



GOIZPER



smart-G -User Manual-

Condition Monitoring System

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0. Introduction

Smart-G is the Condition Monitoring System developed by Goizper Group which is prepared for several purposes.

On the one hand, this system provides information about online values of the process significant parameters: vibrations, temperatures, pressure, oil flow, refrigeration water... Evolution plots of these parameters can be visualized at the smart-G screen or on a PC. Besides, these data can be registered and sent to the master machine controller.

On the other hand, the internal algorithms programmed within the smart-G will generate some warnings and alarms according to the gear box current status. These alerts are sent to the master machine controller via digital outputs or via fieldbus. These alerts are explained in more detail at the smart-G screen or PC (if it is connected to the smart-G).



Figure 1: Guibe gear box with a smart-G box installed

According to sensors installation, they are located strategically at the critical points of the gearbox. Sensors at the input shaft side are numbered in order by odd numbers and sensors at the opposite

side of the motor location are numbered by even numbers. The numbering order always starts from the input shaft till the output shaft of the gearbox, as shown at the next figures.

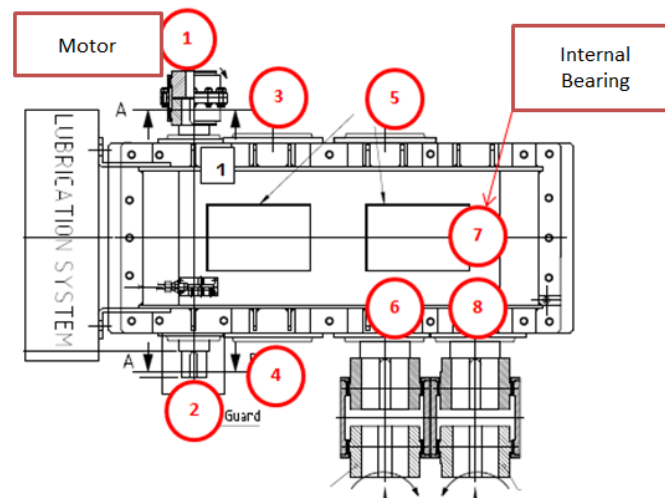


Figure 2: Sensors numbering

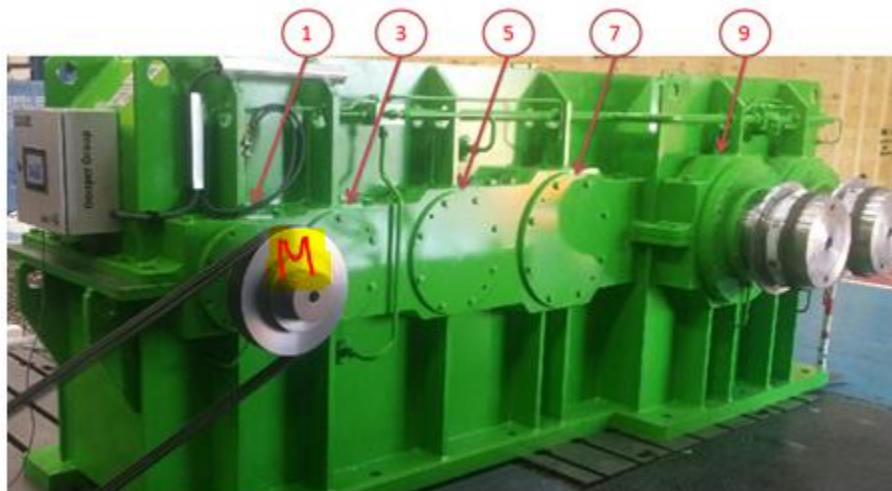


Figure 3: sensors numbering, odd numbers are always at input axis side

1. Visualization

There is a local HMI located at the front door of the smart-G box. At the right side of the screen, the global menu is situated with the buttons-functions explained throughout this document. At

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the left side of the screen, the local menu is found. Interaction with this Human Machine Interface can be performed at the local HMI or by means of a PC.

In the Visualization section, online parameters values are shown. It is divided in different sub-sections: Gear box data source, Lubrication System data source and smart-G generating Outputs.

1.1 Gear box Visualization

At this screen, current data, which origin is the gear box, is visualized. That is why it is called “Gear Box Visualization” screen, shown in the following image.

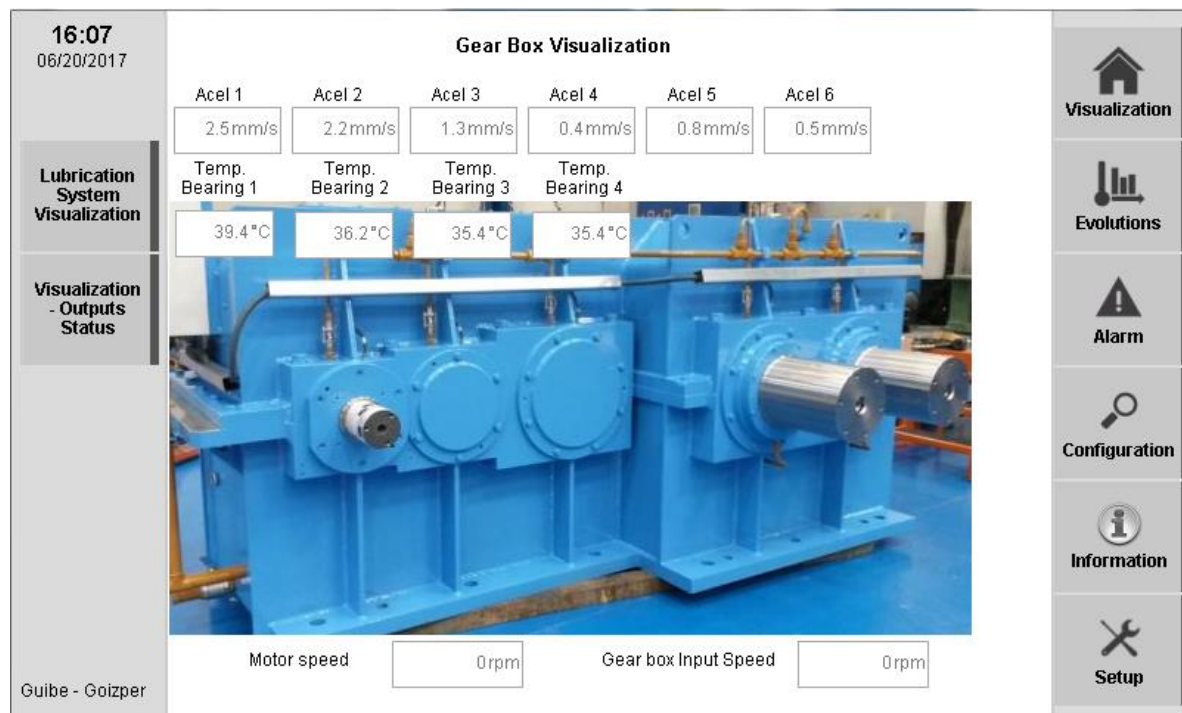


Figure 4: Gear box online data visualization screen

Vibration data is evaluated according to ISO10816 and, depending on the power of the machine, different warning thresholds are programmed. Check the next table.

Velocity threshold values

ISO 10816-3

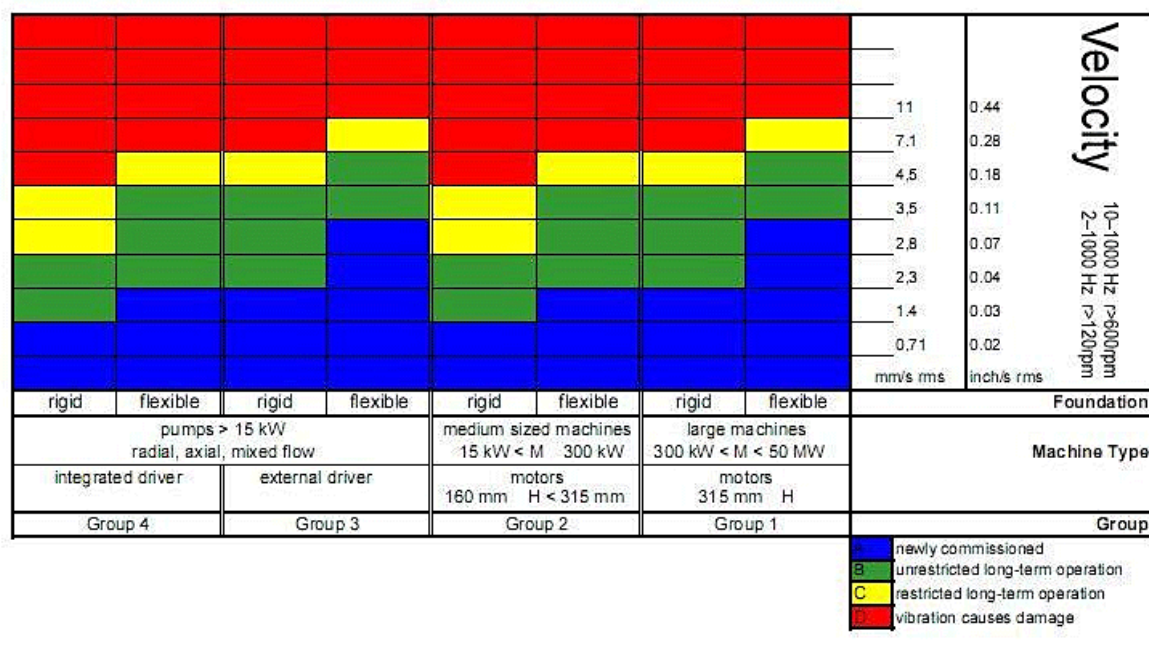


Figure 5: Vibrations table according to ISO 10816-3

1.2 Lubrication System Visualization

At the Lubrication System Visualization screen , online data from the Lubrication System is shown, such as, oil flow, pressures, temperatures, components status...

Current analog inputs are shown at the left side while digital inputs are shown at the right side of the screen.

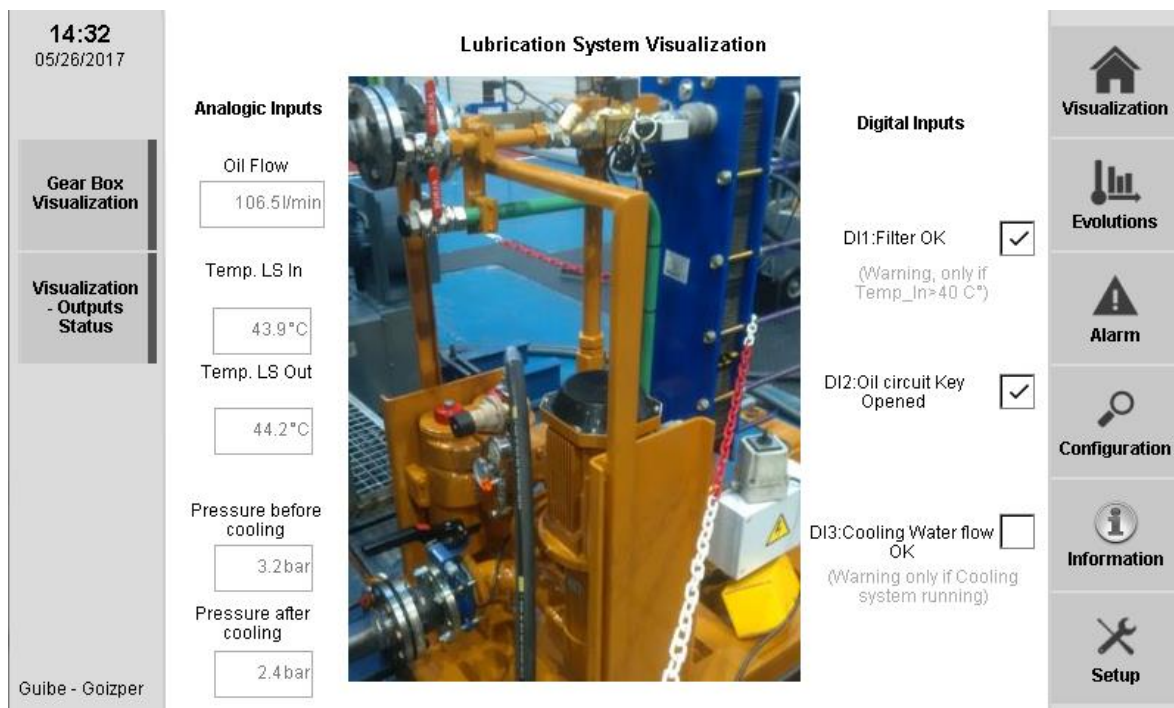


Figure 6: Lubrication System visualization screen

1.3 smart-G Outputs Status

The third visualization screen, Outputs Status, provides the information of the outputs that the smart-G sends to the master controller. Depending on the configuration of the smart-G different Outputs will be provided by the smart-G. Check the Annex 1 to find your smart-G configured Outputs. The most common Outputs are the next.

- DO0, Cooler valve: If active, refrigeration circuit valve opened.
- DO1, Initial Conditions: This condition must be active in order to start the machine.
- DO2, Alarm: If active, stop machine.
- DO3, Warning: If active, check the machine, but it can continue working.
- DO4, Overload Warning: If active, an overload is happening at the machine.

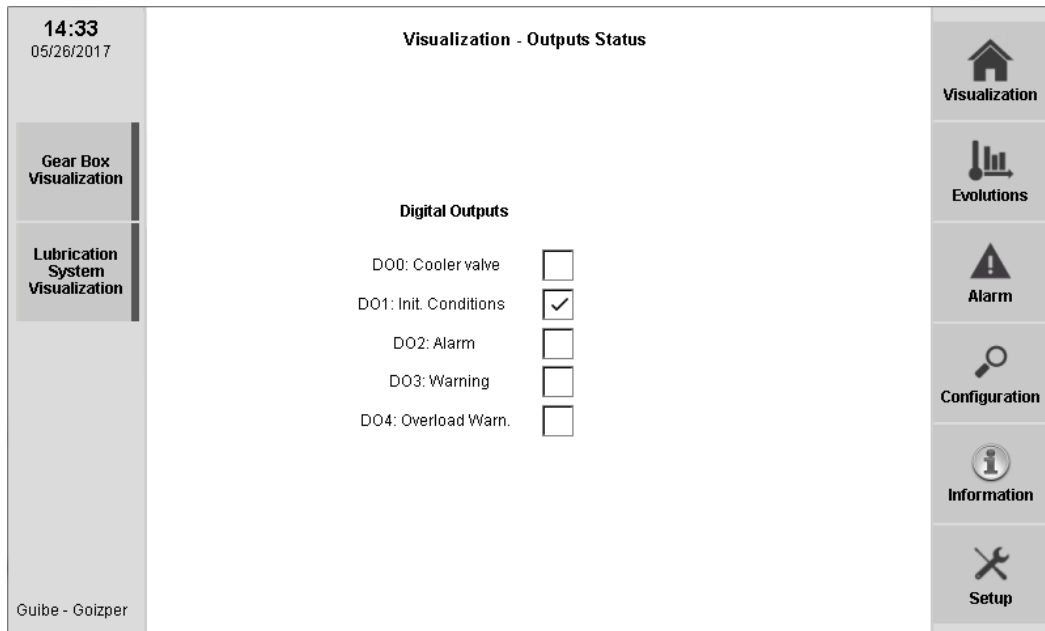


Figure 7: smart-G Outputs screen

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2. Evolutions/Trends

In this section, some parameters are visualized enabling data trend visualization for the time period. Temperature evolution and vibrations RMS evolution data are shown in the two following screens.

2.1 Temperature

Temperatures values in different points (bearings, lubrication system input and output....) of the gear box are plotted in this section.

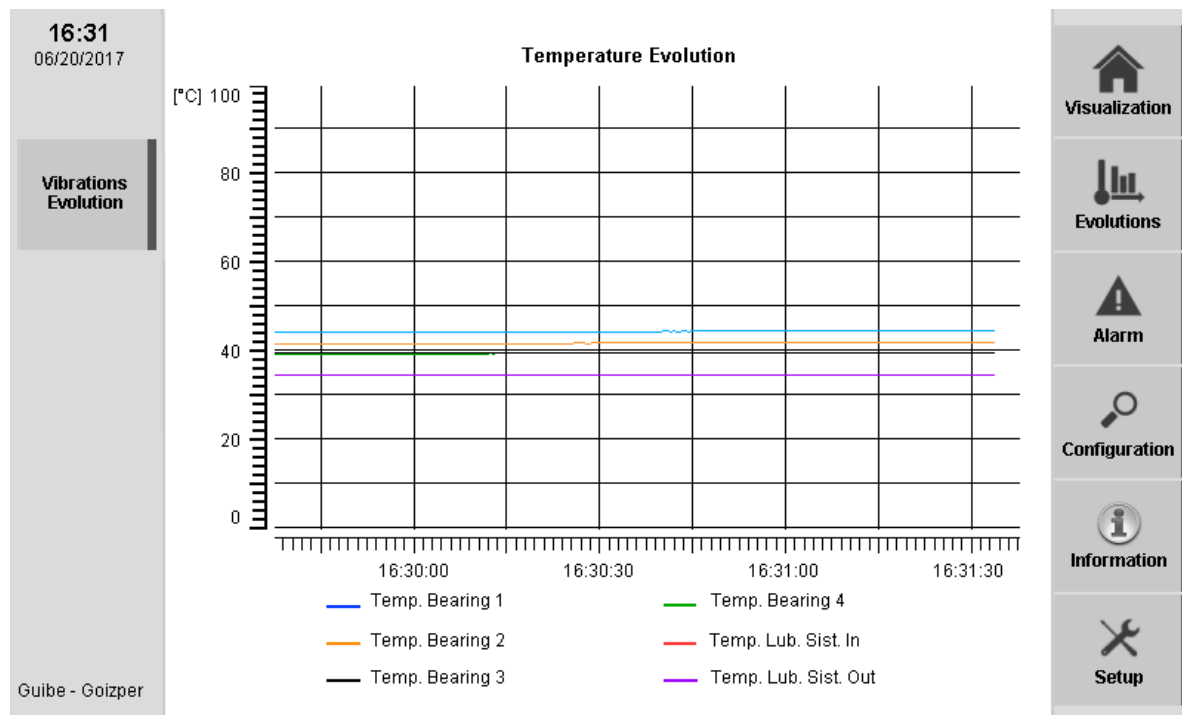


Figure 8: Temperature Evolution screen

All sensors numbering is according to the logic explained within the introduction of this document.

2.1 Vibrations

Vibration values in different bearings of the machine are graphed in this section. Vibration speed according to ISO10816 is considered in RMS values.

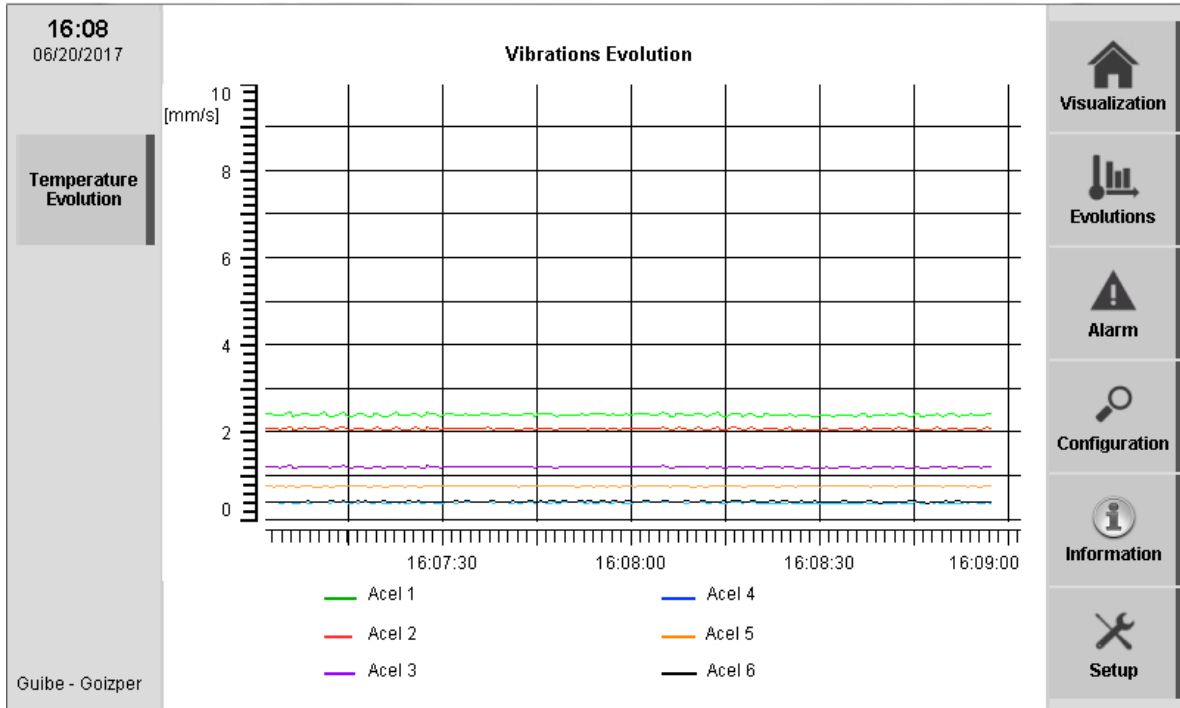


Figure 9: Vibrations Evolution screen

All sensors numbering is according to the logic explained within the introduction of this document.

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3. Alarm

Two types of Alerts are found within the logic of the smart-G (more info about alerts in ANNEX 1).

Warning: *Machine can continue working*, but maintenance performance is needed in some part of the machine because the working conditions are out of the optimal range.

Alarm: *Machine must be stopped* because it is working in dangerous process values conditions or there is something wrong with the gear box. Apart from this screen information, it will always appear a notification (**Alarm!**) at the top right side of each screen.

Process warnings and alarms are shown in orange. Smart-G system warnings are shown in red (not a gear box issue).

3.1 Current Alarms and Warnings

This section shows only the current active warnings and current active alarms.

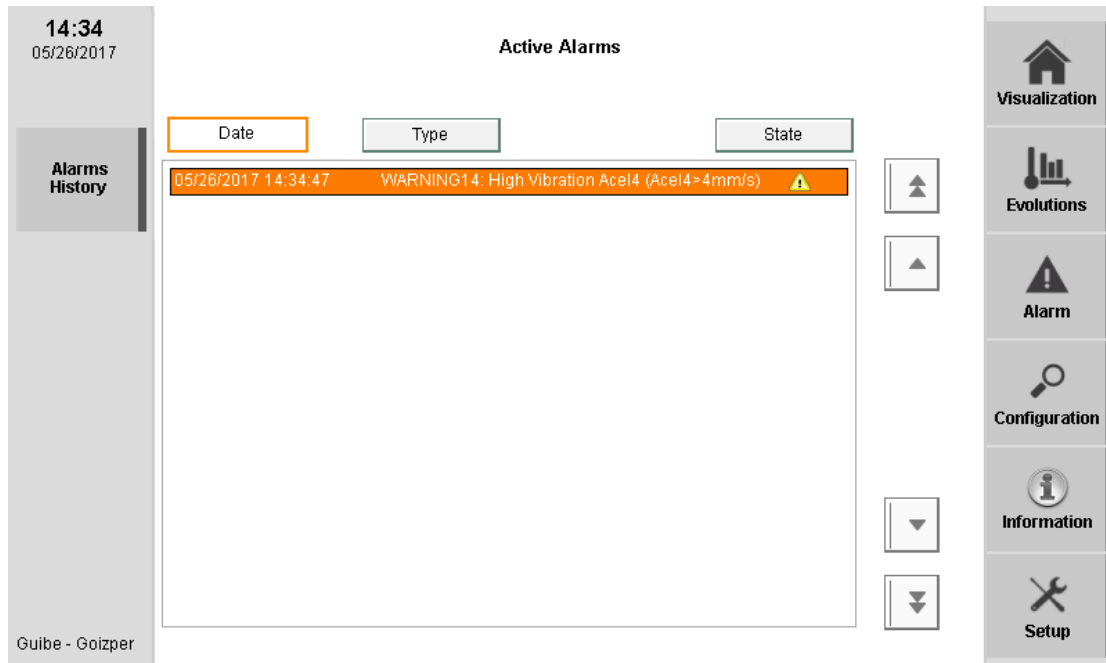


Figure 10: Active Current Alarms are shown in this screen

3.2 Historic Alarms and Warnings

The next section shows the list of historic of alarms and warnings that appeared before in the Current Alarm section.

Two State icons indicate when the Alarm/Warning has appeared and when it has been solved.



Alarm/Warning enabled: Date/time and Alert type are shown in the list.



Alarm/Warning disabled: Date/time and Alert type are shown in the list.

In the next image an example is shown. In this case, high vibrations values at bearing number 1 are detected and warned.

14:51
04/21/2017

Current Alarms

Guibe - Goizper

Alarms History

Alarm!

Date	Type	State
04/21/2017 14:48:35	WARNING11: High Vibration Acel1 (Acel1>4mm/s)	✓
04/21/2017 14:48:34	WARNING11: High Vibration Acel1 (Acel1>4mm/s)	⚠
04/21/2017 14:48:29	WARNING11: High Vibration Acel1 (Acel1>4mm/s)	✓
04/21/2017 14:48:29	WARNING11: High Vibration Acel1 (Acel1>4mm/s)	⚠
04/21/2017 14:48:27	WARNING11: High Vibration Acel1 (Acel1>4mm/s)	✓
04/21/2017 14:48:24	WARNING11: High Vibration Acel1 (Acel1>4mm/s)	⚠
04/21/2017 14:48:24	WARNING11: High Vibration Acel1 (Acel1>4mm/s)	✓
04/21/2017 14:48:23	WARNING11: High Vibration Acel1 (Acel1>4mm/s)	⚠
04/21/2017 14:48:15	WARNING11: High Vibration Acel1 (Acel1>4mm/s)	✓
04/21/2017 14:48:14	WARNING11: High Vibration Acel1 (Acel1>4mm/s)	⚠
04/21/2017 14:48:13	WARNING11: High Vibration Acel1 (Acel1>4mm/s)	✓
04/21/2017 14:48:13	WARNING11: High Vibration Acel1 (Acel1>4mm/s)	⚠
04/21/2017 14:48:12	WARNING11: High Vibration Acel1 (Acel1>4mm/s)	✓

Visualization

Evolutions

Alarm

Configuration

Information

Setup

Figure 11: Alarms & Warnings historic list

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4. Configuration

Within the Configuration screen basic configuration modification is permitted.

4.1 Language

Language selection is possible in this section. Available languages are:

- English
- German
- Spanish

4.2 Network Settings

Smart-G default IP address (IP default: 100.100.100.X), which is shown at Network Settings, is established by Goizper Group, so it can only be modified by software by a Goizper Group technician. If a VNC Client wants to be connected to the smart-G for PC visualization (using vncviewer, UltraVNC...), the Client must be connected to the mentioned smart-G IP network. This is the needed password to obtain the access through a VNC communication:

v: only for view access

c: for view and control access

Figure 12: Configuration screen shape

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4.3 Time and Date

In this sub-section the current time and date can be modified. The smart-G system contains an internal battery in order to maintain the Real Time Stamp. When the smart-G is turned off, the battery is the responsible to maintain the time stamp. This battery usually works for 3-4 years. If the battery must be replaced, always use the next reference battery to replace it: Lithium RENATA CR2477N 3V.



Figure 13: 3 volt external battery

When the battery is low, an alert will appear at the top right side of the screen. "Low Battery!" is advised in red.

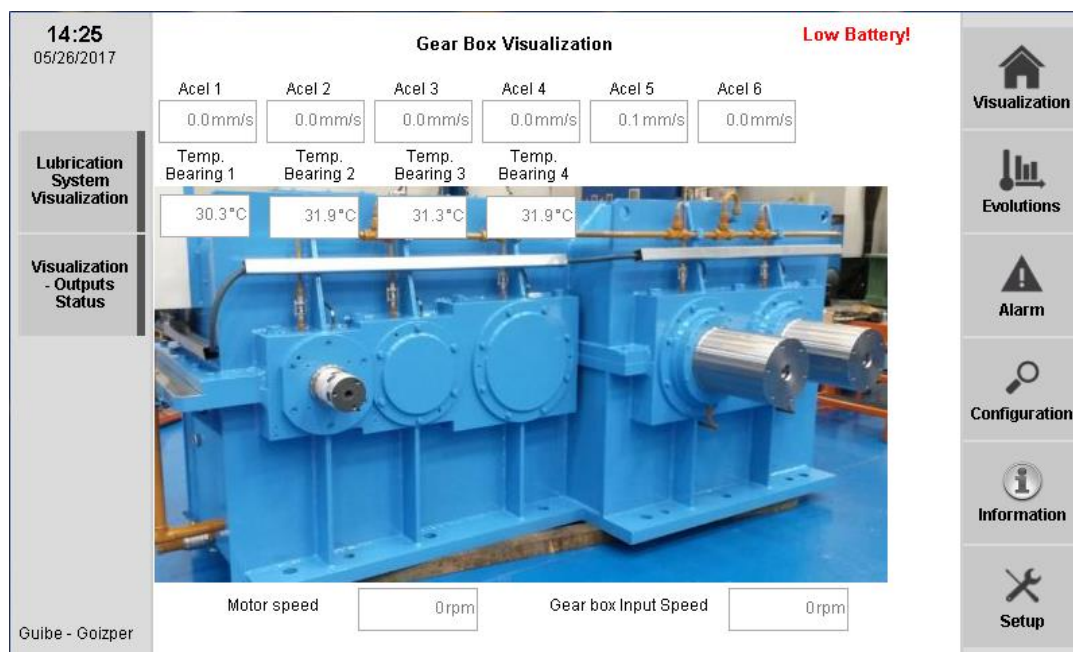


Figure 14: "Low battery" advice

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5. Information

Information section is a smart-G internal controller status visualization where smart-G processor status can be checked and visualized. This data is not relevant for the product final user; in fact, it is only used when there is an issue with the smart-G processor.

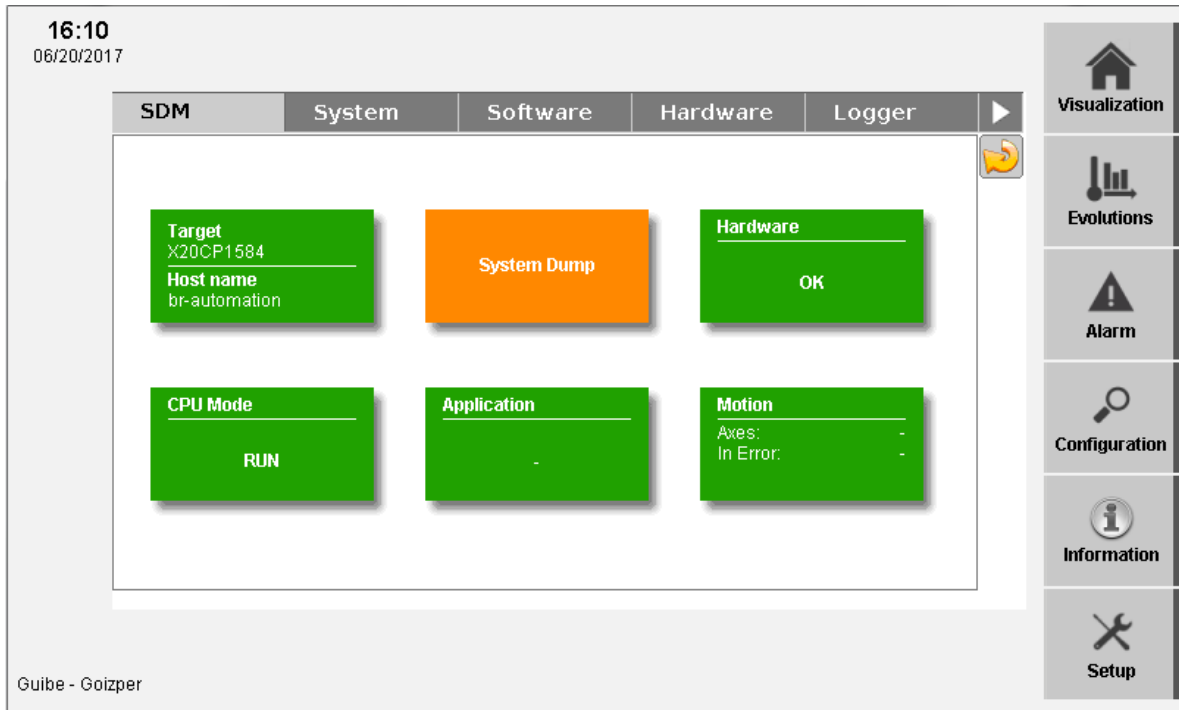


Figure 15: smart-G internal device status information

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6. Setup

This section is reserved for Goizper Group Technicians. Goizper Group Technicians will use this section during the setup of the gear box or during an intervention.



Figure 16: To get in setup, a password is needed

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7. Others

7.1 Data collection

If the customer wants to download the data saved within the memory of the smart-G , the easiest way to do it is copying the csv files from the CompactFlash into a USB. For that, insert a empty USB pen in any of the USB ports at the CPU and wait until the next message is shown:

“Data copied to USB: remove USB”

Then, the USB can be removed and 3 different folders will be found in the USB.

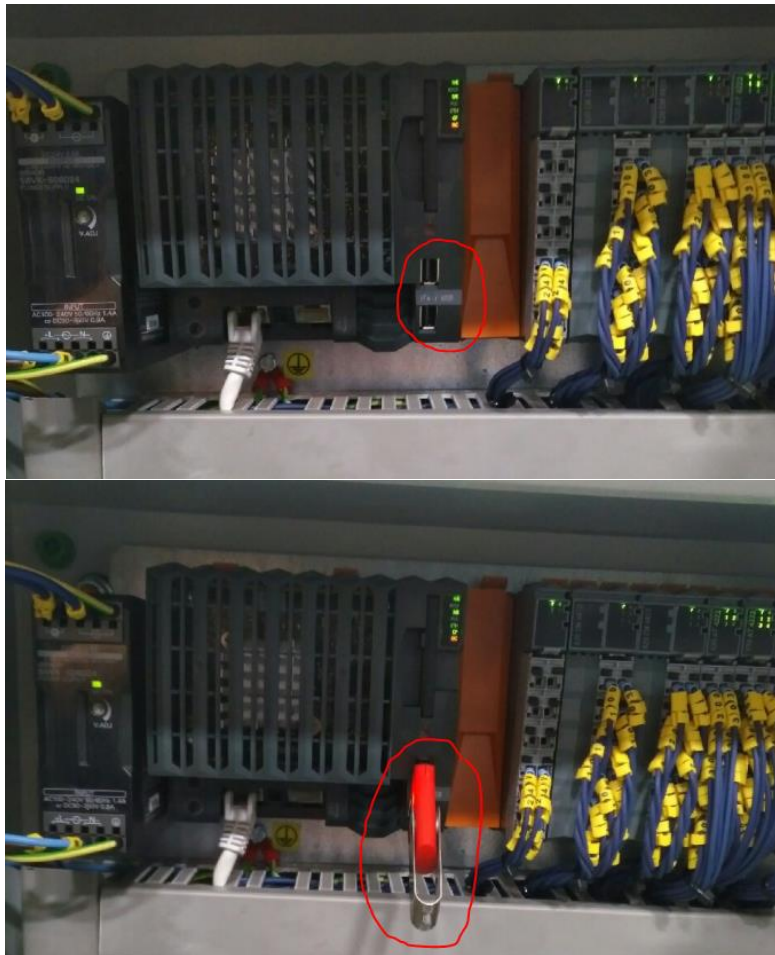


Figure 17: USB introduction port

When the USB device is inserted automatically it will be detected by the processor and immediately it will start copying the 3 folders to the USB device.

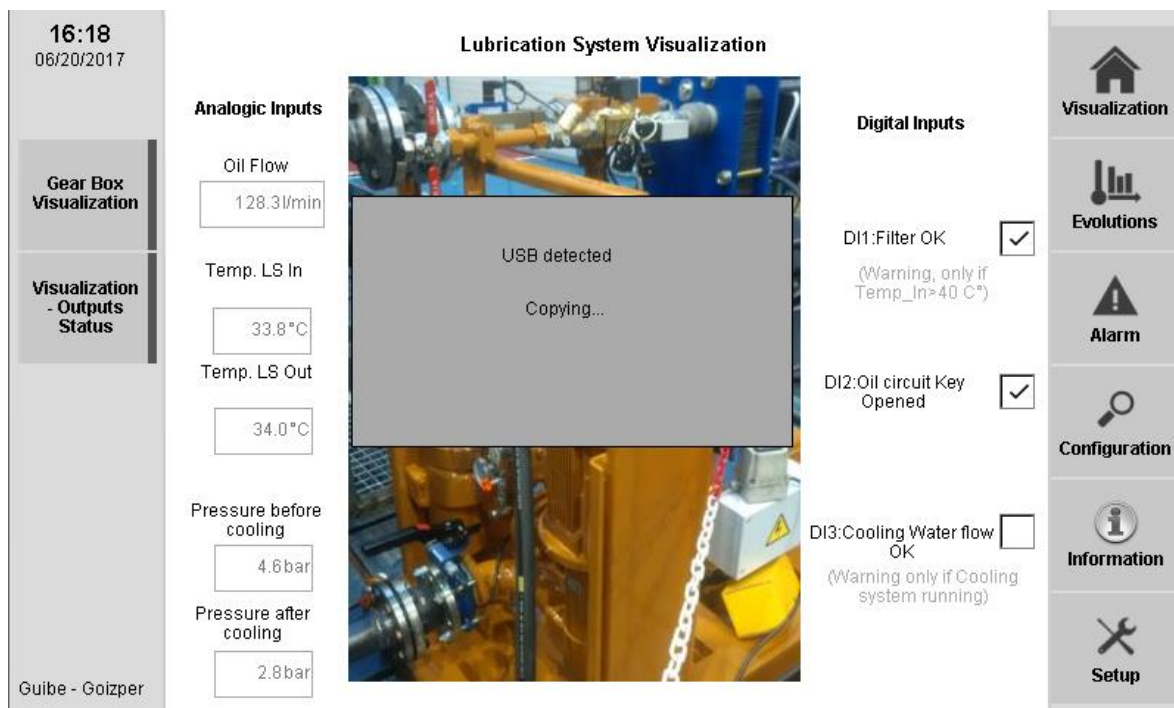


Figure 18: While copying data the next message will appear

When all the data (the 3 folders) are finished to be copied the next message will appear in the popup window.

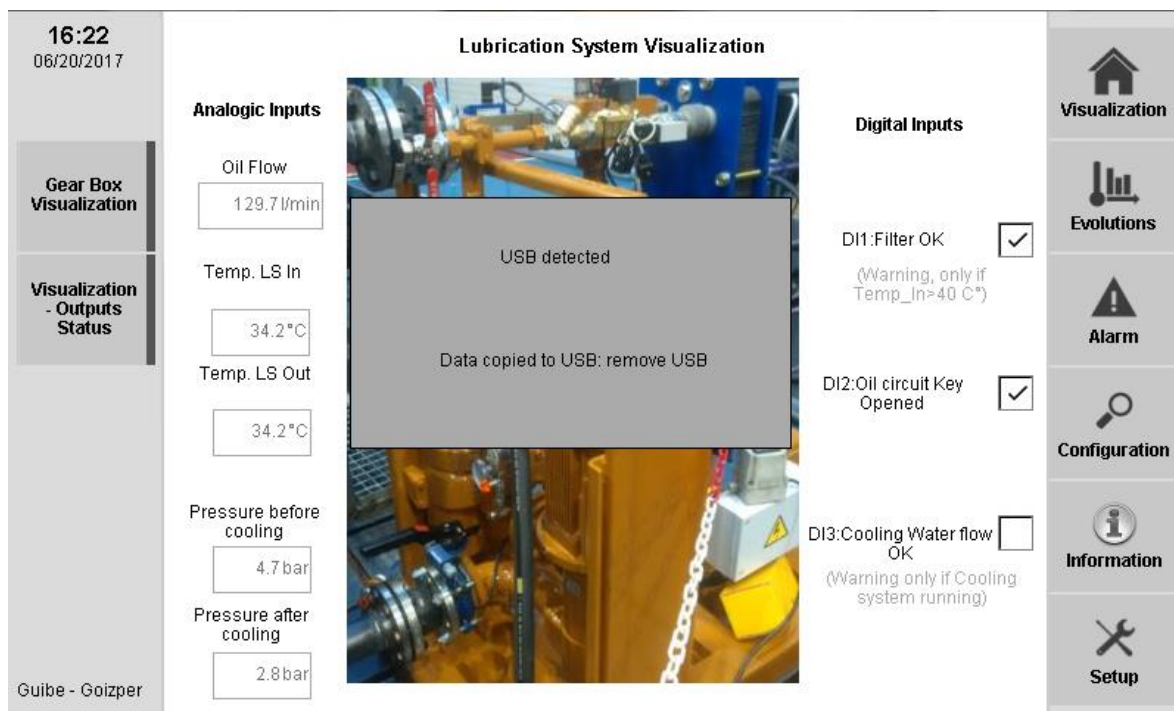


Figure 19: When copying process is finished, “remove USB” is shown in the popup window

- The 3 different folders within the Compact Flash are copied. The containing values are the following(except if the customer asks to modify the capturing frequency):
- - TRIG_button : (1 data/s) //1 csv file contains: 100values = 100 seconds→ For Goizper Group Technicians.
 - TRIG_warn_alarm : (1 data/s) //1 csv file contains: 100values = 100 seconds→Only generated when a warning/alarm occurs.
 - TRIG_periodic : (1 data/5mins) //1 csv file contains: 120values=10h→Always (continuously) generated each 10 hours.

7.2 HMI control from PC

The HMI screen can be visualized and controlled remotely from the office using a PC. This computer must be connected by Ethernet wire to the smart-G Ethernet output connector. The computer must be at the same network as the smart-G IP address (100.100.100.x, found in configuration section). Then, as the smart-G works as a VNC server, VNC protocol is used for this purpose. Different VNC client software can be used on a PC, such us, VNCviewer or UltraVNC.

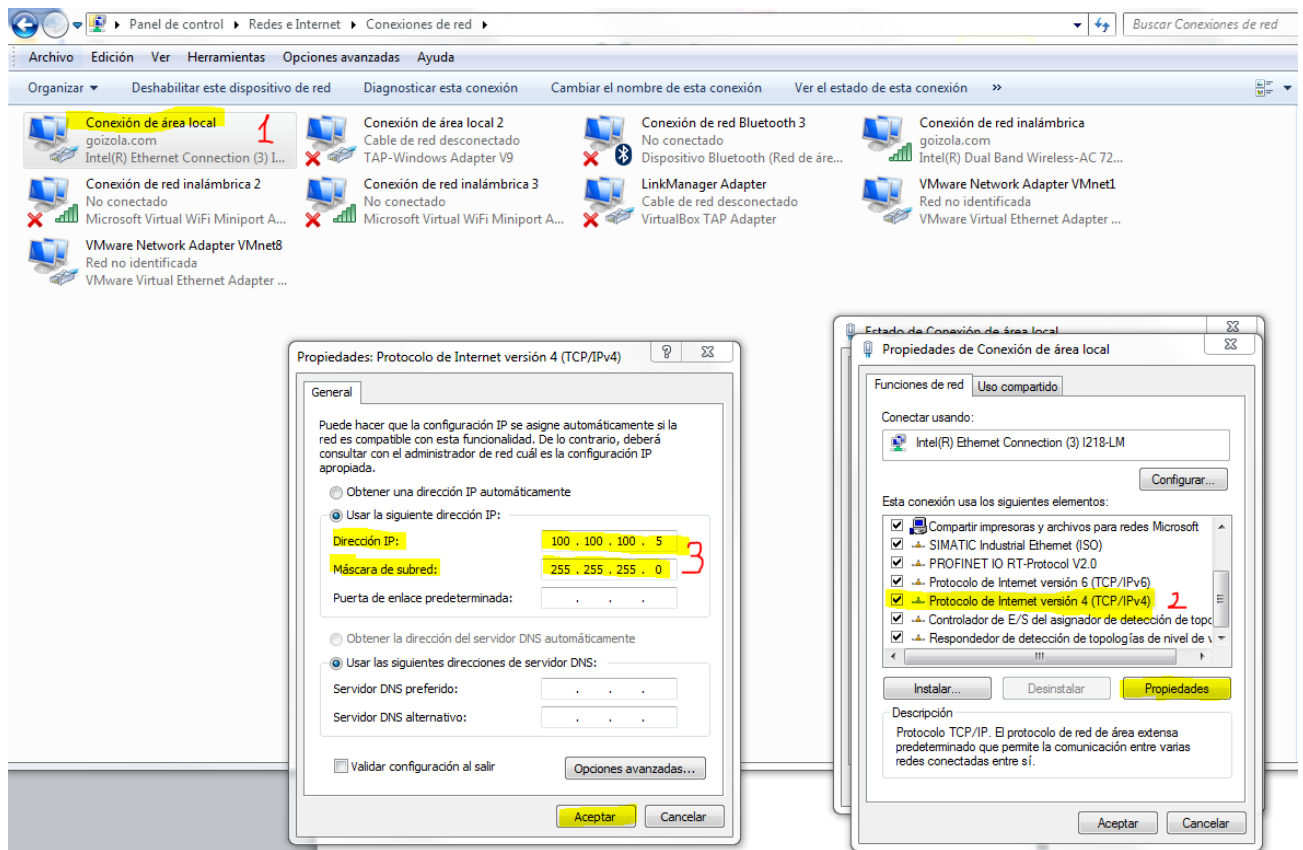


Figure 20: Modification of the PC IP address within Control Panel > Net connexions



Figure 21: Open a VNC client and introduce smart-G IP address (found in Configuration)

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After introducing the VNC server IP address, smart-G address, a password is required. Use one of these two passwords for different purposes:

- c : for controlling the HMI
- v: for only visualizing the HMI (no control)

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8. Outputs and Alarm-Warning list

DO 1) Cooler control:

- Activate valve - Deactivate valve

DO 2) Initial Conditions OK / Confirmation for start machine (to PLC Customer): 1 boolean is obligatory in order to start the machine motor.

DO 3) Conditions NOK/ Stop machine ALARM (to PLC Customer): Stop machine. Check alarm type in HMI.

- ALARM0: Low oil flow
- ALARM1: Oil key closed
- ALARM38: Too high LS temp: LS temperature_ Oil cooling problem
- ALARM39: Tank Oil High Temperature
- ALARM40: Too high LS temp: LS temperature
- ALARM41: T1_ High temperature in Bearing
- ALARM42: T2_ High temperature in Bearing
- ALARM43: T3_ High temperature in Bearing
- ALARM44: T4_ High temperature in Bearing
- ALARM45: T5_ High temperature in Bearing
- ALARM46: T6_ High temperature in Bearing
- ALARM47 :T7_ High temperature in Bearing
- ALARM48: T8_ High temperature in Bearing
- ALARM49: T9_ High temperature in Bearing
- ALARM50: T10_ High temperature in Bearing
- ALARM51: T11_ High temperature in Bearing
- ALARM52: T12_ High temperature in Bearing

DO 4) Warning (to PLC Customer): Notification of an incorrect situation due to different possible problems. The machine can continue working but maintenance has to be performed as soon as possible. Check warning type in HMI.

- WARNING0: Filter clogged
- WARNING1: LS_Pressure too low
- WARNING2: Oil_Humidity High
- WARNING3: Oil cooling problem Low water flow
- WARNING4: Too high Pressure when temp<30°C

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- WARNING5: Too high Pressure when temp >30 and <60°C
- WARNING6: Too high Pressure when temp >60°C
- WARNING9: Oil_level_Low
- WARNING38: LS high temperature_ Oil cooling problem
- WARNING39: Tank Oil High Temperature
- WARNING40: LS high temperature
- WARNING41: T1_ High temperature Bearings
- WARNING42: T2_ High temperature Bearing
- WARNING43: T3_ High temperature Bearing
- WARNING44: T4_ High temperature Bearing
- WARNING45: T5_ High temperature Bearing
- WARNING46: T6_ High temperature Bearing
- WARNING47: T7_ High temperature Bearing
- WARNING48: T8_ High temperature Bearing
- WARNING49: T9_ High temperature Bearing
- WARNING50: T10_ High temperature Bearing
- WARNING51: T11_ High temperature Bearing
- WARNING52: T12_ High temperature Bearing
- WARNING61: Acel 1_ Vibration level too high according to ISO 10816
- WARNING62: Acel 2_ Vibration level too high according to ISO 10816
- WARNING63: Acel 3_ Vibration level too high according to ISO 10816
- WARNING64: Acel 4_ Vibration level too high according to ISO 10816
- WARNING65: Acel 5_ Vibration level too high according to ISO 10816
- WARNING66: Acel 6_ Vibration level too high according to ISO 10816
- WARNING67: Acel 7_ Vibration level too high according to ISO 10816
- WARNING68: Acel 8_ Vibration level too high according to ISO 10816
- WARNING69: Acel 9_ Vibration level too high according to ISO 10816
- WARNING70: Acel 10_ Vibration level too high according to ISO 10816
- WARNING71: Acel 11_ Vibration level too high according to ISO 10816
- WARNING72: Acel 12_ Vibration level too high according to ISO 10816

DO 5) Overload_AxisDisengaged_Warning (to PLC Customer): Notification of overload at the machine and consequently disengagement of the input axis of the reducer from the motor axis.