s012 DAK

Software for data logger management,
its setting features and data dumping

User guide

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1 Table of contents

This document is DAK User Guide, a *Windows* application for a data acquisition station management by a **Siap+Micros** DA9000 data logger

The DA9000 data logger is able to acquire different type of measurements (measurement: analog, digital or over IP in serial mode: Store&Forward, SDI-12, MODBUS, 1-wire etc.) and to realize measurement storage and succeeding data transmission via the most varied media such as radio, Modem, GSM/GPRS, FTP, satellite, etc. As an integration of basic functions, data quality controllers and alarms management could be integrated. Last but not least, it's possible to manage in a complete automated way even some automation process such as waterworks pumping station and other applications.

DAK allows users to communicate with data logger through a variety of commands adapted for info transferring to and from the station (setting condition sending and receiving, recorded data dumping, etc.). It makes available some *editing* function for creating and/or modifying user program. All the operations could be carry out even in a remote mode every time the station is called and connected via modem.

2 Software Installation

Before proceeding with DAK installation, please check the PC has got this minimum System requirement:

- **Pentium** or later
- **RAM 16 Mb** or more of RAM
- **1 Gb Herd Drive** or more
- **CD ROM player**
- O.S. **Microsoft Windows** 95, 98, ME, Win NT, Windows 2000, XP,Vista,Windows 7

For software installation, as follow:

- Insert DAK CD ROM into the player;
- From Task Bar, click on *Start* | *Run...*
- Digit **D:\Setup.exe** in the text box or thumb the CD ROM (See Figure 1)
- Click **OK** button
- Follow the instruction shown during guided installation process untill the end.

Figure 1 – Start installation

3 Configuration management

Depending on the purposes for what it's been used, at the beginning each data logger must be set by a user program (called configuration) that allows the machine make a customized acquisition cycle, data elaboration and data recording.

Configuration stands in a file in the machine and it's been immediately executed as soon as the machine has turned on and at each new start.

Thus, user can create its own configuration, salve it on a file and send it to the station. It's even possible receive the configuration from the station, modify its contents and send it again.

Beyond configuration, data logger needs an initialization file where connection mode are written, such as identifier and the name of the station.

Both configuration file and initialization one have been saved in .XML format (eXtensible Markup Language). It derives that configuration becomes readable and comprehensible even using a usual editor program.

3.1 Configuration opening

In order to open an existing configuration file, select *Open* from the *File* menu. Using dialog box that will appear later, digit path and name of the file, or seek it in the shown folders. *Configuration File* must have an **.xml* extension to be recognized as such.

At the end a window will open (see Figure 2) where the configuration structure will be shown. In the following example, the cnf.xml file has been opened:

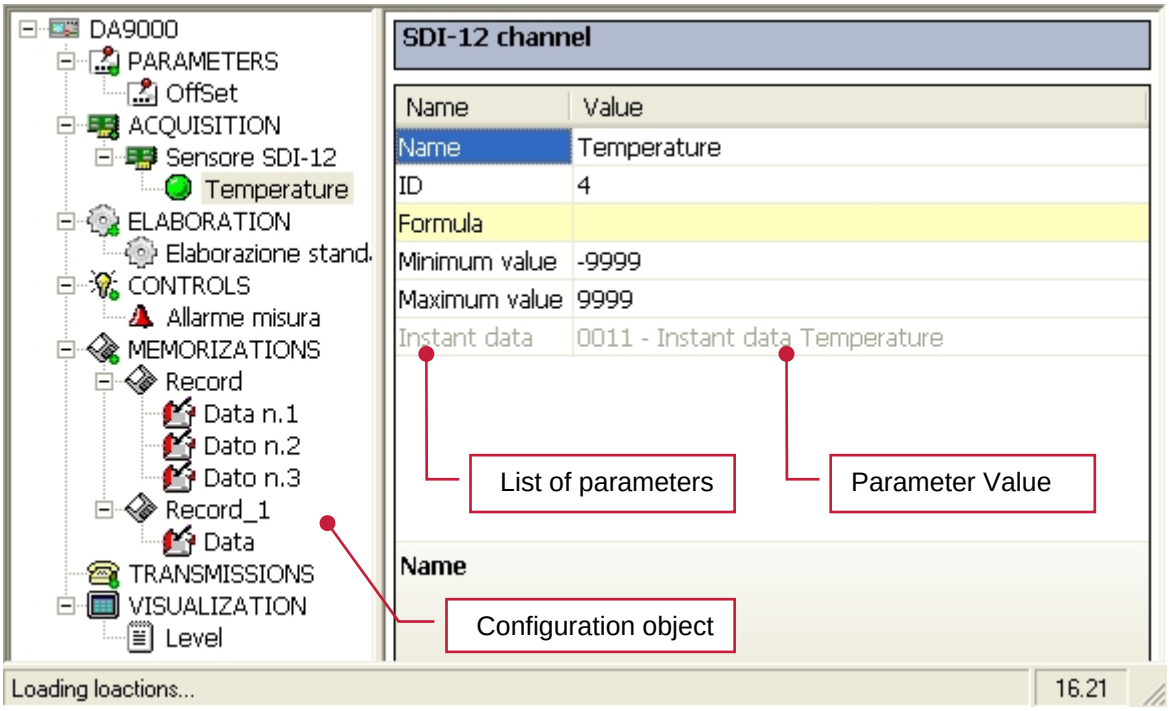


Figure 2 - Configuration window

Referring to Figure 2 you notice how the left side of the window shows a tree structure with objects that compose the configuration. On the right window side, instead, you can see parameters list related to the highlighted object and beyond the description of highlighted parameters.

The following charter deepens and explains on details the configuration structure and configuration representation dwelling on objects that compose it and on every kind of parameters to allocate.

3.2 Configuration structure and configuration objects

A configuration is made by a multi-level tree structure, and inside of it you can find many object as shown in the picture (Figure 3) :

Figure 3 - Tree Structure

Level Zero, that is the root of the whole configuration, includes 6 basic elements that build the data logger macro functions.

Inside each group, other homogeneous objects are placed (the *functions*) which - depending on group type - have different aim such as data acquisition, data elaboration, data recording.

A contextual menu allows to add or to remove specific elements for the single elements.

All the objects, above all the function ones, arrange a parameter list by which the user input the values needed by machine.

Following the function group useful for data logger:

Function group

Each group stands out for its particular type of allocated functionality and it contains a specific function list. In the moment you insert a function in the configuration the final user will have the chance to select from the chosen group a precise heading. If an elaboration function is needed you can choose among different type at your disposal (e.g.: standard elaboration for lower, average, maximum level or wind elaboration).

All the heading definitions, and the associated parameters, are present in an external catalogue file called '*Classes Library"*. This peculiarity allows to have a versatile and expanding configuration system.

Now we're going to see general use of different groups:

Parameters

In this group parameter's definitions are gathered, that is the variable ones set both by keyboard or touch screen in local and in remote by specific command of parameters changing.

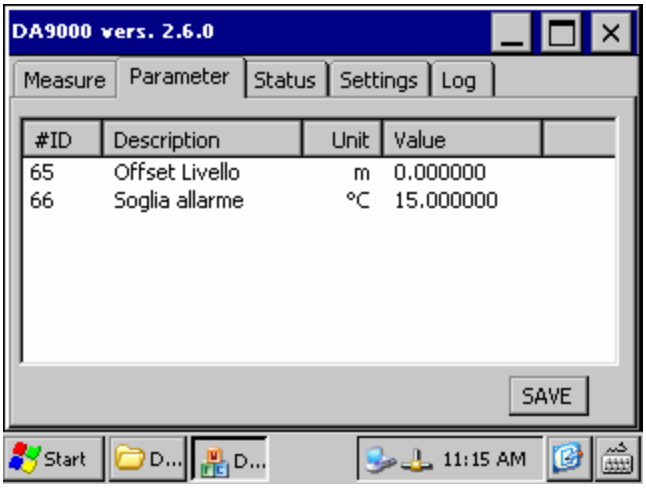


Figure 4 – Parameters Board on DA9000

Acquisitions

Usually the first function to insert in a measurement is the *Acquisition* function, that is that instruction which reads from a specific channel the instantaneous transducer's data and it make it available for user. In this function, parameters which need to be specified vary depending on the acquisition system chosen. As a rule it should insert channel address you need to acquire and the features of connected transducer or the *range* (field of measure) of provided electric signal. This function output is the istantaneous value of measurement and the state of measurement.

Each data are recorded, inside the data logger, in an already allocated memory location and it's make available in input to succeeding functions (e.g. elaboration functions).

Elaborations

Inserting an *Elaboration* function allows to deal data on demand, in order to get other elaborated data. The effect is to take a sample of some function input information and then to produce one or more results at the function output itself. Specified function parameters could be very different and variable depending on the chosen elaboration type. Usually the memory allocation of input required data are chosen among already set channels.

Controls

In this group you'll find all the controller functions as alarm check and output activation.

Memorizations

'Memorization' function is suitable for data recording both acquired and/or elaborated, by machine, on disk and eventually on SD card.

Files have a circular structure and their dimensions are specified in initializing file.

In each case, they are recorded in a *'Micros Record Dinamico'* (Micros Dynamic Record) format.

Each record can contain one ore more than one data, that could be whatever of the transducer output or elaborations functions.

Transmissions

In this section you'll find data and/or alarm sending functions.

Usually, you should specify the serial gate and the transmitting data.

Viewing

Data viewing on DA9000 is implemented by a report list, as you can see in the following figure.

In this section you'll find a variety of rows which compose the list.

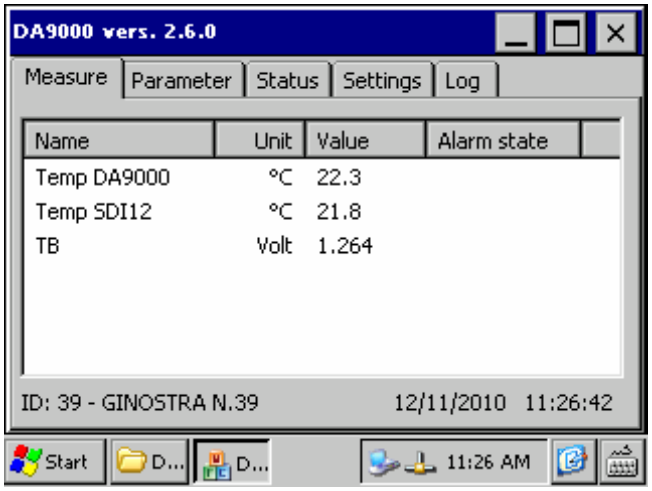


Figure 5 - Display board on DA9000

3.3 Functions' Parameters

As already written, all the objects you can insert in the configuration arrange of a number of parameters, that is values which must be passed to functions in order to customize them. Those parameters are required by user during function inserting but they remain adjustable even afterwards. Each parameter, even if it is seen just in only one common list, it distinguish above all for value type it can be set. The following table sums up the different types of parameter you can find in a configuration:

Parameter type	value Description	Values Range
Constant	not adjustable integer number	Nothing
Text	Alfa-numeric char for Text	*n* variable chars
Expression	Alfa-numeric char for Text on a yellow background	255 chars
Integer	Integer number without decimals	Variable
Decimal	Real Number with floating real point	Variable
Numeric Set	Value of a Limited and ordered integer group	0 ÷ *N*
Memory allocation	Memory allocation position	1 ÷ 2000

Particular types of parameters are the memory allocations. Data logger puts in disposition 9000 memory cells and each of them can contain a single data. When a function creates some output data, it means that it will write data in memory cells. Occupied memory allocations result allocated in an exclusive way in order to contain those data, the other functions could only read contained data.

3.4 Creation of Configuration

In order to create a new configuration, select *New...*. from *File* menu.

A window containing the base structure f the system will open. DAK automatically allocates a defined name to the configuration, depending on the number of already opened windows. If no windows are already opened at the same moment of creation, it will be suggested the name *Config1*. Changing the name is enough saving the configuration (to do that, just select *Save)*. With first saving, the *Save as* window will open and you'll eventually define a different name from the one suggested. In order to avoid loss of work already done. It's kindly advisable to periodically save the file during the creation of configuration.

At this point, user could insert the first acquisition.

To do this, just select ACQUISITION node and select *Insert (or using the right mouse button*).It will show the list of available transducers. If the transducers arrange of more than one pre-defined channels, they will be automatically added. Every new inserted object is shown with a pre-defined *default* value. To change the values of object's property is enough to select the object and set values by **property editor**.

To remove an object is enough to select it and select *Insert* from Delete menu *(or using the right mouse button).*

Further, we can add some ELABORATIONS on acquired data.

Even for elaboration, the same procedure is used. Select ELABORATION object and from Insert meu select available function specifying the right channel on which executing the operation.

Finally, we can add a RECORDING but in this case we must add a definition for record format (ISTANTANEOUS, STATYC or ALARM) and then the data will be insert in record.

In a similar way, even the other elaborations, recording, alarm, transmission functions can be inserted.

3.4.1 Properties Editor

Most important, it's the chance to modify the parameters of each single object (*Object properties*). In order to view parameters, it's enough to select the object by a click. Parameters' list will see on the right hand side of the configuration window (see *Fig.2*). You can move on the list and scroll the headings helped by the cursor. As you can see, each selected parameter matches a short description which explains its meaning. This kind of *Online Help* is very useful to user in order to make easier the identification of parameter and then the decision the most suitable value to insert. Selecting the value cell placed by side of parameter, it will be possible modify its content. Always confirm the inserted value clicking on *Enter*.

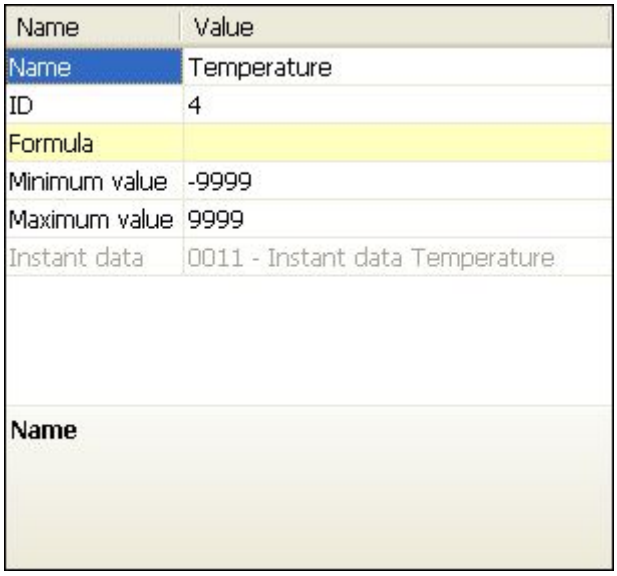


Figure 6 – Properties Editor

3.5 Display viewer

Data viewing on DA9000 is implemented by a report list.

To insert a display viewing it's necessary –first of all – select VIEW object and then add different lines, specifying the properties as name, unit of measurement, data source. ID station info such as Date station name are automatically displayed from software in the data logger, taking info from initializing file.

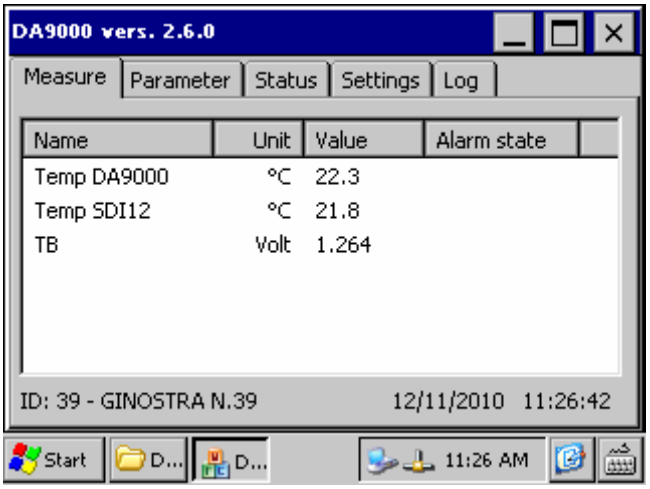
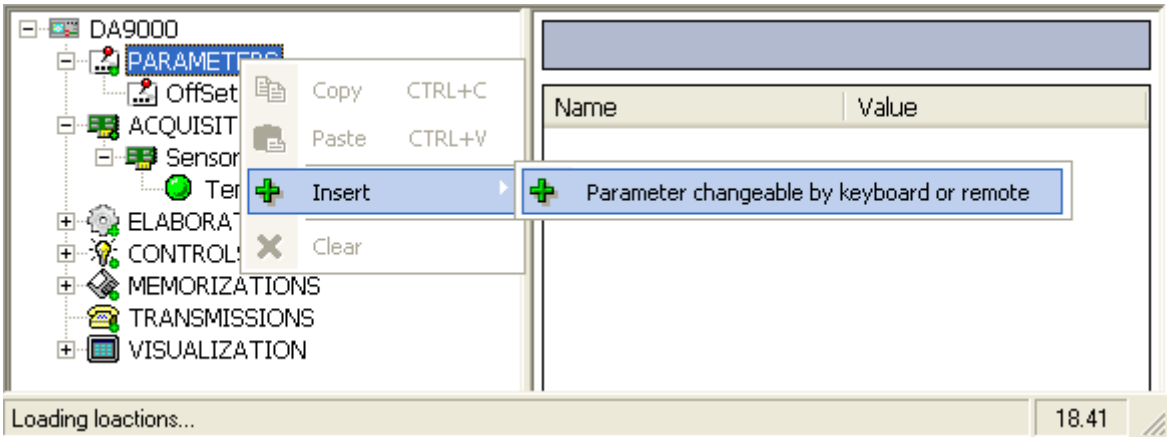


Figure 7 - Display board on DA9000

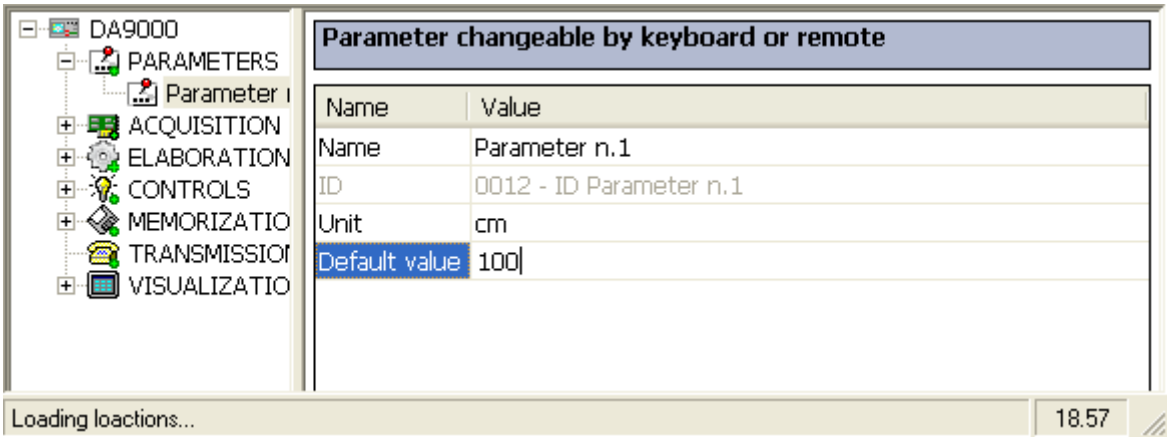
4 Block structure of configuration file.

Now we are going to explain on detail the main blocks that make both the acquisition system and the DA 9000 data-logger data elaboration in synergy with configuration development feasible through DAK software:

4.1 Parameters

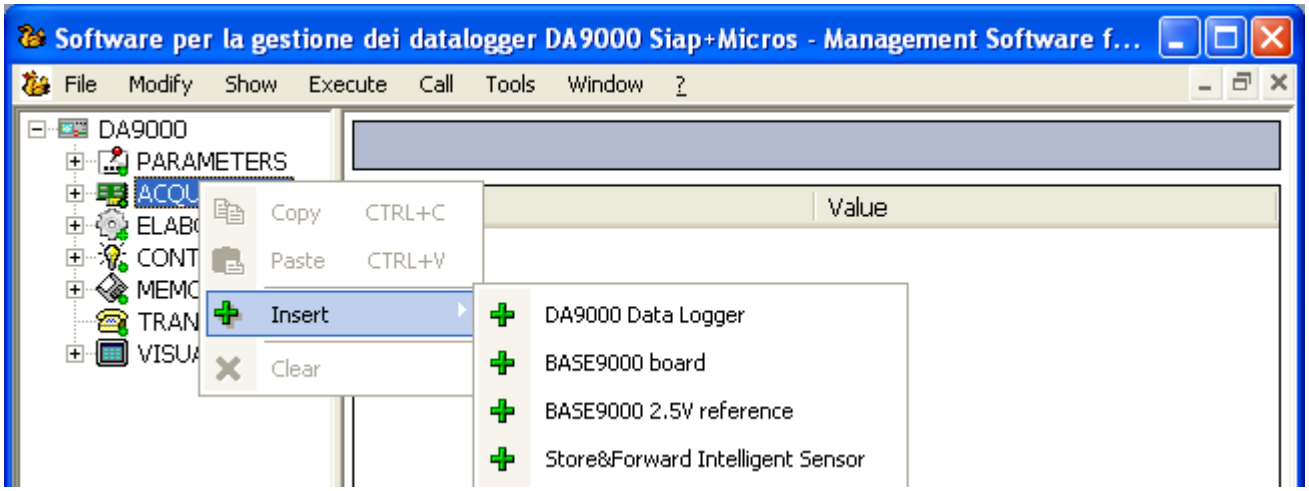


This section collects all the parameters can be useful to measurement management as for offset in order to adjust level measurement.



In the example above we see the offset value to put on the level measurement in order to line up the reading of the level expressed on hydro-metric pole placed in river bed. In this case '100' value is associated and recorded in memory allocation numbered 53. We see further like this memory will be used in the conversion formula associated to measurement.

4.2 Acquisitions



In **ACQUISITION** section is possible to insert and to manage different kind of transducers and of measurement acquisition mode. Let's see in details each single heading:

4.2.1 DA9000 Data Logger

DA9000 Data Logger

Name	Value
Name	DA9000 Data Logger
Polling cadence (sec)	1

This section defines how to use the four input channels placed on DA9000 data logger. *Query Interval* value shows the frequency (cadence) of measurement query. If this value is equal to zero, the measurement is taken only once at the beginning.

Name	Value
Name	I0
Formula	
Minimum value	0
Maximum value	1
Instant data	0027 - Instant data I0

For each of four input channels is possible to associate a name, as for a measurement conversion formula. Minimum Value and Maximum Value fields show measurement acceptability range. If for some reason, the transducer returns a valid value but it stays outside this range, that measurement will be automatically invalidated.

Instantaneous field is an output field not adjustable by user, and it shows memory location where the query measurement value will be saved. This indication will be useful further, programming next measurement management phases (Elaboration, Recording, Displaying, etc).

4.2.2 BASE9000 board

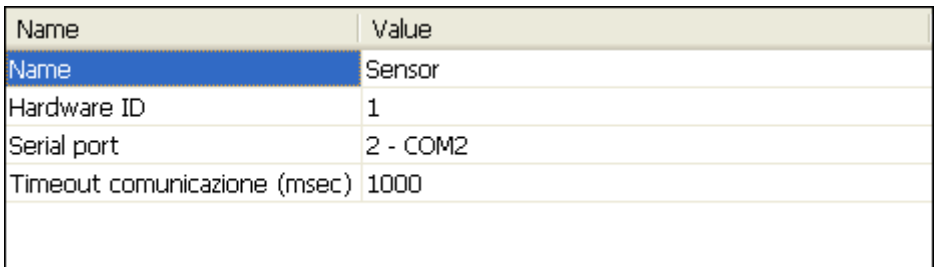
BASE9000 board is an interface related to DA9000 data logger by a RS485 communication line (COM2) that allows to connect different kind of electric measurements such as: voltage, resistance, electric current, frequency, digital contacts, etc. For further details, please refers to technical data sheet of product.

BASE9000 board dialogues with central unit DA9000 by a RS485 communication line and it's possible to connect in cascade up to a maximum of 254 boards, hugely expanding measure number available to acquire.

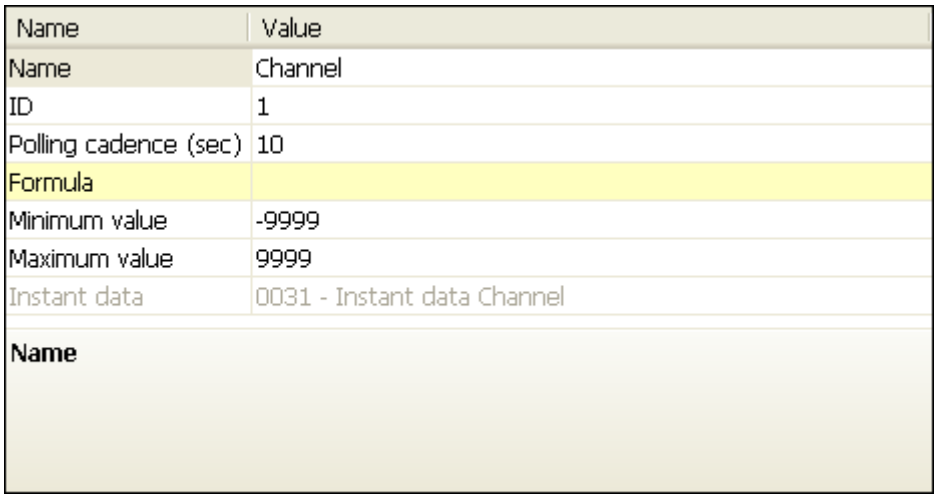
4.2.3 BASE9000 2.5V reference

This kind of input has been used to request to BASE9000 board base the internal reference voltage value which seems to be useful in some way in order to get some measurement from proportional output transducers. At this moment, the only transducer that need this kind of treatment is the wind direction sensor with natural output. The way you deal these measures will be studied further in this guide.

4.2.4 S&F SIAP+MICROS intelligent transducer



In this section, it's possible to associate a name to the transducer I want to query, to define transducer identification hardware, communication port and finally the timeout on waiting the answer.



In this second window, it's possible to give a name to the measure returned by transducer. Identifying field is required to show the field (then the measurement) to take when the required transducer gives more than one measurement at the same time (combined transducers such as temperature and humidity, multi-parameters probe, etc). *Type* field identifies transducer type. The value to put in is easily findable in the documentation in annex with the transducer. Scansion interval shows the frequency (cadence) for measurement query, Formula field allows to modify the returned value such as if it's necessary to apply an offset to a snow level measurement or to refer to sea level for a river level sensor, etc.

Minimum Value and Maximum Value fields show measurement acceptability range. If there're some reasons transducer returns a valid value which stays outside this range, that measurement is automatically invalidated.

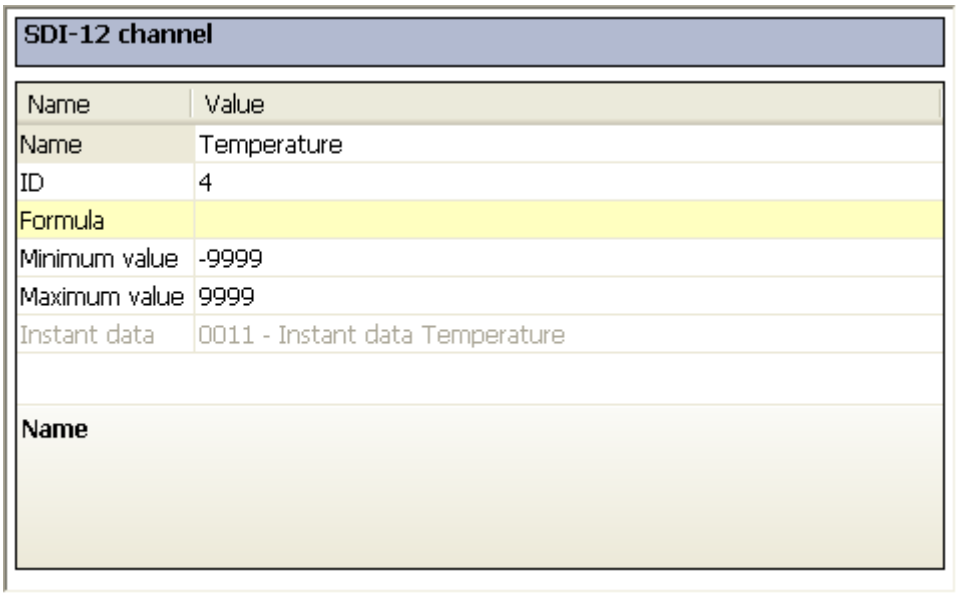
Instantaneous field is an output field not adjustable by user, and it shows memory location where the query measurement value will be saved. This indication will be useful further, programming next measurement management phases (Elaboration, Recording, Displaying, etc).

4.2.5 SDI-12 Transducer

This kind of transducer use a standard communication protocol and they can be acquired by the SDI-12 port placed on frontal panel of DA9000 data logger. As follow, an example of SDI-12 transducer utilization:

In this section, the transducer name will be pointed out, even the unique identification hardware, acquisition delay (frequency), eventual start-up time before making the very query and finally the timeout on waiting the answer from the transducer itself .

Afterwards it's possible to define some other features for each single channel (necessary in the case of multiple transducers, such as combined transducer for temperature and humidity or the multi-parameter probe):

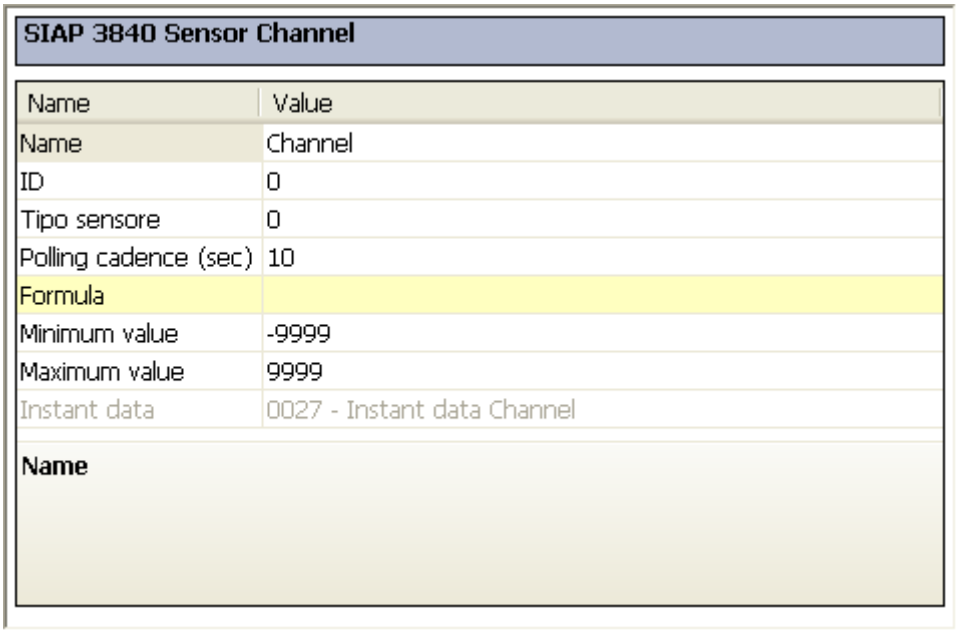


In this case, software knows that channel in field numbered 7 of answer string matches with a temperature measure and after that it's been decided take the row measurement returned by transducer and to put on an offset calculated by a formula, that divides this value by 100. In this case transducer provides a row output expressed in hundredth of Celsius degree returned as an integer. In order to obtain a value more suitable to our goal, we divided this measurement by 100 returning a Celsius degree value in the location numbered 69.

NB: Analog transducers return in M0 variable the row measurement estimated on input and expressed in microvolt (µV).

The Instantaneous field is a output field that is not adjustable by user, and it shows memory allocation where the measurement required will be saved. This indication will be useful further, programming next steps of measure management (Elaborations, Recording, Displaying, etc.)

4.2.6 SIAP generic Intelligent transducer



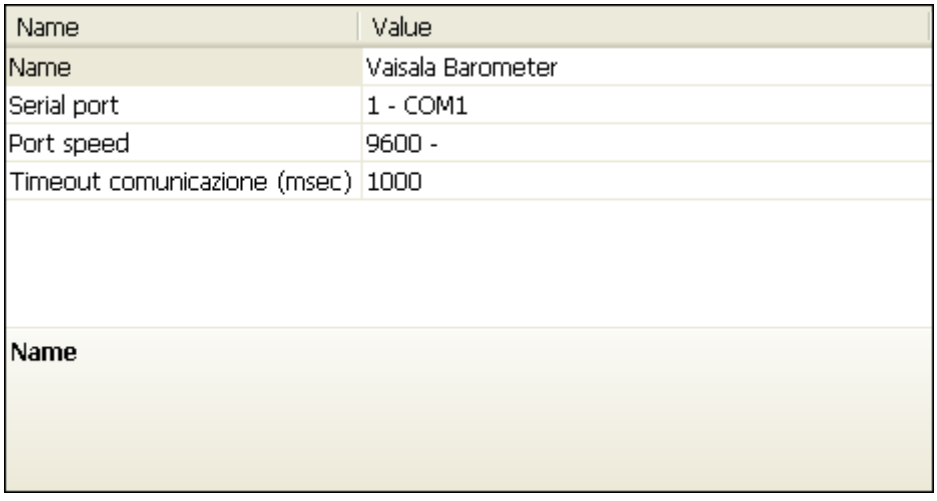
In this section it's possible to associate a name to the transducer I want to query, to define transducer identification hardware, communication port and finally the timeout on waiting the answer.

In this second window, it's possible to give a name to the measure returned by transducer. Identifying field is required to show the field (then the measurement) to take when the required transducer gives more than one measurement at the same time (combines transducers such as temperature and humidity, multi-parameters probe, etc). *Type* field identifies transducer type. The value to put in is easily findable in the documentation in annex with the transducer. Scansion interval shows the frequency (cadence) for measurement query, Formula field allows to modify the returned value such as if it's necessary to apply an offset to a snow level measurement or to refer to sea level for a river level sensor, etc.

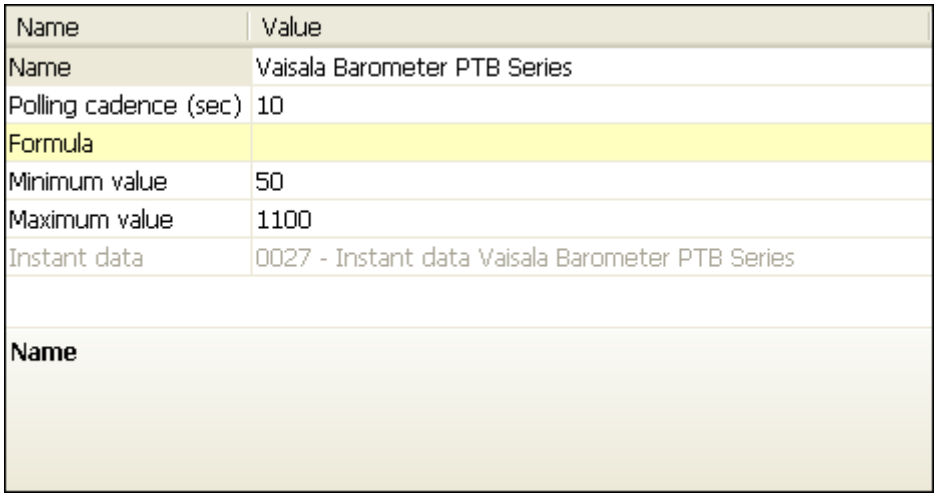
Minimum Value and Maximum Value fields show measurement acceptability range. If there're some reasons transducer returns a valid value which stays outside this range, that measurement is automatically invalidated.

Instantaneous field is an output field not adjustable by user, and it shows memory location where the query measurement value will be saved. This indication will be useful further, programming next measurement management phases (Elaboration, Recording, Displaying, etc).

4.2.7 Vaisala Barometer PTB series



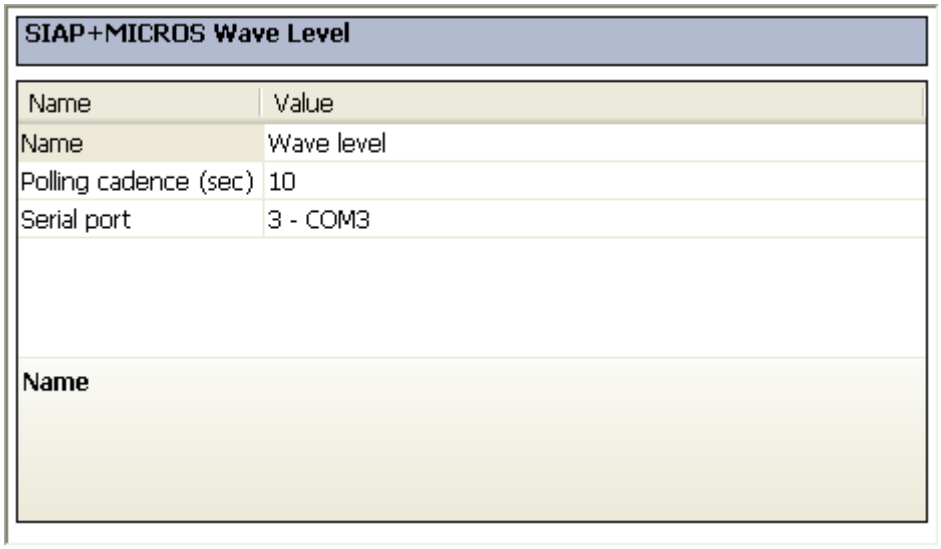
In this section it's possible to associate a name to the transducer I want to query, to define transducer identification hardware, communication port and finally the timeout on waiting the answer.



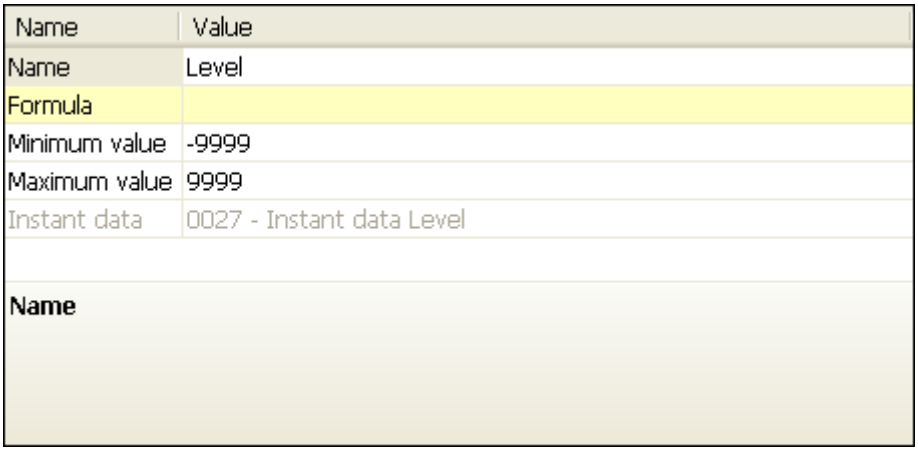
In this section, the transducer name will be pointed out, even the unique identification hardware, acquisition delay (frequency), eventual start-up time before making the very query and finally the timeout on waiting the answer from the transducer itself . Minimum Value and Maximum Value fields show measurement acceptability range. If there're some reasons transducer returns a valid value which stays outside this range, that measurement is automatically invalidated.

Instantaneous field is an output field not adjustable by user, and it shows memory location where the query measurement value will be saved. This indication will be useful further, programming next measurement management phases (Elaboration, Recording, Displaying, etc).

4.2.8 Wave meter



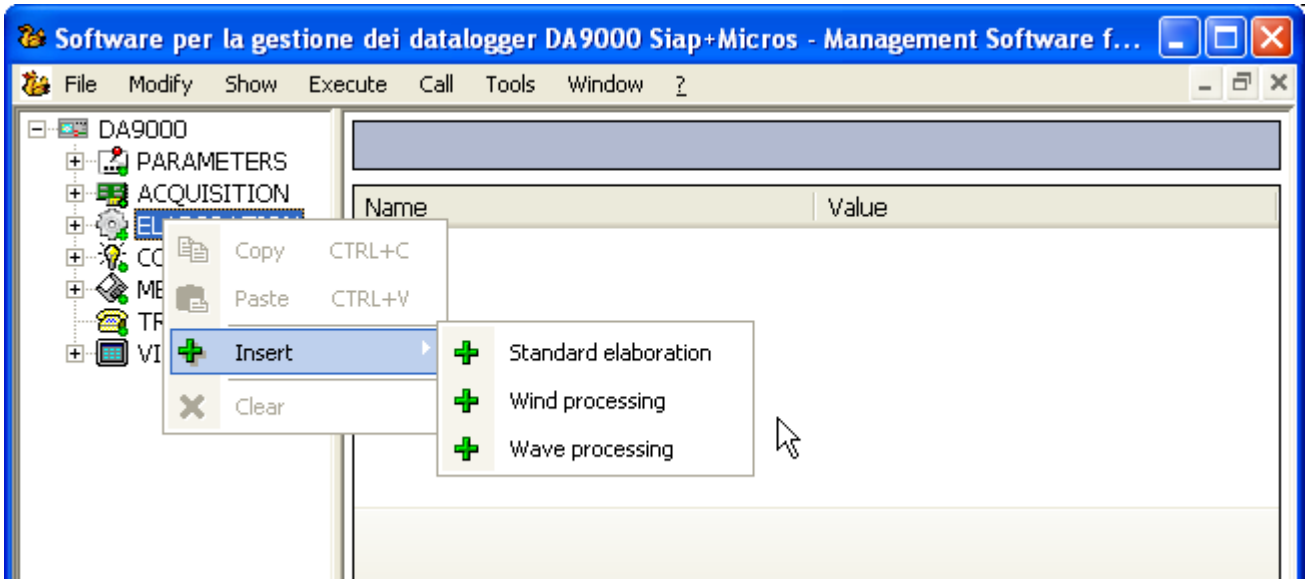
In this section it's possible to associate a name to the transducer I want to query, acquisition interval (frequency) and communication port.



In this second window, it's possible to give a name to the measure returned by transducer. Formula field allows to modify returned value.

Minimum Value and Maximum Value fields show measurement acceptability range. If there're some reasons transducer returns a valid value which stays outside this range, that measurement is automatically invalidated. Instantaneous field is an output field not adjustable by user, and it shows memory location where the query measurement value will be saved. This indication will be useful further, programming next measurement management phases (Elaboration, Recording, Displaying, etc).

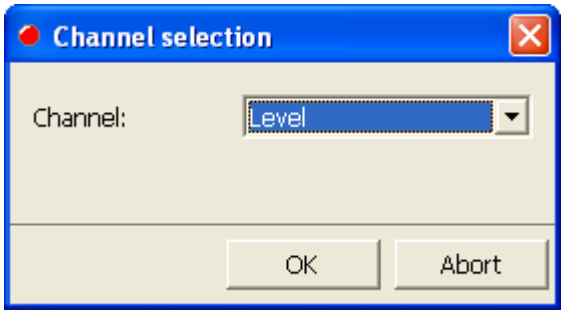
4.3 Elaboration



In **ELABORATION** section is possible to insert and to manage different kind of measurement treatment, previously acquired by acquisition function.

4.3.1 Standard Elaboration

This elaboration allows to get – just for selected measure and for selected period – the following values: arithmetic mean, minimum value, maximum value and minute of the day when minimum and maximum measures happened. When an elaboration of this kind is inserted, at the beginning the system asks for which measure you want to elaborate:



In this window you can select the measure by a drop-down menu. Afterwards you'll see the following window on your display:

Name	Value
Name	Standard elaboration Level
Processing cadence (sec)	3600
Minimum rate of valid data	0
Measure value	0027 - Instant data Level
sum	0028 - sum Level (Standard elaboration Level)
counter	0029 - counter Level (Standard elaboration Level)
valid data counter	0030 - valid data counter Level (Standard elaboration Level)
mean	0031 - mean Level (Standard elaboration Level)
minimum	0032 - minimum Level (Standard elaboration Level)
minute of minimum	0033 - minute of minimum Level (Standard elaboration Level)
maximum	0034 - maximum Level (Standard elaboration Level)
minute of maximum	0035 - minute of maximum Level (Standard elaboration Level)
% of valid data	0036 - % of valid data Level (Standard elaboration Level)
variance	0037 - variance Level (Standard elaboration Level)
std deviation	0038 - std deviation Level (Standard elaboration Level)
measure reference	0039 - measure reference Level (Standard elaboration Level)
delta measure	0040 - delta measure Level (Standard elaboration Level)

Name

with this window you can associate a name to the function, define execution interval (e.g. 3600 seconds suggests that function will be executed every hour 01:00, 02:00, 03:00 and so on). Field called *Measure Value* shows the location that contains measure instantaneous value (see section ACQUISITION).

Output fields: summation, counter, etc. are some not adjustable locations which will contain elaboration results. E.g: Field called *Average* - that will be placed in memory location number 164 -, is created every 3600 seconds and contains arithmetic mean of measure). In this summing up we show you the most used output locations:

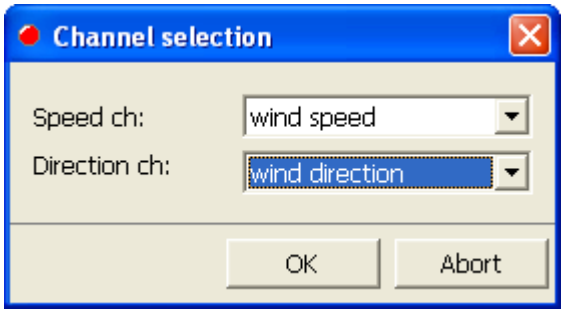
Summation location contains the sum of all the measures taken in a certain period, in order to elaborate them. This value is used to return quantity of rain fall or to show the measure of solar radiation (KJoule/m^2 or joule/m^2). It's used also for make a sum of the minute for leaves wetting or the duration of sunshine duration, etc.

Mean location contains arithmetic mean calculated taking value in Summation field divided value in Counter.

Minimum	location contains minimum value measured in the period.
Minute of minimum	value shows the daily Julian minute of the right moment when the minimum measure is acquired.
Maximum	location contains maximum value measured in the period.
Minute of maximum	value shows the daily Julian minute of the right moment when the maximum measure is acquired.
% Valid data	location contains the percentage of valid measures calculated comparing quality of all the measurements taken.
Variance	Variance of the measurements in the period.
Std Deviation	Standard Deviation of measurement in the period
Delta measure	value shows the gap among the last measure taken minus the first measure taken in the same period. This value can be useful to calculate the measure variation in time or to determine evaporated water quantity in evaporation measurements.

4.3.2 Wind elaboration

This elaboration allows to get some info referred to wind from wind speed and direction transducer:



In this window for channels selection it's possible to quickly show which are the measures to insert in wind elaboration.

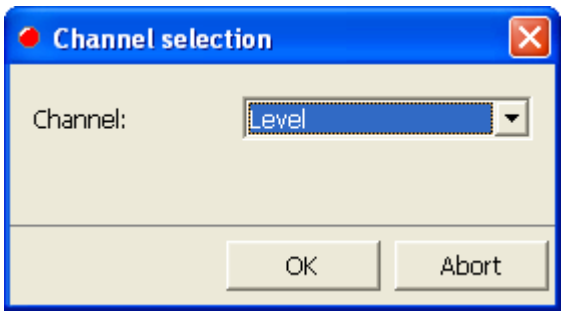
Name	Value
Name	Wind processing wind speed wind direction
Processing cadence (sec)	3600
Minimum rate of valid data	0
Soglia validazione direzione (m/s)	0,5
Speed value	0069 - Instant data wind speed
Direction value	0068 - Instant data wind direction
instant direction	0071 - instant direction wind speed (Wind processing wind speed wind direction)
direction SIN amount	0072 - direction SIN amount wind speed (Wind processing wind speed wind direc
direction COS amount	0073 - direction COS amount wind speed (Wind processing wind speed wind dire
valid direction measures	0074 - valid direction measures wind speed (Wind processing wind speed wind di
calm sector counter	0075 - calm sector counter wind speed (Wind processing wind speed wind direct
direction for maximum speed	0076 - direction for maximum speed wind speed (Wind processing wind speed wi
maximum speed	0077 - maximum speed wind speed (Wind processing wind speed wind direction)

Similarly to other elaboration function, here the execution frequency is shown and memory location containing instantaneous measures returned during acquisition phase to refer. The main output measurements returned by this function are:

direction for maximum speed	wind direction in the right moment of the maximum gust
Maximum speed	maximum speed (gust)
Average direction	wind average direction
Average speed	average speed
Vector speed	wind vector speed, 'weighted' on wind direction
Vector direction	wind vector direction

4.3.3 Wave meter Elaboration

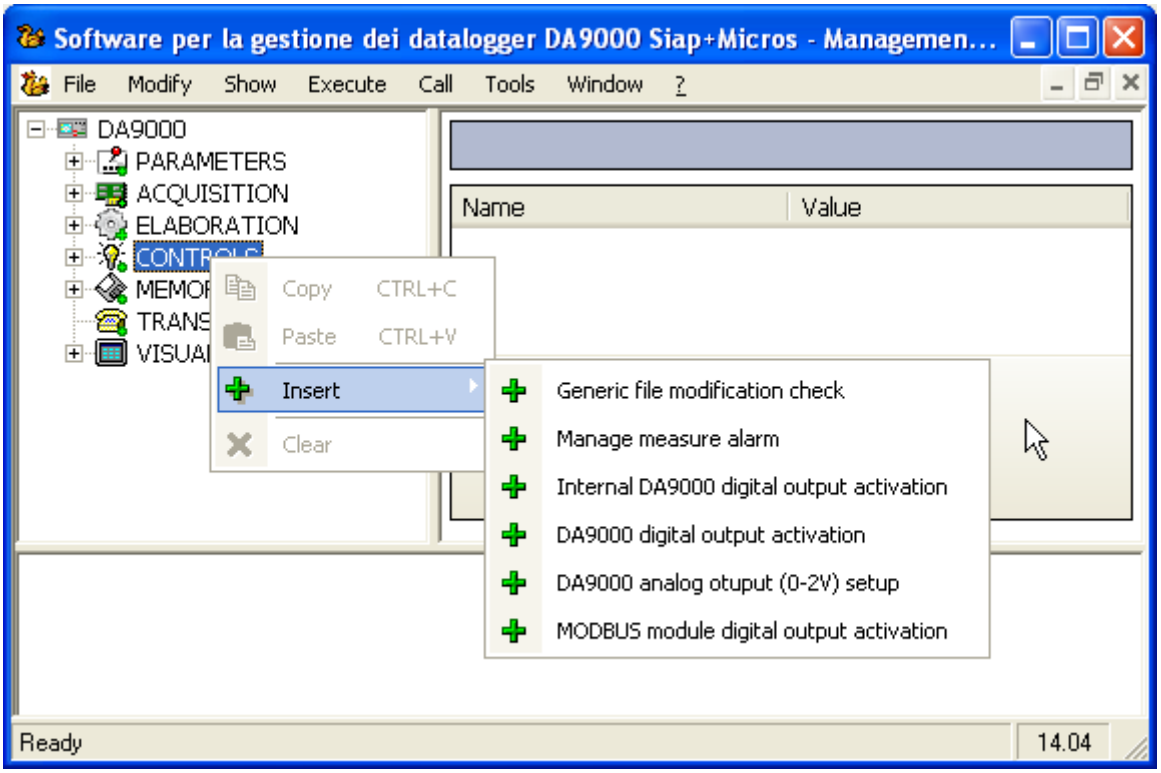
This function allows to create a lot of parameters for research on see waves starting from level value.



Returned data ate the one listed below. For further information, please refers to wave meter user guide:

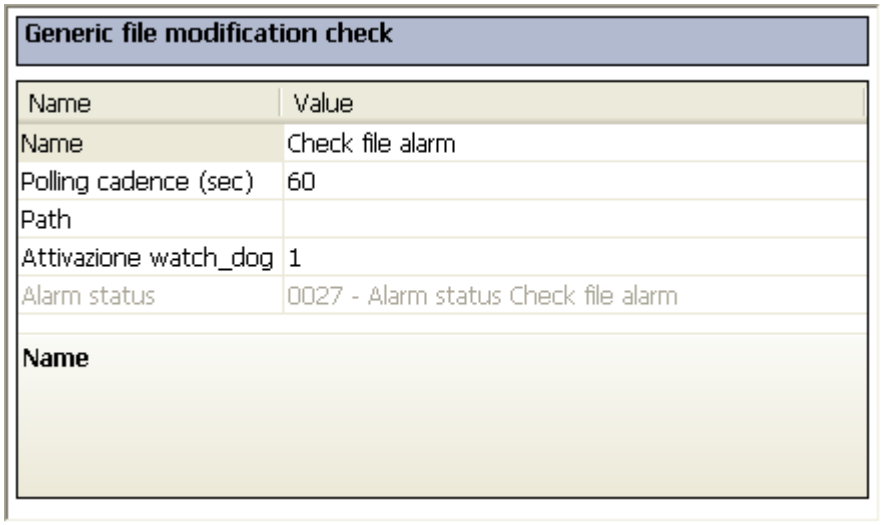
Name	Wave precessing Level
Processing cadence (sec)	900
Instant level	0093 - Instant data Level
Measure frequency	4
Sea depth	1
Storage file for level measures	7
Storage file for report data processing	8
Storage file for wave data processing	9
intercept level/time (a)	0107 - intercept level/time (a) Level (Wave precessing Level)
slope trend level/time (b)	0108 - slope trend level/time (b) Level (Wave precessing Level)
level measure	0109 - level measure Level (Wave precessing Level)
mean level value (m)	0110 - mean level value (m) Level (Wave precessing Level)
minimum level value (m)	0111 - minimum level value (m) Level (Wave precessing Level)
maximum level value (m)	0112 - maximum level value (m) Level (Wave precessing Level)
level RMS (m)	0113 - level RMS (m) Level (Wave precessing Level)
standard deviation of level (m)	0114 - standard deviation of level (m) Level (Wave precessing Level)
level kurtosis	0115 - level kurtosis Level (Wave precessing Level)
level asymmetry	0116 - level asymmetry Level (Wave precessing Level)
number of waves	0117 - number of waves Level (Wave precessing Level)
mean wave value (m)	0118 - mean wave value (m) Level (Wave precessing Level)
minimum wave value (m)	0119 - minimum wave value (m) Level (Wave precessing Level)
maximum wave value (m)	0120 - maximum wave value (m) Level (Wave precessing Level)
RMS wave value (m)	0121 - RMS wave value (m) Level (Wave precessing Level)
wave kurtosis	0125 - wave kurtosis Level (Wave precessing Level)
asymmetry of wave value	0126 - asymmetry of wave value Level (Wave precessing Level)
correlation between waves	0127 - correlation between waves Level (Wave precessing Level)

4.4 Controls



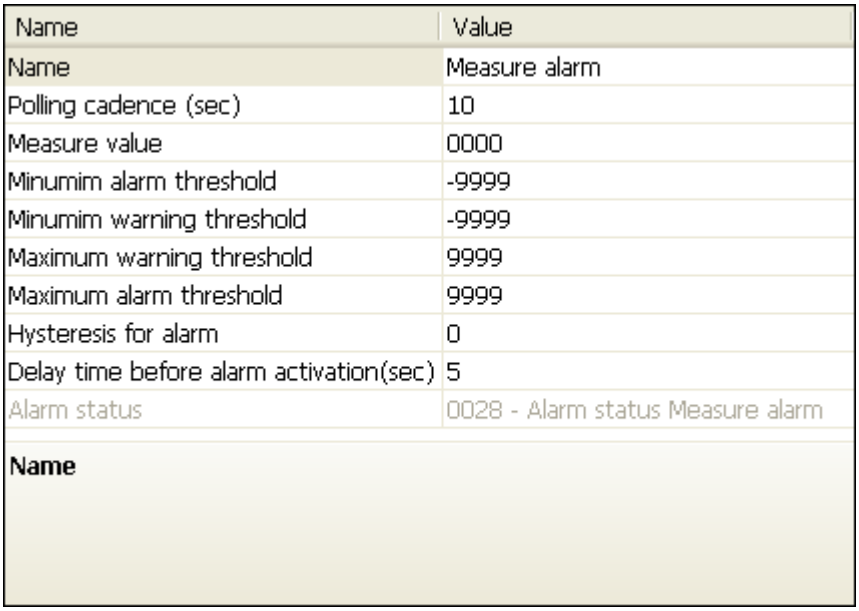
In **CONTROLS** section is possible to manage quality of acquired measures and to create alarm events.

4.4.1 Control on generic file modification



This control allows to keep an eye on state of utilization of a file inside the DA9000 data logger. It's possible to check upgrade and the access to information placed in a file in the DA9000 data logger. If there's some malfunctioning occurs and file shows some modifying signs or access in recommended control period, DA9000 data logger can create an alarm message or make an external circuit on (like a watch-dog) that can be make the whole system restart (reboot). In case of alarm on, the memory called *Alarm state* (e.g. memory numbered 141) is set to be used by other functions which will be shown as follow in the user guide.

4.4.2 Measure alarm management



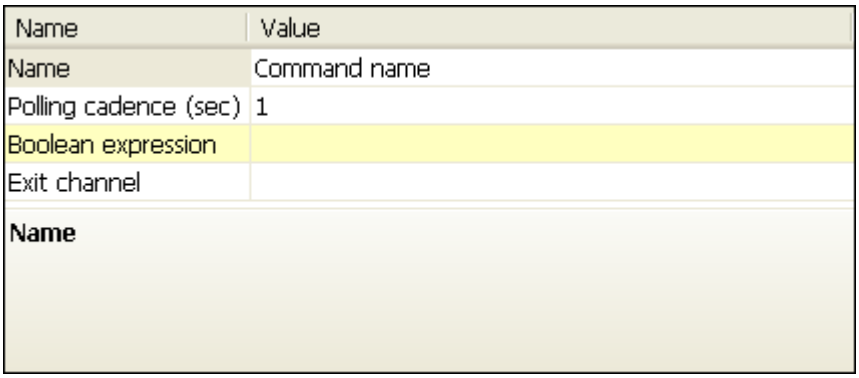
By this control it's possible to define some alarm and pre-alarm thresholds which are associated to acquired measurement, in order to create some alarms or to turn some devices on. Moreover the name of the measure, scanning interval and showing the memory location that contains the measure to check (usually, the location of instantaneous measure, created by acquisition function), it's possible to set minimum and maximum thresholds for alarm and pre-alarm. Hysteresis value needs to define threshold aimed to close an alarm state, avoiding fluctuation around threshold value. E.g,, if we set a maximum alarm threshold in the case of a temperature, at 30°C and a hysteresis of 5°C, it means that the alarm condition starts when temperature goes over 30°C and it stops when it goes under 25°C.

Waiting time - before alarm is getting on - is required in order to avoid false alarm due to a spurious measure. Before alarm state is definitely on, measure must be permanently over a threshold for a specific time.

Output location **Alarm State Memory** will contain a value that shows measurement state (-2=minimum alarm, -1=minimum pre-alarm, 0=normal, 1=maximum pre-alarm, 2=maximum alarm, 3=not valid measure error, 4=over scaled error)

4.4.3 DA9000 internal digital output activation

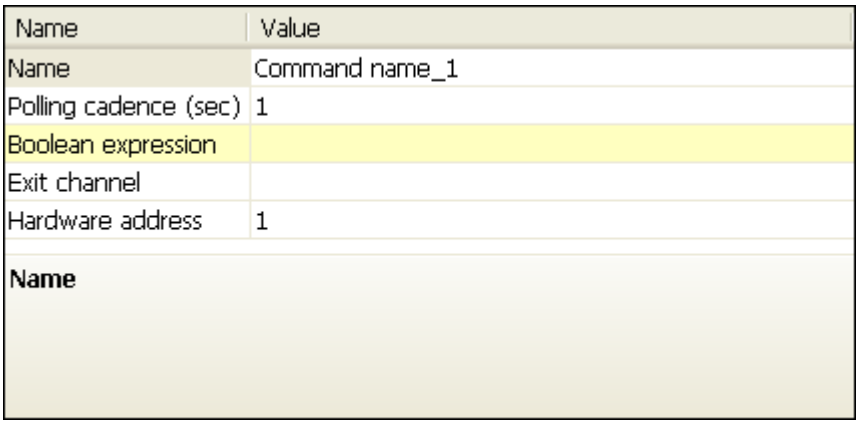
When an alarm is on, it's possible to activate an output digital internal channels of DA9000 data logger in order to turn on the electric devices such as horn, light, relay, etc.



It's possible to define a logic formula (boolean expression): when it's true it turns the selected output channel on.

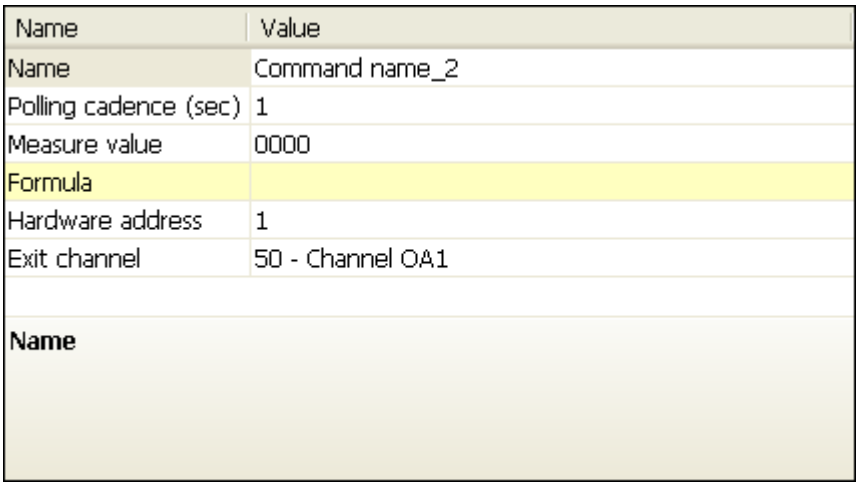
4.4.4 DA9000 digital output activation

When an alarm is on, it's possible to activate an output digital external channels of BASE9000 board in order to turn on the electric devices such as horn, light, relay, etc.



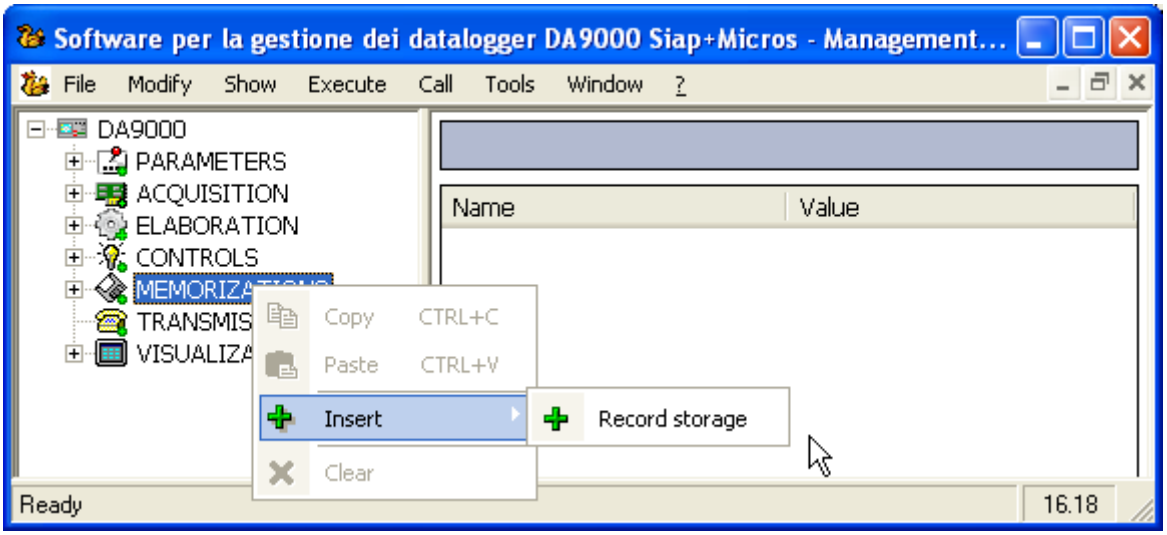
It's possible to define a logic formula (boolean expression): when it's true it turns the selected output channel on. Hardware Address field defines the BASE9000 board to control.

4.4.5 Analogical (0÷2V) output BASE9000 setup



With this control it's possible to create an analog output starting from an acquired value or a calculated one. It's necessary to add an expression, in the already used formula: it will provide a generic value that goes from 0 up to 20000. This range matches – in output – to a voltage that goes from 0 to 2V. Memory M0 shows a raw value returned by memory location shown in *Measure Value* field.

4.5 Recording



4.5.1 Recording of record

In this section, we see how to record the measurements. At the beginning we must define which kind of record we want to record (*record* type) which can be: type 0=historical data record type, type 1=instantaneous measure record or 2=alarm measure record). Recording interval defines how many seconds pass among one recording and the next one. For alarm record type is warmly suggested to set a cadence of 1 second. Recording files take this default values: 6=historical measure file, 1=instantaneous measure file and 4=alarm file.

Name	Value
Name	Record
Record type	0 - Hystorical record
Storage cadence (sec)	3600
Data file	6

Name

Linked to this window, it's possible to link one or more recording blocks.

Name	Value
Name	Data
ID	1
Data attribute	B - Mean
Numero decimali	1
Measure	0000
Unit	

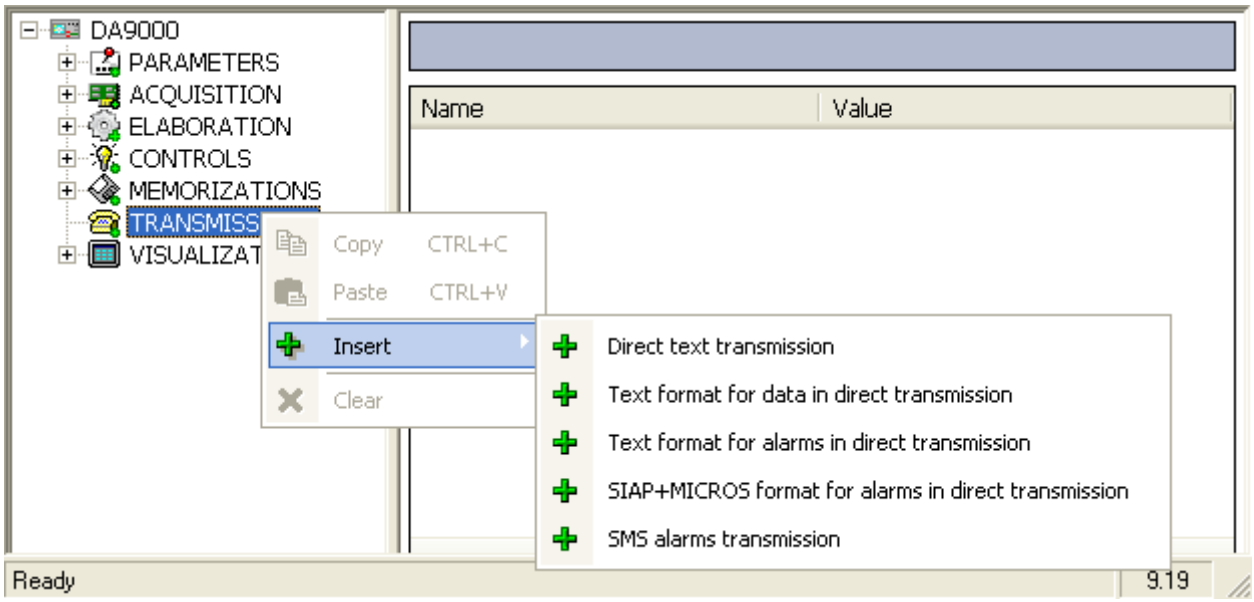
Name

In the above example, level measurement has been recorded into the file 6, in historical measurement mode.

If you want to record an alarm report, you must put the value location (which caused the alarm) in the *Measure Location*.

4.6 Transmission

In this section, we define the operations to do in order to send some messages for initializing, notifying or turning on an alarm, through DA9000 data logger's communication ports.



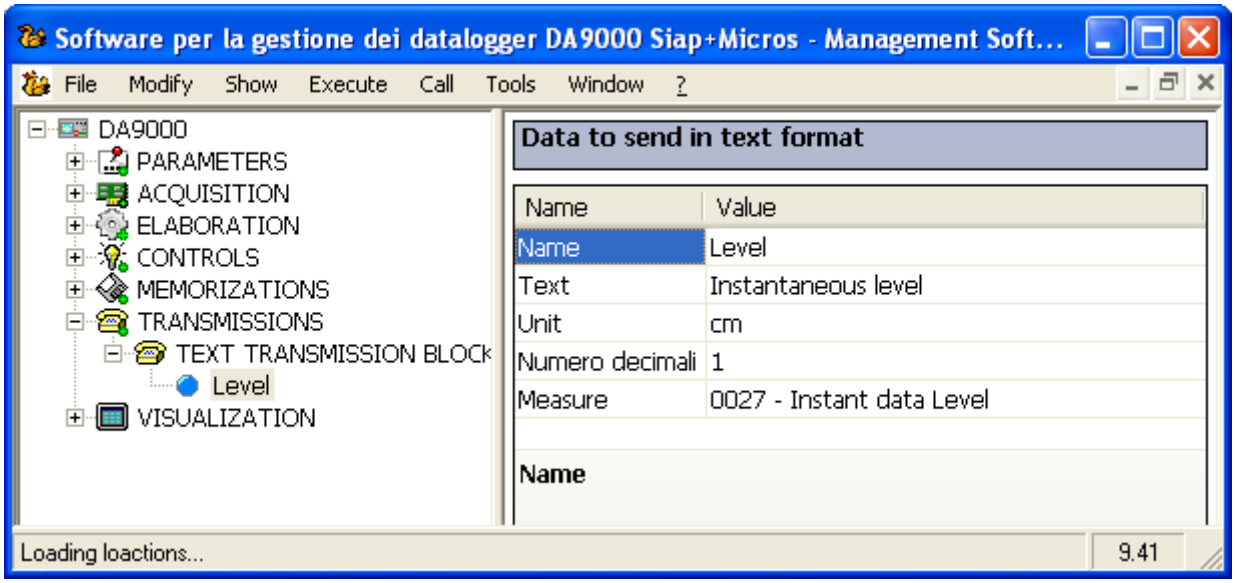
4.6.1 Direct Text Transmission

Name	Value
Name	GENERIC TEXT TRANSMISSION
Transmission interval (sec)	1
Serial port	4 - COM4
Port speed	9600 -
Text to transmit	AT&F;S0=1;&W

Name

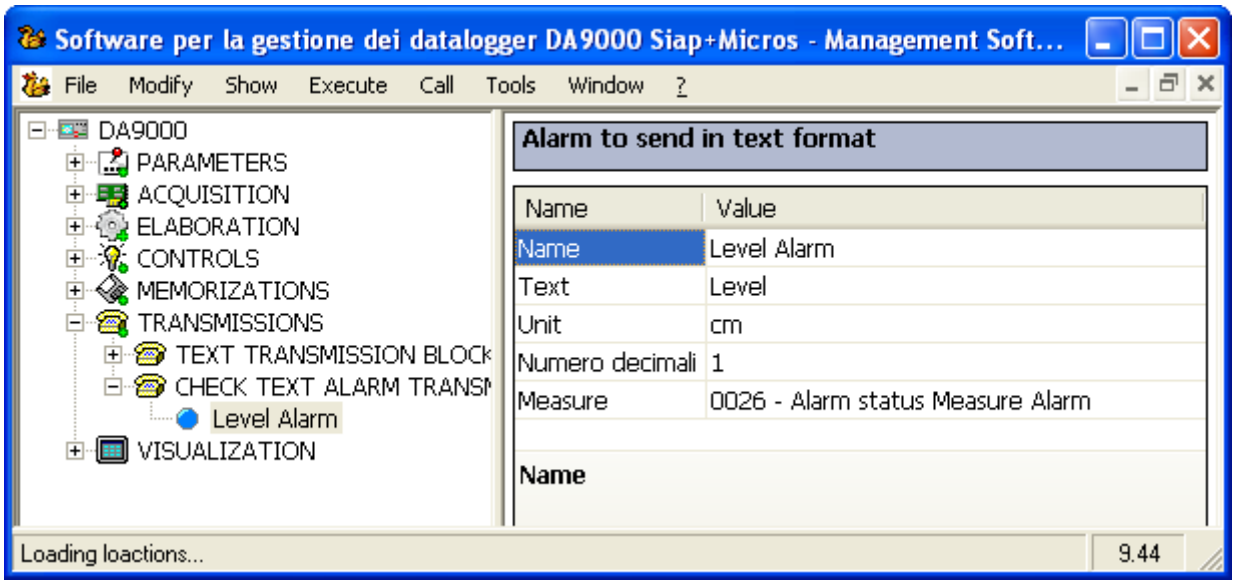
This function is useful when you need to send some customized statements, depending on the set frequency (interval). E.g. this function is used to initialize a GSM modem at any midnight, sending a string with Hayes commands.

4.6.2 Direct transmission of data in text format



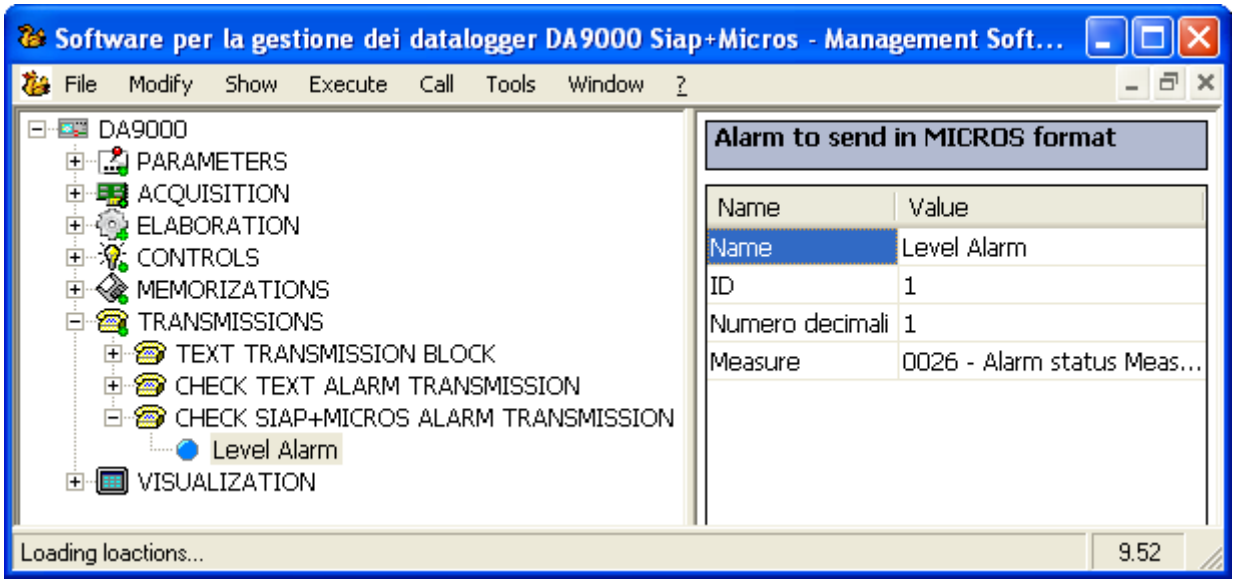
Similarly to what is said before, it's possible to send lilting messages containing the numeric information of a certain measurement.

4.6.3 Direct transmission of alarm in text format



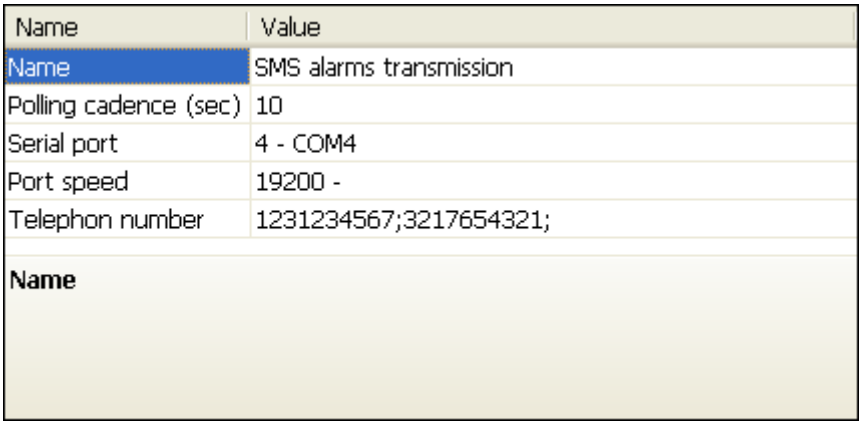
When some conditions occur, it's possible to send a message through a communication port, e.g. towards a printer connected to DA9000 data logger.

4.6.4 Direct transmission of alarm in Siap+Micros format

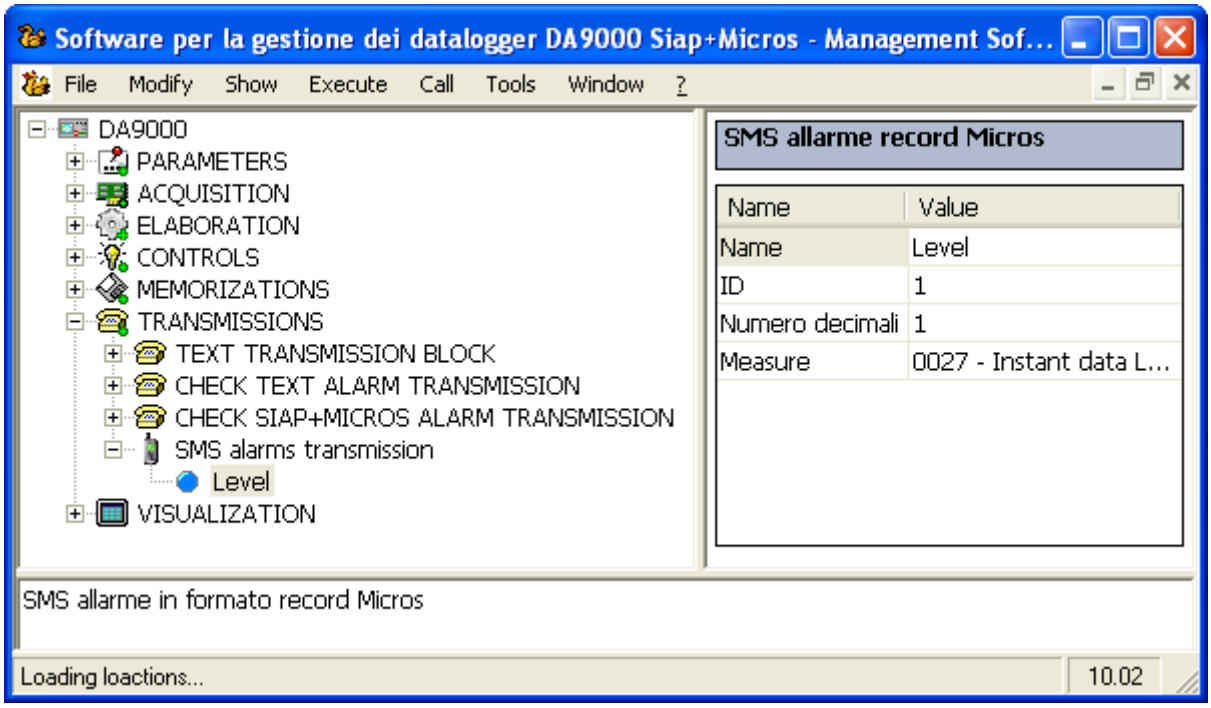


When some conditions occur, it's possible to send a message written in Micros format through a communication port, e.g. towards a PC where the MeteoNet software is running and it will receive these messages in an extemporaneous way.

4.6.5 Transmission of Alarm SMS



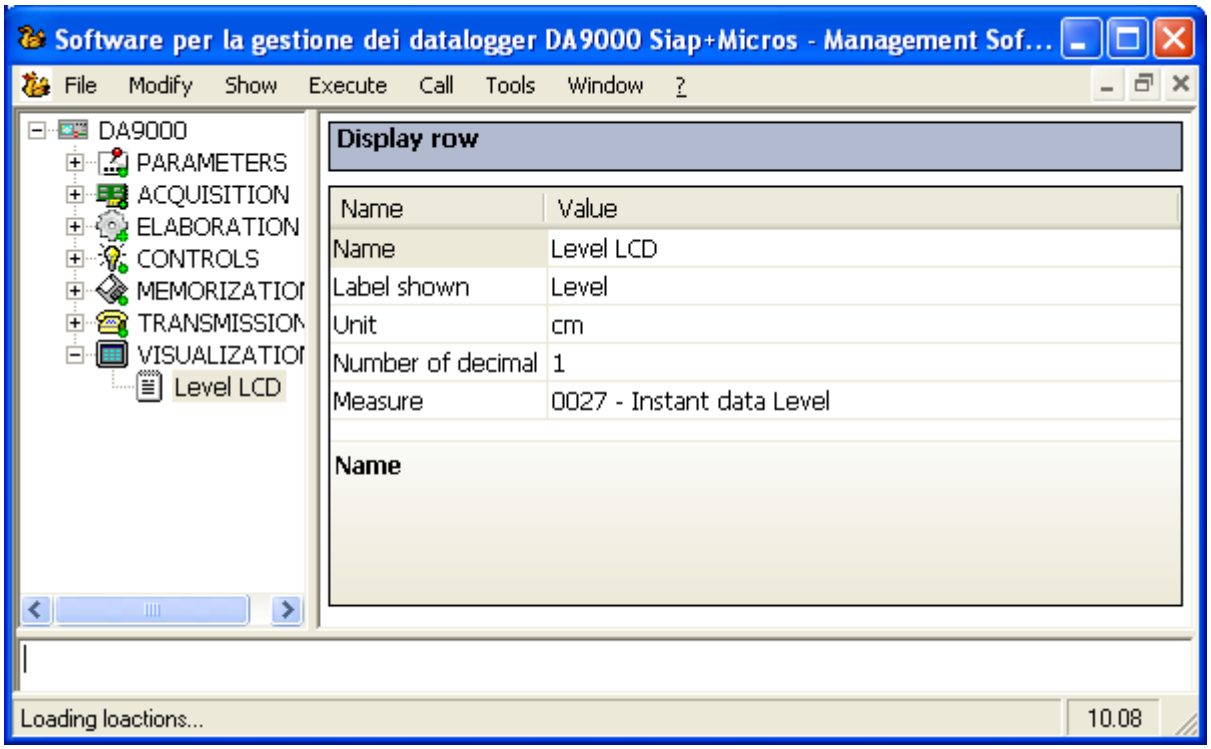
In case of alarm, it's possible to send some alarm SMS (text messages) to a list of recipients in the available telephone numbers.



SMS will notify condition for alarm, pre-alarm or all clear signal.

4.7 Displaying

4.7.1 Display line



This function is useful to define the measurement suitable to be shown on the DA9000 data logger's display. It usually show the label of the displayed measurement and the instantaneous measurement value.

5 Expression

The following tables list operators and functions used in numeric expression.

Register Variables

M*i*	Value of recorded measure in location ***i*** (e.g. M1 = value of measure n.1) If the measure has got value = -9999 it means a not valid value. Note: M0 = raw value of just acquired measure through channel
V*i*	Measure validation code in location ***i*** (e.g. V1 = validation code of measure M1). If validation code gets the value = 1 it means a validate measure else it gets the value = 0 and it means a not valid measure.
$*n*	Value of recorded parameter on register ***n*** (e.g. $1 = parameter value n.1)

Arithmetic Operators

+	Addition
-	Subtraction
/	Division
*****	Multiplication
^	Rise a number to the power

Logical operators

NOT	Logical negation (equivalent operator: **!**)
AND	Logic conjunction
OR	Logic disjunction

Comparison operators

=	Equal
>	Greater than
<	Smaller than
?	Different

Bit comparison operators

&	Bitwise AND
|	Bitwise inclusive OR

Boolean Constants

FALSE	Equal to value **0**
TRUE	Equal to value **1**

Mathematical functions

ABS	Absolute value of a number
ATN	Arc-tangent of an angle
COS	Cosine of an angle
EXP	Rise natural logarithmic base to the power
INT	Keep the integer part of a number
LIM	Maximum or minimum value of a number among two limits
LN	Natural Logarithm of a number
LOG	base 10 Logarithm of a number
MAX	Maximum value among two numbers
MIN	Minimum value among two numbers
SGN	Sign of a number
SIN	Sine of an angle
SQR	Square root of a number
TAN	Tangent of an angle

5.1 Sending and receiving of configuration

In order to send Data logger an open configuration, select *Send*.. from *File* menu. Confirm this operation, and some seconds later a progressive bar will appear and it will show information about the transfer in progress (*see* Figure 8).

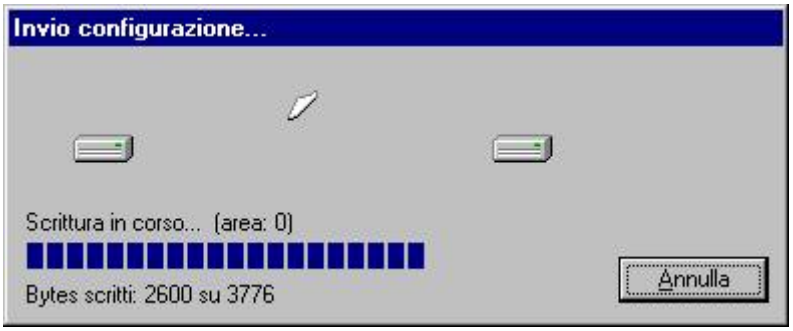


Figure 8 - Configuration sending

Once sending is complete, data-logger is subjected to a *reset* that allows it to load and to run the configuration just received.

Similarly, in order to receive the recorded configuration from station, just select *Receive...* from *File* menu. Subject to selection confirmation, we'll see a bar in progress similar to the one previously seen. At the end, a window will appear and it represents the configuration with a name, automatically allocated by DAK. If the configuration just received is the only window opened, then the suggested name will be *Config1*. User must keep in mind that – at this point – the configuration is not still saved. In order to save the configuration in a file, select *Save*. A dialogue window *Save as* will come up and there you can rename the file or search for a file to substitute.

6 Commands execution

Station users can communicate with data logger by DAK and then they can do some primary operations. Available commands for data logger are summed up as follow:

- *Station ID reading;*
- *Download and resetting of recorded data in memory;*
- *Inquiry and displaying of instantaneous data;*
- *Watch Synch;*
- *User guide sending for specific commands Store & Forward*

As follow we see more in details the peculiarity of each command.

6.1 Station ID

Every data logger must be identified with a unique number when it takes part in a stations net. This number (called *Station ID*) will be seen on recording made by the station itself and it will be useful to sort data in a possible central data base. As usual, the first station in a net or a single station must me set with a ID equal to 1.

In order to check the station ID, it's enough to select *Station ID* from *Run* menu. A dialogue window will open where you can see a cell with its relative value. To set the ID again it's necessary the window "System Setting".

Download and resetting of data

Instruction for data logger data downloading.

Selecting *Download* from DAK **Run** menu and the following dialogue window will appear:

As you can see, it automatically suggests the download of memory location n. 6 which usually is the one containing historical data.

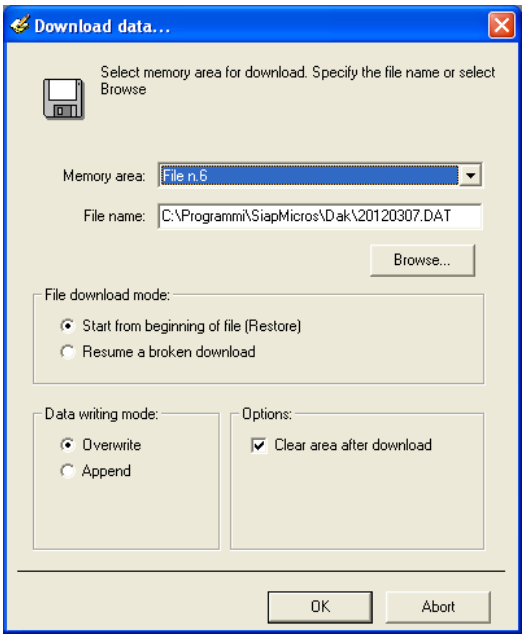
Just below, the name of the file containing downloaded data is automatically suggested too. Name is composed using year, month and day of that moment. However, user can select a new path and a different file name, just selecting the **Flip** button.

Following in the analysis of this dialogue window for data downloading, we see that it's possible define the different way of downloading according to the beginning of data reading. Usually when you download data, you want to pick them in a way that let you read them from the beginning, in order to get the whole data in memory. User has the chance to download data starting from the position when the reading pointer was at the end of previous operation. Using this function is important when you want to restart a download that was interrupted because of some problem in connection.

Afterwards we see it's possible to choose if to create a new data file or to join them to an already existing one. As usual, you keep the option **Overwrite** flagged, so that you create a new file every time.

Last, in **Option** window we can define if data are reset or not at the end of download (we suggest to leave this function flagged in order to avoid to saturate the data logger memory), we can define if send or not data to a DataPro database (out of date option) and last but not least, we can choose to create a graphic representation of data just downloaded.

6.2 Instantaneous data request



Measure instantaneous data can be requested and displayed whenever the data logger is configured for recording. Before requesting instantaneous data, is warmly suggested to open the configuration concerning station or to receive the configuration from station itself. Then you select *Instantaneous data request* from *Run* menu, a new window will appear and some seconds later measures and associated values appear too.

If the station configuration was not opened before request, you only see the measure values while you don't see the names and the unit of measurement. By *Request* button, user can immediately repeat the data request.

6.3 Watch Synch

Setting watch and calendar of the station, it's easy: just select *Watch synch*. Usually this option *Synch with system watch* is on, so that clicking *Enter* station will be synch with calculator watch. Otherwise, user can turn off this option and manually set hour and date to send.

6.4 Store & Forward commands

This section is dedicated to technician or export users, because here you can set the data logger with manual command, according to protocol code *Store & Forward*. User writes coded command in the upper text box and click on *Enter* to transmit it to data logger. In the lower text box you can easily check what station answers.

6.5 System setting

Moreover configuration, data logger needs of an initialization file where connection mode are shown, as well station identifier and station name, and path for data archives.

When you select *Setting management* from *File* menu, a window called System setting" will open.

The main features are::

ID station: it's the communication Hardware identifier;

Name: station name;

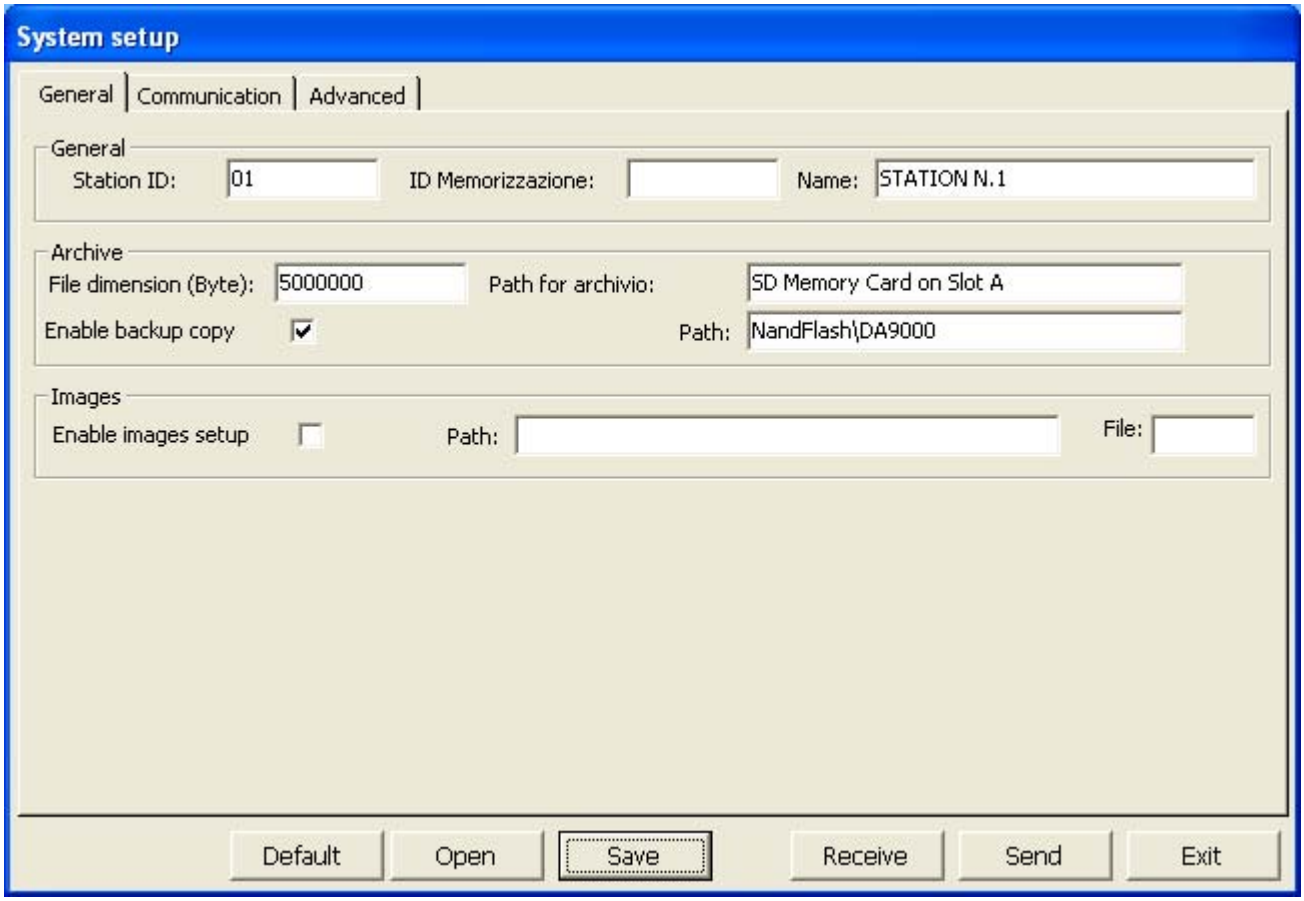
Path where data are recorded;

Path for a possible back-up;

Speed for "listening" serial ports;

Details for TCP connection towards S+M Tunnel both by serial commands to GPRS modem and by RAS service with regular modem.

Read and *Save* buttons allow to read and save the configuration on a local file, while Send and Receive buttons allow to send the new setting directly to data logger.



7 Remote Communication

As already said at the beginning, every station which has got an internal modem, using DAK it can be called and it can be remotely connected. It means that all the operations of info transfer seen before (configuration sending/receiving, data download, etc) can be done in remote, that is on distance. In order to turn the remote communication on, it's enough to make the connection among modem and the station, after a proper connection and initialization of the modem by the calculator serial port.

7.1 Connection and initialization of modem

The chosen modem must be connected to the calculator serial port by the equipped cable. In order to get the selected communication mode, modem must be initialized by proper commands at least once before the first connection. Regarding this point, take a look on section 8.2 Setting modem just to select the commands sequence suitable for initialization.

Here how to initialize: go to the *Call* menu, and then select *Initialize*: a window will appear where you can see the given commands.

7.2 Modem connection

In order to dial up the data logger Siap+Micros, connecting modem, just select *Connect.* from *Dial* menu. A dialogue window will come up (*see figure*) and you there you can digit the station telephone number. If you've already dialled the station, it's not necessary to write the number again, just select it from the latest 10 dialled number. Click on *Dial* button to have a call:

In the while of modem connection, a little window with a sum up of recipient station data will appear. At the end, if there're no mistakes, on the lower right part of the display the connection icon will appear. It means the remote connection is open. At this point user is enabled to execute all the operations as if he was using a local connection.

Once the operations are finished, remember to disconnect the modem using *Disconnect*.

8 Setting

From *Tools* menu select *Setting...* and there you'll see the set option for DAK. Whenever a change occurs to the headings, just click on *Apply* and then *Ok* to confirm them.

8.1 Serial port setting

Click on casebook named *Serial Port,* in order to check its setting.

Usually the pre-defined values (*default*) for a correct communication functioning are as follow:

Port:	COM1
Bit per second:	9600
Parity:	No one
Bit for data:	8
Bit for stop:	1

8.2 Modem setting

Click on casebook named *Modem* in order to check its setting.

On the window appeared, it's possible to set the sequence of commands useful for modem initialization. Select from *Hayes Commands* list the right command line, specific for that connected modem, or digit commands sequence directly in the text box. Usually every kind of modem is associated to a particular commands sequence. In other cases a sequence of standard commands could be the right one. In case of you've got some difficulties in identification of modem initialization type, just ask to technical assistance.

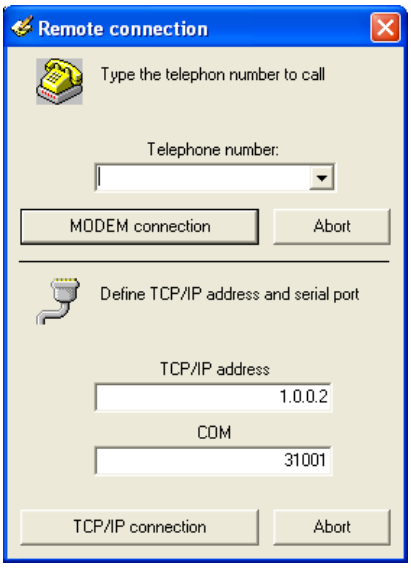
8.3 Setting of maximum number of S&F packets

Into the DAK.INI configuration file it's possible to set a maximum number of packets aim to be used during the communication with data logger. When the transmission mode used is a radio one, it needs to set low values (1 or 2). Default value is 5.

The adjustable variable is: **MaxPacks**.

8.4 TCP/IP connection

Going into the phone connection window, you can easily enable the Socket connection useful to dialogue with data logger connected the business Ethernet network or via GPRS. User inserts IP address and gate number used for connection. Once the connection is established is possible to interact with data logger as if it was connected to serial port.



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