USER MANUAL

NESTi4 version 2.9



USER MANUAL

NESTi4 Software

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Table of content

Release Notes **10**

Version 2.9 – December 2025 10

Version 2.8 – June 2025 10

Version 2.5 – August 2024 11

Version 2.4 – March 2024 12

Version 2.3 – August 2023 13

Version 2.2 – December 2022 14

Version 2.1 – July 2022 15

Version 2.0.7 – April 2022 16

Version 2.0 16

Version 1.7 16

Version 1.6 17

Version 1.5 17

Version 1.3 18

Version 1.2 19

Version 1.1 19

CHAPTER 1. General presentation **21**

1.1 Acknowledgements 21

1.2 Introduction 21

1.3 Copyright and brands 22

CHAPTER 2. Installation & Update **24**

2.1 NESTi4.0 Desktop Edition 24

2.2 NESTi4.0 Network Edition (Multi-Users) 25

2.2.1 General prerequisites 25

2.2.2 Server installation 26

2.2.3 Client installation 28

2.2.4 Client update 28

2.3 Migrate from DESKTOP to NETWORK editions 28

CHAPTER 3. First login **30**

3.1 Logon screen 30

3.2 Home page 31

3.3 User menu 32

CHAPTER 4. Ergonomy concepts **37**

4.1 Navigation bar 37

4.2 Status bar 38

4.3 Predefined Filters 38

4.4 View, Display & Modes 39

4.5 Save your modifications 43

4.6 Contextual menus 44

4.7 Expert Advice 44
4.8 Alarm Status 45
4.9 List of Machines 47
4.9.1 Alarm Status view 47
4.9.2 Expert Advice view 47
4.9.3 Active alerts 48
CHAPTER 5. Setup machine 49
5.1 Machine management 49
5.2 Location properties 53
5.3 Machine properties 54
5.3.1 Identity tab 55
5.3.2 Schematic tab 56
5.3.3 Strategy tab 68
5.3.3.1 FALCON 68
5.3.3.2 MACHINE DEFENDER (MDF) 69
5.3.3.3 EAGLE 71
5.3.3.3.1 Operating conditions 72
5.3.3.3.2 Operating parameters 73
5.3.3.3.3 Input types of parameter 73
5.3.3.3.4 Ranges of parameter 74
5.3.3.3.5 Monitoring strategy 75
5.3.3.4 MVX 77
5.3.3.4.1 Operating conditions 77
5.3.3.4.2 Operating parameters 79
5.3.3.4.3 Input types of parameter 79
5.3.3.4.4 Ranges of parameter 81
5.3.3.4.5 Monitoring strategy 82
5.3.3.5 SPARROW 85
5.3.3.6 External Data (OPC UA) 87
5.3.4 Measurements tab 89
5.3.4.1 Process data 90
5.3.4.1.1 Static data (DC) 91
5.3.4.1.2 Dynamic data (AC) 92
5.3.4.1.3 External data (OPC) 94
5.3.4.2 Vibration data 97
5.3.4.2.1 External data (OPC) 99
5.3.4.3 Operating Condition Measurements 105
5.3.4.4 Parameter properties 105
5.3.4.5 Alarm settings 106
5.3.4.6 External data (OPC UA) 108
5.3.5 Connection tab 108
5.3.5.1 EAGLE Connection 108

5.3.5.1.1 Eagle Sensor mapping 108
5.3.5.1.2 External Modbus inputs mapping 109
5.3.5.2 MVX Connection 110
5.3.5.3 SPARROW Connection 111
5.3.6 Photo tab 113
5.3.7 Document tab 114
5.4 Sensor positions 114
CHAPTER 6. Instruments **117**
6.1 EAGLE Wireless Monitoring System 117
6.1.1 Eagle Configuration 117
6.1.2 Eagle Connection to Nesti4 117
6.1.3 Eagle Management 120
6.1.3.1 Connect to a database 120
6.1.3.2 Start/stop acquisition 121
6.1.3.3 Replace a sensor 122
6.1.4 Eagle Properties 123
6.1.4.1 Connected machines 124
6.1.4.2 Sensors 124
6.1.4.3 Modbus Outputs 125
6.1.4.4 Modbus Inputs 126
6.2 MVX Realtime Monitoring System 126
6.2.1 MVx Configuration 126
6.2.2 MVx Connection to Nesti4 127
6.2.3 MVX Management (Start/stop acquisition) 128
6.2.4 MVx Properties 129
6.2.4.1 General 130
6.2.4.2 Output setup 131
6.2.4.3 Input status 131
6.2.4.4 Operating condition priority 131
6.2.4.5 Live data 132
6.2.5 SFTP mode 134
6.3 SPARROW Wireless Monitoring System 134
6.3.1 Concept 135
6.3.2 Sparrow Configuration 135
6.3.2.1 Sensor pairing 135
6.3.2.2 Acquisition settings 137
6.3.3 Sparrow Connection to Nesti4 141
6.3.4 Sparrow Management (add, …, start, …) 143
6.3.5 Sparrow properties 146
6.3.6 Sensor – machine association 147
6.3.7 Start / Stop acquisition 148
6.4 External OPC UA Server 148

6.4.1 OPC UA servers, browsing & properties 149
6.4.2 OPC UA items subscription 150
6.4.3 Machines list & Asycn recording 151
6.4.4 OPC UA server errors 152
CHAPTER 7. Setup route 153
7.1 Route list 153
7.2 Route properties 153
7.2.1 Machine selection 153
7.2.2 Selection area 154
7.2.3 Route properties area 154
7.2.4 List of data collectors 155
CHAPTER 8. Collect 156
8.1 “Instrument” tab 156
8.1.1 Direct transfer 156
8.1.2 Via intermediate files 156
8.2 “NEST ⟶ Instrument” tab 157
8.3 “Instrument ⟶ NEST” tab 158
CHAPTER 9. Analyst 160
9.1 Purpose 160
9.2 List of Machines 161
9.3 List of Measurements (per machine) 163
9.3.1 Informations 164
9.3.2 Functions (manage, protect, …) 165
9.3.3 Filtering criterias 166
9.3.4 Data recording in progress 168
9.4 Machine Health Matrix 169
9.5 Expert Analysis 173
9.5.1 Accurex mode 173
9.5.2 Accurex SE – Smart Exception mode 174
9.5.3 Defects matrix 175
9.5.4 Expert advice 179
9.6 Schematic 181
9.7 Appendix 182
9.8 Analyst memo 182
9.9 Documents 183
9.10 vibGraph 184
9.10.1 Introduction 184
9.10.2 Customize the graphic 184
9.10.3 Zoom management 185
9.10.4 Cursor management 185
9.10.5 Fault frequencies 186
9.10.6 Curve management 186

9.10.7 Filter the list of dates 187
9.10.8 RSS switch X-axis units 187
9.10.9 OPC UA High Resolution data 188
9.11 Global report generation 189
9.11.1 Step 1: selections of the machines 189
9.11.2 Step 2: Report configuration 190
9.11.3 Report customization 190
9.12 Manual data export in CSV format 192
CHAPTER 10. Administration (databases, users, license) 193
10.1 Databases tab 193
10.1.1 “Properties” tab 195
10.1.2 “User access” tab (Network edition only) 196
10.1.3 “Auto backup” tab 196
10.1.4 “Auto export” tab 197
10.1.4.1 Settings 197
10.1.4.2 CSV Files naming convention 199
10.1.4.3 MACHINES.CSV format 200
10.1.4.4 SCALAR.CSV file format 201
10.1.4.5 SIGNAL.CSV file format 202
10.1.5 “OPC UA output” tab (Network edition only) 202
10.1.5.1 Settings 202
10.1.5.2 Machine information 204
10.1.5.3 Parameter information 204
10.1.5.4 Signal information 204
10.1.5.5 Export CSV file with OPC NodeId 205
10.1.6 Advanced Database Cleanup 205
10.2 Profiles & Privileges tab (Network edition only) 208
10.2.1 Profiles 208
10.2.2 Privileges 209
10.3 User tab (Network edition only) 210
10.4 License tab 213
CHAPTER 11. Platform Administration (PAM) 216
11.1 Domains management 216
11.1.1 Database structure 216
11.1.2 Nesti4 Platform Administration Module (PAM) 217
11.1.3 PAM / Domains Menu 219
11.1.4 PAM / Domains List 219
11.1.5 PAM / Domains Properties 219
11.2 SMTP server settings 222
11.3 SSL Certificates for OPC UA Client interface 223
CHAPTER 12. Application Programming Interface (API) 225
12.1 Overview 225

12.2 Authentication & security 225
12.3 Base URL 226
12.4 Authentication 226
12.5 API functions (available endpoints) 229
CHAPTER 13. How to ... 233
13.1 Understand Alarm settings 233
13.1.1 Absolute alarms 233
13.1.2 Relative alarms 233
13.1.3 Point and machine alarm rules 234
13.2 MVX monitoring fine tuning 235
13.3 NESTi4 OPC UA Server activation 235
13.4 SSL Activation 235
13.5 LDAP Activation 235
13.6 Use Timewave on Event 235
13.7 Use Piping Monitoring features 239
13.7.1 Principe 239
13.7.2 Piping Methods comparison 240
13.7.3 Piping indicators settings 240
13.7.4 Trig MVX piping measurement on criteria 244
13.8 Force vibGraph in English for multi-lingual OS 245
13.9 Recover Platform Administration Module password 246
13.10 Connect as Advisor Center expert 246
13.10.1 Concept 246
13.10.2 Create AC expert accounts 246
13.10.3 Connect to NESTi4 as Advisor Center expert 247
13.11 Send external ID to MVX Embedded OPC UA server (UaiCode) 249
13.12 Record tachometer time signal 253
13.13 Connect an external OPC UA Client connection 255
13.14 Merge FALCON measurements 256
13.15 Install & use NESTi4 Vision 258
13.16 Disable Proxy server use for NESTi4 client connection 260
13.17 Expert Advice approval workflow 260
13.17.1 Concepts 260
13.17.2 User Roles and Privileges 262
CHAPTER 14. References 264
14.1 Devices measurements settings 264
14.1.1 FALCON measurements 264
14.1.1.1 IEPE or AC acceleration input 264
14.1.1.2 IEPE or AC velocity input 266
14.1.1.3 Displacement input 268
14.1.1.4 Broad band (spectrum) 269
14.1.1.5 Process parameters and signals 270

14.1.1.6 Coast-down profile and Duration 272
14.1.2 EAGLE measurements 273
14.1.2.1 Overview 273
14.1.2.2 Settings details 273
14.1.3 MVX measurements 274
14.1.3.1 Overview 274
14.1.3.2 IEPE or AC acceleration input 276
14.1.3.3 IEPE or AC velocity input 279
14.1.3.4 Displacement input 281
14.1.3.5 Broad band, Narrow band (spectrum) 283
14.1.3.6 Process parameters and signals 283
14.1.4 SPARROW measurements 286
14.1.5 SFx & HMx 288
14.2 Post-processing 288
14.2.1 Parameters 288
14.2.1.1 Peak (soft): [A x F0 +B] ± I x Resolution 288
14.2.1.2 Broad band (soft) 289
14.2.1.3 Kurtosis (soft) [time signal] 289
14.2.1.4 Time signal statistics (post-processing) 290
14.2.1.5 Vector extraction (AxRS) 291
14.2.1.6 Arithmetic & logical Combination 291
14.2.1.7 Formula () 292
14.2.2 Signals 293
14.2.2.1 Time signal filtering 293
14.2.2.2 Auto correlation 293
14.2.2.3 Cepstrum 294
14.2.2.4 Spectrum (Time signal) 295
14.2.2.5 Envelope Spectrum (Time signal) 296
14.3 PC Manual input 298

Release Notes

Version 2.9 – December 2025

Hardware & firmware compatibility:

- FALCON v1.82 – new release
- SPARROW v53BT19OS19 with Gateway 2.0 – Oct. 10, 2023
- EAGLE v2.26 – Sept. 16, 2024
- MVX v6.3.0-5 – July 13, 2023
- Machine Defender v2.10 or higher for iOS/Android
- Shaft alignment v3.1.1 or higher for iOS/Android

New features:

- NESTi4
    - Auto CSV export improvements
        - Incremental mode for MACHINE.CSV files
        - Add expertise reports with CSV files
        - New "ZIP" option to build auto archive
    - Manual CSV export improvements
        - New multi machines file
    - DB auto cleanup per day
    - EAGLE spectrum setting extension
        - Add 10 Hz High-Pass filter
    - New expert advice approval workflow
        - New approver profile
        - New Expertise workflow menu
        - New tasks counter notification
        - Tasks module for authorized users
    - Edit operating condition for existing control dates
    - New Envelope Spectrum with FALCON
        - New settings method

- NEST Vision
    - Show “expert” and “approver” name
    - New settings to be reverse proxy proof

Version 2.8 – June 2025

Hardware & firmware compatibility:

- FALCON v1.8 – new release
- SPARROW v53BT19OS19 with Gateway 2.0
- EAGLE v2.26
- MVX v6.3.0-5 (release date July 13, 2023)
- Machine Defender app v2.10 iOS/Android

- Shaft alignment App v3.1.1 for iOS/Android (release date Feb 1, 2024)

New features:

- NESTi4
  - Accurex SE for Sparrow (Smart exception)
  - OPC UA client (HR, sync, async)
  - SFTP interface with MVX – see DOC3192 2025-06 A - NESTi4 v2.8 SFTP Interface with MVX User's Guide (EN)
  - new public API (machine health, reports)
  - Control date input, content icons
  - New "Formula" post processing
  - New "Frequency" and "emergence" results for "peak" post processing
  - CSV export with OPC UA nodeId
  - New license options (opc ua tag, SE)
  - UNVB file format export (optional feature – on demand)
- NEST Vision
  - multi technical inputs with radar view
  - machine lifeline export (XLS)
  - graphs display new design
  - screening mode

VERSION 2.5 – AUGUST 2024

Hardware & firmware compatibility:

- FALCON v1.71 – new release
- Shaft alignment App v3.1.1 for iOS/Android (release date Feb 1, 2024)
- Machine Defender app v2.10 iOS/Android – new release
- EAGLE v2.26 – new release
- SPARROW v53BT19OS19 with Gateway 2.0
- MVX v6.3.0-5 (release date July 13, 2023)

New features:

- New features with EAGLE instrument interface
  - Operating conditions management with EAGLE
  - Process group management with EAGLE
  - Use Modbus inputs as operating or process parameters with EAGLE Gateway
  - Variable rotation speed machines management with EAGLE
  - Import EAGLE machine from XPR/NEST3 (except sensors information)
  - Manual triggering of EAGLE measurement from Nesti4 Analyst module
  - EAGLE security improvement with an authenticated communication with Nesti4 server (idem as for MVX) ; ssl encryption always stays possible
  - Acceleration overall has additional settings: "High pass" = **10Hz** and "Low Pass" = 1kHz
  - Acceleration and Velocity spectrum have additional settings: "Max Frequency" = **500Hz**
  - Time signal has additional settings: "Sampling Frequency" = **1.28kHz**
- New post-processing "spectral envelope" from a time signal

- Email notification when EAGLE sensors presents a low battery level
- Integration of Accurex Hybrid v4.1 within Nesti4, Falcon and Machine Defender
- All Nesti4 post processing are now available for Machine Defender machine
- All bearings of EAGLE machine are now activated by default
- New max value of "Meas time (s)" duration to 80s for MVX Kurtosis calculation
- Specific logos “Summer Release 2024” on logon screens to celebrate the Olympic Games 2024 in France
- Authorize “None” as new setting for relative displacement (SPP) high pass filter of MVX machine
- Show the latest US Patent for Accurex information into About (Nesti4) and Settings (Vision) panels
- Use the existing "displayed" property of parameter to hide/show it into Vision
- Vision
    - Company logo can be customized into domain properties
    - Time signal & spectra visualization with zoom and simple cursor (except RSS data)
    - Spectra concatenation with zoom and simple cursor
    - Lin/Log Y scale for spectra display
    - CSV export of graph data
    - Rename “Work Order” as “Task”
    - New “TOP 10 OFFENDERS” graph into the User Home page
    - Better stability and response time of “LIVE” trends (with MVX machine only)
    - Automatic enlarging of trend graph when LIVE mode is activated (and mask signals)
    - New “LIVE” trends graph for post mortem analysis and Monitoring room display
- New features with Machine Defender App interface
    - Component orientation
    - Point deactivation
    - Manage variable speed machine
    - Display location of a WO machine into the app

VERSION 2.4 – MARCH 2024

Hardware compatibility: idem previous release

New features:

- Manual merging of two measurement dates downloaded from different FALCON
- Advanced database cleanup options per measurement type
- Machine control dates can be protected manually
- Machine setup hyperlink from EAGLE instrument module
- Platform moderator can be notified by email: expiration date, storage quotas
- CSV export files includes machine "designation", "Comment", "Model" and "Serial Number"
- Sparrow licensing based on number of connected sensor per domain
- Sparrow sensor low battery level notification (email)
- Approved expert report notification (email)
- “ACOEM” signature is added into all alarm email notification (SMS conversion)
- Rename Webportal to NESTi4 Vision
- Timezones management in NESTi4 and Vision to normalize datetime format displays
- New location or machine property to show/hide it into Vision (properties)
- Vision
    - Vision – New “Machine Health History” bargraph into the User Home Page
    - Vision – Database name is displayed into the "location" column of "flat" machine list

- Vision – New machine “Recommendations” tab with “Feedback” function
- Vision – New machine “Lifeline” tab to present machine history
- Vision – New function to add “notes” or “maintenance actions” into the machine history
- Vision – Machine “name”, “designation” and “TAG” displayed into list and hierarchical tree tooltip
- Vision – Excel export of machines recommendations and status (planner)
- Vision – Generate Analysis Report file (.pdf or .docx) from the machines list
- Vision – Defects list is presented into the machine “recommendations” tab
- Vision – Custom views for multi-technical analysis (advisor on-demand subscription required)
- Vision – External work order for customer to track/plan site actions
- Vision – New Machine “health status by month” graph into User Home Page
- Vision – Tables dynamic filtering from bar graphs
- Vision – Attachments upload (document, pictures...) allowed in notes, feedbacks and maintenance actions

VERSION 2.3 – AUGUST 2023

Market release compatible with

- MVX version 6.3.0-5 (release date July 13, 2023) update is mandatory
- FALCON version 1.66 (release date July 28, 2023)
- EAGLE version 2.25R51 (release date June 6, 2022)
- SPARROW version 47BT19OS15 (or higher) with Gateway 2.0 new product
- Shaft alignment app v2.4.2 (release date April 6, 2022)
- Machine Defender app v2.00 (release date December 8, 2022)

New features:

- New SPARROW Wireless Sensor & Gateway to monitor machines
- New MVx Revolution Synchronous Sampling measurements (RSS) for variable speed machines
- New FALCON API for integration with any external software
- New MVx embedded OPC UA server with custom Namespace
- Setup improvements
  - New “spectrum” post processing to calculate FFT from any time signal
  - New “envelop spectrum” settings method based on predefined filters – ie: [5 ; 200 Hz] ou [200 ; 2000 Hz] ou [2000 ; 20 000 Hz]
  - List of choices for “Max Frequency” and “Sampling frequency” have been extended for MVx machines
  - Possible to record and visualize a tachometer signal for a variable speed machine (MVx)
  - Possible to make velocity or displacement TWF measurements with MVX and FALCON
  - Relative thresholds are now available for MVX machine per condition (soft alarm)
  - New enable/disable “monitored” property for non Accurex parameters
  - Possible to define up to 20 operating condition per machine (MVx)

    - Possible to define speed range (min, max) for variable speed machine (setup machine)
- Analysis improvements
    - Enrich the list of defects for “Advice (Expert)” in screen and reports
    - New “progression” property per defect into the “Advice (Expert)”
    - New “bad data” severity choice per defect into the “Advice (Expert)”
    - Generate automatic “recommendation” texts for all new defects
    - Effective rotation speed is presented for each point of machine (tooltip)
    - Direct access to the list of machines with alarms (alarm counter)
    - vibGraph: Possible to switch between Hz / Order for RSS spectra
    - vibGraph: Possible to switch between seconds / revolutions for RSS time signal
- Instrument improvements
    - Eagle: Firmware version is checked for communication with NESTi4
    - Eagle: User decides to start or not acquisition after a settings changes
    - Eagle: User can replace a sensor without to repeat sensor-machine mapping
- Advisor, Webportal & Augmented Mechanic Platform
    - New periodic WO management for alignment & vibration measurement with AMP devices
    - Alignment unit management improvements
- Technologies
    - Upgrade to PostgreSQL 15 (latest version)
    - Upgrade to .NET 6

VERSION 2.2 – DECEMBER 2022

Market release compatible with

- MVX 6.2.0-3 mandatory update
- EAGLE 2.25R51
- FALCON 1.64 mandatory update
- Machine Defender app v2.0.3 (cloud only) mandatory update
- Shaft alignment app v2.4.2 (cloud only)

New features:

- New Webportal for a full web access – see dedicated Webportal User’s Guide (internet connection needed)
- Specific solutions for secured network architecture
    - Database replication – see DOC3190 2022-08 A - Nesti4.0 v2.1 - Database Replication User’s Guide (EN).pdf
    - SFTP SAS Mode – see DOC3282 2022-03 A - Nesti4 MVX SFTP Interface User’s Guide (EN).pdf
- NEST3/XPR migration capabilities extension
- Setup improvements
    - New “criticality” machine property
    - New Smart Template setup mode

    - New Machine Defender app compatibility
        - Expert can edit setup of machine initially created in Machine Defender app (MDF)
        - Expert can add some custom post processing into a MDF machine
        - MDF machine setup mode can be changed from/to Accurex and Smart template
        - MDF machine can contain generic components
    - New Piping monitoring (MVX measurements and post processing for all other devices)
    - New filtered time signal (post processing)
    - Addition of envelop spectrum to all Accurex setup
    - New properties for Lobe compressor component
- MVX monitoring strategy improvements
    - Now two storage intervals according to the machine alarm status (OK or ALARM)
    - Minimum interval between stored alarms (to minimize impact of alarm chattering)
    - Hysteresis% can be changed for Accurex machine (to avoid alarm chattering)
    - Storage interval can be null (=0) in order to store measurement as fast as possible
    - Customizable speed value below which the machine is considered to be stopped
    - New 4-20mA input type for rotation speed operating parameter
- New security policy
    - Multi domains management + PAM utility
    - Licensing per domain
    - New quotas per license
    - Automatic inactive session closure
    - New password policy
- New OS platforms supported
    - Windows 11 Professional
    - Windows Server 2022 Standard Edition

VERSION 2.1 – JULY 2022

Intermediate release compatible with

- MVX 6.1.0-3
- Not tested/compatible with Falcon, Eagle neither Dashboard

List of features:

- New double “storage periodicity” setting into MVX strategy in order to adapt periodicity according to the machine alarm status (normal or alarm)

- New "minimal interval between alarms" setting into MVX strategy to avoid alarm storage chattering
- New “Time wave on event” measurement with MVX instrument
- Improvement of Nesti4 import/export functions in order to include MVX properties, channels definitions and measurements mapping
- Improvement of MVX Import/export of monitoring configuration that includes now the Modbus parameter list - see MVX documentation
- New database replication feature to replicate databases from one nesti4 server to another one – see “DOC3190 2022-07 A - Nesti4 Database Replication User’s Guide”
- Improvement of MVX capabilities to display unit label for the following process parameter types – important: this concern only process parameters with “Other AC” or “Other IEPE” input type and the following **Input unit** labels (syntax must be strongly respect into nesti4 settings):
    - Input unit = "**Pa**" for acoustic pressure
    - Input unit = "**A**" for current
    - Input unit = "**km/h**" for wind speed

VERSION 2.0.7 – APRIL 2022

Intermediate release compatible with MVX 6.0.2-2 but not tested/compatible with Falcon, Eagle neither Dashboard.

List of features:

- Management of slow speeds with MVX
- Managing an SFTP interface between Nesti4 and MVX – see “DOC3282 2022-03 A - Nesti4 MVX SFTP Interface User’s Guide (EN)”
- % Hysteresis is now adjustable in “Absolute Thresholds” panel for Accurex machines

VERSION 2.0

- Management of the MVX on-line surveillance system (Network edition only)
    - New MVX Instrument module
    - New acquisition strategy for MV-x
    - New sensor connection for MV-x2
    - Parameters and signals managed by MV-x
- Accurex for MV-x
- Possibility of filtering the list of measurement dates from a trend display

VERSION 1.7

- New version of Accurex engine (v3.4):
    - New indicator: peak to peak overall acceleration to improve bearing diagnosis

    - User feedback management: if vibration behavior has not changed, Accurex keeps automatically the last approved expert Accurex matrix4
- ACOEM Augmented AI program: you can now share approved data ACOEM Augmented AI program, your data will be used to improve the Accurex performance on your machines
- For Desktop edition: data storage is now compatible with the Network edition one
- For Network edition:
    - Accurex is available for EAGLE system
    - Auto backup function
    - Data server option: .CSV automatic file export and OPC UA
- User interface improvements:
    - Notification counters in the top bar
    - Add filtering and sorting functions in numerous lists to help finding items
    - Tree order is now in alphabetic order.
    - Machine alert counter is now from last approved advice

Compatibility:

- FALCON v1.61 or later is **mandatory**
- EAGLE v2.24 or later is **mandatory**

VERSION 1.6

- Accurex matrix
    - Machine diagnosis is displayed in Accurex matrix (Fault severity / bearing)
    - The expert can adjust its own assessment using the matrix
    - Diagnosis and recommendation can be updated automatically
    - This tool can also be used for template machines
    - Expertise report includes the Accurex matrix
- New version of Accurex engine (v3.2): improvement of unbalance and misalignment detection.

Compatibility:

- FALCON v1.60 or later is **mandatory**
- EAGLE v2.24 or later is **mandatory**

VERSION 1.5

- Multi-criteria filters on general views in list mode
- In list mode, a new column “Seen” to search machines with no advice on the last measurement date.
- Manual exports in csv format
    - General machine data corresponding to the Alarm or Advice view list mode

    - Parameter histories between 2 dates
- Reports:
    - Reports in pdf format
    - Flag allowing to exclude some parameters in reports
    - Customization of reports by importing Docx templates
- New types of measurement and processing:
    - Manual input from NESTi4.0
    - Statistical analysis post-processing on time wave
    - Spectrum measurement with zoom
- Management of relative alarms
- Export with measurement: possibility to select date limits
- Running speed adjustment and recomputed on several dates
- Quick display of alarm thresholds
- New "Actions" field in the Appendix tab of the Analyst module
- New functions in Analyst Health matrix
    - Modification of parameters with manual type input
    - Deletion of parameter or signal measurements
- Direct access to the user manual
- For the Network edition:
    - Administration module: function to force a user logoff

Compatibility:

- FALCON v1.59 or later is **mandatory**
- EAGLE v2.24 or later is **mandatory**

VERSION 1.3

- Management of EAGLE wireless on-line monitoring system (Network edition only)
    - Instrument module
    - Machine setup module: acquisition strategy
    - Machine setup module: sensor connection5
    - Parameters and signals managed by EAGLE
- Accurex post-processing
- Management of dynamic process data
- Analyst module: measurement date filtering

Compatibility:

- FALCON v1.59 or later is **mandatory**
- EAGLE v2.24 or later is **mandatory**

VERSION 1.2

- Management of process data :
  - Setup
  - Analyst
- Flexibility to rename machine setup standard components
- New measurement types:
  - Kurtosis
  - Hard broad band from spectrum
  - Phased spectrum
  - Coast down profile
- Access to additional measurement properties:
  - For overall values: measurement time and peak hold
  - For spectrum: averaging type, weighting window, overlapping
- New post processing:
  - Vector extraction (from phased spectrum)
  - Kurtosis (from time wave)
  - Duration (from coast down profile)
  - Combinations
- Accurex: Threshold levels are adjusted to conform to ISO10816-3. These new thresholds are applied to new machines or if a machine is modified.
- XPR import: you can now import more data from NEST3: see "DOC3149 - NESTi4.0 v1.2 - Migration from NEST3 EN" application note
- For Network edition:
  - Administration: user management
    - Possibility to use LDAP directory to create a new user.
    - User defined profile
    - Profile per data base
  - Installation or update of the client workstation does not need an administrator account.
  - Possibility to use encrypted communication between client workstation and the server: see "DOC3151 - NESTi4.0 v1.2 - Secure communication and LDAP" manual

Compatibility:

- FALCON v1.57 or later is **mandatory**

VERSION 1.1

- Network edition:
  - Installation
  - User management

- Machine setup with new “Custom” components
- Template based report in docx format:
    - One machine report
    - Multi-machine global report
- FALCON Off-Route data management:
    - Upload Off-route data
    - Merge Off-route data with existing machine
- Route machine order modification using drag and drop
- Route point order modification
- Predefined inspection notes management
- Custom bearing database
- Multiple reference bearing selection
- Spellcheck function for Advice and Recommendation (Limited to English, Spanish, German, French)

Compatibility:

- FALCON v1.52 or later

CHAPTER 1. General presentation

1.1 Acknowledgements

Thank you for choosing ACOEM System, which is our dedicated condition monitoring solution for rotating machinery.

The ACOEM platform results from 30+ years of experience acquired by ACOEM (previously known as S'tell Diagnostic, 01dB-Stell, 01dB Acoustics & Vibration, and 01dB-Metravib) in the field of condition monitoring, with our eDiag, DivaLine, SurvaoDiag, Moviscope, Survao, Vimex, NEST and other software products.

1.2 Introduction

Machine condition monitoring systems have since long proven their relevance and efficiency for all industrial sectors, where:

- Worker and installation safety can easily be compromised by a malfunction of a rotating machine;
- Unplanned machine downtime induces major additional costs as the result of production loss and the necessary repairs.

NESTi4.0 is part of ACOEM Condition Monitoring System., and is composed of new generation software modules designed to provide an easy and performant access to the most efficient monitoring and analysis tools.

NESTi4.0 Network edition is a real multi-user platform offering the possibility to share the condition monitoring work between several people from different locations over an Intranet network..

NESTi4.0 is compatible with FALCON data collector and EAGLE wireless online monitoring system (EAGLE is available with Network edition). It offers an easy to use and fast solution to implement your condition monitoring on a large range of rotating machines.

NESTi4.0 includes the following modules:



"Setup machine" manages the organization of the machines in the databases. It includes a powerful tool to easily create a new machine based only on its mechanical description. This fast setup can also be manually adjusted: see CHAPTER 5



"Instrument" manages the setting and the communication with EAGLE wireless online monitoring system: see CHAPTER 6 (Network edition only)



"Setup route" manages lists of machines that can be used as routes to load the data collector or as filter in Analyst: see CHAPTER 7



"Collect" sends route data from or to the data collector: see CHAPTER 8



"Analyst", includes powerful tools for machine analysis as the Health Matrix, merged spectra to help you to confirm the Automatic diagnosis or to build up your own analysis and recommendations: see CHAPTER 9



"Administration" includes license and database management and for the Network edition user management: see CHAPTER 10

1.3 COPYRIGHT AND BRANDS

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CHAPTER 2. Installation & Update

NESTi4.0 is available for two architectures:

- **Desktop** edition: it is dedicated to be installed on 1 workstation for 1 user and to manage FALCON portable acquisition devices. It did not include user management, login page and cannot be used with EAGLE wireless monitoring system nor MVX real time acquisition system.
- **Network** edition: it includes 2 components
  - NESTi4.0 server (including Vision service), installed on a server
  - NESTi4.0 client, installed on one or several workstations. They communicate with the server either on your network (LAN or WAN).

This edition has a multi user management and can work with FALCON, EAGLE and MVx devices.



Before any update or migration of NESTi4.0, it is recommended to make a backup of all your databases

2.1 NESTi4.0 Desktop Edition

IMPORTANT: Installation and update must be done using an **administrator** account

Note: the update to the version v1.7 or further must be done from at least version v1.6.0

- Launch the setup (Desktop_NESTi4.0 Vx.xx\SETUP Vx.xx\ Setup_Nesti40Desktop.exe)

Note: default settings are:

- Program folder: C:\Program Files (x86)\ACOEM\NESTi4.0\
- Data folder: C:\ProgramData\ACOEM\NESTi4.0\Data\

You can select other settings from the function 

- Click on: 

and follow instructions
- After the 1st installation, you need to input license information:
  - Start NESTi4.0,
  - Go to in the Administration module
  - Select “License” tab
  - Click on "Update"

- Enter Company information (name, postal code and country code) listed on the form
- Enter the license number
- Click on “OK”

2.2 NESTi4.0 Network Edition (Multi-Users)

2.2.1 *General prerequisites*

- Technical prerequisites
  - Installation and update *on the server* must be done using an **administrator** account
  - Microsoft .NET Framework version 4.6.1 (Installed by the Setup if not there)

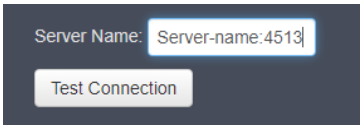


By default, NESTi4.0 server uses the TCP ports 4513 and 4514 for client, Vision client, EAGLE and MVx connections. Make sure that these ports are usable for inbound connections.

The installer takes care of Windows integrated firewall, please make sure that any other security mechanism (3rd party firewall, router, …) is configured to allow this connection.

- **Notes for update from v1.3.XX Network USING Eagle**:
  The default communication port for EAGLE is now the port 4513 (the same as for NESTi4.0 client) and it must be modified in the Gateway:
  - Before the update: in the NESTi4.0 Instrument module, stop the monitoring on all machines of the Gateway.
  - Make the update
  - After the update, it is necessary to modify the communication port from the EAGLE gateway web page (http://eagle-xxxxxx with xxxxxx the last 6 digits of the MAC address). From the “EAGLE” menu, “Settings” page, indicate NESTi4.0 server address or name in the field “Server name” followed by “:4513” and click on “Test connection”.

Example:



  - In the NESTi4.0 Instrument module, start the monitoring on each machine. To optimize the use of the EAGLE network, it is recommended to leave a few minutes between each machine on the same gateway

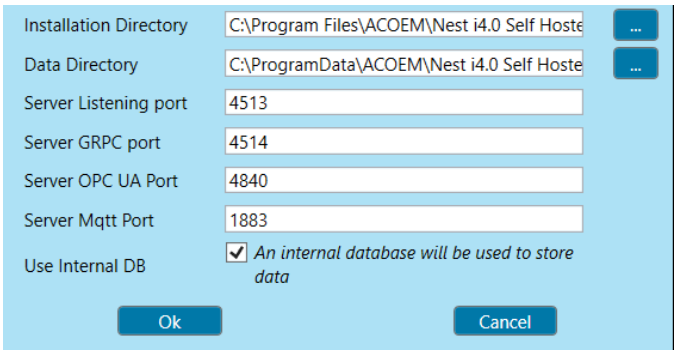
- Notes for update from v1.1.6 Network
    - It is necessary first to update to version v1.2.8
    - Backup format has been changed in version v1.2. In consequence a backup done with v1.1.6 cannot be restored in v1.2 or later. Anyway it is always recommended to do a backup before the update.
    - Default database “b1” is renamed “b1_1”

2.2.2 *Server installation*

- Install NESTi4.0 server by launching the setup (NESTi4.0_ Network Vx.xx\Setup_NESTi40Server.exe)



Note: Click on “Settings” button to edit default installation configuration:



Variables	Description & default values
Installation Directory	Nesti4.0 programs and binaries location C:\Program Files (x86)\ACOEM\NESTi4.0 Self Hosted Web Server\
Data Directory	Nesti4.0 database and temporary data location C:\ProgramData\ACOEMNESTi4.0 Self Hosted Web Server\Data\
Server listening port	4513
Server GRPC port	4514

Server OPC UA port	4840
Server MQTT port	1883
Use internal DB	If this option is selected (default), then a PostgreSQL engine and database are automatically installed with NESTi4. If this option is not selected, then a specific database connection must be defined manually into NESTi4 settings in order to use a remote PostgreSQL database server – Contact ACOEM Technical Support for this case

Notes:

- Do not use a network drive to store the data.
- The installer will automatically create some exceptions on the Windows Firewall to open all these ports. If you are using an external firewall, it must be configured manually to allow incoming connections on these ports.

- Click on “Install”:  and follow instructions

- After the 1st installation, you need to input **license** information:
  - Start NESTi4.0
  - Go to in the Administration module
  - Select “License” tab
  - Click on "Update"
  - Enter Company information (name, postal code and country code) listed on the form
  - Enter the license number
  - Click on “OK”

- NESTi4.0 Network license activation

  If the license you have received with your software is valid for more than 6 months, it needs to be activated within 30 days from the installation date. Contact ACOEM Technical Support to activate your license or connect directly to ACOEM license server:

http://activation.acoemgroup.com/client

  - Copy/Paste in this page the following information accessible from NESTi4.0/ “Administration” module/ “License” tab/Update:
    - Non-activated license

        - Activation code
    - Click on “Validate”, you will get in return your final activated license.
        - Copy/Paste this value in NESTi4.0/ “Administration” module/ “License” tab/Update
        - You can also upload your final license form

2.2.3 *Client installation*

- Install NESTi4.0 client by launching the setup (NESTi4.0_ Network Vx.xx \Client\Setup_NESTi40Client.exe).

- Note: it can be downloaded from the server with following URL:

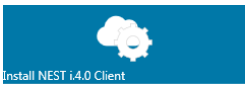
http://<Server address>:4513/Static/Nesti40.html

- Launch the client setup, click on 

and follow instructions

2.2.4 *Client update*

- **From version 1.6 or previous to version 1.7 or more:**
  Once the server has been updated to version 1.7 or more, if the client is in version 1.6 or previous, the client cannot reach the server, you must update the Client by running the setup as indicated in previous paragraph

- From version v1.7 to later version
    - Launch the previous version of the client NESTi4.0, a message indicates that a new version is ready
    - Click on the link to download the setup of the new version.
    - Launch the downloaded setup “SetupNestOneClient.exe”
    - Click on: 

2.3 MIGRATE FROM DESKTOP TO NETWORK EDITIONS

Process for version 1.7 or further:

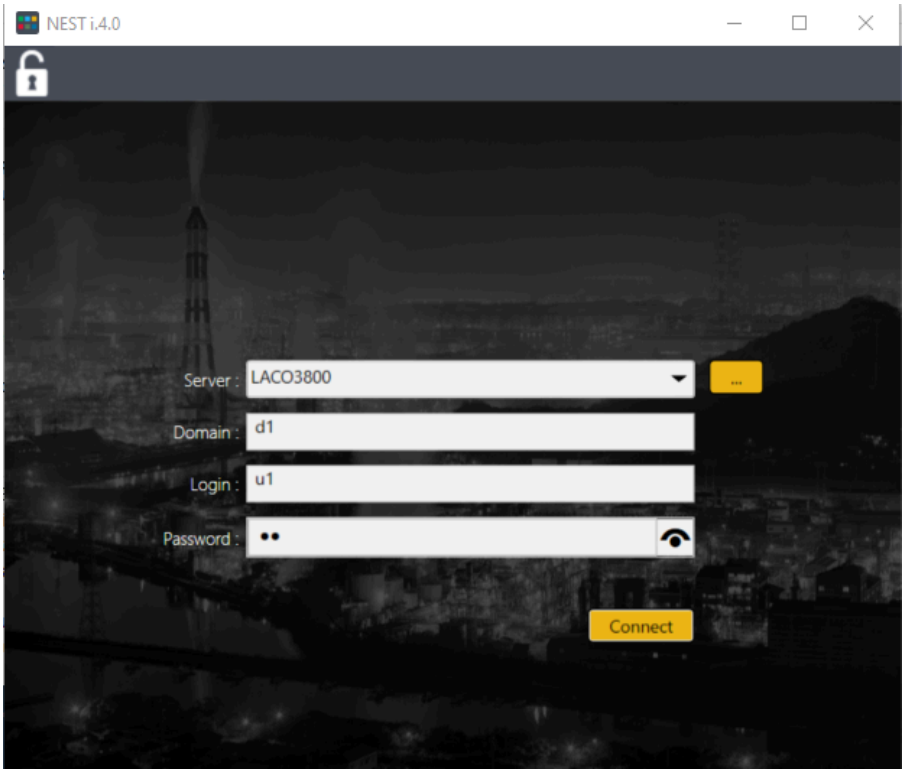
- If necessary update DESKTOP edition to its latest version
- Uninstall DESKTOP edition

- Install NETWORK edition with the same version.
- Input NETWORK edition license information:
    - Start NESTi4.0
    - Go to in the Administration module
    - Select “License” tab
    - Click on "Update"
    - Enter Company information (name, postal code and country code) listed on the form
    - Enter the license number
    - Click on “OK”

CHAPTER 3. First login

3.1 LOGON SCREEN

Click on the NESTi4.0 icon  to start the application



The Network edition displays a login window:

- **Server**: select NESTi4.0 server.

For the first connection, you need to add the address of the server where NESTi4.0 server has been installed:

- Click on 
- Click on “Add”
- Give a server name and its network address
- Select “Server requires secure connection” if the selected server uses encryption

See with your network administrator for connection details.

- **Domain**: enter your domain name ; default one is “d1”
- **Login**: enter you user name ; default one is “u1”
- **Password**: enter your password ; default one is “u1” and you will have to change it at your first login

Once connected to NESTi4.0 Network, use  function in the top bar to sign out

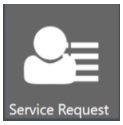
3.2 HOME PAGE

It gives access to the following modules according to the software license and rights granted by the system administrator (see CHAPTER 10)



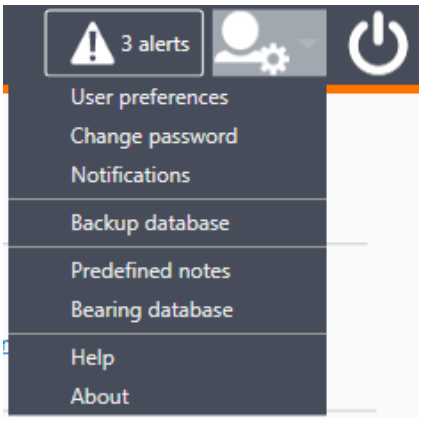


Setup machine manages the organization of the machines in the databases. It includes a powerful tool to easily create a new machine based only on its mechanical description. This fast setup can also be manually adjusted - see CHAPTER 6

	**Instrument** manages the setting and the communication with EAGLE and/or MVx online monitoring systems - see CHAPTER 7
	**Setup route** manages lists of machines that can be used as routes to load the FALCON data collector or as filter in Analyst - see CHAPTER 8
	**Collect** sends route data from or to the FALCON data collector - see CHAPTER 9
	**Analyst**, includes powerful tools for machine analysis as the Health Matrix, merged spectra to help you to confirm the Automatic diagnosis or to build up your own analysis and recommendations - see CHAPTER 10
	**Administration** includes license and database management and for the Network edition user management - see CHAPTER 11
	**Service Request** – Reserved module for Advisor Center members only - This module presents the list of all active SR to be analyzed by the connected Advisor Center

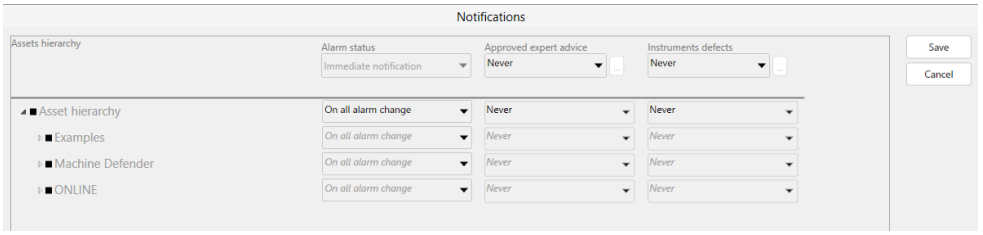
3.3 USER MENU

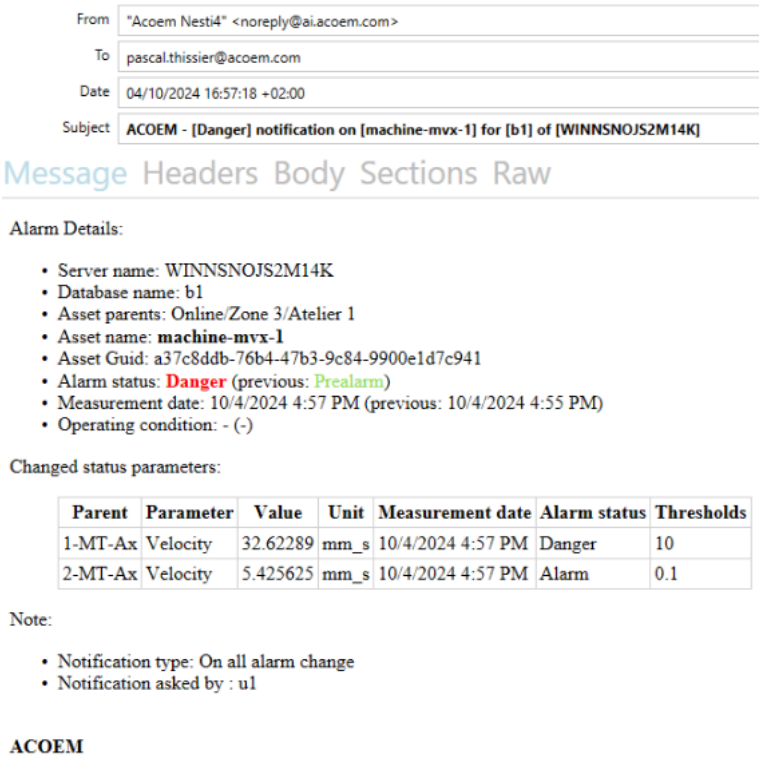
 It is available in the top bar from any module.



It gives access to following functions:

User preferences	• Unit preferences: you can select the unit for each type of parameters (acceleration, velocity, absolute displacement, relative displacement, running speed, power, and

	temperature). They are used as default setting during the setup of a machine and for all displayed values. ● Language: select the language of the user interface
Change password	Network edition only
Notification	User can choose to receive an email when some events occur on the platform: ● **Alarm status** change ● **Approved expert advice** ● **Instrument defects**  By default, notification is disabled for all event types but each user can define his own notification level per category: ● **Alarm status** – only one choice is possible o **Never** – No notification for this level machines o **On aggravating alarm change** – Only aggravating changes are notified o **On all alarm change** – All changes are notified Note: This notification raises only when NEST receives a new measurement date and presents an alarm status change for the machine. If you change manually parameter value or alarm threshold into NEST for an existing measurement date, then notification raise and presents only machine alarm status change information. Example :



From "Acoem Nesti4" <noreply@ai.acoem.com>
To pascal.thissier@acoem.com
Date 04/10/2024 16:57:18 +02:00
Subject **ACOEM - [Danger] notification on [machine-mvx-1] for [b1] of [WINNSNOJS2M14K]**

Message Headers Body Sections Raw

Alarm Details:

- Server name: WINNSNOJS2M14K
- Database name: b1
- Asset parents: Online/Zone 3/Atelier 1
- Asset name: **machine-mvx-1**
- Asset Guid: a37c8ddb-76b4-47b3-9c84-9900e1d7c941
- Alarm status: **Danger** (previous: Prealarm)
- Measurement date: 10/4/2024 4:57 PM (previous: 10/4/2024 4:55 PM)
- Operating condition: - (-)

Changed status parameters:

Parent	Parameter	Value	Unit	Measurement date	Alarm status	Thresholds
1-MT-Ax	Velocity	32.62289	mm_s	10/4/2024 4:57 PM	Danger	10
2-MT-Ax	Velocity	5.425625	mm_s	10/4/2024 4:57 PM	Alarm	0.1

Note:

- Notification type: On all alarm change
- Notification asked by : u1

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- **Approved expert advice** – many choices are possibles
  - **Good & Excellent** – Only Good & Excellent advice are notified
  - **Fair, Critical & No Advice** – Only Fair, Critical & No advice are notified
  - **Accurex** – Only Accurex advice are notified

Example :



A **Acoem Nesti4** <noreply@ai.acoem.com>
À moi

La liste suivante présente les nouveaux diagnostics de vos machines durant la période:

du **22/01/2024 06:30** au **22/01/2024 06:40**

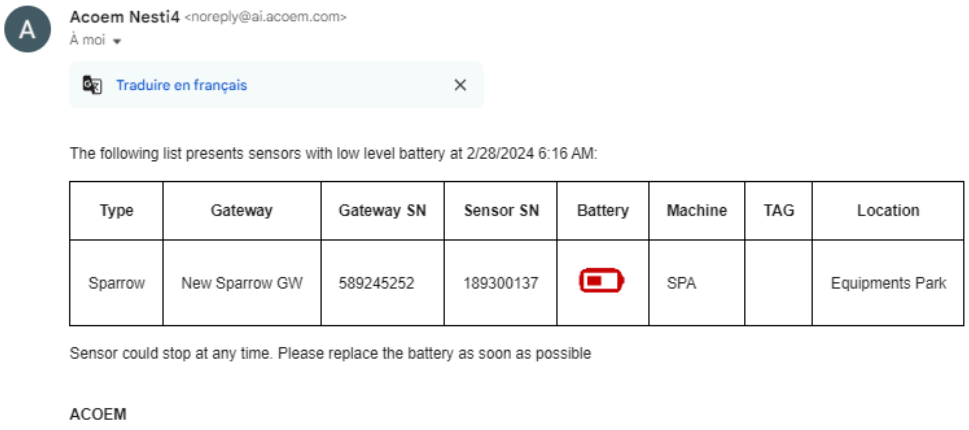
Machine	TAG	Emplacement	Avis	Date
mvx-Accurex		Equipments Park	Bon	22/01/2024 06:30
mvx-Accurex		Equipments Park	Bon	22/01/2024 06:30
mvx-Accurex		Equipments Park	Bon	22/01/2024 06:31
mvx-Accurex		Equipments Park	Bon	22/01/2024 06:32
mvx-Accurex		Equipments Park	Bon	22/01/2024 06:33
mvx-Accurex		Equipments Park	Bon	22/01/2024 06:34
mvx-Accurex		Equipments Park	Bon	22/01/2024 06:35
mvx-Accurex		Equipments Park	Bon	22/01/2024 06:36
mvx-Accurex		Equipments Park	Bon	22/01/2024 06:37
mvx-Accurex		Equipments Park	Bon	22/01/2024 06:38

ACOEM

- **Instrument defects** – following option are possibles
  - **Low battery** – Notification is sent when battery level is not ok ; this notification is available for Eagle and Sparrow sensors

- **Device not reachable** – email is sent when an active connected acquisition device (including external OPC UA server) is not reachable

Example :



Acoem Nesti4 <noreply@ai.acoem.com>
À moi

Traduire en français

The following list presents sensors with low level battery at 2/28/2024 6:16 AM:

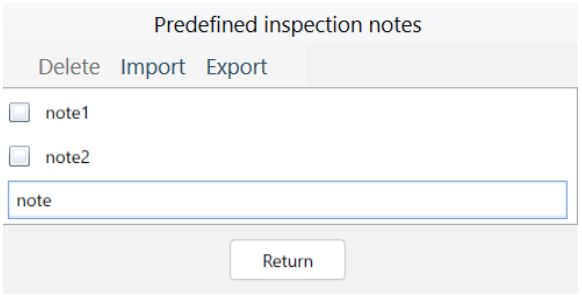
Type	Gateway	Gateway SN	Sensor SN	Battery	Machine	TAG	Location
Sparrow	New Sparrow GW	589245252	189300137		SPA		Equipments Park

Sensor could stop at any time. Please replace the battery as soon as possible

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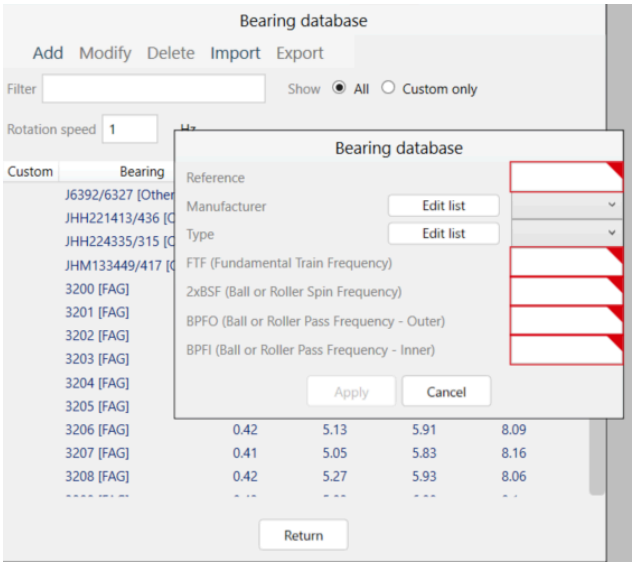
IMPORTANT: email notification need to declare a SMTP server NESTi4 server settings

Backup database	• Backup of the current database. • To restore a database see administration module
Predefined notes	• Manage a list of predefined inspection notes (max. 32 characters)



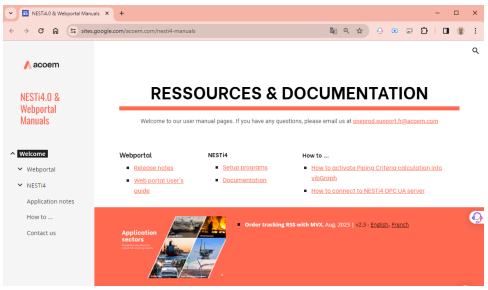
- This list is transferred into the FALCON data collector with each route. It is accessible from the instrument in the “Text note” screen.
- This list is associated with the current database. Use the functions “Export” and “Import” to transfer this list to another database.

Bearing database	• NESTi4.0 is supplied with a bearing database indicating for each bearing reference the fault frequencies. • If you have some bearings which are not in this database, this function can be used to add custom bearings.

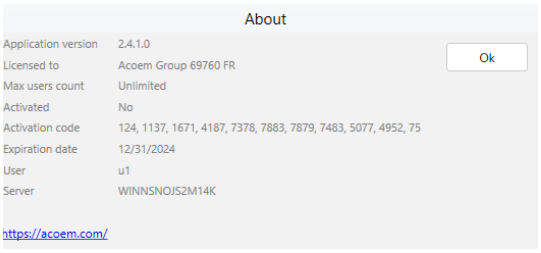


- The list of custom bearings is associated to the current database. Use the functions “Export” and “Import” to transfer selected references to another database.
- Bearing references can be associated to each bearing in the machine setup module, then bearing fault frequencies are displayed in spectrum background.

Help Open User’s manuals web site - https://get.acoem.com/nest-vision



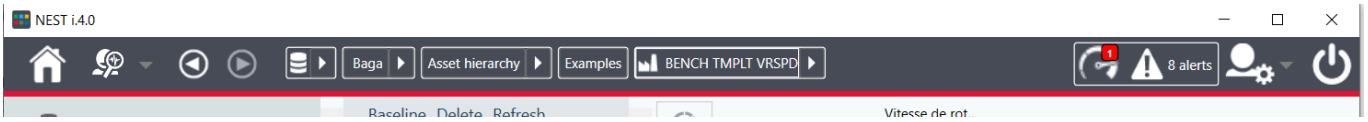
About Software detailed information



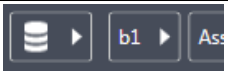
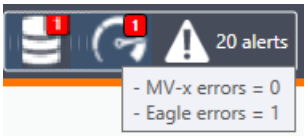
CHAPTER 4. Ergonomy concepts

This chapter describes the main principle of the user interface of NESTi4.0 modules

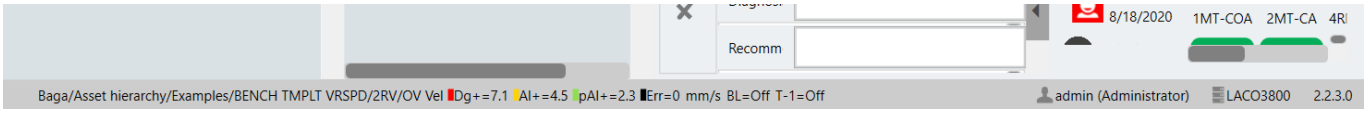
4.1 NAVIGATION BAR



The top bar includes:

	Go directly to the Home screen
	Display the pictogram of the current module. A click on ▼ gives direct access to any other module
	Go to previous or next item pointed by the navigation bar
	Navigation bar to navigate from the database to machine level
	Notifications: 3 types of information are displayed: ● **Administration**: counter of errors for batch operations (auto backup or auto-export) ● **Instruments**: counter of errors for instrument – click on this button to access to the instrument module (within the limits of your access rights) ○ EAGLE: number of gateway with at least 1 error (sensor or timeout) from all databases visible by the current user ○ MVx: number of device with at least 1 error (sensor or timeout) from all databases visible by the current user ● **Machines**: counter of alerts on all machines of the current database – click on this button to access to the list of the concerned machines (within the limits of your access rights)
	Access to user setting and preferences
	Sign out (NESTi4.0 Network edition)

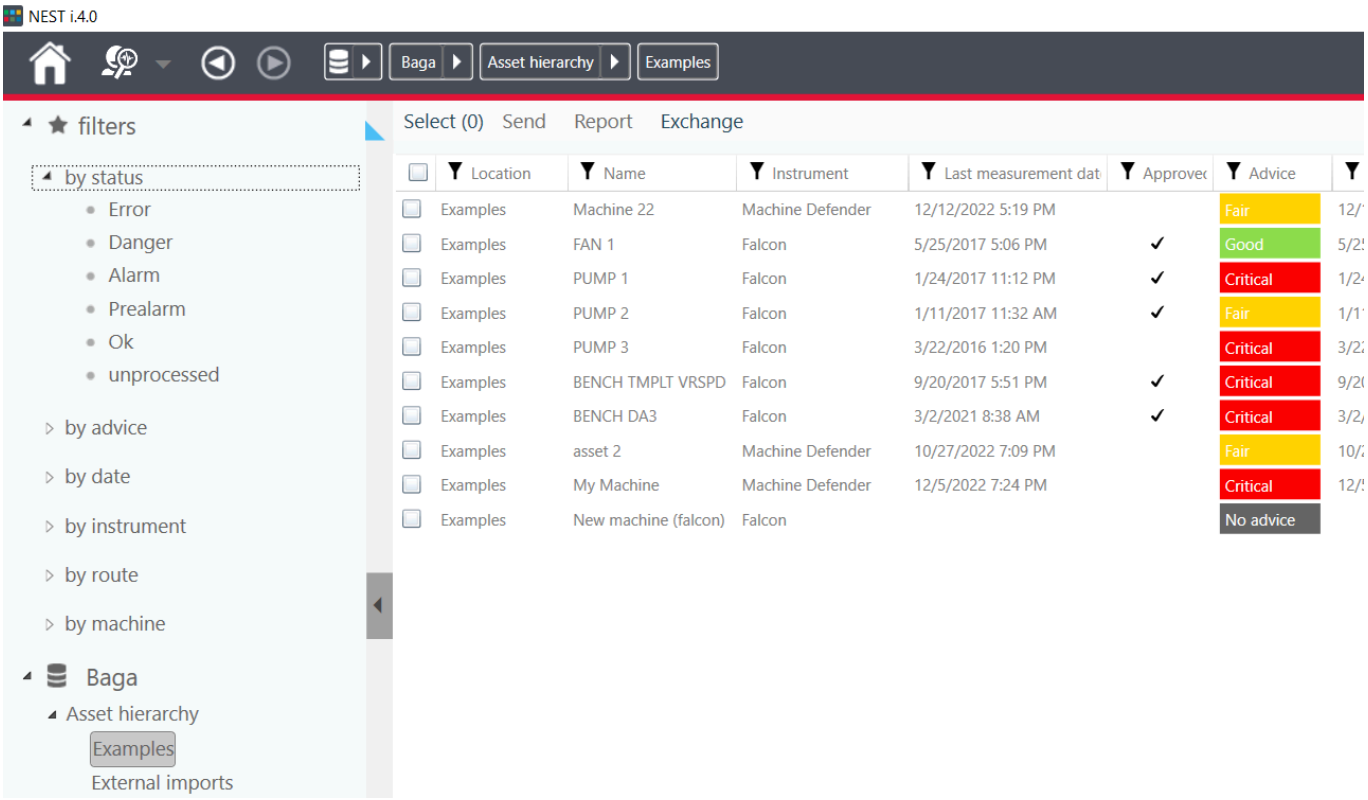
4.2 STATUS BAR



The bottom bar is a status bar. It displays:

- Path of the current item (location or machine)
- In the Analyst module it also shows the alarm setting of the current parameter.
- Current user name (Network edition only)
- Current module name
- Server name (Network edition only)
- NESTi4.0 version number

4.3 PREDEFINED FILTERS



This panel is available in Analyst and Machine setup. It is another way to navigate in databases. For Analyst module, it is possible to apply filters:

- By alarm status: Danger, Alarm, Pre-alarm, OK, unprocessed
- By advice: Excellent, Good, Fair, Critical, No advice
- By date: measurement overdue or not
- By instrument: FALCON, EAGLE
- By route
- By machine: search all machines including a character string

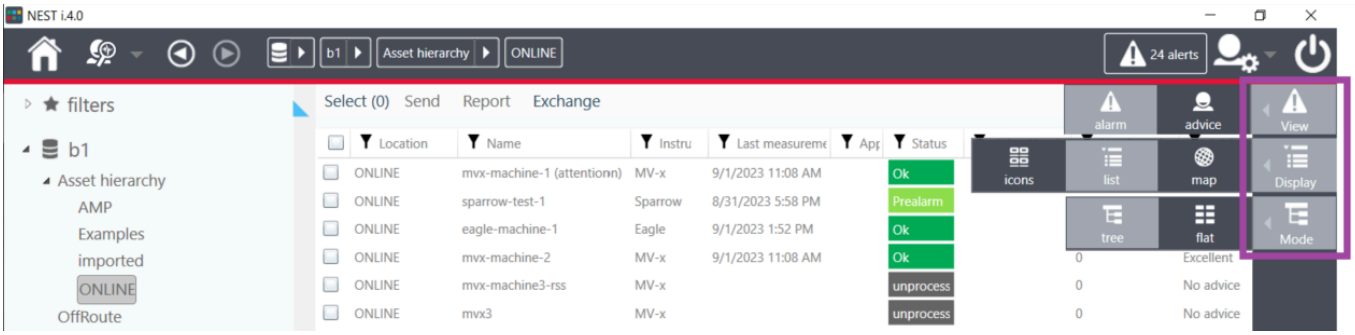
When a filter is selected the mode is switched to flat mode and if a map mode is selected it is switched to icons.

The panel can be open or close using functions  and  .

4.4 View, Display & Modes

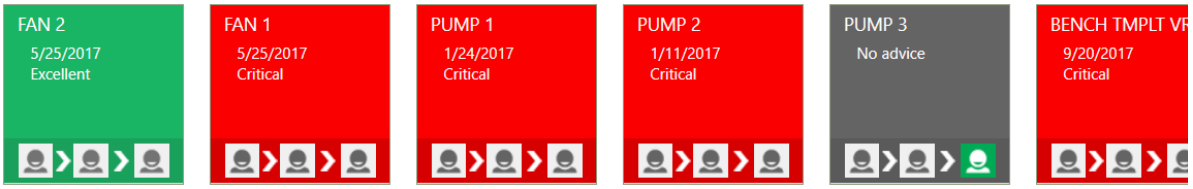
Select View, Display and Mode directly from the lateral right bar of NESTi4 in order to choose:

- how to present the list of machines (icon, list)
- what kind of information to show (alarms or expert advice)
- group machines per location or show all machines into the same list

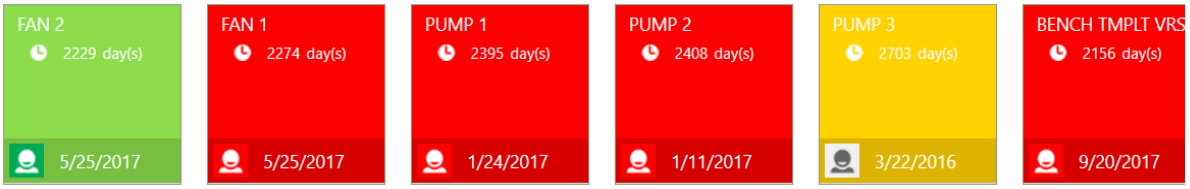


"View" options to choose what you want to see on the screen:

Show expert advice information – ex:

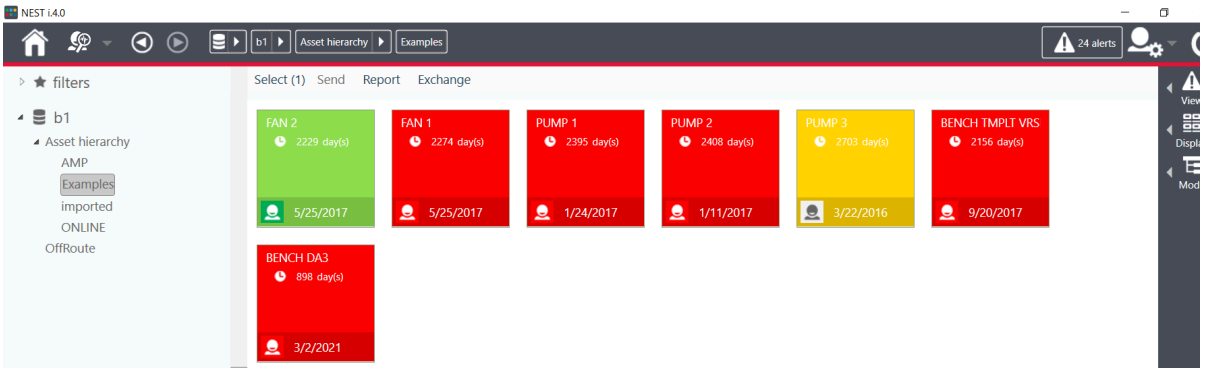


Show alarm status information – ex:

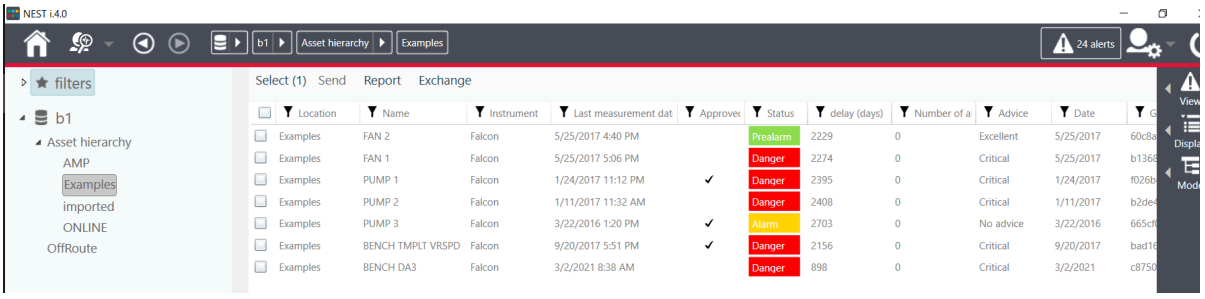


"Display" options to choose how to present the list of machines:

Present machine as large icons – ex:



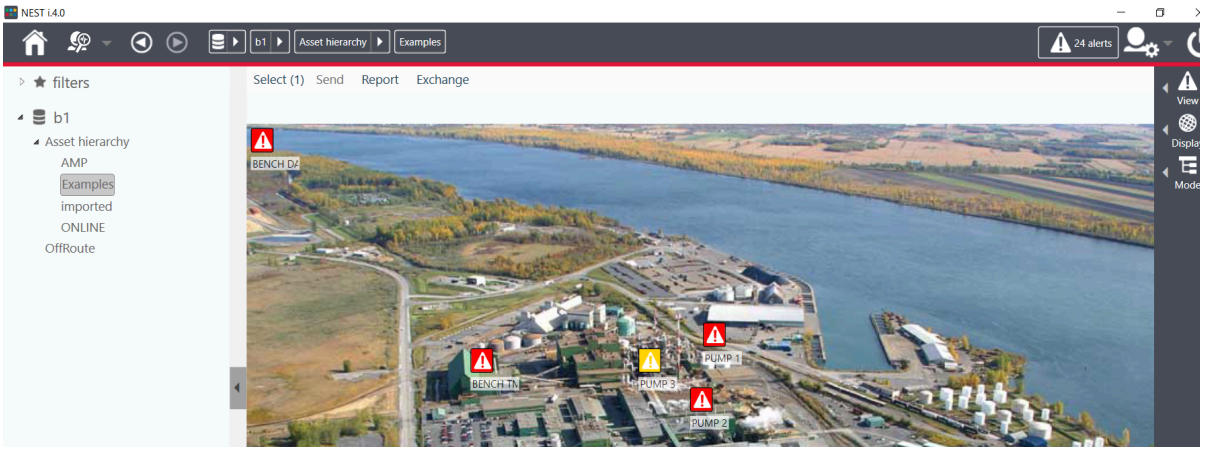
Present machine as a list with details – ex:



List of machines can be filtered and/or sorted:

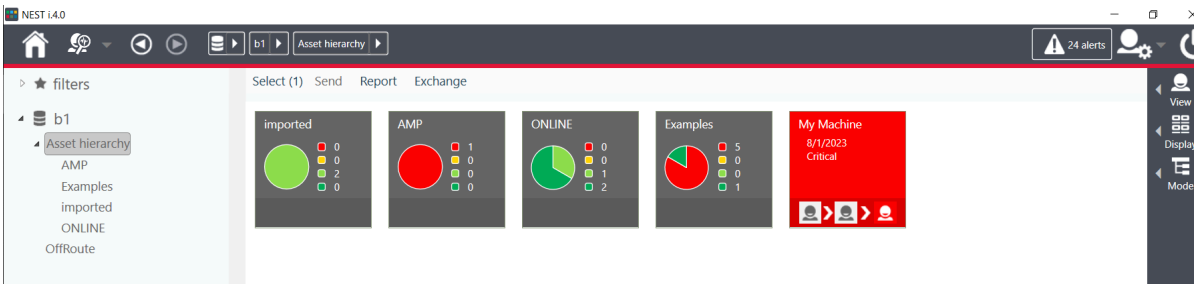
- Click on the column title to sort in ascending or descending order.
- Clilck on the column filter button ▼ to set criteria ; orange colored button ▼ is shown when a filter is active

Present machine as small icon positioned on a photo of the location – ex:

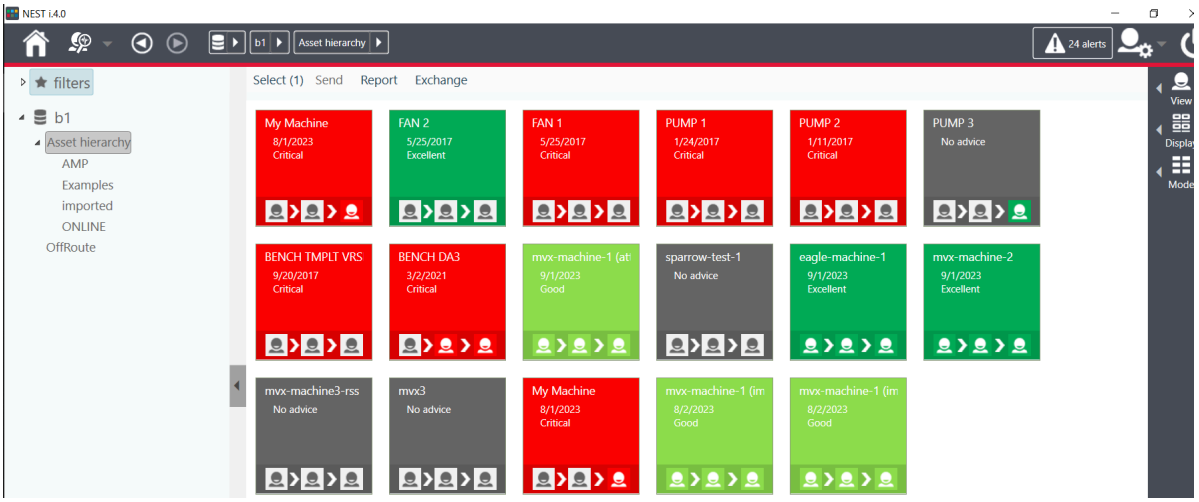


“Mode” options to group machines per location or not – not available into the SETUP module:

Tree, Present machines and group of machine contained into the selected location – ex:

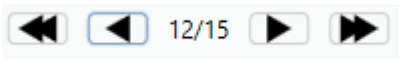


Flat Present all machines contained into the selected location – ex:

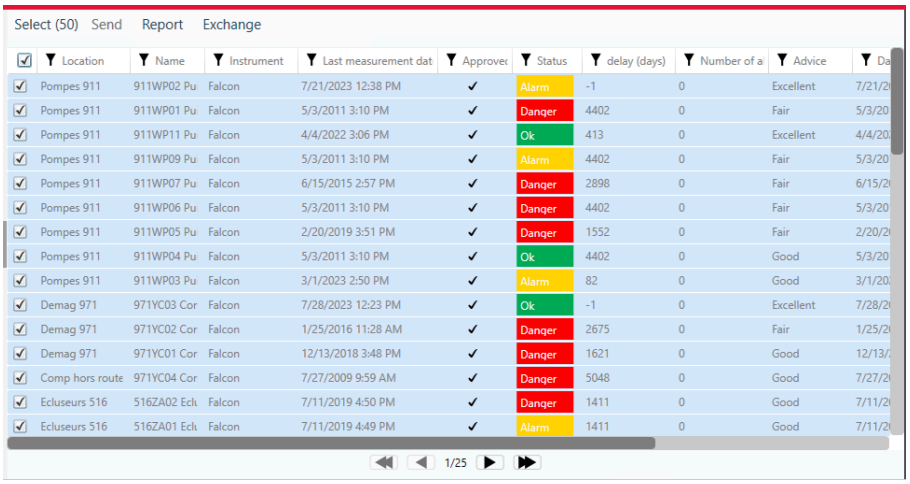


Notes:

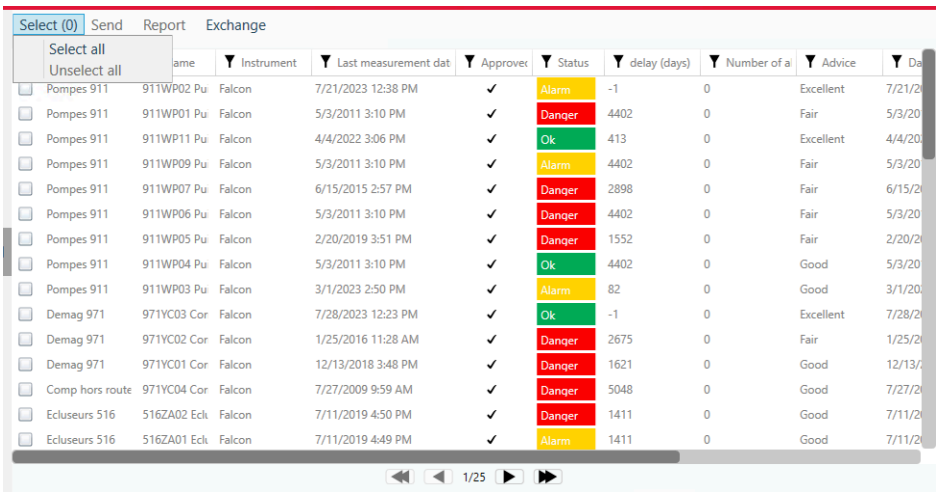
- For Icon and List mode display, the machines are displayed by pages and buttons at the bottom of the screen allow you to navigate from one page to another:



- When multi selection is possible, then the following rules are applied:
  - The check box in the title bar selects the complete current page



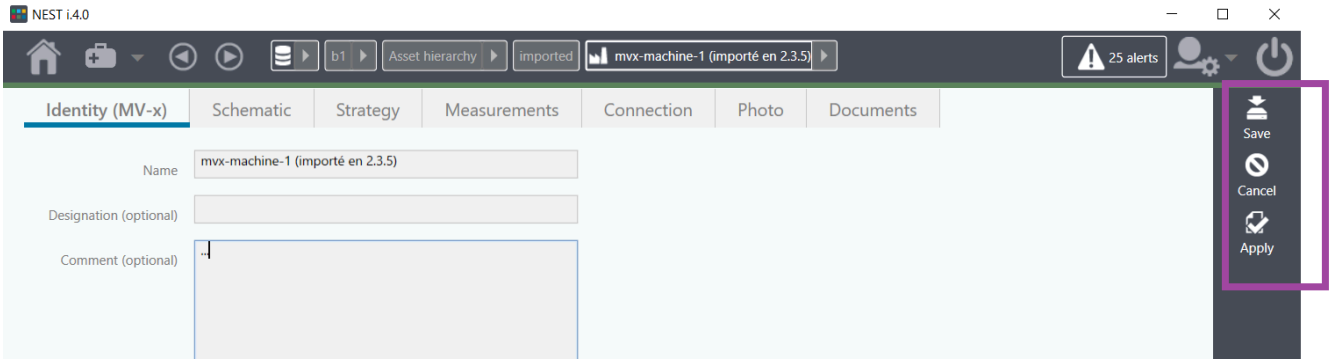
  - The contextual function "Select all" selects all the pages.



- Current selection is canceled when changing page

4.5 SAVE YOUR MODIFICATIONS

When you create a machine or change setup configuration, Save/Cancel/Apply buttons are presented on the right part of the screen:



Save: save the modification and return to the previous screen

Cancel (if modification) or Return (if no modification): return to previous screen without modification

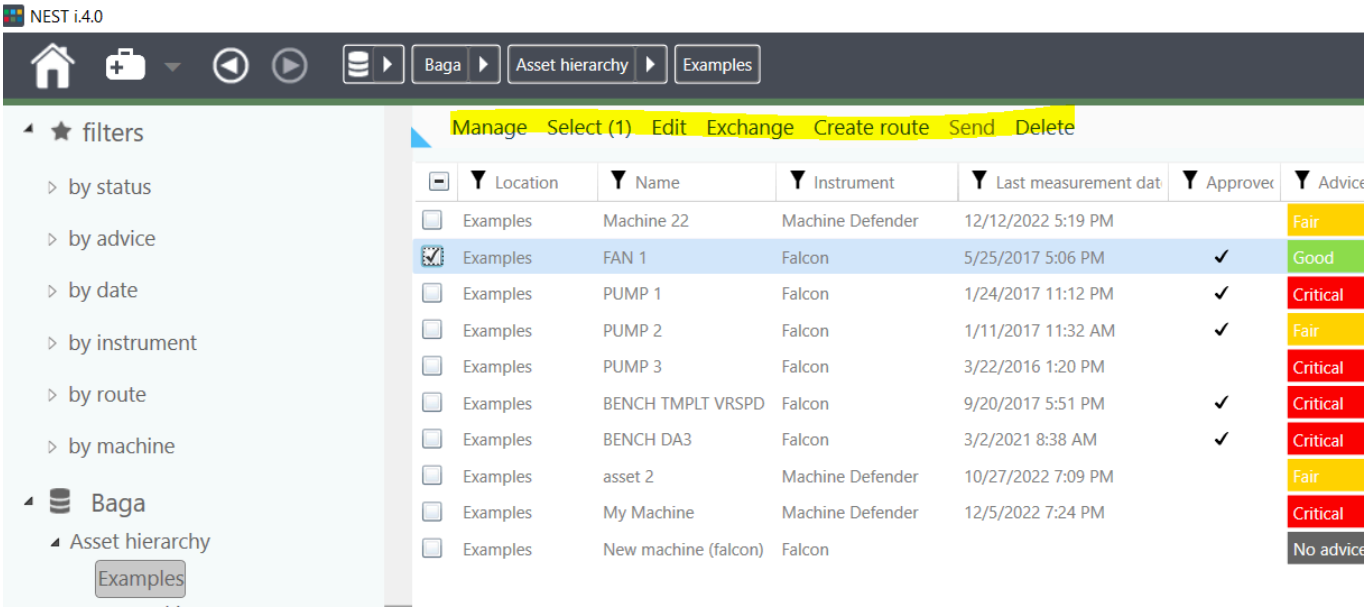
Apply: validates the modification and remains on the screen. This also allows access to the top bar.

Note: Save and Apply functions are not accessible if:

- No modification is done
- Mandatory information is missing. In this case such information is framed in red.

- If modifications are done the navigation bar is not accessible until they are either accepted (Save or Apply) or cancelled.

4.6 Contextual menus



The contextual menu bar is in a light grey above the concerned area.

The blue corner indicates that the bar is active.

- Functions can be active or not according to selected items in the area.
- The keyboard shortcut is shown in the tooltip

4.7 Expert Advice

Details of potential expert advices:

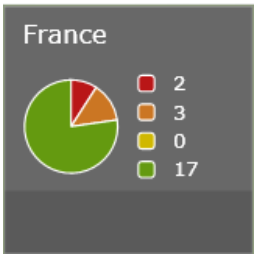
	Description
No advice	No defined advice (default)
Excellent	Health is excellent (no default, low vibration levels).
Good	Health is good for a long service time without restriction.
Fair	Health is not acceptable for a long service time.
Critical	Measurement observed shows that vibration levels could generate damages!

In a global view, machines and sites are represented by icons, whereby a machine icon exhibits the color of the last advice issued and contains the following information:



- The color of the last expert advice (main icon color)
- The name of the machine
- The last expert advice attributed to the machine
- The date of this advice
- The color of the three previous advices, in chronological order from left to right

A site (or location) icon contains the following information:



- The name of the site
- The numbers and distribution (as a pie chart) of the state of health of the various machines that are located at the site in question

Note: machines without advice are not tracked.

Contextual function:

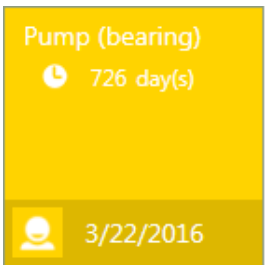
- Send to instrument: this function is accessible once FALCON is ready for communication using the USB interface:
  - Connect FALCON connector to an USB port of the PC
  - From FALCON home screen select the “Communication” module: 
  - In NEST, click on “Load” to transfer the selected machine to FALCON (1 route per machine).

4.8 Alarm Status

Details of potential machine alarm status:

	Description
Unknown	No alarms are set on the machine (default)
OK	All machine monitoring parameters are OK
preAlarm	At least one machine monitoring parameter is in pre ALARM
Alarm	at least one machine monitoring parameter is in ALARM
Danger	at least one machine monitoring parameter is in DANGER
	at least one machine monitoring parameter is in ERROR Note: An error status indicates - typically - an instrument error (faulty measurement chain), which, in turn, indicates that the machine is not being monitored properly.

In a global view, machines and sites are represented by icons, whereby a machine icon contains the following information:

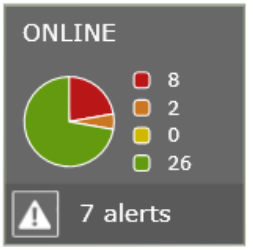


- The alarm status color of the last measurement stored in the database (main icon color)
- The machine name
- The measurement delay counter indicates the number of days since the last expected measurement date (FALCON instrument only). If the measurement is transmitted on the expected date, the interval remains set to 0.
- The number of alerts (escalation to an aggravating alarm status) detected since the last approved expert advice for the relevant machine.

  Note: 1 alert is a change
  - from OK or pre-alarm to Alarm or Danger or Error
  - from Alarm to Danger or Error

- In the secondary information area:
  - The last expert advice attributed to the machine
  - The date of this advice

A location icon contains the following information:



- The name of the location
- The number and distribution (shown as a pie chart) of the statuses of the various alarms for the machines that are part of this site, relative to the last measurement stored for each machine.
- In the secondary information area:
  - The number of alerts (escalation to an aggravating alarm status) detected for all machines at the relevant site, since the last approved expert advice for each machine.

Note: machines without an alarm status are not tracked.

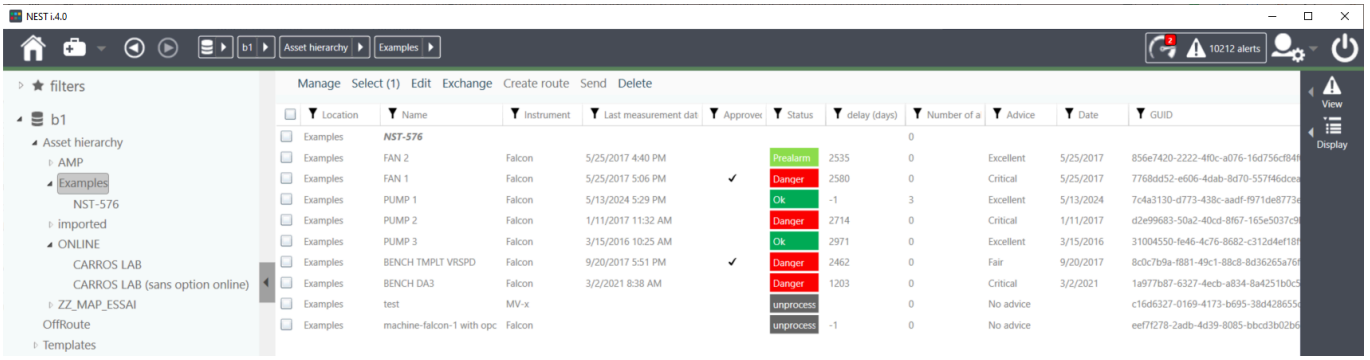
Contextual function:

- Send to instrument: this function is accessible once a FALCON is ready for communication using the USB interface:
  - Connect FALCON connector H to a USB port of the PC
  - From FALCON home screen select the “Communication” module: 
  - In NESTi4.0, click on “Load” to transfer the selected machine to FALCON (1 route per machine).

4.9 List of Machines

List of machines presents the following information for all machines contained into the selected location from the plant hierarchy – see an example below for the “Example” location.

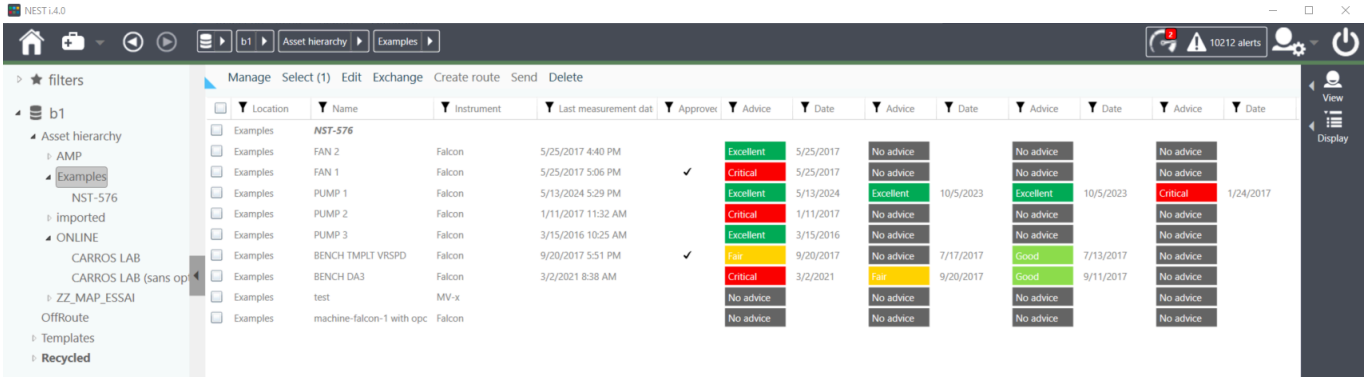
4.9.1 *Alarm Status view*



Description of presented information:

- **Location**: name of the machine location
- **Name**: name of the machine
- **Instrument**: instrument type used to monitor the machine
- **Last measurement date**: date and time of the latest measurement
- **Approved**: activated when expert has approved his latest advice
- **Status**: alarm status of the machine corresponding to the latest measurement
- **Delay (days):** number of days since the last expected measurement date (FALCON instrument only). If the measurement is transmitted on the expected date, the delay remains set to 0
- **Number of alerts**: number of aggravating alarm status changes detected since the last approved expert advice for the relevant machine.
- **Advice**: latest expert advice for the machine
- **Date**: date of measurement concerned by the latest expert advice
- **GUID**: unique identifier of the machine

4.9.2 *Expert Advice view*

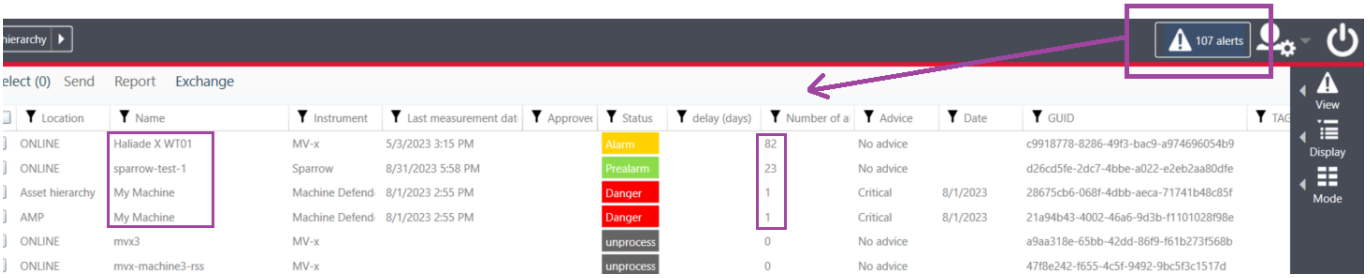


Description of presented information:

- **Location**: name of the machine location
- **Name**: name of the machine
- **Instrument**: instrument type used to monitor the machine
- **Last measurement date**: date and time of the latest measurement
- **Approved**: activated when expert has approved his latest advice
- **Advice1**: latest expert advice for the machine
- **Date1**: date of measurement concerned by the latest expert advice
- …
- **Advice4**: previous expert advice for the machine
- **Date4**: date of measurement concerned by the previous expert advice
- …

4.9.3 *Active alerts*

- Click on the "… alerts" button to directly access the list of machines with the most unacknowledged alarms:



CHAPTER 5. Setup machine



This module is used to create locations and machines in the database. The creation of a machine is made in automatic mode from a simple description of kinematics. This fast setup can be manually adjusted. It is also possible to create machines using copy / paste in the same database or export / import between several bases.

The initial database contents three main folders:

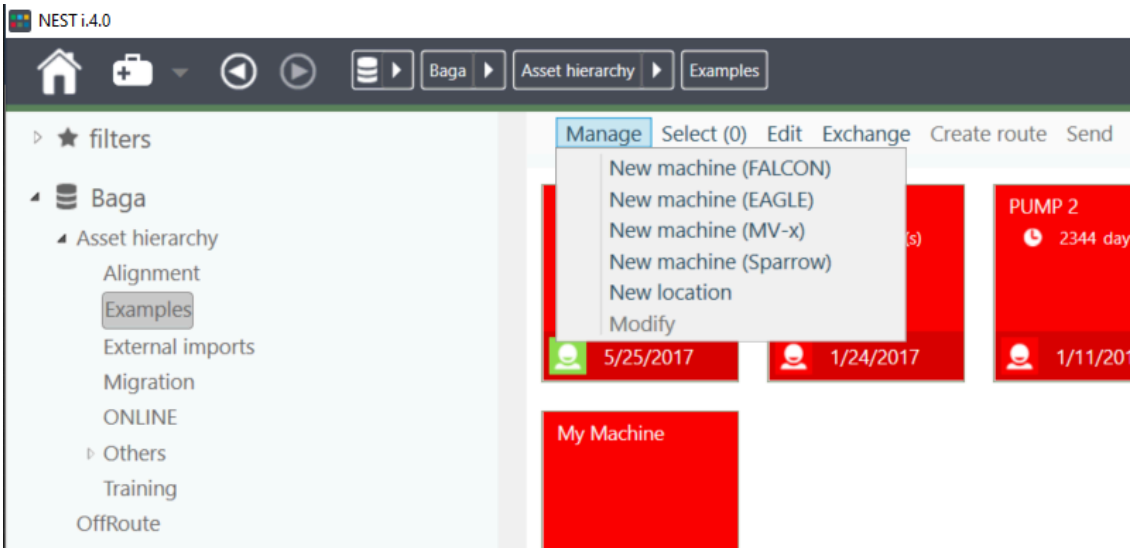
- **Asset hierarchy**: it contains all machines to be monitored. Machines can be organized in a tree structure (Location/sub location/…/machine). There is no limit in the number of sub location levels.
- **Templates**: points of its machines can be used as templates to create other machines, function “Use template”. Machines with templates are supplied with NESTi4.0 media.
- **Recycled**: it includes all deleted machines. It has the “Empty bin” function to delete permanently the machines. To use some machines again, use the edit functions “Cut” and “Paste” to move them back in the “Asset hierarchy” folder.

Notes:

- “Templates” folder cannot contain any machine created with Accurex mode (automatic diagnosis).
- “Templates” and “Recycled” folders are not displayed in Analyst modules.
- In this module the display is always in Tree mode

5.1 Machine management

When a location has been selected into the asset hierarchy tree, then machines or sub location can be managed through the following menu:



- **Manage**: click on this menu to create or modify a sub location or a machine into the selected parent location
    - New machine: When you create a new machine, you must select in the menu the type of device used to take measurement: FALCON data collector, EAGLE (wireless) and MVx online monitoring. This choice cannot be changed later
    - New location
    - Modify: modify the properties of the selected item.

- **Select**: click on this menu to select / unselect all element contained into the selected parent location
    - **Select all**
    - **Unselect all**

      Note: selecting/unselecting is done by a click on each item.

- **Edit**:
    - **Copy**: copy selected items in the clipboard
    - **Cut**: cut selected items in the clipboard
    - **Paste with measurements**: paste the clipboard in current location with all measurements
    - **Paste without measurements**: paste the clipboard in current location without measurements
    - **Merge with existing item**: if the current location contains a similar machine, then clipboard content is added into the existing machine. Only missing data are added; existing ones are preserved. See below the list of similitude criteria to authorize merge operation:
        - Same equipment name or GUID

- Same number of components, type and properties (generic components only)
- Same number of shafts and bearing (properties, naming, axis)
- Same operating condition (number, name, parameters – mvx machine only)
- Same parameter (type, name)

Notes:

- This function adds measurement date on an existing machine – examples :
  - In FALCON data collector a machine is loaded in a standard route
  - A 1st measurement is done in the standard route
  - In FALCON copy the machine to the OFF_ROUTE and take a 2nd measurement
  - Download the standard route and the OFF_ROUTE
  - Copy of the machine downloaded in in the OffRoute to the clipboard
  - Merge it with the original machine: it adds the 2nd measurement.
- Only one machine can be merged at a time
- Merge can only be used if machine configurations are compatible
- The merge function updates also rotation speed, power, speed ratio of transmissions, measurement settings
- 2 machines must be in different locations to be merged

Note: Edit functions are not possible from a database to another one. For that, use the Export/Import functions

- **Exchange**: those functions are used to export and import data (locations and or machines) from a database into another one.
  - **Export to Nesti4**: create a ZIP file that contains all selected locations and machines with the corresponding identification, strategy and measurements settings. Following options can be selected in order to add some data into export file:
    - **with measurements history** □ add measurements data history (overall, spectra and timewave) realized during the entered period (from/to period)
    - **with instrument informations** □ add MVX instrument configuration if exists. During importation, MVX instruments will be automatically created (properties, channels, ….) and measurements – channel mapping will be automatically rebuilt. If the same file is imported many times, then the same instruments will be created many times during importation.
  - **Import from Nesti4**: select a Nesti4 ZIP export file and import it into the current location. All contained data will be automatically imported into the current location/database.

- Import from XPR/Nest3:
    - Import a ZIP file exported from XPR/NEST3. All information will be imported into the current selected location and data are automatically migrated/converted into Nesti4 format – see limitation of compatibility in the following note: “DOC3149 - NESTi4.0 - Migration from NEST3 EN”
    - If some data is not imported, then a report makes it possible to identify the machines concerned and proposes corrective actions that can be applied to recover the data.
    - Open an old XPR/NEST3 import report.

- **Send to instrument** - this function is accessible only when a FALCON is ready for communication using the USB interface:
    - Connect FALCON connector H to a USB port of the PC
    - From FALCON home screen select the “Communication” module 
    - In NESTi4.0, click on “Load” to transfer the selected machine to FALCON

Note: only available for machines measured with FALCON

- **Create a route**: it is a shortcut going directly in the Route module and create a Route including selected machines. Modify route name if necessary and save to create it.

Note: only FALCON machines must be selected

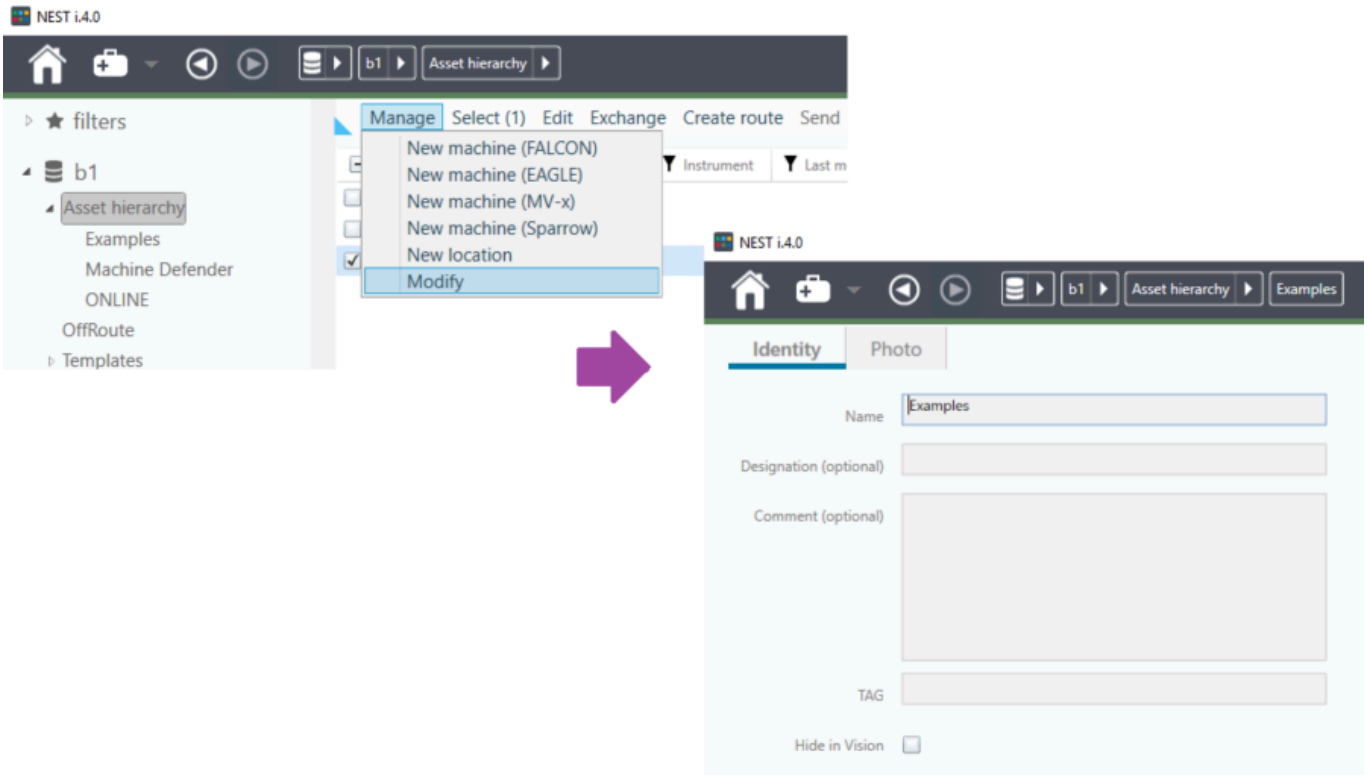
- **Delete**: delete selected items. The machines deleted are moved in the “Recycled” location.

Note: to restore a deleted machine go to the “Recycled” location and use the Copy/Paste functions.

- **Empty bin**: only available in the “Recycled” folder. It deletes definitively selected machines.

Note: in this module the display is always in Tree mode

5.2 LOCATION PROPERTIES



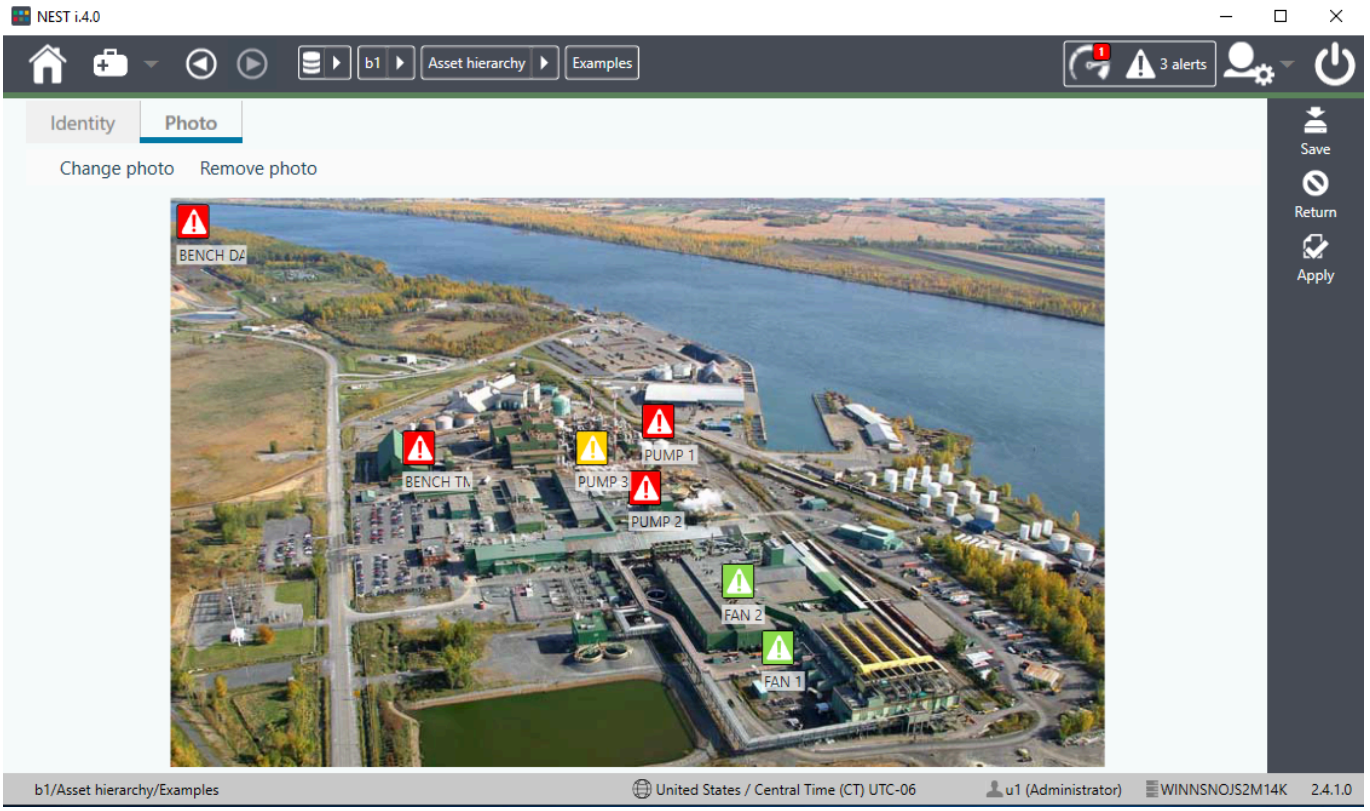
Location "Identity":

Name	**Name of the location - 20 char. maxi**
Designation	Designation of the location - 40 char. maxi
Comment	Comment on the location - 250 char. maxi
TAG	External identifier for the location – ex: CMMS ID, … - this information is used to manage a double identification of the element and simplify interoperability with external application (CSV export, OPC UA interface). NOTE: this TAG is visible only with "OPC UA Activation" license option.
Hide in Vision	Checked this option to make this location and its content **not visible** in NESTi4 Vision. This option is unchecked by default.

Location "Photo":

Change photo	**Click to select an image file (JPEG or PNG) as location photo**
Remove photo	Click to remove current location photo

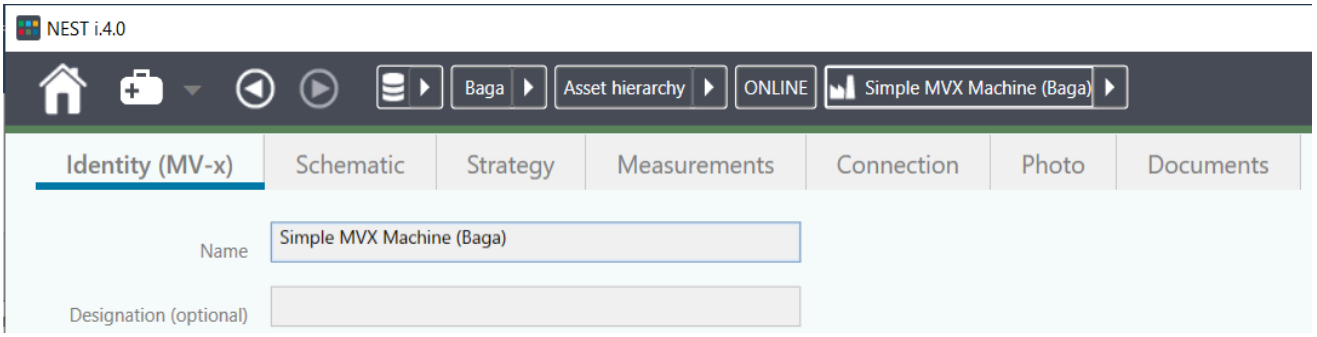
Note it is possible to drag & drop icons on the picture in order to change child element position on the location photo:



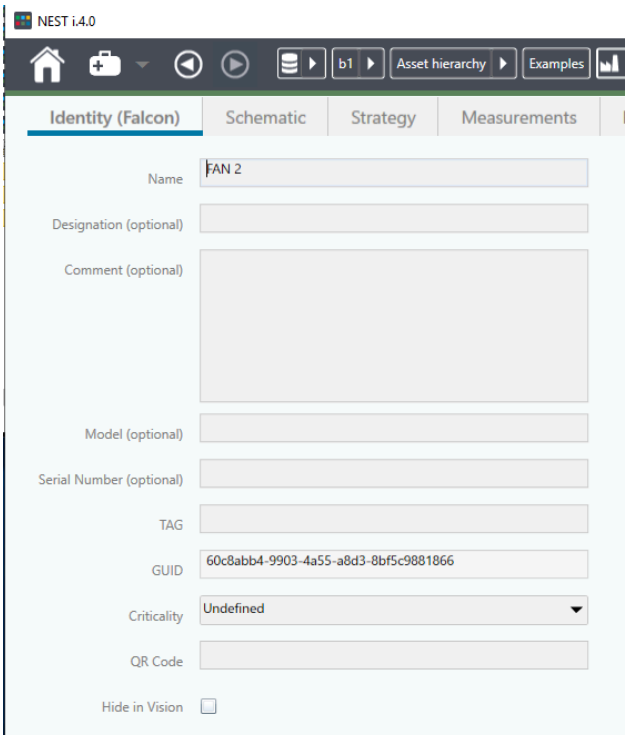
5.3 Machine properties

Properties of a machine are accessible through the following tabs:

- Identity
- Schematic
- Strategy
- Measurements
- Connection
- Photo
- Documents

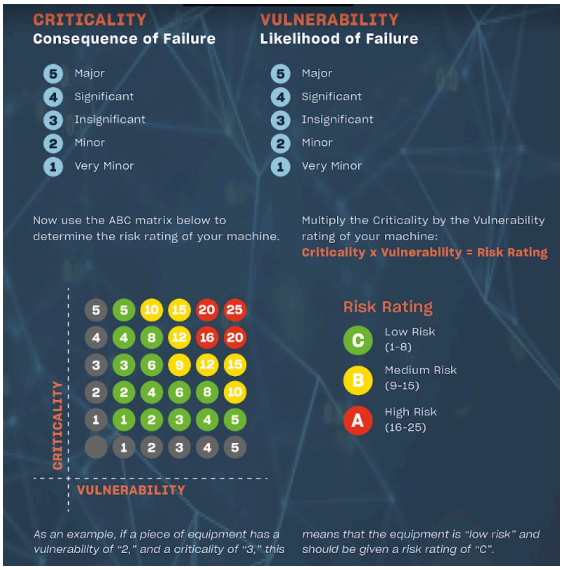


5.3.1 *Identity tab*



General machine information:

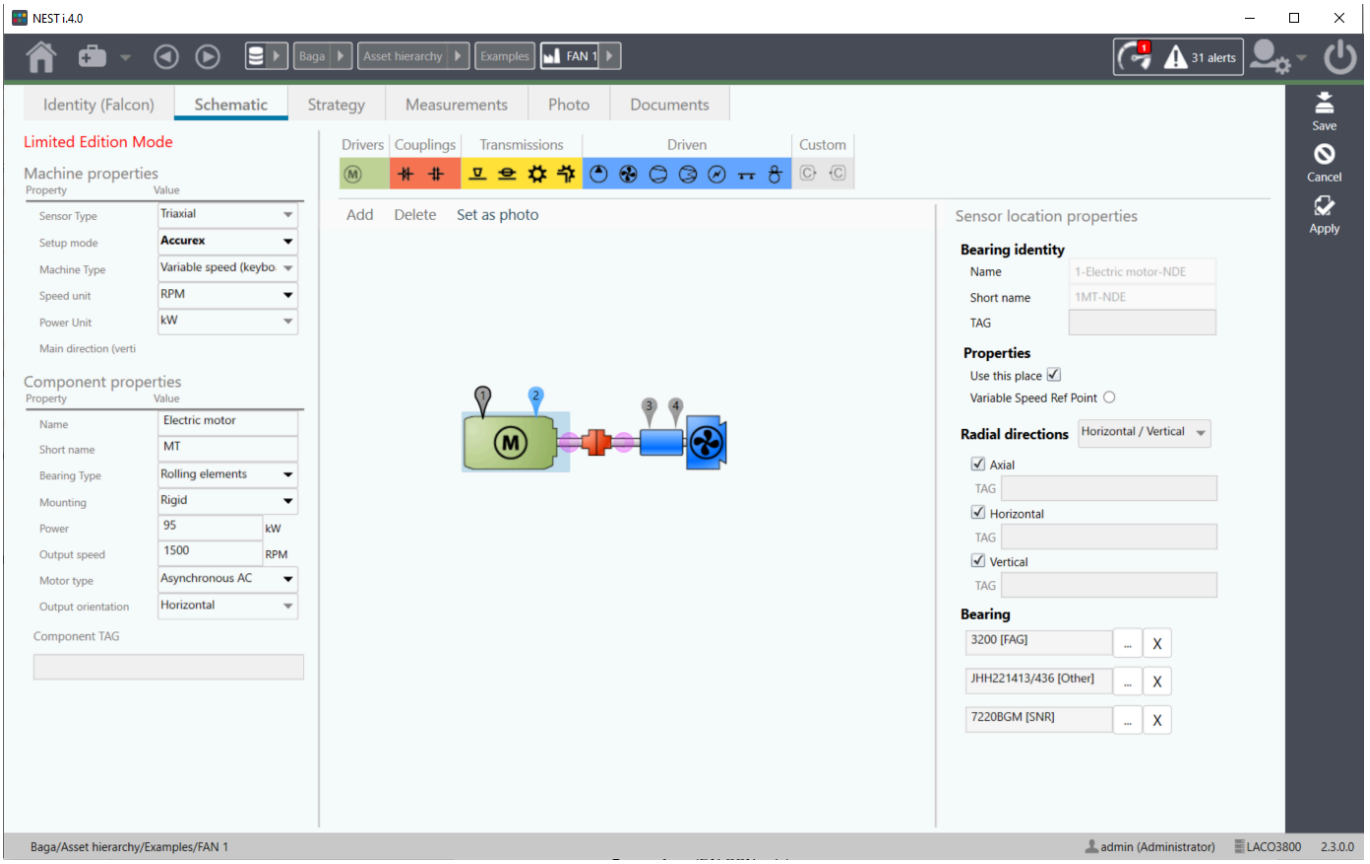
Name	**Name of the machine - 20 char. max**
Designation	Designation of the machine - 40 char. max (optional)
Comment	Comment of the machine - 255 char. max (optional)
Model	Model of the machine (optional)
Serial number	Serial number of the machine (optional)
TAG	External identifier for the machine – ex: CMMS ID, … - this information is used to manage a double identification of the element and simplify interoperability with external application (CSV export, OPC UA interface). NOTE: this TAG is visible only with “OPC UA Activation” license option.
GUID	ACOEM unique identifier for the machine (managed by NESTi4)
Criticality	Level of criticality of the machine. This information will help assessing priority and urgency of action

	
QR Code	only with Machine Defender – this code is recorded the first time with Machine Defender camera and allow to navigate automatically onto this machine when scanned with Machine Defender camera

5.3.2 *Schematic tab*

Introduction:

This tab is to describe the machine properties, setup mode, cinematic and components, monitoring strategy and measurements list



Interface description:

Limited editing mode: This mode is set when measurements are already done on a machine. In this case, only the rotation speed and the power of the driving component can be modified as well as the speed ratio of transmission components.

Note: Because machines with generic components cannot use Accurex mode, measurement configuration can be changed even if measurements have already been made.

- Machine properties
    - **Sensor type** - Only with FALCON (option is required into the data collector)
        - **Triaxial**: the setup generates 3 points in 3 directions for each bearing of the machine
        - **Single axis**: the setup generates 1 point in radial direction for non-drive end bearings and 2 points (1 radial and 1 axial) for drive end bearings. For the Custom component, it generates 2 points (1 radial and 1 axial) for each bearing.

- **Setup mode**

	FALCON	EAGLE	MVx	SPARROW
Accurex	✔ (1)	O	O	X
Smart template	✔	✔	✔	X
Custom Template	✔	✔	✔	✔

✔: available - O: optional - X: not available

Need a specific option into data collector

- **Accurex** (Automatic diagnosis): the list of measurements and corresponding alarm thresholds are created automatically and an automatic diagnosis is performed after measurements.

- **Smart template**: the generation of measurement is fully automatic and based on the same rules as Accurex but without automatic diagnosis.

  This method is used to standardize measurements configuration without blocking some individual settings:

  - Automatic Creation of measurements setup (Time wave length, FFT resolution, filters settings, alarm thresholds suggested) according to speed, power, type of assembly. Machine Setup is identical to the Accurex configuration
  - Possibility of modifying the thresholds of the Velocity, Acceleration, Defect factor parameters (restoration of the Accurex thresholds if the Accurex mode is subsequently reactivated)
  - Benefit of SFx and HMx parameters for non Accurex machines (FALCON)
  - Ability to add custom signals and parameters
  - Possibility to activate Accurex at any time without loss of history (beware, Velocity, Acceleration and Defect Factor thresholds reset to Accurex thresholds)
  - If activated on the database: share data with Acoem that can be used to develop Accurex on new types of components for future versions!

- **Custom Template**: the generation of measurements is based on the selection of point templates

  Notes:

  - Machines with template points must be in the “Templates” location of the database
  - Accurex machines cannot be used as template

- **Machine type:** select if machine is at fixed rotation speed (speed not measured and not modifiable) or if machine is at variable speed (speed is measured). In this 2nd case, select also how the rotation speed is measured.

	FALCON	EAGLE	MVx	SPARROW
Fixed speed	✔	✔	✔	✔
Variable speed	✔ (1)	✔ (3)	✔ (2)	X

✔: available - O: optional - X: not available

(1) with FALCON

- Fixed speed
- Variable speed (Keyboard input): the value is input manually from keyboard in the data collector
- Variable speed (DC): the value is measured from a continuous voltage. In this case the sensitivity must be defined.
- Variable speed (Rot. trigger): the value is measured from the tachometer input.

(2) Variable speed with MVx

"Rotational speed" operating parameter is created automatically into « Strategy » tab where « Input type » need to be entered manually.

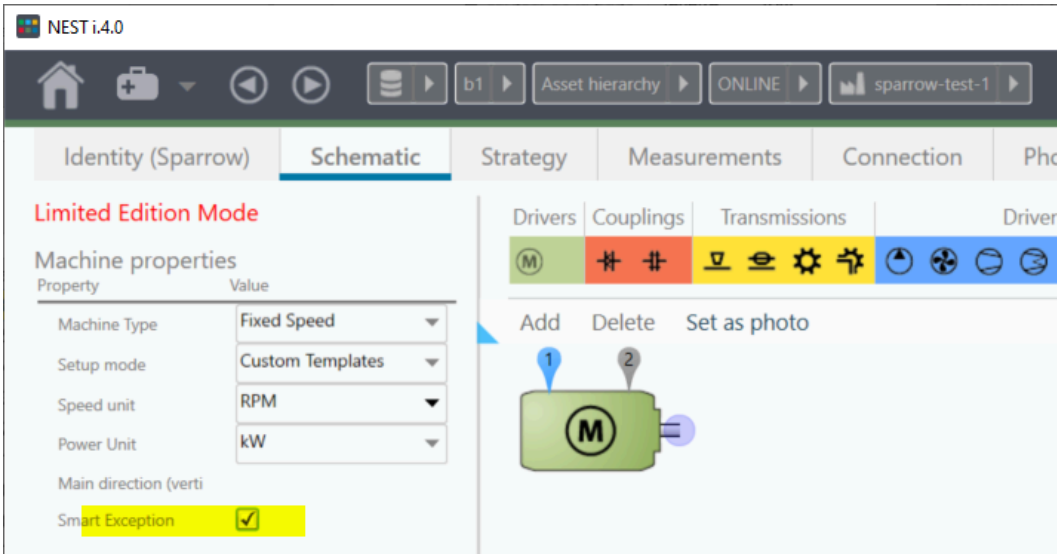
(3) Variable speed with EAGLE

"Rotational speed" operating parameter is created automatically into the « Strategy » tab and « Input type » is limited to “External Input (Modbus)”. This feature requires at least NESTi4 v2.5 and EAGLE v2.26.

Notes:

- SPARROW does not manage variable speed machines but it is possible to adjust the running speed in the Analyst module and reprocess the data.
- For variable speed machines, it is also possible to use FALCON built-in stroboscopes to measure the rotation speed.
- The detection of the rotation speed is essential for the diagnosis. With Accurex (Automatic diagnosis) mode, if you are not sure of the accurate value of the rotation speed (+/- 20 CPM), it is recommended to set the machine to variable speed. In this case, rotation speed can easily be adjusted with the FALCON built-in stroboscope.

- **Speed unit**: Hz or RPM
- **Power unit**: hp or kW
- **Main direction (vertical machine**): for machines with a vertical shaft, this text defines the main radial direction (North-South for example). It is to help the user to mount the sensor in the correct position
- **Smart exception** – only for SPARROW machine – activates ACCUREX Smart Exception mode to detect machine behavior change during monitoring phase



- Components properties

Components can be selected from the bar according to 3 methods:

- by double clicking
- by drag & dropping to the working area
- just by clicking on “Add” button.



5 categories of components are proposed to describe your physical machine:

- **Driver**: Motors
- **Coupling**: Flexible coupling, Rigide coupling
- **Transmission**: Belt/Pulley, Chain, Gearbox, Bevel gearbox
- **Driven**: Pump, Fan, Centrifugal compressor, Lobe compressor, Alternator, Shaft, Roller
- **Custom**: Custom driver, Custom driven – to be used if the other categories does not propose the expected component

Notes:

- Coupling, pulley and chain transmission are not associated with any measurement location. One of these components must be inserted between all other types of components.
- Each standard component can be customized:
  - Name of the component used for bearing naming and for Accurex diagnosis result
  - Short name used for point naming

Motors:

- **Bearing type**: Rolling element or Journal.

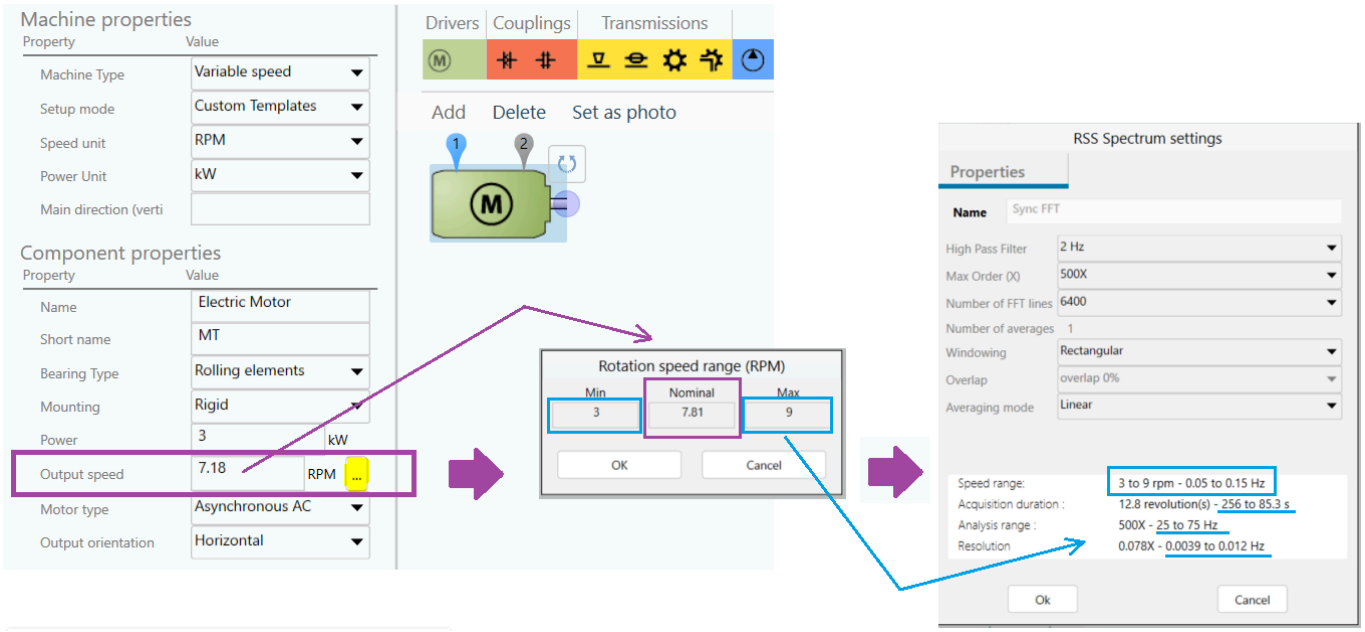
Note: For journal bearings, bearing defects specific to this type are not detected in this version.

- **Mounting**: Rigid or Flexible
- **Power**: Nominal power of the motor. This value is mandatory.
- **Output speed**: Nominal speed of the motor.

Notes:

- This value is mandatory
- For Automatic diagnosis mode and fixed speed machine, the value must be as close as possible from the effective rotation speed (+/- 20 CPM). FALCON gives the possibility to adjust the rotation speed with its stroboscope. **In this case, when downloading the route, the new rotation speed is used to update NESTi4.0 initial setting**
- For MVX machine, you can define min/max values of the output speed in order to calculate automatically the corresponding min/max settings for RSS measurements – example below with a RSS spectrum for a Wind turbine:
  - **Speed range** shows min/max speed values in RPM and Hz
  - **Acquisition duration** shows the number of revolution with the corresponding duration in seconds

- **Analysis range** shows the max order spectrum with the corresponding values in Hz
- **Resolution** shows the order resolution of spectrum with the corresponding min/max values in Hz



- **Output orientation**: horizontal or vertical. It defines the true orientation of the machine (not the one of the drawing).

Notes: when the motor is selected, it is possible to rotate its drawing and all connected component with the function located near the motor in the working area. It defines the machine orientation on the drawing (not the true one).

Flexible coupling:

- **Number of elements**: optional, number of coupling elements.

Rigid coupling

Belt/pulley transmission:

- **Multiplication factor**: output speed / input speed ratio (this value is mandatory).
- Number of belts: optional.

Chain transmission:

- **Multiplication factor**: output speed / input speed ratio (this value is mandatory).
- Number of chains: optional.

 Gearbox transmission:

- **Bearing type**: Rolling element or Journal.

Note: For journal bearings, bearing defects specific to this type are not detected in this version.

- **Mounting**: Rigid or Flexible
- **Multiplication factor**: output speed / input speed ratio (this value is mandatory):
  - If the detail of the gearbox is unknown, give directly the ratio
  - If the detail is known click on “Gearbox detail known” and set:
    - The number of stages: 1 to 4
    - For each stage:
      - Number of teeth of driving gear
      - Number of teeth of driven gear

 Angular or bevel gearbox transmission:

- **Rotation**: Turn right or left (on the drawing)
- **Bearing type**: Rolling element or Journal.

Note: For journal bearings, bearing defects specific to this type are not detected in this version.

- **Mounting**: Rigid or Flexible
- **Multiplication factor**: output speed / input speed ratio (this value is mandatory):
  - If the detail of the gearbox is unknown, give directly the ratio
  - If the detail is known click on “Gearbox detail known” and set:
    - The number of stages: 1
    - Number of teeth of driving gear
    - Number of teeth of driven gear
- **Output orientation**: horizontal or vertical. It defines the true orientation of the machine (not the one of the drawing). This is only for components with a horizontal input. If the input is vertical, the output is forced to horizontal.

 Pump:

- **Bearing type**: Rolling element or Journal.

Note: For journal bearings, bearing defects specific to this type are not detected in this version.

- **Mounting**: Rigid or Flexible
- **Rotor position**: Between bearing or Over hung
- Number of blades: optional.

 Fan:

- **Bearing type**: Rolling element or Journal.

Note: For journal bearings, bearing defects specific to this type are not detected in this version.

- **Mounting**: Rigid or Flexible
- **Rotor position**: Between bearing or Over hung

- Number of blades: optional.

 Centrifugal compressor:

- **Bearing type**: Rolling element or Journal.

Note: For journal bearings, bearing defects specific to this type are not detected in this version.

- **Mounting**: Rigid or Flexible

 Lobe compressor:

- **Bearing type**: Rolling element or Journal.

Note: For journal bearings, bearing defects specific to this type are not detected in this version.

- **Mounting**: Rigid or Flexible

 Alternator or generator:

- **Bearing type**: Rolling element or Journal.

Note: For journal bearings, bearing defects specific to this type are not detected in this version.

- **Mounting**: Rigid or Flexible

 Shaft:

- **Bearing type**: Rolling element or Journal.

Note: For journal bearings, bearing defects specific to this type are not detected in this version.

- **Mounting**: Rigid or Flexible

 Roller:

- **Bearing type**: Rolling element or Journal.

Note: For journal bearings, bearing defects specific to this type are not detected in this version.

- **Mounting**: Rigid or Flexible

 Custom driver component:

This component is fully adjustable. It cannot be used in Accurex mode and it is necessary to add measurements manually or from a template in the “Measurements” Tab. Use it if the standard components listed above do not match to your machine.

- Name *
- Short name *
- Number of bearings: 1 to 8
- Number of outputs: 1 or 2
- **Power**: Nominal power of the motor. This value is mandatory.
- **Input speed**: Nominal speed of the driver. This value is mandatory

- **Output orientation**: horizontal or vertical. It defines the true orientation of the machine (not the one of the drawing).
- For each output: **Output speed ratio** (output speed / input speed ratio)
  - If gear detail is unknown, give directly the ratio
  - If gear detail is known click on “Gear detail known” and set:
    - Number of teeth of driving gear
    - Number of teeth of driven gear

* used to generate location and point names. Location and point names can also be modified manually

Note: when the driver is selected, it is possible to rotate its drawing and all connected component with the function  . It defines the machine orientation on the drawing (not the true one).

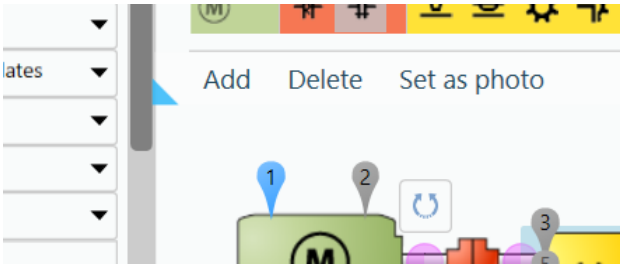
 Custom driven component:

This component is fully adjustable. It cannot be used in Accurex mode and it is necessary to add measurements manually or from a template in the “Measurements” Tab. Use it if the standard components listed above do not match to your machine.

- Name *
- Short name *
- Number of bearings: 1 to 8
- Number of outputs: 1 or 2
- **For each output**: Output speed ratio (output speed / input speed ratio)
  - If gear detail is unknown, give directly the ratio
  - If gear detail is known click on “Gear detail known” and set:
    - Number of teeth of driving gear
    - Number of teeth of driven gear

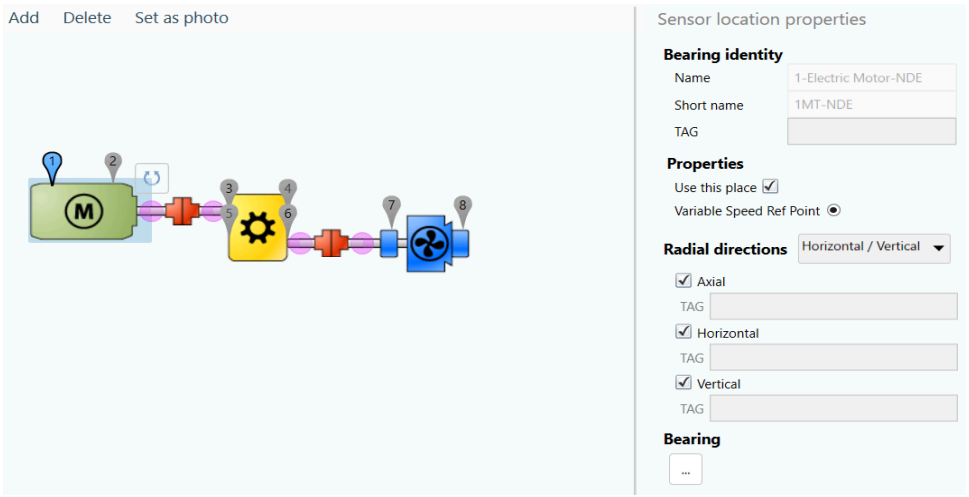
* used to generate location and point names. Location and point names can also be modified manually

- Contextual functions:



- **Add**: add the component selected in the bar to the working area.
- **Delete**: delete the selected component from the working area.
- **Set as photo**: the drawing of the working area is used for the machine display in Analyst or FALCON (map mode).

- Working area



- Connecting components: just drag the driven component close to the output of a driving shaft

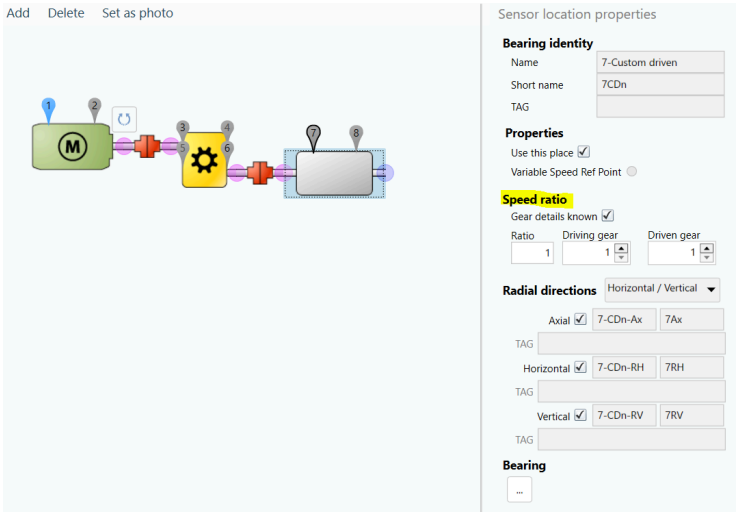
Note: Coupling, pulley and chain transmission must be inserted between all other types of components otherwise, connection is not possible.

- Disconnecting: just click on the link 
- Drawing rotation: select the driver component and click on  to make a 90° clockwise rotation.
- Location properties: click on  to display them:
  - **Variable speed reference point**: select it where the rotation speed is effectively measured. The location is then displayed in blue:  . For the custom component, the speed ratio of this location is forced to 1.

- **Use this place**: unselect it if you do not want to take any measurement on the location.

Note: the setup always creates a machine with a motor. If you want to measure only the driven components just unselect the both locations of the motor.

- **Bearing**: select the bearing reference from the bearing database. It is possible to select up to 3 references per location.
- **Speed ratio** - only for Custom components:



- If gear detail is unknown, give directly the ratio
- If gear detail is known click on “Gear detail known” and set:
  - Number of teeth of driving gear
  - Number of teeth of driven gear

Note: For the variable speed reference location, the speed ratio is forced to 1.

- **Radial directions**: for horizontal shaft, select used direction for radial:
  - Horizontal / Vertical
  - Oblique / Oblique

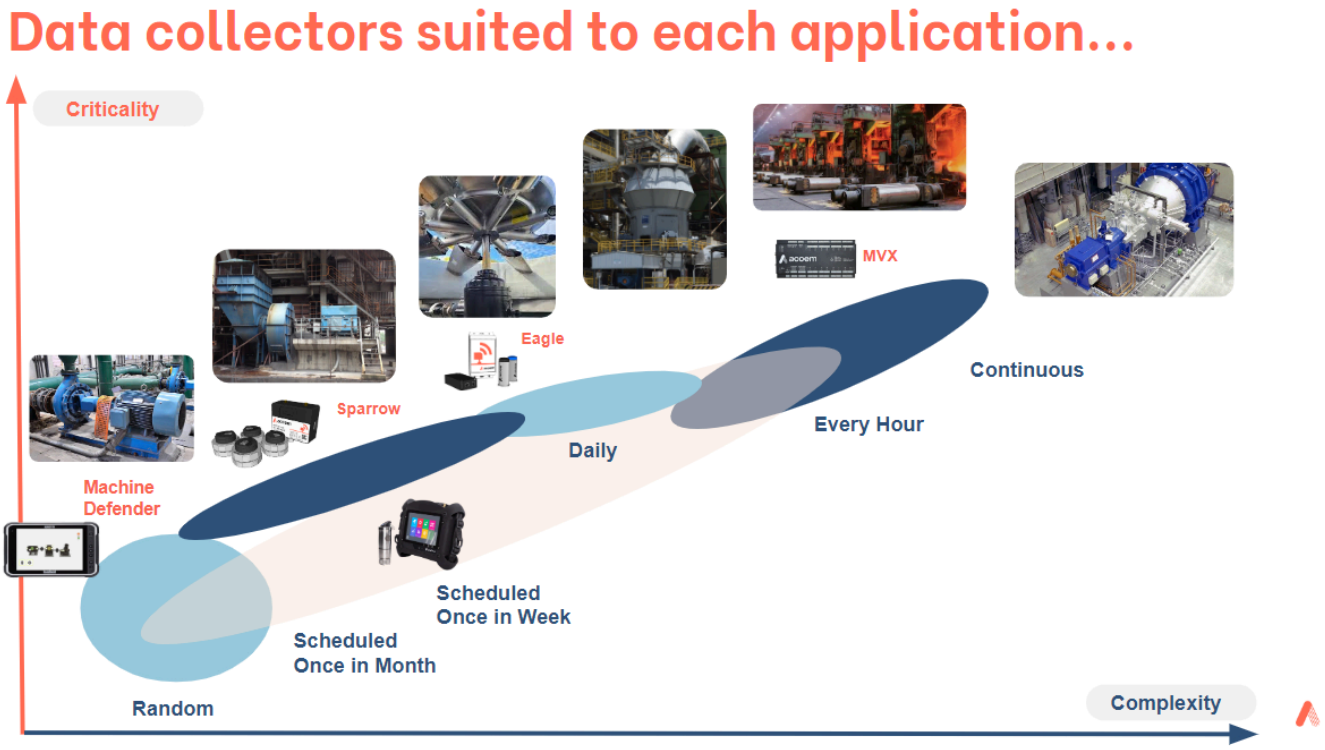
For the Custom component, there is also the option “Other”, it can be used to generate other configurations to take 1, 2, 3 or 4 channel measurement with FALCON. The default value is 4 channels.

- **Directions**: select the direction to be measured. The names of directions depend of the shaft direction:
    - For an horizontal shaft, the names of directions are:
        - Axial, horizontal and vertical
        - Axial, oblique and oblique depending of the selection in “Radial direction”
    - For a vertical shaft, the names of directions are:
        - Axial, Main and Perpendicular (see the definition of the main radial direction in “Machine properties”).

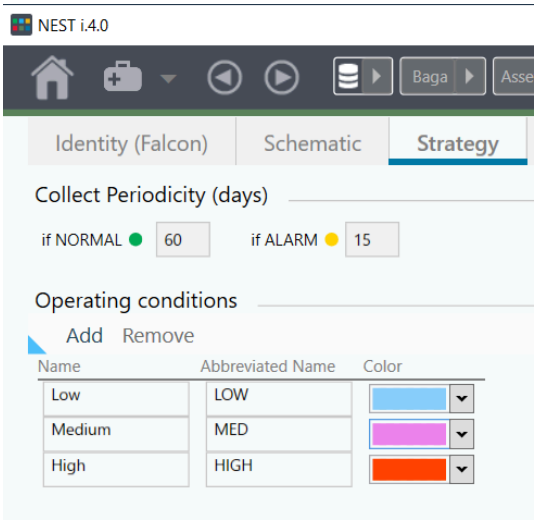
Note: Name and short name of each direction can be adjusted manually.

5.3.3 *Strategy tab*

The content of this tab depend of the acquisition device



*5.3.3.1 **FALCON***



- **Collect Periodicity (days)** defines the expected measurement periodicity in days according to the machine alarm status. These periodicities are used to determine if measurements of the machine are overdue or not.
- **Operating condition**: definition of the operating conditions of the machine. Up to 9 conditions can be created. The list is loaded in the Falcon data collector. The operator can then select the operating condition when he made his measurements
    - Menu functions:
        - **Add** a new condition. Properties are:
            - Name: up to 18 characters
            - Abbreviate: up to 10 characters
            - Color
        - **Remove** the selected conditions

5.3.3.2 *MACHINE DEFENDER (MDF)*

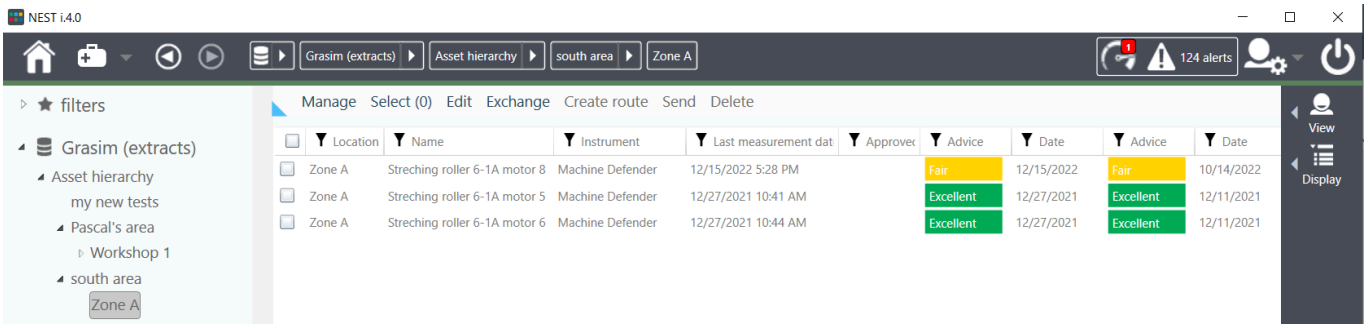
Available on Apple Store and Google Play

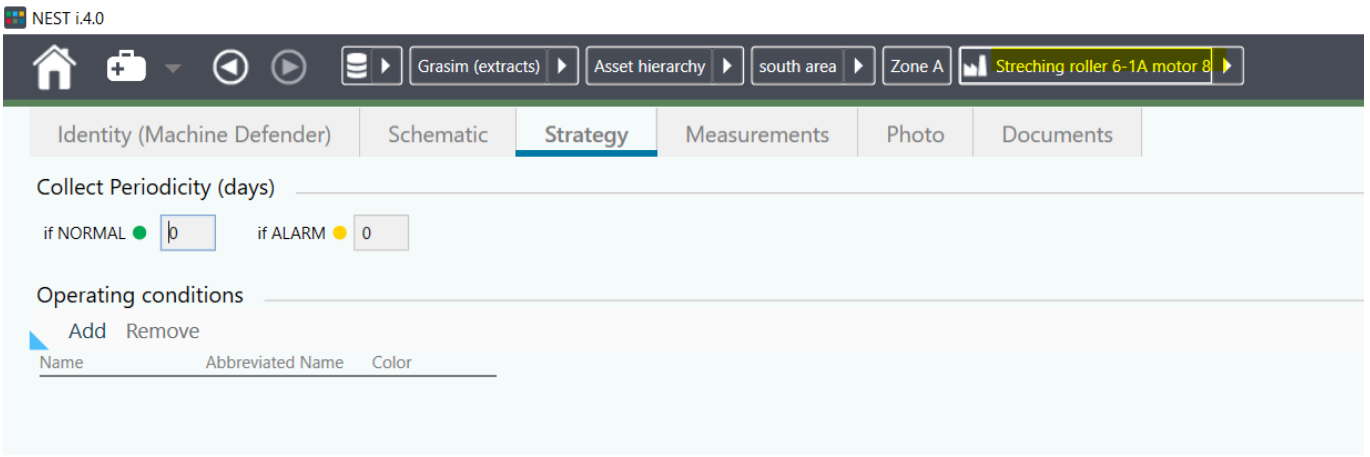
Machine Defender
Productivity

- Automatic diagnosis for rotating machinery based on wireless vibration data.
- Used in combination with the wireless vibration sensor CAC100800, the ACOEM Machine Defender app helps mechanics to collect vibration data wirelessly and detect faults automatically with the ACOEM Accurex artificial intelligence engine.

INFO: This is a specific use case of NESTi4 because this kind of machine cannot be created with NESTi4 but only with the Machine Defender app (considered as an instrument) – see dedicated Machine Defender User's Guide.

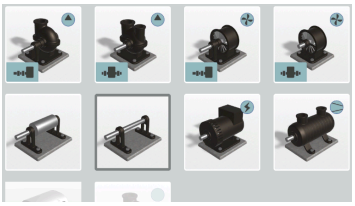
Then this machine is sent to NESTi4 in order to be stored into database and be analyzed in depth if requested – ie: service request via remote advisor service subscription.



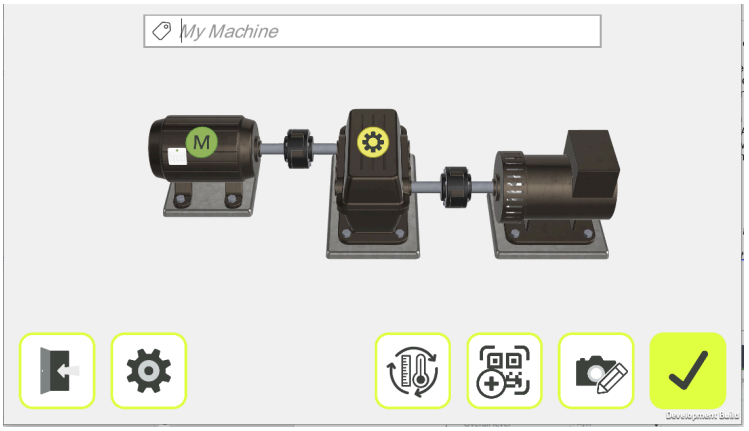


Strategy of MDF machine is quite similar with FALCON machine but some differences exist:

- Operating condition are inactive
- A new MDF machine can only be created with Machine Defender app – see the dedicated user's guide







- MDF machine setup is editable with NESTi4 and custom post processing can be added
- MDF machine setup mode can be changed with NESTi4 as “Smart template” and custom threshold values can be entered
- MDF machine is fully compatible with FALCON and can be measured with both devices
- MDF machine history can be populated from Machine defender and/or from FALCON indifferently
- This dual capabilities for MDF machines allow experts to make measurements with FALCON, to mechanics (or end customers) with MDF and both people add data for the same machine history into NESTi4

NOTE:

- User can upgrade from MDF to a FALCON without any loss of data history for their machines. Be careful, the reverse is not true.
- Limitation with this version: Machine setup initially created for FALCON cannot be added to a work order. Initial setup must come from Machine Defender

5.3.3.3 EAGLE

These features requires at least NESTi4 v2.5 and EAGLE v2.26

EAGLE system makes it possible to ensure continuous monitoring of the machines with **variable rotation speed** and **variable operating condition**s.

The principle is to read **operating parameters** from the gateway **Modbus** interface and use them to identify current operating conditions of the machine and adapt automatically the measurements to be made, post-processing and alarm thresholds to be applied.

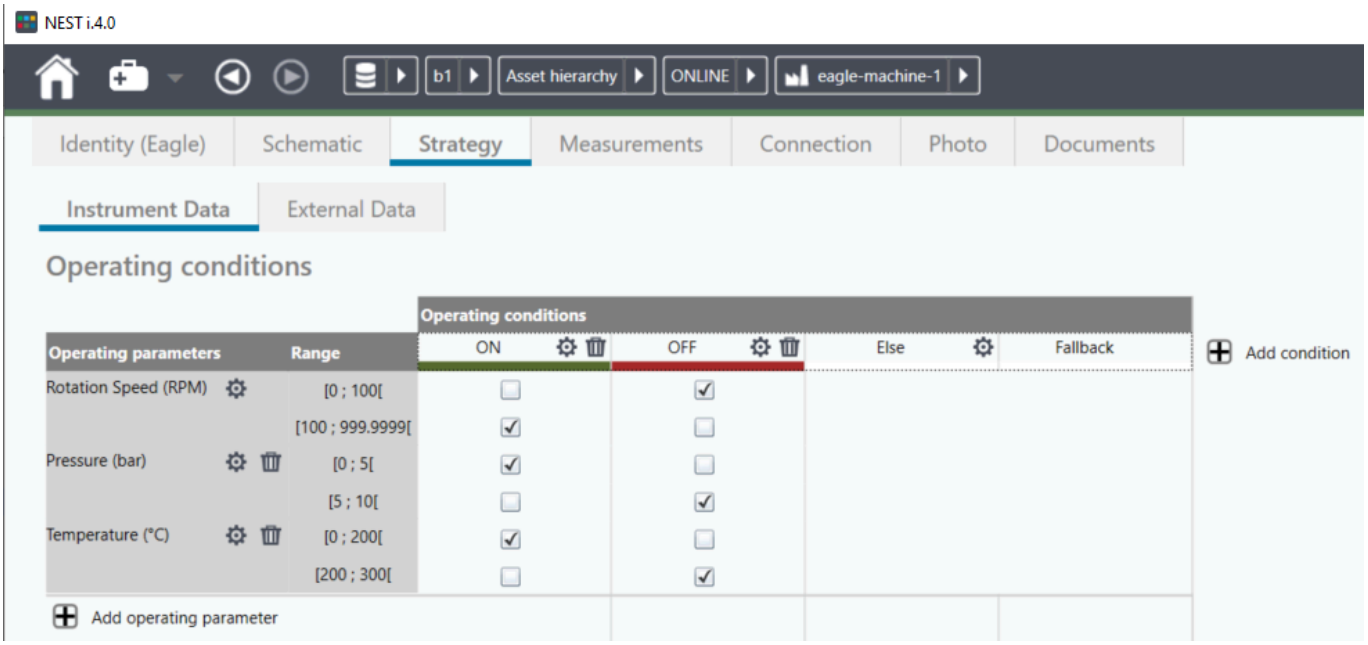
Each machine operating condition is defined with one or more **operating parameters**, for which **ranges of values** must be assigned for each condition.

Each operating parameter can be read from any external systems (PLCs, etc.) via the EAGLE gateway Modbus TCP interfaces.

5.3.3.3.1 Operating conditions

By default, a machine has no specific operating condition but it is possible to declare manually up to 20 conditions per machine.

Operating conditions are identified by a set of operating parameters whose measurements are within certain ranges of predefined values.



Operating parameters are continuously read by EAGLE gateway and their values compared to ranges previously defined for each condition - e.g. a machine is in "ON" condition if the rotation speed is between 100 and 1000 RPM, if Pressure is between 0 and 5 bar and Temperature is between 0 and 200 °C.

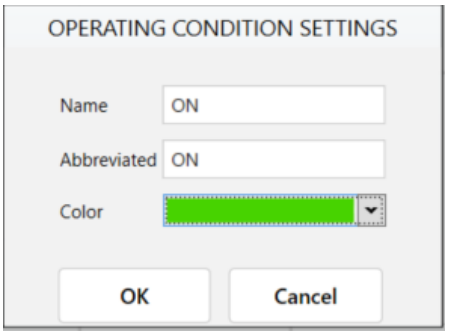
Each operating condition contains:

- A list of measurements to be made
- A set of alarm thresholds to be applied for each monitored parameter

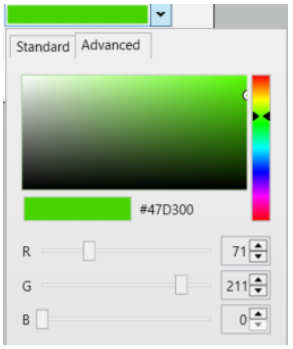
When at least one specific condition exists for a machine, then two other operating conditions are automatically created:

- **ELSE** condition is applied when no other existing condition can be applied for the machine
- **FALLBACK** condition is applied as soon as an operating parameter is not available – ie: sensor defect, unreachable Modbus or OPC parameter … This condition name and color are fixed.

Each condition can be defined with the following information:



In order to provide optimal identification in the various Nesti4 displays, each operating condition is identified by:

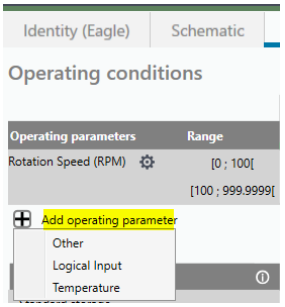


Name	Name of the condition
Abbreviate	Short name of the condition (displayed into SETUP panel)
Color	Select a color from a peaker

5.3.3.3.2 Operating parameters

It is possible to create up to 6 operating parameters per machine:

Parameter type	Max./machine	Description
Rotation speed	1	Automatically created for variable speed machines only. This parameter reads or measures the rotation speed of the machine from many input types
Temperature	2	Any temperature process values
Other		Any other process values (all but temperature) – ex: flow, pressure, loads …
Logical	3	Any boolean value – ex: (On / Off, Open / closed ...) measured from the logic inputs of the instrument



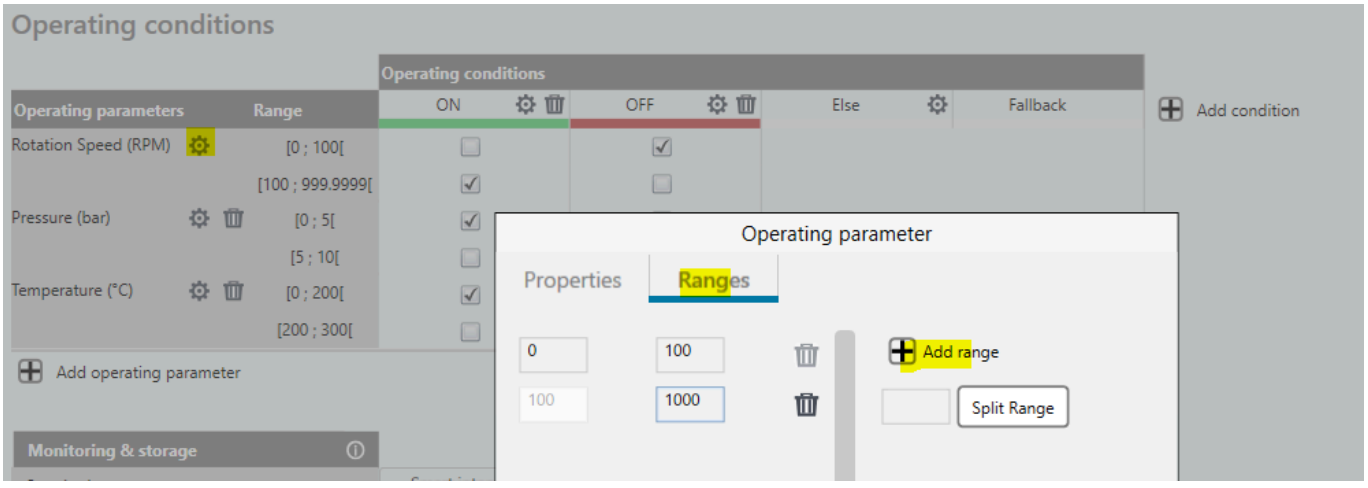
5.3.3.3.3 Input types of parameter

Operating parameters can be reached from the following input types:

		Operating parameter				
Input type	**Properties**	**Logical**	**Rotation speed**	**Smart ON/OFF**	**Temperature**	**Other**
External Input (Modbus)	○ Input Unit: depending of operating parameter type ▪ For rotation speed: {Hz; RPM} ▪ For temperature and/or Other: <enter a label text>	-	-	-	X	X

5.3.3.3.4 Ranges of parameter

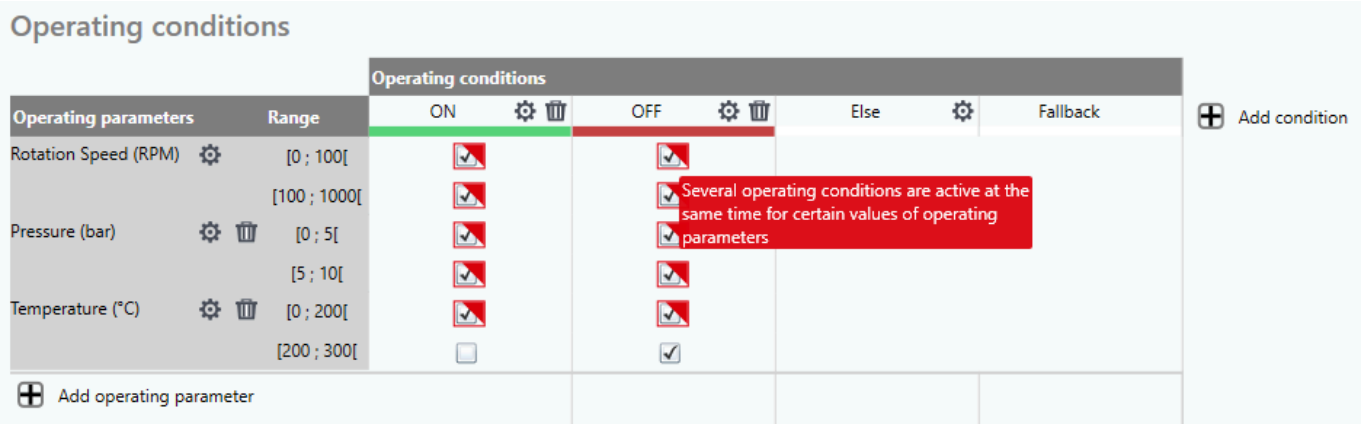
Identification of operating conditions requires definition of corresponding value ranges for each machine operating parameter – ex: see below an example of a primary mill where “Power (kW)” operating parameter (Other) is used to identify “High”, “Med” and “Low” operarting condition according to its value range



IMPORTANT

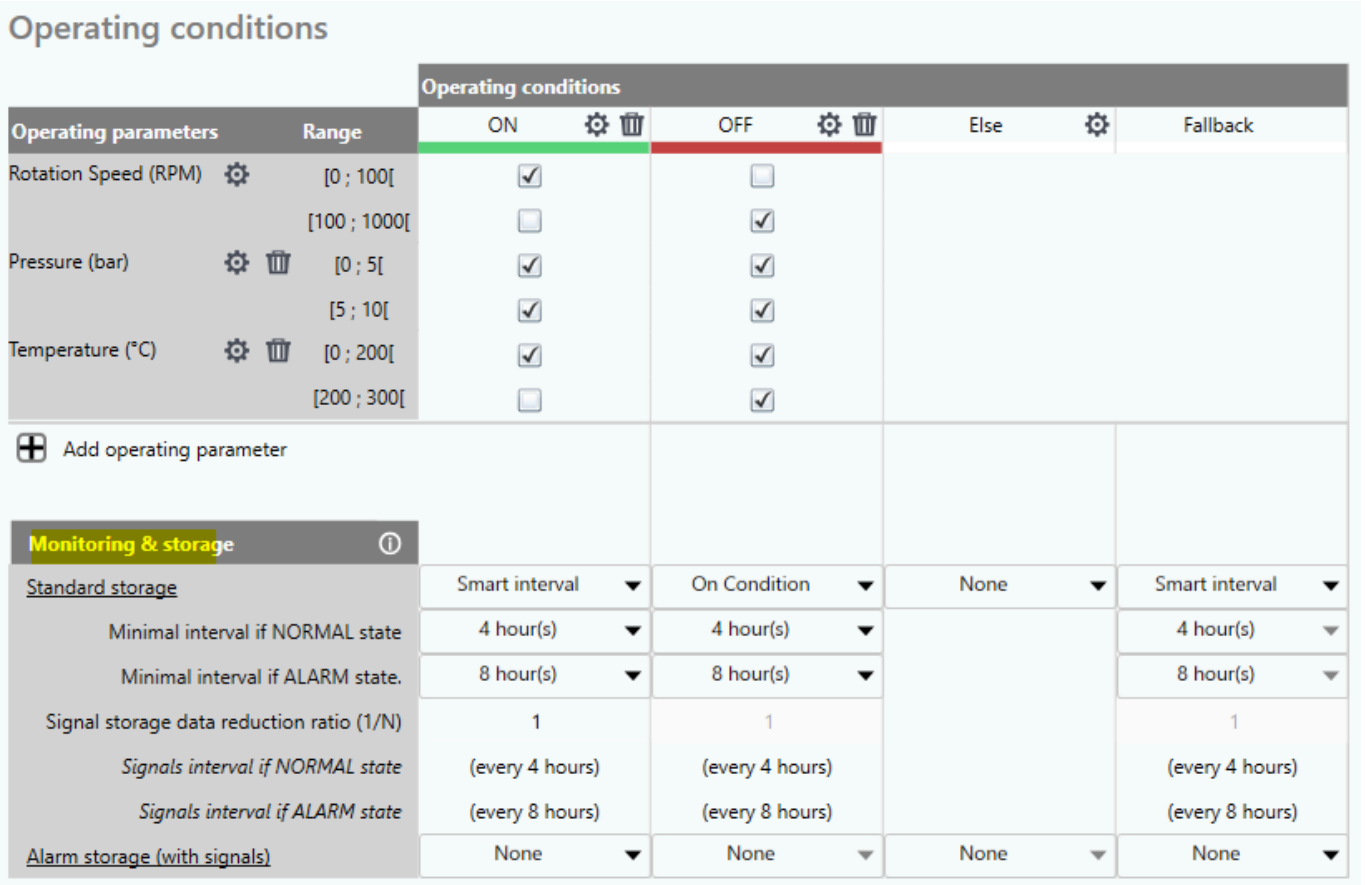
- It is essential that each operating condition be unambiguously identified by the operating parameters and associated value ranges.

- There should be no overlap between different conditions. These overlaps are detected in the configuration screen and the fields to be modified are indicated in red:



5.3.3.3.5 Monitoring strategy

Monitoring strategy must be defined for all declared operating condition of the machine.



Rules for storing measurements:

EAGLE is able to continuously monitor all machine operating parameters but only relevant measurements should be stored into the NESTi4.0 database in order to optimize sensor battery consumption.

To do this, several settings are possible in order to choose the data to be stored for each operating condition of each machine:

Standard Storage	• **Smart interval**: As long as the condition is true, measurements are stored at the storage interval. When the condition is no longer true, then storage is suspended for at least the duration of the specified interval and storage will resume as soon as the condition is valid again. • **On Condition**: Measurements are stored at each occurrence of a condition up to a limit of one per specified interval. IMPORTANT: The time between two successive storage for the same condition is never less than the entered "storage interval"
Minimal interval if NORMAL state	Minimum time between 2 stored measurements for the same condition when machine alarm status is OK (based on instrument measurements). Storage interval is defined in days, hours or minutes. NOTE: • For **"fallback" condition,** the storage interval value is forced to the smallest storage interval of other machine operating conditions
Minimal interval if ALARM state	Minimum time between 2 stored measurement for the same condition when machine alarm status is ALARM or DANGER (based on instrument measurements). Storage interval is defined in days, hours or minutes. NOTE: • For **"fallback" condition,** the storage interval value is forced to the smallest storage interval of other machine operating conditions • preALARM status is not managed by MVX because based only on post processed parameters. So this alarm is not considered for the minimal interval of storage when machine is in alarm
Signal storage data reduction (1/N)	Spectra and/or time wave are stored once on N into database where N is the storage interval.
Signal interval if NORMAL state	This interval is calculated automatically and shows the storage periodicity of signals (spectra and time wave) when machine alarm status is OK.
Signal interval if ALARM state	This interval is calculated automatically and shows the storage periodicity of signals (spectra and time wave) when machine alarm status is ALARM or DANGER.
Alarm storage (with signals)	Used to trigger storage on a change of alarm state of a machine parameter • **None**: None measurement is stored when alarm occurs

- **Aggravating (default)**: An additional measurement is triggered and stored as soon as an aggravating alarm status change has been detected into a periodic measurement set.

CAUTION

- The use of wireless expanders allows reaching remote sensors but also divides the bandwidth between all the sensors connected behind it.
- This can quickly create bottlenecks on the wireless network especially with too short periodicities that can be the cause of missing data. Overalls monitoring periodicity also cannot be higher than the maximum signal transfer time required for your whole machine, or this can also be the cause of missing data.
- You need to ensure that the wireless network topology can support your measurements and periodicity setup. Please refer to EAGLE user manual for more information.
- IMPORTANT: Modbus parameter must be previously declared into the Eagle gateway web page before to be used within Nesti4 – see Eagle gateway User's Guide

5.3.3.4 MVX

The NESTi4.0 / MVX system makes it possible to ensure real-time monitoring of the machines and to automatically adapt the vibration measurements to be made, post-processing and alarm thresholds for each of the different **operating conditions** of the machine - eg: " HIGH ","" MED ","" LOW "for a wind turbine.

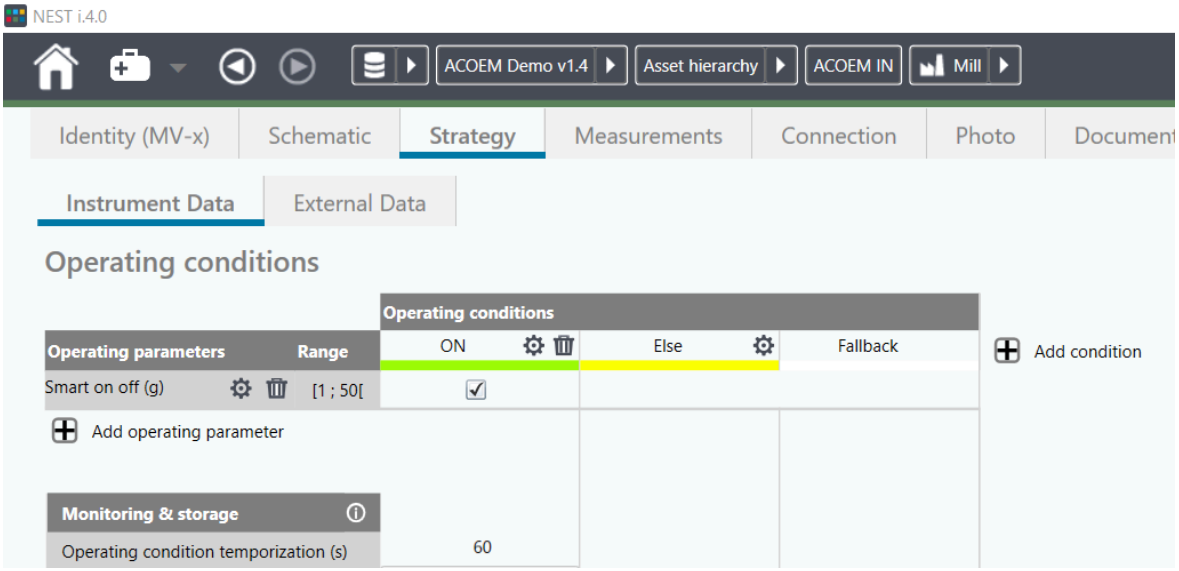
Machine operating conditions are defined by one or more **operating parameters**, for which **ranges of values** must be assigned for each condition.

Operating parameters are retrieved either from MVX measurement channels or from external systems (PLCs, etc.) via Modbus TCP or OPC UA interfaces.

5.3.3.4.1 Operating conditions

By default, a machine has no specific operating condition but it is possible to declare manually up to 20 conditions per machine.

Operating conditions are identified by a set of operating parameters whose measurements are within certain ranges of predefined values.



Operating parameters are continuously evaluated by MVX and their values compared to ranges previously defined for each condition - e.g. a wind turbine is in "HIGH" condition if the speed of rotation between 29 and 31 Hz and if the power is between 1300 and 2500 kW.

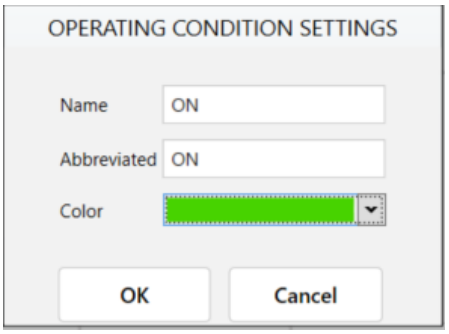
Each operating condition contains:

- A list of measurements to be made
- A set of alarm thresholds to be applied for each monitored parameter

When at least one specific condition exists for a machine, then two other operating conditions are automatically created:

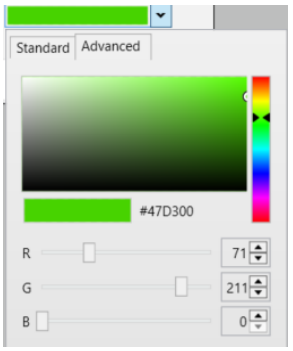
- **ELSE** condition is applied when no other existing condition can be applied for the machine
- **FALLBACK** condition is applied as soon as an operating parameter is not available – ie: sensor defect, unreachable Modbus or OPC parameter … This condition name and color are fixed.

Each condition can be defined with the following information:



In order to provide optimal identification in the various Nesti4 displays, each operating condition is identified by:

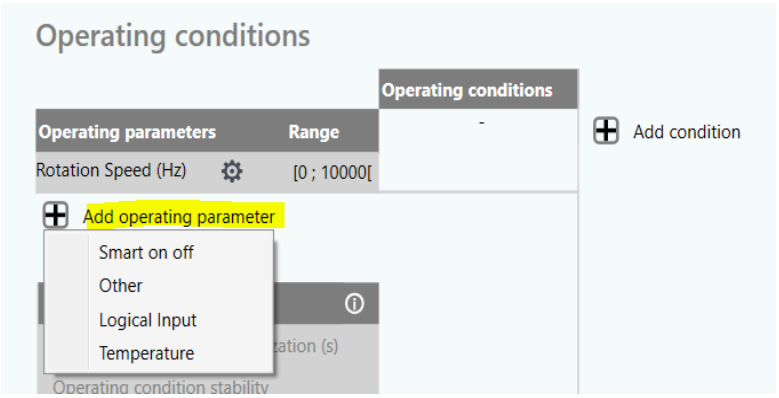
Name	Name of the condition
Abbreviate	Short name of the condition (displayed into SETUP panel)
Color	Select a color from a peaker



5.3.3.4.2 Operating parameters

It is possible to create up to 6 operating parameters per machine:

Parameter type	Max./machine	Description
Rotation speed	1	Automatically created for variable speed machine only. This parameter reads or measures the rotation speed of the machine from many input types
Smart ON/OFF	2	This parameter is based on a 2-20000 HZ RMS overall level (real-time) and evaluate is the machine is running or not
Temperature		Any temperature process values
Other		Any other process values (all but temperature) – ex: flow, pressure, loads …
Logical Input	3	Any boolean value – ex: (On / Off, Open / closed ...) measured from the logic inputs of the instrument



5.3.3.4.3 Input types of parameter

Operating parameters can be reached from the following input types:

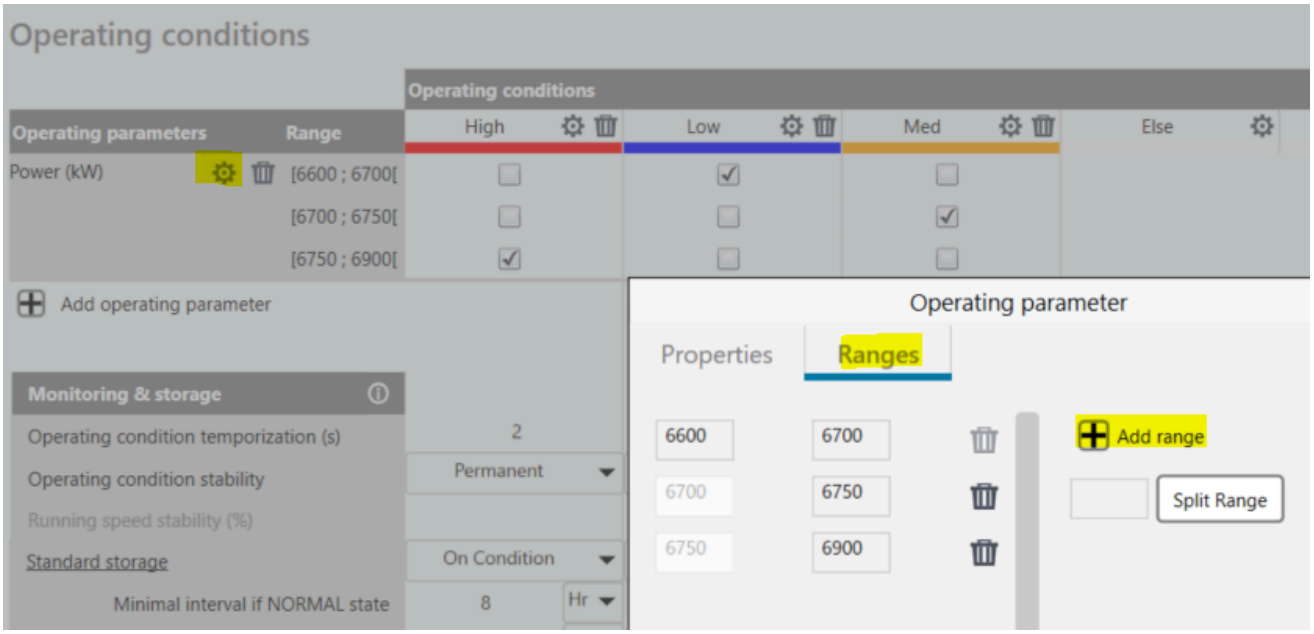
	Operating parameter

Input type	Properties	Logical	Rotation Speed	Smart ON/OFF	Temperature	Other
Tachometer	○ Trigger slope: {+; -} ○ High trigger threshold (V): value entered in volts ○ Low trigger threshold (V): value entered in volts ○ Number of tops per round ○ Minimum frequency below which the machine is considered stopped: value entered in the speed unit chosen in the machine kinematics tab – 0.001Hz ≤ value ≤ 5Hz (default value is 0.2Hz)	-	X	-	-	-
Acceleration IEPE	○ Sensor sensitivity in mV/g	-	-	X	-	-
Acceleration AC	○ Sensor sensitivity in mV/g	-	-	X	-	-
Vib Vel IEPE	○ Sensor sensitivity in mV/mm/s	-	-	X	-	-
Vib Vel AC	○ Sensor sensitivity in mV/mm/s	-	-	X	-	-
Displacement AC	○ Sensor sensitivity in mV/µm	-	-	X	-	-
DC input	○ Unit: depending of operating parameter type ▪ For rotation speed: {Hz; RPM} ▪ For temperature and/or Other: <enter a label text> ○ Sensor sensitivity: value entered in mV/sensor unit ○ Sensor offset: value entered in sensor units ○ High Pass Filter: {without; 2Hz, 10Hz, 3kHz} ○ Low Pass Filter: {300Hz, 1kHz, 2kHz, 3kHz, 20kHz, 40kHz } ○ Detection: {Off; RMS; PP Eq; PP True; P Eq; P True } ○ Measurement duration: value entered in seconds	-	-	-	X	X

4-20mA DC input	○ Unit: depending of operating parameter type ▪ For rotation speed: {Hz; RPM} ▪ For temperature and/or Other: <enter a label text> ○ Physical value for 4 mA: value entered in sensor unit ○ Physical value for 20 mA: value entered in sensor unit	-	-	-	X	X
Logical input	○ Logical state 0 label: <enter a label text> ○ Logical state 1 label: <enter a label text>	X	X	-	-	-
MVx External Input (Modbus)	○ Unit: depending of operating parameter type ▪ For rotation speed: {Hz; RPM} ▪ For temperature and/or Other: <enter a label text>	-	-	-	X	X
OPC UA input (through Nest)	○ Unit: depending of operating parameter type ▪ For rotation speed: {Hz; RPM} ▪ For temperature and/or Other: <enter a label text> NOTE: The expected value in this parameter should be written by an external OPC UA client directly into the OPC UA server of NESTi4	-	-	-	X	X

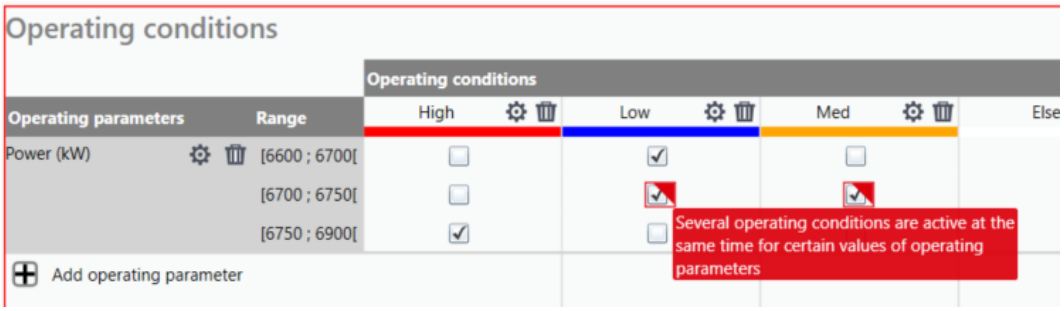
5.3.3.4.4 Ranges of parameter

Identification of operating conditions requires definition of corresponding value ranges for each machine operating parameter – ex: see below an example of a primary mill where “Power (kW)” operating parameter (Other) is used to identify “High”, “Med” and “Low” operating condition according to its value range



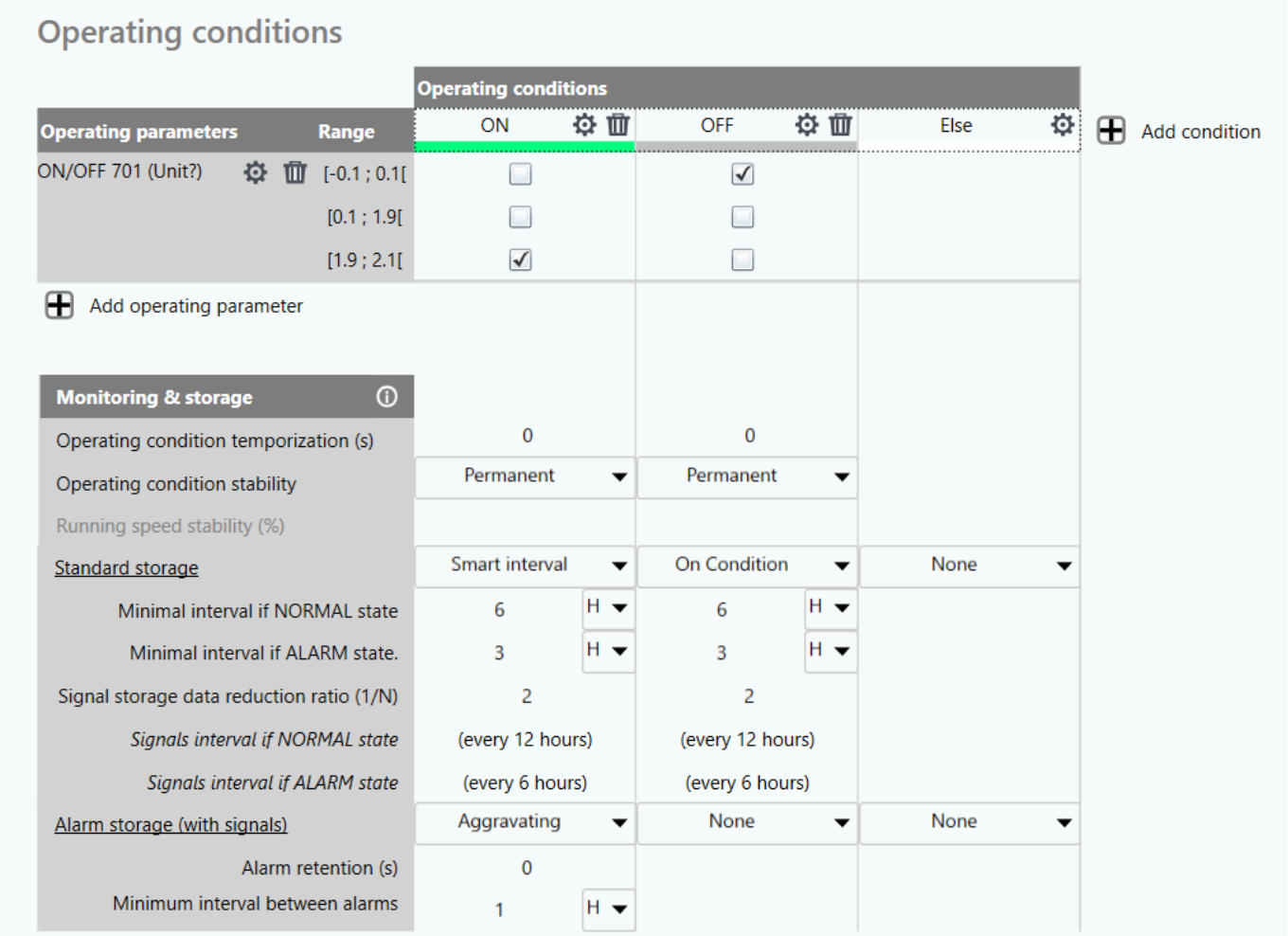
IMPORTANT

- It is essential that each operating condition be unambiguously identified by the operating parameters and associated value ranges.
- There should be no overlap between different conditions. These overlaps are detected in the configuration screen and the fields to be modified are indicated in red:



5.3.3.4.5 Monitoring strategy

Monitoring strategy must be defined for all declared operating conditions of the machine.



Stability of an operating condition:

3 possible settings to decide whether a measurement should be kept or not depending on the stability of the condition:

Operating Condition temporization (sec)	Waiting time between the occurrence of the condition and the start of monitoring. It is a way to avoid transient phases
Operating Condition Stability	Defines whether or not the condition should be maintained for the duration of the acquisition • **Permanent**: the storage will not be done if the condition disappears during the acquisition. • **Not permanent**: the storage is done even if the condition disappears during the acquisition.
Running speed stability (%)	Only for machines with variable rotational speed. This value is the percentage of variation of the rotational speed tolerated during the measurement. If% RPM = 0, then the speed stability is not checked and the measurement is retained regardless of the speed variation.

Rules for storing measurements:

MVX is able to continuously monitor all machine operating and monitoring parameters (including alarms) but only relevant measurements should be stored in the NESTi4.0 database in order to optimize database size and global performance.

To do this, several settings are possible in order to choose the data to be stored for each operating condition of each machine:

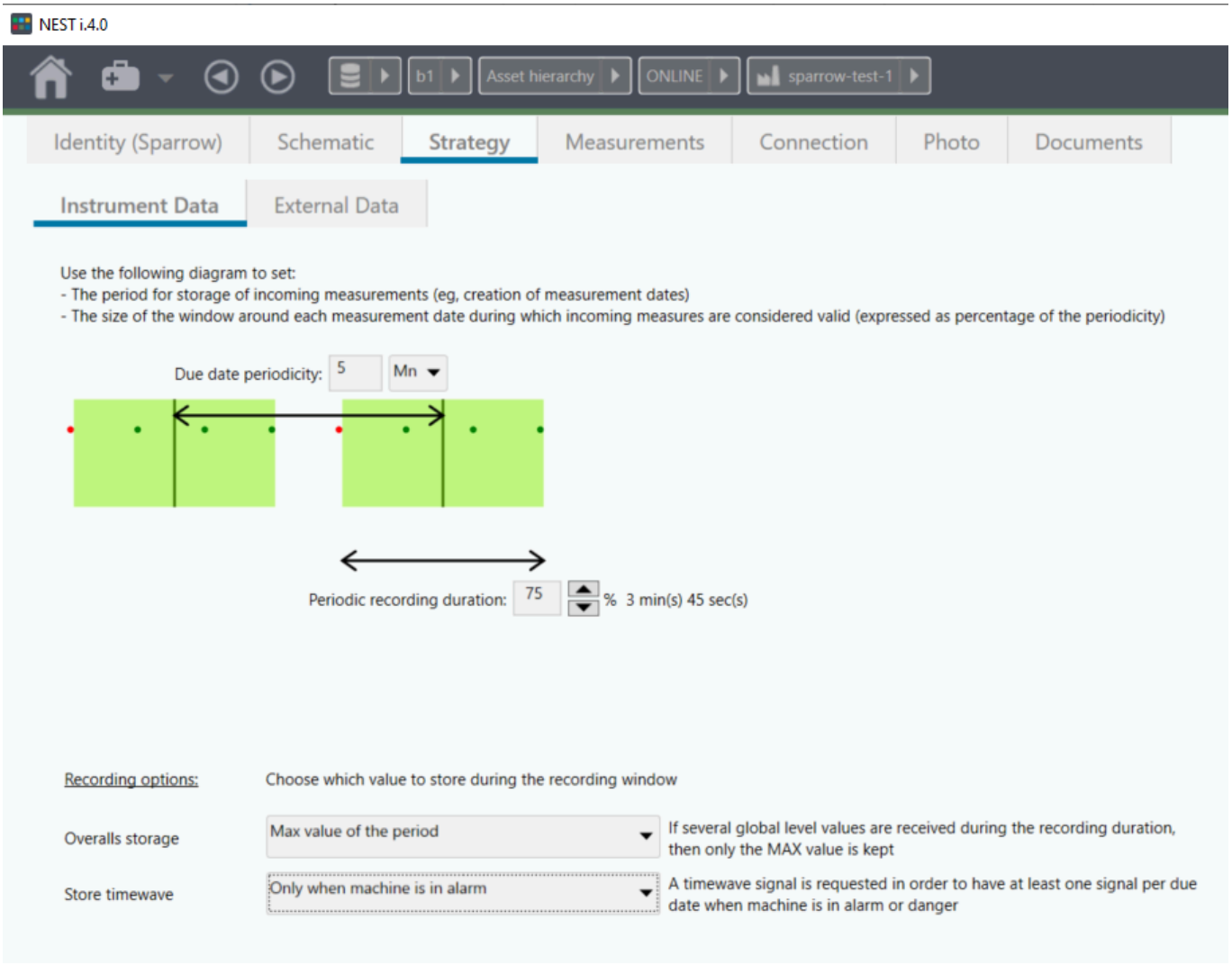
Standard Storage	• **None**: no standard storage for this condition • **Smart interval**: As long as the condition is true, measurements are stored at the storage interval. When the condition is no longer true, then storage is suspended for at least the duration of the specified interval and storage will resume as soon as the condition is valid again. • **On Condition**: Measurements are stored at each occurrence of a condition up to a limit of one per specified interval. IMPORTANT: The time between two successive storage for the same condition is never less than the entered “storage interval”
Minimal interval if NORMAL state	Minimum time between 2 stored measurements for the same condition when machine alarm status is OK (based on instrument measurements). Storage interval is defined in days, hours or minutes. NOTE: • For **“fallback” condition,** the storage interval value is forced to the smallest storage interval of other machine operating conditions
Minimal interval if ALARM state	Minimum time between 2 stored measurements for the same condition when machine alarm status is ALARM or DANGER (based on instrument measurements). Storage interval is defined in days, hours or minutes. NOTE: • For **“fallback” condition,** the storage interval value is forced to the smallest storage interval of other machine operating conditions • preALARM status is not managed by MVX because it is based only on post processed parameters. So this alarm is not considered for the minimal interval of storage when machine is in alarm
Signal storage data reduction (1/N)	Spectra and/or time waves are stored once on N into a database where N is the storage interval.
Signal interval if NORMAL state	This interval is calculated automatically and shows the storage periodicity of signals (spectra and time wave) when machine alarm status is OK.
Signal interval if ALARM state	This interval is calculated automatically and shows the storage periodicity of signals (spectra and time wave) when machine alarm status is ALARM or DANGER.
Alarm storage (with signals)	Used to trigger storage on a change of alarm state of a machine parameter • **None**: None measurement is stored when alarm occurs

	• **Aggravating (default)**: A new measurement is stored as soon as an aggravating alarm status change has occurred on at least one of existing parameters (hard) of the machine • **All alarms**: A new measurement is stored as soon as any alarm status change has occurred on at least one of existing parameters (hard) of the machine
Alarm retention (sec)	Only if alarm storage is active. This function aims to avoid nuisance alarms related to noise or transient phenomena (e.g. related to the start of a nearby machine). It consists of validating an aggravating alarm state only if it is confirmed after the specified time. If the fault disappears beforehand, no storage will be carried out. The effective value of this time will not be less than the measuring cycle of the device, which depends on the programmed parameters and signals.
Minimum interval between alarms	Minimum time between 2 stored measurements on alarm change. This setting is used only when **Alarm storage (with signals)** has been activated.

5.3.3.5 SPARROW

Concept

- Unlike other ACOEM acquisition systems, Sparrow distinguishes the acquisition strategy from the storage strategy.
- The acquisition strategy must be defined for each sensor directly in the web page of the Sparrow gateway.
- The storage strategy remains to be defined for each machine in NESTi4 via the SETUP module.
- NESTi4 receives the data streams from all Sparrow sensors corresponding to their acquisition strategy and all data (global and temporal levels) must be stored according to a schedule of control dates corresponding to the storage strategy.
- Because each Sparrow sensor may have a different acquisition strategy from the other sensors (unlikely but can happen…), NESTi4 must be able to group all of this data and keep only 1 value per control date.
- In order to be able to do this data aggregation, the storage strategy must define a recording window around each control date. This recording window makes it possible to consider only the measurements received during this period and to apply to them decimation rules chosen by the user in order to conserve only the most valuable value.
- Data decimation rules are defined per machine in the storage strategy for each type of measurement (global level, temporal). They make it possible to keep only one value per measurement and per control date concerned (Min, Max, Avg, …).



Description :

Variables	Description
Due date period	Period between 2 control dates presented in the machine Analyst module • 1 to 999999999 minutes, hours or days
Periodic recording duration (%)	Time range centered on each control date during which NESTi4 stores the measurements received from the Gateway by applying the decimation rules on overalls and timewave measurements. This time range is entered in % of the due date period and the corresponding duration is displayed in brackets. NOTE: All measurements received outside this time range will be ignored by nesti4.

Overall storage	Decimation rules for overall measurements: • **Min value** - if several global level values are received during the recording duration, then only the MIN value is kept • **Max value** - if several global level values are received during the recording duration, then only the MAX value is kept • **Average value** - if several global level values are received during the recording duration, then only the AVG value is kept • **Keep the nearest value from the due date period** - if several global level values are received during the recording duration, then only the closed value of the due date is kept
Timewave storage	Decimation rules for time wave measurements: • **On each due date period** - A time wave signal is requested for each due date in order to have at least one signal per due date • **Only when machine is in alarm** - A time wave signal is requested in order to have at least one signal per due date when machine is in alarm or danger NOTE • If machine alarm state is not OK and if "Time storage" = "Only when machine is in alarm" then NESTi4 immediately requests a time measurement request to the Gateway for all the sensors associated with the machine • If several time wave have been received during the recording window, then only the one whose timestamp is closest to the control date is conserved

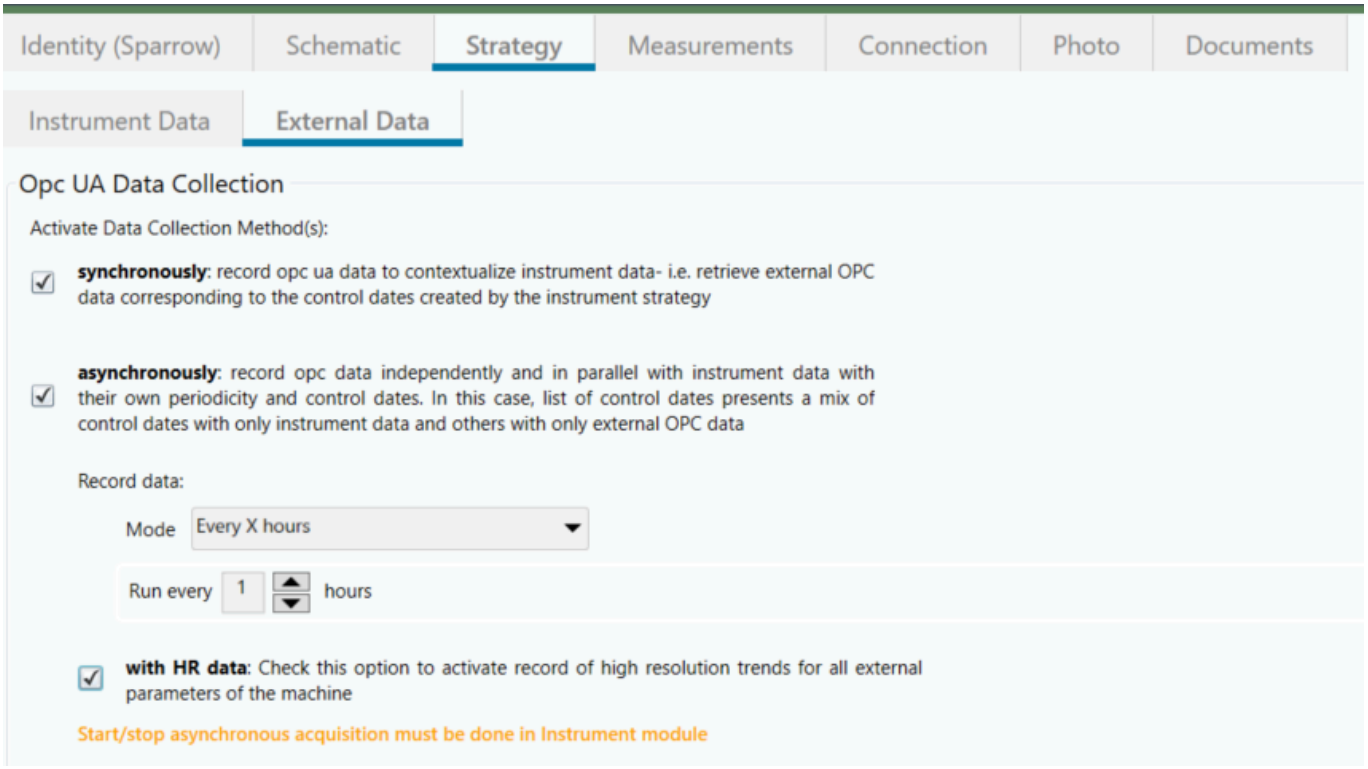
5.3.3.6 External Data (OPC UA)

Requires "interoperability (OPC, …)" license option.

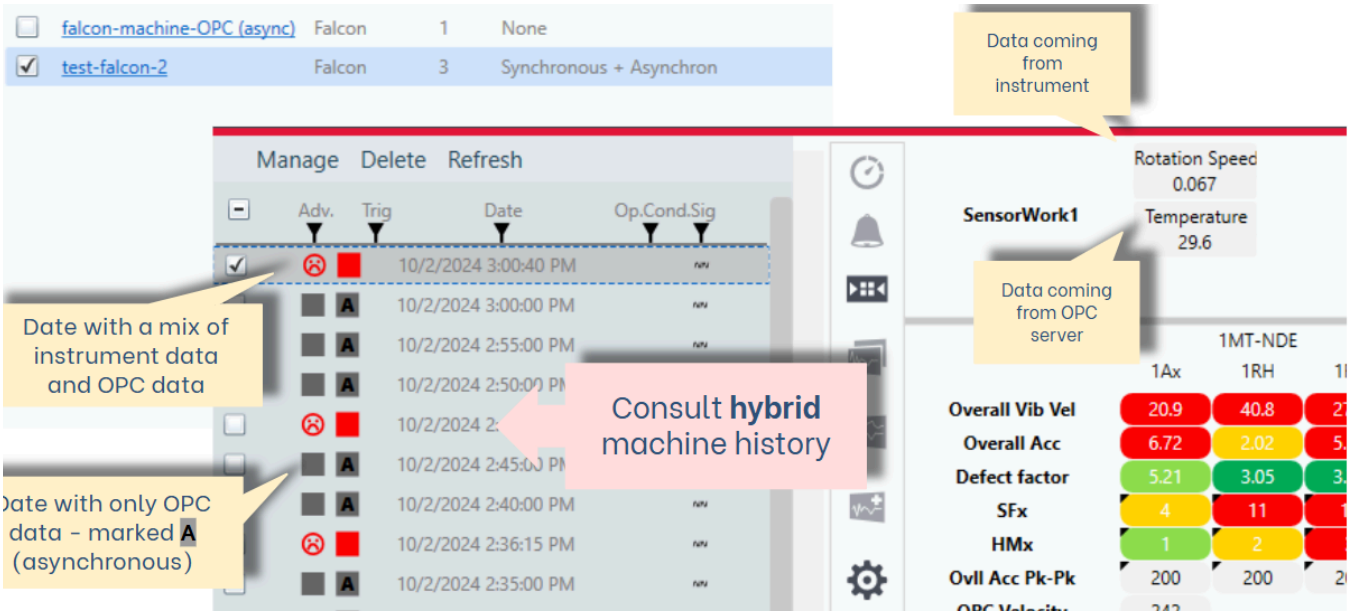
These additional monitoring strategy settings are available for all machine types (Falcon, Sparrow, Eagle, MVx, …) and allow you to define the recording mode for external data that can provide greater visibility into the machine's operating status.

External data can come from one or more OPC UA servers and can be recorded using two methods:

- **Synchronous mode**: External data is read only upon receipt of an instrument measurement (Falcon, Sparrow, Eagle, MVx) in order to contextualize this vibration measurement with selected external data. In this case, the number of machine monitoring dates remains controlled by the instrument strategy (Strategy \ Instrument data).
- **Asynchronous mode**: External data is read according to the recording period defined here and recorded in new dedicated monitoring dates. These monitoring dates are inserted into the machine history.



Both recording modes can be selected and thus create a **hybrid machine history** combining instrument data (Falcon, Sparrow, Eagle, MVx) and external data (OPC UA):



A **"HR data" (High Resolution)** option allows the periodic recording of external data to be enriched with any significant changes outside the dead band defined for each external parameter - example: records the value of this temperature every 15 minutes + all changes greater than +/- 5°C.

IMPORTANT:

- According the defined strategy, machine history contains only instrument data, only external data or both
- External OPC UA items cannot be used as operating parameter for operating condition detection

5.3.4 *Measurements tab*

This tab is used to define measurements to be done (parameters and signals) for each points (or bearing) declared into the machine “Schematic” tab.

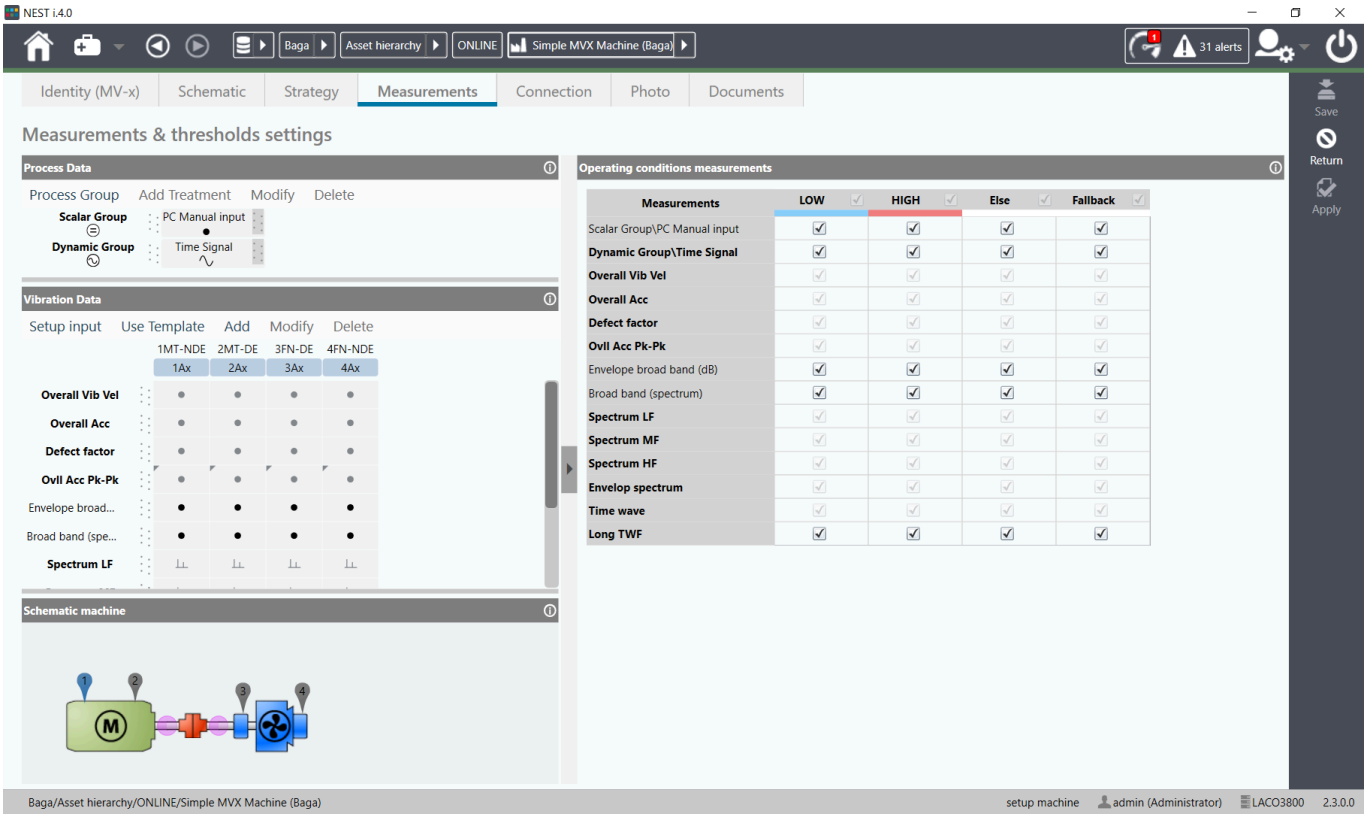
2 types of measurements exist:

- **Parameter** is a scalar value – ex: overalls, peak extraction, energy band calculation, …
- **Signal** is a vectorial value– ex: spectrum, time signal, envelope, …

2 categories of measurement exist:

- **Hard** measurement are elaborated by acquisition device (FALCON, EAGLE or MVX)
- **Soft** measurement are elaborated by NESTi4 as post-processing and based on hard measurements

Interface description:



The interface is split in 4 areas:

- **Process data**
- **Vibration data**
  - Each line of the matrix can be:
    - a measured parameter (Hard parameter displayed in bold characters)
    - a processed parameter (Soft parameter displayed in normal characters)
    - a measured signal: spectrum, envelope, time wave (displayed in bold characters)
  - Each column is a point linked to machine kinematic (point = direction of measurement on a bearing location)
- **Machine schematic**. It works in interaction with the other area to select a location and to show the selected point (and vice-et-versa)
- **Operating conditions measurements** to define which measurement to do per operating condition of the machine

5.3.4.1 Process data

Only for FALCON, MVX and EAGLE machines

This information corresponds to all the process measurements monitored at the same time as the vibration levels on the machine. It can be temperature, pressure, flow ... or any other information

allowing contextualization of measured vibration levels of the equipment in order to identify any correlations between them.

Process parameters can have absolute alarm thresholds. Measurement can be triggered when alarm occurs on a hard parameter – ie: parameter measured by acquisition device. Parameter alarm status is presented into the machine health matrix and used to elaborate global machine alarm status.

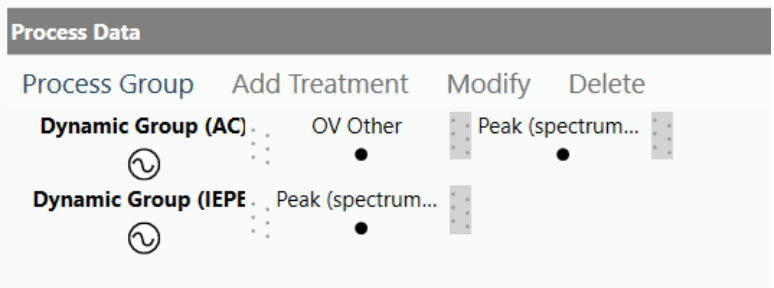
Process parameters are organized by groups in order to facilitate measurement and readability - ex: Pressure measurement group, Group of data collected in a control room …

For FALCON, a group corresponds to a measuring point.

Two types of process group can be used according to the measurement input type:

- **Scalar group (DC)**
- **Dynamic group (AC)**

List of process measurements is presented as the following and new treatment can be added into any declared process group:



5.3.4.1.1 Static data (DC)

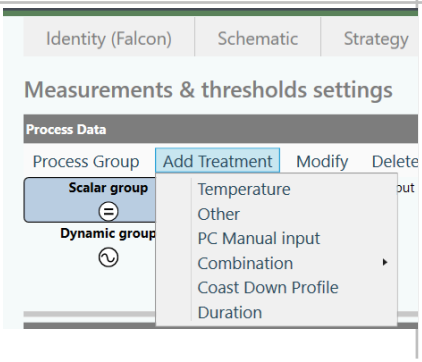
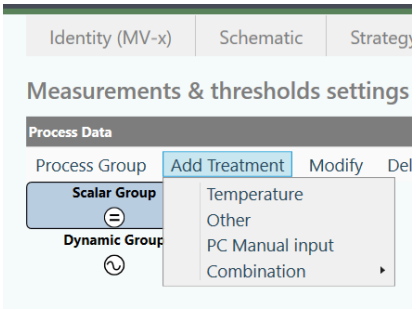
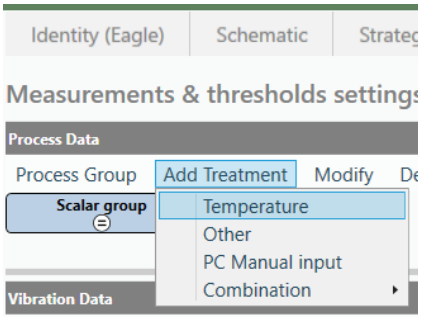
Only for FALCON, SPARROW, EAGLE and MVX machines

Scalar group (DC) where the parameters are measured from a static or pseudo-static input - ex: direct voltage (IEPE or not), from a 4-20mA input, from an external digital input (Modbus or OPC UA) or direct keyboard entry ...

Properties	Descriptions
Short name, Name	Enter a name for the group

List of possible measurements for this group depends on the used acquisition device

FALCON	MVX	EAGLE

• Temperature • Other • PC Manual input • Combination (arithmetic & logical) • Coast Down Profile • Duration	• Temperature • Other • PC Manual input • Combination (arithmetic & logical)	• Temperature • Other • PC Manual input • Combination (arithmetic & logical)
		

Detailed measurements settings are depending on the used acquisition device - see §. References

- FALCON
- EAGLE
- SPARROW
- MVX

5.3.4.1.2 Dynamic data (AC)

Only for FALCON, MVX machines

Dynamic group (AC) where the parameters are measured from a dynamic input - example: spectra and time measurement on an electric current channel …

Properties	Descriptions
Short name, Name	Enter a name for the group
Unit name	Enter a unit label
Input type	Choose a value: • IEPE (sensor is powered) • AC (the sensor is not powered) • Sensitivity (in mV / unit)
Sensor sensitivity	Enter a value in mV/input unit of the used sensor

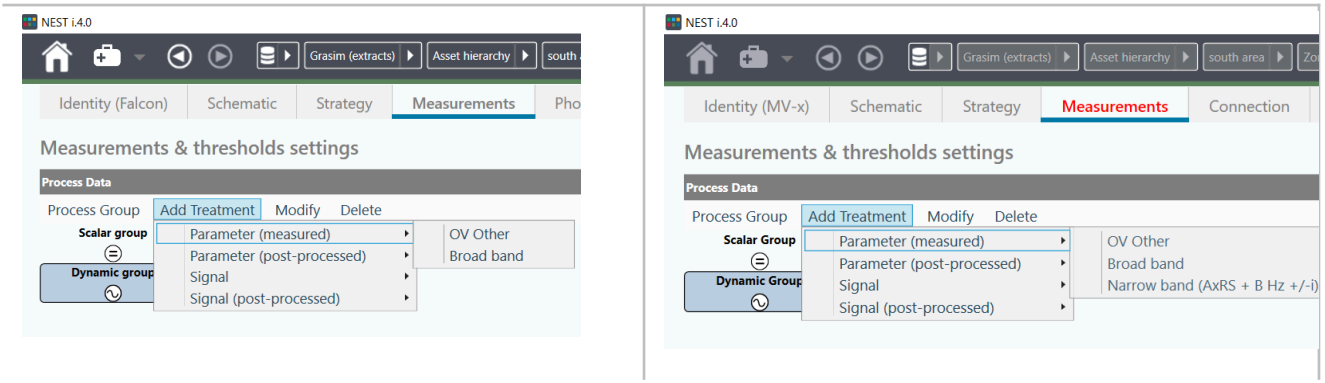
List of possible measurements for this group depends on the used acquisition device (FALCON or MVX) :

FALCON

- Parameter (measured)
  - OV Other
  - Broad band
- Parameter (post-processed)
  - Peak (spectrum : AxRS+B Hz+/-i)
  - Broad band (spectrum)
  - Kurtosis (time wave)
  - Vector extraction (AxRS)
  - Combination
    - aP+b
    - P1-P2
    - Sum
    - Quadratic Difference
    - Quadratic Sum
    - Multiplication
    - P1/P2
    - And
    - Or
- Signal
  - Spectrum
  - Envelop spectrum
  - Phased spectrum
  - Time signal
  - Synchronous time wave
- Signal (post-processed)
  - Time signal filtering

MVX

- Parameter (measured)
  - OV Other
  - Broad band
  - Narrown band (AxRS+B Hz+/-i)
- Parameter (post-processed)
  - Peak (spectrum : AxRS+B Hz+/-i)
  - Broad band (spectrum)
  - Kurtosis (time wave)
  - Vector extraction (AxRS)
  - Combination
    - aP+b
    - P1-P2
    - Sum
    - Quadratic Difference
    - Quadratic Sum
    - Multiplication
    - P1/P2
    - And
    - Or
- Signal
  - Spectrum
  - Envelop spectrum
  - Phased spectrum
  - Time signal
  - Synchronous time wave
- Signal (post-processed)
  - Time signal filtering



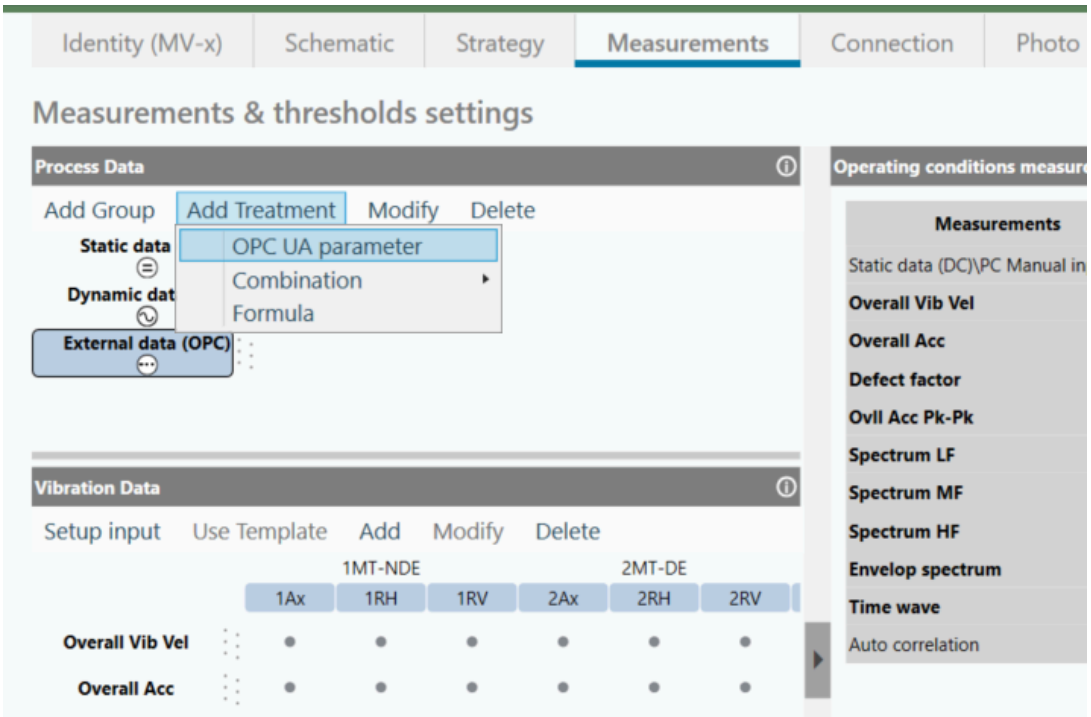
Detailed measurements settings are depending on the used acquisition device - see §. References

- FALCON
- MVX

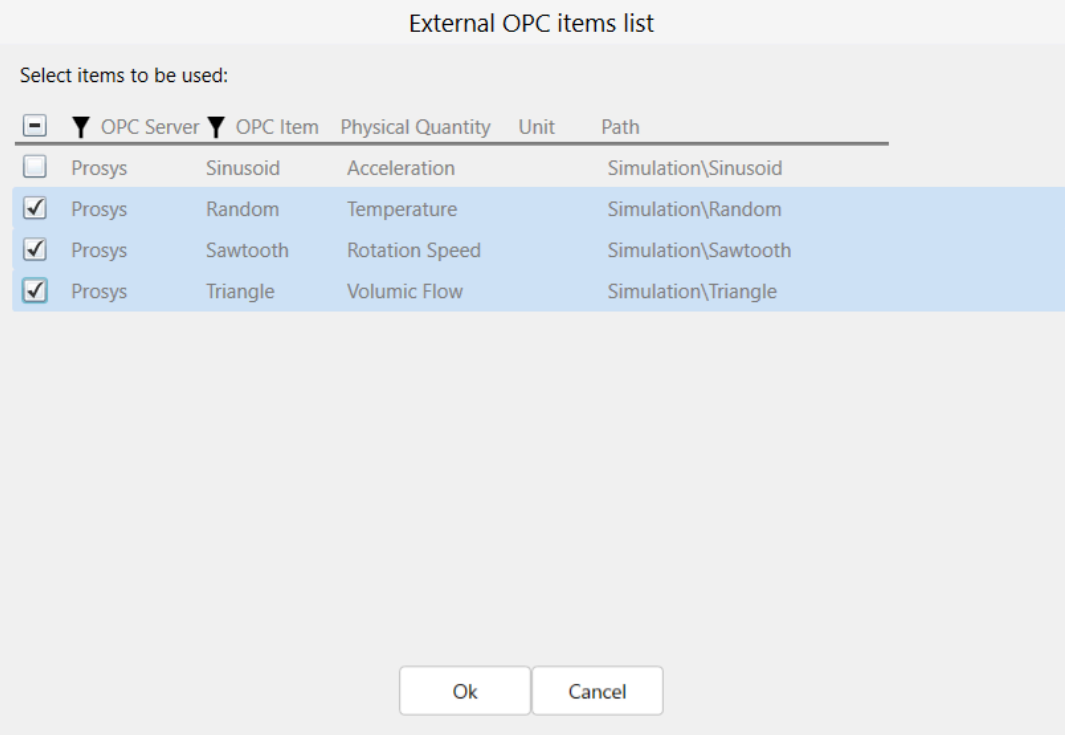
5.3.4.1.3 External data (OPC)

Requires “interoperability (OPC UA, …)” license option. Available for all machines.

This data group allows you to select a list of OPC UA items from those previously selected in the Instrument module. These measurements should be chosen to contextualize vibration measurements performed with ACOEM measuring instruments (Falcon, Sparrow, Eagle, MVx) or simply to monitor the machine context.



Click on “Add treatment \ OPC UA parameter” to open the list of subscribed items from Instrument module and select ones to be added into the group:



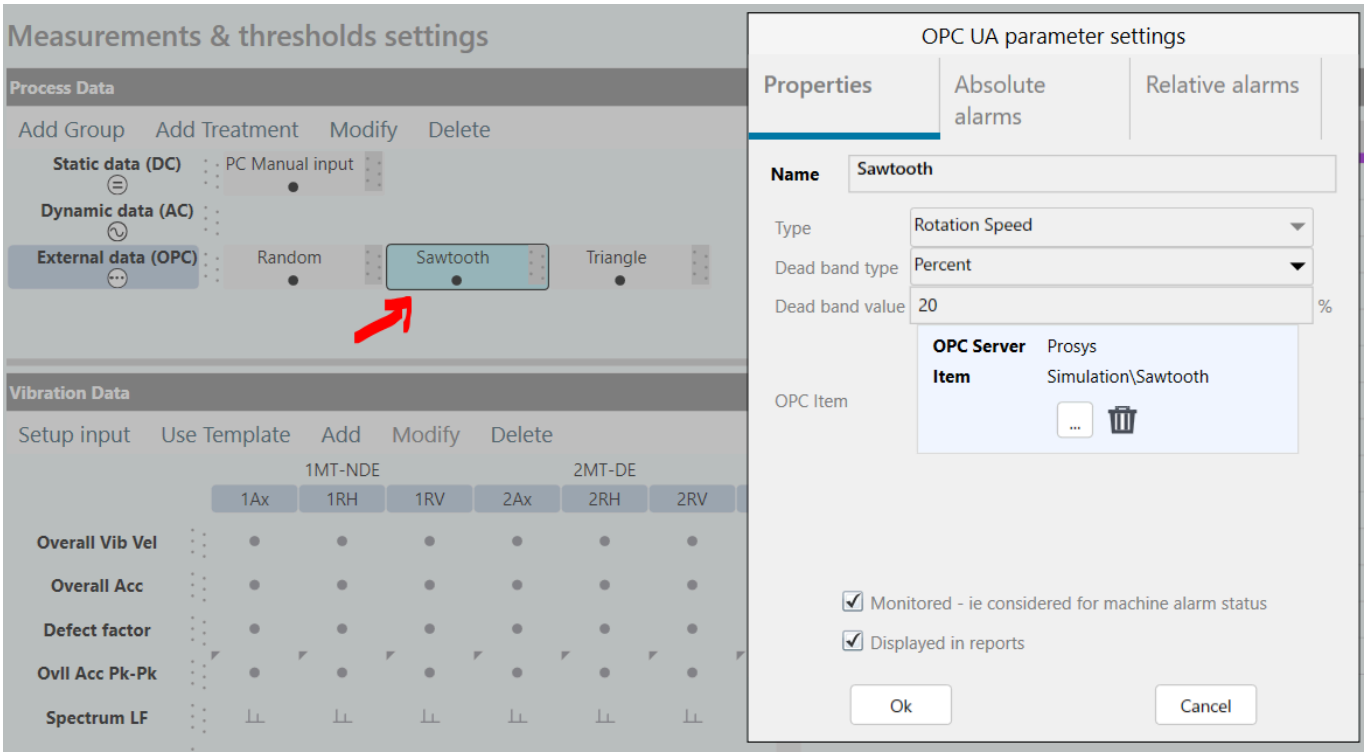
List description:

- **OPC server** shows OPC UA server name
- **OPC item** shows OPC UA items name
- **Physical Quantity** shows the physical category of the item for automatic unit management.
- **Unit** shows unit label of OPC UA item (if not automatically managed by nesti4)
- **Path** show the OPC UA item’s parent hierarchy inside the OPC UA server

Compatible data types & units:

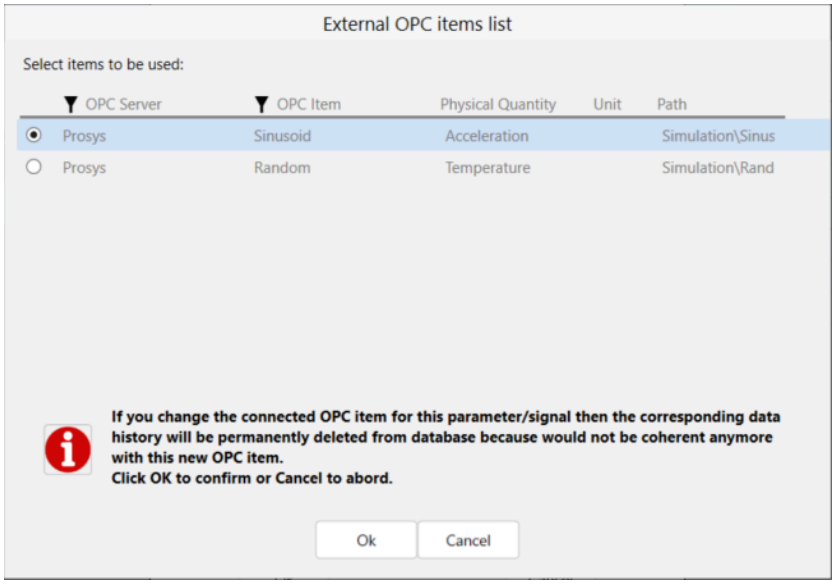
	Data type	**Physical unit**
Parameter	Int16, Int32, Int64,UInt16, UInt32, UInt64, Double, Byte	Automatically read from EngineeringUnits attribute of tag or enter manually (list of values managed by NESTi4) if it does not exist. “Other” unit labels are possible.

When items have been selected then corresponding parameters are automatically created into the group and mapped with OPC item ; no need to switch into “Connection” tab to define “parameter – item” mapping:



At this moment, parameter properties can be edited:

- **Name:** OPC item name by default
- **Dead band**: setting required for "high-resolution" recording of OPC items. It allows you to define the variation range within which the value change is considered insignificant and will therefore not be recorded.
    - **Type**: method for evaluating the change
        - **None** – no dead band; all change of value is recorded – 1/sec maxi.
        - **Percent** – deadband is defined as a percentage - e.g., ±20%, meaning that the new reading value is only recorded if it changes by +/-20% compared to the previous recorded value.
        - **Absolute** – deadband is defined as an absolute value - e.g., ±0.25, meaning that the new reading value is only recorded if it changes by +/-0.25 compared to the previous recorded value.
    - **Value** : Percentage or absolute value used by the deadband algorithm - e.g., 20% or 0.25.
- **OPC item**
    - **OPC server** – present the source OPC UA server name
    - **Item** – present the source OPC item fullname – e.g., Path + Name
    - […] – click on this button to select another OPC UA item **** Caution: If the linked OPC item is replaced by another one, then the parameter's history will be reset to ensure consistency with the newly selected OPC item.*



- 🗑️ – click on this button to unlink this parameter from the OPC UA item **** Caution: If the OPC item linked to the parameter is unlinked, then the parameter's history will be conserved until another OPC item will be linked and will start a new history from scratch.*

IMPORTANT:

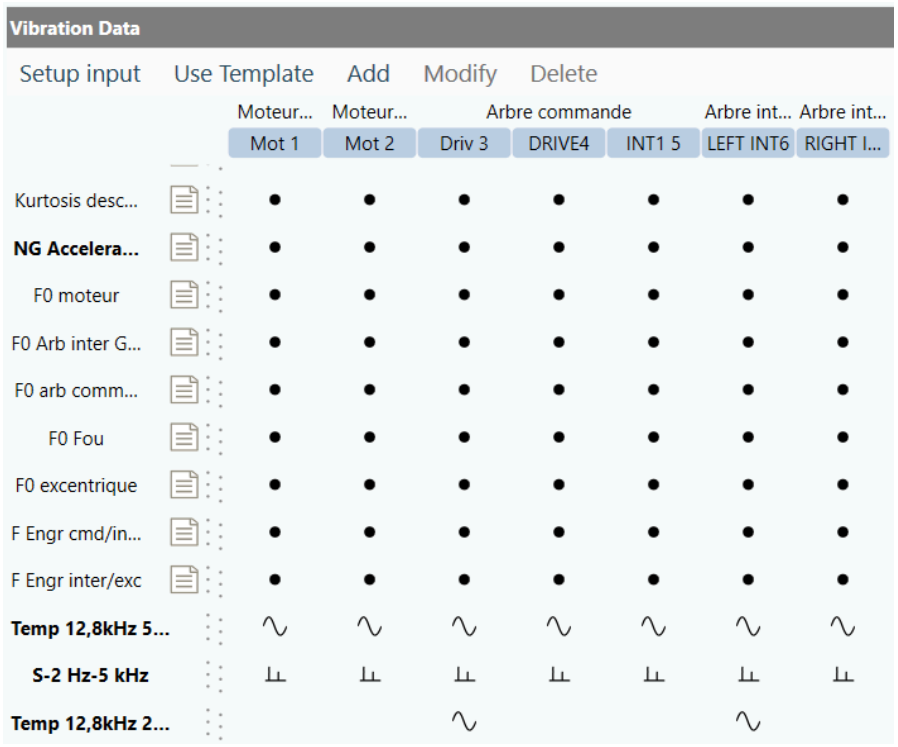
- These external OPC UA data are monitoring parameters (thresholds, alarms, etc.) but not operating parameters and they have no impact on the machine operating conditions management.
- The OPC UA server sends HR data every 1 second to the NESTi4 OPC UA client and the dead band algorithm decides to save or not this latest received value.

5.3.4.2 Vibration data

This information corresponds to all vibration measurements monitored on the machine. It can be acceleration, velocity, bearing defects, … Measurement can be simple parameters (overalls, peak, band, …) or signals (spectrum, time signal, envelope …). They can be measured by acquisition device or post-processed into NESTi4.

Vibration parameters can have absolute alarm thresholds. Measurement can be triggered when an alarm occurs on a hard parameter – i.e. parameter measured by acquisition device. Parameter alarm status is presented into the machine health matrix and used to elaborate global machine alarm status.

List of vibration measurements is presented as the following and new treatment can be added into any machine bearing or measurement point:



Bearings - ex: CA, COA - and measurement points – ex: RH, RV, RO - of the machine are presented in columns and measurements to be done are presented in lines.

Specific matrix functionalities:

- It is possible to make a multiple selection with the mouse and with ctrl or shift keys
- To duplicate a cell, just click on it and then click on the "+" displayed in the free cells
- To reorder a line, drag the sign and drop it on its new position
- Set the editing option in the analysis report:
  - : the parameter is always published in the analysis report
  - : the parameter can be hidden in the analysis report
- To rename a line, use the function ✎.

  Note: 2 lines cannot have the same name

- Contextual functions:

Setup input	**IMPORTANT:** This function is available only for FALCON and MVX **Input type**: select the item corresponding to the used sensor type. The list is: • Acceleration IEPE (sensor is power supplied) • Acceleration AC (no sensor power supply) • Vibration velocity IEPE (sensor is power supplied)

	● Vibration velocity AC (no sensor power supply) ● Displacement AC Notes: ● If measurements are already selected, it is not possible to change acceleration to velocity or displacement. ● Not accessible on multi-selection with different input types and measurements are already selected. **Sensitivity** (FALCON only): in mv/input unit according to the user unit preference.
Use template	One or several columns can be completed or fully programmed using another point as template. Notes: ● To be accessible, the template machine must be located in the “Templates” folder at the root of the database. It is possible to move any machine in the “Template” location using copy/paste or export/import functions. Templates to be imported are available on NESTi4.0 media. ● To be accessible, the template must be for the same type of instrument as the current machine and have the same type of input as the selected points.
Add	Add a parameter or a signal on selected columns
Modify	Modify the properties of the selected parameters or signals. Notes: ● The function is not accessible if several lines are selected. ● It is not possible to modify a parameter or a signal generated in Accurex mode (automatic diagnosis)
Delete	Delete selected parameters or signals Note: it is not possible to delete a parameter or signal generated in Accurex mode (Automatic diagnostic)

5.3.4.2.1 External data (OPC)

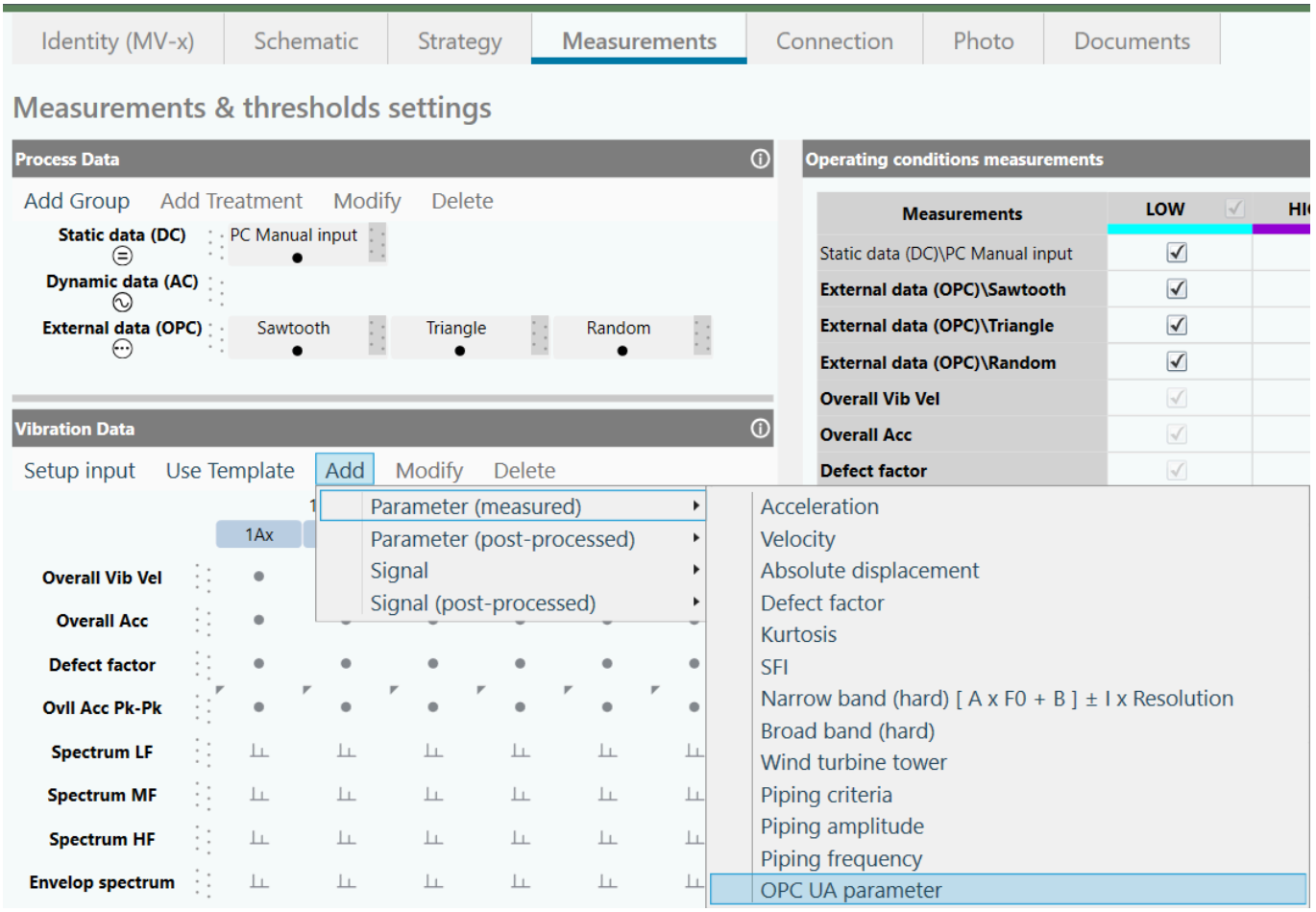
Requires “interoperability (OPC, …)” license option.

Following the same philosophy as for process data groups, it is possible to record external OPC data into the vibration data group. Here it is possible to retrieve scalar values but also time signals while respecting the data type limitations described below:

	Data type	**Physical unit**
Parameter	Int16, Int32, Int64,UInt16, UInt32, UInt64, Double, Byte	Automatically read from EngineeringUnits attribute of tag or entered manually (list

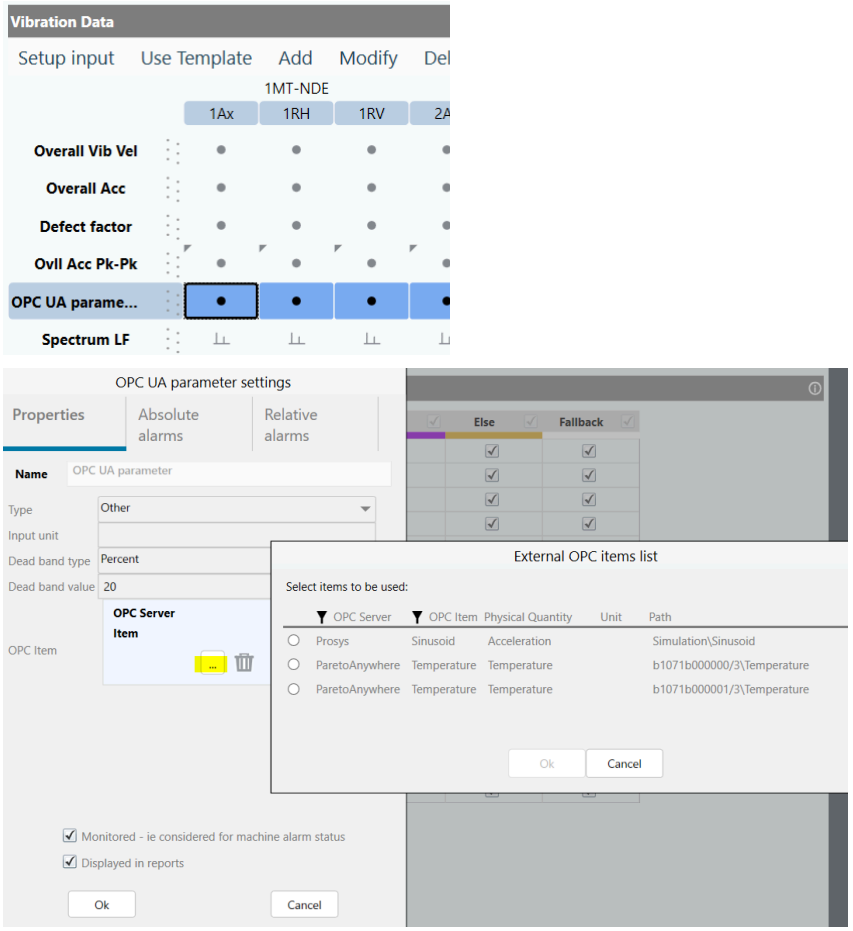
		of values managed by NESTi4) if does not exist. “Other” unit label is possible.
Signals	• Time signal ONLY • ArrayDimension: 1 • ArrayDataType: Double • XAxisDefinition: seconds, milliseconds, microseconds	Automatically read from EngineeringUnits attribute of tag or entered manually (list of values managed by NESTi4) if it does not exist. “Other” unit label is possible.

As with the process group, this external OPC UA data can be added regardless of the machine type (Falcon, Sparrow, Eagle, MVx) to enrich the list of vibration measurements from the acquisition systems or simply perform basic monitoring from one or more external OPC UA servers (without an acquisition system).



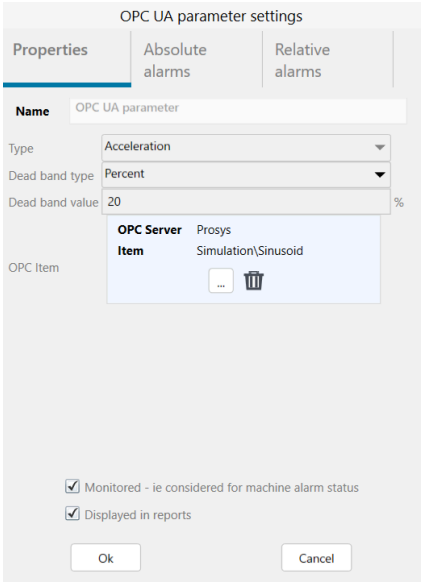
Add \ Parameter (measured) \ OPC UA parameter to add a new external parameter into machine points. Unlike the process group, OPC parameters must be defined in two steps – these operations must be repeated for each new OPC UA parameter

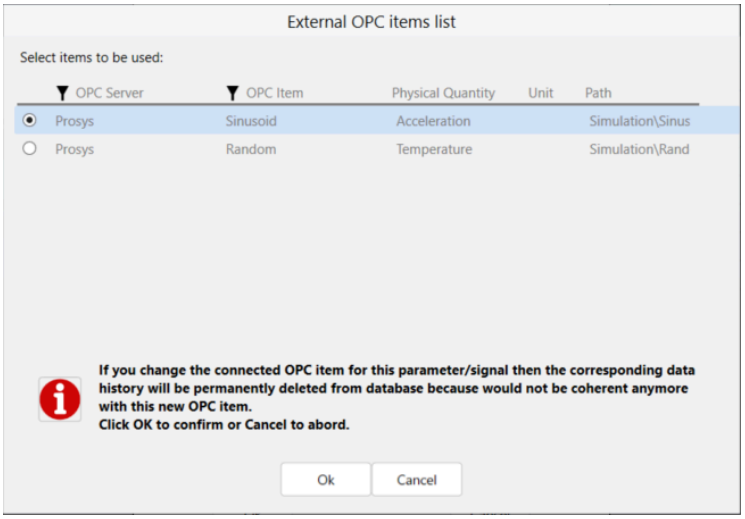
- Add external OPC UA parameter(s) to one or more point of the machine
- Edit all new external OPC UA parameter to define properties and linked OPC UA items



OPC UA parameter properties:

- **Name:** OPC item name by default
- **Type**: show the data type of the selected OPC UA item
- **Input unit**: show the corresponding unit label (only for “other” type)
- **Dead band**: setting required for "high-resolution" recording of OPC items. It allows you to define the variation range within which the value change is considered insignificant and will therefore not be recorded.
    - **Type**: method for evaluating the change
        - **None** – no dead band; all change of value is recorded – 1/sec maxi.
        - **Percent** – deadband is defined as a percentage - e.g., ±20%, meaning that the new reading value is only recorded if it changes by +/-20% compared to the previous recorded value.
        - **Absolute** – deadband is defined as an absolute value - e.g., ±0.25, meaning that the new reading value is only recorded if it changes by +/-0.25 compared to the previous recorded value.
    - **Value** : Percentage or absolute value used by the deadband algorithm - e.g., 20% or 0.25.
- **OPC item**
    - **OPC server** – present the source OPC UA server name
    - **Item** – present the source OPC item fullname – e.g., Path + Name
    - […] – click on this button to select another OPC UA item **** Caution: If the linked OPC item is replaced by another one, then parameter's history will be reset to ensure consistency with the newly selected OPC item.*

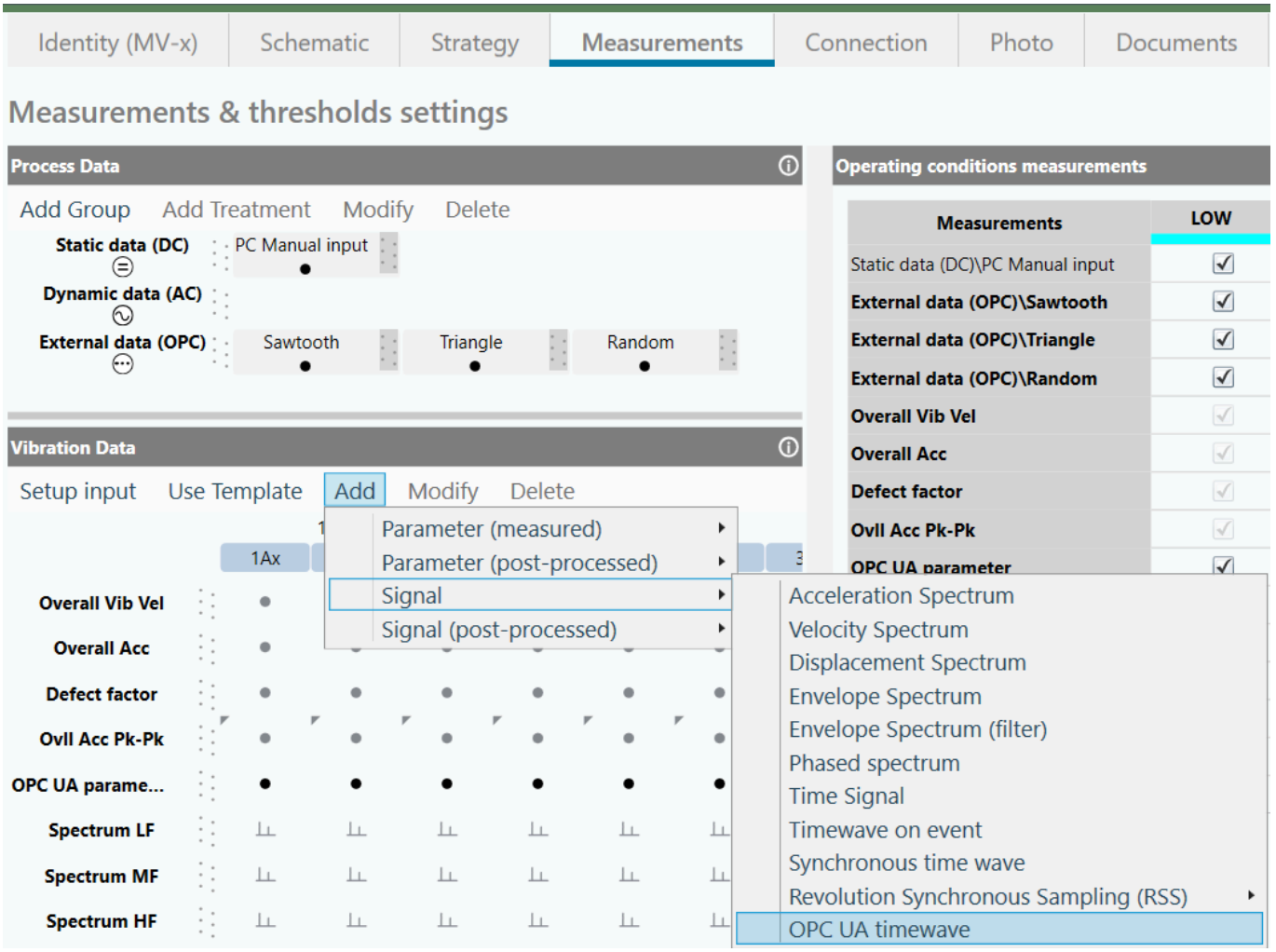




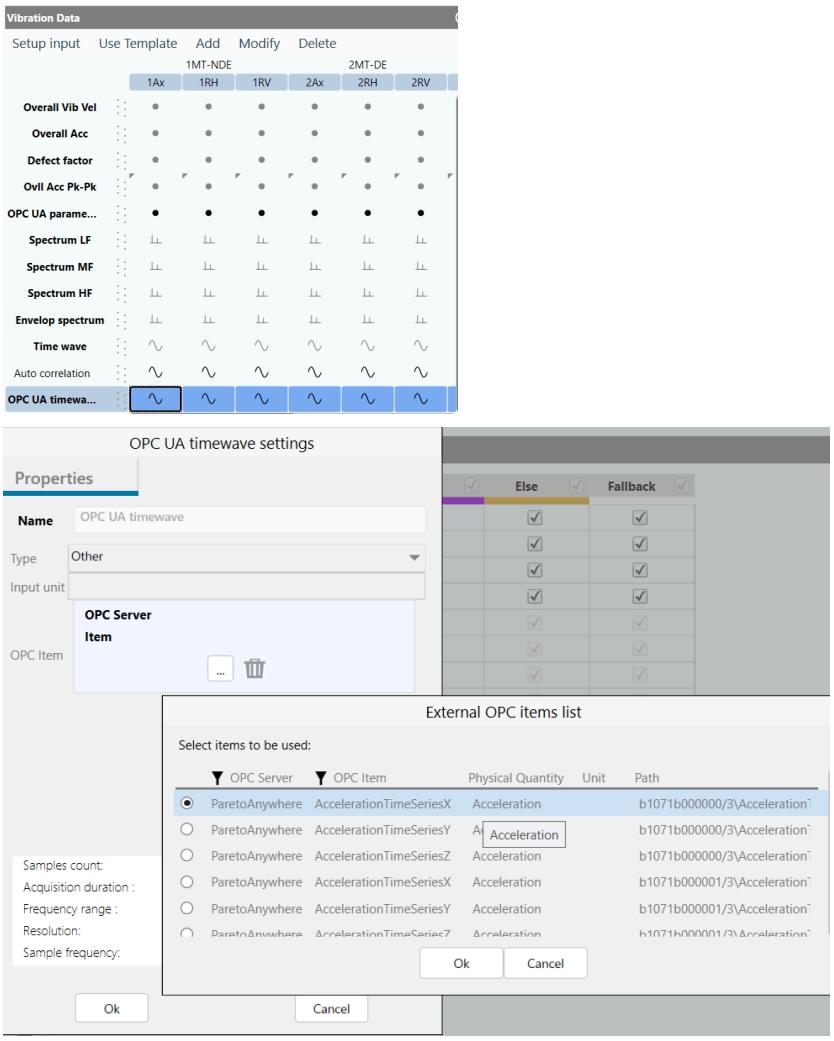
- 🗑️ – click on this button to unlink this parameter from the OPC UA item **** Caution: If the OPC item linked to the parameter is unlinked, then parameter's history will be conserve until another OPC item will be linked and will start a new history from scratch.*

- **External OPC items list**:
  - **OPC server**: source OPC UA server name
  - **OPC item**: source OPC UA item name
  - **Physical quantity**: physical type of item (defined into the instrument module)
  - **Unit**: unit label of item (defined into the instrument module)
  - **Path**: item location into the OPC UA server – see external OPC UA server documentation

It is possible to add external time signals directly to the machine's measurement list. To do this, select "OPC UA timewave" directly from the vibration group menu:



Add \ Signal \ OPC UA timewave to add a new external time signal into machine points. This addition is done in the same way as for an external parameter. Note the list of displayed OPC items is limited to compatible time signals:



OPC UA parameter properties:

- **Name:** OPC item name by default
- **Type**: show the data type of the selected OPC UA item
- **Input unit**: show the corresponding unit label (only for “other” type)
- **Dead band**: setting required for "high-resolution" recording of OPC items. It allows you to define the variation range within which the value change is considered insignificant and will therefore not be recorded.
    - **Type**: method for evaluating the change
        - **None** – no dead band; all change of value is recorded – 1/sec maxi.
        - **Percent** – deadband is defined as a percentage - e.g., ±20%, meaning that the new reading value is only recorded if it changes by +/-20% compared to the previous recorded value.
        - **Absolute** – deadband is defined as an absolute value - e.g., ±0.25, meaning that the new reading value is only recorded if it changes by +/-0.25 compared to the previous recorded value.
    - **Value** : Percentage or absolute value used by the deadband algorithm - e.g., 20% or 0.25.
- **OPC item**
    - **OPC server** – present the source OPC UA server name
    - **Item** – present the source OPC item fullname – e.g., Path + Name
    - […] – click on this button to select another OPC UA item **** Caution: If the linked OPC item is replaced by another one, then parameter's history will be reset to ensure consistency with the newly selected OPC item.*

External OPC items list:

- **OPC server**: source OPC UA server name
- **OPC item**: source OPC UA item name
- **Physical quantity**: physical type of item (defined into the instrument module)
- **Unit**: unit label of item (defined into the instrument module)
- **Path**: item location into the OPC UA server – see external OPC UA server documentation

5.3.4.3 Operating Condition Measurements

IMPORTANT:

These features are available only with MVX

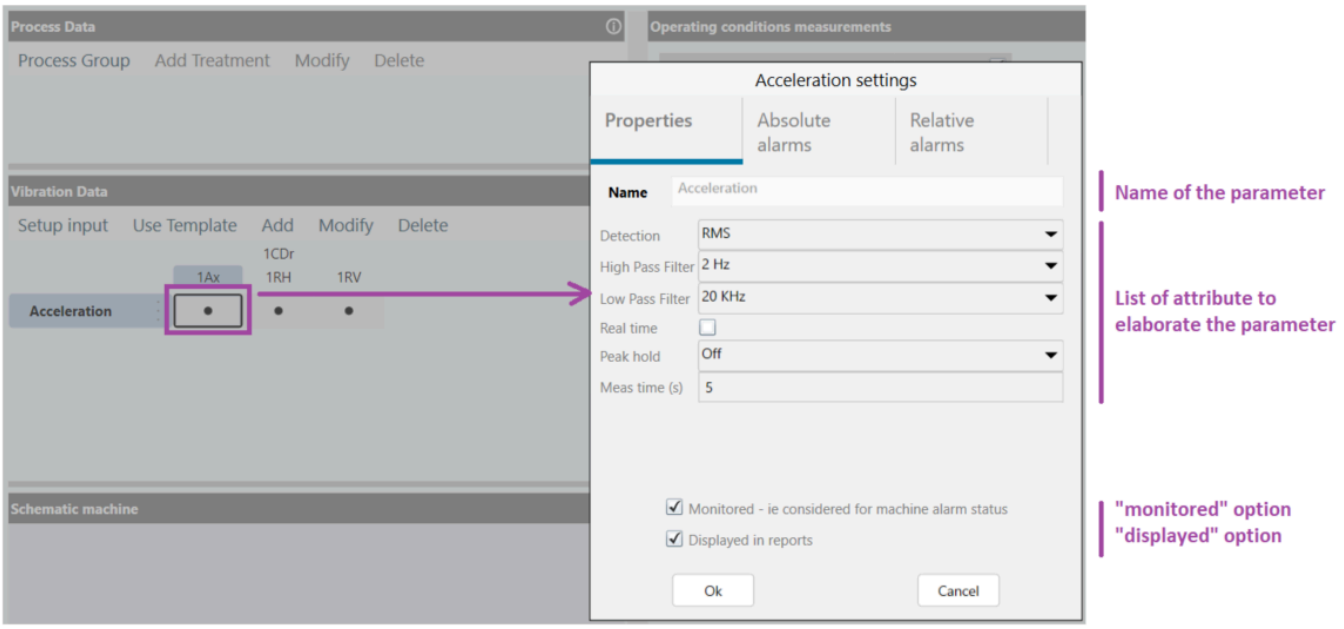
By default, a newly created machine has no operating conditions. In this case, we speak of "default condition" and all the measurements (process and vibration) to be made will then be carried out systematically.

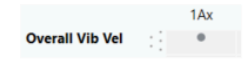
If additional operating conditions have been declared for the machine (see “strategy” tab), it is necessary to choose which measurements are to be made for each of these conditions.

To do this, you must modify the "**Measurements of operating conditions**" table in order to check the measurements to be carried out for each of the conditions of the machine.

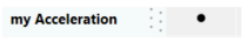
5.3.4.4 Parameter properties

Parameter properties can be edited by double clicking on the corresponding cell or by clicking on “Modify” button with a multi selection of parameter of the same type





Accurex parameter are presented with a grey dot and cannot be edited

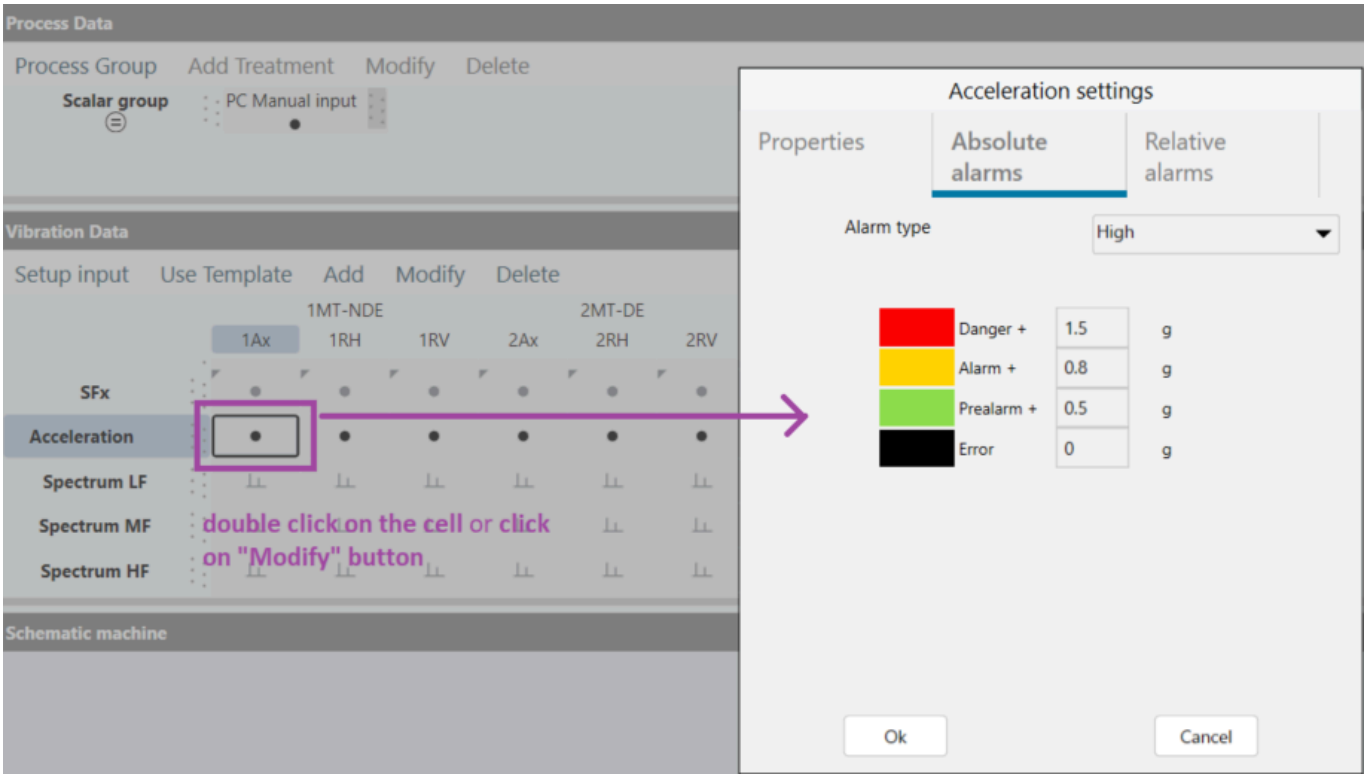


Non Accurex parameter are presented with a back dot and can be edited

Properties	Description
Name	Name of the parameter
Attribute	List of settings to define measurement to be done by acquisition device (hard) or post-processing to be calculated by NESTi4 (soft). This list depends on the type of parameter
Monitored	Check this option to use the alarm status parameter to elaborate the alarm status of the machine. NOTE: Accurex parameters are “monitored” by default and cannot be disabled.
Displayed	Check this option to see the parameter into the analyst report

*5.3.4.5 **Alarm settings***

Alarm settings are presented with the parameter properties into distinct tabs. They can be edited by double clicking on the parameter cell from the measurement matrix:



Two categories of alarms can be defined per parameter:

- Absolute alarms
- Relative alarms

When Accurex mode is activated, then all parameters created automatically have predefined alarm thresholds and they cannot be changed. All other parameters can have customized alarm thresholds.

See below the limit of use for alarm thresholds:

	FALCON	EAGLE	MVx	SPARROW
Process parameters:				
• Absolute alarms	✔	✔	✔	N/A
• Relative alarms	✔	✔	✔	N/A
Vibration parameters:				
• No Accurex mode				
o Absolute alarms	✔	✔	✔	✔
o Relative alarms	✔	✔	✔	✔
• Accurex mode				
o Absolute alarms	⚪	⚪	⚪	N/A
o Relative alarms	⚪	⚪	⚪	N/A
✔: editable - ⚪: pre-defined (cannot be changed) – N/A: not available				

IMPORTANT for Sparrow machine

- Alarms settings defined into NESTi4 are totally independent of alarm settings defined into the gateway webpage – see Sparrow Gateway User's Guide
- Only alarms thresholds defined into NESTi4 are considered by NESTi4 to elaborate parameters and machine alarm status and request / trig a time signal measurement on alarm (if required by strategy)
- All alarms thresholds potentially entered into the Sparrow gateway are ignored by NESTi4

5.3.4.6 External data (OPC UA)

Requires "interoperability (OPC UA, …)" license option. Available for all machines.

5.3.5 *Connection tab*

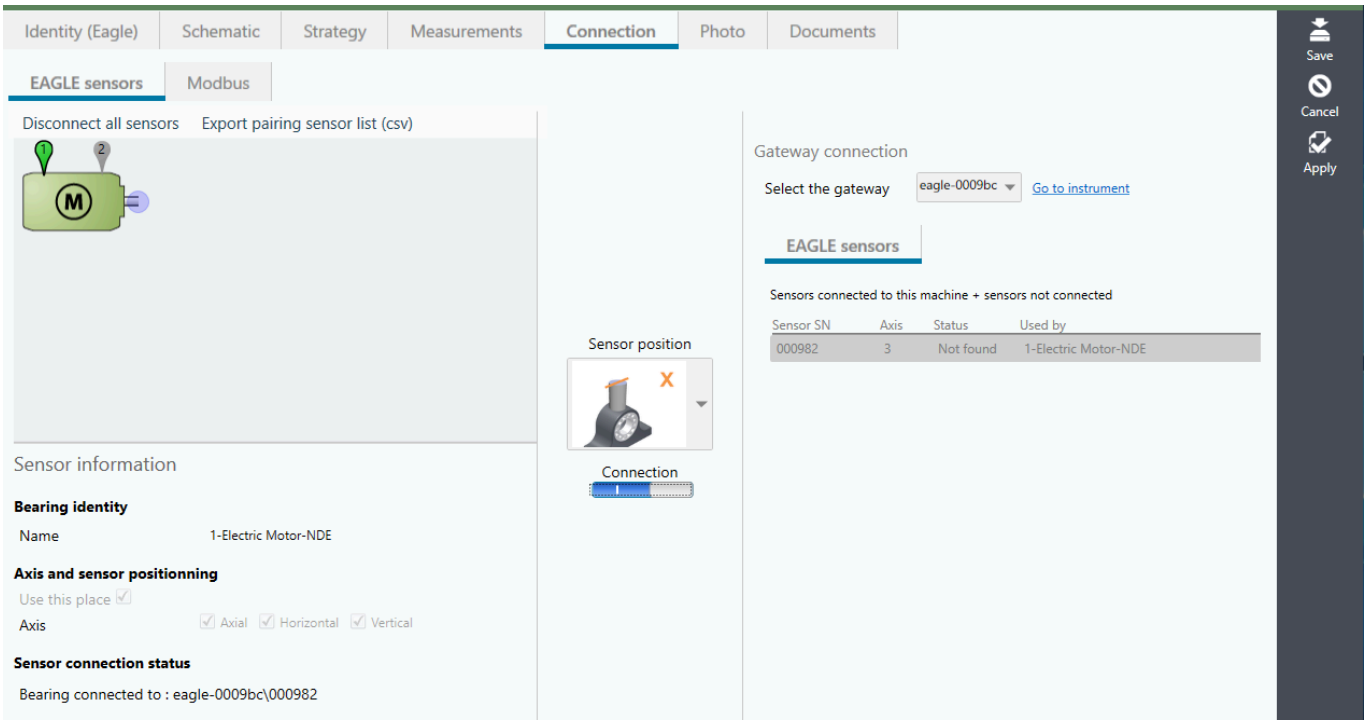
For online system, this tab is used to make the link (or pairing) between each measurement position (or bearings) and each sensors used on the machine.

5.3.5.1 EAGLE Connection

Mapping of sensors, external inputs with machine bearings is defined into the following tabs:

- **Eagle sensor** tab to connect sensor to machine bearing
- **Modbus** tab to connect external Modbus inputs of Eagle gateway to machine parameters (operating and process)

5.3.5.1.1 Eagle Sensor mapping



Interface description:

- The left side displays the machine schematic with the measurement locations. Each location have a status:
  -  - Grey: not used
  -  - Red: not connected
  -  - Green: connected

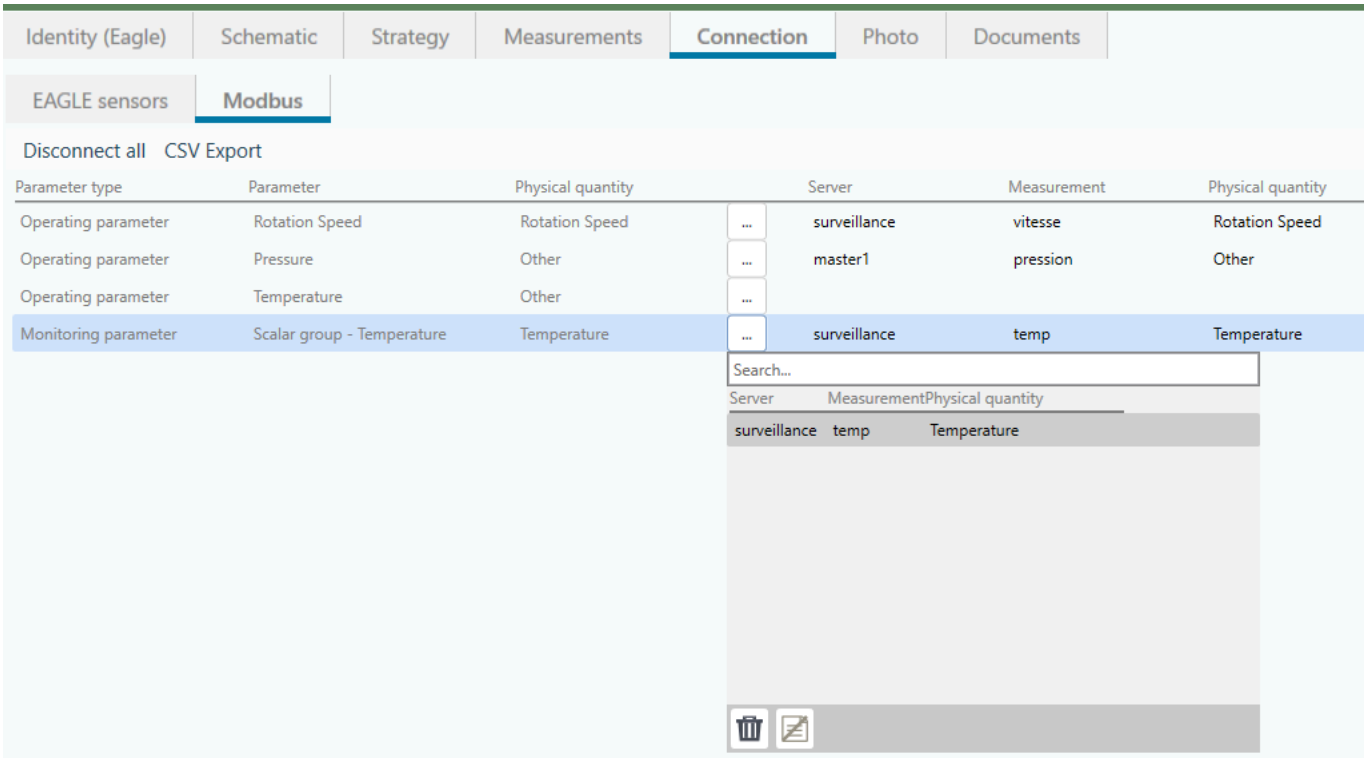
- The right side display the sensors to be connected
  - **Gateway**: select the gateway which is in charge to manage the sensors monitoring the current machine. The gateway must first be associated with the current database from the NESTi4.0 “Instrument” module.
  - **List of sensors**: once the gateway is correctly configured, the list shows all the free sensors viewed by the gateway and the sensors already connected to the current machine.

- Sensor connection: to connect a sensor
  - Select an unconnected measurement location on the schematic
  - Select an unused sensor in the sensor list
  - Click on **“Connect”** button ; it is not accessible if:
    - The selected sensor is 1axis and if the measurement location has more than 1 direction activated. In this case, deactivate unused directions.
    - The selected sensor is 3 axes and the sensor position is not set.

- Contextual functions:
  - Disconnect all sensors
  - Export the sensor pairing information: export the information needed to install the sensors on the machine into a CSV file.

5.3.5.1.2 External Modbus inputs mapping

This panel allow mapping machine parameters with external Modbus registers:



Interface description:

- **Parameter type** is operating or monitoring (process) parameter
- **Parameter** is parameter name
- **Physical quantity** is physical type of measurement – ex: rotation speed, temperature, other …
- **[…]** Click on this button to select one of Modbus register declared into the Eagle Gateway
- **Server** is Modbus server name (defined into the gateway web page)
- **Measurement** is Modbus register name (defined into the gateway web page)
- **Physical quantity** is physical type of Modbus register data (defined into the gateway web page)

All these Modbus parameters will be read locally by the Eagle Gateway and stored with vibration measurement into nesti4 database.

Note:

- All these Modbus parameters must be first locally declared into the Eagle Gateway web page before to be used in nesti4 for machine monitoring strategy and connection

5.3.5.2 MVX Connection

Interface description :

- The left side displays the instrument information. A **device must be selected** from the list created in the Instrument module. Three tabs list all the available entries of the selected device:

    - **Analog inputs**: the number of analog inputs depends on the type of device. Once connected, each channel displays the type of input and the connected machine point.
    - **Logic inputs**: the number of logic inputs depends on the type of device. Once connected, each channel displays the connected machine parameter.
    - **External inputs**: the selected MVX must not be "undefined", this tab lists the external parameters created from the device web page (Modbus parameters)

- The right side shows the parts (or items) of the machine to be connected. It can be:
    - A point of vibration, that is to say a column of G4D matrix.
    - A dynamic process group
    - A parameter of a scalar process group
    - An operating parameter

- Connection process:
    - On the left side, select a device entry
    - On the right side, check the machine item to be connected to the selected device entry

- Disconnection: Uncheck machine items to be disconnected from the device

Notes: MVX Connection Rules

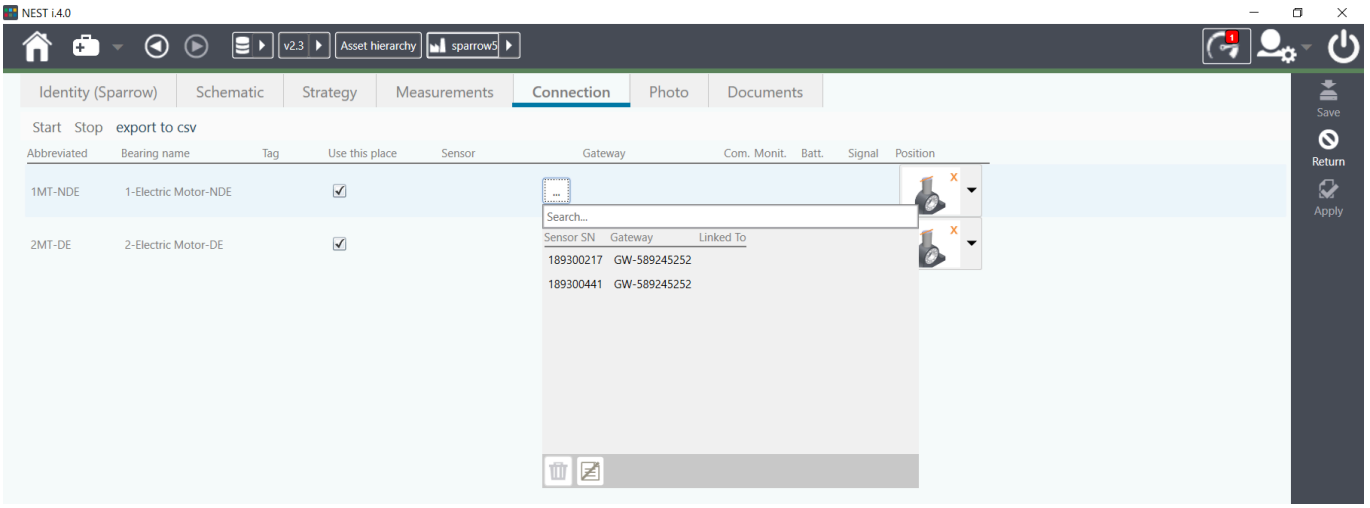
- A machine can be connected to only one instrument
- The same device entry can be connected to different parameters of different machines. In this case, the input properties must be the same - example: rotational speed information can be used by 2 different machines.
- Contextual functions:
    - Disconnect all sensors
    - Export the sensor pairing list: export in a CSV file the information needed to install the sensors on the machine and wire them to the device.

5.3.5.3 SPARROW Connection

When the schematic machine and measurement list are defined, then connection must be established between machine points (bearing) and sparrow sensors into the “Connection” tab.

PREREQUISITES

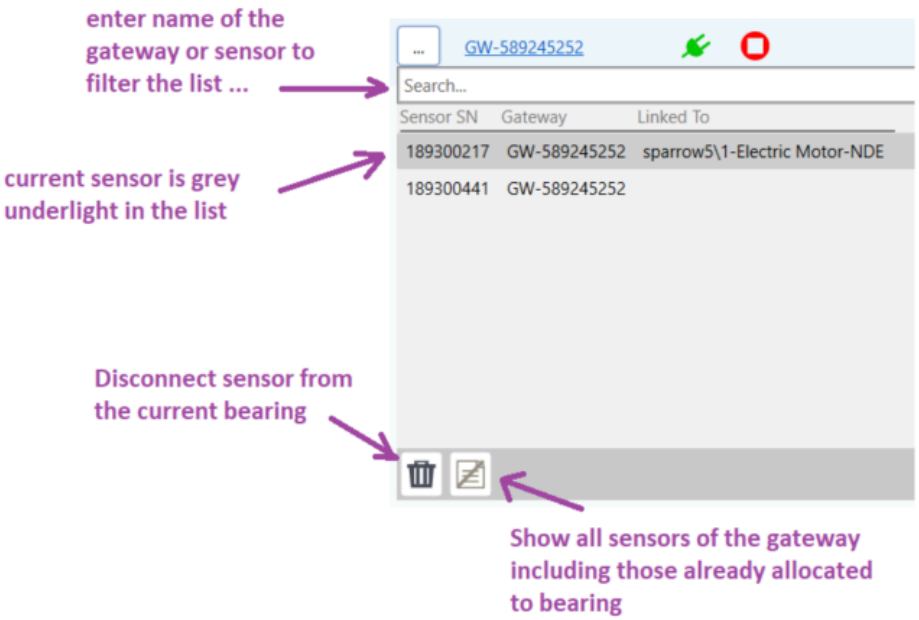
Before to select sparrow sensors for connection, the gateway and all of these sensors must be declared and visible into the INSTRUMENT module



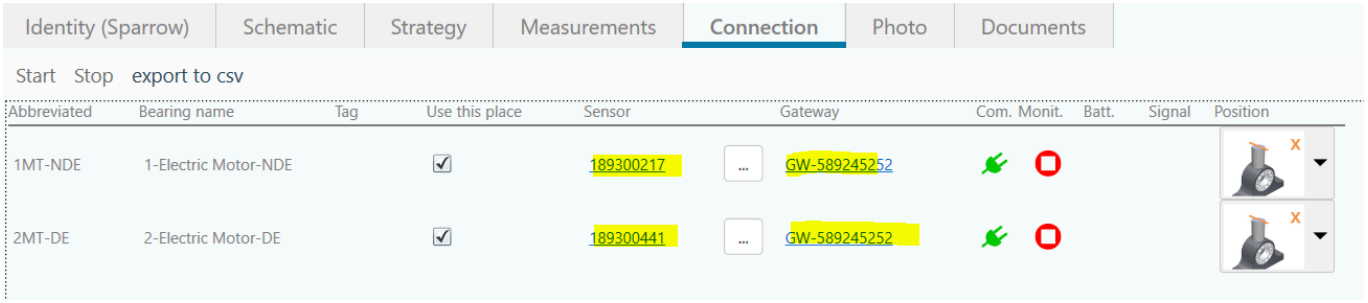
Interface description:

- Menu
  - **Start** – click to start record of measurements for this machine
  - **Stop** – click to stop record of measurements for this machine
  - **CSV** export – click to export “bearing – sensor” mapping information into a CSV file
- Table
  - **Abreviate** Display the short name of bearings
  - **Bearing name** Display the name of bearings
  - **TAG** Display the tag of bearings
  - **Use this place** same box as in Schematic tab and user can change value here
  - **Sensor** Display the sensor name used to monitor this bearing
  - **Gateway** Display the gateway name used to monitor this bearing
  - **Com**. Display the sensor communication status
  - **Monit**. Display the sensor monitoring status
  - **Batt**. Display the sensor battery status
  - **Signal** Display the sensor signal strength status
  - **Position** Select icon corresponding to the position of the sensor

Click on button to manage sensor allocation:



Click on hyperlinks to directly access to the instrument module (in the limit of your privileges):



5.3.6 *Photo tab*

Define the picture used in the background of the map mode display. By default, the picture is the one define from 'Schematic' tab.

Contextual functions:

- Change the photo
- Delete
- Possibility to change the position of the items on the photo by drag and drop.

Notes: Compatible formats are JPEG and PNG

5.3.7 *Document tab*

Technical documents (pdf, doc, xls …) can be associated with each machine and then consulted directly from this tab.

Contextual functions:

- Add: select a new document
- Open: open or save the selected documents. If SAVE is selected, then documents are saved in “My document/NEST” folder.
- Delete: delete selected documents from the database.

5.4 SENSOR POSITIONS

For tri-axial measurement, it is first necessary to select the pictogram indicating the position of the sensor on the bearing. It is only necessary to do it during the first measurement as the selection is saved on the PC database.

- For the WLS sensor, the X axis is marked by ACOEM logo and a point at the base of the sensor, Y is perpendicular to X on the same plane, and Z corresponds to the main axis (height) of the sensor. For wired triaxial sensors, wiring is ch 2 = Z, ch 3 = Y, ch 4 = X. Channels 2 to 3 are accessible on connector B
- For an Eagle Triaxial sensor, X axis is marked by a dot on the sensor base, Y is perpendicular to X on the same plane, and the Z axis correspond to the main axis (height) of the sensor
- For a Sparrow triaxial sensor, X axis is repaired on the sensor and correspond to the direction pointed by the Acoem logo, Z is perpendicular to X on the same plane, and the Y axis correspond to the main axis (height) of the sensor

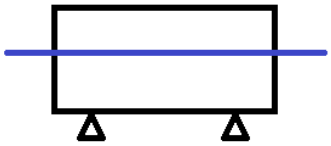
To provide an easy user experience for the correct selection of the triaxial positioning for ACOEM sensors, only 2 questions are essential:

- In which position is mounted the sensor on the bearing – i.e. Vertical, Horizontal or Axial
- According to the sensor position on the bearing, how is the X-axis direction orientation compared to the shaft – i.e.: parallel or perpendicular to the shaft (2 choices possible per sensor position)

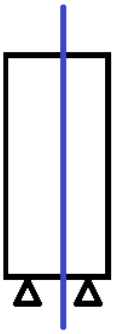
Sensor position pictograms to select will then depend to:

- the **machine shaft orientation** (“Output orientation”) – i.e.: horizontal or vertical
- the **sensor radial direction** (“Radial direction”) – i.e.: Horizontal/Vertical or Oblique/Oblique

Machine shaft orientation:

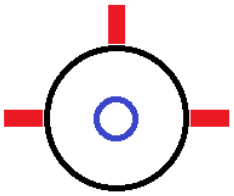


"Horizontal"
output orientation

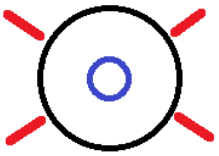


"Vertical" output
orientation

Sensor radial direction:



Horizontal / Vertical



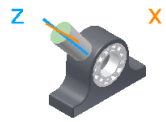
Oblique / Oblique

For machine with **Horizontal shaft** and sensor with radial "**Horizontal/Vertical"** direction, only the following choices are possible for sensor position:

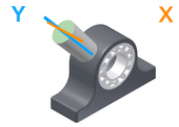
Vertical (V)	Horizontal (H)	Axial (A)
 X	 X	 X
 X	 X	 X

For machine with **Horizontal shaft** and sensor with radial **Oblique/Oblique** direction, only the following choices are possible for sensor position.

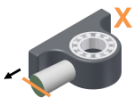
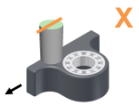
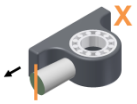
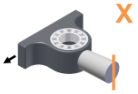
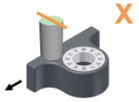
For Eagle or WLS sensors – main direction of sensor is named Z:

For Sparrow sensors – main direction of sensor is named Y:

For machine with **Vertical shaft** direction ("Output orientation" property setup on the component level in the setup module), the sensor positions can be the following:

Parallel with main direction **(//)**	Perpendicular with main direction (P or ⊥)	**Axial** with machine shaft **(A)**
		
		
Parallel or Perpendicular compared to a user defined reference axis, defined arbitrarily: e.g. main axis = output of the pump		

CHAPTER 6. Instruments



"Instrument" module manages the setting and the communication with EAGLE (wireless) and MVx (realtime) Online monitoring system. This module is only available in the Network Edition.

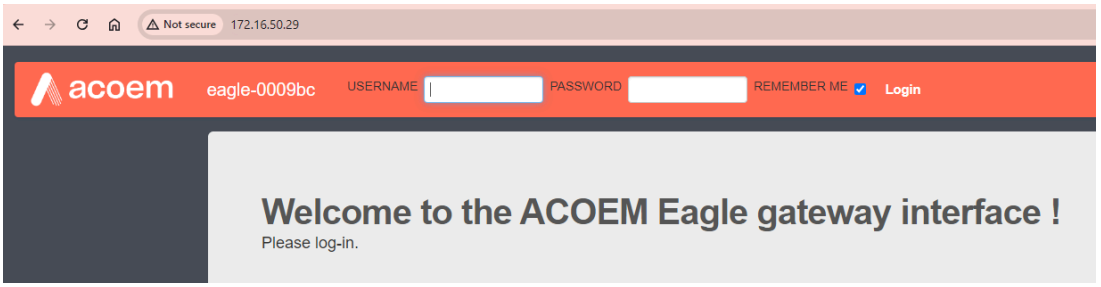
6.1 EAGLE Wireless Monitoring System

These features requires at least NESTi4 v2.5 and EAGLE v2.26

6.1.1 *Eagle Configuration*

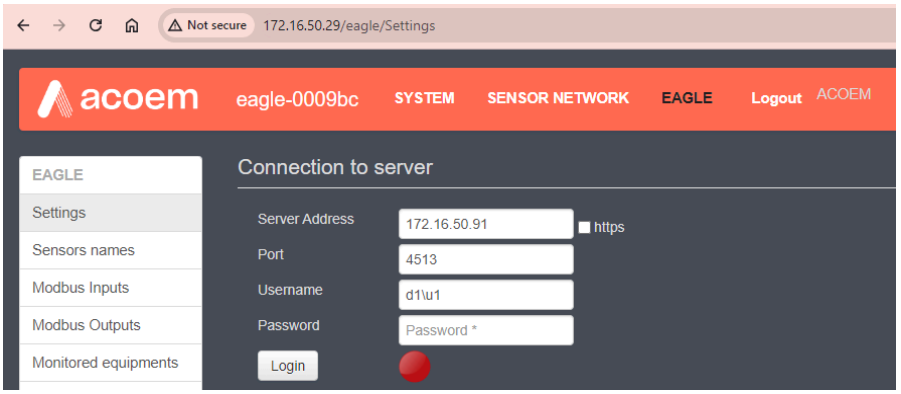
EAGLE configuration requires using a web browser from any computer connected to the same network as the gateway:

- Open a web browser
- Enter the gateway URL - http://eagle-xxxxxx ; with xxxxxx corresponding to the last 6 digits of the gateway MAC address - or a fixed IP address
- Enter the gateway username / password
    - see EAGLE user manual: "DOC3110 - EAGLE User Manual EN"



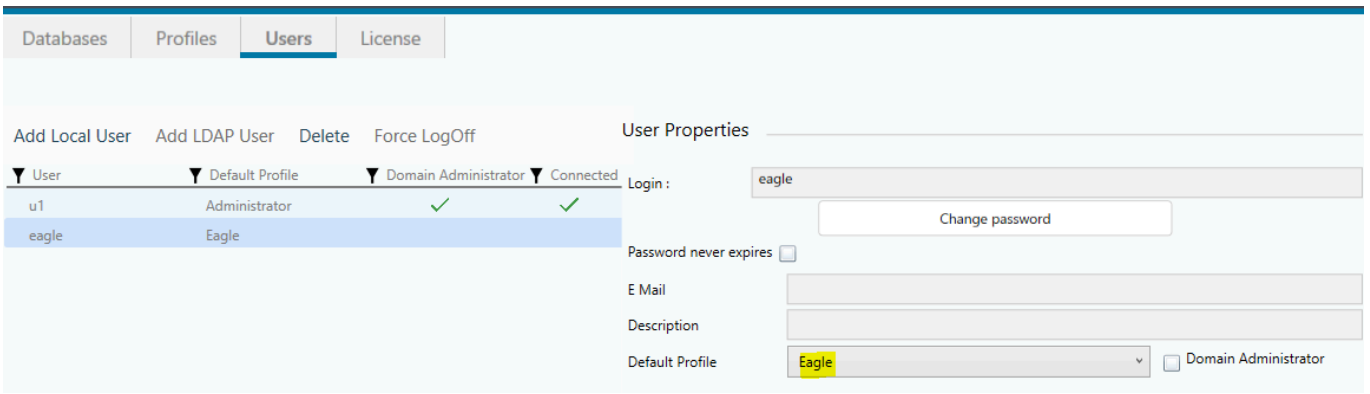
6.1.2 *Eagle Connection to Nesti4*

When gateway system settings have been defined, then the gateway must be connected to NESTi4 server in order to receive configuration and send measurements to be stored into database.



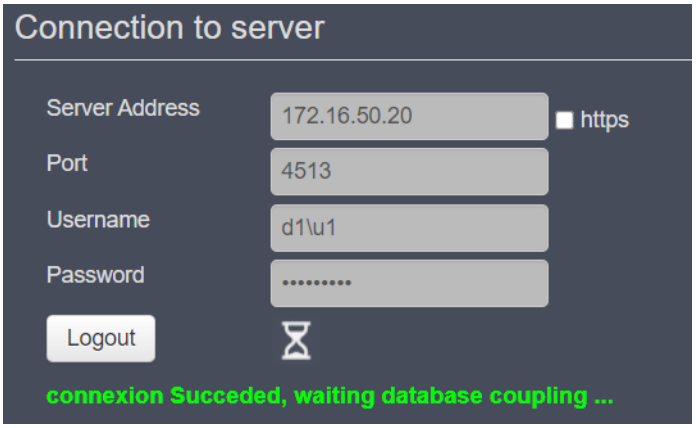
- Click on the “EAGLE” menu
- Click on “Settings” tab
- Enter the NESTi4.0 server credentialsaddress
    - **Server address**: nesti4 server hostname or fixed IP address
    - **Port**: 4513 (default)
    - **Username**: nesti4 account username
    - **Password**: nesti4 account password

    Note: This instrument account must be created first into Nesti4 ADMIN module with “Eagle” instrument profile:

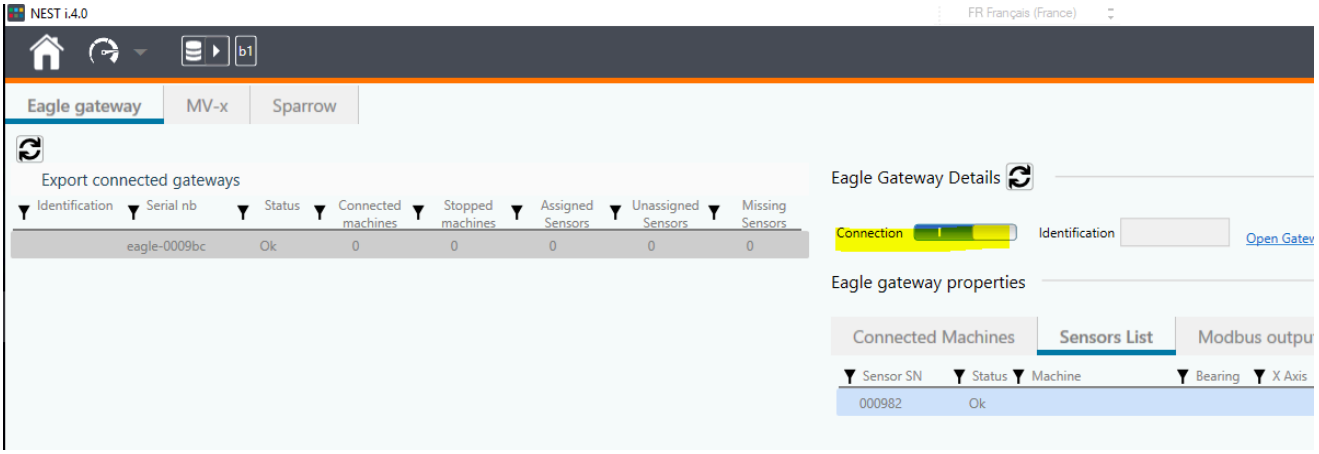


According to the desired level of security, the same user account for all Eagle instrument or individual ones can be created. When Eagle gateway is connected to Nesti4, then device appears in the INSTRUMENT module and can be associated to machines.

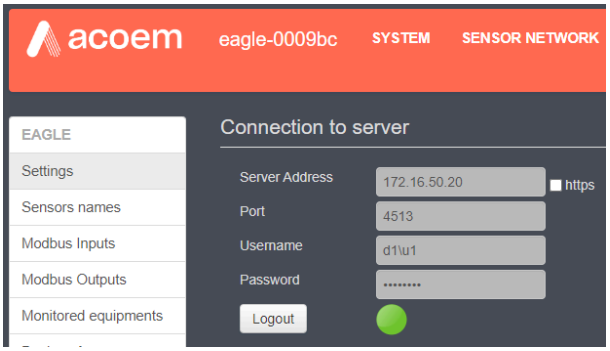
- Click on “Login” button to verify if nesti4 server is reachable from the gateway
- Following message is displayed until the gateway connection is confirmed into Nesti4 Intrument module



- Open Nesti4 and connect to the same database
- Select Instrument module
- Click on “Eagle” tab
- The connected gateway should appear into the list
- Select the gateway to show details
- Click on “Connection” toggle button to accept gateway connection into nesti4



- At this moment, the gateway web page presents the following connection status



Details of the Gateway list:

Identification	Identifier of the gateway
Serial number	Serial number of the gateway
Status	Current status of the gateway: ● **Not used** - The gateway has been configured to work with this server and has not yet been connected to any of its databases ● **OK** - The gateway is connected to the current database and operates normally ● **Time-out** - The gateway is connected to the current database but has not refresh its status recently
Connected Machines	Number of machines connected to the gateway (stopped or not)
Stopped machines	Number of machines stopped and connected to the gateway
Assigned sensors	Number of sensors assigned to a machine
Unassigned sensors	Number of sensors not yet assigned
Missing sensors	Number of sensors assigned not found by the gateway

Additional menu buttons:

-  : Click on this button to force an immediate refresh of the list

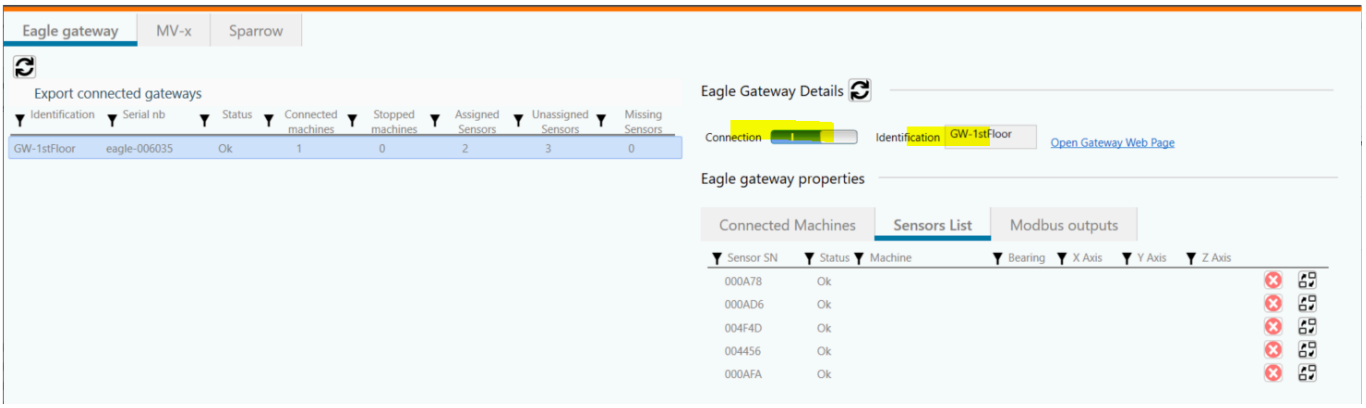
- **Export connected gateways**: this function list in csv format all gateways and sensors recorded in all databases of the server. This function is only accessible by user with “Domain administrator” privilege

6.1.3 *Eagle Management*

6.1.3.1 Connect to a database

To assign a new connected gateway to a specific database:

- Select the database where to assign the new gateway: 
- Select the gateway in the list
- In the gateway details
    - set “Connection” to “On”
    - enter an identification (if needed)



Gateway is now connected to the current database and all properties tabs are now available for this gateway

*6.1.3.2 **Start/stop acquisition***

When sensors are installed on the field and connected to machines within the SETUP module, you can start acquisition from the INSTRUMENT module – example:

- Select the gateway
- Open “Connected machines” tab to see the list of monitored machine with this gateway
- Click on “Start” button to start acquisition and monitor the corresponding machine



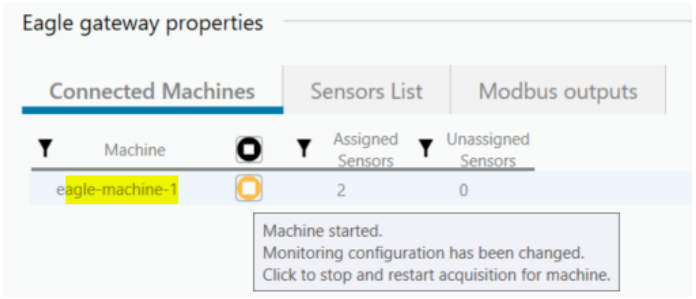
<u>Details of the “Connected machines” list:</u>

Machine	**Name of machine monitored with this gateway + hyperlink to open directly the machine “connect” tab into the setup module**
Start/stop	Start / stop buttons can be used machine per machine or globally for the machine list
▶	Start acquisition and storage for the corresponding machine
■	Stop acquisition and storage for the corresponding machine

Assigned sensors	Number of sensor used to monitor this machine
Unassigned sensors	

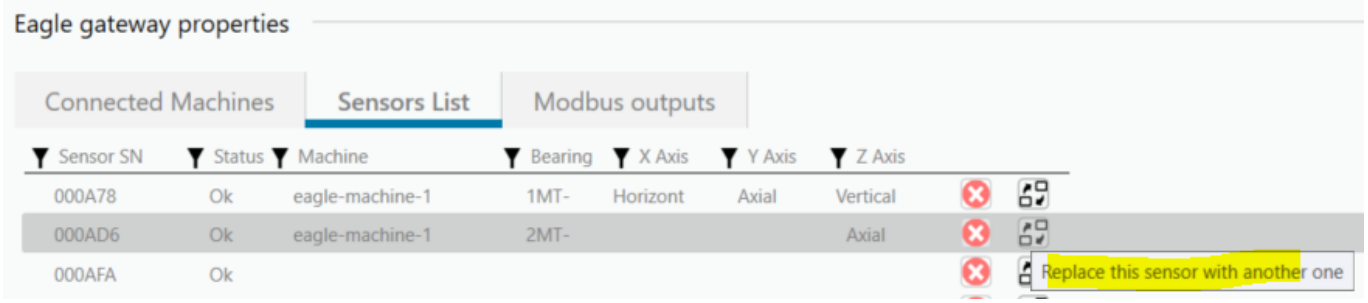
Nota:

- "start" button presents a tooltip with useful context information for the concerned machine
- When you change the machine monitoring strategy, then the start button presents an orange color in order to inform you must restart acquisition for this machine to consider the new acquisition settings:



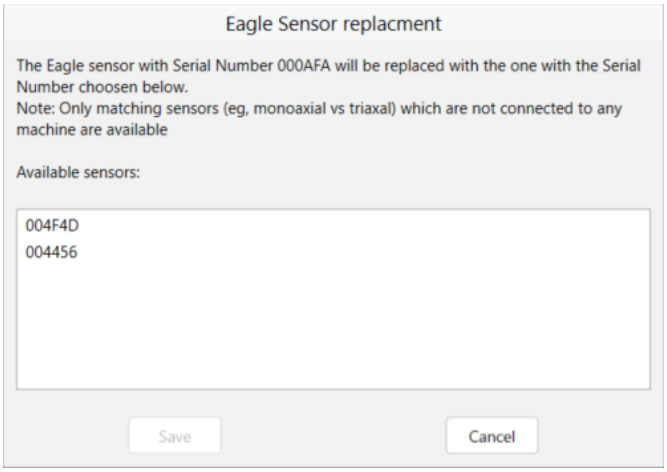
*6.1.3.3 **Replace a sensor***

When eagle sensor breaks down it can be replaced very easily directly from the sensor list:

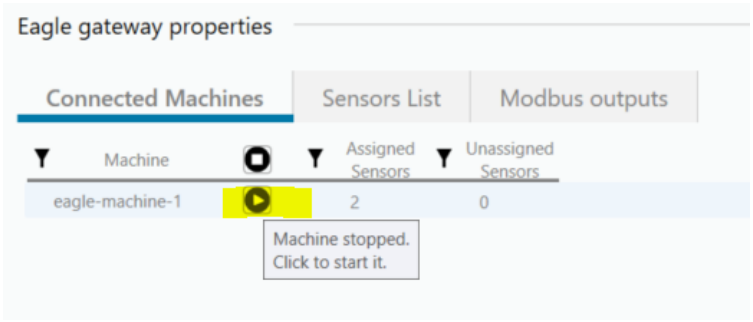


Important – machine acquisition must be stopped before to replace a sensor

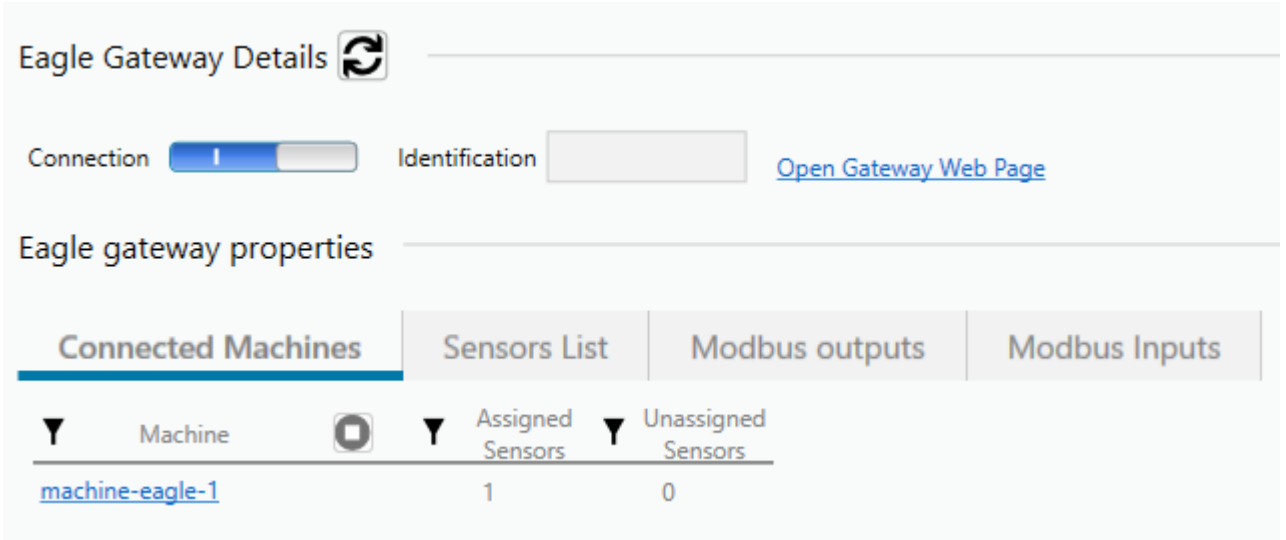
At this moment, the list of available sensor from the same gateway is presented:



Select a new sensor from the list and acquisition can be restarted immediately by clicking on the start button:



6.1.4 *Eagle Properties*



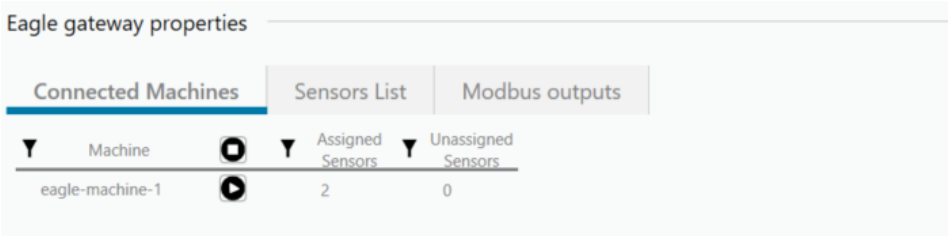
The header includes the following function:

- this function can be used to refresh the gateway information
- **Connection**: move the switch to “On” to assign the gateway to the current database.

Note: if you disconnect the gateway from the database all sensor assignments are erased.

- **Identification**: name of the gateway listed in the first column of the gateway list.

6.1.4.1 *Connected machines*

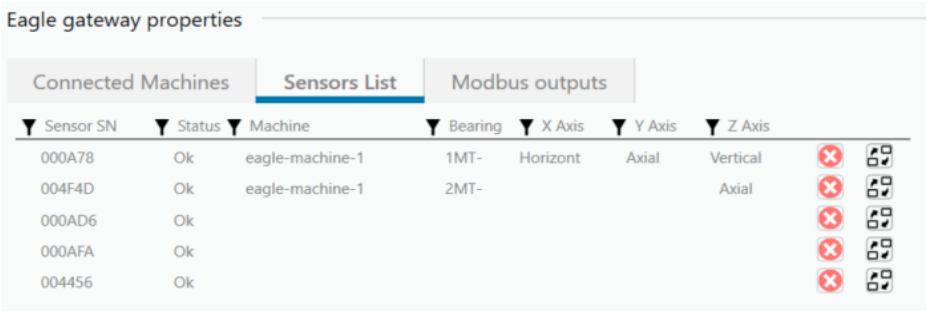


This tab gives the list of connected machines with the following information:

- Machine name
- Number of assigned sensors
- Number of unassigned sensors

A function start/stop (/): this function can be used to stop the storage of data on a machine.

6.1.4.2 *Sensors*



Columns description:

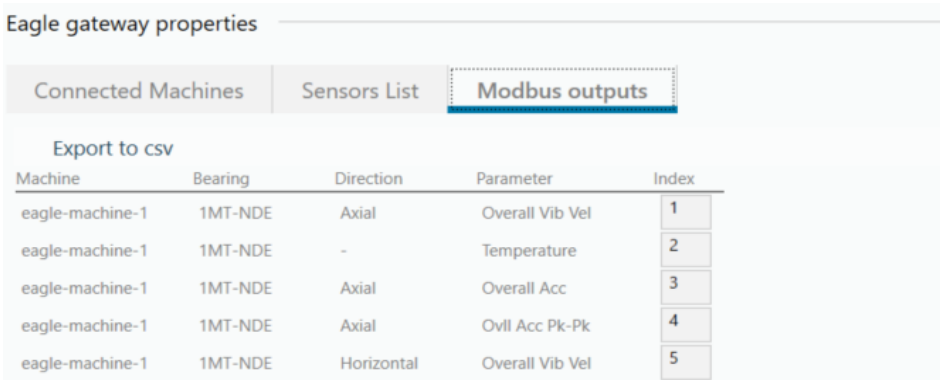
Sensor SN	**Sensor serial number**
Status	Sensor status: • OK • Not found
Machine	Machine name assigned to this sensor
Bearing	Bearing name assigned to this sensor
X axis	Direction of measurement for each sensor axis (depend of selected sensor position)

Y axis	Direction of measurement for each sensor axis (depend of selected sensor position)
Z axis	Direction of measurement for each sensor axis (depend of selected sensor position)

Functions description (per sensor):

	“Remove” function is used to remove a sensor from the list. It can only be accessed if the sensor is not assigned to a machine and the gateway cannot access the sensor (Not found status).
	“Replace” function is used to replace one sensor with another in the event of failure

6.1.4.3 Modbus Outputs



The Modbus tab displays the list of the monitored parameters with its index. They are generated automatically but can be modified if needed. The Modbus address for each item depends of the index of the parameter but is defined by the gateway itself - for more details, see the EAGLE user manual.

All information of monitored parameters is available on the Modbus/TCP interface of the gateway.

For each parameter, published values are:

- Current value
- Unit code
- Alarm status
- Timeliness
- Thresholds

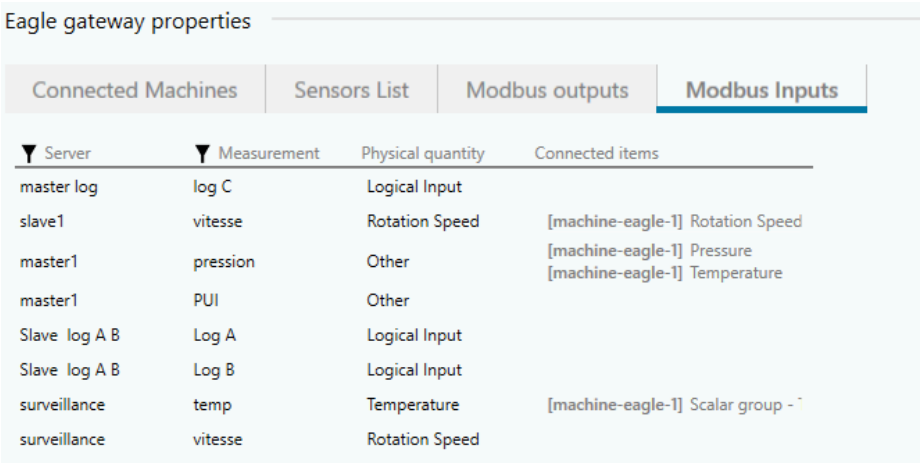
Export to csv: this function export in csv format the list of parameters with the index. It can be used to compute the Modbus addresses.

Notes:

- If items are removed (deleted or disconnected) indexes became free for future used, existing ones remain unchanged
- If new items are added free indexes are re-used
- Two items cannot have the same index
- The index value must be in the range [1, 999]
- For values and thresholds of vibration and temperature data, units are g, mm/s, µm and °C

6.1.4.4 *Modbus Inputs*

This list presents all Modbus inputs parameters declared into the Eagle gateway and ready to be used as operating or monitoring (process) parameter:



Columns description:

Server	**Modbus server name (defined into Eagle gateway)**
Measurement	Reagister name (defined into Eagle gateway)
Physical quantity	Physical type of data (defined into Eagle gateway)
Connected item	[machine name] parameter name connected to this register

6.2 MVX Realtime Monitoring System

6.2.1 *MVx Configuration*

Once the device is connected to the network and powered up, various configuration steps are required and must be performed either from the device's web page or from Nesti4:

	Operations	Via Page web	Via Nesti4	Comments
1	Power supply	-	-	Manual connection
2	Network connection	-	-	Manual connection

3	IP settings (DHCP, static)	Yes	No	"Network settings" tab
4	NTP configuration	Yes	No	"Date & Time" tab
5	Analog inputs	-	-	Manual connection
	Logic inputs	-	-	Manual connection
6	External inputs	Yes	No	“Modbus” tab; selection of all process parameters required for machine monitoring
5	Modbus outputs	No	Yes	INSTRUMENT module, "Output configuration" tab
6	Relay outputs	No	Yes	INSTRUMENT module, "Output configuration" tab
7	Connection to Nesti4	Yes	Yes	An "instrument" user account must be declared in Nesti4 (ADMIN module) in order to be entered in the "Server settings" tab of the MVx web page

Access to the web page is from any internet browser with the following URL:

- MVx in DHCP mode - https: // serial-number
- MVx in Static mode - https: // fixed-ip-address

IMPORTANT:

- All the external parameters (Modbus) must be declared beforehand in MVX in order to be able to be used in Nesti4 for the monitoring of the machines - ex: operating parameters

For more details, see the MVX user manual.

6.2.2 *MVx Connection to Nesti4*

In order for an MVx to communicate with Nesti4, the following operations must be done:

- In Nesti4
  - Create an “instrument” user account with an “MVx” profile
- In MVx web page
  - Open the "Database settings" tab
  - Enter the network ID of the Nesti4 server
    - IP address (or machine name)
    - TCP port
    - User name (instrument account)
    - Password (instrument account)

Note:

- Depending on the level of security desired, a user account per MVx or global to all MVx can be created.
- Once the MVx is connected to Nesti4, the device appears in the INSTRUMENT panel and can be associated with a "virtual" MVx.

6.2.3 *MVX Management (Start/stop acquisition)*

IMPORTANT: In Nesti4, in order to be able to prepare a machine monitoring configuration independently of the commissioning of the MVx in the field, it is possible to declare an MVx without the corresponding device being yet connected to the network. We then speak of “virtual” MVx.

This virtual instrument can thus be used to anticipate the association of all the measurements to be made of the machines with the various acquisition paths of the device according to the planned wiring plan. On the other hand, the external Modbus parameters can only be associated with the measurements to be made machines once the physical MVx is connected to the network and activated in Nesti4

Activating an MVx in Nesti4 is simply done in the INSTRUMENT module by editing the properties of a virtual MVx and selecting from the list of serial numbers the device to be used. From this moment, the virtual instrument becomes real and its external parameters can be associated (SETUP module) and acquisitions started and / or stopped (INSTRUMENT module).

In the INSTRUMENT module, the list of MVx presents all the instruments declared in the current database:

Identification	Device name (editable)
Serial number	Device serial number
State	● **OFF**: the device is not started ● **OK**: the device is started and is OK ● **Time out**: the device does not respond ● **Update**: the configuration of a machine has been updated and the device must be restarted. ● Error
Channels used	number of channels used
Number of channels in error	number of channels used with error
Channels available	number of channels available
Param. missing operating functions	number of missing operating parameters

Contextual functions:

- **Add**: add a new instrument to the list
- **Start**: start the selected instruments
- **Stop**: stop the selected instruments.
- **Reset**: reset the instrument

CAUTION: MVX can be reset only when a device failure has been confirmed.

To check, please try to open the MVX webpage - https:\\mvx-serial-number

If webpage can not be opened then device is probably breakdown and it can be reset from Nesti4.

If the webpage shows live data, then MVX probably works correctly but network connection needs to be checked. In this case, MVX must not be reset because measurement continues to be stored into memory and will be sent to Nesti4 later.

If you still want to reset the device in nesti4, then you must also reset it via its web page if it is accessible.

- **Generate configuration file**: export the configuration file in order to import it manually into the "Monitoring configuration" tab of the MVx web page

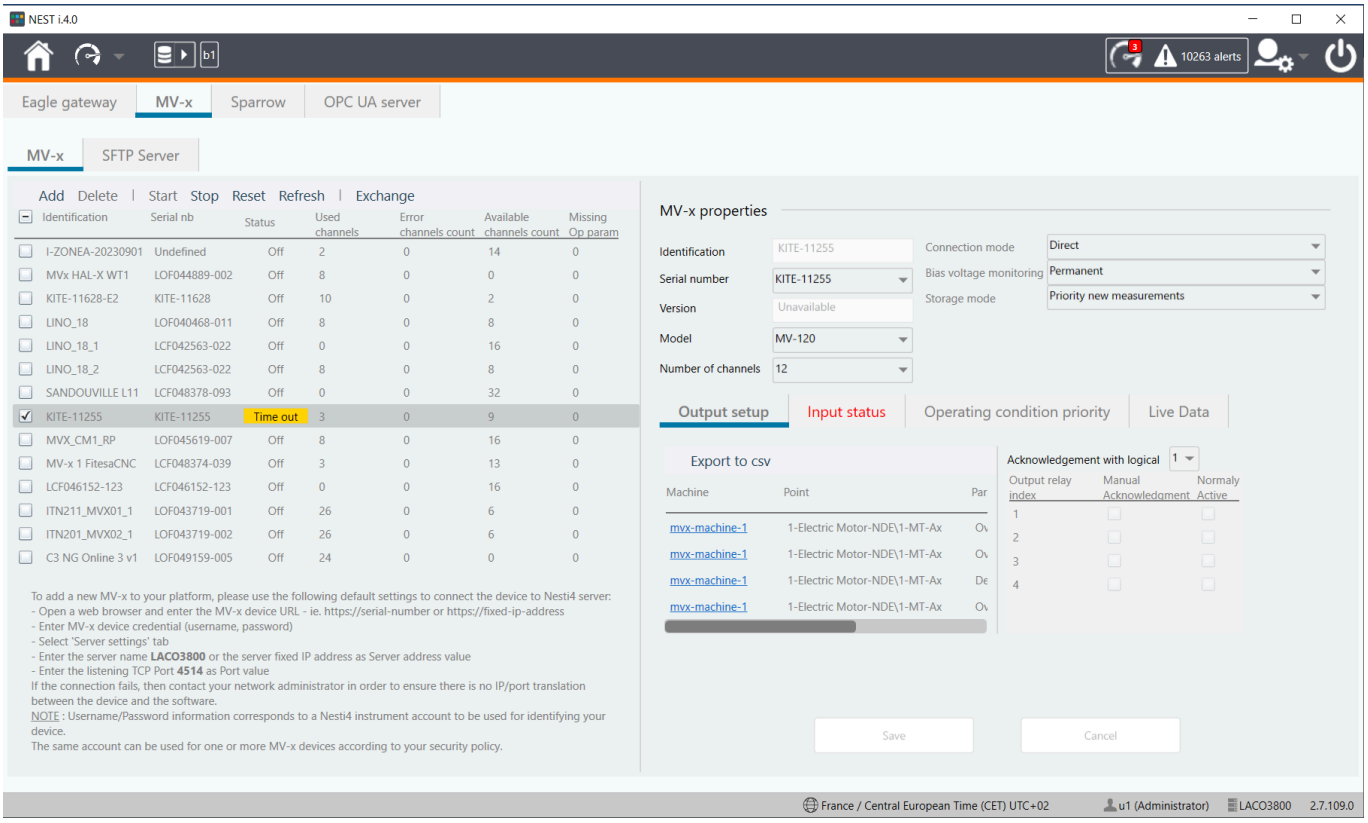
WARNING: in this case, MVx will be presented as stopped in Nesti4 but its measurements will nevertheless go back to the database.

With some versions of Nesti4 (v2.0.7 or more), this function allows communication between Nesti4 server and MVX via an SFTP server. This architecture is particularly suitable for highly secure environments where components cannot communicate directly – see specific documentation ref. DOC 3282 DOC3282 – March 2022 Rev. A

- **Delete**: delete the selected instruments.
- **Refresh**: update of the MVx status of the list

6.2.4 *MVx Properties*

The right side displays the properties of the selected device



6.2.4.1 *General*

Identification	Device name (editable)
Serial number	It is used to make the selection of the physical device. ● By default, it is on "Not defined", ie when the MVX is not yet known or has never been connected to the server. You must then manually set the number of channels. ● You can select from the list of serial numbers of all MVX units declared for this server. It is not possible to start a device if no physical device has been selected. Notes: ● The same physical instrument can be selected multiple times, but only one can be started at a time for all databases on the server ● The number of channels of the selected device must be compatible with its configuration
Number of ways	it is required if the serial number of the device is “Not Defined”
Point of rest monitoring	Check the condition of the IEPE sensor connections: ● Not used ● Periodic ● **Permanent** (default)
Storage mode	Full memory management: ● **Priority to new measurements** (default): the most recent measurement overwrites the oldest.

- Priority to old measurements: acquisition is suspended

6.2.4.2 *Output setup*

The **"Output configuration"** tab presents all the monitored parameters of all the machines associated with this MVx.

The first table on the left is used to define the following actions for each monitored parameter:

- Which **relay** number to activate if the parameter is in "alarm"; put "0" to remain inactive
- Which relay number to activate if the parameter is in "danger"; put "0" to remain inactive
- Which sequence number (1 to 255) to use to publish the value of the parameter in **Modbus**

Contextual menu :

- **CSV export**: exports the output configuration to a CSV file

The last table on the right is used to define the behavior of the 4 or 8 **logic outputs** available on the device. Each output can be configured to have manual acknowledgment or not:

- If the **"Manual acknowledgment" option is checked**, then the relay remains in an alarm state even if the corresponding state returns to the normal state until a manual acknowledgment of the device. This acknowledgment is made from the logic input defined above.
- If the **"Manual acknowledgment" option is not checked**, then the relay automatically returns when the level goes back beyond the hysteresis threshold defined with absolute thresholds.

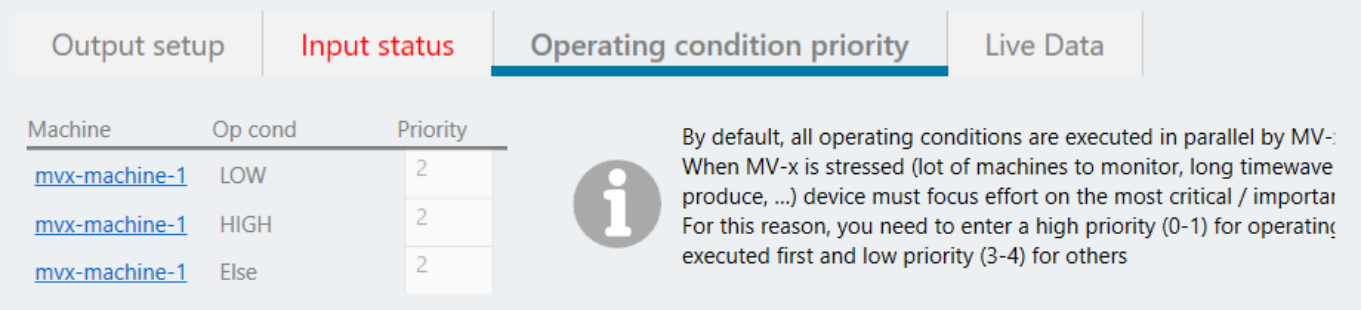
The **"Normally active"** option allows you to specify whether the normal state of the relay is its active or inactive state. WARNING, if the option is checked, then switching off the device may cause the relays controlled by these outputs to go into alarm.

6.2.4.3 *Input status*

The “Input status” tab displays the status of the analog inputs and the external inputs of the device.

6.2.4.4 *Operating condition priority*

If the instrument does not have enough resources (memory or processor) to handle concurrent operating conditions, those with the lowest priority are overridden until the resources are available.



This tab allows you to reorganize the operating conditions of all the machines monitored by the device. For example, you can assign a higher priority to the task of monitoring a non-recurring event, such as capturing the time signal during a machine shutdown

IMPORTANT: Except for specific monitoring cases, setup the “priority” at “2” for all the operating condition.

*6.2.4.5 **Live data***

Real-time monitoring systems like the MVX are capable of continuously processing most of the parameters of the machines they monitor. These parameters make it possible to identify at any time the operating condition and machine alarm states of the corresponding vibration parameters.

In addition to machine information, MVX systems are able to monitor their own instrument state and alert if some problems occur - eg: sensor fault, internal error, network failure...

All these information are then transmitted continuously to third-party applications via the MVX's Modbus TCP output, and/or via the NESTi4 OPC UA server output and can also be displayed into NESTi4 Vision as "live data".

Two categories of information are considered:

- **live machine data** - e.g. alarm status, operating parameter values, monitoring parameter values (hard)
- **live instrument data** - e.g. sensor fault (open circuit, short circuit, ...), internal error, network failure, monitoring stop, ...

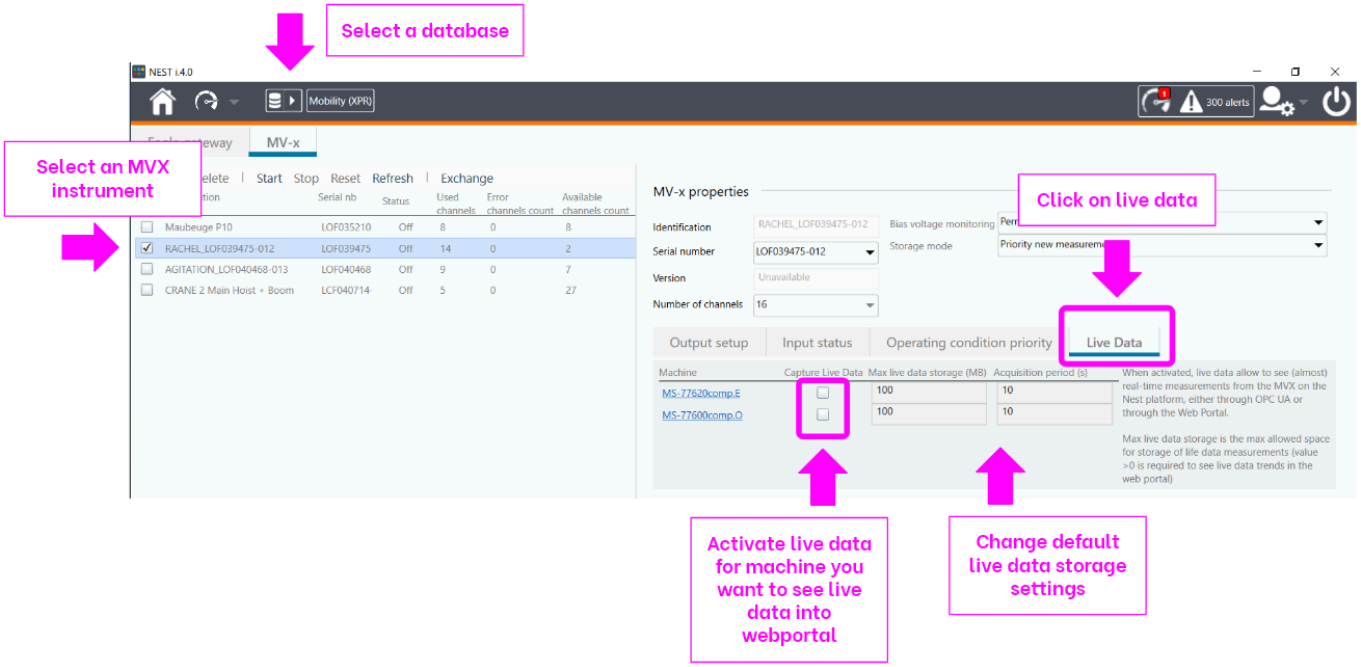
The uploading of live data to the Vision must be activated machine by machine for each MVX concerned; this operation must be done in the INSTRUMENT tab of NESTi4. Once the live data is activated, all the information captured is logged so that it can be both displayed in real time on the Vision screen and allows this information to be consulted in the past with great precision.

Live data is stored in addition to your defined machine-level monitoring & storage policy.

<u>How to activate & configure Live data:</u>

By default, live data is disabled so the Vision does not display live data information for any machine.

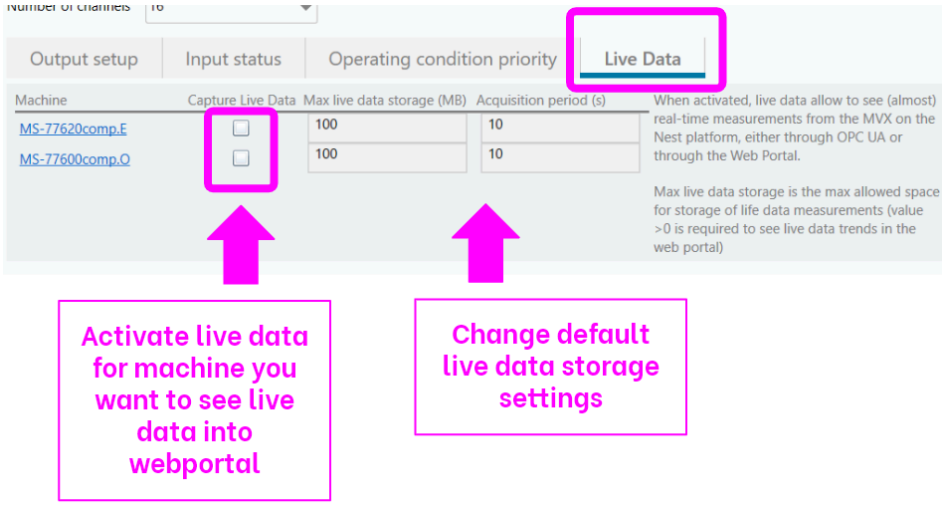
To activate live data, you must open **INSTRUMENT** module, click on **MVX tab** and select the MVX instrument that monitors the machine you want to activate live data:



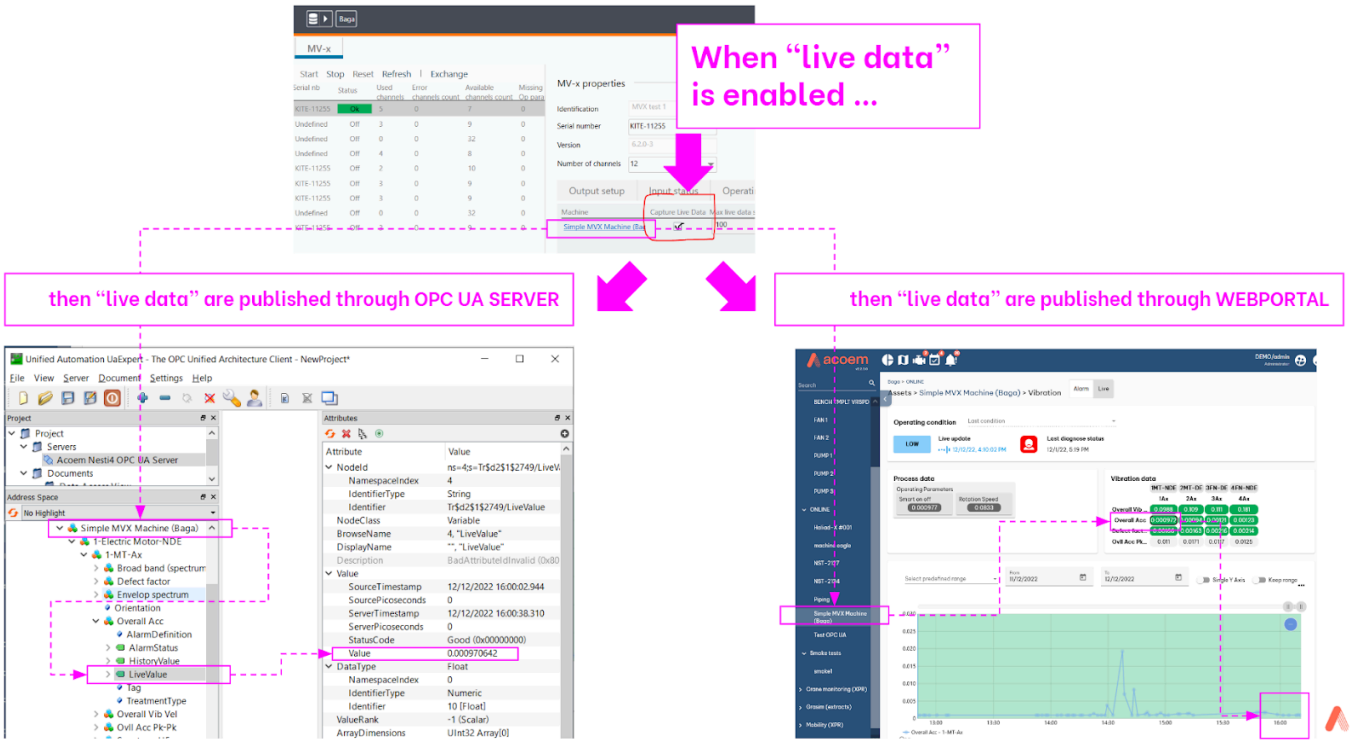
Live data are recorded into dedicated short term databases (1 / machine) in order to offer optimal performance and the following settings must be defined:

- **Capture Live Data** checkbox to activate (or not) live data mode for this machine
- **Max live data storage (MB)** to define the size of the live data buffer (FIFO storage)
- **Acquisition period (s)** to define the periodicity in seconds of writing new values into the FIFO buffer

NOTE: If you just need to publish live data through OPC UA output without display short term trends in Vision, then you must enter Max live data storage (MB) = 0 in order to keep only the latest value in the short term database.



When do you need to activate "Live data"?



Live data are displayed into Vision and/or through OPC UA server output

- "Capture live data" option must be activated into MVX properties (NESTi4 Instrument module) in order to show LIVE DATA of corresponding machines through the Vision and /or the OPC UA server.
- Not live data - ie History data - are not concerned by this option and continue to be published independently of this live data option within the limitation of the subscribed license (Vision option, opc ua server option).

<u>License consideration:</u>

- “live data” information must not be confused with “live value” information that is a part of the OPC UA output interface of NESTi4. This feature is free of charge and can be used for any MVX machine.
- "live value" feature requires OPC UA Output option (paid license) in order to deliver continuously measured overall values for all MVX machines to any external OPC UA client application - see dedicated OPC UA Output Reference.

6.2.5 *SFTP mode*

See dedicated documentation:

DOC3192 2025-06 A - NESTi4 v2.8 SFTP Interface with MVX User’s Guide (EN)

6.3 SPARROW Wireless Monitoring System

Consult SPARROW documentation for commissioning operation details.

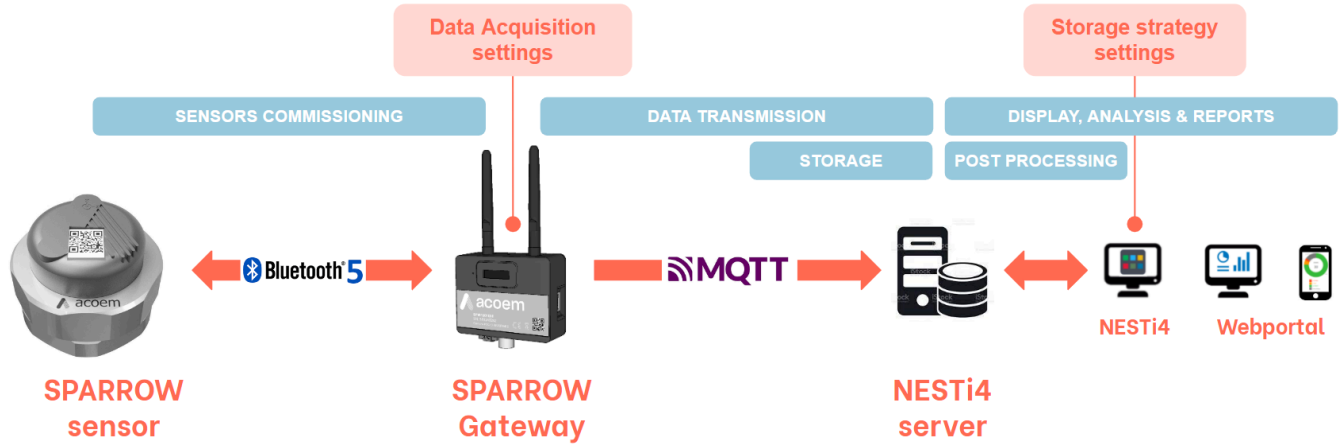
6.3.1 *Concept*

Sparrow sensors are paired to a gateway and this gateway is connected to NESTi4 in order to send measured data to be stored into a database.

CAUTION: Before attempting to use the gateway within NESTi4, it is essential to ensure that:

- At least 1 sensor must be paired to the gateway
- Gateway's MQTT interface must be connected to NESTi4 server – i.e. MQTT Status: Connected into GW MQTT webpage
- At least 1 measurement has been sent to NESTi4 server – i.e. sensor update interval is the minimal delay to wait for this measurement

See below the global solution diagram:



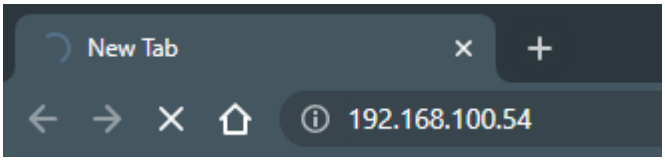
6.3.2 *Sparrow Configuration*

6.3.2.1 Sensor pairing

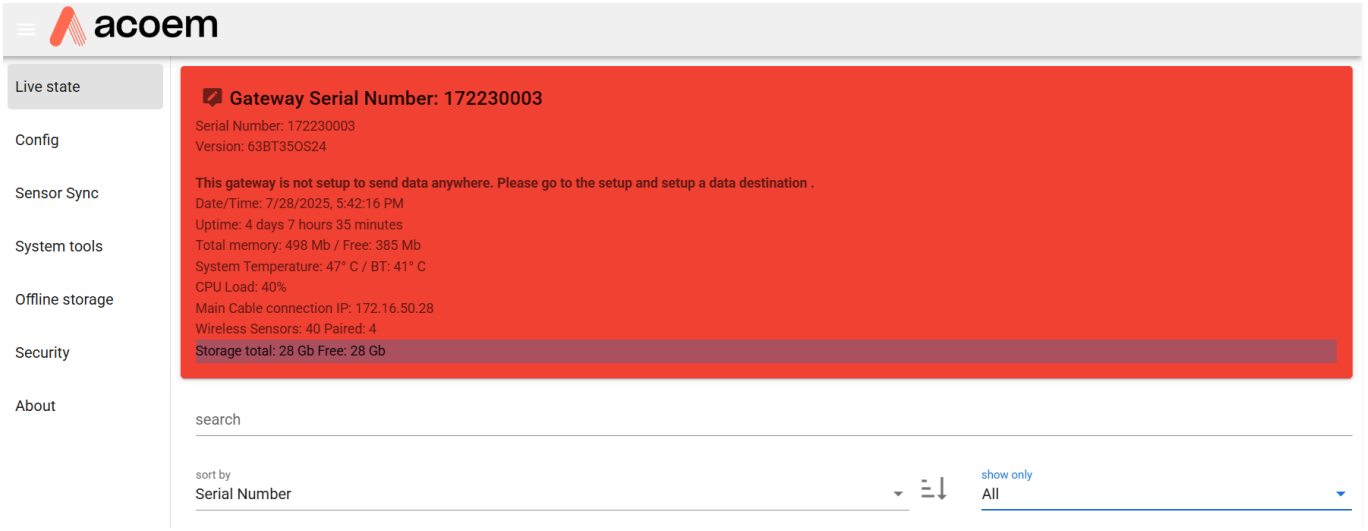
When your gateway is connected to a network it will show an IP address on the main screen



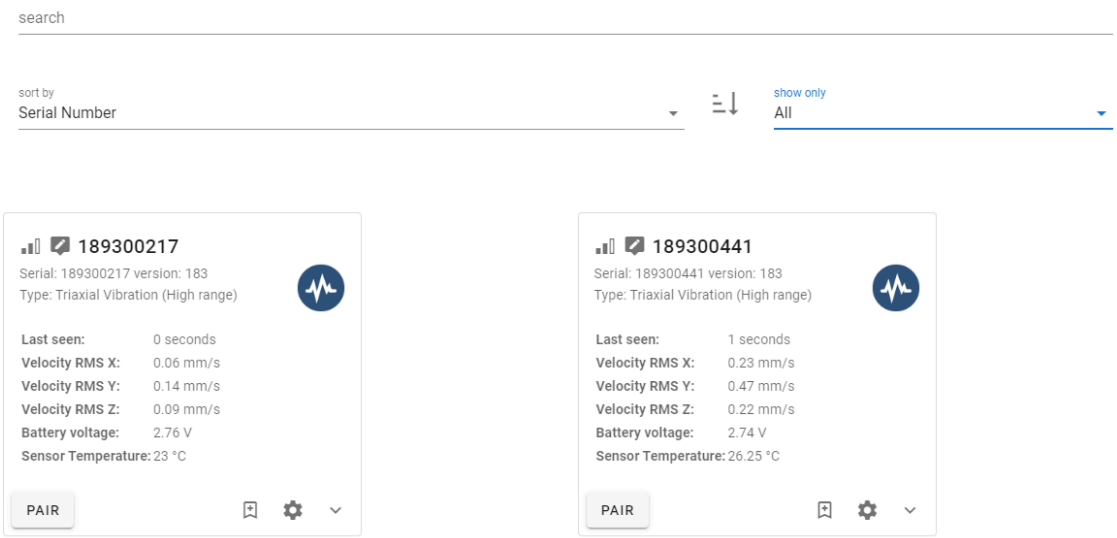
Connect your computer to the same network as the gateway, and go to a web browser, type the IP address in the search bar and press enter, this will load the Gateway settings page



This will load the Gateway 2.0 settings screen. If the Gateway is not yet configured to send data to NESTi4, then information will appear into a red banner



In the “**Live state**” tab, we will see the device general status, with its serial number. In this section, all visible sensors are displayed and they can be paired with the gateway. This is very important as the Sparrow sensors will not automatically connect and pair to the Gateway:



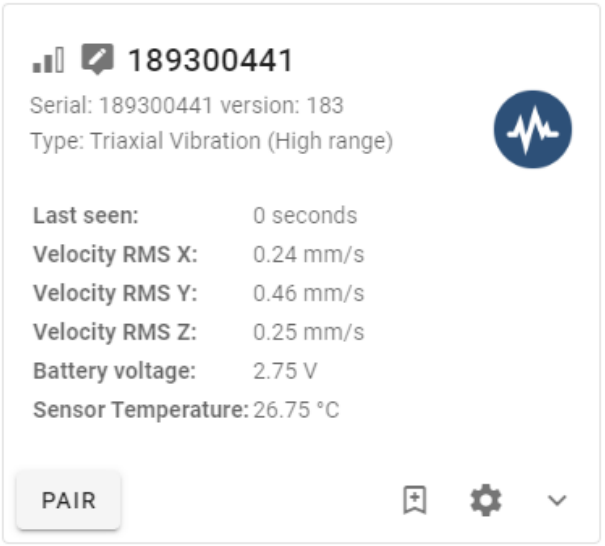
Under “**search**” you can manually enter a Sparrow serial number or part of the number to find the sensor on the list.

You can choose to sort sensors by serial number, last seen, node type, signal strength, battery and last download.

On the right you can filter the sensors, showing only paired sensors, unpaired sensors, sensors with low battery, low signal, your favorites, secured and unsecured sensors. Use any of the options to find your sensor.

6.3.2.2 Acquisition settings

On the screen you will see the status of the sensor with the last date it was seen by the gateway, the RMS value measured on each axis, the battery voltage and the sensor internal temperature.



Use the "**PAIR**" button to pair the sensor with your gateway, the same button allows you to unpair it later if you wish. Remember that sensors will not automatically connect to NESTi4 if they are not paired to the gateway.

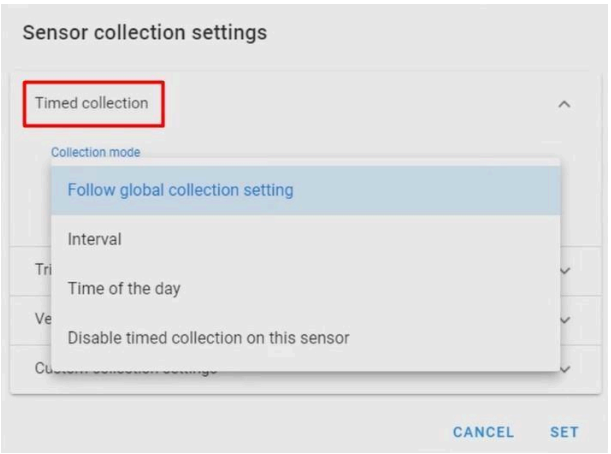
CAUTION: Before attempting to use the gateway within NESTi4, it is essential to ensure that:

- At least 1 sensor must be paired to the gateway
- Gateway's MQTT interface must be connected to NESTi4 server – i.e. MQTT Status: Connected into GW MQTT webpage
- At least 1 measurement has been sent to NESTi4 server – i.e. sensor update interval is the minimal delay to wait for this measurement

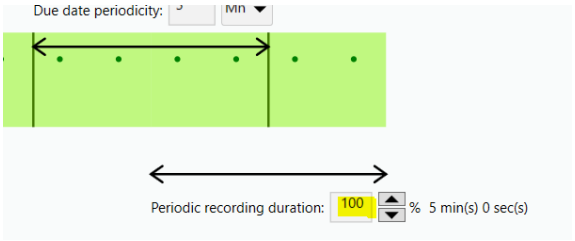
At the bottom right, you will have 5 buttons per sensor:



Details of buttons:

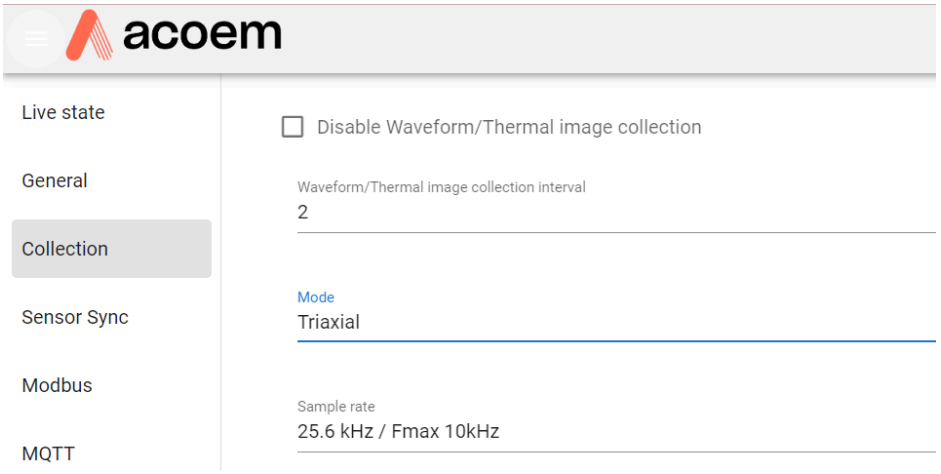
	Sensor is added to your **favorites**
	**Collect waveform now**: it activates the sensor making it record a time waveform and the FFT, with this tool you can collect data whenever you want
	**Sensor Collection settings** are split into 4 categories: ● **Timed collection** you will be able to choose the collection mode:  ○ **"Follow global collection setting"** will make the sensor record data according to the Gateway global settings ○ **"Interval",** allows you to send data with a defined interval, switch between minutes, hours or days on the right side, and on the left side type the interval of your choice, as long as you stay within the allowed range of the sensor. ○ **"Time of the day",** you can choose specific times of the day to send data. Click on "custom collection time" and select the time with the clock, then click on "ADD TIME" to add it to the list. You can add several hours by repeating this process, and remove hours with the "REMOVE" button. ○ **"Disable timed collection on this sensor"** will disable the Sparrow automatic collection; it will only record data if you activate it manually with the "Collect waveform now" tool that we saw earlier. ● **External Triggered collection**: not applicable with Sparrow sensor ● **Velocity RMS Alarms**: not applicable with Sparrow ○ Alarms thresholds must be defined into NESTi4 in order to be considered as for all other ACOEM acquisition device ○ Enabling alarms in the GW will just allow nesti4 to receive more time signal than it would on a simple periodic trigger. On the other hand, nesti4 will have no way of knowing whether the stored time comes from an alarm trigger or a simple periodicity deadline. Time signal on alarm will be stored in the same control date provided as other potential periodic time signal; there is no additional control date tagged "alarm".

- To ensure that nesti4 sees time signal on alarm (that can go up at any time), the recording window must be 100% - see setting below:



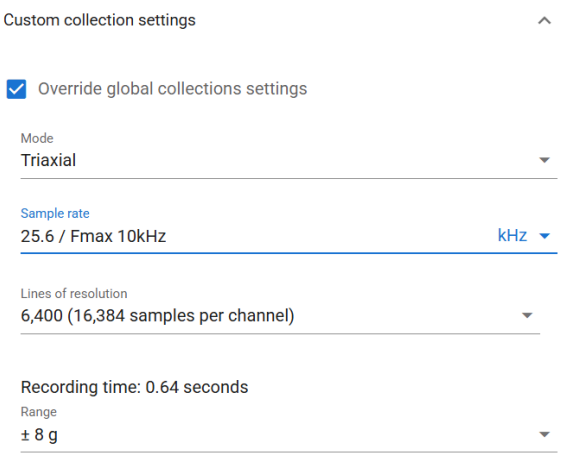
- If time events on alarm and periodicals come up in nesti4 during the same recording window, then only the time event closest to the due date (middle of the recording window) will be recorded in the database.

- **Custom collection settings**: By default the sensor will take the gateway global *Collection* settings – see below:

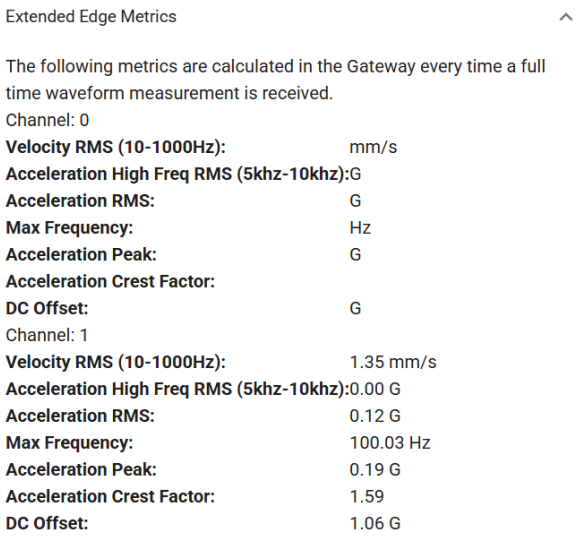


Check the "Override global collections settings" option to modify this sensor configuration only; this will show following options:

- You can choose to record in triaxial or single-axis mode
- In single-axis mode, you can choose which axis to record, or record all 3 axes sequentially
- You can change the **sample rate**, the **resolution lines** and **dynamic range** (±8g is recommended)
- When you are done with these settings click SET to save the changes.



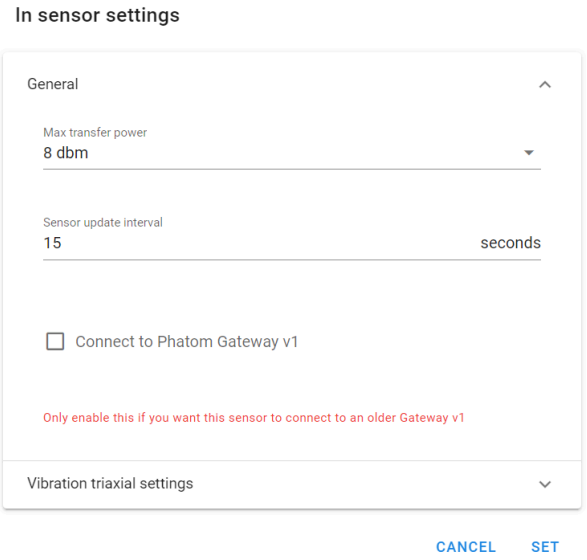
- **Extended Edge Metrics**: Following metrics are calculated in the Gateway every time a full time waveform measurement is received



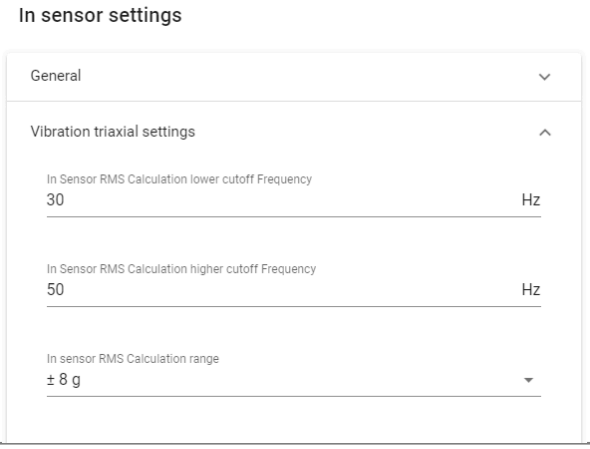


In sensor settings

- **General**
  - **Max transfer power** - recommended to keep with 8dbm
  - **Sensor update interval** - this defines after how many seconds the sensor updates its status, this is called sequence or “COUNT”
  - **Connect to Sparrow Gateway v1**: keep this option disabled (unchecked) with Sparrow



- **Vibration triaxial settings:**
  - You will see the **frequency range** with which the Sparrow sensor RMS values are calculated, according to the standard the range goes from 10 to 1000Hz by default, but you can modify it if you wish.
  - You can also choose the **dynamic range** in which the RMS is calculated, the **sample**



rate and maximum frequency, and the **resolution lines**.

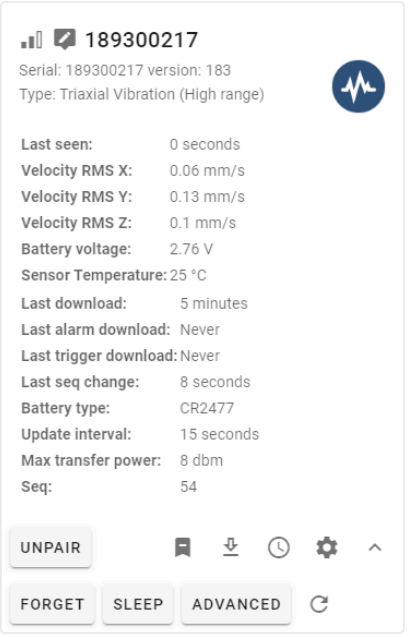
- Click SET when you are done to save your changes.

Display more information as well as 3 additional buttons. On the main screen, it will present:

- The last time the sensor downloaded the time waveform and FFT,
- The last time it was alarmed,
- The last collection by “TRIGGER”,
- How many seconds have passed since the last sequence,
- The type of battery this sensor uses,
- The update interval or time between each sequence,
- The max transfer power and the sequence number, meaning the total number of times it has updated its status.

Below you will have 3 buttons:

- **FORGET** button: it will make the Gateway forget the sensor, this way it will remove the Sparrow from the list and you will delete the configurations you have made, this is intended for sensors that you no longer use, if the sensor is still transmitting it will appear in the list again although it will not be paired or configured.
- **SLEEP** button: the sensor will go into sleep mode, it will not try to connect to the gateway, it will not update its status or check alarms, it will be inactive until it is manually reset with a magnetic key. This will help you to maintain the battery of the sensors that you are not using.
- **ADVANCED** button: it will allow you to load specific firmware into your sensor, to avoid damage to your Sparrow, do not enter a code without the help of an ACOEM technical support assistant.



By following these steps your Gateway will be able to make a successful connection to your Sparrow Sensors. If you have any questions about any part of the procedure, please do not hesitate to contact ACOEM Technical Support.

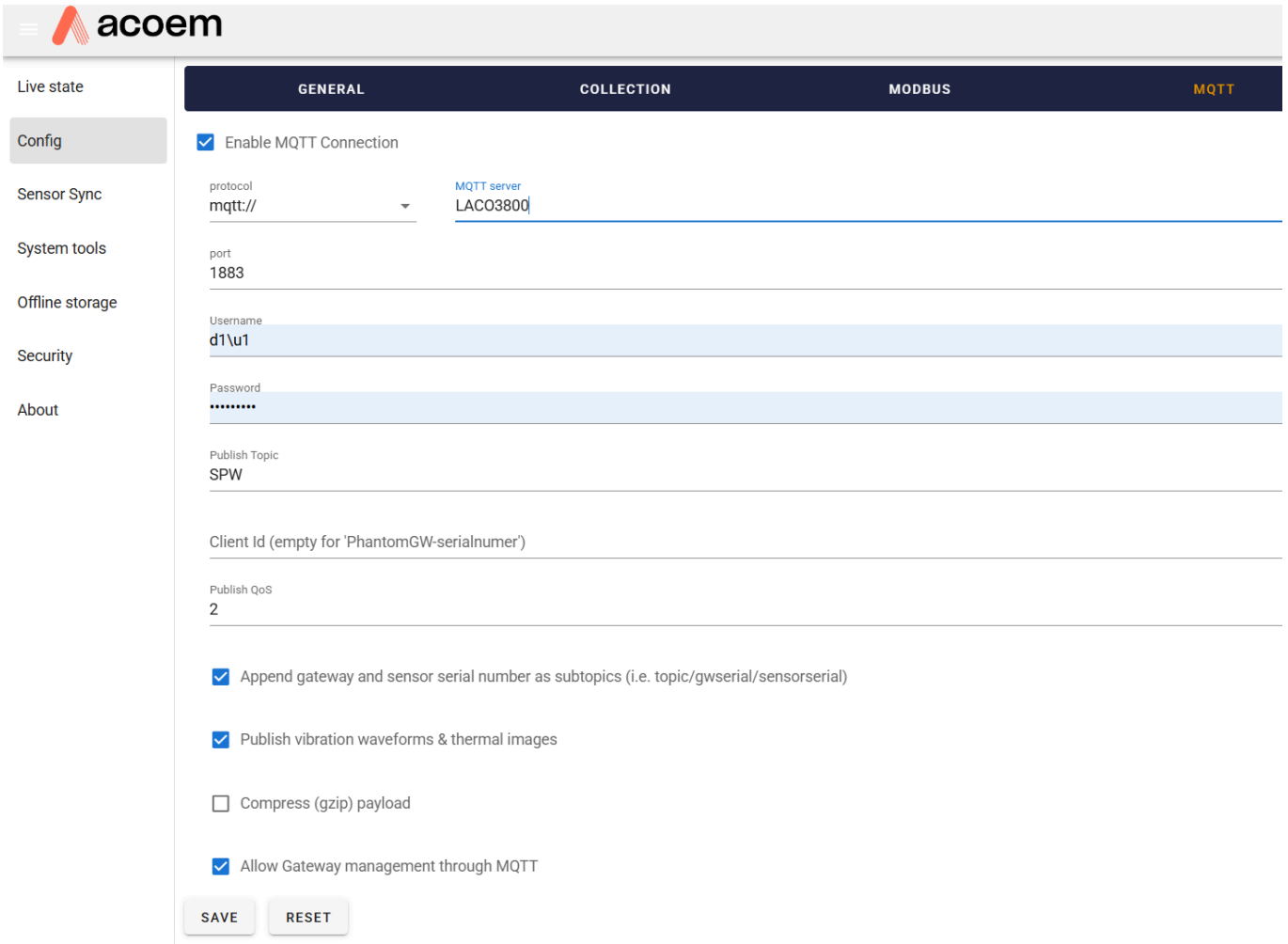
6.3.3 *Sparrow Connection to Nesti4*

The gateway used in the **ACOEM Sparrow ®** system supports the MQTT IoT protocol. All sensors data is available through MQTT, including temperature, velocity as well as full time wave forms from vibration sensors; FFT must be processed by NESTi4.

The gateway acts as a MQTT client that will connect to a MQTT broker embedded into NESTi4 server. To connect the gateway Enabling MQTT interface:

- Click on Config tab
- Click on MQTT tab
- Check “Enable MQTT Connection”

Example :



- Enter communication settings with MQTT broker embedded into NESTi4 server:

Property	Description
Enable MQTT Connection	Check the box to activate MQTT interface with NESTi4 server ☑ Enable MQTT Connection
Protocol	Choose level of encryption of the MQTT brocker: ● **mqtt://** if NESTi4 server is not SSL encrypted ● **mqtts://** (encrypted) if NESTi4 server is SSL encrypted
MQTT server	Enter NESTi4 server IP (or hostname)

Port	Enter listening port – i.e. **1883** (by default) ; this port can be changed into NESTi4 server settings
Username	Enter a NESTi4 account (domain + username) – ex: **d1/u1** (default user account)
Password	Enter the user password
Publish Topic	Not used with NESTi4
Publish QoS	Enter a QoS level in order to use the offline storage of the gateway when network failure occurs. MQTT provides three levels of QoS ; select **"Level 2"** to have the better compromise - Understanding MQTT Quality of Service

QoS	Publisher	Subscriber
0: at most once	Will send a message only once.	*Might receive or might not receive the message.*
1: at least once	Will send a message *at least* once as long as an acknowledgement is received or the command to end the transmission is received.	It is likely to receive the message *at least* once (it is possible that the message can be received more than once).
2: exactly once	Will *only* send a message once.	Will *only* receive the message once.

Append GW and sensor serial number as subtopics	Not required by NESTi4
Publish waveforms	Check the box to authorize time signal measurement sending ☑ Publish waveforms
Compress (gzip) payload	Check to compress MQTT message
Allow Gateway management through MQTT	Check the box to authorize the gateway to receive MQTT messages as external commands - ex: trig measurements, … ☑ Allow Gateway management through MQTT
Subscribe topic	Not required by NESTi4
Subscribe QoS	Not required by NESTi4

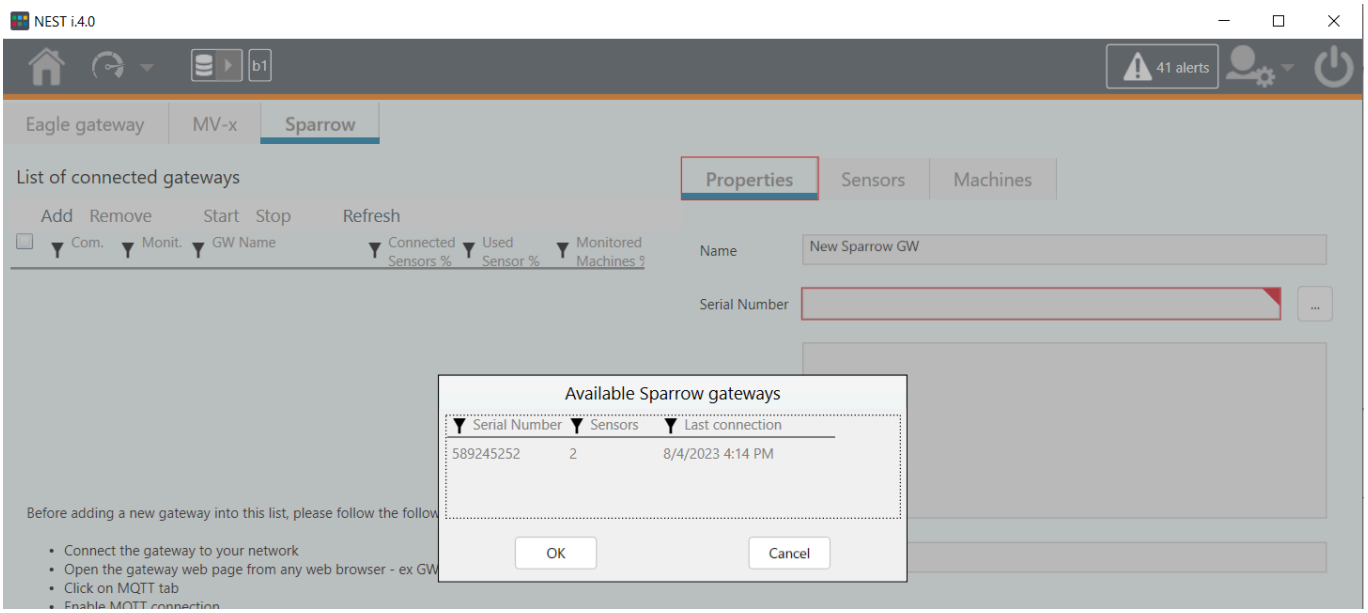
When MQTT settings is ready, then click on SAVE.

The gateway reboots and connects to the NESTi4 server ; the gateway is visible in the INSTRUMENT module.

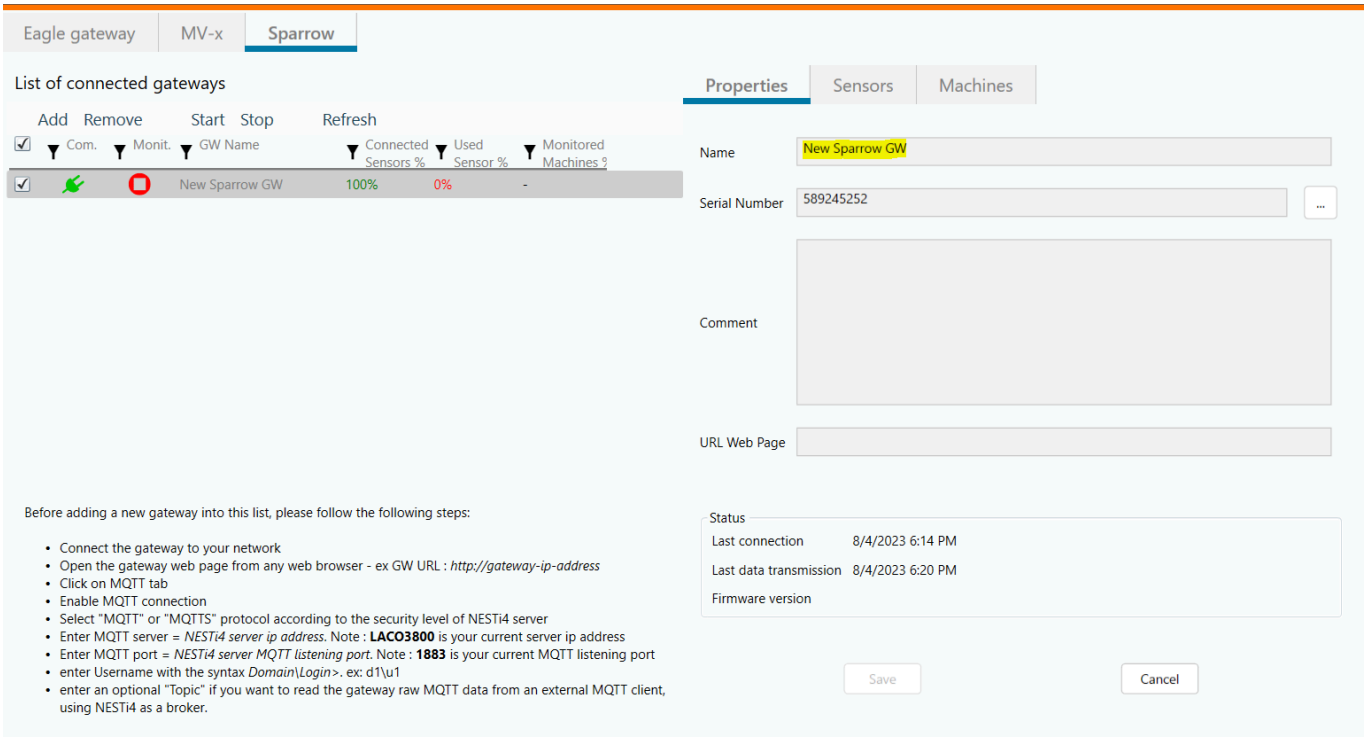
6.3.4 *Sparrow Management (add, …, start, …)*

When a Sparrow gateway is connected to the NESTi4 server then the device is ready to be added into the instrument module of nesti4. CAUTION: At least one sensor must be paired to the gateway in order make this gateway visible into NESTi4.

- Open INSTRUMENT module
- Click on SPARROW tab
- Click on “**Add**” function
- Select the serial number of the new connected gateway with the quantity of paired sensors



- Enter a custom name and click on SAVE



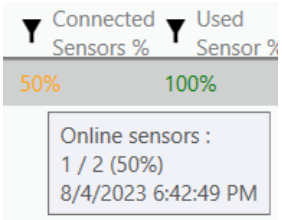
Details of the gateway menu:

Function	Description
Add	Declare a new gateway into database in order to receive and store its measurements
Remove	Remove an existing gateway from the database – only a stopped gateway can be removed
Start	Start recording for the selected gateway
Stop	Stop recording for the selected gateway
Refresh	Force an immediate refresh of gateway and sensor status

Details of the gateway list:

Properties	Description
Com. 	Communication status of the gateway with nesti4 server - see status icons below ○ **connected**: nesti4 server receives and understand messages from the GW ○ **not connected**: nesti4 server does not receives or does not understand messages from the GW
Monit. 	Monitoring status of the gateway - see status icons below ○ **started**: monitoring has been started on at least one machine connected to this gateway ○ **stopped**: monitoring has not been started on any machine connected to this gateway
GW Name	Custom name of the gateway (entered into properties)
Connected%	Ratio of connected (communication) sensor vs total sensors – when ratio = 100% then all your sensor are communicating correctly with the gateway
Used%	Ratio of used (mapped to a machine) sensor vs total sensors – when ratio= 100% then all your sensors are assign to a machine
Monitored%	Ratio of started machines vs total mapped machines to this GW – when ratio= 100% then all machines where your sensor are installed are

NOTE: Some tootips present more details information on ratio – example:

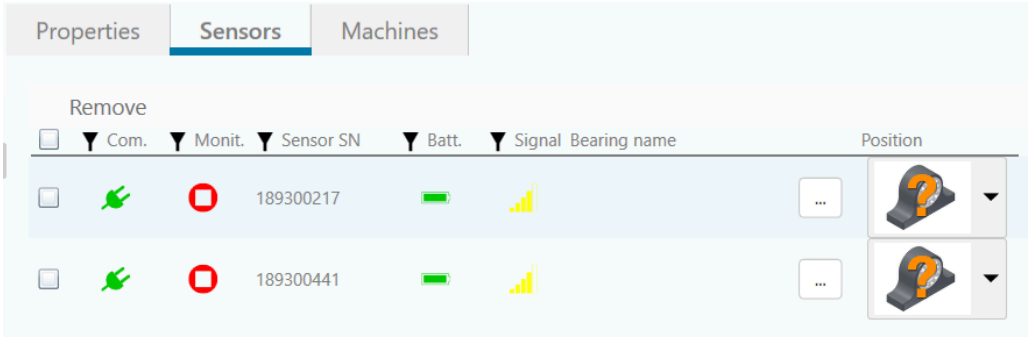


Details of gateway properties:

Properties	Description
Name	Enter a custom name of the gateway
Serial number	Serial number of the gateway. It can be entered manually or selected from the list of new connected gateways.
Comment	Enter a custom description or comments concerning this gateway
URL Web Page	Enter the URL web page of this gateway
Last connection	Date & time when this GW has been viewed as “connected” by NESTi4 - ex: 8/4/2023 6:14 PM
Last transmission	Date & time when a measurement (temperature, overalls or timewave) has been received from this GW – ex: 8/4/2023 6:51 PM
Firmware version	Firmware GW version - ex: 39BT16OS10

6.3.5 *Sparrow properties*

- Click on **“Sensor”** tab to see the list of sensor paired to this gateway



Details of the sensor properties:

Properties	Description
Com.	Communication status of the gateway with nesti4 server - see status icons below ○ **connected**: nesti4 server receives and understand messages from the GW ○ **not connected**: nesti4 server does not receives or does not understand messages from the GW
Monit.	Monitoring status of the gateway - see status icons below ○ **started**: monitoring has been started on at least one machine connected to this gateway ○ **stopped**: monitoring has not been started on any machine connected to this gateway
Sensor SN	Serial number of the sensor – see QR code and sticker on the sensor cap
Batt.	Battery status depends on the battery type:

Battery Type	OK	Under	Almost Depleted
CR2032 or CR2477	V>2.5V	2.3V< V <=2.5V	2.3V>= V

Signal	Signal level - icon color: 0 <= red < 25 <= orange < 70 <= green <= 100 %
Position	Position of the sensor on the machine

- The gateway and sensor are now ready to be associated with a machine to start monitoring.

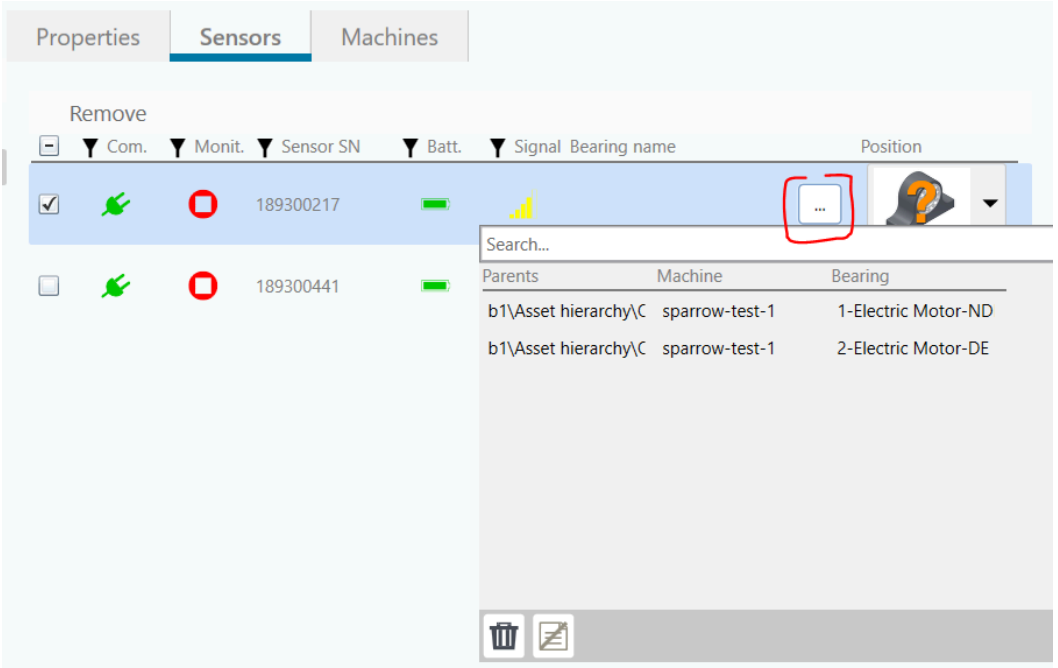
6.3.6 *Sensor – machine association*

"Sensor – machine" association is possible from the INSTRUMENT module or from SETUP module.

Only "Sparrow machine" can be associated with sparrow sensors.

For each sensor:

- Select a machine bearing from the list by clicking on the  button:



- Select a sensor position
- Click on SAVE when finished

NOTE:

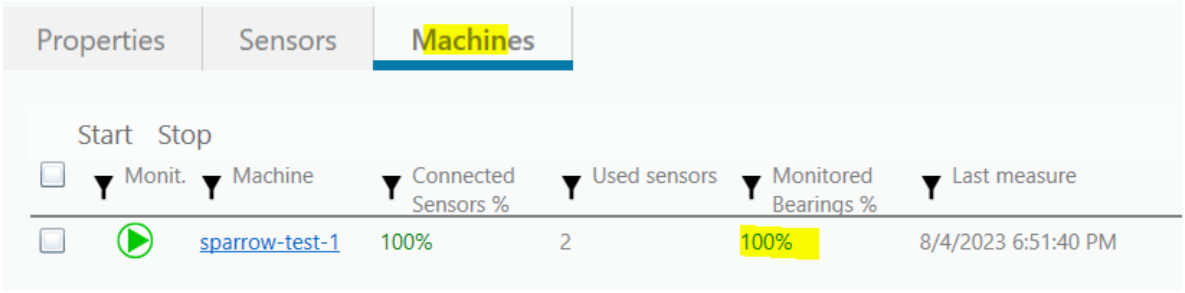
- Click on  to dissociate a sensor from a bearing

- Click on  to see only the list of bearing not yet associated to a sensor

6.3.7 *Start / Stop acquisition*

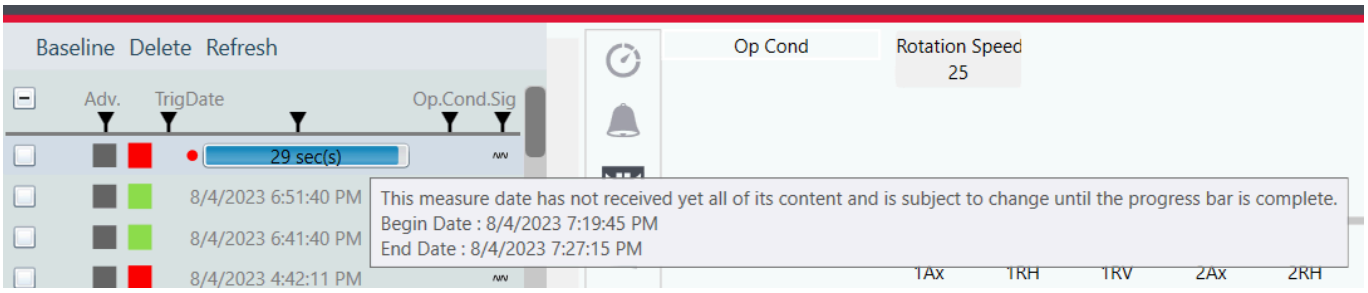
When all bearing of a machine have been associated to a sparrow sensor, then machine monitoring can be started:

- Click on “Machine” tab
- Check “Monitored bearing%” is 100%
- Select the machine
- Click on “Start” button



Now, all measurement coming from sparrow sensor associated to this machine will be stored into database according the storage strategy defined into the setup module

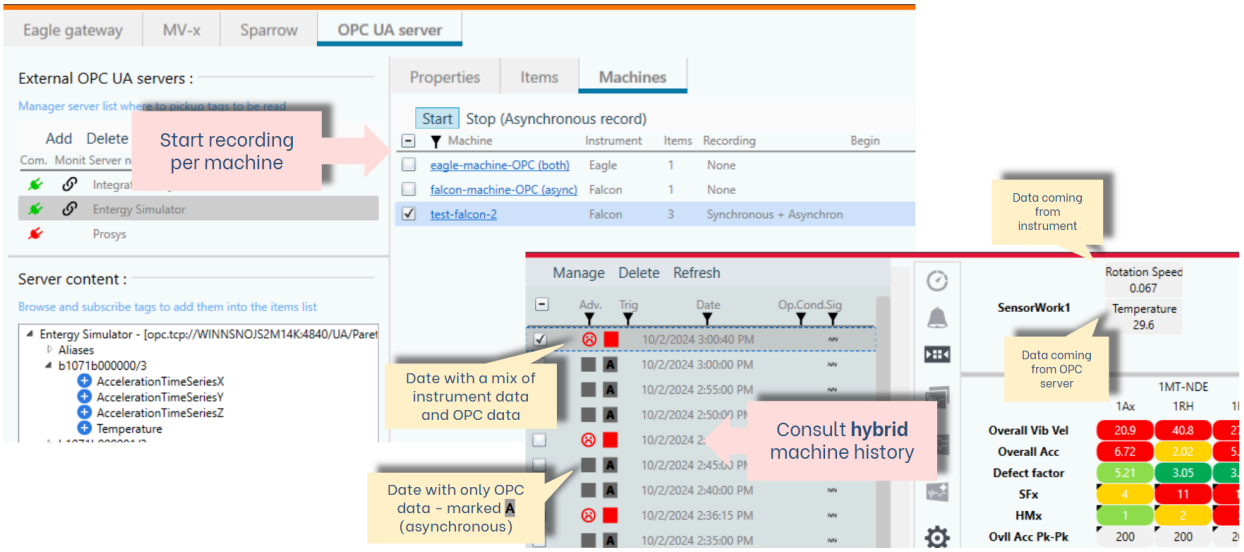
- Click on the machine name hyperlink to access directly to setup module of this machine
- Switch into analyst module to see recording progression into the list of measurement of the machine



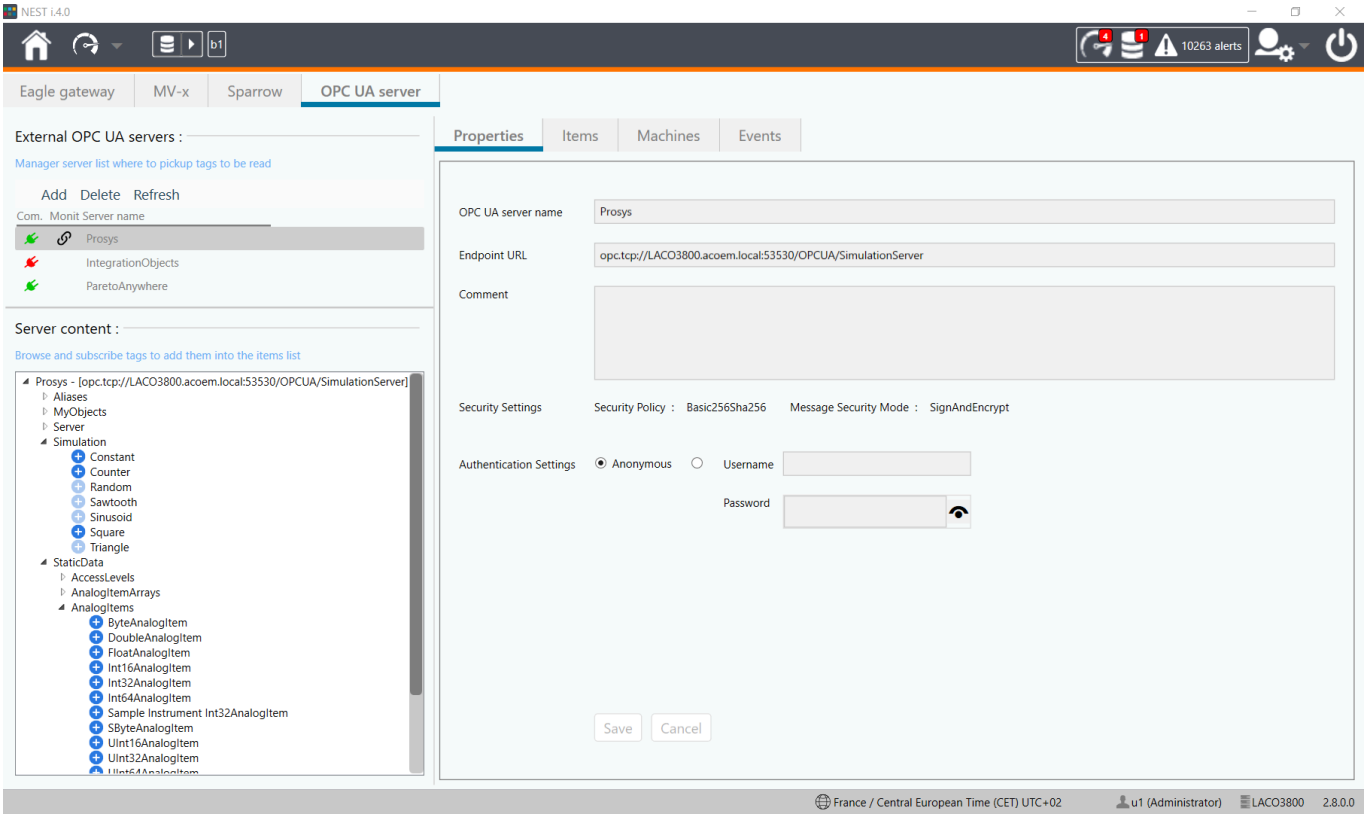
6.4 External OPC UA Server

Requires “interoperability (OPC UA, …)” license option. Available for all machines.

The instrument module allows you to connect one or more OPC UA servers to each database. Once connected to an OPC server, you can browse its tree structure to select one or more tags before linking them to machines and record corresponding data.

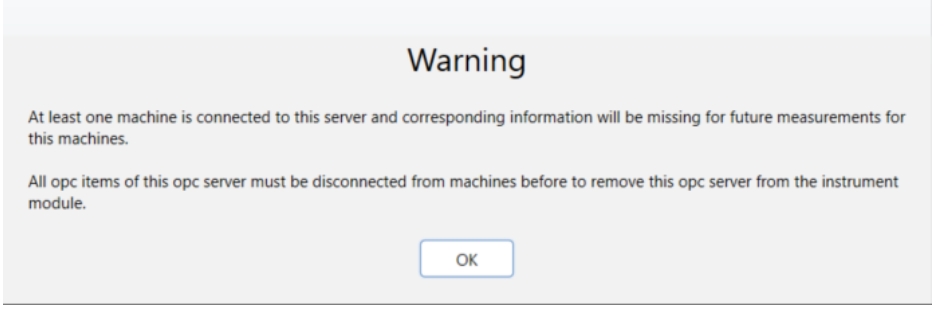


6.4.1 *OPC UA servers, browsing & properties*



- **External OPC servers** list of added opc servers
    - Properties:
        - **Com.** Status of communication – ie: reachable / not reachable
        - **Monit.** Status of monitoring – ie: linked / not linked to a machine
        - **Server name**
    - Functions:
        - **Add** click to add a new opc server

- **Delete** click to remove the server currently selected in the list of servers. Note: A server can be removed from this list only when all its items have been unlinked from any machines.

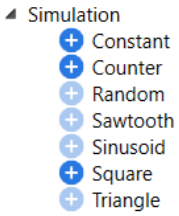


- **Refresh** click to refresh all presented information

- **Server content** browsing area of the content of the server currently selected in the list of server

- **Properties** this tab presents properties of the server currently selected in the list of server
  - **OPC UA server name**: enter a name for this server
  - **Endpoint URL**: opc ua server address to connect
  - **Comment**: enter a comment text to describe this opc server
  - **Security settings**
    - **Security Policy** (automatically negotiated with opc server)
    - **Message Security** mode (automatically negotiated with opc server)
  - **Authentication settings**
    - **Anonymous** connect to server without any credential
    - **Username / password** connect to server with a specific user account

6.4.2 *OPC UA items subscription*



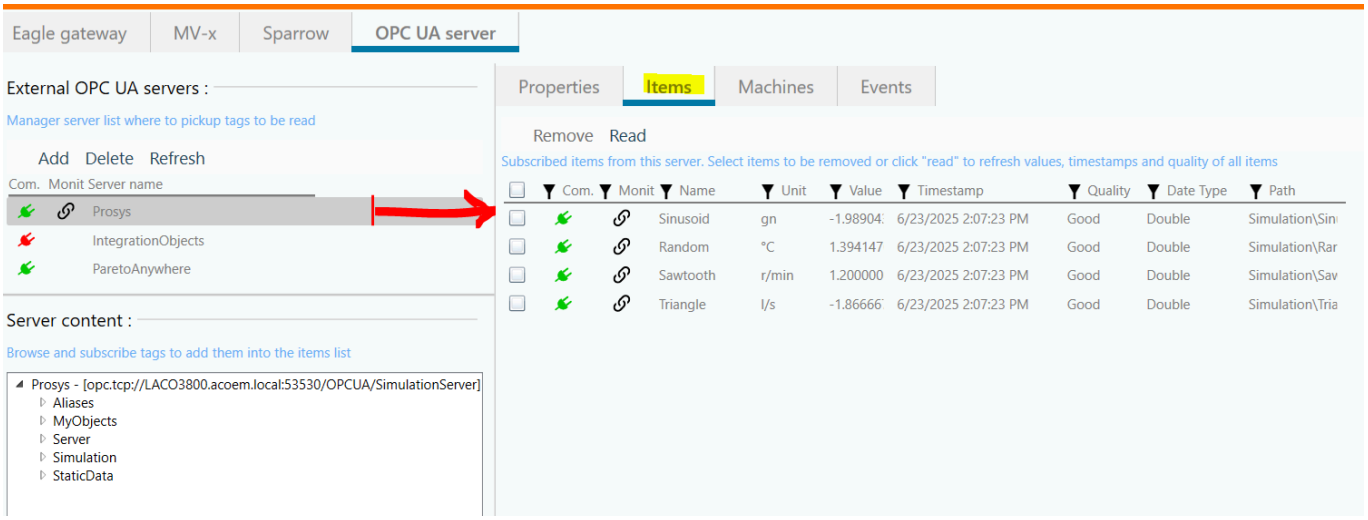
When an OPC server is declared and connected to NESTi4, content is automatically browsed into the server content area. This view presents the hierarchical tree structure of server content. A (+) button is displayed in front of each opc tag in order to select it and add/subscribe it to the nesti4 opc item list.

This subscribe function is active only for **compatible tags** – see details in SETUP module - button is inactive in other cases.

Some wording convention:

- OPC **tags** correspond to the list of variables contained into the OPC server
- OPC **items** correspond to the list of selected (subscribed) tags ready to be used to be recorded by NESTi4

Items list presents the list of subscribed tags from the current selected server – example: list of items of “Prosys” server



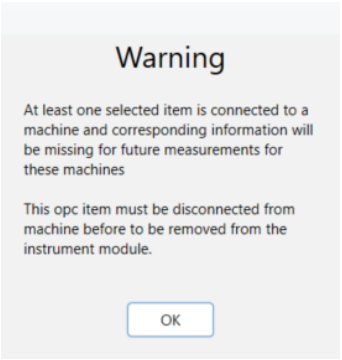
Items list presents the following information:

- **Com.** – Status of communication – ie: reachable / not reachable
- **Monit.** – Status of monitoring – ie: linked / not linked to a machine
- **Name** – item name (same name of selected tag)
- **Unit** – unit label assigned to the opc tag (selected during the tag subscription)
- **Value** – value of corresponding opc tag for the current timestamps
- **Timestamp** – corresponding opc tag server timestamps
- **Quality** –quality of the corresponding opc tag – ex: Good, Bad, …
- **Data type** datatype of the opc tag – ex: Int16, Int32, Int64,UInt16, UInt32,…
- **Path** tag location on the opc server

Items list presents the following functions:

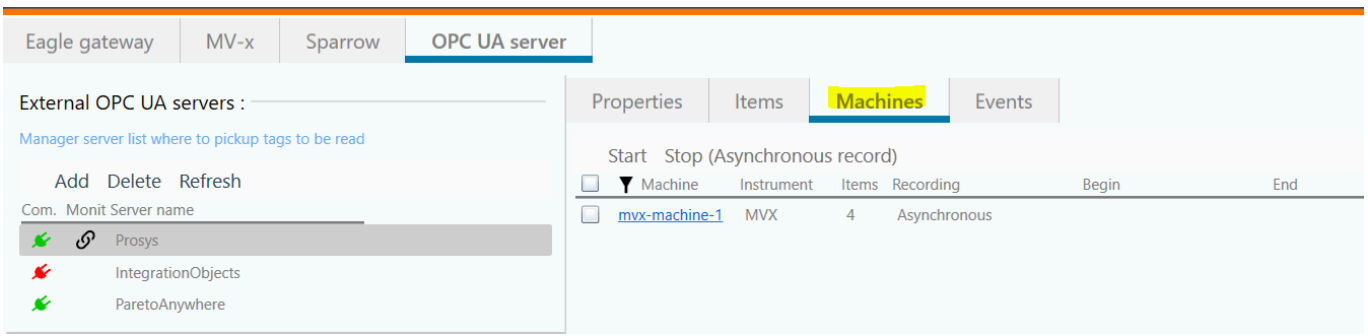
- **Remove** click to remove selected items from the list. Note: An item can be removed from this list only when it is not linked to any machines.

- **Read** click to refresh "value", "timestamp" and "quality" information of all items



6.4.3 *Machines list & Asycn recording*

When OPC items are linked to machines – see SETUP module – then corresponding machines are displayed into the "Machine" tab for each opc server with the following informations:



Machine list properties:

- **Machine** name of the machine + hyperlink onto the machine setup page
- **Instrument** type of used device to monitor the machine – ie: Falcon, Sparrow, Eagle, MVx …
- **Items** quantity of OPC items linked to this machine
- **Recording** recording strategy (syn, async, both)
- **Begin** datetime of OPC record starting
- **End** datetime of OPC record ending

Machine list functions: Concern only asynchronous recording. OPC UA items are recorded according to the record strategy defined into machine setup \ strategy \ external data

- **Start** – click to start asynchronous recording of all external opc items of the machine
- **Stop** – click to stop asynchronous recording

6.4.4 *OPC UA server errors*

Because OPC UA data are integrated into the machine monitoring strategy, it is essential to be informed about **loss of communication** with external OPC UA server (not reachable, …).

These informations are consigned into the “Events” tabs and can be notified by email.

CHAPTER 7. Setup route



Setup route manages lists of machines that can be used as routes to load the data collector or as filters in Analyst.

7.1 ROUTE LIST

The screen lists all routes of the selected database. Information listed is:

- Route name
- Creation date
- Number of machines in the route
- Number of points

Contextual functions are:

- Add: create a new route
- Modify: modify properties of current route.
- Delete: delete selected routes.

7.2 ROUTE PROPERTIES

7.2.1 *Machine selection*

- Use the left navigation panel to select the location from which you want to choose some machines.
- Use the right function bar to set the type of display at your convenience for the selection area.

Note: the flat mode is available with the list display and can be used to select the machine from several locations in one operation.

- Use the selection area in the middle to add or remove machines in the route.
- Use the right area showing the route properties to reorder or remove machines.
- Use the right function bar to save or cancel modification.

7.2.2 *Selection area*

This is the area to select the machines to add in the route. Machines already selected are indicated by the ★ symbol in icons and map display modes or highlighted in orange in list mode.

Contextual functions are:

- **Select**: the number indicates the number of selected items
    - Select all
    - Unselect all

Note: selecting/unselecting is done by clicking on each item.

- **Add**: add in the route all selected machines. The order of selection is the order in the route. If a machine is selected in the route, the machines are added after this one.
- **Remove**: remove selected machines from the route.

7.2.3 *Route properties area*

This area shows the properties of the route:

- **Name** of the route
- **Comment**: this comment is loaded in FALCON and can be used to give special instruction to the person making the measurements.
- List of machines.

Note: selection is done by clicking on each item. A multiple selection can be done using ctrl or shift keys. Selected machines can be moved with a drag and drop.

Contextual functions are:

- **Remove**: remove from the route selected machines.
- Reorder:
    - First: move all selected machines at the beginning.
    - Up: move all selected machines one rank up.
    - Down: move all selected machines one rank down.
    - Last: move all selected machines at the end.

Notes:

- The machine order can also be done with a drag and drop.
- It is possible to reorder a route point per point in the collect module.

7.2.4 *List of data collectors*

It lists the data collectors known by the system. The listed information is:

- FALCON serial number
- **IP address** or DNS name: needed if Ethernet communication is used. See FALCON user manual for more information
- **Comment**: optional
- **Sensor**: optional, sensor identification for traceability
- **Cable**: optional, cable identification for traceability

Contextual functions are:

- **Add**: to add a new collector in the list.
- **Modify**: to modify the properties of selected collector
- **Delete**: to delete selected collector
- **Refresh** connected collectors: to detect connected collectors.

Reminder: FALCON must be set in communication mode: from home screen select the "Communication" module: 

.

CHAPTER 8. Collect



Collect module is used to send route data from or to the data collector.

8.1 "INSTRUMENT" TAB

This tab is used to set the communication mode and manage the list of data collectors.

8.1.1 *Direct transfer*

This mode is used if you connect the instrument directly to the PC.
With FALCON, 2 communication modes are available:

- **USB mode**: if you connect FALCON connector H to a USB port of the PC. The PC automatically selects the connected instrument and creates it in the list if necessary.
- **Ethernet mode**: if you connect FALCON and the PC on the same network (Ethernet or Wi-Fi). In this case, it is necessary to "Add" or "Modify" a collector in the list with following information:
    - FALCON serial number (Ex: 10015)
    - Address:
        - IP address (e.g., 192.168.0.1) or
        - DNS name (e.g., Falcon_10015)

NOTE: Ethernet mode is based on the SMB 1.0 protocol between NESTi4 client and data collector and it can be blocked on certain operating systems due to security rules. Please contact our technical support for any doubt.

From FALCON home screen, select the "Communication" module:  . Once the connection is set, the line is highlighted in orange, you can now go in the "Load" tab.

8.1.2 *Via intermediate files*

In this case, it is not needed to have a direct connection.

- To load a route, NESTi4.0 generates a .zld. This file can be imported in FALCON, once copied in a folder "Import" on a USB memory stick or in FALCON internal memory.
- To download a route, FALCON exports a .zdl file. This is located in a folder "Export" on a USB memory stick or in FALCON internal memory. It can be imported in NESTi4.0 from the "Instrument > NEST" tab.

8.2 "NEST → INSTRUMENT" TAB

This tab is accessible if:

- a data collector is detected and selected or if
- the communication mode set to "Via intermediate files" and a data collector is selected

The list shows all routes of the selected database. Listed information is:

- Loading status: OK or Error
- Route status:
  - OK if the route is not present in the data collector
  - Overwrite if the route is already present in the data collector.
    - Overwrite option is selected if measurement have already been downloaded
    - Overwrite option is unselected if there are measurements which have not been downloaded. If the option is selected, measurement stored in FALCON will be lost.
- Route name
- Creation date
- Number of machines in the route
- Number of points

Contextual functions are:

- **Send**: send selected routes to the instrument. If "Via intermediate files" is selected, NESTi4.0 creates one ZLD file per route.
- **Reorder** measurement points: this function displays the point list of the selected route. Select one or several points (several using either Shift or Ctrl key) and move the selection with a drag and drop. Point order can also be modified with following functions:
  - Reset: point order is set back to the initial order of the route.
  - Order by last measurement date: this function changes automatically the order to take the measurement in the same order that it has been done during the previous data collection.

Notes:

Once the order is modified, the route is flagged in the list by the symbol ★.

- If the route is changed from the "Setup Route" module, the order will be reset.
- If points are added to the machine (or speed changed fixed /variable), the order will be reset.

8.3 "INSTRUMENT → NEST" TAB

This tab is accessible if:

- a data collector is detected or if
- the communication mode set to "Via intermediate files" and a data collector is selected

The list shows all routes of the connected data collector which were initially loaded from the current database.

For "Via intermediate files" mode add the route using the contextual function "Add".

The listed information is:

- Uploading status: OK or Error
- Route status:
  - Green, Warning: route not yet uploaded
  - Grey, Warning: route has been uploaded
  - Blue for the OFF_ROUTE
  - Orange, Server error: the route has been loaded from another server, it will be uploaded in OffRoute
  - Orange, Off-Route: machine from this server but unknown in current database. It will be uploaded as Off-Route.
- Route name
- Loading date
- % of completion
- Number of machines in the route
- Number of points in the route

Contextual functions are:

- **Send**: send measurements from selected routes from the instrument to the database. At the end of the transfer, it is possible to display the download report and to save it
- Measurement log:
  - Display last measurement log.
  - Open saved measurement .json file
- **Refresh**: refresh the list of routes ("Direct transfer" mode).
- **Add**: add a route in the list form a .zdl file ("Via intermediate files" mode).

Notes:

- "OFF_ROUTE" measurements are downloaded in the OffRoute location of the database.
- Unknown machines (deleted machines, or the route loaded from another NESTi4.0 database) are also downloaded in the OffRoute location of the database.
- Limitations: only data managed by the current NESTi4.0 version can be saved. It excludes:
  - Signal triggered spectrum and time waves
  - Time wave or envelope spectrum with integration

- Machine including points with multiple input type
- Machines generated by NEST3

CHAPTER 9. Analyst

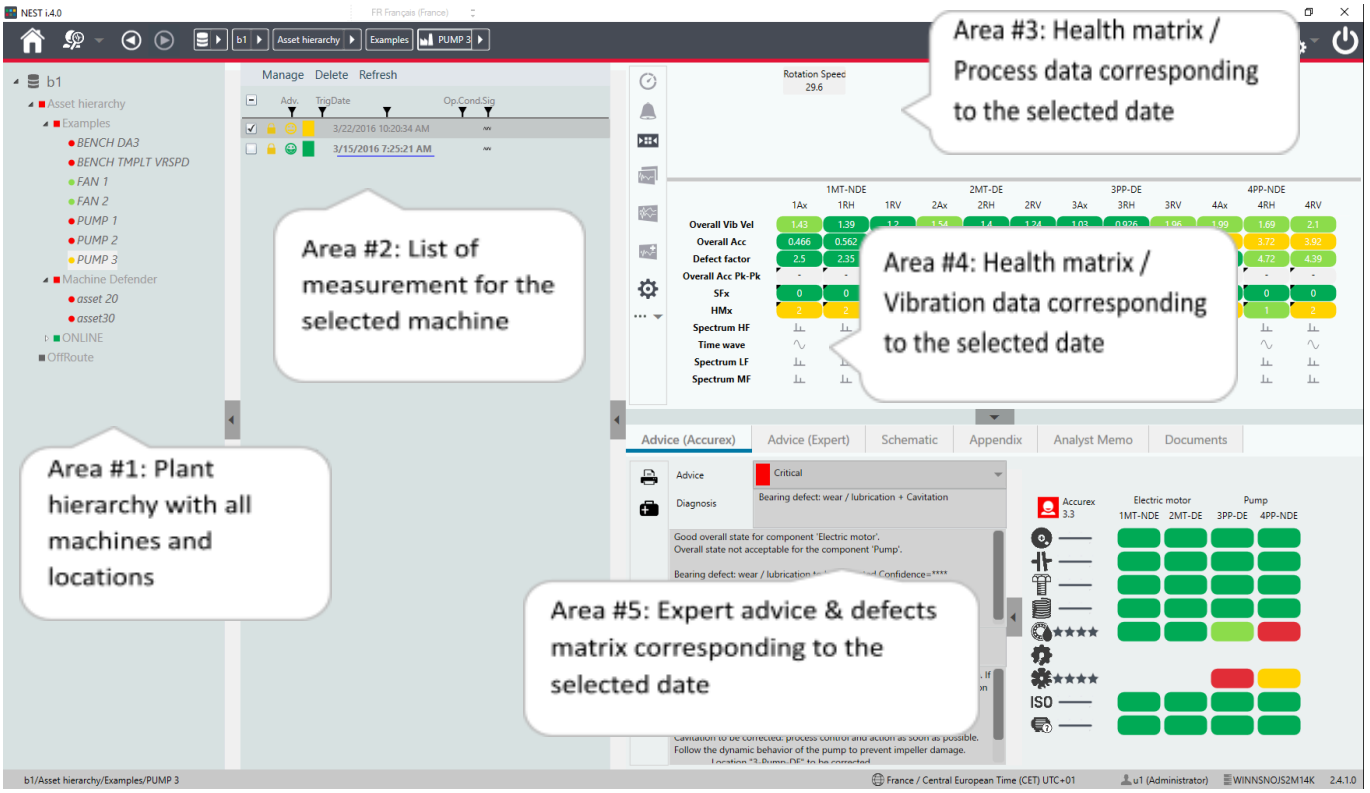


Analyst module includes powerful tools for machine analysis as the Health Matrix, merged spectra to help you to confirm the Automatic diagnosis or to build up your own analysis and recommendations

9.1 PURPOSE

Analyst module is focused on expertise operations and proposes an optimized set of tools to build diagnostic and corresponding recommendations:

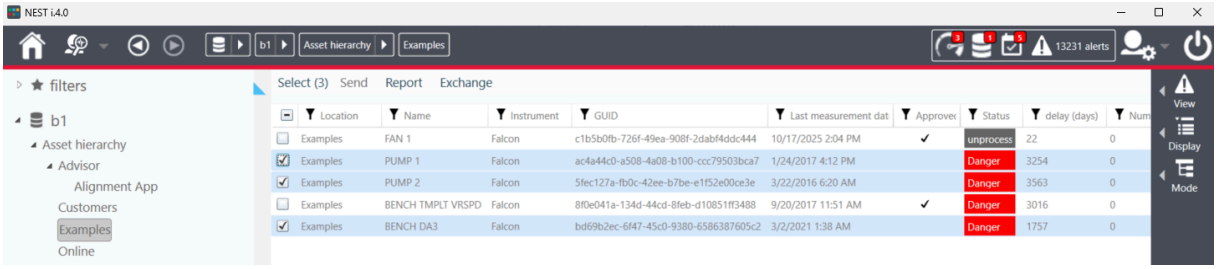
- Consult measurements (trends, spectra, timewaves, …) with vibGraph (cursors, scale, post processing, …)
- Consult alarm status of all parameters and adjust thresholds values
- Consult automatic diagnostic & recommendation provided by Accurex (if applicable)
- Declare detected defects with severity and progression level
- Generate the diagnosis and recommendation texts corresponding to your selected defects then personalize them before approving them in order to make them public
- Generate reports



When user clicks on a date into the list of measurement, then area displays #3 #4 and #5 are refreshed and present information corresponding to the selected date.

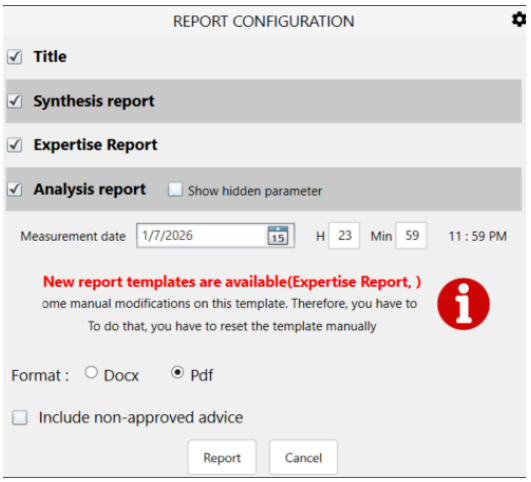
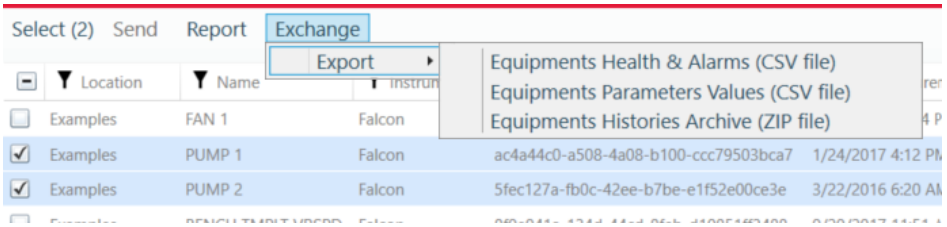
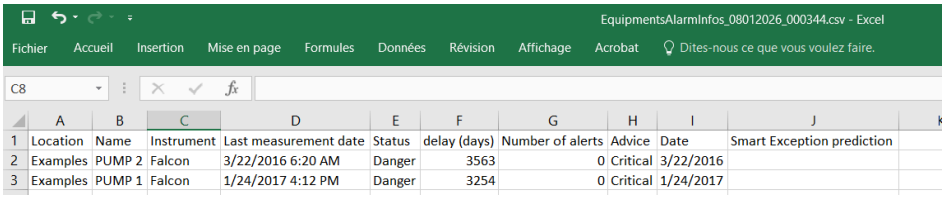
9.2 List of Machines

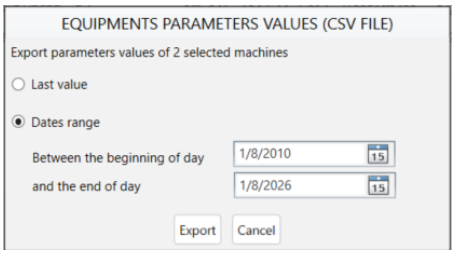
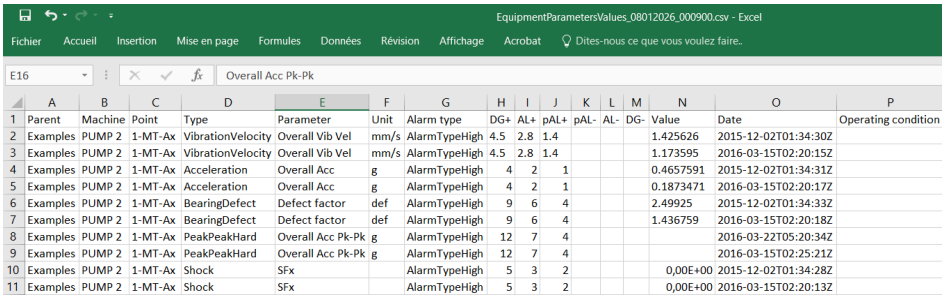
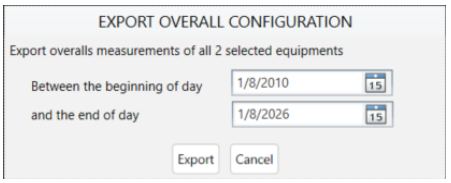
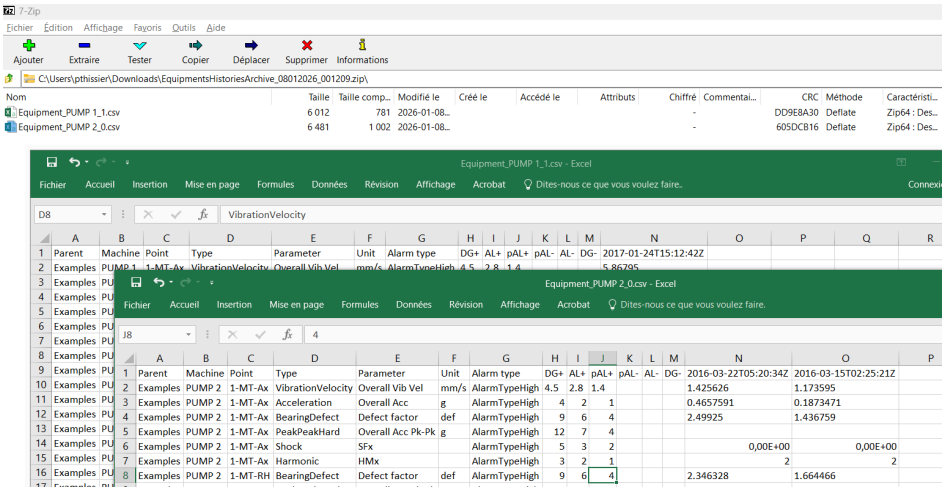
This screen, located in the Analyst module, provides a comprehensive view of the monitored machine fleet.



It allows the user to navigate the machine hierarchy and select one or more machines from the list to apply various operations using the contextual menu functions:

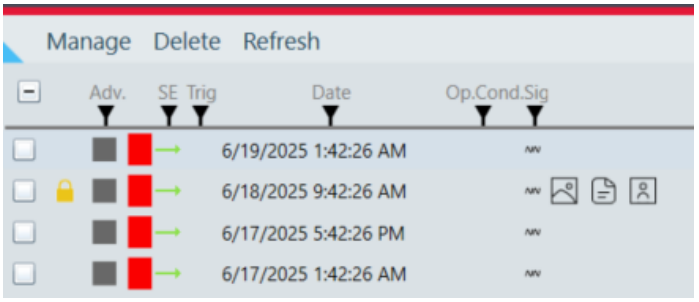
Function	Description
Select	Used to choose one or more machines for subsequent actions. Clicking on an item selects it. Multiple selection is possible to apply functions to a group of machines.
Send	Used to directly load the selected machine and their corresponding measurement points onto an external data collector. This function is accessible once FALCON is ready for communication using the USB interface and when only 1 machine is selected
Report	Generates various types of reports for the selected machine(s): ● Synthesis report ● Expertise report ● Analysis report ○ **Show hidden parameter** - option to force masked parameters display into report ○ **Measurement date & time** - select the control date to display into report ○ **Format** (DOCX, PDF) - select format of report file ○ **Include non-approved advice** - option to add/include non-approved expert advice into report

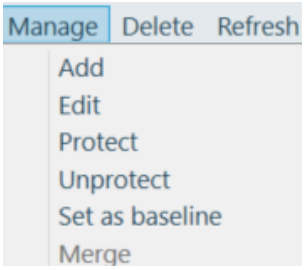
Function	Description
	
Exchange	Used for data export operations. This typically includes exporting data associated with the selected machines in various formats (e.g., CSV):  • **Equipments Health & alarms (CSV file)** - to generate 1 CSV file containing all selected machines and presenting latest/current alarm status and latest/current expert advice  • **Equipments Parameters Values (CSV file)** - to generate 1 CSV file containing all selected machines and presenting vertically parameters history value corresponding to the entered time range

Function	Description
	  A B C D E F G H I J K L M N O P 1 Parent Machine Point Type Parameter Unit Alarm type DG+ AL+ pAL+ pAL- AL- DG- Value Date Operating condition 2 Examples PUMP 2 1-MT-Ax VibrationVelocity Overall Vib Vel mm/s AlarmTypeHigh 4.5 2.8 1.4 1.425626 2015-12-02T01:34:30Z 3 Examples PUMP 2 1-MT-Ax VibrationVelocity Overall Vib Vel mm/s AlarmTypeHigh 4.5 2.8 1.4 1.173595 2016-03-15T02:20:15Z 4 Examples PUMP 2 1-MT-Ax Acceleration Overall Acc g AlarmTypeHigh 4 2 1 0.4657591 2015-12-02T01:34:31Z 5 Examples PUMP 2 1-MT-Ax Acceleration Overall Acc g AlarmTypeHigh 4 2 1 0.1873471 2016-03-15T02:20:17Z 6 Examples PUMP 2 1-MT-Ax BearingDefect Defect factor def AlarmTypeHigh 9 6 4 2.49925 2015-12-02T01:34:33Z 7 Examples PUMP 2 1-MT-Ax BearingDefect Defect factor def AlarmTypeHigh 9 6 4 1.436759 2016-03-15T02:20:18Z 8 Examples PUMP 2 1-MT-Ax PeakPeakHard Overall Acc Pk-Pk g AlarmTypeHigh 12 7 4 2016-03-22T05:20:34Z 9 Examples PUMP 2 1-MT-Ax PeakPeakHard Overall Acc Pk-Pk g AlarmTypeHigh 12 7 4 2016-03-15T02:25:21Z 10 Examples PUMP 2 1-MT-Ax Shock SFx AlarmTypeHigh 5 3 2 0,00E+00 2015-12-02T01:34:28Z 11 Examples PUMP 2 1-MT-Ax Shock SFx AlarmTypeHigh 5 3 2 0,00E+00 2016-03-15T02:20:13Z • **Equipments Histories Archive (ZIP file)** - to generate 1 ZIP file containing 1 CSV file per selected machine presenting horizontally parameters history value corresponding to the entered time range  

9.3 List of Measurements (per machine)

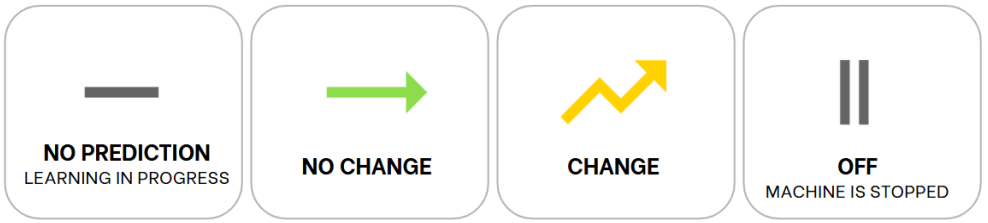
This list presents all measurement dates of the current selected machine:

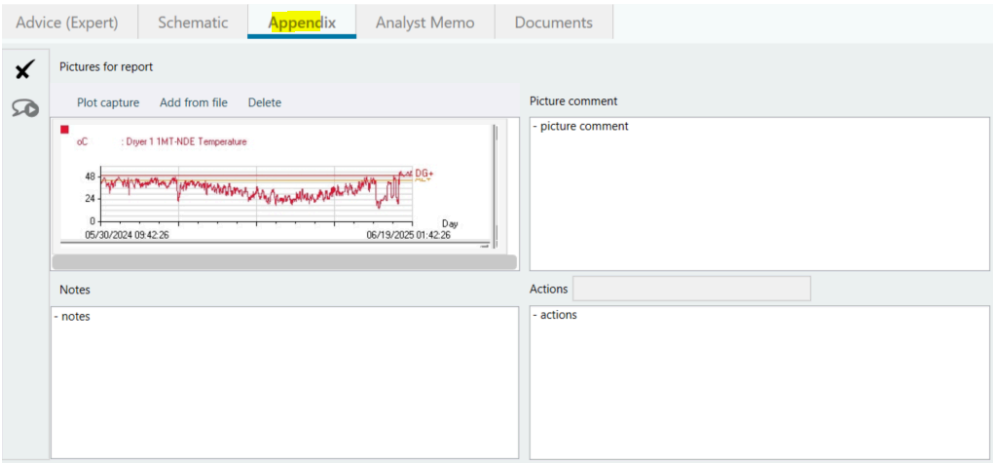




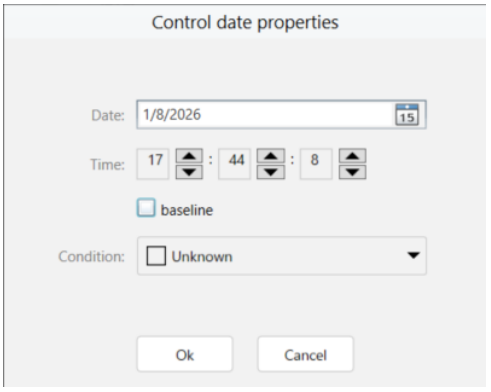
Each measurement date (or check date) contains a list of elementary data (parameters and/or signals) – ie: overall values, spectra, time wave, peak, … - coming from acquisition devices or calculated by NESTi4 itself.

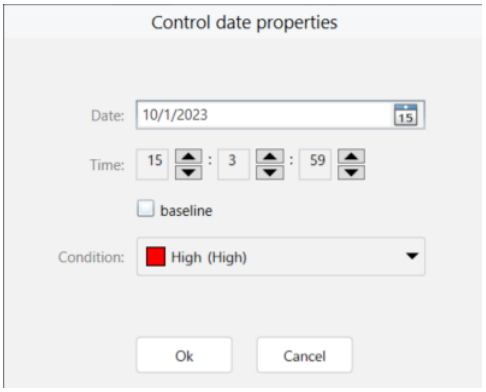
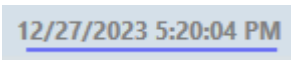
9.3.1 *Informations*

Icons	Title	Description
	protected?	A date is automatically protected when analyst enter an advice, diagnosis and/or recommendations and is not deleted by data cleanup mechanism (see ADMIN module)
	advice level	Expert advice status entered for the corresponding measurement set and describing the global state of health of the machine based on measurements, alarms, diagnostics (manual and/or automatic with Accurex) and recommandations
	SE	Only for SPARROW machine with ACOEM Cloud subscription Accurex SE - Smart Exception presenting the global behaviour of the machine along the time based on automatic raw data analysis (no need to define alarms thresholds) 
	alarm status	The machine alarm status is a combination of the expert's opinion formulated for this date and the most severe parameter alarm state: • DANGER • ALARM • preALARM • OK Additionally to the icon color, one of the following characters can be presented to identify the triggering type of the measurement: • * measurement has been triggered on an alarm status change (on-line) • **M** measurement has been triggered manually
	date	Date of the measurements set – ex: date of the latest downloaded measurements of for this machine from a FALCON route or date of
	Op.Cond.	Machine Operating Condition (label + color) corresponding to the current selected measurement date – ex: HIGH SPEED, LOW SPEED

~	**Sig.**	Flag indicating if date contains signals (spectra, timewave, …) or not
		New visual indicator to inform if some appendixes have been enterd for the measurements set : picture, notes and actions 

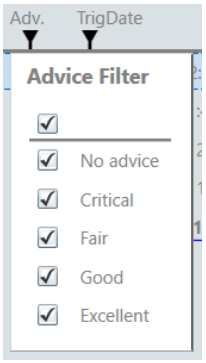
9.3.2 *Functions (manage, protect, …)*

Function	Description
Manage (menu)	
• **Add**	Add manually a new date to contain measurement set and/or expert diagnostic & recommendation 
• **Edit**	Edit and change a control date properties: date, time, baseline option and operating condition (if exists)

	
• **Protect**	Used to protect the selected dates. A padlock icon is displayed for the date and corresponding data are not deleted by automatic database cleanup tool
• **Unprotect**	Used to unprotect the selected dates
• **Set as SE start point** - with SPARROW only	Only for SPARROW machine with ACOEM Cloud subscription Use the current selected date as the new reference date for Accurex SE calculation. This reference date is displayed in bold dark blue text: 
• **Set as baseline**	Used to set the selected date as the new baseline. Baseline is usually the first measurement after machine installation or repair. This reference date is underlined in dark blue: 
• **Merge** - with FALCON only	Used to merge 2 selected control dates
Delete	Used to delete all selected dates. Dates with advice, diagnosis or recommendation are automatically protected; they need a double confirmation to be deleted
Refresh	Used to force an immediate refresh of the list from the database
Measurement	only for EAGLE or MVX machine Used to trig and store a measurement now without waiting for the next due date provided by the storage strategy

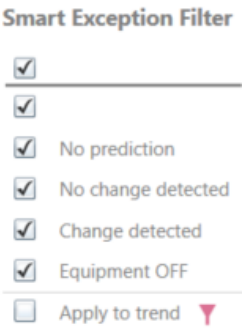
9.3.3 *Filtering criterias*

Filter	Description
Adv.	Filter list of date according to one or more selected expert advice:



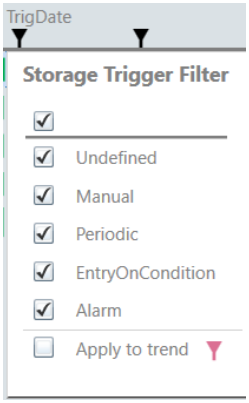
SE

Only for SPARROW machine - Filter list of date according to one or more selected Accurex SE – Smart Exception prediction ; this filter can be optionally applied to trend display



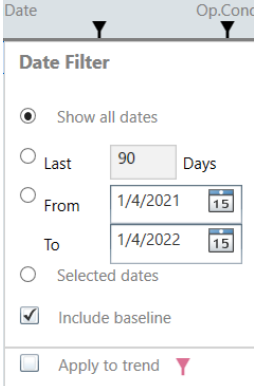
Trig.

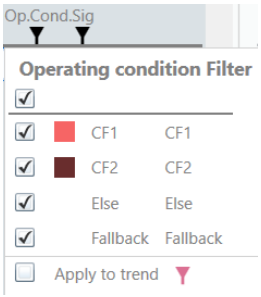
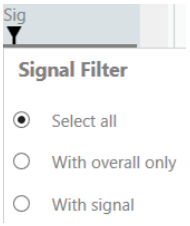
Filter list of date according to one or more selected triggering type ; this filter can be optionally applied to trend display



Date

Filter list of date according to a selected time range period ; this filter can be optionally applied to trend display



Op.Cond.	Filter list of date according to a selected operating condition(s) ; this filter can be optionally applied to trend display 
Sig.	Filter list of date according to signal containing or not 

Color of filter icon indicates if the filter is active or not:

filter is inactive

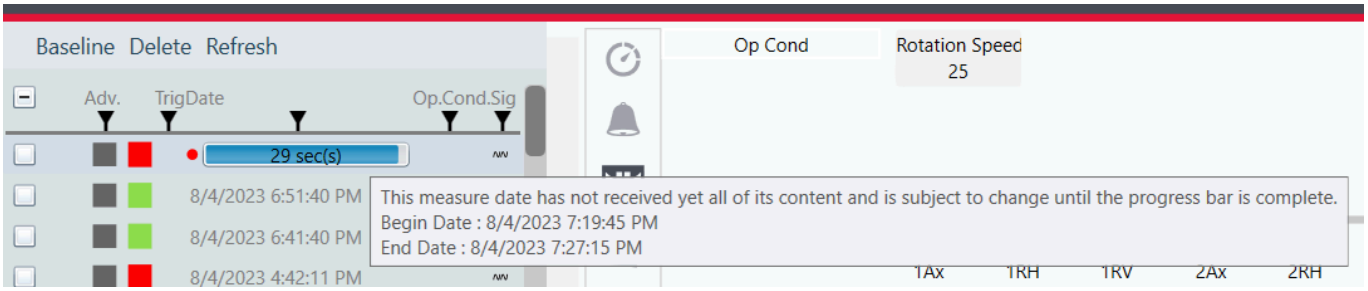
filter is active

filter is inactive and applied on trends

9.3.4 *Data recording in progress*

This display is dedicated to Sparrow machine.

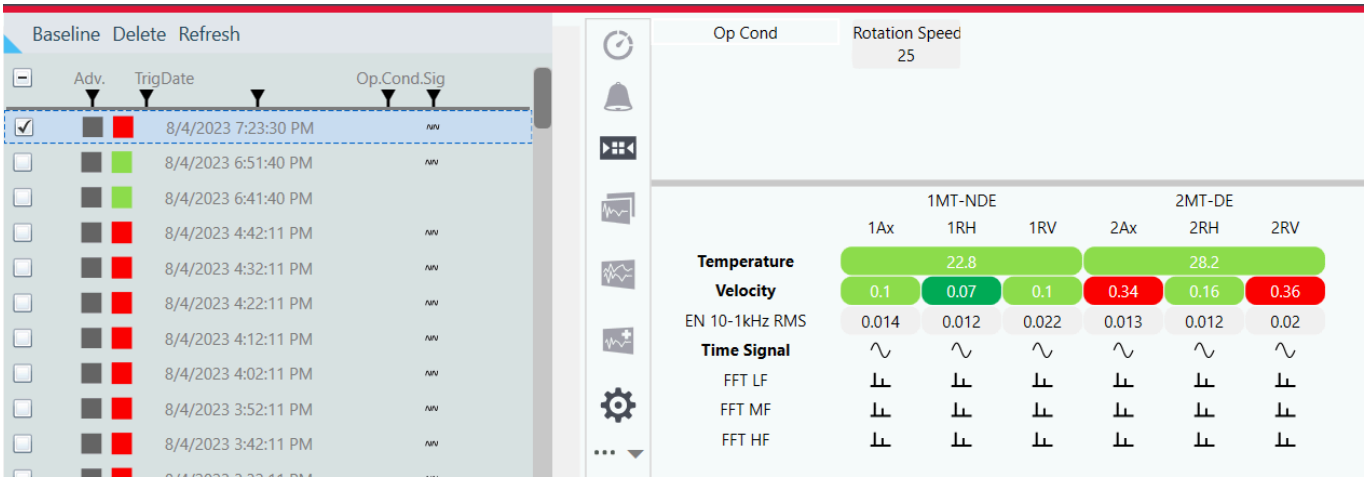
Due to Sparrow's new storage strategy, the measurements stored in the database can evolve throughout the duration of the recording window allocated for each control date - cf. 6.3.3.5. For that reason, each new received data from sensor is presented into the matrix



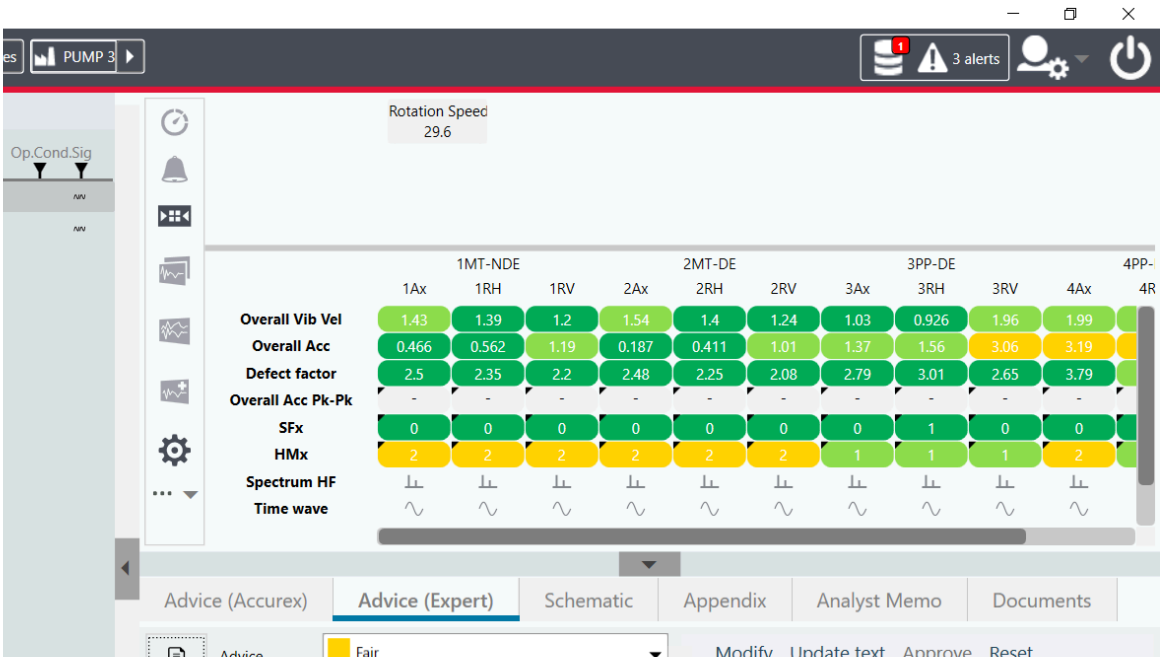
Each new value received from the sensors is presented in the matrix with the corresponding alarm status, as long as the recording window is not closed.

As long as the recording window is open, then the progress bar is displayed in the date list; a tooltip presents the detail (start/end of the window)

Once the recording window is closed, then the alarm states of the hard parameters are calculated, the soft parameters and signals are calculated and the machine alarm state is evaluated then presented:



9.4 Machine Health Matrix

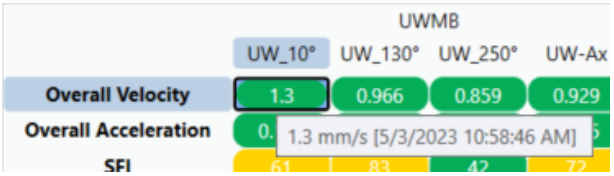


Health matrix is composed with two parts:

- The process data, including the running speed and operating parameters at the top of the screen
- The Health Matrix displays all parameters and signals of the machine as a matrix:
- Lines list:
    - Parameters with their value and status color code. There are 2 types of parameters:
        - measured parameters (Hard parameter displayed in **bold characters**)
        - processed parameters (Soft parameter displayed in normal characters)
    - Signals:
        - Measured signals – ex: spectrum, envelope, time wave - displayed in **bold characters**
        - Post processed signals – ex: FFT, filtered time wave - displayed in normal characters
- Each column is a point linked to machine kinematic (point = direction of measurement on a bearing location).

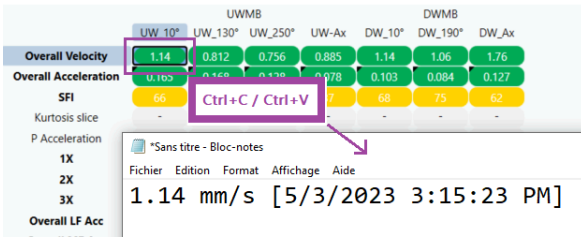
Several **tooltips** are available in order to present some contextual information:

- parameter value, unit label and timestamping – example below for a velocity parameter

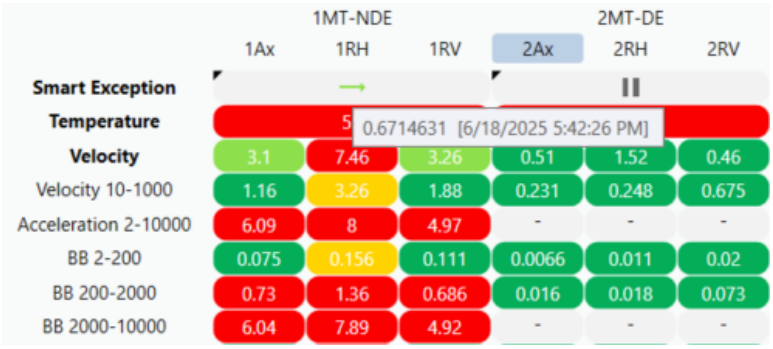


Nota:

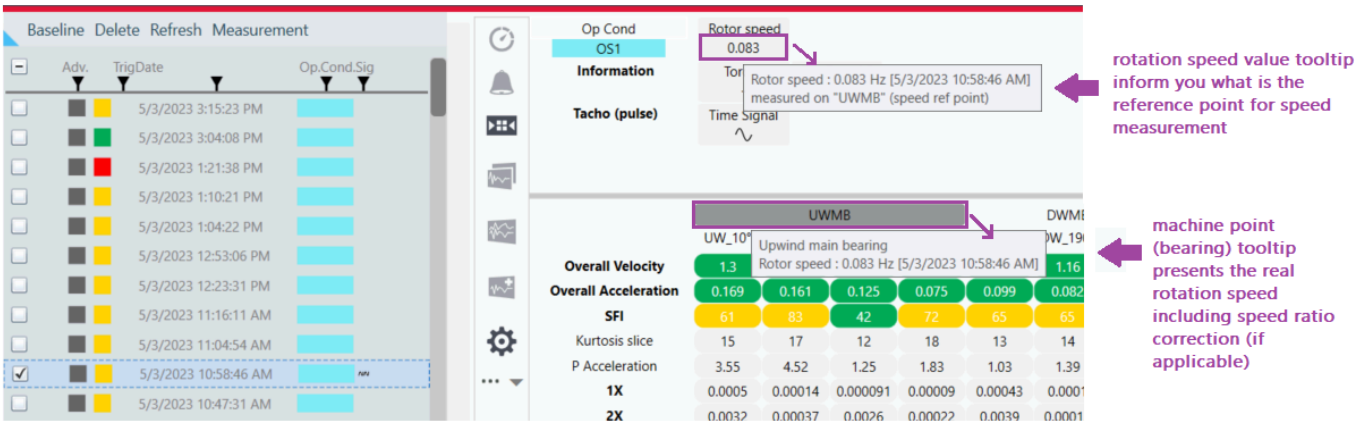
- For FALCON machine, the measurement timestamp correspond to the date when measurement has been recorded with data collector on the field. This date can be different from the date displayed into the measurement list
- Tooltip text can be copied/pasted into any text editor



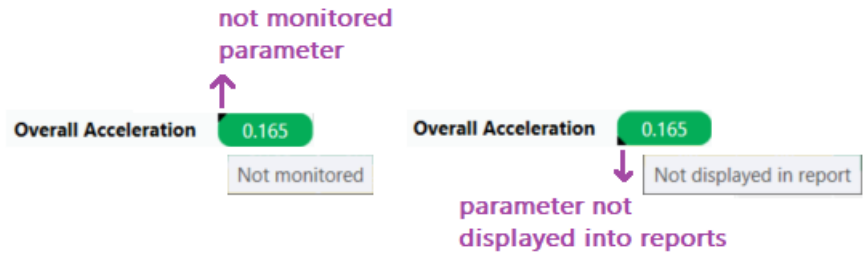
- For Sparrow machine with ACOEM Cloud subscription, Accurex SE prediction indicator is added at the top of the matrix and assigned to machine bearings



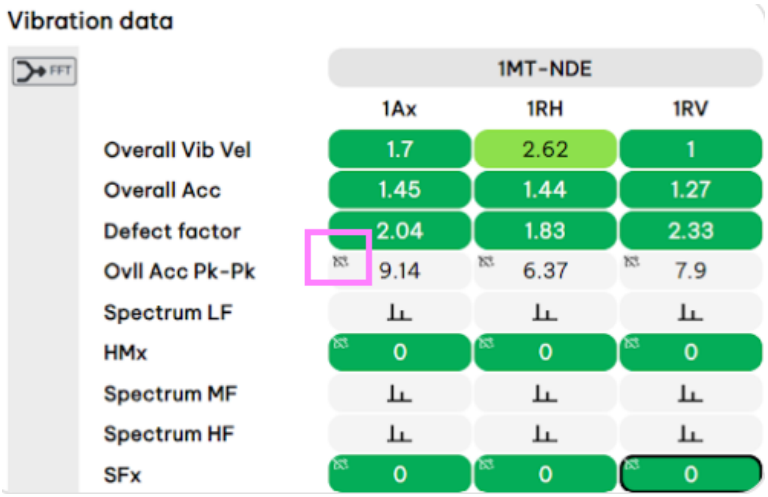
- Rotation speed information: what is the reference point, actual value for each point (taking into account any ratio)



- "not monitored" and/or "not displayed in report" parameter



Note: For some Accurex indicators – ie: Ovl Acc Pk-Pk, HMx and SFx – a specific icon is displayed on the cell to indicate alarm status of this indicator is not considered to build the alarm status of the machine. This is similar with "monitored" property of other parameters but user for these specific indicators cannot change it.



To make further analysis the Health Matrix gives a direct access to display any parameter trend, spectrum and time wave.

It is possible to make a multiple selection of cells:

- A complete line if you click on its title
- Contiguous cells with a mouse drag and drop or using the Shift key
- Cells anywhere using the Ctrl key

The Health Matrix is also interactive with the Schematic tab.

Health Matrix functions:

	Adjust the value of the running speed and recompute. The modification is applied for the all selected measurement dates. All post-processed parameters are recomputed. Available options: ● You can apply the modification to the active point, its bearing (all directions), shaft or the whole machine. ● If several dates are selected, the running speed can be changed on all those dates. ● For an Accurex machine, it is possible to recompute the diagnosis with the new running speed *and if you want to take care of the last expert feedback, check "Use previous approval" option*. ●
	Adjust the alarm threshold of selected parameters. The modification is applied for all measurement dates
 /	Compress / Extend the Health Matrix
	draw the data of each selected cells in separate windows

	superpose les données de chaque cellule sélectionnée dans 1 seule fenêtre
	Open / close the panel to select the plot options: ● **Spectrum** type of display: ○ Single: selected spectrum is displayed in normal way ○ Merged: if the point includes several spectra in different frequency ranges, they are all merged in a unique curve showing the complete vibration behavior of the point. ○ 3D: selected spectrum is displayed in a 3D view. If no specific dates are selected, all measurements are displayed. If some dates are selected, the display is limited to the selected ones. For the 3D view,  and  are not accessible. ● **Add**: use this function to add automatically the baseline and/or the previous measurement for spectrum and time wave display. Note: if some other dates are selected in list of dates, corresponding measurements are also displayed.

Other functions:

- **Quick display of thresholds**: thresholds of the current parameter are displayed in the status bar at the bottom of the screen.
- **Modification** of the value of parameters with "Manual input" type: access is done by clicking on "⋮ " in the cell to modify.
- **Delete measurements**: select the measurements to be deleted then click on and "Delete"

Note: these actions are traced in the system logs

9.5 Expert Analysis

9.5.1 *Accurex mode*

If Accurex option is active into the domain license, then

- "Advice (Accurex)" tab presents automatic diagnostic including
  - Advice
  - Diagnostic (short and detailed texts)
  - Recommendations (short and detailed texts)
  - List of detected defects with "severity" and "confidence" – no "progression" mentioned

- By default, “Advice (Expert)” tab presents Accurex results but expert can change them if he considers some details are missing ; in this case
    - Advice
    - Diagnostic (short and detailed texts)
    - Recommendations (short and detailed texts)
    - List of detected defects with “severity” and “progression”

If the Accurex option is not active, then only the “Advice (Expert)” tab is presented and expert users must manually select all detected defects and enter corresponding characteristics.

IMPORTANT: Accurex option is not available for all acquisition devices – see below the compatibility table:

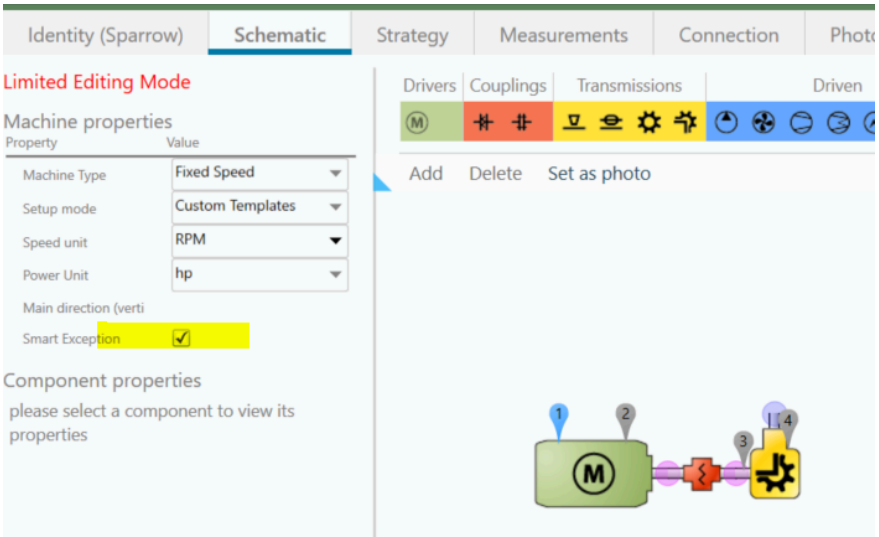
	FALCON	EAGLE	MVx	SPARROW
Accurex	✔ (1)	⚪	⚪	N/A
Smart template	✔	✔	✔	N/A
Custom Template	✔	✔	✔	✔

✔: available - ⚪: optional - N/A: not available
Need a specific option into data collector

9.5.2 *Accurex SE – Smart Exception mode*

Only for SPARROW machine with ACOEM Cloud subscription

When this license options is active, then SPARROW machine setup presents a new Accurex SE - Smart Exception option to be activated in order to receive automatically prediction of significative change of behavior of the machine



See dedicated documentation of Accurex SE:

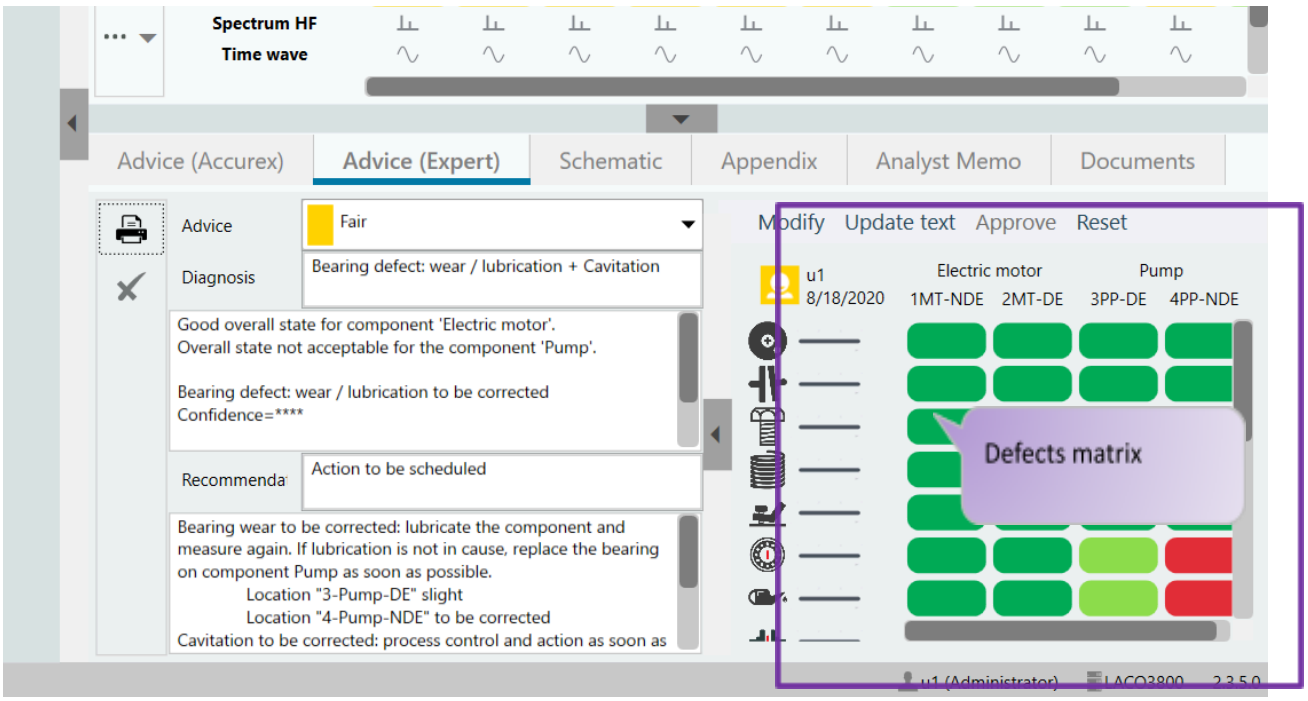
DOC3191 2025-06 A - NESTi4.0 v2.8 - Accurex SE Smart Exception User's Guide (EN)

9.5.3 *Defects matrix*

Defect matrix displays machine faults at a glance with their locations.

If Accurex option is active, then “Advice (Accurex)” tab presents a READ ONLY defects matrix with Accurex results. This information is duplicated into the then “Advice (Expert)” tab in order to be editable for authorized users.

Expert user can consult automatically detected defects by Accurex – license option - into the “Advice (Accurex)” tab and he can enter his own detected defects into the “Advice (Expert)” tab:



List of defects:

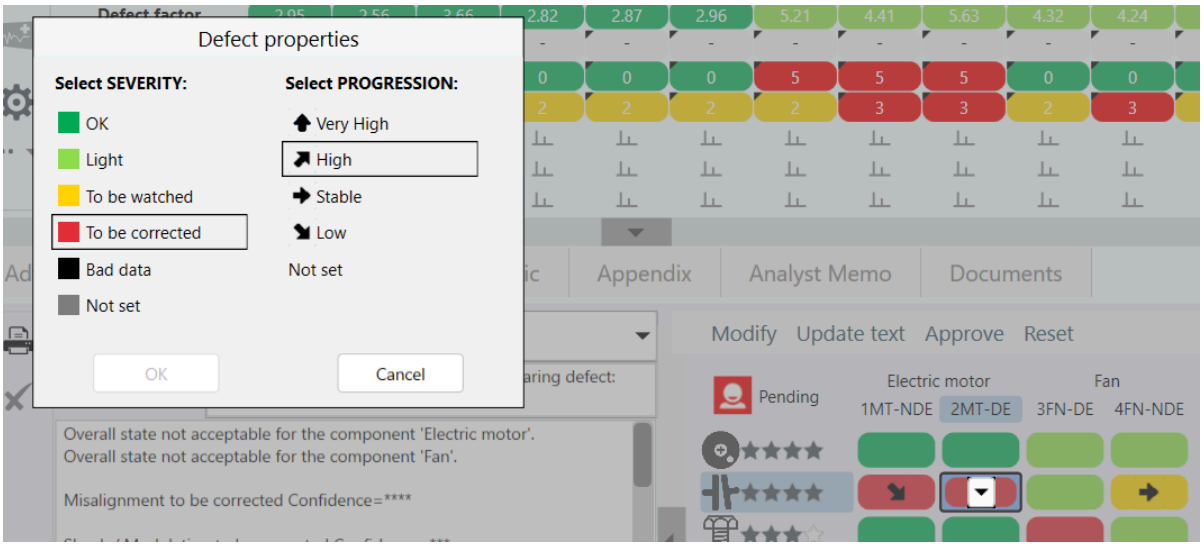
Defects	Accurex	Components
Balance	●	All
Misalignment	●	All
Looseness	●	All

Resonance	●	All
Soft foot		All
Bearing	● [1]	All
Lubrication	● [1]	All
Coupling		Custom, Component connected to a coupling only
Belt		Custom, Component connected to a belt only
Cavitation	●	Custom, Pumps Only
Flow Turbulence		Custom, Fans, Pumps, Compressors (centrifugal and lobes) Only
Gear wear	●	Custom, Gearboxes Only
Gear tooth crack		Custom, Gearboxes Only
Electrical		Custom, Motor only
Oil Whirl		Custom, Component with sleeve bearing only (idem “journal”)
Other ISO	●	All
Suspicious	●	All

●: automatically detected by Accurex

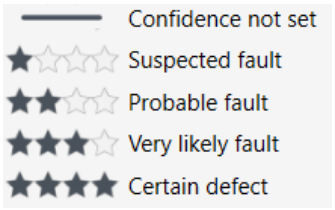
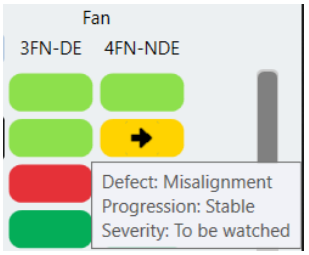
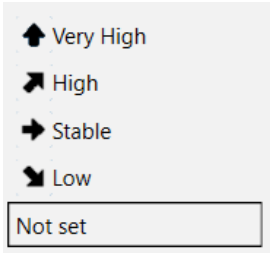
[1]: included into the “Bearing defect: wear / lubrication” defect

According to his measurements analysis, expert user can declare a specific defect for a particular machine bearing just by clicking on the corresponding cell into the matrix – see below an example of misalignment defect qualified as “to be corrected” with a “high” progression



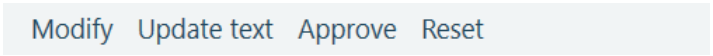
Defect properties:

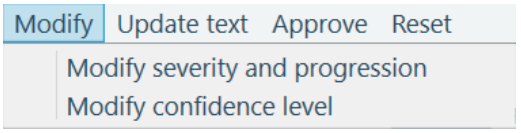
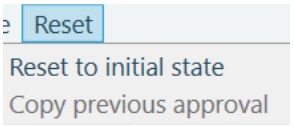
Properties	Description
Confidence	Confidence level according to defect severity & progression

<table>
<tr><td></td><td></td><td> 
</td><td rowspan="4">NOTE: All selected defect properties are presented into an explicit tooltip text for each of cell
 
</td></tr>
<tr><td>Severity</td><td></td><td>Severity of the defect:
 
</td></tr>
<tr><td></td><td></td><td>When a defect is considered with a “Bad Data” severity, then:
Retake vibration readings to assess the machine condition.
1) Data should be recollected.
2) The vibration sensor should be firmly placed on the machine with the magnet properly tightend to the sensor.
3) The sensor should be mounted as close as possible to the bearing and not on any guarding, such as fan cowlings.
4) Care should be taken to correctly orientate the sensor with the logo and the X in line with the rotating shaft.</td></tr>
<tr><td>Progression</td><td>new</td><td>Progression of the defect since previous analysis:
 
</td></tr>
</table>

When expert user has finished declaring all detected defects into the matrix, then he can define manually corresponding diagnostic and recommendations or use the NESTi4 Assistant to generate texts automatically – see **Update text function** below

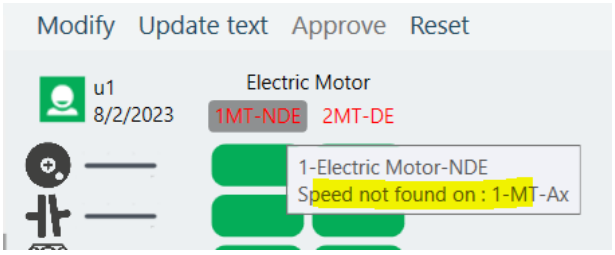
<u>Defects matrix menu description:</u>



Modify	• **Expert can adjust confidence, severity or progression according to its own assessment** 
Update text	Tips & tricks • Diagnosis and recommendation texts are automatically written according to the last update of the defect matrix (confidence, severity or progression) • Of course, you can add/remove any texts into the generated texts … huge time saver!
Approve	• Once approved, expert advice information replace default results of Accurex (if applicable) and are presented to everyones
Reset	 • **Reset to initial state** - reset to Accurex result for an Accurex machine, delete all the cells for other machines • **Copy previous approval** - copy the Accurex matrix, diagnosis and recommendation texts from last approved expert advice

Notes:

- For Accurex machines, bearing location label is presented in red if running speed is not correctly defined:



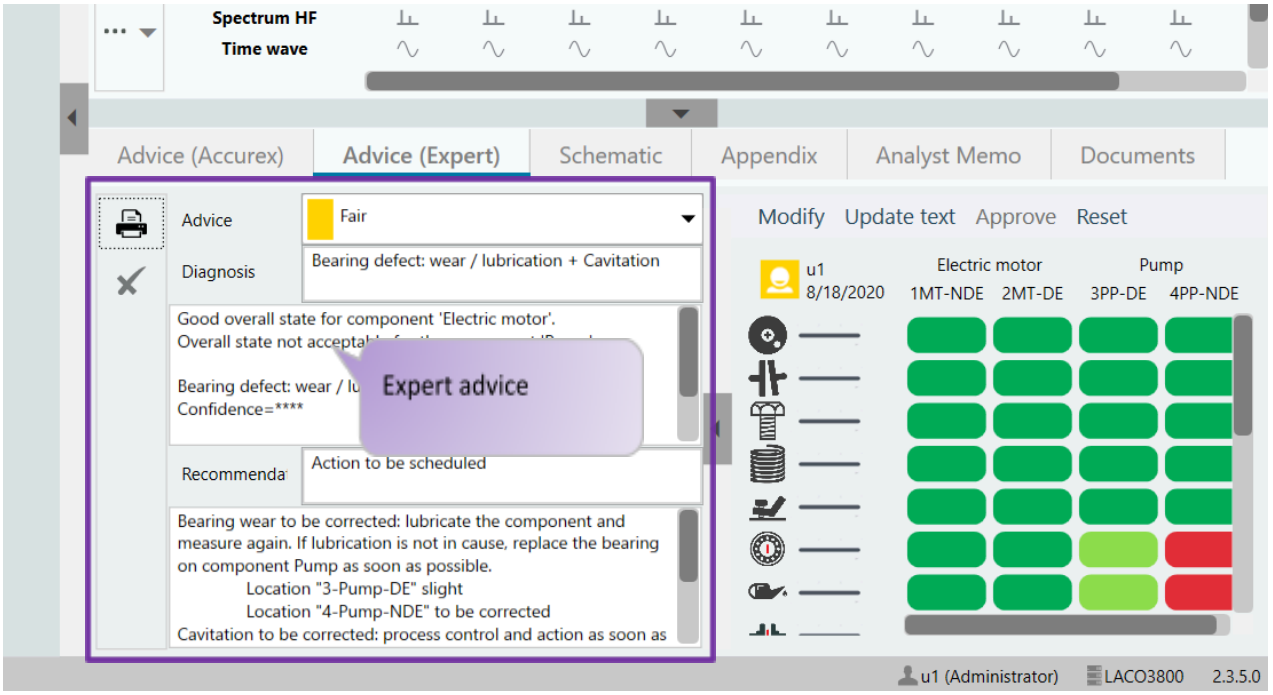
- The Accurex matrix is also displayed for template machines and can be used to generate diagnosis and recommendation.

- Report: the Accurex matrix is included in the Expertise report.

9.5.4 *Expert advice*

If Accurex option is active, then “Advice (Accurex)” tab presents READ ONLY advice / diagnostic / recommendations based on Accurex results. This information is duplicated into the then “Advice (Expert)” tab in order to be editable for authorized users.

Expert user can enter his own advice / diagnostic / recommendations texts only into the “Advice (Expert)” tab:



Expert advice properties:

Advice	**A global synthetic advice can be selected in the following list** No advice Critical Good Fair Excellent **Details:** • **No advice - No defined advice (default)**

	• **Excellent - Health is excellent (no default, low vibration levels).** • **Good - Health is good for a long time service without restriction.** • **Fair - Health is not acceptable for a long time service.** • **Critical - Measurement observed shows that vibration levels could generate damages!**
Diagnostic	Texts describing diagnostic with all detected defects with confidence, severity and progression + location on the machine. • Short text with only (max 120 char.) • Long text (unlimited char.) with spellcheck function for English, Spanish, German and French languages
Recommendations	Texts describing recommended actions corresponding to the detected defects • Short text with only (max 120 char.) • Long text (unlimited char.) with spellcheck function for English, Spanish, German and French languages

Notes:

- You can click on the “Update text” button in order to replace the existing “Diagnostic” and “Recommendation” texts by new automatically generated texts corresponding to the latest selected defects into the matrix.
- All entered texts are automatically saved if another date, another machine or another module is selected
- A user with read-only access to the Analyst module sees only one “Advice” tab:
  - “Advice (Accurex)” tab if the expert has not approved the result
  - “Advice (Expert)” tab as soon as it is approved by the expert.

Expert advice menu description:

	Generate the report in DOCX or PDF format: • Expertise report. • Analysis report. • Full report (Expertise + Analysis) Notes: • Reports are template based • Expertise report does not include dates with no Advice • A global report is also available
	Cancel current modifications and restore last approved texts

	For Accurex machine it is possible to run the automatic diagnosis: For any Accurex machine you can reprocess the diagnosis after a running speed adjustment. If you want to take care of the last expert feedback, check “Use previous approval” option

9.6 SCHEMATIC

It shows the machine schematic or its picture with point’s positions. It is interactive with the Health Matrix:

- Points selected in the Health Matrix are highlighted on the schematic
- A selection on the schematic will move the Health Matrix horizontal slider if the selected points is not in the window



9.7 APPENDIX

This tab shows complementary information to the measurement date. It is possible to manage:

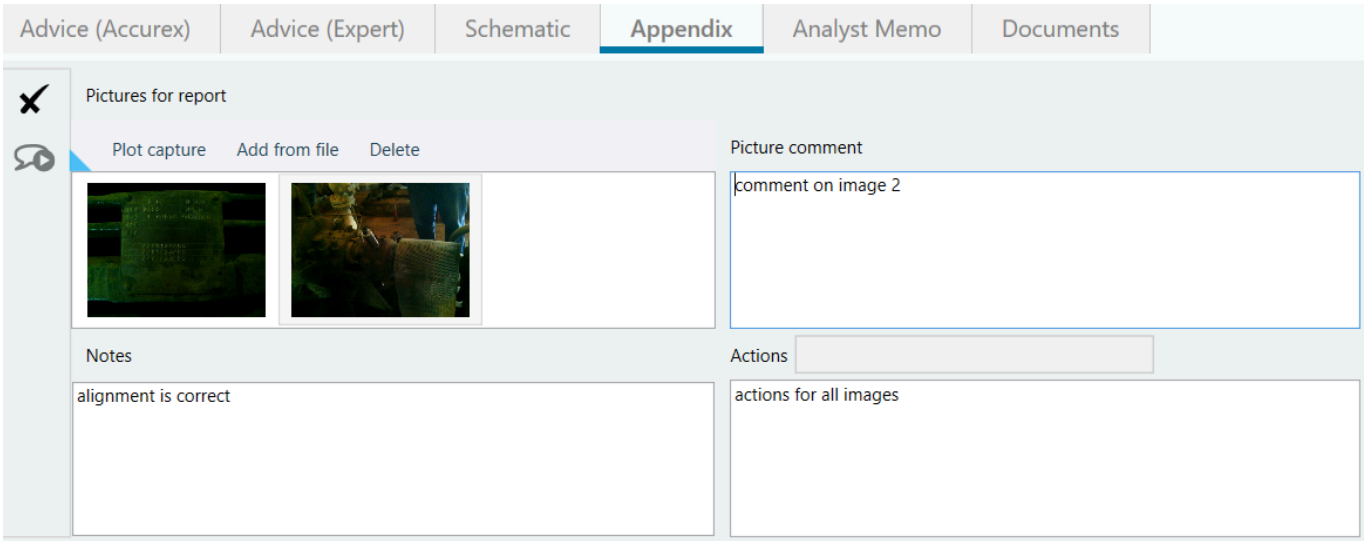
- **Pictures**: there are 3 possibilities to add pictures:
    - Inspection pictures coming directly from FALCON
    - Trends, spectra, time waves captured from vibGraph
    - Any pictures imported from jpg or png files

Each picture can be completed by a comment and appears in the diagnosis report.

Contextual functions:

- **Graphic capture**: import a copy of all open vibGraph windows (spectra, time waves, and trends). Note: vibGraph windows must not be minimized or partly outside the main screen boundaries
- **Add from** file: import jpg or png file.
- **Delete**: delete selected picture.

- **Notes**: it contains inspection notes coming from FALCON. It can be modified
- **Actions**: used to describe maintenance actions performed on the machine



9.8 ANALYST MEMO

The information of this tab is dedicated to expert comments. It is not visible by a read only user and it is not published in the reports.

9.9 DOCUMENTS

Displays documents linked to a measurement date imported from NEST3

9.10 VIBGRAPH

9.10.1 *Introduction*

vibGraph is the tool used to display trends, spectra and time waves. This chapter gives a quick description.

For more details refer to vibGraph user manual (ref DOC3103 - VIBGRAPH User manual EN).

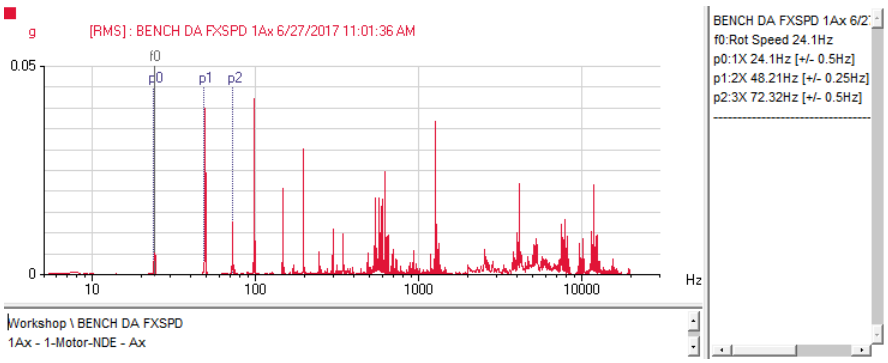
The first time a plot is open two windows appear:

- vibGraph main window in the background. It is used if you want to adjust the user preferences.
- The graphic windows itself.

There are different ways to open one or several graphic windows with one or several curves.

9.10.2 *Customize the graphic*

- Adjust size and position of graphic windows
    - Open a graphic



    - Adjust window size and position, including the comment area (below the graphic) and the cursor information area (right hand side of the window).
    - In the menu, use the function Display/Save size and position.

The next window of the same type will be open using this new setting.

Note: settings are independent for trend, simple spectrum, envelope, merged spectrum (concatenated) and 3D spectrum.

- Adjust the unit display for spectrum and time wave
    - In vibGraph main window
    - In the menu, use the function Preferences/Unit management.
    - Select the unit for each type of data: acceleration, velocity, displacement or frequency

- Adjust the unit conversion for spectrum: acceleration, velocity or displacement
    - In vibGraph main windows
    - In the menu, use the function Preferences/Type of chart
    - Select the type of chart: Single spectrum, Merged spectrum (concatenated)
    - In “Left Y axis” tab, adjust the conversion as needed: initial (no conversion), acceleration, velocity or displacement

- Select linear or logarithmic scale for spectrum
    - In vibGraph main windows
    - In the menu, use the function Preferences/Type of chart
    - Select the type of chart: Single spectrum, Merged spectrum (concatenated)
    - In “Left Y axis” tab, adjust the type as needed: linear or logarithmic

Notes:

- To use vibGraph in a separate screen, it is recommended to have vibGraph on the main screen and NESTi4.0 on the secondary one.
- Numerous other adjustments can be done, please see vibGraph user manual (ref DOC3103 - VIBGRAPH User manual EN).

9.10.3 *Zoom management*

- Use the right button of the mouse to select the area to be zoomed.
- Use the function **1:1** to go back to the initial view.

9.10.4 *Cursor management*

- Select the type of cursor:

 Single cursor

 Double cursor

 Harmonic cursor

 Sideband cursor

- Create the cursor with a single click (single or harmonic cursor). For double or sideband cursor, it is necessary to click another time to select the second position of the cursor.

  Note: to point a peak in the curve just click somewhere above, the nearest peak is automatically selected

It is possible to open several cursors. Use the following buttons to manage them:

 select next cursor

 select previous cursor

 delete active cursor

9.10.5 ***Fault frequencies***

Fault frequencies generated by the kinematic setup are displayed in the spectrum background. It is possible to scan them with the harmonic cursor using  and  buttons.

9.10.6 ***Curve management***

It is possible to open several superimposed curves. Use the following buttons to manage them:

 select next curve

 select previous curve

 delete active curve

9.10.7 *Filter the list of dates*

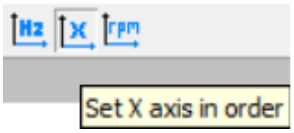
From a trend display, click on  button (vibgraph) to filter on the list of measurement dates:

- between 2 dates if the current cursor is a double cursor.
- on dates selected using several simple cursors.

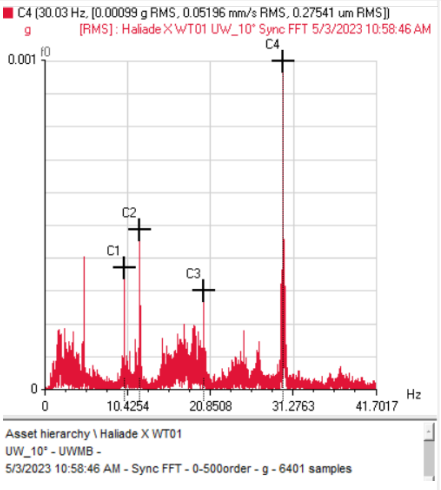
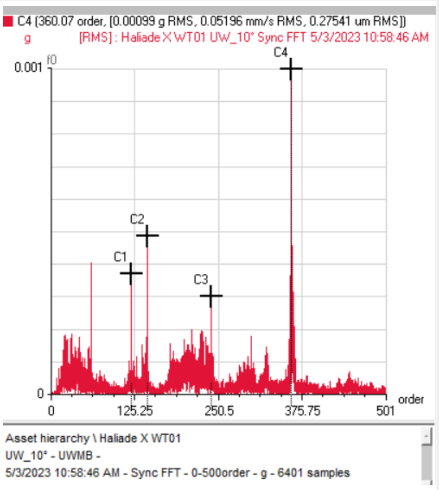
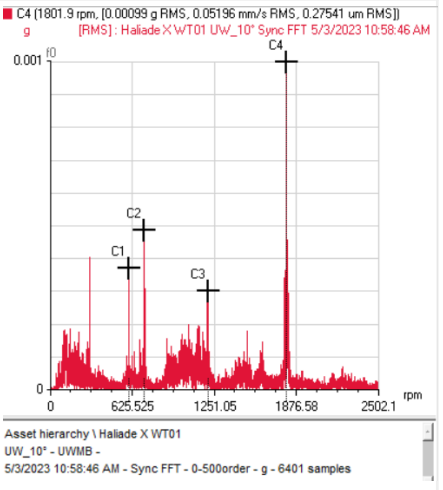
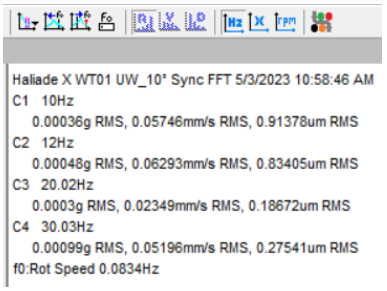
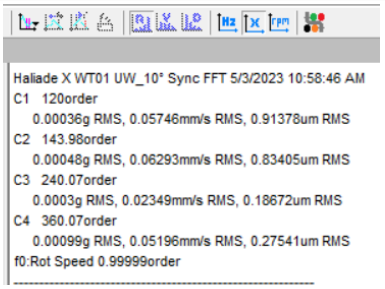
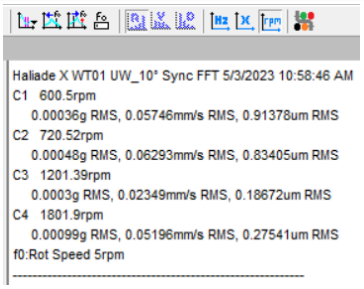
Note: if there is only one cursor, no filter is applied but the corresponding date is selected.

9.10.8 *RSS switch X-axis units*

For RSS spectrum and/or RSS envelope spectrum, the X-axis unit can be switched from Hz / Order / RPM very simply with the following buttons:



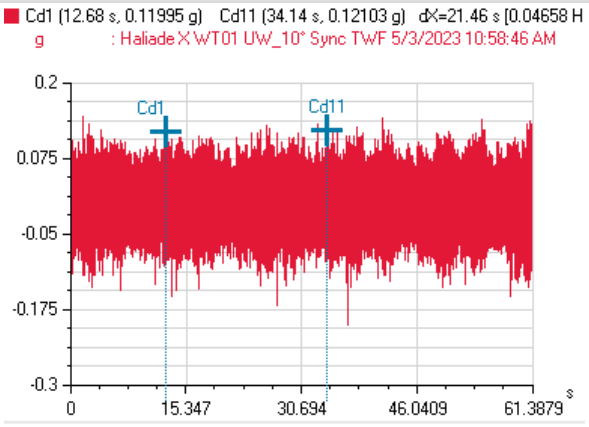
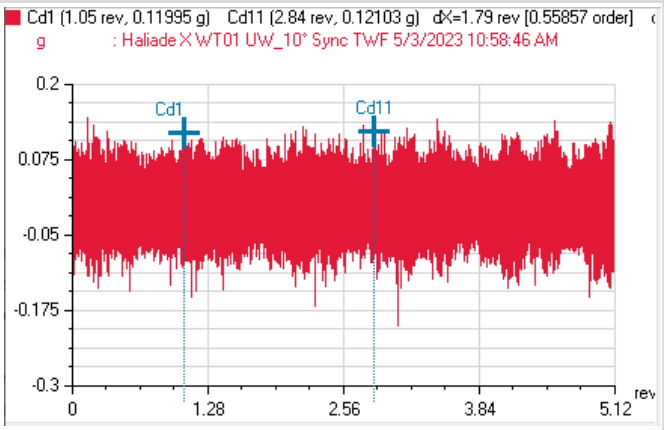
Example with a RSS spectrum:

X-axis in “Hz”	X-axis in “Order”	X-axis in “RPM”
		
		

Same feature for RSS time signal and/or RSS envelope time signal, the X-axis unit can be switched from seconds / revolution very simply with the following buttons – requires a vibGraph Expert license:

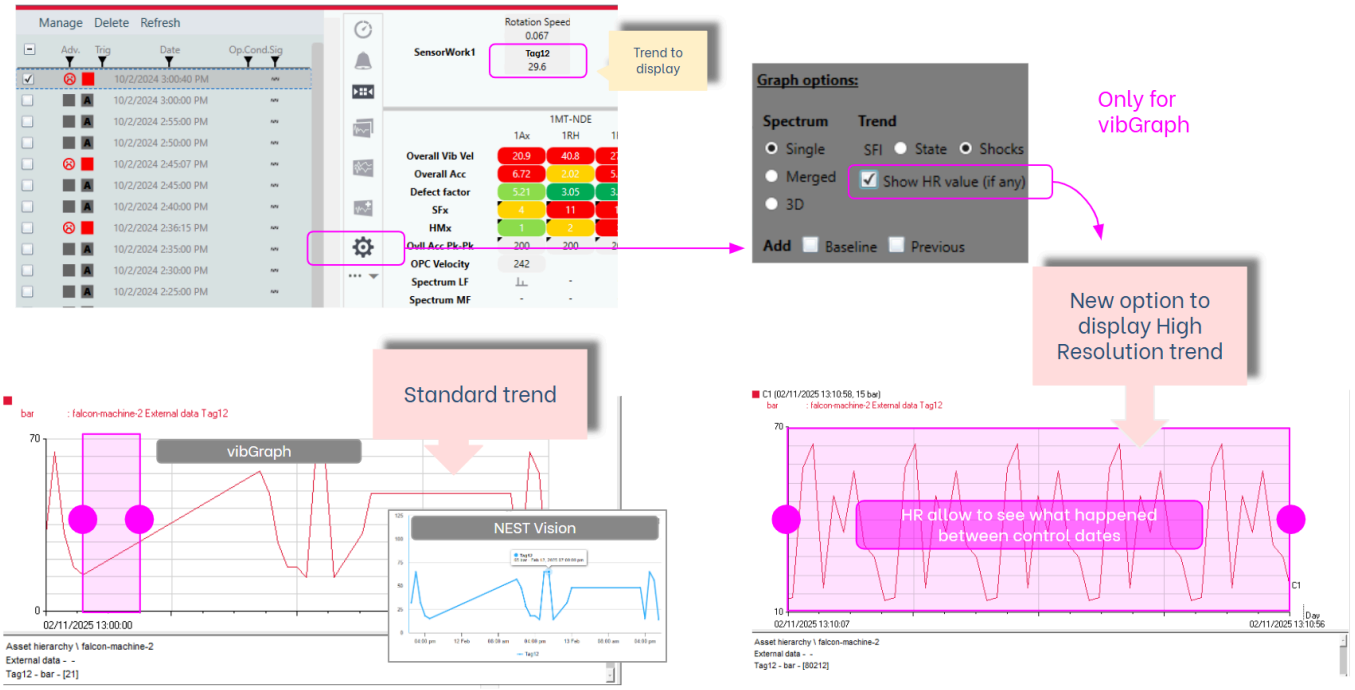


Example with a RSS time signal:

X-axis in “seconds”	X-axis in “revolutions”
	
 Haliade X WT01 UW_10° Sync TWF 5/3/2023 10:58: Cd1 12.68s 0.11995g 34.14s 0.12103g dX:[21.46s, 0.04658Hz] dY:0.00108g (0.90287%)	 Haliade X WT01 UW_10° Sync TWF 5/3/2023 10:5 Cd1 1.05rev 0.11995g 2.84rev 0.12103g dX:[1.79rev, 0.55857order] dY:0.00108g (0.90287%)

9.10.9 *OPC UA High Resolution data*

HR data can be displayed only with vibGraph from NESTi4 Analyst module



« Show HR values » option must be checked in order to display the High Resolution trend – if exists – of external opc ua parameters.

9.11 Global report generation

The Analyst module integrates a powerful tool to generate a global report on any group of machines. This report is issued in DOCX format (It can be open using a word processor software as Microsoft Word or LibreOffice) or in PDF format. It is based on template documents and can be easily customized to your particular requirements.

The generation of a report is done in two quick steps.

9.11.1 *Step 1: selections of the machines*

The first step is to select the machines from the Analyst global view of the machines. There are several ways to make the selection:

- Select machines one by one, in this case the machines appear in the report in the order of selection.
- Use the different filters available in the left hand side navigation panel to select machines according to:
  - Alarm status: Danger, Alarm, Pre-alarm, OK, unprocessed
  - Advice: Excellent, Good, Fair, Critical, No advice
  - Date: measurement overdue or not
  - By route. In this case a global selection will use the route order for the report

- Use the list mode display ( ) in Tree mode ( ) or flat ( ), you can then reorder the report according to the different columns of the list by clicking on its title:
    - Names
    - Alarm status
    - Measurement date
    - …

9.11.2 ***Step 2: Report configuration***

- Once the machine selection is done, use the “Report” function of the contextual menu bar.
- Select the different parts of the report:
    - Title: first page and table of content
    - Synthesis report
    - Expertise report
    - Analysis report, an option also allows to edit the hidden parameters
- Select the measurement date: by default, it is the current date. The report is built with the information dated just before the selected date.
- Select report format: DOCX or PDF
- Skip measurement dates with no Advice: This option is used to not have measurement dates in the report that have not been seen by the expert.
- Click on “Report”: NESTi4.0 builds up the report and opens it using the computer word processor associated with DOCX files or the PDF viewer.
- Click on OK to update the table of content for DOCX format.

9.11.3 ***Report customization***

The report is based on docx word template documents. You can use your word processor to adjust the templates to your requirements:

- Add Company logo
- Change text format
- Remove useless information
- Add static text or comments

There are 4 different templates associated to each part of the report:

- Title: it includes the Title page, the table of content, page header and footer
- Synthesis chapter
- Expertise chapter
- Analysis chapter

IMPORTANT: NESTi4.0 uses important information in the template files. Some modifications can lead to make impossible the construction of the report. Here are listed the main modifications that must not be done:

- Change Title numbering and levels
- Change the markers in the file: a marker is the label between [and] characters
- Remove Row markers, markers including '**Row'** characters.

Template modification:

- Click on "Report" function of the contextual menu bar (at least one machine must be selected)
- Click on  (Top right of the report configuration window)
- Click on  to open the template in the word processor
- Make required modifications
- Save and close the word processor
- In NESTi4.0 click on "Apply"

Note: if the computer does not have a compatible word processor, it is possible to directly import a template made on another computer using the  (Import template) function.

All next reports will use the new template

Process to reset templates:

- Click on "Report" function of the contextual menu bar (at least one machine must be selected)
- Click on 
- Click on 
- Confirm with "OK"

All next reports will use the initial template

Recommendations:

- Once a template modification is finished, it is recommended to save it, in case of problem during a future modification you will have then the possibility to go back to the current state.
- Process to save template: proceed as for modification to open the template and save it in an accessible folder. Depending of the configuration of your Windows user profile, you may have to validate 2 safety messages.

- Process to restore a saved template: proceed as for modification to open the template and then replace its contents with the one of the saved template.

Template organization:

- Each data base has its own templates. They can be adjusted without any interference between databases.
- A copy of docx templates is available in NESTi4.0 media in the folder “Report templates”.

9.12 Manual data export in CSV format

The Analyst module includes a tool for exporting data in csv format.

Two types of data can be exported:

- **General machine information**: the exported information corresponds to that listed in list display. Two options are possible depending on the type of information chosen: Alarm or Advice
- **Overall levels**: export of the history of all the overall levels for the machines selected between 2 dates. A zip file is created including a csv file for each selected machine.

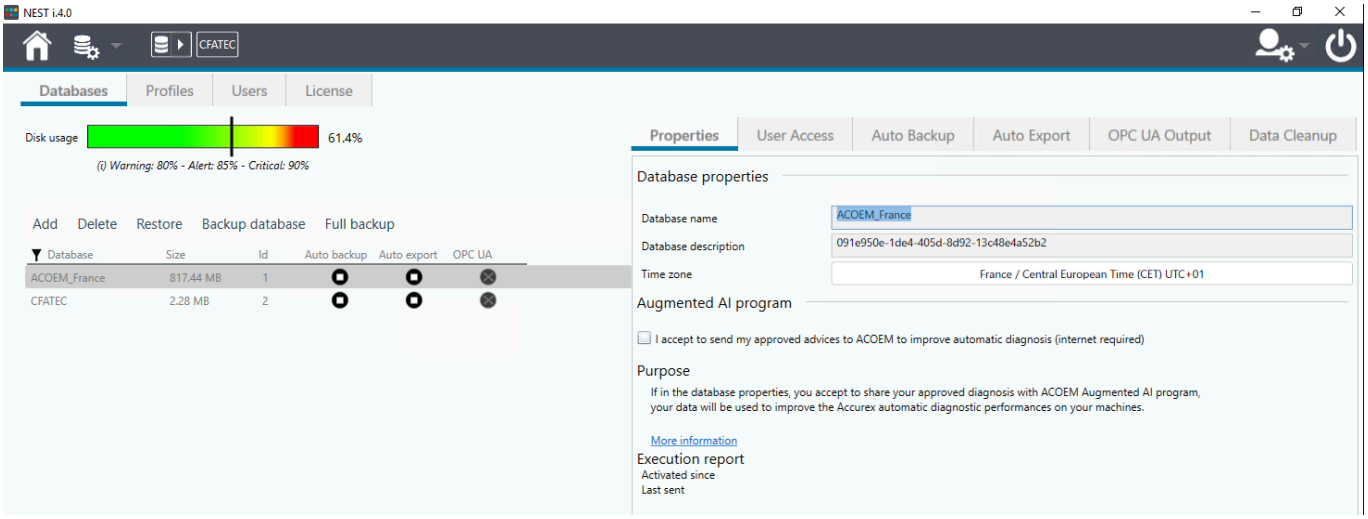
Procedure:

- In Analyst module, from the machine general view select the display modes
- Select the machines to export. In list mode, you can use sorting and filtering tools. To select machines belonging to different locations choose the "flat" mode.
- In the menu bar click on "Export as csv" and choose the type of data to export:
    - General machine information or
    - Overall levels. In this case choose the dates of the period to export.

CHAPTER 10. Administration (databases, users, license)



10.1 DATABASES TAB



It lists the existing databases with following information:

- Database name
- Size in MB
- Status indicators for background operations:
  - Automatic backup
  - Auto export of CSV files (option for Network edition only)
  - OPC UA (option for Network edition only)

Possible statuses are:

Operation not granted by the domain administrator

Operation non activated

Operation activated

Error during the last operation

Contextual functions:

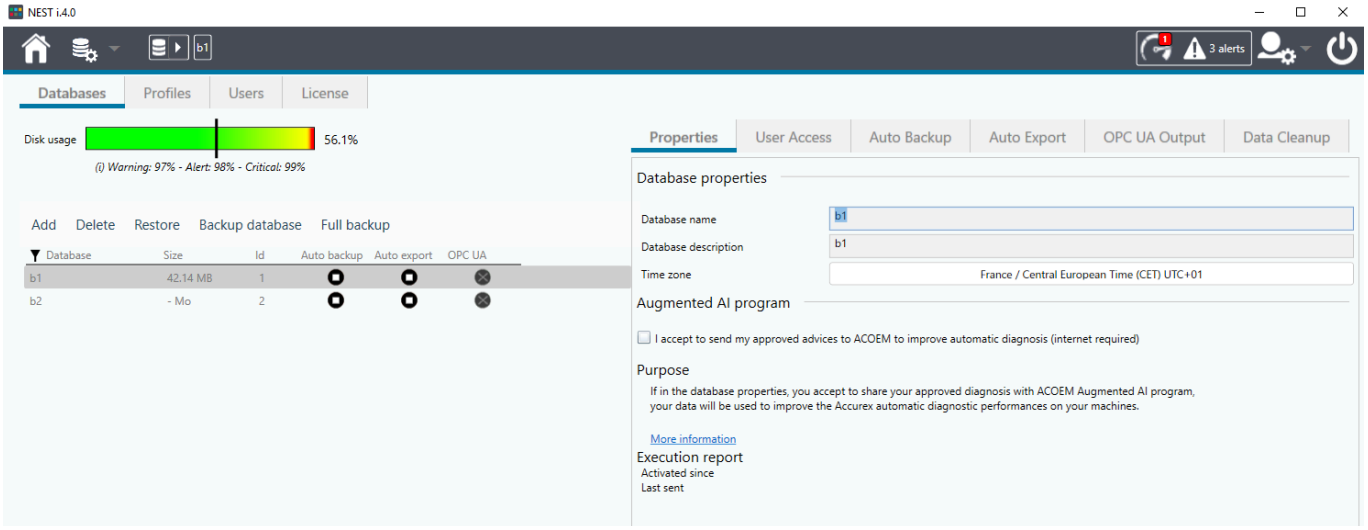
- **Add**: add a new database on the system.
- **Delete**: delete the selected database.
- **Restore**: add on the system a new database restored from a backup file.

Notes:

- If the backup file includes EAGLE gateways or sensors already used on this server, those gateways or sensors will not be restored. If you want to restore them you must first unassign these gateways and disconnect these sensors.
- The list of gateways and sensors used on the server can be generated with the function "Export sensor list" of the “Instrument” module. This function is only accessible if the current user is a domain administrator.
- The list of gateways and sensors included in the backup file is available in the file "XXXXXXX_Eagle-list.csv" created with the backup file.
- The list of gateways or sensors not restored is in the log folder
- Each machine has a unique identifier used for automatic data replication. When restoring a database, you must indicate the purpose of the restore operation:
- Restore to replace a previous database (unique identifiers are not modified) - WARNING: if the original database is still present on the server, the identifiers are no more unique.
- Restore to create a copy (Recommended if you don’t know: unique identifiers are regenerated)
- Restoring a backup done with a version done with Desktop version v1.6 or previous: DESKTOP database format has been changed in version v1.7, to restore a .db backup file use following procedure:
    - Run “Nesti4Desk2Net.exe” (Start menu/All programs/NESTi4.0/Desktop to Network Data Migrator)
    - Select in the 2nd field the .db file to restore.
    - Click on “Start”
    - Once the operation is completed, restart your PC. Then you can access the migrated data directly using the NESTi4.0 NETWORK program.

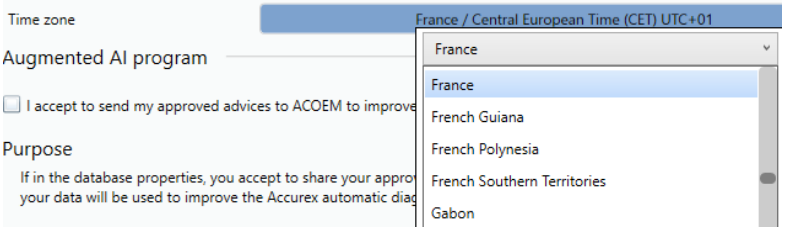
The setting of each database is done through several tabs.

10.1.1 *“Properties” tab*

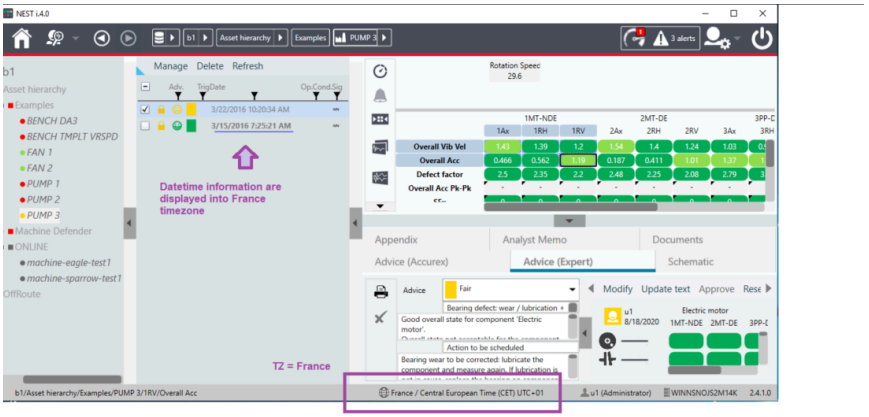


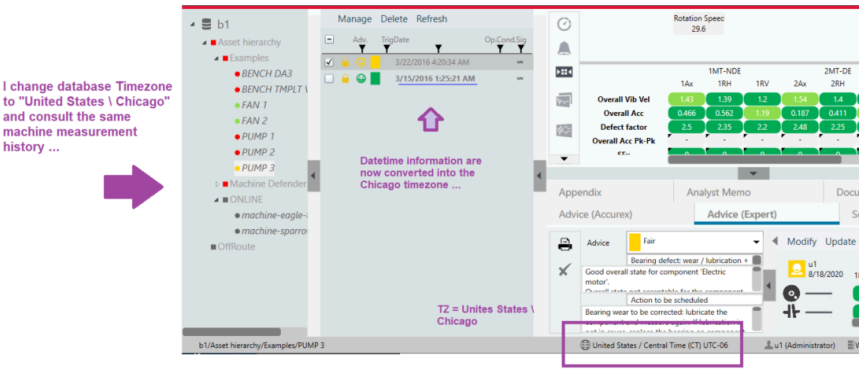
Database properties:

Name	**Name of the database**
Description	Description of the database (contexte, …)
Time zone	• Select a timezone from the list to localize all datetime information of data contained into this database.



- This settings is applied to NESTi4 screen displays and analysis reports
- Database timezone can be changed for an existing database and all existing datetime information will be converted into the new selected timezone – example:





- Datetime information of this database are presented within this timezone for all connected user independently of their own preferences or localization

Augmented AI program	
• [ ] I accept to send my …	Click on this option if you accept to participate to ACOEM AI improvement program
• More information	Click on this link to open a

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Approval request for ACOEM Augmented AI program

Purpose

If in the database properties, you accept to share your approved diagnostics with ACOEM Augmented AI program, your data will be used to improve the Accurex automatic diagnostic performances on your machines.

Which data are used

Once the Augmented AI program option is activated on a given database, all measurement data of machines with an approved diagnostic of this database is shared with ACOEM.
The sharing is triggered when the user approves his diagnosis.
Machine measurements without approved diagnostics are not shared with ACOEM even if the Augmented AI program option is activated on the database.

When data are shared

Each day at the time given in the "Settings" tab if the computer is connected to the Internet. This time can be customized by the user.

10.1.2 *"User access" tab (Network edition only)*

It is possible to adjust the specific access profile for each user

10.1.3 *"Auto backup" tab*

If the function is activated, you can set:

- When the backup is performed. It can be once a day, several times each week or once a month.
- **Retentions**: it defines the maximum number of backup files to be stored. When this number is reached the oldest file is automatically deleted.

- **Destination folder**: it defines where the backup files are stored. If you configure it from the server, you can use  button to browse the folders. From a client workstation, you will have to type the folder path with the keyboard. The selected destination folder must be accessible by NESTI4.0 service.

The tab includes the execution report with:

- Last successful backup
- Last try information
- Next backup information

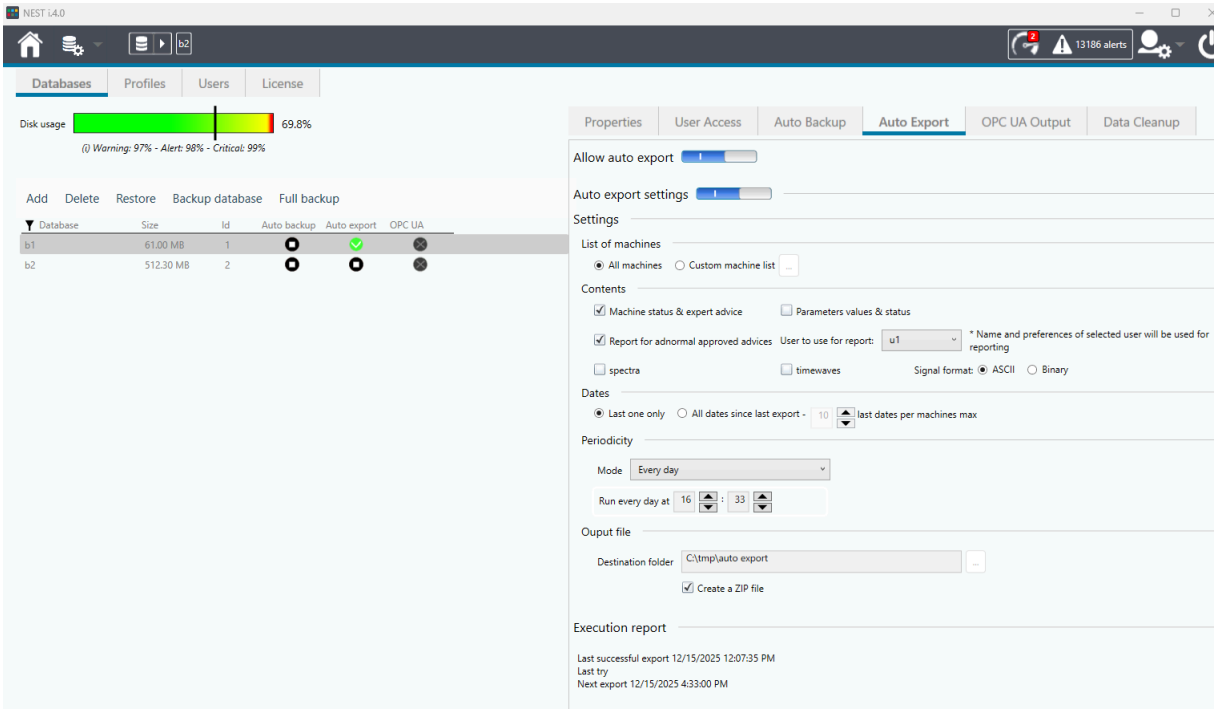
10.1.4 *"Auto export" tab*

This feature is available only with Network Edition and requires "NEST i4.0 Network - OPTION - OPC UA / CSV Interface" license option.

The CSV file autoexport job allows extracting periodically from database new inserted measurements and related machines health status. This is an incremental processus in order to optimize the amount of exchanged data and streamline communication with external applications.

10.1.4.1Settings

This panel displays the detailed settings for the database selected on the left. The Auto Export tab is currently active, allowing users to schedule and define automated data exports.



Details :

	Description
Allow auto export	A toggle switch to globally enable or disable the export function.
Auto export settings	A toggle to unlock and modify the settings below.
List of machines	Defines the scope of the export:: ● **All machines** - Exports data for every machine in the database. ● **Custom machine list** - Allows the user to select specific assets.
Contents	Determines the type of data included in export files: ● **Machine status & expert advice** – only Machine.csv file will be exported ; see detailed format below ● **Parameters values & status** – only Scalar.csv file will be exported ; see detailed format below ● **Report for abnormal approved advices** – add expertise report files (pdf format) corresponding to abnormal approved expertises relating to selected machines o **User to use for report:** A dropdown menu to select the user profile (e.g., "u1") under whose preferences the report is generated. ● **Spectra** – only Signals.csv file will be exported; see detailed format below ● **Timewave** – only Signals.csv file will be exported ; see detailed format below ● **Signal format** – define format of raw data files corresponding to Signals.csv o **ASCII** ; can be read with any text editor o **Binary** **Note :** Spectra & timewave will be extracted according to the license option
Dates	Select the quantity of data to be extracted: ● **Last one only** – extract only data corresponding to the last measurement (not incremental mode) ● **All date since last export** – extract all measurement dates since the previous extraction (incremental mode) o **"N" last dates per machine max.** (10 per default) – Max number of extracted measurement date since the previous extraction (to limit amount of generated files)
Periodicity	Select the periodicity of extraction: ● Every X hours – enter a number of hours ● Every day – enter a time HH24:MI ● Every X week – select one or more days + a time HH24:MI ● Every X month – select a day (1 to 31) + a time HH24:MI ● On the last day of the month – select a time HH24:MI Note: Time is expressed in the database time zone
Destination folder	● **Destination folder:** The local directory path where files will be saved (e.g., `C:\tmp\auto export).` ● **Create a ZIP file:** When checked, the system compresses the exported files into the same `zip` archive file to save space. 1 ZIP file is created per job execution with a unique name (job execution datatime + database name) - ex: `J20251211163300B1.zip`
Execution report	Execution Report displays the status of the automated scheduler: ● Last successful export: Timestamp of the last completed job. ● Last try: Timestamp of the most recent attempt. ● Next export: The calculated timestamp for the next scheduled operation.

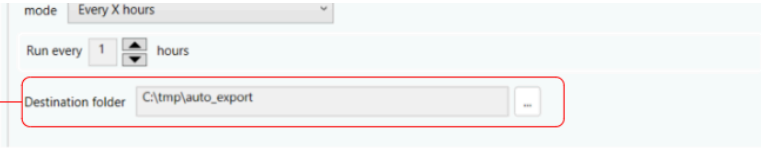
IMPORTANT:

- Nesti4 does not automatically delete export files from the destination directory.
- External application (or you) must manually delete all CSV files from the destination directory.

*10.1.4.2**CSV Files naming convention***

CSV files are generated into the same destination folder:

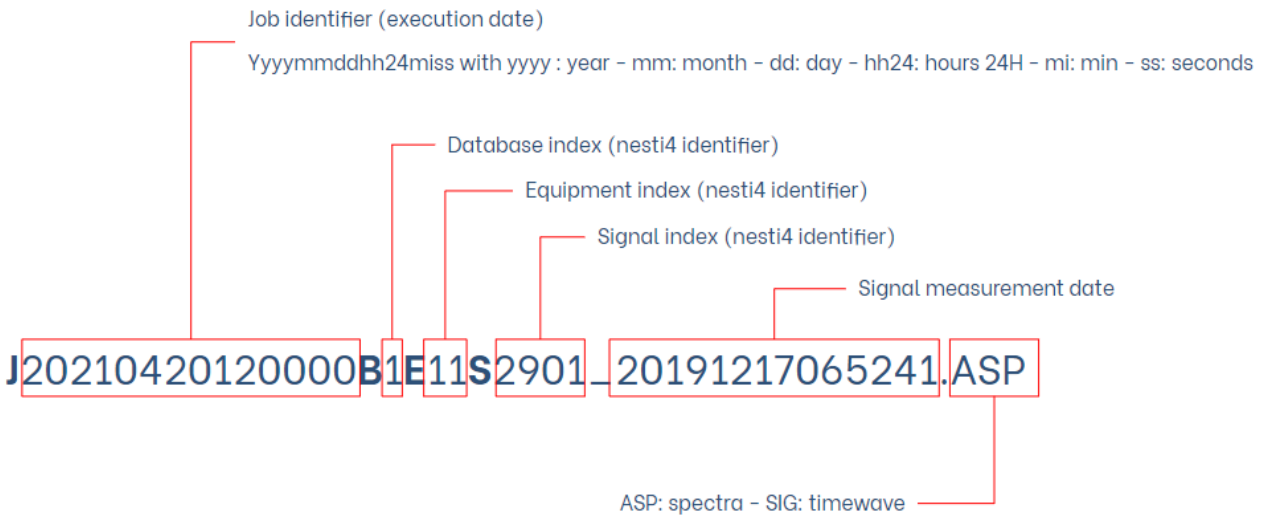
- All files into the same folder
- Files description:



Many CSV files are generated for the same job execution:

J20210420120000B1_**Machines.csv**	Equipment information: Parent, TAG, GUID, date, status, advice, diag, reco ...
J20210420120000B1E11_**Scalars.csv**	Parameters information: Parent, TAG, GUID, alarm thresholds, date, status, value, unit ...
J20210420120000B1E11_**Signals.csv**	Signals information: Parent, TAG, GUID, date, Status, Advice, Diag, Reco ...
J20210420120000B1E11S2901_20191217065241.**ASP**	Spectra raw data
J20210420120000B1E11S2901_20191217065254.**SIG**	Timewave raw data
J20210420120000B1_**MachinesFileVersion.txt**	Version of export engine (only for compatibility management)
J20210420120000B1_**ScalarsFileVersion.txt**	Version of export engine (only for compatibility management)
J20210420120000B1_**SignalsFileVersion.txt**	Version of export engine (only for compatibility management)

CSV files naming convention:



Exemple of CSV files content:



*10.1.4.3**MACHINES.CSV format***

Columns	Description
Parent	Location parent name
Parent TAG	parent TAG (external identifier)
Machine	Machine name
Machine GUID	Machine GUID (universal identifier)
Machine TAG	Machine TAG (external identifier)
Machine IDX	Machine indexe
Instrument	Instrument type used for measurements
Measurement date	Measurement date
Number of point	Number of measurement point (sensor)
Measured by	Measurement author
Status	Machine alarm status label
Status code	Machine alarm status code: 1=unprocessed, 2=OK, 3=pAl, 4=Al, 5=DG, 6=Err, 7=StandBy
Delay (day)	day number before next periodic measurement
Number of alerts	number of alarm status change since last expert advice
Advice	Machine expert advice label (approved or not)
Advice code	Machine expert advice code: 1=no advice, 2=Excellent, 3=Good, 4=Fair, 5=Critical
Advice date	Machine advice date ; avis différent de no advice (accurex ou expert)
Approval date	Machine advice approval date (if approved)
Approval by	Machine advice approver name
Diag title	Machine diagnosis short text

Diag detail	Machine diagnosis detailed text (multi lines)
Recom title	Machine recommendation short text
Recom detail	Machine recommendation detailed text (multi lines)
Criticality	Machine criticality : Undefined, Low, Medium, High
Designation	Machine designation (multi lines)
Comment	Machine comment (multi lines)
Model	Machine model
Serial number	Machine serial number
Smart Exception prediction	Smart exception prediction code value (-1, 0, 1, 2): ● 0 = no prediction ● 1 = no change detected ● 2 = Change detected ● -1 = equipment OFF

*10.1.4.4**SCALAR.CSV file format***

Columns	Description
Parent	location parent name
Parent TAG	parent TAG (external identifier)
Machine	Machine name
Machine GUID	Machine GUID (universal identifier)
Machine TAG	Machine TAG (external identifier)
Component	Component name
Component TAG	Component TAG (external identifier)
Bearing	Bearing name
Bearing TAG	Bearing TAG (external identifier)
Point	Measurement Point Name
Point TAG	Measurement Point TAG (external identifier)
Type	Measurement type {see list of treatments}
Parameter	Parameter name
Unit	Parameter unit label
Alarm type	alarm type detection {AlarmTypeNone ; AlarmTypeLow ; AlarmTypeInside ; AlarmTypeOutside; AlarmTypeHigh }
DG+	high danger thresholds value
AL+	high alarm thresholds value
pAL+	high pre alarm thresholds value
pAL-	low pre alarm thresholds value
AL-	low alarm thresholds value
DG-	low danger thresholds value
Date (list)	machine measurement linked to the parameter, format DD/MM/YYYY HH:MM
Date (meas)	individual measurement date of the parameter, format DD/MM/YYYY HH:MM
Value	parameter value
Status	parameter alarm status label
Status code	parameter alarm status code: 1=unprocessed, 2=OK, 3=pAl, 4=Al, 5=DG, 6=Err, 7=StandBy

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*10.1.4.5**SIGNAL.CSV file format***

Columns	Description
Parent TAG	parent TAG (external identifier)
Machine;	Machine name
Machine GUID	Machine GUID (universal identifier)
Machine TAG	Machine TAG (external identifier)
Component	Component name
Component TAG	Component TAG (external identifier)
Bearing	Bearing name
Bearing TAG	Bearing TAG (external identifier)
Point	Measurement Point Name
Point TAG	Measurement Point TAG (external identifier)
Type	Measurement type {see list of treatments}
Signal	Signal name
Signal TAG	Signal TAG (external identifier)
Unit;	Signal unit label
Frequency;	Value in Hz ; depending on the date type: - Spectrum: maximum frequency - Envelop: maximum frequency of the resulting envelop - Time wave: sampling frequency
Size;	number of values
Op cond;	operating condition short name
Rot freq	rotation frequency in Hz (the one of the bearing or the one measured with phased spectrum)
Date(list)	machine measurement linked to the parameter, format DD/MM/YYYY HH:MM
Date(meas)	individual measurement date of the parameter, format DD/MM/YYYY HH:MM
File name	corresponding measurement file with .ASP or .SIG extension

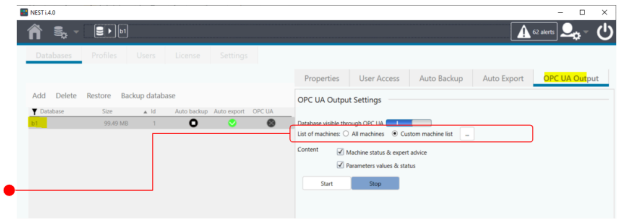
10.1.5 ***"OPC UA output" tab (Network edition only)***

This feature is available only with Network Edition and requires "NEST i4.0 Network - OPTION - OPC UA / CSV Interface" license option.

*10.1.5.1**Settings***

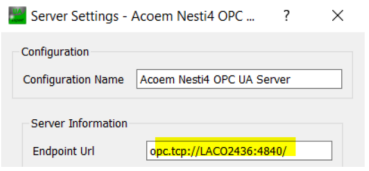
Settings

- Enabled/disabled per database
- Concern All machines or a custom list
- Publishing options
  - Machine status & expert advices
  - Parameter values & status
- Start / Stop publishing



Default endpoint URL is

opc.tcp://<servername>:4840/



Details :

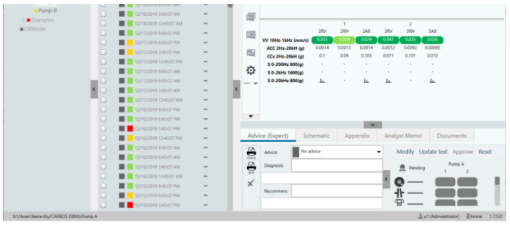
	Description
Allow auto export	Activate toggle to activate Auto export settings toggle
Auto export settings	Activate toggle to access auto export function settings
List of machines	Select the list of machines to be extracted: ● **All machines** ● **Custom machine list** : click on […] button to select machine to be exported
Contents	Select the list of information to be extracted: ● **Machine status & expert advice** – only machine information will be published ● **Parameters values & status** – only measurements information will be published . **Note**: Spectra & timewave will be published according to the license option
Start	Click on this button to start publication. At this moment, any external application with an opc ua client can connect and read data from nesti4 opc ua server.
Stop	Click on this button to stop publication.

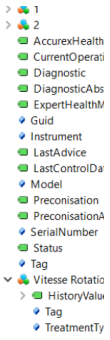
IMPORTANT:

- OPC UA publication is a paid option with 2 levels of service
  - Activation (overall & diagnostics)
  - Extension (overall & diagnostics + signals)
- External OPC UA applications can only subscribe to parameters with no errors – e.g. sensor fault, Modbus link unavailable... Depending on your application cases, a temporary configuration may be necessary to allow subscription to certain parameters – example: if the resting point is permanently monitored (MVX) then all the parameters of a measurement channel will be “invalid” if the channel is faulty (eg: open circuit). In this case, it is necessary to deactivate the monitoring of the resting point, restart the monitoring to allow the external applications to subscribe to all the useful parameters, then reactivate the monitoring of the resting point before restarting the monitoring
- All published date & time are converted into UTC timezone independently of the database timezone

*10.1.5.2**Machine information***

Available information -- Machine level





Machine name
GUID; Machine GUID (universal identifier)
Tag; Machine TAG (external identifier)
Instrument; used instrument {FALCON; EAGLE}
Model; machine model
SerialNumber; machine serial number
LastControlDate; Last measurement date (machine level)
CurrentOperatingCondition: label of operating condition
LastAdvice; Machine advice code (0=no advice, 1=Excellent, 2=Good, 3=Fair, 4=Critical) + Label
Status; Machine alarm status code (0=unprocessed, 1=OK, 2=pAl, 3=Al, 4=DG, 5=Err, 6=StandBy) + Label
DiagnosticAbstract; Machine diagnosis short text
PreconisationAbstract; Machine recommandations short text
Diagnostic; Machine diagnosis detailed text
Preconisation; Machine recommendations detailed text
Vitesse Rotation
...

Data Access View

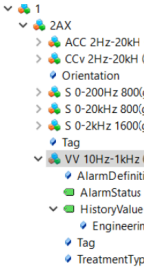
#	Node Id	Display Name	Value	Datatype	Source Timestamp	Statuscode
1	NS3|String|Eq$1$12/Guid	Guid	{9466339f-6878-4caa-9bef...	Guid	18:56:03.389	Good
2	NS3|String|Eq$1$12/Model	Model		Null	18:56:09.810	Good
3	NS3|String|Eq$1$12/SerialNumber	SerialNumber		Null	18:56:12.977	Good

*10.1.5.3**Parameter information***

Available information -- Measurement level

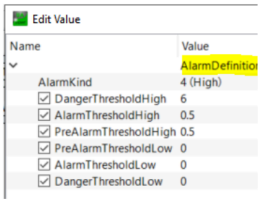






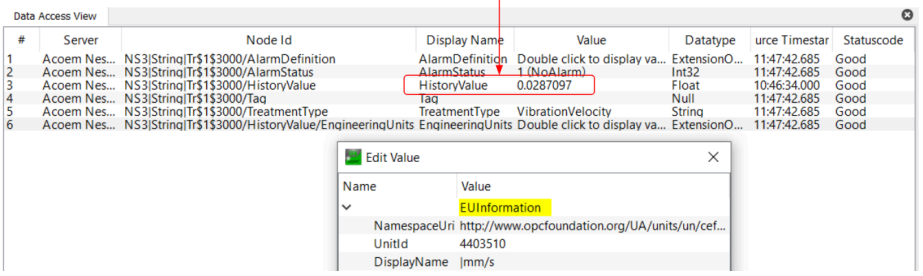
-- for Parameter (overalls)

MeasurementName; ex: ACC 2Hz-20kHz (g)
AlarmDefinition; alarm type and thresholds values (Danger, Alarm, ...) - see AlarmDefinition
AlarmStatus; Machine alarm status code (0=unprocessed, 1=OK, 2=pAl, 3=Al, 4=DG, 5=Err, 6=StandBy)
HistoryValue; Current parameter value
EngineeringUnits; see EUInformation (UnitId, DisplayName, Description)
TreatmentType; see list of treatments



Edit Value

Name	Value
	AlarmDefinitio
AlarmKind	4 (High)
DangerThresholdHigh	6
AlarmThresholdHigh	0.5
PreAlarmThresholdHigh	0.5
PreAlarmThresholdLow	0
AlarmThresholdLow	0
DangerThresholdLow	0



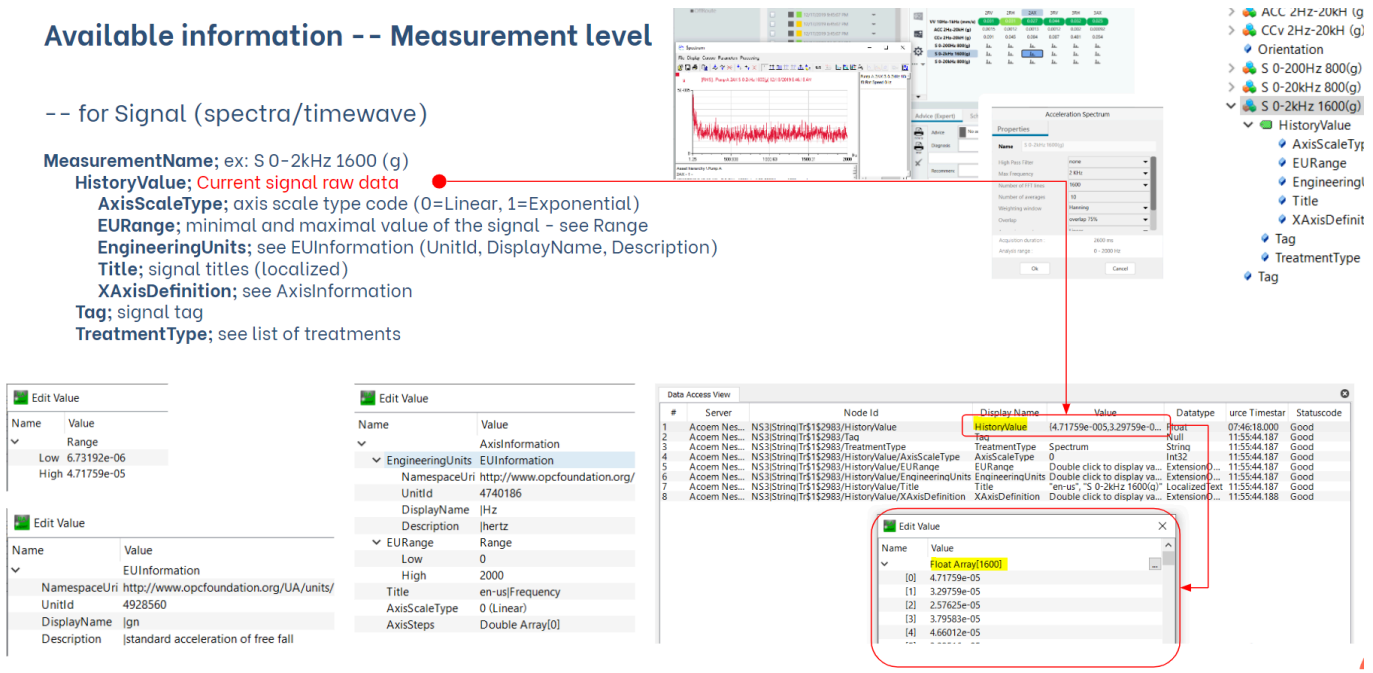
Data Access View

#	Server	Node Id	Display Name	Value	Datatype	urce Timestar	Statuscode
1	Acoem Nes...	NS3|String|Tr$1$3000/AlarmDefinition	AlarmDefinition	Double click to display va...	ExtensionO...	11:47:42.685	Good
2	Acoem Nes...	NS3|String|Tr$1$3000/AlarmStatus	AlarmStatus	1 (NoAlarm)	Int32	11:47:42.685	Good
3	Acoem Nes...	NS3|String|Tr$1$3000/HistoryValue	HistoryValue	0.0287097	Float	10:46:34.000	Good
4	Acoem Nes...	NS3|String|Tr$1$3000/Tag	Tag		Null	11:47:42.685	Good
5	Acoem Nes...	NS3|String|Tr$1$3000/TreatmentType	TreatmentType	VibrationVelocity	String	11:47:42.685	Good
6	Acoem Nes...	NS3|String|Tr$1$3000/HistoryValue/EngineeringUnits	EngineeringUnits	Double click to display va...	ExtensionO...	11:47:42.685	Good

Edit Value

Name	Value
	EUInformation
NamespaceUri	http://www.opcfoundation.org/UA/units/un/cef...
UnitId	4403510
DisplayName	mm/s

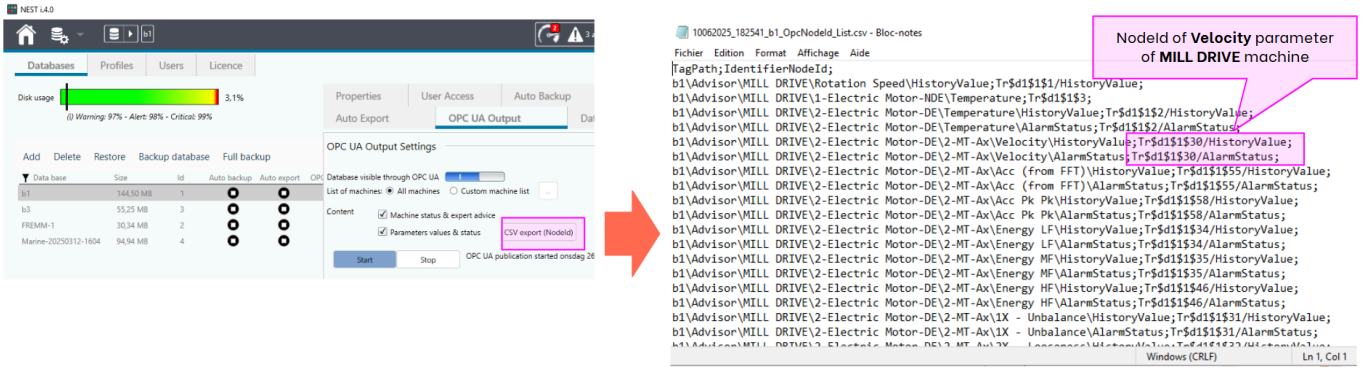
*10.1.5.4**Signal information***



*10.1.5.5**Export CSV file with OPC NodeId***

New CSV file can be exported from ADMIN \ Database \ OPC UA Output tab

CSV file contains OPC tags NodeId identifier for HistoryValue and/or AlarmStatus of all parameters (process & vibration, hard & soft) published via NESTi4 OPC UA server



10.1.6 ***Advanced Database Cleanup***

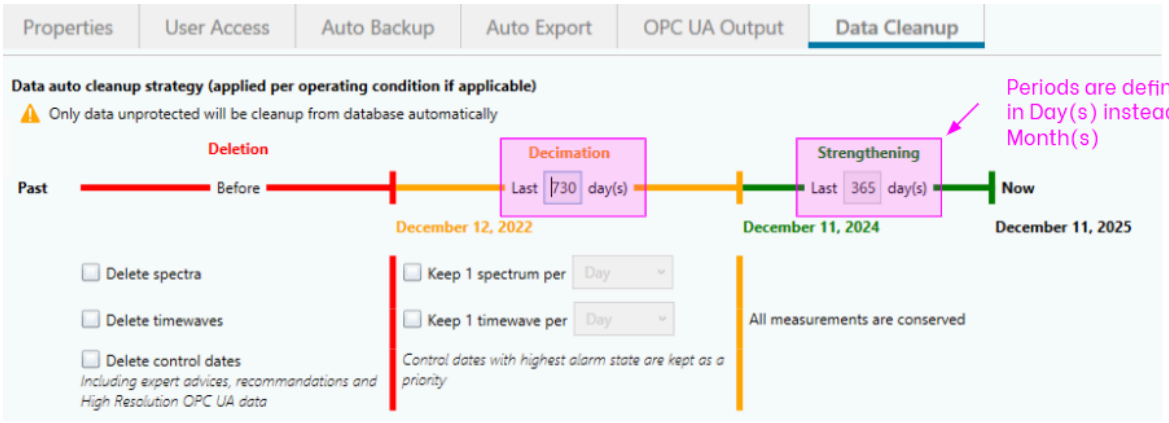
Warning: existing cleanup settings of previous nesti4 release are lost after an upgrade into v2.4 and it must be redefined with these new capabilities

By default, all recorded or inputted data is retained in the database within the maximum storage quota specified in your domain's license.

The "automatic cleaning" module now allows you to define data deletion rules to curb database volume growth over time. These new rules, for instance, enable the retention of all trend

measurements since the beginning of monitoring, but only one spectrum measurement per day and one temporal measurement per week.

This optimization strategy applies to all machines contained within the database and can be executed either automatically or periodically.



Cleanup strategy:

Three distinct strategies can be defined based on three time periods:

- **Short-term period** – named “strengthening” – starts from now to the last X days during which all stored data is preserved and nothing is deleted from the database.
- **Mid-term period** – named "Decimation” – starts from X days ago to Y months days (with Y > X) during which all stored data can be thinned out to retain only a few instances of spectra, envelope (FFT) or time signal (TW).
- **Long-term period** – named “Deletion" – starts from Y days ago to the beginning of monitoring when stored data can be definitively deleted from the database.

Examples:

- FFT data can be thinned out during the mid-term period but should never be entirely deleted.
- TW data may not be thinned out during the mid-term period but can be completely deleted during the long-term period.

Data types concerned by cleanup strategy:

As mentioned, three types of data can be cleaned up:

- **Spectra** - Includes all signals corresponding to simple spectrum, envelope spectrum (both), phased spectrum, RSS spectrum, RSS envelope spectrum, and spectrum.
- **Timewave** - Includes all signals corresponding to time signal, time signal on event, time signal filtering, autocorrelation, RSS time signal, and RSS envelope time signal.
- **Control date** - Includes all data attached to a machine control date, including measurements, post-processing, defects matrix, expert advice, and recommendations. The corresponding date is removed from the measurement list of the machine.

Decimation methodology:

These settings allow specifying the period during which data will be thinned out. For example, selecting "Keep only 1 spectrum per Day" means that only one instance of this spectrum measurement will be preserved **per operating condition** (if applicable) and all other instances will be definitively deleted from the database.

In order to conserv data with potential interesting mechanical phenomenons, the preserved measurement will be the measurement when the machine is in alarm. If more than one measurement with alarm exist, then only one is conserved (the latest of the period).

Options for decimation include:

- Day
- Week
- Month
- Quarter

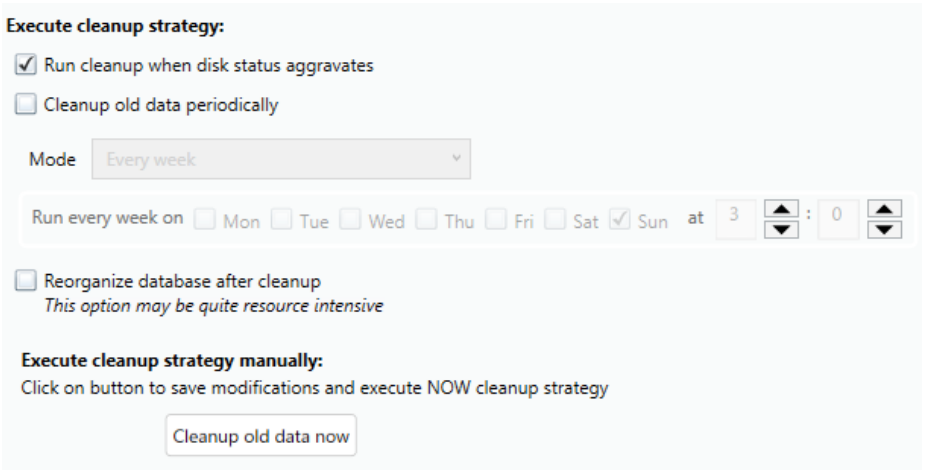
Decimation and/or deletion are applied per data type when the corresponding checkbox is checked. By default, all checkboxes are unchecked so no data is cleaned up.

Notes:

- Reference dates and protected dates are not concerned by clean up strategy – ie their FFT and/or TW measurement are never deleted
- Users can protect/unprotect manually measurement dates directly via the analyst module.

Manual or automatic cleanup:

When cleanup strategy is defined, then it can be run automatically and periodically or just one time (on-demand):



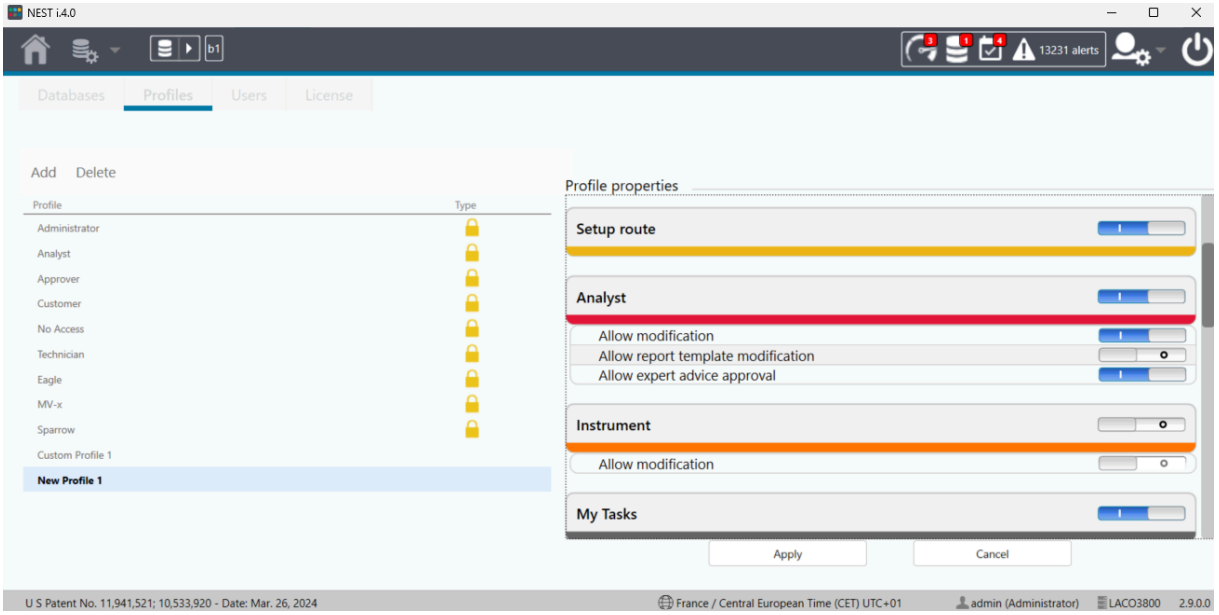
- Automatic & periodic cleanup:
  - check “Cleanup old data periodically”, choose a “mode” and define calendar criteria
    - Every day + time
    - Every week + day & time
    - Every month + day & time
    - On the last day of the month + time

Note: Time is expressed in the database time zone

- On-demand manual cleanup
    - Just click on “Cleanup old data now” button to apply immediately the defined cleanup strategy

10.2 Profiles & Privileges tab (Network edition only)

10.2.1 *Profiles*



The system has some predefined default user profiles and they cannot be modified or deleted.

Modules	Predefined user profiles						
	Administrator	Approver	Analyst	Technician	Customer	No access	MV-x, Eagle, Sparrow
Collect	Yes	Yes	Yes	Yes	No	No	No
Setup machine							
. modification	Yes	Yes	Yes	No	No	No	No
Setup Route	Yes	Yes	Yes	Yes	No	No	No
Analyst							
. modification	Yes	Yes	Yes	No	No	No	No
. template modif.	Yes	Yes	Yes	No	No	No	No
. advice approval [2]	Yes	Yes	No	No	No	No	No
Instrument							
. modification	Yes	Yes	Yes	No	No	No	No
My tasks	Yes	Yes	Yes	No	No	No	No
Administration							
. Databases & Users	Yes	No	No	No	No	No	No
. Profiles	Yes	No	No	No	No	No	No
. License	Yes	No	No	No	No	No	No
. Restore	Yes	No	No	No	No	No	No
Vision							
. Domain	Yes	No	No	No	No	No	No

. Users	Yes	No	No	No	No	No	No
. Own Inbox RO	Yes	Yes	Yes	Yes	No	No	No
. Own Inbox RW	Yes	Yes	Yes	No	No	No	No
. All Inboxes RW	Yes	Yes	Yes	No	No	No	No
. Archives	Yes	Yes	Yes	Yes	Yes	No	No
. Alert acknowledge	Yes	Yes	Yes	No	No	No	No
. Alarms & Alerts RO	Yes	Yes	Yes	Yes	No	No	No
. Live data	Yes	Yes	Yes	Yes	No	No	No
. Maps RW	Yes	Yes	Yes	Yes	No	No	No
. Own Tasks RO	Yes	Yes	Yes	Yes	No	No	No
. Own Tasks RW	Yes	Yes	Yes	No	No	No	No
. All Tasks RO	Yes	Yes	Yes	No	No	No	No
. All Tasks RW	Yes	Yes	Yes	No	No	No	No
. Alignment details	Yes	Yes	Yes	Yes	No	No	No
. Vibration details	Yes	Yes	Yes	Yes	No	No	No
. Accurex reports	Yes	Yes	Yes	Yes	No	No	No
. Custom views	Yes	No	No	No	No	No	No
Public API	No	No	No	No	No	No	No
Miscellaneous							
. Backup	Yes	Yes	Yes	Yes	No	No	No
. Predefined notes	Yes	Yes	Yes	Yes	No	No	No
. Custom bearings	Yes	Yes	Yes	No	No	No	No
. MVX Auth.	Yes	No	No	No	No	No	Yes[1]
. EAGLE Auth.	Yes	No	No	No	No	No	Yes[1]
. SPARROW Authent.	Yes	No	No	No	No	No	Yes[1]

[1] *according to device type*
[2] *Force "modification" and “my task”.*

Contextual functions: it is possible to create other profiles to meet your requirements:

- **Add**: add a new profile.
- **Delete**: delete the selected profile.

NOTE:

- A new "MV-x" profile is now available to create user accounts to be used by MVX acquisition systems to connect to the Nesti4 server.

10.2.2 ***Privileges***

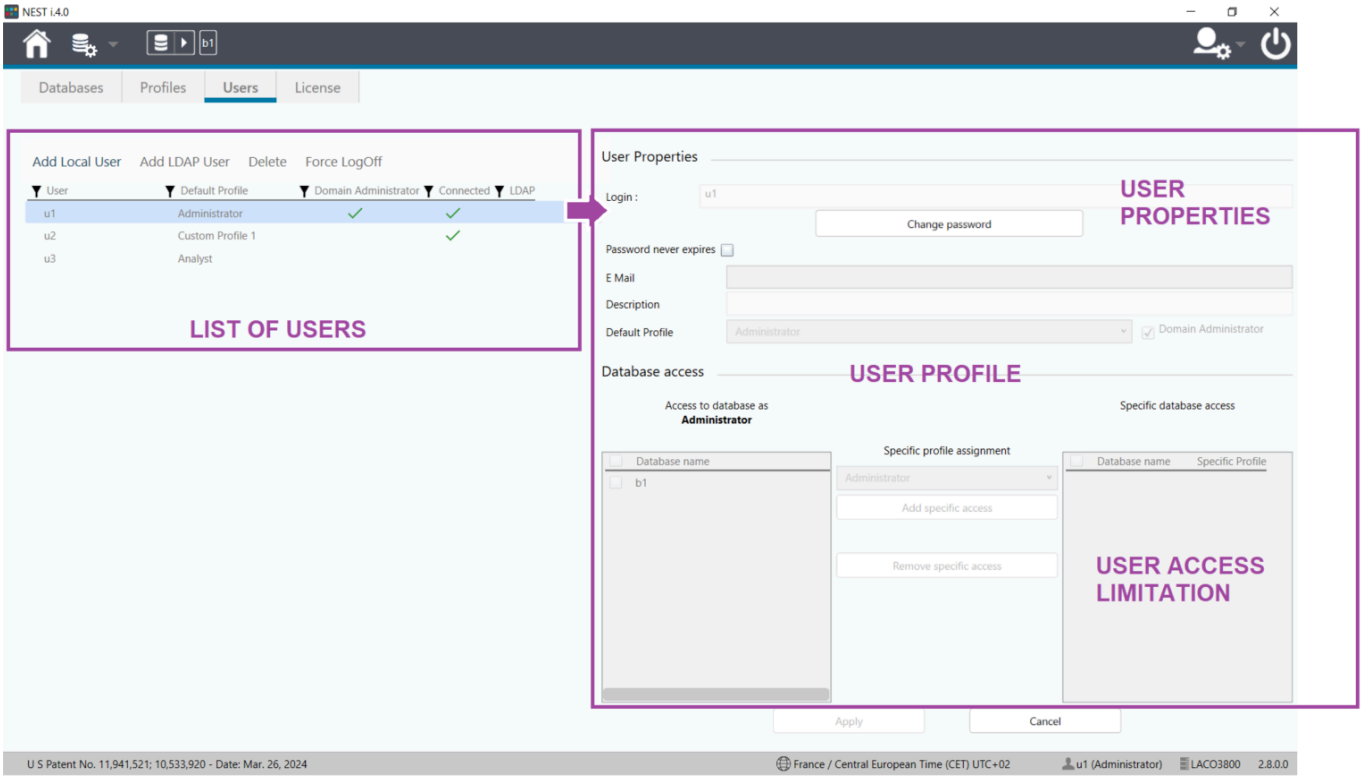
Privileges	Description
Collect	**Can access** or not to “collect” module in NESTi4.
Machine setup . modification	Can access (Read Only) or not to “Setup” module in NESTi4. Can change (R/W) machine setup properites in NESTi4.
Setup Route	Can access (Read Only) or not to “Route” module in NESTi4.
Analyst	Can access (Read Only) or not to “Analyst” module in NESTi4.

. modification	Can change (R/W) or not
. template modif.	Can change (R/W) or not
. advice approval	Can change expert advice approval status.
Instrument	Can access to Instrument module
. modification	Can modify instrument settings
My tasks	Can access to tasks / service requests module
Administration	Can access to Administration module
. Databases & Users	Can add/edit/delete database
. Profiles	Can add/edit/delete profile
. License	Can edit domain license
. Restore	Can restore database
Vision	Can access to NEST Vision
. Domain	Can edit domain properties
. Users	Can add/edit/delete users of domain
. Own Inbox access	Can access (RO) to personal Inbox (machine defender or align apps)
. Own Inbox modification	Can edit (RW) to personal Inbox (machine defender or align apps)
. All users Inboxes modification	Can access (RW) to all Inboxes (machine defender or align apps)
. Archives	Can add/edit/delete files into archive folder of the machine
. Alert acknowledge	Can acknowledge alerts (machine and/or instrument)
. Alarms & Alerts	Can access (RO) to alarms views and alerts views
. Live data	Can access (RO) to live views
. Maps modification	Can edit list of element displayed into machine map view
. Tasks	Can access (RO) to list of personal tasks (service request)
. Tasks modification	Can add/edit/delete personal tasks (service request)
. other users Tasks	Can access (RO) to list of everyone's tasks (service request)
. Other users Tasks modification	Can add/edit/delete list of everyone's tasks (service request)
. Alignment details	Can access to machine alignment details panel
. Vibration details	Can access to machine vibration details panel
. Accurex reports	Can see Accurex auto diagnostic of machine ; if not only expert advice is visible
. Custom views	Can access to custom view (settings and tabs)
Public API	Can access to NEST API
Miscellaneous	
. Backup	Can do database backup from preference menu
. Predefined notes	Can add/edit/delete predefined notes from preferences menu
. Custom bearings	Can add/edit/delete custom bearing refs from preferences menu
. MVX Auth.	Can be used as MVX account
. EAGLE Auth.	Can be used as EAGLE account
. SPARROW Authent.	Can be used as SPARROW account

10.3 User tab (Network edition only)

This module manages all users for NESTi4 and NEST Vision applications including:

- User properties – ie: name, email, description …
- Default profile
- Database accesses



List of users:

Menu functions	**Description**
Add local user	Add a locally managed user
Add LDAP user	**Add** a LDAP user – LDAP interface must be activated and configured before – see specific documentation [R2]
Delete	
Force LogOff	

Fields	Description
User	User account login
Default profile	
Domain administrator	
Connected	
LDAP	

User properties

- Login
- Change password
- Password never expire
- Email
- Description
- Default profile
- Domain administrator

Database access

- Database name
- Specific profile assignment
- Database name + specific profile

It gives access to all the functions to manage users. It lists the existing users with following information:

- **User name** (Max 17 characters)
- Connection status
- **Default profile**: profile used by this user for all the databases if no database specific profile is defined
- **Specific profile** per database: to be used if the organization requires that a user has not the same level of access for all the databases. If a specific profile is defined for a database, it is used instead of the default one.
- Domain administration property:
    - It is special privilege. Only a domain administrator has the possibility to see and to grant the “Domain administration privilege” to another user.
    - Limitations for users without “Domain administration privilege”:
        - No access on this privilege
        - No access to Default profile
        - No access to username and password of users with “Domain administration privilege”:
        - Any user created has a “No access” default profile
        - If he adds a new database his current profile is used as specific profile for this new database

Contextual functions:

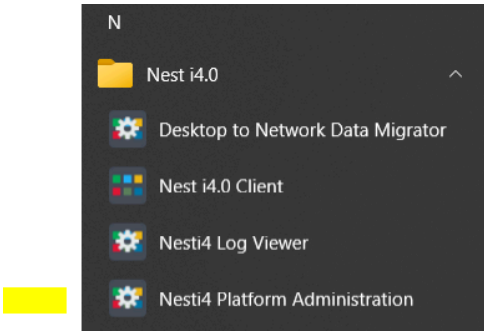
- **Add**: add a new user on the system. There are two ways to create a user:
    - Add a local user: you will have to define its name and password
    - Add a LDAP user: in this case the user is selected from the LDAP directory of your organization. The user will have the same login (name and password) as his Windows session.

Note: to use “LDAP user”, the system must be configured to communicate with the LDAP directory of your organization

- **Delete**: delete the selected user.
- **Force logoff**: force the logoff of the selected user

IMPORTANT:

- After installation the system has a default domain “d1” and a default local user “u1/u1”. This user is administrator of the default domain and cannot be deleted or modified with the exception of its password. For security it is recommended to modify its password.
- In Network edition
    - the number of simultaneous connection is limited by the license
    - Domain management can be done with the ***NESTi4 Platform Administration*** installed only on the NESTi4 server



10.4 License tab

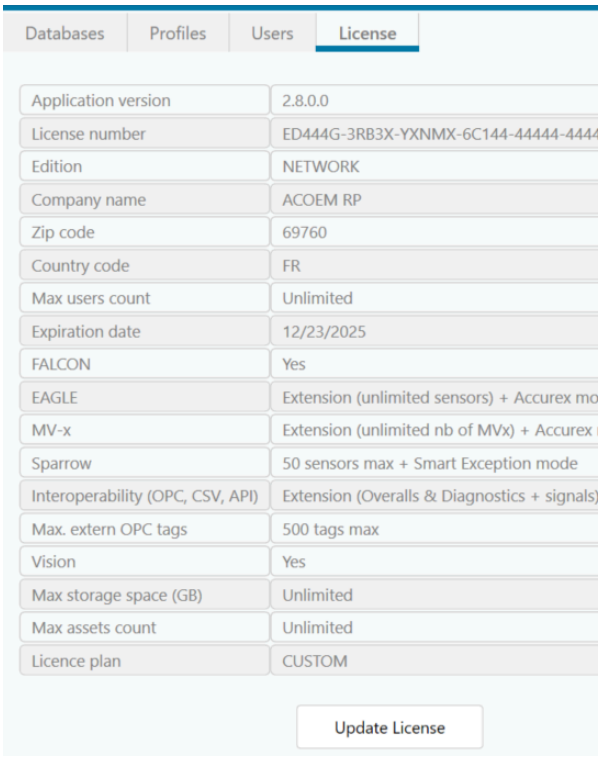
The license is used to manage the options of NESTi4.0

The license information is supplied on “NESTi4.0 License form” document.

To enter the license:

- Click on "Update license" button
- Enter all needed information
- Click on “OK”

For Network edition, the license may need to be activated. Instructions are then indicated in the “License” tab. Activation must be done within 30 days after the installation. If not, the installation is shifted to “Demo” mode [(1)].





The options managed by the License are:

Application version	**Version number of application**
License number	License string
Edition	Application edition – ie: DESKTOP or NETWORK
Company name	License owner company name
ZIP code	License owner ZIP code
Country code	License owner country code
Max user counts	Number of simultaneous user sessions
Expiration date	After this date, the installation is shifted to “Demo” mode(1)
FALCON	Yes, No
EAGLE	Activation (10 sensors maxi), Extention (unlimited sensor), Accurex mode (option)
MVX	Activation (1 MVX maxi), Extention (unlimited MVX), Accurex mode (option)
SPARROW	Number of sensors to be connected – Note a larger number of sensors can be paired to the gateway but only this amount will be able to be connected to machines
Interoperability (OPC, CSV, API)	Activation (Overalls & Diagnostics), Extention (Overalls & Diagnostics + signals)
Max. extern OPC tags	Max. number of OPC tags to be used as OPC items
NEST Vision	Yes, No
Max storage space (GB)	0 (unlimited) or maximum storage for the domain in GB
Max asset count	0 (unlimited) or maximum number of machine declared into the domain

License plan	predefined license plan for the domain – ie Starter, Booster, Custom or Demo

Plans description (predefined license option pack):

	Demo	**Starter**	**Booster**	**Custom**
Max Users Count	1	5	Unlimited	Contact ACOEM Technical Support
Max Assets Count	20	Unlimited	Unlimited	
Max Storage Space (GB)	1 GB	5 GB	10 GB	

Note:

- NESTi4 Desktop Edition licensing is limited to FALCON activation with or without an expiration date
- When at least one quota license has been reached, then NESTi4 runs in “demo mode” with the following limitations:
    - Create 20 machines maxi. including template machines ; all existing machines continue to be visible
    - No Backup/Restore, no Import/Export no adding database

CHAPTER 11. Platform Administration (PAM)

11.1 Domains management

IMPORTANT:

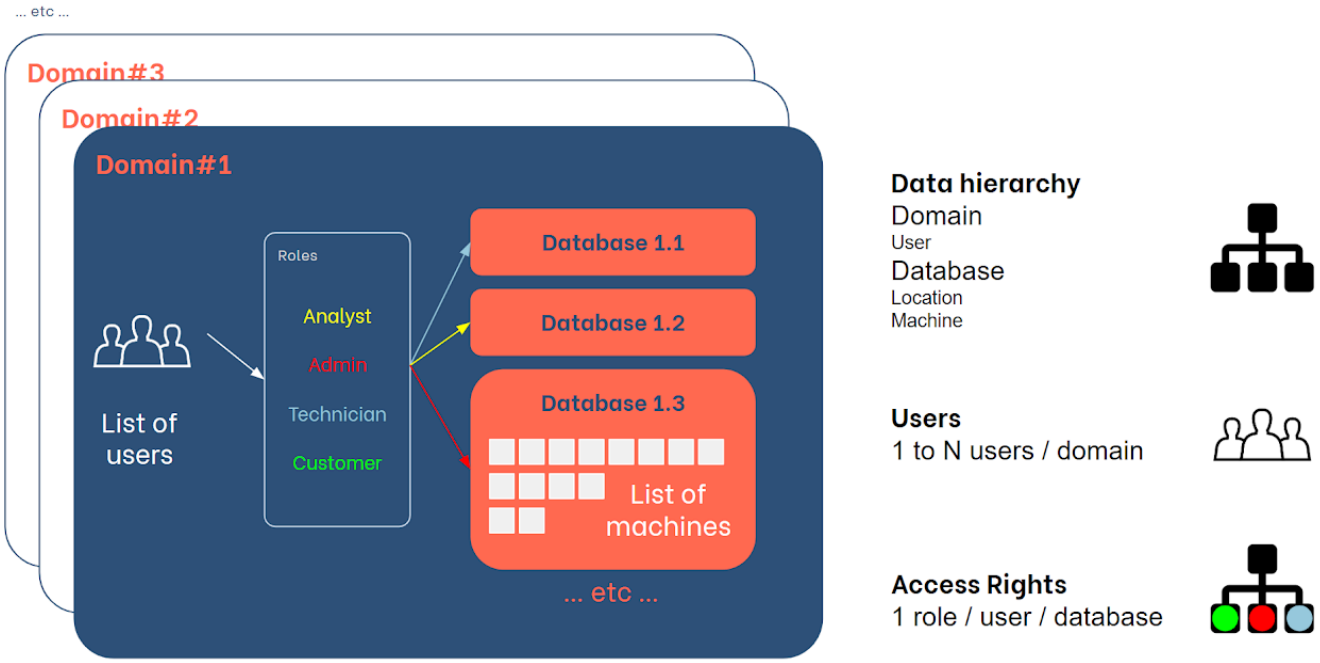
- This feature requires the use of NESTi4 Platform Administration Module (PAM) from the NESTi4 Programs group into the Windows Starting menu
- Platform Administration Module is available on the NESTi4 server only

11.1.1 *Database structure*

Database structure is a key factor for security and performances. User access rights and roles are foundations to guarantee data privacy.

NESTi4 data organization is based on the following:

- **Domain** is the highest hierarchical level of your data. It can contain one or more databases and many users accordingly the subscribed plan (Starter, Booster, Custom)
- **Database** contains one or more assets with all measurements, reports, images and history of diagnostics
- **Users** are declared into one domain and can access to one or more database according to a role - i.e. administrator, analyst, technician or customer



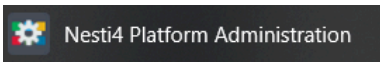
Description of the structure:

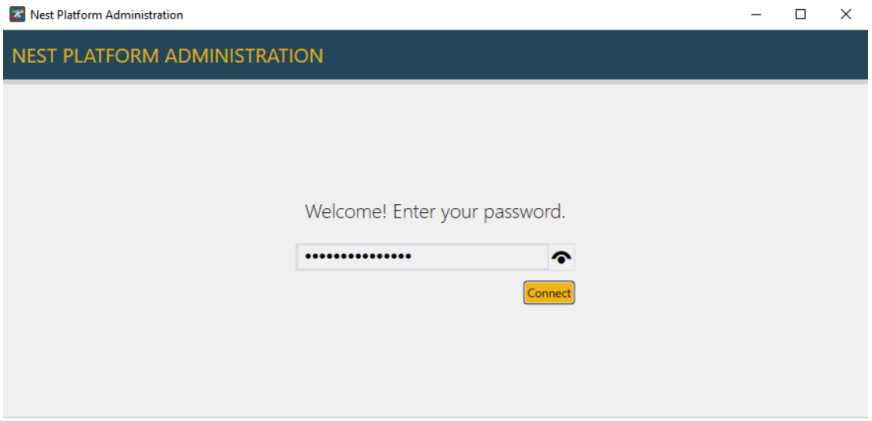
- 1 or more domains can be declared into a NESTi4 server ; only one domain exists after installation
- 1 domain can contain 1 or more databases
- 1 database can contain 1 or more machines and/or locations
- 1 domain can contain 1 or more users and 1 or more roles
- 1 user can access to 1 or more databases
- User access to a database is restricted by a Role in order to limit privileges and protect data

11.1.2 *Nesti4 Platform Administration Module (PAM)*

PAM is the tool to be used for domain administration:

- Click on Windows Start menu
- Open NESTi4 Group
- Select **Nesti4 Platform Administration**

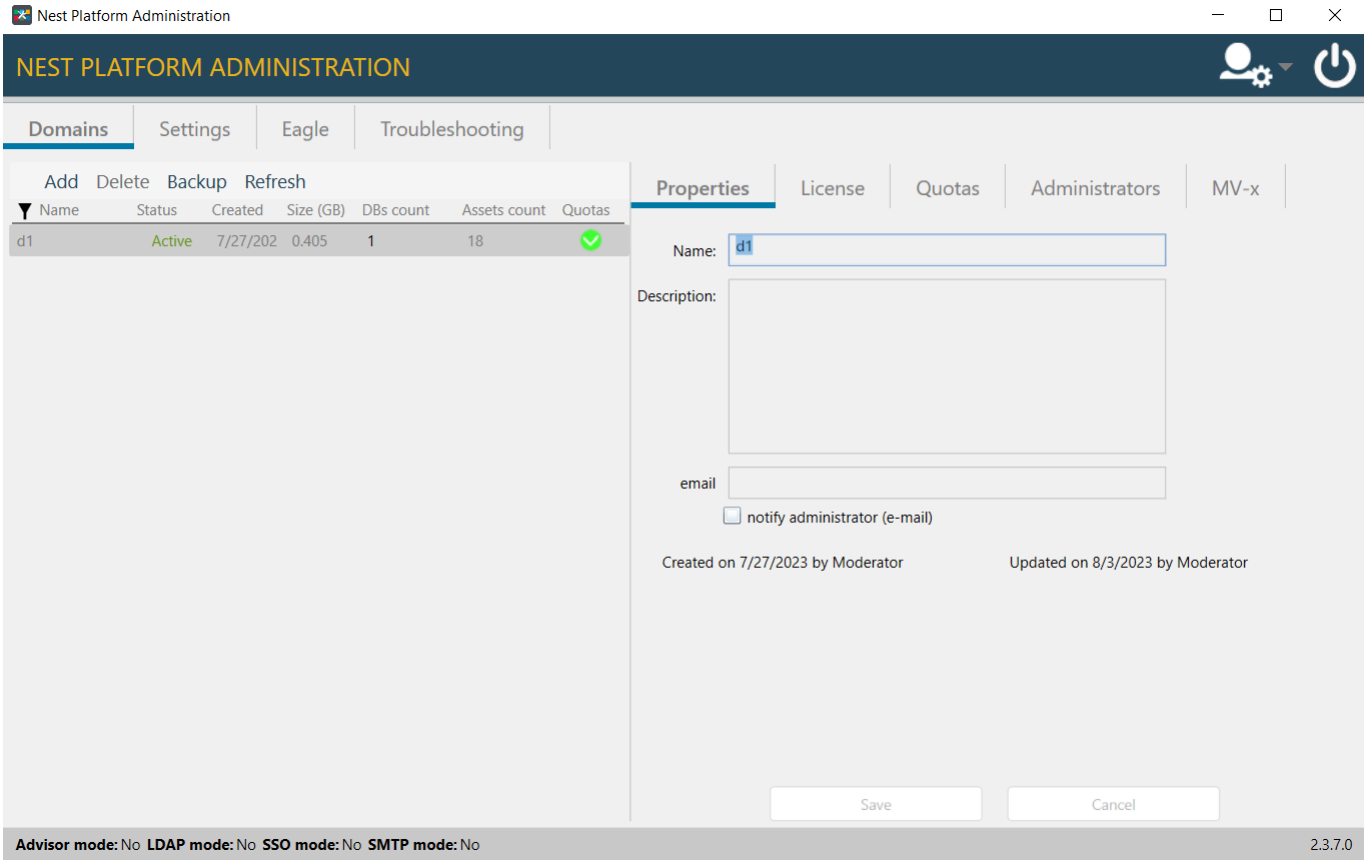




Default PAM password is **change_on_install** and you must change this password when you connect the first time.

IMPORTANT: If you forget this password, please contact ACOEM Technical Support

By default, only “d1”domain exists and the following list is presented:



11.1.3 *PAM / Domains Menu*

Description:

Add	**Create a new domain**
Delete	Delete the selected domain
Backup	Backup all databases of the selected domain
Refresh	Force a refresh of the list

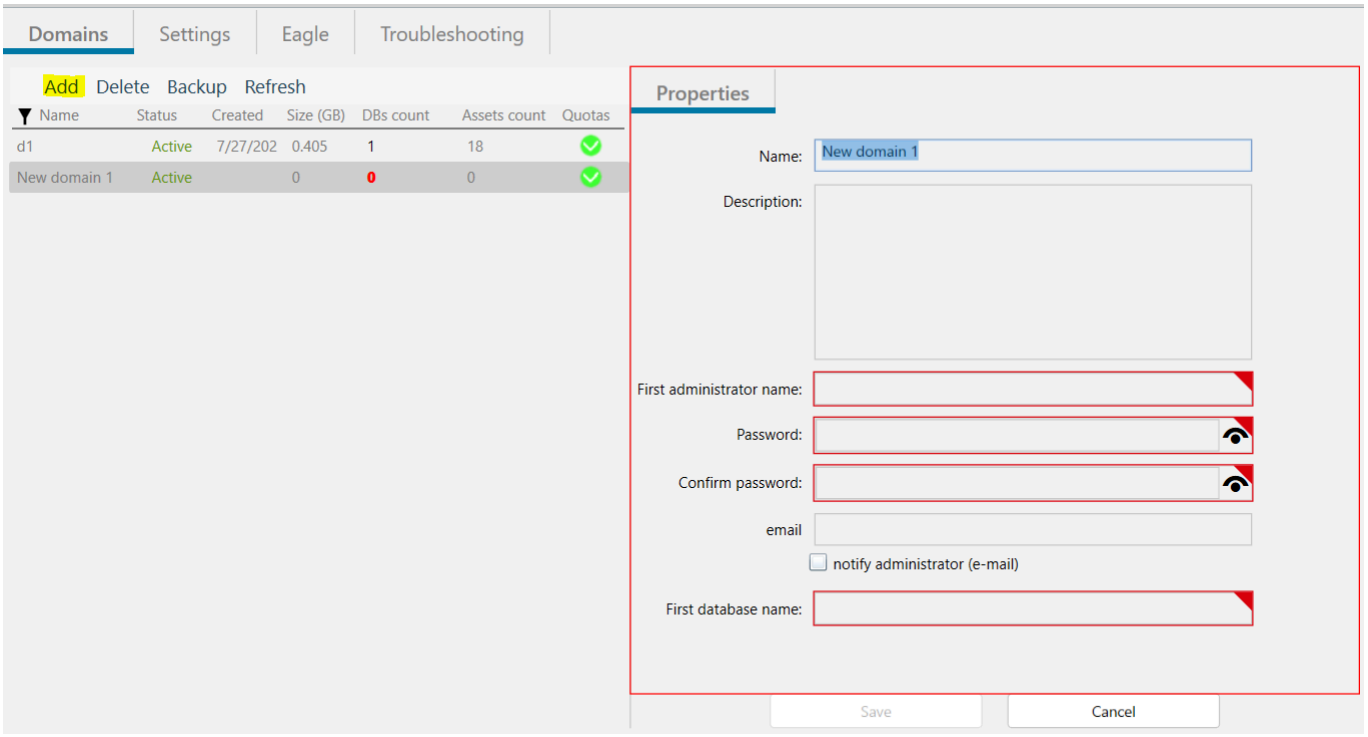
11.1.4 *PAM / Domains List*

Description:

Name	**Name of the domain**
Status	Show global domain status: ● **Active** (default status ; domain is fully operational) ● **Soon Expired** (when the license expired in less than 30 days) ● **Limited** (when license has expired or activation date has expired or no license) ; ie: “limited” means “demo mode” ● **Blocked** (Only for Advisor mode)
Created	● Creation date of the domain
Size (GB)	● Sum of the sizes of all the databases (short term databases included)
DBs count	● Number of attached databases
Asset count	● Number of machines for all the attached databases
Quotas	Show license quotas (restrictions) status: ● **Ok** - Displayed in Green (no quota warning) ● **Soon reached** - Displayed in Orange (at least one quotas is reached soon) ● **Reached** - Displayed in Red (At least one quota is reached)

11.1.5 *PAM / Domains Properties*

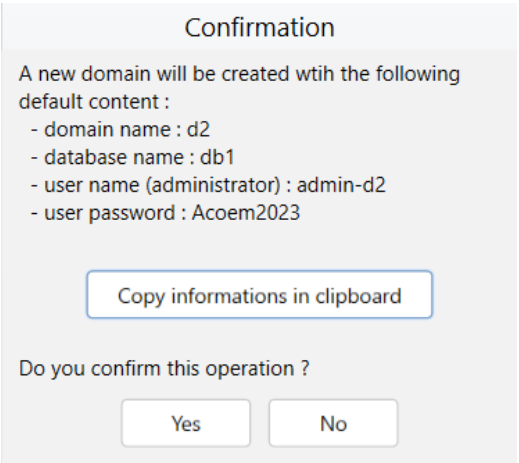
When you add a new domain, the following formula must be completed:



Description:

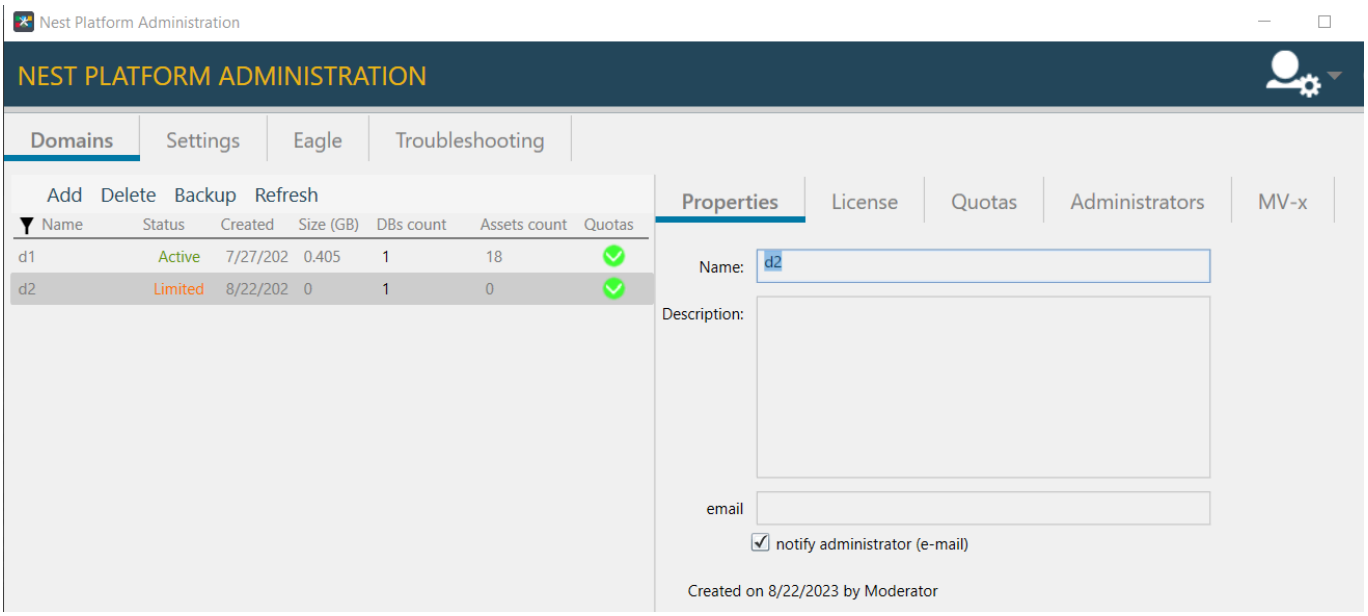
Name	**Name of the domain**
Description	Description on the domain
First administrator name	Domain administrator username – IMPORTANT:
Password	Domain administrator password
Confirm password	Domain administrator password confirmation
Email	Domain administrator email
Notify administrator (email)	Send an email to domain administrator when domain is created
First database name	First database name automatically created into the domain

When you click on SAVE button, a confirmation message is displayed with all credential information needed to connect to this new domain:



- Click on “Copy in clipboard” to paste these information somewhere for backup – ex: Keepass, …
- Click on “Yes” to confirm domain creation

New domain is presented into the list with “Limited” status because license has not been yet entered:



Open NESTi4 to connect to this new domain





11.2 SMTP SERVER SETTINGS

Nesti4 server administrator must enter manually the following MailSettings text into **UserSettings.json** file; default folder is C:\Program Files\ACOEM\Nest i4.0 Self Hosted Web Server\Web Server

```
"MailSettings": {
"Server": "<smtp-server-name-or-ip>",
"Port": 587,
"UseTls": true,
"Login": "<smtp-server-login>",
"Password": "<smtp-server-password>",
"SenderEmail": "noreply@ai.acoem.com",
"SenderName": "Acoem Nesti4"
},
```

Settings description:

"Server"	SMTP server name or IP address
"Port"	TCP port
"UseTls"	{ true, false} according TSL encryption option
"Login"	SMTP server login
"Password"	SMTP server password
"SenderEmail"	Sender email – ex: noreply@<my-company>.com
"SenderName"	Sender name – ex: "Acoem Nesti4"

This new MailSettings text must be added into of file as the following; take care to use the correct syntax:

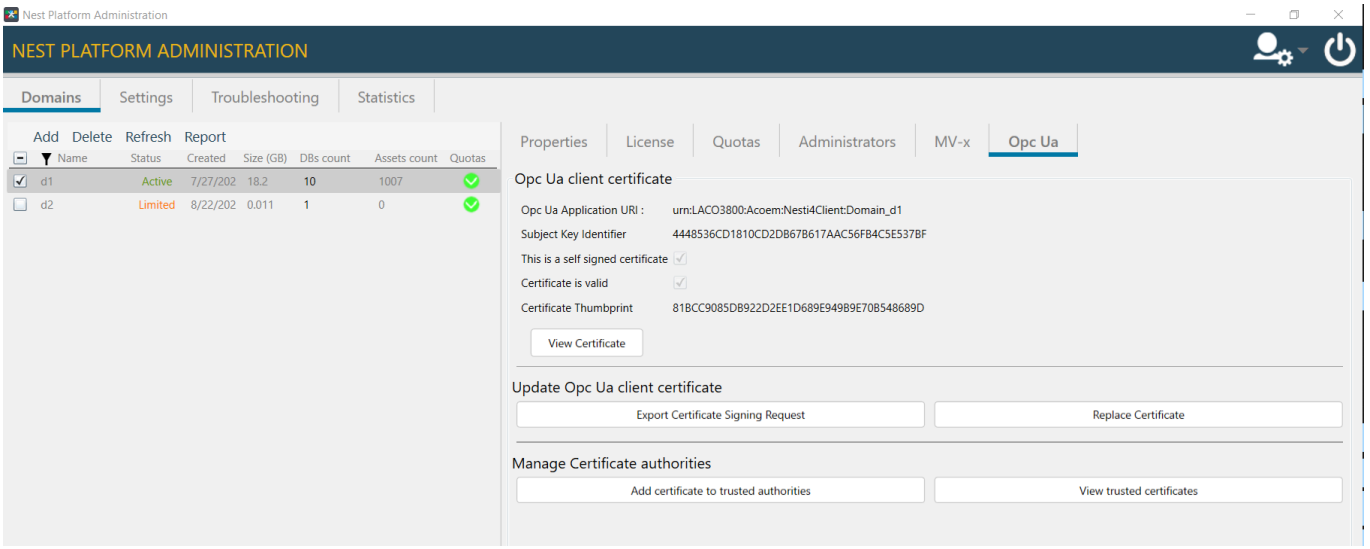


IMPORTANT: When json file has been saved, Nesti4 server service must be restarted.

11.3 SSL Certificates for OPC UA Client interface

These certificates are required to secure communication between NESTi4 OPC UA Client and external OPC UA server. Certificate must identify both parts in order to secure/encrypt communication.

For this reason, PAM \ OPC UA tab must be used to manage these certificates:



OPC UA Client certificate identifies the current used certificate to identify NESTi4 OPC UA client. This certificate is automatically generated during the software installation and it can be replaced by another one coming from a private or public certificate authority.

Update OPC UA Client certificate:

- **Export Certificate Signing Request** generates CSR file – ex: Nesti4_OpcUaClient_Certificate_d1.pem - containing information (e.g. common name, organization, country) the Certificate Authority (CA) will use to create your own certificate. It also contains the public key that will be included in your certificate and is signed with the corresponding private key.

- **Replace Certificate** imports a new certificate coming from another Certificate Authority (CA) and replaces the in-place one to identify NESTi4 OPC UA Client. This new certificate will have to be approved by all connected external OPC UA server in order to accept NESTi4 client to connect and read OPC tags values.

Manage Certificate authorities :

- **Add certificate to trusted authorities** import an external certificate to identify and authorize communication with a specific OPC UA server.
- **View trusted certificates** open the list of all trusted certificate (read only)

CHAPTER 12. Application Programming Interface (API)

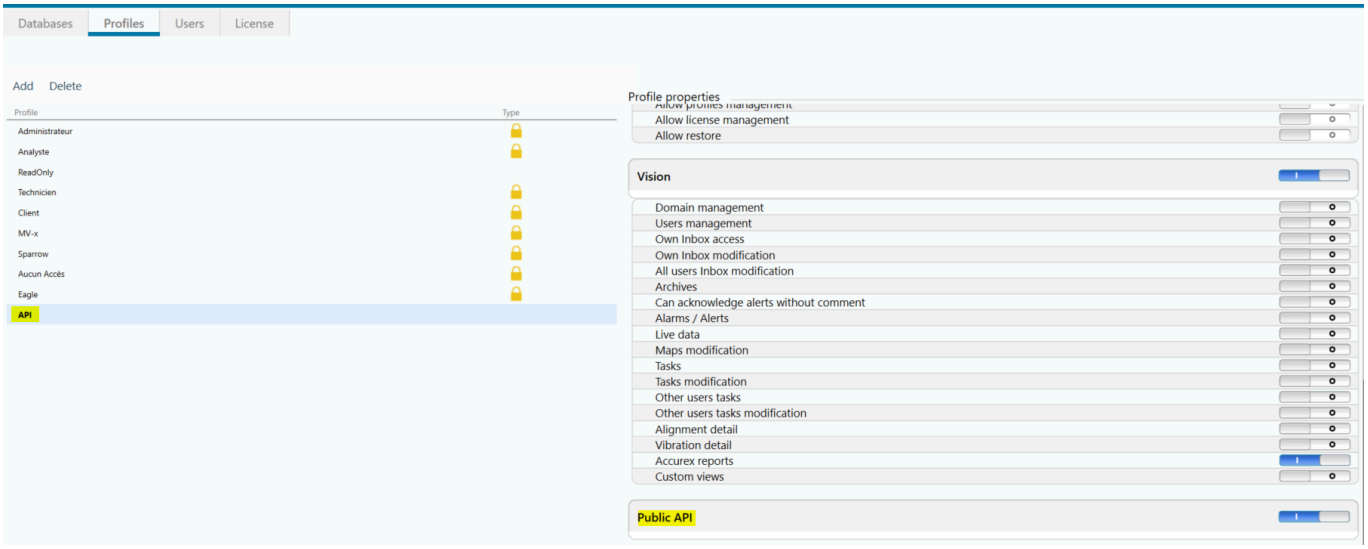
12.1 Overview

The NESTi4 Public API share machines health information (last expert advice, diagnostic and recommandation) with any external applications and can generate on-demand expert reports in Word or PDF format.

This RESTful API is intended for system integrators, partners, or clients requiring automated access to NESTi4's expert analysis features.

12.2 Authentication & security

All API endpoints require Bearer Token Authentication based on a NESTi4 user account with API privilege.



To access the API:

Obtain a client ID and secret via the NESTi4 admin module

Create an API profile with public API privilege

Create an user account with API profile and potential database access limitation

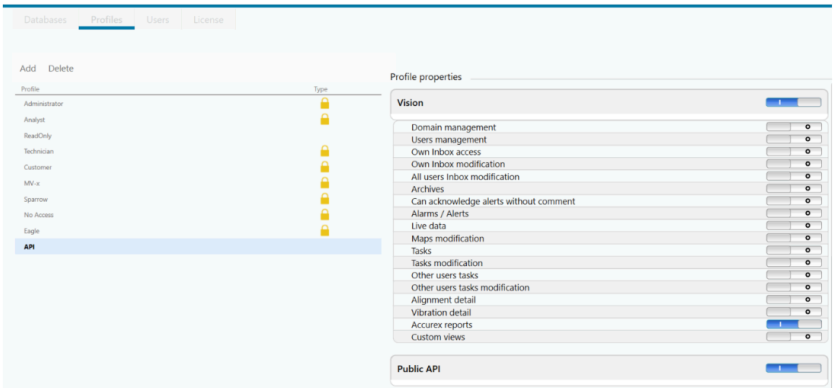
Authenticate via the /auth/token endpoint to retrieve a token.

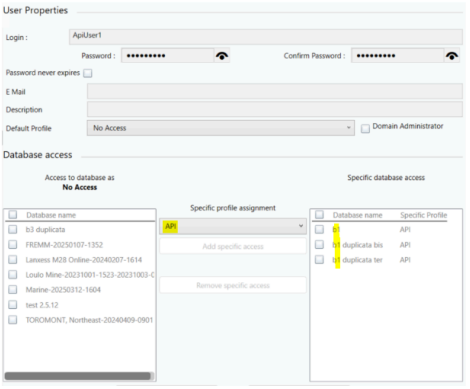
Include the token in all API requests

Secured access :

API calls are authenticated with a NESTi4 user account

Data access restriction is based on user account privileges
Only authorized database are visible
Accurex advice are visible only for user with “Accurex report” privileges



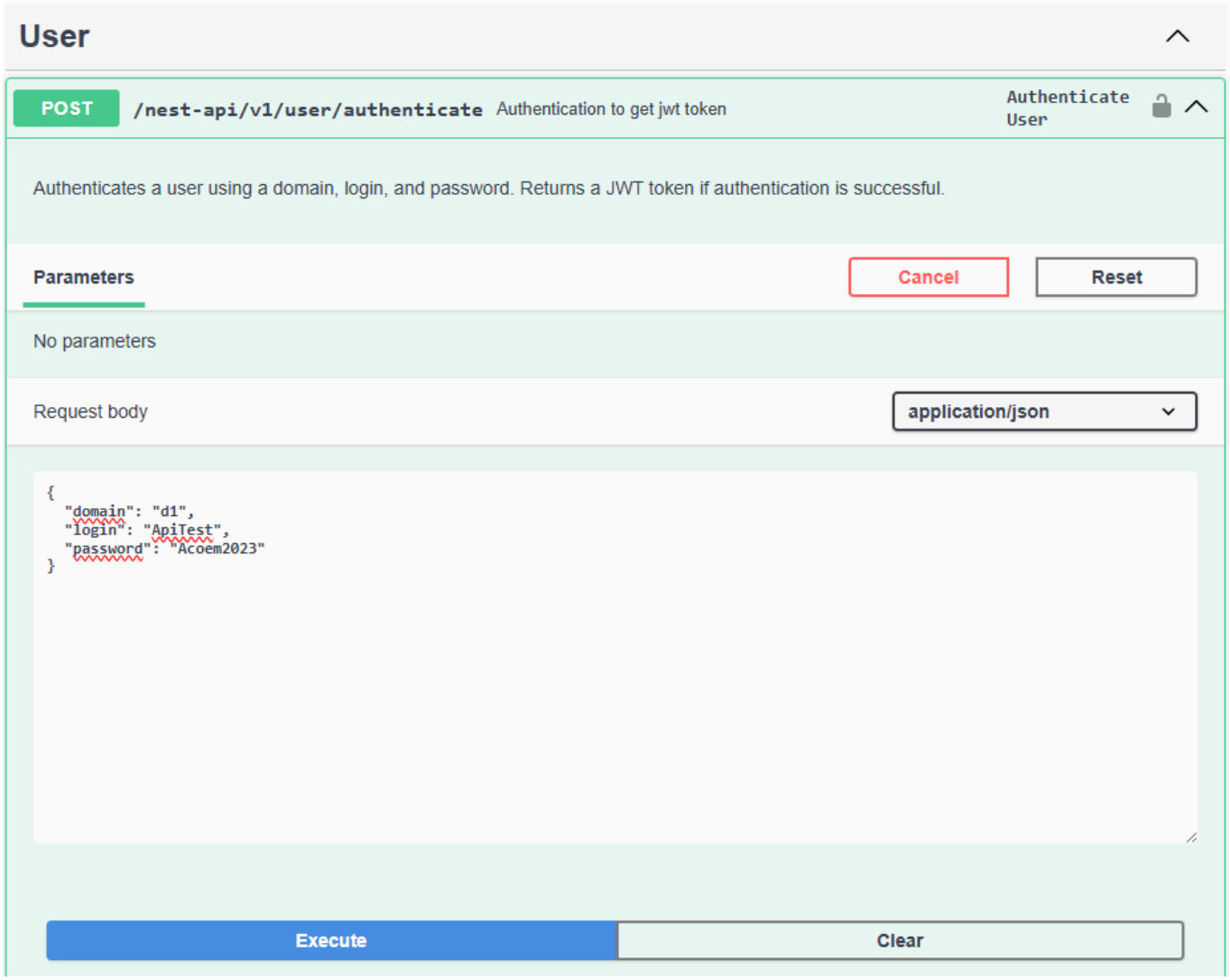


12.3 Base URL

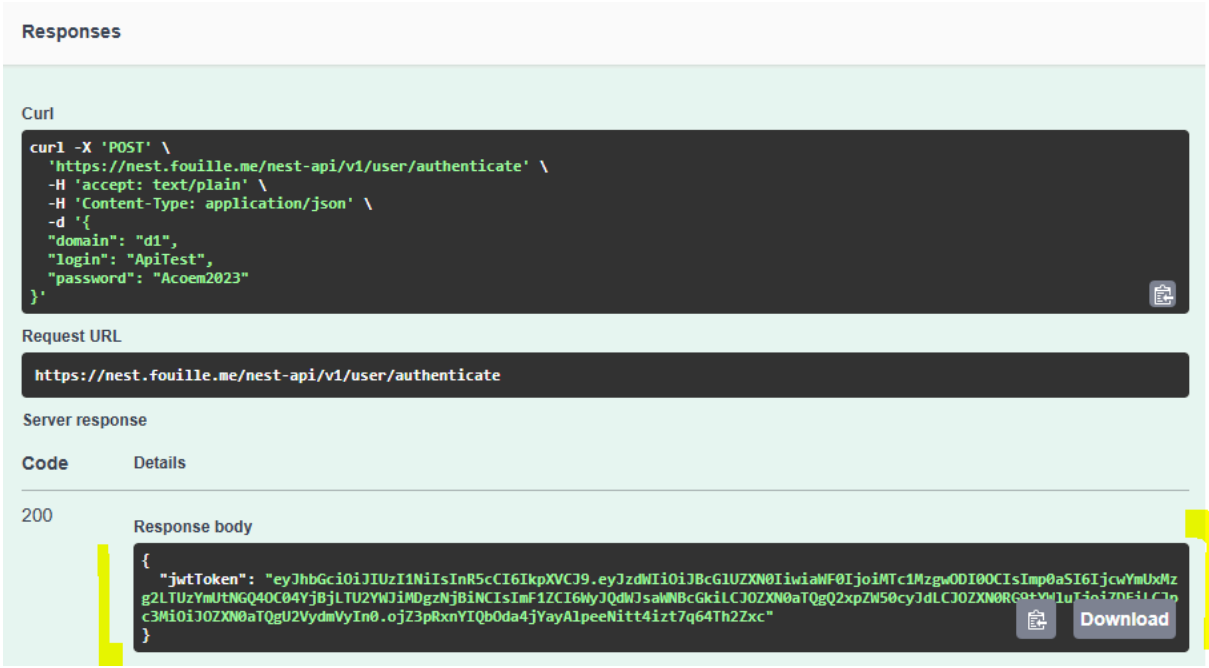
https://<server-name>/nest-api

12.4 Authentication

Each API function call requires an authentication **token** corresponding to a NEST user account. This token is obtained using the **user/authenticate** function, in which the user account credentials must be entered—for example:

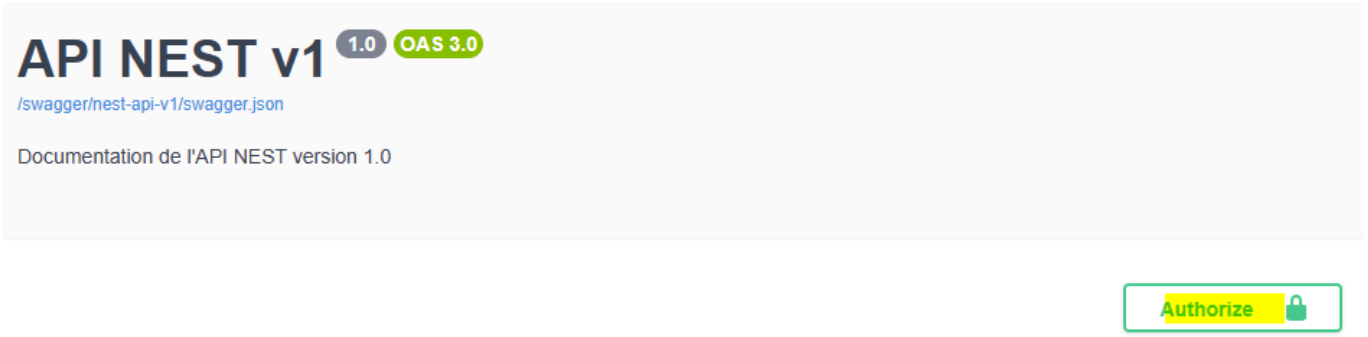


Function result returns a **jwt token string** – see example below:

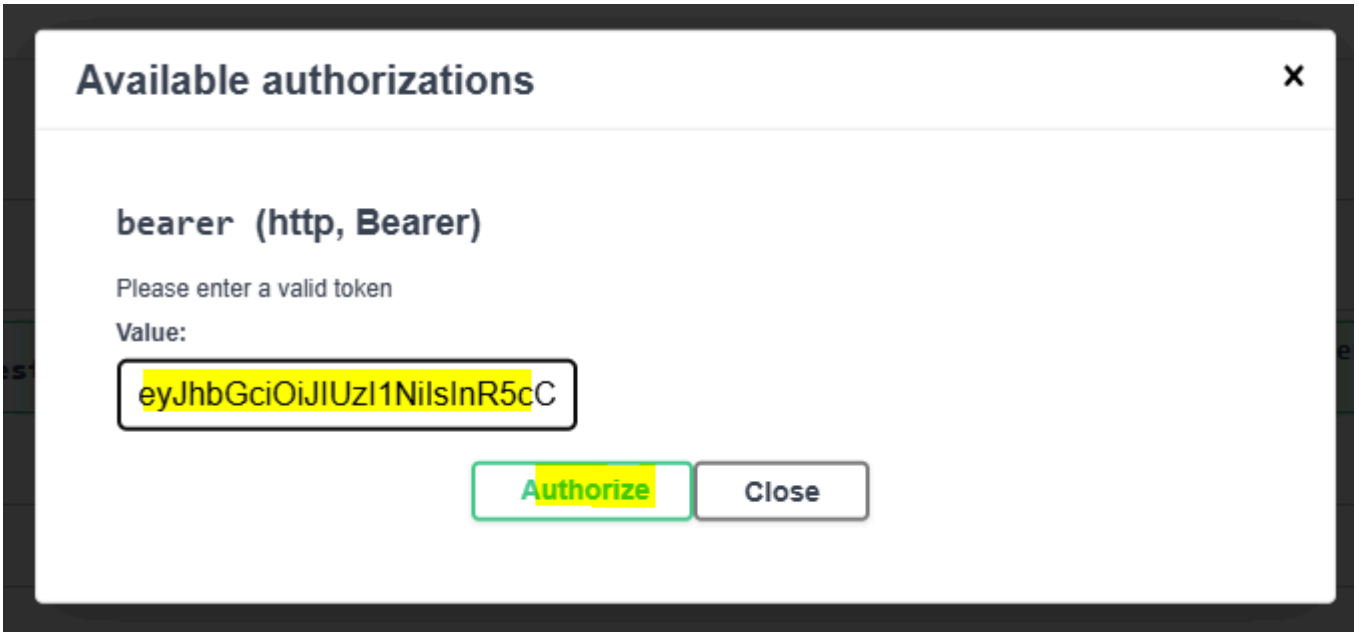


This token is a bearer authentication token to authorize access to API functions and apply data access limitation (database segmentation).

With swagger, click on “Authorize” button …

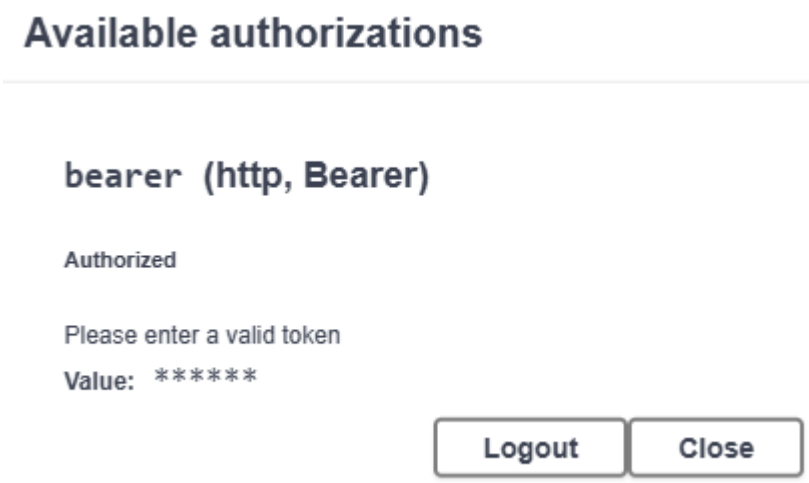


… and copy/paste the token string as bearer value…



… and click on “Authorize” to apply corresponding credentials to all API functions.

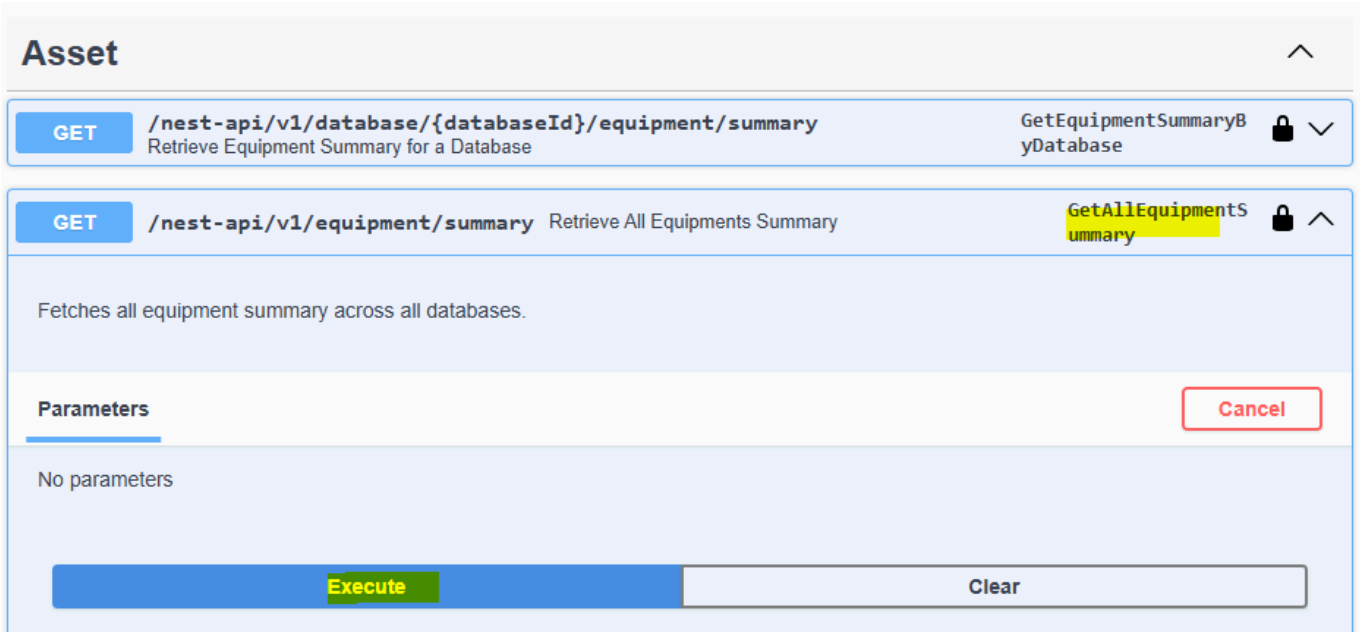
At this moment, all API function can be used with the connected user account privileges and access rigths.



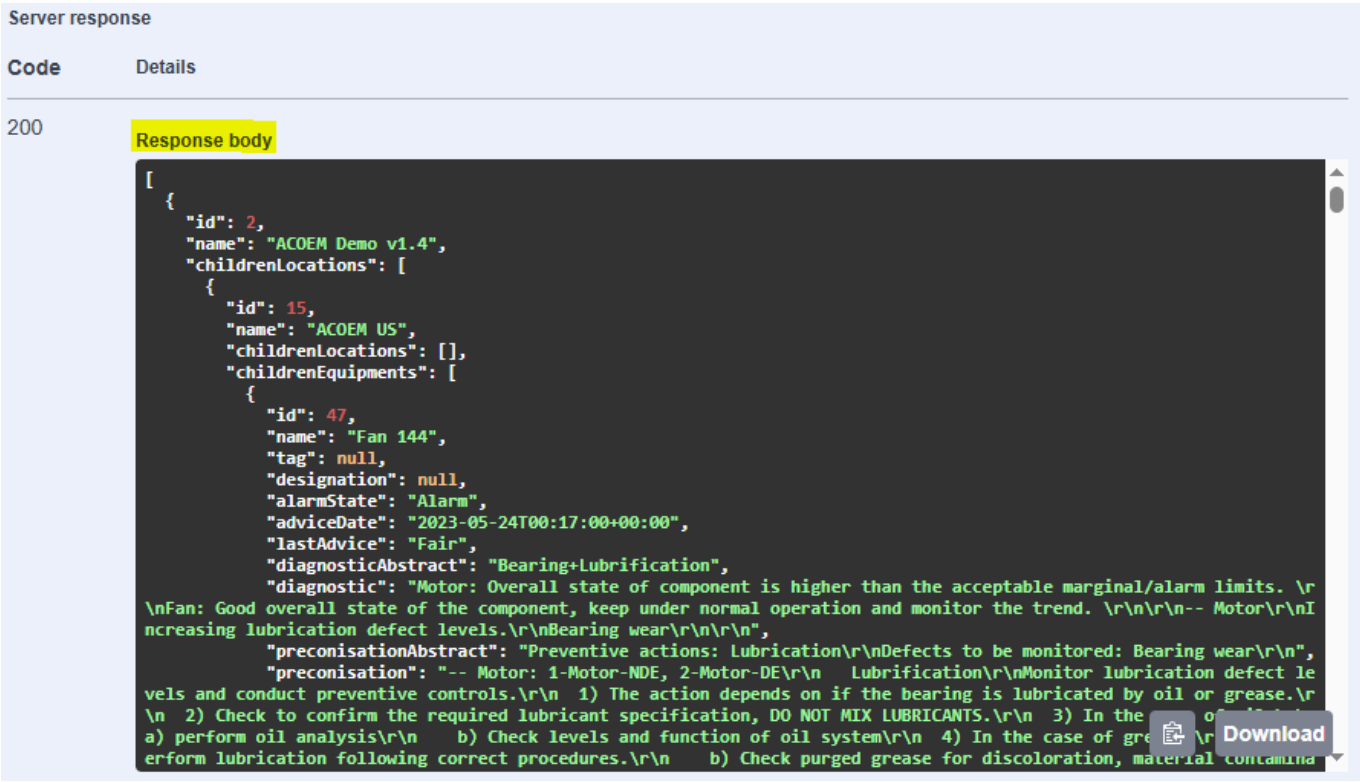
12.5 API FUNCTIONS (AVAILABLE ENDPOINTS)

When jwt token has been entered to authorize access to API, then all API function can be executed.

Example with “GetAllEquipmentSummary()” function:



This function return list of all equipments of all databases where user account has access – example of results:



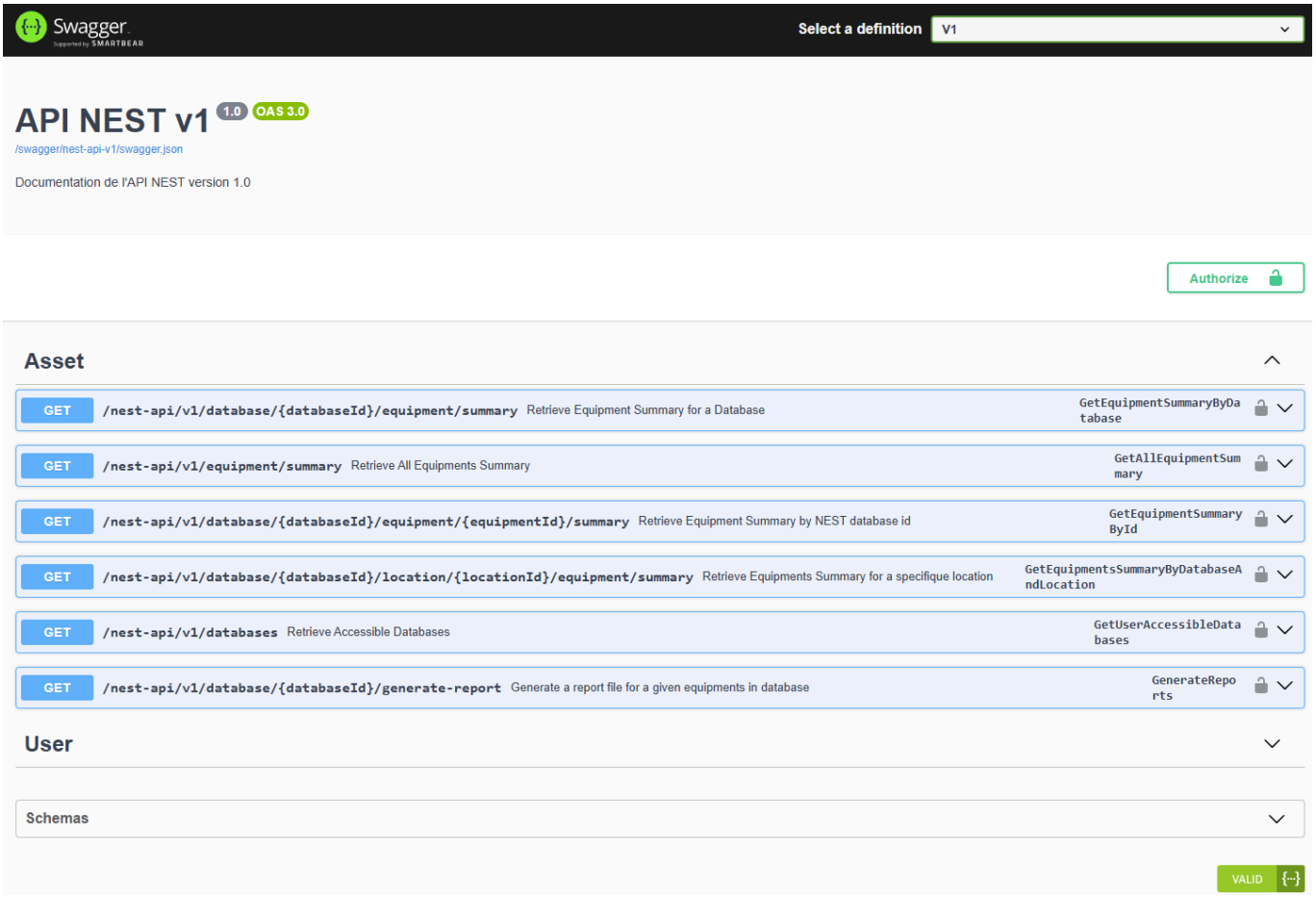

```
[
  {
    "id": 2,
    "name": "ACOEM Demo v1.4",
    "childrenLocations": [
      {
        "id": 15,
        "name": "ACOEM US",
        "childrenLocations": [],
        "childrenEquipments": [
          {
            "id": 47,
            "name": "Fan 144",
            "tag": null,
            "designation": null,
            "alarmState": "Alarm",
            "adviceDate": "2023-05-24T00:17:00+00:00",
            "lastAdvice": "Fair",
            "diagnosticAbstract": "Bearing+Lubrification",
            "diagnostic": "Motor: Overall state of component is higher than the acceptable marginal/alarm limits. \r
\nFan: Good overall state of the component, keep under normal operation and monitor the trend. \r\n\r\n-- Motor\r\nI
ncreasing lubrication defect levels.\r\nBearing wear\r\n\r\n",
            "preconisationAbstract": "Preventive actions: Lubrication\r\nDefects to be monitored: Bearing wear\r\n",
            "preconisation": "-- Motor: 1-Motor-NDE, 2-Motor-DE\r\n   Lubrification\r\nMonitor lubrication defect le
vels and conduct preventive controls.\r\n  1) The action depends on if the bearing is lubricated by oil or grease.\r
\n  2) Check to confirm the required lubricant specification, DO NOT MIX LUBRICANTS.\r\n  3) In the
a) perform oil analysis\r\n    b) Check levels and function of oil system\r\n  4) In the case of gre
erform lubrication following correct procedures.\r\n    b) Check purged grease for discoloration, material
```


Details of expected result is described for each function – example:

Example Value | Schema


```
[
  {
    "id": 0,
    "name": "string",
    "childrenLocations": [
      "string"
    ],
    "childrenEquipments": [
      {
        "id": 0,
        "name": "string",
        "tag": "string",
        "designation": "string",
        "alarmState": "None",
        "adviceDate": "2025-07-29T17:12:37.167Z",
        "lastAdvice": "NoAdvice",
        "diagnosticAbstract": "string",
        "diagnostic": "string",
        "preconisationAbstract": "string",
        "preconisation": "string"
      }
    ]
  }
]
```


Detailed specifications of all API function are available into Swagger documentation:
https://<server-name>/nest-api/swagger


Swagger
Supported by SMARTBEAR
Select a definition
V1
API NEST v1
1.0
OAS 3.0
/swagger/nest-api-v1/swagger.json
Documentation de l'API NEST version 1.0
Authorize
Asset
GET /nest-api/v1/database/{databaseId}/equipment/summary Retrieve Equipment Summary for a Database
GetEquipmentSummaryByDatabase
GET /nest-api/v1/equipment/summary Retrieve All Equipments Summary
GetAllEquipmentSummary
GET /nest-api/v1/database/{databaseId}/equipment/{equipmentId}/summary Retrieve Equipment Summary by NEST database id
GetEquipmentSummaryById
GET /nest-api/v1/database/{databaseId}/location/{locationId}/equipment/summary Retrieve Equipments Summary for a specifique location
GetEquipmentsSummaryByDatabaseAndLocation
GET /nest-api/v1/databases Retrieve Accessible Databases
GetUserAccessibleDatabases
GET /nest-api/v1/database/{databaseId}/generate-report Generate a report file for a given equipments in database
GenerateReports
User
Schemas
VALID

acoem.com

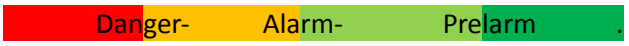
CHAPTER 13. How to …

13.1 Understand Alarm settings

13.1.1 *Absolute alarms*

Alarm type: define the type of alarm to be applied on the parameter.

- None
- High: 

- Low: 

- Outside: 

- Inside: 

Note:

- Alarm status of HMx and SFx parameters are ignored for the machine alarm state computation
- pre-Alarm level is not considered by instruments and is only applied when measurements are received in NESTi4.0.
- MVX can have one set of alarm thresholds per operating condition.
- MVX manages an alarm hysteresis: an on-line monitoring system can generate numerous changes of state when the measured level is close to an alarm threshold. To avoid these repeated changes, it is possible to define a hysteresis threshold stabilizing the alarm state. For example, with a hysteresis of 10% and a danger threshold of 8 g, the transition from the alarm state to the danger state occurs when the level reaches 8 g. If the level drops again, since the hysteresis is 10%, the status will revert to "Alarm" at 7.2mm / s (8 - 8x10%).

Note: the hysteresis is used exclusively by MV-x, the alarm state displayed in NESTi4.0 does not take this parameter into account.

13.1.2 *Relative alarms*

This feature is not available for machine with Accurex setup mode.

Alarms to assess the evolution of the parameter value with each new measurement. This type of alarm can only induce OK or alarm states. This state is only calculated on the most recent measurement date.

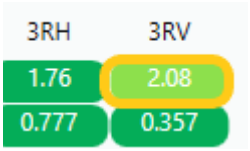
- **Evolution T-1**: monitors the evolution of the parameter compared to its previous measurement. It goes into alarm if the difference between the most recent value and the previous value (at time t-1) is greater than the fixed limit expressed in %
- **Baseline**: monitors the evolution of the parameter compared to the baseline value. It goes into alarm if the most recent value of the parameter is greater than its baseline value multiplied by the defined coefficient.

Notes:

- The baseline date can be modified in the measurement date list of the Analyst module.
- Relative alarms are not used by the instrument and only applied when measurements are received in NESTi4.0.

Display of relative alarms:

- **In the Health matrix** : the cell is surrounded by an orange border:



The parameter tooltip specifies whether the change is compared to the previous date (T-1) and or the baseline date (BL)

- **In the Analysis report** : the cell in the “Previous” column and or “Baseline” column is in orange :

			Value			Alarm threshold		
Point / Param	Status	Unit	Current 9/20/2017 5:51 PM	Previous 7/17/2017 2:38 PM	Baseline 6/27/2017 11:26 AM	pAl	Al	Dg
	1-MT-Ax							
OV Vel	Ok	mm/s	1.63	1.77	1.71	2.3	4.5	7.1
OV Accel	Ok	g	0.139	0.143	0.129	2	3	6
Bearing defect	Ok	def	2.3	2.36	2.23	4.5	6	9
1X Vel	Ok	mm/s	0.297	0.229	0.053	2	4	6.4
2X Vel	Ok	mm/s	0.058	0.089	0.085	0.9	1.8	2.8
3X Vel	Ok	mm/s	0.246	0.12	0.246	0.7	1.35	2.15
LF RMS Accel	Ok	g	0.065	0.061	0.066	0.2	0.4	0.8

13.1.3 *Point and machine alarm rules*

The state of the parameter is the most aggravating state of the absolute alarm and the relative alarm. This state then rises up to the point, machine and location levels.

13.2 MVX MONITORING FINE TUNING

See document « DOC3021 MVX User Manual (EN) »

13.3 NESTi4 OPC UA SERVER ACTIVATION

See document « DOC3170 - Nesti4.0 OPC UA Server Reference Guide (EN) »

13.4 SSL ACTIVATION

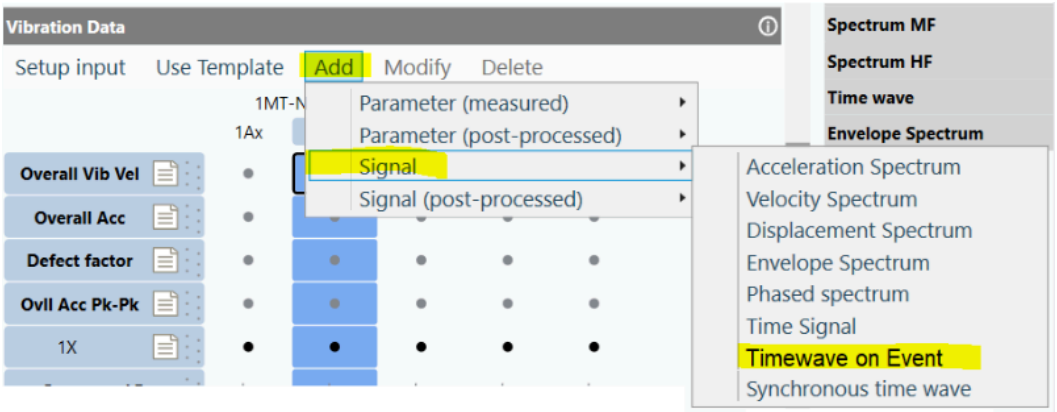
See document « DOC3151 - Nesti4.0 SSL & LDAP Configuration Guide (EN) »

13.5 LDAP ACTIVATION

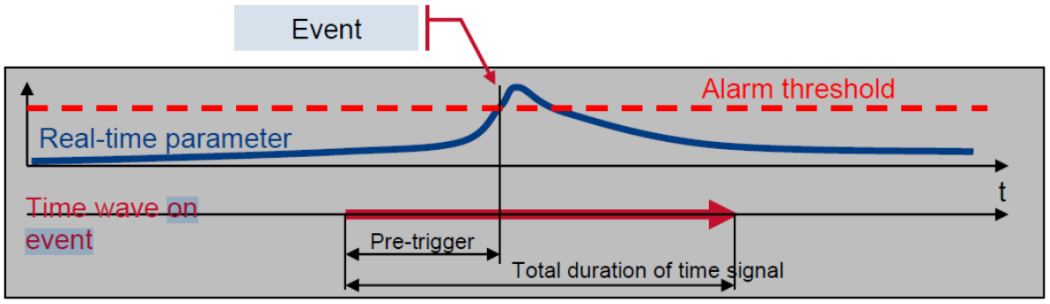
See document « DOC3151 - Nesti4.0 SSL & LDAP Configuration Guide (EN) »

13.6 USE TIMEWAVE ON EVENT

Timewave on event is possible only for “MVX machine”. This measurement can be added into a measurement point or a Process Group AC with or without existing real time parameter for the machine:

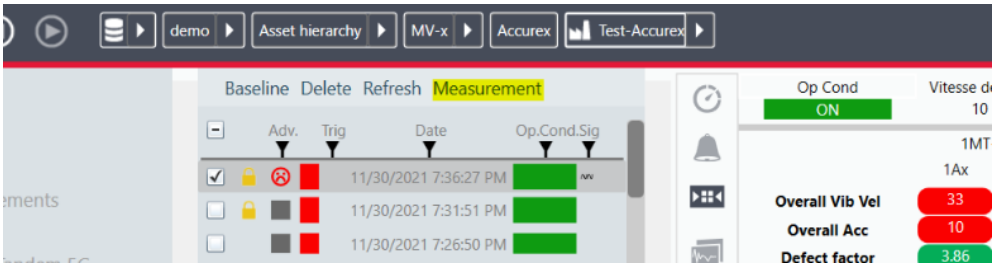


This time wave is recorded on specific event with a pre-trigger buffer. This buffer captures a part of the signal before the triggering event:



Triggering event can be one of the following:

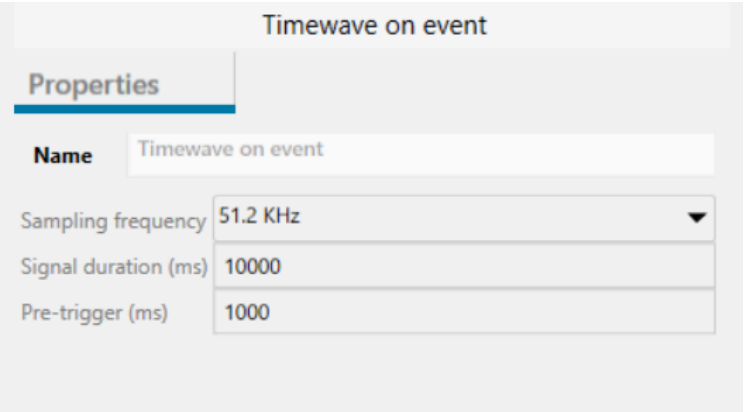
- An aggravating alarm status change on a real-time parameter if “Alarm storage” is not “None” into the strategy tab
- An operating condition change if “Standard storage” is not “None” into the strategy tab. In this case, it is not mandatory to use real time parameter.
- A manual measurement request from the machine measurements list. In this case, it is not mandatory to use real time parameter:



IMPORTANT:

- Only aggravating alarm status change on a real-time parameter trig a timewave on event
- A periodic measurement does not trig a timewave on event

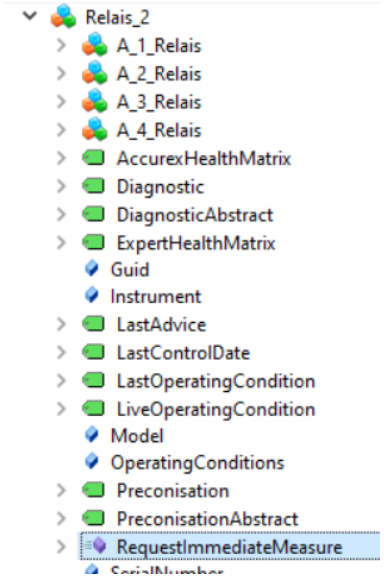
Timewave on event properties:

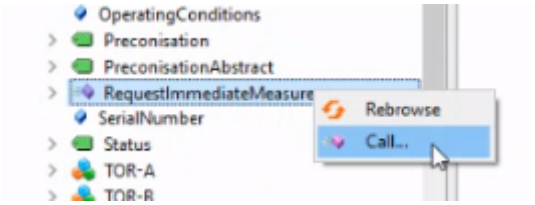


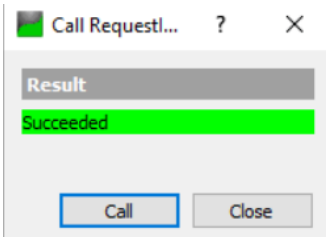
- “Sample frequency”
  - Sampling frequency of the timewave
  - Fixed to 51.2kHz (maximum of MVX capabilities) for the moment
- “Signal duration (ms)”
  - Total duration of the signal including the pre-trigger (ms) - 960s maxi.”
- “Pre-trigger (ms)”
  - Pre-trigger duration (ms) - 460s maxi.

Consultation (analyst):

- Timewave on event is presented as a normal timewave into the machine health matrix - ie: user can add post processing based on timewave on event, use vibgraph … in the same way as with a standard timewave
- When user asks an immediate measurement from the measurement list, then “timewave on event” are implicitely included into the request
- When external application asks an immediate measurement from OPC UA interface then “timewave on event” are implicitely included into the request – example with uaExpert :







-

Rules & limitations:

- Different timewave on event can be created for 1 or more measurement points on the same machine without any limitation
- Timewave on event signal is sampled at 51.2 kHz by MVX (a fixed frequency).
- The measurement length and the pre-trigger buffer length are configured into the measurement properties panel (setup module) and defined in milliseconds
- The maximum length will depend on the number of channels with a time signal and the memory of the device (hardware model). Device will display an error message if configuration cannot be started because of a not sufficient memory.
- If MVX can not produce the expected measurement, (for any reason), then MVX refuses to start acquisition and Nesti4 presents a specific message with the corresponding explanation
- No limitation of quantity of Timewave on Event per machine or point
- “Timewave on event” is presented as a normal timewave - ie: user can add post processing based on timewave on event
- Migration from XPR:
    - “Timewave on event” signal + pre-trigger durations properties are automatically converted from seconds to milliseconds
    - “Timewave on event” can be imported from XPR and signal + pre-trigger durations are automatically imported into each individual imported measurement settings

13.7 Use Piping Monitoring features

13.7.1 *Principe*

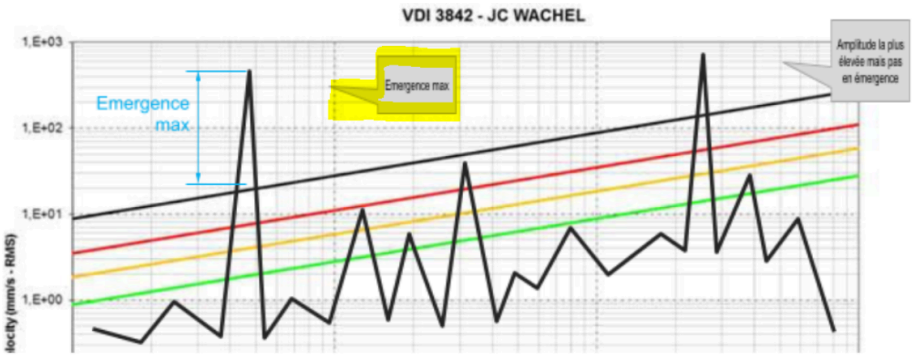
Integrated piping monitoring feature is a very attractive feature to know continuously the state of health of installation pipes and be able to

- ensure the safety of your installations
- adapt production rates on platforms that are sometimes aging or in “off-design” operation and boost production capacity without risk

Our solution relies on standards widely used worldwide in the industry and propose to choose one of the following methods:

- VDI 3842 (Wachel)
- EI 2018 (Energy Institute)

Both methods are based on a velocity spectrum measurement where a peak extraction is calculated in order to find the most emerging peak (amplitude and frequency) comparing to a set of predefined threshold curves:



This peak identifies the current state of health of the pipe and provide the following indicators:

- **Piping criteria** - ie: DANGER, CORRECTION, ...
- Amplitude
- Frequency

These piping indicators are integrated into MVX and can be used as any other MVX hard measurement – ie: overalls, hard peak, … - including trig a new measurement if abnormal criteria is detected.

IMPORTANT: Piping criteria parameter does not have any alarm status so it cannot generate any alarm at the machine level.

Corresponding data (criteria, amplitude and frequency) are available in all existing outputs of NESTi4 and/or MVX:

- MVX Modbus TCP output
- NESTi4 database
- NESTi4 machine health matrix
- NESTi4 reports
- NESTi4 export files
- NESTi4 OPC UA server outputs
- NESTi4 vibgraph trends

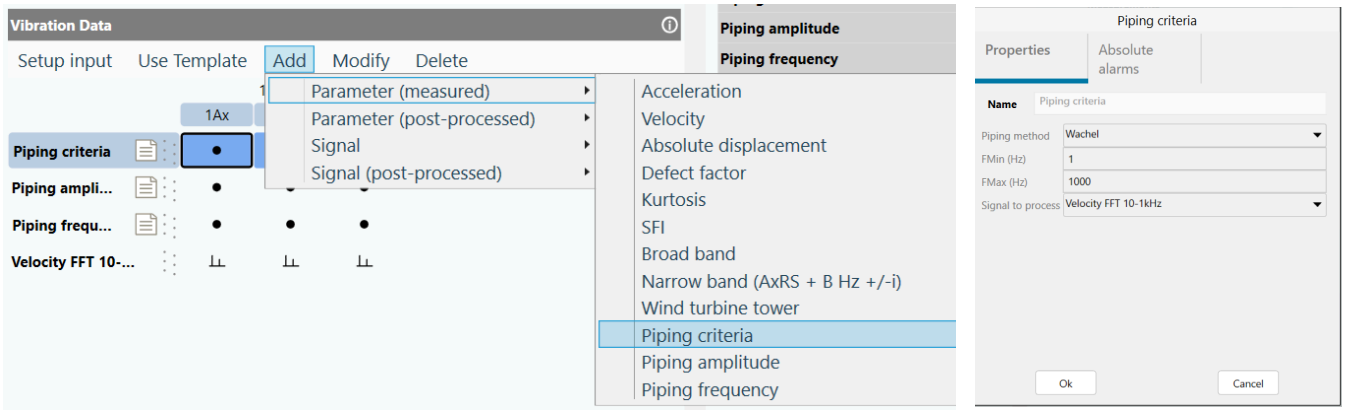
NOTE: Piping indicators have been integrated into vibgraph in order to be used for machine monitored with FALCON or EAGLE – see dedicated vibgraph user's guide for piping monitoring. In this case, piping indicators are only available into the vibgraph display.

13.7.2 *Piping Methods comparison*

	WACHEL (VDI 3842)	**EI 2018 (Energy Institue)**
Method	• Accelerometer • Velocity spectrum • RMS Amplitude, mm/s • Band: 1-1000Hz	• Accelerometer • Velocity spectrum • RMS Amplitude, mm/s • Band: 1-300 Hz
Criterias & Colors	• DESIGN • MARGINAL • CORRECTION • DANGER	• ACCEPTABLE • CONCERN • PROBLEM

13.7.3 *Piping indicators settings*

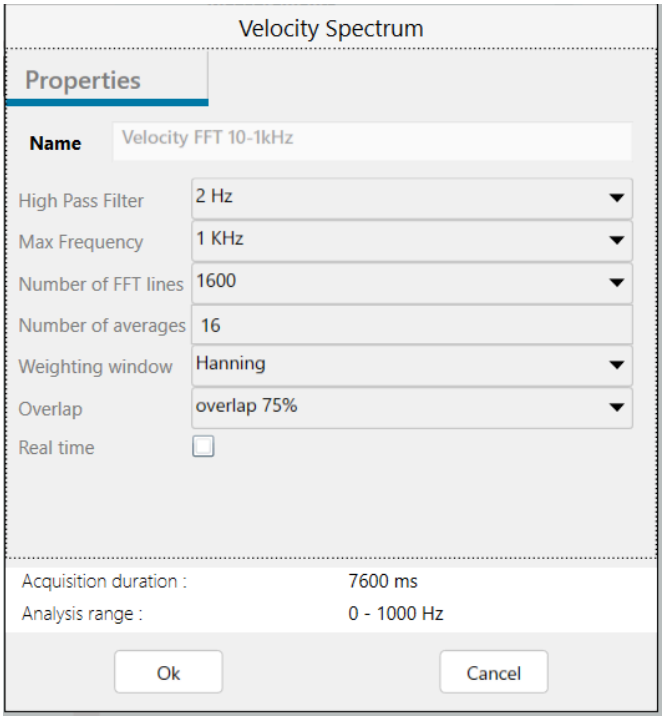
Edit a MVX machine setup configuration and add new measurement into the vibration data table:



Select one or more “piping” measurements – ie: criteria, amplitude or frequency - and defines the corresponding settings. All piping measurement have the same list of properties:

Measurement	Properties	Description
Piping Criteria or Amplitude or Frequency	Piping method	Wachel or Energy Institute
	FMin (Hz)	Predefined analysis bandwidth for piping criteria detection according to the selected method – ie: 1-300Hz for EI a, 1-1000Hz for Wachel. Note: These values can be changed manually
	FMax (Hz)	
	Signal to process	Select a velocity spectrum to be processed NOTE: Any spectrum can be selected as signal to process in order to offer you maximum of flexibility.

See below recommended velocity spectrum configuration for piping monitoring:

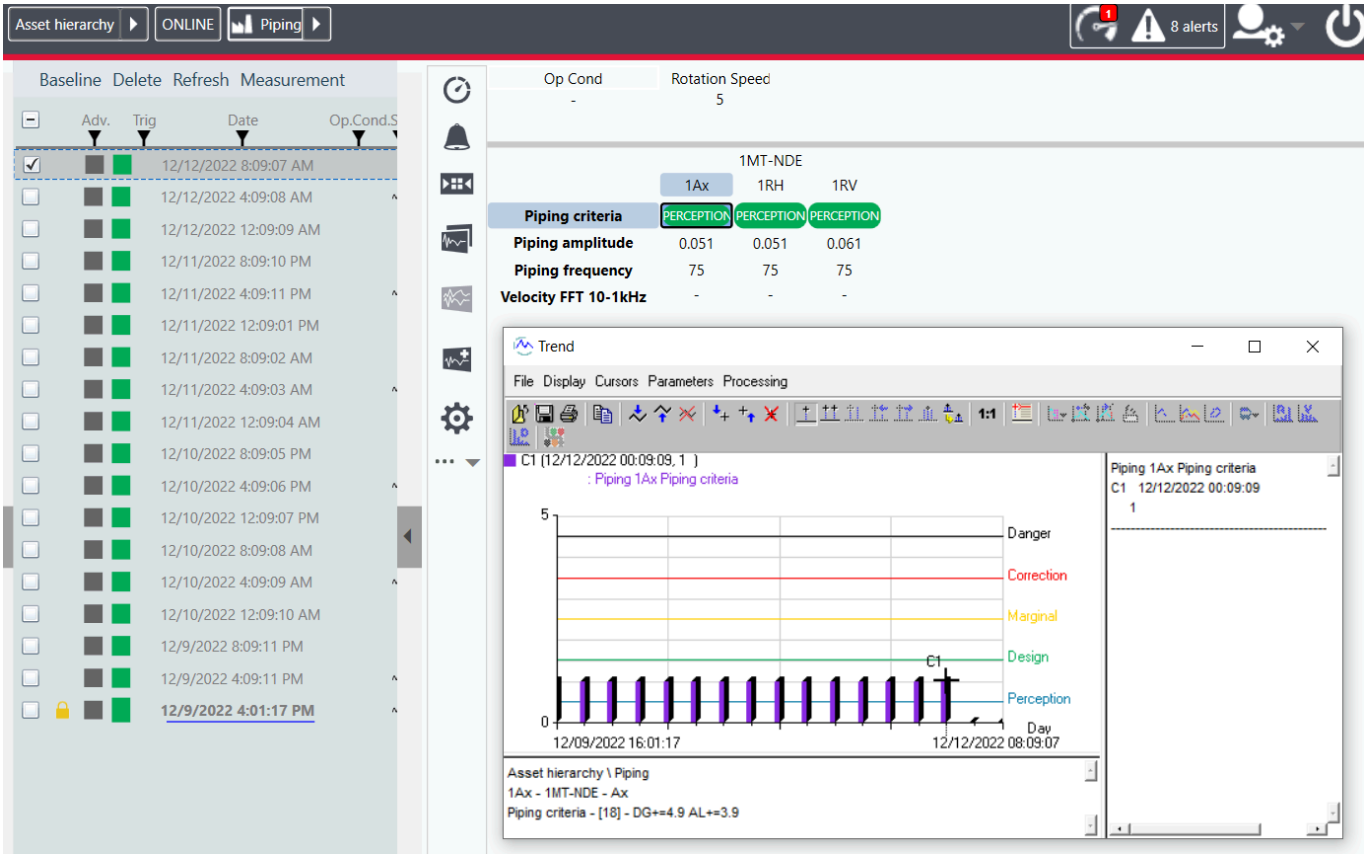


Because these piping measurements are standard hard measurements of MVX, they must be connected to a physical MVX channel. When connected, acquisition can be started from Instrument module.

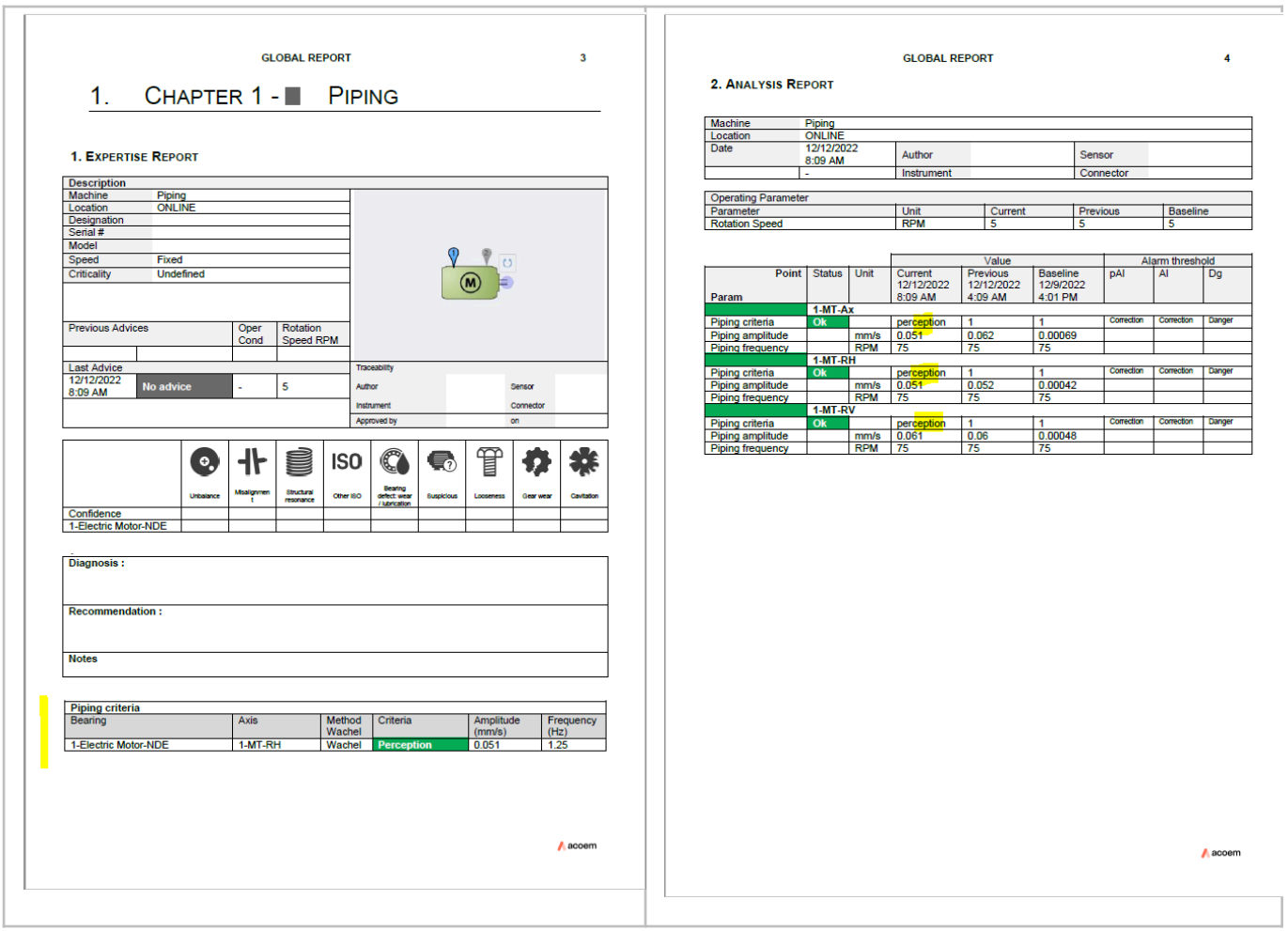
When measurement is done, the the following result are presented into the machine health matrix:

- Piping criteria: Criteria label of the most emerging peak – depending of the piping method
- Piping amplitude: Amplitude of the most emerging peak in mm/s
- Piping frequency: Frequency of the most emerging peak in Hz

Piping parameters trend can be edited with vibgraph – see below an example of wachel piping criteria evolution



Piping parameters trend are fully integrated into expertise and analysis reports:



GLOBAL REPORT 3

1. CHAPTER 1 - ■ PIPING

1. EXPERTISE REPORT

Description	
Machine	Piping
Location	ONLINE
Designation	
Serial #	
Model	
Speed	Fixed
Criticality	Undefined

Previous Advices	Oper Cond	Rotation Speed RPM

Last Advice			
12/12/2022 8:09 AM	No advice	-	5

Traceability

Author | Sensor

Instrument | Connector

Approved by | on

	Unbalance	Misalignment	Structural resonance	Other ISO	Bearing defect, wear / lubrication	Suspicious	Looseness	Gear wear	Cavitation
Confidence									
1-Electric Motor-NDE									

Diagnosis :

Recommendation :

Notes

Piping criteria					
Bearing	Axis	Method Wachel	Criteria	Amplitude (mm/s)	Frequency (Hz)
1-Electric Motor-NDE	1-MT-RH	Wachel	Perception	0.051	1.25

acoem

GLOBAL REPORT 4

2. ANALYSIS REPORT

Machine	Piping			
Location	ONLINE			
Date	12/12/2022 8:09 AM	Author		Sensor
	-	Instrument		Connector

Operating Parameter				
Parameter	Unit	Current	Previous	Baseline
Rotation Speed	RPM	5	5	5

			Value			Alarm threshold		
Point / Param	Status	Unit	Current 12/12/2022 8:09 AM	Previous 12/12/2022 4:09 AM	Baseline 12/9/2022 4:01 PM	pAl	Al	Dg
	1-MT-Ax							
Piping criteria	Ok		perception	1	1	Correction	Correction	Danger
Piping amplitude		mm/s	0.051	0.062	0.00069			
Piping frequency		RPM	75	75	75			
	1-MT-RH							
Piping criteria	Ok		perception	1	1	Correction	Correction	Danger
Piping amplitude		mm/s	0.051	0.052	0.00042			
Piping frequency		RPM	75	75	75			
	1-MT-RV							
Piping criteria	Ok		perception	1	1	Correction	Correction	Danger
Piping amplitude		mm/s	0.061	0.06	0.00048			
Piping frequency		RPM	75	75	75			

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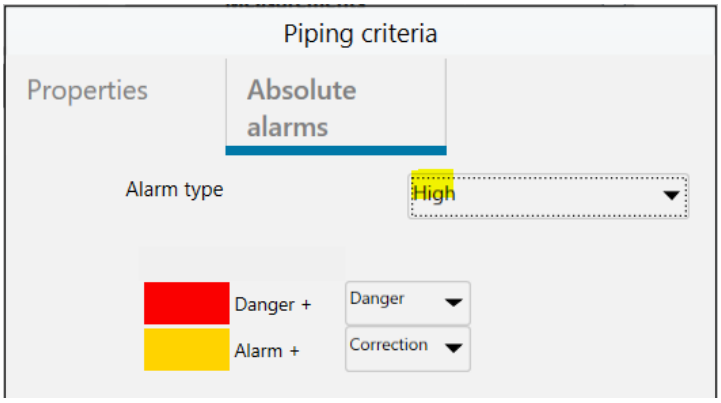
13.7.4 *Trig MVX piping measurement on criteria*

By default, this feature is inactive because alarm type is “None” for new created piping criteria.

Because piping criteria indicator is continuously measured by MVX, it is possible to trig MVX measurement according to the piping criteria measured value.

For that functionality, piping criteria absolute alarm must be activated – ie: alarm type set to “High” - and criteria labels must be selected for each alarm level triggering.

Example: the following configuration ask MVX to trig measurement when piping criteria presents some aggravating changes from MARGINAL to CORRETION to DANGER (wachel method)



NOTE: This feature inherit the same logic as MVX measurement triggering based on the aggravating alarm status changes.

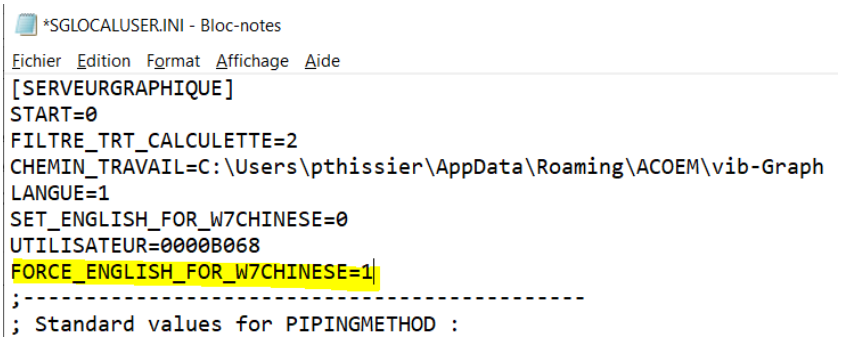
13.8 Force vibGraph in English for multi-lingual OS

With some multi lingual Operating System – especially Asian OS like Korean, the automatic detection of language code fails and vibGraph refuses to start.

A workaround has been integrated into vibGraph and needs the following manual operations to be done onto each computer where vibGraph is used:

- Open Windows File Explorer
- Navigate into %AppData%\Acoem\vib-Graph
- Edit **SGLOCALUSER.INI** file with NOTEPAD.EXE
- Add following text into **[SERVEURGRAPHIQUE]** section

  FORCE_ENGLISH_FOR_W7CHINESE=1



- Save and close INI file
- Restart vibGraph

13.9 Recover Platform Administration Module password

Contact ACOEM Technical support

13.10 Connect as Advisor Center expert

IMPORTANT This feature is available only within ACOEM cloud services and requires a specific subscription – https://ai.acoem.com

13.10.1 *Concept*

ACOEM Advisor diagnostic services are based on the ACOEM cloud platform https://ai.acoem.com and powered by numerous ACOEM Advisor Centers around the world.

For a subscription fee, ACOEM Expert can support each customer for on-demand expert assessments. At this moment, the customer's domain is assigned to an ACOEM Advisor Center that will handle all his service requests – see Create a Service Request with NESTi4 Vision

This "domain - Advisor Center" assignment is made by ACOEM when the service is subscribed, and the center is chosen according to territory and language in order to offer the best reactivity.

Once this assignment has been made, customer service requests are processed by ACOEM experts using NESTi4. To avoid reconnecting to the different domains of each customer, the experts have a specific NESTi4 user account declared within the domain corresponding to his Advisor Center (AC). So, when the expert is connected to his AC domain, he has a direct access to all the databases of all the domains attached to his Advisor Center.

13.10.2 *Create AC expert accounts*

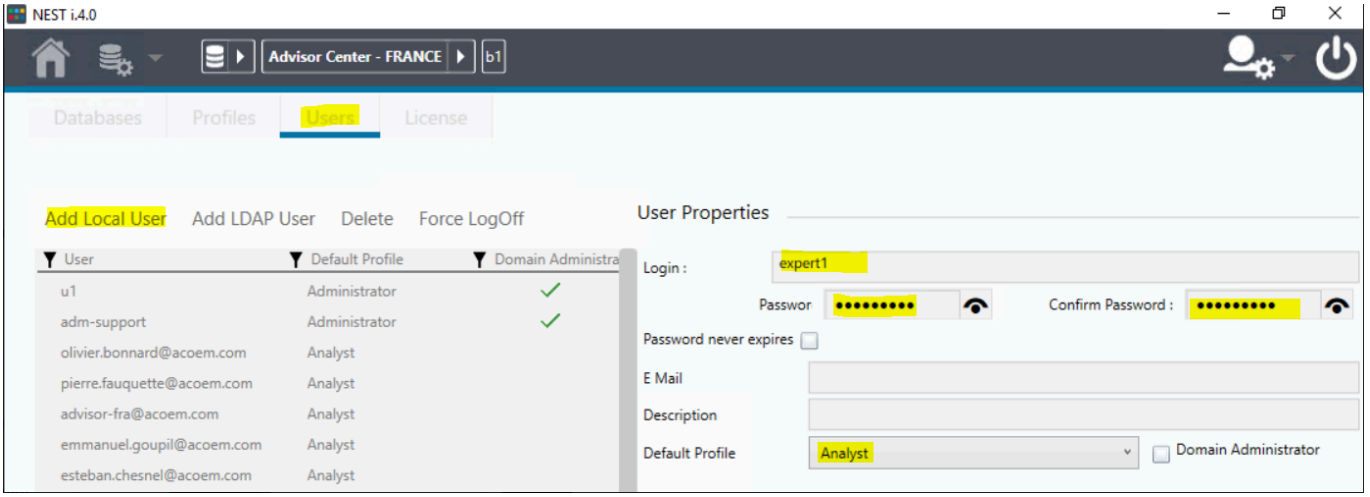
The administrator of each Advisor Center must use NESTi4 to create user accounts for each expert likely to process a service request:

- Open NESTi4
- Enter advisor center name as "domain name"
- Enter advisor center administrator credentials as "username" and "password"

Example:



Because you are connected as administrator of Advisor Center domain, then you can use ADMIN module in order to create as many user accounts as there are experts working in the AC:

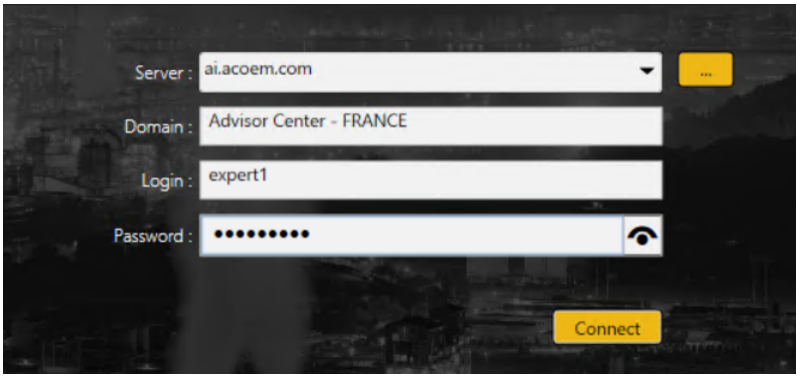


Send credential information to all experts people of this advisor center:

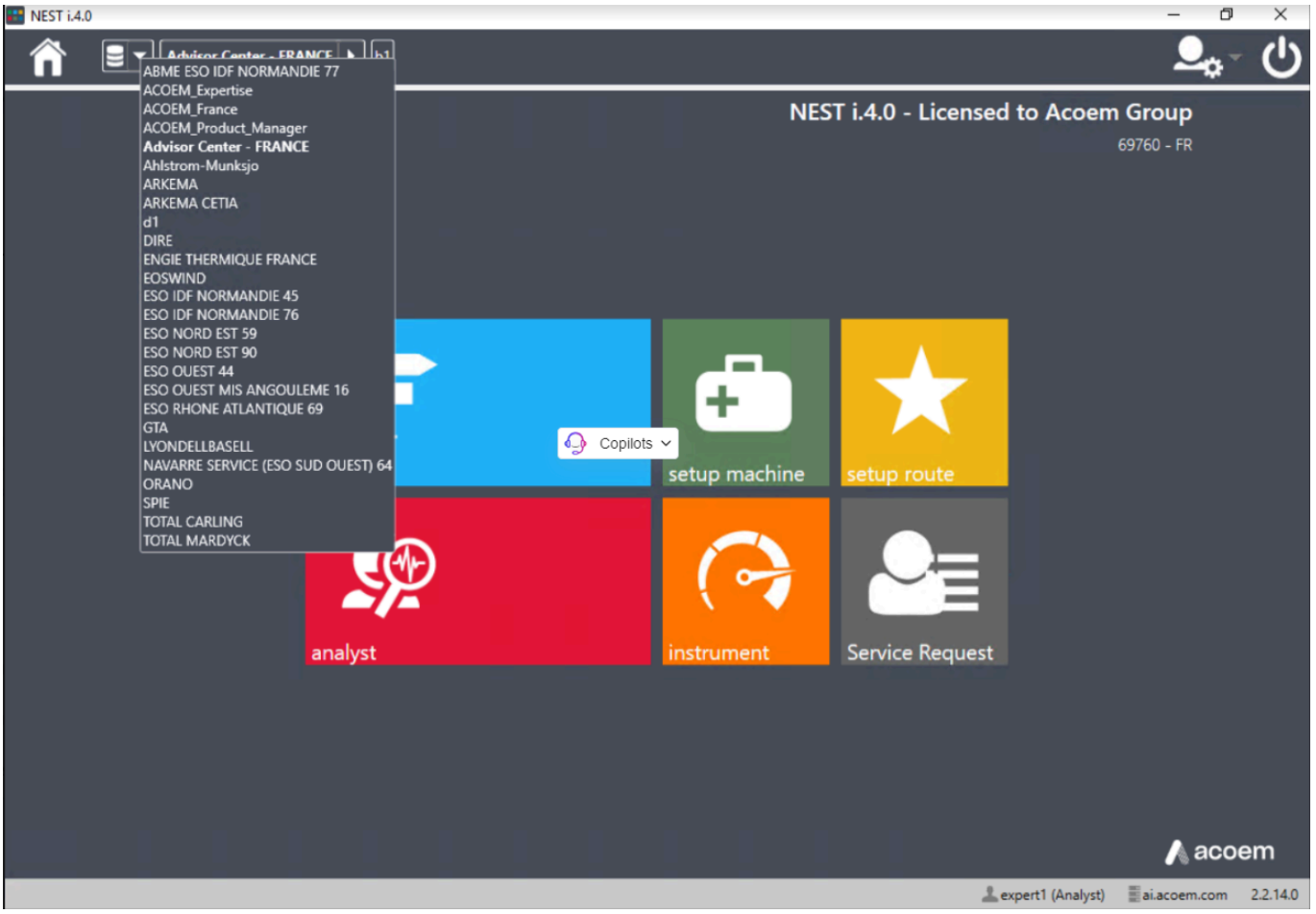
- domain name Advisor Center name
- username Expert login
- password Expert password

13.10.3 *Connect to NESTi4 as Advisor Center expert*

Expert will have to enter his advisor center name + his own credentials to log into nesti4



Then expert user is connected as "analyst" to AC domain and he can select any domain from the list of domains attached to his advisor center – example:



After have selected a domain, then he can select one database, one location, one machine - as usual – and use all NESTi4 modules to do analysis, enter recommendation and generate reports.

13.11 Send external ID to MVX Embedded OPC UA server (UaiCode)

This feature requires at least NESTi4 v2.3.10 and MVX 6.3.0-5

OPC UA is ubiquitous in industry, standardizing machine-to-machine exchanges and enabling the digitization of processes from order processing to product delivery.

To facilitate the integration of its solutions into this digital eco-system, NESTi4 enables the dual identification of monitored machines and monitoring instruments (MVX). This function enables you to identify all information published in OPC UA with your own codes - e.g. UaiCode - and not just with ACOEM codes.

In this way, all other systems connected to OPC UA can directly use ACOEM data, and know which machines they correspond to, and which acquisition systems produced them.

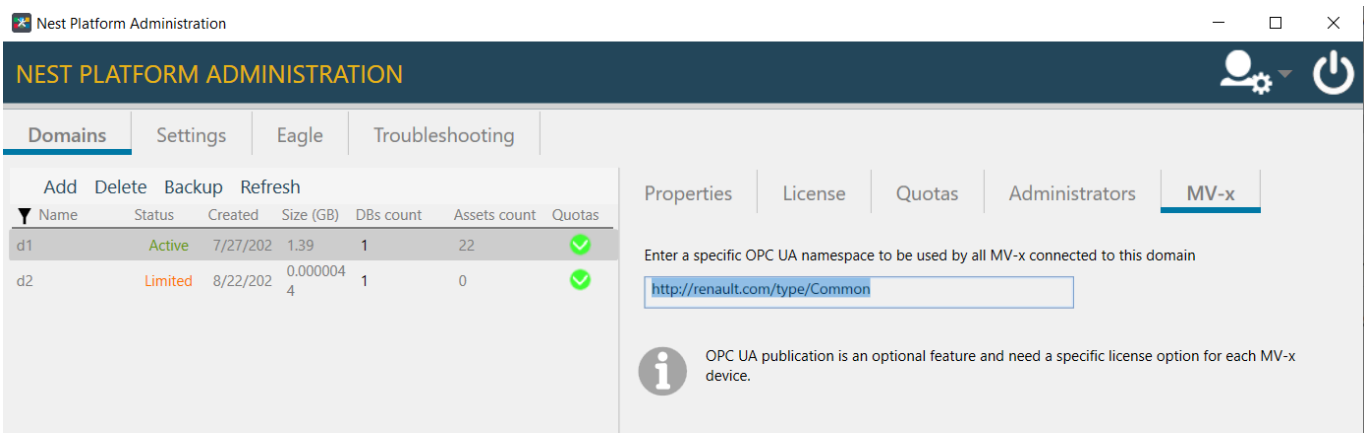
Nota:

- OPC UA publication from MVX requires a specific option into the device license.
- See MVX documentation for the detailed list of information published through the embedded OPC UA server

Enter OPC UA namespace to activate publication of external identifier:

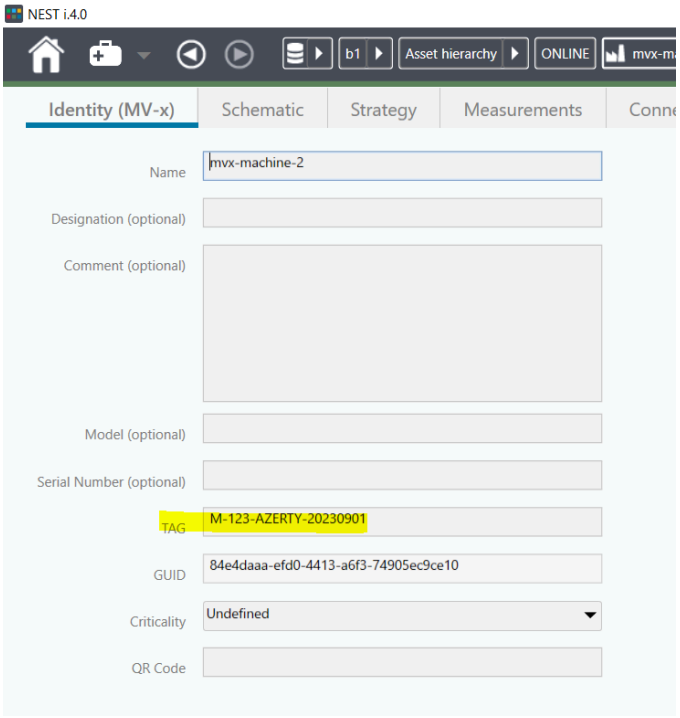
- Open PAM
- Select domain where MVX is connected
- Click on “MVX” tab
- Enter the namespace – ex: http://renault.com/type/Common (developed with Renault)
- Click on SAVE

Be careful: MVX will consider this new setting only when you will restart acquisition for this device.



Enter the external machine identifier :

- Edit machine properties with SETUP module
- Enter external ID into “TAG” fields – ex:

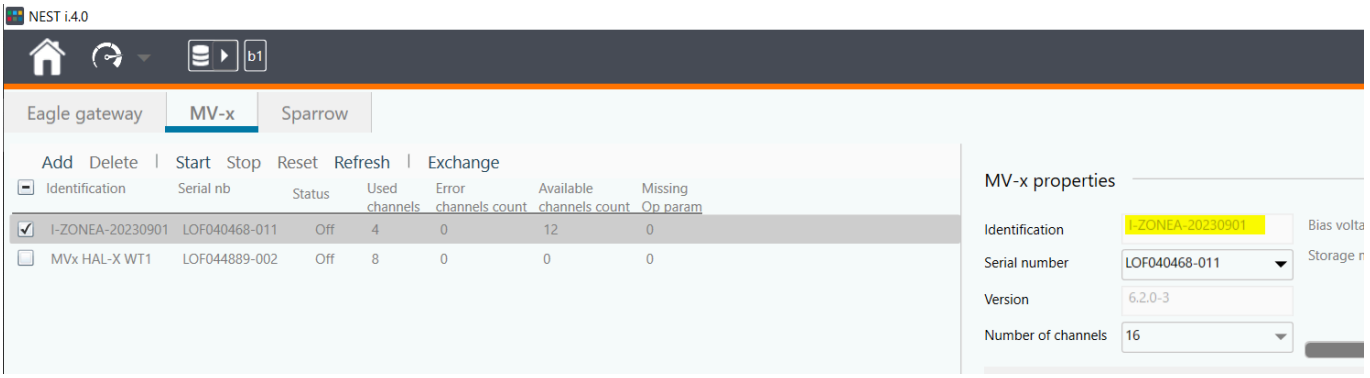


- Click on SAVE
- MVX will consider this new setting only when you will restart device acquisition.

Enter the external MVX instrument identifier :

- Open INSTRUMENT module
- Select the concerned MVX device from the list
- Enter external ID into “Identification” fields – ex:

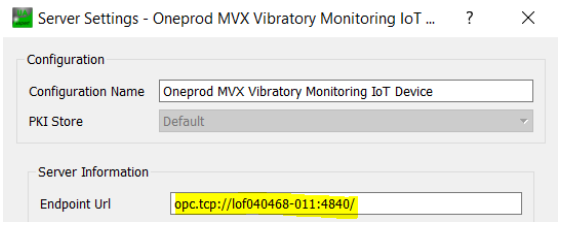
IMPORTANT: Device identification can be changed only when no device channels are connected to any machine



- Click on SAVE
- Open SETUP module
- Connect all machine points to device channels
- Click on SAVE
- Open INSTRUMENT module
- Start MVX device acquisition

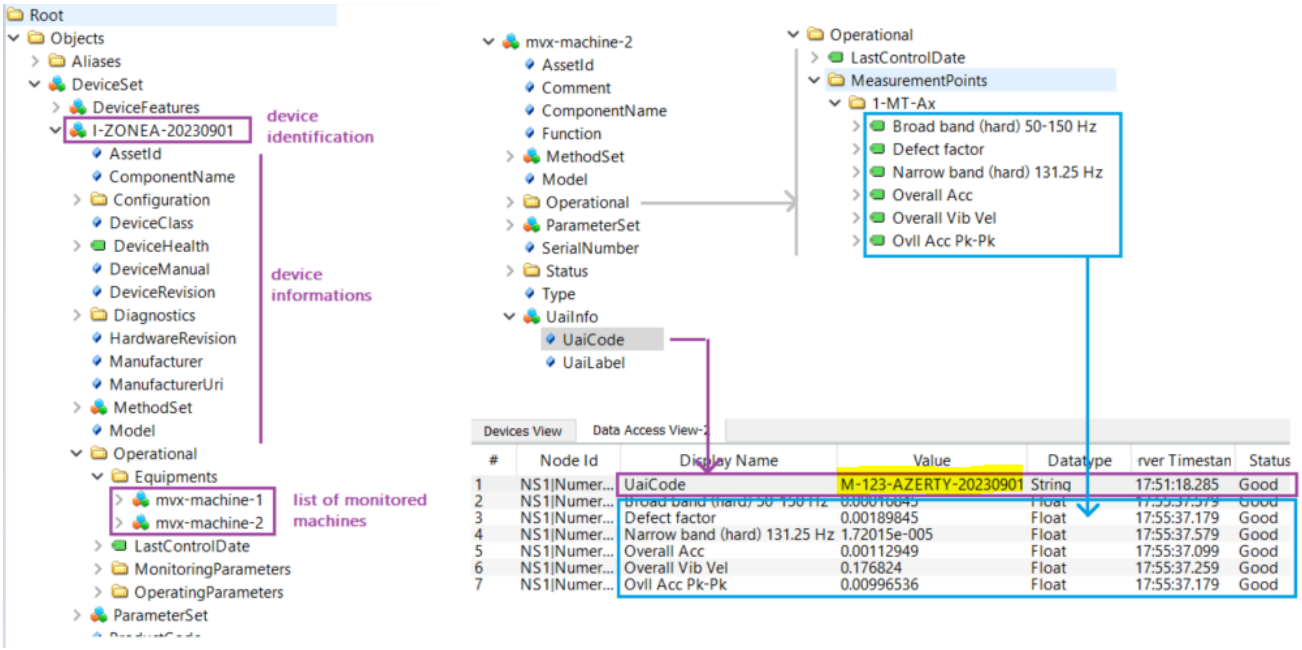
Example of OPC UA publication from MVX (viewed with uaExpert utility):

- Open uaExpert
- Add a new server – ex:

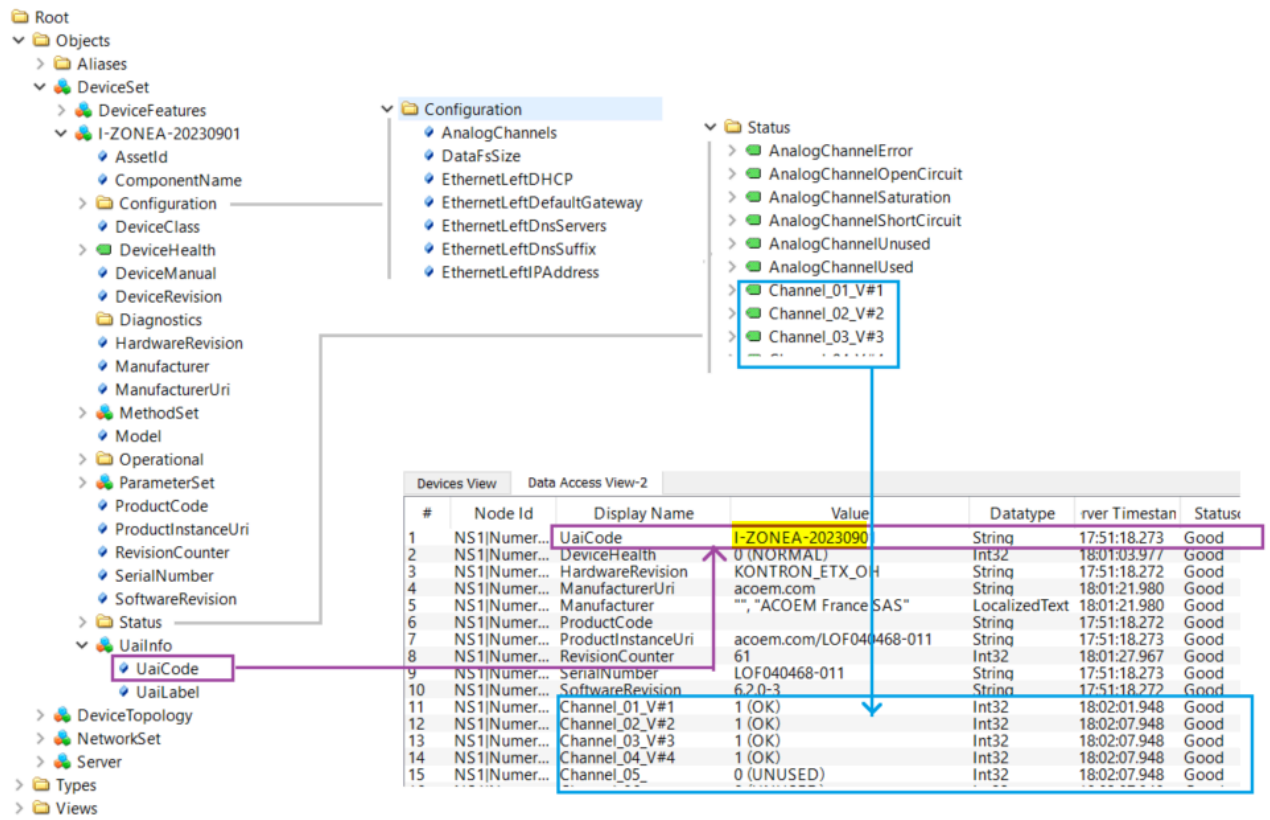


- Connect to new server with a local MVX user account (same as for device web page)
- MVX OPC UA objects data structure is presented:

Objects data structure : Machine information with external identifier (UaiCode) :



Device information with external identifier (UaiCode) :

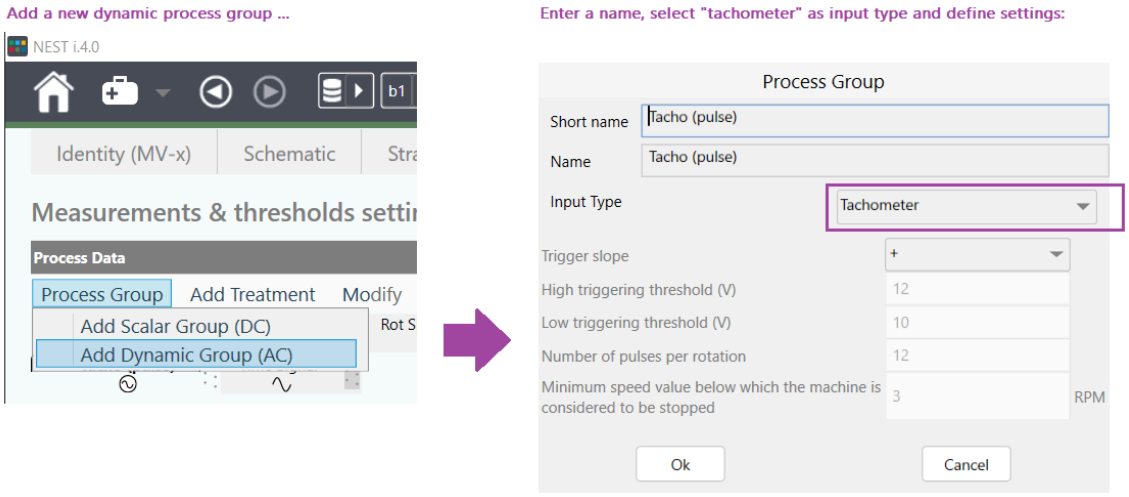


13.12 Record tachometer time signal

This feature requires at least NESTi4 v2.3.10 and MVX 6.3.0-5

In order to help tachometer (pulse) installation and/or troubleshooting for RSS monitoring or any other reason, you can record tachometer signal, store it into database and use vibGraph to visualize it.

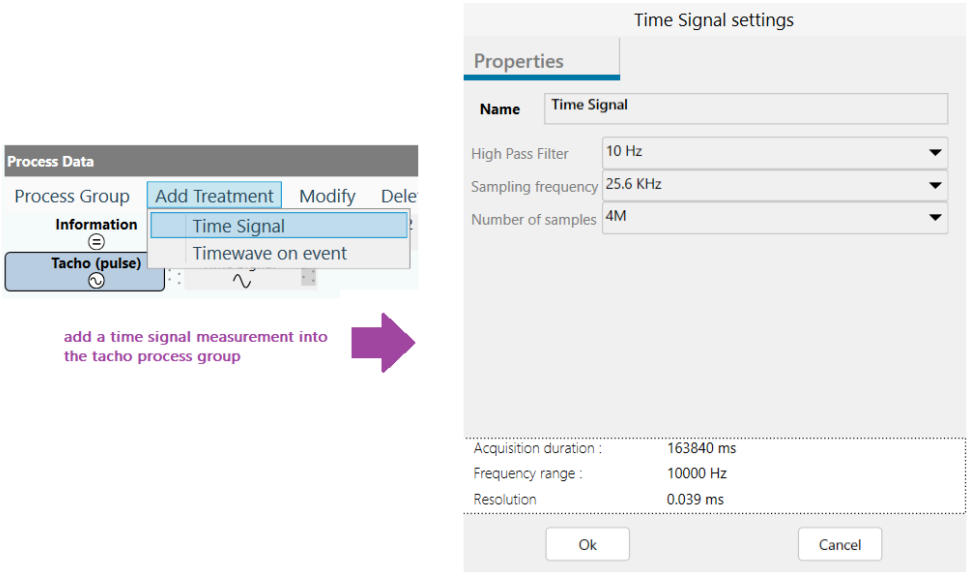
- Open SETUP module
- Select machine where to add a tachometer time signal
- Click on “measurement” tab
- Add a new Dynamic Process Group (AC) – ex: Tacho (pulse)



- Enter a name for the process group
- Select “tachometer” as input type
- Define tachometer settings (trigge slope, triggering thresholds, pulse per rotation …)
- Click on OK to close the group properties window

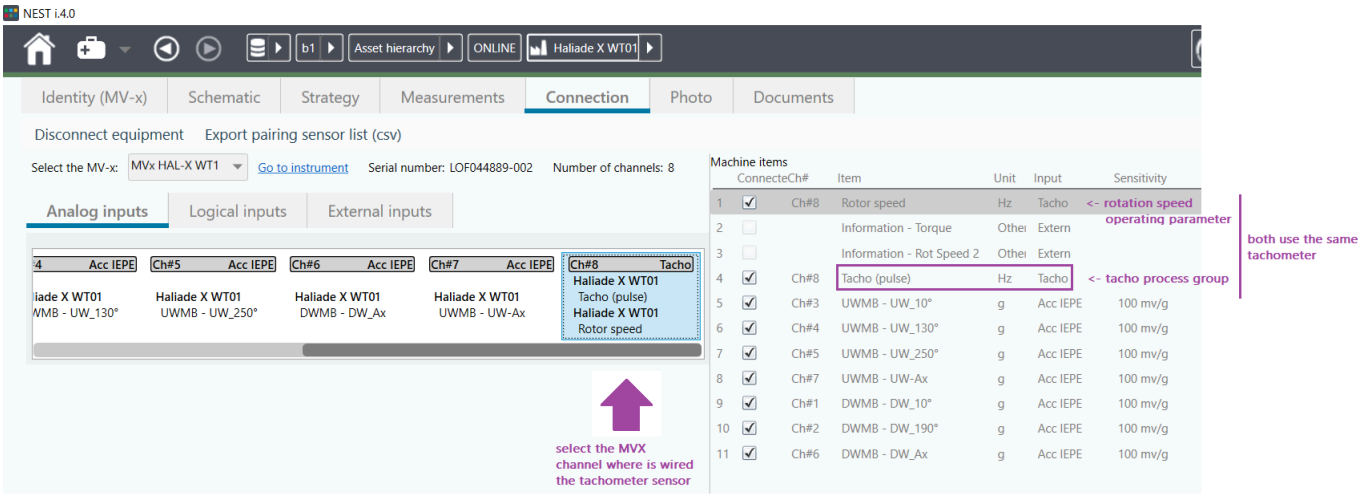
After the creation of the group, you must add a time signal measurement:

- Select the group
- Add a time signal into the tacho process group
- Define time signal settings as usual
- Click on OK to close the signal properties window



After the creation of the group and measurement, you must connect them to MVX channel

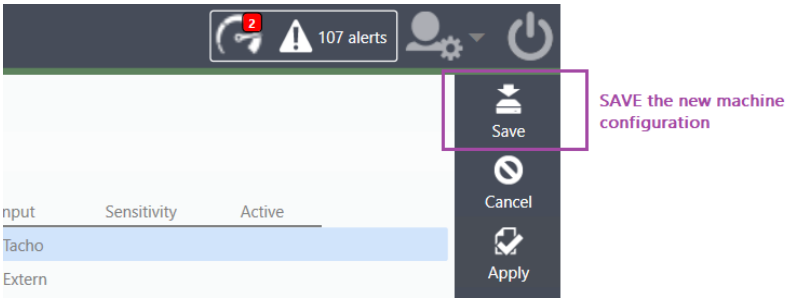
- Click on “Connection” tab
- Select the MVX channel where tachometer sensor is wired
- Check the tacho process group to connect it with the channel



Nota:

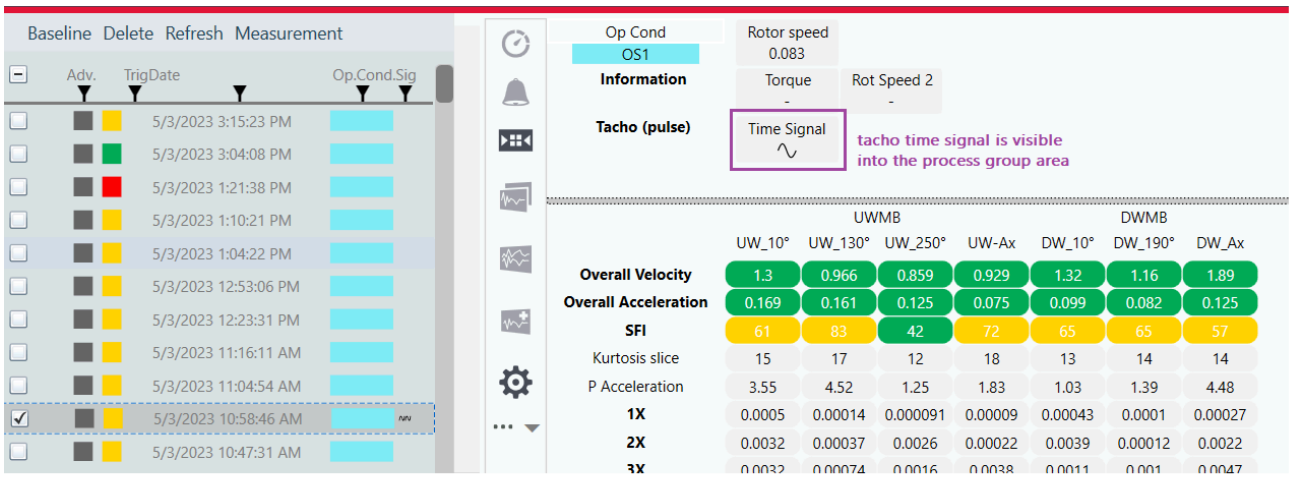
- Tacho process group and the rotation speed operating parameter use the same MVX channel where is wired the tachometer

- Click on SAVE to save the new machine configuration and close the window



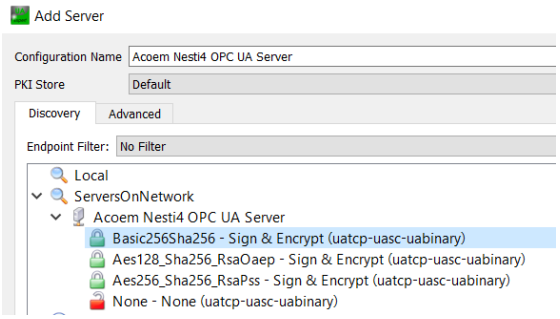
When configuration is ready, you can start acquisition and consult measurement with the ANALYST module:

- Time signal is visible into the “tacho” process group
- Double click on it to display the signal with vibGraph
- Use vibGraph tools (cursor, zoom) to analyze signal as any other time signal



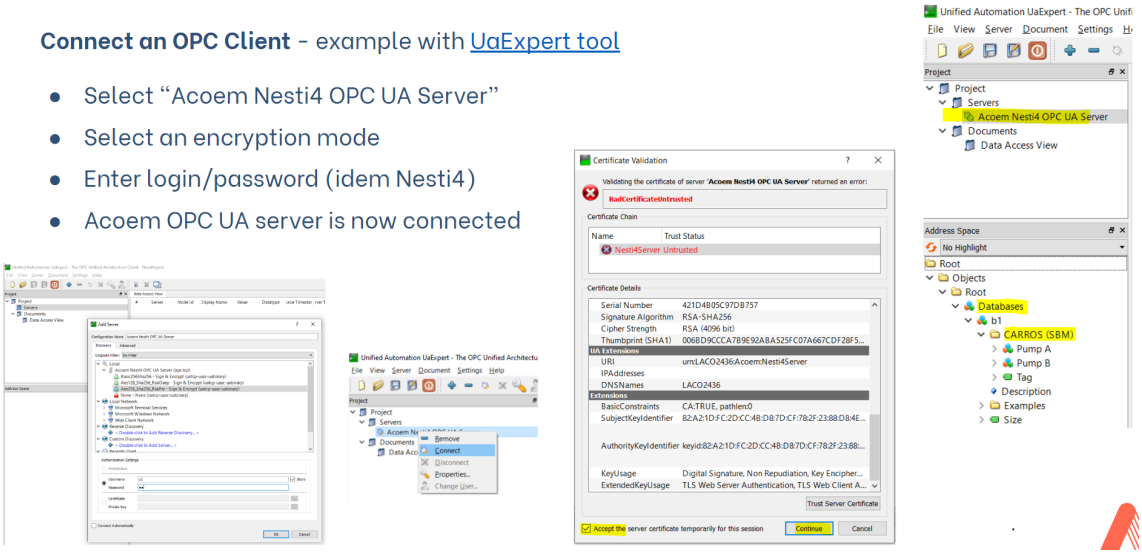
13.13 Connect an external OPC UA Client connection

The same login/password can be used for all your connections to NESTi4 server from NESTi4 client, Vision, MVX and external NESTi4 OPC UA server. In order to increase security, we recommend to create a dedicated user account for external OPC UA client connection – example:



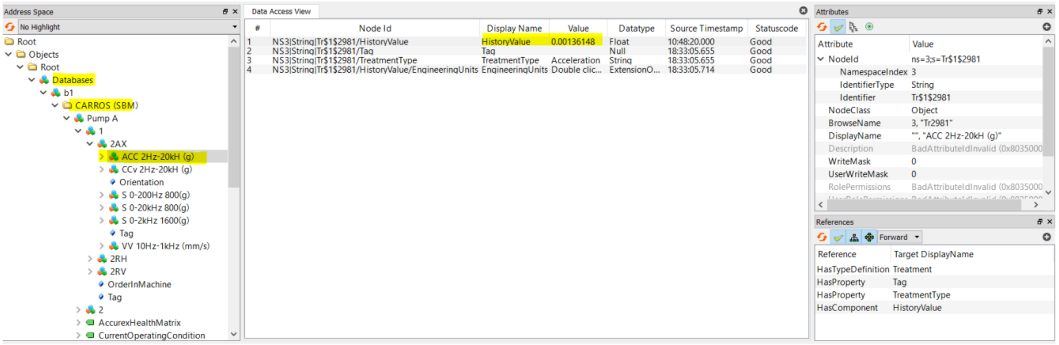
Connect an OPC Client - example with UaExpert tool

- Select "Acoem Nesti4 OPC UA Server"
- Select an encryption mode
- Enter login/password (idem Nesti4)
- Acoem OPC UA server is now connected



Explore "Acoem Nesti4 OPC UA Server" - example with CARROS equipments

- Server databases are presented hierarchically
- Select "ACC 2Hz-20kHz (g)" parameter on "2AX"measurement point of "Pump A"
- "HistoryValue" present the current value of the selected parameter

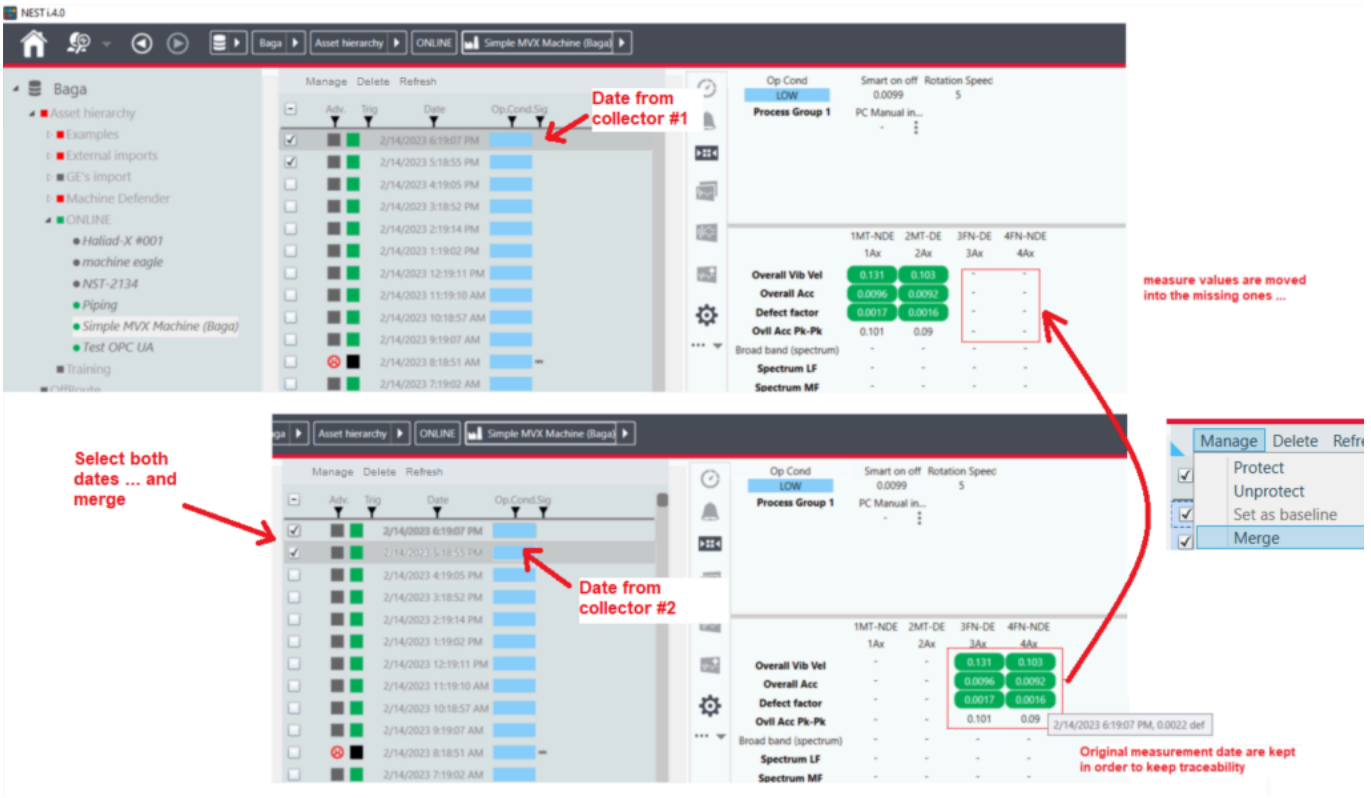


13.14 MERGE FALCON MEASUREMENTS

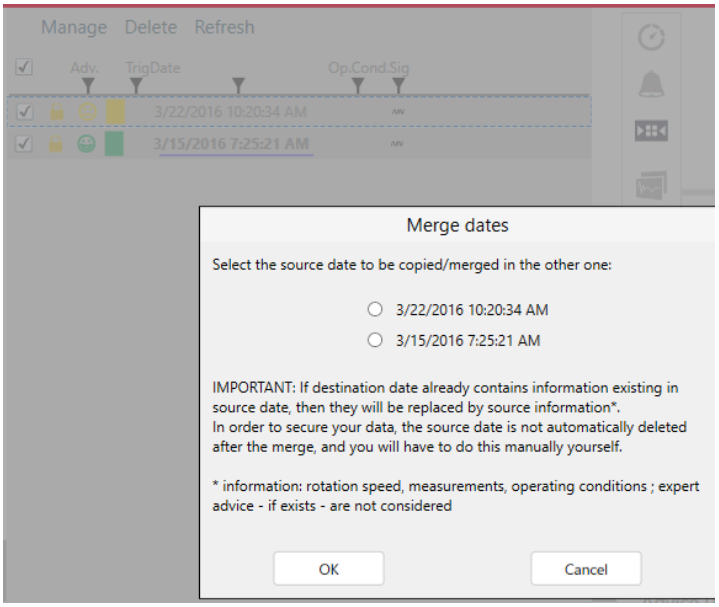
This feature requires at least NESTi4 v2.4.1 and is limited to FALCON machine

This feature is dedicated for long machine – ie paper mill with many rollers – where 2 peoples can make measurements with two FALCON at the same time, one on CC side the other one on CT side.

This means that one data collector will have one-half of all rollers and the other one the other half and when data are downloaded into NESTi4, then two control dates are then created for the machine, each with half of the measurements made:



When measurement dates to be merged are selected, merge function can be applied and the following message appears to ask which date must be copied/merged in the other one – example:



Note:

- If destination date already contains vibration data, then they will be replaced by the source information. All other data of destination date are preserved.
- Original individual measurement date are conserved after the merge operation
- This feature is limited to FALCON machines and only 2 measurement dates must be selected. In all other case, this “merge” function is not available.

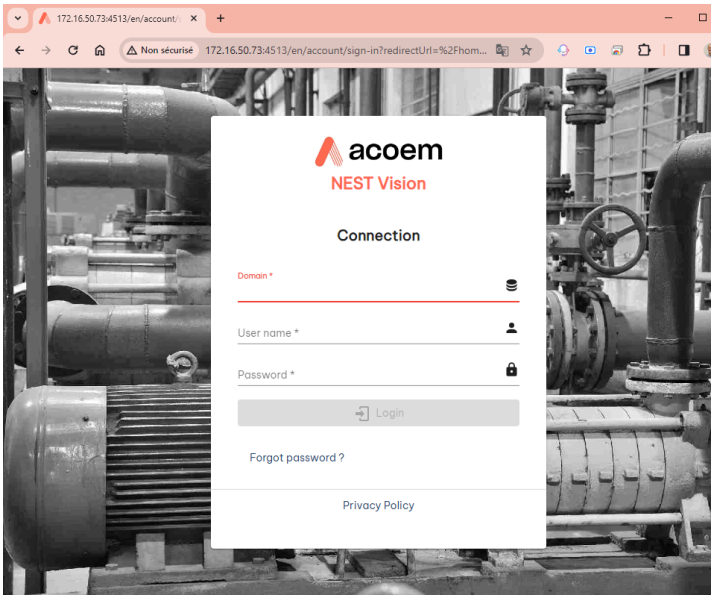
13.15 Install & use NESTi4 Vision

NESTi4 Vision is a paid license option

NESTi4 Vision is a full web application module presenting all your machine health information through any modern web browser - see dedicated User’s guide here

Use Web application from any web browser:

- Open a web browser – ex: Chrome or Firefox
- Enter the following URL : **http://<your-local-nesti4-server>:4513**
  - <your-local-nesti4-server> corresponds to NESTi4 server IP address or hostname
  - 4513 is the default TCP port of NESTi4 (it can be changed during installation)

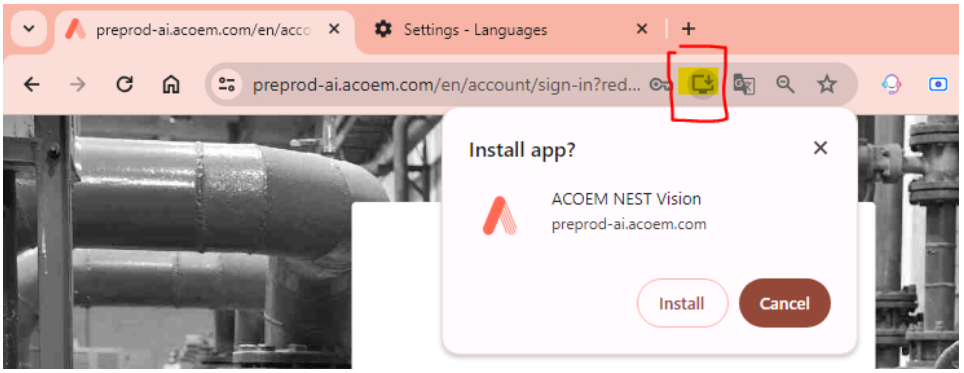


- Enter the following default credentials:
  - domain: **d1**
  - user name: **u1** ; this user is "administrator" (role) of "d1" domain
  - Password: **u1 ;** this default password must be changed at the first use
- Default User Home Page presents the following overview of domain machines

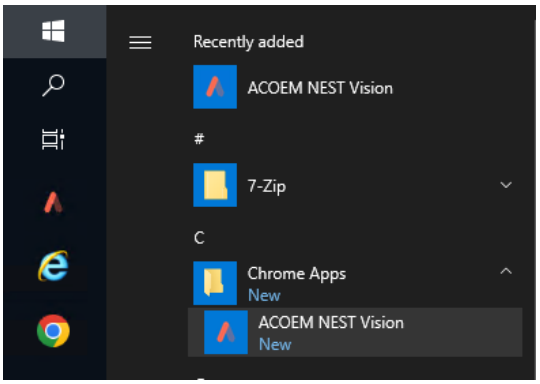


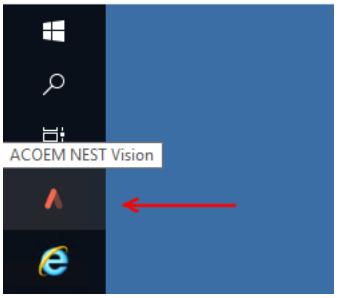
Web application installation on Windows:

Nest Vision can be installed as a web application on your computer with a direct access from the Windows program menu and/or pin to taskbar.

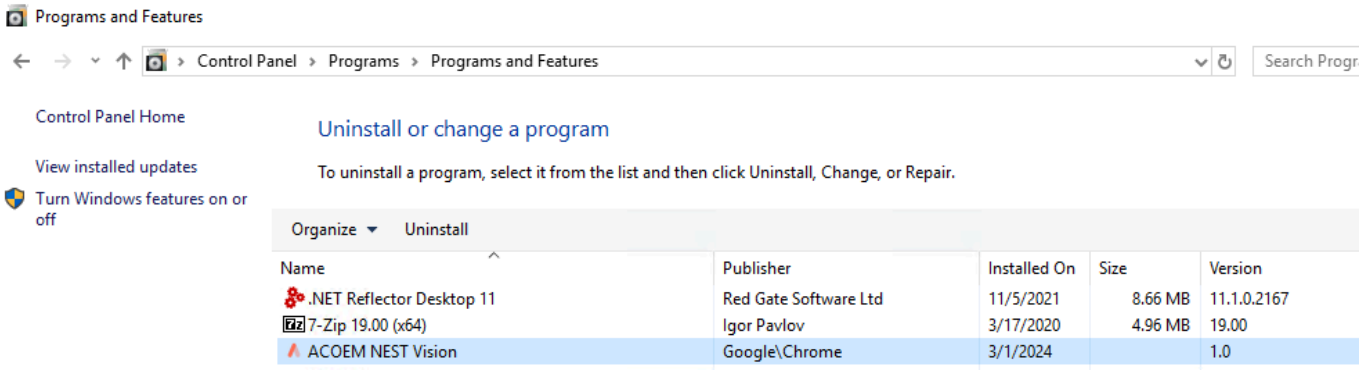


Then, Web application can be launched directly from Chrome Apps and from Taskbar:





Web application can be uninstalled directly from Window Control Panel \ Uninstall programs:



13.16 Disable Proxy server use for NESTi4 client connection

By default, nesti4 client use the system proxy server to establish Ethernet or Wifi connection to the nesti4 server.

In some situation, it could be useful to disable this connection with the following procedure ; please contact ACOEM Technical Support before to operate:

- Open file explorer on nesti4 server
- Navigate into **C:\Program Files\ACOEM\Nest i4.0 Self Hosted Web Server\Web Server** folder
- Edit **01db.OneProd.Client.dll.config** file
- Change **ByPassHttpProxy** variable to “true”
- Save file
- Restart nesti4 server

```
<?xml version="1.0" encoding="utf-8"?>
<configuration>
  <appSettings>
    <add key="ValidationMode" value="false"/>
    <add key="LocalMode" value="false"/>
    <add key="ServerTcpPort" value="4513"/>
    <add key="VibGraphInstallationKey" value="HKEY_LOCAL_MACHINE\SOFTWARE\ACOEM\vib-Graph"/>
    <add key="ByPassHttpProxy" value="false"/>
  </appSettings>
  <startup>
    <supportedRuntime version="v4.0" sku=".NETFramework,Version=v4.6.1"/>
  </startup>
  <runtime>
    <assemblyBinding xmlns="urn:schemas-microsoft-com:asm.v1">
    </assemblyBinding>
  </runtime>


</configuration>
```

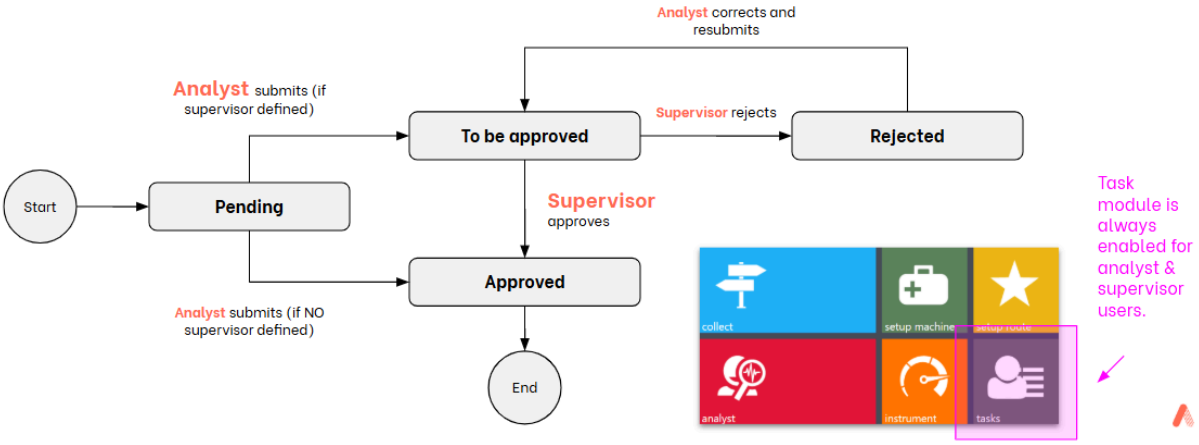
13.17 Expert Advice approval workflow

13.17.1 *Concepts*

To ensure the quality of the expert opinions applied to your machines, it is essential to have a clear and simple approval process to implement. For this purpose, it is now possible to use a new user profile called "approver" to whom all new opinions will be assigned when the expert has finished their analysis and declares their opinion as "to be approved".

At that moment, if at least one "approver" type user exists in the domain, they are notified of this approval request and can directly access the machine and the relevant measurement to check the analysis performed by the expert and then approve or reject it.

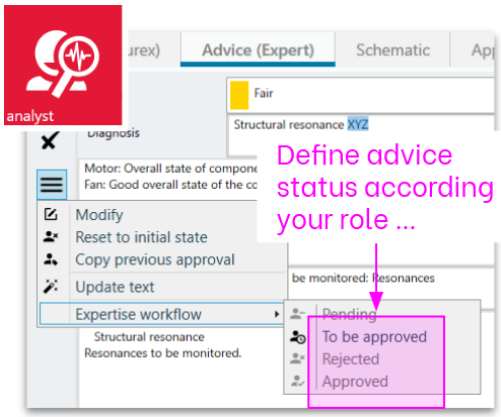
As is currently the case, if the analysis is approved, the expert's opinion is visible to everyone; otherwise, the opinion remains private, and the expert is notified that their analysis has been rejected and that they must redo their analysis.



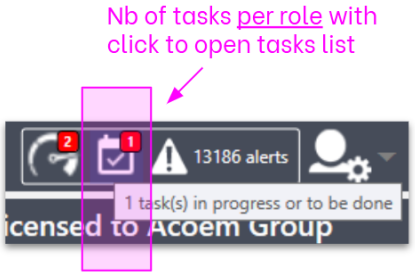
NOTE: It is not mandatory to use this workflow, and the same person can perform all analysis and approval operations alone, as is currently the case. In this scenario, this person must have an "Approver" profile.

Description of the operating mode:

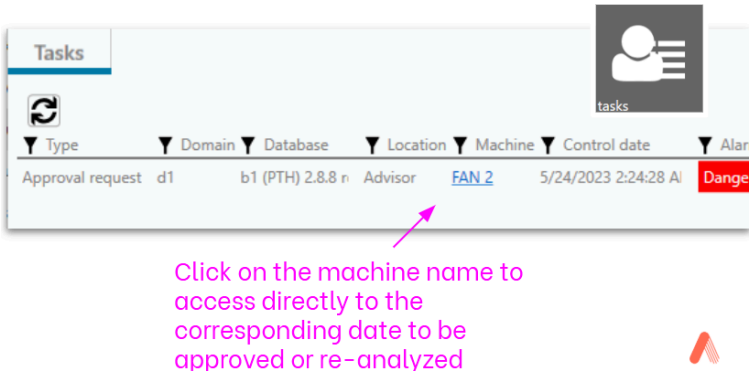
- **Expert** (or analyst) and **Approver** users must be declared into domain - see Administration \ User & profile management
- **Expert** (or analyst) provides new advice, including a diagnosis and a recommendation for a specific machine measurement date. This new advice is initially assigned the status of "Pending." Once the expert has finalized the content, he change the status to **"To be Approved"** to initiate the review process by domain approvers.



- **Notification** counter in NESTi4 indicates that action is required. Approver users can click this counter to automatically open the tasks module.



- **"Tasks"** module displays all outstanding actions relevant to the current user profile. Approver users have visibility of all tasks designated as "to be approved" and can click on them to navigate directly to the associated machine and measurement. This enables them to review the proposed expert advice and proceed to either approve or reject it.



- **Approval** or **Rejection** triggers the relevant notification and workflow. If the approver rejects the expert's advice, the advice is marked as "rejected," and the experts (or analysts) receive a corresponding workflow notification in the counters panel. The expert must click on the counter to open the task list, then click on the machine associated with the rejected expert advice to navigate directly to the measurement requiring review. At this point, the expert performs the necessary correction and changes the status to "to be reviewed" when the revision is complete.

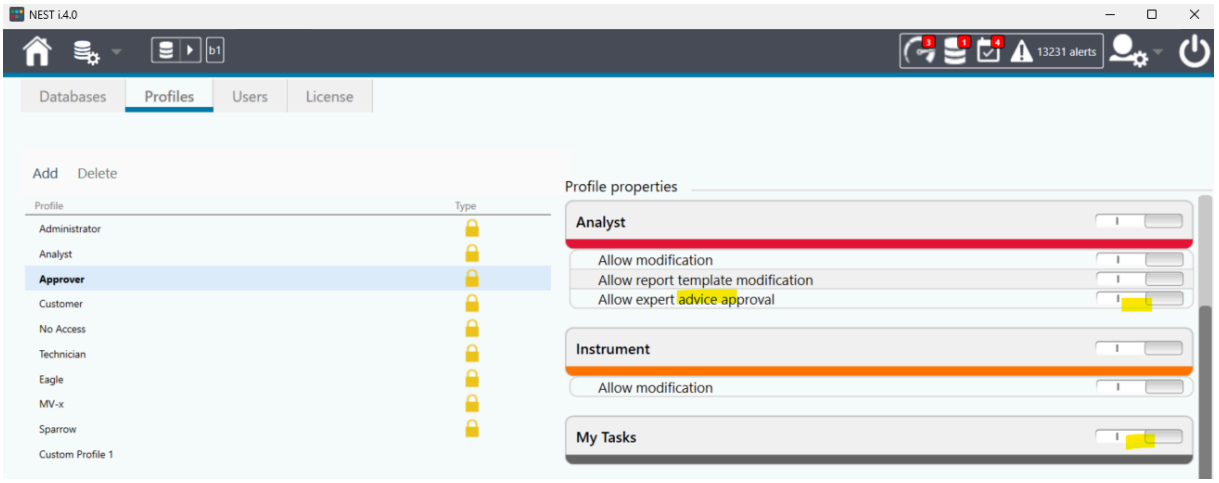
NOTE:

- Users with the "analyst" profile can change the expert advice status to "pending" or "to be approved."
- Users with the "approver" profile, considered a super-analyst, can change the expert advice status to any available option (pending, to be approved, approved, or rejected).

13.17.2 *User Roles and Privileges*

Predefined "approver" **profile** is available in the administration module, allowing for the direct creation of new users who combine the "analyst" profile with the privileges to approve or reject expert advice.

"Allow expert advice approval" **privilege** is available within the administration module, enabling the creation of custom profiles with corresponding permissions. This privilege mandates the activation of both "My tasks" and "Analyst\Allow modification.



CHAPTER 14. References

14.1 Devices measurements settings

14.1.1 *FALCON measurements*

14.1.1.1IEPE or AC acceleration input

- **Overall level (Acceleration, Velocity, Absolute displacement):**
  - Detection: RMS, true or equivalent peak, true or equivalent peak-to-peak
  - High-pass filter: None*, 2 Hz (120 CPM), 10 Hz (600 CPM), 3 kHz (180 kCPM)*
  - Low-pass filter: 300 Hz (18 kCPM), 1 kHz (60 kCPM), 2 kHz (120 kCPM), 3kHz (180 kCPM),
    20 kHz (1200 kCPM), 40 kHz (2400 kCPM)
  - Measurement time: 1 to 20 s
  - Peak hold: Off, On

* Not available for Velocity and Displacement

- **Bearing defect factor:**
  - Measurement time: 1 to 20 s, default value : 7 s

Note: Recommended thresholds are 6 for the Alarm and 9 for Danger.

- **Kurtosis:**

This processing computes the Kurtosis on the signal filtered by a band-pass filter. This indicator detects the presence of shocks in the signal and is suitable for machines with slow rotation speeds. The Kurtosis processing is mathematically defined as the 4th-order centered moment of the time series.

  - High-pass filter: from 50 Hz to half of the value of the low-pass filter
  - Low pass filter: from twice the high-pass filter to 20 kHz. Minimum value is 500 Hz
  - Measurement time: 1 to 5 s

- **Spectrum (Acceleration, Velocity, Absolute displacement):**
  - High-pass filter: None*, 2 Hz (120 CPM), 10 Hz (600 CPM)
  - Max Frequency: 80 kHz (4800 kCPM), 40 kHz (2400 kCPM), 20 kHz (1200 kCPM), 10 kHz (600 kCPM), 5 kHz (300 kCPM), 2 kHz (120 kCPM), 1 kHz (60 kCPM), 500 Hz (30 kCPM), 200 Hz (12 kCPM), 100 Hz(6000 CPM), 50 Hz (3000 CPM)
  - Number of FFT lines: 100, 200, 400, 800, 1600, 3200, 6400, 12.8k, 25.6k, 51.2k, 102.4k
  - Number of averages: 1 to 4096

- Windowing: Hanning, rectangular, flat top
- Overlap: 0%, 50%, 75%
- Averaging mode: Linear, Peak
- Zoom factor: x1, x2, x4, x8, ..., x128
- Zoom central frequency (Hz): Value in Hz (If zoom ≠ x1)

* Not available for Velocity and Displacement

- **Envelope spectrum (manual) - Acceleration:**
  - Max Frequency: 80 kHz (4800 kCPM), 40 kHz (2400 kCPM), 20 kHz (1200 kCPM), 10 kHz (600 kCPM), 5 kHz (300 kCPM), 2 kHz (120 kCPM), 1 kHz (60 kCPM), 500 Hz (30 kCPM), 200 Hz (12 kCPM), 100 Hz(6000 CPM), 50 Hz (3000 CPM)
  - Number of FFT lines: 100, 200, 400, 800, 1600, 3200, 6400
  - Number of averages: 1 to 4096
  - Band-pass filter width: Frequency input range divided by 2, 4, 8 … ,128
  - Filter central frequency: Value in Hz
  - Windowing: Hanning, rectangular, flat top
  - Overlap: 0%, 50%, 75%
  - Averaging mode: Linear, Peak

- **Envelope spectrum (bands) - Acceleration**
  - Envelope filter: [5-200Hz], [200Hz-2kHz], [1kHz-6kHz], [2kHz-20kHz], Auto ShockView, Auto ShockView LF
    - [5-200Hz] ⟶ Fmax preset = 39Hz - 800L. Fix Sampling freq. 12800Hz
    - [200Hz-2kHz] ⟶ Fmax preset = 625Hz - 800L. Fix Sampling freq. 12800Hz
    - [1kHz-6kHz] ⟶ Fmax preset = 625Hz - 800L. Fix Sampling freq. 25600Hz
    - [2kHz-20kHz] ⟶ Fmax preset = 1.25kHz - 1600L. Fix Sampling freq. 51200Hz
    - ShockView: band filter based on SFI algorithm and Fmax choices are 5kHz, 2.5kHz, 1.25kHz, 625 Hz, 312.5Hz, 156.25Hz, 78.125Hz or 39.0625Hz
      - Auto ShockView ⟶ Fmax preset = 625Hz -800L. Fix Sampling frequency 51200Hz
      - Auto ShockView LF ⟶ Fmax preset = 625Hz - 800L. Fix Sampling Freq. 12800Hz
  - Max Frequency: 80 kHz (4800 kCPM), 40 kHz (2400 kCPM), 20 kHz (1200 kCPM), 10 kHz (600 kCPM), 5 kHz (300 kCPM), 2 kHz (120 kCPM), 1 kHz (60 kCPM), 500 Hz (30 kCPM), 200 Hz (12 kCPM), 100 Hz(6000 CPM), 50 Hz (3000 CPM)
  - Number of FFT lines: 100, 200, 400, 800, 1600, 3200, 6400
  - Number of averages: 1 to 4096
  - Overlap: 0%, 50%, 75%
  - Windowing: Hanning, rectangular, flat top
  - Averaging mode: Linear, Peak

- **Phased spectrum (Acceleration, Velocity, Absolute displacement):**
    - High-pass filter: None*, 2 Hz (120 CPM), 10 Hz (600 CPM)
    - Frequency range: 40 kHz (2400 kCPM), 20 kHz (1200 kCPM), 10 kHz (600 kCPM), 5 kHz (300 kCPM), 2 kHz (120 kCPM), 1 kHz (60 kCPM), 500 Hz (30 kCPM), 200 Hz (12 kCPM), 100 Hz(6000 CPM), 50 Hz (3000 CPM)
    - Number of lines: 100, 200, 400, 800, 1600, 3200, 6400
    - Number of averages: 1 to 4096

* Not available for Velocity and Displacement

Notes:

- Weighting window is set to Hanning
- This type of measurement requires a “tachometer” as trigger input used as phase reference. It measures also the rotation frequency. This frequency value is stored along with the phased spectrum and used as running speed by the vector extraction parameter.

- **Time wave (Acceleration, Velocity, Absolute displacement):**
    - High-pass filter: None, 2 Hz (120 CPM), 10 Hz (600 CPM)
    - Sampling frequency: 204.8 kHz, 102.4 kHz, 51.2 kHz, 25.6 kHz, 12.8 kHz, 5.12 kHz, 2.56 kHz, 1.28 kHz, 512 Hz, 256 Hz
    - Number of samples: 256, 512, 1K, 2K, 4K, 8K, 16K, 32K, 64K. With FALCON long time wave option: 128K, 256K, 512K, 1M, 2M and 4M

- **Synchronous Time wave (Acceleration):**
    - High-pass filter: None, 2 Hz (120 CPM), 10 Hz (600 CPM)
    - Sampling frequency: 204.8 kHz, 102.4 kHz, 51.2 kHz, 25.6 kHz, 12.8 kHz, 5.12 kHz, 2.56 kHz, 1.28 kHz, 512 Hz, 256 Hz
    - Number of samples: 256, 512, 1K, 2K, 4K, 8K, 16K, 32K
    - Number of averages: 1 to 4096

Notes: this type of measurement requires a “tachometer” as trigger input used to trigger each average. Averaging reduces the influence of the part of the signal not synchronous with the trigger signal.

14.1.1.2 IEPE or AC velocity input

- **Overall level (Velocity, Absolute displacement):**
    - Detection: RMS, true or equivalent peak, true or equivalent peak-to-peak

- High-pass filter: None*, 2 Hz (120 CPM), 10 Hz (600 CPM), 3 kHz (180 kCPM)*
- Low-pass filter: 300 Hz (18 kCPM), 1 kHz (60 kCPM), 2 kHz (120 kCPM), 3kHz (180 kCPM),
  20 kHz (1200 kCPM), 40 kHz (2400 kCPM)
- Measurement time: 1 to 20 s
- Peak hold: Off, On

* Not available for Displacement

- **Spectrum (Velocity, Absolute displacement):**
  - High-pass filter: None*, 2 Hz (120 CPM), 10 Hz (600 CPM)
  - Frequency range: 80 kHz (4800 kCPM), 40 kHz (2400 kCPM), 20 kHz (1200 kCPM), 10 kHz (600 kCPM), 5 kHz (300 kCPM), 2 kHz (120 kCPM), 1 kHz (60 kCPM), 500 Hz (30 kCPM), 200 Hz (12 kCPM), 100 Hz(6000 CPM), 50 Hz (3000 CPM)
  - Number of lines: 100, 200, 400, 800, 1600, 3200, 6400, 12.8k, 25.6k, 51.2k, 102.4k
  - Number of averages: 1 to 4096
  - Overlapping: 0%, 50%, 75%
  - Weighting window: Hanning, rectangular, flat top
  - Averaging: Linear, Peak
  - Zoom factor: x1, x2, x4, x8, ..., x128
  - Zoom central frequency zoom : Value in Hz (If zoom ≠ x1)

* Not available for Displacement

- **Phased spectrum (Velocity, Absolute displacement):**
  - High-pass filter: None*, 2 Hz (120 CPM), 10 Hz (600 CPM)
  - Frequency range: 40 kHz (2400 kCPM), 20 kHz (1200 kCPM), 10 kHz (600 kCPM), 5 kHz (300 kCPM), 2 kHz (120 kCPM), 1 kHz (60 kCPM), 500 Hz (30 kCPM), 200 Hz (12 kCPM), 100 Hz(6000 CPM), 50 Hz (3000 CPM)
  - Number of lines: 100, 200, 400, 800, 1600, 3200, 6400
  - Number of averages: 1 to 4096

* Not available for Displacement

Notes:

- Weighting window is set to Hanning
- This type of measurement requires a trigger input used as phase reference. It also measures the rotation frequency. This frequency value is stored along with the phased spectrum and used as running speed by the vector extraction parameter.

- **Time wave (Velocity):**
  - High-pass filter: None, 2 Hz (120 CPM), 10 Hz (600 CPM)
  - Sampling frequency: 204.8 kHz, 102.4 kHz, 51.2 kHz, 25.6 kHz, 12.8 kHz, 5.12 kHz, 2.56 kHz, 1.28 kHz, 512 Hz, 256 Hz

- Number of samples: 256, 512, 1K, 2K, 4K, 8K, 16K, 32K, 64K. With FALCON long time wave option: 128K, 256K, 512K, 1M, 2M and 4M

- **Synchronous Time wave (Velocity):**
  - High-pass filter: None, 2 Hz (120 CPM), 10 Hz (600 CPM)
  - Sampling frequency: 204.8 kHz, 102.4 kHz, 51.2 kHz, 25.6 kHz, 12.8 kHz, 5.12 kHz, 2.56 kHz, 1.28 kHz, 512 Hz, 256 Hz
  - Number of samples: 256, 512, 1K, 2K, 4K, 8K, 16K, 32K
  - Number of averages: 1 to 4096

Notes: this type of measurement requires a "tachometer" as trigger input used to trigger each average. Averaging reduces the influence of the part of the signal not synchronous with the trigger signal.

14.1.1.3 Displacement input

- **Overall level (Relative Displacement):**
  - Detection: RMS, true or equivalent peak, true or equivalent peak-to-peak
  - High-pass filter: 2 Hz (120 CPM), 10 Hz (600 CPM)
  - Low-pass filter: 300 Hz (18 kCPM), 1 kHz (60 kCPM), 2 kHz (120 kCPM), 3kHz (180 kCPM),
    20 kHz (1200 kCPM), 40 kHz (2400 kCPM)
  - Measurement time: 1 to 20 s
  - Peak hold: Off, On

- **Position:**
  - Measurement time: 1 to 20 s
  - Peak hold: Off, On

- **Spectrum (Relative displacement):**
  - High-pass filter: None, 2 Hz (120 CPM), 10 Hz (600 CPM)
  - Frequency range: 80 kHz (4800 kCPM), 40 kHz (2400 kCPM), 20 kHz (1200 kCPM), 10 kHz (600 kCPM), 5 kHz (300 kCPM), 2 kHz (120 kCPM), 1 kHz (60 kCPM), 500 Hz (30 kCPM), 200 Hz (12 kCPM), 100 Hz(6000 CPM), 50 Hz (3000 CPM)
  - Number of lines: 100, 200, 400, 800, 1600, 3200, 6400, 12.8k, 25.6k, 51.2k, 102.4k
  - Number of averages: 1 to 4096
  - Overlapping: 0%, 50%, 75%
  - Weighting window: Hanning, rectangular, flat top
  - Averaging: Linear, Peak
  - Zoom factor: x1, x2, x4, x8, ..., x128

- Zoom central frequency zoom : Value in Hz (If zoom ≠ x1)

- **Phased spectrum (Relative displacement):**
  - High-pass filter: None, 2 Hz (120 CPM), 10 Hz (600 CPM)
  - Frequency range: 40 kHz (2400 kCPM), 20 kHz (1200 kCPM), 10 kHz (600 kCPM), 5 kHz (300 kCPM), 2 kHz (120 kCPM), 1 kHz (60 kCPM), 500 Hz (30 kCPM), 200 Hz (12 kCPM), 100 Hz(6000 CPM), 50 Hz (3000 CPM)
  - Number of lines: 100, 200, 400, 800, 1600, 3200, 6400
  - Number of averages: 1 to 4096

Notes:

- Weighting window is set to Hanning
- This type of measurement requires a trigger input used as phase reference. It also measures the rotation frequency. This frequency value is stored along with the phased spectrum and used as running speed by the vector extraction parameter.

- **Time wave (Relative displacement):**
  - High-pass filter: None, 2 Hz (120 CPM), 10 Hz (600 CPM)
  - Sampling frequency: 204.8 kHz, 102.4 kHz, 51.2 kHz, 25.6 kHz, 12.8 kHz, 5.12 kHz, 2.56 kHz, 1.28 kHz, 512 Hz, 256 Hz
  - Number of samples: 256, 512, 1K, 2K, 4K, 8K, 16K, 32K, 64K. With FALCON long time wave option: 128K, 256K, 512K, 1M, 2M and 4M

- **Synchronous Time wave (Relative displacement):**
  - High-pass filter: None, 2 Hz (120 CPM), 10 Hz (600 CPM)
  - Sampling frequency: 204.8 kHz, 102.4 kHz, 51.2 kHz, 25.6 kHz, 12.8 kHz, 5.12 kHz, 2.56 kHz, 1.28 kHz, 512 Hz, 256 Hz
  - Number of samples: 256, 512, 1K, 2K, 4K, 8K, 16K, 32K
  - Number of averages: 1 to 4096

Notes: this type of measurement requires a “tachometer” as trigger input used to trigger each average. Averaging reduces the influence of the part of the signal not synchronous with the trigger signal.

*14.1.1.4**Broad band (spectrum)***

This parameter extracts the overall value of the spectrum in the indicated frequency range. It is computed in the instrument.

- Fmin in Hz: lower frequency of the band in Hz
- Fmax in Hz: upper frequency of the band in Hz
- Detection: RMS, equivalent peak, equivalent peak-to-peak

- Parameter: Acceleration, Velocity, Displacement
- Signal to process: select the spectrum

14.1.1.5 Process parameters and signals

- **Process DC parameter:**
  - Name
  - Input type: DC input or keyboard input
  - Unit:
    - If temperature: °C or °F
    - If “Other”: input the unit name
  - If Input type is “DC”
    - Sentivity in mV/Unit
    - Measurement time: 1 to 20 s
    - Peak hold: Off, On

Note: if the input type is keyboard, it is possible to modify the value in the Health matrix if you click on “⋮”

- **Process AC parameter Overall level:**
  - Name
  - Detection: RMS, true or equivalent peak, true or equivalent peak-to-peak
  - High-pass filter: None, 2 Hz (120 CPM), 10 Hz (600 CPM), 3 kHz (180 kCPM)
  - Low-pass filter: 300 Hz (18 kCPM), 1 kHz (60 kCPM), 2 kHz (120 kCPM), 3kHz (180 kCPM),
    20 kHz (1200 kCPM), 40 kHz (2400 kCPM)
  - Measurement time: 1 to 20 s
  - Peak hold: Off, On

- **Process AC parameter Spectrum:**
  - Name
  - High-pass filter: None, 2 Hz (120 CPM), 10 Hz (600 CPM)
  - Frequency range: 80 kHz (4800 kCPM), 40 kHz (2400 kCPM), 20 kHz (1200 kCPM), 10 kHz (600 kCPM), 5 kHz (300 kCPM), 2 kHz (120 kCPM), 1 kHz (60 kCPM), 500 Hz (30 kCPM), 200 Hz (12 kCPM), 100 Hz(6000 CPM), 50 Hz (3000 CPM)
  - Number of lines: 100, 200, 400, 800, 1600, 3200, 6400, 12.8k, 25.6k, 51.2k, 102.4k
  - Number of averages: 1 to 4096
  - Overlapping: 0%, 50%, 75%
  - Weighting window: Hanning, rectangular, flat top

- Averaging: Linear, Peak
- Zoom factor: x1, x2, x4, x8, ..., x128
- Zoom central frequency zoom : Value in Hz (If zoom ≠ x1)

- **Process AC parameter Envelope Spectrum:**
  - Name
  - Frequency range: 80 kHz (4800 kCPM), 40 kHz (2400 kCPM), 20 kHz (1200 kCPM), 10 kHz (600 kCPM), 5 kHz (300 kCPM), 2 kHz (120 kCPM), 1 kHz (60 kCPM), 500 Hz (30 kCPM), 200 Hz (12 kCPM), 100 Hz(6000 CPM), 50 Hz (3000 CPM)
  - Number of lines: 100, 200, 400, 800, 1600, 3200, 6400, 12.8k, 25.6k, 51.2k, 102.4k
  - Number of averages: 1 to 4096
  - Band-pass filter width: Frequency input range divided by 2, 4, 8 … ,128
  - Band-pass filter central frequency: Value in Hz
  - Overlapping: 0%, 50%, 75%
  - Weighting window: Hanning, rectangular, flat top
  - Averaging: Linear, Peak

- **Process AC parameter Phased spectrum:**
  - High-pass filter: None, 2 Hz (120 CPM), 10 Hz (600 CPM)
  - Frequency range: 40 kHz (2400 kCPM), 20 kHz (1200 kCPM), 10 kHz (600 kCPM), 5 kHz (300 kCPM), 2 kHz (120 kCPM), 1 kHz (60 kCPM), 500 Hz (30 kCPM), 200 Hz (12 kCPM), 100 Hz(6000 CPM), 50 Hz (3000 CPM)
  - Number of lines: 100, 200, 400, 800, 1600, 3200, 6400
  - Number of averages: 1 to 4096

Notes:

- Weighting window is set to Hanning
- This type of measurement requires a trigger input used as phase reference. It also measures the rotation frequency. This frequency value is stored along with the phased spectrum and used as running speed by the vector extraction parameter.

- **Process AC parameter Time wave:**
  - High-pass filter: None, 2 Hz (120 CPM), 10 Hz (600 CPM)
  - Sampling frequency: 204.8 kHz, 102.4 kHz, 51.2 kHz, 25.6 kHz, 12.8 kHz, 5.12 kHz, 2.56 kHz, 1.28 kHz, 512 Hz, 256 Hz
  - Number of samples: 256, 512, 1K, 2K, 4K, 8K, 16K, 32K, 64K. With FALCON long time wave option: 128K, 256K, 512K, 1M, 2M and 4M

- **Process AC parameter Synchronous Time wave:**
  - High-pass filter: None, 2 Hz (120 CPM), 10 Hz (600 CPM)
  - Sampling frequency: 204.8 kHz, 102.4 kHz, 51.2 kHz, 25.6 kHz, 12.8 kHz, 5.12 kHz, 2.56 kHz, 1.28 kHz, 512 Hz, 256 Hz

- Number of samples: 256, 512, 1K, 2K, 4K, 8K, 16K, 32K
- Number of averages: 1 to 4096

Notes: this type of measurement requires a “tachometer” as trigger input used to trigger each average. Averaging reduces the influence of the part of the signal not synchronous with the trigger signal.

14.1.1.6 Coast-down profile and Duration

- **Coast-down profile**: This processing allows controlling the slow-down duration of a machine. The deceleration can be checked by measuring the slow-down time between two speed thresholds called “Beginning speed” and “Ending speed” thresholds. Duration shorter than expected can reveal friction hence damage to the machine.
  - Beginning speed: Recording triggering threshold for slow-down time of the machine. From 12 to 60000 RPM (0.2 to 1000 Hz)
  - Ending speed: Stopping threshold for the measurement of slow-down time. From 12 to 60000 RPM and < Beginning speed.
  - Delta TIME (sec): Maximum time between 2 points of the sampled signal: if speed has not varied significantly since the last point, a point is recorded after the indicated time delta. From 0.1 to 60.
  - Delta speed: points of the sampled signal: a point is recorded after a speed variation higher than or equal to the indicated RPM delta for a time period shorter than the time delta. From 0 to 600.
  - Full scale: Full scale value during recording for the y-axis. Greater than Beginning speed.

Notes:

- The maximum number of recorded samples is 1024 for a slow-down profile.
- The end speed can be set to 12 RPM but the time accuracy will depend on the passing moment for the last pulse of the shaft rotation during the last revolution.
- Recommendations for setting :
  - As a general rule, a slow-down profile with about 500 points is accurate enough to interpret the measurement and compare it with a reference curve.
  - The delta time and delta speed parameters must be adjusted, in particular for machines with a high initial rotation speed (> 3000 rpm) for a long shutdown time (>60 s).
  - For the other machines, delta speed can be set to 0 (maximum resolution with respect to the rotation speed)
- Measurement, operating mode:

1. Wait for the display by the collector of the instantaneous rotation speed

2. Wait for the rotation speed of the machine to be higher than the Beginning speed parameter value
3. Wait for the bargraph displayed by the collector to switch to red and for the display of the “wait for measurement to start” message
4. Start the measurement
5. Wait for 2 seconds to make sure the collector has taken into account the measurement triggering signal
6. Ask the operator to start the slow-down of the machine

- **Duration**: this post-processing is applied on a coast-down signal and allows determining the time required to go from the Start value to the End value:
    - Start value
    - End value
    - Signal to process: select the Coast-down profile to process.

14.1.2 *EAGLE measurements*

14.1.2.1 Overview

Operating parameters:

Measurements : / Input type :	**Rotation speed**	**Other**	**Logical**	**Temperature**
External Input (Modbus)	x	x	x	x

Monitoring parameters & signals:

Input type: / Measurements :	**Eagle Wireless Sensor (1 or 3-axis)**
Overall	Temperature (per sensor), Acceleration, Velocity
Spectrum	Acceleration, Velocity
Envelope spectrum	Acceleration
Time signal	Acceleration

14.1.2.2 Settings details

- **Temperature**
    - no settings

- **Overall Acceleration level:**
    - Detection: RMS, true peak-to-peak
    - High-pass filter: None, 2 Hz, 10 Hz
    - Low-pass filter: 1 kHz, 20 kHz
    - Measurement time: 1 to 5 s

- **Overall Velocity level:**
  - Detection: RMS
  - High-pass filter: 2 Hz (120 CPM), 10 Hz (600 CPM
  - Low-pass filter: 1 kHz (60 kCPM), 20 kHz (1200 kCPM)
  - Measurement time: 1 to 5 s

- **Spectrum (Acceleration, Velocity):**
  - High-pass filter: None*, 2 Hz, 10 Hz
  - Frequency range: 20 kHz, 10 kHz, 5 kHz, 2 kHz, 1 kHz, 500 Hz, 200 Hz, 100 Hz
  - Number of lines: 800, 1600, 3200
  - Number of averages: 1 to 60
  - Overlapping: 0%, 50%, 75%
  - Weighting window: Hanning
  - Averaging: Linear

  * Not available for Velocity

- **Envelope spectrum (Acceleration):**
  4 fixed settings are available:

Use case	Name	ENV filter	ENV max freq.	# lines	Aver.
CPM < 300	ENV (0.5-5.5kHz) 200Hz	500Hz-5.5kHz	200 Hz	1600	4
250 < CPM < 1000	ENV (1-6kHz) 500Hz	1kHz-6kHz	500 Hz	1600	4
1000 < CPM < 3000	ENV (2-12kHz) 1000Hz	2kHz-12kHz	1000 Hz	3200	4
3000 < CPM	ENV (8-20kHz) 2000Hz	8kHz-20kHz	2000 Hz	3200	4

  Other properties:

  - Overlapping: 50%
  - Weighting window: Hanning
  - Averaging: Linear

- **Time wave (Acceleration):**
  - High-pass filter: None, 2 Hz, 10 Hz
  - Sampling frequency: 25.6 kHz, 12.8 kHz, 5.12 kHz, 2.56 kHz, 1.28 kHz, 512 Hz, 256 Hz
  - Number of samples: 256, 512, 1K, 2K, 4K, 8K, 16K

14.1.3 *MVX measurements*

14.1.3.1 Overview

Operating parameters:

Measurements : / Input type :	Rotation speed	Smart On Off	Other	Logical	Temperature
Tachometer	x				
IEPE or AC acceleration		x			
IEPE or AC velocity input		x			
AC displacement input		x			
DC input	x		x		x
IEPE DC input			x		x
4-20mA DC input	x		x		x
Modbus input (via MVx)	x		x	x	x
Logical				x	
OPC UA input (via NESTi4)	x		x	x	x
OPC UA input (via MVx)					

Monitoring parameters & signals:

Input type: / Measurements :	IEPE or AC acceleration input	IEPE or AC velocity input	IEPE or AC displacement input
Monitoring parameters with alarms (if needed)			
Overall	Acceleration, Velocity, Absolute displacement	Velocity, Absolute displacement	Relative displacement, Position
Defect factor	x	not available	not available
Kurtosis	x	not available	not available
SFI	x	not available	not available
Narrow band	x	x	x
Broad band	x	x	x
Wind turbine tower	x	not available	not available
Piping Criteria	x	x	not available
Monitoring signals (spectra, timewave, …)			
Spectrum	Acceleration, Velocity, Displacement	Velocity, Displacement	Displacement
Envelope spectrum	Acceleration	not available	not available
Envelope spectrum (filter)	Acceleration	not available	not available
Phased spectrum	Acceleration, Velocity, Displacement	Velocity, Displacement	Displacement
Time signal	Acceleration, Velocity, Displacement	Velocity, Displacement	Displacement
Time wave on Event	Acceleration	Velocity	Displacement
Synchronous Time wave	Acceleration	Velocity	Displacement
RSS Spectrum	Acceleration	Velocity	Displacement
RSS Envelope Spectrum	Acceleration	Velocity	Displacement
RSS Time signal	Acceleration	Velocity	Displacement

RSS Envelope Time signal	Acceleration	Velocity	Displacement

14.1.3.2 IEPE or AC acceleration input

- **Overall (Acceleration, Velocity, Absolute Displacement)**
  - Detection: RMS, True Peak or Equivalent, True Peak Peak or Equivalent
  - High Pass Filter: None*, 2 Hz (120 CPM), 10 Hz (600 CPM), 3kHz (180 kCPM)*
  - Low-pass filter: 300 Hz (18 kCPM), 1 kHz (60 kCPM), 2 kHz (120 kCPM), 3kHz (180 kCPM), 20 kHz (1200 kCPM)
  - Real time:
    - Yes, No If Yes: Time constant: 1 to 600 s
    - If No: Measurement time: 1 to 20 s Max memorization: On, Off

* not accessible for Vibration Speed and Displacement.

- **Defect factor**
  - Measurement duration: 1 to 20 s, default value: 7 s

Note: the recommended thresholds are 6 for the Alarm threshold and 9 for the Danger.

- **Kurtosis**

This processing calculates the Kurtosis on the signal filtered by a band-pass filter. This indicator detects the presence of shocks in the signal and is suitable for machines with slow rotation speeds. The treatment is defined mathematically as the central moment of order 4 of the time series :

  - High pass filter: from 50 Hz to half the frequency of the low pass filter
  - Low pass filter: from 2 times the frequency of the high pass filter to 20 kHz. Minimum value: 500 Hz
  - Measurement duration: 1 to 80 s

- **SFI Shock Finder Index**

The SFI was developed primarily to monitor slowly rotating machinery. It mainly applies to the transmission of wind turbines and can also give indications on the state of paper machines, ... The original concept is to base an alarm on the number of abnormal shocks received by the monitored equipment.

The process is described as follows:

- The algorithm filters the temporal signal in order to eliminate the noise, and to reveal the shocks.
- The algorithm then detects the shocks, and counts them.
- The algorithm uses a dedicated function to check the repeating pattern over an observation period (smoothing) to avoid false alarms.

Note : it is necessary to first create a time signal measurement. It is recommended that its sampling frequency be higher than 25.6 kHz. Its duration should be at least 3 revolutions of the shaft.

- Threshold (number of shocks): Integer from 0 to 65536, default value = 10
- Smoothing depth (PL): 1 to 100, default value = 20
- Max total number of overruns (Ntot): from 1 to PL, default value = 15
- Max number of successive overruns: from 1 to Ntot, default value = 10
- Signal to process: select from the list of times. You cannot set more than one SFI indicator on each time wave

Display of the result in Analyst:

- The displayed result is the number of shocks corresponding to the stored time
- Cell color: green if number of shocks < threshold, orange otherwise
- The trend shows the number of shocks
- Overrun counting is used by MVX to avoid false alarms due to shocks unrelated to a machine fault

- **Spectrum (Acceleration, Velocity, Absolute displacement)**
  - High Pass Filter: None*, 2 Hz (120 CPM), 10 Hz (600 CPM)
  - Frequency range: 20 kHz (1200 kRPM), 10 kHz (600 kRPM), 5 kHz (300 kRPM), 2 kHz (120 kRPM), 1 kHz (60 kRPM), 500 Hz (30 kRPM), 200 Hz (12kRPM), 100Hz (6000RPM), 50Hz (3000RPM)
  - Number of lines: 400, 800, 1600, 3200, 6400, 12.8k, 25.6k
  - Number of averages: 1 to 4096
  - Weighting window: Hanning, rectangular, flat top
  - Recovery: 0%, 50%, 75%
  - Real time: Yes, No

  * not accessible for Vibratory speed and Displacement.

- **Envelope spectrum (Acceleration)**
  - Frequency range: 20 kHz (1200 kRPM), 10 kHz (600 kRPM), 5 kHz (300 kRPM), 2 kHz (120 kRPM), 1 kHz (60 kRPM), 500 Hz (30 kRPM), 200 Hz (12kRPM), 100Hz

(6000RPM), 50Hz (3000RPM), 50Hz (3000RPM) , 20Hz (1200RPM) , 10Hz (600RPM) , 5Hz (300RPM) , 2Hz (120RPM) , 1Hz (60RPM), 0.5Hz (30RPM)
    - Number of lines: 400, 800, 1600, 3200, 6400, 12.8k, 25.6k
    - Number of averages: 1 to 4096
    - Bandpass filter width: “Input frequency range” divided by 2, 4, 8 … .128
    - Center frequency bandpass filter: value in Hz
    - Recovery: 0%, 50%, 75%
    - Windowing: Hanning, rectangular, flat top
    - Averaging: Linear, Exponential, Peak

- **Envelope spectrum (filter) (Acceleration)**
    - Envelope Filter: [2000;20000Hz], [200;2000Hz] and [5;200Hz]
    - Frequency range: 20 kHz (1200 kRPM), 10 kHz (600 kRPM), 5 kHz (300 kRPM), 2 kHz (120 kRPM), 1 kHz (60 kRPM), 500 Hz (30 kRPM), 200 Hz (12kRPM), 100Hz (6000RPM), 50Hz (3000RPM), 50Hz (3000RPM) , 20Hz (1200RPM) , 10Hz (600RPM) , 5Hz (300RPM) , 2Hz (120RPM) , 1Hz (60RPM), 0.5Hz (30RPM)
    - Number of lines: 400, 800, 1600, 3200, 6400, 12.8k, 25.6k
    - Number of averages: 1 to 4096
    - Windowing: Hanning, rectangular, flat top
    - Overlap: 0%, 50%, 75%
    - Averaging: Linear, Exponential, Peak

- **Phased spectrum (Acceleration, Velocity, Absolute displacement)**
    - High Pass Filter: None*, 2 Hz (120 CPM), 10 Hz (600 CPM)
    - Frequency range: 20 kHz (1200 kRPM), 10 kHz (600 kRPM), 5 kHz (300 kRPM), 2 kHz (120 kRPM), 1 kHz (60 kRPM), 500 Hz (30 kRPM), 200 Hz (12kRPM), 100Hz (6000RPM), 50Hz (3000RPM)
    - Number of lines: 400, 800, 1600, 3200, 6400
    - Number of averages: 1 to 4096

* not accessible for Vibratory speed and Displacement

Note:

- The weighting window is Hanning.
- This type of measurement requires a variable speed machine measured from a trigger input, it serves as a phase reference. It also measures rotational frequency. This frequency value is stored with the phased spectrum and is used as rotational speed by the vector extraction parameter

- **Time wave (Acceleration)**
    - High pass filter: None, 2 Hz (120 CPM), 10 Hz (600 CPM)

- Sampling frequency: 51.2 kHz, 25.6 kHz, 12.8 kHz, 5.12 kHz, 2.56 kHz, 1.28 kHz, 512 Hz, 256 Hz, 128 Hz
- Number of samples: 1K, 2K, 4K, 8K, 16K, 32K, 64K, 128 K, 256 K, 512 K, 1 M, 2 M and 4 M

- **Synchronous Time wave (Acceleration)**
  - High Pass Filter: None, 2 Hz (120 CPM), 10 Hz (600 CPM)
  - Sampling frequency: 204.8 kHz, 102.4 kHz, 51.2 kHz, 25.6 kHz, 12.8 kHz, 5.12 kHz, 2.56 kHz, 1.28 kHz, 512 Hz, 256 Hz
  - Number of samples: 256, 512, 1K, 2K, 4K, 8K
  - Number of averages: 1 to 4096

Notes : This type of measurement requires a variable speed machine measured from a trigger input, it is used as a trigger reference for synchronous averaging. This reduces the influence of signals not synchronous with the top turn.

- **Time wave on Event (Acceleration)**
  - Sampling frequency: 51.2 kHz
  - Signal duration (ms) : 0 to 960000 ms
  - Pre-trigger duration (ms) : 0 to 460000 ms

Notes : This type of measurement requires to use real time parameter to catch signal on aggravating alarm status change.

14.1.3.3 IEPE or AC velocity input

- **Overall level (Velocity, Absolute displacement)**
  - Detection: RMS, True Peak or equivalent, True Peak to Peak or equivalent
  - High Pass Filter: None*, 2Hz (120CPM), 10Hz (600CPM), 3kHz (180kCPM)*
  - Low pass filter: 300 Hz (18 kCPM), 1 kHz (60 kCPM), 2 kHz (120 kCPM), 3 kHz (180 kCPM), 20kHz (1200 kCPM)
  - If Real time = Yes
    - Time constant: 1 to 600 s
  - If Real time = No:
    - Measurement duration: 1 to 20 s
    - Peak hold : On, Off

* not accessible for displacement

- **Spectrum (Velocity, Absolute displacement)**
    - High Pass Filter: None*, 2 Hz (120 CPM), 10 Hz (600 CPM)
    - Frequency range: 20 kHz (1200 kRPM), 10 kHz (600 kRPM), 5 kHz (300 kRPM), 2 kHz (120 kRPM), 1 kHz (60 kRPM), 500 Hz (30 kRPM), 200 Hz (12kRPM), 100Hz (6000RPM), 50Hz (3000RPM)
    - Number of lines: 400, 800, 1600, 3200, 6400, 12.8k, 25.6k
    - Number of averages: 1 to 4096
    - Weighting window: Hanning, rectangular, flat top
    - Recovery: 0%, 50%, 75%
    - Real time: Yes, No

* not accessible for displacement

- **Phased spectrum (Velocity, Absolute displacement)**
    - High Pass Filter: None*, 2 Hz (120 CPM), 10 Hz (600 CPM)
    - Frequency range: 20 kHz (1200 kRPM), 10 kHz (600 kRPM), 5 kHz (300 kRPM), 2 kHz (120 kRPM), 1 kHz (60 kRPM), 500 Hz (30 kRPM), 200 Hz (12kRPM), 100Hz (6000RPM), 50Hz (3000RPM)
    - Number of lines: 400, 800, 1600, 3200, 6400
    - Number of averages: 1 to 4096

* not accessible for displacement

Notes :

- The weighting window is Hanning.
- This type of measurement requires a variable speed machine measured from a trigger input, it serves as a phase reference. It also measures the rotational frequency. This frequency value is stored with the phased spectrum and is used as rotational speed by the vector extraction parameter

- **Time wave (Velocity)**
    - High pass filter: None, 2 Hz (120 CPM), 10 Hz (600 CPM)
    - Sampling frequency: 51.2 kHz, 25.6 kHz, 12.8 kHz, 5.12 kHz, 2.56 kHz, 1.28 kHz, 512 Hz, 256 Hz, 128 Hz
    - Number of samples: 1K, 2K, 4K, 8K, 16K, 32K, 64K, 128 K, 256 K, 512 K, 1 M, 2 M and 4 M

- **Synchronous Time wave (Velocity)**
    - High pass filter: None, 2 Hz (120 CPM), 10 Hz (600 CPM)

- Sampling frequency: 204.8 kHz, 102.4 kHz, 51.2 kHz, 25.6 kHz, 12.8 kHz, 5.12 kHz, 2.56 kHz, 1.28 kHz, 512 Hz, 256 Hz
- Number of samples: 256, 512, 1K, 2K, 4K, 8K
- Number of averages: 1 to 4096

Notes : This type of measurement requires a variable speed machine measured from a trigger input, it is used as a trigger reference for synchronous averaging. This reduces the influence of signals not synchronous with the top turn.

- **Time wave on Event (Velocity)**
  - Sampling frequency: 51.2 kHz
  - Signal duration (ms) : 0 to 960000 ms
  - Pre-trigger duration (ms) : 0 to 460000 ms

Notes : This type of measurement requires to use real time parameter to catch signal on aggravating alarm status change.

*14.1.3.4**Displacement input***

- **Overall level (Relative Displacement)**
  - Detection: RMS, True Peak or equivalent, True Peak to Peak or equivalent
  - High pass filter: None, 2 Hz (120 CPM), 10 Hz (600 CPM), 3 kHz (180 kCPM)*
  - Low pass filter: 300 Hz (18 kCPM), 1 kHz (60 kCPM), 2 kHz (120 kCPM), 3 kHz (180 kCPM),
  - 20kHz (1200kCPM)
  - If Real time = Yes then
    - Time constant: 1 to 600 s
  - If Real time = No then
    - Measurement duration: 1 to 20 s
    - Peak hold: On, Off

- **Position :**
  - If Real time = Yes then
    - Time constant: 1 to 600 s
  - If Real time = No then
    - Measurement duration: 1 to 20 s

        - Peak hold: On, Off

- **Spectrum (Relative displacement)**
    - High pass filter: None, 2 Hz (120 CPM), 10 Hz (600 CPM)
    - Frequency range: 20 kHz (1200 kRPM), 10 kHz (600 kRPM), 5 kHz (300 kRPM), 2 kHz (120 kRPM), 1 kHz (60 kRPM), 500 Hz (30 kRPM), 200 Hz (12kRPM), 100Hz (6000RPM), 50Hz (3000RPM)
    - Number of lines: 400, 800, 1600, 3200, 6400, 12.8k, 25.6k
    - Number of averages: 1 to 4096
    - Weighting window: Hanning, rectangular, flat top
    - Recovery: 0%, 50%, 75%
    - Real time: Yes, No

- **Phased spectrum (Relative displacement)**
    - High pass filter: None, 2 Hz (120 CPM), 10 Hz (600 CPM)
    - Frequency range: 20 kHz (1200 kRPM), 10 kHz (600 kRPM), 5 kHz (300 kRPM), 2 kHz (120 kRPM), 1 kHz (60 kRPM), 500 Hz (30 kRPM), 200 Hz (12kRPM), 100Hz (6000RPM), 50Hz (3000RPM)
    - Number of lines: 400, 800, 1600, 3200, 6400
    - Number of averages: 1 to 4096

Notes:

- The weighting window is Hanning.
- This type of measurement requires a variable speed machine measured from a trigger input, it serves as a phase reference. It also measures the rotational frequency. This frequency value is stored with the phased spectrum and is used as rotational speed by the vector extraction parameter

- **Time wave (Relative displacement)**
    - High pass filter: None, 2 Hz (120 CPM), 10 Hz (600 CPM)
    - Sampling frequency: 51.2 kHz, 25.6 kHz, 12.8 kHz, 5.12 kHz, 2.56 kHz, 1.28 kHz, 512 Hz, 256 Hz, 128 Hz
    - Number of samples: 1K, 2K, 4K, 8K, 16K, 32K, 64K, 128 K, 256 K, 512 K, 1 M, 2 M and 4 M

- **Synchronous Time wave (Relative displacement)**
    - High pass filter: None, 2 Hz (120 CPM), 10 Hz (600 CPM)
    - Sampling frequency: 204.8 kHz, 102.4 kHz, 51.2 kHz, 25.6 kHz, 12.8 kHz, 5.12 kHz, 2.56 kHz, 1.28 kHz, 512 Hz, 256 Hz
    - Number of samples: 256, 512, 1K, 2K, 4K, 8K
    - Number of averages: 1 to 4096

Notes : This type of measurement requires a variable speed machine measured from a trigger input, it is used as a trigger reference for synchronous averaging. This reduces the influence of signals not synchronous with the top turn.

14.1.3.5 Broad band, Narrow band (spectrum)

NOTE: MVX can integrate but not derivate – ie: hard peak or band can be calculated as a velocity on an acceleration spectra but not the reverse

- **Broad band**

This parameter extracts the overall level of the spectrum in the specified frequency band. It is calculated in the instrument :

  - Fmin in Hz: lower band limit in Hz
  - Fmax in Hz: upper band limit in Hz
  - Detection: RMS, equivalent peak, equivalent peak to peak
  - Parameter: acceleration, velocity, displacement
  - Signal to process: select the spectrum

- **Narrow band (AxVRot+ B Hz +/-i)**

This parameter is used to extract the amplitude of the spectrum around the indicated frequency.

  - A in order: 1 to extract the peak at rotation speed, 2 for harmonic 2, ...
  - B in Hz: used to extract the amplitude at a fixed frequency.
  - i online search width: integer to indicate online the search interval around “AxVrot + B”.
  - Detection: RMS, equivalent peak, equivalent peak to peak
  - Parameter: acceleration, velocity, displacement
  - Signal to process: select the spectrum.

14.1.3.6 Process parameters and signals

- **Process DC parameter (monitoring parameters or operating parameters)**
  - Name
  - Input type : DC, IEPE DC, 4-20mA DC, Externe (MVX Modbus) or OPC UA (NESTi4)
  - Unit :
    - If rotation speed: Hz or RPM
    - If temperature parameter: °C or °F

        - If "Other" parameter: name of the unit
    - If input type is « DC » or « IEPE DC »
        - Sensitivity in mV/Unit
        - Offset in Input Unit
    - If input type is « 4-20mA »
        - Physical value for 4 mA in input unit
        - Physical value for 20 mA in input unit
    - If input type is « Tachometer »
        - High trigger threshold: from -24 to +24V
        - Low trigger threshold: from -24 to +24V
        - Number of top per revolution: from 1 to 65536
    - Real time: Yes, No (Monitoring parameters only, operating parameters are real time)
        - If Yes then Time constant from 1 to 600 s
        - If Yes then measurement duration from 1 to 20 s and Max memorization : On, Off

- **Logical input (operating parameter)**
    - Logical state 0 label : string of characters
    - Logical state 1 label: string of characters

- **Smart On/Off (operating parameter)**

One of the scalar operating parameters can be the "Smart_On/Off" parameter using a vibration channel to detect whether the machine is working or not (Off if the vibration level is very low) :

- Input type: IEPE Acc, AC Acc, IEPE Vib Speed, AC Vib Speed, AC Displacement
- Sensitivity: in mV/input unit

The processing is a global level 2-20000 Hz RMS, real time, Time constant = 5 s. Input type and sensitivity must match if connected to a channel that is already in use

- **AC Process parameter – Overall**
    - Name
    - Detection: RMS, True Peak or equivalent, True Peak to Peak or equivalent
    - High pass filter: None, 2 Hz (120 CPM), 10 Hz (600 CPM), 3 kHz (180 kCPM)
    - Low pass filter: 300 Hz (18 kCPM), 1 kHz (60 kCPM), 2 kHz (120 kCPM), 3 kHz (180 kCPM),

- 20kHz (1200kCPM)
- Real time: Yes, No
    - If Yes: Time constant: 1 to 600 s
    - If No: Measurement duration: 1 to 20 s and Max memorization: On, Off

- **AC Process parameter – Spectrum**
    - High pass filter: None, 2 Hz (120 CPM), 10 Hz (600 CPM)
    - Frequency range: 20 kHz (1200 kRPM), 10 kHz (600 kRPM), 5 kHz (300 kRPM), 2 kHz (120 kRPM), 1 kHz (60 kRPM), 500 Hz (30 kRPM), 200 Hz (12kRPM), 100Hz (6000RPM), 50Hz (3000RPM)
    - Number of lines: 400, 800, 1600, 3200, 6400, 12.8k, 25.6k
    - Number of averages: 1 to 4096
    - Weighting window: Hanning, rectangular, flat top
    - Recovery: 0%, 50%, 75%
    - Real time: Yes, No

- **AC Process parameter – Envelop spectrum**
    - Frequency range: 20 kHz (1200 kRPM), 10 kHz (600 kRPM), 5 kHz (300 kRPM), 2 kHz (120 kRPM), 1 kHz (60 kRPM), 500 Hz (30 kRPM), 200 Hz (12kRPM), 100Hz (6000RPM), 50Hz (3000RPM)
    - Number of lines: 400, 800, 1600, 3200, 6400, 12.8k, 25.6k
    - Number of averages: 1 to 4096
    - Bandpass filter width: “Input frequency range” divided by 2, 4, 8 … .128
    - Center frequency bandpass filter: value in Hz
    - Recovery: 0%, 50%, 75%
    - Weighting window: Hanning, rectangular, flat top
    - Averaging: linear, peak

- **AC Process parameter – Phased spectrum**
    - High pass filter: None, 2 Hz (120 CPM), 10 Hz (600 CPM)
    - Frequency range: 20 kHz (1200 kRPM), 10 kHz (600 kRPM), 5 kHz (300 kRPM), 2 kHz (120 kRPM), 1 kHz (60 kRPM), 500 Hz (30 kRPM), 200 Hz (12kRPM), 100Hz (6000RPM), 50Hz (3000RPM)
    - Number of lines: 400, 800, 1600, 3200, 6400
    - Number of averages: 1 to 4096

Notes:

- The weighting window is Hanning
- This type of measurement requires a variable speed machine measured from a trigger input, it serves as a phase reference. It also measures the rotational

frequency. This frequency value is stored with the phased spectrum and is used as rotational speed by the vector extraction parameter

- **AC Process parameter – Time wave**
  - High pass filter: None, 2 Hz (120 CPM), 10 Hz (600 CPM)
  - Sampling frequency: 51.2 kHz, 25.6 kHz, 12.8 kHz, 5.12 kHz, 2.56 kHz, 1.28 kHz, 512 Hz, 256 Hz, 128 Hz
  - Number of samples: 1K, 2K, 4K, 8K, 16K, 32K, 64K, 128 K, 256 K, 512 K, 1 M, 2 M and 4 M

- **AC Process parameter – Synchronous Time wave**
  - High pass filter: None, 2 Hz (120 CPM), 10 Hz (600 CPM)
  - Sampling frequency: 204.8 kHz, 102.4 kHz, 51.2 kHz, 25.6 kHz, 12.8 kHz, 5.12 kHz, 2.56 kHz, 1.28 kHz, 512 Hz, 256 Hz
  - Number of samples: 256, 512, 1K, 2K, 4K, 8K
  - Number of averages: 1 to 4096

Notes : This type of measurement requires a variable speed machine measured from a trigger input, it is used as a trigger reference for synchronous averaging. This reduces the influence of signals not synchronous with the top turn.

- **AC Process parameter – Time wave on Event**
  - Sampling frequency: 51.2 kHz
  - Signal duration (ms) : 0 to 960000 ms
  - Pre-trigger duration (ms) : 0 to 460000 ms

Notes : This type of measurement requires to use real time parameter to catch signal on aggravating alarm status change.

14.1.4 *SPARROW measurements*

IMPORTANT

Measurements settings must be entered into the gateway webpage but not into NESTi4 – see INSTRUMENT module + click on Sparrow tab

- **Temperature**
  - no settings

- **Overall Velocity (RMS in mm/s) – in sensor calculation**
    - Detection: RMS
    - High-pass filter: From 1 to 10000Hz (manual input) – 10Hz by default
    - Low-pass filter: From 1 to 10000Hz (manual input) – 1000Hz by default
    - Range: ± 8 g, ± 16 g or ± 32 g
    - Sampling frequency:
        - 1.6 kHz / Fmax 625Hz
        - 3.2 kHz / Fmax 1.25kHz
        - 6.4 kHz / Fmax 2.5kHz
        - 12.8 kHz / Fmax 5kHz
        - 25.6 kHz / Fmax 10kHz
    - Lines of resolution:
        - 3200 (8192 sample per channel)
        - 6400 (16384 sample per channel)

- **Time signal (Acceleration in g) – in collection or sensor collection settings**

	Single axis mode	**Tri axial mode**
Sampling frequency	▪ 1.6 kHz / Fmax 625Hz ▪ 3.2 kHz / Fmax 1.25kHz ▪ 6.4 kHz / Fmax 2.5kHz ▪ 12.8 kHz / Fmax 5kHz ▪ 25.6 kHz / Fmax 10kHz	
Lines of resolution	▪ 25,600 (65,536 samples) ▪ 30,000 (76,800 samples)	▪ 25,600 (65,536 samples) ▪ 30,000 (76,800 samples)
Recording time (sec)	from 2.56 to 48 seconds	from 0.64 to 20.48 seconds

Nota:

- Spectra must be declared as post processing into NESTi4 in order to be calculated from the time signal received from the sensor.

14.1.5 *SFx & HMx*

These parameters are specific for Accurex machines elaborated only with FALCON and/or Machine Defender

- **SFx**: Shock Finder indeX is generated automatically on machines created in Accurex mode. It is based on the ACOEM Shock Finder technology. This indicator has a value from 0 to 5 with Alarm and Danger thresholds at 3 and 5. You can see at a glance the location on the machine generating shocks without the need to analyze in detail every time waves.

Note: The alarm status of this parameter is not taken into account for the global machine alarm status.

- **HMx**: Harmonic index is also generated automatically on machines created in Accurex mode. It indicates if low or medium frequency spectra include significant harmonic families. This indicator has a value from 0 to 3 with Alarm and Danger thresholds at 2 and 3. You can see at a glance the location on the machine generating high level of harmonics without the need to analyze in detail every spectra.

Note: The alarm status of this parameter is not taken into account for the global machine alarm status.

14.2 POST-PROCESSING

14.2.1 *Parameters*

14.2.1.1 *Peak (soft): [A x F0 +B] ± I x Resolution*

This parameter extracts the amplitude of the spectrum at the indicated frequency.

- A (Order): 1 to extract the running speed, 2 for harmonic 2, …
- B (Hz): used to extract the amplitude at a fixed frequency.
- i (Nb of lines): integer to indicate in line the search interval around “AxF0 + B”.
- Detection: RMS, equivalent peak, equivalent peak-to-peak
- Result: Amplitude, Frequency (Hz), Emergence (dB)
- Parameter: Acceleration, Velocity, Displacement, As signal*
- Signal to process: Merged spectrum or select the spectrum. Merged spectrum does not manage Envelope spectrum.

* “As signal” is not accessible for merged spectrum

Note:

- No value is returned if there is no peak within the search range.

*14.2.1.2**Broad band (soft)***

This parameter extracts the overall value of the spectrum in the indicated frequency range.

- Fmin in Hz: lower frequency of the band in Hz
- Fmax in Hz: upper frequency of the band in Hz.
- Detection: RMS, equivalent peak, equivalent peak-to-peak
- Parameter: Acceleration, Velocity, Displacement, As signal*
- Signal to process: Merged spectrum or select the spectrum. Merged spectrum does not manage Envelope spectrum.

* “As signal” is not accessible for merged spectrum

*14.2.1.3**Kurtosis (soft) [time signal]***

Kurtosis is a performant indicator to detect shocks in a time wave. The Kurtosis processing is defined mathematically as the 4th order centered moment of the time series:

$$Kurtosis = \frac{1}{N}\sum_{i=1}^{N}\left(\frac{x_i - \mu}{\sigma}\right)^4$$

- Result:
  - Overall Kurt.: return the Kurtosis value of the time signal
  - Nb of sections > Threshold: return the number of sections with Kurtosis exceeding the threshold per section.
  - Max Kurt.: return the Max value of the Kurtosis computed on each sections
  - Detected impacts: return ‘1’ if the number of sections exceeding the ‘Kurt threshold per section’ is greater than ‘Threshold in nb of sections’ if not return ‘0’.
- Number of sections: integer value. Number of calculation sections. Not used if “Result” = “Overall Kurt.”
- Kurt threshold per section: Detection threshold for a section. Not used if “Result” = “Overall Kurt.” or “Kurt. Max”
- Threshold in nb of sections: Number of exceeding sections to validate the detection of an impact. Integer value < Number of sections. Used only if “Result” = “Detected impacts”
- Start in s*: starting abscissa for Kurtosis processing (in second)
- End in s*: ending abscissa for Kurtosis processing (in second)

* If Start = End = 0 then Kurtosis is calculated over the whole signal

*14.2.1.4**Time signal statistics (post-processing)***

This processing is used to extract indicators from a time signal. The extracted parameter may be the Peak-to-Peak value, the positive Peak value, the negative Peak value, the Average value or the RMS value calculated over the whole signal (overall mode) or over a section thereof (synchronized mode). In the latter case, the result can be averaged over several successive cycles. T0, the cycle period, is calculated from F0, the rotation frequency of the machine (T0 = 1/F0). If F0=0, this processing cannot be executed.

- Result:
  - Computed on the whole signal:
    - Overall RMS
    - Overall Peak to Peak
    - Overall Peak +
    - Overall Peak -
    - Overall Average
  - Computed on a window around “Delay Alt+”:
    - Synchro RMS Alt +
    - Synchro Peak Alt +
    - Synchro Average Alt +
  - Computed on a window around “Delay Alt-”:
    - Synchro RMS Alt -
    - Synchro Peak Alt -
    - Synchro Average Alt –
  - Computed on a window around “Delay Alt-” for negative peaks and on a window around “Delay Alt+” for positive peaks:
    - Synchro Peak to Peak
- Delay Alt+ (s): delay (in sec) to set the window of processing for processing performed on positive alternation (alt+ type)
- Delay Alt- (s): delay (in sec) to set the window of processing for processing performed on positive alternation (alt- type)
- Window width (s): Width of window over which processing is performed (centered around Delay Alt+ or Alt-)
- Number of cycles: For synchro type processing, number of cycles over which the result is averaged. If the number of cycles exceeds the length of the time signal, it is supplemented by 0s

14.2.1.5 *Vector extraction (AxRS)*

This parameter extracts the amplitude or the phase of the phased spectrum at the indicated frequency order.

- A in Order: 1 to extract the running speed, 2 for harmonic 2, …
- Result: Amplitude or Phase
- Detection: RMS, equivalent peak, equivalent peak-to-peak
- Signal to process: select the phased spectrum

Notes:

- The running speed used is the one stored within the phased spectrum and not the one shown on the health matrix.
- Extracted amplitude may be slightly higher than the one of the phased spectrum as this processing relies on an algorithm to limit the estimation error due to the weighting window.
- RS: Rotation speed

14.2.1.6 *Arithmetic & logical Combination*

This list of post-processing can be used to compute a parameter by arithmetic or logical combination of other parameters from the same point. It can be vibration or process parameters:

Arithmetic combinations:

Formula	Description
aP + b	
Sum (Param1, Param2, …)	
P1 - P2	
Quadratic Sum (Param1, Param2, …)	$\sqrt{P1^2 + P2^2 + \ldots}$
Quadratic Difference	$\sqrt{P1^2 - P2^2}$ Note: there is no result if P2 is greater than P1
Multiplication (Param1, Param2, …)	P1 * P2 *
P1/P2	Note: there is no result if P2=0

Logical combinations:

It is used to combine logically alarm statuses of several indicators of the same measurement point. It does not give any value to the indicator. Its alarm status only is worked out depending on the alarm status of the operand indicators:

Formula	Description
AND (Param1, Param2, …)	the resulting status is the most important alarm status

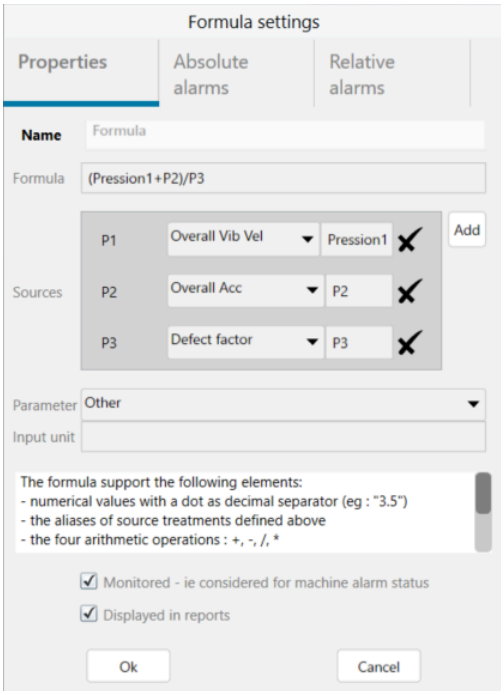
OR (Param1, Param2, …)	the resulting status is the less important alarm status

Notes:

- For temperature parameters only the combination “P1-P2” is possible.
- For the combinations axP+b, sum and difference, quadratic sum and difference, if the unit of the arguments is the same, it is preserved otherwise the resulting unit is unlabeled.
- For Multiplication and Division combinations the resulting unit is unlabeled.
- When the resulting unit is unlabeled, the values used to combine the parameters are in the storage unit (g, mm / s, µm for vibration data)

*14.2.1.7**Formula ()***

This post processing calculate a combination of one or more parameter according a specific formula entered manually into a lexical editor – example:



Definition

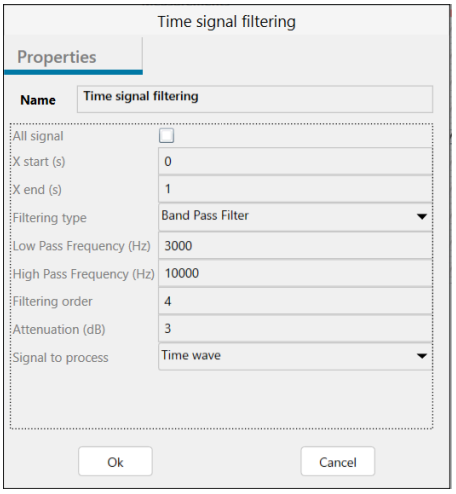
- **Name** - enter a custom name
- **Formula** - enter the mathematic expression of the expected result – ex : (P1+P2)/P3 + PI/3
- **Sources** - add/remove arguments used by mathematic expression – ex: P1 = Overall Vib Velocity, P2 = Overall Acc and P3 = Defect factor …
- **Parameter** – select a physical category (acceleration, …, temperature, … or other) in order to manage unit conversion automatically if possible
- **Input unit** – enter unit label if parameter is “other”
- **Assistant** – quick user’s guide to explain formula syntax convention and limitations

Notes:

- Formula() post processing can be added into all process groups and vibration group.

14.2.2 *Signals*

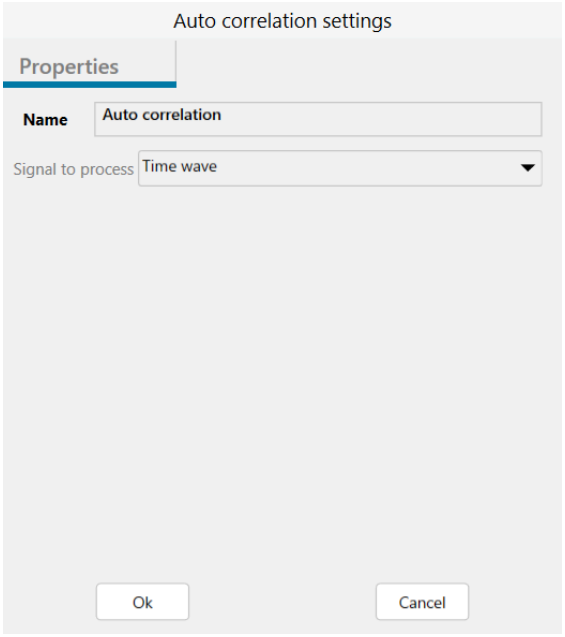
14.2.2.1 Time signal filtering



This processing makes it possible to filter all or part of a temporal signal.

Properties	Description
All signal	If checked then the time signal is entirely filtered
X start (s)	*Begin of signal to be filtered (in second)*
X end (s)	*End of signal to be filtered (in second)*
Filtering type	Select a filter type: Band Cut Filter Low Pass Filter Band Pass Filter High Pass Filter
Low pass frequency (Hz)	Enter the lower frequency of the filtering band
High pass frequency (Hz)	Enter the higher frequency of the filtering band
Filtering order	Recommended value: 4
Attenuation (dB)	Recommended value: 6
Signal to proceed	Select a timewave signal

14.2.2.2 Auto correlation



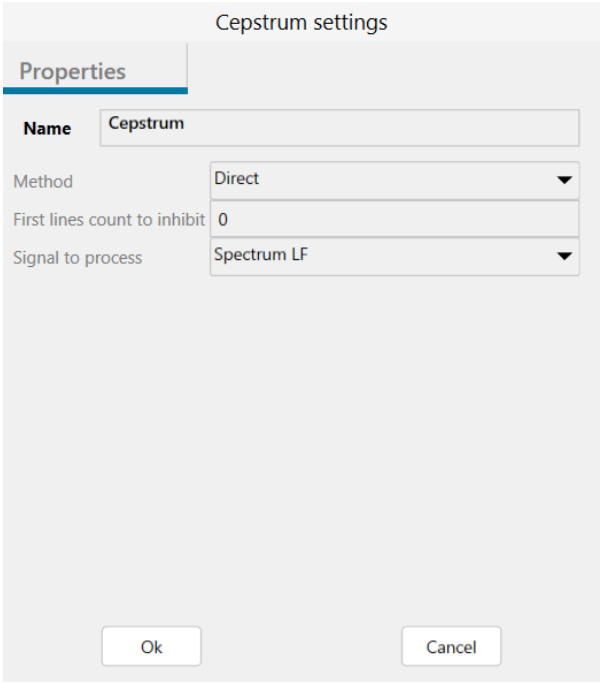
This processing is used to search for periodicities in a time signal.

Formula:

$$C_k(\tau) = \frac{1}{t_L - t_0} \int_{t_0}^{t_L} x_k(t) x_k(t-\tau)\,dt$$

Properties	Description
Signal to proceed	Select a timewave signal

*14.2.2.3**Cepstrum***

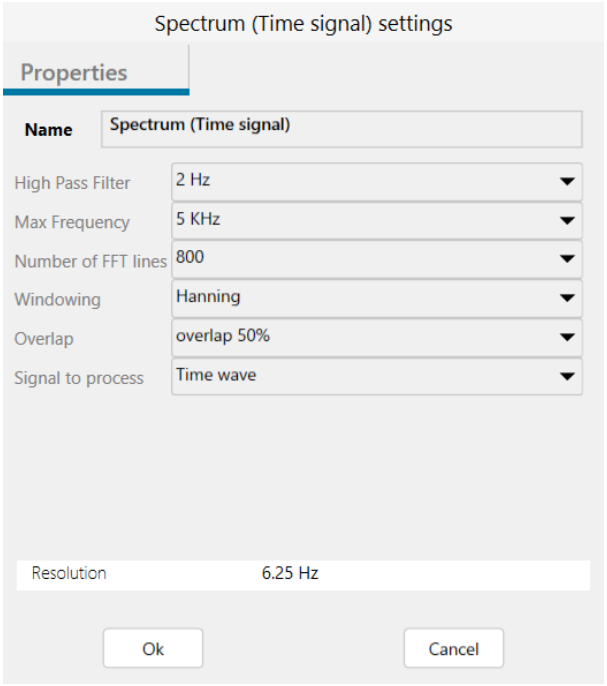


This processing allows for periodicity search in a power autospectrum. Furthermore, using the cepstrum allows ignoring the contribution of a bearing and of the different transfer functions between excitation and measurement

Formula:

Properties	Description
Method	• Methods: Operand signals are complemented at 2^n points for FFT calculation. • **Direct** (or Rensenblatt): Ce = |TF (Ln Gxx(f))|² ○ Calculation of Log of the power spectral density (G_{xx}) ○ Calculation of direct Fourier transform ○ Benefit: representation in dB scale ○ Drawback: result over 2^n /2 points => resolution loss • **Inverse** Ce = TF^{-1} [Ln G_{xx}(f)] ○ Calculation of Log of the power spectral density (G_{xx}) ○ Calculation of reverse Fourier transform ○ Benefit: Result over 2^n points (resolution is preserved) ○ Drawback: Linear scale only
First lines count to inhibit	Nb of line to ignore
Signal to process	Select a spectrum or envelope spectrum

*14.2.2.4**Spectrum (Time signal)***

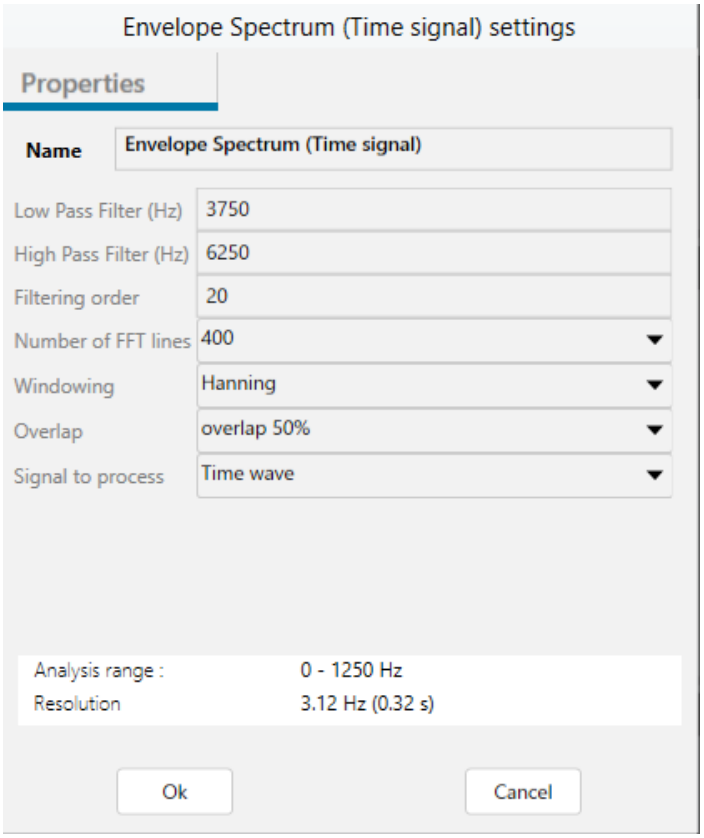


This processing allows calculating spectrum from any timewave signal

Properties	Description
High Pass Filter	None/2/10Hz
Max Frequency	50/100/200/500/1k/2k/5k/10k/20k/40k/80kHz
Number of FFT lines	100/200/400/800/1600/3200/6400/12800
Windowing	Hanning, Hamming, Rectangular, Flat top
Overlap	0/25/50/75%
Signal to process	Select a timewave signal

NOTE: Computed spectrum range can be different from spectrum Max Frequency set by user when time wave frequency range (time sampling frequency / 2.56) is less than spectrum max frequency - ex : If user sets a spectrum of 1KHz using a source time wave with sampling frequency = 1280Hz (=> Frequency range = 1280*2.56 = 500Hz), then the range of computed spectrum will be 500Hz.

14.2.2.5Envelope Spectrum (Time signal)

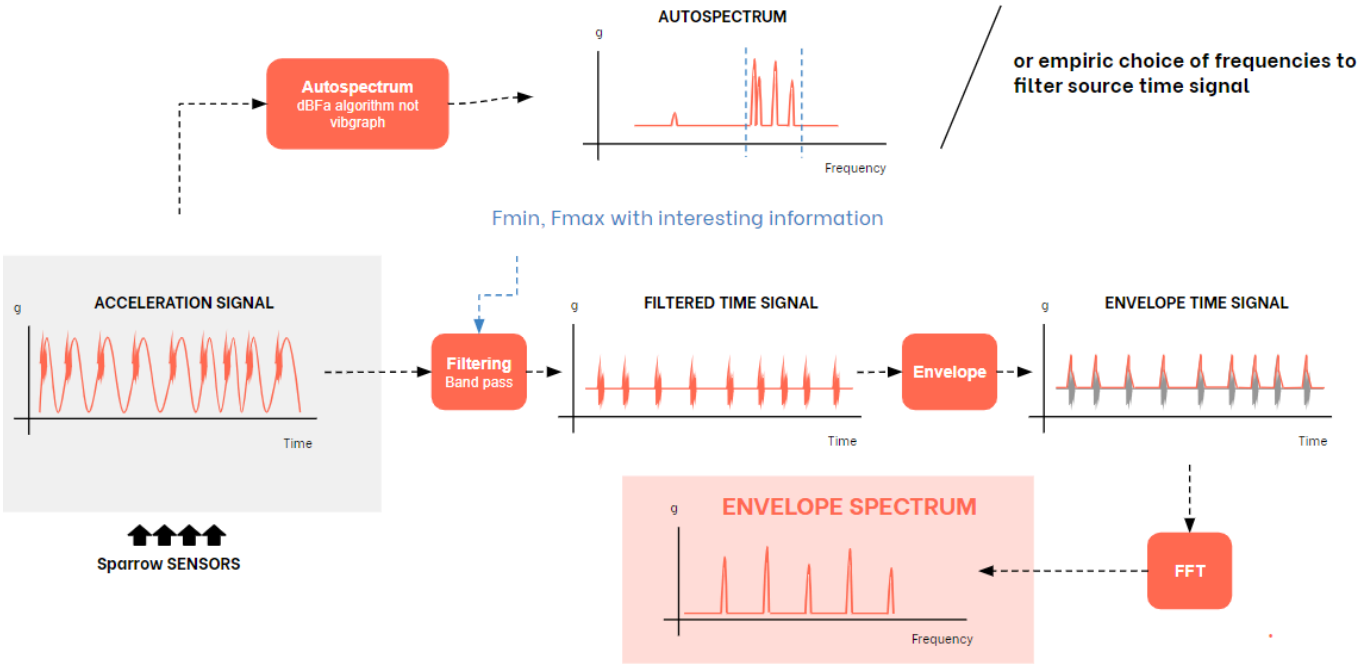


This processing allows calculating spectrum from any timewave signal

Properties	Description
Low Pass Filter (Hz)	Enter the lower frequency of the filtering band From 0 to 20000 Hz, default value is 3750 Hz
High Pass Filter (Hz)	Enter the higher frequency of the filtering band From 0 to 20000 Hz, default value is 6250 Hz
Filtering order	From 2 to 20, default value is 20
Number of FFT lines	100/200/400/800/1600/3200/6400/12.8K
Windowing	Hanning, Hamming, Rectangular, Flat top
Overlap	0/25/50/75%
Signal to process	Select a timewave signal

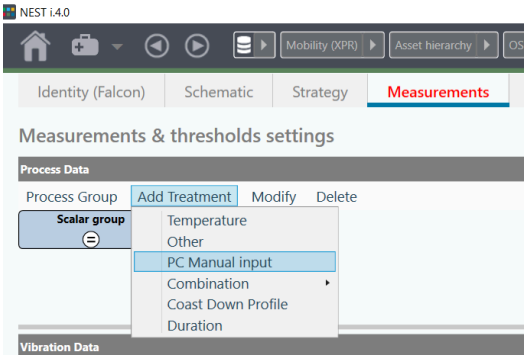
NOTE:

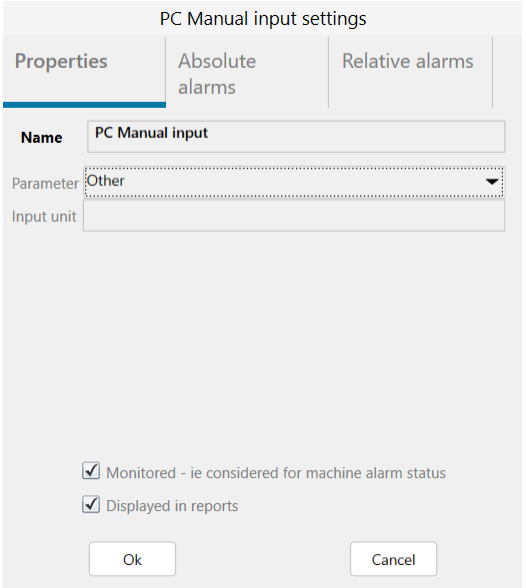
- Amplitude will be calculated in the same unit as the processed signal
- Calculation method



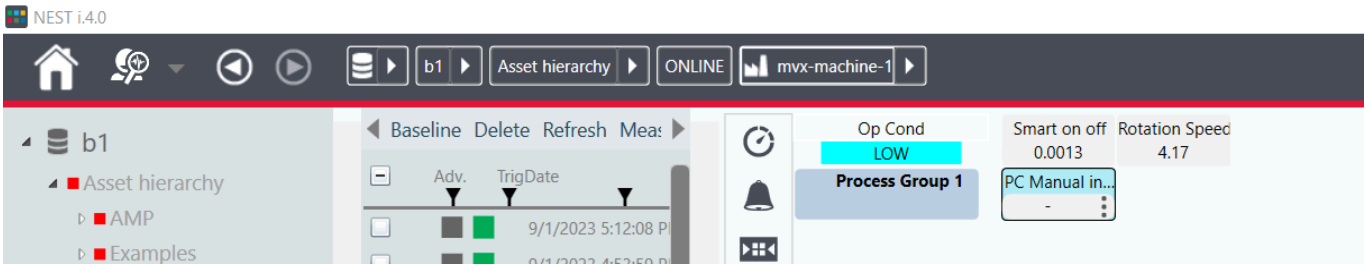
14.3 PC Manual input

Parameter must be created first into a process scalar group of the machine:

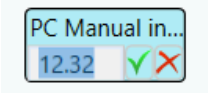




Parameter value can be entered manually directly into the Health matrix of the machine:



Click on button, enter the value directly into the parameter cell and click on to save it:



Properties	Description
Name	Name of the parameter
Parameter	Choose a parameter: Acceleration, Velocity, Displacement, Rotation speed, Temperature, Other. In this case, NESTi4 will be able to apply automatic unit conversion according your user preferences
Unit	Enter unit label if the parameter is “Other”. No unit conversion in this case.