# Operating Manual MAS-100™

**Microbial Air Sampler MAS-100 with data-port (prod.code 1.09090.0002)**
**MAS-100 software package (prod. Code 1.09226.0002 to be ordered separately)**

*new*

*PC communication for safe results*

MAS-100™ is a trademark of MBV/Switzerland

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## 2 Introduction

There is increasing need for effective air sampling in all areas where airborne micro-organisms may contaminate or otherwise effect industrial products and processes. Monitoring is especially important in:

- the pharmaceutical industry
- the food industry
- hospitals
- the cosmetics industry
- the environment

Today a number of monitoring methods are available, most of which are based on the impaction principle. During development of the MAS-100, all the shortcomings of existing sampling systems were eliminated, and their best aspects retained, leading to the creation of a user-friendly, dependable and precise air sampler for standard Petri dishes.
The MAS-100 aspirates 100 liters of air per minute, allowing up to 2000 liters to be sampled per cycle. This performance enables sampling to be carried out according to the strict conditions of monitoring in sterile and "clean" areas [1].

The impaction velocity (speed at which airborne micro-organisms hit the surface of the agar) is approximately 11 meters per second, corresponding to stage 5 of the Andersen Sampler [3]. This velocity guarantees that all particles > 1 µm are collected. Comparisons with other methods of air sampling [2] have not revealed any significant differences in the number of micro-organisms collected.

## 3 Basic principle

The MAS-100 is a high-performance instrument that is based on the principle of the Andersen air sampler [3], which aspirates air through a perforated plate. The resulting airflow is directed onto a standard Petri dish containg agar. After the collection cycle, the Petri dish is incubated and the colonies counted. The MAS-100 operates with a high-performance suction device, and the aspirated volume is continuously monitored. The system measures the inflow of air and regulates the aspirated volume to a constant value of 100 liters per minute. The MAS-100 automatically regulates this volume if there are external factors preventing a steady flow of air, or if overfilled Petri dishes are blocking or impeding flow. The sampling time should not exceed 10 minutes, or the agar surface may show signs of dehydration.

## 4 New features of the MAS-100

The following new features have been incorporated into units with serial number 75000 and above:

- No need to open the unit in order to calibrate it
- Easy calibration using the new DA-100™ digital anemometer
- Reports and results can be downloaded to a computer
- Choice of operation: manual sampling or computer mode sampling
- Preset volumes freely configurable between 0 and 2000 liters
- Preset volumes not needed can be deactivated (blanked from the display)
- New environmentally friendly NiMH rechargeable batteries
- Calibration reminder can be set for between 1 and 12 months
- New K5 calibration value for range calibration
- Start delay can be deactivated if not needed

## 5 Major benefits of the MAS-100

- Now features data communication for automatic record-keeping
- Manual mode allowing for additional testing outside the computer records
- No need to validate agar plates for air tests, if already in use for other microbiology tests
- Built-in anemometer guarantees reproducible results (compensation feature)
- Different filling volumes in Petri dishes do not affect airflow (anemometer feature)
- Low airflow detection
- Real time clock and calendar
- Compact and easy to use
- Easy to calibrate
- Automatic calibration reminder
- Adjustable sampling head
- 100/240V, 50-60kHz power unit, or battery operation
- Isokinetic measurement (unidirectional airflow with 0.45 m/sec horizontal velocity)

# 6 Functions

## 6.1 General

The MAS-100 has a built-in dialog software. To accept a parameter or command, press the “yes” button. To ignore it, press the “no” button. The program works its way automatically through all the required parameters. Once you have set the aspirated volume and delay time, the program goes to the “Start ?” prompt. When you press “yes”, the MAS-100 starts to sample the pre-set volume of air, and a green light indicates that the instrument is operating. The sampled volume and time remaining are continuously displayed. Once the pre-set volume has been sampled, the red “stop” light is on.

## 6.2 Battery charging

When the mains charger is connected and the MAS-100 is in “Sleep mode” (display dark), “Battery charging” appears on the display and the red light is on.

Provided neither the “yes” nor the “no” button is pressed, “Battery OK” appears once the battery is fully charged. A complete recharging cycle takes about 3.5 hours. With a fully charged battery, the instrument has a sampling capacity of approximately 50,000 liters.

## 6.3 Battery replacement

After inserting a new battery pack the MAS-100 needs recharging using the mains charger to reach its maximum capacity of 50,000 liters.

Upon activating by pressing the “yes” button the MAS-100 displays the firmware version and the volume of air (“XXXXX liters left to aspirate”) left for sampling with the current battery status. If the displayed volume is insufficient for the coming sampling operation, you need to recharge the battery or connect the unit directly to a 110 Volts outlet using the mains charger.

The MAS-100 circuitry makes sure that the mains charger keeps the battery optimally charged. Do not charge the battery using an external battery charger. Doing so would drastically shorten the life of the battery.

**Note:** Use only the MAS-100 mains charger to recharge the NiMH battery. The charging circuitry of the MAS-100 prevents overcharging of the battery.

To run tests while the battery is charging, you need to press “yes” and continue as shown in the firmware flow diagram. The battery charging continues while sampling cycle is in progress.

### 6.4 Battery level indicator

In operation the message “10,000 liters left to aspirate” is displayed followed by a “Low battery! ! Show capacity?” message. Pressing “yes” and the remaining air volume in liters is displayed. You can finish your test without having to recharge the MAS-100. If the battery is too weak to enable the run to be completed, the message “Airflow blocked” appears and the red light is on. To avoid any low-battery problems, you can now charge the MAS-100 or run it directly with the mains charger. Repeat the sampling cycle.
Pressing “no” takes you to the “Start ?” menu.

### 6.5 Battery discharge and status display

In parameter Mode 5 (see section 6), following “Set time and date” comes the “Batt. discharge” option. If the MAS-100 is left in this position, the battery will be automatically discharged. The remaining battery capacity is shown in liters. The green “run” light and the red “stop” light will be flashing.

### 6.6 Switching on the MAS-100

Press “yes” to turn on the MAS-100. First the display shows the firmware version and the volume of air ("XXXXX liters left to aspirate") left for testing with current battery status followed by the most recently used volume.

**Exception:** With the calibration reminder being activated and the calibration deadline has been reached, the display first shows “Calibration time expired” and then “Please recalibrate unit”. If you press “yes” or “no”, you will see the date on which the MAS-100 was last calibrated. The program then moves to the next prompt.

**Note:** The MAS-100 is permanently on if connected to the mains charger.

### 6.7 Calibration reminder

In Mode 6 of the calibration menu, you can opt to have a calibration reminder displayed once the calibration expiry date has been reached. You may choose from 1 to 12 months. After the set number of months have elapsed, the display will show “Calibration time expired!” and “Please recalibrate unit”. If you press “yes” or “no”, you will see the date of the last calibration (“Last calibration XX.XX.XX”) and the MAS-100 will move to the next prompt. It will still allow you to finish your testing.

**Note:** For details of how to set the calibration reminder see Section 9 Calibration (Calibration Mode 6).

### 6.8 Manual and/or PC mode

Depending on what was selected in parameter Mode 5, the MAS-100 will show the Manual, PC or Selectable (Manual or PC) menu.

- Use “Manual Mode” if not connecting to a computer at all
- Use “PC Mode” if you will use the preset computer program with your testing
- Use “Selectable Mode” if you need to switch between both options

### 6.9 Last volume

If you choose “yes”, the program moves to the “Delay Modify?” mode (if the Delay menu was activated in Parameter Mode 5); in addition the most recent aspirated volume is displayed and may be used again. If you press “no” the program takes you to "Volume setting standard mode ?", where you can pre-select a standard volume (see also sections 4.9 and 4.10).

### 6.10 Delay function

If the delay function “Act./ Deact. Delay menu?“ is activated in Parameter Mode 5, the display shows "Delay modify ?". By choosing “yes” you may set a start delay between 1 and 60 minutes. Press the “yes” button repeatedly until the desired delay time is displayed. Pressing the “no” button will accept the displayed time and brings up the “Start ?” menu. To start the sampling without delay, press the “no” button in the “Delay modify” menu. The program takes you to the “Start ?” position.

### 6.11 Start ?

To start sampling, press “yes”. If a delayed start has been programmed, the sampling cycle only starts when the delay time is elapsed.
Pressing “no” the message “Last volume: XXXX liters” is displayed. If you press “no” again, the “Select other volumes Y/N ?” comes up.

### 6.12 User definition

The MAS-100 computer software (to be ordered separately) enables you to define up to 10 users. User 1 to User 10 are the defaults. In the PC Mode the users name can be added to the test data. This is not possible in the Manual Mode.

### 6.13 Pre-set volumes

The MAS-100 ex factory has 5 pre-set sampling volumes: 50, 100, 250, 500 and 1000 liters. These can be found in Parameter Mode 5 under “Customize standard volume?”. Each of these volumes can be modified between 1 and 2000 liters. Setting a volume to 0 (zero) blanks it from the display in the main menu. Each volume can be Re-activcated and to be displayed again.

### 6.14 Freely selectable volume

A further option allows to program a volume by changing it to a value of your choice. This volume remains in the memory unless overwritten by a standard volume or another manual change. The freely selectable volume does not overwrite a standard volume.

# 7 Parameter Mode 5

## 7.1 General

Pressing “yes” and “no” simultaneously for 5 seconds after you activated the MAS-100 takes you to the “Parameter Mode 5” menu. This menu is for erasing data (if you sampled in PC Mode)b and for creating a printout (if you are using a printer; see 7.3 for details). In the bottom menu you can set user-specific data such as date, time, volume, start delay, etc.. Additionally you can check the airflow with the built-in anemometer (see 6.6 for details).

## 7.2 Erasing report data

In this menu report (protocol) data can be erased. Overall 10 reports, each with 10 line item information are stored and available. Additionally there is a manual record containing the last 10 manually collected data. The “Clear all prot.” function enables all of the reports to be erased in one operation. The “Modify (Y/N)” function is used to select an individual report and erase it. While the data are being deleted, the red and green lights flash and the display shows “clear data in progress”.

## 7.3 Connecting a printer

The MAS-100 may be connected to a printer. The printer port has been specifically configurated for the thermal printer model DPU-201GS type 01SE from Seiko Instruments Inc.
The printer should be obtained from a local Seiko dealer; a printer cable is available on request. If “Print protocol” is activated but no printer is connected, the message “No printer device connected” will appear. Pressing “no” takes you to the next prompt. From there, press “yes” to return to the main menu or “no” to move to the user parameters.

## 7.4 Selecting date format (EU or US)and changing time and date

**Set time and date?**

The first item in the "User" menu is the "Date mode". With “yes” you can switch between US and European date format. By pressing “no” you accept the displayed format.

Then the time is displayed. Pressing “no” places a cursor underneath the first number. Press “no” until the required number is displayed. When you press “yes”, the cursor moves on to the next number. Continue until you have set the correct time.

Then the date is displayed. The cursor moves to the first number. Pressing “no” changes the numerical value and “yes” places the cursor below the next number. You return to the start of the “Set time and date” menu. Pressing “no“ to take you to the next prompt.

## 7.5 Battery discharge

**Select battery discharge mode?**

In the utility menu following “Set time and date” comes the “Batt. discharge” option. Press “yes” to activate the battery discharge.

**Recommendation: Discharge and recharge the battery each month !**

“Batt. Discharge” appears together with the capacity in liters. The figure decreases in proportion to the degree of discharge and the red and green lights flash simultaneously during this operation. The fan does not start (unlike in models with serial numbers below 75000). The battery discharges automatically. Pressing the “no” button terminates this operation and displays the next prompt. When the capacity drops below 10,000 liters the MAS-100 switches to the Anemometer Mode and shuts off automatically after 5 minutes.

## 7.6 Airflow display and checking performance in Anemometer Mode

**Select anemometer mode?**

When in Anemometer Mode, the MAS-100 regulates the airflow to 100 liters per minute (calibration value). Be sure that the perforated lid is in place, because the MAS-100 is calibrated with it on. Also ensure that the dust cover is removed, otherwise “Flow too low” will be displayed. The MAS-100 will display the true airflow when the figure of 100 liters ± 2% is reached. The figure displayed should be 98 to 102. If not, press the “yes” button again to start a new anemometer cycle. A higher volume will be displayed if the perforated lid is removed. In this mode an actual airflow of between 50 and 150 liters per minute will be displayed digitally. Values lower or higher than this range will be displayed as “Flow too low” or “Flow too high”.
A faulty anemometer will be reported with an “Anemometer error” message. In this event please contact your local MAS-100 distributor.

**Note:** The airflow display in liters per minute confirms that the volume sensor is functioning correctly. Annual calibration of the MAS-100 is recommended.

Pressing “no” takes you to the next prompt.

## 7.7 Customizing the standard volume

**Customize standard volume?**

Each of the 5 pre-set volumes (standard volumes 50, 100, 250, 500, 1000 liters) may be customized. A figure of between 1 and 2000 liters may be specified. Press “yes” to increment the displayed value by 1. By holding down “yes” you can scroll quickly to the required value. Pressing “no” takes you to the next volume. Setting a volume to 0 blanks it from the screen. For example, you could display just two volumes by setting the other three to 0. They are activated again as soon as you assign them a value of between 1 and 2000.

## 7.8 Delay menu

**Act./Deact. Delay menu?**

The MAS-100 has a start menu that enables you, if you wish, to introduce a delay time of between 1 and 60 minutes before the start of sampling. If this menu is activated, the MAS-100 will ask you before you start to sample whether you wish to introduce a delay time. The most recent delay time will be displayed. By pressing “yes”, you can set a delay time of between 0 and 60 minutes. If you enter 0 as the delay time, no delay is activated. The MAS-100 starts as soon as you press “yes” at the “Start?” prompt.
If you never use the delay function, you can suppress the “Delay?” prompt by deactivating the delay in this menu (to exit the program answer “no” to “deactivate delay menu?”). You can reactivate the delay at any time (to exit the program answer “no” to “activate delay menu?”)

## 7.9 Working with a PC and MAS-100 software, or manually

**Select manual or PC mode?**

Use this menu to define how you wish to work with the MAS-100. There are 3 options, as briefly described below.

## 7.10 Manual Mode

Use Manual Mode when you do not wish to establish a PC connection. For example, when your work does not follow a regular pattern and/or there is no PC available, it is best to work in Manual Mode.

## 7.11 PC Mode

MAS-100 systems with serial number 75000 and above are equipped for data communication. The necessary PC software is available separately.
Use PC mode when all of the data are invariably sent to a PC.

**Note:** A communication cable for transferring data between the MAS-100 and the PC, which comes with user instructions for the MAS-100 software, is available separately from your MAS-100 distributor.

Working in this mode guarantees that an automatic, error-free computer record is kept of all sampling data. The Petri dish results can also be included in the record. The integrated Feller conversion table automatically makes corrections and calculates the actual microbial count per $m^3$ of air.
In PC mode a sample datum (a location designated by the PC plus the relevant volume) can be sampled once only. When sampling has occurred without interruption, the location can only be overwritten when the data have been erased in the “Clear data” menu.

**Note:** If a sampling is to be carried out two or more times, it can only be accomplished in Manual Mode. However, the data are not available for the report.

## 7.12 Selectable Mode

Selectable Mode is used when only some of the data are sent to the PC and flexibility in the use of the MAS-100 must be guaranteed. In this mode the display asks before each sampling run whether sampling is to be

done manually or to a location designated by the PC. In PC mode the user is prompted to select the report and location so that sampling may begin.

Pressing "yes" takes you to the main menu, “no” to the start of the Parameter Mode 5 menu.

# 8 Operation

## 8.1 Switching on the MAS-100

Press “yes” to turn on the MAS-100. After power-on, the MAS-100 displays the software version number and the volume of air ("XXXXX liters left to aspirate") that can still be sampled with the current battery charge, followed by the most recent aspirated volume.

**Exception:** When the power unit is connected, the MAS-100 is permanently switched on. When the calibration reminder has been programmed and the calibration deadline has been reached, the display shows the calibration reminder. Press “yes” or “no” to display the last calibration date. The menu moves to the next prompt.

## 8.2 Adjusting Petri dish support

Before using the MAS-100 for the fist time you will need to adjust the blue Petri dish support.
Lift off the perforated lid and place a Petri dish on the dish support. Use a 3 mm Allen key to adjust the three blue jaws until the Petri dish is securely supported and there is no play. Check that the Petri dish is properly supported by turning the sampling head to the horizontal position. The Petri dish support is now adjusted. The procedure need only be repeated at most if you change Petri dish manufacturer.

**Note:** Do not over-tighten the blue jaws. If you do, the Petri dish may break and shed plastic debris in the aspiration unit and block the motor.

## 8.3 Air sampling

Place the MAS-100 on a firm support.
- Open the perforated lid (with attached dust cover) by rotating to the right.
- Place a closed standard Petri dish filled with agar on top of the dish support.
- Take the lid off the Petri dish.
- Close the MAS-100 perforated lid.
- The sampling head can be adjusted to any angle from horizontal to vertical airflow direction.
- Program the MAS-100 as instructed.
- Remove the dust cover and start the collection cycle by pressing the “yes” button in the “Start ?” menu.
- After the collection cycle the red LED will light up and the sampled volume will be displayed.
- Open the sampling head, close the Petri dish with the Petri dish cover, and remove.
- The Petri dish is now ready for incubation.
- Proceed as instructed by the manufacturer of the culture medium.

After the test the instrument will display “passed test completed”, which signifies that the set volume was collected without interruption and the collection process is valid.

## 8.4 Switching off the MAS-100

After the collection the red LED will illuminate and the total volume collected will be displayed. In this position the MAS-100 will automatically shut off after 30 minutes.
In all other menu positions the MAS-100 switches off automatically after 5 minutes.

**Note:** After a collection cycle the instrument will display the last volume collected. Press “yes” or “no” to activate the 5-minute automatic shut-off.

### 8.5 Interrupting a test

If the “no” button was pressed during sampling, the instrument will display “failed! repeat test!”. Repeat the test.
If the MAS-100 is activated in PC Mode, nothing is registered by the software. The test must be repeated until the volume specified by the PC has been collected without interruption.

### 8.6 Low airflow

**Air flow blocked**

If the inbuilt sensor does not attain the 100 liters of air per minute, the instrument issues an “Air flow blocked” warning and the red LED flashes. Sampling is stopped. Remove the Petri dish and start a new test. Press “yes” or “no” to cancel the error message. In PC Mode an incomplete test is not registered. Repeat the test.

## 9 PC software, evaluation

### 9.1 Software package

To enable your MAS-100 to communicate with your PC you need a special MAS-100 communication cable. This is available separately under Cat. No. 1.09226.0002 (Software package for MAS-100), and contains a detailed description of how to download the MAS-100 software with ease from our homepage, and how to operate.

### 9.2 Specimen report generated by the MAS-100 software

(here: example – individual layout according to users specification and input)

Company Name Ltd. Title No2b

1/1

| | | | | |
|---|---|---|---|---|
| Company | Inopharma | Responsable 1 | MBV_234 | Batch No.: 34567 |
| Department | Injectables | Responsable | | Production: 98765 |
| No. | B354 | Template | C:\Programme\MAS-100\template\Insulin SE.vor: Insulin SE | |
| | | Filename | C:\Programme\MAS-100\data\Test003_1999.dat | |

| No | Location<br>Device | Date | Time | Counted by: | Volume<br>l | Counted<br>CFU | Corrected<br>CFU/m3 | Limit<br>CFU/m3 | Status | Judge |
|---|---|---|---|---|---|---|---|---|---|---|
| No0 | Room 1<br>Tabel | 16.04.01 | 11:03 | Mr. Green | 100 | 0 | 0 | 10 | pass | |
| No1 | Room 1<br>Exit door | 16.04.01 | 11:04 | Mr. Green | 100 | 0 | 0 | 10 | pass | |
| No2 | Zone B<br>Filling 34 | 16.04.01 | 11:05 | Mr. Green | 100 | 2 | 20 | 10 | fail | |
| No3 | Zone B<br>Filling 44 | 16.04.01 | 11:07 | Mr. Green | 100 | 0 | 0 | 10 | pass | |
| No4 | Zone A<br>Isolator 56 | 16.04.01 | 11:08 | Mr. Green | 100 | 0 | 0 | 1 | pass | |
| No5 | Zone A<br>Isolator 57 | 16.04.01 | 11:09 | Mr. Green | 100 | 0 | 0 | 1 | pass | |
| | Zone A | | | | | | | | | |

### 9.3 Interpreting the results

First, the total microbial count is corrected based on FELLER's statistical correction table (see Section 17 "Appendix"), then it is converted to contaminant particles per cubic meter.
The correction table is based on the principle that as the number of organisms per sampling rises, the chance that several organisms will enter the same hole in the perforated lid also increases.
(A table of statistical corrections according to FELLER for the MAS-100 in a plastified cover is provided with each sampler).

## 10 Calibration

The MAS-100 is factory calibrated to 100 liters per minute. For more calibration information please refer to the calibration certificate that accompanies each instrument and the information provided in the Operators Manual of the DA-100 Digital Anemometer used to calibrate the new MAS-100.

Only authorized personnel may exchange any mechanical parts in the instrument or change any of the software settings in the "Service" menu.

## 11 Technical specifications for the MAS-100 with data-port

| | |
|---|---|
| Height: | 26 cm |
| Diameter: | 11 cm |
| Weight: | 2.2 kg |
| Material: | anodized aluminum |
| Diameter of sampling head: | 10 cm |
| Nominal airflow: | 100 liters / min. ± 2.5% |
| Standard sampling volumes: | 50, 100, 250, 500, 1000 liters. |
| Freely definable sampling volumes: | 1 to 2000 liters |
| Tripod adapter: | for use with normal camera tripod |
| Battery pack: | NiMH rechargeable battery, 10 V |
| Motor: | 6 V |
| Display: | alphanumeric liquid crystal display, 32 characters |
| Lifetime RTC battery: | RTC (real time clock) battery: good for about 10 years |
| Driving motor: | PWM frequency for driving motor |
| Processor: | type: 80C552. |
| Airflow regulation: | hot-wire anemometer, numerical control |
| CE approval: | EN 55022 Class B, EN 61000-4-2, ENV 50140, ENV 50204, EN 61000-4-4, ENV 50141 |
| Power unit/battery charger: | 110-240 Volt, 50-60 KHz |

Technical specifications subject to change without notice.

Additional information for UL/USA

sign underneath

**Environmental conditions**

Indoor use:

Altitude up to 2000m or above if specified by manufacturer.
Temperature 0 to +40°C; Maximum relative humidity 80 percent for temperatures up to 31°C decreasing linearly to 50 percent relative humidity at +40°C;
Mains supply voltage fluctuations not to exceed ± 10 percent of the nominal voltage;
Other supply voltage fluctuations as stated by the manufacturer;
Transient over voltage according INSTALLATION CATEGORIES (OVERVOLTAGE CATEGORIES) I,II, and III and normal category is II;
POLLUTION DEGREE 1 or 2 in accordance with IEC 664.

## 12 Components checklist

The MAS-100 comes in a portable plastic case containing the following:

1 MAS-100, complete system with perforated lid, dust cover, battery pack (rechargeable battery)
1 mains charger
1 Allen key 3 mm (for centering Petri dish)
1 plastified “Table of statistical corrections according to FELLER” and “Software flow diagram”
1 calibration certificate
1 Operating Manual

## 13 Accessories and Spare Parts

| Product code | description | Pack size |
|---|---|---|
| 1.09228.0002 | DA-100 Digital Anemometer (used for calibration) | 1 ea |
| 1.09226.0002 | MAS-100 software package (SW) | 1 ea |
| 1.09326.0001 | Tripod (100 – 325 cm) | 1 ea |
| 1.09223.0002 | Quick adapter (for use with tripod) | 1 ea |
| 1.09126.0001 | Shoulder bag (leightweight, blue color) | 1 ea |
| 1.09224.0002 | Tube adapter | 1 ea |
| 1.09088.0002 | Perforated lid (anodized aluminum) | 1 ea |
| 1.09084.0002 | Dust cover (anodized aluminum) | 1 ea |
| 1.09085.0002 | Mains charger | 1 ea |
| 1.09229.0002 | Battery pack (NiMH) | 1 ea |
| 1.09225.0002 | Robust Carrying case | 1 ea |

## 14 Care and maintenance

The MAS-100 should be periodically calibrated (see section 10).
The perforated lid and dust cover are autoclavable (15 min/121°C). When the MAS-100 is being moved to a sterile or “clean” area, we suggest that it be wiped with a suitable disinfectant. Between sampling cycles the lid may be cleaned with disinfectant. Make sure that the holes in the perforated lid are not clogged. A separate perforated lid (autoclaved and kept in a sterile bag) can be used as lids are interchangeable without the need for recalibration.

## 15 Warranty

We guarantee the MAS-100 for 1 year against failure resulting from malfunction of electrical and electronic components (valid from day of purchase).

The MAS-100 is a laboratory instrument and should only be used by qualified personnel.

**Note:** **The sampling head has been factory calibrated and the locking screw sealed with lacquer.**
**This locking screw must not, under any circumstances, be opened.**
**Failure to observe this point will render the guarantee invalid.**

## 16 References

[1] The Rules Governing Medicinal Products In The European Community
Vol. IV: Guide to Good Manufacturing Practice for medicinal products, 1992

[2] MAS-100, Qualification of air sampler systems: The MAS-100
Meier R. and Zingre H., (Swiss Pharma 1-2/00)

[3] New Sampler for the Collection, Sizing, and Enumeration of Viable Airborne Particles,
A. Andersen, U.S. Army Chemical Corps Proving Ground, Dugway, Utah, 1958

[4] Feller, W. An introduction to the probability theory and its application, p. 175.
John Wiley and sons, Inc., New York, 1950

## 17 Appendix

Table of statistical corrections according to FELLER

This table is based on the principle that, as the number of particles impinging on a plate rises, the probability that two particles will go into the same hole increases. Two micro-organisms in the same hole would produce only a single colony. A statistical correction can be made using the conversion formula devised by FELLER [4]:

$$Pr = N [1/N + 1/N-1 + 1/N-2 + \quad 1/N-r+1]$$

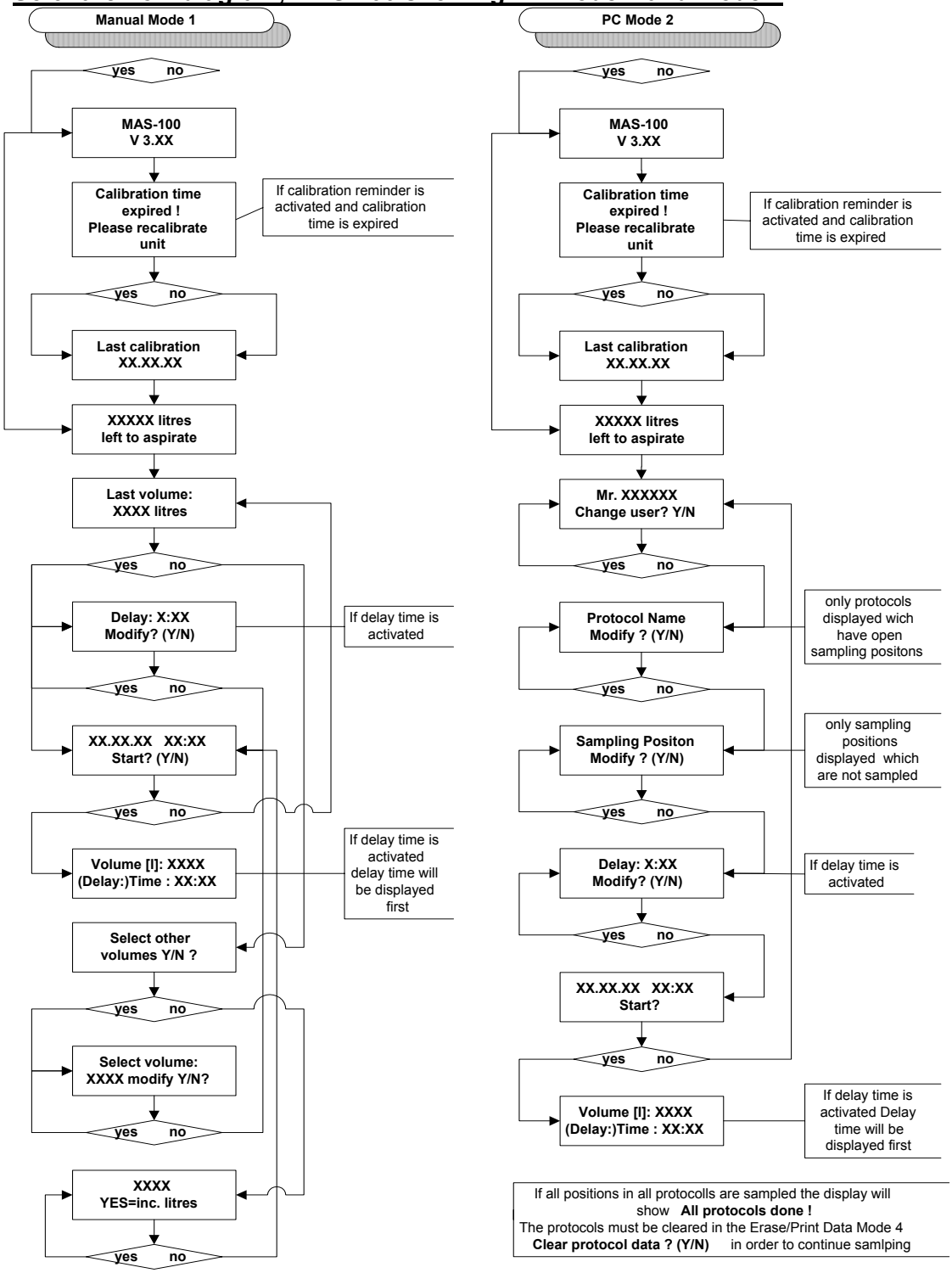
N represents the 400 holes in the perforated plate.
For easy application of this formula please refer to the table in section 17.2.
For each colony count **r** the table gives a statistically corrected total count **Pr**.

## 18 Table of statistical corrections according to FELLER

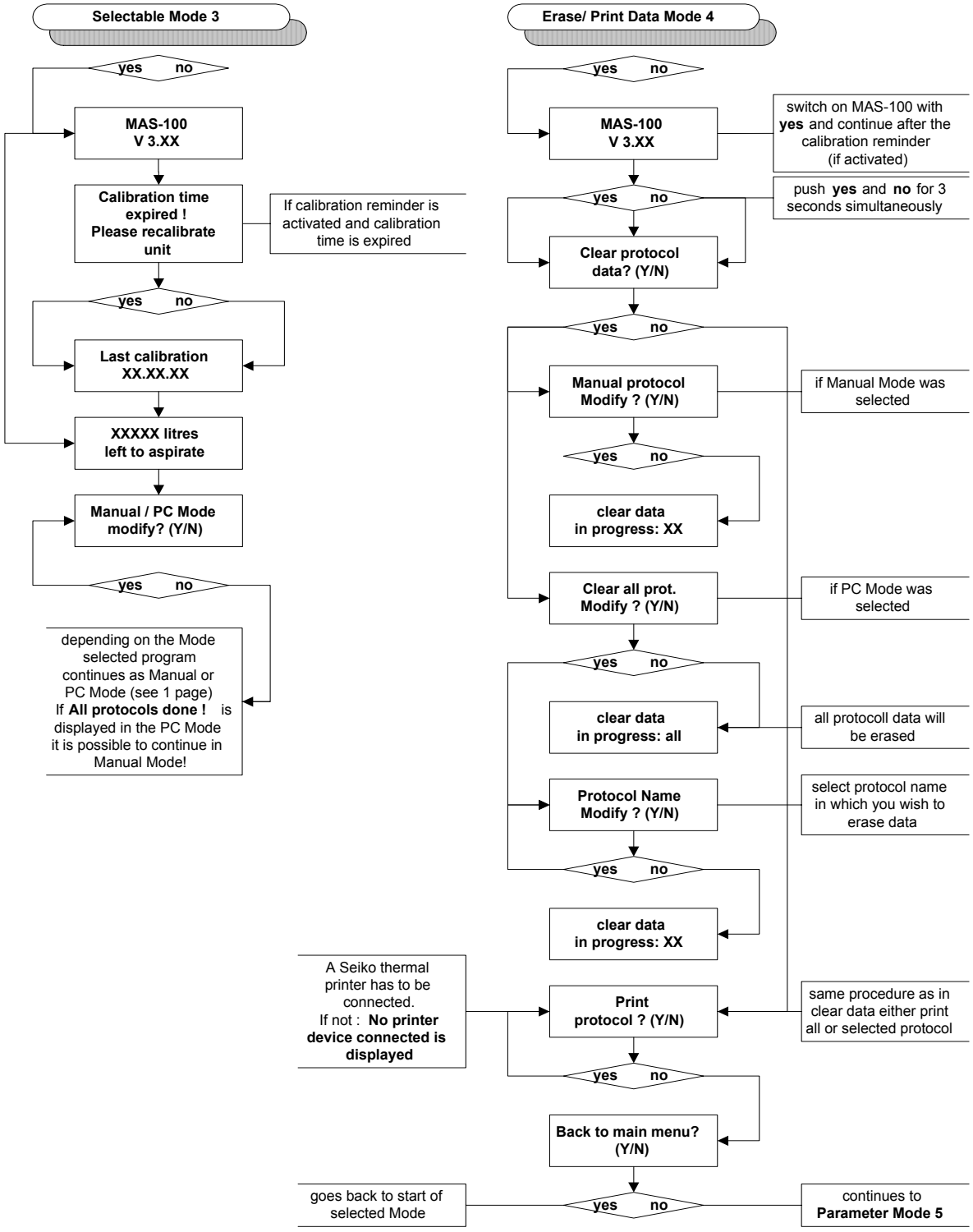
r = Number of colony forming units counted on standard Petri dish  **Pr** = Probable statistical total

| R | Pr | r | Pr | r | Pr | r | Pr | r | Pr | r | Pr | r | Pr | r | Pr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | 51 | 54 | 101 | 116 | 151 | 189 | 201 | 279 | 251 | 394 | 301 | 557 | 351 | 836 |
| 2 | 2 | 52 | 56 | 102 | 118 | 152 | 191 | 202 | 281 | 252 | 397 | 302 | 561 | 352 | 844 |
| 3 | 3 | 53 | 57 | 103 | 119 | 153 | 193 | 203 | 283 | 253 | 400 | 303 | 565 | 353 | 853 |
| 4 | 4 | 54 | 58 | 104 | 120 | 154 | 194 | 204 | 285 | 254 | 402 | 304 | 569 | 354 | 861 |
| 5 | 5 | 55 | 59 | 105 | 122 | 155 | 196 | 205 | 287 | 255 | 405 | 305 | 573 | 355 | 870 |
| 6 | 6 | 56 | 60 | 106 | 123 | 156 | 197 | 206 | 289 | 256 | 408 | 306 | 578 | 356 | 879 |
| 7 | 7 | 57 | 61 | 107 | 124 | 157 | 199 | 207 | 291 | 257 | 411 | 307 | 582 | 357 | 888 |
| 8 | 8 | 58 | 63 | 108 | 126 | 158 | 201 | 208 | 293 | 258 | 413 | 308 | 586 | 358 | 897 |
| 9 | 9 | 59 | 64 | 109 | 127 | 159 | 202 | 209 | 295 | 259 | 416 | 309 | 591 | 359 | 907 |
| 10 | 10 | 60 | 65 | 110 | 128 | 160 | 204 | 210 | 297 | 260 | 419 | 310 | 595 | 360 | 917 |
| 11 | 11 | 61 | 66 | 111 | 130 | 161 | 206 | 211 | 299 | 261 | 422 | 311 | 599 | 361 | 927 |
| 12 | 12 | 62 | 67 | 112 | 131 | 162 | 207 | 212 | 301 | 262 | 425 | 312 | 604 | 362 | 937 |
| 13 | 13 | 63 | 68 | 113 | 133 | 163 | 209 | 213 | 304 | 263 | 428 | 313 | 608 | 363 | 947 |
| 14 | 14 | 64 | 70 | 114 | 134 | 164 | 211 | 214 | 306 | 264 | 431 | 314 | 613 | 364 | 958 |
| 15 | 15 | 65 | 71 | 115 | 135 | 165 | 212 | 215 | 308 | 265 | 433 | 315 | 618 | 365 | 969 |
| 16 | 16 | 66 | 72 | 116 | 137 | 166 | 214 | 216 | 310 | 266 | 436 | 316 | 622 | 366 | 981 |
| 17 | 17 | 67 | 73 | 117 | 138 | 167 | 216 | 217 | 312 | 267 | 439 | 317 | 627 | 367 | 992 |
| 18 | 18 | 68 | 74 | 118 | 140 | 168 | 218 | 218 | 314 | 268 | 442 | 318 | 632 | 368 | 1005 |
| 19 | 19 | 69 | 76 | 119 | 141 | 169 | 219 | 219 | 317 | 269 | 445 | 319 | 637 | 369 | 1017 |
| 20 | 20 | 70 | 77 | 120 | 142 | 170 | 221 | 220 | 319 | 270 | 449 | 320 | 642 | 370 | 1030 |
| 21 | 22 | 71 | 78 | 121 | 144 | 171 | 223 | 221 | 321 | 271 | 452 | 321 | 647 | 371 | 1043 |
| 22 | 23 | 72 | 79 | 122 | 145 | 172 | 224 | 222 | 323 | 272 | 455 | 322 | 652 | 372 | 1057 |
| 23 | 24 | 73 | 80 | 123 | 147 | 173 | 226 | 223 | 325 | 273 | 458 | 323 | 657 | 373 | 1071 |
| 24 | 25 | 74 | 82 | 124 | 148 | 174 | 228 | 224 | 328 | 274 | 461 | 324 | 662 | 374 | 1086 |
| 25 | 26 | 75 | 83 | 125 | 150 | 175 | 230 | 225 | 330 | 275 | 464 | 325 | 667 | 375 | 1102 |
| 26 | 27 | 76 | 84 | 126 | 151 | 176 | 232 | 226 | 332 | 276 | 467 | 326 | 673 | 376 | 1118 |
| 27 | 28 | 77 | 85 | 127 | 153 | 177 | 233 | 227 | 335 | 277 | 471 | 327 | 678 | 377 | 1134 |
| 28 | 29 | 78 | 87 | 128 | 154 | 178 | 235 | 228 | 337 | 278 | 474 | 328 | 684 | 378 | 1152 |
| 29 | 30 | 79 | 88 | 129 | 156 | 179 | 237 | 229 | 339 | 279 | 477 | 329 | 689 | 379 | 1170 |
| 30 | 31 | 80 | 89 | 130 | 157 | 180 | 239 | 230 | 342 | 280 | 480 | 330 | 695 | 380 | 1189 |
| 31 | 32 | 81 | 90 | 131 | 158 | 181 | 241 | 231 | 344 | 281 | 484 | 331 | 701 | 381 | 1209 |
| 32 | 33 | 82 | 92 | 132 | 160 | 182 | 242 | 232 | 346 | 282 | 487 | 332 | 706 | 382 | 1230 |
| 33 | 34 | 83 | 93 | 133 | 161 | 183 | 244 | 233 | 349 | 283 | 491 | 333 | 712 | 383 | 1252 |
| 34 | 35 | 84 | 94 | 134 | 163 | 184 | 246 | 234 | 351 | 284 | 494 | 334 | 718 | 384 | 1276 |
| 35 | 37 | 85 | 95 | 135 | 164 | 185 | 248 | 235 | 353 | 285 | 497 | 335 | 724 | 385 | 1301 |
| 36 | 38 | 86 | 97 | 136 | 166 | 186 | 250 | 236 | 356 | 286 | 501 | 336 | 730 | 386 | 1327 |
| 37 | 39 | 87 | 98 | 137 | 167 | 187 | 252 | 237 | 358 | 287 | 504 | 337 | 737 | 387 | 1356 |
| 38 | 40 | 88 | 99 | 138 | 169 | 188 | 254 | 238 | 361 | 288 | 508 | 338 | 743 | 388 | 1387 |
| 39 | 41 | 89 | 101 | 139 | 171 | 189 | 255 | 239 | 363 | 289 | 511 | 339 | 749 | 389 | 1420 |
| 40 | 42 | 90 | 102 | 140 | 172 | 190 | 257 | 240 | 366 | 290 | 515 | 340 | 756 | 390 | 1456 |
| 41 | 43 | 91 | 103 | 141 | 174 | 191 | 259 | 241 | 368 | 291 | 519 | 341 | 763 | 391 | 1496 |
| 42 | 44 | 92 | 104 | 142 | 175 | 192 | 261 | 242 | 371 | 292 | 522 | 342 | 769 | 392 | 1541 |
| 43 | 45 | 93 | 106 | 143 | 177 | 193 | 263 | 243 | 373 | 293 | 526 | 343 | 776 | 393 | 1591 |
| 44 | 47 | 94 | 107 | 144 | 178 | 194 | 265 | 244 | 376 | 294 | 530 | 344 | 783 | 394 | 1648 |
| 45 | 48 | 95 | 108 | 145 | 180 | 195 | 267 | 245 | 378 | 295 | 534 | 345 | 791 | 395 | 1715 |
| 46 | 49 | 96 | 110 | 146 | 181 | 196 | 269 | 246 | 381 | 296 | 537 | 346 | 798 | 396 | 1795 |
| 47 | 50 | 97 | 111 | 147 | 183 | 197 | 271 | 247 | 384 | 297 | 541 | 347 | 805 | 397 | 1895 |
| 48 | 51 | 98 | 112 | 148 | 185 | 198 | 273 | 248 | 386 | 298 | 545 | 348 | 813 | 398 | 2028 |
| 49 | 52 | 99 | 114 | 149 | 186 | 199 | 275 | 249 | 389 | 299 | 549 | 349 | 820 | 399 | 2228 |
| 50 | 53 | 100 | 115 | 150 | 188 | 200 | 277 | 250 | 391 | 300 | 553 | 350 | 828 | 400 | 2628 |

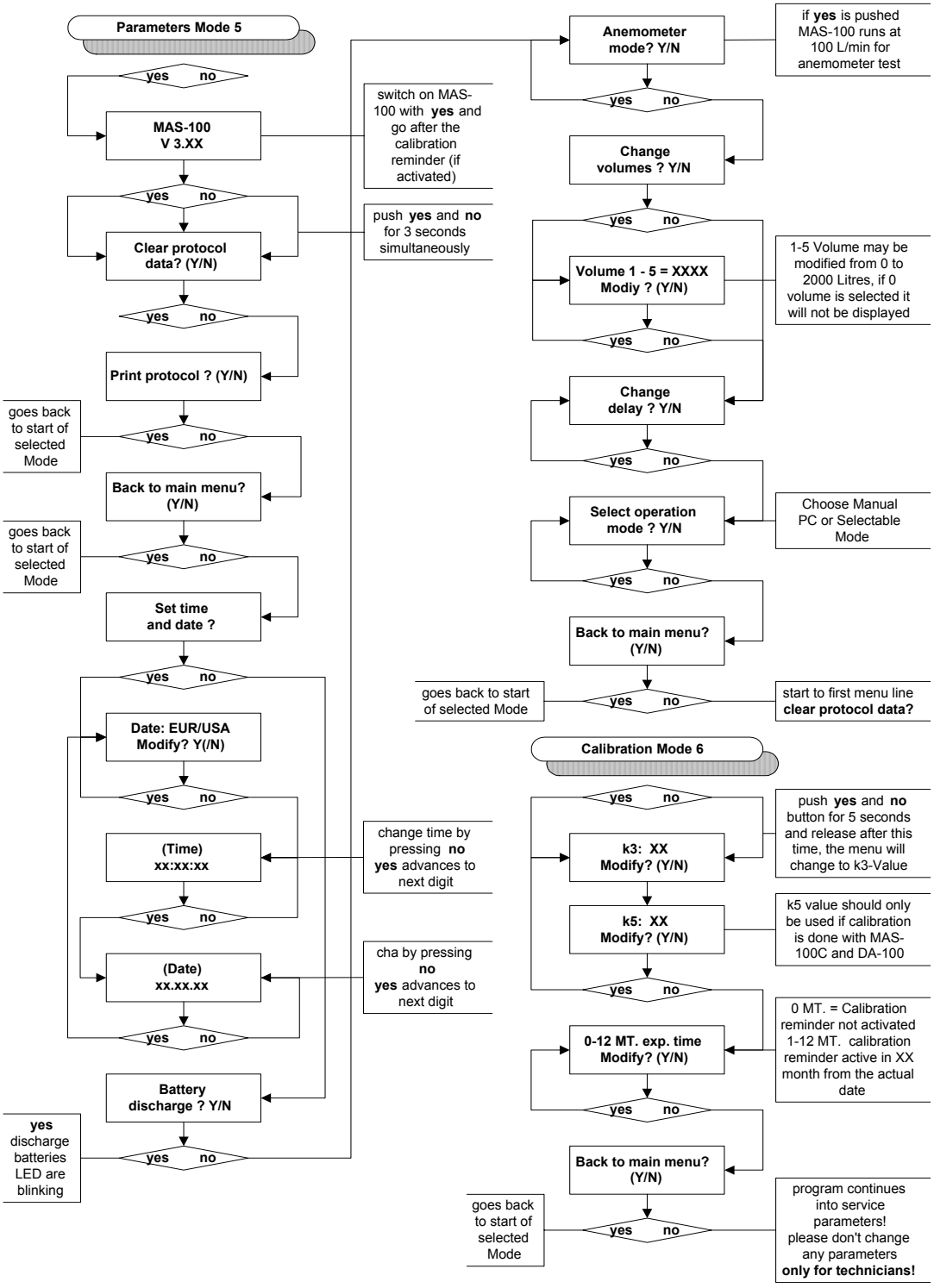
## 19 Software flow diagram, MAS-100 showing PC Mode 1 and Mode 2




## 20 Software flow diagram, MAS-100 showing PC Mode 3 and Mode 4




## 21 Software flow diagram, MAS-100 showing PC Mode 5 and Mode 6


Parameters Mode 5
yes no
MAS-100 V 3.XX
switch on MAS-100 with yes and go after the calibration reminder (if activated)
yes no
Clear protocol data? (Y/N)
push yes and no for 3 seconds simultaneously
yes no
Print protocol ? (Y/N)
goes back to start of selected Mode
yes no
Back to main menu? (Y/N)
goes back to start of selected Mode
yes no
Set time and date ?
yes no
Date: EUR/USA Modify? Y(/N)
yes no
(Time) xx:xx:xx
change time by pressing no yes advances to next digit
yes no
(Date) xx.xx.xx
cha by pressing no yes advances to next digit
yes no
Battery discharge ? Y/N
yes discharge batteries LED are blinking
yes no
Anemometer mode? Y/N
if yes is pushed MAS-100 runs at 100 L/min for anemometer test
yes no
Change volumes ? Y/N
yes no
Volume 1 - 5 = XXXX Modiy ? (Y/N)
1-5 Volume may be modified from 0 to 2000 Litres, if 0 volume is selected it will not be displayed
yes no
Change delay ? Y/N
yes no
Select operation mode ? Y/N
Choose Manual PC or Selectable Mode
yes no
Back to main menu? (Y/N)
goes back to start of selected Mode
yes no
start to first menu line clear protocol data?
Calibration Mode 6
yes no
k3: XX Modify? (Y/N)
push yes and no button for 5 seconds and release after this time, the menu will change to k3-Value
k5: XX Modify? (Y/N)
k5 value should only be used if calibration is done with MAS-100C and DA-100
yes no
0-12 MT. exp. time Modify? (Y/N)
0 MT. = Calibration reminder not activated 1-12 MT. calibration reminder active in XX month from the actual date
yes no
Back to main menu? (Y/N)
goes back to start of selected Mode
yes no
program continues into service parameters! please don't change any parameters only for technicians!