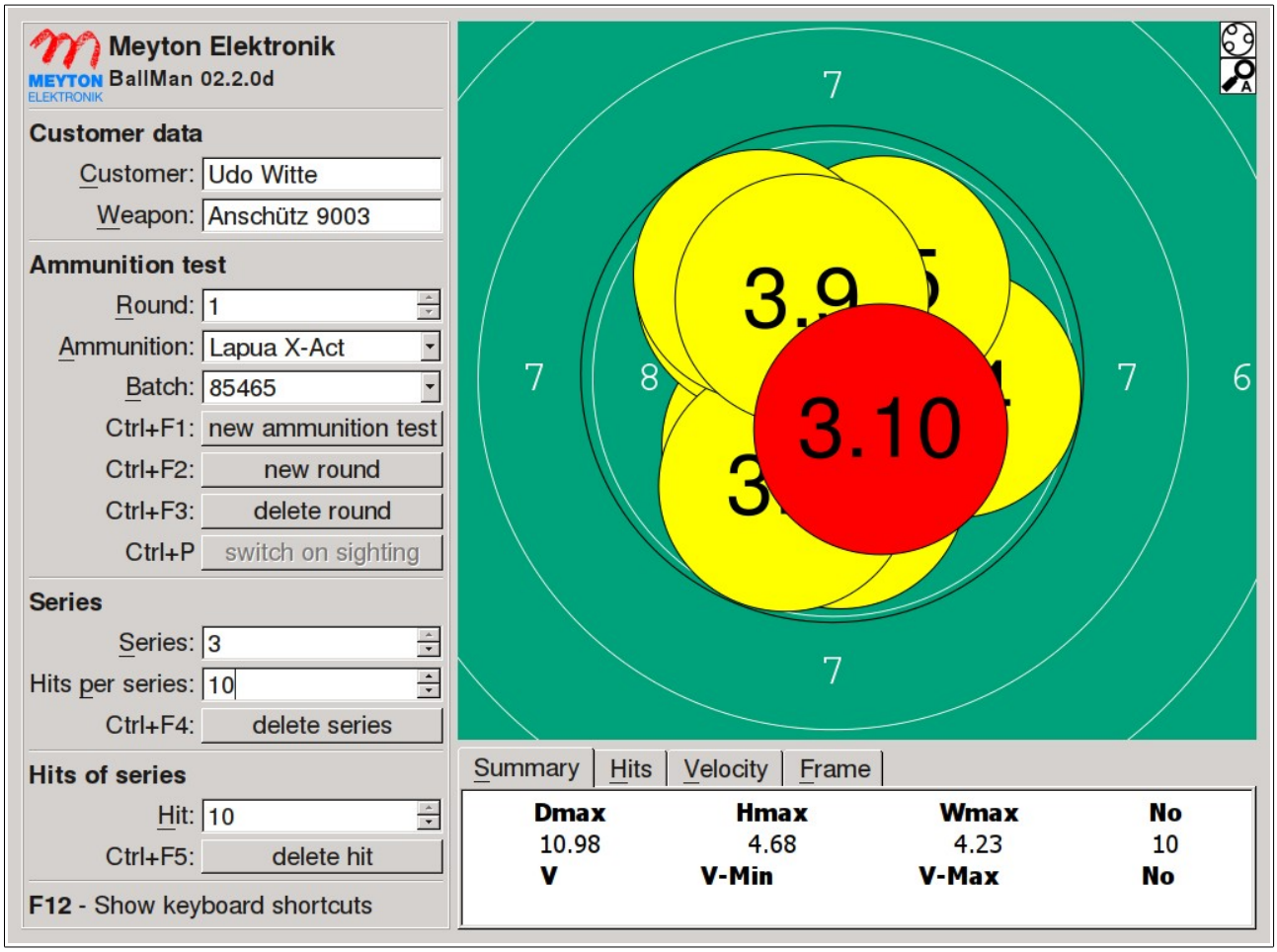
Ballistic Manager (BallMan)

Version 02.2.3a



User Manual

Version 1.4.6 Roman Geile
18.01.2013

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1 Getting Started

1.1 About BallMan

The Ballistic Manager (BallMan) is a specially developed product for statistical hit analysis. It is used in the quality assurance of weapon and ammunition manufacturers and in customer test shooting ranges to determine the best ammunition for a weapon under different environmental conditions (e.g. different temperatures) or between different ammunition production batches.

The BallMan measures bullet positions and calculates out of them the following statistical hit values:

- **Dmax**: Diameter of the smallest circle which contains all hits of a series.
- **Hmax**: Height of the hit area. Distance between the center points of the actual target's highest and lowest hit.
- **Wmax**: Width of the hit area. Distance between the center points of the actual target's leftmost and rightmost hit.
- **H+W**: Sum of Hmax and Wmax.
- **Sx**: Standard deviation of the hit positions in horizontal direction.
- **Sy:** Standard deviation of the hit positions in vertical direction.
- **Sa:** Quadratic mean of Sx and Sy. $\sqrt{\frac{S_x^{\,2}+S_y^{\,2}}{2}}$
- **DHH (Distance Hit Hit):** Center point distance between two consecutive hits.
- **DHH-Mean:** Mean value of the DHH values of the consecutive hits of a series.
- **DHH-STD:** Standard deviation of the DHH values of the consecutive hits of a series.
- **DHH-Min:** Smallest DHH value of consecutive hits of a series.
- **DHH-Max:** Biggest DHH value of consecutive hits of a series.
- **DHH(M):** This value is always calculated for a whole batch of an ammunition test. DHH(M) is the mean value of all batch series DHH-Mean values.
- **Series position:** Distance between the mean value of all target hits of a batch and the mean value of the actual series hits in horizontal and vertical direction.
- **Dmax(M), STD, Min, Max:** These values are calculated for a whole batch of an ammunition test. **Dmax(M)** is the mean value of all batch series Dmax values. **STD** is the standard deviation of all batch series Dmax values. **Min** is the minimum Dmax value of all batch series Dmax values. **Max** is the maximum Dmax value of all batch series Dmax values.

Note: All values are given in the unit [mm] with a resolution of 1/100mm .

Combined with the Mehl ballistic speed measurement system (http://www.kurzzeit.com) BMC 18, PVM 21, BMC 21 or BMC 31 the BallMan can also determine the bullet's velocity (see chapter 2.2.2.6). If the BallMan is connected to one of these devices, the software calculates the following additional statistical hit values:

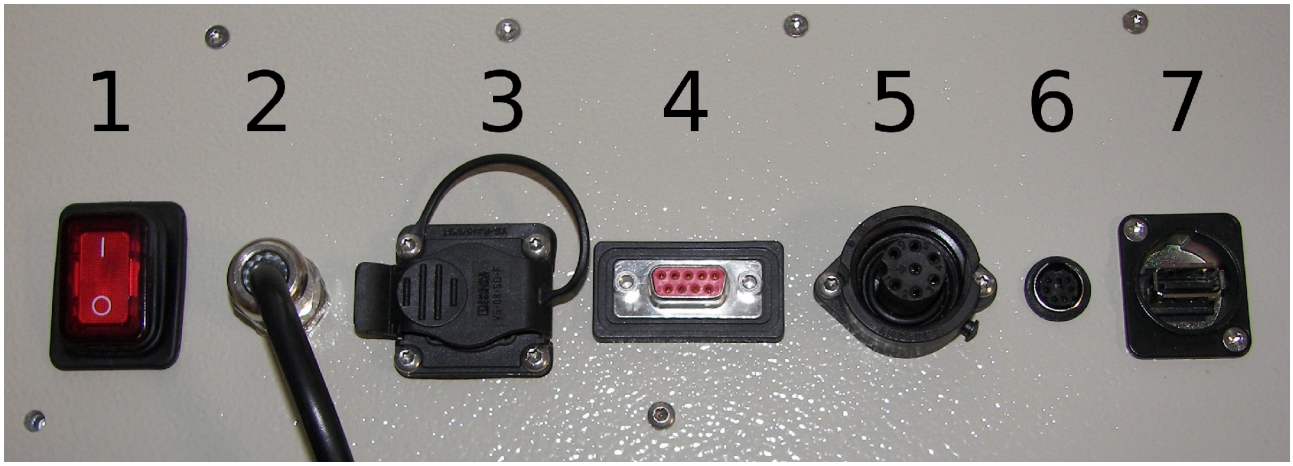
- **V**: Velocity of the last measured hit.
- **V-Mean:** Mean value of the bullet velocities of all hits of a series.
- **V-STD:** Standard deviation of the bullet velocities within a series.
- **V-Min:** Minimum bullet velocity within a series.
- **V-Max:** Maximum bullet velocity within a series.
- **V-No.:** Number of hits, which was used to calculate the V-Mean, V-STD, V-Min and V-Max.

Note: All velocity values are given in the unit [m/sec].

Mehl ballistic speed measurement system BMC 18

1.2 Commissioning

You will find the following switches and connectors at the back of the BallMan device (from left to right):



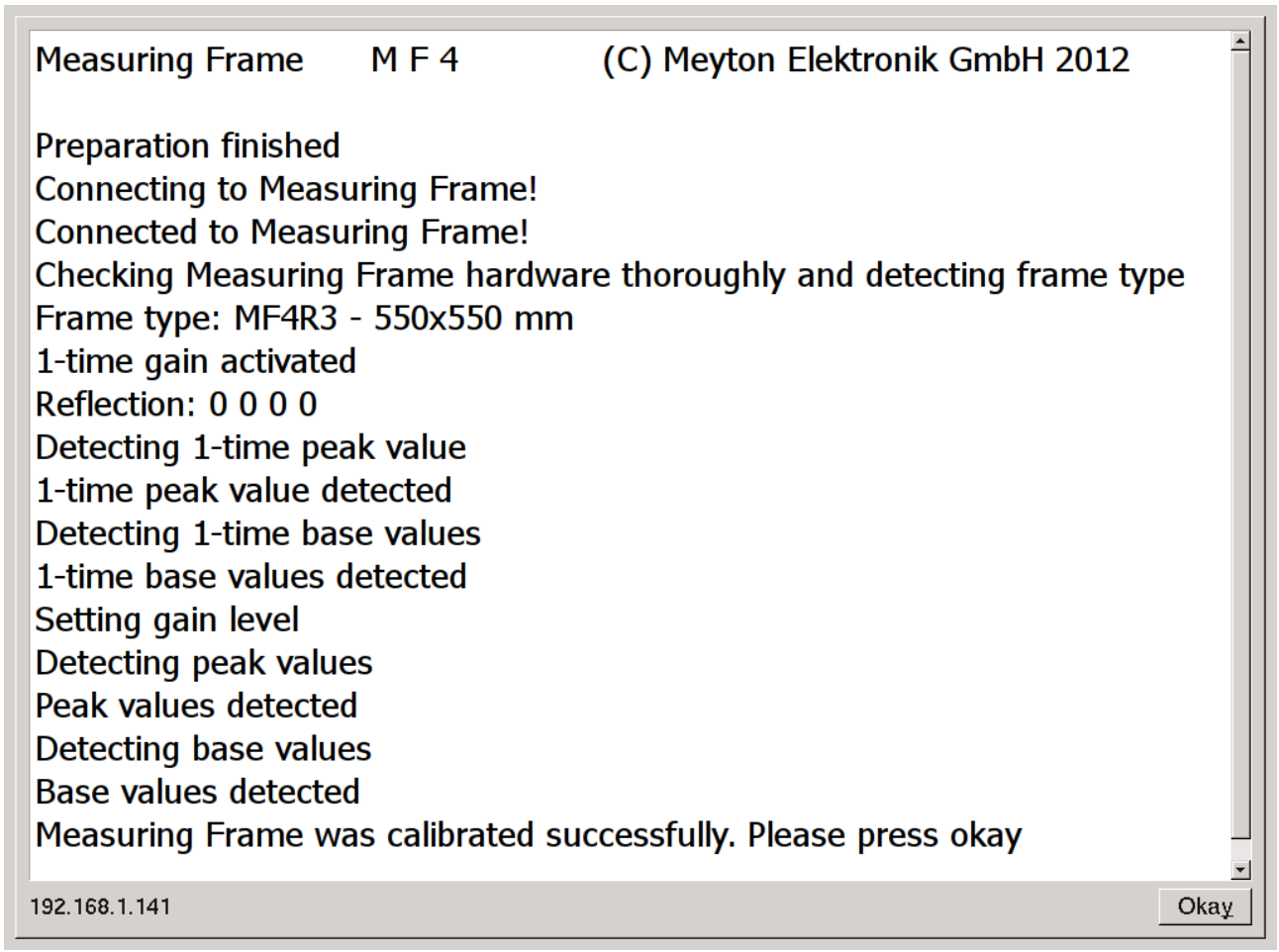
1. Power switch
2. Power cable with plug
3. RJ45 network interface (LAN) covered by protective cover
   (used for a local network connection and network printers)
4. RS232c serial port (to connect the “Mehl” ballistic speed measurement system)
5. Measuring frame connection (Tuchel plug)
6. PS2 Keyboard connection
7. USB Port (used for software updates, external data storage, USB keyboards, USB mice and Mehl ballistic speed measurement systems)

Commissioning:

- Plug the measuring frame cable into connector (5) and screw it tightly.
- Plug the PS2 Keyboard into connector (6).
- If you want to use a network printer or connect the BallMan to an existing local network (LAN), please remove the protective cover and connect a network cable with port (3).
- If you want to use a “Mehl” ballistic speed measurement system, connect the Mehl control unit to the serial port (4) or the USB port (7).
- Connect the power cable (2) with a power outlet and use the power switch (1) to power up the BallMan.

1.3 BallMan start-up

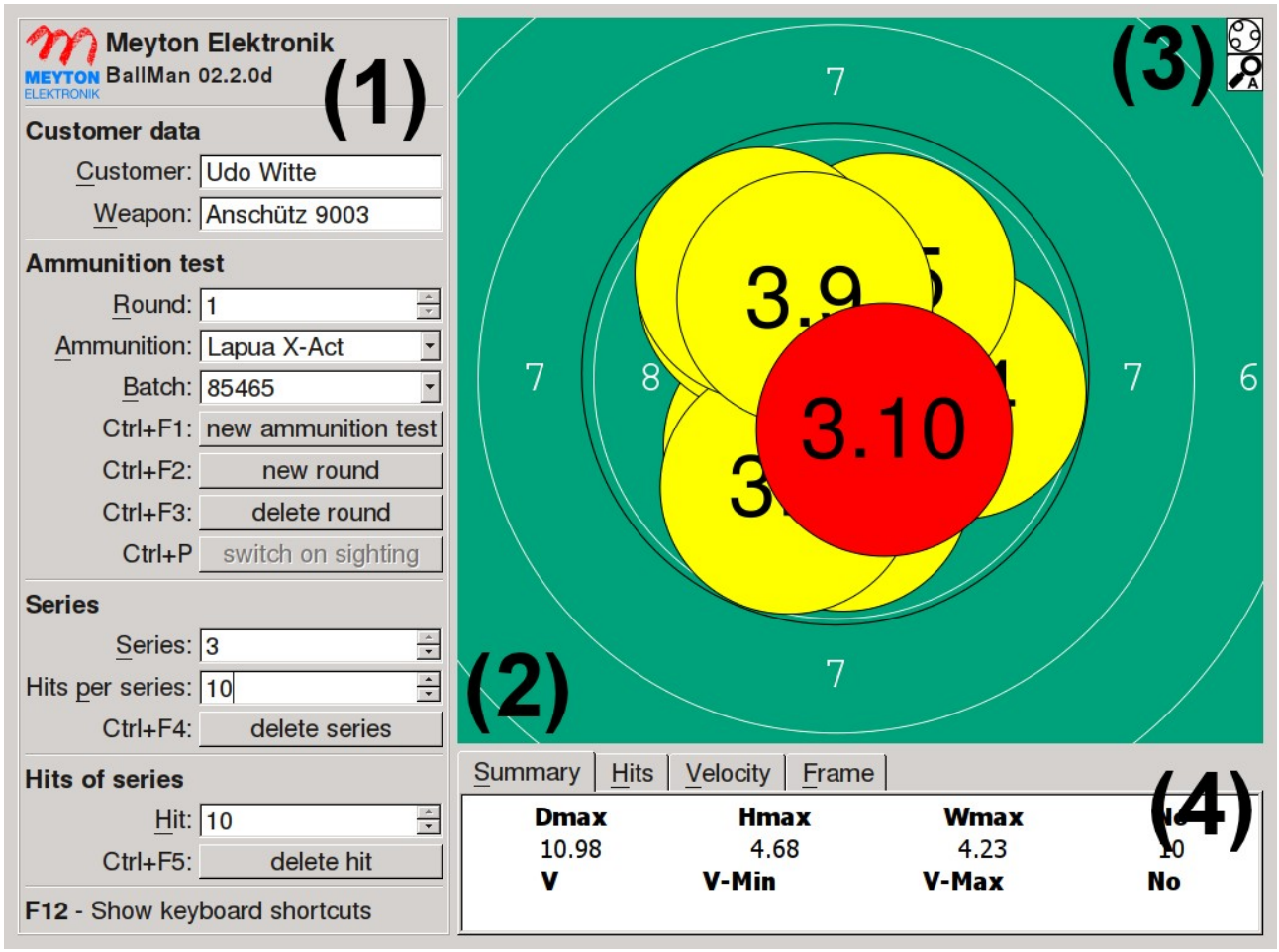
After having switched on the power switch (1), the device boots automatically from an internal Compact Flash card. While starting the BallMan software the hardware of the connected measuring frame is checked and calibrated. The calibration is done to guarantee perfect measurement results under all environmental conditions.



After the completion of the calibration the BallMan main window is displayed.

2 Graphical User Interface (GUI)

2.1 Main Window



The BallMan main windows is divided into three different areas. On the left side (1) you will find the main control area with the most important setting options. Here you can define customer and weapon data, start new ammunition tests, split an ammunition test into different rounds and switch between the different series and hits of the current ammunition test or delete them.

On the right side of the window (2) the target display is arranged. Here the actual target with the shots of the current batch series is displayed. Furthermore, a black hit dispersion circle is drawn either through the hit centers, around the outmost hit edges or using the inner hit edges. The representation of the hit dispersion circle depends on the actual program settings (see chapter 2.2.1.1).

At the upper right edge of the hit display you will find the status display (3). By means of icons, the user receives information about important program settings and connected additional hardware (e.g. Mehl ballistic speed measurement systems). For more detailed information concerning the icon meanings, please see chapter 2.1.3.

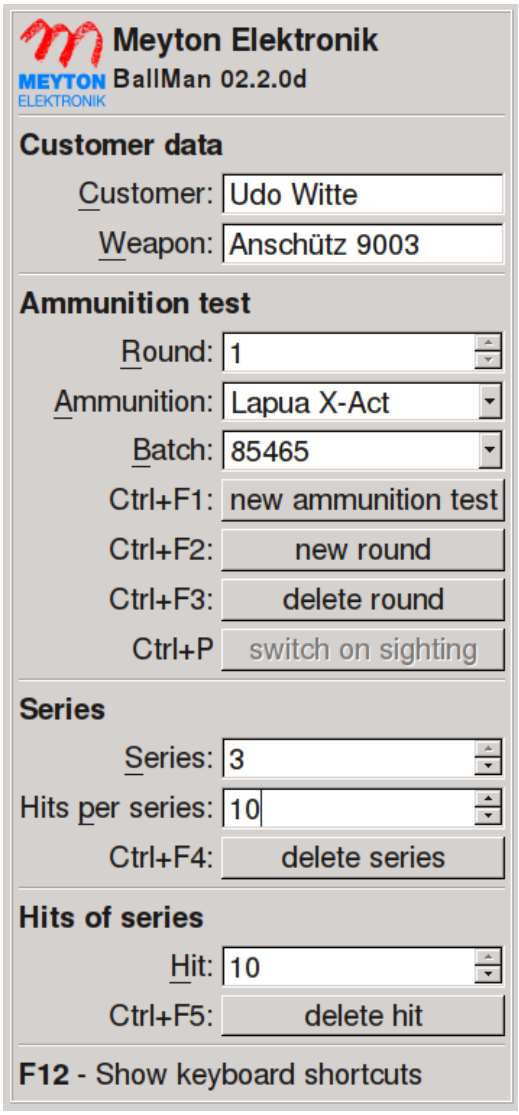
On the bottom right side (4) you can switch between the summary, hit, velocity and frame area. In the summary area you will find a short summary of the most important hit and velocity statistics of the actual batch series.

The hit statistics area displays detailed statistical hit information about the actual batch series. Among others the DHH (Distance-Hit-Hit) statistics of the actual series are displayed here.

The hit velocity area displays statistical information about the bullet velocities within the actual batch series. The hit velocity values in the summary and velocity area are only available if a Mehl ballistic speed measurement system is connected to the BallMan device (see chapter 2.2.2.6). A short explanation of all statistical values can be found in chapter 1.1.

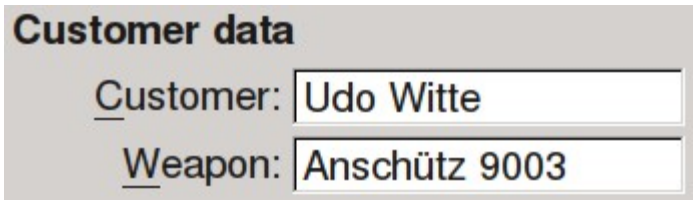
The measuring frame area provides information about the connected measuring frame andthe status of the measuring frame's LEDs (light barriers). Furthermore the measuring frame quick test and the frame calibration can be started here.

2.1.1 Main Control Area



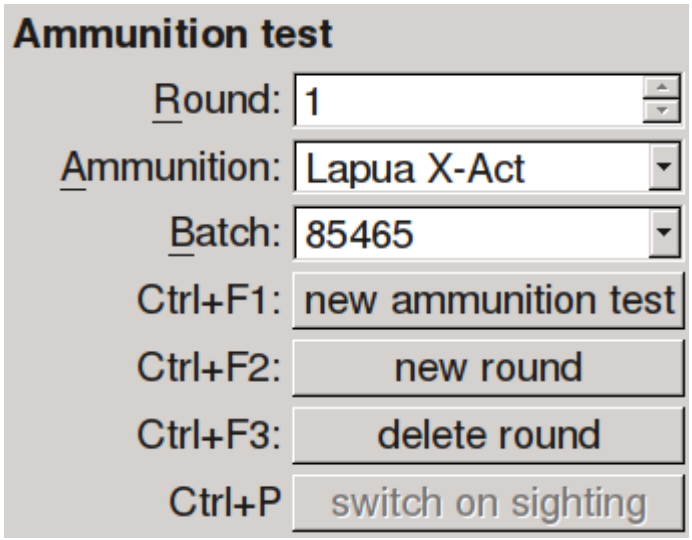
This area provides the most important settings to control the course of an ammunition test. Here you can insert custom and weapon data, start new ammunition tests, split an ammunition test into different rounds and switch between the different series and hits of the current ammunition test or delete them.

2.1.1.1 Customer Area



In this area the main customer data are collected, for whom this ammunition test is conducted. This includes the name of the customer and the model designation of the weapon that is used for the ammunition test. The data appear subsequently on different kinds of printouts (see chapter 3).

2.1.1.2 Ammunition test settings



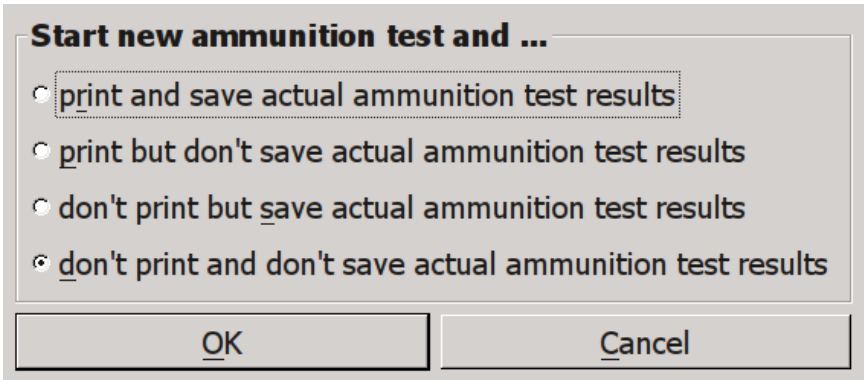
This area serves to control the course of an ammunition test. Here you can start new ammuntion tests, split an ammunition test into different rounds and switch between the different rounds of the current ammunition test or delete them.

Generally, an ammunition test can be divided into up to 8 rounds. Every round can consist of up to 5 series at 10 shots each. 400 is the maximum number of shots per ammunition test! By means of the ammunition test division into single rounds, you can compare different batches of the same ammunition type as well as ammunition types of different manufacturers with each other. In particular, for the subsequent evaluation it should be noted that a new round is started for every batch or every new ammunition type. You have to select an ammunition type and a batch (series number of the chosen ammunition type) for every round within an ammunition test.

After having started up the BallMan or after the start of a new ammunition test, you always begin in round 1 of a new ammunition test.

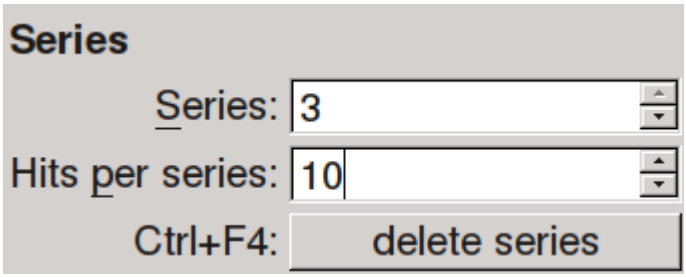
You can control the course of an ammunition test as follows with the fields available in this area:

- By means of the field **Round** you can switch between the already available rounds of the current ammunition test. If the round number has been changed, the ammunition and batch description, the hit display and the hit statistic is being refreshed automatically.
- By means of the fields **Ammunition** and **Batch** you can choose the ammunition type and the corresponding batch of the current round. Depending on the program settings you can choose the ammunition type and the corresponding batch either via the ammunition selection menu (F4 key) or by directly filling the corresponding fields. Please find further information concerning the ammunition selection menu in chapter 2.2.4. In the default settings the ammunition selection is automatically opened when a new ammunition test or round is started.
- By means of the key combination **Ctrl+F1** the currently running ammunition test is finished after completion of the desired number of rounds and a new ammunition test is started. After activation of this function a new window appears, where the user can decide how the data of the current ammunition test shall be processed.



- By means of the key combination **Ctrl+F3** you can delete the currently activated round of the ammunition test including all series and hits. If you intend to delete an already finished round, you have to activate it at first with the field **Round**. After a round has been deleted, the BallMan switches automatically to the previous round.
- With the key combination **Ctrl+P** you can switch on or off the sighting mode. In the sighting mode up to 400 sighting shots may be shot that are not included in the evaluation of the ammunition test. The sighting mode is especially useful, if the weapon has to be adjusted before the start of the ammunition test. You can only activate the sighting mode at the beginning of an ammunition test, if no hits have been measured yet. The activated sighting mode can be identified by means of a black triangle at the upper right corner of the hit display (see chapter 2.1.2). When leaving the sighting mode all hits that had been measured in the course of the sighting will be deleted.

2.1.1.3 Series settings

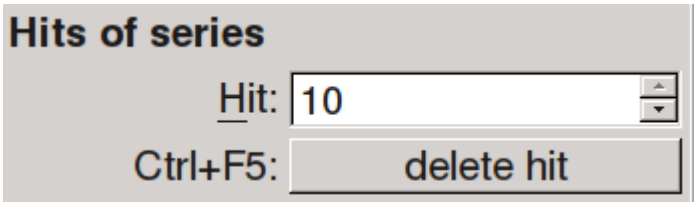


In this area you can define the series settings of the current round. You can switch between the different series of the current ammunition test, delete rounds or determine the number of hits that shall be grouped to a series.

- With the field **Series** you can scroll through the already existing series of the current round. After changing the series number the hit display and the hit statistics are refreshed automatically.
- With the field **Hits per series** you can select the number of hits which should be grouped into a series. The number of hits per series is limited to 50.
- If you want to delete a series, please select the desired series in the field **Series** and press the key combination **Ctrl+F4**. Afterward the BallMan switches back automatically to the previous series.

Generally a series is a group of 3-50 shots which are displayed together in the hit display in the main window of the BallMan. The hit statistics beneath the hit display is calculated for the currently displayed series shots. Furthermore the hits of a series are always printed together in the different printouts (see chapter 3).

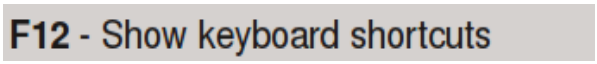
2.1.1.4 Hits of Series



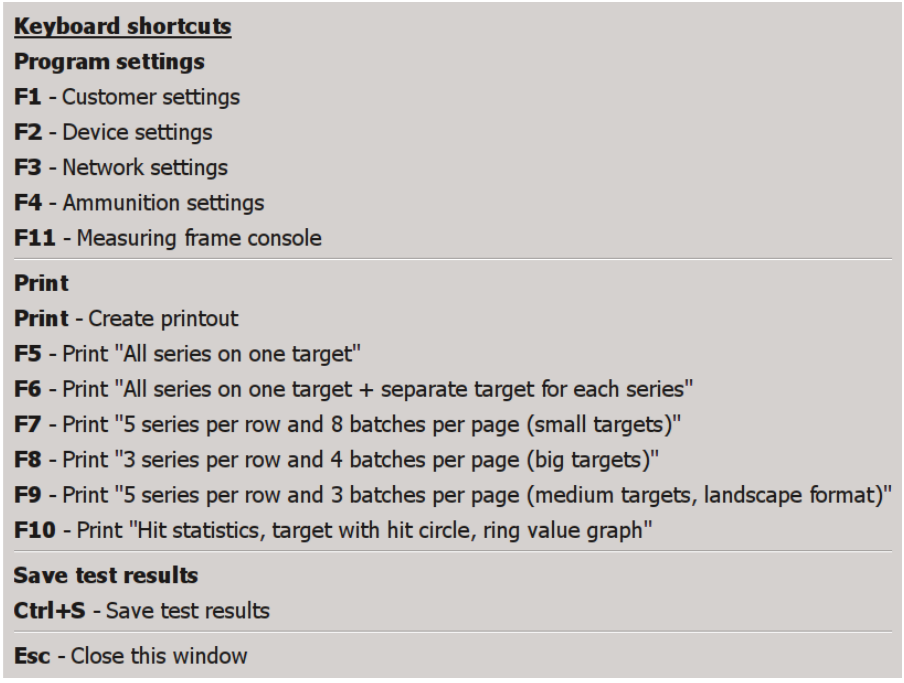
In this area you can browse through the hits of the current batch series and delete single hits of this series.

- By means of the field **Hit** you can browse through the hits of the current series. The selected hit is always displayed on top of all other hits in the target display.
- If you want to delete a single hit from the actual series, select the desired hit by means of the field **Hit**. Afterward please press the key combination **Ctrl+F5**. The hit display and the hit statistics will be refreshed automatically.

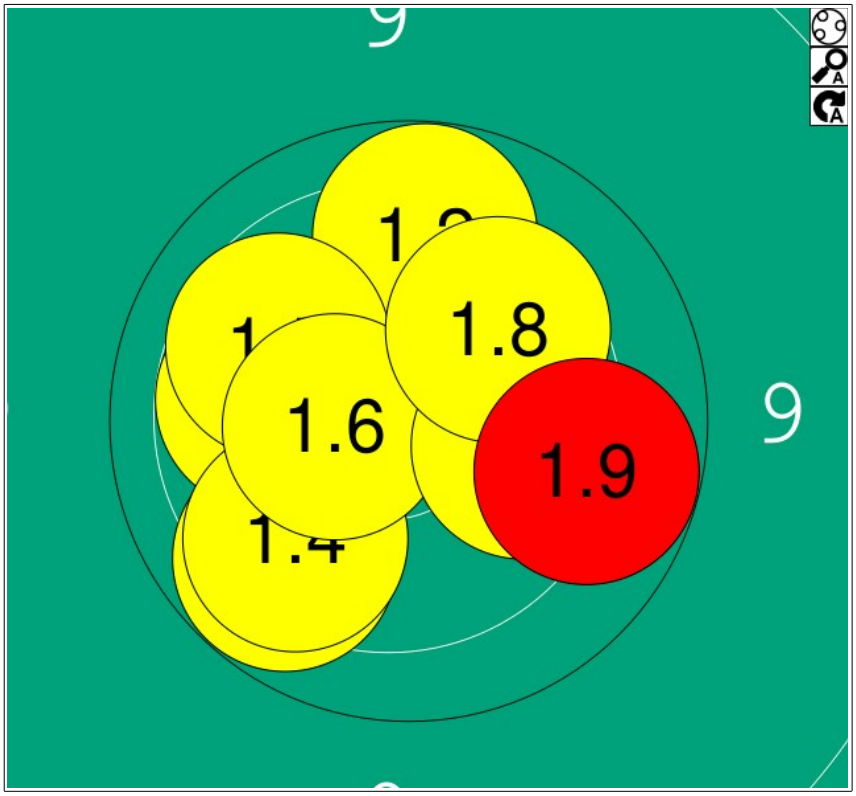
2.1.1.5 Keyboard Shortcuts



By pressing the **F12** button a page with the BallMan's most important keyboard shortcuts can be displayed anytime you want.



2.1.2 Hit display



In the hit display all hits of the current batch series are displayed. The size of the hit display depends on the selected target zoom. In the default settings the automatic zoom is pre-installed. In this mode the target zooms in or out automatically after every hit depending on the actual series hit dispersion, so that all hits of a series are displayed. You can changed the target zoom in the device settings (see chapter 2.2.2.5).

The hits are numbered according to the following scheme:

<series number>.<hit number within a series>

To illustrate the dispersion of the recently used ammunition (ammunition type) a black dispersion circle is drawn in the hit display. In the standard settings this circle is drawn around the outmost hit edges of the current series hits. Consequently, this is the smallest circumscribed circle which contains all hits of this series.

The BallMan software offers three different modes to display the hit dispersion circle:

1. Draw hit circle around outmost hit edges.
2. Draw hit circle through centers of the hits.
3. Draw hit circle using the inner hit edges.

You can change the hit dispersion circle display settings in the customer settings (see chapter 2.2.1.1).

2.1.3 Status display

At the upper right edge of the hit display you will find the status display. Here you can obtain information about important program settings and connected additional hardware (e.g. Mehl ballistic speed measurement systems) by means of icons.

The following pieces of information are shown in the status display:

1. **Hit dispersion circle display**

   Here the currently activated mode of the hit dispersion circle display is shown:

   -  Hit circle around outmost hit edges.
   -  Hit circle through centers of the hits.
   -  Hit circle display using the inner hit edges.

   Please find more information concerning the change of the hit circle display in chapter 2.2.1.1.

2. **Target zoom**

   Here the current zoom mode of the hit display on the current target is shown:

   -  no zoom (the whole target is shown)

-  automatic zoom
-  fixed zoom up to ring 8
-  fixed zoom up to ring 6
-  fixed zoom up to ring 4

Please find further information concerning the change of the target zoom in chapter 2.2.2.5.

3. Automatic mode

-  If this symbol is displayed, the automatic mode is activated. In this mode the BallMan switches automatically to the next batch of the ammunition list after a series has been completed. Please find further information concerning the automatic mode in chapter 2.2.4.3.3.

4. Master/Slave mode

You can connect two BallMan device in order that they show the same data. In doing so, one device takes over the provision of the data (Master) and the other device (Slave) takes over this data and shows then the same information as the Master. By means of the following status icons you can see, if the Master or Slave mode is activated:

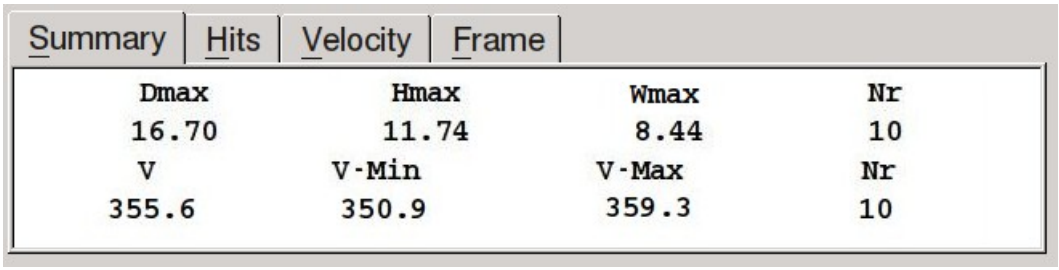
-  Master mode is active
-  Slave mode is active

Please find more information concerning the Master/Slave operation in chapter 2.2.3.7.

5. Bullet velocity measurement

-  If this symbol appears, a device, which measures the bullet velocity, is connected to the BallMan. Please find further information concerning the Measurement of bullet velocities in chapter 2.2.2.6.

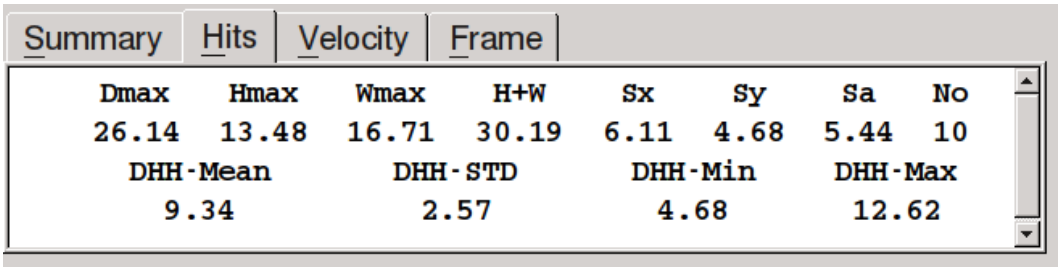
2.1.4 Summary



In this area a short summary of the most important hit and velocity statistics of the recent batch series is displayed. The statistics are refreshed automatically after every measured hit. The values displayed here are explained in chapter 1.1. The unit of the values is millimeter [mm] for the hit statistics and meters per second [m/sec] for the velocity statistics.

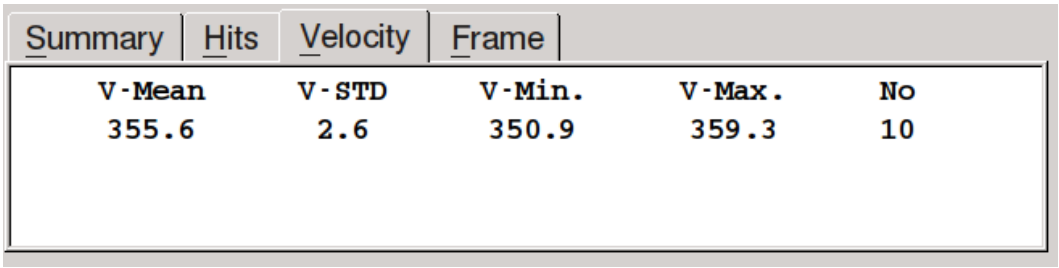
Note: The display of the bullet velocity statistic is only filled with data, if the BallMan is connected to a Mehl ballistic speed measurement system BMC 18, PVM 21, BMC 21 or BMC 31. See chapter 2.2.2.6 for further information.

2.1.5 Hit statistics



In this area statistical information about the hits of the current batch series is displayed. The statistics are refreshed automatically after every measured hit. The values displayed here are explained in chapter 1.1. The unit of these values is millimeter [mm].

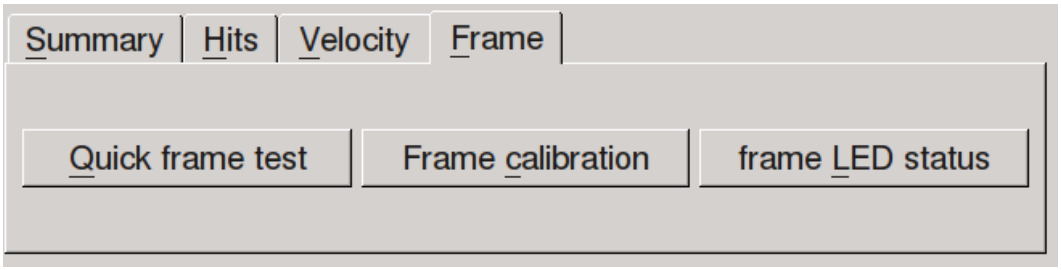
2.1.6 Velocity statistics



In this area statistical information about the bullet velocities within the current batch series is displayed. The statistic is refreshed automatically after every measured hit. The values displayed here are explained in chapter 1.1. The unit of these values is meters per second [m/sec].

Note: The display of the bullet velocity statistic is only filled with data, if the BallMan is connected to a Mehl ballistic speed measurement system BMC 18, PVM 21, BMC 21 or BMC 31. See chapter 2.2.2.6 for further information.

2.1.7 Measuring frame area



In this area information about the connected measuring frame hardware and the status of the measuring frame LEDs is displayed. Furthermore you can start a measuring frame quick test and a measuring frame calibration here.

2.1.7.1 Quick frame test

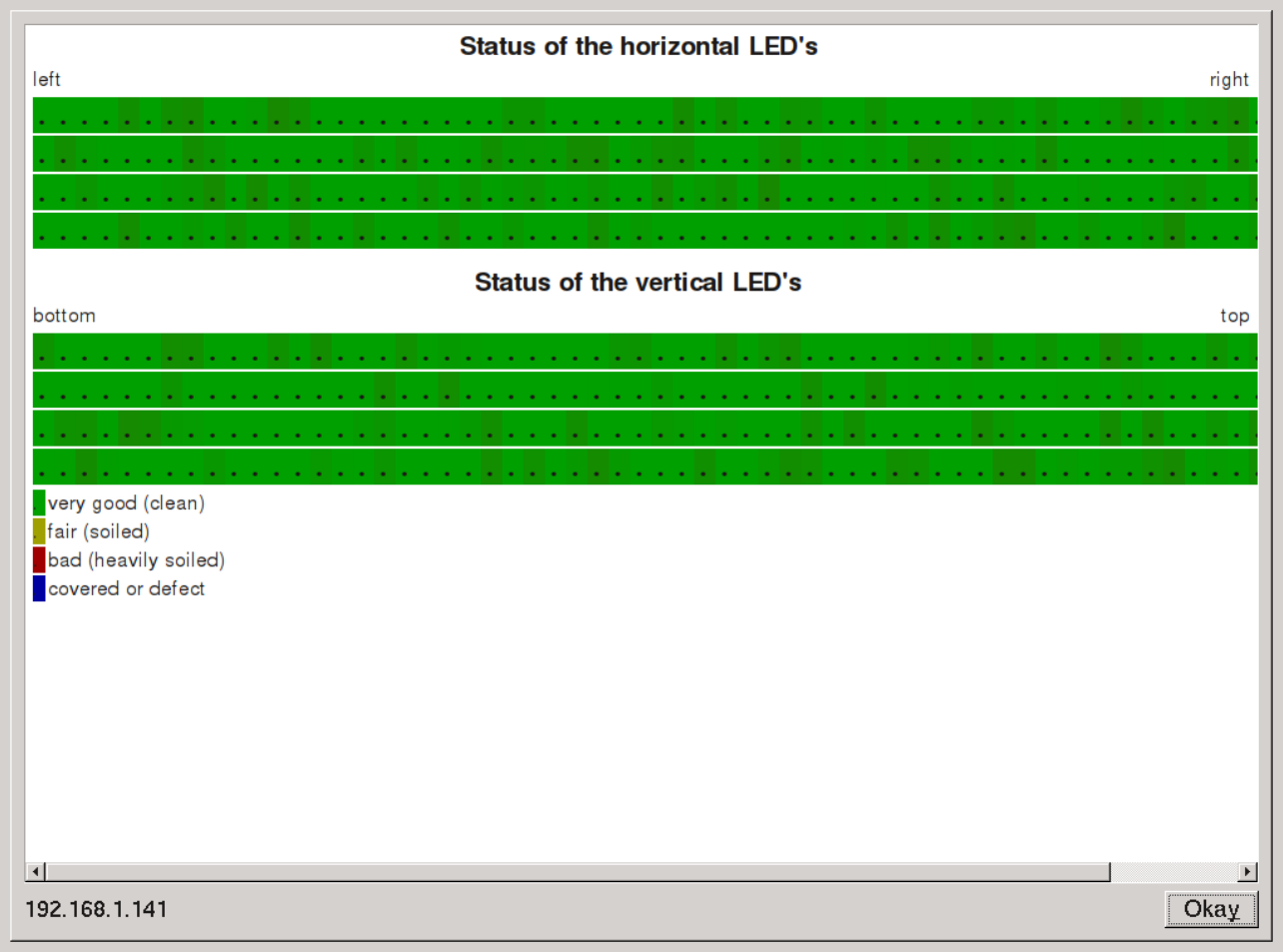
The quick frame test compares the LED status values of the last frame calibration with the current LED status values. If these values differ too much for one or more LED's, the programm displays a warning message. In this case please check if some dirt particles, such as ammunition splinters, are lying in the inner measurement area of the frame.

Important: After having cleaned the frame during operation, you must recalibrate it.

2.1.7.2 Frame calibration

During a measuring frame calibration the luminosity of its LEDs is adjusted to the present environmental conditions. Thereby, perfect measurement results are ensured irrespective of the external conditions. As the frame is automatically calibrated at the start-up of the BallMan, a recalibration is usually not necessary. A manual recalibration is only recommended, if the frame has been cleaned while the BallMan was still running or if the environmental conditions changed drastically during operation (e.g. temperature variations of more than 15°C).

2.1.7.3 Frame LED Status



This function displays the current status of the measuring frame's LEDs. The LED values are represented by different colors. The colors change from green (very good) over yellow (soiled) and red (heavily soiled) to blue (covered or defect). If there are red or blue LEDs, we recommend to clean the measuring frame and recalibrate it.

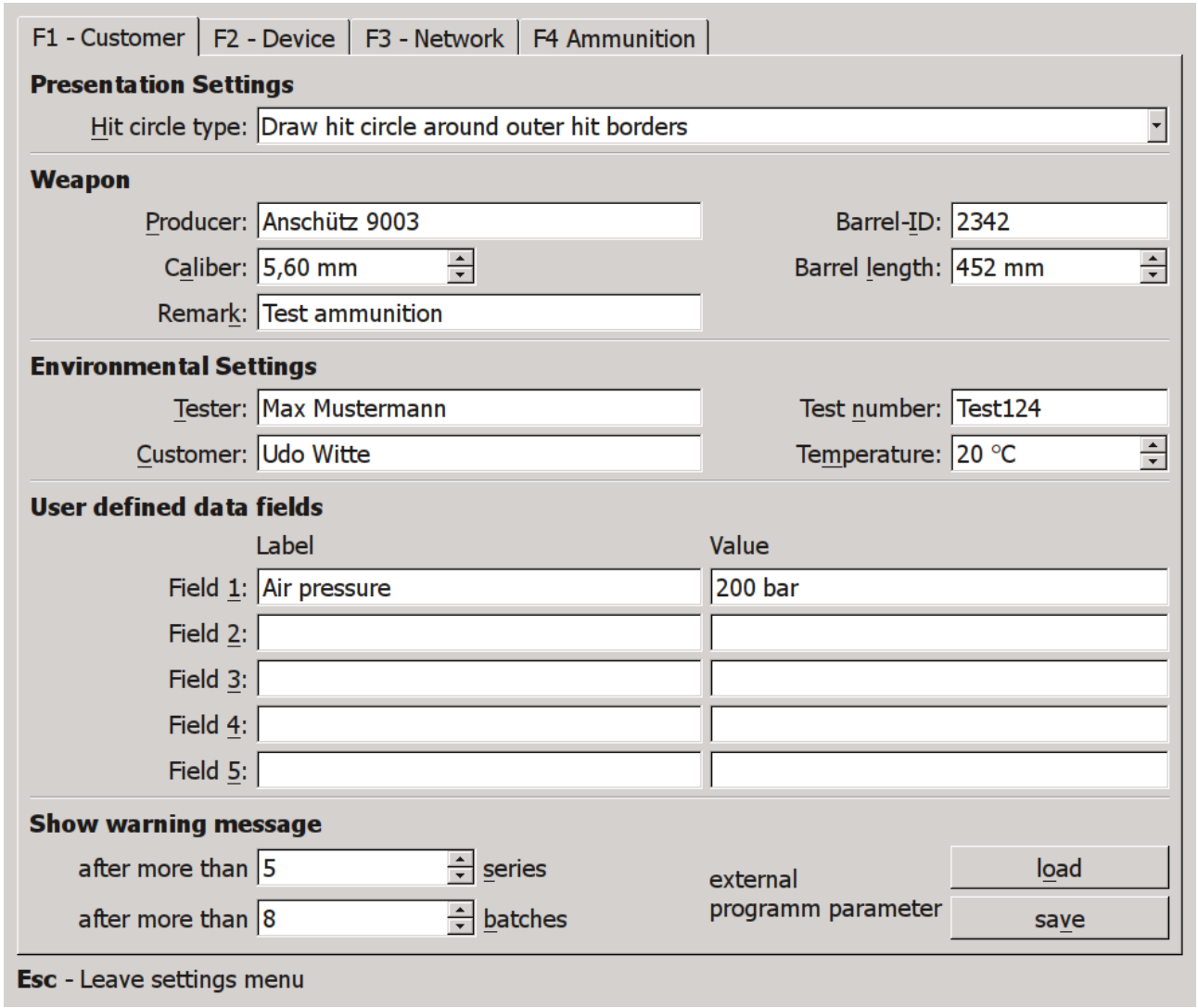
2.2 BallMan settings

By changing the program settings the BallMan can be adjusted to your or your customer's individual convenience. Generally the BallMan settings are divided into four different main categories:

- Customer settings (F1)
- Device settings (F2)
- Network settings (F3)
- Ammunition settings (F4)

To activate a settings menu, please press one of the hotkeys (F1-F4) in the configuration menu. To leave the settings menu press the “Escape” (Esc) key. After a query, the settings are saved automatically.

2.2.1 Customer settings (F1)



In this section all information about the customer-specific data (e.g. weapon data, current environmental conditions) is gathered. The data typed in here are mainly required for creating the different types of result printouts (see chapter 3) and result export file (see

chapter 4).

2.2.1.1 Presentation

Here you can choose how the black hit dispersion circle in the hit display (see chapter 2.1.2) shall be displayed. Currently there are 3 different types of displaying the hit dispersion circle:

1. Draw hit circle around the outmost hit edges.
2. Draw hit circle through the centers of the hits.
3. Draw hit circle using the inner hit edges.

2.2.1.2 Weapon data

Here all information about the weapon is collected, which is used for the present ammunition test. The data typed in here are mainly required for creating the different types of result printouts (see chapter 3).

The following settings are available:

- **Producer:** Producer or type of the used weapon.
- **Barrel-ID:** Precise identification characteristics of the used barrel (number or name).
- **Caliber:** Caliber of the barrel in [mm].
- **Barrel length:** Length of the weapon barrel in [mm].
- **Remark:** User-defined remark for the result printout.

2.2.1.3 Environmental Settings

Here information about the people / company performing the ammunition test and the environmental conditions during the ammunition test is collected. These data also appear in the different types of result printouts.

- **Tester:** Name of the person who is performing the ammunition test.
- **Test number:** Precise test number of the current ammunition test.
- **Customer:** Name of the customer the ammunition test is done for.
- **Temperature:** Environmental temperature while performing the ammunition test.

2.2.1.4 User-defined data fields

In this area further information about the current ammunition test can be stored. For this purpose the program provides 5 freely definable data fields. For every single data field you can enter a description and a value.

These fields are especially useful, if the data, which are collected in the course the ammunition test, shall be processed electronically later on, as the user-defined input fields are stored in a generated CSV (Character Separated Values) file, when the ammunition results are saved (exported). Please find further information about the export of ammunition test results in chapter 4.

Furthermore, you can take over the user-defined data fields to the different result printouts. For further information concerning the adaptation of the different result printouts see

chapter 2.2.2.4.

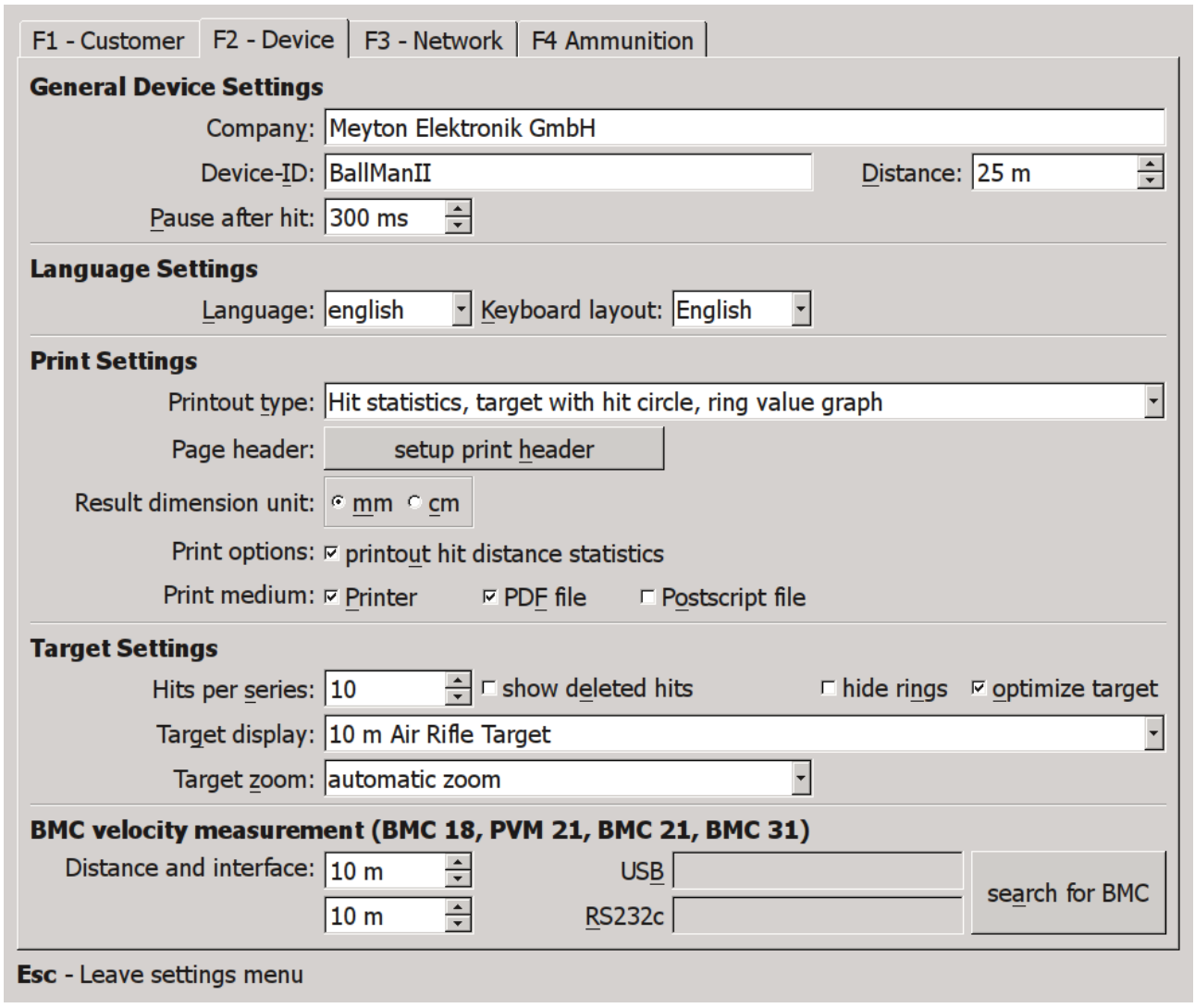
2.2.1.5 Show warning message

The BallMan allows you to display a warning message when the tester exceeds a fixed number of batches or series. If no warning message shall be shown you have to set a 0 into these fields.

2.2.1.6 External program parameters

In the lower left part of the customer settings you will find an area that serves to administrate the program settings. Here you can save the entire program settings to an external storage medium or a network folder or you can recopy them from it. The external storage medium with the defined data path, which has been chosen in the network settings, is used to save or recopy the program parameters. Please find further information about the storage medium and the data path in the chapters 2.2.3.3 and 2.2.3.4.

2.2.2 Device Settings (F2)



In this section of the program settings all device-dependent BallMan settings (such as shooting distance, keyboard layout, printout and target display type) are collected.

2.2.2.1 General Device Settings

Here information about the BallMan device location is gathered.

- **Company:** Name of the person or company that owns this BallMan device.
- **Device-ID:** Precise identification number or name of this BallMan device. The Device-ID is an important distinctive feature if you own several BallMan devices.
- **Distance:** Shooting distance between the weapon and the measuring frame in meters [m].
- **Pause after hit:** If this option is set, the measuring frame is deactivated for a fixed amount of time [ms] after measuring a hit. Thereby you can prevent the measuring frame from detecting splinters, which can bounce back when a bullet hits the bullet trap.

2.2.2.2 Language Settings

Here you can change the BallMan's display language and the keyboard layout.

- **Language:** Language of the BallMan's user interface. At the moment, the following languages are supported: German, English.
- **Keyboard layout:** Layout of the used keyboard. At the moment, the following layouts are supported: German, English.

2.2.2.3 Print Settings

Here you can select which result printout of the four available ones shall be created when the the **Print** key is used in the main window of the BallMan. Furthermore you can determine on which output medium you want to print.

- **Printout type:** At the moment you can choose between 6 different types of printout formats:
  1. **All series on one target**
     Prints all series of the current batch onto one big target. For further information see chapter 3.1.
  2. **All series on one target + separate target for each series**
     Prints all series of the current batch on a big target and up to 5 small targets for each series of the current batch. For further information see chapter 3.2.
  3. **5 series per row and 8 batches per page (small targets)**
     Prints up to 8 batches of the current ammunition test onto one page. For each batch up to 5 series with one target per series are displayed. The target size is 28 x 28 mm. For further information see chapter 3.3.
  4. **3 series per row and 4 batches per page (big targets)**
     Prints up to 4 batches of the current ammunition test onto one page. For each batch the first 3 series with one target per series are displayed. The target size is 50 x 50 mm. For further information see chapter 3.4.

5. **5 series per row and 3 batches per page (medium targets, landscape format)**
   Prints up to 3 batches of the current ammunition test in the landscape format onto one page. For each batch up to 5 series with one target per series are displayed. The target size is 45 x 45 mm. For further information see chapter 3.5.
6. **Statistic tables, hit pattern with hit circle, ring value diagram**
   Prints up to 8 ammunition batches of the current ammunition test onto one page. For each batch the hit statistic, the hits of the batch with a dispersion circle and a histogram with the frequency of the hit values are displayed. For further information see chapter 3.6.

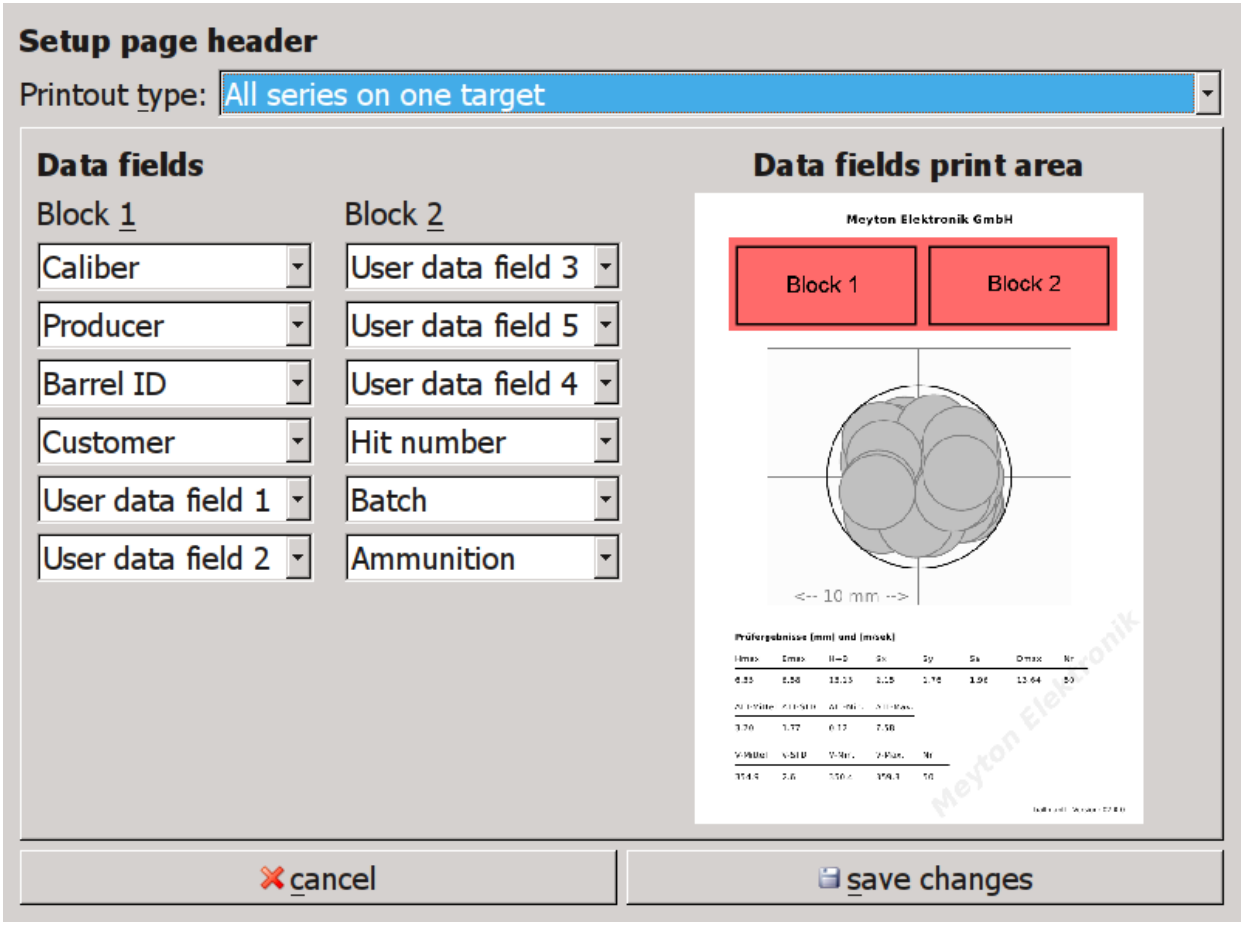
- **Setup print header:** Here you can define individually for every printout, which information (data fields) shall appear on the page header of the printout. Please see chapter 2.2.2.4 for further information concerning the page header modifications.
- **Print options:** Here you can switch on or off further printer options.
  - **Result unit dimension:** Here you can select the unit, which should be used to display the hit information in the result printouts. Currently you can choose millimeter [mm] or centimeter [cm].
  - **Printout hit distance statistic:** If this option is activated the DHH (Distance Hit Hit) statistic values (see chapter 1.1) are added to the different types of printouts.
  - Print medium: Here you can choose on which output medium you want to print.
    - **Printer:** Prints on the currently set network printer. You can define the network printer to be used in the network settings (see chapter 2.2.3.5).
    - **PDF file:** Prints into a PDF file and stores the file on an external storage medium. For further information about the use of an external storage medium, please see chapter 2.2.3.3.
    - **Postscript file:** Prints into a PS file and stores the file on an external storage medium. For further information about the use of an external storage medium, please see chapter 2.2.3.3.

2.2.2.4 Setup print header

With the BallMan software you can assort individually the data fields that shall appear in the page header of the different result printouts. In order to conduct the settings, the software provides a clear entry mask.

To change the page header settings of a printout, please proceed as follows:

1. Open the window of the page header settings by using the key combination **Alt+H** or by activating the button **setup print header** in the device settings.
2. Then the following window appears:



In this window you can determine individually for every printout the data theat shall be displayed in the page header of the printout. To do so, a certain number of selection boxes is available, which are listed in columns according to the appearance of the data on the printout. In order to illustrate the column scheme of the selected printout, a picture of the printout including the arrangement of the data columns is shown the field **Data field print area**.

3. Please select now by means of the selection box **Printout type** the printout whose page header information you want to edit.
4. Then please choose your favored data fields for the different columns of the page header information by means of the selection boxes. You can open the selection boxes by pressing the **space bar**. Use the **tabulator** key to switch between the selection boxes.
5. In order to save the settings, please press the key combination **Alt+S** or activate the button **save changes.**

2.2.2.5 Target settings

In this area you will find all the settings that are related to the target and hit display in the main window of the BallMan software. You can change here the following settings:

- **Hits per series:** Here you set the default series size. The default series size is set automatically when a new ammunition test is started.
- **Show deleted hits:** If you activate this option, deleted hits will still be displayed in the BallMan's hit display. In order to distinguish between the deleted and valid hits,

the deleted hits are displayed in grey in the hit display. ***Note: The BallMan software ignores deleted hits when calculating the hit statistics.***

- **Optimize target:** If this option is set, the center of the displayed target will be moved to the point of gravity of the actual group of shots.
- **Hide rings:** If this option is activated, no rings will be displayed on the target in the hit display area of the main screen.
- **Target display:** Here you select which kind of target shall be used to show the current batch series hits in the hit display. Currently the following targets are available:
  - **50 m rifle target:** Official ISSF 50 m rifle target (ISSF rule no. 6.3.2.2).
  - **25 m precision and 50 m pistol target:** Official ISSF 25 m precision pistol and 50 m rifle target (ISSF rule no. 6.3.2.5).
  - **10 m air rifle target:** Official ISSF 10 m air rifle target (ISSF rule no. 6.3.2.3).
  - **10 m air pistol target:** Official ISSF 10 m air pistol target (ISSF rule no. 6.3.2.6).
- **Target zoom:** Here you can choose which part of the selected target shall be shown in the hit display in the main window of the BallMan. You can choose the following settings:
  - **no zoom (whole target):** The entire target is always shown.
  - **automatic zoom:** The size of the target is adjusted in such a way that all hits of the current batch series are displayed.
  - **fixed zoom till ring 8:** The target is displayed from the center to ring 8.
  - **fixed zoom till ring 6:** The target is displayed from the center to ring 6.
  - **fixed zoom till ring 4:** The target is displayed from the center to ring 4.

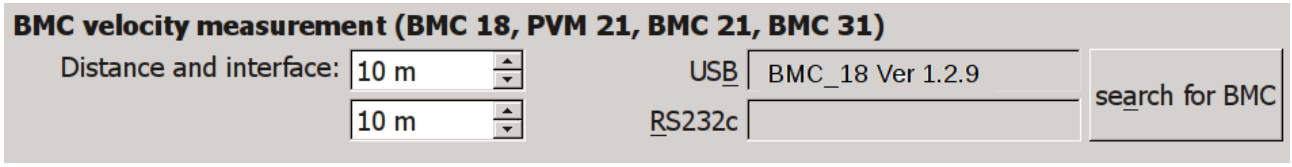
  Note: If you have chosen the zoom modes "fixed zoom up to ring 8, 6 or 4", the hits, which are outside of this ring edges are not shown on the target. However, these hits are included in the calculation of the hit statistics.

2.2.2.6 BMC velocity measurement (BMC 18, PVM 21, BMC 21, BMC 31)

Combined with the Mehl ballistic speed measurement system (http://www.kurzzeit.com) the BallMan is able to detect and evaluate bullet velocities. The following Mehl ballistic speed measurement devices are currently supported:

- BMC 18
- PVM 21
- BMC 21
- BMC 31

To set up one of these devices to cooperate with the BallMan, connect it to the serial port or the USB port of the BallMan (see chapter 1.2). Then please activate the **search for BMC** button. Hereupon all identified Mehl devices with interface, device name and firmware version are displayed on the right side of the BMC bullet velocity measurement area.

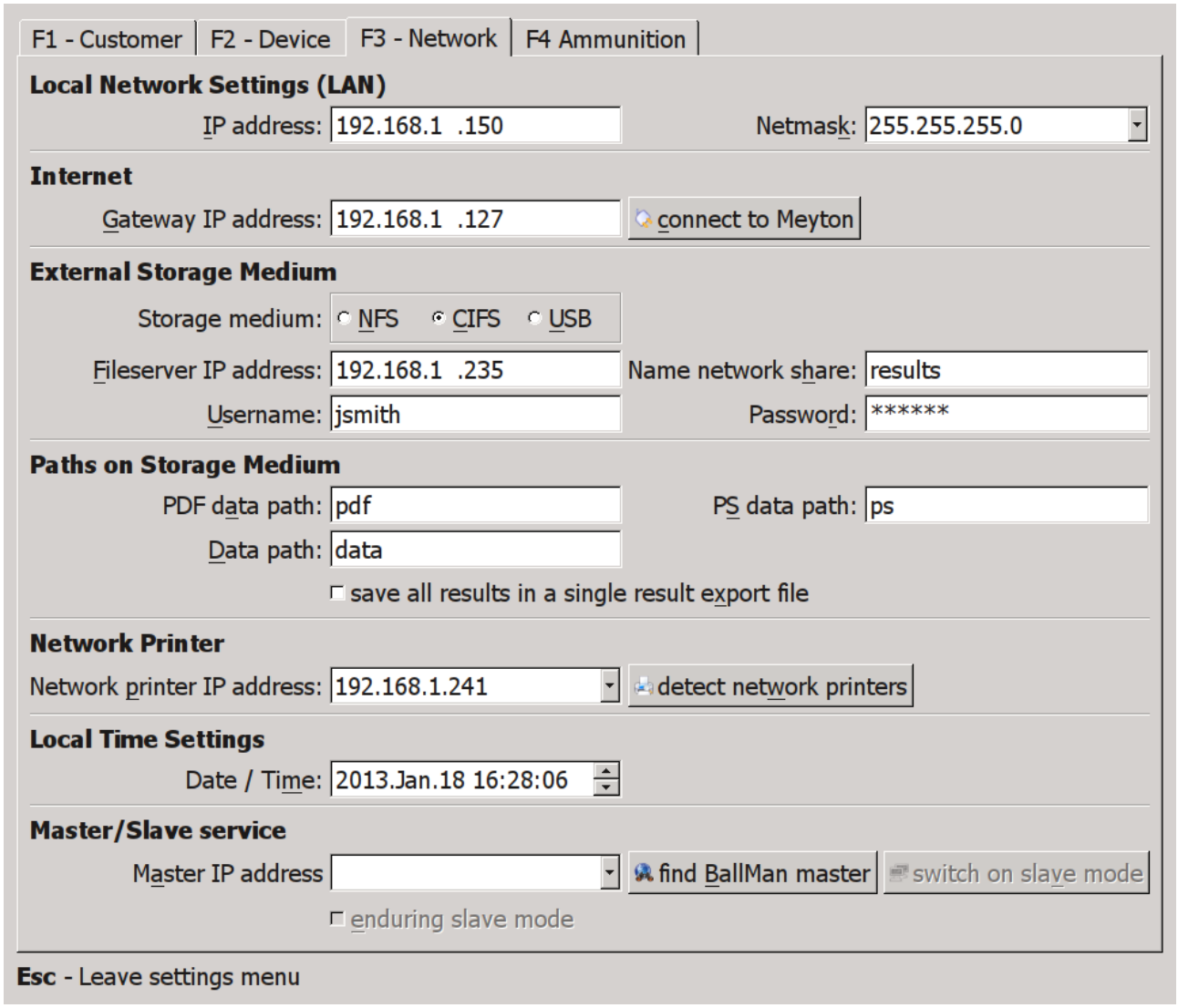


After that you only have to type in the distance between the end of the weapon's barrel and the Mehl ballistic velocity measurement system into the distance box at the left of the used device.

When a Mehl ballistic velocity measurement system is connected, the following special features are available:

- The summary and velocity area in the down right in the BallMan's main window are filled with hit velocity data and refreshed after every hit (see chapters 2.1.4 and 2.1.6).
- The statistical hit velocity values are inserted to the different kinds of printouts and to the result file of the BallMan. See chapter 3 for further information.

2.2.3 Network Settings (F3)



In this section you can determine the network settings of the BallMan device within the local area network (LAN). After setting the correct parameters the BallMan uses its included network interface to communicate with other network devices such as network printers or file servers.

2.2.3.1 Local Network Settings (LAN)

Here you can set the current IP address and netmask for the BallMan's network interface.

- **IP address:** Current local IP address of the BallMan device in the local network. In order to change the IP address, please type in a new address into this field and confirm with the **Enter** key.
- **Netmask:** Current netmask of the BallMan device. The netmask indicates the subnet the device is located in. You can choose the following subnets:
    - **class B** net (255.255.0.0) with a maximum of 65024 devices
    - **class C** net (255.255.255.0) with a maximum of 254 devices

2.2.3.2 Internet

In this area you can setup the BallMan system to use an existing internet connection. This is especially useful for remote servicing purposes.

- **Gateway IP address:** Here you have to type in the local IP address of the device which is connected to the Internet. Normally this is local IP address of your internet or ADSL router.
  Note: The Gateway must be located in the same subnet as the BallMan device! Possibly you can achieve this by changing the local network settings (see chapter 2.2.3.1).
- **connect to Meyton:** Use this button to establish a remote servicing connection to the Meyton server.

2.2.3.3 External Storage Medium

Because of its limited internal memory, the BallMan allows you to store ammunition test results (as .csv files) and printouts (as .ps or .pdf files) on external storage media such as USB sticks, external hard disks and shared network folders. The following kinds of external storage media are currently supported:

- **NFS:** If you choose this option the BallMan device stores ammunition test results and printouts in a shared Linux network folder using the NFS (Network File System) protocol. To use this feature you need a computer with an active NFS server program and an active share. To set up a NFS shared folder to store data, you have to type in the following values:
  - **File server IP address:** IP address of the NFS file server.
  - **Path network share:** Full path of the server's NFS share folder.
- **CIFS:** If you choose this option the BallMan device stores ammunition test results and printouts in a shared Windows network folder using the CIFS (Common Internet File System) protocol. To use this feature you need a computer with a shared CIFS network folder. The shared folder has to be writable and the must be accessible with a non password protected guest account. To set up a CIFS shared folder, you have to type in the following values:
  - **File server IP address:** IP address of the CIFS file server.
  - **Name network share:** Name of the network share.
  - **Username:** Username for accessing the netwok share. If the share is public and not password protected the can leave this field blank.
  - **Password:** Password for accessing the network share. If the share is public and not password protected you can leave this field blank.
- **USB:** If you choose this option the BallMan device stores ammunition test results and printouts on an external USB mass storage device. To use this feature you have to connect an USB stick or an external USB mass storage device to the BallMan's USB port (see chapter 1.2).
  Note: The external storage device must be formatted with the FAT32 file system.

2.2.3.4 Paths on Storage Medium

Here you can define which folders on the currently selected external storage medium (see 2.2.3.3) shall be used to store the different kinds of user data (ammunition test results and printouts). Furthermore, you can define here, if a single result export file shall be generated for every ammunition test or if one general export file shall be generated for all ammunition tests when the ammunition test results are exported (see chapter 4).

- **PDF data path:** Path relative to the storage medium's root (USB) or share folder (NFS, CIFS), which shall be used to store PDF printout data (see chapter 2.2.2.3).
- **PS data path:** Path relative to the storage medium's root (USB) or share folder (NFS, CIFS) which shall be used to store PS printout data (see chapter 2.2.2.3).
- **Data path:** Path relative to the storage medium's root (USB) or share folder (NFS, CIFS) which should be used to store ammunition test results (see chapter 4).
- **Save all results in a single result export file**: If this option is activated, the BallMan stores the results of all ammunition tests in one export file on the selected external storage medium when the function **Save data** is used. New results are always added to the already existing file. In the default settings, for every ammunition test an own result export file is generated.

Note: If the data shall be stored in subdirectories, you have to divide them, when entering the path, by means of a normal slash / and not by means of a backslash \ that is usually used under Windows! Example of a correct path statement: `/results/PDF`. ***Subdirectories, which do not exist on the medium, are automatically generated.***

2.2.3.5 Network Printer

The BallMan device can print the results of the current ammunition test on a network-compatible postscript printer. You can choose the network printer to used in this area:

- **Network printer IP address:** Here you can select the IP address of the network printer to be used. The BallMan automatically scans the current network subnet for suitable printers and displays the network addresses of these printers in this field. By activating the button **detect network printers** you can refresh the list of network printers.

2.2.3.6 Local Time Settings

Here you can change the BallMan's local time by changing the input field **Date/Time**. Switch with the **tabulator** key to the value you want to change (year, month, day, hour,...) and modify the value with the **arrow keys** (up or down).

2.2.3.7 Master/Slave mode

With this feature you can interconnect two BallMan devices, so that both devices show the same target, hit statistics and velocity statistics in their main windows. The master / slave mode is mainly used to display the progress of the current ammunition test on more than one BallMan device at the same time. This is especially useful if you have one BallMan device at the shooting range - this is the one the MEYTON measuring frame is connected to (master device) - and one BallMan device in a control room - this one has no measuring

frame connected (slave device). If you want the slave device in the control room to display the same target (and shots) as the master device, you have to switch it to slave mode.

The following steps are necessary to switch a BallMan device into the slave mode:

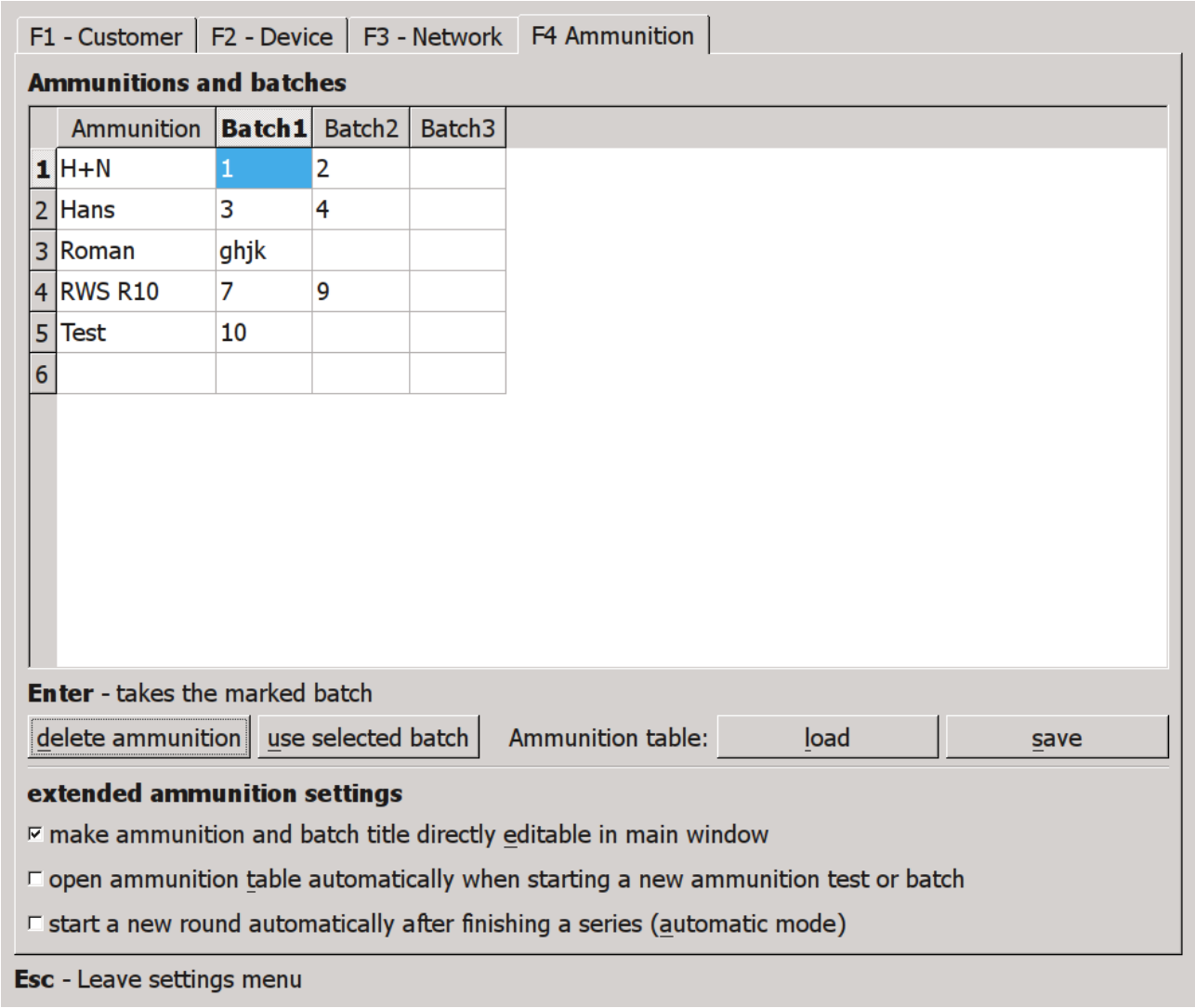
1. Activate the **find BallMan master** button. The BallMan searches for other BallMan devices in the local network and lists them in the **Master IP address** field.
2. Select the IP address of the desired BallMan master device from the **Master IP address** box and press the **switch to slave mode** button. The connection between the master and slave device is established successfully, if the label of the button switches to **switch off slave mode.**

After activating the slave mode you have the opportunity to switch on the option **enduring slave mode**. If this option is set the BallMan device automatically switches to slave mode after booting. As long as this option is set you can't change the Master/Slave mode settings.

To leave the slave mode, first disable the option **enduring slave mode** if it is set. Then activate the button **switch off slave mode**. After having left the slave mode the BallMan restores the target and hit data, which had been active before the activation of the slave mode.

2.2.4 Ammunition and batch settings (F4)

2.2.4.1 Ammunition types and batches



In this area all different kinds of ammunition with their related batches are gathered.

In this area all ammunition types with the corresponding batches are collected, which shall be available for the different ammunition tests.

Generally you can use the following scheme when inserting new kinds of ammunition and batches:

- If you want to test **different production batches of the same ammunition**, create an ammunition type, such as "Meyton .44 Magnum" and different batches, such as "Class A from 2010" and "Class A from 2008" for each different production batch.
- If you want to compare **different ammunitions of the same ammunition type**, create an ammunition type, such as "Air rifle ammunition" and different batches, such as "Meyton .44 Special" and "RWS Gold .44" for each different ammunition type.

2.2.4.1.1 Insert new ammunition

A new ammunition can be inserted as follows:

1. Switch with the arrow keys to the first free field in the **Ammunition** column at the end of the table of all already registered ammunition types. The active cell is surrounded by a dashed line.

	Sorte	Los1	Los2	Los3	Los4	Los5	Los6	Los7	Los8	Los9
1	Sorte1	Los11	Los12	Los13	Los14	Los15	Los16	Los17	Los18	
2	Sorte2	Los21	Los22	Los23	Los24	Los25	Los26	Los27	Los28	
3	Sorte3	Los31	Los32	Los33	Los34	Los35	Los36	Los37	Los38	
4	Sorte4	Los41	Los42	Los43	Los44	Los45	Los46	Los47	Los48	
5										

2. Now, please type in the new ammunition title with the keyboard and confirm it with **Enter**. The new ammunition is automatically inserted in an alphabetic order into the list of the available ammunition.

2.2.4.1.2 Change ammunition title

The title of an existing ammunition can be changed as follows:

1. Choose with the arrow keys the ammunition title within the **Ammunition** column you want to change.
2. Overwrite the old ammunition title with the new one using the keyboard and confirm with the **Enter** key. The new ammunition is automatically inserted in an alphabetic order into the list of the available ammunition.

2.2.4.1.3 Delete ammunition type

An ammunition type including the corresponding batches can be deleted as follows:

1. Choose by means of the arrow keys the ammunition type within the **Ammunition** column you want to delete.
2. Then, please press the **delete ammunition** button by using the key combination **Ctrl+L** or press the delete key on the keyboard.

2.2.4.1.4 Insert new batch

In order to insert a new batch for an already existing ammunition type, please proceed as follows:

1. Switch by means of the arrow keys to the table rows of the desired ammunition type and choose there the first free **batch** column. The active cell is surrounded by a dashed line.

2. Now, please type in the new batch title with the keyboard and confirm with **Enter**. The new batch is automatically inserted in an alphabetic order into the list of the available batches of the current ammunition.

2.2.4.1.5 Change batch title

The title of an existing batch can be changed as follows:

1. Switch with the arrow keys to the batch title cell you want to change within the desired ammunition row. The currently chosen batch cell is marked in blue.

2. Overwrite the old batch title with the keyboard and confirm with **Enter**. The batches of the ammunition test are automatically sorted in an alphabetic order after this action.

2.2.4.1.6 Delete batch

A batch of an existing ammunition type can be deleted as follows:

1. Switch with the arrow keys to the desired ammunition row of the batch you want to delete. The selected batch is marked in blue.
2. Press the delete key on the keyboard by means of the arrow keys.

2.2.4.2 Administrate ammunition data

At the right beneath the ammunition table you will find an area that serves to administrate the ammunition data. Here you can save the entire ammunition table to an external storage medium or a network folder or you can recopy the ammunition table from it. The external storage medium with the defined data path that has been selected in the network settings, is used to save and recopy the ammunition settings. Please find further information concerning the selection of the storage medium and the data path in the chapters 2.2.3.3 and 2.2.3.4.

2.2.4.3 Extended ammunition settings

In this field you can adjust additional setting, which influence the kind of input and processing of ammunition and batch data in the course of an ammunition test with the BallMan system. The following setting are available:

2.2.4.3.1 Open ammunition table automatically when starting a new ammunition test or round

If this option is activated, the ammunition selection window (F4 key) is being opened automatically, when the user starts a new ammunition test or round. This option ia activated automatically in the default settings of the BallMan and is especially useful, if the customer tests different kinds of ammunition from a fixed stock of ammunition types and batches in any order and if the customer selects a new ammunition type or batch per round. This could be the case, if the best ammunition type for the customer's weapon shall be found out.

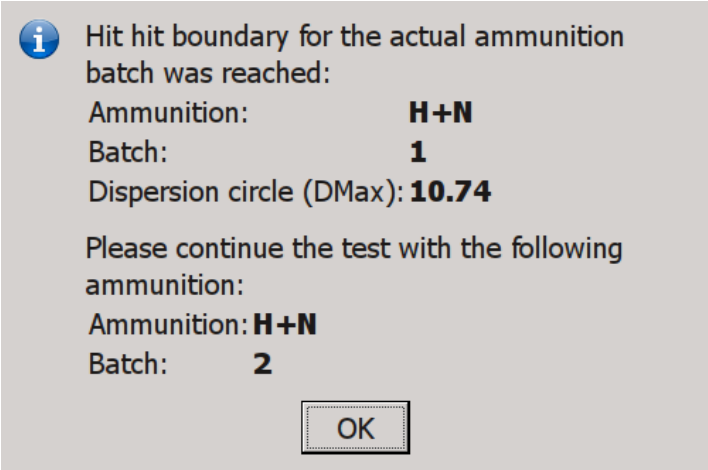
2.2.4.3.2 Make ammunition and batch title directly editable in main window

If this option is activated, you can change or enter directly ammunition and batch descriptions via the keyboard into the corresponding input fields in the main window of the BallMan. This option is especially useful when it is combined with the turning-off of the option “Open ammunition table automatically when starting a new ammunition test or round” (see chapter 2.2.4.3.1). It is intended for the case that a test is conducted without a defined number of ammunition or batches (i.e. without using the ammunition table). This might be useful for the quality assurance of ammunition manufacturers, as in most cases no batch or ammunition descriptions are assigned at that time, as a certain quality level is assigned to the ammunition not until the test had been conducted.

Note: Please bear in mind that you always have to confirm changes of the input fields “Ammunition” and “Batch” in the main window of the program with the “Enter” key. Furthermore, a modification of the ammunition title effects that the batch description is reset and that the cursor moves directly to the field “Batch”. When a new ammunition test or round is started, the cursor moves automatically to the field “Ammunition”.

2.2.4.3.3 Start a new round automatically after finishing a series (automatic mode)

If this option is activated, the BallMan leads the user automatically through the ammunition test. In doing so, the program processes automatically step by step all ammunition types and batches of the ammunition table (see chapter 2.2.4.1). If the specified number of series hits is reached (see the chapters 2.1.1.3 and 2.2.2.5), a new round is started automatically. Furthermore, the user is informed about the results (DMax) of the current round and requested to switch to the next ammunition type.



If all ammunition types and batches have been completed in the automatic mode, the user is requested if a new ammunition test shall be started. If the user affirms this, the dialogue “new ammunition test” appears automatically (see chapter 2.1.1.2). There the user can select how the data of the completed ammunition test shall be processed (e.g. create a printout and store results in an external storage medium). If the user chooses a print option, the printout that had been selected in the print settings (see chapter 2.2.2.3) is generated automatically.

Note: If the printouts "All series on one target" or "All series on one target + separate target for each series" had been chosen, the result of the best round of the ammunition test is printed in the automatic mode.

The automatic mode is especially useful, if your ammunition tests are conducted according to the same scheme and if the number and the sequence of the ammunition types and batches to be tested is fixed. As most of the actions are conducted automatically in this mode, even the handling for users, who are not familiar with the BallMan system, is very simple and self-explanatory.

Further indications: As the number of rounds within an ammunition test is limited to 8, you can test in the automatic mode a maximum of 8 different ammunition batches. When creating the ammunition list for the automatic mode, please ensure that this number is not exceeded. Besides, when the automatic mode is activated, the options 2.2.4.3.1 and 2.2.4.3.2 can no longer be selected, as this would not be reasonable in this case.

3 Print results

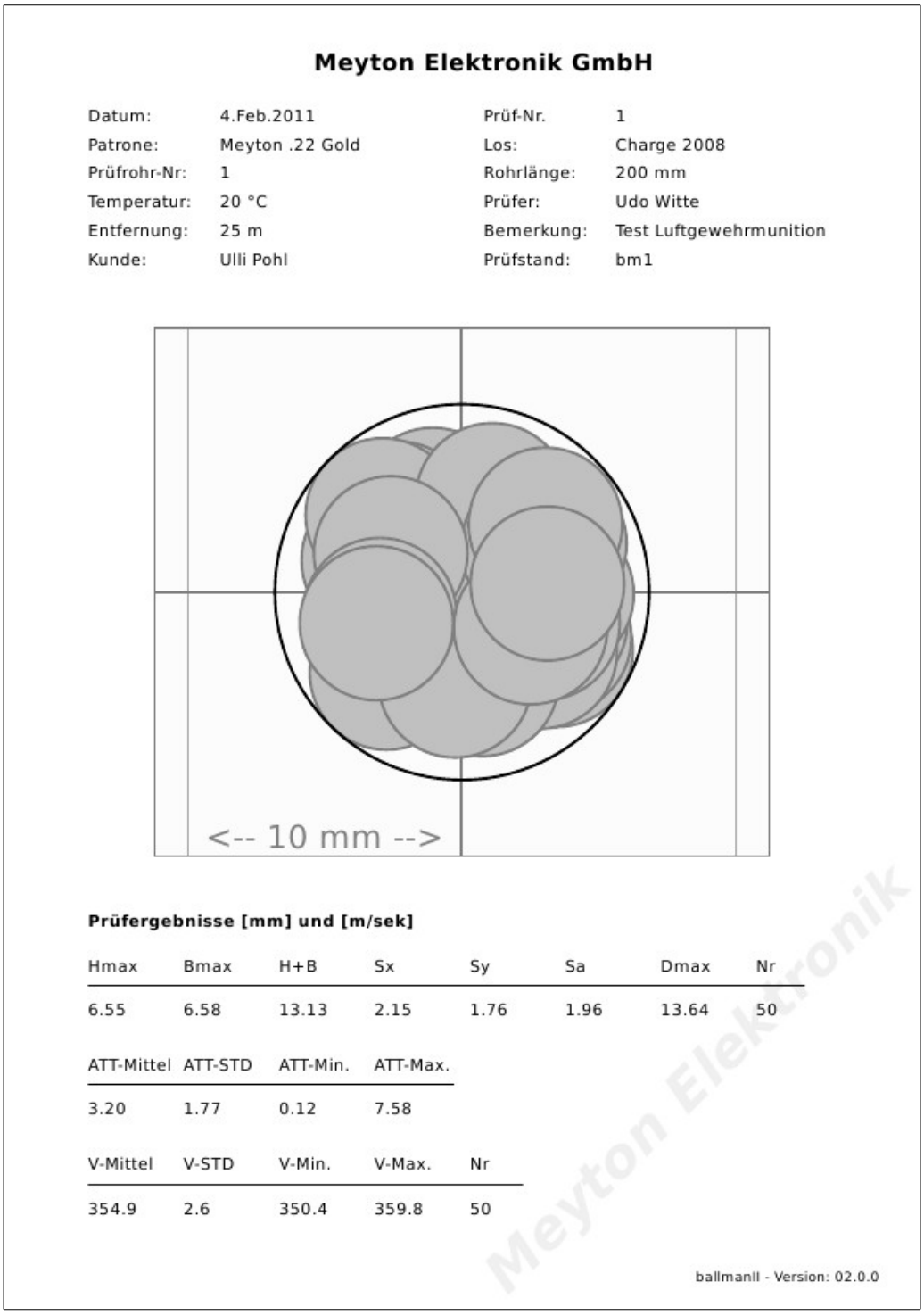
The BallMan software can create different types of printouts to visualize the results of an ammunition test. These printouts can be printed on a network printer or stored into a PDF or PS file (depending on the current printer settings). The BallMan currently provides six different kinds of printouts.

You can select the actual printout type in the printer settings (see chapter 2.2.2.3). To create a printout simply press the **print** key in the BallMan main window. The six different kinds of printouts can also be printed directly by pressing one of the hotkeys **F5 - F10** in the BallMan main window. A detailed description of the statistical hit values that appear in the printouts can be found in chapter 1.1.

By activating the **Hit distance statistic** option in the printer settings (see chapter 2.2.2.3), additional DHH (Distance Hit Hit) statistics are added to the printouts. When using a Mehl ballistic speed measurement system, the hit velocity statistics are also added to some printouts.

Furthermore, you can adjust the information that shall appear in the **page header** of the printouts according to your own requirements. Please find further information in chapter 2.2.2.4.

3.1 Printout - All series on one target (F5)



Meyton Elektronik GmbH

Datum:	4.Feb.2011	Prüf-Nr.	1
Patrone:	Meyton .22 Gold	Los:	Charge 2008
Prüfrohr-Nr:	1	Rohrlänge:	200 mm
Temperatur:	20 °C	Prüfer:	Udo Witte
Entfernung:	25 m	Bemerkung:	Test Luftgewehrmunition
Kunde:	Ulli Pohl	Prüfstand:	bm1

Prüfergebnisse [mm] und [m/sek]

Hmax	Bmax	H+B	Sx	Sy	Sa	Dmax	Nr
6.55	6.58	13.13	2.15	1.76	1.96	13.64	50

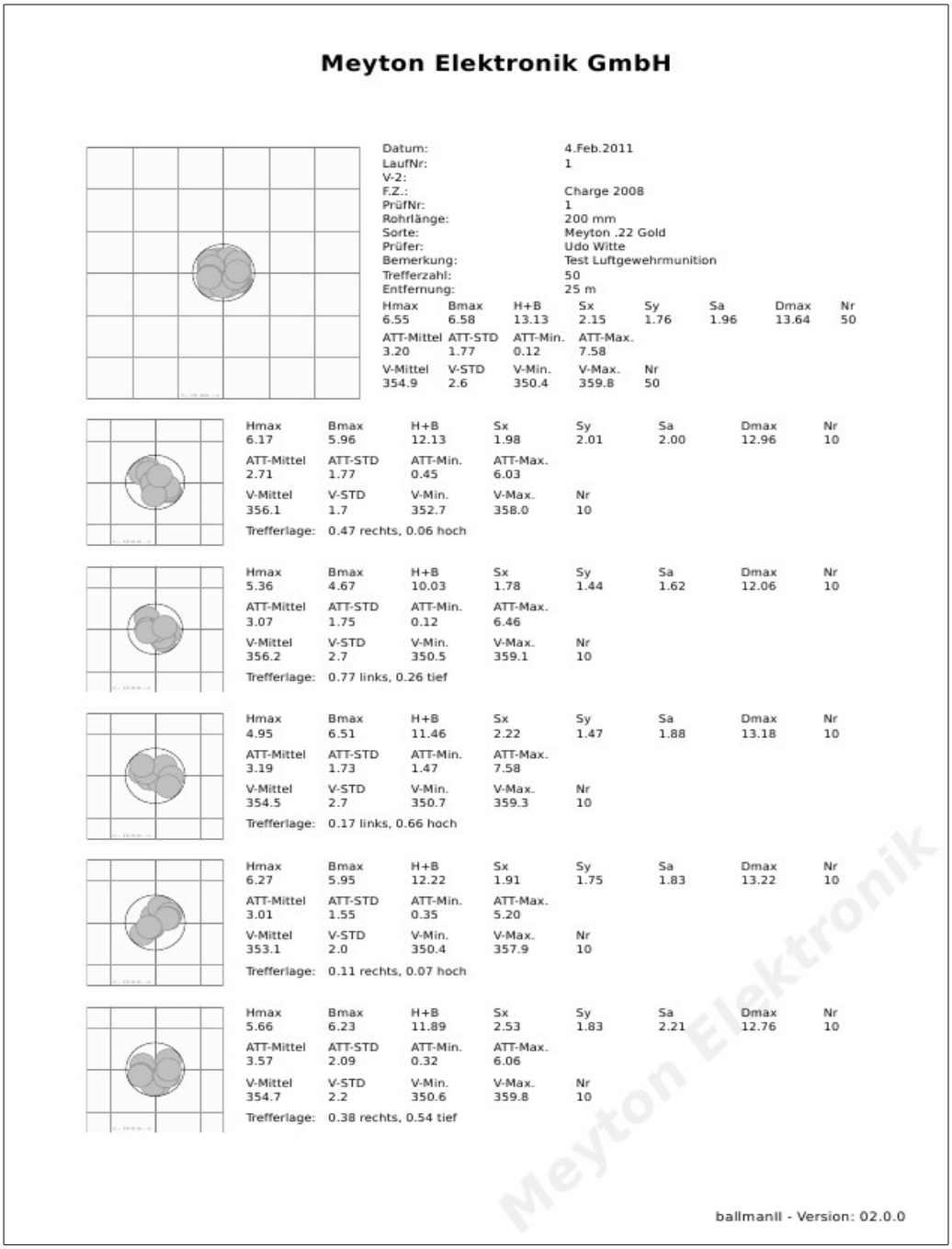
ATT-Mittel	ATT-STD	ATT-Min.	ATT-Max.
3.20	1.77	0.12	7.58

V-Mittel	V-STD	V-Min.	V-Max.	Nr
354.9	2.6	350.4	359.8	50

ballmanII - Version: 02.0.0

This printout presents the results of the current batch. The hits of all batch series are displayed on one big target. Beneath the target you will find a table with the statistical hit values, which are calculated from all hits of the current batch.

3.2 Printout - All series on one target + separate target for each series (F6)



Meyton Elektronik GmbH

Datum:	4.Feb.2011
LaufNr:	1
V-2:	
F.Z.:	Charge 2008
PrüfNr:	1
Rohrlänge:	200 mm
Sorte:	Meyton .22 Gold
Prüfer:	Udo Witte
Bemerkung:	Test Luftgewehrmunition
Trefferzahl:	50
Entfernung:	25 m

Hmax	Bmax	H+B	Sx	Sy	Sa	Dmax	Nr
6.55	6.58	13.13	2.15	1.76	1.96	13.64	50

ATT-Mittel	ATT-STD	ATT-Min.	ATT-Max.
3.20	1.77	0.12	7.58

V-Mittel	V-STD	V-Min.	V-Max.	Nr
354.9	2.6	350.4	359.8	50

Hmax	Bmax	H+B	Sx	Sy	Sa	Dmax	Nr
6.17	5.96	12.13	1.98	2.01	2.00	12.96	10

ATT-Mittel	ATT-STD	ATT-Min.	ATT-Max.
2.71	1.77	0.45	6.03

V-Mittel	V-STD	V-Min.	V-Max.	Nr
356.1	1.7	352.7	358.0	10

Trefferlage: 0.47 rechts, 0.06 hoch

Hmax	Bmax	H+B	Sx	Sy	Sa	Dmax	Nr
5.36	4.67	10.03	1.78	1.44	1.62	12.06	10

ATT-Mittel	ATT-STD	ATT-Min.	ATT-Max.
3.07	1.75	0.12	6.46

V-Mittel	V-STD	V-Min.	V-Max.	Nr
356.2	2.7	350.5	359.1	10

Trefferlage: 0.77 links, 0.26 tief

Hmax	Bmax	H+B	Sx	Sy	Sa	Dmax	Nr
4.95	6.51	11.46	2.22	1.47	1.88	13.18	10

ATT-Mittel	ATT-STD	ATT-Min.	ATT-Max.
3.19	1.73	1.47	7.58

V-Mittel	V-STD	V-Min.	V-Max.	Nr
354.5	2.7	350.7	359.3	10

Trefferlage: 0.17 links, 0.66 hoch

Hmax	Bmax	H+B	Sx	Sy	Sa	Dmax	Nr
6.27	5.95	12.22	1.91	1.75	1.83	13.22	10

ATT-Mittel	ATT-STD	ATT-Min.	ATT-Max.
3.01	1.55	0.35	5.20

V-Mittel	V-STD	V-Min.	V-Max.	Nr
353.1	2.0	350.4	357.9	10

Trefferlage: 0.11 rechts, 0.07 hoch

Hmax	Bmax	H+B	Sx	Sy	Sa	Dmax	Nr
5.66	6.23	11.89	2.53	1.83	2.21	12.76	10

ATT-Mittel	ATT-STD	ATT-Min.	ATT-Max.
3.57	2.09	0.32	6.06

V-Mittel	V-STD	V-Min.	V-Max.	Nr
354.7	2.2	350.6	359.8	10

Trefferlage: 0.38 rechts, 0.54 tief

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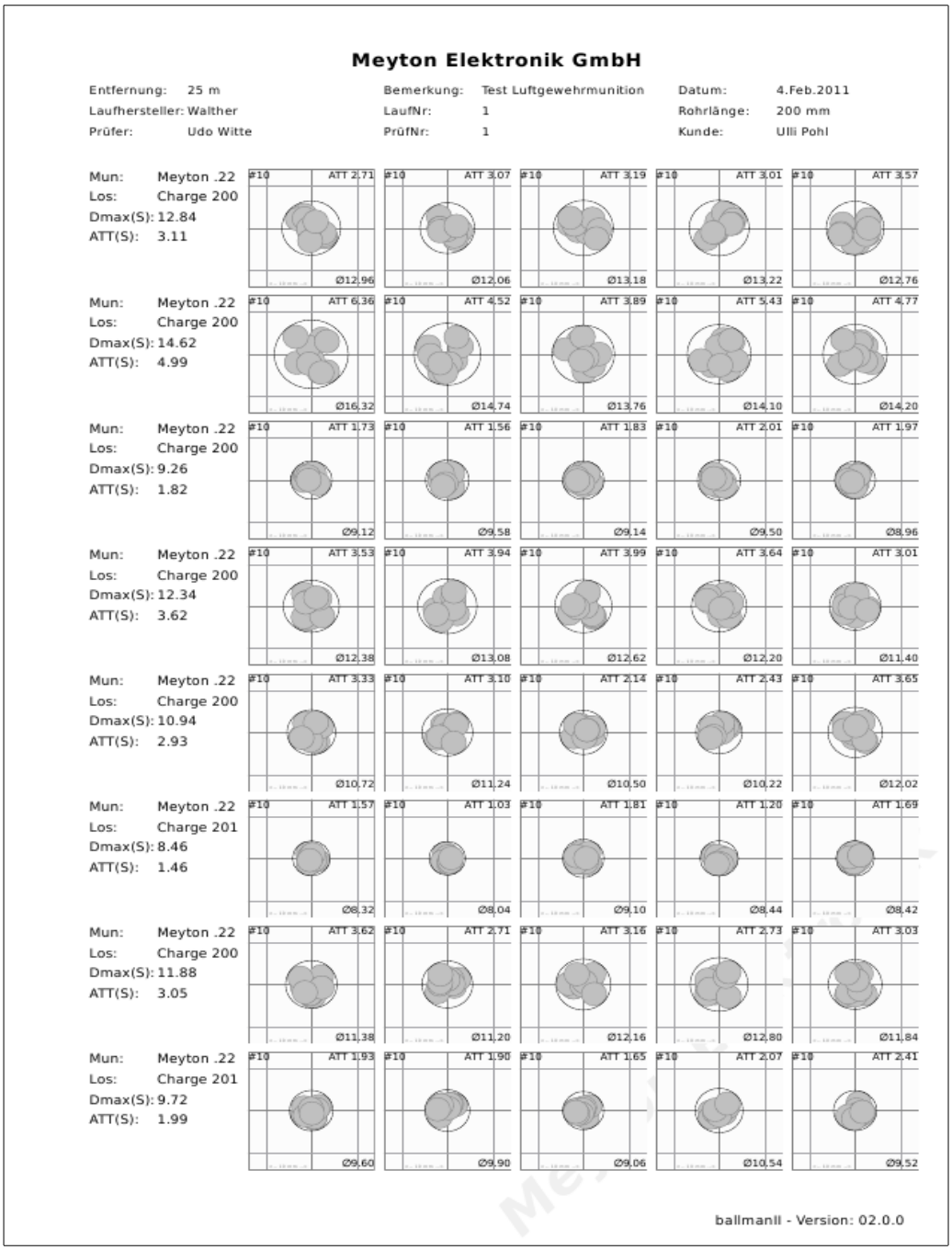
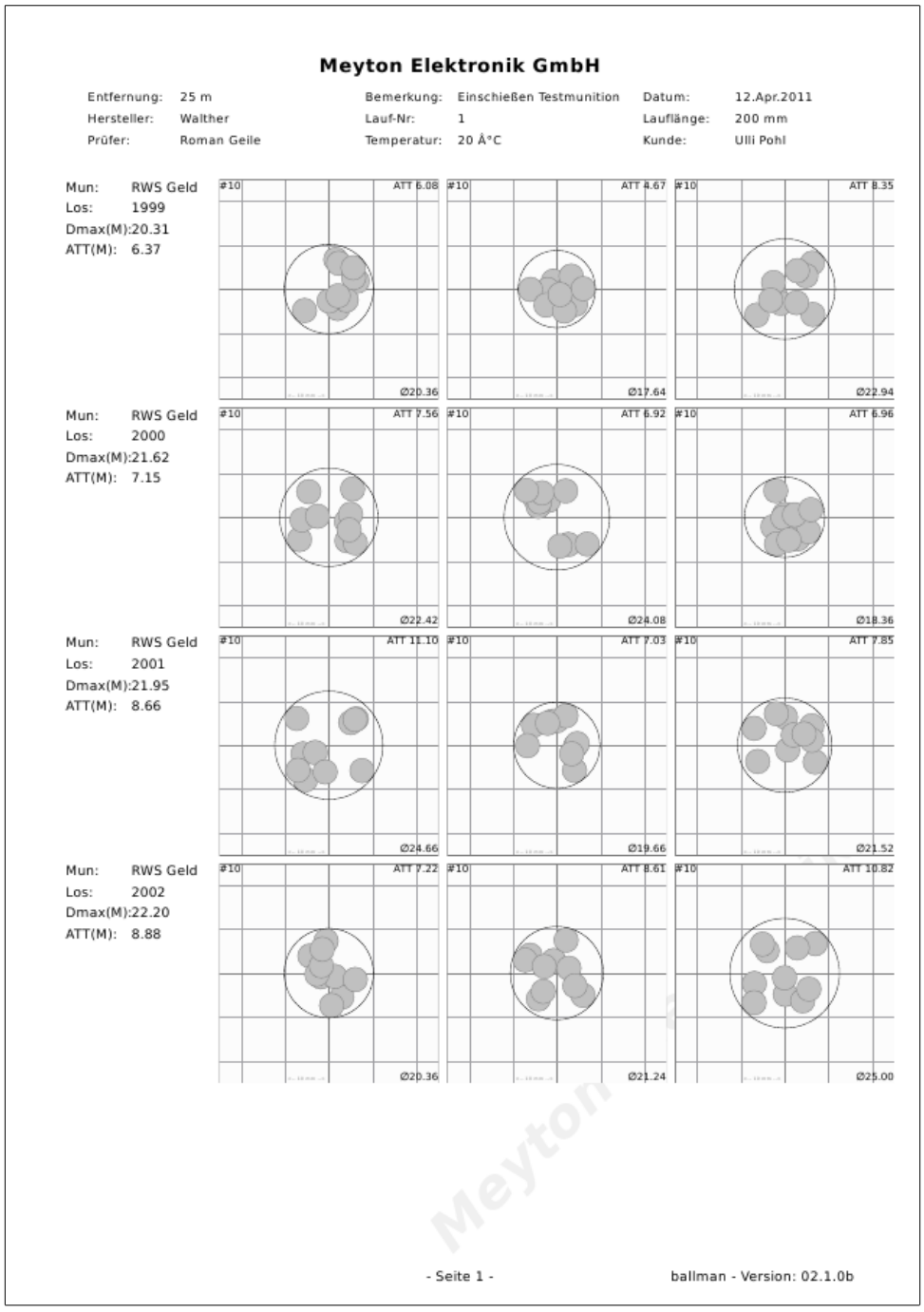
This printout presents the results of the current batch. The hits of all batch series are displayed on one big target. On the right you will find a hit statistic, which is calculated from the data of all hits of this batch. Beneath the big target up to 5 smaller targets with the hits of the single batch series and the corresponding hit statistics are displayed. In addition, the series position is shown for every series. The series position is the distance between the mean value of all hits of the whole batch and the mean value of the hits of a batch series.

3.3 Printout - 5 series per row and 8 batches per page (small targets) (F7)



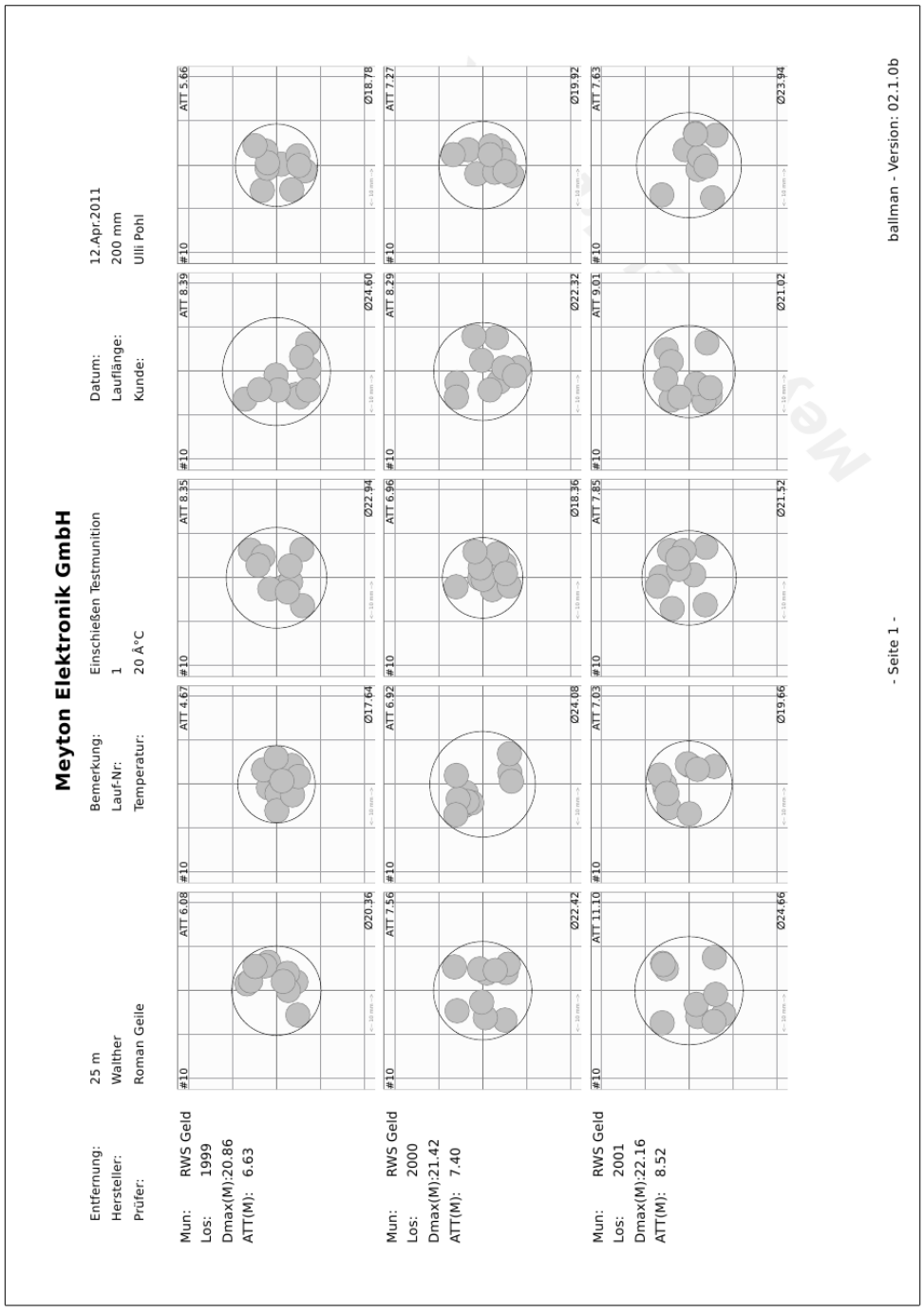
This printout presents the test results of a complete ammunition test. Up to 8 batches are printed on one page. For each batch the statistical hit data and up to 5 targets with the hits of the single batch series are displayed in one row. The target size is 28 x 28 mm.

3.4 Printout - 3 series per row and 4 batches per page (big targets) (F8)



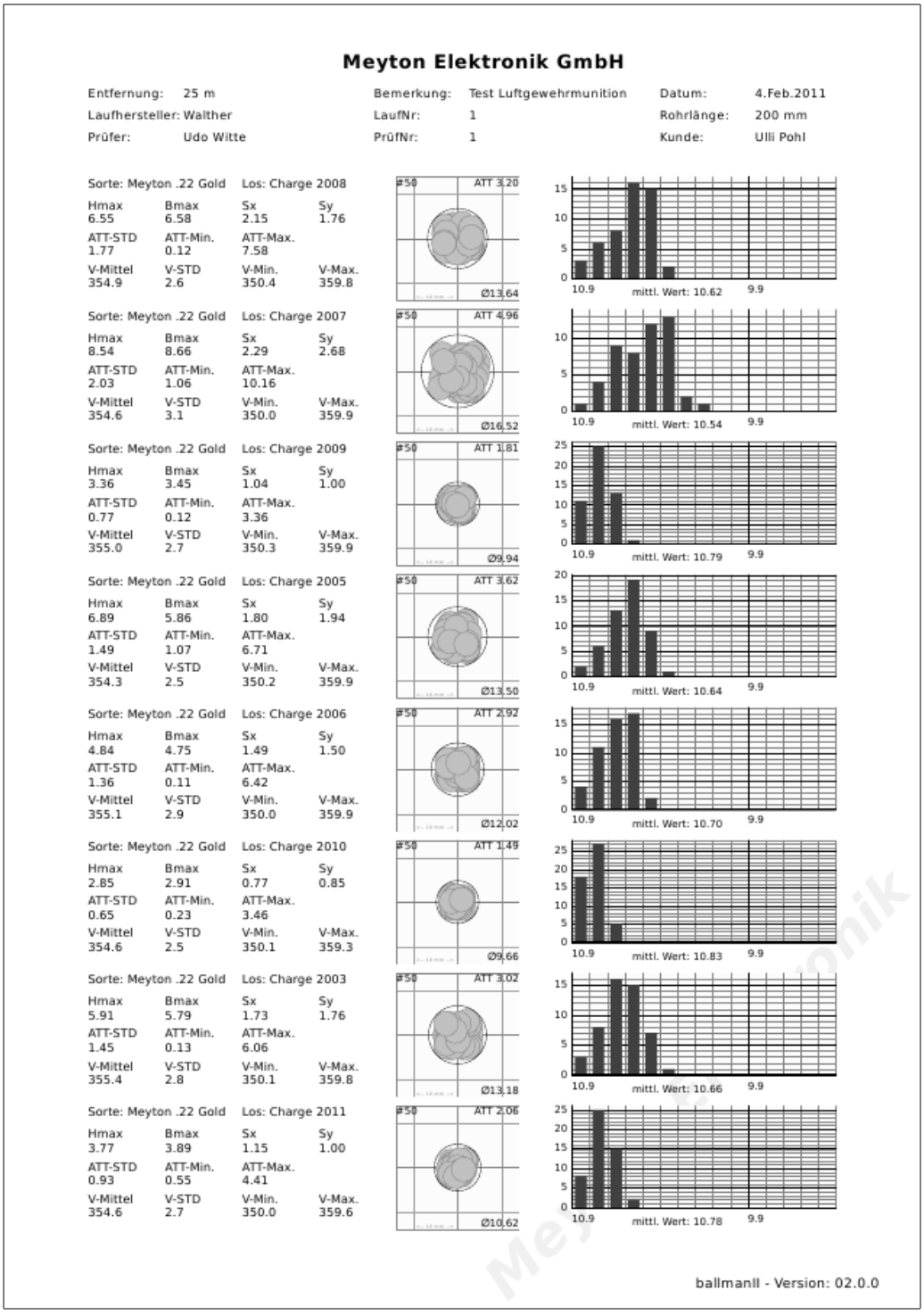
This printout presents the test results of a complete ammunition test. Up to 4 batches are printed on one page. For each batch the statistical hit data and up to 3 targets with the hits of the first 3 batch series are displayed in one row. The target size is 50 x 50 mm.

3.5 Printout - 5 series per row and 3 batches per page (medium targets, landscape format) (F9)



This printout presents the test results of a complete ammunition test. Up to 3 batches are printed together on one page in the landscape format. For each batch the statistical hit data and up to 5 targets with the hits of the single batch series are displayed in a row. The target size is 45 x 45 mm.

3.6 Printout - Hit statistics, target with hit circle, ring value graph (F10)



Meyton Elektronik GmbH

Entfernung: 25 m | Bemerkung: Test Luftgewehrmunition | Datum: 4.Feb.2011
Laufhersteller: Walther | LaufNr: 1 | Rohrlänge: 200 mm
Prüfer: Udo Witte | PrüfNr: 1 | Kunde: Ulli Pohl

Sorte	Los	Hmax	Bmax	Sx	Sy	ATT-STD	ATT-Min.	ATT-Max.	V-Mittel	V-STD	V-Min.	V-Max.	ATT	Ø	mittl. Wert
Meyton .22 Gold	Charge 2008	6.55	6.58	2.15	1.76	1.77	0.12	7.58	354.9	2.6	350.4	359.8	3,20	13,64	10.62
Meyton .22 Gold	Charge 2007	8.54	8.66	2.29	2.68	2.03	1.06	10.16	354.6	3.1	350.0	359.9	4,96	16,52	10.54
Meyton .22 Gold	Charge 2009	3.36	3.45	1.04	1.00	0.77	0.12	3.36	355.0	2.7	350.3	359.9	1,81	9,94	10.79
Meyton .22 Gold	Charge 2005	6.89	5.86	1.80	1.94	1.49	1.07	6.71	354.3	2.5	350.2	359.9	3,62	13,50	10.64
Meyton .22 Gold	Charge 2006	4.84	4.75	1.49	1.50	1.36	0.11	6.42	355.1	2.9	350.0	359.9	2,92	12,02	10.70
Meyton .22 Gold	Charge 2010	2.85	2.91	0.77	0.85	0.65	0.23	3.46	354.6	2.5	350.1	359.3	1,49	9,66	10.83
Meyton .22 Gold	Charge 2003	5.91	5.79	1.73	1.76	1.45	0.13	6.06	355.4	2.8	350.1	359.8	3,02	13,18	10.66
Meyton .22 Gold	Charge 2011	3.77	3.89	1.15	1.00	0.93	0.55	4.41	354.6	2.7	350.0	359.6	2,06	10,62	10.78

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This printout presents the results of a complete ammunition test. Up to 8 ammunition batches are printed together on one page. For each batch the statistical hit data, a target with all hits of the batch and a ring value frequency histogram are displayed in one row. The ring value histogram displays how often the ring values from 10.9 to 9.5 were scored within this batch. For calculating the hit values for the histogram, the target is centered to

the point of gravity of all batch hits. This means that the center point of the printed target is the point of gravity of the batch hits.

4 Store results

The BallMan software can store the results of the current ammunition test into a CSV (Character Separated Values) file. CSV is a structured plain text file format, which is used for data exchange. CSV data files can be processed with spreadsheet software such as Microsoft Excel or Open Office Calc. The data in the BallMan's result CSV file are arranged in rows an columns. Each line of the file represents a spreadsheet row, which can be divided into multiple columns. The columns within a row are separated from each other by a semicolon character ";". In order to create a result file in the CSV format, please press the key combination **Ctrl+S** or use the save option when starting a new ammunition test. Before data can be stored, you have to set at first a storage medium and a storage path in the network settings of the BallMan (see chapters 2.2.3.3 and 2.2.3.4).

Usually, an own CSV result file is generated on the external storage medium for every ammunition test. By means of the option **save all test results to a single result export file** (see chapter 2.2.3.4) you can change this performance and determine that the results of all ammunition tests shall be stored in one single export file and that new results shall always be added to this file.

The following data are stored in the BallMan's result file:

- Line 1: This line contains the headlines of the available data columns.
- Line 2..n: These lines contain the results of the current ammunition test including the results of all batches and all batch series. These lines can be divided into two different groups:
    1. For every batch you will find a data row containing the summarized results of all batch hits. In these batch result rows all data columns are filled. All batch result rows are marked in gray in the example file in chapter 4.3. More information about the structure of a batch result row can be found in chapter 4.1.
    2. Each batch result row is followed by up to 5 series result rows. These series result rows contain the statistical hit data of a batch series. Series results rows can be easily distinguished from batch result rows, because they do not contain data in the first 17 columns. Series result rows are marked in white in the example file in chapter 4.3. More information about the structure of a series result rows can be found in chapter 4.2.

4.1 Batch result row

A batch result row contains the summarized results of a batch and consists of the following data columns (see chapters 2.2.1 and 2.2.2):

1. **Ammunition:** Name of the current ammunition test.
2. **Batch:** Name of the current batch.
3. **Tester:** Name of the person performing this ammunition test.
4. **TestNo:** Test number of the actual ammunition test (see chapter 2.2.1.3).
5. **Customer:** Name of the customer the ammunition test was done for.
6. **Caliber:** Caliber of the tested ammunition in hundredth millimeter.
7. **Distance [m]:** Distance between the test weapon and the measuring frame in meter.
8. **Barrel no.:** Precise identification characteristics of the barrel (number or name).
9. **Barrel length [mm]:** Length of the weapon barrel in millimeter.
10. **Barrel producer:** Manufacturer of the used weapon.
11. **Remark:** Remark for the current ammunition test.
12. **Data field 1**: Value of the first user-defined data field (see chapter 2.2.1.4)
13. **Data field 2**: Value of the second user-defined data field (see chapter 2.2.1.4)
14. **Data field 3**: Value of the third user-defined data field (see chapter 2.2.1.4)
15. **Data field 4**: Value of the fourth user-defined data field (see chapter 2.2.1.4)
16. **Data field 5**: Value of the fifth user-defined data field (see chapter 2.2.1.4)
17. **Dmax-Type:** Hit dispersion circle type used for calculating the statistical hit data (see chapter 2.2.1.1).
18. **Hit number:** Number of batch hits.
19. -31. **Dmax, Hmax, Wmax, H+W, Sy, Sx, Sa, Hit position, Series, DHH-Mean, DHH-STD, DHH-Min, DHH-Max:** Summarized statistical hit data that are calculated from all hits of the current batch. See chapter 1.1 for detailed descriptions of these values. The unit of these values is hundredth millimeter.

If a “Mehl” ballistic speed measurement system (see chapters 1.1 and 2.2.2.6) is connected to the BallMan device, the following data columns are added to each batch result row:

32.-36. **V-Mean, V-STD, V-Min, V-Max, V-No.:** Summarized statistical hit velocity statistics calculated from all hits of the current batch. See chapter 1.1 for detailed descriptions of these values. The unit of these values is tenth meters per second.

4.2 Series result row

In a series result row the first 17 columns are not filled with data, because these columns contain global batch data which are valid for all the series of the current batch. From column 18 a series result row contains the summarized results of one series of the current batch and consists of the following data columns:

18**. Hit number:** Number of hits within the current batch series.

19.-31. **Dmax, Hmax, Wmax, H+W, Sy, Sx, Sa, Hit position, Series, DHH-Mean, DHH-STD, DHH-Min, ATT-Max:** Summarized statistical hit data calculated from all hits of the current series. See chapter 1.1 for detailed descriptions of these values. The unit of these values is hundredth millimeter.

If a Mehl ballistic speed measurement system (see chapters 1.1 and 2.2.2.6) is connected to the BallMan device, the following data columns are added to each batch series result row:

32.-36. **V-Middle, V-STD, V-Min, V-Max, V-No.:** Summarized statistical hit velocities calculated over all hits of the current batch series. See chapter 1.1 for detailed descriptions of these values. The unit of these values is tenth meters per second.

4.3 Example result file

This is an example of a BallMan CSV result file after importing it into a spreadsheet software such as Microsoft Excel or Open Office Calc.

Important: While importing a CSV file with a spreadsheet software, you have to tell the program to use the semicolon character ";" as column delimiter (field delimeter) and "UTF-8" as character encoding. The numerical values within the CSV file are stored as whole numbers (without decimal dot). The unit of the length values is hundredth millimeter and the unit of the bullet velocity values is tenth meters per second. The program uses only whole numbers to prevent spreadsheet software from interpreting numerical values in a wrong way.

Ammunition	Batch	Examiner	ExaminerID	Customer	Caliber	Distance [m]	Barrel ID	Barrel length [mm]	Barrel producer	Remark	Air pressure	Tank	Sights	User-ID	Supervision	Dmax-Type
Lapua X-Act	1	Joachim Seibold	AB12345	Udo Witte	560	50	2342	450	Anschütz	Test BallMan Software	200 bar	full	Laser	23346451	Roger	Außen
Lapua X-Act	24566	Joachim Seibold	AB12345	Udo Witte	560	50	2342	450	Anschütz	Test BallMan Software	200 bar	full	Laser	23346451	Roger	Außen
RWS R10	78335	Joachim Seibold	AB12345	Udo Witte	560	50	2342	450	Anschütz	Test BallMan Software	200 bar	full	Laser	23346451	Roger	Außen

Hit number	Dmax	Hmax	Wmax	H+W	Sy	Sx	Sa	Series position	Series	DHH-Mean	DHH-STD	DHH-Min	DHH-Max	V-Mean	V-STD	V-Min	V-Max	V-No.
30	3036	1757	1842	3599	549	491	521	0.00, 0.00	0	915	458	162	1740	3546	30	3501	3599	30
10	2594	1512	1724	3236	466	529	498	1.19 rechts, 0.94 tief	1	1133	422	215	1740	3543	32	3504	3597	10
10	2478	1438	1607	3045	632	392	526	0.97 links, 2.84 hoch	2	859	473	162	1532	3546	28	3504	3589	10
10	2664	1523	1719	3242	512	408	463	0.22 links, 1.90 tief	3	753	432	230	1716	3536	27	3501	3587	10
50	2938	1805	1963	3768	562	535	549	0.00, 0.00	0	989	494	179	2209	3551	28	3502	3599	50
10	2190	1093	1517	2610	561	327	459	1.09 links, 1.09 hoch	1	967	408	179	1339	3554	25	3523	3595	10
10	2650	1757	1398	3155	403	619	522	0.03 rechts, 0.95 hoch	2	1129	442	445	1829	3548	24	3509	3594	10
10	2778	1511	1925	3436	658	496	583	2.14 rechts, 1.04 hoch	3	1215	638	235	2209	3552	28	3509	3590	10
10	2278	1648	1356	3004	386	537	468	2.74 rechts, 0.69 tief	4	870	373	289	1546	3554	28	3511	3589	10
10	2482	1726	1197	2923	494	561	529	3.81 links, 2.40 tief	5	801	441	240	1656	3548	34	3502	3599	10
20	2722	1942	1808	3750	571	587	579	0.00, 0.00	0	1031	482	338	1949	3546	25	3501	3599	20
10	2428	1670	1546	3216	525	545	535	1.24 rechts, 0.95 tief	1	880	487	338	1618	3555	22	3522	3598	10
10	2696	1942	1789	3731	588	611	600	1.24 links, 0.95 hoch	2	1153	456	566	1949	3552	22	3509	3589	10

Batch results rows are marked in gray and series result rows are marked in white. In order to keep the display clear, the table had been wrapped.