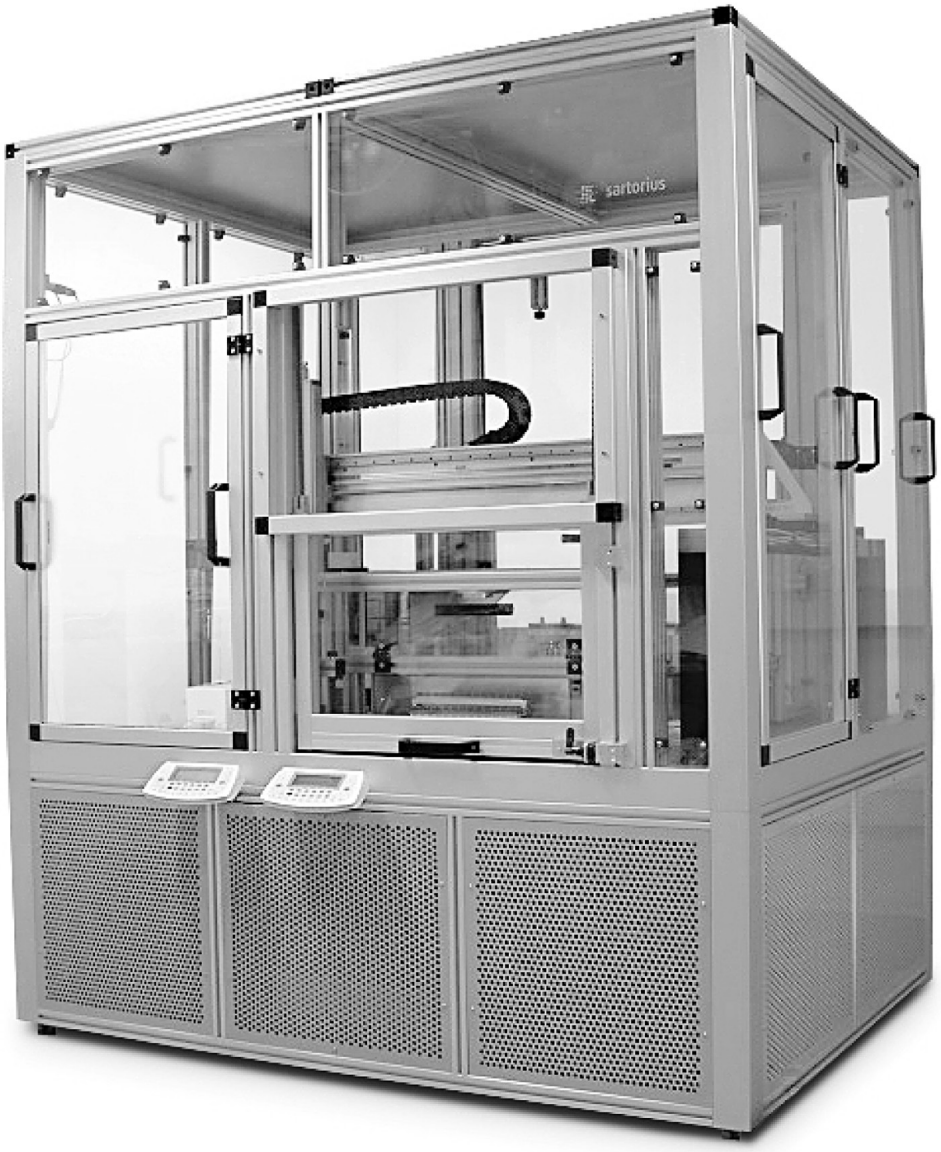
Operating Instructions

CCR Client Measuring Program in Conjunction with the Sartorius CCR 10-1000 Mass Comparator



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Safety Precautions

- Please observe the operating and safety instructions for the mass comparators.
- The electrical connections must not be detached or altered. This applies in particular to the green-yellow grounded connections between the individual components. Alterations can influence the operational safety and function of the devices.
- Do not reach into the path of the robot during operation. This poses a risk of crushing.
- Do not place any objects into the path of the robot.
- Maintenance hatches on the outer wind shield should only be opened by specially trained personnel.
- All attachments or fittings in the comparators or outer wind shield can have a significant influence on the function or the performance of the Sartorius CCR. Only attach non-magnetic parts. Electrical power dissipation can influence the performance of the Sartorius CCR.
- Check the weight stations on the reference magazine and turning magazine regularly for contamination and damage. Clean or notify the Service department if necessary.
- The Sartorius CCR must be set to standby prior to pivoting the turning magazine or opening the reference magazine doors.
- Do not place any weights that fall outside of the geometric specifications, or that are heavier than 1 kg or 10 g respectively, on the magazine stations. Weights that are too small or too large present a risk of striking something or falling off.
- Incorrectly placed specimens can be damaged or can damage the Sartorius CCR.
- If the control PC is part of a potentially susceptible network environment, regular updates to the operating system and suitable virus protection measures must be assured. Security can be increased using a firewall that releases corresponding network ports explicitly and exclusively for the remote control of the comparator and that authorizes the corresponding IP addresses for remote control.
- Cleaning of all outer surfaces may only be carried out using a soft dry cloth. Do not use solvents.
- If the robot does not start automatically after an electrical power outage, follow the restart/recovery procedure on page 28.
- The mass comparators' scale displays are on "standby" after an electrical power outage and must be switched on using the blue I/O button. Do not change this behavior in the scale configuration menu!
- Working on the robot with the doors open calls for great care, due to the risk of injury.
- Please do not touch the weight grabber because the grabber teeth are sensitive. If the grabber teeth should become bent, please inform the Sartorius Service Department and cease operation with the equipment.

Brief Description

The area of use for the CCR 10–1000 is the determination of weights from 1 mg to 1 kg. This can be determined with accuracy classes E1, E2, and F1 according to OIML R111, or class 0, class 1, and class 2 according to ASTM E617 [1]. Table 1 gives information regarding the technical data for the robot:

Table 1:

	CCR 10-1000	
	CCR-10	CCR-1000
Area of use	1 mg – 10 g	10 g – 1 kg
Max. weight	10.1 g	1002 g
Resolution	0.1 µg	1 µg
Repeatability, s* Repeatability (typical), s*	0.3 µg 0.2 µg	3 µg (<100 g) 5 µg 2 µg
Linearity	1 µg	20 µg
Electronic weighing capacity	3.5 g	2.1 g
Magazine stations	39	21
Optional magazine stations	26 – 65	2 – 39

Dimensions of the CCR 10–1000: 1900 × 1250 × 2300 mm
(width × depth × height)

10 g comparator:
The grate width of the placement stations is 1.8 mm;
any weights which can be securely placed on the grate can be used. We recommend a minimum weight diameter of 3 mm.
It is possible to use a 100 mg weight with known mass as a base for very small or irregular weights.

1000 g comparator:
The grate width of the placement stations is 4.5 mm;
any weights which can be securely placed on the grate can be used. We recommend a minimum weight diameter of 10 mm.

Environmental sensors:
The housing offers sufficient space for your own sensors;
these are also available from Sartorius if required. CAD drawings are available on request.

Software:
The CCR_Client program is detailed further in this operating manual.

Startup

Switching the System On and Off

The system should not be switched off, even during breaks in measuring. The Sartorius CCR is designed for permanent operation and requires a long warm-up period after being switched on.

Switch-on Procedure:

1. Switch on the main switch on the multiple socket outlet.
2. Switch on the control PC.
3. Check that the portal arm is in a safe corridor.
4. Switch on the control electronics.
5. Switch on the scale using the I/O button on the display.
6. Initialize the system.

Switch-off Procedure:

1. Finish job and relieve the scale of any loads.
2. Switch off the control electronics.
3. Switch off the control PC.
4. Switch off the main switch on the multiple socket outlet.

Loading and Unloading of the CCR

The Sartorius CCR enables direct mass comparisons and connected weighing in the nominal range of 1 mg to 1 kg. The weights must be manually placed on the magazine stations by the operator prior to the mass comparison. The mass comparisons desired will then be automatically processed without operator input. The weights can be removed by the operator after the mass comparisons. All magazine stations are clearly labeled. The turning magazine doors can be opened during a measurement. The reference magazine doors may only be opened if the robot is in the park position (weight grabber at highest position).

Before the Measurement/Loading Procedure:

1. Open the turning magazine door.
2. Ensure, by conducting a visual check, that the stations to be loaded are free.
3. Place the weights on the free magazine stations, taking care to place them securely and centrally. Use the ring marking to place the weights centrally. Lay wire weights in the V-channel in order to avoid twisting; see chapter on “Loading a Magazine” for more details. Do not slide the weights onto the stations, always lift them!
4. Enter magazine loading in the software.
5. Check that the robot is in the park position: weight grabber at the highest position.
6. Carefully rotate the turning magazine in the robot. Loosen the quick clamp to do this, and then tighten again after turning. Turn slowly so that the weights do not shift.
7. Start measurement.

After the Measurement/Unloading Procedure:

1. Check that the robot is in the park position: weight grabber at the highest position.
2. Open the turning magazine door.
3. Rotate the turning magazine carefully outwards. Loosen the quick clamp to do this, and then tighten again after turning. Turn slowly so that the weights do not shift.
4. Remove weights.

Information Panel

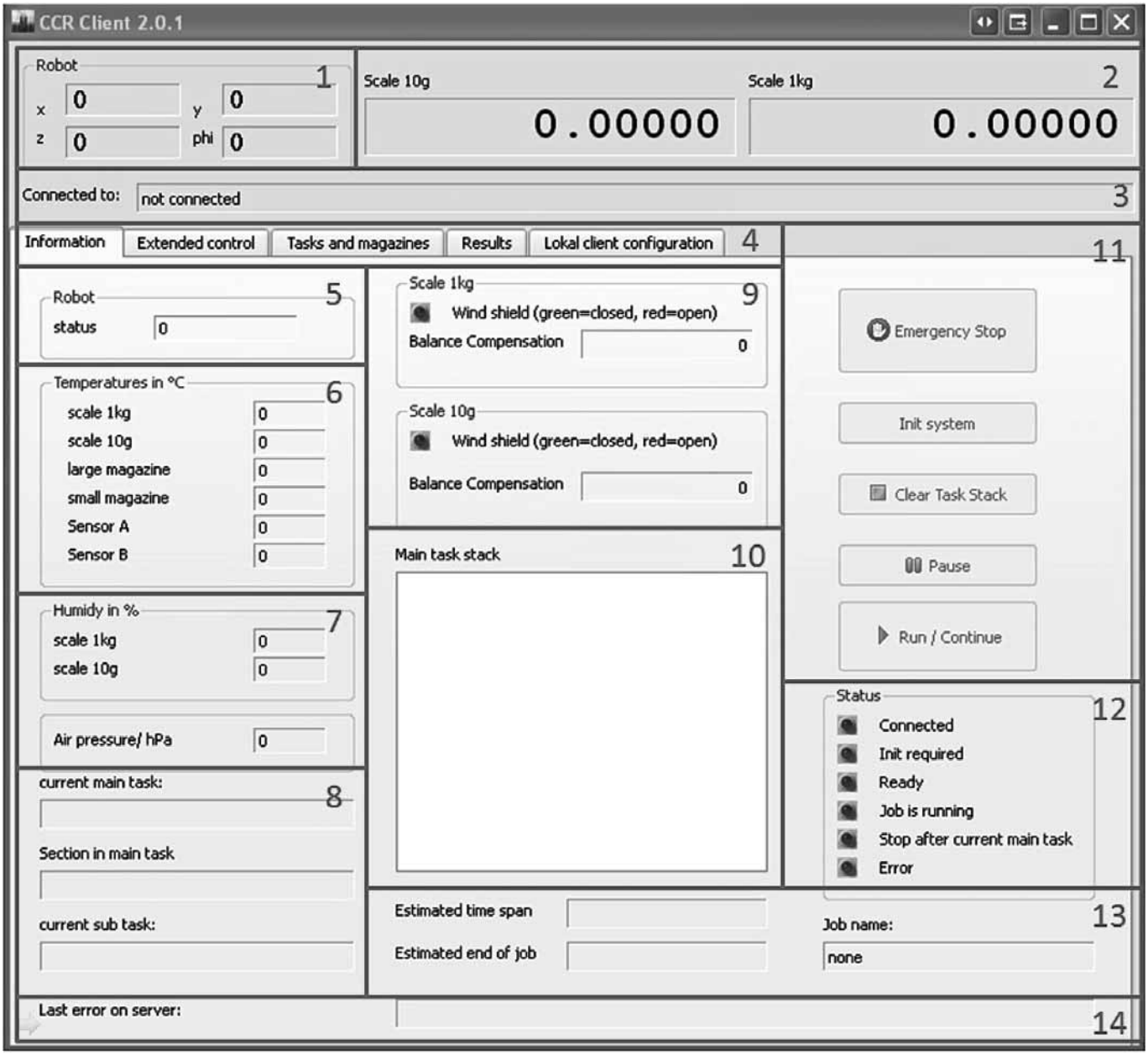


Figure 1: Information panel

1. Position and turning angle of the CCR robot weight grabber in the space
2. Current display for the 10 g and 1000 g comparators
3. Shows the current connection to a mass comparator
4. Tabs for the individual panels
   - Information displays current information about the CCR robot
   - Extended control contains control elements which are useful primarily after an emergency stop
   - Tasks and magazines contains all elements necessary to generate tasks and send them to the robot
   - Results contains the facility to display the results of current or old measurements
   - Local client configuration contains the network configuration and the location of the saved measurement results
5. Robot status
6. Shows the temperatures at the comparators, the magazines, and two additional attached sensors
7. Air humidity in the 10 g and 1000 g comparator as well as the prevailing air pressure
8. Shows which stage of the procedure the system is currently processing:
   - **Current main task:** Shows what is currently being processed, e.g. comparison of two magazine stations
   - **Section in main task:** Shows the current cycle, e.g. 6 of 7 ABBA cycles, as well as the part of the ABBA cycle being processed
   - **Current subtask:** Shows movements as well as opening and closing of the wind shield
9. Compensation of specific mass comparators, setting of the internal substitute weights

10. Shows all that still remains to be processed
11. Buttons for directing the job:
    - **Emergency stop:** Represents the emergency stop switch whereby the system halts immediately, and the weights as well as the robot remain in their present position. Press this button ONLY in the event of an emergency and not to finish a measurement!
    - **Init system:** Initialize the comparator, i.e. start the motors and the incremental counters; establish operational readiness. It is possible that the robot will move after pressing init to initialize the positioning (required once after powering up). Please take care.
    - **Clear Task Stack:** Deletes the main task stack. This button is only active if there is no job running.
    - **Pause:** The system completes the current step in the main task stack and then brings the weights back to their starting position, and the robot moves to the park position. Pause is gray/inactive as long as the robot is waiting for a job to be received or continued. Pause is active if a job is running.
    - **Run/Continue:** Starts or continues a job after it has been interrupted by pressing the Pause button. The button is gray/inactive if the Init System button has not yet been actuated, or if a measurement is already in progress.
12. Shows the current status of the connection to the robot and the job processing.
13. Estimated time remaining for the job to be processed; estimated completion time for the job; name of the current job.
14. Last error reported by server.

Extended Control

15. Moves the robot arm to the park position. If gray/inactive, please actuate the Init System.
16. Deletes the top task in the main task list.
17. Opens and closes the 1 kg comparator wind shield.
18. Opens and closes the 10 g comparator wind shield.

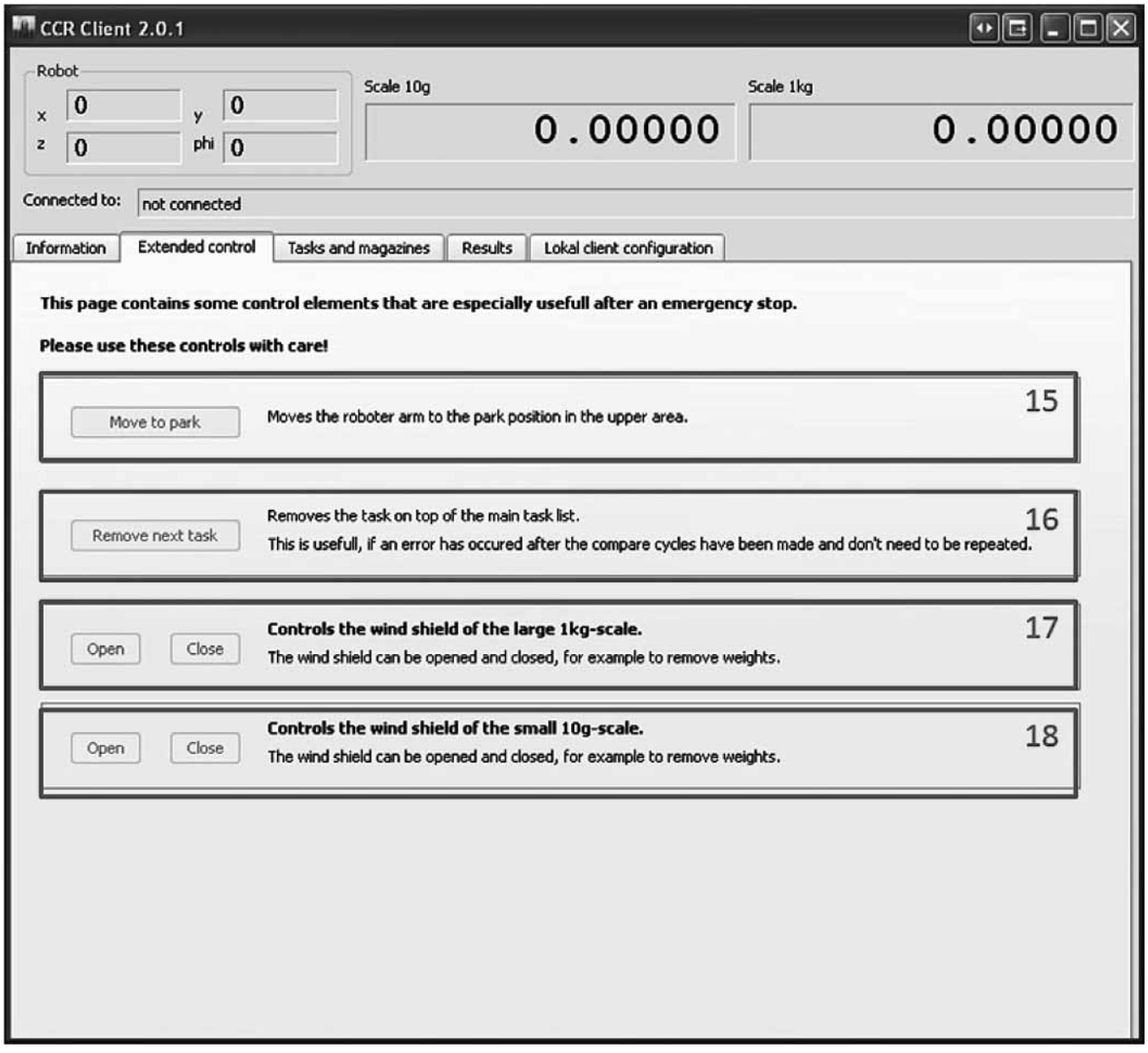


Figure 2: Extended Control panel

Tasks and Magazines

19. Composition of a job
    - **Job name:** State a name for the job
    - **Edit Allocation:** Allocate the magazine stations for the weights, as well as their dimensions
    - **Add center task:** Order to center a weight
    - **Add transfer task:** Order to transfer a weight from one magazine station to another. This can be necessary if a 10 g item must be available to both comparators
    - **Add compare task:** Order to compare two weights
    - **Add service task:** Order to create a service (more details to follow later)
20. Set the accuracy class for the complete job as well as the comparison method (whereby tasks can be edited individually and can be assigned a different accuracy level); point in time from which the processing of the job should be started
21. Create a new job and delete all current data in the Comparator Tasks, as well as in the Edit Allocation menu; load a job that has already been created, or if a job has already been created, and another must be added to it, the operator is asked if these two jobs should be merged. Here the magazine loading of the last loaded job has priority, and the old magazine loading is overwritten; see Fig. 5. The comparator tasks of the job to be loaded are added to the existing ones; overwriting the magazine loading can lead to inconsistencies, therefore the comparator tasks must be checked continuously! Save a job to a file.
22. List of tasks to be processed for the job prepared
23. Edit the selected task, move a selected task up or down, and remove selected tasks; send the task list for the comparator to the server so that this can be processed
24. List of tasks that already exist in the server ready to be processed; delete this list

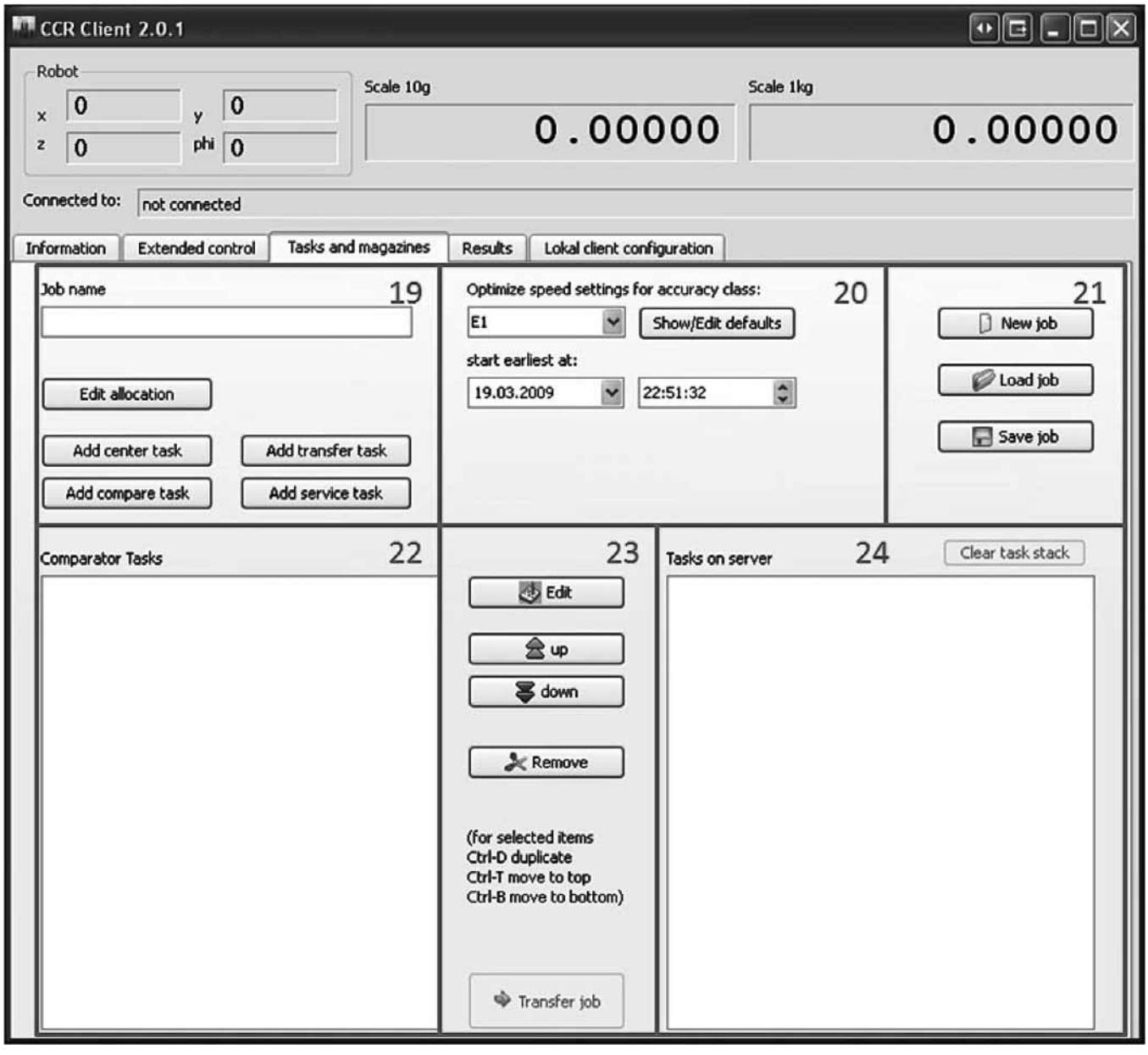


Figure 3: Tasks and Magazines panel

Magazine Allocation
The placement stations for the weights are entered into the program in the Magazine Allocation menu. There are two options here. A previously saved arrangement of weights on the magazines can be recalled via the Load button. If desired, several arrangements can be loaded, and these are then combined.
If a discrepancy should arise during this process because stations are already occupied, the weights belonging to the last loaded arrangement have priority; see Fig. 5. In the example, magazine loading arrangement 2 is loaded and added to magazine loading arrangement 1. The operator is not asked whether this loading arrangement should be merged with the other during the loading process! If this combining of the newly loaded arrangement with the current arrangement is not desired, the magazine loading arrangement must first be deleted (clear all mags) and then the desired new arrangement loaded. If you prefer to use your own arrangement of weights on the magazines, select a suitable magazine, and enter the corresponding parameters (nominal weight, possible identifiers for a weight, diameter, height) into the corresponding list. When performing these steps, ensure that the limits listed for the weight or dimensions are not exceeded or undercut. There is no maximum character length. However, no more than 20 characters should be used for the sake of legibility. Equals signs cannot be used and the name should not contain spaces (hint: use underscores). Depending on the robot configuration, up to four magazines (A-D) are available for the 1 kg comparator, as well as a maximum of four magazines (F-I) for the 10 g comparator. The magazines E1 to E3 are magazines for the 1 kg comparator, which can accept weights with larger dimensions, e.g. disk weights or buoyancy artifacts. If a complete deletion of the station distribution for the weights in the magazines is to be carried out, this can be achieved with the Clear all mags button. After completing the desired adjustments, exit the menu via the “OK” button, and the current loading of the magazine will be saved internally for the job.

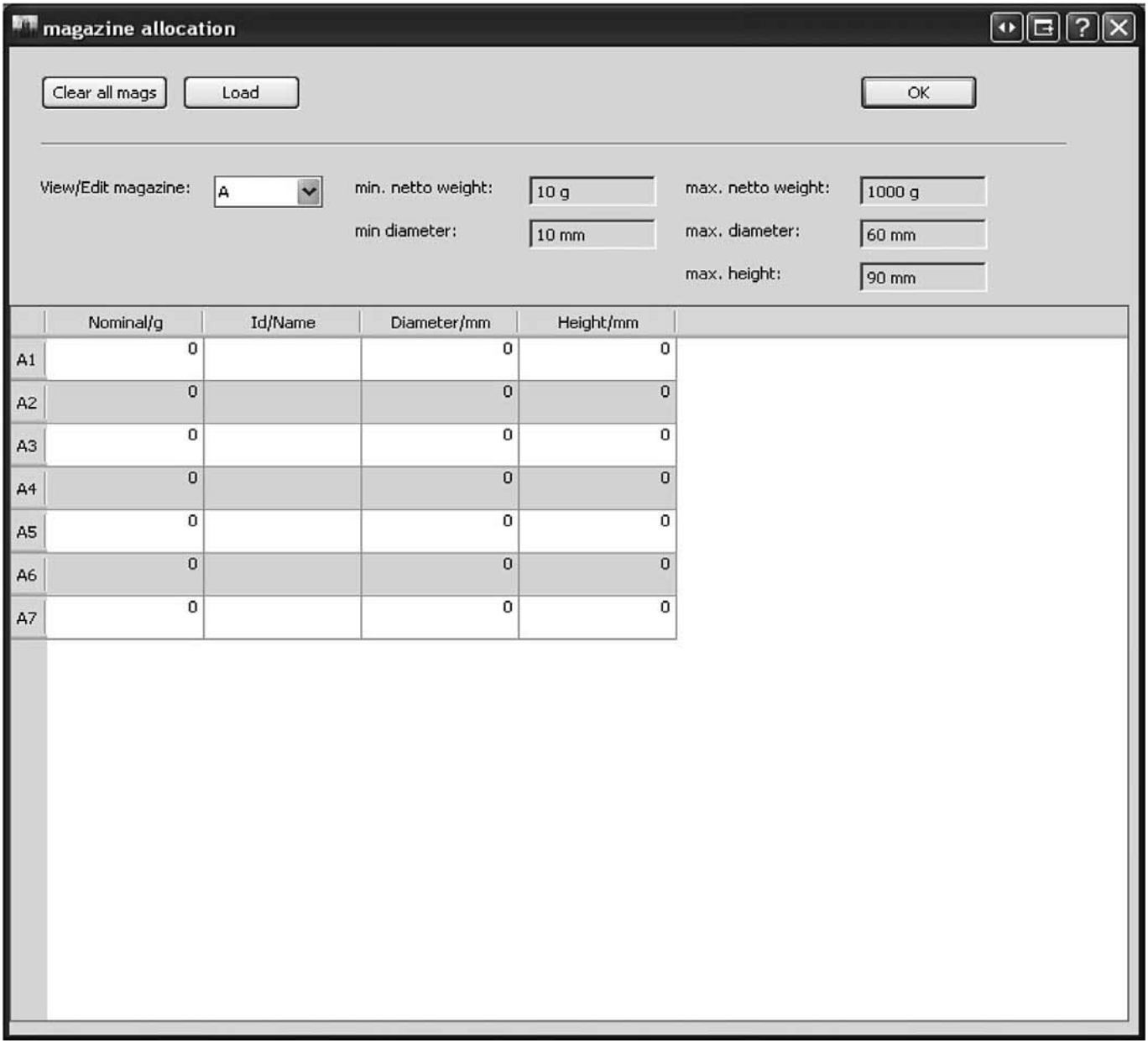


Figure 4: Magazine Allocation menu

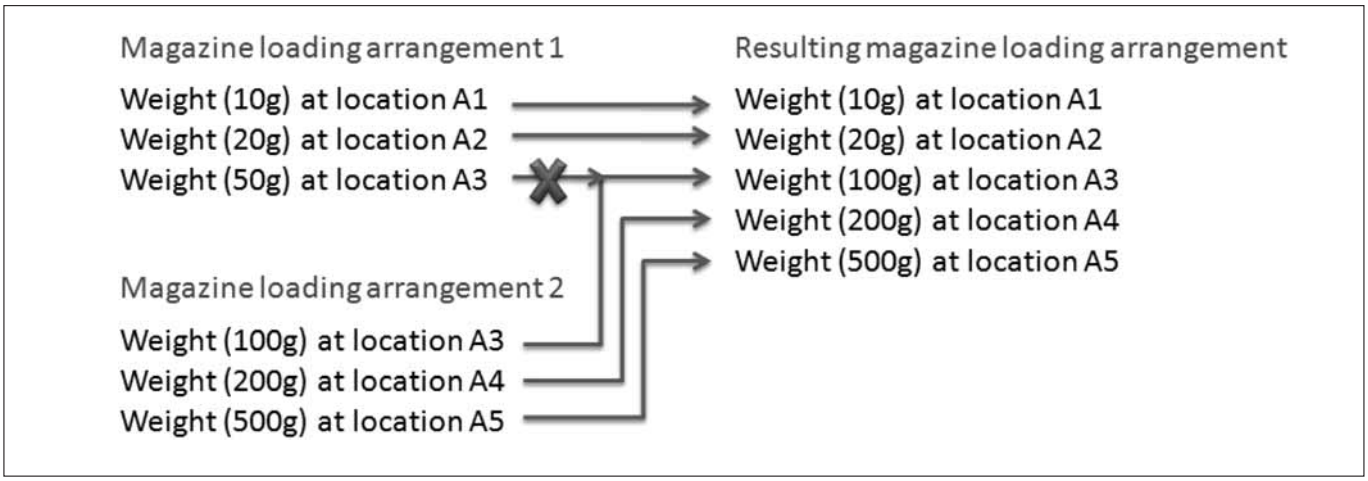


Figure 5: Combining of magazine loading arrangements

Center Task
Center Task serves to center the weight on its station, because the weights are not usually precisely centered when loaded onto the magazine. To achieve this, select a weight or several weights from the list to be centered. Here, the number of centering cycles can be adjusted as desired from 1 to 99. The default setting depends on the accuracy profile used. After selecting one or more weights and the number of centering cycles, select “OK” if the task should be entered in the comparator task list or “Cancel” if the settings should be discarded.

The centering of weights can only be carried out with the 1 kg comparator, since only this one is equipped with a Centermatic device.

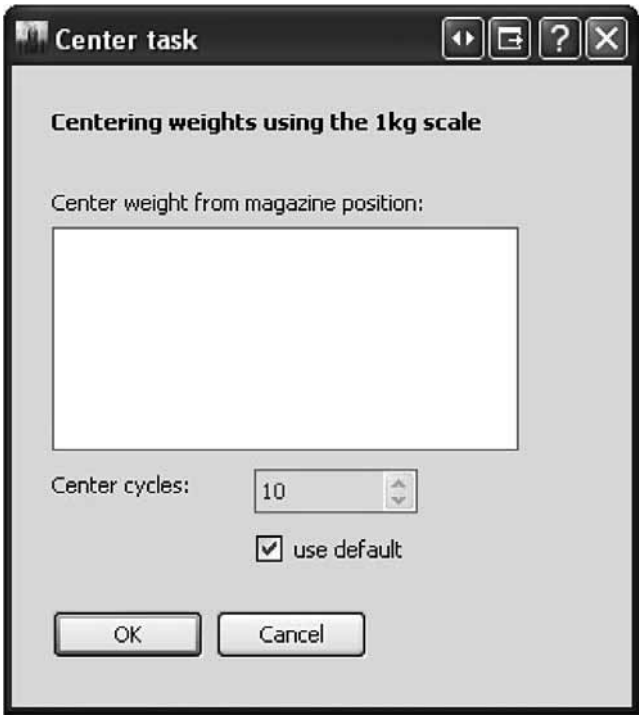


Figure 6: Center Task menu

Figure 7: Transfer Task menu

Transfer Task
The Transfer Task serves to transfer weights between the small and large magazines. As an example, a 10 g weight has been nominated to be used on both comparators. The current station and the desired station for the weight are set for transfer.
By pressing "OK," the change becomes effective, and the task is added to the comparator task list. "Cancel" discards the settings and returns to the previous menu.

Compare Task
In Compare Task, there is the option to select a comparator where the comparison is to be carried out or to measure on both comparators simultaneously. This can be advantageous if time saving is a priority. But using both comparators at the same time means that the accuracy is limited. After the comparator has been selected, select the weights to be compared with one another, either individually or in combination. The left-hand column corresponds to the 10 g comparator, and the right-hand column to the 1 kg comparator. A further menu, where profiles for the accuracy classes and the comparison method can be set, can be accessed via "Extended Settings." The "Extended Settings" allows you to overwrite the accuracy optimized manufacturers settings and should only be used when necessary. When all the necessary adjustments have been made, the comparison task is added to the comparator task list by pressing "OK." "Cancel" discards the adjustments and returns to the previous menu.

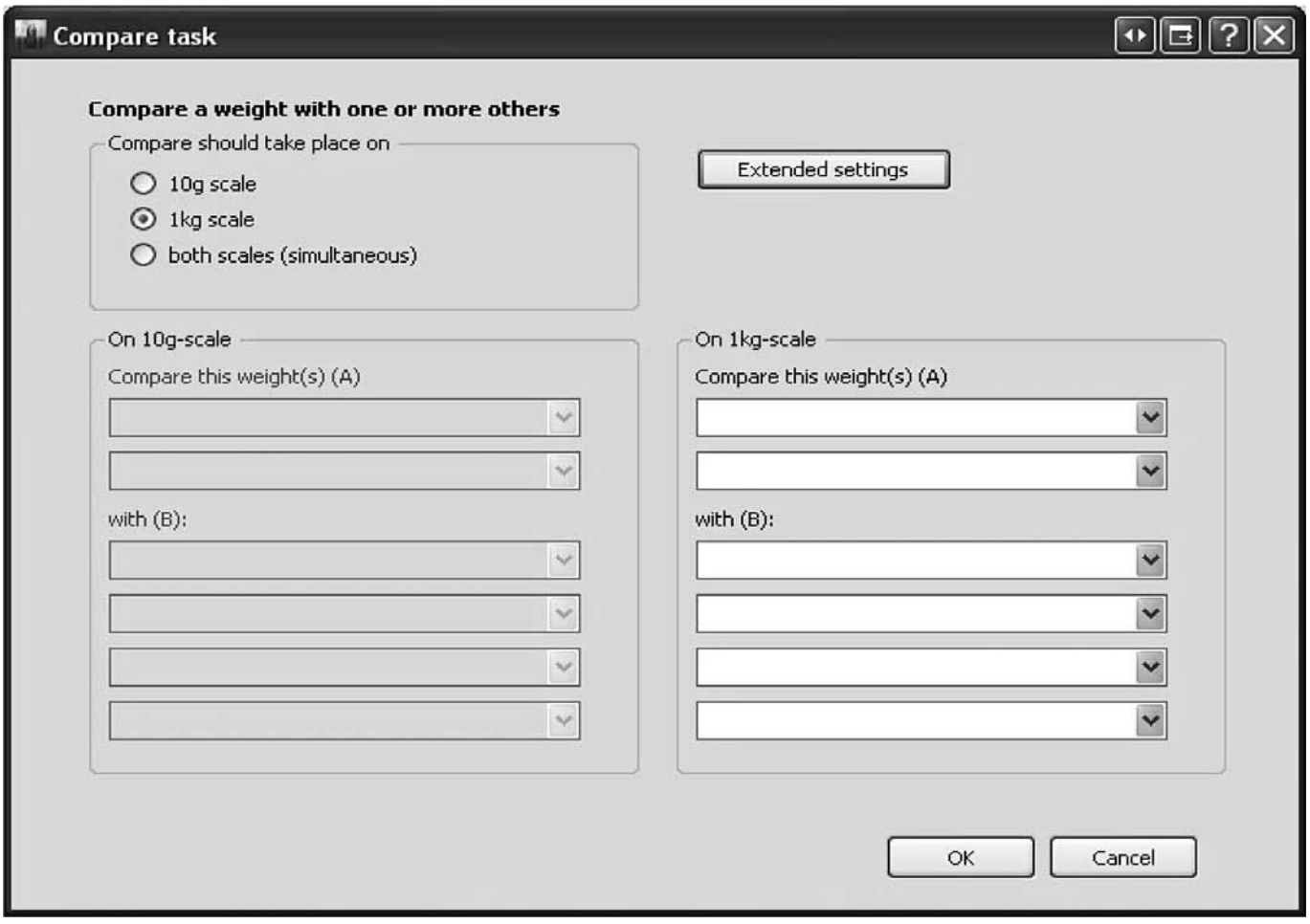


Figure 8: Compare Task menu

Compare Task – Extended Settings
The Compare Task extended settings enable an accuracy class to be set for an individual weighing process with profiles. Every profile comprises various parameters of the weighing process (e.g. drive speed of the robot). The profiles are optimized by the manufacturer for individual accuracy classes and named accordingly. Your own profiles can also be created if desired, by contacting Customer Support. ABBA is the standard comparison method set in the profiles. However, other methods (ABA ABA; ABA BAB) can be selected. The number of comparison cycles is preset depending on the profile, but can be freely selected between 1 through 99. Furthermore, a time delay (Delay) can be set for each of the comparators. This determines the time after which the measurement can begin so that the comparator can settle. The integration time for the measurement is likewise freely adjustable. During the weighing process, the 1 kg comparator offers the option of setting the centering cycles for the weights directly in Compare Task. Both comparators offer the option of setting the pre-cycles. After carrying out the selection, the settings are applied by pressing "OK." "Cancel" discards the settings and returns to the old menu.

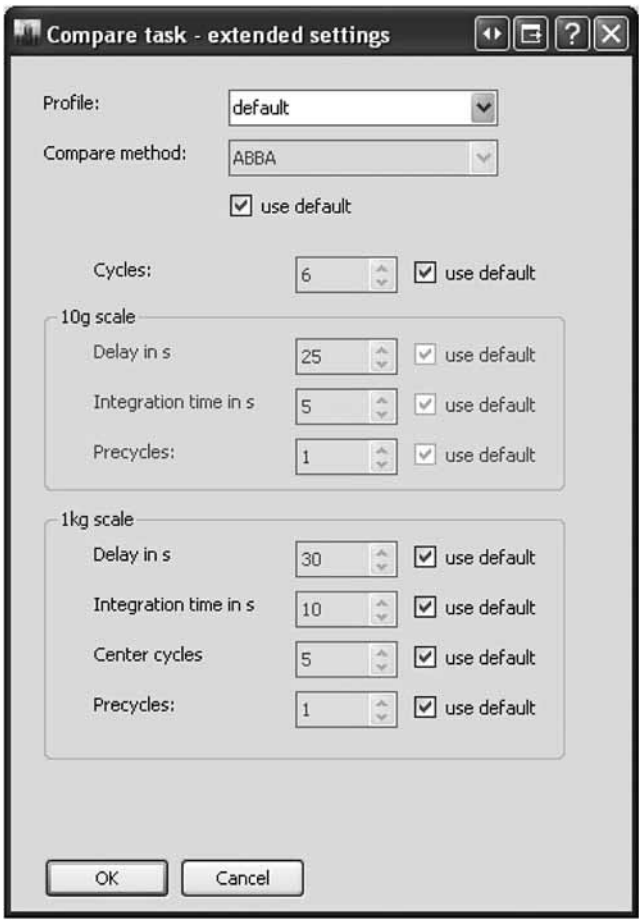


Figure 9: Compare Task – Extended Settings menu

Service Task
Service Task serves to insert a sensitivity test for a scale, to test the corner load on the 10 g comparator, to implement delays between tasks, and to calibrate a scale. After selecting the appropriate item, the selected menu is made available by pressing "Next." "Cancel" discards the task and returns to the previous menu.

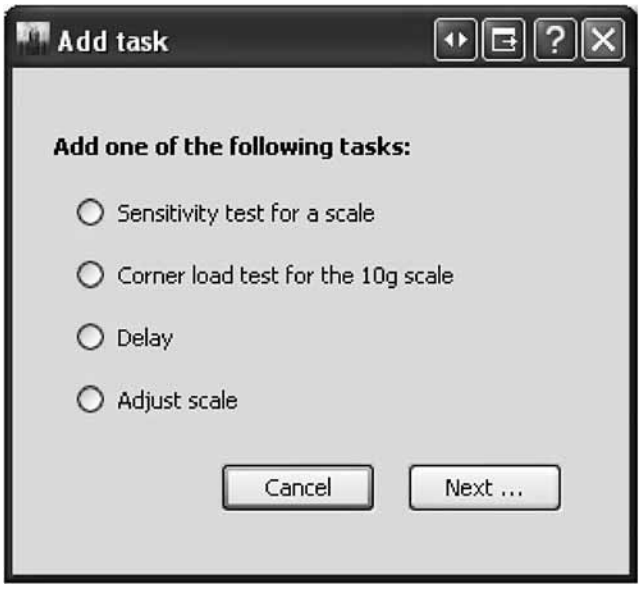


Figure 10: Service Task menu

Sensitivity Test
The menu offers the option of checking the sensitivity of each scale using a test weight. For this, the magazine station of the test weight is entered, and in the case of the 1 kg comparator, the station for a base weight is also entered. The number of measurements can be varied between 1 and 99. The "Extended Settings" button and corresponding menu are configured identically to the "Extended Settings" menu of Compare Tasks, except that it is not possible to select a comparison method. The centering of the weights is omitted from this menu.

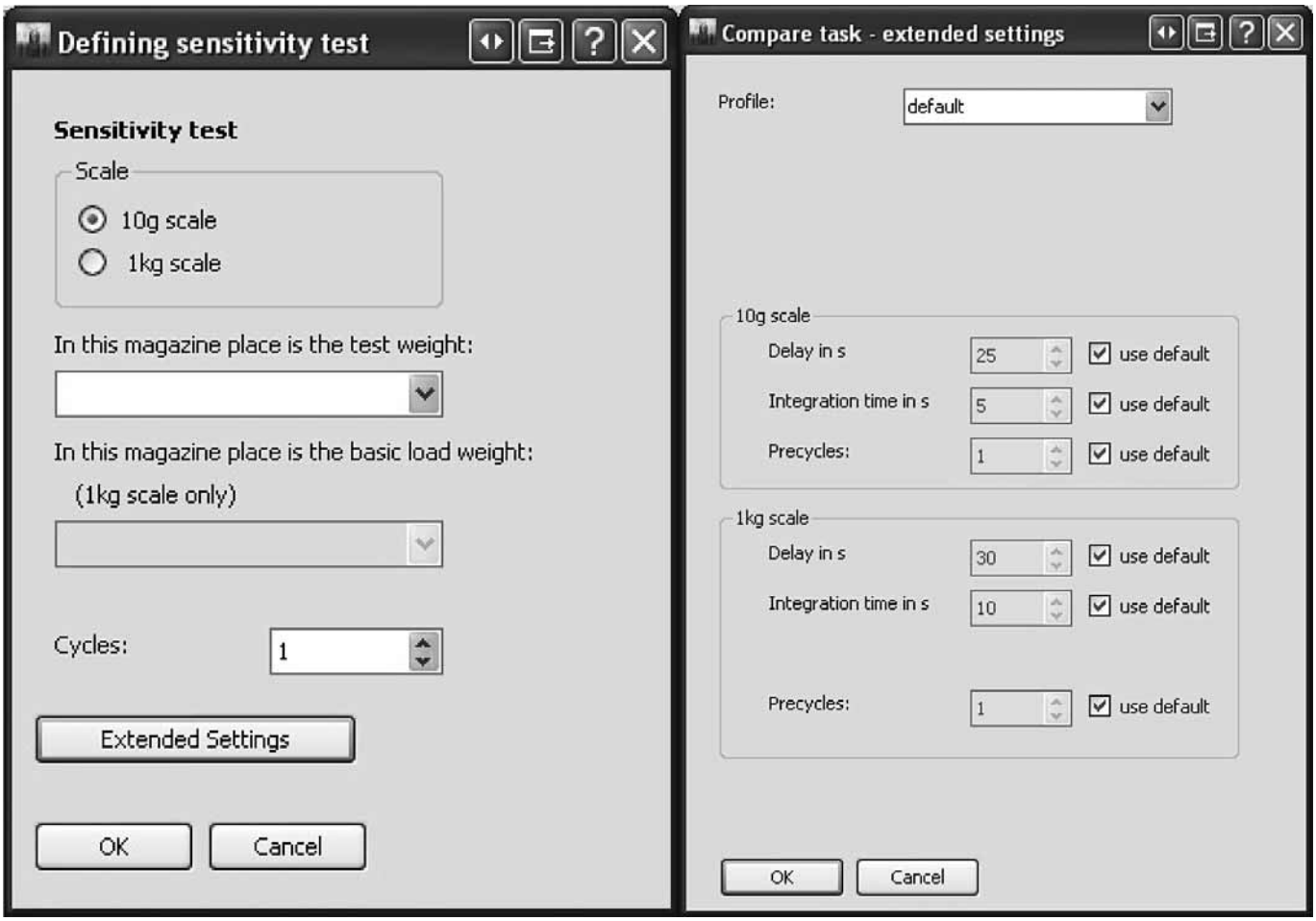


Figure 11: Sensitivity Test menu (left); Extended Settings menu of the Sensitivity Task (right)

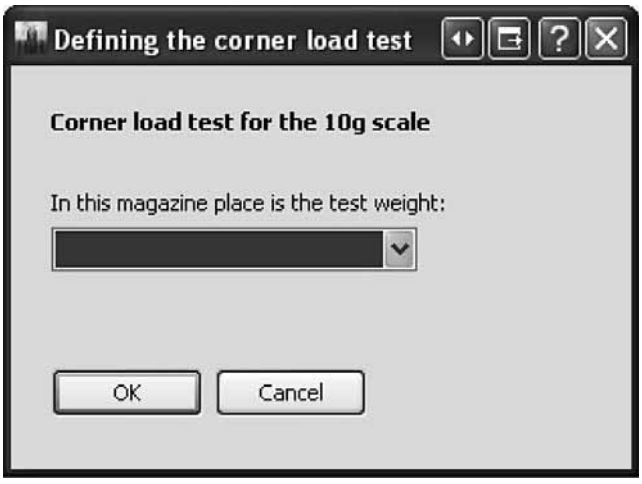


Figure 12: Corner Load Task menu

Corner Load Task
The corner load test menu creates a task to check the corner load error on the 10 g comparator. A corner load test is not possible on the 1 kg comparator side, because a Centermatic is integrated there. For the corner load test, the magazine station where the test weight is placed is selected, and this is then used to test the 10 g comparator, in order to determine the corner load error. After selecting the magazine station, the task is entered into the comparator task list by pressing "OK." "Cancel" discards all settings and returns to the previous menu.

Delay Task
Delay Task serves to insert a time delay between two tasks or before the start of a job. The selection is between a fixed delay, which can amount to seconds or hours, and a fixed point in time when the measurement can first be started or can first be continued. If neither radio button is selected, the bottom menu item is the default selection.

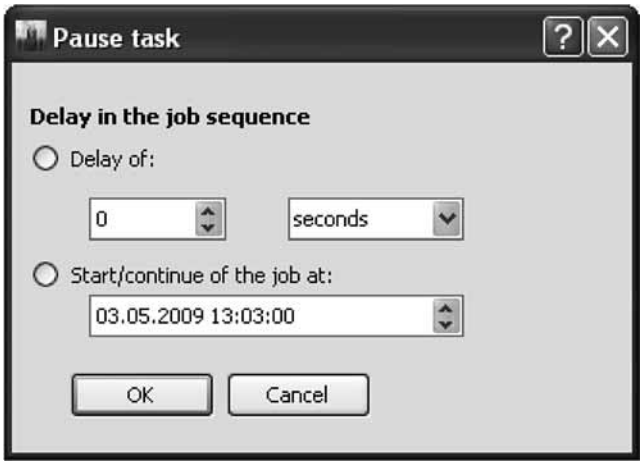


Figure 13: Delay Task menu

Adjust Scale
The Adjust Scale task is used to readjust the comparator in question. With the 10 g comparator, the corresponding magazine station where the 2 g reference weight is located is selected. For the 1 kg comparator, the magazine station where the tare weight is located is also selected. This is necessary because with 2 g, the comparator is not yet in the defined measurement range. Weights up to the diameter of a 100 g knob weight (diameter d = 44 mm) can be used as tare weights, according to OIML. Pressing "OK" exits the menu and enters the Adjust Scale task into the comparator task list. "Cancel" discards the settings and returns to the previous menu, without making any alterations.

Adjust Scale is identical to Sensitivity Test in most regards, with added effect that the comparator is adjusted here.

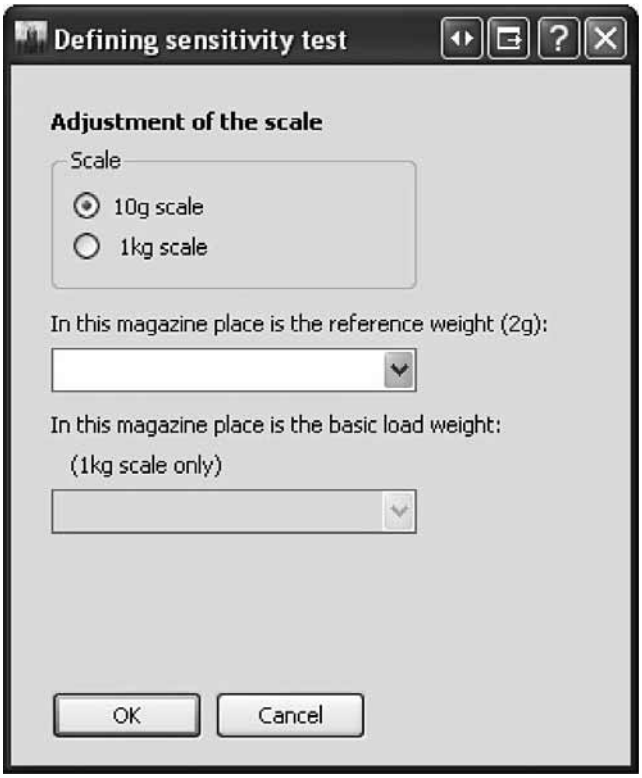


Figure 14: Adjust Scale menu

Results

The results for the current job are retrieved from the server and displayed by pressing “Refresh.” The jobs are saved on the server. TaskID indicates the comparison of two weights. Date/Time indicates when this measurement was started. The magazine stations are listed under ‘A’ and ‘B’; weight combinations can also be listed here. Value shows the value in mg. Std.Dev. is the standard deviation of the measurement and is shown in µg.
By double-clicking on a measurement, it is possible to inspect the individual results of the measurement parts. A file viewer opens for this. This then shows the individual measurements.

It is possible to have the list automatically update itself if the “refresh automatic” box is ticked; this will ensure that the list is always kept up-to-date. Furthermore, it is possible to load old measurements by clicking the “Load Old Jobs” button. Here it is possible to find the desired measurement and to display the results list.
The name of the current job is in the “Job Name” field, and the location where the results are stored is listed in the “Results have been saved to” field. This location can be any writable medium (network, server, USB stick, etc.) The default location for storing results is set in the “Local client configuration” panel;
see next page.

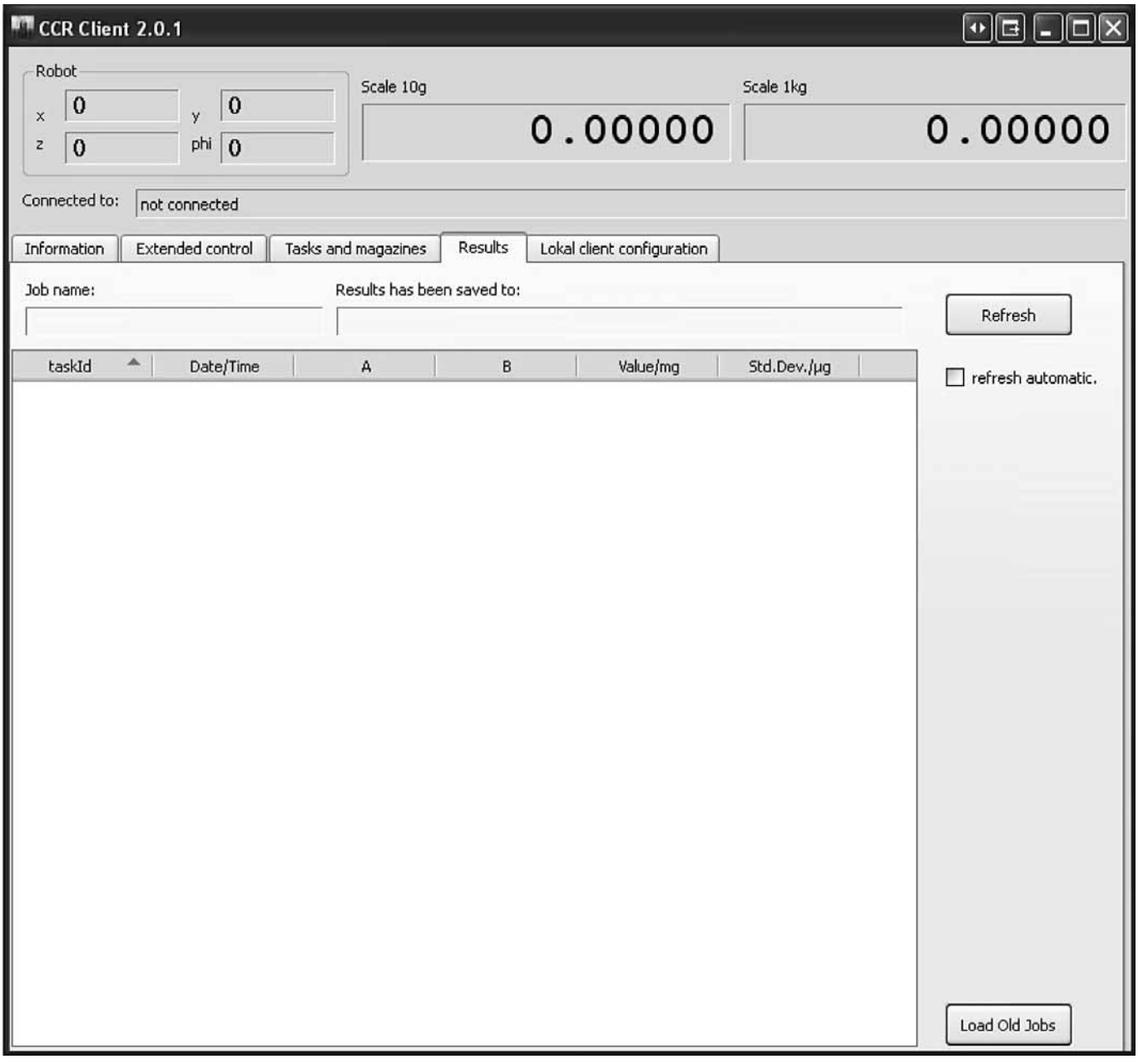


Figure 15: Results panel

Local Client Configuration

The settings for the network connection to the CCR-server can be set under this tab. Port 35320 is used as the port (see page 29). Whether or not the client is to be automatically connected to the server after startup is determined by whether the “autom. connect/reconnect” box is ticked. If it is ticked, a connection attempt is made approx. every three seconds. It is recommended that “autom. connect/reconnect” is activated.

Furthermore, the directories for the scripts and the results are freely selectable. There is also an option to save results in subdirectories with the date and time – this is also strongly recommended.

If required, Task Management can also be accessed via ScalesNet. The corresponding checkbox should be ticked for this. This results in the corresponding elements in this program being suppressed, and the CCR client can then only be used to display the current status and results.

After all the necessary information has been adjusted, this can be saved and applied via the “Save and apply” button.

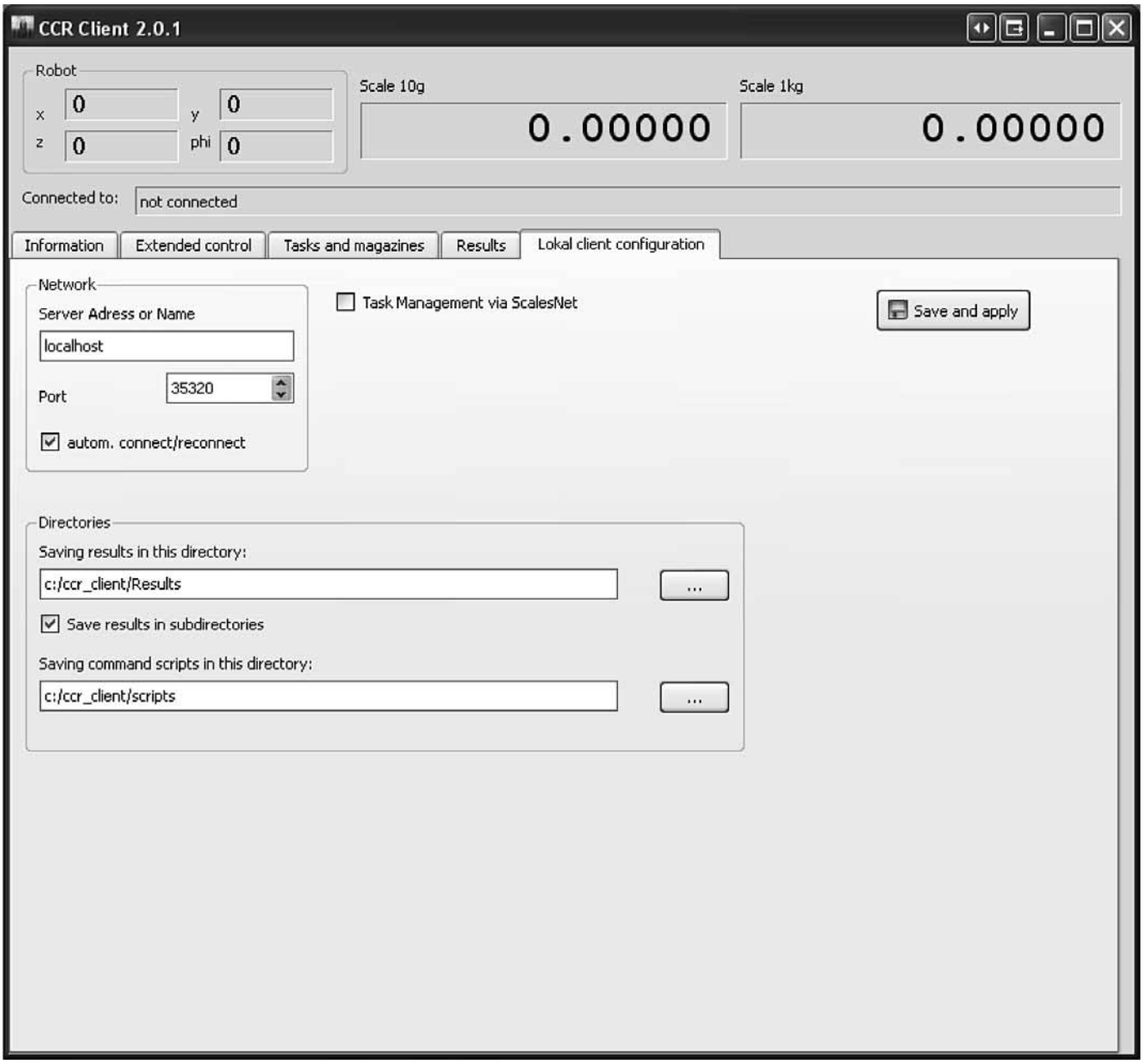


Figure 16: Local Client Configuration panel

Carrying Out a Measurement

In order to carry out a measurement, it is advisable to note the general construction and features of the robot that should be considered during a measurement. Furthermore, it should also be noted what to do in the event of an emergency and corresponding emergency stop, instigated either by the operator or automatically by the machine itself.

Schematic Composition of the CCR 10-1000

The schematic composition is described in more detail in Fig. 17.

1. 1 kg comparator for comparing weights
2. 10 g comparator for comparing weights
3. Set-down station for gathering combinations of weights together
4. Turning magazine for the 10 g comparator as well as set-down station for reference weights
5. Turning magazine for the 1 kg comparator as well as set-down station for reference weights
6. Position marker on the X axis that identifies the position of the weight grabber in the collision-free corridor
7. Weight grabber for transferring individual weights or combinations of weights on the comparators

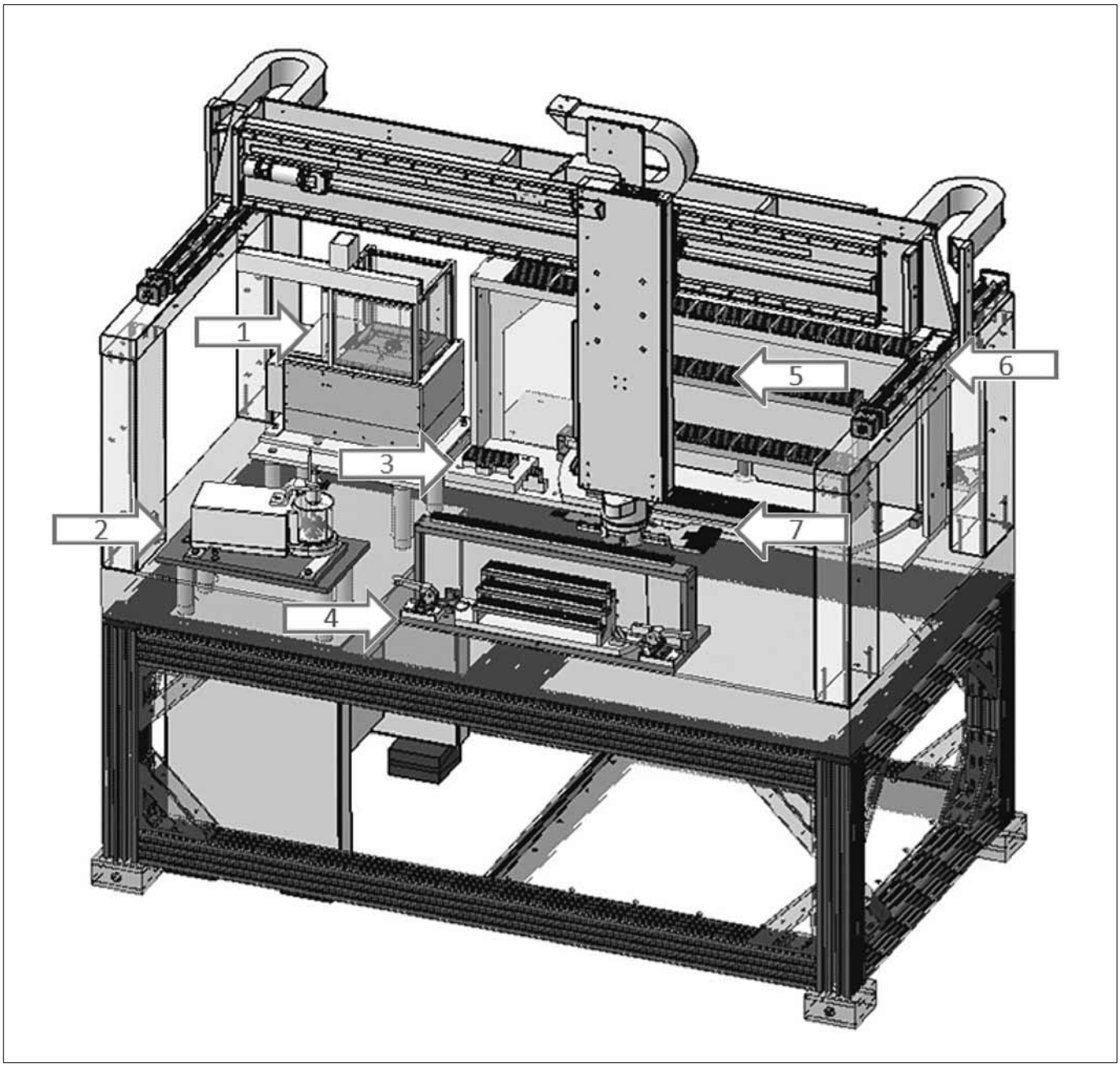


Figure 17: Schematic composition of the CCR 10-1000 comparator

The turning magazine for the 10 g side is shown in more detail in Fig. 18; the 1 kg side is similarly constructed. The turning magazine comprises three magazine rows on each side and a bridging magazine, which is attached above the turning device. The bridging magazine is accessible separately via a tilting door and is used in preference for placement of reference weights which must remain in the robot for a longer period. To load the turning magazine, the quick clamp is loosened, and this allows the turning magazine to be rotated 180°. After loading, the turning magazine is rotated 180° again, so that the weights to be measured come to rest on the weight grabber side in the inner compartment. In addition, the quick clamp is then locked again, so that three magazines can be loaded for a measurement and three further magazines can be prepared. When doing this, ensure that the turning magazine is rotated carefully. All doors must be closed securely and if necessary locked!

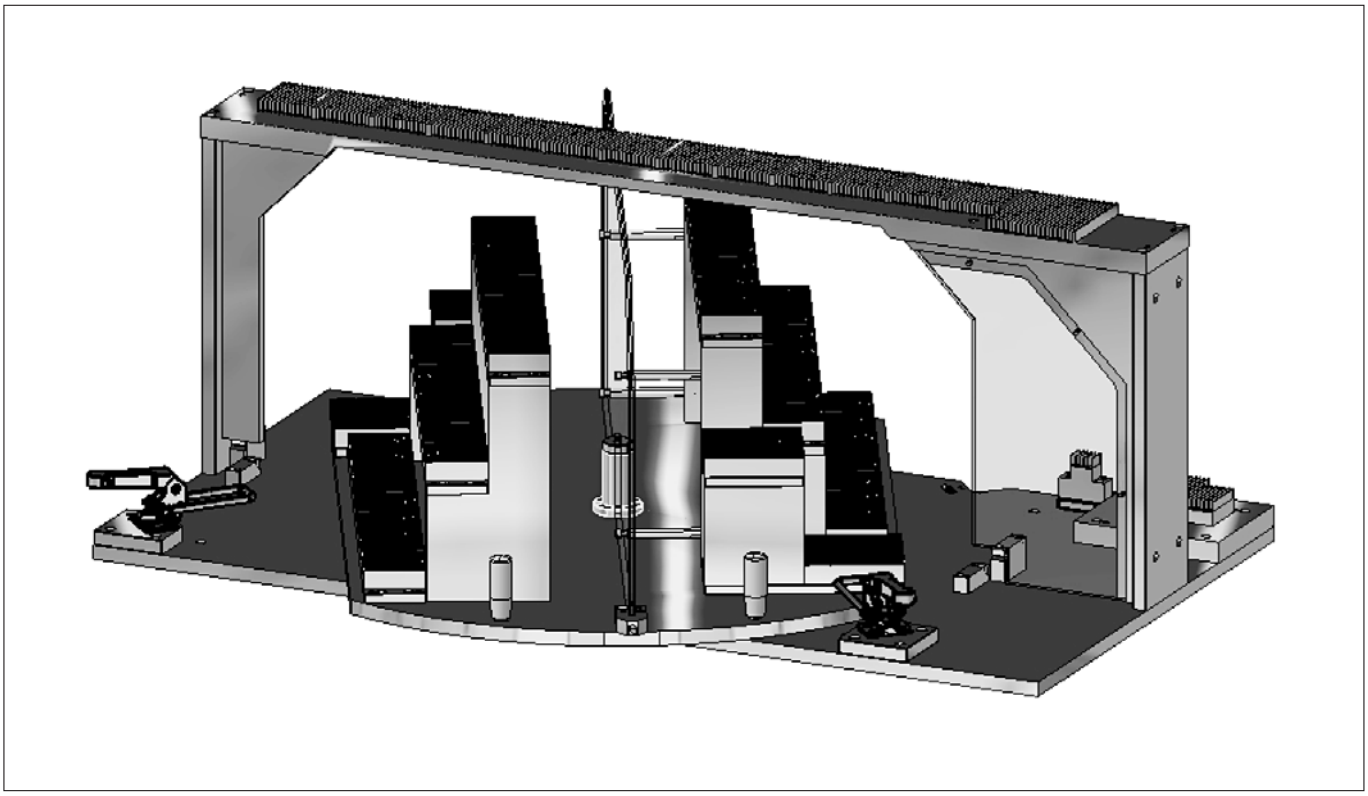


Figure 18: Turning magazine of the 10 g comparator incl. bridging magazine

Loading a Magazine

When loading the magazine, ensure that the physical properties of the weights are suitable for the corresponding placement station, i.e. they should not have too large dimensions, or be too heavy or too irregularly shaped. One possible loading configuration is shown in the following figure.

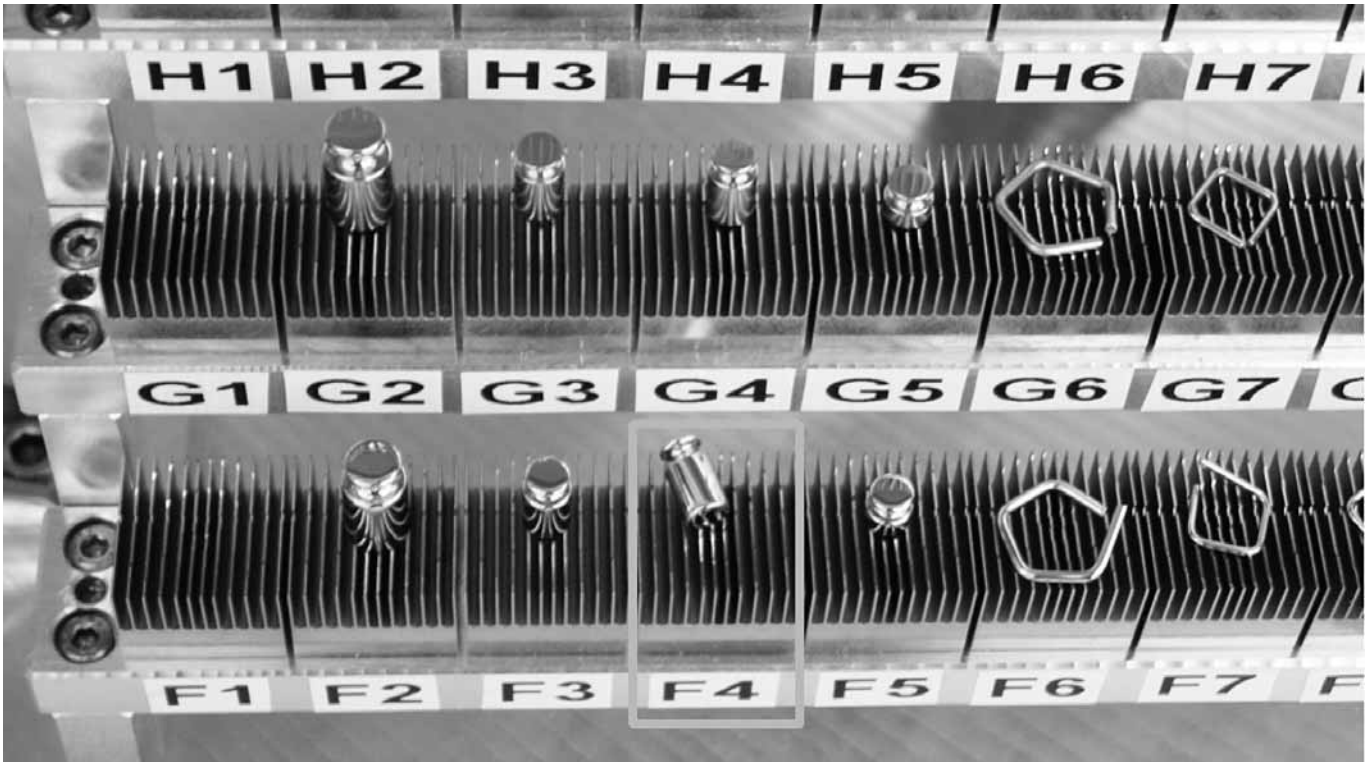


Figure 19: Arrangement of weights on the turning magazine stations

When loading, ensure that the weights are placed centrally. Weights must not topple over or, if irregularly shaped, weights must be determined and an appropriate base should be placed underneath them. Station F4 in the above figure shows a weight that has toppled over; this must be avoided! The weights should be set down on the stations using only special tweezers. The best suited tweezers are those with plastic tips since these will not damage the surface of the weights; see Fig. 20. Wire weights should be laid down with one side in the V-channel of the stations so that they sit securely. Always pick weights up to reposition them.

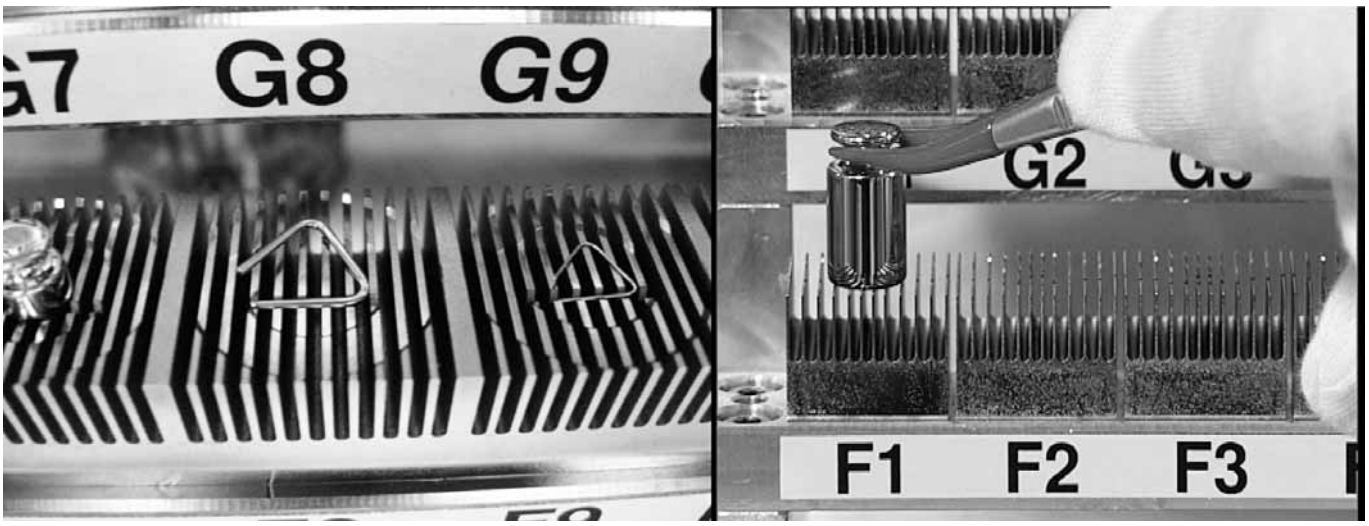
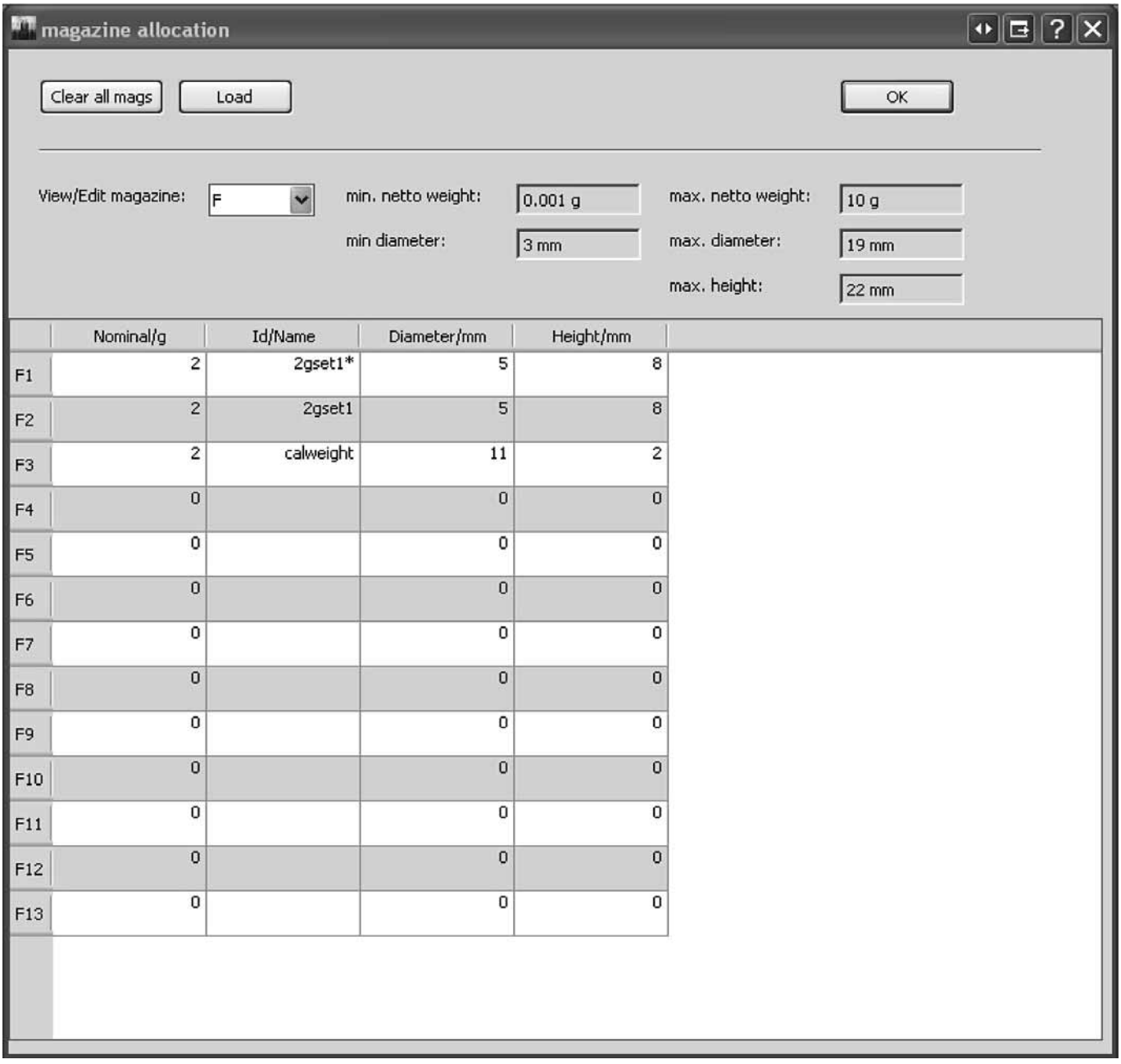


Figure 20: Wire weights in the V-channel of the magazine stations, and placing a weight

Example of a Measurement with CCR

In the measurement described below, the weights placed in the magazines were centered, and then the 10 g comparator was adjusted. The test weight was transferred to the 1 kg magazine side, and this comparator was also adjusted. After that, weights with an accuracy class of E1 were compared with one another. In doing this, only individual weights were compared with one another, and weight combinations were omitted.

Step 1
Open the "Tasks and Magazines" panel and create a new job here using "New job". A new name for this can be entered in the "Job name" field. Later, the job can be saved under this name. Set the desired accuracy class and start time/date. Inform the program of pre-allocated magazine stations using the "Edit allocation" button. To achieve this, the magazine in question is selected, and the weight mass, weight ID, and weight dimensions associated with each occupied station are set. This is shown for magazine F in the following figure. Here, weights with a mass of 2 g are placed on each of the stations F1, F2, and F3. The weights on F1 and F2 are from the same set, whereas one is differentiated by a point which is represented by the star in the ID. The weight on station F3 is a calibration weight, which must be used to calibrate the scale. In addition, the dimensions of the three weights are entered. Care is taken with all data to ensure that these do not exceed or undercut the permissible properties of magazine F. After all necessary magazines have been processed, the screen is closed using "OK," and this also saves the settings.



	Nominal/g	Id/Name	Diameter/mm	Height/mm
F1	2	2gset1*	5	8
F2	2	2gset1	5	8
F3	2	calweight	11	2
F4	0		0	0
F5	0		0	0
F6	0		0	0
F7	0		0	0
F8	0		0	0
F9	0		0	0
F10	0		0	0
F11	0		0	0
F12	0		0	0
F13	0		0	0

Figure 21: Loading the magazine stations in magazine F (10 g comparator side)

Step 2
After the CCR_Client has been informed of the positions at which the robot can find the corresponding weights, these must then be centered, because these seldom lie in the center of the magazine stations when placed manually. To do this, open the "Add center task" and select all of the stations in order to center them. The number of centering cycles depends on the profile selected (with E1, it is 10 cycles). However, this can be varied. Confirm your selection using "OK." Fig. 22 shows one possible configuration.

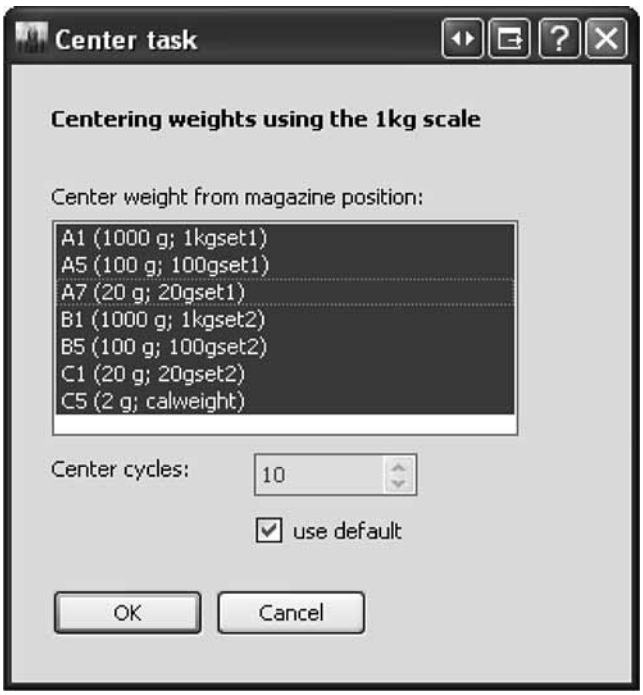


Figure 22: Centering the weights with 10 centering cycles for each of the placement stations

Step 3
Create a sensitivity test with the calibration weight, in order to adjust the 10 g comparator. For this, open the "Add service task" window, select "Sensitivity test for a scale," and open the next window with "Next." Select the 10 g scale here and the station with the calibration weight, which is F3 in the example. For sufficient measurement results, select five measurements, and confirm the settings using the "OK" button; more detail is shown in Fig. 23. In order to use the calibration weight, this must still be entered into the robot. To do this, use the scale display for the 10 g comparator on the robot. Press "Setup"→"Balance Scale"→ "Calibration adjustment"→"Parameter for ext. weight" and enter the value of the calibration weight here. Make sure that nothing is entered in the "weight ID" field. After completing the input, confirm it with "Enter" and save the settings.

Next, select "Adjust scale" in the "Add service task" menu and press "Next." Select the 10 g scale and the calibration weight, which is placed on F3 in the example, and press "OK." This task will adjust the scale with the calibration weight.

Check the adjustment of the scale with one further sensitivity test. Open "Add service task" again, select "Sensitivity test for a scale" and press "Next." Select the 10 g scale again and the calibration weight. After selecting the test cycles, select "OK." The scale is now checked with the 2 g weight to determine whether the display change agrees with the calibration value of the 2 g weight.

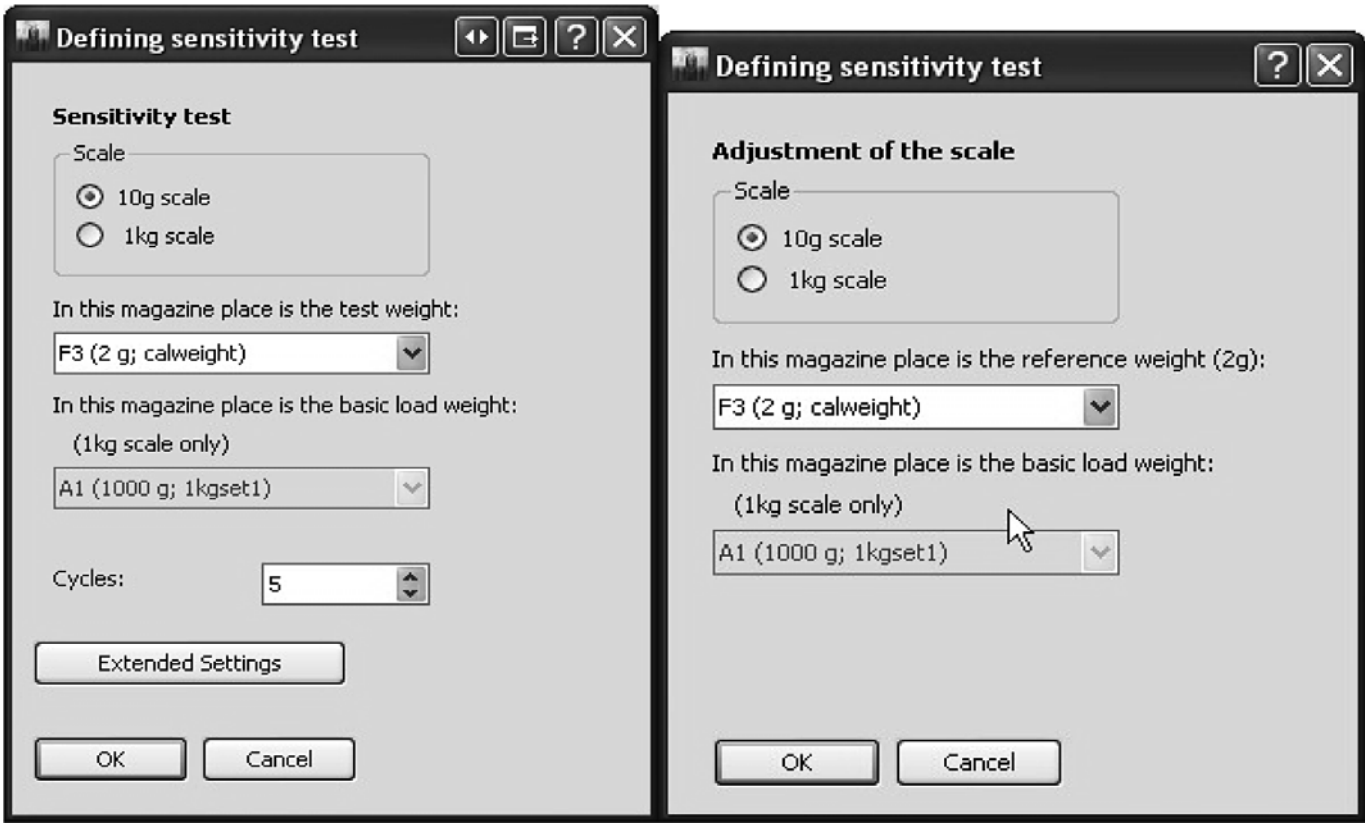


Figure 23: Sensitivity test for a scale and adjusting a scale

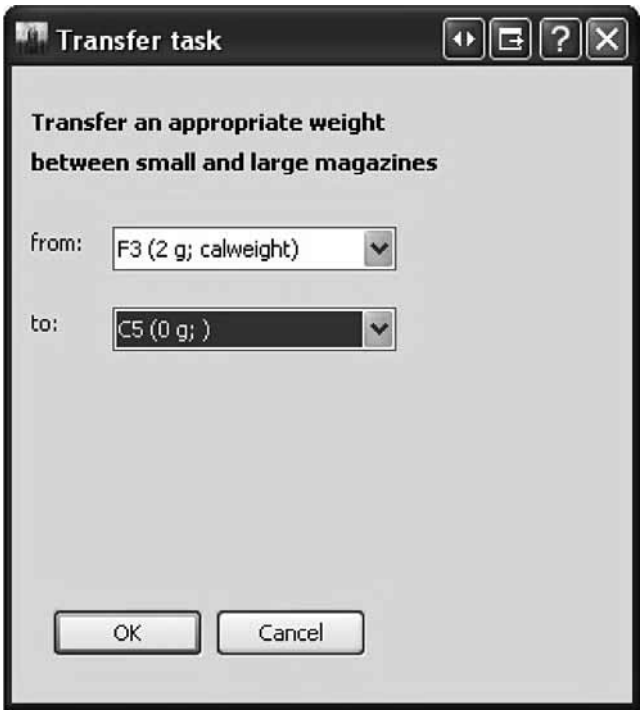


Figure 24:
Transfer Task for the calibration weight from F3 to C5Step 5

Step 4
Because both the 10 g scale and the 1 kg scale must be adjusted, the calibration weight must be transferred from magazine station F3 to a free magazine station in the 1 kg comparator. For this, open "Add transfer task." Select station F3 as source of the weight and C5 as the target. This magazine station lies on the 1 kg comparator side. Confirm with "OK"; see Fig. 24.

Step 5
Create a sensitivity test with the calibration weight in order to adjust the 1 kg scale. For this, open the "Add service task" window, select "Sensitivity test for a scale," and open the next window with "Next." Select the 1 kg scale here and the station with the calibration weight, which is C5 in the example. Since the measurement range of the 1 kg scale is not yet reached with 2 g, a tare weight is necessary (see page 13). In the example, a defined 100 g weight is added for the measurement. For sufficient measurement results, select five measurements and confirm the settings with the "OK" button; see Fig. 25.

Next, select "Adjust scale" in the "Add service task" menu and press "Next." Select the 1 kg scale and the calibration weight, which is placed on C5 in the example, as well as the 100 g weight used, and press "OK." This task will adjust the scale with the calibration weight.

Check the adjustment of the scale with one further sensitivity test. Open "Add service task" again and select "Sensitivity test for a scale" and press "Next." Select the 1 kg scale and also the 2 g calibration weight and the 100 g additional weight. After selecting the test cycles, select "OK." The scale is now checked with the 2 g weight to determine whether the display agrees with the actual value of the 2 g weight.

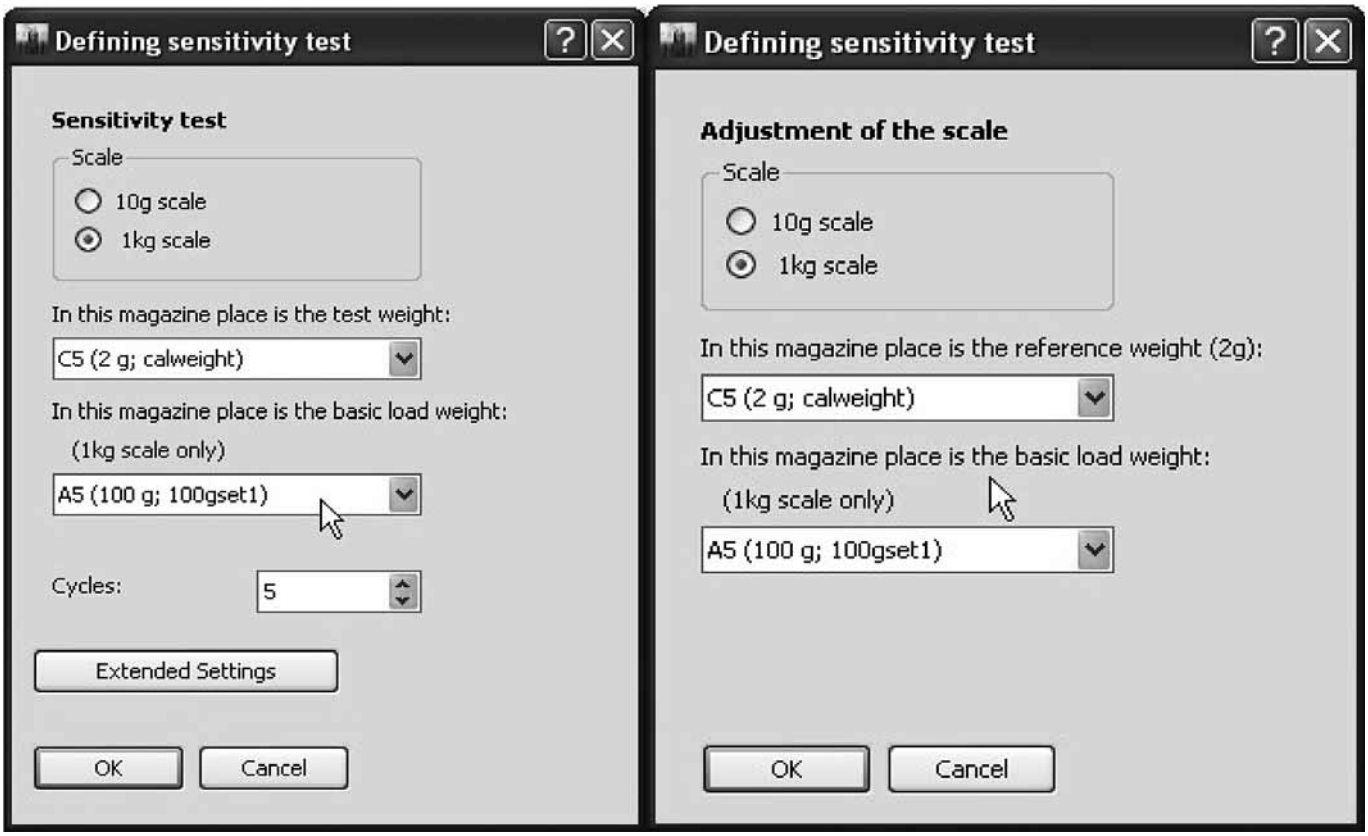


Figure 25: Sensitivity test on the 1 kg scale and adjustment of this

Step 6
The scales are now adjusted and can be used for mass comparison. To carry out a mass comparison, open “Compare task,” and select the pertinent scale (in the example, both scales are used; however these are not used simultaneously, but rather one after the other). The example here shows the comparison of the weights on F1 and F2; see figure below. If desired, combinations can also be created. These are created in a similar way. After setting the two masses to be compared, the task is confirmed with “OK.” This step is carried out similarly for the 1 kg scale and the masses to be compared there.

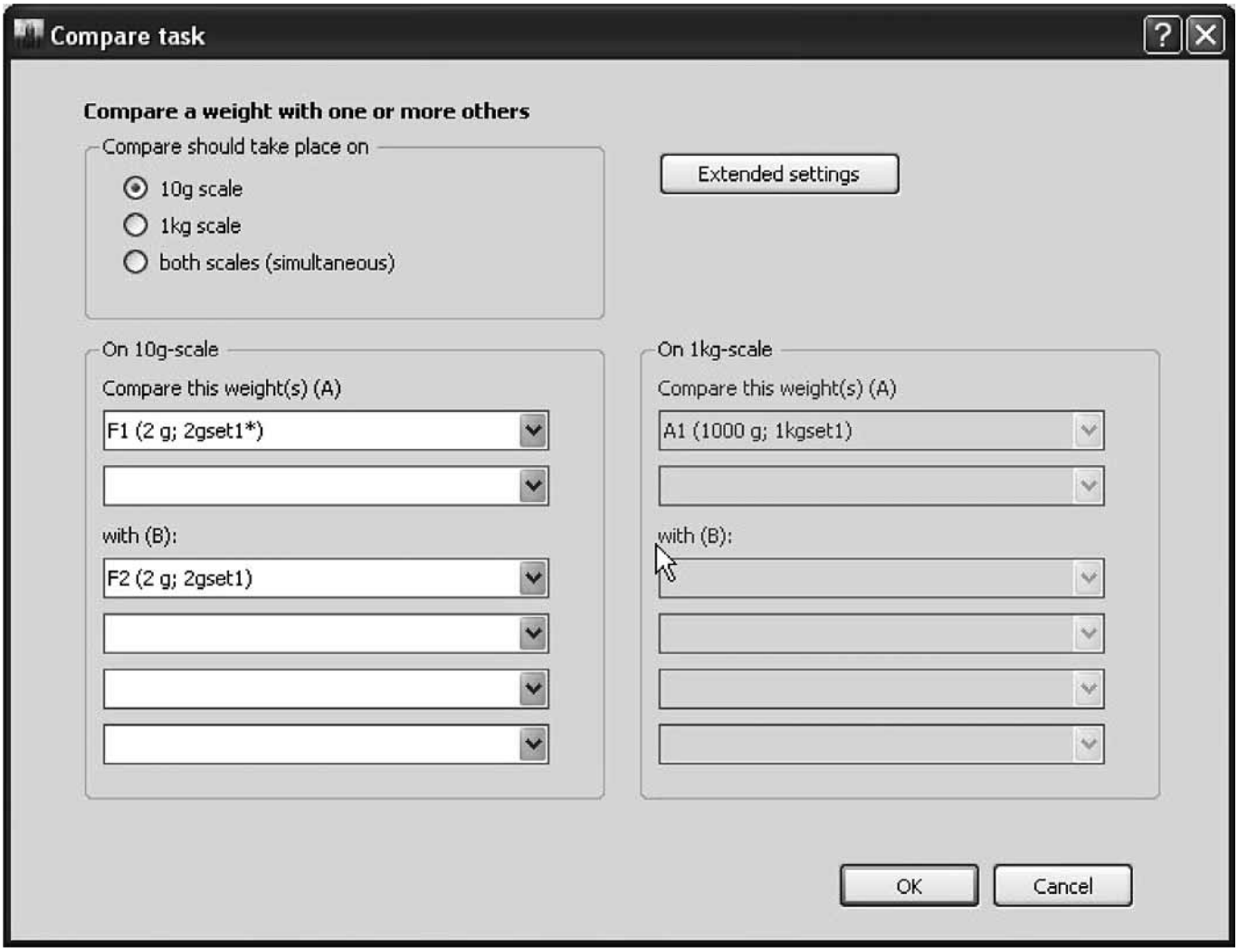


Figure 26: Comparison of weight at station F1 with weight at station F2

Step 7
After having added further mass comparisons, the list of jobs will appear as shown in Fig. 27. The five comparisons should now be duplicated by selecting them and duplicating them by pressing the key combination "Ctrl+D." After this has been carried out, the job is saved using "Save job" so that it is available from now on for subsequent repetition or alteration.

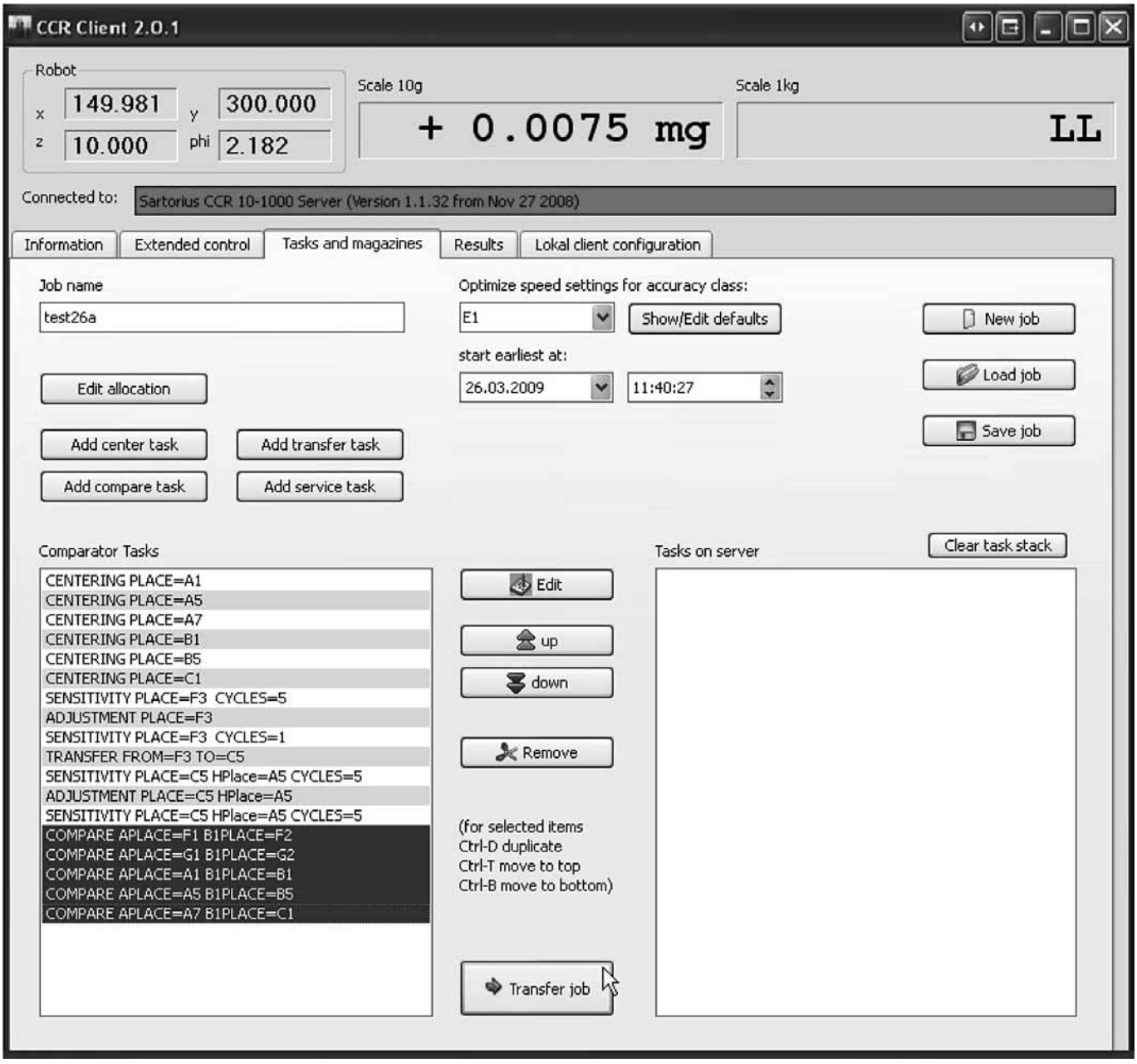


Figure 27: Roundup of tasks to be processed

Figure 28: Transfer of tasks to be processed to the robot server

After the list has been completed, this is transferred to the server using the "Transfer job" button, provided there is a connection to the server. If there is an existing connection and the data is transferred, this is shown in the following window.

If no errors arise during the transfer, the “Tasks and magazines” window now looks like this:

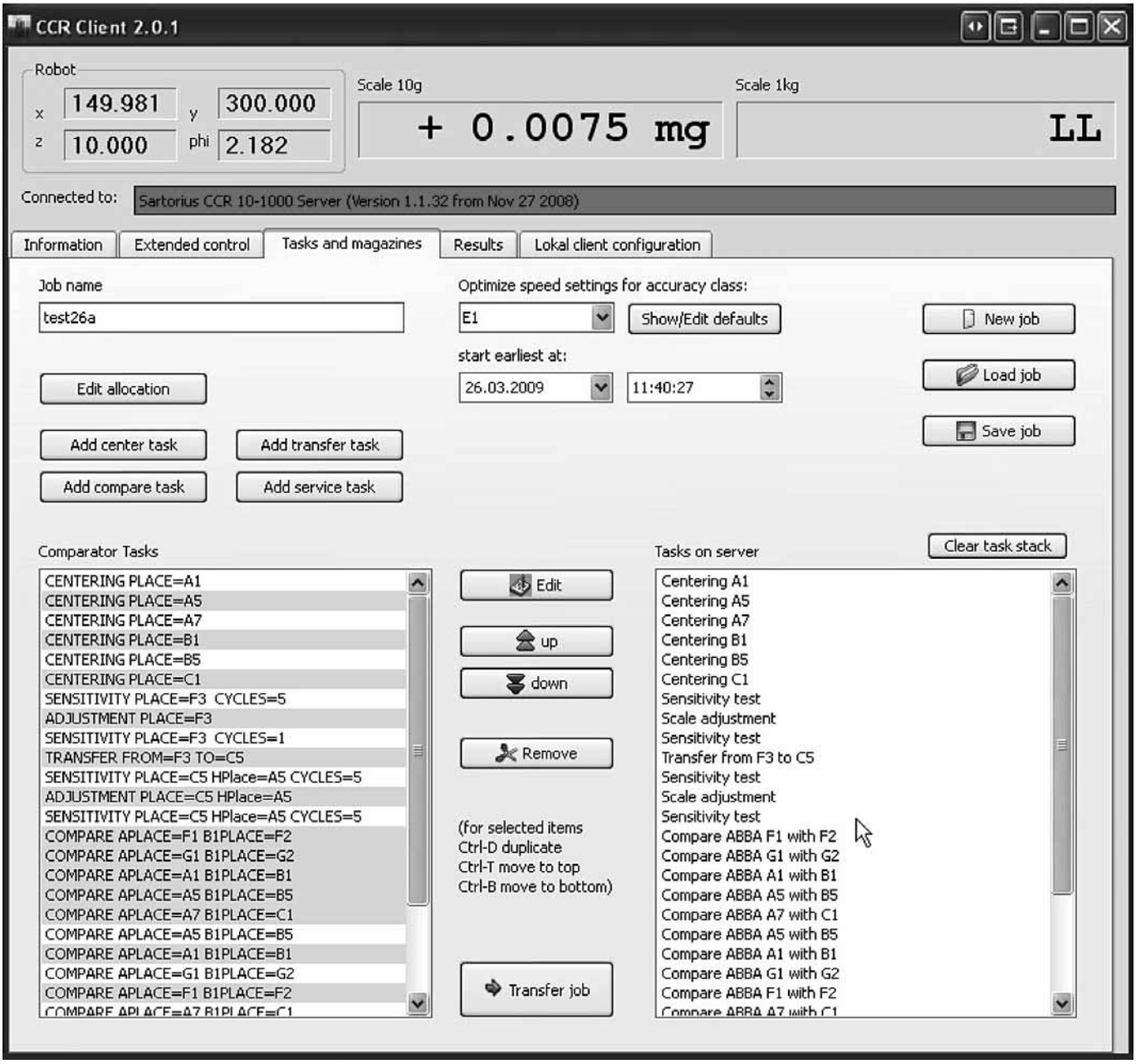


Figure 29: Tasks and magazines menu after duplication of Compare Tasks and transfer to CCR

Step 8
In order to process the tasks, select the “Information” tab and initialize the robot with “Init System.” By pressing this button, all drive systems and scales are switched to active. The “Init System” must also be actuated after any emergency stop in order to re-initialize the system. After the initialization, the “Run/Continue” button is switched to active, and the “Main task stacks” can start processing. After “Run/Continue” is actuated, this button is ghosted to gray once again, and the “Pause” button is switched to active. From now on, the row after each task will be processed until the operator presses “Pause” or the whole stack is completely processed.

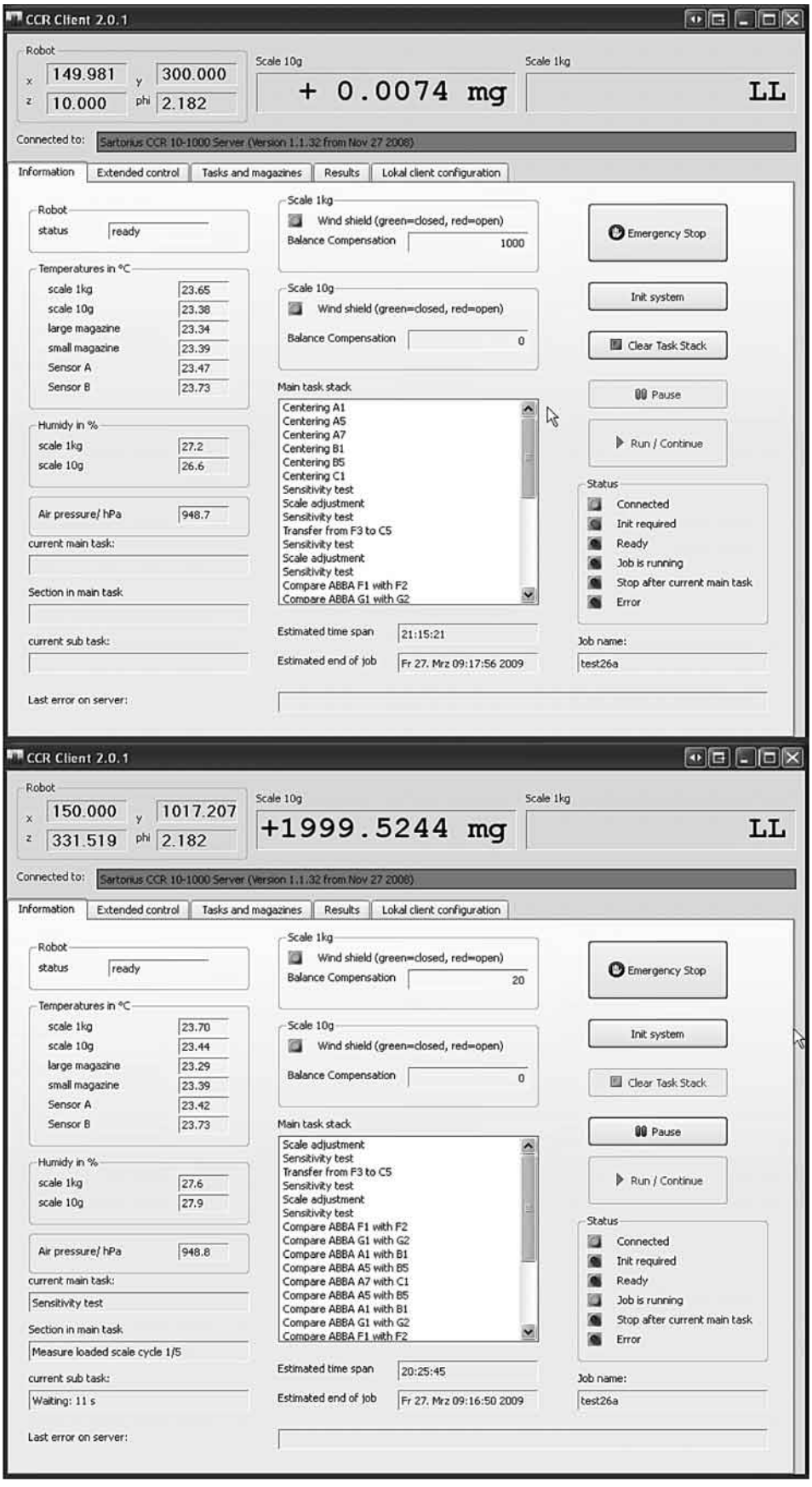
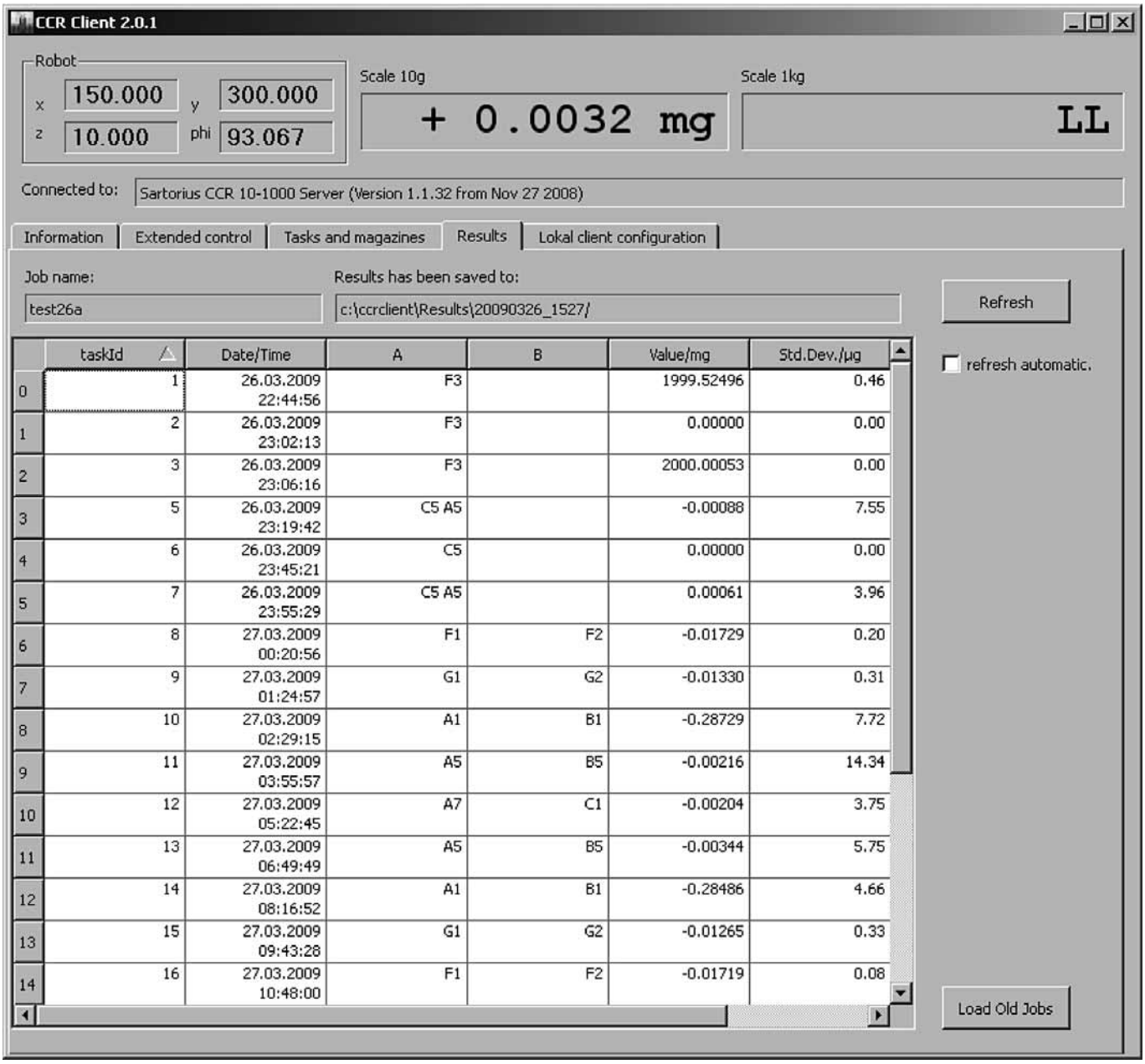


Figure 30: System to be initialized (top picture) and running job (bottom picture)

Step 9
The results can be seen on the “Results” page and can be retrieved from the server via the “Refresh” button. They can also be reinstated later via the “Load old jobs” button. When refresh is actuated, the current measurement results for the job that is presently running appear; see Fig. 31.



	taskId	Date/Time	A	B	Value/mg	Std.Dev./µg
0	1	26.03.2009 22:44:56	F3		1999.52496	0.46
1	2	26.03.2009 23:02:13	F3		0.00000	0.00
2	3	26.03.2009 23:06:16	F3		2000.00053	0.00
3	5	26.03.2009 23:19:42	C5 A5		-0.00088	7.55
4	6	26.03.2009 23:45:21	C5		0.00000	0.00
5	7	26.03.2009 23:55:29	C5 A5		0.00061	3.96
6	8	27.03.2009 00:20:56	F1	F2	-0.01729	0.20
7	9	27.03.2009 01:24:57	G1	G2	-0.01330	0.31
8	10	27.03.2009 02:29:15	A1	B1	-0.28729	7.72
9	11	27.03.2009 03:55:57	A5	B5	-0.00216	14.34
10	12	27.03.2009 05:22:45	A7	C1	-0.00204	3.75
11	13	27.03.2009 06:49:49	A5	B5	-0.00344	5.75
12	14	27.03.2009 08:16:52	A1	B1	-0.28486	4.66
13	15	27.03.2009 09:43:28	G1	G2	-0.01265	0.33
14	16	27.03.2009 10:48:00	F1	F2	-0.01719	0.08

Figure 31: Measurement results

If a row is now selected and activated by double-clicking, a further window opens which contains the individual results of this individual measurement. This is shown in Fig. 32.

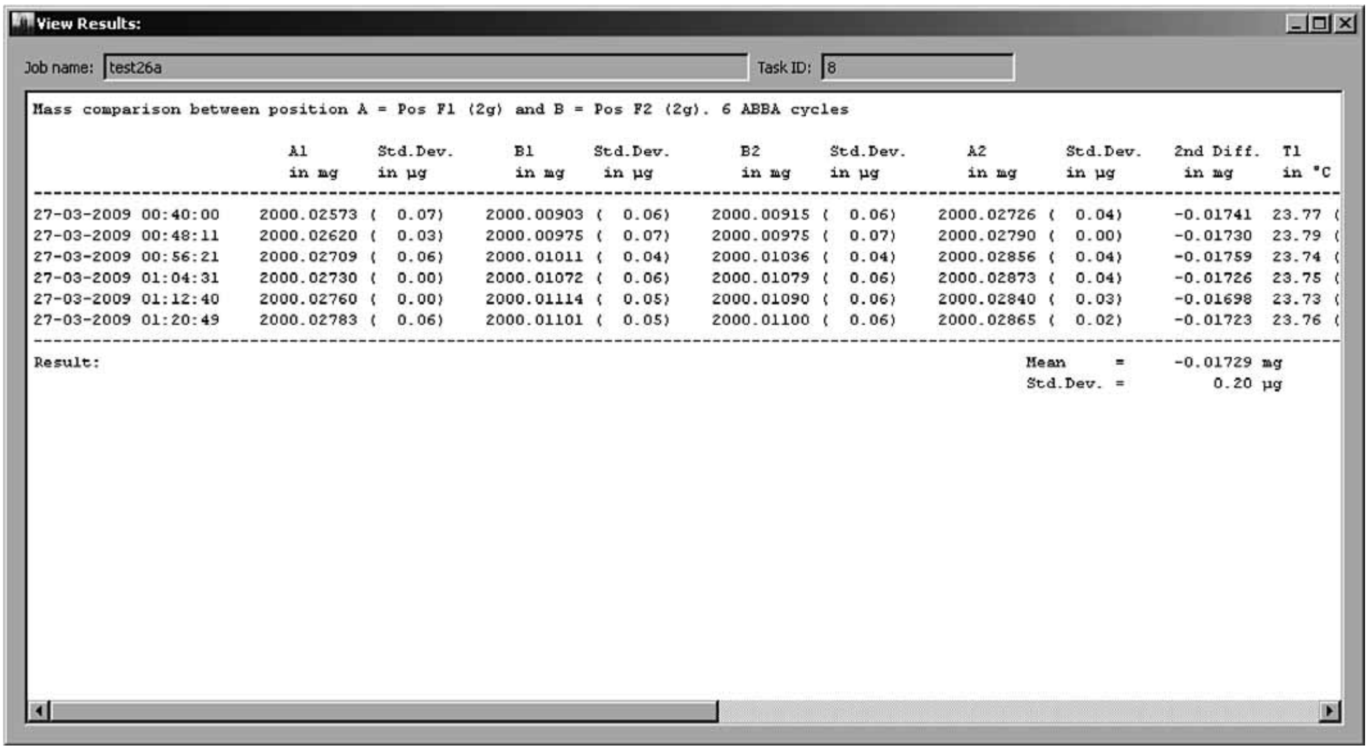


Figure 32: Individual results of a measurement

The results files and the files for the individual jobs can be found in the folder defined in "Local Client Configuration." The job file used is shown as an example. It shows the command sequence that the server should process in a readable form. The following text typifies this:

```
COMMAND OPERATION=NEW NAME=test26a PROFILE=E1
USING place=A1 nominal=1000 diameter=48 height=82 id=1kgset1
USING place=A5 nominal=100 diameter=18 height=40 id=100gset1
USING place=A7 nominal=20 diameter=12 height=20 id=20gset1
USING place=B1 nominal=1000 diameter=48 height=82 id=1kgset2
USING place=B5 nominal=100 diameter=18 height=40 id=100gset2
USING place=C1 nominal=20 diameter=12 height=20 id=20gset2
USING place=F1 nominal=2 diameter=5 height=8 id=2gset1*
USING place=F2 nominal=2 diameter=5 height=8 id=2gset1
USING place=F3 nominal=2 diameter=11 height=2 id=calweight
USING place=G1 nominal=10 diameter=10 height=16 id=10gset1
USING place=G2 nominal=10 diameter=10 height=16 id=10gset2
CENTERING PLACE=A1
CENTERING PLACE=A5
CENTERING PLACE=A7
CENTERING PLACE=B1
CENTERING PLACE=B5
CENTERING PLACE=C1
SENSITIVITY PLACE=F3  CYCLES=5
ADJUSTMENT PLACE=F3
SENSITIVITY PLACE=F3  CYCLES=1
TRANSFER FROM=F3 TO=C5
SENSITIVITY PLACE=C5 HPlace=A5 CYCLES=5
ADJUSTMENT PLACE=C5 HPlace=A5
SENSITIVITY PLACE=C5 HPlace=A5 CYCLES=5
COMPARE APLACE=F1 B1PLACE=F2
COMPARE APLACE=G1 B1PLACE=G2
COMPARE APLACE=A1 B1PLACE=B1
COMPARE APLACE=A5 B1PLACE=B5
COMPARE APLACE=A7 B1PLACE=C1
COMPARE APLACE=F1 B1PLACE=F2
COMPARE APLACE=G1 B1PLACE=G2
COMPARE APLACE=A1 B1PLACE=B1
COMPARE APLACE=A5 B1PLACE=B5
COMPARE APLACE=A7 B1PLACE=C1
COMPARE APLACE=F1 B1PLACE=F2
COMPARE APLACE=G1 B1PLACE=G2
COMPARE APLACE=A1 B1PLACE=B1
COMPARE APLACE=A5 B1PLACE=B5
COMPARE APLACE=A7 B1PLACE=C1
```

The results of each job are saved in the results folder, whereas there are three files available for every task where a measurement was carried out. The file with the "res" file extension is in the ASCII character set so that it can be read by any editor. The file with the "csv" file extension is intended for further processing in Excel. The file with the "dsc" file extension contains information about the corresponding task, but no results. In addition, there is a file in every folder with the name "summary.txt" in which the results are recorded in short form.

Recovery of the System

What to Do After an Emergency Stop

An emergency stop can occur for the following reasons:

- Actuation of the electromechanical emergency off switch on the equipment.
- Actuation of the emergency off button on the CCR Client.
- Opening a door on the robot.
- Electrical contact in the event of a weight being disturbed.

In the above cases, the system stops immediately, and all motors are switched off. To reactivate, proceed as follows:

- Working on the robot with the doors open requires great care due to the risk of injury.
- Do not touch the weight grabber due to the sensitive grabber teeth. If the grabber teeth bend, inform the Sartorius Service Department and cease operation with the equipment!
- If weights are lying on the grabber, they must be removed manually.
- The portal must be moved into the safe corridor manually. There is a red label marked “safe” attached to the robot arm for this; see Fig. 33. This label must line up with the label on the frame as precisely as possible. (See schematic composition of the CCR 10-1000 on page 16, item 6).
- In the event of a mechanical emergency stop, this must be loosened. The knob is loosened using a turning movement for this purpose.
- Close all of the robot’s doors.
- Actuate the “Init System” in the CCR Client, thereby switching the motors on again.
- Bring the robot into the park position using “Move to park,” which can be found under the “Extended control” tab, or if it is in the park position, actuate “Run/Continue” in order to continue with the current job.
- If there are weights lying on the comparators, open the wind shield and remove the weights manually.
- Then close all the doors. Actuate “Init System” once again.
- The system is now ready for operation again.

Figure 33:
Holding point for sliding the portal into the safe corridor

If the weight grabber cannot be unloaded due to the current position of the robot, it is possible to empty the grabber once it has reached the park position. If Init System is not possible, check whether the robot is in the safe corridor and that all doors are closed.

Restart

Please follow the steps below:

1. Bring the robot into the park position:
   - Actuate “Init System” in the CCR Client.
   - Actuate “Move to park” in the Extended Control menu of the CCR Client.
   - Wait until the robot has reached the park position.
2. Remove the 110/220 V main power supply connector.
3. Wait 30 seconds.
4. Replace the main power supply connector.
5. Wait two minutes.
6. Actuate the blue I/O button on both scale displays in order to switch the mass comparators on.
7. Actuate “Init System” in the CCR Client.
8. Wait until the beep stops (maximum 2-3 minutes; if this lasts longer or if the robot does not move, a fault has occurred. In this case, go back to step 2 and repeat the sequence once again.)
9. The robot is now ready for operation.

Appendix

Network Information

The CCR robot software comprises a server and one or more clients. The server application of the CCR robot runs internally on LINUX Debian. The client software runs based on WindowsTM on an operator's standard PC. Communication between the server and the client occurs via a local network where the TCP/IP port 35320 is used. This port can be configured on the server, but should preferably not be changed. The server has an SSH server running on port 22 for remote maintenance tasks. Other network services do not run on the CCR robot. The schematic composition of the network is shown in Fig. A.1.

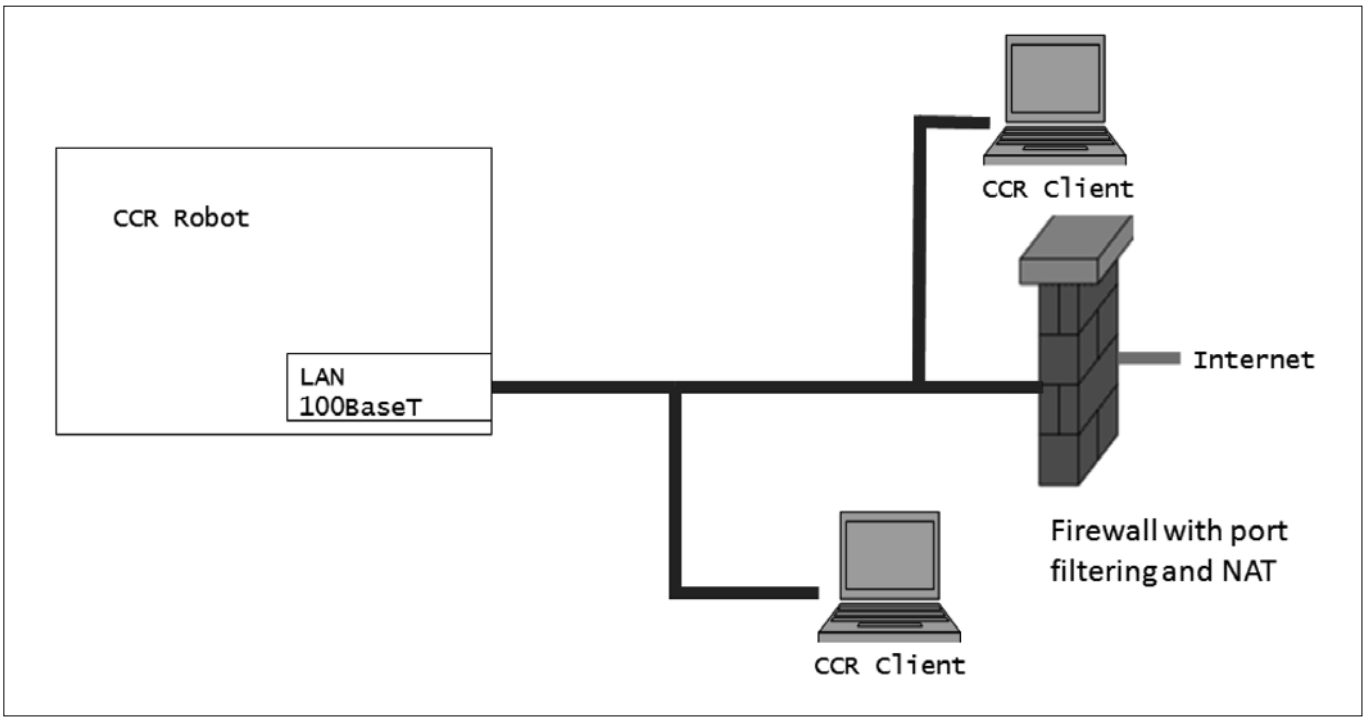


Figure A.1: Schematic network layout between server, clients, and internet

From this, the following network requirements for the CCR robot can be derived:

- Network connection 100BaseT with static IP addresses or DHCP with name resolution.
- All clients (e.g. CCR_Client.exe just as ScalesNet32) must communicate via port 35320. This port should only be routed through a firewall by means of a tunnel, in case clients outside the local network wish to access the CCR robot.
- Optional extra functions:
  - The CCR robot optionally sends status information via e-mail. For this to occur, it is necessary to be able to initialize an SMTP connection to a local mail server or a mail server on the internet. The operator is responsible for the mail server and access to it. To achieve this, the CCR robot requires the name and IP address of the SMTP server as part of its configuration.
  - The CCR robot optionally synchronizes its time via the NTP protocol (port 123). The operator is responsible for the NTP server and access to it. The CCR robot requires the name and IP address of the NTP server as part of its configuration.
- Only for maintenance purposes:
  - The CCR robot can create an FTP connection over the internet in order to send status information and log files to an FTP server which is operated by Sartorius.
  - An internet connection to the SSH port of the CCR server is required, whereas a tunnel through the firewall and perhaps NAT will be required. The port visible from outside can be freely selected, but must be internally mapped to port 22 of the CCR robot.

The network requirements for the CCR Client are as follows:

- WindowsTM PC, 512MB RAM, 50MB hard drive space.
- 100BaseT network connection or WLAN connection to a local network with static IP addresses or DHCP with name resolution.

Section deals with the ScalesNet32 software

The following section deals with the ScalesNet32 software. This option is available for the CCR 10-1000. Here the same test measurement is described as that already described with the CCR Client. ScalesNet32 comprises four individual programs which should run in parallel. ScalesNet-Server manages the database and is the program that serves as the base module for the other programs. This must always be running. ScalesNet-Printer creates test records and prints as a file. ScalesDesk serves administration functions such as managing weights, examining results, creating new users, selecting pre-allocations in the magazine, etc. Finally, ScalesMass serves to actually create a measurement and to send this to the robot.

Comparison of Individual Weights with ScalesNet32

Below, the measurement that was initially carried out in the CCR Client is repeated with ScalesNet32. In order to compare two weights with one another, one must be declared as reference and have a known mass and uncertainty. Reference sets are defined for this. These can be entered in ScalesDesk under "Database → Reference weights". Reference set 1 is selected for the following test. The masses of this set were previously entered by the user. If reference sets with appropriate weights are already available, these can be used; otherwise further references must be created. The creation of new references is carried out in the same menu.

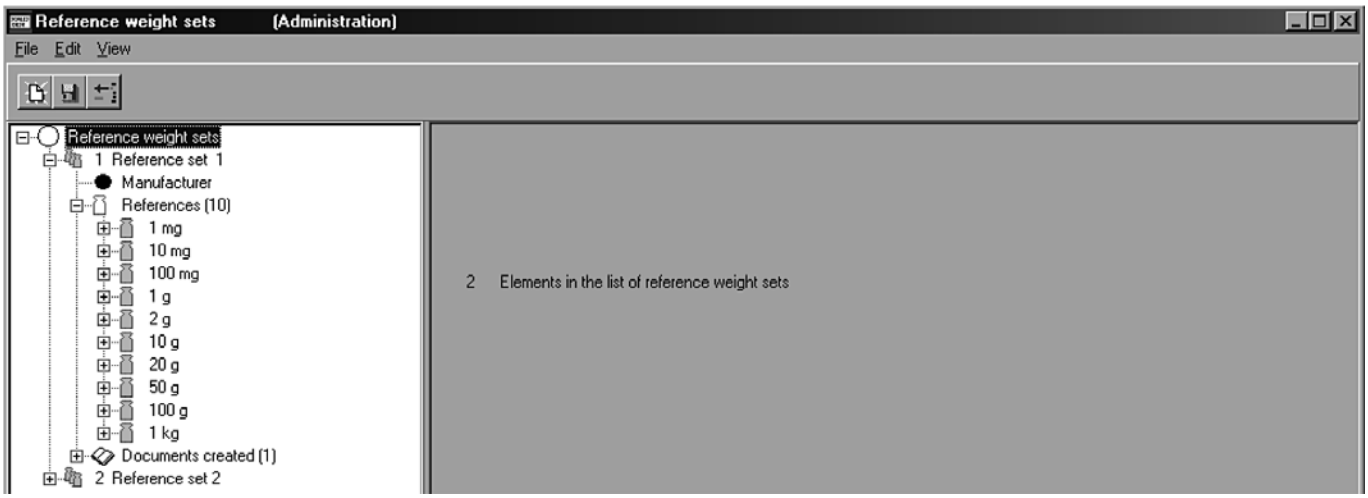


Figure B.1: Standard set used

If not yet completed, an end customer for whom the weights are to be calibrated, should be defined in ScalesDesk under "Database → Customer". For internal comparisons, this can also be a laboratory user. In addition, the manufacturer of the weights that are to be used later for the measurement should be defined under "Database → Manufacturer". References, manufacturer data, and customer data are then available in ScalesMass for further processing. If references are going to be in permanent use on a magazine station, this can be harmonized in ScalesDesk under "Database → Magazines". These references do not then need to be set in ScalesMass. Instead, these are located on the station which was pre-defined for them from the outset.

If the pre-settings are sufficiently complete and the appropriate scale is selected in ScalesMass, this should appear in the right window margin if available. Two scales are shown in the figure below. In this example the CCR 10-1000 is shown as number 2.

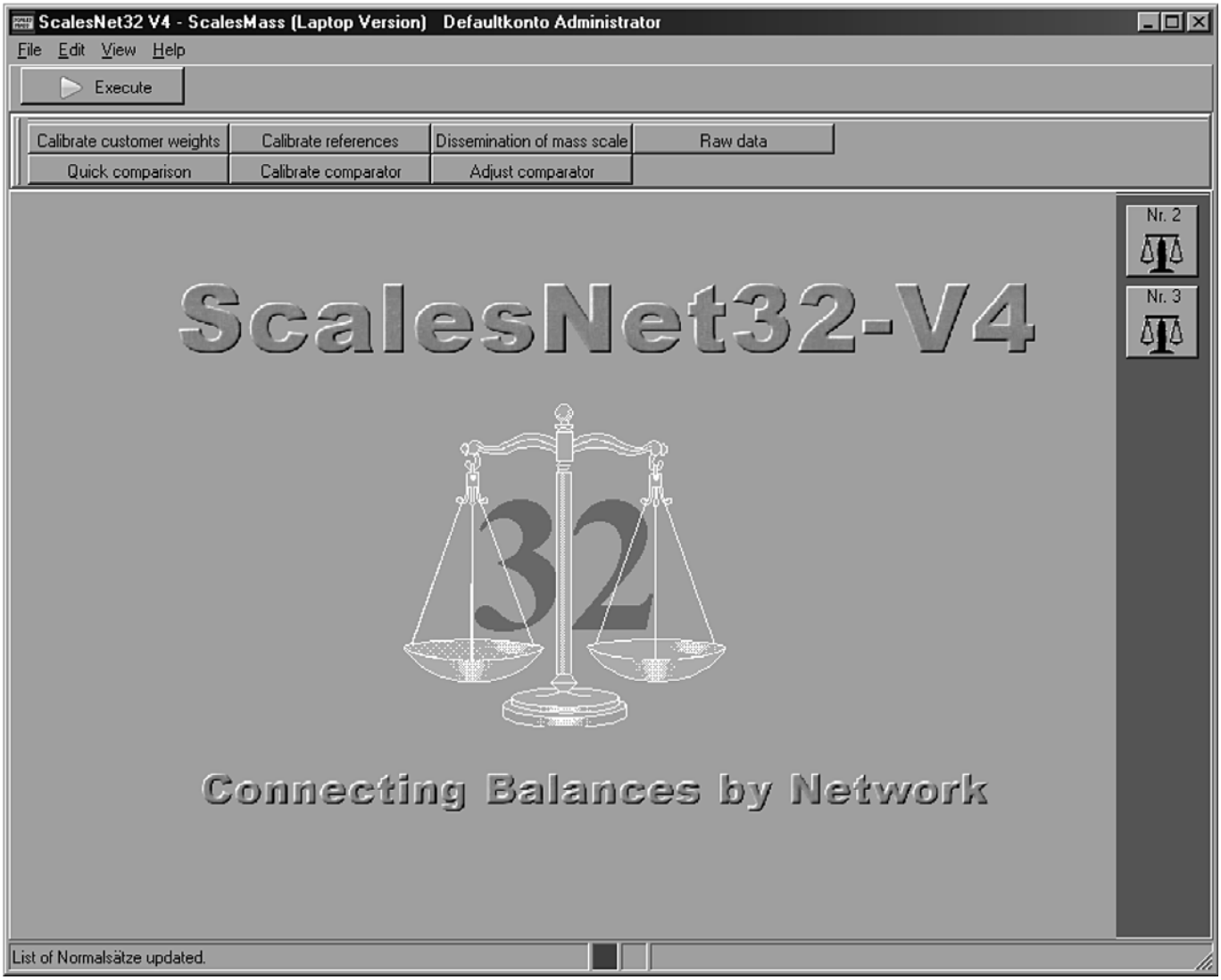


Figure B.2: ScalesMass menu including scales

If there are no scales visible in the right-hand margin, the CCR 10-1000 is not connected to ScalesNet32. In this case, contact the Sartorius Support Department.

In the CCR Client example, the 2-10-20-100-1000 [g] masses were compared. The sensitivity test and the calibration of the scale were omitted from the measurement with ScalesNet32. The scales are subject to a periodic cycle, and based on this, a message will be received from SaclesNet32 stating that the scales must be recalibrated.

In order to start a comparative measurement, click on the appropriate scale in the right-hand screen margin or on “Calibrate customer weights” in the top menu. In the latter case, you must still select the scale to be used to calibrate the specimens. Select a placement station for the specimen in the magazine window; see Fig. B.3. The comparator and the associated magazine stations can be selected via the tab. If references are already placed on the magazine in ScalesDesk, this is visible here. In the example, placement station F1 is used. Enter a job number, a customer, a fabrication number, and the weights’ manufacturer in the following menu; see Fig. B.4. The customer menu is configured in alphabetical order. To select a customer, click on the customer number in front of their name and confirm with “OK”; see Fig. B.5. You can enter either your own manufacture number or create a new one. Select the manufacturer from the list in the manufacturer menu and confirm this; see Fig. B.5.

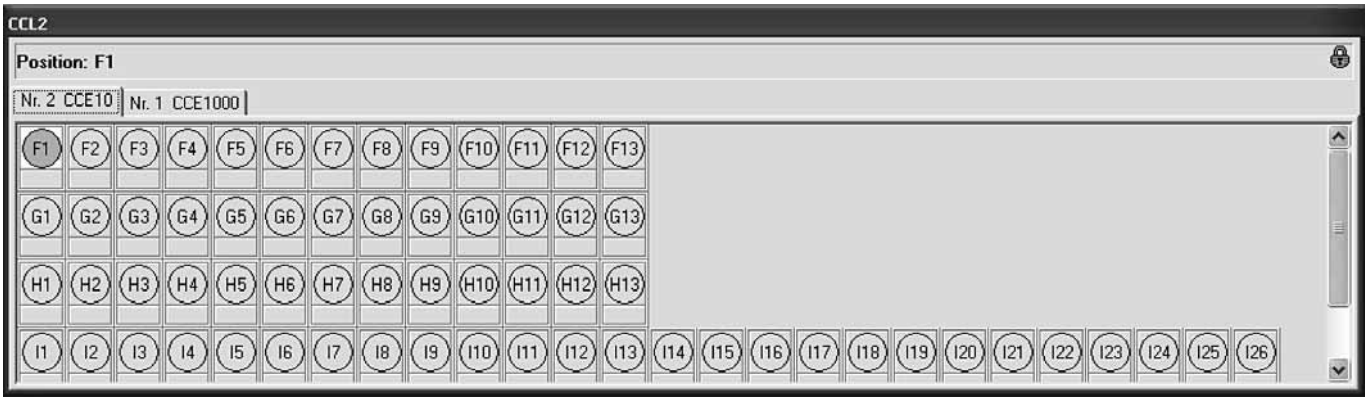


Figure B.3: Magazine menu

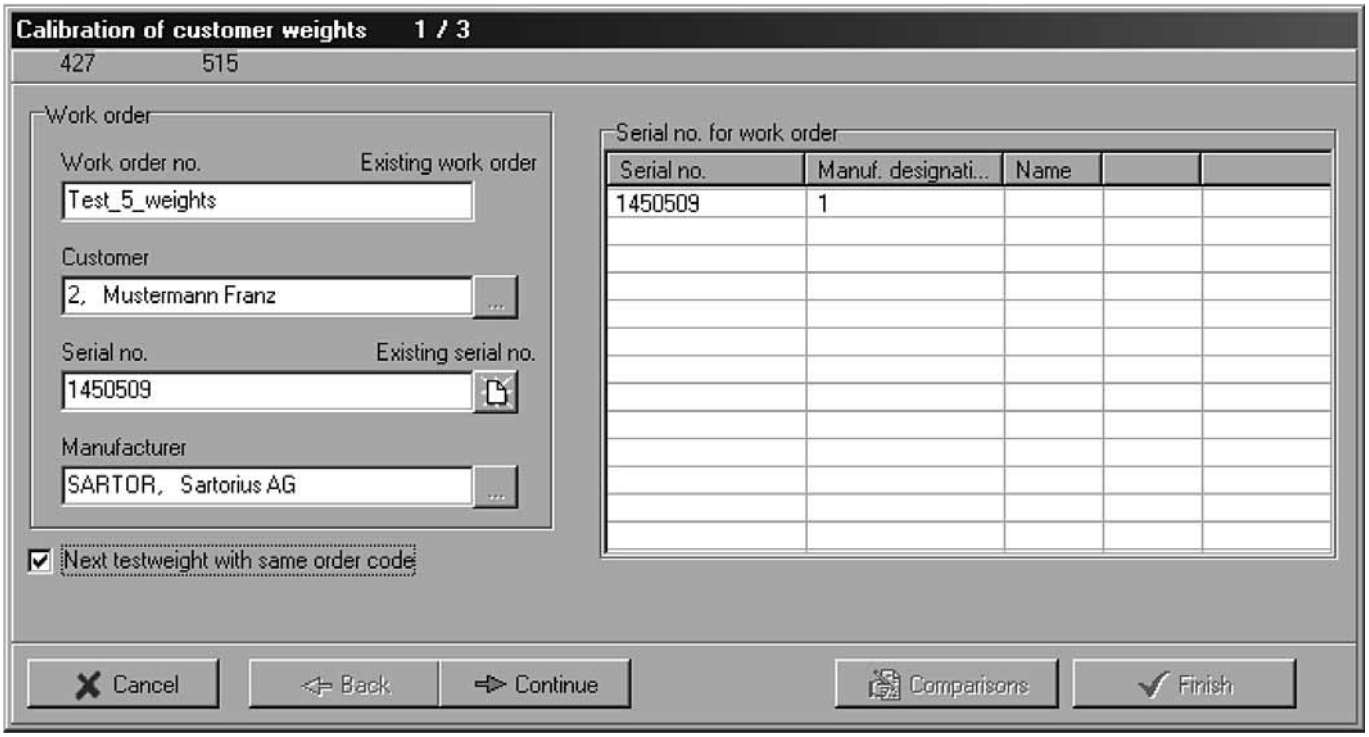


Figure B.4: Calibrating a specimen, menu 1/3

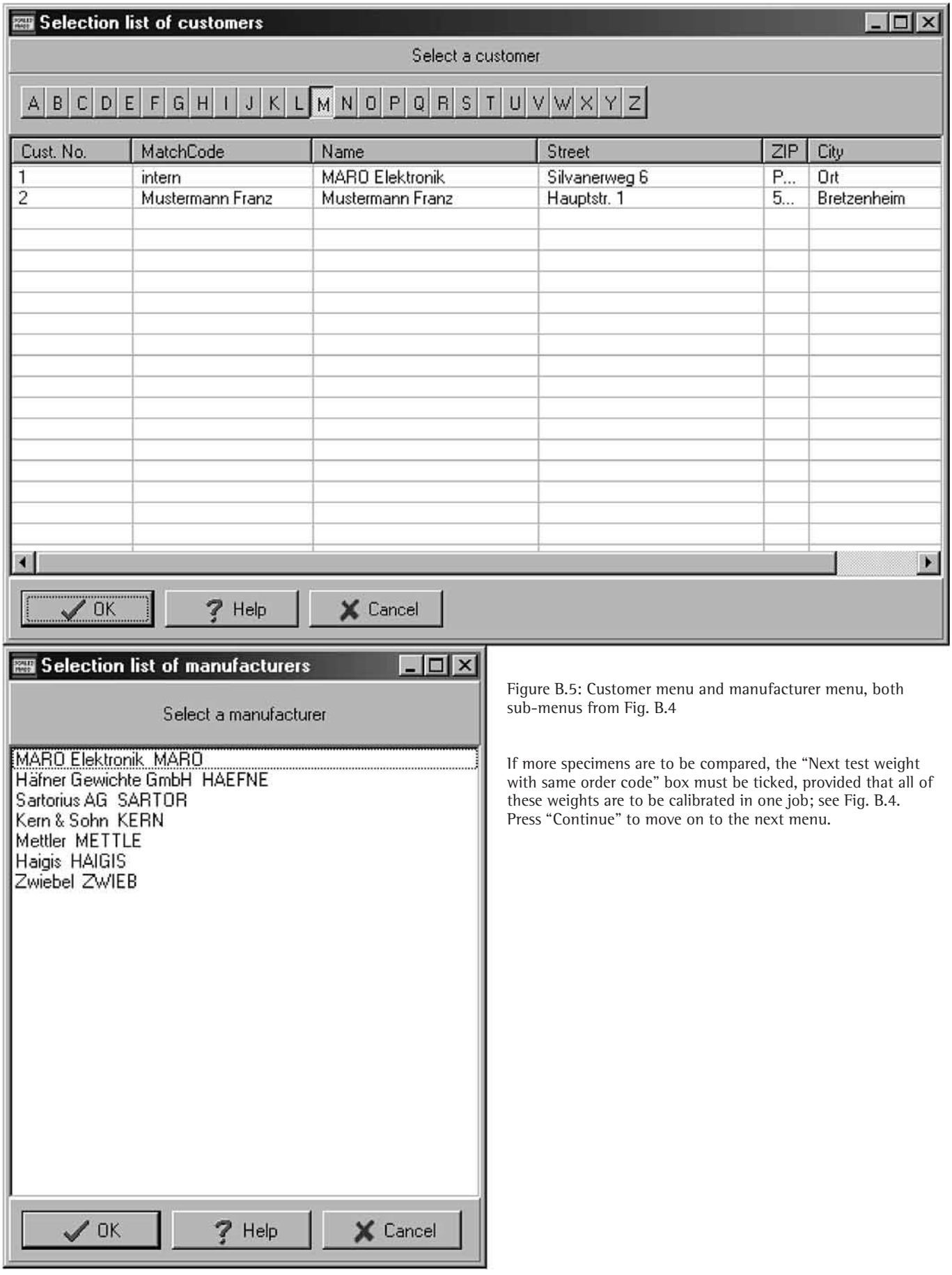


Figure B.5: Customer menu and manufacturer menu, both sub-menus from Fig. B.4

If more specimens are to be compared, the “Next test weight with same order code” box must be ticked, provided that all of these weights are to be calibrated in one job; see Fig. B.4. Press “Continue” to move on to the next menu.

The nominal value of the weight, the accuracy class, the design, the dimensions, and the weighing standard are selected in the following menu; see Fig. B.6. The identifier of a weight should be clear and should only be used once. If two weights of identical mass are to be calibrated, these must have different identifiers.

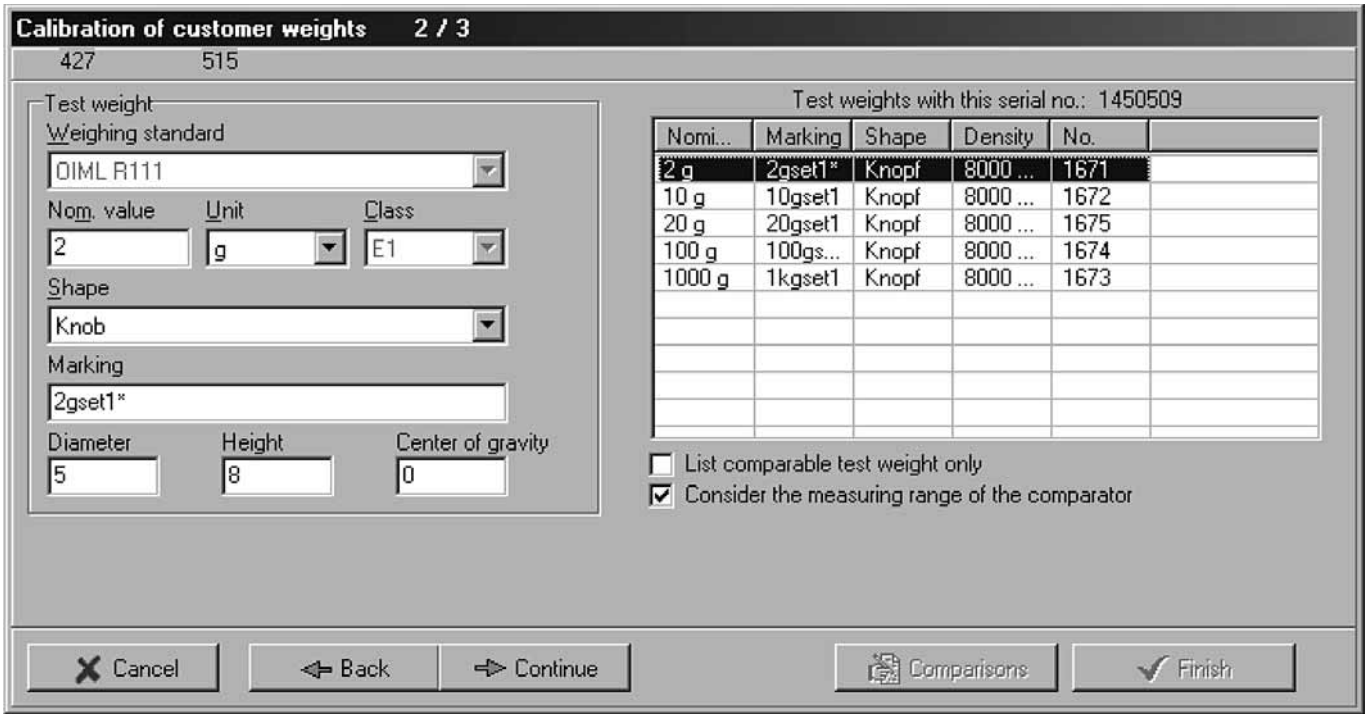


Figure B.6: Calibration menu for a specimen, menu 2/3

The accuracy class selected here with the first weight defines the accuracy class for the subsequent weights! In the example, E1 is selected, and therefore the subsequent weights automatically have an accuracy class of E1. Press “Continue” to move on to the next menu.

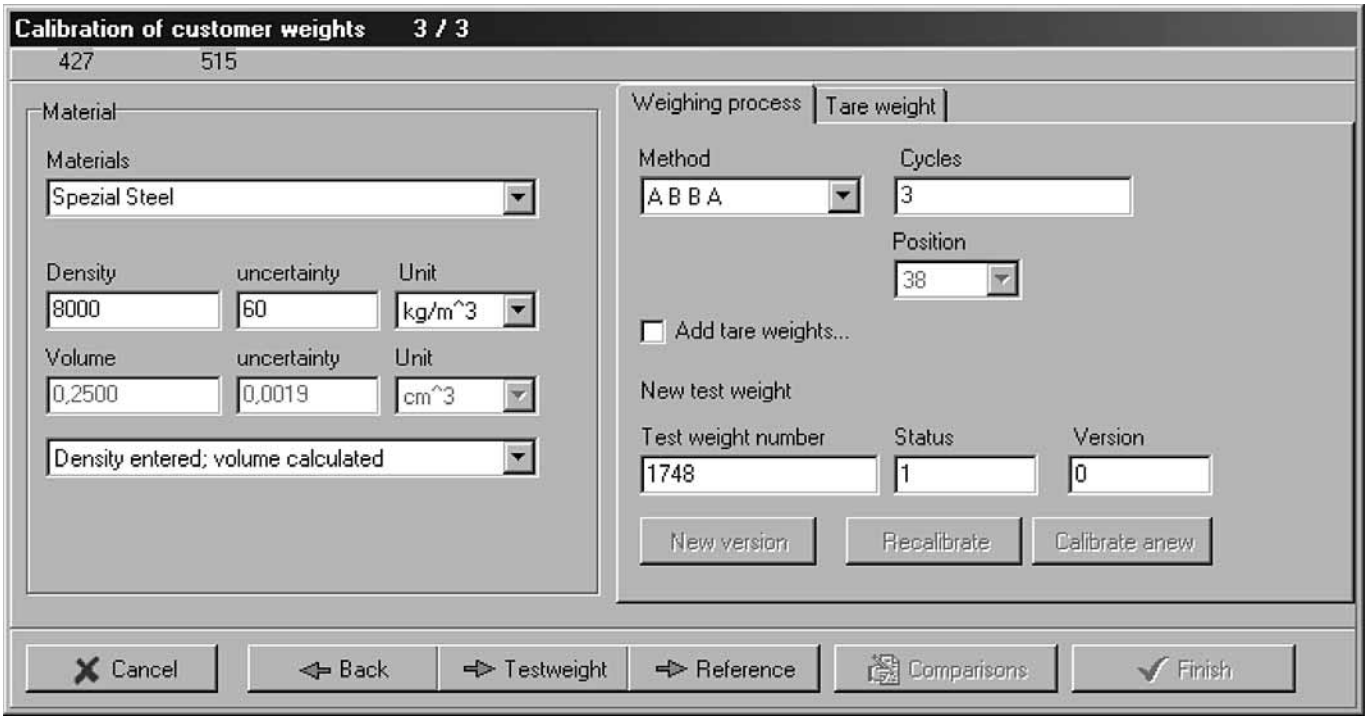


Figure B.7: Calibration menu for a specimen, menu 3/3

In the 3rd menu, further specifications related to the material of the specimen, the tare weights used, or the weighing process can be manipulated; see Fig. B.7. For the example, all the settings can be left as shown, since this is a special stainless steel weight. A specimen number must be created nonetheless; click on the "New Version" button to do this. This should result in the "Test weight" and "Reference" buttons becoming active. Now select whether you wish to place a further specimen or a reference as the next weight. A reference is selected here for simplicity. Now, the next station in the magazine is selected by default. If the weight is placed there, select the corresponding reference set; see Fig. B.8. The list on the right shows the reference set weights. Select the relevant weight here and transfer it to the placement station on the left by using the red arrow for the appropriate direction. Any selected weight can be moved from left to right or vice versa using the appropriate arrow button. In the example, the 2 g weight is set to station F2 here. After you have placed a weight, the "Test weight", "Reference" and "Comparisons" buttons become active; see Fig. B.8. It is now possible to start a measurement using the measuring button. However, further weights should be placed. Press the "Reference" button, and select the station for the next reference. In the example, there are further references on stations G2 (10 g), B1 (1 kg), B5 (100 g), and C1 (20 g). After you have placed the last reference, select the "Test weight" button to place the remaining specimens. The remaining placement stations in the example are G1 (10 g), A1 (1 kg), A5 (100 g), and A7 (20 g). Which one is occupied first is irrelevant; here station G1 is selected to place the 10 g weight. The calibration menu for the specimen should appear similar to that shown in Fig. B.9 in the first stage. Nothing should have changed with regards to Fig. B.4, except that the manufacture number is now added on the right hand side. The checkbox must remain active in order to continue to enter the remaining specimens into the same job. Press the "Continue" button to move to the next menu.

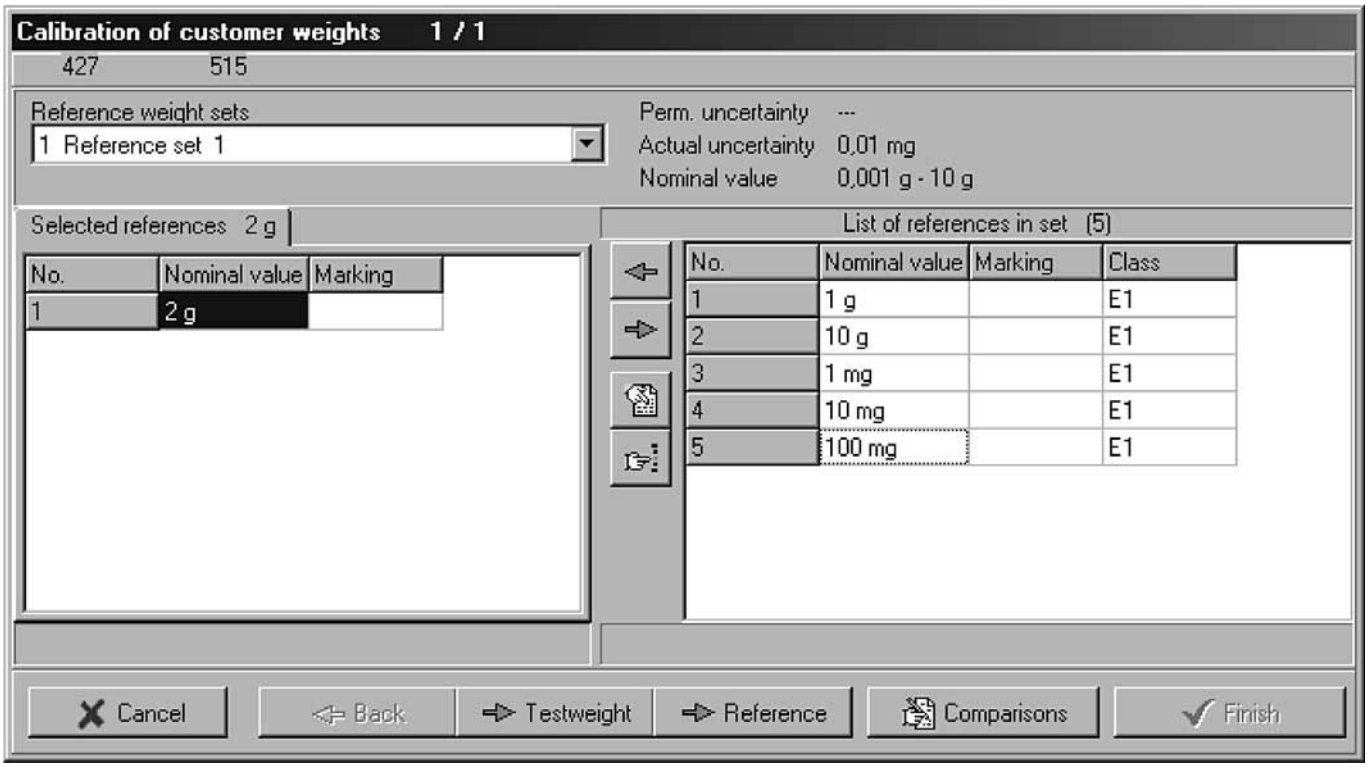


Figure B.8: Placing references on a magazine placement station of the large or small scale

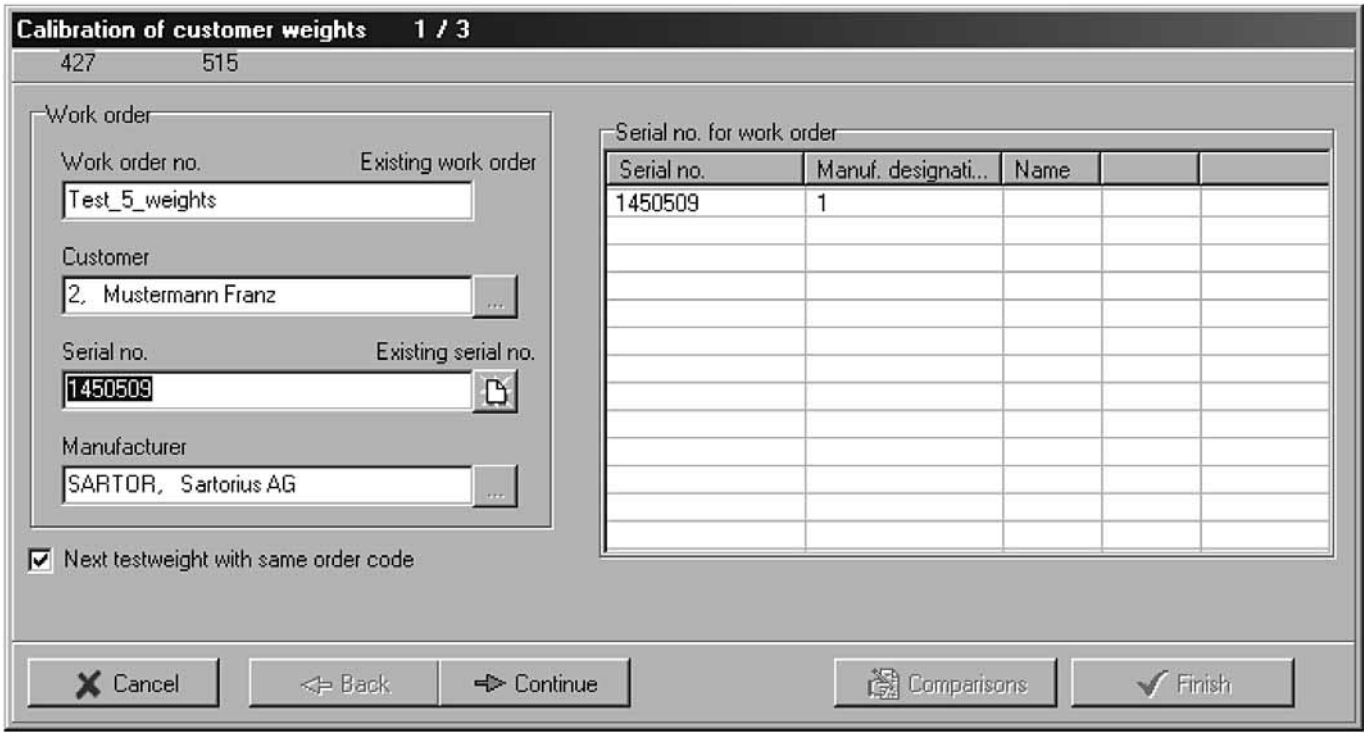


Figure B.9: Calibration menu 1/3 for a further specimen

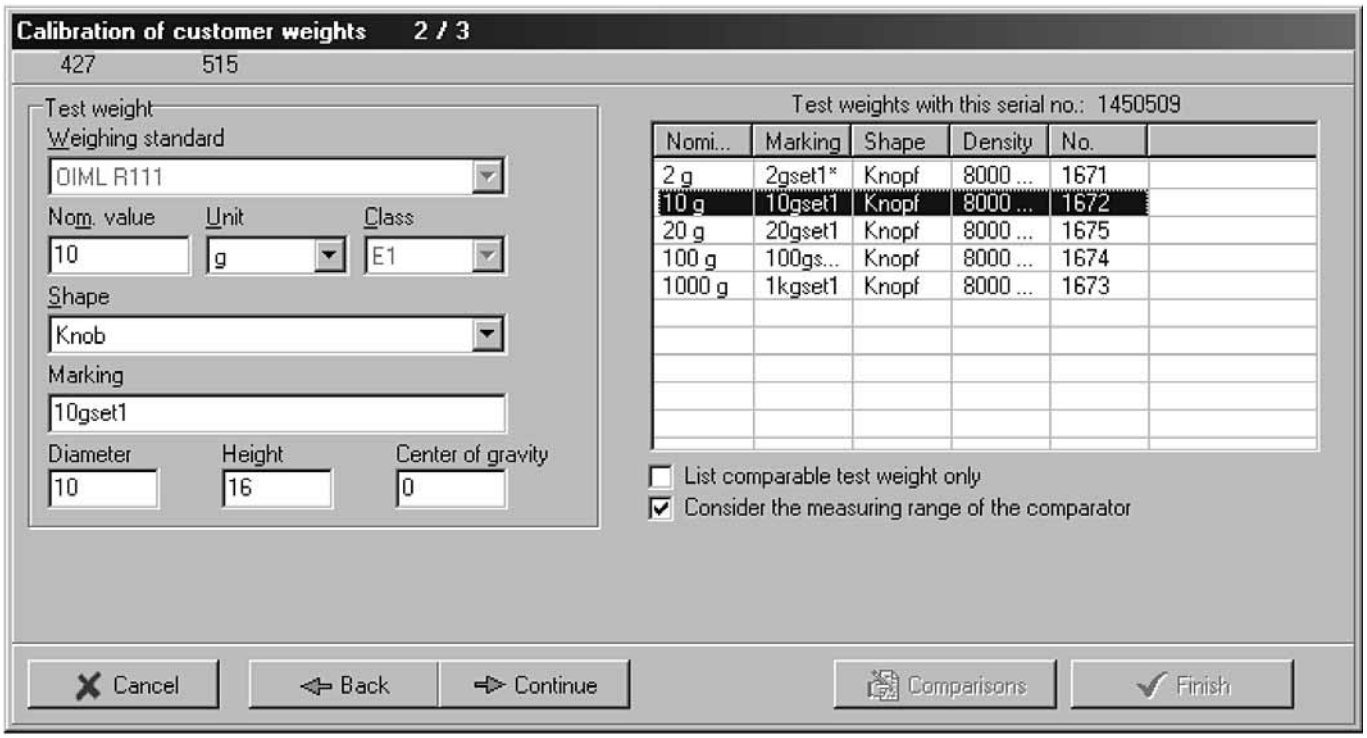


Figure B.10: Calibration menu 2/3

The calibration menu for the specimen is shown in Fig. B.10. As previously mentioned, the accuracy class can no longer be changed and is fixed for all subsequent specimens. Specimens that have already been defined for the same job can be found on the right-hand side. Confirm the settings with “Continue”. The menu that follows must be filled out in exactly the same way as on page 36. Press the “New version” button. The only difference is that the “Comparison” button is now also active; see Fig. B.11. In order to place the remaining three specimens, proceed as already described. Next, select the “Test weight” button and repeat the procedure.

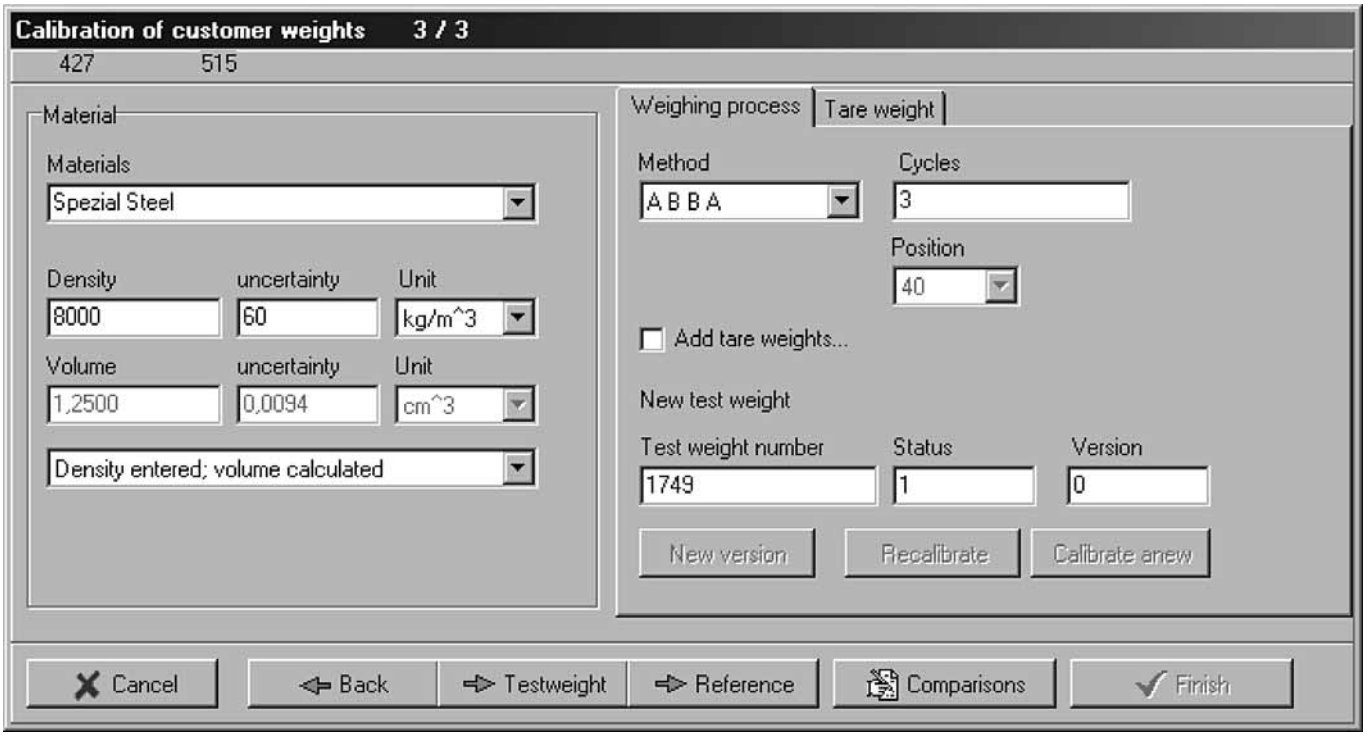


Figure B.11: Calibration menu 3/3

After all standards and specimens have been placed, the loading of the magazine should appear as in Fig. B.12. When the last specimen to be placed has been reached, select the "Comparisons" button in the calibration menu.

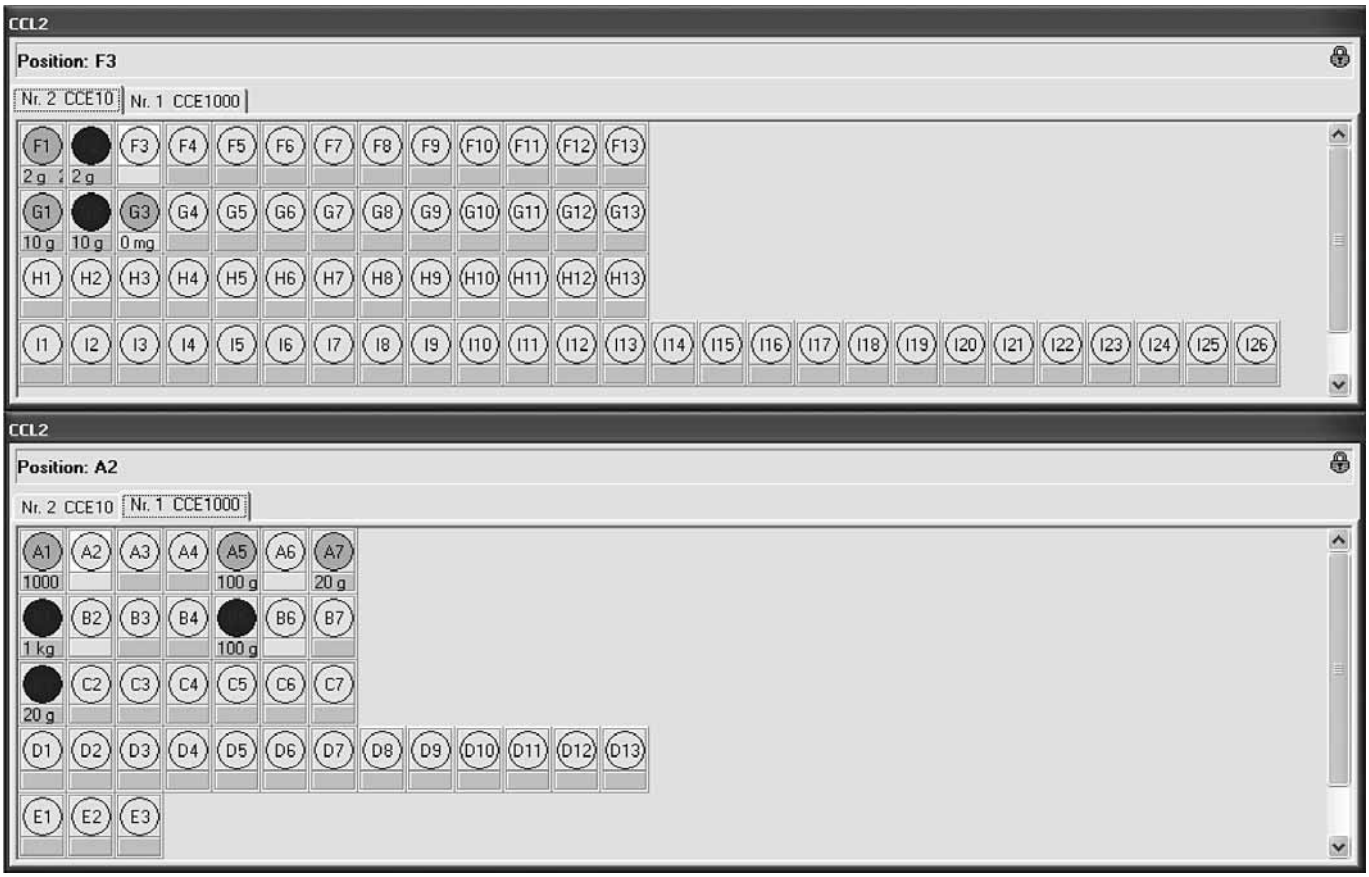


Figure B.12: Loading of the magazine

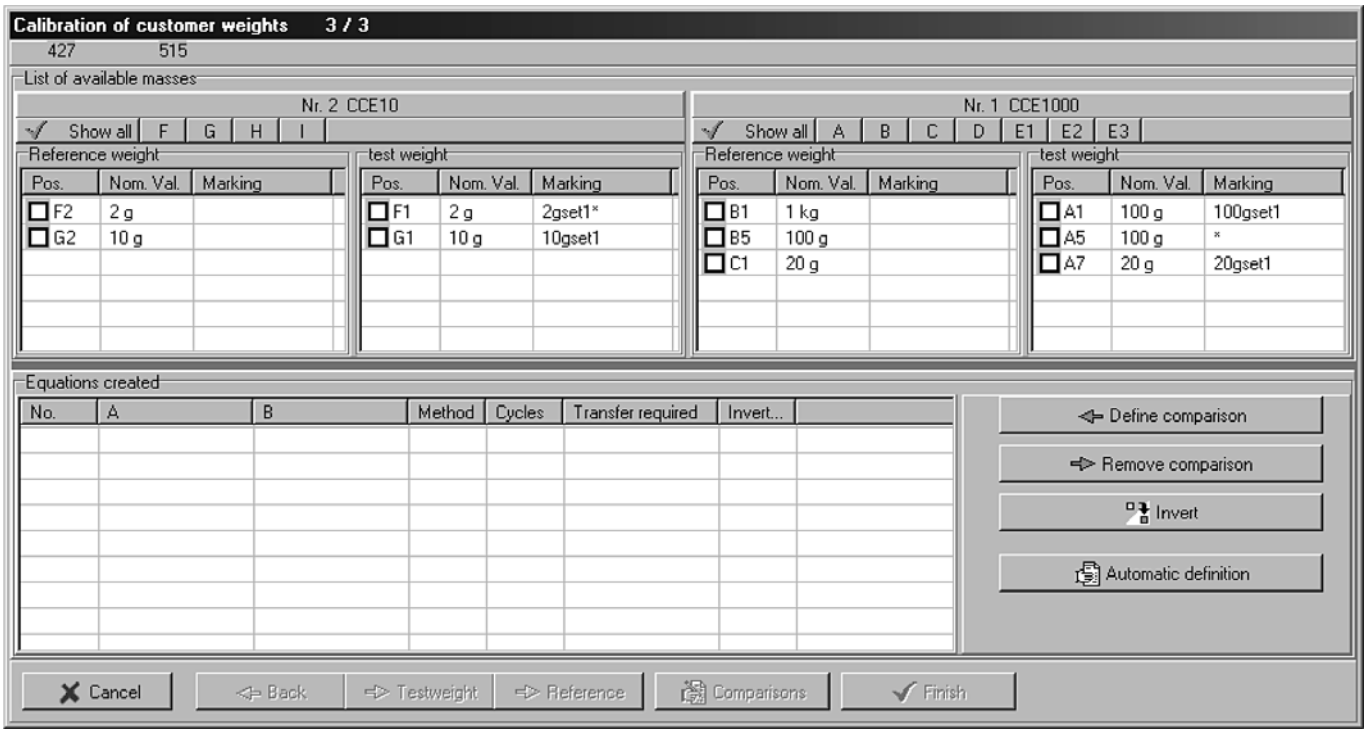


Figure B.13: Creating the weighing comparisons

A new menu should appear; see Fig. B.13. This serves to create the ABBA comparison. Either select the particular reference and corresponding specimen/test weight manually and click on "Define comparison", or let these be defined automatically by ScalesNet32 by clicking on "Automatic definition".

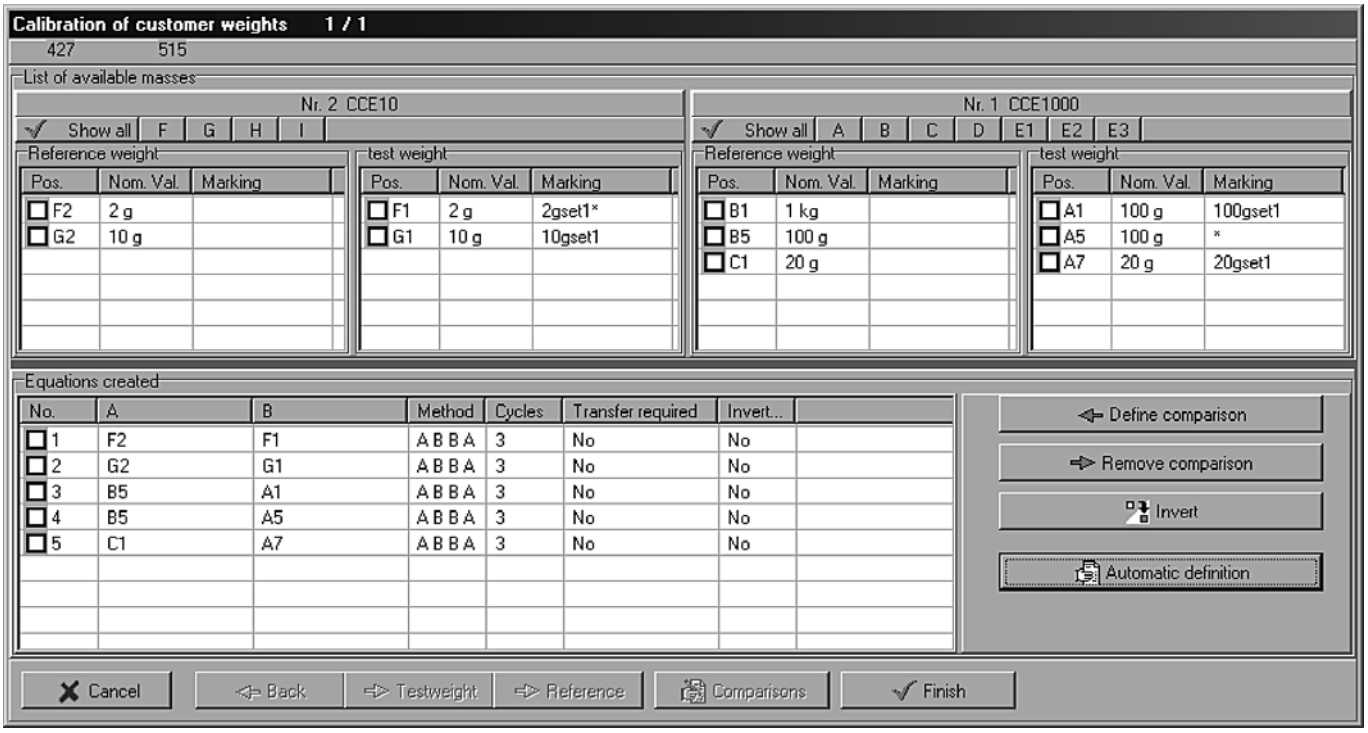


Figure B.14: Created ABBA comparisons

The comparisons were created automatically here and are listed in the window below for checking; see Fig. B.14. In addition, a filter is available in case only particular magazines need to be displayed. As can be seen in the table above, this is currently set to "Show All". In order to proceed, press the "Finish" button.

In the following menu, the user is once again given the opportunity to adjust the profile of the measurement; see Fig. B.15. The "Update" button shows the code that will be sent from ScalesNet32 to the CCR 10-1000 server under the "Output for robot" tab. Here the user can again check that the settings are correctly sent to the robot; see Fig. B.16. If there are no errors, the job is placed in the ScalesNet32 buffer by pressing "OK." The user is then returned to the ScalesMass main page; see Fig. B.17. The taskbar in the window reports that a job for the robot has been received. Now pressing the [execute] button takes the user to the menu that sends the job to the router and starts the job; see Fig. B.18. Please press "OK" to start the job. This will send the job to the robot, which will then immediately start the measurement. Please do not close ScalesMass, ScalesNet-Server, and ScalesNet-printer while a measurement is underway! In the event of an emergency, the robot can be set to emergency-stop by pressing "STOP". After the measurement is finished, ScalesMass returns to the main page, and a test record is created. You will be asked to enter a save location. The test record will open automatically immediately after it has been saved. One such test record is shown in Fig. B.19. If the results are required again at a later point in time, these are available in ScalesDesk under "Work orders → orders". The calibration job for this measurement with all its weights is shown in Fig. B.20. If no faults arise during the measurement, all weights should be marked green.

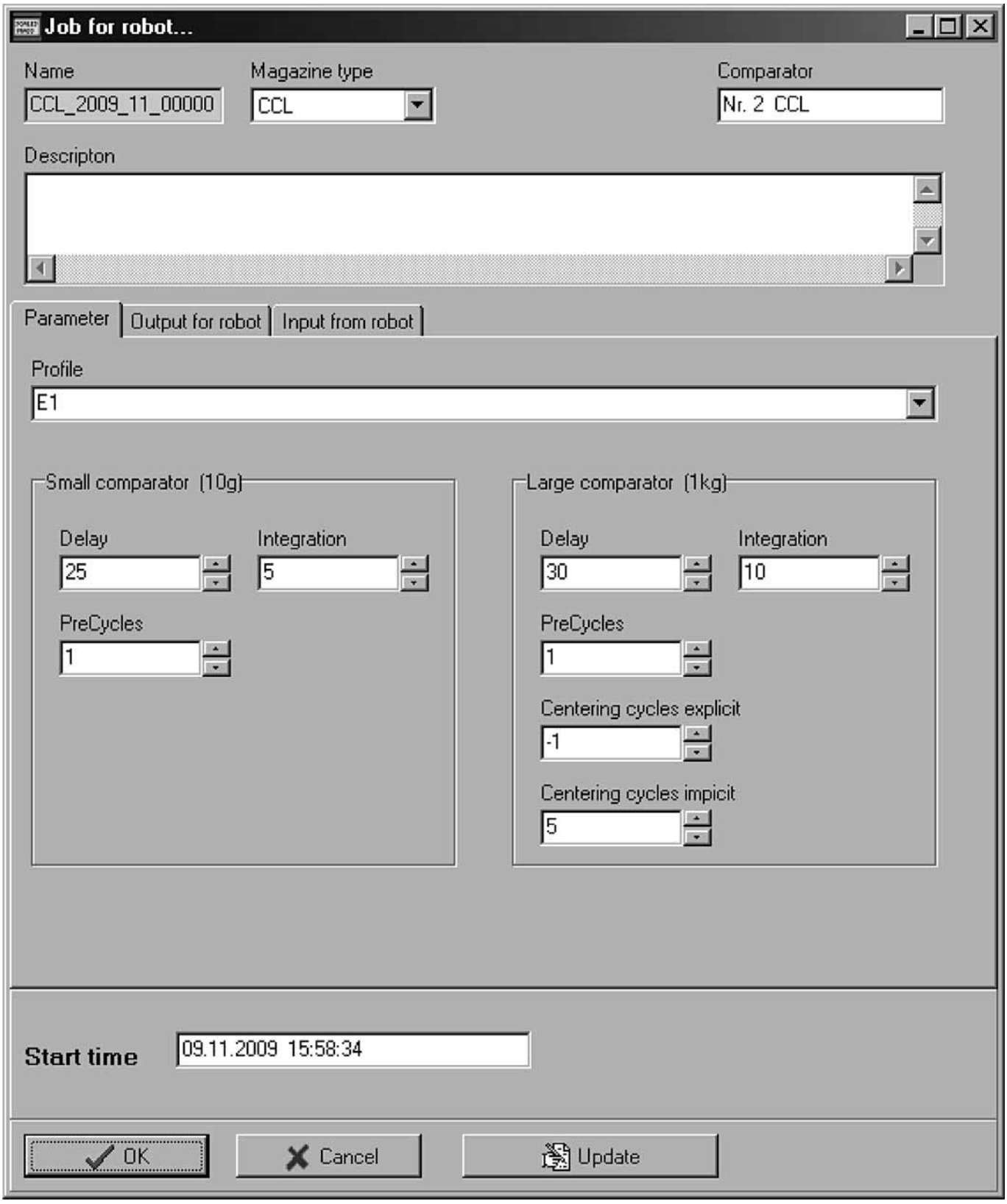


Figure B.15: Job for robot, tab with job parameters

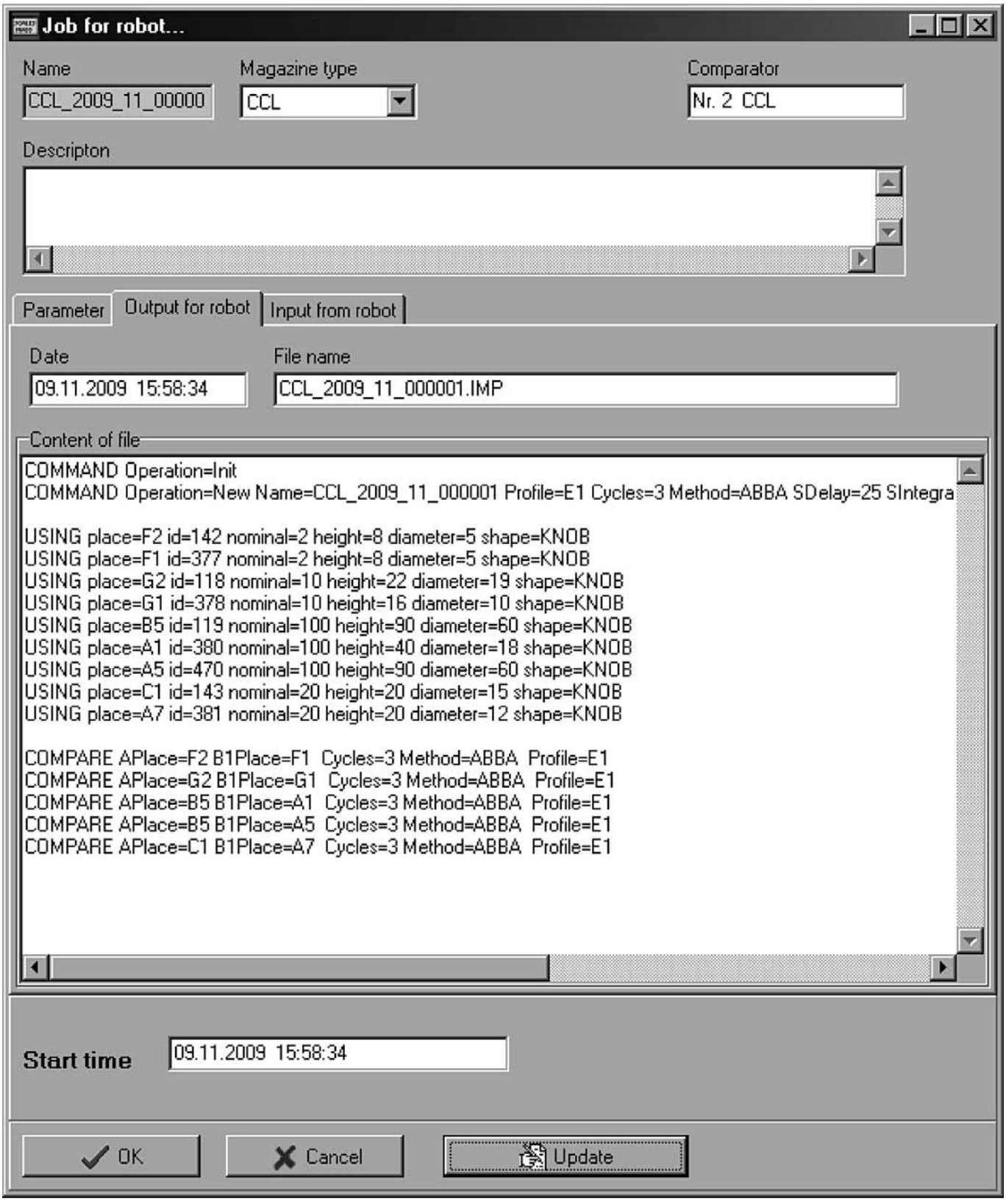


Figure B.16: Job for root, tab with tasks for the robot

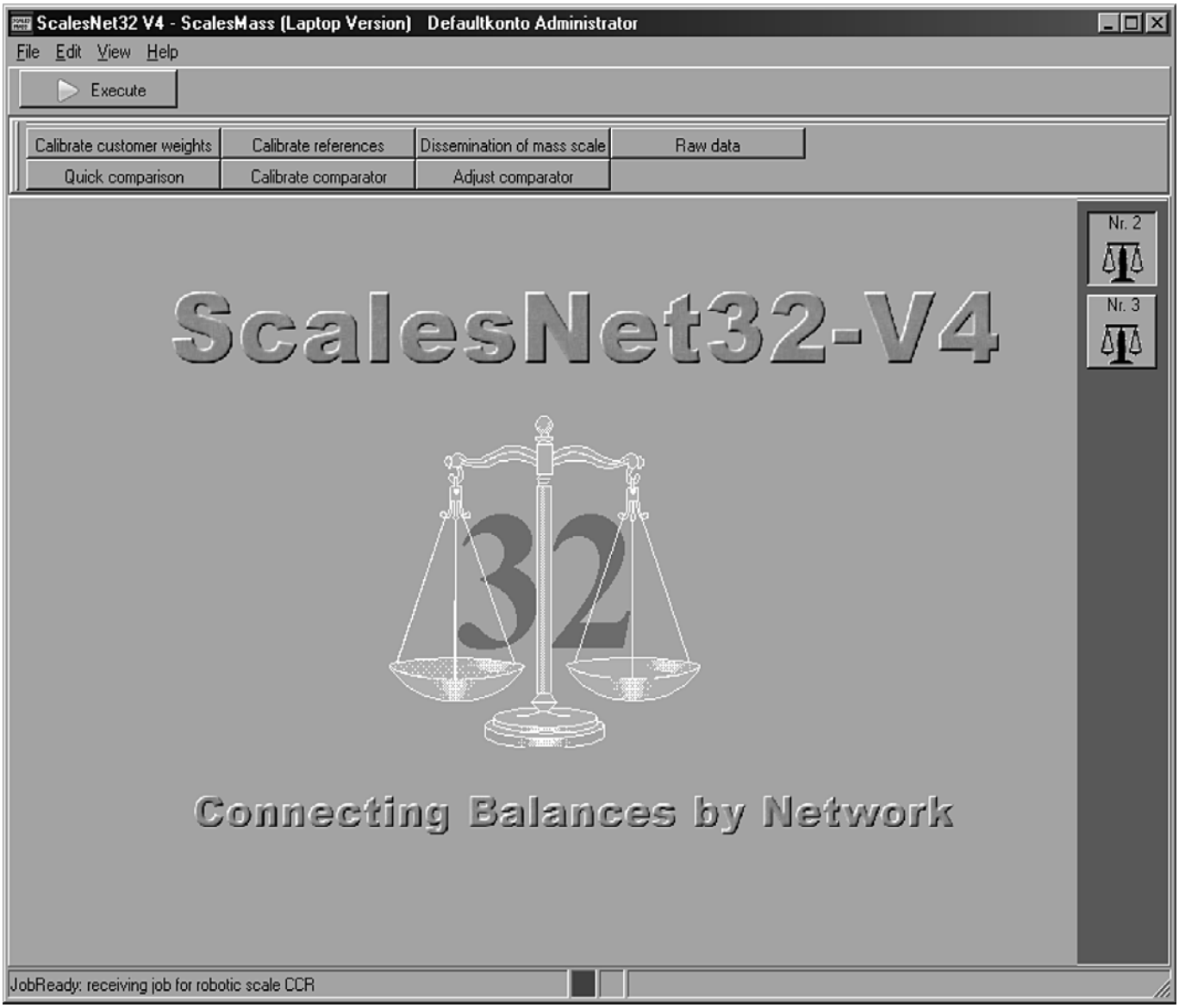


Figure B.17: ScalesMass main page with the information that a job for the robot has been received (see below in the taskbar)

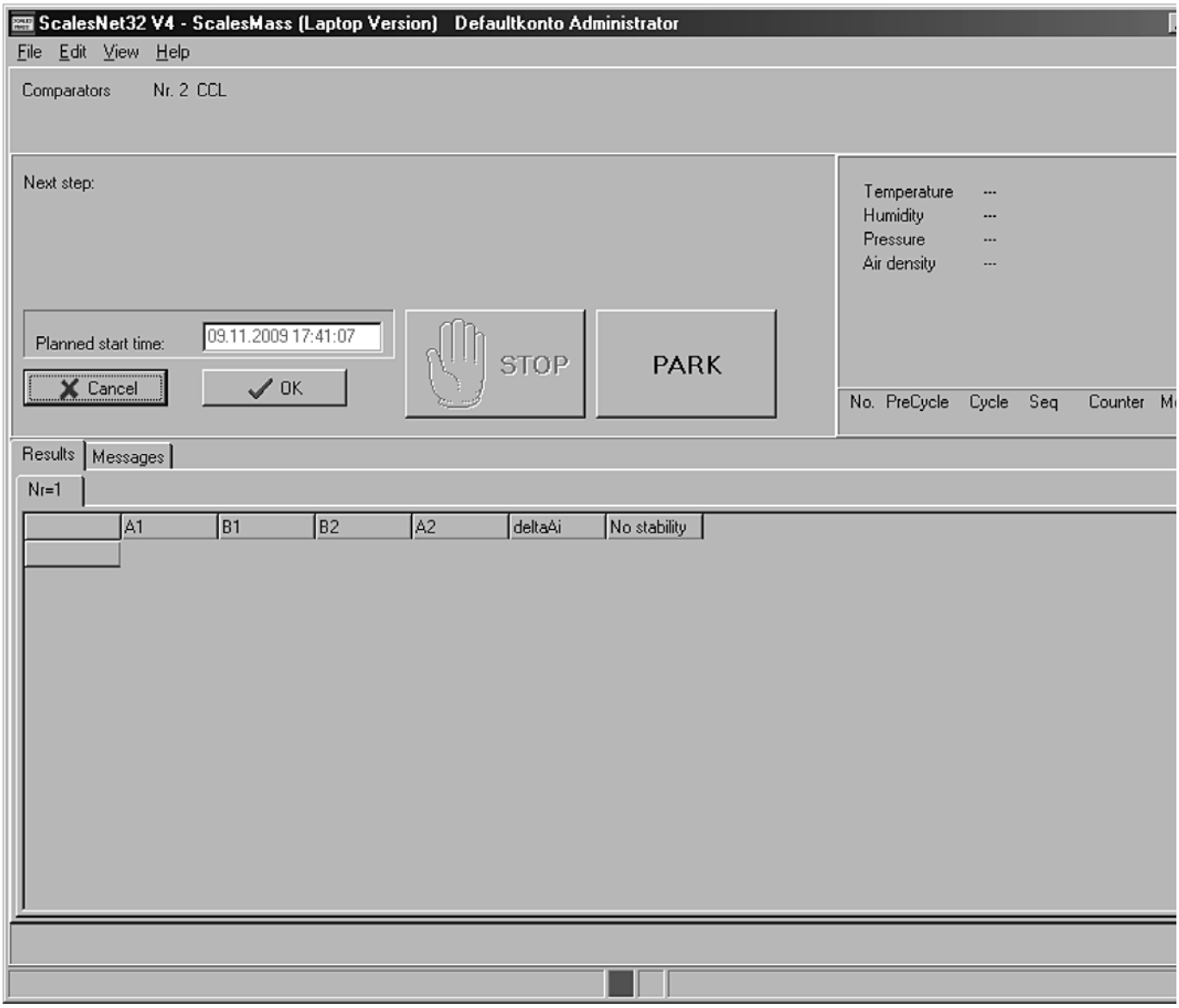


Figure B.18: Menu for starting the measurement

Test weight calibration

Calibration record-No.: 09_05_000023

Nominal value:	100 g	**Cust-no.:**	2	**Date:**	11.05.2009 15:59	**Test weight-no:**	1674
Marking:	100gset1	**Customer:**	Mustermann Franz	**Tester:**	Administrator	**Status:**	1
Serial-no.:	1450509	**Manufact.:**	Sartorius AG	**Order-no.:**	Test_5_weights	**Version:**	1

Test weight information:		OIML-Class:	E1	Reference-no:. (Nom. value / Marking)		1(100 g/)	
perm. δmcT	0,05 mg	perm. U(mcT)	0,015 mg	$m_{cR} = \sum m_{cRi}$	99,99999800 g	$U(m_{cR}) = \sum U(m_{cRi})$	0,015 mg
Material	Spezial Edelstahl	Shape	Knopf	$m_R = \sum m_{Ri}$	99,99997200 g	$U(m_R) = \sum U(m_{Ri})$	0,015 mg
ρ_T [kg/m³]	8000 kg/m^3	U(ρ_T) [kg/m³]	60 kg/m^3	$V_R = \sum V_{Ri}$	12,5000 cm^3	$U(V_R) = \sum U(V_{Ri})$	0 cm^3
V_T [cm³]	12,5000 cm^3	U(V_T) [cm³]	0,0938 cm^3	ρ_R [kg/m³]	8000 kg/m^3	U(ρ_R) [kg/m³]	60 kg/m^3

Comparator-no.	1
Typ of comp.	CCE1000
Measurem. area	1
Readability d	0,000001 g
s_p (R-T-T-R)	0,00300 mg
s_p (R-T-R)	0,00350 mg *
E_J	1,0000000000
ρ_J	8000 kg/m^3
ρ_{aj}	1,0000 kg/m^3
Only autom balances	
Pos. n	5
E_{Ex} from n	---

Testweight-supplement (Referencel-Set-no.):				Reference/Sensitiv-supplement (Reference-set-no.):			
$m_{cST} = \sum m_{cSTi}$	-	$U(m_{cST}) = \sum U(m_{cSTi})$	-	$m_{cSR} = \sum m_{cZNi}$	-	$U(m_{cSR}) = \sum U(m_{cSRi})$	-
$M_{ST} = \sum m_{STi}$	-	$U(m_{ST}) = \sum U(m_{STi})$	-	$M_{SR} = \sum m_{ZNi}$	-	$U(m_{SR}) = \sum U(m_{SRi})$	-
$V_{ST} = \sum V_{STi}$	-	$U(V_{ST}) = \sum U(V_{STi})$	-	$V_{SR} = \sum V_{ZNi}$	-	$U(V_{SR}) = \sum U(V_{SRi})$	-
ρ_{ST} [kg/m³]	-	U(ρ_{ST}) [kg/m³]	-	ρ_{SR} [kg/m³]	-	U(ρ_{SR}) [kg/m³]	-

Measurement values and utilization after cycle type and size				Cycle typ:	A B B A		Number of cycles:	3
I_{M1} [mg]	I_{T1} [mg]	I_{T2} [mg]	I_{M2} [mg]	$I_{R,1\ (mg)}$	ΔI_i	ΔI_{Ei}	ΔI_{Si}	S_i
- 0,088269	- 0,088462	- 0,093231	- 0,098600		**+0,00258800**	+0,00258800	-	-
- 0,105923	- 0,107769	- 0,108038	- 0,113731		**+0,00192350**	+0,00192350	-	-
- 0,119640	- 0,118440	- 0,122077	- 0,128731		**+0,00392700**	+0,00392700	-	-

t in °C	h in %	p in hPa	Air density ρ_{ai}	Δm_i [mg]	$\Delta m_i'''$ [mg]	m_{cTi} [g]	$\Delta m_i'$ [mg]	m_{Ti} [g]
23,4	41,1	959,3	1,12199	+0,00258800	+0,00258804	100,00000060	+0,00258804	99,99997459
23,4	41,0	959,3	1,12200	+0,00192350	+0,00192353	99,99999992	+0,00192353	99,99997392
23,4	40,8	959,3	1,12193	+0,00392700	+0,00392706	100,00000190	+0,00392706	99,99997593

T in °C	H in %relF	P in hPa	ρ_a in kg/m³	Δm_w [mg]	$\Delta m_w'''$ [mg]	m_{cT} [g]	$\Delta m_w'$ [mg]	m_T [g]
23,41	40,93	959,27	1,12197	+0,00281283	+0,00281288	100,00000080	+0,00281288	99,99997481
u(t) in °C	u(h) in %relF	u(p) in hPa	u(ρ_a) in kg/m³	**s(Δm_w) [mg]**	Mean value			
0,10	2,00	0,30	0,00036	**0,00102050**				

R=Reference weight T=Test weight

C:\Programme\ScalesNet32_V4\Protocols\PKP\2009_11\09_05_000023.doc

Conventional value and Mass

Conventional value		Mass	
m_{cT}	100,00000080 g	M_T	99,99997481 g
Δm_{cT}	+0,0008 mg	Δm_T	-0,0252 mg
m_{cT}	**100 g +0,001 mg**	**M_T**	**100 g -0,025 mg**

Measurements accuracy

$u_A(m_{cT}) = u(\Delta m_w)$	0,001732 mg	$u_A(m_T) = u(\Delta m_w)$	0,001732 mg
$u(m_{cR})^2$	0,000056 mg^2	$u(m_R)^2$	0,000056 mg^2
$u_{cb}(\Delta m_w)^2$	0,000027 mg^2	$u_b(\Delta m_w)^2$	1,257897565E-18 mg^2
$u_{bs}(\Delta m_w)^2$	1,666686447E-7 mg^2	$u_{bs}(\Delta m_w)^2$	1,666686447E-7 mg^2
$u_B(m_{cT})$	0,009120 mg	$u_B(m_T)$	0,007511 mg
$u_C(m_{cT})$	0,009283 mg	$u_C(m_T)$	0,007708 mg
$U(m_{cT}) = 2*u_C(m_{cT})$	**0,018566 mg**	**$U(m_T) = 2*u_C(m_T)$**	**0,015416 mg**

Appraisal factors

Δm_{cT} + perm. $U(m_{cT})$ < perm δm_{cT}:	ok	Temp. 01:00: ok
Δm_{cT} + $U(m_{cT})$ < perm δm_c :	ok	Temp. 04:00: ok
$U(m_{cT})$ < perm. $U(m_{cT})$:	failed	Temp. 24:00: ok
s(Δm_w) < sp used :	ok	Feuchte 04:00: ok

Figure B.19: Test record for the 100 g weight

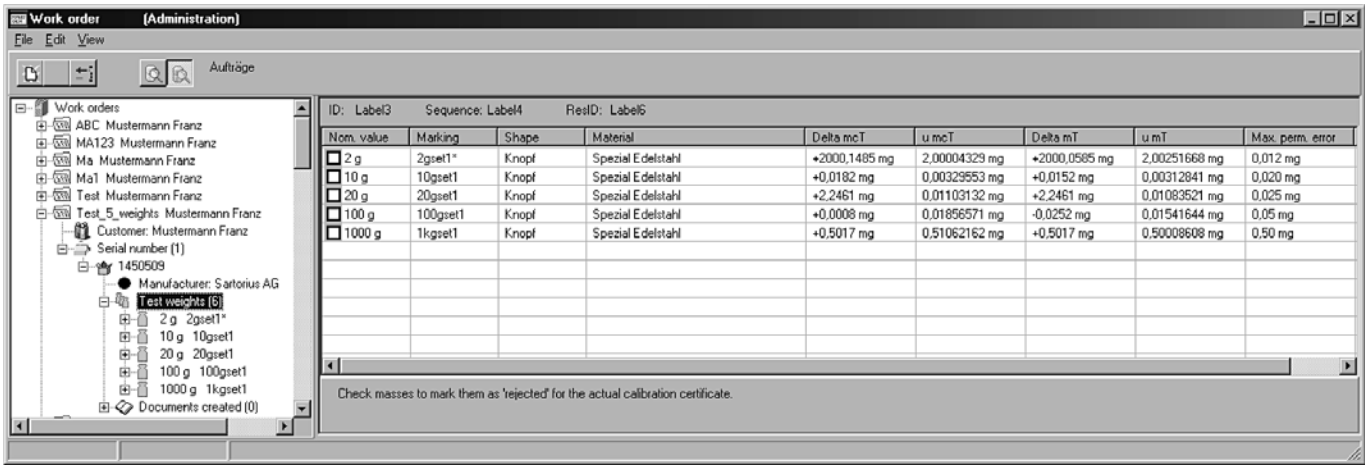


Figure B.20: Calibration job and its results

Original

EG-/EU-Konformitätserklärung
EC / EU Declaration of Conformity

Hersteller *Manufacturer*	**Sartorius Lab Instruments GmbH & Co. KG** **37070 Goettingen, Germany**

erklärt in alleiniger Verantwortung, dass das Betriebsmittel
declares under sole responsibility that the equipment

Geräteart *Device type*	**Roboter** *Roboter*
Modell *Model*	**CCR10, CCR1000, CCR10-1000**

in der von uns in Verkehr gebrachten Ausführung allen einschlägigen Bestimmungen der folgenden Europäischen Richtlinien - einschließlich deren zum Zeitpunkt der Erklärung geltenden Änderungen - entspricht und die anwendbaren Anforderungen folgender harmonisierter Europäischer Normen erfüllt:

in the form as delivered fulfils all the relevant provisions of the following European Directives – including any amendments valid at the time this declaration was signed - and meets the applicable requirements of the harmonized European Standards listed below:

2014/30/EU	Elektromagnetische Verträglichkeit *Electromagnetic compatibility* EN 61326-1:2013
2011/65/EU	Beschränkung der Verwendung bestimmter gefährlicher Stoffe in Elektro- und Elektronikgeräten (RoHS) *Restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS)* EN 50581:2012
2006/42/EG *2006/42/EC*	Maschinen *Machines* EN ISO 12100:2010, EN 61010-1:2010

Die Person, die bevollmächtigt ist, die technischen Unterlagen zusammenzustellen:
The person authorised to compile the technical file: Sartorius Lab Instruments GmbH & Co. KG
International Certification Management
37070 Goettingen, Germany

Jahreszahl der CE-Kennzeichenvergabe / *Year of the CE mark assignment:* **16**

Sartorius Lab Instruments GmbH & Co. KG
Goettingen, 2016-04-20

i.V. | i.V.

Dr. Reinhard Baumfalk
Vice President R&D

Dr. Dieter Klausgrete
Head of International Certification Management

Diese Erklärung bescheinigt die Übereinstimmung mit den genannten EG- und EU-Richtlinien, ist jedoch keine Zusicherung von Eigenschaften. Bei einer mit uns nicht abgestimmten Änderung des Produktes verliert diese Erklärung ihre Gültigkeit. Die Sicherheitshinweise der zugehörigen Produktdokumentation sind zu beachten.

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The information and figures contained in these instructions correspond to the version date specified below.
Sartorius reserves the right to make changes to the technology, features, specifications and design of the equipment without notice.
Masculine or feminine forms are used to facilitate legibility in these instructions and always simultaneously denote the other gender as well.

Last updated:
04 | 2016

Printed in the EU on paper bleached without chlorine. | W
Publication No.: WCC6030-e160403