

Data Logger

Mitec AT40

Users Manual

Universal Recorder AT40

Users Manual

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This manual is valid for instruments from program version 1.70.
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Universal Recorder Mitec AT40

Mitec AT40, a professional universal instrument.

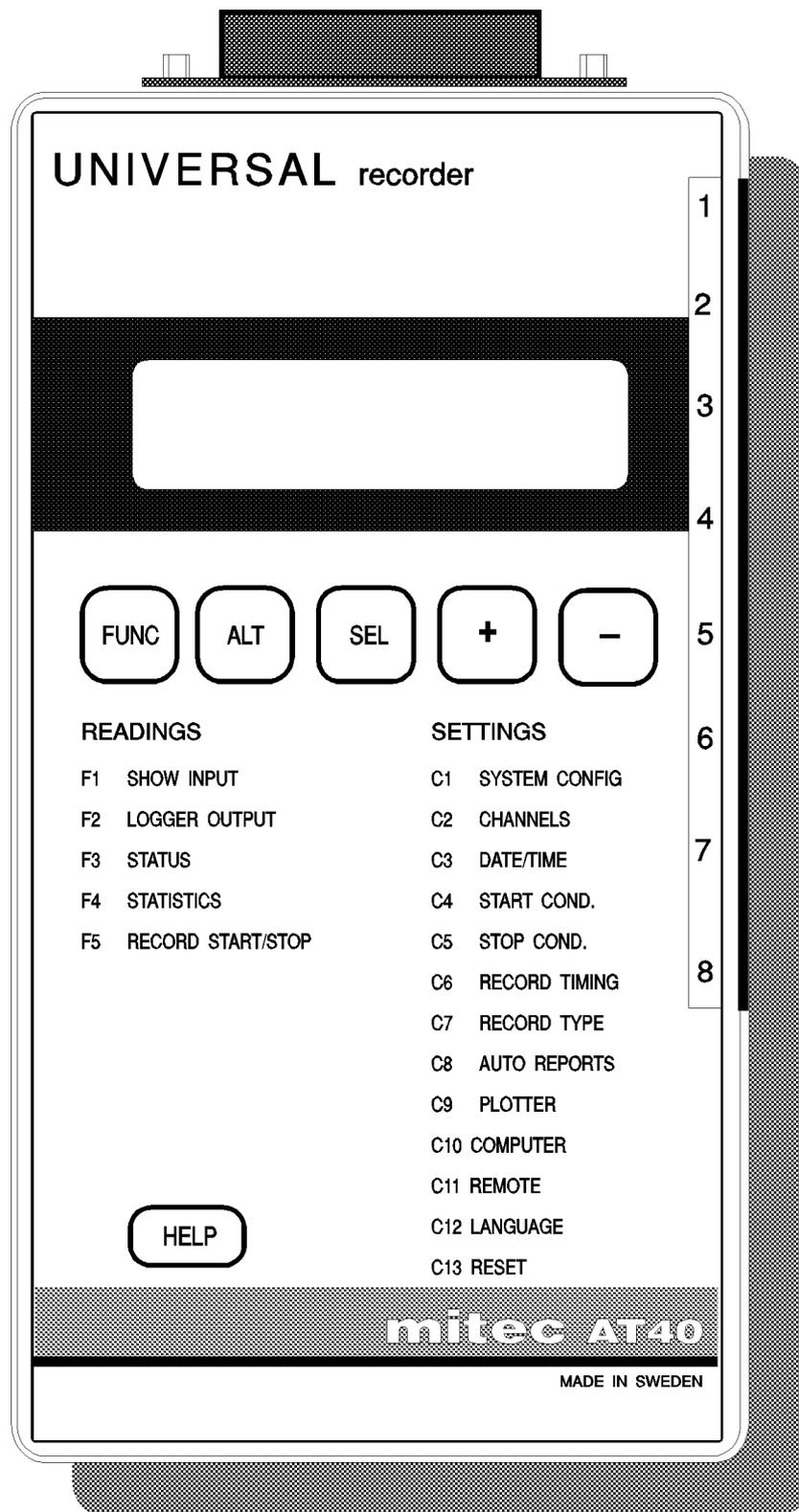
This is the operation manual for the Mitec 8-channel Data Logger type AT40. We have designed the AT40 to function as an intuitive instrument, ie, so you can use it "instinctively" and without instructions. However, some functions do initially require an explanation. We therefore recommend that you at least glance through the manual before you start using the instrument.

The Mitec AT40 is a compact data logger with powerful performance. Conventional data loggers only accept and transmit data. Mitec products go one step further. A portable colour plotter can be connected directly to the AT40 where the data is presented as graphics in four colours. The AT40 accepts data and transmits structured information! This information can, of course, also be transmitted to a computer.

The AT40 has 8 universal inputs. All sensors and transmitters known on the market, analogue or digital, linear or nonlinear can be directly connected to each input. In any combination!

By use of five, logically structured, push-keys you select the different functions while the 32-digit display provides instructions to the user. A sixth key provides the help text.

The AT40 is the base of a measuring system. A wide choice of accessories is available, from sensor to computer.



Quick Start-up

Start directly

The best way to learn the AT40 is to read chapter "**Basic Information**" in this operations manual and then carry out a test measurement.

If you want to start up immediately with the measurements, just follow the instructions below.

What you need

To carry out a measurement you need:

- Data Logger AT40
- An alkaline battery type 6LR6
- A suitable sensor, e.g., temperature sensor MU-TE100

Connect the Battery

Open the cover on the rear of the instrument and connect the battery. Insert the battery and close the cover.

Reset the instrument. Use, e.g., the tip of a pen to press in the switch located in the hole on the right-hand side of the box.

Connect the Sensor

Connect a sensor to Channel 1. Turn the sensor's 9-pole connector with the arrow pointing upwards. Make sure the connector is inserted properly.

Start-up

Push the **FUNC**-key to illuminate the display. The display now shows F1, CONTINUOUS.



Push once on the **ALT**-key to show the instantaneous temperature value.

There is no ON/OFF key, but the display will automatically darken after approx. 2 minutes and the instrument goes into a "standby" position.

Continue by reading the chapters under "**Basic Information**" and "**Handling**".

This manual has five main parts. It is all right to make a quick start-up, but afterwards we suggest that you read chapter "**Basic Information**"!

"**Quick Start-up**" provides fast information when you want to start with practical measurements directly and learn the

instrument that way.

"**Basic Information**" and "**Handling**" provides all pertinent information needed in order to handle the instrument. These chapters are a must to read.

"**Extended Functions**" describes functions that perhaps are not used daily, but are indispensable in certain applications.

Information on different functions

F1	SHOW INPUT	Shows the actual value from sensor on display.
F2	LOGGER OUTPUT	This where you start sending data to plotter. Data is displayed as graphs on A4 paper without using the PC.
F3	STATUS	Shows if the logging is in process and the amount of used memory.
F4	STATISTICS	Presents statistics on logged data. Min, max and average values are calculated.
F5	RECORD START / STOP	This is where you start and stop logging.
C1	SYSTEM CONFIG	Reserved for future use.
C2	CHANNELS	Sensors can be deselected from logging but still be used for start and stop.
C3	DATE/TIME	Date and time setup.
C4	START/ COND.	Setup of start condition (time, external trig, manual)
C5	STOP/COND	Setup of stop condition (time, external trig, memory full, manual)
C6	RECORD TIMING	Setup of registration and sample interval. Also manual start is available.
C7	RECORD TYPE	Select if you want to store average value only or a combination of average, max and min.
C8	AUTO REPORTS	Reserved for future use.
C9	PLOTTER	Select plotter type.
C10	COMPUTER	Select communication method (PC, modem etc) and speed.
C11	REMOTE	Reserved for future use.
C12	LANGUAGE	Standard language is Swedish. Other languages as English and German are built in.
C13	RESET	Logger reset. Serial number, software version etc. can be displayed.

HELP-functions

This manual is the best tool when you are learning how to handle the instrument.

However, very soon you will learn to manage without the manual. As a memory support we have included **HELP**-texts in the instrument. Such **HELP**-texts are available for all functions and you call them up by pushing the **HELP**-key.

HELP-key

The **HELP**-texts can be called up at any time while the instrument is used.

The **HELP**-texts are connected to the function currently in use and this way you can always obtain relevant information.

How to call up HELP-text

- Push the **HELP**-key.

The first two lines in the help text show up on the display.

- Push the + or - key.

The text scrolls two lines forwards or backwards.

How to close HELP-text

- Push the **HELP**- or **FUNC**-key when help text is shown.

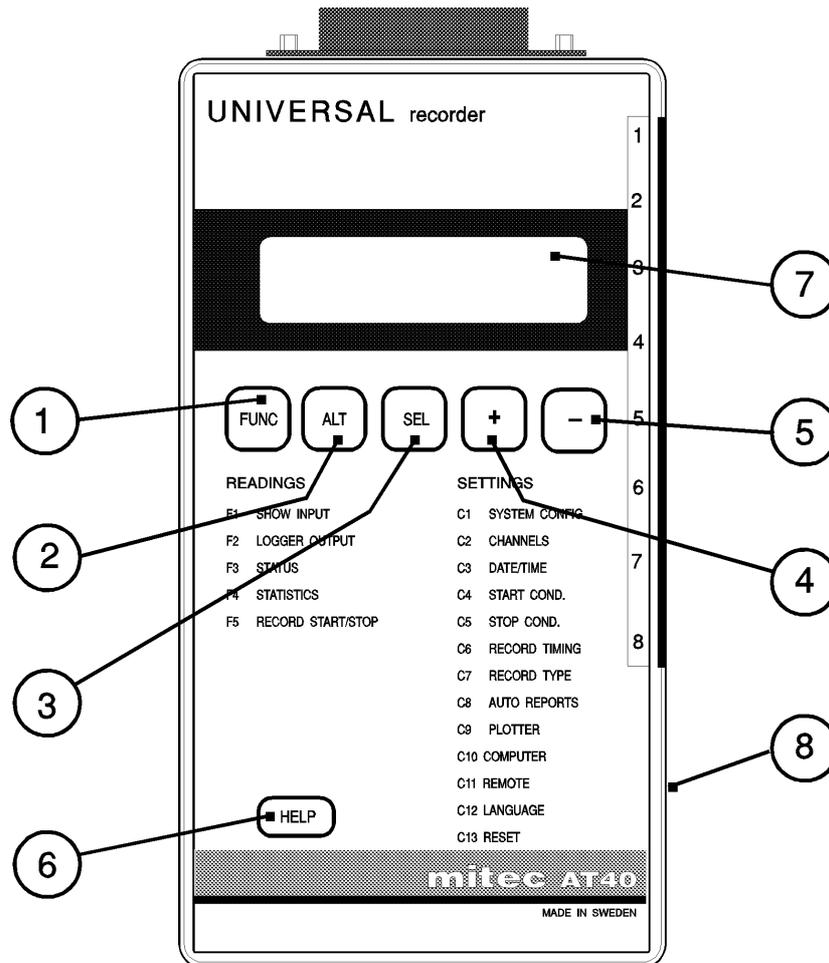
The **HELP**-text is only meant as a support for your memory and as a complement to the manual.

If you push the **HELP**-key when the display is dark, a general text will show up on the display. By pushing the **HELP**-key a second time you darken the display. If the **FUNC**-key is pushed down instead, the first function F1 will be activated.

If you push the **HELP**-key and the display is illuminated, the help text for the current function will be shown. Deactivate the help text by pushing the **HELP**- or **FUNC**-key.

Basic Information

Display and Keys

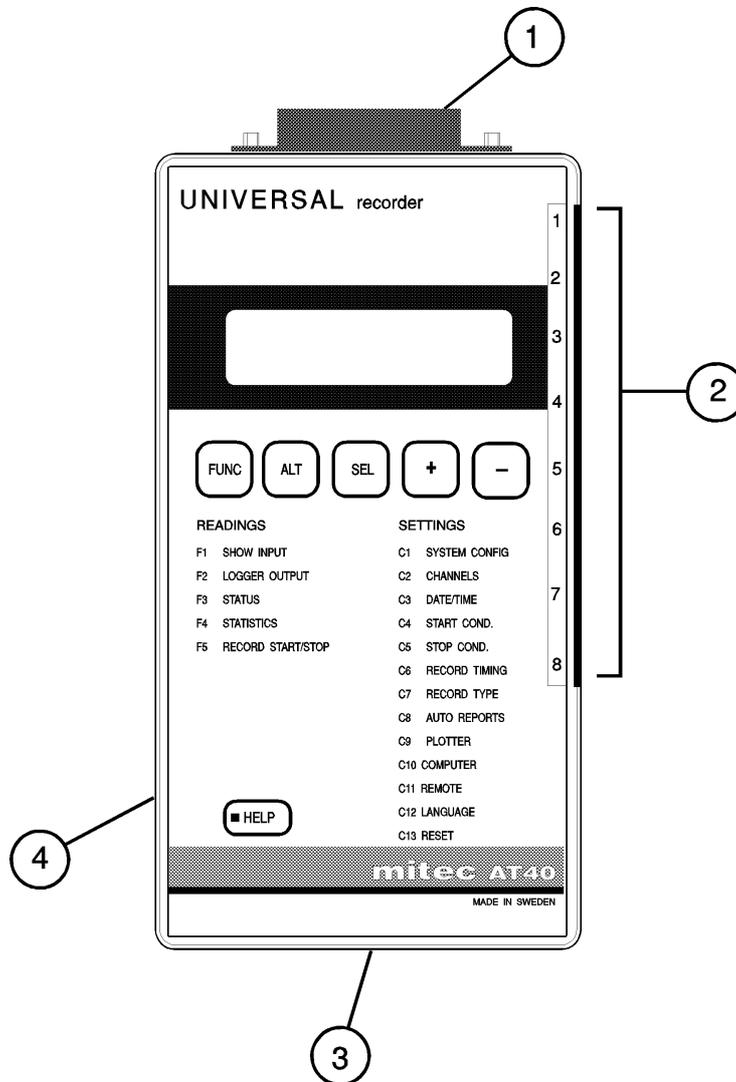


- | | |
|--|---|
| <p>1..FUNC Use this key to go between the functions according to the table on the front panel</p> <p>2..ALT For selection of different sub-alternatives in each function</p> <p>3..SEL Used to select desired subalternative. Use the cursor as a pointer</p> <p>4.. + Increase-key, used for varoius settings</p> | <p>5.. - Decrease-key, used for settings together with the + key</p> <p>6..HELP HELP-key. Gives information in the display about which keys to use</p> <p>7..Display 32-digit display that shows both text and digits</p> <p>8..Reset Zerp-key. Use after, e.g., a battery replacement</p> |
|--|---|

KEYS

See chapter "General information about Readings 1-5" for a detailed description of the key functions.

Connectors



- | | |
|--|---|
| <p>1.. 25-pole connector (male) for connection of a computer, plotter, etc.</p> <p>2.. Eight 9-pole connectors for connection of a sensor to AT40.</p> | <p>3.. Battery compartment with connector for 9V battery, e.g., 6 LR 61</p> <p>4.. 3.5 mm jack for the connection of external supply voltage, 9 - 15 V DC</p> |
|--|---|

See chapters "Sensor" and "Battery and Eliminator" for detailed information about the use.

Power supply

The AT40 is designed, both for portable use and fixed installation. Internally it operates with a supply voltage of 5 V. The primary power supply unit is the 9 V battery. It can also be supplied from an external source.

Battery

We recommend you to use an alkaline 9 V battery of type IEC 6LR61. Insert the battery in the compartment found under the cover at the rear of the instrument.

- Open the cover and fasten the battery cable to the battery.
- Wind the cable round the poles of the battery and insert the battery.
- Close the cover.
- Push the **FUNC**-key and check that the display illuminates.

Low Battery

The AT40 continually checks the condition of the battery and gives an alarm when it needs to be replaced.

When display shows "**Change battery**" and you hear 1-5 short beeps, the battery is low. This warning only shows up when you push the **FUNC**-key and the display illuminates.

The first time this warning shows up, about 85-90% of the battery capacity is used up. The warning text disappears after a short while.

- **Note!** Do not store the instrument for any length of time with the battery installed.
- **Note!** Unplug the cable to plotter and computer when these are not in use. Power consumption from the battery in AT40 increases when they are connected.

Also, other types of batteries can be used apart from the 6LR61. Common dry batteries type 6F22 can be used but, their expected durability is only 50% of the alkaline battery. Lithium batteries can also be used. They have a capacity of 1000 mAh, i.e. twice the capacity of alkaline batteries. Rechargeable batteries (NiCd) can be used. However, their expected durability is only 25% of the alkaline battery and we **do not** recommend them.

The AT40 is equipped with built-in protection against polarisation errors and a temporary error in battery position cannot harm the instrument.

Battery capacities: **Dry batteries** type 6F22, 250 mAh; **Alkaline batteries** type 6LR61, 500 mAh; **NiCd**, 110 mAh; **Lithium**, 1000 mAh. (mAh = milliampere hours).

Battery low warning is given in five steps. The first warning is one beep and display shows text "Replace battery" when battery voltage is approx. 6.8 to 7.0 V (remaining battery capacity is 10-15%). With decreasing voltage the number of beeps increases to a maximum of five. At this time the battery voltage is down to 5.8 to 6.0 V. At one beep the instrument functions properly, at four to five beeps we do not guarantee the function. **Change the battery at the first warning!**

Battery Eliminator

AT40 can also be energized from a battery eliminator. A 3.5 mm telephone jack is provided on the left-hand side of the instrument for this purpose.

We suggest you use the 12 V eliminator that Mitec can supply.

The eliminator replaces the battery function. The switching over from battery to eliminator is "cushioned" and will not affect the instrument function.

Power Supply of Two-wire Sensors

The signal inputs of AT40 are designed so that they can be used to supply power to external sensors and two-wire transmitters (4-20 mA), e.g., pressure transmitters. In such cases the power supply comes from the eliminator. Always check required power supply for each transmitter and use the correct type of eliminator.

Many instruments and transmitters require a supply voltage between 10 and 24 V DC. This means that a 12 V eliminator can be used in most cases.

Current Consumption

In its resting position the AT40 has low current consumption, approx. 0.5 mA. The consumption increases when it measures and when it is connected to various sensors. The level of this increase depends on the number and types of sensors connected and the selected registration interval.

Example: If you, e.g., connect eight sensors, each using 10 mA, and measure once per sec. the total consumption will be approx. 110 mA and the battery will be exhausted after a couple of hours. **Note!** This is a theoretical "worst case".

If you select measuring frequency "High", the measuring interval will be 1 sec. independent of the registration interval. This will result in considerable current consumption. We recommend you to use a battery eliminator when measuring frequency "High" is selected.

There are a number of battery eliminators available on the market. AT40 requires an eliminator with a stabilized voltage of 9 to 12 V DC. The output effect shall be approx. 3 W. The eliminator shall be equipped with a 3.5 mm telephone jack where + shall be connected to the top of the plug.

Preferably use the Mitec eliminator since this unit is equipped with protection against mains interference.

AT40 is protected against polarisation errors and the instrument will not be harmed by a temporary connection error.

 Use the eliminator if the battery needs to be replaced while the instrument is measuring. Via the eliminator input it is also possible to connect an external 9 V battery.

Start-up of instrument

The instrument is ready for use as soon as the battery is connected. Since the AT40 has a low consumption in its resting position, it is not equipped with any ON/OFF switch.

Zero Setting after a Battery Replacement

The AT40 shall be "Plus"-zero reset after the supply voltage has been connected. The reset switch is found on the right-hand side of the instrument.

- Zero the instrument by first pushing the "+"-key and simultaneously pushing the tip of a pen through the hole.

Display will go down and then show "RESET".

Error Messages

The start-up generates an automatic selftest of the internal functions. The message "**Error in selftest**", appears on the display if an error is found. In such a case, change the battery and repeat the start-up procedure. If the error remains, please contact your supplier or Mitec.

To Illuminate the Display

Normally the display is dark when the instrument is operating. To illuminate the display, push the **FUNC**-key.



Automatic Darkening of the Display

The display darkens automatically after approx. 2 minutes if no key is activated. In function F1 (instantaneous value) the display darkens after approx. 5 minutes.

Three different kinds of zerosettings can be performed:

Normal-zerosetting, by pressing the reset button (no. 8 in the figure on page "Front panel"). All important parameters in the instrument will be initialised *except those that concern logging. Collected data will not be affected.*

Logg-zerosetting is performed under C13 (see chapter "Serial number"). This zerosetting *erases collected information and all parameters that concern logging.* See the table below. (Note this does not affect the clock.)

Registration intervall	1 hour
Start conditions	Manual
Stop conditions	None
Recording type	Average value
Plotter	Casio
Computer	9600 baud
Language	Latest used

Plus-zerosetting is a combination of the Normal- and Logg-zerosettings. The plus-zerosetting is carried out by first pressing the "+"-button and simultaneously pressing the reset button found on the side of the instrument.

Plus-zerosetting erases *collected information.*

At the installation a plus-zerosetting is performed and the clock is initiated to show 920101.

Universal inputs

Practically all types of sensors, transmitters and instruments available on the market can be connected to the AT40. All that is required is an interconnecting cable equipped with a 9-pole connector. The cable is adjusted for the current sensor and provides the instrument with information about type of sensor, measuring range, unit, linearising requirements, etc.

The universal inputs give the AT40 a quite unique performance. No matching card and no intermediary boxes are required, all is there from the beginning.

The instrument shows the real physical unit, e.g., when measuring electricity it shows kWh, not number of pulses. When measuring air speed it shows m/s and not voltage!

Unit and type follow the measurement up to the report on a plotter.

What is a Probe?

This manual uses the word probe. A probe is made up of a sensor and a cable with connector. The cable is adjusted for the actual sensor.

The cables can be delivered on their own for connection to the customer's own instrument or sensor.

Available Cable Types

Cables can be made for almost all types of sensors and instruments available on the market.

The cable types can be divided in different groups.

Analogue cables can measure: voltage, current and resistance. They are used with, e.g., Pt-100 sensors, moisture probes, pressure transmitters, level sensors, pH-meters, etc.

Digital cables can measure: number of pulses, time and register status (ON/OFF). They are used, e.g., with electricity and water meters.

For manufacturing the cables are divided in four main groups.

Analogue cables, are used for, e.g., temperature and pressure transmitters. AT40 samples the measured values from the sensor at a time interval given by the measuring frequency and registration interval.

Pulse cables, collect information from pulse giving sensors, e.g., flow meters and power meters. The number of pulses sent during a registration interval are added up and recorded in the logger after being scaled with the cable constants and the time unit selected under C2 (CHANNELS). See under "*Setting of Time Units*" in this chapter.

Time cables are used to measure time, e.g., how long time a connected switch has been open or closed. Here a time quotient is measured and displayed. The time quotient is presented as "*ratio unit/time unit*". "*Ratio unit*" is the unit selected in the probe and "*time unit*" can be set as desired. The registration interval is of no importance for the measured value. See also "*Setting of Time Units*" in this chapter.

Status cables are used for registration and show if a switch is ON or OFF. When presented on a plotter, the channel will be plotted with one level for OFF and one level for ON. The registration interval is of importance when it comes to the possibility to detect fast changes. If a contact has opened or closed several times during a registration interval the plotted result will be a triangle-shaped curve.

Connection to AT40

Each probe and cable has a 9-pole connector. The connector can be connected to any of the eight inputs.

- Look for the arrow on the connector and turn the arrow upwards.
- Insert the connector and make sure it seats correctly.

How to Check the Connection

The simplest way to check that the connection is correct is to read the instantaneous value under F1.

- Push the FUNC-key.
Display illuminates.
- Push the ALT-key.
The instantaneous value, type and unit are shown.
- Select the channel to be controlled with the + - keys.
Read the display for information about selected probe.
- End by pushing the FUNC-key.



Note! It is not possible to change to **another type** of probe while logging is in progress.

How AT40 uses the probes

Information about connected probes can be obtained in many places in the AT40.

Function F3 (STATUS) shows the presently used probes or the probes that were used in the preceding measurement, i.e., the measurement with values recorded in the memory. See also chapter "Checking of Activity"

Function C2 (CHANNELS) shows (and can be used to set) how to use the probes for the next measurement.

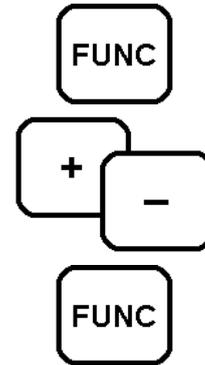
Mitec supply connection cables for a large amount of sensors and instruments. A list can be downloaded from <http://www.mitec.se>.

Temporary Disconnection of Probe

The function of connected probes at the next measurement, can be set under function C2, CHANNELS. The probe can be disconnected here so that it is not used during logging.

Go to function C2

- Push the **FUNC**-key.
Display illuminates.
- Push keys + and - at the same time.
Display shows function C1.
- Push the **FUNC**-key again.
Display shows function C2 CHANNELS and selected choice.



Read and Set

- Push the **ALT**-key.
Display shows the channel number and characters + - .
- Select channel with the **SEL**-key.
The cursor (a line) shows the position.
- Select probe with the + - keys.
Display shows () if the probe is not connected.
Display shows (-) if the probe is connected but not chosen.
Display shows (+) if the probe is chosen.



End

- Push the **FUNC**-key to end the settings.
Display shows how probes have been selected.
- Push + and - at the same time to go back to F1 again.

Probe selection

Function C2 CHANNELS has been included to simplify the decision on how to use connected probes at the next measurement. Connect the probe with the +key. This is indicated by a + shown in the display for current channel. When probe is connected its output signals will be registered at logging and recorded in the memory.

Disconnect the probe with the - key. A disconnected probe is indicated by a - in the display. Signals from a disconnected probe will not be included in the logging and not recorded in the memory. However, its instantaneous value can be read in the display and it can be used for start and stop of a measurement. See chapters "Automatic start of Measurement" and "Automatic stop of Measurement". When the display shows a blank position this means that no probe is connected. (Note the difference to function F3 (STATUS). F3 shows how the probes were used during the preceding measurement.)

Setting of Time Units

The time unit is of importance when measuring with pulse and time cables. Set the time unit under function C2.

Pulse Cables

When pulse cables are connected, the AT40 registers quantity per time unit. Sensors that generate pulses, e.g., electricity meters and flow meters can for the measurements be given a time unit. Independent of selected registration interval the AT40 will show the correct value (e.g., effect and flow), despite the varying number of pulses entered.

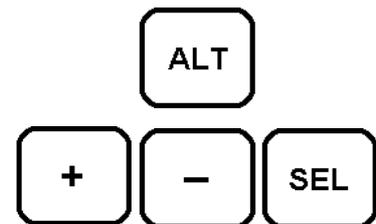
Time Cables

Time cables always measure with a resolution of one sec. The result of the measurement can, for statistics and plotting, be shown in an optional unit selected under function C2. (See also chapter "Information from AT40").

Go to function C2

Go to function C2 according to description on page 14.

- Push twice on the **ALT**-key.
Display will now show time unit.
- Scroll to the desired time unit using the + and - keys.
- Use the SEL-button to change to Setting of channel.
- End the setting by pushing the **FUNC**-key.



Time unit and pulse cables

With pulse generating sensors every pulse means a specific quantity. E.g., for a water meter every pulse may mean 5 liters or 0.25 m³ or something else. An electricity meter may have a scale factor of 5 Wh or 0.2 kWh.

In every case the unit is a **quantity**. The AT40 will automatically recalculate to **quantity/time unit**. For a water meter this means flow and for an electricity meter this means effect. The desired time unit shall be set under function C2 according to above description.

If the recalculation wasn't done automatically, different values would be shown depending on selected registration interval. **Example:** An electricity meter that during one hour gives 100 pulses would in 15 minutes only give 25 pulses. This despite the load is the same in both cases.

This unique quality of the AT40 considerably simplifies the evaluation of measured data, since no regard has to be taken to the registration interval.

For pulse sensors the time units can be selected to: **second (s), minute (m), hour (h), day (d), week (w)**.

Time unit and time cables

Also here, the AT40 will recalculate the probe time to a quotient to make the measurement independent of selected registration interval.

For time cables you can select presentation in: %, **hour/24 hours (h/d), hour/week (h/w), second/minute (s/m), minute/hour (m/h)**.

See also chapter "Information from AT40".

Supply Voltage to Sensors

Some sensors, e.g., moisture probes and transmitters must have an external power supply. The 9-pole connector for the AT40 is provided with sockets for power supply, both from battery and mains, via the instrument battery eliminator.

This simplifies both installation and handling.

Programming of Cables

The manufacturing of measuring cables is based on a limited number of basic versions. These are adjusted to different applications through programming of a memory circuit in the cable.

The programming is done by the supplier from a PC with a special program.

The memory can be reprogrammed several times and it is therefore quite simple to change a cable originally meant for a different purpose and to make special cables to suit different instruments and sensors used with AT40.

Power supply to Sensors

In most cases it is an advantage if you can avoid connecting the instrument to the main power. The instrument handling will be simpler and there will be less risk of interference.

For this reason it is advantageous to supply the sensors from the AT40 battery via the sockets in the 9-pole connector. To prevent discharging of the battery due to high current consumption, the instrument will only switch on when measurement shall take place.

Stabilized voltages from 1 to 8 V DC can be obtained individually for each channel. Maximum permitted load is 15 mA (momentary) per channel.

Some sensors have a high current consumption and also require a higher voltage. Also these, can be supplied from the 9-pole connector. Here the power is obtained from the battery eliminator and the sensors will depend on a continuous mains voltage. Typical sensors for this type of application are the 2-wire transmitters that give 4-20mA, e.g., pressure transmitters.

Information in the cable

Some important parameters that can be programmed are:

Signal type	Indicated if the signal is analogue or digital
Measuring range	Limits for the sensor operating range
Unit	Unit measured by the sensor
Scale factor and linearising	Linearising, max equation of the seventh degree
Calibration information	Each sensor can be calibrated individually
Serial number	Varje sladd har ett individuellt serienummer för full spårbarhet av mätningen.

Thermo-couples. When two or more thermo-couples are used, these may not be galvanically connected to each other, the thermo-wires must be insulated.

Readings and Settings

This chapter describes the principles for reading and setting of AT40.

Functions in AT40

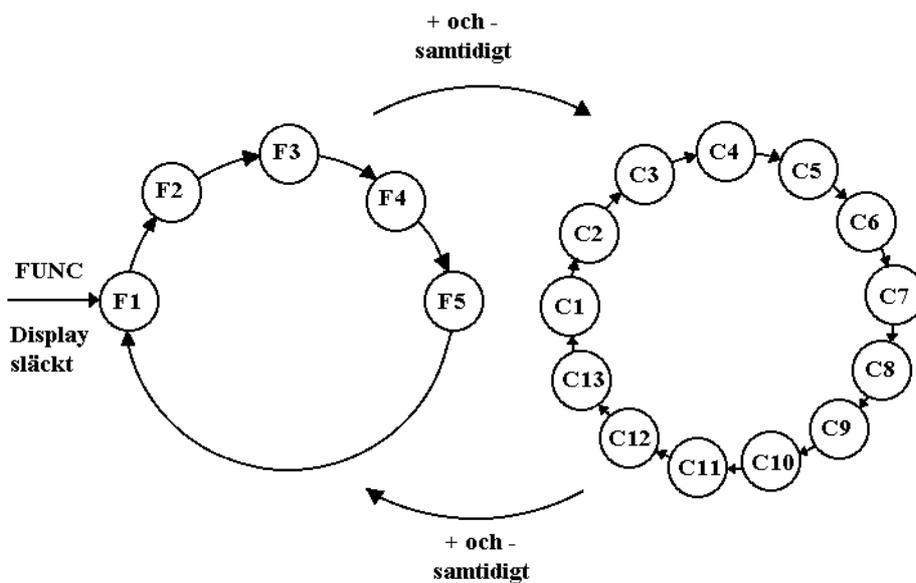
The handling of AT40 has been divided in the two main groups: Reading and Setting.

Reading is the most commonly used. Its functions have been designated with an "F".

Setting is used to determine how the instrument shall operate and its functions have been designated with a "C".

The FUNC-key is used most of the time to change between the different functions. To enter the "Setting" function you have to push keys + and - at the same time.

The figure below illustrates the functions and how they are connected.



Settings and Readings

See below for grouping of the functions in AT40.

Readings

Under "Readings" you find the functions used most of the time. When you illuminate the display by pushing the FUNC-key you will automatically enter the first reading function. The reading group is symbolized with an "F". This letter is always displayed in the upper left-hand corner of the display together with a digit, e.g., "F2".

Funktion	Namn	Användning
F1	CONTINOUS	Shows the instantaneous value for each sensor.
F2	PLOT LOGGER	Print-out of measured values on plotter.
F3	STATUS	Information about current measurement.
F4	STATISTICS	Calculates and shows min, max and average values.
F5	RECORD START/STOPP	Manual start or stop of registration.

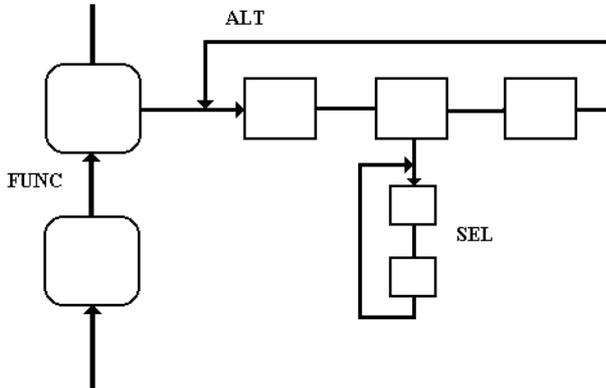
Settings

Under "Settings" you find the functions required to adjust the AT40 before measurement commences. Setting mode can be reached from reading mode when you push keys "+" and "-" at the same time. Settings are symbolized with a "C" shown in the upper left-hand corner of the display.

Funktion	Namn	Användning
C1	SYSTEM CONFIG	Reserved for future extension.
C2	CHANNELS	Connection and disconnection of sensor, etc.
C3	DATE/TIME	Setting of clock.
C4	START COND.	Setting of start cond.
C5	STOP COND.	Setting of stop cond.
C6	RECORD TIMING	Setting of registration interval and measuring frequency.
C7	RECORD TYPE	Setting of record type.
C8	AUTO REPORT	Reserved for future extension.
C9	PLOTTER	Setting of print-out format.
C10	COMPUTER	Setting of baud rate and type.
C11	REMOTE	Reserved for future extension.
C12	LANGUAGE	Setting of lanuage.
C13	RESET	Serial number and resetting.

Functions, Alternatives and Subalternatives

For each function (**FUNC**) there are a number of alternatives (**ALT**), and under each alternative there are a number of subalternatives (**SEL**). The AT40 has one key reserved for each level.



Function, FUNC

Choose function with the **FUNC**-key, the most used key. This key illuminates the display and permits you to go between different functions. The name of the function and its symbol is always shown on the top line in the display.



The symbol is shown on the left-hand side and the name is shown on the right-hand side in capital letters.

The function designations are F1-F5 and C1-C13. Their names are also printed on the front of the instrument.

First choose the desired function and then the alternative.



Display

Change of function

A new function is always chosen with the **FUNC**-key. At times it can be necessary to go back to a previous function. Do this by pushing the (-) key provided the display shows that you are in the main level of the function. (The name of the function is shown in capital letters on the upper line.)

Go to setting

The simplest way to go to setting is from the main level in function F1, push the + and - keys at the same time. If you afterwards want to go back to reading, once again push the + and - keys at the same time.

You can go to setting from other functions than F1 and will then enter the setting that is closest related to the reading function you left.

Alternative, ALT

Each alternative has different main alternatives that can be chosen. Use the ALT-key to select the desired alternative.

Every time the ALT-key is pushed the display text is replaced and a new alternative is shown.

End the selection with the FUNC-key unless you want to select a subalternative.



C4	start if
Ch1 >	11,1 °C

Alternative 1

C4	time start
97-10-08	10.30

Alternative 2

Subalternative, SEL

For each alternative there are one or more subalternatives. Select the desired one with the SEL-key. The chosen alternative will be shown by the position of the cursor. The cursor is shown in the display as a line underneath the text.

Continue and make the setting with the + and - keys, or end the selection by pushing the FUNC-key once.



C4	time start
97-10-08	<u>10.30</u>

Subalternative

Alternatives

Always select alternatives with the ALT-key. Some times there is only the one alternative and this will be indicated by a beep and a message in the display when you push the ALT-key.

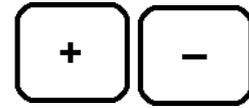
If you push the SEL-key by mistake, the error will be indicated in the same manner.

Setting with + and -

The cursor points to the parameters that shall be altered. It can, e.g., be a channel or a trig level. Each time the + or - key is pushed, the value increases (decreases) one step.

As long as the key is kept in the pushed down position the increase (decrease) will be automatic.

When the correct value is set you can continue to next subalternative with the SEL-key, or end with the FUNC-key.



C4	time start
97-10-08	<u>10.30</u>

Cursor

Handling

Instantaneous value

The instantaneous value can be read under function F1. The instantaneous value is the input signal from the sensor at the time of the reading.

This function is most useful when a sensor installation needs to be checked or when you want to use the AT40 as a handheld (8-channel!) instrument.

Tun on display

- Push the FUNC-key.

The display illuminates and shows F1, INSTANTANEOUS VALUE.

- Push the ALT-key.

The display shows information from the probe.



Display

The upper line shows channel number and type of input signal. The second line shows the instantaneous value and unit.

F1	Ch1	Temp
63,7 °C		

Display with Instantaneous Value

Change of Channel

The cursor indicates the channel no.

- Push the + or - key.

Next channel number with its information appears.



Signal type. The upper line shows the type of input signal from the probe. The signal type is determined at the programming of the probe before delivery and can be selected as desired. **Note!** *The type shown is what the probe measures (e.g., pressure), not the given output signal (e.g., Volt). The output signal from the probe is in this case of no significance.*

Units. The second line after the value shows the topical unit, i.e., type selected, e.g., mBar. The unit is also determined at the programming of the probe in accordance with above description.

A prefix is some times shown before the unit, e.g., "m" (milli = 1/1000). AT40 handles prefixes automatically and always shows the correct prefix and position of the decimal point. Prefixes for the probe are also determined at the programming of the probe/cable.

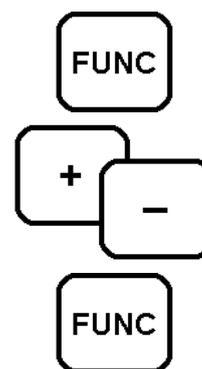
Note! Also read in chapter "Sensor 1" about the various cables and signals. In chapter "Sensor 4" you can read about time units.

Date & Time Date & Time

The clock is one of the most important parts of the data logger. The quartz crystal clock in AT40 shows year, month, day, hour and minute. The resolution for internal time handling is 1 second, but seconds are not shown. Read and set the clock under function C3.

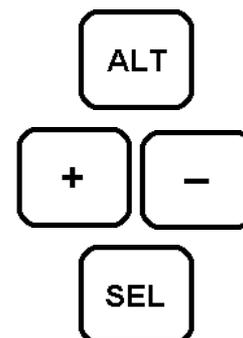
Go to function C3

- Push the FUNC-key.
The display illuminates and shows F1.
- Push keys + and - at the same time.
The display shows function C1.
- Push the FUNC-key twice.
Function C3 with time and date shows up on the display.



Set the time

- Push the ALT-key.
The cursor illuminates under year.
- Set the year by pushing the + and - keys.
The display goes one step forward (backward) each time the key is pushed.
- Change to month using the SEL-key.
The cursor moves to month.
- Set the month and repeat the procedure with day, hour and minute.



End the setting by pushing the FUNC-key. The display will now show the set date and time.

The Clock

The clock is controlled by a quartz crystal and its accuracy is comparable to that of a wristwatch, i.e., the error is approx. one minute per month.

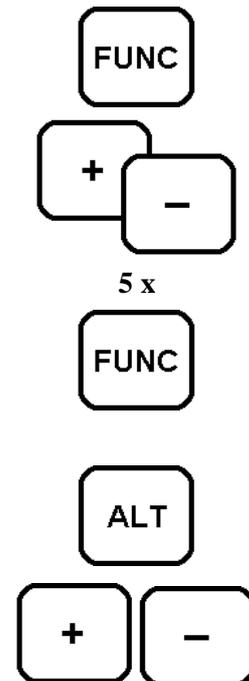
When the time is set, the seconds are set to 00 when setting is completed with the FUNC-key.

Registration interval

The registration interval (recording interval) is the time between two recordings of measured values in the logger memory. This time can be set under function C6, RECORD TIMING.

Go to function C6

- Push the FUNC-key.
Display illuminates and shows F1.
- Push the + and - keys at the same time.
The display shows function C1.
- Push the FUNC-key five times.
Function C6 with selected interval is shown..



Set the Interval

- Push the ALT-key.
The cursor is shown underneath the selected interval.
- Set the desired interval with the + and - keys.
The display goes one step forward (backward) each time the key is pushed.

End the setting by pushing the FUNC-key. The chosen interval is shown.

Note! Under function C6 you can also set the number of measurements that shall be performed during registration. For further information, see chapter "Selection of Sample Rate".

See also chapter "**Registration of min, max, average**". Normally only the average value is recorded at registration. The following pages describe the principles for registration and memory handling.

What is a Registration Interval?

The principle for a data logger (collector of measured values) is that it makes automatic measurements and records these in its memory for reading at a later time.

A basic function is the registration interval, i.e., the time between two memory recordings. (Compare with the speed of the paper for a line printer.)

How is a Registration carried out?

The registered value is the average value of a large number of measurements. The number of measurements carried out follow the registration interval according to the table below. This can also be set so that measurements are taken every second. See chapter "Selection of Sample Rate" for further details.

If so is desired, it is also possible to store not only the average value but also the smallest (min) and the largest (max) value measured during the interval. See chapter "Registration of min, max, average" for further details.

Measurements can be performed simultaneously on all channels with a probe connected. Only the values from the selected probes will be recorded in the memory. (See "Temporary Disconnection of Probe" in chapter "Sensors".

How are Data Recorded in the Memory?

By standard the AT40 can accept up to 55,000 measured values, but its memory can be extended to accept up to 240,000 values.

Available memory is split on the selected channels. If, e.g., 4 channels are used, the memory can accept up to 14,000 registrations before it is filled.

Note! If you have chosen to record also the min and max values, the memory space required will be three times larger.

When the memory is full, the oldest value can be thrown out and replaced by a new (standard condition) or, the measurement can be stopped. How this is done is decided under function C5, STOP COND. See also chapter "Automatic Stop of Measurement".

Measuring Frequency

The measuring frequency indicates how often a measurement shall be done. The registration (recording of data in the memory) is the *average value* of a number of measurements. In the table below we have recalculated the measuring frequency to a measuring time, i.e., the time lapse between two measurements.

Interval	Measuring time	Interval	Measuring time	Interval	Measuring time
MAN	---	1min	12s	1h	3min
1s	1s	2min	24s	2h	3min
2s	1s	5min	60s	4h	3min
5s	1s	10min	3min	6h	3min
10s	1s	15min	3min	8h	3min
15s	3s	30min	3min	12h	3min
30s	6s	--	--	24h	3min

The above table is valid for a measuring frequency in position **Normal**. An alternative is to select a measurement that is performed every second (**High**). See chapter "**Selection of Sample Rate**" for further details.

When the memory is full

Influencing factors are (apart from memory capacity), number of selected channels, registration interval, and type of recording. A multiple of combinations is available, see tables below.

Note! Available memory is not exactly 55,000 values. The space available varies somewhat depending on the selected combination of measuring channels.

Function F3, STATUS enables you to see how much memory is used during the measurement. See chapter "Checking of Activity" for further information.

AVERAGE VALUE, memory capacity 55,000

	1 channel	4 channels	8 channels
1 s	16 h	4 h	2 h
15 s	10 days	62 h	31 h
1 min	41 days	10 days	5 days
15 min	1 year 8 months	156 days	78 days
1 hour	6 years 9 months	1 year 8 months	312 days

AVERAGE, MIN and MAX, memory capacity 55,000

	1 channel	4 channel	8 channel
1 s	5 h	83 min	42 min
15 s	83 h	20 h	10 h
1 min	13 days	83 h	41 h
15 min	208 days	52 days	26 days
1 hour	2 year 2 months	208 days	104 days

What Measuring Interval shall be chosen?

Mainly, there are two factors that determine the interval that shall be chosen.

The process time constant, i.e., how fast the input signal varies, is the most important. For a representative picture of the signal variations you need at least two recordings per period.

The period time is defined as the time between, e.g., two max-value measurements (or min-value measurements) in a varying signal.

Available memory is also of great importance. For each measurement you must consider the time required to fill the memory.

What Intervals are Available?

The interval can be set in a number of stages between 1 sec. and 24 hours, see the table below.

Manuell	1 min	1 h
1s	2 min	2 h
2s	5 min	4 h
5s	10 min	6 h
10s	15 min	8 h
15s	30 min	12 h
30s	--	24h

Manual start and stop

The collection of data can start as soon as the settings according to the preceding chapters are completed. This can be done both automatically and manually. Description below refers to the manual Start/Stop performed under function F5, RECORD START / STOP.

Go to F5

- Push the FUNC-key
Display illuminates and shows F1.
- Push the FUNC-key four times.
Function F5, RECORD START is shown.

If logging is in progress RECORD STOP is shown instead.

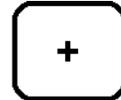


5 x



Start

- Push the ALT-key.
"LOG STOP" and "+ for start" is shown.
- Push + to start.
Text "Confirm" is shown.
- Confirm by pushing + to start.
Display reverts to function level and shows that measurement is in progress.



Note! The measurement cannot start if no sensor is connected.

Stop

If measurement already is in progress the display shows "RECORD STOP". The procedure is the same as for start. Follow the directions given in the display.

Start and stop can also be performed automatically at a specific time or following a specific action. See chapters "**Automatic Start of Measurement**" and "**Automatic Stop of Measurement**" for further information.

Note! When measurement starts, all previously collected information will be erased. This is the only time the memory is emptied, apart from at zero setting and power failure. Under function F5 the display will show some information about the progress in measurement.

STOP No registration. The memory contains information collected during the latest measuring period. (Or is empty if no measurement has been performed since zero setting.)

BEGIN This means that you have selected a start based on external conditions. Start measure has been ordered but the start condition has not been met.

RUNNING Means that the start condition has been reached and that measurement is in progress. This is the normal condition for logging.

FINISH This means that you have selected a stop based on an external condition and this condition has been met. However, an "after measurement" is still in progress. See chapter "**Automatic Stop of Measurement**" for further information.

Checking of activity

How does the Instrument Operate?

Function F3, STATUS provides fast information about what is happening and how the instrument operates.

Go to F3

- Push the FUNC-key.
Display illuminates and shows F1.
- Push twice on the FUNC-key.
Function F3, STATUS is shown.



2 x



Logger

- Push the ALT-key.
"Logger mode" is shown on the first line.



The second line shows how the logger operates. If logging is running, and the selected registration interval. It also shows the actual measuring interval that can be "High" or "Norm" (fast or normal).

Memory

A second push on the ALT-key shows available memory in the form of number of registrations. It also shows how many registrations have been performed since the start. (Note 1.)

Input Selection

A third push on the ALT-key shows the connected probes and if these are activated. The example below shows that probes on channel 1 and 2 are activated.

F3	Ch:	12345678
Status		++

End function F3 by pushing the FUNC-key.

Note 1. If the figures for number of registrations and available memory are the same, this means that the memory is full. Logging can still be in progress depending on selected stop condition (C5).

Print-out

AT40 can print out the collected information as graphics on a colour plotter. For an instrument of this type it is a unique feature.

The result of the measurement can be obtained as a diagram in four colours, on a standard A4 paper by, e.g., connection of the portable plotter FP100.

The printout can be formatted in various manners. Scaling can, e.g., be performed individually on the eight Y-axes as well as on the time axis.

Go to F2

- Push the FUNC-key.
Display illuminates and shows F1.
- Push the FUNC-key again.
Function F2, PLOT LOGGER is shown.
- Push the ALT-key.
"Plot logger" is shown on the first line.
The second line shows "+ for start".

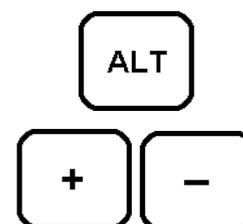


You can now choose printout to **start**, if you want **automatic** scaling of the axis or if you want **manual** scaling. If manual scaling is selected, the number of functions that you can choose with the **ALT**-key will be increased. See the following page.

Select Manual or Automatic format

- Push the ALT-key until "Axis mode" is shown on the first line.
- Use the + and - keys to select between "Manual" and "Automatic".

When automatic scaling of the axis is chosen the diagram will automatically adjust to the collected information, both in the Y-direction and in the time direction. Manual selection means that all settings will be performed individually. See next page for further information.



Start print-out

- Start print-out by pushing the + key.
Stop print-out in progress by pushing the - key.



Note! A prerequisite for printout is that logged measured values exist. If no measured values are available, an error message, "Access denied" or "Logged data missing" will be shown.

Manual Scaling of the Axis

When manual scaling is selected it is possible to make the settings individually, both for the Y-axis and the time axis.

In this case the number of functions that can be selected with the **ALT**-key will be increased.

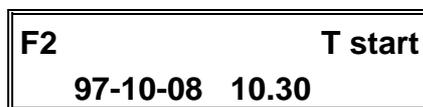
Not only start and scaling of the axis will be made available, but also the alternatives T-start, T-factor, Y-start and Y-range.

- Push the ALT-key until the desired alternative is shown.



Time Axis, T-start

The scaling can be affected by two selections. **T-start** is the time when the diagram shall begin.



Display

The above display is shown at T-start. Use the + and - keys to set the start time. The cursor shows the position that can be set. Change position with the SEL-key.

End with the ALT-key.



Time Axis, T-factor

The T-factor is the time resolution per scale division.



Display



The above display is shown at T-factor. Use the + and - keys to set the resolution. Setting can be done in the interval 10 s/div (10 seconds) to 20 w/div (20 weeks).

End with the ALT-key.



There are 10 scale divisions (abbreviated to "div") in the time direction on the plotted diagram. This means that the diagram includes a time period of 10 times the number of selected "div".

If, e.g., 10 s/div is selected, the plotted diagram will comprise a time of 100 s (10 x 10), starting at the time selected with "T-start".

Y-axis, Y-start

Also, this scaling can be affected by two selections. Y-start is the value where the axis shall begin.



Display

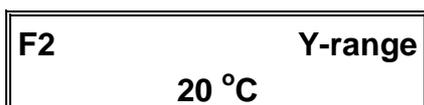
The above display is shown at Y-start. Use the + and - keys to set the start value. The cursor shows the position that can be set. Change positions between channel number and value with the SEL-key.

End with the ALT-key.



Y-axis, Y-range

The Y-range is the measuring range included in the plotting.



Display

The above display shows the Y-factor. Use the + and - keys to set the resolution. Intervals that can be used will automatically adjust to the sensor for the actual channel.

End with the ALT-key.



Y-start is the starting level for the diagram and Y-range is the measuring range calculated from Y-start.

Example: If Y-start is set to 10°C and the Y-range to 20°C the diagram will go from 10° to 30°C.

At the setting the alternatives will be shown in 1-2-5 steps, i.e., the scale will be doubled (approx.) for each step.

Note! Pull out the cable to the plotter when the printout is ready. Otherwise, it will cause an increase in the power consumption from the battery in AT40.

Note! Only the average value graph can be printed on the plotter. If the measurement has been performed with setting "min, max, average", set under C7, this information has to be transmitted to a PC for analysis.

Download to PC

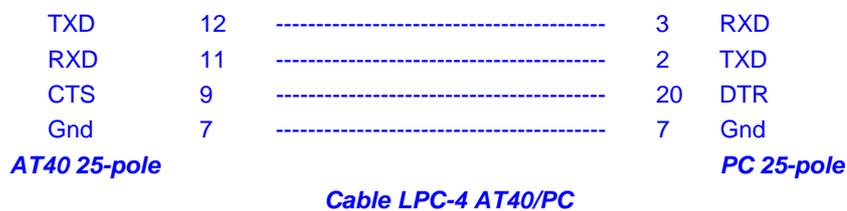
It is simple to transmit information from the AT40 to a computer for further treatment.

Transmission is done through serial communication via RS232. Normally it will require no adjustment to the AT40 and the transmission is started and controlled from a PC.

Connection of Computer

Connect AT40 to the computer with a cable equipped with a suitable connector.

As an accessory to the IBM PC's, and compatible computers, we stock LPC-4 which is meant for a PC with a 25-pole connector and LPC-5 which has a 9-pole connector.



At start-up of AT40 the serial gate setting is standard 9600 baud, 8 bits, 1 stop bit, no parity. The baud rate can be changed under function C10. See chapter "Adjustment to Computer" for further information.

Multiple instruments

AT40 has the unique feature of connecting more than one instrument at the same time to the PC communication port (*multidrop*).

The only things needed are connection cable LPC-10 between PC and first instrument and cable LPC-11 to second an up instruments.

A maximum of 16 instruments (128 channels) can be connected at the same communication port.

Program in Computer

In order to accept information from the AT40, the computer needs a program which can communicate with binary numbers.

The Mitec WinLog is a powerful analysis program for communication, database handling, calculation and presentation. WinLog requires a minimum of Windows 3.1, a 386-PC with a 4 Mbyte memory.

Mitec Monitor is an extended version of WinLog, including modem communication and more facilities compared to WinLog.

Mitec can supply simple programs for PC's (e.g., MCOM and MFORM) that can be used together with other programs for communication with AT40.

The AT40 memory capacity can be extended to accept approx. 240,000 values. In computer terms this means approx. 500 kbytes or 0.5 Mbytes.

A considerable amount of data shall be transmitted and it is quite important that the communication is fast. For this reason the data are transmitted as binary numbers where a measured value is 2 bytes (two digits). With transmission in ASCII-code and 9600 baud it would take 50 minutes to empty a logger! With the binary protocol it only takes 15 minutes.

Extended Functions

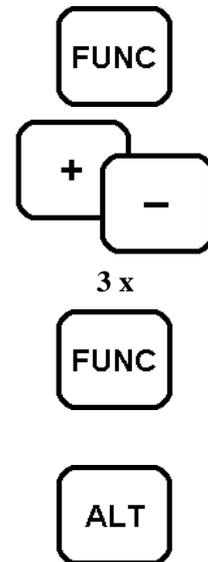
Start logging on external condition

The AT40 cannot only be started manually, but also on external conditions or at a specific time.

This is especially useful at testing or when troubleshooting.

Go to C4

- Push the FUNC-key.
Display illuminates and shows F1.
- Push the + and - key at the same time.
Display shows function C1.
- Push the FUNC-key three times.
Function C4, START COND, is displayed.



Selection of Start Conditions

- Push the ALT-key.
"Manual start" is shown on the first line.

There are three ways in which to start the measurement. Standard is manual start and this is shown as the first choice. The other two are time-start and start on external conditions.

Scroll through the alternatives with the ALT-key.

Read more on next page!

Start on **external conditions** is very useful for checking and troubleshooting. The measurement can, e.g., start when the temperature falls below a set value or when a flow is exceeded. AT40 will start to measure, and register the progress, when the condition has been met.

Start at a **specific time** is also useful for some of the troubleshooting cases, in the same manner as external conditions are. Time-start is also used for the synchronizing of several different measuring instruments, to obtain simultaneously measured data.

Measurement is continuous after start until possible stop conditions have been met or the measurement is stopped manually.

Note! When start has been ordered, but before the condition is met, the text **Begin** will be shown for a time under function F5. This means that measurement has started and that values are being recorded. When the start condition has been met, the display will read **Running**.
Registration will continue until automatic or manual stop is requested.

Manual start

Push the ALT-key until "Manual" is shown in the display.



Display

End the setting with the FUNC-key.

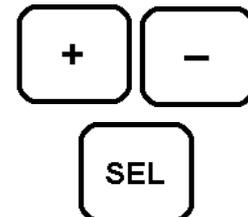
Start on a specific time

Push the ALT-key until "Time start" is shown in the upper line. The second line shows date and time.



Display

- Set year with the + and - keys.
Display steps one step forward (backward) for each push.
- Change to month with the SEL-key.
The cursor moves to month.
- Set the month and then repeat the procedure for day, hour and minute.
- End the setting with the FUNC-key and activate start.



Note! See "To activate start" further ahead in this chapter.

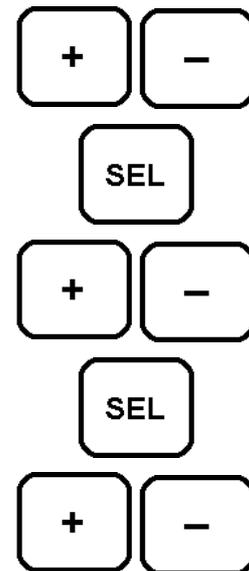
Start on External Conditions

Push the ALT-key until "Start if" is shown in the upper line. The second line will show the start condition. The measurement can start if the value is lower than, or exceeds the set value on any channel.

C4	start if
Ch1>	63,0 °C

Display

- Set the desired channel with the + and - keys.
Display steps forward (backwards) for each push.
- Change to symbol > with the SEL-key.
The cursor moves to the > symbol.
- Set > if measurement shall start when the set limit value is exceeded. Set < if measurement shall start when the measured value falls below the set limit value. Use the + and - keys for the setting.
- Move the cursor to the limit value with the SEL-key.
- Set the desired limit value with the + or - keys.
- End the setting with the FUNC-key and activate start.



Note! See "To activate start" further ahead in this chapter.

To end the setting

When the conditions have been selected and the setting is completed you end by pushing the FUNC-key. The display will show, not only the headline but also, on the second line, the chosen condition.

To activate Start

After automatic start (time or external condition) has been chosen according to above, you must activate the condition. Do this by starting the measurement under function F5.

See chapter "Manual Start and Stop" for further information.

Note! When automatic start has been activated the text "**Begin**" will be shown in the display under F5 until the start condition is met and registration has started. Then the text changes to "**Running**".

Manual start is performed under function F5. First set "**Manual Start**" under the above described function C4.

Stop logging on external condition

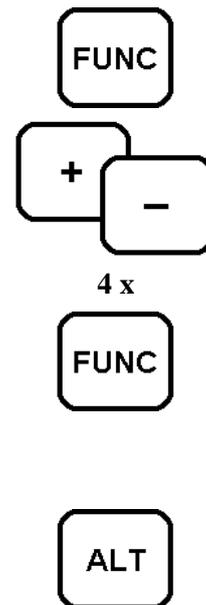
Automatic Stop of Measurement

In the same manner as for automatic start the measurement with AT40 can be stopped on external condition or at a specific time.

Measurement can also be stopped when the memory is full.

Go to C5

- Push the FUNC-key.
Display illuminates and shows F1.
- Push the + and - keys at the same time.
Display shows function C1.
- Push the FUNC-key four times.
Function C5, STOP COND. is displayed.



Selection of Stop Condition

- Push the ALT-key.
"No" stop is shown on the first line.
There are three more conditions, apart from "No stop" to choose between. The standard is **No stop** and this is shown as the first choice. The three alternatives are, **Stop when memory full**, **time stop** and **stop, external cond.**
- Scroll between the alternatives with the ALT-key.

Read more on next page!

A manual stop can be done under function F5.

Stop on **external condition** is very useful for checking and troubleshooting. A stop can, e.g., be set to occur when the temperature falls below a set value or when a flow is exceeded. With this alternative the measurement continues until the condition is met. In this way a process that led to a certain condition can be recorded.

Stop at a **specific time** is also useful in certain troubleshooting sequences in the same manner as external condition is.

Stop when memory full

- Push the ALT-key until the text "Stop when memory full" is shown in the display.
- End the setting with the FUNC-key.



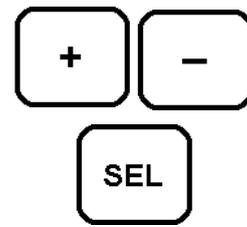
Stop at a Specific Time

- Push the ALT-key until "Time stop" is shown on the first line. The second line shows date and time.



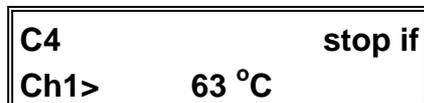
Display

- Set year with the + and - keys.
Display steps one step forward (backward) for each push.
- Change to month with the SEL-key.
The cursor moves to month.
- Set the month and repeat the procedure for day, hour and minute.
- End the setting with the FUNC-key.



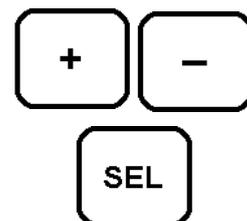
Stop on External Condition

- Push the ALT-key until text "Stop if" shows in the first line. The second line will show the stop condition. Stop will occur if the measured value, on any channel, falls below or exceeds a set value.

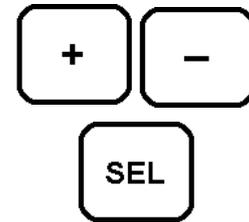


Display

- Set the channel with the + and - keys.
Display steps one step forward (backward) for each push.
- Change to symbol > with the SEL-key.
The cursor moves to the > symbol.



- Set > if measurement shall stop when the set limit value is exceeded. Set < if measurement shall stop when the measured value falls below the set limit value. Use the + and - keys for the setting.
- Move the cursor to the limit value with the SEL-key.
- Set the desired limit value with the + and - keys.
- End the setting with the FUNC-key.



To end the Setting

When the desired conditions have been selected and the setting is completed you end by pushing the FUNC-key. The display will show, not only the headline but also, on the second line, the chosen condition.

Manual logging

AT40 also has the possibility of storing data on manual command. In this case the registration interval has no function. Data is not stored on a regular time. Data is stored on a command from the user. Data can be stored from push button on the instrument or on external condition via a signal cable connected to any of the sensor inputs.

Select manual registration and start

- Select registration alternative "Man" under function C6.
- Select alternative "Manual Start" under function C4.
- Start logging as usual under F5.

Se chapter "Manual start"

Store data using push button

The HELP-button on the instrument front is also used for manual data storage.

- Push Help-button
A short beep confirms data storage.

Store data on external command

Data storage can also be performed using an special signal cable connected to any of the sensor inputs.

All other functions are the same as when using push button.



Check data storage

Under function C3 "Status" is showed the number of storage's performed.

Every time data is stored a new registration number is issued. If needed it is possible to repeat a storage (measurement). The registration number (storage number) to be changed is selected using the "+" and "-" buttons.

- Press "+" or "-" button to increase or decrease registration number.



Presentation of stored data

Manual and automatic logging stores data using exactly same method. Data can be transferred to PC and displayed as graphs on screen, printer or plotter. But please **NOTE!** Manually stored data should not be presented as a graph. The time interval between storage's is unknown and a misleading result can be obtained. Data in this case should be presented numerically in a table.

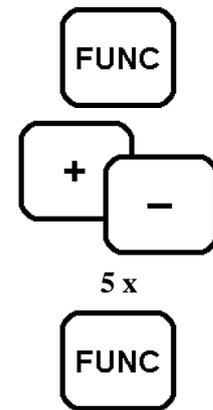
Selection of sample rate

Select Number of Measurements during a Registration

Select, under function C6, the number of measurements that shall be performed during registration. There are two alternatives, **Normal**, where the time between the measurements follows the registration interval, and **High**, where a measurement is performed once per second.

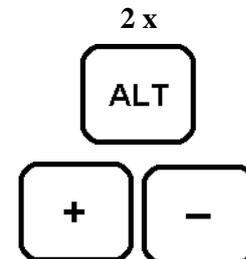
Go to C6

- Push the FUNC-key.
Display illuminates and shows F1.
- Push the + and - keys.
Display shows function C1.
- Push the FUNC-key five times.
Function C6, RECORD TIMING is shown.



Selection of Sample Rate

- Push the ALT-key twice.
- First line reads "Sample rate" and the second "High" or "Norm".
- Change between High and Norm with + and - keys.



To end the setting

When the conditions have been selected and the setting is completed you end by pushing the FUNC-key. The display will show, not only the headline but also, on the second line, the chosen condition.

The sample rate indicates the number of measurements. A registration (recording of data in the memory) consists of the *average value* from a number of measurements. The table below is valid for a sample rate in mode "Normal". In mode "High" a measurement is performed once per second. (In the table below the frequency has been recalculated to time between two measurements and is indicated as measuring time.)

Interval	Measuring time	Interval	Measuring time	Interval	Measuring time
MAN	---	1min	12s	1h	3min
1s	1s	2min	24s	2h	3min
2s	1s	5min	60s	4h	3min
5s	1s	10min	3min	6h	3min
10s	3s	15min	3min	8h	3min
15s	3s	30min	3min	12h	3min
30s	6s	--	--	24h	3min

We recommend use of battery eliminator when measuring time "High" is selected.

Registration of min, max, average

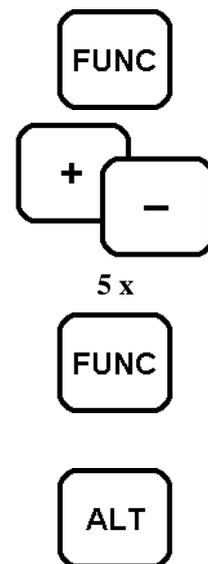
Record the min and max values when Measuring

Select, under function C7, in which way data shall be recorded. Usually only the average value from a number of measurements is recorded, (see chapter "Selection of Sample Rate" for further information).

With the AT40 you can also choose to record the largest (max) and smallest (min) value of the measurements performed during registration.

Go to C7

- Push the FUNC-key.
Display illuminates and shows F1.
- Push the + and - key at the same time.
Display shows function C1.
- Push the FUNC-key five times.
Function C7, RECORD TYPE is shown.



Selection of Record Type

- Push the ALT-key once or twice.
"Average" or "Average, min, max" reads on the second line.

Average means that only the average values during registration will be recorded. Average, min, max means that the average, min and max values during registration will be recorded.

To end the Setting

When the conditions have been selected and the setting is completed you end by pushing the FUNC-key. The display will show, not only the headline but also, on the second line, the chosen condition.

Record Type

Read chapters "Selection of Registration Interval" and "Selection of Sample Rate" to completely understand the meaning of the different recording types.

Every registration consist of several measurements. The variations in the measured values can be seen if you choose to record also the max and min values. It is possible to save on memory space by increasing the registration intervals and still get a good picture of the input signal variations.

However, note that the min and max values take up more memory capacity since three positions are used for each registration. See chapter "Selection of Registration Interval 3" where you find a table showing different examples.

Do not confuse the above with the statistics of collected measured values that can be presented under function F4, STATISTICS. The information under F4 is based on all collected measured values and the calculation uses the recorded average value for each registration.

Automatic print-out of report

Automatic print-out of the report is not available with this version of the program (v1.700).

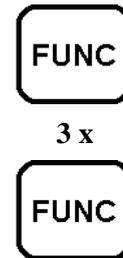
Statistics

Statistics over Collected Measured Values

Statistics for the collected measured values in the data logger are available under function F4. The average measured value and also the largest (max) and smallest (min) in the memory for each channel are available.

Go to F4

- Push the FUNC-key.
Display illuminates and shows F1.
- Push the FUNC-key three times.
Function F4, STATISTICS is shown.



Selection of Presentation

- Push the ALT-key.
Display according to the one below is shown.



Display

The upper line shows the measuring channel and the type of presentation selected (min, average or max). The second line shows the topical value calculated with its unit.

- Push the ALT-key again to change to average value.
Display shows Average and its corresponding value.
- Push the ALT-key again to show Max value.



Change of Channel

- Set the channel using the + and - keys.
Display steps one step forward (backward) for each push.



To end the setting

- End the setting by pushing the FUNC-key.

Statistics

The values shown under statistics are calculated from the collected data in the memory. The calculation is individual for each channel and is performed each time a presentation is requested.

The calculation uses the recorded average value for each registration in the memory.

Note! Do not confuse the statistics function with the registration of min, max and average value that can be set as a recording type. See chapter "Registration of min, max, average" for further information.

Plotter selection

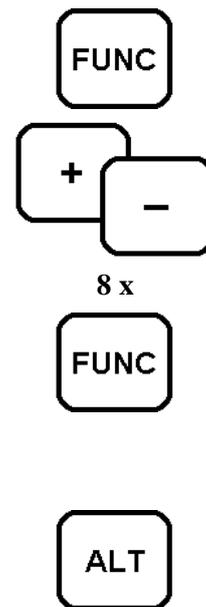
Data collected with AT40 can be printed out directly as graphics (curves) on printer, in colour or black.

AT40 is adapted for use with printers made by Hewlett Packard (HP).

Also other brands simulating HP can be used. The printout can be colour or black depending on selected printer. The printer is connected directly to AT40 using the Mitec PS100 cable.

Go to C9

- Press FUNC.
Display shows F1.
- Press + and - simultaneously.
Display shows C1.
- Press FUNC eight times.
Function C9 PLOTTER is shown.



Select printer type

- Press ALT en two or three times.
Selected printer is shown on second row
- **PCL, 3 colours** should be selected when Desk Jets with colour cartridge is used
- **PCL, B/W** should be selected when Laserjets and Desk Jets with B/W cartridge is used
- **Casio FP100** is selected when Casio FP100 4-colour pen plotter is used

AT40 with program versions earlier then 1,5 has only Casio Plotter. These instruments can be upgraded for use with HP-printers.

Finish setup

Finish setup and exit function by pressing FUNC key.

Selected settings is confirmed on second row.

PRINTERS

AT40 uses the graphic language HPPCL3 when communicating with printers. This language is created by Hewlett Packard and has become an industry standard.

All HP LaserJets and Desk Jets understand this language and can be used with AT40. For portable printing we recommend the HP Desk Jet Portable 320 and 340.

PC connection

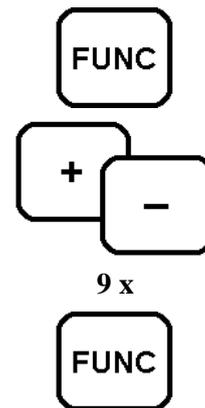
Collected information can be transmitted to a computer via serial communication (RS232 or V24).

The computer can be connected with the Mitec cables LPC-4 (25-pole PC-connection) or LPC-5 (9-pole PC-connection).

No special adjustments are required. However, if required, the baud rate can be set to between 150 baud and 38,400 baud. Initial value after a zero setting is 9600 baud.

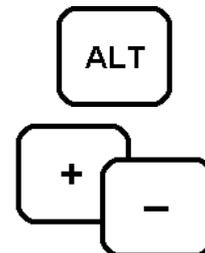
Go to C10

- Push the FUNC-key.
Display illuminates and shows F1.
- Push the + and - keys at the same time.
Display shows function C1.
- Push the FUNC-key nine times.
Function C10, COMPUTER is shown.



Selection of Communication Type

- Push the ALT-key.
Text "select type" is shown on the first line.
- Push the + and - keys and select "serial port".
- Then push the ALT-key to select baud rate.

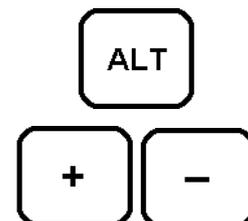


Selection of Baud Rate

First select Communication Type (see above).

Text "select baud rate" is shown

- Set the baud rate with the + and - keys. Different alternatives are shown for each key push.



To end the setting

End the setting by pushing the FUNC-key.

Also see chapter "Transmission of Measured Result to Computer"

Baud Rate

The transmission speed is in baud and this can be translated as bits/sec. One character consists of 10 bits. With a baud rate of 9600 the transmission speed will be 960 characters per second. A measured value in AT40 consists of two characters and with a baud rate of 9600 this means that 480 measured values can be transmitted per second. However, the mean speed will be less than this, since the transmission will be temporarily stopped every time the computer sends a verifying character to AT40. After a zero setting of the instrument the baud rate will be 9600.

Modem on AT40

AT40 can be used with different types of modem (telephone, radio etc.) A standard Hayes modem is used. These modems requires repeated initialisation from the logger using a "init-string".

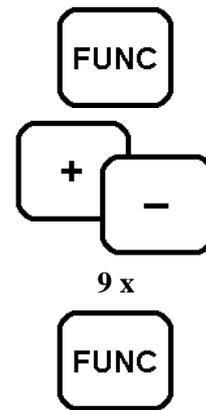
The init-strings are individual for each modem brand. AT40 has built in initialisations for some common modems and these has to be selected on the AT40.

Select modem type

Setting is performed under function C10 "COMPUTER".

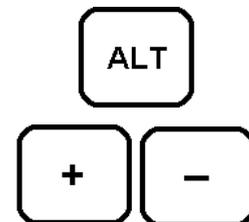
Go till C10

- Press FUNC.
Display shows function F1.
- Press + and - simultaneously.
Display shows function C1.
- Press FUNC 9 times.
C10 COMPUTER is shown.



Select communication method

- Press ALT.
The text "set type" is shown.
- Select modem type using "+" and "-" buttons. "Modem1", "Modem2", "Modem3", "SRT2.4" , "SRT2.4EN" and "GSM" are the modem alternatives.
- Press ALT to select speed (baudrate).

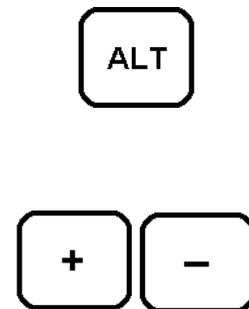


Set communication speed

First select communication method (above).

Text "set baudrate" is shown.

- Select baudrate type using "+" and "-" buttons



Finish setup

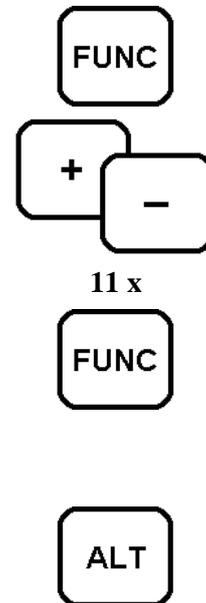
Finish setup and exit by pressing the FUNC button. The selected parameters are shown in display on second row.

Selection of language

Information from AT40 can be shown in up to six languages. C12 is used for the changing between languages.

Go to C12

- Push the FUNC-key.
Display illuminates and shows F1.
- Push the + and - keys at the same time.
Display shows function C1.
- Push the FUNC-key eleven times.
Function C12, LANGUAGE is shown.



Selection of Language

- Push the ALT-key.
Text "Select language" is shown.
- Push the ALT-key until the desired language shows up.

To end the Setting

End the setting by pushing the FUNC-key. The display will show the selected language.

Instead of pushing the FUNC-key eleven times from C1 you can go backwards by pushing the - key.

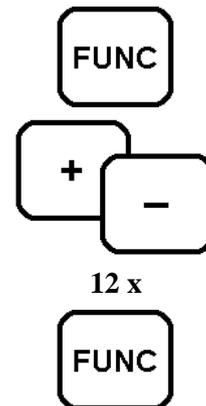
Serial and revision number

Under function C13 you will find additional information about the instrument, e.g., serial number and program revision number.

Here you can also zero set parameters and collected information.

Go to C13

- Push the FUNC-key.
Display illuminates and shows F1.
- Push the + and - keys at the same time.
Display shows function C1.
- Push the FUNC-key twelve times.
Function C13, RESET is shown.



Selection of Alternative

- Push the ALT-key.
Text "reset" is shown. Here you can Logg-zero the instrument.

Warning! Recorded information will be erased.

- Push the ALT-key again.
Text "Instrument ID" will be shown.
The second line will show the instrument serial number and program revision number.



To end the setting

End the setting by pushing the FUNC-key.

See next page for additional functions under C13.

Instead of pushing twelve times on the **FUNC**-key from C1, you can go backwards by pushing the - key.

Zero setting performed under this function is a so called Logg-zero setting. Other types of resetting can be made with the zero button on the right-hand side of the box. See also chapter "**Start-up**" for further information.

Note! Logg-zero setting means that collected data will be lost.

Quick guide for those who knows

This page describes what normally needs to be set before a measurement.

Battery and Zero Setting

- Connect the 9 V battery and push in the reset button on the side of the instrument.
- Set the time under C3.

See also chapters "Start-up", "Battery and Eliminator" and "Setting of Clock".

Selection of Sensor

- Connect 1 to 8 sensors to optional channels.
- Select, under C2, the sensor(s) (if any) you do not want to be included in the logging.
- Check under F1 that the sensors show the correct input signals.

See also chapter "Sensor".

Set Registration Interval

- Select the registration interval under C6.
- Select recording type under C7.

See also chapters "Selection of Registration Interval" and "Registration of min, max, average".

Start the Measurement

- Set start and stop conditions under C4 and C5.
- Manual start is done under F5.
- Check measurement in progress under F3.

See also chapters "Manual Start and Stop", "Automatic Start of Measurement" and "Automatic Stop of Measurement". Also see "Checking of Activity".

Print-out after Measurement

- Collected information, can be transmitted to plotter or computer under F2.

See also chapters "Print-out on Plotter" and "Transmission to Computer".

Technical specification

GENERAL

No. of measuring channels	8
Size of memory	128 kbytes or 512 kbytes.
Number of measured values	55 000 or 240 000.
Registration interval	1, 2, 5, 10, 15, 30 sec, 1, 2, 5, 10, 15, 30 min, 1, 2, 4, 6, 8, 12, 24 tim or manual.
Display	32 charcters, LCD, alphanumeric.
Language	Adjustable. Swedish, English and German are standard.
Supply	9V battery 6LR61 and external supply 9-15V DC.
Battery life	2 days to 4 months. (Depending on registration interval. 1 min interval equals approx. 2 months lifetime.)
Supply, sensor	Switched, battery supplied 1-8V DC.
Supply, transmitter	Via eliminator 9-15V DC.
Ambient temperature	-20 till +50 °C. No condensate.

INPUTS

Types	DC voltage, AC voltage, DC current, AC current, resistance (e.g., Pt-100, thermistor), thermocouple, bridges, pulse, operations time.
Input selection	Automatic detection.
Resolution	12 bits excluding characters.
Linearising	Automatically detected, max 7 terms.

DC-voltage input

Signal type	Fixed or automatic polarity selection.
Range	Optional 5 mV to 50 V.
Signal deviation	0.10% of full scale deflection.

AC-voltage input

Type	RMS indicating.
Range	Optional 100 mV to 50 V.
Signal deviation	0.20% ± 2mV of full scale deflection.

Resistance

Type	Resistance transmitters, thermistors, potentiometers.
Thermistor	Optional type, standard is Mitec MU-TE100, resolution 0.1°C.
Resistance transmitter	Optional type, standard is Pt-100, Ni-1000, 2-wire or 4-wire.

Thermocouples

Type	Optional, standard is J, K, T.
Cold junction compensation	Automatic. Accuracy 0,4 °C.

Pulse input

Maximum frequency	16 Hz, minimum pulse width 35 ms.
Type	Potentialfree contact, 4 - 24 V DC.

FUNCTIONS

Probes	Automatic selection, display shows type, unit, measuring range.
Start and stop conditions	Adjustable trig-level on optional input, time start, manual start and stop.
Recording type	Adjustable. Average value or average, min and max for each registration.
Reading	Instantaneous value, statistics, status information.
Reports	Automatic plotting at set time.

COMMUNICATION

Plotter	LaserJet, DeskJet and Casio FP100 via Centronics. (HPPCL 3)
Computer	RS232. Control command from computer.
Modem	External, hayes-compatible.

MECHANICAL SPEC.

Box	Moulded ABS-compound, size 185 * 100 * 34 mm.
Connectors	25-pole DSUB male, 9-pole mini-DIN, 3.5 mm telephone jack for eliminator
Keys	6, hermetically sealed membrane keys
Front	Polycarbonate, non-destructible text.

Connectors

25-pole connector

The 25-pole connector of type "D-sub" is used for communication with external units. It includes Centronics- interface, RS232-interface and remote control connection.

We recommend that you contact Mitec before connecting any unknown external equipment to AT40.

PIN NR.	FUNKTION
1	Remote binary
2	Remote auto
3	Remote reserved XO
4	Centronics Data 7
5	Centronics Busy
6	RS232 Data Carrier Detect
7	RS232 Gnd
8	Centronics Strobe
9	RS232 Clear To Send
10	Centronics Acknowledge
11	RS232 Rx Data
12	RS232 Tx Data
13	+5V (Note! must not be loaded)
14	Remote A in
15	Remote B out
16	Remote reserved X2
17	Remote reserved X1
18	Centronics Data 6
19	RS232 Data Terminal Ready
20	Centronics Data 5
21	Centronics Data 4
22	Centronics Data 3
23	Centronics Data 2
24	Centronics Data 1
25	Centronics Data 0
Screen	Gnd

CE



Declaration of conformity

Manufacturer:	Mitec Instrument AB Västra Storgatan 18, P.O.Box 91, S-66122 Säffle Sweden
Equipment type number:	AT40 and AT31
Description of Equipment:	Portable Data Logger
European standards:	EN50081-1, EN50081-2, EN50082-1

We certify that the apparatus identified above conforms with the requirements of Council Directive 89/336/EEC as amended by Directives 91/263/EEC and 92/31/EEC.

Service and Support

Telephone support

Mitecs products are designed and manufactured by Mitec Instrument AB, Säffle, Sweden.

We provide complete service of the equipment in our factory. In case of problems, contact us on: **+46 533 16050**.

Telefax & e-mail

Our faxnumber is **+46 533 16045**.

Our e-mail address is **info@mitec.se**.

Home page

You can find our homepage at **<http://www.mitec.se>**.

Parcels

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S-661 30 Säffle

Sweden

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