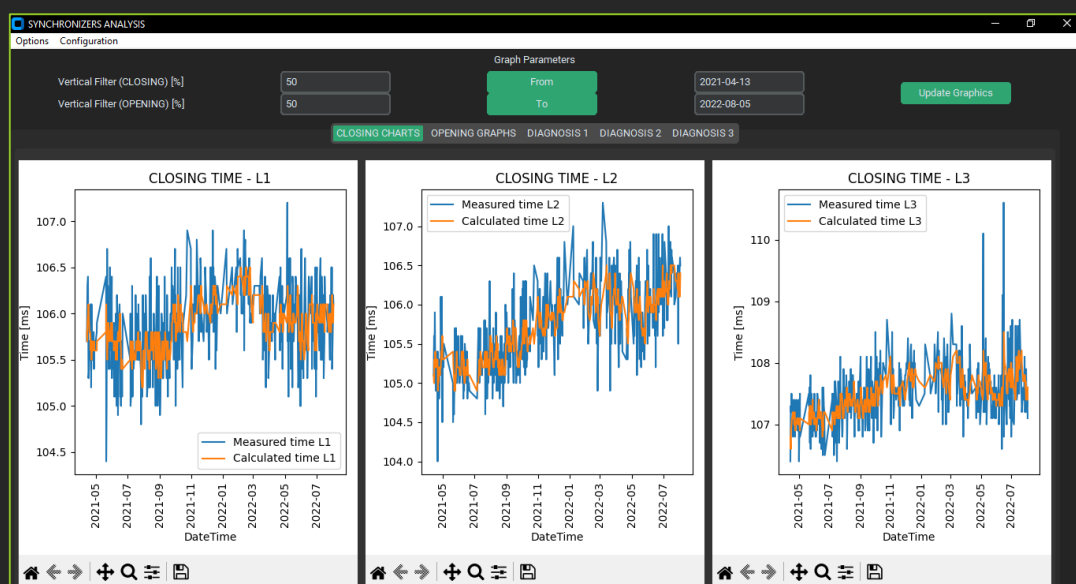


USER'S GUIDE FOR SYNCHRONIZER ANALYSIS SOFTWARE



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1 OBJECTIVE

To explain in a quick, summarized and easy way how to use the program in order to obtain a satisfactory experience for the user.

2 DESCRIPTION

The program is to evaluate and analyze the correct operation of the RPH2 Synchronizer. It allows in an easy and fast way to visualize in a graph the history of the times measured and times calculated by the relay. It also has the possibility to perform 3 diagnostics:

- **Performance:** verify that the delays in the closing and opening orders are in accordance with the configured maneuver program and that they are within the allowed tolerance ranges.
- **Last operations:** it allows detecting large deviations between the times configured in RPH2 and the times measured in the last maneuvers.
- **Alarms:** it is possible to display the total number of occurrences of the alarms configured in RPH2, as well as the date and time of the last occurrence.

3 INSTRUCTIONS

3.1 GENERAL

To use the software it is not necessary to install it, it is only necessary to run the program icon that is downloaded. The operating system requirements for running the software are: 64bit operating system, 2GB of RAM and at least 250MB of disk space.

To use the application you must have 2 files that are downloaded from RPH2:

- .CSV file (file with maneuver history).
- .RPH file (configuration file)

3.2 USE

When you run the program, the main window opens

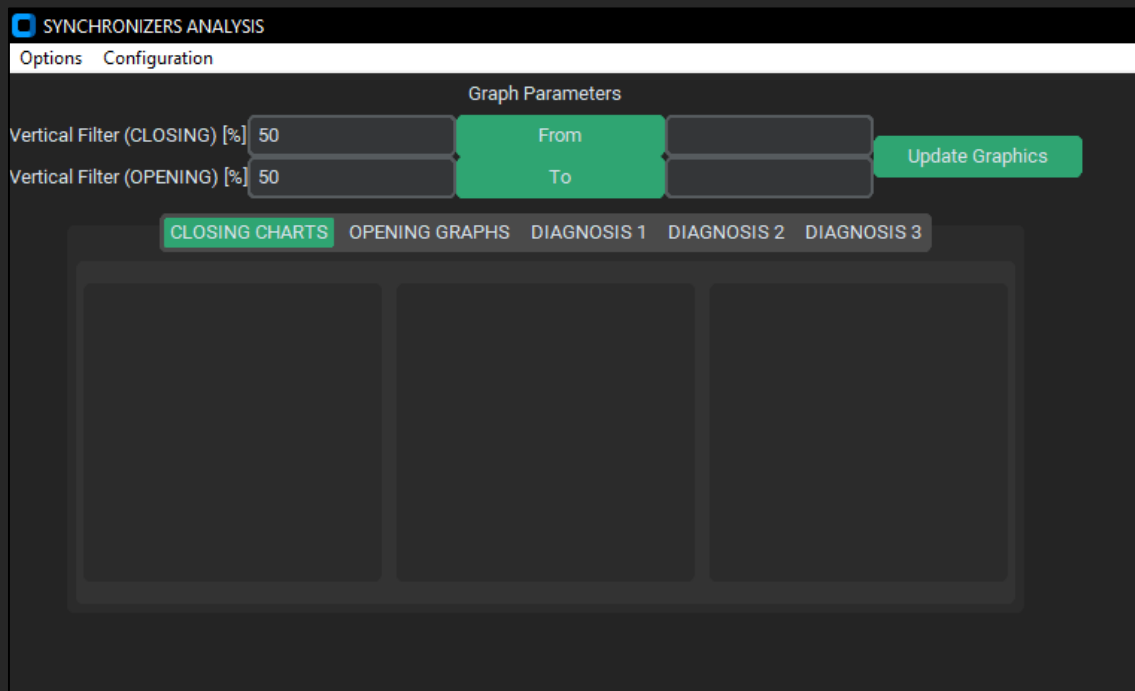


Figure 1 - Software main window

3.2.1 GRAPHICS

To generate the time graphs it is necessary to open the .csv file from the "Options" menu.

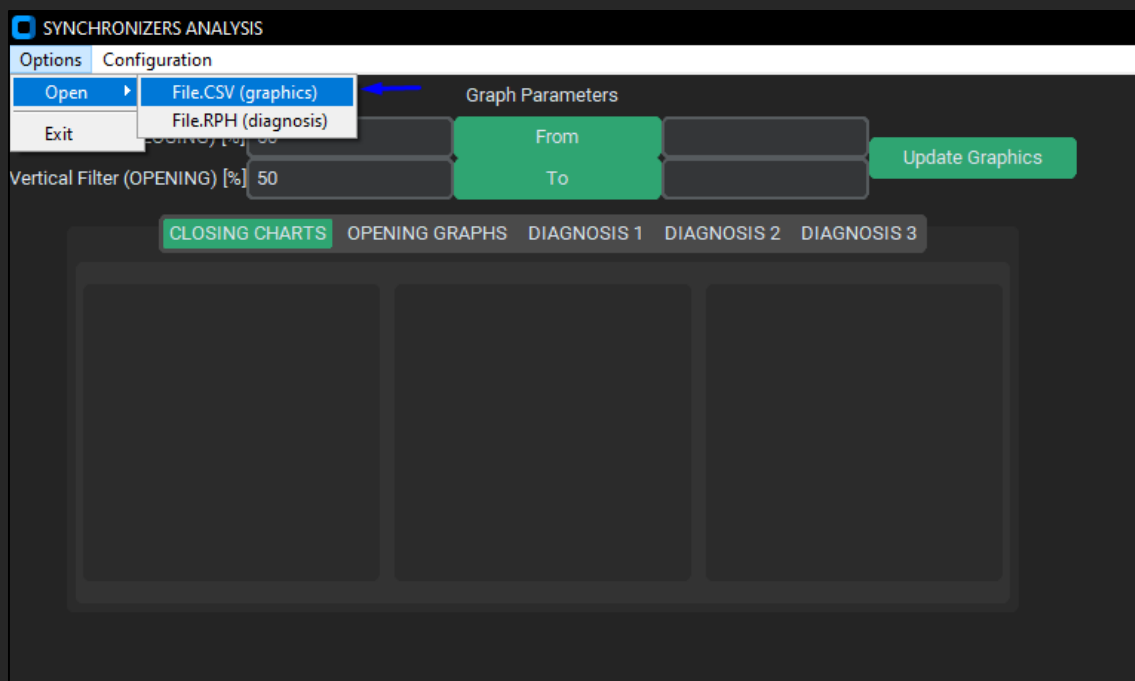


Figure 2 - Open .csv file

Then the window opens to search for the .csv file within the documents stored on the computer and once selected the graphics are automatically generated.

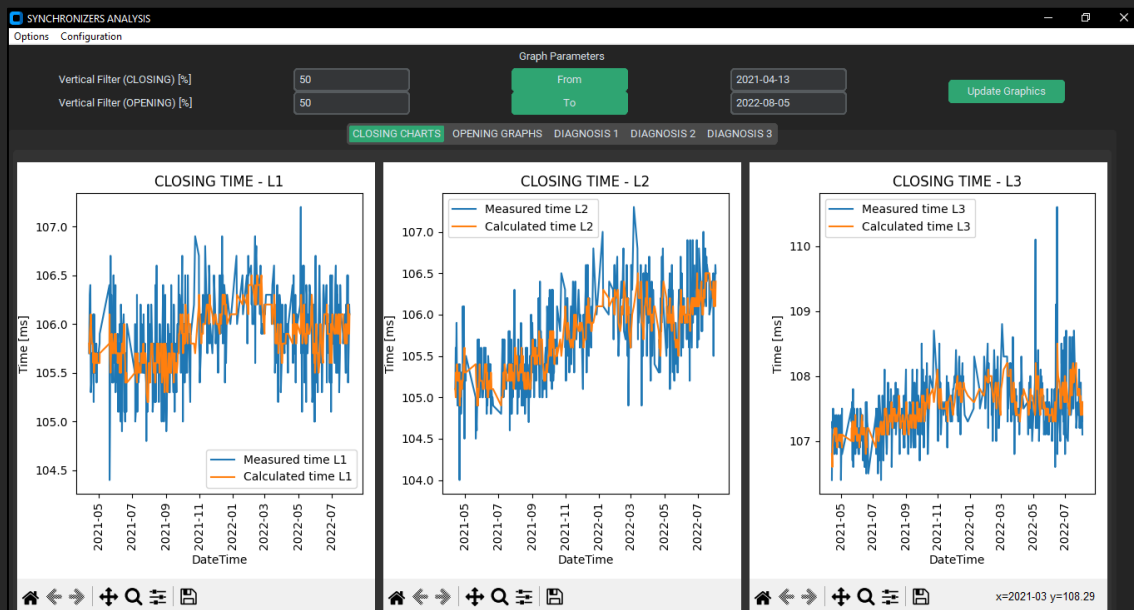


Figure 3 - Closing charts

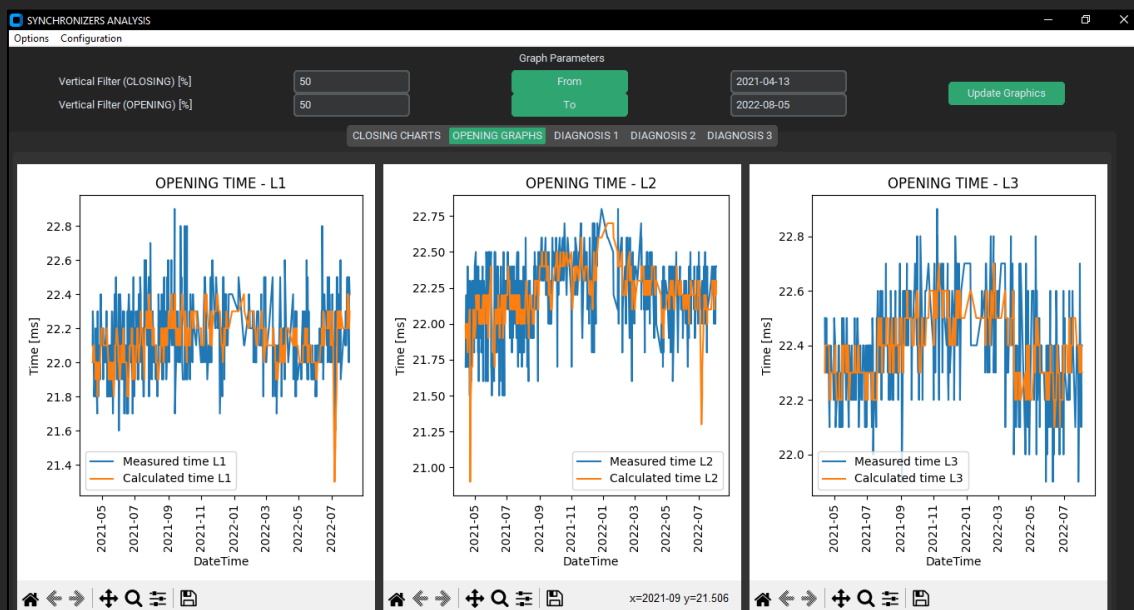


Figure 4 - Opening charts

3.2.2 DIAGNOSTICS

To generate the diagnostics, it is necessary to open the .RPH file from the "Options" menu.

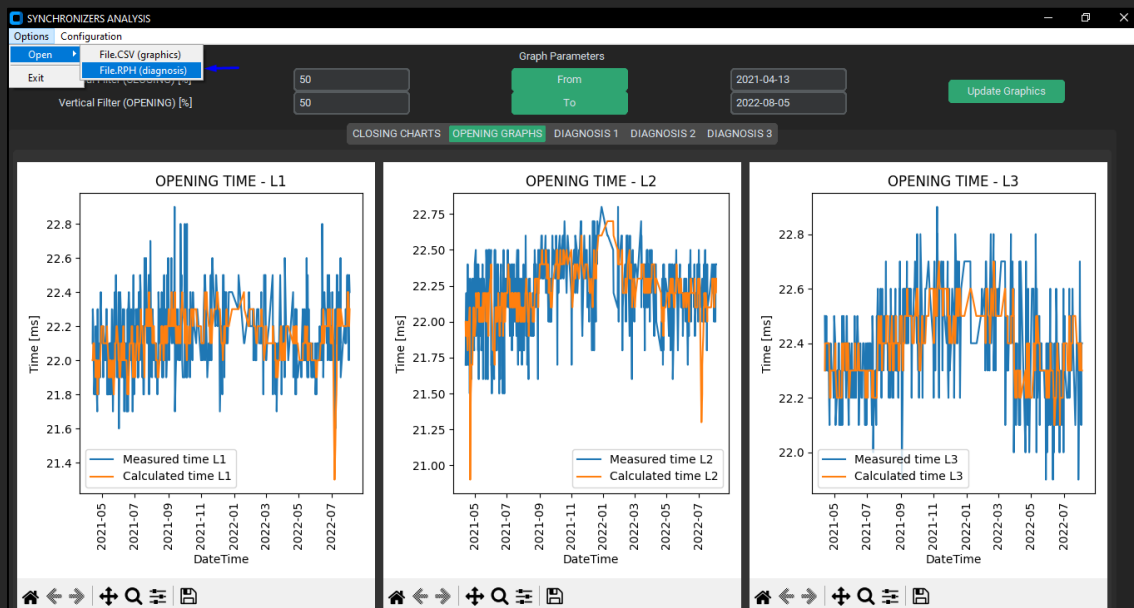


Figure 5 - Open .RPH file

Then the window opens to search for the .RPH file within the documents stored on the computer and once selected the diagnostics are automatically displayed.

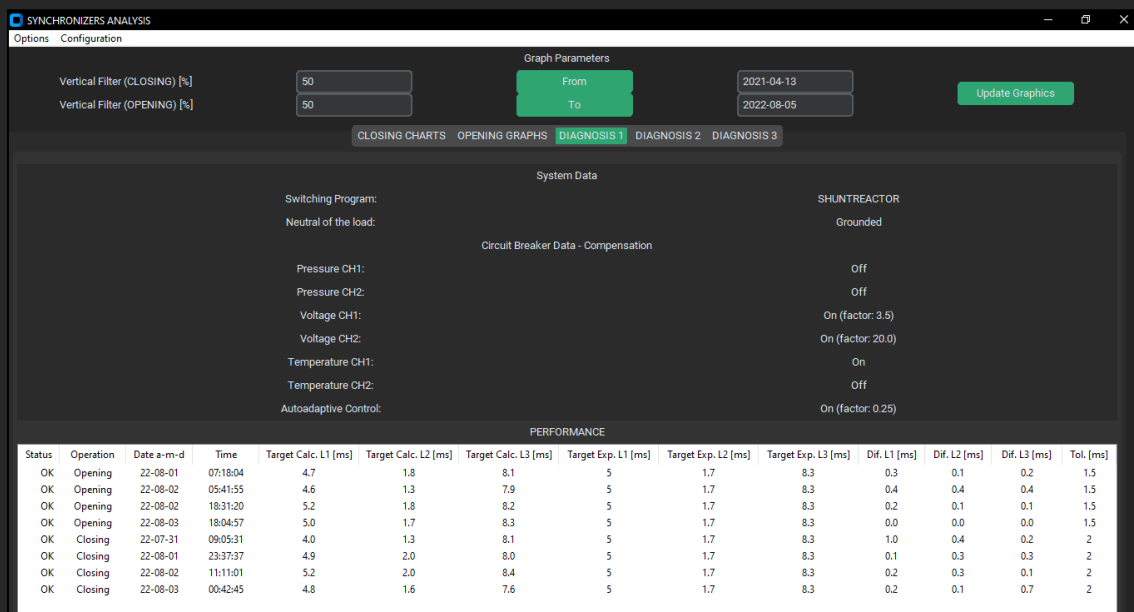


Figure 6 - Diagnosis 1

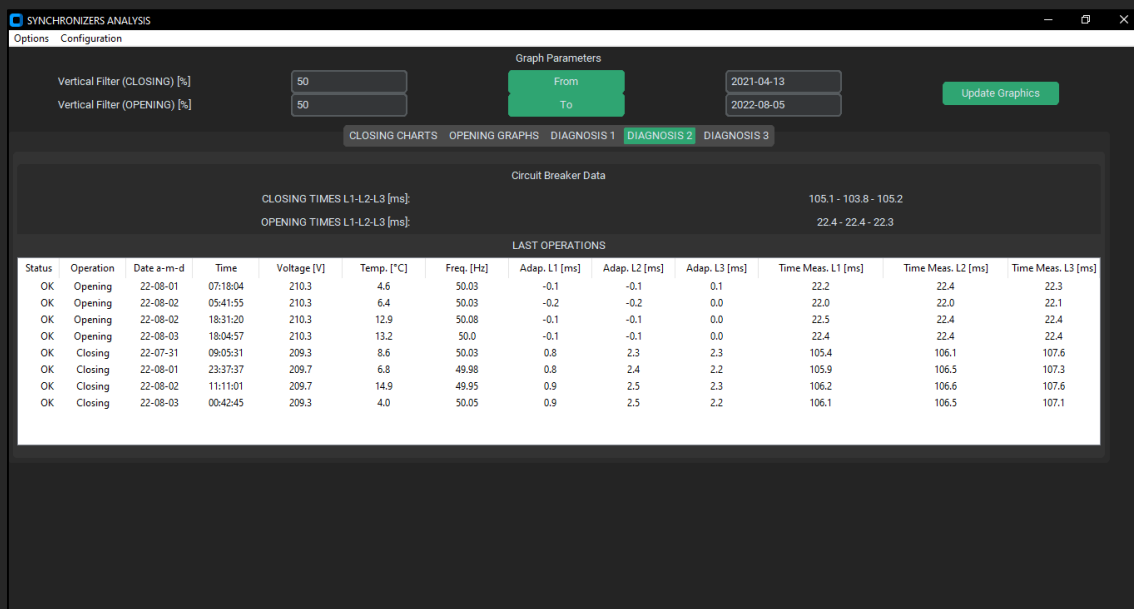


Figure 7 - Diagnosis 2

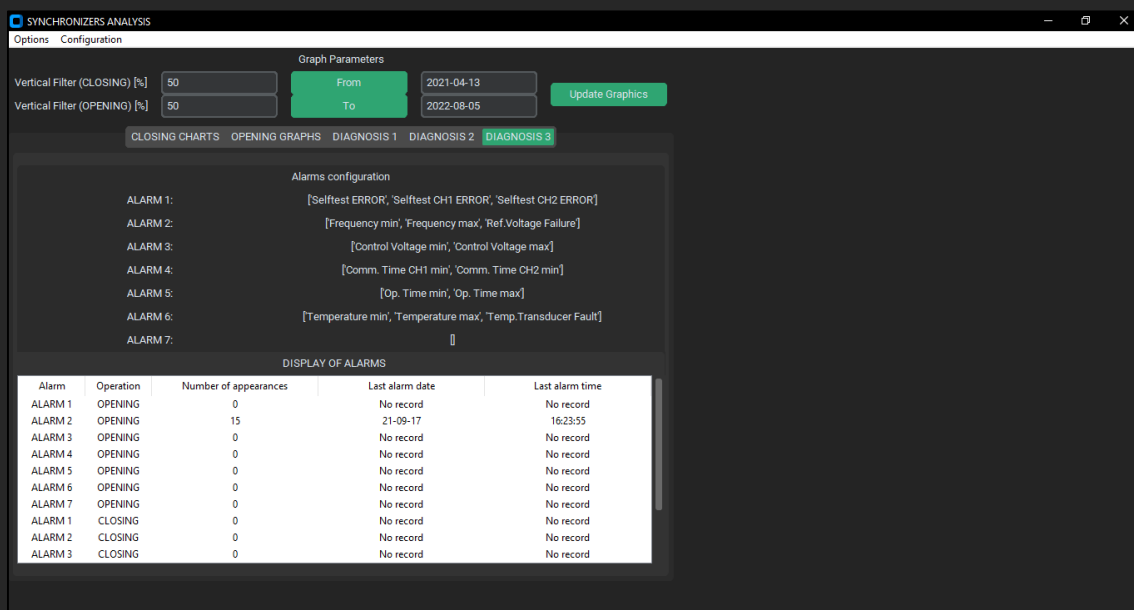


Figure 8 - Diagnosis 3

3.3 INTERPRETATION OF THE DIAGNOSIS

3.3.1 DIAGNOSIS 1

The upper part shows information related to the system data (selected switching program and condition of the load neutral) and to the compensation that is activated or deactivated.

The lower part shows a table with the last 4 closing and 4 opening maneuvers. According to the selected switching program and load neutral condition, the Expected Target (Target Exp. L1, L2 and L3) is shown according to table 1 of the manual, **Figure 9**.

To perform the diagnosis, the RPH2 operating Target (Target Calc. L1, L2 and L3) is calculated according to the following equation:

$$\text{Target Calc. L1 (closing)} = \text{Comm. OutTime L1} + \text{Meas. Op. Time L1} - \text{Arc Time}$$

$$\text{Target Calc. L1 (opening)} = \text{Comm. OutTime L1} + \text{Meas. Op. Time L1} + \text{Arc Time}$$

Table 1: Delay times of the various switching programs.

Switching programs	Neutral	Operation	Delay time		
			L1	L2	L3
Transformer	GROUNDED	CLOSING	5 (4.2)	10 (8.3)	10 (8.3)
		OPENING	5 (4.2)	1.7 (1.4)	8.3 (6.9)
	ISOLATED	CLOSING	5 (4.2)	0	0
		OPENING	5 (4.2)	10 (8.3)	10 (8.3)
Reactor	GROUNDED	CLOSING	5 (4.2)	1.7 (1.4)	8.3 (6.9)
		OPENING	5 (4.2)	1.7 (1.4)	8.3 (6.9)
	ISOLATED	CLOSING	5 (4.2)	0	0
		OPENING	5 (4.2)	10 (8.3)	10 (8.3)
Capacitor	GROUNDED	CLOSING	0	6.7 (5.6)	3.3 (2.8)
		OPENING	5 (4.2)	1.7 (1.4)	8.3 (6.9)
	ISOLATED	CLOSING	10 (8.3)	5 (4.2)	5 (4.2)
		OPENING	5 (4.2)	10 (8.3)	10 (8.3)

Values in () for 60 Hz.

Figure 9 - Delay times of the various switching programs

The time difference between the two previous Target (Dif. L1, L2 and L3) is obtained and according to the tolerance (Tol.) mentioned in the manual (3.2, 3.3 and 3.4) the diagnostic status (Status) is determined.

DIAGNOSTIC 2

The upper part shows the closing and opening times configured in RPH2.

The lower part shows a table with the last 4 closing and 4 opening maneuvers. This table shows information for each maneuver such as date, voltage, temperature and frequency. It also shows the time that is compensated by the self-adaptive control (Adap. L1, L2 and L3) as well as the time measured by the RPH2 (Time Meas. L1, L2 and L3) for each one.

According to the time that the self-adaptive control is compensated (deviation between the set time and the actual operating time) if it is greater or less than:

- 5ms for opening
- 10ms for closing

The Status column shows the result of the diagnostic. Favorable (OK) when the deviation is less than these times or unfavorable (BAD) when the deviation is greater than these times.

DIAGNOSTIC 3

The upper part shows the alarms configured for each of the 7 available alarms.

The lower part shows a table where you can see the total number of times that a certain alarm appears, being able to differentiate between closing and opening. If the alarm has appeared at least once, the date of the last occurrence is shown.