

# HNS SPC

Statistical process and quality control

## Automatic Out of Control monitoring and alert



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## 1 Description of the function

The aim of the automatic OoC\* monitoring and alert function is that if there is durable OoC in certain selected processes, i.e. no measures have been taken to eliminate the existing OoC according to the technological command, then the appropriate persons in charge should automatically be notified thereof.

\*: OoC - Out of Control.

### 1.1 Operation of the monitoring function

In case the monitoring function is activated, the software checks the important processes at the predefined frequency of execution if necessary, i.e. if there has been data entry since the previous check. In case durable OoC is detected, the program sends an alert indicating the given sample – sampling time – and the OoC. Durable OoC means that a given OoC event has been existing for a longer time. The user has to define the decision criteria related to the individual processes.

After durable OoC has occurred, it is necessary that a person with appropriate engineer-level authorisation take measures and it is also necessary to administrate the measures in order to acknowledge the given alert. Otherwise the software will systematically repeat the alerts at the specified intervals.

Similarly to the Data Connection, the software assures the monitoring and alerting function as in-built services. In order for the function to be available and to operate in a given SPC system, it is necessary to have at least one – running – software where this function – service – is enabled.

#### **Attention!**

*In case the service is not authorised in either program in a given SPC system, then monitoring is suspended and the e-mails containing possible alerts will not be sent either.*

In the case of the processes selected for monitoring, the inspections to be carried out are registered and scheduled on a database level so the system handles the administration of the new samples independently of the service's status (whether automatic monitoring is turned off or on). When the service is started, the software examines all new samples belonging to the specified processes, entered since stopping and also sends the repeated alerts that have become due since the turn-off.

As the service is to be operated continuously – even 24 hours a day, depending on the number of shifts – it is useful to designate – at least – one computer in the system where the software assuring the service will be running constantly.

#### **Note**

*The monitoring function works for the factory actually specified in the given program.*

## 2 Settings

### 2.1 Registration of user e-mail addresses

It is a new service in the software that an e-mail address can also be allocated to the individual users on the **Personal >>** page in the **Password** menu item of the **Settings** menu.

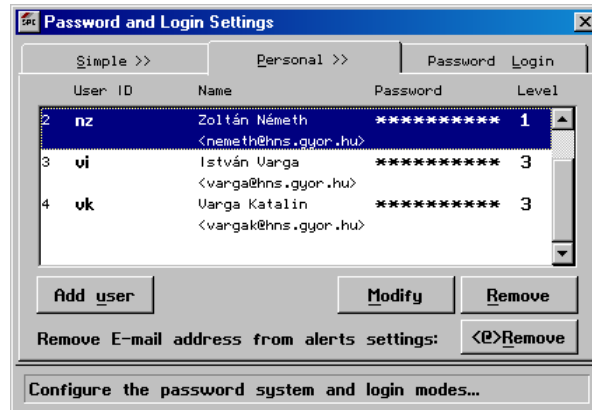


Figure 1: Personal password settings

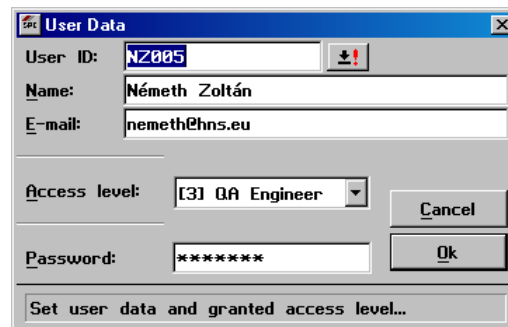


Figure 2: User data, providing the e-mail address

Providing the e-mail addresses is of importance because the software supports the specification of the recipients at the alert settings with the e-mail addresses stored in the user registration. The e-mail addresses do not have to be typed in separately in each case, the e-mail addresses of the desired recipients can be selected from a list.

The given user will remove from all alert e-mail lists in the actual factory by clicking on **<@>Remove** button. From the password list removed users are deleted from all alert e-mail lists automatically. In case of modification of an e-mail address here, it will be modified in all alert e-mail lists automatically.

#### Note

*Creating a user list does not mean that it is only possible to use personal passwords. Even if there is a user list, common passwords can be used or password protection can even be turned off.*

### 2.2 Selecting important processes and alert settings

The important processes can be selected and the related alert conditions can be set when the processes are created or when the process settings are modified:

1. in the **Measured process / Attributed process** menu item of the **Database** menu, when manufacturing tools are allocated
2. in the **Process settings - Change** menu item of the **Database** menu, when the process settings are modified.

## 2.2.1 In the case of measured process

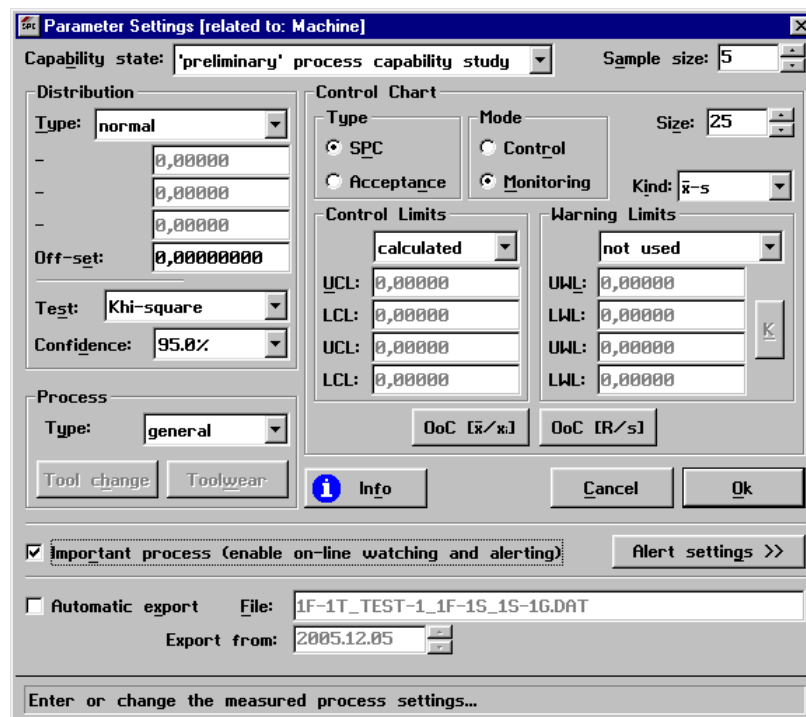
In the **Parameter Settings** window you can find the **Important process (enable on-line watching and alerting)** option by enabling which and in the window opening when the **Alert settings>>** button is pressed, you can specify the alert conditions to be interpreted related to the given process.

### Note

Automatic alerts are not sent related to the process sections being under machine capability study. A reason thereof is that in the case of the data entered at a machine capability study, the function cannot be interpreted – just as no control charts are taken for these process sections.

In case of a machine capability study of an important process, the software executes the tests registered based on the entered samples and also registers it in the automatic alert log. However no e-mail alert is sent and “no alert” entry will be registered in the alert log as well.

Due to functional considerations, the Important process switch and the Alert settings switch are not disabled in the case of machine capability status as this way – in order to prepare for the switch to the later, process capability study – the important process status can be set in advance and the settings related to the alert can be specified, too.



The screenshot shows the 'Parameter Settings [related to: Machine]' dialog box. The 'Capability state' is set to 'preliminary' process capability study. The 'Distribution' is set to 'normal' with a 'Test' of 'Chi-square' and 'Confidence' of '95.0%'. The 'Control Chart' is set to 'SPC' with 'Monitoring' mode and 'x-s' kind. The 'Control Limits' are set to 'calculated'. The 'Warning Limits' are set to 'not used'. The 'Process' type is 'general'. The 'Important process (enable on-line watching and alerting)' checkbox is checked, and the 'Alert settings >>' button is visible. The 'Automatic export' checkbox is unchecked, with the file name '1F-1T\_TEST-1\_1F-1S\_1S-1G.DAT' and 'Export from' date '2005.12.05'.

Figure 3: Selecting the important process in the Parameter Settings window

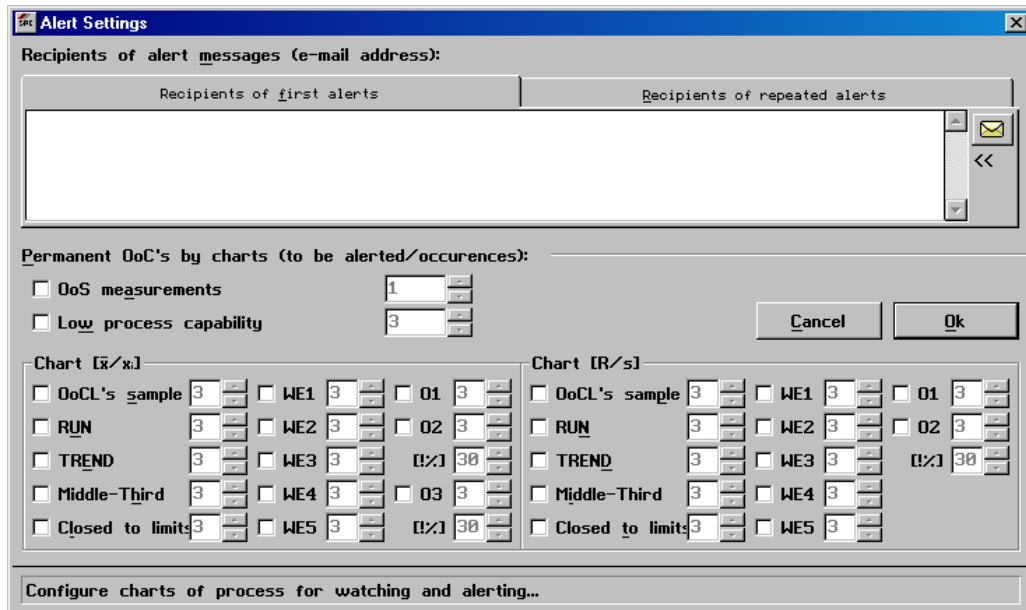


Figure 4: Specifying the settings related to alert in the case of measured processes

The users (e-mail addresses) to whom alerts related to the given process have to be sent, have to be provided in the **Alert message recipients (e-mail addresses)** field in the *Alert Settings* window.

If you have defined the users and provided their e-mail address in the **Password** menu item of the **Settings** menu, then you can choose the e-mail addresses of the persons to be selected for the given process from the list of users, with the help of the << [envelope icon] button. In the list of users, more than one person can also be selected at a time. The software automatically locates the e-mail addresses of the persons selected from the list after the addresses possibly already provided. When selecting from the list, the program also controls that one address should be featured only once in the given list.

The e-mail addresses can also be entered through the keyboard. When providing several e-mail addresses, then the individual addresses have to be entered in the usual way: one after the other, separated by a semicolon – see the previous figure.

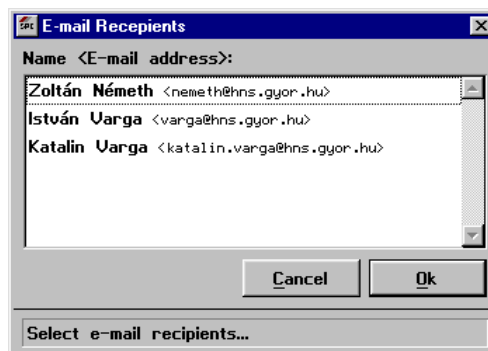


Figure 5: Selecting e-mail addresses

The e-mail addresses are provided on two levels. The users specified in the **First alert** field will obviously receive the alert sent for the first time. The users specified in the **Repeated alerts** field will receive all the other repeated alerts, depending on the specified maximum number of repeats. The two lists are independent from each other so if you want to send someone the first alert and the repeated alerts, too, then this person's e-mail address has to be specified in both fields.

**Attention!**

*In order for the software to be able to send e-mails, the settings necessary for e-mail sending have to be provided in the **E-mail** menu item of the **Settings** menu – e.g. SMTP host. Without providing the settings related to mailing or in the case of faulty settings, the software cannot send e-mails. The software records the errors of e-mail sending into the automatic alert log as 'E-mail error' entry. (The mentioned menu item had already been featured in the earlier version of the software because of the alert function connected to the measurement task.)*

Following this, you have to select the OoCs, in the case of the durable existence thereof alert has to be sent and also how many times in a row the given event has to occur in order for the software to qualify the OoC as durable and to sent the related alert. Obviously the first criterion always applies to the measured values of the given entered sample and the others always apply to the process section interpreted based on the given sample.

**Attention!**

*To operating of alert have to be switched on the given OoC case also between OoC settings.*

In the case of the individual durable OoC criteria, the value to be specified is to be interpreted as follows ( $n$  is the number of occurrences):

**OoS measurements**

There are  $n$  or more than  $n$  values measured outside tolerance in the entered sample – the value of  $n$  can be specified as a value between 1 and the sample size.

**Low process capability**

Following the entry of the last  $n$  samples, (one by one, following the entry of each sample) the value of the capability index is smaller than the critical value given for the parameter – the value specified in the *Index minimum* fields of the *Measured parameter* menu item in the *Database* menu. The software executes the checking of capability indices only for full control charts so if the number of samples specified as the control chart size is available.

**OoCL's sample**

On the given diagram of the control chart, all of the last consecutive  $n$  pieces of samples are outside the control limit.

**RUN**

Following the entry of the last  $n$  samples, (one by one, following the entry of each sample) there is RUN OoC on the given diagram of the control chart – RUN is detected based on the criteria specified among the *Out of Control settings*.

Meaning of *RUN* Out of Control: there are several points which are following each other on the same side of centre line on given diagram of control chart.

**TREND**

Following the entry of the last  $n$  samples, (one by one, following the entry of each sample) there is TREND OoC on the given diagram of the control chart – TREND is detected based on the criteria specified among the *Out of Control settings*.

Meaning of *TREND* Out of Control: several points which are following each other are increasing or decreasing on given diagram of control chart.

**Middle-Third**

Following the entry of the last  $n$  samples, (one by one, following the entry of each sample) there is Middle-Third OoC on the given diagram of the control chart – Middle-Third is detected based on the criteria specified among the *Out of Control settings* related to the given chart of the given process.

Meaning of *Middle-Third* Out of Control: there are more or fewer points than expected inside the middle third of control range on given diagram of control chart.

**Closed to limits**

Following the entry of the last  $n$  samples, (one by one, following the entry of each sample) there is closed to limit OoC on the given diagram of the control chart – closed to limit is detected based on the criteria specified among the *Out of Control settings* related to the given chart of the given process.

Meaning of *Closed to limits* Out of Control: there are several points which are following each other closed to control limits on given diagram of control chart.

**WE1**

Following the entry of the last  $n$  samples, (one by one, following the entry of each sample) there is WE1 OoC on the given diagram of the control chart.

Meaning of *WE1* Out of Control: 14 points which are following each other are alternating up and down in proportion to centre line.

### **WE2**

Following the entry of the last  $n$  samples, (one by one, following the entry of each sample) there is WE2 OoC on the given diagram of the control chart.

Meaning of WE2 Out of Control: 2 of 3 points which are following each other are inside the middle two third of control range on the same side of centre line.

### **WE3**

Following the entry of the last  $n$  samples, (one by one, following the entry of each sample) there is WE3 OoC on the given diagram of the control chart.

Meaning of WE3 Out of Control: 4 of 5 points which are following each other are outside the middle third of control range on the same side of centre line.

### **WE4**

Following the entry of the last  $n$  samples, (one by one, following the entry of each sample) there is WE4 OoC on the given diagram of the control chart.

Meaning of WE4 Out of Control: 15 points which are following each other are inside the middle third of control range on the both side of centre line.

### **WE5**

Following the entry of the last  $n$  samples, (one by one, following the entry of each sample) there is WE5 OoC on the given diagram of the control chart.

Meaning of WE5 Out of Control: 8 points which are following each other are outside the middle third of control range on the both side of centre line.

### **O1**

Following the entry of the last  $n$  samples, (one by one, following the entry of each sample) there is O1 OoC on the given diagram of the control chart.

Meaning of O1 Out of Control: 2 of 3 points which are following each other are out of warning limits on the same side of centre line.

### **O2**

Ratio of points out of control limits is grater than given % value given.

### **O3**

Distance between centreline and nominal value is grater than given % value.

This criterion is related to only upper diagram of control chart.

Related to every event, the number of occurrences specifiabile at the above settings – except for the value measured outside tolerance – is at most 5.

The relationship between the OoC criteria specified among the *Out of Control settings* and the OoC criteria specified among the *Alert settings* is to be interpreted as follows – explained through the example of TREND. Let the OoC criterion related to TREND among the OoC settings be 6 out of 6 points and the durable OoC criterion specified among the alert settings related to TREND be 3.

With the above settings, the alerts will take place in the below order.

1. On the below figure, 6 out of 6 process sections increase monotonously thus the TREND sign appears on the control chart but no alert is made (TREND detected for the first time).



Figure 6: TREND no. 1

2. Section no. 7 also increases monotonously thus the checked parameter of the process continues to shift in the same direction so the software extends the TREND sign to this point on the control chart as well but no alert is made at this time either (TREND detected for the second time),

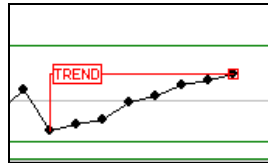


Figure 7: TREND no. 2

3. If process section no. 8 also increases monotonously then the behaviour of the process has not changed and the software extends the TREND sign to this point on the control chart as well. At this point – sample – alert is also made as TREND OoC subsisted at each of the last 3 samples, which was indicated as the criterion of durable OoC (TREND detected for the third time).

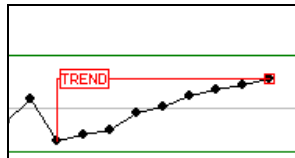


Figure 8: TREND no. 3

Durable OoC is to interpreted in a similar way in the case of the other OoC criteria as well.

Naturally the important process status can also be enabled or disabled subsequently and the settings of the alert conditions can be changed in the **Process settings - Change** menu item of the **Database** menu.

## 2.2.2 In the case of attributed process

In the *Failure Group Settings* window you can find the **Important process (enable on-line watching and alerting)** switch, by enabling which and by pressing the **Alert settings >>** button, you can provide the alert conditions for the given process in an opening window.

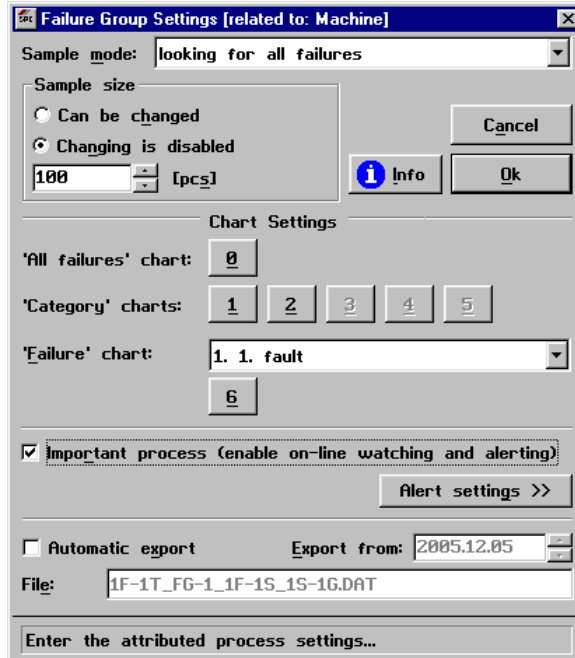


Figure 9: Selecting the important process in the Failure Group Settings window

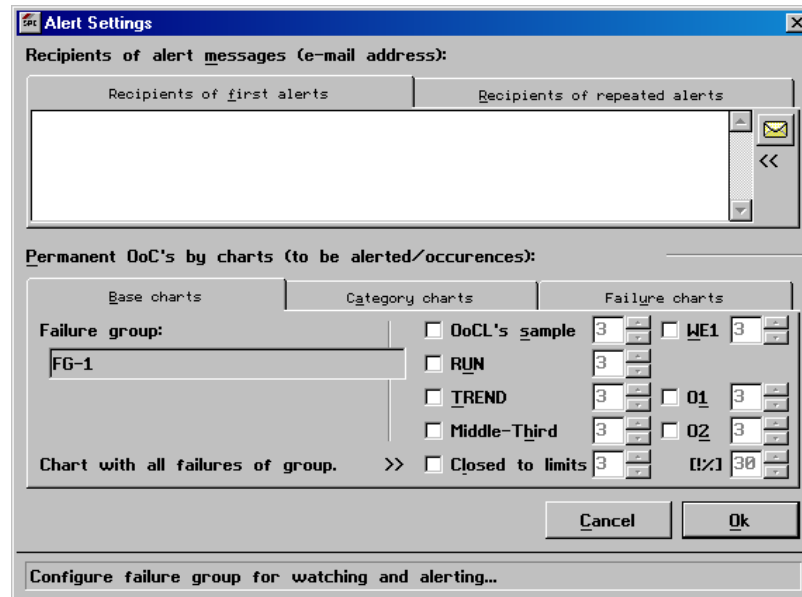


Figure 10: Providing the alert settings in the case of attributed processes

The users (e-mail addresses) to whom alerts related to the given process have to be sent, have to be provided in the **Alert message recipients (e-mail addresses)** field in the *Alert Settings* window.

If you have defined the users and provided their e-mail address in the **Password** menu item of the **Settings** menu, then you can choose the persons and their e-mail addresses to be selected for the given process from the list of users, with the help of the << [envelope icon] button. The e-mail addresses can also be entered through the keyboard. In the case of multiple recipients, the individual addresses have to be separated by a semi-colon.

The e-mail addresses are provided on two levels. The users specified in the **First alert** field will obviously receive the alert sent for the first time. The users specified in the **Repeated alerts** field will receive all the other repeated alerts (the number of repeats can be adjusted). The two lists are independent from each other so if you want to send someone the first alert and the repeated alerts, too, then this person's e-mail address has to be specified in both fields.

**Attention!**

*In order for the software to be able to send e-mails, the settings necessary for e-mail sending have to be provided in the **E-mail** menu item of the **Settings** menu. In the case of faulty settings or any other error, the e-mail will not be sent and an 'E-mail error' entry will be made in the automatic alert log. (The mentioned menu item had already been featured in the earlier versions of the software because of the alert function connected to the measurement task.)*

In the case of qualification parameters, durable out-of-controls are defined on the three levels below:

1. Related to the base chart, i.e. the card containing all the failures of the given failure group.

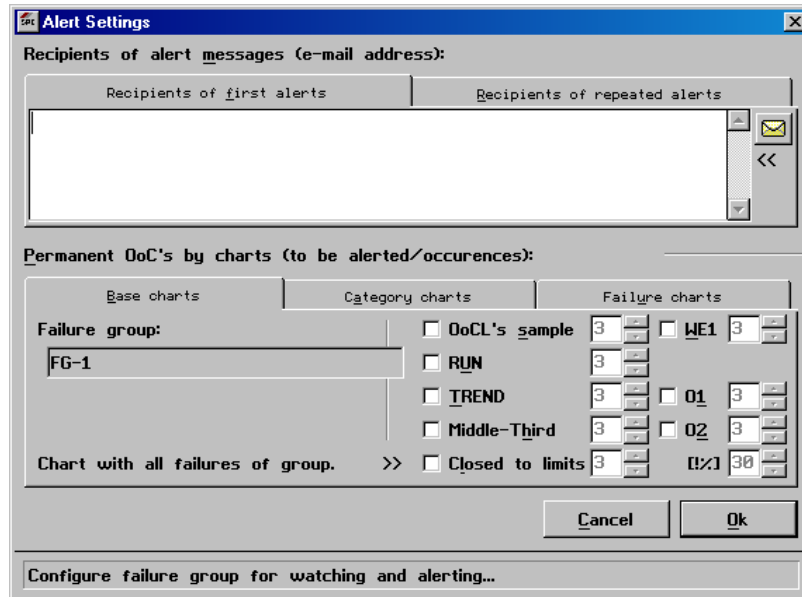


Figure 11: Alert settings related to failure group chart

2. Related to the category charts, i.e. the control charts containing the failures belonging to the individual failure categories.

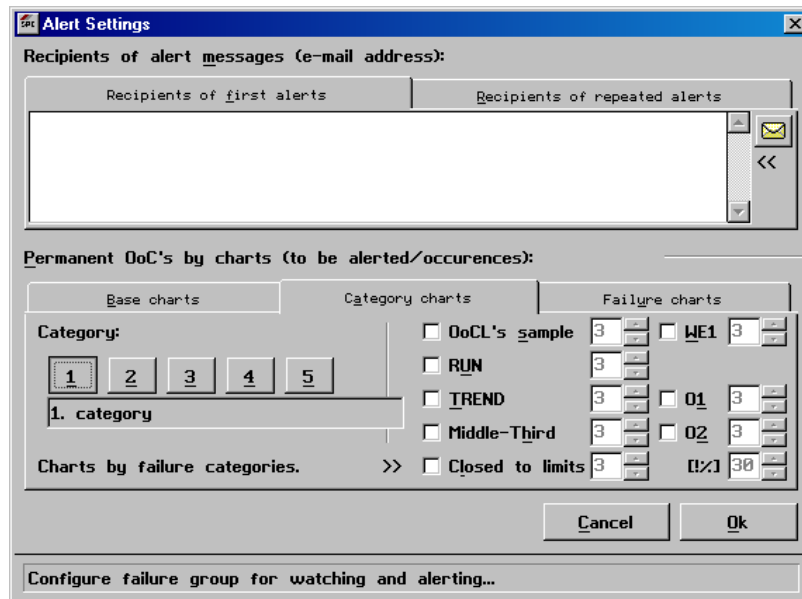


Figure 12: Alert settings related to category charts

In order to change between the individual – at most five – failure categories, click on the button with the number of the given failure category.

3. Failure charts, i.e. each failure reason given separately in the failure group.

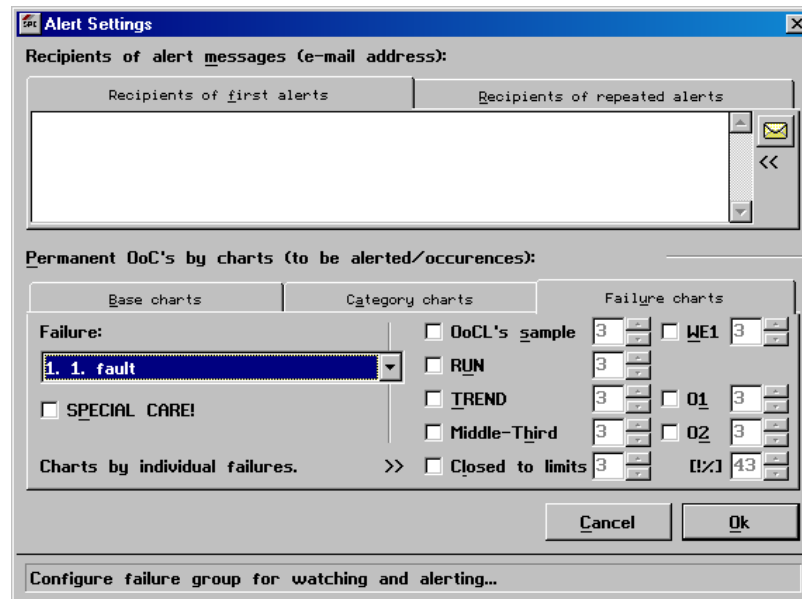


Figure 13: Alert settings related to failure charts

You can change between the individual – at most one hundred – failures by selecting the given failures from a list. There is also a **Special Care** button belonging to each failure, which indicates that the given failure may not come about at all. Enabled care means that if the given failure comes about – even if it happens only once – then it results in immediate alerting. In this case, all the users featured on both lists of the software will receive the e-mail containing the alert (naturally those featured on both lists will only receive one e-mail).

The number of specifiable occurrences at the above settings is at most 5 for every event. The occurrence values to be specified are to be understood in the same way as described in the case of the measurable parameters.

Meaning of Out of Control cases is correspondent with writs by measured processes.

**Attention!**

To operating of alert have to be switched on the given OoC case also between OoC settings.

## 2.3 Automatic alert settings

### 2.3.1 Automatic alert settings

In order for the specified processes to be monitored automatically and for the possible alerts to be sent, it is not enough to select the important processes and to provide the alert conditions. The automatic OoC monitoring and alert function have to be enabled separately with the **Automatic monitoring enabled** button in the **Service** item of the **Automatic Alerts** menu item of the **Settings** menu moreover the necessary parameters have to be set as well.

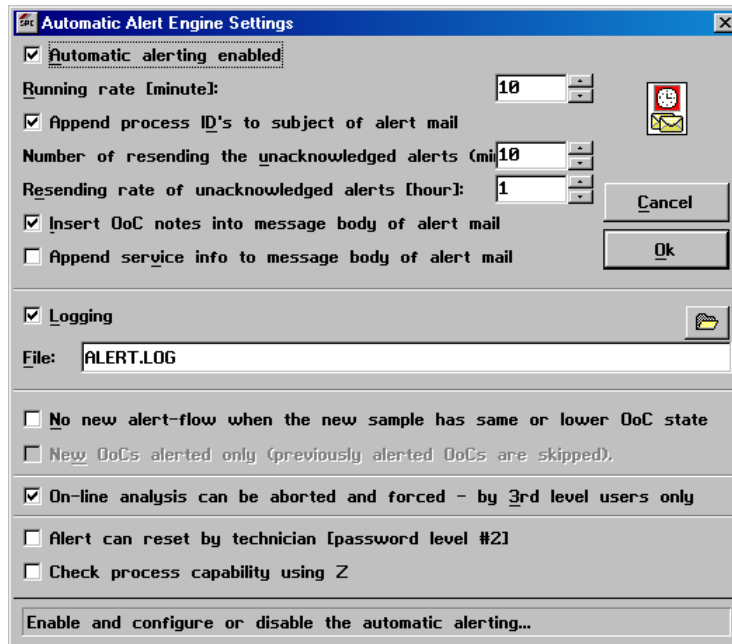


Figure 14: Automatic alert settings

The service status is shown by the sign in the bottom right corner of the main window:



Figure 15: Status of the monitoring and automatic alert function

The parameters to be adjusted are the following:

### **Running rate [minute]**

In the case of the processes set as important, the software examines the given sample of the process for each sample and the section of the control chart belonging to the given sample. Accordingly in the case of important processes, the software will register the entry of each new sample – examination task. The software will start the execution of the examination tasks at the intervals provided here. This frequency can be adjusted knowing the typical sampling frequencies and the registered data quantities, respectively.

The smaller this value is set – the evaluation frequency is increased –, the closer the registration of the sample and the evaluation of the sample, thus the sending of the possible alert, get to one another in time, that is, the faster the problems will be noticed automatically. However when the value is specified, it has to be taken into account that the software carries out database queries at the intervals provided at the execution frequency, thus executes small-volume but regular database and network traffic at the given frequency according to the following (the following four database queries, in order):

1. querying the evaluation – OoC checking – task belonging to the earliest scheduled measurement sample, thereby defining if there is any task to be executed,
2. is there any alert related to any measurement process, waiting for repeated sending,
3. querying the evaluation – OoC checking – task belonging to the earliest scheduled qualification sample, thereby defining if there is any task to be executed,
4. is there any alert related to any qualification process, waiting for repeated sending.

In case the software is not able to process all the scheduled examinations during the specified period, then it prepares an entry thereon in the log – running overlapped. This phenomenon generally does not affect the software's operation because processing will run until the software executes all the scheduled examination tasks. However if overlaps consolidate then it means that the software is not able to execute the evaluations allocated to the recorded data, parallel to data recording. In this case it is useful to enable this function in another (or several other) software(s).

**Attention!**

If in a given system, the automatic monitoring function is enabled in several programs, then it is useful to set different frequencies of execution on the individual machines (10 minutes on the first machine, 20 minutes on the second machine, etc.) because in this case, the further individual machines will actually join the evaluation only if it is actually necessary.

If in a given system, the automatic monitoring function is enabled in several programs, then care has to be taken that the repeat time of alerts and the number of repeats should possibly be set to the same value in order for the alerts to be made at the same intervals independently of which machine actually sent the message.

If there is a scheduled task and samples waiting to be evaluated, evaluation will start automatically at the intervals appropriate to the settings, independently of which function of the software you are using. The software executing automatic evaluation will be occupied during the evaluation time and the software will suspend activity under process. After finishing the evaluation, the activity suspended at the start can be resumed; from this aspect, the function is fully identical to the Data Connection function. Based on the above, it is also useful to enable automatic evaluation at a machine or machines where the other load is low.

**Append process ID's to subject of alert mail**

If the switch is on, the ID's [factory, workgroup, machine, head, position, product, parameter] of the process to which the given alert is related will be featured in the e-mail subject field of the sent alert. Besides the ID's, the software also indicates the serial number of the repeated alert.

**Number of resending the unacknowledged alerts**

In the field it has to be specified at most how many times you wish the software to send the individual alerts. In case no intervention is made even as an effect of the number of alerts here specified (reset – the recipient does not handle the related alert), then the software will automatically cease the given alert after the specified number of resends and acknowledge it, too. The number of resending the alert can be set between 10 and 99.

**Resending rate of unacknowledged alerts [hour]:**

The resending rate of alerts has to be specified here, i.e. at what intervals you wish to repeat unacknowledged alerts. Its value can be set between 1 and 168 hours.

**Insert OoC notes into message body of alert mail**

The text of the alert mail indicates the individual OoC occurrences in abbreviated format. The explanation of the abbreviations can be inserted into the message body of the alert mail by ticking the box as seen in the figure below.

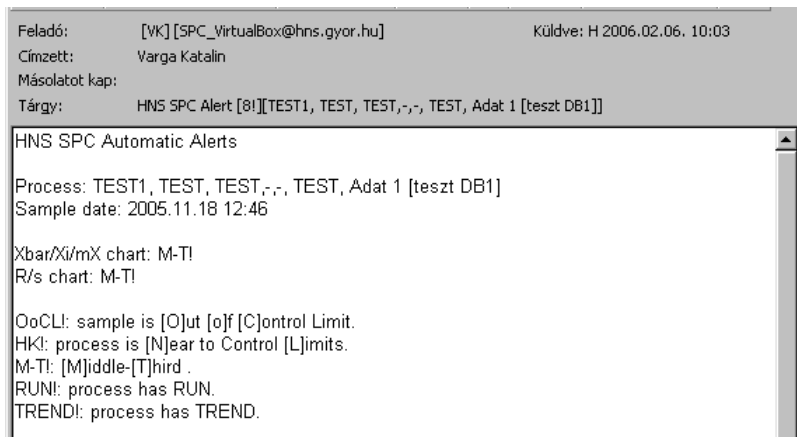


Figure 16.: OoC notes in message body of alert mail

**Append service info into message body of alert mail**

If necessary, the software can attach the service info belonging to the given alert – the physical sending time of the mail from the software, the preparation time of the given alert and the physical ID used in the database – to the end of the message body of the alert mail.

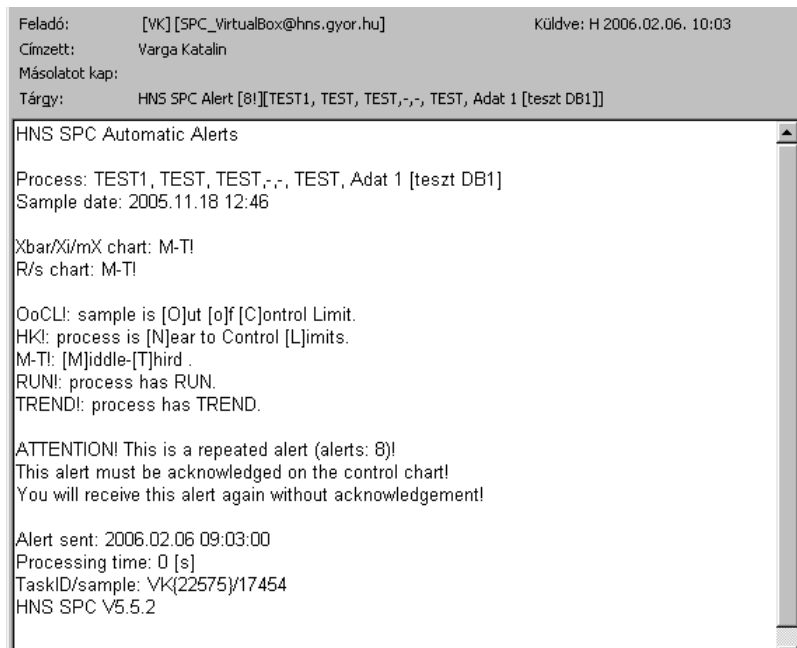


Figure 17: Service info in message body of alert mail

### Logging

It is possible to log the automatic examinations. In order to enable logging, you have to tick the **Logging** box and have to specify a file where the software will locate the log entries.

### No new alert when the new sample has same or lower OoC state

With this switch, the software assures a possibility to choose that it will not initiate alerting related to those samples where only such durable OoC(s) come about, related to which there has already been alerting in the given process but it has not yet been acknowledged (i.e. live alert).

*Example (in case the box is ticked):*

- # *Related to a process, there have been A, B and C durable OoCs in a sample recorded at 14:54 on July 28, 2005 according to the settings. The software initiated alerts for these but no measures have been taken (acknowledgement) until the next sample recording executed at 15:07 on July 28, 2005. Following the recording of the new sample, the same A, B and C durable OoCs have come about. For this sample, the software has not initiated any alerts.*
- # *Related to a process, there have been A, B and C durable OoCs in a sample recorded at 15:31 on July 28, 2005 according to the settings. The software initiated alerts for these but no measures have been taken (acknowledgement) until the next sample recording executed at 15:33 on July 28, 2005. Following the recording of the new sample, A, B, C and D durable OoCs have come about. For this sample, the software has initiated an alert, indicating all four – A, B, C and D – OoCs in the message body of the alert mail.*

### New OoC alerted only (previously alerted OoCs are skipped)

The function can only be operated in case the previous box is ticked and as its effect, the software will neglect those durable OoCs in the case of alerts, related to which alert has already been made but it has not yet been acknowledged. This means that if at the entry of a sample, only such durable OoC occurs related where to there is live (unacknowledged) alert, then no alert is made and if besides this, such OoCs come about to which there is no live alert, then only these new OoCs are indicated in the alert message text.

*Example (in case both boxes are ticked):*

- # *Related to a process, there have been A, B and C durable OoCs in a sample recorded at 15:31 on July 28, 2005 according to the settings. The software initiated alerts for these but no measures have been taken (acknowledgement) until the next sample recording executed at 15:33 on July 28, 2005. Following the recording of the new sample, A, B, C and D durable OoCs have come about. For this sample, the software has initiated an alert, indicating only the new – D – OoC in the text of the alert message.*

*Note on the operation of the function controlled by the latter two switches*

*The function applies not only to samples entered one directly after the other, i.e. the number of samples recorded between the occurrence of OoCs is insignificant.*

*Acknowledging an alarm means acknowledging those OoCs that are featured in the text of the alert.*

*The function is also valid for special monitoring that can be set in the case of qualification parameters.*

**On-line analysis can be aborted and forced - by 3<sup>rd</sup> level users only**

If this switch is on, on-line analysis can be aborted and forced, but only by 3<sup>rd</sup> level users (QA engineer).

**Alert can reset by technician [password level #2]**

Alerts can be reset by QA engineer (3<sup>rd</sup> user), as default. If this switch is on, reset by technician (2<sup>nd</sup> user) is permitted, too.

**Check process capability using Z**

If this switch is on, test of process capability is on the basis of Z index (calculated by 6sigma method). Program compares Z value with Z goal defined by user.


The software checks the recorded samples of the important processes according to the above settings at regular intervals but the execution of the tasks (checking) can also be started out-of-turn by clicking the  icon with the left mouse button. This icon can be found in the bottom right corner of the main windows and in the status row of the software's initial window as well but as the function can be directly accessed by users having engineer-level authorisation, out-of-turn processing can only be started after third-level login, from the engineer-level main window.



Figure 18: Prompt start of scheduled task execution

**Note**

*The software executes checking only in case there has been data entry since the last check.*

The window appearing on screen indicates the checking under process.

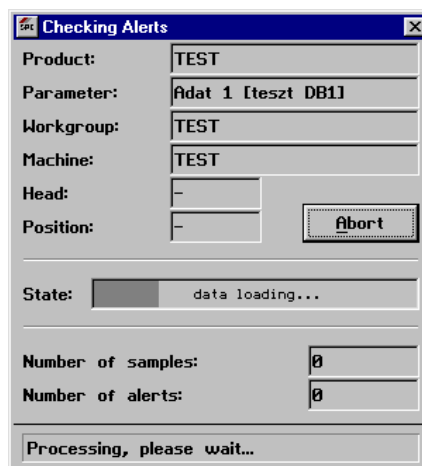


Figure 19: Important process checking in process

Processing under process – loading the control charts of the scheduled tasks, evaluation and message sending if necessary – can be aborted by pressing the **Abort** button found in the status window.

**Attention!**

*Aborting becomes valid only after the sample check under process is finished.*

## 2.3.2 Checking the automatic alert function

The software assures a possibility to continuously monitor whether the automatic alert function is enabled at any of the workstations (programs). This function can be enabled by turning on the **Enable checking of running of Alert Engine(s)** switch in the **Checking service** item of the **Automatic alert** menu item of the **Settings** menu.

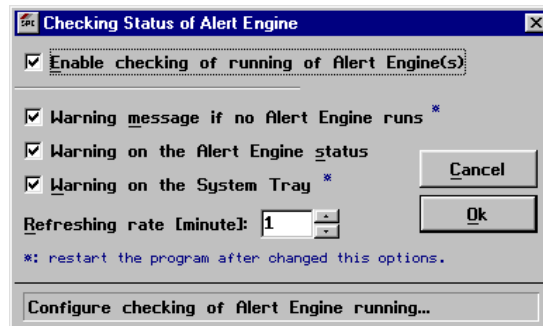


Figure 20: Setting the checking status of automatic alert function

Following checking, if the automatic alert engine does not work, the software might give some warning signal – depending on the settings specified by the user according to the following possibilities:


### **Warning message if no Alert Engine runs\***

When logging in to the software, a window appears and warns of the lack of any automatic alert engine running.




Figure 21: Warning message on the lack of automatic alert engine running

### **Warning on the Alert Engine status**

In case the automatic alert engine is not running, the icon signalling the status of automatic alert flashes in red (  ). (The icon can be found in the bottom right corner of the main windows and in the status row of the software's login window as well.)

### **Warning on the System Tray \***

In case the automatic alert engine is not running, a warning icon (  ) appears in the bottom right corner of the screen.

### **Attention!**

*In order to enforce the changes set with the options marked with a \*, the program has to be restarted.*

### **Refreshing rate [minute]**

The checking frequency of the running of the automatic alert engine. Its value can be set between 1 and 60 minutes. Each change is enforced at the latest after the period set for the refreshing rate has elapsed.

It is possible to enable the checking function only if at least one of the three warning options has been selected (i.e. the refreshing rate field and the OK button will not be active until at least one of the boxes have not been ticked).

### **Note**

*If there are no processes specified for alerting in the actual factory, then the checking / warning functions can be enabled but no warning signals will appear.*

### 3 Handling the alerted status on the control charts

If there is an alert related to a process, then a so-called 'alerted' status will be allocated to the sample at the entry whereof a durable OoC has come. On the control chart this is indicated by a red square.

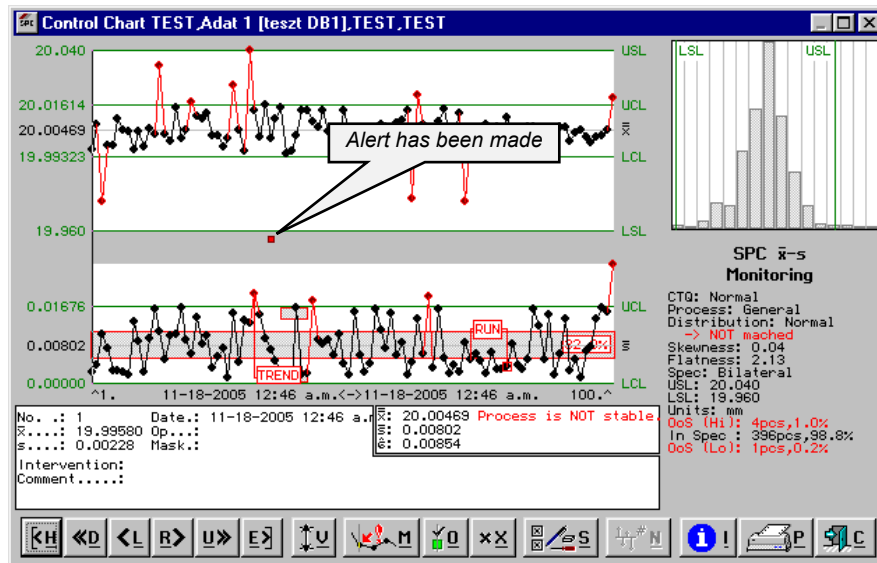


Figure 22: Marking the alerted status on the control chart

The alerts are repeated at the given intervals – but at most at the number of times specified – until a person having engineer-level authorisation interferes in the process and records the fact of interference on the control chart and acknowledges the alert - *Reset*.

It is possible to cease the alerted status in the window appearing when the control chart's *Marker* button is pressed.

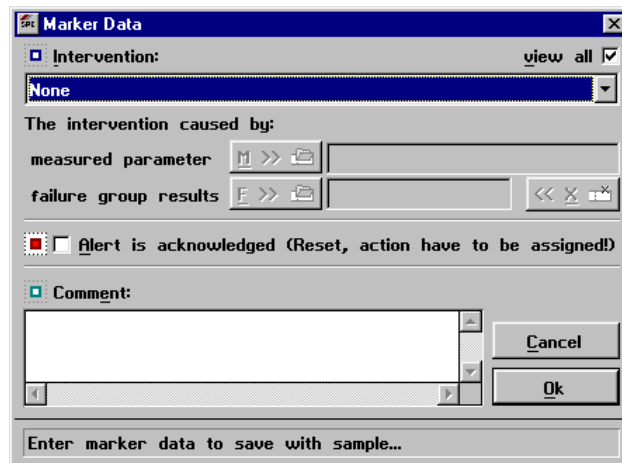


Figure 23: Marker data window – alerted status

It is possible to acknowledge the 'alerted' status by enabling the **Alert is acknowledged (Reset, action have to be assigned!)** function. Following this, an intervention has to be selected from the list of acknowledgements or an optional comment referring to the measures has to be entered.

The program acknowledges the alert only if besides enabling the acknowledgement option an intervention or a comment was entered as well (the program lets the window to be closed with the **Ok** button only in this case).

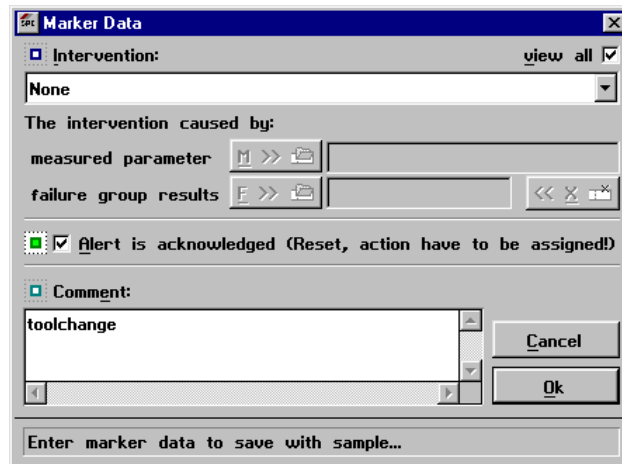


Figure 24: Marker data window – alert is acknowledged

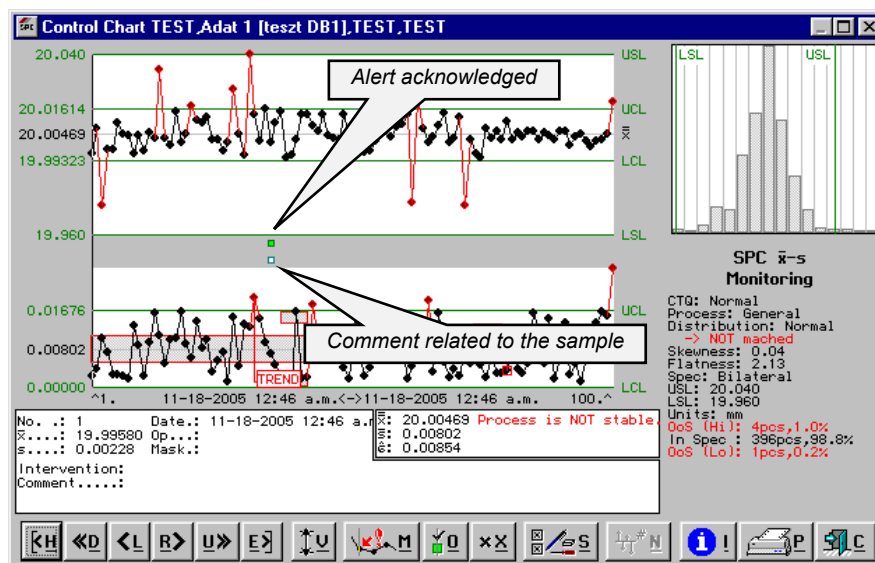


Figure 25: Marking the alert acknowledgement on the control chart

Following the acknowledgement of the alert, the red square turns green moreover the square indicating the intervention / comment also appears on the chart. After acknowledgement, the program stops re-sending the alerts belonging to the given sample.

The software automatically acknowledges the alert (and the red square turns green) when the last repeated alert has been sent as well – in conformity with the adjusted number of repeats. Then the following text is automatically entered into the comment field:

NUMBER OF REPEATED ALERTS: ...  
NO INTERVENTION MADE, ALERT AUTOMATICALLY ACKNOWLEDGED!

This comment can be edited by the persons having engineer-level access.

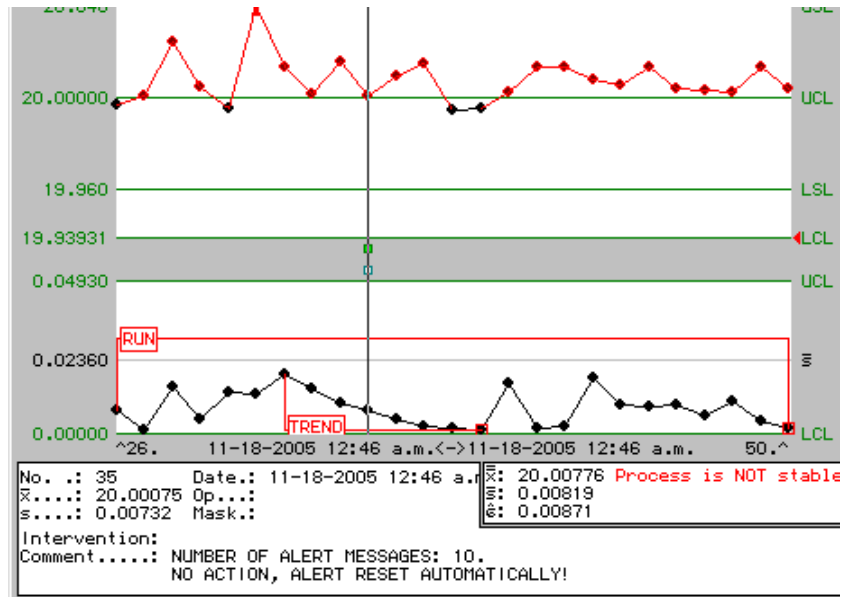


Figure 26: Alert automatically acknowledged after sending the last alert

## 4 E-mail containing the alert

### 4.1 Subject field

As default, the subject field of the e-mail is the following: *HNS SPC Alert*.

In case the **Append process ID's to subject of alert mail** option is enabled in the **Automatic alert settings** menu item of the **Settings** menu, then the subject field contains the following:

*HNS SPC Alert [Factory, Workgroup, Machine, Head, Position, Product, Parameter]*

E.g.: *HNS SPC Alert [HNS, 100, 110, 1,-, 111-00, Leg length]*

If it is a repeated alert, then the number the given alert has been resent also appears in the subject field of the e-mail, i.e. the number of the given alert in order.

*HNS SPC Alert [Number of alerts!][ Factory, Workgroup, Machine, Head, Position, Product, Parameter]*

E.g.: *HNS SPC Alert [2!][HNS, 100, 110, 1,-, 111-00, Leg length]*

### 4.2 Content of the first alert

The contents of the e-mails sent for the first time is as follows:

*HNS SPC Automatic Alerts*

*Process: HNS, 100, 110, 1,-, 111-00, Leg length*  
*Sample date: 2005.05.24 08:32*

*Out of Specification measurements: 1!*  
*Xbar/Xi/mX chart: OoCL! M-T!*  
*R/s chart: M-T!*

*Alert sent: 2005.05.24 08:33:49*  
*Processing time: 1 [s]*  
*Task ID/sample: VK[27146]/18129*  
*HNS SPC V5.5.2*

*Durable OoC(s) occurred at the upper diagram (Xbar / Xi / mX) of the control chart*

*Durable OoC(s) occurred at the lower (R / s) diagram of the control chart*

### 4.3 Content of the repeated alerts

Contents of the repeated e-mails is as follows:

*HNS SPC Automatic Alerts*

*Process: HNS, 100, 110, 1,-, 111-00, Leg length*  
*Sample date: 2005.05.24 08:32*

*Out of Specification measurements: 1!*  
*Xbar/Xi/mX chart: SZH! M-T!*  
*R/s chart: M-T!*

***ATTENTION! This is a repeated alert (number of alerts: 2)!***  
***You have to acknowledge this alert on the control chart!***  
***If there is no acknowledgement, you will receive this alert again!***

*Alert sent: 2005.05.24 09:34:11*  
*Processing time: 0 [s]*  
*Task ID/sample: VK[30582]/18129*  
*HNS SPC V5.4.26*

Contents of the last repeated e-mail:

*HNS SPC Automatic Alerts*

*Process: HNS, 100, 110,-,-, 111, M-111-00*

*Sample date: 2005.05.30 14:16*

*Failure <Flash>: SPECIAL CARE(1)!!!*

*ATTENTION! THIS IS THE LAST REPEATED ALERT (SENT MASSAGES 10)!*

*Number of resent alerts has overrides the specified limit, but NO ACTION MADE 🐛.*

*This alert task will be reset by the system automatically 🐛.*

*Alert sent: 2005.05.31 08:30:26*

*Processing time: 1 [s]*

*Task ID/sample: VK[13266]/16384*

*HNS SPC V5.4.26*

## 5 Log

It is possible to log the important process checking executed at given intervals. The alert log can be enabled by turning on the **Logging** switch in the **Automatic alerts – Service** menu item of the **Settings** menu and by specifying the log name.

*Note: If the access route of the log file is not specified only the file's name, then it will automatically be located in the program folder (the same folder where the SPC.EXE file itself is located).*

### 5.1 Handling the log


The alert log can be opened easily by clicking on the  icon found in bottom right corner of the main screen on the third level, with the right button of the mouse. The icon can be found in all main windows but as controlling, settings and managing automatic evaluation and alert is an engineer-level task, the function enabling log management from the software (viewing, saving, printing) can also be accessed from the engineer- (third-) level access level only.



Figure 27: Displaying the log by clicking on the status sign

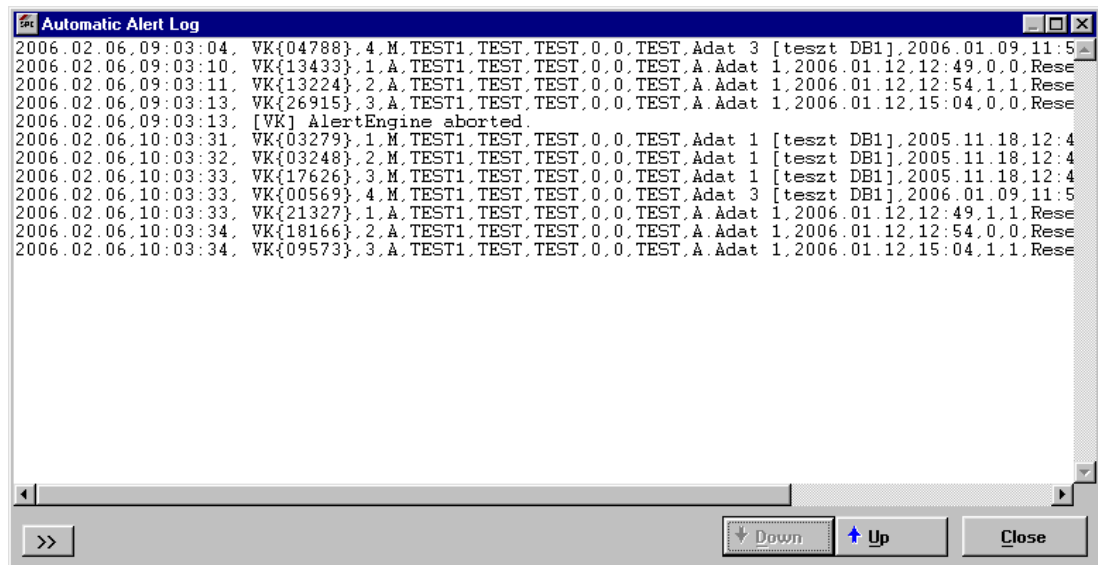


Figure 28: Displaying the log

With the help of the **Down** and **Up** buttons, you can change between the log pages (as the amount of text that can be displayed at a time is limited). By pressing the **>>** button, further functions can be accessed, with the help whereof the alert log can be printed (to the printer specified in the **Printer** menu item of the **File** menu) or it can be saved as a text file to a location you specify.



Figure 29: Printing and saving the automatic alert log

#### Note

*The automatic alert log can also be viewed when the important processes checking or the operation logging options are disabled. If the important processes checking option is disabled, then it is indicated in the header of the log [Disabled].*

### 5.2 Contents of the log

Each time the software checks an important process, sends an alert or any error comes about, an entry is made into the automatic alert log.

The contents of the entries in order: *Timestamp, Task, Number, Measure/Attribute, Factory, Workgroup, Machine, Head, Position, Product, Parameter/Failure group, Sample date, Sample time, Total/loading time [s], State, Alerts, Deleting.*

Examples:

```
2005.05.18,12:16:45, VK[27663],1,M,HNS,100,110,0,0,111-00,Full  
length,2005.05.18,12:16,0,0,No alert,0,---
```

Interpretation of the entry: based on the sample recorded at 12:16 PM on May 18, 2005 for the a 'HNS/100/110/0/0/111-00/Full length' measurement process, there was no durable OoC when the sample was taken.

```
2005.05.20,11:27:35, NZP3[31158],1,M,HNS,100,110,0,0,111-00,Full  
length,2005.05.20,11:26,2,1,Sent,1,Started
```

Interpretation of the entry: at the same process, the program detected durable OoC at 11:26 on May 20, 2005 and sent the first alert.

```
2005.05.24,08:17:00, VK[32349],97,M,HNS,100,110,0,0,111-00,  
Diameter,2005.05.20,16:17,0,0,Resent,4,Under alerting ...
```

Interpretation of the entry: the program detected durable OoC at the given process's sample recorded at 16:17 on May 20, 2005, the acknowledgement (*Reset*) whereof was not executed until May 24, 2005 so it sent a repeated alert at 8:17 AM, which was already the fourth alert related to the given OoC.

```
2005.05.24,16:18:55, VK[20674],1,M,HNS,100,110,0,0,111-00,  
Diameter,2005.05.20,16:17,1,0,Repeated,5,Deleted!
```

Interpretation of the entry: the program detected durable OoC at the given process's sample recorded at 16:17 on May 20, 2005, the acknowledgement (*Reset*) whereof was not executed until 16:18 on May 24, 2005 but as the number of repeated alerts reached the repeat limit specified in the settings, the program declared the given alert invalid – the alert became out of date.

**Attention!**

*When the last alert in conformity with the specified number of repeated alerts is sent, a 'Deleted!' command will be entered in the given row of the alert log.*

Besides the above events, the software also logs the important process checking started or stopped on the given machine, the overlap and the occurrence of the possible errors.

Examples:

```
2005.05.23,09:20:55, [VK] AlertEngine started.
```

```
2005.05.23,12:27:25, [VI] AlertEngine stopped.
```

```
2005.05.20,07:23:36, [NZP3] AlertEngine running overlapped (previous batch is running).
```


```
2005.05.18,09:13:14, E-mail ERROR - VK[-1].
```

## 6 Scheduled Tasks and Alerts

A new function of the program is the status matrix serving for displaying the samples registered for checking and the alerts under process. The aim of the function is to be able to view the samples appointed for checking and the alerts under process at one location in a table format. The status matrix also assures a possibility to directly display the control charts containing the alerts – with one click.

The status matrix always contains the data of the actually selected factory and can be accessed at technician (2<sup>nd</sup>) and engineer (3<sup>rd</sup>) level.

### 6.1 Accessing the status matrix

The status matrix can be opened in the **Alerts** menu item of the **Data** menu. By clicking on the  icon found in the software's login window, the status matrix can be displayed directly after starting the program.

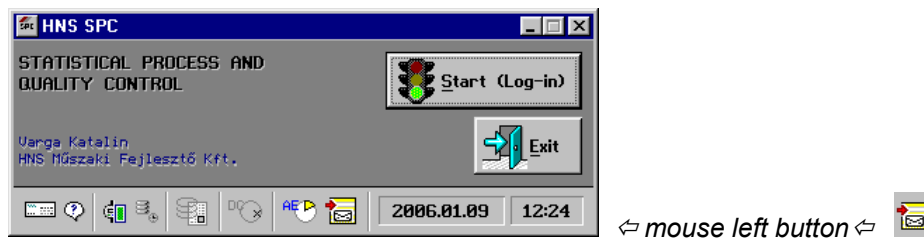


Figure 30: Accessing the status matrix from the status row of the login window

### 6.2 Contents of the status matrix

Icon	Task Name	Description	Count 1	Count 2	Date	Time	Actions
	TEST	TEST	0	0	2005.11.18	12:46	>
	TEST	Adat 1 [teszt DB1]	>>	! 2	2006.01.09	12:56	>
	TEST	TEST	0	0	2005.11.18	12:46	>
	TEST	Adat 1 [teszt DB1]	>>	! <?>	---		>
	TEST	TEST	0	0	2005.11.18	12:46	>
	TEST	Adat 1 [teszt DB1]	>>	! 2	2006.01.09	12:55	>
	TEST	TEST	0	0	2006.01.09	11:54	>
	TEST	Adat 3 [teszt DB1]	>>	! 1	2006.01.09	12:49	>

Figure 31: Status matrix

Meaning of the numbers found in the header of the status matrix: *Number of total tasks [Number of scheduled tasks/alerts related to measured parameters/ Number of scheduled tasks/alerts related to failure groups]*

Interpretation of the status matrix rows:

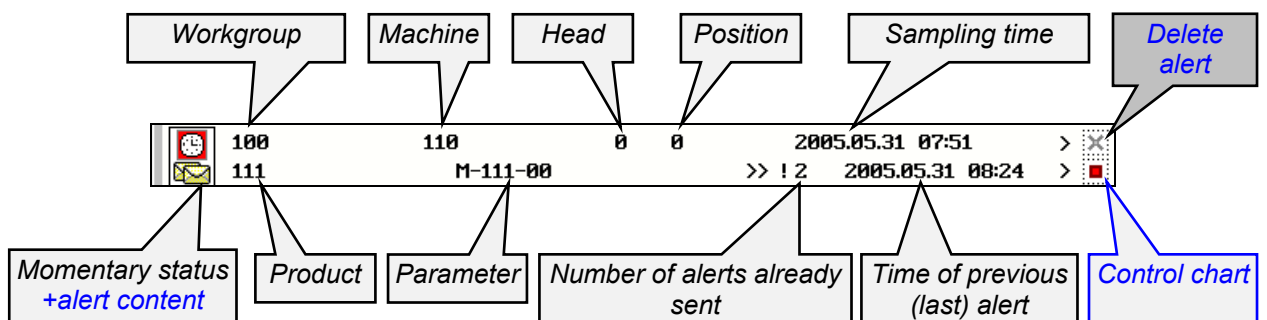








Figure 32: Interpretation the lines of the status matrix

If there has been sample entry to the given process but it has not yet been evaluated or the alert has been already acknowledged in the meantime, then '?' appears instead of the number of repeats and the alert time field remains empty.

Interpretation of the icons indicating the alert status:

-   first alert done, alerting under process,
-   repeated alert(s) sent, alerting under process,
-  alert acknowledged,
-  data entry at the process, the sample is waiting to be checked.

By clicking on the icon of the alert status, the contents of the given alert can be displayed.

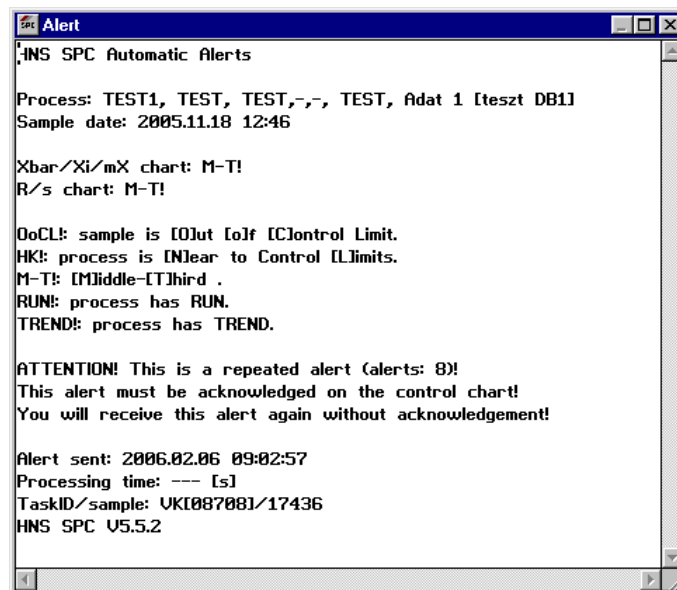




Figure 33: Displaying the contents of the alert

By clicking on the  icon found at the end of the row, the related control chart can be displayed. The program always displays the section of the control chart to which the given alert refers, which means that the sample for which the alert has been made will be the last point in the chart and the samples entered later will not be depicted. By using this function, it is possible to manage (acknowledge) all the alerts from the status matrix, without having to select the control charts of the processes one by one and to load them for analysis.

**Note**

After the alert is acknowledged, the signal turns to green  after which it is no longer possible to display the control chart through the status matrix.

The  icon can be used to delete the given alert task – this service function is not accessible for users.

**Attention!**

The status matrix always contains the status that was actual at previous refreshing.

### 6.3 Menu and status rows of the status matrix

Status matrix has its own menu and status row. In the menu, the display order of the status matrix can be set and the service functions serving for displaying the control chart and other functions can be accessed.

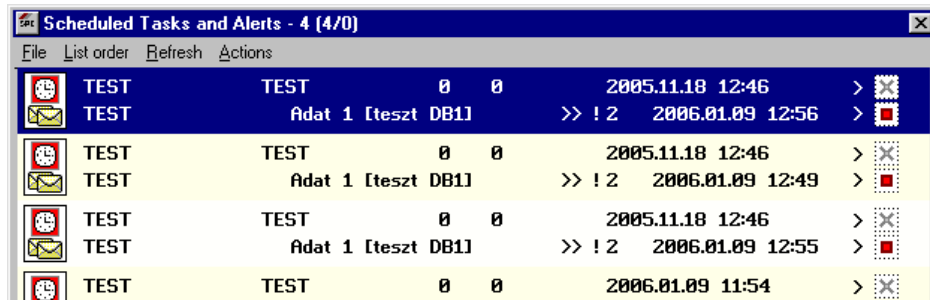


Figure 34: Menu row of the status matrix.

#### 6.3.1 File menu

In the **File** menu, the alert log can be displayed with the help of the **View log** menu item. The **Print** menu item makes it possible to print the status matrix while the status matrix display can be quit through the **Logoff (close)** menu item.

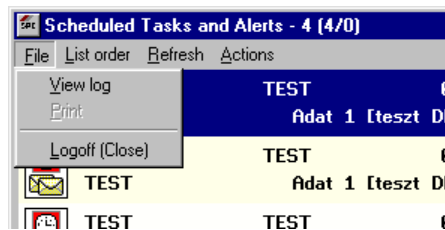


Figure 35: File menu of the status matrix

#### 6.3.2 List order menu

In the **List order** menu, the display order of the status matrix lines can be selected as follows.

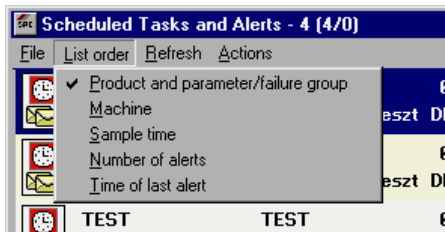


Figure 36: List order menu of the status matrix

#### 6.3.3 Refresh menu

If the **Refresh automatically** option of the **Refresh** menu is enabled, then the software will refresh the status matrix automatically, every 1 minutes. With the help of the **Refresh now** menu item, the status matrix can be refreshed instantly.

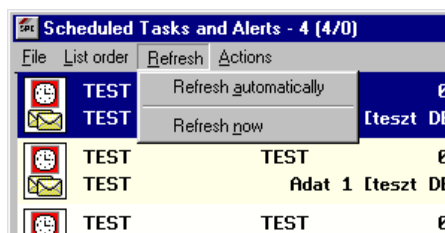




Figure 37: Refresh menu of the status matrix

### 6.3.4 Actions menu

The **Control chart** menu item of the **Actions** menu has the same the function as the  icon located at the end of the individual rows of the status matrix – displaying the control chart belonging to the actual row. The **Alert message** menu item serves to display the alert message belonging to the given – actually selected – row. The **Delete task** (it has the same function as the  icon) and the **Delete all tasks** menu items can obviously be used to delete the actually selected and all the alert tasks found in the status matrix, respectively – these two service functions are not accessible for users.

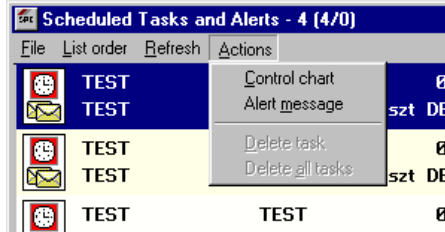


Figure 38: Actions menu of the status matrix

## 7 Alert states by processes – Multilevel status matrix

This function summarizes important processes and all actual alerts in a multilevel table format. This function also assures a possibility to directly display the control charts containing the alerts – with one click.

The status matrix always contains the data of the actually selected factory and can be accessed at technician (2<sup>nd</sup>) and engineer (3<sup>rd</sup>) level.

### 7.1 Accessing the multilevel status matrix

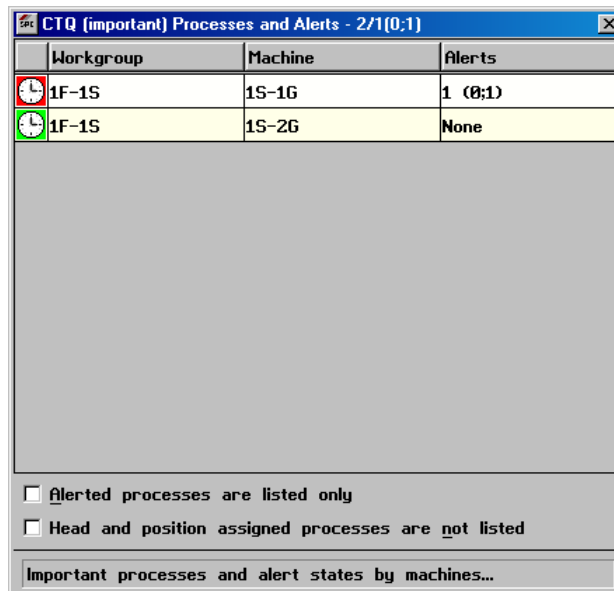
The status matrix can be opened in the **Alerts** menu item of the **Data** menu.

#### **Comment**

**This function is available only in SQL database. This menu item is not active in xBase database, multilevel status matrix is not usable.**

### 7.2 Contents of the status matrix

After choosing **Alert states by processes** function is displayed the list of the machines in the actual factory in the first step.





Workgroup	Machine	Alerts
1F-1S	1S-1G	1 (0:1)
1F-1S	1S-2G	None

Alerted processes are listed only  
 Head and position assigned processes are not listed

Important processes and alert states by machines...

Figure 39: Multilevel status matrix – machine list

There is displayed in the header the number of machines in the table / number of actual alerts related to displayed machines, separately by measured and attributed processes between brackets. Column **Alerts** contains the number of actual alerts related to given machine separately by measured and attributed processes between brackets. The colour of the icon in first column marks, if there is actual alert related to given machine. It is red  by actual alerts, and green  by no alerts.

User can restrict the scope of displayed processes by means of two switches at the bottom of window. By switching **Alerted process are listed only** will be display only alerted processes. In this case are displayed in all level the rows which consist actual alert, that is rows wherein is a red icon in the first column. By switching **Head and position assigned processes are not listed** are displayed only processes related to machine.

By clicking (with left mouse button) on a row can be gone on to next level, where is displayed the list of measured and attributed important processes (products and parameters) related to selected machine.

CTQ (important) Processes and Alerts - 7/12(8:4)					
Workgroup:		1F-1S	1F-1WORKGROUP		
Machine:		1S-1G	1F-1WORKGROUP-1MACHINE		
	Product	Parameter/Failure group	Head	Position	Alerts
	1F-1T	V TEST-1	-	-	8
	1F-1T	V TEST-10	-	-	None
	1F-1T	V TEST-2	-	-	None
	1F-1T	A FG-1	-	-	4
	2f-2t	V TEST-1	-	-	None
	2f-2t	V TEST-10	-	-	None
	2f-2t	V TEST-2	-	-	None

Alert states of important processes assigned to selected machine by parameters...

Figure 40: Multilevel status matrix – important process list

There is displayed in the header the number of processes in the table / number of actual alerts related to displayed processes, separately by measured and attributed processes between brackets. There is on top of window the workgroup and machine which is displayed in the table. The **V** character in front of parameter marks measured parameters, and **A** marks failure groups. Column **Alerts** contains the number of actual alerts related to given machine separately by measured and attributed processes between brackets. The colour of the icon in first column marks, if there is actual alert related to given machine. It is red by actual alerts, and green by no alerts.

*Comment*





If user has switched **Unalerted processes are not listed** on previous level, will be displayed only alerted processes..

By clicking (with left mouse button) on a row can be gone on to next, lowest level, where is displayed the list of related to selected process. This level is displayed only in related to alerted processes (where is red icon in first column).

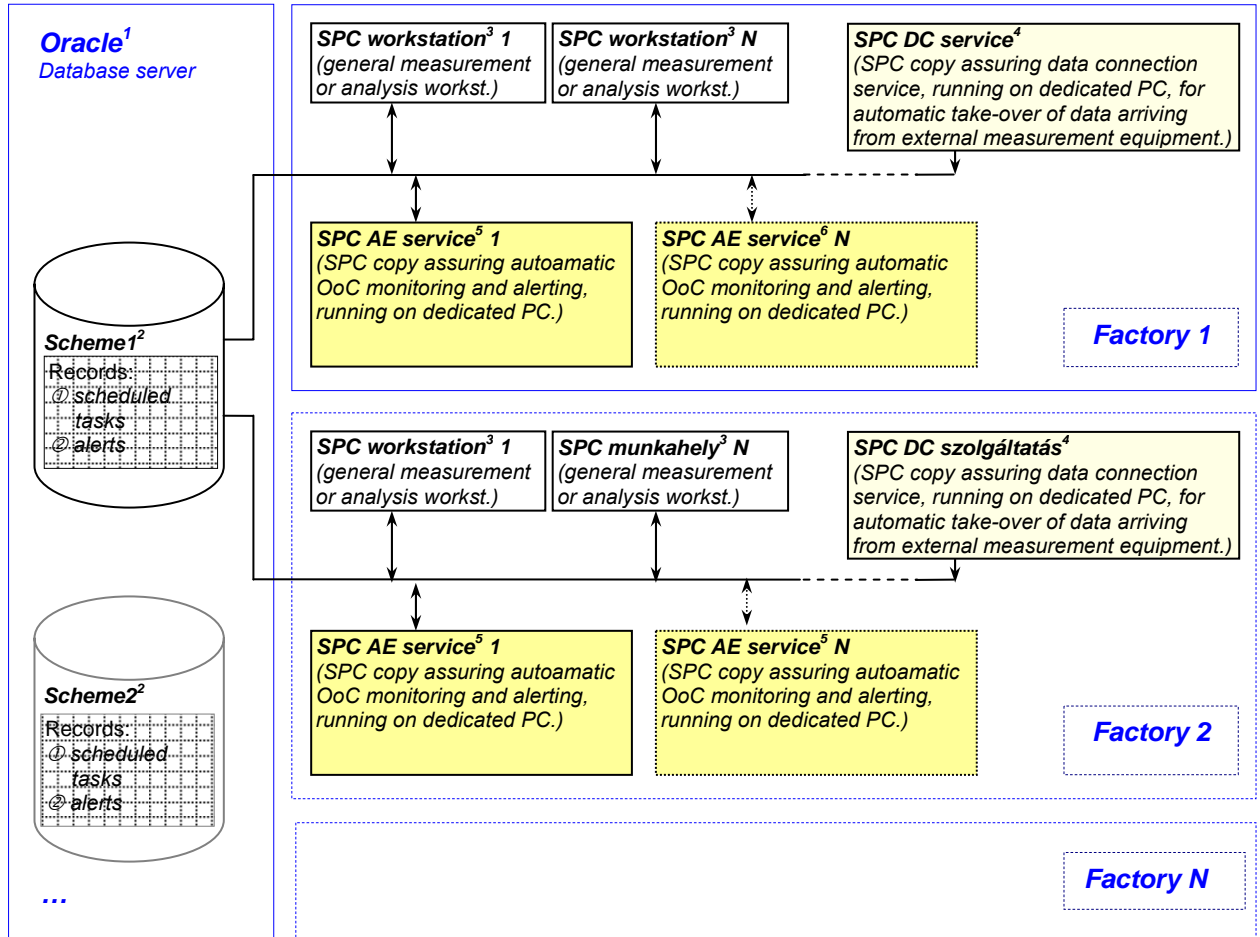
Alerts - 8							
Workgroup:		1F-1S	1F-1WORKGROUP				
Machine:		1S-1G	1F-1WORKGROUP-1MACHINE				
Product:		1F-1T	1F-1PRODUCT				
Parameter:		TEST-1					
	Sample time	Messages	OoS	Low capability	Xbar/Xi Chart OoCL	Xbar/Xi Chart RUN	Xbar/TI
	1995.09.22 03:06	6	1	-	-	-	
	1995.09.22 03:06	6	-	-	-	-	
	1995.09.22 03:06	6	1	-	X	-	
	1995.09.22 03:06	6	-	-	-	-	
	1995.09.22 03:06	6	-	-	-	X	
	1995.09.22 03:06	6	-	-	-	-	
	1995.09.22 03:06	6	1	-	-	-	

Running and unhandled alerts of the selected process...

Figure 41: Multilevel status matrix – alert list

There is displayed in the header the number of alerts in the table. There is on top of window the process which is displayed in the table. There is in column **Messages** the number of messages are sent till now. Also the icon in first column marks this, that the first message were sent , or also repeated alerts were sent . User can see the given control chart by clicking on  icon. The program always displays the section of the control chart to which the given alert refers, which means that the sample for which the alert has been made will be the last point in the chart and the samples entered later will not be depicted. By using this function, it is possible to manage (acknowledge) all the alerts from the multilevel status matrix, without having to select the control charts of the processes one by one and to load them for analysis. After the alert is acknowledged, the signal turns to green  after which it is no longer possible to display the control chart through the status matrix. Acknowledged alerts are not displayed by next display of status matrix. There are marked the reasons of alerts in further columns of the table with an **X** sign.

## Automatic Out of Control monitoring and alert Typical system structure



### **Attention!**

In order to control the important processes and to manage the automatic alerts, it is necessary to update the database objects (previously created charts) used by SPC and to introduce new objects (new charts, indices and triggers), i.e. to update the database:

***the necessary database version V1.9.***

Updating can be done by running the PL-SQL script handed over as a part of the SPC installation kit:

***UPGRADE9.SQL.***

### Legend and notes

#### 1 - Oracle

Manufactured database server handling the SPC database schemes. There is no obligation related to the Oracle version number but it is suggested to use Oracle8 or a later-version database as these already support queries that enable substantially faster execution at the critical points. The SPC program automatically recognises the database server version and automatically runs the adequate queries.

## **2 - Scheme**

Independent database schemes for storing SPC data – *a possibility assured by the SPC system.*

## **3 - SPC workstation 1, 2 ... N**

An optional number of general-purpose SPC measurement workstations for data input by the operator, using the measurement programs and general-purpose SPC engineer workstation for evaluating the data, respectively.

## **4 - SPC DC service**

SPC station assuring continuous DataConnection service.

The SPC software's DataConnection service assures the automatic receipt of the measured and attributed samples arriving from external data sources and their forwarding to the SPC database. This service is an in-built function of the SPC program, which has to be authorised separately. In case this function is enabled, the given SPC program becomes an individual DataConnection server. In an SPC system, an optional number of such servers can be operated but in general it is enough to operate one single station.

In extensive SPC systems also embracing automatic measurement equipment, for managing the data coming from the measurement equipment it is suggested to constantly run the SPC program copy assuring the DataConnection service thus to install it onto a constantly operating PC reserved especially for this reason, i.e. dedicated to this purpose ⇒ *on-line service.*

## **5 - SPC AE (Alert Engine) service**

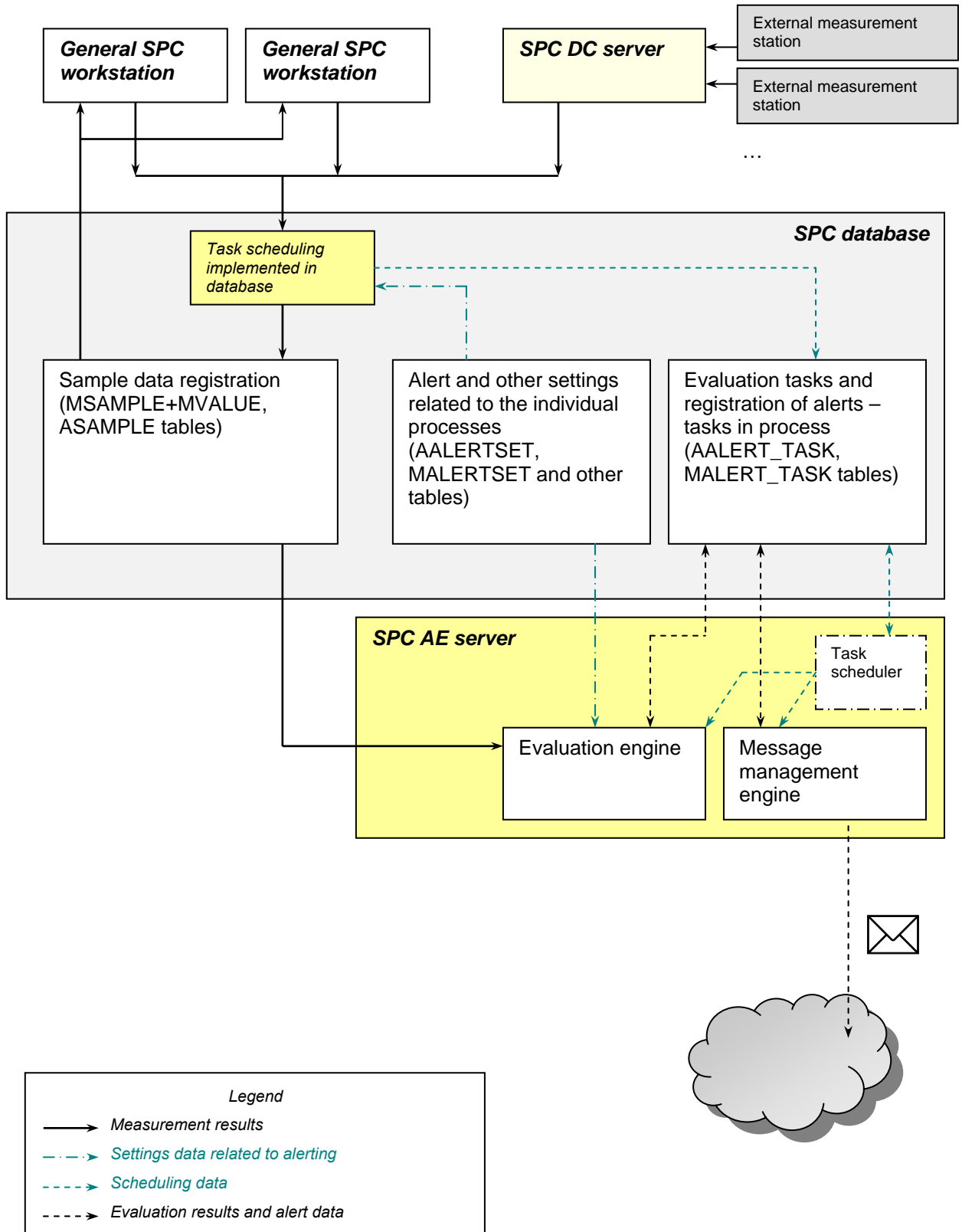
The SPC station monitoring the important processes and managing the automatic alerts.

Similarly to the DataConnection, the SPC program contains the service as in-built, which also has to be enabled. When the service is enabled, the software becomes an AE server. Depending on the conditions of application, the function manages a significant amount of data so the database needs high performance and bandwidth. Besides the significant data flow, the computer running the SPC software assuring the service also needs an appropriate calculation capacity. The alerts are sent to the responsible persons by e-mail so obviously a mail server is also necessary which is accessible to the software.

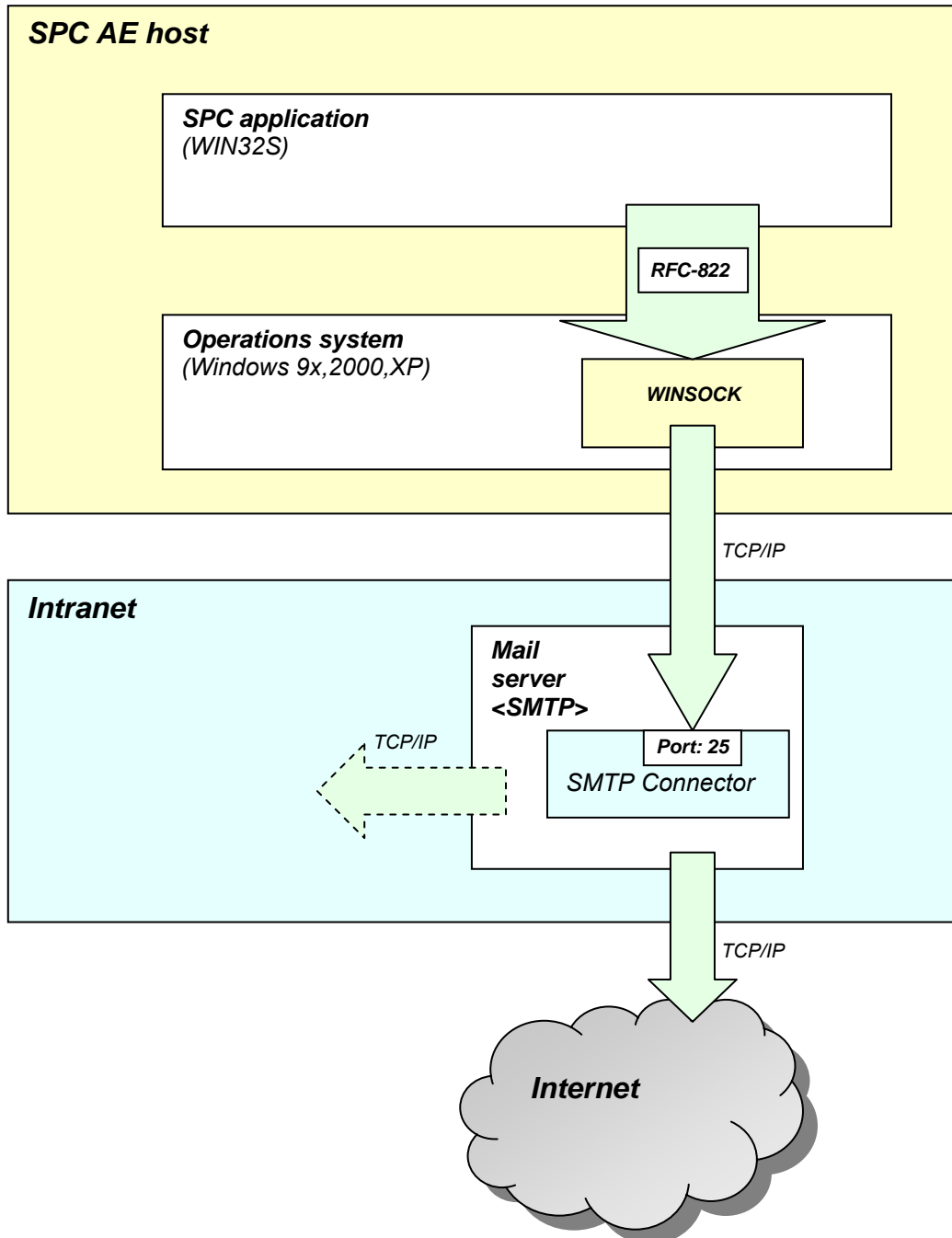
Given the function's character – OoCs can be detected on-line and it is also practical to send the alerts on-line – it requires continuous operation so it is useful to assure the service through an SPC program running on an independent, dedicated PC.

In case the speed of data entry makes it necessary, then several AE servers can be operated in the SPC system in parallel. In the case of several AE servers, the division of load can be influenced by the running rate set in the individual SPC programs – see chapter 2.3. it is practical to set different running rates on the individual servers (e.g. 10 minutes on the first server, 20 minutes on the second one, ...) so the individual servers only join in to assure the service in case it is actually needed.

*Automatic Out of Control monitoring and alert*  
**Operation scheme**



*Automatic Out of Control monitoring and alert*  
**E-mail technology**



**Note**

The SPC software generates a one-way process – sending mails by using an SMTP protocol. No mail downloading function is implemented in the software.  
 No reply can be sent to the mails sent by the SPC software - return-path value is '???@???'.

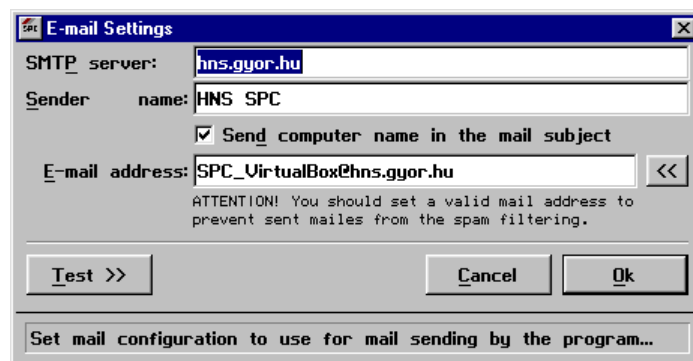
**The SPC software sends mail only in a way controlled by the user according to their intentions.**

*Automatic Out of Control monitoring and alert*  
**Program settings required for sending e-mails**

*In earlier versions of the software, there have already been functions that carried out e-mail sending so the settings necessary for e-mail sending are also included in the documentation issued earlier. In the present issue, the setting possibilities have changed at a small extent so they are outlined in this documentation as well.*

The software sends e-mails in a way outlined in the previous appendix, by using an SMTP server and the software does not download e-mails.

The E-mail settings can be specified in the **E-mail** menu item of the software's **Settings** menu:



**SMTP server**

In this field you have to specify the SMTP server's name (DNS) or IP address.

**Sender name**

In this field you have to specify the name wished to appear in the sender field of the sent mails.

**Send computer name in the mail subject**

By ticking this box, you can turn on the function that the software should automatically attach the name of the computer running the e-mail sending programme to the sender name. If this possibility is turned on, then the computer sending the mail can be clearly identified on the network, which might be necessary in case more extensive applications using several automatic assessment workstations in parallel are used.

**E-mail address**

In sent mails, any e-mail address can be specified as the sender's e-mail address.

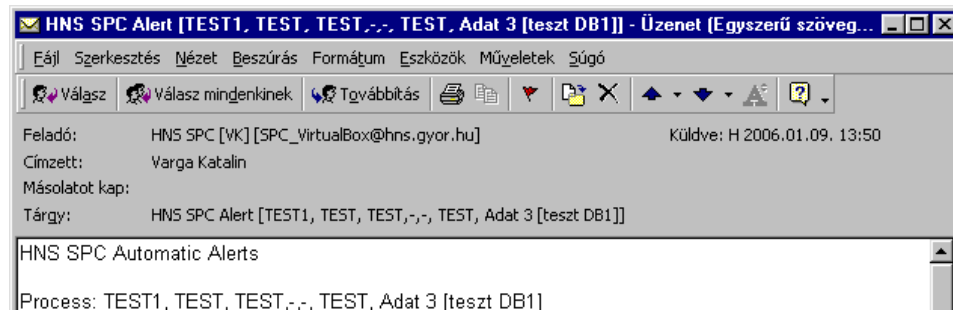
It depends on the sending but primarily on the receiving mailing system, what e-mail address has to be provided here. As default, the software suggests such a non-existing e-mail address that refers the fact that the mail is sent by the SPC software: *SPC\_VirtualBox*. The domain name can also be specified optionally. If the << button is pressed, the software inserts the name given in the SMTP server field to the mailbox name.

**Attention!**

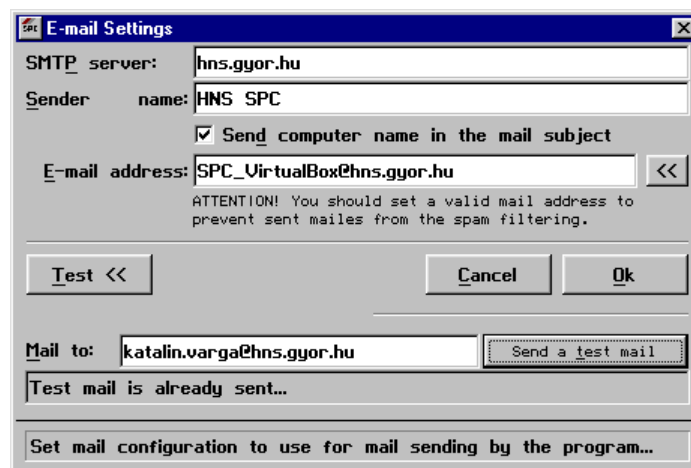
*The recipient receiving the mail might use a SPAM filter, which fact have to be taken into consideration when specifying the sender's e-mail address:*

- *the SPAM filter might check the domain name: an existing and valid name has to be provided or otherwise the recipient will not get the mail sent by the SPC software,*
- *the SPAM filter might check the sender's whole e-mail address: in this case a valid e-mail address have to be provided,*
- *in case the SPAM filter on the recipient side checks the sender side with an request of acknowledgement – the SPC software obviously cannot handle this – then the recipient has to assure separately that the filter "lets through" the mails sent by the SPC software.*

The e-mail sent with the above settings arrived with the following heading:



It is also possible to check the E-mail Settings directly in the settings window by sending a test mail. To do so, you have to press the **Test** button:



In the unfolding part of the window, enter the e-mail address – **Mail to** -, where you would like to send the test mail and then press the **Send a test mail** button. The software will send the mail and will indicate the status of sending: *Test mail is already sent* or *ERROR, test mail can not be sent*.

The test mail will be as follows:

