

have to edit all affected elements in the **regression window**.

Now edit the calibration of the new channel and, if necessary, of other interfered spectral lines in the Regression window. Define the standardization samples to be used in the Dialog Box Standardization Samples. Start the Standardization now. The measured intensity values for the new channels are stored as rated values. Check the contents of the Dialog Box Standardization Data, especially the rated values for the high- and low samples for the new channel.

After calibration, check the entries in the Dialog Box Calibration ranges and the possible need for a line switch in the Dialog Box Element Parameter.

Make now necessary settings, if you want to use further functions like Type Calibration, Type Standardization, Control Sample Measurement.

✓ **Saving and checking**

Now save the modified analytical program via the Menu File. Load the program in the **measure window**. Measure some different samples of known composition which are typical for the application of the analytical program. Check the results. Consider spectral interferences which may occur due to the composition of your production samples and make sure that the analytical program works reliable. Now the program development is finished.

See also:

Line Selection - Line Interferences
Program Development
Scan Manager Monochromator
Measure Window

15.12 Line Selection - Line Interferences

A careful line selection is very important for the generation of analytical programs. You only have the free choice of lines, if your Spectrometer is equipped with a Monochromator. Otherwise the spectral lines which can be measured are preset by the equipment of your Simultaneous Optics.

The first factor is the required detection sensitivity. when you measure contents close to the detection limit, the most sensitive line is necessary. When you measure higher concentrations, a less sensitive line is often recommended. The second factor is the question for possible spectral Interferences, which might occur.

To make the line selection easier, the element lines can be sorted according to their sensitivity by means of the **Line Proposal**. To check whether a selected line may be interfered through a matrix element, possible interferences can be called-up for each line.

When you generate a program, you should record scans in any case at each selected line with samples of different concentrations. When you select the samples to be scanned, make sure that you recognize interferences in good time.

If a line is interfered and there is no suitable alternative line, it is possible to calculate in the regression the influence of the interferer through simultaneous measurement of the interfering element. This is possible, if the interference had been recognized before

See:

have to edit all affected elements in the **regression window**.

Now edit the calibration of the new channel and, if necessary, of other interfered spectral lines in the Regression window. Define the standardization samples to be used in the Dialog Box Standardization Samples. Start the Standardization now. The measured intensity values for the new channels are stored as rated values. Check the contents of the Dialog Box Standardization Data, especially the rated values for the high- and low samples for the new channel.

After calibration, check the entries in the Dialog Box Calibration ranges and the possible need for a line switch in the Dialog Box Element Parameter.

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If a line is interfered and there is no suitable alternative line, it is possible to calculate in the regression the influence of the interferer through simultaneous measurement of the interfering element. This is possible, if the interference had been recognized before

See:

Operating the Monochromator

16 Tips & Tricks



Saving and transmitting analysis results

The Spark Analyzer software offers manifold possibilities to output and present analysis results for further processing.

First analysis results can be printed locally and be saved in a Sample Management.

Additionally analysis results can be saved in several formats in ASCII files on the hard disk. The hard disk is not necessarily the hard disk of the Spectrometer PC, also a drive installed in a network is usable. The PC must be integrated into that network. So called User Tasks can read the ASCII files and process them (see Dialog Box Output Parameters).

The analysis results can be transmitted in the SPECTRO-4.4-Protocol to another computer via the integrated serial interface. A transmission to a remote serial printer and video terminals is also possible.

Sometimes further features are required for special applications. Thus the Spectrometer PC can be equipped with a serial multi interface board. The analysis results may be output to each of these serial interfaces, even with different formats per interface. Based on an entry in the sample identification fields it is possible to address selectively one or more interfaces for an analysis. The following analysis can be transferred to another interface. For example, an analysis result can be transmitted from the laboratory to several furnace platforms.

Tip: Data Transmission

Tip: ext. Printer and Terminals



Optimized Printer Output

In Tip: Optimize Printer Output you find methods how to print out analysis results in a paper saving way.



Analysis of oxygen

To avoid the penetration of oxygen from the air into the spark stand during the replacement of samples when analyzing for oxygen, the Argon Shield-Flush is available. For more details see Argon Flow.

16.1 Tip: Data Transfer

The spectrometer can transfer the analysis results to any other station by means of its serial data transfer.

Standard data transfer through an interface

At least one serial interface must be available. The data transfer is effected by means of the SPECTRO 4.4- protocol. The structure of the protocol is described in **Data Formats**.

- ▶ Installation of the "Serial Interface" through the Dialog Box Install Accessory Devices in the menu 'Installation' of the Program Development
- ▶ Initialization with the Menu Item Initialize
- ▶ After selection: set 'Buffered Output' or 'Direct Output' in the Dialog Box Output-Setup
- ▶ Check the output "Transmit" in the Dialog Box Output Format
- ▶ Element selection and formatting the results for the output "Transmit" in the Dialog Box Element Format

- ▶ Adjustment of interface and Baud rate in the Parameter File TRANSPAR.ASC

Field entry control / Output to several interfaces

Field entry control means that the entry in the field of sample data controls the output.

Additional or deviating settings for field entry control or output to several interfaces:

- ▶ Adjust 'Buffered Output' in the Dialog Box Output Setup
- ▶ Install the User Task "SER_OUT.EXE" for transmission via the Dialog Box Output Format
- ▶ Adjust e.g. "OutputType=2" in file MULTI.ASC (see below.)
- ▶ Adjust the interface and Baud rate in the parameter file MULTI.ASC instead of TRANSPAR.ASC
- ▶ Definition of field features in the Parameter File MULTI.ASC

When you output through several interfaces, the installation of a multi interface board in the PC is required.

The analysis results can be output with each of these serial interfaces, even in different formats per interface. With an entry in the sample identification fields it becomes possible to address selectively one or more interfaces for a special analysis. The following analysis then may be transferred to another interface.

Note:

Please use the 'normal' data transfer of the SPARK ANALYZER without entry of a user function when you want to make a normal (static) data transmission. Then you may connect additionally external printers etc. via the serial multi interface board (see Tip: external Printer and Terminals)

Troubleshooting for transmission errors

If transmission errors have occurred and the program realized such errors, the respective data set is saved and transmitted during the next scheduled transmission. If this transmission is also defective, the system goes on with this procedure until a transmission is successful.

Output formats

Currently the following output formats are defined for the analysis results:

OutputType=1 SPECTRO 4.2 - Protocol

OutputType=2 SPECTRO 4.4 - Protocol

OutputType=4 Siemens 3964R - Protocol with SPECTRO data format

OutputType=5 Compac protocol

Details of data formats for the Type 1 and 2 are described in Data Formats . This is a data transmission with software handshake. The current data transmission protocol is the SPECTRO-4.4-Protocol. The 4.2 Protocol is also available due to compatibility requirements.

OutputType=3 is the output of the results like a standard printer output. This setting is used for the output to serial printers (external Printer) and video terminals.

OutputType=4 is the output in the Siemens 3964R Protocol. The output data are transmitted in a block, embedded into the Siemens-protocol. The format of the output character string corresponds with the SPECTRO standard format, described in Data Format, file format ANALYSEN.DAT.

OutputType=5 Compac protocol

This protocol is also documented under Data Formats.

The interfaces COM1 to COM9 are supported by the software. In addition, a transmission in a network with the TCP/IP protocol is possible.

Hardware-Handshake and XON/XOFF - protocol are not supported.

See:

Tips & Tricks

Tip: external Printer and Terminals

16.2 Tip: Optimizing Printer Output

The spectrometer prints with the built-in Windows standard functions. Each printing of analysis results is regarded as the printing of a concluded document. As a result, it can happen that a paper feed often occurs to a new page, although one would still have used the current sheet of paper.

Remedial action provides a function which manages the Windows printing functionality. However, this functionality is not suitable for all printers. So-called GDI printers (GDI = Graphic Device Interface) require Windows for setup of the pages. These printers have no internal, local intelligence and cannot print without Windows.

You activate the use of this functionality over the Dialog Box Printer Setup which you open via the Menu File of the measuring window.

The analysis data to be printed are formatted in a file named C:\SPECTRO\RESULTS\NUMERIC\PAGE_OPT.ASC and temporarily buffered. (If you have installed your program in another directory or on another drive, another file path applies).

A batch file named C:\SPECTRO\OUT.BAT is called up instead of the normal print procedure. In this batch file, you can specify on which interface information should be printed. An output on a network printer is also possible. Different printers can be operated simultaneously provided that they are controlled via different interfaces of the device PC or with different network addresses. As a last operation in this batch file, the print file PAGE_OPT.ASC is deleted.

The data are not immediately printed out. Printing occurs not before a page is full or if a page feed is initiated via the operation panel of the printer.

For example:

OUT.BAT

```
type C:\Spectro\RESULTS\NUMERIC\PAGE_OPT.ASC >|pt1:
type C:\Spectro\RESULTS\NUMERIC\PAGE_OPT.ASC
>"\\ComputerName\SharedPrinterName"
del C:\Spectro\RESULTS\NUMERIC\PAGE_OPT.ASC
```

The first line diverts the content of the file to the printer which is connected at the standard printer interface LPT1.

The second line diverts the content of the file to a printer which is installed in the network. The computer name is to be specified where the printer is connected along with the name under which the printer is entered in the network. Please, ask your network administrator for details.

The print file is deleted with the third line. This file is generated again during the next print procedure.

Note that exactly 3 lines are necessary for these 3 instructions. If more lines are displayed in the document, that you are reading, then the formatting of the screen display or the printout is the reason.

This procedure is NOT possible for controlling External Printers.

See:

Tips & Tricks

Tip: Data Transmission

Tip: External Printers and Terminals

16.3 Tip: external Printer and Terminals

The spectrometer can transfer the analysis results to any printer and video terminals station by means of its serial data transfer. At least one serial interface must be available, e.g. through equipping the spectrometer PC with a serial multi interface board. The analysis results can be output with each of these serial interfaces. With an entry in the sample identification fields it becomes possible to address selectively one or more interfaces for a special analysis.

Output to remote printers or video terminals

Video terminals are treated like serial printers.

- ▶ Installation of the external Printer through the Dialog Box Installation of Devices in the menu 'Installation' of the Program Development
- ▶ Initialization with the Menu Item Initialize

- Check the output "external Printer" in the Dialog Box Output Format
- Element selection and formatting the results for the output "external Printer" in the Dialog Box Element Format
- Parameter setting "OutputType=3" in the file MULTI.ASC (see below)

Output formats

OutputType=3 ASCII output without protocol

OutputType=3 is the output of results in form of the simple printer output. At the line ending a CR,LF is made for the line break. Control characters for formatting (font style etc.) are not included in the output string. This setting is used for the output to a serial printer (external printer) and video terminals.

The interfaces COM1 to COM 9 are supported by the software.
Hardware-Handshake and XON/XOFF - protocol are not supported.

See in Parameter File the entries in the file MULTI.ASC

There is also a possibility described how to optimize the output in a way that as much as possible information fit into your terminal window or into your printer paper.

If you are looking for a optimization of the printer output for your standard printer, read the Tip: Optimize Printer Output. But the procedure described there is not suitable for printers which are controlled as external printers.

See:

- Tips & Tricks
- Tip: Data Transmission
- Tip: Optimize Print Output

17 Trouble-Shooting

In case of questions or problems with the instrument please contact our Service. There you will find the necessary support.

This chapter is a first aid in case of minor problems. It will be supplemented continuously. In case the support provided by this chapter is not sufficient or you feel uncertain, please contact the service department.

➔ Problems with communications between Spectrometer-PC and EPC

If you receive the following error message "**Communications error, no data received!**", there is a communication problem between PC and EPC. If this problem occurs permanently, you cannot operate your Spectrometer.

If you think that the communication between PC and EPC is too slow, you may verify the baud rate setting.

The EPC is a microcomputer which is installed in the Spectrometer. It manages the measurement tasks given by the Spectrometer PC and transferring back the results. This is called external solution. The communication takes place via a serial interface. To check whether your Spectrometer is equipped accordingly, read the Dialog Box Modes and Intervals which can be called up from the Menu Instrument, menu item 'Installation' of the Program Development. If you read the entry 'internal' under 'Operation mode', these explanation do not apply to you.

In case of a communication error you should try out a new initialization first. Call up the Menu Item Initialize in the Program Development. If the problem continues, try out a communication with decreased baud rate. The baud rate can be adjusted in the Parameter File INST_ADR.ASC.

Increase the baud rate if the communication is too slow. This is also effected in the above mentioned parameter file.

When you changed settings in this file, you have to initialize again or restart the Spectrometer and the PC.

In some cases, communications problems may be caused by the copy protection, see below.

➔ Notes on Copy Protection

The copy protection (also called Hardlock or Dongle) is delivered with the spectrometer. It is a 6 x 5 cm connector plug which must be plugged to an interface of your device PC. The software checks whether a copy control is installed at your device and authorizes you to use the suitable software releases from release 2.0.

The copy control can be plugged to both, a serial and a parallel interface. The two sides of the copy control plug are labeled correspondingly.

You should plug in the copy control in the following specified preference. Only if a possibility is excluded or causes problems, you should pass to the next one:

- 1. plug into the serial interface COM2:
- 2. plug into the parallel printer connection LPT1:
- 3. plug into the serial interface COM1: Via this interface, your device PC communicates with the subordinate device control computer EPC.

The serial interfaces are designed depending on PC-model as a 9-pin connector or as a 25-pin connector. The copy control is equipped with a 25-pin connector. If you require a 9-pin connection, you must insert an adapter.

18 Parameter Files

In the following a description is given, which refers to selected entries of the parameter files. Keeping up the parameter files can be done with the editor from the sub menus 'Installation / Parameter Files' of the Program Development. For other files you have to call up the editor by yourself.

When you have modified a parameter file, you have to save it using the menu 'file' of the used editor in order to write the changes to the hard disk. Then they can be used by the Spectrometer program. Sometimes it will be necessary to restart to program to make modifications active.

Note:

Only experienced spectrometer users, who are additionally competent in computers, shall carry out changes of files. SPECTRO cannot take any warranty on problems which are causally connected with changes of settings in the parameter files.

The parameter files are ASCII-files, which must be exclusively edited with a real text editor. Editors adding control characters must definitely not be used!!! We warn you to use WRITE, WINWORD and similar editors, because they may add control characters to the file. The editor NOTEPAD is suitable. You find this editor in the program group 'accessories' of the Windows operating system.

There are titles in the ASCII-files which are marked by []: here you may find entries. You must not change titles and entry name to the left of the equals sign.

For example:

[Check Limits]

Ctl_Use_Ext_Limits=1

Survey

Parameter file **PS_GEN.ASC in the subdirectory SETS**

Here you may carry out adjustments for:

Unit Conversion

Sample Management

Control Sample Measurement

Quality Control

Matrix Calculation

Automatic Average Calculation

Data Saving

Argon Flow

Parameter file **MULTI.ASC in the subdirectory RESULTS\NUMERIC**

In this file you set the parameters for the serial output of analysis results for several interfaces or the serial output depending on the field entries.

♦ **Output on external printers or on video terminals**

- ◆ Data transfer to several interfaces and in the network
- ◆ Data transfer depending on field entries

Parameter file PS_SID.ASC in the subdirectory SETS

In this file you enter the default values for the sample identification names.

Parameter file PS_STORE.ASC in the subdirectory SETS

In this file you save the parameters for file format for the storage of analysis results in ASCII-files.

Parameter file INST_ADR.ASC in the subdirectory SETS

Here you can adjust the Baud rate for the serial communication between the spectrometer PC and the EPC.

Parameter file PS_PROF.ASC in the subdirectory SETS

Here you can adjust the parameters for reprofiling the optics. You find some explanations in the chapter Carry out a SIM Reprofiling about parameters which may be changed by the user.

Parameter file PRN_SETS.ASC in the subdirectory SETS

You must not change the content of this file. The file contains entries for printer control. Here the settings on printer control are stored, which you have made with the user interface of the SPARK ANALYZER.

Parameter file TRANSPAR.ASC in the subdirectory SETS

This file is used to set parameter values of the standard data transfer interface to a superordinated computer. You need special know how to adjust the parameter values. All allowed entries are documented in the header of the file.

Additional files in the subdirectory SETS

You must not change any other files in the directory SETS.

Read Data Formats for more information on data formats which may be used for communication between the spectrometer program and external devices.

18.1 Parameter File PS_GEN.ASC

File PS_GEN.ASC in the subdirectory SETS

Aside from the selected entries described here there are some more entries which you should not modify!

Topic Unit Conversion**[Output Filter]**

Unit1=%,1
Unit2=ppm,10000
Unit3=ppb,10000000

The number behind the decimal point specifies the factor, by which the number must be multiplied, if it is entered in the base unit % and output in another.

Topic Sample Management

[Results_Library]

Auto_Storage=1
Statistic_Mode=3
Symbol_Mode=2
File_Check_Mode=1
Max_File_Size=100
Auto_Select=1

Auto_Storage defines whether the storage is done automatically. You get the choice between automatic storage or no storage. Storing selected samples by means of a button is not possible. Enter to the right of the equals sign (=) the figure 0 or 1.

0 means no storage

1 means automatic storage

Statistic_Mode describes which kind of data are to be stored. Enter to the right of the equals sign (=) the figure 0 or 1 or 2 or 3.

0 means single value 1 means average value 2 means average and standard deviation 3 means everything (single values, average value, standard deviation)

When storing single values, all single measurements of a sample are stored.

Symbol_Mode defines whether channel results, element results, or both is to be stored.

Enter to the right of the equals sign (=) the figure 0 or 1 or 2.

0 means channel 1 means element 2 means store all

The File_Check_Mode defines how the check and limitation of the file size is to be done. The check helps to avoid storing too many sample results in the course of time, what may lead to a full hard disk. This may cause the error message 'hard disk full', which may endanger the routine operation of the spectrometer.

. Enter to the right of the equals sign (=) the figure 0 or 1 or 2 or 3.

0 means no check 1 means check of file size in KByte 2 means check of number of data records 3 means check of date in days

The parameter Max_File_Size the maximum size of a file and the period the data are stored. Enter to the right of the equals sign (=) a figure. The meaning of the figure depend on the parameter setting of the file_Check_Mode.

Example: File_Check_Mode=2 Max_File_Size=100

As soon as 100 entries are stored in the result library, a warning message will be given. You are reminded to delete some data records.

Auto_Select defines whether the check box 'automatic' is marked in the dialog 'result library' of the window on sample management. This is just a default setting, which may be changed by the operator in the dialog 'result library'. Enter to the right of the equals sign (=) the figure 0 or 1.

0 means check box 'automatic' marked

1 means check box 'automatic' not marked

Topic Repeated Copying of Files

With these entries you can copy files repeatedly.

[Copy File]

SourceFileName=C:\SPECTRO\RESULTS\NUMERIC\ANALYSEN.DAT

FileName_1=C:\SPECTRO\RESULTS\NUMERIC\FILE1.DAT

FileName_2=C:\SPECTRO\RESULTS\NUMERIC\FILE2.DAT

The file ANALYSEN.DAT is read and copies are stored under the names FILE1.DAT and FILE2.DAT.

Copies can be used by user tasks. You find details in the description of the dialog box Output Parameters.

Topic Control Sample Measurement**[Check Limits]**

Ctl_Use_Ext_Limits=0

means that the inner limits are checked in the course of a control sample measurement.

Ctl_Use_Ext_Limits=1

means that the outer limits are checked in the course of a control sample measurement.

Ctl_Use_Int_Diff_Colors=0

means that exceeding the outer or inner limits is marked with the same color on the Measure Window.

Ctl_Use_Int_Diff_Colors=1

means that exceeding the outer or inner limits is marked with different colors on the Measure Window.

These entries are evaluated during Carry out a Control Sample Test.

Topic Quality Control

Equivalent meaning to control sample measurement have similar entries for **Quality Control**, also to be found under the header Check Limits.

Qual_Use_Ext_Limits=1

Qual_Use_Int_Diff_Colors=0

These entries are selected during Carry out an Alloy Grade Test.

[Qual]

AutoSelect=1

Controls the selection of entries in the Dialog Box Alloy Grade Library. If a character is entered in the group 'Search and Sort Criteria', the search starts immediately after the first entry which contains a part of the name. If AutoSelect=0 is chosen, the search starts after a click of the button.

The next fields are needed for the alloy grade search. For details please see Carry out an Alloy Grade Search.

CallMode=0 standard mode for alloy grade search

CallMode=1 extended mode for alloy grade search, tolerance windows and weighting are incorporated (KLASSOR procedure).

Show Mode=1 only one alloy grade is displayed in the window for found alloy grade during alloy grade search.

Show Mode=2 the window with the results of the alloy grade search is not displayed.

The entries 'MinProbability' and 'MaxQuality' control the visible inputs in the list of the found alloy grades in the extended mode of the alloy grade search.

Topic Matrix Calculation

No entries are necessary, if you want to use a procedure which is not the standard procedure. Possible procedures are explained in the Dialog Box Global Parameters. Please refer to that topic before you make any entries in this parameter file.

It is not necessary to enter any data for the standard procedure. In case you use the different rounding method described above, please enter the following steps:

[MatrixCalcDef_0]

IsDefined=1

Title=Standard

[MatrixCalcDef_1]

IsDefined=1

Title=Al-Basis is selectable

MinConc=0.001 is selectable

RoundToNumberOfDecimales=3 is selectable

Topic Automatic Average Calculation

[Auto_Average]

Delete_Complete_Row=0

means, that during the calculation of the average with freak value test only the freak value is eliminated. The single measurement of the other elements is kept.

Delete_Complete_Row=1

If a freak element is detected during the freak value test, the entire single measurement, i.e. the single result of all elements, are eliminated. This corresponds to the manual detection of a measurement sequence in manual mode.

Topic Data Saving

[Backup_and_Restore]

Backup_Command=

Restore_Command=

Here you see the entries for the functionality data backup and data restore in the Menu Extras in the window on Program Development. SPECTRO would like to support you to install the commands, tailored to your directories.

Topic Argon Flow

[Check Interval]

Argon_Shield_Flush=

Enter the time (in seconds) the spark stand is to be flushed with the so called Shield Flush after an analysis is done. A typical entry is 30 (30 seconds). The entry 0 or no entry mean that the Shield Flush is disabled. The Shield Flush is only necessary if you want to analyze oxygen in the samples. Shield-Flush means that the spark stand after the analysis is done is still flushed with the increased analytical flow of **Argon** for the period of sample exchange. So oxygen from the air cannot penetrate during the sample is replaced. If you do not need to analyze the element oxygen, the Shield Flush is not needed. It should not be switched on for minimizing the Argon consumption. After the Shield Flush period expired the instrument switches over to constant flow. From now on the time measurement for the Argon Saver is enabled (see below).

The other entries under the header [Check Interval] are handled by the user interface of the program. Here you should not change any settings. Entries are made in the Menu Instrument of the Program Development, menu item 'Installation / Modes' and 'Intervals'. There you can open the Dialog Box Modes & Intervals where you can carry out your settings. You may also change settings to decrease the Argon flow during operation breaks(Dialog Box Argon Saver).

18.2 Parameter File PS_STORE.ASC

File PS_STORE.ASC in the subdirectory SETS

You may save analysis results in ASCII files. These ASCII files may be used with external programs for a later processing of analysis results. You save the parameters for the file format in this file.

Parameters for storage of analysis results for the Sample Management are entered into the file PS_GEN.ASC. This file is described elsewhere.

The next entry is used for formatting the output in standard format (SPECTRO-4.4-Format): (from reasons of compatibility the entries have the version number 4.3, not 4.4 in their name)

[SPECTRO_4.3_Format_Options]

ValueRightAligment=1 The measurement value is entered flush right in the field for the measurement value (default setting).

ValueRightAligment=0 The measurement value is entered flush left in the field for the measurement value.

FillWithSpaces=0 Open space in the field for the measurement value is filled with 0 (default setting).

FillWithSpaces=1 Open space in the field for the measurement value is filled with spaces.

See:

Data Formats

Parameter File PS_GEN.ASC

18.3 Parameter File MULTI.ASC

File MULTI.ASC in the subdirectory RESULTS\NUMERIC

In this file you set the parameters for the serial output of analysis results on several interfaces or in a network using TCP/IP or also the serial output depending on the field entries.

The interfaces COM1 to COM 9 are supported by the software.

Hardware-Handshake and XON/XOFF - protocol are not supported.

Output formats

Currently four output formats are defined for the analysis results:

OutputType=1 SPECTRO 4.2 - Protocol

OutputType=2 **SPECTRO 4.4 - Protocol**

OutputType=3 ASCII output without protocol

OutputType=4 Siemens 3964R - Protocol with SPECTRO data format

OutputType=5 Compac protocol

Under Data Formats you find a survey of the output formats.

An example of a TCP/IP transmission is given below.

Entries in the file MULTI.ASC

[INFO_FIELD]

Under this header the selection is made when which interfaces are addressed.

Field=

For example: Field=2

In case of this entry, the content of the sample identification field named 2 controls the output. The number of the sample identification field is displayed in the Dialog Box Sample-ID-Format on the very left.

Static Output=

If there is an entry in the field above "Field=", here an entry **must not** be in!

Static Output = 4,6,7 means all results are transferred to the interfaces COM4 and COM6 and COM7.

Instead of the interface name, you may assign so called **Alias-Names**.

[Alias Names]

AliasCom3=O

AliasCom4=L

...

If the controlling sample identification field contains a O or L, the analysis is output to COM3 or COM4. Here O might mean the furnace platform and L might be the laboratory, this would control the output location. If this field contains both letters, the analysis will be output to both interfaces. Instead of letters you may also use character strings. A check is performed whether a letter or a character string is defined as an Alias name. In this example the field entry OL4711 addresses the interfaces 3 and 4.

AliasCom6=ALWAYS

The entry ALWAYS as Alias name means that the output is performed always on this interface, independent from the content of the controlling field.

Note:

Never use an interface which is necessary for the operation of the spectrometer. Normally COM1 is reserved for communication with the one-board computer (EPC) which controls the measurement tasks of the spectrometer. A mouse may be connected to COM2.

Configuration of the transmission rate and several parameters

For example:

[PORT_3_SETTINGS]

Baud=9600

Parity=n permitted: n,e,o

DataBits=8

StopBits=1

OutputType=3 The meaning of this field is described above.

The following settings are possible for each port. However, they only make sense during a data transfer which works with ENQ/ACK and CS/ACK. For this purpose, compare the documentation of the communication protocols. A modification of the provided entries is only necessary under especially critical data transfer conditions. If these entries in your file MULTI.ASC are not available, one works with default values. If required, you can incorporate these entries into your parameter file MULTI.ASC and adjust the parameters correspondingly.

Enq Sleep Time=100

specifies the waiting period after an unsuccessful transmission of an ENQ, before an ENQ is sent a second or a third time.

Default value: 100 ms

ENQ ACK Wait Time=1000

gibt die Wartezeit auf das ACK an, nachdem ein ENQ gesendet wurde.

Voreinstellung: 1000 ms

CS ACK Wait Time=1000

specifies the waiting period for ACK after the checksum was sent.

Default value: 1000 ms

NoAck:

NoAck=0 means: After an ENQ, an ACK is expected

NoAck=1 means: After an ENQ *NO* ACK is expected; can be used to display the data flow for test purposes with a terminal program

Configuration for optimized output on external printers or terminals

You can set parameters under the item [Printout optimization] in order to optimize terminal control or remote ASCII printers. These entries are not intended for the internal printer which is operated directly by the device under WINDOWS. If these entries are not available in your file MULTI.ASC, you can incorporate these entries into your parameter file MULTI.ASC, if required and adjust the parameters correspondingly.

If these entries are not available, a standard output is carried out on a printer or a terminal in a way of 80 characters per line. **Unless special requirements are available, we recommend the renunciation of these optimization and the output in the default format.**

The optimization only works during an output of the average values. Therefore, it is unconditionally necessary to output only the analysis average values (no standard deviation or individual measurements). Check your settings in the Dialog Box **Output Parameters**.

[Printout optimization]

Use=1

means: make use of the optimizations

Number of columns=132

means: The terminal or the printer can display 132 characters per line; Standard terminals or default printers can display 80 characters per line

Delete head lines=ALL

means: Delete all header lines; Header lines are the first 4 lines with information on program name, date / time, comment etc.

With "All" the 4 headers are deleted completely.

With 1, the first and the fourth lines are deleted.

With 0 no header is deleted

Blank lines below header=0

0 means: Below header no blank lines must follow.

Enter a digit >= 0.

Blank lines below SID=0

0 means: no blank lines below the lines with sample name, quality etc.;

Enter a digit >= 0.

Blank lines below result=0

0 means: no blank lines below result line

Enter a digit ≥ 0 .

Hide Qual=0

If quality control is on, 2 extra lines are output with quality limits.

0 means: quality limits are displayed

1 means: quality limits are not displayed

Hide Percent=0

0 means: lines with units (e.g. % or ppm) are displayed.

1 means: lines with units (e.g. % or ppm) are not displayed.

SID_Cut_Pos=10

Character strings with sample names etc. can be cut. These fields have a length of 30 characters as a default, filled up at the end with blanks.

Example: SID_Cut_Pos=10: Fields for sample names etc. are cut after 10 characters.

TCP-IP Transmission

Example:

[PORT_A_SETTINGS]

Host_Name=ANALYSEN_HOST

Port=4000

OutputType=2

The PORT_A_SETTINGS always refer to an output with TCP/IP. For an output via a serial interface, the entries are made under port numbers (e.g. PORT_3_SETTINGS).

Instead of an IP number the host name is specified.

The program searches via the network a host computer with pre-set name, in this case ANALYSEN_HOST.

Ask your network administrator concerning the port number.

The data transfer always occurs net in the format of the ANALYSEN.DAT (see data formats). Control character as STX and ETX are not transmitted. The net data record starts with the record length and stops with last characters of the supplementary field. A checksum is not transmitted.

See:

Data Formats

Tips & Tricks

Tip: Data Transmission

Tip: ext. Printer and Terminals

18.4 Parameter File PS_SID.ASC

File PS_SID.ASC in the subdirectory SETS

You can enter default values for sample identification names in this file. The sample identification names are displayed in a combination field in the Dialog Sample Data. When entering a sample name and other identification features before analyzing a new sample, you may select an entry from the combination field, thus saving the entry. It is helpful to use predefined sample identification names if some names often return. To display a sample identification field as a combination field, you have to select the entry 'User Defined Sample ID' in the column 'Origin' in the Dialog Box Sample-ID-Format.

For example:

Aside from the sample name you always want to enter a customer name as an identification feature for a sample. The field name is 'customer'. You often use the customer names Meyer, Müller, Schulze, Peters. Then create the following entry in the file PS_SID.ASC:

```
[Customer]
SID_Text_01 = Fa. Meyer GmbH
SID_Text_02 = Müller KG
SID_Text_03 = Schulze & Sohn OHG
SID_Text_04 = Stahlhandel Peters
```

When you enter the sample identification names you can select one of the four customer names from the list of the combination field to be filled into the field 'customer'. If the requested name is not available here, you can of course enter another name, selecting no entry from the list in the combination field.

The dialog box Sample Data may contain field entries already in. this is due to the parameter setting of the fields as 'external' origin in the Dialog Box Sample-ID-Format and the existence of the file EXT_SID.ASC in the subdirectory \INPUT.

This entry in PS_SID.ASC represents the delay time for the presentation of the file EXT_SID.ASC before the Dialog Box Sample Data is opened, provided it is not present when it is called up.

```
[External_SID]
Timeout = 60    waiting 60 Seconds for the file EXT_SID.ASC.
```


18.5 Parameter File INST_ADR.ASC

File INST_ADR.ASC in the subdirectory INSTDATA

In this file you adjust the data transmission rate of the serial communication between spectrometer PC and EPC. Read also the section **Trouble-Shooting**. The baud rate is set in the factory to an optimum value. You should only change settings if there are problems with your current setting.

You are only allowed to change the baud rate in this file. You must not change other parameters without discussion with Spectro.

A typical entry in this file looks like follows:

```
[Inst-Com-PC]
ComPort=1           ;1 (COM 1) or 2 (COM 2)
ComAdr=0x03F8       ;0x03F8 (COM 1) or 0x02F8 (COM 2)
ComIRQ=4            ;4 (COM 1) or 3 (COM 2)
DataBits=8          ;Databits
StopBits=1          ;Stopbits
Parity=N            ;No parity
Baudrate=115200      ;19200, 38400, 76800,115200
```

There are no baud rates above 115200. Baud rates below 9600 are not recommended.

If there is no entry with the row **Baudrate=** in your file, you may add this row. Only the listed baud rates and 9600 are applicable.

Try always first a transmission with 115200 Baud.

19 Function Keys

The program provides short cuts in the various windows to call up immediately selected program functions by means of a key combination. The following short cuts are available:

- ➔ special function keys Measure Window
- ➔ special function keys Program Development
- ➔ special function keys Regression
- ➔ special function keys Scan Manager
- ➔ special function keys Sample Management

19.1 Functions Keys for the Measure Window

To call-up the different menu items in the windows of the SPARK-Analyzer program, you may use short keys or shortcuts. Now it is possible to operate the program easily with no mouse.

| Shortcut | Window | Function |
|---------------|----------------|---|
| <F1> | Measure Window | Display context-related help |
| <F2> | Measure Window | Start measurement |
| <Shift>+<F2> | Measure Window | Start multi-measurement |
| <Alt>+<F2> | Measure Window | Retrieve previous measurement |
| <F3> | Measure Window | Stop measurement |
| <F4> | Measure Window | Calculate average |
| <Alt>+<F4> | Measure Window | Quit SPARK-Analyzer program |
| <F5> | Measure Window | Calculate average and RSD |
| <F6> | Measure Window | Display single values |
| <F7> | Measure Window | Start standardization |
| <Shift>+<F7> | Measure Window | Start global standardization |
| <F8> | Measure Window | Start type standardization |
| <Shift>+<F8> | Measure Window | Load type standardization |
| <Ctrl>+<F8> | Measure Window | Delete type standardization |
| <F9> | Measure Window | Define next sample |
| <Shift>+<F9> | Measure Window | Edit sample data |
| <Alt>+<F9> | Measure Window | Display results of the last measurement |
| <F10> | Measure Window | Load program |
| <Shift>+<F10> | Measure Window | Search program |
| <F11> | Measure Window | Start control sample test |
| <F12> | Measure Window | Print locally |
| <Shift>+<F12> | Measure Window | Enable program development window |
| <Ctrl>+<F12> | Measure Window | Enable scan manager window |
| <Alt>+<F12> | Measure Window | Enable sample manager window |
| <Ctrl>+<A> | Measure Window | Delete all single values |
| <Ctrl>+<D> | Measure Window | Print locally |
| <Ctrl>+<F> | Measure Window | Switch on / off Argon flow |
| <Ctrl>+<M> | Measure Window | Mark |
| <Ctrl>+<P> | Measure Window | Print locally |
| <Ctrl>+<Q> | Measure Window | Display alloy grade list |
| <Ctrl>+<S> | Measure Window | Store results |
| <Ctrl>+<T> | Measure Window | Transfer results |
| <Ctrl>+<U> | Measure Window | Search alloy grade |
| <Ctrl>+<X> | Measure Window | Print externally (remote print) |

| | | |
|------------|----------------|--------|
| <Ctrl>+<Z> | Measure Window | Undo |
| | Measure Window | Delete |

See:

Short Keys

19.2 Function Keys for Program Development

To call-up the different menu items in the windows of the SPARK-Analyzer program, you may use short keys or shortcuts. Now it is possible to operate the program easily with no mouse.

| Shortcut | Window | Function |
|---------------|---------------------|-------------------------------------|
| <F1> | Program Development | Display context-related help |
| <Shift>+<F2> | Program Development | Edit standardization samples |
| <F2> | Program Development | Edit standardization data |
| <Alt>+<F2> | Program Development | Control samples |
| <F3> | Program Development | Samples for type standardization |
| <Alt>+<F3> | Program Development | Samples for type calibration |
| <Alt>+<F4> | Program Development | Exit program development |
| <F8> | Program Development | Regression |
| <F9> | Program Development | Save |
| <Shift>+<F9> | Program Development | Save as |
| <F10> | Program Development | Load program |
| <Shift>+<F10> | Program Development | New program |
| <F11> | Program Development | Calibrate |
| <F12> | Program Development | Measure window |
| <Alt>+<F12> | Program Development | Sample management |
| <Ctrl>+<F12> | Program Development | Scan manager |
| <Ctrl>+<0> | Program Development | Global parameters |
| <Ctrl>+<1> | Program Development | Excitation parameters |
| <Ctrl>+<2> | Program Development | Element parameters |
| <Ctrl>+<3> | Program Development | Channel parameters |
| <Ctrl>+<4> | Program Development | Element format |
| <Ctrl>+<5> | Program Development | Output parameters |
| <Ctrl>+<6> | Program Development | Parameters auto average calculation |
| <Ctrl>+<7> | Program Development | Calibration ranges |
| <Ctrl>+<8> | Program Development | Standard samples for calibration |
| <Ctrl>+<9> | Program Development | Global interferences |
| <Ctrl>+<D> | Program Development | Print program |
| <Ctrl>+<L> | Program Development | Copy lines |

See:

Short Keys

19.3 Function Keys for Regression

To call-up the different menu items in the windows of the SPARK-Analyzer program, you may use short keys or shortcuts. Now it is possible to operate the program easily with no mouse.

| Shortcut | Window | Function |
|--------------|------------|----------------------------------|
| <F1> | Regression | Display context-related help |
| <Ctrl>+<F1> | Regression | Linear polynomial |
| <Shift>+<F2> | Regression | Edit standardization samples |
| <F2> | Regression | Edit standardization data |
| <Ctrl>+<F2> | Regression | Square polynomial |
| <Ctrl>+<F2> | Regression | Cubic polynomial |
| <Shift>+<F3> | Regression | Cascade windows |
| <F4> | Regression | Load channel |
| <Shift>+<F4> | Regression | Tile windows |
| <Alt>+<F4> | Regression | Exit regression program |
| <F5> | Regression | Calculate |
| <Ctrl>+<F5> | Regression | Lock/release IECs |
| <Shift>+<F5> | Regression | Calculation parameters |
| <Alt>+<F5> | Regression | Reset all IECs |
| <F6> | Regression | Filter settings |
| <Shift>+<F7> | Regression | Data window |
| <Alt>+<F7> | Regression | Zoom in |
| <F8> | Regression | Interferences |
| <Shift>+<F8> | Regression | Graphic window |
| <Alt>+<F8> | Regression | Draw again |
| <F9> | Regression | Accept |
| <Shift>+<F9> | Regression | Data window + graphic window |
| <Ctrl>+<2> | Regression | Element parameters |
| <Ctrl>+<3> | Regression | Channel parameters |
| <Ctrl>+<7> | Regression | Calibration ranges |
| <Ctrl>+<8> | Regression | Standard samples for calibration |
| <Ctrl>+<9> | Regression | Global interferences |
| <Ctrl>+<P> | Regression | Print data |
| <Ctrl>+<G> | Regression | Print graph |
| <Ctrl>+<A> | Regression | Print all |
| <Ctrl>+<S> | Regression | Display icons |

See:

Short Keys

19.4 Function Keys for Scan Manager

To call-up the different menu items in the windows of the SPARK-Analyzer program, you may use short keys or shortcuts. Now it is possible to operate easily the Windows-program with no mouse.



| Shortcut | Window | Function |
|--------------|--------------|-------------------------------|
| <F1> | Scan Manager | Display context-related help |
| <F2> | Scan Manager | Start scan |
| <Shift>+<F2> | Scan Manager | Line selection |
| <Alt>+<F2> | Scan Manager | Retrieve previous measurement |

| | | |
|---------------|--------------|-----------------------------------|
| <F3> | Scan Manager | Stop scan |
| <F4> | Scan Manager | Smooth scan |
| <Ctrl>+<F4> | Scan Manager | Close scans |
| <Alt>+<F4> | Scan Manager | Close window of scan manager |
| <F5> | Scan Manager | Define measure position |
| <Ctrl>+<F5> | Scan Manager | Center scan |
| <Alt>+<F5> | Scan Manager | Center all scans |
| <F6> | Scan Manager | Label peaks |
| <Ctrl>+<F6> | Scan Manager | Label |
| <Alt>+<F6> | Scan Manager | Remove label |
| <Alt>+<F7> | Scan Manager | Zoom in |
| <Alt>+<F8> | Scan Manager | Full display |
| <F9> | Scan Manager | Save scan |
| <Shift>+<F9> | Scan Manager | Save as |
| <Ctrl>+<F9> | Scan Manager | Save all scans |
| <Alt>+<F9> | Scan Manager | Save scan group |
| <F10> | Scan Manager | Load scan |
| <Alt>+<F10> | Scan Manager | Load scan group |
| <F12> | Scan Manager | Activate measure window |
| <Shift>+<F12> | Scan Manager | Enable program development window |
| <Alt>+<F12> | Scan Manager | Enable sample manager window |
| <Ctrl>+<A> | Scan Manager | Print all scans |
| <Ctrl>+<D> | Scan Manager | Print scan |
| <Ctrl>+<F> | Scan Manager | Switch on/off Argon flow |
| <Ctrl>+<I> | Scan Manager | Open interference library |
| <Ctrl>+<S> | Scan Manager | Reprofile |
| <Ctrl>+<L> | Scan Manager | Open line library |
| <Ctrl>+<S> | Scan Manager | Edit excitation parameters |



Shortcut

| |
|------------|
| <F1> |
| <F2> |
| <Alt>+<F4> |
| <F6> |
| <F9> |
| <F12> |
| <Ctrl>+<F> |
| <Ctrl>+<S> |
| <Ctrl>+<R> |
| <Ctrl>+<U> |
| <Ctrl>+<Z> |

Window

| |
|--------------|
| Scan Manager |
| Scan Manager |
| Scan Manager |
| Scan Manager |
| Scan Manager |
| Scan Manager |
| Scan Manager |
| Scan Manager |
| Scan Manager |
| Scan Manager |
| Scan Manager |

Function

| |
|------------------------------|
| Display context-related help |
| Load scan / New scan |
| Close window of scan manager |
| Print Scan |
| Save scan |
| Activate measure window |
| Switch on/off argon flow |
| Edit excitation parameters |
| Resize window |
| Undo Zoom |
| Zoom |

See:

Short Keys

20 Data Formats

A description of data formats follows, which can be used for communication between Spectrometer program and devices around. The data described here can be read in by the Spectrometer program before the start of the measurement or it can represent the results of the measurement.

This is no description of internal file formats, e.g. of the analytic programs. This is also no description of the parameter files to influence partially the behavior of the Spectrometer software. The relevant parameter files are described below the key word Parameter Files.

The following data formats are described:

- | | | |
|----|------------------------------|--|
| 1. | file ANALYSEN.DAT | output file for results |
| 2. | data communications protocol | output format for data communication of results via serial interface |
| 3. | file EXT_SID.ASC | input file for sample identification information |
| 4. | file SID_STA.ASC | output file for sample identification information |

The subdirectories mentioned below, where the files can be found, correspond with a standard setting. In most cases the subdirectories can be modified.

1. File ANALYSEN.DAT

The file ANALYSEN.DAT is an outcome-file in a fixed format, where analysis results can be stored. Storing the data is effected via the **Dialog Box Output Format** and the **Dialog Box File Parameters** via the menu 'edit program development.

| number of bytes | type | content | comment |
|-----------------|------|---------------|--|
| 4 | N | record length | record length starting with date |
| 6 | N | date | format TTMMJJ |
| 6 | N | time | format HHMMSS |
| 1 | A | state | Flag Byte 1=concentration 2=corrected intensities 3=standardized intensities 4=intensity ratios 5=raw intensities 6=channel concentrations 7=type standardization conc. 8=reference intensities 9=SSE standard deviation A=standardization factors |

| | | | |
|-----------|---|---|---|
| 1 | A | alloy grade control | B=standardization offsets "Y" or "N" |
| 1 | A | type of data | N=single measurement J=average value S=absolute standard deviation R=relative standard deviation |
| 2 | A | type of instrument | F=SPECTROFLAME L=SPECTROLAB T=SPECTROTEST |
| 1 | A | type of communication | B=Buffer D=direct communication |
| 4 | N | year, 4 characters | starting with version 1.32 for example: 1999, 2000, 2001... |
| 9 | A | reserve | former versions empty field for future application |
| 10 | A | program name | name of the analytical program |
| 30 | A | ID 1 | e.g. sample number |
| 30 | A | ID 2 | e.g. sample identification |
| 30 | A | ID 3 | alloy grade |
| 30 | A | ID 4 | further sample names |
| 3 | N | number of measure values | corrected for leading zeros |
| n*18 | | n*meas | n = number of measure values, structure of measure value fields see below |
| 2 | N | number of additional fields | |
| n*(10+30) | A | name add. field (10) + content add. field (30) | n=number of additional fields (=further sample-ID-fields) |

Description of the file types:

A alphanumeric (flush left with following space)
N Numeric (flush right with guiding space)

Note: The last additional field may contain as 30th sign the character #. Alternatively, the length of the last data field may be less than 30 characters. Then the length of the last data field is equal with the length of the effective content; annexed blanks are dropped. With the entry in the field 'record length', always the precise number of bytes is given. This file is an ASCII file, each line (and consequently each data record) is finalized with CR(13dez), LF (120dez).

Structure of measure value fields:

| number of bytes | type | description |
|-----------------|------|--|
| 6 | A | element symbol 1. letter capital, further small letter |
| 1 | A | alloy grade control (+ = exceeded) (- = fell short) |
| 1 | A | calibration curve surveillance (> = exceeded) |

| | | |
|---|---|---|
| 1 | | (≤ fell short) |
| 9 | N | reserve measure value in ASCII-Format (concentrations / intensities) including decimal points |

The number of digits after the decimal point is set according to the formatting description used (dynamically or fixed number of digits).

The measure value is entered flush right into the field by default. To the left the field is filled up with "0". A flush left entry with spaces instead of "0" is possible. You can make this adjustments in the parameter file PS_STORE.

2. Data Communication Protocols

2a. SPECTRO 4.4 Data Communication Protocol

The SPECTRO 4.4 data communication protocol transfers information of the file ANALYSEN.DAT in the format described above. These operational data are embedded in a Software-Handshake.

Pattern:

| step | sender | address |
|------|---------------|--------------------|
| 0. | | EOT #04 |
| 1. | ENQ #05 | |
| 2. | | ACK #06 / NACK #06 |
| 3. | data qpackage | |
| 4. | | ACK #06 / NACK #06 |

Explanation:

The characters EOT, ENQ, and ACK are control characters.

Step 0 is used if the receiver is started after the sender. It gets the sender to repeat step 1 immediately with no waiting period for a timeout of the sender. The sender executes step 1 always at the start.

Structure of the data package :

- ◆ STX #02
- ◆ 4 bytes for the number of data bytes excluding Checksum
- ◆ Data bytes
- ◆ Checksum
- ◆ ETX #03

The **Checksum** is calculated as follows:

$$\text{Checksum} = (\text{Checksum} + K) \text{ MOD } 10000$$

K = ASCII-value of the transferred byte

The Checksum is calculated only from communication data. The control characters ENQ, STX, and ETX are not recognized for calculation.

The sender program waits after ENQ and after a transferred data record for a ACK. If a NACK is received, ENQ or the just sent data record is transferred once again. If a NACK is received after three of these communication trials, the communication is interrupted displaying an error message.

Transmission form data buffer (Menu Item Transmit Buffered Data):

The last data record, which signalizes that the buffer is empty, contains as record length a "0001". The next byte is EOT (#4 End of Transmission) followed by the Checksum.

2b. SPECTRO 4.3 Data Communication Protocol

This is a version of the data communication protocol SPECTRO 4.4, where the fields for the 4-digit year had not yet been implemented. There are empty reserve fields at these places.

2c. SPECTRO 4.2 Data Communication Protocol

This is a version of the data communication protocol SPECTRO 4.3 with no transmission of ETX.

2d. COMPAC Data Communication Protocol

1. Frame Protocol

| field length | SPECTROLAB sends | receiver sends | comment |
|-----------------|---------------------|--------------------------------|--|
| 1 | ENQ (05hex) | | data are ready, PC wants to send |
| 1 | | ACK/NACK (06hex/ 15hex) | receiver is ready (ACK) or not ready (NACK) to receive data with NACK or Timeout (typically 3 sec) the sender repeats ENQ twice maximum) |
| X | data package | | variable length, see description of data format |
| 1 | | ACK/NACK (06hex/ 15hex) | receiver has received data correctly (ACK) or not correctly (NACK) with NACK or Timeout (typically 3 sec) the sender repeats ENQ twice maximum) |

Data package

Also all numerical data are transmitted in plaintext. The digit 2 is transmitted as "2" = 32hex = 50dez.

| byte no. | field length | SPECTROLAB sends | comment |
|----------|-----------------|---------------------|---|
| 1 | 1 | STX | start-of-text (02hex) |
| 2 | 3 | Satzlänge XXX | record length modulo 1000 corresponds with the number of sent characters of STX (<u>including</u>) up to check sum (<u>excluding</u>) |

| | | | |
|-----------|----|------------|--|
| 5 | 1 | , | with record length > 999 this number is displayed which is given by the division by 1000 |
| 6 | 2 | HH | hour (with high-order zero, if necessary) |
| 8 | 1 | , | spacer comma (2Chex) |
| 9 | 2 | MM | minute (with high-order zero, if necessary) |
| 11 | 1 | , | spacer comma (2Chex) |
| 12 | 2 | TT | day (with high-order zero, if necessary) |
| 14 | 1 | , | spacer comma (2Chex) |
| 15 | 2 | MM | hour (with high-order zero, if necessary) |
| 17 | 1 | , | spacer comma (2Chex) |
| 18 | 2 | JJ | year (with high-order zero, if necessary) z.B. 00 für 2000, 02 für 2002 |
| 20 | 1 | , | spacer comma (2Chex) |
| 21 | 10 | XXXXXXXXXX | name of the analytical program (flush left, at right filled up with blanks) |
| 31 | 1 | , | spacer comma (2Chex) |
| 32 | 10 | XXXXXXXXXX | sample identification field 1 (e.g. sample name) |
| 42 | 1 | , | spacer comma (2Chex) |
| 43 | 10 | XXXXXXXXXX | sample identification field 2 |
| 53 | 1 | , | spacer comma (2Chex) |
| 54 | 2 | NN | number of elements (with high-order zero, if necessary) |
| 56 | 1 | , | spacer comma (2Chex) |
| 72+ | 3 | XXX | element data of NN elements |
| (NN-1)*15 | | | check sum (check sum) sum modulo 256 of all digit values of STX (including) up to check sum (excluding) |
| 75+ | 1 | ETX | end-of-text (03hex) |
| NN-1)*15 | | | |

Element data

| | | | |
|----------|----|-------------------------------|--|
| 57 + | NN | 6 | element name (flush left, at the right filled up with blanks) n = consecutive element number |
| (n-1)*15 | * | 20.1.1.1.1.1.2 EEE | |
| | 15 | EEE | |
| | 1 | , | spacer comma (2Chex) |
| | 1 | "<" oder ">" oder Leerzeichen | 20.1.1.2 blank = concentration within calibration range > = concentration exceeds calibration range < = concentration falls short of calibration range |
| | 6 | KONZ | element concentration (flush left, at the right filled up with blanks). no high-order zeros, 0.123 e.g. as "0.123" |
| | 1 | , | spacer comma (2Chex) |

3. File EXT_SID.ASC

This file can be installed in the subdirectory \INPUT. It may contain sample identification information, which is provisionally entered into the Dialog Box Sample Data and are displayed. After reading, the file EXT_SID.ASC is deleted automatically. Therefore this file is

exceptionally suitable for regular provision of sample identification by superior computer systems.

For example:

```
[Sample_ID]
Field_01="R345"
Field_02="St37"
Field_03=
Field_04="Krupp Hoesch"
Field_05="Fa. Meier & Wolff KG"
Field_06=
```

The numeration Field_XX corresponds with the line number of the table in the Dialog Box Sample-ID-Format. After the equals sign (=) the words to be entered are listed. The quotation marks "" may be left out. The data are entered exclusively into the dialog box 'sample data', provided the field is defined as external.

4. File SID_STA.ASC

This file is always automatically written, if the **Dialog Box Sample Data** is closed. It contains under 2 headings the field name and the sample identification information, which were entered into the dialog box 'sample data'.

Example:

```
[Sample_ID_Name]
Field_01=Sample-No.
Field_02=Quality
Field_03=Sample iD
Field_04=Manufacturer
Field_05=Client
Field_06=Ref.No.
```

```
[Sample_ID]
Field_01=R345
Field_02=St37
Field_03=
Field_04=Krupp Hoesch
Field_05=Fa. Meier & Wolff KG
Field_06=
```

21 Glossary

Alloy Grade

Materials are divided in alloy grades (qualities). There are standards defining the chemical composition on the various alloy grades. This alloy grade definition consists of the information on the concentration ranges (min. conc./max. conc.) of the elements the material contains. The alloy grade may be defined as one of the sample identification items before starting the analysis. This leads to a check whether the results of the analysis correspond to the alloy grade limit values (Alloy Grade Check). Generally the alloy grade limit values to be applied are recorded once by the spectrometer user. A Type-Standardization sample may be assigned to a alloy grade, used automatically in case a production sample of alloy grade shall be measured.

Alloy Grade Assurance

Checking the analysis of a production sample for correspondence with alloy grade limit values. Such elements are marked, which have concentrations out of the alloy grade limits. The alloy grade limit values and the result of the alloy grade check are displayed on the Measure Window, provided that a field from the type 'Quality' was defined in the dialog box 'Format Sample-ID' and was filled in the dialog box 'Sample Data' before the measurement starts. For further information please refer to the menu item 'constant light test'.

Alloy Group

Alloy grades of similar composition are summarized under an alloy group. Alloy groups on iron are e.g. mild steel, manganese steel, tool steel. There are alloy groups on other base elements too.

Argon Flow

The argon flow is used to flush the Spark Stand to ensure both, a proper spark excitation and a transmission of short wavelengths in an oxygen-free environment. Three kinds of argon flow are default and are enabled automatically depending on the operation mode of the spectrometer: low flow, constant flow, analytic flow. The analytical flow is a volume flow which flows into the spark stand during measurement. If your instrument is designed for measurement of oxygen, small amounts of oxygen from the air are interfering, if they penetrate the spark stand during change of samples. To avoid this problem you may define an increased analytical flow through the spark stand after an analysis. This is done with an entry in the parameter file PS_GEN where you may also choose the flow period. This flow is named Shield-Flush.

Automatic Program Selection

A suitable Analytical Program is automatically selected, based on the analysis in the orientation program. Provisional intensities determined in the orientation program are compared with the concentration ranges which can be defined through the automatic program selection for each analytical program for program switch. It is switched to the first fitting analytical program, which has an analysis of the orientation program with all values within the defined concentration ranges.

Then the intensities determined in the orientation program are converted into concentration units by means of the calibration on the Analytical Program; finally the concentrations are output. The automatic program selection is based on the first measurement of a production sample; subsequent remeasurement of the same sample are evaluated with the current Analytical Program.

Base

The base, or better the base element, is the element defining the sample-matrix. Several Analytical Programs may be assigned to a base element, depending on type and concentration of elements contained in the sample. The lines of the base element are used as Reference Lines in the rule.

BEC & LOD

BEC and LOD are used to characterize the performance of a spectrometer. BEC means 'Background Equivalent Concentration'. BEC is the concentration necessary to generate a signal which is equivalent to the signal of the background. LOD means limit of detection. The detection limit of an analysis process is the lowest concentration value of an element which can be detected within the frame of a preset statistical accuracy. There is a correlation between BEC and LOD with view to the reproducibility of the background signal. The two values are channel-specific.

Binary Samples

Standards containing just one more element in addition to the main matrix element are called binary samples. These samples are especially used to determine an interferer. Generally the interfering element exists in high concentrations in the binary samples. Binary samples are often marked with a * in front of the name by SPECTRO.

Calculation Steps

The conversion from measured intensities into the element concentrations which are displayed in the window, is accomplished in several steps:

Light sensors are positioned in the Optic at the location of the projection of the spectral lines, integrating up the measure signals of each light sensor by electronic integrators, a tension is achieved which is proportionally to the light signal for each channel. This tension is digitalized and read-in by the Spectrometer computer. This digitalized Light Intensity Value for a channel is called **Raw Intensity**.

Generally the **intensity ratio** of the analysis channel and a suitable Reference Channel shows a better reproducibility than the single channel result of the analytical element. This is why often intensity ratios instead of raw intensities are used to calibrate the channels. To avoid that the intensity ratio is given as a very little numerical value, it is multiplied by the **typical intensity**. The typical intensity is a fixed factor in the order of the reference intensity. It is exclusively used to rise the numerical value of the intensity ratio to a value which can be operated.

By means of the Standardization which shall be carried out regularly, the deviations of intensities for the same sample are corrected, which occur in the course of time. A factor and an offset are calculated to transform the intensity ratios into **Standardized Intensity Ratios**.

Provided that the spectral interferences (Inter Element Coincidence) for the individual channels are known, the numerical figures of the standardized intensity ratios may be corrected by the value of the interferer influence. This is called **IEC-corrected Intensity Ratios**.

They are used to calculate the **Concentration Ratios** through the calibration function.

This results in **Matrix-corrected Concentrations** (see Analysis Function and Calculation of Concentrations).

Up to this point all data are channel-specific data.

By means of the concentration-depending channel switch (Line Switch) the results of several Logical Channels can be displayed onto one element. This is the **Element Concentration**. This represents the measure result which is usually displayed.

If you are working with an adaptation which depends on the sample type (Type Standardization, Type Calibration), a further step in the direction of the **Typecorrected Concentration** is achieved.

In the measure window you can switch between the single calculation steps. In case of unclear analysis results, the generation of the result can be checked.

See:

- Analysis Function
- Calculation of Concentrations
- Interferences during Measurement

Calibration

A calibration is the process to measure samples of known concentrations (Calibration Samples) and to determine a calibration function (calibration graph) derived from the intensities obtained.

Calibration Curve / Regression Curve

The calibration curve performs the connection between measured intensities and element concentrations for a logical channel. The dependence of intensity and concentration is expressed by a calibration polynomial (**calibration function**) which is calculated in the regression calculation.

Calibration samples

Calibration samples are samples of known content which are measured during a Calibration. Apart from the name 'calibration sample', the name 'calibration standard' is commonly used.

CCD Chip



CCD pixels are grouped in CCD chips. These chips detect radiation intensities between a minimum and a maximum wavelength of the incident radiation. The intensities delivered by a CCD chip after a measurement are called a frame.

Channel

A channel is a logic read-out unit. Both, the electric operation with the light detector which measures the light of the spectral line and the parameter setting of the source parameters belong to the channel. A light detector may be bonded with several channels, reading-out the detector signal under several source conditions.

Classification acc. to Wavelength Ranges

A classification of Optics may be effected acc. to measurable wavelength ranges, apart from the classification acc. to SIM/SEQ-Optics. **UV-Optics** are suitable to measure wavelengths in the range of ultraviolet light (short wavelengths). Light of these wavelengths is absorbed in air, consequently the optics to measure UV-wavelengths are to be protected against air. This may be achieved with a filling of nitrogen or an evacuation of the optics. Depending on the technical solution the device is called **Nitrogen Optics** or Vacuum Optics. In contrast to this **Air Optics** are operated without special protection on air. Short wavelengths cannot be measured.

Concentration

A calculation step from raw intensity to element concentration.

See:

Calculation Steps

Constant Light Test

During a constant light test the channel signals are determined which are supplied by small LED light sources incorporated in the optical systems. The constant light test is used to check the spectrometer read-out system. For further information please refer to the menu item 'constant light test'.

Control Sample Test


The control sample test is used to analyze the control samples of an analytic program. A warning message will be given, if determined contents are out of the limits which are defined for control samples. The control sample test is used to check both, the spectrometer and its analytic programs

Control Samples




Control samples belong to Standard Samples. Control samples are used to check the spectrometer and its analytic programs. The chemical composition of control samples is known. Limit values above and below the known concentration are defined for one or elements of the control sample. During the Control Sample Test the control samples of the respective analytic program are analyzed. In case the determined contents are out of the defined limits, a warning message is displayed.

Dark Current Test

By means of the dark current test channel signals are registered without emitting light out of a sample. The dark current test is used to check the spectrometer selection system. For more information please refer to the menu item 'dark current test'.

 In the case of the SPECTROLAB jr. CCD, a dark current test is carried out with each start of the Spectrometer software. The determined results are considered for the evaluation of the analysis signal.

Device Types / Models

This manual applies for several device types of stationary metal analysators of the company SPECTRO. At places where a distinction is required, it is indicated by the pictograms ,  and .



This text applies only for SPECTROCAST.



This text applies only for SPECTROLAB. SPECTROLAB can be divided into several models, e.g. SPECTROLAB - S which can be equipped with a Monochromator or SPECTROLAB Jr. CCD.



This symbol marks specialties for distinction between SPECTROLAB Jr. CCD and SPECTROLAB.

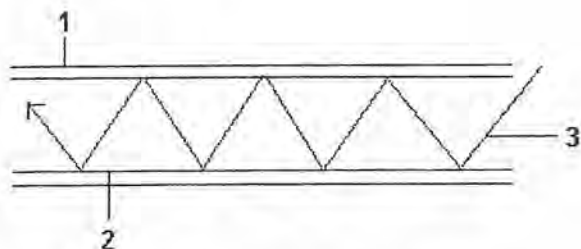
DIA

DIA and DIA-Light are external programs to manage your analysis results. DIA is featured by an extended functionality compared with the integrated sample management which you select in the menu files of the measure window. The previous version of the program DIA is called SDC (SPECTRO DATA CONTROL).

External Sample File

The results of your measurements can be stored in the external data file, set as ASCII-Format. So you may transfer the measure results into other programs or into a LIMS. It is possible to store the file e.g. on an external file server, provided that the respective hardware is available (network board etc.).

Fibre Optics



1. outer jacket

2. inner jacket

3. incident light

The fibre optic is a high-purity glass fiber coated by a cover (inner jacket) which performs a 100% reflection. To protect the fiber, another cover, the outer jacket, is used, made of plastics. Thus the fibre optics is flexible and may be bent. Inside the instrument, each fibre optic has another thicker plastic liner up to the optic.

Frame



The intensity data delivered by a single CCD chip during a measurement are called a frame.

Global Standardization Program

A global standardization program is an Analytical Program which is used to standardize all channels of a base. A standardization can be carried out for each Analytical Program too. To standardize all programs of a base separately, all programs of this base would be called up and all standardization samples of each program would be measured theoretically. On the other hand many programs are based on the same standardization samples, consequently many samples would be measured repeatedly. To avoid useless efforts you may standardize all analytical samples of a base by means of a global standardization program. This program requests all samples required for min. one program of a base. The intensities determined are transmitted into the individual programs automatically to calculate the current standardization factors and standardization offsets. A standardization of individual programs becomes unnecessary. In case you generate a new Analytical Program, we recommend to use the global standardization program as basic program. The global standardization programs generated by SPECTRO are usually called FE-00, AL-00, PB-00, etc., depending on the base element (in the example: Fe, Al, Pb).

Hg-Test

The Hg-test (Hg = mercury) is a function concerned with a Monochromator: If your stationary metal analyzer is equipped with a monochromator, you may set the parameters for your control software in such a way that periodically the monochromator moves to a definite spectral line of a mercury lamp. The respective position of the monochromator stepper motor is then checked. This procedure does not take much time and is accomplished in the background.

High Sample

Generally two samples are used for a Standardization. The high sample represents the standardization sample with the high concentration of the resp. element.

IEC-Corrected Intensity Ratios

A calculation step from raw intensity to element concentration, see Calculation Steps.

Intensity

During light emission the wavelengths of the light emitted is characteristic on the element. The level of the signals is defined as intensity. The intensity is measured by the spectrometer as relative value and may be displayed in the Measure Window, before the data set is converted into concentrations.

See:

Calculation Steps

Intensity Correction

During Standardization an intensity correction is effected. During Calibration of the spectrometer the standardization samples were measured and the intensities achieved were stored. In case of a remeasurement after a time, slightly different values will be obtained. Based on these deviations a factor and an offset are calculated which are used to correct all later intensity values of production samples. By means of this the measured intensity values of the production samples are converted into intensity values. These values would have been achieved in case the production samples would be measured at that time the calibration was effected. By means of this intensity correction a former calibration may be used as base for a concentration output at any time.

Intensity Ratios

A calculation step from raw intensity to element concentration.

See:

Calculation Steps

Concentration Ratios

A calculation step from raw intensity to element concentration.

See:

Calculation Steps

Interference

An interference is the influence on a channel by other elements. There are two types of interference: additive interference (line interference) and multiplicative interference (matrix effect). The additive interference is based on superposition effects of lines which are close together. The arithmetical correction may be often carried out by subtracting the interference. The multiplicative interference is based on the implementation of the element to be analyzed in the sample matrix. The arithmetical correction may be often carried out by application of a multiplicative factor.

KLASSOR

KLASSOR means classification tool for steel grades. It is a procedure to search for a matching alloy grade in an analysis. This program part is also suitable for the search for non-ferrous metals. The classification procedure KLASSOR is based on a comparison of the analysis with concentration limits plus a tolerance interval of a alloy grade. A non-precise measurement value or an unimportant element do not automatically counts as non-identification of the alloy grade. Only the probability for the alloy grade will be reduced.

LIMS

LIMS is an abbreviation on Laboratory Information Management System. This is a communication system mostly based on computer networks within a laboratory environment. LIMS is used to exchange, to evaluate, to summarize the measure results determined by the analysis systems. It is possible to integrate the stationary metal analyzer in all the commonly used network environments, provided that the respective drivers and a network board are installed. The output of analysis data can be effected by means of the External Sample File to a free network board or via a TCP/IP transmission to another network computer. Additionally the data transfer of analysis results can be carried out via the serial interface

Line Switch

At the end of a calibration range of a line (Channel), a line switch to another line is effected (Channel), which covers the adjoining concentration range. Instead of a switchover between various lines of different wavelengths you may switch over between various source parameters. Separate channels are assigned to various source parameters; this is equivalent to a channel switchover.

Low Sample

During Standardization two samples are generally used. The low sample is the standardization sample with the low concentration of the element to be standardized. Often the low sample is used as so called blank sample which does not contain the respective element (almost nothing). Sometimes the low sample is not used (one-point-standardization).

Matrix

The sum of all main elements is called matrix, with the exception of the element to be measured.

Matrix-Corrected Concentrations

A calculation step from raw intensity to element concentration.

See:

Calculation Steps

Monitor Element/Monitor Line

A monitor element and a monitor line are not calibrated. Sometimes monitor elements and monitor lines are incorporated in the Analytical Program to detect problems on the samples and the spectrometer. There is no calibration; just the intensity values are displayed on the measure screen.

Optics

The optics or optical system of a spectrometer are the units splitting the light into its spectral components and detecting the components by light sensors. The electric discharge between sample and electrode in the spark stand acts as light source which is controlled by the source parameters; the light entrances in the optical system via a direct optical way or an optical fiber. A spectrometer may contain one or more optics. A characterization of the various optics may be effected either acc. to the structure (SIM/SEQ-Optics) or acc. to the Wavelength Ranges.

Orientation Program

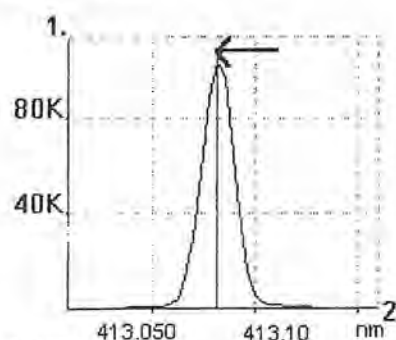
The orientation program is a general Analytical Program on a base providing a survey analysis on a wide concentration range and lots of elements. Provided that the Automatic Program Selection is switched on, a suitable Analytical Program is selected based on the analysis obtained; a precise analysis is output which is calculated by means of the calibration graphs optimized on this Alloy Group.

Partial Standardization

Partial standardization means a standardization of **individual** lines. As a result, the partial standardization differs from classical standardization where all lines are standardized.

A partial standardization is only possible in the case of automated systems (SPECTROLUX). The partial standardization is carried out if a deviation of the measured variables from pre-set limits occurs in the case of a control sample measurement. The lines with a deviation of the measured variables are standardized through the measurement of the assigned standard samples. If deviation occurs in the case of a line which is combined with another line via a line switch, then additionally the combined line is standardized. The call of the partial standardization occurs by the master computer of the automated system.

Peak Position



1. Intensity Axis

2. Step Axis or Wavelength Scale

The peak position is the point of the highest measured intensity of a spectral line, measured with no interference. The spectral line is scanned in the vicinity of the expected peak position. A diffraction pattern of the slit is achieved, see figure.

Photo tube / CCD

Photo tubes and CCD units are used for the reception of light which is emitted by the sample during the sparking process.

The classical variant are photo tubes (photo multiplier, briefly called PM). The light in a vacuum tube causes an electron current proportional to the light intensity which is analyzed. The photo multiplier is also called secondary electron multiplier.

CCD units are photoreceiver on a semiconductor base as they are also used in e.g. video cameras. "CCD" stands for charge coupled device.

Both sensors have their specific advantages and disadvantages. Depending on device type, your spectrometer contains either photograph electron tubes or CCD units.

PIMS

PEAK INTEGRATION METHOD SPECTRO; PIMS is a special integration procedure on the light signal, which facilitates the determination of metallic and precipitated parts of oxides

forming elements. Analyzing steel the method may be applied on the elements Al, B, Ca and Ti.

Production Sample

Production samples are samples of unknown composition to be measured with the spectrometer.

Profil Position

The profile position is the position of an adjusting device related to reprofiling, where the intensity signal of a spectral line shows highest intensity. See also Check Profile, Peak Position, and Reprofile.

Program

The Analytical Program means the sum of all spectrometer data necessary for analyzing a production sample, e.g. list of elements to be analyzed, calibration data, source parameters, standardization samples and standardization data, parameter setting of result output. Often various Analytical Programs belong to a spectrometer optimized on definite Alloy Groups.

Pseudo Element

A pseudo element is an element (value) which cannot be measured directly. A spectrometer performs measurements of elements exclusively. In case a definite element in the sample exists in a definite chemical bond (e.g. an oxide), it is possible to define a pseudo element and to calculate its concentration by means of a user defined formula. The user defined formula converts the result of the measurable element on the pseudo element. Additionally pseudo elements may be mechanical properties which are calculated acc. to empirical formulas derived from the analysis, e.g. tensile strength.

Raw Intensities

Raw intensities are the intensities determined by the Spectrometer without any processing. The following processing steps to obtain concentrations are intensity ratios, standardized intensity ratios, etc., see Calculation Steps.

Reference Element / Reference Line

The reference element, or better reference line, is the spectral line of the base element (e.g. Fe on steel). This line is measured by means of the reference channel. During the measurement of a sample mostly the intensity ratio between the analytic element of interest and the channel result of the reference element are used for calculation of the concentration. The intensity ratio shows a better reproducibility than only the channel result of the analytic element as a rule.

Remote Printer

The remote printer is connected to the spectrometer computer through the serial interface. This may be a printer as well as a serial video terminal. This printer resp. the terminal may be set-up in a distance from the analysis system, e.g. in a control room, this is why this printer is called external printer.

Reprofiling

Due to thermal and other influences spectral lines in the Optics may be slightly displaced in the course of time. To ensure an optimum positioning of light sensors in relation to spectral lines, a possibly profile drift is determined during reprofiling and - if necessary - corrected. See also Profile Check.

The procedure of a reprofiling of the simultaneous optics is described under Carry out a SIM Reprofiling.

If your unit is equipped with a Monochromator, carry out a reprofiling once per day or after each restart. The procedure of a reprofiling of the Monochromator is described under Carry out a SIM Reprofiling.

SAFT

SPARK ANALYSIS FOR TRACES; SAFT is a special measure procedure combined with an additional evaluation electronics to improve the detection limits of a lot of elements significantly.

Sample Identification

The sample identification results from the entries in the respective fields before starting the analysis. It is used to achieve an unambiguous assignment of analysis to sample.

SATEUS

SATEUS = SAMPLE TEST OF USEFULNESS; SATEUS is in addition to SEREPS and SETEME a process for both, to reduce the analysis duration and to detect bad samples. **SATEUS** is used to check the spark discharge during the prespark period in order to detect defective samples. In case a bad sample is detected, the system interrupts the sparking process.

Scan Group

Often several scans of different spectral lines are recorded for one measure task. They are logically linked. If you would save these scans in separate files with no bonding, it would be very complicated to load all of them again. Thus it is much easier to summarize loading and storing several scans in so called scan groups. Certainly each scan window is stored under an individual file, but a bonding information enables the matching scan windows to be reloaded together.

The master file of scan groups has a free selectable name with the file extension *.ASC, e.g. GROUP1.ASC. All scans belonging hereto are stored in files with identical file names, but incremented file supplement, e.g. GROUP1.001, GROUP1.002 etc. This information is important, if you want to copy scan groups with their scans onto diskettes for backup by means of the Windows-Filemanager or Windows-Explorer.

Scanning / Scan

Scanning or recording of scans is defined as the stepped measurement of intensities around a position where a spectral line is projected. Scanning lines with stationary metal analyzer requires a stationary metal analyzer model which is equipped with the optionally available Monochromator.

The scan procedure starts at a measure position beside the expected line position. Here the measure signal is integrated up and the monochromator moves to the next measure position. As a result the measure positions detect a position of maximum intensity. Beyond this point, the intensity drops down. The display is effected as intensity by wavelength. Each individual measure point is displayed immediately, so you can observe the scan procedure at the screen.

The expected intensity distribution is only displayed if the selected element is present and the line is sensitive enough. Provided that the measure signal is not interfered by a non-symmetrical background or a neighbored line, the peak maximum is accepted for measure position (Peak Position) for the line. The resulting graph 'intensity distribution by measure positions' is called **Scan** of the spectral line.

Scans are managed in **Scan Documents**. Open scan documents are called **Scan Windows**. The display is effected as intensity by wavelength. A scan window may contain several scans.

You may measure out scans. Keep the left mouse key down in the scan window. Crosshairs are displayed at the current cursor position. In the left field of the status bar you see 2 numerical figures. These figures display the current crosshairs position as X- and Y-axes values.

SEREPS

SEREPS = SELF REGULATED PRESPARK; SEREPS is in addition to SATEUS and SETEME a process for both, to reduce the analysis duration and to detect bad samples. **SEREPS** is the dynamic control of the prespark period. In case of a bad sample the prespark time is extended to a maximum value. As soon as the maximum value is reached and the discharge is still diffuse, the measurement is stopped and an error message is displayed.

SETEME

SETEME = SECURITY TEST FOR MEASUREMENT; SETEME is in addition to SATEUS and SEREPS a process for both, to reduce the analysis duration and to detect bad samples. **SETEME** is used in combination with SATEUS to detect bad samples. SETEME checks the spark discharge during integration. In case a sample shows cracks or holes below the surface, the integration is stopped.

SIM/SEQ-Optics

A characterization of the Optics can be effected acc. to the criteria whether several Wavelengths can be measured simultaneously or sequentially on after the other. Apart from some special instruments all stationary metal analyzers contain **SIM-Optics**. The name SIM-Optics means simultaneous optics; various wavelengths are measured simultaneously, i.e. at the same time. To perform such a measurement a number of light sensors must be implemented in the optics. Another name for a simultaneous optic is **Polychromator**.

1. Light guide
2. Grid
3. Light sensor

Polychromators are linked with the spark stand either by a light guide (air optic) or a light tube (UV optic). The exit slits on the Rowland circle are exactly positioned at the positions of the spectral lines. The light sensors (3) behind the exit slits detect the incident light. All lines can be measured simultaneously in this optic.

In contrast to this the **SEQ-Optics** are an optical system which perform measurements sequentially. The different light intensities of different wavelengths are measured on after the other. An electromechanical positioning unit moves the light sensor to the correct point. A system containing such a positioning unit is called **Monochromator**. The monochromator does not belong to the standard equipment of a stationary metal analyzer.

A monochromator provides a very high flexibility compared to the fixed installed lines of the simultaneous optic. So it is not necessary to know all elements the user wants to analyze later on, when the Spectrometer is manufactured. Elements which are not foreseen for a measurement in the simultaneous optic can be measured by means of the monochromator.

The disadvantage of a monochromator compared to a simultaneous optic is the more complex mechanical structure and the necessary time to move to the measure position. To optimize the movement time between the wavelength positions, the SPECTRO-monochromator has several entrance- and exit slits.

1. Light Guide
2. Grid
3. Moving Segment

The monochromators have 4 entrance slits and 6 exit slits which are positioned on the moving segment. Making use of the different entrance- and exit slit combinations together with the moving segment, each position in the given spectral range can be reached in less than 2 seconds with a wave length precision <0.15nm. If you are interested in this option, please ask our staff for more information.

Source Parameters

Source parameters are the settings of the electrical parameters on the generator for electrical discharges, which excite the atoms of the sample to emit light. Depending on the source parameters arc-shaped or spark-shaped discharges may be adjusted. Additionally SAFT and PIMS belong to the source parameters.

SSE (Single Spark Evaluation)

The single spark evaluation is a special data record procedure during sparking. The excitation unit generates some hundreds of pulses per second during the measurement. In case of the classic measurement the generated light pulses are integrated. The single spark evaluation processes the single light pulses separately pulse by pulse. As soon as summed-up, the intensity of the single spark is equal to the value received by the classic integration value. But you gain additional statistical information about the single sparks which are useful for quality assessment of a measurement. In addition it is possible to reduce the number of sparks and consequently the measurement time. SSE uses special Spectrometer hardware and needs the configuration of a built-in one-board Spectrometer computer plus an external PC for operating the Spectrometer software.

Spark Counter

The spark counter is implemented into the software and is incremented with each measurement. You may use it to determine e.g. the number of measurements of a series of samples or the number of measurements during the day. The current value of the counter is displayed in the fourth field of the status bar of the Measure Window. This counter may be reset in the Measure Window at any time.

Spectro 4.4-Protocol

The Spectro 4.4 Protocol defines the transmission format for a serial data transfer of measure results. Without control characters it is identical to the format for the external sample file. You find this format under the keyword 'file format'.

Standard Samples

Standard samples are all the samples with a special function for the operation of the spectrometer, e.g. calibration samples, standardization samples, control samples. The other group are the Production Samples, which are of unknown composition and are to be analyzed by the spectrometer.

Standardization

By means of the standardization gradual changes of Intensities are corrected on identical samples. During the process of standardization, the intensities on each channel for a High Sample and a Low Sample are determined, using the same sample on various channels possibly. The intensities determined are compared with the resp. intensities at the time of the Calibration. To correct the following measurement of Production Samples a factor and an offset are determined on each Channel to carry out a Intensity Correction. The standardization may be carried out only with a high sample instead of the combination of low and high sample. In this case it is a one-point standardization instead of a two-point-standardization. It is assumed that in case of a one-point standardization the measurement of the low sample would result in an intensity of 0. In other words, the value 0 is used as basic value of the low sample to calculate the standardization factor and offset. Another name for standardization is recalibration, sometimes used in literature.

Standardized Intensity Ratios

A calculation step from raw intensity to element concentration.

See:

Calculation Steps

System Menu

The system menu of a window (application window or document window) is opened through a click on the small icon at the left upper corner of the window. The system menu allows you to minimize/maximize a window or to go back to its original size. Additionally the window may be generally closed by means of the system menu.

TCP/IP Transmission

TCP/IP stands for transmission control Protocol/Internet Protocol. It describes a protocol with which data are transmitted from one computer to another. The protocol attained great importance because communication in the Internet is carried out with this protocol. With stationary metal analysers of SPECTRO, data according to this protocol can be transmitted to other computers via an (optional) network access.

Type-Calibration

The type calibration is applied on global calibrated Analytical Programs. A particular calibration on several alloy groups is not present. During type calibration deviations related to the reference variables occur; based on these values a corrective factor or an corrective offset are calculated. Generally measurements on type calibration samples are carried out only once at the occasion of the first use of the spectrometer (in contrast to Type Standardization!). During measurement on Production Samples corrective factors of a fitting type calibration sample are loaded automatically and are incorporated in the output of the results. The global parameters define whether the correction of the result shall be effected by a type calibration factor or a type calibration offset. Type calibration excludes type standardization and visa versa!

Type Standardization

The type standardization improves the precision of the analysis. In case of critical Production Samples a suitable type standardization sample is measured in advance. The difference between the measure result and the known reference variable on the type standardization sample is converted into a corrective factor or offset, which is used for the calculation during the analysis of the unknown sample. Instead of measuring the type standardization sample the corrective factor or offset may be read-out from a data bank, which was determined during the last measurement. In contrast to the single measurement of the Type Calibration Sample the measurements of the type standardization samples are carried out regularly. Type calibration excludes type standardization and visa versa!

Typical Intensity

This is a numerical value which is necessary for the calculation steps from raw intensity to element concentration, see Calculation Steps.

User Task

The user task is a MS-DOS or MS-Windows-program called up for data processing. There are two positions in the spectrometer program 'Spark-Analyzer' where user tasks may be incorporated: firstly the output parameters for customer-specific processing of analysis results and secondly for identification of samples, e.g. the automated filling of sample identification fields and for transmission of contents. The user task may be either programmed by SPECTRO according to your demands, or the spectrometer user may program the user task by himself taking the default file formats into account.

User Level

User levels are set up in order to enable a graduated access for spectrometer software. Different user levels of the program can be assigned to different users. Each user level can be protected by an own password. A graduated access to parts of the program and menus is combined with it so that not each user can use the complete functions of the program. In such a way, you can prevent that important settings or analytical parameters can be changed by unauthorized persons. You can take the classification of the user levels from the help function of the dialog box user levels and passwords.

22 Index

| | |
|--|---|
| About | 9-36 |
| Additional Devices | 11-64 |
| Additional Maintenance | 6-8 |
| Air Filter | 6-8 |
| Air Optics | 4-8 |
| Alloy Grade | 9-30, 9-32, 9-34, 21-1 |
| Alloy Grade Library | 9-30, 9-32, 9-34 |
| Analytical Capabilities | 4-1 |
| Analytical Function | 4-4 |
| Analytical Program | 9-4, 9-5, 9-22, 11-1, 11-2, 11-3, 11-4, 11-5, 11-14, 11-20, 11-29, 11-31, 11-34, 11-35, 11-46, 11-48, 11-57, 11-61 |
| Argon | 4-9, 5-2, 6-2, 6-5 |
| Argon Supply | 5-2 |
| Auto Average | 9-12, 11-35 |
| Average | 9-12 |
| Average + RSD | 9-12 |
| Bi-annual Maintenance | 6-7 |
| Binary Samples | 21-2, 21-5, 21-15 |
| Burn-Spot | 6-2 |
| Calculation of Concentrations | 4-5 |
| Calculation Steps | 21-2 |
| Calibration | 11-24, 11-38, 11-39, 15-14 |
| Calibration and Standardization | 5-3 |
| Calibration Curve | 21-3 |
| Calibration Data | 11-24 |
| Calibration Ranges | 11-38 |
| Calibration Samples | 11-39 |
| Carry out a Control Sample Test | 15-26 |
| Carry out a Control Sample Test II | 15-29, 15-42 |
| Carry out a Reprofiling | 15-36 |
| Carry out a SIM Reprofiling | 15-37 |
| Carry out an Alloy Grade Check | 15-29 |
| Carry out an Alloy Grade Search | 15-32 |
| CCD chip | 21-4 |
| Changing the Water | 6-6 |

| | |
|--|---------------------------|
| Channel | 11-16, 11-20, 11-46 |
| Channel Parameter | 11-16, 11-20, 11-46 |
| Check Argon Supply | 6-2 |
| Checking the Burn-Spot | 6-2 |
| Cleaning Inside Instrument | 6-7 |
| Cleaning Quartz Windows | 6-8 |
| Cleaning Spark Stand | 6-3 |
| Cleaning the Air Filter | 6-8 |
| Cleaning the Argon Exhaust | 6-5 |
| Completely Cleaning Spark Stand | 6-6 |
| Concentration | 21-4 |
| Constant Light Test | 11-78 |
| Content | 8-1 |
| Contents | 1-17 |
| Control Sample Test | 15-26, 15-29, 15-42, 21-4 |
| Control Samples | 21-5 |
| Daily Maintenance | 6-1 |
| Dark Current Test | 11-78 |
| Data Backup | 11-99 |
| Data File | 11-32 |
| Data Formats | 20-1 |
| Data Window (Regression) | 12-19 |
| DB Control Samples | 11-50 |
| Delete All | 9-11 |
| Delete Measurement | 9-11 |
| Delete Program | 11-3 |
| Device Types | 21-5 |
| Devices | 11-64 |
| DIA | 21-5 |
| Dialog Box Accept Scans for analytical Program | 13-13 |
| Dialog Box Argon Saver | 11-68 |
| Dialog Box Autom. Program Selection Concentration Ranges | 11-96 |
| Dialog Box Automatic Program Selection | 11-95, 11-96 |
| Dialog Box Constant Light Test | 9-27 |
| Dialog Box Control Sample Limits | 11-52 |
| Dialog Box Control Sample Test | 9-17 |
| Dialog Box Dark Current Test | 9-26 |
| Dialog Box Data Conversion | 11-68 |

| | |
|---|--------------|
| Dialog Box Delete Scan Group | 13-10 |
| Dialog Box Display Parameter (Scan Manager CCD) | 14-9 |
| Dialog Box Edit Formula (Scan Manager CCD) | 14-7 |
| Dialog Box Edit Password | 9-35 |
| Dialog Box Edit Scan Parameter | 13-18 |
| Dialog Box Filter Settings (Regression) | 12-12 |
| Dialog Box Intensities of Calibration Samples | 11-41 |
| Dialog Box Interferences (Regression) | 12-14 |
| Dialog Box Interfering Lines | 13-24 |
| Dialog Box Line Parameters SIM-Reprofileing | 11-74 |
| Dialog Box Lines Installed | 11-71 |
| Dialog Box Load Channel (Regression) | 12-8 |
| Dialog Box Load or Create New Scans | 14-5 |
| Dialog Box Load Scan | 13-5 |
| Dialog Box Load Scan Group | 13-8 |
| Dialog Box Load Type Standardization | 9-22 |
| Dialog Box Mode & Intervals | 11-68 |
| Dialog Box Optics Installed | 11-70 |
| Dialog Box PIMS-Parameter | 11-27 |
| Dialog Box Program Export | 11-101 |
| Dialog Box Program Import | 11-100 |
| Dialog Box Regression Parameter | 12-11 |
| Dialog Box Sample Intensities | 12-22 |
| Dialog Box Save all Scans | 13-6 |
| Dialog Box Save Scan as | 13-6 |
| Dialog Box Save Scan Group | 13-9 |
| Dialog Box Scale of Axis (Scan Manager) | 13-21 |
| Dialog Box Scan Colors | 13-22 |
| Dialog Box Scan Selection For Group File | 13-10 |
| Dialog Box Scan Selection for Group File II | 13-11 |
| Dialog Box Scan Window Settings | 13-23 |
| Dialog Box Select Data for Scan Group (CCD) | 14-8 |
| Dialog Box Select Lines For Scanning | 13-17 |
| Dialog Box Select more Lines for Scanning | 13-19 |
| Dialog Box SEQ-Parameter | 11-75 |
| Dialog Box Set Axis (Regression) | 12-17 |
| Dialog Box Set Desktop Parameter (Regression) | 12-17 |
| Dialog Box SIM-Parameter | 11-73, 11-74 |

| | |
|---|----------------------------------|
| Dialog Box SSE-Parameter | 11-27 |
| Dialog Box Standard Concentrations | 11-41 |
| Dialog Box Symbols Alloy Groups | 12-18 |
| Dialog Box Type Calibration | 11-56 |
| Dialog Box Type Standardization | 11-56 |
| Dialog Box Wavelength Calibration | 11-76 |
| Dialog Box Wavelength Display | 11-92 |
| Display of Results | 9-12, 9-28, 9-30, 11-17, 11-31 |
| Edit | 9-9, 11-4 |
| Electrical Source | 5-2 |
| Element Format | 11-29 |
| Element Parameter | 1-14, 11-19, 11-29, 11-57, 11-61 |
| Element Specific Formula | 11-17 |
| Evaluation of Measure Results | 4-4 |
| Exit | 9-9 |
| External Data File | 11-32 |
| Extras | 9-28 |
| Fibre Optics | 21-6 |
| File | 9-3, 11-1 |
| File ANALYSEN.DAT | 20-1 |
| Filter Settings | 11-88 |
| Find Alloy | 9-34 |
| Formula | 11-17, 11-19 |
| Frame (CCD) | 21-6 |
| Function Keys | 19-1, 19-2, 19-3 |
| Function Keys for Program Development | 19-2 |
| Function Keys for Regression | 19-2, 19-3 |
| Function Keys for Scan Manager | 19-3 |
| Global Parameter | 11-5 |
| Global Standardization | 9-19 |
| Graphic Window (Regression) | 12-23 |
| Handling | 2-1, 3-1, 3-2, 3-3, 5-1 |
| Help | 9-36 |
| Hg-Test | 21-7 |
| Hotkeys | 19-1, 19-3 |
| How the Stationary Metal Analyzer works | 4-8 |
| Important Notes | 2-1, 7-1, 16-1, 17-1 |
| Installing Instrument | 5-1 |

| | |
|--|--|
| Instrument | 5-1, 6-1, 9-25, 11-62, 13-23 |
| Intensity Ratios | 21-4, 21-7, 21-8 |
| Interference | 4-6, 11-42 |
| Interference Library | 11-42 |
| Intrument Maintenance | 16-1, 17-1 |
| KLASSOR | 21-8 |
| Last Measurement | 9-16 |
| Layout | 9-5 |
| Line Library | 11-90 |
| Line Selection | 15-45 |
| Line Switch | 11-16 |
| List of Function Keys | 19-1, 19-2, 19-3 |
| Load Program | 9-4 |
| Local Print | 9-7 |
| Maintenance | 2-1, 6-1, 6-5, 6-7, 6-8, 7-1 |
| Mark Mode | 9-10, 9-11 |
| Matrix | 21-9 |
| Measure | 9-14 |
| Measure Window | 9-1, 9-3, 9-9, 9-10, 9-11, 9-12, 9-14, 9-15, 9-16, 9-22, 9-25, 9-28, 9-36, 13-23 |
| Measurement | 4-6, 9-11, 9-12, 9-15, 9-16, 15-4 |
| Menu Display (Scan Manager Monochromator) | 13-20 |
| Menu Edit | 9-9, 11-4 |
| Menu Edit (Regression) | 12-6 |
| Menu Edit (Scan Manager Monochromator) | 13-14 |
| Menu Edit Program | 9-20, 9-24, 11-4, 11-5, 11-8, 11-14, 11-16, 11-17, 11-19, 11-20, 11-24, 11-25, 11-29, 11-31, 11-34, 11-35, 11-38, 11-39, 11-44, 11-46, 11-48, 11-54, 11-57, 11-59, 11-61, 11-89 |
| Menu Extras | 9-28, 9-30, 9-32, 9-34, 9-35, 11-32, 11-42, 11-64, 11-66, 11-81, 11-82, 11-85, 11-87, 11-88, 11-89, 11-90, 11-93, 11-97, 11-98 |
| Menu Extras (Measure Window) | 9-28 |
| Menu Extras (Program Developement) | 11-79 |
| Menu Extras (Scan Manager Monochromator) | 13-24 |
| Menu File | 9-3, 9-4, 9-5, 9-6, 9-7, 9-8, 9-9, 11-1, 11-2, 11-3, 11-4 |
| Menu File (Scan Manager CCD) | 14-4 |
| Menu Help | 9-36 |
| Menu Instrument | 9-23, 9-25, 9-26, 11-62, 11-78 |
| Menu Instrument (Scan Manager CCD) | 14-11 |
| Menu Instrument (Scan Manager Monochromator) | 13-23 |

| | |
|---|--|
| Menu Item ICS Access | 11-76 |
| Menu Item ICS-Spy | 11-77 |
| Menu Item Initialize | 11-77 |
| Menu Item Log Book | 11-76 |
| Menu Item Multiple Measurement | 9-16 |
| Menu Item UV Check | 11-77 |
| Menu Item UV-Transmissions Test | 11-69 |
| Menu Measure | 9-10, 9-11, 9-12, 9-15, 9-16, 9-18, 9-19, 9-20, 9-24 |
| Menu Measure (Measure Window) | 9-14 |
| Menu Measure (Scan Manager Monochromator) | 13-16 |
| Menu Operations (Scan Manager CCD) | 14-9 |
| Menu Program | 9-22 |
| Menu Program (Regression) | 12-8 |
| Menu Regression | 12-9 |
| Menu Scan Window (CCD) | 14-11 |
| Menu Window (Regression) | 12-15 |
| Menu Window (Scan Manager Monochromator) | 13-25 |
| Mode & Interval | 11-66 |
| New Program | 11-2 |
| New Standardization Sample | 11-93 |
| Operating the Monochromator | 15-42 |
| Options | 9-30 |
| Output Mode | 9-28 |
| Output Parameters | 11-31 |
| Output Setup | 11-81 |
| Oxiclear-Patrone wechseln | 6-9 |
| Parameter Files | 18-1, 18-3, 18-7, 18-12, 18-13, 20-1 |
| Parameter Settings for PIMS | 11-29 |
| Parameter Settings for SSE | 11-29 |
| Partial Standardization | 21-10 |
| Password | 11-97 |
| Peakposition | 21-10 |
| Photo Tube / CCD | 21-10 |
| PIMS | 11-25, 11-26 |
| PIMS Parameters | 11-25, 11-26 |
| Prespark Time | 9-23, 11-8 |
| Principles of Spectrometry | 4-1, 4-6, 4-7 |
| Print Program | 11-4 |

| | |
|--------------------------------------|--|
| Printer | 9-5, 9-6, 9-7, 9-8, 9-9, 11-4 |
| Printer Setup | 9-6 |
| Procedures | 5-2, 15-1, 15-2, 15-4, 15-8, 15-14, 15-19, 15-23, 15-26, 15-29, 15-42 |
| Profile Check | 6-9 |
| Profile Position | 21-11 |
| Program | 9-4, 9-5, 9-22, 11-1, 11-2, 11-3, 11-4, 11-5, 11-14, 11-20, 11-29, 11-31, 11-34, 11-35, 11-46, 11-48, 11-57, 11-61 |
| Program Development | 11-1, 11-4, 11-62 |
| Quartz Windows | 6-8 |
| Raw Intensities | 21-11 |
| Regression | 12-1 |
| Regression Calculation | 12-4 |
| Remote Print | 9-8 |
| Replace Standardization Sample | 6-10 |
| Replacing the Electrode | 6-5 |
| Reprofiling | 9-26, 15-37 |
| Routine Operation | 15-1 |
| Sample Data | 9-13, 11-82 |
| Sample ID Format | 9-13, 11-82 |
| Sample Manager | 10-1 |
| Sample Preparation | 5-2, 15-2 |
| Sample Taking | 15-2 |
| Samples | 10-1 |
| Save Analytical Data | 6-10 |
| Save Program | 11-2, 11-3 |
| Scan Group | 21-12 |
| Scan Manager CCD | 14-1 |
| Scan Manager CCD Tool Bar | 14-3 |
| Scan Manager Monochromator | 13-1 |
| Scan Window CCD | 14-2 |
| Scanning/Scans | 21-13 |
| Scans | 13-1 |
| Search Program | 9-5 |
| Service | 7-1, 16-1, 17-1 |
| Service Organisation | 7-1 |
| SETEME | 21-13 |
| SIM Profiling | 9-26 |
| SIM-Optic | 9-26 |

| | |
|--|--|
| Single Values | 9-12 |
| Software Structure | 8-1 |
| Source Parameters | 4-10, 9-23, 11-8 |
| Spark Counter | 21-15 |
| Spark Source | 4-10 |
| Spark Stand | 6-3, 6-6 |
| Spectro Service | 7-1 |
| Spectro-Service | 16-1, 17-1 |
| SSE (Single Spark Evaluation) | 21-15 |
| Standard Sample | 11-85, 11-87, 11-88, 11-89 |
| Standard Sample Concentration | 11-89 |
| Standard Sample List | 11-85 |
| Standardization | 4-7, 6-3, 9-18, 9-19, 9-24, 11-44, 11-93, 15-8 |
| Standardization Data | 9-24 |
| Standardization Parameter | 11-48 |
| Standardization Samples | 11-44 |
| Standardize Program | 9-19 |
| Start Measurement | 9-15 |
| Stop Measurement | 9-15 |
| Store | 9-8 |
| System Description | 4-1, 4-8, 4-9, 5-1, 5-2 |
| System Menu | 21-16 |
| Tables | 3-2 |
| TCP/IP Transmission | 21-16 |
| Technical Data | 5-1 |
| Tip: Data Transfer | 16-1 |
| Tip: ext. Printers and Terminals | 16-1, 16-3, 16-4 |
| Tip: Optimize Printer Output | 16-3 |
| Tips & Tricks | 16-1, 17-1 |
| Transmit | 9-9, 9-35 |
| Transmit buffered Data | 9-35 |
| Troubleshooting | 17-1 |
| Type Calibration | 11-54, 15-23 |
| Type Calibration Samples | 11-54 |
| Type Standardization | 9-20, 11-59, 11-61, 15-19 |
| Typical Intensity | 21-17 |
| Undo | 9-11 |
| User | 9-35, 11-97, 11-98 |

| | |
|--------------------------------|--------------------|
| User Level | 21-17 |
| User Management | 9-35, 11-97, 11-98 |
| User Task | 11-34 |
| Using Keyboard and Mouse | 3-1 |
| UV Optic | 4-9 |
| Water | 6-6 |
| Windows | 3-1, 3-2, 3-3 |
| Working with Tables | 3-2 |