

Data Logger Mitec SatelLite-E

Users Manual

Data Logger SatelLite-E

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Note! All references made to °F are for information only. The instrument will measure in °C.

Data Logger Mitec SatELite-E

Mitec SatELite Professional Data logger

This is the manual for the Mitec data logger SatELite-E.

SatELite is designed to satisfy high requirements regarding quality and handling. The instruments in the SatELite family are encased in sturdy aluminium casings. Various types of sensors can be connected via connectors on the end piece. Set-up and reading is performed by a PC provided with a Mitec program. The built-in crystal clock is provided both with time and date and measurement can be started and stopped at the desired time.

Unique concept for Electric Power Measurement

SatELite-E is designed for measurements on the mains supply and can measure both current and power.

Sat-E has inputs for connection of current clamps, with AC or DC output.

It also can measure on pulses from electricity meters with a pulse output. For measurements on electricity meters with a balance disc an optical eye fitted on the glass measures the number of turns. Measuring constants are entered in the PC-program when measured data are collected.

Use of modern microprocessor technology has made it possible to provide the Sat-E with unique features.

Four different methods can be used for the measurement of current.:

- True RMS
- Mean value
- Peak value

You can also measure the ratio between mean value and True RMS, here called:

- A/R ratio.

One or more parameters can be stored at the same time.

Start-up Currents and Fast Processes

SatELite-E registers (stores) measured values up to 16 times / second. This means that Sat-E is suitable for the measurement of e.g. start-up currents on motors and other similar processes. During the measurement Sat-E samples (measures) 2000 times / second, and this means that a true picture of the curve shape will be registered as a basis for calculation of TRMS, mean value, peak value and ratio mean / peak. See below for an explanation.

Harmonics

SatELite-E also can be used for the measurement of harmonics. The high sampling interval (2000 Hz) permits an accurate representation of the current curve shape. By a comparison of True RMS and mean value a good indication of harmonics is obtained. Sat-E can be set-up to register the ratio, mean value / TRMS.

New Program for Analysis

All Mitec analysis programs can be used. For the SatelLite-family we have developed Mitec WinSat. WinSat is above all characterised by its simple handling but it has also some sophisticated functions for graphic analysis.

All programs from Mitec will automatically tag data with sensor and instrument ID for full traceability according to the requirements in ISO 9000.

Unique Battery Operation

The built-in electronics is powered by a single standard 1.5 V battery. The cost of batteries is thereby reduced to one tenth, compared to the cost of the special Lithium batteries used by similar instruments of other makes. The power consumption is very low and one battery can last over a year, all strongly depending on how the measurements are performed.

Also the optical eye is supplied from the battery through use of a special switch technology. The high power consumption of the eye will however, in this case, reduce the life of the battery to approximately one week. An external 1.5 V battery can be connected in parallel to the built-in battery.

Large Memory

SatelLite has a built-in non-volatile memory that will not lose its information if the battery runs out and 20000 measured values can be stored. Depending on how the measurement is performed (if e.g. mean and TRMS are stored at the same time) it is possible to store 5 000, 6 700, 10 000 or 20 000 measured values.

Made in Sweden

SatelLite is part of the Mitec system for professional acquisition of measured values. Measured data can be analysed with one or the other of our programs for Windows, WinLog or Monitor. These two programs can also be used for other Mitec products. A choice of additional products are available as accessories.

Mitec is a Swedish company. SatelLite is designed and manufactured in Säfte, Sweden.



Quick Start

First Attempt

The easiest way to learn SatelLite is to start by reading through this manual and then perform a test measurement.

If you want to start directly with a measurement you can do this by following the instructions on this page.

What is needed

To carry out a measurement you need:

- Data logger SatelLite-E
- A current clamp, pulse cable or an optical eye MU-DS100
- Program WinSat, WinLog or Monitor, version 1.51 or later.

Connect the Battery

Check that the battery is fitted in the instrument.

Sensor

Connect the selected sensor with its accompanying cable to Sat-E. The 8-pole modular contact is used for all sensors and the instrument will itself find out what is connected.

Start with WinSat

There is no ON / OFF key. In standby position the instrument uses very little power. The green LED in the contact flashes when the instrument is in operation. Start the measurement with any of the programs WinLog, Monitor or WinSat. See below and also the short description of the WinSat program.

THE MANUAL

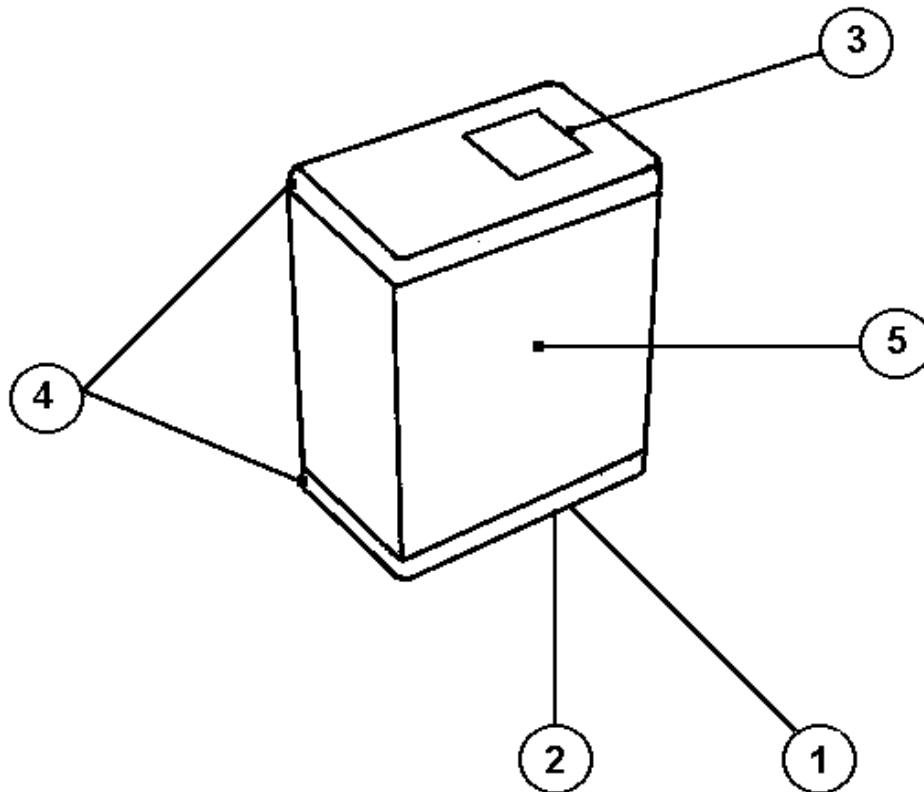
This manual has four main parts. By all means, do a **QUICK START** but then read through the chapter **BASICS!** "Quick Start" provides a brief information for those who want to start with practical measurements and that way learn how to handle the instrument..

BASICS and **HANDLING** will give you the necessary basic information you need to know in order to handle the instrument correctly. These parts of the manual are a must to read.

ADDITIONAL INFORMATION includes descriptions of various items and can be read as needed.

Basics

Main Parts



- 1.. 4-pole connector (female) for connection to computer.
- 2.. Flashing LED shows when activated.
- 3.. 8-pole connector (female) for connection of sensor.

- 4.. Remove these end pieces before replacing the battery.
- 5.. Aluminium casing

Power Supply

Satellite is designed for portable use. Internally it operates with a power supply of 5V. The primary power supply unit is a common 1.5 V battery.

It has a non-volatile memory and will retain its information even when the battery runs out.

Battery Replacement

We recommend a 1.5 V alkali battery of type IEC 6LR6. The battery is mounted to a holder inside the casing.

- Remove both end pieces.
- Extract the circuit card from the casing.
- Install a new battery. **NOTE! Turn the battery the correct way!**
- Put the circuit card in the lower end piece (the one with the connector).
- Pull the aluminium cover over the card and snap fasten it to the end piece.
- Snap fasten the top end piece to the aluminium casing.

The LED shall flash three times when the battery is snap fastened to the holder.

A battery that is *temporarily* inserted incorrectly will not harm the instrument. However, after a while the protective circuit will burn off and this can cause permanent damage to the instrument. Therefore, always check that the battery is inserted the correct way.

Power Consumption

In standby position Satellite has a very low power consumption. During measuring the consumption will increase. The magnitude of the increase will depend on type of sensor, selected registration interval, measuring frequency and how often data is tapped from the memory. A normal life span for an alkali battery type LR6 is 1 week to 1 year. See further information below.

When the optical eye is used you can connect an external 1.5V battery in parallel with the built-in battery to increase the measuring period. The connector for data communication is used and a separate cabling is required.

Low Battery

Satellite continuously monitors the condition of the battery and will tell you in the program when a replacement is needed.

- **NOTE!** Disconnect the cable to the PC when it isn't in use. The power consumption from the battery in Satellite increases when is connected.

Different Types of Batteries

Satellite only uses a so called 1.5V Pen Light battery (14x50 mm). This type of battery is both inexpensive and common and can be bought practically everywhere.

We recommend an alkali battery type IEC LR6 as it has a high capacity.

However, do note that even alkali batteries have different capacities. Some of the cheaper types have a capacity as low as approx. 1800 mAh. Try to select a battery that corresponds to the types indicated below.

We recommend:

Duracell MN1500 with a stated capacity of 2700 mAh

Varta 4006 with a stated capacity of 2500 mAh

At temperatures below approx. 10 °C / 50 °F the capacity of alkali and zinc-carbon batteries will be considerably reduced. A very good alternative in such cases are the 1.5V Lithium batteries that can be used at temperatures below the freezing point, e.g.,

Energizer FR6

Common dry batteries (zinc-carbon batteries) type IEC R6 can also be used, but they do have a life span that is less than half of the alkali batteries. We do not recommend use of the brown stone batteries due to their short life span.

You can also find NiCd batteries in this size, but again we do not recommend that you use them. One of the reasons is that they are a potential hazard to the environment and the other reasons are their poor capacity and relatively high cost.

Calculation of Battery Life Span

The Mitec programs WinSat, WinLog and Monitor are used for the programming of Satellite.

During the programming you also state the capacity of the selected battery. If the battery is new you state the capacity as indicated on the battery. If the battery is used you must estimate the remaining capacity.

The program will then calculate expected life span on the basis of how the instrument is set-up and will indicate how many days it will last. This calculation is based on the assumption that the capacity will not drop due to e.g. low temperature.

Do note that the stated capacity is approximate and valid at room temperature. The capacity drops at low temperatures. This is especially important to note with common dry batteries as they are quite unsuitable for use in temperatures below zero.

When the instrument is re-programmed, the program will remember the consumed capacity in the battery and will take regard of that when a new calibration is made.

However, if you remove the battery this information will be lost and you must yourself estimate how much of its capacity is left. The program will automatically discover that the battery has been removed and will alarm for this.

If the battery runs out of power while measuring you will not lose the measured data, they can be read when a new battery has been installed.

Start of the Instrument

The instrument is ready for use as soon as the battery has been connected. SatelLite has a very low power consumption in standby position and therefore has no power switch.

Resetting to Zero after a Battery Replacement

As soon as supply power is connected to SatelLite an automatic resetting to zero will be performed.

- Connect the battery according to instructions above

The LED will make three fast flashes.

- Fit the aluminium cover.

The instrument is now ready for use but not before certain configurations have been carried out with help of the PC program.

Please continue your reading under "*Handling*" below.

TIPS. If the LED does not flash during the installation a proper "power on reset" has not been possible to do for the instrument. Let it "rest" some time and try again. During this time the filter capacitors of the 1.5 V supply will discharge and the switched net part is reset. Then a new start-up can be made.

Measuring Principle

Sat-E has inputs for the connection of current clamps, both with AC and DC output.

In addition it can measure pulses from electricity meters with a pulse output. For measurements on electricity meters with a balancing disc there is an optical eye that is fitted to the glass and measures the number of turns of the disc.

For measurement of current you can choose four different ways of measurement. Note that one or more parameters can be measured and stored at the same time.

Current True RMS

True RMS (TRMS) is a true effective value.

It is calculated as the square root of the mean value, i.e. all samples are squared and added and then the mean value is calculated and finally the square root of the mean value is calculated.

The true effective value considers the shape of the curve. This is important in power applications when currents that show harmonics shall be measured.

Satellite-E measures TRMS with a band width of approx. 1 kHz and a crest factor of 3 (see below for explanations).

Current Mean Value

The mean value is calculated as the sum of all samples divided with the number of samples.

As a rule it is far simpler to measure mean value and most instruments do this, but are corrected to show effective value ("showing effective value" or "RMS-showing"). The instruments will show correct value for a sinus shaped voltage but will show the wrong value if harmonics are present.

Also the mean value can be measured by Satellite-E. This is used to detect the presence of harmonics (see "shape factor" below about the relationship between mean value and TRMS).

CREST-factor.

Instruments that measure AC voltage (current) must be able to handle curve shapes of a varying amplitude without error.

Example: An instrument has a measuring range of 200 mV AC and a crest factor of 3. This means that the instrument in a correct manner can measure a peak value of 600 mV without distortion of the signal. This is important for measurements of curve shapes with harmonics.

BAND WIDTH

An instrument that measures alternating voltage must be able to handle signals of varying frequencies. For practical use in power measurements it is sufficient to measure up to the 20:th harmonics ($20 \times 50 \text{ Hz} = 1000 \text{ Hz}$). The sampling frequency must be at least twice the max. frequency to properly reflect the information.

Satellite-E samples with a frequency of 2kHz and this provides sufficient accuracy for practical use in the application.

Current Peak Value

The peak value is the absolute value of the highest value of the measured signal. Sinus curves have a peak value that is $\sqrt{2}$ (1,414) times larger than the mean value (and in this case the effective value).

Satellite-E can also measure the peak value. With a sinus shaped current the peak value will always be 1.414 times higher, e.g. a current with the mean value 20 A will have a peak value of 28.3 A.

The peak value will be used to show presence of harmonics as these usually have an amplitude that is higher than the peak of the base tone.

Current A/R Ratio.

Another method of showing the presence of harmonics is to measure both TRMS and the mean value and then compare the two values.

A sinus formed curve shape with only the base tone (50 Hz in connection with electric power) will give the same value to TRMS and the mean value.

When harmonics are present the curve shape will deviate from sinus and the TRMS and mean values will differ, mostly the mean value will be lower.

Satellite-E measures both TRMS and the mean value and these two measurement series can be shown separately as two different curves.

An alternative is to let Satellite-E measure both and also in advance calculate the ratio. We call this the A/R ratio.

When there are no harmonics present the A/R ratio will be on level "1". Deviations from this is an indication of that harmonics are present.

DC-signals

Satellite-E has a band width ranging from 0 Hz to 1 kHz , and this means that it also can measure on DC voltage (current).

The measuring range for True RMS is used directly.

Pulses

Electricity meters with pulse output can be connected to Satellite with a suitable cable according to below. Pulses with contact closure (potential free contact), open collector and active voltage pulse can be connected.

For measurement with electro mechanical electricity meters the Mitec optical eye is used for registration of the number of turns of the balance disc.

Satellite-E can be programmed to **store** measured values at different intervals, down to 16 times / second. Each registration consist of one or more **measurements**, the number can be set by the user in predetermined steps.

For each measurement 78 **samples** are taken with an interval of 512 μ s (micro seconds). This means that approx. 2 periods of the 50 Hz curve are measured with a sampling frequency of 1953 Hz. This is sufficient to register curve shapes including frequency components up to approx. 1 kHz.

Sensors

Current Clamp AC

There are a number of current clamps of different makes available on the market. Satelite-E is designed for measurement with current clamps with a V AC (alternating voltage) output.

Clamps with an AC A (alternating current) output must be equipped with a current shunt before they can be connected to Sat-E.

Satelite-E has two measuring ranges adapted to the clamps available on the market:

0-200 mV AC

0-1V AC

The measuring range will change automatically when the cable is connected to the instrument. See below for a description of the cable types.

Conversion from clamp voltage output (V) to the primary current (A) is done in the PC during analysis.

During the data transmission from logger to the PC the program will request scaling factors that the user must enter.

Current Clamp 500A

Current Clamp DC

Also current clamps with a V DC output can be connected to Satelite-E.

Sat-E has a crest factor of 3 and that means that the measuring range for DC-signals is:

0-600 mV DC

0-3 V DC

Use the same cables as are used for V AC and handle in the same way.

Reversible AC/DC Current Clamp

Pulse Transmitter

Electricity meters with a pulse output can be connected to SatelLite-E with a signal cable (see below for selection of type).

There are two main types of pulse signals:

Contact closure

Contact closure is a potential free contact, relay or similar. Also a transistor output (open collector) can be connected with this cable. SatelLite-E pulses out a 12V DC supply used for reading of the position of the contact.

Voltage pulse

A voltage pulse means that the supply is delivered from a connected equipment, electric meter or other. The allowed voltage are between 6 and 24V DC.

Optical Eye

Optical eye type MS-DO101 is used for the reading of number of turns on the balancing disc of electro mechanical electricity meters.

The eye is a so called reflection detector and is attached to the glass window of the electricity meter with double sided sticky tape. The eye can be used on balancing discs that have sufficient contrast between disc and marking. The sensitivity is set with a trimming screw and a LED.

Optical eye

During the transmission of measured data to the PC the measuring constant is stated in r / kWh and the program in the PC will re-calculate this into effect in kW for the presentation.

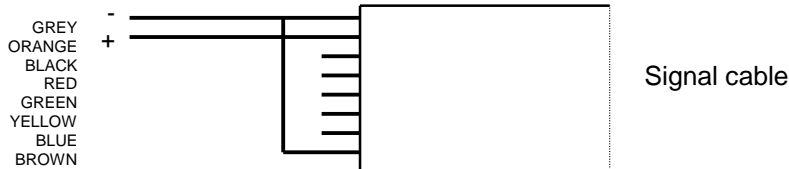
The eye is fed directly by the built-in battery in SatelLite-E. The battery life span is a couple of days. For longer measuring series an external battery (1.5V) can be connected to SatelLite-E.

Connection Cables

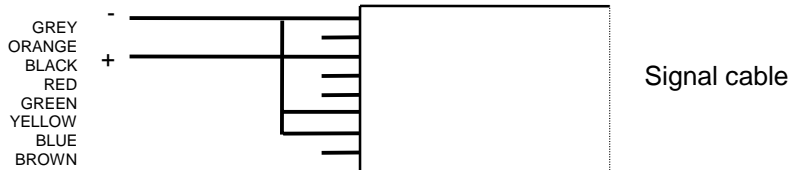
For SatelLite-E there are different cables available as accessories. Cables for current clamps are provided with banana pins. These are:

Art. no.	Function	Technical data
MS-UA100	Current clamp	0-200 mV AC (0-600 mV DC).
MS-UA101	Current clamp	0-1 V AC (0-3V DC).
MS-DP116	Contact pulse	12 V supply from SatelLite, max. 12 Hz, min 35 ms.
MS-DP119	Voltage pulse	6-24 V external supply, max. 12 Hz, min 35 ms.
MS-DO101	Optical eye	Optical eye, supply from SatelLite, max. approx.1 r / s (min. 70 ms).

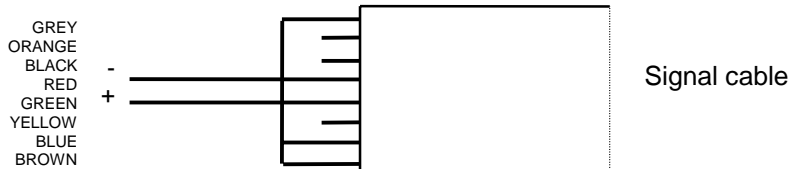
MS-UA100. 0-200 mV AC (600 mV DC)



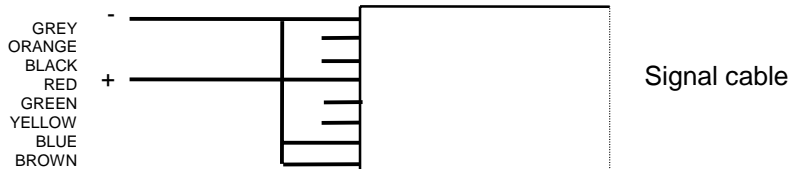
MS-UA101. 0-1V AC (3V DC)



MS-DP116. Pulse, contact



MS-DP119. Pulse, voltage



Automatic adaption of the Input Signal

The signal cables are equipped with an 8-pole gold-plated connector. SatelLite recognises the cables in the manner the different contacts are used (*see above*).

When the contact has been connected the instrument will automatically adjust to the scale factor used by the cable. The information (measuring range and unit) about the selected input signal is stored with the measured data and will be transferred to the PC.

This unique possibility makes the SatelLite-E quite flexible since the same instrument can be used for different types of measurements.

PLEASE NOTE! Do not connect the computer and pulse transmitter to any *unknown measuring equipment* together with SatelLite.

The inputs are not galvanically isolated from the communication output. Both the measurement and the transmission of data can be disturbed and in the worst case the instrument can be ruined.

If the pulse output isn't galvanically isolated you should disconnect the transmitter cable when measured data shall be transmitted to the PC.

Handling

Settings and Readings

Complete Series of PC Programs

All settings and readings from SatelliLite are done from a PC. Mitec can supply three different programs. Program version 1.51 or later shall be used for Sat-E.

WinSat is made specially for SatelliLite only and only includes basic functions.

WinLog is the Mitec standard program for communication, analysis and calculation and can be used with all data loggers from Mitec.

Mitec Monitor is the most advanced program and includes, e.g. XY - diagram, macro functions, modem communication, etc.

All programs are in English with manuals in English and support from Mitec.

Below we show only the functions in the programs that concern SatelliLite at set-up and checking. For information about how the analysis of measured data is performed we refer you to the respective manuals.

General Information about Set-up with the Programs

The programs have different methods for "Set-up" but the functions all look alike when they are started up. Below we introduce the common parts.

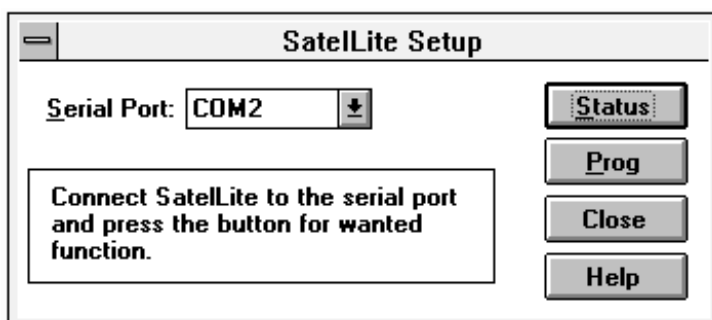
See further on in this manual for installation of the WinSat program.

SatelliLite Set-up

The first box shown gives two choices, Status and Programming.

Status is used to show the setting of the instrument and what will happen while **Prog** is used to make an instrument set-up.

Optional communication port can be used.



Status, General

When button "STATUS" is pushed information about the instrument set-up and how it operates will be shown.

See also chapter "Checking of activity" for further information.

Programming, General

If you choose "PROG" the dialogue box below will pop up.

The screenshot shows a dialog box titled "Satellite Program". It contains the following fields and buttons:

- Registration Interval: 1 m (dropdown menu)
- Time until memory full: 7 days
- Measurements per Reg.: 10 (6 s) (dropdown menu)
- Calculated Battery Life: 172 days
- Buttons: Program, Cancel, Help, Advanced >>
- Text at the bottom: "The time is set automatically from the computer clock during programming."

Additional functions are available if you push the "ADVANCED" button.

The screenshot shows the "Satellite Program" dialog box in its advanced view. It includes the same fields as the previous screenshot, plus:

- Channels:
 - Temperature
 - External
- Start Condition:
 - Immediately
 - Time Start: Date: 1997-10-10, Time: 00.00.00
- Stop Condition:
 - No stop
 - Memory Full
 - Time Stop: Date: 1997-10-11, Time: 00.00.00
- Initial programmed battery capacity at the last battery: 2000 mAh

The desired settings can now be made. See additional information below for a more detailed description.

Set Date & Time

The clock is one of the more important parts of the data logger. The quartz crystal clock in SatelLite shows year, month, day, hour, minute, second and milli second.

The clock in the PC will automatically be read by the program and used to set the clock in the data logger.

Satellite Set-up

All set-up will be performed under this function. Each time a new set-up is made also the clock will be set.

The program will read the actual time in your PC and download this to SatelLite. Therefore, make sure that the clock in your PC shows the correct time!

THE CLOCK

The clock is controlled by a quartz crystal and its accuracy is similar to a common wrist watch, i.e. the variation in error can be between a few seconds up to approx. 1 minute per month.

Setting of Registration Interval

The registration interval (storage interval) is the time taken between two storings of measured values in the logger memory.

Setting of Registration Interval

- Select SatelLite Set-up
- Push the Prog key

The programming box (see above) is shown.

Registration Interval: 

Select registration interval from the scroll bar.

Store the Settings

Store the settings by pushing PROGRAM or make further settings in the ADVANCED menu.

What is a Registration Interval

The principle for a data logger (measured value sampler) is that it automatically makes measurements and stores these in its memory for later reading.

A basic function is the registration interval, the time lapse between two storings in the memory. (Compare with the speed of the paper on a line printer).

The table below shows the available registration intervals

Interval	Interval	Interval	Interval
62.5 ms (16 Hz)	1 s	1 min	1 h
125 ms (8 Hz)	2 s	2 min	2 h
0.25 s (4 Hz)	5 s	5 min	4 h
0.50 s (2 Hz)	10 s	10min	6 h
	15 s	15 min	8 h
	30 s	30 min	12 h
		-	24 h

How is a Registration Performed

The registered value is the mean value from a number of measurements. The number of measurements performed can be selected when programming. The alternatives are those shown in the scroll bar in the programming box.

What Interval shall be chosen

Mainly two factors determine what interval to choose.

The process time constant i.e., the most important one is how fast the input signal varies. To get a reasonably representative picture of the variations in the input signal you must make sure of at least two storings per period. The period time is defined as the time lapse between e.g., two max. values (or min values) in a varying signal.

Satellite-E can store measured values up to 16 times per second and this means that it is quite suitable for the measurement of start-up currents and other fast processes.

Available memory is also of great importance. For every measurement you must make an estimate of the time required to fill the memory.

How Data is stored in the memory

Satellite-E has sufficient space for 20 000 measured values.

When the memory is full the oldest values can either be discarded and replaced by a new value (standard condition) or the measurement can be stopped. This is determined at the programming. See chapter "Automatic Stop of Measurement".

Satellite uses a sensor, e.g. a current clamp. However, the information from this sensor can be stored in several different ways at the same time.

Up to four different processes can be stored at the same time, this means that 4 times as much memory will be consumed. *See table below.*

When the memory is Full

The influencing factor here (apart from the memory size), is the registration interval. NOTE! The available memory is not exactly 20 000 values, it varies somewhat due to the configuration.

The tables below show the time it takes to fill the memory in Satellite-E (20 000 registrations) with one parameter stored. With two parameters (see Settings) stored the time will be cut in half, with 3 it will be cut to 1/3 and with 4 parameters it will be cut to 1/4.

Interval	Time before the memory is full	Interval	Time before the memory is full	Interval	Time before the memory is full	Interval	Time before the memory is full
62,5 ms	22 min	1 s	6 h	1 min	15 days	1 h	882 days
125 ms	44 min	2 s	12 h	2 min	29 days	2 h	4,8 years
0.25 s	88 min	5 s	29 h	5 min	73 days	4 h	9,6 years
0.50 s	3 h	10 s	2 days	10 min	147 days	6 h	14 years
		15 s	4 days	15 min	220 days	8 h	19 years
		30 s	7 days	30 min	441 days	12 h	29 years
				--	--	24h	58 years


Selection of Measuring Frequency

Select Number of Measurements per Registration

In SatelLite you can choose how many measurements that shall be performed for each registration. The value that is stored (registered) is the mean value of the measurements.

- Select SatelLite Set-up.
- Push the Prog key.

The programming box (see above) is shown.

Measurements per Reg.: 

Select the measuring interval from the scroll bar.

Store the Settings

Store the settings by pushing PROGRAM or make additional settings in the ADVANCED menu. Select number of measurements for a registration.

Measuring frequency states how often a measurement shall take place. A registration (storage of data in the memory) is the mean value from a number of measurements. The number can be chosen as required in different predetermined steps.

The table below shows available alternatives.

Interval	Measurements /reg.	Interval	Measurements /reg.	Interval	Measurements /reg.	Interval	Measurements /reg.
62.5 ms	1	1 s	1-16	1min	1-240	1 h	8-225
125 ms	1-2	2 s	1-32	2min	1-240	2 h	15-240
0.25 s	1-4	5 s	1-80	5min	1-150	4 h	30-240
0.50 s	1-8	10 s	1-160	10 min	2-150	6 h	45-240
		15 s	1-240	15min	2-150	8 h	60-240
		30 s	1-240	30 min	4-225	12 h	90-240
				--	--	24 h	180-240

Select Measuring Method

Measurement of Current

Satellite -E has the unique capacity of being able to measure in several different ways and at the same time store the results of the different measuring principles.

One to four different curves can be stored. Satellite-E can measure:

True RMS

Mean value

Peak value

A/R-ratio

See description under *Measuring Principle* in chapter Basics for a closer explanation.

- Select Satellite Set-up.
- Push the Prog key.

The programming box (see above) is shown.

To the far right a box offering different alternatives is shown.

- Tick one or several of the boxes.

Channels	
<input checked="" type="checkbox"/>	True RMS
<input type="checkbox"/>	RMS showing
<input type="checkbox"/>	Top value
<input type="checkbox"/>	A/R-quotient (RMS/TRMS)

In the example above only a curve with True RMS measurements will be stored. Note that the memory is distributed over the number of chosen measuring methods.

Measurement with a Pulse Transmitter

For pulse measurements there are no alternative choices. Satellite-E will be configured automatically when the signal cable is connected.

The above box can be ticked but in this case it has no function.

Manual Start and Stop

When the settings in the former chapter are done, the collection of measured values can start immediately. This can be done both automatically and manually. Below we describe the manual start/stop.

Immediate Start of the Measurement

The measurement can be started in conjunction with the programming of the instrument.

- Select SatelLite Set-up

- Push the Prog key.

The programming box (see above) is shown.

- Push the ADVANCED key.

The dialogue box extends. The extension includes a section about start conditions.

Start Condition	
<input checked="" type="radio"/> Immediately	
<input type="radio"/> Time Start	Date: 1997-10-10
	Time: 00.00.00

Choose the alternative "Immediately" to start the measurement in conjunction with the programming.

NOTE. If no sensor cable is connected while programming the logging will not start until the cable is connected to the instrument.

Stop the Measurement Immediately

The measurement continues until the next programming opportunity (unless you have selected automatic stop).



The above dialogue box will show if you try to program a SatelLite while a measurement is in progress.

Push "Yes" to stop the measurement and "No" to continue with an uninterrupted logging.

Start and stop can also be made automatically at a specific time. See chapters "Automatic start of Measurement" and "Automatic stop of Measurement".

NOTE! A reprogramming will automatically erase all previously collected information. This is the only time the memory will be emptied.

Conditional Start and Stop of Logging

Apart from starting the measurement with SatelLite **manually** it is possible to start it **on condition** or at a **specific time**.

The logging can stop when the **memory is full** or at a **specific time**.

Start at a Specific Time

- Select SatelLite Set-up.
- Push the Prog key.

The programming box (see above) is shown.

- Push the ADVANCED key.

In the dialogue box for programming there is a box for start conditions.

Start Condition	
<input type="radio"/> Immediately	
<input checked="" type="radio"/> Time Start	Date: <input type="text" value="1997-10-10"/>
	Time: <input type="text" value="00.00.00"/>

Select the alternative "Time start" and enter date and time when logging shall start.

Store the Settings and Activate Start

When the desired conditions have been set and the configuration is complete you store by pushing key PROGRAM in the dialogue box.

NOTE! When auto start has been activated the text "**Begin**" will show at Status check until the start conditions have been fulfilled and registration can start.

Thereafter the text "**Run**" will show.

NOTE! If no sensor cable is connected at the programming the logging will not start until the cable has been connected to the instrument (and the time condition is fulfilled).

Start at a **specific time** can be very useful when trouble shooting. Time start is also used when you want to synchronise several different measuring instruments and this way get measured values taken at the same time.

The measuring will proceed continuously after start until a stop condition has been fulfilled or you perform a manual stop.

NOTE! When start has been ordered and until the start conditions have been met, the text **Begin** will be shown under Status check.

This means that measurement has commenced but that the start conditions have not yet been met. When they are, **Run** will show in the display and storage in memory starts.

The registration will continue until an automatic or manual stop has been ordered.

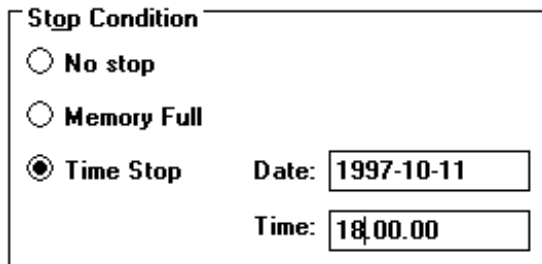
Stop at a Specific Time

- Select SatelLite Set-up
- Push the Prog key.

The programming box (se above) will show.

- Push the ADVANCED key.

The dialogue box for programming includes a box for stop conditions.

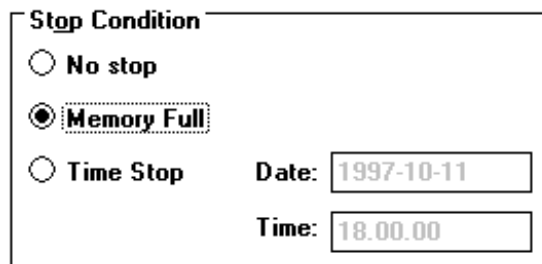


The screenshot shows a dialog box titled "Stop Condition". It contains three radio button options: "No stop", "Memory Full", and "Time Stop". The "Time Stop" option is selected. To the right of the "Time Stop" option, there are two input fields: "Date:" with the value "1997-10-11" and "Time:" with the value "18.00.00".

Select the alternative "Time Stop", enter date and time when you want the logging to stop.

Stop when Memory is Full

The box for stop conditions also includes the alternative "Memory Full" and this can be chosen as an alternative to Time Stop.



The screenshot shows a dialog box titled "Stop Condition". It contains three radio button options: "No stop", "Memory Full", and "Time Stop". The "Memory Full" option is selected. To the right of the "Time Stop" option, there are two input fields: "Date:" with the value "1997-10-11" and "Time:" with the value "18.00.00".

Store the Settings and Activate Start

When the desired conditions have been selected and the configuration is completed you can store the settings by pushing the PROGRAM key in the dialogue box.

Checking of Activity

LED on SatelliTe

A green LED sits behind the computer contact. It flashes every 4:th second after the instrument has started and is logging or waits for logging to start at time start.

At reset it flashes rapidly 3 times.

How does the Instrument Operate

For fast information about the procedure and how the instrument operates the Mitec programs have function STATUS. This function you find under menu "SatelLite Set-up".

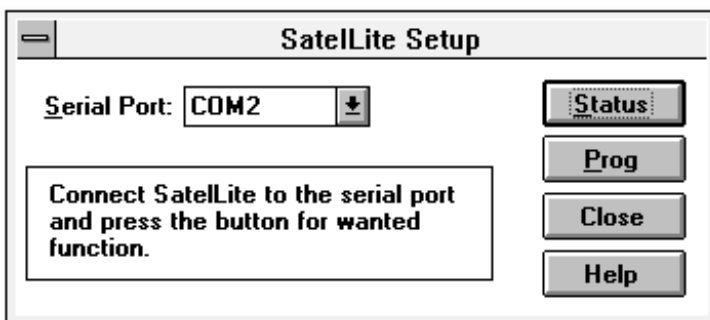
SatelliTe Set-up

The first box shown offers two alternatives, Status and Programming.

Status is used to show the instrument settings and what happens.

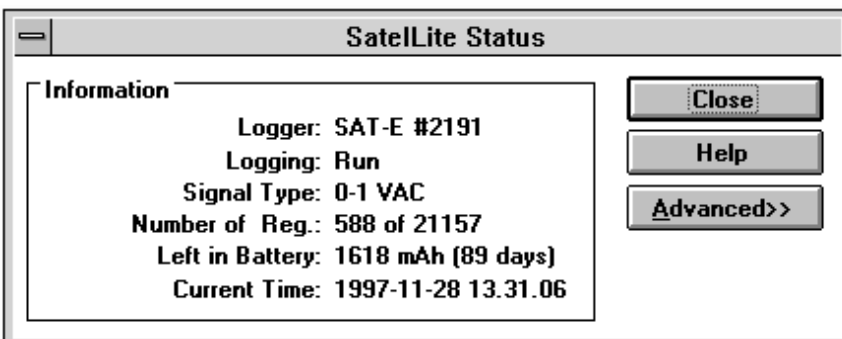
Optional communication port can be used

Prog is described in another place.



Status

When you push the "Status" key the information stored in SatelliTe will be entered and displayed. The first box shown is the summary box shown below.



By pushing the "ADVANCED" key you obtain further information.

Satellite Status		
Information Logger: SAT-E #2191 Logging: Run Signal Type: 0-1 VAC Number of Reg.: 588 of 21157 Left in Battery: 1618 mAh (89 days) Current Time: 1997-11-28 13.31.06	<input type="button" value="Close"/> <input type="button" value="Help"/> <input type="button" value="Advanced >"/>	Logger Version: 3 Manufacturing Date: 1997-09-24
Program Program Date: 1997-11-28 13.11.20 Start Condition: Immediately Stop Condition: No Stop Interval: 2 s (2 s)		Battery Programmed Capacity: 2000 mAh Time since last change: 52 days Execution time since last: 29 min
		Logging Oldest: 1997-11-28 13.11.32 Latest: 1997-11-28 13.31.06

Status "Information"

Logger: Shows type of instrument and its serial number. Each instrument has its own individual serial number given during the manufacturing.

Logging: Shows current activity. This can be Stop, Begin or Running. See below for explanation.

Signal type: Shows the type of input signal to the logger.

Number of registrations: Apart from the number in the memory it also displays the total memory space available.

Note 1.

Remaining in battery: Consumed capacity is calculated. **Note 2.**

Current time: Shows the time in the logger when the status key was pushed (+3 seconds).

Status "Programming"

Executed: Date and time of the programming.

Start condition: Set start condition.

Stop condition: Set stop condition.

Interval: Registration interval. Within brackets it displays the time lapse between the measurements (the measuring interval).

Status "Logger"

Version: The instrument version number.

Manufacturing date: The date when the instrument software was loaded.

Status "Battery"

Stated battery capacity: The capacity figure entered by the operator at battery replacement. **Note 3.**

Time elapsed since battery replacement: Time elapsed since the latest power interruption and new statement of the capacity (In practise the time elapsed since the battery was inserted).

Operation time since the battery was replaced: Time the instrument has been used for logging, i.e. active operation. **Note 4.**

Status "Logging"

Oldest: Time for the oldest registration stored in the memory at the status request.

Latest: Time for the youngest (latest) registration stored in the memory at the status request.

The table below explains the status information in box "Information / Logging".

STOP	No registration is active. The memory contains information collected during the previous measuring period. (Or is empty if no measurement has been done since the zeroing.)	RUN	Means that the start condition has been met and measurement is in progress. This is the normal condition at logging.
BEGIN	This means that you have chosen to start on an external condition. Measurement has been ordered but the start condition has not yet been met.		

Note 1

Memory consumption. Note, the memory is full if the figures for number of registrations and available memory are equally large. Logging can still be in progress depending on the stop condition you have chosen.

Note 2.

Remaining in battery. This calculation is based on the capacity stated by the operator during programming. NOTE! The calculation is based on a typical power consumption and is not exact. SatelLite will remember how much has been consumed of the installed battery and will disregard a new statement for battery capacity. To change the capacity you must remove the battery and reinstall it.

The calculation is not valid for pulse input since the load is not known.

Note 3.

Battery capacity. SatelLite will notice if the power has been disconnected and will give alarm for this at the next programming. The operator shall then enter a figure for the capacity of the battery that has just been installed. The capacity shall be entered in conjunction with the installation of the battery. This figure will be used by SatelLite until the battery is removed and installed again.

Read about current supply in chapter "Basics".

Note 4.

Operation time. This time is the sum of the time that the instrument has been used for logging, i.e. the time for measuring. Standby with stopped logging is not counted. The operation time counter will be zeroed when the battery is replaced (when a new capacity is entered).

Transfer of data to PC

Information from SatelLite can simply be transferred to a PC for further treatment. The transfer is made by a serial communication via RS232. Normally you need make no settings on SatelLite and the transmission is started and controlled completely from the PC.

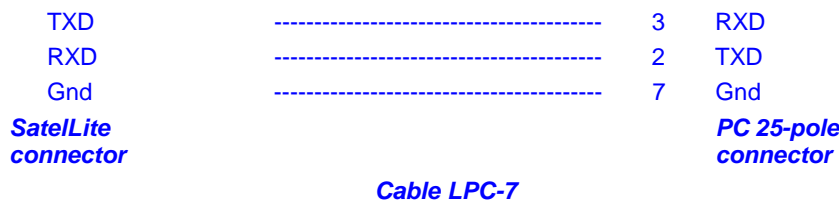
Connect the Computer

The connection to the computer is done with a cable provided with suitable contact devices.

As an accessory to IBM PC and compatible units we carry cable LPC-7 in stock. This can be used both for 25- and 9-pole contact devices in a PC.

Connect the cable to the 4-pole modular contact on SatelLite and to a free COM: port on the PC.

NOTE! Do check that no other program, e.g. the mouse, uses that COM port on the PC!



At start-up of SatelLite you get a standard setting of the serial port, which is 9600 baud, 8 bits, 1 stop-bit, no parity. WinSat and WinLog will automatically adjust to this.

The transmission speed will drop somewhat when SatelLite-E at the same time is logging with a short registration interval.

Note! In this case several start attempts might also be required before the transmission starts.

Readout of Measured Data

Readout of the measured data differs somewhat between the programs. SatelLite shall be handled in the same manner as other products from Mitec in the handling of the readout.

Data is stored in the same manner and measured data from SatelLite can at the presentation and calculation be mixed with data from e.g. AT40 or other loggers.

See the manual for each program!

TRANSMISSION SPEED

The speed of the data transmission is in baud and this can be translated as bits/second. One character is made up of 10 bits. With a speed of 9600 baud you can transfer 960 characters per second and in SatelLite this means 500-700 measured values per second. In practice the speed is lower due to control characters, etc.

Program in Computer

A program that can communicate with binary coded characters is required to receive information from SatelLite.

The program WinSat is an accessory to SatelLite. This program can be used to transmit data to a PC for a simple presentation or for transmission to a calculation program type Excel or Lotus 1-2-3.

Mitec can also provide complete communication and analysis programs for Windows. **Mitec WinLog** is a powerful program for communication, storage of data, calculation and presentation.

Mitec Monitor is an extended version of WinLog and this program includes automatic communication via modem.

WinSat as well as Monitor and WinLog require Windows 3.1 and at least a 386-PC with 4 Mbytes RAM.

Computers of later model are of course recommended for better performance.

The programs can also be run under Windows 95 and NT. However, do note that some functions do not perform to their full extent under NT.

Serial and Revision Number

The Status function can provide information about instrument type and serial number.

You will also find a space for the instrument number on the label stuck to the instrument end piece. Check the serial number with the "Status" function in the program and write down this number on the label using a ball-point pen.

Introduction to WinSat

General Information about WinSat

WinSat is a program in the same series as Mitec Monitor and WinLog. WinSat can only be used with the Mitec SatelLite series, while the other programs also can be used together with other Mitec instruments.

How to Install

Insert the diskette in A:

- Select "Run" in the program manager "File" menu.
- Write A:\install

The program will now be automatically installed. Answer to the questions as needed. Program group **Mitec WinSat** will be created.

Start the Program

Double click on the SatelLite icon. This will start the program and display the welcome page.

The top part of the menu looks as the picture below.



Program Function

The program is very simple to use and has been made so it is "self instructing". The handling of WinSat is only described in the **program help text**. You find this text under "?" on the menu.

Quick Start

Click "File" and select "Set-up". Here you do all the configurations needed to start up SatelLite. See previous sections in this manual.

Collect the measured data under "File" and "Sampling".

Diagrams will automatically be created as soon as the sampling is completed.

Structure

The measurement is performed on an **Object**. Enter the name of the object when starting the sampling.

You will find the measured data under the object name when you select "Open" and a diagram will be displayed.

In WinSat a measurement and a diagram is the same thing. Do note that you can "add" data to an already existing object.

The measured data will be stored in the same format as in the other programs from Mitec, Monitor and WinLog, and can be transferred to these programs.

Analysis

Measured data displayed in the diagram can be studied using the different tools.



Put the cursor in the diagram and click the **right mouse key**. Test!

Also test the zooming function by using the flexible axis's. Point to a value on the time or Y-axis and drag the value to a new position.

Ready!

The menu has scrolling arrows  and zoom keys .

And a key that restores everything. .

Use the keys below to print out the diagram or to export it to the editing board.  .

No calculations can be made in WinSat. Instead use WinLog or Monitor that both are equipped with an advanced and easy to use formula language.

Test all the program functions and search through the help text.



Additional Information

What is a Data logger?

Background

The term data logger we have, as with many other technical terms, borrowed from the English language. Logg comes from the naval term *to log* meaning in a logbook, i.e. to make careful notes about events in chronological order.

With data logger we then mean careful "notes" of measured data in a mass memory.

We prefer the term *measured value collector*, but it is of course more international to use the term *data logger*.

Mitec introduced its first data logger on the market in 1984. It was the 4-channel logger MTM20 that we called a TEMP-recorder. Shortly afterwards we introduced its sister instrument, the PULSE-recorder PM20. The next generation was the ANALOGUE-recorder AT30 and now we have come to the third generation, the UNIVERSAL-recorders AT40, AT31 and the new concept SatelLite.

Our product names have made their mark. In Sweden you can e.g. look in the "Buyers Guide for Engineers" (Ekonomisk Litteratur AB) under "Recorder" where our product names have been used as headlines in the product index. We can only say Thank You! for that.

The data logger is not a new invention. You can find old literature references, such as e.g. "Airborne recorder and Computer Speed flight-test Data Processing System" from 1958.

The loggers were developed in step with the development of the semi-conductors. The microprocessor plays a very important role here.

The real and major break-through came in the beginning of the 90's after the logger had gained its general acceptance.

How does it work?

The principle is rather simple. The main parts of a modern logger are the microprocessor, the

semi-conductor memory and an analogue/digital converter.

A sensor gives an analogue signal, e.g. 4-20 mA. The micro processor that has a built-in clock controls the process. The sensor is read at set time intervals and the measured values are stored in the memory.

Eventually it has collected a number of measured values that form a *time series*. The time series can be printed out as a diagram on a printer or on a computer screen

Modern data loggers are rather sophisticated and offer different possibilities on how to treat the information. Below we have described some of the more common terms.

Memory is of course quite important. Common sizes are for approx. 1000 values up to several 100 000. There are non-volatile memories available with a built-in battery so they will not lose data in case of a power failure.

Measuring channels will tell you how many sensors that can be connected at the same time. Handheld professional loggers generally have 2 to 8 channels.

Type of input tells you about the type of sensor that can be connected. Most sensors can measure temperature or a voltage signal e.g. 0-10V. Different types of sensors can be connected to the more advanced loggers.

Registration interval is the time between two storings in the memory. It is usually adjustable in steps between 1 s and 24 hours. The registration interval determines how fast processes you can measure on. 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 make sure of a more accurate value. The measuring interval can be adjustable.

A **clock** is required. A modern logger has a calendar clock (crystal clock) with date and time.

Start condition is the condition that must be met before measurement can start and data be stored in the memory. It can be manual start, time start or start on external condition, (e.g. when a temperature is exceeded).

Stop condition determines when the measurement shall stop. It can be manual, on time, or when the memory is full.

Storing conditions can be set on some loggers. It is e.g. possible to store only the mean value during a registration or *several values*. e.g. min, mean and max.

How to take Care of the Measured Data

The collected measured values are stored in digital form as data words. Before you can use the information it must be processed.

Older loggers only 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 the information in the shape of a curve. Some loggers can draw curves directly on 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 then can be stored on a magnet 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 personal computers using Windows have made possible a very efficient handling due to the graphical interface using the mouse as a pointer.

What must be Considered.

One of the first items is to make sure that you have an instrument that is up to the present work situation, in other words it must be "good enough".

Type.

You must first decide if the instrument shall be portable or have a fixed installation. For field measurements the requirements are low weight and battery operation.

Some suppliers use the PC also in the field. Don't forget that the PC is attractive to thieves, never leave it unguarded!

Some of the cheaper loggers are made as "black boxes" without keys and display. These leave you dependent on the PC for configurations and control of the operation, even in the field. Some of these loggers have a fixed built-in battery and the instrument has to be dumped when the battery runs out.

Ergonomics

Unfortunately this area 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.

Extension.

Also check the procedure for connection of sensors of different types and to extend the equipment. Some instruments are only constructed for certain types of sensors. If you want to connect other sensors you then either have to purchase a new instrument or special circuit cards.

Battery life span.

It is important to check the power consumption. A modern battery driven logger should not in stand-by position consume more than 0.1 mA. When measuring it may consume a lot more, approx. 30-40 mA. Do note that short registration intervals (1-30 s.) increases the consumption sharply.

Input signal.

You get maximum flexibility if you select an instrument with universal inputs. To these you can, with a suitable cable and connection, directly connect different types of sensors.

Some loggers require external signal transducers to adjust the sensors. Consider that these generally use a lot of power and that they also take up space.

A very important aspect is the power supply to the sensors. If you have to arrange for an external supply it will mean a hassle with extra cables.

Quality loggers have a built-in supply directly via the sensor cable.

Watch out for the power consumption here! E.g. a humidity sensor can exhaust a 9 V battery in 24 hours if connected the whole time. Select a logger that can control the power supply to the sensor.

Accuracy.

Many suppliers make no difference between resolution and accuracy and yet they are two different things. The resolution indicates how "small" the parts of the signal are that can be spotted. Many suppliers have for reason of cost only used 8 bits and this can give a resolution of 1/256. With a measuring range of e.g. 300°C / 572°F this means a resolution of just over 1°C / 1.8°F. You should ask for at least 10-12 bits (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, e.g. °C or in %. You should also require that the supplier can show a traceability for the calibration, i.e. that he can show that the instrument measures correctly.

Memory.

These days the memory capacity is no limitation. 25-50 000 measured values is standard. Do note! Some suppliers show the memory in Kbytes (kilobyte = 1000 byte). To store a measured value with an acceptable resolution you need 2 byte i.e. 128 Kbytes is sufficient for 64000 measured values. Most memories can also be delivered with a power failure protection.

Manuals.

Make sure you get manuals in your own language. Check that the supplier can give service!

Mitec Data loggers.

The Mitec data loggers are designed and manufactured by Mitec in Säffle, Sweden. As a customer you are always close to the source. You

can get help and advice if you have a measurement problem.

We deliver instruments for physical measuring signals, i.e. we don't leave you with a 0-10 V input. We also deliver the sensor or a cable that directly fits the sensor you already have.

Field adjusted.

Our instruments are made for the user. We put great emphasis on simple handling and on flexibility. SatelLite, our latest logger is based on our 10 year long manufacturing experience of data loggers for use in the field

Simple handling.

Instruments with a display in English will tell you exactly how to make the configuration. The simple and clear structure of settings and readings ensures that you learn to master the instrument in your first tryout.

Flexible.

Universal inputs for volt, mA, electricity meters, temperature sensors, current clamps, flow meters, etc. ensure that our instruments can be used for a great number of applications. Without reconstruction or additions. Our concept with "smart cables" see to it that you directly can see signal type and unit in the display without any programming.

Technical performance.

State-of-the art technology of the microprocessors provide us all with the possibility to build "high-tech-Christmas trees". However, our long experience has taught us that technology is not an end in itself. Our instruments have a "sufficient" capacity, to quote a known English car manufacturer.

You still do not believe us? Ask a colleague who already has a Mitec instrument.

Technical Specifications SatelliTE-E

GENERAL

Number of measuring channels	1-4 (one sensor at a time)
Memory size	32k byte, 20 000 measured values
Resolution, storage	12 bits
Clock	quartz crystal, date and time.
Registration interval	62.5 ms (16 Hz), 125 ms (8 Hz), 250 ms (4 Hz), 500 ms (2 Hz), 1, 2, 5, 10, 15, 30 sec., 1, 2, 5, 10, 15, 30 min, 1, 2, 4, 6, 8, 12, 24 h
Measuring frequency	Selectable in different steps for each registration interval
Selection of type of input	Automatic when sensor is connected (cable)
Supply	1.5V battery LR6 (alkali) or Lithium (also external supply 1.5V)
Battery life span (LR6)	1 week to 1 year. (Depending on registration interval, temperature and type of sensor).
Ambient temperature	-20°C to +50 °C. No condensation.
EU standard	EN50081-1, EN50081-2, EN50082-1

PULSE MEASUREMENT S0

Connection	Cable, automatic configuration
Min pulse length	35 ms
Max. frequency	12 Hz
Supply	Internal pulsed 12V DC or external 6-24V DC.
Scale factor	Scaling in analysis program (Windows)

PULSE MEASUREMENT OPTICAL EYE

Sensor	Optical eye Mitec type MS-DO101
Max. number of turns	approx. 1 turn/s (min 70 ms passing time for indication)
Supply, sensor	Built-in battery (approx. 1 week). External battery can be connected.
Scale factor	Scaling in analysis program (Windows)

CURRENT CLAMP

Measuring range	0-1V AC (0-3V DC), 0-200 mV AC (0-600 mV DC).
Sensor	Current clamps with DC or AC output.
Type of signals	True RMS, Mean value, Peak current, Harmonic content (ratio Mean / TRMS)
Inaccuracy	Current < 1% excluding current clamp
Resolution	0.1% (10 bits)
Crest factor	3
Selection of signal type	At start of measurement in analysis program (Windows)
Selection of range, linearising	Automatic when input cable is connected

FUNCTIONS

Start and stop conditions	Adjustable, time start or manual start and stop
Storage method	Mean value, number of measurements per registration is adjustable.
Reading and setting	Via PC and one of the Mitec programs WinSat, WinLog or Monitor.

COMMUNICATION

Computer	RS232, 9600 baud. Control command from computer. Modem and GSM-telephone can be connected.
Indication	LED. Flashes once every 4:th second while logging is in progress.

MECHANICS

Connector	4 pole modular contact, 4/4 and 8 pole modular contact, 8/8
Box	Aluminium 60 x 50 x 30 mm.
Weight	100 g including battery

We reserve the right to make technical improvements and changes.

Connectors

4-pole contact

The 4-pole contact is used for communication with external units. Mitec cables LPC-7 are used for the connection to the computer. See the chapter about connection to computer above.

Service and Support

Telephone support

Mitec products are manufactured by Mitec Instrument AB in Säffle, Sweden.

We can offer a complete service of the equipment in our workshop. In case of problems, contact us on telephone
+46 533 16050.

Fax & E-mail

Our fax number is + **46 533 16045.**
E-mail address is **info@mitec.se.**

Web page

You find our homepage on **<http://www.mitec.se>**
There you find Demo-versions of our programs, the latest probe list and various help programs.

Goods

Equipment sent in for service and calibration should be sent to:

Mitec Instrument AB
Västra Storgatan 18
S-661 30 Säffle, Sweden

Always include a dispatch note and a short description of what the problem is.

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