DATA RECORDER

MODBUS DATA ACQUISITION AND RECORDING SOFTWARE

USER MANUAL



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SENECA
AUTOMATION INTERFACES

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CONTENTS

CONTENTS 2
1 INTRODUCTION 3
1.1 IDENTIFICATION DATA OF THE MANUAL 3
1.2 PURPOSE AND OSE OF THE MANUAL 3
1.3 CONSULTATION OF THE MANUAL 3
1.4 GLOSSARY 4
1.5 FORMULATION OF INTELLECTUAL PROPERTY RIGHTS 4
2 PRODUCT DESCRIPTION 5
2.1 GENERAL DESCRIPTION 5
2.2 INTENDED USE 8
2.3 TECHNICAL SPECIFICATIONS 9
2.4 RESIDUAL RISKS 10
3 CREATING A PROJECT 11
4 SOFTWARE PAGES 17
4.1 Pages menu 17
4.2 Common elements 20
4.3 Global commands 21
4.4 “ General settings” page 23
4.5 “Scheduler” page 25
4.6 "Display pages" page 27
4.7 "Display" page 29
4.8 "Chart" page 30
4.9 “Channels”, “Calibration”, “Notes” pages 31
4.10 “Automatic report” page 37
4.11 "License" page 38
4.12 “Unit of measurement” page 39
5 SYSTEM UPDATE 40
6 LIST OF FIGURES 41
7 LIST OF TABLES 42

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1 INTRODUCTION

1.1 IDENTIFICATION DATA OF THE MANUAL

The identification data of the manual can be found in the footer of this manual.

1.2 PURPOSE AND OSE OF THE MANUAL

This Manual is an integral part of the product and is intended for all people who work on the product or interact with the users of the product itself. It aims to provide all the information necessary to:

- quickly identify all parts of the product;
- create a project, import channels, create viewing pages and record data from channels using different scheduling modes
- ensure the efficient operation of the product.

This manual must be read carefully in its entirety before carrying out any operation on the product. In case of doubts on the correct interpretation of the instructions contained therein, contact SENECA s.r.l. to obtain the necessary clarifications.
This Manual must be kept with care throughout the life of the product and must accompany the product itself in all its transfers, for any reason, to other users. It must be placed near the product, in a place protected from atmospheric agents, heat, humidity and corrosive agents, easily accessible and known to all users; it must be consulted taking care not to damage it, not to remove pages, not to modify its contents in any way.
If, as a result of constructive changes that entail a change in the operation of the product, an update of the manual should be necessary, SENECA will provide the Customer with a revision of the Manual itself that will replace the previous one in all respects.

1.3 CONSULTATION OF THE MANUAL

Inside the manual the information is organized in:

- chapters,
- subchapters,
- paragraphs,
- subparagraphs

and they are easily traceable by consulting the Summary at the beginning of the Manual itself. To draw users' attention to the correct and safe use of the product, the following graphic symbols are used in this manual:

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The symbol is used to indicate dangerous situations for people or situations that may cause damage to the product or compromise its efficiency.



The symbol is used to indicate prohibited operations.



The symbol is used to call attention to particularly important information.

1.4 GLOSSARY

I/O modules
Hardware integrating inputs and outputs

Z-NET4
I/O module hardware configuration software

Modbus RTU
Serial communication protocol

Modbus TCP
TCP/IP communication protocol

Sampling interval
Time interval between reading two values from any system

Database
Structured data store

1.5 FORMULATION OF INTELLECTUAL PROPERTY RIGHTS

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The only one authorized to use the documentation in question is the Customer to whom the Manual is supplied as an integral part of the product, for the sole exclusive purpose of correctly carrying out all the operations related to the various phases of the life cycle of the product itself.

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2 PRODUCT DESCRIPTION

2.1 GENERAL DESCRIPTION

Data Recorder is the ideal software for testing sessions, laboratories, test rooms, process measurement monitoring which allows you to view and record values from I/O modules.
In particular, through Data Recorder it is possible to view with displays and graphs the instantaneous values of groups of channels divided into various pages, view in real time some alarms defined on various channels and simultaneously record the values of channels and alarm events in a database.



Throughout the Manual, the Data Recorder software will be referred to as "software".

Maximum number of devices connected simultaneously	ModBUS TCP: dependent on the application ModBUS RTU: using the Seneca Z-PC I/O series number of 40+ devices Using third party devices maximum 32 before amplifying the RS485 signal.
Number of simultaneously recordable I/O systems	Dependent on the application
Maximum number of recordable channels	From a minimum of two channels to unlimited channels depending on the size of the license.
Recording sampling time	From a minimum of 1 second to a maximum of 30 minutes.
Maximum number of displays per page	48
Maximum number of sticks per chart	8
Maximum number of alarms that can be associated with each channel	Four thresholds (high high alarm, high alarm, low alarm, low low alarm) displayed and stored on database A write alarm threshold on an output channel
Manual recording	Start and stop button
Automatic recording	Three different scheduling methods: At fixed times and days Continuous and periodic with settable start time and duration Start and stop on digital input status Recording option also with pc in stand-by
Calibration	Possibility to carry out various calibrations of different groups of channels associated with TC or PT-100 through linear interpolation Each calibration can be performed on a minimum of one point up to a maximum of five points per channel
Languages	Italian and English

Tab. 1 Technical specifications

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Acquisition of measurements

The software allows the physical acquisition, processing and real-time display of the measurements acquired via ModBUS RTU and ModBUS TCP protocols through distributed I/O modules of the Seneca Z-PC series (with or without CPU) or any standard ModBUS RTU slave device set in one or more projects.

Calculated channels or math package:

In addition to physical channels, the software allows the creation of calculated channels starting from a combination of imported channels and mathematical operators, it gives the possibility of inserting a possible different scaling for each channel. A calculated channel must be considered as an acquisition channel for the purposes of sizing the license.

Arithmetic operators
+
-
*
/
^
Boolean operators
AND
OR
XOR
NOT
Analogue functions
Sin()
Cos()
Tan()
Sqrt() = square root
exp()
ln()
log()
int() = module
sgn()
Saturation temperature

Tab. 2 Mathematical operators

Calibrate the channels that need calibration

If necessary, it allows the calibration of one or groups of channels (measurements from TC and/or PT-100) using a linear interpolation calculated on a number varying from one to five points chosen by the user to eliminate any possible error at the end of the acquisition line.

Viewing by pages on the display

Create various display pages containing groups of different channels that show the instantaneous values acquired by the system in the form of a display. In addition to the name and the instantaneous value of the acquired channel, each display on each page also shows the status of any alarms set.

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Viewing by chart
Each display page corresponds to a real-time time chart containing a maximum of eight contemporary pens that can be customized in colours, with a time axis that can be set from a minimum of thirty seconds up to a maximum of twenty-four hours.

Recording on database
Each recording generates a database in which the instantaneous value taken by the variable at the time of sampling, its maximum, minimum and average value calculated in the time interval between samples is written for each sample.

Recording sampling time:
Project options can be set and can vary from a minimum of one second to a maximum of half an hour.

Data recording schedule:
Quite flexible scheduling allowing both manual recording that starts and is stopped by the user and automatic recording via scheduling that can be set in three different modes: recording at times and days of the week, continuous recording and recording with start from digital input. Timed recording allows you to set up to eight daily recording starts for all days of the week or choosing the recording days with the recording duration which also determines the size of the databases created; continuous recording allows you to choose the recording start time and the size in which to break the various registered databases to avoid generating excessively heavy databases; finally, recording from digital input allows you to set a digital channel that controls the recording start and stop.

Notes on databases:
For each recording, it is possible to insert descriptive notes which are also shown on a column of the relevant database.

Report package
At the end of each recording, it is also possible to have the software generate automatic reports of all the project display pages or only some which may include graphs, tables of values and tables of recorded alarms.

Alarm package
For each analogue channel it is also possible to enable a set of threshold alarms (high high alarm, high alarm, low alarm and low low alarm) which are then displayed in realtime in the display of the instantaneous values in the various display pages that can be generated. If you choose to enable alarms on a channel, you can also write one of the four alarms on an output channel chosen by the user. Each output channel on which an alarm writing is enabled must be considered as an acquisition channel for the purposes of sizing the license.

Multiclient package:
Option that allows you to start multiple Data Recorder requests on the same PC.

Historical data display:
Once the databases have been recorded, using the Trend Viewer software, it is possible to view in graphs, filter by channels and times and print the data recorded on the database by Data Recorder both in graphical and tabular CSV format.

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2.2 INTENDED USE

The software is intended for one of the following applications:

- import multiple Z-NET4 projects within the same Data Recorder project;
- import channels from different Z-NET4 projects;
- calibrate the channels that need calibration;
- create calculated channels from imported channels;
- define multiple pages with different groups of channels displayed;
- view the instantaneous values of the groups of channels through displays divided into different pages;
- display through graphs the instantaneous values of the groups of channels associated with the different pages;
- view in real time the alarms defined on the channels;
- record the values of the channels in .sqlite database;
- view and record alarm events.

Subsequently, using the Trend Viewer software it will be possible to view, filter and print the historical data recorded by Data Recorder.

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2.3 TECHNICAL SPECIFICATIONS

The physical data acquisition takes place via distributed I/O modules of the Seneca Z-PC series (with or without CPU) or via any standard Modbus RTU slave device set in one or more Z-NET4 projects. The communication between hardware and PC can be serial (RS232/RS485/ModBUS RTU) or Ethernet/Modbus TCP, on wired or wireless physical medium (using Z-Link for the serial connection and a WiFi network for Ethernet connections).



Communication with the modules can take place via both ModBUS RTU and ModBUS TCP protocols.

Licensing is managed with a USB key and covers a display range from 2 to unlimited channels, be they analogue, digital, impulsive or calculated. The realtime display offers multiple selection possibilities: groups of channels, representation interval, scrolling direction on the screen. The consultation of the historical archive (data and alarms) is guaranteed with the appropriate visualization tool (Trend Viewer software). The basic package includes: alarm management (with implementation of digital outputs), management of automatic reports and mathematical package with algebraic, linear, trigonometric, boolean functions for creating calculated channels, calculating averages, compensations and deviations on measurements. Furthermore, in the Plus license package you have the multi-client functionality to use multiple software requests simultaneously on the same PC.

DR-02	Maximum of two channels imported into the project (between acquired, calculated, alarms and digital outputs).
DR-04	Maximum of four channels imported into the project (between acquired, calculated, alarms and digital outputs).
DR-08	Maximum of eight channels imported into the project (between acquired, calculated, alarms and digital outputs).
DR-16	Maximum of sixteen channels imported into the project (between acquired, calculated, alarms and digital outputs).
DR-32	Maximum of thirty-two channels imported into the project (between acquired, calculated, alarms and digital outputs).
DR-64	Maximum of sixty-four channels imported into the project (between acquired, calculated, alarms and digital outputs).
DR-UN	Unlimited channels imported into the project (between acquired, calculated, alarms and digital outputs) with physical limitation to 256 channels.

Tab. 3 License sizes for channels to be acquired

The main features of the software are therefore:

- data acquisition from 2 to unlimited channels (minimum sampling period 1 second);
- setting of display pages;
- visualization in graphic or display mode;
- start/stop/pause recording commands;
- selection of channel groups divided into different pages;
- display of real-time measurement values;
- automatic report generation;
- recording scheduling;
- alarm display;
- thermocouple calibration;
- independent multi-client recording sessions.

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2.4 RESIDUAL RISKS

SENECA s.r.l. is not liable for any damages deriving from:

- installation/use other than those envisaged and, in particular, other than the safety prescriptions provided for by the regulations in force in the country where the product is installed and/or indicated in this Manual;
- tampering and/or alteration of the product;
- product configuration incorrect or not compatible with the type of application for which it is intended.



SENECA s.r.l. declines all responsibility for damage to persons and/or property deriving from the incorrect configuration of the product.

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3 CREATING A PROJECT

To open the software if you have already completed Z-NET-4 projects, click on the start button of the operating system in the bottom left corner, write "data recorder" then double click on the name (A - Fig. 1). If there are no complete Z-NET4 projects, launch Z-NET4, set up a project and then from Z-NET4 click on "Project" and "Data Recorder" (B - Fig. 1); then click on “Data Recorder” (C - Fig. 1) and then on the project name (B - Fig. 1 page 11).

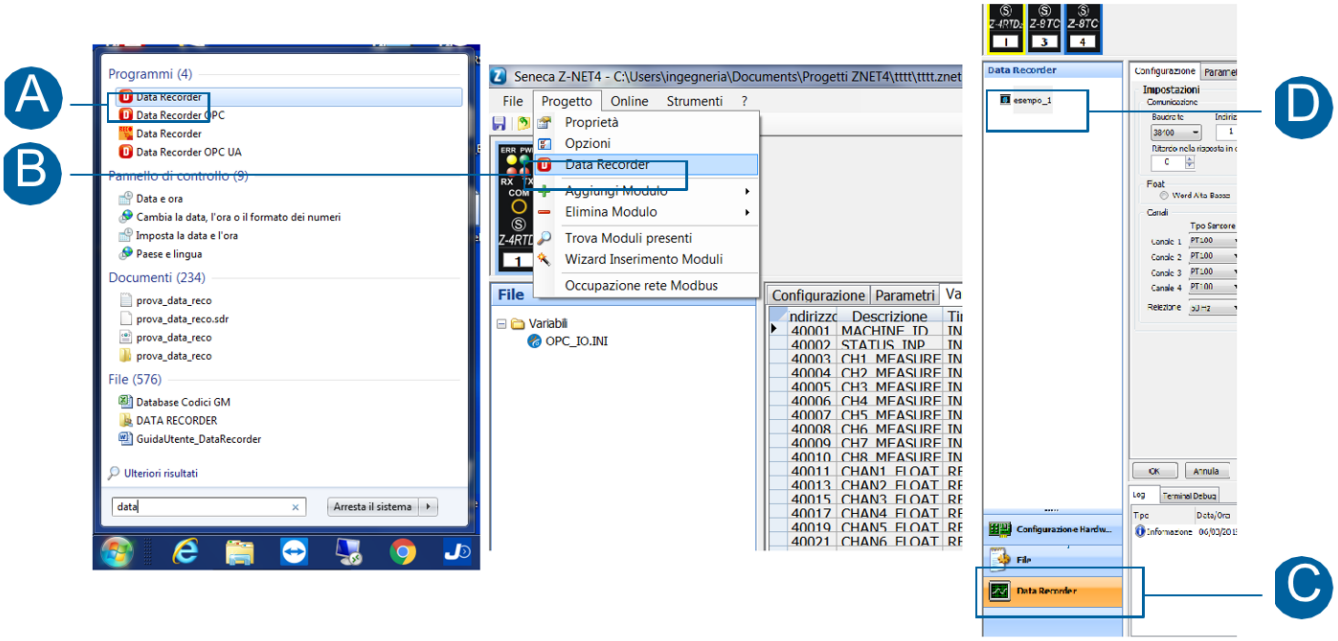


Fig. 1 Opening Data Recorder

Import all the Z-NET4 projects that you want to integrate into the Data Recorder project (A - Fig. 2); if you open the project from Z-NET4 you will have that Z-NET4 project already imported.
Choose the sampling interval (minimum 1 second, maximum 30 minutes) (B - Fig. 2).
Set the folder in which to save the database with the recorded data and the name to be assigned to the database (C - Fig. 2).
Details on the "General settings" page (4.4 “ General settings” page);

When choosing the sampling time it is important to keep in mind that the instantaneous value is displayed in the Data Recorder display pages, but the instantaneous value taken by the variable at the moment of sampling, the maximum, the minimum and the average value calculated in the time interval between one sample and another are written in the database for each sample.

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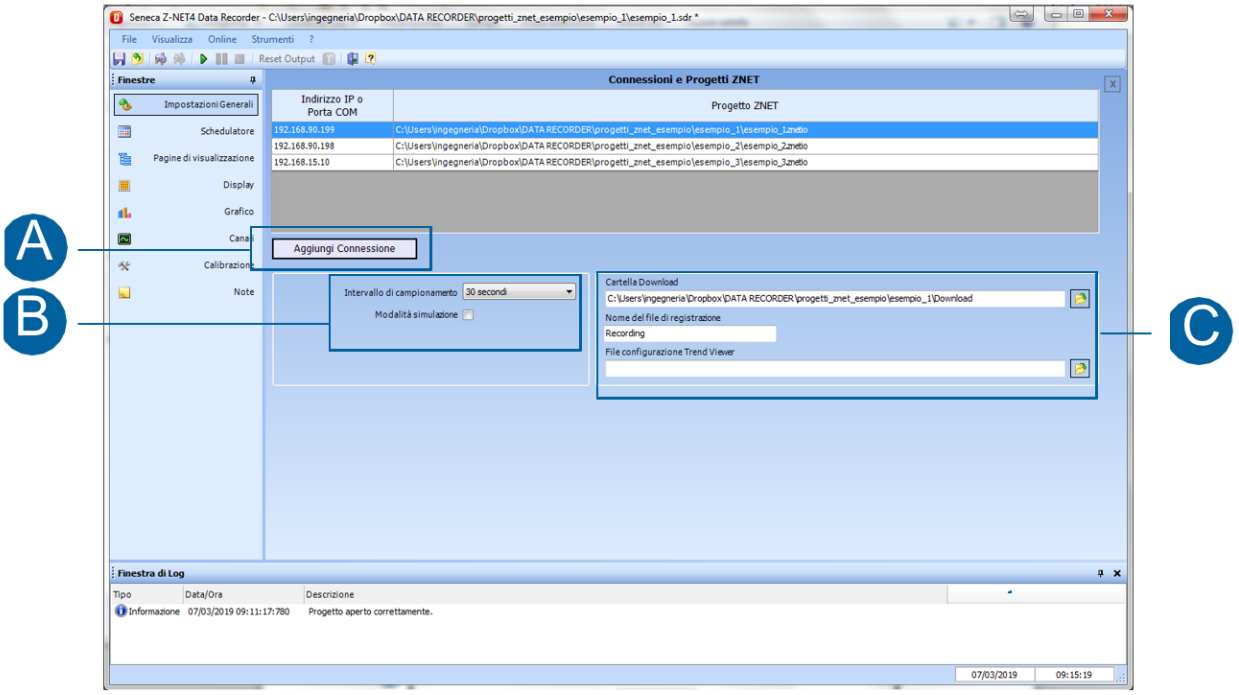


Fig. 2 Importing the Z-NET4 projects

Click in the navigation menu on the "Channels" page (A – Fig.3).
Import the channels you want to track (B – Fig.3) use the "Add Channel" button to import one at a time and "Add Channels from modules" to simultaneously import the channels of one or more modules of the same Z-NET4 project.
Create any calculated channels (C – Fig.3).
Click on a channel row to open the pop-up with the channel settings in which to set any alarms, units of measurement and scaling and choose whether or not to save a channel on the database during recording (D – Fig.3).
Details on the "Channels" page (4.9 “Channels”).



It is possible to import only the channels that have been enabled in the ZNET-4 project, in fact, if a channel is disabled in the hardware project, it cannot be imported into Data Recorder .

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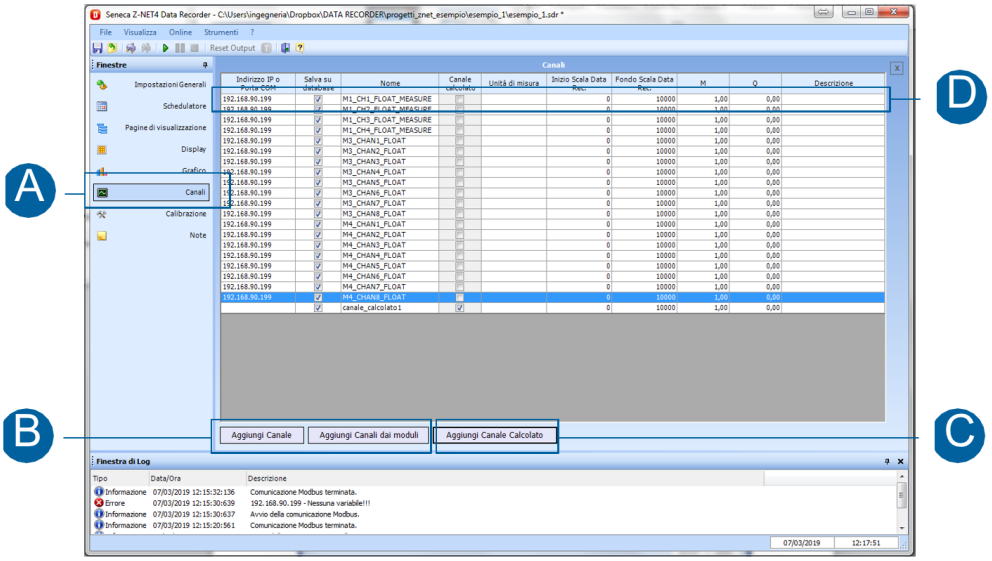


Fig. 3 Importing channels

If calibration of one or more channels is necessary, click in the navigation menu on the "Calibration" page (A – Fig.4).
Click on “Add” to create a group of channels to be calibrated (B – Fig.4).
Click on C – Fig.4 to choose the number of points on which calibration can be performed.
Select the channel to add, multiple channels can be selected at the same time (D – Fig.4).
Click on E – Fig.4 to add the channels to the created calibration group.
Click on F – Fig. 4 page 20 to connect the system and enable the "Execute Calibration" button.
Click on the "Perform Calibration" button G - Figure 4 page 20, the pop-up in which to perform the calibration opens (Fig. 5).
Details on the "Calibration" page (4.10 "Calibration" page).

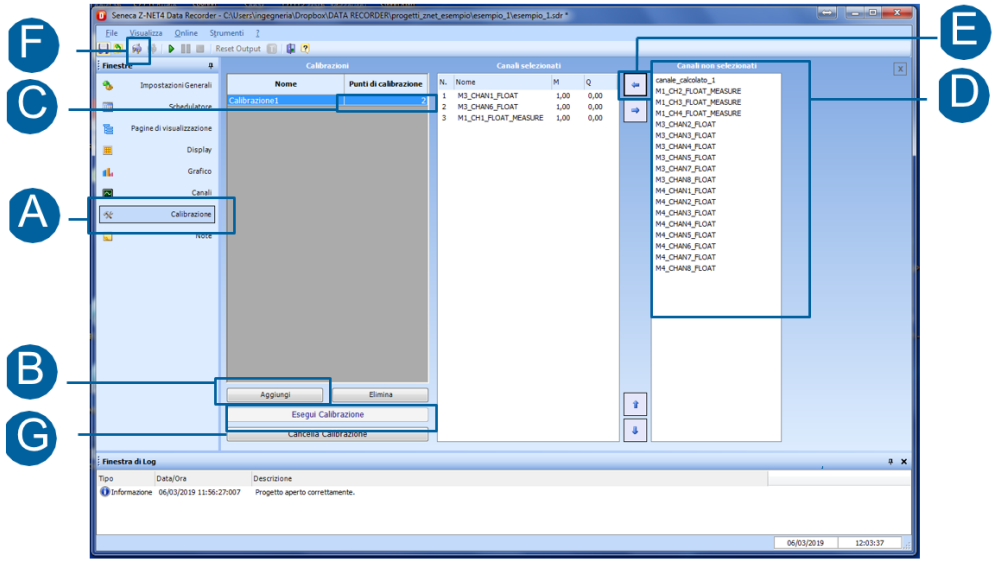


Fig. 4 Choosing the channels to be calibrated

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Click on A - Fig. 5 to choose the duration of the calibration for each point.
Write on field B - Fig. 5 the value of that point, button C - Fig. 5 "Store values" is enabled.
Click on the "Store values" button C - Fig. 5
Repeat for all calibration points.
Click on the "Accept Calibration" button D
Details on the "Calibration" page (4.10 "Calibration" page).



Fig. 5 Performing the calibration

Click in the navigation menu on the "Display pages" page (A - Fig. 6).
Click on "Add" (B - Fig. 6) to create a viewing page.
Choose whether to create a page of analogue or digital channels (C - Fig. 6).
Select one or more channels to be displayed on the display page (D - Fig. 6).
Click on Fig. 6 to add channels to the display page.
Repeat the procedure for all the desired display pages.
Details on the "Display pages" page (4.6 "Display pages" page).

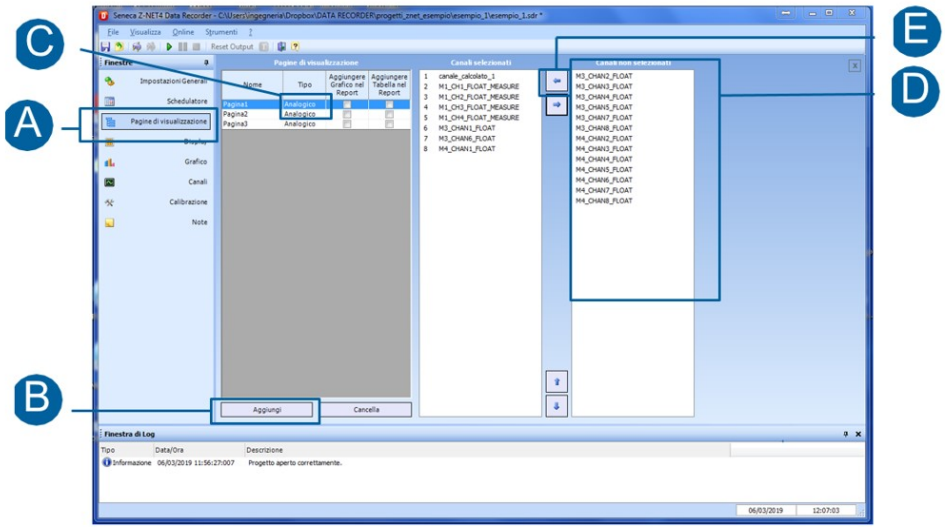


Fig. 6 Creating display pages

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By clicking on connect on the global project commands at this point it is possible to see the instantaneous values on the "Display" (4.7 "Display" page) and "Chart" (4.8 "Chart" page) pages.

To start recording in manual mode, click on the navigation menu in the "Scheduler" page (A - Fig. 7).
Select “Manual” from drop-down menu B - Fig. 7
Connect the system by clicking on C - Fig. 7
Start the recording by clicking on D - Fig. 7.
In the "Display" (4.7 "Display" page page 29) and "Chart" (4.8 "Chart" page) page it is possible to see the instantaneous values and the software saves the database of the recorded values.
To stop recording click again on D - Fig. 7

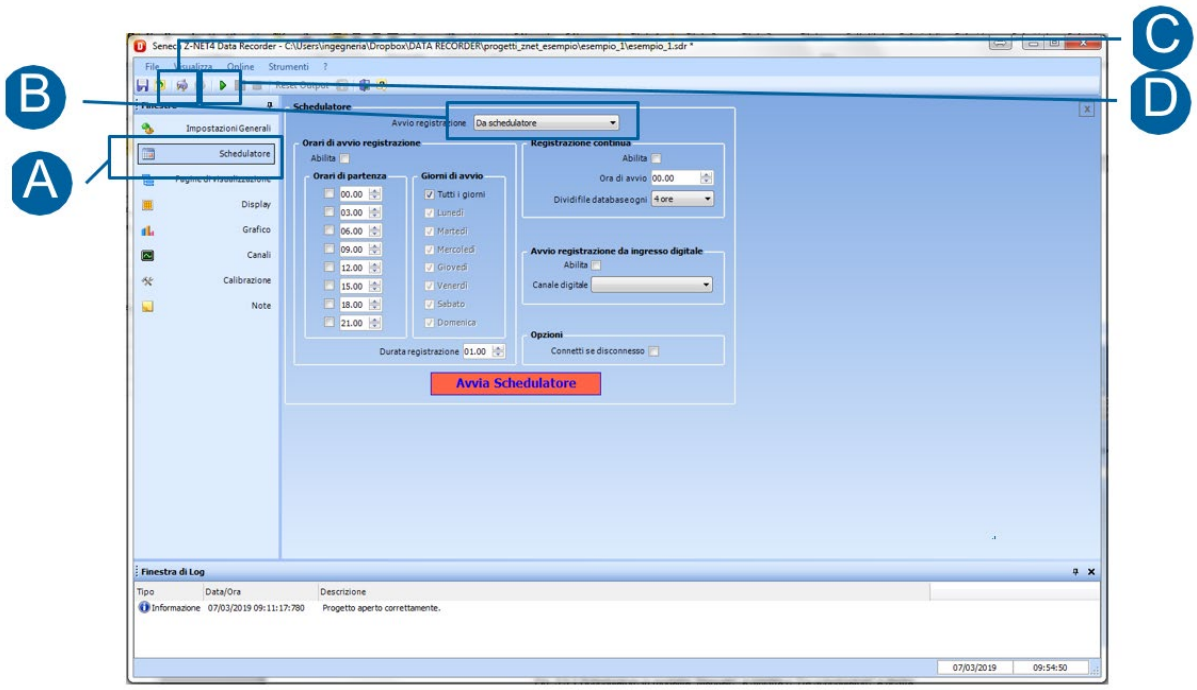


Fig. 7 Starting recording in manual mode

To start recording in "From scheduler" mode, click on the navigation menu in the "Scheduler" page (A - Fig. 7).
Select "From scheduler" from drop-down menu B - Fig. 7.
Connect the system by clicking on C - Fig. 7.
Choose the desired scheduling mode from "Recording start times", "Continuous recording" and "Start from digital input" D - Fig. 7 and set the desired scheduling times.
Start recording by clicking on E - Fig. 7.
In the "Display" (4.7 "Display" page) and "Chart" (4.8 "Chart" page) pages it is possible to see the instantaneous values and the software saves the database of the recorded values according to the times set in the scheduler.
To stop recording click again on E - Fig. 7 .

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Details on the "Scheduler" page (4.5 “Scheduler” page).

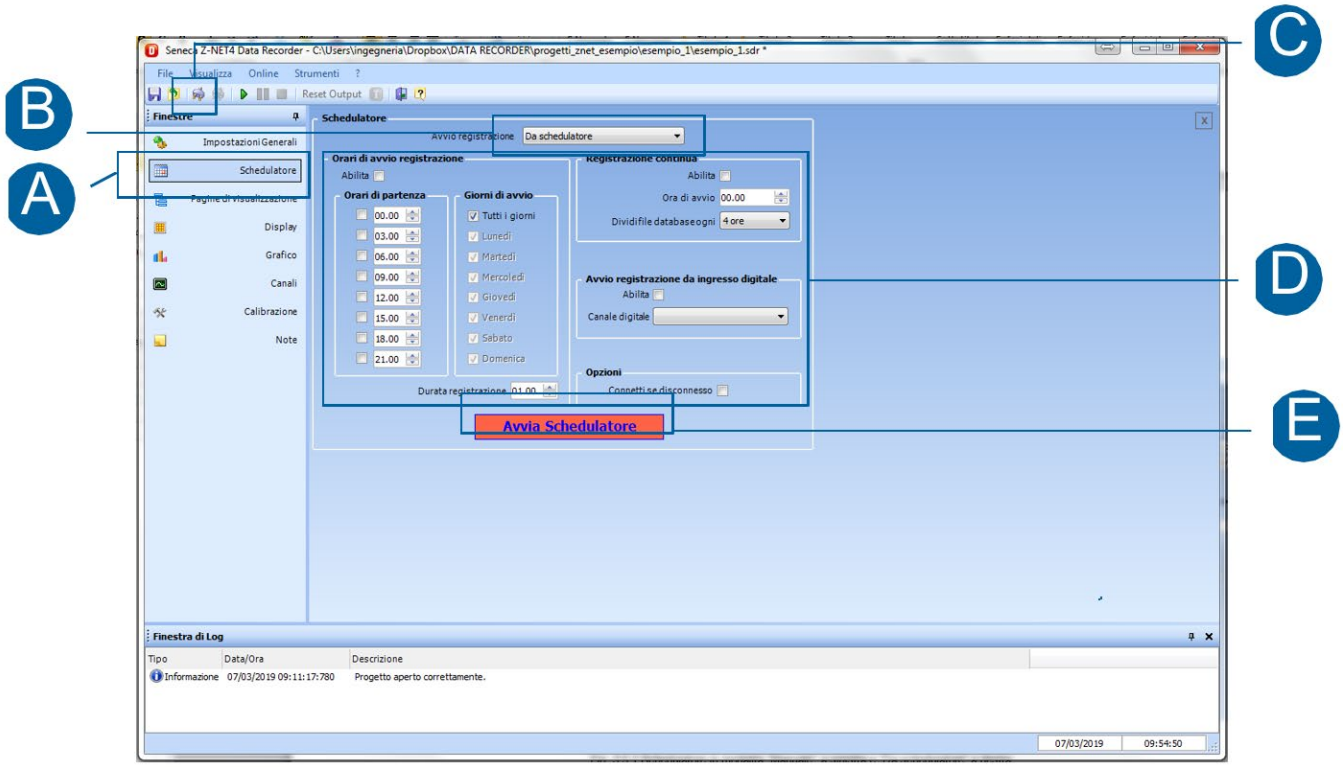


Fig. 8 Start recording in scheduler mode

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4 SOFTWARE PAGES

4.1 Pages menu

The main pages are navigable using the pages menu (A - Fig. 9) on the left side of each main page.

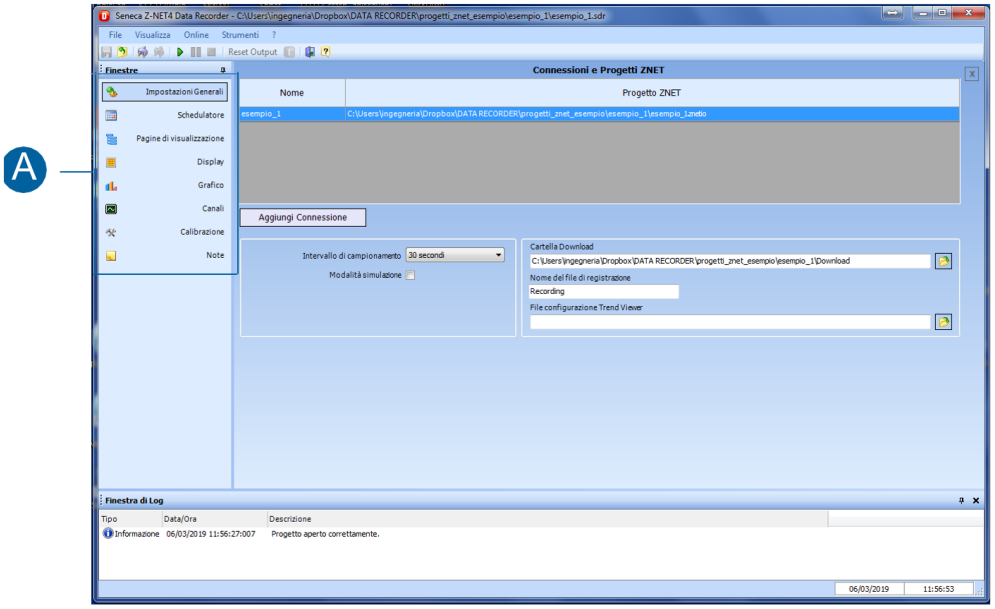


Fig. 9 Pages menu

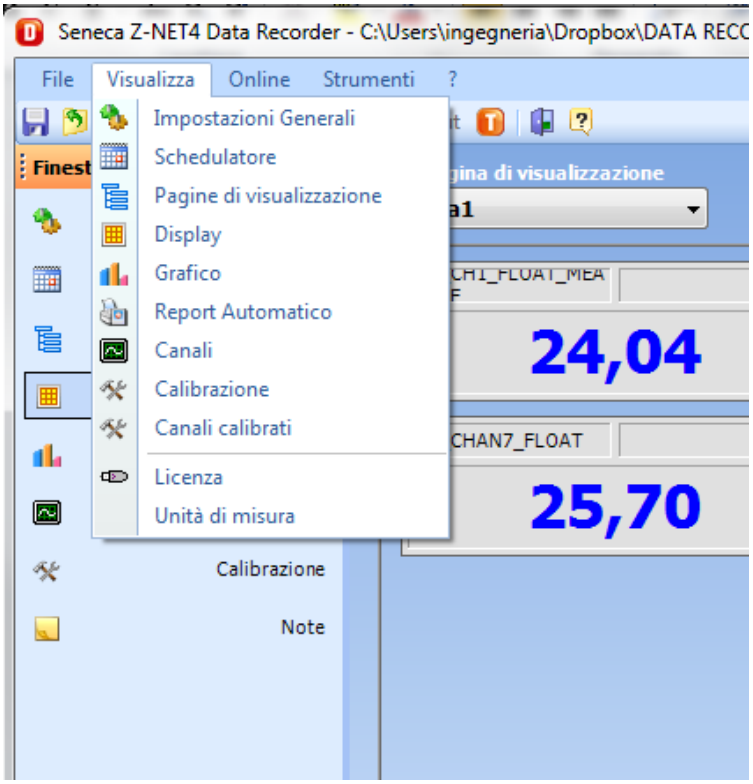
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Impostazioni Generali	**Key to access "General settings"** (4.3 Global commands).
Schedulatore	**Key to access the "Scheduler" page** (4.5 “Scheduler” page).
Pagine di visualizzazione	**Access key to the "Display Pages" page** (4.6 "Display pages" page).
Display	**Key to access the** "Display" page (4.7 "Display" page).
Grafico	**Key to access the** "Chart” page (4.8 "Chart" page).
Canali	**Key to access the** "Channels” page (4.9 “Channels”).
Calibrazione	**Key to access the** "Calibration" page (0 “Calibration” page)
Note	**Key to access the "Notes" page** (0 “Notes” page).

Table 1 Pages menu

The pages can also be navigated by clicking on "Display" in the first line at the top of the software (Fig. 4) from which the pages "Calibrated Channels", "License" and "Units of measurement" can also be reached.



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Fig. 10 Pages menu from “Display”

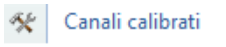
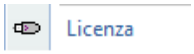
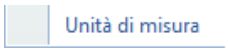
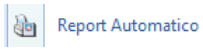
	Key to access the "Calibrated channels” page
	Key to access the “License” page (4.11 "License" page)
	Key to access the “Unit of measurement” page (4.12 “Unit of measurement” page)
	Key to access the “Automatic report” page (4.10 “Automatic report” page)

Table 2 Extra pages menu from “Display”

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4.2 Common elements

Fig. 11 Common elements

A	Global project commands: in the first line the submenus "File", "Display", "Online", "Tools" and "?" and on the second line a series of commands from icon
B	Area relating to the main page selected from the navigation menu or from the "Display" menu.
C	Log window showing the events that take place in the software, in particular four groups of events are displayed: error messages, information (result of operations carried out), data (messages sent by the modules), trace (more specific additional information).
D	Current date and time.

Table 3 Common elements

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4.3 Global commands

The first two lines at the top of the software contain the global project commands (Fig. 6).

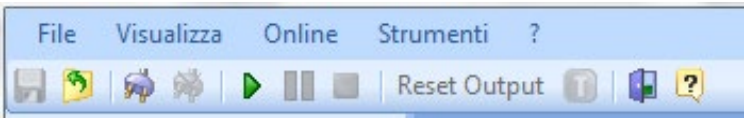


Fig. 12 Project global commands

Each item in the first row opens a submenu listed in Table 4.

File	If no project is open it contains the "New", "Open", "Save", "Save As", "Recent projects", "Exit" commands. If the project is open, it contains the "Close", "Save", "Save as", "Recent projects", "Exit" commands.
Display	Navigation menu of all software pages
Online	It contains the "Connect", "Disconnect", "Start", "Pause", "Stop", "Reset Output", "Trend Viewer" commands.
Tools	It contains the "Options" commands which opens the "Options" pop-up, "Start Minimized to icon", "Log Window" which hides or shows the "Log Window", "License" which opens a pop-up with the information about the present license and the number of channels used within the project.
?	It contains the "Online Help", "About Seneca Z-NET4 Data Recorder" commands.

Table 4 Global commands in the software first line

Each icon in the second row executes the command described in Table 5.

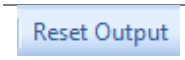
	Saves changes to the project.
	Closes the project.
	Opens a new project.
	Connects the software to the modules, starts communication with modules.
	Disconnects the software from the modules, closes the communication with the modules.
	Starts manual recording. Enabled if communication with the modules has been started previously.
	Pauses recording. Enabled only if recording has been started previously.
	Stops manual recording. Enabled only if recording has been started previously.
	Resets the outputs of any digital alarms set on the channels used in the project.
	Opens the Trend Viewer software.
	Closes the software.
	Help.

Table 5 Global commands in the software second line

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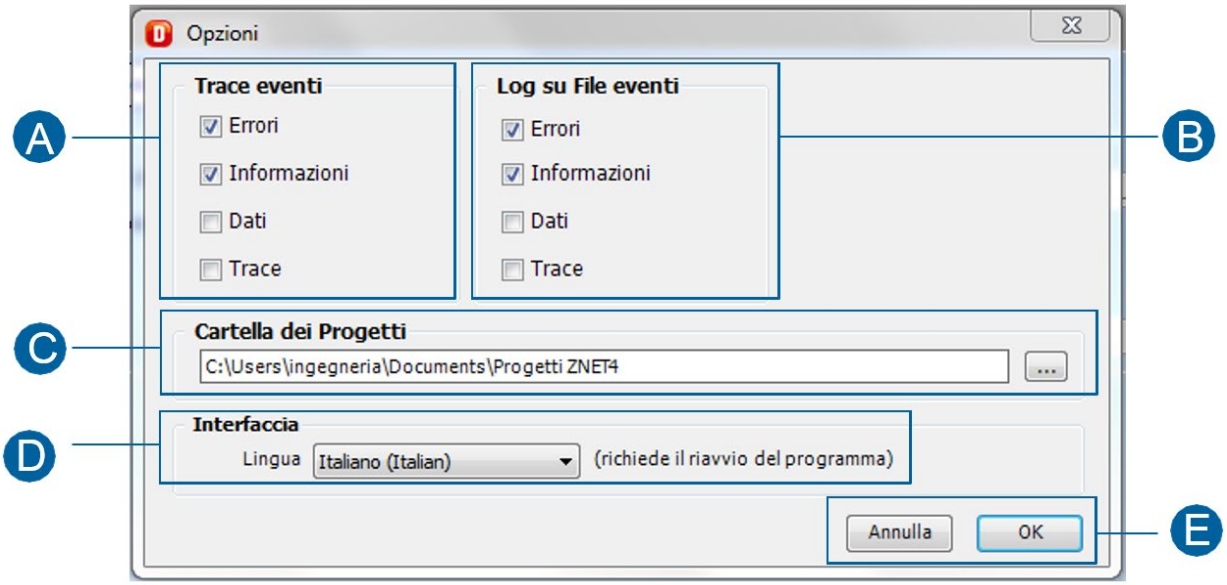


Fig. 13 “Options connection” pop-up

A	Section where you can select and deselect the signalling groups you want to see in the "Log Window"
B	Section where you can select and deselect logs on event files
C	Project storage folder
D	Interface language selection
E	The "Delete" button closes the pop-up and returns to the "General settings" page without any modification to the project; the "OK" button closes the pop-up and adds the selected Z-NET4 project with the set parameters to the Data Recorder project.

Table 6 “Options” pop-up

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4.4 " General settings" page

The "General settings" page allows you to import the Z-NET4 projects from which to select the channels in which to enable recording and to choose the general settings of the Data Recorder project such as the sampling interval and the name of the database containing the values that will be recorded.

Fig. 14 "General settings" page

A	Area where the imported Z-NET4 projects are shown. On the right column the complete address is displayed in the pc of the imported Z-NET4 project, while in the left column the IP address or COM port relating to the project indicated on the same row is displayed.
B	Opens the "Modbus Connection and ZNET Project" pop-up to add a new Z-NET4 connection to the Data Recorder project.
C	General project settings: the drop-down menu allows you to choose the sampling interval during data recording, the smallest value is 1 second, the largest 30 minutes; the flag allows to execute the current project in simulation mode.
D	Section for data saving settings of the Data Recorder project: the "Download folder" indicates the folder on the PC where the database of recorded values is saved, the "Name of the recording file" allows you to indicate the name with which the recording database is saved; the "Trend Viewer configuration file" allows you to import any configuration file generated with the Trend Viewer software.

Table 7 "General settings" page

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To delete an imported connection, select the connection to be deleted and click on "Delete" on the PC keyboard.

Fig. 15 “ModBus connection and ZNET project” pop-up

A	On the left the field in which to indicate the address in the PC of the Z-NET4 project to be added, on the right the button to browse the folders of the PC and select the Z-NET4 project to be added.
B	Drop-down menu for choosing the type of communication set in the Z-NET4 project to be imported. The "Modbus RTU" selection enables the parameters of section C, the "Modbus TCP" selection enables the parameters of section D.
C	Communication parameters to be set consistently with the project to be imported if the "Modbus RTU" type of communication is present.
D	Communication parameters to be set consistently with the project to be imported if the "Modbus TCP" type of communication is present.
E	Waiting time in milliseconds and number of attempts before declaring the communication with each module in the Z-NET4 project to be imported as failed.
F	The "Delete" button closes the pop-up and returns to the "General settings" page without any modification to the project; the "Apply" button makes the changes set on the pop-up effective; the "OK" button, to be clicked after the "Apply" button, closes the pop-up and adds the selected Z-NET4 project to the Data Recorder project with the set parameters.

Table 8 “ModBus connection and ZNET project” pop-up

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4.5 "Scheduler" page

The "Scheduler" page allows you to select the recording mode and the scheduling settings of the recordings in "From scheduler" mode.

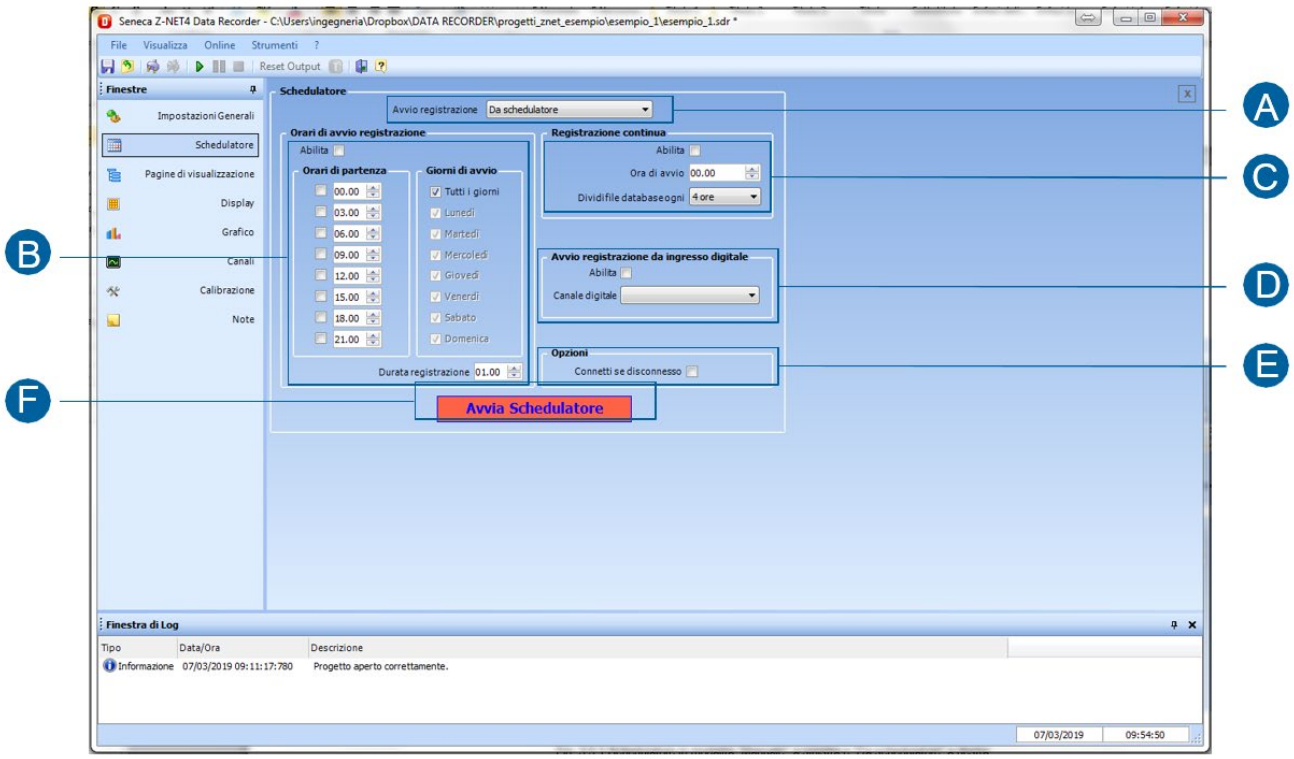


Fig. 16 "Scheduler" page

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A	Selection of the recording mode between "Manual" and "From scheduler". In "Manual" the recording starts and stops by clicking on the appropriate buttons in the global commands in the second line of the software, or by using the appropriate buttons in the "Online" submenu in the global commands in the first line of the software. For each operator's recording start and stop, a separate database will be created. In "From Scheduler" mode, the rest of the "Scheduler" page is enabled.
B	Section for setting the recording by periodic scheduling. By clicking the "Enable" box it is possible to modify the rest of the section. In the "Start times" subgroup you can select and set up to eight daily recordings that start at different settable times; the "Start days" subgroup has by default the "all days" recording selected, but by deselecting it, you can choose the days on which to start the recording. Finally, the "Recording duration" field allows you to set the recording time for each start, keep in mind that this setting also determines the size of the databases created since you will have a database for each recording.
C	Section to set the start of recording from continuous. By clicking the "Enable" box it is possible to modify the rest of the section. The "Start time" field allows you to set the time when recording is to start, while the "Divide database files every" field allows you to set how often to create a separate database during recording. Compared to recording in manual mode this allows the creation of databases all of the same size.
D	Section for setting the recording from digital input. By clicking the "Enable" box it is possible to modify the rest of the section. **The "Digital channel" field allows you to select the digital channel to be used as the recording start and stop; to be present in the drop-down menu of the "Digital channel" field, the channel must first be imported into the "Channels" page** (4.9 "Channels"). Recording starts when the selected digital channel takes value 1 and stops when it takes value 0. The files in the database will have a variable size depending on how long the trigger variable remains at 1.
E	The "Connect if disconnected" option allows you to keep Data Recorder connected and recording as long as the PC remains on even if the user of the operating system disconnects so you are advised to always enable it.
F	Button that starts and stops recording using the settings chosen on the "Scheduler" page.

Table 9 "Scheduler" page



It is possible to enable only one recording start mode at a time from the scheduler and selecting one mode disables the others.

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4.6 "Display pages" page

The "Display pages" page allows you to create different pages to display instantaneous data and to associate the channels you want to view for each page.

Fig. 17 "Display pages" page

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A	List of the created display pages. A click on a field in the “Name” column modifies sections C and D of the page showing in section C the channels selected for display on the selected page and in section D the channels present in the current project relating to the type of selected page (analogue or digital) but not selected for display on the page being considered. A double click on a field in the "Name" column allows you to change the name of the selected page. Clicking on a field in the "Type" column opens a drop-down menu that allows you to choose if you want to create a page with analogue or digital channels; the choice modifies sections C and D of the page, showing respectively the channels present in the project not selected and selected in the page that is being created only analogue or only digital depending on the selection. Careful, changing the type after choosing the displayed channels cancels the selection made. The flags "Add Chart in Report" and "Add Table in Report" allow you to choose whether to integrate every page in the form of a table or in the form of a chart in any set reports.
B	The "Add" button allows you to add a new display page to the project, the "Delete" button deletes the display page selected in section A.
C	List of channels selected for display on the page selected in section A. The channels are all analogue or all digital depending on the "Type" chosen in section A.
D	List of channels not selected for display on the page selected in section A but present in the project. The channels are all analogue or all digital depending on the "Type" chosen in section A.
E	The arrow to the left allows you to bring the channels that are selected in the "Unselected channels" section into "Selected channels", adding them to the selected display page, while the arrow to the right allows you to bring the channels that are selected in “Selected channels” into the "Unselected channels" section, therefore deleting them from the selected display page.
F	The up and down arrows allow you to change the order of the list of channels in "Selected channels" thus changing the order in which the channels are displayed on the page.

Table 10 "Display pages" page

For each display page, it is possible to insert up to a maximum of 48 channels that can be displayed simultaneously on the "Display" page (4.7 "Display" page) and a maximum of 8 channels that can be displayed simultaneously on the "Chart" page (4.8 "Chart" page). By setting more than eight channels per display page, you will see up to forty-eight channels on the "Display" page while on the "Chart" page relating to the same display page the first eight will be shown.

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4.7 "Display" page

The "Display" page allows you to view the instantaneous values for each display page once the connection has started (using the appropriate buttons in the global commands in the first or second line of the software regardless of whether the software is recording the data in a database.

Fig. 18 “Display” page

A	Drop-down menu that allows you to choose the display page to be displayed in section B.
B	Display of the instantaneous values in the channels for each display page selected in section A. The instantaneous values are displayed once the connection is started, regardless of whether the software is recording them or not in a database.
C	Display of a channel. In the top left corner the name of the channel, in the centre the instantaneous value detected, on the right, if enabled within the channel in the “Channels” page (4.9 “Channels”), the very high (HH), high (H), low (L) and very low (LL) alarms in green if not active and in red if active. **A double click anywhere in the box relating to a channel opens a small pop-up in which it is possible to modify the decimal digits displayed from 1 to 5 (this modification has no effect on recording the value in the database, but has only effect on the display of the instantaneous value in the "Display" and "Chart" page) and the colour of the pen associated with that channel in the chart on the "Chart” page** (4.8 "Chart" page).

Table 11 “Display” page

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4.8 "Chart" page

The "Chart" page (Fig. 19) allows you to view a chart of the instantaneous values for each display page once the connection has started (using the appropriate buttons in the global commands in the first or second row of the software Table 12 and Table 13) regardless of whether the software is recording data in a database or not.

Fig. 19 “Chart” page

A	Section that allows you to choose the display page to be displayed in the chart in section B, set the length of the time axis displayed in the chart in section B (variable from 30 seconds to 24 hours), choose the horizontal or vertical orientation of the chart and choose whether to display the normalized data or with their real values.
B	Chart relating to the channels on the display page and with the parameters selected in section A.
C	List of channels on the display page and then in the chart in section B. Each box relating to a channel has the name of the channel at the top and below the instantaneous value detected (once the connection has started regardless of whether the software is recording them or not in a database); the panels associated with the channels do not display the alarms on this page. A double click anywhere in the box relating to a channel opens a small pop-up in which it is possible to modify the decimal digits displayed from 1 to 5 (this modification has no effect on recording the value in the database, but has only effect on the display of the instantaneous value on the "Display" and "Chart" page) and the colour of the pen associated with that channel in the chart; in addition to the pen in the chart, the outlines of the entire box are also coloured with the selected colour.

Table 12 “Chart” page

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4.9 “Channels”, “Calibration”, “Notes” pages

The “Channels” page (Fig. 20) allows you to import the channels to be used in the software from the various Z-NET4 projects.

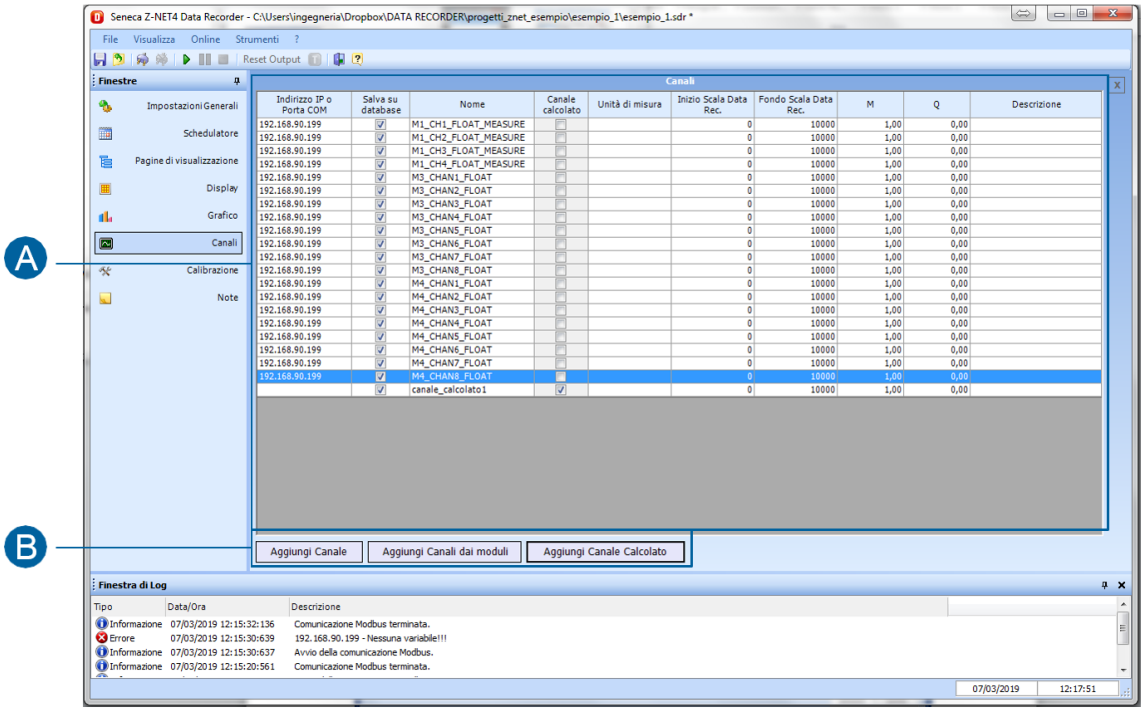


Fig. 20 “Channels” page

A	**List of channels imported from the various modules of the various Z-Net-4 projects imported into the "General settings" page** (4.4 “ General settings” **page**). For each channel from left to right there is the "IP address or COM port" relating to the project from which the channel was imported, the tick "Save to database" enabled by default the "Name" assigned to the variable, which is the name that is then used within the software for that channel, the tick "Calculated channel", which cannot be changed, indicating whether the channel comes from a direct reading or if it is a channel created from a combination of other channels; the "unit of measurement", the "Start of Data Rec Scale.", the Data Rec. Full Scale " If set, the "M" and "Q" calculated during the calibration of the channel on the "Calibration" page. Channel changes can only be made with the system disconnected (by clicking on the appropriate button in the global commands in the second line of the software, or by using the appropriate buttons in the "Online" submenu in the global commands in the first line of the software. With a single click on "Save to database", the saving of the values of that channel to the database in case of recording is disabled; a single click on "Unit of measurement" brings up an arrow that opens the drop-down menu from which you can select the unit of measurement to be assigned to the channel; a single click on the "Start of Data Rec. Scale", Data Rec Full Scale. " and "Description" allow you to write in these fields. A double click on any point of the line relating to a channel (with the exception of the "Save on database" column) opens the "Edit channels" pop-up in which it is possible to modify all the parameters relating to the selected channel.
B	The "Add Channel" button allows you to add one channel at a time and opens a pop-up in which you can select the Z-NET4 project from which to import the channel, then a second pop-up opens in which you can select the module and then the channel to be imported, finally the "Edit Channels" pop-up opens where you can edit all the parameters you wish; finally clicking on “OK” the channel is imported. The "Add Channels from modules" button allows you to simultaneously add all the channels of one or more modules associated with an imported Z-NET4 project. The "Add Calculated Channel" button opens the "Edit Calculated Channel" pop-up and allows you to create

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a channel calculated as a combination of other channels already imported.

Table 13 “Channels” page

To delete an imported channel, select it and click on "Delete" on the PC keyboard.

Fig. 21 “Edit channels” pop-up

A	The "Channel Name" field shows the name defined in the Z-NET4 project for that channel, editable in this pop-up for the Data Recorder project. The "Channel Description" field allows you to enter a description of the channel.
B	Channel information, set in the Z-NET4 project, uneditable. The "Choose" button allows you to change the selected channel within the same Z-NET4 project.
C	Drop-down menu to set the unit of measurement associated with the variable.
D	Ticking the "Enabled" box enables the fields in this section where you can set a scaling for the selected channel.
E	**Checking the "Enabled" box** enables the fields in this section where you can set the High High (HH), High (H), Low (L) and Low Low (LL) alarm thresholds which are then displayed in the " Display” page (4.7 "Display" page) where the channel is inserted. If the channel being considered is digital, it is also possible to enable the "Alarm on the falling edge".
F	Enabling the alarm in section E enables the fields in this section where it is possible to write the alarm status on a digital channel. **In order to select the "Alarm output channel" it is necessary to have previously imported the channel into the "Channels" page** (4.9 “Channels”).
G	The "OK" button confirms the changes to the channel and closes the pop-up. The "Delete" button closes the pop-up cancelling any changes made on the channel.

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Table 14 “Edit channels” pop-up

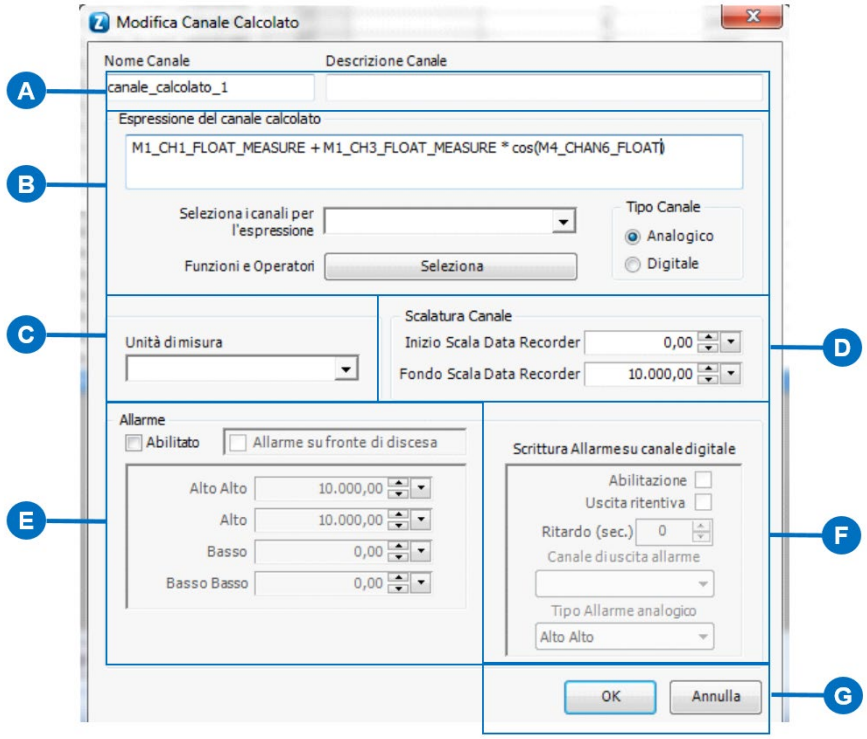


Fig. 22 “Edit calculated channel” pop-up

A	In the "Channel Name" field, the desired name for the calculated channel being created must be entered. The "Channel Description" field allows you to enter a description of the channel.
B	Section in which you can create the combination of channels from which to generate the calculated channel. Whenever you want to add a channel to the calculation, open the "Select channels for expression" drop-down menu and click on the chosen channel; every time you want to add an operator click on "Select" next to "Functions and Operators" and choose the desired function. Alternatively, freely write the expression in the "Expression of the calculated channel" field. In a correct expression the background of the "Expression of the calculated channel" field is white, while in an incorrect expression the background is yellow with a circle and a flashing red exclamation mark next to the same field. On the right under "Channel Type" you select if you want to create an analogue or digital channel.
C	Drop-down menu to set the unit of measurement associated with the variable.
D	Section in which it is possible to set a scaling for the channel.
E	**Checking the "Enabled" box** enables the fields in this section where you can set the High High (HH), High (H), Low (L) and Low Low (LL) alarm thresholds which are then displayed in the " Display” page (4.7 "Display" page) where the channel is inserted. If the channel being considered is digital, it is also possible to enable the "Alarm on the falling edge".
F	Enabling the alarm in section E enables the fields in this section where it is possible to write the alarm status on a digital channel. **In order to select the "Alarm output channel" it is necessary to have previously imported the channel into the "Channels" page** (4.9 “Channels”).
G	The "OK" button confirms the changes to the channel and closes the pop-up. The "Delete" button closes the pop-up cancelling any changes made on the channel.

Table 15 “Edit calculated channel” pop-up

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"Calibration" page

The "Calibration" page **(Fig. 23)** allows you to create groups of channels to be calibrated and carry out the calibration.

Fig. 23 "Calibration" page

A	List of the created calibrations. A click on a field in the "Name" column modifies sections C and D of the page showing in section C the channels selected for calibration on the selected page and in section D the channels present in the project but not selected for calibration in the calibration group being considered. A double click on a field in the "Name" column allows you to change the name of the selected calibration. Clicking on a field in the "Calibration points" column opens a drop-down menu that allows you to choose the number of points for calibration, ranging from one to five.
B	The "Add" button allows you to add a new calibration to the project, the "Delete" button deletes the calibration selected in section A, the "Perform calibration" button is enabled only with the connected project using the appropriate button in the global commands in the second line of the software, or by using the appropriate button in the "Online" submenu in the global commands on the first line of the software and opens the "Calibration" pop-up which allows you to calibrate the group of channels associated with the selected calibration. The "Clear Calibration" button cancels any calibration already performed on the group of channels associated with the calibration selected in section A.
C	List of the channels selected for the calibration selected in section A.
D	List of the channels not selected for the selected calibration in section A but present in the project.
E	The arrow to the left allows you to bring the channels that are selected in the "Unselected channels" section into "Selected channels", adding them to the selected calibration, while the arrow to the right allows you to bring the channels that are selected in "Selected channels" into the "Unselected channels" section, therefore deleting them

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	from the selected calibration.
F	The up and down arrows allow you to change the order of the list of channels in "Selected channels".

Table 16 “Calibration” page

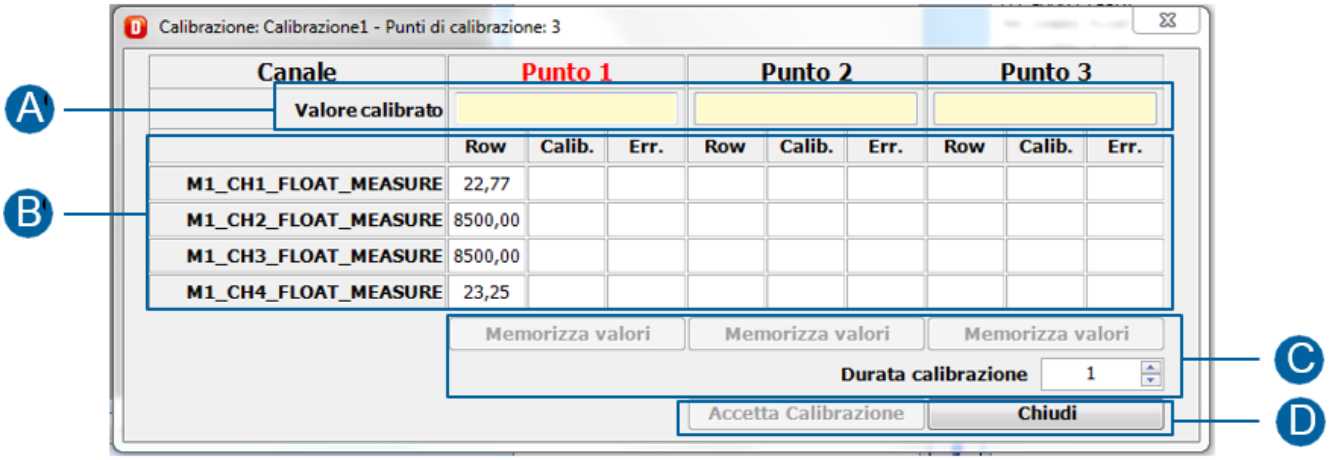


Fig. 24 “Calibration” pop-up

A	The actual values of the measurement to be entered for calibration. To insert a value click on the field to be modified, type the value then click enter. The pop-up columns vary from one to five depending on the number of calibration points set in section A of the "Calibration" page (Fig.24).
B	The channels to be calibrated, for each channel for each calibration point, have the "Row" column indicating the recorded value to be calibrated, "Calib." indicating the measured value corrected by the calibration and "Err." showing the extent of the correction made.
C	The "Store values" button is enabled after the corresponding calibration value in section A has been set and the system has recorded the number of samples set in "Calibration duration"; allows you to store the calibration point for its column. Definition of calibration duration: the number of samples used to perform the moving average of the measurement to be calibrated.
D	Once calibration is complete, the "Accept Calibration" button allows you to validate the calibration and close the pop-up, while the "Close" button closes the pop-up without saving the calibration that may have been carried out.

Table 17 “Calibration” pop-up

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"Notes" page

The "Notes" page (Fig. 25) allows you to create descriptive notes when recording data in the database which are also copied to a column in the database. Please note that notes can only be created, edited and deleted during recording.



Fig. 25 "Notes" page

A	List of the created notes. From left to right the "TimeStamp" column indicates the date and time when the note was created, the "Code" column shows any code that was entered during the creation phase of the note (even if the note is subsequently modified the date and time are not edited), finally the "Description" column shows the text of the note.
B	The buttons in this section are enabled only when recording data in the database. The "Add" button allows you to add a new note opening the pop-up of section C. The "Edit" button allows you to edit the note selected in section A opening the pop-up of section C. The "Delete" button deletes the note selected in section A.
C	Pop-up for creating and editing a note. The fields to the right of "Date/Time" contain the current date and time, but can be edited at will. The text of the note must be entered in the "Description" field, a code for identifying the note (optional field) can be entered in the "Code" field. The "OK" button is enabled after filling in the "Description" field and closes the pop-up saving the created note which is then added to the list in field A, while the "Delete" button closes the pop-up without saving the created note.
D	Updates the list of created notes.

Table 18 "Notes" page

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4.10 "Automatic report" page

The "Automatic report" page (Fig.26) allows you to set up the creation of automatic reports.

Fig. 26 "Automatic report" page

A	The button with the yellow folder allows you to import a .jpg or .btm file, usually the logo, which is integrated into the automatic report. The button with the red "X" deletes the selected logo and the box shows a preview of the uploaded image.
B	Field in which to insert any notes.
C	By clicking on the "Activate Automatic Report" flag, the other fields in this section through which you can choose what to include in the report are enabled.
D	Drop-down menu from which to select the means by which to print the report.

Table 19 "Automatic report" page

Once the automatic report has been set and the project is saved, the software generates a report every time a database file is closed, therefore every time a recording session is ended.

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4.11 "License" page

The “License” page (Fig. 27) shows the characteristics of the license used and the number of channels used in the current project.

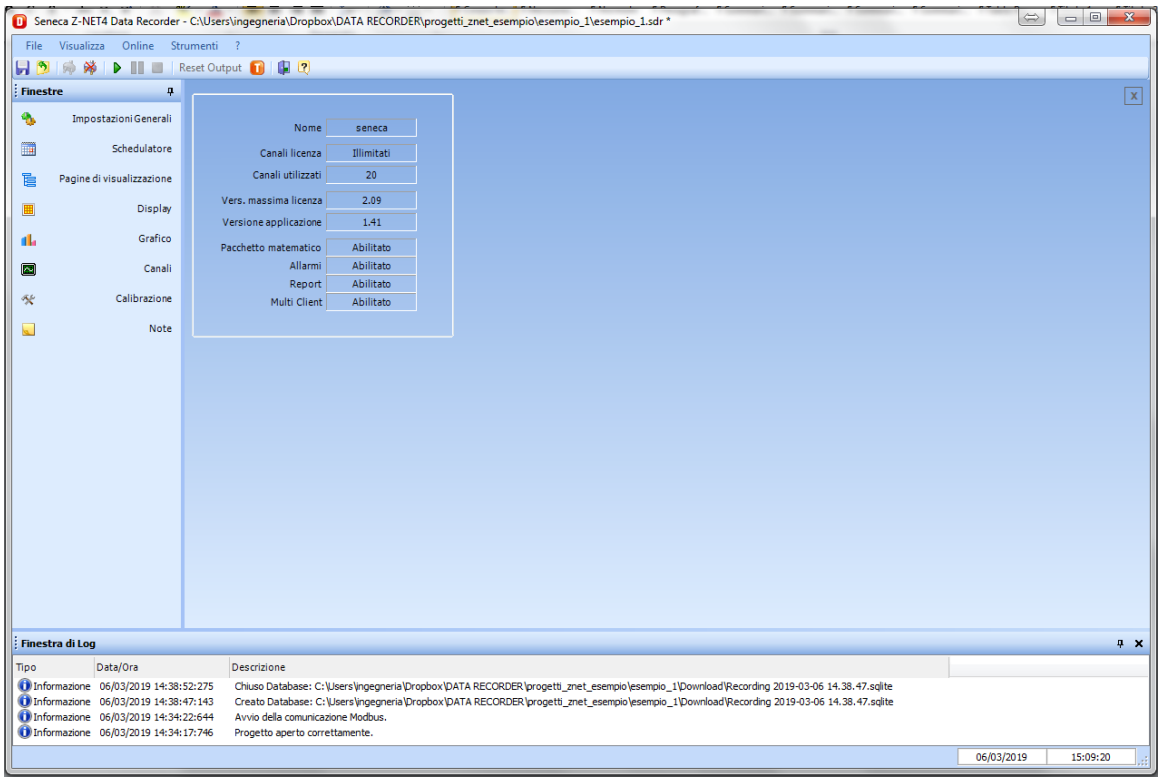


Fig. 27 "License" page

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4.12 “Unit of measurement” page

The “Unit of measurement” page (Fig. 28) shows the editable list of units of measurement present in the software.

Fig. 28 “Unit of measurement” page

A	List of measurement units present in the project. From left to right the "Name" column indicates the unit of measurement, the "Description" column allows you to enter a description for each unit of measurement. A double click on a field of any column allows you to edit that field. Scrolling the list with the scroll bar on the right at the end you will find a white line highlighted with an asterisk on the left: here you can add other units of measurement to the list, every time you change the empty "Name" field and click " enter ”the new unit of measurement is added at the bottom of the list and there is a new empty line highlighted with an asterisk for other entries.

Table 20 “Unit of measurement” page

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5 SYSTEM UPDATE

The latest version of the software is available from the www.seneca.it website



It is possible to download from this link: https://www.seneca.it/linee-di-prodotto/acquisizione-dati-e-automazione/daq-software/data-recorder/

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6 LIST OF FIGURES

Fig. 1 Opening Data Recorder 12
Fig. 2 Importing Z-NET4 projects 13
Fig. 3 Importing channels 15
Fig. 4 Selecting the channels to calibrate 15
Fig. 5 Performing the calibration 15
Fig. 6 Creating display pages 15
Fig. 7 Starting recording in manual mode 16
Fig. Starting recording in scheduler mode 17
Fig. 9 Pages menu 18
Fig. 10 Pages menu from “Display” 20
Fig. 11 Common elements 21
Fig. 12 Project global commands 22
Fig. 13 “Options connection pop-up 23
Fig. 14 “General settings” page 24
Fig. 15 “ModBus connection and ZNET project” pop-up 25
Fig. 16 “Scheduler” page 26
Fig. 17 "Display pages" page 28
Fig. 18 “Display” page 30
Fig. 19 “Chart” page 31
Fig. 20 “Channels” page 32
Fig. 21 “Edit channels” pop-up 33
Fig. 22 “Edit calculated channel” pop-up 34
Fig. 23 “Calibration” page 35
Fig. 24 “Calibration" pop-up 36
Fig. 25 “Notes” page 37
Fig. 26 ”Automatic report” page 39
Fig. 27 "License" page 40
Fig. 28 “Unit of measurement” page 41

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7 LIST OF TABLES

Table 1 Pages menu 19
Table 2 Extra pages menu from “Display” 20
Table 3 Common elements 21
Table 4 Global commands in the software first line 22
Table 5 Global commands in the software second line 22
Table 6 “Options” pop-up 23
Table 7 “General settings” page 24
Table 8 “ModBus connection and ZNET project” pop-up 25
Table 9 “Scheduler” page 27
Table 10 "Display pages" page 29
Table 11 “Display” page 30
Table 12 “Chart” page 31
Table 13 “Channels” page 32
Table 14 “Edit channels" pop-up 33
Table 15 “Edit calculated channel” pop-up 34
Table 16 “Calibration” page 35
Table 17 “Calibration” pop-up 36
Table 18 “Notes” page 37
Table 19 “Automatic report” page 38
Table 20 “Unit of measurement” page 40

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User Manual

Data Recorder

Ver.1.41 Beta9

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