

OPERATING INSTRUCTIONS

Option package III for Finn-Power UC-control **ONLINE QUALITY MONITORING**

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FINN-POWER
Crimping since 1973



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OPTION PACKAGE III

Option package III for Finn-Power UC control includes options for pressure crimping, multi-step crimping and online quality monitoring.

PRESSURE CRIMPING

GENERAL

Pressure crimping is an ideal solution when crimping is done according to force instead of traditional crimping based on diameter. Pressure control can be used when objects have too big variations in dimensions or when joining sensitive materials.

In pressure crimping the dies will stop according to the set pressure. Crimping by diameter can be used as well. The machine stops crimping according to the set crimping diameter or the set pressure, depending on which one is achieved first.



BEFORE OPERATION READ THROUGH ALSO THE UC-CONTROL OPERATING INSTRUCTIONS.

MAIN PRINCIPLES OF THE OPERATION

The pressure sensor measures hydraulic pressure that has straight relation to the crimping force. The measured value is transformed continuously to the screen where the operator can see momentary value of the pressure (bar). The screen will also show the adjusted pressure limit where crimping movement will be stopped to.

When the control notices that the adjusted pressure has been reached, it will stop the crimping.

The machine stops either according to the pressure or according to the set crimping diameter depending on which one is achieved first. This makes it possible to use the diameter control as a backup during the pressure crimping. This way the possible danger situations can be avoided if e.g. mistakes are made when setting the pressure limit.

It is important to notice that crimping machines equipped with double pump system has a quite high approaching speed.

During the crimping the pressure will rise very fast if the crimping speed is high. This might cause overshoot of the adjusted pressure.

Crimping machine equipped with double pump will change to the slower crimping speed either when 100 bar pressure level has been reached or 2 mm before the adjusted crimping diameter value. To avoid or minimize pressure overshoot with objects which require max. 100 bar pressure, make sure that the diameter setting is close enough to the actual diameter value so the slow-down will take place.

WARNINGS



During the crimping the part may brake and burst out of the machine. Work very carefully when making new crimpings with new parts. Protect yourself and others near the machine!

It is important to follow these instructions. See also the operating instructions for the crimping machine and UC control, especially chapters "Warnings".



Always check before crimping that the correct pressure value is set to the pressure control. The pressure is checked by making a test crimp with an alignment tool by using the crimping and retraction buttons in manual mode!

ACTIVATING THE PRESSURE CRIMPING

The pressure crimping mode is activated from Pop-up menu, behind the first symbol in menu bar.

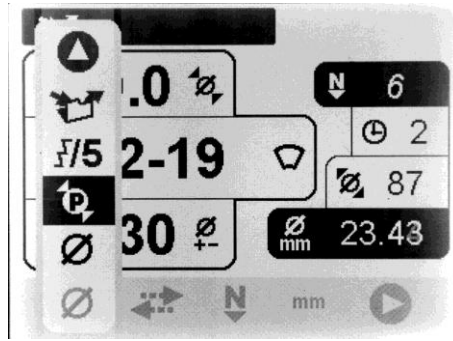


Fig.1. Activating the pressure crimping.

PRESSURE SCREEN

- 1. FILENAME
- 2. ACTUAL PRESSURE
- 3. CRIMPING PRESSURE
- 4. CRIMPING DELAY
- 5. CORRECTION
- 6. PIECE COUNTER
- 7. RETRACTION
- 8. ACTUAL DIAMETER
- 9. DIE SET
- 10. DIE POSITION
- 11. CRIMPING DIAMETER



SETTING THE ADJUSTMENTS

The crimping parameters can be recalled from the memory or adjusted manually to the screen. For adjusting the parameters see also UC control operating instructions, chapter *Adjusting parameters*.

- 1. Open the pressure crimping screen.
- 2. Activate the editing mode of the screen by pressing SET. The screen is now in editing mode.
- 3. Adjust the desired parameters: pressure, crimping diameter, retraction and crimping delay.
- 4. Close the editing mode by taking the cursor to menu bar and pressing SET.
- 5. If desired, set the counting mode for the piece counter.
- 6. Make a test crimp.
- 7. Check the crimping result and make corrections, if needed.

SETTING THE RIGHT BACKUP VALUE FOR THE CRIMPING DIAMETER

To find the right backup crimping diameter value:

- 1. For the first test crimp set the crimping diameter to the nominal value of die set and the correction value to -1.00 . This way it is made sure that stopping will happen according to pressure.
- 2. Set the right pressure limit. If the set values are not correct the object may brake and burst out of the machine.
- 3. Make the first test crimp carefully.
- 4. Check and measure the diameter of the crimped object.
- 5. When crimping for production, set the crimping diameter according to the measured diameter. Also consider tolerances of the object and possible bounce back of the object.

PRESSURE CRIMPING PROCESS

DIE POSITION

The black arrow in *Die position* field (10) displays the real-time position of the dies. The direction of the arrow shows which direction the dies are moving: downward arrow = dies are closing, upward arrow = dies are opening. When the dies move, the arrow flashes.

1. During the crimping cycle the arrow flashed and moves downwards according to the die position:



2. When the crimping pressure (3) or the crimping diameter (8) is reached and the dies have stopped, the arrow stops flashing and stays to the lower edge of the *Die position* field (10):



3. When the dies are opened, the arrow turns upwards and starts flashing again:



4. The arrow starts moving upwards according to the die position. The movement and flashing stop when the retraction position is achieved:



SLOW-DOWN MOVEMENT

The crimping speed slows down just before the set crimping pressure or crimping diameter is reached. The starting point of the slow-down is determined by the crimping diameter.

PRESSURE CRIMPING CYCLE

During the crimping cycle the dies start to close until the slow-down point is reached. Dies go on with slower speed until the set crimping diameter or pressure is reached, depending on which one is reached first. If the crimping diameter is reached before the set crimping pressure, the crimping pressure will be ignored.

For safety reasons the crimping movement can be interrupted by pressing the retraction button.

MULTI-STEP CRIMPING

GENERAL

Multi-step crimping is done according to the crimping diameter or the crimping pressure. Crimping diameter or crimping pressure is set individually to each step, as well as the retraction diameter.



NOTE! The retraction of the last step must be bigger than the first crimping diameter.

BEFORE OPERATION READ THROUGH ALSO THE UC-CONTROL OPERATING INSTRUCTIONS.

ACTIVATING THE MULTI-STEP CRIMPING

The multi-step crimping mode is activated from Pop-up menu, behind the first symbol in menu bar.

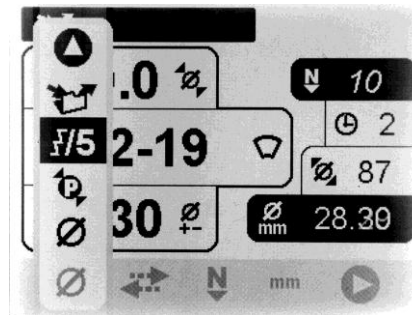
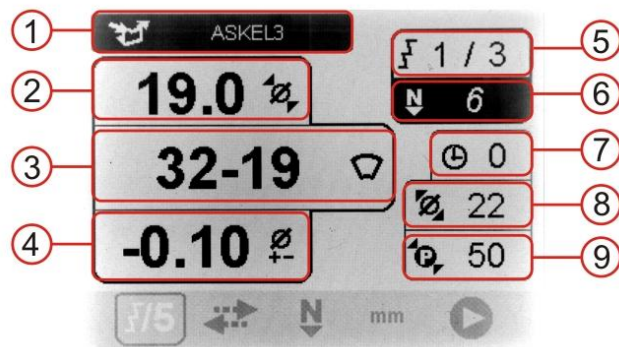


Fig.2. Activating the multi-step crimping.

MULTI-STEP SCREEN

1. FILENAME
2. CRIMPING DIAMETER
3. DIE SET
4. CORRECTION
5. CURRENT STEP / TOTAL AMOUNT OF STEPS
6. PIECE COUNTER
7. CRIMPING DELAY
8. RETRACTION
9. CRIMPING PRESSURE



SETTING THE ADJUSTMENTS

The parameters can be recalled from the memory or adjusted manually to the screen. For adjusting the parameters see also UC control operating instructions, chapter *Adjusting parameters*.

NOTE! The parameters of all steps are saved under one filename. The parameters of the steps are separated with Step # -column (the last field at the end of the row). Operator can select parameters of any step and the control unit will automatically update all the steps.

1. Open the multi-step crimping screen. The cursor jumps to the *Steps*-field (5). The field displays two values: the current step, opened to the screen / the total amount of the steps. Navigation between these two values is done with Up- and Down-navigation buttons.
2. Select the total amount of the steps -value by pressing Up-navigation button and activate the field by pressing SET. Add the needed amount of the steps (max.10). Confirm by pressing SET. Press Down-navigation button in order to choose desired step.
3. Add the sequence number of the step, which parameters need to be adjusted. In case of new data, add number 1. Confirm by pressing SET.
4. Set the desired crimping diameter, die set and retraction diameter to the screen.
5. Take the cursor to the *Steps*-field and add the number of next step. Confirm by pressing SET.
6. Repeat sections 3 and 5 until the parameters of all steps are adjusted.
7. Finally, take the cursor back to the menu bar and press SET.

ONLINE QUALITY MONITORING

GENERAL

Online quality monitoring assists to make a production with a uniform quality. The adjustments to the workpiece are set and locked by the supervisor or other person in charge.

Monitoring function has adjustable limits for the crimping result. If the crimping result exceeds these adjusted limits, the machine stops, and the control makes an alarm. The machine goes on working when the alarm is set off.

The monitoring screen displays the adjusted crimping parameters, limiting values, measurement results and the bars for visualizing the crimping result. The crimping parameters have to be recalled from the memory. Online quality monitoring saves the measurement results and crimping parameters automatically to the control memory.

Adjust the correct crimping parameters and make test crimpings before activating the online quality monitoring. Crimping parameters cannot be edited in monitoring screen. New crimping parameters have always to be recalled from the memory.

Activating or deactivating the monitoring function requires the monitoring password.



BEFORE OPERATION READ THROUGH THE UC-CONTROL OPERATING INSTRUCTIONS.

ACTIVATING THE ONLINE QUALITY MONITORING

The monitoring function is activated from pop-up menu, behind the first symbol in menu bar. The online quality monitoring screen is opened after entering the monitoring password.

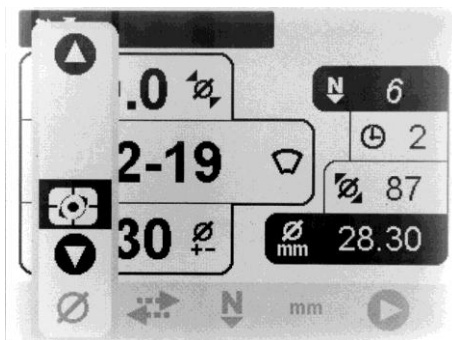


Fig.3. Select and activate the monitoring function.

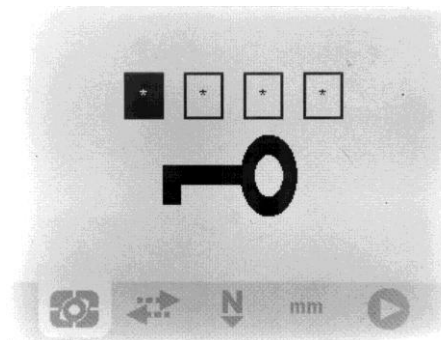
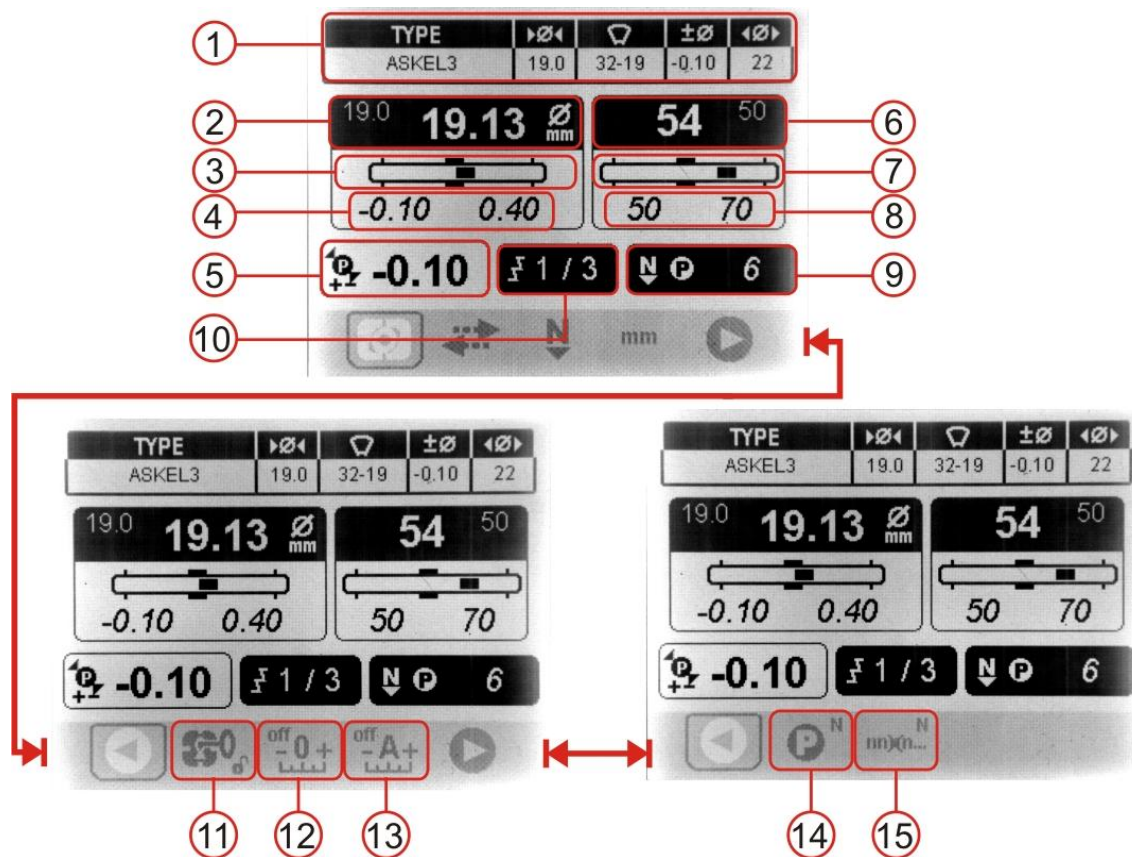


Fig.4. Monitoring password screen.

MONITORING SCREEN

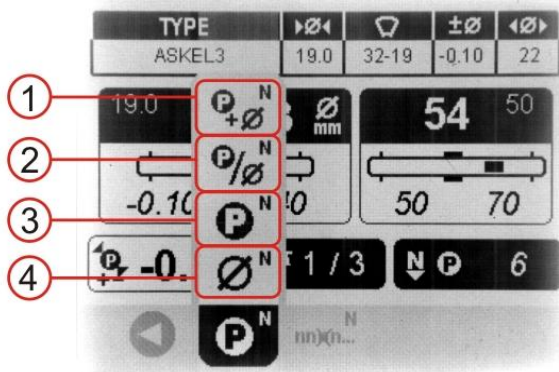


1. CRIMPING PARAMETERS
2. ACTUAL CRIMPING DIAMETER / ADJUSTED DIAMETER (in small fonts)
3. DIAMETER BAR
4. CRIMPING DIAMETER LIMITS
5. CORRECTION
6. ACTUAL PRESSURE / ADJUSTED PRESSURE (in small fonts)
7. PRESSURE BAR
8. PRESSURE LIMITS
9. PIECE COUNTER
10. CURRENT STEP / TOTAL AMOUNT OF STEPS
11. LOCKING
12. OFFSET
13. AUTO CORRECTION
14. COUNTING MODE
15. DEVIATION ALARM

COUNTING MODES

With the counting mode the operator defines which measuring method will be monitored. **The chosen counting mode controls the accepted crimpings.** If the monitored measuring value is too high/low, the machine makes an alarm.

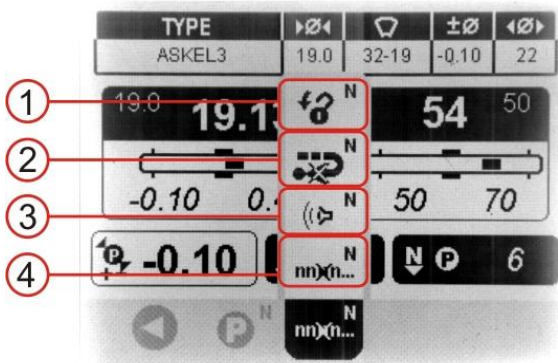
The counting mode is selected from pop-up menu in third menu bar.



1. ACCORDING TO PRESSURE AND CRIMPING DIAMETER
2. ACCORDING TO PRESSURE OR CRIMPING DIAMETER
3. ACCORDING TO CRIMPING PRESSURE
4. ACCORDING TO CRIMPING DIAMETER

DEVIATION ALARM (function in fault situations)

The deviation alarm defines the function of the machine in fault situations. Deviation alarm is activated from the pop-up menu in third menu bar.



1. CONTROL LOCKING
2. DIE MOVEMENT DISABLED
3. EXTERIOR ALARM (LIGHT OR SIGNAL)
4. COUNTING DISABLED

SETTING THE ACCEPT LIMITS

1. Activate the online quality monitoring function.
2. Open the desired crimping parameters from the control memory.
3. Adjust the accept limit values for the crimping pressure and the crimping diameter.

Crimping diameter limits are entered as an increase/decrease of the target value. Pressure limits are defined as total values.

An example: Target values are 19.0 mm for the crimping diameter and 60 bar for the pressure. The values of the accept limits are entered:

| | | |
|---------------------------|--------------|---------------|
| Crimping diameter limits: | min. -0.1 mm | max. +0.40 mm |
| Crimping pressure limits: | min. 50 bar | max. 70 bar |

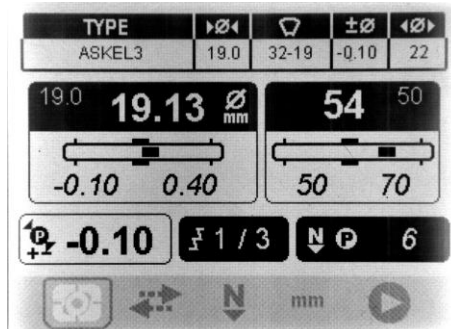


Fig.5. Accept limits for the crimping pressure and the crimping diameter.

4. Take the cursor back to the menu bar and press SET.
5. Select the desired counting mode. See chapter *Counting modes*.
6. Activate the deviation alarm. See chapter *Deviation alarm*.

FUNCTION

LOCKING

When the online quality monitoring is activated, all the adjustable parameters (correction, crimping diameter limits, pressure limits) are locked by default. Also pop-up menus are locked.

The locking is removed by selecting the locking symbol from the second menu bar and pressing Up - navigation button. Monitoring password is required. Locking is reactivated in the same order: 1) select the locking symbol, 2) press Up-navigation button and 3) enter the monitoring password.

VISUAL BARS

The crimping diameter and the crimping pressure are measured from each crimping. When the crimping has been made, the actual crimping diameter of the crimped part and the used crimping pressure are displayed in the screen.

The visual bars visualize the actual crimping values. The pressure bar shows the actual crimping pressure in comparison to the preset accept limits. In proportion, the crimping diameter bar shows the actual crimping diameter in comparison to the preset accept limits.

If the tolerance is exceeded/not reached, the control gives an alarm, disables the die opening or locks the machine.

OFFSET CORRECTION

Offset correction is used in situations where the actual diameter is correct but the value displayed in the screen is not.

The actual crimping diameter, measured with an exterior measuring device, is entered to the Offset-field, This offset-value corrects the subsequent display measuring. See also chapter *Calibration*.

Offset correction is activated from the pop-up menu in second menu bar:

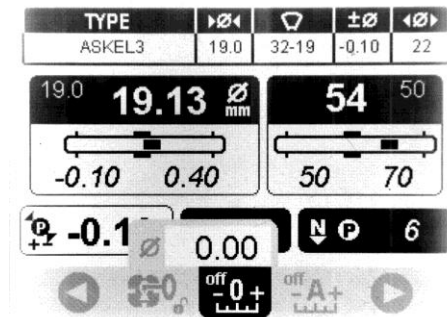


Fig.6. Offset correction function.

AUTO CORRECTION FUNCTION

The second menu bar has also a pop-up menu for activating/deactivating the auto correction function. Auto correction function monitors the crimping results during the crimping process and corrects the crimping diameter automatically in order to keep the crimping results inside the target limits.

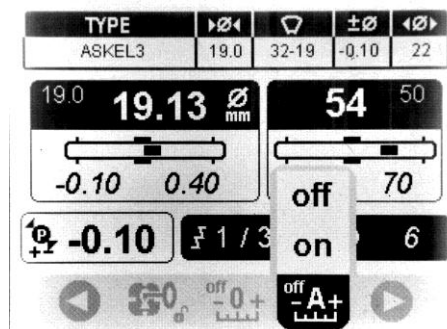


Fig.7. Auto correction function.

THE DEFINITE METHOD OF MEASUREMENT

Monitoring function is performed as follows:

When the set crimping diameter or pressure (depending on the selected counting mode) is reached, the crimping data will be saved and visualized in the bars.

After crimping the crimping diameter will be measured, corrected with the offset-value and saved into the monitoring memory (*report.csv*).

The results are compared to the accept limits. If the crimping diameter and the crimping pressure are inside the accept limits, the dies will be opened and the machine is ready for the next crimping. The crimping cycle has been performed successfully and value (0) will be written to the *fault* column in *report.csv* file.

If the crimping result is not inside the limits, the machine gives an alarm or disables the die opening, depending on the chosen deviation alarm. When the error occurs the undershoot value (1) or the overshoot value (2) is written to the *report.csv*.

| DESCRIPTION | CODE |
|----------------------------------|------|
| Result is accepted | 0 |
| Result does not reach the limits | 1 |
| Result exceeds the limits | 2 |

REPORT.CSV FILE

Online quality monitoring automatically saves the crimping data to *report.csv* file. The data includes crimping parameters, filename, target limits, time, date, measuring results and success of the crimping.

| Line number | Name | Chanal (not in use) | Set Diameter | Set pressure | Dies in use | Correction | Return diameter | Delay time | Counter | Total steps | Actual step | Diameter after crimping | Diameter min tolerance | Diameter max tolerance | Pressure after crimping | Pressure min tolerance | Pressure max tolerance | Error code | Actual Date | Actual Date | Actual Date | Actual Time | Actual Time | Actual Time |
|-------------|--------|---------------------|--------------|--------------|-------------|------------|-----------------|------------|---------|-------------|-------------|-------------------------|------------------------|------------------------|-------------------------|------------------------|------------------------|------------|-------------|-------------|-------------|-------------|-------------|-------------|
| [ID] | [Name] | [Ch] | [Diam] | [Pres] | [Dies] | [Corr] | [App] | [Del] | [Cnt] | [Steps] | [Step#] | [DiamResult] | [DiamMin] | [DiamMax] | [PresResult] | [PresMin] | [PresMax] | [Limit] | [Day] | [Month] | [Year] | [Hour] | [Minute] | [Second] |
| 0 | | 1 | 19 | 0 | 32-19 | -0.1 | 87 | 0 | 38 | 0 | 0 | 18,94 | 0 | 0 | 1 | 0 | 0 | 1 | 30 | 3 | 2009 | 12 | 5 | 40 |
| 1 | | 1 | 19 | 0 | 32-19 | -0.1 | 87 | 0 | 38 | 0 | 0 | 18,92 | 0 | 0 | 2 | 0 | 0 | 1 | 30 | 3 | 2009 | 12 | 5 | 51 |
| 2 | | 1 | 19 | 0 | 32-19 | -0.1 | 87 | 0 | 38 | 0 | 0 | 18,92 | 0 | 0 | 2 | 0 | 0 | 1 | 30 | 3 | 2009 | 12 | 5 | 59 |
| 3 | | 1 | 19 | 0 | 32-19 | -0.1 | 87 | 0 | 38 | 0 | 0 | 18,89 | 0 | 0 | 1 | 0 | 0 | 1 | 30 | 3 | 2009 | 12 | 6 | 19 |
| 4 | | 1 | 19 | 0 | 32-19 | -0.1 | 87 | 0 | 39 | 0 | 0 | 18,89 | -0.2 | 0.2 | 1 | 0 | 0 | 0 | 30 | 3 | 2009 | 12 | 7 | 57 |
| 5 | | 1 | 19 | 0 | 32-19 | -0.1 | 87 | 0 | 40 | 0 | 0 | 18,92 | -0.2 | 0.2 | 1 | 0 | 0 | 0 | 30 | 3 | 2009 | 12 | 8 | 4 |
| 6 | | 1 | 19 | 0 | 32-19 | -0.2 | 87 | 0 | 40 | 0 | 0 | 18,79 | -0.2 | 0.2 | 2 | 0 | 0 | 1 | 30 | 3 | 2009 | 12 | 8 | 20 |
| 7 | | 1 | 19 | 0 | 32-19 | -0.2 | 27 | 0 | 41 | 0 | 0 | 18,87 | -0.2 | 0.2 | 4 | 0 | 0 | 0 | 30 | 3 | 2009 | 12 | 9 | 20 |
| 8 | | 1 | 19 | 0 | 32-19 | -0.2 | 27 | 0 | 42 | 0 | 0 | 18,81 | -0.2 | 0.2 | 2 | 0 | 0 | 0 | 30 | 3 | 2009 | 12 | 9 | 24 |
| 9 | | 1 | 19 | 0 | 32-19 | -0.2 | 27 | 0 | 43 | 0 | 0 | 18,82 | -0.2 | 0.2 | 3 | 0 | 0 | 0 | 30 | 3 | 2009 | 12 | 9 | 26 |
| 10 | | 1 | 19 | 0 | 32-19 | -0.2 | 27 | 0 | 44 | 0 | 0 | 18,80 | -0.2 | 0.2 | 3 | 0 | 0 | 0 | 30 | 3 | 2009 | 12 | 9 | 29 |
| 11 | | 1 | 19 | 0 | 32-19 | -0.2 | 27 | 0 | 45 | 0 | 0 | 18,82 | -0.2 | 0.2 | 2 | 0 | 0 | 0 | 30 | 3 | 2009 | 12 | 9 | 32 |
| 12 | | 1 | 19 | 0 | 32-19 | -0.1 | 27 | 0 | 46 | 0 | 0 | 18,94 | -0.2 | 0.2 | 1 | 0 | 0 | 0 | 30 | 3 | 2009 | 12 | 9 | 52 |
| 13 | | 1 | 19 | 0 | 32-19 | -0.1 | 27 | 0 | 47 | 0 | 0 | 18,92 | -0.2 | 0.2 | 1 | 0 | 0 | 0 | 30 | 3 | 2009 | 12 | 9 | 55 |
| 14 | A2 | 1 | 19 | 0 | 32-19 | 0 | 87 | 1 | 15 | 2 | 1 | 18,77 | 0 | 0 | 2 | 0 | 0 | 1 | 2 | 4 | 2009 | 9 | 32 | 17 |
| 15 | A2 | 1 | 19 | 0 | 32-19 | 0 | 87 | 1 | 15 | 2 | 1 | 18,77 | 0 | 0 | 2 | 0 | 0 | 1 | 2 | 4 | 2009 | 9 | 32 | 32 |
| 16 | A2 | 1 | 19 | 0 | 32-19 | 0 | 87 | 1 | 15 | 2 | 1 | 18,82 | 0 | 0 | 2 | 0 | 0 | 0 | 2 | 4 | 2009 | 9 | 33 | 3 |
| 17 | A2 | 1 | 21 | 0 | 32-19 | 0 | 29 | 0 | 16 | 2 | 2 | 20,97 | 0 | 0 | 2 | 0 | 0 | 0 | 2 | 4 | 2009 | 9 | 33 | 24 |
| 18 | A2 | 1 | 19 | 0 | 32-19 | 0 | 87 | 1 | 15 | 2 | 1 | 18,82 | 0 | 0 | 2 | 0 | 0 | 0 | 2 | 4 | 2009 | 9 | 33 | 24 |

Fig.8. An example of a report.csv file.

When *report.csv* file becomes full, closing the dies and making new crimpings will be disabled. For safety reasons the die opening is still enabled.

The pop-up window informs the user when the *report.csv* file is full. 'No' is selected by default. Confirming it disables new crimpings until *report.csv* is copied to the USB-memory. Choosing 'Yes' overwrites the file and new crimpings can be made at once.

NOTE! If the locking function is activated, it has to be opened before data saving.

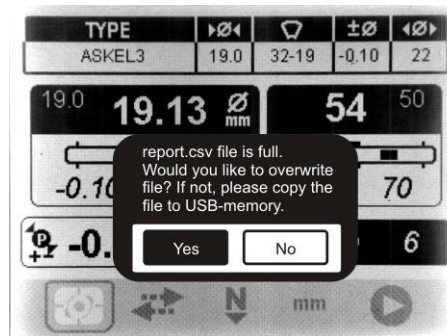


Fig.9. Confirmation dialog box.

CALIBRATION

Before activating the monitoring function, the measurement has to be calibrated:

1. Adjust the crimping parameters or open the saved parameter file and make a test crimp.
2. Check the crimping diameter.
3. Enter the actual diameter value to the offset-field.
4. If desired, activate also the auto correction function.

EXIT

Online quality monitoring is shut by selecting some other function from pop-up menu, behind the first symbol in menu bar and pressing SET. Shutting requires monitoring password.