

**NGA 2000**

# **Software Manual**

## **MLT Analyzer**

### **MLT Analyzer Module**

(combined with NGA 2000 platform /  
MLT analyzer / TFID analyzer  
or customer-developed control unit)

**Software Version 3.2.X**

2<sup>nd</sup> Edition 07/98

Catalog No.: 90 003 482

This Operation Manual includes information about the operation of the instrument. Information about the additional indications and notes regarding maintenance, troubleshooting and repair are found in the accompanying Maintenance & Operation Manual.



Troubleshooting, component replacement and internal adjustments must be made by qualified service personnel only.

**Fisher-Rosemount GmbH & Co** does not take responsibility for any omissions or errors in this manual. Any liability for direct or indirect damages, which might occur in connection with the delivery or the use of this manual, is expressly excluded to the extent permitted by applicable law.

This instrument has left the works in good order according to safety regulations. To maintain this operating condition, the user must strictly follow the instructions and consider the warnings in this manual or provided on the instrument.

Misprints and alterations reserved

©1998 by FISHER-ROSEMOUNT GmbH & Co. (ETC/PAD)

*1<sup>st</sup> Edition: 04/98*

*2<sup>nd</sup> Edition: 07/98*



Read this operation manual carefully before attempting to operate the analyzer !  
For expedient handling of reports of defects, please include the model and serial number which can be read on the instrument identity plate.

## **Fisher - Rosemount GmbH & Co.**

**European Technology Center**

 **Process Analytic Division**

**Industriestrasse 1**

**D - 63594 Hasselroth • Germany**

**Phone + 49 (6055) 884-0**

**Telefax + 49 (6055) 884-209**

**Internet: <http://www.processanalytic.com>**

# Contents

<b>1</b>	<b>Introduction</b>	<b>1 - 1</b>
<b>2</b>	<b>Structure of Menus</b>	<b>2 - 1</b>
<b>3</b>	<b>Startup and Operation, General Notes and Main Menu</b>	<b>3 - 1</b>
3.1	Starting and Initializing .....	3 - 1
3.2	Display and Function.....	3 - 2
3.3	"TAG" and Operating Keys .....	3 - 2
3.4	Lines and Softkey Functionality .....	3 - 3
3.5	Important Functions of the Softkeys.....	3 - 4
3.6	Entering/Changing of Variables.....	3 - 5
3.7	Starting a Function .....	3 - 6
3.8	Main Menu .....	3 - 7
<b>4</b>	<b>Basic Controls and Analyzer Module Calibration</b>	<b>4 - 1</b>
4.1	Analyzer Channel Status.....	4 - 3
4.1.1	Status Details – Failures .....	4 - 5
	– Maintenance requests .....	4 - 7
	– Function controls .....	4 -11
	– Measurements/Alarms.....	4 -13
	– Events.....	4 -15
	– Acknowledge and clear failures .....	4 -19
	– Acknowledge and clear maintenance requests .....	4 -23
	– Acknowledge and clear function controls.....	4 -27
4.1.2	Operational Settings.....	4 -31
4.2	Single Component Display - Change of Channel.....	4 -33
4.3	Multi Component Display - Change of Channel .....	4 -35
4.4	Calibration Procedure Status .....	4 -37
4.5	Zero Calibration.....	4 -39
4.6	Span Calibration.....	4 -43
4.7	Flow Zero Gas.....	4 -47
4.8	Flow Span Gas.....	4 -51
4.9	Flow Sample Gas.....	4 -55
4.10	Flow Test Gas .....	4 -59
4.11	Close all Valves.....	4 -63

<b>5</b>	<b>Analyzer and I/O-Module Expert Configuration</b>	<b>5 - 1</b>
5.1	<b>Analyzer Module Setup</b>	5 - 3
5.1.1	Calibration Parameters .....	5 - 5
	– Span gases .....	5 - 6
	– Tolerances .....	5 - 7
	– Calibration procedure setup .....	5 - 9
	– Time controlled calibration .....	5 -12
	– Calibration .....	5 -15
	– Advanced calibration methods .....	5 -18
	– Zero gases .....	5 -20
5.1.2	Alarm Parameters.....	5 -21
5.1.3	Range Parameters .....	5 -25
	– Begin and end of ranges.....	5 -27
	– Response times ( $t_{90}$ ) .....	5 -28
	– Autoranging control.....	5 -29
5.1.4	Cross Interference Compensation.....	5 -31
5.1.5	Linearization .....	5 -33
5.1.6	Programmable Logic Control (PLC).....	5 -37
5.1.7	Programmable Calculator .....	5 -45
5.1.8	Measurement Display Configuration.....	5 -49
5.1.9	Acknowledgement of Status Reports.....	5 -52
5.1.10	Concentration Measurement Parameters.....	5 -54
5.1.11	Peak Measurement .....	5 -55
5.1.12	Differential Measurement .....	5 -57
5.1.13	Gasflow Setup .....	5 -59
5.1.14	Pressure Compensation .....	5 -60
5.1.15	Flow Measurement .....	5 -62
5.1.16	Temperature Measurement.....	5 -63
5.1.17	Loading/Saving Configuration Parameters.....	5 -64
5.1.18	Inputs and Outputs .....	5 -67
	– Local SIO .....	5 -68
	– Local DIO .....	5 -74
	– Signal codes.....	5 -75
5.1.19	Delay and Average .....	5 -79
5.1.20	Special Functions .....	5 -81
5.1.21	AK-Protocol Communication .....	5 -82

5.2	<b>I/O Module Controls</b>	5 -83
5.2.1	SIO Module	5 -84
5.2.2	DIO Module(s)	5 -93
5.3	<b>I/O Module Setup</b>	5 -99
<b>6</b>	<b>System Configuration</b>	<b>6 - 1</b>
6.1	Diagnostic Menus.....	6 - 3
	6.1.1 Control Module Diagnostics.....	6 - 4
	6.1.2 Analyzer Module Diagnostics .....	6 - 5
6.2	Date and Time.....	6 - 6
6.3	Security Codes.....	6 - 7
6.4	Network Module Binding .....	6 - 9
6.5	System Reset.....	6 -11
6.6	System Modules.....	6 -12
<b>7</b>	<b>Display Controls</b>	<b>7 - 1</b>

**Index**

**Supplement: System Calibration**



# 1 Introduction

This software manual describes step by step how to operate successfully with the ½ 19" and 19" MLT analyzer module and analyzer of the **FISHER-ROSEMOUNT** NGA 2000 Series.

Chapter two shows the structure of the MLT software menus. Chapter three describes the display and the keyboard of the analyzer. Chapter four describes the basic controls with detailed illustrations. So you can easily compare the actual display of the analyzer module with the illustrations of the manual.

Chapter five describes the expert configurations of the analyzer module and of the Input/Output Modules (I/O modules). Chapter six describes the system configuration. The layout of both chapters is not as detailed as in chapter four. Normally, the way to a certain menu of the MLT software is described with the software catchwords you have to press to reach this menu. You will find the illustration of the corresponding LCD screen at the end of the catchword listing. After that you can read the meaning of the functions and variables of each expert or system configuration menu.

Some contents of the expert configurations are not important for each customer. It depends on the configuration of your NGA 2000 system, relative to the following components:

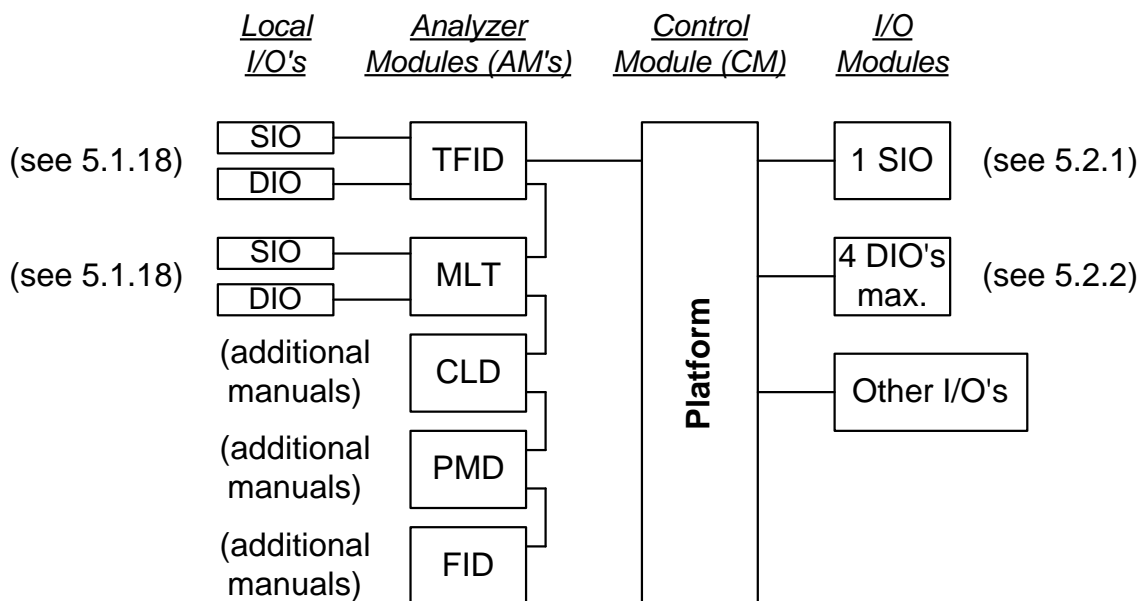
- ◆ Control Module                   **CM**
- ◆ Analyzer Module                   **AM**
- ◆ Input/Output Modules       **I/O's** (SIO = Standard I/O, DIO = Digital I/O,  
System Auto Calibration I/O, Analog Output with 3 Alarms I/O,  
Auto Calibration I/O)

You can distinguish the following system units and SIO/DIO configurations:

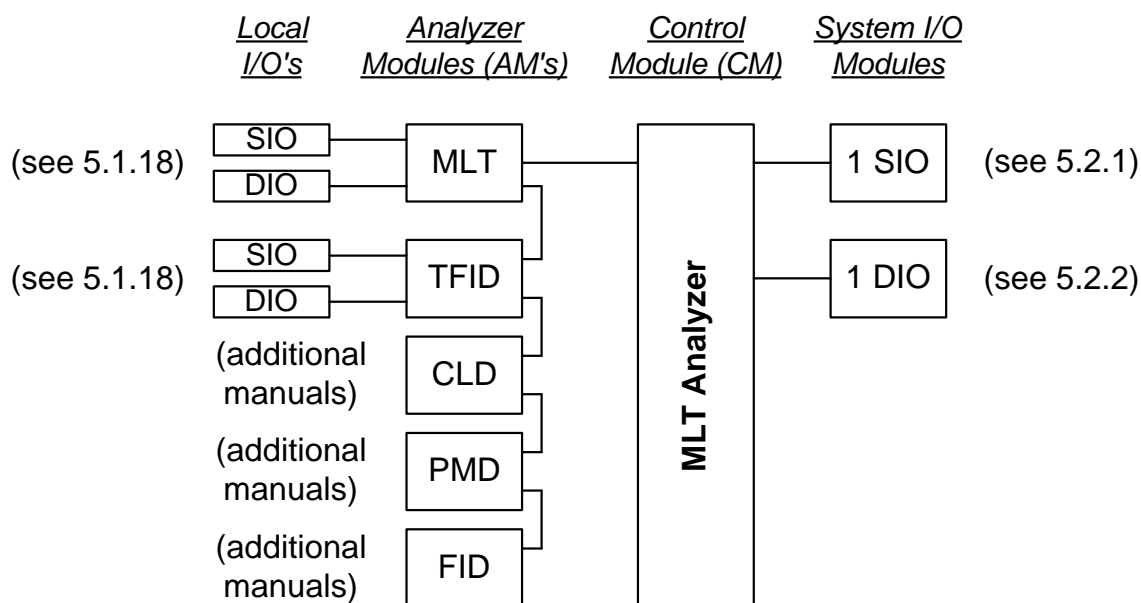
System Unit	SIO/DIO-Configuration	Section Page
<u>MLT analyzer module (AM):</u> <ul style="list-style-type: none"> <li>• without front panel, i.e. without control unit</li> <li>• can be combined with a platform, an MLT analyzer, a TFID analyzer or a customer developed control unit</li> </ul>	⇒ 1 local SIO and 1 local DIO can be installed in the MLT analyzer module ⇒ SIO and DIO can be configured for the channels of the analyzer module only	* 5.1.18 p. 5-67
<u>Platform (CM Software):</u> <ul style="list-style-type: none"> <li>• Control unit with front panel</li> <li>• Without measurement channels</li> </ul>	⇒ 1 SIO and up to 4 DIO's can be installed in the platform (CM I/O) ⇒ SIO and DIO can be configured for all channels combined with the platform	* 5.2 p. 5-83
<u>MLT analyzer (CM and MLT AM software):</u> <ul style="list-style-type: none"> <li>• Analyzer with front panel</li> <li>• CM and AM software in the same analyzer, i.e. all functions of the control unit and of the AM are combined in one controller board</li> </ul>	⇒ 1 SIO and 1 DIO can be installed in the MLT analyzer (CM I/O) ⇒ SIO and DIO can be configured for all channels combined with the MLT analyzer	* 5.2 p. 5-83

The following illustrations shall make plain the connection between the hardware configuration and the software setup of the modules:

### NGA 2000 System via Platform

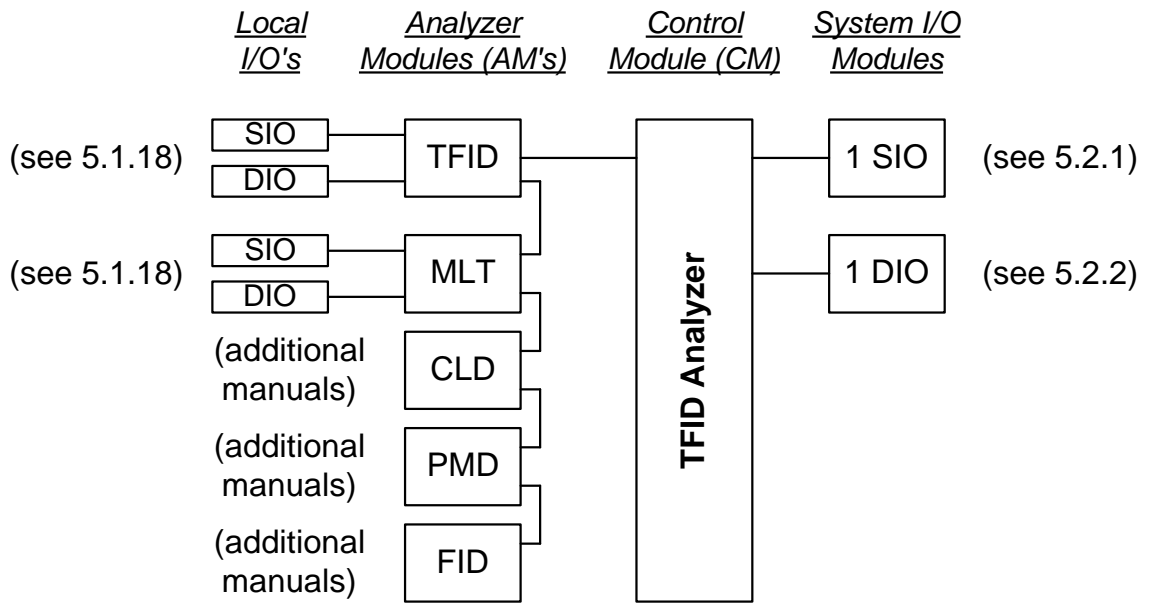


### NGA 2000 System via MLT Analyzer

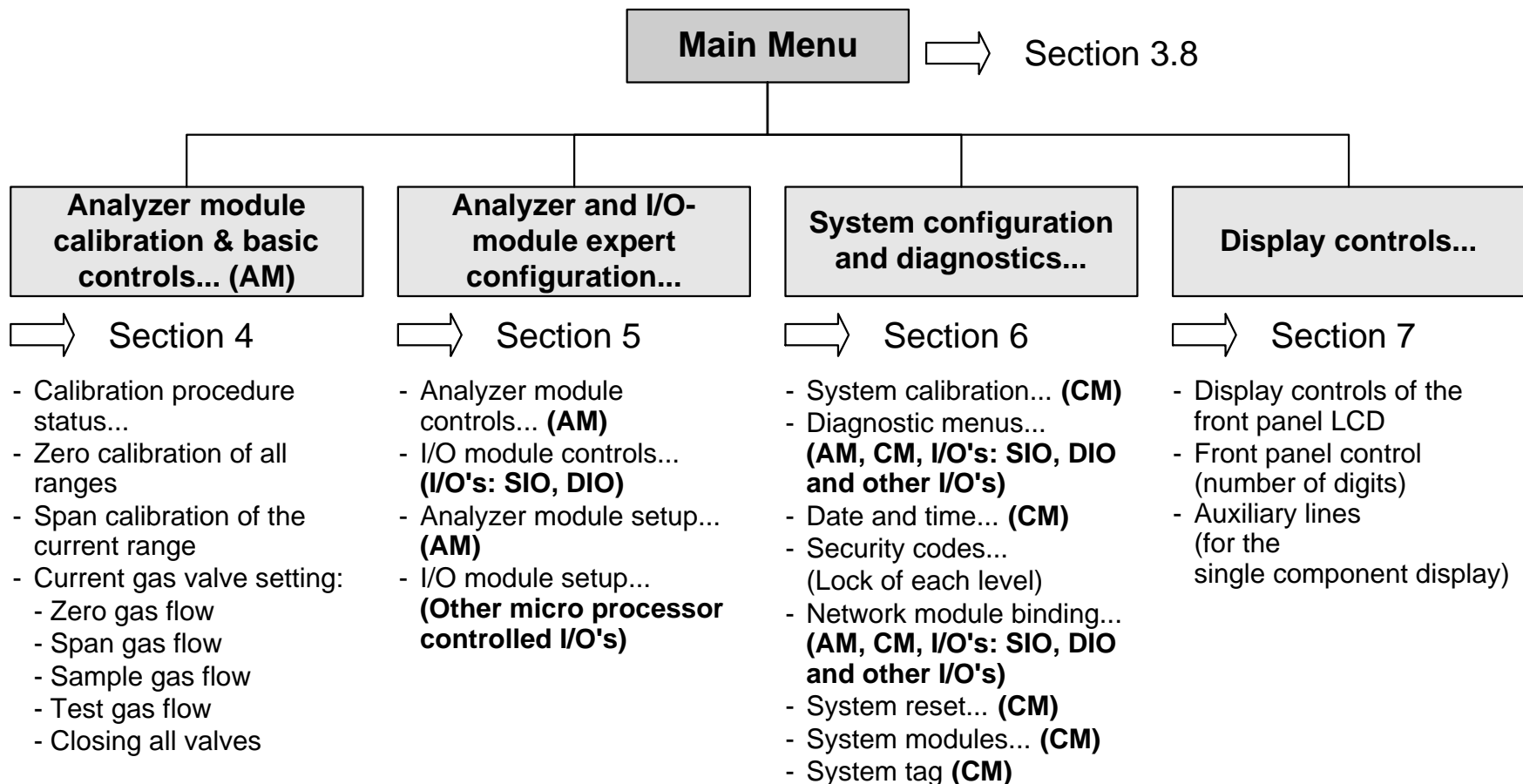




## NGA 2000 System via TFID Analyzer





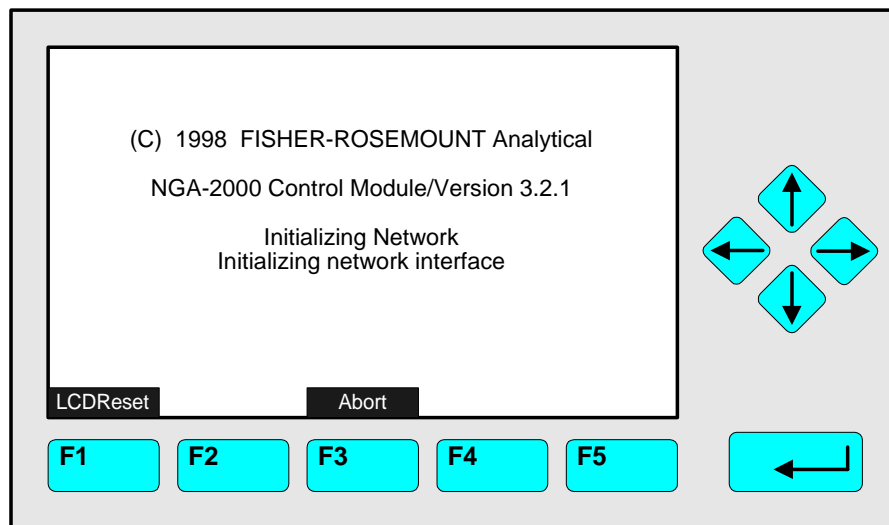
Notes:

- \* Menu lines ending with three points (...) are followed by submenus with further functions and set-ups.
- \* All set-ups in the menu "Basic controls" are valid for the analyzer module (AM).
- \* At each menu point of the "Expert configuration" and "System configuration" you can find which functionality will be set up: AM (Analyzer Module), CM (Control Module), I/O (Input-/Output Module).



#### 3.1 Starting and Initializing

After switching on the MLT analyzer or analyzer module (in a platform or part of a NGA network), the initialization procedure will be performed. A self control of the analyzer modules or the analyzer is running. You can see a sequence of several displays. They show the status of initialization, revision notes of the MLT software and the **FISHER-ROSEMOUNT** tag:



If you press the F1 key during the initializing, you will reset the LCD brightness and contrast to factory settings (see also section 7). Pressing the F3 key will abort the network initializing. Then you will have no connection to any analyzer module. Only the menus of the platform will be available.

At the end of the initializing procedure you can see the single component display of channel one (see illustration on next page). It is the origin to all the other channels, menus and submenus.

The instructions of the basic controls (chapter four) are all beginning with the single component display. The actual display might differ from the shown one because the customer can configure it according to his requirements (see section 5.1.8 p. 5-49 and section 7).

## 3.2 Display and Function

The LCD screen shows all measurement values of the analyzer and all customer instructions. You can operate with five function keys, four arrow keys (cursors) and the enter key. The function of each key depends on:

- ◆ the type of analyzer/analyzer module used
- ◆ the optional auxiliary modules (e.g. I/O boards) used
- ◆ the individual menu displayed

In case of power failure all customer specific module parameters are saved by a battery-powered buffer.

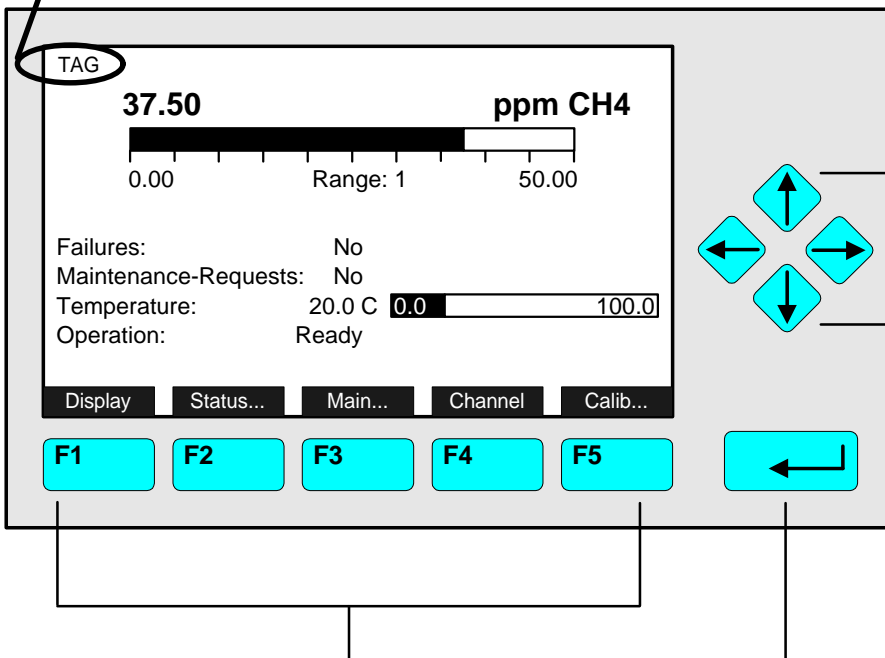
## 3.3 "TAG" and Operating Keys

At the top left of each menu page you will find the tag of the current channel.

Typical tags:

- ◆ MLT/CH1/R1: MLT Analyzer or Analyzer Module / Channel 1 / Range 1
- ◆ TFID-R1: Thermo FID Analyzer or Analyzer Module - Range 1

In this manual you will find normally "TAG" as general name. But in the specific MLT menu pages you will find "MLT".



### Cursor keys:

↑ -key / ↓ -key:

- ◆ Line up / line down within the same menu
- ◆ Alteration of numbers, variables or digits

← -key / → -key:

- ◆ Moving back/forwards between the pages of a menu
- ◆ Selection of digits

### Function Keys:

- ◆ keys without defined functions
- ◆ The current function depends on the menu selected
- ◆ The softkey legend is shown on the display above the key

### Enter Key:

- ◆ To confirm a previously entered value (variable)
- ◆ To start a selected function (Alternative: → -key)
- ◆ To go into a menu (via menu line)

#### 3.4 Lines and Softkey Functionality

Lines can be selected by the ↓ -key or the ↑ -key. The selected line is displayed white on black. You have four different types of lines in the menu:

##### Menu line... / Menu Softkey...

- ◆ Line/Softkey lettering ending with three dots.
- ◆ You will go to a submenu/further menu by pressing the softkey resp. by pressing the ↵ -key or the → -key in the menu line.

##### Function line / Function Softkey !

- ◆ Line/Softkey lettering ending with an exclamation-mark.
- ◆ You will start a function (e.g. calibration) by pressing the softkey resp. by pressing the ↵ -key or the → -key in the function line.

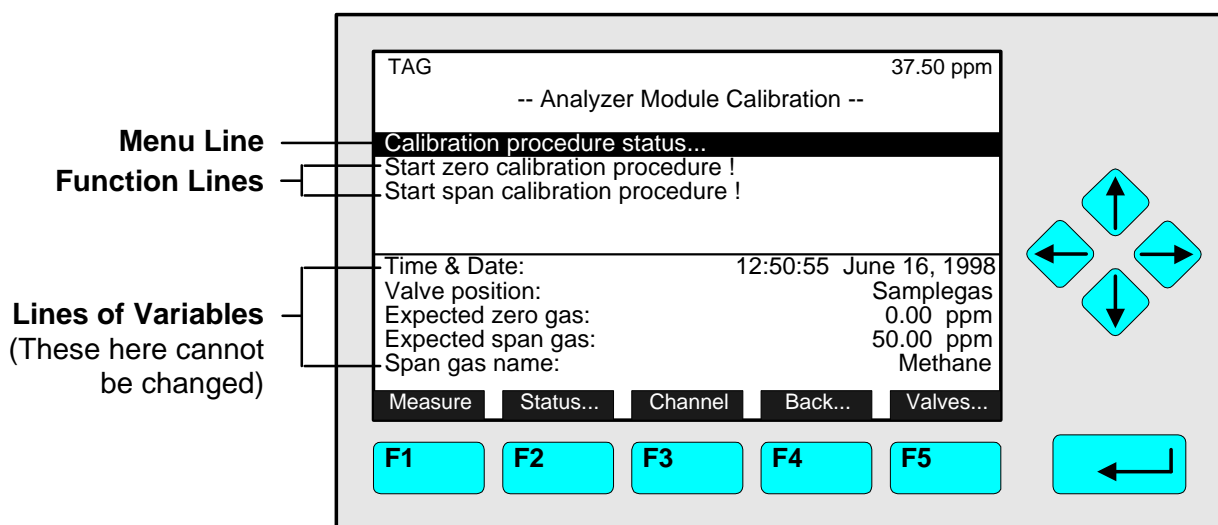
##### Line of variables:

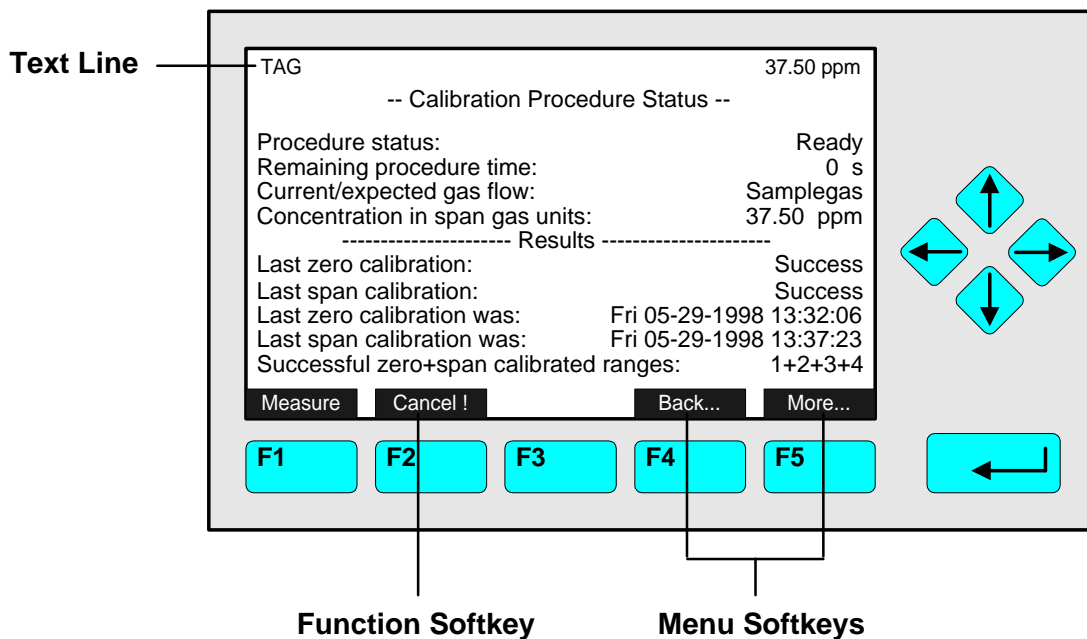
- ◆ Line ending with a colon.
- ◆ Display of module parameters (variables).
- ◆ Some parameters can be changed (e.g. begin of range), some parameters display only a status (e.g. temperature) and cannot be changed. These variables will be displayed below a line within the menu.

##### Text line

- ◆ Line without any punctuation marks.
- ◆ Only display of informations.

The following illustrations shall make plain the functionalities of lines and softkeys described above:





### 3.5 Important Functions of the Softkeys

#### Display

- ◆ Change from the single component display to the multi component display.
- ◆ F1 in the single component display.

#### Measure

- ◆ Change from all menus and submenus to the single component display of the channel selected.
- ◆ F1.

#### Status (see section 4.1 p. 4-3!)

- ◆ Change to the menu "Analyzer Channel Status":  
Display of the most important parameters and information about the status of the current channel or module.
- ◆ If available: F2.

#### Main (see section 3.8 p. 3-7!)

- ◆ Change from the single component display to the main menu.
- ◆ F3 in the single component display.

#### Channel

- ◆ Scrolling through the channels in the same menu. In the main menu and the single component display you can move among all channels of the connected analyzers and analyzer modules. In the submenus you can only move among the channels of the current analyzer or analyzer modules.
- ◆ If available: F3 (F4 in the single component display).



#### Lock

- ◆ Lock of all three operation levels from the main menu, if a security code is activated in the system configuration level (see section 6.3 p. 6-7).
- ◆ F4 in the main menu.

#### Calib (see section 4.4 p. 4-37 and 5.1.1 p. 5-15!)

- ◆ Change from the single component display to the menu "Analyzer module calibration".
- ◆ F5 in the single component display.

#### MFG Data (see section 3.8 p. 3-7/8!)

- ◆ Change from the main menu to the menu "Module Manufacturing Data":  
Further submenus are available with informations about the control module and analyzer module data, such as address of the manufacturer, serial number of the modules or the software and hardware revisions.
- ◆ F5 in the main menu.

#### Back

- ◆ Moving back to the last menu page selected (Alternative: ← -key) or reset of a changed but not confirmed parameter to the former value.
- ◆ If available: F4 for moving back, F2 for reset.

#### More

- ◆ Changing to a further menu page.
- ◆ If available: F5.

### 3.6 Entering/Changing of Variables

#### ↵-key

- ◆ If you have already selected a line of variables (displayed white on black) and press the ↵ -key, only the parameter will be selected and can be changed.  
If you press the ↵ -key again, the new value will be confirmed.

#### ↑ -key / ↓ -key

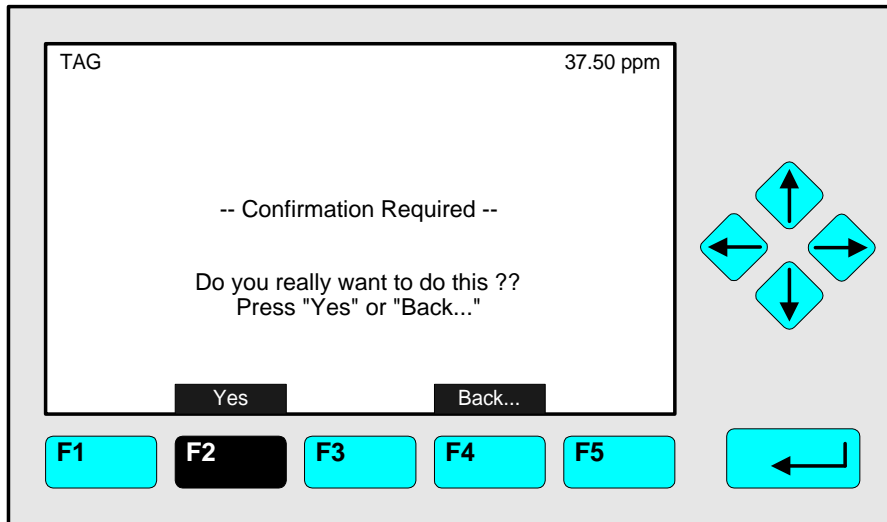
- ◆ Function depends on the variable selected: - Changing the parameter values  
- Scrolling among variables selected  
- Changing of digits or characters
- ◆ Increasing or decreasing of numbers.

#### ← -key / → -key

- ◆ Selection of digits within a number.
- ◆ For some variables you can change the quantity of digits or characters.

### 3.7 Starting a function

If you press the ←-key or the →-key in a function line, you will be asked to confirm the order in the following way:



- ◆ If you will press the F2 key, the function will start immediately.
- ◆ If you will press the F4 key, you will go back to the last menu page.

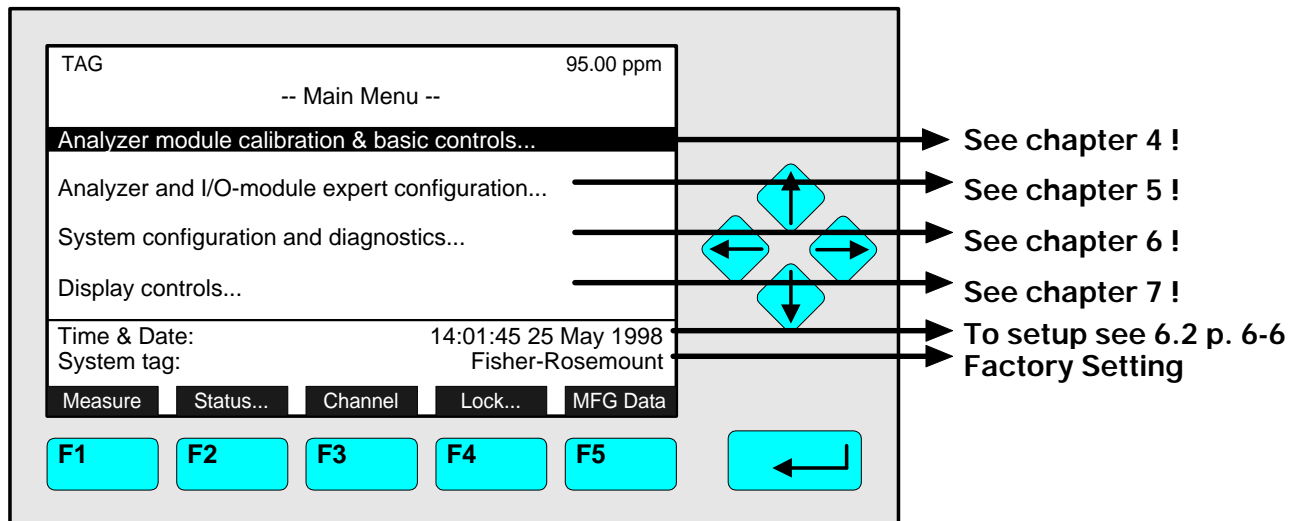
**Note:** If you don't want to be asked before the start of each function, you can configure it in the menu "Measurement Display Configuration" in the expert configuration level (see section 5.1.8 p. 5-49). Select "No" in the line "Display confirmation menus". Then, each function will start directly after the order is done and no confirmation will be required.






#### 3.8 Main Menu

If you press the F3 key (Main...) or the → -key in any single component display, you will change to the "Main Menu". From there you can change to all operating levels of your MLT analyzer or analyzer module to set up and control the parameters of measurement, calibration and data transfer !

Via the F5 key (MFG Data) you can change to several submenus, where you will find a lot of important data about the control module (MLT analyzer or platform) and the analyzer module, such as service address or serial number !

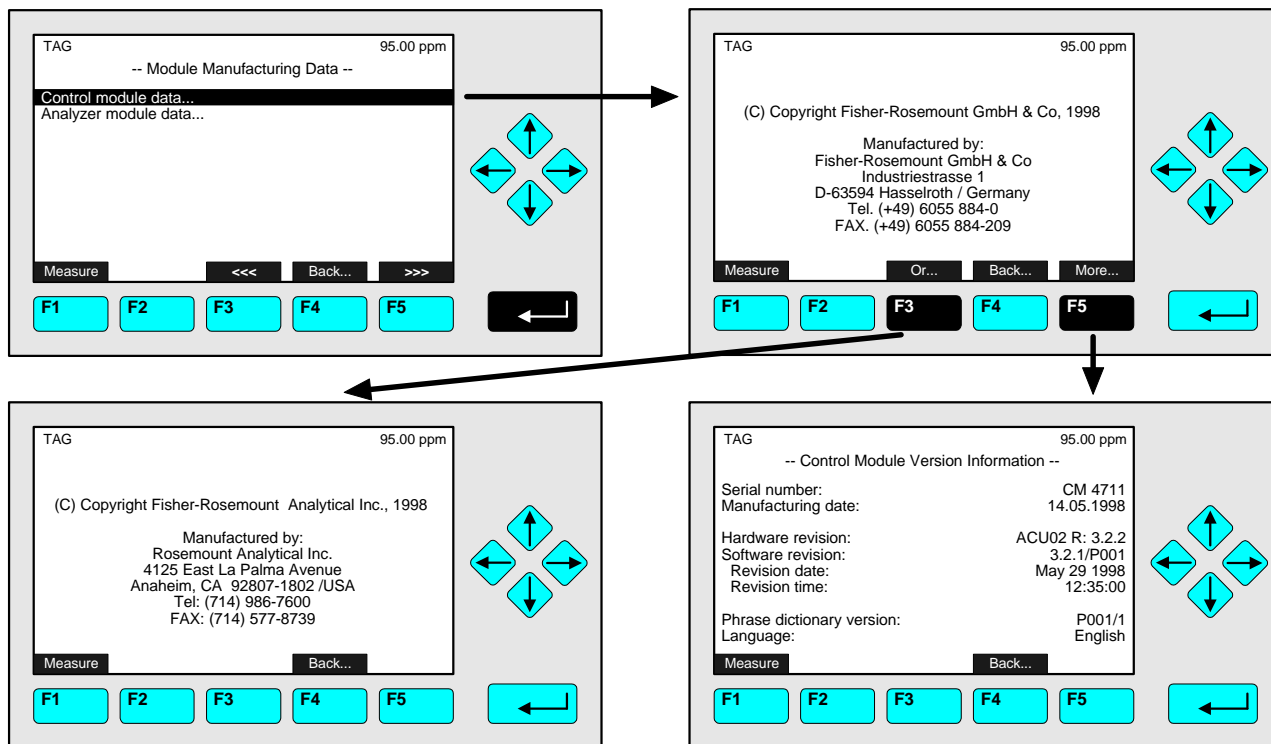
#### Ramifications from the Main Menu:



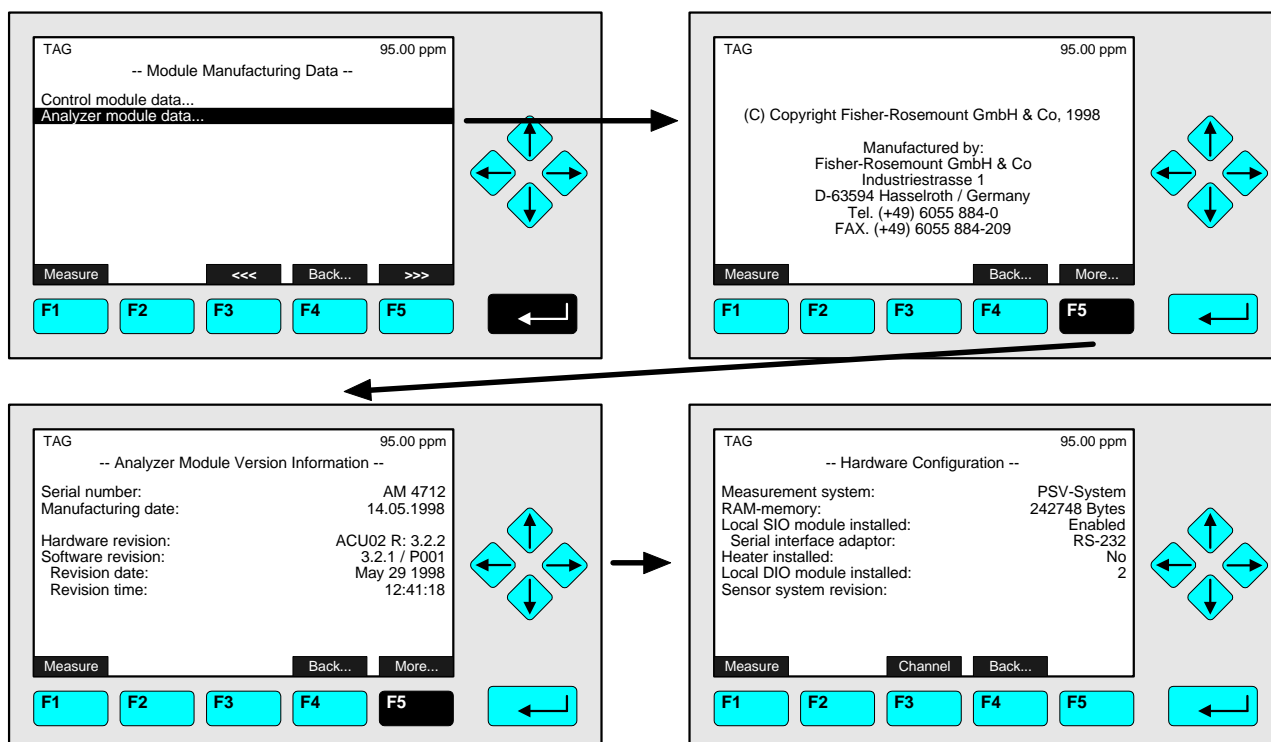
- F1** Changing to the single component display of the current channel  Section 3.1 p. 3-1/2 !
- F2** Changing to the menu "Analyzer Channel Status" of the current channel  Section 4.1 p. 4-3 !
- F3** Scrolling through all channels of the connected analyzers and analyzer modules  See channel tag !
- F4** Lock of any operating level by security code  Section 6.3 p. 6-7 !
- F5** Changing to the menu "Module Manufacturing Data"  See next pages !

## Ramifications from the menu "Module Manufacturing Data":

### 1. Control module data:



### 2. Analyzer module data:



## 4 Basic Controls and Analyzer Module Calibration

In the chapter "Basic Controls and Analyzer Module Calibration" the most important measurement and calibration functions of your MLT analyzer or analyzer module are described.

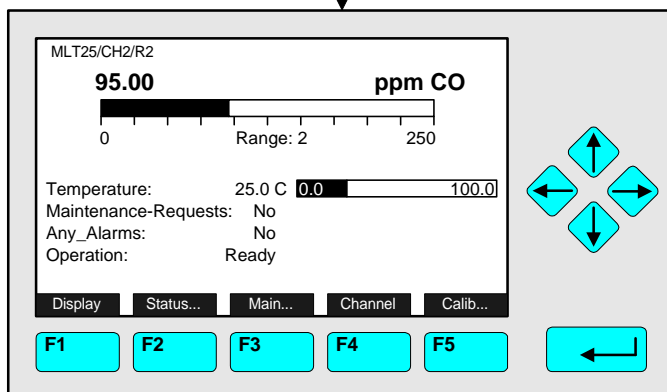
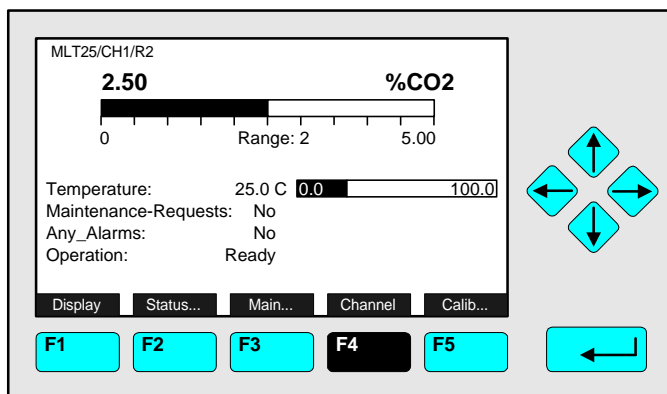
All steps are figured with detailed illustrations and operation instructions. In the left column you can see display and keyboard of the NGA front panel. The keys you have to press are illustrated in black. In the right column you can read the instructions and notes. All instructions will begin with any single component display and will end with the corresponding single component display after the setups are done. So you can easily compare the actual display of the analyzer or analyzer module with the illustrations of the manual.

Example: You want to change from the single component display of channel 1(CO<sub>2</sub>) to the single component display of channel 2 (CO).

- Picture one shows the starting situation: single component display of CO<sub>2</sub>.
- Picture two shows the result you get if you press the F4 key (Channel): single component display of CO.

### Left column:

Display and keyboard



### Right column:

Instructions and notes

⇒ **Change to the single component display of another channel**

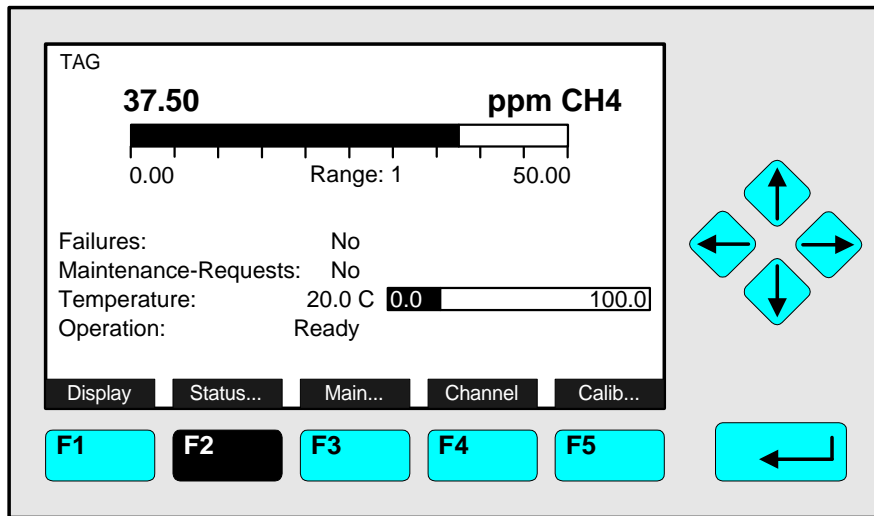
Press **F4**

Example:  
Changing from  
CO<sub>2</sub> (Channel 1) to  
CO (Channel 2)

⇒ **Next instruction or step**



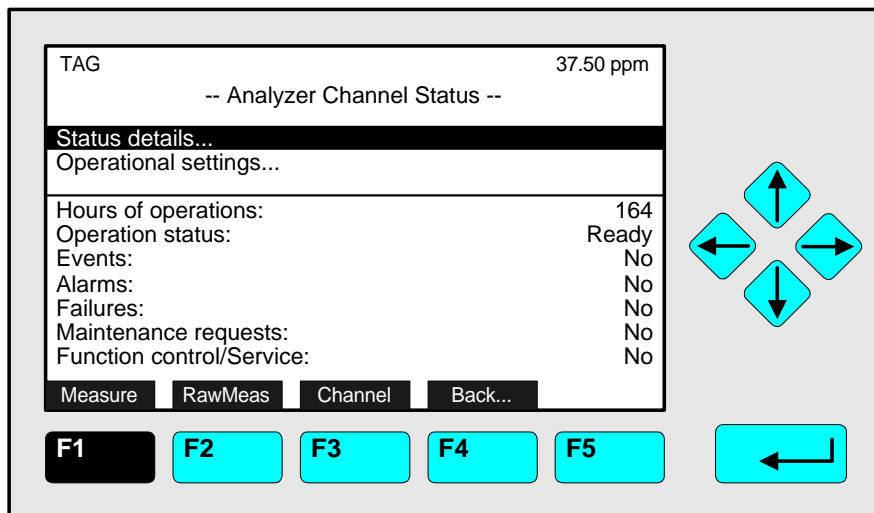
## 4.1 Analyzer Channel Status



⇒ **Change to the menu "Analyzer Channel Status"**

Press **F2**

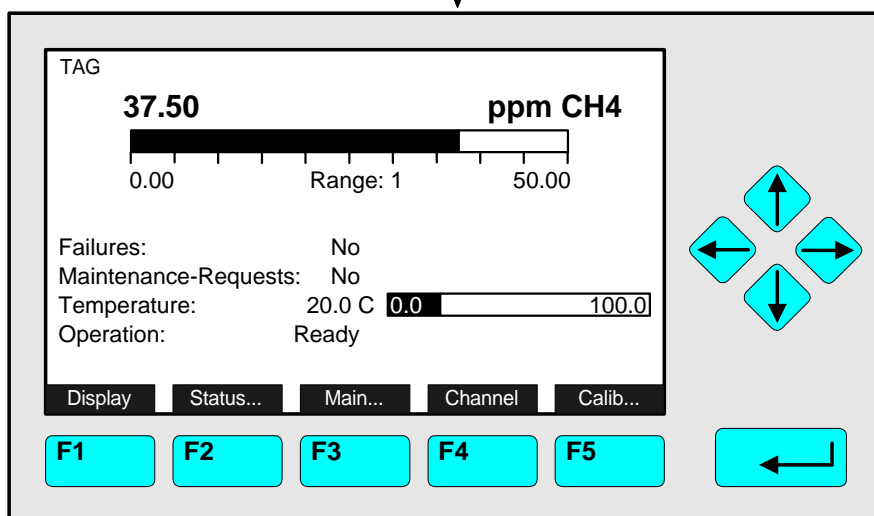
In the menu "Analyzer Channel Status" you can find status informations of the current channel. Via the menu lines "Status details..." and "Operational settings..." you can change to further submenus. (see 4.1.1 p. 4-5...30 and 4.1.2 p. 4-31/32)



⇒ **Change to the single component display**

Press **F1**

Note:  
Via the F2 key you can change to submenus containing the primary and secondary raw measurements.

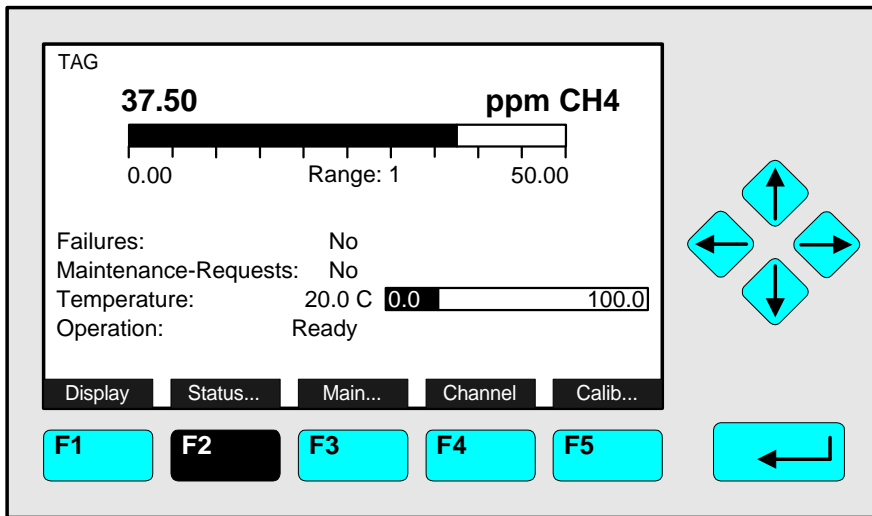


⇒ **Back in the single component display**



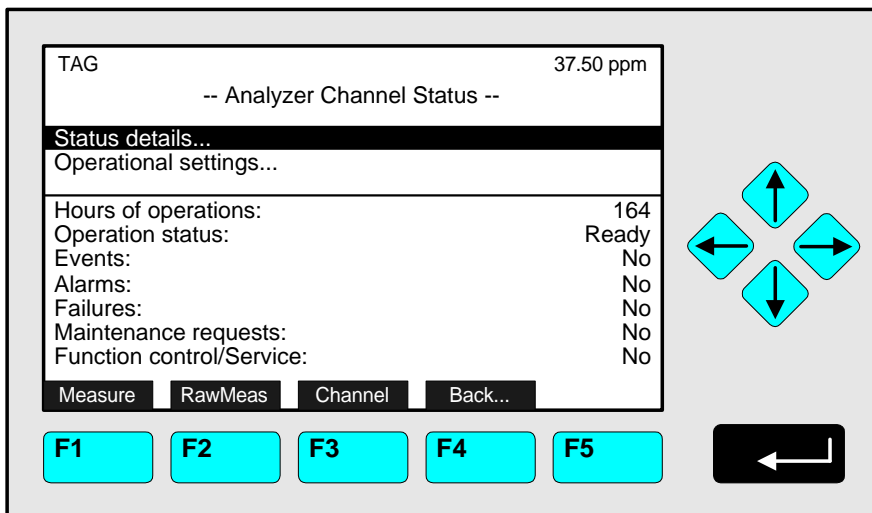


# 4.1.1 Analyzer Channel Status - Status Details Failures



⇒ Change to the menu "Analyzer Channel Status"

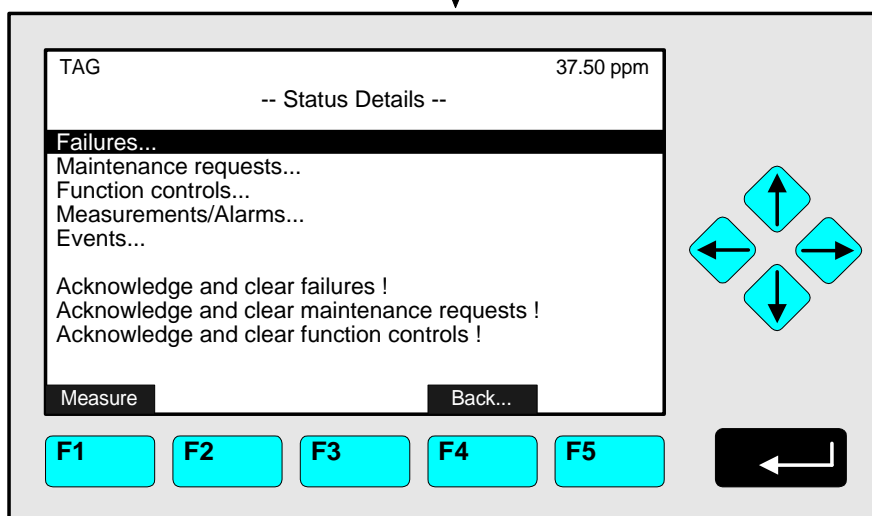
Press **F2**



⇒ Change to the submenu "Status Details"

Press

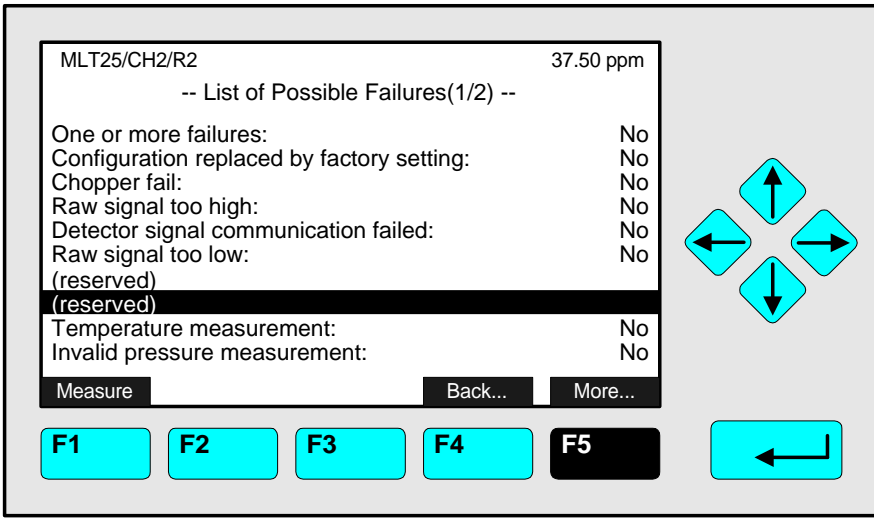
or



⇒ Change to the "List of Possible Failures (page 1 of 2)"

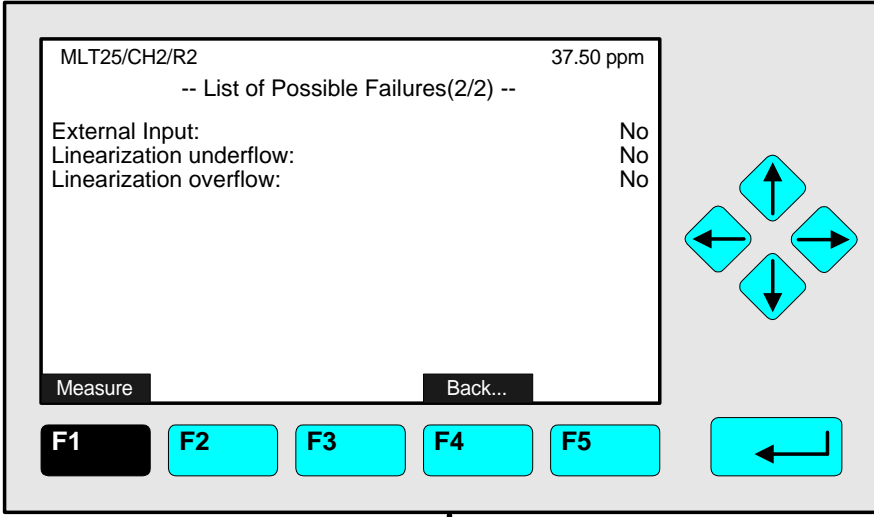
Press

or



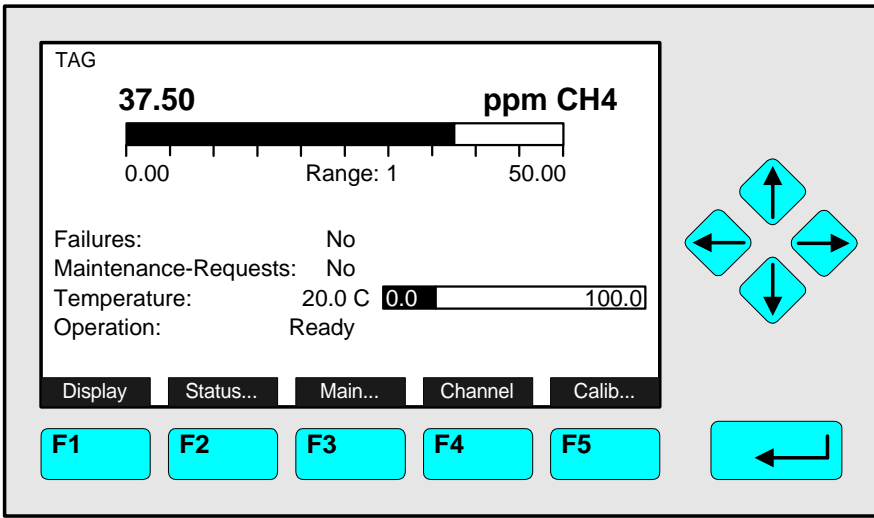
⇒ Change to the second menu page

Press **F5**



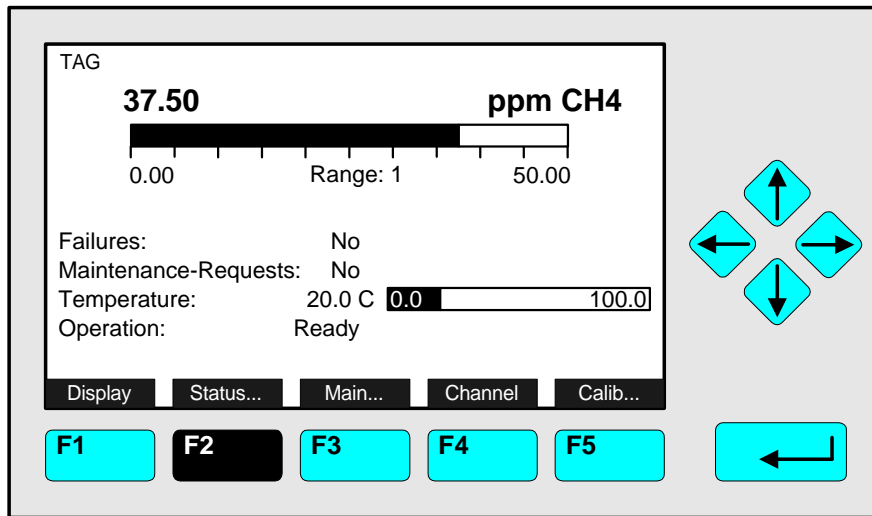
⇒ Change to the single component display

Press **F1**



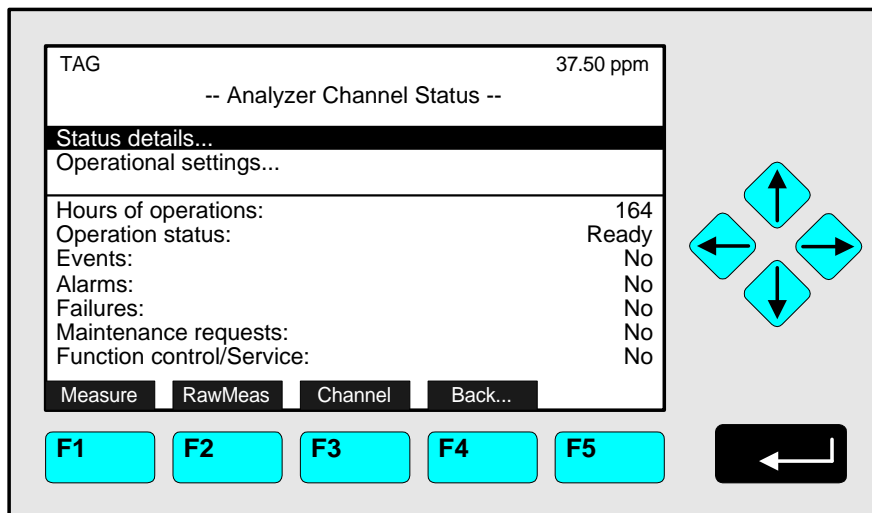
⇒ Back in the single component display of the current channel

## 4.1.1 Analyzer Channel Status - Status Details Maintenance Requests



⇒ Change to the menu "Analyzer Channel Status"

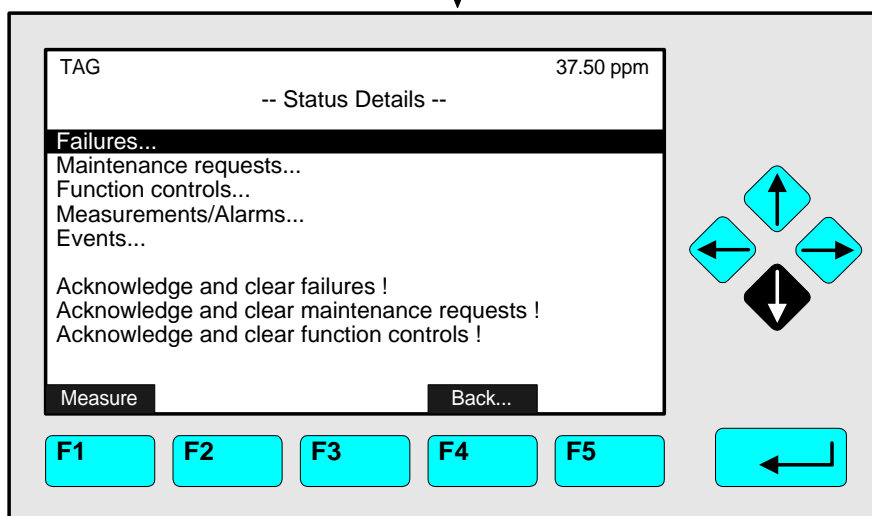
Press **F2**



⇒ Change to the submenu "Status Details"

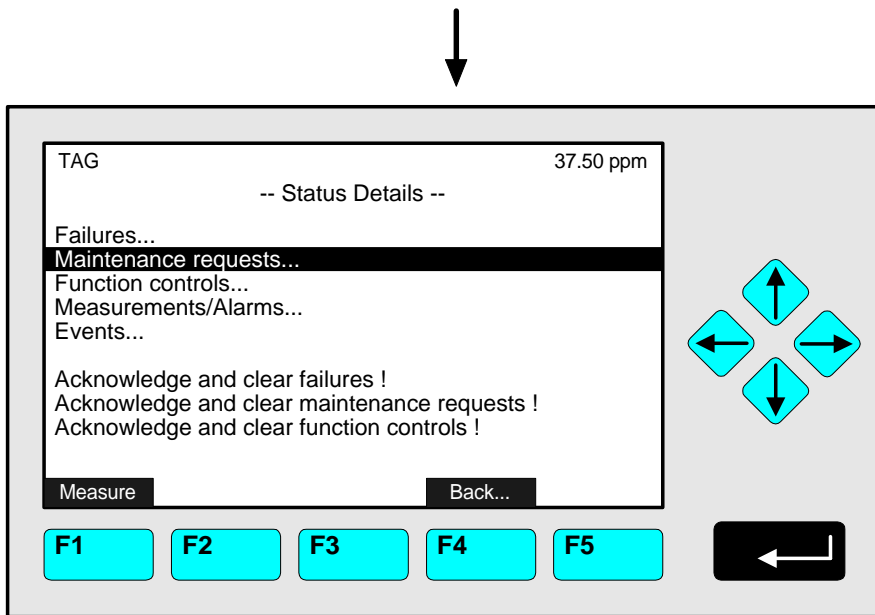
Press

or



⇒ Change to the line "Maintenance requests..."

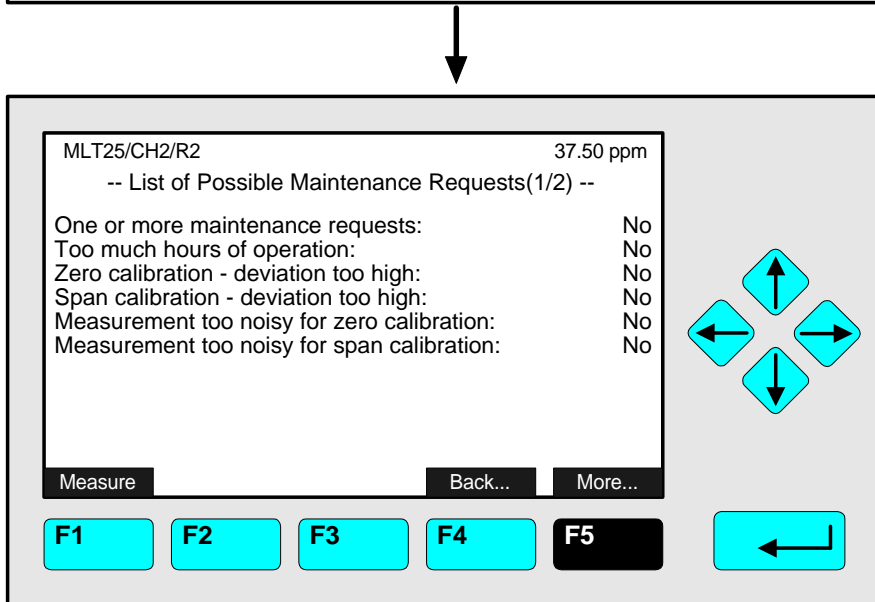
Press or as often as necessary to get the menu line "Maintenance requests..." white on black.



⇒ Change to the "List of Possible Maintenance Requests (page 1 of 2)"

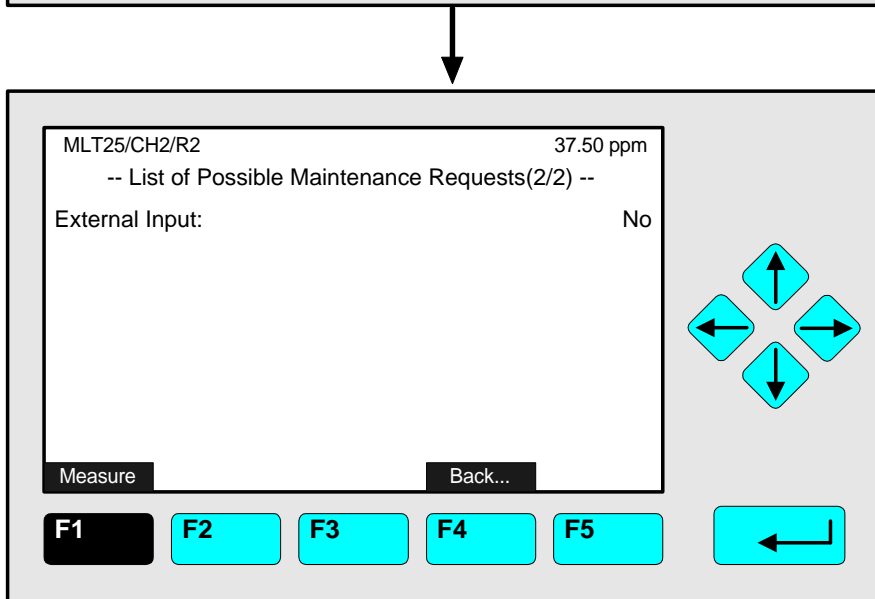
Press

or



⇒ Change to the second menu page

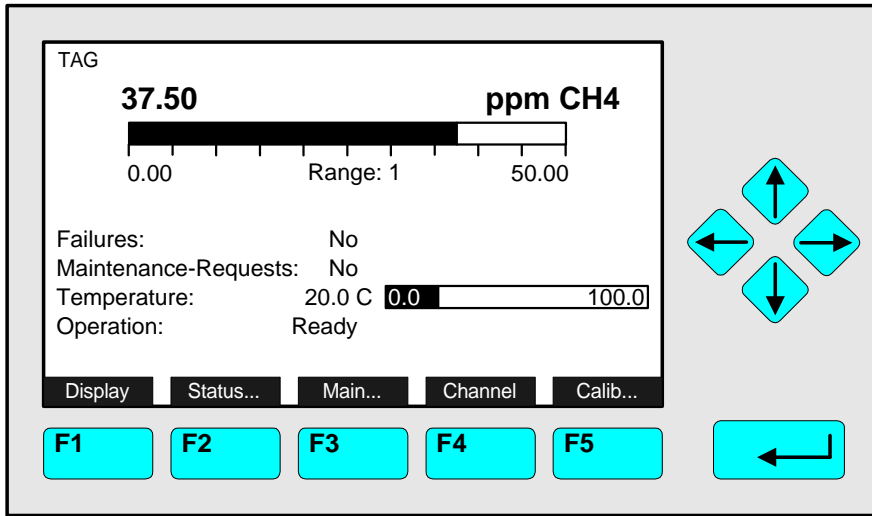
Press



⇒ Change to the single component display

Press

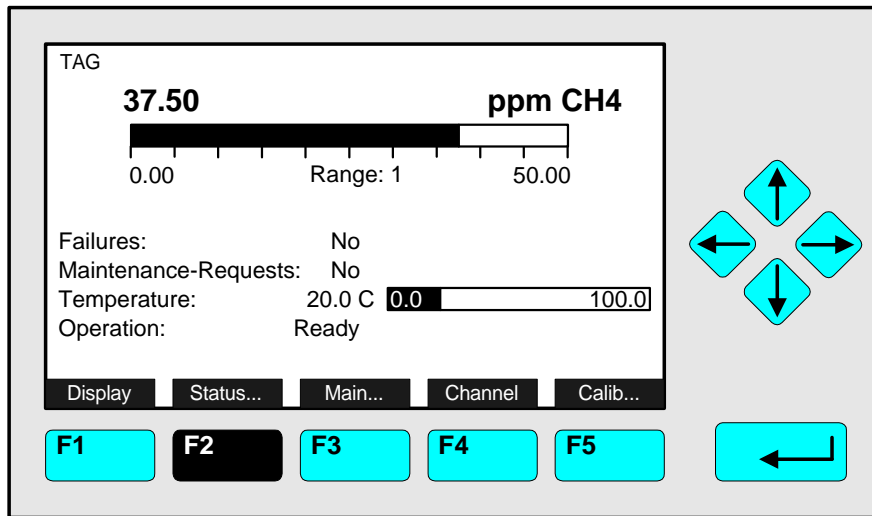
## 4.1.1 Analyzer Channel Status - Status Details Maintenance Requests



⇒ Back in the single component display of the current channel

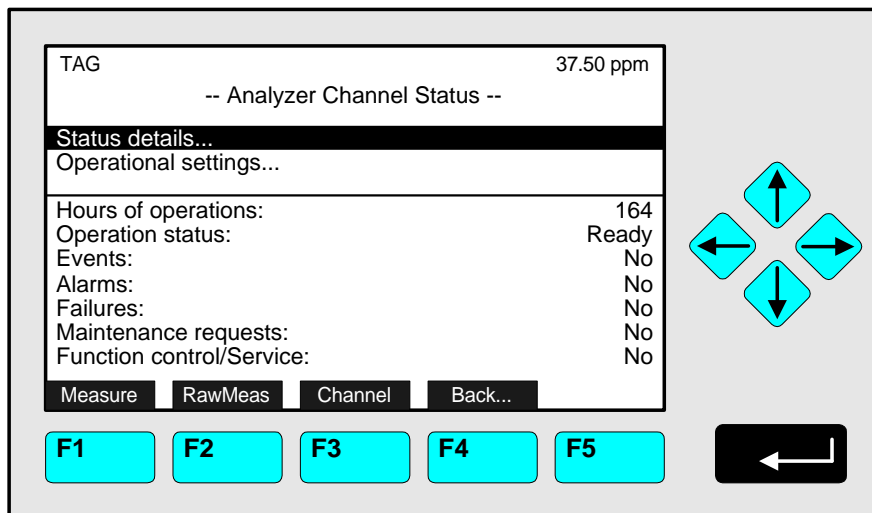


## 4.1.1 Analyzer Channel Status - Status Details Function Controls



⇒ Change to the menu "Analyzer Channel Status"

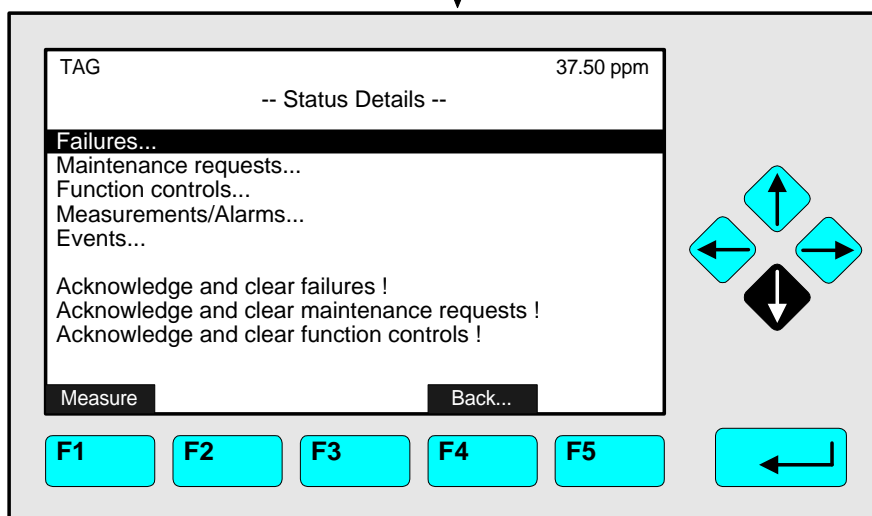
Press **F2**



⇒ Change to the submenu "Status Details"

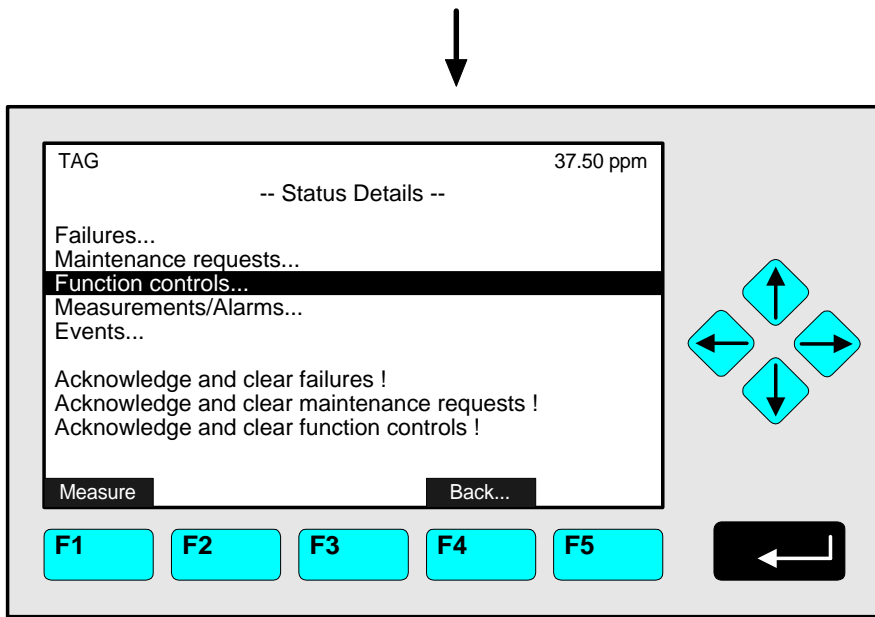
Press

or



⇒ Change to the line "Function controls..."

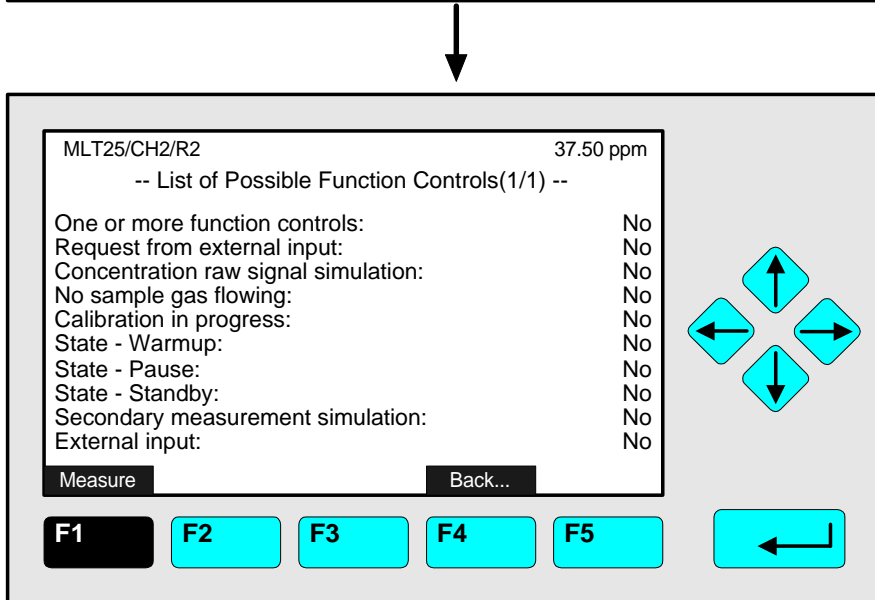
Press or as often as necessary to get the menu line "Function controls..." white on black.



⇒ Change to the "List of Possible Function Controls"

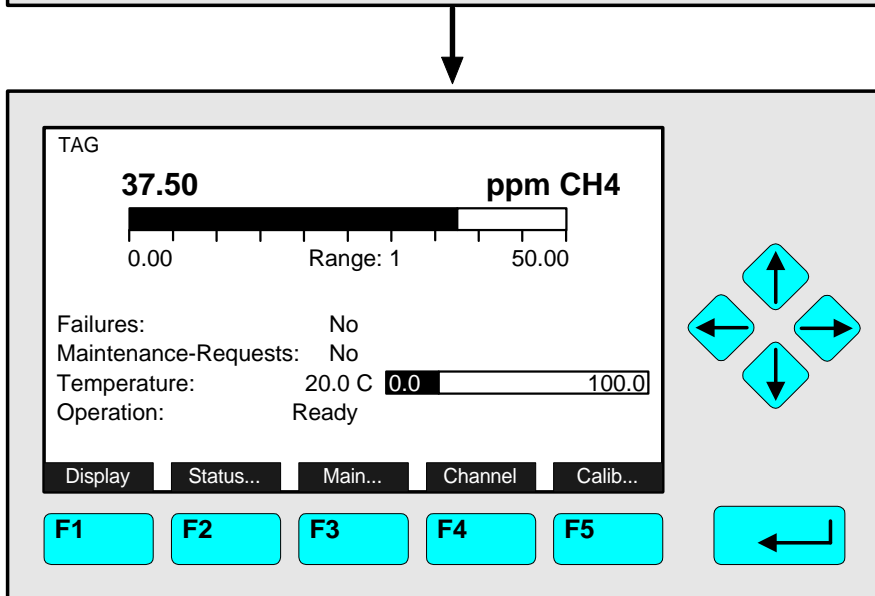
Press

or



⇒ Change to the single component display

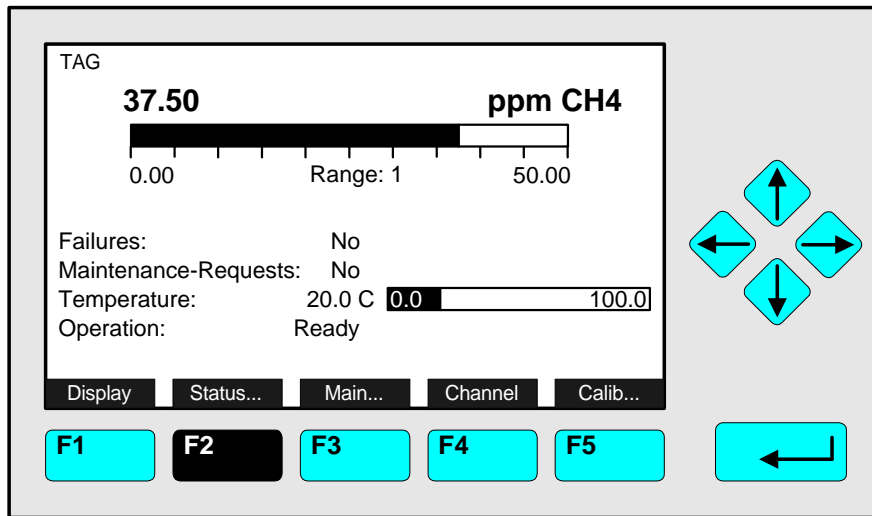
Press



⇒ Back in the single component display of the current channel

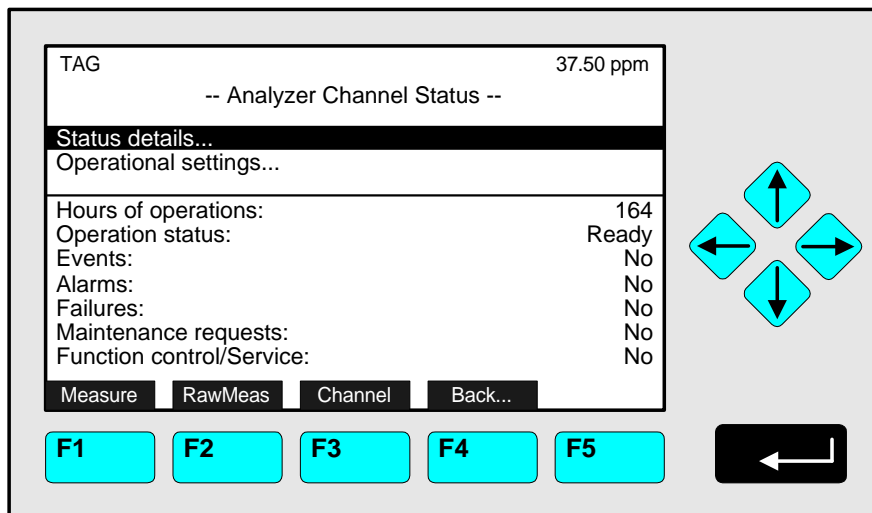


## 4.1.1 Analyzer Channel Status - Status Details Measurements/Alarms



⇒ Change to the menu "Analyzer Channel Status"

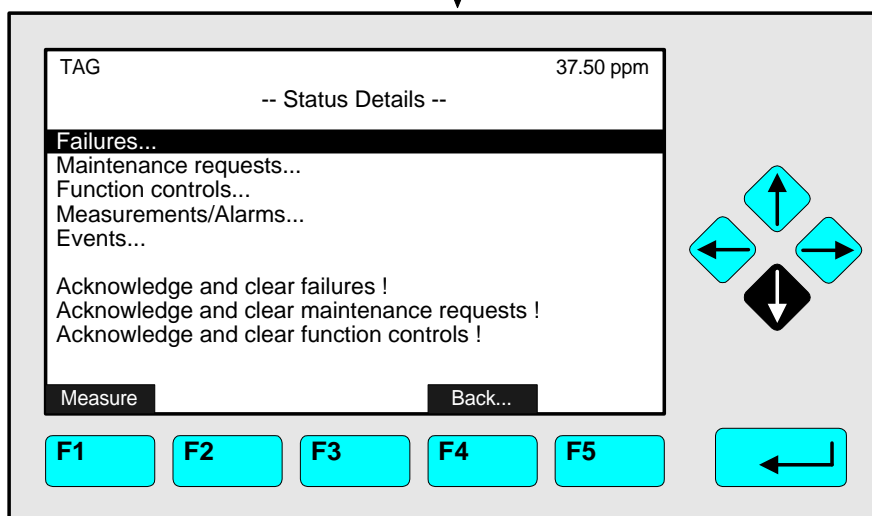
Press **F2**



⇒ Change to the submenu "Status Details"

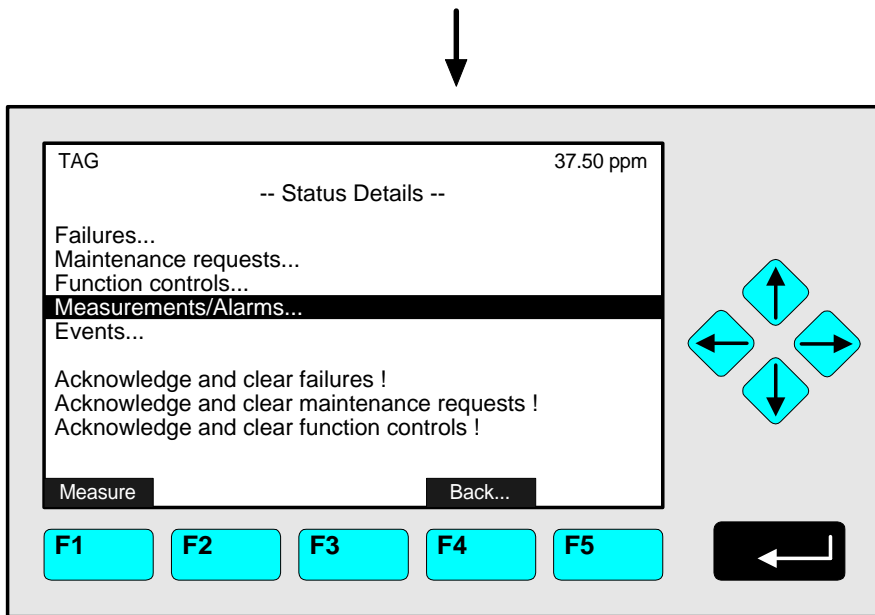
Press

or





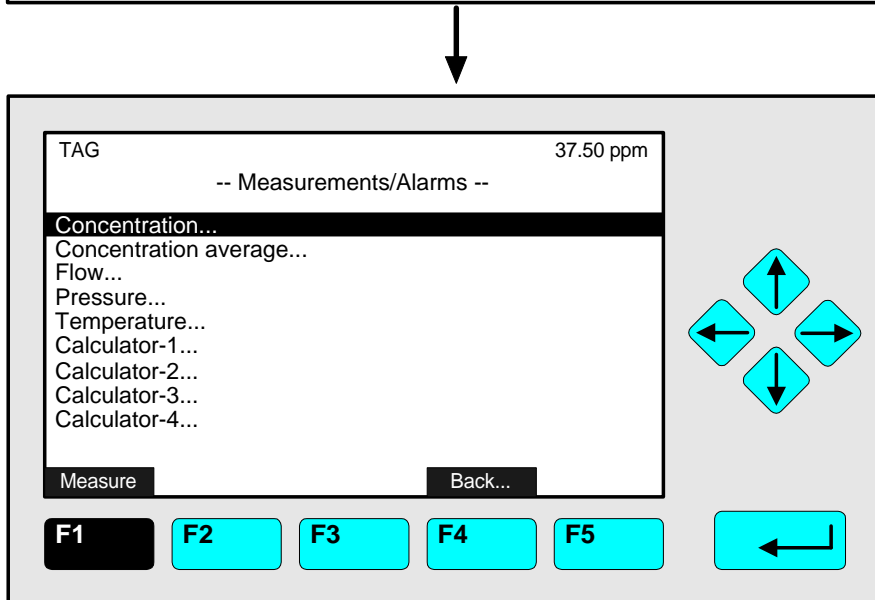
⇒ Change to the line "Measurements/Alarms..."

Press or as often as necessary to get the menu line "Measurements/Alarms..." white on black.



⇒ **Change to the submenu "Measurements/Alarms"**

Press   
or 



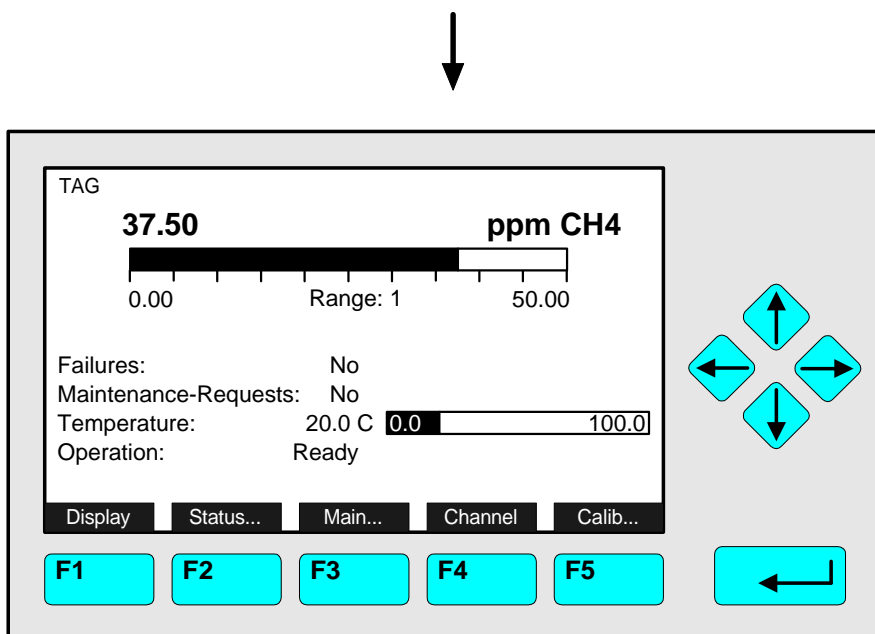
⇒ **Change to the single component display**

Press 

Options:

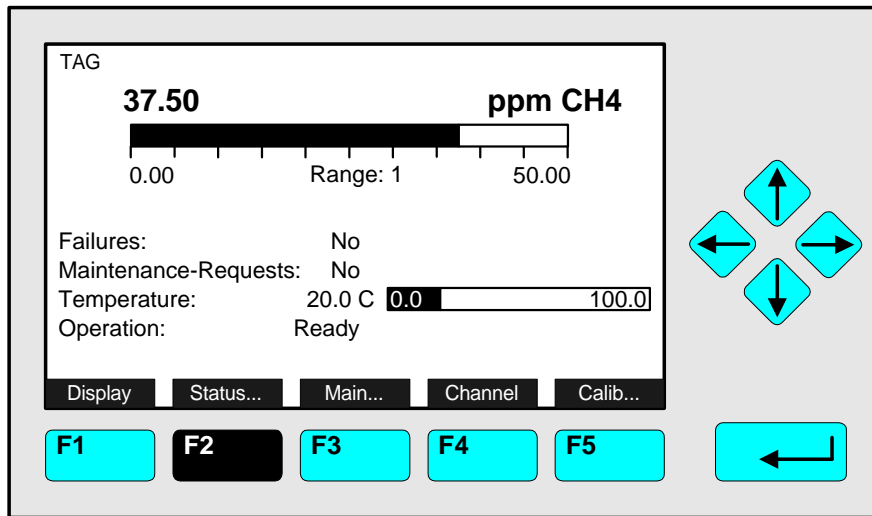
- With the ↑ or the ↓ -key you can change to each line in the menu.
- Press the ← -key in the line selected to change to the corresponding submenu: There you will find the status of the four alarms

Note: If the hardware of the menu point selected is not available, a corresponding message will appear!



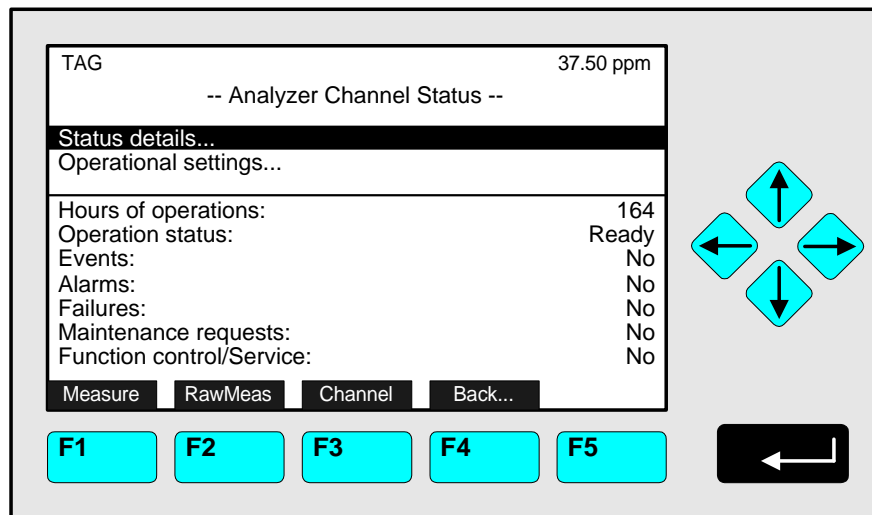
⇒ **Back in the single component display of the current channel**

## 4.1.1 Analyzer Channel Status - Status Details Events



⇒ Change to the menu "Analyzer Channel Status"

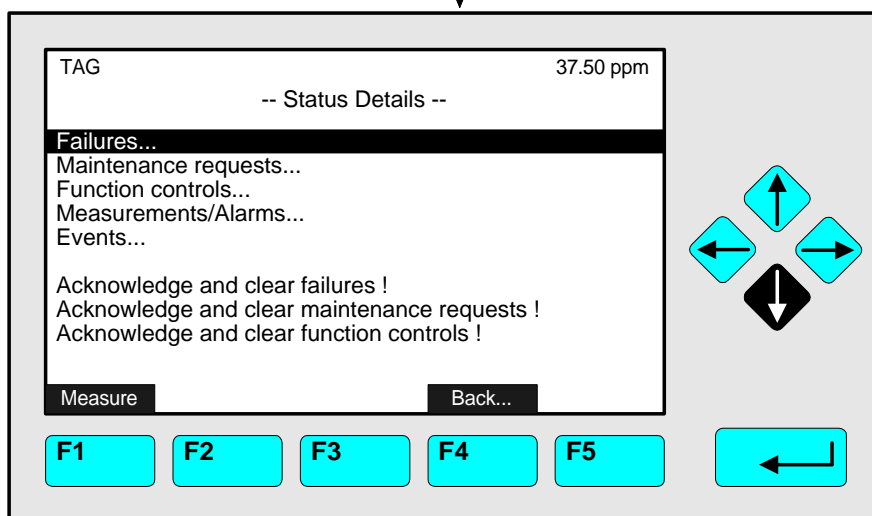
Press **F2**



⇒ Change to the submenu "Status Details"

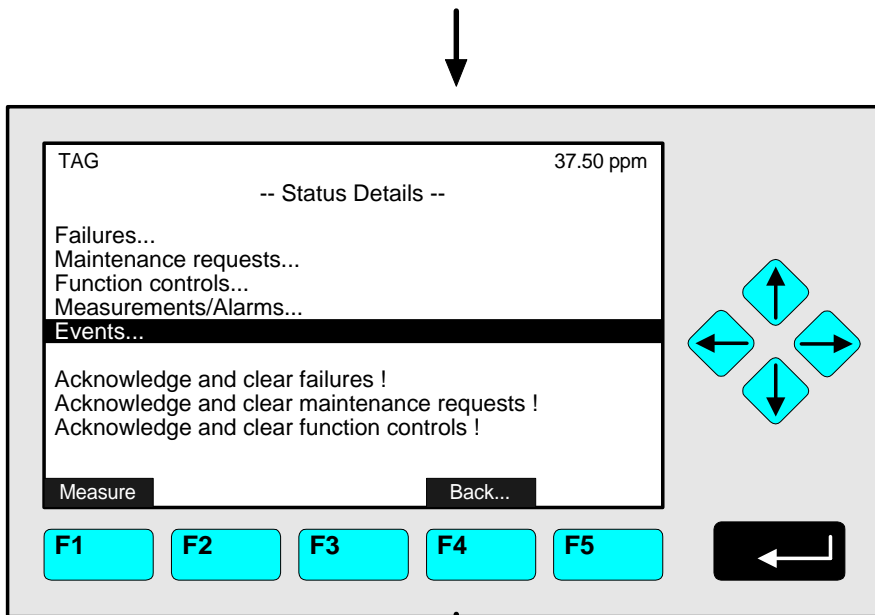
Press

or



⇒ Change to the line "Events..."

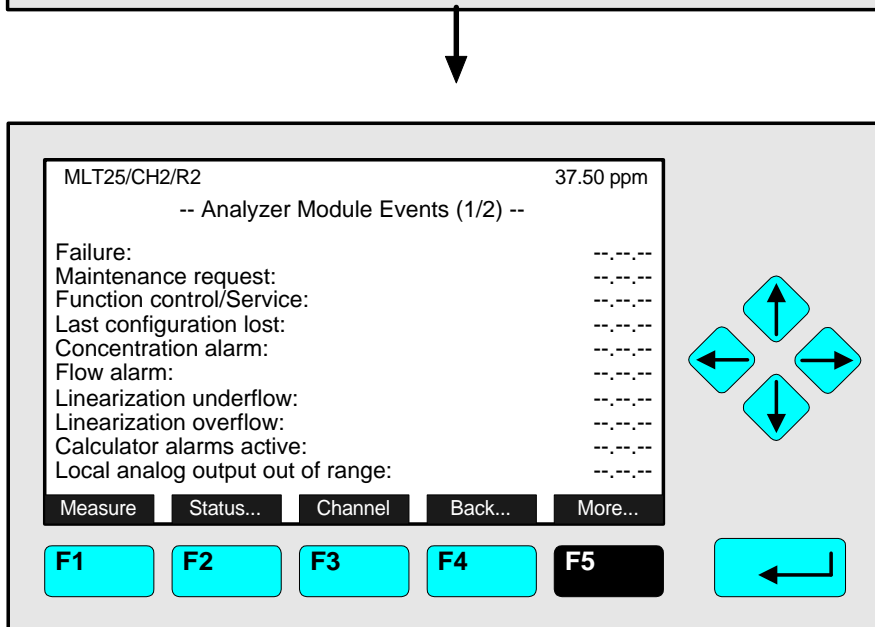
Press or as often as necessary to get the menu line "Events..." white on black.



⇒ Change to the submenu "Analyzer Module Events (page 1 of 2)"

Press

or

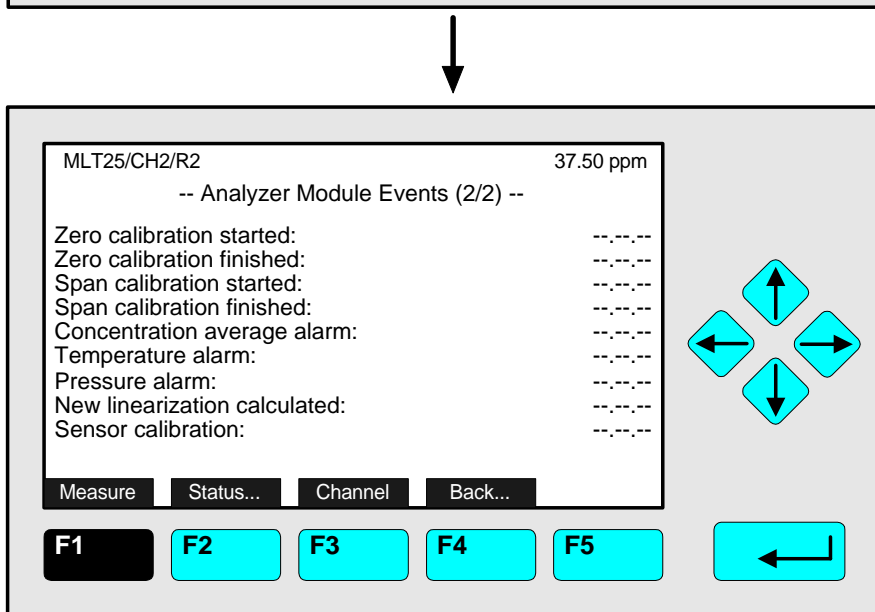


⇒ Change to the second menu page

Press

Note:

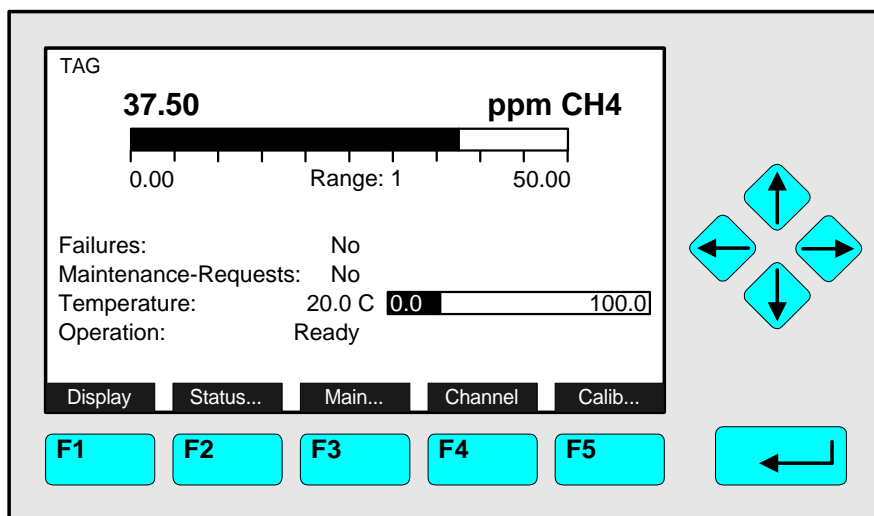
If any event has happened, you will find a report of date and time in the corresponding line of this menu.



⇒ Change to the single component display

Press

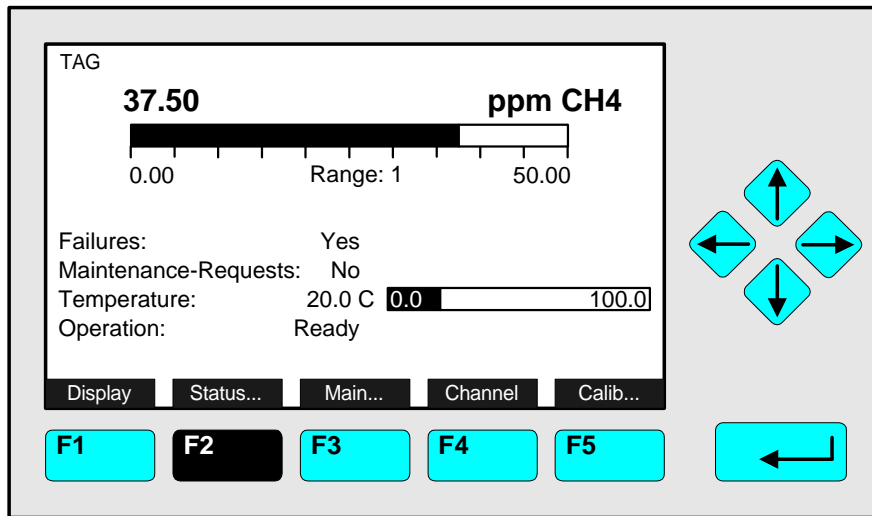
## 4.1.1 Analyzer Channel Status - Status Details Events



⇒ Back to the single component display of the current channel



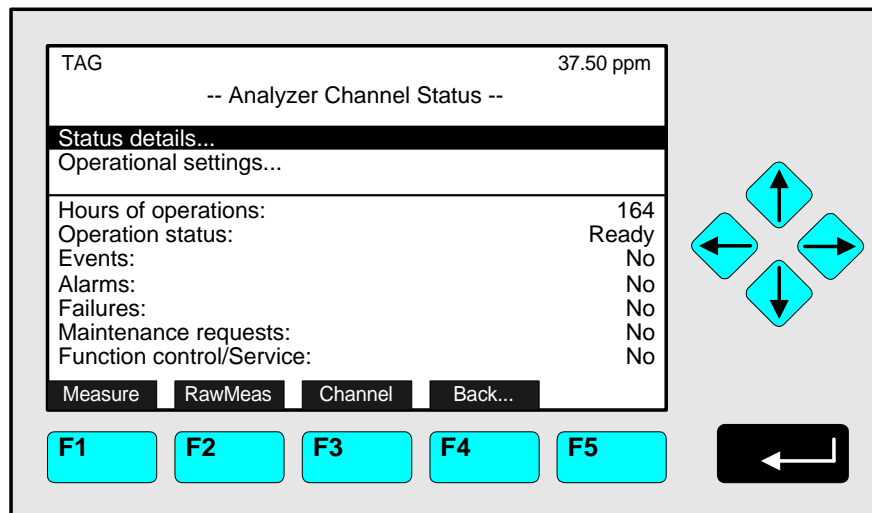
## 4.1.1 Analyzer Channel Status - Status Details Acknowledge and Clear Failures



⇒ Change to the menu "Analyzer Channel Status"

Press **F2**

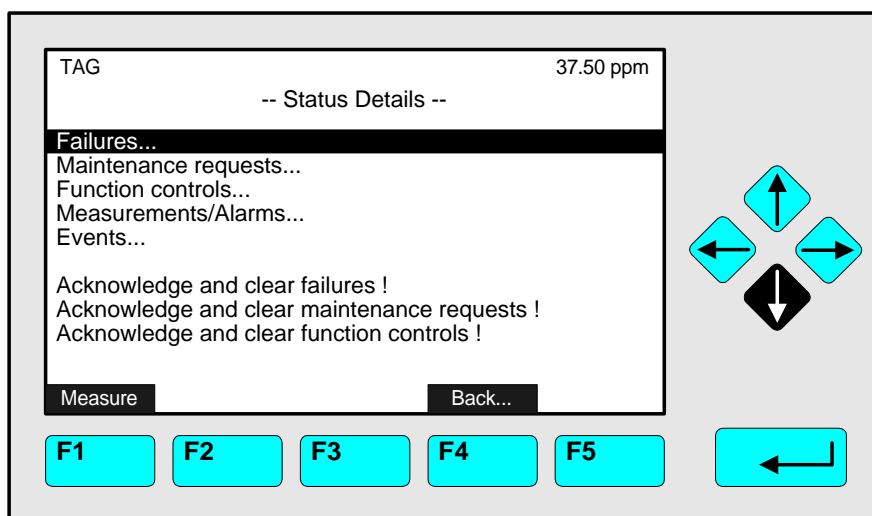
Notes:  
If you have solved the reasons for the failures reported, you should start this function.  
The menu "List of Possible Failures" will be ready for new reports !



⇒ Change to the submenu "Status Details"

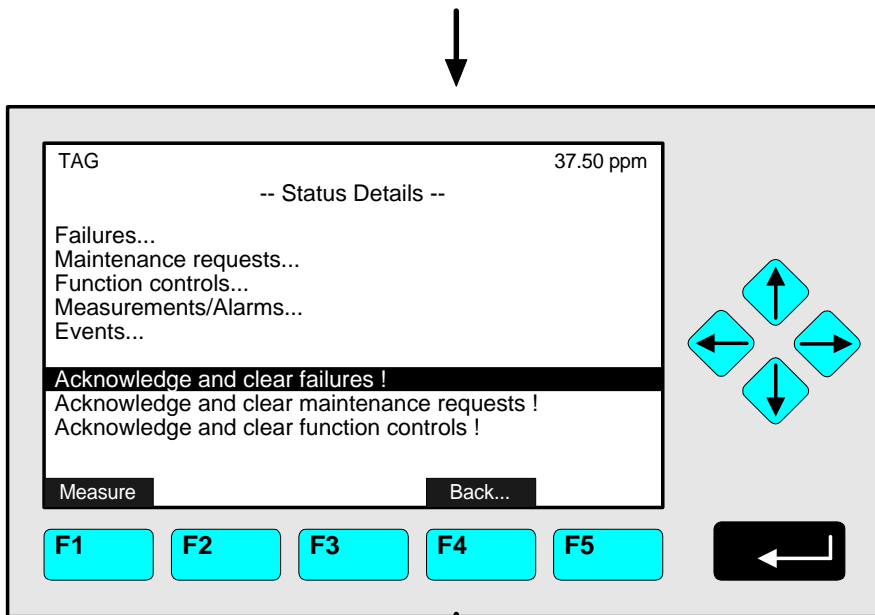
Press

or



⇒ Change to the line "Acknowledge and clear failures !"

Press or as often as necessary to get the menu line "Acknowledge and clear failures !" white on black.

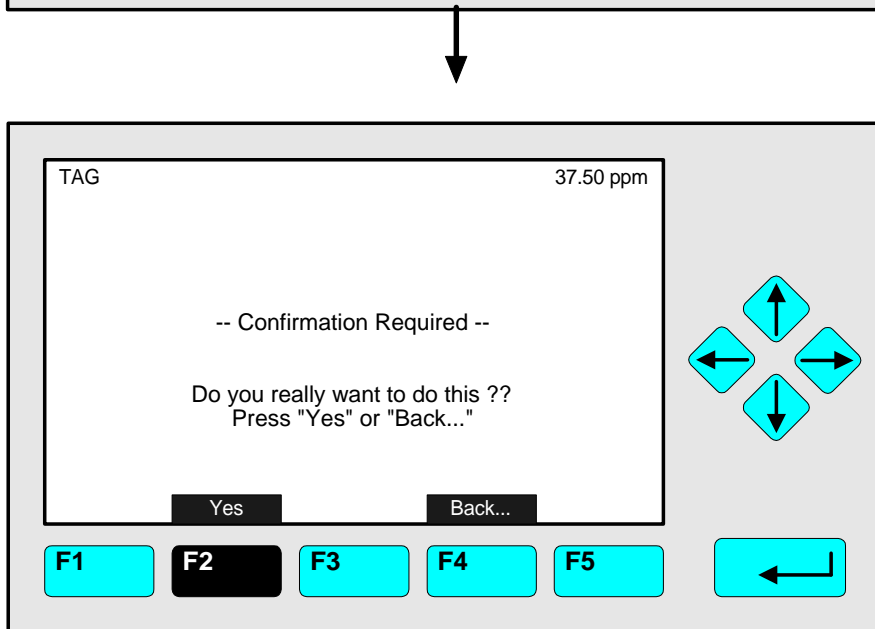


⇒ **Start the function**


Press 

or 

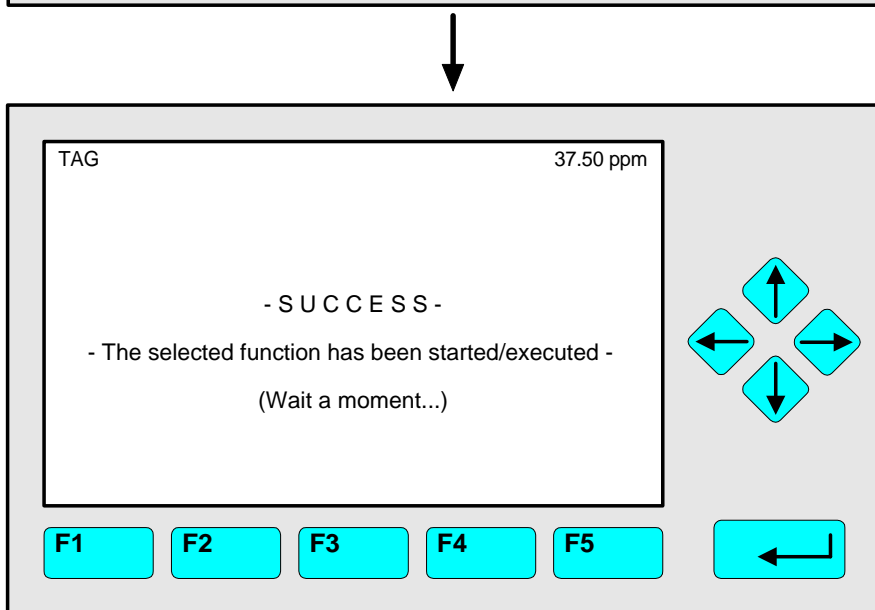
Note:  
Starting this function here is only possible, if it is enabled in the menu "Acknowledgement of Status Reports" (see 5.1.9 p. 5-52) !



⇒ **Confirm the order**

Press  **F2**  
to start the function immediately.

Option:  
Press the F4 key if you want to cancel the order and go back to the menu "Status Details".

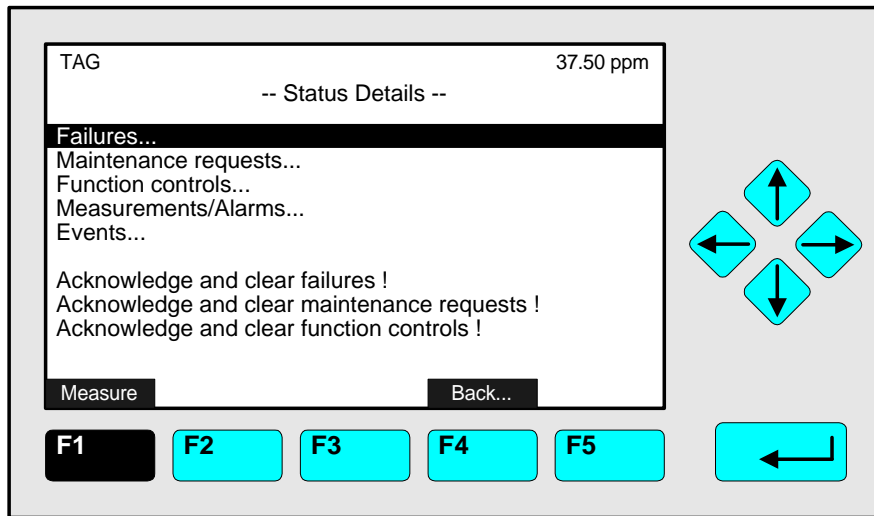


⇒ **Confirmation message of the function start appears**

This message will be displayed after the function has been started. Then the display will jump automatically to the menu "Status Details".

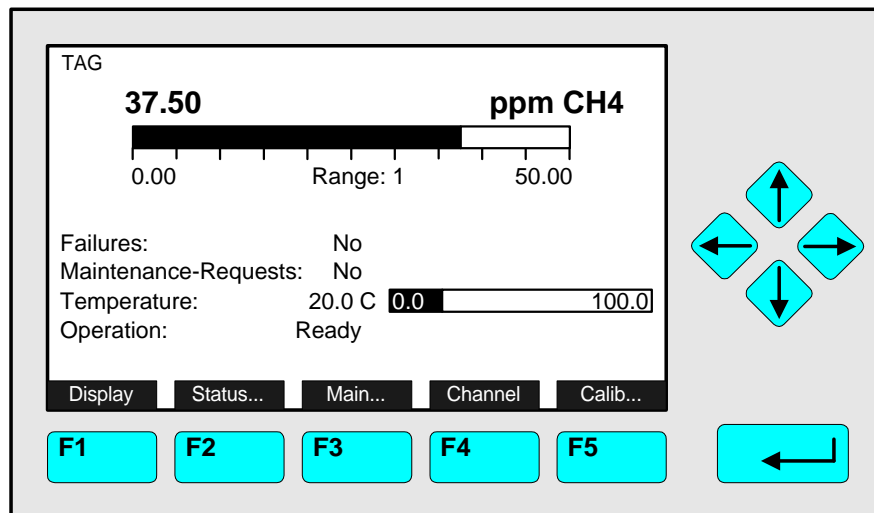


## 4.1.1 Analyzer Channel Status - Status Details Acknowledge and Clear Failures



⇒ Change to the single component display of the channel selected

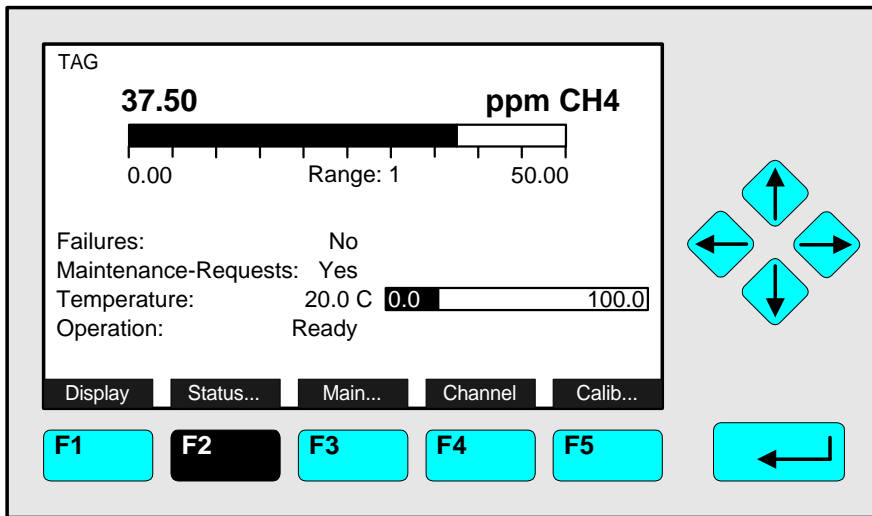
Press **F1**



⇒ Back to the single component display of the current channel after clearing of failures



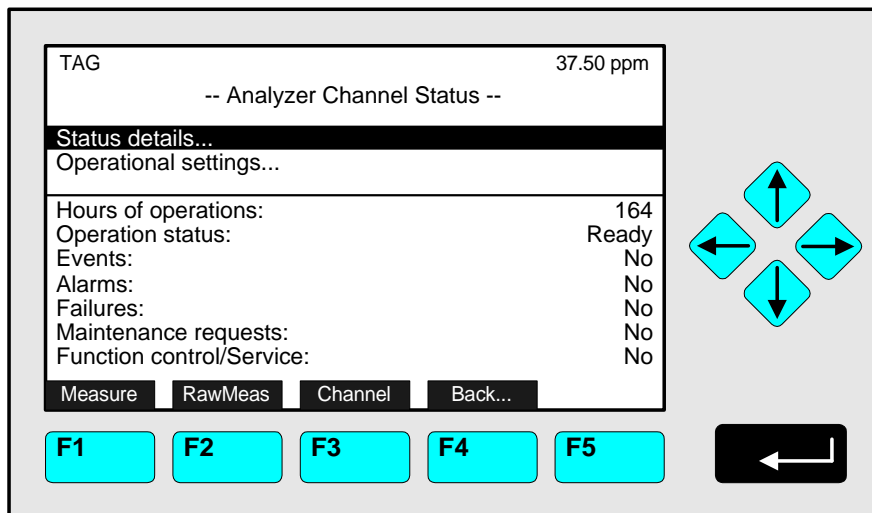
## 4.1.1 Analyzer Channel Status - Status Details Acknowledge and Clear Maintenance Requests



⇒ Change to the menu  
"Analyzer Channel  
Status"

Press **F2**

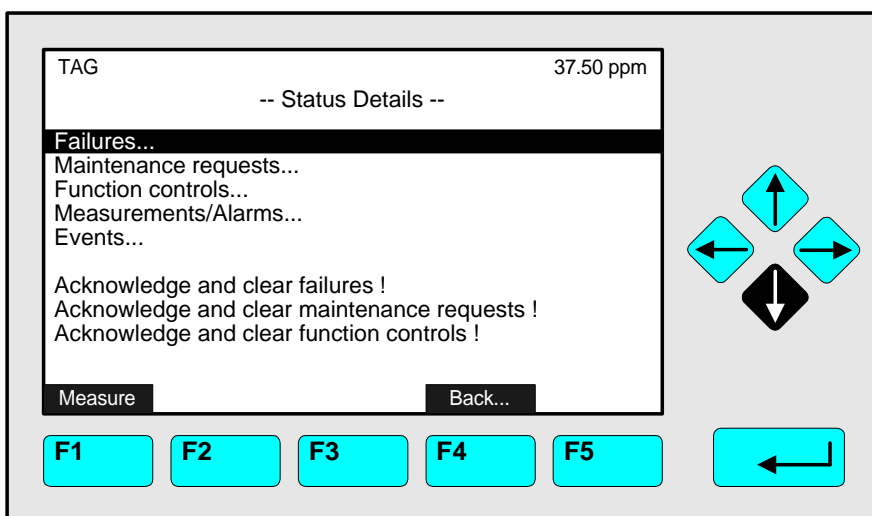
Note:  
If you have solved the reasons for the maintenance requests reported, you should start this function. The menu "List of Possible Maintenance Requests" will be ready for new reports !



⇒ Change to the  
submenu "Status  
Details"

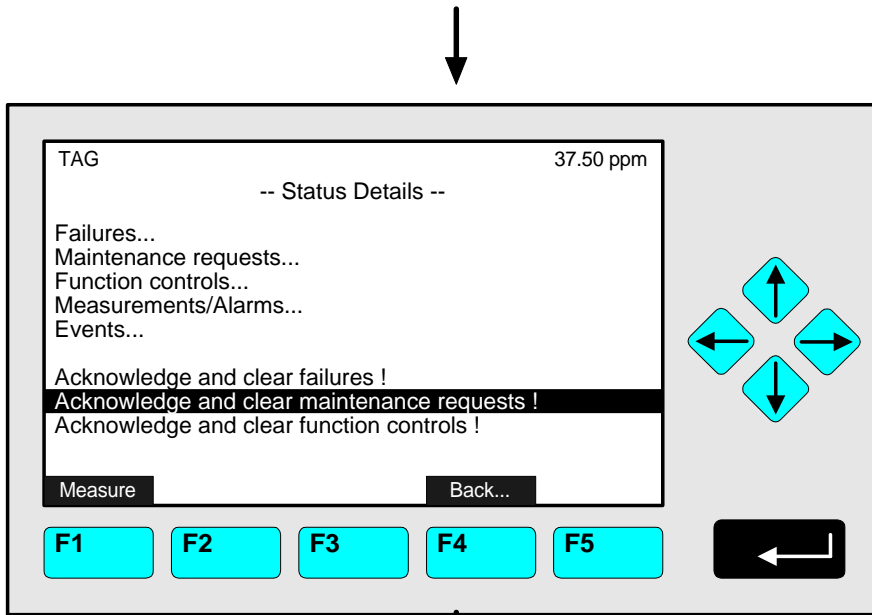
Press

or



⇒ Change to the line  
"Acknowledge and  
clear maintenance  
requests !"

Press or   
as often as necessary  
to get the menu line  
"Acknowledge and clear  
maintenance requests !"  
white on black.

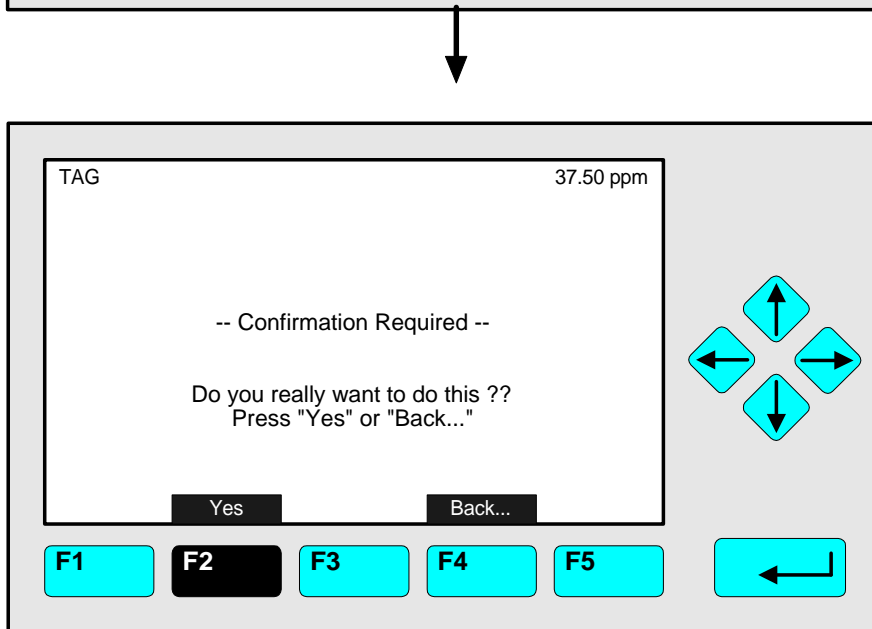


⇒ **Start the function**

Press

or

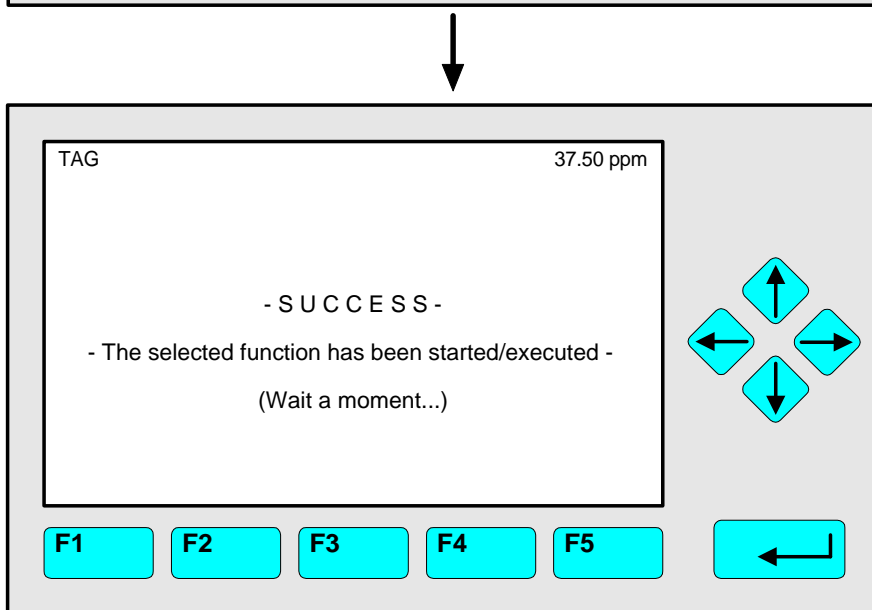
Note:  
Starting this function here is only possible, if it is enabled in the menu "Acknowledgement of Status Reports" (see 5.1.9 p. 5-52) !



⇒ **Confirm the order**

Press to start the function immediately.

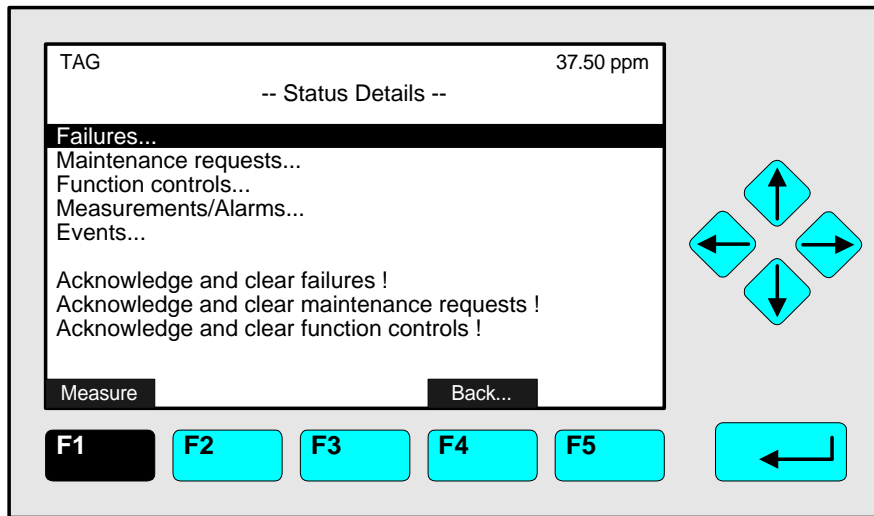
Option:  
Press the F4 key if you want to cancel the order and go back to the menu "Status Details".



⇒ **Confirmation message of the function start appears**

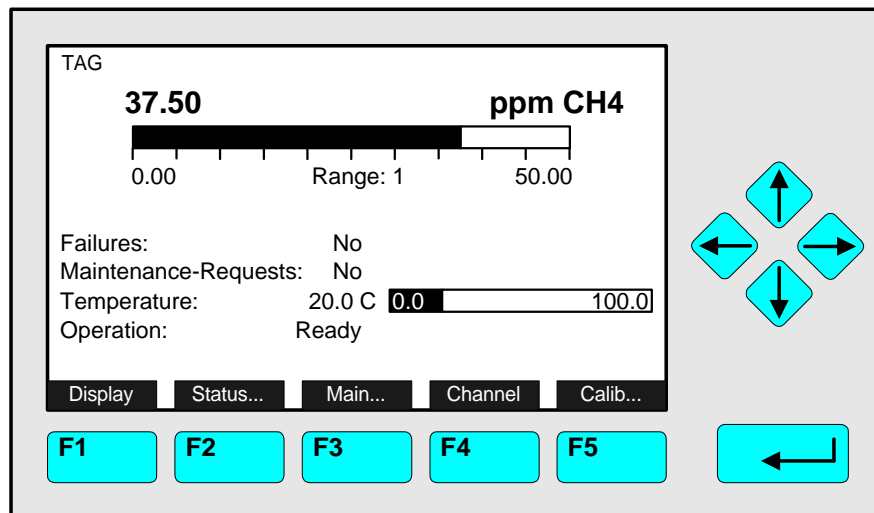
This message will be displayed after the function has been started. Then the display will jump automatically to the menu "Status Details".

## 4.1.1 Analyzer Channel Status - Status Details Acknowledge and Clear Maintenance Requests



⇒ Change to the single component display of the channel selected

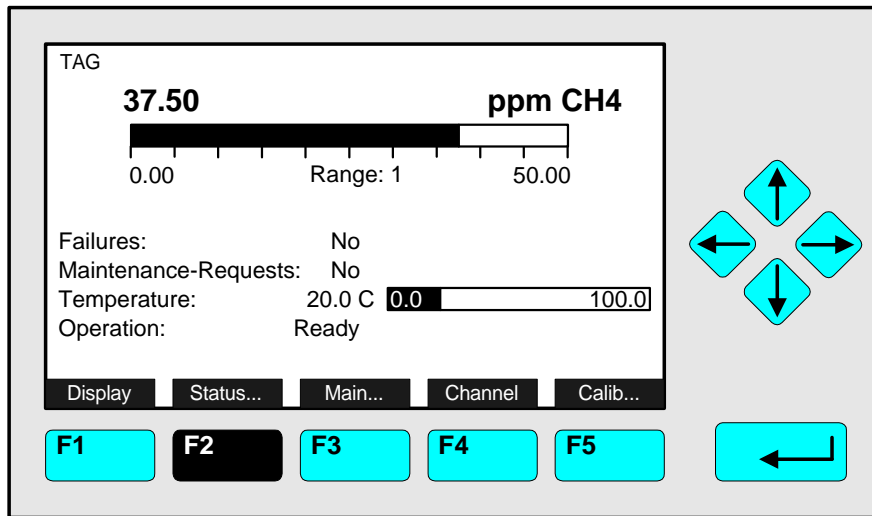
Press **F1**



⇒ Back to the single component display of the current channel after clearing of maintenance requests



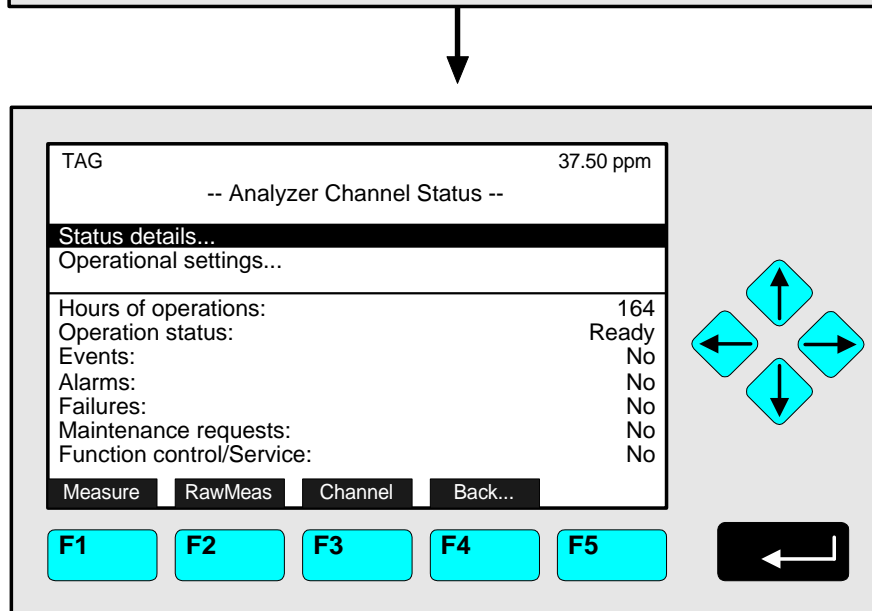
## 4.1.1 Analyzer Channel Status - Status Details Acknowledge and Clear Function Controls



⇒ Change to the menu  
"Analyzer Channel  
Status"

Press **F2**

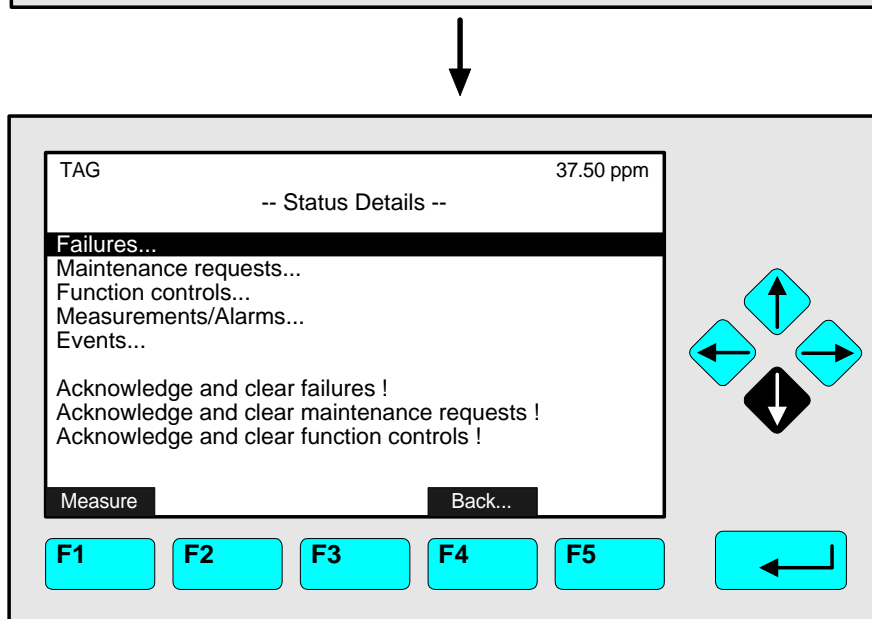
Notes:  
If you have solved the reasons for the function controls reported, you should start this function. The menu "List of Possible Function Controls" will be ready for new reports !



⇒ Change to the  
submenu "Status  
Details"

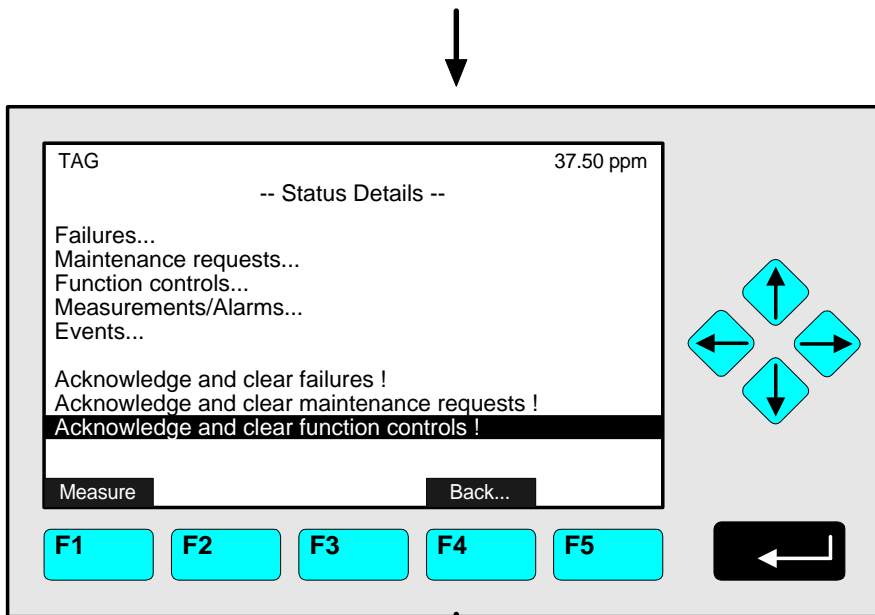
Press

or



⇒ Change to the line  
"Acknowledge  
and clear function  
controls !"

Press or   
as often as necessary  
to get the menu line  
"Acknowledge and clear  
function controls!" white  
on black.

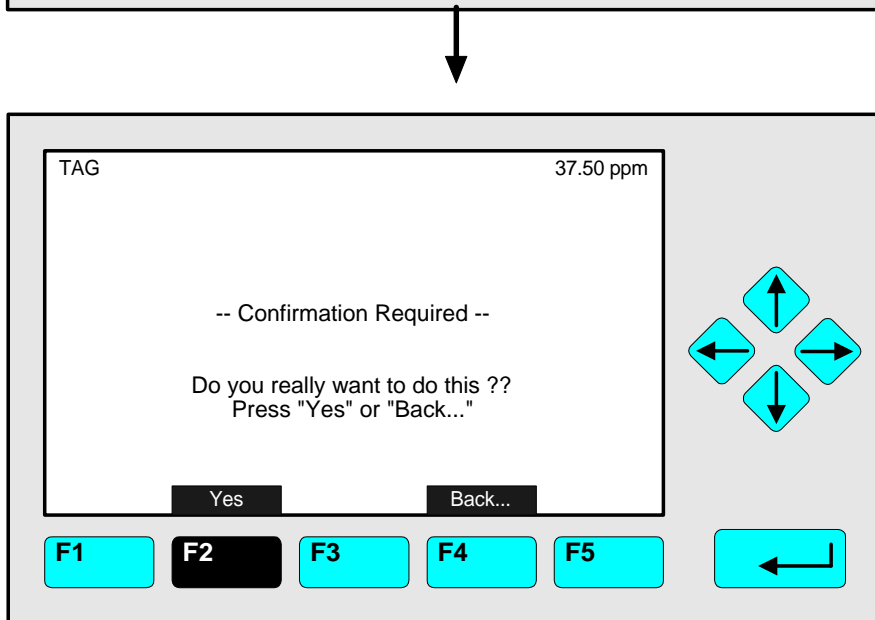


⇒ **Start the function**


Press 

or 

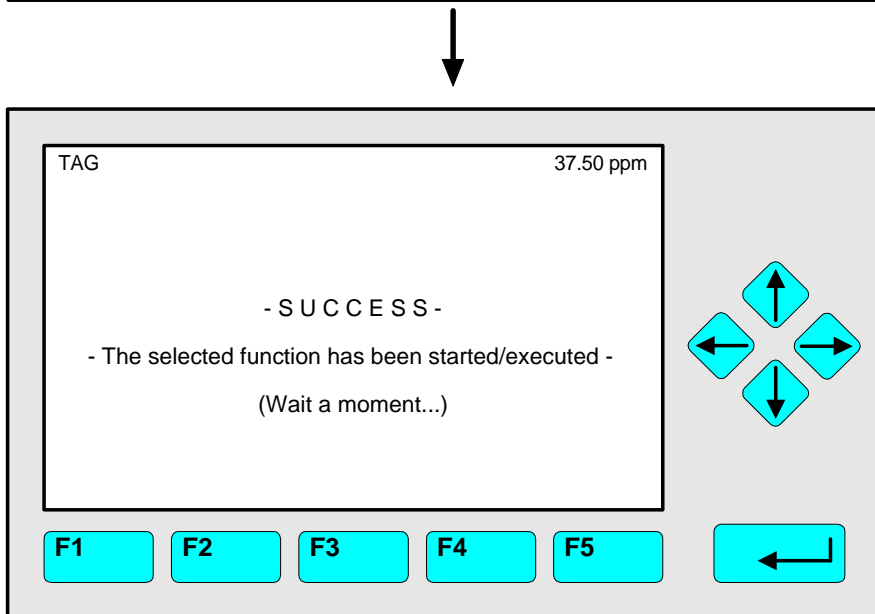
Note:  
Starting this function here is only possible, if it is enabled in the menu "Acknowledgement of Status Reports" (see 5.1.9 p. 5-52) !



⇒ **Confirm the order**

Press   
to start the function immediately.

Option:  
Press the F4 key if you want to cancel the order and go back to the menu "Status Details".

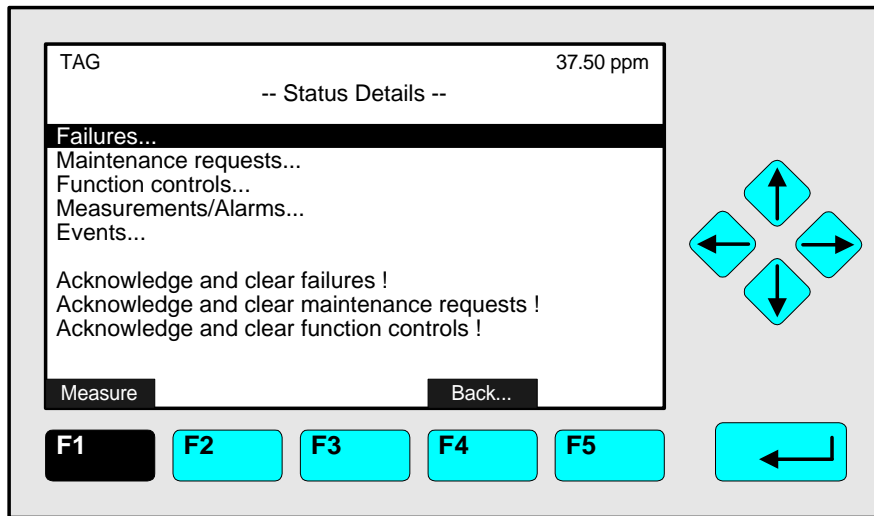


⇒ **Confirmation message of the function start appears**

This message will be displayed after the function has been started. Then the display will jump automatically to the menu "Status Details".

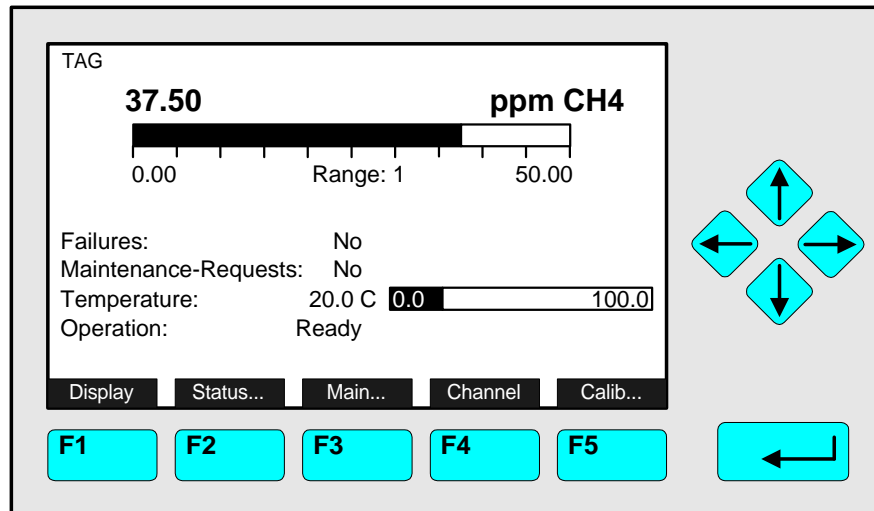


## 4.1.1 Analyzer Channel Status - Status Details Acknowledge and Clear Function Controls



⇒ Change to the single component display of the channel selected

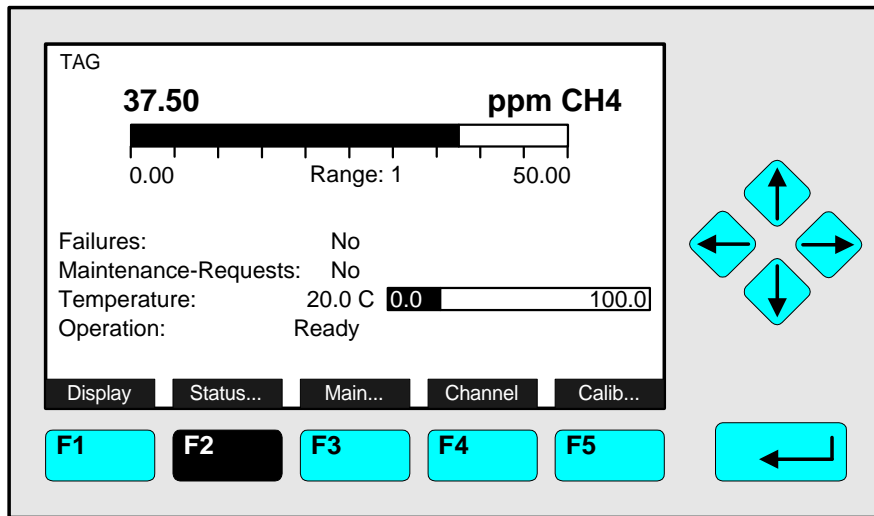
Press **F1**



⇒ Back to the single component display of the current channel after clearing of function controls

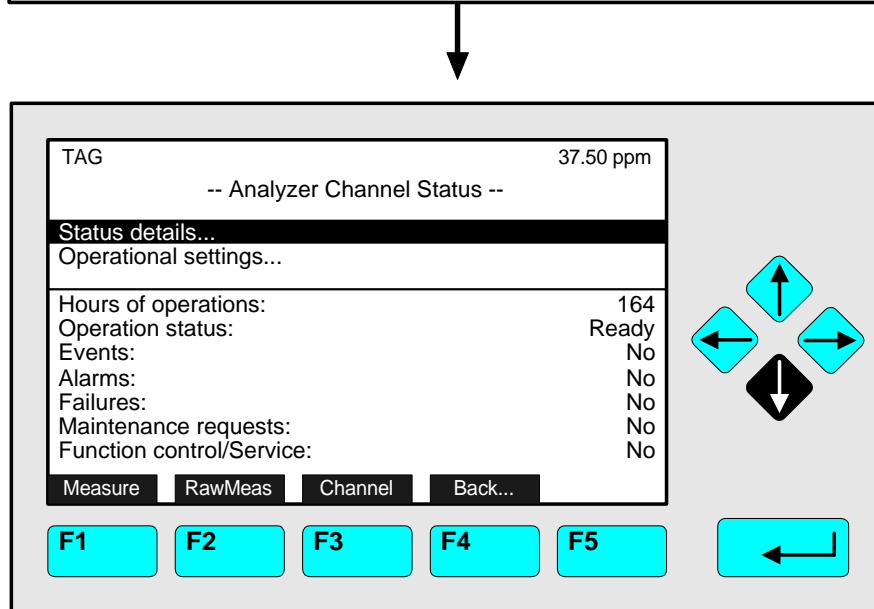


## 4.1.2 Analyzer Channel Status - Operational Settings




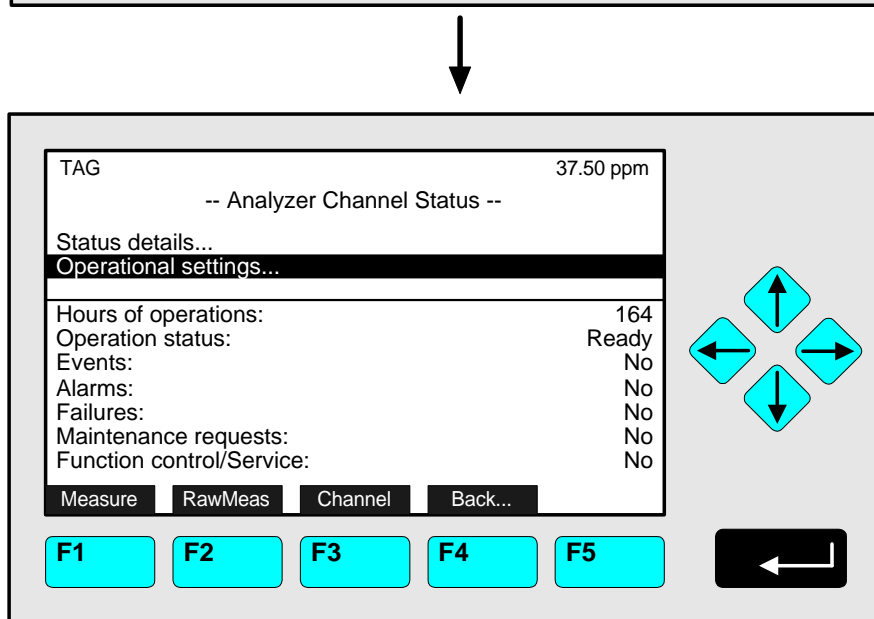
⇒ Change to the menu "Analyzer Channel Status"

Press **F2**



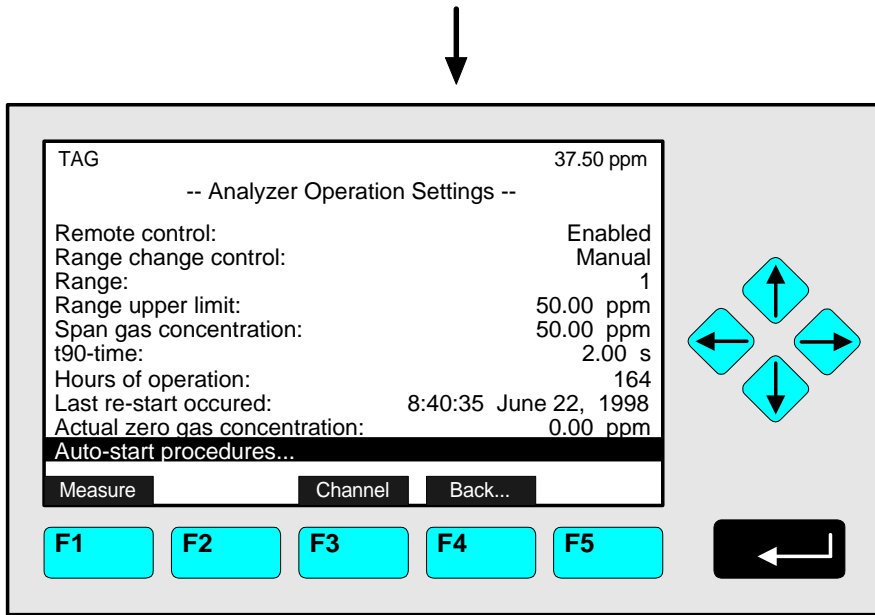
⇒ Change to the line "Operational settings..."

Press  once to get the line "Operational settings..." white on black.



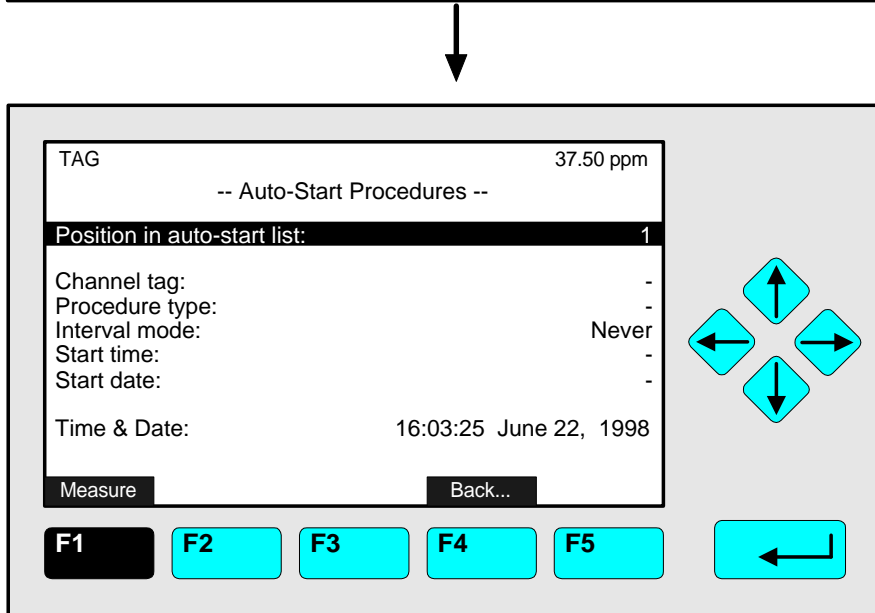
⇒ Change to the menu "Analyzer Operation Settings"

Press 



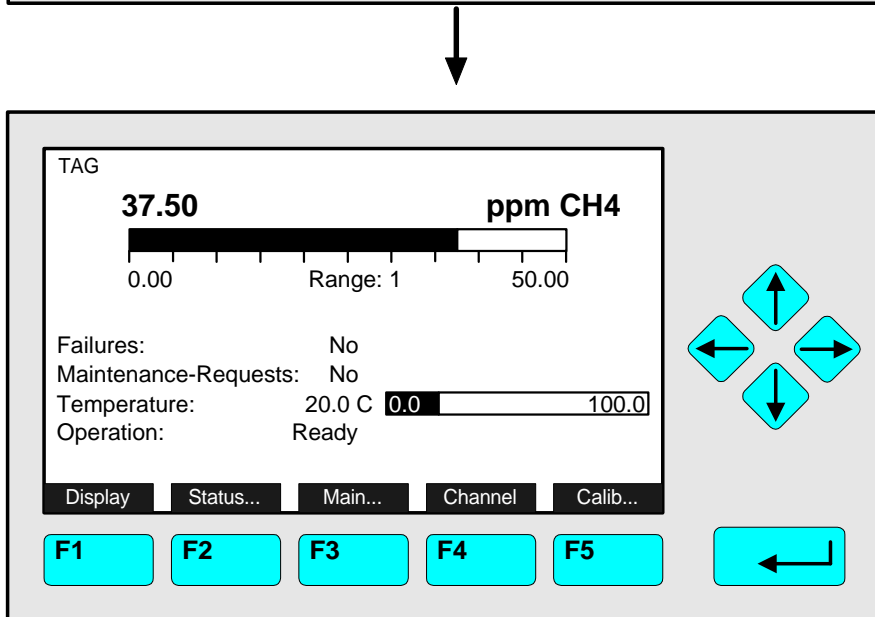
⇒ Change to the submenu "Auto-Start Procedures"

Press 



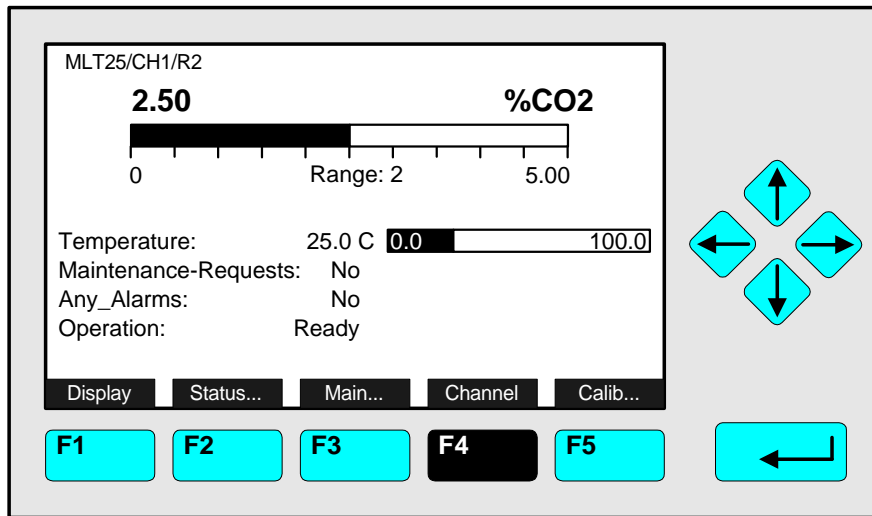
⇒ Change to the single component display

Note:  
In the menu "Auto-Start Procedures" you can control the status of the three kinds of time controlled calibrations. (see 5.1.1 p. 5-12/13)



⇒ Back to the single component display of the current channel

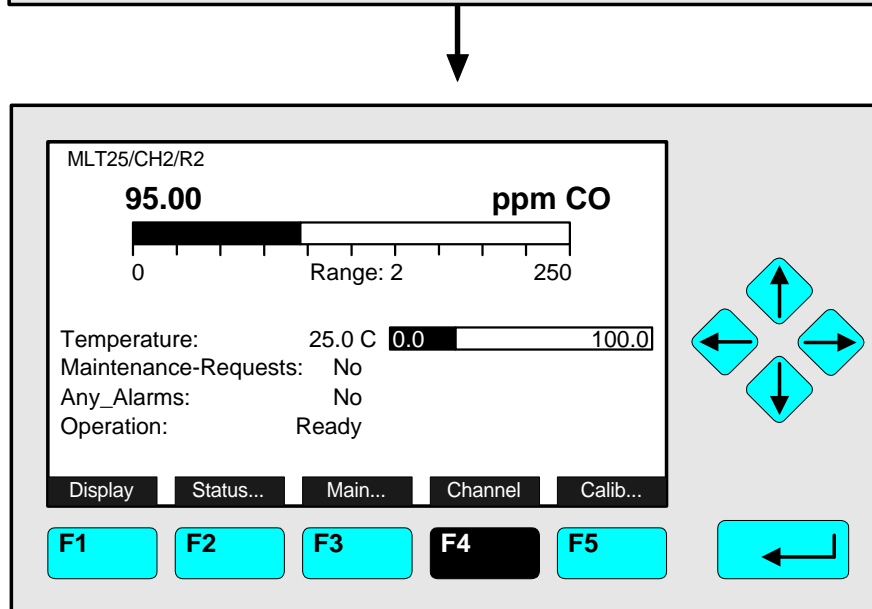
## 4.2 Single Component Display Change of Channel



⇒ **Change to the single component display of another channel**

Press **F4**

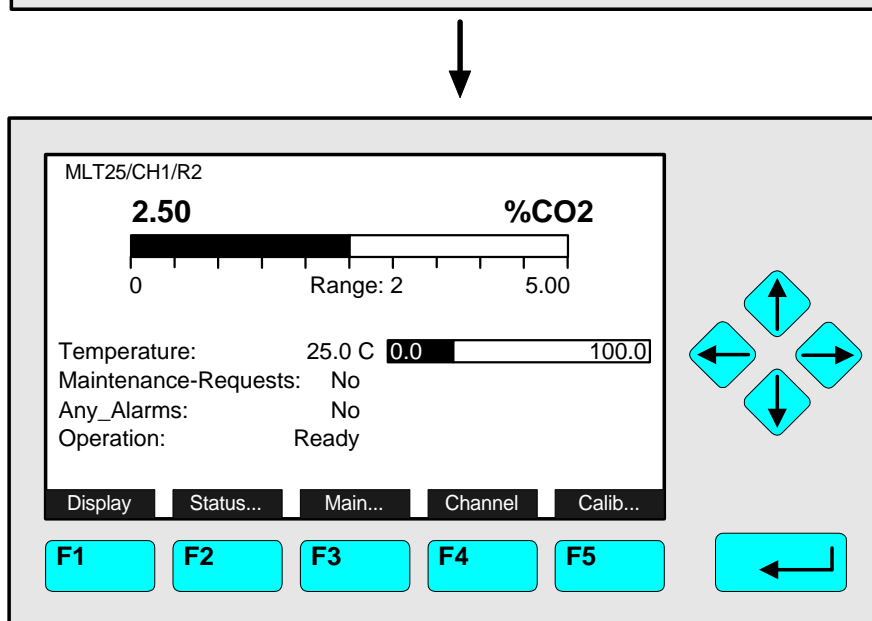
Example:  
Changing from CO<sub>2</sub> (Channel 1) to CO (Channel 2)



⇒ **Change back to the single component display of the starting channel**

Press **F4** as often as necessary to get the display of the channel you want

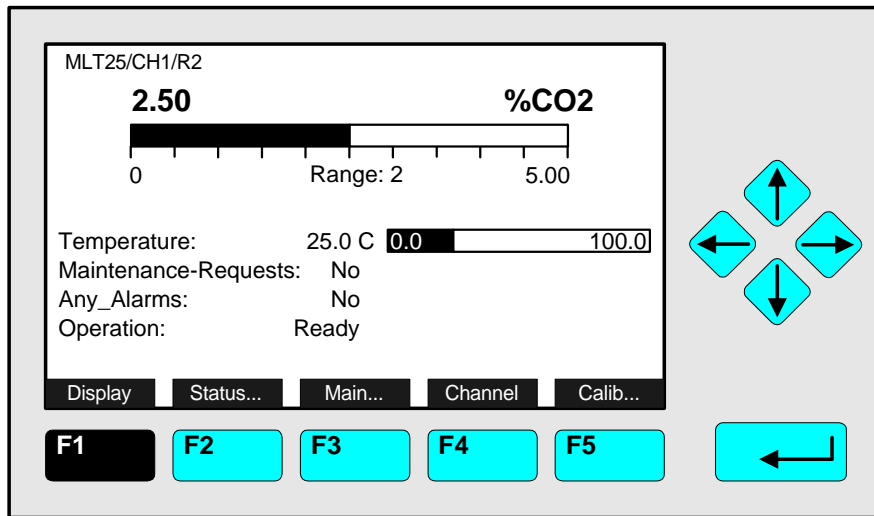
Note:  
You can reach any existing channel by pressing the F4 key for several times.



⇒ **Single component display of the starting channel appears**



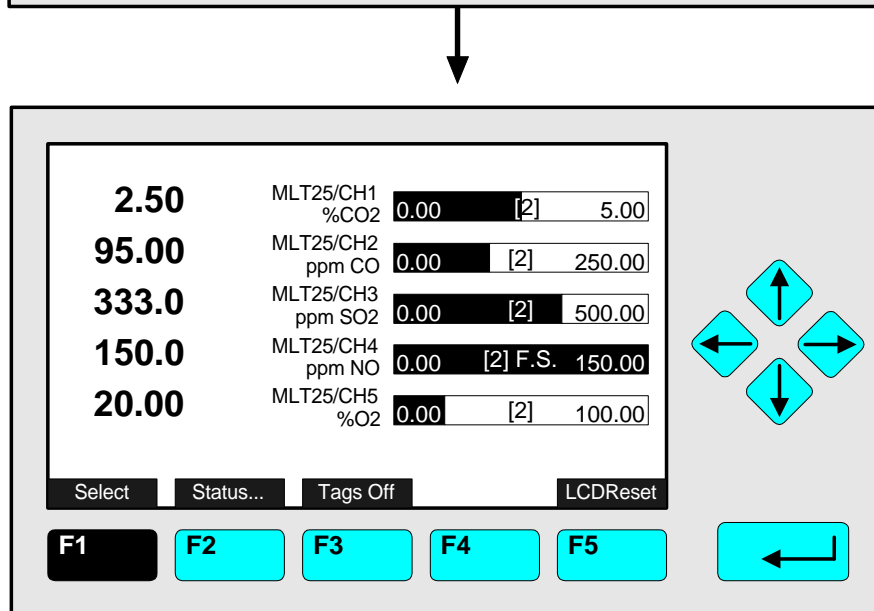
## 4.3 Multi Component Display Change of Channel



⇒ **Change to the multi component display**

Press **F1**

Note:  
You can change to the multi component display from each single component display.



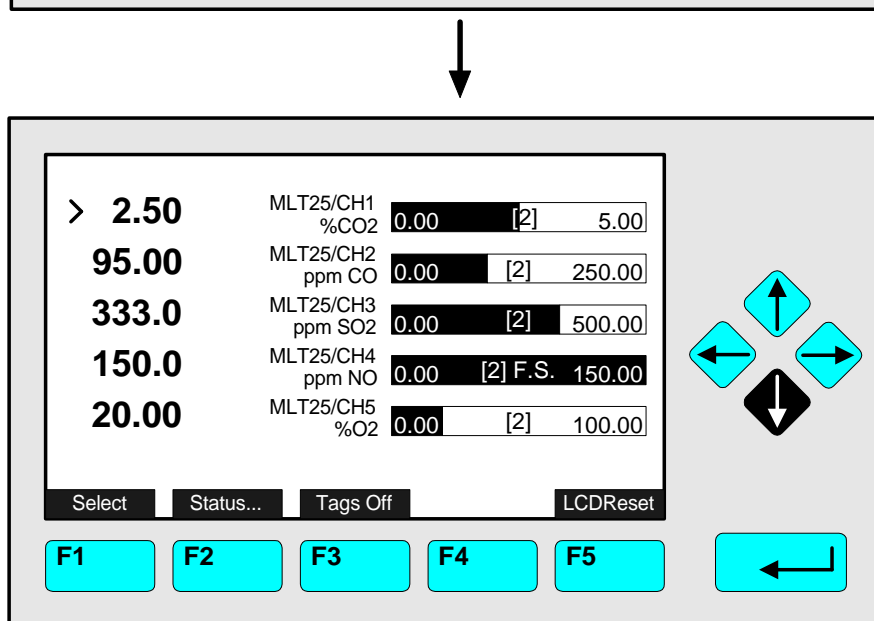
⇒ **Enable the "selecting symbol": >**

Press **F1** or

Notes:

- In each bargraph you will find the begin and end of range of the corresponding channel. (F.S. = full scale)
- The number in parentheses shows the number of the selected range.

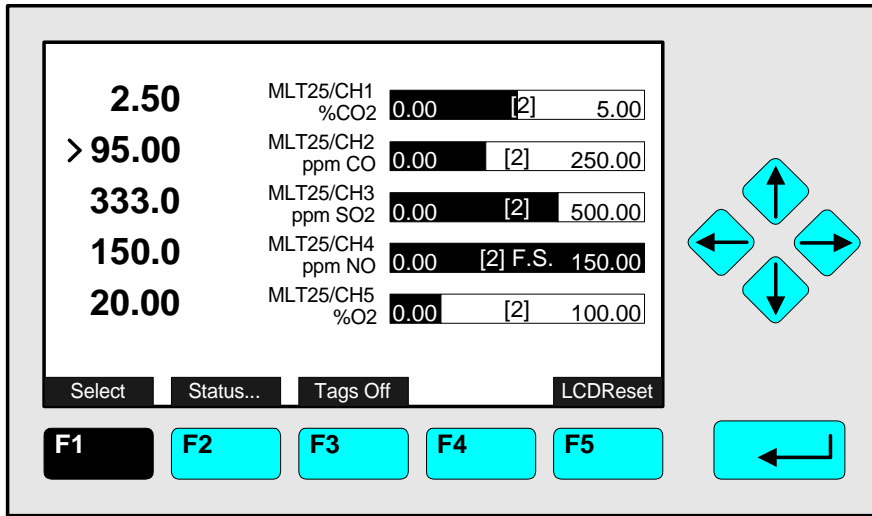
Option:  
With the F3 key you can fade out or in the tags.



⇒ **Select any channel**

Press or as often as necessary to put the > - mark into the line you want to select.

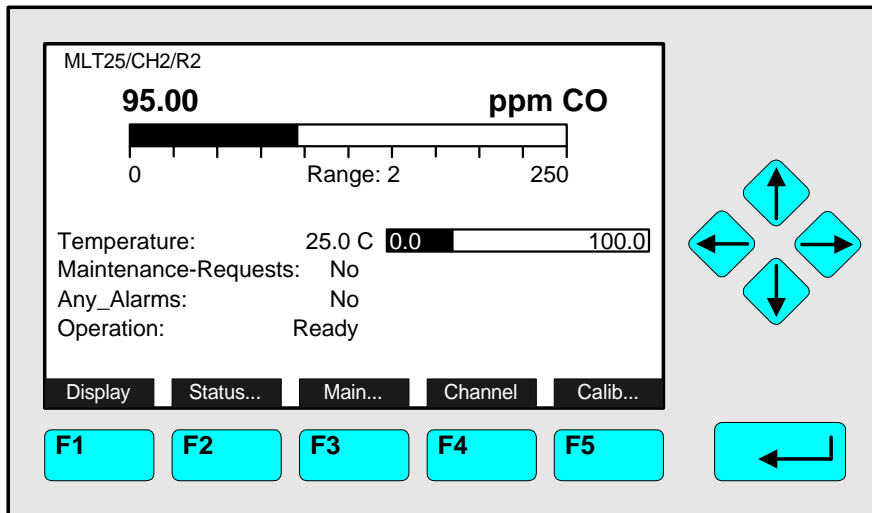
Example:  
Change from CO<sub>2</sub> (Channel 1) to CO (Channel 2)



⇒ **Change to the single component display of the channel selected**

Press **F1**

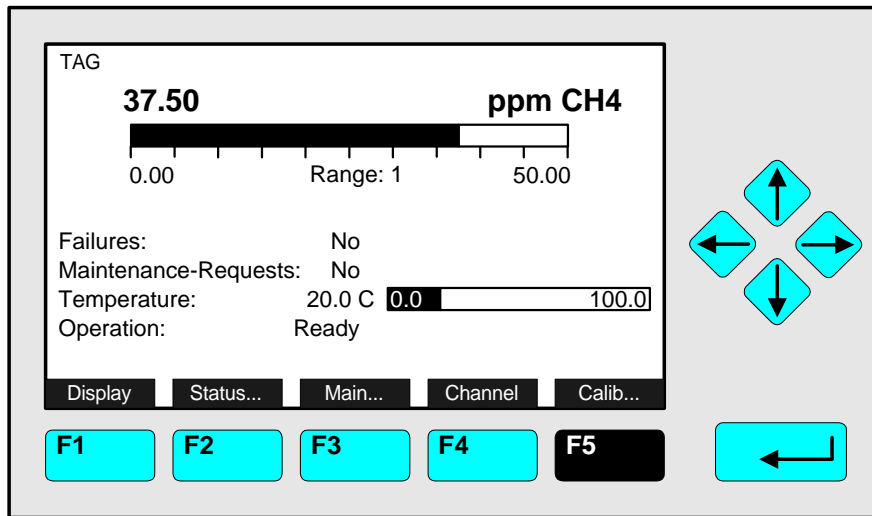
Note:  
With the F5 key you can enable the LCD-brightness and contrast of the factory settings (see also section 7).



⇒ **Single component display of the channel selected appears**

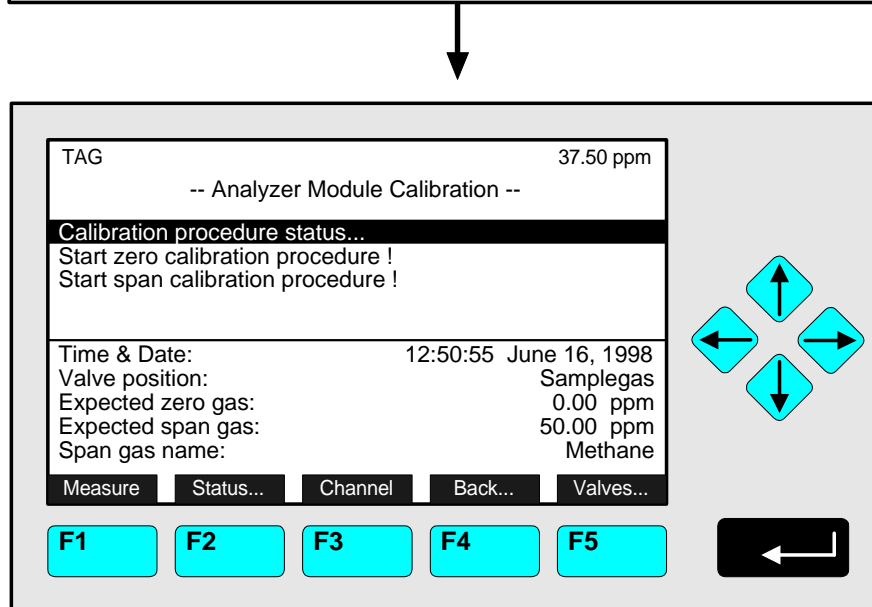


## 4.4 Calibration Procedure Status



⇒ Change to the menu "Analyzer Module Calibration"

Press **F5**



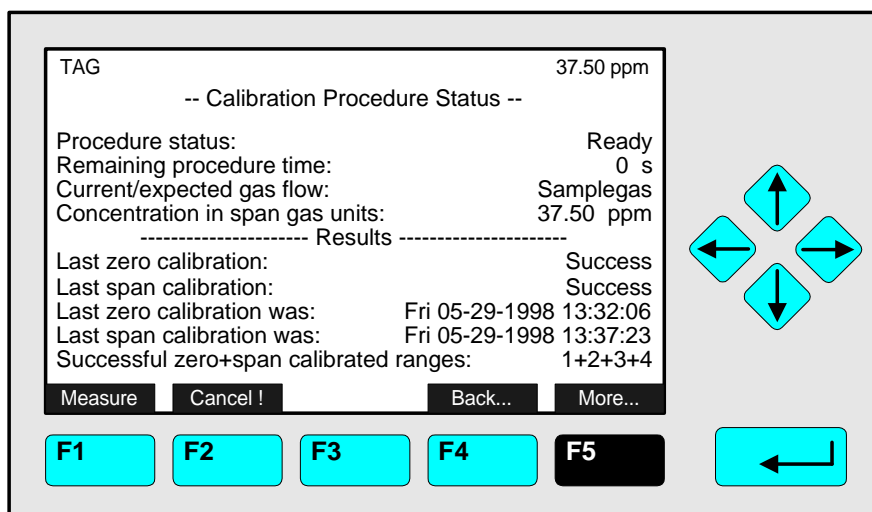
⇒ Change to the menu "Calibration Procedure Status"

Press

Options:  
 Via the F5 key you can change to a submenu, where you can close all valves or set up each valve separately with:

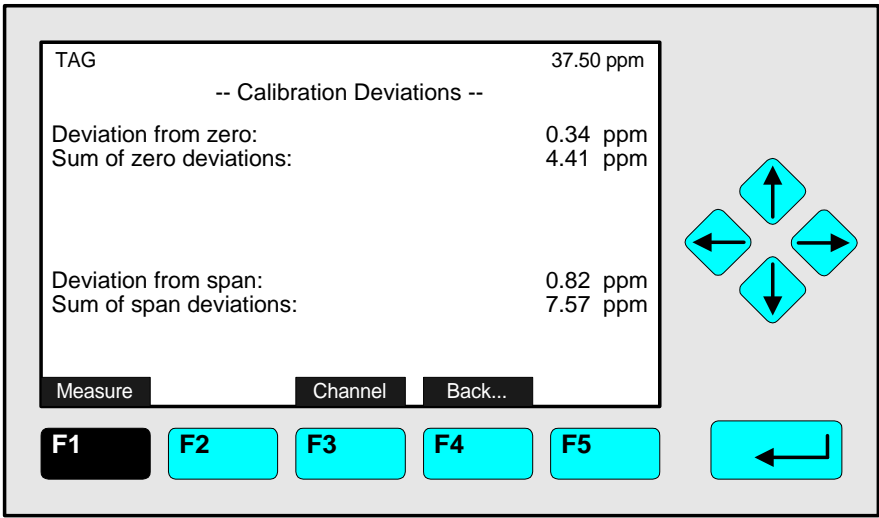
- zero gas or
- span gas or
- sample gas or
- test gas.

(See sections 4.7 to 4.11, p. 4-47...)



⇒ Change to the menu page "Calibration Deviations"

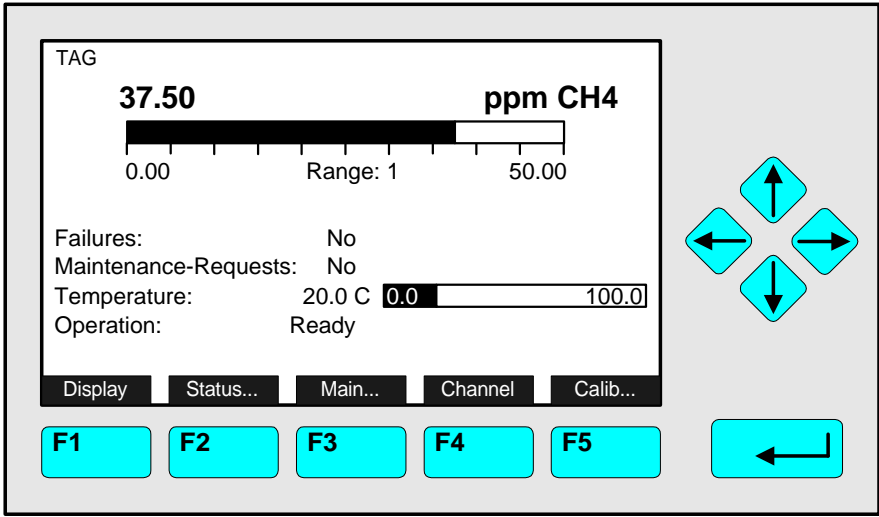
Press **F5**



⇒ **Change to the single component display of the current channel**

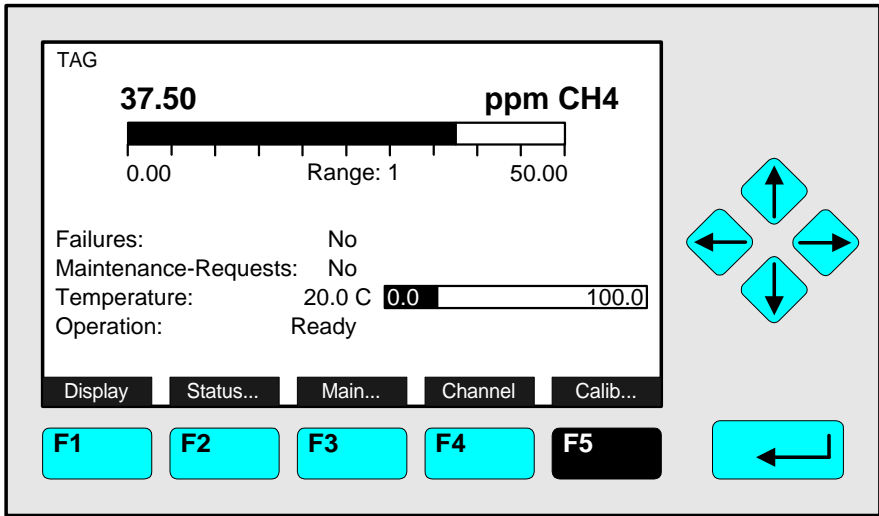
Press **F1**

- Options:
- With the F3 key you can change to further available channels to check their "Calibration Deviations".
  - With the F4 key you can go back to the menu "Calibration Procedure Status".



⇒ **Back to the single component display**

# 4.5 Zero Calibration

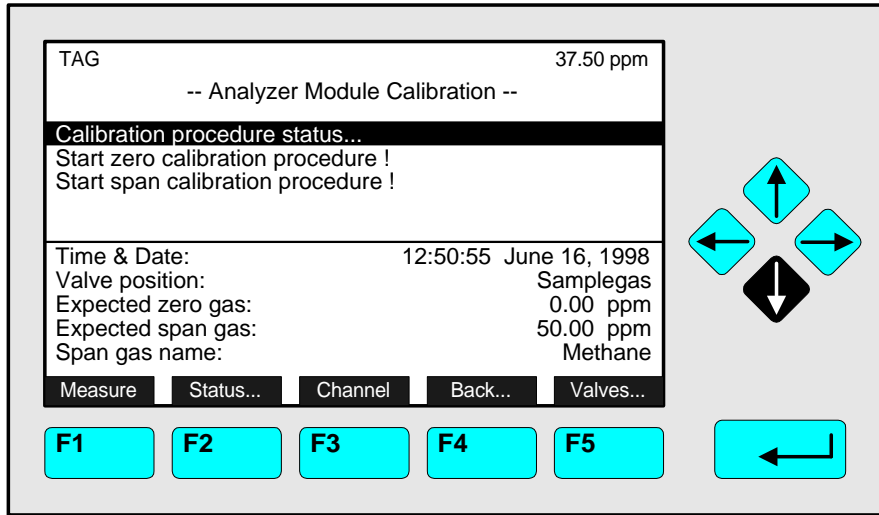


⇒ Change to the menu "Analyzer Module Calibration"


Press **F5**

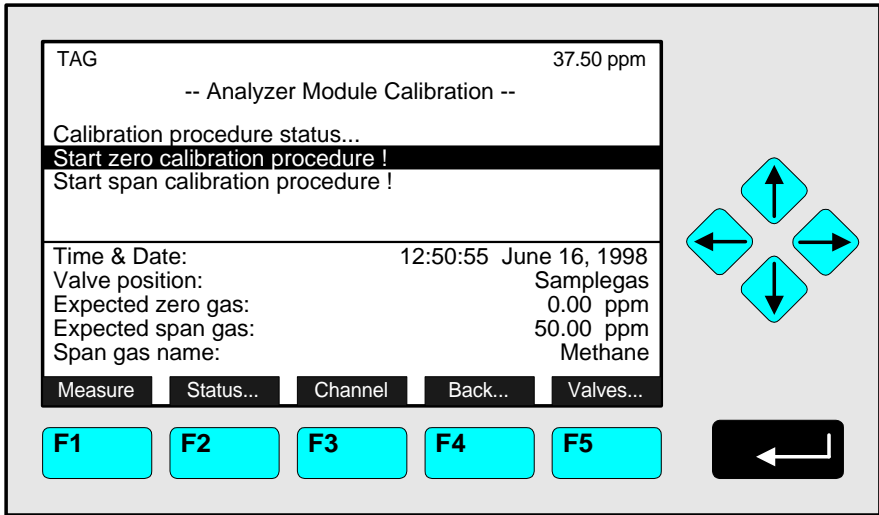
**Caution:**  
Before starting zero calibration, realize that zero gas is available ! (See also section 5.1.1, p. 5-5... !)

**Note:**  
The zeroing of all measurement ranges of the same channel is running simultaneously.



⇒ Change to the line "Start zero calibration procedure !"

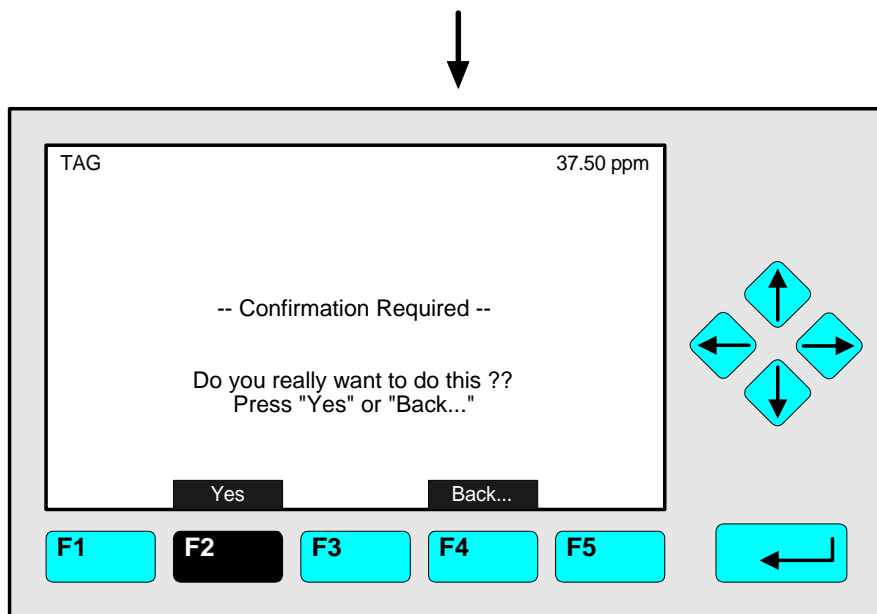
Press  once to get the line "Start zero calibration procedure !" white on black.



⇒ Start the zero calibration

Press 

or 



⇒ **Confirm the order for zero calibration**

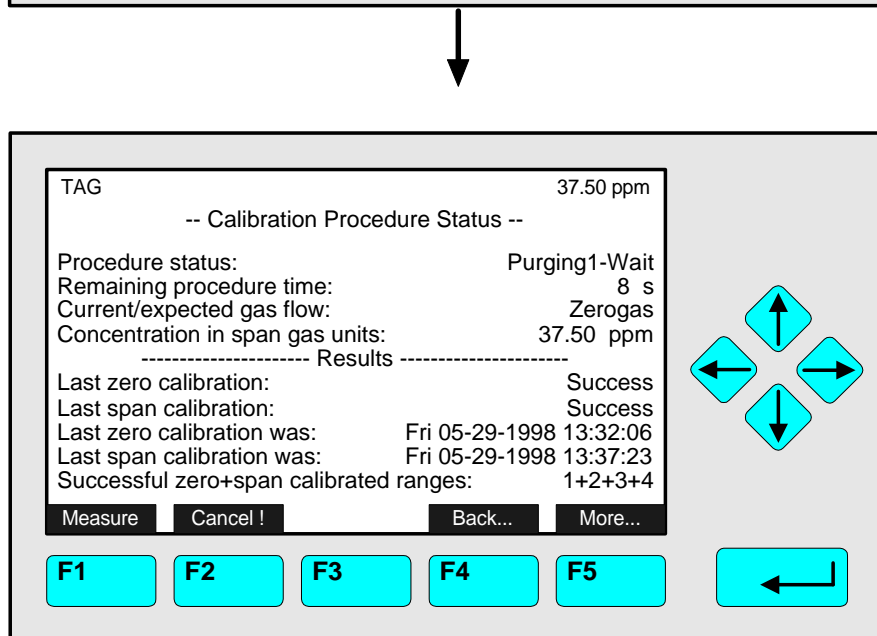
Press **F2** to start the zeroing immediately.

Option:

Press the F4 key if you want to cancel the order.

Notes:

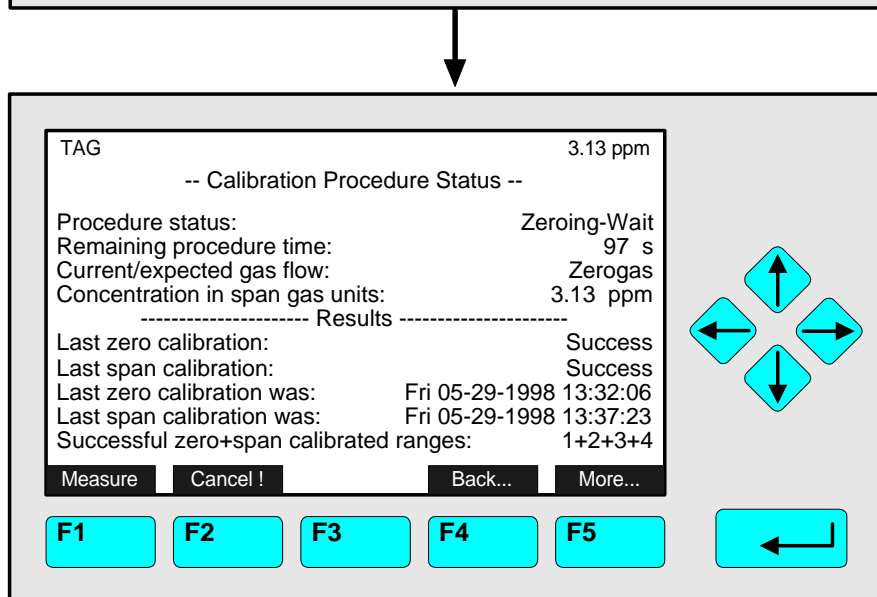
- The display of this message depends on the setup in the expert configurations. (see 5.1.8 p. 5-49)
- The 3 following illustrations show the displays you can see after starting the zeroing procedure.



⇒ **Zeroing:**  
**1. Purging-Wait**

Notes:

- The procedure time depends on the parameters entered for purge time (see section 5.1.1 p. 5-9).
- The purge time must be long enough to get a stable signal before calibration.
- You can cancel the running calibration procedure at any time with the F2 key.

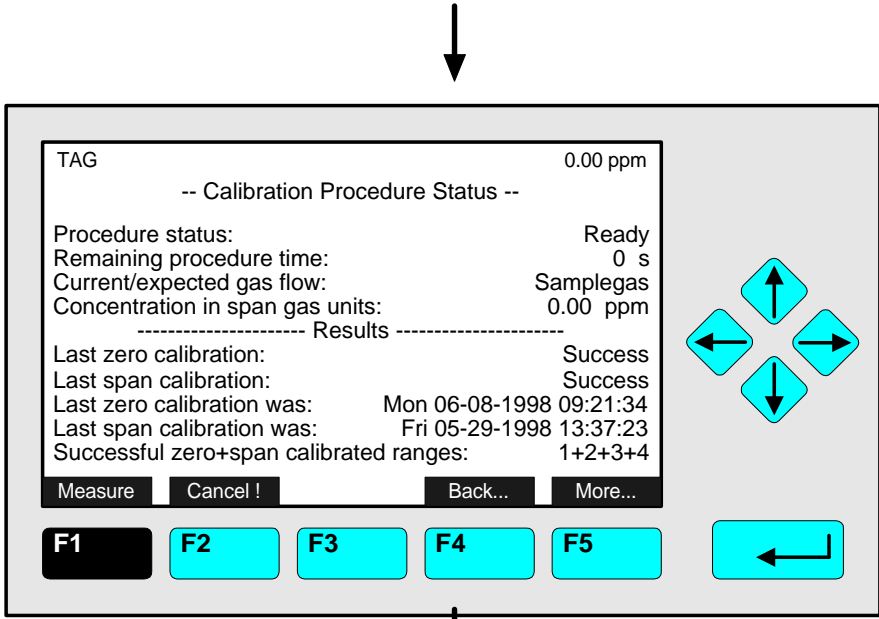


⇒ **Zeroing:**  
**2. Zeroing-Wait**

Note:

The procedure time depends on the parameters entered for stability time and averaging time. (see section 5.1.1 p. 5-9)

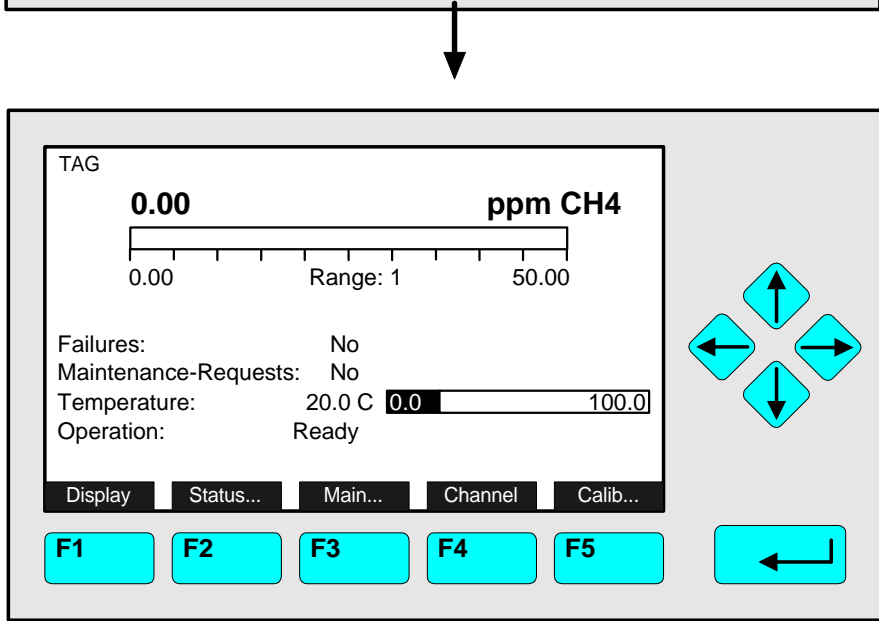
# 4.5 Zero Calibration



⇒ **Change to the single component display of the current channel**

Press **F1**

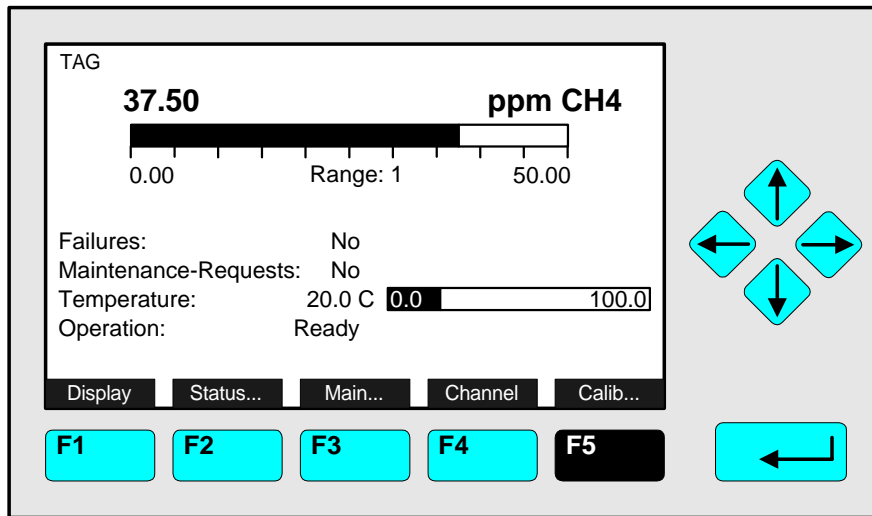
- Options:
- F4 key: Changing back to the menu "Analyzer Module Calibration".
  - F5 key: Changing to the menu "Calibration Deviations".



⇒ **Single component display appears after zeroing is done**



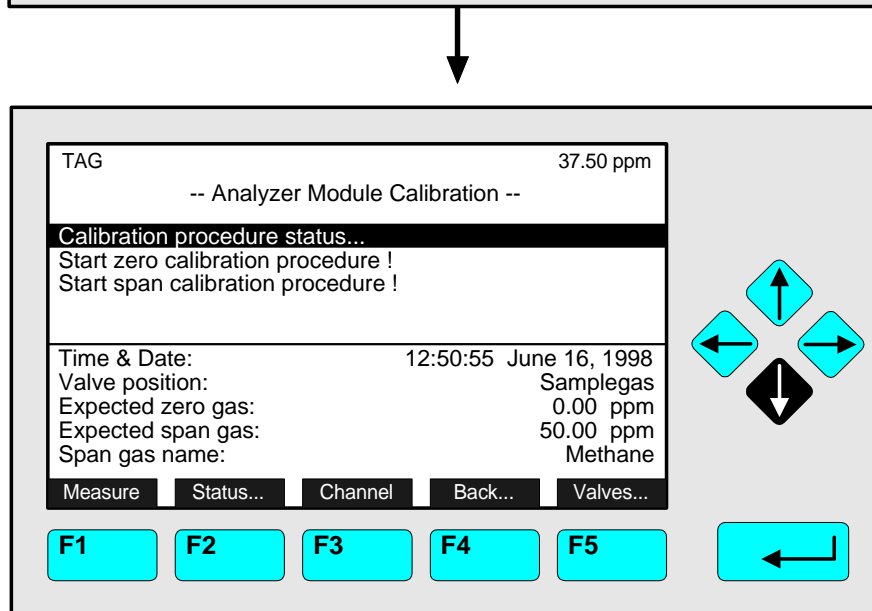
## 4.6 Span Calibration




⇒ Change to the menu "Analyzer Module Calibration"

Press **F5**

**Caution:**  
Before starting span calibration, realize that spangas with correct concentration is available !  
(See also section 5.1.1, p.5-5... !)

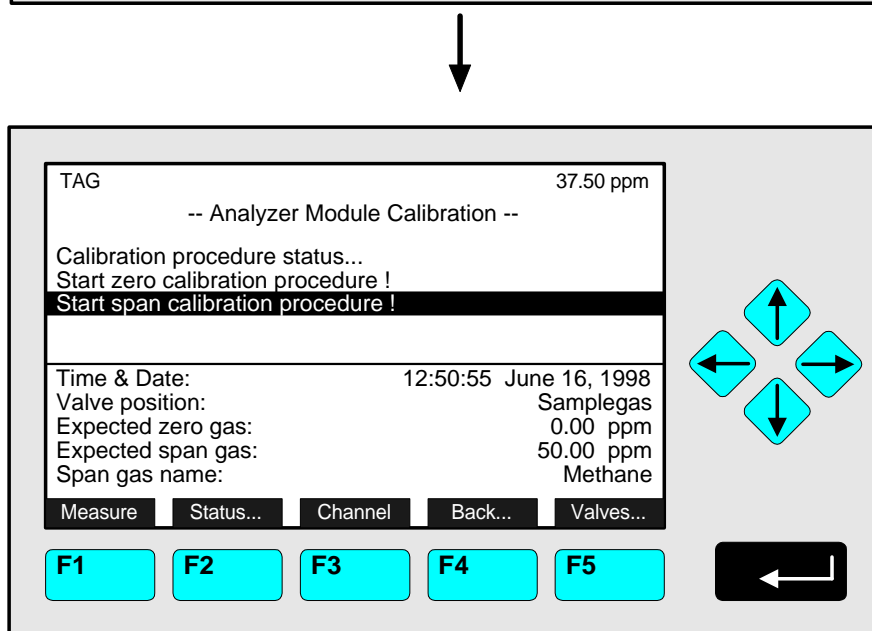


⇒ Change to the line "Start span calibration procedure !"

Press  twice to get the line "Start span calibration procedure !" white on black.

**Notes:**

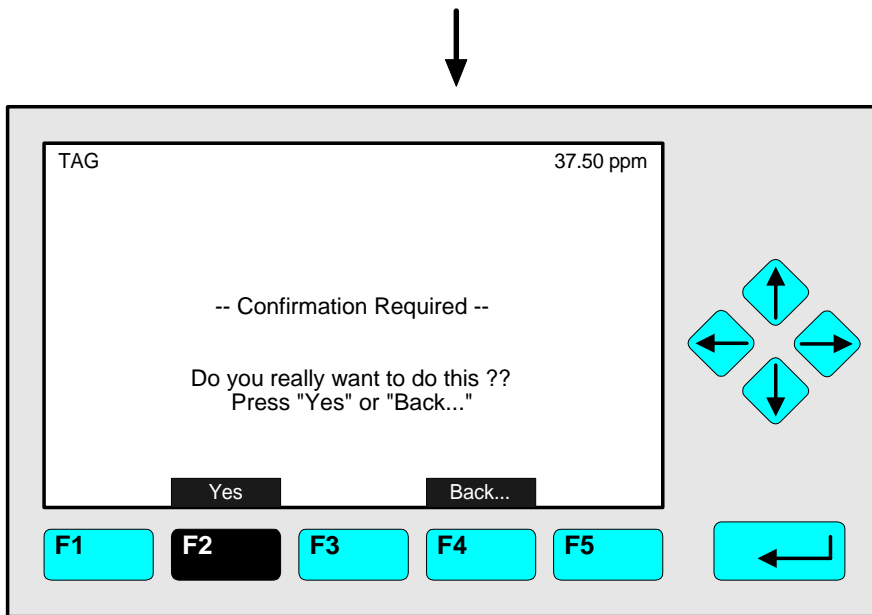
- Normally, all measurement ranges of the same channel will be calibrated simultaneously.
- To calibrate separately you have to change the parameters (see 5.1.1 p. 5-11).



⇒ Start the span calibration

Press 

or 



⇒ **Confirm the order for span calibration**

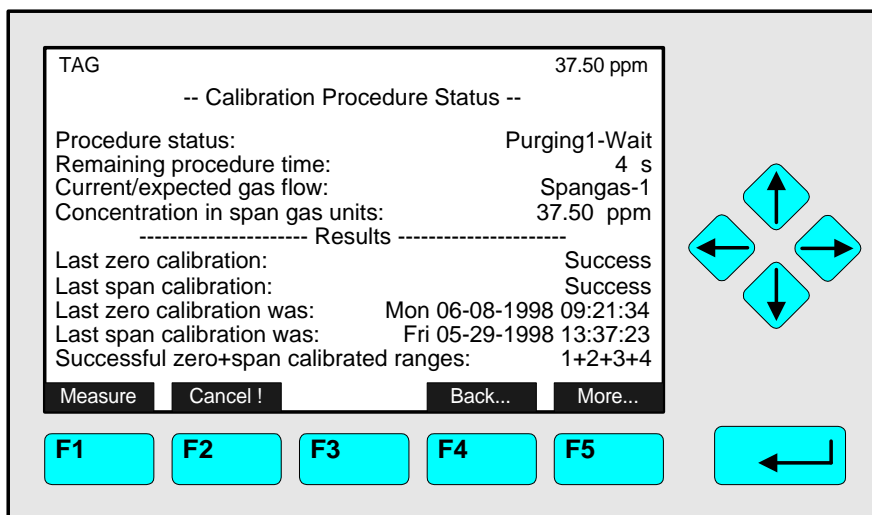
Press **F2** to start the spanning immediately.

Option:

Press the F4 key if you want to cancel the order.

Notes:

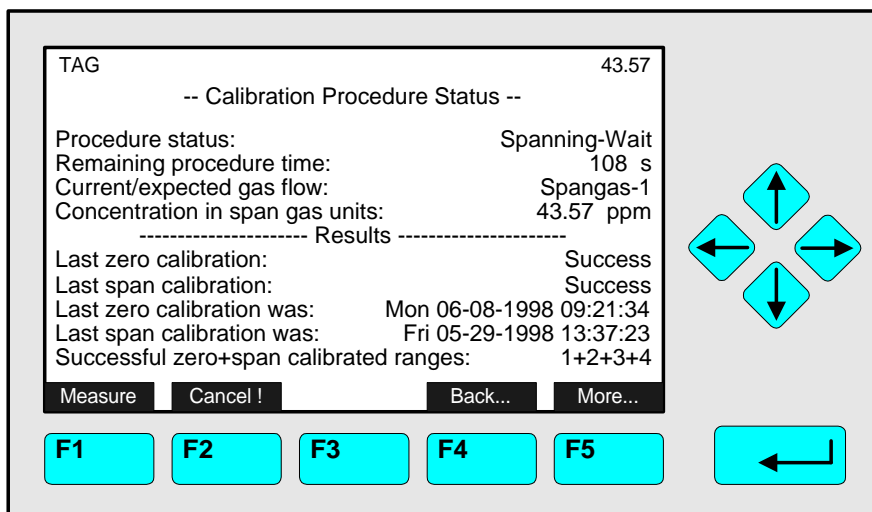
- The display of this message depends on the setup in the expert configurations. (see 5.1.8 p. 5-49)
- The 3 following illustrations show the displays you can see after starting the spanning procedure.



⇒ **Spanning: 1. Purging-Wait**

Notes:

- The procedure time depends on the parameters entered for purge time (see 5.1.1 p. 5-9).
- The purge time must be long enough to get a stable signal before calibration.
- You can cancel the running calibration procedure at any time with the F2 key.



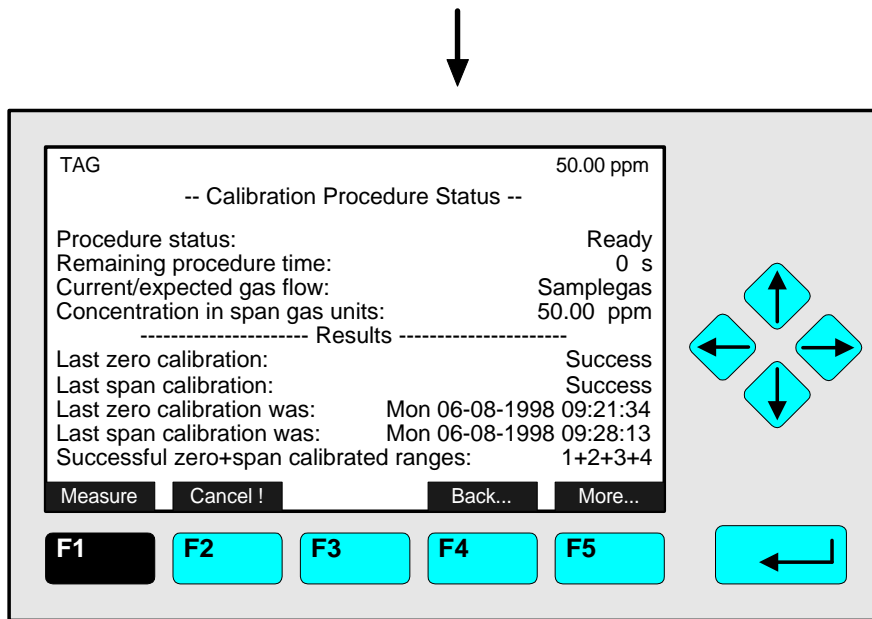
⇒ **Spanning: 2. Spanning-Wait**

Note:

The procedure time depends on the parameters entered for stability time and averaging time. (see 5.1.1 p.5-9)



## 4.6 Span Calibration

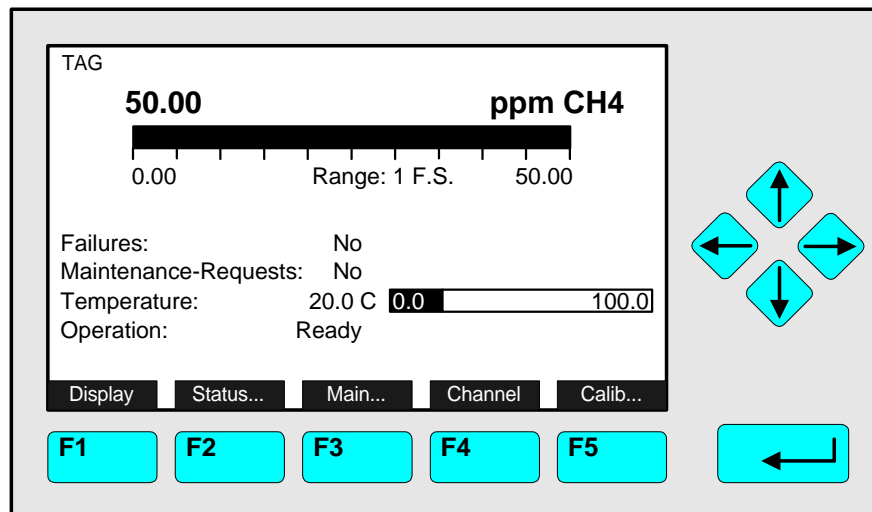


⇒ **Change to the single component display of the current channel**

Press **F1**

Options:

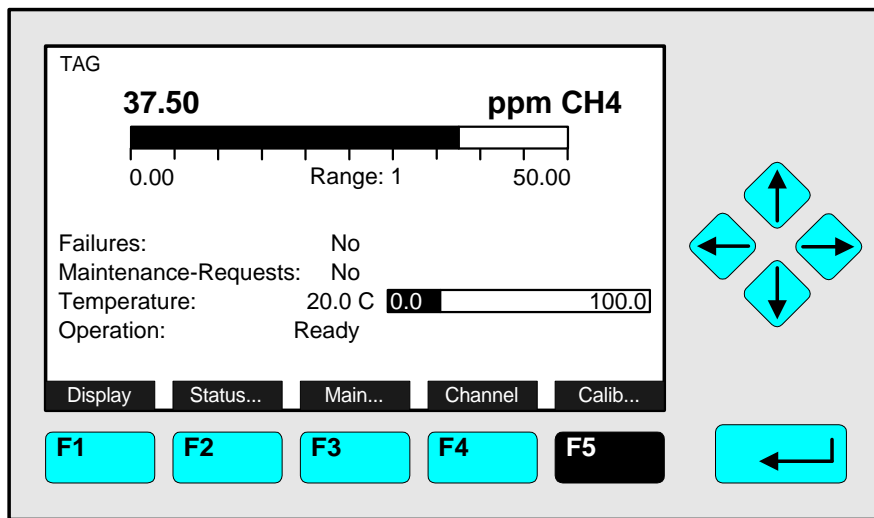
- F4 key: Changing back to the menu "Analyzer Module Calibration".
- F5 key: Changing to the menu "Calibration Deviations".



⇒ **Single component display appears after spanning is done**



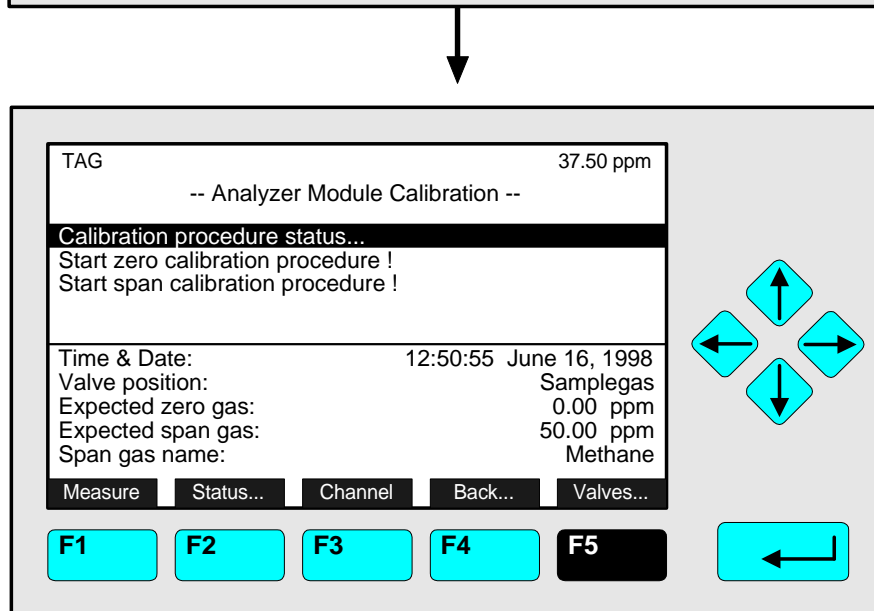
## 4.7 Flow Zero Gas



⇒ Change to the menu "Analyzer Module Calibration"

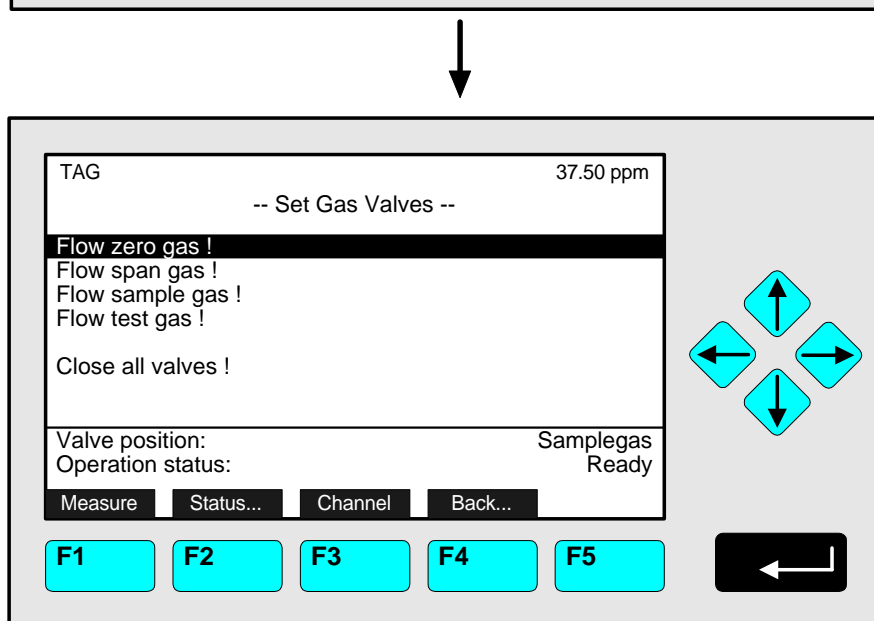
Press **F5**

**Caution:**  
Before starting zero gas flow, realize that zero gas is available !  
(See also section 5.1.1, p.5-5... !)



⇒ Change to the menu "Set Gas Valves"

Press **F5**

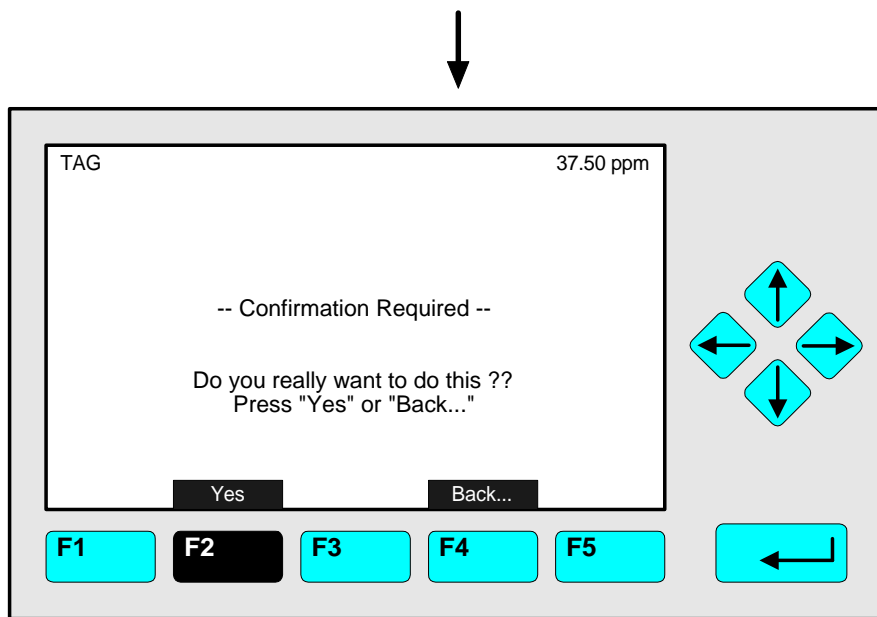


⇒ Start the zero gas flow

Press

or

Starting this function will switch on the zero gas valve as current gas valve.

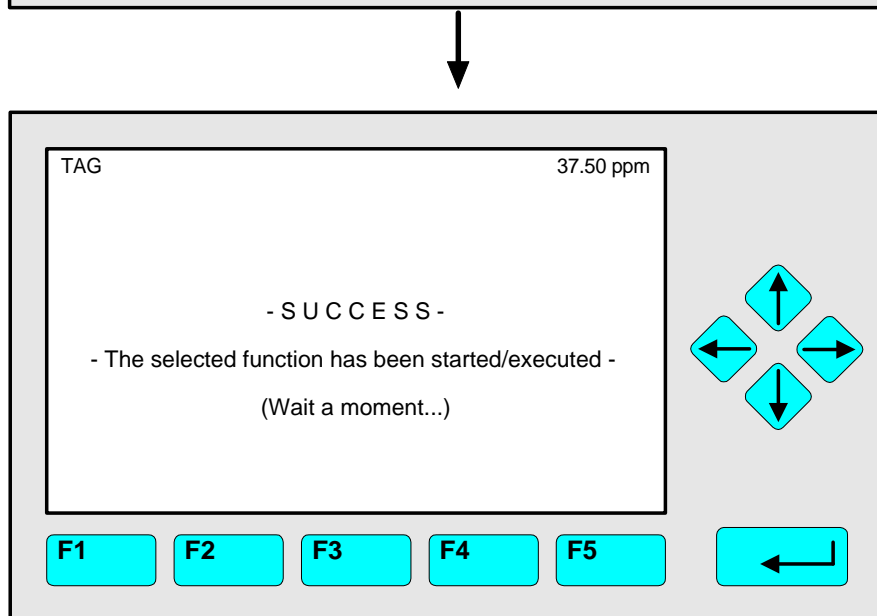


⇒ **Confirm the order to flow zero gas**

Press **F2** to start the zero gas flow immediately.

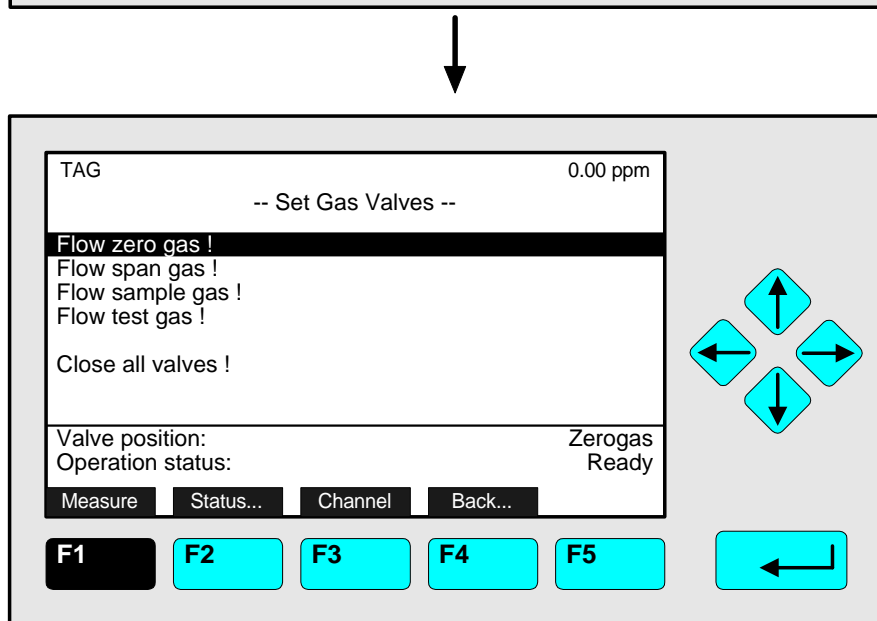
Option:  
Press the F4 key if you want to cancel the order and go back to the menu "Set Gas Valves".

Note:  
The display of this message depends on the setup in the expert configurations. (see 5.1.8 p. 5-49)



⇒ **Confirmation message of the function start appears**

Note:  
This message will be displayed after the function has been started. Then the display will jump automatically to the menu "Set Gas Valves".

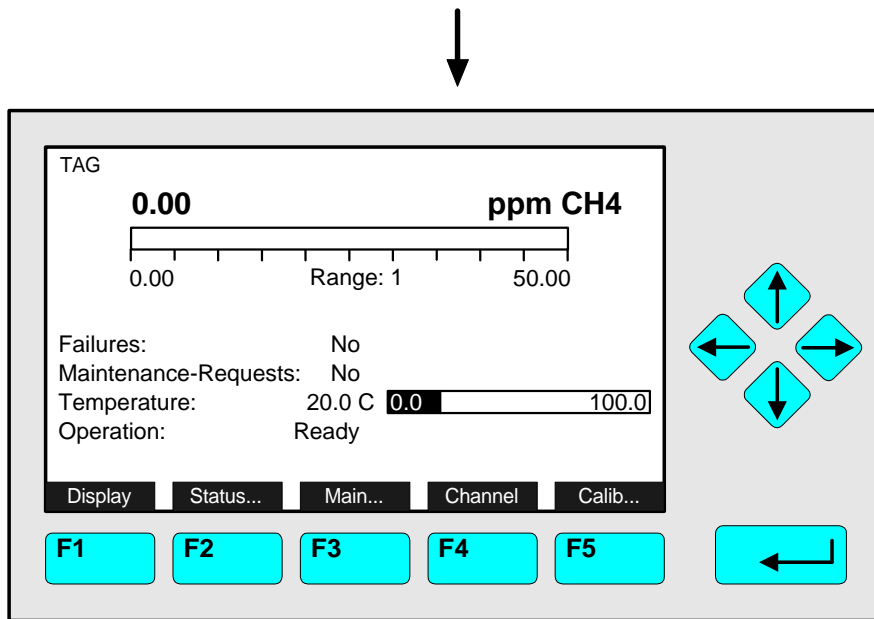


⇒ **Change to the single component display of the current channel**

Options:

- Start the gasflow with span gas, sample gas or test gas.
- Close all valves.
- F3 key: Changing to another available channel to execute gas flow.
- F4 key: Go back to the menu "Analyzer Module Calibration" to start zeroing or spanning.

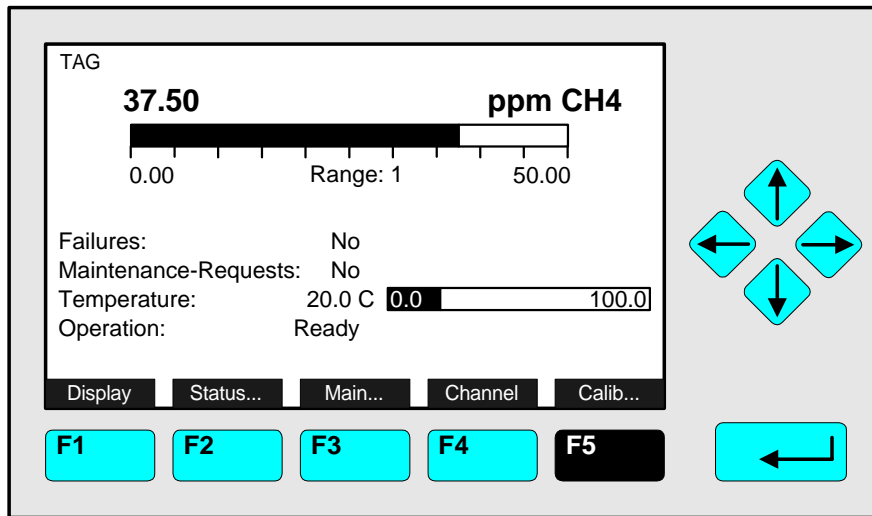
## 4.7 Flow Zero Gas



⇒ **Single component display appears during the zero gas flow is running**



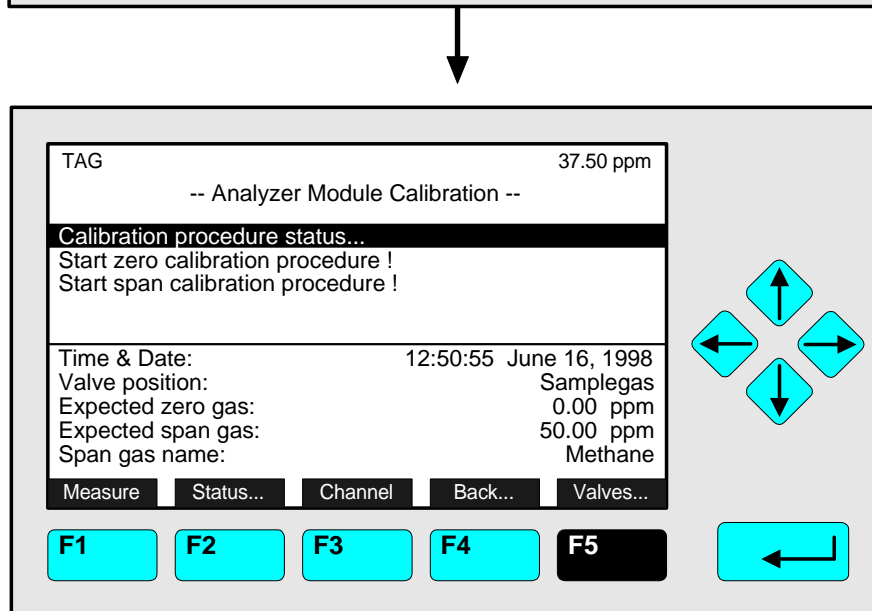
## 4.8 Flow Span Gas



⇒ Change to the menu "Analyzer Module Calibration"

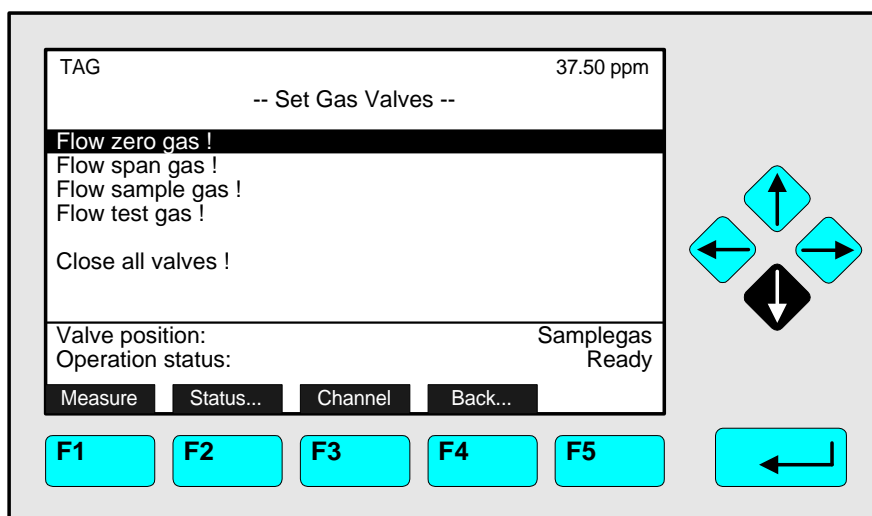
Press **F5**

**Caution:**  
Before starting span gas flow, realize that spangas is available !  
(See also section 5.1.1, p. 5-5... !)




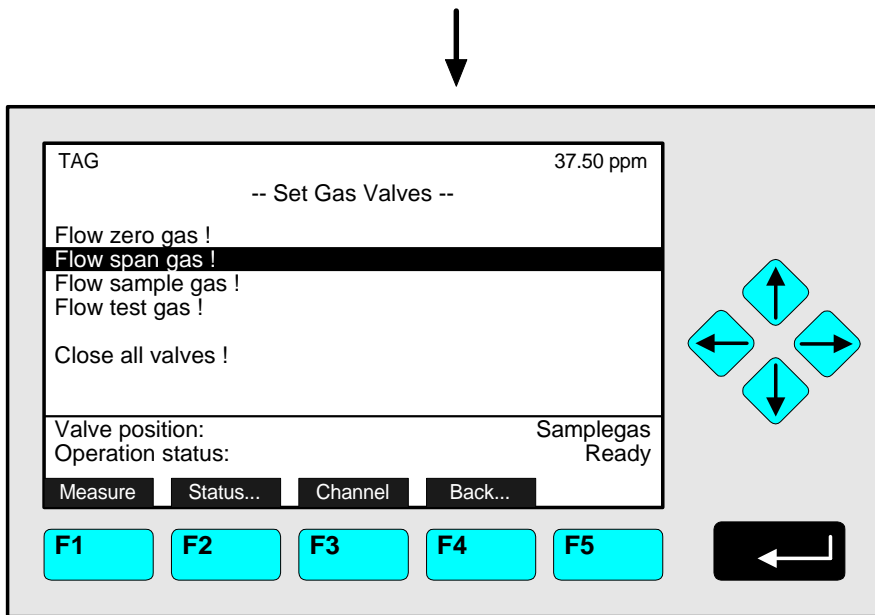
⇒ Change to the menu "Set Gas Valves"

Press **F5**



⇒ Change to the line "Flow span gas !"

Press  once to get the line "Flow span gas !" white on black.

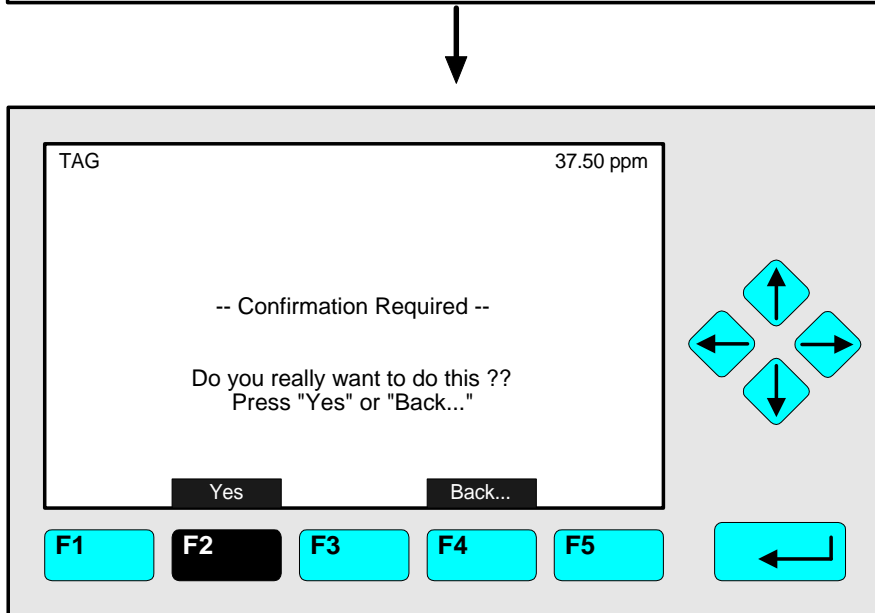


⇒ **Start the span gas flow**


Press 

or 

Starting this function will switch on the span gas valve as current gas valve.

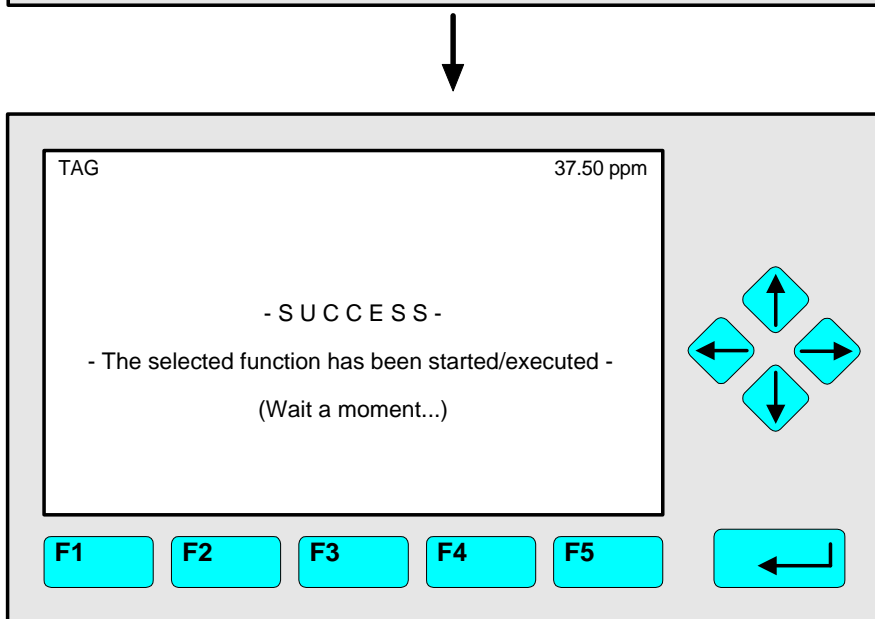


⇒ **Confirm the order to flow span gas**

Press  to start the span gas flow immediately.

Option:  
Press the F4 key if you want to cancel the order and go back to the menu "Set Gas Valves".

Note:  
The display of this message depends on the setup in the expert configurations. (see 5.1.8 p. 5-49)

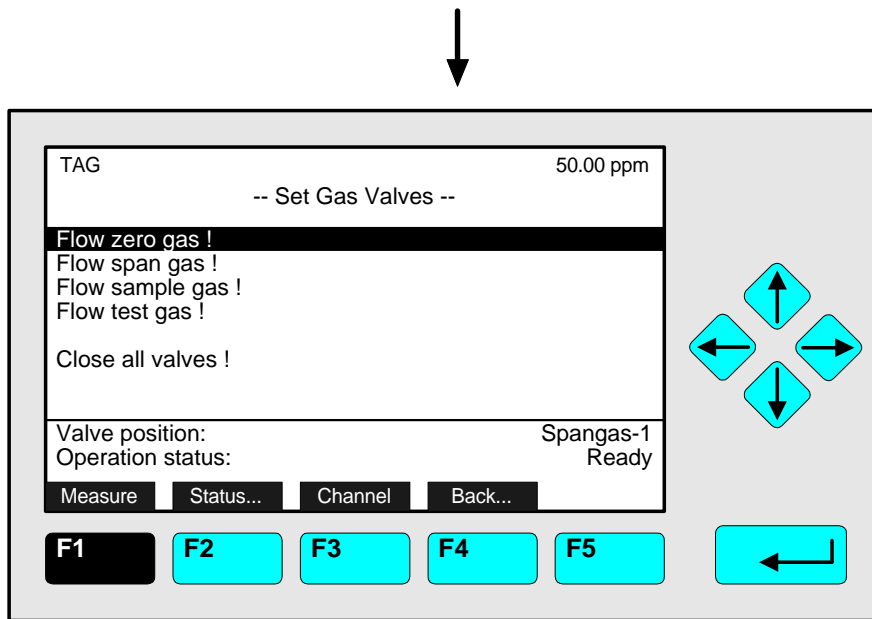


⇒ **Confirmation message of the function start appears**

Note:  
This message will be displayed after the function has been started. Then the display will jump automatically to the menu "Set Gas Valves".



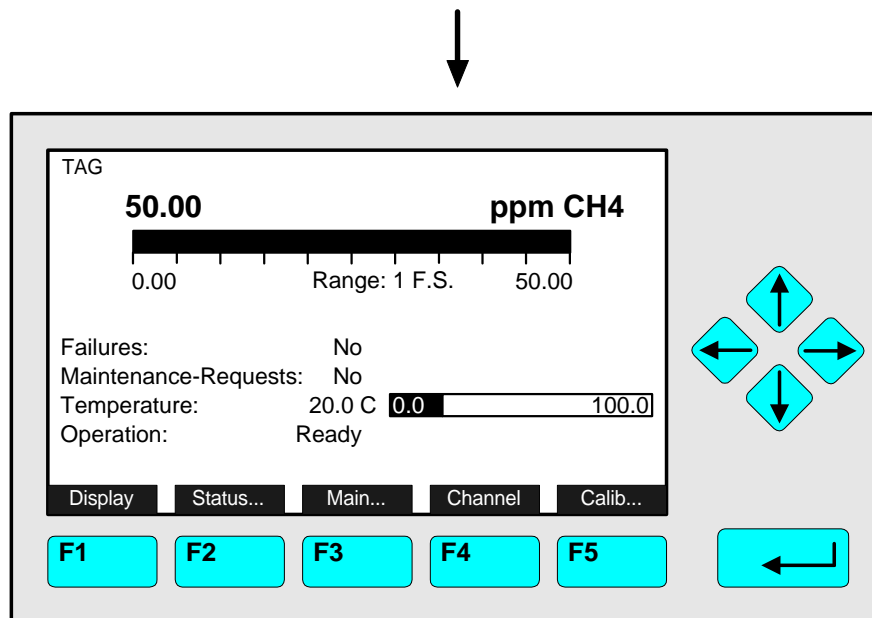
## 4.8 Flow Span Gas



⇒ **Change to the single component display of the current channel**

Options:

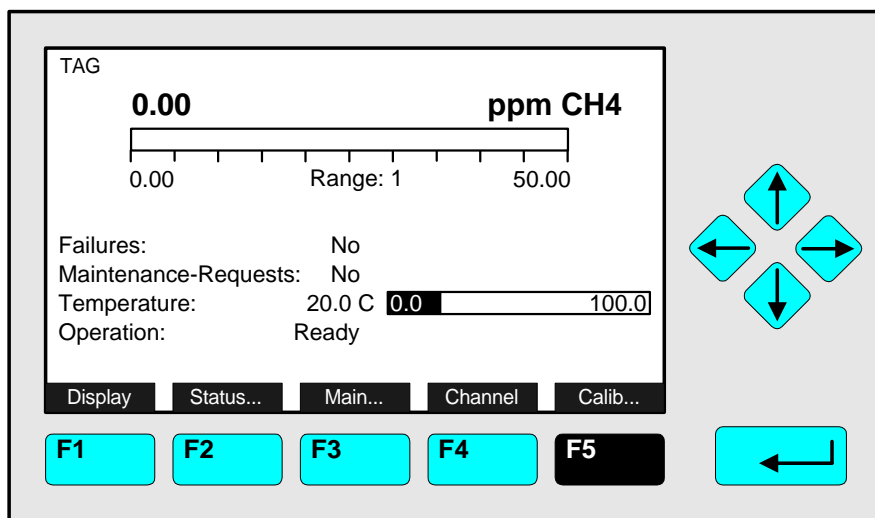
- Start the gasflow with zero gas, sample gas or test gas.
- Close all valves.
- F3 key: Changing to another available channel to execute gas flow.
- F4 key: Go back to the menu "Analyzer Module Calibration" to start zeroing or spanning.



⇒ **Single component display appears during the span gas flow is running**

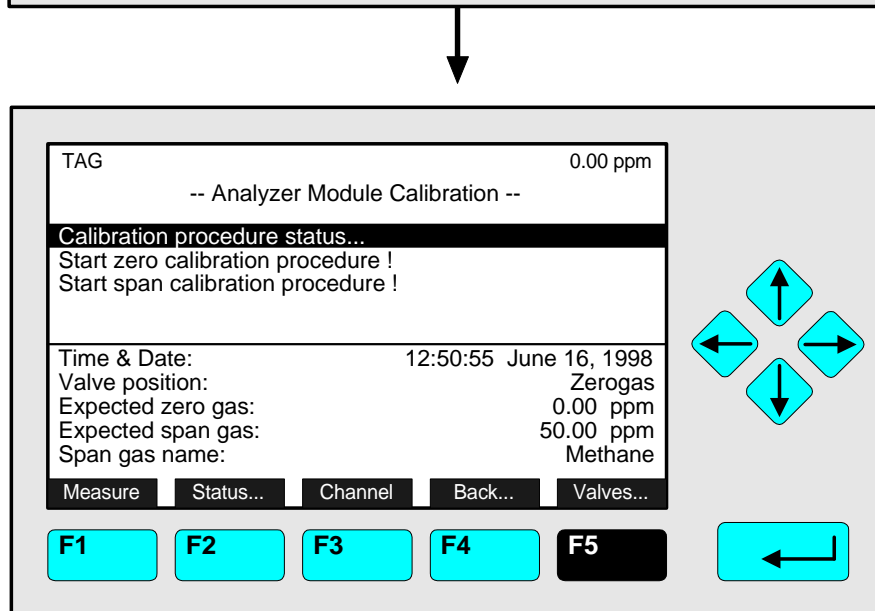


## 4.9 Flow Sample Gas



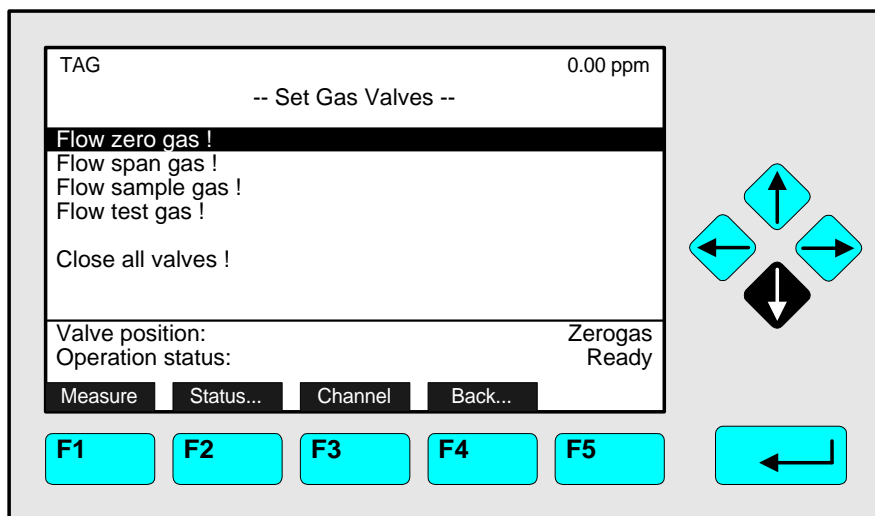
⇒ Change to the menu "Analyzer Module Calibration"

Press **F5**





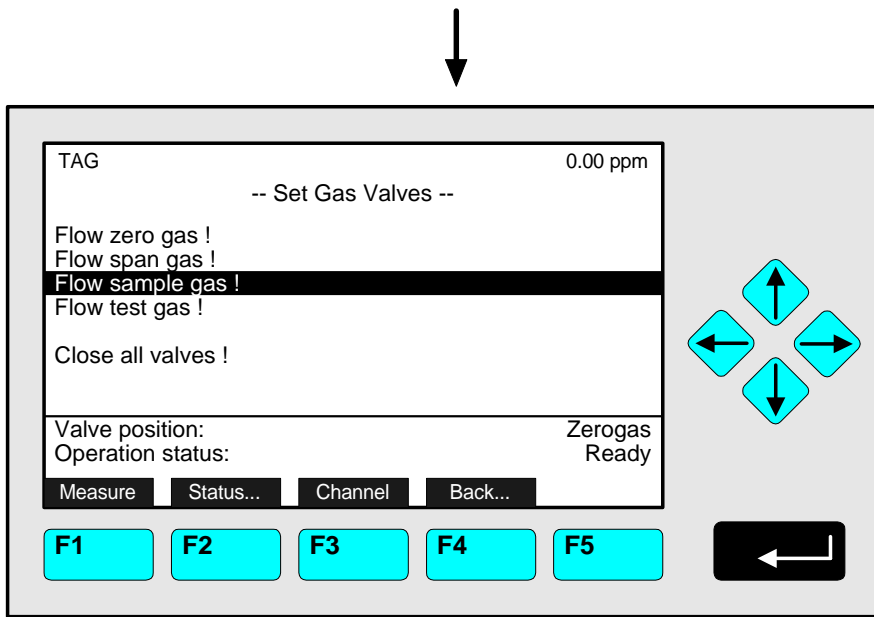
⇒ Change to the menu "Set Gas Valves"

Press **F5**



⇒ Change to the line "Flow sample gas !"

Press  or  as often as necessary to get the line "Flow sample gas !" white on black.

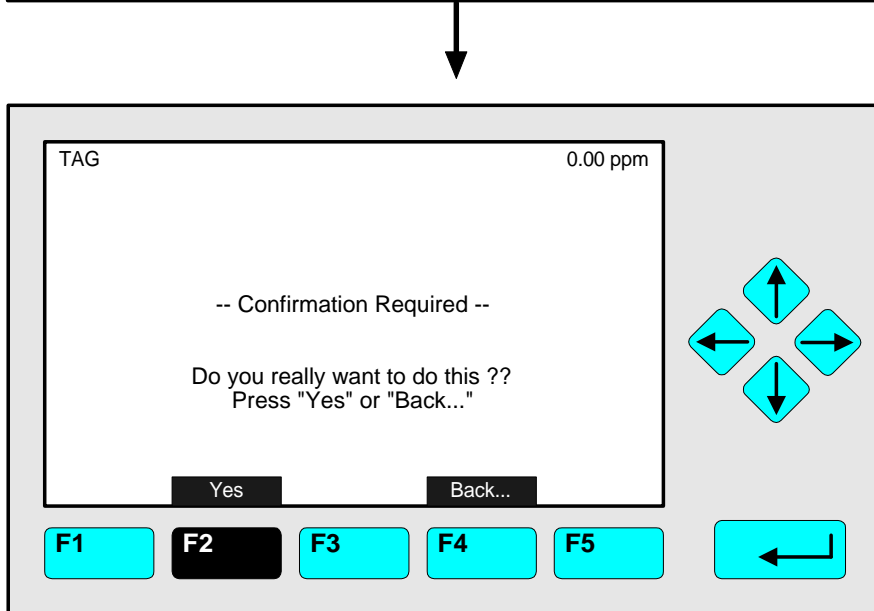


⇒ **Start the sample gas flow**


Press 

or 

Starting this function will switch on the sample gas valve as current gas valve.

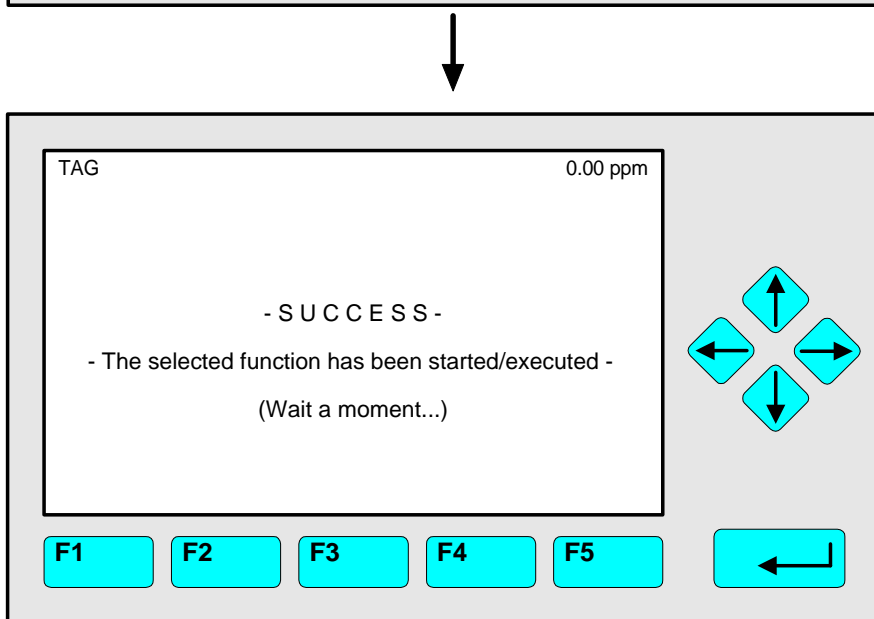


⇒ **Confirm the order to flow sample gas**

Press  to start the sample gas flow immediately.

Option:  
Press the F4 key if you want to cancel the order and go back to the menu "Set Gas Valves".

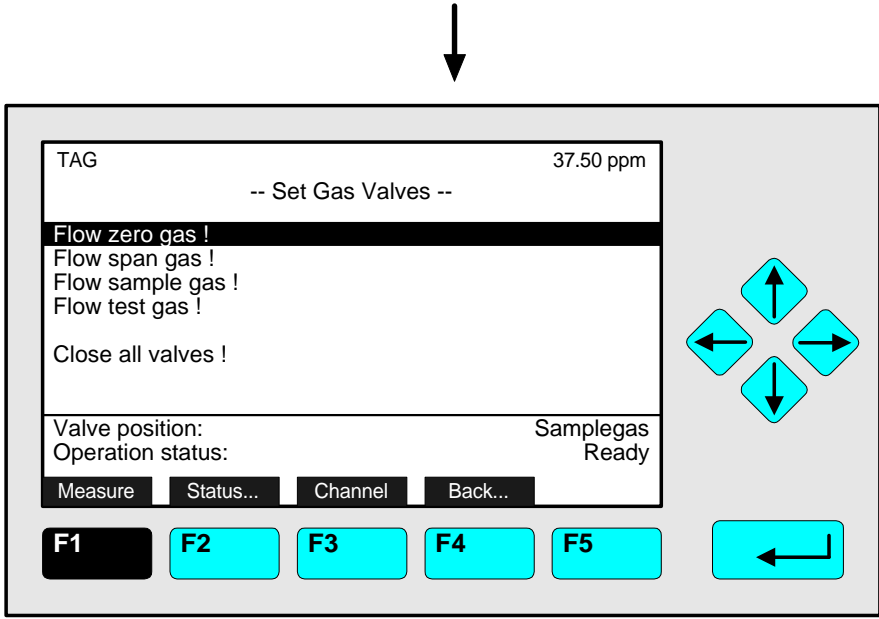
Note:  
The display of this message depends on the setup in the expert configurations. (see 5.1.8 p. 5-49)



⇒ **Confirmation message of the function start appears**

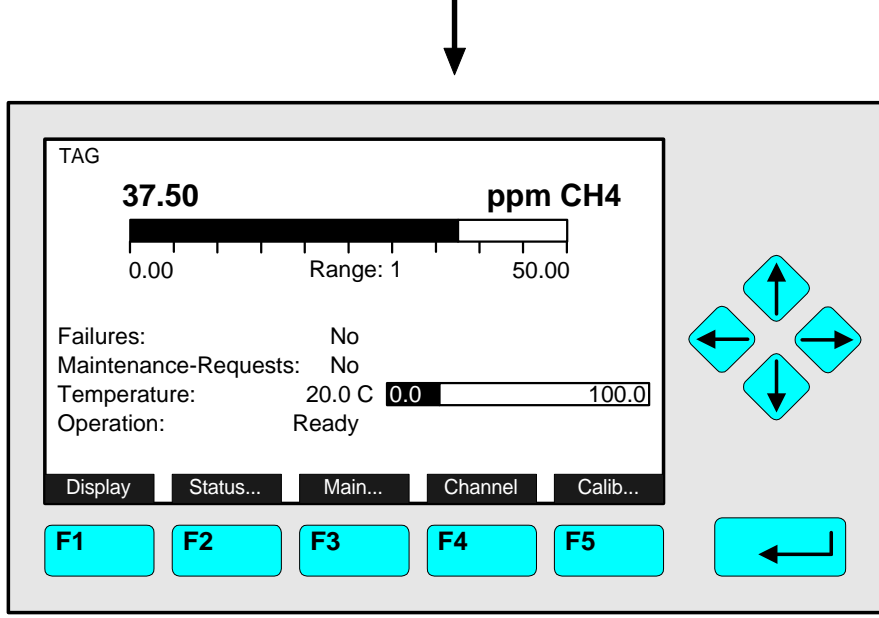
Note:  
This message will be displayed after the function has been started. Then the display will jump automatically to the menu "Set Gas Valves".

# 4.9 Flow Sample Gas



⇒ **Change to the single component display of the current channel**

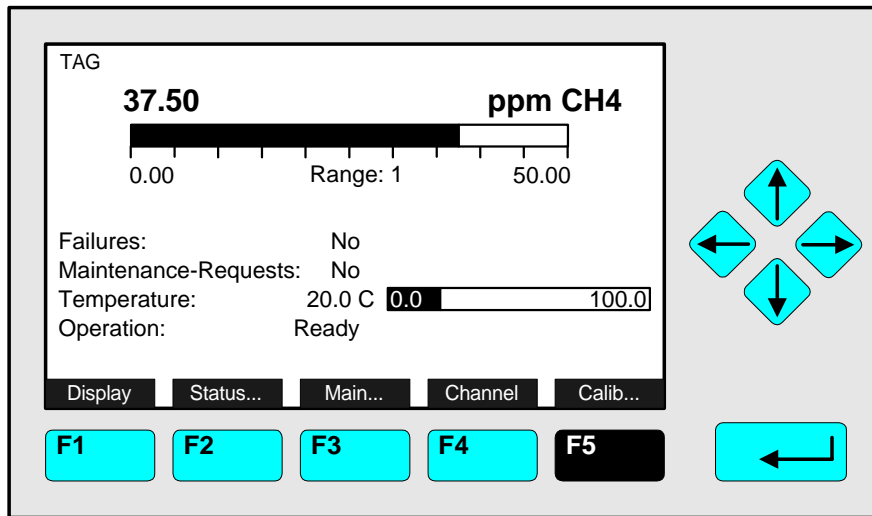
- Options:
- Start the gasflow with zero gas, span gas or test gas.
  - Close all valves.
  - F3 key: Changing to another available channel to execute gas flow.
  - F4 key: Go back to the menu "Analyzer Module Calibration" to start zeroing or spanning.



⇒ **Single component display appears during the sample gas flow is running**



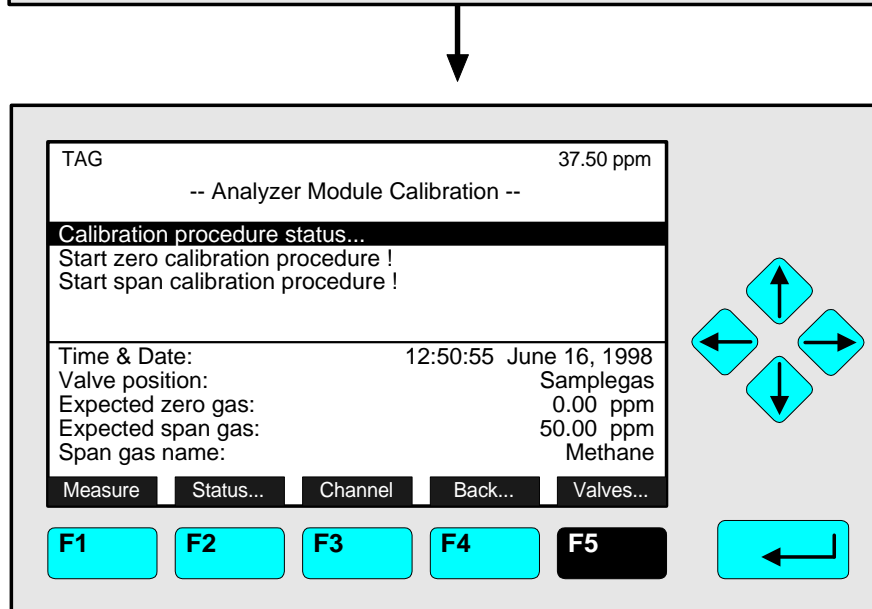
## 4.10 Flow Test Gas



⇒ Change to the menu "Analyzer Module Calibration"

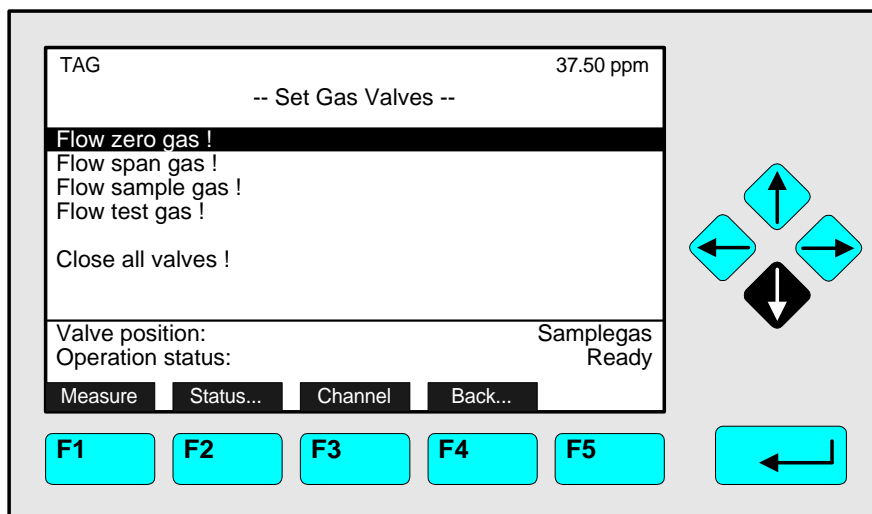
Press **F5**

Starting this function will switch an external valve and flow the MLT with test gas.





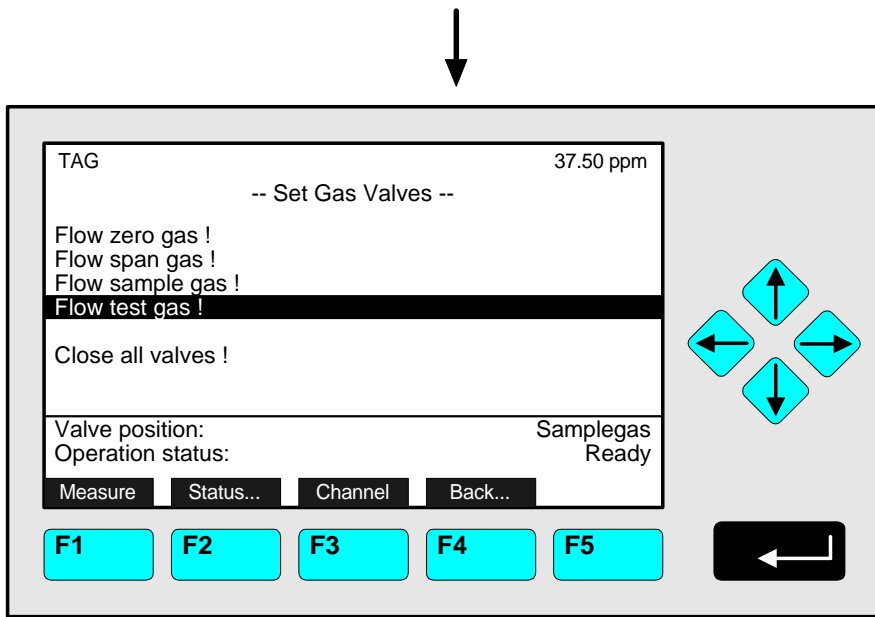
⇒ Change to the menu "Set Gas Valves"

Press **F5**



⇒ Change to the line "Flow test gas !"

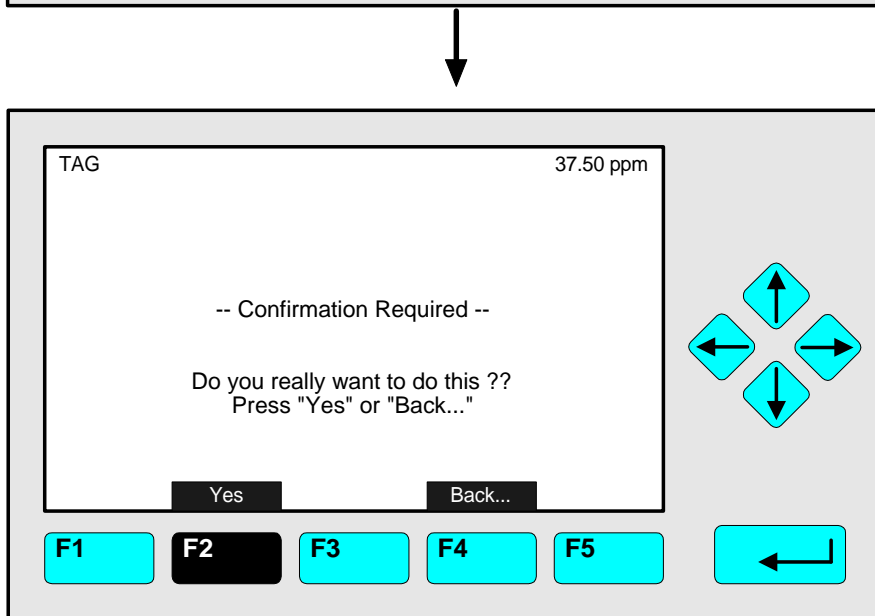
Press  or  as often as necessary to get the line "Flow test gas !" white on black.




⇒ **Start the function to flow test gas**

Press 

or 

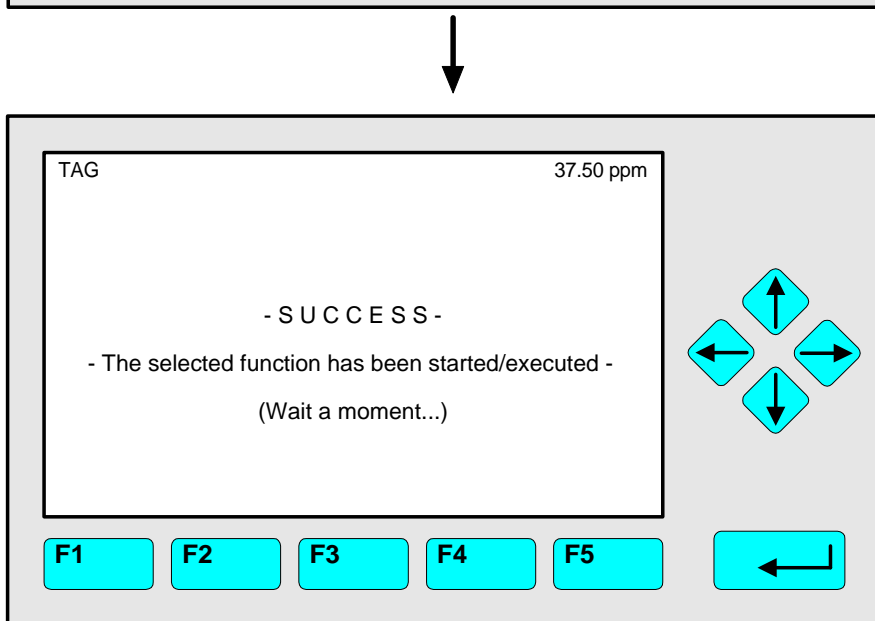


⇒ **Confirm the order to flow test gas**

Press  to start the test gas flow immediately.

Option:  
Press the F4 key if you want to cancel the order and go back to the menu "Set Gas Valves".

Note:  
The display of this message depends on the setup in the expert configurations. (see 5.1.8 p. 5-49)

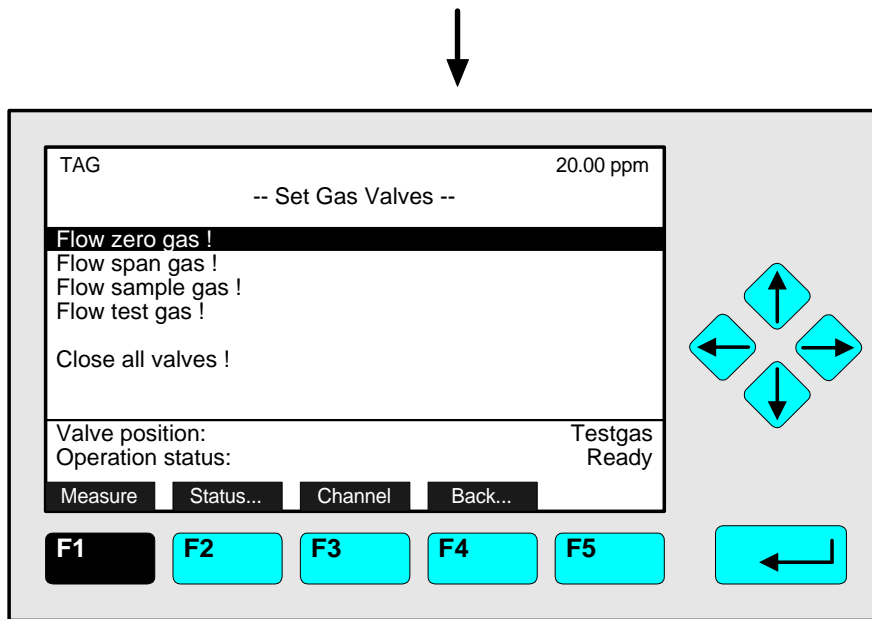


⇒ **Confirmation message of the function start appears**

Note:  
This message will be displayed after the function has been started. Then the display will jump automatically to the menu "Set Gas Valves".



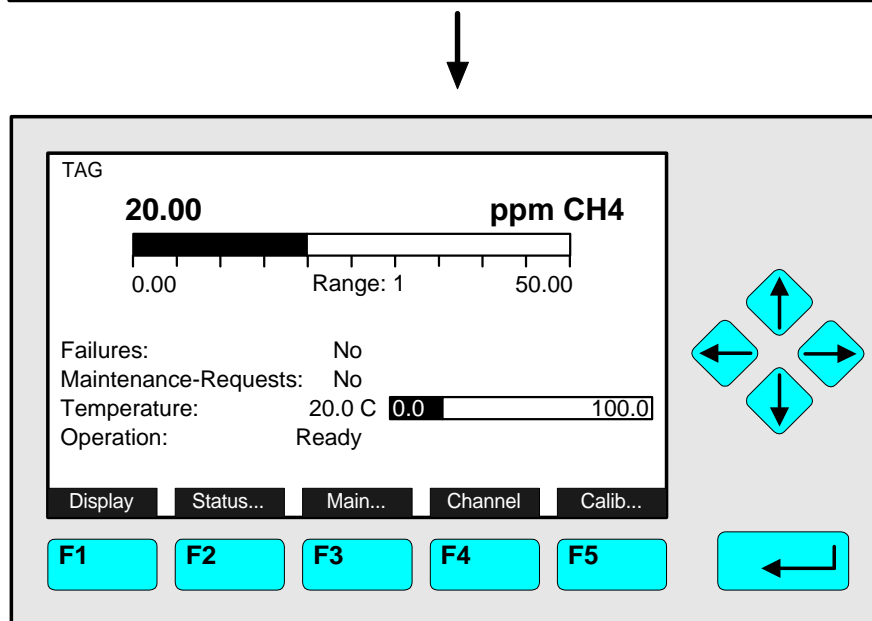
## 4.10 Flow Test Gas



⇒ **Change to the single component display of the current channel**

Options:

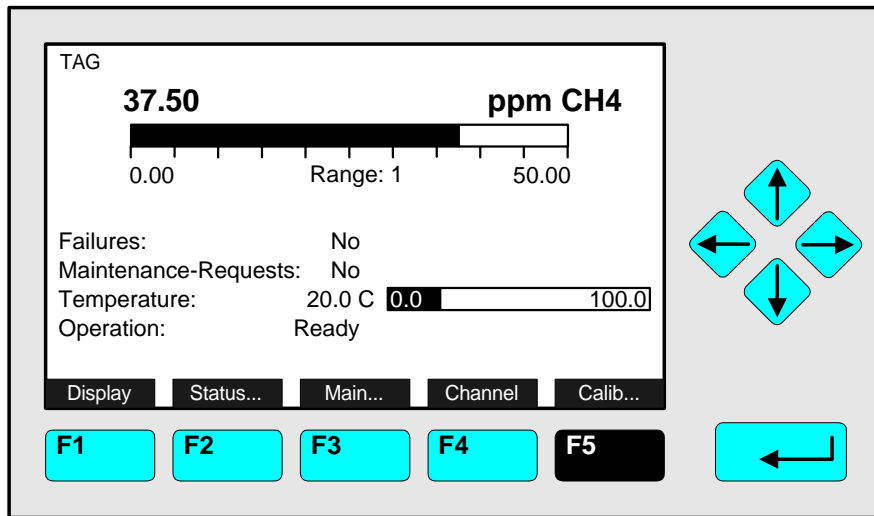
- Start the gasflow with zero gas, span gas or sample gas.
- Close all valves.
- F3 key: Changing to another available channel to execute gas flow.
- F4 key: Go back to the menu "Analyzer Module Calibration" to start zeroing or spanning.



⇒ **Single component display appears during the test gas flow is running**

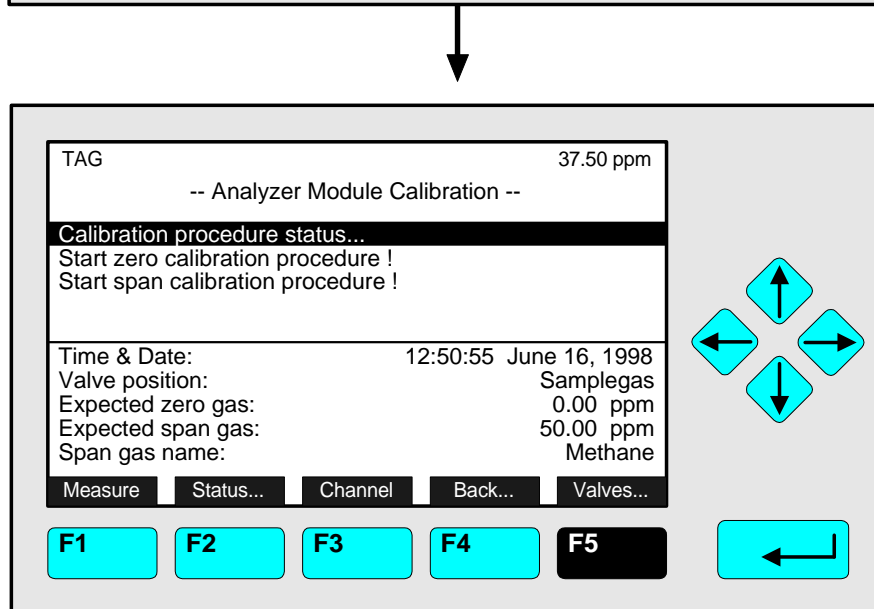


## 4.11 Close all Valves



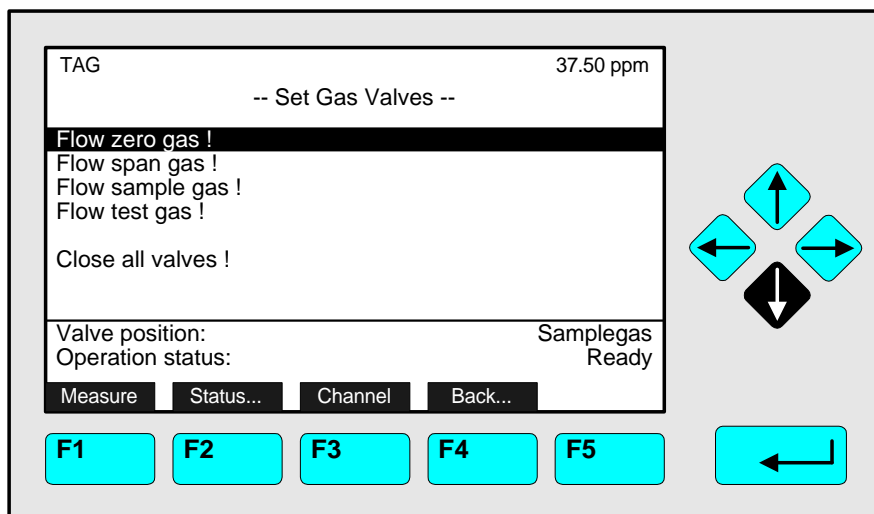
⇒ Change to the menu "Analyzer Module Calibration"

Press **F5**





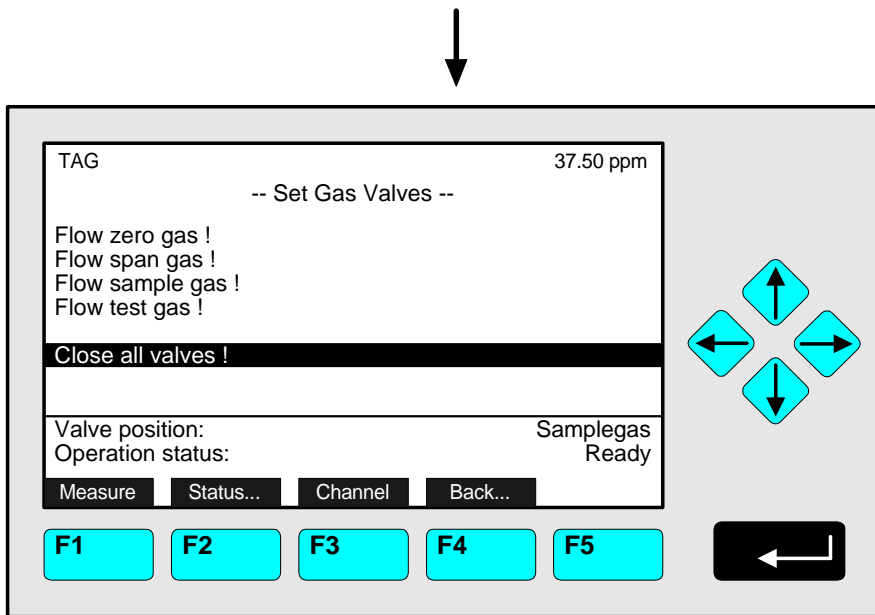
⇒ Change to the menu "Set Gas Valves"

Press **F5**



⇒ Change to the line "Close all valves !"

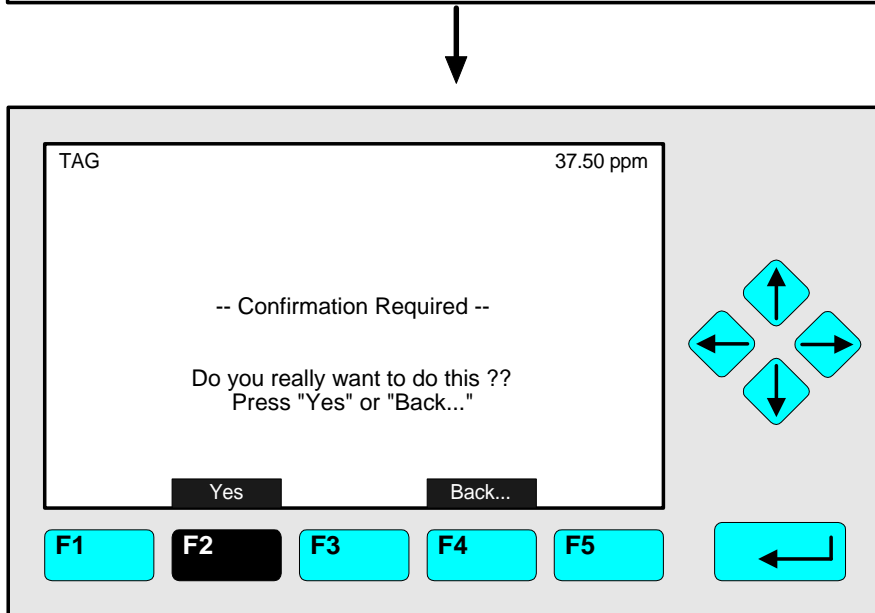
Press  or  as often as necessary to get the line "Close all valves !" white on black.




⇒ **Start the function to close all valves**

Press 

or 

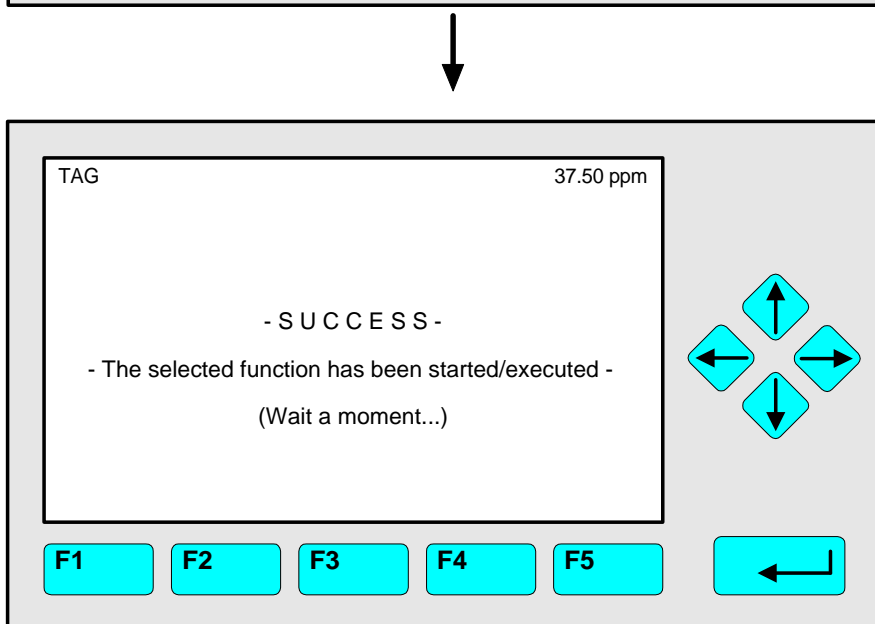


⇒ **Confirm the order to close all valves**

Press  to close all valves immediately.

Option:  
Press the F4 key if you want to cancel the order and go back to the menu "Set Gas Valves".

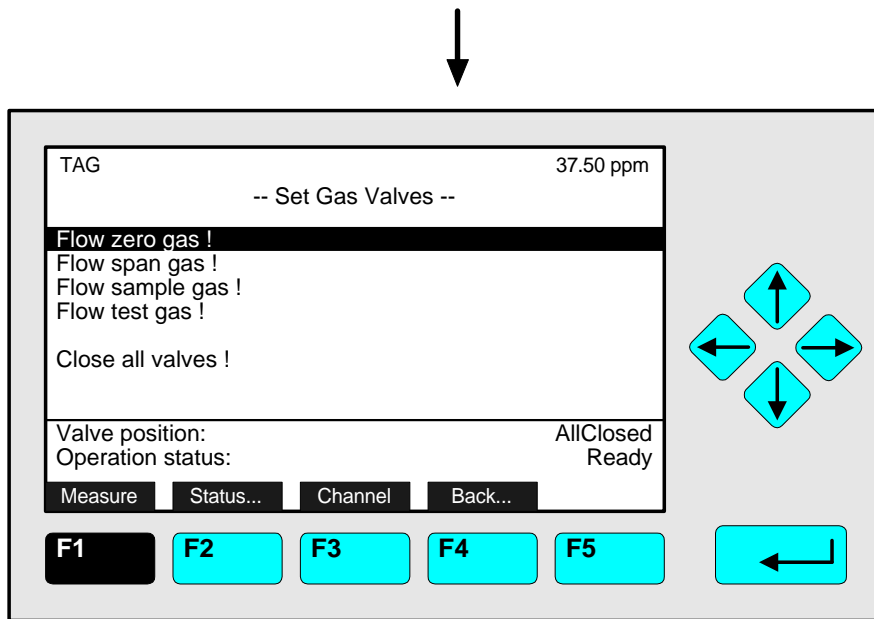
Note:  
The display of this message depends on the setup in the expert configurations. (see 5.1.8 p. 5-49)



⇒ **Confirmation message of the function start appears**

Note:  
This message will be displayed after the function has been started. Then the display will jump automatically to the menu "Set Gas Valves".

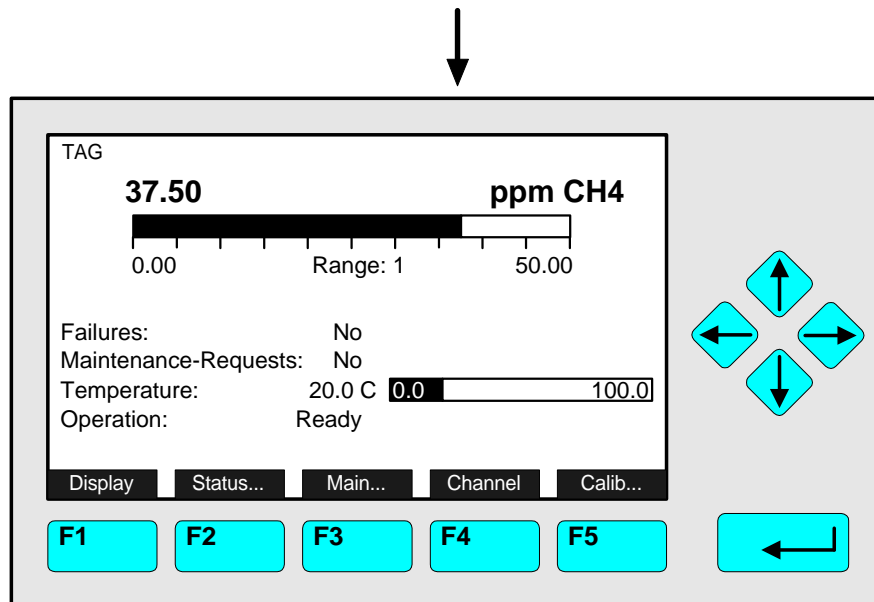
## 4.11 Close all Valves



⇒ **Change to the single component display of the current channel**

Options:

- Start the gasflow with zero gas, span gas, sample gas or test gas.
- F3 key: Changing to another available channel to execute gas flow.
- F4 key: Go back to the menu "Analyzer Module Calibration" to start zeroing or spanning.



⇒ **Single component display appears in the standby mode: All valves are closed**

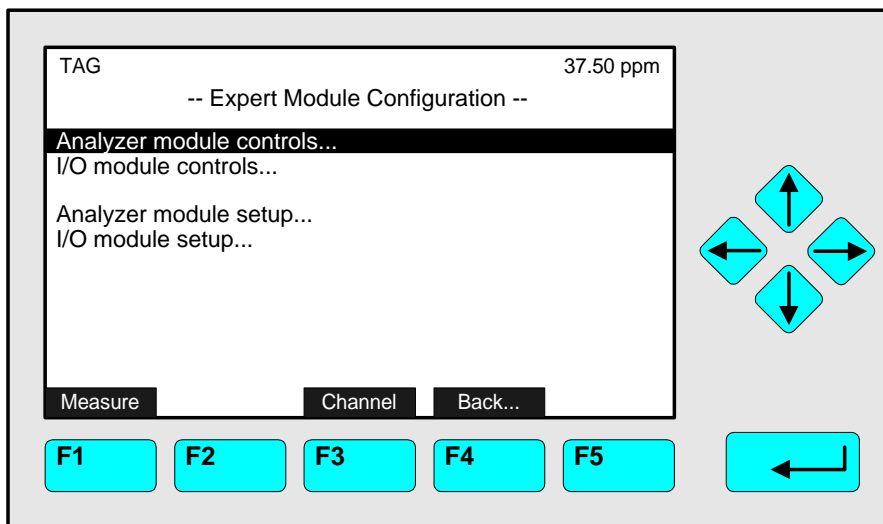
Note:

After the valves are closed you can start again the measurement with the "Flow sample gas" order (see 4.9).



## 5 Analyzer and I/O-Module Expert Configuration

If you press the ← -key or the → -key in the line "Analyzer and I/O-module expert configuration..." of the "Main Menu", you will change to the following display:



From the menu "Expert Module Configuration" you can change to several submenus to set up parameters for the measurement and calibration of your analyzer and analyzer module. Besides you can set up the configuration for auxiliary modules. Which part of these menus are important for you depends on the configuration of your NGA 2000 system.

In the following table you will find a short overview about the contents of the menus:

Menu	Important Contents	Section/Page
<i>Analyzer module controls...</i>	⇒ See "Analyzer module setup" and note below!	
<i>I/O module controls...</i>	⇒ Configuration of the SIO and of the DIO's installed in a platform or in an MLT analyzer (auxiliary I/O's)	* 5.2 p. 83 - 98
<i>Analyzer module setup...</i>	⇒ Measurement set up and control ⇒ Calibration set up and control ⇒ Configuration of the SIO and of the DIO's installed in the MLT analyzer module (Local SIO/DIO) ⇒ Programmable logic control (PLC) ⇒ Programmable calculators	* 5.1 p. 3 - 82
<i>I/O module setup...</i>	⇒ Set up for micro processor controlled auxiliary I/O modules	* 5.3 / p. 99

### Note:

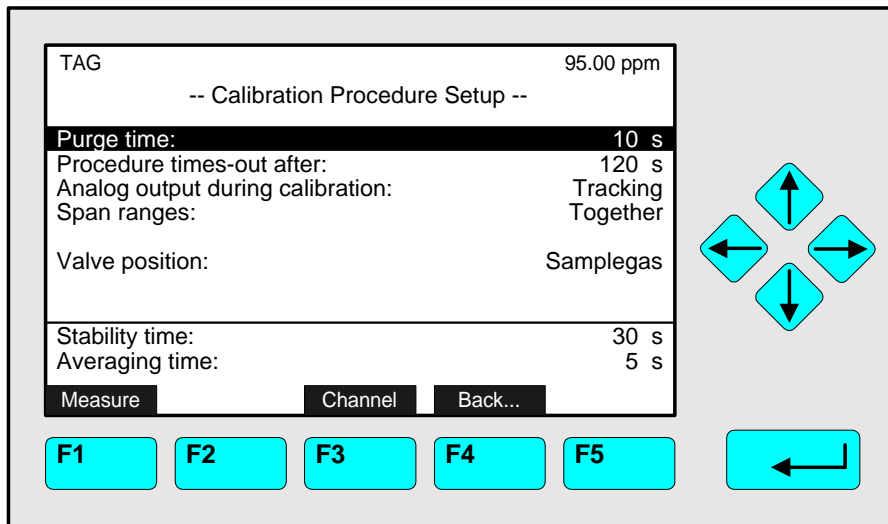
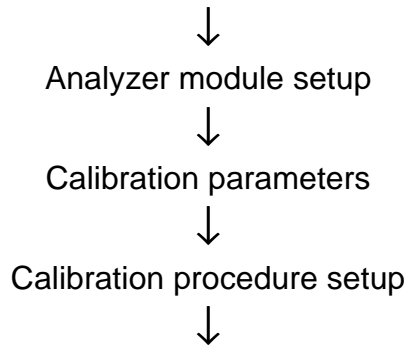
All submenus of "Analyzer module controls..." are the same like those of "Analyzer module setup...", if you use an MLT analyzer or analyzer module (resp. TFID analyzer or analyzer module)! If your analyzer is not such a type, the submenus of "Analyzer module controls..." and "Analyzer module setup..." will look different, partially. Look at the corresponding software manuals.

**Structure of chapter five:**

At the begin of any chapter you will find the way to a certain submenu of the MLT software starting from the line "Analyzer and I/O-module expert configuration" in the "Main Menu". The way will be described with the software catchwords, that you have to enter one after another to reach the corresponding submenu. At the end of the catchword listing you will find the illustration of the LCD screen. After that you can read the set up instructions and explanations. Sometimes the illustration will be completed by sketches or further menu pictures.

Example: You will set up the calibration parameters for the calibration procedure of the analyzer module.

**Main Menu — Analyzer and I/O-module expert configuration**



In the menu "Calibration Procedure Setup" you can set up the parameters for the calibration procedure of the zeroing and spanning ...

Further explanations and instructions will follow !



# 5.1 Analyzer Module Setup

Main Menu — Analyzer and I/O-module expert configuration

↓  
Analyzer module setup  
↓

TAG 95.00 ppm  
-- Analyzer Module Setup and Controls (1/3) --

Calibration parameters...  
Alarm parameters...  
Range parameters...  
Cross interference compensation...  
Linearization...  
Programmable logic control (PLC)...  
Programmable calculator...  
Measurement display configuration...  
Acknowledgement of status reports...  
Concentration measurement parameters...

Measure ManData Channel Back... More...

F1 F2 F3 F4 F5

Navigation arrows and a return key are visible on the right side of the screen.

TAG 95.00 ppm  
-- Analyzer Module Setup and Controls (2/3) --

Peak measurement...  
Differential measurement...  
Gasflow setup...  
Pressure compensation...  
Flow measurement...  
Temperature measurement...  
Loading/saving configuration parameters...  
Inputs and outputs...  
Delay and average...  
Special functions...

Measure Channel Back... More...

F1 F2 F3 F4 F5

Navigation arrows and a return key are visible on the right side of the screen.

TAG 95.00 ppm  
-- Analyzer Module Setup and Controls (3/3) --

AK-protocol communication...

Measure Back...

F1 F2 F3 F4 F5

Navigation arrows and a return key are visible on the right side of the screen.

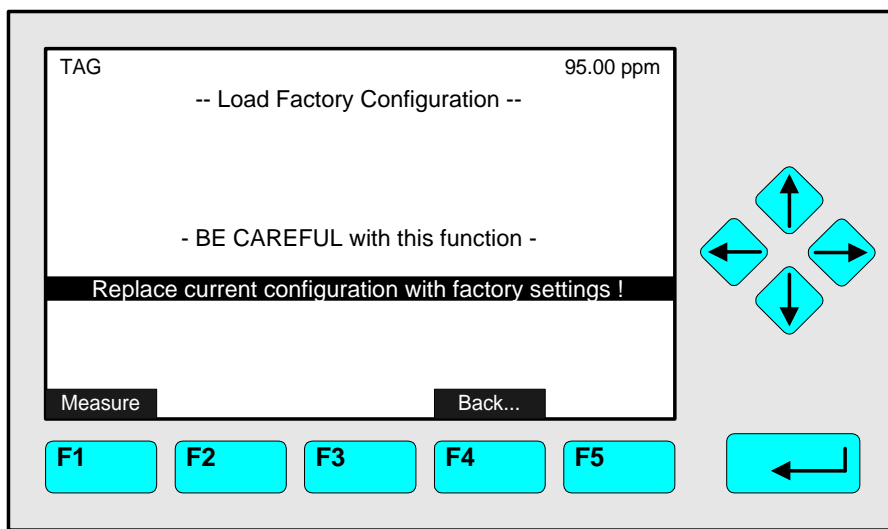
From the menu "Analyzer Module Setup and Controls" you can change to all menus and submenus of the expert configuration level via the corresponding menu lines.

**Changing to the menus and submenus:**

- ◆ Select the menu line you want with the ↓ -key or the ↑ -key.  
If necessary: Change to a further menu page with the F5 key (More...)
- ◆ Change to the corresponding menu/submenu with the ← -key or the → -key.

**Menu "Load Factory Configuration":**

If you press the F2 key (ManData) in the menu "Analyzer Module Setup and Controls (1/3)", you will change to the following menu:



With the function of this menu you can delete the RAM data and load the factory settings from the Flash-EEPROM.

**Caution:**

**This function is irreversible after starting (and confirmation) ! Your RAM settings will be deleted !**

**Note:**

The same function is available in the menu "Load/Save Analyzer Module Configuration" ! (see section 5.1.17 p. 5-64)

Starting the function:

- ◆ Press the ← -key or the → -key or cancel and go back to the last menu page with the F4 key (Back...) or the ← -key.
- ◆ If asked: Confirm with the F2 key (Yes) or cancel and go back to the last menu page with the F4 key (Back...) or the ← -key.

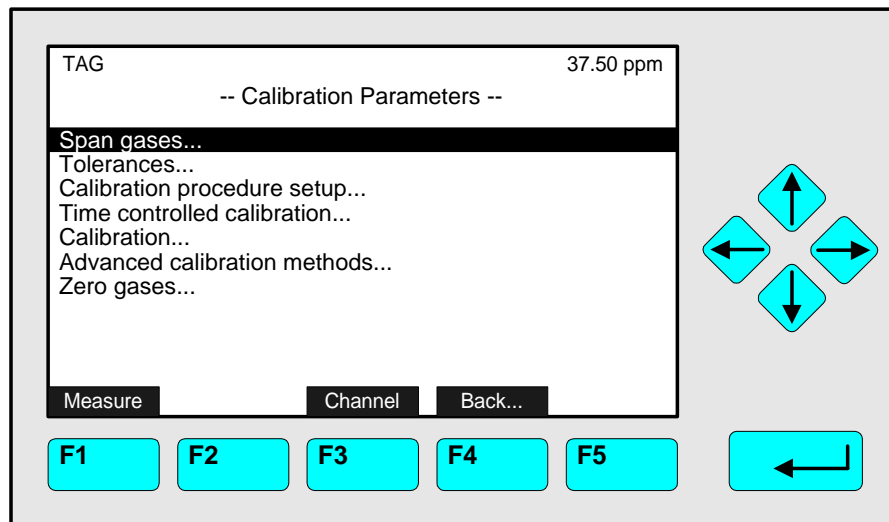
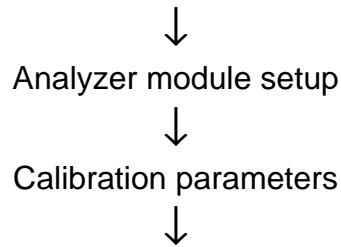
**Further Ramifications via softkeys:**

- F1** Change to the single component display of the current channel ! Chapter 4 !
- F3** Change to the other available channels of an MLT analyzer or analyzer module ! See channel tag !

## 5.1 Analyzer Module Setup

### 5.1.1 Calibration Parameters

#### Main Menu — Analyzer and I/O-module expert configuration



From the menu "Calibration Parameters" you can change to several submenus to set up the zero and span gas calibration parameters and to start the different calibration methods.

#### Change to the submenus:

- ◆ Select the menu line you want with the ↓ -key or the ↑ -key.
- ◆ Change to the corresponding submenu with the ← -key or the → -key.

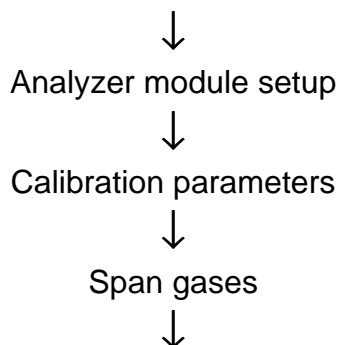
#### Alternatives:

- ◆ F1: Change to the single component display !
- ◆ F3: Change to the other available channels of an MLT analyzer or analyzer module !
- ◆ F4: Go back to the last menu page !

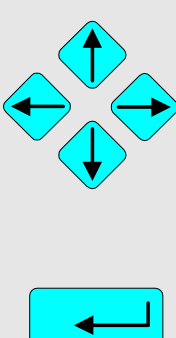
## 5.1 Analyzer Module Setup

### 5.1.1 Calibration Parameters – Span gases

Main Menu — Analyzer and I/O-module expert configuration



MLT25/CH2/R2	95.00 ppm
-- Span Gas Definition --	
Actual span gas concentration:	250.0 ppm
Spangas range -1:	50.00 ppm
Spangas range -2:	250.0 ppm
Spangas range -3:	2500 ppm
Spangas range -4:	10000 ppm
Span gas unit:	ppm
"ppm" --> "mg/Nm3" conversion factor:	1.000
Concentration in span gas units:	95.00 ppm
Measure	Back...



F1	F2	F3	F4	F5	↩
----	----	----	----	----	---

In the menu "Span Gas Definition" you can set up the default value for each range of the current channel, the actual span gas concentration and the desired span gas unit. The concentration of each range should be a value between 70 and 110% of the end of range value.

#### Set up parameters:

- ◆ Select any line of variables with the ↓ -key or the ↑ -key.
- ◆ Select the variable with the ← -key or the → -key.
- ◆ Select any digit with the ← -key or the → -key and adjust a new value with the ↑ -key or the ↓ -key  
resp. select the whole parameter with the ↑ -key or the ↓ -key.
- ◆ Confirm the new value with the ← -key or  
cancel and go back to the last value with the F2 key.

#### The last two lines of variables:

These lines are only information lines. The variables cannot be changed.

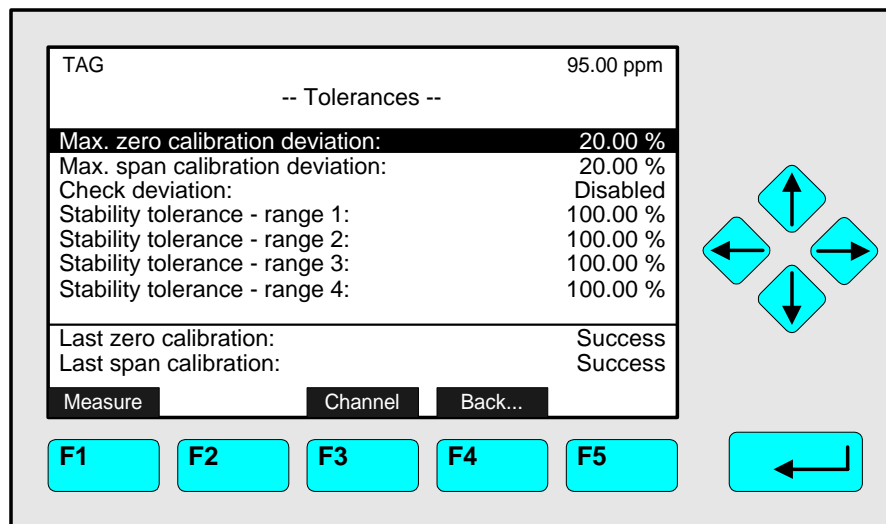
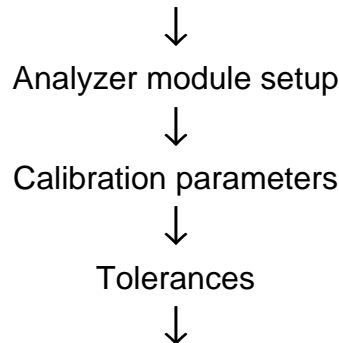
#### **Note:**

The "ppm → "mg/Nm<sup>3</sup>" conversion factor can be set up in the menu "General Concentration Measurement Setup" (see section 5.1.10 p. 5-54) !

## 5.1 Analyzer Module Setup

### 5.1.1 Calibration Parameters – Tolerances

#### Main Menu — Analyzer and I/O-module expert configuration



In the menu "Tolerances" you can set up the parameters of the stability controlled calibration procedure (see p. 5-9/10) in one channel. Besides, you can disable the stability control and the maximum calibration deviation (deviation control → deviation tolerance). If you want to set up the parameters of the other channels of an MLT analyzer or analyzer module, press the F3 key.

#### Set up parameters:

- ◆ Select any line of variables with the ↓ -key or the ↑ -key.
- ◆ Select the variable with the ← -key or the → -key.
- ◆ Select any digit with the ← -key or the → -key and adjust a new value with the ↑ -key or the ↓ -key  
resp. select the whole parameter with the ↑ -key or the ↓ -key.
- ◆ Confirm the new value with the ← -key or  
cancel and go back to the last value with the F2 key.

#### Lines "Last zero calibration/Last span calibration":

The calibration status of the last calibration will be displayed in these two lines.

Lines of variables "Max. zero calibration deviation" / "Max. span calibration deviation":

The deviation between two zero or span gas concentrations will be determined during the stability time of the calibration procedure (see menu "Calibration Procedure Setup" p. 5-9/10). The maximum calibration deviation is the deviation tolerance expressed as percentage of the current end of range value. The calibration procedure will only be possible within this range.

If you choose a very small deviation tolerance, perhaps the calculated deviation is out of range during the whole calibration procedure and the calibration will run into time out. If you choose a very large deviation tolerance, the calibration will also be done in ranges with a little stability.

Value is usually: 10% or 20%

Line of variables "Check deviation":

- ◆ **Enabled:** The stability and tolerance control during the calibration procedure will be based on the values of the menu "Tolerances".
- ◆ **Disabled:** The calibration procedure is running without stability and tolerance control. Any Calibration will be accepted.

*Example:*

- ◆ End of range: 1000 ppm
- ◆ Max. calibration deviation: 20% (equivalent 200 ppm)
- ◆ Desired value: 990 ppm
- ◆ Display: 720 ppm
- ◆ Deviation: 250 ppm (more than 200 ppm!)
- ◆ Result: Max. calibration procedure time over limit;  
Calibration will be canceled !

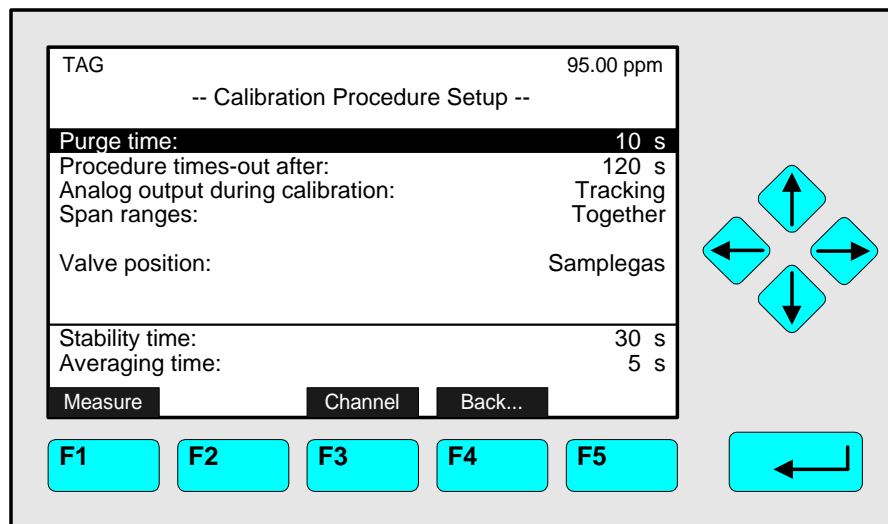
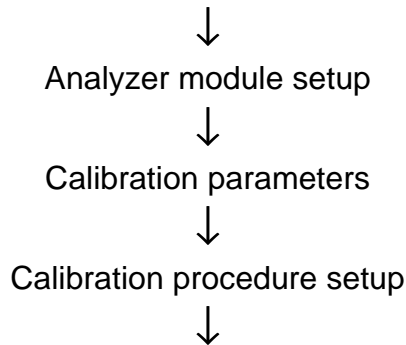
Potential solutions:

- ◆ Adjust 100% in the line "Max. zero calibration deviation" resp. "Max. span calibration deviation"  
or  
select "Disabled" in the line "Check deviation".
- ◆ Result: Any Calibration will be accepted!

## 5.1 Analyzer Module Setup

### 5.1.1 Calibration Parameters – Calibration procedure setup

#### Main Menu — Analyzer and I/O-module expert configuration



In the menu "Calibration Procedure Setup" you can set up the parameters for the calibration procedure of the zeroing and spanning in one channel. If you want to set up the parameters of the other channels of an MLT analyzer or analyzer module, press the F3 key.

#### Set up parameters:

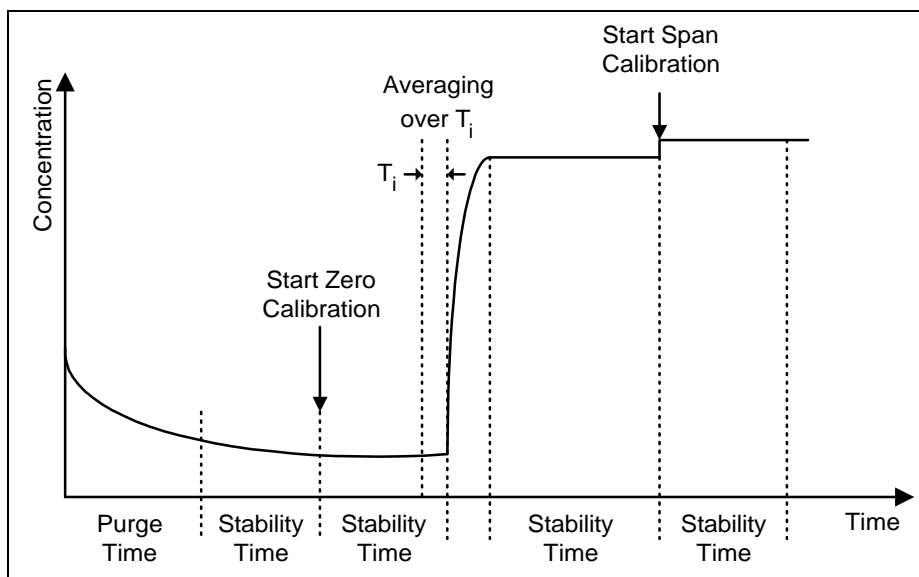
- ◆ Select any line of variables with the ↓ -key or the ↑ -key.
- ◆ Select the variable with the ← -key or the → -key.
- ◆ Select any digit with the ← -key or the → -key and adjust a new value with the ↑ -key or the ↓ -key  
resp. select the whole parameter with the ↑ -key or the ↓ -key.
- ◆ Confirm the new value with the ← -key or  
cancel and go back to the last value with the F2 key.

#### Lines of variables "Purge time" / "Procedure times-out after" and "Stability time" / "Averaging time" – Informations about the calibration procedures setup:

The measurement signal should be stable in a certain range before zeroing and spanning. Therefore the analyzer cell should be purged enough with zero gas or span gas before calibration. Then, after the purge time, the stability time is running. During the stability time the average over two signals will be calculated. The averaging time determines the time difference between these two signals.

If the deviation of the two values is less than the allowed maximum calibration deviation (see menu "Tolerances", p. 5-7/8), the calibration may start. If not, the stability control is starting again until a stable measurement is possible. The time in the line "Procedure times-out after" is the limit for the whole procedure.

The following figure shows the procedure of the stability controlled zero and span gas calibration:



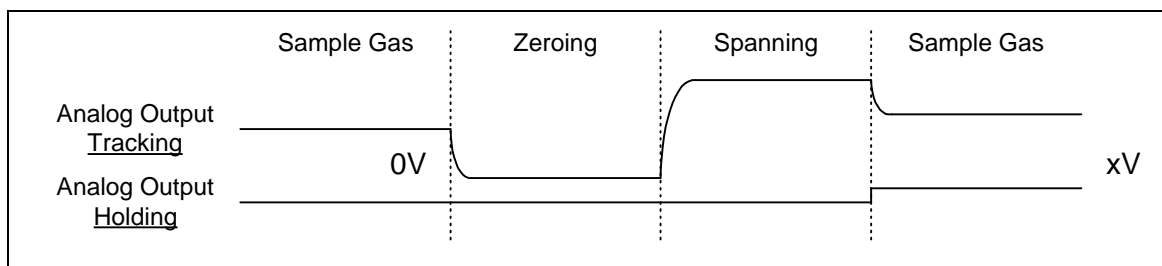
**Note:**

The stability time and the averaging time are factory settings and cannot be changed by the customer. If you want to use other values, ask your service !

Line of variables "Analog output during calibration":

Here, you can determine if you want to hold the analog output and the limits of a local SIO in the MLT analyzer module during calibration. The set-ups for a platform or MLT analyzer SIO have to be done in the menu "Analog Outputs" (see 5.2.1 p. 5-87).

- ◆ **Tracking:** The analog output signal is following to the signal during the whole calibration procedure.
- ◆ **Holding:** During the whole calibration procedure the analog output signal is fixed to the last signal before calibration. This adjustment may be used for instance to control limits with the analog output.





Line of variables "Span ranges":

- ◆ **Together:**  
All measurement ranges of the same channel will be calibrated together.  
This is the usual calibration mode.
- ◆ **Separately:**  
Each measurement range will be calibrated separately.

Line of variables "Valve position":

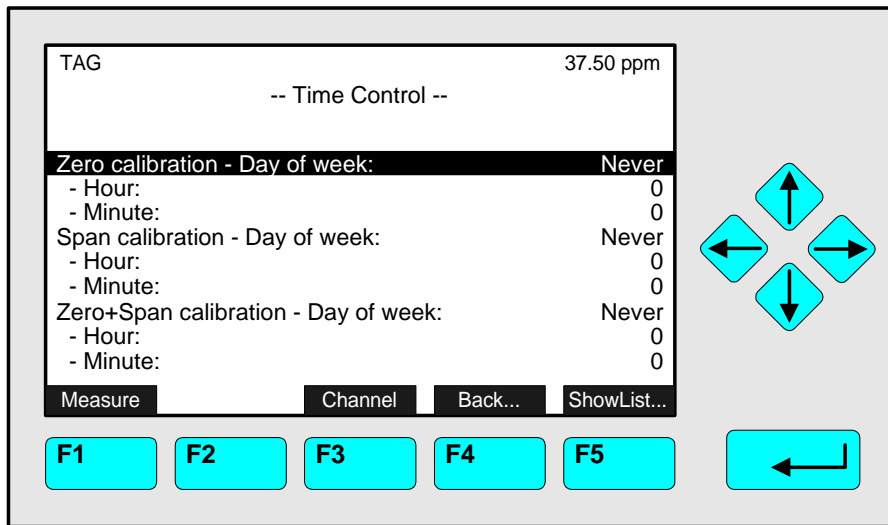
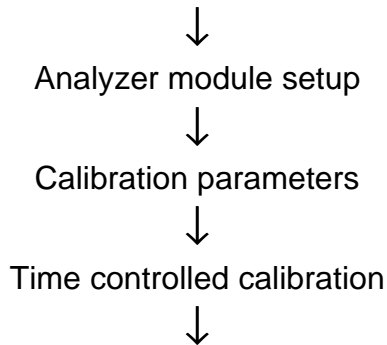
**Options:**

- ◆ Samplegas
- ◆ Zerogas
- ◆ Purgegas
- ◆ Testgas
- ◆ Spangas-1...-4
- ◆ Linearizer
- ◆ Spangas
- ◆ AllClosed
- ◆ Other-Proc.
- ◆ Basic-Status

# 5.1 Analyzer Module Setup

## 5.1.1 Calibration Parameters – Time controlled calibration

Main Menu — Analyzer and I/O-module expert configuration



In the menu "Time Control" you can determine the starting time of the zero gas calibration resp. the span gas calibration for one channel. If you want to determine the values of the other channels of an MLT analyzer or analyzer module, press the F3 key.

### Notes:

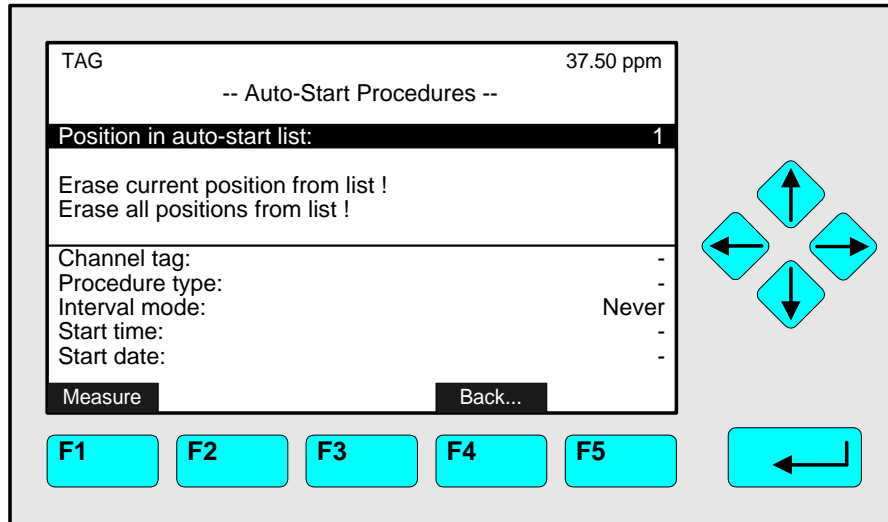
- ◆ The time controlled calibration is only possible if the span gas comes from a valve gear! If the valve gear is not available you have to select "Never" in all lines containing "Day of week".
- ◆ A zero gas calibration should be done before starting a span gas calibration. Therefore the starting time of the zero gas calibration should be different from the starting time of the span gas calibration. If you select the option "Zero+Span calibration" the zeroing will run before the spanning, automatically.

### Set up time parameters:

- ◆ Select any line of variables with the ↓ -key or the ↑ -key.
- ◆ Select the variable with the ← -key or the → -key.
- ◆ Select any digit with the ← -key or the → -key and adjust a new value with the ↑ -key or the ↓ -key resp. select the whole parameter with the ↑ -key or the ↓ -key.  
*Options* for day of week: Monday, ..., Sunday, Each day, Never  
for hour: 0, 1, 2, 3, ..., 23  
for minute: 0, 1, 2, 3, ..., 59
- ◆ Confirm the new value with the ↵ -key or cancel and go back to the last value with F2.

## Further Parameters:

Via the F5 key (ShowList) you can change to the following submenu:



In this submenu you can determine some further parameters of the time controlled calibration.

Lines "Position in auto-start list", "Erase current position from list !" and "Erase all positions from list !":

If you have disabled a time controlled calibration in the menu "Time Control" you have to reset the memory to avoid further calibrations by time control. Starting the function "Erase current position from list !" will reset the memory for the position selected in the line "Position in auto-start list".

There are three positions belonging to the following lines in the menu "Time Control":

- Position 1: Zero calibration
- Position 2: Span calibration
- Position 3: Zero+Span calibration

Starting the function "Erase all positions from list !" will delete the set-ups for all kinds of time controlled calibration in the menu "Time Control".

The last five lines of variables:

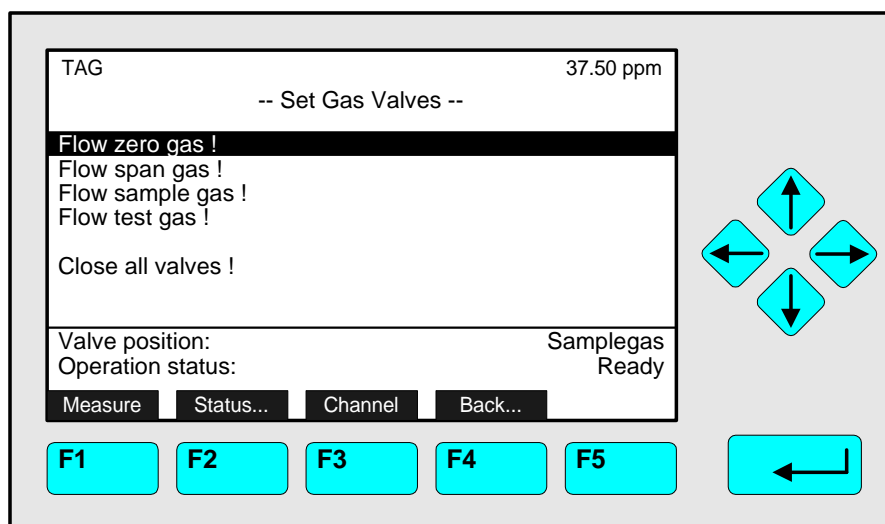
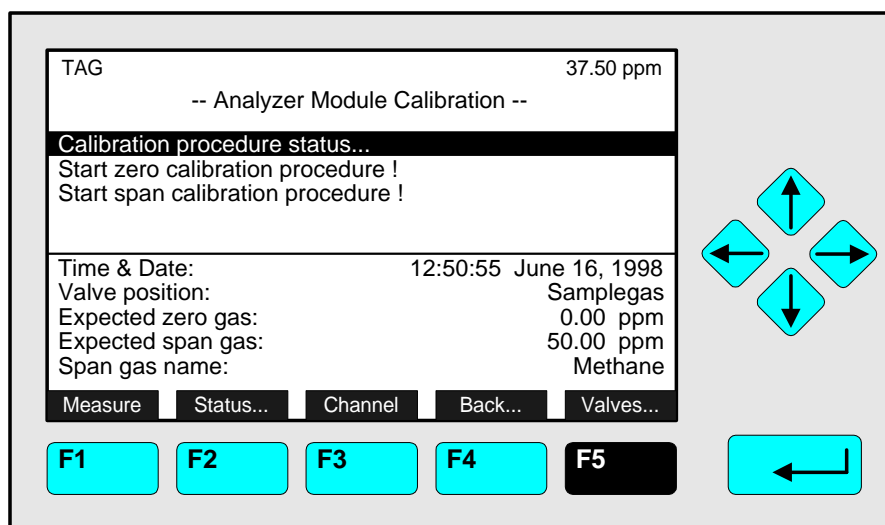
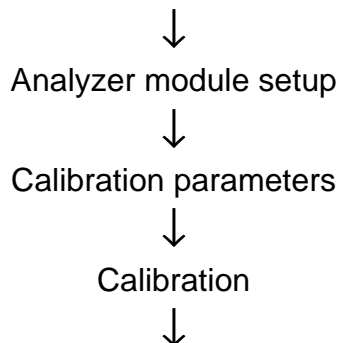
These lines will display the parameters of the position selected in the line "Position in auto-start list".



# 5.1 Analyzer Module Setup

## 5.1.1 Calibration Parameters – Calibration

Main Menu — Analyzer and I/O-module expert configuration



In the menu "Analyzer Module Calibration" you can

- ◆ **start the zero calibration or start the span calibration** of all measurement ranges of the same channel for an MLT analyzer or analyzer module.

Via the F5 key you can change to the menu "Set Gas Valves", where you can

- ◆ set up the gas flow of the current channel with
  - zero gas or
  - span gas or
  - sample gas or
  - test gas or
  - close all valves.

Starting the functions:

- ◆ Change to the line you want with the ↑ -key or the ↓ -key.
- ◆ Press the ← -key or the → -key or cancel and go back to the last menu page with the F4 key (Back...) or the ← -key.
- ◆ If asked: Confirm with the F2 key (Yes) or cancel and go back to the last menu page with the F4 key (Back...) or the ← -key.

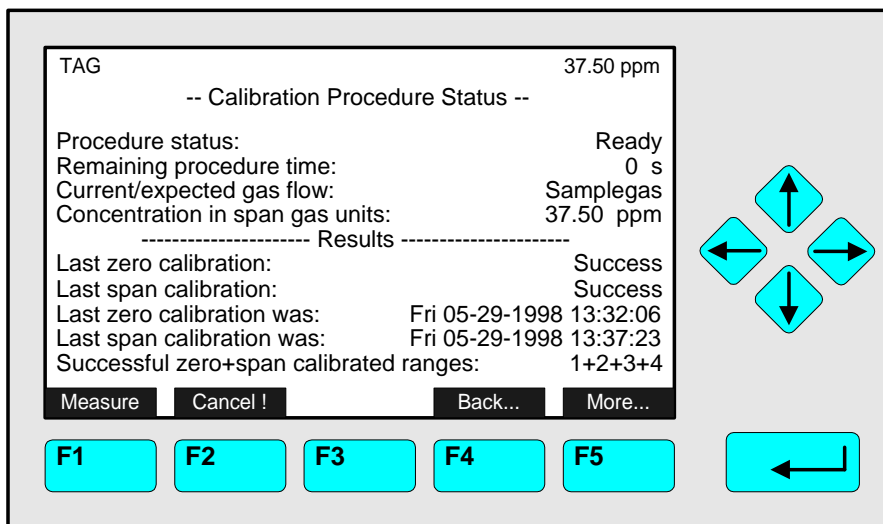
**Notes:**

- ◆ **The signal has to be stable before starting any calibration !**
- ◆ The last five lines of the menu "Analyzer Module Calibration" resp. the last two lines of the menu "Set Gas Valves" are information lines.
- ◆ The menu "Analyzer Module Calibration" is the same as the menu "Analyzer Module Calibration" of the "Basic Controls" (see sections 4.4 to 4.11), including all submenus. So, the calibration and gas flow procedures are analogous to the descriptions in the sections 4.5 to 4.11.
- ◆ If you want to calibrate or set up the other channels of an MLT analyzer or analyzer module, you have to change the channel with the F3 key. If you want to start the zero and/or the span calibration for all channels simultaneously, you have to change to the menu "Advanced Calibration Methods" (see p. 5-18).
- ◆ If you want to calibrate the measurement ranges separately with span gas, you have to set up "Separately" in the line "Span ranges" of the menu "Calibration Procedure Setup" (see p. 5-11).
- ◆ **Via the F2 key you will reach the menu "Analyzer Channel Status".** In that menu and its corresponding submenus you will find the status report of the current channel for
  - Failures
  - Maintenance requests
  - Function controls
  - Measurements/Alarms
  - Events
  - Hours of operationand the operational settings of the current channel like
  - range settings and
  - response time ( $t_{90}$ -time).

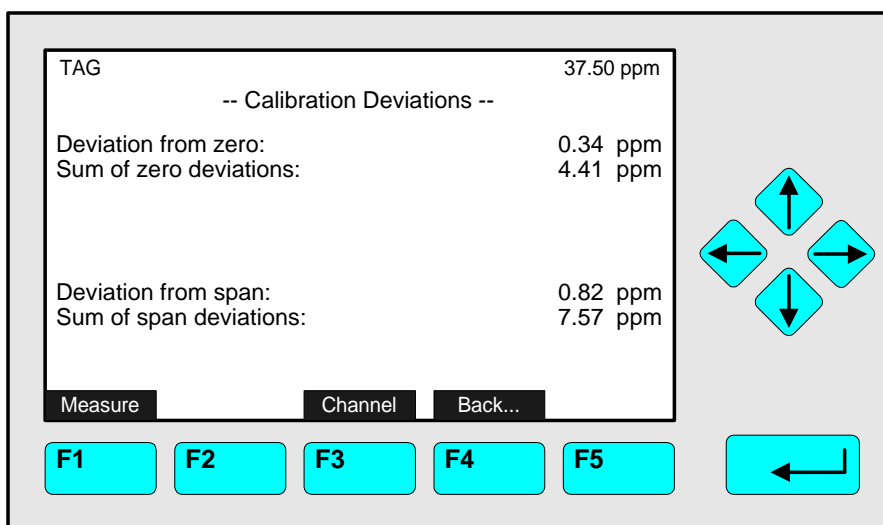
The menu "Analyzer Channel Status" and its submenus are displayed detailed in section 4.1.

**Menu "Calibration Procedure Status":**

Press the ←-key or the →-key in the line "Calibration procedure status..." to change to the corresponding submenu:



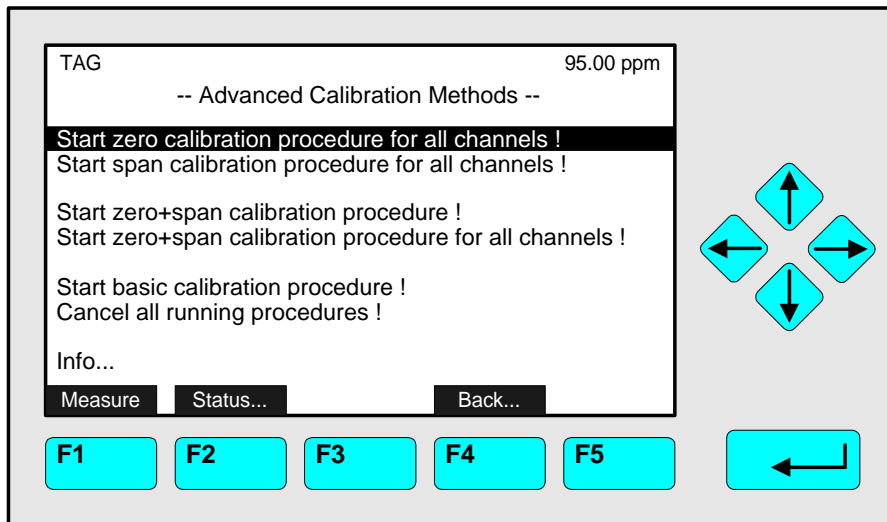
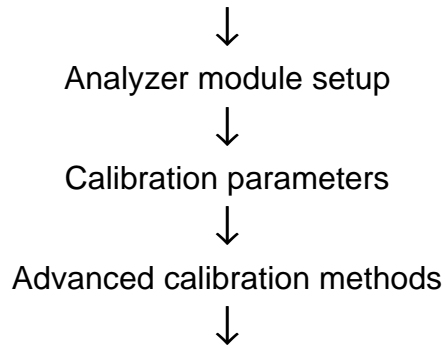
In the menu "Calibration Procedure Status" you will find the results of the last calibrations. This menu will appear automatically after starting the zero or span gas calibration. Then it will display the status of the running calibration procedure (see sections 4.5/4.6 p. 4-39 to 4-46). If a calibration is still running, you can cancel it at any time with the F2 key. With the F5 key (More...) you will change to a submenu, where you will find the calibration deviations of the current channel. The deviations of the other channels of an MLT analyzer or analyzer module you will find there by changing the channel with the F3 key.



## 5.1 Analyzer Module Setup

### 5.1.1 Calibration Parameters – Advanced calibration methods

Main Menu — Analyzer and I/O-module expert configuration



In the menu "Advanced Calibration Methods" you can

- ◆ **start the zero calibration** of all measurement ranges **for all channels** of an MLT analyzer or analyzer module simultaneously or
- ◆ **start the span calibration** of all measurement ranges **for all channels** of an MLT analyzer or analyzer module simultaneously or
- ◆ **start the zero and span calibration together** for the **current channel** of an MLT analyzer or analyzer module or
- ◆ **start the zero and span calibration together** for **all channels** of an MLT analyzer or analyzer module or
- ◆ **set all calibration deviations to zero** ("basic calibration procedure").

Starting the functions:

- ◆ Change to the line you want with the ↑ -key or the ↓ -key.
- ◆ Press the ← -key or the → -key or cancel and go back to the last menu page with the F4 key (Back...) or the ← -key.
- ◆ If asked: Confirm with the F2 key (Yes) or cancel and go back to the last menu page with the F4 key (Back...) or the ← -key.



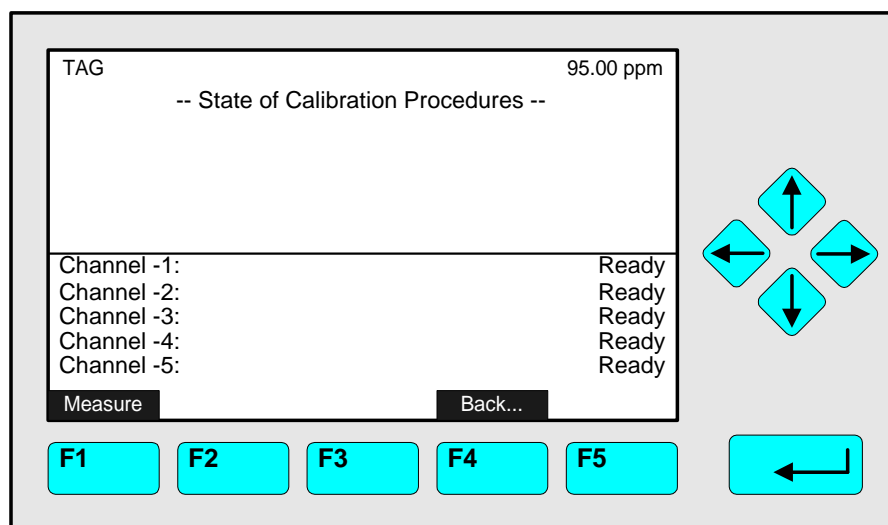
**Notes:**

- ◆ **The signal has to be stable before starting any calibration !**
- ◆ If you want to start the zero and the span calibration separately, or if you want to calibrate separately each channel of an MLT analyzer/analyzer module, or if you want to calibrate the measurement ranges separately with span gas, you have to change to the menu "Analyzer Module Calibration" (see p. 5-15) resp. to the menu "Calibration Procedure Setup" (p.5-9).
- ◆ You can cancel any calibration procedures with the function "Cancel all running procedures !"
- ◆ **Via the F2 key you will reach the menu "Analyzer Channel Status".** In that menu and its corresponding submenus you will find the status report of the current channel for
  - Failures
  - Maintenance requests
  - Function controls
  - Measurements/Alarms
  - Events
  - Hours of operationand the operational settings of the current channel like
  - range settings and
  - response time (t<sub>90</sub>-time).

The menu "Analyzer Channel Status" and its submenus are displayed detailed in section 4.1.

Menu line "Info...":

Via this menu line you can change to the submenu "State of Calibration Procedures", where you will find the actual status of each channel of an MLT analyzer or analyzer module.



## 5.1 Analyzer Module Setup

### 5.1.1 Calibration Parameters – Zero Gases

Main Menu — Analyzer and I/O-module expert configuration



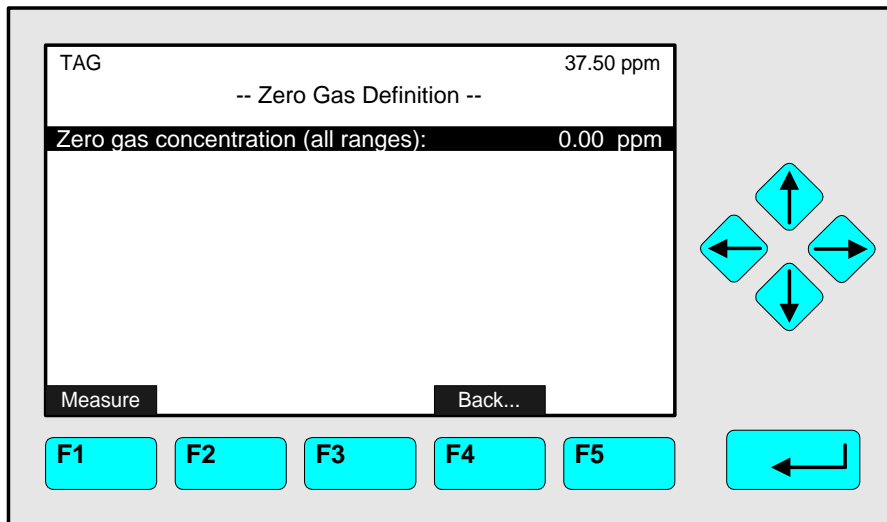
Analyzer module setup



Calibration parameters



Zero gases



In the menu "Zero Gas Definition" you can set up the zero gas concentration for all ranges of the current channel of an MLT analyzer or analyzer module. The concentration unit ("ppm", "ppb", "%" etc.) is determined by the setup of the current channel (see section 5.1.10 p. 5-54).

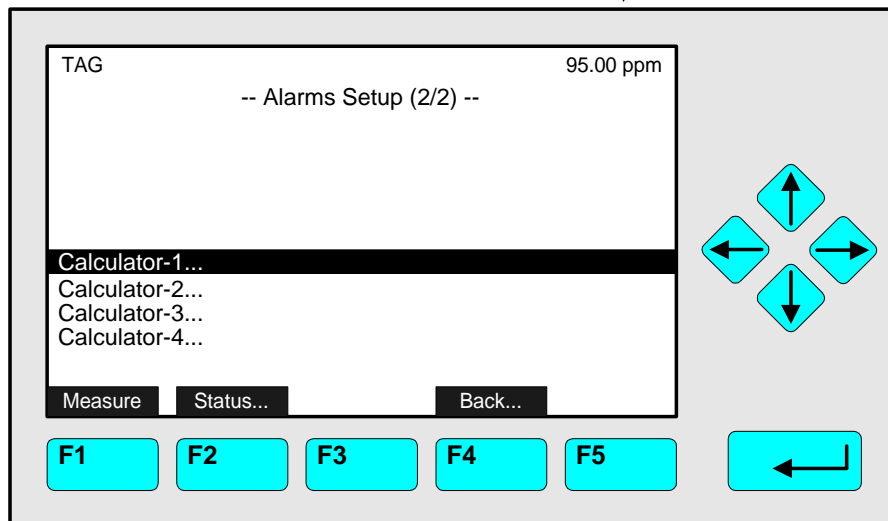
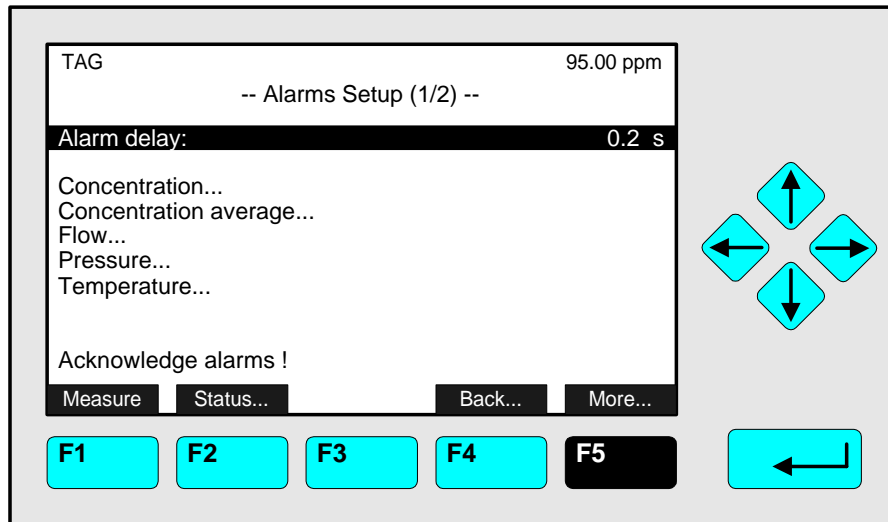
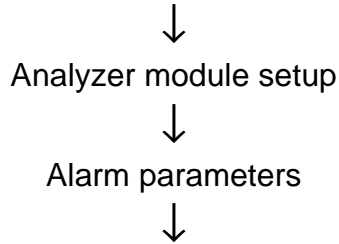
#### Zero gas concentration setup:

- ◆ Select the variable with the  $\leftarrow$ -key or the  $\rightarrow$ -key.
- ◆ Select any digit with the  $\leftarrow$ -key or the  $\rightarrow$ -key and adjust a new value with the  $\uparrow$ -key or the  $\downarrow$ -key  
resp. select the whole parameter with the  $\uparrow$ -key or the  $\downarrow$ -key.
- ◆ Confirm the new value with the  $\leftarrow$ -key or  
cancel and go back to the last value with the F2 key.

# 5.1 Analyzer Module Setup

## 5.1.2 Alarm Parameters

Main Menu — Analyzer and I/O-module expert configuration



In the menu "Alarms Setup" and its submenus you can set up and control alarms for several parameters of each channel of an MLT analyzer or analyzer module. If the selected parameter signal will exceed a certain limit, you will get the corresponding alarm message. If the parameter selected is displayed with a mini bargraph in the single component display, you will find little flag icons at the alarm values on its bargraph.

### Parameters set up or changing to submenus:

- ◆ Select the line of variables, any menu line or the function line with the ↓ -key or the ↑ -key.
- ◆ Select the variable, start the function or change to the submenu with the ← -key or the → -key.
- ◆ Select any digit with the ← -key or the → -key and adjust a new value with the ↑ -key or the ↓ -key  
resp. select the whole parameter with the ↑ -key or the ↓ -key.
- ◆ Confirm the new value with the ← -key or  
cancel and go back to the last value with the F2 key.

### Line of variables "Alarm delay":

The alarm message of any enabled parameter will start after the time in this line is over.  
Options: 0, 0.1, ... , 30.0 s.

### Function line "Acknowledge alarms !":

Starting this function will delete a running alarm message. You should do this after the signal is back in the allowed range to reset the alarm message for new events.

### **Note:**

Via the F2 key you will reach the menu "Analyzer Channel Status". In that menu and its corresponding submenus you will find the status report of the current channel for

- ◆ Failures
- ◆ Maintenance requests
- ◆ Function controls
- ◆ Measurements/Alarms
- ◆ Events
- ◆ Hours of operation

and the operational settings of the current channel like

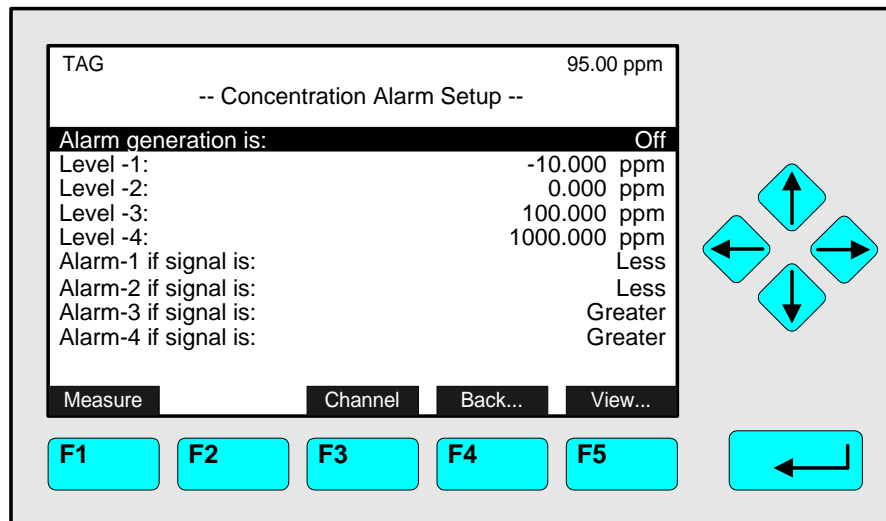
- ◆ range settings and
- ◆ response time ( $t_{90}$ -time).

The menu "Analyzer Channel Status" and its submenus are displayed detailed in section 4.1.

### Alarms Setup and Control – Example: Concentration Alarm Setup

- ◆ Select the parameter you want in the menu "Alarms Setup", i.e. "Concentration", and change to the corresponding menu:

**Note:** If the setup of the parameter selected is not possible, a corresponding message will appear on the screen, i.e. no flow sensor installed to measure the flow.



- 1) Switch off the alarm control:
  - Before beginning the alarm parameter setup, you have to select "Off" in the line "Alarm generation is".
  - Otherwise, an alarm may start during the parameter will be configured.
- 2) Signal limits setup for alarm ("Level -1, ... , -4"):
  - You can adjust four limit values for each signal parameter.
  - You should fix the low alarm with "Level -2" and the high alarm with "Level -3". Then, you should save the low alarm with "Level -1" and the high alarm with "Level -4".
  - The units and the possible range of values depend on the signal parameter selected.
  - You also can adjust negative values:  
Select the number with the ←-key or the →-key and press F4 (+/-) to change the sign.
- 3) Conditions for alarm start ("Alarm-1, ... , -4 if signal is"):
  - In these lines you can determine for which kind of exceeding each alarm shall be generated:
  - **Less:** The alarm message will appear, if the value of the parameter selected is below the corresponding limit ("Level -1, ..., -4").
  - **Greater:** The alarm message will appear, if the value of the parameter selected is above the corresponding limit.
- 4) Switch on the alarm control:
  - Select one of the following set-ups to start the alarm control for the parameter limits selected:

- **On:** The alarm message of the signal parameter selected will only appear as long as the signal will exceed the allowed level. The alarm message will disappear, if the value is again in the range allowed.
- **On (Hold Alarm):** The alarm message for the signal parameter selected will appear after the signal will have exceeded the allowed value. The alarm message will also keep alive, if the value will be back again in the range allowed.  
To delete the message, you have to go back to the menu "Alarms Setup" with the F4 key or the ← -key and to start the function "Acknowledge alarms !".

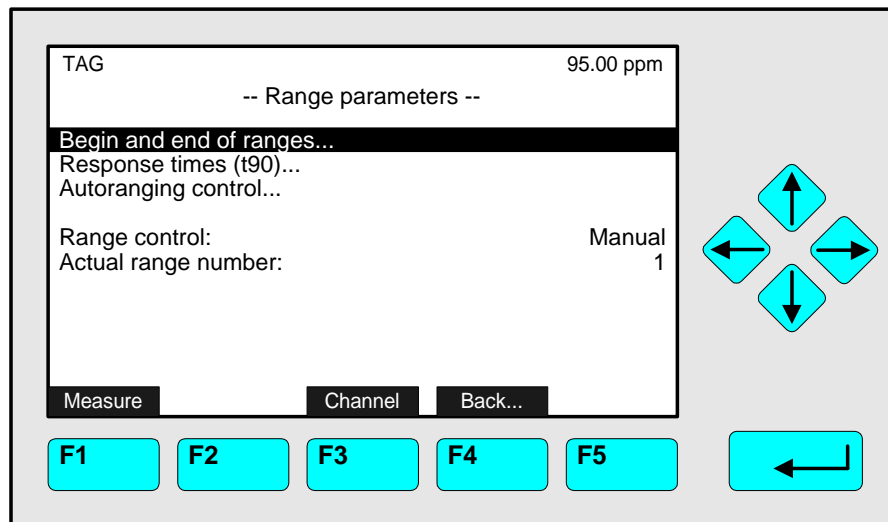
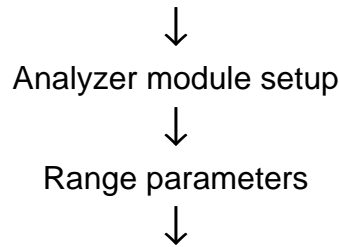
Options:

- ◆ F3 (Channel):  
To change to the setup menu of the other channels of an MLT analyzer or analyzer module.
- ◆ F5 (View...):  
To change to the submenu "Parameter (i.e.: Concentration) Alarm Status", where you will find the alarm status ("On/Off") of the four alarms for the parameter selected.

## 5.1 Analyzer Module Setup

### 5.1.3 Range parameters

#### Main Menu — Analyzer and I/O-module expert configuration



In the menu "Range parameters" and its submenus you can set up and control range parameters like

- ◆ begin and end of range
- ◆ response time ( $t_{90}$ -time)
- ◆ autoranging

for one channel. You can change to the other channels of an MLT analyzer or analyzer module with the F3 key.

#### Parameters setup or changing to submenus:

- ◆ Select any line of variables or any menu line with the ↓ -key or the ↑ -key.
- ◆ Select the variable or change to the submenu with the ← -key or the → -key.
- ◆ Select the parameter with the ↑ -key or the ↓ -key.
- ◆ Confirm the new setup with the ↵ -key or cancel and go back to the last setup with the F2 key.

#### Line of variables "Range control":

The parameter selected in this line is valid for the autoranging control of the current channel (see p. 5-29). You have the following options:

- ◆ **Manual:** You have to change the range manual. The switch level hysteresis is disabled (see p. 5-30).
- ◆ **Self/Automatic:** The autoranging is running by the comparison of the current measurement value with the end of range. The signal at the analog output is tracking. The value in the line "Switch level hysteresis" of the menu "Autoranging Control" is enabled (see p. 5-30).
- ◆ **Program I/O-module:** The autoranging is controlled by the I/O-Board. The value in the line "Switch level hysteresis" of the menu "Autoranging Control" is enabled (see p. 5-30).
- ◆ **Inputs I/O-module:** The autoranging is controlled by the digital input. The value in the line "Switch level hysteresis" of the menu "Autoranging Control" is enabled (see p. 5-30).

Line of variables "Actual range number":

In this line you will find the range number selected. You can select any of the four ranges of the current channel. If the autoranging is enabled, you will find the current range.



## 5.1 Analyzer Module Setup

### 5.1.3 Range parameters – Begin and end of ranges

Main Menu — Analyzer and I/O-module expert configuration

↓  
Analyzer module setup

↓  
Range parameters

↓  
Begin and end of ranges



TAG	95.00 ppm
-- Begin and End of Ranges --	
Begin of range -1:	0.00 ppm
Begin of range -2:	0.00 ppm
Begin of range -3:	0.00 ppm
Begin of range -4:	0.00 ppm
End of range -1:	50.00 ppm
End of range -2:	250.0 ppm
End of range -3:	2500 ppm
End of range -4:	10000 ppm
Actual begin of range:	0.00 ppm
Actual end of range:	250.00 ppm

Measure Channel Back...

F1 F2 F3 F4 F5

In the menu "Begin and End of Ranges" you can set up the begin and end of range for each range of the current channel. To change to the other channels of an MLT analyzer or analyzer module, you have to press the F3 key.

#### Set up parameters:

- ◆ Select any line of variables with the ↓ -key or the ↑ -key.
- ◆ Select the variable with the ← -key or the → -key.
- ◆ Select any digit with the ← -key or the → -key and adjust a new value with the ↑ -key or the ↓ -key  
resp. select the whole value with the ↑ -key or the ↓ -key.

#### Allowed minimum/maximum range values:

Concentrations in the lines "Absolute, range lower/upper limit" of the menu "Autoranging Control" (see p. 5-29).

- ◆ Confirm the new value with the ← -key or cancel and go back to the last value with the F2 key.

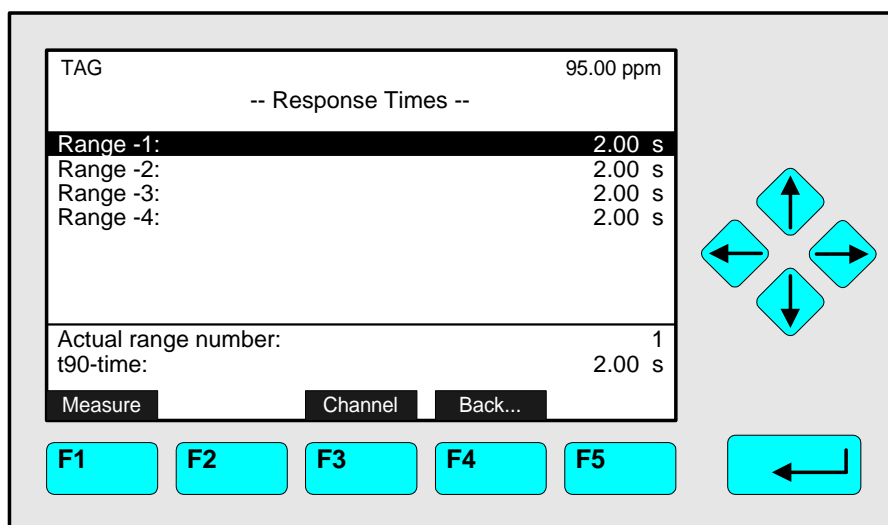
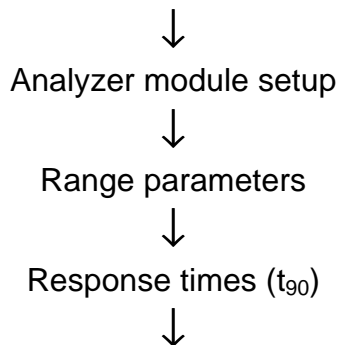
#### Lines "Actual begin of range" / "Actual end of range":

In these lines you will find the begin and end of the current range.

## 5.1 Analyzer Module Setup

### 5.1.3 Range parameters – Response times ( $t_{90}$ )

Main Menu — Analyzer and I/O-module expert configuration



In the menu "Response Times" you can set up the response time ( $t_{90}$ -time) for each range of the current channel. To change to the other channels of an MLT analyzer or analyzer module, you have to press the F3 key.

The response time ( $t_{90}$ -time) is defined as the time that has to run until the analyzer displays 90% of a component's concentration after a concentration jump.

#### Set up parameters:

- ◆ Select any line of variables with the ↓ -key or the ↑ -key.
- ◆ Select the variable with the ← -key or the → -key.
- ◆ Select any digit with the ← -key or the → -key and adjust a new value with the ↑ -key or the ↓ -key  
resp. select the whole value with the ↑ -key or the ↓ -key.  
Options: 0.01 to 28 seconds for each range of a channel.
- ◆ Confirm the new value with the ← -key  
or cancel and go back to the last value with the F2 key.

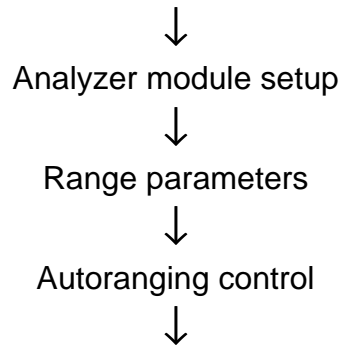
#### Notes:

- ◆ The setup of the response time is limited to 0.1s by the calculators' rate of the analyzer.
- ◆ Normally, the response time should not be less than 2s.
- ◆ You should use a value of 2s minimum for calibrations.
- ◆ The response time of this menu is not the response time of the whole analyzer!
- ◆ If you will use the autoranging control (see p. 5-29 ), you have to set up the same response time for all ranges of the current channel!

## 5.1 Analyzer Module Setup

### 5.1.3 Range parameters – Autoranging control

#### Main Menu — Analyzer and I/O-module expert configuration



TAG	95.00 ppm		
-- Autoranging Control --			
Switch level hysteresis:	10 %		
Usage of range -1:	Enabled		
Usage of range -2:	Enabled		
Usage of range -3:	Enabled		
Usage of range -4:	Enabled		
Absolute, range lower limit:	0.00 ppm		
Absolute, range upper limit:	1000000 ppm		
Calculate switch levels automatically:	Enabled		
Measure	Channel	Back...	More...

F1   F2   F3   F4   F5   ↩

In the menu "Autoranging Control" you can set up the parameters for the autoranging control of the current channel. If you want to set up the autoranging control of the other channels of an MLT analyzer or analyzer module, you have to press the F3 key. If the autoranging is enabled, the best range for the current concentration will be selected, automatically.

#### Conditions:

- ◆ The range control has to be enabled!  
To setup: See the line "Range control" in the menu "Range parameters", p. 5-25/26.
- ◆ The begin of range has to be zero for all four ranges of the current channel!  
To setup: See menu "Begin and End of Ranges", p. 5-27.
- ◆ All four response times of the current channel must have the same value!  
To setup: See menu "Response Times", previous page.
- ◆ The span gas concentration has to be in the correct range!  
To setup: See menu "Span Gas Definition", section 5.1.1 p. 5-6.

#### The last three lines of the menu:

The parameters in these lines are factory settings and cannot be changed in this menu.

- ◆ **Absolute, range lower limit:** Normally is this value zero. It will only differ from zero for differential measurements (see 5.1.12 p.5-57).
- ◆ **Absolute, range upper limit:** It is 120% of the largest end of range from putting into operation. Higher values will not be accepted as end of range values!

**Notes:**

- ◆ You can enable or disable each range in the lines "Usage of range -1, ..., -4".
- ◆ "Range -4" has not to be the biggest range.

Set up parameters:

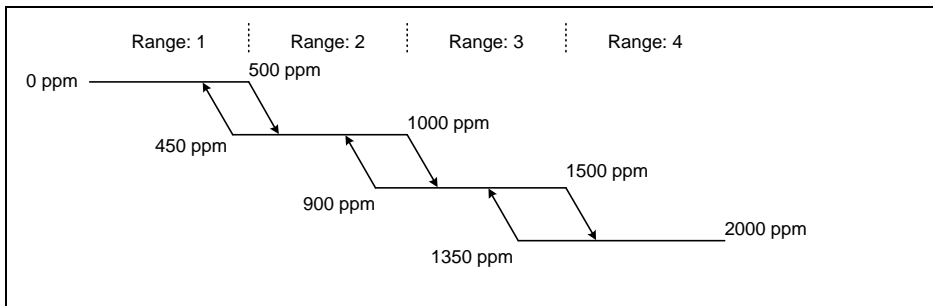
- ◆ Select any line of variables with the ↓ -key or the ↑ -key.
- ◆ Select the variable with the ← -key or the → -key.
- ◆ Select any digit with the ← -key or the → -key and adjust a new value with the ↑ -key or the ↓ -key  
resp. select the whole parameter with the ↑ -key or the ↓ -key.
- ◆ Confirm the new value with the ↵ -key or cancel and go back to the last value with the F2 key.

Line of variables "Switch level hysteresis":

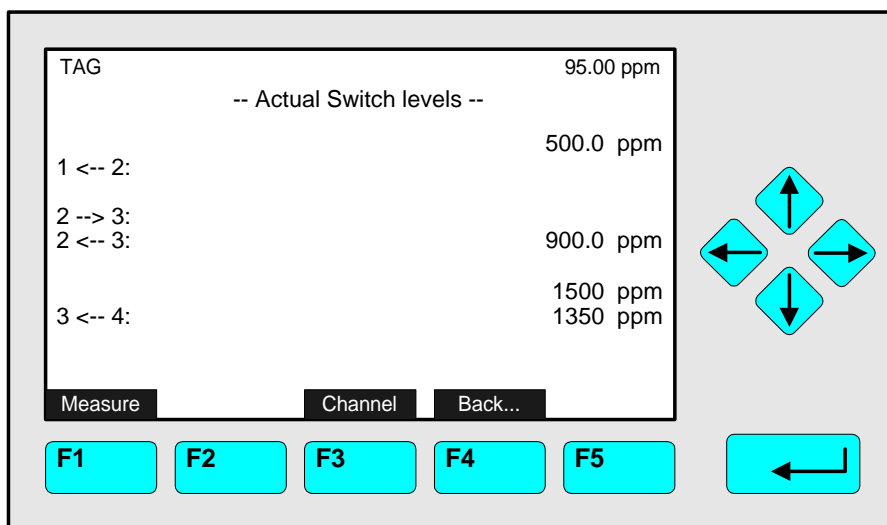
The value in this line determines the level hysteresis between the ranges for autoranging. The hysteresis is calculated as percentage of the current end of range. Options: 10 to 50% (Standard value: 10%)

*Example:*

Switch level hysteresis: 10%; End of range -1, -2, -3, -4: 500, 1000, 1500, 2000 ppm



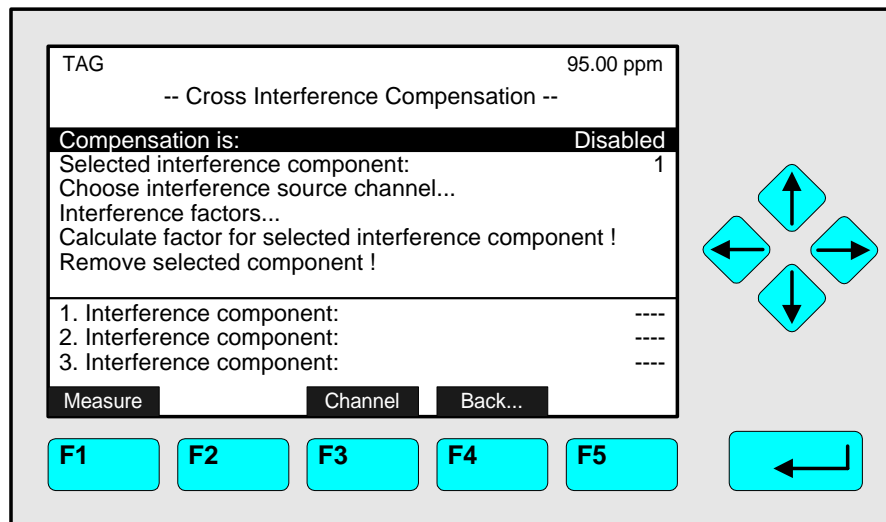
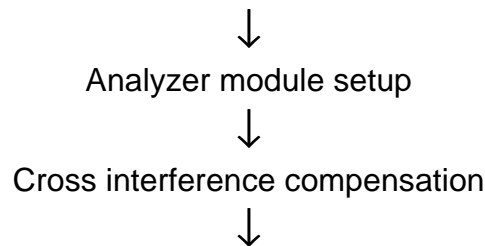
Via the F5 key (More...) you can change to the submenu "Actual Switch levels", where you will find switch levels between the ranges of the current channel:



# 5.1 Analyzer Module Setup

## 5.1.4 Cross Interference Compensation

### Main Menu — Analyzer and I/O-module expert configuration



In the menu "Cross Interference Compensation" you can calculate the influence of other components to the result of the analyt component. You can take maximum three interference components for each channel of the MLT analyzer. It is not possible to calculate the cross interference compensation for signals of auxiliary modules!

If you want to calculate the compensation for other channels of an MLT analyzer or analyzer module, you have to press the F3 key.

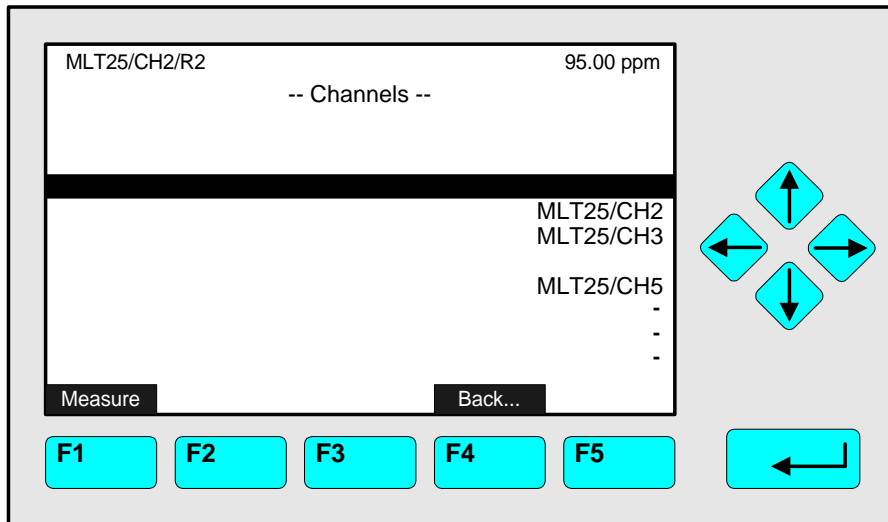
#### Conditions:

- ◆ You only have to use pure gases or gases in inert atmosphere (e.g. CH<sub>4</sub> in N<sub>2</sub>) for all components that you need to calculate the compensation. Do not use mixed gases!
- ◆ You have to calibrate all channels you need to calculate the interference compensation. Besides, all channels must be part of the same MLT analyzer or analyzer module.

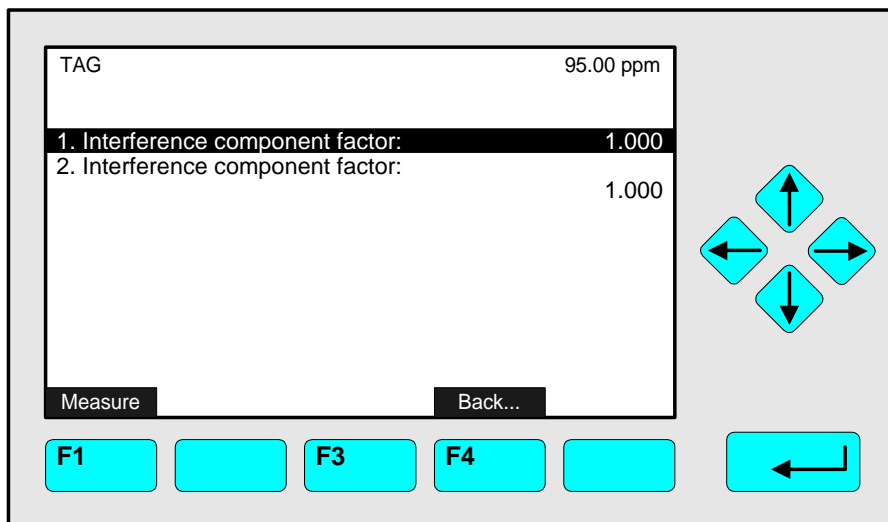
#### Calculation of the Cross Interference Compensation:

- 1) In the line "Compensation is" you have to select "Disabled". If you select "Enabled" the result will be influenced by earlier values.
- 2) In the line "Selected interference component" you have to select the number of the current interference component.
- 3) Press the ← -key or the → -key in the line "Choose interference source channel..." to change to the submenu "Channels" (illustration see next page):
  - Select the line you want with the ↓ -key or the ↑ -key.
  - Choose the interference source channel with the ← -key or the → -key: The display will go back to the menu "Cross Interference Compensation" automatically. The tag of the interference component will appear in one of the last three lines in the menu. The position depends on the number selected in the line "Selected interference component".

- You can repeat the last two steps as often as necessary until you have selected all interference components (maximum 3) you need.



- 4) Give the interference component into the sample gas channel and wait for a stable signal.
- 5) Go to the line "Calculate factor for selected interference component !" with the  $\uparrow$  -key or the  $\downarrow$  -key and then start the calculation with the  $\leftarrow$  -key or the  $\rightarrow$  -key. If you want to see the results change to the line "Interference factors..." and press the  $\leftarrow$  -key to go to the corresponding submenu:



In this submenu you can also set up each interference component factor manual.

- 6) Select "Enabled" in the line "Compensation is" of the menu "Cross Interference Compensation" to start the cross interference compensation.

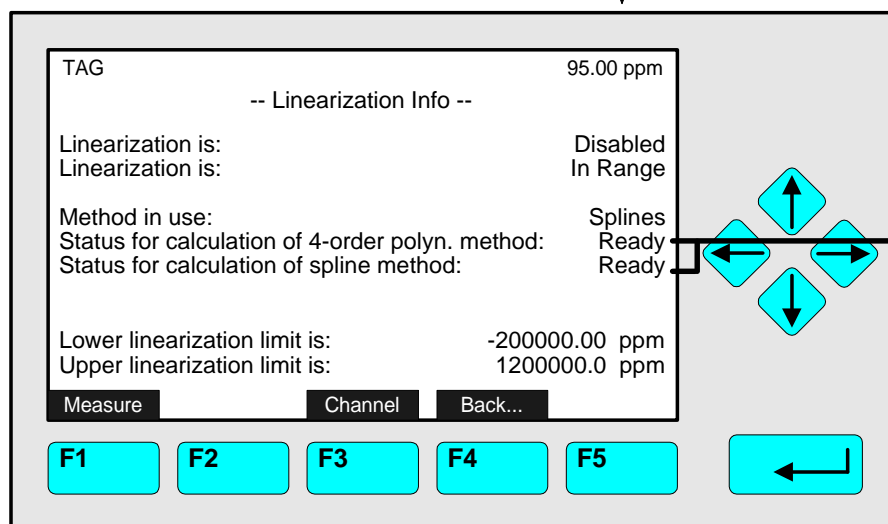
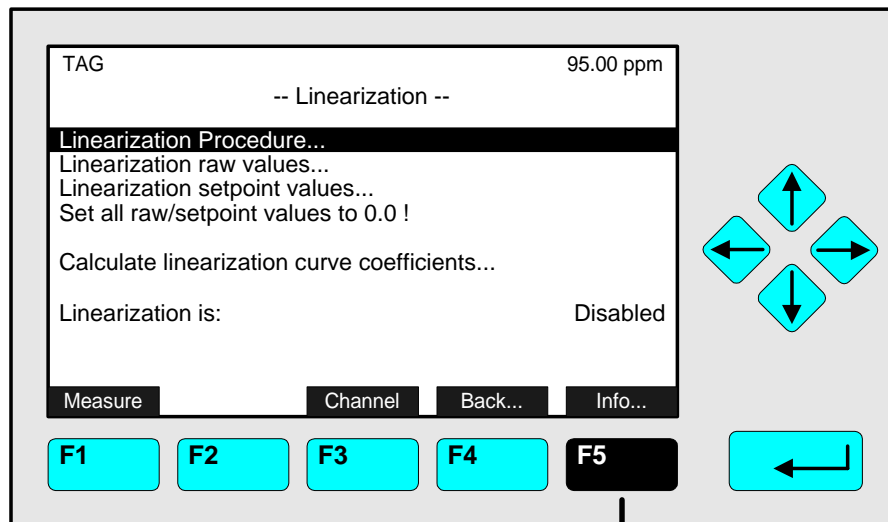
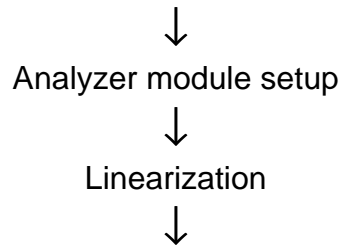
Function line "Remove selected component !"

If you press the  $\leftarrow$  -key or the  $\rightarrow$  -key in this line you will delete the interference factor of the selected interference component !

# 5.1 Analyzer Module Setup

## 5.1.5 Linearization

### Main Menu — Analyzer and I/O-module expert configuration



In these lines you can control if the calculated linearization was successful !

In the menu "Linearization" and its submenus you can set up and start the calculation to linearize one channel of an MLT analyzer or analyzer module. With the F3 key you can change to the other channels. With the F5 key (Info...) you can change to the submenu "Linearization Info", where you will find the results and some parameters of linearization.

#### Background:

The optical absorption of a gas as a function of its concentration is not linear in the whole range. Therefore the result of the analyzer has to be linearized. You can linearize manual or semi-automatically. In this chapter the manual linearization is described. If you want to linearize automatically, contact your customer service, please.

### Conditions:

- ◆ Before you start the linearization you have to calibrate the largest range of the channel (usually range 4) with zero gas and span gas.
- ◆ You have to record a raw values/setpoint values table to linearize a channel. You need minimum 6 raw values and their corresponding setpoint values: zero, end of range and 4 intermediate values. You should take 10 to 15 values (maximum: 30) to improve the precision of the linearization curve.

### Realize the linearization:

#### 1) Disable the linearization:

- Before you record the linearization values you have to disable the current linearization to avoid the influence from the old values to the calculation of the new curve.
- Change to the line "Linearizer is" with the ↑ -key or the ↓ -key.
- Press the ← -key or the → -key and select "Disabled" with the ↑ -key or the ↓ -key.
- Confirm your adjustment with the ↵ -key.

#### 2) Zero and span gas calibration:

- Calibrate the largest range (usually: range 4) with zero and span gas.
- The method is described in 4.5 p. 4-39 and 4.6 p. 4-43 or in 5.1.1 p. 5-15 to 5-17.

#### 3) Recording the raw values/setpoint values table:

- If you have a defined gas flow, you can read each raw value in any menu display at the top right or in the single component display.

- *Example:*

You have got the following values for the NO-Channel of the analyzer:

No.	Setpoint Value [ppm NO]	Raw Value [ppm NO]
1	0.000	0.000
2	217.455	266.291
3	319.620	387.709
4	428.610	517.464
5	536.760	645.199
6	636.510	757.313
7	955.395	1113.910
8	2105.560	2263.390
9	3163.860	3163.860

#### 4) Putting the table values into the corresponding menus:

- Change to the menu line "Linearization raw values..." or "Linearization setpoint values..." with the ↑ -key or the ↓ -key.
- Press the ← -key or the → -key to change to the menu "Linearization Raw Values" or "Linearization Setpoint Values".
- Select the first number with the ← -key or the → -key.
- Put in the first raw/setpoint value of the table:
- Select any digit with the ← -key or the → -key and adjust the new value with the ↑ -key or the ↓ -key and confirm the new value with the ↵ -key.



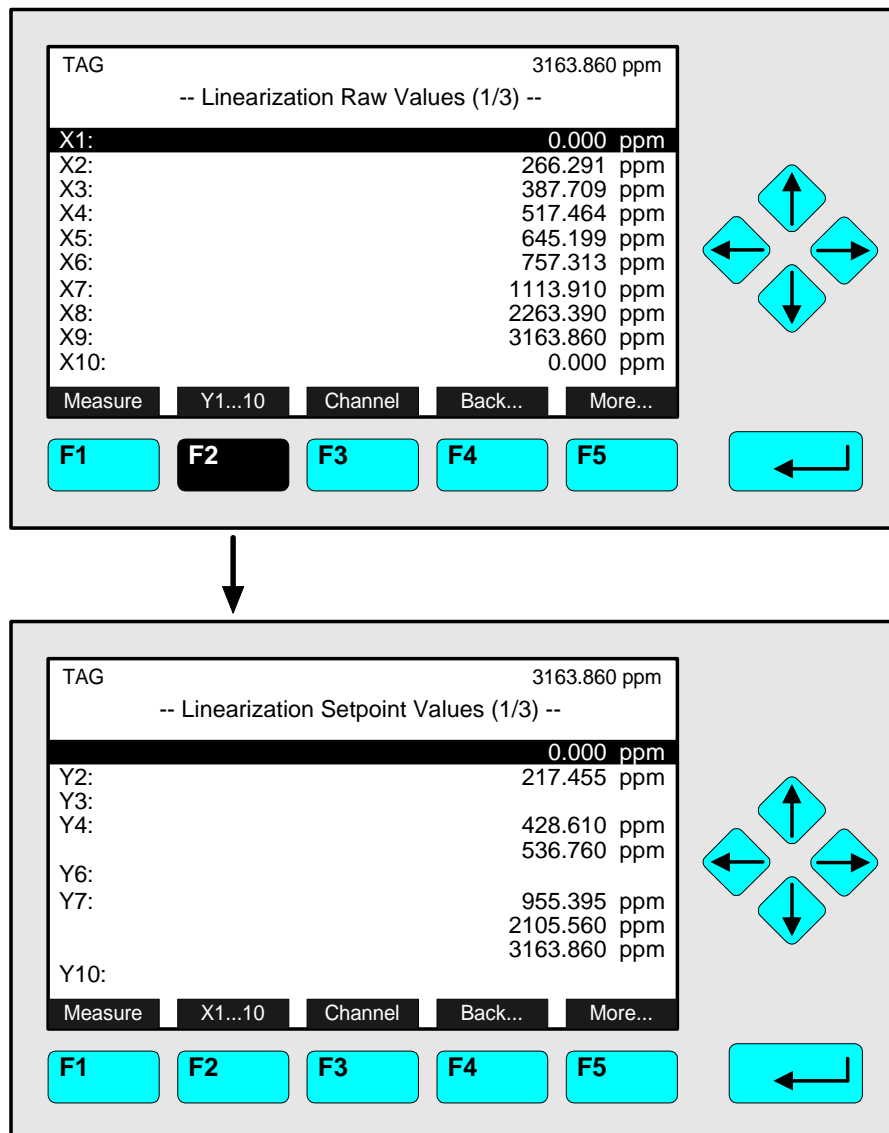
## 5.1 Analyzer Module Setup

### 5.1.5 Linearization

- Change with the ↓ -key to the next line to put in the second value.
- Repeat these steps until all raw/setpoint values of the table are part of the corresponding menus.
- If you have more than 10 values you can go to further menu pages with the F5 key (More...). There are maximum 30 lines available. The current menu page number is always displayed in the headline. If you have less than 30 values you have to put in "0" in the line following the last real value of the table!

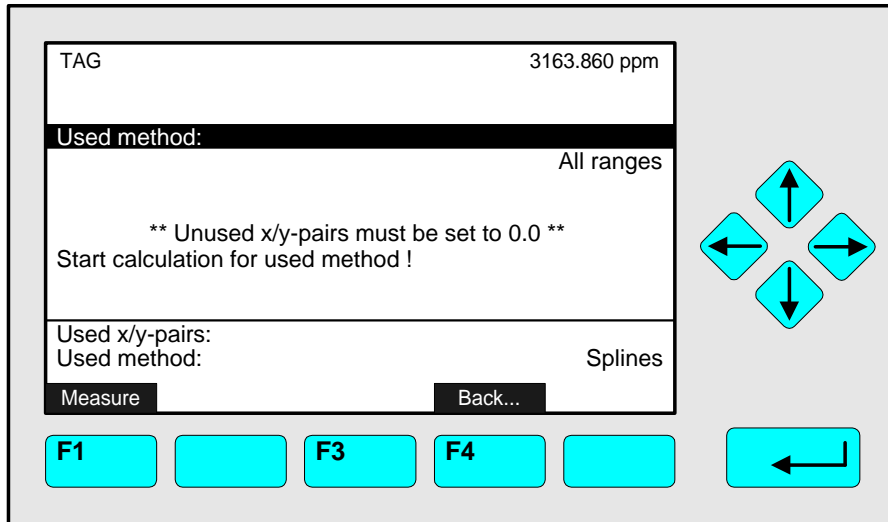
#### Notes:

- ◆ You can change between the menus "Linearization Raw Values" and "Linearization Setpoint Values" with the F2 key!
- ◆ The raw value "X2" must belong to the setpoint value "Y2" ! Otherwise, the calculation of the linearization may be wrong !



**5) Calculate linearization curve:**

- Change in the menu "Linearization" to the menu line "Calculate linearization curve coefficients..." with the ↑ -key or the ↓ -key.
- Press the ← -key or the → -key to change to the corresponding submenu:



- Press the ← -key or the → -key in the line "Used method" to select the parameter and setup "Splines" or "4th-order polyn."; confirm it with the ← -key.
- Change to the line "Effected range for 4th-order polynomial" with the ↓ -key.
- Press the ← -key or the → -key to select the parameter.
- Select any of the four ranges or all ranges with the ↑ -key or the ↓ -key and confirm your adjustment with the ← -key.
- Change to the line "Start calculation for used method !" with the ↑ -key or the ↓ -key and start the calculation of the linearization curve with the ← -key.

**6) Enable the linearization:**

- Change in the menu "Linearization" with the ↑ -key or the ↓ -key to the line "Linearizer is".
- Press the ← -key or the → -key and select "Enabled" with the ↑ -key or the ↓ -key.
- Confirm your adjustment with the ← -key.

**7) Linearization control:**

- Repeat the measurement with the same setpoint values used for the linearization curve.
- The full scale deviation has to be better than 1% rel. !

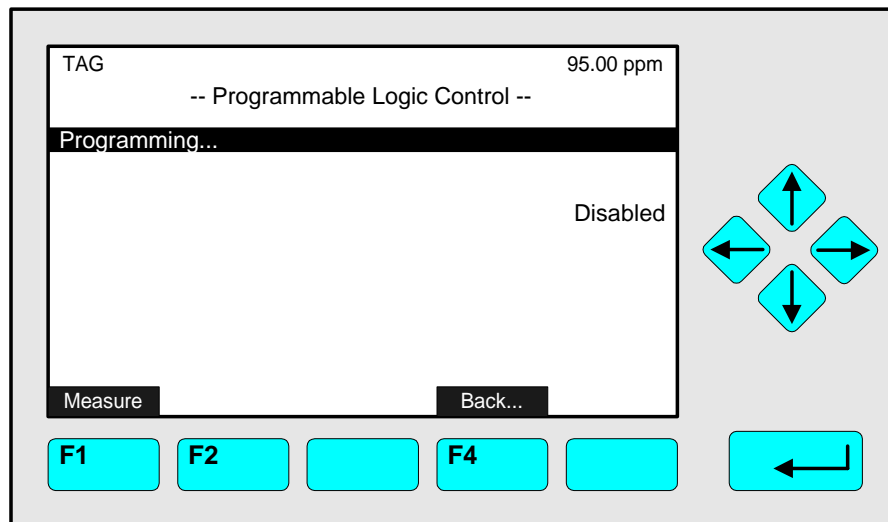
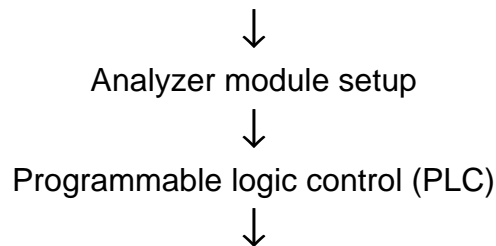
Further Setups and ramifications in the menu "Linearization":

- ◆ **Set all raw/setpoint values to 0.0 !**  
Starting this function will reset all x/y-pairs of raw and setpoint values to zero.
- ◆ **Menu Line "Linearization Procedure...":**  
Via this line you can change to the menu "Linearization Procedure", where you can
  - set up gas blender parameters
  - set up the valve position
  - control the linearization procedure status

## 5.1 Analyzer Module Setup

### 5.1.6 Programmable Logic Control (PLC)

#### Main Menu — Analyzer and I/O-module expert configuration



In the menu "Programmable Logic Control" you can enable or disable the logic control of the MLT analyzer, of the analyzer module or of the digital outputs by a corresponding program. So, you can decide for instance if some calibration results should be sent to a certain analyzer output. If you want to realize a program, you have to change to the submenu "Program" (line "Programming..."). If you want to control the output status you have to change to the submenu "PLC Outputs" (line "Results...").

#### Note:

The PLC is only able to work with signals of the MLT analyzer or analyzer module selected! It is not possible to work with auxiliary modules or external undefined input signals!

#### Set up parameters:

- ◆ Select the line of variables or any menu line with the ↓ -key or the ↑ -key.
- ◆ Select the variable or change to the submenu with the ← -key or the → -key.
- ◆ Select "Enabled" or "Disabled" in the line "PLC is" with the ↑ -key or the ↓ -key.
- ◆ Confirm the parameter selected with the ← -key or cancel and go back to the last value with the F2 key.

**Programming (👉 Consider the example p. 5-41 to 5-43 !):**

**1) Disable PLC:**

- Before you will begin with the programming you have to disable the PLC function in the line "PLC is" to avoid starting the program while you are writing it.

**2) Put in the program:**

- Press the ← -key or the → -key in the line "Programming..." to change to the sub-menu, where you can put in your program step by step (👉 See example p. 5-42).
- A program is composed of single commands (e.g. Selecting a gas valve), which have to be connected logically (e.g. OR-Operator). You have to put in a certain code in every program line for each operator and each command (operand).
- You have to set every operator in the line before the commands that shall be combined. If an intermediate result is not used in the process directly, you have to delete the result buffer ("CLEAR"). So, you can avoid errors of the following logical operations. Each program must end with the operator "-7" ("END of the program").

**3) Enable PLC:**

- You have to select "Enabled" in the line "PLC is" in the menu "Programmable Logic Control" to start the program.

**4) Controlling of the results:**

- Press the ← -key or the → -key in the line "Results..." of the menu "Programmable Logic Control" to change to the submenu "PLC Outputs", where you can control the output status.

**Available operators for PLC:**

Operator types	Operator Description	
-1	<b>NOP</b>	No operation (= blank line)
-2	<b>OR</b>	operand to IR
-3	<b>AND</b>	operand to IR
-4	<b>INVERT</b>	the IR (intermediate result)
-5	<b>STORE</b>	the IR to RB (result buffer)
-6	<b>CLEAR</b>	set IR to LOW/OFF/FALSE
-7	<b>END</b>	of the program

**Available Commands for PLC (Signal Codes 1 - 359):**

General Signals	
Signal ID	Signal
1	RAM-Fail
2	ROM-Fail
3	Seconds; LOW/HIGH change all 1000 ms
4	Any sample gas valve selected (Channel 1...5)
5	Any zero gas valve (Channel 1...5)
6	Any span gas valve Selected (Channel 1...5)
7	NAMUR-status: Failure (Channel 1...5)
8	NAMUR-status: Maintenance Request (Channel 1...5)
9	NAMUR-status: Function Control (Channel 1...5)
10 - 19	Reserved

## 5.1 Analyzer Module Setup

### 5.1.6 Programmable Logic Control (PLC)

<b>Programmable Calculator</b>	
<b>Signal ID</b>	<b>Signal</b>
20	Execution status
21	Result 1 / Limit 1
22	Result 1 / Limit 2
23	Result 1 / Limit 3
24	Result 1 / Limit 4
25	Result 2 / Limit 1
26	Result 2 / Limit 2
27	Result 2 / Limit 3
28	Result 2 / Limit 4
29	Result 3 / Limit 1
30	Result 3 / Limit 2
31	Result 3 / Limit 3
32	Result 3 / Limit 4
33	Result 4 / Limit 1
34	Result 4 / Limit 2
35	Result 4 / Limit 3
36	Result 4 / Limit 4
37 - 39	Reserved
<b>Programmable Logic Controls</b>	
<b>Signal ID</b>	<b>Signal</b>
40	Output Result buffer #1
41	Output Result buffer #2
42	Output Result buffer #3
43	Output Result buffer #4
44	Output Result buffer #5
45	Output Result buffer #6
46	Output Result buffer #7
47	Output Result buffer #8
48	Output Result buffer #9
49	Output Result buffer #10
50	Output Result buffer #11
51	Output Result buffer #12
52	Output Result buffer #13
53	Output Result buffer #14
54	Output Result buffer #15
55	Output Result buffer #16
56	Output Result buffer #17
57	Output Result buffer #18
58	Output Result buffer #19
59	Output Result buffer #20
60	Execution status
61 -69	Reserved

<b>SIO I/O-module</b>	
<b>Signal ID</b>	<b>Signal</b>
70	Output #1 < 0V
71	Output #1 > 10V
72	Output #2 < 0V
73	Output #2 > 10V
74	Output #3 < 0V
75	Output #3 > 10V
76	Output #4 < 0V
77	Output #4 > 10V
78	Output #5 < 0V
79	Output #5 > 10V
80	Output #6 < 0V
81	Output #6 > 10V
82	Output #7 < 0V
83	Output #7 > 10V
84	Output #8 < 0V
85	Output #8 > 10V
86	Relay #1
87	Relay #2
88	Relay #3
89	Reserved
<b>DIO I/O-module</b>	
<b>Signal ID</b>	<b>Signal</b>
90	Input #1
91	Input #2
92	Input #3
93	Input #4
94	Input #5
95	Input #6
96	Input #7
97	Input #8
98	Output 1..8 fail
99	Output 9..16 fail
100	Output 17..24 fail
101	General Fail
102 - 109	Reserved

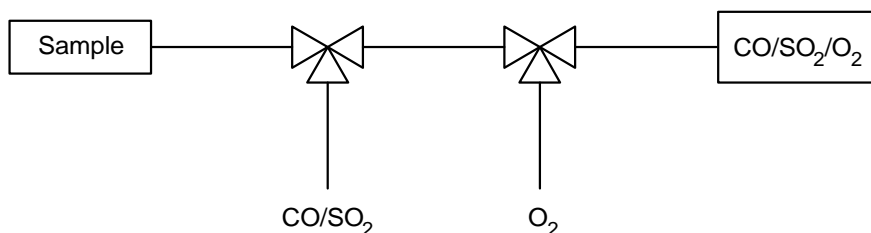
 Table will be continued on the next page !

## Measurement-Channels

Signal ID Ch 1	Signal ID Ch 2	Signal ID Ch 3	Signal ID Ch 4	Signal ID Ch 5	Signal
110	160	210	260	310	Raw signal failure
111	161	211	261	311	Sample gas valve
112	162	212	262	312	Zero gas valve
113	163	213	263	313	Test gas valve
114	164	214	264	314	Span gas valve - range 1
115	165	215	265	315	Span gas valve - range 2
116	166	216	266	316	Span gas valve - range 3
117	167	217	267	317	Span gas valve - range 4
118	168	218	268	318	Any of the span gas valves
119	169	219	269	319	Lin1 gas valve
120	170	220	270	320	Lin2 gas valve
121	171	221	271	321	Purge gas valve
122	172	222	272	322	Linearization Underflow
123	173	223	273	323	Linearization Overflow
124	174	224	274	324	Zero calibration in progress
125	175	225	275	325	Span calibration in progress
126	176	226	276	326	Range Underflow
127	177	227	277	327	Range Overflow
128	178	228	278	328	Range #1
129	179	229	279	329	Range #2
130	180	230	280	330	Range #3
131	181	231	281	331	Range #4
132	182	232	282	332	Failure (Namur)
133	183	233	283	333	Maintenance request (Namur)
134	184	234	284	334	Function Control (Namur)
135	185	235	285	335	Concentration / Limit #1
136	186	236	286	336	Concentration / Limit #2
137	187	237	287	337	Concentration / Limit #3
138	188	238	288	338	Concentration / Limit #4
139	189	239	289	339	Conc. Average / Limit #1
140	190	240	290	340	Conc. Average / Limit #2
141	191	241	291	341	Conc. Average / Limit #3
142	192	242	292	342	Conc. Average / Limit #4
143	193	243	293	343	Temperature / Limit #1
144	194	244	294	344	Temperature / Limit #2
145	195	245	295	345	Temperature / Limit #3
146	196	246	296	346	Temperature / Limit #4
147	197	247	297	347	Pressure / Limit #1
148	198	248	298	348	Pressure / Limit #2
149	199	249	299	349	Pressure / Limit #3
150	200	250	300	350	Pressure / Limit #4
151	201	251	301	351	Flow / Limit #1
152	202	252	302	352	Flow / Limit #2
153	203	253	303	353	Flow / Limit #3
154	204	254	304	354	Flow / Limit #4
155	205	255	305	355	External signal #1
156	206	256	306	356	External signal #2
157	207	257	307	357	External signal #3
158	208	258	308	358	External signal #4
159	209	259	309	359	External signal #5

**Example for PLC Programming:**

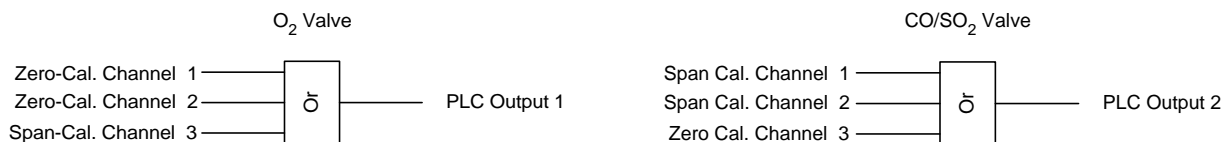
- ◆ You have three channels in your analyzer: CO, SO<sub>2</sub> and O<sub>2</sub>.
- ◆ You want to write a program for the zero and span gas calibration.
- ◆ The valve gear is:



So you have the following zero and span gas for each gas component:

Channel:	CO	SO <sub>2</sub>	O <sub>2</sub>
Zero gas:	O <sub>2</sub>	O <sub>2</sub>	CO/SO <sub>2</sub>
Span gas:	CO/SO <sub>2</sub>	CO/SO <sub>2</sub>	O <sub>2</sub>

So you have the following logical combination of the valves:



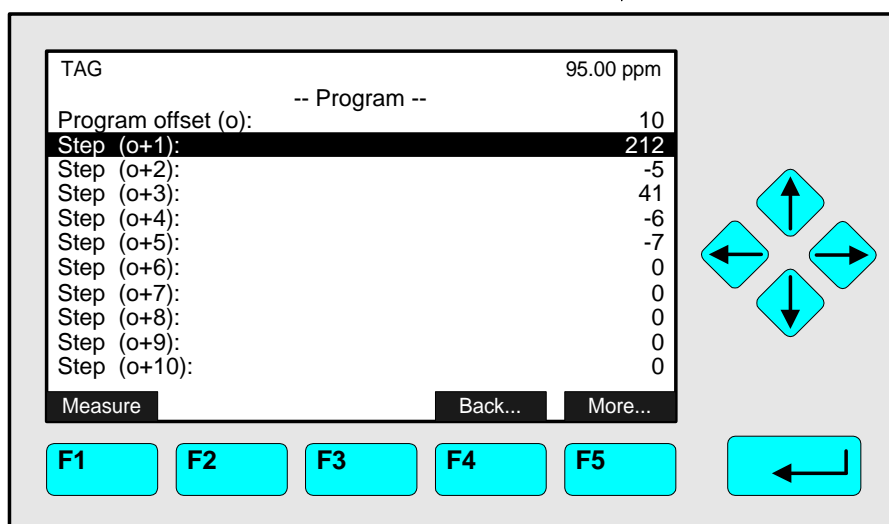
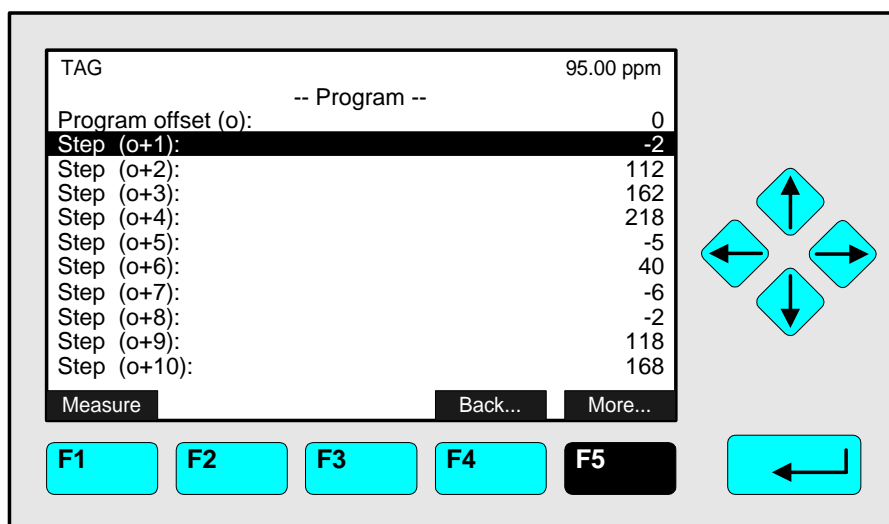
With the conditions described you will get the following program:

Step- No.	Code	Function/Parameter
1	-2	OR (Combination of the next three operands)
2	112	Zero gas calibration of channel 1
3	162	Zero gas calibration of channel 2
4	218	Span gas calibration of channel 3
5	-5	STORE (Saving the intermediate result to the result buffer)
6	40	Output result buffer 1
7	-6	CLEAR (Deleting the intermediate result of the calculator)
8	-2	OR (Combination of the next three operands)
9	118	Span gas calibration of channel 1
10	168	Span gas calibration of channel 2
11	212	Zero gas calibration of channel 3
12	-5	STORE (Saving the intermediate result to the result buffer)
13	41	Output result buffer 2
14	-6	CLEAR (Deleting the intermediate result of the calculator)
15	-7	END (End of program)

You have to put in the codes of the table into the corresponding lines of the submenu "Program". If you have more than ten program steps, you can change to another menu page with the F5 key (More...). Maximum of program steps: 100. Maximum of results: 20.

Putting in the codes in the menu:

- ◆ Select the program steps with the ↑ -key or the ↓ -key.
- ◆ Select the field for the code number with the ← -key or the → -key.
- ◆ Select any digit with the ← -key or the → -key and adjust the code number with the ↑ -key or the ↓ -key. If necessary, change the sign (+/-) with the F4 key.
- ◆ Confirm the code with the ↵ -key or cancel and go back to the last value with the F2 key.

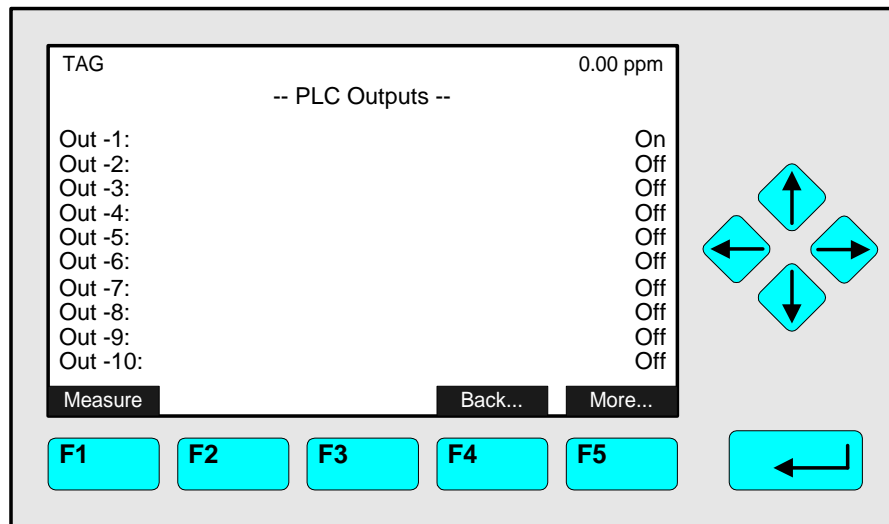




## 5.1 Analyzer Module Setup

### 5.1.6 Programmable Logic Control (PLC)

Start the program with "Enabled" in the line "PLC is" of the menu "Programmable Logic Control". Then, control the output status in the submenu "PLC Outputs". You will reach this menu via the line "Results..." in the menu "Programmable Logic Control":



In the display shown above the output 1 is "On". That means for the example described: The zero gas calibration of channel 1 or 2 or the span gas calibration of channel 3 is still running.

#### Note:

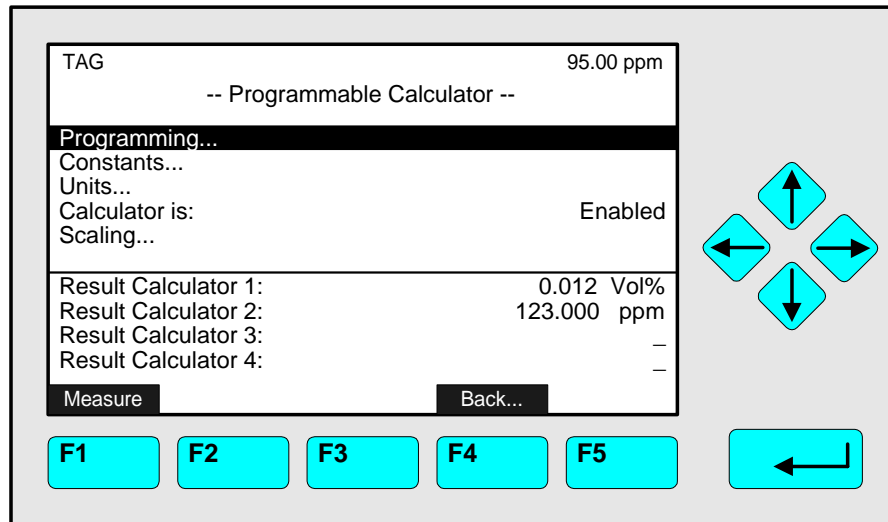
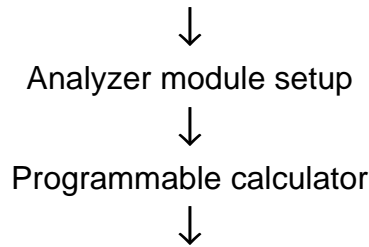
Via the F5 key (More...) you can reach another menu page with the results of the plc outputs 11 to 20.



## 5.1 Analyzer Module Setup

### 5.1.7 Programmable Calculator

#### Main Menu — Analyzer and I/O-module expert configuration



In the menu "Programmable Calculator" you can start the calculation with variables of the MLT analyzer or analyzer module selected, e.g. conversion of concentrations from ppm to  $\text{mg/m}^3$ . You have four memory places to calculate results. The required program and further conditions have to be set up in several submenus. The calculation with values of auxiliary modules is not possible!

#### Set up parameters:

- ◆ Select the line of variables or any menu line with the ↓ -key or the ↑ -key.
- ◆ Select the variable or change to the submenu with the ← -key or the → -key.
- ◆ Select "Enabled" or "Disabled" in the line "Calculator is" with the ↑ -key or the ↓ -key.
- ◆ Confirm the parameter selected with the ← -key or cancel and go back to the last value with the F2 key.

#### Programming and starting of the calculator (👉 Consider the example p. 5-47/48 !):

##### 1) Disable the calculator:

- Before you will begin with the programming, you have to select "Disabled" in the line "Calculator is" to avoid starting calculation while you are writing the program.

##### 2) Putting in the program:

- Press the ← -key or the → -key in the line "Programming..." to change to the submenu "Program", where you can put in your program step by step.
- A program of a calculator consists of operands like concentration or flow and of operators like the addition command. You have to put in a certain code in each program line for each operator and each variable or constant.

In the following table you can see which types of operators and operands you can use:

Operator types	Operator Description	
-1	<b>ADD</b>	Add Operand to IR (intermediate result)
-2	<b>SUB</b>	Subtract Operand from IR
-3	<b>DIV</b>	Divide IR by operand
-4	<b>MUL</b>	Multiply IR with operand
-5	<b>ADDC c</b>	Add Constant to IR
-6	<b>SUBC c</b>	Subtract constant from IR
-7	<b>DIVC c</b>	Divide IR by constant
-8	<b>MULC c</b>	Multiply IR with constant
-9	<b>ADDM m</b>	Add Memory to IR
-10	<b>SUBM m</b>	Subtract Memory from IR
-11	<b>DIVM m</b>	Divide IR by memory
-12	<b>MULM m</b>	Multiply IR with memory
-13	<b>STOM m</b>	Store IR at memory and set IR = 0.0
-14	<b>STOR r</b>	Store IR to <i>result</i> and set IR=0.0
-15	<b>NOP</b>	No operation
-16	<b>ABS</b>	Convert IR into absolute value
-17	<b>EOP</b>	End of program
Operand Types	Operand Description	
1	<b>Calculator Result #1</b>	
2	<b>Calculator Result #2</b>	
3	<b>Calculator Result #3</b>	
4	<b>Calculator Result #4</b>	
5	<b>Concentration</b>	Channel 1 (PPM!)
6	<b>Concentration average</b>	Channel 1 (PPM!)
7	<b>Temperature</b>	Channel 1
8	<b>Pressure</b>	Channel 1
9	<b>Flow</b>	Channel 1
10	<b>Concentration</b>	Channel 2 (PPM!)
11	<b>Concentration average</b>	Channel 2 (PPM!)
12	<b>Temperature</b>	Channel 2
13	<b>Pressure</b>	Channel 2
14	<b>Flow</b>	Channel 2
15	<b>Concentration</b>	Channel 3 (PPM!)
16	<b>Concentration average</b>	Channel 3 (PPM!)
17	<b>Temperature</b>	Channel 3
18	<b>Pressure</b>	Channel 3
19	<b>Flow</b>	Channel 3
20	<b>Concentration</b>	Channel 4 (PPM!)
21	<b>Concentration average</b>	Channel 4 (PPM!)
22	<b>Temperature</b>	Channel 4
23	<b>Pressure</b>	Channel 4
24	<b>Flow</b>	Channel 4
25	<b>Concentration</b>	Channel 5 (PPM!)
26	<b>Concentration average</b>	Channel 5 (PPM!)
27	<b>Temperature</b>	Channel 5
28	<b>Pressure</b>	Channel 5
29	<b>Flow</b>	Channel 5

- You have to set each operator in the line above the corresponding variable. After each calculating step you have to store the intermediate result and to delete the memory before you will continue with the next step. Each program must end with the command "End of program".

**3) Putting in the constants:**

- Press the ← -key or the → -key in the line "Constants..." of the menu "Programmable Calculator" to change to the corresponding submenu, where you can define maximum four constants, e.g. conversion constant from ppm to mg/m<sup>3</sup>.

**4) Determination of the units:**

- Press the ← -key or the → -key in the line "Units..." of the menu "Programmable Calculator" to change to the submenu "Calculator Result Units" to determine in which unit the calculator's result shall be displayed, e.g. ppm, mg/Nm<sup>3</sup>, Vol.% and so on.
- Note: This step can also be changed after the program is still running.

**5) Scaling**

- Via the line "Scaling..." of the menu "Programmable Calculator" you can change to a submenu, where you can determine the minimum and maximum for each result. This will be necessary, if you want to show the calculator's result in the single component display. The minimum/maximum values are the limits of the bargraphs.

**6) Starting the program:**

- Select "Enabled" in the line "Calculator is" of the menu "Programmable Calculator".

**7) Check the results:**

- The results of each calculator will be displayed in the last four lines of the menu "Programmable Calculator".

**Example for the calculation with a program:**

You want to calculate the whole content of NO<sub>x</sub> as NO<sub>2</sub> in mg/m<sup>3</sup> from the concentrations of NO in ppm (Channel 1) and of NO<sub>2</sub> in ppm (Channel 2). So you have to add the single concentrations and then to multiply with a constant:

$$(\text{ppm NO} + \text{ppm NO}_2) \cdot \text{"conversion constant (here: 2,05 mg/ml)} = \text{NO}_x \text{ as mg/m}^3 \text{ NO}_2$$

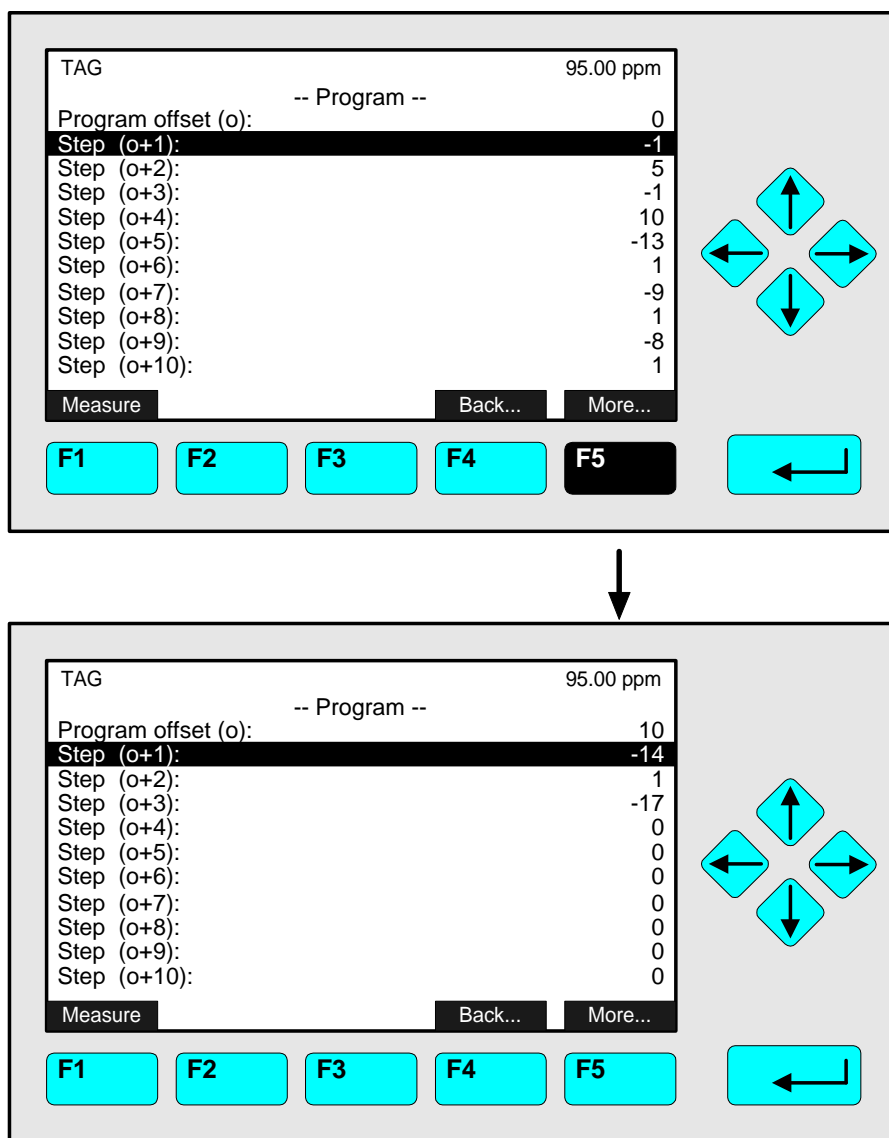
So you will get the following program:

<u>Step- No.</u>	<u>Code</u>	<u>Program Description</u>
1	-1	Add to intermediate result (At the beginning the memory is zero)
2	5	NO-Concentration from channel 1 (ppm)
3	-1	Add to IR (the concentration of channel 1)
4	10	NO <sub>2</sub> -Concentration from channel 2 (ppm)
5	-13	Result of the addition to memory and set IR = 0
6	1	Result 1
7	-9	Add memory to IR (= sum of NO and NO <sub>2</sub> in ppm)
8	1	Result 1
9	-8	Multiply IR with constant ([ppm NO + ppm NO <sub>2</sub> ] • "conversion constant")
10	1	Result 1 (= "conversion constant" ppm to mg/m <sup>3</sup> , here: 2,05 mg/ml)
11	-14	Store IR to result and set IR = 0
12	1	Result 1 (= mg/m <sup>3</sup> NO <sub>2</sub> )
13	-17	End of program

You have to put in the codes of the table into the corresponding lines of the submenu "Program". If the program consists of more than ten steps, you can change to another menu page with the F5 key. Maximum of program steps: 100. Maximum of results: 4  
 Maximum of constants: 4.

Putting the program steps in the menu:

- ◆ Select the program steps with the ↑ -key or the ↓ -key.
- ◆ Select the field for the code number with the ← -key or the → -key.
- ◆ Select any digit with the ← -key or the → -key and adjust the code number with the ↑ -key or the ↓ -key. If necessary, change the sign (+/-) with the F4 key.
- ◆ Confirm the code with the ↵ -key or cancel and go back to the last value with the F2 key.

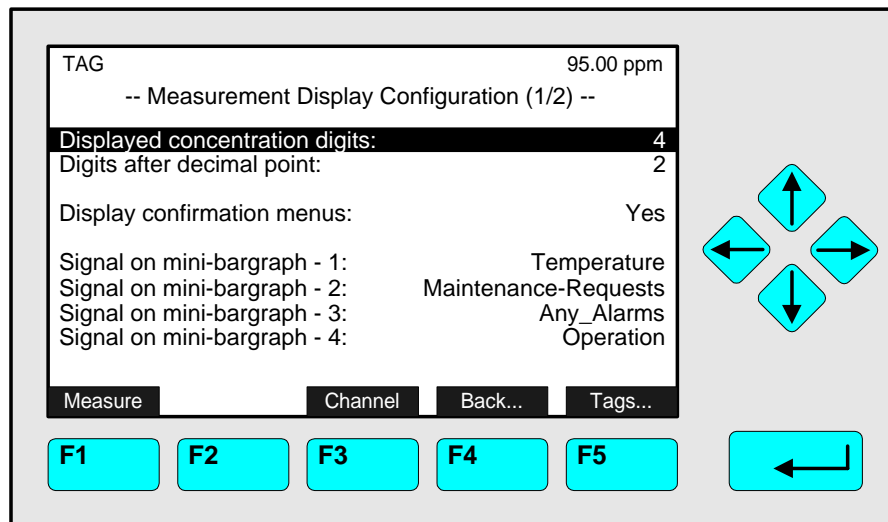
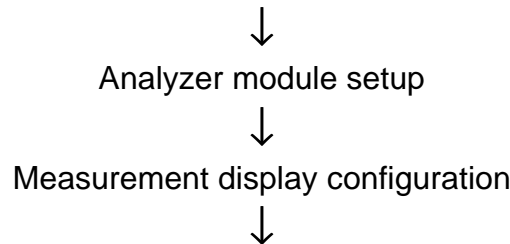


Start the calculation with "Enabled" in the line "Calculator is" of the menu "Programmable Calculator". The results will appear in the last four lines of that menu.

# 5.1 Analyzer Module Setup

## 5.1.8 Measurement Display Configuration

### Main Menu — Analyzer and I/O-module expert configuration



In the menu "Measurement Display Configuration" you can determine

- ◆ the parameters for the single component display for one channel of an MLT analyzer or analyzer module. To set up the conditions of the other channels, you have to press the F3 key.
- ◆ the display of the confirmation menus.
- ◆ the tags of the MLT analyzer or analyzer module and the tags of each range for the current channel (2nd page of the menu).

#### Caution:

**If you change the identification tag, you have to change the configuration of the programmable digital inputs and analog outputs. Because, the parameters of the module source will change! So, the relations will disappear !**

#### Set up parameters:

- ◆ Select any line of variables with the ↓ -key or the ↑ -key.
- ◆ Select the variable with the ← -key or the → -key.
- ◆ Adjust a new value with the ↑ -key or the ↓ -key resp. select the whole parameter with the ↑ -key or the ↓ -key.
- ◆ Confirm the new value with the ← -key or cancel and go back to the last value with the F2 key.

Line of variables "Displayed concentration digits":

- ◆ You can adjust the number of digits for the concentration display.  
Options: 3, 4, 5, 6

Line of variables "Digits after decimal point":

- ◆ Options: 0, 1, 2, 3

Line of variables "Display confirmation menus":

- ◆ **Yes:**  
After each function start you will be asked "Do you really want to do this ?". So you will have the option to cancel the order for function start or to confirm it.
- ◆ **No:**  
You will never be asked to cancel or confirm any function.  
**Caution:** Each function will start immediately after the starting order will be done!

Lines of variables "Signal on mini-bargraph -1, -2, -3, -4":

You can decide which of the following parameters shall appear in the last four lines of the single component display for the current channel:

- ◆ Temperature (measurement value with bargraph)
- ◆ Pressure (measurement value with bargraph)
- ◆ Flow (measurement value with bargraph)
- ◆ Calculator-1, -2, -3, -4 (result of a calculator's program; see 5.1.7, p. 5-45 to 5-48)
- ◆ Failures (message: yes/no)
- ◆ Maintenance-Requests (message: yes/no)
- ◆ Function-Control (message: yes/no)
- ◆ Range ID (measurement range with bargraph)
- ◆ Operation (status message: ready, warm-up, etc.)
- ◆ Any\_Alarms (message: yes/no)
- ◆ Span-Conc. (span gas concentration value with bargraph)
- ◆ Gasflow (zerogas, spangas, samplegas)
- ◆ Concentration (measurement value with bargraph)
- ◆ Average (measurement value with bargraph)
- ◆ Minimum (measurement value with bargraph)
- ◆ Maximum (measurement value with bargraph)

**Note:**

- ◆ Each bargraph will display the low limit (beginning value) and the high limit (end value) of the corresponding parameter.

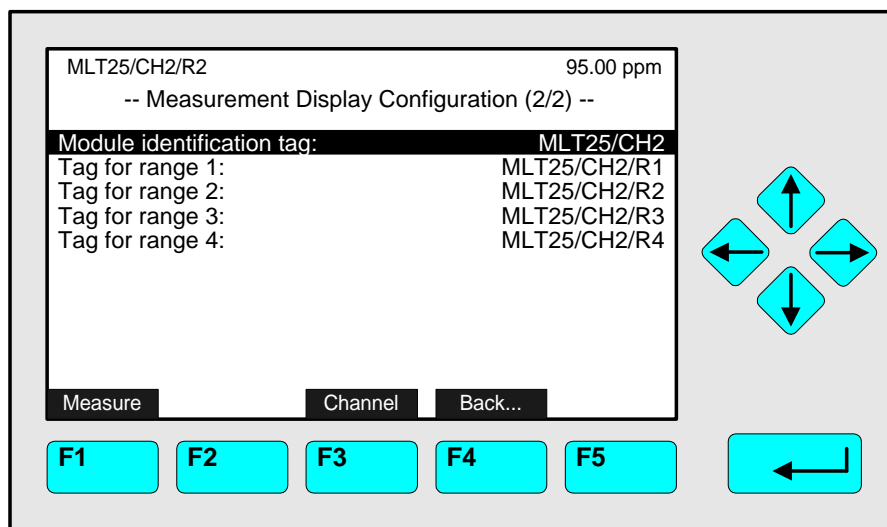


**"Tags...":**

Via the F5 key (Tags...) you can change to the second page of the menu "Measurement Display Configuration". There you can adjust the identification tag of the MLT analyzer or analyzer module and the tag of each range for the current channel. These range tags will appear at the top left of each menu page display. If you want to change the tags of the other channels, you have to press the F3 key.

**Caution:**

**If you change the identification tag, you have to change the configuration of the programmable digital inputs and analog outputs. Because, the parameters of the module source will change ! So, the relations will disappear !**



Tags set up:

- ◆ Select the line you want with the ↑ -key or ↓ -key.
- ◆ Select the parameter with the ← -key or the → -key.
- ◆ Select the digit you want to change with the → -key or the ← -key and adjust the new value with the ↑ -key or the ↓ -key;  
Maximum of digits for each tag: 30  
Options: alphabet (capital and small letters), umlauts, letters from different languages, 0, 1, 2,..., 9, +, -, \*, /, =, ?, !, %, \$ and many others.
- ◆ Confirm the new value with the ← -key or cancel and go back to the last value with the F2 key.

Notes:

- ◆ The changes of the range tags will be realized after you have changed the range for the first time !
- ◆ You can set up the digits more fast by holding the ↑ -key or the ↓ -key. The scrolling will accelerate.

## 5.1 Analyzer Module Setup

### 5.1.9 Acknowledgement of Status Reports

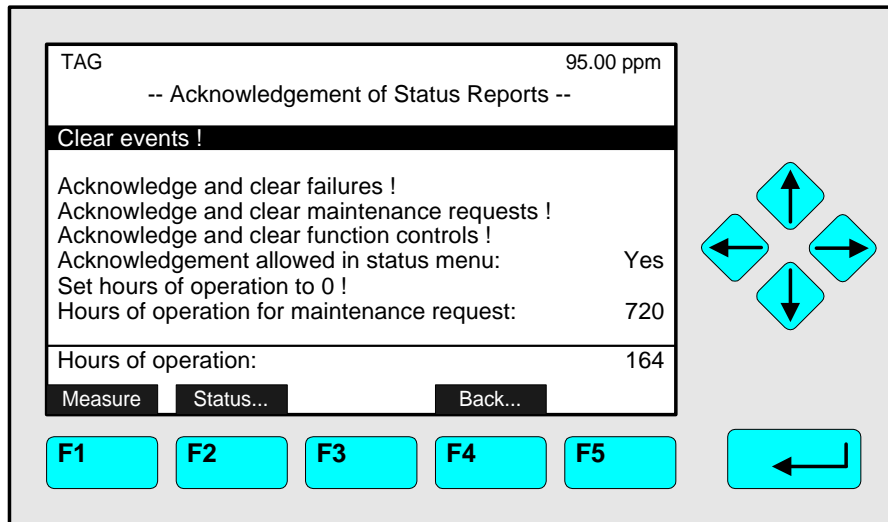
Main Menu — Analyzer and I/O-module expert configuration



Analyzer module setup



Acknowledgement of status reports



In the menu "Acknowledgements" you can

- ◆ acknowledge and clear all events of the MLT analyzer or analyzer module starting the function "Clear events !" or acknowledge and clear certain events with the functions "Acknowledge and clear failures / maintenance requests / function controls !"
- ◆ allow the acknowledgement and clear functions for the corresponding lines in the menu "Status Details" (see section 4.1.1 p. 4-19 to 30)
- ◆ set hours of operation to zero in the corresponding function line
- ◆ set up hours for maintenance request in the corresponding line of variables.

#### Notes:

- ◆ In the line "Hours of operation for maintenance request" you will set up, how many hours the MLT analyzer or analyzer module may run until the maintenance will be required. Options: 1 to 30000 hours.
- ◆ The last line of the menu displays the total number of hours of operation since the startup of an MLT analyzer or analyzer module resp. since the last reset of hours of operation.
- ◆ Via the F2 key you will reach the menu "Analyzer Channel Status". In that menu and its submenus you will find the status report of the current channel for

- Failures
- Maintenance requests
- Function controls
- Measurements/Alarms
- Events

and the operational settings of the current channel like

- range settings and
- response time ( $t_{90}$ -time).

The menu "Analyzer Channel Status" and its submenus are displayed detailed in section 4.1.

#### Set up parameters:

- ◆ Select the line of variables or any function line with the ↓ -key or the ↑ -key.
- ◆ Select the variable or start the function with the ← -key or the → -key.
- ◆ If asked after function start: Confirm with the F2 key (Yes) or cancel and go back to the menu page with the F4 key (Back...) or the ← -key.
- ◆ Variable changing: Select any digit with the ← -key or the → -key and adjust a new value with the ↑ -key or the ↓ -key resp. change the whole value with the ↑ -key or the ↓ -key.
- ◆ Confirm the new value with the ← -key or cancel and go back to the last value with the F2 key.

## 5.1 Analyzer Module Setup

### 5.1.10 Concentration Measurement Parameters

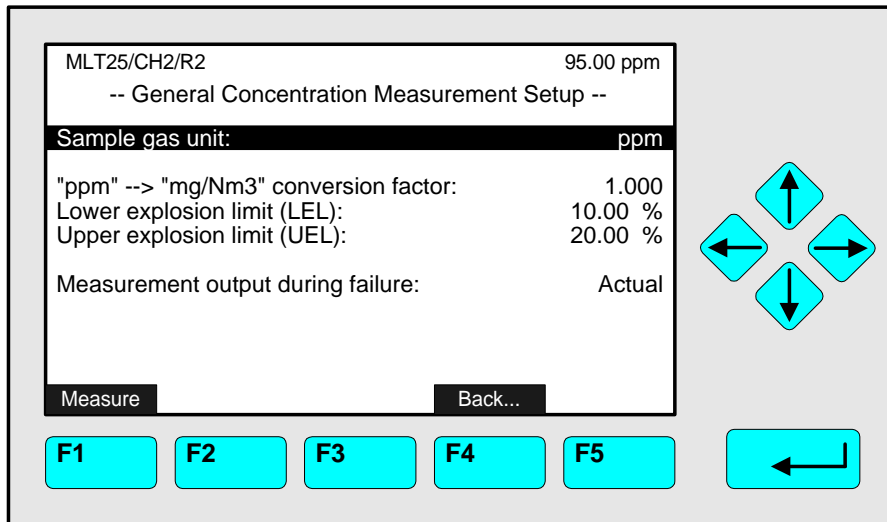
Main Menu — Analyzer and I/O-module expert configuration



Analyzer module setup



Concentration measurement parameters



In the menu "General Concentration Measurement Setup" you can set up for the current channel of an MLT analyzer or analyzer module the following parameters:

- ◆ the sample gas unit  
Options: ppb, ppm, %,  $\mu\text{g}/\text{Nm}^3$ ,  $\text{mg}/\text{Nm}^3$ ,  $\text{g}/\text{Nm}^3$ , %LEL, %UEL
- ◆ the "ppm  $\rightarrow$   $\text{mg}/\text{Nm}^3$ " conversion factor  
Options: 0 to 1000000  
**Note:** The "ppm"  $\rightarrow$  " $\text{mg}/\text{Nm}^3$ " conversion factor depends on the sample gas which is used. The set-up is necessary if you want to display sample gas values in " $\text{mg}/\text{Nm}^3$ " !
- ◆ the lower explosion limit (LEL) and the upper explosion limit (UEL)  
Options: 0 to 100%
- ◆ the measurement output during failure  
Options: Actual, 0.0 V, End of range.

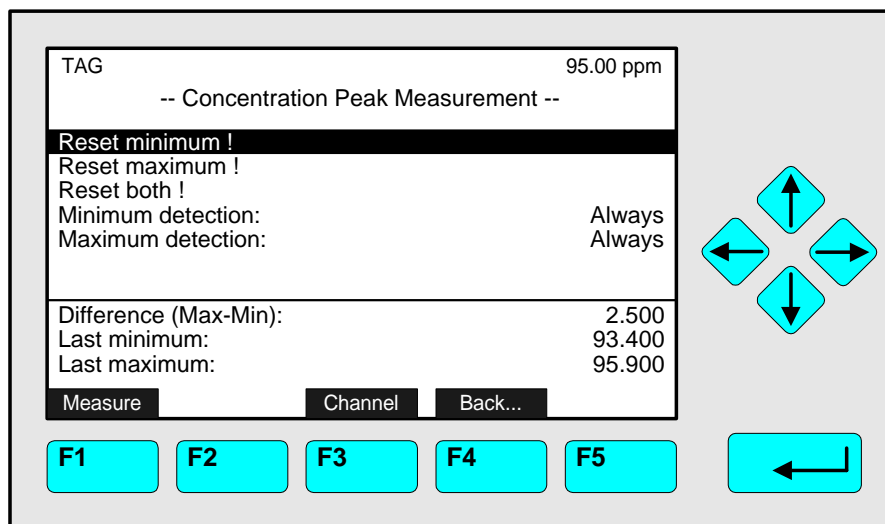
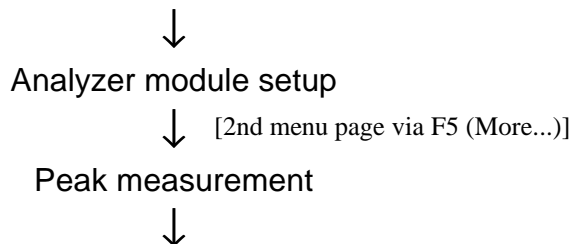
#### Set up parameters:

- ◆ Select any line of variables with the  $\downarrow$ -key or the  $\uparrow$ -key.
- ◆ Select the variable with the  $\leftarrow$ -key or the  $\rightarrow$ -key.
- ◆ Select any digit with the  $\leftarrow$ -key or the  $\rightarrow$ -key and adjust a new value with the  $\uparrow$ -key or the  $\downarrow$ -key  
resp. select the whole parameter with the  $\uparrow$ -key or the  $\downarrow$ -key.
- ◆ Confirm the new value with the  $\leftarrow$ -key or  
cancel and go back to the last value with the F2 key.

## 5.1 Analyzer Module Setup

### 5.1.11 Concentration Peak Measurement

#### Main Menu — Analyzer and I/O-module expert configuration



In the menu "Concentration Peak Measurement" you can determine the conditions for the extreme values of a channel. If you want to change to the other channels of an MLT analyzer or analyzer module, you have to press the F3 key.

#### Set up parameters:

- ◆ Select any line of variables or any function line with the ↓ -key or the ↑ -key.
- ◆ Select the variable or start the function with the ↵ -key or the → -key.
- ◆ If asked after function start: Confirm with the F2 key (Yes) or cancel and go back to the menu page with the F4 key (Back...) or the ← -key.
- ◆ Variable changing: Select the parameter with the ↑ -key or the ↓ -key.
- ◆ Confirm the new parameter with the ↵ -key or cancel and go back to the last adjustment with the F2 key.

#### Function lines "Reset minimum !" or "Reset maximum !"

Starting these functions will reset the last minimum or maximum value of concentration. This is necessary to start a new minimum or maximum determination.

#### Function line "Reset both !"

Starting this function will reset the last minimum and the last maximum value of concentration simultaneously.

Lines of variables "Minimum detection" or "Maximum detection":

- ◆ **Always:** The minimum or the maximum detection is running automatically.
- ◆ **External:** The minimum or the maximum detection depends on an external instruction.
- ◆ **Off:** No detection of the extreme values is running.

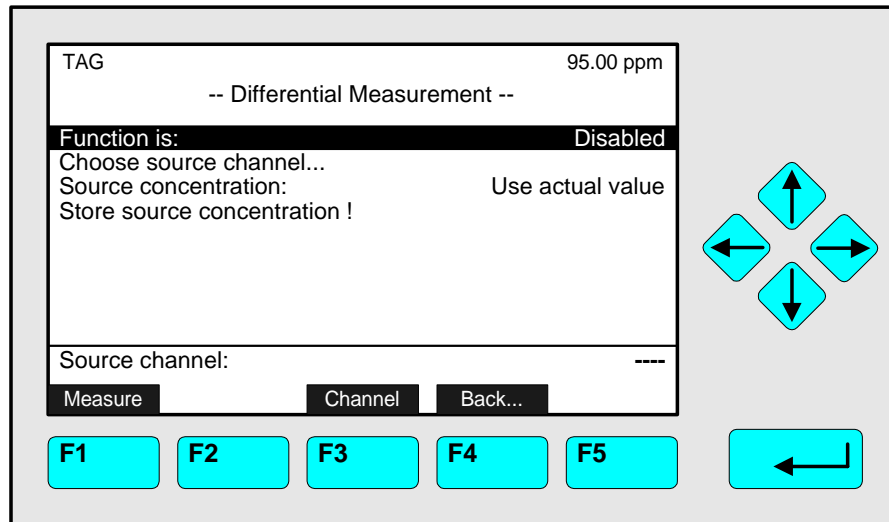
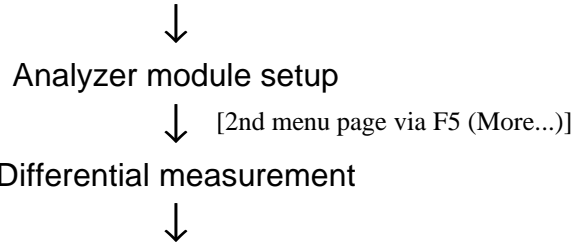
Lines of variables "Difference (Max-Min), "Maximum", "Minimum":

- ◆ These lines display the actual or last minimum/maximum value and the difference of the extreme values for one channel of an MLT analyzer or analyzer module.
- ◆ You can send these values to the analog outputs.
- ◆ You can display the minimum and the maximum value in one of the last four lines of the single component display using the adjustments of menu "Measurement Display Configuration" (see 5.1.8 p. 5-49/50).

# 5.1 Analyzer Module Setup

## 5.1.12 Differential Measurement

### Main Menu — Analyzer and I/O-module expert configuration



In the menu "Differential Measurement" you can measure the difference between the current concentration and a reference concentration of the same gas component. That means, the measurement value is not based on the zero value as it is usual for an absolute value measurement. Instead of this the signal will be compared with defined concentration of the component selected. That may be useful for concentrations that only differ a little from the basic value of this component in the measurement environment (Example: CO<sub>2</sub> of plant in air).

If you want to make a differential measurement for other components, you can change to the other channels of an MLT analyzer or analyzer module with the F3 key.

#### Condition:

- ◆ You have to calibrate with zero gas and to linearize the measurement channel and the reference channel.
  - To calibrate see 4.5 p. 4-39 and 4.6 p. 4-43 or 5.1.1 p. 5-15 to 5-17.
  - To linearize see 5.1.5 p. 5-33

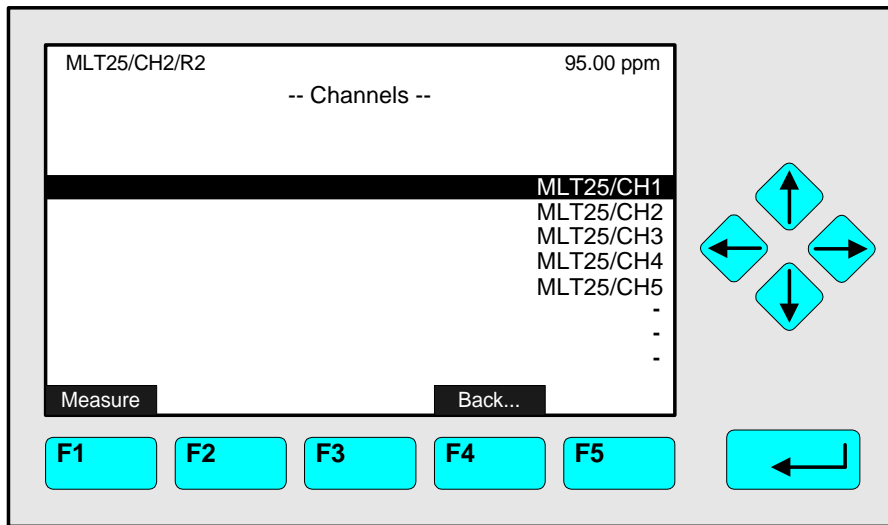
#### Differential measurement:

##### 1) Disable the function:

- Press the ← -key or the → -key in the line "Function is" to select the parameter and adjust "Disabled" with the ↑ -key or the ↓ -key. Confirm it with the ← -key.
- This is necessary to avoid interference of values while the parameters were determined.

##### 2) Select the reference channel:

- Change to the menu line "Choose source channel..." with the ↓ -key and press the ← -key or the → -key to go to the submenu "Channels":



- Change to the line you want with the ↓ -key or the ↑ -key.
- Select the tag of the reference channel with the ← -key or the → -key:  
The display will go back to the menu "Differential Measurement" automatically. You can see the channel selected in the line "Source channel".

### 3) Status determination of the reference channel:

- Change to the line "Source concentration" with the ↑ -key or the ↓ -key and press the ← -key or the → -key to select the parameter. Adjust the parameter with the ↑ -key or the ↓ -key and confirm it with the ← -key.
- **Use actual value:**  
The reference value to calculate the difference concentration will always be the current value of the reference channel.
- **Use stored value:**  
The reference value to calculate the difference concentration will be fixed during the whole differential measurement.

### 4) Give up reference gas to the reference channel:

- You have to give up a defined concentration of the measurement gas to the reference channel to determine the reference value.
- If the reference signal is stable, you have to change to the line "Store source concentration !" with the ↑ -key or the ↓ -key. Press the ← -key or the → -key to start this function. If asked, confirm with the F2 key (Yes) or cancel and go back to the menu page with the F4 key (Back...) or the ← -key:  
The current signal will be fixed for the differential measurement.

### 5) Give up measurement gas to the measurement channel:

- You have to give up the measurement gas to the measurement channel while the reference signal is stable to measure the differential concentration.

### 6) Enable the differential measurement:

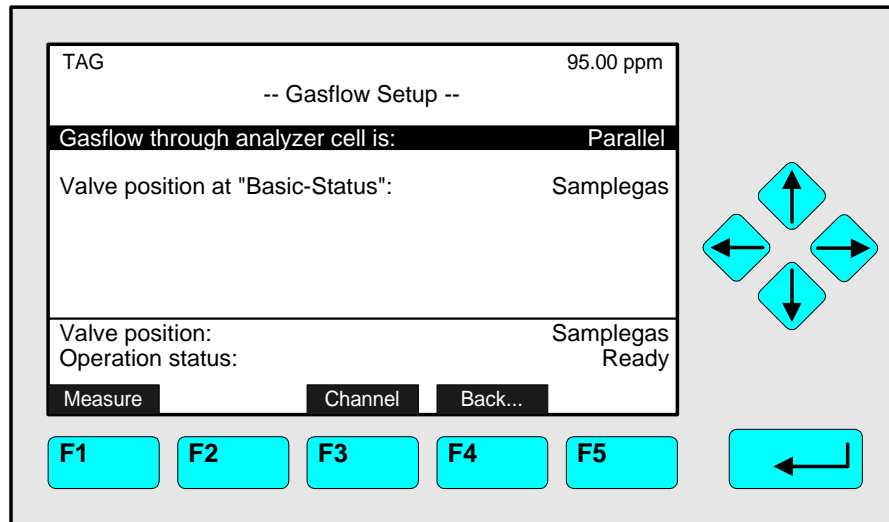
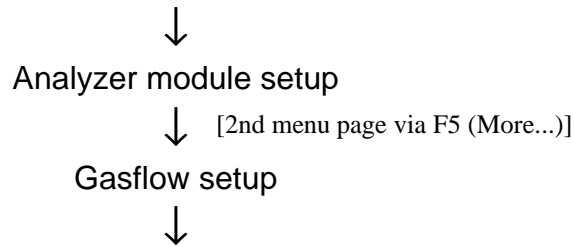
- Press the ← -key or the → -key in the line "Function is" and adjust "Enabled" with the ↑ -key or the ↓ -key. Confirm it with the ← -key:  
The differential measurement will start and the differential concentration will be determined.



# 5.1 Analyzer Module Setup

## 5.1.13 Gasflow Setup

### Main Menu — Analyzer and I/O-module expert configuration



In the menu "Gasflow Setup" you can set up the modus of gas flow through the analyzer cell:

- ◆ Parallel or
- ◆ Serial

and the valve position at "Basic-Status":

- ◆ Samplegas or
- ◆ All closed

#### Notes:

- ◆ **The adjustment for the gas flow through the analyzer cell depends on the real combination of the analyzer cells.**
- ◆ The setup is normally correct by factory setting.  
You have only to change it, if you modify your configuration of cells.
- ◆ The correctness of this adjustment is very important for the time controlled calibration with valve gear (see 5.1.1 p. 5-12)

#### Set up parameters:

- ◆ Change to the line you want with the ↑ -key or the ↓ -key.
- ◆ Press the ← -key or the → -key to select the variable.
- ◆ Select the parameter you want with the ↑ -key or the ↓ -key.
- ◆ Confirm your adjustment with the ← -key or cancel and go back to the last one with the F2 key.

# 5.1 Analyzer Module Setup

## 5.1.14 Pressure Compensation

Main Menu — Analyzer and I/O-module expert configuration

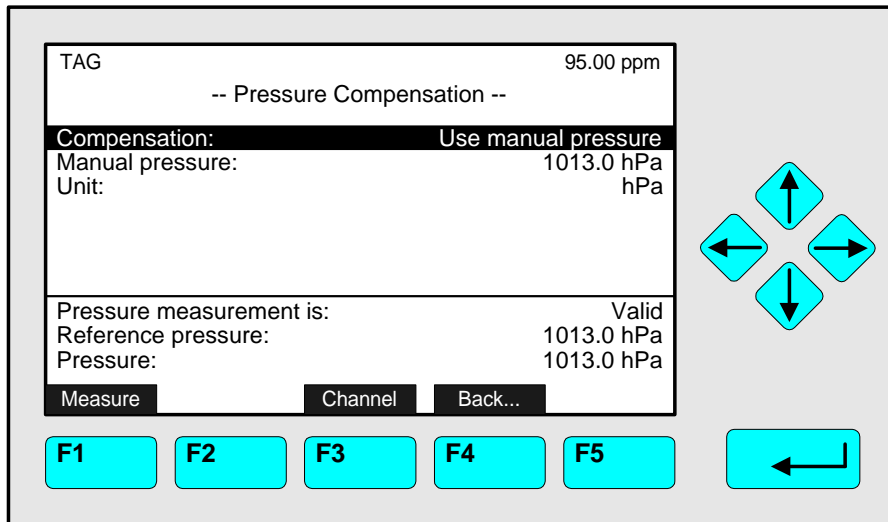


Analyzer module setup



[2nd menu page via F5 (More...)]

Pressure compensation



In the menu "Pressure Compensation" you can set up the parameters of pressure for the current channel of an MLT analyzer or analyzer module. With the F3 key you can change to the other channels.

### Set up parameters:

- ◆ Select any line of variables with the ↓ -key or the ↑ -key.
- ◆ Select the variable with the ← -key or the → -key.
- ◆ Select any digit with the ← -key or the → -key and adjust a new value with the ↑ -key or the ↓ -key  
resp. select the whole parameter with the ↑ -key or the ↓ -key.
- ◆ Confirm the new value with the ← -key or  
cancel and go back to the last value with the F2 key.

### Line of variables "Compensation":

- ◆ **Use manual pressure:**  
The pressure compensation of the current channel is based on the value of the line "Manual pressure".
- ◆ **Use sensor value:**  
The pressure compensation of the current channel is based on the value measured by a pressure sensor. The corresponding value will be displayed in the line "Reference pressure". This setup is not available, if no sensor is installed. Then, you will find the standard pressure of 1013.0 hPa resp. 14.7 psig in that line.
- ◆ **Disabled:**  
No pressure compensation will be done.

Line of variables "Manual pressure":

- ◆ You can put in the actual atmospheric pressure which can be used for pressure compensation.
- ◆ Potential values: 500 to 1300 hPa resp. 7,3 to 18,9 psig

Line of variables "Unit":

- ◆ You can set up the pressure unit for the pressure compensation.
- ◆ Options:
  - hPa
  - psig

Lines of variables "Pressure measurement is", "Reference pressure", "Pressure":

These lines are information lines. They are not available.

## 5.1 Analyzer Module Setup

### 5.1.15 Flow Measurement

Main Menu — Analyzer and I/O-module expert configuration

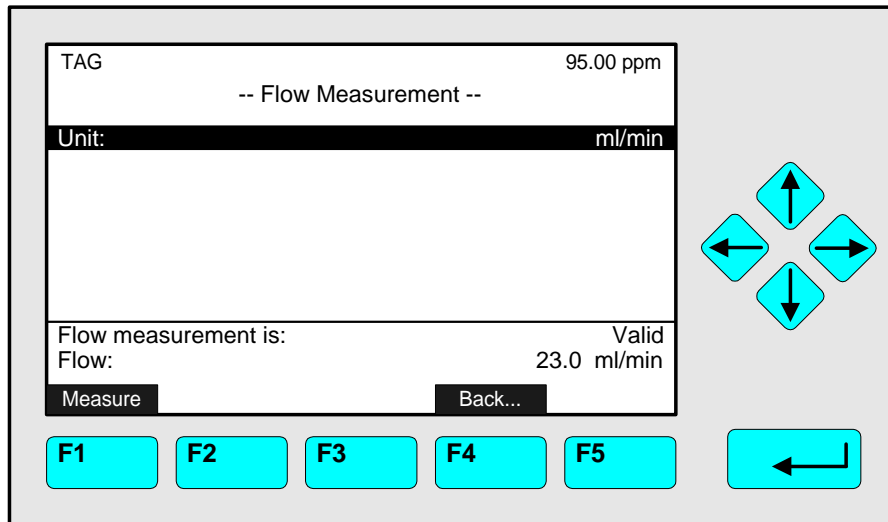


Analyzer module setup



[2nd menu page via F5 (More...)]

Flow measurement



In the menu "Flow Measurement" you can set up the flow unit for the current channel of an MLT analyzer or analyzer module. In the last line of this menu you will find the actual flow of the channel selected.

#### Flow unit setup:

- ◆ Press the ← -key or the → -key to select the variable.
- ◆ Select the unit with the ↑ -key or the ↓ -key.  
Options: ml/min, l/min
- ◆ Confirm your adjustment with the ↵ -key or cancel and go back to the last one with the F2 key.

#### **Note:**

If no flow sensor is installed, you will find a corresponding message on the screen instead of the menu page shown above.

## 5.1 Analyzer Module Setup

### 5.1.16 Temperature Measurement

Main Menu — Analyzer and I/O-module expert configuration

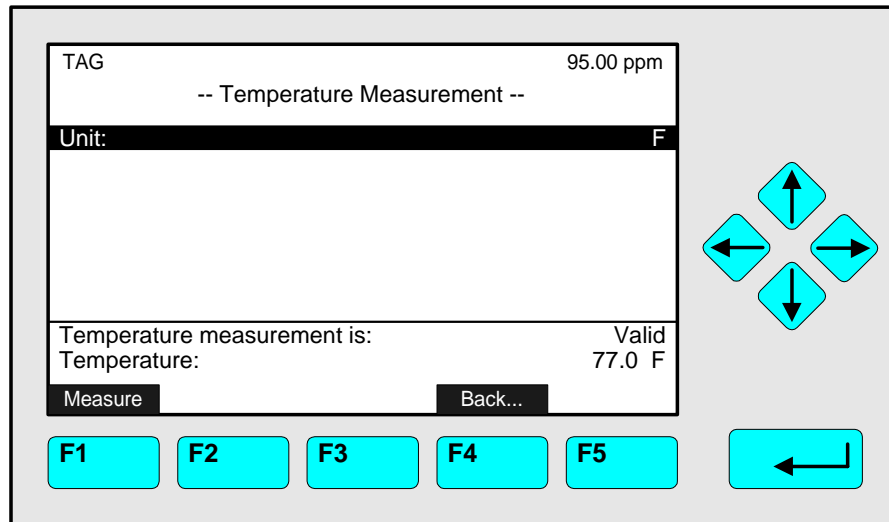


Analyzer module setup



[2nd menu page via F5 (More...)]

Temperature measurement



In the menu "Temperature Measurement" you can set up the temperature unit for the current channel of an MLT analyzer or analyzer module. In the last line of this menu you will find the actual temperature of the channel selected.

#### Temperature unit setup:

- ◆ Press the ← -key or the → -key to select the variable.
- ◆ Select the unit with the ↑ -key or the ↓ -key.  
Options: °C, °F
- ◆ Confirm your adjustment with the ↵ -key or cancel and go back to the last one with the F2 key.

#### **Note:**

If no temperature sensor is installed, you will find a corresponding message on the screen instead of the menu page shown above.

# 5.1 Analyzer Module Setup

## 5.1.17 Load/Save Analyzer Module Configuration

Main Menu — Analyzer and I/O-module expert configuration

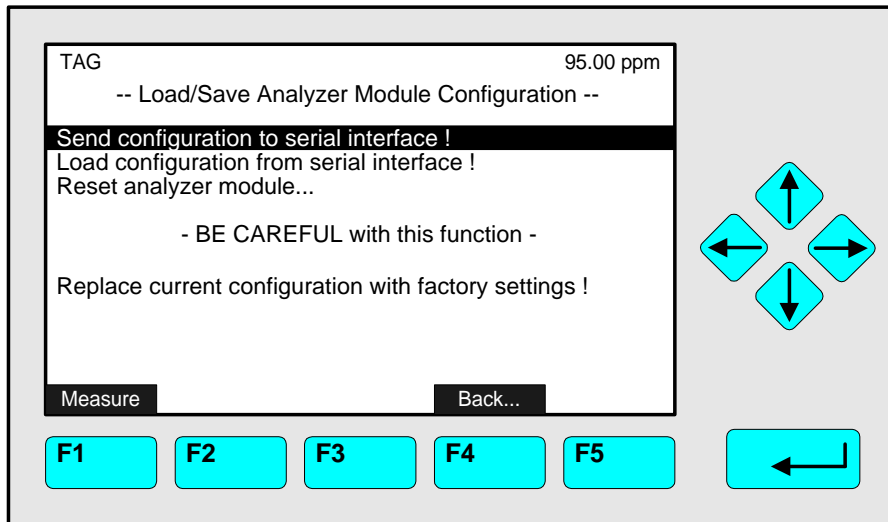


Analyzer module setup



[2nd menu page via F5 (More...)]

Loading/saving configuration parameters



In the menu "Load/Save Analyzer Module Configuration" you can start several functions to send or load configuration data of the MLT analyzer or analyzer module via the serial interface. These functions are only available, if a SIO with serial interface is installed in the MLT analyzer or analyzer module.

**Attention with loading of data:  
You will delete all data of the RAM!**

Starting the functions:

- ◆ Select the function line you want with the ↓ -key or the ↑ -key.
- ◆ Press the ← -key or the → -key to start the function.  
If asked, confirm with the F2 key (Yes) or cancel and go back to the menu page with the F4 key (Back...) or the ← -key.

Function line "Send configuration to serial interface !":

You will send the RAM data via the serial interface of the MLT analyzer or analyzer module to the EPROM programmer or to an external computer!

Function line "Load configuration from serial interface !":

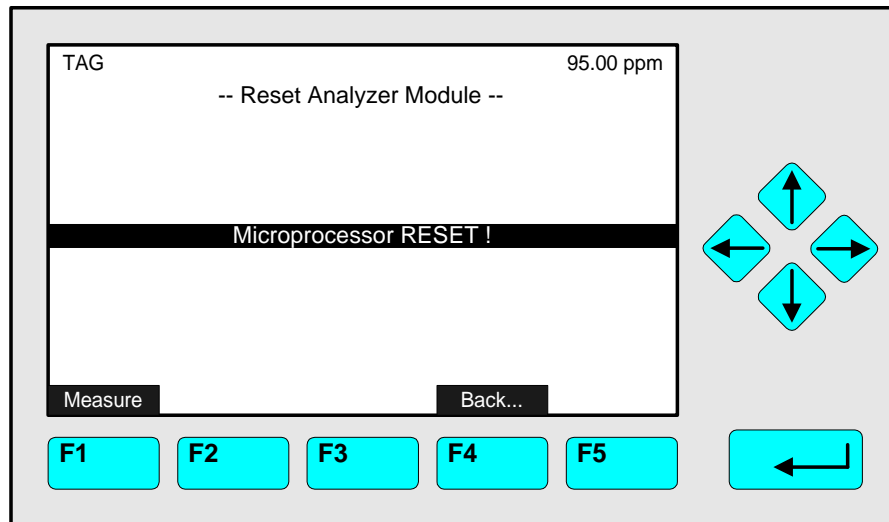
You will load data from an external memory to the RAM of the MLT analyzer or analyzer module via the serial interface. So you will delete the current RAM data!

Function line "Replace current configuration with factory settings !":

You will delete the RAM data and load the factory settings from the Flash-EPROM!

Menu line "Reset analyzer module...":

- ◆ Change to the line "Reset analyzer module..." with the ↑ -key or the ↓ -key.
- ◆ Press the ← -key or the → -key to change to the corresponding submenu:



- ◆ Press the ← -key or the → -key to start the function.  
If asked, confirm with the F2 key (Yes) or  
cancel and go back to the menu page with the F4 key (Back...) or the ← -key.

**Notes:**

- ◆ With the function "Microprocessor RESET !" you can reset an MLT analyzer or analyzer module to the initializing mode.
- ◆ Starting this function will generate the same start-up procedure as the switching on of an MLT analyzer or analyzer module.

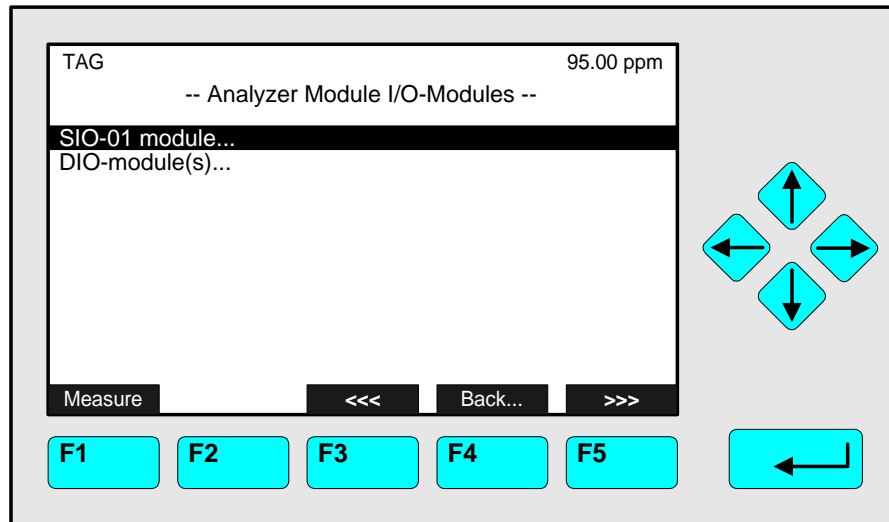
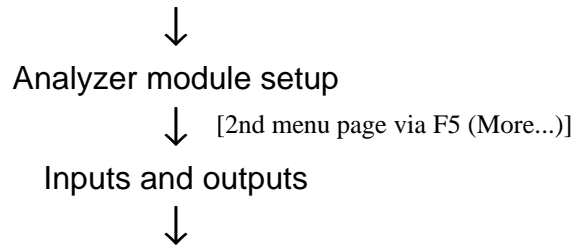




## 5.1 Analyzer Module Setup

### 5.1.18 Inputs and Outputs (Local SIO/DIO)

#### Main Menu — Analyzer and I/O-module expert configuration



From the menu "Analyzer Module I/O-Modules" you can change to several submenus, where you can set up the parameters of the local SIO module or the local DIO modules of an MLT analyzer module:

- ◆ Press the ← -key or the → -key in the line "SIO-01 module..." or "DIO-module(s)..." to change to the corresponding submenus

#### Notes:

- ◆ If there is no local I/O module in the analyzer module, you will see a corresponding note on the display instead of the menu page shown above.
- ◆ If you want to set up the auxiliary SIO or DIO modules, you have to go to the submenus of the menu "I/O Module Controls" (see 5.2 p. 5-83).

## 5.1 Analyzer Module Setup

### 5.1.18 Inputs and Outputs – Local SIO

Main Menu — Analyzer and I/O-module expert configuration



Analyzer module setup

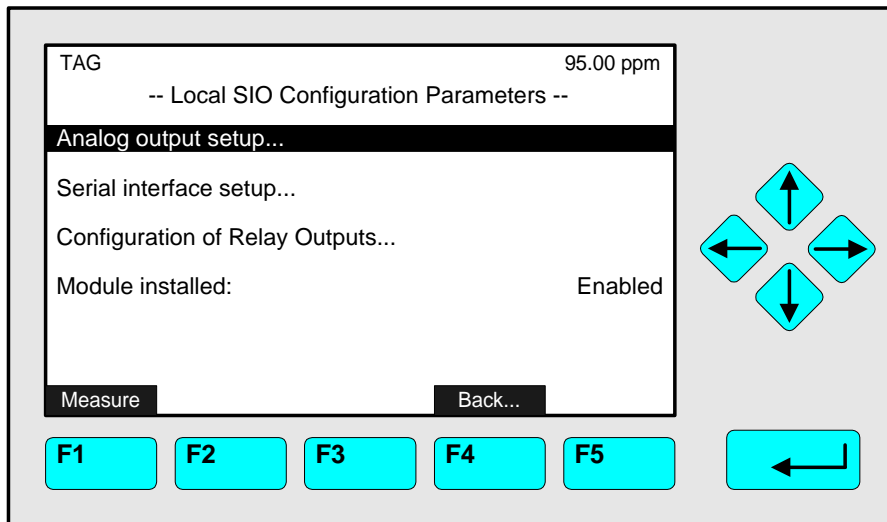


[2nd menu page via F5 (More...)]

Inputs and outputs



SIO-01 module



From the menu "Local SIO Configuration Parameters" you can change to submenus to control and set up several output configurations of the local SIO module.

General Configuration of a SIO board (the whole specification see its own manual):

- ◆ Analog outputs: minimum 2, maximum 8
- ◆ Serial interface (RS 232 or RS 485) to connect the analyzer module with an external computer
- ◆ Three relay outputs

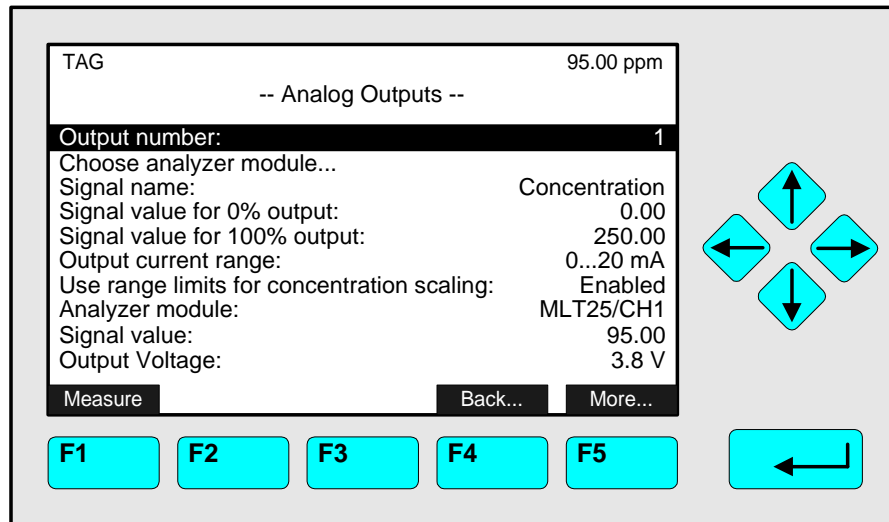
If there is a SIO module installed in the analyzer you have to put in "Enabled" in the line "Module installed", otherwise "Disabled".

#### Set up parameters:

- ◆ Select the line of variables or any menu line with the ↓ -key or the ↑ -key.
- ◆ Select the variable or change to the submenu with the ← -key or the → -key.
- ◆ Select the parameter with the ↑ -key or the ↓ -key.
- ◆ Confirm the new adjustment with the ↵ -key or cancel and go back to the last value with the F2 key.

## Analog Output Setup:

Press the ← -key or the → -key in the line "Analog output setup..." to change to the corresponding submenu:



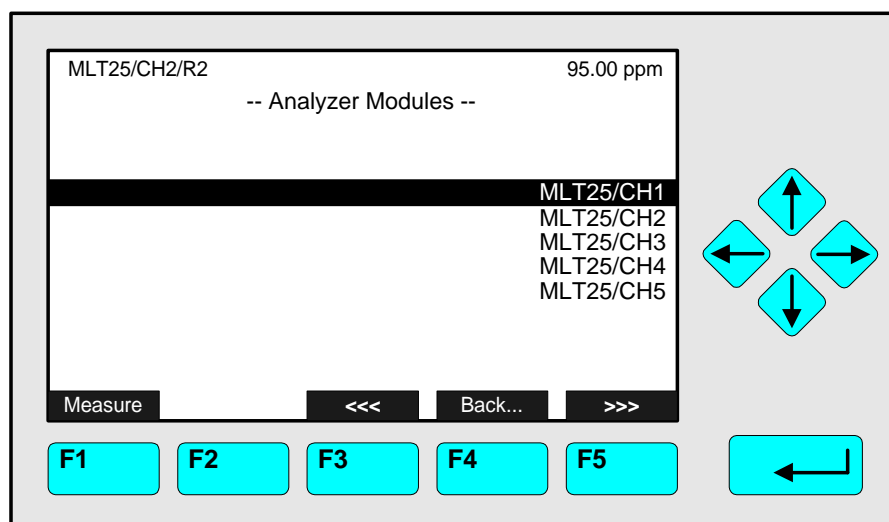
### Configuration of the analog output:

#### 1) Select the analog output number:

- You can set up all parameters in the menu "Analog Outputs" separately for each of the available analog outputs. The number of outputs depends on the hardware configuration of the local SIO module (minimum: 2, maximum: 8).
- Press the ← -key or the → -key to select the output number and adjust the value you want with the ↑ -key or the ↓ -key.
- Confirm the number selected with the ← -key.

#### 2) Choose the analyzer module:

- Change with ↓ -key to the line "Choose analyzer module..."
- Change to the submenu "Analyzer Modules" with the ← -key or the → -key:



- Go to the line you want with the ↑ -key or the ↓ -key.
- Select the tag of the channel with the ← -key or the → -key:  
The display will go back to the menu "Analog Outputs" automatically.  
The tag of the channel selected will appear in the line "Analyzer module".

### 3) Select the signal name:

- Change to the line "Signal name" with the ↓ -key
- Select the parameter with the ← -key or the → -key and adjust one of the following parameters with the ↑ -key or the ↓ -key:

Concentration  
Average  
Peak-Value  
Temperature  
Pressure  
Flow  
Range  
Calculator-1  
Calculator-2  
Calculator-3  
Calculator-4

- Confirm the parameter selected with the ← -key.

### 4) Determination of the output signal values:

- You can determine the signal value for the 0% output and the 100% output in the lines "Signal value for 0% output" or "Signal value for 100% output". So you have the possibility to zoom out a certain part of the whole range.

- Example:

Range from 0 to 1000 ppm

0% value shall be 400 ppm, 100% value shall be 700 ppm

Analog output is normally: 0V = 0 ppm      10V = 1000 ppm

After changing the output signal: 0V = 400 ppm      10V = 700 ppm

- Change to the line "Signal value for 0% output" or "Signal value for 100% output" with the ↓ -key.
- Select the value with the ← -key or the → -key.
- Select any digit with the ← -key or the → -key and adjust a new value with the ↑ -key or the ↓ -key.
- Confirm the new value with the ← -key.

- **Note:**

If you change the measurement range, the adjustment done in this menu will disappear and go back to the standard values of the range! To change the output signal values permanently you have to change the adjustments in the menu "Begin and End of Ranges" (see 5.1.3 p. 5-27)!

- **Attention:**

The signal range at the analog output should not be less than the littlest range! Otherwise, the noise level may be very high at the analog output!

5) Determination of the output current range:

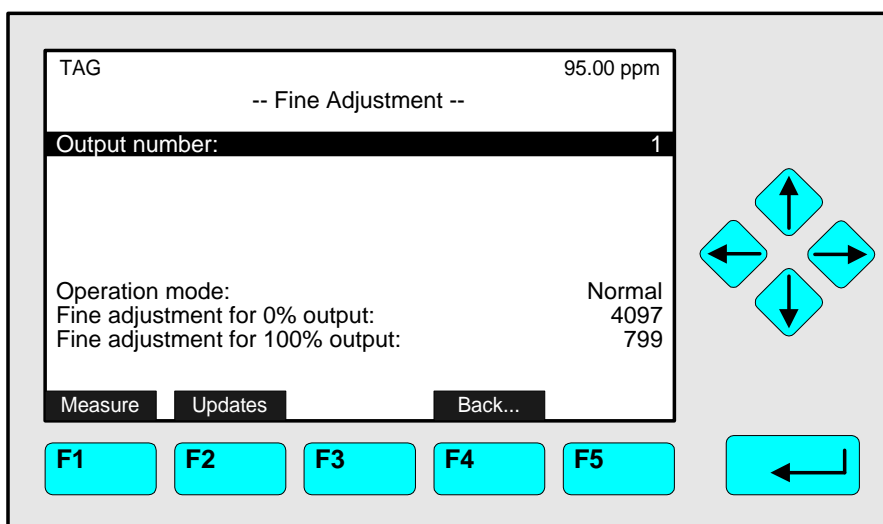
- Press the ← -key or the → -key in the line "Output current range" to select the range and select the value you want with the ↑ -key or the ↓ -key.
- Confirm the new adjustment with the ← -key.
- Options: 0...20 mA (and automatically 0...10V) or 4...20 mA (2...10V).

6) Concentration scaling:

- Press the ← -key or the → -key in the line "Use range limits for concentration scaling" to select the parameter and adjust with the ↑ -key or the ↓ -key "Enabled" to enable the limits control or "Disabled" to disable it.
- Confirm the new parameter with the ← -key.

7) Fine adjustment of the analog output:

- If you press the F5 key (More...) in the menu "Analog Outputs", you can change to the submenu "Fine Adjustment", where you can do the fine adjustments of the analog output:



- Press the ← -key or the → -key in the line "Operation mode" to select the parameter and adjust one of the following parameters with the ↑ -key or the ↓ -key:

**Normal:** The absolute measurement signal will be sent to the analog output.

**Zero:** Coordination between the display and the analog output for 0V with fine adjustment 0%.

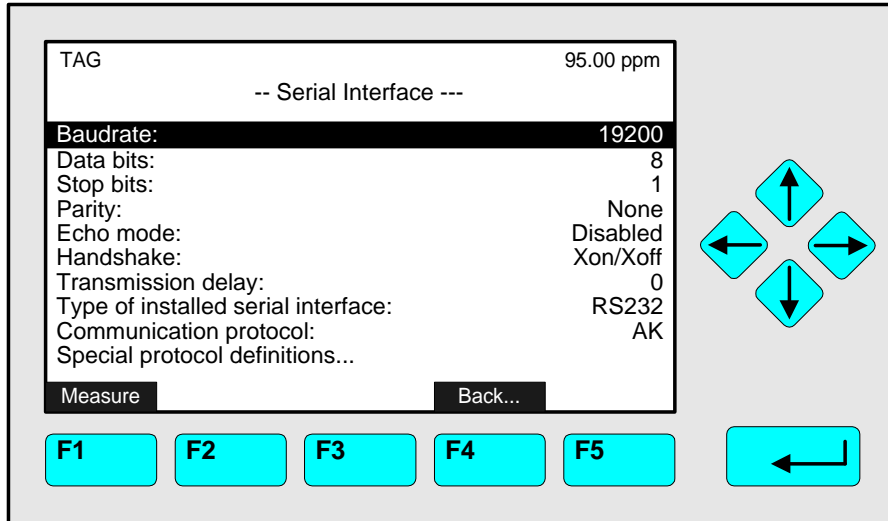
**Full Scale:** Coordination between the display and the analog output for 10V with fine adjustment 100%.

- Confirm the new parameter with the ← -key.
- Press the ← -key or the → -key in the line "Fine adjustments for 0% output" or "Fine adjustment for 100% output" to select the corresponding value.
- Adjust the value you want with the ↑ -key or the ↓ -key and confirm it with the ← -key. Options: 3000 - 6000 for 0% and 600 - 1000 for 100%.

*The last three lines of variables in the menu "Analog Outputs" only display some values of the analog output! They are not available.*

**Serial interface setup:**

Press the ← -key or the → -key in the line "Serial interface setup..." of the menu "Local SIO Configuration Parameters" to change to the corresponding submenu:



In the submenu "Serial Interface" you can determine the parameters of the data transfer between the analyzer module and external implements. The setups in this menu depend on the configuration of the analyzer module and the corresponding implement. The specification of the serial interface is described in another manual.

Set up parameters:

- ◆ Select any line of variables or the menu line with the ↓ -key or the ↑ -key.
- ◆ Select the variable or change to the submenu with the ← -key or the → -key.
- ◆ Select any digit with the ← -key or the → -key and adjust a new value with the ↑ -key or the ↓ -key resp. select the whole parameter with the ↑ -key or the ↓ -key.
- ◆ Confirm the new value with the ↵ -key or cancel and go back to the last value with the F2 key.

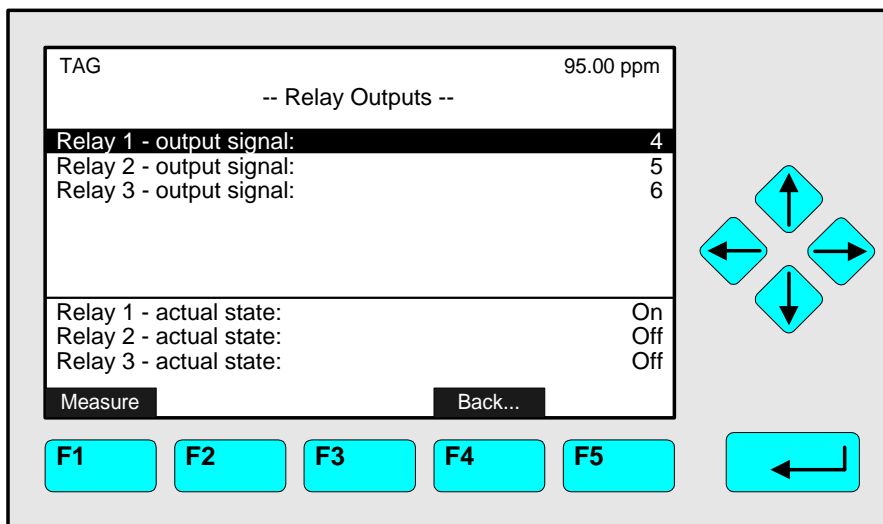
Options:

Baudrate:	300	1200	2400	4800	9600	19200
Data bits:	7	8				
Stop bits:	1	2				
Parity:	None	Even	Odd			
Echo mode:	Enabled	Disabled				
Handshake:	None	Xon/Xoff				
Transmission delay:	0 ... 100					
Type of installed serial interface:	RS 232	RS 485/2w	RS 485/4w	RS 485/4w-Bus	None	
Communication protocol:	AK	MODBUS RTU		None		

**Note:** Via the line "Special protocol definitions..." you can change to a submenu, where you can set up the parameters of the "AK" or "MODBUS RTU" communication protocol.

### Configuration of Relay Outputs:

Press the ← -key or the → -key in the line "Configuration of Relay Outputs..." of the menu "Local SIO Configuration Parameters" to change to the corresponding menu:



In the menu "Relay Outputs" you can attach signals to the relay outputs of the local SIO board, e.g the relation between the zero valve and a certain channel. You have to put a number code (= variable of a signal) in the corresponding line for the relay:

See the table "Signal Codes 1 - 359" on the following pages: p. 5-75 to 5-77 !

There are three relays on the local SIO board. With a jumper you can determine the relay contact status: NO or NC. Informations about the whole specification of the SIO board you can find in another manual.

#### Note:

In this menu you only can determine the relay output configuration for channels of the analyzer module, not for channels of auxiliary modules.

#### Set up parameters:

- ◆ Select any line of variables with the ↓ -key or the ↑ -key.
- ◆ Select the variable with the ← -key or the → -key.
- ◆ Select the code number for the signal with the ↑ -key or the ↓ -key.  
☞ Options: Code 1 to 359 according to the list at page 5-75 to 5-77 !
- ◆ Confirm the new value with the ← -key or cancel and go back to the last value with the F2 key.

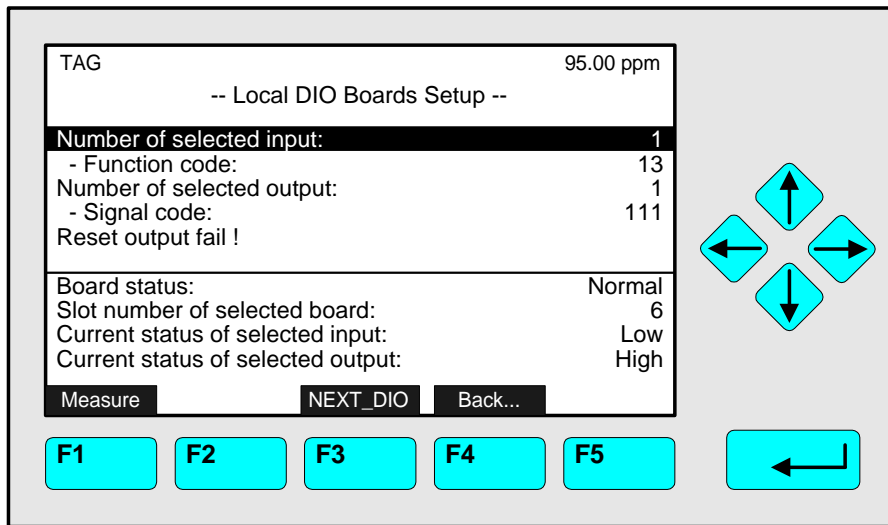
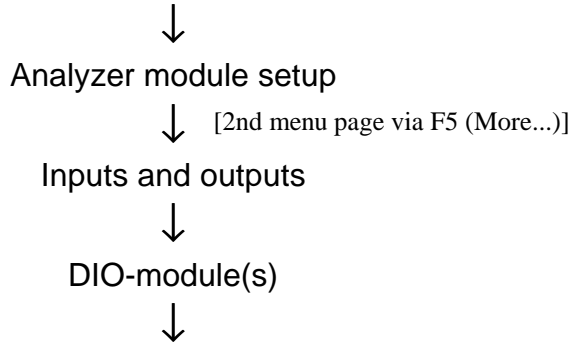
#### Lines of variables "Relay 1, 2, 3 - actual state":

These lines display the current gear status of each relay. The lines are not available.

# 5.1 Analyzer Module Setup

## 5.1.18 Inputs and Outputs – Local DIO

### Main Menu — Analyzer and I/O-module expert configuration



In the menu "Local DIO Boards Setup" you can set up the configuration of the local DIO modules of the analyzer module. Each DIO module is composed of 8 digital inputs and 24 digital outputs. You can attach a function to each input (e.g. opening of a valve) and a signal to each output (e.g. zero valve) by a corresponding code.

See the tables on the following pages:

**Signal codes 1 -359: see p. 5-75 to 5-77; Function codes: 1 - 599 see p. 5-78 !**

Set up parameters:

- ◆ Select the line of variables or the function line with the ↓ -key or the ↑ -key.
- ◆ Select the variable or start the function with the ← -key or the → -key.
- ◆ If asked after function start: Confirm with the F2 key (Yes) or cancel and go back to the menu page with the F4 key (Back...) or the ← -key.
- ◆ Variable changing:  
 Select any digit with the ← -key or the → -key and adjust a new value with the ↑ -key or the ↓ -key.
- ◆ Confirm the new value with the ← -key or cancel and go back to the last value with the F2 key.



### Function line "Reset output fail !"

The 24 digital outputs are composed of 3 units with 8 outputs. If there is a short circuit or an overload in one unit, it will be switched off and saved against destruction. After the defect is removed, the board is available immediately. You only have to press the ← -key or the → -key in the line "Reset output fail !". If asked: Confirm with F2 key (Yes). Informations about the whole specification of the DIO board you will find in another manual.

### The last four lines of variables:

These lines display the board status, the slot number and the gear status of the DIO board selected. The lines are not available.

---

## Signal Codes 1 - 359

### Available for:

- ◆ SIO relay outputs (see p. 5-73)
- ◆ DIO outputs (see p.5-74)
- ◆ Programmable logic control (see 5.1.6 p. 5-37)

<b>General Signals</b>	
<b>Signal ID</b>	<b>Signal</b>
1	RAM-Fail
2	ROMFail
3	Seconds; LOW/HIGH change all 1000 ms
4	Any sample gas valve selected (Channel 1...5)
5	Any zero gas valve (Channel 1...5)
6	Any span gas valve Selected (Channel 1...5)
7	NAMUR-status: Failure (Channel 1...5)
8	NAMUR-status:Maintenance Request (Channel 1...5)
9	NAMUR-status:Function Control (Channel 1...5)
10 - 19	Reserved
<b>Programmable Calculator</b>	
<b>Signal ID</b>	<b>Signal</b>
20	Execution status
21	Result 1 / Limit 1
22	Result 1 / Limit 2
23	Result 1 / Limit 3
24	Result 1 / Limit 4
25	Result 2 / Limit 1
26	Result 2 / Limit 2
27	Result 2 / Limit 3
28	Result 2 / Limit 4
29	Result 3 / Limit 1
30	Result 3 / Limit 2
31	Result 3 / Limit 3
32	Result 3 / Limit 4
33	Result 4 / Limit 1
34	Result 4 / Limit 2
35	Result 4 / Limit 3
36	Result 4 / Limit 4
37 - 39	Reserved

<b>Programmable Logic Controls</b>	
<b>Signal ID</b>	<b>Signal</b>
40	Output Result buffer #1
41	Output Result buffer #2
42	Output Result buffer #3
43	Output Result buffer #4
44	Output Result buffer #5
45	Output Result buffer #6
46	Output Result buffer #7
47	Output Result buffer #8
48	Output Result buffer #9
49	Output Result buffer #10
50	Output Result buffer #11
51	Output Result buffer #12
52	Output Result buffer #13
53	Output Result buffer #14
54	Output Result buffer #15
55	Output Result buffer #16
56	Output Result buffer #17
57	Output Result buffer #18
58	Output Result buffer #19
59	Output Result buffer #20
60	Execution status
61 -69	Reserved

<b>SIO I/O-module</b>	
<b>Signal ID</b>	<b>Signal</b>
70	Output #1 < 0V
71	Output #1 > 10V
72	Output #2 < 0V
73	Output #2 > 10V
74	Output #3 < 0V
75	Output #3 > 10V
76	Output #4 < 0V
77	Output #4 > 10V
78	Output #5 < 0V
79	Output #5 > 10V
80	Output #6 < 0V
81	Output #6 > 10V
82	Output #7 < 0V
83	Output #7 > 10V
84	Output #8 < 0V
85	Output #8 > 10V
86	Relay #1
87	Relay #2
88	Relay #3
89	Reserved

<b>DIO I/O-module</b>	
<b>Signal ID</b>	<b>Signal</b>
90	Input #1
91	Input #2
92	Input #3
93	Input #4
94	Input #5
95	Input #6
96	Input #7
97	Input #8
98	Output 1..8 fail
99	Output 9..16 fail
100	Output 17..24 fail
101	General Fail
102 - 109	Reserved

## 5.1 Analyzer Module Setup

### 5.1.18 Inputs and Outputs – Signal Codes

<b>Measurement-Channels</b>					
<b>Signal ID Ch 1</b>	<b>Signal ID Ch 2</b>	<b>Signal ID Ch 3</b>	<b>Signal ID Ch 4</b>	<b>Signal ID Ch 5</b>	<b>Signal</b>
110	160	210	260	310	Raw signal failure
111	161	211	261	311	Sample gas valve
112	162	212	262	312	Zero gas valve
113	163	213	263	313	Test gas valve
114	164	214	264	314	Span gas valve - range 1
115	165	215	265	315	Span gas valve - range 2
116	166	216	266	316	Span gas valve - range 3
117	167	217	267	317	Span gas valve - range 4
118	168	218	268	318	Any of the span gas valves
119	169	219	269	319	Lin1 gas valve
120	170	220	270	320	Lin2 gas valve
121	171	221	271	321	Purge gas valve
122	172	222	272	322	Linearization Underflow
123	173	223	273	323	Linearization Overflow
124	174	224	274	324	Zero calibration in progress
125	175	225	275	325	Span calibration in progress
126	176	226	276	326	Range Underflow
127	177	227	277	327	Range Overflow
128	178	228	278	328	Range #1
129	179	229	279	329	Range #2
130	180	230	280	330	Range #3
131	181	231	281	331	Range #4
132	182	232	282	332	Failure (Namur)
133	183	233	283	333	Maintenance request (Namur)
134	184	234	284	334	Function Control (Namur)
135	185	235	285	335	Concentration / Limit #1
136	186	236	286	336	Concentration / Limit #2
137	187	237	287	337	Concentration / Limit #3
138	188	238	288	338	Concentration / Limit #4
139	189	239	289	339	Conc. Average / Limit #1
140	190	240	290	340	Conc. Average / Limit #2
141	191	241	291	341	Conc. Average / Limit #3
142	192	242	292	342	Conc. Average / Limit #4
143	193	243	293	343	Temperature / Limit #1
144	194	244	294	344	Temperature / Limit #2
145	195	245	295	345	Temperature / Limit #3
146	196	246	296	346	Temperature / Limit #4
147	197	247	297	347	Pressure / Limit #1
148	198	248	298	348	Pressure / Limit #2
149	199	249	299	349	Pressure / Limit #3
150	200	250	300	350	Pressure / Limit #4
151	201	251	301	351	Flow / Limit #1
152	202	252	302	352	Flow / Limit #2
153	203	253	303	353	Flow / Limit #3
154	204	254	304	354	Flow / Limit #4
155	205	255	305	355	External signal #1
156	206	256	306	356	External signal #2
157	207	257	307	357	External signal #3
158	208	258	308	358	External signal #4
159	209	259	309	359	External signal #5

## Function Codes 1 - 599

### Available for:

- ◆ DIO inputs (see p. 5-74)

The following functions occur only if the signal at the input changes from low to high level:

ID	General functions
1	Set all channels into STANDBY state (Stop procedures)
2 - 99	Reserved

ID CH1	ID CH2	ID CH3	ID CH4	ID CH5	Channel dependent functions
100	200	300	400	500	Start Zero calibration
101	201	301	401	501	Start Span calibration
102	202	302	402	502	Start Zero + Span calibration
103	203	303	403	503	Open sample gas valve
104	204	304	404	504	Open zero gas valve
105	205	305	405	505	Open purge gas valve
106	206	306	406	506	Open test gas valve
107	207	307	407	507	Open linearizer gas valve
108	208	308	408	508	Open span gas valve (of current range)
109	209	309	409	509	Open span gas valve of range-1
110	210	310	410	510	Open span gas valve of range-2
111	211	311	411	511	Open span gas valve of range-3
112	212	312	412	512	Open span gas valve of range-4
113	213	313	413	513	Close all valves (STANDBY)
114	214	314	414	514	Set range-1
115	215	315	415	515	Set range-2
116	216	316	416	516	Set range-3
117	217	317	417	517	Set range-4
118	218	318	418	518	Reserved
...	...	...	...	...	...
149	249	349	449	549	Reserved

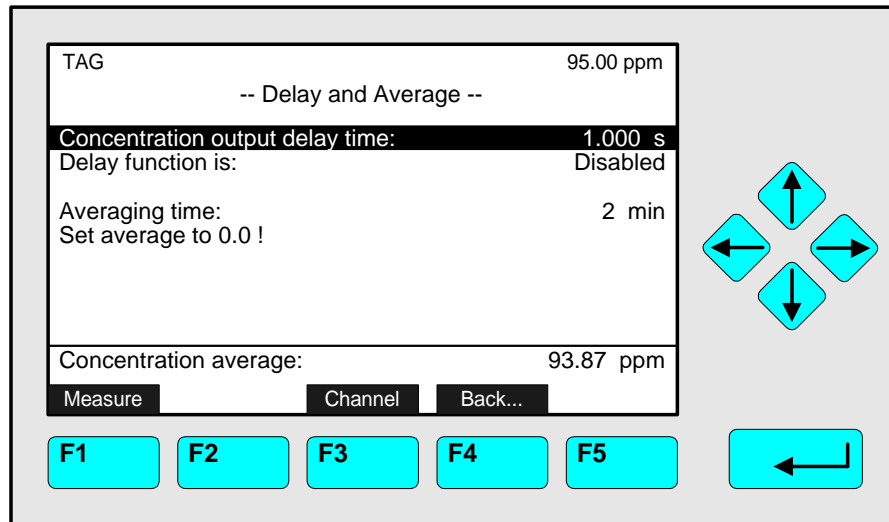
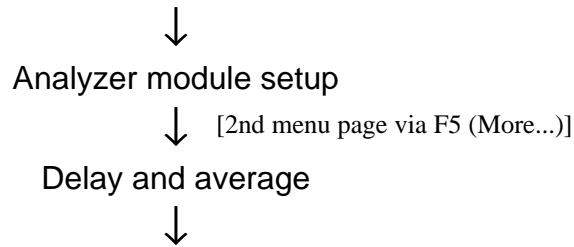
The following functions are active if the signal at the input is set to high level:

ID CH1	ID CH2	ID CH3	ID CH4	ID CH5	Channel dependent functions
150	250	350	450	550	<i>AK key-switch</i> : Remote
151	251	351	451	551	<i>Namur signal</i> : Function Control
152	252	352	452	552	Reserved
...	...	...	...	...	...
199	299	399	499	599	Reserved

## 5.1 Analyzer Module Setup

### 5.1.19 Delay and Average

#### Main Menu — Analyzer and I/O-module expert configuration



In the menu "Delay and Average" you can set up the

- ◆ analog output delay time of the measurement signal and
- ◆ averaging time to calculate the mean value of concentration

for one channel of an MLT analyzer or analyzer module. To set up the parameters of the other channels, you have to change with the F3 key.

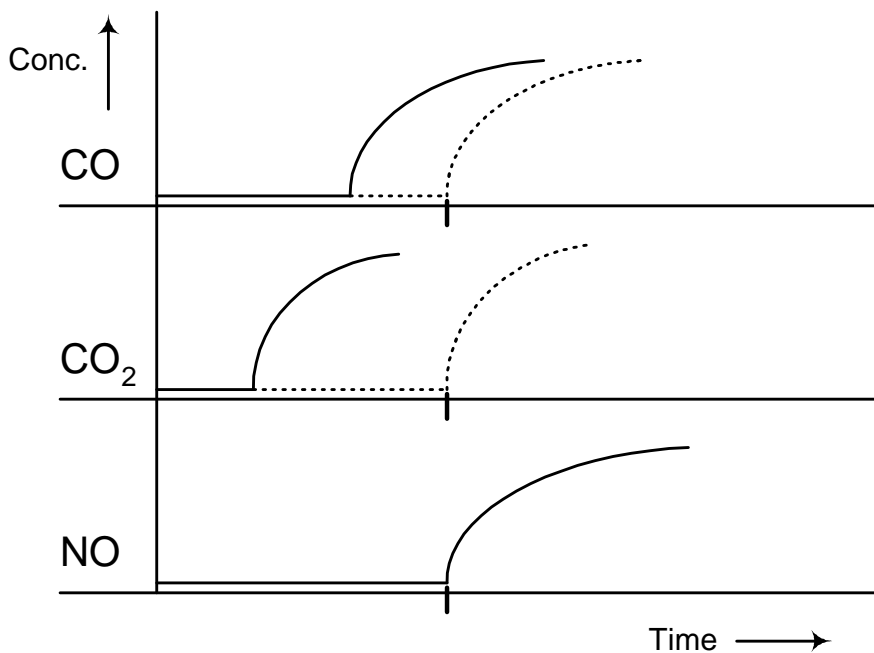
#### Set up parameters:

- ◆ Select any line of variables or the function line with the ↓ -key or the ↑ -key.
- ◆ Select the variable or start the function with the ← -key or the → -key.
- ◆ If asked after function start: Confirm with the F2 key (Yes) or cancel and go back to the menu page with the F4 key (Back...) or the ← -key.
- ◆ Variable changing:  
Select any digit with the ← -key or the → -key and adjust a new value with the ↑ -key or the ↓ -key  
resp. select the whole parameter with the ↑ -key or the ↓ -key.
- ◆ Confirm the new value with the ← -key or cancel and go back to the last value with the F2 key.

Lines of variables "Concentration output delay time" / "Delay function is":

- ◆ With the setup in the line "Concentration output delay time", you can shift the absolute time of the analog output signal for one channel. If you use the right output delay time, you can watch the signals of several channels at the same starting time.
- ◆ Options: 0.000 to 3.000 seconds.
- ◆ Select "Enabled" in the line "Delay function is" to use the delay time for the concentration output.

Example:



Line of variables "Averaging time" and function line "Set average to 0.0 !":

- ◆ The mean value of a measurement is calculated as follows (arithmetic mean value):

$$\text{Concentration mean value} = \frac{\text{Sum of all concentrations}}{\text{Number of values}}$$

- ◆ The number of measurement values depends on the averaging time.
- ◆ Options: 1, 2, 3, ... , 60 minutes
- ◆ You will find the result of the latest/actual mean value calculation in the line "Concentration average".
- ◆ Starting the function "Set average to 0.0 !" will calculate a new mean value. After the time of the line "Averaging time" is over, you will find the result in the line "Concentration average".

# 5.1 Analyzer Module Setup

## 5.1.20 Special Functions

Main Menu — Analyzer and I/O-module expert configuration

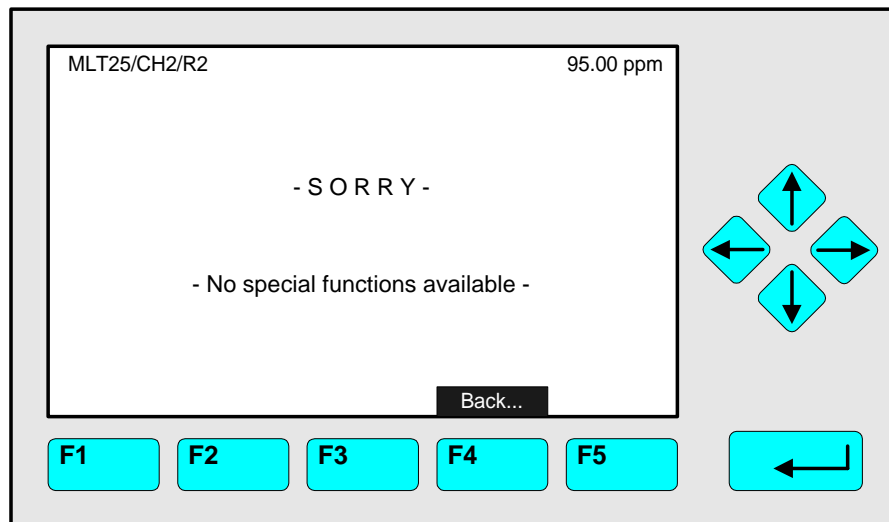


Analyzer module setup



[2nd menu page via F5 (More...)]

Special functions



The menu "Special Functions" is reserved for functions of the typical measurement process for a certain analyzer module (e.g. CLD, FID, MLT-AM) !

# 5.1 Analyzer Module Setup

## 5.1.21 AK-Protocol Communication

Main Menu — Analyzer and I/O-module expert configuration

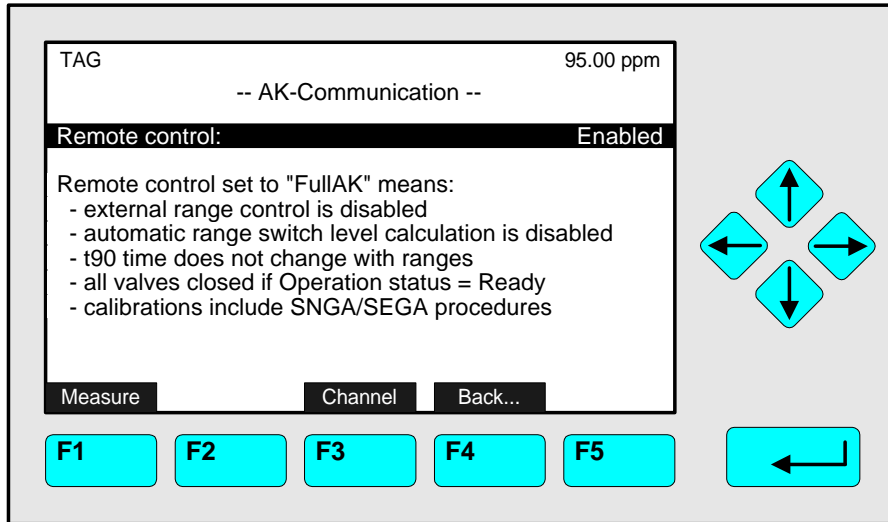


Analyzer module setup



[3rd menu page via 2 times F5 (More...)]

AK-protocol communication



In the menu "AK-Communication" you can set up the parameters for the remote control of the current channel via the serial interface. With the F3 key you can change to the other channels of an MLT analyzer or analyzer module.

### Set up parameters:

- ◆ Press the ←-key or the →-key to select the parameter.
- ◆ Select the parameter you want with the ↑-key or the ↓-key.

### Options:

- **Disabled:** No data transfer by remote control is possible.
  - **Full AK:** The data transfer is only possible for commands of the AK standard.
  - **Enabled:** The data transfer is possible for the commands of the AK standard and further commands like service commands.
- ◆ Confirm the parameter selected with the ←-key or cancel and go back to the last setup with the F2 key.

### Notes:

- ◆ Further informations about the "AK-communication protocol" you will find in an own manual.
- ◆ To setup the data transfer parameters (e.g. baudrate) you have to change to the menu "Serial Interface" (see section 5.1.18 p. 5-72 resp. 5.2.1 p. 89).

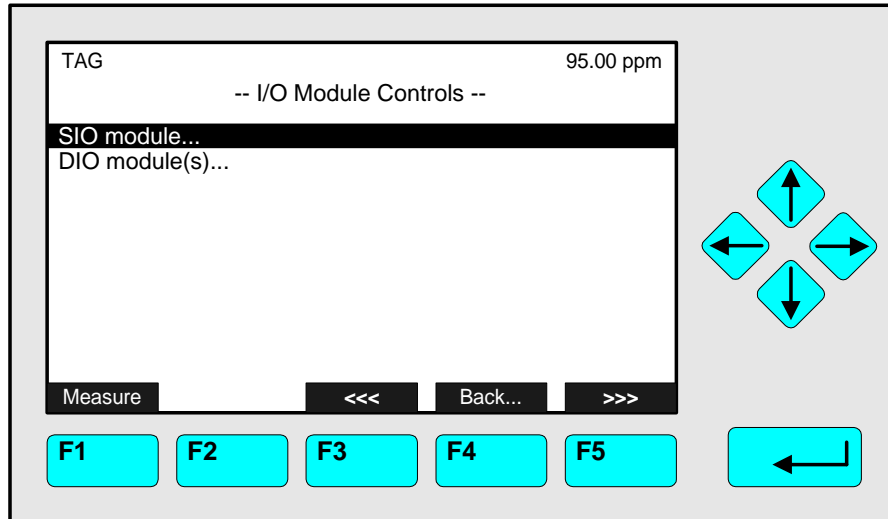


## 5.2 I/O Module Controls

Main Menu — Analyzer and I/O-module expert configuration



I/O module controls



From the menu "I/O Module Controls" you can change to some submenus where you can set up the parameters for the SIO module and the DIO modules of the MLT analyzer or platform:

- ◆ Press the ←-key or the →-key in the line "SIO module..." or in the line "DIO module(s)..." to change to the corresponding submenus.

## 5.2 I/O Module Controls

### 5.2.1 SIO Module

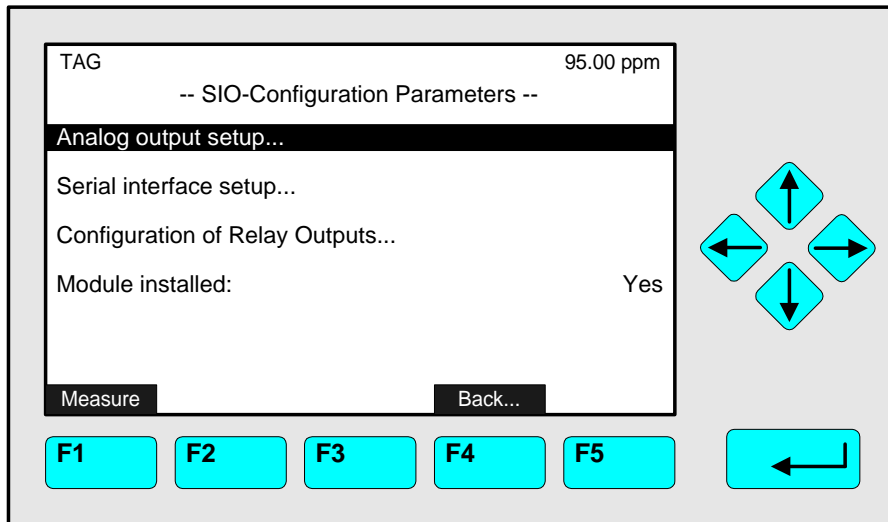
Main Menu — Analyzer and I/O-module expert configuration



I/O module controls



SIO module



From the menu "SIO - Configuration Parameters" you can change to submenus to control and set up several output configurations of the auxiliary SIO module.

General Configuration of a SIO board (for the whole specification see its own manual):

- ◆ Analog outputs: minimum 2, maximum 8
- ◆ Serial interface (RS 232 or RS 485) to connect the analyzer with an external computer
- ◆ Three relay outputs

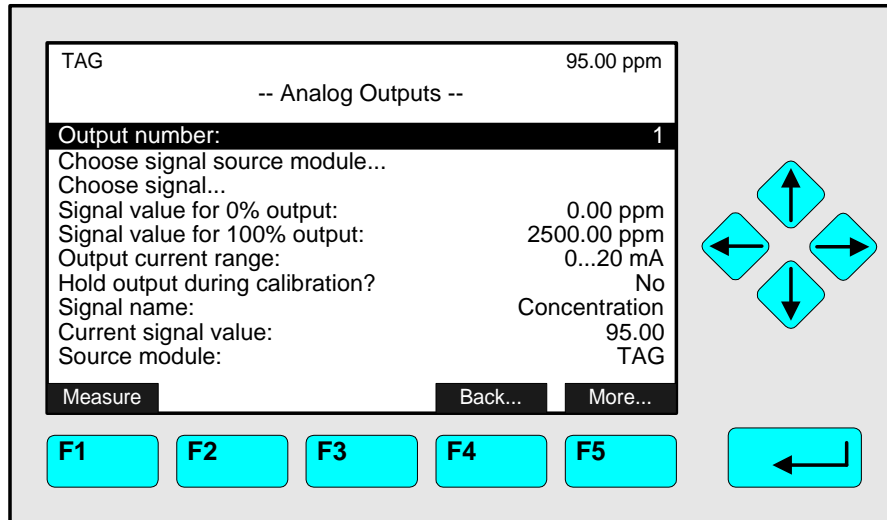
If there is a SIO module installed in the platform or in the MLT analyzer, you have to put in "Yes" in the line "Module installed", otherwise "No".

#### Set up parameters:

- ◆ Select the line of variables or any menu line with the ↓ -key or the ↑ -key.
- ◆ Select the variable or change to the submenu with the ← -key or the → -key.
- ◆ Select the parameter with the ↑ -key or the ↓ -key.
- ◆ Confirm the new adjustment with the ↵ -key or cancel and go back to the last value with the F2 key.

**Analog Output Setup:**

Press the ← -key or the → -key in the line "Analog output setup..." to change to the corresponding submenu:



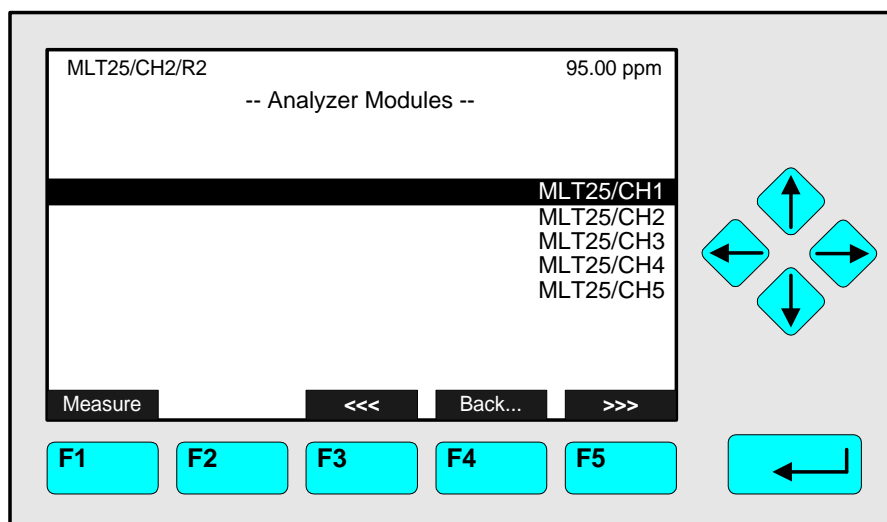
Configuration of the analog output:

**1) Select the analog output number:**

- You can set up all parameters in the menu "Analog Outputs" separately for each of the available analog outputs. The number of outputs depends on the hardware configuration of the local SIO module (minimum: 2, maximum: 8).
- Press the ← -key or the → -key to select the output number and adjust the value you want with the ↑ -key or the ↓ -key.
- Confirm the number selected with the ← -key.

**2) Choose the analyzer module:**

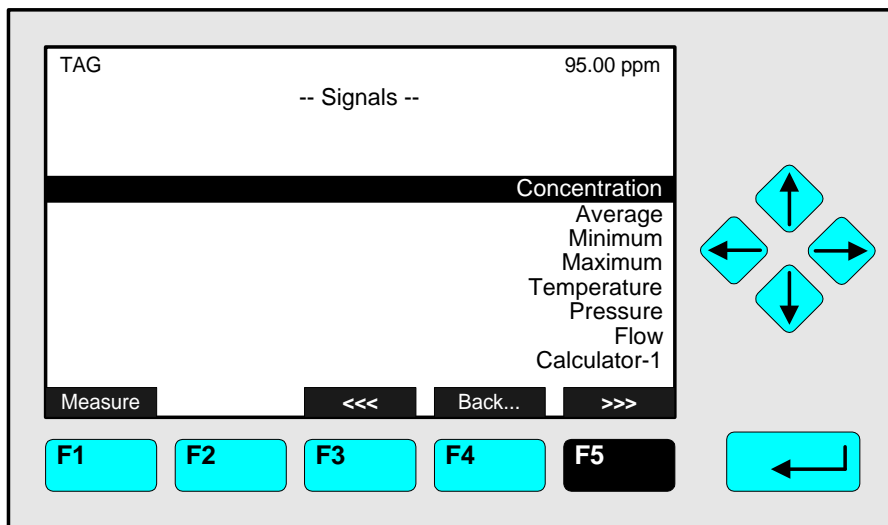
- Change with the ↓ -key to the line "Choose signal source module..."
- Change to the submenu "Analyzer Modules" with the ← -key or the → -key. The tags of all analyzer modules combined with the platform or the MLT analyzer will appear:



- Go to the line you want with the ↑ -key or the ↓ -key.
- Select the tag of the channel with the ← -key or the → -key:  
The display will go back to the menu "Analog Outputs" automatically.  
The tag of the channel selected will appear in the line "Source module".

**3) Select any signal:**

- Change to the line "Choose signal" with the ↓ -key.
- Press the ← -key or the → -key to change to the submenu "Signals":



- Available signals on further menu pages:
- ◆ Calculator-2
  - ◆ Calculator-3
  - ◆ Calculator-4
  - ◆ Failures
  - ◆ Maintenance-Requests
  - ◆ Function-Control
  - ◆ Range-ID
  - ◆ Operation
  - ◆ Any\_Alarms
  - ◆ Span-Conc.
  - ◆ Gasflow

- Go to the line you want with the ↓ -key or the ↑ -key. With the F5 key (>>>) you can go to further menu pages containing signals. With the F4 key you can go back to the menu "Analog Outputs".
- Select the signal with the ← -key or the → -key:  
The display will go back to the menu "Analog Outputs" automatically.  
The signal selected will appear in the line "Signal name".

#### 4) Determination of the output signal values:

- You can determine the signal value for the 0% output and the 100% output in the lines "Signal value for 0% output" or "Signal value for 100% output". So you have the possibility to zoom out a certain part of the whole range.
- Example:
  - Range from 0 to 1000 ppm
  - 0% value shall be 400 ppm, 100% value shall be 700 ppm
  - Analog output is normally: 0V = 0 ppm                      10V = 1000 ppm
  - After changing the output signal: 0V = 400 ppm                      10V = 700 ppm
- Change to the line "Signal value for 0% output" or "Signal value for 100% output" with the ↓ -key.
- Select the value with the ← -key or the → -key.
- Select any digit with the ← -key or the → -key and adjust a new value with the ↑ -key or the ↓ -key.
- Confirm the new value with the ← -key.
- **Note:**  
If you change the measurement range, the adjustment done in this menu will disappear and go back to the standard values of the range! To change the output signal values permanently you have to change the adjustments in the menu "Begin and End of Ranges" (see 5.1.3 p. 5-27)!
- **Attention:**  
The signal range at the analog output should not be less than the littlest range! Otherwise, the noise level may be very high at the analog output!

#### 5) Determination of the output current range:

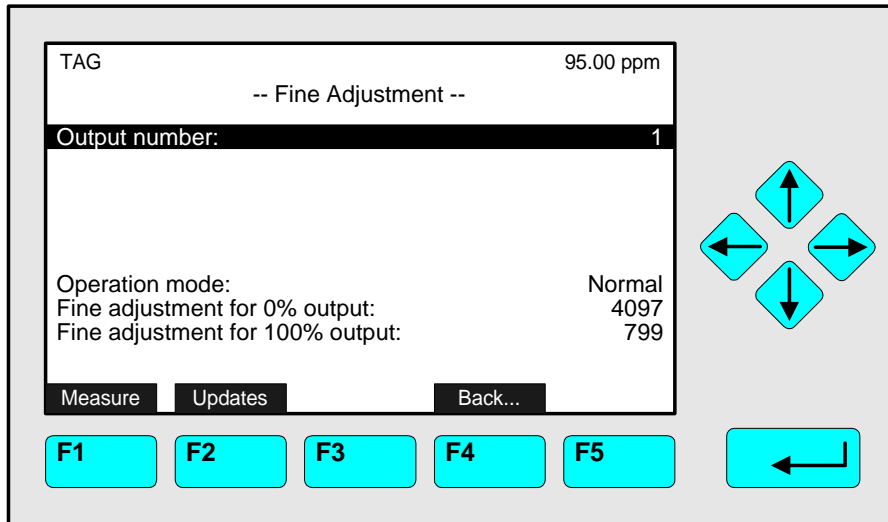
- Press the ← -key or the → -key in the line "Output current range" to select the range and select the value you want with the ↑ -key or the ↓ -key.
- Confirm the new adjustment with the ← -key.
- Options: 0...20 mA (and automatically 0...10V) or 4...20 mA (2...10V).

#### 6) Analog output during calibration:

- In the line "Hold output during calibration?" you can determine the signal drift of the analog output and of the limits during calibration:
  - Yes:** During the whole calibration the analog output signal and the status of the limits are fixed to the last value before calibration.
  - No:** The analog output signal and the status of the limits are following to the measurement signal during the whole calibration procedure.
- **Notes:**  
The adjustments "Yes/No" are valid for all kinds of calibrations of a platform SIO or MLT analyzer SIO: manual, time controlled, AK controlled and system calibration.  
The signal drift and status of limits of a local SIO in an MLT analyzer module will be determined in the menu "Calibration Procedure Setup" in the line "Analog output during calibration: ... Holding/Tracking" (see 5.1.1 p. 5-9/10).

## 7) Fine adjustment of the analog output:

- If you press the F5 key in the menu "Analog Outputs" you can change to the submenu "Fine Adjustment", where you can do the fine adjustments of the analog output:



- In the line "Output number" appears the output number selected in the menu "Analog Outputs". If you want, you can select another output in the submenu "Fine Adjustment":  
Press the ← -key or the → -key to select the output number and adjust the value you want with the ↑ -key or the ↓ -key. Options: 1, ... , 8.  
Confirm the number selected with the ↵ -key.

### Fine adjustment setup of the analog output:

- Press the ← -key or the → -key in the line "Operation mode" to select the parameter and adjust one of the following parameters with the ↑ -key or the ↓ -key:  
**Normal:** The absolute measurement signal will be sent to the analog output.  
**Adjust 0V:** Coordination between the display and the analog output for 0V with fine adjustment 0%.  
**Adjust 10V:** Coordination between the display and the analog output for 10V with fine adjustment 100%.
- Confirm the new parameter with the ↵ -key.
- Change to the following lines with the ↑ -key or the ↓ -key.
- Press the ← -key or the → -key in the line "Fine adjustment for 0% output" or "Fine adjustment for 100% output" to select the corresponding value.
- Adjust the value you want with the ↑ -key or the ↓ -key and confirm it with the ↵ -key. Options: 3500 - 4800 for 0% and 750 - 900 for 100%.

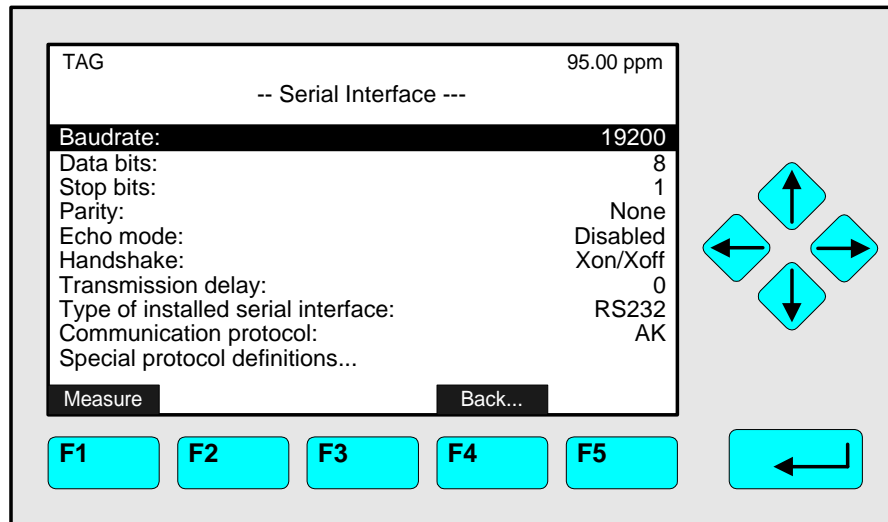
### F2 key (Updates):

- With the F2 key you can change to the submenu "Analog Output Updates per Second".

*The last three lines of variables in the menu "Analog Outputs" only display some values of the analog output! They are not available.*

**Serial interface setup:**

Press the ← -key or the → -key in the line "Serial interface setup..." of the menu "SIO - Configuration Parameters" to change to the corresponding submenu:



In the submenu "Serial Interface" you can determine the parameters of the data transfer between the MLT analyzer or platform and external implements. The set-ups in this menu depend on the configuration of the analyzer resp. platform and the corresponding implement. The specification of the serial interface is described in another manual.

Set up parameters:

- ◆ Select any line of variables or the menu line with the ↓ -key or the ↑ -key.
- ◆ Select the variable or change to the submenu with the ← -key or the → -key.
- ◆ Select any digit with the ← -key or the → -key and adjust a new value with the ↑ -key or the ↓ -key  
resp. select the whole parameter with the ↑ -key or the ↓ -key.
- ◆ Confirm the new value with the ← -key or  
cancel and go back to the last value with the F2 key.

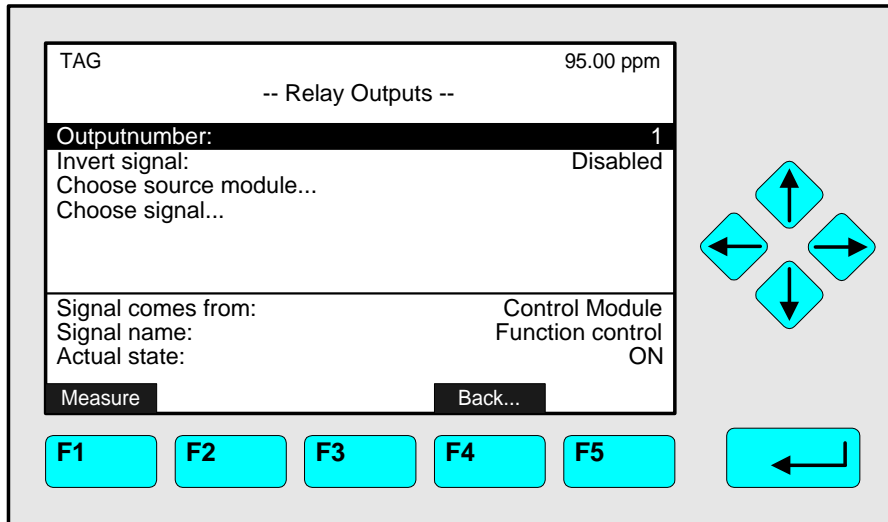
Options:

Baudrate:	300	1200	2400	4800	9600	19200
Data bits:	7	8				
Stop bits:	1	2				
Parity:	None	Even	Odd			
Echo mode:	Enabled	Disabled				
Handshake:	None	Xon/Xoff				
Transmission delay:	0 ... 100					
Type of installed serial interface:	RS 232	RS 485/2w	RS 485/4w	RS 485/4w-Bus	None	
Communication protocol:	AK	MODBUS RTU		None		

**Note:** Via the line "Special protocol definitions..." you can change to a submenu, where you can set up the parameters of the "AK" or "MODBUS RTU" communication protocol.

**Configuration of Relay Outputs:**

Press the ←-key or the →-key in the line "Configuration of Relay Outputs..." of the menu "SIO - Configuration Parameters" to change to the corresponding menu:



There are three relays on any SIO board. The relay contact status is NO (normally opened) by factory setting. With a jumper you also have the option to determine the relay contact status as NC (normally closed). Informations about the whole specification of the SIO board you can find in another manual.

In the menu "Relay Outputs" you have to determine the configuration of the three relay outputs of the SIO!

Configuration setup:

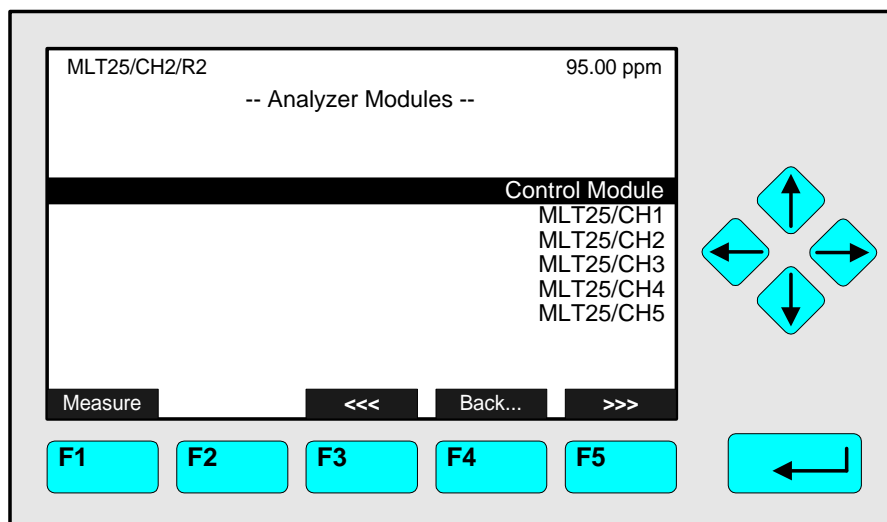
**1) Select the output number:**

- Press the ←-key or the →-key in the line "Outputnumber" and adjust the output number one, two or three with the ↑-key or the ↓-key.
- Confirm the number selected with the ←-key.

**2) Choose the source module:**

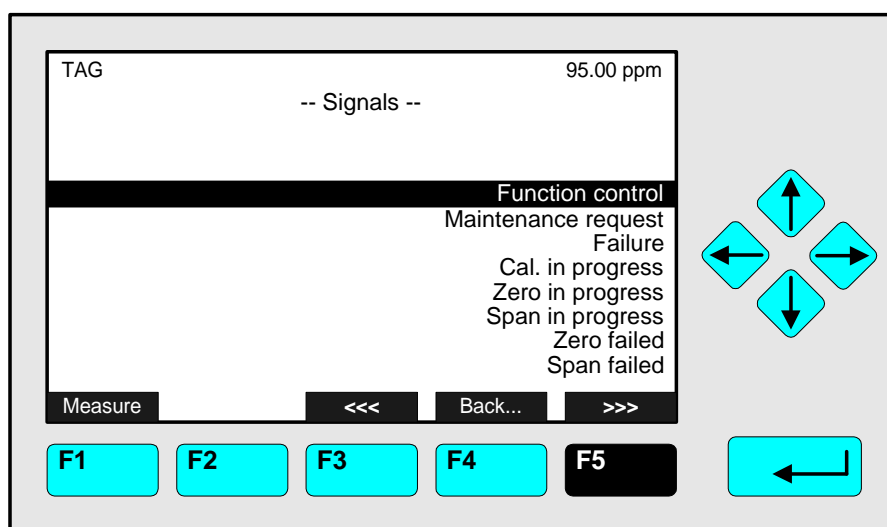
- Change with the ↓-key to the line "Choose source module...".
- Change to the submenu "Analyzer Modules" with the ←-key or the →-key. (illustration see next page)  
All analyzer modules joint to the platform or to the MLT analyzer and the control module are available.
- Go to the line you want with the ↑-key or the ↓-key. If there are more than eight source modules available, you have to press the F5 key to go to another menu page.
- Select the tag of the module with the ←-key or the →-key:  
The display will go back to the menu "Relay Outputs" automatically. The tag of the module selected will appear in the line "Signal comes from".





### 3) Select any signal:

- Change to the line "Choose signal..." with the ↓ -key.
- Press the ← -key or the → -key to change to the submenu "Signals":



- Go to the line you want with the ↓ -key or the ↑ -key. With the F5 key (>>>) you can go to other menu pages containing further available signals:

Range overflow  
 Range underflow  
 Flow too low  
 Flow too high

and further signals, if need be:

All signals of the control module and of the analyzer modules joint to the platform or MLT analyzer (e.g. CLD, FID, MLT AM) are available in the menu "Signals".

- Select the signal with the ← -key or the → -key:  
 The display will go back to the menu "Relay Outputs" automatically.  
 The signal selected will appear in the line "Signal name".

#### 4) Invert signal:

- You can decide, if the measurement signal should be inverted at the relay output. This can be necessary to combine a failure with an alarm control.

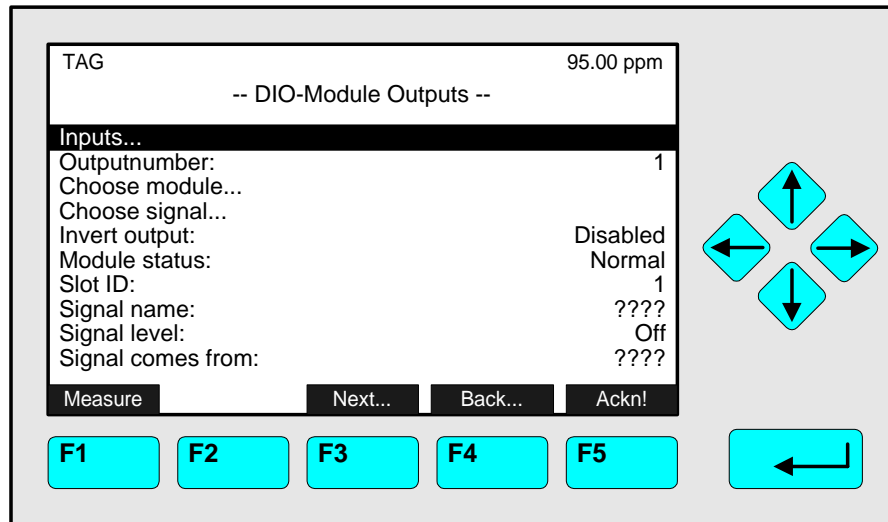
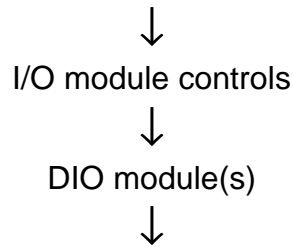
Press the ← -key or the → -key in the line "Invert signal" to select the parameter and adjust "Enabled" or "Disabled" with the ↑ -key or the ↓ -key.

Confirm the parameter selected with the ← -key or the → -key.

*The last three lines of variables in the menu "Relay Outputs" only display some adjustments of the relay output selected! They are not available:*

- ◆ "Signal comes from:" displays the source module selected for the current relay output.
- ◆ "Signal name:" displays the signal selected for the current relay output.
- ◆ "Actual state:" displays if the relay status of the current relay is "On" or "Off".

#### Main Menu — Analyzer and I/O-module expert configuration



In the menu "DIO-Module Outputs" you can set up the output configuration of the auxiliary DIO modules. Besides you can change to the submenu "DIO-Module Inputs" to configure the inputs of the auxiliary DIO modules.

Each DIO module is composed of 8 digital inputs and 24 digital outputs. If there exist several DIO modules in the platform, you can change to the setup menu of each with the F3 key. The tag number of the DIO board selected will appear in the line "Slot ID". The changing with the F3 key is not available for MLT analyzers, because only one DIO can be installed in it.

The 24 digital outputs are composed of 3 units with 8 outputs. If there is a short circuit or an overload in one unit, it will be switched off and saved against destruction. After the defect is removed the board is available immediately. You only have to press the F5 key. Informations about the whole specification of the DIO board you will find in another manual.

#### Set up parameters:

- ◆ Select any line of variables or any menu line with the ↓ -key or the ↑ -key.
- ◆ Select the variable or change to the submenu with the ← -key or the → -key.
- ◆ Adjust a new value or select the whole parameter with the ↑ -key or the ↓ -key.
- ◆ Confirm the new value with the ← -key or cancel and go back to the last value with the F2 key.

#### Line of variables "Invert output":

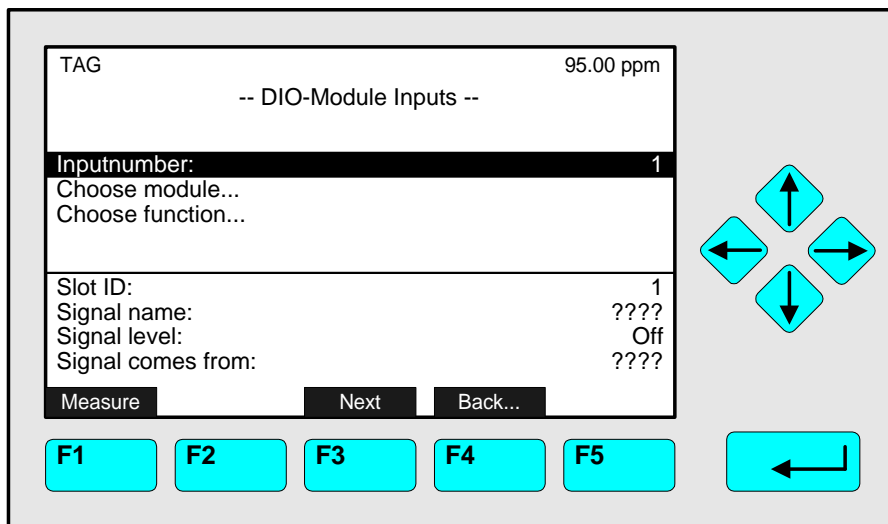
Select "Enabled" in the line "Invert output", if you want to invert the measurement signal at the actual digital output, otherwise select "Disabled". The output inversion can be necessary for instance, if you want to combine a failure with an alarm control.

The last five lines of variables in the menu "DIO-Module Outputs" only display some adjustments of the DIO output selected! They are not available:

- ◆ "Module status:" displays the status of the current DIO board.
- ◆ "Slot ID:" displays the tag number of the DIO board selected.
- ◆ "Signal name:" displays the signal selected for the current DIO output.
- ◆ "Signal level:" displays the status of the signal selected.
- ◆ "Signal comes from:" displays the source module selected for the current DIO output.

**Configuration of the DIO module inputs:**

Press the ← -key or the → -key in the line "Inputs..." to change to the corresponding submenu:



In the menu "DIO-Module Inputs" you have to determine the configuration for all of the eight DIO module inputs!

DIO input configuration setup:

**1) Select the input number:**

- Press the ← -key or the → -key in the line "Inputnumber" and adjust an input number (1, ... , 8) with the ↑ -key or the ↓ -key.
- Confirm the number selected with the ← -key.

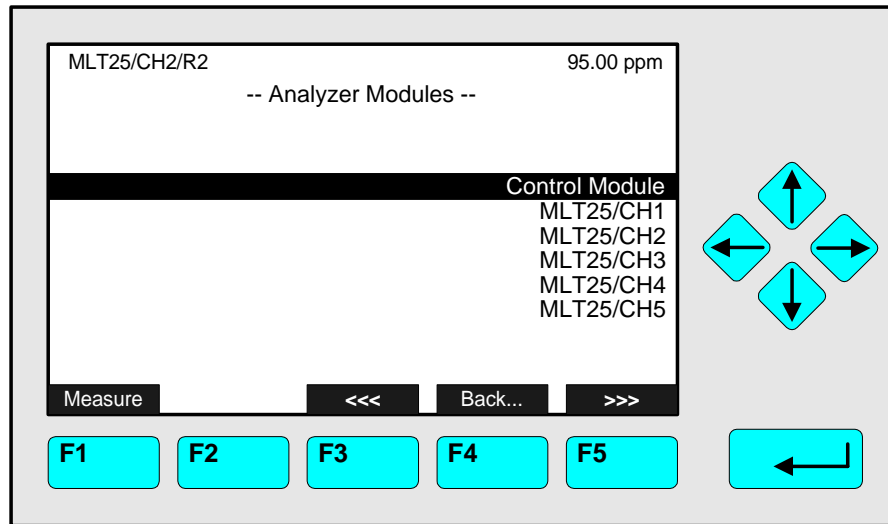
**2) Choose the module:**

- Change with the ↓ -key to the line "Choose module...".
- Change to the submenu "Analyzer Modules" with the ← -key or the → -key. (illustration see next page)  
All modules joint to the platform or to the MLT analyzer and the control module will be available.
- Go to the line you want with the ↑ -key or the ↓ -key. If there are more than eight source modules available, you have to press the F5 key to go to another menu page.

## 5.2 I/O Module Controls

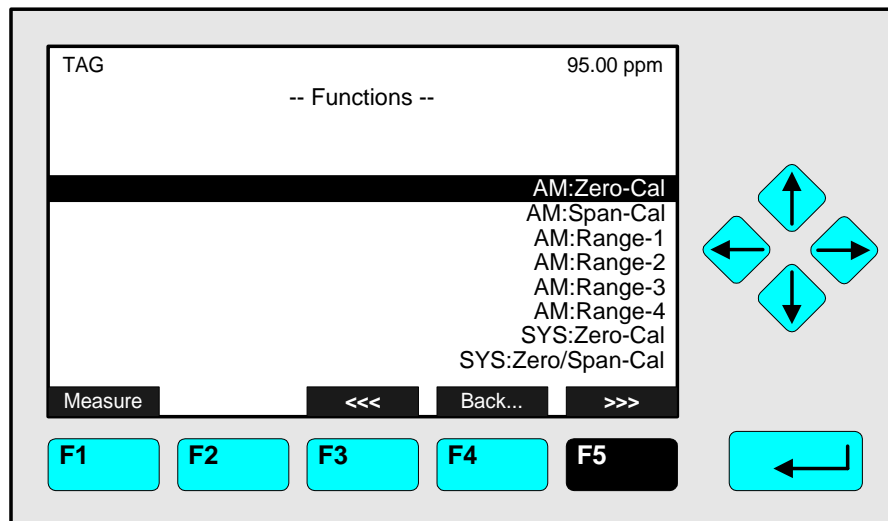
### 5.2.2 DIO Module(s) – Input configuration

- Select the tag of the module with the ← -key or the → -key:  
The display will go back to the menu "DIO-Module Inputs" automatically.  
The tag of the module selected will appear in the line "Signal comes from".



### 3) Select any function:

- Change to the line "Choose function..." with the ↓ -key.
- Press the ← -key or the → -key to change to the submenu "Functions":



- Go to the line you want with the ↓ -key or the ↑ -key. With the F5 key you can go to further menu pages containing also available signals:

SYS:Program-Cal  
 SYS:Cancel-Cal  
 SYS:CAL-Test-Mode  
 SYS:AM-Zero-Gas  
 SYS:AM-Span-Gas1, 2, 3, 4  
 External function control  
 AM: Hold Outputs  
 AM-closed-valves

CLD-AM: NOx

External failure

External maintenance

and further functions, depending of the analyzer module selected.

- Select the function with the ← -key or the → -key:  
The display will go back to the menu "DIO-Module Inputs" automatically.  
The function selected will appear in the line "Signal name".

*The last four lines of variables in the menu "DIO-Module Inputs" only display some adjustments of the DIO input selected! They are not available:*

- ◆ "Slot ID:" displays the tag number of the DIO board selected. If there exist several DIO modules in the platform you can change to the setup menu of each with the F3 key. The tag number of the DIO board selected will appear in the line "Slot ID".
- ◆ "Signal name:" displays the signal selected for the current DIO input.
- ◆ "Signal level:" displays the status of the signal selected.
- ◆ "Signal comes from:" displays the source module selected for the current DIO input.

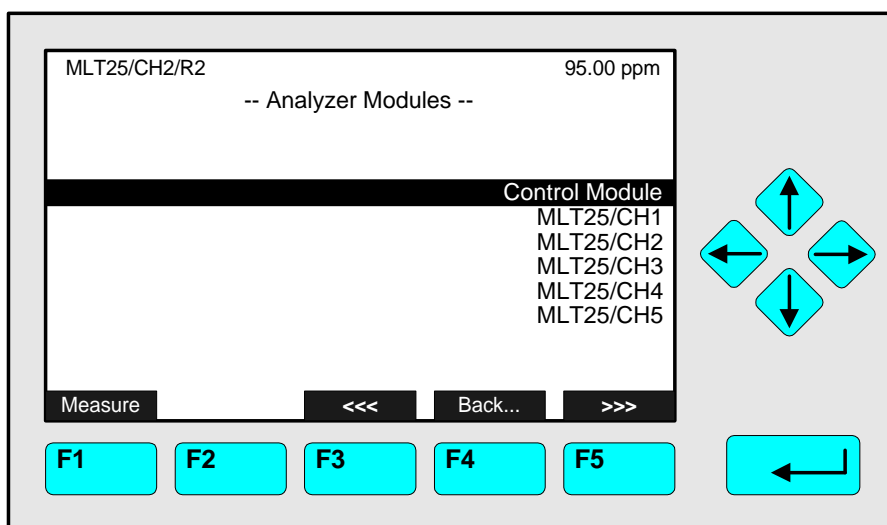
### Configuration of the DIO module outputs:

#### 1) Select the output number:

- Press the ← -key or the → -key in the line "Outputnumber" of the menu "DIO-Module Outputs" and adjust an output number (1, ... , 24) with the ↑ -key or the ↓ -key.
- Confirm the number selected with the ← -key.

#### 2) Choose the module:

- Change with the ↓ -key to the line "Choose module...".
- Change to the submenu "Analyzer Modules" with the ← -key or the → -key.  
All modules joint to the platform or to the MLT analyzer and the control module will be available:



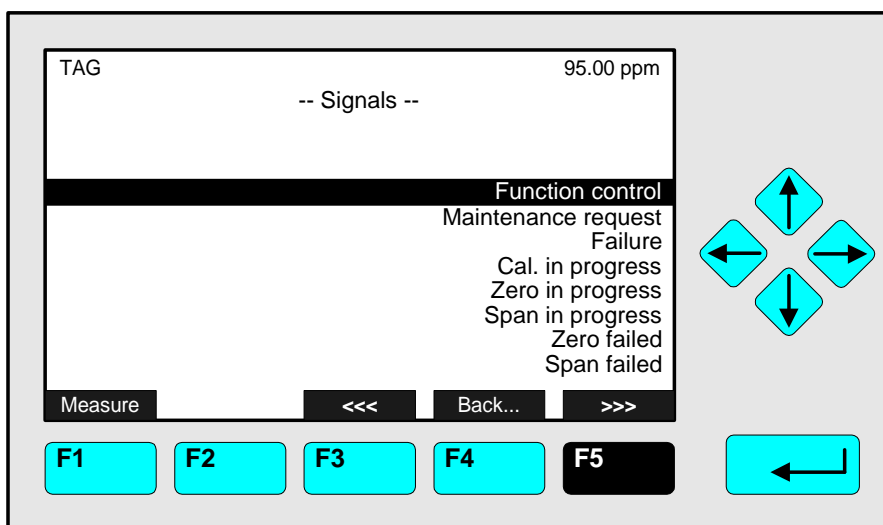
## 5.2 I/O Module Controls

### 5.2.2 DIO Module(s) – Output configuration

- Go to the line you want with the ↑ -key or the ↓ -key. If there are more than eight source modules available, you have to press the F5 key to go to another menu page.
- Select the tag of the module with the ← -key or the → -key:  
The display will go back to the menu "DIO-Module Outputs" automatically.  
The tag of the module selected will appear in the line "Signal comes from".

#### 3) Select any signal:

- Change to the line "Choose signal..." with the ↓ -key.
- Press the ← -key or the → -key to change to the submenu "Signals":



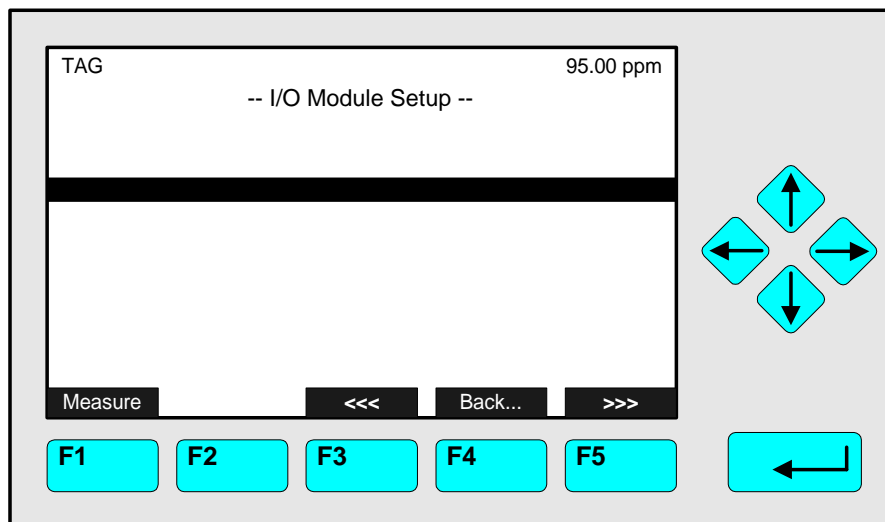
- Go to the line you want with the ↓ -key or the ↑ -key. With the F5 key you can go to further menu pages containing also available signals:  
Range overflow  
Range underflow  
Flow too low  
Flow too high  
SYS:Valve-1, -2, ... , -32  
and further signals, if need be:  
All signals of the control module and of the analyzer modules joint to the platform or MLT analyzer (e.g. CLD, FID, MLT AM) are available in the menu "Signals".
- Select the signal with the ← -key or the → -key:  
The display will go back to the menu "DIO-Module Outputs" automatically.  
The signal selected will appear in the line "Signal name".





### Main Menu — Analyzer and I/O-module expert configuration

↓  
I/O module setup



In the menu "I/O Module Setup" you can select any of the following types of micro processor controlled auxiliary modules:

- 1) Analog Output with 3 Alarms I/O Module
- 2) Auto Calibration I/O Module
- 3) System Auto Calibration I/O Module

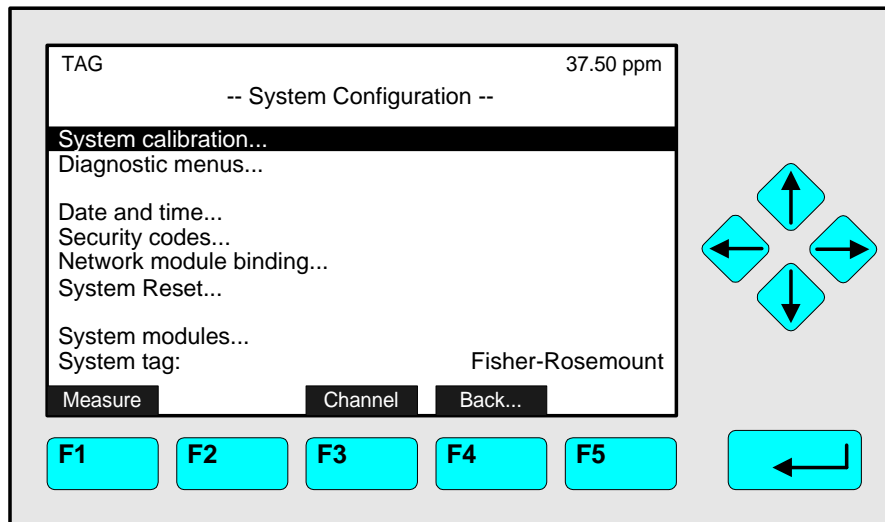
#### Notes:

- ◆ If one of these auxiliary modules is available, you will find its corresponding tag in a line of this menu. If there exist more than eight of such modules, you can change to another menu page with the F5 key.
- ◆ Press the ←-key or the →-key in the line where the tag of the module is displayed to change to the setup submenus of the corresponding I/O board.
- ◆ For further Informations, please contact your customer service or look at the manual of the I/O board!



## 6 System Configuration and Diagnostics

If you press the ←-key or the →-key in the line "System configuration and diagnostics..." of the "Main Menu", you will change to the following display:



From the menu "System configuration" you can change to several submenus to set up the system parameters of the platform or of the MLT analyzer. Besides you can set up or control the software and hardware configuration of the control module or the analyzer modules.

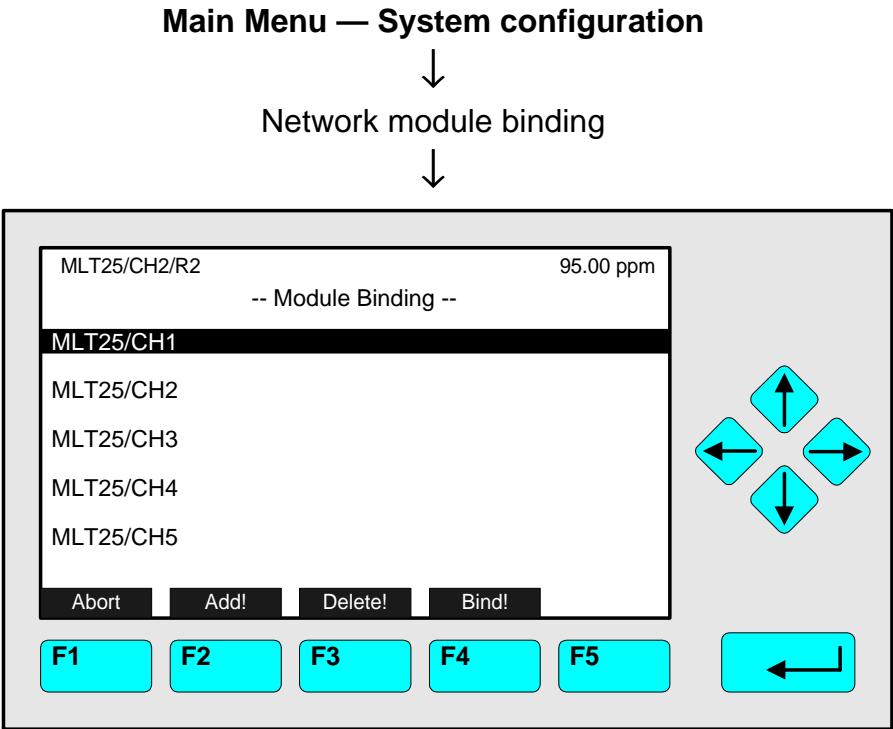
In the following table you will find a short overview about the contents of the menus and where you will find their description in this manual:

Menu	Important Contents	Section/Page
<i>System calibration...</i>	⇒ Calibration of all analyzer modules in a common process	* See Supplement!
<i>Diagnostic menus...</i>	⇒ Error messages of the control module and analyzer modules' software	* 6.1 / p. 3 to 5
<i>Date and time</i>	⇒ Date and time setup of the control module (platform or MLT analyzer)	* 6.2 / p. 6
<i>Security codes...</i>	⇒ Setup of security codes for the different operating levels	* 6.3 / p. 7, 8
<i>Network module binding...</i>	⇒ Binding of analyzer modules with micro processor controlled I/O modules, which are connected with the platform	* 6.4 / p. 9, 10
<i>System Reset...</i>	⇒ System reset of the control module and re-initializing of the network	* 6.5 / p. 11
<i>System modules...</i>	⇒ Overview of all modules connected to the control module (platform or MLT analyzer)	* 6.6 / p. 12

**Structure of chapter six:**

The structure of chapter six is analogous to the structure of chapter five: At the begin of any chapter you will find the way to a certain submenu of the MLT software, starting from the line "System configuration and diagnostics..." in the "Main Menu". The way will be described with the software catchwords, that you have to enter one after another to reach the corresponding submenu. At the end of the catchword listing you will find the illustration of the LCD screen. After that you can read the set-up instructions and explanations containing further menu pictures, if necessary.

Example: You will bind micro processor controlled modules with analyzer modules.



In the menu "Module Binding" you can bind with the analyzer modules the following types of micro processor controlled I/O modules connected to the platform:

- 1) Analog Output with 3 Alarms I/O Module
- 2) Auto Calibration I/O Module
- 3) System Auto Calibration I/O Module

You can unbind all existing bindings between ...

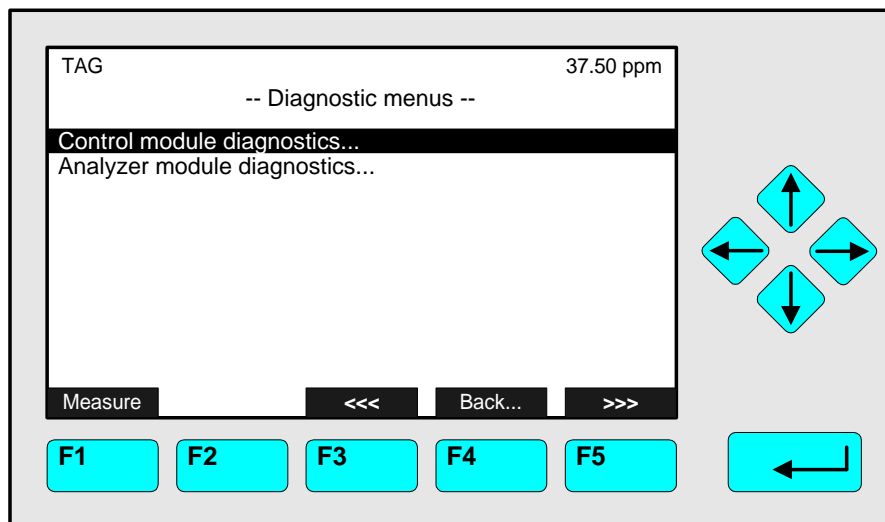
Further explanations and setup instructions will follow !

## 6.1 Diagnostic Menus

Main Menu — System configuration and diagnostics



Diagnostic menus



From the menu "Diagnostic menus" you can change to submenus, where you will find software error messages of the control module or of the analyzer module. If need be, you can remove the error messages in these menus.

### Changing to the submenus:

- ◆ Scroll with the ↑ -key or the ↓ -key to select the menu line you want.
- ◆ Press the ← -key or the → -key in the line selected to change to the corresponding submenu.

## 6.1 Diagnostic Menus

### 6.1.1 Control Module Diagnostics

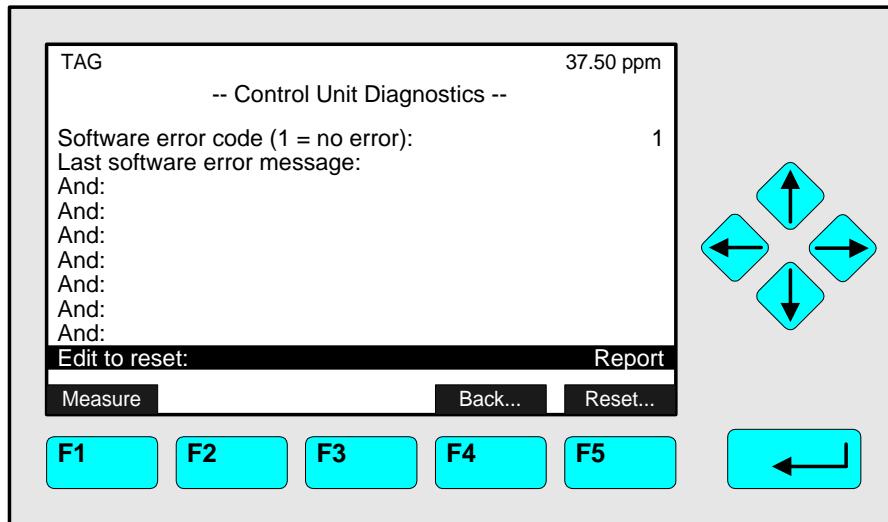
Main Menu — System configuration and diagnostics



Diagnostic menus



Control module diagnostics



In the menu "Control Unit Diagnostics" you can find software error messages of the control module. If such messages are existing, you can act in the following way:

1) Make a note of the error messages.

2) Reset the message:

- Press the ←-key or the →-key in the line "Edit to reset".
- Set up "Reset" with the ↑-key or the ↓-key and confirm it with the ←-key:  
The error messages will disappear, if their reason will not exist any longer.
- If the error messages will keep displayed:

3) System reset:

- Change to the menu "System Reset" with the F5 key (Reset...).
- Press the ←-key or the →-key in the line "System reset !" to reboot (see 6.5 p. 6-11).

4) Check the error messages:

- Go again to the menu "Control Unit Diagnostics".
- If the error messages will still exist, contact your customer service, please.
- If the error messages will be disappeared, you should set up the report status again:  
Set up "Report" in the line "Edit to reset".

## 6.1 Diagnostic Menus

### 6.1.2 Analyzer Module Diagnostics

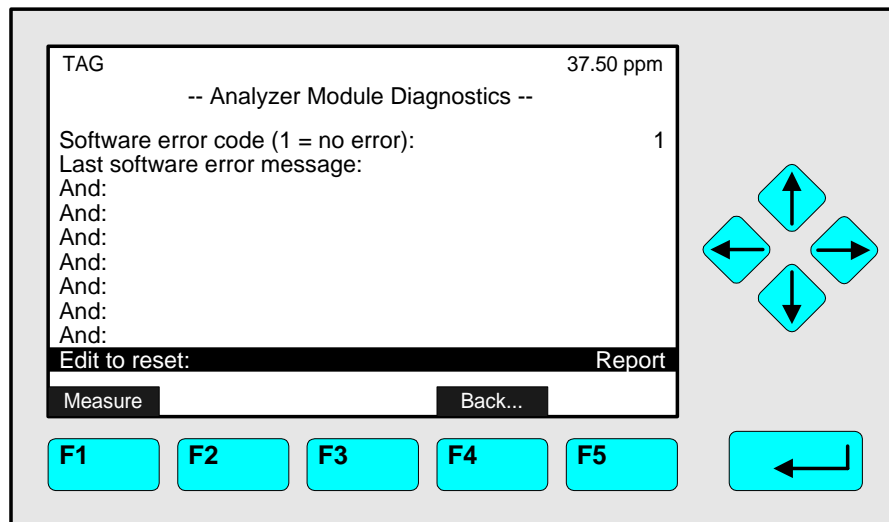
Main Menu — System configuration and diagnostics



Diagnostic menus



Analyzer module diagnostics



In the menu "Analyzer Module Diagnostics" you can find software error messages of the analyzer module. If such messages are existing, you can act in the following way:

**1) Make a note of the error messages.**

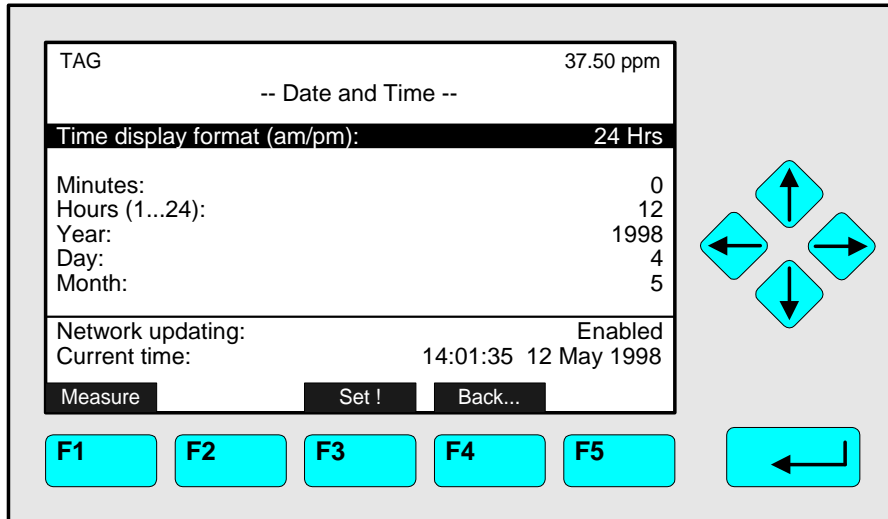
**2) Reset the message:**

- Press the ←-key or the →-key in the line "Edit to reset".
- Set up "Reset" with the ↑-key or the ↓-key and confirm it with the ←-key:  
The error messages will disappear, if their reason will not exist any longer and the parameter "Report" will appear again, automatically.
- If the error messages are still existing, contact your customer service, please.

## 6.2 Date and Time

### Main Menu — System configuration and diagnostics

↓  
Date and time  
↓



In the menu "Date and Time" you can set up the date and the time of the control module (platform or MLT analyzer).

#### Line of variables "Time display format (am/pm)":

In this line you can decide, if the time of the control module should be displayed in the 12 hours format or in the 24 hours format.

#### Line of variables "Network updating":

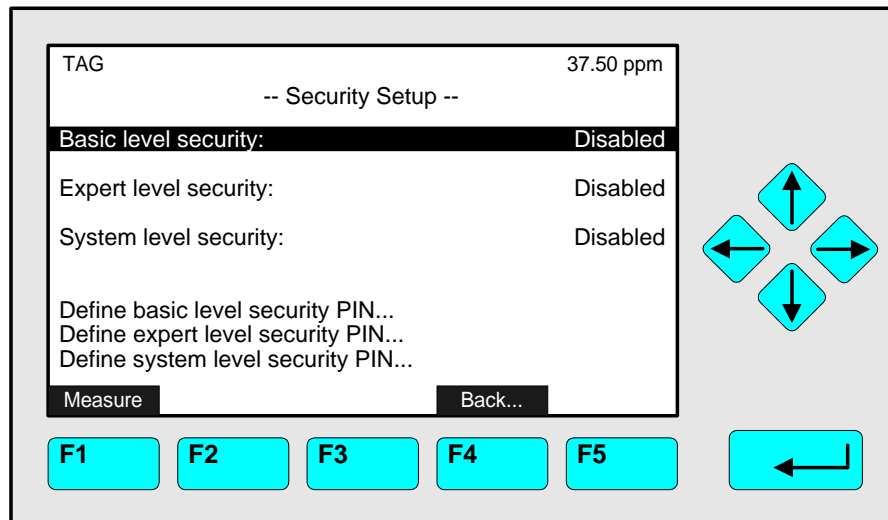
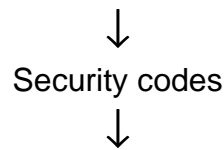
All modules combined with the control module can use its date and time setup, automatically.

#### Set up a new date or time:

- 1) Press the ← -key or the → -key in the line "Minutes", "Hours", "Year", "Day", or "Month" to select the corresponding number.
- 2) Select any digit with the ← -key or the → -key and adjust a new value with the ↑ -key or the ↓ -key.
  - Options:
    - Minutes: 0 to 59
    - Hours: 0 to 23
    - Year: manufacturing year (e.g. 1998) to 2035.
    - Day: 1 to 28/30/31 depending on the month selected
    - Month: 1 to 12
- 3) Press the F3 key to set the new date or time. The new adjustment will appear in the line "Current time". The display in this line will be refreshed every five second.



### Main Menu — System configuration and diagnostics



In the menu "Security Setup" you can enable a security code for the entering of the "Basic level" as well as for the "Expert level" and for the "System level".

**Caution:** If you enable a security code and forget it, you will not have any possibility to enter the locked level!

#### How to setup and to enable the security codes:

##### 1) Determination of the code number for the:

- "Basic level" (factory setting: 12345):
- "Expert level" (factory setting: 12345):
- "System level" (factory setting: 54321):

Go to the line

"Define basic level security PIN..." resp.

"Define expert level security PIN..." resp.

"Define system level security PIN..."

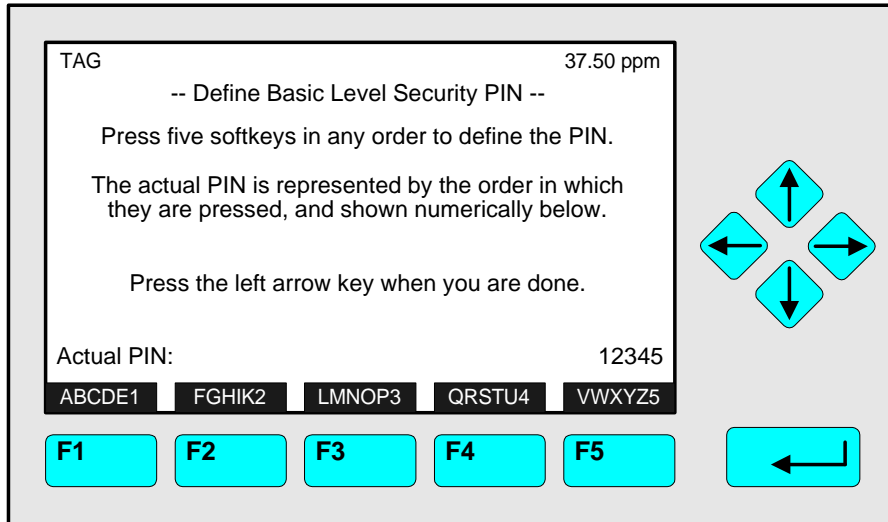
with the ↑ -key or the ↓ -key and change to the corresponding submenu with the ↵ -key or the → -key (see illustration on the next page; "basic level" as example).

- Put in the code you want with the function keys F1, ..., F5:  
The sequence of the code numbers will appear in the line "Actual PIN".
- Notes:  
"1" is attached to F1, "2" to F2 and so on. The characters displayed above the function keys will not be displayed as code numbers.  
If your input was wrong, you can repeat as often as you want until the sequence of the digits will be in your way.  
If the input of the security code is done, you can go back to the menu "Security Setup" with the ← -key.

• Example:

Security code shall be: 53412

You have to press the sequence: F5 F3 F4 F1 F2



2) **Enable the security code:**

- With the ↑ -key or the ↓ -key you can change to the line:
  - "Basic level security" to enable the code for the "Basic level".
  - "Expert level security" to enable the code for the "Expert level".
  - "System level security" to enable the code for the "System level".
- Press the ← -key or the → -key to select the parameter and adjust "Enabled" with the ↑ -key or the ↓ -key. Confirm it with the ↵ -key.

3) **Change to a level locked by security code:**

- Go back to the "Main Menu", for instance with F4 (two times).
- Try to change to the locked level via the corresponding menu line with the ← -key or the → -key:
  - A menu page will appear with the invitation to enter the security code. In the line "Input" you will find the setup "Ready".
- Enter the security code with the right sequence of function keys:
  - The symbol "\*" will appear in the line "Input" for each input.
  - If the code is wrong, "Ready" will appear again in this line. Then you cannot change to the locked level.
  - If the code is correct, the display will change automatically to the locked level after the last digit of the code will be entered.

**Note:**

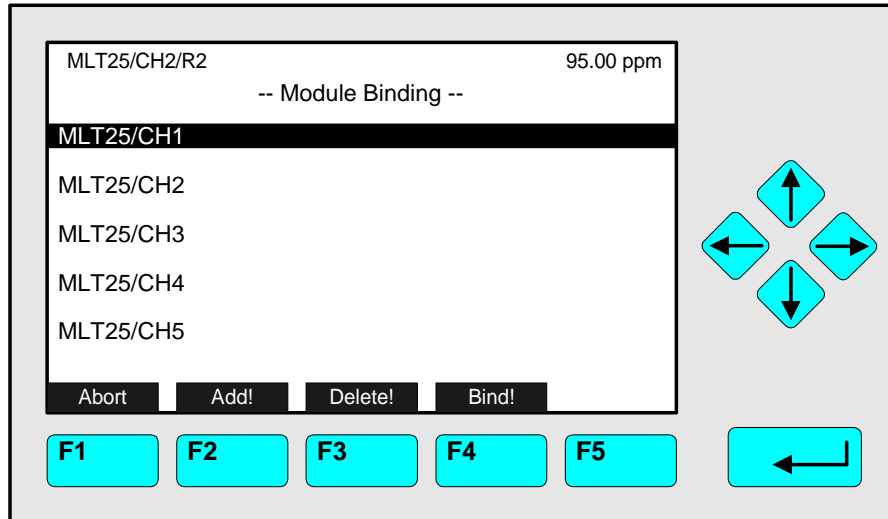
If you have entered a level by security code, this level will be unlocked generally. If you want to enter this level only by security code, you have to press the F4 key (Lock...) in the "Main Menu" after each return from the specific level!

## 6.4 Network Module Binding

Main Menu — System configuration and diagnostics



Network module binding



In the menu "Module Binding" you can bind with the analyzer modules the following types of micro processor controlled I/O modules connected to the platform:

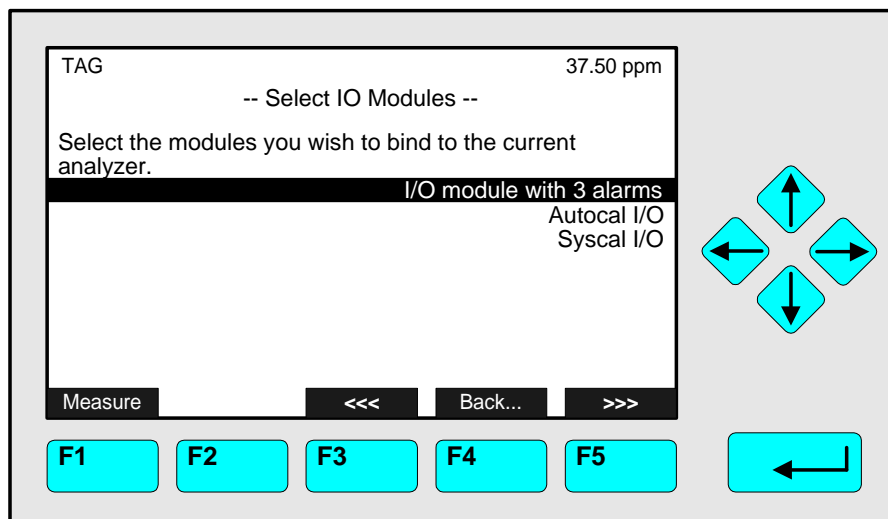
- 1) Analog Output with 3 Alarms I/O Module
- 2) Auto Calibration I/O Module
- 3) System Auto Calibration I/O Module

You can unbind all existing bindings between the analyzer module and the I/O modules, if you press the F3 key (Delete!)

### Module binding:

#### 1) Selecting the channel:

- Change to the line you want with the ↑ -key or the ↓ -key.
- Press the ↵ -key or the → -key resp. the F2 key (Add!) to change to the submenu "Select IO Modules":

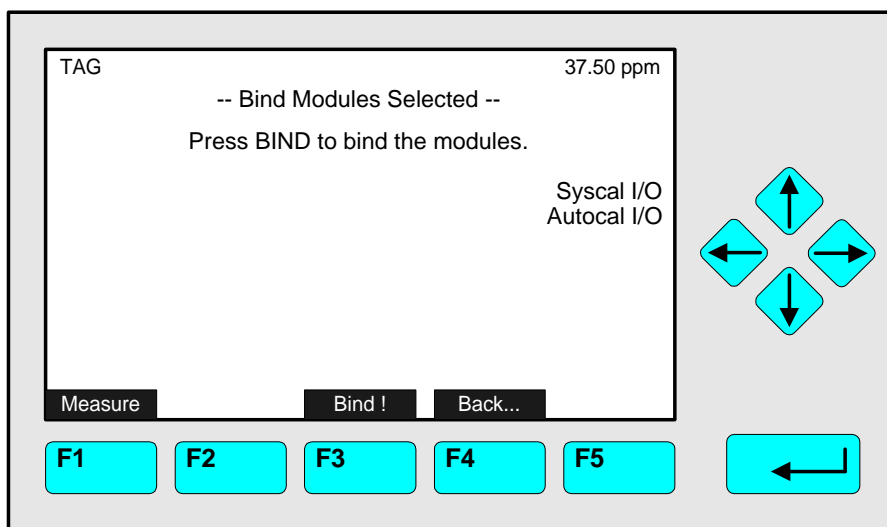


## 2) Selecting the I/O module:

- Change to the line you want with the ↑ -key or the ↓ -key.  
If there are more than eight unbound I/O modules available, you can change to another menu page with the F5 key (>>>).
- Press the ← -key or the → -key to select the tag of the I/O module:  
The display will go back to the menu "Module binding" automatically.
- Repeat the steps 1) and 2) as often as necessary until all modules you want to bind will be selected.

## 3) Binding:

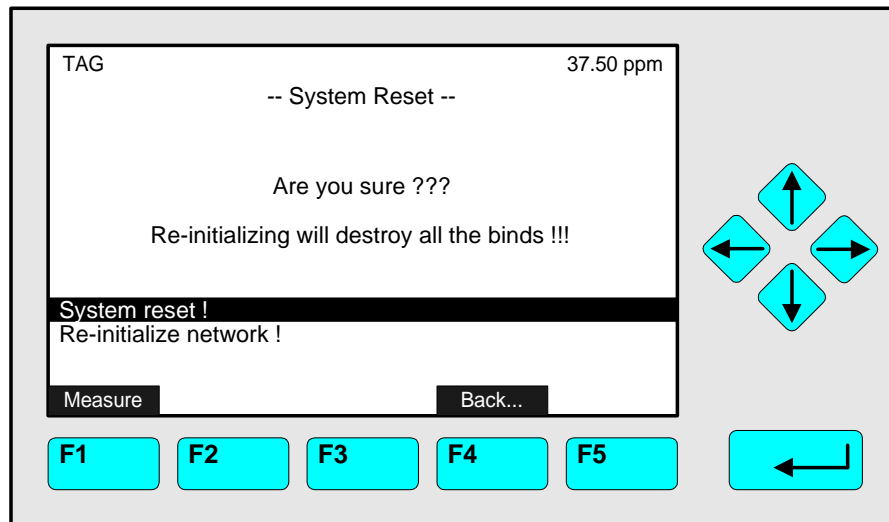
- Press the F4 key (Bind!) to change to the submenu "Bind Modules Selected":



- Press the F3 key (Bind !) to bind the modules selected:  
The control module will change to the initializing mode and the binding will be done automatically.

### Main Menu — System configuration and diagnostics

↓  
System Reset



You can start the following functions in the menu "System Reset":

#### 1) System Reset:

- The MLT analyzer or the platform will change to the initializing mode automatically, if you press the ← -key or the → -key in the line "System reset !":  
This reboot is analogous to the switching on of the control module.

#### 2) Re-initialize network:

- Change to the line "Re-initialize network!" with the the ↑ -key or the ↓ -key.
- Press the ← -key or the → -key to start this function.

#### Caution:

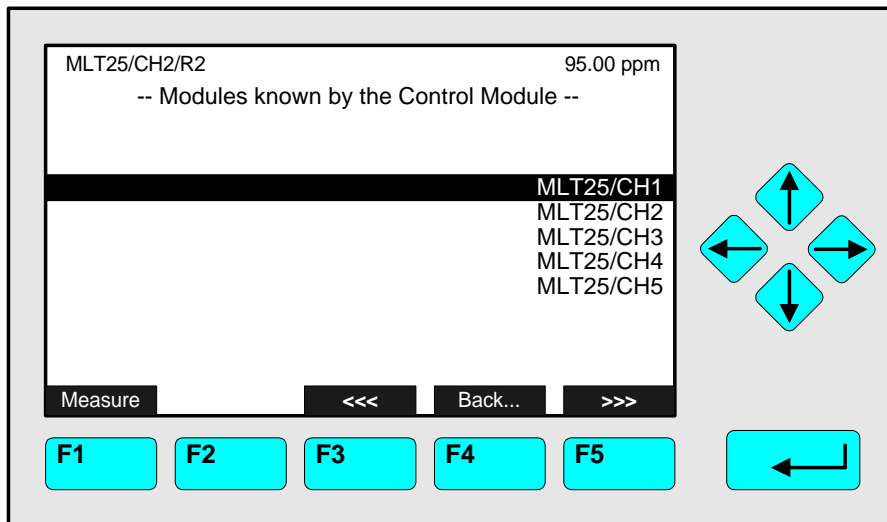
- ◆ With the function "Re-initialize network !", you will delete all bindings between analyzer modules and I/O modules.
- ◆ All configuration data of the SIO and DIO modules will disappear!

## 6.6 System Modules

Main Menu — System configuration and diagnostics



System modules



In the menu "Modules known by the Control Module" you will find the tags of all modules combined with the platform or the MLT analyzer. If there are more than eight modules available, you can change to another menu page with the F5 key (>>>).

### Set up:

- ◆ Go to the line you want with the ↑ -key or the ↓ -key.
- ◆ Select the tag of the module with the ← -key or the → -key:
  - The display will change automatically to the menu "Analyzer Module Calibration" (see 4.4 p. 4-37 or 5.1.1 p. 5-13 to 5-15) of the corresponding channel.
  - Then, all menus of the module selected will be available.

## Main Menu — Display controls



TAG 37.50 ppm  
 -- Display Controls --  
 Brightness: 74 %  
 Contrast: 23 %  
 Switch automatically to "Measure" after: 10 Min  
 Measure Back... More...  
 F1 F2 F3 F4 F5



TAG 37.50 ppm  
 -- Front Panel Control --  
 Maximum total number of digits: 4  
 Digits after the decimal point: 2  
 Measure Back... More...  
 F1 F2 F3 F4 F5



TAG 37.50 ppm  
 -- Auxiliary Lines --  
 First auxiliary line: Enabled  
 Second auxiliary line: Enabled  
 Third auxiliary line: Enabled  
 Fourth auxiliary line: Enabled  
 First line source...  
 Second line source...  
 Third line source...  
 Last line source...  
 Measure Channel Back...  
 F1 F2 F3 F4 F5

In the menu "**Display Controls**" you can set up several display parameters of the front panel. With the F5 key (More...) you can change to the menu "**Front Panel Control**", where you can set up the number of digits for the display of the measurement values. These numbers do not alter the accuracy of measurement.

From the menu "Front Panel Control" you can change via the F5 key to the menu "**Auxiliary Lines**". There you can enable or disable each of the last four lines of the single component display for the current channel. To change to further available channels you have to press the F3 key.

## The menu "Display Controls"

### Set up parameters:

- ◆ Select any line of variables with the ↓ -key or the ↑ -key.
- ◆ Select the variable with the ← -key or the → -key.
- ◆ Select any digit with the ← -key or the → -key and adjust a new value with the ↑ -key or the ↓ -key  
resp. select the whole parameter with the ↑ -key or the ↓ -key.
- ◆ Confirm the new value with the ↵ -key or  
cancel and go back to the last value with the F2 key.

### Lines of variables "Brightness" and "Contrast":

In these two lines you can determine the quality of the LCD reproduction. The best values depend on your position to the screen and on the light of the environment.

- ◆ Options: 20 to 100% for LCD brightness and 10 to 80% for LCD contrast.
- ◆ Usually: 70 to 90% (brightness) and 20 to 30% (contrast).
- ◆ **Caution:** Be careful with the changing of these values! Perhaps you can not read the display any longer if you use very extreme values!  
You have only two possibilities to reset the display to factory settings:

- 1) Change to the multi component display by pressing the F1 key twice.  
In the multi component display you have to press the F5 key (LCDReset).
- 2) Restart your analyzer and press the F1 key (LCDReset) while the initializing is running.

### Line of variables "Switch automatically to 'Measure' after":

In this line you can decide if and after which time without front panel operations the display shall change from the current menu to the single component display.

Options: 10s, 30s, 1min, 5min, 10min, 30min, Never.



### The menu "Front Panel Control"

#### Set up the number of digits:

- ◆ Select one of the two lines of variables with the ↓ -key or the ↑ -key.
- ◆ Select the number with the ← -key or the → -key.
- ◆ Select the digit with the ↑ -key or the ↓ -key.  
Options: Maximum total number of digits: 3, 4, 5, 6  
 Digits after the decimal point: 0, 1, 2, 3.
- ◆ Confirm the new value with the ← -key or cancel and go back to the last value with the F2 key.

#### *Example:*

- ◆ Measured number: 1.2345
- ◆ Select 3 for total number of digits and 2 for digits after decimal point.
- ◆ The screen will display: 1.23

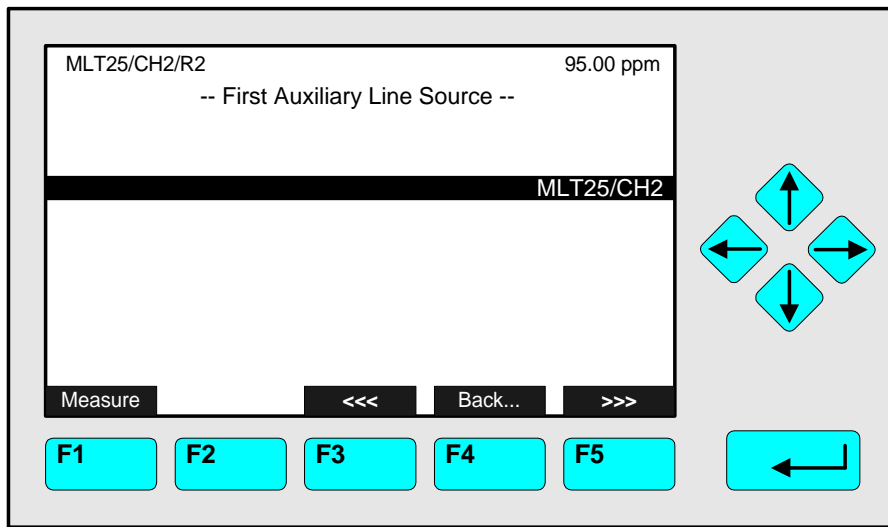
### The menu "Auxiliary Lines"

#### Set up parameters:

- ◆ Select any line of variables or any menu line with the ↓ -key or the ↑ -key.
- ◆ Select the variable or change to the submenu with the ← -key or the → -key.
- ◆ Select "Enabled" or "Disabled" with the ↑ -key or the ↓ -key to enable or disable the corresponding auxiliary line in the single component display of the current channel.
- ◆ Confirm your setup with the ← -key or cancel and go back to the last one with the F2 key.

#### Choose the source module for the auxiliary lines:

Via the corresponding menu line you can change to a submenu, where you can select the source module for the first/second/third or fourth line of the single component display. The tags of all modules combined with the platform or MLT analyzer will be available:



- ◆ Select the line you want with the ↑ -key or the ↓ -key.  
If there are more than eight modules available, you can change to another menu page with the F5 key.
- ◆ Press the ← -key or the → -key to enable the module selected as line source:  
The display will go back to the menu "Auxiliary Lines", automatically.  
The selection will be done.

**Note:**

To select the measurement parameter for each auxiliary line of the single component display, you have to change to the menu "Measurement Display Configuration" of the "Analyzer and I/O-module expert configuration" (see section 5.1.8 p. 5-49).

**A**

AK Communication Protocol 5-72, 5-82,5-89

Alarms 4-13

acknowledgement 5-22

delay 5-22

setup 5-21...24

Analog Output(s)

fine adjustment 5-71, 5-88

holding 5-9/10

setup 5-69...71, 5-85...88

tracking 5-9/10

with 3 alarms I/O module 1-1, 5-99 ,6-9

Analyzer 1-1...3, 3-1

Analyzer Channel Status 4-3, 5-16

Analyzer Module 1-1, 3-1

calibration 4-1, 5-15...19

data 3-5/8

diagnostics 6-5

events 4-15

I/O modules 5-67

reset 5-65

setup 5-3...82

tags 5-49/51

Auto Calibration I/O Module 1-1, 5-99, 6-9

Autoranging 5-26/29/30

Auto-Start Procedures 4-32, 5-13

Auxiliary Lines 7-1...4

Averaging Time 5-80

**B**

Basic Controls 4-1

Binding

network module 6-9

Brightness (LCD) 7-1/2

**C**

Calculator 5-45...48

program 5-47

Calibration 5-15...19

all channels 5-18/19

analyzer module 4-1, 5-15...19

deviations 4-38, 5-8, 5-17

parameters 5-5...20

procedure setup 5-9...11

procedure status 4-37, 5-17

span gas 4-43, 5-15...19

time controlled 5-12

zero gas 4-39, 5-15...19

Channel 3-1/2/4

change of 4-33/35

Codes

function 5-78

security 6-7

signal 5-38...40, 5-75...77

Communication Protocol 5-72, 5-82, 5-89

Compensation

interference 5-31/32

pressure 5-60

Component

multi component display 4-35

single component display 4-33, 5-49, 7-2

Concentration

measurement parameters 5-54

peak measurement 5-55

span gas 5-6

zero gas 5-20

Configuration

DIO module inputs 5-94

hardware 3-8

loading and saving 5-4, 5-64

measurement display 5-49

relay outputs 5-73, 5-90

system 6-1

Confirmation Menus Display 5-49

Constants 5-47

Contrast (LCD) 7-1/2

Control Module 1-1

data 3-5/8

diagnostics 6-4

Conversion factor

"ppm → mg/Nm<sup>3</sup>" 5-6, 5-54

Cross Interference Compensation 5-31/32

## **D**

- Date and Time 6-6
- Delay Time 5-80
- Deviations 4-38, 5-8, 5-17
- Diagnostic(s)
  - analyzer module 6-5
  - control module 6-4
  - menus 6-3
- Differential Measurement 5-57/58
- DIO Module 1-1, 5-74, 5-93
  - function codes 5-78, 5-95
  - inputs 5-74, 5-94
  - outputs 5-74, 5-96
- Display 3-1/2/4
  - confirmation menus 5-49
  - controls 7-1/2
  - measurement display config. 5-49
  - multi component 4-35
  - resolution 5-49/50, 7-1...3
  - single component 3-1/2, 4-33, 5-49, 7-2

## **E**

- Events 4-15, 5-52

## **F**

- Failures 4-5, 4-19, 5-52
- Flow
  - gas 5-50, 5-59
  - measurement 5-62
  - sample gas 4-55
  - span gas 4-51
  - test gas 4-59
  - unit 5-62
  - zero gas 4-47
- Front Panel 1-1
  - control 7-1...3
- Function 3-2
  - codes 5-78
  - controls 4-11, 4-27, 5-52
  - line 3-3
  - softkey 3-3
  - starting 3-6

## **G**

- Gas flow 5-50, 5-59

## **H**

- Hardware Configuration 3-8
- Hours of Operation 4-3, 5-52

## **I**

- Initialize Network 6-11
- Initializing 3-1
- Input Number (DIO) 5-74, 5-94
- Inputs and Outputs 5-67...78, 5-83...98
- Interference Compensation 5-31/32
- I/O Module 1-1
  - controls 5-83...98
  - DIO 5-74, 5-93
  - micro processor controlled 5-99, 6-9
  - setup 5-99
  - SIO 5-68, 5-84
  - with three alarms 1-1, 5-99, 6-9

## **K**

- Keyboard 3-2

## **L**

- LCD 7-1...3
- Linearization 5-33...36
- Lines 3-3
- Load/Save Analyzer Module Config. 5-64
- Local DIO 1-1, 5-67, 5-74
- Local SIO 1-1, 5-67...73
- Lower Explosion Limit (LEL) 5-54

**M**

- Main Menu 3-7
- Maintenance Requests 4-7, 4-23, 5-52
- Manual Pressure 5-60/61
- Manufacturing Data 3-5/7/8
- Measure 3-4
- Measurement(s) 4-13
  - differential 5-57
  - peak 5-55/56
- Menu
  - line 3-3
  - main 3-7
  - softkey 3-3
  - structure 2-1
- Mini Bargraph 5-49/50
- Modbus RTU Comm. Protocol 5-72, 5-89
- Module(s)
  - analyzer module 1-1...3
  - binding 6-9
  - control module 1-1...3
  - identification tag 5-51
  - manufacturing data 3-5/7/8
  - system 6-12
- Multi component display 4-35

**N**

- Network, initialize 6-11
- Network Module Binding 6-9

**O**

- Operational Settings 4-31
- Output Number
  - DIO 5-74, 5-96
  - SIO 5-69, 5-90

**P**

- Peak Measurement 5-55/56
- Platform 1-1...3
- "ppm → mg/Nm<sup>3</sup>"
  - conversion factor 5-6, 5-54
- Pressure 5-60
- Procedures, Auto-start 4-32, 5-13
- Programmable Calculator 5-45...48
- Programmable
  - Logic Control (PLC) 5-37...43
- Protocol 5-72, 5-82, 5-89
  - AK-communication
  - modbus RTU communication
- Purge Time 5-9

**R**

- Range(s) 5-25...30
  - autoranging 5-26, 5-29/30
  - begin of 5-27
  - control 5-25/26
  - end of 5-27
  - number 5-25/26
  - parameters 5-25...30
  - span 5-11
  - tag 5-51
- Reference Pressure 5-60
- Relay Output
  - auxiliary SIO 5-90...92
  - local SIO 5-73
- Remote Control 5-82
- Reset
  - analyzer module 5-65
  - system 6-11
- Response Time 5-28

## **S**

- Sample Gas
  - flow 4-55
  - pressure 5-81
  - unit 5-54
- Save/Load Analyzer Module Config. 5-64
- Security Codes 6-7
- Sensor Value 5-60
- Serial Interface
  - load/send configuration 5-64
  - setup 5-72, 5-89
- Signal
  - codes 5-38...40, 5-75...77
  - on mini-bargraph 5-49/50
- Single Component Display 3-1, 4-33, 5-49
  - auxiliary lines 7-1...4
- SIO Module 1-1...3, 5-68, 5-84
  - analog output 5-69, 5-85
  - auxiliary 5-84
  - local 5-68
  - relay output 5-73
  - serial interface 5-72, 5-89
- Softkey 3-3
- Span Gas
  - calibration 4-43, 5-15...19
  - concentration 5-6
  - definition 5-6
  - flow 4-51
  - "ppm → mg/Nm<sup>3</sup>" conversion factor 5-6
  - pressure 5-81
  - ranges 5-11
  - unit 5-6
- Stability Time 5-9/10
- Stability Tolerances 5-7
- Starting and Initializing 3-1
- Status 3-4
  - analyzer channel 4-3, 5-16
  - calibration procedure 4-37, 5-17
  - details 4-5...30
- Switch Level Hysteresis 5-30
- System Auto Calibration
- I/O Module 1-1, 5-99, 6-9

## **System**

- modules 6-12
- reset 6-4, 6-11
- tag 6-1

## **T**

- Tag
  - channel 3-2
  - range 5-49/51
  - system 6-1
- Temperature 5-63
- Test Gas 4-59, 5-15/16
- Time and Date 6-6
- Time Controlled Calibration 5-12
- Tolerances 5-7
- T<sub>90</sub>-Time 5-28

## **U**

- Units
  - calculator results 5-47
  - flow 5-62
  - pressure 5-60/61
  - sample gas 5-54
  - span gas 5-6
  - temperature 5-63
- Upper Explosion Limit (UEL) 5-54

## **V**

- Valve(s)
  - close all 4-63
  - position 5-12
- Variables, line of 3-3

## **Z**

- Zero Gas
  - calibration 4-39, 5-15...19
  - concentration for all ranges 5-20
  - flow 4-47

# **NGA-2000**

## **Software Manual**

### **Supplement: System Calibration**

**NGA-Software Version 3.2.X**

## Table of Contents

<b>1 Introduction</b>	<b>2</b>
<b>2 Valves for system calibration</b>	<b>4</b>
2.1 Assigning an output-port to a system valve	4
<b>3 Operating System Calibration</b>	<b>6</b>
3.1 Set-up analyzer modules	7
3.2 Programming Calibration Sequences	9
3.3 Set-up general parameters	11
<b>3.4 Controlling System Calibration</b>	<b>13</b>
3.4.1 Control via menu system	14
3.4.2 Control System Calibration by LON-Variables	17
3.4.3 Control System Calibration by Programmable Input	18
3.4.4 Control System Calibration by AK-protocol command	20
3.4.5 Time controlled System Calibration	21
3.5 Calibrate single Analyzers	23
<b>4 Functionality</b>	<b>24</b>
4.1 Gas flow	24
<b>4.2 Running system calibration</b>	<b>25</b>
4.2.1 Filling sequence buffer	26
4.2.2 Before starting actions	28
4.2.3 Control of actions	28
4.2.3.1 Switch valves	28
4.2.3.2 Wait for Purging	28
4.2.3.3 Zero Calibration	29
4.2.3.4 Span Calibration	29
4.2.3.5 Wait for Finishing Calibration	30
4.2.4 Finishing System Calibration	30
<b>4.3 Running Single Analyzer Calibration</b>	<b>31</b>
<b>4.4 Holding analog outputs of the SIO and avoid limit violation alarms</b>	<b>32</b>



## 1 Introduction

In opposite to the possibility to zero and span each analyzer module (MLT channel) individually and independently from the others, **System-Calibration (SYSCAL)** allows to combine the calibration procedures of all into a common process.

This is been achieved with a special assignment of the valves. The idea is not longer to require for each gas of each analyzer an own valve.

Instead of we have a pool of valves. The valves of this pool can be assigned to the different gases of the analyzers. That also means different analyzers can share the same valve for their gases, e. g. for span gas mixtures or a common zero gas valve for several channels. So we have the possibility to reduce the number of valves and also the consumption of calibration gases.

The program, which will allow this, runs on the CM (Control Module) and needs programmable I/O's (Input/ Output Modules SIO or DIO).

SIO: Standard I/O Module

DIO: Digital I/O Module

SIO and DIO can be located in a platform, an MLT or a TFID analyzer.

The displayed menus are also inscripted with the appropriate LON-Variables.

## 2 Valves for system calibration

Before using the system calibration we have to put together the required valve pool. There are in principle three types of I/O modules supporting this:

- DIO - 24 digital outputs / 8 digital inputs (max. 4 DIO modules per platform or 2 per MLT/TFID analyzer)
- SIO - 3 digital outputs (max. 1 SIO module per CM)
- [CVU - 4 digital outputs (max. 4 modules per CM)]

Software supports up to 32 system valves. SIO and DIO are available, the control valve unit (CVU) is in progress.

### 2.1 Assigning an output port to a system valve

Assigning of an output can be accomplished by using the menus for selected output module (DIO, SIO or CVU).

There we have to select the NGA Control Module as the Source Module. Control module then provides the signals for system valve V1...V32.

For example the DIO:

Analyzer and I/O-module expert configuration...



DIO module(s)...

- DIO-MODULE OUTPUTS-	
Inputs...	
Choose module...	
Choose signal...	
Module status:	NORMAL
Slot ID:	1
Signal level:	OFF
Signal comes from:	NGA Control Module

DIOOUTNUMC

DIOOUTINVC

DIOMODSTAC

DIOSLOTIDC

DIOOUTSIGC

DIOOUTSTATC

DIOOUTSRCC

There we have to

- select "Outputnumber"
- then choose „NGA Control Module“ as module
-

It is also possible to configure the DIO-outputs via LON-Variables (i.e. SLTA-adapter or AK-protocol).

Therefore is the LON-variable "DIOOUT\_ENTRYSIG" which corresponds to DIOOUTSIGC and evaluates enum-values of ST1NAME (enum-values 0..19), ST2NAME (enum-values 20..39) or ST3NAME (enum-values 40..59).

For digital output we have to setup variables in following order.

1. DIOSLOTIDC
2. DIOOUTNUMC
3. DIOOUTSRCC
4. DIOOUT\_ENTRYSIG
 

SYS: VALVE-1	= 20	(enum-value in ST2NAME)
SYS: VALVE-2	= 21	
.	.	
.	.	
.	.	
SYS:VALVE-32	= 51	(enum-value in ST3NAME)

For each needed system valve we have to repeat these appropriate selections.

It is also possible to distribute the system valves onto different output modules.

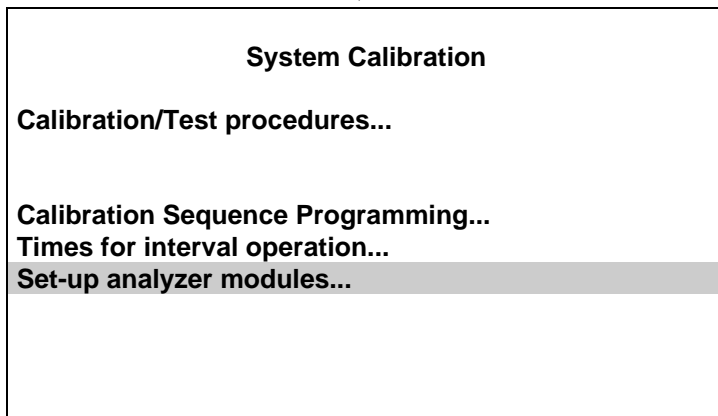
### 3 Operating System Calibration

Because there are many possibilities how to use SYSCAL it must be configured through the Expert Operator. There we can find the menu „System Calibration“ from were we can do the required setups and start routines.

System configuration and diagnostics...



System calibration...



Meaning of displayed menu points:

- Calibration/Test procedures...: starting and stopping of system calibration and test procedures
- Calibr. Sequ. Programming...: programming of user defined calibration sequences
- Times for interval operation...: setting up of automatically started system calibrations
- Set-up analyzer modules...: include and setup different analyzer modules into system calibration

### 3.1 Set-up analyzer modules

Before we can run any system calibration features we have to include the different analyzer modules (**AM's**) into system calibration by setup needed parameters. Only after correct setting up, an AM is included into system calibration and only then it makes sense to go into the other menus.

System configuration and diagnostics...



System calibration...



Set-up analyzer modules...



Analyzer Set up		
Choose analyzer module....		
Gas type:	SPANGAS-1	SCAMGAS
Assigned to system valve:	V5	SCVALVE
Purge time:	20 s	SCPURGE
Note: Ranges are always calibrated separately !		
<hr/>		
Analyzer module:	MLT/CH2	SCMODULE
Module enabled for system-cal:	NO	SCCONTROL
View...		

Setting up an AM for system calibration means **assigning valves from system valve pool**. The Control Module provides support of up to **32 system-valves** V1....V32. We have to decide which valves deliver which gases for an analyzer module. Also we have to know the purge time from a valve to the AM/ MLT channel.

For each of the following types in the parameter „Gas type“ we have to assign a valve and the appropriate purge time :

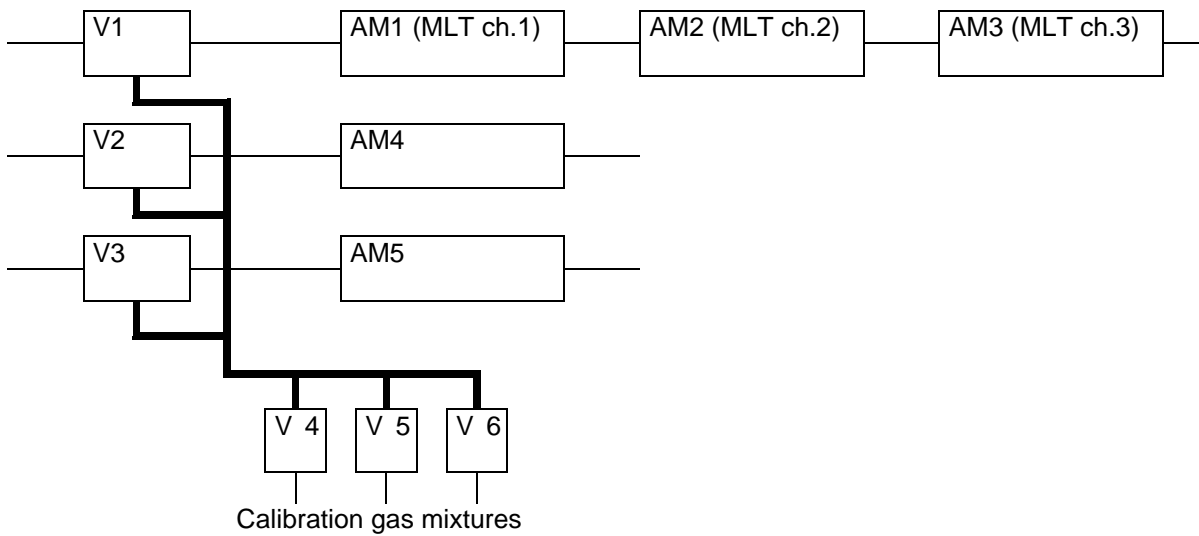
- SAMPLE-GAS
- ZERO-GAS
- SPANGAS-1 (span gas for range 1)
- SPANGAS-2 (span gas for range 2)
- SPANGAS-3 (span gas for range 3)
- SPANGAS-4 (span gas for range 4)

Conditions for the valve assignment:

- **Once a valve has been assigned to be a sample gas valve for any AM it must not be used for zero or span gases !**
- **The zero valve of an AM can not be a span valve of the same AM.**
- **All gas types have to be assigned to a system-valve.**
- **TFID has internal valves to be assigned separately as system valves!**

## NGA-2000 System Calibration

Example for an NGA analyzer system:



Appropriate assignment:

	AM1/Ch.1	AM2/Ch.2	AM3/Ch.3	AM4	AM5
SAMPLE-GAS	V1	V1	V1	V2	V3
ZERO-GAS	V4	V4	V5	V5	V6
SPANGAS-1	V5	V5	V4	V6	V5
SPANGAS-2	V5	V5	V4	V6	V5
SPANGAS-3	V6	V5	V4	V4	V4
SPANGAS-4	V6	V5	V4	V4	V4

**Attention:** Take in mind that any MLT channel is regarded as AM in this case!  
 Take care that for TFID separate valves are chosen which are not related to other AM's or MLT channels (internal TFID valves only)!

This assigning procedure is to perform for all analyzer modules which should be included in system calibration.

To display the assigned valves and purge times for each AM we can push the softkey „View“.

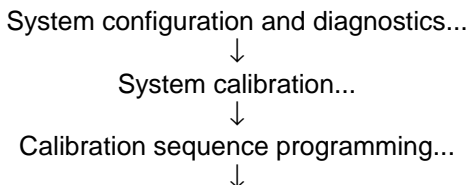
If we want to **exclude an AM from SYSCAL** we can do this by **entering an invalid valve**. We can watch in the **display** whether an **AM/channel is enabled for system calibration**.

**Attention:** Remember to assign a system valve to an output-port!

### 3.2 Programming Calibration Sequences

Beside the standard programs „zero calibration“ and „zero/span calibration“ it is possible to run the system calibration in an user definable order of up to 40 steps.

The menu to set-up this feature looks as follows.



-- Calibration Sequence Programming --		
<b>Step #:</b>	<b>1</b>	<b>SCSTEP</b>
<b>Calibration procedure type:</b>	<b>ZERO-CAL</b>	<b>SCCALTYPE1</b>
<b>Choose specific analyzer module...</b>		
<b>Select all analyzer modules!</b>		
<b>Program steps 1-10...</b>		
<b>Program steps 11-20...</b>		
<b>Program steps 21-30...</b>		
<b>Program steps 31-40...</b>		
<hr/>		
<b>Analyzer-module:</b>	<b>MLT/CH3</b>	<b>SCSTEPMOD</b>

For programming the sequence you must

1. select „Step #“
2. select „Calibration procedure type“
3. select analyzer module/ MLT channel

Repeat this order for all program steps.

The programmable „Calibration procedure types“ are:

- |                  |   |
|------------------|---|
| 1. NoOp          | no operation (for deleting a step in an existing program) |
| 2. Zero-Cal      | do a zero calibration                                     |
| 3. Span-Cal      | do a span calibration for all available ranges            |
| 4. Zero/Span-Cal | do a zero cal then a span cal for all available ranges    |
| 5. Span1-Cal     | do a span calibration only for range #1                   |
| 6. Span2-Cal     | do a span calibration only for range #2                   |
| 7. Span3-Cal     | do a span calibration only for range #3                   |
| 8. Span4-Cal     | do a span calibration only for range #4                   |
| 9. END-OF-PGRM   | end of sequence   |

## NGA-2000 System Calibration

For each step we have the choice to select a specific AM or to activate the step for all enabled AMs.

After the program is input, the appropriate menu can give an overview of the current program:

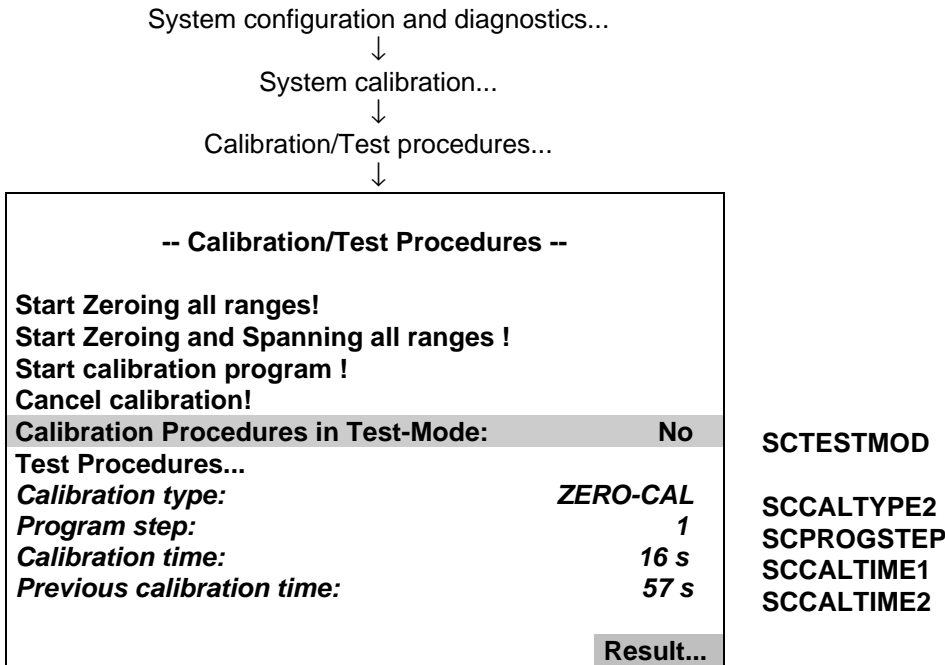
**-- Calibration Sequence Program --**

<b>Step #1:</b>	<b>Zero-Cal:ALL</b>
<b>Step #2:</b>	<b>Span-Cal: FID</b>
<b>Step #3:</b>	<b>Span-Cal: CLD</b>
<b>Step #4:</b>	<b>Span1-Cal:MLT/CH1</b>
<b>Step #5:</b>	<b>Span2-Cal:MLT/CH1</b>
<b>Step #6:</b>	<b>Span3-Cal:MLT/CH1</b>
<b>Step #7:</b>	<b>Span4-Cal:MLT/CH1</b>
<b>Step #8:</b>	<b>Span3-Cal:MLT/CH2</b>
<b>Step #9:</b>	<b>END-OF-PROGRAM</b>
<b>Step #10:</b>	<b>END-OF-PROGRAM</b>



### 3.3 Set-up general parameters

One general parameter is "Calibration Procedures in Test-Mode". It is located in the menu "Calibration/Test procedures".

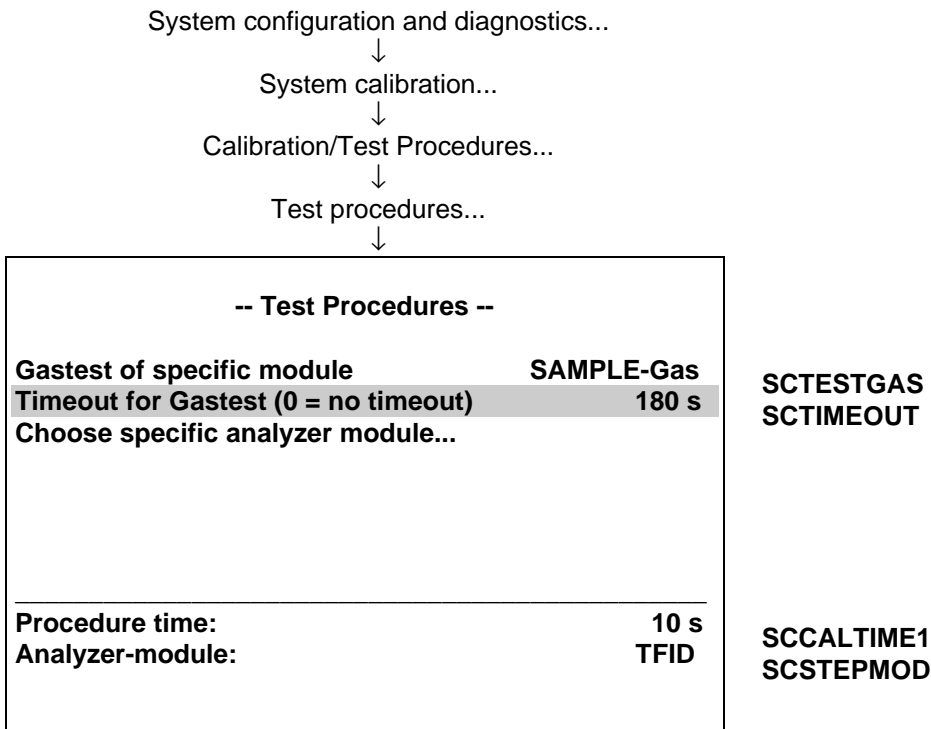


With this parameter we can **run all the calibration procedures** either **in the defined mode or in a test mode** (set test mode to „Yes“). The test mode means that the valve switching and waiting for purge times is done in the same manner like in the normal calibration procedure.

The only **difference is** that the single **calibrations** of the modules and the appropriate times the modules would need for the calibration **are not done**.

## NGA-2000 System Calibration

A further general parameter is "Timeout for Gastest". It is located in the menu "Test procedures".



This parameter is related to the possibility to activate a gas valve of a specific module for test purposes. Here we can determine a time after which an **activated gastest** automatically switches **back onto SAMPLE-Gas**.

Is this parameter set to "0" **no automatic back switching** is done.

### 3.4 Controlling System Calibration

After setting-up there is the possibility to start 3 different modes:

- system zero-calibration:* In this mode a zero-cal of all modules, which are enabled for SYSCAL, will be performed. The order of modules depends on purge time for zero-valves because the whole calibration is time optimized.
- system zero/span-calibration:* In this mode will be performed a zero-cal and a span-cal for every enabled AM. The order of calibration is optimized to have a minimum of calibration time. The only condition is to have for each AM first the zero-cal and after this the span-cal. With zero-cal an AM is zeroed with all ranges together, the span-cal is done separately for all available ranges. A range is available if its span-gas value is > 0.0.
- user defined sequence program:* In this mode the user is responsible for the optimization. See setup of this mode.
- gas test:* It is also possible to switch for test purposes onto a special gas of a specific module. A calibration is not done.

Any mode can be started by the following instances:

- Manually by operator interaction
- Triggered by programmable input (DIO)
- AK-protocol command
- Programmed time-automatic (no gas test possible!)
- LON-Variable CMFUNC

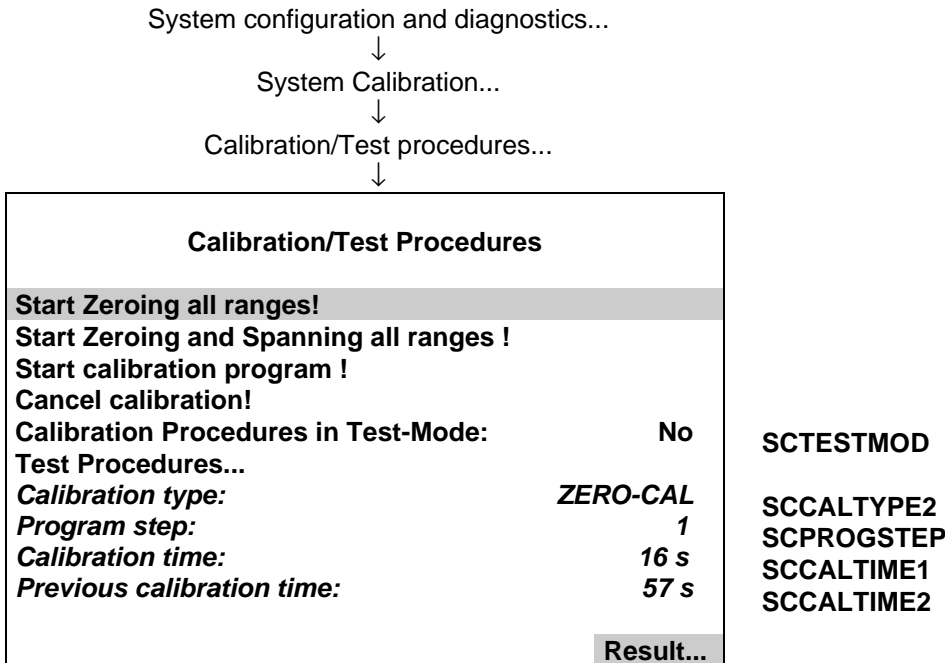
It is also possible to cancel a running system calibration. This can be done by the following instances:

- Manually by operator interaction
- Triggered by programmable input (DIO)
- AK-protocol command
- LON-Variable CMFUNC

There is no priority by which way SYSCAL can be started. If SYSCAL was started it cannot be restarted by a further instance. Only after canceling it can be restarted.

### 3.4.1 Control via menu system

The possibility to control via menu is located in the menu page „Calibration/Test procedures“. There can be started and stopped any kind of system calibration respectively test procedure.



During a running SYSCAL there can be watched current information:

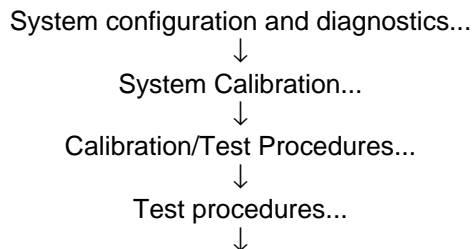
- running calibration type
- running program step of user defined program (other modes than user program show a „0“!)
- consumed calibration time
- calibration time of last valid SYSCAL

The result of calibration for included AMs is displayed in an own menu page. This can be achieved by softkey „Result...“ from different menu pages of SYSCAL.

- Calibration Results -		
<b>Choose analyzer module...</b>		
<b>Analyzer-module:</b>	CLD	SCMODULE
<b>Enabled for system-cal:</b>	No	SCCONTROL
<hr/>		
<b>Result of last run:</b>	OK	SCLRESULT
<b>Successfully calibrated ranges:</b>	1+2+4	SCVALIDITY
<b>Zero-Cal fail of any analyzer module:</b>	NO	SCRESULT1
<b>Span-Cal fail of any analyzer module:</b>	YES	SCRESULT2

Remember to run the calibration procedures as a test without actually to calibrate assert parameter "Calibration Procedures in Test-Mode" to <Yes>.

It is also possible to switch for test purposes onto a special gas of a specific module. This possibility is located in menu "Test procedures".



-- Test Procedures --		
<b>Gastest of specific module</b>	<b>SAMPLE-Gas</b>	SCTESTGAS
<b>Timeout for Gastest (0 = no timeout)</b>	<b>180 s</b>	SCTIMEOUT
<b>Choose specific analyzer module...</b>		
<hr/>		
<b>Procedure time:</b>	<b>10 s</b>	SCCALTIME1
<b>Analyzer-module:</b>	<b>MLT/CH3</b>	SCSTEPMOD

## NGA-2000 System Calibration

Here we first choose the specific analyzer module and then we select at the parameter "Gastest of specific module" the required gas.

Each of the following types is possible:

- SAMPLE-Gas (test mode deactivated)
- Zero-Gas
- All valves closed
- SpanGas-1 (span gas for range 1)
- SpanGas-2 (span gas for range 2)
- SpanGas-3 (span gas for range 3)
- SpanGas-4 (span gas for range 4)

With parameter "Timeout for Gastest" we can determine a time after which the activated gastest switches automatically back onto SAMPLE-Gas.

Is this parameter set to "0" the automatic back switching is not done automatically and user must break this mode with a "Cancel Calibration" Command.

### 3.4.2 Control System Calibration by LON-Variables

SYSCAL can also be controlled by LON-Variable CMFUNC. Setting this variable will cause the appropriate function (see following table).

CMFUNC	function which is started
1	system zero-calibration
2	system zero/span-calibration
3	user defined sequence program
4	cancel a running system calibration

We can also realize some other functionality with setting of LON-Variables. Herefore see the appropriate menu pages, where the concerned variables are documented.

For example: "Test procedures".

--Test Procedures --		
<b>Gastest of specific module</b>	<b>SAMPLE-Gas</b>	<b>SCTESTGAS</b>
<b>Timeout for Gastest (0 = no timeout)</b>	<b>180 s</b>	<b>SCTIMEOUT</b>
<b>Choose specific analyzer module...</b>		
<hr/>		
<b>Procedure time:</b>	<b>10 s</b>	<b>SCCALTIME1</b>
<b>Analyzer-module:</b>	<b>MLT/CH3</b>	<b>SCSTEPMOD</b>

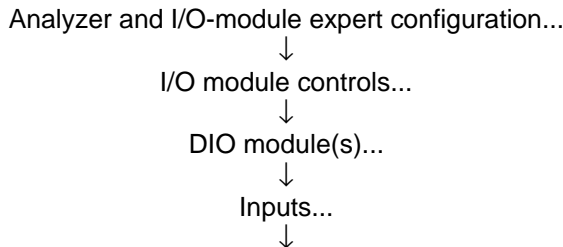
Here we have first to set variable SCSTEPMOD similar to the TAG of the requested analyzer module. Setting SCTIMEOUT will set the timeout. And setting variable SCTESTGAS to the appropriate enum-value will start the procedure.

Table of enum-values and procedures:

SCTESTGAS-function	????	Zero-Gas	SAMPLE-Gas	SpanGas-1	SpanGas-2	SpanGas-3	SpanGas-4
enum-value	0	1	2	3	4	5	6

### 3.4.3 Control System Calibration by Programmable Inputs

We can use the possibility to control SYSCAL by triggering with programmable inputs. This feature is supported by inputs of the DIO-Module. Assigning of an programmable input can be accomplished by using the menus for DIO module.



-- DIO- Module Inputs --		
<b>Inputnumber:</b>	<b>5</b>	<b>DIOINPNUMC</b>
<b>Choose module...</b>		
<b>Choose function...</b>		
<hr/>		
<b>Slot ID:</b>	<b>1</b>	<b>DIOSLOTIDC</b>
<b>Signal name:</b>	<b>SYS:Cancel-Cal</b>	<b>DIOINPSIGC</b>
<b>Signal level:</b>	<b>OFF</b>	<b>DIOINPSTATC</b>
<b>Signal comes from:</b>	<b>Control Module</b>	<b>DIOINPSRCC</b>

There we have to select

1. wanted input number
2. the appropriate module as Source Module (see following table)
3. the wanted function for system calibration

The provided functions for system calibration are:

function	source module	function (positive edge)	function (negative edge)	enum-value in STINAME
SYS:Zero-Cal	CM	start system zero-calibration	-	6
SYS:Zero/Span-Cal	CM	start system zero/span-calibration	-	7
SYS:Program-Cal	CM	start user defined sequence program calibration	-	8
SYS:Cancel-Cal	CM	stop a running procedure and disable any start commands	enable starting commands	9
SYS:CAL-Test-Mode	CM	switches into test mode	switches off test mode	10
SYS:AM-Zero-Gas	AM	switches zerogas-valve	stop a running procedure	11
SYS:AM-Span-Gas1	AM	switches spangas-valve for range 1	stop a running procedure	12
SYS:AM-Span-Gas2	AM	switches spangas-valve for range 2	stop a running procedure	13
SYS:AM-Span-Gas3	AM	switches spangas-valve for range 3	stop a running procedure	14
SYS:AM-Span-Gas4	AM	switches spangas-valve for range 4	stop a running procedure	15

Please take notice that all actions are edge-triggered. Therefore take care of functionality of positive as well as negative edge.



It is also possible to configure the DIO-inputs only per LON-Variables (i.e. SLTA-adapter or AK-protocol). Therefore is the LON-variable "DIOINP\_ENTRYSIG" which corresponds to DIOINPSIGC and evaluates enum-values of STINAME.

For each digital input we have to setup variables in following order.

1. DIOSLOTIDC
2. DIOINPNUMC
3. DIOINPSRCC
4. DIOINP\_ENTRYSIG (see enum-value in STINAME)

### 3.4.4 Control System Calibration by AK-protocol command

We can start and stop SYSCAL over serial interface by AK-protocol commands. Therefore the commands **SCAL**, **STBY** and **ASTZ** has to be used.

Start-Command: SCAL Kx m (n)

m (type of SYSCAL)	Kx (channel number)	n (optional parameter)
0 = ZERO-CAL	K0	n = 1: switch into test mode else: switch into normal mode
1 = ZERO/SPAN-CAL	K0	
2 = PROGRAM	K0	
3 = TEST ZERO-GAS	K1...999	timeout in sec
4 = TEST SPAN-GAS1	K1...999	timeout in sec
5 = TEST SPAN-GAS2	K1...999	timeout in sec
6 = TEST SPAN-GAS3	K1...999	timeout in sec
7 = TEST SPAN-GAS4	K1...999	timeout in sec

If optional parameter n is not in command string the appropriate variable is not changed.

Starting condition: All attached AMs are in the Standby-Mode (AK STBY) and the variable CALSTAT is 0, otherwise the response is BUSY (BS).

Stop-Command: STBY K0

Only using K0 will stop running SYSCAL-procedure (besides all the procedures of the other AMs).

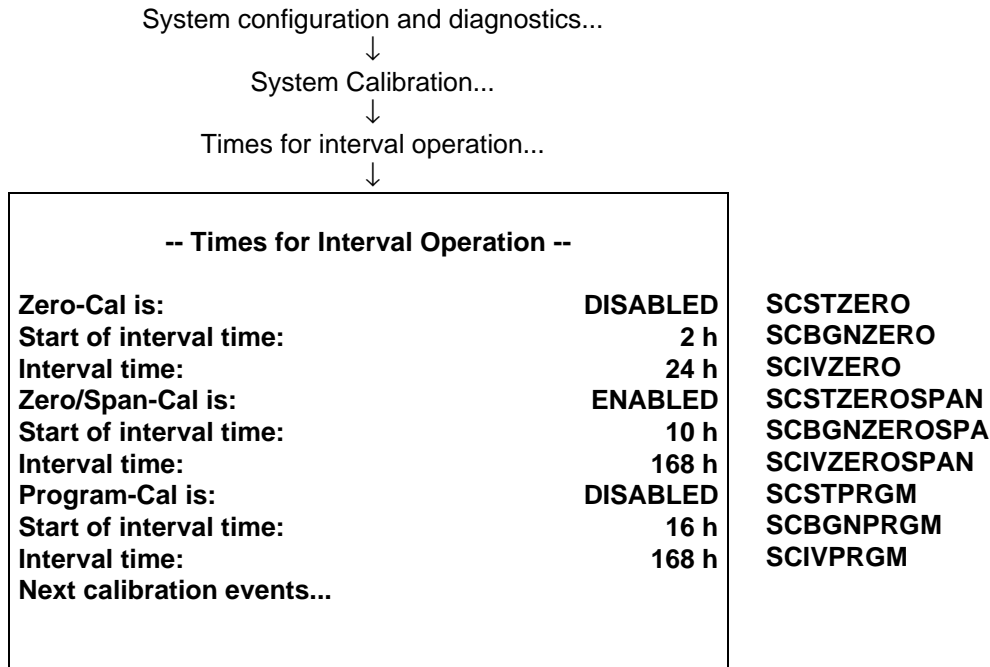
Check-Command: ASTZ K0

The ASTZ K0 command gives the information if a SYSCAL-procedure is running or not.

If running it returns a „SCAL“ if not this string is missed.

### 3.4.5 Time controlled System Calibration

To activate a time controlled system calibration we have to set-up this in an own menu page.



For the 3 different SYSCAL-modes there is the possibility to

- enable/disable the activation
- determine start of time calculations (start time of current day)
- determine in which time intervals after start time the activation is done

Attention:

Other than in some AM-functionalities the interval time is to be input as interval hours. For example, for a weekly calibration you have to calculate 24 h \* 7 = 168 h.

The logic for the time calculations is as follows.

The basic is the respectively parameter „Start of interval time“ (**SIV-time**). By changing this SIV-time or changing the „interval time“ (**IV-time**) the basic is new calculated as date of current day and time of the SIV-Time (only entire hours possible). This basic stays valid (also after a program reset!) until new values for SIV-time or IV-time are entered.

$$\text{Basic-time} = \text{SIV-Time of current day}$$

The next start of SYSCAL (**ACT-time**) happens at

$$\text{ACT-time} = \text{Basic-time} + n \times \text{IV-time} \quad (n = 0,1,2,3,\dots)$$

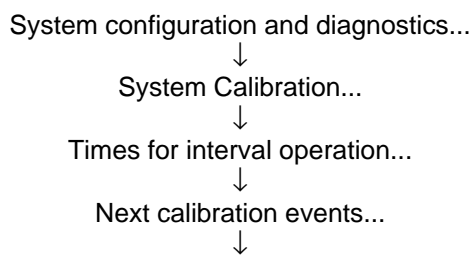
Is the basic time-time before present point of date/time then there are added further IV-times until it is later.

## NGA-2000 System Calibration

For example:

- Starting time for zero calibration: daily at 2:00 o'clock.
- Starting time for zero/span calibration: weekly at 10:00 o'clock.
- Starting time for program calibration: weekly at 16.00 o'clock
- Entry in menu page „times for interval operation“ are at 4/13/99 at 8.00 o'clock
- First possible calibration: 4/14/99 at 2 o'clock (then all 24 hours automatically)

We can display the calculated ACT-times in menu page „next calibration events“...  
But these times will only appear when the appropriate time controlled calibration type is enabled.



<b>Next Calibration Events</b>		
<b>Zero-Cal:</b>	<b>2:00 14 Apr 1999</b>	<b>Menu1Line</b>
<b>Zero/Span-Cal:</b>	<b>10:00 13 Apr 1999</b>	<b>Menu2Line</b>
<b>Program-Cal:</b>	<b>16:00 14 Apr 1999</b>	<b>Menu3Line</b>

### **3.5 Calibrate single Analyzers/ Analyzer Modules/ MLT Channels**

Each specific analyzer has still the possibility to start a calibration over other instances than SYSCAL. For this functionality we now have some additional considerations.

- **Do not start a calibration of a single AM or MLT channel during a running SYSCAL.** This will confuse the valve switching and the calibration commands of SYSCAL. Therefore look also for all automatic start instances of an analyzer.
- A single calibration cannot use the purge times of system valve settings. Instead of we have to setup the AMs own parameters in the manner to wait for the required purge time after a valve switching.
- It is refused to start single calibration of a second AM if the needed calibration gas valve is also any calibration gas valve of the first started AM.

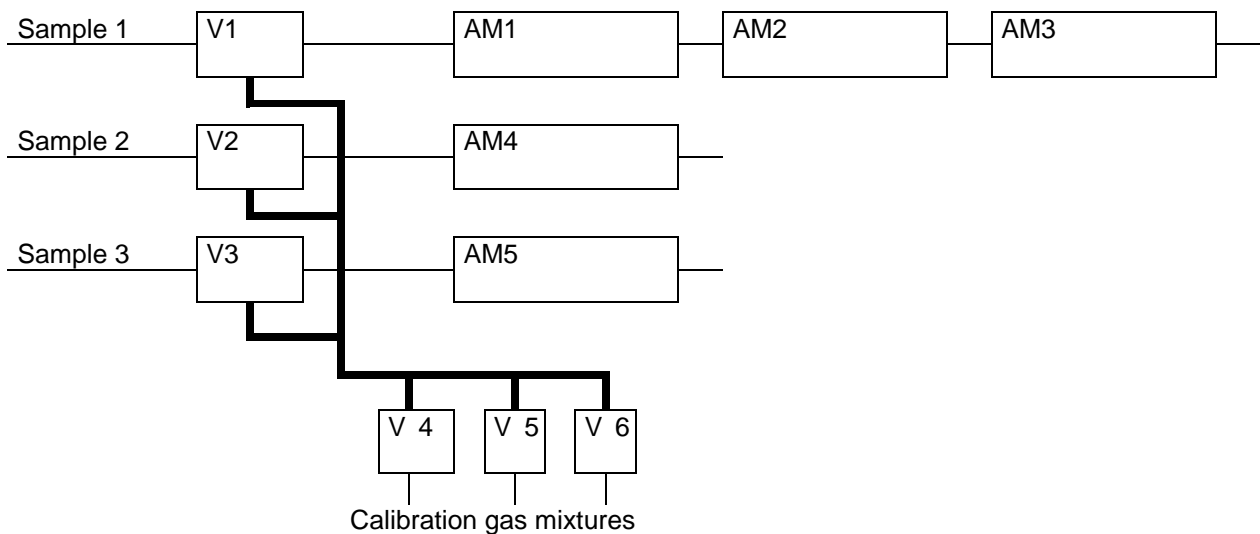
These considerations are valid for all AMs which are included into SYSCAL.

## 4 Functionality

### 4.1 Gas flow

The gas flow through the analyzers can be configured in any way:

1. only serial
2. only parallel
3. serial and parallel mixed



Connections for program logic and flow configurations:

- To each AM (channel) must be assigned a sample gas valve.
- During a calibration of an AM the assigned sample gas valve will be closed and returns to the OPEN-state after the calibration of the AM is done.
- The calibration gases can only flow into an AM if sample gas valve is closed.
- With a opened sample gas valve it is expected to actually flow sample gas.

**The state of assigned sample gas valve also decides about some AM specific states!**

## 4.2 Running system calibration

The system calibration is running in an own Task. This task is only allowed to run once. Any try to restart this task is refused.

The main steps SYSCAL-Task has to do are realized in the following way.

1. Fill all actions to do into a **sequence buffer**.
2. Make some preparations before starting the actions
3. Work through the sequence buffer
4. Restore states and make some other finishing work

The contents of the sequence buffer depends on the type of SYSCAL (ZERO\_ALL, ZEROSPAN\_ALL or USER\_PROG). With the start command this type is delivered.

It is allowed to cancel the SYSCAL-task. This is realized by setting a parameter to a defined value. This parameter is watched during step 3("working through the sequence buffer"). If a cancel is caused the task cancels its current action in step 3, works through step 4 and ends.

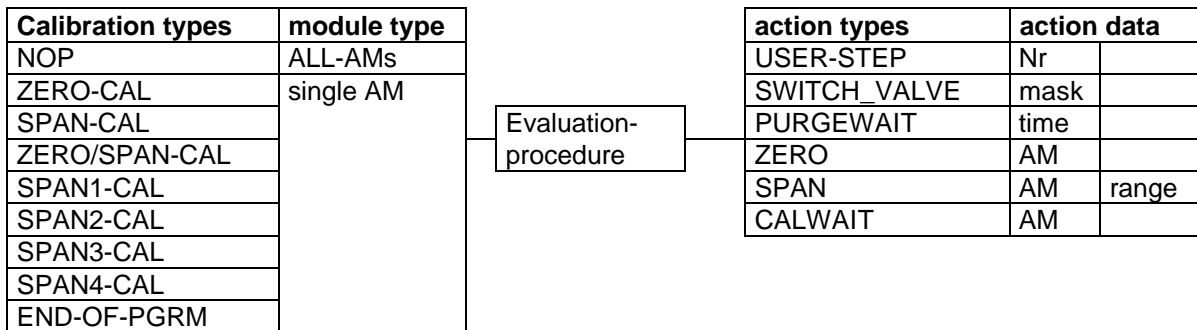
Cancelling the SYSCAL-task per digital input will also disable any further starting action as long as the digital input will stay at „cancel-state“.

4.2.1 Filling sequence buffer

The contents of the sequence buffer depends on

- calibration types and belonging module type
- coherence of modules and system valves

An evaluation procedure has the choice of listed action types.



One calibration type has following sequence frame:

1. SWITCH\_VALVE
2. do different PURGEWAIT, ZERO, or SPAN which are possible with this valve adjustment (order is determined by shortest purge time)
3. do different CALWAIT (wait for finishing a started calibration)

The evaluation procedure optimizes the order of actions by time.

The only condition is in case of ZERO/SPAN-CAL, where an AM has to do first its "ZERO" before any of its "SPAN"s can be done.

The PURGEWAIT-delay-measurement is started with the last SWITCH\_VALVE-action.

We can see, that the SYSCAL-types "ZERO\_ALL" and "ZEROSPAN\_ALL" are special cases of a user program.

- ZERO\_ALL:                 ZERO-CAL of ALL-AMs
- ZEROSPAN\_ALL:         ZERO/SPAN-CAL of ALL-AMs



**Example of a filled sequence buffer**

Assignment of modules, system-valves and purge-times:

	AM1	AM2	AM3
SAMPLE-GAS	V1 / 5 sec	V1 / 5 sec	V2 / 4sec
ZERO-GAS	V4 / 10 sec	V4 / 10 sec	V5 / 12 sec
SPANGAS-1	V5 / 10 sec	V5 / 10 sec	V6 / 12 sec
SPANGAS-2	V5 / 10 sec	V5 / 10 sec	V6 / 12 sec
SPANGAS-3	V6 / 10 sec	V5 / 10 sec	V4 / 14 sec
SPANGAS-4	V6 / 10 sec	V5 / 10 sec	V4 / 14 sec

To do is following user program:

1. ZERO-CAL            ALL-modules
2. SPAN4-CAL        AM2
3. END-OF-PGRM

Belonging sequence buffer:

action type	action data[0]	action data[1]
USER_STEP	1	
SWITCH_VALVE	0006 hex (V4, V2)	
PURGEWAIT	10	
ZERO	AM1	
PURGEWAIT	10	
ZERO	AM2	
CALWAIT	AM1	
CALWAIT	AM2	
SWITCH_VALVE	0011 hex (V5,V1)	
PURGEWAIT	12	
ZERO	AM3	
CALWAIT	AM3	
USER_STEP	2	
SWITCH_VALVE	0012 hex (V5, V2)	
PURGEWAIT	10	
SPAN	AM2	4
CALWAIT	AM2	
END-OF-PGRM		

The size of sequence buffer is currently 320.

### 4.2.2 Before starting actions

Before any action of sequence buffer is done there are some preparations to do:

- store previous calibration time for the case of cancelling
- previous calibration time is now the actual one
- actual calibration time is reset
- cancel any running calibration of an AM

### 4.2.3 Control of actions

#### 4.2.3.1 *Switch valves*

The SWITCH\_VALVE action just takes the action data[0] (valve mask) for the new setting of system valves.

We have just to modify LON-variable STCONT3, STCONT4 and partially STCONT5 , which are linked to system valves.

This action also resets time (takes system tick) for delay measurement of purge times.

#### 4.2.3.2 *Wait for Purging*

The PURGEWAIT-action looks for the present time went over since last SWITCH\_VALVE-action.

For the still required difference up to the needed purge time is now waited. It gives time to other tasks. If there is no additional time to wait it is continued directly with next action.

#### 4.2.3.3 Zero Calibration

Before starting of zero calibration there are some parameters (LON-variables) to modify. After ending system calibration these modified variables are restored to their previous value.

- CONTROL: This variable determines which instance is controlling range of an AM. The parameter is set to "controlled by control module"
- ZERORNGS: This variable determines if all ranges are zeroed together or separately. The parameter is set to "zero all ranges together".
- AMSERPHYSTAT: This variable exists only in a multi-channel AM (MLT!) and determines if the AM has a serial/parallel gas flow. The parameter is set to "parallel gas flow" because only this state allows SYSCAL to calibrate the different channels simultaneously.

After modifying these parameters zero calibration is started by LON-variable:

- AMFN: This variable can start functions on a AM. It is set to the value for function "Zero".

#### 4.2.3.4 Span Calibration

The span calibration can be done only in single ranges. Any action for a span calibration in a range can only be done if "spangas value <> 0.0".

Before starting then span calibration there are some parameters (LON-variables) to modify. After ending system calibration these modified variables are restored to their previous value.

- CONTROL: This variable determines which instance is controlling range of an AM. The parameter is set to "controlled by control module"
- CALRANGES: This variable determines if all ranges are spanned together or separately. The parameter is set to "span all ranges separately".
- AMSERPHYSTAT: This variable exists only in a multi-channel AM (MLT!) and determines if the AM has a serial/parallel gas flow. The parameter is set to "parallel gas flow" because only this state allows SYSCAL to calibrate the different channels simultaneously.
- CRANGE: This variable controls the current range of an AM. It is set to the respectively required range.

After modifying these parameters span calibration is started by LON-variable:

- AMFN: This variable can start functions on a AM. It is set to the value for function "Span".

#### ***4.2.3.5 Wait for Finishing Calibration***

Any AM has the LON-variables

- CALSTAT

Whether the selected AM is still calibrating or not, is checked by reading the variable CALSTAT.

This CALSTAT-check is done in time intervals. During the intervals time is given to other tasks.

#### **4.2.4 Finishing System Calibration**

After system calibration was working through the sequence buffer or it was canceled there is to do some finishing work.

- Actualize some displayed LON-variables
- Look for some still running calibrations in case of cancelling and cancel them, too.
- Restore modified LON-variables of AMs.
- Switch system valves to sample gas state for all AMs
- Cause to set any AM's LON-variable PROCESS = "valid sample gas" after purging time of sample gas valve.

### 4.3 Running Single Analyzer Calibration

A single analyzer calibration also needs to switch appropriate system valves.

The difference to the system calibration is that calibration procedure of AM is already running and we have to respond upon this state.

The reaction is possible by watching any change of the LON-variable CALSTAT.

- CALSTAT\_ZERO (zero calibration in progress): switch off belonging sample valve and switch on zero valve.
- CALSTAT\_SPAN (span calibration in progress): switch off belonging sample valve and switch on span valve appropriate to current state of CRANGE-variable.
- CALSTAT\_DONE (calibration finished): switch on sample valve and switch off calibration gas valves.

After a calibration command the AM itself is responsible to wait the required purge times until calibration actually is done.

The reaction onto a CALSTAT-change is only active if no system calibration is running.

#### 4.4 Holding analog outputs of the SIO and avoid limit violation alarms

Any AM has LON-variable:

- PROCESS

This variable is an input-variable. Its meaning is to tell the AM that another instance is not allowing the measurement sample to flow valid.

In the AM are some states depending from PROCESS.

- "valid measurement" only if PROCESS = "valid sample gas".
- holding analog outputs if PROCESS = "no valid sample gas"
- watching limit violations is switched off if PROCESS = "no valid sample gas"

It's now the task of the system calibration to handle the variable PROCESS for any involved AM. This is done in the following way:

Any switching of a system valve looks if in the switched valves is a sample valve of any AM. If yes, then it sets PROCESS like follows.

sample gas valve	time delay	PROCESS-variable
switched off	-	sample not valid
switched on	purge time of sample valve	sample valid

It's very important to notice following:

SYSCAL only watches state of appropriate sample gas valve for setting of PROCESS-variable.

Any additional valve, serial to sample valve, which can switch off flow of sample gas can not be registrated for logic of PROCESS-variable.