Anton Paar

Measure,
what is measurable,
and make measurable
that which is not.

Galileo Galilei (1564 – 1642)

Instruction Manual

TAG 4

Tag Flash Point Tester

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INHALTSVERZEICHNIS

1. IMPORTANT NOTES

WARNING
TAG 4 107101 (with water cooling) must never be operated without circulating cooling liquid. (damage of cooling assembly)

Thank you for purchasing the new TAG 4 which by its patented construction offers easy handling in sample changes.

Conventional devices require ignition, moving of the lid and indication as separate operation steps while changing the samples, whereas the TAG 4 does all this for you in one go by gently pushing the multifunction head.

The advantages are obvious: In most cases more than one test insert can be filled ready for change at the same time, covered with lids and multifunction detectors- all set for change.

The actual sample change after a completed test thus is not only faster but also requires less of the users attention since this is all done practically as the device goes along. This of course means less errors (Ignition connected? Sensor inserted? etc.) because the user can direct all his or her attention to the important tasks.

With the new electric ignition system the TAG 4 offers another important improvement. Despite the compact size of the device it contains an intelligent ignition control. You will be reminded if the ignition needs changing. The ignition itself is operated at its optimum and therefore lasts much longer. Especially the voltage fluctuations common to the industry in 24-hour-operation are now perfectly absorbed.

Of course you can run your TAG 4 with a gas ignition as well. The electric ignition then is used as an aid to ignition. This comes in handy when doing reference tests and for general assumptions. The electric ignition controls and ignites the gas flame at start of test or reignites it automatically in case of extinction. Please ensure a low pressure gas supply to avoid problems at setting.

1.1. Liability

The device is an electrically operated appliance. It may not be operated unattended or in areas at risk of explosion or damp locations. Whenever the device is used, a thorough knowledge of the Instructions for Use and compliance with same is assumed. In all cases the operator is liable for the safe operation of the device if it is not used according to instructions. Repair of the device must be carried out only by Anton Paar ProveTec GmbH. Only original Anton Paar ProveTec parts and replacement parts must be used to operate the device.

The use of a standard may involve hazardous materials, operations and equipment. A standard does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of this standard to take appropriate measures for protection of the safety and health of the personnel prior to application of this standard, to check whether statutory requirements exist for this purpose and to fulfill these requirements.

Anton Paar ProveTec is not responsible for damage or malfunctions caused by the operator using the device improperly or contrary to the instructions. We reserve the right to make technical changes.

DANGER
This device is not to be used in explosive atmospheres!

1.2. Warranty

1. Anton Paar ProveTec products are warranted against defects in material and workmanship for a period of one year from the date of purchase.
2. Anton Paar ProveTec will replace or repair products - free of any charge - that fail as a result of defective materials or workmanship within the warranty period.
3. None of the obligations of Anton Paar ProveTec shall apply to any products which have been subjected to misuse, neglect, accident or any extreme environmental condition or improper handling.
4. If defective products are returned to Anton Paar ProveTec, the costs of such return will be borne by the customer, and those of delivering the repaired or replacement products to the customer will be borne by Anton Paar ProveTec.

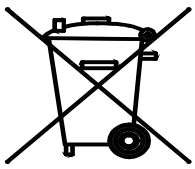
Anton Paar ProveTec's sole liability shall be to repair or replace any product which proves to be defective. In no event shall Anton Paar ProveTec be liable for any special incidental, consequential, indirect or other similar damages arising from failure of its products.

1.3. Service

Should you require service, please contact our Anton Paar service department.

1.4. General Safety Information

1. The device should only be used by trained personnel or those who have been instructed accordingly.
2. Before connecting the instrument to the mains, make sure that the voltage/frequency ranges indicated on the instrument type plate correspond to the local specifications.
3. Alterations on the device, especially opening of same or changes to the electrical connections/electronic devices should only be done by company trained service technicians and only after receiving permission from Anton Paar ProveTec GmbH.
4. Unauthorized changes will also cause refusing warranty issues by Anton Paar ProveTec.
5. Before opening the device, disconnect the electrical current.
6. If heating devices are used, please ensure that there are no combustible materials near the heating source.
7. For safety reasons, we recommend using an earth leakage circuit breaker. Ask your electrician for further details and equipment.
8. We make these recommendations on the assumption that a regular function and safety test is performed at least every two years.
9. Do not dispose of the device in ordinary household waste! In light of the long lifespan of the device, regulations may change. For this reason, please only delegate the disposal of the device to qualified personnel or speak to Anton Paar ProveTec!



For EU countries:

Directive 2002/96/EC: Directive 2002/96 of the European Parliament and of the Council of 27 January 2003 on waste electrical and electronic equipment.
(Anton Paar ProveTec Registration Number WEEE 80418806).
The directive describes the obligation to not dispose of electrical and electronic devices as unsorted municipal waste and to collect this WEEE separately. Contact us for an authorized waste disposal company in your country.

CE The product described in these instructions conforms with:
EC Low-Voltage Directive 73/23/EEC and 93/68 EEC respectively.
EMC Directive 2004/108/EC.

1.5. Device Specific Safety Information

Please take into account that handling with flammable material always is dangerous. The instrument should only be used by trained staff or those who have been instructed accordingly.

The TAG 4 was constructed for use according to the named applications. For use apart from the named applications we cannot make any kind of confirmations about safety and functioning.

Please take care to pay attention to the safety regulations referring to the handling of gas. This refers as well to regularly inspections of the gas supplies and tubes.

If the possibility of health injuries by evaporating gases exists insert the TAG 4 into a drain.

Please take care to keep adequate distance between the device and flammable materials.

It can never be totally excluded that a sample might be burning longer than expected and therefore can cause damages. Please make sure only to use the device without watching when handling known samples and when there is absolutely no risk for the surroundings.

The ignitions may only be used inside their supports.

DANGER

To prevent injuries never touch the test insert or other components of the device which might be hot during test.

1.6. Summary of all Warnings in this Document

10. When setting up the device select a location away from heat, smoke, electrical or magnetic interference and avoid excessive electrostatic discharges (ESD) to the device. The bench top must be a level surface and free of vibration.
11. The device is tested to comply with the limits of the European Electromagnetic Compatibility (EMC) Directive 2004/108/EC. However this device generates radio frequency energy. If the device is not installed or used in accordance with the instruction manual it may cause interference to radio communications.
12. Ensure the heater of the device is not exposed to flammable liquids or other combustible material including the packaging material. Clean the surface before starting a heater test.

2. DESCRIPTION OF THE DEVICE

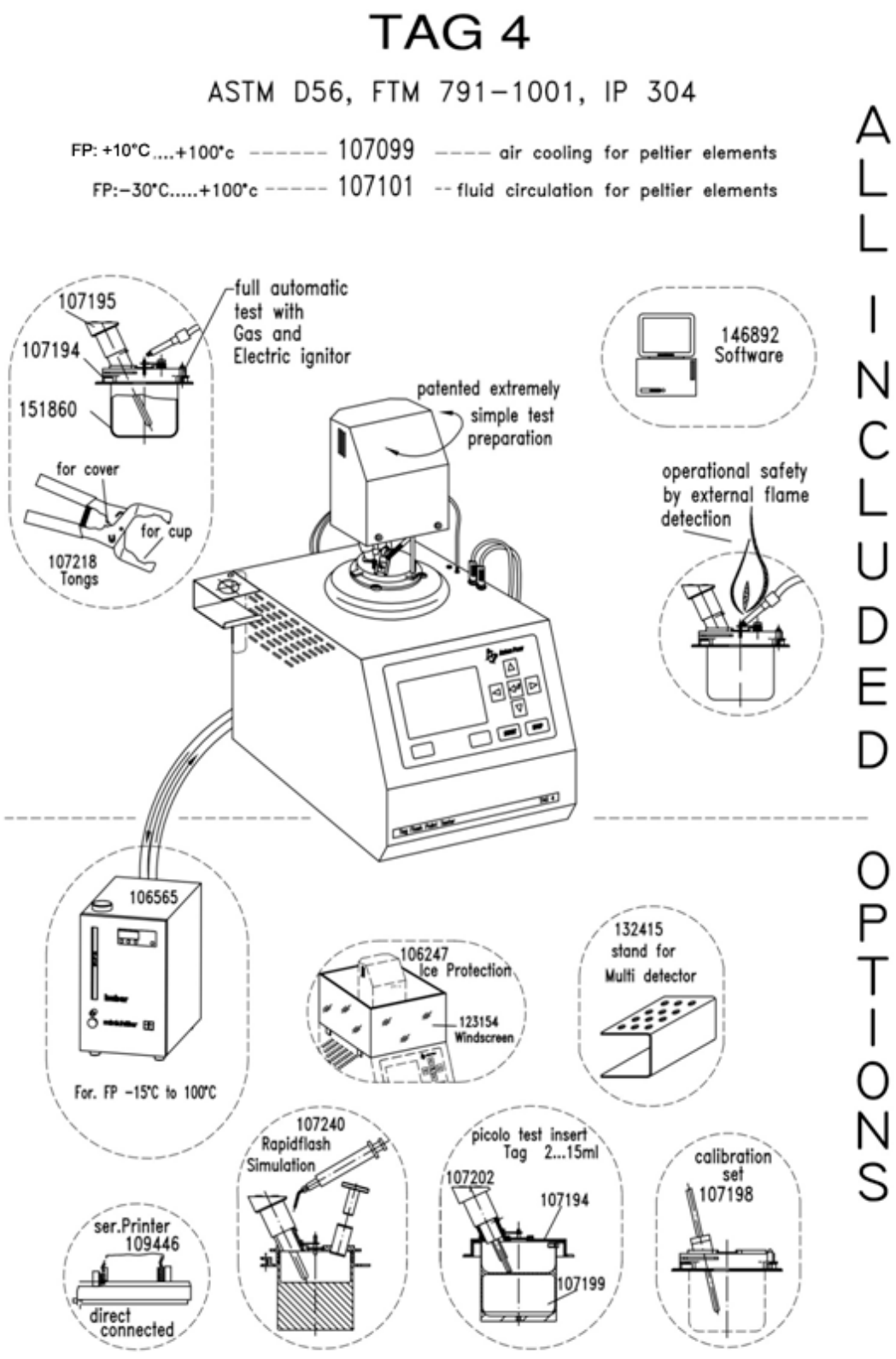


Fig. 1

2.1. Device properties and connection values

Mains voltage:	230 V +-10%, 50/60 Hz or 115 V +-10%, 50/60 Hz (alternating)
Fuse:	M2 A for 220/230 V M4 A for 110/115 V
Power:	approx. 180 W
Flashpoint range:	+10°C up to 110°C (107099 internal cooling) at room temperature:23°C -30°C up to 110°C (107101 external cooling)
Gas connection:	Propane/butane or natural gas, pre-set to max. 0,05 bar
Barometric Pressure Sensor:	max error +/-0,3% full scale
Temperature sensor:	Pt100 -70°C up to 120°C max error ± (0,1 + 0,0017 *T)

Data output:

- serial RS 232 for printer (Option: 109446)
- serial RS 232 for PC connection
  a) for service to update program without having to open control unit (Download)
  b) for PC control / evaluation

Conditions of transport:

Temperature:	-50°C up to +50°C
Relative air humidity:	max. 90%
Vibrations:	8 to 120Hz at 30m/s^2 max.

2.2. Dimensions and Weight

Dimensions (W x H x D):	230 x 430 x 470 mm

2.3. Components

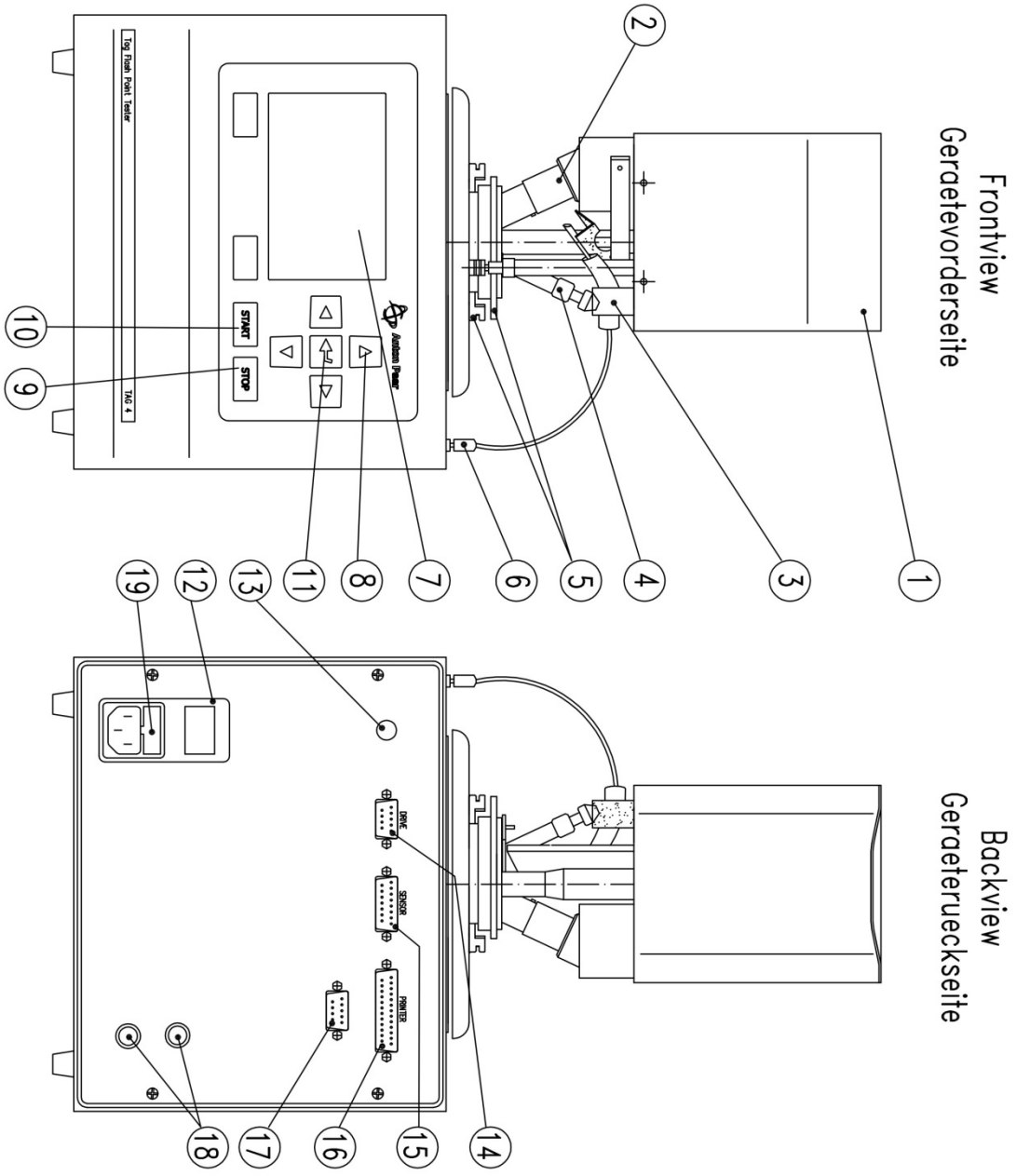


Fig. 2

Front side

1 Multifunction head
2 Multi detector for flashpoint and temperature
3 Indicator for gas flame
4 Ignition system
5 Test insert with lid (107205)
6 Ignition (gas or electric ignition)
7 Display
8 Cursor-keys
9 STOP-key
10 RUN (START)-key
11 ENTER-key

Rear side

12 ON/OFF-switch
13 Gas connection (for external gas supply)
14 Connecting cable for sensor
15 Control cable for stepping motor
16 Printer interface (RS 232)
17 PC interface (RS 232)
18 Connection for external cooling (only 107098)
19 Alternating switch 115V/230V and fuse holding device

3. PUTTING INTO OPERATION

3.1. Location

Because of heat emission please make sure the TAG 4 stands freely.

Please take care the device is not exposed to draft. Draft might falsify the measured flashpoint and influence the gas flame's function control.

If you place more than one TAG 4 next to each other you should separate them with an appropriate screen since their ventilation can influence their performance in temperature increase and flashpoint.

3.2. Putting into operation

3.2.1. Installation

3.2.1.1. Mounting the multifunction head

To ensure safe transportation the TAG 4 is divided into bottom part (control device) and upper part (multifunction head).

On the bottom part a column has to be mounted (acc. to drawing 4) which holds the multifunction head later on.

The column is screwed onto the bottom part as shown in drawing 4 with the partition pointing to the left.

Mount the multifunction head on the bottom part by inserting the bolt into the guide of the column. Make sure that the pin clicks into place.

Turn the multifunction head to the right and click it into place.

Connect plug for step motor control and the multi detector at the back of the device.

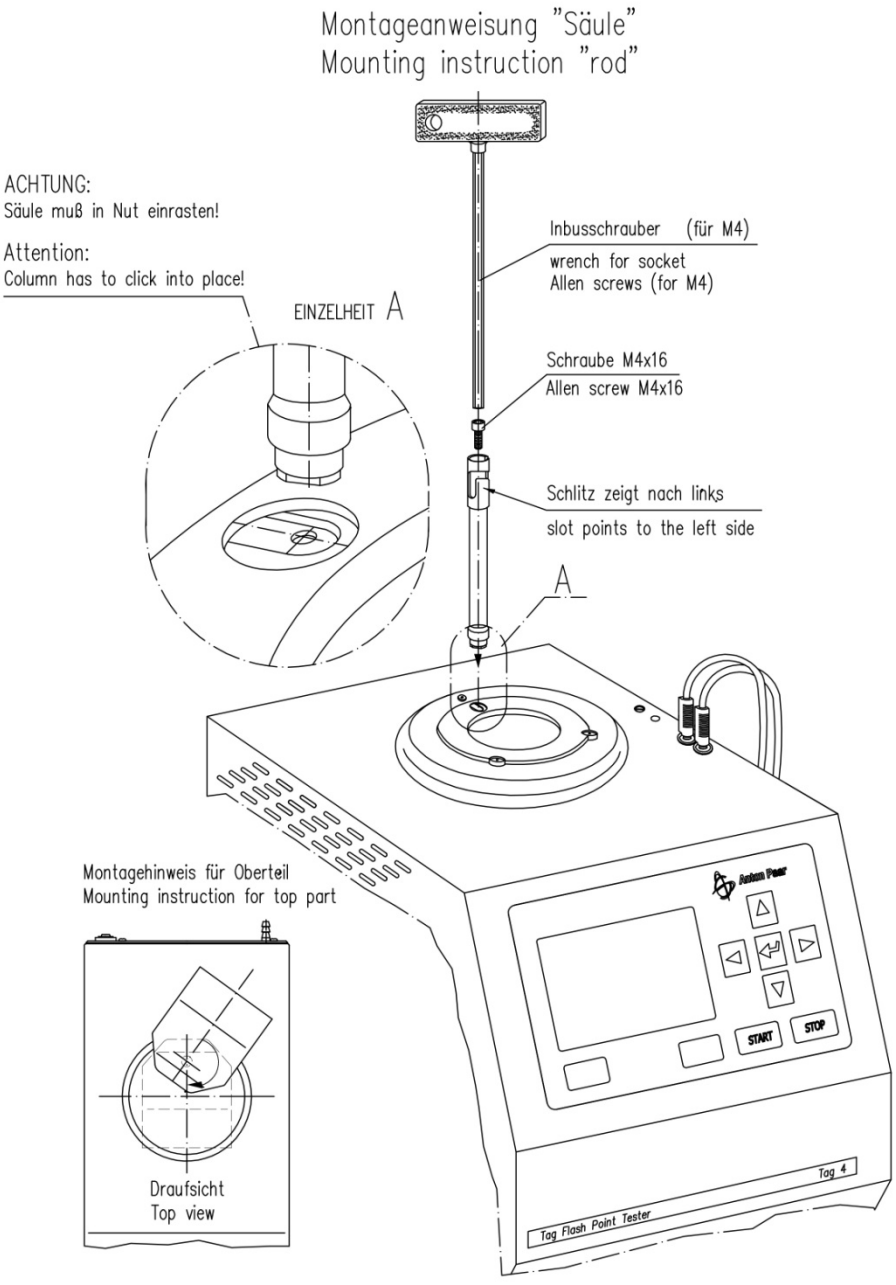


Fig. 3

At mounting the multifunction head please make sure the column at the head's front side exactly hits the pin of the crucible.
Normally this is done before delivery.

If this setting is not done properly please re-adjust according to drawing 5.

Therefore please release the metal casing by loosening the screws.
At the rear you find the adjusting screw (refer to graph 5). By loosening this screw the head can be brought in the required position.
Afterwards please tighten the screw again and mount the casing.

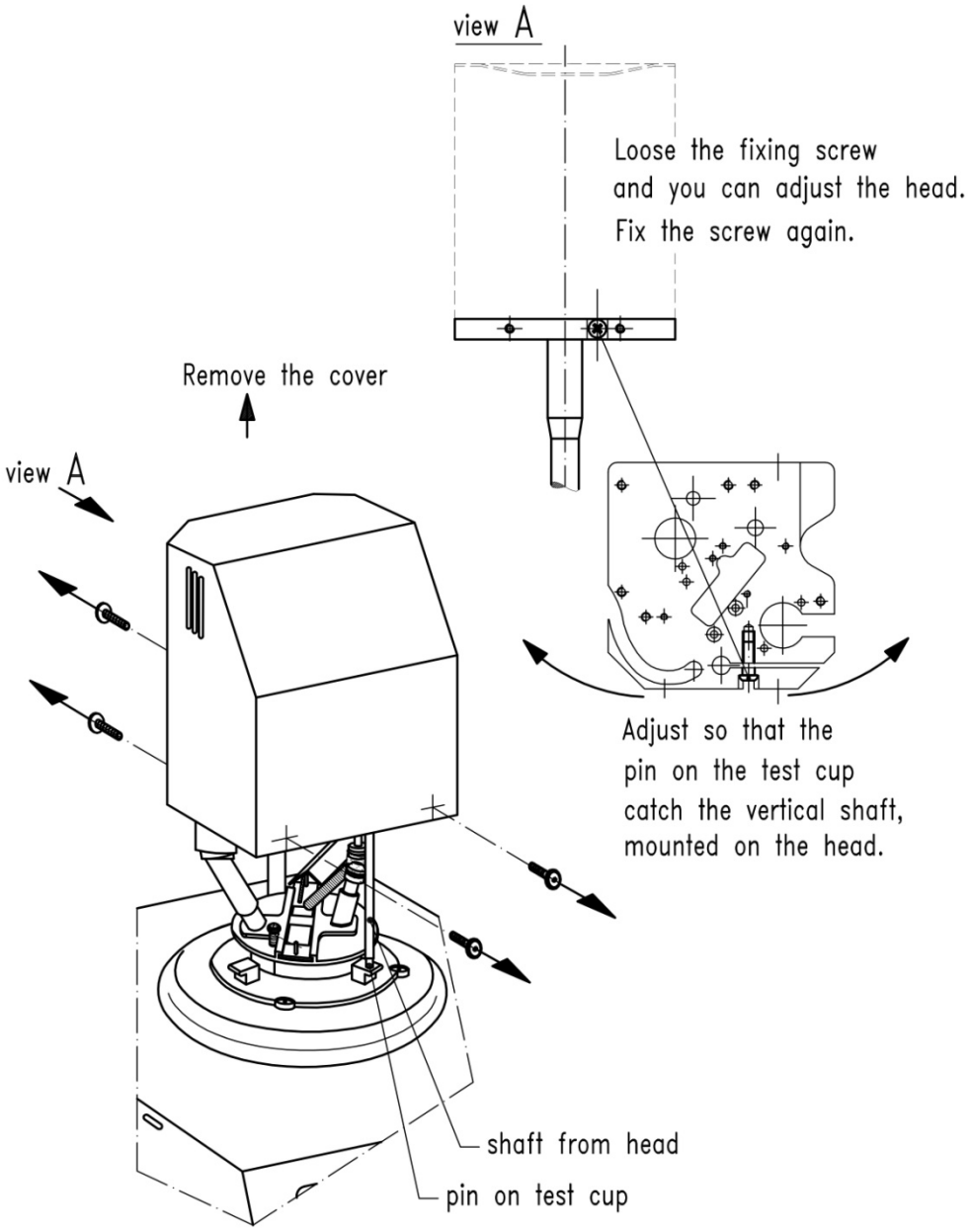
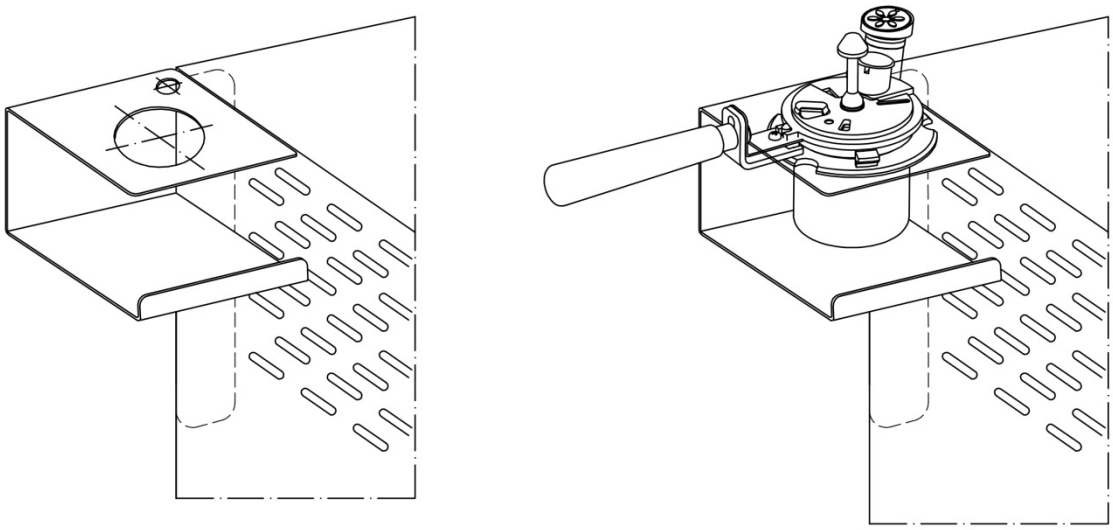


Fig. 4

3.2.1.2. Mounting of the test cup holder (109319)

The test cup holder is mounted on the left of ABA 4 rear side. The 2 screws at the left of the rear panel are loosened and fixed again together with the holder.



3.2.2. External cooling

At devices using external cooling a cryostat has to be connected with the two pipe unions at the rear side of the device. It is not important which pipe is connected with the coolant supply and which one with the coolant outlet.

WARNING
Never use silicon oil as coolant!
We recommend to use a mixture of water and glycol as coolant.

Cooling circuit

Recommended medium:	a) Water to +2°C b) 67Vol.% Water+ 33Vol.% Glycol - mixture below +2°C
Permissable flow rate:	1 l/min...2 l/min
Maximum permissable pressure:	1 bar

The following flashpoints can be achieved by different coolant's temperatures:

cryostat temperature	**approx flash point range**
-15°C	-30°C ... +45°C
+15°C	+05°C ... +75°C
+50°C	... +110°C

Please be aware that the mounted Peltier-elements can only realize a temperature difference of about 60°C. Therefore to achieve the auto start temperature at low flashpoints the cryostat temperature has to be pre-set low.
At higher flashpoints the cryostat temperature has to be pre-set accordingly higher (see table).
In relation to the material used (high viscose/ low viscose) the given flashpoint range can vary slightly.

Please bear in mind that according to the standard the empty sample insert has to be precooled to a temperature of 10°C below the expected flashpoint.
Therefore the parameter for auto start has been set to 11°C below the expected flashpoint in the reference programs.

3.2.3. Switching on

Before connecting the device to the mains please ensure that the stated voltage on the back matches the mains or - if necessary - adjust accordingly.

Connect printer (if existent) to the printer interface at the back of the device.

Printer must be switched on prior to switching on the TAG 4 to ensure that the head line will properly be printed with actual date.

When using a gas ignition connect the external gas supply to the back of the device.
Please fix the electric ignition in its holding or when using the gas ignition in the holding for the ignition's aid.

In the TAG 4-crucible you will find a circular mark indicating the filling amount of 50 ml.

After inserting the sample TAG 4 lid and crucible will be connected by a bayonet joint.

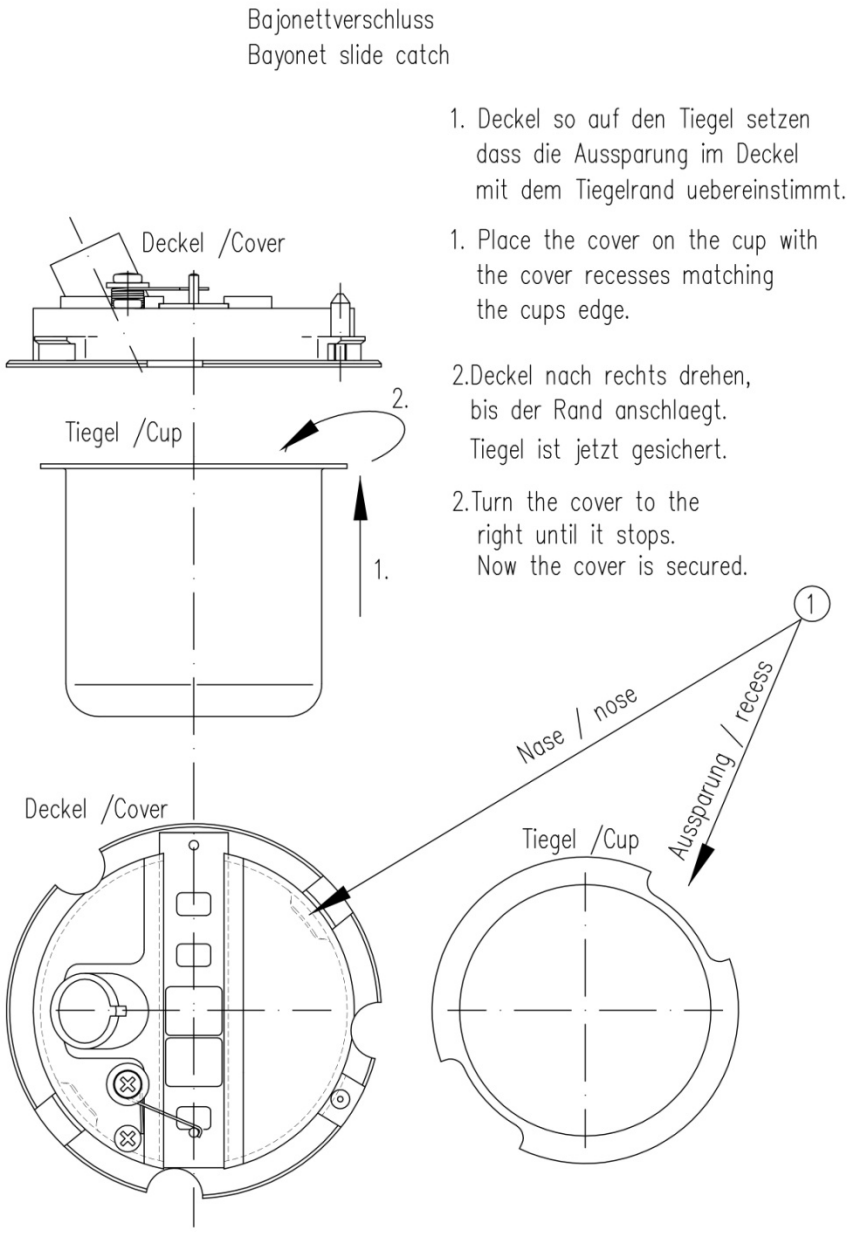
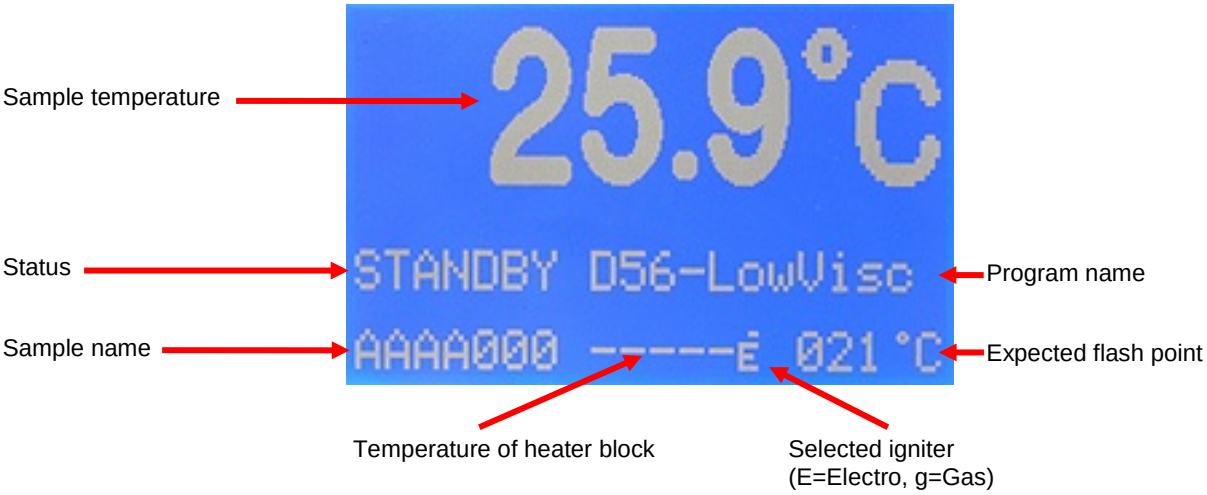


Fig. 5

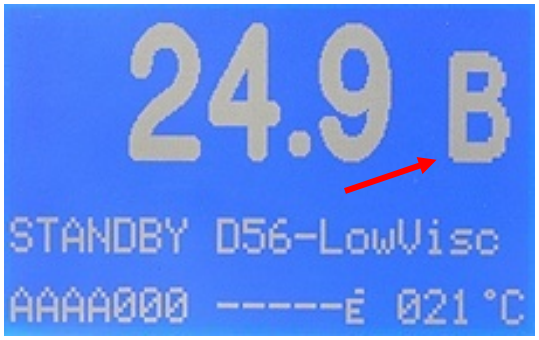
Insert the multi detector into the test insert (cup and lid). Position test insert into the TAG 4 and turn the multifunction head towards you so that the connection between multi detector and stirrer is made.

Now you can switch on the TAG 4.

After a brief self test the device gives a quadruple signal to indicate readiness.
The introduction menu displayed is the following:



If TAG 4 is switched on without the test insert with indicator and sensor being assembled you will be given the following display:



Sample temperature cannot be indicated.
Heater block temperature is displayed and indicated by a "B" behind the value.

3.3. Menu Guidance

Pressing <ENTER> will position the blinking cursor on the display at the decimal digit of the flashpoint preselection.

With the keys < Arrow right> and <Arrow left> you can get from one menu point to the other.

With the keys <Arrow up> and <Arrow down> within the respective menu you select your choice and confirm with <Enter>.

If you move the cursor keys to a menu point and confirm with <ENTER> without having made a selection yet the display will explain the respective menu points.

If within 10 sec you don't put anything in while being in a submenu the device will automatically return to the initial position.

Pressing the <ENTER>key will indicate the following display:

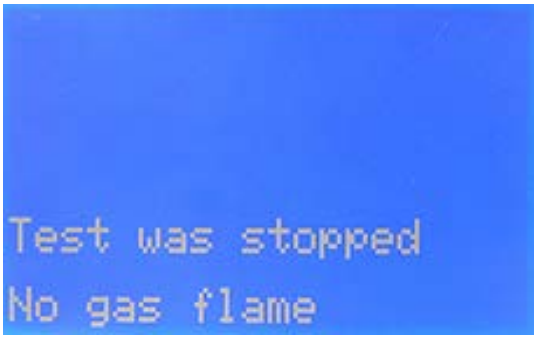
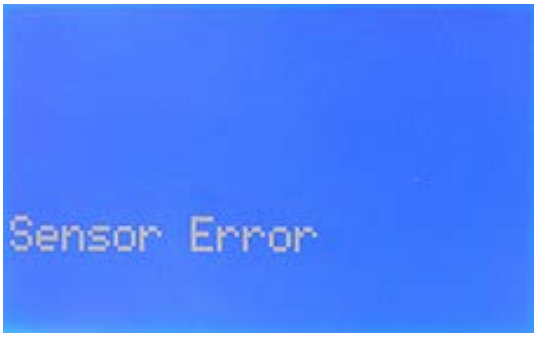
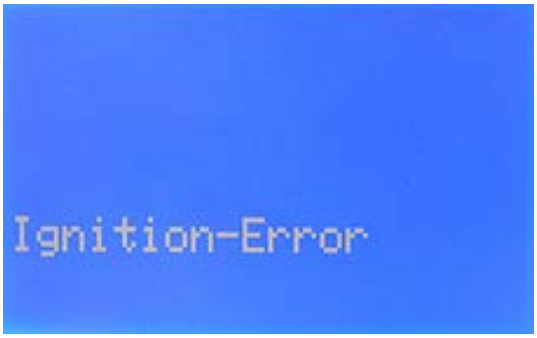
The flashing cursor is on the decimal digit of the flashpoint preselection.

3.3.1. Status display

Following status displays are possible:

The respective explanation is given on display when moving the cursor keys to the menu point status indication and once again pressed <ENTER>.

STANDBY	The device is in the STOP-mode, no heating	
STOP	A running test was stopped	
STOPhead	Safety feature If the multifunction head is moved out during the running test the device aborts the program immediately.	

STOPgas	Safety feature If the magnetic valve for gas ignition is opened and the indicator for ignition flame control is not given a signal for an ignition flame after 50 sec the magnetic valve automatically turns off again and the program is at STOP. This function prevents the emission of too much gas. This safety function is active during the whole test, i.e. when during 50s no gas flame is detected the test will be stopped automatically:	
STOPsen	The sensor is not connected.	
STOPign	The electric ignition is not connected.	
STOPgrad	The expected flashpoint temperature cannot be achieved because the pre-set cryostat temperature is too low.	

WARNING
The functions STOPgas, STOPhead, STOPsen, STOPign, STOPgrad will be printed out. On the display you can just see STOP. By moving the cursor to STOP and <ENTER> you can call up the explanations.

BURN — The device registered a flashpoint outside the pot.

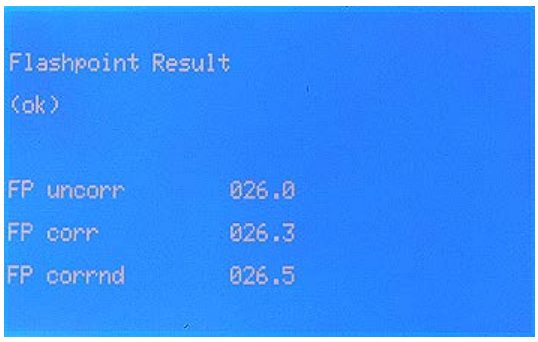
The program automatically is terminated.

The test has to be started all over again with a lower flashpoint preselection.

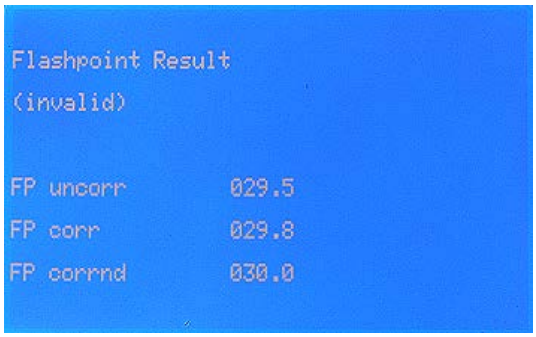
RUNNING — The program was started. The device heats up (or cools down to auto start temperature).

TESTING — The program was started. The TAG 4 is in its test phase.
Flashpoint tests are carried out.

FPok The device detected a flashpoint.
The detected flashpoint corresponds to the standard preselected for flashpoint preselection and test range.

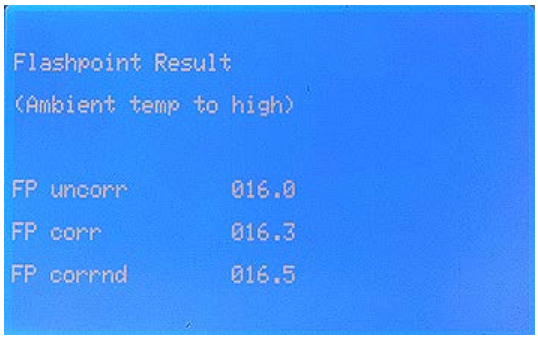


FPinval A flashpoint being detected during the ignition's first immersion or during safety mode is not valid.



FPnoP02

The flashpoint was detected by a non-standard test.
The pre-set cryostat temperature was too high so the auto start temperature could not be achieved or using devices with air conditioning the auto start temperature cannot be achieved because the ambient temperature is too high.



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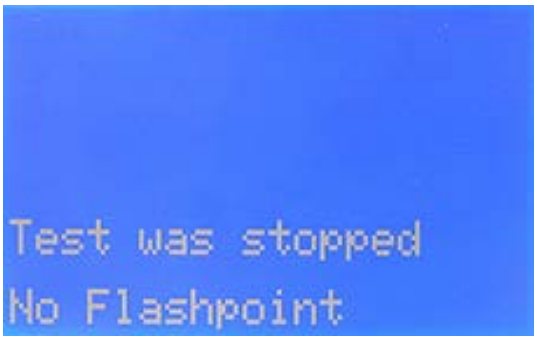
noFP

No Flashpoint was found in equilibrium program EQ1 according to ISO 1516 or in Rapidflash-Simulation programs RT1 and RT2.



OVERFLO

10°C above the pre-set temperature of the expected flashpoint the program automatically is aborted for safety reasons.

3.3.2. Programs

Following programs can be chosen:

D56-LoVisco	Program acc. to ASTM D 56 for low viscous samples, auto start at EFLP-11°C then rise of temperature 1°/min, 1. ignition test 5°C below expected flashpoint.
D56-HiVisco	Program acc. to ASTM D 56 for high viscous samples, auto start at EFLP-11°C then rise of temperature 1°/min, 1. ignition test 5°C below expected flashpoint.
RAPID-LoVisc	RAPID-Program for low viscous samples, auto start at EFLP-11°C. First rise of temperature 3°/min, then 1°/min or. 5°C/min, then 3°C/min , 1. ignition test 5°C below expected flashpoint.
RAPID-HiVisc	RAPID-Program for high viscous samples, auto start at EFLP-11°C then rise of temperature 3°/min, then 1°/min resp. 5°C/min, then 3°C/min, 1. ignition test 5°C below expected flashpoint.
SEARCH-LoVis	Search program for low viscous samples, cooling of the sample to -35°C, then rise of temperature 5°/min, ignition test immediately every 2°C
SEARCH-HiVis	Search program for high viscous samples, cooling of the sample to -35°C, then rise of temperature 5°/min, ignition test immediately every 2°C
EQ1-ISO_1516	Equilibrium method acc to ASTM D 3934, 10min tempering of the sample at preselected flash point then flash point test
EQ2-ISO_1523	Equilibrium method acc ISO 1523, tempering at expected flash point-5°C and 1. flash point test, then temperature rise 0,5°C/1,5min until flash point or overflow
RT1<ambient	Rapidflash simulation program for flash points < ambient temperature (only possible with Rapidflash-Set 107240)
RT2>ambient	Rapidflash simulation program for flash points > ambient temperature (only possible with Rapidflash-Set 107240)
UserProgram1	User program 1, free programmable, pre-set with program ASL
UserProgram2	User program 2, free programmable, pre-set with program ASH

If flashing cursor is positioned on a program and no new program has been selected by the arrow keys you can call up a detailed explanation of the program with <ENTER>.

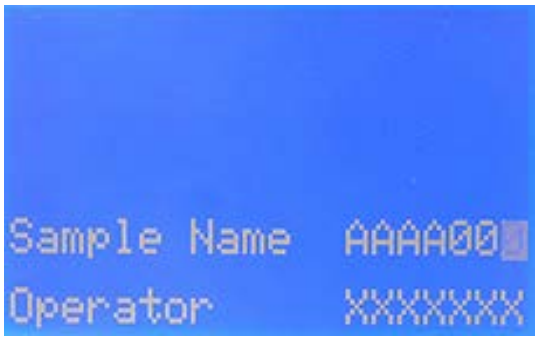
By scrolling with the cursor keys the bottom line shows the following:

DISPLAY HISTORY	the results of the last 99 tests conducted can be called-up on the display
PRINT HISTORY	the last 99 test results are printed
PRINT PARAMETER	prints the current program parameters
CHANGE PARAMETER	jumps to the SETUP-Menu for the program parameters
PRINT MANUAL	a brief manual is printed

When you press <ENTER>-you will call up the respective function.

3.3.3. Sample ID

You can put in sample-ID and user-ID in this sample-ID menu.



For sample- and user-ID you are given 7 digits which can be used for alphabetical (A to Z) or numerical (0 to 9) signs.

If a new user name is put in the header is automatically printed out anew.

The four latest used sample names are saved together with all parameters (used program, expected flashpoint) and can be called up again by scrolling with the cursor keys.

If the last 3 digits of the sample name are numeric, the sample number is automatically counted up. To activate this function however the device parameter 29 has to be set at 0001 (chapter 5.2 and 5.3.2).

This parameter is set to 0000 by the manufacturer.

Example:

- OEL0001 at 1. test
- OEL0002 at 2. test and so on

3.3.4. Choice of the ignition system to be used

Beim TAG 4 ist es möglich, sowohl eine Elektro- als auch eine Gaszündung zu verwenden.

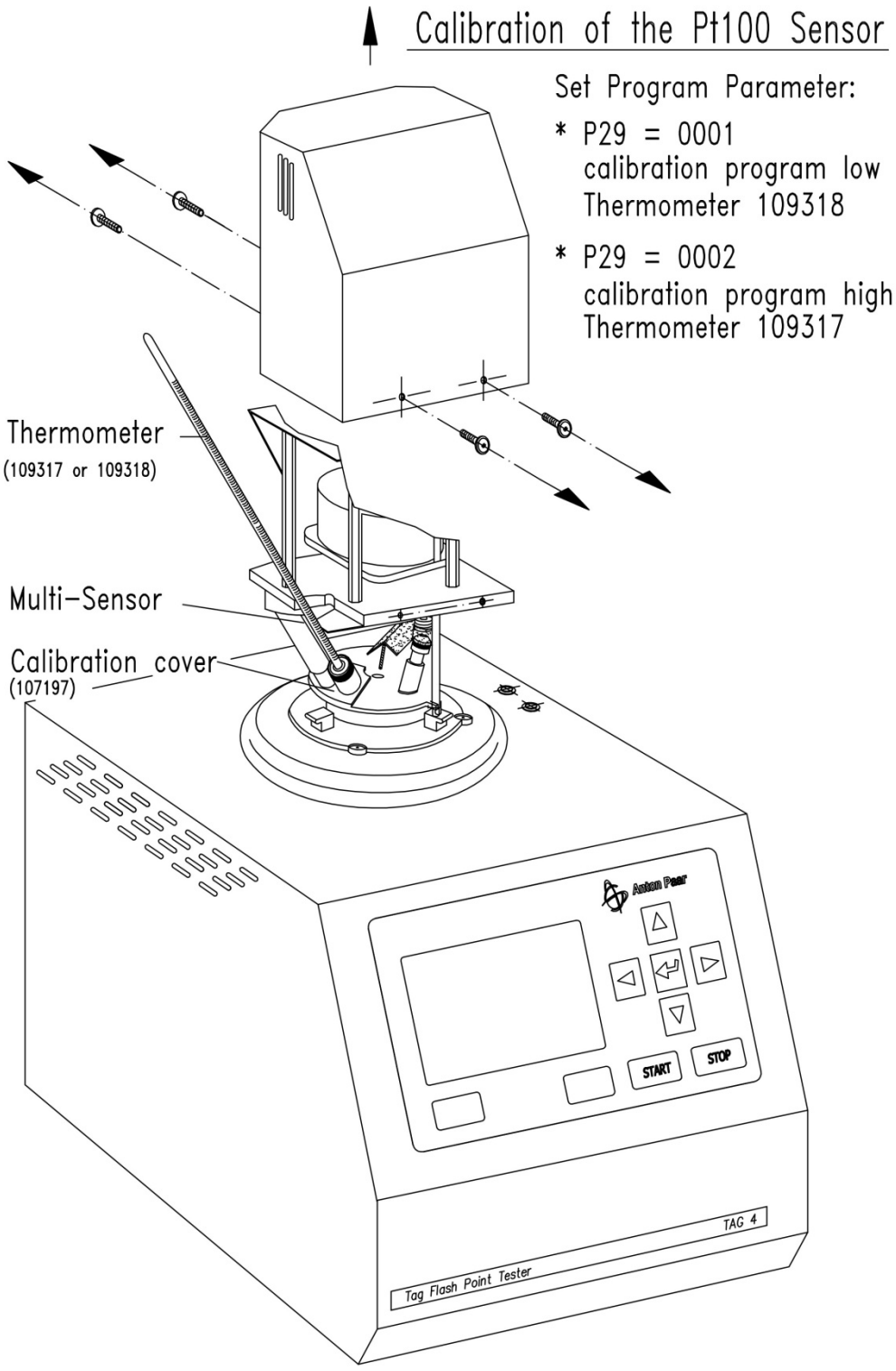
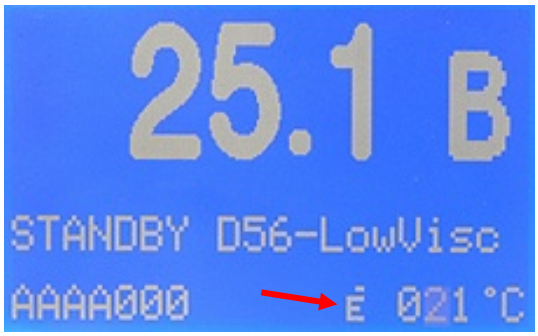


Fig. 6

For selection of the ignition please move the cursor to the ignition symbol.



Press <ENTER>-to get to the submenu.

Select the ignition to be used with the arrow keys:

Confirm with <ENTER>.

The selection can be checked by means of the symbol appearing on the display:

Gas igniter

Electric igniter

Electric ignition

The electric ignition is put into the ignition holder and fixed with a knurled head screw. Both ignition plugs are connected into the sockets at the upper surface of the device.

WARNING
Before plugging in the ignition make sure that the knurled head screw is nearly loose since otherwise the ignition coils could be damaged.

Menu point ELECTRIC IGNITOR contains a submenu for the exchange of the electric ignition after ageing or short circuit.
See 11.3 Re-placing the electric ignition

Gas ignition

Using the gas ignition the electric ignition has to be used as auxiliary ignitor fixed in a special support.

WARNING
Make sure that the igniter cables are not bended and don't interfere with the gas supply, e.g. when moving the multifunction head.

WARNING
For safety reasons the gas valve is switched off during delivery!

Before starting a test please conduct a manual immersion test to put the gas ignition into operation.

Therefore press <arrow up> and keep it pressed until the escaping gas is ignited by the electric ignition. (The opening of the magnetic valve is indicated by a faint cracking sound.)

This ensures that the gas has been in all hoses before the test.
Simultaneously the gas valve can be set in that manner, that the ignition flame reaches an average of 4mm according to standard.

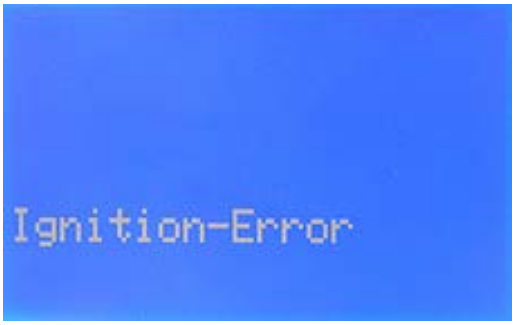
To shorten the initial ignition process the valve can be CAREFULLY opened a tiny bit for a very short period of time.

Safety function

If the flame indicator registers no ignition flame within 50 sec the magnetic valve automatically switches off.

WARNING
For the gas-connection use tubes which are admitted for gas-operation only!

WARNING
If after a program was started the device realizes that there is no electric ignition connected the program automatically returns to STOP and the following malfunction message is given.



3.3.5. Expected flashpoint

With the TAG 4 it is possible to detect flashpoints up to 110°C.

To change the preselection move the cursor to the flashpoint preselection, set the requested value with the arrow keys and confirm with <ENTER>.

If you press <ENTER>-without changing the flashpoint preselection an explanation is given on display:

The expected flashpoint can be altered even while the program is running.

Just press the <ENTER>-key during the running program and the cursor will flash at the ten digit of the flashpoint preselection. You can now alter your preselection and confirm with <ENTER>.

However, if the program has already proceeded to the test range (ignition started) and you increase the preselection that high, that the program is out of test range again, the ignition is turned off again.

3.3.6. Temperature course of the block

The temperature of the heating block is expressed on the display by the following symbols:

Block has cooled down to the temperature given by the respective parameter.

Program has been started. Block is heating.
(One bar means approx. 1 min until reaching the test phase.)

Device is testing for flash point. Cup symbol is flashing.
When the program is in safety mode, only TESTING appears but the cup symbol is still not flashing. The arrow for heating progress still appears on display.

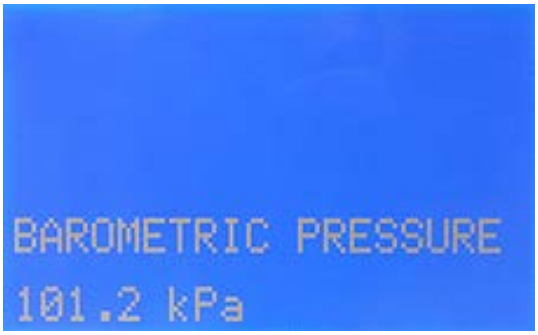
Flashpoint detected, ventilator turned on, block is cooling down.

3.3.7. Setting date and time

By setting test code 9993 in program parameter 1 of any program actual date and time can be set with cursor keys and confirmed with <ENTER>:

3.3.8. Setting barometric pressure correction

Barometric pressure can be displayed by setting program parameter 1 in any program to 9991.



If there is any correction necessary it has to be inserted into device parameter 4 (see chapter 5.3.2 Changing of device parameters).

3.3.9. Setting LCD brightness

LCD brightness can be adjusted by pressing and holding <STOP> for 5sec in the opening menu.

The brightness can be altered using <arrow up> and <arrow down>.
Changes are confirmed with <ENTER>.

4. TEST CONDUCT

4.1. Program selection

Select the program according to the sample under test and the standard to be used.

4.1.1. Programs D56-LoVisco and D56-HiVisco

The programs D56-LoVisco and D56-HiVisco are standard programs according to ASTM D 56 for low as well as high viscous samples. If the viscosity of the sample can't definitely be identified as low or high always the program for low viscous samples should be used.

The auto start temperature is about 11°C below the expected flashpoint.
The first flashpoint test has to be carried out at 5°C below the expected flashpoint and then every 0,5°C (EFLP under 60°C) and every 1°C (EFLP above 60°C).

According to standards the rise of temperature is preset with 1°C/min for flashpoints expected below 60°C and with 3°C/min for flashpoints expected above 60°C.

4.1.2. Programs RAPID-LoVisc and RAPID-HiVisc

The programs RAPID-LoVisc and RAPID-HiVisc are programs appropriate for high flashpoints (above 70°C).

The auto start temperature is about 11°C below the expected flashpoint.

The temperature gradient at beginning is 3°C/min or 5°C/min. At 25°C below the expected flashpoint the gradient is slowed down to the normal rise of 1°C/min or 3°C/min.

The first flashpoint test will be conducted at 5°C below the expected flashpoint - and then every 0,5°C resp. every 1°C.

4.1.3. Programs SEARCH-LoVis and SEARCH-HiVis

These programs are search programs for unknown samples. The auto start temperature is 145°C below the expected flashpoint which has to be set to 110°C.

Using devices with external cooling the cryostat temperature has to be set to a low value (e.g. -15°C). The sample has to be cooled down to -35°C and then be put into the precooled crucible (see test conduct).

The temperature gradient will be 5°C/min the ignition immediately dips every 2°C.

Because the cooling of the Peltier elements can only realize a temperature difference of about 60°C between cryostat temperature and sample temperature, the program will be stopped at approx. 50°C because of missing sample gradient.

If up to then the device didn't detect a flashpoint the test has to be repeated at a higher cryostat temperature.
Before starting a new test (after setting the cryostat temperature to a higher value) program parameter 02 for autostart temperature should be set to a lower value to make an autostart at 50°C then. For achieving this, program parameter 02 must be set to 0600 (60°C) with an expected flash point of 110°C.

4.1.4. Programs EQ1-ISO_1516 and EQ2-ISO_1523

Programs EQ1-ISO_1516 and EQ2-ISO_1523 are programs for equilibrium methods acc to ASTM D3934/ISO 1516 (EQ1) und ASTM D 3941/ISO 1523 (EQ2).

Acc. to ASTM D 3934 sample temperature is regulated to the preselected temperature. As soon as the sample has attained the same temperature as the block it is held for 10min at this temperature. After these 10min a flash point test is performed. When a flash point is indicated the test is terminated and has to be repeated at a lower test temperature.
Acc. to ISO 1516 sample temperature is regulated to the preselected temperature. As soon as the sample has attained the same temperature as the block it is held for 10min at this temperature. After these 10min a flash point test is performed. When a flash point is indicated the test is terminated and has to be repeated at a lower test temperature. When no flash point is detected the sample is temperated for further 10min and a second flash point test is performed.

Depending on the indication of a flash point as a result either FP (flash point detected) or noFP (no flash point detected) are documented.

EQ1 is preset to a test conduct acc to ASTM D 3934 and can be set to a test conduct acc to ISO 1516 by setting program parameter 30 to 0002.

According to ASTM D 3941/ISO 1523 the sample is temperated at 5°C below test temperature. As soon as the sample has attained the bath temperature a flash point test is performed. If a flash point is indicated the test has to be repeated at a 5°C lower test temperature. If no flash point was found the sample is heated at 0,3°C/min and flash point tests are performed each 0,5°C until a flash point is found or the overflow is attained.

4.1.5. Programs RT1<ambient and RT2>ambient

Programs RT1<ambient and RT2>ambient are simulation programs for rapid test methods according to ISO 3679, 3680, EN 456, DIN 55680, ASTM D 3828.

Test conduct is only possible with rapid flash set .107240

As this is only a simulation of rapid flash tests deviations to the flash points from the original device are possible.

4.1.6. Programs UserProgram1 and UserProgram2

The USER programs are free programmable user programs. At delivery the parameters of the programs D56-LoVisco (UserProgram1) and D56-HiVisco (UserProgram2) are programmed.

After programming new parameters these are stored even after switching the device off and on again.

In all other programs except UserProgram1 and UserProgram2 parameters can be changed but are only stored until the next switching off of the device. Switching on again reinstalls the pre-set parameters.

When programming a user program parameter 30 (standard parameter) must be set correctly to the standard that should be applied. Program parameters PP02, PP07 to PP12, PP21, PP22, PP25 and PP26 must be set like in the respective programs or at least logically correct (e.g. autostart before test start), otherwise test run will not work correctly.

4.2. Program start

4.2.1. Precooling

The TAG 4 allows precooling of the heating block as well as the empty sample insert by using the function "Precooling". It is activated by <arrow left>.

The heating block will be cooled down to a temperature about 17°C below the expected flashpoint and kept there for 5 minutes. If during that time no program start took place the block will be heated up to 25°C (at EFLP<60°C) resp. 35°C (at EFLP>60°C) to prevent icing-up.

If the cooling gradient becomes as low as 0.1°/min, the cooling will be stopped even without achieving the temperature. After an acoustic signal this block temperature will be kept for 5 minutes. By this function icing-up of the cooling block can be prevented at extremely low temperatures.

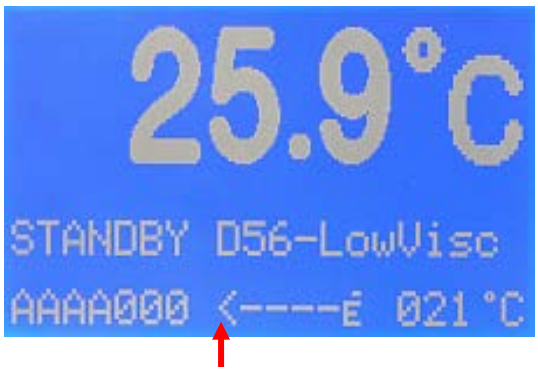
CAUTION
Is the block temperature not sufficient, a lower cryostat temperature has to be chosen.

Using devices cooling by air the precooling depends highly upon the ambient temperature. If the required temperature can't be achieved the ambient temperature might be too high

For the determination of flashpoints several proceedings are possible:

1. Expected Flashpoint < ambient temperature, acc. to ASTM D 56
As described in the standards the crucible, lid, multi detector and sample have to be precooled to a temperature of 10°C below expected flashpoint. It is possible to pre-cool the empty crucible together with the lid and indicator in the TAG 4 before starting the program. Press the key <arrow left>.

The display shows the following:



The block will be cooled down to auto start temperature (in the standards 11°C below expected flashpoint). This temperature will be kept for 5 min.

At achieving this temperature you can hear a short acoustic signal. The display shows:

flashing

Now it is possible to put the precooled sample into the crucible.
Having inserted the crucible into the heating block the test can be started by RUN.
To prevent the empty heating block from icing-up we recommend to cover it with appropriate isolating material during cooling.

2. Expected flashpoint > ambient temperature

After applying the sample into the test cup the insert will be put into the TAG 4.
After starting the device heats immediately according to standards.
After test abortion the block cools down to STOP-temperature of 25°C resp. 35°C according to the selected flashpoint.

3. Expected flashpoint below ambient temperature, test conduction not acc. to standards

For flashpoints below ambient temperature it is possible to insert the uncooled sample at ambient temperature in the crucible (not recommended because volatile components can evaporate easily and the flashpoint may be affected).
Having inserted the crucible into the device and started the program the sample will be cooled down to auto start temperature. Then the test will be started.

This test conduct is possible with pure materials. Working with mixed compounds the sample should always be cooled down to the temperature recommended by standards.

4.2.2. Working with gas ignition

Before using the gas ignition for the first time it is recommended to conduct a manual test to make sure that the gas has already reached the tip of the ignition jet. Therefore press the key <arrow up> in the <STOP>-Status and keep it pressed until gas is escaping and ignited by the electric ignition. Release key then and let the device conduct an immersion test.

Before using the gas ignition for the first time the gas supply to the TAG 4 is filled with air instead of gas. Therefore it will take some time till the gas is set free from the jet. To increase the speed you can accelerate the outflow speed (Attention: Take care because the flame will be larger now).

Press the key <arrow up> till gas escapes from the jet and is ignited by the electric ignition.

WARNING
If the speed of outlet is too high the gas stream will cool down the glowing electric ignition: No flame can emerge!.

After selecting the requested program, the flashpoint preselection and the ignition the <START>-key can be pressed.

You can go ahead even if shortly after pushing the multifunction head the sample temperature is not yet displayed.

If head has not clicked into place and the contact to the sensor is not established following error message is given:

Once the program is started you will have following display:

After achieving autostart temperature or directly after test start the ignitor glows for 30s for detecting ignitor reference voltage.
Depending on the selected program the device gets into the test phase approx. 5°C before the preselected flashpoint
About 0.5 °C before first immersion there will be a short acoustic signal.

The cup-symbol will be flashing left from the preselected flashpoint.

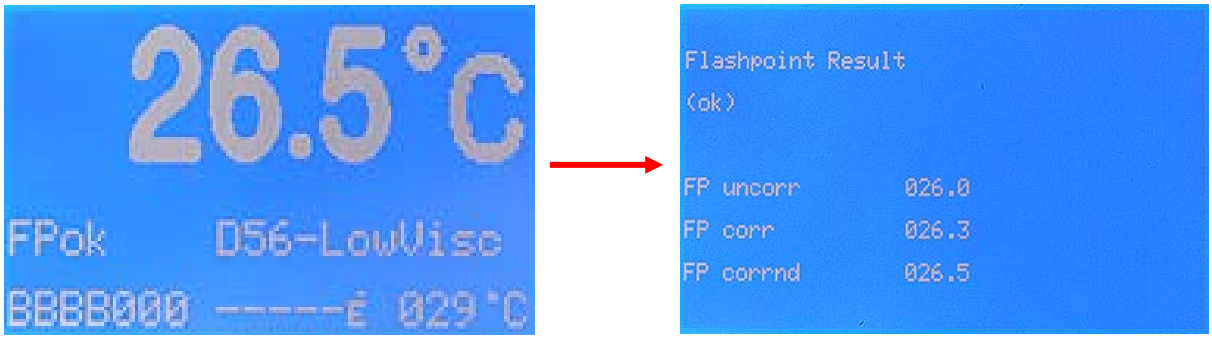
Independent from the flashpoint preselection it is possible (until 5°C/9°F before test range) to initiate a flashpoint test with the key <arrow up> at any time.

If a flashpoint was detected the program automatically stops and shows the indicated flashpoint on the display:

The device automatically cools down to auto start temperature.

If a flashpoint was detected depending on the compliance with the standards the display shows the following:

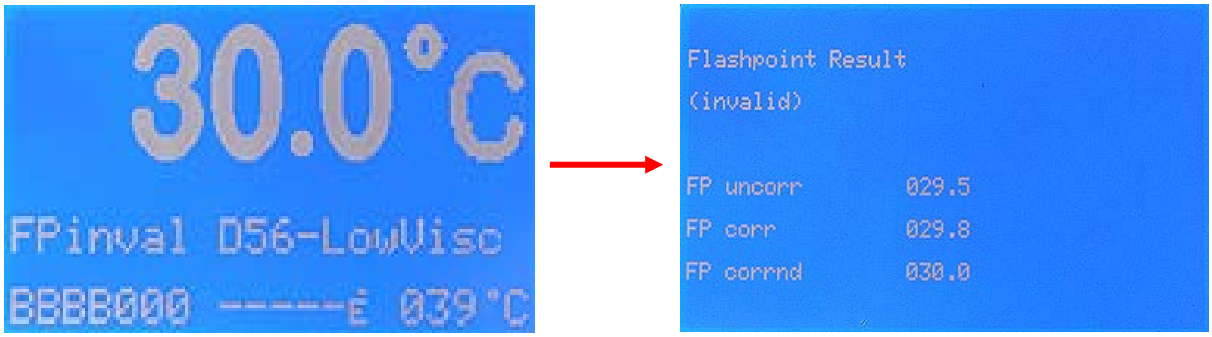
FPok: The detected flashpoint was found in accordance with the relevant standard.



On the left (main) display always the barometric corrected rounded flash point is displayed.

You can switch to the right (sub) display by pressing <ENTER>, moving the cursor to "FPok" and pressing <ENTER> again. On this display the values for the uncorrected and corrected not rounded flash point are shown additionally.

FPinval: Flashpoint invalid.
If a flashpoint was detected at first dipping or during safety mode the flash point is invalid:



The test has to be repeated with a new sample and a flashpoint preselection at least 10°C lower than before.

If no flashpoint was detected the device automatically stops at a sample temperature of 10°C above expected flashpoint:

4.3. Program tables

4.3.1. Program table °C

Program	Gradient	Overflow	Dip-in start	Dip-in cycle
D56-LoVisco				
EFLP<60°C	1,0 °C/min	EFLP+10°C	EFLP-05°C	each 0,5°C
EFLP≥60°C	3.0°C/min			each 1.0°C
D56-HiVisco				
EFLP<60°C	1,0 °C/min	EFLP+10°C	EFLP-05°C	each 0,5°C
EFLP≥60°C	3.0°C/min			each 1.0°C
RAPID-LoVisc				
EFLP<60°C	3.0 &1.0°C/min	EFLP+10°C	EFLP-05°C	each 0,5°C
EFLP≥60°C	5.0 &3.0°C/min			each 1.0°C
RAPID-HiVisc				
EFLP<60°C	3.0 &1.0°C/min	EFLP+10°C	EFLP-05°C	each 0,5°C
EFLP≥60°C	5.0 &3.0°C/min			each 1.0°C
SEARCH-LoVis	5.0 °C/min	EFLP+0°C	EFLP-130°C	each 2°C
SEARCH-HiVis	5.0 °C/min	EFLP+0°C	EFLP-130°C	each 2°C
EQ1-ISO_1516	0,0 °C/min	1. Test	EFLP	--
EQ2-ISO_1523	0,5°C/1,5min	EFLP+10°C	EFLP-5°C	each 0,5°C
RT1<ambient	0,5 °C/min	EFLP	EFLP	----
RT2>ambient	0 °C/min	EFLP	EFLP	----
UserProgram1=D56-LoVisco				
EFLP<60°C	1,0 °C/min	EFLP+10°C	EFLP-05°C	each 0,5°C
EFLP≥60°C	3.0°C/min			each 1.0°C
UserProgram2=D56-HiVisco				
EFLP<60°C	1,0 °C/min	EFLP+10°C	EFLP-05°C	each 0,5°C
EFLP≥60°C	3.0°C/min			each 1.0°C

4.3.2. Program table °F

Program	Gradient	Overflow	Dip-in start	Dip-in cycle
D56-LoVisco				
EFLP<108°F	2°F/min	EFLP+18°F	EFLP-10°F	each 1°F
EFLP≥108°F	5°F/min			each 2°F
D56-HiVisco				
EFLP<108°F	2°F/min	EFLP+18°F	EFLP-10°F	each 1°F
EFLP≥108°F	5°F/min			each 2°F
RAPID-LoVisc				
EFLP<108°F	5°&2°F/min	EFLP+18°F	EFLP-10°F	each 1°F
EFLP≥108°F	9°&5°F/min			each 2°F
RAPID-HiVisc				
EFLP<108°F	5°& 2°F/min	EFLP+18°F	EFLP-10°F	each 1°F
EFLP≥108°F	9°& 5°F/min			each 2°F
SEARCH-LoVis	9°F/min	EFLP+0°F	EFLP-234°F	each 4°F
SEARCH-HiVis	9°F/min	EFLP+0°F	EFLP-234°F	each 4°F
EQ1-ISO_1516	0,0 °F/min	1. Test	EFLP	--
EQ2-ISO_1523	0,5 °F/min	EFLP+18°F	EFLP-9°F	each 1°F
RT1<ambient	1,0 °F/min	EFLP	EFLP	----
RT2>ambient	0,0 °F/min	EFLP	EFLP	----
UserProgram1=D56-LoVisco				
EFLP<108°F	2°F/min	EFLP+18°F	EFLP-10°F	each 1°F
EFLP≥108°F	5°F/min			each 2°F
UserProgram2=D56-HiVisco				
EFLP<108°F	2°F/min	EFLP+18°F	EFLP-10°F	each 1°F
EFLP≥108°F	5°F/min			each 2°F

4.3.3. Program parameter in °C

Programm/Parameter	D56 LoVisc	D56 HiVisc	RAPID LoVisc	RAPID HiVisc	SEARCH LoVis	SEARCH HiVis
01: Test function	0000	0000	0000	0000	0000	0000
02: Autostart	0110	0110	0110	0110	1450	1450
03: init heat.diff 1/10°C a	0015	0070	0070	0120	0120	0150
04: init heat diff 1/10°C b	0070	0120	0120	0150	0120	0150
05: start diff 1/10°C a	0015	0070	0070	0120	0120	0150
06: start diff 1/10°C b	0070	0120	0120	0150	0120	0150
07: 1. sample grad 1/10°C a	0010	0010	0030	0030	0050	0050
08: 1.samplegrd 1/10°C b	0030	0030	0050	0050	0050	0050
09: 2. samplegrd 1/10°Ca	0010	0010	0010	0010	0050	0050
10: 2. samplegrd 1/10°Cb	0030	0030	0030	0030	0050	0050
11: grad1->grad2 1/10°C a	0000	0000	0100	0200	0000	0000
12: grad1->grad2 1/10°C b	0000	0000	0200	0300	0000	0000
13: block nomvalue 1/10°Ca	0000	0000	0020	0030	0000	0000
14: block nom value 1/10°Cb	0000	0000	0000	0030	0000	0000
15: overflow 1/10°C	0100	0100	0100	0100	0000	0000
16: stirrer speed (rpm)	0000	0000	0000	0000	0000	0000
17: precooling time sec	0300	0300	0300	0300	0300	0300
18: block temp at stop 1/10°Ca	0250	0250	0250	0250	0250	0250
19: block temp atstop1/10°Cb	0350	0350	0350	0350	0350	0350
20: Stop after flashp1/0	0001	0001	0001	0001	0001	0001
21: Testcycle 1/10°C a	0005	0005	0005	0005	0020	0020
22: Testcycle 1/10°C b	0010	0010	0010	0010	0020	0020
23: sampletempcontr on/off a	0001	0001	0001	0001	0001	0001
24: sampletempcontr on/off b	0001	0001	0001	0001	0001	0001
25: start testcycle a	0050	0050	0050	0050	1300	1300
26: start testcycle b	0050	0050	0050	0050	1300	1300
27: a logic -> b logic	0600	0600	0600	0600	0600	0600
28: No Gradient logic	0001	0001	0001	0001	0003	0003
29: (0/1/2) calprog	0000	0000	0000	0000	0000	0000
30: (0/1/2/3/4/5) standard	0000	0000	0000	0000	0000	0000
31: (0) Reserved	0000	0000	0000	0000	0000	0000
32: (0) Reserved	0000	0000	0000	0000	0000	0000
33: (0) Reserved	0000	0000	0000	0000	0000	0000
34: (0) Reserved	0000	0000	0000	0000	0000	0000
35: (sec) Printcycle	0060	0060	0060	0060	0060	0060

Programm/Parameter	EQ1-ISO_1516	EQ2-ISO_1523	RT1 <ambient	RT2 >ambient	User Prog1	User Prog2
01: Test function	0000	0000	0000	0000	0000	0000
02: Autostart	0100	0100	0040	0030	0110	0110
03: init heat.diff 1/10°C a	0000	0000	0000	0000	0000	0070
04: init heat diff 1/10°C b	0000	0000	0000	0000	0070	0120
05: start diff 1/10°C a	0000	0000	0000	0000	0000	0070
06: start diff 1/10°C b	0000	0000	0000	0000	0070	0120
07: 1. sample grad 1/10°C a	0000	0000	0000	0000	0010	0010
08: 1.samplegrd 1/10°C b	0000	0000	0000	0000	0030	0030
09: 2. samplegrd 1/10°Ca	0000	0003	0000	0000	0010	0010
10: 2. samplegrd 1/10°Cb	0000	0003	0000	0000	0030	0030
11: grad1->grad2 1/10°C a	0000	0050	0030	0000	0000	0000
12: grad1->grad2 1/10°C b	0000	0050	0030	0000	0000	0000
13: block nomvalue 1/10°Ca	0000	0000	0000	0000	0000	0000
14: block nom value 1/10°Cb	0000	0000	0000	0000	0000	0000
15: overflow 1/10°C	0100	0100	0100	0100	0100	0100
16: stirrer speed (rpm)	0000	0000	0000	0000	0000	0000
17: precooling time sec	0300	0300	0300	0300	0300	0300
18: block temp at stop 1/10°Ca	0250	0250	0250	0250	0250	0250
19: block temp atstop1/10°Cb	0350	0350	0350	0350	0350	0350
20: Stop after flashp1/0	0001	0001	0001	0001	0001	0001
21: Testcycle 1/10°C a	9999	0005	9999	9999	0005	0005
22: Testcycle 1/10°C b	9999	0005	9999	9999	0010	0010
23: sampletempcontr on/off a	0001	0001	0001	0001	0001	0001
24: sampletempcontr on/off b	0001	0001	0001	0001	0001	0001
25: start testcycle a	0000	0050	0000	0000	0050	0050
26: start testcycle b	0000	0050	0000	0000	0050	0050
27: a logic -> b logic	0600	0600	0600	0600	0600	0600
28: No Gradient logic	0001	0001	0001	0001	0001	0001
29: (0/1/2) calprog	0000	0000	0000	0000	0000	0000
30: (0/1/2/3/4/5) standard	0001	0003	0004	0005	0000	0000
31: (0) Reserved	0000	0000	0000	0000	0000	0000
32: (0) Reserved	0000	0000	0000	0000	0000	0000
33: (0) Reserved	0000	0000	0000	0000	0000	0000
34: (0) Reserved	0000	0000	0000	0000	0000	0000
35: (sec) Printcycle	0060	0060	0060	0060	0060	0060

4.3.4. Program parameter in °F

Programm/Parameter	D56 LoVisc	D56 HiVisc	RAPID LoVisc	RAPID HiVisc	SEARCH LoVis	SEARCH HiVis
01: Test function	0000	0000	0000	0000	0000	0000
02: Autostart	0200	0200	0200	0200	2430	2430
03: initheat. diff 1/10°F a	0030	0130	0130	0220	0220	0270
04: init heat diff 1/10°F b	0130	0220	0220	0270	0220	0270
05: start diff 1/10°F a	0030	0130	0130	0220	0220	0270
06: start diff 1/10°F b	0130	0220	0220	0270	0220	0270
07: 1.samplegrd 1/10°F a	0020	0020	0050	0050	0090	0090
08: 1.samplegrd 1/10°F b	0050	0050	0090	0090	0090	0090
09: 2.samplegrd 1/10°F a	0020	0020	0020	0020	0090	0090
10: 2.samplegrd 1/10°F b	0050	0050	0050	0050	0090	0090
11: grd1->grd2 1/10°F a	0000	0000	0180	0360	0000	0000
12: grd1->grd2 1/10°F b	0000	0000	0360	0540	0000	0000
13: blocknomval 1/10°F a	0000	0000	0040	0050	0000	0000
14: blocknomval 1/10°F b	0000	0000	0000	0050	0000	0000
15: overflow 1/10°F	0180	0180	0180	0180	0000	0000
16: stirrer speed rpm	0000	0000	0000	0000	0000	0000
17: precooling time sec	0300	0300	0300	0300	0300	0300
18: block temp atstop1/10°Fa	0770	0770	0770	0770	0770	0770
19: block temp at stop1/10°F b	0950	0950	0950	0950	0950	0950
20: Stop after flashpoint 1/0	0001	0001	0001	0001	0001	0001
21: Testcycle 1/10°F a	0010	0010	0010	0010	0040	0040
22: Testcycle 1/10°F b	0020	0020	0020	0020	0040	0040
23: sampletempcontr on/off a	0001	0001	0001	0001	0001	0001
24: sampletempcontr on/off b	0001	0001	0001	0001	0001	0001
25: start testcycle a	0100	0100	0100	0100	2340	2340
26: start testcycle b	0100	0100	0100	0100	2340	2340
27: a logic -> b logic	1400	1400	1400	1400	1400	1400
28: No Gradient logic	0000	0000	0000	0000	0010	0010
29: (0/1/2) calprog	0000	0000	0000	0000	0000	0000
30: (0/1/2/3/4/5)standard	0000	0000	0000	0000	0000	0000
31: (0) Reserved	0000	0000	0000	0000	0000	0000
32: (0) Reserved	0000	0000	0000	0000	0000	0000
33: (0) Reserved	0000	0000	0000	0000	0000	0000
34: (0) Reserved for test	0000	0000	0000	0000	0000	0000
35: (sec) Printcycle	0060	0060	0060	0060	0060	0060

Programm/Parameter	EQ1-ISO_1516	EQ2-ISO_1523	RT1 <ambient	RT2 >ambient	User Prog1	User Prog2
01: Test function	0000	0000	0000	0000	0000	0000
02: Autostart	0180	0180	0070	0050	0200	0200
03: initheat. diff 1/10°F a	0000	0000	0000	0000	0030	0130
04: init heat diff 1/10°F b	0000	0000	0000	0000	0130	0220
05: start diff 1/10°F a	0000	0000	0000	0000	0030	0130
06: start diff 1/10°F b	0000	0000	0000	0000	0130	0220
07: 1.samplegrd 1/10°F a	0000	0000	0000	0000	0020	0020
08: 1.samplegrd 1/10°F b	0000	0000	0000	0000	0050	0050
09: 2.samplegrd 1/10°F a	0000	0005	0000	0000	0020	0020
10: 2.samplegrd 1/10°F b	0000	0005	0050	0000	0050	0050
11: grd1->grd2 1/10°F a	0000	0090	0050	0000	0000	0000
12: grd1->grd2 1/10°F b	0000	0090	0000	0000	0000	0000
13: blocknomval 1/10°F a	0000	0000	0000	0000	0000	0000
14: blocknomval 1/10°F b	0000	0000	0000	0000	0000	0000
15: overflow 1/10°F	0180	0180	0180	0180	0180	0180
16: stirrer speed rpm	0000	0000	0000	0000	0000	0000
17: precooling time sec	0300	0300	0300	0300	0300	0300
18: block temp atstop1/10°Fa	0770	0770	0770	0770	0770	0770
19: block temp at stop1/10°F b	0950	0950	0950	0950	0950	0950
20: Stop after flashpoint 1/0	0001	0001	0001	0001	0001	0001
21: Testcycle 1/10°F a	9999	0010	9999	9999	0010	0010
22: Testcycle 1/10°F b	9999	0010	9999	9999	0020	0020
23: sampletempcontr on/off a	0001	0001	0001	0001	0001	0001
24: sampletempcontr on/off b	0001	0001	0001	0001	0001	0001
25: start testcycle a	0000	0090	0000	0000	0100	0100
26: start testcycle b	0000	0090	0000	0000	0100	0100
27: a logic -> b logic	1400	1400	1400	1400	1400	1400
28: No Gradient logic	0002	0002	0002	0002	0000	0000
29: (0/1/2) calprog	0000	0000	0000	0000	0000	0000
30: (0/1/2/3/4/5)standard	0001	0003	0004	0005	0000	0000
31: (0) Reserved	0000	0000	0000	0000	0000	0000
32: (0) Reserved	0000	0000	0000	0000	0000	0000
33: (0) Reserved	0000	0000	0000	0000	0000	0000
34: (0) Reserved for test	0000	0000	0000	0000	0000	0000
35: (sec) Printcycle	0060	0060	0060	0060	0060	0060

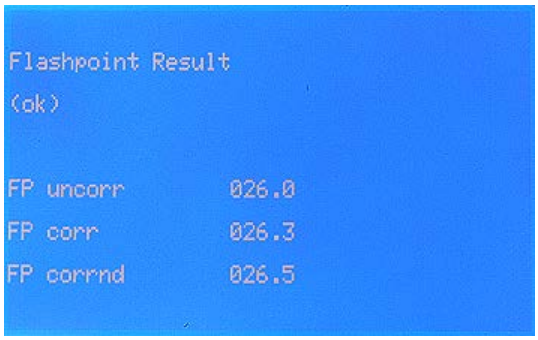
4.4. Barometric correction

The integrated barometric pressure sensor enables automatic barometric correction of the test result. The corrected flashpoint will be printed.

The barometer correction is calculated according to these formulas:

- korFP = FP + 0,25 (101,3 - p) for °C
- korFP = FP + 0,45 (101,3 - p) for °F

It is also possible to call the corrected flashpoint on display. To do this move the cursor to "FPok" and confirm by pressing the <ENTER> key.
Following display is given:



On main display (standard setting) the barometric pressure corrected rounded flash point is displayed. By setting of device parameter 10 it is also possible to show on main display the uncorrected flash point or the not rounded flash point.

4.5. Printed protocol of a test run

ANTON PAAR PROVETEC BLANKENFELDE-MAHLOW Tel:033708-56300
TAG 4-Version 13.05.2006 Device No 00000001 Date 14.05.2006

OPERATOR XXXXXXX

SAMPLE NAME	PROG NAME	EFP °C	SAMPLE °C	FPcor °C	FPcrd °C	BAP kPa	GRAD °C/min	IGN G/E	STATUS	TIME (HH:MM)
DODECAN	D56-LowVisc	0800	081.0	80,6	80,5	102.7	001.0	E	FPok	06:14

The head line will only once be printed when the instrument is switched on.
If the operator is changed, the headline will be printed again.

SAMPLE NAME	Sample ID
PROG NAME	used program
EFP (°C)	expected flashpoint
SAMPLE (°C)	Sample temperature at program abortion by detecting a flashpoint, STOP, Overflow
FPcor (°C)	corrected flashpoint (barometric correction)
FPcrd (°C)	flash point, barometric pressure corrected, rounded according to standard
BAP (kPa)	atmospheric pressure in kPa
GRADIENT	Rise of sample temperature in °C/min
IGN (G/E)	used ignition (Gas/Electric)
STATUS	State of terminated test (e.g. FPok, OVERFLO, STOP)
TIME (H:M)	Time at test abortion

5. PARAMETERS

The parameters of the TAG 4 are divided in program parameters and device parameters.

Program parameters of all programs except the user programs User1and USER 2 are initiated at switch-on. Any change undergone in the programs are lost after turn-off.

The device parameters are exclusively for service purposes and should at no means be changed.

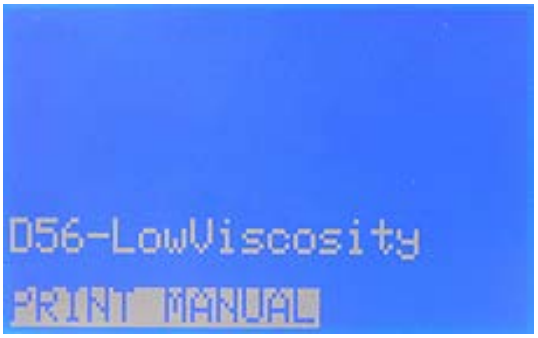
5.1. Program parameters

Parameter 1 Setting of parameter 1 allows to conduct various tests and special functions.

Select a program with the cursor in the opening menu and confirm with <ENTER>.
Then move the cursor to the program and change with <ENTER> to the sub menu.

Select with the cursor keys:

DISPLAY HISTORY
PRINT HISTORY
PRINT PARAMETER
CHANGE PARAMETER
PRINT MANUAL



If PRINT MANUAL is selected and confirmed by <ENTER>, the following printout is given:

TAG 4 TEST & SPECIAL FUNCTIONS MANUAL

P1 is test & special function parameter

For test/special function set parameter value and then press <ENTER> to execute

For setup lcd contrast press <STOP> 5 sec.

Test/special functions:

0001	Flash programming
1011	Safety mode on
1234	Jump to device setup menu
2000	Print device parameter
4010	Initialize device parameter
4020	Initialize userprogramparameter, samplelabels & operatorname
9990	Ignition lifetime test
9991	Barometer pressure test
9992	Indicator test
9993	Setup date/time
9994	Pt100 amplifier adjustment (excl software offset)
9997	Ignition dip test
9998	Pt100 software offset adjustment
0998	testprint after start, every P35 value & display block / sample temperature
0997	Display ignition current on test cycle
0996	Display gas flame indicator
0990	Display NTC value
0950	Display inspection counter

Parameter 1: will be set to the a.m. value and confirmed with <ENTER>.

0001 A software upgrade can be entered into the device from a computer.
The display shows:

1234 The parameter set of device parameters can be edited.

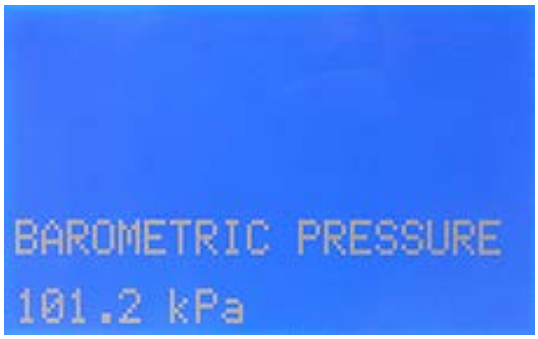
(Only for service purposes)

2000 Device parameters are printed out.

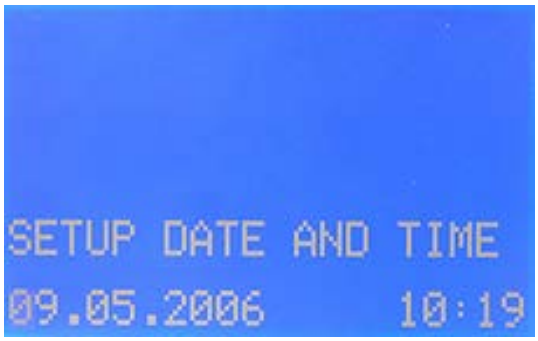
4010 Program parameters are initialized, meaning they are reset to delivery mode.

4020 The parameters of the USER programs, sample numbers and operator name are initialized

9991 Test of the barometer pressure display



9993 Setting of date and time



0998 Test printout of important parameters of the running test. Block and sample temperature are displayed.

B behind the temperature display designates the block temperature.

Following values are printed:
PROG=ASL EFLP=0080 P1=998 P02=99 P03=1000
P04=0750 P18=0050 P25=0060

nom-BT	Block-desired temperature
corr-B	Correction of heating power
act-BT	Block-actual temperature
nom-BG	Block-desired gradient
act-ST	Sample-actual temperature
nom-SG	Sample-desired gradient
act-SG	Sample-actual gradient
NT/CT/HP	Control values of heating
TIME	Time of running test

Parameter 2:	1/10°C Auto start, when sample temperature <= EFLP-P02 Is the program started at a temperature higher than EFLP-P02, first the device cools down to the required start temperature. Having achieved the right temperature it starts automatically.
Parameter 3:	1/10°C Initial temperature difference (a) Initial heating parameter. After starting the device heats up to the sample temperature + difference to initial temperature. Then it switches to normal heater control according to starting temperature difference (Parameter 5 and 6). This parameter helps to achieve the standard gradient very quickly.
Parameter 4:	1/10°C Initial temperature difference (b)
Parameter 5:	1/10 °C Start temperature difference (a) After achieving the initial temperature difference the device switches to start temperature difference (Sample temperature + Parameter 5) and starts the heat control.
Parameter 6:	1/10 °C Start temperature difference (b)
Parameter 7:	1/10°C 1. Sample Gradient (a) Rise 1 of sample temperature per minute
Parameter 8:	1/10°C 1. Sample Gradient (b)
Parameter 9:	1/10°C 2. Sample Gradient (a) Rise 2 of sample temperature per minute
Parameter 10:	1/10°C 2. Sample Gradient (b)
Parameter 11:	1/10°C Gradient 1 --> Gradient 2 when sample temperature >= EFLP-P11 (a) Switching from gradient 1 to gradient 2 at this sample temperature.
Parameter 12:	1/10°C Gradient 1 --> Gradient 2 when sample temperature >= EFLP-P11 (b)

Parameter 13: 1/10°C
Block nominal value - P13 when gradient 1 --> gradient 2 (a)
Block nominal value - P13 when switching from gradient 1 to gradient 2
Because in the RAPID programs the second gradient is smaller than the first one, to achieve a quick result the temperature of the heating block has to be reduced.

Parameter 14: 1/10°C
Block nominal value - P13 when gradient 1 --> gradient 2 (b)

CAUTION
Parameter 27 divides the flashpoint tests in 2 temperature areas - flashpoints higher or lower than given in parameter 27.
During test procedure it is possible to define 2 different speeds of temperature rise e.g. like in the RAPID programs.
These different gradients can be determined differently for both temperature areas a and b referring to parameter 27.

Example:
A USER program has to be prepared in which at flashpoints below 50°C the rise of temperature at the beginning is 1°C/min. Afterwards starting at 20°C below expected flashpoint the rise is decreased to 0,5°C/min. At flashpoints above 50°C the rise of temperature is given with 3°C/min, then decreased to 1°C/min. Parameters have to be set like following:

Parameter 27: 0500
Parameter 07: 0010
Parameter 08: 0030
Parameter 09: 0005
Parameter 10: 0010
Parameter 11: 0200
Parameter 12: 0200

If a very high gradient has to be decreased to a very low one in parameters 13 and 14 reductions of the heater block's temperature have to be noted. If necessary the respective suitable value has to be determined by testing several times.

Parameter 15:	1/10°C Overflow = EFLP+P15 If no flashpoint is detected the device automatically switches to STOP at 10°C above expected flashpoint (safety function)
Parameter 16:	Not used
Parameter 17:	sec Precooling time By using <arrow to the left> the precooling of the (empty) crucible can be started. After achieving the desired temperature = Auto start temperature the device stays at that temperature for about 5 min. Afterwards it heats up to the STOP temperature (25°C or 35°C).
Parameter 18:	1/10°C Block temperature at STOP (a) Temperature at which the block switches to STOP: Having detected a flashpoint the device first controls the auto start temperature (Parameter 2), if this is below temperature of parameter 18. After a period of waiting according to parameter 17 (Precooling time) it regulates to the temperature of parameter 18 to prevent the test insert from icing-up caused by a too long period of cooling.
Parameter 19:	1/10°C Block temperature at STOP (b)
Parameter 20:	1/0 Stop after flashpoint if P20=1 In delivery mode this parameter is set to 1, meaning STOP after a flashpoint was detected. If parameter is set to 0 the program continues until overflow is reached. This parameter allows an observation of the flashpoint by the user. The user can thus decide when to abort the program by pressing STOP.
Parameter 21:	1/10°C Testcycle (a) Diving cycle of ignition at sample temperatures < Parameter 27
Parameter 22:	1/10°C Testcycle (b)

Parameter 23	1/0 sample temperature controlling on/off (a) For normal tests this parameter is set to 1, that means the temperature rise is controlled in the sample. For high viscous samples this parameter can be set to 0. Now the temperature is controlled only in the heating block. The block temperature is increased only by the required temperature rise of the sample. So it is possible to prevent local overheating in the sample because the temperature rise in the sample is slower.
Parameter 24:	1/0 sample temperature controlling on/off (b)
Parameter 25:	1/10°C Start test cycle when sample temperature >= EFLP-P25 (a)
Parameter 26:	1/10°C Start test cycle when sample temperature >= EFLP-P26 (b)
Parameter 27:	1/10°C If EFLP<P27 then (a) logic, else (b) logic If the preset flashpoint is below the temperature set in parameter 27, logic a is applied, otherwise logic b.
Parameter 28:	No-Grad-Logic: Finish autostart if gradient >= P28*(-1) Logic for precooling of the sample resp. auto start. Is the temperature decrease less than set in parameter 28, the precooling phase or the cooling of the sample during program conduction is stopped.
Parameter 29:	(0/1/2) 0=Normal/ 1=calprog low / 2=calprog high Calibration program for samples Pt100 If this parameter in any of the programs is set to 1 or 2 the Pt100 can be compared with a calibrated thermometer.
Parameter 30:	Standard method PP30=0: "normal" flash point test acc to Abel (ISO 13736) PP30=1: flash point test acc to ASTM D 3934, equilibrium program similar to ISO 1516 with 1x dip-in (for TAG 4) PP30=2: flash point test acc to ISO 1516 PP30=3: flash point test acc to ISO 1523 PP30=4: Rapidflash-Simulation for EFLP<ambient PP30=5: Rapidflash-Simulation for EFLP>ambient

Parameter 31:	Reserved
Parameter 32:	
Parameter 33:	
Parameter 34:	
Parameter 35:	(sec) Printcycle if P1=998 Pressure interval at test parameter 1 set to 998

5.2. Device parameters

Parameter 1:	Correction of sample-Pt100 sensor in 1/10°C an offset can be set (difference between thermometer and Pt100)
Parameter 2:	Correction of block-Pt100 sensor in 1/10°C an offset can be set (difference between thermometer and Pt100)
Parameter 3:	Offset for gas flame indicator in digit (relative temperature)
Parameter 4:	Barometric pressure correction in 1/10 kPa
Parameter 5:	Unused
Parameter 6:	Block temperature correction for Rapidflash-Simulation programs
Parameter 7:	Maximum temperature in the heater block in °C Safety function: To avoid overheating of the ABA-4 the maximum achievable temperature of the heater block is limited by this parameter. If this value is achieved, the heater will stabilize the temperature constantly to this value. The heater is not switched off.
Parameter 8:	Safety mode: flash point tests each 10°C
Parameter 9:	Switch to °C/°F by setting parameters to 0000 or 0001 When switching from °C to °F and vice versa the parameters of all programs including the USER programs and device parameters, except offsets are initiated.
Parameter 10:	Result display Depending on this parameter flash point value is displayed as uncorrected value (0002), barometric pressure corrected value (0001) or barometric pressure corrected rounded value (0000). Parameter is preset to 0000, display of barometric pressure corrected rounded value

Parameter 11:	Flash point registration at theoretical test temperature off on (0/1) Flash point is registrated in PMA4 at the temperature when it happens. Depending on the sample gradient this may also be at a temperature value other than full numbers (e.g. 60,2°C). When this parameter is set to 0001 flash point is always registrated at theoretical test temperature (e.g. 60,0°C; 61,0°C or 62,0°C). The parameter is preset to 0000.
Parameter 12:	unused
Parameter 13:	PC-steering on/off by setting parameter to 0001 or 0000
Parameter 14:	unused
Parameter 15:	Switching from gas to electric ignition by setting parameters to 0000 or 0001. (The option gas or electric ignition is usually set directly in the menu)
Parameter 16:	maximum permissible deviation of the ignition voltage in mV downwards
Parameter 17:	maximum permissible deviation of the ignition voltage in mV upwards
Parameter 18:	lower value of ignition current in 1/100 mA Between two ignition tests the ignition current will shortly be reduced to extend the lifecycle of the electric ignition.
Parameter 19:	higher value of ignition current in 1/100 mA Ignition current at ignition cycle
Parameter 20:	Threshold for indication of a "run-over" flashpoint in digit on application of electric igniter. If after the first ignition test there is an ignition outside of the cup it can safely be assumed that the expected flashpoint was set much too high. The test has to be performed again with a lower preselection. When this parameter is set to 4095, the function is switched off.
Parameter 21:	Unused
Parameter 22:	Threshold value for gas flame indication (relative temperature in digit) According to this threshold values it will be detected if the gas ignition flame is on or off.
Parameter 23:	Threshold for indication of a "run-over" flashpoint in digit on application of gas igniter.

Parameter 24:	Unused
Parameter 25:	
Parameter 26:	
Parameter 27:	
Parameter 28:	
Parameter 29:	If the last 3 digits of the sample name are numerical, the sample number is increased by one after each flashpoint test. After switch-on or off it the counting starts from the last number counted. This function is switched on/off by setting the parameter to 0000/0001.
Parameter 30:	(0/1) Cooling system air/liquid This parameter controls the cooling system (air or water).
Parameter 31:	NTC threshold for cooling block control
Parameter 32:	Unused
Parameter 33:	

5.3. Changing of parameters

5.3.1. Changing the program parameters

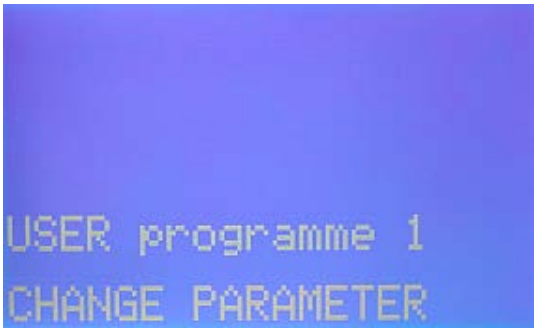
Only the programs UserProgram1 and UserProgram2 can be changed permanently (User programs).
In all other programs modifications are accepted, but will be deleted after switching off.
With each new switching on of the TAG 4 all program-parameters are newly initialized.

To change parameters move the cursor to the relevant program and press <ENTER>.

In the menu appearing the following can be selected:

DISPLAY HISTORY
PRINT HISTORY
PRINT PARAMETER
CHANGE PARAMETER
PRINT MANUAL

Move the cursor to CHANGE PARAMETER and confirm with <ENTER>.
You are now in the setup-mode of the program parameters of the selected program:



On the left the number of the parameter is shown (here: program parameter 1), on the right the parameter's value.

With the cursor by the left you can select the number of the parameter to change.
With the cursor you can as well select the new value of the parameter and confirm with <ENTER>.

Leave the mode with <STOP>

If the parameter was changed, but not confirmed with <ENTER> and only left with <STOP>, the former value of the parameter will be kept.

5.3.2. Changing of device parameters

The device parameters are set by the manufacturer and should not be changed by the user except device parameter 1 (Offset Pt100), 4 (Barometric correction) and device parameter 29 for counting numerically set sample names.

To change a device parameter in any given program change to the program parameter set. For parameter 1 put in value 1234 and confirm with <ENTER>.

Display:

As with the program parameters the number of the parameter will be displayed left and the value on the right. Changes are made with the cursor keys and confirmed with <ENTER>.

The changes will remain permanent even after switching off the device.

Reset of device parameters to delivery mode:

In any given program for program parameter 1 give in value 4010 and confirm with <ENTER>.

5.4. Printing the parameters

5.4.1. Printing the program parameters

Select program and use <ENTER> to confirm.
Move the cursor to the program and call up the respective submenu with <ENTER>:

Repeated pressing of <ENTER> key prints out actual program parameter set.

5.4.2. Printing the device parameters

In any program after calling up function CHANGE PARAMETER set parameter 1 to test code 2000 and confirm with <ENTER>.

The parameter set of the device parameters is printed out:

DEVICE PARAMETERS

01=0000	(1/10°C) Pt100 Sample correction
02=0000	(1/10°C) Pt100 Block correction
03=0106	(trel) Gas flame indicator correction
04=-022	(1/10kPa) Barometer pressure correction
05=0000	(0) Unused
06=0025	(1/10%) RT Prog: Block to cupbottom difference
07=0115	(°C) Max temperature at heating unit
08=0000	(0/1 Safety Mode off/on)
09=0000	(0/1) °C/°F
10=0000	(0/1/2) Result display (FPcrd/FPcorr/FPuncorr)
11=0000	(0/1) FP registration at theoretical test temperature
12=0000	(0) Unused
13=0001	(0/1) PC control
14=0000	(0) Unused
15=0000	(0/1) Gas/Electric ignition
16=0200	(mV) delta U-low (0=function off)
17=0200	(mV) delta U-high
18=0900	(1/100A) Low I-Ign
19=1080	(1/100A) High I-Ign

20=2000 (trel) E-IGN: Threshold overdrive indicator
21=0000 (0) Unused
22=1500 (trel) Threshold gas flame indicator
23=0300 (trel) GAS-IGN: Threshold overdrive indicator
24=0000 (0) Unused
25=0000 (0) Unused
26=0000 (0) Unused
27=0000 (0) Unused
28=0000 (0) Unused
29=0000 (0/1) Increment sample label
30=0000 (0/1) Cooling system (air/liquid)
31=3700 (dgt) NTC threshold
32=0000 (0) Unused
33=0000 (0) Unused

6. FUNCTIONS DISPLAY HISTORY AND PRINT HISTORY

After pressing <ENTER> move the cursor to the program and press <ENTER> again. You will get the following display:

Calling up this function with <ENTER> the display shows the results of the last 99 tests like following:

The last test conducted will be marked by "last".
The following ones shown will be counted from 02 up to 99.

Not used memory space (number of tests conducted <99) will be shown as "INVALID".

By PRINT HISTORY the last 99 test results will be printed.

ANTON PAAR PROVETEC BLANKENFELDE-MAHLOW Tel:033708-56300
TAG 4-Version 22.05.2006 Device No 00000001 Date 26.05.2006

OPERATOR XXXXXXX

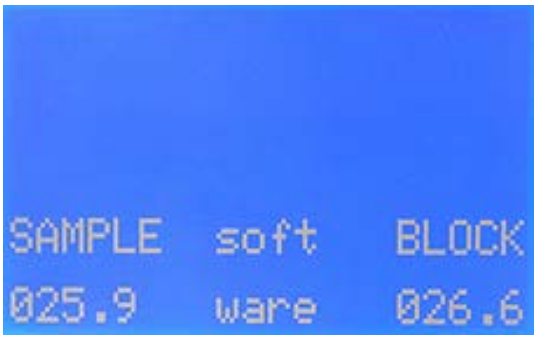
SAMPLE NAME	PROG NAME	EFP °C	SAMPLE °C	FPcor °C	FPcrd °C	BAP kPa	GRAD °C/min	IGN G/E	STATUS	TIME (HH:MM)
SPIR000	D56-LowVisc	0080			80,5		H I S T O R Y		FPok	LAST

7. FLASH POINT DETERMINATION ACC. TO ISO 1516/ASTM D 3934 AND ISO 1523/ASTM D 3941

ISO1516/ASTM D 3934 and ISO1523/ASTM D 3941 are equilibrium methods for flash point determination, the sample to be tested and the air/vapor mixture in the cup are in thermal equilibrium.
For these programs a special test procedure is necessary.
In these programs it is not possible to change the expected flash point in a running test. A manual test is also not possible. In the small cup the difference between sample and heater block is much greater than 2°C according to standard, it is also not possible to use a small cup for the equilibrium tests.
When tests are performed in the air-cooled device the user must pay attention that the preselected test temperature is in the working range of the device (+10°C to +110°C).

The sample Pt100 must be aligned against the block temperature sensor and a calibrated thermometer. This procedure should be done with a calibration lid (107197), best when the device has not been working over a longer period because in the air-cooled device there would be an influence from the cooling elements to the heater block and therefore to the temperature sensor.
In the water cooled device the cryostat should be switched off.

By setting test code 9998 in program parameter 1 of any program the Peltier cooling is switched off and block and sample temperature are shown on the display:



An offset for the sample Pt100 must be entered into device parameter 1 and an offset for the block Pt100 is entered into device parameter 23.
If the adjustment is not done correctly the regulation to the equilibrium temperature will last for a longer time.

Some requirements of the standards are inaccurate and had to be modified for the test run. The sample has to reach the same temperature like the heater bath. For this temperatures above and below room temperature were not considered in the standards because for both the sample will not reach the bath temperature as it is additionally influenced by the ambient temperature (e.g. through the cover). That is why we introduced an internal heater block correction that guarantees that the sample will attain the test temperature.

7.1. Test conduct according to ISO 1516/ASTM D 3934

Program EQ1-ISO_1516 has to be selected.
The test temperature has to be corrected for barometric pressure and then it is entered in the menu as expected flash point. After introducing the (if necessary precooled to 10°C below test temperature) sample the test is started with RUN.

After the sample has attained the test temperature it is held at this temperature for 10min. On the display this is shown by counting the time down from 600 seconds to 0:

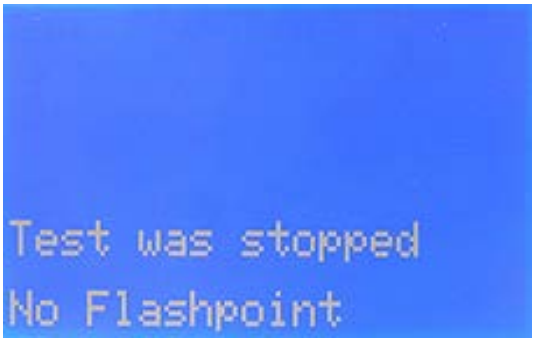
After expiry of 10min one flash point test is performed:

The test symbol next to the display of the expired time is flashing.

If a flash point is found the test is terminated and the following display is shown:

On the display the barometric pressure corrected, not rounded flash point appears.
FPinval (invalid) shows that the test should be repeated at a lower temperature.

If no flash point is found the test is stopped according to ASTM D 3934 with the following message:



If no flash point is found in the 1. test according to ISO 1516 a further 10min temperating of the sample takes place:

After time expiration a second flash point test is performed.
Test is terminated after the second test is finished:

No flash point was found:

Flash point was found:

To switch between test conduct according to ASTM D 3934 and ISO 1516 program parameter 30 is set to 0001 (ASTM D 3934, preset as standard setting) or 0002 (ISO 1516).

7.2. Test conduct according to ISO 1523/ASTM D 3941

Program EQ2-ISO_1523 has to be selected.
According to ISO 1523 the (precooled) sample is introduced into the device. Then the sample is temperated to 5°C below test temperature (expected flash point).
As soon as the sample has attained the bath temperature a flash point test is performed.
When a flash point is found the test must be repeated at a test temperature that is 5°C lower.

Display:

If no flash point is detected the sample is heated with 0,3°C/min and flash point tests are performed each 0,5°C.
Test runs until a flash point is found or the overflow at 10°C above the expected flash point is attained. According to ISO 1523 a test duration of 1 hour should not be exceeded.

When a flash point was found the test is terminated with the following display:

As a result the barometric pressure corrected, to 0.5°C rounded flash point is displayed.

8. RAPIDFLASH SIMULATION PROGRAMS

Programs RT1<ambient and RT2>ambient are for test simulation acc to ISO 3679, ISO 3680, EN 456, DIN 55680
It is ONLY possible to work in these programs with Rapidflash-set 107240.

This set consists of a special cup with a similar volume like in the rapid tester, a special lid, a multisensor for flash point detection, a sample syringe and a stopper for closing the opening in the lid.

In RT1<ambient and RT2>ambient instead of the sample temperature detected with the multisensor a corrected block temperature based on the real block temperature is displayed. That is why also a sample temperature will be shown on the display although the head is off and the multisensor is not connected.

In RT1<ambient and RT2>ambient the multi detector is only used for flash point detection.
As this is a simulation of tests with the rapid tester, the flash point values found can deviate from values that were found with the original equipment.

8.1. Rapidflash-Simulation for flash points<ambient RT1<ambient

Program RT1<ambient is selected.
The empty cup with lid and multi detector is placed into the device.
After program start the device cools down to 4°C below expected flash point (autostart):

After auto start temperature was attained the device heats up to 3°C below the expected flash point:

When the filling temperature is reached there will be an acoustic sound for filling the precooled sample with the syringe into the test cup. When the sample was inserted this is confirmed with <ENTER>.
After this the device heats up to the test temperature (expected flash point).
The igniter is switched on and one dip-in test is carried out:

Depending on a flash point was found or not the test is finished and on the display appears:

no flash point:

flash point:

The device cools down to STOP temperature.

FPinval (Flash point invalid) shows that a flash point was found at first dip-in (this is always the case in the RT programs).
According to standard now the flash point preselection has to be changed and the test repeated with fresh sample.

8.2. Rapidflash-Simulation for flash points>ambient RT2>ambient

Program RT2>ambient is selected.
The empty cup with lid and multi detector is placed into the device.
After program start the device cools down to 3°C below expected flash point (autostart). After attaining the auto start temperature it heats to test temperature (expected flash point).

After reaching the test temperature there will be an acoustic sound for filling the sample with the syringe into the cup.
When confirming with <ENTER> after filling the sample the 60s timer (2ml sample) is activated.
When <ENTER> is pressed for a longer time (>2s) the 120s timer (4ml sample) is activated.

After time expiration a flash point test is carried out.

The result is similar to the test conduct in RT1<ambient either "noFP" (no flash point) or FPinval (flash point).
According to standard the test has to be repeated if necessary with fresh sample and a modified preselection.

For sample filling there will an acoustic sound for maximum 10min, after 10 min without confirming the sample filling with <ENTER> a dip-in test will be carried out and the test will be stopped.

9. SAFETY MODE: DIP-IN TESTS EVERY 10°C

In TAG 4 a safety mode can be activated, that recognizes a wrong flash point preselection.
The safety mode is activated by inserting test code 1011 into program parameter 1 of any program.

1. Immediately after achieving the autostart temperature one flash point test is carried out. The test is done with an active electric or gas igniter. A too low flash point can already be detected here.

2. The active igniter dips in further at 10°C intervals until the test temperature is reached. Samples with too high flash point preselection can be detected early enough to prevent any hazard. The flash point is already detected at a lower temperature and the test will be stopped then.

Every flashpoint detected during the safety mode is displayed as FPinval (invalid flash point).

In programs RT1<ambient and RT2>ambient the safety function is not active.

This safety function can be deactivated by setting device parameter 8 to 0000.

10. MAINTENANCE

We take regularly maintenance of the unit for granted which should be carried out by the user himself or trained personnel at the given time intervals.
The given time intervals can be seen as reference to a normal operation of 8 hours every day. Depending on the intensity of use the intervals might have to be extended or shortened.
After a certain number of tests on TAG 4 display the message appears:

By pressing any key the display returns to the normal start display.

If the Inspection message occurs, please contact Anton Paar ProveTec service for further information.

	Object	Function	Inspection	Test interval	Inspector	Instruction
1	electric ignition	wear & tear test	visual test**	1x / month	operator	
2	electric ignition	adjustment	visual test**	1x / month	operator	
3	multi-sensor	contacts	visual test	1x / year	operator	
4	test inserts	lid movement	function test / cleaning	1 x / week	operator	
5	gas ignition	even flame?	jam test / blowing free	1x / year; with gas ignition	operator/ specialist	service
6	MFH (head) rotary slide valve opening / closing	control of rotary slide valve movement	spring elasticity spring positions at start of dipping	1x / year	operator/ specialist	service
7	MFH (head) dipping mechanics of ignition	control of ignition positions	positions normal and during dipping	1x / year	operator / specialist	service
8	MFH (head) stirrer coupling insert stirrer	position and wear & tear	driving force sound test	1x / year	operator / specialist	service
9	MFH (head) contact set	contacts	exchange	1x / 2 years	operator / specialist	service contact set
10	MFH (head) lead	MFH movement without hindrance	position of ignition cable and plug connections	1x / 2 years	operator	service draft
11	MFH (head) adjustment	column guiding	adjustment and wear & tear	1x / 2 years	specialist / operator	service

** The message "Change Ignitor" is only displayed at the TAG 4 – not at the PC

11. TROUBLE SHOOTING

11.1. Calibration

11.1.1. Calibration of the Pt100 sensor

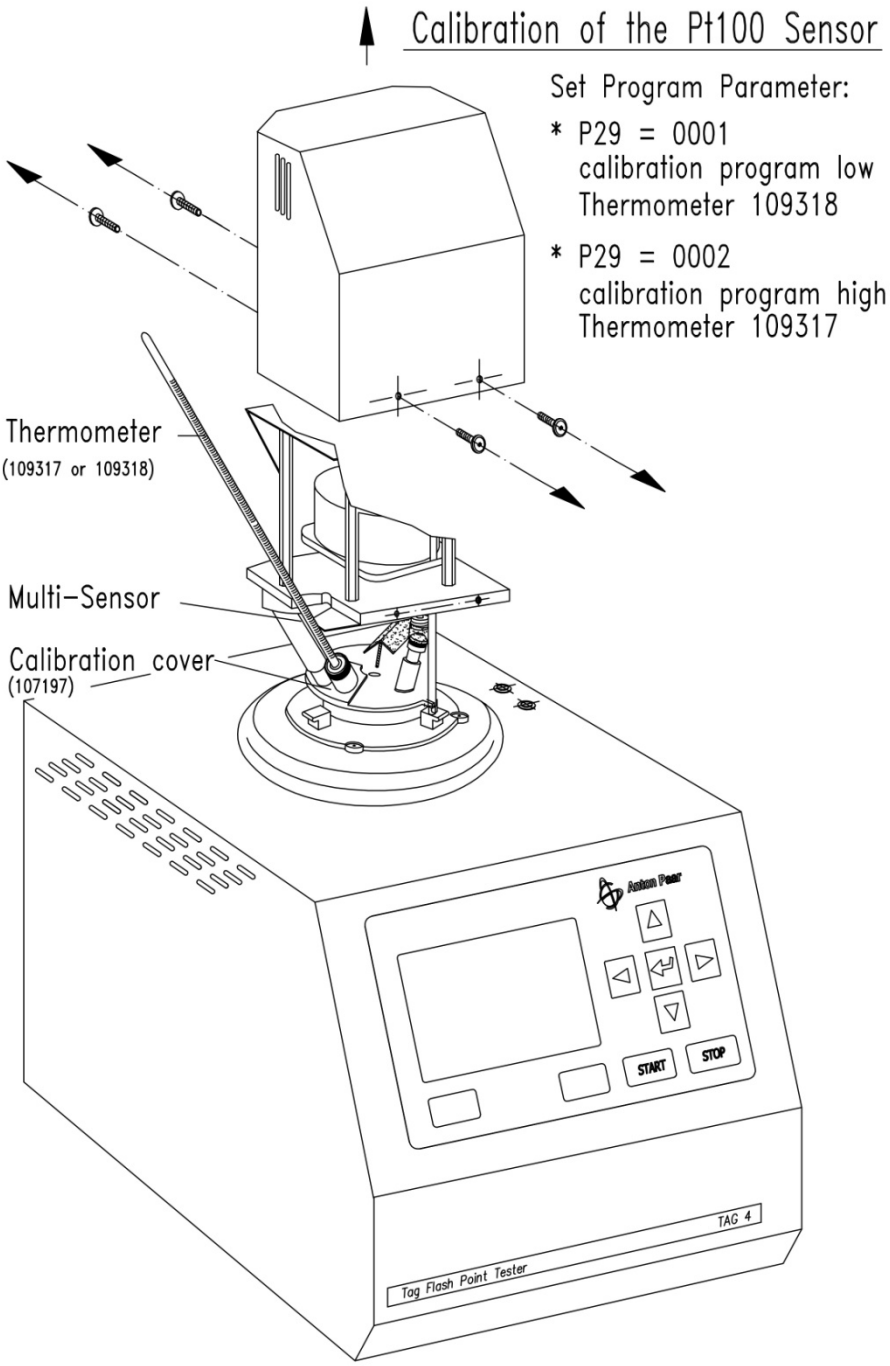


Fig. 7

Due to calibration lid in the calibration set it is possible to check the display of the Pt100 in the STOP-mode as well as in the running program.

In general every program can be used as calibration program.

In the selected program the program parameter 29 has to be set to 0001 or 0002.

P29: 0001 Calibration program for thermometer 109318 (-20°C to +50°C)
P29: 0002 Calibration program for thermometer 109317 (-5°C to +110°C)

Remove the 4 fixing screws at the upper part of the device (multifunctional head) and CAREFULLY lift up the cover.

Place the calibration lid on the cup filled with sample and insert the Pt100 to be checked into the cup.

Chose the thermometer type according to the used temperature range.
The small gap in the brass middle plate of the multifunctional head allows to insert the thermometer directly into the lid.

The calibration points for thermometer 109317 (Temperature range -5°C to +110°C) are 0°C; 35°C; 70°C and 105°C.

The calibration points for thermometer 109318 (Temperature range -20°C to +50°C) are -20°C; 0°C; 25°C and 50°C.

Calculate the deviations by aid of the information given in the calibration certificate, for example:

deviation acc. to certificate +0.3°C at 35°C. Temperature, at which you read: 35,3°C.

The program is started in the usual way. According to selected program following printout is produced:

calibration program low

Pt100	Thermometer	Sample gradient
°C/°F	°C/°F	°C/min °F/min

The sample is heated up as stated in the program. About 5°C before the next calibration point an acoustic signal is given. The user gets the chance to read the temperature at the thermometer in time. As soon as the temperature which was calculated according to calibration certificate is reached press <Enter>. The temperature at the Pt100 sensor is printed out.

For controlling the actual temperature ramp is printed out during test

The column "Thermometer °C/°F" has to be filled in manually by user.

If one reading point was missed the program continues heating normally. The missing value is not noted on the printout.

It is possible to start at a higher value and, for instance, to leave out the 0°C-point for the lower temperature range.

If the comparison proves a constant deviation between thermometer and Pt100-sensor the deviation can be set as offset in device parameter 1.

If it shows a fluctuating deviation first establish if this might result of reading errors at the thermometer (always read in the same level as your eyes).

11.1.2. Calibration of the device with flash point reference materials

In accordance with the various requirements for your laboratory it is necessary to recalibrate the TAG 4 in suitable intervals of time.

It is possible to use reference calibration material of PTB or other certified reference material. Internal reference materials should never be used for official certification. They just serve to check the functioning of the device in normal laboratory working.

Standard Reference Materials are officially certified by national bodies (PTB) or other approved calibration services.

Values mentioned by manufacturers or services of laboratory and chemical materials in most cases refer to values in literature. These values normally are very old, a reason for the named flashpoints being about 10°C too low. Today production and cleaning of chemicals is done by modern methods. The purity is much higher and the flashpoints therefore as well are higher. Nevertheless, for safety reasons the "historical" values are given.

Further is to be mentioned that for reference-tests in several standards the "historical" manual flashpoint tester with gas-ignition is required.

Please for your reference tests take care to conduct the tests using gas ignition.
Therefore faults caused by aged or not fully functioning electric ignition can be prevented.

11.2. Trouble shooting

11.2.1. Display does not work when switched on

- Check fuse?

11.2.2. Gas ignition does not work

- Gas connected?
- Device in gas ignition mode? (see ignition symbol on the display)
- Is there air instead of gas in the connecting tube?
- Do you use special gas tight connecting tube?
  Silicon is not gas tight. Using this material the gas ignition only has a slowly raising flame size resp. can't be started within 55 sec in the next ignition period (Safety function), because the gas outlet is not effective.
- Does the magnetic valve "click" while performing a manual test?
- Is the valve opened?
  If the gas supply is opened too less or too much a gas flame can't develop.

11.2.3. Gas flame is unstable

Gas valve must be cleaned in regular intervals (see service instruction)

11.2.4. Electric ignition does not work

- Are the cables properly connected to the sockets?
- Is the ignition coil defective/damaged?

11.2.5. No indication of sample temperature

- Is the indicator plug properly connected to the rear?
- Does the multifunction head sit in its correct position?
- Is the glass body of the Pt-100 temperature sensor defective/broken?
- Are the contacts of the multi detector dirty?

CAUTION
For cleaning of the contacts of the multi detector please only use a soft fabric with alcohol.

11.2.6. Device does not start after pressing RUN-key

- Please check error messages:

SENSOR-ERROR-SAMPLE SENSOR	➔	started too early Pt100 broken
SENSOR-ERROR-FLP-SENSOR	➔	Multifunction head not in correct position
SENSOR ERROR-FIRE-INDICATOR	➔	Gas flame indicator broken
SENSOR ERROR-HEATING SENSOR	➔	Block-Pt100 out of order

11.2.7. Flashpoints of reference materials do not comply with the certificate

Check ignition (Diving depth, Flame diameter, electric ignition defective/aged)
Check gradient (Test code 0998 in parameter 1)
Check for residues on the thermo wire.

WARNING
Depending on the samples used for tests it is possible that residues build up at the wire, which can influence the flashpoint's indication.
Please do check the indicator every now and then!.

11.2.8. Indication FP no GAS

When flashpoint tests are carried out using a gas ignition, the gas flame is checked during immersion.
If the gas flame is off during an immersion you will get an error message after finishing the test (FPnoGAS).
Even if a flashpoint was detected the operator shall be informed that there have been irregularities in the gas supply during testing and that the test possibly has to be repeated.

The reasons for this indication may be different:

- the gas flame was blown out by vaporized sample
- interruption of gas supply
- the device is influenced by draft.

11.2.9. Permanent audible alarm

Cooling water alarm

The temperature of the cooling unit is permanently controlled.
If the external cooling circuit was not switched on (for devices with water cooling) this can lead to an overheating at the Peltier elements.

When the temperature exceeds a critical threshold cooling is switched off and a permanent acoustic signal sounds. On the display "COOL" appears instead of the sample name:

When the temperature goes below the threshold, the signal switches off. On the display "COOL" remains until the <STOP> key is pressed.

If the device is in test mode when the alarm appears the test will go on. The test, however, will not proceed according to standard (temperature rise will not be correct)

If the device is in STOP mode when the alarm appears it will not be possible to start a test.

11.3. Replacing the electric ignition

Since the ignition in the TAG 4 is run with smooth current and the working current between the ignition tests is lowered to a minimum the ignition has a considerably longer life expectancy than conventional ignitions.

The quality of the ignition is evaluated by the device according to a number of criteria (voltage rise or drop).

If the electric ignition needs changing following message is displayed after the flashpoint test

This message has to be confirmed with <ENTER>.

Now the initial menu is displayed (depending as to whether a flashpoint was found, whether the device is OVERFLO after reaching overflow etc.)

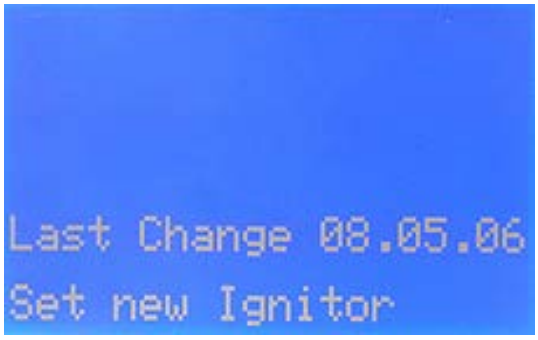
The printout under point IGNITION states: E-CH for "Change electric ignition".

Bringing the new ignition into service:

Move the cursor in the main menu to the ignition symbol and confirm with <ENTER>.

In the menu ELECTRIC IGNITION confirm once again with <ENTER>.

You are given the following submenu:



Now move the cursor to NEW and confirm with <ENTER>.

The changed date signals that a new ignition has been installed.

12. SPARE PARTS

107184	Multi Gas Ignition
151860	TAG 4 test crucible
107194	TAG 4 test lid
107195	TAG 4 multi detector
107219	Plug to close thermometer opening
107218	Tongs for crucible
135376	PC-Software
107197	Calibration lid
107198	Calibration set
107240	Rapidflash-Set, consisting of:

107241	Rapidflash cup
107242	Rapidflash lid
109322	Stopper for opening
107243	Syringe with gauge needle
107202	Multi detector Pico