USER MANUAL

SIAM – Industrial fermentation software



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PREFACE

Introduction

SIAM is intended for operators who want an easy-to-use data acquisition or automation system at laboratory, pilot or small production scale. Depending on the options chosen at purchase one can:

- Configure whichever devices and channels specified at purchase
- Visualise values of channels or enter personal set points.
- Save the data from an individual application and edit it with other programs.
- Visualise data as a graph against time.
- Set alarms
- Regulate and modify the set points of channels with different functions
- Control outflows
- Keep a log automatically
- Visualise applications on a systematic diagram.
- Alternatively, only use the program for data acquisition.

If the software does not require all the functions described here, applications can be adapted according to the requirements.

If other functions are needed, you can make contact with us. We will integrate the desired functions in your software system, in such a way that it conforms optimally to your specifications.

Hints

An automation system should make the work easier. Before initiating the process, think of a question: what will happen in the event of a system failure (e.g. an interface, measuring apparatus or PC breaking down)? Experimental set up should be made to have a minimal effect due to breakdown and the system should be safe.

For example:

- Appropriate valves are opened or closed automatically during power cut.
- Pumps should not be overloaded.
- Before leaving the program, switch all apparatus to the "Zero" position.
- Your equipment must be capable of withstanding the most extreme possible conditions placed on it. (Example: For pressure regulation, your apparatus should be able to tolerate the maximum pressure allowed by the safety valve).
- To avoid overheating of electronic circuits, nothing should ever be placed on the D/A converter box.

Text convention

Italic: words which appear in the program, like menu, text on buttons (example: OK)

Supported devices

The standard version supports the following devices:

- 6 Lambda MINIFOR fermenters and it can be extended up to 99

- 12 Lambda Integrators
- 6 Lambda Pumps
- 6 Tecon 350 datalogger
- 6 Tecon 239
- 6 Tecon UR5
- 6 Balances (Mettler, Explorer,...)
- Much more devices of your choice

The COM port and the device address are freely configurable.

If you wish to connect other devices, please contact us either by email (<u>sysmatec@rhone.ch</u>) or telephone (+41-27-946-80-18).

INSTALLATION

To install SIAM (LEA version 5.6) insert the CD-ROM into the CD-ROM drive and start the set-up program 'Setup.exe', then install the Dongle.

Any extension cards that may be required (RS232, RS485, etc...) can then be installed. To do this, it is necessary to exit SIAM (Lea version 5.6), shut down Windows and switch the computer off.

If a RS232/RS485 converter is to be used, this can also be connected at this time. Finally switch the various devices on, boot the computer and start SIAM (Lea version 5.6).

PROGRAM CONFIGURATION

This chapter describes the basic configuration of the program and the procedure to generate a configuration which can be saved and reopened later.

Software is provided with an example configuration file based on your requirement. You could use it or build your own application.

Synoptic window

To generate a new window, select the *Enter* command in the *Configuration* menu and enter the password *"lea"* in the dialog box. A new entry is then made in the *Configuration* menu and the program is now in configuration mode.

🚺 LEA 5.705 Gas	1 LEA 5.705 Gas
File Configuration Windows Help	File Message
Enter	To configurate the program, please enter the password.
	Password input
🔺 Alar 🗇 🗆 😒 🌺 Rep 🗇 💷 💌	

To open a new window, select *New* in the *Windows* menu. An empty window will be displayed in which an application can be built by inserting various elements.

1 LEA 5.705 Gas			LEA 5.705	Gas			x
File Configuration W	/indows Help		File Edition	Configuration	Windows H	Help	
	New Rename Import bitmap image Duplicate Cascade Tile Arrange icons Alarms Report	E		Synoptic1			

A bitmap image can be imported for use as a background by selecting *Import Bitmap* in the *Windows* menu. The image can for example represent your experiment.

LEA 5.705 Gas		LEA 5.705 Gas	x
File Edition Configuration	Windows Help New Rename Import bitmap image Duplicate Cascade Tile Arrange icons Alarms Report Report	File Edition Configuration Windows Help	

To rename the window select *Rename* in the *Window* menu. To open an existing configuration, select *Open* in the *File* menu.

🛔 LEA 5.705 Gas			🔳 I	EA 5.705 Gas	
File Edition Configuration W	Vindows Help	_	File	Edition Configuration Windows I	Help
Synoptic1	New Rename Import bitmap image Duplicate Cascade Tile Arrange icons Alarms Report			Open Save Save as Print Printer configuration Quit	

VISUAL COMPONENT TOOLBAR

Introduction

Select *Visual Components* in the *Configuration* menu to display the visual components toolbar from which components can be selected to place in the synoptic window. This allows an application to be built step by step.

1 LEA 5.705 Gas		Visual components
File Edition Configuration Windows Help		Static Status Buttons Values Curves Devices Misc.
Device configuration		Panel Image Text
Minifor 1 Visual components		
Communication visualisation		File Edition Configuration Windows Help
ExitConfiguration	=	Minifor 1
		=
	,	·

The toolbar contains several headings:

Static: these components are linked to small channels or devices.

Status: these components display the status (on or off) of the digital inputs and outputs.

Buttons: using these components the state of the digital outputs (on or off) can be changed, a channel option window displayed, the calibration of an analogue input carried out, or a link between two windows defined.

Values: these components show the values of analogue inputs and outputs or functions.

Curves: these components display channel values as curves.

Devices: these components can simultaneously group several channels from a device in a block, together with several basic modules.

Misc.: components that don't belong under other headings. E.g. to save channel values as text files.

Static components

Visual components						
Static Status Buttons Values Curves	Devices Misc.					
Panel Image Text						
abc 🔳						

Panel:

Palette button

Display of panel button on the synoptic window

I	Panel
I	

Component properties: The component colour can changed. Double click on the surface in the colour frame to open a window in which a colour can be selected.

Configuration f	for panel		X	
Color				
Position and s	size			
Left	202	Тор	113	
Height	40	Width	80	
🗸 ок	X Cancel			

Image:

Palette button Display of image button on the synoptic window





Component properties: Click on the *button to select an image to display in this object. If the configuration is later saved to a file ensure that when reopening it the configuration file that the image is still in the same directory.*

Configuration	n for image			×
Picture filen	ame			
[None]				
Position and	d size			
Left	172	Тор	35	
Height	50	Width	40	
	K X Cance	el		

Text:

Palette button Appearance of text button on the synoptic window

Text	
abc	

Text

Component properties: Text can be entered here. Click on the button to select a font

Configuration	for text			×
Text				
	Text			
	MS Sans Serif	8		
Position and :	size			
Left	117	Тор	179	
Height	18	Width	80	
✓ OK ¥ Cancel				

Status Components

Visual co	omponents						3
Static	Status	Buttons	Values	Curves	Devices	Misc.	7
LED							

Square LED:

Channels that can be connected

- digital inputs
- digital outputs

Palett	e butto	on
LED		

Display of LED on the synoptic window

The component colour is dependent on the channel status.

Component properties: Click on a colour field in the colour frame to change the LED colour. The first field sets the colour when the channel value equals zero, the second sets the colour when the channel value equals 1.

Configuration fo	or square led		×
Color			
If value =0		If value =1	
Position and siz	e		
Left	136	Тор	161
Height	12	Width	20
🗸 ок	X Cancel		

Buttons components

Visual components	
Static Status Buttons Values Curves Devices Misc.	
On Opt. Cal. Link	

On/Off button:

-

Channels that can be connected

Digital outputs

Palette button

Display of On/Off button on the synoptic window



Component properties: The text displayed on the button can be changed in the text field, to change the font click on the •••• button.

Configuration f	or On/Off button			×
Text				
	On/Off			
	MS Sans Serif	8		
-Position and s	ize			
Left	239	Тор	159	
Height	25	Width	80	
🗸 ок	X Cancel]		

Option button:

Channels that can be connected

Palette button

Opt.

Display of Options button on the
synoptic window

Options

-	Digital	inputs

- Digital outputs
- Analogue inputs
- Analogue outputs

Component properties: The text displayed on the button can be changed in the text field, to change the font click on the •••• button.

Properties for C	Options button			×
Text				
	Options			
	MS Sans Serif	8		
-Position and s	ize			
Left	77	Тор	121	
Height	25	Width	80	
🗸 ок	X Cancel]		

Calibration button:

This function allows to calibrate the channels.

Channels that can be connected

Palette button

- Analogue inputs
- Cal.

Display of Calibration button on the synoptic window

Calibr.

If a channel has only 2 lines in the calibration table, a 2-point calibration procedure can be carried out. The calibration parameters are calculated by the program and saved in the table.

This allows a sensor to be calibrated with two reference solutions e.g. a pH electrode. (Caution: the program must not be in configuration mode. Click on the calibration button. A calibration window is displayed (Fig.34) Immerse the electrode in the first solution (e.g. pH 4) and enter the effective value into the First Point box and click on Apply. Immerse the sensor in the second solution (e.g. pH 7), wait until the value is stable, enter the second value into the Second point box and click on Apply. The first value must always be less than the second. Close the window with the OK button.

Sensor calibration		×
First point		
	Apply	V UK
Second point		🗙 Cancel
	Apply	

Component properties: The text displayed on the button can be changed in the text field, to change the font click on the ... button.

Configuration fo	or Calibration button			×
Text				
	Calibr.			
	MS Sans Serif	8		
Position and si	ze			
Left	348	Тор	68	
Height	25	Width	80	
🗸 ок	X Cancel]		

Link button:

The link button is used to link windows together (similar to hypertext links). If this button is pressed the linked window opens in the foreground.

Channels that can be	Palette button
connected	Link
- none	

Display of Link button on the synoptic window

Link

Component properties: The linked window can be chosen from the list. The text displayed on the button can be changed in the text field, to change the font click on the ... button.

Configuration for Link button				
Window				
	[None]			-
Text	[None] Synoptic 1 Synoptic2			
	Link			
	MS Sans Serif	8		
Position and	size			
Left	401	Тор	151	
Height	25	Width	80	
		_		
	K 🗙 Cancel			

Values components



These components are designed to display the channel values.

Analogue input 1:

Channels that can be Palette button connected A 1. 1

analogue inputs -

A. IN. T	
12.3	

Display of Link button on the synoptic window

Component properties: To change the font click on the ... button. The background colour can be changed by clicking the *Background colour* button.

Proper	Properties for analog input 1					
		MS Sans Serif	8	abc		
		Background color				
Pos	tion and size	,				
Lef	t	31	Тор	164		
He	ight	18	Width	80		
	🗸 ок	X Cancel				

Analogue output 1:

Channels that can be connected	Palette button	Display of Link button on the synoptic window
- analogue outputs	121:	

To enter a new value click on the input field. A second field is displayed into which the new target value can be entered. Press the return key to confirm the entry. If the value is outside the calibration limit it will not be accepted by the system.

To close the field without change press the Escape key. The target value can be changed using the scrolling arrow. The change steps correspond to 1/1000 of the displayed interval.



Component properties: To change the font click on the **...** button. The background colour can be changed by clicking the *Background colour* button.

Properties for analog output 1 component					
	MS Sans Serif	8	abc		
	Background color				
-Position and s	ize				
Left	263	Тор	18		
Height	22	Width	80		
🗸 ок	X Cancel				

Vertical gauge:

Channels that can be connected

- analogue outputs
- analogue inputs



Palette button

Display of vertical gauge button on the synoptic window



Component properties: Click on the *background colour* field to change the colour. The display limit can also be entered. This limit can differ from the one used for the channel.

Properties for a simple gauge component					
	Backg	ound color			
Min.	0	Max	100		
Position and si	ize				
Left	168	Тор	110		
Height	150	Width	60		
🗸 ок	X Cancel]			

Horizontal gauge:

Channels that can be connected

Palette button

Display of Horizontal gauge button on the synoptic window

- analogue outputs --
- Gauge
- analogue inputs

100		100
-100	U	100

Component properties: Click on the Background colour 1 or 2 to change the gauge colour. The display limit can also be entered. This limit can differ from one used in other channels.

Properties for composed gauge component					
	Back	ground color 1			
	Back	ground color 2			
Min.	-100	Мах	100		
Position and s	size				
Left	43	Тор	96		
Height	60	Width	150		
		_			
🗸 ок	X Cancel				

Analogue inputs with option:

Channels that can be connected

> analogue inputs -

Bloc
0

Palette button

Display of Analogue inputs with option button on the synoptic window



Curves components

Visual components				
Static Status	Buttons Values Curves Devices Misc.			
<u>R</u>				

Trend:

-

Channels that can be connected

Up to 10 channels can be displayed as curves.

Palette button





Channel choice:

In the curve, the legend displays the channel name, the unit and the last value. Time relates to the last point entered.

To change the scale, double click on the axis. A second field is displayed into which the minimum and maximum values can be entered.

To select a channel click on the button. This opens a in which the channel to be displayed can be selected together with one of four axes and the curve colour.

Channels	Visualisation			
Device		Channel	Axis	Color
Minifor1 👻		MFAcidPump1	1 -	— •
MFAcidPump1	$ \rightarrow \ (\ \ \ \ \ \ \ \ \ \ \ \ $	MFActAir1	2 🔻	-
MFActpH1 MEActpO21	\rightarrow (<	MFActpH1	1 -	
MFActTemp1	\rightarrow $<$	MFActTemp1	3 🔻	
MFActX1 =	\rightarrow <	MFBasePump1	4 🔻	-
MFBasePump1 MFBegQir1			1 -	-
MFRegp021			1 -	-
MFRun1			1 -	-
MFSetAgit1 +			1 -	-
Only displayed channels			1 -	-
		_		

The P and P buttons reduce and enlarge the time interval and this button displays a ruler. The channel values are displayed in the legend and the corresponding time is displayed above right. This button inactivates the automatic curve renewal mode. It is

possible to return to this mode using the $\boxed{1}$ button.

Devices components

Visual o	omponents	5				3
Static	Status	Buttons	Values	Curves	Devices Misc.	
Sample	Run Re	set Run/R	Contr. Co	ntr. UR5	Minifor Gas sta.	
U	12 1 5 12					

These components are combinations of the simple components previously described. In this way you can create the user interface quicker than with single components.

These objects no longer relate to channels, but to devices.

Sample management:

Samples can be managed with the virtual device, e.g. a concentration can be manually entered.

Palette button Sample	Display of Sample on the synoptic window
U	Glucose g/l
	Sample Result

To take a sample click on the Sample button. A window is opened into which a sample description can be entered. The samples are automatically numbered by the system. Date and time are automatically entered. The numbering is reinitialised by clicking on the New Series button.

New sample						
Sample						
Nr	ı 🔤					
Description						
1	New Serie					
V OK X Cancel						

If the analysis results are known click on the Result button and a new window is opened in which the sample concentration can be entered. This value is also saved in the text file as long as the data saving is still running.

Sample result					
Nr	Date/Time	Description	Unit	Value	
1	02.04.2004 08:59:50	nr230104	g/l	5	
	1				
🗸 ок	🗙 Cancel				

Run block button:

Devices that can be connected:

- Pulse function
- Program

R	un
12	È.

Palette button

Display of Run blo window	ock on the synoptic
PulsFunction1	Device name Option button Run button
· · · · · ·	Channel value

Reset block button:

Devices that can be connected:

- Balances

Palet	te b	utton



Display of Reset block on the synoptic window



Run and reset block:

Devices that can be connected:

- Profile
- Timer

Run/R ▶,I∎ Display of Run and reset block on the synoptic window



Simple controller block:

Devices that can be

connected:

Palette button

- On/Off controller
- PID Controller
- Contr.

Display of Simple controller on the synoptic window



Gauge for controller block:

On/Off controller

PID Controller

Devices that can be connected:

_



Palette button

Display of Gauge for controller block on the synoptic window



Tecon UR5 controller block:

Devices that can be connected:

- Tecon UR5 controller

UR5	
] <mark> </mark>	

Palette button

Display of Tecon UR5 controller block on the synoptic window



The controllers in this series are equipped with 2 PID controllers. For further details please refer the controller manual.

MINIFOR Fermenter-bioreactor block:

Devices that can be connected:

Palette button

 LAMBDA MINIFOR fermenter and bioreactor

Minifor	
120 120 120 120	

_

Display of MINIFOR fermenterbioreactor block on the synoptic window



Miscellaneous components

Visual co	Visual components					
Static	Status	Buttons	Values	Curves	Devices	Misc
TXT						
TXT						

Save in the text file:

This option allows the channel values to be saved as a text file. Text files can be imported into most office programs e.g. word processors, spreadsheets, databases etc.

Palette button

TXT

TXT

Display of Text file block on the synoptic window

[None]	
Config.	On

To save channel values to a text file, click on the *Config.* button to open the 'Save data to text file' window. Select the *File* tab and enter the *file name*, then select the *Channel* tab and choose the channel for which the values need to be saved. Select the *Time* tab, if it is necessary to record the time interval between two entries and the time format.

The data will be saved from the moment the *On* button is pressed and the **file name will be displayed at the top**.

To **stop saving** the data click the On button once again, and **[None]** will be displayed at the top. If data storage is stopped, it is impossible to save further data. This applies particularly to offline values (sample management).

Save data to a text file	×
File Channel Time Device Minifor1 MFAcidPump1'SetAir1 MFActAir1 MFSetpH1 MFActp11 MFActp21 MFActp21MFSetTemp1 MFActp021MFSetTemp1 MFActX1 MFActX1 MFSetX1 MFActx1 MFSetX1 MFActx1 MFSetX1 MFRegQir1 MFReg021 MFReg021 MFRenote1 MFRun1 MFSetAgit1	
OK X Cancel	

Common attributes

When a component is displayed in the window there are only two further steps needed to make it functional.

For components to be connected to channels:

First step: to connect a channel, click on the component with the right mouse button and select *Channel choice* in the popup menu.

Second step: to configure the selected channel, click on the component with the right mouse button and select *Channel configuration* in the popup menu. A dialog window is displayed, within which the channel can be configured. The fields are dependent on the channel, only the field Name is always available.

For components to be connected to devices:

First step: to connect a device, using the right mouse button click on the component and select *Device choice* in the popup menu.

Second step: to configure the selected device, click on the component with the right mouse button and select *Device configuration* in the popup menu. A dialog window is opened, within which the channel can be configured. The fields are dependent on the device.

The appearance of some of the components can be changed. Click on the component with the right mouse button and select *Component properties* in the popup menu. A window is

opened showing the specific attributes (font colour size etc). These attributes can also be changed. These templates are also described in this chapter.

Channel names

The first character must be a letter, but the following characters can also be numerals. Spaces or blanks are not allowed. Each name must be unique and two different channels may not have the same name. Words used in the programming language e.g. begin, if, etc. may not be used as names.

CHANNELS

The channels are the connections between the devices and the visual components. Some devices possess several channels in order to reduce the amount of work required to configure them, these devices have their own visual component. The various channels are connected automatically to each component.

Channel configuration

There are two different ways to configure a channel in configuration mode.

1. In the *Configuration* menu click the command *Device configuration* and select the required device.

1 LEA 5.705 :				x
File Configuration Windows Help				
Device configuration	Tecon 239	•		-
Visual components	Tecon UR5	•		
Communication visualisation	Tecon 350	•		
ExitConfiguration	Integrator	•		
	Tecon 231	•		
1	Nudam 6013	•		
	Nudam 6017	•		
	Adam 4017	•		
	Balance	- •	7	Ξ
	Minifor	Minifor 1		
	Pump	Minifor 2		
	Massflow	Minifor 3		
	Omnicoll	Minifor 4		
	Sample management	Minifor 5		
	df/dt function	Minifor 6		
	Timer	+	-	
	Puls function	•		
	Profile	•		
	On/Off controller	•		
	PID controller	•		
	Program	•		
	Gas station	F		
🎦 Syn 🖻 🗉 🖾				-

A window will be displayed like below for the chosen device and then click on the button which corresponds to the channel required.

Configuration for	r a Minifor ferm	entor	_	×
Device Name COM Port	Minifor1 COM1	▼ Slav	e address 1	•
Fermentor type				
1 (before 2)	012) 🧕) 2 (after 2012)		
Channels				
MFRun1	MFBasePump1	MFActAir1	MFSetAir1	
MFRemote1	MFAlarm1	MFActX1	MFSetAgit1	· · ·
MFRegAir1	MFActTemp1	MFSetTemp1	MFSetX1	· · · ·
MFRegp021	MFActpH1	MFSetpH1	· .	· · ·
MFAcidPump1	MFActp021	MFSetp021		· · ·
Description Minifor1				
Information				
🗸 ок	× 0	Cancel		

A window displaying the channel to be configured will open. For example: pO2 channel.

Configuration for a value						
Name Left digits	MFSetp021	Unit Right digits	mg/l			
Display limits						
Low	0	High	25			
Description Minifor1, MFS	etp021					
Information						
🗸 ок	X Cancel					

2. Right click on the desired channel on the visual component and select *Channel choice* to select the channel and then *channel configuration* for configuring it.

Rem R	<u>.</u>
Alarms	Agitation (Hz)
Air flow (I/mir	n) pO2 (mg/l)
•	
1	Align visual component
рН (•)	To the background
•	Channel choice
	Channel configuration
Temp. , _,	Visual component properties
-	
🖬 Run	Flow control p02 control Acid Base

Each channel has a unique name e.g. Temperatur1, pH1 etc. This name can comprise a maximum of 20 characters, and must always start with a letter, but the following characters can also be numerals.

Blanks are not allowed.

Names which are already in use by other channel may not be repeated, and words which belong to computer programming languages (refer the chapter Visual components for more details) are also not allowed.

Digital inputs

Configuration	n for a digital input	×
Name	T239ED1	
Description		
Tecon239	Nr1, T239ED1	
User informa	tion	
🗸 of	K X Cancel	

When all the field entries have been made click on OK to confirm and save the choice. If the program discovers a mistake, an error message is displayed. The Cancel button closes the window without saving the changes.

Digital output

Configuratio	n for a digital output	X
Name	T239SD01	
Status		
🗖 Inversio	on	
User informa	ation	
Description		
Tecon239	3Nr1, T239SD01	
~ 0	K X Cancel	

The Inversion check box allows the output control to be reversed.

Pressing the Channel control button in the group window switches the output to its lowest state (normally 0 volt).

If the output is in a high state e.g. 24 volt, then channel control is switched off.

Analogue input

Configuration fo	r an analog input			×
Name Left digits Signal type	TUR5EA1 3 0 to 10 V	Unit Right digits	2	
Display limits	0	High	10	
Description TeconUR5Nr1	, TUR5EA1			
Information				
🗸 ок	X Cancel			

Enter a name (as described above), followed by the measurement unit (maximum 5 characters). The characters '/, '-', and '°' are not allowed.

Before connecting the measuring device, check the maximum voltage and power output of the device, as too high a signal can damage the converter.

Enter the limit values to be displayed into the group window. All values which are outside this range will be rounded up or down.

Example:

To make a flow rate measurement with a device that delivers 0 to 2 volts (0 to 6 l/hr) using a 0 to10 volt input, enter values which correspond to 0 and 10 volts in the calibrations table: 0 l/hr and 10/2*6 = 30 l/hr. Enter 0 as low and 6 as high limit values. The flow rate will only be displayed between 0 and 6 l/hr.

When all the values have been entered click on *OK* to confirm and save the choice. The *Cancel* button closes the window without saving the changes.

Analogue output

Соп	figuration fo	r an analog output			×
	Name Left digits Signal type	TUR5SA1 3 V	Unit Right digits	2 💌	
)isplay limits Low	0	High	10	
)escription TeconUR5Nr1	, TUR5SA1			
	nformation				
	🗸 ОК	X Cancel			

The fields are identical to those for an analogue input.

Take care, when selecting an output, too high voltage or current could damage the device

|--|

Configuration fo	r an analog input						×
				GBCalibr	ation		
Name	MassfAct1	Unit	1/mn		Signal (digit)	Value	<u> </u>
Left digits	3 🔹	Right digits	2 🔹	1	0] 0	
Signal type	digit 3 🛛 🔻			2	5	5	
				3			
Display limits				4			
Low	0	High	5	5			
				6			
			Default values	/			
Description				8			
Massflow1 M	assfAct1			10			
				11			
Information				12			
				13			
				14			-
🗸 ок	X Annuler						

Enter a name (as described above), followed by the measurement unit (maximum 5 characters). The characters '/', '-', and '°' are not allowed.

Each channel can be specifically calibrated in the calibration table. If the electrical signal of the measurement is linear over the whole range, enter the values for the minimum and maximum of the signal. If the electrical signal is not linear over the whole range it can be made to fit with linear segments. The values are automatically sorted by clicking on OK. In order to convert the electrical signal to the right intensity the system carries out a linearization using 2 adjoining values. The values allowed are within the range {[-10000,-0.001], 0, [+0.001, +10000]}. If the table contains only two lines the sensor can be retrospectively calibrated in the visualisations block using a two point procedure.

Before connecting the measuring device, check the maximum voltage and power output of the device, as too high a signal can damage the converter.

Enter the limit values to be displayed into the group window. All values which are outside this range will be rounded up or down.

Example:

To make a flow rate measurement with a device that delivers 0 to 2 volts (0 to 6 l/hr) using a 0 to 10 volt input, enter values which correspond to 0 and 10 volts in the calibrations table: 0 l/hr and 10/2*6 = 30 l/hr. Enter 0 as low and 6 as high limit values. The flow rate will only be displayed between 0 and 6 l/hr.

When all the values have been entered click on *OK* to confirm and save the choice. As long as the channel is not displayed in a group window the configuration can be changed. The *Cancel* button closes the window without saving the changes.

Analogue output with calibration table

Configuration for	an analog output						×
				 □ GBCali	bration		
Name	T239SA01	Unit	mA		Signal (mA)	Value	
Left digits	3 💌	Right digits	2	1	0	0	
Signal type	0 to 20 mA 📃 💌			2	20	20	
				3			
Display limits				4			
Low	0	High	20	5			
			Default and and	7	_		
				8	_		
Description				9	-		
Tecon239Nr1.	T239SA01			10	_		
				11			
				12			
				13			
 				14			
				15			
				16			
🗸 ок	X Cancel						

The fields are identical to those for an analogue input with calibration table.

Take care while selecting an output as too high a voltage or current could damage the device.

If the device does not react in a linear manner to changes in voltage or current, it is possible to change its operation with voltage or current = f (value) linear segments in the calibrations table as with analogue inputs.

Channel options

Digital inputs and outputs

Configurate alarms	×
Alarms © 0	🗸 ок
0 1	🗙 Cancel
Activate	

Select the level 1 or 2 at which an alarm should be given. Click on the *Activate* check box and the on *OK* to activate the alarm.

Analogue inputs and outputs

Alarm configuration			×
Alarms			
Low	High	10	🗸 ОК
Low-Low 0	High-High	10	🗶 Cancel
C Activate			

Enter a limit value and click on the *Activate* check box and then on *OK* to activate the alarm. The individual alarms are shown in the Alarm window.

DEVICES

Device configuration

1. To display and change a device configuration, click on the command *Device configuration* in the *Configuration* menu and select the connected device e.g. Minifor1

1 LEA 5.705			
File Configuration Windows Help			
Device configuration	Tecon 239	+	
Visual components	Tecon UR5		
Communication visualisation	Tecon 350	- +	
ExitConfiguration	Integrator		
	Tecon 231		
	Nudam 6013		
	Nudam 6017		
	Adam 4017	- - -	
	Balance	→ <u> </u>	=
	Minifor	Minifor 1	
	Pump	 Minifor 2 	
	Massflow	 Minifor 3 	
	Omnicoll	Minifor 4	
	Sample management	Minifor 5	
	df/dt function	Minifor 6	
	Timer	+	_
	Puls function	•	
	Profile	- - -	
	On/Off controller	+	
	PID controller	+	
	Program	+	
	Gas station	+	
🍢 Syn 🗊 🗉 🖾			-

2. Alternatively right click on a visual component, if it is a device component. Select Device configuration and a window showing the device configuration is displayed.

Rem R				
Alarms	Agitation (Hz)			
Air flow (I/min)	Align visual component			
•	To the background			
·	Device choice			
bH (·)	Device configuration			
-	Visual component properties			
· •				
Temp. (°C)				
•				
•				
🗖 Run 📕	Flow control			
	Acid			
	Base			

Tecon239

The device Tecon 239 has 4 digital inputs, 8 digital outputs, 8 analogue inputs and 4 analogue outputs. Up to 6 such devices can be managed with this version.

Select the *COM Port* to which the device is connected and select its *Address*. Click on the *Connected* check box to initiate communication between the PC and the device. The scanning rate is ca. once every 10 seconds.

The channel buttons allow each channel to be individually configured (see Chapter Channels). The *Description* field displays the internal device name. The *Information* field is free for user input.

Tecon UR5 controller

There are 6 different controllers in this series and each has its own communications protocol and its own channel. Up to 6 such devices can be managed with this version.

- UR 5 D: flow rate controller
- UR 5: pH: pH controller
- UR 5 T: Temperature controller
- UR 5 TK: Cascade temperature controller
- UR 5 TKK: Cascade temperature controller
- UR 5 V: Pressure controller

Device		
Name	TeconUR5Nr1	
COM Port	COM1 Slave address	1 •
	Connected	
Controller type		
	[None]	
Channels	(None) UR5 D UR5 pH	
TUR5Run1 TUR5EA1	UR5 TK 755A2 TUR5 UR5 TKK R5Y1 -	Y2 -
Description		
TeconUR5N	1	
Information		

Select the *COM Port* to which the device is connected and select its *Address*. Click on the *Connected* check box to initiate communication between the PC and the device. The scanning rate is ca. once every 4 seconds.

Then select the controller type from the list.

The channel buttons allow each channel to be individually configured (see Chapter Channels). The *Description* field displays the internal device name. The *Information* field is free for user input.

Datalogger supervisor Tecon 350

The device Tecon 350 has 8 analogue inputs. Up to 6 such devices can be managed with this version.

Configuration for	a Tecon 350
Device Name COM Port	Tecon350Nr1 COM1 ▼ Slave address 1 ▼ Connected
Channels T350EA01 T350EA02	T350EA03 T350EA05 T350EA07 - T350EA04 T350EA06 T350EA08 -
Description Tecon350Nr1	
Information	
🗸 ок	Cancel

Select the *COM Port* to which the device is connected and select its *Address*. Click on the *Connected* check box to initiate communication between the PC and the device. The scanning rate is ca. once every 10 seconds.

The channel buttons allow each channel to be individually configured (see Chapter Channels. The *Description* field displays the internal device name. The *Information* field is free for user input.

Balances

The balances listed below can be connected to a COM Port.

Explorer

Mettler communications protocol type PR

Mettler communications protocol type PM

Mettler communications protocol type SG

Configuration fo	or a balance
Device Name COM Port	Balance1 COM3 Connected
Balance type	[None]
Channels ResetBal1	Weight1
Description Balance1	
Information	
🗸 ок	X Annuler

Select the COM Port to which the device is connected. Click on the Connected check box to initiate communication between the PC and the device. The scanning rate is ca. once every 10 seconds.

Then select the balance type from the list.

Minifor fermentor

Configuration for	r a Minifor ferm	nentor	_	×	
Device Name COM Port	Minifor1 COM1	▼ Slav	e address 1	-	
Fermentor type					
🔘 1 (before 2	012) 🧕) 2 (after 2012)			
Channels					
MFRun1	MFBasePump1	MFActAir1	MFSetAir1	·	
MFRemote1	MFAlarm1	MFActX1	MFSetAgit1	· .	
MFRegAir1	MFActTemp1	MFSetTemp1	MFSetX1	· · ·	
MFRegp021	MFActpH1	MFSetpH1	· ·	· · ·	
MFAcidPump1	MFActp021	MFSetp021		· .	
Description Minifor1	Description Minifor1				
Information					
🗸 ок	× 0	Cancel			

Select the *COM Port* to which the device is connected and it's Address. Click on the *Connected* check box to initiate communication between the PC and the device. The scanning rate is ca. once every 10 seconds.

LAMBDA Peristaltic Pump

Configuration fo	r a Lambda pump 🧮	
Device Name COM Port	Pump1 COM1 Slave address 9 Connected	
Channels PumpLocal1	PumpSet1	
Description Pump1		
Information		
🗸 ок	X Annuler	

Select the *COM Port* to which the device is connected and it's Address. Click on the *Connected* check box to initiate communication between the PC and the device. The scanning rate is ca. once every 10 seconds.

Integrator for LAMBDA Pumps

Configuration fo	r a Integrator 🛛 🗮 🗮
Device Name COM Port	Integrator1 COM1 Slave address T Connected Send address
Channels IntegrRun1	IntegrReset1 IntegrQtite1 .
Description Integrator1	
Information	X Cancel

Select the *COM Port* to which the device is connected and it's Address. Click on the *Connected* check box to initiate communication between the PC and the device. The scanning rate is ca. once every 10 seconds.

The *Send address* button assigns the device address, it must be ensured that all other integrators are switched off or disconnected from the bus.

VIRTUAL DEVICES

These devices are not connected to the computer, they are functions that manage one or more channels.

Sample management

This function allows results from sample analysis to be entered into the system.

Configuration for a sample manager
Device Name Samples1
Channels SampleType1 -
Description Samples1
Information
OK X Cancel

The channel buttons allow each channel to be individually configured (see Chapter Channels). The Description field displays the internal device name. The Information field is free for user input.

df/dt function

Enter the calculation interval in seconds. The larger it is, the less background noise there will be. Then enter the Factor (dependent on whether the unit is in: h-1, mn-1, s-1) and select the channel to be linked from the list.

Configuration for df/dt function			
Device Name dfdtFunction1			
Calculation Period (1-3600 sec) 10			
Factor second			
Linked channel [None]]		
Channels dfdtValue1 -			
Description dfdtFunction1			
Information			
✓ OK X Cancel	1		

The channel buttons allow each channel to be individually configured (see Chapter Channels). The *Description* field displays the internal device name. The *Information* field is free for user input.

Timer

This function allows a time to be displayed. This device functions like a stop watch.

Configuration for a timer
Device Name Timer1
Channels RunTimer1 ResetTimer1 TimerValue1
Description Timer1
Information
✓ OK X Cancel

The channel buttons allow each channel to be individually configured (see Chapter Channels). The Description field displays the internal device name. The Information field is free for user input.

Pulse function

This function allows a pulse to be generated.

Select the output to accessed from the list and enter the minimum and maximum values together with the times (hours, minutes and seconds) from the two states of the output. For digital outputs enter the values 0 and 1. The output values for start and stop can also be selected with this function.

Configuration for puls function			
Device Name	PulsFunction1		Channels RunPulsFct1 PulsValue1
Off State Duration	000:00:01	Value 0	Description PulsFunction1
On State Duration	000:00:01	Value 0	Information
Start with	Off value) On value	
Stop with	Off value	🔘 On value	
- Linked channe	əl	-[None]	
🗸 ок	X Cancel		

The channel buttons allow each channel to be individually configured (see Chapter Channels). The Description field displays the internal device name. The Information field is free for user input.

Profile

Configuration for profile					x
Device	Profile	prf			
Name		Begin	End	Time (HHH:MM:SS)]
Linked channel	1	0	0	000:00:00	
-[None]	2	0	0	000:00:00	
GSSetTotFlow1	3	0	0	000:00:00	
GSSetTotFlow3	4	0	0	000:00:00	
StartProfile1 GSSet1 otFlow4 MassfSet1	5	0	0	000:00:00	
MassfSet10 MassfSet11	6	0	0	000:00:00	
Description	7	0	0	000:00:00	
Profile1	8	0	0	000:00:00	
Information	9	0	0	000:00:00	
	10	0	0	000:00:00	
	11	0	0	000:00:00 🔻	
	Rem	arks			
OK X Cancel		j Open	Save	Print	

Enter the 'begin' and 'end' values and the duration. The format for duration must be correct: use three figures for hours and two for minutes and seconds respectively. If the duration is set to zero the segment will be ignored.

The 'begin' and 'end' values must be in the same interval, as defined for output. Then select the output to be accessed from the list. It is possible to configure a ramp without linking to a channel (none in the list). A ramp can be configured using the programming language.

On/Off Controller

Select the channels to be used for measurements and as outputs (only one output can be selected) from the list.

Enter the difference between the actual and target values in percentage (%).

For an analogue output the minimum and maximum values can be entered.

Example: if the measurement is greater than 2% of the pH target value, the controller switches pump 1 on. If the measurement is greater than the target value, pump 2 is switched off. If the measurement is less than the target value pump 1 is switched off, and if the measurement is less than 2% of the target value pump 2 is switched on.

Configuration for on/off controller	X
Device Name Reg001	Channels StartReg001 YReg001 SetPtReg001
Linked input	
-[None]	Description
	Reg001
Linked ouput nr 1 -[None]	Information
When Mes.>Set. + 0 %, output = 0 When Mes. <= Set. then output = 0 0 0	
Linked output nr 2 [None]	
When mes. <set %,="" 0="" output="0</th"><th></th></set>	
When Mes. >= Set. then output =	
OK Cancel	

When all the values have been entered click on OK to confirm and save the configuration.

The Cancel button closes the window without saving any changes to the configuration.

PID Controller

Configuration:

Enter the P, I, D parameters, a zero renders the corresponding component inactive. The working range for I is the measurement value range within which the 'I' part must be calculated.

Example: A temperature controller is used to take measurements between 0 and 200 °C. If 10% is entered as the working range and 100 °C as the temperature target value, the I part is only calculated between 80 and 120 °C. The calculation starts with the initial YI (% output range).

Configuration for PID controller					x	
Device Name	RegPID1				Channels StartRegPID1 YRegPID1 SetPtRegPID1	
Parameters						
P(%)	0	l(s) 0	D(s)	0	Description	
initial YI (%)	0	Working zo	ne for I (%)	100	RegPID1	
Linked input					Information	
			-[None]	•		
Linked output	t if measurement	> setpoint	-[None]	•		
Lower limit			Higher limit			
-Linked output	t if measurement	< setpoint	-[None]	•		
Lower limit			Higher limit			
🗸 ок	×	Cancel				

Select the channels to be used for measurements and as outputs (only one output can be selected) from the list. If the measurement is greater than the target value (or Y>0) then the output 1 is active. If (Y<0) output 2 is active.

Limits can also be entered for analogue outputs.

If this option is not required the limit value (minimum and maximum value of the output channel) that has been defined in the channel configuration must be entered.

With digital outputs the time in high and low states are affected by Y. Enter the output cycle duration (duration high + duration low). The duration in every state is dependent on Y.

Example: Cycle duration = 10 seconds.

If Y=0 then the output 1 will be low.

If Y=100% then the output 1 will be high.

If Y=20% the output will be 8 seconds low and 2 seconds high.



Duration of every state for digital output 1 dependent on Y.



Output control Nr.1 for a time cycle of 10 seconds and Y = 20%

When all the values have been entered click on OK to confirm and save the configuration.

The Cancel button closes the window without saving any changes to the configuration.

PID parameter determination (Zeigler and Nicols method):

Take care when using the method described below, as the measured value can significantly rise above the entered target value.



measured value

P Parameter

The P parameter reduces the output performance when the measurement approaches the target value, allowing the oscillations that occur with an On/Off controller to be reduced or even eliminated.

I Parameter

The I parameter alone does not allow the actual value to reach the target value. The performance is not zero only if the measurement is different from the target value. The I parameter only adds a value as long as the target value has not been reached.

Entering too small an I value produces oscillations and if too large a value is used it takes a long time to reach the target value.

D Parameter

With the PI controller there is a danger that when the controller starts, the measured value can rise above the target value. The D parameter reduces the change speed of the controller output. Too small a value has no effect.

Method 1

Set the P, I and D parameters to 0, start the controller and measure the interval Pe between 2 oscillations. Increase the P value until there is a reduction in the oscillations and measure the interval Po between 2 oscillations. The new parameters are calculated as follows:

P= 1.7 x Po I= 0.5 x Pe D= 0.12 x Pe

Method 2

Allow the system to settle down. Set the output to maximum e.g. the heating to maximum power. Plot the measurement on a graph (refer the figure below).



Heating curve (courtesy of Tecon AG, CH 9242 Oberuzwil)

Calculate the K and L from the graph. The new parameters are calculated as follows:

P= 0.85 x K I= 2 x L D= 0.5 x L

Program

The programming language is a very advanced tool, which can be used to create control algorithms and on-line simulations.

Configuration:

A value can be calculated using this channel. Enter the unit together with the maximum and minimum value of the result. All values which are outside this range will be rounded up to the limit value.

These fields must be filled out even when the there is no result to be calculated.

A program can have up to 900 characters, which corresponds to 40 - 50 lines.

Configuration for program	
Device Name Program1	Program
Channels StartProgr1 ValueProgr1	
Description	
Program1	
Information	
Cancel	

When all the values have been entered click on OK to confirm and save the configuration.

Programming language syntax:

The syntax analyse does not differentiate between lower case and capital letters e.g. pH1, ph1, and PH1 when represented in the same channel.

Reserved words

- activate, begin, boolean, else, end, getcontroller Y, getval, hi, hihi, if, init, lo, lolo, loop, program, quit, real, reset, setval, start, stop, then, var.

These words may not be used as channel or variable names.

Program structure

The program is divided into three parts which must not necessarily be present at the same time.

Initialising blocks

The instructions are only carried out when the program is started.

Syntax

init begin Instruction end;

Ending blocks

The instructions are only carried out when the program is stopped.

Syntax

quit begin Instruction end;

Cyclic blocks

The instructions are carried out cyclically ca. every second.

Syntax Ioop

begin Instruction end;

Internal variables

These can be declared as command lines or Boolean (true / false).

Syntax

var' variable name variable type';'

Example: var x:real; var y:boolean;

Instructions

There is a semicolon at the end of an instruction.

Assignment ':='

The terms on each side of the character must be the same. The channel values are assumed to be Real, together with those from digital channels 0 or 1.

Example:

a:=Getval(pH1) - 7 * 2; b:=false;

Conditional statements

Syntax

if condition then instruction else instruction;

If the condition after 'if' is true, then the instruction is carried out after 'then', otherwise the instruction is carried out after 'else'. 'Else' is not obligatory (consequently no further instruction is necessary. Caution, the equals test is written '=' and not ':='.

Example:

if GetVal(pH1)=7 then SetVal(P1,3) else SetVal(P1,100);

Operators

+, -, *, / AND, OR, NOT =, >, <, >=, <=

The values allowed range from -10000 to -0.00001 and from 0.00001 to 10000. The value 0 is also allowed except for a division. If a calculation results in a value outside this range the program is automatically stopped.

Procedures

Channels can be accessed in order to change a target value, start a ramp etc. Lower or upper case characters may be used.

SetVal (channel name, comma value)

The channel must be a digital or analogue output or a program channel.

Example:

```
SetVal(P1, 3.2);
SetVal(P1,GetVal(T1)*2);
```

Example:

```
loop
begin
if getval(temp)>124 then
begin
setval(msg1,1);
stop(ramp1); (TempRamp is stopped)
end;
if getval(msg1)=2 then
begin
start(ramp1); (TempRamp is started again)
reset(msg1);
end;
end;
```

Functions

Functions deliver values which are mainly comma values that can be assigned to a variable or a channel.

GetVal(channel name)

This command allows access to values from digital or analogue in-and outputs, sample management channels, weight measurements etc.

The values supplied are real.

Example: a:=GetVal(T1)*2.5;

Error management

After pressing the OK button the program syntax is checked; if an error is found an error message is displayed.

Example program

Pump 1 and T1 are analogue outputs Rpump 1 and RT1 are ramps that control Pump1 and T1 mT1 is a temperature measurement

```
var b:boolean;
init
begin
setval(Pumpe1,1);
end;
quit
begin
setval(pumpe1,0);
setval(T1,0);
end;
loop
begin
b:=getval(mT1)>40;
end;
```

ALARM AND REPORT WINDOWS

The alarm and report windows are always available, they cannot be closed.

Alarm window

Operation:

Alarms	
a	
Delete all Acknowledge	

When an alarm is triggered the date, time, channel name and value are automatically entered into the alarm list. To cancel an acoustic alarm, press the *Acknowledge* button.

After an alarm has been acknowledged it can be deleted from the list selecting the alarm from the list and pressing the Delete button. It is recommended that the list of alarm messages is deleted from time to time as they take up storage capacity.

Buttons and Icons:



Print out the contents of the window

Diama I	
Hann	

Acoustic alarm



Optical alarm

Report window

Operation:

This window functions like a simple text editor. Individual remarks can be written here.



Additionally most user interventions are automatically entered and it is also possible for the user to enter these messages:

- Controller and function start and stop
- Alarms

4

Buttons and Icons:

- opens a text file (*.txt)
- Save text to a file
 - Print out the contents of the window

FURTHER INFORMATION

The channel values are saved in RAM. When the computer is switched off all the data are lost. It is however possible to save the data to a file and manipulate them at a later date with other programs. A program to convert the data into ASCII code is supplied as part of the package.

Data history function

The channel values are stored in a circular buffer. When this is full the oldest data are over written. To prevent the buffer from filling up too quickly only data which has been changed is saved.

Example:

If the temperature remains constant for 2 hours only one point is saved In addition some of the channels may have a lot of background noise. To prevent the buffer from filling up too quickly only data which have been changed are saved when the time difference is > 8 seconds.

Pictorial representation of data history function

When data are saved to a file the system searches the circular buffer once a minute for newly entered data and copies them to a file.



APPENDIX

Troubleshooting

If the set value Y is not accepted by the system:

Check the minimum and maximum values of the set value

Files

Lea.exe

Quickchimes.wav (Sound file for alarms)

Occupied communication interfaces

COM1	
COM2	
COM3	
COM4	

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