SIAP+MICROS
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s012 DAK

Programming manual for data loggers

DA9000 / DA15K / DA18K

DAK Ver. 3.3.0

Software for the management of the acquisition units with configuration and data download functionality

User Manual Vers. 06

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1 Table of contents

This document is the user manual of DAK, a Windows application for the management of data acquisition stations equipped with **Siap+Micros** DA9000/DA15K/DA18K series dataloggers and for the related programming and use of the functions contained therein.

The DA9000/DA15K/DA18K dataloggers are able to acquire measurements of various types (measurements: analog, digital or registered in serial mode: Store & Forward, SDI-12, MODBUS, NMEA, etc.) and to carry out the storage of the same and the subsequent transmission of data through the most disparate means of communication: radio, Modem, GSM / GPRS, FTP, satellite, etc..

In support of these basic functions, data quality controls or alarm management can be included. Last but not least, it is also possible to automatically manage automation processes such as the management of pumping plants of aqueducts, and many other applications.

DAK allows operators to communicate with the datalogger through a series of commands to transfer information to and from the station (sending and receiving the configuration, downloading the stored data, etc.). It makes available editing functions for the creation and / or modification of the user program. All operations can also be carried out remotely if the station is connected via a suitable communication system: cable, network, GPRS / UMTS, Ethernet, etc.

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 Configuraion 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:empio che segue è stato aperto il file CNF.xml:

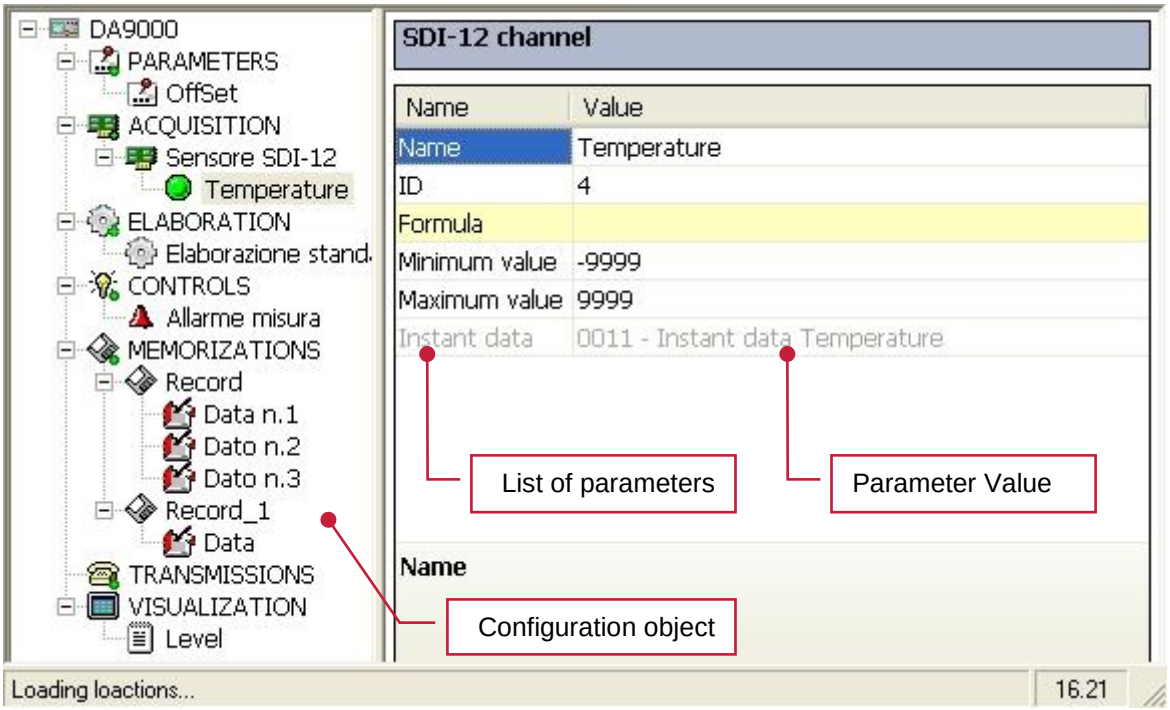


Figure 2 - Configuration window

Referring to **Errore. L'origine riferimento non è stata trovata.** 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.

4 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**) :

Figure 3 - Tree Structure

In pratica il livello zero, che costituisce la radice dell'intera configurazione, comprende diversi elementi base che costituisco le macro sezioni del datalogger.

All'interno di ciascuna sezione vengono poi inseriti a sua volta altri oggetti omogenei (le funzioni) che a seconda della tipologia del gruppo hanno lo scopo di acquisire il dato, elaborarlo, memorizzarlo, trasmetterlo.

La figura seguente mostra il diagramma di processo del datalogger rappresentando le varie sezioni di lavoro:

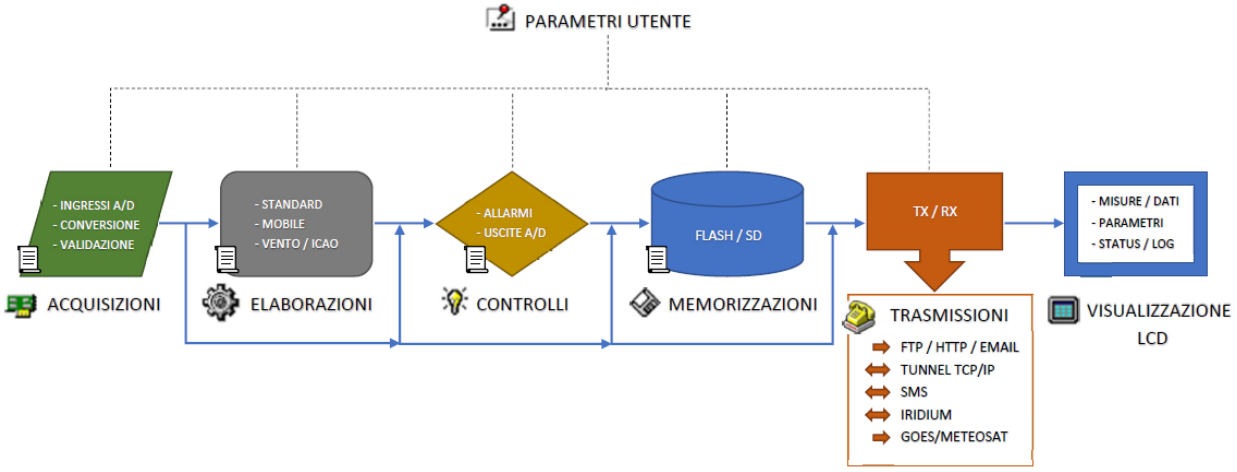


Figura 3 - Diagramma di processo

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.

Specifically, the acquisitions section follows the following procedure for each data:
• Acquisition of the physical signal (analog or digital)

• Conversion into engineering units

• Validation of the data in range (min. ÷ max.)

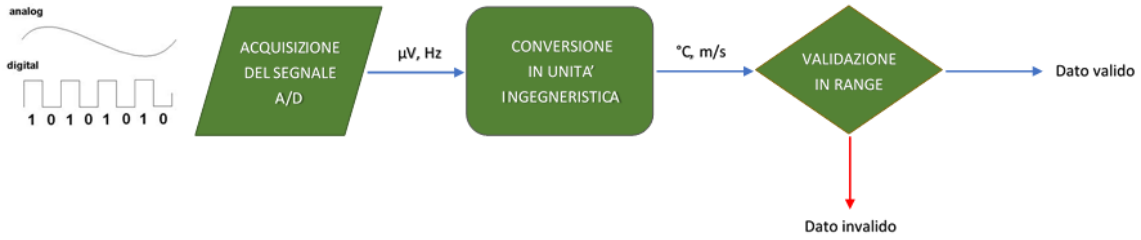


Figura 4 - Procedura di acquisizione del dato

The following function groups are defined in the configuration:

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).

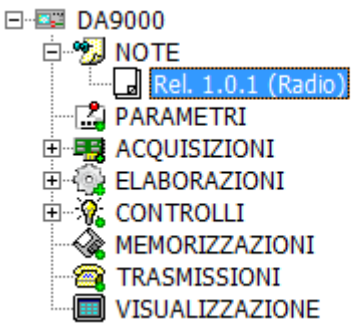
All the heading definitions, and the associated parameters, are present in an external catalogue file called ‘Classes Library”. This peculiarity allows to have a versatile and expanding configuration system.

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

4.1 Note

4.1.1 (function: Note)

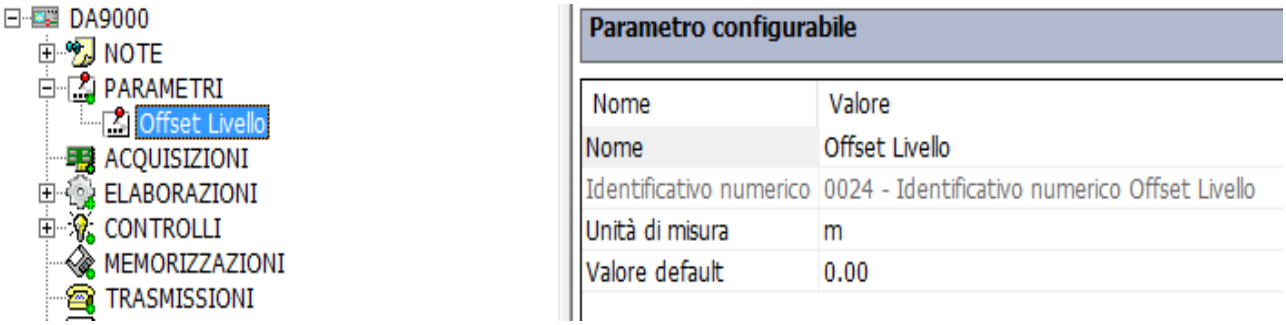
In questa funzione possono essere inseriti uno o più riferimenti mnemonici per annotare eventuali modifiche apportate alla configurazione, come pure l’autore ed altre informazioni utili.



4.2 Parameters

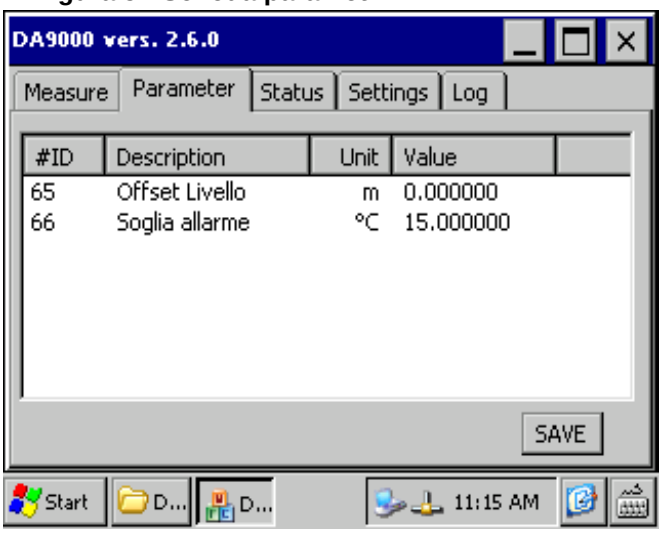
4.2.1 (Function: Configurable parameter)

With this function all the definitions of the parameters are inserted, that is, those variables that can be set both locally via keyboard or touch-screen or remotely via a specific parameter change command.



On the screen of the datalogger, this setting will be visible in the appropriate window (tag) of the parameters and it will be possible to make changes to these values by operating in the field on the touch-screen without having to use other tools.

Figura 5 - Scheda parametri



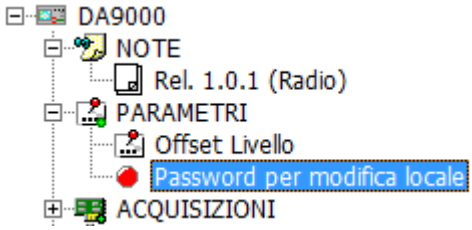
The parameter managed in this function can then be used within the configuration using the syntax: $<numero_parametro>. In the example above we see that the offset to be applied to the level measure is recorded in location 24. To use this parameter, you can put it in a formula with this syntax: M0+$24.

Where M0 is the raw measure of the level.

The Parameters function is also used to enter the plausibility limits of the measurements or the accepted variation limit between two consecutive measures obtaining the automatic validation of the measurements.

4.2.2 (Function: Password for local change)

It is also possible to define a password to avoid unauthorized changes to the parameters of the control unit.



Password per modifica locale

Nome	Valore
Nome	Password per modifica locale
Password	12345678

4.3 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.

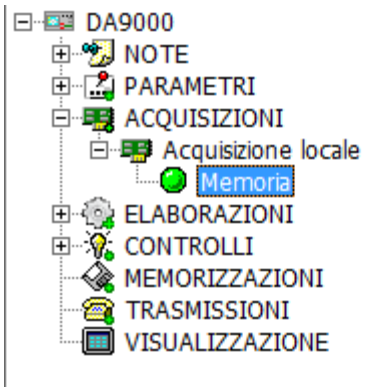
Each data are recorded, inside the data logger, in an already allocated memory location and it's make available in input to succeeding functions (e.g. elaboration functions).

4.3.1 (Local Acuisitions group)

Nome	Valore
Nome	Acquisizione locale
Intervallo interrogazione (sec)	1

In this group it is possible to set the frequency (cadence) of execution of the various functions contained in it and that we list below:

(funzione: Location memory)



Locazione memoria

Nome	Valore
Nome	Memoria
Locazione	34
Formula	M0^2
Limite minimo	-2000000000
Limite massimo	2000000000
Valore	0020 - Valore Memoria

This function is very important and allows me to manipulate the values present in the memory locations of the datalogger (typically a value acquired by an input channel) to be able to modify it according to additional formulas as in the example above where we see that the value contained in the Questa funzione è molto nella location number 34 (now associated with the variable M0), is raised to the square. The result of this operation is subjected to the criteria of minimum and maximum plausibility and finally the value is recorded in the new location of memory 20 and can in turn be resumed to submit it to other processing.

Using this function it is possible to perform even very complex formulas by introducing even more than one input value. It is sufficient to indicate in the formula the memory location with the syntax M<locazione>. For

example, for the calculation of the Dew-point, where it is necessary to interact with both temperature and humidity values, this programming structure is used:

Locazione memoria

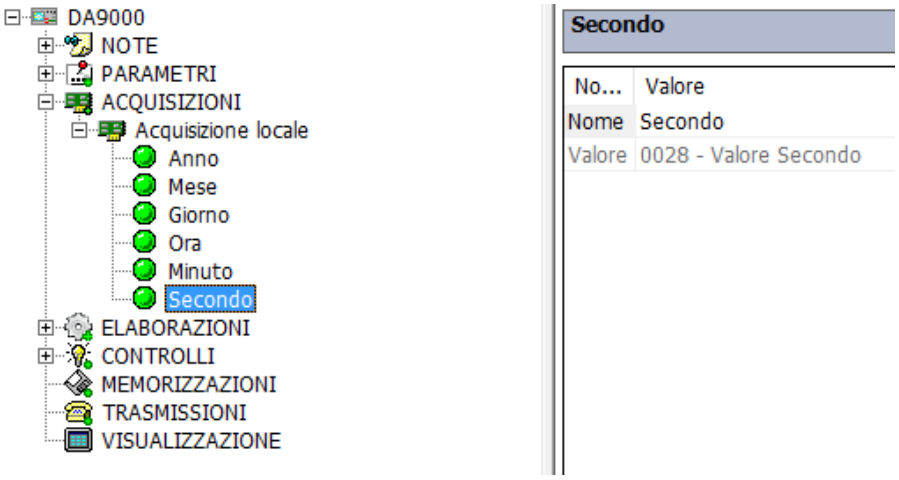
Nome	Valore
Nome	DEW POINT
Locazione	1
Formula	(237.7*(((17.27*M101)/(237.7+M101))+LN((M102/100))))/(17.27-(((17.27*M101)/(237.7+M101))+LN((M102/100))))
Limite minimo	-200
Limite massimo	200
Valore	0029 - Valore DEW POINT

Where M101 is the location that contains the temperature value and M102 the humidity value.

Within the Formula field it can also be used the logical conditions TRUE/FALSE, AND, OR, >, <, <>, etc. This is to be able to make formulas with different results based on certain logical conditions.

Appendix 1 lists all logical and mathematical operators that can be used in formulas.

4.3.2 (funzioni: Anno, Mese, Giorno, Ora, Minuto, Secondo)



Using these functions, you can transfer the values can be transfered of the system date and clock to some memory locations. These functions are useful for example to create the daily Julian minute or to realize particular automatisms related to the clock, such as timed switching on of a transmission device (see control group below). Using these functions, you can transfer the values of the system date and clock to some memory locations. These functions are useful for example to create the daily Julian minute or to realize particular automatisms related to the clock, such as timed switching on of a transmission device (see control group below).

4.3.3 (gruppo: Scheda base 9000)

Outdated or reserved functionality. Documentation is available on request.

4.3.4 (Group: base temperature 9000)

Outdated or reserved functionality. Documentation is available on request.

4.3.5 (Group: Riference 2.5V base 9000)

Outdated or reserved functionality. Documentation is available on request.

4.3.6 (Group: Smart sensor Store&Forward)

Outdated or reserved functionality. Documentation is available on request.

4.3.7 (Group: Smart sensor ISIDL/SISLP)

Outdated or reserved functionality. Documentation is available on request.

4.3.8 (Group: sensor SIAP 3820)

Outdated or reserved functionality. Documentation is available on request.

4.3.9 (Group: sensor SIAP 3840)

Outdated or reserved functionality. Documentation is available on request.

4.3.10 (Group: Sensor SIAP 3840/3840P series)

Outdated or reserved functionality. Documentation is available on request.

4.3.11 (Group: Sensor SDI-12)

Sensore SDI-12

Nome	Valore
Nome	Sensore SDI-12
Identificativo hardware	0
Intervallo interrogazione (sec)	10
Comando misurazione	M!
Tempo anticipo misurazione (sec)	10
Timeout comunicazione (msec)	1000

In this group it is possible to define the sensors to be acquired using the SDI-12 protocol. It is possible to define the number of the sensor with its hardware identifier, the interval (cadence) of query expressed in seconds, the command to indicate to the sensor to make the measurements (typically M!), the time of advance measurement that defines how many seconds before the reading commands (D0!, D1!, etc.) must be given the command M! and finally the maximum time-out for waiting for the response from the sensor.

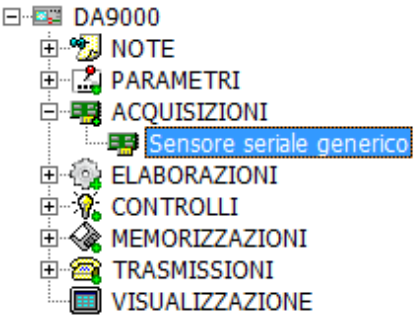
(function: Misura SDI-12)

Misura SDI-12

Nome	Valore
Nome	Temperatura
Canale	0 - D0!
Posizione valore	1
Ritardo acquisizione (sec)	0
Formula	M0/10
Limite minimo	-50
Limite massimo	60
Istantanea	0020 - Istantanea Temperatura

With this function, the actual reading of the SDI-12 measurement is carried out. The nime of the measure is defined, the channel from which to obtain the information (drop-down menu with the possibility of indicating various values of the Dx! command, the position of the measurement in the response string obtained by the sensor, any acquisition delay between one measurement and the next, the formula to convert or adapt the value just acquired (in this case we tell the datalogger to divide by 10 the raw value read by the sensor) and finally the limits of plausibility of the measurement. The final value will be saved in this case in memory location number 20.

4.3.12 (gruppo: serial generic sensor)

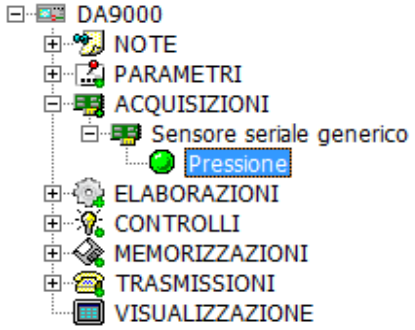


Sensore seriale generico

Nome	Valore
Nome	Sensore seriale generico
Porta seriale di comunicazione	1 - COM1
Velocità porta seriale (bps)	9600 -
Bits di dati	8 -
Parità	0 - None
Bits di stop	0 - 1 bit
Timeout comunicazione (msec)	1000

In this group it is possible to set the acquisition of a generic serial sensor, understood as a device that can be queried by means of a command to which it responds by providing the value of the desired measure.

(function: Measurement channel)



Canale misura

Nome	Valore
Nome	Pressione
Comando	M
Caratteri di testa	MIS=
Caratteri di coda	hPa
Intervallo acquisizione (sec)	60
Formula	M0
Limite minimo	500
Limite massimo	1100
Istantanea	0011 - Istantanea Pressione

For example, let's say we have a sensor that returns a measurement of atmospheric pressure in this format: MIS=1012.3 hPa. In this case we must enter the appropriate command and also define the appropriate head and tail characters to intercept the desired numerical value.

It is also possible to omit the Command field if we are faced with a sensor that autonomously sends the output measurements on the serial port. In this case it is important to define how often the sensor provides the output value and adjust the time-out on the communication accordingly, increasing it as needed.

4.3.13 (Group: Sensor MODBUS standard)

Sensore MODBUS standard

Nome	Valore
Nome	Sensore MODBUS
ID hardware	1
Porta di comunicazione	3 - COM3
Velocità porta seriale (bps)	9600 -
Bits di dati	8 -
Parità	0 - None
Bits di stop	0 - 1 bit
Indirizzo IP	0.0.0.0
Porta TCP/IP	502
Intervallo interrogazione (sec)	10
Codice funzione	03 - Read Holding Registers
Indirizzo di partenza	0001
Quantità dati richiesti	1
Timeout comunicazione (msec)	200
Ritardo (msec)	0

In this group, sensors with ModBUS interface are managed. It is possible to manage by entering the appropriate hardware addresses and reading pointers, both sensors in serial RTU mode and Ethernet TCP / IP.

(funzione: Misure)

Misura

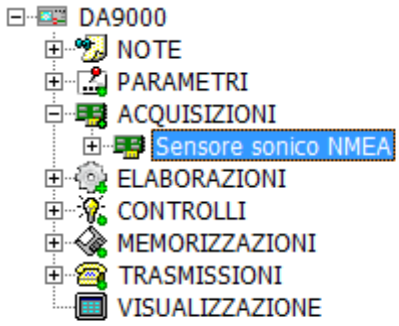
Nome	Valore
Nome	Torbidità
Indirizzo dato	1
Tipo	2 - Floating-point (4 bytes)
Formula	M0/10
Limite minimo	0
Limite massimo	2000
Istantanea	0020 - Istantanea Torbidità

With this function you interact with the ModBUS measurement query group indicating the reading address (position of the desired data within the requested data block), the type of size that can be: Boolean (0/1), Integer (16bit), Floating-point (4 bytes), Swapped Float (4 bytes), Long integer (32-bit) and Swapped Long (32-bit). Here too you can immediately apply a conversion formula to be applied to the value just read.

4.3.14 (Group: Sensor GEOSIS)

Outdated or reserved functionality. Documentation is available on request.

4.3.15 (Gruop: Standard sensor NMEA)



Sensore standard NMEA

Nome	Valore
Nome	Sensore sonico NMEA
Prefisso identificativo	GPRMC
Porta seriale di comunicazione	3 - COM3
Velocità porta seriale (bps)	4800 -
Intervallo interrogazione (sec)	3
Timeout comunicazione (msec)	1000

This group allows tp acquire sensors with NMEA protocol. Here you can define the prefix of the NMEA message (the character $ is omitted) the serial port and its communication speed, as well as the frequency of querying the measurements and the waiting time-out of the answers.

(funzione: Misura)

Misura

Nome	Valore
Nome	Velocità vento
Posizione dato	1
Formula	
Limite minimo	0
Limite massimo	60
Istantanea	0011 - Istantanea Velocità vento

This group allows to acquire sensors with NMEA protocol. Here you can define the prefix of the NMEA message (the character $ is omitted) the serial port and its communication speed, as well as the frequency of querying the measurements and the waiting time-out of the answers.

4.3.16 (gruppo: Ricevitore GPS protocollo NMEA (GGA))

Outdated or reserved functionality. Documentation is available on request.

4.3.17 (group: Barometro Vaisala PTB series)

Outdated or reserved functionality. Documentation is available on request.

4.3.18 (group: Barometro SETRA 470)

Outdated or reserved functionality. Documentation is available on request.

4.3.19 (group: Ondametro SIAP+MICROS)

or reserved functionality. Documentation is available on request.

4.3.20 (group: Module ASCON IO-MB/AI-04RT)

Outdated or reserved functionality. Documentation is available on request.

4.3.21 (group: Modulo ASCON IO-MB/AI-08HL)

Outdated or reserved functionality. Documentation is available on request

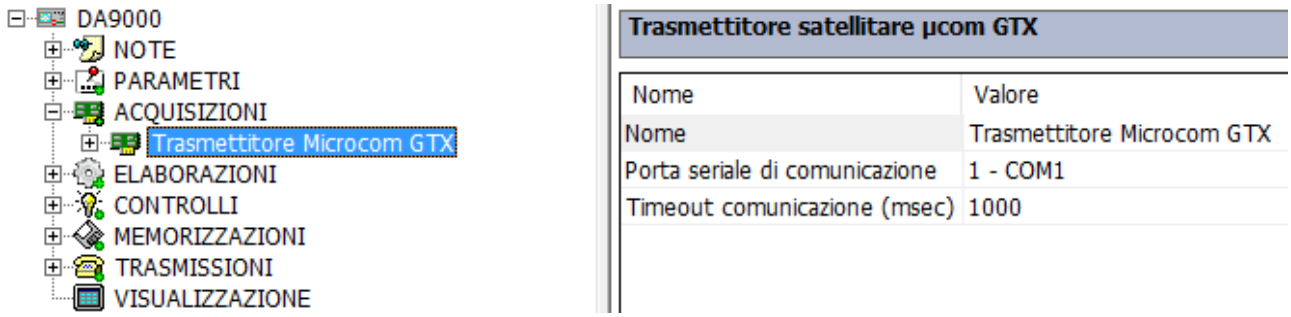
4.3.22 (group: Modulo ASCON IO-MB/DI-16VL)

Outdated or reserved functionality. Documentation is available on request

4.3.23 (group: Modulo ASCON IO-MB/DO-16TS)

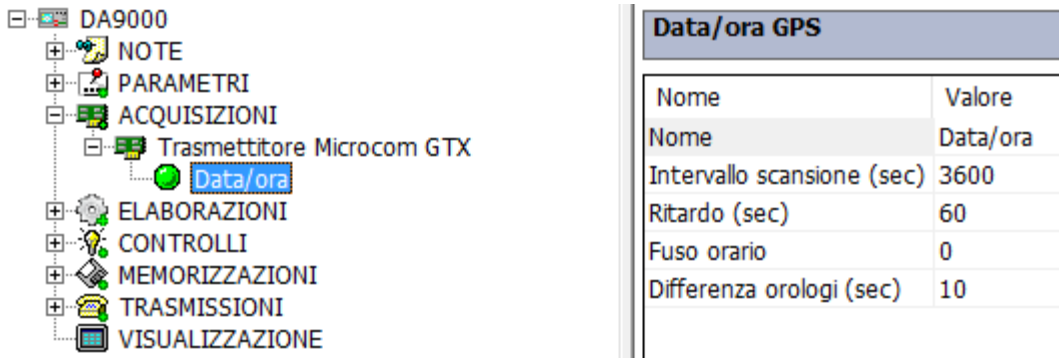
Outdated or reserved functionality. Documentation is available on request

4.3.24 (group: Trasmettitore satellitare µcom GTX



This group allows to define the communication port on which the Microcom GTX/GTX2 satellite radio usually used for GOES/METEOSAT communications is connected with the aim of being able to extract from it the information of the watch (GPS) and with this synchronize the clock of the datalogger.

(funzione: Data/ora GPS)



This function allows to define the execution interval of the clock synchronization command, in addition to the scan (3600 in the example) it could have an additional delay of 60 seconds to avoid having the synchronization of the clock perform right at the end of the hour. You can set the Time zone (Time zone; 0 = GMT/UTC) and the permissible deviation threshold between the GPS clock and the clock that is set for synchronization to take place.

4.3.25 (group: Visibilimetro Campbell Scientific PWS100)

Outdated or reserved functionality. Documentation is available on request

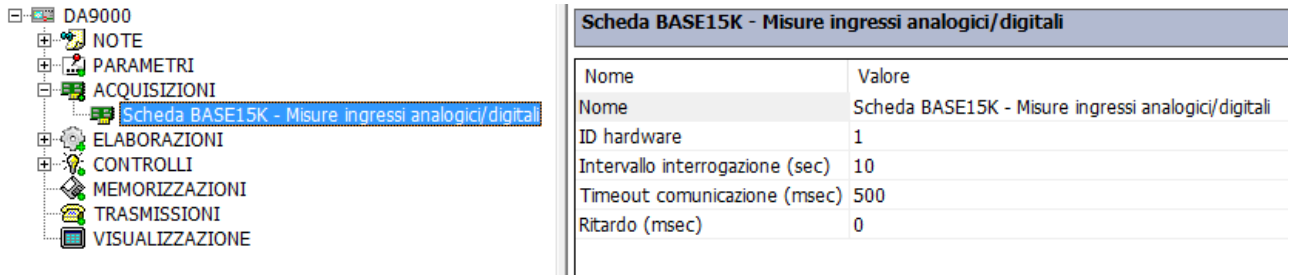
4.3.26 (group: Sonda STS DL/N)

Outdated or reserved functionality. Documentation is available on request

4.3.27 (group: Sonda SBE 26plus)

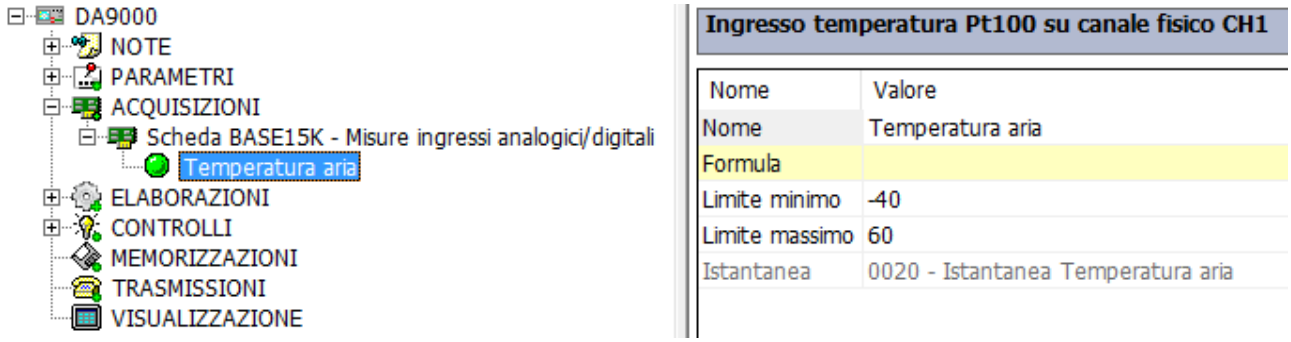
Outdated or reserved functionality. Documentation is available on request

4.3.28 (group: Scheda BASE15K - Analog/digital input measurements)



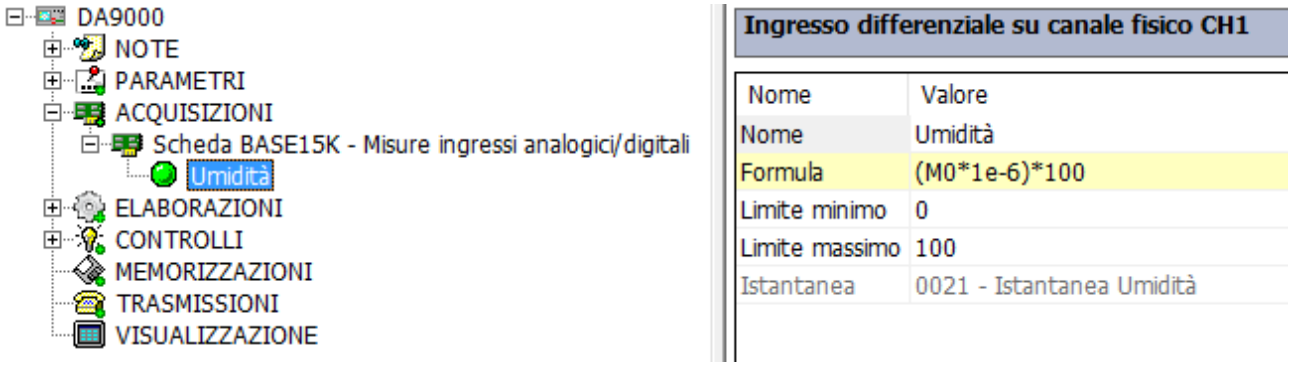
In this group, you can define how to query the datalogger capture base. It is possible to indicate the hardware ID of the device (default:1), the interval (cadence) of query of the connected measurements on the base, the time-out for waiting for the response and an optional delay that can be inserted to slow down the acquisition cycle of several bases connected in cascade.

(function: temperature Input Pt100 on physical channel CH1, CH2, CH3 e CH4)



This function allows you to acquire a temperature measurement from a Pt100 thermistor connected to channels 1, 2, 3 and 4. Typically these functions do not require the conversion formula because the measure that is saved in memory (M20 in this example) is already expressed in °C. If you wanted to have a measure expressed in °F then in the formula you could enter: (M0*1.8)+32.

(function: Differential input on physical channel CH1, CH2, CH 3 and CH4)



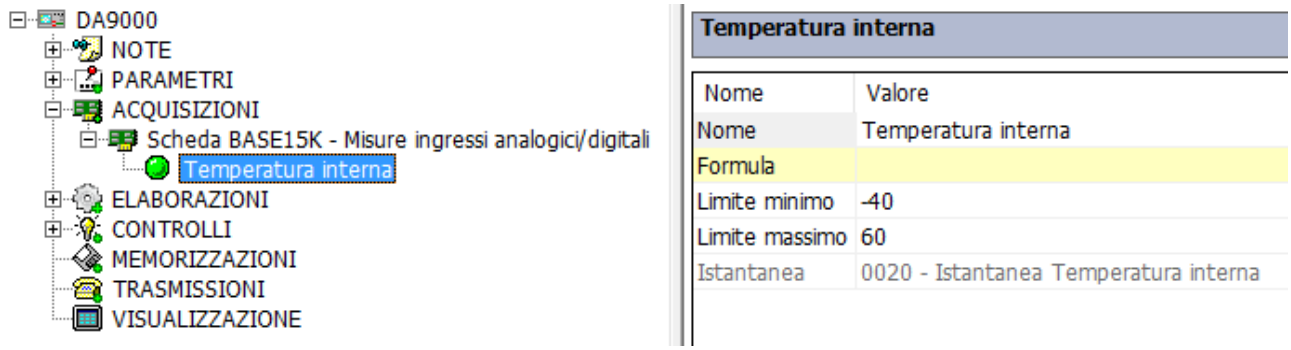
This function acquires an analog measurement (voltage) from input channels 1, 2, 3 and 4. The raw measurement returned (before the possible conversion formula) is always expressed in microvolts (µV). In ns. example we have an example of using channel 1 to acquire a humidity sensor with analog output 0/1Volt

and with range 0/100%. As seen, the raw measurement in microvolts is immediately converted back into a value in volts and then multiplied by 100 thus obtaining the desired range. Downstream of the formula we have as usual the verification of the plausibility of the measure with the minimum and maximum limits of acceptability. (function: Single-ended input on physical channel from CH5 to CH16)

This function is the same in all respects to the previous one with the only difference that the channels from CH5 to CH16 are with reference of the negative pole connected to ground while the channels from CH1 to CH4 can be connected in differential mode.

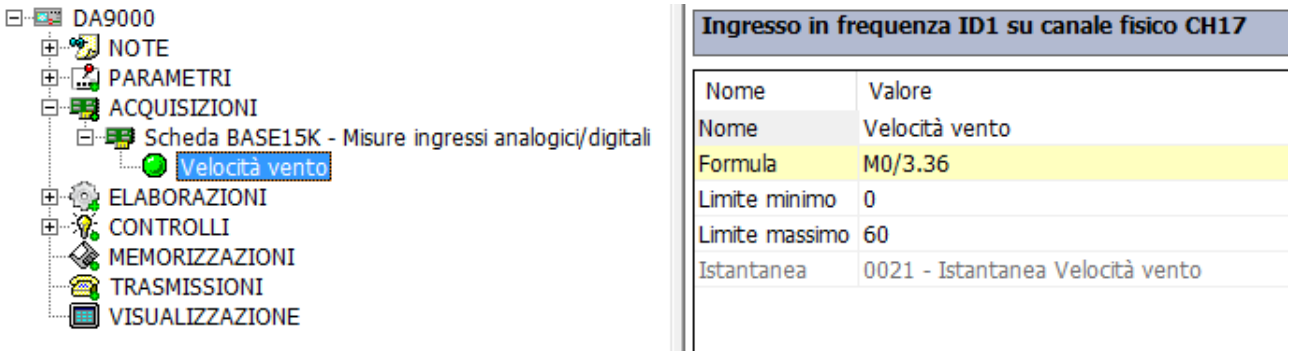
A special mention is made for the CHANNELS CH8, CH9, CH14 and CH15. These channels can be enabled, through a dip-switch located on the top panel of the datalogger base board (it is accessed by unscrewing the two screws that are on the sides of the datalogger itself and lifting the upper box) to connect a 100 Ohm precision resistance to its garments. Using this shunt resistance it is therefore possible to easily convert the input from voltage to current and is therefore suitable for acquiring sensors with 4/20mA output. In this case the corrective formula will have to be adapted. Below we give an example of a level sensor with a range of 0/15 meters and with a 4/2mA output. The formula to be introduced will be as follows: (M0*1e-6)-0.4*(15/1.6). Where 0.4 is the voltage present at the ends of the shunt resistance when this is traveled by a current of 4 mA while 1.6 is the difference given by 2Volt minus 0.4 mA.

(Function: Internal temperature)



This function acquires the value of the internal temperature of the datalogger board and is therefore useful to have a sufficiently faithful indication of the temperature of the box in which it is housed. Also in this case it is not necessary to apply the conversion formula since the recorded value is already expressed in °C.

(Function: ID1 frequency input on physical channel CH17 and CH18)

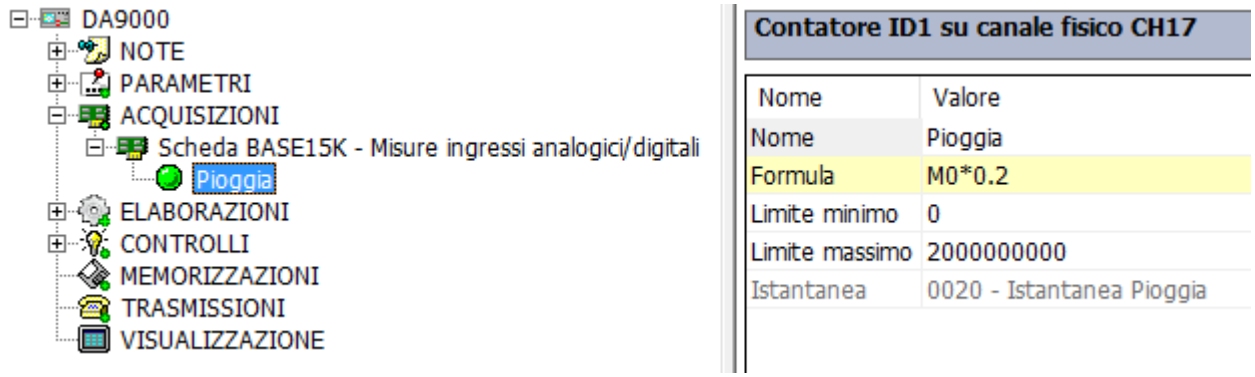


Using this function it is possible to acquire electrical quantities in the form of square-wave frequency signals. Typically traditional wind speed sensors have this type of output. In the example shown we see how to interface a cup sensor with instrumental constant of 3.36 Hz / m / s.

(Function: ID3 to ID8 frequency input over physical channel DIG_IN_A and DIG_IN_B)

This function is identical to the previous one, only it refers to other input channels.

(Function: ID1 counter on physical channel CH17 and CH18)

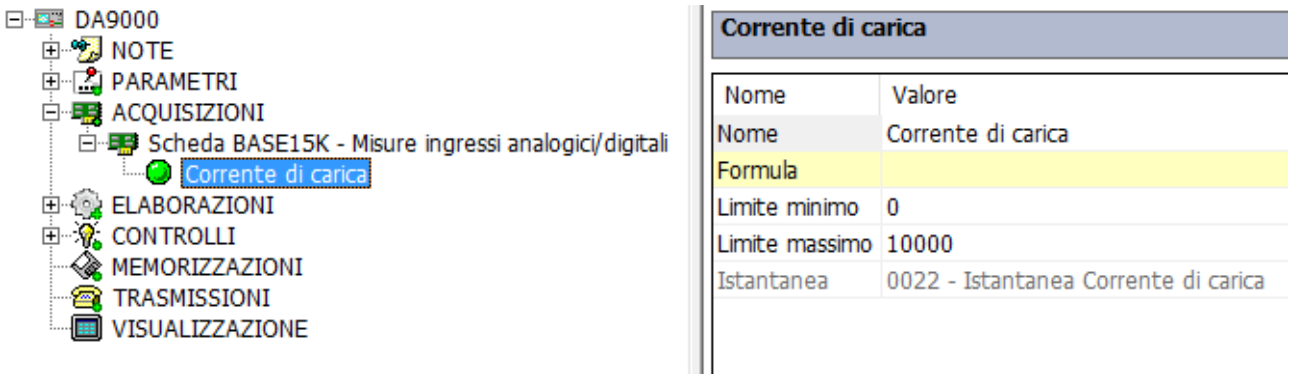


The counter function allows to acquire the number of closures of the contact associated with the indicated channel detected in the defined scanning period. The input channel typically comes from a clean contact present in tilt pluviometers. Each switching of the bascula corresponds to an electrical impulse that is counted by means of an instrumental constant. In the example shown there is a rain gauge with an instrumental constant of 0.2 mm for each tilt.

(Function: ID3 to ID8 counter on physical channel DIG_IN_A and DIG_IN_B)

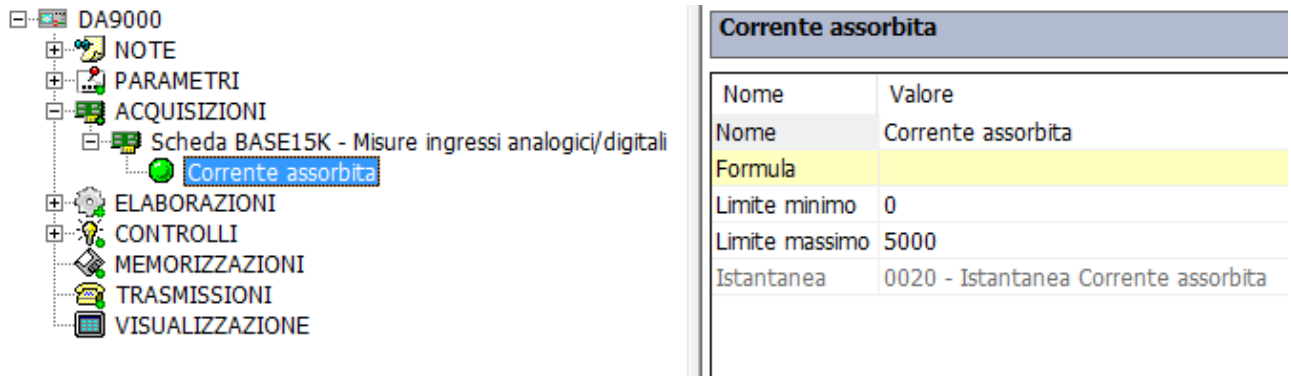
This function is identical to the previous one, only it refers to other input channels.

(Function: Charging current)



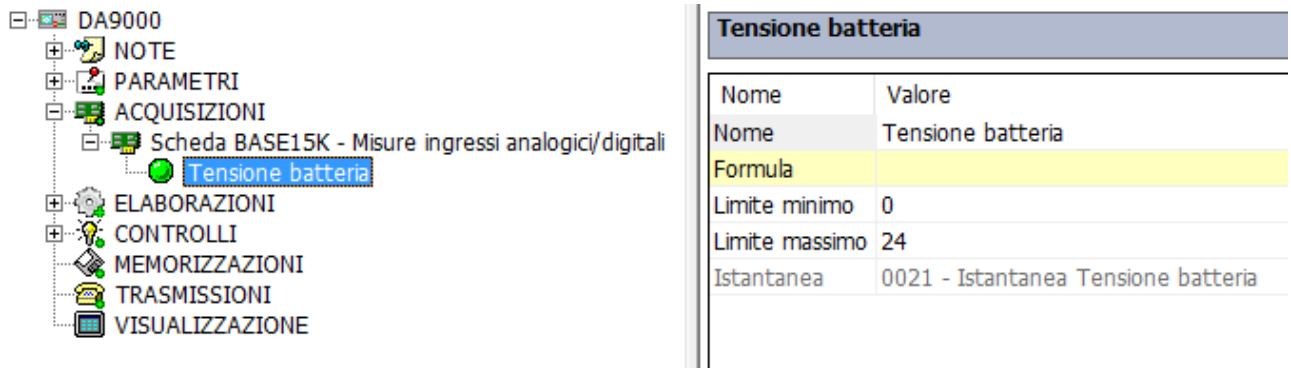
With this function you can request the charge value of the battery connected to the datalogger. The Formula field can be left blank, the measure is expressed in milliamps.

(Function: Current consumption)



With this function you can request the discharge value of the battery connected to the datalogger. The Formula field can be left blank, the measure is expressed in milliamps.

(Function: Battery voltage)



With this function you can request the value of the battery voltage. The Formula field can be left blank, the measurement is expressed in Volts.

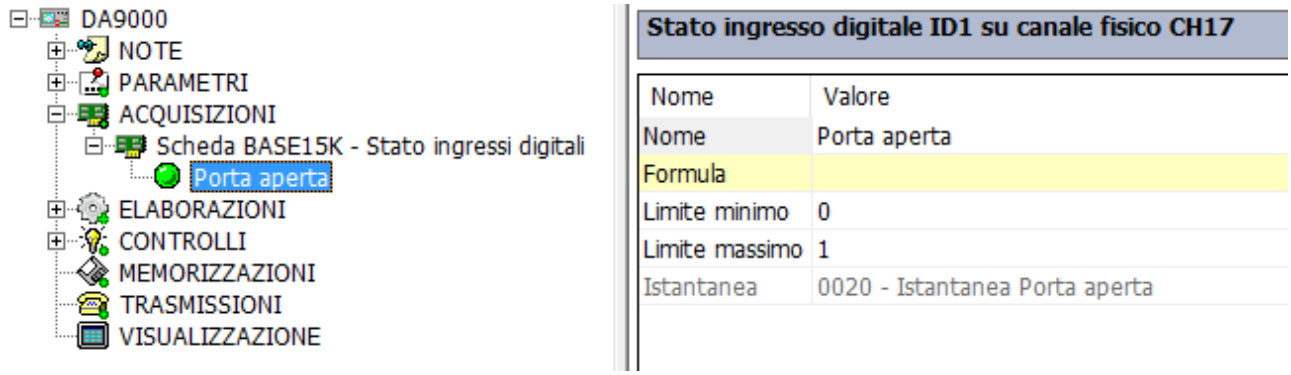
(Function: Solar Panel Tracking)

Outdated or reserved functionality. Documentation is available on request.

4.3.29 (group: Scheda BASE15K – Digital input states)

In this group, It can be defined how to query the datalogger capture base. It is possible to indicate the hardware ID of the device (default:1), the interval (cadence) of query of the connected measurements on the base, the time-out for waiting for the response and an optional delay that can be inserted to slow down the acquisition cycle of several bases connected in cascade.

(Function: ID1 to ID8 digital input status on physical channels CH17, CH18, DIG_IN_A and DIG_IN_B)



This function allows you to capture the status of a digital input. Typically this function is used to know the status of a contact (open door) or can be used to count the duration of the closure of a contact (Heliophania, Leaf wetting, etc.).

To configure a channel as a time counter (minutes of leaf wetness for example) we proceed in this way: Knowing the cadence of execution from the function, let's say every 10", the following value is inserted into the formula: M0*(10/60). In doing so we obtain that at each cycle, only a portion of the time of the minute is

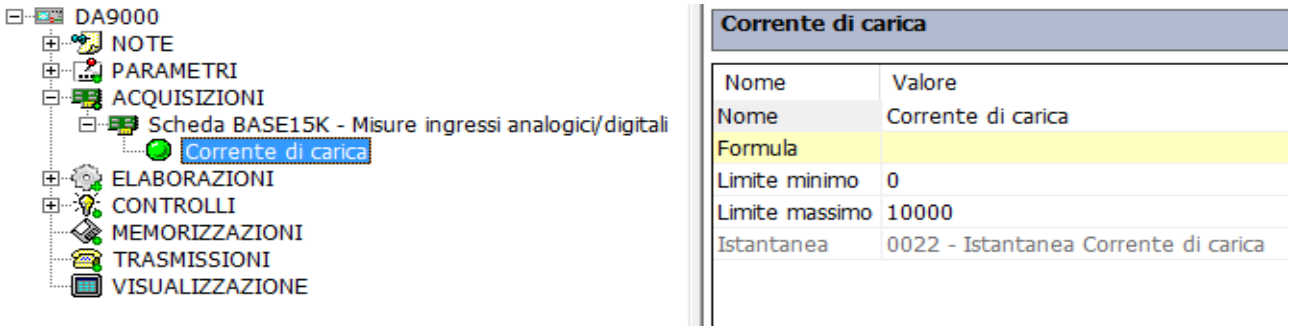
counted. It will then be sufficient to set up an accumulation acquisition processing (see §Processing) to obtain the contact closing minute counter, i.e. the wetting minutes within the desired range.

(Function: Charger digital status PIN 1 and PIN 2)

Outdated or reserved functionality. Documentation is available on request.

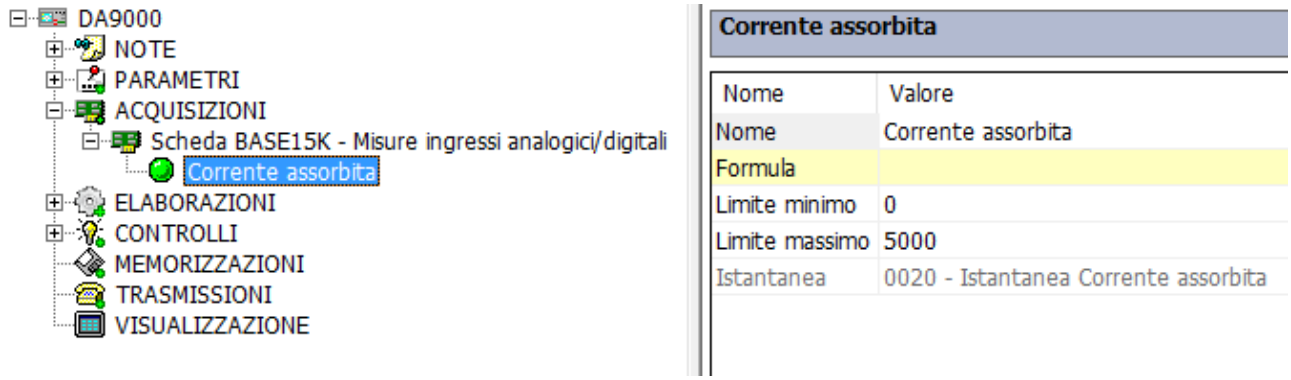
function is identical to the previous one, only it refers to other input channels.

(Function: Charging current)

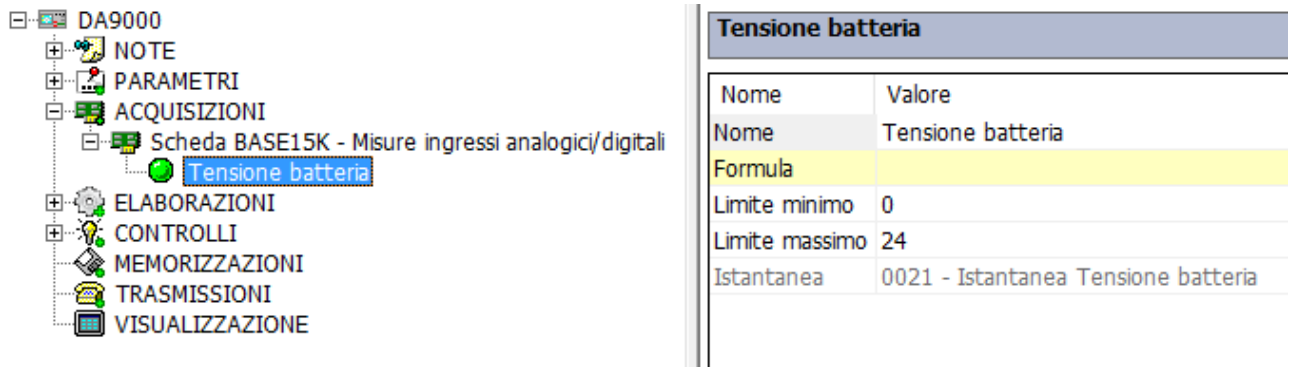


With this function you can request the charge value of the battery connected to the datalogger. The Formula field can be left blank, the measure is expressed in milliamps.

(Function: Current consumption)



With this function you can request the discharge value of the battery connected to the datalogger. The Formula field can be left blank, the measure is expressed in milliamps.
(Function: Battery voltage)



With this function you can request the value of the battery voltage. The Formula field can be left blank, the measurement is expressed in Volts.

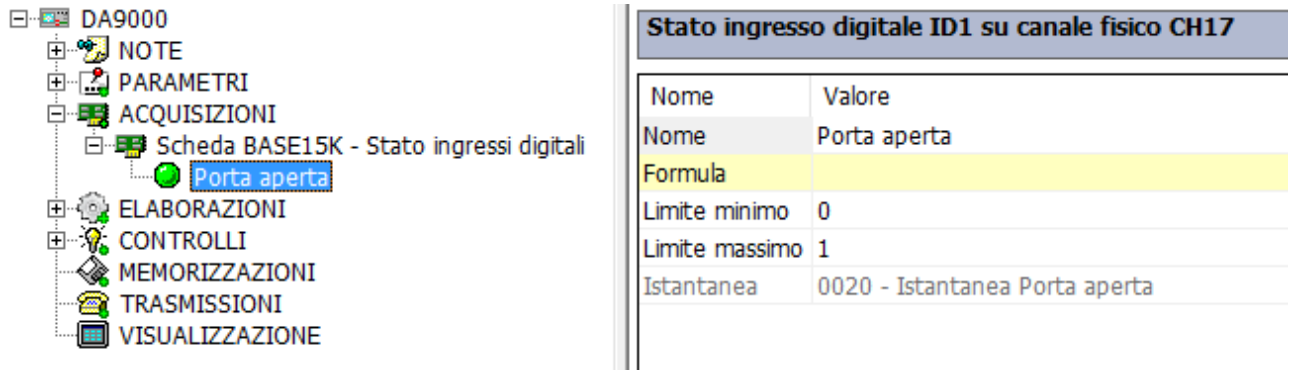
(Function: Solar Panel Tracking)

Outdated or reserved functionality. Documentation is available on request.

4.3.30 (group: Scheda BASE15K – Digital input states)

In this group, It can be defined how to query the datalogger capture base. It is possible to indicate the hardware ID of the device (default:1), the interval (cadence) of query of the connected measurements on the base, the time-out for waiting for the response and an optional delay that can be inserted to slow down the acquisition cycle of several bases connected in cascade.

(Function: ID1 to ID8 digital input status on physical channels CH17, CH18, DIG_IN_A and DIG_IN_B)



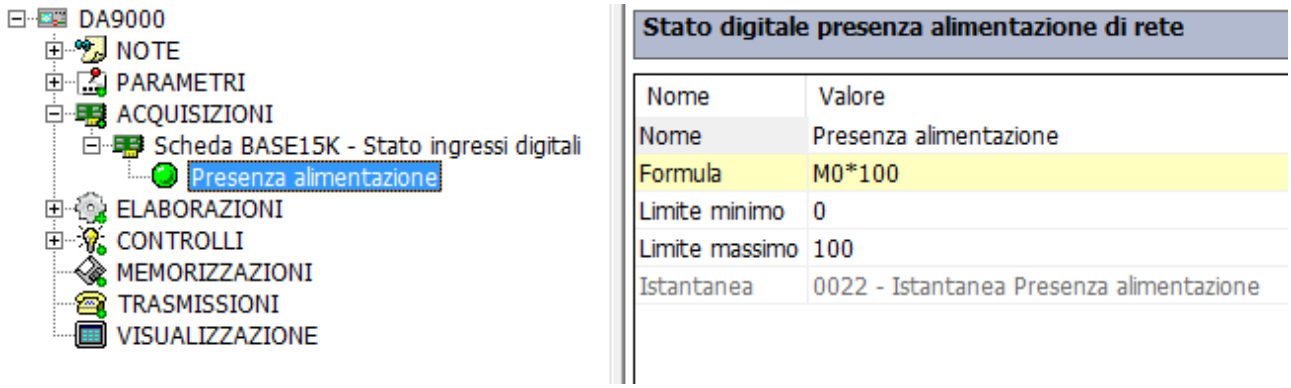
This function allows you to capture the status of a digital input. Typically this function is used to know the status of a contact (open door) or can be used to count the duration of the closure of a contact (Heliophania, Leaf wetting, etc.).

To configure a channel as a time counter (minutes of leaf wetness for example) we proceed in this way: Knowing the cadence of execution from the function, let's say every 10", the following value is inserted into the formula: M0*(10/60). In doing so we obtain that at each cycle, only a portion of the time of the minute is counted. It will then be sufficient to set up an accumulation acquisition processing (see §Processing) to obtain the contact closing minute counter, i.e. the wetting minutes within the desired range.

(Function: Charger digital status PIN 1 and PIN 2)

Outdated or reserved functionality. Documentation is available on request.

(Function: Digital status presence mains power supply)



This function returns a value of 0 or 1 based on the presence of power on the VDC power terminals. This function returns in practice the status of the presence of power supply of the control unit and the proper functioning of the power supply. If we want to convert this state value 0/1 to a percentage value, then it is possible to intervene in the corrective formula as indicated above. This expedient allows us to subsequently process the value as an arithmetic average that will give us the information of the total percentage of network presence in the chosen time interval (eg: hourly or daily).

4.3.31 (Group: Digital Output Status from OD1 to OD8 (DIG OUT))

Outdated or reserved functionality. Documentation is available on request.

4.3.32 (group: Scheda BASE15K – Analog output values)

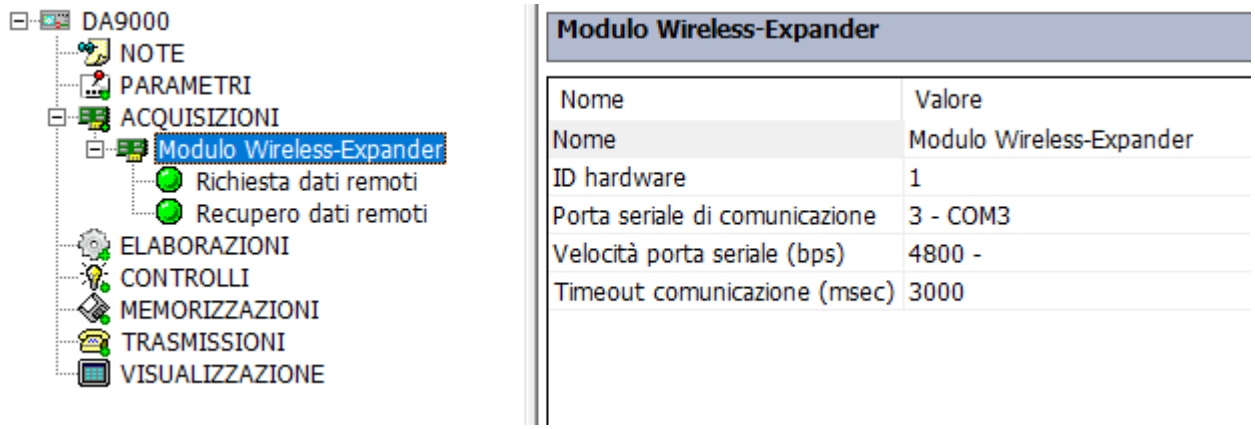
Outdated or reserved functionality. Documentation is available on request.

4.3.33 (group: Scheda BASE15K – Extension of measurements analog inputs)

Outdated or reserved functionality. Documentation is available on request..

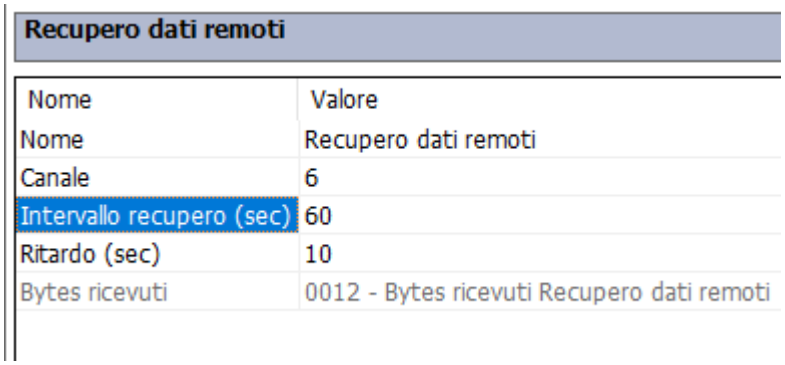
4.3.34 (group: Modulo Wireless-Expander)

This group allows to efficiently acquire the historical data stored by remote sensors usually connected with short-range radio equipment (Wireless-Expander modules). For communication you must set the hardware ID of the remote module (default:1) and the parameters of the serial port:



The group inserts two separate functions, the first for the normal request of the data that must be cadenced equal to the remote storage interval and the other for the possible recovery of the data that will be activated only in case of non-communication. The latter can be performed with a higher scan. On both it is possible to set a query delay, especially for the cadenced request the delay will be useful to ensure the presence of the data at the time of the call.

Set the file number to be read on the remote device as the capture channel (default: n.6):



Recupero dati remoti

Nome	Valore
Nome	Recupero dati remoti
Canale	6
Intervallo recupero (sec)	60
Ritardo (sec)	10
Bytes ricevuti	0012 - Bytes ricevuti Recupero dati remoti

For the correct acquisition of data from the Wireless-Expander modules, it is also necessary to include the clock synchronization control and the storage of the remote archive in the configuration. See in this regard the paragraphs:

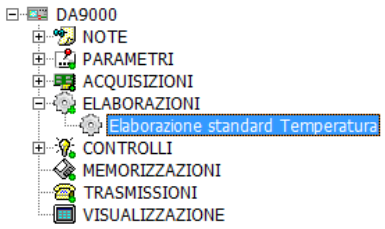
4.5.13 Function: Remote Clock Synchronization

4.6.6 Function: Remote data storage

4.4 Processing

The insertion of a Processing function allows to process the data according to the desired needs in such a way as to obtain other processed data. The effect in practice, is to take some information input to the function and then produce one or more results at the exit of the same. The parameters to be specified in the function can be different and variable depending on the type of processing chosen. Normally the memory locations of the incoming data requested are chosen from the channels already configured.

4.4.1 (Function: Standard Processing)



Elaborazione standard

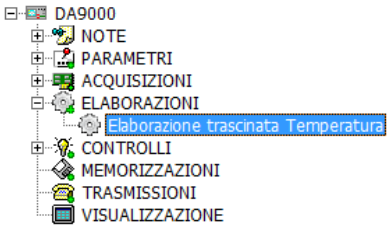
Nome	Valore
Nome	Elaborazione standard Temperatura
Intervallo elaborazione (sec)	3600
Sfasamento (sec)	0
Tasso minimo dati validi (%)	0
Misura	0011 - Istantanea Pt100 CH1
sommatoria	0070 - sommatoria Pt100 CH1 (Elaborazione standard Temperatura)
contatore	0071 - contatore Pt100 CH1 (Elaborazione standard Temperatura)
contatore dati validi	0072 - contatore dati validi Pt100 CH1 (Elaborazione standard Temperatura)
media	0073 - media Pt100 CH1 (Elaborazione standard Temperatura)
minimo	0074 - minimo Pt100 CH1 (Elaborazione standard Temperatura)
minuto del minimo	0075 - minuto del minimo Pt100 CH1 (Elaborazione standard Temperatura)
massimo	0076 - massimo Pt100 CH1 (Elaborazione standard Temperatura)
minuto del massimo	0077 - minuto del massimo Pt100 CH1 (Elaborazione standard Temperatura)
% di dati validi	0078 - % di dati validi Pt100 CH1 (Elaborazione standard Temperatura)
varianza	0079 - varianza Pt100 CH1 (Elaborazione standard Temperatura)
deviazione standard	0080 - deviazione standard Pt100 CH1 (Elaborazione standard Temperatura)
riferimento misura	0081 - riferimento misura Pt100 CH1 (Elaborazione standard Temperatura)
scostamento misura	0082 - scostamento misura Pt100 CH1 (Elaborazione standard Temperatura)

This function allows you to obtain post-processing at the end of the indicated processing period (3600 seconds in our example). The values mainly used are, The arithmetic mean (present in the location 73), the minimum and maximum value recorded in the range, (respectively stored in the location 74 and 76), the daily Julian minute of the time when the minimum and maximum values were detected and to follow other calculations useful for statistical purposes. These memory locations will then be reused later as for example in the storage section.

You can specify a phase shift value to move the time on which to synchronize the execution of the function. A typical example is when you want to carry out a daily processing but you do not want to make it coincide with midnight, but with 9 am. In this case you have to enter the value of 32400 seconds in this field. This postponed daily processing is used, for example, to align the data with the historical surveys of daily rainfall that in the past was carried out at 9 am.

To automatically invalidate the results of the function if a certain number of valid samples of samples are not reached, you can set the Minimum valid data rate (%). Leaving at zero, the processed values will be considered valid even if only one valid value is detected in the range.

4.4.2 (Function: Processing Dragged)

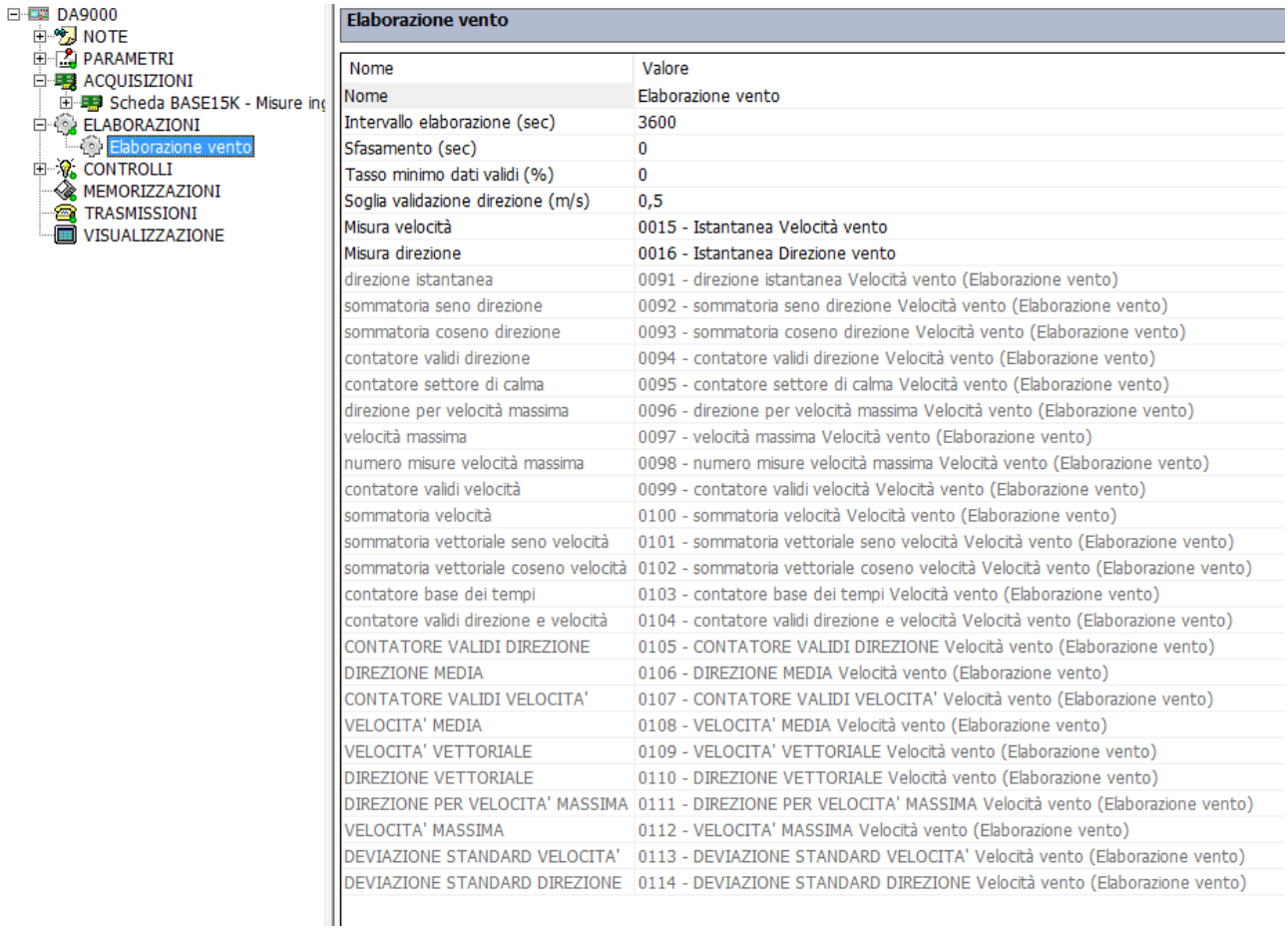


Elaborazione trascinata

Nome	Valore
Nome	Elaborazione trascinata Temperatura
Intervallo di osservazione (sec)	900
Tasso minimo dati validi (%)	0
Misura	0011 - Istantanea Pt100 CH1
contatore	0083 - contatore Pt100 CH1 (Elaborazione trascinata Temperatura)
contatore dati validi	0084 - contatore dati validi Pt100 CH1 (Elaborazione trascinata Temperatura)
% di dati validi	0085 - % di dati validi Pt100 CH1 (Elaborazione trascinata Temperatura)
accumulata mobile	0086 - accumulata mobile Pt100 CH1 (Elaborazione trascinata Temperatura)
media mobile	0087 - media mobile Pt100 CH1 (Elaborazione trascinata Temperatura)
deriva mobile	0088 - deriva mobile Pt100 CH1 (Elaborazione trascinata Temperatura)
minima mobile	0089 - minima mobile Pt100 CH1 (Elaborazione trascinata Temperatura)
massima mobile	0090 - massima mobile Pt100 CH1 (Elaborazione trascinata Temperatura)

This function allows you to obtain dragged processing such as: the moving average, the minimum and maximum moving, etc. referring to an observation period (scrolling window). This function is very useful to know, for example, the amount of rain that has fallen in the last 3 hours (mobile drift measurement and observation range 10800).

4.4.3 (Function: Wind Processing)



Elaborazione vento

Nome	Valore
Nome	Elaborazione vento
Intervallo elaborazione (sec)	3600
Sfasamento (sec)	0
Tasso minimo dati validi (%)	0
Soglia validazione direzione (m/s)	0,5
Misura velocità	0015 - Istantanea Velocità vento
Misura direzione	0016 - Istantanea Direzione vento
direzione istantanea	0091 - direzione istantanea Velocità vento (Elaborazione vento)
sommatoria seno direzione	0092 - sommatoria seno direzione Velocità vento (Elaborazione vento)
sommatoria coseno direzione	0093 - sommatoria coseno direzione Velocità vento (Elaborazione vento)
contatore validi direzione	0094 - contatore validi direzione Velocità vento (Elaborazione vento)
contatore settore di calma	0095 - contatore settore di calma Velocità vento (Elaborazione vento)
direzione per velocità massima	0096 - direzione per velocità massima Velocità vento (Elaborazione vento)
velocità massima	0097 - velocità massima Velocità vento (Elaborazione vento)
numero misure velocità massima	0098 - numero misure velocità massima Velocità vento (Elaborazione vento)
contatore validi velocità	0099 - contatore validi velocità Velocità vento (Elaborazione vento)
sommatoria velocità	0100 - sommatoria velocità Velocità vento (Elaborazione vento)
sommatoria vettoriale seno velocità	0101 - sommatoria vettoriale seno velocità Velocità vento (Elaborazione vento)
sommatoria vettoriale coseno velocità	0102 - sommatoria vettoriale coseno velocità Velocità vento (Elaborazione vento)
contatore base dei tempi	0103 - contatore base dei tempi Velocità vento (Elaborazione vento)
contatore validi direzione e velocità	0104 - contatore validi direzione e velocità Velocità vento (Elaborazione vento)
CONTATORE VALIDI DIREZIONE	0105 - CONTATORE VALIDI DIREZIONE Velocità vento (Elaborazione vento)
DIREZIONE MEDIA	0106 - DIREZIONE MEDIA Velocità vento (Elaborazione vento)
CONTATORE VALIDI VELOCITA'	0107 - CONTATORE VALIDI VELOCITA' Velocità vento (Elaborazione vento)
VELOCITA' MEDIA	0108 - VELOCITA' MEDIA Velocità vento (Elaborazione vento)
VELOCITA' VETTORIALE	0109 - VELOCITA' VETTORIALE Velocità vento (Elaborazione vento)
DIREZIONE VETTORIALE	0110 - DIREZIONE VETTORIALE Velocità vento (Elaborazione vento)
DIREZIONE PER VELOCITA' MASSIMA	0111 - DIREZIONE PER VELOCITA' MASSIMA Velocità vento (Elaborazione vento)
VELOCITA' MASSIMA	0112 - VELOCITA' MASSIMA Velocità vento (Elaborazione vento)
DEVIAZIONE STANDARD VELOCITA'	0113 - DEVIAZIONE STANDARD VELOCITA' Velocità vento (Elaborazione vento)
DEVIAZIONE STANDARD DIREZIONE	0114 - DEVIAZIONE STANDARD DIREZIONE Velocità vento (Elaborazione vento)

This function carries out with the set cadence, the processing of the anemological quantities connected to the control unit. The required input channels are: memory 15 containing the instantaneous value of the wind speed and memory 16 containing the instantaneous value of the wind direction.

It is possible to specify a phase shift value to move the time on which to synchronize the execution of the function. A typical example is when you want to carry out a daily processing but you do not want to make it coincide with midnight, but with 9 am. In this case you have to enter the value of 32400 seconds in this field. In this case you have to enter the value of 32400 seconds in this field. This postponed daily processing is used, for example, to align the data with the historical surveys of daily rainfall that in the past was carried out at 9 am.

To automatically invalidate the results of the function if a certain number of valid samples of samples are not reached, you can set the Minimum valid data rate (%). Leaving at zero, the processed values will be considered valid even if only one valid value is detected in the range.

To prevent the wind direction from being considered valid in calm wind conditions, it is possible to define a minimum wind speed threshold below which the wind direction is considered unreliable. The most important measures generated by this function are capitalized. As It can can seen, both scalar and vector measurements are available for both quantities, as well as the measurement of the maximum gust of the wind and its direction.

4.4.4 (function: Wind direction processing (ICAO))

Outdated or reserved functionality. Documentation is available on request.

4.4.5 (function: Wind speed processing (ICAO))

Outdated or reserved functionality. Documentation is available on request.

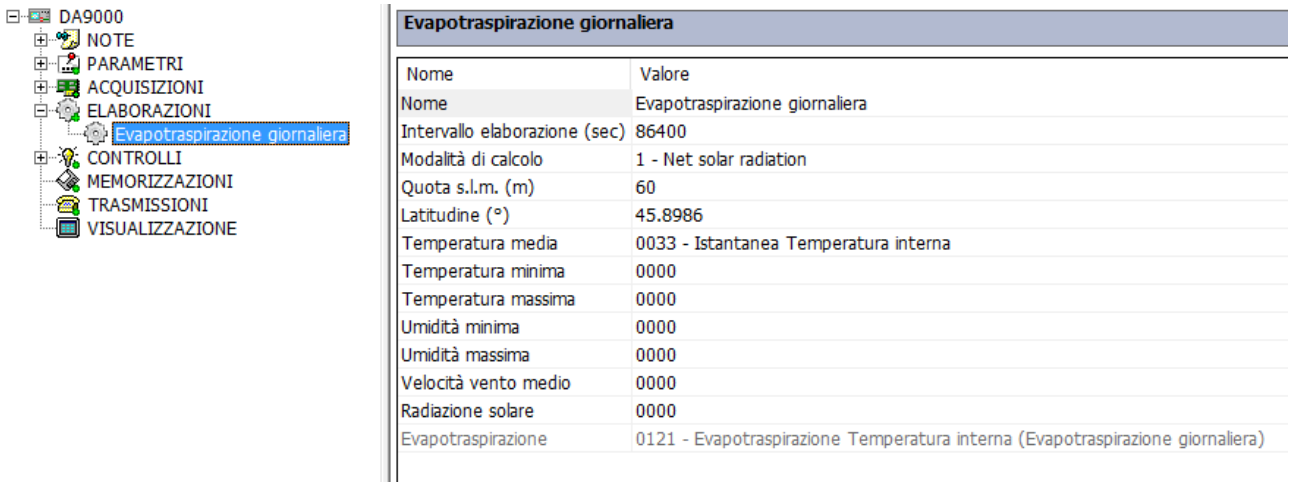
4.4.6 (function: ondametric processing)

Outdated or reserved functionality. Documentation is available on request.

4.4.7 (function: Tsunami Alert forecast

Outdated or reserved functionality. Documentation is available on request..

4.4.8 (function: Daily evapotranspiration)



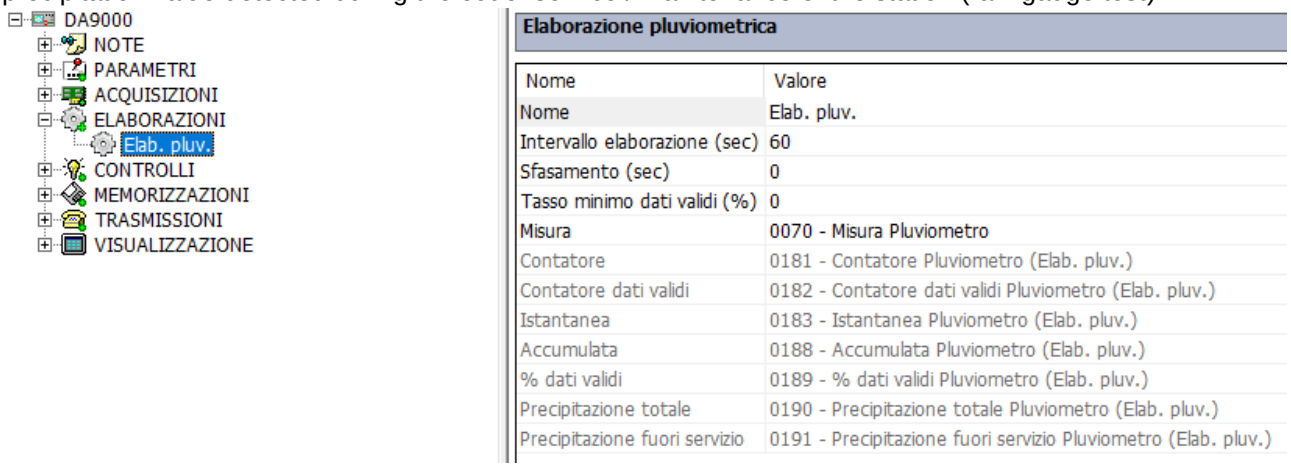
This is a function that performs a particular algorithm to obtain the calculation of daily evapotranspiration (Penman-Monteith method). The value leaving the function, stored in location 121 is expressed in mm. In order to make this calculation, the control unit must be equipped with the following sensors: ambient temperature, relative humidity, wind speed positioned at 2 meters high and a net or global solar radiation sensor.

It is necessary to indicate to the function which net or solar radiation sensor you intend to use, as well as it is necessary to indicate the altitude in meters above sea level of the station and the absolute value of latitude. Other parameters to be passed to the function and that will be taken from daily processing previously prepared are: Minimum and maximum daily temperature, Minimum and maximum daily humidity, average daily wind speed and summation in MJ / m2 of solar radiation.

4.4.9 (Function: Pluviometric processing)

This function allows to obtain the data of accumulated rainfall in the processing interval in addition to the total precipitation accumulated since the start of the datalogger. The measurement to be provided at the input must be the progressive accumulation meter acquired from the rain gauge. At the output is also available the

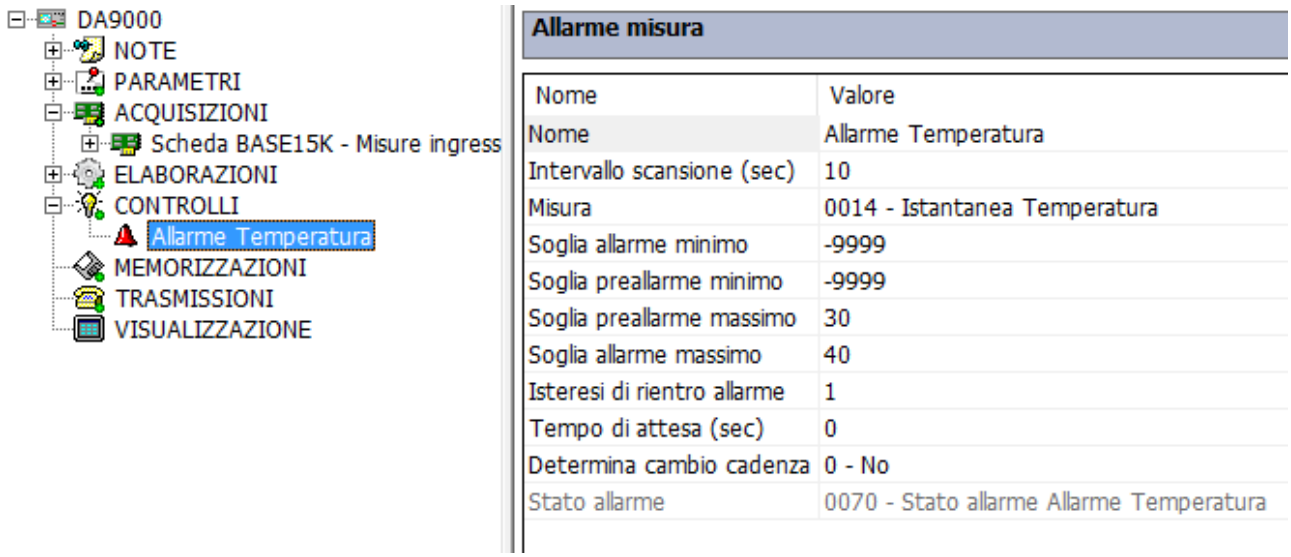
precipitation value detected during the out of service / maintenance of the station (rain gauge test).



4.5 Controls

In this group are inserted all the control functions such as checking the alarms and activating the outputs.

4.5.1 (funzione: Allarme misura)



With this function it is possible to define alarm and early warning thresholds to be associated with the acquired measurements in order to generate alarm signals or to operate devices. In addition to the name of the measurement, the scan interval and the indication of the memory location that contains the measurement to be checked (typically the location of the instantaneous measurement generated by the acquisition function), è possibile impostare le soglie di allarme e preallarme minimi e massimi (It can be set the minimum and maximum alarm and early warning thresholds (you can also indicate here parameters previously set for example $14, $15, etc.). The hysteresis value is used to define the threshold to conclude an alarm state avoiding pendulums around the threshold measure. For example, if we set a maximum alarm threshold for a temperature of 30 ° c and a hysteresis of 5 ° c, this means that the alarm condition is triggered when the temperature exceeds 30 ° c and ends when it falls below 25 ° C.

The attestation time before generating the alarm serves to avoid false alarms due for example to a spurious measure. The measure must be permanently exceeding a threshold for a certain time before it can be decreed the state of alarm.

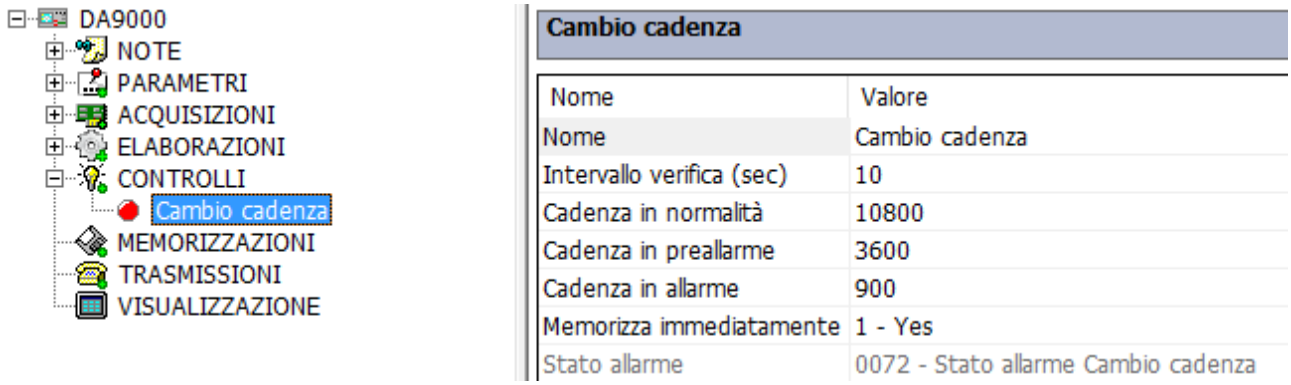
It is also possible to define whether the activation of this alarm will also affect the cadence of certain operations carried out by dataloggers, typically an increase in the frequency of data storage. The M70 output

memory can be used in the configuration to perform other actions. This value summarizes the alarm status (value 0=OK, 1=max early warning, 2=max alarm, -1=min early warning, -2 min alarm).

4.5.2 (Function: File Checker)

Outdated or reserved functionality. Documentation is available on request

4.5.3 (Function: Cadence change)

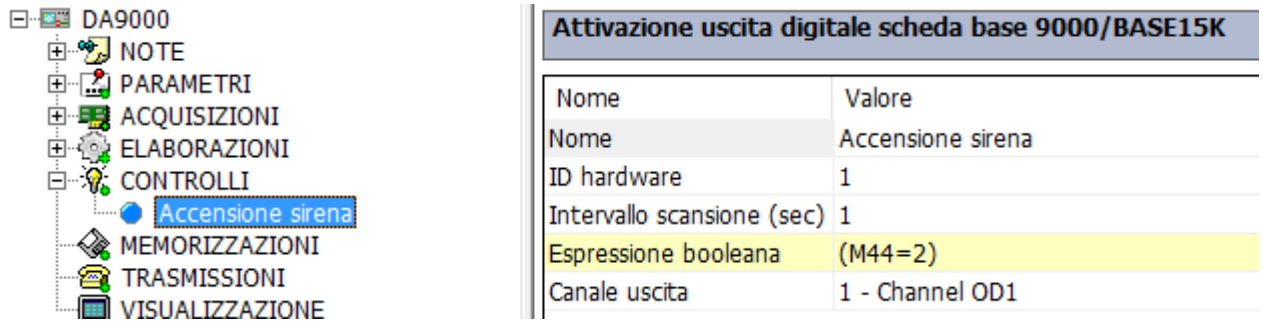


This function interacts with the alarm functions to define the cadence change modes. In the example above it can seen that in early warning and alarm conditions, all the operations present in the configuration to which the scan value of 10800 seconds (3h) is associated, will be carried out with the differentiated cadences proportional to the degree of alarm present in the station. This will speed up any data storage or other actions.

4.5.4 (function: Activation of the digital output of the datalogger)

Outdated or reserved functionality. Documentation is available on request.

4.5.5 (function: Activation digital output base card 9000/BASE15K)



With this function it is possible to control the activation of a device connected to one of the digital outputs of the datalogger. Traditional relays or solid-state relays are usually connected to these channels. In the example above we see that a Boolean expression (returns true or false) has been inserted that verifies whether or not the memory location contains the value 2. As mentioned above in the description of the alarm function, it is possible to associate a memory with the state of a measure. Above we have the example of a digital datalogger channel (OD1) that is activated when the temperature alarm status is set at 2 (max alarm. Clearly, much more complex formulas can also be inserted here in order to generate activation conditions based on logical conditions that take into account several alarm states, timers, parameters, etc. at the same time.

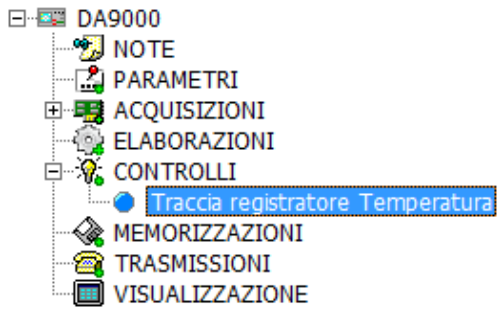
4.5.6 (Function: Modbus standard digital output activation)

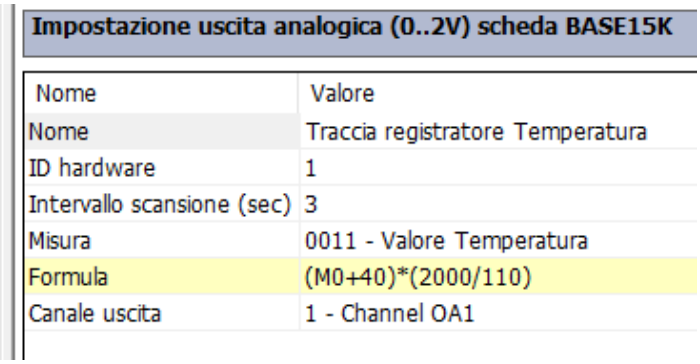
Outdated or reserved functionality. Documentation is available on request

4.5.7 (Function: Analog output setting (0-2V) base board 9000)

Outdated or reserved functionality. Documentation is available on request

4.5.8 (Function: Analog output setting (0..2V) BASE15K card)





Impostazione uscita analogica (0..2V) scheda BASE15K

Nome	Valore
Nome	Traccia registratore Temperatura
ID hardware	1
Intervallo scansione (sec)	3
Misura	0011 - Valore Temperatura
Formula	(M0+40)*(2000/110)
Canale uscita	1 - Channel OA1

The datalogger has two analog outputs that can be driven to provide a voltage output from 0 to 2Volt. It is necessary to set the hardware ID of the board to which the datalogger is connected (default = 1), the update cadence of the output measurement. In the example above we sampled a temperature measurement with a range from -40 to +70°C. We intend to represent this range of measurements on a paper recorder by driving the analog output of the datalogger with a voltage ranging from 0mV (-40 ° C) up to 2000mV (+70 ° C). To do this we use a corrective formula capable of transposing the temperature value into a proportional voltage value.

measurement, the scan interval and the indication of the memory location that contains the measurement to be checked (typically the location of the instantaneous measurement generated by the acquisition function), è possibile impostare le soglie di allarme e preallarme minimi e massimi (It can be set the minimum and maximum alarm and early warning thresholds (you can also indicate here parameters previously set for example $14, $15, etc.). The hysteresis value is used to define the threshold to conclude an alarm state avoiding pendulums around the threshold measure. For example, if we set a maximum alarm threshold for a temperature of 30 ° c and a hysteresis of 5 ° c, this means that the alarm condition is triggered when the temperature exceeds 30 ° c and ends when it falls below 25 ° C.

The attestation time before generating the alarm serves to avoid false alarms due for example to a spurious measure. The measure must be permanently exceeding a threshold for a certain time before it can be decreed the state of alarm.

It is also possible to define whether the activation of this alarm will also affect the cadence of certain operations carried out by dataloggers, typically an increase in the frequency of data storage. The M70 output memory can be used in the configuration to perform other actions. This value summarizes the alarm status (value 0=OK, 1=max early warning, 2=max alarm, -1=min early warning, -2 min alarm).

4.5.9 (Function: File Checker)

Outdated or reserved functionality. Documentation is available on request

4.5.10 (Function: Cadence change)

Cambio cadenza

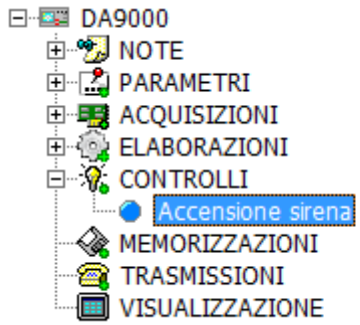
Nome	Valore
Nome	Cambio cadenza
Intervallo verifica (sec)	10
Cadenza in normalità	10800
Cadenza in preallarme	3600
Cadenza in allarme	900
Memorizza immediatamente	1 - Yes
Stato allarme	0072 - Stato allarme Cambio cadenza

This function interacts with the alarm functions to define the cadence change modes. In the example above it can seen that in early warning and alarm conditions, all the operations present in the configuration to which the scan value of 10800 seconds (3h) is associated, will be carried out with the differentiated cadences proportional to the degree of alarm present in the station. This will speed up any data storage or other actions.

4.5.11 (function: Activation of the digital output of the datalogger)

Outdated or reserved functionality. Documentation is available on request.

4.5.12 (function: Activation digital output base card 9000/BASE15K)



Attivazione uscita digitale scheda base 9000/BASE15K

Nome	Valore
Nome	Accensione sirena
ID hardware	1
Intervallo scansione (sec)	1
Espressione booleana	(M44=2)
Canale uscita	1 - Channel OD1

With this function it is possible to control the activation of a device connected to one of the digital outputs of the datalogger. Traditional relays or solid-state relays are usually connected to these channels. In the example above we see that a Boolean expression (returns true or false) has been inserted that verifies whether or not the memory location contains the value 2. As mentioned above in the description of the alarm function, it is possible to associate a memory with the state of a measure. Above we have the example of a digital datalogger channel (OD1) that is activated when the temperature alarm status is set at 2 (max alarm. Clearly, much more complex formulas can also be inserted here in order to generate activation conditions based on logical conditions that take into account several alarm states, timers, parameters, etc. at the same time.

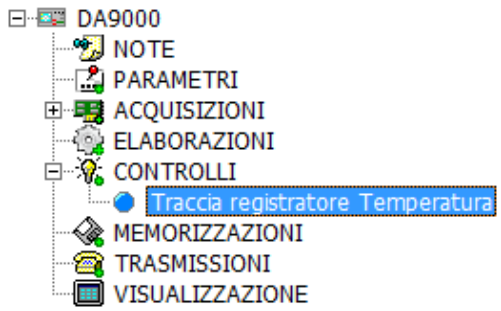
4.5.13 (Function: Modbus standard digital output activation)

Outdated or reserved functionality. Documentation is available on request

4.5.14 (Function: Analog output setting (0-2V) base board 9000)

Outdated or reserved functionality. Documentation is available on request

4.5.15 (Function: Analog output setting (0..2V) BASE15K card)



Impostazione uscita analogica (0..2V) scheda BASE15K

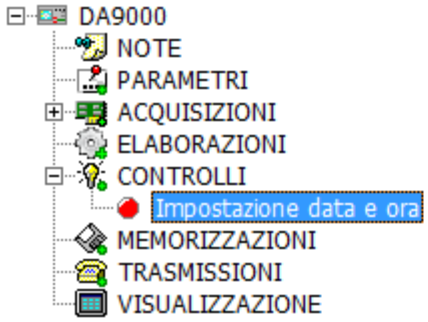
Nome	Valore
Nome	Traccia registratore Temperatura
ID hardware	1
Intervallo scansione (sec)	3
Misura	0011 - Valore Temperatura
Formula	(M0+40)*(2000/110)
Canale uscita	1 - Channel OA1

The datalogger has two analog outputs that can be driven to provide a voltage output from 0 to 2Volt. It is necessary to set the hardware ID of the board to which the datalogger is connected (default = 1), the update cadence of the output measurement. In the example above we sampled a temperature measurement with a range from -40 to +70°C. We intend to represent this range of measurements on a paper recorder by driving the analog output of the datalogger with a voltage ranging from 0mV (-40 ° C) up to 2000mV (+70 ° C). To do this we use a corrective formula capable of transposing the temperature value into a proportional voltage value.

4.5.16 (funzione: Impostazione valore analogico MODBUS standard)

Funzionalità obsoleta o riservata. E' disponibile la documentazione su richiesta.

4.5.17 (Function: Date and time setting)



Impostazione data e ora

Nome	Valore
Nome	Impostazione data e ora
Intervallo scansione (sec)	3600
Fuso orario	1
Locazione data	0012 - Valore DATA
Locazione ora	0013 - Valore ORA

This function allows to synchronize the datalogger clock by drawing on the information contained within two memory locations, one for the date information and one for the time information. Typical application of this function is for example that for clock synchronization by drawing on the information previously read by a GPS receiver via NMEA track reading function.

4.5.18 (Function: Backup Data Compression)

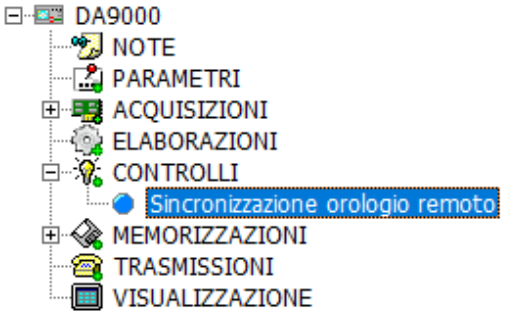
Outdated or reserved functionality. Documentation is available on request.

4.5.19 (Function: Reset datalogger)

Outdated or reserved functionality. Documentation is available on request.

4.5.20 (Function: Remote Clock Synchronization)

This function is used in the presence of Wireless-Expander systems and allows you to synchronize the clock of the remote device with the local date / time. For communication it is necessary to set the hardware ID of the remote module (default:1) and the parameters of the serial port::



Sincronizzazione orologio remoto

Nome	Valore
Nome	Sincronizzazione orologio remoto
ID hardware	1
Intervallo scansione (sec)	3600
Ritardo (sec)	60
Porta seriale di comunicazione	3 - COM3
Velocità porta seriale (bps)	4800 -

4.6 Storage

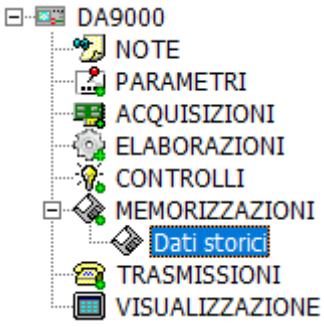
The 'Storage' function is inserted to record the data acquired and / or processed, by the machine, on the internal memory and possibly on the SD card.

The files have a circular structure whose size is specified in the initialization file.

The format in which the data is recorded is 'Dynamic Micros Record'. The time reference that is inserted in the record (timestamp), is always that of the moment in which it is stored, that is, at the end of the observation / processing period.

Each record can contain one or more data that can be any of the sensor outputs or processing functions.

4.6.1 (Group: Storing Records)



Memorizzazione record

Nome	Valore
Nome	Dati storici
ID stazione alternativo	
Formato	0 - Standard
Tipo di record	0 - Hystorical record
Intervallo memorizzazione (sec)	3600
Sfasamento (sec)	0
Archivio di memorizzazione	6
Accorpamento record	1 - Yes
Backup	1 - Enabled
Visualizza dati	0 - Disabled

This group allows you to assign one or more data storage functions. Here you can set some general aspects such as: the alternative station ID: if left blank the data will be marked by the station number indicated in the INI file (see below) alternatively you can assign a different station ID; Record type, which can be type 0=historical data record, 1=instant measurement record, or 2=alarm measurement record). The storage interval defines how many seconds to store the data. for alarm records it is advisable to set a cadence of 1 second.

It can specified a phase shift value to move the time on which to synchronize the execution of the function. A typical example is when it is wanted to carry out a daily processing but you do not want to make it coincide with midnight, but with 9 am. In this case you must enter the value of 32400 seconds in this field. This

postponed daily processing is used, for example, to align the data with the historical surveys of the daily rainfall that in the past was performed at 9 am.

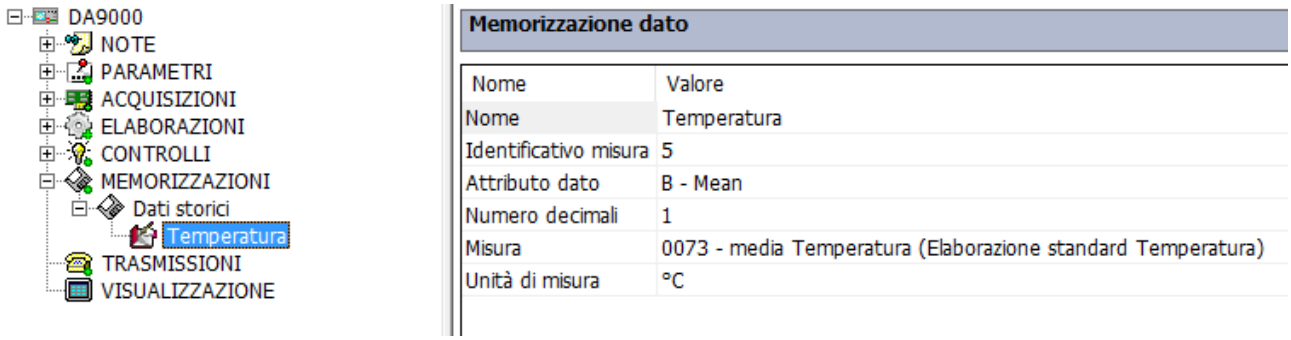
The storage store indicates the number of the file where the data is stored. This field is free but by convention it is used to store instant data in file #1, alarm data in file #4 and finally historical data in file #6.

The record merge option results in a grouped recording of records that have the same time.

The Backup flag (Enabled/Disabled) is used to define whether the data should be stored, in addition to the internal memory, also on the removable SD Card backup media.

By setting the storage times appropriately, synchronous with the time base of data acquisition, it is also possible to create a circular buffer of standard size of 5Mbyte containing the history of all the raw measurements acquired by the datalogger. This file can be consulted on site and it is also possible to transfer it to the center.

(funzione: Memorizzazione dato)



This function, along with others in the same group, contribute to generating the data record. The information contained in this function are: the name of the measure, the identifier to be associated with the measurement, the attribute of the data (according to the Micros record path corresponds: A = snapshot, B = average or accumulation, C = minimum, D = maximum, etc.), number of decimals of the measure, memory location to be stored and finally the engineering unit of the measurement.

4.6.2 (Group: GEOSIS Data Storage)

Outdated or reserved functionality. Documentation is available on request.

4.6.3 (Function: Serial CSV file storage)

Outdated or reserved functionality. Documentation is available on request.

4.6.4 (Function: Keeping data in memory)

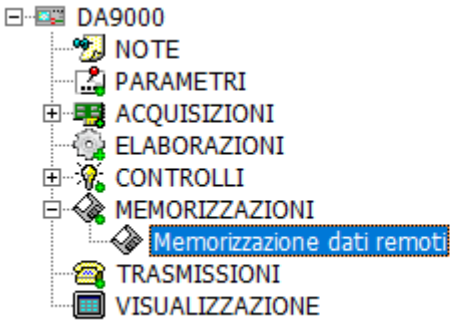
Outdated or reserved functionality. Documentation is available on request.

4.6.5 (Group: Saving Memory Locations)

Outdated or reserved functionality. Documentation is available on request.

4.6.6 (Function: Remote data storage)

The inclusion of this function is necessary in the acquisition of Wireless-Expander systems to locally store the data downloaded from the remote storage. set the hardware ID of the remote module to which the data refers and the number of the local store where it will be stored:



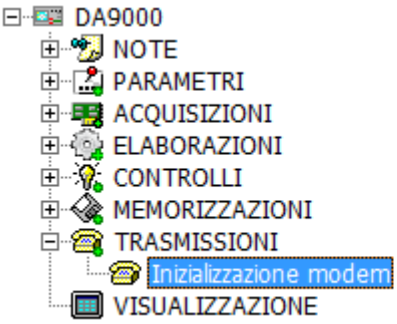
Memorizzazione dati remoti

Nome	Valore
Nome	Memorizzazione dati remoti
ID hardware	1
Archivio di memorizzazione	7
Backup	1 - Enabled
Visualizza dati	0 - Disabled

4.7 Transmissions

In this section groups the functions of sending data and or alarms. Normally it will be necessary to specify the serial port and the data to be transmitted.

4.7.1 (Function: Modem initialization)



Inizializzazione modem

Nome	Valore
Nome	Inizializzazione modem
Intervallo trasmissione (sec)	86400
Ritardo (sec)	0
Porta seriale di comunicazione	4 - COM4
Velocità porta seriale (bps)	38400 -
Comandi AT	AT;ATS0=1;ATE0;ATV1

This feature allows to issue Hayes commands to connected modem devices. Setting the transmission interval allows to define the frequency of sending commands. Cadence = 0 means that the commands will be sent only once when the datalogger starts, otherwise other cadences indicate a repetitive and cadenced operation; 86400 seconds corresponds to 24 hours and this is also the maximum interval that can be entered. The Delay allows to define a small pause before starting to send commands. It can indicated the serial port to be used as well as the port speed. Finally, the AT Commands field defines the individual Hayes commands that must be separated by the (;).

4.7.2 (Group: Sensor Initialization S&F)

Outdated or reserved functionality. Documentation is available on request.

4.7.3 (Function: Simple direct drive)

Outdated or reserved functionality. Documentation is available on request.

4.7.4 (Group: Direct data transmission in text format)

Outdated or reserved functionality. Documentation is available on request.

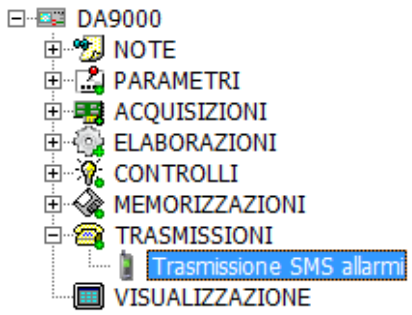
4.7.5 (Group: Direct data transmission in Micros format)

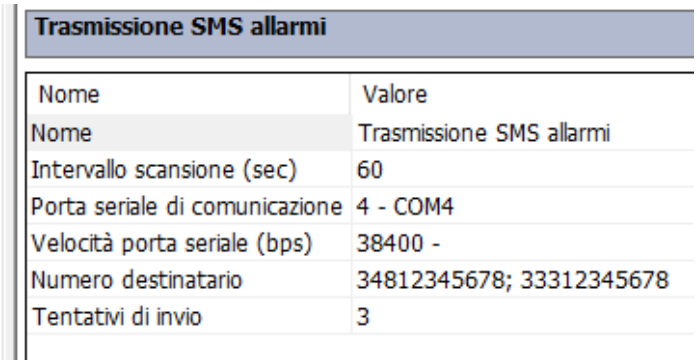
Outdated or reserved functionality. Documentation is available on request.

4.7.6 (Group: SMS data transmission)

Outdated or reserved functionality. Documentation is available on request.

4.7.7 (Group: SMS Transmission Alarms)





Trasmissione SMS allarmi

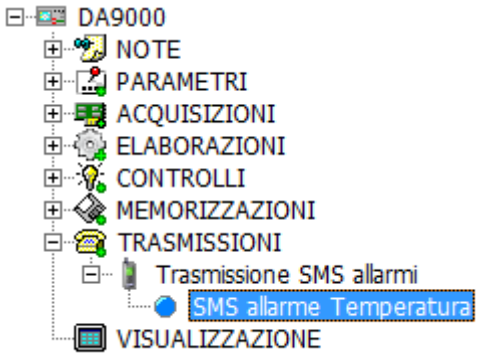
Nome	Valore
Nome	Trasmissione SMS allarmi
Intervallo scansione (sec)	60
Porta seriale di comunicazione	4 - COM4
Velocità porta seriale (bps)	38400 -
Numero destinatario	34812345678; 33312345678
Tentativi di invio	3

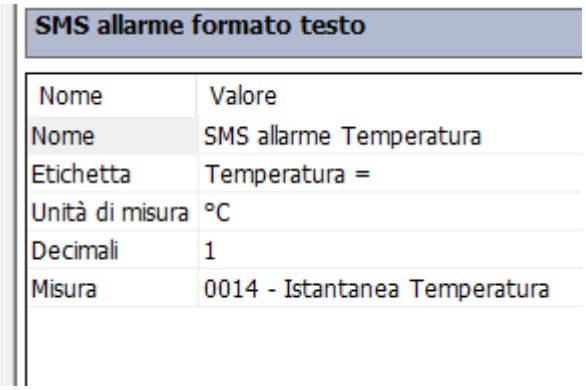
It can associated an alarm with sending an SMS message. In this group It can be set the criteria for sending messages such as: the time scan to check for the presence of new messages to be sent, the communication port on which the GPRS module is connected, the communication speed of the serial port, the list of recipients of messages separated by (;) and finally the number of attempts to send messages.

(function: SMS record alarm Micros)

Outdated or reserved functionality. Documentation is available on request.

(funzione: SMS text format alarm)



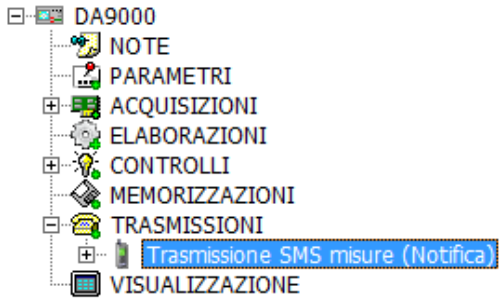


SMS allarme formato testo

Nome	Valore
Nome	SMS allarme Temperatura
Etichetta	Temperatura =
Unità di misura	°C
Decimali	1
Misura	0014 - Istantanea Temperatura

With this function it is possible to enter the measure associated with the alarm on which it is expected to send an SMS in the event of an alarm. It can indicated the label that will be displayed in the message, as well as the unit of measurement and the number of decimals. Important: The measurement associated with the alarm (M14 in the above case) must refer to the same memory used for alarm control. SMS will be sent to notify the presence of early warnings, alarms and re-entry under normal conditions of the associated measure.

4.7.8 (gruppo: Trasmissione SMS misure)

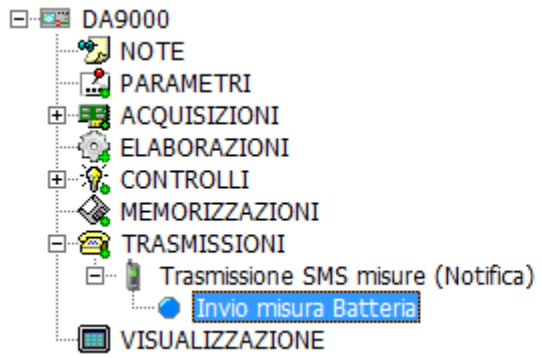


Trasmissione SMS misure

Nome	Valore
Nome	Trasmissione SMS misure (Notifica)
Intervallo trasmissione (sec)	86400
Sfasamento (sec)	43200
Porta seriale di comunicazione	4 - COM4
Velocità porta seriale (bps)	38400 -
Numero destinatario	34812345678

This group enables the transmission of a frequency of an SMS to one or more recipients with the aim of keeping them updated on the operating status of a control unit or for example to be always informed about the level of a watercourse, even when there are no alert situations. Who receives this message, as well as knowing the value of the river level also understands that the acquisition and alert system is working regularly and It is ready to send, for example, early warning and alarm messages if the need arises.

4.7.9 (Function: Send measure)

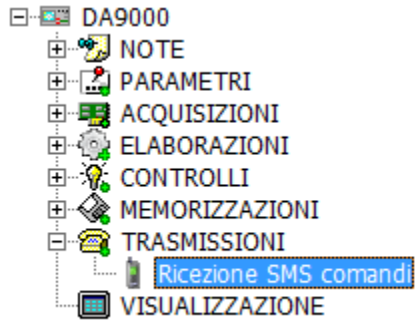


Invio misura

Nome	Valore
Nome	Invio misura Batteria
Etichetta	Batteria =
Unità di misura	V
Decimali	1
Misura	0053 - Istantanea Tensione batteria

In the example above, we have that to the number of the recipient indicated, daily (ie every 86400 seconds) will be sent an SMS containing the value of the battery voltage.

4.7.10 (Function: Receiving SMS commands)



Ricezione SMS comandi

Nome	Valore
Nome	Ricezione SMS comandi
Intervallo scansione (sec)	3600
Porta seriale di comunicazione	4 - COM4
Velocità porta seriale (bps)	38400 -

It is possible to instruct the datalogger to be able to periodically receive commands via SMS to be able, for example, to change an offset of a level, or to change an alarm threshold, etc.

The extended syntax of commands that can be sent via SMS are described in the datalogger manual.

4.7.11 (Group: TETRA-SDS data transmission) - (Function: Sending data)

Outdated or reserved functionality. Documentation is available on request.

4.7.12 (Group: TRANSMISSION TETRA-SDS alarms) - (Function: Send alarm)

Outdated or reserved functionality. Documentation is available on request.

4.7.13 (Group: FTP Transmission)

Trasmissione FTP

Nome	Valore
Nome	Trasmissione FTP
Protocollo	0 - FTP (File Transfer Protocol)
Cartella locale	\NandFlash\DA9000\Ftp
Indirizzo server	cloud.ftp.siapmicros
Porta	21
Nome utente	siapmicros
Password	********
Crittografia dati	1 - SSL/TLS se disponibile
Cartella remota	\Dati
Stato trasferimento	0011 - Stato trasferimento Trasmissione FTP

In order to transmit data in FTP transfer, It is necessary first to define the account for accessing the FTP area of the server. You will need to set the IP address or host name, the communication port (default 21) and then the username and password. you can then select the ssl/tls data encryption level and then indicate an alternative file destination folder to the root.

Transmission is also available in SSH File Transfer Protocol (SFTP).

(Function: Sending Files)

Invio file

Nome	Valore
Nome	Invio file storici
Scansione di invio (sec)	3600
Sfasamento (sec)	0
File sorgente	6
Pacchetto max. (KB)	128
Tracciato dinamico	0 - Standard
Compressione dati	0 - No
Nome file destinazione	ST%iii_FILE6_%yyyy%mm%dd%hh%nn%ss.dat

The next function inserts the timed sending of a file (historical data archive, alarms, etc.) by the datalogger to an FTP/SFTP server. It can defined the rate of sending the file which can also be different from the cadence of storage; a faster sending cadence will increase the number of transmission attempts. If, for example, we have an hourly rate of storage of historical data and a frequency of sending every 10 minutes, we will have that the datalogger will try to send the data every 10 minutes and when this happens successfully, it will not make other retransmissions until there is other data to be transmitted.

The Source File field indicates the number of the data store to be transferred (typically: 6=Historical data, 4=Alarms).

The Max. Packet field indicates the maximum size of the data packet to be sent. The default value is 128 KByte but It can be possible to indicate smaller size to break up the data submission into smaller packets; this is useful in case of poor quality of the gprs/umts telephone signal.

It is possible to indicate whether the data should be sent in native format (default) or if these should be compressed. In this case, the name of the submitted file changes the extension to .zip.

The name of the file to be sent must have a structure that can be easily identified and for this reason it was decided to structure it by entering the date of the time of sending using the special characters that appear in the example above. Use: %iii (station ID), %yyyy (year), %mm (month), %dd (day), %hh (hours), %nn (minutes), and %ss (seconds).

(Function: Sending files (CSV format))

Outdated or reserved functionality. Documentation is available on request.

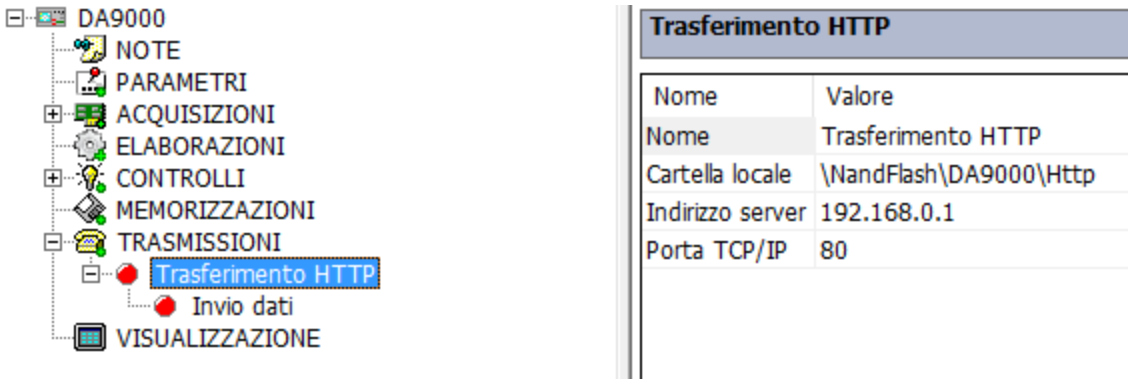
(Function: Send IP address)

Outdated or reserved functionality. Documentation is available on request.

(Function: Sending files (XML format))

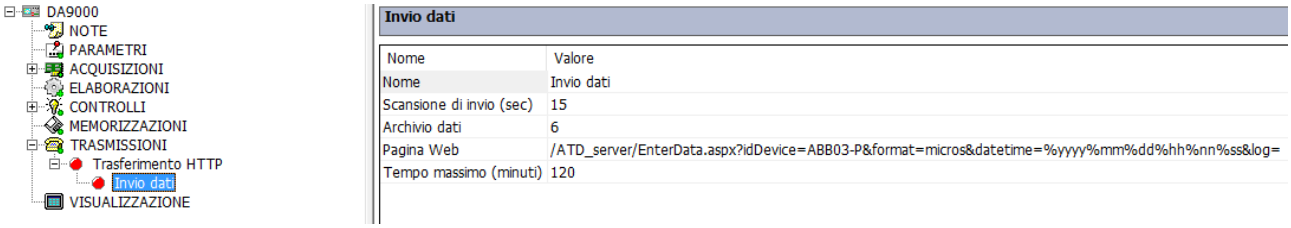
Outdated or reserved functionality. Documentation is available on request.

4.7.14 (Group: HTTP Transfer)



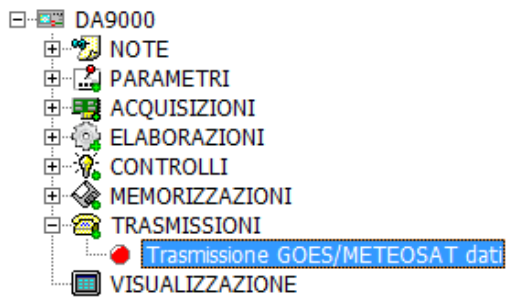
The use of the functions contained in this group allows you to enable the sending of data to a WEB page. You must first define the IP address of the destination server as well as the TCP/IP port to use.

(Function: Send data)



Then it is necessary to indicate the web page on which to pour the data of the file indicated (in our case file 6).

4.7.15 (Function: GOES/METEOSAT data transmission)

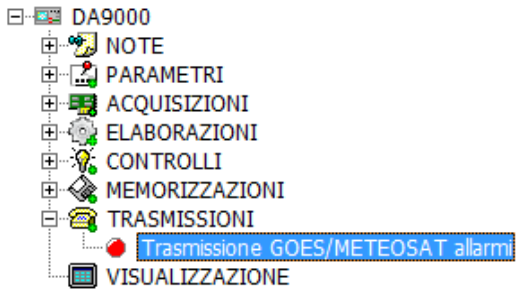


Trasmissione GOES/METEOSAT dati

Nome	Valore
Nome	Trasmissione GOES/METEOSAT dati
Scansione trasmissione (sec)	3600
Buffer di trasmissione	0 - Timed Transmit Buffer
Porta seriale di comunicazione	1 - COM1
Archivio dati	6
Caratteri di testa	
Pacchetti ridondanti	0

This function enables communication with the µcom GTX satellite radio module in order to achieve GOES/METEOSAT satellite communication. It is possible to set the transmission cadence in seconds, the transmission mode (Transmission Buffer) which can be 0 – for ordinary cadenced transmissions, or 1 – for impromptu data sending as in the case of alarms. You can indicate the communication port on which the satellite radio is connected. The data store field sets the internal file to be sent that was previously managed at the storage level. head characters options on the message (for METEOSAT transmission add Sdmyhn) can be entered . In the Redundant Packets field there is the possibility to indicate whether or not the transmitted data should contain a copy of the messages previously sent in order to have a greater guarantee that the data sent all reach the center even in case of non-transmission of some packet.

4.7.16 (Group: TRANSMISSION GOES/METEOSAT alarms)

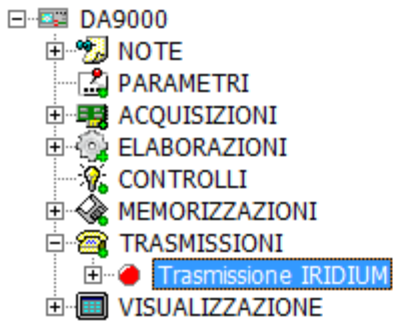


Trasmissione GOES/METEOSAT allarmi

Nome	Valore
Nome	Trasmissione GOES/METEOSAT allarmi
Intervallo scansione (sec)	900
Buffer di trasmissione	1 - Random Transmit Buffer
Porta seriale di comunicazione	1 - COM1

With this function the measurements can listed whose alarm status will have to be forwarded by satellite as an impromptu measure. In addition to the name of the measurement, it is possible to indicate the channel (measurement identifier) of the transmitted parameter, the number of decimals of the measurement (multiplicative factor) and the memory location of the measure in alarm.

4.7.17 (Group: IRIDIUM data transmission)



Trasmissione IRIDIUM dati

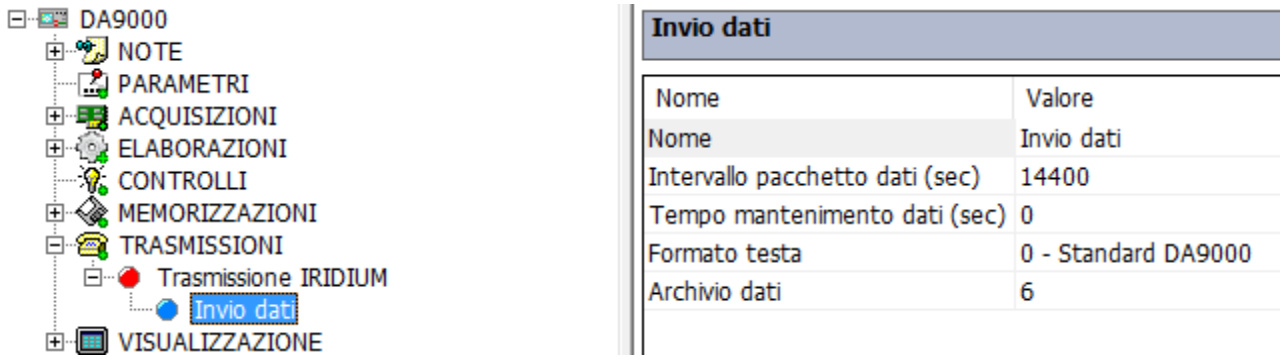
Nome	Valore
Nome	Trasmissione IRIDIUM
Intervallo sessione (sec)	600
Porta seriale di comunicazione	4 - COM4
Velocità porta seriale (bps)	9600 -
Periodo ricezione messaggi	0

This function enables communication with the IRIDIUM satellite radio module. It is possible to set the frequency of activation of the transmission session in seconds, the communication port, the communication

speed of the serial port and finally the period of receipt of any messages from the center. The modality of reception messages from the center follows this logic:

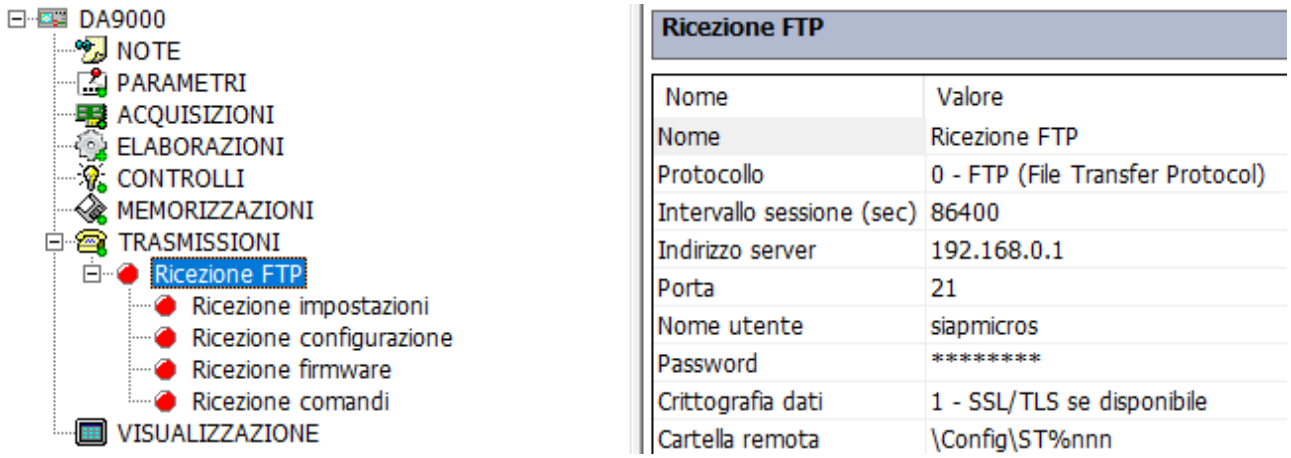
Number of periodic sessions receiving incoming messages: 0 = Only if there is data to be transmitted, 1 = Always at each session, x = Periodically at each x sessions.

(Function: Send data)



The function allows to define the mode of sending data. The Data Packet Range field defines how many seconds the datalogger composes the data packet to be sent. The package thus created has not yet been transmitted. To carry out the actual transmission it is necessary to respect the timing indicated in the following field: Data retention time. If set to 0 then the transmission coincides with the time of creation of the package (as in the example above), otherwise you will wait for the expiration of this time before sending the packets that in the meantime have been generated.

4.7.18 (Group: FTP Receiving)



In order to interact with a control unit through FTP transfer, this special group has been set up with which the datalogger has the possibility to receive updates from the center. For example: a new settings file (INI file), a new configuration file (CNF file), a new firmware, or messages containing special commands to change, for example, the offset of a measurement, or to change an alarm threshold or storage cadence. It is possible to enable one or more of these functions at will.

The configuration files (INI and CNF) to be downloaded, will be placed in the remote folder indicated in the FTP server. use the special characters that appear in the example above to replace the %nnn parameter with the numeric station storage identifier (logical id)).

(Function: Data transmission via Tunnel)

Outdated or reserved functionality. Documentation is available on request.

4.7.19 (Group: Voice Message Transmission)

Outdated or reserved functionality. Documentation is available on request.

4.7.20 (Group: Transmission of measures Box)

Outdated or reserved functionality. Documentation is available on request.

4.7.21 (Group: E-mail data transmission)

This feature allows you to transmit emails with archive data and/or other types of attached files. All emails sent use the standard security level with SSL/TLS encryption (ref. par. 8.1.5 - SMTP Server).

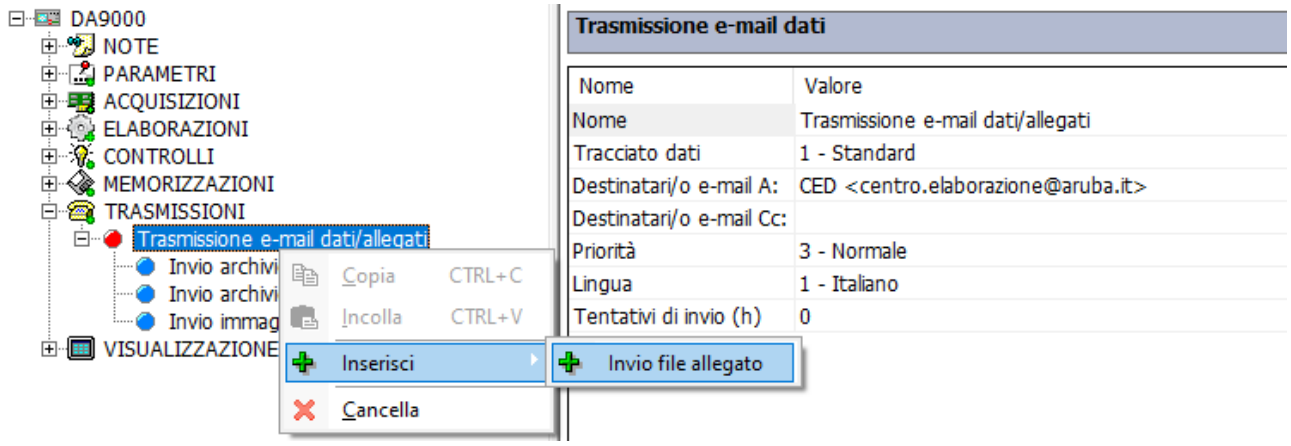
In this group, you can set common broadcast options::

- - the direct recipient(s) of the e-mails (A:) and those in carbon copy (Cc:).
- - the priority level of the messages and the number of sending attempts.
- - the language to be used in the messages.

Recipients must be expressed with a valid e-mail address, e.g. utente@dominio.com they may be preceded by a name as in the form: NAME <utente@dominio.com>. Multiple recipients must be separated by a semicolon (;).

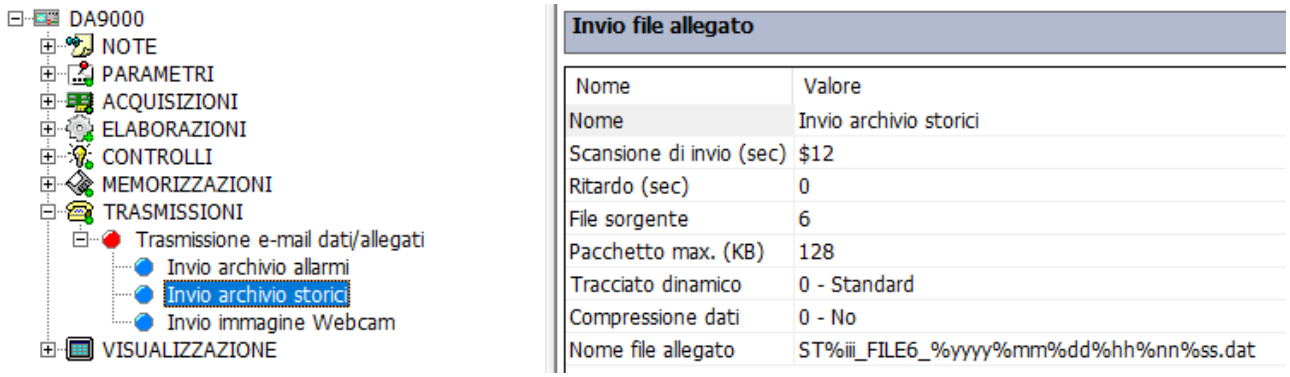
Sending attempts are expressed in hours (h) of stay beyond which e-mail messages are canceled if the transmission has failed. Set zero (0) to get infinite send attempts.

Add an attachment to send by right-clicking on "Insert > Sending File Attachment" and set the next parameters:

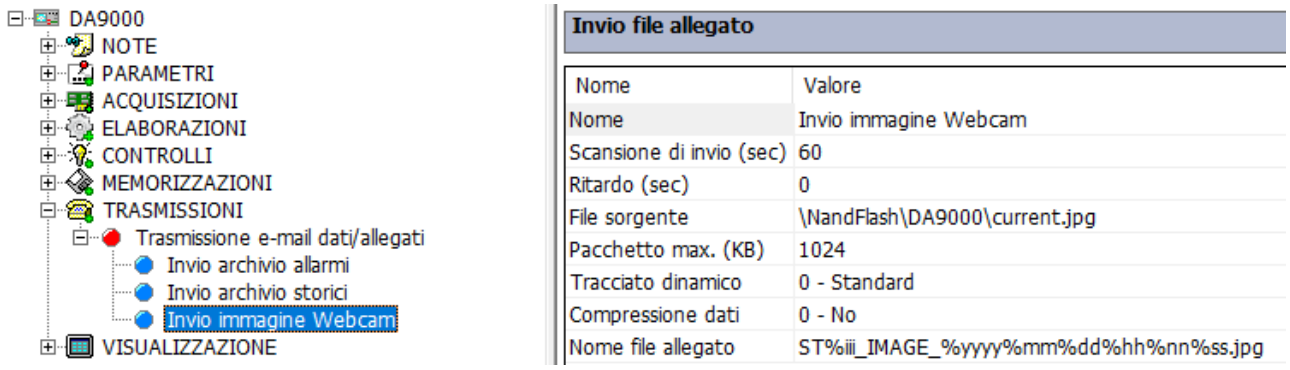


- For each submission it is necessary to specify:
- interval or scan of verification of the data to be sent (sec.) plus any delay;
- the source archive of the data or the path of the file to be attached (typically for archive data no. 6, for the current image of a webcam for example NandFlashDA9000current.jpg);
- in the case of a data store, set the maximum size of the package to be attached (KB);
- specify if compression of the file to be attached is required (Zip, ZStandard, etc.);
- the name to be assigned to the attached file (parameterization with storage ID and date/time is available).

Example sending historical data:

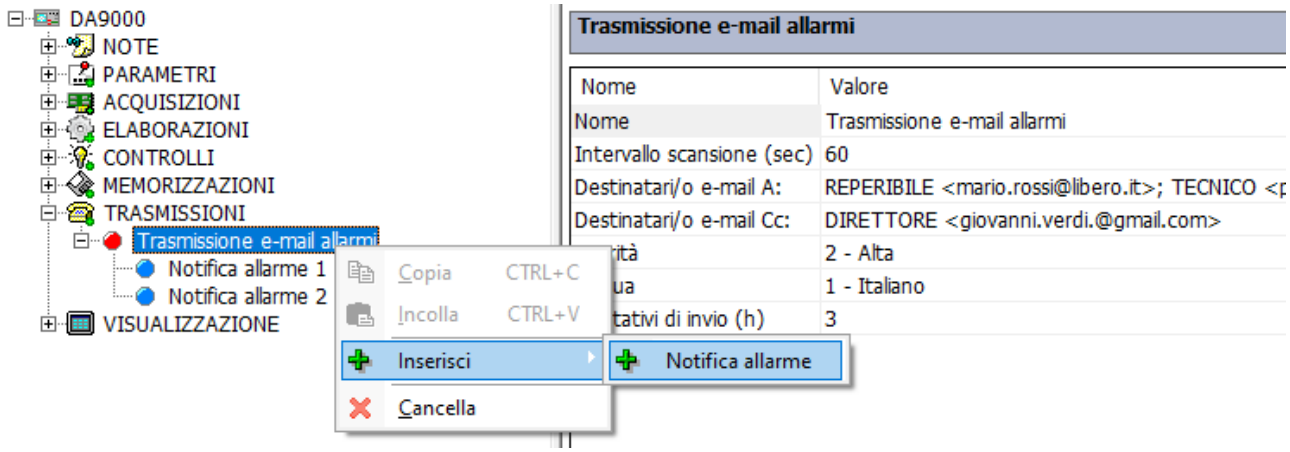


Example sending Webcam image:



4.7.22 (Group: Email Transmission Alarms)

The function allows you to transmit alarm notifications by sending e-mail messages. The emails sent use the standard security level with SSL/TLS encryption (ref. par. 8.1.5 - SMTP Server).



Set broadcast options in this group:

- - interval or scan for the presence of new alarms to be sent (e.g. 60 sec.);
- - the direct recipient(s) of the e-mails (A:) and those in carbon copy (Cc:);
- - the priority level of the messages and the number of sending attempts;
- - the language to be used in the messages.

Recipients must be expressed with a valid e-mail address, e.g. utente@dominio.com they may be preceded by a name as in the form: NAME <utente@dominio.com>. Multiple recipients must be separated by a semicolon (;).

Sending attempts are expressed in hours (h) of stay beyond which messages are canceled if the transmission failed. Set zero (0) to get infinite send attempts.

Enter the sending of multiple alarms by selecting "Enter > Alarm Notification" with the right mouse button.

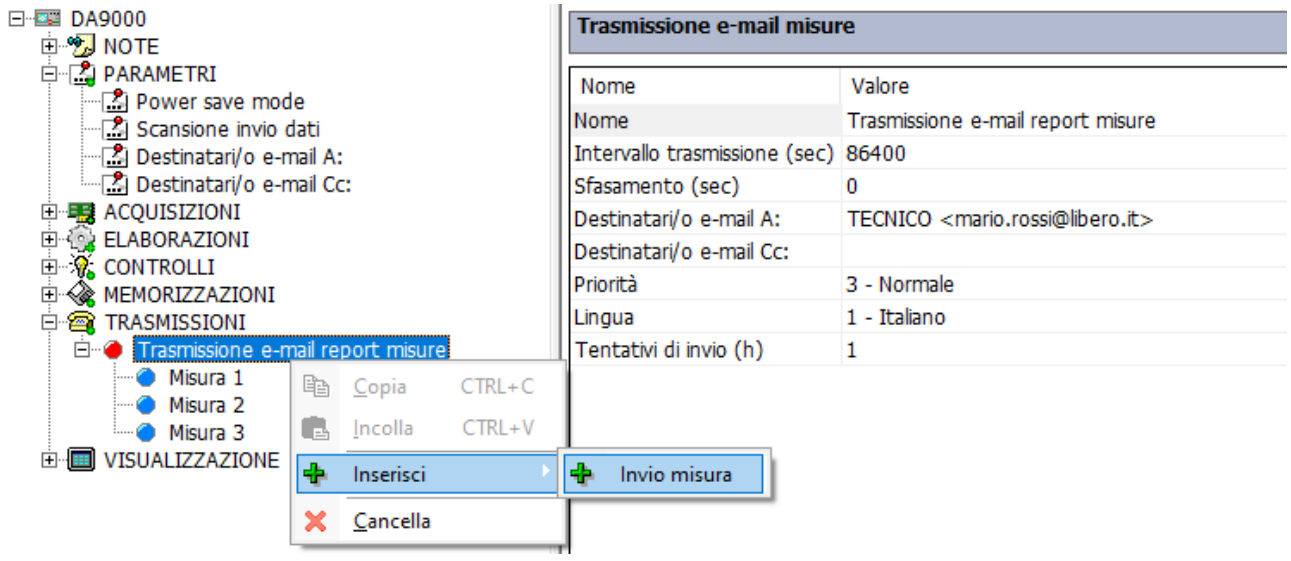
- For each alarm notification it is necessary to specify:
- The measure associated with the alarm control,
- The description (label);
- The engineering unit and the number of decimals to be displayed.

Notifica allarme

Nome	Valore
Nome	Notifica allarme 1
Etichetta	Temperatura ambiente =
Unità di misura	°C
Numero decimali	1
Misura	0021 - Istantanea TAMB

4.7.23 (Group: E-mail transmission measures)

This function can be used to periodically transmit a measurement report by e-mail.



Set broadcast options:

- periodic transmission interval of the ratio (e.g. 86400 sec. = 1 day);
- The direct recipient(s) of the e-mails (A:) and those in carbon copy (Cc:);
- The priority level of the messages and the number of sending attempts;

- the language to be used in the messages.

Add the sending of multiple measures by right-clicking on "Insert > Send measure".

As with alarms, for each measure entered it is necessary to specify:

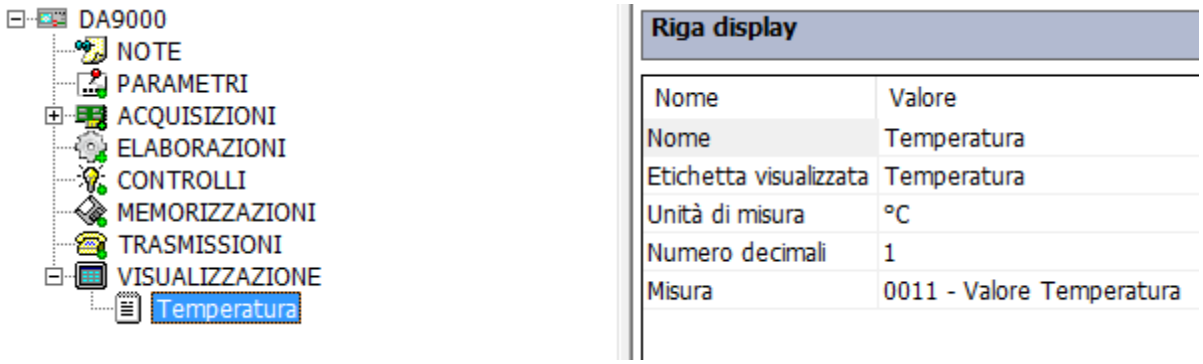
- the measure to be sent;
- the description (label);
- the engineering unit and the number of decimals to be displayed.

The example above, sends a daily e-mail to the recipient technician indicated, reporting the values of three selected measures.

4.8 Visualization

In this section the functions of representation of the measurements on the display of the control unit are grouped.

4.8.1 (Function: Line display)



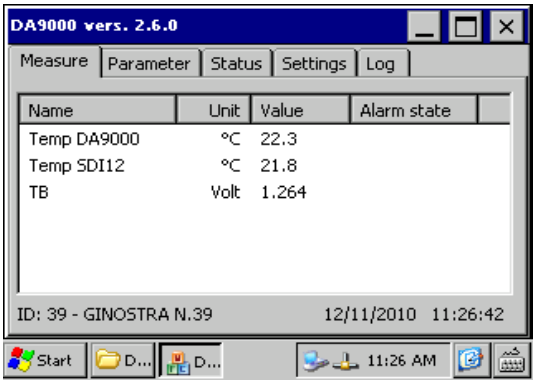
This function allows to make the instantaneous values of the acquired measurements visible on the screen. It is possible to indicate the label to be displayed, as well as the unit of measurement and the number of decimals. Each measurement displayed on the screen is then accompanied by an Alarm state (icon) that indicates whether the measure in question is in an alarm state or not.

4.9 Data Display

The data visualization on the DA9000/DA15K/DA18K dataloggers is implemented through a report-type list.

To insert a display on the display you must first select the DISPLAY object and then add the various rows specifying the name properties, unit of measurement, and the source of the data.

The information related to the station ID, the data and station name information are automatically displayed by the program on board the datalogger by retrieving the information from the initialization file.



5 Creating the configuration

To create a new configuration, select New.... Menu *File.*

A window will open containing the basic structure of the system. DAK automatically assigns the configuration a default name based on the number of open windows. If there are no windows open at the time of creation, the name "*Config1*" is proposed. To change the name, simply save the configuration. To save the configuration file, select "*Save*". With the first save will open the "*Save As*" dialog box in which to specify a name different from the one proposed. to avoid loss of work performed it is advisable to save the file periodically during configuration creation.

The user can now enter the first capture.

To do this, simply select the ACQUISITIONS node and select the Insert menu *item (or using the right mouse button)*. The list of available sensors will be proposed. If the sensor has predefined channels, they will be added automatically. Each new object inserted is proposed with a default value by *default*. To change the values of the *object's properties*, simply select the object and set the values using the property editor.

To delete an object simply select the item and select the menu item Delete Insert (or using the right mouse button*).*

Then It can be added PROCESSING on the acquired data.

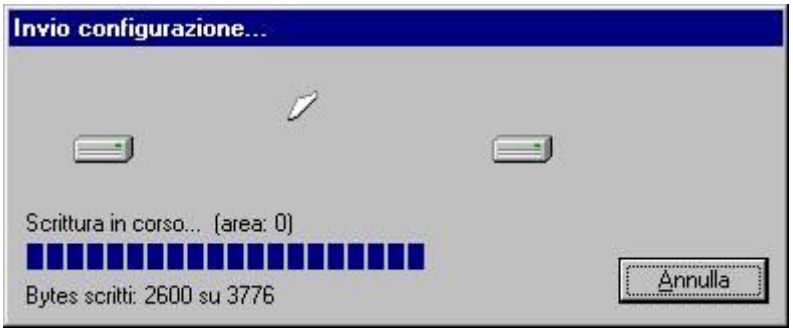
The same procedure is also used for processing. You select the PROCESSING object and from the insert menu you select the available function specifying the channel on which to perform the processing.

Finally It can added a MEMORIZATION. In this case, however, It is necessary to add a definition of the format of the record (INSTANT, STATIC or ALARM) and then the data that will be inserted into the record.

In a very similar way, the other functions of processing, storage, alarm, transmission, etc. can obviously also be inserted, always following the same procedure.

6 Sending and receiving the configuration

To send an open configuration to the datalogger, select *Send*... from the *File* menu. Once the operation to be performed has been confirmed, after a few moments a progressive bar will appear showing the information on the transfer in progress.



Once the sending is finished, the datalogger will undergo a reset that will allow it to load and execute the received configuration.

Similarly, to receive the stored configuration from the station It will be needed to select *Receive...* from the File menu. Subject to confirmation of the selection, a progressive bar identical to the one previously seen will come out. At the end the representative window of the configuration will open with a name automatically assigned by DAK. If the configuration just received is the only window open, the name Config1 will be proposed. However, the user should bear in mind that the configuration is not yet saved. To save the configuration to a file, select *Save*. this invokes the save as dialog box where you can optionally specify a new name or search for a file that already exists to replace.

7 Executing commands

Through DAK, station users can communicate with the datalogger and perform some basic service operations. The commands available with the datalogger can be summarized as follows:

• Reading the station ID

• Download and reset of data recorded in memory

• Instant data request and visualization

• Clock synchronization

• Manual sending of specific Store & Forward commands

Below we will deepen the particularities of each command.

7.1 Station ID

Each datalogger must be identified with a unique number within the same network of stations. This number (called station ID) will appear on the registrations made by the station itself and will subsequently be used to sort the data into a possible central database. Normally the first station in a network or a single station should be set to ID equal to 1.

To check the station ID just select the Station ID item from the Run menu. A window will open in which a box with its value appears. To set the ID again you need to use the 'System Settings' window

Data download and reset

Instructions for downloading data from dataloggers.

Selecting the Download Data item from the **Run** menu of the DAK displays the following form:

As you It can be seen, it is already automatically proposed the discharge of the memory area number 6 which is typically the one that contains the historical data.

Immediately below is automatically proposed the name of the file that will contain the downloaded data. The name is composed using the current year, month and day. The operator is still given the freedom to select a new path and a different file name and this is done by pressing the **Browse** button…

Continuing in the analysis of this data download mask, It could be observed that it is possible to define the download mode regarding the beginning of the data to be read. Normally when the data are downloaded, It is often preferred to take them by reading them from the beginning, so as to take all the data in the memory. The operator is still given the opportunity to download the data by starting the download from the position where the reading pointer was at the end of the previous operation. The use of this function has the only justification when you want to resume a data download interrupted perhaps by the interruption of the telephone connection.

Then It is possible to choose whether to create a new data file or append these to a pre-existing file. Under normal conditions leave this option on **Overwrite** to create a new file each time.

Finally, in the **Options** window It can be defined whether or not to reset the data at the end of the download (we recommend leaving this function enabled to avoid saturating the memory of the datalogger).

7.2 Instant data request

Instant measurement data can be requested and displayed on the screen if the datalogger has been configured to record them. before requesting instant data it is advisable to open the configuration for the station or receive the configuration from the station itself. Selecting Instant Data Request later from the Run menu will open a display window and after a few moments the associated measurements and values will appear. If the station configuration was not opened before the request, It will be only seen the measurement values while the names and units of measurement will not appear. Through the Request button the user can repeat the data request immediately.

7.3 Synchronizing the watch

To set the station clock and date display, select *Synchronize Clock*. Normally the synchronize with clock option of the system is active, so pressing *Send* station will be synchronized with the computer clock. Otherwise the user can disable this option and manually set the time and date to be sent.

7.4 Store & Forward Commands

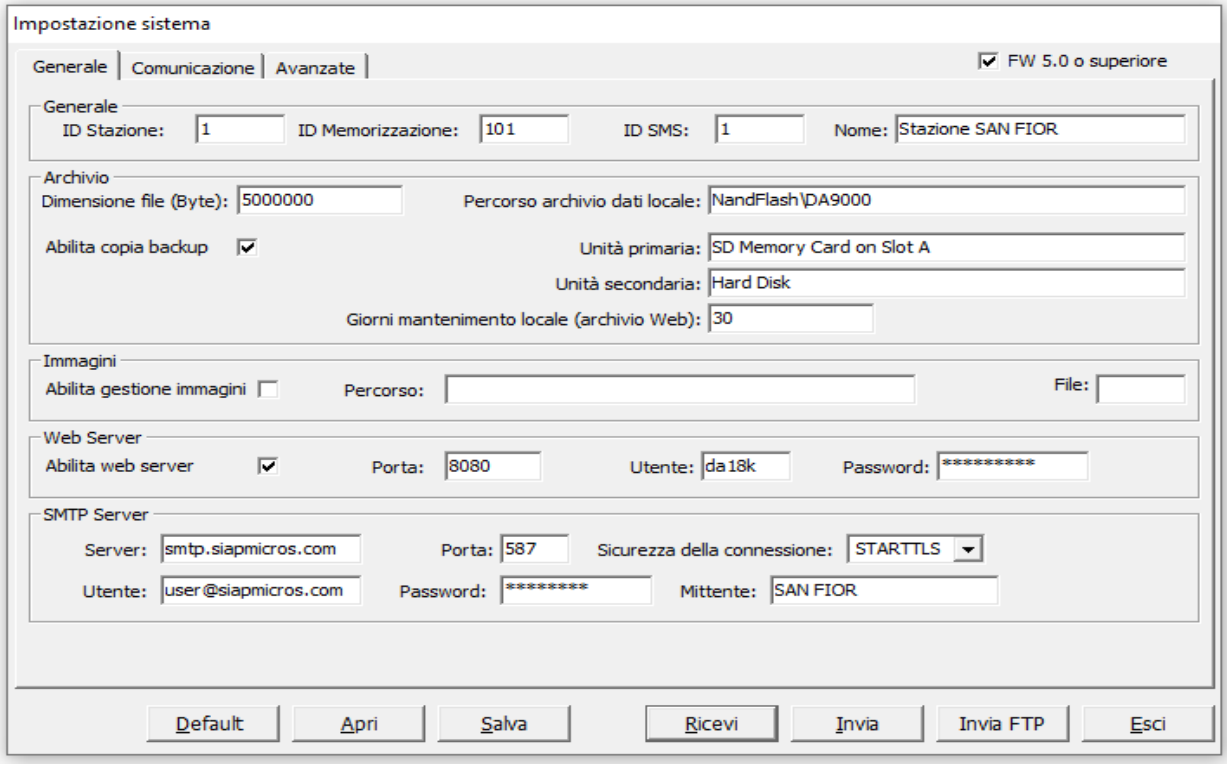
Dedicated to technical assistance personnel or in any case to experienced users, through the selection of this item the datalogger commands can be given in manual mode according to the coding of the *Store & Forward* protocol. The operator writes the encoded command to the top text box and presses *Send* to transmit it to the datalogger. The station's response can be checked in the lower text box.

8 System Settings (INI Files)

In addition to the configuration, the datalogger needs an initialization file in which the connection modes, the identifier and the name of the station, and the paths of the data stores are essentially indicated.

Selecting the Menu item File> Settings Manager will open the 'System Setup' window::

8.1 General settings



8.1.1 General

In this section you can enter the identifier:

Station ID. This is a value closely related to the hardware of the device and the range allowed for this value is from a minimum of 1 up to 254.

Storage ID, on the other hand, is an optional value that serves to indicate what will be the station identifier used when you go to save the data in the storage files. If left blank, the storage ID will coincide with the Station ID while if filled in, this value allows you to extend the station number beyond the limit of 254. The same goes for the parameter:

SMS ID that uses the station identifier in the data transmitted via *SMS.*

Name instead is the field that allows to give a name to the station. this value is displayed in the snapshot form.

8.1.2 Archive

In this section will be found some settings that affect the management of data and internal and external memories of the datalogger:

File size: This value indicates the maximum size of the data files (circular buffer). When the data that accumulates in the data files reaches the indicated size, the older data is overwritten. The size can be

changed according to the needs but the default size of 5 Mbytes guarantees a reserve of data more than enough for a normal use of a device equipped with a communication system. If the intent is instead to store the data without therefore having a radio, telephone or satellite transmission system, the solution to store large amounts of data remains the SD card removable memory described in the following paragraphs.

Local Data Store Path: Indicates the location of where the data that can be reached and downloaded using the functions of the web server is located.

Primary drive: This is the name of the SD card removable memory bay device (slot) (do not change this setting).

Secondary drive: this is the name of the additional data storage device which consists of the possibility of inserting an additional USB memory (pen drive) to extend the data backup (do not change this setting).

Local maintenance days (web archive): This value indicates the maximum number of days of data that can be downloaded via the functions of the web server. The maximum value is 30 days.

8.1.3 Images

Obsolete section now replaced by FTP data sending.

8.1.4 Web Server

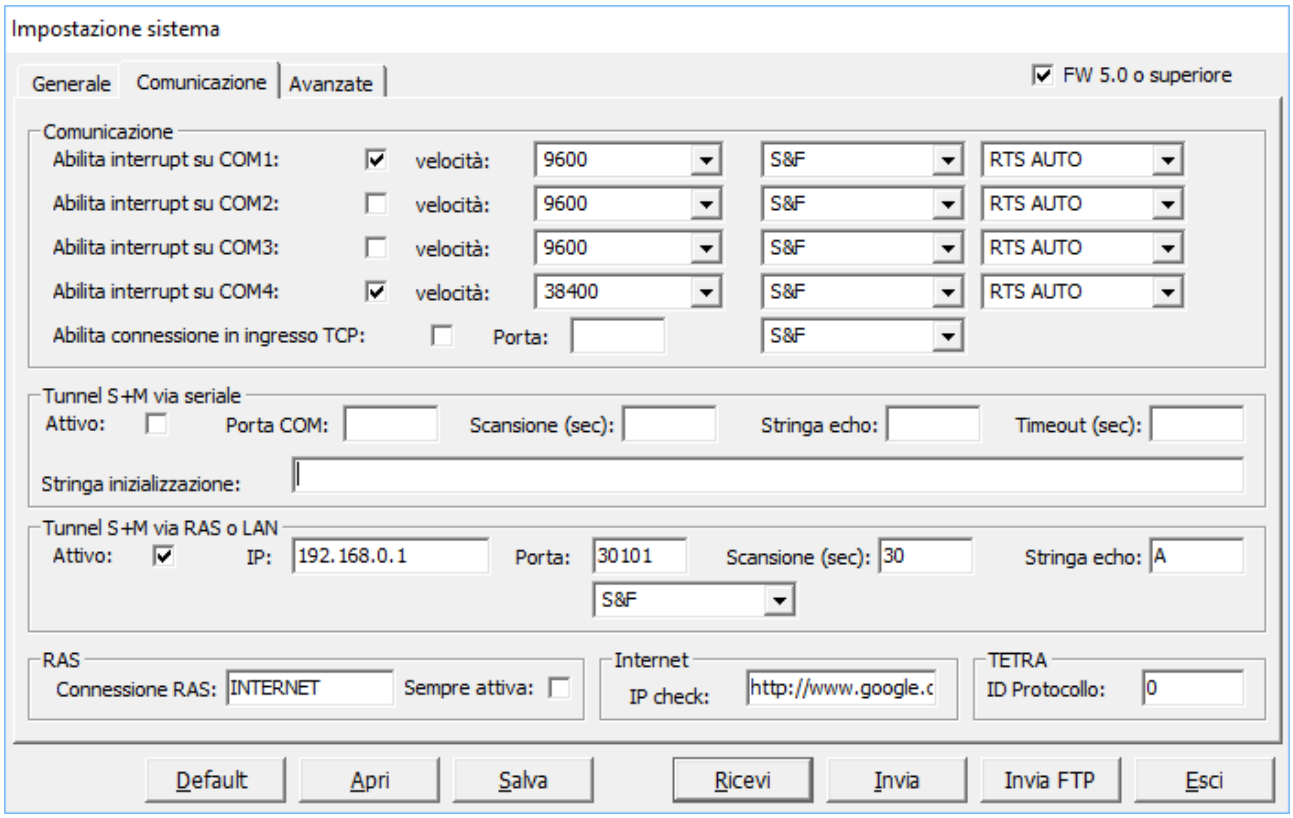
In this section some features of the TCP/IP connection are set for the management of the internal web server of the device such as the login credentials and the communication port for the browser.

8.1.5 SMTP Server

Setting up the SMTP e-mail server that will be used for outgoing emails:

- SMTP server name and connection port;
- Type of security used (SSL/TLS, STARTTLS);
- Authentication account (username and password);
- Sender (optional);

8.2 Communication settings



8.2.1 Communication

this section lists the four serial communication ports of the datalogger (two rs-232 and two rs-485).

Enable interrupt on COMx: for each of them It can be set the communication speed, the communication protocol to be used (Store & Forward, ModBUS or TETRA) and the status of the RTS criterion (request to send) which can be: Automatic, Handshake, ON or OFF. this policy is sometimes used to control the management of radio device communications (ptt)).

Enable TCP incoming connection: in this section It can enable the management of TCP communication to and from the datalogger by specifying the communication socket port and the protocol to be used (Store & Forward, ModBUS or TETRA).

8.2.2 Tunnel S+M via serial

Obsolete section supplanted by the Tunnel connection via RAS or LAN.

8.2.3 Tunnel S+M via RAS o LAN

In this section It can be activated the tunnel connection between the device and the data collection center. This communication methodology allows to reach the device via socket even it is unknown the dynamic IP address associated with the communication system (modulo GPRS/UMTS, router, ecc.). The task of keeping track of communication addresses is entrusted to the SocketTunnel program.exe installed on a server whose static address is known. At this address both interlocutors (Datalogger and PC) must refer in order to communicate with each other. The SocketTunnel.exe software provides pairs of socket ports, identified by convention as left SX port and right DX port.

Active: to make this feature active It is needed to put the check mark in this box.

IP: This is the static IP address of the server on which the tunnel software is installed.

Port: Here to indicate the DX socket port assigned by the tunnel software for the station.

Scanning: to keep the socket tunnel connection active it is necessary to generate traffic, even minimal otherwise the telephone operator closes the connection after a certain interval. at the end It can be periodically send a short message (typically a single letter) to keep the connection active.

Echo string: A character that is periodically sent (default letter A) to keep the tunnel connection active.

Communication protocol to be used: (Store&Forward, ModBUS or TETRA).

8.2.4 RAS

In this section it is possible to indicate whether or not the RAS remote connection (which by default is called INTERNET) must always remain active allowing bilateral access to the socket communication. This setting is essential for example if It is intended to use the services offered by the web server of the device.

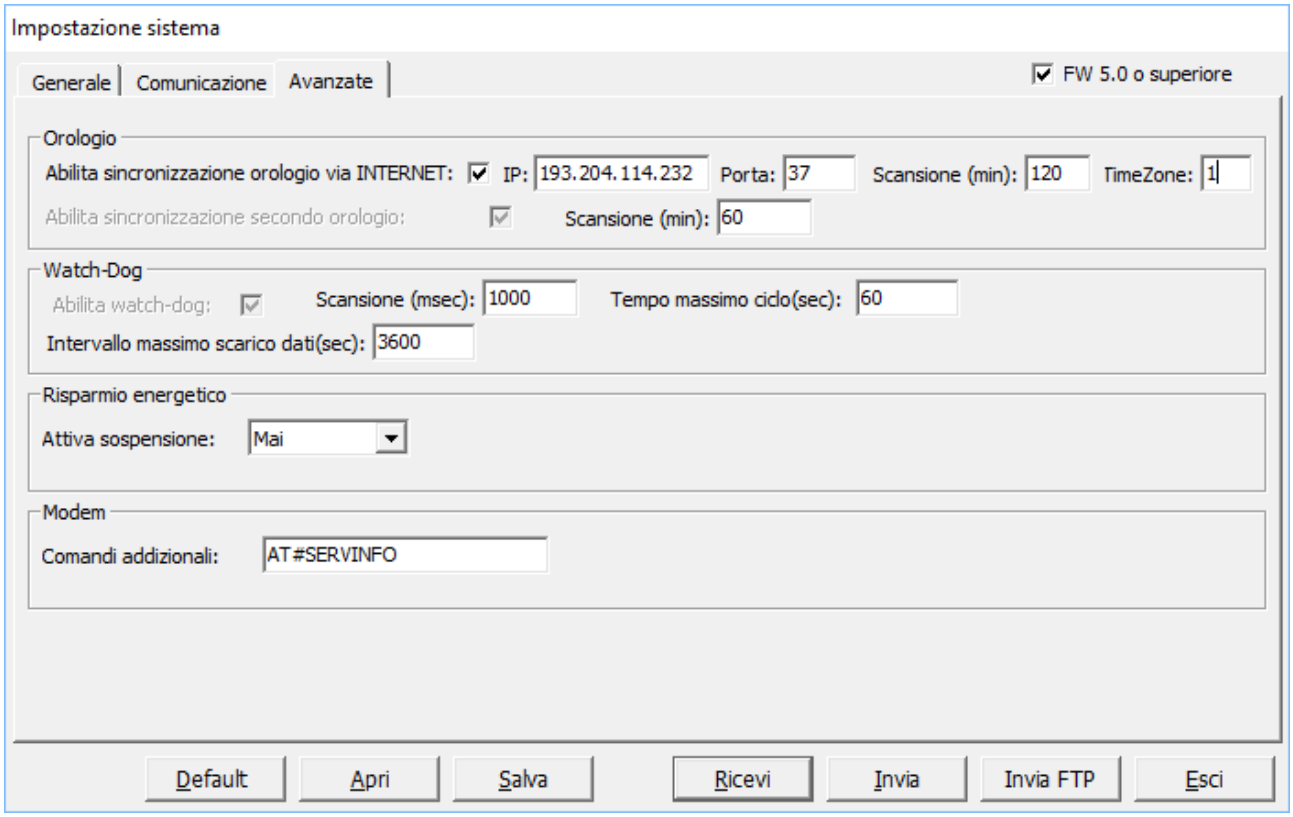
8.2.5 Internet

This section sets a valid address (URL) in order to verify the correct connection and operation of the datalogger's TCP communication devices. The default address is: http://www.google.com.

8.2.6 TETRA

This is the address used in radio communication with TETRA protocol.

8.3 Advanced settings



8.3.1 Clock

this section manages the datalogger clock settings:

Enable clock synchronization via INTERNET: allows you to set the credentials for connecting to an NTP server. The parameters to be entered are: The IP address of the server, the port (default 37=, the time scan to check the alignment of the clocks and the Time Zone to refer the datalogger clock to your geographical area. Time Zone = 0 = GMT/UTC clock.

The item *Enable synchronization according to clock* is a parameter always enabled and serves to synchronize periodically (by default every 60 minutes) the two internal clocks of the datalogger.

8.3.2 Watch-Dog

This section defines the terms for the intervention of the watch-dog software. These settings allow a general reboot of the datalogger and all the equipment connected to it (including transmission systems) when malfunctioning conditions occur that cause the interruption on the data flow.

Scanning: this parameter that by default is 1000 mSec indicates to the datalogger with which interval must generate a control pulse to be sent to the underlying base. The base as long as it hears these impulses coming from the datalogger, understands that everything is working properly. If due to a blockage of the operation of the datalogger, these impulses should fail, the datalogger after 10 minutes commands a general restart (REBOOT) with which it will try to restore the operation of the entire system. Maximum cycle time: this time expressed in seconds indicates the time limit that the datalogger allows to carry out a full cycle of data acquisition from the field. If due to one or more devices not working, this time should last too long. The datalogger will decide to perform a general reboot (REBOOT) with which it will try to restore the operation of the non-functioning cards and sensors.

Maximum data download interval: this time expressed in seconds indicates the time limit that the datalogger admits between one data download and the next. Data download means both downloading data imparted by the center and sending data in different ways such as sending FTP data. Under normal conditions the datalogger is queried by the center or it is itself to generate data transmission sessions to send the data to the center. If for some reason this session is not successful, it means that there is something wrong with the transmission devices (radio, GOPRS/UMTS modules, routers, etc.) in which case, after the time limit of the set interval, the datalogger commands a general restart (REBOOT) with which it will try to restore the operation of the entire system. If the value = 0 is set then the control remains disabled.

8.3.3 Energy saving

In this section It can be defined whether to activate the energy saving of the datalogger by allowing the internal circuits to switch to sleep mode when the datalogger is waiting for card queries or data processing. By setting this interval appropriately and consequently all the timing of acquisition, processing, storage, etc. it is possible to significantly reduce energy consumption. This is indicated for example in the case of systems powered only by bacteria.

8.3.4 Modem

Additional commands: during the normal operation of the datalogger, with an associated GPRS/UMTS modem communication system, it is possible to indicate in this section, an additional command to be sent periodically to the modem in order to obtain additional information such as those on the status of the connection and strength of the radio signal. The default command AT#SEREVINFO is used to request information from the modem on the status of the communication. The result of these commands will be reported in the daily log files and will be very useful for carrying out checks and checks on the goodness of the communication system.

9 Remote communication

To call Siap+Micros *dataloggers*, by connecting modems, select *Connect*... from the *Call menu*. *The mask* (see figure) will be displayed on which to type the telephone number of the station. If the station has already been called previously it is not necessary to rewrite the number, just check it on the box among the last ten numbers entered. Then press the *Compose button* to activate the call:

During the modem connection, a small window will appear in which the data of the recipient station is summarized. When it is done, if there were no errors, the connection icon will appear on the bottom right of the screen. This indicates that remote communication is open. at this point the user is enabled to perform all operations as in a local link.

after you have completed the operations remember to disconnect the modem with *disconnect*.

10 Settings

From the *Tools* menu, select *Settings*... to display the options set for DAK. If changes are made to the entries press *Apply or OK* to confirm them.

10.1 Serial port settings

Click on the *Serial Port* box to check the port settings.

normally the default values for the correct functioning of the communication are as follows:

Port: COM1

Bits per second: 9600

Parity: None

Data bits: 8

Stop bits: 1

10.2 Modem Settings

Click on the Modem TAG to check the modem settings.

On the form that appears, It can be set the set of commands to use to initialize the modem. Select the specific command line for the connected modem from the Hayes Commands list, or type the sequence of commands directly in the text box. Normally each type of modem is associated with a particular sequence of commands. In other cases, a series of standard commands may be fine. if there are difficulties identifying the type of modem initialization if necessary contact technical support.

10.3 Setting maximum S&F packet count

Inside the DAK configuration file. INI can be set a maximum number of packets to be used when communicating with the datalogger. When using transmission systems such as radio, low values (1 or 2) must be set. The default value is 5.

The variable to modify is as follows: MaxPacks.

10.4 Connessione TCP/IP

By accessing the mask of the telephone connection it is possible to enable the Socket connection to be able to communicate with the datalogger connected to the company Ethernet network or via GPRS. The operator must enter the IP address and port number to be used in the connection. Once the connection is established it is possible to interact with the datalogger as if it were connected to the serial port.

11 Basic Code Interpreter

11.1 Generality

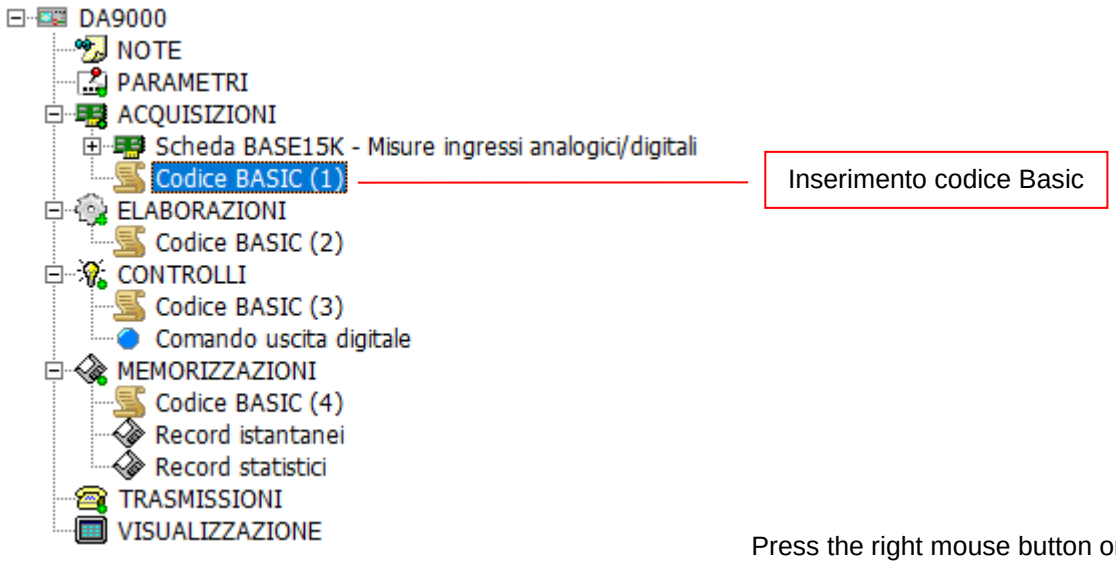
DA15K/DA18K series dataloggers feature a Basic code interpreter that can be used to add versatility to control applications and expand decision-making and processing capabilities.

11.2 Configurazione Basic

The user has the possibility to insert in the configuration the execution of Basic code through which it is possible to invoke and manipulate the memory locations used in the process.

The Basic code (or user program) can be inserted in several parts of the configuration, in particular in the following working sections:

- ACQUISITIONS
- PROCESSING
- CONTROLS
- STORAGE



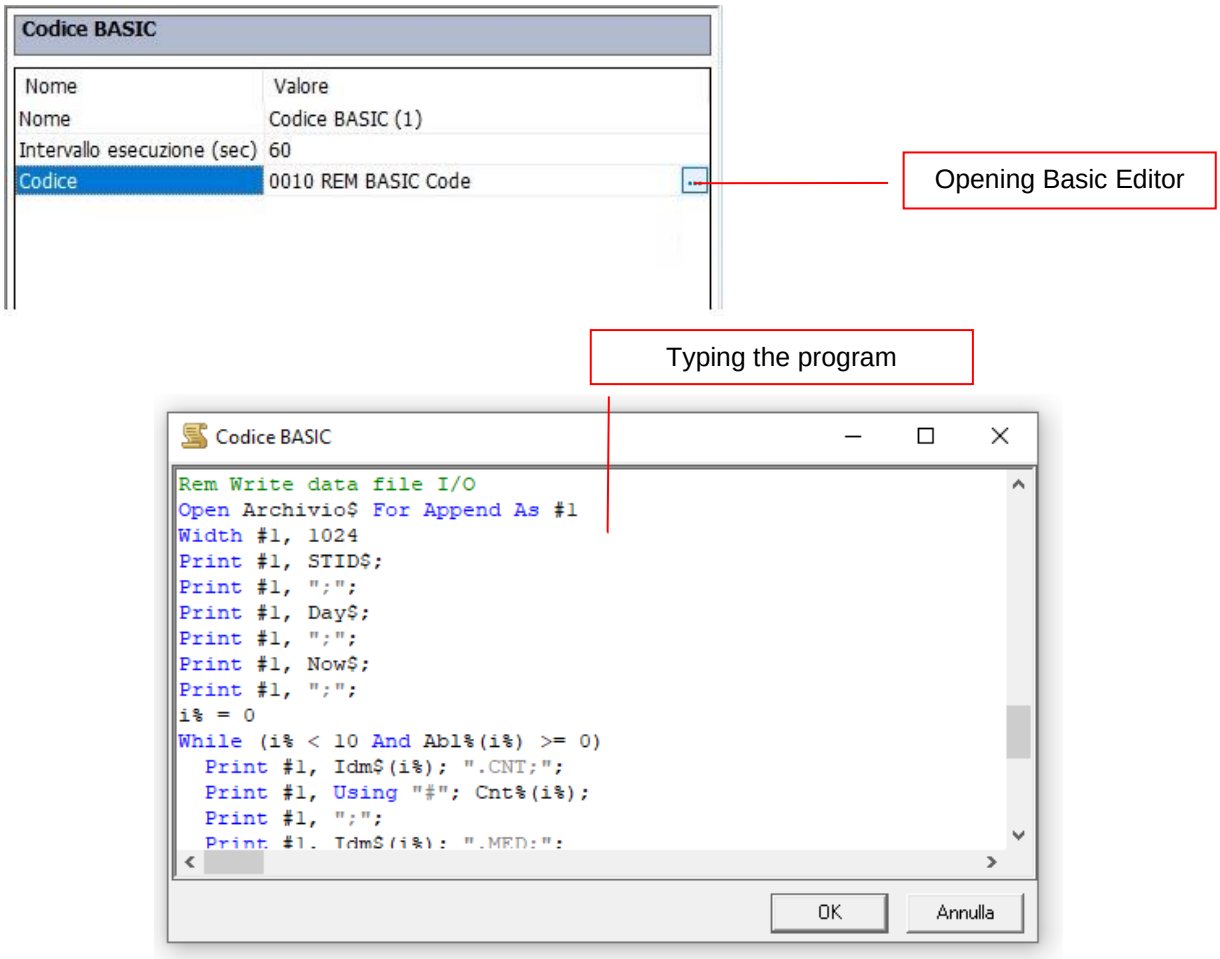
Press the right mouse button on the chosen configuration level and select:

Enter > BASIC Code

For each level you can enter one or more programs and specify on each the interval of execution (seconds). the programs will run at the set deadline and in the chosen order.

To call up the text editor of the Basic code click on the menu [...] near the "Code" item.

the basic code window opens where you type the program code:



Syntax notes:

Within the code the line numbers are not strictly required, they can be omitted but are indispensable if line jump instructions such as GOTO, GOSUB, etc. are used (ref. par.11.11).

Basic command and function names are not case-sensitive. Example: The ABS(), Abs() or abs() statements are equivalent. Unlike other basic types, variable names are case-sensitive so for example A$ and a$ are two distinct variables..

Basic commands and functions have reserved names that cannot be used for variables.

the following chapters describe the functionality of the basic interpreter and in particular the commands and instructions that can be used in the program code.

11.3 Expressions, constants, variables, and operators

Expressions used in Basic code can contain constant values, variable names, and operators. Constants and variables can be of type: numeric or string.

Costants

Numeric constant representation:

Integers	Integers (positive or negative) between -2,147,483,648 and +2,147,483,647
Real	Real numbers with decimal point (positive or negative) can also be represented in scientific notation. Scientific notation consists of an integer or decimal number (mantissa) followed by the letter E o and with a marked exponent. For example: 1.2345E-6. The range available for real constants is 3.0×10-39 to 1.7×1038
Hexadecimal	Hexadecimal numbers represented with prefix &H. For example: &HFF
Octal	Octal numbers represented with prefix &O. For example: &O77

String constant representation:

The string constant is a sequence from 0 to 255 alphanumeric characters enclosed in double superscripts.

Examples::

“ST001”

“NandFlash\DA9000”

Variables

Variables can be used without formal declaration, an initial assignment of the type is sufficient:

LET N = 0: LET A$ = “String”

of which the LET statement can be omitted making the simplest form equivalent:

N = 0: A$ = “String”

Variable names can contain up to a maximum of 40 alphanumeric characters (uppercase and digit letters) but cannot begin with a digit or contain spaces. Reserved names for basic statements and functions are excluded.

Names can use (suffix) characters for the explicit declaration of the type with which the type of variable is indicated.

the following types of variable declaration are recognized:

Character	*Type of variable*	*Bytes*	*Range*
%	Long whole (*integer*)	4	-2.147.483.648 ÷ 2.147.483.647
!	Real in single precision (*single*)	4	$\pm 3.4\times10^{38}$ (7 digit)
#	Real in double precision (*double*)	8	$\pm 1.7\times10^{308}$ (15 digit)
$	String (*string*)	0 ÷ 255	0 ÷ 255 caratteri

Examples of variable assignment for each type:

N% = 1

V1! = 1.23

V2# = 1.234567

A$ = “Temperatura”

When the type declaration character is omitted, the variable is automatically declared to be of real type in single precision (default).

The default type for a numeric variable is real in single precision. Double accuracy, while very accurate, uses more memory space and more computational time. The single accuracy is accurate enough for most applications. However, the seventh significant digit (if printed) will not always be accurate. Be very careful when making conversions between integer, single-precision, and double-precision variables.

In addition to simple variables, multi-dimensional arrays can also be defined. Arrays are sized with the DIM statement (ref. par.11.4 – Declarative instructions).

Variabili Mx (locazioni di memoria)

Variable names beginning with the letter M (capital letters) and following a numeric index (without initial 0s) are reserved to identify memory locations used internally in the configuration (e.g. M100 = location 100). these variables are implicitly declared as real variables in double-precision to which the values of the existing memory locations (input values) are assigned at the beginning of the program).

Mx variables are used in the program as normal variables but at the end of execution they will return their value to memory locations (outgoing values).

Example:

```
REM Contatore M100
M100 = M100 + 1
```

this program increases the internal lease m100 by value 1 with each execution.

Operators

Operators are necessary to combine constants and/or variables in various expressions in order to obtain a single result (mathematical and/or logical operations). Expressions with parentheses are evaluated first and precedence rules are applied to them for each operator.

The following describes all the available operators divided into the various categories:

Arithmetic operators

the following operators are listed in order of precedence:

^	Elevation to power
*	Multiplication
/	Division
\	Entire division
MOD	Rest of the entire division
+	Addition (or string concatenation)
-	Subtraction

Note: If a division by zero is encountered during the evaluation of an expression, the error log "Division by zero" will be logged and the program will be stopped. if the evaluation of an expression produces a value outside the allowed range, the error "Overflow" will be logged".

Relational operators

Relational operators are used to compare two values. The result of the comparison can be true (-1) or false (0). The result can be used to make a decision in the program. note that the equality sign is also used for assigning a variable.

=	Equal (or assignment)
<>	Different
<	Minor
>	Major
<=	Less than or equal
>=	Greater than or equal

Logical operators

Logical operators are useful for multiple relationships and Boolean operations. The result can be bit manipulation or a true (-1) or false (0) value. Again, the result can be used for a decision-making assessment. the following operators are listed in order of precedence:

NOT	Negation
AND	Conjunction
OR	Disjunction
XOR	Exclusive disjunction
EQV	Equivalence
IMP	Implication

11.4 Declarative instructions

They are used at the beginning of the code to declare/initialize the variables and/or constants that will be used:

Instruction	***Description***
DATA constant[, constant]...	Declares a set of constant values.
READ variable[, variable]...	Reads and assigns the set of constant values to the variables
RESTORE [line]	It allows the re-reading of the series of constant values.
DEFINT letter[-letter]...	Declares variable names of integer type.
DEFSNG letter[-letter]...	Declares real type variable names in single precision.
DEFDBL letter[-letter]...	Declares real type variable names in double accuracy.
DEFSTR letter[-letter]...	Declares variable names of type string.
OPTION BASE n	Declares the base index value for arrays (the default is 0).
DIM variable(elements)...	Declares and sizes array variables.

LET variable = expression	Declares and assigns simple variables.
ERASE variable[, variable]...	Deletes variables and arrays from the program.
CLEAR	Sets all numeric variables to zero and null strings.

Iteration instructions

Allow to repeat the execution of instruction blocks (execution cycles):

Istruzione	***Description***
FOR count = start TO finish [STEP increment] **statements...** **NEXT counter**	cycle *FOR* Executes a block of instructions for a specific number of times.
WHILE expression **statements...** **WEND**	cycle *WHILE* Executes a block of instructions while the logical expression is true.

11.5 Conditional expression

The conditional expression creates a decision point about the program flow:

Instruction	***Description***
IF expression THEN statement [ELSE statement]	If the logical/comparative expression is true, the following instructions are executed THEN. If the espresso is not true, the following instructions are executed ELSE (optional).

11.6 Mathematical functions

The following mathematical functions apply to a numeric expression (argument x):

Function	***Description***
ABS(x)	Returns the absolute value of x.
INT(x)	Returns the integer part of x.
LOG(x)	Returns the natural logarithm (based on e) of x.
EXP(x)	Returns the value of e (natural logarithm base) raised to power x.
SQR(x)	Returns the square root of x.
SGN(x)	Returns the sign of x (1 if x is positive, 0 if x is zero, -1 if x is negative).
COS(x)	Returns the cosine of x (the argument x must be expressed in radians).
SIN(x)	Returns the sine of x (the argument x must be expressed in radians).
TAN(x)	Returns the tangent of x (the argument x must be expressed in radians).
ATN(x)	Returns the arctangent of x. The result is expressed in radians.

RANDOMIZE [**(x)**]	Initializes the pseudo-random number generator.
RND [**(x)**]	Returns a pseudo-random number between 0 and 1.

11.7 Conversion functions

the following functions are used to convert different types of data such as numeric expressions to string (and vice versa):

Function	*Description*
ASC(s$)	Returns the ASCII code of the first character of a s$ string.
CHR$(c)	Returns the character corresponding to an ASCII code c.
CINT(n)	Returns the rounded integer value of a fractional expression n.
CSNG(n)	Converts the value of an n expression to a single-precision real number.
CVI(s$)	Converts a 2-byte s$ string to an integer.
CVS(s$)	Converts a 4-byte s$ string to a single-precision real number.
CVD(s$)	Converts an 8-byte s$ string to a real number with double accuracy.
MKI$(n%)	Converts an integer n% to a 2-byte string.
MKS$(n!)	Converts a single-precision number n! in a 4-byte string.
MKD$(n#)	Converts a double-precision number n# to an 8-byte string.
HEX$(n)	Returns the string representation of the hexadecimal value n.
OCT$(n)	Returns the string representation of the octal value n.
STR$(n)	Returns the string representation of the decimal expression n.
VAL(s$)	Returns the numeric value represented by the string s$.

11.8 Functions for strings

They are used to manipulate string variables:

Function	*Description*
LEN(s$)	Returns the number of characters in a string s$.
LEFT$(s$, n)	Returns the left side of a string s$ up to n characters.
RIGHT$(s$, n)	Returns the right side of an s$ string up to n characters.
MID$(s$, p, n)	Returns the part of a string s$ from the initial position p up to n characters.
LSET s$ = n$	Assign the string variable s$ the string expression n$ from the left.
RSET s$ = n$	Assign the string variable s$ the string expression n$ from the right.
INSTR$([p], s$, a$)	Returns the position of the string a$ sought within the string s$.
STRING$(n, c$)	Returns a string with n characters equal to the ASCII code or the c$ character.
SPACE$(n)	Returns a string with n characters of space.

11.9 System Functions

System variable values return:

Function	Description
DATE$	Returns the current system date (dd/mm/y) in string format.
TIME$	Returns string format the current time of the system (hh:nn:ss).
TIMER	Returns a single-precision value that represents the number of seconds since midnight (or system reset).

11.10 Handling errors and line jumps

Instruction set for handling error occurrences and hijackings in running a program:

Function	Description
ERR	Returns the error code of the last error that occurred.
ERL	Returns the line number where the error was found.
ERROR number	Simulates the event of an error or causes a user-defined error.
GOTO line	Hijacks the execution of the program on a specific line.
GOSUB line	Hijacks the execution of the program on a specific line of sub-routines.
RETURN	Returns from running a sub-procedure to the following GOSUB statement.
ON ERROR GOTO line	Reoute error handling on a specific line of sub-routines.
ON n GOTO|GOSUB line	Reoute error handling according to the n-value across multiple sub-routine lines
STOP	End running the program.
END	It finishes the execution of the program and closes all open files.

11.11 File I/O Operations

The following instructions allow you to manage input/output operations (read and/or write I/O) on files on the internal disk or on another device connected to the data-logger.

To begin a file I/O operation, the OPEN statement must be executed first, assigning the number of files required for subsequent read and/or write instructions. the close statement will close the trades when the operation is complete.

Istruction / Function	*Description*
Syntax 1) **OPEN mode, [#]filenumber, filename [, record-len]** *Syntax 2)* **OPEN filename [FOR mode] AS [#]filenumber [LEN=record-len]**	Opens an input/output (I/O) operation on a specific file or device. filename: path/name of the file or device (*). **mode**: **I** | / **O** | **A** | **R** **mode**: **INPUT** | **OUTPUT** | **APPEND** | **RANDOM** **filenumber**: assigned file number (1 ÷ 16). record-len: record length (RANDOM mode). (*) Serial port device name (syntax 2): **"COM*n*:Speed,Parity,Data,Stop,[Options]"** **Speed:** 1200, 2400, 4800, 9600, 19200, 38400, 57600 (bps) **Parity:** N (none), O (odd), E (even), M (mark), S (space) **Data:** 5, 6, 7, 8 **Stop:** 1, 1.5, 2 **Options:** *Non implementate*
FIELD [#]filenumber, width AS var$ [, width AS var$ ...]	Allocates the necessary space for random buffer fields. **width**: number of characters to allocate for each field. **var$**: String variables used for random access.
GET [#]filenumber [,rec-num]	Reads the buffer of a record from a random file **rec-num**: number of the record to read..
PUT [#]filenumber [,rec-num]	Write the buffer of a record from a random file. **rec-num**: number of the record to write.
INPUT [#]filenumber, var[,var]…	Reads data from a sequential file assigning it to a list of specified variables **var[, var]…**
INPUT$(n, filenumber)	Returns a $ string of maximum n characters read from a sequential file or serial device.
LINE INPUT [#]filenumber, var$	Reads an integer line (up to 255 characters) from a sequential file and assigns it to a **var$** string variable
WRITE [#]filenumber, exp[,exp]…	Writes data to a sequential file specifying a list of string and/or numeric expressions **exp[, exp]**...
WIDTH [#filenumber,] n	Sets the number of characters n for the width of the printable line with **PRINT**.
PRINT [#]filenumber, [USING format-string$;] expressions...	Print data to sequential file by specifying a list of string expressions and/or numeric **expressions.**..
EOF(filenumber)	USING can be used to print strings or numeric expressions in a specific format.
LOC(filenumber)	Returns the location of the last read/write within the file.
LOF(filenumber)	Returns the current length (or size) of the file (number of bytes occupied).
CLOSE [[#]filenumber]...	Closes I/O operations on one or more files.

11.12 Console I/O Operations

Instructions for reading data entered from the keyboard and/or printing on the video console:

Istruction / Function	*Description*
INPUT [;][**prompt;**] **var**[, **var**]...	It reads data entered by the keyboard and assigns them to a list of specified variables**: var[, var]...**
LINE INPUT [;][**prompt;**] **var$**	**prompt:** The string that appears on the video console.
WRITE exp[, **exp**]...	Reads an integer line (up to 255 characters) from the keyboard and assigns characters to a **var$ string variable**
WIDTH n	Sets the number of characters n for the width of the printable line with PRINT.
POS	Function not currently implemented.
PRINT [**USING format-string$;**] [**expressions**[;]]...	Print to the video console specifying a list of string and/or numeric expressions... USING can be used to print strings or numeric expressions in a specific format. To insert a certain number of spaces or tabs you can use the functions: **SPC**(n); **TAB**(n)

11.13 File Management Functions

System functions to rename, copy, and/or delete a file on disk:

Function	*Description*
KILL filename	Delete a file.
NAME old-filename AS new-filename	Moves or renames a file.
COPY existing-filename AS new-filename	Copy a file (non-standard Basic).
SHELL exe-filename	Non-standard Basic function not currently implemented (for future development).
ENVIRON var$ = string **ENVIRON$(var$)**	Functions not implemented.
SYSTEM	Function not implemented.

11.14 Instruction Tracking

Commands to enable/disable Basic statement tracking when executing code:

Command	*Description*
TRON	Enable (trace on) instruction tracking.
TROF	Disables (trace off) instruction tracking.

12 Revision history

The following table provides a description of the changes made to this document.

Version	Date	Updates
06	*16/05/2022*	*Current version of the document..*

APPENDIX 1 – Logical and arithmetic operators that can be used in formulas

Variables in memory

M*i*	Value of the measure stored at location i (e.g. M001 = lease value 001) If the measure takes the value = -9999 indicates an invalid value. Note: M0 = raw value of the measurement just acquired from the channel.
V*i*	Validation code of the lease measure i (e.g. V001 = measurement validation code M001). If the validation code takes the value = 1 it indicates that the measurement is valid otherwise if it takes the value = 0 it indicates that the measure is not valid.
$*n*	Parameter value with identifier n (e.g. $11 = ID parameter value 11)

Arithmetic operators

+	Addition
-	Subtraction
/	Division
*****	Multiplication
^	Elevation to power

Logical operators

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

Comparison operators

=	Equal
>	Major
<	Minor
?	Different

Bit comparison operators

&	Bitwise AND
|	Bitwise inclusive OR

Boolean constants

FALSE	Equivalent to value 0
TRUE	Equivalent to value 1

Mathematical functions

ABS	Absolute value of a number
ATN	Arctangent of a number
COS	Cosine of a corner
EXP	Elevation to power of the base of natural logarithms and
INT	Whole part of a number
LIM	Maximum or minimum value of a number between two limits
LN	Natural logarithm of a number
LOG	Logarithm in base 10 of a number
MAX	Maximum value between two numbers
MIN	Minimum value between two numbers
SGN	Sign of a number
SIN	Breast of an angle
SQR	Square root of a number
TAN	Tangent of an angle

APPENDIX 2 – Examples of Programs in Basic Code

Example 1. Calculation of water salinity (PSU)

Codice BASIC

```
0010 REM Calcolo salinità dell'acqua (C = Conducibilità, T = Temperatura)
0020 C = M50
0030 T = M53
0040 PSU = -99
0050 IF (C < 0) OR (T < 0) THEN GOTO 70
0060 GOSUB 100
0070 M57 = PSU
0080 END
0090 REM Subroutine salinità (PSU)
0100 a0 =  0.0080
0110 a1 = -0.1692
0120 a2 = 25.3851
0130 a3 = 14.0941
0140 a4 = -7.0261
0150 a5 =  2.7081
0160 b0 =  0.0005
0170 b1 = -0.0056
0180 b2 = -0.0066
0190 b3 = -0.0375
0200 b4 =  0.0636
0210 b5 = -0.0144
0220 c0 =  0.6766097
0230 c1 =  2.0056400e-2
0240 c2 =  1.1042580e-4
0250 c3 = -6.9698000e-7
0260 c4 =  1.0031000e-9
0270 k = 0.0162
0280 CSmp = C / 42.914
0290 CKcl = c0 + c1*T + c2*T^2 + c3*T^3 + c4*T^4
0300 Rt = CSmp / CKcl
0310 Ft = (T - 15) / (1 + k*(T - 15))
0320 Ds = (b0 + b1*Rt^(0.5) + b2*Rt + b3*Rt^(1.5) + b4*Rt^(2) + b5*Rt^(2.5))* Ft
0330 PSU = a0 + a1*Rt^(0.5) + a2*Rt + a3*Rt^(1.5) + a4*Rt^(2) + a5*Rt^(2.5) + Ds
0340 RETURN
```

OK Annulla

Note:

- The program uses line numbers for calling the subroutine 0090 (GOSUB 100 instruction)
- Input data are: Conductivity = M50, Temperature = M53
- The output data is: M57 = PSU

Example 2. Average, minimum, maximum statistical data processing (up to 10 sensors)

Codice BASIC

```
Rem Elaborazione dati statistici
Dim Abl%(10)
Dim Cnt%(10)
Dim Ist#(10)
Dim Sum#(10)
Dim Med#(10)
Dim Min#(10)
Dim Max#(10)
Abl%(0) = M100: Ist#(0) = M101: Cnt%(0) = M102: Sum#(0) = M103: Min#(0) = M105: Max#(0) = M
Abl%(1) = M110: Ist#(1) = M111: Cnt%(1) = M112: Sum#(1) = M113: Min#(1) = M115: Max#(1) = M
Abl%(2) = M120: Ist#(2) = M121: Cnt%(2) = M122: Sum#(2) = M123: Min#(2) = M125: Max#(2) = M
Abl%(3) = M130: Ist#(3) = M131: Cnt%(3) = M132: Sum#(3) = M133: Min#(3) = M135: Max#(3) = M
Abl%(4) = M140: Ist#(4) = M141: Cnt%(4) = M142: Sum#(4) = M143: Min#(4) = M145: Max#(4) = M
Abl%(5) = M150: Ist#(5) = M151: Cnt%(5) = M152: Sum#(5) = M153: Min#(5) = M155: Max#(5) = M
Abl%(6) = M160: Ist#(6) = M161: Cnt%(6) = M162: Sum#(6) = M163: Min#(6) = M165: Max#(6) = M
Abl%(7) = M170: Ist#(7) = M171: Cnt%(7) = M172: Sum#(7) = M173: Min#(7) = M175: Max#(7) = M
Abl%(8) = M180: Ist#(8) = M181: Cnt%(8) = M182: Sum#(8) = M183: Min#(8) = M185: Max#(8) = M
Abl%(9) = M190: Ist#(9) = M191: Cnt%(9) = M192: Sum#(9) = M193: Min#(9) = M195: Max#(9) = M
i% = 0
While (i% < 10 And Abl%(i%) >= 0)
  If Cnt%(i%) = 0 Then Sum#(i%) = 0
  Cnt%(i%) = Cnt%(i%) + 1
  Sum#(i%) = Sum#(i%) + Ist#(i%)
  Med#(i%) = Sum#(i%) / Cnt%(i%)
  If Cnt%(i%) = 1 Then Min#(i%) = Ist#(i%)
  If Cnt%(i%) = 1 Then Max#(i%) = Ist#(i%)
  If Ist#(i%) < Min#(i%) Then Min#(i%) = Ist#(i%)
  If Ist#(i%) > Max#(i%) Then Max#(i%) = Ist#(i%)
  If Abl%(i%) = 0 Then Cnt%(i%) = 0
  If Abl%(i%) = 0 Then Sum#(i%) = 0
  If Abl%(i%) = 0 Then Med#(i%) = -9999
  If Abl%(i%) = 0 Then Min#(i%) = -9999
  If Abl%(i%) = 0 Then Max#(i%) = -9999
  i% = i% + 1
Wend
M102 = Cnt%(0): M103 = Sum#(0): M104 = Med#(0): M105 = Min#(0): M106 = Max#(0)
M112 = Cnt%(1): M113 = Sum#(1): M114 = Med#(1): M115 = Min#(1): M116 = Max#(1)
M122 = Cnt%(2): M123 = Sum#(2): M124 = Med#(2): M125 = Min#(2): M126 = Max#(2)
M132 = Cnt%(3): M133 = Sum#(3): M134 = Med#(3): M135 = Min#(3): M136 = Max#(3)
M142 = Cnt%(4): M143 = Sum#(4): M144 = Med#(4): M145 = Min#(4): M146 = Max#(4)
M152 = Cnt%(5): M153 = Sum#(5): M154 = Med#(5): M155 = Min#(5): M156 = Max#(5)
M162 = Cnt%(6): M163 = Sum#(6): M164 = Med#(6): M165 = Min#(6): M166 = Max#(6)
M172 = Cnt%(7): M173 = Sum#(7): M174 = Med#(7): M175 = Min#(7): M176 = Max#(7)
M182 = Cnt%(8): M183 = Sum#(8): M184 = Med#(8): M185 = Min#(8): M186 = Max#(8)
M192 = Cnt%(9): M193 = Sum#(9): M194 = Med#(9): M195 = Min#(9): M196 = Max#(9)
```

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Note:

• The program does not use line numbers

Example 3. Write statistical data files (CSV format)

Codice BASIC

```
Rem Write data file I/O
Open Archivio$ For Append As #1
Width #1, 1024
Print #1, STID$;
Print #1, ";";
Print #1, Day$;
Print #1, ";";
Print #1, Now$;
Print #1, ";";
i% = 0
While (i% < 10 And Abl%(i%) >= 0)
  Print #1, Idm$(i%); ".CNT;";
  Print #1, Using "#"; Cnt%(i%);
  Print #1, ";";
  Print #1, Idm$(i%); ".MED;";
  Print #1, Using "#.###"; Med#(i%);
  Print #1, ";";
  Print #1, Idm$(i%); ".MIN;";
  Print #1, Using "#.###"; Min#(i%);
  Print #1, ";";
  Print #1, Idm$(i%); ".MAX;";
  Print #1, Using "#.###"; Max#(i%);
  Print #1, ";";
  i% = i% + 1
Wend
```

OK Annulla

Note:

- This piece of code is shown as an example for writing a data file in CSV format in "Append" mode. the program is part of a more complex basic configuration that requires the assignment of variables in use.