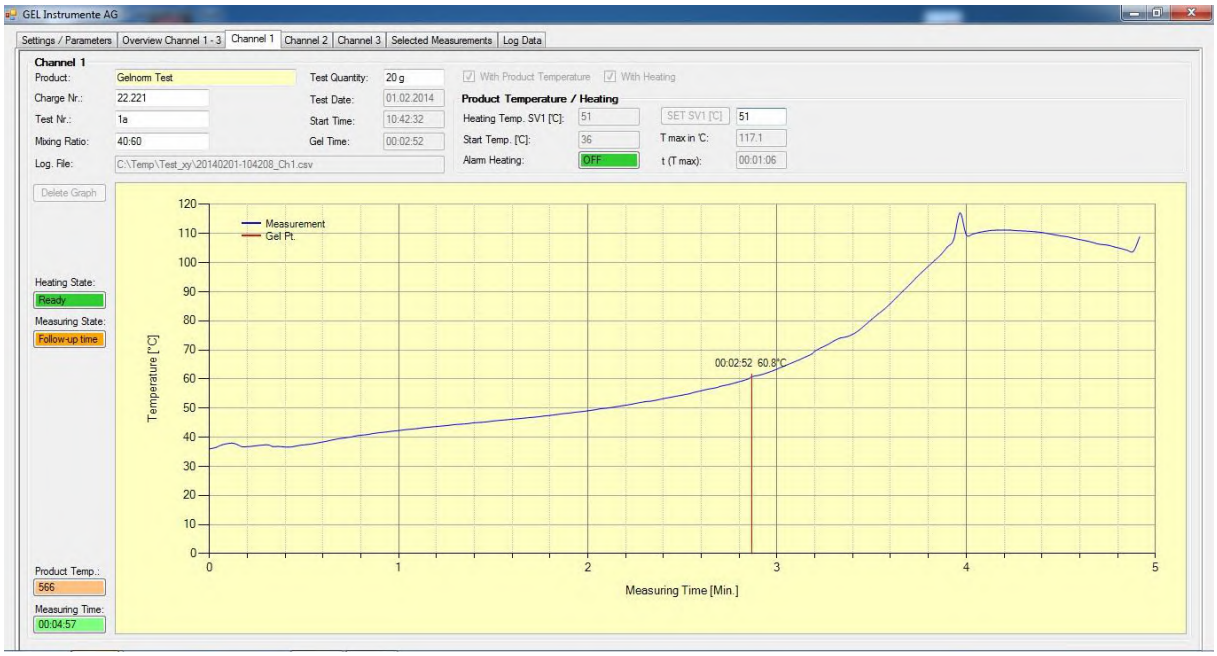
- 3 x temperature controller with integrated display of the sample temperature

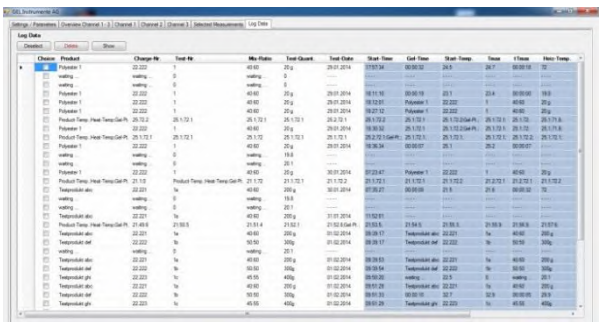
Rear View PTT-3

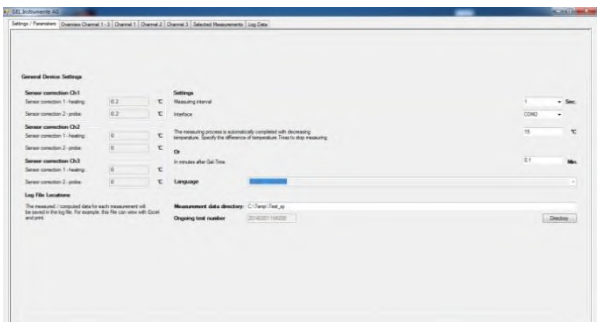
- power connector with fuse holder for 2 fuses and main switch
- Connection 1 ... 3 for the Heating Block GT and sample temperature sensor type K
- Connection for PTC-3
- USB connection

Online gel time and temperature measuring with temperature control of the heating block

Overview of all parameters and settings







Pictures of easy-to-use software from PTT-3 und PTC-3

The captured data are available for direct comparison with the reference curve and further processing for Excel. The specifications of the heating, sample identification and sample temperature are recorded (for Microsoft Windows 7…10).

Electrical data from the controller PTC-3

Power supply	115VAC / 230 VAC, 50/ 60 Hz (internally switchable)
Power consumption	20 VA
Ports	3 x M12 8 pole for test unit, 24 VAC, 10 VA
	5 pin Din connector for connection to the PTT -3
Main switch	on the rear panel
Fuses	2 pieces, F 3.15A L 250 VAC
Electric safety	2006/95/EC, 2004/108/EC, EN 61010-1:2001
	61010-2-010:2003 EN, EN 61326-1:2006

Electrical data of the control and measuring unit PTT-3

Power supply	100 ... 240 VAC, 50/ 60 Hz
Power consumption	600 VA with 3 connected heaters
Connectors	8 Pole Binder connector for connecting the heating block GT
USB	2.0 type A connector
	5 pin DIN connector for connecting to the PTC -3
	3 x thermal connector K-type , EN 60 584
Main switch	on the rear panel
Fuses	2 pieces F5A L250 VAC
	Electrical safety 2006/95/EC, 2004/108/EC , EN 61010-1:2001
	61010-2-010:2003 EN, EN 61326-1:2006

Temperature control for the electrical heating block GT

Actual value (Pt100)	Range: 0.0 °C ... 200.0 °C , adjustable and calibrated
Accuracy:	± 0.3 % of full scale ± 1 digit
Set value:	Range: 0.0 ° C ... 200.0 °C
Resolution:	0.1 K
Load output	power max. - Resistive load: maximum 600 W
	Self-optimization

Temperature measurement for the sample

Sensor	Thermocouple Type K (Ni- CrNi) , EN 60 584
Connector	Mini connector type K thermocouples, EN 60 584
Range	0.0 ° C 400.0 °C...
Accuracy	± 1.5 ° C including cold-junction compensation
	Adjusted and calibrated

Time, Stopwatch

Display	LCD, 12mm
Start button	with status indicator
Stop	optical switch
range	up to 99HH : 59MM : 59SS
Accuracy	± 1 second / 2 hours

Test unit optical Sensor

Motor	24 VAC, 50/ 60 Hz, 6 rpm
Switch	optical sensor, standard!
Sample temperature	thermocouple type K for installation in the test tube to the sample
Stroke	25mm, 10 seconds for an up and down motion

Electric heating for the sample, thermal block GT (Standard)

The integrated control system controls the temperature of the heating block temperature for the sample. The actual and set-point temperature is displayed digitally with a background lighted LCD. About the display color of the control difference is optically very visible represented.
To ensure high reliability, the controller switches at a value exceeding from the power supply for the heater. In the heating block GT, an irreversible safety thermostat which switch off at 270 ° C is installed. This heating block can be installed as an option at any time later on Geltimer.

Security:

- Exceeding controller alarm temperature setpoint +10 °C
- Safety temperature limiter at 270 °C
- Short circuit of the sensor
- Interruption of the sensor

Using the software, activate the heater and adjust the set point. The release for the measurement takes place only when the set point is reached. The heater can be adjusted with an actual value offset.

Thermostatic control

Prerequisite for accurate and repeatable measurement is a precise temperature control of the sample. Using a water or oil bath, the buoyancy force of the immersed sample must be considered!

Thermostatic Bath with silicon-oil, 30 °C … 150 °C

It is possible to perform tests at defined temperatures by submersing the portion of the test tube with the reaction resin into a thermostatic bath. The amount of the liquid in the bath should be adjusted such that its level is about 1 cm higher than the level of the reaction resin in the test tube. (Please note, that the volume excluded by the test tube influences the experiment and, hence, it has to be constant in order to reach an optimal reproducibility of the results.)

Note that the buoyancy forces distort the measurement!
As a balancing weight on the test tube must be attached.
Note:
According to DIN EN ISO 9396 requires the use of the bath, a coating weight of 10 g and 20 g for liquid resins for solid or powder resins.

Implementation of Online Measurement

Preparing the system

Connect the PTC-3 to the PTT-3, USB to PC

Sample temperature	yes / no	connect the thermocouple
Electric heating	yes / no	select set point and let heat up
Measurement Experiment	put in the identification and description from the sample	

The recording starts when you press the Start button on the PTC-3.

Preparing the Test Mixture

Weigh 100 g of reaction resin (deviation of 1 % permitted according to DIN 16 945) in a beaker.

Weigh hardener and accelerator according to instructions, accurate to 0, 01 g.

After mixing well for approx. 1 minute, place the sample mixture in a test tube (160 x Ø 16 mm, net weight approx. 10 g) up to a height of abt. 70 mm (weight of resin approx. 12 g). Test tube – incl. foam ring - and resin mixture should have a total weight of 22 g. To obtain exact and reproducible results, it is essential to pay attention to the total weight.

The time between completion of mixing the sample and starting the test should be less than one minute.

Test unit with optical sensor:

Place the test tube (including foam ring) with the sample and stamper into the test unit, fix the stamper into the clamp by tightening the screw and press the start button on the control unit.

Upon reaching the gel point, the stamper can no longer retract from the sample, the test tube is lifted with the up-ward motion of the stamper and the clock is stopped via the signal created by the optical sensor. Test units with optical sensor allow for adjustment of the switch-off level (i.e. the level to which the test tube has to be elevated to stop the test). The standard setting is ca. 6 mm.

For the simultaneous determination of gel time, maximum temperature T_{max}, and $t(T_{max})$, with a connected Ni-Cr-Ni-thermocouple to the control unit. The thermocouple is inserted into the reaction resin together with the stamper at the beginning of the test.

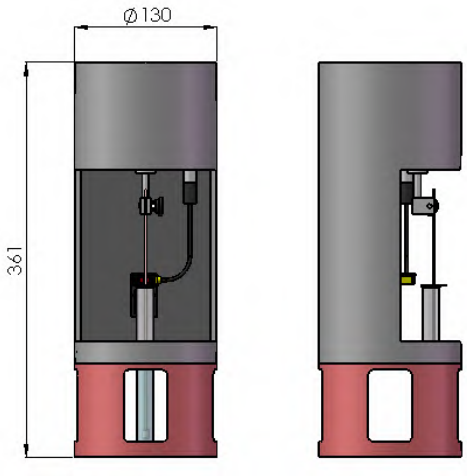
The measurement data can be recorded by using a computer with the online software.

The Test tube and measuring stamps are disposed of after the measurement. A cleaning is unnecessary. The thermocouple may be cut off and has to be twisted.

Technical Data

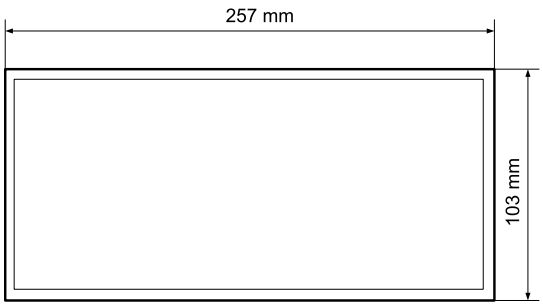
Geltimer Test Unit with optical Sensor 200.20.18

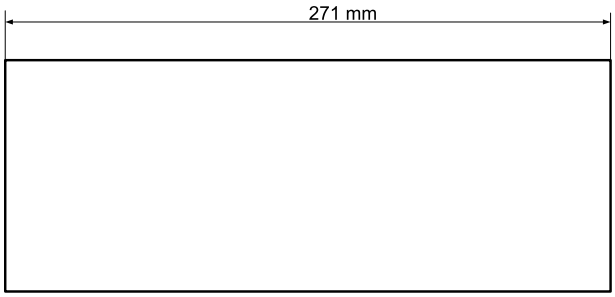
Time	99h 59min 59s
Cycle Other cycle is possible on request	10 sec
Dimension	∅ 130 mm, H = 361 mm
Weight	~ 2.5 kg
Material,	Aluminium anodised
Environment temperature	-30 °C… 50 °C
Power	24 VAC
Connection cable	0.5 meters



PTC-3 – 3 channel control unit 200.30 and PTT-3 – temperature controller / measuring 200.32

Housing frame	die-cast aluminium
Base and lid	coated sheet
Ventilation	slots in base plate
Front and rear walls	aluminium anodized
Dimensions	W x H x D = 257 mm x 103 mm x 271 mm
Weight	PTC-3 ~ 3.1 kg PTT-3 ~ 3.0 kg





Order code, item numbers

GELNORM® - Geltimer, for 3 measuring channels:

1	pc	controller PTC-3	200.30
3	pcs	Test units	200.20.18

Options for the 3-channel measuring system

Electric heating, sample temperature and PC connection required for online measurements

1	pc	controller- and measuring device PTT-3, incl. software	200.32
3	pcs	thermo block GT for Ø 16 mm glass tubes	200.16.41
3	pcs	thermo block GT for Ø 20 mm glass tubes	200.20.41
3	pcs	thermocouple type K, 5 meters	20.32

Thermostatic bath for 3 measuring head's (without thermostatic oil)	20.51
with bracket and cover for the thermostat bath	20.51HC

Consumables for the GELNORM® - Geltimer

Stamper aluminium, D = 1 mm x 235 mm, package with 500 pcs	20.30
Stamper steel (for aggressive specimen mixture), D = 1 mm x 235 mm, package with 500 pcs	20.36
Test tubes D = 16 mm x 160 mm, package with 100 pcs	20.55
PE Foam Rings, set with 10 pcs	80.50
Holder for alu stamper, package with 3 pcs	20.48

Gel Time Measuring

Temperature Measuring

Temperature Controlled

Geltimer