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726 Titroprocessor

A Short Introduction

8.726.1023

96.12 dm

Preface

This short introduction to the 726 Titroprocessor is meant to facilitate your getting familiar with this complex but powerful instrument.
Read these instructions carefully and work through the included tutorial. It will lead you to all the dialog pages and show you some of the most interesting features of the 726 Titroprocessor.

Markings used in this manual

<QUIT>	Physical hardkey on the keyboard
[File]	Softkey as shown on the screen, referring to the hardkeys <F1>..<F9>
`Display Text`	Display text as shown on the screen
`[one | another]`	Selection of optional entries

Important note

Pressing the <HELP> key on the keyboard will always display a help page that will show information on the current dialog page.

When editing any parameters, pressing the [Help on entry] softkey or the <HELP> key will give you information on the parameter you are editing, including the entry range and an example.

Table of Contents

1 Overview

The 726 Titroprocessor is available in four versions.

Versions with 1 measurement group:

2.726.0010 With complete accessories, without built-in printer, but with parallel interface for an external printer

2.726.0020 As 2.726.0010, but with integrated, space-saving thermal printer (DIN A4), without additional parallel interface for printer

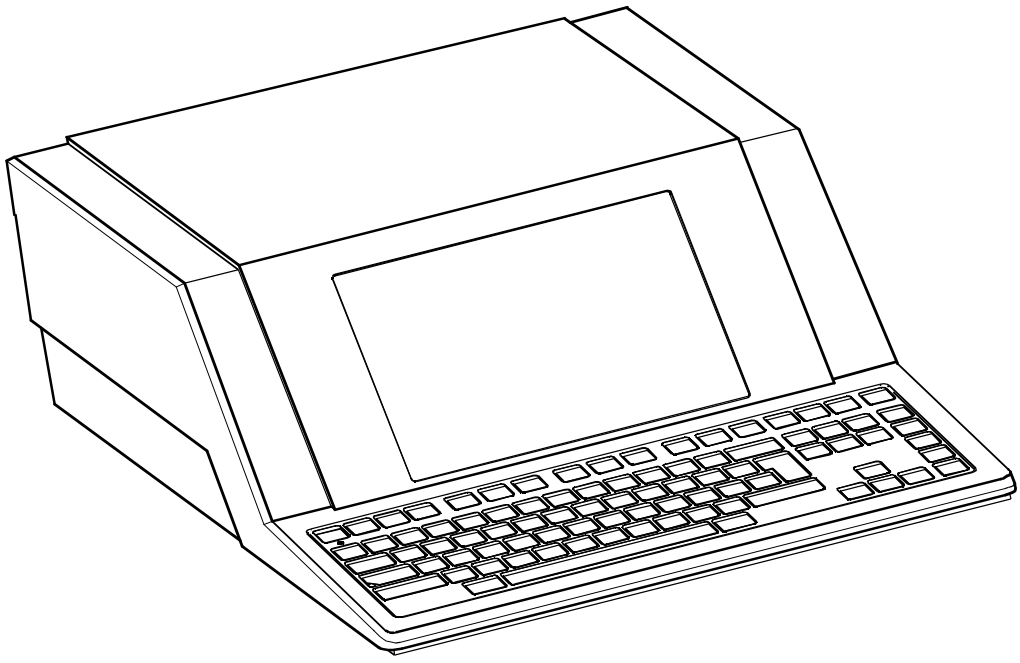
Versions with 2 measurement groups:

2.726.0110 With complete accessories, without built-in printer, but with parallel interface for an external printer

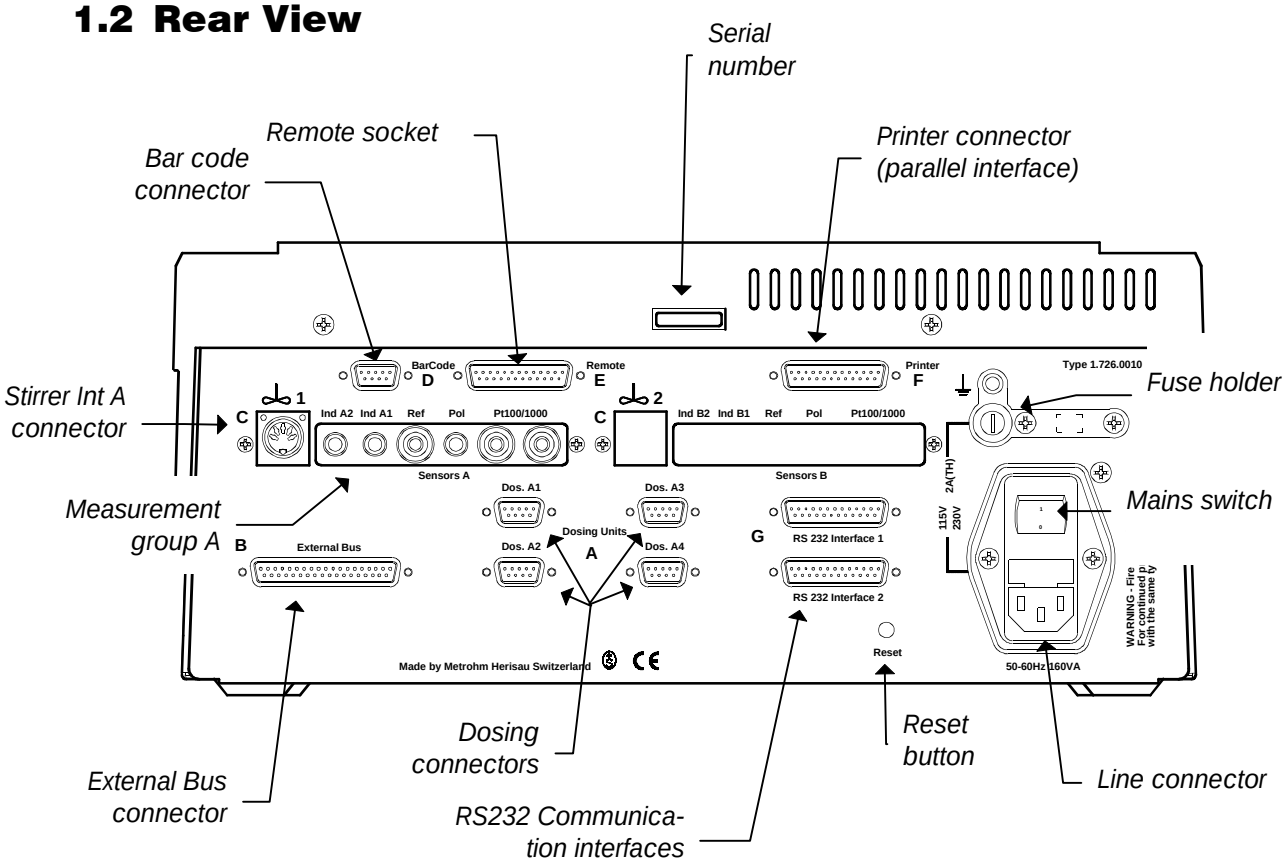
2.726.0120 As 2.726.0110, but with integrated, space-saving thermal printer (DIN A4), without additional parallel interface for printer

1.1 Front View

The 2.726.0010 Model of the 726 Titroprocessor without built-in printer.



1.2 Rear View

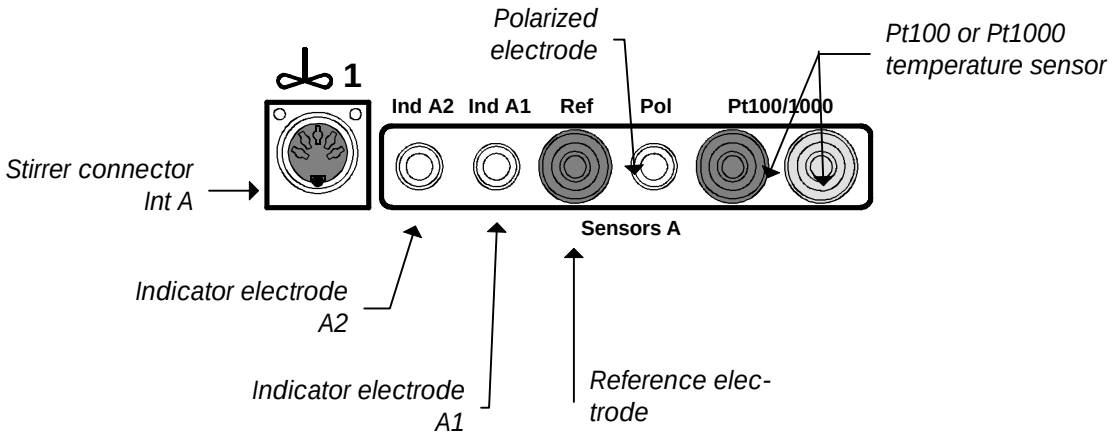


1.3 Where to Connect the Peripherals

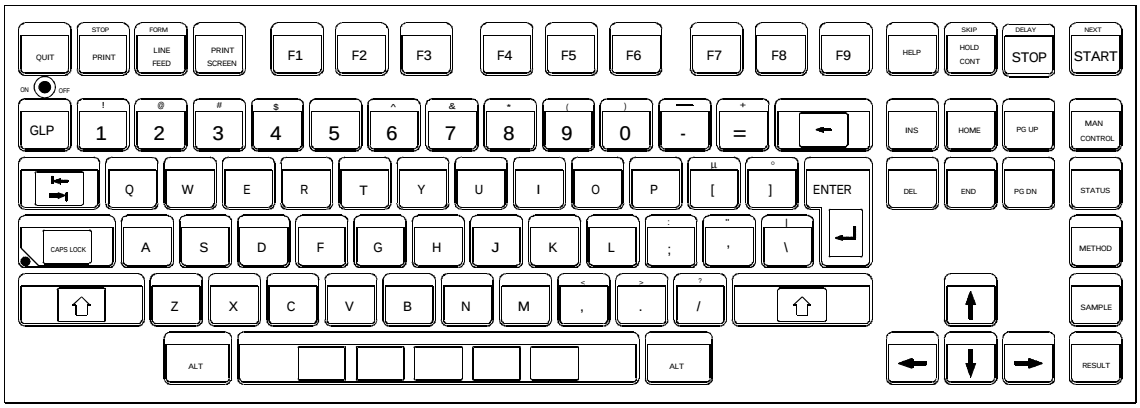
Device	Interface designation	Label
Balances	RS232 interface 1 or 2	G
Indicator electrodes	Sensors A or B (Ind A1, Ind A2, ...)	C
Indicator electrodes	Sensors A or B (Ref)	C
Temperature sensors	Sensors A or B (Pt100/1000)	C
Stirrers	Sensors A or B	C
Dosing devices	Dosing Units	A
Sample changers	External Bus	B
Dosing interface 729	External Bus	B
Printers (Centronics)	Printer	F
Printers (serial)	RS232 interface 1 or 2	G
Bar code readers	Barcode	D
Personal computers/LIMS	RS232 interface 1 or 2	G
Auxiliary instruments	Remote	E

1.4 Measuring Interfaces

The 726 Titroprocessor models 2.726.0110 and 2.726.0120 are equipped with 2 measurement groups (Sensors A and Sensors B).
The drawing below shows where to connect the sensors at the measuring interface A, which is common to all 726 Titroprocessor models.



1.5 The Keyboard



The PC-like keyboard allows comfortable editing and data entry in method development and routine use.

1.5.1 Function Keys (Softkeys)

The blue function keys are used for the navigation within the windows oriented user dialog. The action that will be executed on pressing these function keys depends on the dialog page or window. The softkey list at the bottom of the screen always displays the available functions.

1.5.2 Hotkeys

The yellow Hotkeys enable direct access to the most important functions or dialog pages of the 726. Hotkeys may be pressed at any time.

MAN CONTROL - opens the dialog page for manual operation

STATUS - displays the basic status info as shown on the main page

METHOD - opens the method selection window

SAMPLE - opens the sample input window

RESULT - opens a window that shows the short result reports and statistics

1.5.3 Action Keys

The action keys have an immediate effect on the course of a method. The <START> key starts a method; the <STOP> key will terminate it. With <HOLD / CONT> the course of a method may be interrupted or continued.

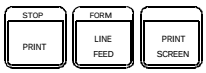
By simultaneously pressing the <Shift> key and an action key the processing of a sample series (with autostart 'on') can be controlled directly.

<Shift><START> (=NEXT) ends the treatment of the current sample and starts the same method with the next sample in the series.

<Shift><STOP> (=DELAY) stops the sample series after the current sample has been processed.

<Shift><HOLD> (=SKIP) ends the execution of the current command and continues with the next command line of the loaded method.

1.5.4 Manual Printing



The built-in A4 thermal printer or any connected printer can be manually controlled via the yellow printing keys.

The <PRINT> key opens the printer menu, where any report type can be selected. Global reports and determination reports (if any determination is present in the working memory) may be selected.

<Shift><PRINT> (= STOP PRINT) will stop a printout immediately.

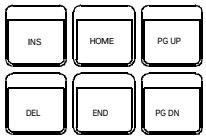
<LINE FEED> will execute a line feed of the connected printer.

<Shift><LINE FEED> (= FORM FEED) will execute a form feed on the connected printer.

<PRINT SCREEN> will print the actual screen contents.

1.5.5 Navigation and Edit Keys

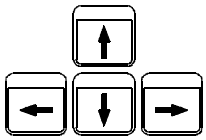
The <QUIT> key closes an edit field, a window or a dialog page and accepts any parameter changes beforehand. The dialog switches to the next higher level.



<INS> (=Insert) switches on or off the insert mode for editing an entry field.

<DEL> (=Delete) deletes the next character to the right of the cursor position.

<Shift><DEL> clears an entire edit field.



<HOME> places the cursor into the first edit field of a dialog window (in navigation mode).

<END> places the cursor into the last sample silo line or command line (in method editor).

<PG UP> moves the field cursor up in the sample silo or the method editor by one page.

<PG DN> moves the field cursor down in the sample silo or the method editor by one page.

<Cursor up> moves the cursor up by one line.

<Cursor down> moves the cursor down by one line.

<Cursor left> moves the cursor to the left by one field (in navigation mode) or by one character (in edit mode).

<Cursor right> moves the cursor to the right by one field (in navigation mode) or by one character (in edit mode).

1.5.6 HELP Key

The <HELP> key opens a page with help text referring to the opened dialog page or window. In edit mode it opens the help window for the parameter entry.

2 Installation

2.1 Connections

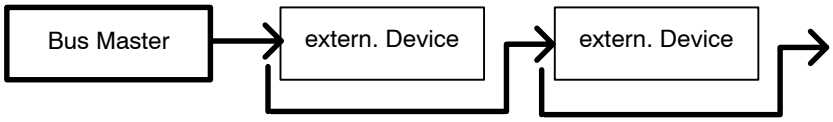
Some recommendations for the connection with Sample Changers and additional dosing devices:

Sample Changers and additional Dosimats are connected via the External Bus Interface.

Before plugging in an external device or changing an EBus address, switch off the instrument.

2.1.1 External Bus

The External Bus enables external devices to be controlled by a master instrument. Sample changers and dosing devices such as the 685 Dosimat or the 700 Dosino can communicate bi-directionally with the master instrument.
External devices must be connected by EBus cables. The cables are to be chained like this:



External Bus

Each external device is identified by an EBus address. The different devices are identified automatically. For each device, the EBus address must be set (1…9,A…F; *0 stands for the bus master device*).

Address selector

Use a screw driver to set the appropriate EBus address. You find the EBus address selector on the rear panel of each device.

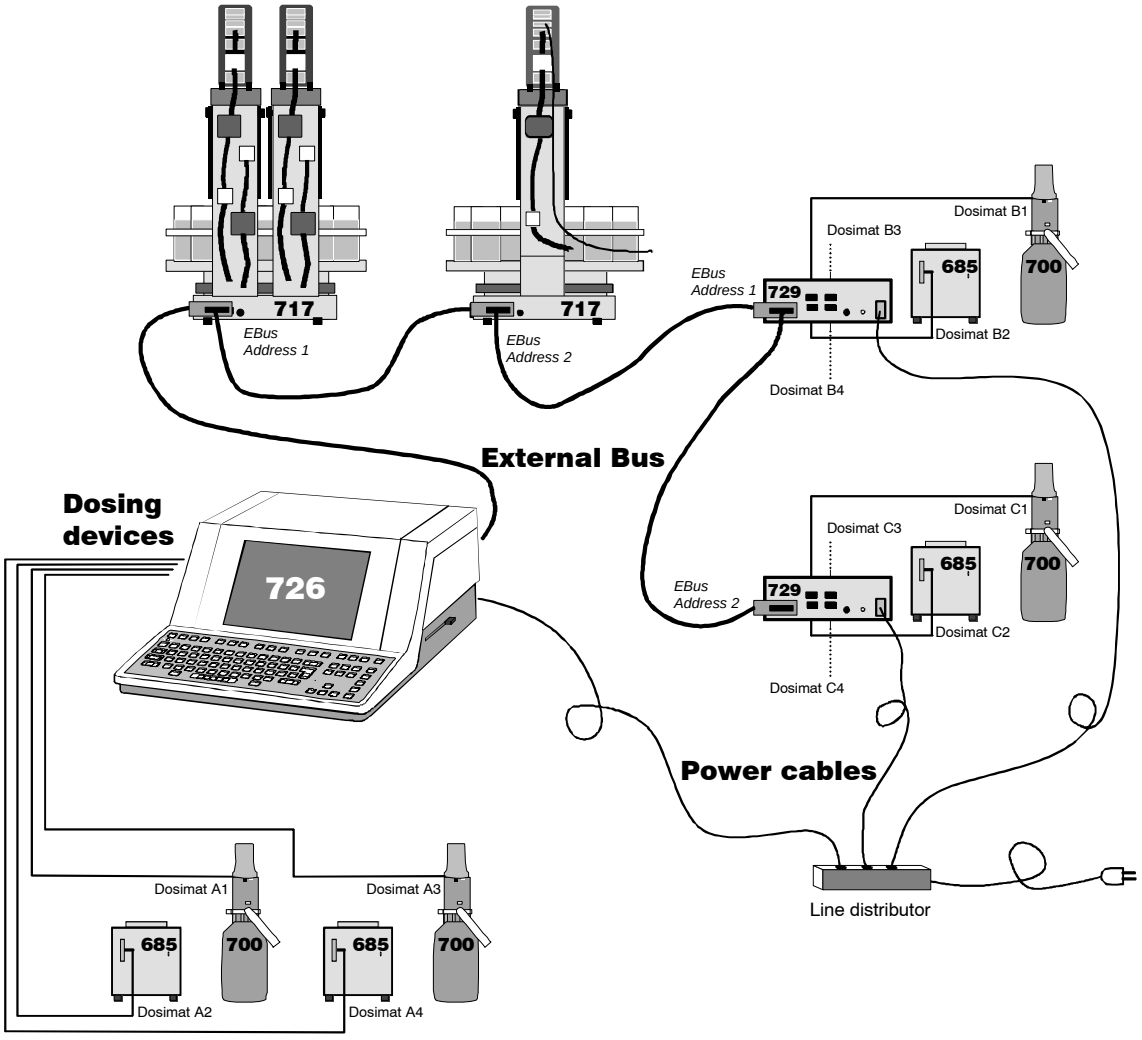
Device	EBus address	Peripherals
Sample Changer 1	**1**	1…2 Lifts, 0…4 Pumps, 1…4 Stirrers
Sample Changer 2	**2**	1…2 Lifts, 0…4 Pumps, 1…4 Stirrers
Dosimat Interface 1	**1**	1…4 Dosimats (B1…B4)
Dosimat Interface 2	**2**	1…4 Dosimats (C1…C4)

Connect the power consuming devices, such as Sample Changers, first in the EBus cable chain. This is especially important if the Sample Changer is equipped with more than one pump. The 729 Dosimat Interfaces may be plugged in to the Sample Changer.

The 726 Titroprocessor and the Dosimat Interfaces need to be connected to the same ground. Use a line distributor for the power supply of all the instruments.

Switch off the 726 Titroprocessor before plugging in any peripheral device.

2.1.2 Connecting Scheme



2.2 Safety Considerations

If failure or malfunctioning occurs during operation of the 726 Titroprocessor, it is recommended to first search for the cause with the help of the diagnostic functions. If this is of no help in rectifying the disorder or the cause of the malfunction cannot be identified, the Metrohm Service Department should be consulted.

If the instrument is has to be opened, the following safety precautions are to be strictly adhered to:

Before opening the instrument disconnect it from all electrical sources. Make sure that the power plug has been pulled out.

Only in exceptional cases should the instrument be opened while it is switched on. Because parts that conduct current are exposed in this case, this should only be undertaken by an expert who is acquainted with the associated dangers.

Electronic components are sensitive to static electricity and can be destroyed by discharge. Before touching any components inside the instrument, both the person and his tools should be grounded by grasping a grounded object (for example: the casing of the instrument or a radiator) in order to eliminate any static electricity.

If it becomes apparent that the instrument can no longer be operated safely, it must be put out of operation.

3 Concepts

3.1 Determinations and Titrations

Unlike other Metrohm instruments, the 726 Titroprocessor offers the ability to include up to five titration or measuring modes in one method.
One method defines a determination to be done with one sample. This determination may include multiple titrations or measurements. Each one of these modes may include separate calculation formulas and report definitions. Each mode produces its own data sets (measuring point list), which is the origin for any report to be printed or sent to an external device such as a PC or a LIMS.
Methods and determinations can be stored in separate files, either on a data card or in the internal storage of the 726.

Sample →	Determination →	Determination data →	Reports →	File
	Measurement	Measuring point list	Curve(s), Result(s)…	Meas. data
	Titration	Measuring point list	Curve(s), Result(s)…	Titration data
	Titration	Measuring point list	Curve(s), Result(s)…	Titration data
	Measurement	Measuring point list	Curve(s), Result(s)…	Meas. data
	Titration	Measuring point list	Curve(s), Result(s)…	Titration data

Determinations can be reloaded and modified. Recognition and display settings can be changed. All formulas can be modified and recalculated. Even a re-evaluation of the endpoints is possible. A new set of reports may be defined and printed.
Common variables that have been valid at determination time are stored with the determination data and may be used for recalculations as temporary common variables. Recalculations do not have an effect on the global common variables.

Multiple (but similar) titration and measuring curves may be compared by overlaying.

3.2 Data Storages and Statistics

Methods, sample silos, configuration files and determination data can be stored on a data card or in the internal storage.
Determination data may be saved automatically with the auto save function (see MAIN PAGE, Auto save, Destination). File names and comments will be assigned automatically. The type of file name assignment can be modified on the configuration page.
Configure the 'File name type' for your needs. Choose a combination of date, run number, sample identification or standard file name. The standard file name is a text string that you can edit under 'Standard data file name'. The assignment of file comments may be customized in the same manner.

Determination data files are built into the working memory. The number of data files that will be held in the working memory depends on the statistics settings.
With statistics 'off', one single data file (the current determination) will be held in the working memory.
With statistics 'on', as many files as indicated by the number of the statistics definition will be held in the working memory.
To reset/clear the working memory, you have to reset the statistics (MAIN PAGE / Statistics 'rst' <ENTER>).

When the statistics counter has reached its limit, the working memory will be cleared with the beginning of the next determination.

It is a good idea to always use the auto save function and store determination data in the internal storage or on a data card. If you want to copy, delete or move any files, use the file manager, which supports comfortable file operations.

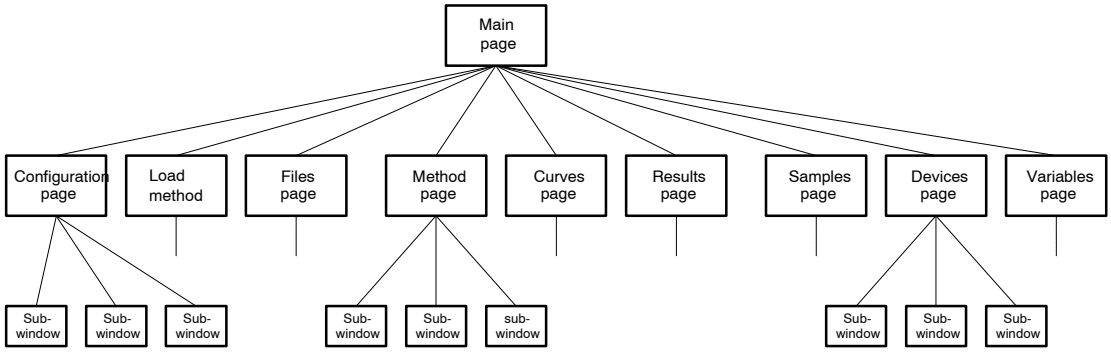
The 726 Titroprocessor is shipped with a 128 KB SRAM data card. Any PCMCIA card (< 2 MB capacity) may be used as well. The file system of the 726 allows to store 256 files per storage location (except the working memory).

Although the internal storage and the working memory are separated, they share the same 1.2 MB of user memory. It is recommended to store methods in the internal storage and save your determination data frequently on a data card.

4 How to Navigate

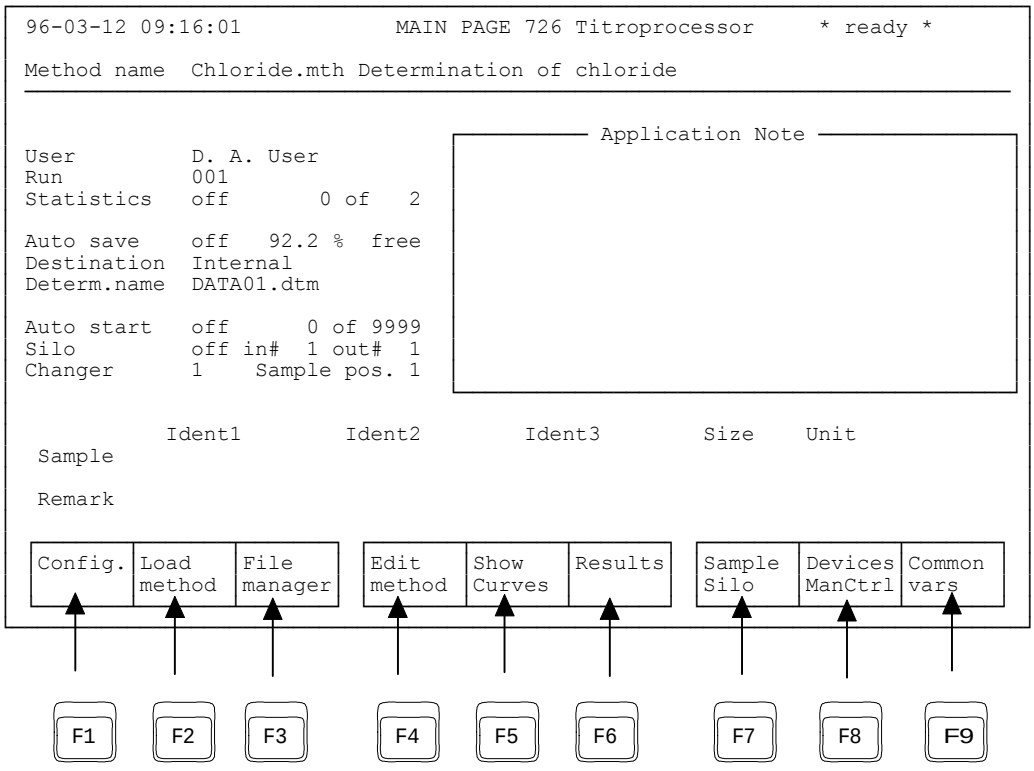
4.1 Dialog Overview

The user dialog of the 726 Titroprocessor consists of 10 main pages, which contain hierarchically structured subwindows.



The monitoring page is the main page of the user dialog. All other pages can be accessed by using the corresponding softkeys (F1 to F9).

4.2 The Softkeys



To navigate from page to page or from subwindow to subwindow you can use the blue function keys F1 to F9. These function keys alter their meaning or functionality, depending on the dialog page or window that is shown on

the screen. The function of the corresponding function key is always shown at the bottom of the screen. It is called the softkey bar. The function keys (F1 to F9) are called softkeys.

A dialog page or window can be left or closed by pressing the <QUIT> key. Any prior modifications of parameters will be accepted.

The shortcut keys of the rightmost key column on the keyboard allow direct access to some important dialog windows or features.

4.3 Field Cursor

To navigate on a page or in a dialog window you can use the cursor keys <←>, <→>, <↑> or <↓>. The position of the so called field cursor is indicated by the black field background of the edit field the cursor is pointing to. To navigate right or left within a line you can use the <TAB> key or the <Shift><TAB> key combination, respectively. The <HOME> key sets the field cursor to the first edit field of a page or dialog window.

5 How to Edit

To edit an entry of an edit field just type in the new value or press the <SPACE> key. In most cases a picklist is shown, from which you can select a given value by using the cursor keys <🡻> and <🡹>. The selection must be confirmed with <ENTER> or the picklist may be closed by pressing the <QUIT> key. The field cursor will turn into a block cursor which indicates the edit mode.
The PC-like keyboard allows comfortable editing of text or numeric entries. To erase any character use the <DELETE> (forward deletion) or the <BACKSPACE> key (backward deletion). The <INSERT> key switches the insert mode to the overwrite mode and vice versa.

In this mode a special softkey bar is shown.

The [Help] softkey may be used to open a window with a short explanation of the meaning or the content of the entry field to be edited. The entry range and one or more examples for entry values will be shown.

The [Select] softkey opens the picklist of the selected entry field. If no picklist is available, the [Select] softkey is displayed in gray letters to indicate that its function is not available.

The [Cancel] softkey rejects any modifications and resets the former field content. The edit mode will be canceled as well.

Modifications of field contents are to be confirmed with the <ENTER> or the <QUIT> key. The latter will terminate the edit mode.

5.1 Navigation in Edit Mode

In edit mode the cursor keys <🡸> and <🡺> allow the navigation within an entry field. To access other fields in the same line use the <TAB> key or the <Shift><TAB> key combination, respectively. The cursor keys <🡻> and <🡹> allow vertical navigation.

6 Configuration

6.1 Basic Configuration

The basic configuration is accessible from the main page by pressing the [Config.] softkey.

Items to be configured:

`Dialog in`	not yet implemented in 5.726.0010 program version (German, French and Spanish in 5.726.0011 program version)
`Date and Time`	system date and time
`LCD contrast`	screen brightness
`Screen save`	delay time for screen switch-off
`Error beep`	acoustic error warning on/off
`Edit beep`	acoustic editor warning on/off
`Edit mode`	switches overwrite/insert mode

Data file options:

Each determination is automatically given a data file name. This file name can be set up in different ways, combining determination time, run number and/or a certain standard text that can be defined.

`Standard data file name`	standard text (up to 5 or 8 characters resp.)
`File name type`	combination type for file name
`File comment type`	combination type for file comment

The device header that will be printed with every report can be edited after pressing the [Device header] softkey.

For information on the configuration of dialog restrictions (softkey [Access control] see page XX.

Interface configuration

Two serial RS232 interfaces can be used for connecting external printers, balances or computers/LIMS (or other peripheral devices). The interface parameters are separated in two columns for interface 1 (Ifc.1) and interface 2 (Ifc.2). Always ensure that the interface settings correspond with those of the connected devices.

Interface parameters:

`Baud rate`	transmission rate
`Data bit`	number of data bits used
`Stop bit`	number of stop bits used
`Parity`	type of parity checking
`Handshake`	type of handshake

`Receive mode` switches on/off the reception of transmitted data

Type of connected instruments:

`Balance` type or manufacturer of the connected balance

`Printer` emulation of printer type
try HP Deskjet for any inkjet or laser printer (with RS232 interface)
try Epson or IBM Proprinter for dot matrix printers (with RS232 interface)

Data communication settings

The 726 Titroprocessor may communicate with a personal computer or a LIMS system via the RS232 interfaces. The settings are:

`Communication Int.` RS232 interface used for the connection

`Commun. mode` Mode of data communication:

- `keyCTRL` (=remote control using key code simulation)
- `keySEND` (=send codes of keys pressed to a PC)
- `LIMS` (=data output to a PC or LIMS system e.g. for raw data report to a LIMS)
- `off` no data communication

Centronics printer port (726 model without built-in printer)

It is recommended to connect a printer to the parallel printer port rather than to any RS232 interface (see your printer manual).

`Printer` emulation of printer type
try HP Deskjet for any inkjet or laser printer
try Epson or IBM Proprinter for dot matrix printers

Internal printer settings (726 models with built-in thermal printer)

The built-in printer may be used besides an external printer (RS232 interface).

Internal printer switch on/off the internal printer

Auto form feed switch on/off automatic paper feed after report printing (with original Metrohm 6.2237.040 thermal paper only)

The softkeys [Reset RS232 1] and [Reset RS232 2] will reset the input and output buffers of the RS232 interfaces.

6.2 Sample Changer Configuration

The sample changer configuration is accessible from the main page by pressing the [Config.] and then the [Sample changer] softkey.

For safe operation of the 717 Sample changer it is important to accurately configure the racks used. Use only Metrohm standard racks with the 717 Sample changer and the 726 Titroprocessor. The preset magnetic rack code with which every Metrohm standard rack is equipped, will ensure the correct identification of the rack type. Do not change the magnetic rack code unless you want to use several racks of the same type, but with different special positions or special beaker settings.

Rack definitions

`Name` optional rack name

`Beakers` number of beakers; given with the rack type

Special lift positions; must be set to correspond with the beaker size and the titration head equipment. Lift positions are to be defined in mm, measured from the top of the changer's tower (rest position).

`Work position` lift position for the sample treatment

`Shift position` lift position for rack shifting

`Rinse position` lift position for rinsing of the titration head equipment

`Spec. Position` special lift position for any purpose

`Type` rack type (e.g. M12-0 = Metrohm standard rack, 12 beakers)

`Code` rack code for automatic rack identification corresponding to the physical arrangement of the rod magnets of each rack. The code has to be unique. The softkey [Check code] will check multiple use of the same code.

For every rack you may define up to eight special beaker positions that can be separately accessed during the execution of a sample series.
The softkey [Special beakers] opens a dialog window that enables the editing of the special beaker positions of a previously selected rack.

`Spec.beaker` name of special beaker
`Position` rack position of special beaker (0=not defined)
It is recommended not to define special beakers at the first rack positions, but at higher positions.

General sample changer configuration

The dialog page '`Configuration: Sample Changer`' shows the softkeys [Changer 1] and [Changer 2], which enable to access the general sample changer configurations, namely:

`Tower max. height` maximum height, defines the lowest possible lift position

`Tower 1 X pumps` number of pumps on tower 1

`Tower 2 X pumps` number of pumps on tower 2

7 Sample Data and Sample Silo

For each sample a set of data can be entered. The sample data comprise the following:

- Identification items (Ident1, Ident2, Ident3)
- Sample size and unit
- Remark line

Identification items may be used as plain descriptive text or as numeric values that can be used for calculations (variables ID1, ID2, ID3). The headers and the field type (text, numeric, auto) may be modified to suit your needs, see [Config.][Config.idents.].

The sample size and unit will usually be used for calculations (variable SS) and may be entered manually or be received from a balance via the RS232 interface(s), even while a currently determination is running.

The remark line may serve to clearly specify a sample and may be used for producing automatic file comments (see [Config.]).

7.1 How to enter Sample Data

Sample data can be entered in several different ways:

With single sample treatment (silo 'off')

- manual editing in the sample data area of the main page.
- manual editing in the 'Actual Sample' window, using the <SAMPLE> hardkey on the keyboard.
- manual editing in a during a running method sequence, using the ASK command.
- automatic data entry by data transmission from a balance

With sample series (silo 'on')

- manual editing in the sample silo.
- automatic data entry in the sample silo by data transmission from a balance

7.2 The Sample Silo

The sample silo is a table consisting of 160 lines to hold the data of the samples forming a sample series. It can be accessed by pressing the [Sample silo] softkey on the main page.
The sample identification headers and field types may be configured with the [Sample idents] softkey. The content of the sample silo can be saved and restored (via the [File] softkey) from the internal storage, a data card or even from a personal computer via the RS232 interface(s).
The normal view shows the sample data line by line. Using the [Remark] softkey you can edit or view the sample remark of each silo line. The same softkey brings you back to the normal silo view.
The sample silo is controlled by the 'input' and 'output' pointers. The leftmost silo column always shows the current position of the input pointer (>) and the output pointer (<).

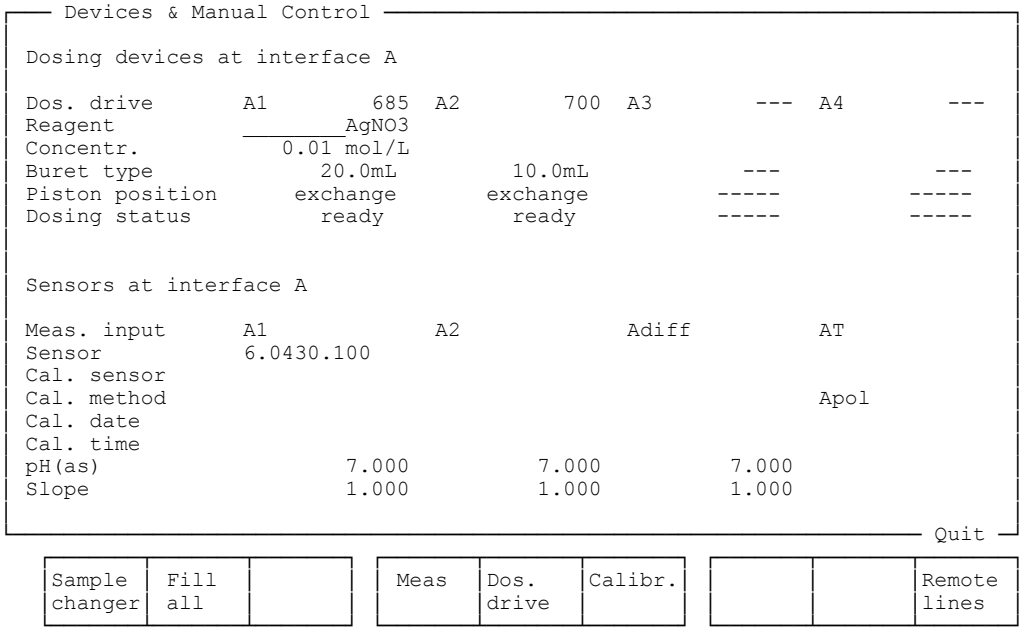
The input pointer marks the silo line that is next to receive a sample size from a balance.
Set the input pointer by focusing a silo line and pressing the softkey [--> In pointer] that is located on the second softkey list, which you can access with the [>> >>] softkey. The input pointer (>) will be moved to the focused silo line. If sample data is sent by a balance, the data will be stored in the marked silo line and the pointer will be moved forward by one line.

The output pointer (<) marks the silo line that will be used for the next determination. Setting the output pointer is carried out in the same way as setting the input pointer.
For the treatment of a sample series, fill in the sample data in the sample silo and set the output pointer to the silo line that you want the series to start with. The number of samples or silo lines, respectively, that are to be treated, can be set in the status window (<STATUS> key) or on the main page with the 'Auto start' option.
The method that is to be applied to a given sample can be defined in the method entry field of every silo line. The specified method will be loaded in the working memory and executed using the sample data of the current silo line. If no method is specified, the current method in the working memory is executed. After finishing the determination the sample data will remain in the sample silo, but the output pointer will be moved forward by one line.

8 Devices and Manual Operation

To manually operate or control any peripheral device (dosing drive, sensor, sample changer) call up the 'Devices & Manual Control' page. Press the [Devices ManCtrl] softkey on the main page or the <MAN CONTROL> key on the keyboard.

8.1 Overview



The upper part of the screen shows the status of the dosing devices that are connected to the Titroprocessor. The lower part shows the status of the sensors connected.
Each device is identified by an address (A1, A2, ...) that represents the socket which it is connected to. The type of dosing drive (685 Dosimat or 700 Dosino) is recognized automatically.

Address allocation scheme:

Dosing drives	A1 ... A4	Dosing drive at the 726 Titroprocessor
	B1 ... B4	Dosing drive at the 729 Dosing Interface/EBus
	C1 ... C4	Dosing drive at the 729 Dosing Interface/EBus

Sensors	A1, A2	Indicator electrode at meas. interface 'Sensors A'
	Adiff	Differential potentiometric assembly at meas. interface 'Sensors A'
	AT	Pt100/1000 temperature sensor at meas. interface 'Sensors A'
	Apol	Polarized electrode at meas. interface 'Sensors A'
	B1, B2	Indicator electrode at meas. interface 'Sensors B'
	Bdiff	Differential potentiometric assembly at meas. Interface 'Sensors B'
	BT	Pt100/1000 temperature sensor at meas. interface 'Sensors B'
	Bpol	Polarized electrode at meas. interface 'Sensors B'

To operate a device move the field cursor to the corresponding edit block and press the relevant softkey. To access further devices, such as the dosing drives B1 ... C4 or the sensors of the measuring interface B, press the <TAB> key. With <Shift><TAB> or <TAB> you can switch from one display to the other of the different interfaces.

8.2 Dosing devices

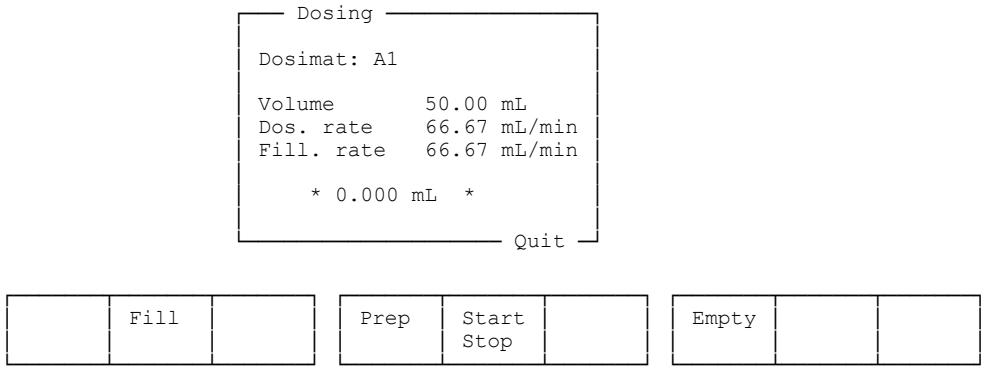
For each dosing drive the name and concentration of its reagent can be entered. This serves to enable the automatic reagent check if a given method requires a specific reagent.

Automatic reagent check

It may be convenient to force a comparison check to determine whether the settings for a dosing drive in a method and the current settings on the 'Devices' page are identical. If any reagent name and/or concentration is entered on both dialog pages (Method editor and Devices & Manual Control page), an automatic reagent check will be performed. Both entries will be compared. Any difference in a reagent or concentration setting will cause an error message at the beginning of that particular titration.
The automatic reagent check is disabled if the reagent and concentration settings are cleared on at least one page.

Operating a dosing drive

Move the cursor to a dosing drive and press the [Dos. drive] softkey to manually operate a Dosimat or Dosino.



Enter the desired reagent volume to be dispensed and adjust the dosing and filling rate, if required.

The softkeys:

[Start Stop] Starts the dosing process of the preset volume. Holds or continues a process, respectively.

[Fill] Starts the filling of the buret.

Special functions for Dosino handling:

[Prep] Starts a preparation cycle of a Dosino to flush the buret's tubing and cylinder.

[Empty] Starts emptying the tubing and the cylinder of a Dosino's dosing unit.

The 'Prep' function should be executed before starting any sample series or a single determination to ensure bubble-free tubing. Use it whenever required, but at least once a day.
The 'Empty' function is useful if you want to change the reagent of a buret unit. It will empty the tubing and the buret cylinder, so you can easily change the reagent without significant loss of reagent volume.

The 'Prep' and 'Empty' functions are automated filling and dosing processes that take into account the cylinder and tubing volumes. It is therefore necessary to define the tubing dimensions and furthermore the reagent outlet port where the waste reagent has to be ejected to.

After pressing the [Prep] or the [Empty] softkey, the following request will appear on the screen:

```
Use existing tube settings(y/n)? [y]
```

In most cases the default settings will be fine. Pressing the <ENTER> key will start the function immediately.
If you use special tubing enter 'n' and edit the following requests:

```
Length of dosing tube on port 1    (0..30000mm) [ 1000]
Diameter of dosing tube            (0.1..20.0mm) [ 2.0]
Length of aspiration tube on port2 (0..30000mm) [  250]
Diameter of aspiration tube        (0.1..20.0mm) [ 2.0]
Outlet: tip (port 1) or flask (port 4)? port[1]
```

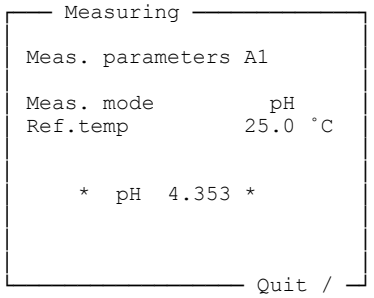
The function will be executed immediately.

All of these buret operations are automatically terminated as soon as the dosing window is closed with <QUIT>.

8.3 Sensors

The various sensors can be named differently. Enter a description for every measuring input in the 'Sensor ' field.

Measuring



Measurements can be carried out by marking the measuring input to which the appropriate sensor is connected. The [Meas] softkey will open a dialog window where the measuring parameters, such as measuring mode or measuring temperature, can be modified depending on the sensor type.

Calibration

pH sensors at the measuring inputs A1, A2, Adiff, B1, B2, Bdiff can be calibrated. Calibration data remain until changed even when the 726 is switched off. The softkey [Calibr.] opens the calibration window.

```
┌─── Calibration ──────────────────────────────────────────────────────────┐
│                                                                          │
│ Meas. parameters A1:              # Buffer    pH val. T[°C] pH cor. Val.[mV] │
│                                   ----------  ------- ----- ------- -------- │
│ Signal drift      2 mV/min        1  Metrohm   4.000                     │
│ Equilibr.time   110 s             2  Metrohm   7.000                     │
│ Temperature    25.0 °C            3  Metrohm   9.000                     │
│ Buffer type Metrohm 4.00 ..9.00                                          │
│                                                                          │
│ Buffer 1  pH  4.000                                                      │
│                                                                          │
│                                                                          │
│                                                                          │
└──────────────────────────────────────────────────────────────── Quit ─┘
```

The calibration parameters '`Signal drift`', '`Equilibration time`' and '`Temperature`' can be modified.
Buffers can be defined one by one or a preset buffer series can be used. Select a buffer type or manufacturer first and add a buffer set to the buffer table by pressing the softkey [Preset series] or [Add series]. Press the [Start Stop] softkey to start the calibration process. Each buffer listed in the buffer table will be requested and measured after the [Start Stop] softkey is pressed. The measured values will be displayed in the buffer table.

It is also possible to calibrate without a preset buffer table.
You can define the buffers (type and value) one by one.
Select a buffer type, enter a pH value and press the softkey [Start Stop]. The potential will be measured and the results added to the buffer table. After you have done this at least twice the calibration curve may be viewed by pressing the [Show curve] softkey. With the calibration curve the resulting values for 'slope' and asymmetry potential pH_{as} will be shown too.

Calibration data are assigned to the measuring input (e.g. A1) and are stored in the Titroprocessor. The calibration data can be viewed at any time. Before recalibrating a sensor, clear the previous calibration with the [Clear calibr.] softkey. An incorrect calibration can be deleted with the [Cancel calibr.] softkey. The previous calibration data will be restored.

The '`Devices & Manual Control`' page will always show the current calibration data for each measuring input, including the name of the calibrated sensor, the calibration method (calibrations can be done automatically within a method sequence) and date and time of calibration. The calibration results pH_{as} and slope may be edited manually, if necessary. This will overwrite any existing calibration.

```
│ Sensors at interface A
│
│ Meas. input      A1             A2
│ Sensor           6.0238.000     6.0203.100
│ Cal. sensor      6.0238.000     comb. glass
│ Cal. method      manually       * by edit *
│ Cal. date             96-10-28       96-10-28
│ Cal. time             10:08:14       10:12:48
│ pH(as)                   6.987          7.000
│ Slope                    0.958          1.000
```

8.4 Sample Changer

A Sample Changer (if any is connected) can be operated by opening the Sample Changer window with the [Sample changer] softkey on the 'Devices & Manual Control' page.

The Sample Changer window displays the status of the connected Sample Changer(s). The softkey list allows to operate the components of each Sample Changer.

For each connected Sample Changer the data of the mounted rack are displayed, namely: rack type, rack code and number of beakers. For each tower the status information is given: the lift position, the actual beaker position and the response of the automatic beaker test (presence of a beaker).The actual state of each pump (rinsing or aspiration pump) and stirrer is displayed, as well as the set stirring rate, for which 15 different settings are available.

You can use the cursor keys <🡐> and <🡒> to mark a specific tower, pump or stirrer. A movable rectangle indicates the marked changer and tower for which a softkey function can be executed.

The softkeys and their functions

[Shift right], [Shift left]	rotates the rack clockwise or counterclockwise
[Lift up], [Lift down]	moves the lift of the marked tower up or down
[Pump on/off]	switches the marked pump on or off
[Stirrer on/off]	switches the marked stirrer on or off
[Remote lines]	editing of the state of the input/output lines of the remote socket
[Reset]	resets all changer functions; all lifts will be moved to the rest position, the rack will be turned to the initial position, pumps and stirrers will be switched off

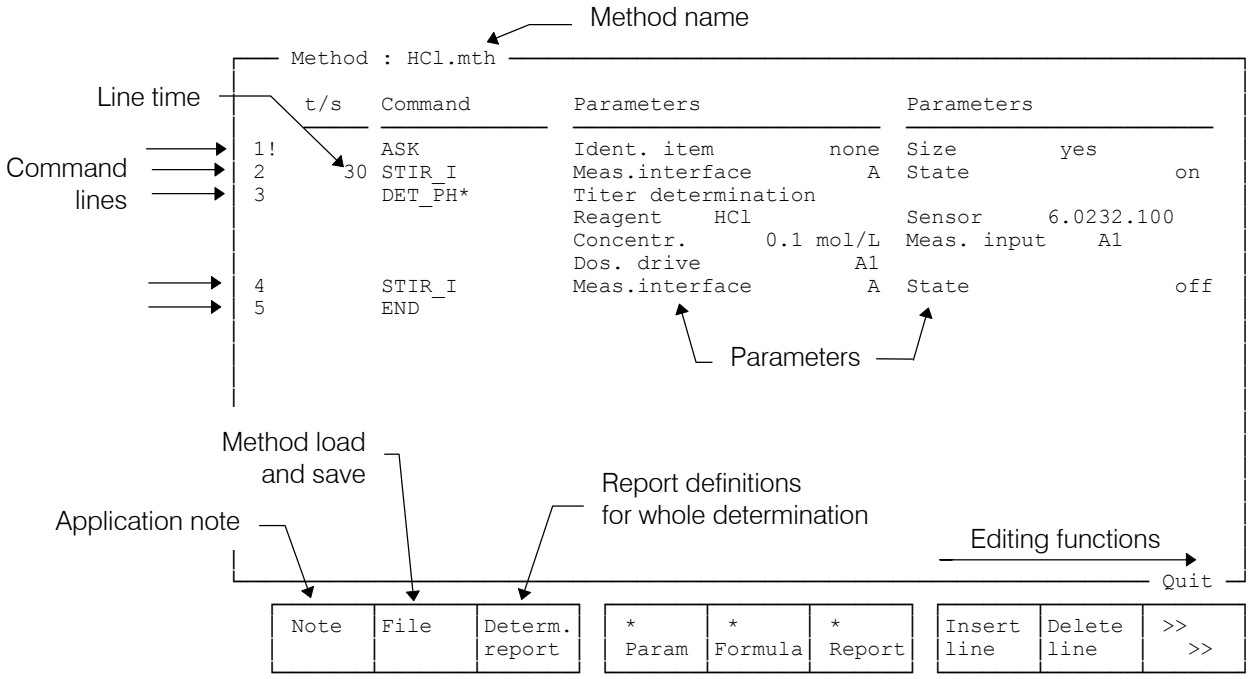
The <PG UP> and <PG DN> keys will run the focused lift to the shift or work position, which must be predefined in the rack definitions of the mounted rack. The <HOME> key will run the lift to the rest position (0 mm position) at the top of the selected tower.

Rack and lift operations

For safety reasons, it is not possible to turn a rack if any lift is in a lower position than the specified shift position. Therefore it is important to define correct rack definitions(see p. 17). Press the <PG UP> or <HOME> key before turning the rack.

When using a rack that is not designed for parallel processing (M14-0, M16-0, M10-0) with a two-tower changer model, you have to ensure the correct position of a beaker in front of a tower to operate a lift. For this you have to mark the target tower and shift the rack left or right using the corresponding softkeys.

9 Method Editor



A method is organized in command lines that will be processed one by one. Up to 99 commands are possible. Five titration or measuring modes can be included in one method. Further commands can be combined individually. For use with a sample changer (Auto start 'on') you can define a start sequence and/or a final sequence. A start sequence `(OMOVE ... )OMOVE` will be executed with the first sample of a series. A final sequence `(CMOVE ... )CMOVE` will be executed with the last sample of a series.

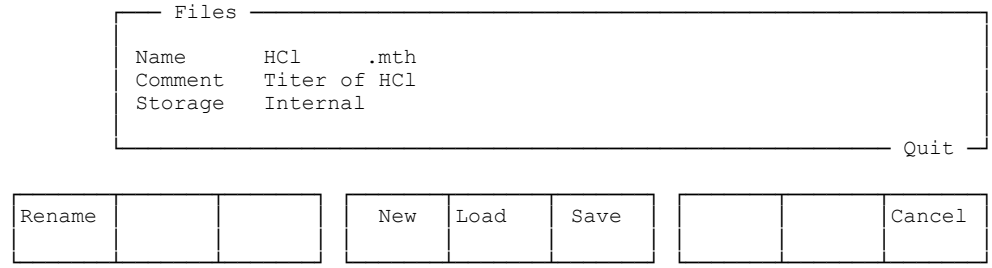
A method has always to be terminated with the 'END' command.
A command line consists of the command name, the parameters, the line time and the line attribute.
A line can be marked as invalid with a '!' sign as line attribute (see line 1 above). A block of lines can be either marked with a '@' sign at the first and the last one of the lines that are meant to be invalidated.
A line time (see line 2 above) can be set to force a minimum time to be used for the execution of a command. The next command will not be performed before this line time has elapsed and the previous command has been executed.

Application Note

Press the [Note] softkey to edit the application note that will appear on the main page. You can enter a short description of the current method or the prescription of the sample preparation.

File

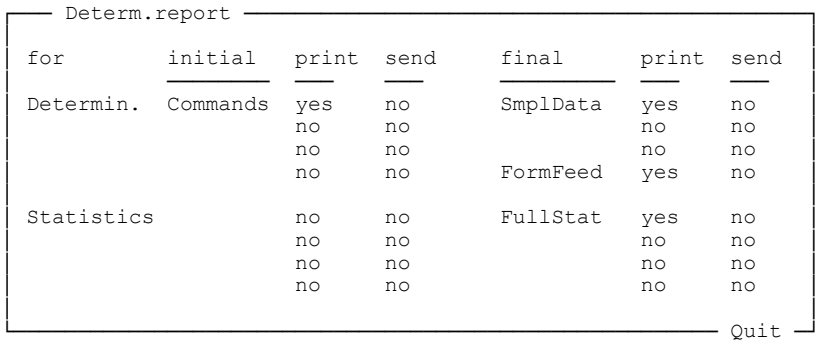
The [File] softkey opens the dialog window for saving or loading a method.



Determination Reports

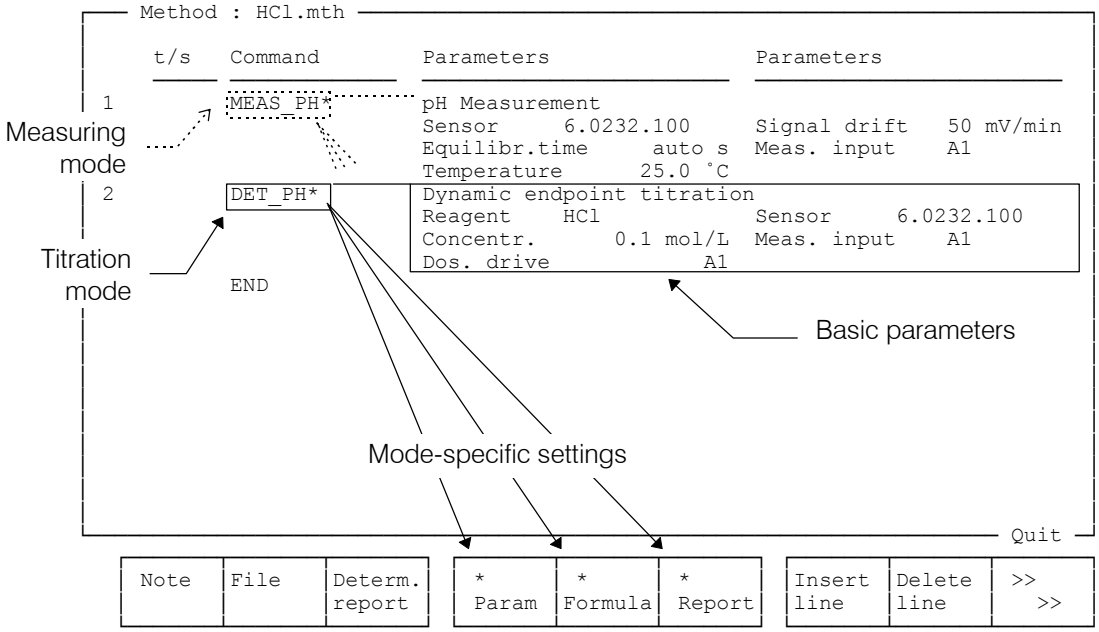
Reports that will be printed **at the end of a determination** (which may include up to five titration or measuring modes) are to be defined under [Determ. Report].
You may define reports to be printed at the beginning of a determination (initial reports) or at the end of a determination (final reports). You may even define reports that only will be printed when the statistic counter has reached its limit (statistical sample series).

Reports are printed by the printer(s) that are configured under Configuration/Interfaces. It is also possible to send a report to a LIMS (Laboratory Information Management System).



You can find more information about every report if you press the <HELP> key of the 726 when the determination report window is shown on the screen.

9.1 Titration and Measuring Modes



The basic parameters determine peripherals used with the particular titration or measuring mode.

9.1.1 List of Titration and Measuring Modes

Titration Modes:

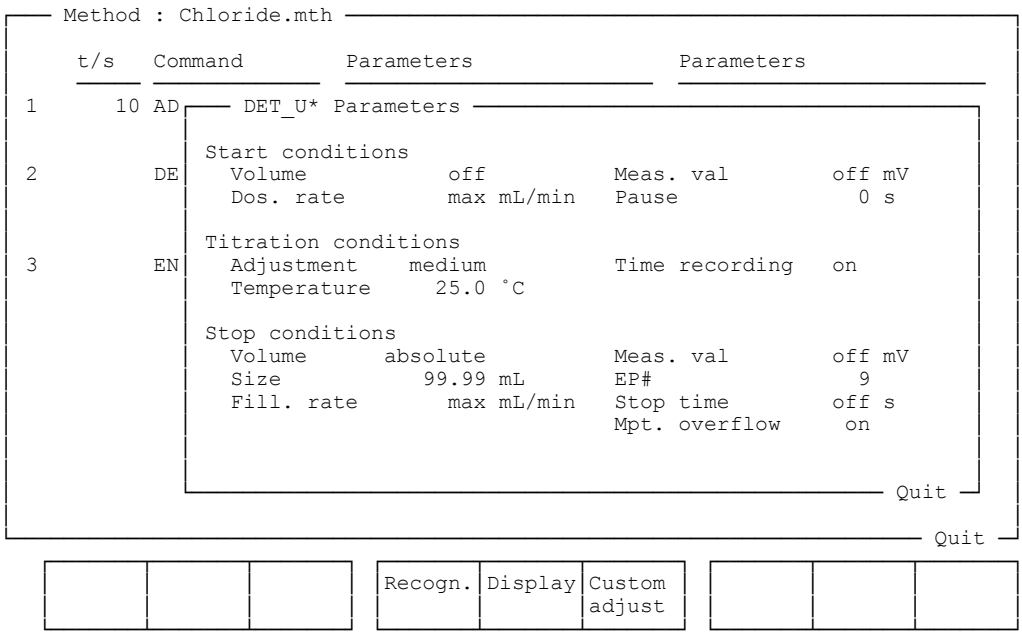
DET_PH	Dynamic Endpoint Titration,	measured value pH
DET_U	" " "	" " mV
DET_UPOL	" " "	with polarization voltage
DET_IPOL	" " "	with polarization current
MET_PH	Monotonic Endpoint Titration,	measured value pH
MET_U	" " "	" " mV
MET_UPOL	" " "	with polarization voltage
MET_IPOL	" " "	with polarization current
SET_PH	Set Endpoint Titration,	measured value pH
SET_U	" " "	" " mV
SET_UPOL	" " "	with polarization voltage
SET_IPOL	" " "	with polarization current
SEC_PH	SET Endpoint Conditioning,	measured value pH
SEC_U	" " "	" " mV
SEC_UPOL	" " "	with polarization voltage
SEC_IPOL	" " "	with polarization current
KFT_IPOL	Karl Fischer Titration,	with polarization current
KFT_UPOL	" " "	with polarization voltage
KFC_IPOL	Karl Fischer Conditioning,	with polarization current
KFC_UPOL	Karl Fischer Conditioning,	with polarization voltage

Measuring Modes:

MEAS_PH	Measurement,	measured value pH
MEAS_U	"	measured value mV
MEAS_UPOL	"	with polarization voltage
MEAS_IPOL	"	with polarization current
MEAS_T	"	measured value °C
CAL	Calibration,	measured value pH

The parameters of a titration or measuring mode can be set after pressing the [* Param] softkey. Each mode has ist own parameter set.

Example:



The titration modes are structured into ‘start conditions’, ‘titration conditions’ and ‘stop conditions’.

‘Start conditions’	Actions or conditions to be executed before the regular, controlled titration, e.g. `Start volume` or `Pause` (after distribution of start volume).
‘Titration conditions’	Control parameters of the titration e.g. `Adjustment [slow | medium | fast]`. These entries are sets of control parameters that may be customized if necessary, see softkey [Custom adjust].
‘Stop conditions’	Settings to determine the termination of the titration, e.g. `EP#` (stop when endpoint reached), `Stop volume`.

The conditioning modes SEC and KFC only show ‘Titration conditions’.

The calibration mode CAL* shows the buffer table where buffer types and values can be entered.

The measuring mode MEAS shows ‘Measure conditions’ which allow to perform multiple drift-controlled measurements to optain a measuring curve. Note: Do not define an Equilibr. time greater than the cycle time.

Custom Adjustments

The control parameters of a titration may be fine tuned if the adjustment settings [slow | medium | fast] do not satisfy the needs of an application.

Press the [Custom adjust] softkey.

Consult the 'Custom adjustment' help page of the 726 Titroprocessor to get more information regarding the specific control parameters.

Example (DET_pH mode):

```
┌─── DET_PH* Parameters ──────────────────────────────────────┐
│                                                             │
│ Start conditions                                            │
│   Volume           off          Meas.val. pH     off       │
│   Dos. rate        max mL/min   Pause              0 s      │
│                                                             │
│ Titration conditions                                        │
│   Adjustment    medium          Time recording   on         │
│   Temperature     25.0 °C                                   │
│                                                             │
│ Stop conditions                                             │
│   Volume      absolute          Meas.val. pH     off       │
├─── DET_PH* Custom adjustments ──────────────────────────────┤
│                                                             │
│   Meas.pt.density    4          Signal drift    50.0 mV/min │
│   Min.increment     10 µL       Equilibr.time   auto s      │
│   Dos. rate        max mL/min                               │
│                                                             │
└──────────────────────────────────────────────────── Quit ─┘
```

Press <HELP> for more information.

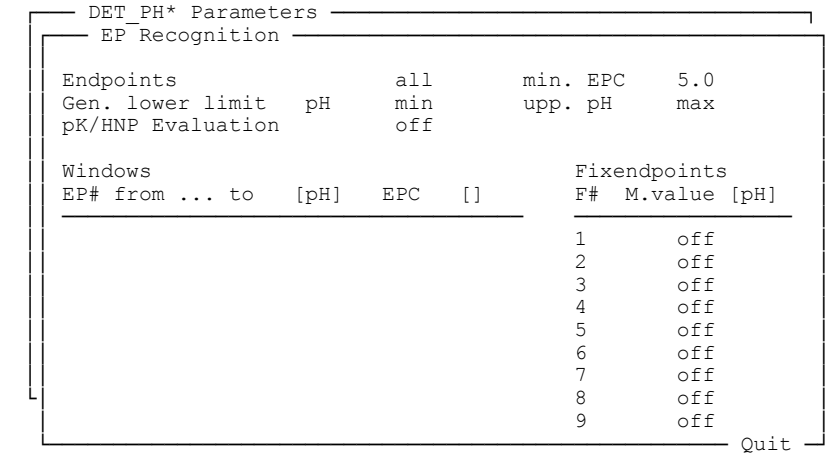
Display Settings

```
┌─── * Display ──────────────────────────┐
│                                        │
│ Curve       Y_Axis       X_Axis        │
│ ──────────────────────────────         │
│ Quantity    M. value        Volume     │
│ Scale           auto          auto     │
│   begin   pH                      mL   │
│   end     pH                      mL   │
│ Division                     1 mL/cm   │
│                                        │
└──────────────────────────────── Quit ─┘
```

After Pressing the [Display] softkey the settings of the curve representation can be modified. These settings are valid for the screen display and the printed output of the titration curve, but not for the 'live' curve, which always is scaled automatically.

Endpoint Recognition

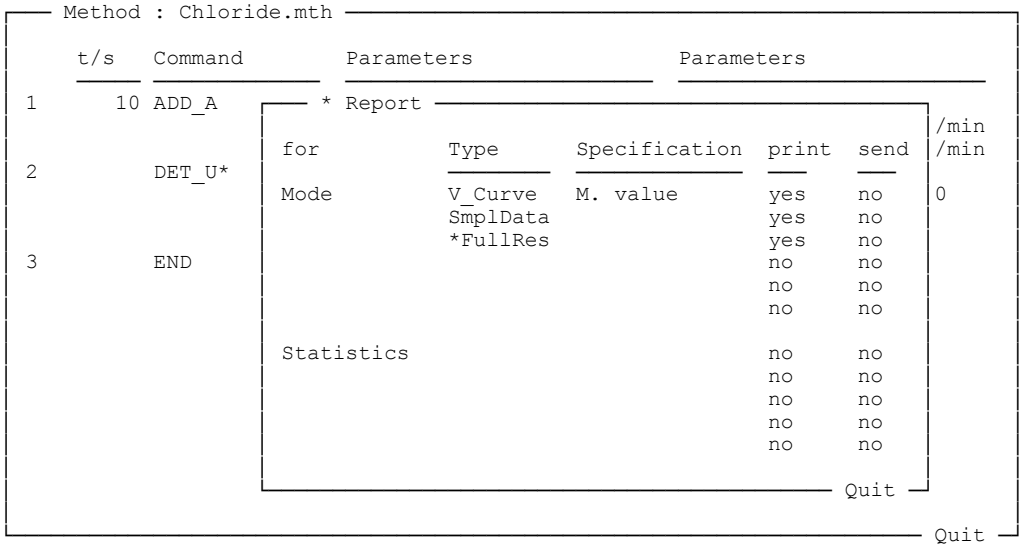
For sophisticated evaluation of endpoints the recognition settings may be modified within wide ranges. Press the [Recogn.] softkey.



First define a general recognition window within which an endpoint recognition is possible. Set the lower and upper limits of the measuring value to define the range of the general recognition window. Then select a recognition type under `Endpoints [all | last | greatest | window | off]`.
With `Endpoints 'window'` every endpoint can be assigned a separate range in which this particular endpoint must be recognized. The endpoint windows must not overlap.

Mode Reports

For each titration or measuring mode (up to five modes per determination) individual reports can be printed out. Press the [* Report] softkey in the method editor after selecting the desired mode.



The reports to choose from are:

- C_Curve Calibration curve
- V_Curve Volume curve (measured value vs. volume)
- T_Curve Time curve (measured value vs. time)

- *FullRes Full result report, including extended values
- *ShrtRes Short result report, only calculated results
- SamplData Sample data, including identifications
- CalData Calibration data
- *Param Parameter report of titration or measuring mode
- MP_List Measuring point list
- RawData Raw data of titration or measuring (for LIMS)
- FormFeed Paper feed on printer

Additional reports that may be printed when the statistic counter has reached its limit:

- MCurve_V Multiple volume curve, overlaid curves
- MCurve_T Multiple time curve, overlaid curves

These reports may be set under '*Report for Statistics'.

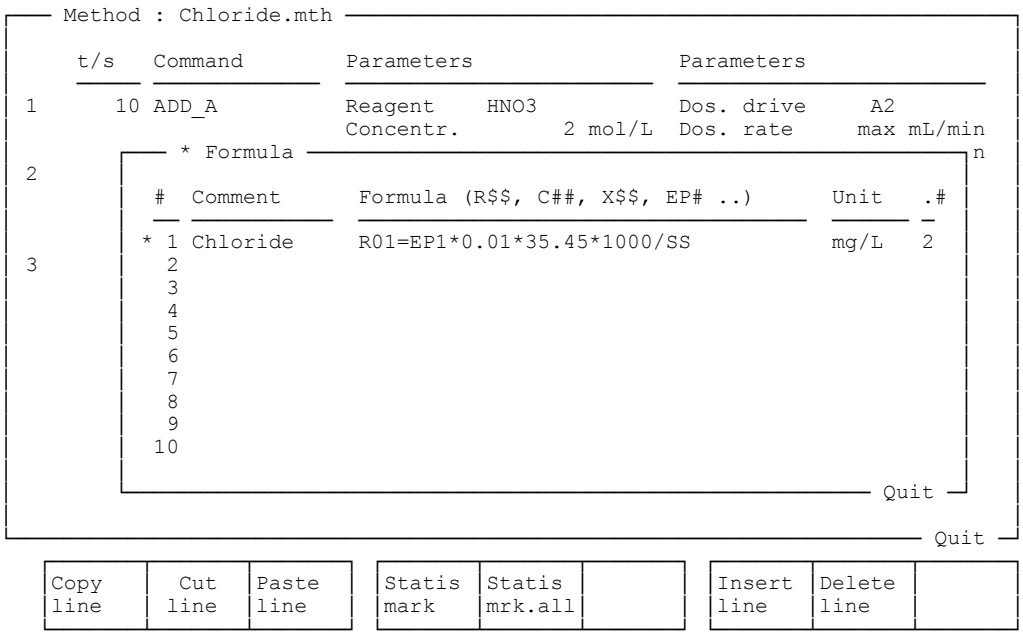
The definition of a curve report needs a further specification. Select the quantity to be displayed on the Y-axis (X-axis see V_Curve or T_Curve).

- M. value Measured value (pH, mV, μA, °C)
- Volume Dispensed reagent volume
- Temp. Measured temperature
- dMV/dV 1st derivative, measured value with respect to volume
- dMV/dt 1st derivative, measured value with respect to. time
- dV/dt 1st derivative, volume with respect to time
- MV, Temp. Measured value and temperature, combined
- MV, dMV/dV Measured value and 1st derivative, combined
- all All possible quantities, combined

Chose whether the reports are to be printed or sent to a PC or LIMS.

9.2 Calculations

For each titration or measuring mode up to 10 calculation formulas may be defined.



A calculation formula has to be assigned to a result variable (R$$, use numbers or any character for '$$'), an intermediate result value (X$$, use numbers or any character for '$$') or a common variable (C##, use numbers 01…19 as '##'). Results and common variable assignments will be printed out with a result report.

9.2.1 Mathematical Functions

+	Addition
–	Subtraction
*	Multiplication
/	Division
^	Exponentiation
( )	Parenthesis
LOG( )	Decimal logarithm
EXP( )	Decimal exponent
LN( )	Natural logarithm
SQRT( )	Square root
TST(,)	Test function (tested variable, substitution term)

Use the TST( ) function to assure correct calculations, if invalid values may be used in a formula. The syntax:

TST(variable to be tested , substitution term)

If the value of the specified variable is invalid, the calculation will be executed using the substitution term (variable or formula).

Use the TST( ) function for testing the presence of an endpoint.

```
R01=TST(EP1,0)*0,1*C01*157,45*100/SS
```

If no endpoint is found, the result R01 will not be invalid. The correct result zero (0) will be indicated.

9.2.2 System Variables

All of the following system variables may be used for calculations.

Rxx	Result
RT1	Result of titer determination for validation
RT2	Theoretical result for validation
RE	Endpoint for syst. error calculation in validations
Xxx	Intermediate result
C##	Common Variable (of actual titration or measurement)
EP#	Endpoint volume
MNRxx	Mean value of results
MNXxx	Mean value of intermediate results
MNC##	Mean value of Common Variables
ID1	Sample identification 1
ID2	Sample identification 2
ID3	Sample identification 3
SS	Sample Size
DD	Determination Duration
MD	Measuring Duration; (of actual titration or measurement)
SD	Start Duration; for start conditions
IT	Initial temperature
ST	Start temperature
CT	Closing temperature
IM	Initial measured value
SM	Measured value at the start of a titration or measurement
CM	Measured value at the closing of a titration or measurement
SV	Dispensed start volume
CV	Dispensed volume at the closing of a titration
C	Concentration of reagent (available only with automatic reagent check)
EM#	Endpoint measured value
EF#	Endpoint flag; endpoint found yes/no (1/0)
F#	Fixed endpoint volume
FM#	Fixed endpoint measured value
FF#	Fixed endpoint flag; fixed endpoint reached yes/no (1/0)
HNV#	HNP volume
HNP#	HNP measured value
AP	Asymmetry potential of calibrated sensor
SL	Slope of calibrated sensor
DRC	Signal drift in conditioning status
DOD	Dosing duration
ITD	Intermediate titration duration
$RN	Run number
$AS	Auto start counter
$CRF	Conditioning ready flag (Cond ok, yes/no (1/0)
$BC	Buffer counter

9.3 Sample Changer Commands

CHANGER	Definition of changer parameters
SAMPLE	Modification of the actual 'SAMPLE' variable
MOVE_S	Moving the sample beaker to a working station
MOVE_B	Moving a special beaker to a working station
LIFT	Positioning of a titration head
PUMP	Pump control
STIR_C	Controlling a stirrer of a sample changer
RESET_C	Resetting a changer to initial position

9.4 Auxiliary Functions

ASK	Request for sample data
HOLD	Interruption of a determination
WAIT	Waiting time in sec. (or infinite)
WAIT_T	Waiting for a preset time
WAIT_C	Waiting for conditioning to be 'ready'
ADD_A	Adding absolute volumes of auxiliary reagents
ADD_R	Adding relative volumes of auxiliary reagents
STIR_I	Controlling of internal stirrers A and B
REM	Comment line in method editor
NOOP	No operation
BEEP	Beeper
END	End mark of method

9.5 Sequences

(OMOVE ...)OMOVE	The Opening Move or Start Sequence may contain commands that will be processed once during the first run of a sample series.
(CMOVE ...)CMOVE	The Closing Move or Final Sequence may contain commands that will be processed once during the last run of a sample series.
(CASE ...)CASE	A CASE sequence will be executed if the condition defined at the top of the sequence is true.

Example for use of CASE:

```
Command         Parameters                 Parameters

MEAS_PH*        Initial pH  measuring
                Sensor     comb. Glass     Signal drift   50 mV/min
                Equilibr.time     auto s   Meas. input    A1
                Temperature      25.0 °C

(CASE           CM < 7          (CM=Closing measured value, pH value)
  REM           If pH value of sample <7, titrate free acid
  DET_PH*       Titration of free acid
                Reagent    NaOH            Sensor     comb. Glass
                Concentr.      0.1 mol/L   Meas. input    A1
                Dos. drive            A1
 )CASE
```

All system variables may be used with the CASE command. The possible operators:

=	equals
>	greater than
<	less than
>=	equal or greater than
<=	equal or less than
<>	unequal

Example: (CASE CM <= 7

More than one conditional terms may be combined with the logical operators:

AND	both conditions must be fulfilled
OR	one condition must be fulfilled

Example: (CASE CM > 4 AND CM < 7

Furthermore the status of the input lines of the remote socket may be set as the condition of a CASE statement.

Example: (CASE StateA=00000000

Input line 7 Input line 0

The condition of this term is fulfilled if all input lines (input 0 … 7) of the remote socket on the rear side of the 726 are reset.

The possible states of each line can be scanned as follows:

0	line is reset (high level)
1	line is set (low level)
*	don't care for line status

Addresses of the remote sockets are:

StateA	Remote socket of the 726
State1	„ „ of the 1st Sample Changer (717)
State2	„ „ of the 2nd Sample Changer (717)

The operators:

=	equal states
<>	unequal states

Example: (CASE State1=*******1

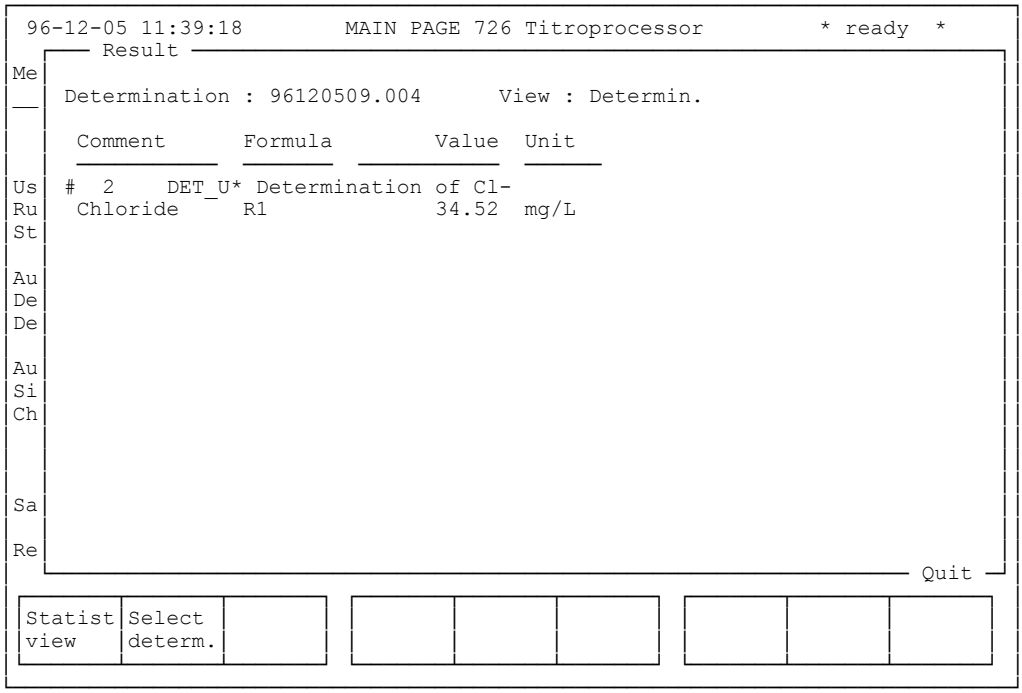
This means that the CASE sequence will be executed if the input line01 of the 1st Sample Changer is not set. No other input line will be scanned.

10 Results, Curves, Recalculation

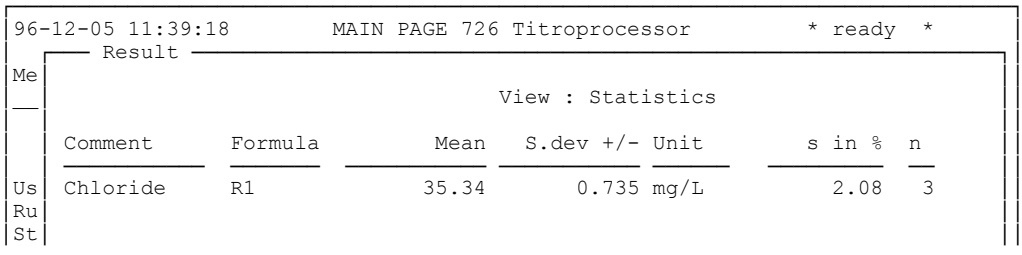
Results may be viewed after a determination has finished in two different ways. The <RESULT> key opens a result window that shows all results in a table. The [Results] softkey on the main page offers the opportunity to modify most of the parameters that were used to obtain the results. Not only recalculations but even reevaluation of the raw data (measure point list) is possible.

10.1 Result Key

Press the <RESULT> key to view the result table of the current determination.



To view the results of previous determinations press the [Select determ.] softkey and choose a file name from the picklist. The statistics results of the current sample series will be shown when you press the [Statist view] softkey.

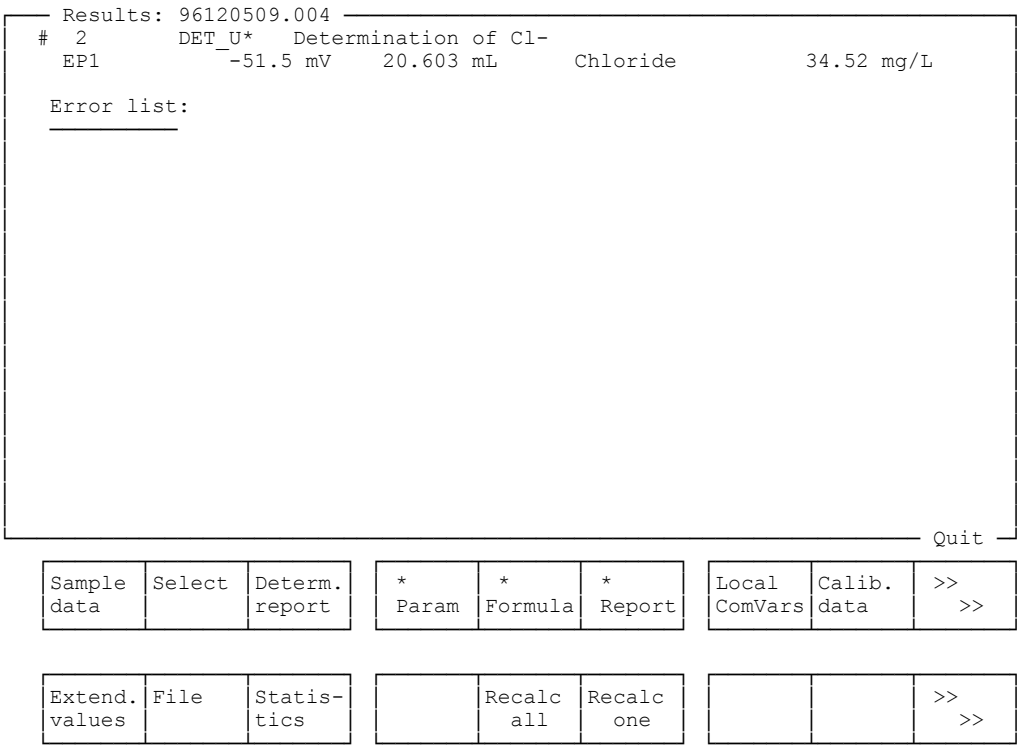


The [Determ. View] softkey will display the previous window again.

10.2 Result Pages

The result pages enable the modification of the produced data. Statistics results, common variables and extended values of the current determination can be viewed and manipulated within certain ranges.

If results of more than one titration or measuring mode are visible, a given mode can be selected by marking the corresponding command line, which is identified by its line number in the method editor.



Important Notice

With the start of any determination the method parameters, the actual sample data, the calibration data and the set of actual common variables are copied into the determination file. Any modification in the result page and its subwindows are local and volatile. They will not have any effect on the loaded method or any commonly used data. If you want to keep the changes, you have to save the determination via the [File]softkey. Modifications you wish to apply to subsequent determinations must be carried out in the method editor.

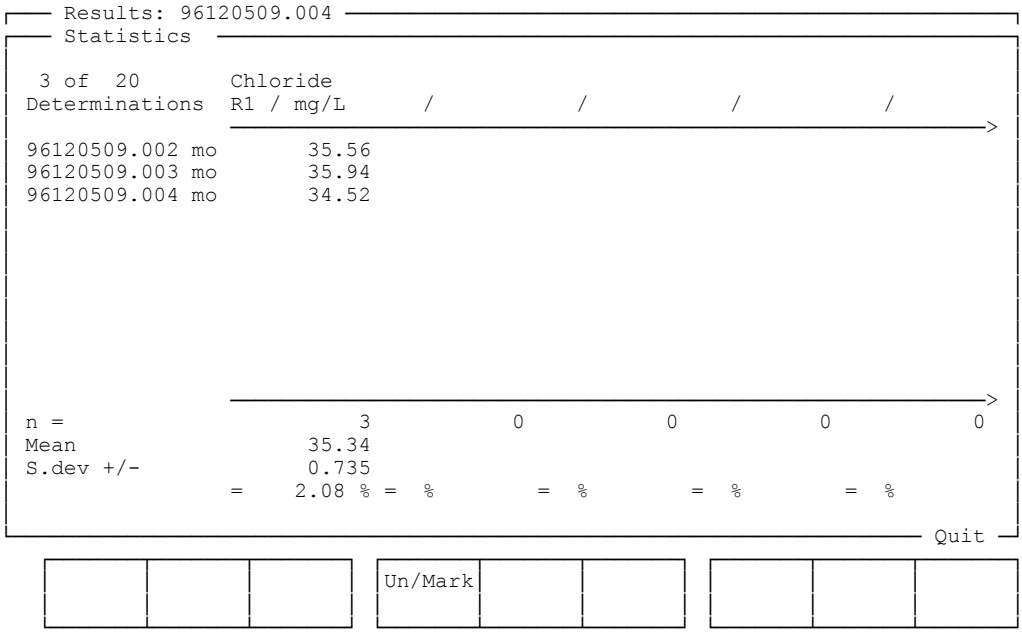
The softkeys

[Sample data]	Modification of the sample data. A recalculation is needed to make it effective.
[Select]	A picklist to chose a previous determination from.
[Determ. report]	Definitions of determination reports. See method editor.

[* Param]	Modifications of the endpoint recognition and display settings. Re-evaluations of the raw data with modified recognition settings need a recalculation for the modified parameters to become effective.
[* Formula]	Modification of the calculation formula(s). A recalculation is needed to make it effective.
[* Report]	Report definitions for a single titration or measuring mode.
[Local ComVars]	Table of Common Variables for recalculations. Modifications of these variables will not change the global Common Variables.
[Calib. Data]	Display of the calibration data of the applied sensor.
[Extend. Values.]	Display of additional data of the selected titration or measuring mode.
[File]	File dialog for saving or recalling a determination.
[Statistics]	Opens the statistics page.
[Recalc all]	Recalculation of all determinations in the working memory (statistics recalculation).
[Recalc one]	Recalculation of the currently displayed determination.

The statistics page

Pressing the [Statistics] softkey on the result page will display the statistics results.



The results of each determination in the working memory may be displayed here. A formula that you wish to be involved in the calculation of statistical results has to be marked in the formula editor of the method. Up to 50 different formulas are possible. The results will be lined up in 50 columns. You scroll through the columns with the <Cursor left>, <Cursor right> keys or with <TAB> or <Shift TAB>, respectively.

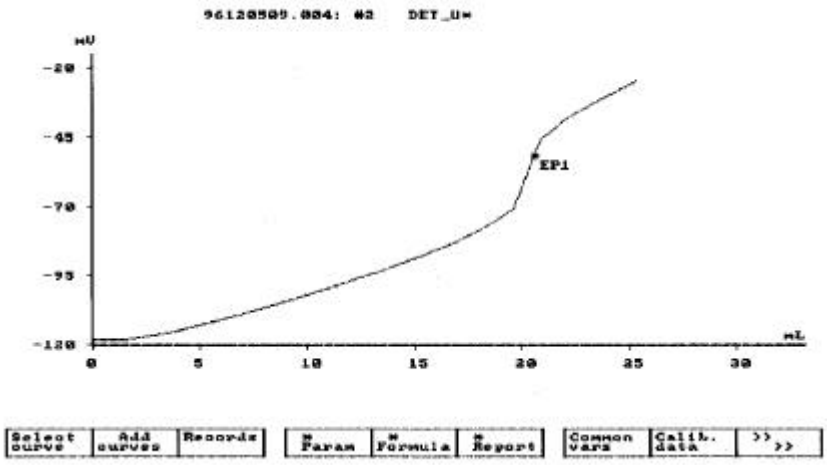
The determination file names are accompanied by the file attributes, which show, how the results of this determination were obtained.
The first character of the file attribute stands for the calculation procedure. The second character stands for the method that was used for producing the raw data of the determination.

Attribute	Calculation	Method
o = original	unmodified	unmodified
n = new		new, unsaved
m = modified	recalculated	loaded and modified

If you want one individual result not to be included in the statistics calculation, select it with the cursor keys and press the [Un/Mark] softkey. These results will be labeled by an exclamation mark (!). The recalculation of the statistics results will occur immediately.

10.3 Single Curves

Titration curves can be viewed by pressing the [Show curves] softkey on the main page.



The representation of the curve may be modified in the same way as on the result pages. All modifications are local and volatile, i.e. modifications on the 'Curves' page will not change the current method.

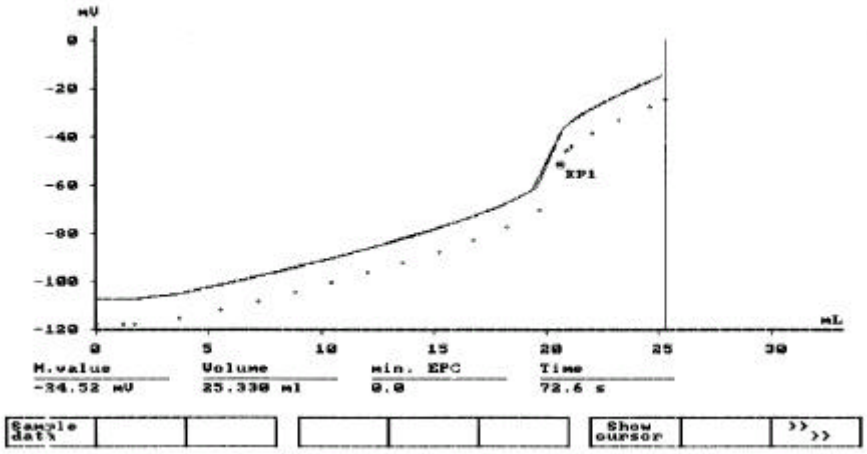
The following softkeys act like those on the result pages

[* Params] [* Formula] [* Report] [Common vars] [Calib. Data] [Sample data]

If more than one curve has been produced in a determination, you can select one of them by pressing the [Record] softkey and choosing a curve from the appearing picklist.

Press [Select curve] to view curves of other determinations. You can then choose a determination from the list of the determinations currently present in the working memory. Furthermore you can select an individual curve if there are more than one per determination.

You may want to view the data set of each measuring point or the data of each endpoint found. Just press the [Show cursor] softkey of the second softkey list and select whether you wish to view measuring point data or endpoints.
With the cursor keys <left> and <right> you can now move a vertical line cursor (or a cross-hairs cursor for endpoints) from one measuring point to another. The corresponding values for measured value, volume, minimum endpoint criterion and time will be displayed at the bottom of the screen. This feature is also available for overlayed curves.



10.4 Overlaying Curves

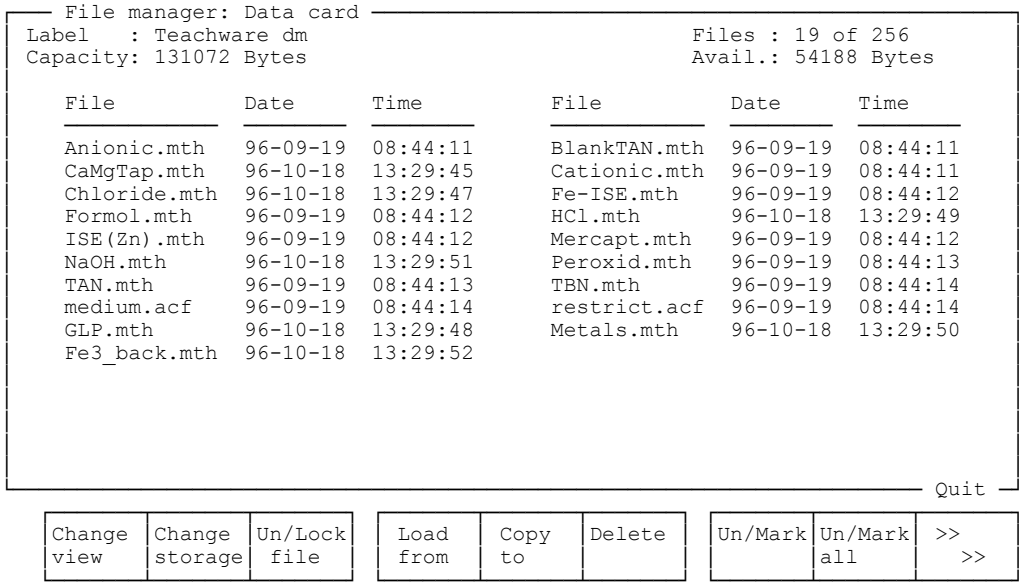
Multiple curves of the same type (same method, same modes, same displayed quantities) may be overlaid and visually compared on the screen. Make sure you have loaded the corresponding determinations in the working memory. Use the file manager to do so.

First load a curve to display and set the display settings you want to apply. Then press [Add curves] to display the list of the curves to be compared in the working memory. You can now select one or more curves by holding the <Shift> key and then press the <Cursor up> or <Cursor down> key. The selected curves will be marked with a 'Ö' sign and be displayed after pressing the <ENTER> key. The same procedure will work for deselecting a curve.
Overlaid curves will be displayed in light gray. Use the <Cursor up> and <Cursor down> keys to select a particular curve. It will then become black and may be used for displaying the measuring point or endpoint values (see above).

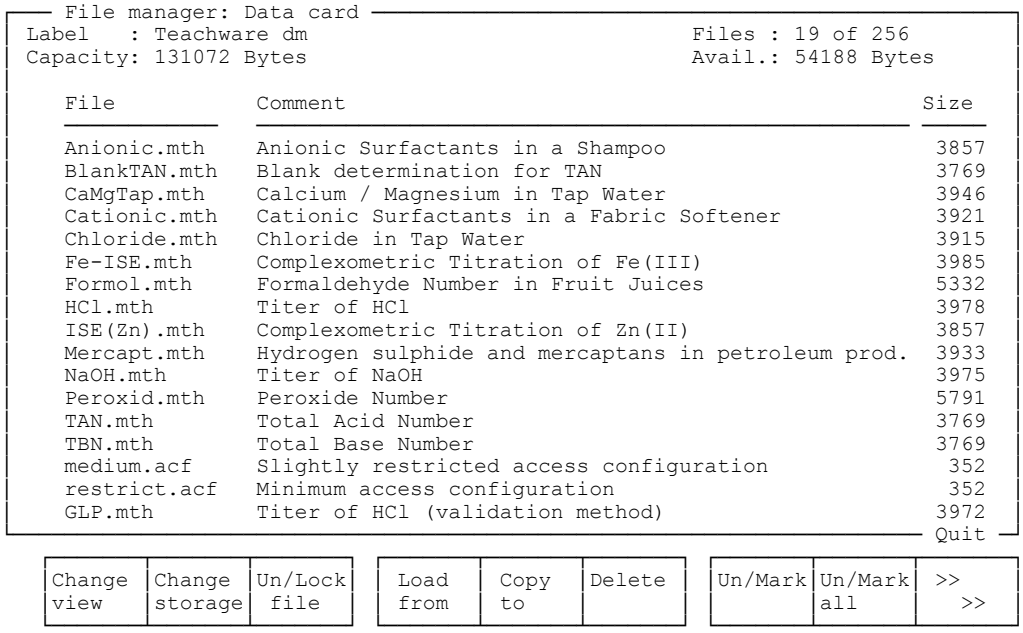
11 File Manager

11.4 The File List

The file manager of the 726 Titroprocessor is a useful tool for managing data files, methods, silo files or access control files.
The file manager is accessible via the [File manager] softkey on the main page.



The file manager page shows the content of one storage location in a window (use <PG UP> or <PG DN> to scroll). A file list can be displayed in two different views. Use the [Change view] softkey to switch from file name/date/time view (see above) to the file name/comment/size view (see below) and vice versa.

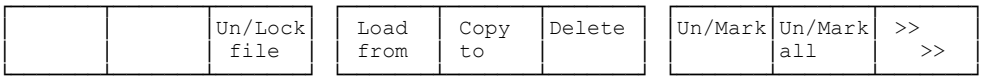


Any file operations can be executed in the working memory, the internal storage or on a data card. Furthermore any files can be sent to or received from a computer via an RS232 interface (use the 6.2125.060 cable and the 726 Backup software). The capacity of each storage location is limited to 256 files.

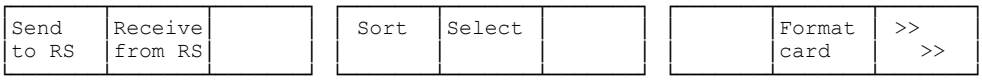
The storage location can be switched using the [Change storage] softkey.

11.5 File Operations

It is strongly recommended not to remove a data card during file operations.

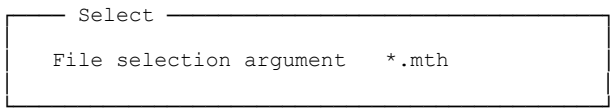


The softkey list can be switched by pressing the [>> >>] softkey.



Any file can be protected against deletion. The softkey [Un/Lock file] will mark or unmark a file as locked. A locked file must be unlocked before it can be deleted.

Copying or deleting files can be executed with single or with multiple files. Use the [Un/Mark] or [Un/Mark all] softkeys to select multiple files. You can either mark files using file selection criteria to mark a distinct group of files. Press [Select] for this purpose.



The wildcards for file selections:

*	any character or character string
?	any single character
#	any numeric character

To copy the all marked files press [Copy to] and select the target location (Working memory, Internal storage or Data card).
To delete all marked files press the [Delete] softkey and confirm the appearing system warning with <Y>.

The [Load from] softkey may serve to copy any files from a selectable location to the displayed storage location.
In this way you can store the current method, the sample silo and determination files that are held in the working memory directly to the storage location which contents are shown on the screen.

The file list can be sorted by file name in alphabetical order (case sensitive) by pressing the [Sort] softkey.

11.6 File Backup

It is a good idea to backup method or determination files on a Personal computer at regular intervals. Files can be sent via RS232 interface to a PC and be stored on a hard disk or any other disk media.
You require the Metrohm '726 Titroprocessor Backup' software and a serial 6.2125.060 cable to connect the Titroprocessor and the PC.

Interface configuration for file backup:

- Connect the serial cable to the RS232 socket 1 or 2 on the Titroprocessor and the COM1 or COM2 port of the Personal Computer.
- Under [Config.] [Interfaces] the communication mode of the corresponding RS232 interface has to be set to 'LIMS'.
- Set the transmission parameters for the corresponding RS232 interface as follows:

  For sending files:

Baud rate	9600
Data bit	8
Stop bit	1
Parity	none
Handshake	Hwshort
Receive mode	off

  For receiving files:

Baud rate	2400
Data bit	8
Stop bit	1
Parity	none
Handshake	Hwshort
Receive mode	on

  The settings of the backup software always have to correspond.

- Switch on the 'Receive' or 'Send' mode of the backup software on the PC before you press the [Send to RS] or [Receive from RS] softkey on the 726 to start a file transmission. After the selection of the RS232 interface the transmission will be executed.

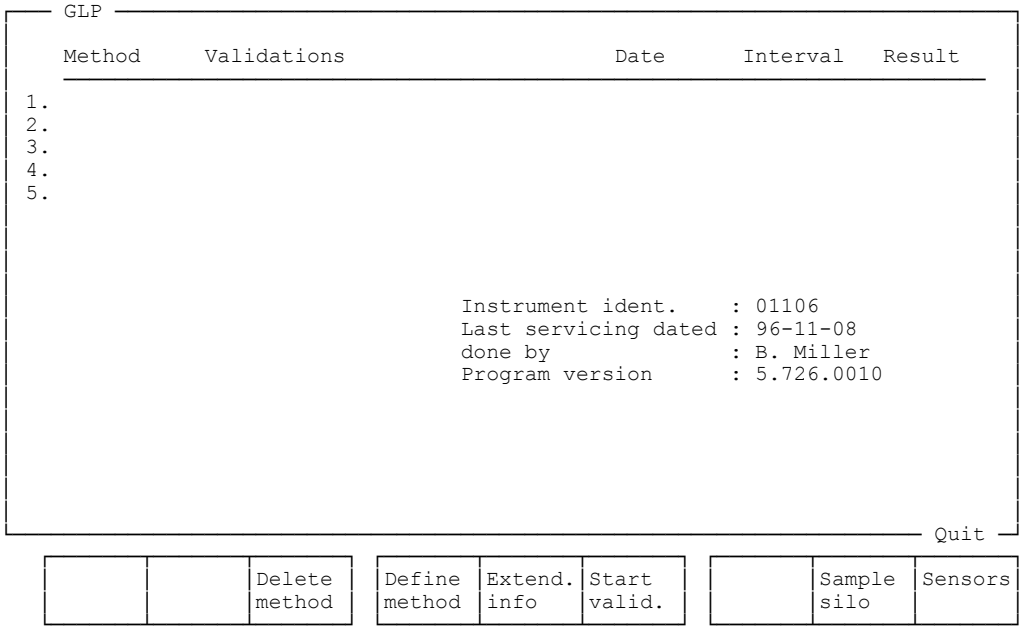
12 GLP Functions

The 726 Titroprocessor supports the supervision of servicing intervals as well as system validation and sensor tests.

12.4 Servicing Intervals

The maintenance of the 726 Titroprocessor should include a yearly service check carried out by a specialist from your Metrohm supplier.
The service engineer will update the service data and enter an appropriate service interval.
When the service interval has expired, the 726 Titroprocessor will display a warning at start-up and advice the user to ask for a Metrohm Service.

The service data can be inspected on the GLP page. It is accessible by pressing the <GLP> key on the keyboard.



The service data will be updated by the service engineer.

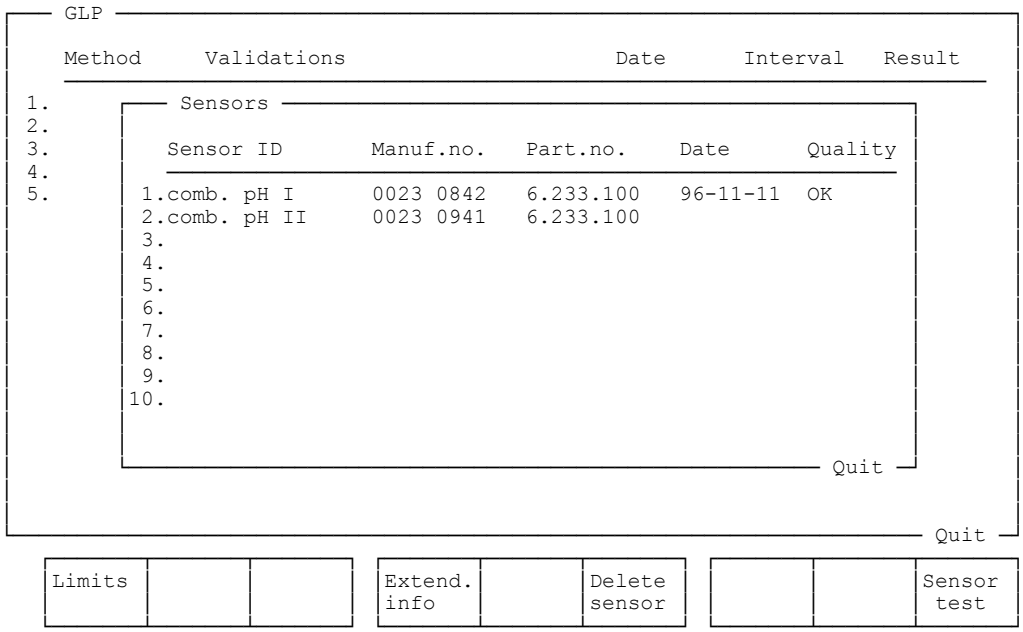
12.5 Sensor Test

The 726 Titroprocessor offers a sensor test procedure that allows you to determine whether your pH electrode is still working properly. For each sensor, separate limits can be defined that must be fulfilled during the a sensor test to ensure the suitability of the sensor for a specific (or common) application.

The sensor test consists of an extended calibration with automatic control of the stirrers Int.A or Int.B. The test can be carried out with any buffer set containing the buffers pH 4 and pH 7. While we recommend to use Metrohm buffers, other buffer sets can be used as well.

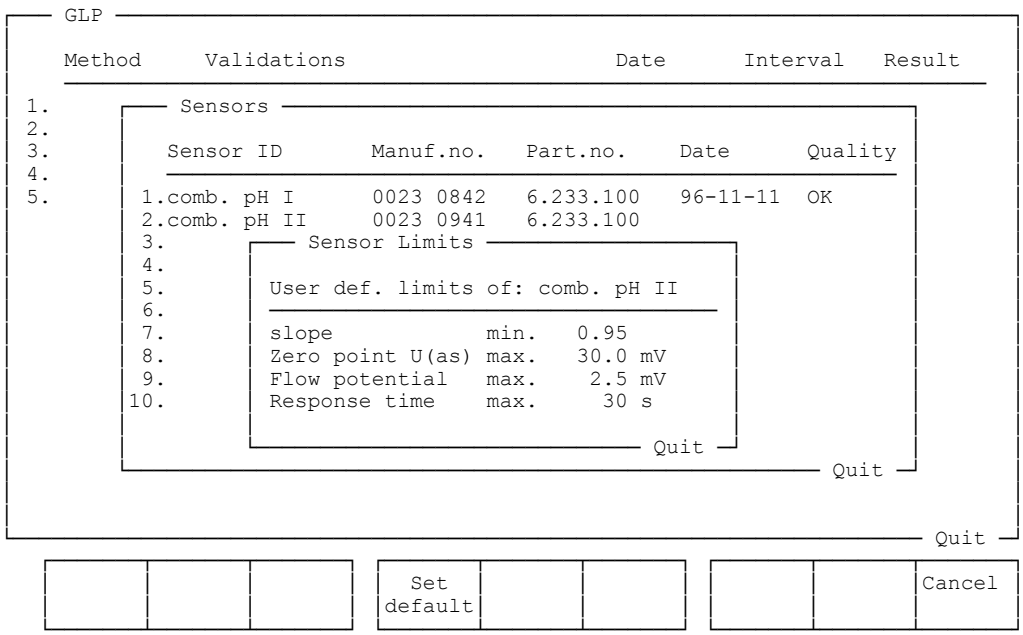
12.5.1 Defining a sensor list

Press the <GLP> key on the main page and then the [Sensors] softkey.



Ten sensors can be defined in a list. The test data of each listed sensor will be stored and may be viewed and updated at any time.

To define the limits press [Limits]. In the appearing dialog window you can adjust the limits to the applications this specific sensor is used for. If a sensor is not used for measurements but for titrations only, the limits may be set less restrictively. The screen depicted below shows the recommended default values for common applications. These settings may be recalled at any time by pressing the [Set default] softkey.



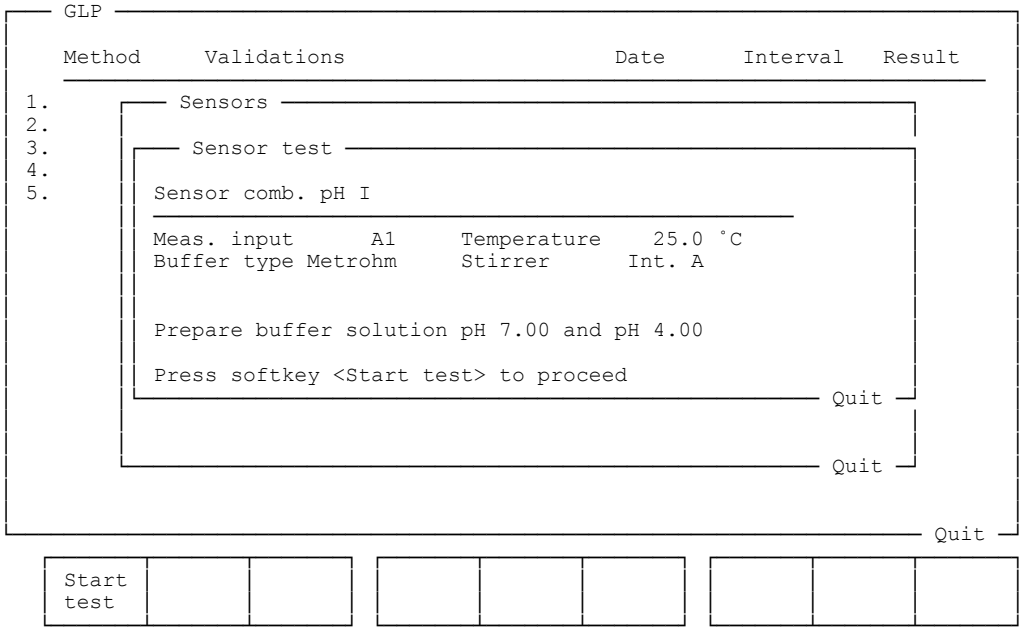
Limits can be defined for:

Slope	electrode slope determined by calibration
Zero point	asymmetry potential at pH 7 (U_{as})
Flow potential	potential difference with stirred – non stirred buffer
Response time	maximum time for sensor equilibration

Changes in limit settings can be rejected by pressing the [Cancel] softkey.

12.5.2 How to perform a Sensor Test

Enter an identification for the sensor(s) and add its manufacturing and part number. Place the cursor in the line of the sensor to be tested and press [Sensor test].



The sensor has to be plugged into the measuring input A1, A2, B1 or B2. A magnetic stirrer should be connected to the stirrer output 1 (Internal A)or 2 (Internal B) on the back panel of the Titroprocessor, which will control the stirrer automatically. Prepare two beakers containing buffer solutions pH 7 and pH 4. The buffer type can be entered in the dialog window 'Sensor test'. The measuring temperature can be determined automatically when using a pH electrode with built-in Pt100 or Pt1000 temperature sensor or a separate temperature sensor. The measuring temperature will be considered in the sensor test.
Fill in the necessary entries in the 'Sensor test' window.

After the [Start test] softkey has been pressed, the test runs automatically.

Sequence of the sensor test:

- After starting the test you have to immerse the sensor into the first buffer solution (pH 7) within five seconds.

- The stirrer will be switched on and the potential monitored during three minutes.
- The stirrer will then be switched off and the potential monitored for an additional minute.
- The buffer then has to be exchanged (pH 4) and the same procedure started again by pressing [Next].
- The resulting test data will be displayed after completion of the sensor test.

```
┌─── Sensor test ──────────────────────────────────────────────────┐
│                                                                  │
│ Meas. input  A1                                                  │
│ Temperature   25.0°C                                             │
│                                                                  │
│ Buffer           ** pH 7.0 **            ** pH 4.0 **            │
│ Time/min      U/mV   Drift/mV/min     U/mV   Drift/mV/min        │
│ ----------    -------------------     -------------------        │
│ 1  stirred      -1.4       0.1         171.5      -0.1           │
│ 2  stirred      -1.0       0.3         171.9       0.1           │
│ 3  stirred      -1.2       0.1         171.4       0.3           │
│ 4               -1.3       0.0         177.5      -0.2           │
│                                                                  │
│ Response time      9.0 s  OK              11.0 s  OK             │
│ Flow pot.          0.3 mV OK               0.2 mV OK             │
│ ---------------------------------------------------------        │
│                                                                  │
│    Slope    0.974    OK                                          │
│    U(as)     -0.7 mV OK                                          │
│    pH(as)   6.988              Summary: OK                       │
└──────────────────────────────────────────────────────────── Quit ─┘
```

The test results of a sensor may be viewed later by pressing the [Extend Info] and the [Full info] softkey. The test results of the previous sensor test will also be displayed.

12.6 System Validation

GLP (Good Laboratory Practice) requires the periodic checking of analytical instruments for reproducibility and accuracy using standard operating procedures (SOP).
Validate the 726 Titroprocessor as a complete, integrated titration system. Perform a series of titrations (preferably titer determinations) using standard titrimetric substances (primary standards). The assessment of the results and the monitoring of the validation intervals can be taken over by the Titroprocessor.
The limits for the assessment of reproducibility and accuracy of the determinations may be set individually to meet the requirements of your applications.

The validation can be done with any determination method that is stored in the internal storage or on a data card. A simple modification of the calculation will ensure the correct evaluation of the relevant data.

- The result for the statistical calculations
  RT1=…

- The theoretical result
  RT2=…

- The endpoint used for the calculation of the systematic error
  RE=EPx (x=0…9)

Example for a titer determination of hydrochloric acid using TRIS as sample.

```
* Formula

 #  Comment        Formula (R$$, C##, X$$, EP# ..)      Unit   .#

* 1 Titer          RT1=SS*1000/0.1/121.14/EP1                  4
* 2 Theor.titer    RT2=1.0000                                  4
* 3 Consumption    RE=EP1                               mL     3
  4
```

The method has to be saved.

12.7 Preparing a Validation

Recall the main page and press the <GLP> key.

```
GLP

   Method     Validations                     Date      Interval   Result

1. HCl        Validation method               96-11-14  12 month(s) OK
2.
3.
4.
5.

                           Instrument ident.    : 01106
                           Last servicing dated : 96-11-08
                           done by              : D. Miller
                           Program version      : 5.726.0010

                                                                  Quit

|        |        | Delete | | Define | Extend.| Start  | |        | Sample | Sensors |
|        |        | method | | method | info   | valid. | |        | silo   |         |
```

Five different validation methods may be defined, for different purposes. Select a line and press the [Define method] softkey.

```
Validation Method Definition

   Method    HCl     .mth
   Comment   Validation method potentiometric
   Storage    Internal

   Limits

   Mean value                        0.995    1.005
   Standard deviation absolute  ±    0.003
                      relative  ±      0.3 %
   Systematic deviation d(rel)  ±      0.1 %
   Systematic error (intercept) ±    0.010 mL

   Validation interval            12 month(s)

                                                                  Quit
```

Select a storage location (Internal or Data card) and a stored method. You can use the <Space> key or the [Select] softkey for opening a picklist to choose from. Add a comment and modify the limits for the validation results.

12.8 The Limits and their Meanings

The validation results will provide you with a reliable assessment of the accuracy and reproducibility of the titration system including dosing drives and sample changer.

`Mean value`

The mean value of all determination results (RT1) of the validation series. At least 10 determinations should be performed. We recommend titer determinations as validation methods.
Default limits 0.995…1.005

`Standard deviation absolute`

Absolute standard deviation of the results (RT1) of the validation series.
Default limit ± 0.003 (for titer determinations)

`Standard deviation relative`

Relative standard deviation in percent.
Default limit ± 0.3 %

`Systematic deviation d(rel)`

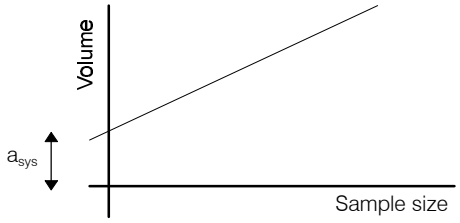
Systematic deviation of the mean resultat vs. theoretical result (RT2).

$$d_{rel} = \frac{result_{mean} - result_{theo}}{result_{theo}} * 100$$

Default limit ± 0.1 %

`Systematic error` (a_{sys})

Systematic error due to disturbing influences such as solvent blank values or method-inherent imperfections. It is determined by the intercept of the linear regression of the endpoint volumes (RE) vs. sample sizes (SS).



Default limit ± 0.010 mL

`Validation interval`

Time interval for the expiration of the validation. When a validation has expired a message will appear at each startup of the Titroprocessor.
Default limit '`12 month(s)`'

Press the [Sample silo] softkey on the GLP main page to enter the sample data. The sample sizes should scatter randomly within wide ranges. The sample silo can be saved and restored later.

The validation can be started by pressing the [Start valid.] softkey. You will be asked then to answer the following questions:

```
Do you really want to overwrite actual method [y]
Do you really want to reset all statistics data [y]
Do you want to set statistics "on" [y]
Do you want to set silo "on" [y]
Do you want to set auto start "on" [y]
Did you set up all necessary silo data [y]
Do you change samples manually [n]                (*)
Accept all previous settings [y]
```

If you confirm all default settings by pressing <enter> you can proceed with the validation after entering your user name.

```
Validation from xx-xx-xx done by user: [                  ]
```

Explanation:

It is recommended to save all actual data (method and determinations) before performing a validation. Correct statistical calculations require the clearing of the working memory.
Validations should be done with auto start and silo „on“. If a sample changer is connected, you are free to choose to use the changer or to change the samples manually, see (*).

After finishing the validation series a validation report will be printed automatically and the results may be viewed on the GLP page (<GLP> key).

13 Access Control Configuration

The dialog can be restricted to avoid data loss or method modification by unskilled personnel. Softkeys and some hotkeys on the keyboard can be hidden or disabled respectively. This may result in a simpler user dialog.

The modification of access control files can be accessed under [Config.] / [Access control] or simply by pressing <ALT><A> on the MAIN PAGE. The access control configuration can be protected with a password.

Password protected configuration files (*.acf) may be copied to another Titroprocessor and can be loaded via [Config.] / [Access control] / [File]. The original password will be copied too.

14 Technical Specifications

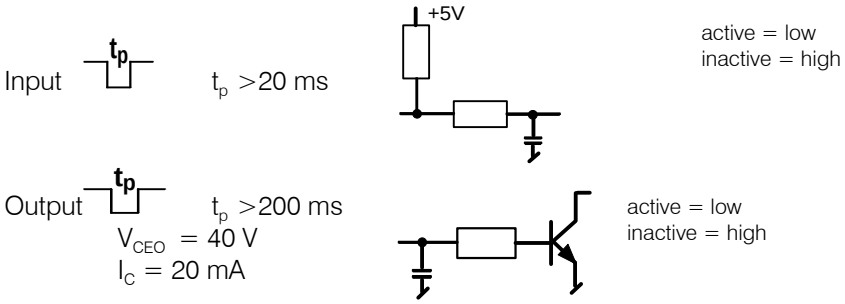
14.4 Brief Characterization

Compact titration and measuring instrument for analyses in the laboratory and plant. Connection possibilities for 1 or 2 sample changers, 4 potentiometric sensors (pH / mV), 2 polarizable electrodes, 2 temperature sensors.

Circuitry based on SMD technology, 32-bit microprocessor, 16 MHz clock frequency, 2 Mbyte battery-backed SRAM, 3 Mbyte EPROM.

Genuine multitasking with dynamic memory management.

Dimensions	*Height*	With built-in printer 205 mm, without printer 175 mm
	Width	405 mm
	Depth	500 mm
Weight	With built-in printer 12.6 kg, without printer 11.1 kg	
Material	*Housing*	Polyurethane rigid foam with fire protection for fire class UL94VO, FCHC-free
Power supply	*Line voltage*	100…120 V ± 10 %, 220…240 V ± 10 %
	Line frequency	50…60 Hz
	Power consumption	Max. 160 VA
	Fuse	2 ATH (slow-blow, high breaking capacity) 5 mm Ø, length 20 mm
Screen	*Type*	LCD screen, backlit
	Screen diagonal	257 mm
	Resolution	640 x 400 dots, 4 grey levels; 28 lines each of 80 characters
	Refresh rate	72 Hz
	Contrast	Adjustable
Keyboard	Tactile touch keyboard with action point, splashwater-proof	
Interfaces	2 x RS 232C for serial data communication with balance, PC or printer	
	Standard	EIA RS232C, CCITT V.24, ISO 2110, DIN 66020
	Socket	D-subminiature 25-pin
	Max. baud rate	9600
	Remote interface for the control of external devices	
	Type	Logical control lines
	Lines	8 Output (open collector), V_{CE} = 40 V, I_C = 20 mA 8 Input, (pull-up 5 V) 1 Power supply, 4…5.5 V, 200 mA 1 GND



Printer (option)

Type	Thermal printer
Paper	6.2237.040 Continuous thermal paper A4, perforated
Resolution	84 dpi in alphanumeric mode 160 dpi in graphics mode

Connections

· Bar-code reader connection for data entry

Connector	D-subminiature 9-pin (RS232C style)	
Transmission settings	Baud rate	9600
	Data bit	8
	Stop bit	1
	Handshake	RTS/CTS
String terminator	CR/LF	
Input buffer	40 characters	
Character set	7-Bit ASCII	

Pin assignment			
Pin 1	empty	Pin 6	empty
Pin 2	TxD (output)	Pin 7	RTS (output)
Pin 3	RxD (input)	Pin 8	CTS (input)
Pin 4	empty	Pin 9	+5 V
Pin 5	GND (0 V)		

Wiring	*726 socket*		*Bar-code reader*
	TxD	→	RxD
	RxD	←	TxD
	RTS	→	CTS
	CTS	←	RTS
	GND	—	GND
	+5 V	→	+5 V

· Connections for four 700 Dosinos or 685 Dosimats

Connector	D-subminiature 9-pin

· 1 or 2 stirrer connections for 728 Magnetic Stirrer

Output voltage	10.8…13.2 V
Current	250 mA

Short-circuit-proof and switchable

· Metrohm external bus connection for
  · Two 717 Sample Changers
  · Two Dosimat interfaces each for four 700 Dosinos or 685 Dosimats

· Printer connector (option), parallel port for standard printer

Connector	D-subminiature 25-pin

Measurement group

1 or 2 (option) measurement groups each with

- 2 high-impedance measurement inputs for pH, redox, ISE sensors
- 1 input for separate reference electrode
- The above inputs also serve as a differential amplifier
- 1 measurement input for polarised electrodes
- 1 measurement input for Pt 1000 or Pt 100 temperature sensors, with automatic recognition
- 1 polarizer
- 2 parallel deltasigma A/D-converters, 20 bit, 50 ms sampling rate
- 1 stirrer connector (see above)

Electrical insulation

All interface signals are referred to a common reference potential. The reference source is electrically insulated from the main circuit. Each measurement interface is insulated individually as well.
The electrical insulation is due to the measuring technique. It does not comply with certain security specifications.

Measurement ranges

Potentiometric	–2500 mV…2500 mV
	pH –20.000…20.000
Amperometric	–250 µA…250 µA (Upol)
Voltametric	–2500 mV…2500 mV (Ipol)
Temperature	–150 °C…450 °C

Measuring inaccuracy

Limits	*Inputs*	*Abs. error*	*Resolution*
	Ind A1, A2, B1, B2	≤ ± 0.8 mV	5 µV
	Diff A, Diff B	≤ ± 4.0 mV	5 µV
	Pol (µA, Upol)	≤ ± 3 µA	0.001µA
	Pol (mV, Ipol)	≤ ± 20 mV	5 µV
	Pt100/1000		
	0°C…100°C	≤ ± 0.3°C	0.005°C

Reference conditions

The measurement error limits are guaranteed at works, measured at an ambient temperature of 25°C (± 5°C) after 5 min. operating time.

The error limit of the temperature measurement applies to the socket contact resistance as well as to the sensor cable of the Metrohm (6.1103.0000) Pt100 Temperature Sensor. It does not consider the sensor inaccuracy.

Polarizer source accuracy

Polarizer voltage (Upol)

Range	-1270 mV…1270 mV
Linearity	≤ ± 20.0 mV
Resolution	10.0 mV

Polarizer current (Ipol)

Range	-127 µA…127 µA
Linearity	≤ ± 3.0 µA
Resolution	1.0 µA

Ambient temperature	*Nominal operating range*	5…40 °C
	Storage, transport	–25…60 °C
Ambient atmospheric humidity	*at £40 °C*	max. 95% relative humidity
	at 45°C	max. 70% relative humidity
	at 60°C	max. 35% relative humidity

Titration and measurement modes

DET	Dynamic equivalence-point titration; U, pH, I_{pol}, U_{pol}
MET	Monotonic equivalence-point titration; U, pH, I_{pol}, U_{pol}
SET	Titration to preset endpoint; U, pH, I_{pol}, U_{pol}
SEC	Conditioning to preset endpoint; U, pH, I_{pol}, U_{pol}
KFT	Karl Fischer endpoint titration; I_{pol}, U_{pol}
KFC	Conditioning according to Karl Fischer; I_{pol}, U_{pol}
MEAS	Measurement; U, pH, I_{pol}, U_{pol}, T
CAL	pH calibration

Memories	*Program memory*	EPROM, max. 4 MB
	Data memory	2 MB SRAM, battery backed
	Determination memory	for up to 20 determination data records each with up to 5 titrations or measurements
	Method memory	for freely definable sequence, up to 99 command lines
	Silo memory	sample data memory for up to 160 sample data records
	File memory	free RAM area for the storage of determinations, methods, sample data tables
Memory card	*Type*	Memory card according to standard JEIDA 4.X / PCMCIA 2.X (68 pins)
	Memory capacity	128 kB (6.2245.010); other versions up to 2 MB

Safety specifications Construction and testing in accordance with IEC 1010 / EN 61010 / UL 3101-1, protection class I
Degree of protection IP 52

The instruction manual contains information and warnings which the user should follow to guarantee the safe operation of the instrument.

Electromagnetic compatibility (EMC)

Emitted interference The 726 Titroprocessor complies with the basic specifications EN 50081-1 01.92, EN 55011 (class B), EN 55022 (class B), and NAMUR.

Noise immunity The standards EN 50082-2: 1995, IEC801-2 up to IEC801-6, EN 60555-2 and NAMUR are complied with.

CE

14.5 EC Declaration of Conformity

The METROHM AG company, Herisau, Switzerland hereby certifies, that the instrument:

726 Titroprocessor

meets the requirements of EC Directives 89/336/EWG and 73/23/EWG.

Source of the specifications:

EN 50081-1 01.92 Electromagnetic compatibility, basic specification
Emitted Interference
EN 50082-2:1995 Electromagnetic compatibility, basic specification

Interference Immunity
EN 61010 Safety requirements for electrical laboratory measurement and control equipment

Description of the instrument:

Highly integrated titrator for analytical purposes in laboratory and industry; master device for titration and measuring systems in conjunction with peripheral dosing devices, sample changers and various sensors.

Herisau, September 10, 1996

Dr. J. Frank

Development Manager

Ch. Buchmann

Production and
Quality Assurance Manager

14.6 Certificate of Conformity and System Validation

This is to certify the conformity to the standard specifications for electrical appliances and accessories, as well as to the standard specifications for security and to system validation issued by the manufacturing company.

Name of commodity:	726 Titroprocessor	
System software:	Stored in ROMs	
Name of manufacturer:	Metrohm Ltd., Herisau, Switzerland	
Principal technical information:	Voltages:	100…120, 220…240 V
	Frequency:	50…60 Hz

This Metrohm instrument has been built and has undergone final type testing according to the standards:

IEC801-2/IEC1000-4-2 (level 4), IEC801-3 (level 2), IEC801-4/IEC1000-4-4 (level 3), IEC 801-5/IEC1000-4-5 (level 2/3), IEC801-6/IEC1000-4-6 (level 2), EN55011 / class B, EN55022 / class B, EN50081-1 01.92, EN 50082-2:1995, EN60555-2 — *Electromagnetic compatibility*

IEC1010, EN61010, UL3101-1 — *Security specifications*

It has also been certified by the Swiss Electrotechnical Association (SEV), which is member of the International Certification Body (CB / IEC).
The technical specifications are documented in the instruction manual.
The system software, stored in Read Only Memories (ROMs) has been validated in connection with standard operating procedures in respect to functionality and performance. The features of the system software are documented in the instruction manual.

Metrohm Ltd. is holder of the SQS-certificate of the quality system ISO 9001 for quality assurance in design/development, production, installation and servicing.

Herisau, Sept. 10, 1996

Dr. J. Frank	Ch. Buchmann
Development Manager	Production and Quality Assurance Manager

15 Accessories

15.4 Titroprocessors

726 Titroprocessor with 1 measurement group, without printer	**2.726.0010**
includes the following accessories:	
Data card (SRAM) JEIDA4/128 Kbyte	6.2245.010
Dust cover	6.2723.280
Application card (FLASH card)	6.6024.000
Metrodata 726 PC Backup software	6.6026.000
Short introduction manual	6.726.1023

726 Titroprocessor with 1 measurement group, with built-in printer	**2.726.0020**
includes the following accessories:	
Data card (SRAM) JEIDA4/128 Kbyte	6.2245.010
Thermal paper, roll of app. 40 m	6.2237.040
Paper reel, axis for thermal paper roll	6.2241.020
Dust cover	6.2723.280
Application card (FLASH card)	6.6024.000
Metrodata 726 PC Backup software	6.6026.000
Short introduction manual	6.726.1023

726 Titroprocessor with 2 measurement groups, without printer	**2.726.0110**
includes following accessories	
Data card (SRAM) JEIDA4/128 Kbyte	6.2245.010
Dust cover	6.2723.280
Cable for 622/703/728 stirrer	6.2108.110
Application card (FLASH card)	6.6024.000
Metrodata 726 PC Backup software	6.6026.000
Short introduction manual	6.726.1023

726 Titroprocessor with 2 measurement groups, with built-in printer	**2.726.0120**
includes the following accessories:	
Data card (SRAM) JEIDA4/128 Kbyte	6.2245.010
Thermal paper, roll of app. 40 m	6.2237.040
Paper reel, axis for thermal paper roll	6.2241.020
Dust cover	6.2723.280
Cable for 622/703/728 stirrer	6.2108.110
Application card (FLASH card)	6.6024.000
Metrodata 726 PC Backup software	6.6026.000
Short introduction manual	6.726.1023

15.5 Options

Accessories to separate order at additional charge:

Dosing drives

685 Dosimat		**2.685.0010**
Cable 685 — 726		6.2134.000
Exchange Unit with ceramic stopcock		
	1 ml	6.3013.113
	5 ml	6.3013.153
	10 ml	6.3013.213
	20 ml	6.3013.223
	50 ml	6.3013.253
Exchange Unit with PTFE stopcock		
	1 ml	6.3014.113
	5 ml	6.3014.153
	10 ml	6.3014.213
	20 ml	6.3014.223
	50 ml	6.3014.253
700 Dosino		**2.700.0010**
Dosing unit for Dosino	2 ml	6.3030.120
	5 ml	6.3030.150
	10 ml	6.3030.210
	20 ml	6.3030.220
	50 ml	6.3030.250
729 Dosimat Interface		**2.729.0010**
728 Magnetic Stirrer		**2.728.0040**
Ti-Stand 727 with		**2.727.0010**
Rod Stirrer		2.722.0010
Ti-Stand 727 with Magnetic Stirrer		**2.727.0100**
Ti!Stand 703		**2.703.0010**

Sample Changer 717

717 Sample Changer with 1 work station, 1 pump	2.717.0010
717 Sample Changer with 1 work station, 2 pumps	2.717.0020
717 Sample Changer with 1 work station, no pump	2.717.0030
717 Sample Changer, 2 work stations, 1 pump each	2.717.0110
717 Sample Changer, 2 work stations, 2 pumps each	2.717.0120
717 Sample Changer, 2 work stations, no pumps	2.717.0130

722 Rod stirrer for the sample changer	
Rod stirrer	2.722.0020
Stirrer propeller PP (104 mm)	6.1909.020
741 Magnetic stirrer	
Magnetic stirrer	2.741.0010
Macro Titration head (6x NS14, 3x NS9)	**6.1458.010**
Micro Titration head (4x M10)	**6.1458.020**

Sample racks and beakers

Rack 12x 250 ml M12-0 *)	**6.2041.310**
Metrohm glass beaker 250 ml	6.1432.320
Metrohm PP beaker 200 ml	6.1453.220
Metrohm PP beaker 250 ml	6.1453.250
Rack 12x 150 ml M12-0 *)	**6.2041.360**
for standard glass beaker 150 ml (narrow) or disposable beaker (Euro) PP 200 ml (1000 pcs.)	6.1459.310
Rack 14x 200 ml M14-0	**6.2041.370**
for disposable beaker (Euro) PP 200 ml 6.1459.310	
Rack 14x 8 oz M14-0	**6.2041.380**
for disposable beaker (US) PP 8 oz	
Rack 16x 150 ml M16-0	**6.2041.320**
for standard glass beaker (narrow)	
Rack 24x 75 ml M24-0 *)	**6.2041.340**
(with Micro titration head only)	
Metrohm glass beaker 75 ml	6.1432.210

*) Parallel processing at 2 towers possible

Other sample racks on request.

Electrodes

comb. pH glass electrode with SGJ, without cable	6.0233.100
comb. pH glass electrode, without cable	6.0232.100
comb. micro pH glass electrode, without cable 6.0234.100	
comb. pH glass electrode with built-in temperature sensor, with SGJ	6.0238.000
Temperature sensor (Pt1000) with SGJ, no cable	6.1110.100
Electrode cable, 1m	6.2104.020
Cable for temperature sensor	6.2104.080
SGJ sleeve for electrode without SGJ	6.1236.040

Electrodes for Sample Changers

It is recommended to use Longlife-Electrodes (LL) or titrodes (without polished glass surface) with the SGJ sleeve SGJ14/12mm 6.1236.040 made of silicon caout-chouc for titrations with the Macro Titration head.

The following special changer electrodes can be used with the Micro Titration head.

Comb. micro-pH-electrode (LL)	16 cm	6.0234.110
Micro reference electrode Ag/AgCl	16 cm	6.0736.100
Micro glass electrode	16 cm	6.0134.110
Micro-Ag titrode	16 cm	6.0433.110
Micro-Pt titrode	16 cm	6.0434.110
Micro-Au titrode	16 cm	6.0435.110

Bar-code Reader

On request