Analysis program Mitec Monitor

User Manual

Mitec Monitor

User Manual

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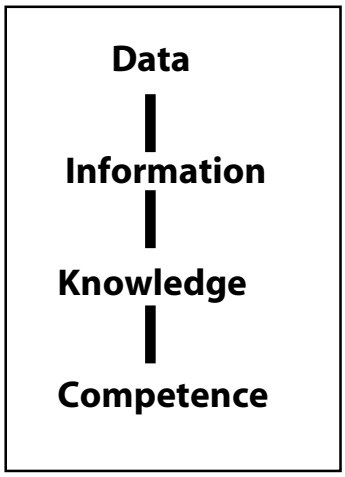
Mitec Monitor

From data to compentence

Welcome to **Mitec Monitor,** our program for collecting, processing and analysing measuring data.

The purpose of all measurements is to increase knowledge of the surrounding environment. For this to be possible, measuring data must be organized and displayed in a logical manner.



Measuring data must be organised so that it provides meaningful **information.** Information leads to knowledge about the surrounding environment and improves the decision-making process.

Ultimately, the combined knowledge will increase the competence of both the individual and the organization.

WinLog *presents* measuring data to PC screen or printer as graphs, bar charts, statistics etc. WinLog has functions for *communication*, database management, calculation and *analysis*.

Monitor can be used by anyone with Windows on their PC. It is suitable for smaller measurements with single sensors but is most suitable for more comprehensive projects with large quanties of data and a fixed installed system.

It can be used with all Mitec data loggers and measuring stations.

WinLog is a Swedish program developed by Mitec, for our customers and market.

Installation and start

We recommend that you study relevant sections of the user manual before starting measurement.

You can however get started quickly by following the instructions in this chapter to get an insight into how the program works.

Installation

System requirements

Mitec Monitor is designed for use on a PC. The program is not available for Mac. The program is designed for a single user, but by saving measuring data on a common harddisk, several operators can use the program at the same time.

Monitor requires that you have at least Windows 3.1 and a 386 computer. No extra memory need be installed. WinLog can therefore be run on older computers.

Monitor is designed for Windows 3.11 but can be run on Windows 95/98 without problems.

Windows NT can also be used but full functionality can not be guaranteed (printer and COM ports are not completely compatible.)

Mitec Monitor requires at least the following equipment:

- Windows version 3.1 with associated requirements.
- A 386-computer or compatible.
- A free COM port for connection of communication equipment and data loggers.

The following equipment is recommended:

- Pentium PC with 32 - 64 Mbyte memory
- Screen with 800x600 point resolution on screen and graphic card.
- Colour printer

All modern PCs can be used with Monitor, the faster the better. Monitor has been designed so it can be also be used on older computers. The program is extremely compact and only requires approximately 0.5 Mb harddisk memory. The amount of RAM in the PC marginally affects Monitor.

Sometimes a computer will only have a single COM port and if the mouse is connected to this, an extra port must be installed. Monitor accepts communication on COM1 to COM4.

Installing the program

The program is delivered on a 1.4 Mbyte diskette or via Internet. In addition to the software, the diskette includes sample measuring data. There is no special network, server or client version. All programs are the same. *Refer information below regarding simultaneous multiple users*.

It is assumed that you have first started Windows on your computer.

- Insert installation diskette in drive A: (or other name)
- Select **File** and then **Run** from **Program manager / Start**
- Type **A:\INSTALL** in the text box and select **OK**.
- Follow screen instructions.

Licence number

A licence number is required so the software can be used,. If the licence number is not correct the program will be run in demo mode.

The licence number consists of a combination of numbers and letters with 17 characters, for example **12RY2-345QW-UIO23.**

The licence number is supplied by Mitec when the program is delivered and can be found on the accompanying **Licence Agreement.**

- Click on the menu option ? and then on *Licence*.

  A Dialog box appears for entering the licence number.

  .

- Enter the licence number (17 characters) and press OK.

Read more about licence numbers in the *Program Installation* chapter.

Multiple simultaneous users in network

The program is essentially a single-user program.

By providing a common searchpath on the local network to the measuring data, several different operators can use the program at the same time.

A program must be installed on each computer to be used. The installation procedure is the same regardless of the computer, and the same installation disk can be used.

A unique license number is required for each computer.

The common searchpath must be given in every program. This is done from within the program after the installation is completed and the program has been started. Refer *General settings* below.

Note. The same license number cannot be used, with a common searchpath to the data, on different computers. Monitor will issue a warning and measuring data cannot be accessed.

Note. If several users are to share information, it is most practical if one of the computers is regarded as the ”communication computer” and equipped with modem etc. The other computers can then be used purely for analysis.

What happens during installation?

During installation a library is created, C:\MONITOR if not indicated otherwise.

The program code and help files are located in this library. No changes are made or required in AUTOEXEC.BAT, CONFIG.SYS or in Windows .INI-files or directories.

Exclusive of data, the program only takes approximately 1.0 MB of hard disk memory.

PROGRAM UPDATES

Mitec software is continually updated with new functions and improvements, normally 2-4 times annually. From v1.70 updates are available via internet.

Support Center on Internet

On **http://www.mitec.se** under the heading Service & Support, there is a special Customer Support Center.

The Support Center is available to all Mitec customers by requesting a **User-ID** and **password.**

New versions of WinLog and user manuals are available from the Support Center as well as general technical information

Support agreement

The best way to guarantee constant access to new versions is to take out a support agreement. By doing this you receive a new licence number for your software that enables you to download and install new program versions free of charge.

Starting the program

During installation, a program group is created called Mitec Monitor. This includes two programs **Mitec Monitor** and **Monitor Help**.

Windows 3.1 creates a program group with icons that are shown on the

screen. Click directly on the Monitor icon to start the program.

In **Windows 95** the program can be started by pressing the *Start* button and choosing *Program* and *Mitec Monitor*. With the help of *Setup* and *Control Panel*, an icon is created for Monitor that is placed directly on the screen.

When Monitor starts, the program will first ask if the date is correct. If not, set the clock in the computer and try again.

Uninstalling the program

Monitor can be removed from the computer at any time. All files required by the program are located in the Monitor directory or its subdirectories.

Monitor does not locate any files in the computer's system directories or any other files.

Use Explorer and select the Monitor directory. Press the Delete key on the keyboard and follow the instructions on the screen.

NOTE! This method will also **remove all measuring data**.

Ensure that important information is first saved to diskette or other backup. Read more about backup in the chapter *Measuring and data collection*.

General program information

Introduction

Applications for Monitor

Monitor is a program for collecting, processing and analysing measuring values from Mitec's data acquisition instruments.

The program presents **measuring data** on the screen and printer, as **graphs, bar charts, statistics** etc.

Mitec Monitor has powerful functions for communication and data collection.

Monitor can communicate via standard and GSM modem, and also provides automatic data collection, SMS-alarm and Internet presentation.

This means that Monitor is suitable for larger projects that run over longer time periods and where measuring equipment may be geographically spread.

Monitor is the heart of the Measuring Central in Mitec's automatic monitoring system for Logistics and Industrial service.

Monitor also has powerful analysis tools with X-Y graphs, macrofunctions, etc.

Monitor can also directly use measuring data saved from the less advanced programs Mitec WinSat and WinLog.

Other Mitec software

Mitec WinLog is designed primarily for occasional measurements with a limited number of sensors.

The program is based on a working method where one or more measuring instruments are equipped with sensors and placed out in the field during a limited time period.

The instrument is then connected directly to the PC and colleced information downloaded to the computer for presentation.

The concept behind Mitec WinLog is that you should quickly, without significant installation, present a measuring result in a time chart with key statistics. This simplicity does not compromise the program's functionality

WinSat is designed specifically for Mitec's SatelLite range of data loggers. WinSat has a limited number of functions and is suited to more simple measurements. Measuring data from WinSat can be directly used by WinLog and Monitor.

Year 2000

All systems for measuring and data acquisition were affected by the transition to the year 2000.

Mitec's products are assured under to the IT Commission's definition for transition to the year 2000. This means that the turn of the century did not affect the products, and that the year 2000 is considered a leap year.

Mitec's Windows programs are specifically designed for handling long series of measuring data and have highly advanced functions for time calculation and analysis.

Time calculation is based on the Gregorian calendar and is starts from the year 0000. Time is saved as a 64-bit number with a resolution of 1/1024th second. All time calculations include lear year adjustments every 100th and 400th year, and are handled up until the year 9999..

Year 2038

The next bomb will arrive in the year 2038!

On the 18th January year 2038, all time calculations based on so-called UNIX time will reach the limit.

This time counts the number of seconds starting from 1-1-1970 and 2,147,483,647 seconds later, all 32 bits are used up.

Mitec WinSat, Monitor och Monitor will however continue to function as normal, due to the fact that we calculate time with 64-bit number.

At least up until the year 9999.....

Structures

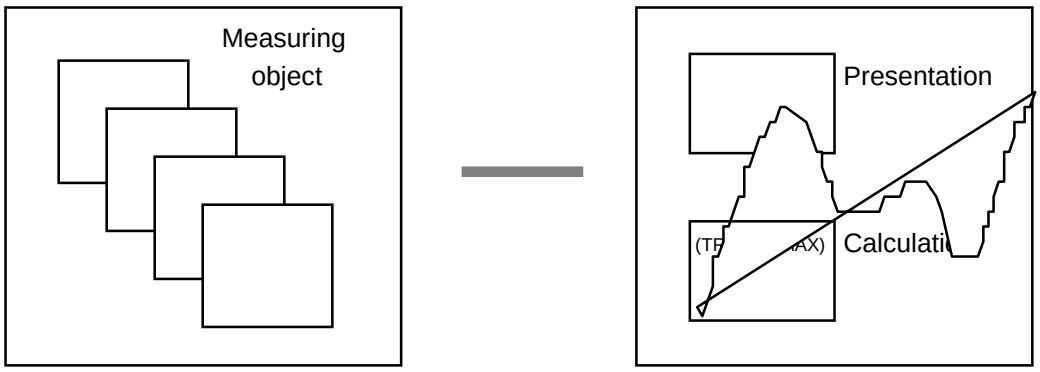
Structure of the program

Monitor is based on three basic functions that are reflected in its functionality and operation.

- Communication (data acquisition)
- Saving of data
- Analysis and presentation

From an operational perspective, communication and storage of data are integrated and managed in the **measuring system's** configuration**.**

Measuring data that is collected and saved can then by studied using the program's **analysis tools.**



Measuring system

The *Measurement* section contains information on how the measurement was made, the sensors used, scale factors, measuring instruments, etc. Each measurement belongs to a *measuring object*, which is the place, equipment etc that the measurement is carried out on. Measuring data is saved under the object's name.

For every **new measuring situation,** the user defines the appearance of the measuring system and creates a new object.

Note that new measuring data can continually be added to an existing measuring object as more information is collected

Program help

Collected information can be processed and presented in different ways in Monitor. The program has advanced *analysis tools* that can perform calculations and graphic presentation of measuring data.

Measuring data can also be transfered to other programs for further processing.

Internet

Mitec Monitor also has inbuilt functions for automatic presentation to a website. All measuring information including graphics, statistics and calculations can be exported.

Mitec also provide complete internet solutions for navigation and presentation. Refer www.mitec.se for additional information.

On the demo center on the Mitec website you can see on-line measurements that are automatically published from some of our measuring centrals.

Mitec's system for automatic measuring and monitoring

Alarm

The sytem also includes functions for alarm, both local and via SMS to GSM-telephone.

Help function

The program's inbuilt help functions complement the user manual.

Help buttons.

Menus and appearance

The program uses symbols and concepts that are similar to standard Windows programs such as Microsoft Word.

The idea is that the program should be self-educational and that the user can navigate intuitively without in-depth prior knowledge.

Menu bar

The uppermost bar is called the program's menu bar. All functions available in the program can be reached through it.

The menu bar changes in appearance depending on its location in the program.

When the program is started, the following short menu is displayed.

When a graph is open, there are additional menu options. The program can be setup so that the full menu is always displayed.

Buttons

Under the menu bar there is a row of buttons, a toolbar. Active buttons have black illustrations and those with light grey symbols are not currently active. The toolbar can be hidden if you wish.

In this example the printer button is grey because a printer has not been selected for the current graph.

Status bar

At the bottom right hand corner of the screen is a status bar that shows what the program is doing, for example with communication. The right side of the status bar shows date and time. Both the status bar and time display can be hidden.

The right-most button on the toolbar quickly provides help for each function displayed on the screen. Click on the button and drag the question mark symbol to the current function.

Measuring and data collection

Measuring with measuring stations

General information on measuring time series

Monitor is a program for managing series of measuring data, not single measurements. In this user manual we use the term *time series*. This refers to a number of measuring values taken at a regular set time interval. It is easiest to measure a time series with automatic equipment, a data logger, often known as a data acquisition instrument.

A data logger is a measuring instrument with a memory. One or more sensors can be connected to the data logger and the logger configured to automatically measure and save signals from sensors, at a certain registration interval.

There are inbuilt data logger functions in Mitec's RMS40 and RMS31 measuring stations.

Data in the memory is then collected using a PC program such as Monitor and saved to the computer's hard disk for further analysis and presentation.

Mitec Monitor is designed for use with Mitec data loggers and can not communicate with other products.

Mitec data loggers

Mitec has manufactured data loggers since the early 1980s. Several generations have been developed since this. Monitor can manage measuring data from all Mitec data loggers.

- MTM20, MTM200 *)
- PM20, PM200 *)
- AT30, Mitec303 *)
- AT31, AT40, RMS31, RMS40
- SatelLite type -T, -TH, -U, -E.
- eLog series, SatelLite50 type -TK/6, -TK/12, -TH/E, -U and future additions

*) no longer manufactured.

AT40, AT31, SatelLite and eLog are equipped with Mitec's system for automatic identification of sensors. This means that features such as the magnitude, unit and other information about the sensors are automatically transferred to the PC, thus making analysis and presentation significantly easier.

Measuring data from Mitec's data loggers is transferred to the PC via direct connection or via telephone or GSM modem (Monitor).

Work method for Monitor

A measuring project requires a certain amount of planning to be effective.

Monitor has been developed from practical experience of field measurements and its structure and functionality adapted to this.

Work with **Monitor** follows a basic pattern:

- **Define a measuring object**

  Decide how the measuring system should look, which sensors and measuring instruments are used, etc. This is defined using *Measurement, Configuration.*

- **Present your measurement result**

  Show the measuring result in a graph. The graph is created automatically or manually. The *Analysis* and *Composition* menus are used.

This user manual describes the operation and function of each part of the program. The description essentially follows the methodology described above

PRINCIPLES FOR MEASURING OBJECT

Mitec software saves measuring data in a measuring object.

The measuring object is given a name by the user. Measuring data is then collected and analysed using this name.

A measuring object can contain measuring data from one or more measuring instruments. Every instrument can in turn have one or more sensors.

- **All related measuring data under a single name**
- **Data records can be extended as often as you wish – still under the same name**
- **The same graph can be used for all similar measuring objects – switch to collecting data from another object with a keystroke.**

It is therefore not necessary to deal with saving measuring data as files. If you wish to collect measuring data from a measurement and then continue the measurement, the additional data is added to previously saved data and an infinite data record can be built up.

For example, data from Mitec's weather station for Säffle on **www.seffle.com** is collected each day. In the course of a year there are 365 data collections. All are automatically saved in a single measuring object – without opening and closing files.

Simple data acquisition programs require that each transfer is a file. This would mean that in the example above, 365 files per year are saved and 365 files are gathered into a graph. A hopeless task. **Mitec's program solves this automatically.**

Define a measuring object

A fundamental concept in Monitor is *Measuring object*. A measuring object is the place, equipment or similar where the measurement is made.

Measuring data saved under the object's name.

For each new measurement, the measuring object must first be defined.

Under the heading *Measurement* you define how the measurement will be made, which sensors are used, scale factors, measurement instruments etc.

Configuration of a new object

The measuring object is described under the *Measurement* menu.

- Click on *Measurement* and select *Configuration.*

  The dialog box Configuration is opened

- Select *Add* to create a new measuring object..

  A new dialog box *Configuration of object* is opened. (Use *Edit* to change existing objects and *Delete* to remove an object.)

PASSWORDTo prevent unauthorised changes to the measuring system, *Configuration of the measuring system* is protected with a password. Click on the button Password and enter up to 16 characters. To access configuration information, the password must be entered.

- Complete the dialog box with your choice of name for the measuring object.
- Press *Add new* to go continue.

  A new dialog box *Group with xxx* is opened:

INFO FIELD

In the top right hand corner there are 5 fields for optional text. Here you can enter information such as address, customer name or similar. The information is a VARIABLE in the formula language and contents of the field can be connected to a text box in a graph using %I. Refer also FORMULA LANGUAGE.

CONSTANTS

Each object can also be assigned constants (CONST) which are used in formula during calculations. CONST 1 to 5 are constants that are connected to the current measuring object. Constrants are used in different expressions and can be entered in the dialog box above or changed during analysis by selecting CONST from the analysis menu (or press F10). Refer also FORMULA LANGUAGE.

Dialog box for "Group"

Each Group has a common communications path. A group can contain up to 16 different measuring instruments but it has just a single communications path. This can be a modem (with telephone number) or a certain serial port on the computer.

- Enter the name of the group under measuring object and select the correct family of measuring instrument.
- Note any useful information about the group.
- Select the communications method in the Connect type box
- Press *OK* to continue

  A new dialog box *Group to* xxxxx is opened:

GROUP
The **name** can be freely selected with up to 8 characters. The group name is only used to differentiate different groups of measuring instruments with different communication methods in a single measuring object.

Family indicates which type of measuring equipment there is in the group. If different types of instrument are to be used in the object, a new group must be created.

Memory note is a field reserved for internal comments.

Connection type concerns how the communication with the group is to occur.

Serial port	should be selected if the measuring equipment is connected to one of the computer's COM-ports, directly or via shorthaul modem. At the same time select baudrate (same baudrate as in measuring equipment). Cross CTS/RTS handshake if the measuring equipment is directly connected without modem.
Modem	is selected if the measuring equipment has a modem (or GSM telephone) and is connected to the telenet. Enter the actual telephone number. (If dialling should go via an exchage enter 0W before the number to first dial 0.) If Mitec instruments in the 20/30/200 series are used, the extra Init string should be used. *Refer help text in the program.*
Addressable short haul modem	Should be crossed if a ESC-addressable shorthaul modem is used (direct to the Serial port or together with a normal modem), such as MA-43. This can only be used with the 31/40 series.
Slow link	Should be crossed if the communications link is slow. With a slow link, Monitor waits longer for the data that is sent from the logger.
Half duplex (2-wire)	Should be crossed if only half duplex is possible. This applies for example to short haul modems where only 2 wires are used. Using half duplex, Monitor makes a short pause when the data direction is changed between Monitor and the logger.
Search logger (broadcast)	Should be crossed if Monitor should automatically search for connected measuring equipment and collect data from them. The instrument or instruments found will then be automatically included in the measuring system the their sensors assigned an available sensor name.

Automatic collection concerns how automatic collection of measuring data should be made.

Next, date	Date for next automatic collection
Next, time	Time for next automatic collection.
Interval	Time interval between automatic collection or None for no automatic collection.

Logger Shows a list of available loggers to select from. These have previously been selected manually or automatically in the group.

Indicate which measuring equipment is connected

Previously, a group of measuring equipment has been selected. The program must also know which individual instruments there are. This can be done automatically by crossing the box Broadcast (refer above) or manually.

Manual configuration is preferable when you also want to set up scale factors for sensors.

- Press the *Add* button.

  A new dialog box appears.

- Select the type of measuring equipment and give its serial number. Give the address of the shorthaul modem if one is used.

LOGGER

Type: specify which instrument is used. Select from the scroll list.
Pos: is the position in the group from 1-16. This does not normally need to be specified as it is selected automatically.
Serial number: is the serial number of the current instrument.
Address for shorthaul modem: If an addressable shorthaul modem such as Westermo MA-43 is used, its address should be entered here.

Sensors. A list of names of the sensors used on the current instrument. These have previously been defined.

Adding sensors

- Press the button *Add* in the dialog box Configuration of sensors

  A new dialog box *Sensors to xxxxx* is opened.

The new dialog box containes a number of fields for different functions. Refer below for a description of every field.

- Indicate the name of the sensor.

  See rules below for sensor names.

  If scale factors are needed, enter in the box *Gain* and *Offset*. Use the calculation sheet to make calculation easier.

- Complete by pressing OK

DIALOG BOX FOR SENSORS

Name: Enter the name of the sensor, 1-8 characters.
Channel: Indicate which measuring channel on the instrument is used (automatic function).
Calculation sheet: Here there are a number of options for automatic scaling of input signals. Selct from the drop-down list and press *Exec. sheet*.
Parameters for next data record: These are the scale factors to be used by the program from next collection of data from the logger. The equation *Y=kx+m* is used. *k=Gain* and *m=Offset*
Parameters for all data records: This is the information on type, signal type, measuring range etc. The information applies to all data records including those already saved. AT40/31 and SatelLite loggers automatically complete the information, but if other loggers are used they must be entered manually. The information is used by Monitor for scaling graph axes when graphs are generated automatically.

Data record: This shows which data records, i.e. blocks of measuring data, have previously been collected into the program. This therefore is the program's database for the current sensor's measuring data.

SENSORS AND SENSOR NAME

A number of different types of sensors can be connected to Mitec's measuring system to measure different physical elements such as pressure, temperature, power etc.

Each sensor is assigned a name in the program. Using this name, measuring data collected by the program can be analysed and presented.

The sensor name can have up to 8 characters. The name can be assigned manually when the measuring object is configured. It must start with a letter and can only contain the characters A-Z, 0-9 and _. Examples are TEMP, PRESS10, FLOW_2 etc.

If no name is assigned, the program automatically assigns sensors the label G1, G2 and so on.

HOW THE NAME OF THE OBJECT AFFECTS THE SENSOR

Internally, Monitor uses both the "first name" and "surname" when measuring data is managed.

" First name" = The object's name (eg ELSTREET)

" Surname" = The sensor's name (eg L1)

For example, the measuring object ELSTREET has three sensors called L1, L2 and L3 (measuring three phases of current).

The complete internal name is ELSTREET.L1, ELSTREET.L2 and ELSTREET.L3.

During analysis the graph first checks which object has been selected and then which of the sensor names are used in the graphs. Measuring data can then be collected from both the correct object and sensor.

SCALING OF INPUT SIGNALS

Measuring sensors output an electrical signal that carries information about the parameter (eg pressure) being measured. The information is carried in the signals current, voltage or frequency. Mitec data loggers have functions for automatic scaling of input signals.

However it is often practical to manually input scale factors while measuring data is being processed. Monitor can manage this either during presentation of the diagram or during collection of measuring data.

We recommend that scaling is done during data collection to simplify presentation. In the sensor dialog box the sensor's name and gain is provided. Refer to above explanation of the different fields.

Parameters for all data records

Parameters for all data records contains information that affects all measuring data for the current sensor as well as *previously collected* data and *new data* to be collected in the future.

The box has five different fields with the functions described below.

When Mitec data loggers AT40/AT31 and SatelLite are used, the fields are completed automatically and don't need to be changed.

If older Mitec data loggers MTM20, PM20 or AT30 are used, the fields should be entered manually.

TYPE Type indicates which input type is used by the sensor. Options are Analog, Pulse, Time, Status and Auto.

MAGNITUDE Magnitude is used by Monitor to label the Y-axes when the graph is created automatically during analysis. This shows the quantity of the measuring signal, eg Pressure, Flow, Temperature etc. The information is collected automatically from the sensor when newer Mitec data loggers are used.

UNIT Unit is used by WinLog to label the Y-axes when the diagram is created automatically during analysis. This indicates the unit of the measuring signal, eg Bar, m3/h, etc. The information is collected automatically from the sensor when newer Mitec data loggers are used.

START Indicates where the measuring range starts on the sensor. This is used by WinLog to scale the Y-axes when the diagram is created automatically during analysis, as well as when new scale factors are calculated using calculation sheets.

STOP Indicates where the measuring range ends on the sensor. This is used by WinLog to scale the Y-axes when the diagram is created automatically during analysis, as well as when new scale factors are calculated using calculation sheets.

Parameters for the next data record

Parameters for next data record includes information that affects measuring data that will be saved *from and including the next collection* of measuring data from the data logger.

The box has three different fields with the functions explained below.

- Calculate new gain and enter in field. Alternatively, a calculation sheet can be used. Select format and press *Exec. sheet*. Complete the fields and close.

SCALING OF INPUT SIGNALS

Data loggers convert signals and save them with the type (size) that is being measured. For example, a pressure measurement can output a 4-20mA signal that may actually mean 0 - 10 Bar. Mitec AT40 and AT31 data loggers automatically perform the scaling and save in the correct way.

In some cases you will want to do the scaling yourself using WinLog. The program has powerful functions for converting and scaling of measuring data.

INFO is a field for variable text which can be used for comments. Information is saved here along with the data record (measuring data) and can be displayed in the graph using the text functions in Monitor's formula language (%**M** - function)

GAIN is the k-factor in the equation *Y=kx+m.* The expression is used to recalculate the sensor's input signal to the signal required. Scaling is equivalent to area in everyday terminology.

OFFSET is the m-factor in the equation *Y=kx+m.* The expression is used for recalculating the sensor's input signal to the signal required. Offset is equivalent to zero-point.

Correction factors for measuring sensors

Parameters for the next data record can also be used for correction of output signals from sensors.

When a sensor is calibrated, two methods can be used to compensate for error.

- **Adjustment** means that the sensor or instrument is adjusted so that the value shown is the same as the actual value.
- **Correction** means that the sensor is not adjusted, and the incorrect signal will remain. Instead, a correction factor is used to compensate for the error.

In the second case, Monitor can be used to automatically correct incorrect values from the sensor.

The correction factors must then be calculated and expressed as an offset (zero point) and a factor (range) according to a linear equation.

For example, if a pressure sensor with measuring range 0-10.00 Bar that should have a nominal output of 0-10.00V appears to output 0-9.85V, then the correction factor will be 10/9.85=1.015 which is then entered in the *Gain* box in Monitor.

In the same way, the correction for zero point failure can be calculated and entered in the box *Offset.*

When it collects measuring data, Monitor will compensate for incorrect display and recalculate to the correct value.

Each time a new gain is entered in Monitor, a new data record is created. The comments entered in the *Info* box are also saved here.

This means that changes cannot be made without the program noting them, and thus it is possible to track changes and manipulations to meet the requirements of all serious quality systems.

Edit a data record

After scaling, measuring data is saved on the computer's hard disk as a data record under a sensor name.

The data record contains all information about the current sensor. Sometimes it is necessary to change previously collected data. Monitor therefore has a function which is called Edit the data record.

Measuring data cannot be changed. However, the gain and offset as well as the timestamp can later be corrected for:

- Correction of incorrect calculation constants
- Calibration of sensors
- Adjustment of time if the clock in the logger has been incorrect.

To edit a data record:

- Click on data record

  Edit and *Delete* buttons are activated

- Press the *Edit* button

  A new dialog box appears

- Enter the new gain, new start time for data record or Info. End with *OK*

Date and time for the data record indicate the time point for the first measurement (when it is stored in the data logger) in the data record. By changing this time, the clock can be "adjusted" after the event, for example if the clock in the logger was incorrect during the measurement.

Delete data record

Occasionally it is necessary to completely delete a data record. This is done in a similar way to Editing.

Note: data records must be deleted in order, with the oldest data record deleted first.

To delete a data record:

- Click on data record

  Edit and *Delete* buttons are activated

- Press the *Delete* button

  The program will display warning messages and ask whether the data record should be deleted. Follow the instructions on the screen.

WHAT IS A DATA RECORD?

A data record is a certain quantity of data which is saved on the computer's hard disk. A new data record is created automatically when a new measurement is started for the first time.

Each sensor has its own data record. When additional measuring data is collected, the data record is extended.

The same sensors can have several data records without them being visible in the graph. A new data record is created if you change the configuration, eg gain, or if measuring data is missing relative to the previous data record (gap in measuring data caused by a deliberate break in the measurement for example).

Change and delete a measuring object

Measuring objects that have been created can easily be changed and deleted. Measuring objects are configured under the Measurement menu.

- Click on *Measurement* and select *Configuration.*

  The dialog box Configuration is opened

- Select measuring object from the scroll list.

  The buttons *Edit* and *Delete* are activated. With E*dit* you can change existing objects and with *Delete* you can remove measuring objects.

By double-clicking on the object name you quickly enter the **Edit** function.

Delete removes all settings and all data belonging to the object.

If you wish to only remove measuring data, go into Edit the object and use the function *Delete data record*. See description above.

The program will provide a number of warnings before the data is deleted. Nothing can be accidentally removed.

Collect measuring values manually

Measuring data can be collected into the program manually or automatically at a given date and time. The manual collection process is described below.

Collection of measuring data

WinLog can collect information from all Mitec data loggers. The information can be read into the program in different ways:

- Via one of the PC's COM ports
- Via modem or GSM-telephone connected to the PC's COM ports
- Import of Mitec file format

Collecting data from the logger

Before measuring values can be read into Monitor, a measuring object must be first defined. Refer to the description above for Configuration of the measuring system. After that, measuring data can be collected and saved.

Operation is the same regardless of which type of communication is used. Collection is run under the *Measurement*, *Collection* menu. .

For collection direct to the COM port:

- Connect the data logger to the COM port using one of Mitec's cables.

If collection should occur via modem:

- Check that the modem is correctly connected and switched on.

  Refer to the chapter *General Setup* for connection of modem.

- Select *Measurement* and *Collection* from the menu.

  A new dialog box is opened.

- Enter to which measuring object and to which group the measuring data should be collected to and press *OK*.

  A *Collect Data* window appears.

- Check that data collection has started and that no error messages are shown

A message is shown in the status window when collection is complete. End data collection with OK.

Importing measuring data

Monitor can import .A40 files and save them in the same way as when data is collected directly from the logger. This file format has been used previously in some of Mitec's help programs.

Measuring data from Mitec's older DOS program Logbase can also be input to WinLog. These files have the suffix **.LB**.

- Select *Measurement* and *Import* from the main menu.

  A new dialog box is opened.

- Press the Files button to select which file should be imported to WinLog. Choose from .A40 or .LB files.

  When the file is selected, a new dialog box is opened *Select import*.

- Select which measuring object the data is to be imported to. **NOTE. The type and serial number of the data logger must match for the import to work!**

When the import is complete, a dialog box will appear.

Collect measuring values automatically

Measuring data can be collected into the program manually or automatically.

If a measuring object is to have automatic collection, this is defined under *Measurement* and *Configuration*. Here it is specified on which date and at which timepoint the collection should start, and at which time intervals the collection should occur. No additional action is required from the user. Refer description above.

If data should be collected to many measuring objects, it can be suitable to spread the time points evenly over time. Monitor can however manage many processes simultaneously, and should collection be requested by several objects at the same time the requests will be queued and carried out in order.

Other programs can be used at the same time as Monitor is communicating. Similarly, other functions in the program such as analysis can be used at the same time.

Activities in the program are saved in a so-called Log file. It is recommeded that the contents of this file is studied now and then (*Options, Log*) to check any possible errors in the measuring.

Always ensure that the modem is switched on and connected in the correct way to the telephone net and to the computer. Refer to the chapter *General Setup* below for more information on modem connection.

How and where data is saved

Measuring data is saved automatically when it is collected and no special action is required.

Transfer from instrument to PC is made using a secure communications protocol that has self-correcting functions. If no error message is received, you can be sure that the measuring data has been saved correctly.

Data format

The user sees data saved in a measuring object where each sensor has a name.The data can be studied by composing a graph and indicating the current sensor name and measuring object.

If you study the hard disk (using ”Explorer” or similar) you will see the program’s internal data structure.

Folders for measuring objects

Measuring data is saved in the directory shown under *Options* and *Setup*. In this directory each measuring object is assigned an individual folder with the object’s name. For example, the measuring object HUS318 will have a folder with the name *hus318.dat.*

Files for measuring data

The folders contain measuring data for the sensors associated with the object. Each sensor has its own file. For example, a sensor with the name LEVEL_7A will be assigned the name *level_7a.*.

The folder also contains a file with information about the measuring object. The file is given the name $setup$.dat. This file name occurs in every folder with measuring data (ie one for every measuring object).

Measuring data in the sensor files is stored in binary format. Every measuring value will use 2 bytes on the hard disk. (The ASCII format generally used in spreadsheet and other programs takes three to four times as much space).

Search paths

During installation of the program, you can select which folder the program should be installed in.

Normally measuring data will be saved in new folders under the main folder.

However, it is possible to save measuring data in a location other than the program's main directory, for example on a common file-server.

Refer *Setup* above for information about multiple simultaneous users.

The search path to the common directory is shown on the *Options* menu. The search path can be changed at any time. The program must however be restarted after each change.

- Select menu *Options* and the submenu *Setup*.

  A new dialog box is opened.

- Enter the current folder under the menu *Directory* and restart the program to use the new folder.

Dialog box for setup of the measuring data folder.

Refer *General setup* chapter for explanation of other settings in the dialog box.

Data record

Measuring data is saved in a data record. Each sensor has its own data record. Large quantities of data can be saved from each and every sensor.

What is a data record?

A data record is a certain amount of measuring data that is saved to the computer's hard disk. A new data record is created automatically when a new measurement is input for the first time.

Every sensor has its own data record. When additional measuring data is collected, the data record is extended.

Each sensor can have several data records without it being apparent in the graph. A new data record is created if you change the configuration in some way, such as adjusting the gain, or if measuring data is missing relative to the previous data record (eg there is a gap caused by a deliberate pause in the measurement).

Browse function

The program has a function for detailed study of the database. The function is called *Browse* and is found under the *Measurement* menu.

This function can also be reached using the button on the toolbar.

- Press the Browse button.

  A new dialog box is opened. The technical information for each measuring object is displayed here, including which sensors are used and how they are configured.

OBJECT is a list of the objects in the system. SENSORS are the sensors associated with the current object. DATA RECORD shows which data records exist for each sensor and their time range. The INFO field shows which information has been entered in the Info box in Measurement configuration. DATA RECORD INFO includes possible comments for each data record. In the lower right hand corner, you can see detailed information regarding the current measuring sensor (refer below).

- Highlight the measuring object to be studied

  A list of sensors for the object is shown and *Info* for the object is shown.

- Select a sensor from the list

  All data records for the sensor are shown.

- Select the data record from the list

  Detailed information about the data record and the associated sensors is displayed

- Close the dialog box using *OK*

SENSOR INFORMATION

The data record box contains a lot of detailed information about the sensor that is used in the data record. Here you can see information such as the individual serial number of the sensor, which means that the equipment and measurement are traceable back to Mitec and back via Mitec's norms to international measurement norms.

Logger	Serial number for current instrument.	Gain	Gain used in this collection.
Channel	Shows which measuring channel on the instrument is in use.	Offset	Offset used in this collection.
		Factor	Calculation factor (for internal control).
Quantity	Quantity (type) of the measured parameter.	Term	Calculation factor (for internal control).
Unit	Unit (kind) of the measured parameter.	ID	ID-number for current *signal cable.*
	Shows where the measuring range starts.	Date	Manufacturing data for signal cable.
Start	Shows where the measuring range stops.	Serial no.	Signal cable's individual serial number.
Stop	Input signal type (Analog, Pulse, Time, Status).	Reg. Int.	Registration interval for data record.
Type		Reg no.	No. of registrations in the data record.
Next gain.	Gain to be used in the next collection.	Per reg.	No. of measuring values per registration (1 or 3).
Next offset	Offset to be used in the next collection.		

Backup

Collected measuring data can become highly valuable.

Thus we recommend that regular backup copies are made. The simplest way is to include measuring data in the company's normal routines for backup by saving it for example to the company's file server. Refer to the section above on how to set up different *searchpaths*.

Backup copies can also be made to diskette by using *Explorer* in Windows 95 or later.

Typically one diskette is used per measuring object. Around 0.5 to 0.6 million measuring values fit onto a standard 3 1/2" diskette.

- Insert an empty diskette in A:
- Start *Explorer* in Windows 95 or later (*File manager* in

Windows 3.1) and go to the directory where measuring data is stored.

- Select the directory or directories to be copied and drag them to A: You can also use *Copy* in the *Edit* menu and then *Paste* in A:

- Highlight and copy the graphs that are to be backed up in this way. Note that all graphs that have the suffix **.mon**, are saved in the main directory (eg. C:\monitor) indicated under the search path.

Move measuring data

To move measuring data to another computer or another folder, use *Explorer* or *File manager* in the same way as described above for backup.

Show the measuring result

General

Simple but advanced

Measuring data must be arranged in such a way that it provides reliable **information.** Nothing is gained by a collection of data in a table. The information should lead to **knowledge** about the world around and be useful in the decision process.

In Monitor you are completely free to decide how much to transform your data before the result is presented to the user.

Export transfers the collected raw data from a measuring sensor direct to a file in ASCII format. The file can then be opened by other programs.

Report also transfers measuring data to a file. However, Report takes information from a graph, ie measuring data that has been processed using different calculations, gains and so on. Time resolution can also be adjusted and information from several sensors can be transferred to the same data file.

Graph shows the information in graphic form. Measuring data is presented to screen or printer as curves, bars, statistics etc. Monitor has powerful functions for *calculation* and *analysis* which can be used in graph presentation.

Monitor's presentation functions are optimized to enable you to quickly and with minimal preparation transform measuring data to information. But not at the cost of functionality.

The user should be able to focus on gathering knowledge about his process. Not waste it on learning to use the tools.

Presentation functions

Monitor's functionality is designed to manage most of the day-to-day requirements of field measurements:

- Object-oriented.
- Time graphs with lines and bars
- Individual graph appearance
- Advanced calculations
- Graph formats as accessories
- Export, report
- Print out to printer, export to clipboard

Work method

Measuring object and graph formats

An important and fundamental property of Monitor is the relationship between saved measuring data and its presentation in a graph.

The same graph can be used to present measuring data from different measuring objects.

This means that a graph can be made (composed) as a format which can then be adapted for different applications.

The only requirement is that comparable measuring sensors are given the same name in every object!

How do you look at measuring data?

It is assumed that measuring data has been input to the PC and saved on the hard disk under an Object name.

- First open a graph.
- If there is no suitable graph available, create one automatically with Generate, or manually using Composition.
- Then select measuring data to view by selecting Object.
- You then use the *Analysis* tools to study details, select time period etc.
- You can then *print out* to printer, *export* or create a *report*. You may choose to export *graphics to clipboard* and paste the graph into another program.

Read more below on how to use the different parts of the program.

OBJECT STRUCTURE

The table below illustrates the relationship between **Measuring object** and **Graph..**

\	Graph 1	Graph 2	Graph n	....	.....
Measuring object 1					
Measuring object 2					
Measuring object n					
....					
....					

Each graph can be used for all measuring objects using a matrix structure. The only requirement is that measuring sensors have the same name.

Measuring object to be presented is selected with the button or from the menu under *Analysis* and *Object*.

The presentation graph is selected with the button or from the menu under *Graph* and *Open.*

Analysis

Analysis focussed on the work carried out by the user to study and process measuring data.

The analysis task and the tools used are described in the chapter *Analysis tools* below.

Composition

Composition refers to the composition of the graph.

A graph does not need to be created for every measurement! It is sufficient to make a format similar to a fax format on a word processing program.

Individually designed graphs can be created using the the tools in the *Composition* menu. Graphs can also be created automatically using the ”Generate” function.

Read further in the chapter *Compose graph* below

Generate a graph automatically

Monitor can also create graphs automatically using the *Generate* function.

A standardised graph format is created automatically. The user just specifies which measuring sensors are to be used for drawing the curves.

Axes and scaling are based on the size of the data record and by which measuring sensors are required in the diagram. Select *Graph* and *New* and press the button..... Read more below!

The Graph menu

The Graph menu is located where you normally find File in word processing and similar programs.

Different presentations are opened and closed from the Graph menu, and from here you can select the presentation type you want to use.

Measuring data is not connected to a specific graph!
A unique function that makes the analysis task significantly easier is the minimal number of graph formats required. Regardless of how many hundred measurements have been made or how many thousand sensors used.

Display and print out graph

Open graph

A graph is a ready presentation that has been previously created and stored under your choice of name.

How the graph is created is described in the chapter on *Composition* below.

- Select Graph from the menu bar

  Pull-down menu for Graph is shown

- Select Open and click with the mouse

  A dialog box with previously saved graphs is shown.

- Select the graph required from the scroll list and then click OK.

  The selected graph is opened in a new window. Measuring data can now be studied and the graph printed out.

Scaling and in-depth study

Below is an example of an open graph.

In this case a graph format for calculation of power and energy based on measurement of current.

The diagram has a Y-axis for power as well as text boxes with formula for calculating power and energy. In this case the graph is shown as a line, but a bar-chart can be selected.

The diagram can be regarded as a ”display window” where a part of the graph (time series) is shown.

Using different analysis tools, various parts of the graph can be enlarged and reduced, and different time areas selected.

The chapter *Analysis tools* below describes in detail which tools are available and how they can be used.

Graph name

Free choice of text for graph

Text box with variable-based text information

Fixed text

Each graph can have up to 16 Y-axes, 128 curves, an unlimited number of text boxes with formula and fixed text. Placement and size can be freely selected. Measuring data is collected from any measuring object. A virtual LEGO!

Output to printer

The Graph is printed out by pressing the . button.

The printer is part of the graph's composition, ie different graphs can be connected to different printers and have individual units etc. (For the printout to be successful, a printer must first have been selected for the graph during composition. If a printer has not been selected, the button is "grey".)

Y-axis

- Click on the graph to be printed out.
- Press the button in the button bar.

  The graph is printed out. If nothing happens check that the printer is connected and turned on and that the correct printer is selected.

Read further in the chapter *Composition* under *Page layout*. Read also in the chapter *Printers* about how to select and configure different printers.

Curve (graph)

Time axis

Text box with calculations

Import the graph to word processing program

Graphs presented in Monitor can be directly transferred as a graphic to other programs, usually a word processing program, using the copy and paste function.

- Press on the button in the button panel.

  The graph is transferred to the clipboard.
- Start the word processing program and select paste in the required document

  The graphs will now be included in the current document.

The word processor's text tools can now be used to enlarge / reduce, add text and comments, change colours, typestyles etc.

Several windows

Monitor can simultaneously manage a large number of graphs which are opened in different windows in the same way as documents in a word processing program.

The windows can be arranged in various ways using the *Window* menu.

- Click on *Window* in the menu bar.

  A pull-down menu is opened.

- Select required presentation by clicking on the options.

  Switch between active windows by clicking on the desired graph name.

  In the above example MALL_S2 is selected while MALL_I2 is open but not active.

Analysis tools

General information about analysis

Every measuring project is unique. The user's knowledge about the physical process being measured is critical to how good the result will be.

The analysis tools are available to help the user to transform measuring data to information and knowledge.

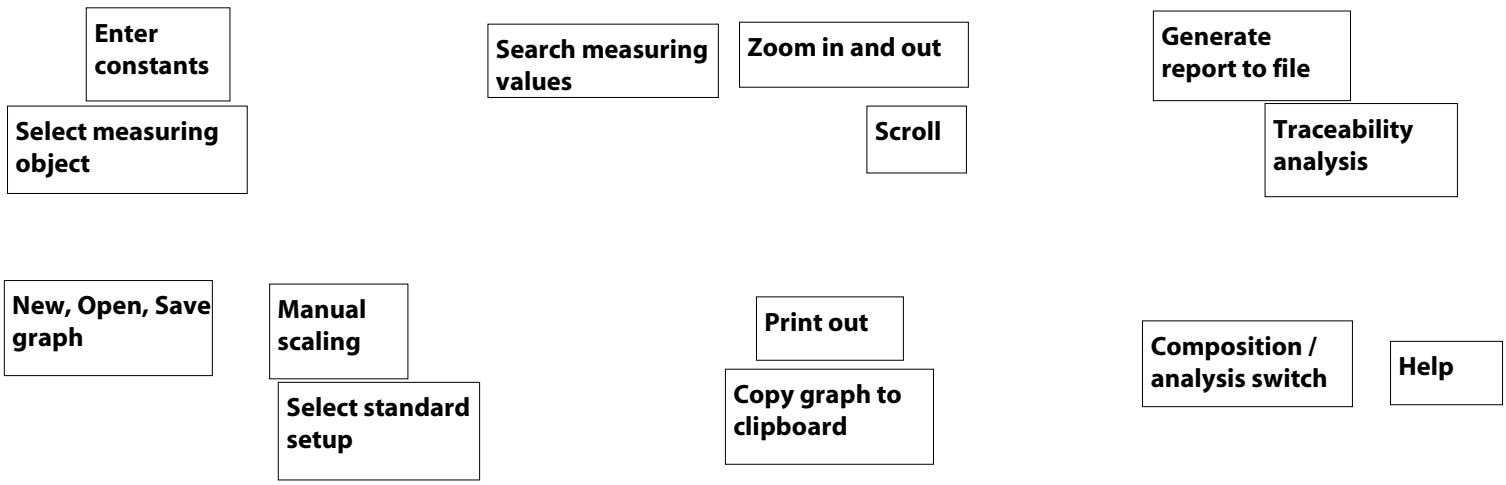
Monitor has highly powerful functions for presentation, calculation and printing of collected measuring data.

- Graphic analysis and presentation
- Calculation
- Export
- Report
- Printing

This chapter describes which tools are available and how these can be used.

NOTE! Measuring data is not affected in any way by analysis work.

Zoom, scroll, calculations etc. affect only the appearance of the "display window".



The most important tools are accessible on the button panel. Tools are also found in the menus and can be activated from the keyboard.

Tools on the menus

The functions shown on the button panel above are also found in the pulldown menu under *Analysis* on the menu bar.

- **Object** selects from different measuring objects
- **CONST** opens dialog for input of constants in formula
- **Find values** searches forwards or backwards in time after measuring data
- **Scale** opens dialog for manual entry of gain
- **Zoom** zooms In or Out in both Y and time directions
- **Scroll** moves the graph up, down, to right or left
- **Mode** for Mark, Zoom, Scroll, shows which functions are now used by the right mouse button

Right mouse button

By clicking on the right mouse button you quickly switch between different analysis tools.

Each click of the mouse button changes the cursor's appearance. Four different cursors are available:

Normal mode

No tool is connected.

Mark mode

Shows specific value and its time stamp at any position. Refer to the chapter *Show actual value* below.

Zoom mode

Enlarges a selected area in the graph. Refer chapter *Zoom* below

Scroll mode

A graph can be tracked in detail with the fine-scroll function. Refer chapter *Tracking graphs* below.

The cursor changes appearance only when it is moved into the graph or onto one of the graph's axes. Outside the graph it resumes its normal form.

Zoom

To get a quick overview, you can use the Zoom Out function, and for detailed study you can Zoom In the graph.

It is easiest to use the buttons on the button panel.

Zooming occurs in both the Y-axis and time axis simultaneously.

- Click on Zoom Out (- button)

  All graphs in the diagram are reduced. The time frame increases and the range of the Y-axis is increased.

- Click on Zoom in (+ button)

  All graphs in the diagram are enlarged. The time scale is reduced and the range of the Y-axis is reduced.

Every Zoom out can be compensated with a Zoom in.

The function is also available on the Analysis menu but is much easier to use from the button panel.

Scroll

Another way of moving around in the graph is to use the Scroll function.

It is easiest to use the buttons on the button panel.

Scrolling works in both the horizontal and vertical direction.

- Click on Scroll up / down

  Curves in the graph are moved a half-diagram height down or up respectively.

- Click on Scroll right / left

  Curves in the graph are moved a half-diagram width to the left or right respectively.

These functions are also available on the *Analysis* menu but it is easiest to use the button panel.

Show current value

Current measuring values for each curve can be displayed by placing a cursor in the form of a vertical bar in the diagram. The function can be enabled using the right mouse button or selected from the *Analysis* menu and *Cursor type*.

The vertical line is placed in the required place and both measuring value and time is displayed.

- One click (from normal) with the right mouse button enables the cursor type.

  The cursor changes appearance to two vertical bars and a vertical line appears in the diagram.

- Press and hold the left mouse button.

  The vertical line jumps to the cursor.

- Holding the mouse button, drag the cursor sideways to the required position on the curve.

  The current measuring value and its time is continually displayed.

You can select the colour of the cursor under *Page layout* in *Composition.*

Select time range manually

Different parts of the diagram can be accessed, enlarged and reduced using the mouse and buttons on the menu.

The desired time and measuring range can also be entered in numerical format from the keyboard using *Manual scaling*.

The button can also be used.

- Select Analysis and Scaling from the menu. Then select *Manual*.

  The dialog box is shown below.

A dialog box for manual scaling is displayed.

Start date / time is the time stamp for the first measuring value shown in the graph.

Stop date / time is the time stamp for the last measuring value shown in the graph.

Axes show Left #1 to Left #8 or Right #1 to Right #8.

Start is the minimum value for the Y-axis selected.

Stop is the maximum value for the Y-axis selected.

Setup time range

- Place the cursor in one of the time frames and enter the time point to be modified.

The time format given under *Alternative* and *Setup* must be used.

Setup axis scales

- Select which of the 16 possible axes are to be used by clicking on the pull-down list.
- Place the cursor in the *Start* or *Stop* box and enter the desired value.

Complete setup by clicking on OK.

NOTE.
The quickest way to open a dialog box for manual scaling is to double click with the left mouse button on an empty field in the graph!

Automatic scaling

WinLog has several functions for automatic scaling of graphs in the dialog box *Analysis, Scale.*

In addition to *Manual* described above, there is *Standard, Last value, All values.*

Standard resets the diagram to the scaling that was defined when the diagram was composed (time range, Y-scale).

Last value rescales the diagram so that it shows the entire last data record

All values rescales the diagram so that it shows all measuring values (all data records) that have been collected for the current sensor.

When the diagram is created automatically using the Generate function, the function *Last value* will automatically be used and the graph will be shown with the latest data record.

Last value

A graph may have several data records with different times, ie several measurements made with different instruments. When Last value is run in this case, the latest measuring value from the last data record will always be shown in the bottom right hand corner of the diagram. The graph will then reach as far to the left as the shortest data record.

In other words, the graph stops at the end of the data record that finishes last and starts at the beginning of the data record that commences first.

All values

The graph starts where the oldest data record starts and ends where the most recent data record finishes.

Zoom out a frame

Any area in the diagram can be enlarged, zoomed out, by drawing a frame over the area.

A frame is drawn and the area enlarged.

The function can be initiated with the right mouse button or selected from the *Analysis* menu and *Cursor position.*

Two clicks (from normal) with the right mouse button shows a magnifying glass.

- Click in a corner of the diagram with the left mouse button and hold the button in
- Drag the mouse diagonally over the area to be enlarged.

  A frame will be displayed over the selected area.

- Release the button.

  The area is enlarged.

The sequence can be repeated and in this way the area is gradually enlarged.

To return to the default setting, click the button in the button panel.

Track a curve

An enlarged curve can be tracked using the fine-scroll function.

The function can be enabled with the right mouse button or selected from the *Analysis* menu and *Cursor position*.

The center of the diagram is marked with a fixed cross.

Three clicks (from normal) with the right mouse button enables the fine-scroll function. The cursor changes in appearance to an arrow.

The principle is that with every click with the left mouse button, the center of the graph is moved to the point where the cursor (cross) was.

- Click with the left mouse button on the curve.

  The range where the cross is places jumps to the center of the graph.

By clicking repeatedly, you can track the curve in detail back and forth in time.

Placement is made by increasing one of the grids in the graph, which means that if you want higher resolution for scrolling you should compose the graph using a denser grid..

The cursor colour can be selected under *Page Layout* in *Composition.*

Stretch axes

Monitor is uniquely able to quickly enlarge sections of the graph using a function we call **stretch**

The mouse is used to drag and release a time-point or Y-value on one of the axes.

Axis before stretch

Axis after stretch. The value 20 has been moved with the mouse to the end of the axis and the axis and graph has been enlarged.

- First select one of the mouse's analysis tools by clicking one or more times on the right mouse button.

  The cursor changes appearance

- Drag the cursor to a value on the time or Y-axis.

  The cursor is changed to a double arrow, horizontal or vertical, depending on the axis selected.

- Press and hold the left mouse button.

  A box is highlighted around the current value.

- With the mouse button still held in, drag the box with its value to the new position where the value should be placed. Release the button.

  The graph has now been rescaled.

If the time axis is stretched it will affect all curves.

If one of the Y-axes is stretched, it affects only that axis and the curves that are connected to the current axis.

To return to the original graph, click on the button in the button bar.

Search first and last measuring value

A large quantity of measuring data can be managed by WinLog. Measuring data is saved under a measuring object that can contain measuring data from many different sensors.

Data can be collected repeatedly from each sensor and an increasingly long series of data built up in WinLog as new data transfers are made.

A data record is created.

If there is a break in measuring, for example due to a deliberate pause in data collection (perhaps a measurement is made in spring and a new check made in autumn) a new data record is created for the sensor. This is not evident to the user but is an internal action in Monitor.

Monitor is however equipped with analysis tools that jump between the different data records.

They can be found in the menu under *Analysis* and *Find values*.

The tools are useful for searching for data. The different options are

Previous, Next, First and Last.

Last will place the latest measuring value last in the diagram.

First will place the earliest measuring value first in the diagram.

Next and **Previous** switch back and forth between subsequent data records.

Next and Previous are also on the button panel.

SEARCH MEASURING VALUE is very useful when you make repeated measurements for the same measuring object.

Say that once per month you check an object.

The operation is then very simple. It is sufficient to make a data transfer to the same measuring object as previously, no configuration or file management is needed. During analysis you open the old diagram and press on the Next or Previous button. Measuring data is searched for and shown in the diagram.

It is also possible to attach comments to each data record that can be shown in the diagram.

When you have zoomed too far

Monitor has many ways of doing quick and easy analysis using different tools such as zoom, scroll etc.

Sooner or later you will ”zoom too far” and want to return to the starting point. For this purpose there is a special button on the button panel.

It is called Standard scaling and the function is also found on the Menu under *Analysis*, *Scaling* and *Standard.*

- Press the button on the button panel.

  The standard value defined when the graph is created is used and the axes are rescaled.

When the button is pressed, WinLog will return to the start and select the time range and default values that the graph was originally set up for.

Change standard scaling

Changes these original values in *Composition* by opening the appropriate axis or grid and modifiying.

Read more below in the *Composition* chapter.

Constants for calculation

Monitor contains a powerful formula language that can be used for calculations between time series (curves) and to produce statistics and summaries.

The formula language is used when a graph or presentation is composed and is described in detail below.

An important part of all calculations are constants, ie fixed numbers that are entered in formula such as density, resistance, limit values etc.

It is sometimes necessary to quickly change these constants from an operating menu without going into the formula and changing it.

Monitor therefore uses a concept based on constants, ”CONST”. (Named Const so that it is easily recognized when a formula is created). Usage of constants is described in detail in the *Composition* chapter below.

Changing constants

In the *Analysis* menu there is an option called CONST.

The function can also be reached from the menu bar with the button.

- Press or select CONST from the *Analysis* menu.

  A dialog box is opened.

- Click in one of the CONST fields and enter the new value.

The definitions of the respective CONSTants are defined under *Measurement* and *Configuration* and are entered as text.

Read more above about how to *define a measuring object* along with how you use *formula language*.

Compose a diagram

A building system

Monitor has many ways to create presentations and perform calculations suited to the users requirements.

- Optional choice of grid with time scaling
- Up to 16 different Y-axes
- Up to 128 different curves (graphs)
- Powerful formula language for calculations of time series (curves)
- Unlimited number of text boxes
- Advanced formula in text boxes
- Virtual (theoretically created) graphs
- Free choice of print format

Composition works like a drawing program that contains different building blocks. The user can easily create and change presentations as required.

From the composition menu you can reach all the work tools needed to create a presentation.

Principles

It is a straightforward process to compose and modify a graph.

The aim is for a diagram to be composed ”once and for all” and then used for different measurements.

A number of well thought-through graphs are sufficient. Naturally modifications are needed now and then for new applications and new conditions but it should not be necessary for every measurement to require a new graph.

Measurement data is completely independent of the presentation. The graph is simply a ”display window”.

Remember!

- **The graph consists of a number of ”building blocks”.**
- **Double clicking on the building block opens a dialog box.**
- **Drag and release the building blocks in the graph.**
- **Click and drag the corner of every building block to change its size.**
- **Add building blocks from the Composition menu.**
- **Remove building blocks using the Delete key.**
- **Switch between *Analysis* and *Composition* using the -button.**
- **Press every time the composition is changed and left.**

Create a new graph

Graphs can be created in two ways: **Manually** or **automatically**.

The fastest is to let the computer automatically create a graph based on a typical measurement.

Then you can change the contents and appearance of the graph to suit your requirements.

Automatic graph

When a new measurement is made that is different to previous measurements, a new graph is needed. It is easiest to allow WinLog to automatically create the initial version of the diagram.

The required changes can then be made manually.

- Select *Graph* and *New* from the menu or click on the button in the menu bar.

  The dialog box *Page layout* is opened.

- Select printer and press OK (Refer to Page Layout chapter below for detailed modifications)

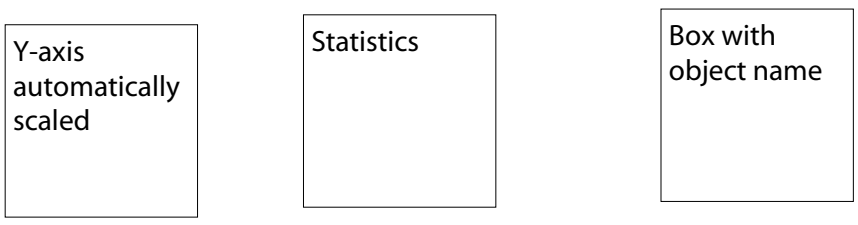
  A new dialog box *New* is opened.

- Click first on the measuring object to be used and then click on the measuring sensor to be graphed. Use Ctrl- and Shift-keys to select more than one.

- Then select Generate.

  A graph is opened, in this case with two curves and a single Y-axis.

  The measurement is shown and you can start analysis work. The graph's appearance and content can then be modified as needed.



Example of automatically generated graph with two current curves.

Manual graph

To create a graph completely manually, start in the same way as for automatic composition.

- Select *Graph* and *New* from menu or click on the button in the menu bar.

  The dialog box *Page layout* is opened. **Refer above.**

- Select printer and press OK. (Refer chapter Page layout below regarding more detailed changes).

  A new dialog box *New* is opened. **Refer above**.

- Click on *New Empty*.

  A new window with an empty work space is opened. The window is given the name COMPx (where x is a digit). Composition switches the program to composition mode and the button is pressed.

It is now possible to start adding content to the empty graph.

The work can, for example, be done step-by-step in the following order:

1. **Grid**
2. **Y-axis**
3. **Graphs (Curves and bars)**
4. **Text boxes**
5. **Text boxes with formula for statistics**
6. **Printers and format**

The following detailed description explains how you add different components to the graph. All necessary tools are available in the *Composition* menu.

Create a gride for X-T graph

The most basic part of the graph is the grid. There are two types: X-Y graphs (time charts) and X-Y graphs. An X-T graph functions as follows:

There must always be a grid in Monitor presentations. It can be made very small and given a white colour so it beomes invisible, but it must exist.

The description below assumes that you have first clicked on the menu *Composition* and *Composition mode*.

- Click on Create X-axis and *Time graph*.

  A dialog box *Time graph* is opened.

- Now select *Type* from the drop-down menu.

  A Curve is the most usual and is easiest to work with.

  Continue and select style and appearance on the grid using the various choices in the dialog box.

  Refer below for explanations of the various options!

- Complete setup by pressing OK.

  The Dialog box is closed and you can now go on to add new components in the graph or review them to see how they look.

- Press on the button to exit composition and go into analysis mode.

- Now press the button to collect the standard values selected.

  Check and continue graph composition.

These settings can now be saved from the Graph menu. The program will also check if you want to save them when the dialog box is closed.

NOTE! The information provided will now be the graph's standard values.

During analysis, scaling can be easily reset to standard values using the button.

NOTE!
If you want to change the composition of the graph,
click on the component to be changed.
A dialog box is opened.
To change the Y-axis, double-click on the axis.
To change a curve, double-click on the curve's text box etc.
NB! Switch first into composition mode.

TIME GRAPH **DIALOG**

On the left side of the dialog box you can select parameters common to both curve and bar charts. On the right side are boxes that are specific to each type. Use the buttons to select typestyle and colour.

GRAPH TYPE has options for *Curves*, *Side bars*, *Top bars* and *Offset and Step curves*.

Side bars place different sensors beside each other and top bars on top of each other (stacked). Offset curves are used to repeat curves, eg to align the days of the week over one another.

Y-SCALES selects the number of horizontal lines.

TIME RANGE is the time range that you want the diagram to cover.

TIME SCALING sets the times between vertical gridlines. Any number can be entered and from the drop-down list you can select from second to year. Take care **not** to select a combination of **large** time range and **short** time scaling. There can be many gridlines!

TIME DISPLAY is the method used to show time on the T-axis. You can select different variables: including **absolute time** (date and timestamp); **relative time**, which is time in seconds for example, from the beginning of the graph; and relative registration number.
Tip: Select Date and Time to start with.

HORIZONTAL and **VERTICAL** grid lines are optional.

HOW SHOULD THE GRAPH LOOK?

In the middle section of the dialog box there are options regarding the appearance of the graph.

In the upper box you can enter **RESOLUTION** which is simply the curve's thickness on the screen. This applies only if you have previously selected the Graph type "Curve".

Consider that the thicker the curve you select the more measuring values are hidden behind each "colour spot" (a curve consistes of a number of dots so near each other that they merge). Monitor keeps track of how many measuring values a spot contains and calculates a median value of all. Then the spot is drawn in the place where the median value should be.

This means that the thicker the line (higher resolution) you choose, the more "smoothed out" the curve will become.

In the lower box you can select the width of bars in a BAR CHART. Enter any number in the left box and from the drop-down list select a width from second to year.

Monitor will calculate a mean value for the selected time period and position the top of the bar at this point. The appearance of the bar (pattern, colour, etc) is selected from another dialog box (connected to the graph, refer description below).

BUTTONS

TYPESTYLE and **COLOUR** can be freely selected using the standard Windows approach. The **COLOUR ON X-AXIS** selects the colour of the time display while **COLOUR** selects the colour of the grid.

Tip: If you wish to hide the grid and only show calculations or text select white colour!

BROWSE provides access to a summary of the measuring structure. Here you can find a summary of information about sensors, objects etc.

Create grid for X-Y graph

The most basic part of the graph is the grid. There are two types: X-Y graphs (time charts) and X-Y graphs. An X-T graph functions as follows.

There must always be a grid in Monitor presentations. It can be made very small and given a white colour so it beomes invisible, but it must exist.

The description below assumes that you have first clicked on the menu *Composition* and *Composition mode*.

- Click on *Create X-axis* and *XY-graph*

  A dialog box *XY-graph* is opened.

- Enter the name of the sensor that will be the reference on the X-axis.

NOTE! The information provided will now be the graph's

Continue filling in the other fields in the dialog box.

Refer to the explanation below of the different options!

- Complete setup by pressing OK.

  The Dialog box is closed and you can now go on to add new components in the diagram or review them to see how they look.

- Press on the button to exit composition and go into analysis mode.

- Now press the button to activate the standard values selected.

- Check and continue graph composition.

Check and continue graph composition.

standard values.

During analysis, scaling can be easily reset to standard values using the button.

XY-GRAPH DIALOG

XY-graphs make it possible to compare two sensors to each other. For example, the x-axis can show termperature and various Y-axes can show power consumption.

Y-scale specifies the number of grid marks in the X-axis.

X-scale specifies the number of grid marks on the Y-axis.

Resolution specifies the thickness (in mm) of the graph displayed on the screen.

Consider that the thicker the curve you select the more measuring values are hidden behind each ”colour spot” (a curve consistes of a number of dots so near each other that they merge). WinLog keeps track of how many measuring values a spot contains and calculates a median value of all. Then the spot is drawn in the place where the median value should be.

This means that the thicker the line (higher resolution) you choose, the more ”smoothed out” the curve will become.

Significant digits indicates how many digits the axis gradient should have.

SI-Units indicate that the prefix milli, kilo etc. is used.

Horizontal and **Vertical** lines can be selected or switched off.

Auto Settings collects information automatically from the sensor (see equivalent box in *Measurement Configuration*). If information is entered in these boxes, this will be used instead of default values.

BUTTONS

TYPESTYLE and **COLOUR** can be freely selected using the standard Windows approach. The **COLOUR ON X-AXIS** selects the colour of the time display while **COLOUR** selects the colour of the grid.

Tip: If you wish to hide the grid and only show calculations or text select white colour!

BROWSE provides access to a summary of the measuring structure. Here you can find a summary of information about sensors, objects etc.

Create Y-axis

Monitor can have up to 16 different Y-axes, 8 on each side. Normally however, only 2-4 axes are used at the same time. Before the axes are added a grid must exist. Refer above.

In the description below it is assumed that you have first clicked on the menu *Composition* and *Composition mode*.

- Click on *Create Y-axis*.

  A dialog box for the axis appears.

- Select the axis position using the drop-down list, select the number of digits on the axis along with the desired SI-prefix (milli, kilo, etc).

  WinLog suggests the first available place for a new axis.

- The box *Auto settings* can be filled in if desired but can be left empty.

- Select colour and typestyle for the axis.

- Complete with OK.

  The dialog box is closed and you can now continue to add new components to the graph or check the appearance.

- Press the button to leave composition and go into analysis and then press the button to collect the standard values selected.

  Check and continue graph composition.

The settings can now be saved from the Graph menu. The program will also ask if you want to save when the dialog box is closed.

Read below for further information on the functions in this box.

SIGNIFICANT DIGITS indicates how many digits the axis gradient should have. SI-UNITS mean that the prefix milli, kilo etc are used.

AUTO SETTINGS collects information automatically from the measuring sensor (refer equivalent box in *Measurement Configuration*). If information is entered in this box it will be used instead of default values.

Create curves and bars

Measuring data can be presented as curves or bars. The common name in WinLog is *Graphs*.

An unlimited number of graphs can theoretically exist in a diagram and each graph can have its own Y-axis or share with another graph.

Before the graph is created, a grid must exist. It therefore makes sense to first create the Y-axes. *Refer description above*.

In the description below it is assumed that you have first clicked on the menu *Composition* and *Composition mode*.

- Click on Create Y-axis.

  A dialog box for the axis opens.

- Enter the name of the measuring sensor to be presented in the box *Formula*.

  The name can be part of a formula combined with the names of other sensors. Press the *Browse* button for a summary of which sensors are available in the system.

- Enter a comment that describes the sensor or its function in the *Comments* box.

  This information will then be shown in the graph for the current sensor. If no comment is entered, the formula / sensor name in the Formula field will be displayed.

- Complete the other information in the dialog box

  Refer below for a description of the various fields in the dialog box.

- End with OK

  The dialog box is closed and you can continue to add new components in the graph or check how it looks.

- Press the button to leave composition and go into analysis mode, and then press the button to select default values.

  Check and continue graph composition.

- The settings can now be saved from the Graph menu. The program will also ask if you want to save when the graph is closed.

WinLog has an enormous capacity for calculating time series.

Review the chapter on Formula Language about available mathematical functions.

GRAPH DIALOG BOX

Graphs can be fully designed to suit the user's requirements, in terms of both function and appearance.

Graphs can have two basic appearances, **Curve** or **Bar**. Selecting the appearance is related to the grid and is done in the dialog box Time graph. This means that either a bar chart or a curve is used, and the two types cannot be combined in the same graph.

When the dialog box is opened, there are a number of options for the most typical properties. It is sufficient to simply enter the sensor's name and press OK.

FORMULA is the field that must be completed with at least the **sensor's name**. You can also enter a formula and thus perform a calculation where the sensor name is included as a variable.

Example of a formula: CURRENT230*0.9/1000.

This formula multiplies the CURRENT sensor by the power 230 (V) and the effect factor 0.9 (both values have been provided in this measurement). The result is then divided by 1000 and the result is an effect curve in kW.

CURVES AND BARS contain information on how the graph should look. In the drop-down list **Y-axis** you select which axis should be used for the graph. This axis should then correspond with the contents of the graph (ie if you measure for example a 0-10 Bar pressure it is not suitable to use a Y-axis that is scaled -100 to 400°C!).

The checkbox **Hide comments** hides the optional text that is entered in the Comments box above. **Hide curve / bar** hides the graph on presentation. This can be useful if a curve is only used as a transitional step in a calculation and doesn't need to be shown. **Hide in report** removes the graphs measuring values from the report to a file that can be generated with the button Report. **Graph number** is a sequence number that is assigned to every graph. The number is used with certain calculations using formula language.

ADJUSTMENT is used to adjust the text in the graphs text box (that shows the comment).

BAR setup is used to provide pattern and appearance (applies only if a bar chart is selected as the grid).

OFFSET CURVE makes it possible to displace curves one graph width and in this way repeat curves, eg one week's measuring data can be shown as 7 curves with a 24-hour width for the graph.

BUTTONS to the right make it possible to select optional colour and typestyle appearance using the normal Windows approach.

Tip! Select the same colour for the graph as on the Y-axis. Refer below for configuration of alarm

Alarm

Monitor has functions for both local and external alarm. The alarm is activated when a user-defined limit value is exceeded.

The alarm will be triggered at the same pace as new measuring data comes in and is presented.

The alarm is defined during *Graph* composition and is therefore part of the program's analysis tools. Alarm limit is a specific graph based on a constant that is entered by the user.

For the alarm to be activated, it is necessary for the current graph to be open.

Definition of alarm limits

Alarm limits are entered as a curve (graph). This level is defined during composition or taken from a constant (Const).

- Open a graph with curves for the current measuring object and go into *Composition mode*.
- Click on *Composition* and select *Create curve*.
- Specify the required *curve alarm* as a numerical value along with the *axis* that is to be used for the alarm curve.

  The alarm level has now been defined and will be shown as a line in the graph.

  For an alarm to be activated an action must be defined. Refer below.

Indicate which curve (graph) should trigger alarm

- Click the *Alarm* buttonn in the dialog box.

  A new dialog box will be opened.

- Indicate which graph the alarm should affect as well as whether Min or Max alarm should be used.

ALARM LEVEL FUNCTION

All graphs can be used for alarm and in all graph dialog boxes there is a button **ALARM**.

The system is completely general. All graphs can send alarms on all other graphs. Because each graph is assigned a number, all combinations are possible.

CONDITIONS

The graph with alarm settings must be open for the alarm to be given. The diagram can however be reduced to an icon on the screen. The alarm is given immediately it is noticed by Monitor, in other words measuring data must have been collected in from the measuring station.

MAX and MIN alarm

The alarm function is based on a comparison between selected graphs. The alarm can be given either when a limit is exceeded from either above or below. In the dialog box the sign < (less than) and > (greater than) are used to indicate the relationship.

The dialog box works on the basis that the Max alarm is given if ”this graph is greater than graph number X” and the Min alarm is given if ”this graph is less than graph number X”.

ACTION ON ALARM

When a limit is exceeded, the alarm triggers the actions that have been specified (Alarm 1 to Alarm 4). Up to 4 events can therefore be activated at the same time. A single event can for example cause the system to ring two GSM numbers, activate a dialog box on the screen and send a Mini Call.

TEST FUNCTIONS

In the menu Measurement there is an option Alarm. This can be used to TEST the alarm function and this does not affect the settings in the various graph dialog boxes.

Indicate what should occur on alarm

- Click on one of the buttons *Alarm 1* to *Alarm 4*.

  A new Alarm dialog box is opened.

- Select from the drop-down list which type of alarm is to be used.

  Select Local Alarm or SMS (modem connection with text message requires special software on the receiving PC).

- If SMS or Mini Call is selected, enter the number to the operator's message central (refer help text in the program).

  Different operators have different telephone numbers.

- Provide the number of the receiver's GSM telephone or Mini Call receiver.

- If Mini Call is used, provide your sender number and password.

  An authorised send subscription is required to be able to send Mini Call messages.

- Write the text message that is to be sent out for the particular alarm.

- Press OK to close the *Graph alarm* dialog box and OK again to close the *Alarm* dialog. Then close Graph settings and press OK in the *Graph* dialog box.

GRAPH ALARM DIALOG BOX

Max alarm	Alarm if current graph has greater value than alarm graph.
Min alarm	Alarm if current graph has lower value than alarm graph.
Alarm 1	Alarm number 1 to perform on alarm, refer Alarm
Alarm 2	Alarm number 2 to perform on alarm.
Alarm 3	Alarm number 3 to perform on alarm.
Alarm 4	Alarm number 4 to perform on alarm.
OK	Use these settings.
Cancel	Cancel
Help	Display help text

ALARM DIALOG BOX

Alarm type	Type of alarm:
Local alarm	Gives alarm on screen and via speaker on computer.
Modem	Rings up a modem and sends alarm as text. The modem that replies can for example be connected to a printer.
SMS	Sends SMS messages to GSM telephone or Mini Call.
Tel to message central	Telephone number for modem to ring up. This is the number to an answering modem or to SMS central.
Extra modem initialisation	Modem initialisation in addition to that done in modem settings. Normally no extra is required.
Tel to receiver	Telephone number to GSM or Mini Call that should receive the SMS message. This telephone number is not dialled, but is sent to the message central.
Origin	Number of sender.
Password	Sender password.
Message to send	Text to display or send.
OK	Use these settings.
Cancel	Cancel
Help	Help text.

Create text boxes

A very important function in the Monitor diagram is the **Text box**.

In theory, an unlimited number of text boxes can be added to a diagram. The boxes can be placed anywhere in the diagram and made whatever size you want. The colour and size of the typestyle is optional.

Text boxes can contain **optional text** or **formula** for calculations of measuring data. Information can also be collected automatically from the measuring system's composition using the %I variable.

In the description below it is assumed that you have first clicked on the menu *Composition* and *Composition mode*.

- Click on *Create Text*.

  A dialog box *Text* opens.

- Enter the required text or formula. Refer *Formula language* for description or press the help button.

  In the example above, only the *Maximum value* and *Bar* will be shown as text. When "%F[" is entered it means that "here comes a formula" which is then completed with "]". The above formula is PRESSURE:MAX which means collect and show the highest value from the PRESSURE sensor.

Several rows of text and formula can be combined in a single text box.

Use Ctrl C and Ctrl V to copy and paste text and formula.

- Select the typestyle and colour and adjustments then press OK.

  A new text box is opened in the graph

- Click on the box and drag it to the required place. Click in the corner and stretch the box to the required size.

- Press the button to switch from composition mode to analysis.

  The completed text box is now shown in the assigned place on the graph.

  NOTE! If ###### is displayed in the box instead of a numerical value, it may be because the incorrect time range was selected in the graph. It is easiest to search for data using the buttons or enter the time using *Analysis, Scaling, Manual.*

- Return to the composition and complete. To open the dialog box *Text* again **Double click** on the text.

- Settings can now be saved from the Graph menu. The program will also ask if you want to save when the graph is closed.

COORDINATES WINDOW

The placement and size of components in Monitor diagrams can be controlled using a coordinate window. The window can be accessed in Composition mode and can be switched on and off from the menu *Composition* and *Coordinates*.

The window shows both the size and placement of the active component (grid, text, etc)..

Page layout

The size of the graph during printing and display as well as the colours of the cursor and background can be set in *Page layout* in Composition mode.

Selection of printer and other related settings can also be made in *Page layout*.

- Click on *Composition* and *Page layout* in the menu panel.

  A dialog box *Page layout* opens.

- Select the printer to be used from the drop-down list. Press the Setup button to select paper size, colour settings, etc.

  A dialog box for the current printer is opened.

- Select the size of printout to screen and printer.

  Tip! Select approx. 130% on printer scaling and then select Landscape A4 in printer setup.

- Select cursor colour (analysis tool *Cursor*). If a background colour other than white is required, select using the *Background colour* button.

NOTE! In Monitor all settings for page layout are saved individually in each graph.

Shortcut!

Double-click anywhere on the diagram's background to open the dialog box Page layout (must be in Composition mode).

SIZE indicates the size of the graph in mm that will be printed to the printer if 100% *Scaling, Printer* is selected.

SCALING scales from this size up or down on the screen and printer.

MAX SIZE adjusts the graph to the current screen so that the graph will always be as large as possible.

Save and delete a graph

graph works like a document in a word processing program. It can be Opened, Saved and Deleted in the same way.

- Click on the menu *Graph*.

  A pulldown menu is opened.

- Select Save or Save as.

  A graph name must be given. Select a name that describes the function of the graph, avoid associating it with the measuring object's name unless the graph is made specifically for a single measurement. Refer *graph formats* below.

- Select Delete.

A list of previously-created graphs is opened.

Click on the graph to be deleted.

NOTE! Only the graph is deleted. NOT the measuring data!

The measuring data is in a database that can only be deleted under *Measurement, Composition*.

Change the appearance of a graph

If you have read and understood the chapter Compose graph above, this chapter will be a repetition.

Composition mode

Usually a graph is used to analyse existing information. There are a number of analysis tools available that are described in the chapter *Analysis tools* above.

When the graph should be changed for some reason - perhaps you want to add a calculation, change the standard values for time range etc., the graph should be in *Composition mode*.

In addition to the *Composition mode* menu the button can also be used, and is the quickest way to switch in and out of composition mode.

- Press the button to switch to *Composition*
- Release the button to switch to *Analysis*.

Default value

When a graph is composed, it is assigned certain properties such as the width of the grid, the number of gridlines, scaling of the Y-axis etc.

These properties are called Default values.

In Analysis, both the time-scales and Y-scales are changed using zoom, scroll etc. To return to the graph's default values there is a special button This function can also be reached from the menu *Analysis, Scaling, Default.*

- In Analysis mode, press the button to collect the graph's default values.

  The graph is rescaled and takes on its original scale values. Note that **absolute time** (the time window that you want to look at) may need to be changed again.

Make a habit of pressing the button when you leave Composition.

Add and delete graph elements

A graph consists of a number of components (”building blocks”) as shown in the above diagram *Manual graph* in the *Compose* chapter above.

The components can be added or deleted.

Add a component with *Create*.... in the *Compose* menu.

Delete a component by clicking on the it and then pressing the *Delete* key.

Note that you must first switch to *Composition* mode using the button (or from the menu).

Change colour and other properties

All componenets have properties that can be changed.

Size

Time range

Y-axes

Quantity and unit

Formula and sensors

Time format

Typestyle

Scale lines

Colours

- Go into Composition mode using the button.
- Click on the current component.

  A box appears round the component.
- Change the size by clicking on and dragging the corner of the component
- Double click in the frame and the dialog box for the component opens.

  Make the required changes. Refer to the chaper *Compose Graph* for details on each dialog box.

Use graph formats

Graphs in Monitor are independent of displayed measuring data.The graph is just a ”display window” that has certain properties for different applications.

For example, a graph can be modified to show details over a 24-hour period - *24-hr diagram*. You can then compose a graph to get an overview of the same measuring data - such as a *Monthly diagram*.

Composed well, a graph can be a general format that is not connected to a specific measuring object or a specific measurement.

Copy a diagram

The easiest way to create a new graph is to copy an existing one!

- Open a graph.
- Select *Save as* in the *Graph* menu.

  Enter a name for the new graph.
- Go into *Composition*, make the required changes, then *Save* the new graph with its new properties.

Measuring object

Measuring data in Monitor is saved under a Measuring object (that has been previously defined and that you have collected measuring data for).

Monitor can have many different measuring objects.

By planning ahead you can use a single graph for different measuring objects. The only requirement is that you must give the sensors the same names.

Obviously this assumes that the measurements are similar, ie the you measure the same things.

Therefore graph formats are suitable for applications where you have repetitive and similar measurements.

Read in the *Structures* chapter about *Program design* and in the *Work method* chapter above. This explains the relation between measuring object and graph.

Well into a graph you decide to collect data from the required measuring object using the button (or in the *Analysis* menu, *Object*, or using the F2-key).

Importance of using the right sensor name

For graph formats to function, different measuring objects must use the same sensor names.

If for example you measure 3-phase current on a series of measuring objects, you can name the phases L1, L2 and L3 **on each object**. In other words, the same name. (Alternatively you can let WinLog name the sensors automatically and they will automatically be named G1, G2 and so on.).

You need to ensure that the sensors are connected in the same way from measurement to measurement so that the phase one will always be L1, phase 2 L2 etc.

Later during graph composition, you create a graph that collects data from L1 and so on.

Using the %I variable described below, you can manage the header text and collect information from the measuring object.

You have now created a general graph that can be used for different measurements.

Using the %I variable

If you change object during analysis and thereby collect measuring data from another measurement, possibly made at another geographic location, you will most likely want the headings and other information to be changed automatically.

The variable %I is used for this purpose.

Wherever %I is used in the graph's text box, Monitor will go into the current object and replace %I with the text information entered by the user when the measuring object was defined.

The variable exists in an array of forms, with six different meanings.

%I is always the measuring object's name.

%I[1] is Info 1 defined in *Measurement, Configuration.*

%I[2] is Info 2 defined in *Measurement, Configuration*

and so on up to **%I[5].**

Refer also to the example below.

Example using the %I-variable.

A heading text can be created in a Text box using only the variables %I.

In analysis mode, the text box will create the header in the graph:

The information is taken from the Info field in the current measuring object:

Calculations and formula

Formula language

Monitor can carry out many calculations on collected and saved measuring data. A series of measuring data, consisting of two to millions of measuring values, is known as a data record.

A time series is regarded as a variable in an equation, for example (TEMP1 + TEMP2)/2 calculates mean value of two temperatures. In Monitor, the temperatures can consist of a year's measuring data from two different sensors collected at one minute intervals. In other words, two data records with around half a million measuring values each.

Monitor creates a new data record (a graph) that is the mean value of each measuring point and draws a new curve.

Another example of a calculation is (POWER1:INT/3600) - in this case calculated as the area under the curve (integral) of the data record POWER (which could perhaps be pulses from a current meter collected over three months at 15-minute intervals, around 9000 measuring values).

Monitor creates a total that is in this case the energy during the time period. Because Monitor always calculates in SI-units, the integral will be in seconds and must therefore be multiplied by 3600 to get kWh (where the type of the pulse was kW).

This therefore results a numerical value rather than a graph, and the calculation must be displayed in a text box and not in the graph.

Both examples above use a way of expressing, naming and creating a mathematical expression. In Monitor, we call this formula language.

Formula language is described in the program's help text and each formula and expression is explained there in detail.

The overall structure is described below to provide an understanding of the system.

Calculations in the graph

Calculations can, as explained in the example above, be made on graphs and / or on text boxes.

Calculations in above graphs are entered in the dialog box *Graph* that is created under the *Composition* menu.

Explanation of the above example:

The example show a mathematical expression that calculates the power factor (cos fi) from a measurement of active and reactive effect. The measurement has been made using Mitec's AT40 data logger along with a combined current-meter with pulse output.

The calculation expression is based on Pythagorean theorem:

Power factor = Pa /√ (Pa^2 x Pr^2).

Pa: Active power

Pr: Reactive power

Using the formula language, the expression is written in much the same way as when it expressed manually.

The result is a third "virtual" curve created theoretically from two actual measured signals from a current-meter.

Calculations in text boxes

Calculations in text boxes are also made out on a data record. However the result of the calculation is a value rather than a new data record.

A text box is shown below with a formula that calculates the maximum value from a data record based on measuring data from the sensor PRESSURE.

The result of the calculation is shown in the graph as part of a line of text.

Many similar calculations can be made using formula language and are described in more detail under the heading *Text formula*.

FORMULA LANGUAGE

The formula language in Monitor is a set of tools and a method for carrying out advanced calculations on measuring data (data records). Formulas can be used to:

- make calculations on **curves** and enter them in **GRAPH dialog boxes**.
- make calculations that give a **numerical** result and enter it in **text boxes**.

Using Formula language, powerful calculations can be made on long series of measuring values (curves) as if they were individual numbers.

The formula language can be split into parts:

Formula
Constants
Variables
Operators
Functions
Text formulas
SI-prefix
GRAPH-objects

The formula are written in the same way as you normally would with manual calculations. The approach is described in more detail below.

FORMULA

A formula is a mathematical expression that can contain *Constants*, *Variables*, *Operators* and *Functions*.

Formula are used both in graphs and in *Text formula*.

A formula gives the result as a number.

This number can be one of many that together form a new **Graph**. This is the case when the formula is used in a Graph (data record).

A value can also be presented in a text box using **Text formula**.

Example:

TEMP

TEMP_IN-TEMP_UT

EFFICIENCY.FLOW*(TEMP_IN:MAX-TEMP_UT:MIN)

LOG(G1/EXP(G2:INT)+BAS.OFF)

CONSTANTS

Constants are numerical values.

The number can include + - signs, digits, decimal points, exponents.

(The exponent part can contain both + - sign and digits, eg. 1E3 is equivalent to 1*10^3, ie 1000).

Examples:

1

12

5,2

+3

-6,4

1E6

VARIABLES

In Monitor, variables are measuring data from the sensors.

Variable name is the name given to the sensors during Configuration of the Measuring system.

To differentiate variables from constants, variables start with a letter. This is the reason that object and sensor names also start with a letter.

The other characters in the variable can be letters, digits or the underscore sign.

A variable can consist of three parts.

Object.Sensor:Mod

- the first part indicates the object

- the second, sensor (under the object)

- the third part is a so-called modifier of measuring data

*Note that colon **:** is used to indicate that a modifier shall be used.*

If the object is not defined, the current object is used (the object that is selected with the Object button. If Mod is not defined AVG is used (refer below)

The modifier can be any of the following:

AVG	Mean value, SUM/NUM.
MAX	Maximum value.
MIN	Minimum value.
DER	Derivative, difference between the values divided by the difference in seconds.
INT	Integral, the sum of all the values multipled by the registration-interval in seconds.
TIM	Total time in seconds relative to all values.
SUM	The sum of all values.
NUM	The number of values.
RMS	Root Mean Square, SQRT(SM2/NUM).
STD	Standard deviation, square root of the variance, SQRT(VAR).
SM2	The squared sum of all values.
VAR	Variance, squared standard deviation, (SM2-SUM^2/NUM)/(NUM-1).

Calculation time range for variables

When a variable is used in a formula, it collects the measuring data from the sensor during the selected time range.

When the variable is used in graphs, the calculation is made with the resolution given by the curve's thickness or the column's width.

Examples of variables:

TEMP	Sensor name
STORG18.TEMP_UTE	Object and sensor name
FLOW:MAX	Sensor name (with Modifier)

TEXT FORMULA

Text formula are formula in a text box. The text formula can be combined with normal descriptive text.

% F[formula|valuenumber|SI-prefix]

"Formula".

When %F is written in the text, Monitor interprets it that the following character is a formula and not text. A formula is a mathematical expression that can contain *Constants, Variables, Operators* and *Functions*.

The formula starts with the character "[" and finishes with "]" (Alt Fn along with 8 or 9).

Before the square brackets you can also indicate the **number of digits** that should be presented in the result, as well as the **SI-prefix** that should be used (milli, kilo etc). The symbol "|" is used as a divider. (| is Alt Fn and the "<>|" key).

Example:

%F[CURRENT:MIN|2]

The above formula takes the lowest value from the data record (measuring value from the sensor) CURRENT and displays it with two digits (rounded).

Because no SI-prefix was given, this is excluded. If significant digits is not indicated, it will always default to 4.

It is NOT possible to leave out significant digits and include the SI-prefix. You must exclude "from the end".

Example:

%F[CURRENT:MIN|4|SI] %U

Here we have indicated that the SI-prefix should be used. Therefore we **must** also indicate that the type (%U) must automatically be used (collected from the measuring object). This means that if current is 0.995A for example, it is presented as 955mA. If it reaches 1001A it is presented as 1,001kA.

SI-prefix

10-exponent:	Prefix:
18	E
15	P
12	T
9	G
6	M
3	k
0	
-3	m
-6	u
-9	n
-12	p
-15	f
-18	a

%U[Object.Sensor]

Unit.

When %U is written in the text, Monitor will look up the type of **Sensor** under **Object** and use that instead.

You can leave out the Object name and enter just the sensor name. Information will then be collected from the object that was selected using the object button.

If you leave out both the object name and the sensor and in addition use SI earlier in the formula, the SI-unit will be displayed and you then need to manually indicate the type using text

Example:

%F[CURRENT:MIN] %U[CURRENT]. Will be displayed as **3,102 A** (if the minimum value was 3,102).

%I[Index|Object]

Info.

When %I is written in the text, Monitor will look up text information about the measuring object and display it. The text information has been previously entered during Composition of the measuring system.

Index is a digit from 1 to 5. You can leave out the object's name, in which case the object selected with the Object button will be used.

Example:

%I[3].

Read the text in info box 3: found under Measurement system configuration. If you enter only %I you get the current object's name

%M[Object.Sensor]

Measurement

When %M is entered in the text, Monitor will look up *Data record information* for the correct Object and Sensor.

Data record information is the text you enter in Measurement Configuration along with the sensor. The heading on the box is "Parameters for the next data record" and *Info*.

If several data records are currently displayed in the diagram, the first within the time range is used.

If Object is left out, the current object is used.

Example:

%M[CURRENT].

Information on the current data record for the CURRENT sensor will be collected (possibly notation on current calibration).

%D[Type]

Date.

When %D occurs, Monitor inserts the date in the text.

Type indicates the type of date, which can be START, STOP or CLOCK.

START indicates the date for the start of the graph.

STOP indicates the date for the end of the graph.

CLOCK is the current date.

If you write just %D, the start date will be used.

%T[Type]

Time.

When %T occurs, Monitor enters a timestamp in the text.

Type indicates the type of time, which can be START, STOP or CLOCK.

START indicates the time for the start of the graph.

STOP indicates the time for the end of the graph.

CLOCK is the current time.

If you write just %T, the start time will be used

Example:

%D[START] %T[START] to %D[STOP] %T[STOP]

can be shown as 991118 12:00 to 991218 18:00 if this is the range selected in the graph.

THE GRAPH-OBJECT

In Text formula, a special object in Variables can be used, known as GRAPH.

The ”Sensor ” for the object GRAPH is simply a curve - a graph. Graphs are assigned sequential numbers when they are created (refer Graph dialog). This number is used in Text formula. (eg GRAPH.1 or GRAPH.4)

By using the GRAPH object in the text formula, you can make calculations faster during analysis, and simplify input during composition.

Formula such as TEMP1-TEMP2 will not always give the required result when they are used in text formula. Individual values can be, for example, from different times (clock stamps) and this means the calculation will not work.

In such cases, a graph can be created with the formula ”TEMP1-TEMP2”. The graph’s number is then used in the Text formula instead of the direct calculation. The GRAPH object is simply an interim step in the calculation.

If the modifiers (refer Variables) MAX or MIN are used in the GRAPH object (eg GRAPH.1:MAX), you can also get different maximum and minimum values depending on how much you have zoomed in in the graph.

The values provided represent the visible maximum and minimum in the graph.

If you require an absolute maximum or minimum, the sensor’s name should be used directly in the calculation. eg. TEMP:MAX.

MORE THAN THESE FOUR CALCULATION METHODS!

Variables and constants are not sufficient to build a complete formula.

You also need calculation methods, such as plus, minus, square etc. In WinLog's Formula language we have divided these into OPERATORS and FUNCTIONS.

In addition, Monitor has SELECTORS for sorting measuring data from different time periods, MACROS to simplify formula and TABLES to express relationships between different variables.

OPERATORS

Operators perform a mathematical operation on one or more formula (expressions).

Operators are listed below in the order they are performed if combined in an expression (known as precedence order).

Higher precedence is performed before lower precedence, eg A+B*C is the sames as A+(B*C) and A^B*C is the same as (A^B)*C.

Parentheses can always be used in formula in Monitor.

Operators:

x^y	Exponent, calculated x to the power of y
x*y	Multiplication, x multiplied by y
x/y	Division, x divided by y
x+y	Addition, x plus y
x-y	Subtraction, x minus y

FUNCTIONS

Functions in formula perform a mathematical function on one or more arguments in the form of formula (expressions).

The argument of a function is written within parentheses. The entire expression can therefore be used as an argument.

The argument is separated with a character defined under *Setup* (in the definitions below a semicolon is used as as separator).

Certain functions can not always be assigned a defined result value when certain arguments are used (eg logarithm of 0). In such cases, the entire formula will be undefined and no result is given.

In Text formula this is presented as ########, and in graphs there will be dots in the diagram or an entire bar will be missing.

Functions:

ABS(x)	Absolute value of x
ACOS(x)	Arc cosine of x
ADD(x;y)	x+y
ASIN(x)	Arc sine of x
ATAN(x)	Arc tangent of x
ATAN2(x;y)	Arc tangent of x/y
CEIL(x)	Gives the lowest whole number that is greater than or equal to x
CHS(x)	Change the sign on x, same as 1*x
COS(x)	Cosine of x
COSH(x)	Hyperbolic cosine of x
DIV(x;y)	x/y
EXP(x)	Natural exponent function of x, e^x
FLOOR(x)	Gives the greatest whole number that is less than or equal to x
HIGH(x;y)	1 if x>=y, 0 if x<y
LOG(x)	Natural logarithm of x
LOG10(x)	10 logarithm of x
LOW(x;y)	1 if x<=y, 0 if x>y
MOD(x;y)	The remainder of the division x/y
MUL(x;y)	x*y
NOP(x)	Gives x, same as x
POW(x;y)	x^y
RANGE(x;y;z)	1 if x>=y and x<=z, 0 if x<y or x>z
SIGN(x)	1 if x>=0, -1 if x<0
SIGNZERO(x)	0 if x=0, 1 if x>0, -1 if x<0
SIN(x)	Sine of x
SINH(x)	Hyperbolic sine of x
SQRT(x)	Square root of x
SUB(x;y)	x-y
TAN(x)	Tangent of x
TANH(x)	Hyperbolic tangent of x

SELECTORS

Selectors are used in formula to select measuring data from sensors within a *specified time period*.

Selectors can be used in both graphs and text boxes.

Selectors can be freely defined by the user under the menu *Alternative* and *Selectors*.

Selectors are indicated within { and } inside the formula. All variables after (to the right of) a given selector are affected by that selector until a possible new selector is used in the formula.

If you indicate {}, in other words curve parentheses without a selector, it means that no selector should be applied to the following variables.

Selectors can not be used with the GRAPH object.

Example 1.

{MONDAY}TEMP

Show or calculate measuring values from Mondays.

Example 2.

G1/{SEL1}G2

Sensor G1 is divided by measuring data from sensor G2 but only G2 data during the time defined in the selector SEL1

Example 3.

({DAY}TP-{NIGHT}TP)*{}FLOW

The difference in measuring values from sensor TP during day and night is produced. (ie all measuring values that are not day or night).

These are then multiplied by flow without time selection.

MACRO

Macro is used to simplify complex calculation expressions that are frequently used and that would be complicated to write.

The macro can be locked and in this way valuable calculation expressions can be protected against copying and unauthorised usage in other contexts.

Macro functions are functions that are defined by the user using *Macro functions* under the *Options* menu.

The principle for Macro is simple. A complex calculation expression contains different mathematical functions, constants and variables ”packaged” and given a name.

Example 1.

You want to make a general formula for calculation of a median value of two sensors.

The calculation to be made is (G1+G2)/2. In other words, add G1 and G2 and divide in two.

We define a macro and call it MEAN:

((#1)+(#2))/2

Instead of indicating a sensor name we use #1, #2 etc.

When we later use the macro MEAN with our two sensors G1 and G2 for calculating in a text box, we write:

MEAN(G1;G2).

Monitor now inserts G1 in place of #1 and G2 in place of #2 and the calculation that is performed will be:

(G1+G2)/2

Example 2.

A more realistic example is to convert a measuring sensor to another physical magnitude. Such a macro function could for example look like this:

*23,93934 + 3,44623 * (#1) + 5,3481 * (#1)^2 + 0,12334 * (#1)^3*

If the macro function is called NH2 and is used as follows:

NH2(G1).

The following will be calculated:

*23,93934 + 3,44623 * (G1) + 5,3481 * (G1)^2 + 0,12334 * (G1)^3*

Note:

- In all the above examples the argument (#1, #2, etc) has been the sensor, but this does not have to be the case.
  The argument can be a complex expression, or any type of text. When #N is replaced, the given text is used.
- Up to four individual arguments can be used.
- A macrofunction can not call up another macrofunction.
- NOTE parantheses round (#1) och (#2)
  You should always use parentheses when the argument is a part of an expression.

TABLES

The table function in Monitor is a method of defining a relationship between two variables.

The advantage of tables is that you don't need to develop an equation to describe a relationship between two variables. It is sufficient that that relationship exists in a table.

The table is defined by the user and imported to Monitor. The table can then be used in calculation expressions.

Table format

There is a relationship between a pressure and a temperature. The relationship is expressed in a table where you can, for every temperature between 0 and 100 degrees, go in and look up a pressure.

The table could look like this: (Temp=X, Tryck =Y)

Temp oC	**Pressure Bar**
1	0,2
2	0,27
3	0,34
4	0,45
etc.	

To use a table in Monitor, only a text file is required where the table values are separated with Monitor's list separator (semicolon if not otherwise specified under *Options Setup*).

The table above is written as:

1;0,2

2;0,27

3;0,34

4;0,45

etc

It is saved in text format in a file given an optional name in an optional place and then imported to Monitor. Refer operation description elsewhere in the user manual.

When the table is used in a calculation expression, a temperature sensor is used to generate an entry value to the table. A pressure is produced as a result.

In other words, if the temperature was 3 degrees, the value 0.34 will be produced by the expression.

Monitor performs a linear intrapolation of values between the table values. If the temperature was 3.5 degrees, the resulting value will be in between 0.34 and the next value 0.45 (0.395).

Example

Assume that the above table has been imported to Monitor and given the name TAB. Assume that we have a temperature sensor that is called TEMP1.

To make a calculation in text boxes or graphs you write:

TAB(TEMP1)

The table's name is therefore followed by the sensor's name in parentheses.

You can also indicate a constant instead of the sensor's name, for example:

TAB(2,0)

The result in our example will always be 0.27.

Note:

- Use a text file (ASCII-file).
- Separate numeric pairs with Monitor's list separator.
- Import tables to Monitor and give them a name with up to 8 characters.
- The table can be used both in text boxes and to draw graphs.
- Refer operation description in the chapter *General settings* below.

Export to other programs

Monitor's analysis tools and formula language provide unique opportunities to create presentations and calculations for most requirements.

In addition to this, measuring data can also be transferred to other programs via files saved to disk. Measuring data is stored in ASCII-format in rows and columns that can be read by programs such as Excel, Word, Notepad etc.

Measuring data can be transferred in two main ways:

Export transfers all measuring data from one sensor at a time to a file.

Report transfers measuring data from curves in an open graph to a file.

Export

Export transfers measuring data from any given sensor to a file with any given name.

All measuring data within the selected time range is transferred with the registration interval used during measurement. Export can be said to transfer "raw data".

- Click on *Measurement* and select *Export.*

  A dialog box for export is opened.

- Click on *Object* and *Sensor* to be exported.
- Enter a file name and a search path where the file should be saved. Select file and directory with the *Files* button.
- Select the time range *All* or select the time range manually.
- Click on *Options*.

  The dialog box is enlarged. Formatting details can now be changed.

- End using OK.

  If Run Notepad has been ticked, the file with exported data will be shown on the screen.

Example of data format for export

EXPORT DIALOG BOX

File name is the searth path and the file name that the file will be saved under. Select using the **Files** button or enter directly.

Export all values can be ticked if all collected measuring values should be exported. Alternatively the required time range can be given in **Start** and **Stop**, **Date** and **Time**.

Object and **Sensor** shows which measurements there are. Click first on Object and then Sensor. Only a single sensor at a time can be exported. (Refer *Report* if multiple sensors should be exported simultaneously).

Date format defines which format should be used for the date. For example, yyyy-mm-mm presents the date as 2000-02-14. Enter the required format.

Decimal Separtor defines which character should be used as a decimal point.

List separator defines which character should be used as a divider between columns.

Include unit means that the sensor's unit should be written after every measuring value.

Convert to DOS characters converts the contents of the file to DOS standard. Otherwise Windows characters are used.

Milliseconds mean that time is presented including milliseconds. (Monitor saves data with 1/1000th of a second resolution).

Run notepad starts the Notepad program automatically.

Export to web

In monitoring applications it is often necessary to share information among a group of users.

Often these users are in different geographic locations and can also belong to different organisations.

In this case Internet is a good way of providing access to common information.

Monitor therefore has inbuilt tools for automatic export of analysis results and graphs to a website.

The web solution will alway be individual and should therefore be created in partnership with Mitec and the organisation's IT personnel.

When the system is customised and installed, graphs will automatically be exported to the website or intranet whenever data collection occurs.

Export can also be done manually under *Analysis, Send to web*.

- Select *Analysis* from the menu.

- Select *Send to Web*

  The current graph will be exported automatically to the website via the computer's / network's normal Internet connection.

Report

Report is another way of saving measuring data to a data file. Report transfers measuring data from a graph (as opposed to Export that transfers measuring data direct from the sensor).

Report can be said to transfer processed measuring data.

This means that:

- several sensors are presented at the same time in different columns

- measuring data can be processed using calculations, a virtual data record can be created

- the quantity of measuring data can be reduced using a mean calculation

- time range can be selected via the graph.

- Open the graph to be reported.
- Press on the button on the button menu or select *Analysis* and *Create report* from the menu.

  A Report dialog box is opened.

- Enter the file name and search path where the measuring data is to be saved or use the Files button to select.
- Indicate the time steps used to save measuring data to file.
- Press OK.

  The measuring data will be written to the selected file.

Details in the report format can be changed by expanding the dialog box using the *Options* button.

- Press Options

  The Dialog box is expanded.

- Tick the appropriate options and then press OK to generate the report. Completed settings will be saved to the next report.

THE REPORT DIALOG BOX

File name is the search path and file name that the file will be saved under. Select using **Files** button or enter directly.

Time format defines the format to be used for time, for example hh:mm:ss presents the time as 12:26:10. Indicate the required format.

Date format defines the format to be used for the date, for example yyyy-mm-dd presents the date as 2000-02-14. Indicate the required format.

Decimal separator defines which character should be used as a decimal point.

List separator defines which character should be used as a separator between columns.

Significant digits indicates how many digits should be included in the report.

Headlines indicates whether only measuring data should be reported or whether a summary of important information regarding the measurement should be included in a table heading.

Include unit means that the sensor's unit is written after every measuring value.

Convert to DOS characters converts the contents of the file to DOS-standard. Otherwise Windows characters are used.

Milliseconds indicates that time is written including milliseconds (WinLog saves measuring data with 1/1000 second resolution).

Run notepad starts the Notepad program automatically.

Use 0 when error or no value indicates that the digit 0 (zero) should be written if measuring values are missing or are incorrect at a specific timepoint. Otherwise NaN (not available now) is used.

Time mark at start of the period means that the first measuring value included is the time when the measurement commenced. Normally the time of the first registration is used (or calculated, reduced registration depending on interval time).

Example of a report from two measuring sensors. Table heading included.

Example of a report without table heading but including type

Program settings

General settings

In addition to settings that affect measuring and presentation, there is a menu for general customisation of Monitor. This is located under the menu *Options* as well as the menu ?

Options menu

The ? menu

Date format, decimal separator and other

- From the menu select *Options* and *Setups.*

  A dialog box Setup is opened.

Searchpaths

In the dialog box *Setup* there is a field with the name *Directory*. When the program is started the first time, the search path to the program and its data files is shown.

You can select here to save measuring data in a place other than in the main directory, for example on a file server in the network or in a directory belonging to a specific project.

Example 1:

On the company's file server there is a hard disk that is used for common information. This has been given the name **X:**

To save measuring data on X:, the directory name in Monitor must be changed.

- Select *Options* from the menu and click on *Setup*.
- Enter the name of the directory on X: where the measuring data should be saved.

  Next time Monitor is started, measuring data is collected from the new directory and will continue to do so until a new search path is provided.

Measuring data will now be saved in subdirectories under X:\MÄTDATA according to Monitor's standard method. Refer to the chapter *How and where measuring data is saved* for more information.

NOTE. The program remains on the computer where it was originally installed. Only measuring data and graphs will be saved in the new directory.

In this way measuring data can also be divided between different users that have access to the common resource X: in the network.

Example 2:

A project with the name ELANALYS is to be started and the measuring data saved on the computer's hard disk in a directory with the same name.

To locate measuring data on C:\ELANALYS, the Directory name in Monitor should be changed.

- Select *Options* from the menu and click *Setup*.
- Enter the name C:\ELANALYS: in the directory field

Next time Monitor is started, measuring data is collected from the new directory and will continue to do so until a new search path is provided as in *Example 1* above..

SETUP DIALOG BOX

Directory	Default (main) directory, where all graphs and measuring objects are saved.
Time format	Time format used with display and input of time. The time format is indicated using hh, mm and ss representing hours, minutes and seconds, with optional order and choice of separator. Example: hh:mm:ss or hh.mm.ss.
Date format	The date format used with display and input of date. The date format is indicated using yyyy yyyy, yy, mm and dd representing year with or without century, month and day, with optional order and choice of separator. Example: yyyy-mm-dd or dd/mm-yy.
Decimal separator	Sign to use as decimal point
List separator	Character used to separate items in lists and function arguments.
Serial port	The serial port to use during data collection from the measurement instrument. Speed (baud-rate) that is used for collection is 1200 bps for 20/30/200-series, 9600 bps for 31/40-series och 19200 for eLog-series. Refer also to *description of communications port* below.
Alternative colour	Alternative colour for dialog box and various other windows.
Clock	The clock should be displayed in the status field.
All menus	All menus should always be displayed.
Toolbar	Toolbar should be displayed.
Status field	The Status field should be displayed.
Nearest colour	Use special nearest-colour converting for units (screens, printers, etc.) wth 16 colours or less.
OK	Use this setup.
Cancel	Cancel
Help	Display help side.

Selectors

Selectors are part of the formula language used to divide up time series. They can be used with both presentation of graphs and calculations.

Refer also to the chapter *Calculations and formula*.

Selectors can be defined by the user based on Month, Weekday and Time.

- Select *Options* and *Selectors* from the menu.

  A new dialog box is opened.

- Provide a name for the selector to be created and complete the time point as well as select days and months.

- Press the *Add* button and then *Close*.

To change or delete a Selector, press the appropriate button.

In the above example, work time is defined as the time between 6.30am and 5pm Monday to Friday all months.

Macro

Macro is used to simplify complex calculation expressions that are frequently used.

Refer also to the chapter *Calculations and formula*.

Macro functions are functions that are defined by the user.

- Select *Options* and *Macro functions*.

  A dialog box is opened.

Previously defined macros are shown in the list. The macro's definition and description are displayed in the Formula and Comments box.

To create a macro:

- Enter the macro's name, formula and comment text.
- Press the *add* button.

  The macro is now saved.
- To protect the macro press the *Lock* button.

  A new dialog box is opened.
- Enter a password and press OK

  The Macro will now be protected.

The macro's function is not affected by being locked. Locking only prevents the calculation expression being displayed.

A locked macro is opened by pressing the *Unlock* button and then giving the current password.

NOTE. Make a note of the password!

THE MACRO DIALOG BOX

Function	Name of the function to change or add.
Formula	The macro function's formula. When the macro function is used, #1, #2, #3 and #4 will be replaced by the expression that is used as an argument for the macro function.
Comment	Optional text.
Close	Close the dialog box.
Change/Add	Change or add settings.
Restore/Clear	Restore or clear settings.
Delete	Delete selected changes.
Lock/Unlock	Lock or unlock selected functions. The Lock dialog is shown where password is provided.
Help	Display help text.

Tables

Table functions in Monitor are a way of defining a relationship between two variables.

The advantage of tables is that you don't need to develop an equation to describe a relationship between two variables. It is sufficient that the relationship exists in a table.

Tables are defined by the user and imported to Monitor. The table can then be used in a calculation expression.

Importing a table.

- Select *Options* and *Table functions* from the menu.

  A dialog box is opened.

- Enter the table name selected and press Import.

  A new dialog box is opened:

- Enter the name and searchpath to the text file with the table to be imported. Press OK.

  The file is imported.

Press *Add* and then *Close* to finish.

NOTE. Read more about tables in the chapter Calculations and Formula above.

THE TABLE DIALOG BOX

Function	Name of the function to change or add.
X-start	First X-value in the current table.
X-interval	Constant interval between X-values in the current table.
Number of values	Number of values (numerical pairs) in the current table.
Comments	Optional text.
Close	Complete the dialog.
Change/Add	Change or add settings.
Restore/Clear	Restore or clear changes.
Delete	Delete selected function.
Lock/Unlock	Lock or unlock the selected function. The Lock dialog is shown when a password is provided.
Help	Help text
Import	Import table. The Table import dialog is run.
Export	Export table. The Table export dialog is run.

Modem settings

A vital component in the Mitec measuring system is the modem.

The modem is used for collecting measuring values from measuring stations equipped with either a standard modem or a GSM-telephone.

Most standard modems on the market can be used with Mitec Monitor.

The modem is adapted to Monitor using settings which are made in a dialog box under *Options* and *Modem settings*.

These settings are general and are used for communication with all Mitec's measuring instruments and measuring stations.

Individual modem settings can be made for each measuring group under *Measurement*, *Configuration*, if required. In practice this is only necessary when one of Mitec's older systems in the 20/30/200 series is used.

- Select *Options* and *Modem settings* from the menu.

  A new dialog box is opened.

- Complete the different fields in the dialog box. Refer to the program's help text for detailed information on different modems.

  Complete with OK. Test the modem.

MODEM DIALOG BOX

Serial port	Serial port (COM1, COM2, etc) used by the modem.
Baud rate	Speed (baud-rate) between the computer and the modem, to be used during modem initialisation and dialling.
CTS/ RTS handshake	Tick if hardware handshake with CTS/RTS should be used.
Locked baud	Tick if Baud rate should also apply after connection is made, otherwise the baud rate will be changed to that given by the modem's CONNECT-message.
Init 1	Initialisation command 1. This command is sent to the modem first. Standard command: ATZ.
Init 2	Initialisation command 2. This command is sent after Init 1. Standard comand: AT&C1&D2S0=0S2=255S7=60.
Dial prefix	Dialling command. This command is sent after a possible command defined for the current group (refer Configuration of group dialog). Standard command: ATDT
OK	Use settings.
Cancel	Cancel
Help	Help text.

The modem should be configured / initialised so that it does / completes the following:

- The modem must made use of text commands and text replies (not codes).
- As a reply for an accepted command the modem must answer OK.
- When a carrier is established, the modem must reply CONNECT, possibly followed by baud rate if locked baud is not used. The modem should only reply with a single text row on an established carrier.
- If the modem sends a text reply for ringing, this should be RINGING.
- It must be possible for the modem to break a connected connection when the DTR signal is deactivated.
- The modem must not affect or be affected by data that is sent by the modem, including characters such as XON/XOFF.

Tips:

Always tick **CTS/RTS** as well as **Locked baud.**

If the communication does not function Test using **AT&F** as Init 1 and leave Init 2 empty.

Ring upp should always be **ATDT**. If the modem is connected to an exchange enter **ATDT0w** to dial the zero and wait for the tone. **ATDT0** can be required for certain modems.

Fonts

In the *Options* menu there is also a selection for *Font*. This is used to set the font to be used in the *Status bar* lowest down in Monitor.

- Select *Options* and *Fonts.*

  The standard Windows dialog box for font selection is displayed.

Options

From version 1.70 and on, Monitor has a number of add-on functions that can be purchased as accessories.

Some of these functions can be reached from the *Options* dialog box. In the example above the option *Serial number external probe*.

Log report

Internal events in Monitor are registered in a log as an aid in trouble-shooting. The log can be read using the menu Log report.

- Select *Options* and *Log report.*

  The report is started automatically and shows a report of events during the current day.

The log report is erased automatically every day. If you want to save a report it can be done using the function *Save as* in *Notepad*.

In Monitor there is also a detailed program log that saves all events. Select *Extended log* under *Options* and *Setup*. This extends the detailed information that can be useful with trouble-shooting, for example with communication.

Information rows with a plus (+) in front are only shown if Extended log is selected.

- Select *Options* and *Log.*

  An information box that shows all events in the program is opened.

Tips: The log file can grow and be quite large, particularly if Extended log is selected. The file can then simply be deleted, a new one will be created automatically.

Licence number

Along with the introduction of WinLog 1.70 a new system of licence numbers was started.

The licence number consists of a combination of digits and letters with 17 characters, such as **12RY2-345QW-UIO23.**

The licence number includes information about which options are available in the program and whether a service agreement has been taken out or not. The licence number is received from Mitec when the program is purchased.

The number is also used to differentiate between single and multi-user versions in network, and warns when programs with identical numbers are used on a network.

A valid licence number is required for the program to function fully. If the licence number is missing or is incorrect, the program will be run as a demo version.

- Click on the menu bar ? and then on *Licence*.

  A dialog box is shown for entering the licence number.

  .

- Enter the licence number (17 characters) received from Mitec and press OK.

  A new dialog box is shown which confirms that the licence number has been accepted.

- Press OK and start using the program.

Mitec will continually release program updates via internet which are available to everyone with a service agreement.

For further infomation see http://www.mitec.se.

Should a new version with increased functionality be released, a new licence number may have to be entered.

Use this approach and follow the instructions in the dialog box.

Printers

All printers installed in Windows can be used for printing out Monitor graphs.

Installation of printers is done in Windows and is completely independent of Monitor.

Connection

The normal printers connected to the computer or network should be used. These are usually connected to the computer's parallel port (LPT1 or LPT2) with a printer cable.

Refer to the printer's user manual for connection and installation of associated driver routines.

Settings

In Monitor a specific printer can be connected to a specific graph.

This means that no "general" printers are available and that all printer installations should be made in individual graphs.

Print format, colour, printer are therefore individual and adapted as required in the graph composition.

Printer settings are made in the *Composition* and *Page layout* menu. (Composition mode must be on). The following dialog box is shown.

Refer to the previous chapter *Display and print out graph* for details on settings.

Additional information

What is a Data logger?

Background

The term data logger has, like many other technical terms, been borrowed from the English language. Log comes from the naval term *to log* meaning in a logbook, ie to make careful notes about events.

By data logger we therefore mean careful ”notes” of measured data in a mass memory.

Mitec introduced its first data logger in 1984. It was the 4-channel logger MTM20 that we called a TEMP-recorder. Shortly afterwards we introduced a related instrument, the PULSE-recorder PM20. The next generation was the ANALOG-recorder AT30 and later the AT31 and AT40 UNIVERSAL-recorder and SatelLite data loggers.

Our product names have made their mark. In Sweden you can look in such guides as the ”Buyers Guide for Engineers” (Ekonomisk Litteratur AB) under ”Recorder” where our product names have been used as headlines in the product index.

The data logger is not a new invention. You can find old literature references such as ”Airborne recorder and Computer Speed flight-text data processing system” from 1958.

The loggers were developed in step with the development of semi-conductors. The microprocessor plays a very important role.

The real and major breakthrough came in the early 1990s after the data logger had gained general acceptance.

How does it work?

The principle is quite simple. The main parts of a modern logger are the microprocessor, the semi-conductor memory and an analog/digital convertor.

A sensor gives out an analog signal, such as 4-20mA. The micro-processor with a built-in clock controls the process. The sensor is read at set time intervals and the measured values are saved in the memory.

Eventually it has collected a number of measured values that forms a *data record*. The data record can be printed out as a graph on a printer or to a computer screen.

Moderm data loggers are quite sophisticated and are able to process information in many ways. These are some of the more common terms used:

Memory is of course important. Common it varies between approx. 1000 values to several hundred thousand. Non-volatile memories are available with a built-in battery so that data will not be lost in the event of power failure.

Measuring channels indicate how many sensors can be connected at the same time. Hand-held professional data loggers generally have two to eight channels.

Type of input indicates the type of sensor that can be connected. Most sensors can measure temperature or a voltage signal such as 1-10V. Different types of sensors can be connected to more advanced loggers.

Registration interval is the time between two measurements saved in the memory. It is usually adjustable in steps between 1 second and 24 hours. The registration interval determines the speed of processes that can be measured. A rule of thumb is to make at least two registrations per period for the measuring signal.

Measuring interval is the time between two measurements. The most modern loggers measure several times per registration to ensure a more accurate value. The measuring interval can be adjustable.

A clock is required. Modern loggers have a crystal clock with date and time.

Start condition is the condition required for measuring to start and data saved in the memory. It may be a manual start, time start or start on external factor such as when a temperature is exceeded.

Stop condition determines when the measurement should stop. Can be manual, time, external factor or when the memory is full.

Storage conditions can be set on some loggers. You can choose to store only the mean value during a registration or *multiple values* such as minimum, mean and maximum.

How to handle the measured data

Collected measured values are saved in digital format as data bytes. Before you can use the information it must first be processed.

Older loggers simply printed out the information as numeric values on a printer. This resulted in long and cumbersome tables that were hard to interpret.

The best way is to present information in graphic format as a curve. Some loggers draw curves directly to a printer or a plotter, and this is acceptable if you are satisfied with unprocessed data.

The most common method is to transmit the information to a PC for analysis in a program.

The main advantages with this are that the information can then be stored on magnetic media for later analysis and that the work involved with the analysis has been made easier as the calculation and presentation capacity of the computer can be used.

Modern PCs using Windows have made it very efficient to handle this information due to the graphical interface and mouse functions.

What should be considered.

You should first ensure that you have an instrument appropriate to your application.

Type

Decide whether you need a portable instrument or fixed installation. For field measurements, low weight and battery operation are important.

Some suppliers also use a PC in the field. Consider that the PC is attractive to thieves and should not be left unsecured.

Certain cheaper loggers are made as ”black boxes” without keys or display. With these you are completely dependent on the PC for installations and operation, even in the field. These loggers often have a built-in battery and the instrument will be discarded when the battery runs out.

Ergonomics

Unfortunately the industry has been very ”high-tech” inspired. Many instruments are difficult to overview and have a number of keys for different functions. Select an instrument that has a logical construction. It should also have a display with letters and figures and some clearly marked keys.

Expansion

Check also the procedure for connecting different types of sensors and expanding the equipment. Some instruments are only designed for certain types of sensors. If you need to connect other types of sensors you need to purchase a new instrument or special circuit boards.

Battery life time

It is important to check power consumption. A modern battery-driven logger should not consume more than 0.1mA in standby position.

During measuring it may consume considerably more, approx 30-40mA. Note that short registration intervals (1-30 seconds) significantly increase consumption.

Input signals

You have maximum flexibility if you select an instrument with universal inputs. You can connect different types of sensor directly using the appropriate cable and connection.

Some loggers require external signal transducers to scale the sensors. Consider that these generally use a lot of power and also take up a lot of space.

An important aspect is the power supply to the sensors. If an external power supply is needed there is the inconvenience of extra cables. Quality loggers have a built-in supply directly via the sensor cable.

Watch out for the power consumption here! A humidity sensor for example can flatten a 9V battery in 24 hours if connected the entire time. Select a logger that can control the power supply to the sensor.

Accuracy

Many suppliers do not differentiate between resolution and accuracy and yet they are actually two different things. The resolution indicates how ”small” the parts of the signal are that can be identified. Many suppliers have, for cost reasons, only used 8 bits and this provides a resolution of 1/256.

With a measuring range of, for example, 300°C /572°F this means a resolution of just over 1°C /1.8°F. At least 10-12 bits are required (a resolution of 1/1000 to 1/4000).

Accuracy is an indication of how well everything works together. This should be specified in a technical unit, such as °C or %. Also insist that the supplier can demonstrate traceability for the calibration, ie that he can prove the instrument measures correctly.

Memory

Today, memory capacity is no longer a limitation. 25 - 50,000 measured values are standard. Note however that some suppliers show the memory in kbyte (kilobyte = 1000 bytes). To store a measured value with an acceptable resolution you need two bytes, ie 128 kbyte is sufficient for 64,000 measured values. Most memories can also be delivered with a power failure protection.

Bruksanvisningar.

Se till att få svenska bruksanvisningar. Importerade instrument har i allmänhet engelska manualer vilka kan vara svåra att förstå. Kontrollera att leverantören kan ge service!

Mitec data loggers.

Mitec data loggers are designed and manufactured by Mitec in Säffle. As a customer you are always able to get help and advice if you have a measurement problem.

We deliver instruments for physical measuring signals, in other words we don’t leave you with a 1-10V input. We also deliver the sensor or a cable that directly fits your existing sensors.

Designed for use in the field

Our instruments are designed with the user in mind. We put a lot of emphasis on simple operation and flexibility. Our data loggers are based on nearly 20 years experience manufacturing data loggers for use in the field.

Simple operation

A display in English will guide you through the configuration. The simple and clear structure of setup and readings means you will be able to master the instrument straight away.

Flexible

Universal inputs for volt, mA, electricity meters, temperature sensors, current clamps, flow meters, etc. mean that our instruments can be used for a wide range of applications. Without rebuilding or additions.

Our Mitec SmartCable concept ensures that you can directly see signal type and unit in the display without any programming.

Technical performance

The latest microprocessor technology makes it possible to build ”high-tech Christmas trees”. However, long experience has taught us that technology should not be an end in itself. Our instruments have ”sufficient” performance to quote a well-known English car manufacturer.