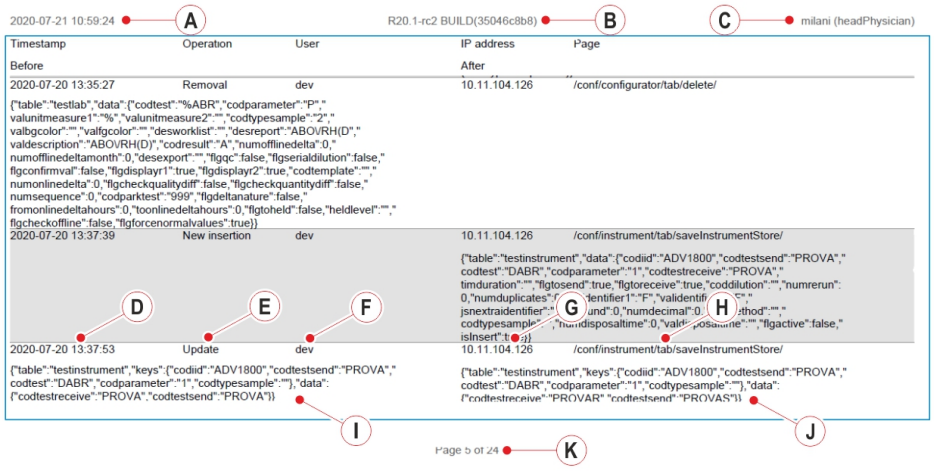
Figure 27: Example of PDF report



Section	Item
Header	Timestamp of the report in the format yyyy-MM-dd HH:mm:ss (Figure 27 *Example of PDF report* – A)
	DMS software version (Figure 27 *Example of PDF report* – B)
	User name and role of the person who generated the report (Figure 27 *Example of PDF report* – C)
Body	Timestamp of the modification (Figure 27 *Example of PDF report* – D)
	Type of operation: New insertion, Update, Removal (Figure 27 *Example of PDF report* – E)
	User name who performed the change (Figure 27 *Example of PDF report* – F)
	IP address of the PC client where the changes have been performed (Figure 27 *Example of PDF report* – G)
	Page (request URL) where the modification occurred (Figure 27 *Example of PDF report* – H)
	The value of the configuration before the change (JSON format) (Figure 27 *Example of PDF report* – I)
	The value of the configuration after the change (JSON format) (Figure 27 *Example of PDF report* – J)
Footer	Page number of the report(Figure 27 *Example of PDF report* – K)

For a new insertion, the column “Before” is blank because no old value was present on DMS for that configuration before the change.

For a removal, the column “After” is blank because no value is present on DMS after the change.

For an update, the columns “Before” and “After” contain a value. This value has the following format:

- table: the database table where the update has been applied
- keys: the table key of the updated row
- data: the table fields updated with the related values

For some configurations, the values “Before” and “After” have a special format (e.g. General Settings).

4.7.4.2 CSV report

The Configuration Changelog report in CSV format is composed of:

- Timestamp of the report in the format yyyy-MM-dd HH:mm:ss
- Type of operation: New insertion, Update, Removal
- User name who performed the change
- IP address of the PC client where the changes have been performed
- Page (request URL) where the modification occurred
- The value of the configuration before the change (JSON format)
- The value of the configuration after the change (JSON format)

4.8 System

The `System` menu allows to display data relating to the entire System.

The menu is made up of the following items.

Screen	Access Level	Description
`System Events`	Guest	Diary of all of the events that have occurred and the operations carried out while using Data Management Software.
`Exceptions List`	Guest	List of exception messages sent to Data Management Software from the connected Instruments.
`Unsolicited`	Guest	List of unsolicited results sent from the Analyzers to Data Management Software; unsolicited results refer to tests without an order (either from the Host, or created manually), performed by the Analyzers in addition to the list of requested tests.
`Rejected`	Laboratory Technician	List of refused results due to QC failed.
`Rerun`	Guest	List of all the tests for which a rerun has been performed, together with the previous and current results.
`Log Viewer`	Laboratory Technician	Displays functions of the log of communication with the Instruments and the log of operations on the Data Management Software System.
`DAS`	Guest	Opens the DAS application.

4.8.1 System events

The `System events` screen is a chronological record which tracks the main events that occurred throughout the use of the software, such as, for example, communication errors, operations carried out by the user, errors, warnings, notices, etc...

For each event listed the following information is shown.

Item	Description
`Description`	Description of the event
`Event Date`	Date of the event
`Warning Code`	Type of alert. Alerts are classified according to the following ascending levels of attention: • `Notice` (Notice) • `Warn` (Warning) • `Error` (Error)
`Event Code`	Internal number that identifies the event or, for Automation System events, the type of message sent to/ from the Automation System
`Sid`	Sample code to which the event refers
`User name`	User Name linked to the event
`Order`	Order code (OID) to which the event refers

At the bottom of the screen, the empty search box can be used to insert numerical data to perform searches among the `Event Date`, `Event Code`, `Sid` and `Order` columns (by pressing the `Refresh` icon on the left of the box).

On the right of the numerical Search box, it is also possible to specify a range of times for the Search.

4.8.2 Exceptions list

The Exception list screen displays the exception messages sent to Data Management Software from the Instruments.

For each exception, the following details are displayed.

Item	Description
Exception	Description of the exception
Exception Date	Date on which the exception occurred
Exception Code	Code of the exception
Inst. Exception Code	Flag Code as configured in Flags Converter table (action reserved to technical assistance staff)
Id exception	Univocal ID of the exception
Order	Order ID (OID) to which the exception refers
Sid	Sample ID to which the exception refers
Test Code	Test code to which the exception refers
Instrument	Instrument ID that sent the exception to DMS
User Name	Username that visualized the exception. “Nemo” is the default username.

4.8.3 Unsolicited

The `Unsolicited` screen allows to link the Unsolicited results for known sample tubes to the relative sample(s).

There are two possible cases.

Parameter	Description
`Unknown SID`	(no test orders from Host/LIS, anagraphic details not present): if a result is received, a new patient will be created with this SID and with the “unknown” name in anagraphic details. Any test results for this SID will be always linked to this unknown patient and will never be displayed in the Unsolicited screen, regardless of the auto-linking option configuration
`Known SID`	(some test orders from Host/LIS available, anagraphic details present): if an unsolicited test result is received, the test will be connected to the SID to which it refers only if the auto-linking option is checked, otherwise, if the auto-linking is disabled, the unsolicited tests will be displayed in the Unsolicited screen

For known SIDs, if the option for automatically linking the Unsolicited results is active, the page only shows the results which have not been possible to link, otherwise all of the results are displayed (the link must be performed manually).

The available filters are:

- `Order`
- `Sid`
- `From Date/To Date`
- `Test Code` (with a checkbox option to show only the Linkable test codes).

4.8.4 Rejected

The Rejected screen allows to display and manage the list of test results considered rejected. The test “A” is ordered and sampled on an Analyzer. If a failed QC result (from the same Analyzer and for the same test) is received before the test “A” result, the result of the test “A” is rejected. A QC result is considered failed due to different validation criteria.

NOTE
A test result can be rejected due to a QC failure only if the Instrument Option Reject Result by QC for the specific Instrument that produced this result is set to “YES”.

The evaluation of QC result can also be performed by an external software that will send back the information to Data Management Software for each QC result received by each analyzer. If the QC is not valid, the external software can send “RJ” string in the order message to Data Management Software and the test for which the QC is failed, is considered rejected and disabled on the configured analyzer.

For example: The test “A” is ordered and sampled on an Analyzer. Then, before the test result is received, a failed QC result arrives from the same Analyzer and for the same test. Then, the result for the Test “A” arrives, the result value will not been saved, as usual, in Validation screen but it will be added to the Rejected page, its validation will be stopped and it will remain “rejected” until the User will try to move online that result value (**NOTE:** Also all subsequent test results for the test “A” will not be accepted, and moved to the Rejected page, until the QC for Test “A” remains “failed” or a manual results is inserted for the Test “A”).

Rejected results can be linkable (not highlighted) or not linkable (highlighted in yellow).

- Linkable rejected tests (tests that have no results online) can be removed from the list and send online. In addition the user can resend the order to automation, order a delivery of the tube and delete rejected results
- Not linkable rejected tests have a result online that can be accepted and a message is sent to Host LIS with “A” flag that means “Accepted” in Result type field in Result record. In addition the user can manually order a rerun, order a delivery on the tube, delete the result and accept the result.

The upper part of the Rejected page contains the Filter Action mask, that allows the User to filter the rejected results to be displayed in the list below, according to different parameters:

Parameter	Description
Order	Order ID (OID) to which the rejected result refers
Sid	Sample ID to which the rejected result refers
Test Code	Test code to which the rejected result refers
ID	ID of the related Analyzer
From To	Time interval of the day when the rejected result arrived
Linkable	Type of rejected result

Parameter	Description
Not linkable	Type of rejected result
WL id	Worklist identifier. Parameter sent by LIS
Load id	Load identifier. Parameter sent by LIS
ID from LIS	ID of the instrument that produced the results. Parameter sent by LIS
Rack No.	Rack Number. Parameter sent by LIS
Rack seq.	Tube location in the rack. Parameter sent by LIS
Reason	Reason for result rejection. Parameter sent by LIS

The Clear Filter button allows to reset all the filters to the default values and to insert new parameters.

The lower part of the page displays the list of rejected results found by the filter configured above. For the results listed, the User can perform various actions, according to the type of rejected result:

- Resend the order to the Automation, move the result online (in the Validation screen, for further evaluation), deliver the related sample tube, or delete the linkable rejected results.

  NOTE:

  When a test is moved online, a message is sent to Host LIS flagged with “A” that means “Accepted”.

- Accept the not linkable rejected result: the result is marked as accepted and its copy is deleted from the rejected results. The accepted result, having been already validated, is re-sent to the LIS
- Execute a rerun, deliver the related sample tube, or delete the not linkable rejected results.

The buttons Move online and Delete result can be used to apply the related actions to the tests currently selected (checking the square boxes near the test names). The button All allows to apply the available actions (Move online , Rerun , Delete result) to all records that match the selected filters.

In case the sample is flagged as “restraint” (for example due to contamination), User is not able to accept, rerun or move online the related result that was rejected.

4.8.5 Rerun

The Rerun screen consists of a list with the details of all Reruns performed on the System, related to the samples not yet archived.

This screen is for consultation only.

4.8.6 Log Viewer

The Log Viewer screen allows to filter and consult the System log and the log of communications with the Instruments.

Parameter	Description
System log	This tab reports all of the messages and operations performed while using Data Management Software. It can be filtered according to the alert level of the message, to the User information (name, type and User description) and to the date of occurrence.
Instrument Logs	The log of communications with the Instruments can be selected according to the date of occurrence from a tree menu, structured according to the sequence, Year > Month > Day. Once the specific day of interest is selected, a list of available logs is displayed, identified by the name of the Instrument. Having selected a log, this log is displayed in the text window. In addition, the log can be downloaded onto the client PC as a compressed text file by means of the Download Log File button.

4.8.7 DAS

4.8.7.1 Graphical user interface (GUI)

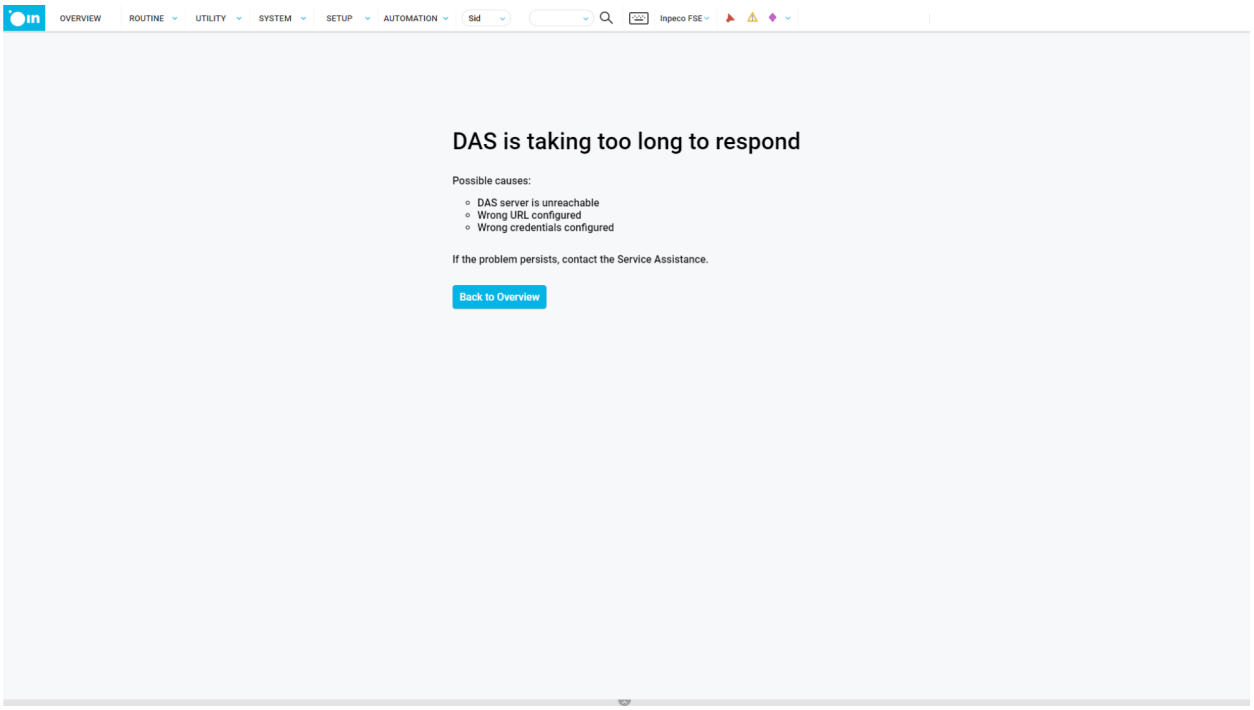
4.8.7.1.1 Graphical user interface (GUI) overview

The Graphical Interface (GUI) of DAS, displayed to the User in the client computer browser, appears with a top panel including several icons from which the user can check the timestamp of the most recent timestamp of FlexLab, DMS and ProTube (T-Hub)[20] imported data, the Menu Action toggle button, the Filter toggle button and the `Sign out` link for the logout. While in the central workspace an initial dashboard is shown to the user.

NOTE
Whenever a timestamp is displayed in the GUI, it always refers to the server time zone. Example: If looking at a DAS GUI of a server in “US/Eastern” time zone, every timestamp will be localized in “US/Eastern”, even if the computer that is running the browser is in a different time zone (e.g. “Europe/Rome”).

4.8.7.1.1.2 DAS communication error

In case of missing communication with Hosting services DAS is not displayed and a failure message appears indicating possible causes.



20. In this document, the terms T-Hub and ProTube are used interchangeably

4.8.7.1.1 GUI structure

The Graphical Interface (GUI) of Data Analytics System, displayed to the User in the client computer browser, appears with a top panel including several icons from which the user can check the timestamp of the most recent time-stamp of FlexLab, DMS and ProTube (T-Hub) imported data, the Menu Action toggle button, the Filter toggle button and the “Sign out” link for the logout. While in the central workspace an initial dashboard is shown to the user.

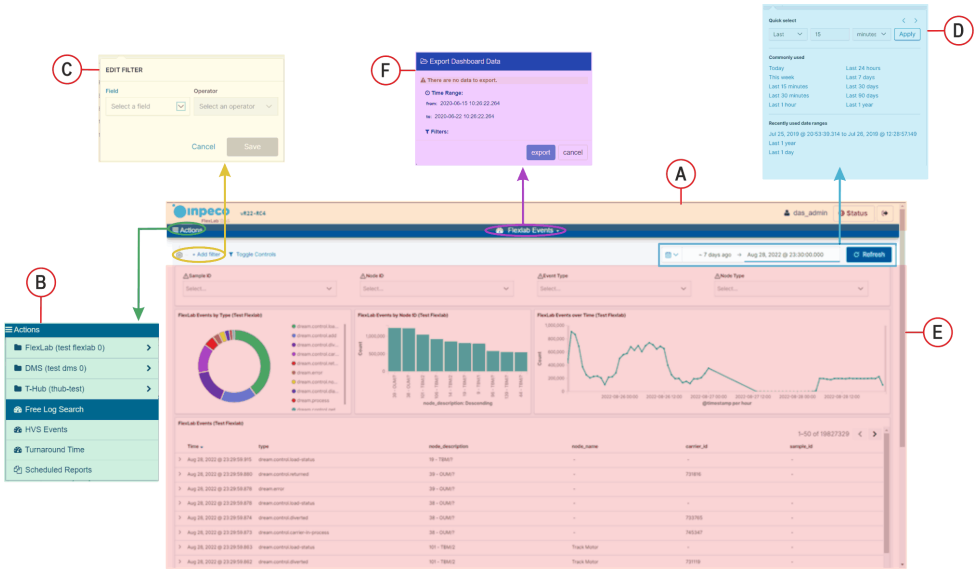
> ***NOTE***
>
> Whenever a timestamp is displayed in the GUI, it always refers to the server time zone.
>
> Example: if we are looking at a DAS GUI of a server in “US/Eastern” time zone, every timestamp will be localized in “US/Eastern”, even if the computer that is running the browser is in a different time zone (e.g. “Europe/Rome”).

The GUI screen is divided into 4 areas:

Table 52: GUI structure

Section	Description
Upper panel (Figure 28 – A)	Always visible at the top, containing the `Sign out` button, the `Toggle User Action` button, the widget regarding the `status` of the last imported data.
User Action panel (Figure 28 – B)	There is on top to the left side, visible after clicking the `Toggle User Action` button. It contains all the operations allowed by the Data Analytics System.
Filter panel (Figure 28 – C)	There is on the right side, visible after clicking the `Toggle Filter` button, containing all the filters available for the selected menu item.
Time picker (Figure 28 – D)	There is on the left side, visible after clicking the `Toggle Filter` the timestamp filters (From and To), a calendar window appears with 3 possible options Absolute, Relative and Now, from which it is possible to choose the desired date.
Central workspace (Figure 28 – E)	Updated from time to time according to the menu item recalled by the User in the action menu.
Dashboard name and data export (Figure 28 – F)	The name of the displayed Dashboard with (if available) the drop-down menu to export Dashboard data.

Figure 28:



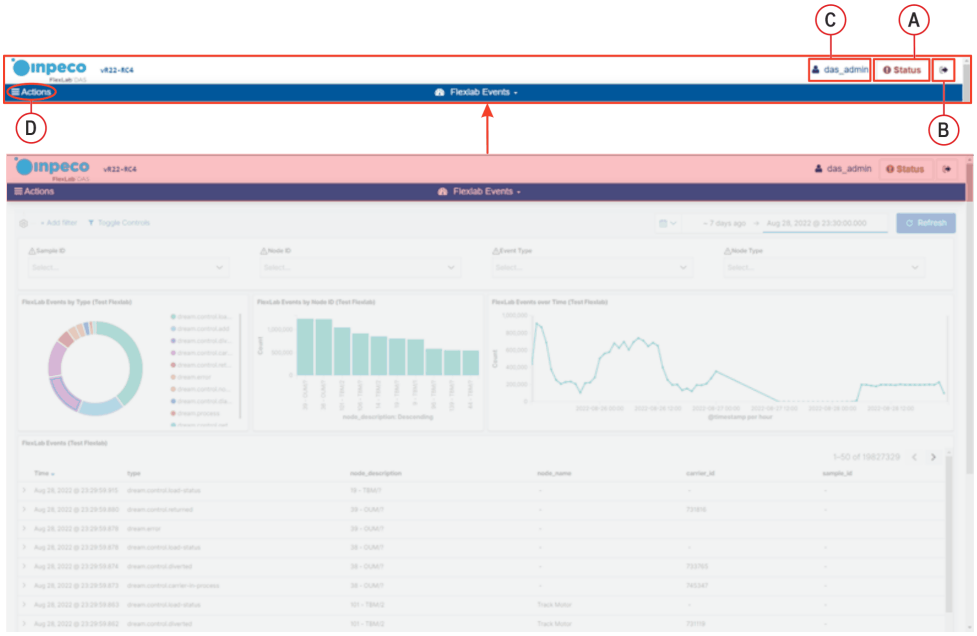
4.8.7.1.1.1 Upper panel

In the top part of the GUI there is a permanently visible panel containing various elements:

Table 53: Upper panel

Section	Description
Status widget (Figure 29 – A)	Provides a visual and immediate overview of the global status of the monitored data.
Sign out button (Figure 29 – B)	By clicking this button, the current User is logged-out and the browser window goes back to the initial login screen, from which it is possible to log in again.
Toggle User Action menu button (Figure 29 – C)	Selecting this button, the User Action panel can be show or hide according to user needs.
Toggle Filter panel button (Figure 29 – D)	Selecting this button, the Filter panel can be show or hide according to user needs.

Figure 29:

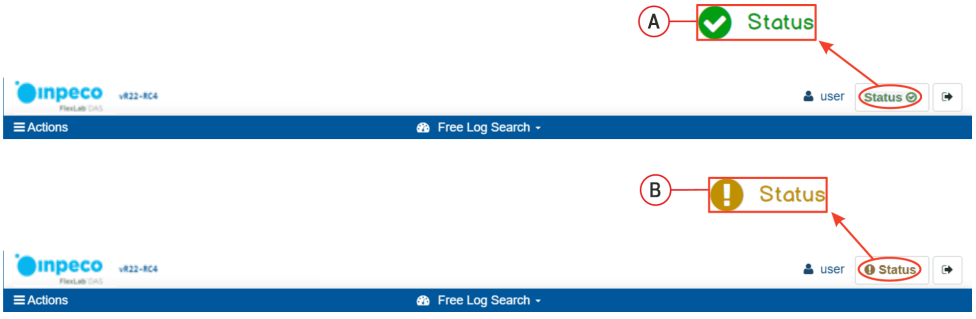


4.8.7.1.1.1.2 Status widget

The Status widget provides an overview of the most recent imported data of the components and algorithms visible to the logged user. By default, when the last imported data for all components and algorithms is more recent than 10 minutes a green check icon (Figure 30 – A) appears in the bar.

Otherwise, an orange icon (Figure 30 – B) with a warning sign warns that the last imported data is not updated, and by clicking on the `Status` label a modal window appears showing the details of the components visible to the User. Usually there are one or more systems, and each system has one or more components (FlexLab, DMS or T-Hub) and possibly some analysis algorithms.

Figure 30:



Each component has a Received data child with the last update timestamp, and can also have child algorithms. Every algorithm has the last update timestamp and all the elements in the window have the icon related to their status, that can be one of the following:

Table 54: Status widget

Icon color	Description
Green check icon 	Data updated.
Grey eye icon 	There is no data for the current element.
Orange clock icon 	Data is too old.

NOTE
For the Turnaround Time algorithm the latest Received data refers to the date of TAT opening (TAT0).

4.8.7.1.1.1 User Action Menu

The User Action Menu contains all the DAS functions available to the current user. Every item, when selected, opens its own contents in the central workspace with max-height of 720px, compatible with low-resolution screen devices 720p.

4.8.7.1.1.1.2 Menu item

The menu item are grouped depending on the source of data which are displaying: FlexLab, DMS, T-Hub and Monitored System for the ones that display information regarding multiple data sources.

There are two types of menu item: one group shows charts and tables in a dashboard, while the other shows a table containing folders and files. The available menu items are the following:

Table 55: Global menu items

Item	Description
`Scheduled Reports`	Display scheduled data export files available for download. ***NOTE*** As scheduled reports can refer to different Monitored Components (i.e. a single report can generate CSV files for many different FlexLab and/or DMS instances at the same time), if a user has this menu item in his/her action menu, he/she will be able to download ALL generated report results.

Table 56: FlexLab menu items

Item	Description
`Events`	Displays every available FlexLab event, with charts grouped by type and node ID.
`Sample Events`	Displays information regarding FlexLab sample processing events, with charts grouped by process step and node ID.
`Sample Time line`	Provides an overview of the sample time line different contributions.
`Sample Workflow`	Shows the sample workflow phase and provides statistics for each sample ID.
`Errors`	Displays FlexLab errors, with charts grouped by error color and error code.
`Uptime`	Displays uptime information regarding a specific automation system, as well for each of its modules.
`Queue Analysis`	Displays the physical and firmware work list queue for each module of the automation.
`FlexLab-DMS Communication`	Displays communication messages between FlexLab and DMS.
`UTC Motor Current`	Displays information regarding UTC motor current over time.
`Resource Monitor`	Provides a subset of information regarding FlexLab performances.
`Configuration Settings Change`	Shows all the manual configuration changes done of the selected automation.
`Q-Size`	Shows the size in bytes over time of the messages directed to Dream software not yet processed.
`System Configurations`	Shows the history of the saved FlexLab configuration files.
`Performance Dream`	Shows the detailed performance of each message being processed by the FlexLab software.

Table 56 FlexLab menu items (cont'd.)

Item	Description
Software Usage	Shows the percentage of software usage over each second, divided by message type.
Automation Map	This button open a new tab of the browser linked to laboratory automation map.

Table 57: DMS menu items

Item	Description
DMS Tests	Displays tests performed on samples, with charts grouping by day of week, test code and instrument code.

Table 58: T-Hub menu items

Item	Description
ProTube Orders	Displays information regarding Pro Tube orders.
ProTube Reports	Displays information regarding Pro Tube errors.
ProTube Timeline	Shows Pro Tube events time line
ProTube Transport	Displays information regarding T-Hub transport events.
ProTube queue management	Displays information regarding T-Hub queue-management events.

Table 59: Monitored System menu items

Item	Description
Turnaround Time	Displays statistical information regarding turnaround time results for a single test run of a specific sample.
Free Log Search	Allows the user to perform custom queries.

Table 60: Anatomical Pathology menu items

Item	Description
Events	Displays the type and list information about all events in Anatomical Pathology process
Monitoring	Displays statistical information regarding Anatomical Pathology phases

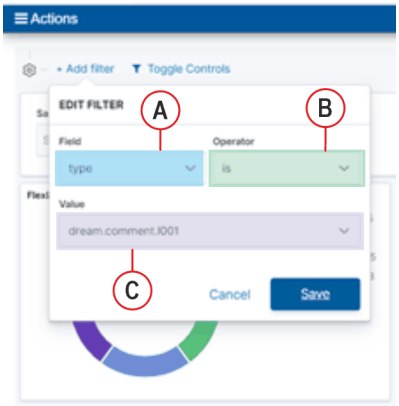
4.8.7.1.1.1 Filter panel

Sections that show dashboards provide a Filter panel searching specific events inside the event list. Depending on the menu item selected, different text boxes are shown on the Filter panel after clicking on the Toggle Filter Panel button.

4.8.7.1.1.1.2 Add Filter

Sections that show dashboards provide a Filters panel searching specific events inside the event list.

Figure 31:



In this filters panel there are 3 available combo box: Fields, Operators and Values:

Table 61: Add Filter panel

Filter	Type
Fields (Figure 31 – A)	All Fields mapped and searchable in the json data stored.
Operators (Figure 31 – B)	• Is (match only one value) • Is not (exclude only one value) • Is one of (match multiple values) • Is not one of (exclude multiple values) • Is between (match a specific range, only for duration or numbers)[21] [22] • Is not between (exclude a specific range, only for date type or numbers)[21] [22] • Exist (check for one field) • Does not exist (uncheck for one field)
Values (Figure 31 – C)	All Values related to the fields stored in the json data.

4.8.7.1.1.1.3 Controls visualizations

Controls visualization is positioned on the top in the first row of the dashboard.

21. Do not filter by “@timestamp”, use Time Range Filter panel
22. The duration supported format is in seconds

Figure 32:

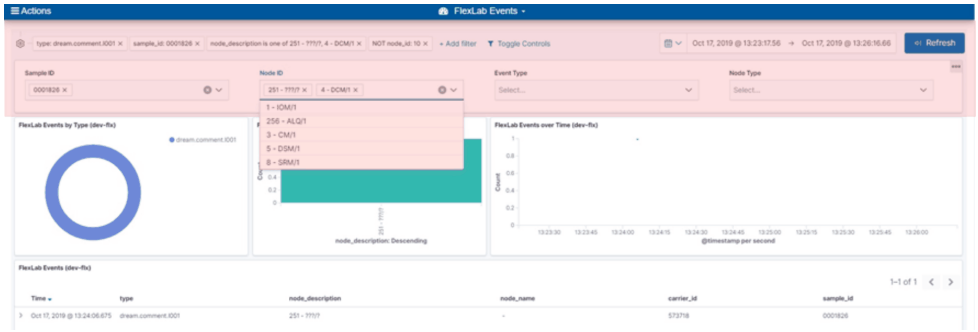


Table 62: Controls visualizations

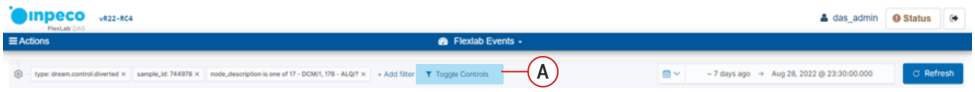
Filter	Type	Notes
`Sample ID`	Autocomplete	Limited to 10.000 fields, in DAS-R20-rc1 a warning icon will appear when this threshold is exceeded
`Event Type`	Autocomplete	
`Node ID`	Autocomplete	
`Node Type`	Autocomplete	
`Carrier ID`	Text	Limited to 10.000 fields, in DAS-R20-rc1 a warning icon will appear when this threshold is exceeded
`Error Code`	Autocomplete	
`Error Color`	Autocomplete	
`Error Message`	Full text	Searches any word contained in Error Message
`Automation Behavior`	Autocomplete	
`Workflow Pre-Analytical`	Autocomplete	
`Require UI`	Autocomplete	
`Order ID`	Full text	
`Test Code`	Full text	
`Instrument Code`	Full text	
`Day of Week`	Full text	0 = Sunday to 6 = Saturday
`Patient ID`	Autocomplete	
`Patient visit number`	Autocomplete	Limited to 10.000 fields, in DAS-R20-rc1 a warning icon will appear when this threshold is exceeded
`Workstation`	Autocomplete	
`Operator ID`	Autocomplete	
`Workplace`	Autocomplete	

NOTE

The autocomplete controls provide suggestions while typing into text boxes. To search for all available values of `sample_id`, `carried_id` and `patient_visit_number` use Filters Panel.

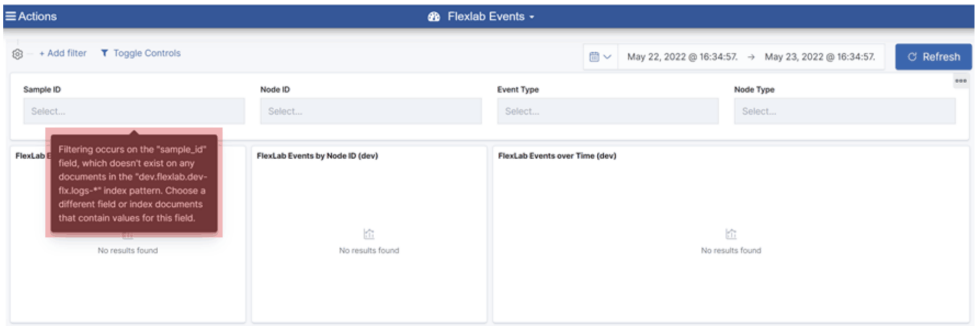
The filters are applied on the data by selecting options. Multiple filters selection is allowed. Inverted filters are supported. It is possible to hide the controls row by clicking on the `Toggle Filters` (Figure 33 – A) button.

Figure 33:



Be aware that if there is no data available on the dashboard, the control filter cannot be applied and an alert pop up appears:

Figure 34:



This behaviour is normal and will persist until at least one log is available on the dashboard.

NOTE

If a dashboard has no data, check if the way the system is configured will let DAS to populate it. If not, evaluate to disable the dashboard.

4.8.7.1.1.1.4Time picker panel

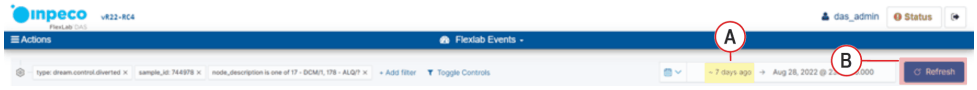
By selecting the timestamp filters (From and To), a calendar window appears with 3 possible options Quick, Relative and Absolute, from which it is possible to choose the desired date. The pin icon located on the left of some filters means that they are applied globally in all the dashboards being loaded.

At first dashboard loading the time filter range is setted by default to `Last 24 hours` (Figure 35 – A), on each dashboard switch the time filter will be persisted only with absolute values, e.g. if current time is October 1st 2019, 16:45:20.000 the convertion will be: from `Last 24 hours` to `October 1st 2019, 16:45:20.000 to October 2nd 2019, 16:45:20.000`.

The left and right carets are used to shift time step by step through the selected date range.

Refresh (Figure 35 – B) button is now available in the sub-bar next to the right of time-picker, allows user to update the dashboard according to active filters related to selected time range.

Figure 35:

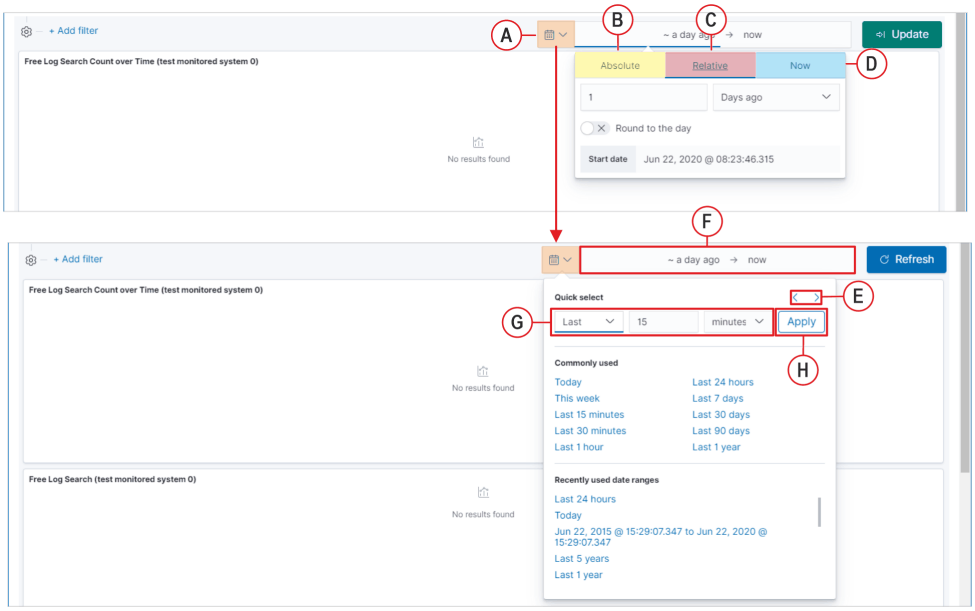


Clicking on the button where the time filter value is displayed, a time picker panel will open, the available time options are:

Table 63: Time picker panel

Time options	Description
Quick select – Span Time Range filter (Figure 36 – A)	Allows to Shift Time Range values by selected time interval ***NOTE*** The time interval triggered by `<Span time range>` (Figure 36 – E) is related to time-range (Figure 36 – F) in the top of the timepicker panel, if you want to use the "Quick select" options (Figure 36 – G) you must to click the button `Apply` (Figure 36 – H) to configure time range configured in quick select section
Absolute (Figure 36 – B)	Select your time range thanks to timepicker options panel
Relative (Figure 36 – C)	Insert relative parameters values from a selected date time, quick combo options and rounded function
Now (Figure 36 – D)	Set the current time as a quick option

Figure 36:



4.8.7.1.1.1 Central Workspace

The central workspace is the main window where the action contents (plots, charts, tables, etc.) are displayed, depending on the menu item selected.

4.8.7.1.1.1.2 Visualizations and aggregations

The data can be displayed using different kind of graphs: Pie chart, Bar Chart, Timeseries, Table, Metrics and Timeline.

All chart types display aggregated metrics. Example: in the pie, bar and timeseries visualizations, we typically display only the top n° occurrences of relevant field groupings.

Use the dashboard filters to navigate deeper into the data refer to 4.8.7.1.1.1.3 *Dashboard*.

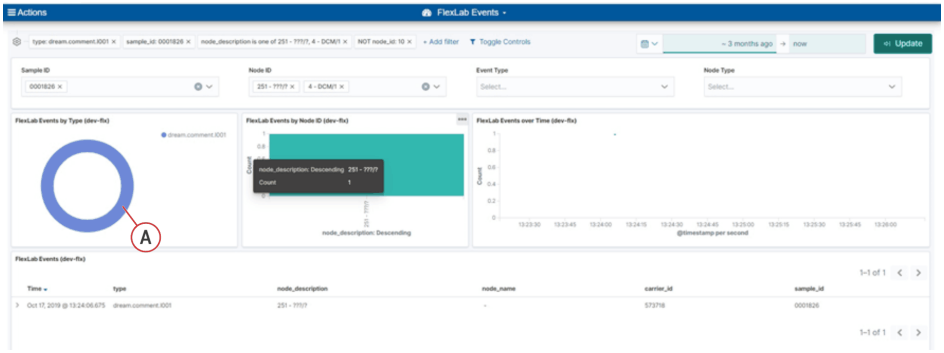
NOTE
The value of n° can vary, and is set according to the context of the various dashboards and to the cardinality of the field in question.

4.8.7.1.1.1.3 Dashboard

The data appearing in the dashboards can be manually filtered in three different ways:

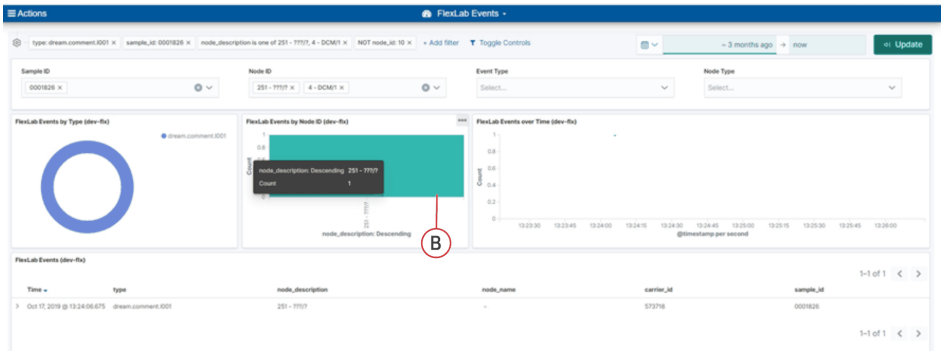
- By clicking on a specific chart subgroup (Figure 37 – A)

Figure 37:



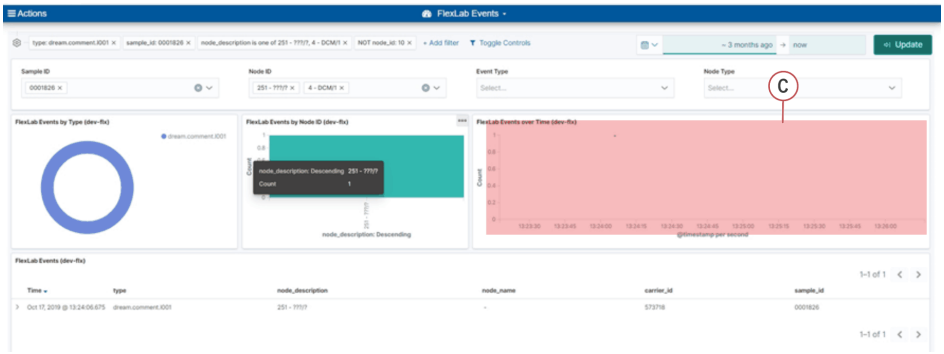
- By selecting a chart time interval (Figure 38 – B)

Figure 38:



- By selecting a row in a data grid visualization (Figure 39 – C)

Figure 39:



Each selection adds the relative filter to the search. When create a filter, a blue oval at the top of the central workspace shows the filter conditions .

The following icons are displayed by clicking on the filter button:

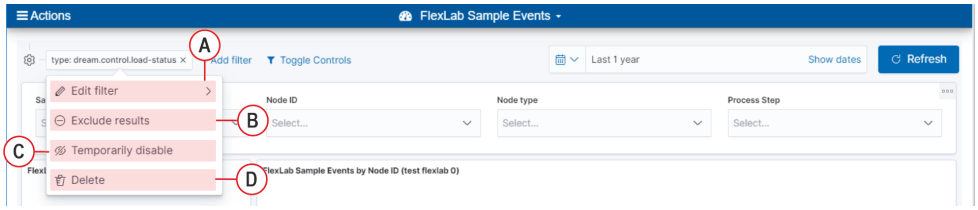
Table 64: Filter icons description

Option	Description
Edit filter (Figure 40 – A)	Allows to edit the proprieties of the filter.
Include/Exclude results (Figure 40 – B)	This icon defines:

Table 64 Filter icons description (cont'd.)

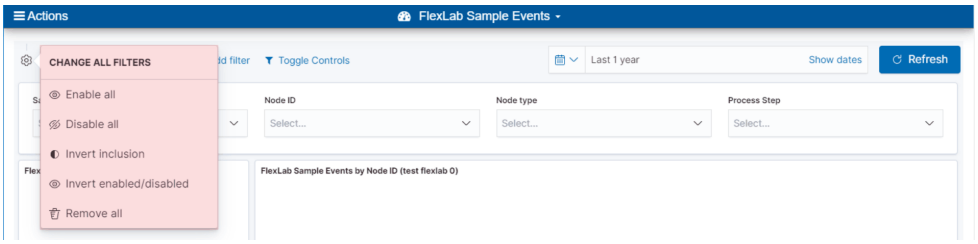
Option	Description
	• inclusive filter, displaying only elements that match its value. • exclusive filter, displaying only elements that do not match its value.
Re-enabled/Temporarily disabled (Figure 40 – C)	Trigger the filter status enabled or disabled.
Delete (Figure 40 – D)	Click this icon to remove a filter.

Figure 40:



Clicking on the `Change All Filters` button allows the user to perform the same operations to all the filters together.

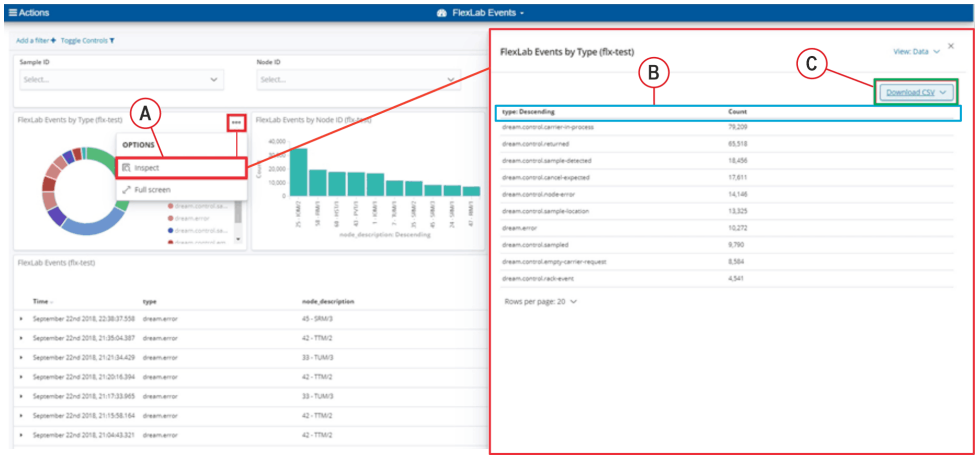
Figure 41:



To display the raw data behind the visualization, click the bar at the bottom of each plot (Figure 42 – A). A representation of the underlying data, presented as a paginated data grid with detailed information about the raw data, replaces the visualization. The user can sort the items in the table by clicking on the table headers at the top of each column (Figure 42 – B).

To export the raw data as a comma-separated-values (.csv) file, click on either the `Raw` or `Formatted` links (Figure 42 – C) at the bottom of any of the detailed information tabs. A `Raw` export contains the data without any formatting; a `Formatted` export contains the data as displayed.

Figure 42:



4.8.7.1.1.1.4 Details Table

Many dashboards contain a details table showing each event pertaining to a particular view on the data. The details table shows only some pre-configured columns deemed relevant for the particular view, but each row contains all the fields relative to the specific event. The Details Table is limited to the first 500 rows, depending on currently selected sorting (typically by descending timestamp), divided in 10 pages containing a maximum of 50 rows each.

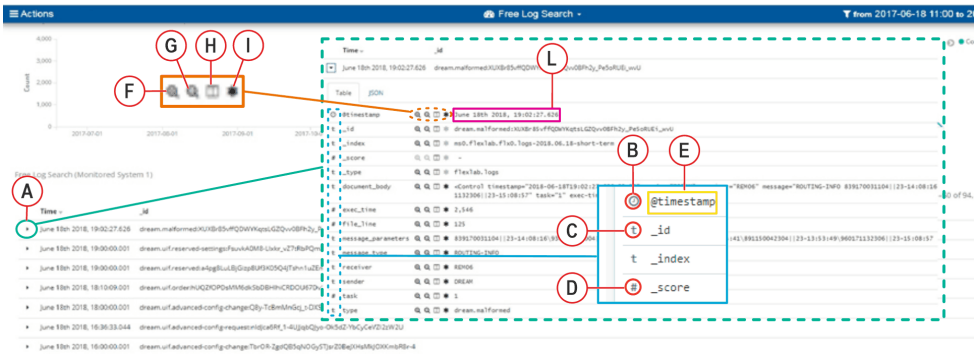
To expand the contents of each row, click on the arrow (Figure 43 – A) on the left most side of the row.

When a row (A) is expanded, see every available field, its type and its value.

Table 65: Details Table field description

Field	Description
Field type (Figure 43 – B) (Figure 43 – C) (Figure 43 – D)	This is represented by a symbol (Figure 43 – B) for timestamp, (Figure 43 – C) for number and (Figure 43 – D) for text.
Field name (Figure 43 – E)	The name of the field as stored internally (Figure 43 – E).
Control buttons (Figure 43 – F) (Figure 43 – G) (Figure 43 – H)	There are three control buttons with the following meaning: • (Figure 43 – F) : add this field to the existing dashboard filters, including the given value • (Figure 43 – G): add this field to the existing dashboard filters, excluding the given value • (Figure 43 – H): toggle (show/hide) this field in the columns of the details table • (Figure 43 – I): toggle (show/hide) the type of log.
Field value (Figure 43 – L)	The value of the field.

Figure 43:

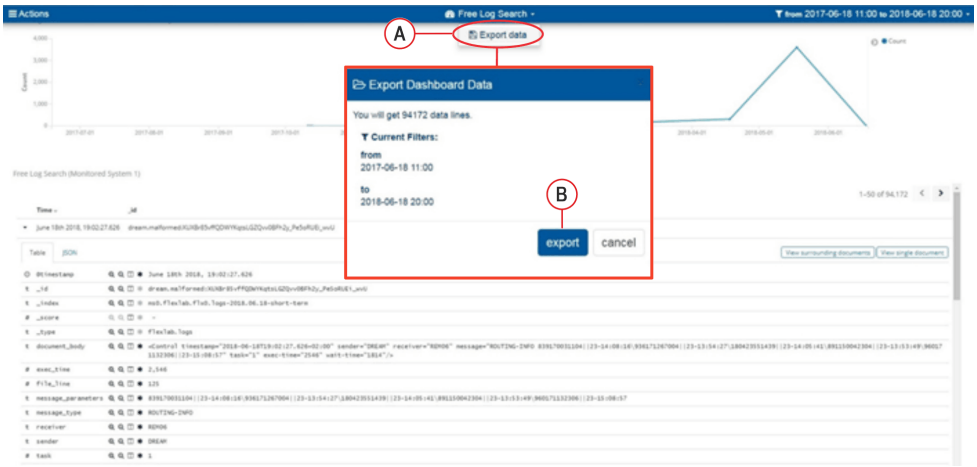


4.8.7.1.1.1.5 Data Export

Whenever the `Export Data` (Figure 44 – A) button is visible and enable, DAS software allows the user to export the data visualized in a (.csv) format file which contains the data lines and columns shown in the details table of the dashboard. The user can add, delete or change the order of the columns by directly interacting with the table.

All the dashboards that support this feature have a clickable `Export Data` (Figure 44 – A) button. By selecting it the Export Dashboard Data pop-up appears. This pop-up shows the current filters applied and the number of data lines returned once clicked on the `Export` (Figure 44 – B) button. In the export popup can see the document size with the number of total lines to export, the selected time interval and the current filters applied to dashboard [23] [24] [25].

Figure 44:



23. The amount of exported lines is limited to 100,000 by default, to avoid the creation of large files. The maximum amount of exported lines can be configured by DAS A-dministrator
24. The first column of each exported CSV file is the event timestamp, which is always localized in the server time zone. The timestamp format is ISO 8601 including UTC offset. Example: 2020-02-27T13:09:34.973 +01:00
25. All CSV lines are sorted by ascending timestamp, so if you exceed the configured limit, you will get the first X lines in chronological order (X is 100,000 by default, as specified above)

4.8.7.1.1.1.6 Export data from chart and visualization

In all the visualizations present in the dashboard there is an options button that allows to inspect the data of the visualization with the possibility to download the data in csv format.

4.8.7.2 Flexlab

4.8.7.2.1 Events

The Events dashboard provides an overview of all the DAS log events.

The available controls are as follows: `Sample ID`, `Event Type`, `Node ID` and `Node Type`.

Table 66: Events dashboard

Chart	Description
`DAS events by type`	The pie chart illustrates the numerical proportion of the DAS events enabled grouped by type. Each slice represents a different event type, whose name is shown in the legend with the relative color.
`DAS events by Node ID`	The bar chart displays the count of DAS events for each module, for the top ten modules that generated the most events.
`DAS events over time`	The line chart shows the total amount of DAS events over time.
`DAS events`	The list shows the events of DAS, refer to Table 67 *DAS events*

Table 67: DAS events

Field	Description
`Time`	The timestamp of the event.
`Type`	The type of the event, which is structured like <source>.<log type>.<event type> (e.g. dream.control.diverted identifies an event coming from the DREAM source, with log type CONTROL and event type DIVERTED).
`Node_description`	The description of the node that generated the event, in the form <node ID> - <node type> / <node instance> (e.g. 1 – IOM/1)
`Node_name`	The extended module name.
`Carrier_id`	The carrier ID (if any) tied to this event.
`Sample_id`	The sample ID (if any) tied to this event.

4.8.7.2.2 Sample events

The Sample Events dashboard provides an overview of the DAS sample processing events.

The available controls are as follows: `Sample ID`, `Node ID` , `Node Type` and `Process Step`.

Table 68: DAS sample dashboard

Chart	Description
`DAS sample events by step`	Pie chart on the top-left side illustrates the numerical proportion of the DAS sample processing events grouped by process step.
`DAS sample events by node ID`	The bar chart in the top-center displays the count of DAS sample processing documents for each module.
`DAS sample events over time`	The line chart shows the total amount of DAS sample processing events over time.
`DAS sample events`	The list shows the events of DAS, refer toTable 69 *DAS sample events*.

Table 69: DAS sample events

Field	Description
`Time`	The timestamp of the event.
`Type`	The type of the event, which is structured like <source>.<log type>.<event type> (e.g. dream.control.diverted identifies an event coming from the DREAM source, with log type CONTROL and event type DIVERTED).
`Node_description`	The description of the node that generated the event, in the form <node ID> - <node type> / <node instance> (e.g. 1 – 4).
`Node_name`	The extended module name.
`Process_step`	The sample processing step, which can be one of the following: • `Processed`: this is generated when the node finished processing the sample, and the sample is put back on the main track. This event is generated by every node that processes samples in any way • `Unloaded`: this is generated only by nodes that take samples off-track (e.g. pick-and-place analyzers, centrifuge modules, and so on), and is generated when the sample is taken off-track to be processed. • `Disposed`: this is generated only by nodes that dispose of samples (currently only storage module and high-volume storage), and is generated when the sample is disposed.
`Carrier_id`	The carrier ID (if any) tied to this event.
`Sample_id`	The sample ID (if any) tied to this event.

4.8.7.2.3 Sample Timeline

The Sample Timeline duration represents the time interval in milliseconds between two specific timeline events with the same sample ID. Together with the Time Duration, DAS software provides the sample timeline label which represents the timeline phase associated to the Sample Timeline duration.

The Sample Timeline dashboard provides an overview of the sample timeline different contributions (according to the process pipeline) in order to easily verify the various contributions of each different operations.

The available controls are as follows: `Sample ID`, `Carrier ID`, `Node ID` and `Node Type`.

Table 70: Sample timeline phases

Phase	Description
`Dwell Time`	Time spent by the sample in the pit lane of a module or inside itself.
`Travel Time Return`	Time spent by the sample in the main track, between a Return gate and a consecutive Divert gate.
`Travel Time Passed`	Time spent by the sample in the main track, between two consecutive Divert gates.
`Unknown`	Initial period when the sample timeline phase has not been found yet, or some required events are missing.

Table 71: Sample timeline dashboard

Chart	Description
`DAS sample timeline by label`	The pie chart illustrates the numerical proportion of the DAS sample timeline duration grouped by phases.
`DAS sample timeline by sample ID`	The bar chart shows the total sample timeline duration of DAS sample timeline events for each sample ID, grouped by phases.
`DAS sample timeline – module Dwell time stats`	The bar chart shows the min, avg and max sample timeline duration of DAS sample timeline events for each module (DWELL time).
`DAS sample timeline – module Dwell time samples count`	The line chart displays the count of sample processed by each module.
`DAS sample timeline – module travel time stats`	The bar chart shows the min, avg and max sample timeline duration of DAS sample timeline events for Travel Time Pass and Travel Time Returned track sections.
`DAS sample timeline – events`	The list shows the events of DAS sample timeline, refer to Table 72 *DAS sample timeline events*.

Table 72: DAS sample timeline events

Field	Description
`Time`	The timestamp of the event.
`Type`	The type of the event, which is structured like <source>.<log type>.<event type> (e.g. dream.control.diverted identifies an event coming from the DREAM source, with log type CONTROL and event type DIVERTED).
`Node_description`	The description of the node that generated the event, in the form <node ID> - <node type> / <node instance> (e.g. 1 – IOM/1).
`Node_name`	The extended module name.
`Sample_id`	The sample ID tied to this event.
`Carrier_id`	The carrier ID tied to this event.
`Sample_timeline_label`	The sample timeline phase until the selected sample event.
`Sample_timeline_duration`	The interval time between the current sample timeline event and the previous one with the same sample ID (hh:mm:ss.SSS).

Due to the massive amount of data and performance required by this analysis, the sample timeline worker has been split in two: a basic analysis calculating only the `Dwell Time`, and an optional full analysis that calculates the Travel Time as well.

NOTE

Only standard values of sample ID field are considered for calculation; all the values starting with "&" (that represent particular case values of this field, like duplicates management) are not taken into account.

4.8.7.2.4 Sample Workflow

The DAS Sample Workflow dashboard shows the sample workflow phase and provides statistics for each sample ID.

Sample workflow calculation, once enabled, is made real-time in streaming mode; therefore, when `dream.process` events are parsed they are not only written on the data store but also immediately sent to a dedicated process.

The available controls are as follows: `Sample ID`, `Node Type` and `Node ID`.

Table 73: DAS sample workflow dashboard

Chart	Description
`DAS sample workflow over time`	The line chart shows the average time duration of DAS samples spent during their workflow.
`DAS sample workflow by full path`	The bar chart displays the count of DAS sample that have done the same full path.

Table 73 DAS sample workflow dashboard (cont'd.)

Chart	Description
DAS sample workflow stats	The bar chart displays the minimum, maximum and average sample workflow duration.
DAS sample workflow events	The list shows the events of DAS sample workflow, refer to Table 74 *DAS sample workflow events*.

Table 74: DAS sample workflow events

Field	Description
Time	The initial timestamp of the sample workflow.
Sample_id	The sample ID related to this workflow.
Full	The module types where the sample passed through.
Sample_workflow_duration	The total time spent by the sample during the workflow (hh:mm:ss.SSS).

NOTE
Only standard values of sample ID field are considered for calculation; all the values starting with “&” (that represent particular case values of this field, like duplicates management) are not taken into account.

4.8.7.2.5 Errors

The Errors dashboard provides information on DAS error events.

The available controls are as follows: Error Code, Error Color, Node ID, Node Type, Requires UI and Error Message.

The Error Message filter allows full-text search on the error_message field.

Table 75: DAS errors dashboard

Chart	Description
DAS errors by color	The pie chart shows the numerical proportion of the DAS error document grouped by color.
DAS errors by code	The bar chart displays the count of DAS documents grouped by error code.
DAS errors by node ID	The bar chart displays the count of DAS grouped by node ID and error color.
DAS errors over time	The line chart shows the total amount of DAS error documents over time.
DAS errors event	The list shows the errors event of DAS, refer to Table 76 *DAS errors event* .

NOTE

In the pie and bar charts, the colors represent the error color.

Table 76: DAS errors event

Field	Description
`Time`	The timestamp of the event.
`Node_description`	The description of the node that generated the event, in the form <node ID> - <node type> / <node instance> (e.g. 1 – IOM/1).
`Node_name`	The extended module name.
`Error_code`	The error code as recorded in the logs.
`Error_message`	The error description as recorded in the logs.
`Error_color`	The error color, as reconstructed by matching the error code and the node type with the error handling configuration info.
`Requires_ui`	The “Requires User Intervention” error configuration info, as reconstructed by matching the error code and the node type with the error handling configuration info.

NOTE

The error_color, requires_ui, error_message and automation_behavior (not shown) fields may have a value of (unknown), which means one of two things:

- If the document has the flag_error_data_not_found set to true, it means that DAS did not find any correct match between error code and node type with error handling configuration info.
- If the document does not have the flag_error_data_not_found, it means that DAS did not process this document yet.

4.8.7.2.6 Uptime

The Uptime dashboard provides uptime information regarding an automation system as a whole, as well each of its modules.

The available controls are as follows: `Node ID`, `Node Type`, `Automation Behavior`, `Automation behavior`, `Requires UI` and `Error Message`, which allows full-text search on the `error_message` field.

Table 77: DAS uptime dashboard

Chart	Description
DAS Uptime by category	The pie chart illustrates the proportion of the system uptime categories(No Errors, Efficiency Loss, Functionality Loss). Each slice represents a different category whose name is shown, with the relative color, in the legend.
DAS Uptime category over time	The line chart displays the minimum and maximum system uptime category (No Errors, Efficiency Loss, Functionality Loss and Off-line) over time.
DAS Uptime by node category	The pie chart illustrates the time proportion of the module uptime categories. The two slices represent the OK and KO and KO_WAIT category of module uptime events. If no filters are applied, the pie chart represents the sum of all modules.
DAS Uptime by node ID	The bar chart represents the module uptime category grouped by node ID.
DAS Uptime by node type	The bar chart represents the module uptime category grouped by node type.
DAS Uptime	The list shows the uptime events of DAS,refer to Table 78 *DAS Uptime events*.

Table 78: DAS Uptime events

Field	Description
Time	The timestamp of the event.
File_line	An incremental ID representing the sequence of events as logged in a DAS log files. This is necessary to correctly sort events with the same timestamp.
Node_description	The description of the node that generated the event, in the form <node ID> - <node type> / <node instance> (e.g. 1 – IOM/1).
Node_name	The extended module name.
Message_type	The DAS log message type.
Run_Status	In case of an event of type RUN-STATUS-CHANGE, this field shows the ON-LINE or OFF-LINE node status.
Error_code	In case of an event of type ERROR or NODE-ERROR, this field shows the error code.
Error_color	In case of an event of type ERROR or NODE-ERROR, this field shows the error color.
Error_message	The error description as recorded in the logs.
Uptime_system_current_category_description	The description of the automation system uptime category reached at the current event.

NOTE
All uptime durations are calculated in milliseconds but displayed in dashboards with following format HH:MM:SS

4.8.7.2.7 Queue Analysis

The Queue Analysis dashboard provides information regarding the physical and firmware worklist queue of the automation system.

The available controls are as follows: `Node ID` and `Node Type`.

Table 79: Queue Analysis dashboard

Chart	Description
`Queue analysis — physical`	"Physical": queue counts the number of physical carriers located in the pit lane of the node. The bar chart displays the average number of carriers in the physical queue of each module.
`Bar analysis — firmware worklist`	"Firmware worklist": represents the carriers allocated in the module firmware buffer The bar chart displays the average fill percentage of the firmware worklist of each module.
`Queue analysis events`	The list shows the queue analysis events, refer to Table 80 *Queue Analysis events*.

Table 80: Queue Analysis events

Field	Description
`Time`	The timestamp of the event.
`Node_description`	The description of the node that generated the event, in the form <node ID> - <node type> / <node instance> (e.g. 1 – IOM/1).
`Node_name`	The extended module name.
`Message_type`	The type of the event, which is structured like <source>.<log type>.<event type> (e.g. dream.control.diverted identifies an event coming from the DREAM source, with log type CONTROL and event type DIVERTED).
`Buffer_queue_count`	The number of carriers present in the physical queue of the module.
`Buffer_queue_reserved_STAT`	The number of slots position available for STAT sample.
`Buffer_queue_worklist`	The number of carriers present in the firmware worklist of the module.
`Buffer_queue_length`	The maximum number of slots (routine + STAT) available in the firmware worklist.

NOTE

In the current DAS version, the Physical Queue Analysis is available only for modules with a single pit lane and single divert.

4.8.7.2.8 DAS-DMS Communication

The DAS-DMS Communication dashboard provides information regarding the messages between them.

The available controls are as follows: `Node ID`, `Sample ID` and `Event Type`.

Table 81: DAS-DMS Communication dashboard

Chart	Description
`DAS—DMS communication by type`	The bar chart displays the count of DAS-DMS message documents grouped by document type.
`DAS—DMS communication over time`	The line chart illustrates the total amount of DAS-DMS message documents over time.
`DAS—DMS communication`	The list shows the communication events of DAS, refer to Table 82 *DAS-DMS Communication events*.

Table 82: DAS-DMS Communication events

Field	Description
`Time`	The timestamp of the event.
`Type`	The type of the event, which is structured like <source>.<log type>.<event type> (Example: dream.control.diverted identifies an event coming from the DREAM source, with log type CONTROL and event type DIVERTED).
`Comment_description`	The message type description of the event.
`Node_description`	The node ID tied to the event (if any).
`Sample_id`	The sample ID tied to the event (if any).

4.8.7.2.9 UTC Motor Current

The UTC Motor Current dashboard provides visual information on the UTC motor current absorption and thresholds.

The available controls are as follows: `Node ID`.

Table 83: UTC Motor Current dashboard

Chart	Description
`UTC motor current by node ID`	Displays some information about the UTC motor current over time, grouped by node ID. The nodes on the top are those with the highest average absorption, to help focus on the most problematic cases. The chart shows the following information: • Average mean current and i^2t • Maximum current peak and i^2t • Minimum current peak and i^2t • Minimum and maximum current absorption thresholds
`UTC motor current`	The list shows the motor current event of DAS, refer to Table 84 *UTC Motor Current events*.
`UTC motor Threshold`	The list shows the Threshold event of DAS, refer to Table 85 *UTC Motor threshold events*.

Table 84: UTC Motor Current events

Field	Description
`Time`	The timestamp of the sample.
`Node_description`	The description of the node that generated the event, in the form <node ID> - <node type> / <node instance>.
`Actual_current`	The instantaneous current being absorbed by the motor when the sample is taken (in mA).
`Mean_current`	The average current absorbed by the motor since the last sample (in mA).
`i²t`	The i^2t (thermal energy associated with current flow) generated by the motor since the last sample (in mA^2s).
`Maximum_peak`	The maximum current absorbed by the motor since the last sample (in mA).
`Minimum_peak`	The minimum current absorbed by the motor since the last sample (in mA).
`Standard_deviation`	The standard deviation from the average current absorbed by the motor since the last sample (absolute number).

Table 85: UTC Motor threshold events

Field	Description
`Time`	The timestamp of the sample.
`Node_description`	The description of the node that generated the event, in the form <node ID> - <node type> / <node instance>.

Table 85 UTC Motor threshold events (cont'd.)

Field	Description
`Minimum_current`	The minimum current threshold (in mA), under which the motor is considered as idle.
`Maximum_current`	The maximum current threshold (in mA), over which the motor is considered as under stress.
`Maximum_i²t`	The maximum i^2t (in mA^2s), over which the motor shuts down to avoid melting.
`Maximum_torque`	The maximum torque threshold.
`Number_of_samples`	The number of 1 Hz samples being taken into consideration for each macro-sample being logged.

4.8.7.2.10 Resource Monitor

The Resource Monitor dashboard provides performances information (RAM, CPU, and disks utilization) of the monitored DAS systems [26].

Table 86: Resource monitor dashboard

Chart	Description
`CPU usage`	The chart displays total CPU usage divided by type of CPU task (user, system, nice, irq, softirq, iowait).
`CPU Usage by Core`	The chart displays total CPU usage divided by core.
`CPU Usage by Process`	The chart displays total CPU usage divided by the top 10 processes.
`CPU Metrics`	The panel displays the total number of available CPU cores, the average CPU usage, and the peak CPU usage. ***NOTE*** All the CPU percentages are not normalized, meaning that the theoretical limit is 100% x number of cores (e.g. with 4 CPU cores, the theoretical maximum is 400%).
`Process Metrics`	The panel displays the average number of processes present in the system, as well as the average number of running processes.
`Memory usage`	The chart displays total memory usage divided by Free, Used and Cache.
`Memory Metrics`	The panel displays total available memory and average used memory (both in bytes and percentage).

26. The resource monitor is an optional feature of DAS Agent, which must be explicitly activated on the monitored FlexLab system. If the resource monitor is not enabled, this dashboard will be empty.

Table 86 Resource monitor dashboard (cont'd.)

Chart	Description
Process Summary	The table displays the top 10 processes, and for each process the average & peak CPU usage, and average & peak memory usage
Network Usage	The chart displays inbound and outbound network traffic expressed in bytes/second
Network Summary	The table displays inbound and outbound cumulative traffic (in bytes) for each network interface.
Disk I/O	The chart displays disk reads and writes, expressed in bytes/second.

NOTE

Resource usage is sampled by default every 10 seconds, so these charts shall be queried at least over 10 minutes. If the time interval queried is smaller, the charts will become harder to read as they will show spikes every 10 seconds, or even nothing at all if the interval queried is too small and does not include even a single sample.

4.8.7.2.11 Configuration Settings Change

The Configuration Settings Change dashboard shows all the manual configuration changes done of the selected automation.

Table 87: Configuration Settings Change dashboard

Chart	Description
Total configuration changes over time	At the top-right side of the dashboard is located a bar chart representing the total number of configuration change events over time grouped by event type.
Login history	Refer to Table 88 *Login history*.
Configuration changes	Refer to Table 89 *Configuration changes*.
Overload configuration changes	Refer to Table 90 *Overload configuration changes*.
Layout Configuration Changes	Refer to Table 91 *Layout Configuration Changes*.
"Advanced Configuration Changes – Exercise	Refer to Table 92 *Advanced Configuration Changes – Exercise*.
Overload Configuration Changes	Refer to Table 93 *Overload Configuration Changes*.
Advanced Configuration Changes – Carrier Buffer	Refer to Table 94 *Advanced Configuration Changes - Carrier Buffer*.
Advanced Configuration Changes – Test Cap Colors	Refer to Table 95 *Advanced Configuration Changes - Test Cap Colors*.
Advanced Configuration Changes – LIS	Refer to Table 96 *Advanced Configuration Changes - LIS*.
Advanced Configuration Changes – Vision System	Refer to Table 97 *Advanced Configuration Changes - Vision System*.

Table 88: Login history

Chart	Description
Time	The timestamp of the event.
Sender	From which GUI the login has been done.
User_id	The ID associated to the user logged.

Table 89: Configuration changes

Chart	Description
Time	The timestamp of the event.
Config_entry	Is one of the entries described in the FL-SA
Config_value	Is the relevant configuration entry value.

Table 90: Overload configuration changes

Chart	Description
Time	The timestamp of the event.
Analyzer_type	Is one of the entries described in the FL-SA.
Overload_config	The new Overload Threshold.

Table 91: Layout Configuration Changes

Chart	Description
Time	The timestamp of the event.
Node_id	The ID of the module tied to the event.
Node_type	The type of the module tied to the event.
Next_jump_node_id	Is the updated Next Node ID
Stat_reserve	Is the updated number of carriers reserved for STAT.
Track_queue_length	Is the updated track length in carriers.

Table 92: Advanced Configuration Changes – Exercise

Chart	Description
Time	The timestamp of the event.
Config_class	Is the type of event (EXERCISE or EXERCISE-TYPE).
Node_id	The ID of the module tied to the event.
Exercise_status	Is the new Exercise status for the node (Enabled/ Disabled).
Start_floor	Updated start_floor parameter of the storage.

Table 92 Advanced Configuration Changes – Exercise (cont'd.)

Chart	Description
Start_lane	Updated start_lane parameter of the storage.
Number_of_floors	Updated storage number_of_floors parameter of the storage.

Table 93: Overload Configuration Changes

Chart	Description
Time	The timestamp of the event.
Analyzer_type	Is the Analyzer type.
Overload_config	The new Overload Threshold.

Table 94: Advanced Configuration Changes - Carrier Buffer

Chart	Description
Time	The timestamp of the event.
Config_class	Is the type of event (CARRIER-BUFFER or EXERCISE-TYPE)
Node_id	The ID of the module tied to the event.
Empty_carrier_percentage	Is the new settings for Empty Carrier percentage.
Node_type	The type of the module tied to the event.
Carrier_buffer	The current setting for carrier buffer

Table 95: Advanced Configuration Changes - Test Cap Colors

Chart	Description
Time	The timestamp of the event.
Test_code	Is the test code.
List_of_allowable_cap_colors	The list of allowable Cap Colors for the test.

Table 96: Advanced Configuration Changes - LIS

Chart	Description
Time	The timestamp of the event.
Entry	The ID of the module tied to the event.
Value	Is the relevant configuration entry value.

Table 97: Advanced Configuration Changes - Vision System

Chart	Description
`Time`	The timestamp of the event.
`Node_id`	The ID of the module tied to the event.
`Vision_system_status`	Is the new Exercise status for the node (Enabled/ Disabled).

4.8.7.2.12 Q-Size

The Q-Size dashboard shows the size in bytes over time of the messages directed to Dream software not yet processed.

Table 98: Q-size dashboard

Chart	Description
`Q Size over time – max dots`	Line chart at the top side displays the average Q-Size over time with dots representing the max value for each time interval.
`Max Q Size over time`	Chart in the middle displays the max Q-Size over time.
`Q Size over time – percentile 95th 99th`	Line chart, under the one representing the max Q-Size over time, displays 95th and 99th percentile Q-size over time.
`Q-Size Metrics`	Metric chart at the bottom-right displays the maximum, 95th and 99th percentile Q-size.
`Q-size events`	Refer to Table 99 *Buffer Q-size events*.

Table 99: Buffer Q-size events

Chart	Description
`Time`	The timestamp of the event.
`Q-size`	The current size in bytes of the messages directed to Dream software not yet processed.

4.8.7.2.13 Node Performance

The Node Performance dashboard shows the performance of the nodes in terms of throughput and overload counters.

For each nodes when overload is not configured only data related the throughput will be shown.

The controls filters supported in these dashboard are `node_type` and `node_instance`.

The charts displayed are as follows:

Table 100: Node Performance

Chart	Description
`Tubes Processed By Node Type`	Metric chart displays the count of tube processed by node type, the top 5 plus a single bucket that sum the other nodes excluded from visualization.
`Node Throughput – Node Overload Counters – Node Overload Threshold over Time`	Line chart, displays this metrics overlapped and filtering by controls node_type and node_instance user can evaluate and compare the performance of the selected nodes. By default are supported only the first series for each metrics, when user filters by node type the top 10 instances is shown. ***NOTE*** This visualization aggregates data according @timestamp per 10 minutes.
`Node Throughput over Time`	Line chart, displays the Node Type Throughput over time for the top 5 occurrences, when user filters by node_instance the count over time is related for the selected single node.
`Max Node Overload Counters over Time`	Line chart, display the max value of overload counter for the top 5 node type class, when user filter by multiple node_instance the overload counter shown is the max value between the multiple instances.
`Node Overload Counters`	Table chart, display the max value of overload counter for the top 5 node type class, when user filter by multiple node_instance the overload counter shown is the max value between the multiple instances.

4.8.7.2.14 Track Status

The Track Status dashboard shows the count of the carriers total, full or empty inside the Automation System, Main Track, Buffer Module or Overpass Module.

In this dashboard are also represented the count of tubes not identified/Unknown on Track and the count on tube inside the Storage module.

The charts displayed are as follows:

Table 101: Track Status

Report	Description
`Carrier`	Line chart displays: • Carriers on Automation System Total/full/empty series over Time. • Carriers on Main Track Total/full/empty series over Time. • Carriers on Module buffers Total/full/empty series over Time. • Carriers in outbound Overpass Module Total/full/empty series over Time. • Carriers in internal Overpass Module Total/full/empty series over Time.
`Tube`	Line chart displays: • Tubes to be identified on Track & Unknow tubes on track over Time. • Tubes in Storage module series over Time, splitted by storage instances

4.8.7.2.1 Scheduled Reports

The Scheduled Reports consists of a three-column table, which allows the user to download scheduled reports in csv format or in a ZIP archive file that contains CSV file.

The first column displays the report name which describes the type and the related time interval, the second column shows the report creation time-stamp, and the third column contains the `Download` button (For more details refer to the following paragraphs).

The Scheduled Reports Dashboard allows the user to navigate through different reports and report execution. Every files, result of a scheduled report execution, can be found at the following path: `/<report-id>/<execution-timestamp>`.

Table 102: Scheduled Reports

Report	Description
`Error Detail`	A detailed report about blocking errors refer to 4.8.7.2.1.2 *Error Detail*.
`Node Efficiency`	The daily rate of blocking errors over processed carriers, by node refer to 4.8.7.2.1.3 *Node Efficiency*.
`Sample Analysis`	The daily rate of sample processing by node, taking into account only specific events refer to 4.8.7.2.1.4 *Sample Analysis*.
`Tube Counters`	The hourly rate of sample processing by node refer to 4.8.7.2.1.5 *Tube Counters*.
`Node Uptime`	The daily uptime/downtime by node refer to 4.8.7.2.1.6 *Node Uptime*.

Table 102 Scheduled Reports (cont'd.)

Report	Description
`System Uptime`	The whole automation system uptime/downtime refer to 4.8.7.2.1.7 *System Uptime*.
`OEE`	The hourly OEE metric (Overall Equipment Effectiveness) refer to 4.8.7.2.1.8 *OEE (Overall Equipment Effectiveness)*.
`HVS Retrieve Times`	A detailed report about the retrieve times of the HVS refer to 4.8.7.2.1.9 *HVS Retrieve Times*.
`Module Reboots`	A detailed report of each REBOOT command sent to each module refer to 4.8.7.2.1.10 *Module Reboots*.
`Errors by Hour`	A hourly count of node-related and sample-related errors refer to 4.8.7.2.1.11 *Errors by Hour*.
`Loading Unloading by Lane`	A detailed report refer to 4.8.7.2.1.12 *Loading Unloading by Lane* .
`Test Counters`	A detailed report refer to 4.8.7.2.1.13 *Test Counters*.

4.8.7.2.1.2 Error Detail

The Error Detail report exports a detailed list of module blocking errors that acts as a support for more synthetic reports like node efficiency and node uptime.

Table 103: Blocking error

Event	Result
Events of type dream.control.node-error or dream.control.error with `error_color`	Red or Red+
Excludes the events with `requires_ui`	Analyzer Error
Excludes the events with `error_code`	S0032, S0033, S202B, 2D92

Given start and end dates in "YYYY-MM-DD" format, the report is named`<monitored_system_id>__<flexlab_id>__error-detail__<start datetime>__<end datetime>.csv` and contains the following columns:

Timestamp	Node_id	Node_type	Node_ instance	Error_code	Error_ message	Error_color
Timestamp of the error event in ISO 8601 format	Numeric ID of the node	Type of the node	Instance number of the node	Error code	Descriptive error message	Error color (severity)

4.8.7.2.1.3 Node Efficiency

The Node Efficiency report exports the daily count of blocking errors and processed carriers for each node.

The node efficiency can be then computed as:

$$1-\left(\frac{blocking\_errors}{processed\_carriers}\right)$$

The query criteria are the following:

1. Blocking errors
2. Processed carriers:
   - The count of dream.control.returned events for all nodes that generate this type of event (all except those noted below)
   - The count of dream.control.diverted events for nodes of type TBM, TTM, TUM

Given start and end dates in "YYYY-MM-DD" format, the report is named `<monitored_system_id>__<flexlab_id>__node-efficiency__<start datetime> __<end datetime>.csv` and contains the following columns:

Node_id	Node_type	Node_ instance	Node_de-scription	Date	Process-ed_ carriers	Blocking_ errors	Blocking_ errors_re-quires_ui_ yes
Numeric ID of the node	Type of the node	Instance number of the node	Verbose description of the node	Date in YYYY-MM-DD format	As defined above	As defined above	Subset of blocking errors with requires_ui = Yes

NOTE

The column `blocking_errors_requires_ui_yes` represents the number of blocking errors requiring a user intervention to be solved. Efficiency computed using this number of errors considers as "inefficiency" only those blocking errors that required a user intervention to solve them.

4.8.7.2.1.4 Sample Analysis

The Sample Analysis report exports a daily summary of sample processing events, grouped by event type and node.

Table 104: Sample processing events

Event	Description
`L001 – Sample Receipt Notification`	It is generated when a sample is loaded and identified by the Automation System for the first time.
`L002 – Sample Re-Load Notification`	It is generated when a sample is loaded on the Automation System a second or subsequent time.
`L003 – Sample Re-Identification Notification`	It is generated when a sample is re-identified for confirmation.

Table 104 Sample processing events (cont'd.)

Event	Description
S001 – Sample Location Notification	It is generated when a sample is moved to an off-track location (i.e. in a centrifuge, in a storage module, in a pick-and-place analyzer, and so on).
S003 – Tube Sampled Notification	It is generated when a sample is returned to main track after being sampled.

Given start and end dates in "YYYY-MM-DD" format, the report is named sample_analysis_<start date> _<end date>.csv and contains the following columns:

Comment_ type	Node_id	Node_type	Node Instance	Date	Count
The comment code as defined above	Numeric ID of the node	Type of the node	Node instance	Date in YYYY-MM-DD format	The count of the comment occurrences

4.8.7.2.1.5 Tube Counters

The Tube Counters report exports an hourly summary of sample processing events, grouped by node.

The sample processing events being counted are divided into three steps:

1. **Processed**: it is generated when a sample is returned to the main track from a node's pit lane, after being processed.
2. **Unloaded**: it is generated when a sample is moved to an off-track location to be processed (i.e. in a centrifuge, in a storage module, in a pick-and-place analyzer, and so on).
3. **Disposed**: it is generated when a sample is disposed by a storage module.

Given start and end dates in "YYYY-MM-DD" format, the report is named tube_counters_<start date> _<end date>.csv and contains the following columns:

Node_id	Node_type	Node Instance	Date	Hour	UTC Offset	Process_ step	Count
Numeric ID of the node	Type of the node	Node instance	Date in YYYY-MM-DD format	The hour in HH format	The UTC offset	The process step as defined above	The count of the comment occurrences

4.8.7.2.1.6 Node Uptime

The Node Uptime report is associated to a Flexlab component and exports an hourly summary of node uptime and downtime.

Given the blocking error, the node uptime / downtime is defined as follows:

- OK (uptime): the node transitions to this state whenever a non-blocking error is generated.
- KO_WAIT : a start-recovery event defines the transition from the KO_WAIT to the KO condition.

- `KO` (downtime): the node transitions to this state whenever a blocking error is generated.

Given start and end dates in “YYYY-MM-DD” format, the report is named `<monitored_system_id>__<flexlab_id>__uptime-node__<start datetime>__<end datetime>.csv` and contains the following columns:

Node_id	Node_ type	Node In- stance	Date	Hour	UTC Offset	Ok_du- ration	Ko_du- ration	Ko_du- ration_ mainte- nance	KO Wait Dura- tion Not Mainte- nance
Numeric ID of the node	Type of the node	Node in- stance	Date in YYYY- MM-DD format	Hour in HH format	The UTC offset	The up- time du- ration ex- pressed as deci- mal frac- tion of 24 hours (0.0416- 67 = 1 hour)	The down- time du- ration ex- pressed as deci- mal frac- tion of 24 hours (0.0416- 67 = 1 hour)	The frac- tion of down- time du- ration due to mainte- nance errors	The down- time du- ration due to “not in mainte- nance” errors

The `ko_duration_maintenance` has been explicitly separated because it is a “foreseen” downtime for modules that require periodic maintenance.

You can compute the downtime without maintenance by subtracting the following columns:

$$ko\_duration - ko\_duration\_maintenance$$

4.8.7.2.1.7 System Uptime

The System Uptime report exports a summary of the whole Automation System uptime and downtime.

Table 105: Automation System uptime / downtime category

Category	Result
`No Errors`	All the nodes are in OK state.
`Efficiency Loss`	At least one node is in KO state, but there are other nodes of the same type in OK state. This category denotes a possible efficiency loss: the Automation System can still perform the desired operation, but not at full capacity
`Functionality Loss`	At least one node is in KO state, and there are no other nodes of the same type in OK state. This category denotes a possible functionality loss: the Automation System cannot perform the desired operation, if needed.

Table 105 Automation System uptime / downtime category (cont'd.)

Category	Result
`Total Stop`	A whole Automation System downtime. This happens only in two cases: • A software error that stops the whole Automation System • A firmware error with automation_behavior = Pause
`Offline`	The whole Automation System is offline, not due to an error but due to a foreseen shutdown.

Given start and end dates in "YYYY-MM-DD" format, the report is named `<monitored_system_id>__<flexlab_id>__uptime-system__<start datetime>__<end datetime>.csv` and contains the following columns:

Category	Duration
The Automation System uptime category, as defined above.	The total number of milliseconds spent in the given category.

4.8.7.2.1.8 OEE (Overall Equipment Effectiveness)

The OEE report exports the data necessary to compute the hourly OEE metric.

The OEE metric is defined as `Availability*Performance*Quality`, where each term is defined as follows:

- **Availability**: the hourly node uptime, expressed as an absolute number between 0 (0% uptime in the given hour) and 1 (100% uptime in the given hour).
- **Performance**: the actual number of processed samples over the theoretical throughput of the module, computed as $\frac{actual\_throughput}{theorical\_throughput}$.
- **Quality**: we do not take this parameter into account, so it is assumed to be always 1.

Given start and end dates in "YYYY-MM-DD" format, the report is named `oee_details_<start date>_<end date>.csv` and contains the following columns:

Node_id	Node_ type	Node In-stance	Date	Hour	UTC Offset	Ok_du-ration	Total_ dura-tion	Actual_ throug-hput	Theo-retical_ throug-hput
Numeric ID of the node	Type of the node	Node in-stance	Date in YYYY-MM-DD format	The hour in HH format	The UTC offset	Node uptime in milli-seconds	The down-time du-ration ex-pressed as deci-mal frac-tion of 1 hours (3600.0-00)	Actual number of proc-essed samples	Theoret-ical maxi-mum number of proc-essed samples by hour

The OEE final metric can be then computed as follows:

- Availability: $\frac{ok\_duration}{3600}$
- Performance: $\frac{actual\_throughput}{theorical\_throughput}$
- OEE: $availability \cdot performance$

NOTE

The production_date field represents the day to which the given OEE lines are formally associated, from 6 PM to 6 AM:

- Equals to date from 6 PM to 12 AM
- Equals to date minus 1 day from 12 AM to 6 AM (the production date is considered “yesterday” until 6 AM)
- Equals to blank from 6 AM to 6 PM (outside of production hours)

NOTE

The report extract information related only to nodes for which a static definition of theoretical throughput is provided.

4.8.7.2.1.9 HVS Retrieve Times

The HVS Retrieve Times report exports a detailed analysis of HVS sample retrieval times.

The analysis considers a specific subset of samples: only those who have one or more RETRIEVE requests (message type dream.control.retrieve) for any HVS, followed by one or more L004 event (message type dream.comment.l004, the “Sample Exit from Storage” notification), followed by at least one S003 event (message type dream.comment.s003, the “Tube Sampled” notification).

Given start and end dates in “YYYY-MM-DD” format, the report is named `hvs_retrieve_times_<start date>_<end date>.csv` and contains the following columns:

Sample ID	First Retrieve Request / Last Retrieve Request	Retrieve Count	First L004 / Last L004	L004 Count	S003	Time from First Request to First L004	Time from Last Request to First L004	Time between L004	Time from Last L004 to S003
The sample ID	The time-stamps of the first and last retrieve request made for this sample	The number of retrieve requests made before actual sample retrieval	The time-stamps of the first and last L004 message, indicating actual sample retrieval. These time-stamps should always be the same; if they are different, it may be the symptom of some-thing wrong in the retrieval logging.	The number of L004 messages (should always be 1)	The time-stamp of the first S003 message logged after actual retrieval, generated when a retrieved sample goes to the first analyzer to be analyzed	This is the HVS retrieval time as computed from the first retrieve request to the first L004 message. This is the "true" HVS sample retrieval time; the following one should be used only in case of retrieval problems.	This is the HVS retrieval time as computed from the last retrieve request to the first L004 message. This HVS sample retrieval time should be used only in case of retrieval problems with the first request.	The time between the first and last L004 (should always be 0)	This is the time between the exit from storage and the first sampling event. This time is not related to HVS efficiency, but measures the time it takes a sample to go from HVS retrieval to the first available analyze.

Sample ID	First Retrieve Request	Last Retrieve Request	Retrieve Count	First L004	Last L004	L004 Count	S003	Time from First Request to First L004	Time from Last Request to First L004	Time between L004	Time from Last L004 to S003
The sample ID	Timestamps of retrieve request made for this sample. Format: YYYY-MM-DD HH:mm:ss:SSS + UTC Offset	Timestamps of last retrieve request made for this sample Format: YYYY-MM-DD HH:mm:ss:SSS + UTC Offset	Number of retrieve requests made	Timestamps of the first L004 message. Format: YYYY-MM-DD HH:mm:ss:SSS + UTC Offset	Timestamps of the last L004 message. Format: YYYY-MM-DD HH:mm:ss:SSS + UTC Offset	Number of L004 messages	Timestamp of the first S003 message received after actual retrieval	Time from first retrieve request to the first L004 message expressed as decimal fraction of 24 hours (0.0416-67 = 1 hour)	Time between the first and last L004 expressed as decimal fraction of 24 hours (0.0416-67 = 1 hour)	Time between the first and last L004 expressed as decimal fraction of 24 hours (0.0416-67 = 1 hour)	Time between the exit from storage and the first sampling event expressed as decimal fraction of 24 hours (0.0416-67 = 1 hour)

4.8.7.2.1.10 Module Reboots

The Module Reboots report exports a detailed list of module reboots.

Module reboots are defined as events of type `dream.control.diagnostics` with command equals to 10.

Given start and end dates in "YYYY-MM-DD" format, the report is named `reboot_<start date> _<end date>.csv` and contains the following columns:

Date	Hour	Node ID	Node Type	Node Instance
The date of the reboot event in YYYY-MM-DD format	The hour of the reboot event in HH format	Numeric ID of the node	Type of the node	Node instance

4.8.7.2.1.11 Errors by Hour

The Errors by Hour report is associated to a Flexlab component and exports a hourly count of module-related and sample-related errors, with the following criteria:

- Module-related errors are a count of `dream.control.node-error` occurrences.
- Sample-related errors are a count `dream.error` occurrences, where the `sample_id` field exists and is different from empty string.
- Errors with color `Green` and (unknown) are not counted.

Given start and end dates in YYYY-MM-DD format, the report is named <monitored_system_id>__<flexlab_id>__error-by-hour__<start datetime> __<end datetime>.csv and contains the following columns:

Error Code	Node Type	Error Color	Error Message	Requires UI	Automation Behaviour	Date	Hour	UTC Offset	Count (Node)	Count (Sample)
The code of the error	Type of the node	The color of the error	The message of the error	The error category in terms of user intervention	The automation behavior when the error happens	The local date in YYYY-MM-DD format	The local hour in HH format	The UTC offset	The count of module-related errors	The count of sample-related errors

In particular, the two Count columns have the following meaning:

- Both columns show the number of times the given error code occurred for the given node type in the given date & hour.
- Count (Node): this is the number of occurrences not related to a specific sample, but only related to the node itself.
- Count (Sample): this is the number of occurrences related to a specific sample.

Please bear in mind that the same row can have both Count columns with a value higher than 0. For example, this is a valid report line

Error Code	Node Type	Error Color	Error Message	Requires UI	Automation Behaviour	Date	Hour	UTC Offset	Count (Node)	Count (Sample)
0207	IOM	Yellow	Unreadable Sample ID	No	n/a	2020-02-16	00	-05:00	12	12

In this case, the last two columns have the following meaning:

- Count (Node): there were 12 occurrences of the 0207 IOM error relative only to the node
- Count (Sample): there were 12 occurrences of the 0207 IOM error relative to samples

The two columns are independent, and their meaning is related to the specific error code. In case of 0207 IOM error (“Unreadable Sample ID”), the IOM module reports one occurrence only related to the module, and THEN another separate occurrence relative to a specific sample.

4.8.7.2.1.12 Loading Unloading by Lane

The Loading Unloading by Lane report is associated to a Flexlab component and exports a hourly count of sample loading and unloading rate by module lane, with the following criteria:

- `dream.control.sample-detected` type messages are considered sample load occurrences while `dream.control.sample-location` type messages are considered sample unload occurrences.
- The report is extended to all the modules that contain the Lane information (rack_lane field exists and is greater or equal than 0).

> ***NOTE***
>
> Flexlab messages not providing lane information are excluded from this report. Example: re-identification of samples by IOM.

Given start and end dates in YYYY-MM-DD format, the report is named <monitored_system_id>__<flexlab_id>__loading-unloading-by-lane__<start date time> __<end datetime>.csv and contains the following columns:

Node ID	Node Type	Node Instance	Node Name	Lane	Type	Date	Hour	UTC Offset	Count
Numeric ID of the node	Type of the node	Node instance	Name of the node	Number of the lane where the tube is	Type of the operation: it can be Load or Unload	The local date in YYYY-MM-DD format	The local hour in HH format	The UTC offset	The sample count

The Count columns represents the number of the Loading or Unloading count grouped by node, lane and hours.

4.8.7.2.1.13 Test Counters

The Test Counters report is associated to a DMS component and exports a hourly count of test grouped by test code and instrument code, with the following criteria:

- Messages with event_code “111004” are used to compute the test count. This means that the resulting value is a count of all results received from analyzers (valid, not valid or reruns)

Given start and end dates in YYYY-MM-DD format, the report is named <monitored_system_id>__<dms_id>__ test-counters__<start datetime> __<end datetime>.csv and contains the following columns:

Test Code	Instrument Code	Date	Hour	UTC Offset	Count
Code of the Test	Code of the Instrument	The local date in YYYY-MM-DD format	The local hour in HH format	The UTC offset	The test count

The Count columns represents the number of test count grouped by test code, instrument code and hours.

4.8.7.2.14 Configuration Backup

The Configuration Backup consists of a three-column table, which allows the user to download the saved DAS configuration backup files.

The first column displays the filename, the second column shows the relative timestamps, and the third column contains the `Download` button to download the file.

The table reproduces the folder layout of the DAS configuration folder. If the row is a file, a `Download` button for the download is located in the third column, otherwise if the row is a folder it is possible to access it by clicking over the row itself.

In case there are multiple files of the same type, by clicking on the `Previous Versions` link a list containing all the related files appears.

On the top of the dashboard there is a bread crumbs section, which allows the user to keep track of their locations within the folder structure. Clicking on the Home icon redirects to the document root folder.

4.8.7.2.15 Performance Dream

The Performance Dream dashboard provides a detailed view on Dream message processing times .

The available controls are as follows: `Message type` , `Node Type`, `Node ID` and `Task Number`.

Table 106: Performance Dream dashboard

Chart	Description
Software Usage by Message Type	The chart shows FlexLab Software Usage divided by message type, where the percentage is the portion of 1 second that the software is taking to process the given message types. The colored areas show the top 10 message types being processed; the size of each area represents how much time the software is devoting to process that type of message. ***NOTE*** • The theoretical maximum value for the percentage is 100% for number of FlexLab threads (so with 1 thread the maximum is 100%, with 4 threads is 400%, and so on). • While this metric is a good representation of software load, the fact that it reaches the theoretical limit does not mean that the system will immediately experience problems; it just means that the software is reaching its full capacity to process messages. You should monitor q-size along with software usage, as when software usage stays above the theoretical maximum for extended periods of time, q-size is expected to ramp up.
Exec-Time Metrics	The chart shows average, maximum and minimum exec_time, along with the grand total of messages processed in the given time window.
Software Usage by Task	The chart shows FlexLab Software Usage divided by task. The colored areas show the various tasks that are processing messages; the size of each area represents how much time each task is taking to process all its messages.
Count by Task and Message Type	The bar chart shows the top 10 message types by count, divided by task.
Average Exec-Time by Message Type	The chart represents the average message processing time over time, split by message type.
Average Exec-Time by Message Type	The bar chart shows the absolute average for each of the top 10 message types.
Average Exec-Time by Tube Presence over time	The chart represents the average PASS processing time over time, split by tube_presence.
Average Exec-Time by Tube Presence	The bar chart shows the absolute average for tube presence TRUE and FALSE.
Average Exec-Time by Tube Presence	The chart represents the message count over time, split by message type.
Message Type Count over time	The bar chart shows the count for each of the top 10 message types.

Table 106 Performance Dream dashboard (cont'd.)

Chart	Description
`Message Type Count`	The chart represents the average message processing time over time, split by node ID.
`Average Exec-Time by Node over time`	The bar chart shows the absolute average for each of the top 10 node IDs.
`Average Exec-Time by Node Type`	The chart represents the average message processing time over time, split by node type.
`Average Exec-Time by Node Type`	The bar chart shows the absolute average for each of the top 10 node types.

4.8.7.3 DMS

4.8.7.3.1 Tests

The DMS Tests dashboard provides an overview of the tests loaded and performed by the instruments linked to DMS

The available controls are as follows: `Day of Week`, `Sample ID`, `Order ID`, `Test Code`, and `Instrument Code`.

Table 107: DMS Tests dashboard

Chart	Description
`DMS tests by day of week`	The bar chart displays the total amount of tests per day of week.
`DMS tests by code / run`	The bar chart displays the proportion between unique runs and reruns for each test code.
`DMS tests by instrument / code`	The bar chart displays the total amount of tests performed by instrument.
`DMS tests by code / instrument`	The bar chart displays the total amount of tests performed, grouped by test code and instrument.
`DMS test`	The list shows the DMS test event, refer to Table 108 *DMS Tests events*.

Table 108: DMS Tests events

Field	Description
`Time`	The timestamp of the event
`Sample_id`	The sample ID of the event
`Order_id`	The order ID of the event
`Test_code`	The DMS test code of the event
`Instrument_code`	The DMS instrument code of the event

4.8.7.4 T-Hub

4.8.7.4.1 ProTube Orders

The ProTube Orders dashboard provides several information regarding ProTube events.

he available controls are as follows: `Patient ID`, `Patient Visit Number`, `Workstation`, `Operator ID` and `Workplace`.

Table 109: ProTube Orders dashboard

Chart	Description
`Order count, Tubes count, Other containers count, Order Turn-around Time`	A set of windows displays : the number of orders, tubes, other containers and the average time per order.
`Orders by status`	The pie chart displays the orders grouped by status (aborted, completed, partial), (with relative percentage).
`Orders by hour`	The bar chart displays the number of order per hour.
`Orders by workplace`	The pie chart displays the number of order per laboratory (with relative percentage).
`Orders by workstation`	The bar chart displays the number of order grouped by ProTube.
`Orders by date`	The bar chart displays the number of order per date.
`Orders by operator`	The bar chart displays the number of orders per operator.
`Average order time by date`	The line chart shows the average order time over date.
`Tubes and other containers by date`	The bar chart displays the number of tubes and other containers grouped by date.
`Tubes labeled`	The bar chart displays tubes labeled per date. ***NOTE*** If filters are applied, this chart will not be display data due to the different data source.
`Orders`	The list shows the Orders events, refer to Table 110 *ProTube Orders events*.

Table 110: ProTube Orders events

Field	Description
`Time`	The timestamp when the job has been started.
`Ended`	The timestamp of the last recorded operation of the job.
`Type_description.en`	The job status.

Table 110 ProTube Orders events (cont'd.)

Field	Description
Operator_id	The operator ID who has been assigned to the selected job.
Patient_id	The patient ID from which the sample were taken.
Placer_group_number	The placer group number ID is an order of patient tests.
Machine_name	ProTube name.
Workplace	Laboratory where the ProTube is located.

4.8.7.4.2 ProTube Reports

The ProTube Reports dashboard provides information regarding ProTube errors.

The available controls are as follows: Workstation, Operator ID and Workplace.

Table 111: ProTube Reports dashboard

Chart	Description
Errors by date	The bar chart display the errors per date grouped by type.
Errors by workstation	The bar chart displays the errors per workstation grouped by type.
Errors count	The bar chart displays the errors per type grouped by ProTube name.
Tubes labeled	The bar chart displays tubes labeled per date grouped by model.
DMS stats over time	The line chart displays Mahalanobis Distance statistics over time.
DM metrics	The window displays Mahalanobis Distance metrics.
Tube not matched by model	The bar chart displays the number of tubes not matched per model.
Color mismatch by model	The bar chart displays the number of color mismatched per model.
Reports	The list shows the Reports events, refer to Table 112 *ProTube Reports events*.

Table 112: ProTube Reports events

Field	Description
Time	The timestamp when the job has been started
Type_description.en	The event description

Table 112 ProTube Reports events (cont'd.)

Field	Description
Alias	ProTube description field.
Operator_id	The operator ID who took the sample.

4.8.7.4.1 ProTube Timeline

The ProTube Timeline dashboard shows the ProTube traceability events timeline including transport and queue management events.

The available controls are as follows: Patient ID, Barcode, Patient Visit Number and Patient Visit Number (Queue Managment). If you are using Filters panel you can only search for the Patient ID, Barcode, Patient Visit Number (referred to Placer Group Number) and Patient Visit Number (referred Queue Management Artexè Mr.You) fields

Table 113: ProTube Timeline dashboard

Chart	Description
Time ascending	Allows to change the timeline order from ascending to descending or vice versa.
Number ProTube events	Displays the number of ProTube events visualized in the current page over the total number.
Timeline events over time	Displays the timeline events over time, where each color stands for a different event and the length is its duration related to the total timeline.
Timestamp of the first timeline event, timestamp of the first timeline event and the total duration	Displays the timestamp of the first timeline event (left) and c (right), in the middle is shown the total duration between them.
ProTube traceability events timeline	Displays the ProTube traceability events timeline in details.

NOTE

Timeline view displays only the first 50 events (using Time ascending ordering) of the total messages filtered or the last 50 events (using Time descending ordering) of the total messages filtered. If the total number of events exceeds 100 events, the data between the first 50 and the last 50 events will not be displayed.

Example: if you have a total of 300 events filtered, you can display the first 50 events (from 1st to 50th), or the last 50 events (from 300th to 251th), but you can't display the other events (from 51th to 250th). To avoid this case, you should reduce the number of total events displayed to less than 100 events, filtering results by Patient ID, Patient Visit Number or using a narrower time interval, and then using Time ascending or Time descending ordering to display the first 50 or the last 50 events. The number of displayed events and total events filtered is displayed on the top-right of the timeline bar chart (showing <displayed hits> of <number of total hits>).

4.8.7.4.1.2 ProTube Timeline event details

The vertical timeline shows ProTube events in vertical ascending order. For each event is displayed:

Table 114: ProTube Timeline event details dashboard

Chart	Description
Timestamp	Displays timestamp with the time elapsed and its percentage in relation to the total timeline.
Number ProTube events	Displays the event with the same color used to represent the event in the horizontal timeline.
Timeline events over time	Displays the timeline events over time, and some additional information.
Queue management	Displays the queue management events. ***NOTE*** By clicking on one of the event names the user can collapse or extend all the detail tables

Table 115: ProTube process event details

Events	Value
Abort	Reason
Batch	• Row: Workplace Workstation • Operator ID • Labels
File Corrupted	File
Checkout	-
Check Printer	Row: Workplace, Workstation, Operator ID
Communication Error	Row: Workplace, Workstation, Operator ID
Color Mismatch	Row: Workplace, Workstation, Operator ID
Identification	• Row: Workplace, Workstation, Operator ID • Table: Query parameter, Value • Table: Patient
Labeled	-
Label Search	• Row: Workplace, Workstation, Operator ID • Table: Model, Samples
Length Mismatch	• Row: Workplace, Workstation, Operator ID • Tube Short
Order Done	Row: Workplace, Workstation, Operator ID
Order Search	• Table: Query parameter, Value

Table 115 ProTube process event details (cont'd.)

Events	Value
	• Table: Placer Group Number, Barcode, Logical Tube ID, Test
`Pending`	-
`Relabeling`	Table: Barcode, Tube/Label, Logical Tube ID
`Start Labeling`	Table: Barcode, Tube/Label, Logical Tube ID
`Tube Done`	• Table: Workplace, Workstation, Operator ID • Model
`Tube Load`	-
`Tube Matched`	• Row: Workplace, Workstation, Operator ID • Table: Model, Probability, RGB
`Tube not Matched`	• Row: Workplace, Workstation, Operator ID • Table: Tube, Reason, Probability, RGB
`Tube not in Batch`	• Table: Workplace, Workstation, Operator ID • Model
`Transport Mission Start` and `Transport Mission End`	Table 1: Mission id, Container id with the amount of tube it contains, and, only if there is a filter for patient, the Patient id with the total number of tubes drawn for the patient. Table 2: Rack, patient, barcode
`Scheduled time reservation`	-
`Ticket withdrawal with reservation`	Table 1: Terminal ID, Room ID
`Ticket withdrawal without reservation`	Table 1: Terminal ID, Room ID
`Queue manager Call`	Table 1: Terminal ID, Room ID
`Queue manager Recall`	Table 1: Terminal ID, Room ID
`Queue manager Lost`	Table 1: Terminal ID, Room ID
`Time difference between ticket withdrawal to call`	Table 1: Time difference, Value
`Time difference between ticket withdrawal to reservation` (only for patient with reservation)	Table 1: Time difference, Value
`Time difference between reservation to call` (only for patient with reservation)	Table 1: Time difference, Value

4.8.7.4.3 ProTube Sample Transportation

The ProTube Sample Transportation dashboard showing the following charts:

The dashboard is searchable by `mission_id` and `container.racks.samples.barcode`.

Table 116: ProTube sample transportation details dashboard

Chart	Description
`Transport acceleration`	The chart shows the temperature data.
`Transport temperature`	The chart shows the acceleration data.
`Acceleration metrics by mission ID` (thub-test)	The data table shows the average, maximum and minimum acceleration by mission_id.
`Temperature metrics by mission ID` (thub-test)	The data table shows the average, maximum and minimum temperature by mission_id

4.8.7.5 Anatomical pathology

4.8.7.5.1 Anapath monitoring

In this dashboard are displayed visualizations with high-level metrics of Anapath process: surgery, accessioning, grossing, embedding and microtomy.

Table 117: Anapath monitoring dashboard

Chart	Description
`Orders sent`	This value can be retrieved counting ORDER_REQUEST_SENT occurrences, in the selected range.
`Existing specimens`	This value shall be the number of existing specimens, where existing means that the specimen has been SPECIMEN_CREATED and not SPECIMEN_DELETED in the selected range.
`Specimens accepted`	So, considering as 100% the Existing specimen value, the metric should show the number of specimens whose last state is SPECIMEN_PENDING and the number of specimens whose last state is SPECIMEN_ACCEPTED, in the selected range.
`Existing cassettes`	This value shall be the number of existing cassettes, where existing means that a cassette has been CASSETTE_CREATED and not CASSETTE_DELETED in the selected range.
`Paraffin blocks`	This value can be retrieved counting PARAFFINBLOCK_CHECKOUT occurrences, in the selected range.
`Slices creates`	This value can be retrieved counting SLIDE_CREATED occurrences, in the selected range.
`Existing specimens`	This pie chart consider 100% the Existing specimen value, the chart should show the number of specimens whose last state is SPECIMEN_PENDING and the number of specimens whose last state is SPECIMEN_ACCEPTED, in the selected range.
`Specimens`	This pie chart should consider as 100% the accepted specimens in the selected range, and show how many of those specimens have been grossed. We consider a specimen as “grossed” when it has at least one CASSETTE_CREATED occurrence.
`Biocassettes`	This pie chart should consider as 100% the CASSETTE_CREATED occurrences in the selected range, and show how many of them have been deleted considering the CASSETTE_DELETED occurrence in the selected range.
`Biocassettes and blocks`	This pie chart should consider as 100% the difference between CASSETTE_CREATED occurrences in the selected range, and CASSETTE_DELETED. We can call this value the Existing biocassettes.

Table 117 Anapath monitoring dashboard (cont'd.)

Chart	Description
	So, considering as 100% the Existing biocassettes value, the chart should show how many of them became paraffin blocks considering the PARAFFIN_BLOCK_CHECKOUT occurrences.
`Blocks`	This pie chart should consider as 100% the PARAFFIN_BLOCK_CHECKOUT occurrences in the selected range, and show how many of them have been sliced. We consider a paraffin block as “sliced” when it has at least one SLICE_CREATED occurrence.
`Orders to laboratory`	This bar chart should consider ORDER_REQUEST_SENT occurrences grouped by time.
`Accepted specimens`	This bar chart should consider SPECIMEN_ACCEPTED occurrences grouped by time.
`Grossed specimens`	This bar chart should consider CASSETTE_CREATED occurrences, unique by specimen, grouped by time.
`Created biocassettes`	This bar chart should consider CASSETTE_CREATED occurrences, grouped by time.
`Paraffin blocks`	This bar chart should consider PARAFFINBLOCK_CHECKOUT occurrences, grouped by time.
`Slides creates`	This value can be retrieved counting SLIDE_CREATED occurrences, grouped by time.

4.8.7.5.2 Anapath Events

In this dashboard are displayed visualizations with Anapath events splitted by type.

Table 118: Anapath events

Chart	Description
`Anapath events type`	The pie chart shows anapath events splitted by type.
`Anapath events`	The bar chart shows anapath events grouped by @timestamp.
`Events`	A table chart grouped by type, description, transaction_id, actor_type, counter_value.

4.8.7.6 Monitored System

4.8.7.6.1 Free Log Search

From the Free Log Search dashboard, the user is able to run custom queries using the syntax documented in following paragraph.

Table 119: Free Log Search dashboard

Chart	Description
Free log search count over time	The line chart shows the result count over time.
Free log search	The table displays the list of documents returned.

Moreover, DAS software allows to `save`, `edit`, `load` and `delete` user queries.

To perform a query, the user must type the query string in the input text bar and click the `Run` button. By clicking the Query button, users can choose between the `save` and `load` buttons:

Table 120: Free Log Search dashboard

Chart	Description
`Save`	Open the `Save` popup where the user shall insert the query name and syntax. By default, queries can be viewed only by the user who created them; they can be made visible to all users by checking the Public flag.
`Load`	Open the Load popup where all saved queries are shown. The user can search specific queries by entering part of the name or query string in the input text bar and choosing to display all queries, or just the public or private ones. After selecting a specific query, the user can load it by clicking the `Load` button or delete it with the `delete` button. Every time user delete a query the `Query bar session` is cleaned and the `Load` button will be disabled until another option is selected.
`Clean`	Reset all the `Query bar session` info, set Free Log query bar to match all '*' and allow the user to `create/save a new query`.
`Query bar session`	Display next to the left of Free Log Bar, when user load a query in the Query bar session label will display: 1. the name of the saved query. 2. the state icon that represent one of the two query status Public/Private. 3. The query string loaded in the Free Log Bar.
`Edit Mode`	If user working on a loaded query can edit the selected query clicking on `Query>Save`, the modal will display a alert message that notify the user that the current query is in `Edit Mode` and could update the query name, status and string.

The `Info` button in the Free Log Search bar opens an help online, for example an info panel containing examples of query syntax.

NOTE

The table at the bottom displays the data in raw format, so some datetime fields (like the “duration” ones) are visualized as they are saved in the database in the absolute value expressed in seconds instead of a formatted value like HH:MM:SS.

NOTE

For searching in the free-log search the new error color "red*" it will be necessary to use the escape character \ for searching * (otherwise it will be interpred as "anyString" by the search bar), so in this case the search will have to be done as: `error_color: "Red\*"`

4.8.7.6.1.2 Query syntax

It is possible to specify fields in the query syntax:

Table 121: Field name

Where	Command
The field`node_type` contains `IOM`	`node_type: IOM`
The field `type` contains `dream.error` or `dream.control.error`	`type: (dream.error OR dream.control.error)`
The field `error_message` contains the exact phrase `“Delay at Barcode Reader Gate”`	`error_message: "Delay at Barcode Reader Gate"`
The field `sample_id` has no value (or is missing)	`_missing_: “sample_id”`
The field `sample_id` has any non-null value	`_exists_: “sample_id”`

Table 122: Wildcards

Where	Command
Wildcard searches can be run on individual terms, using “`?`” to replace a single character, and “`*`” to replace zero or more characters	`type: dream.control.*` **NOTE** Be aware that wildcard queries can use large amount of memory and perform badly.

Table 123: Ranges

Where	Command
Ranges can be specified for numeric or string fields. Inclusive ranges are specified with square brackets [min TO max] and exclusive ranges with curly brackets {min TO max}	`node_id: [1 TO 10]` `error_code: {0000 TO 1111}`

Table 124: Grouping

Where	Command
Multiple terms or clauses can be grouped together with parentheses, to form sub-queries	`node_type: (IOM OR CM) AND error_code: 9999`

4.8.7.6.3 Turnaround Time (TAT)

TAT analysis is the results of 4 different phases in laboratory, starts when DMS receives an order for a specific test to be performed on a specific sample ID and ends when that result is sent to LIS.

The Turnaround Time (TAT) dashboard provides statistical information on turnaround time results for a single test run of a specific sample.

The available controls are as follows: `Sample ID`, `Order ID` and `Test Code`.

Table 125: TAT phase

Phase	Description
`TAT-0` (pre-check-in)	Starts when DMS receives an order for a specific test to be performed on a specific sample ID, either from LIS or from other possible conditions (for example the manual addition of a test or the reception of an order update), and finishes when the sample is put on the main track of the automation.
`TAT-1` (pre-analytical)	Starts when the sample is put on the main automation track, and ends when DMS receives a query from an analyzer with the corresponding key (sample ID + order ID + test code).
`TAT-2` (analytical)	Starts with the instrument query, and ends when DMS receives the result from that same analyzer for the same key.
`TAT-3` (validation)	Starts when DMS receives the result, and ends when that same result is sent to LIS.

NOTE

The total TAT does not consider phase 0 (pre-check-in).

Table 126: Turnaround Time dashboard

Chart	Description
`Average TAT`	A metric chart displays the minimum, maximum and average turnaround time.
`Average TAT over time`	The line chart shows the average turnaround time over time.
`Turnaround Time events`	The list shows the TAT event, refer to Table 127 *Turnaround Time events*.

Table 127: Turnaround Time events

Field	Description
`Time`	The timestamp of the event.
`Sample_id`	The sample ID of the TAT run.
`Order_id`	The order ID of the TAT run.
`Test_code`	The test code of the TAT run.
`Tat_0_duration`	The duration in milliseconds of TAT-0 phase.
`Tat_1_duration`	The duration in milliseconds of TAT-1 phase.
`Tat_2_duration`	The duration in milliseconds of TAT-2 phase.
`Tat_3_duration`	The duration in milliseconds of TAT-3 phase.
`Tat_total_duration`	The duration in milliseconds of TAT-1 + TAT-2 + TAT-3 phases.

NOTE

For each Manual request of a re-run for a test, TAT 1-2-3 are computed according only to the last test re-run without any reference to the re-run test history.

NOTE

The latest Turnaround Time data displayed both on the dashboard and on Status Monitor popup (Status monitor / Turnaround time / last update item) refers to the date of the TAT opening (TAT_0 event).

4.8.7.6.4 HVS events

The HVS Events dashboard provides an overview of all the HVS log events. These events are generated only by the m High Volume Storage (mHVS) module.

Table 128: HVS count over time dashboard

Field	Description
`HVS count over time`	The bar chart on the first row displays the count of HVS events over time.
`HVS events`	The list shows the HVS event, refer to Table 129 *HVS events*.

Table 129: HVS events

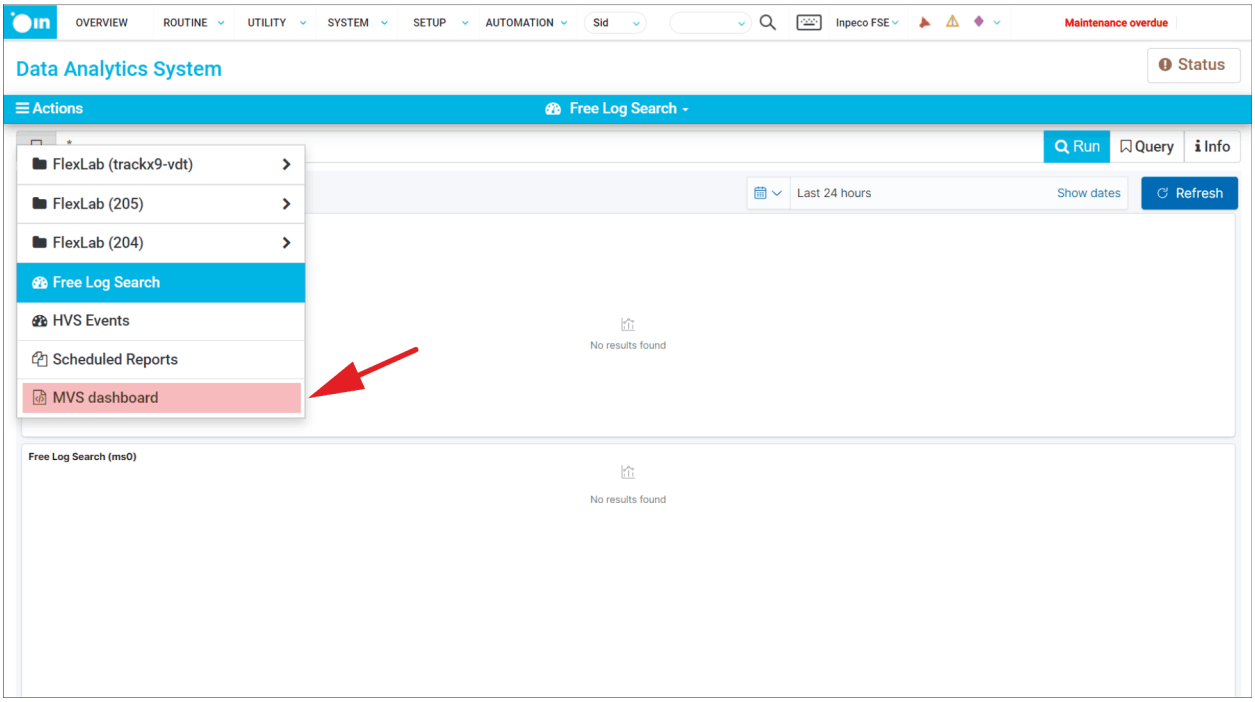
Field	Description
`Time`	The timestamp of the event.
`Actor_id`	The ID of the HVS instance that produced this event
`Event_type`	The type of this event

Table 129 HVS events (cont'd.)

Field	Description
`Component_id`	The ID of the HVS submodule that produced the log event
`Message`	The log message
`Trace_source`	The software component that produced the log event
`Callstack`	The .NET callstack associated with the event

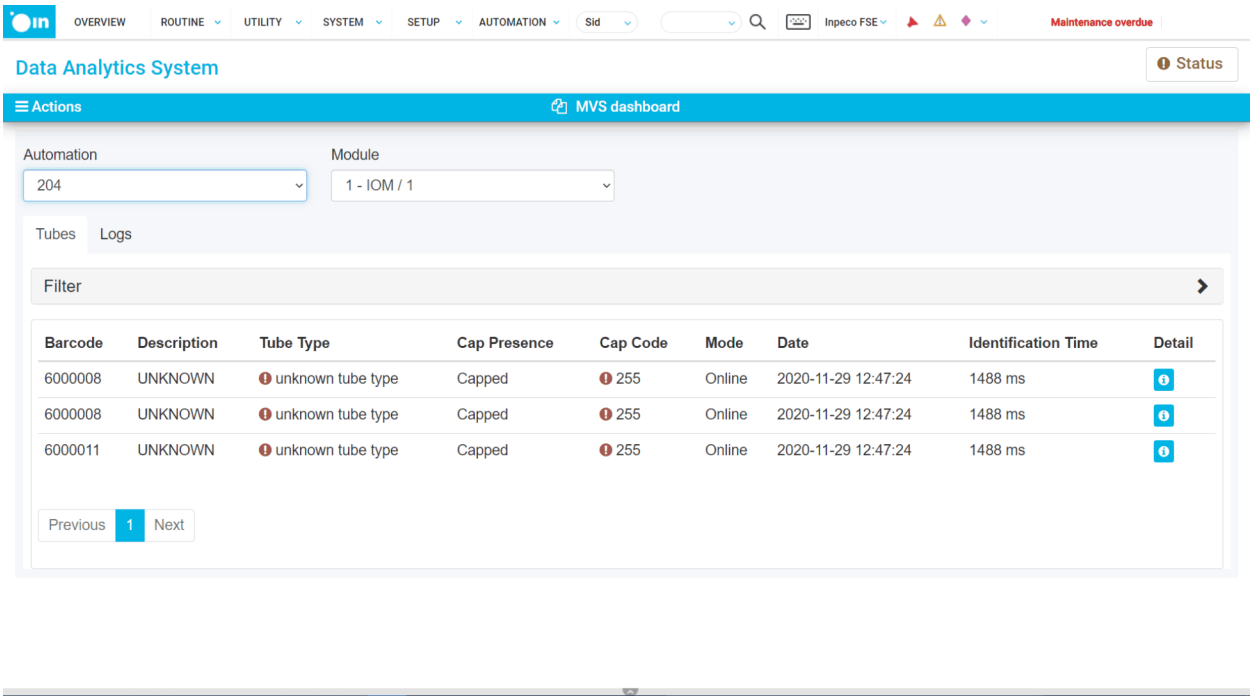
4.8.7.7 MVS dashboard

MVS dashboard, is intended for troubleshooting purposes, for FSE users, and it's accessible through the `Actions` menu, `MVS Dashboard` sub-menu. This page provides all the information about the acquisitions and identifications that a vision system, installed on an input module.



To be able to filter for the modules on the automation, a configuration on the DAS Admin panel must be made.

MVS dashboard lets the user choose for which available automation and module display the acquisitions, using related dropdowns. The modules list is updated with all the configured modules for the selected automation. If an automation has no module configured for the vision system, no dropdown option is displayed in the list and a warning is shown in the below area.



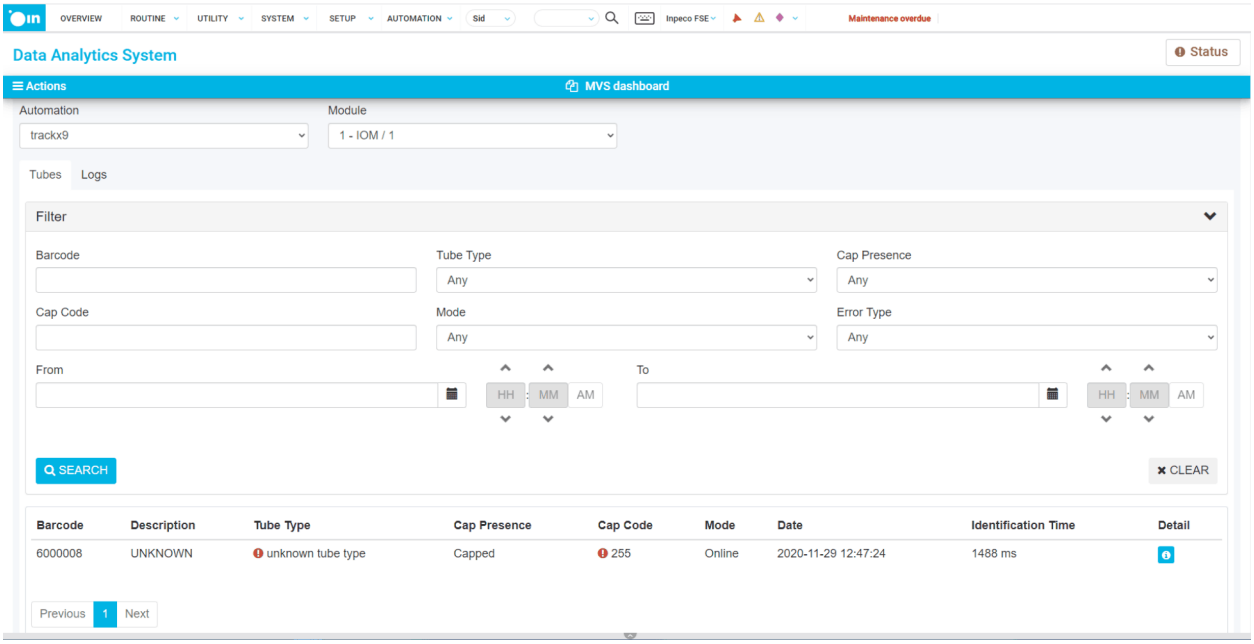
4.8.7.7.1 Tubes tab

Tubes tab is the default one and displays all the acquisitions for the selected module in a specific automation. It displays a Filter area where users can perform detailed research on the entire identifications list that the module has performed; this can be done by filtering for:

- Barcode
- Tube type
- Cap presence
- Cap code
- Mode
- Error type
- Date and time, through a calendar graphical component

Once the user has filled the fields of interest, by clicking on the Search button the table below is updated with the filtered information. A Clear button is present in order to reset all the filters.

The number of displayed records can be configured on the DAS Admin panel.

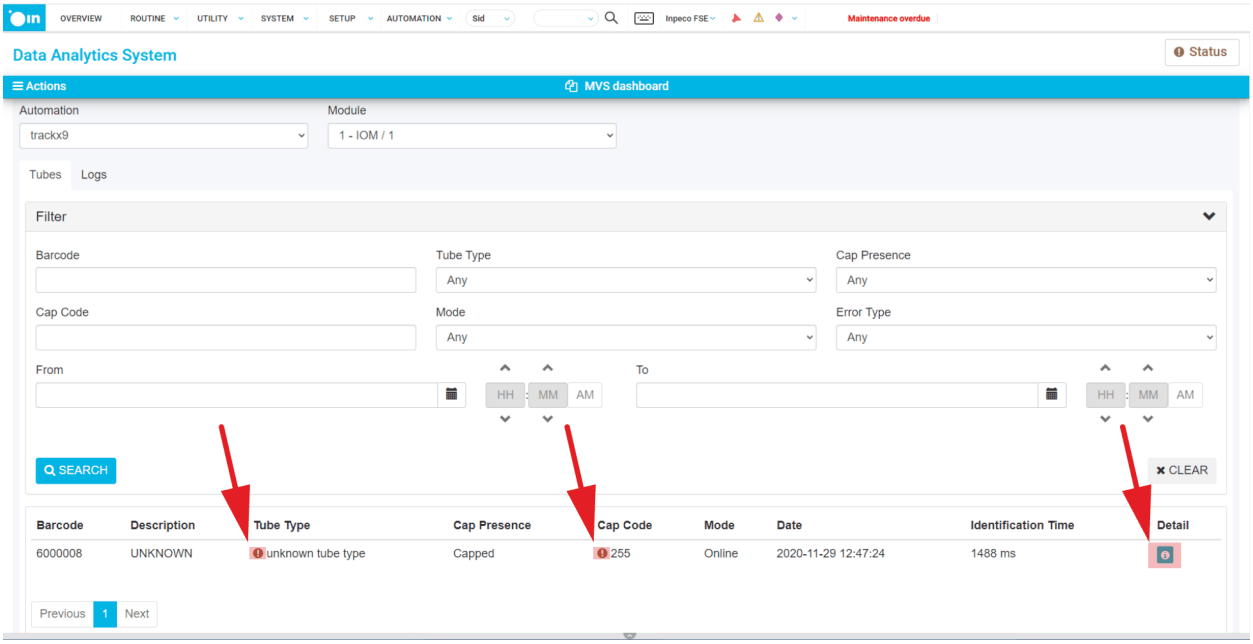


All the filtered results are available in the table below, which shows all the information specified in the filters section and, in addition:

- Barcode
- Description
- Tube type
- Cap presence
- Cap code
- Mode
- Date
- Identification time
- Detail button

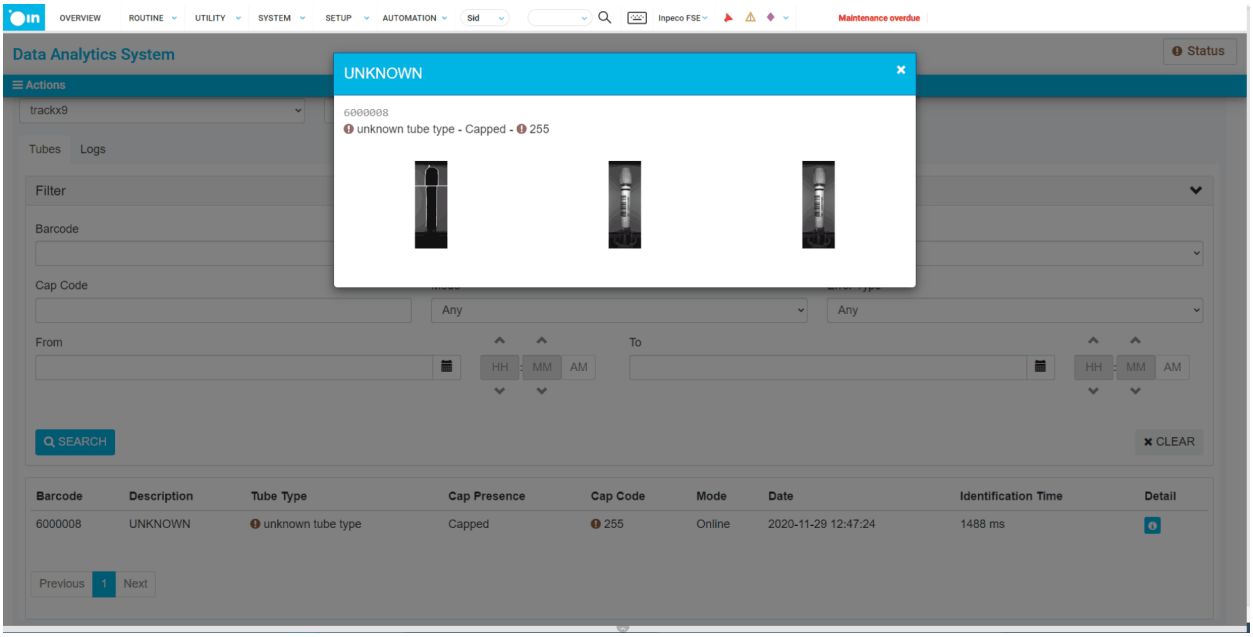
Users can interact with the Results table by:

- Details button, (refert to 4.8.7.7.1.2 *Details button*)
- Table rows with errors, (refert to 4.8.7.7.1.3 *Table rows with errors*)

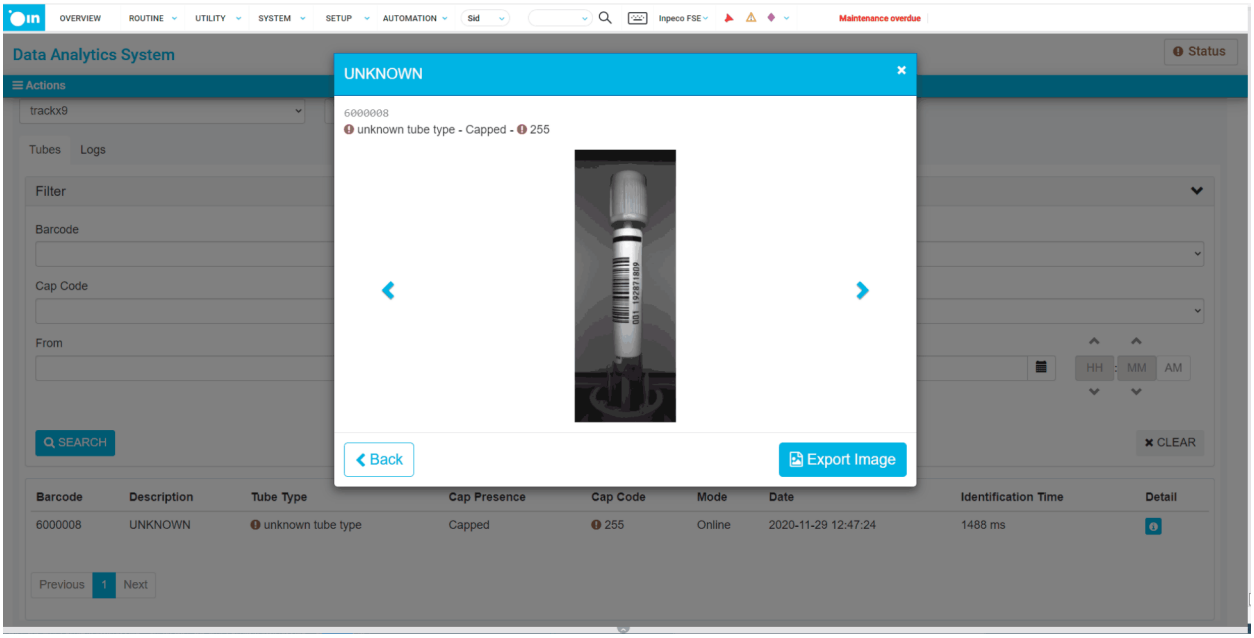


4.8.7.7.1.2 Details button

Clicking the button, a modal appears displaying information and images about the chosen tube during the current acquisition.

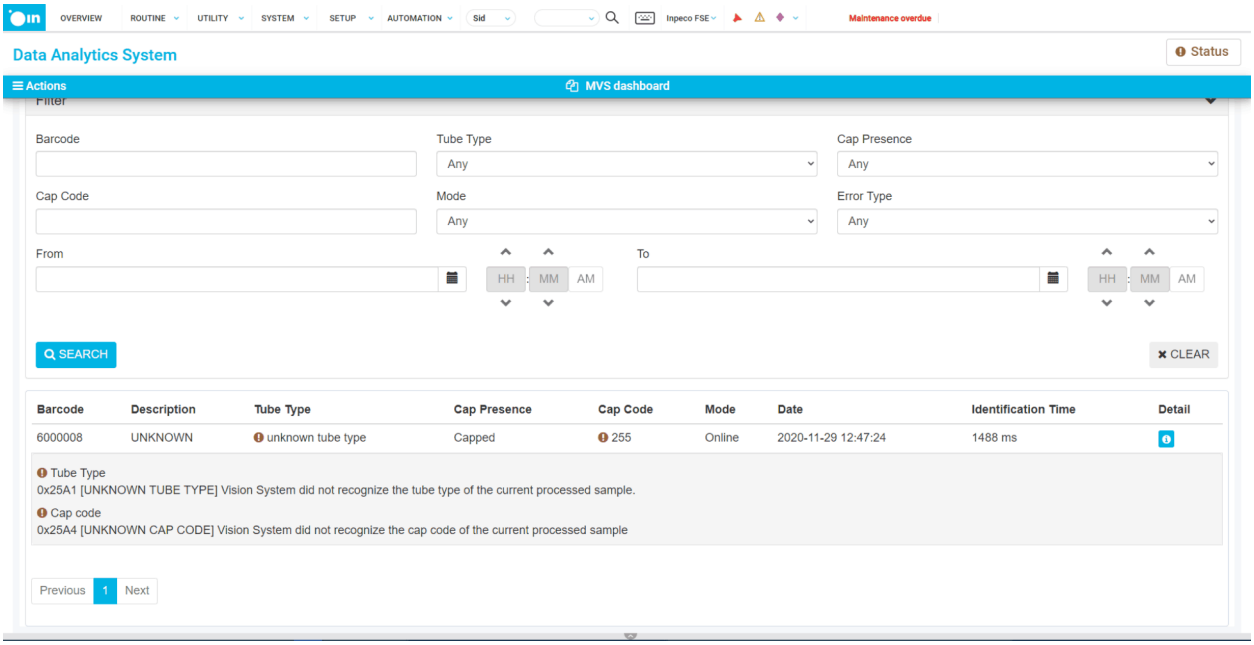


All the images can be zoomed by clicking on them; in case of more than one image, users can move from one acquisition to another using the arrow icons. Every single zoomed image can be exported using the specific button. A jpg file is exported.



4.8.7.7.1.3 Table rows with errors

In case the tube has been processed with some error, these are represented with a red circular icon in correspondence of the columns with the errors, and it's possible to visualize the details of the error by clicking directly on the row. A dedicated section is opened under the selected row displaying all the errors details.



4.8.7.7.4 Logs tab

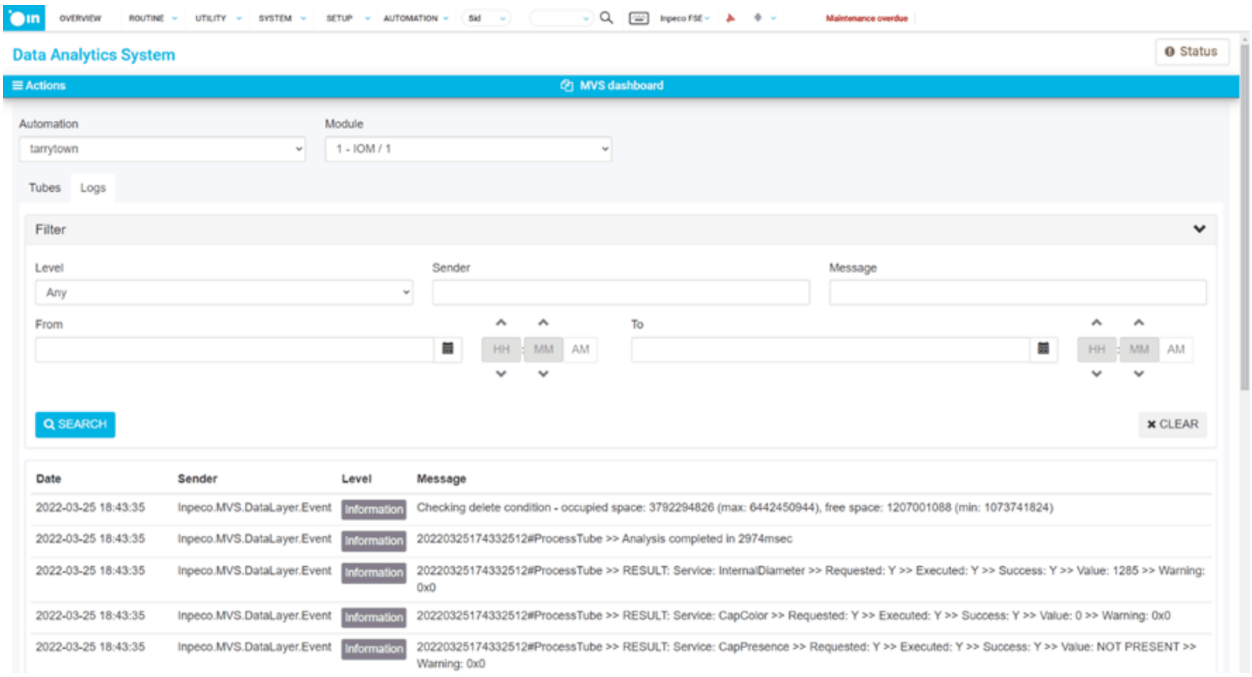
Logs tab displays all the logs for each acquisition made by the vision system.

It displays a Filter area too, in which users can filter through the logs produced by the module inside an automation, both selectable in the above dropdowns; logs can be filtered by:

- Level (Information, Verbose, Warning, Error, Critical)
- Sender
- Message
- Time period (date and time), through a calendar graphical component

As for the Tubes tab, a Search and a Clear button are displayed in the bottom part of the Filter area. A table is shown below with the filtered information.

The number of displayed records can be configured on the DAS Admin panel.



As for the Tubes view, the Logs one offers the possibility to visualize the filtered information through a table.

In the log section you can export the set of extracted logs through the Export Logs button at the bottom right corner, that produces a file in CSV format.

4.9 Setup

The `Setup` menu includes functions for personalizing the Data Management Software in terms of specific software settings (language, interface, communication with Instruments, etc.) and also the configuration of settings used within the laboratory (test maps and codes, result management rules, user permissions, etc).

The menu is made up of the following items.

Screen	Access Level	Description
`Personal Settings`	Laboratory Technician	Reports specific items for the User who is logged in, namely language, password, default printer, date format, etc.
`Enable/Disable Tests and Instruments`	Laboratory Supervisor	Allows to enable/disable connected Instruments and select the available tests, for each Analyzer, that can be enabled/disable.
`Instrument`	Head Physician	It is a shortcut to the Instrument configuration table. The use is reserved for technical support staff.
`Users`	Head Physician	Allows the configuration and the management of the DMS users.
`Configurator`	Refer to 4.9.4 *Configurator*, page 232	Section for input and update of some parameters.

4.9.1 Personal Settings

The Personal Settings screen allows the logged in User to configure personal settings for using the software.

The following configurable items are available.

Item	Description
Password	Box for changing access password to the Automation Software.
Password Verify	Box for confirming the new password **NOTE:** When LDAP authentication mode is active, Password and Password Verify items are not displayed because these are completely managed by LDAP-server.
Language	Language to use for graphic interface items. Any change in the default language takes effect at the next System login.
Manage	Default manage used for the User.
Date format	Allows to choose the format in which dates shall be displayed.
AM/PM	If selected, indicates that times will be displayed in AM/PM instead of 24h format.

Display Tube Lost and NSD Error popup	• if set to In automation, the Tube Lost and the NSD error notifications are displayed only on the clients connected to the GUI channel on which the error occurred.
	• if set to Yes, the Tube Lost and the NSD error notifications are displayed on all the clients. On the clients connected to the GUI channels different than the one on which the error occurred, the following additional information related to the GUI channel that detected the event is displayed:
	  • name of the related Automation for the Tube Lost messages
	  • automation code/node id on which the NSD Error popup error occurred.
	• if set to No, the Tube Lost and the NSD Error are not notified.

Printer	Default printer used by the User. A list of all selectable configured printer is displayed. If no printer has

Item	Description
	been configured, the list will be empty.
`BC Printer`	Default printer used by the User to print the barcodes. A list of all selectable configured bar-code printers is displayed. If no bar-code printer has been configured, the list will be empty.
`Excluded Trace Events`	Box for configuring all the messages not to be displayed in the tube Trace pop-up after filtering. Insert the list of the events to be excluded separated by comma.

4.9.2 Enable/Disable Tests and Instruments

The `Enable/Disable Tests and Instruments` screen allows to enable/disable tests for the channels Automation, Instrument and Host.

Channel	Description
`Automation`	Allows to enable or disable tests to be sent to the Automation channels
`Instrument`	Allows to enable/disable one or more Instruments and enable/disable one or more tests for each Instrument
`Host`	Allows to enable/disable tests to be sent to the Host result channels. Only the available Host result channels and the related available tests are displayed.

NOTE

Tests and instruments can be filtered by configured Lab Specialties assigned to tests/instruments. In case of instruments that manages sub-modules, tests and instruments are filtered only in case `Enable/Disable Tests on Sub-Modules` instrument option is enabled (if available).

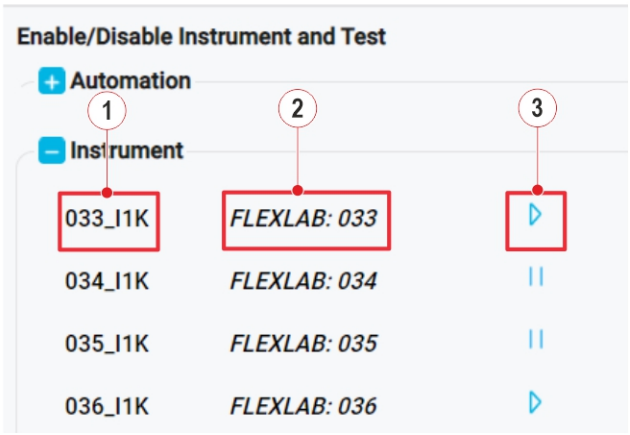
4.9.2.1 Instrument - Enable/Disable Instruments

Instruments that can be checked by the User have a PLAY/PAUSE button near the name indicating the current Instrument status (PLAY = Enabled, PAUSE = Disabled). When the button is selected, the value is switched between the two alternative statuses.

The list of Instruments provides also the information about the Automation to which each Instrument is connected and the related Automation node number.

Figure below shows an example of Instruments connected to the Automation.

Figure 45:



1. Instrument ID
2. Automation ID and Instrument position on Automation
3. Instrument status

4.9.2.2 Instrument - Enable/Disable Tests

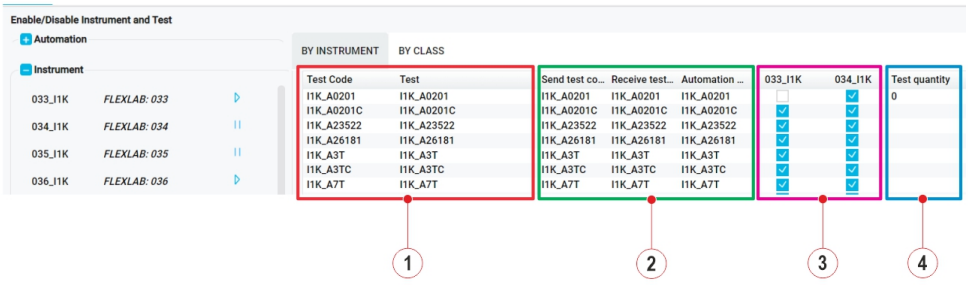
When an Instrument is selected from the list, a map of the available tests is displayed.

Tests can be viewed using two different tabs:

- `by Class`: for each test of the selected Instruments, shows also all the other Instruments where the same tests are configured.
- `by Instrument`: shows only the tests of the current Analyzer.

Figure below shows an example of test map for the relevant Instrument class.

Figure 46:



Grid component	Description
Figure 46 – 1	Allows the User to check the enabled/ disabled tests for up to 30 Analyzers belonging to a specific Instrument class (the one of the selected Analyzer) and connected to the same Automation System. Refer to Table 130 *Notifications for Test code/Test grid*, page 224 for the test status.
Figure 46 – 2	Displays the Instrument code and Automation test code as set in configuring of Laboratory tests.
Figure 46 – 3	A column for each configured Analyzer belonging to the selected Instrument class is displayed.
Figure 46 – 4	Displays the inventory data associated to the test.

Figure 46 – 1 can be highlighted in two different ways in order to notify non standard situations:

Table 130: Notifications for Test code/Test grid

Background color	Description
Red	Indicates that the test is disabled or not correctly configured for the communication with the Automation System. No order for the specific test can be transmitted to the Automation System.
Light pink with Yellow warning icon	Indicates that the test is currently disabled on the Automation System. Nevertheless, the test can be enabled on one or more Analyzers granting the possibility to perform the assay manually loading tubes on the instrument. This notification is particularly useful for those instrument which provide separated assay availability for tubes loaded from the Automation System and those manually loaded into the Analyzer.

A check mark next to a test, if present, indicates that the test is enabled and may be performed by the Analyzer. The User can amend the current test selection (a red triangle next to the test name indicates amendments that have not yet been saved) or select/deselect all the tests in a block.

It is possible to specify more entries for a single Instrument.

Changes are not saved until the `Save` button is pressed. To display the previous status, it is sufficient not to save the changes and re-select the Instrument from the list.

In case of wrong settings, a warning popup is displayed.

The test can be enabled and disabled by different actors:

- Automation actor is the I004 message (Test Inventory Notification) that Automation software sends to DMS in order to transmit the inventory update of the Analyzer or the Assay Availability message (Inventory driver message) directly transmitted from the Analyzer to DMS.
- Manual actor is the action performed by the User in `Enable/Disable Tests and Instruments` screen, or the action performed by the User on Analyzer by accessing the Automation GUI and DMS receives the I007 message (Enable/Disable Test Notification), or the action is sent by Host, or action is sent by Analyzer.

  If the action is sent by Host or Analyzer, in case of Instruments with sub-modules configured for enabling/disabling tests, the “disabled test” message for the main module is sent to Automation only when all sub-modules are disabled and the “enabled test” message for the main module is sent to Automation only when at least one submodule is enabled.
- QC actor is the action performed when the QC result is failed and the `Disable test on QC` Instrument option is enabled (action reserved technical assistance staff).

  Only disable action can be applied by this actor.
- GEM-DM-Flags actor is the action performed by the General Event Manager, by the Decision Making and by the Flags/Exceptions.

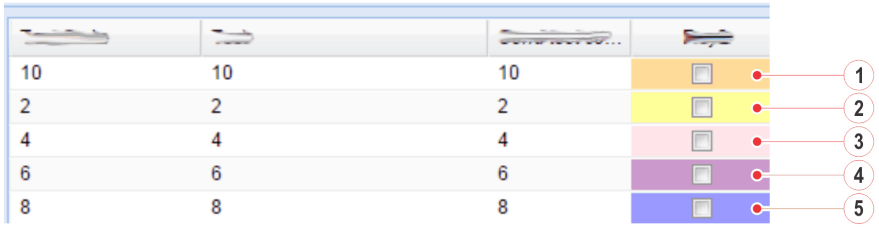
  Only disable action can be applied by Flags/Exceptions actor.
- Batch actor is the action related to the Batch Test management.

The disable action of the test on the specific Instrument is represented by a color, different for each actor that has performed the action.

NOTE

The color coding convention is valid only for tests properly configured into `Inventory` table (action reserved technical assistance staff).

Figure 47: Colors of the actors that have performed the disable action



1. Automation
2. Manual
3. QC
4. GEM-DM-Flags
5. Batch

NOTE

Hovering your mouse cursor over the colored cell, a tooltip with the indication of the actor that has triggered the disabling of the test is displayed.

It is possible that the enable/disable action performed by an actor can over-write the cause (that has conducted the enabling/disabling of the test) and the status of the test on the basis the following table.

Table 131: Priorities of actors that have performed the enable/disable action

Source of disabling	Source of enabling				
	Automation	**Manual**	**QC**	**GEM - DM - Flags**	**Batch**
Automation	Allowed	Not allowed	Not allowed	Not allowed	Not allowed
Manual	Not allowed	Allowed	Not allowed	Not allowed	Allowed
QC	Not allowed	Allowed	Allowed	Not allowed	Not allowed
GEM - DM - Flags	Not allowed	Allowed	Not allowed	Allowed	Not allowed
Batch	Not allowed	Allowed	Not allowed	Not allowed	Allowed

According to the above table, a test can be manually re-enabled in all cases, unless the test was disabled by Automation (I004 message).

If a test can not be enabled on a specific instrument due to actors' priority, a notification popup is displayed.

If the quantity of the reagents for a test of a certain Analyzer decreases and reaches the warning limit, an icon is displayed in the Icon Area, near the Analyzer name, to notify that the quantity of remaining reagents for a test on that Analyzer is low (see Table 10 *Low Level Reagents icon*, page 44) and a warning popup is displayed. When the reagents are refilled (above the warning limit), the icon disappears.

If the quantity of reagents for a test of a certain Analyzer drops below the configured limit, the test is automatically disabled (the `Recent Tests Enabling/Disabling` icon is displayed in the Icon Area near the Analyzer, see Table 6 *Recent Test Enabling/Disabling icon*, page 41) and a notification popup is displayed.

In case there are test profiles configured (i.e. group of tests configured in `Test Panel` table with `Profile` check box flagged – configuration reserved to FSE only), there are two different behaviors in the enable/disable workflow

- If the Analyzer has the parameter flgprofile set in typedriver table (e.g. AlinityH class), when a test is manually enabled/disabled in this screen, all the tests included in the profile are automatically enabled/disabled. In case the test belongs to multiple profiles, the smaller one is considered. This logic applies only to manual enable/disable actions.
- If the Analyzer has not the parameter flgprofile set in typedriver table, and the test profile contains a "main" test configured with `Profile test` as `Result type`, the following logic applies to all the enable/disable actions:
  - if a test of the profile is disabled, the "main" test of the profile is disabled as well.
  - if a test of the profile is enabled, the "main" test of the profile is enabled only if all the tests of the profile are enabled.

According to the permission of the User, additional commands are available at the bottom of the screen.

Commands	Description
Save	Makes the changes effective
Hosts and Automations	If selected before pressing the Save button, allows to automatically save the changes performed on some tests on all the Hosts and Automations channels (for example: enabling/disabling a test on an Analyzer and selecting this button before selecting Save , allows to automatically enable/disable the test also on all Hosts and Automation channels)
Select All / Unselect All	Checks/unchecks all tests in the lists
Collated	If selected, allows (only for Analyzers) to select/unselect at the same time all the tests linked to a common Test Code using only one of the linked tests. For example, if a series of tests (e.g.: GLU1, GLU2, GLU3, ...) are all linked to the same test code (e.g. 1039), and the Collated option is selected, the User can check/uncheck only one of the tests (e.g. GLU2) to check/uncheck all the other related tests (GLU1, GLU3, ...)
Other Data	Allows to display the details of the test configuration
Inventory Data	Allows the visualization of the inventory thresholds. Not available for submodules configured for enabling/disabling tests.

Commands	Description
`Command`	See Table 132 *Command submenu*, page 229. Not available for submodules configured for enabling/disabling tests.
`Save Columns Layout`	Allows to save the columns layout (i.e. column headers and columns width) configured in `By Class` and `By Instrument` tabs for the selected instrument, in order to apply it every time the specified instrument is selected. In particular, when a columns layout is saved, it will be applied to all instruments belonging to the same group (`Automation`, `Host` or `Instrument`). If columns headers are common, i.e for `By Instrument` tab, only a layout could be saved for each group, since columns headers are the same for every instrument, and overwritten in case of multiple saving. For `By Class` tab, the layout saved will be applied to the entire group for headers which are common, while the configuration set on instrument-specified headers will be applied to the specified instrument and to those instruments which have the same instrument code and configuration (in case of instruments which support sub-modules management, the layout set for a main instrument will be used to other main instruments of the same class; in case of specialty management, the layout set for an instrument configured for a specific specialty will be used to instruments with same specialty configuration). The layout applied to `Enable/Disable Tests and Instruments` page is user specified: different user shall store different layout. The saved columns layout will not be applied to other users. In case no columns layout configuration is available in the database for the `Enable/Disable Tests and Instruments`" page for the current user, the default page layout is applied.

Table 132: Command submenu

Command	Description
`Send Inventory Request (I003)`	Allows to update the amounts of reagents for each test (for Instruments supporting this function).
`Send Panel Request (I005)`	Allows to update the Test Map available on the Analyzer.
`Send Test Map Request (I009)`	Allows to update the Test Map which reports the actually enabled/disabled tests.
`Send Configuration`	Allows (only for Analyzers) to send to the Automation System the current configuration (enabled/disabled) for all the tests of the Instrument displayed.

4.9.3 Users

The `Users` screen allows the management of the Users and the configuration of their main settings, such access level.

The following configurable items are available in the `Editing Panel`.

Item	Description
`User ID`	Internal identification number of the User. **NOTE:** This field is not editable and is automatically assigned and filled when saving a new User.
`User name`	Identification name of the User (used for login).
`Password`	Box for changing access password to Automation Software. **NOTE:** The password must be at least 8 characters long. It must have at least one uppercase letter, one lowercase letter, one number and one symbol and must not contain parts of the `User name` value. If the User tries to save a malformed password that does not respect the criteria restriction, an error popup is displayed.
`Password verify`	Box for confirming the new password. **NOTE:** When LDAP authentication mode is active, `Password` and `Password Verify` items are not displayed because these are completely managed by LDAP-server. In addition, it is displayed the `LDAP ID` item (not editable) related to the association between the DMS user record and the LDAP identity that represents it.
`Restricted`	if `Yes`, it specifies that the user can display and perform actions only on the Tests configured as “Restricted” . See 4.9.4.1 *Test*, page 234 for further details.
`User Desc.`	Description or extended name of the User (as displayed in the User menu).
`Language Code`	Language of the UI for the User.
`User Type`	Level and permissions of the User.
`Date Format`	Format for dates.
`Date Formats on Reports`	Format for dates in Reports.

Item	Description
`Time Format`	if selected, indicates that times will be displayed in AM/PM instead of 24h format.

`Display Tube Lost and NSD Error popup`	• if set to `In automation`, the Tube Lost and the NSD error notifications are displayed only on the clients connected to the GUI channel on which the error occurred.
	• if set to `Yes`, the Tube Lost and the NSD error notifications are displayed on all the clients. On the clients connected to the GUI channels different than the one on which the error occurred, the following additional information related to the GUI channel that detected the event is displayed:
	  • name of the related Automation for the Tube Lost messages
	  • automation code/node id on which the NSD Error popup error occurred.
	• if set to `No`, the Tube Lost and the NSD Error are not notified.

`Manage`	Default manage used for the User.
`Printer`	List of printers used by the User. If no printer has been configured, the list will be empty.
`BC Printer`	List of printers used by the User to print the barcodes. If no barcode printer has been configured, the list will be empty.
`Excluded Trace Events`	Box for configuring all the messages not to be displayed in the tube Trace pop-up after filtering. Insert the list of the events to be excluded separated by comma
`Session Lifetime`	Time (in minutes) of inactivity allowed for the User before automatic logout from the browser. If set to “0”, the timeout is not active.

4.9.4 Configurator

The `Configurator` menu allows to configure the followings items.

Screen	Access Level	Description
`Test`	Head Physician	Allows the configuration of laboratory tests (test names, codes used in communications with Automation and Analyzers, reference values, measurement units, Delta Check, etc).
`Tables`	FSE	Allows to configure the DMS database tables. The configuration is restricted to technical assistance staff.
`General Settings`	FSE Head Physician	Allows to configure the main settings for operation of DMS, DAS and Automation Map.
`Site Editor`	Head Physician	Allows to configure the user permissions to perform actions (validation, rerun, etc.) on each test available in the configured Sites, when the Multisite option is enabled.
`Automated Qc`	Laboratory Technician	Allows to configure automated QC.
`Batch Tests`	FSE	Allows to choose the instrument to perform the test on. The configuration is restricted to technical assistance staff.
`Decision Making`	Laboratory Supervisor	Allows to configure rules for automatic validation, for management of reruns and reflexes, for computerised processing of results, etc.).

Screen	Access Level	Description
GEM editor	FSE	Allows to configure actions that the Data Management Software operates as a consequence of particular events. The configuration is restricted to technical assistance staff but a series of GEM rules are preconfigured and enabled by default.
Automation Tests	Laboratory Supervisor	Allows the configuration of the Automation System tests.

NOTICE

Print a copy of the configurations for approval by technical assistance staff (see 5.1.16 *How to print the configurations*, page 352). The technical assistance staff is responsible for the DMS configurations. The technical assistance staff shall verify the configurations before starting the routine samples processing.

4.9.4.1 Test

The Test screen is divided into different panels.

Panel	Description
Test Type	Collection of standard tests that can be used as a starting point for creating the Laboratory Tests list. **NOTE:** When editing a Test Type, if the Restricted option is configured to Yes, a user configured as “Restricted” (refer to 4.9.3 *Users*, page 230) can display and perform actions on the test. Otherwise, tests not configured as restricted will not be visible to the restricted users.
Parameter Type	Contains a list of measurable quantities to be associated with a Test Type for the creation of a Laboratory Tes.
Laboratory Test Editing Panel	This section is used to: • Create a new personalized laboratory test, combining a pre-existing test model (from Test Type list) and a parameter to be analyzed (from Parameter Type list); • Edit a test that has already been configured and saved (selected from the Laboratory Tests list); • Define delta values to be used in comparison of results for a given test for the same patient (Delta Check Editor section); • Define if the specific test is a Quality Control test.
Laboratory Tests	List of all tests configured and available on Analyzers; also it allows setting of normal values and Instrument options. **NOTE:** the Laboratory Tests list can be sorted according to different parameters (Test Code, Test Name, Parameter Code or Result Type) by selecting the related columns header and then choosing the Ascending/ Descending order.

4.9.4.1.1 Laboratory Test Editing Panel

This panel contains the following items.

Item	Description
Test Code	Test code selected in Test Type panel.
Parameter Code	Parameter code selected in Parameter Type panel.
Test Name	Descriptive name of test.
Result type	Indicates the result manage method. Four options are available: • Standard (for normal test): the order is downloaded to the Automation System and then considered Completed when a result is received from the Analyzers and released back to the Host/LIS. • Aliquot Test: for aliquoting tests to be performed on aliquoted secondary samples. • Printable: for test to be printed in the medical report. • Profile test: test to be considered as representative of a Test Profile (group of tests configured in Test Panel table with Profile check box flagged – configuration reserved to FSE only). • Sorting: is a test considered completed as soon as it is downloaded to the Automation System, without waiting for results.
Material	Material the sample is made up of. If necessary, can be used in combination with Cap Color codes to calculate the list of tests to be associated to a sample tube **NOTE:** Data management Software checks that all tests ordered on the same tube have the same sample material and notifies the User of the wrong order with an Exception that can be visualized in the drop-down menu of the Icon Area in correspondence to the relative communication channel. In addition, Data Management Software does not store the order and shows a popup that alerts the User about the wrong order. The error can also be visualized in the System events menu. **NOTE:** The sample material congruence check takes into consideration only

Item	Description
	the Standard type of test (Sorting, Aliquot and Printable Tests are excluded from it).
Units 1	Parameter measurement unit associated to the Id1 field of Config Instruments. **NOTE:** If the Analyzer result message contains its own unit of measures for result parameters configured in Id1 field, Units 1 will be replaced by these unit of measures.
Units 2	Parameter measurement unit associated to the Id2 field of Config Instruments. **NOTE:** If the Analyzer result message contains its own unit of measures for result parameters configured in Id2 field, Units 2 will be replaced by these unit of measures.
Print sequence	Progressive number used to establish order of tests displayed in a printout, in reports and on validation pages
Test Description	Descriptive name of test to be displayed on reports
Description on worklist	Descriptive name of test to be displayed on Instrument Worklist
Description on exports	Descriptive name of test to be displayed in exports on file (Statistics, QC exports, ...)
Foreground color	Color used to display test text
Background color	Color used to display background of boxes containing test text
Template Code	Template to be used for the selected test (it is allowed to leave this field empty, because each template can be connected to a department in the Department table)
Park test Code	Progressive number to establish priorities for performing test on Instruments (available codes are configured in the dedicated table)
Offline prev. result delta	Delta check value to be used in comparing the current result with the last archived one for the same patient and test/parameter. **NOTE:**

Item	Description
	numeric field that allows 11 digits including decimal point and one decimal value.
`Offline prev. result time (months)`	Number of months that defines the range of time from the current result date time, where looking for an archived result for the same patient and test/parameter. **NOTE:** numeric field that allows 3 digits (maximum value is 999); in order to search unlimited, type 999. Example: Current result date/time = 2016-03-20 09:17:52; `Offline prev. result time (months)` = 8; DMS searches results with date newer than 2015-07-20 09:17:52 and older 2016-03-20 09:17:52.
`Online prev. result delta`	Delta check value to be used in comparing the current result with the last online one (excluded rerun) for the same patient and test/parameter. **NOTE:** numeric field that allows 11 digits including decimal point and one decimal value. **NOTE:** Time range where search for the last online result has to be configured in `From (hours)` and `Back To (hours)` fields.
`From (hours)` `Back To (hours)`	Range (in hours) where looking for the last online result for the same patient and test/parameter. **NOTE:** spinner numeric fields that have ranges from 0 to 9999. If the `From (hours)` field is set to '0', DMS will search from the current result date time. In order to search unlimited, set `Back To (hours)` to 9999. Example: Current result date/time = 2016-03-20 09:17:52; `From (hours)` = 24 - `Back To (hours)` = 72; DMS searches results with date newer than 2016-03-17 09:17:52 and older 2016-03-19 09:17:52

Item	Description
	NOTE: If the User configures `From` field with a value greater than `Back To` field and tries to save the configuration, a warning popup is displayed and both fields are reset to “0”.
`Delta check evaluation (Checked = Abs, Unchecked = %)`	This field refers both to the `Offline prev. result delta` value and to the `Online prev. result delta` value. If checked, both the configured value are considered absolute, and vice versa.
`Force Offline Check`	If this field is checked, it means that DMS has to evaluate also the offline delta check even when the online delta check has been applied and has not held the result. **NOTE:** if online delta check has held the result, offline delta check will NOT be evaluated in any case.
`Force Normal Values Evaluation`	If checked, Normal Values will be evaluated in any case after Delta Check process, if unchecked, when Delta Check (online or offline) finds something to be evaluated, Normal Values are not processed.
`Choose Held Level`	checkbox that allows the User to choose the Level to hold test results based on Delta Check evaluation. If the checkbox is enabled, the listbox with the available levels (H1, H2, H3, H4) is displayed below. As default, the checkbox is disabled and set level is H1. **NOTE:** if the checkbox is enabled but the listbox is not configured and left blank, the behavior is equal to the checkbox disabled and set level is H1.
`Is QC test`	This flag has to be selected if a Quality Control will be performed on this test. Quality Control test will have the same name of the test which is referred to.
`Confirm Value`	Displays an additional confirmation pop-up during test validation.
`Display 1st result`	If selected, displays results interpreted in the `Result` box in the Validation screen.
`Display 2nd result`	If selected, displays actual numerical results received by the Instrument in

Item	Description
	the Result box in the Validation screen.
Check qualit. diff.	Checks whether the result differs qualitatively from the previous result the historic archive (e.g. Positive/ Negative). **NOTE:** the maximum previous period in which the latest test has to be searched for is the one set in the Offline prev. result time (months) field.
Check quantit. diff.	Checks whether the result exceeds the delta check value set in the Offline prev. result delta
Serial dilution	If checked, each time a rerun is needed, the dilution value used for the rerun is updated to the next configured dilution value (i.e. the first rerun uses the first dilution value, the second rerun uses the second dilution value, ...). **NOTE:** Requires that a list of sequential dilution values is previously configured in the Dilution table by the technical support staff.

4.9.4.1.2 Config Instruments in Laboratory Tests panel

The Config Instruments pop-up contains the following item.

Item	Description
Class	Instrument class
Sent test code	Test code sent to the Instrument
Receive test code	Test code received from the Instrument
Lab Specialty Code	Laboratory specialty linked to the test code of the specified instrument class. It is possible to configure this option for analyzer class only.
Duration	Timespan between query and result
Send	Enables sending the test code
Receive	Enables receiving the test code
Dilution Code	Dilution code for the Instrument
Reruns	Maximum number of reruns
Duplicates	Allows to enter more instances of the same test at the same time

Item	Description
Id1	Id1 result type
Id2	Id2 result type
Extra IDs	Allows to enter multiple result aspects (i.e. extra aspects associated to the results) transmitted by the Instrument in DMS.
Round	Enables rounding the test result. If disabled, test results are truncated.
Dec. digits	Number of decimal digits considered when rounding/truncating decimals of results. **NOTE:** Data Management Software limits the maximum decimal figures to “6”. **NOTE:** When evaluating decimals, as decimal mark is always considered the point (.) character. The comma (,) character is not evaluated.
Method	Type of method.
Material	Sample material. Data Management Software limits the Material code to 30 characters. A warning pop-up will be returned if the User sets the Material code with a length greater than 30 characters.
Disposal Time Disposal Units	Time (and its unit of measurement) that a sample tube with this test associated will remain in the Storage Module or High Volume Storage Module, before being disposed. These values override the Storage Default Dwell Time or High Volume Storage Default Dwell Time settings available in the Settings screen.
Skip park on query	If checked, the test is not managed by parktest sequence priority. When a query arrives from the Instrument, DMS answers with all tests configured and enabled on the Instrument and for which this flag is marked, without considering the park test level linked to the tests. **NOTE:** When tests are sent to Instrument in the query answer and the level of parktest is different from the tube level of parktest, the tests are not sent to Automation System software (event code “111067”).

4.9.4.2 General Settings

Users with access level Head Physician can set the following configurations.

Item	Description
`Send Unknown results to LIS`	If selected, a disclaimer pop-ups to warn User against the use of this functionality. If User select `Yes`, this functionality is enabled. This means that, when DMS receives results for unsolicited tubes: • results will be automatically validated with level V1 • the field `Validated` of `Test Details` will be set to `Automatic` • the field `Rule` of `Test Details` will be set to `Unknown to LIS` • DMS will create a known demographic, with unique PID (Patient ID) value starting with the string `unkn_` • DMS will write a new event in *eventnemo* table with code 111403, stating that "Unknown order created with PID:codpid” • DMS will send received results to LIS without applying any validation rule Once order comes from Host LIS, DMS will update the patient data. Click on `Save` to save the setting.

4.9.4.3 Site Editor

The Multisite option (available in `General Settings`) allows to organize Automation Systems and Analyzers in different locations, or `Sites` . For each Site, it is possible to configure the users that can access the Site and, for each user, the permissions to manage tests in the Validation screen and to send commands to the Automation Systems. The `Site Editor` screen allows the configuration of the permissions for the users.

The `Site Editor` screen is constituted by a drop-down menu (`User ID` drop-down menu) for the selection of the user to be configured, and by a series of tabs for the selection of Sites, Analyzers and tests.

Each main tab represents a particular Site and is made up of a series of sub-tabs, one for each different Analyzer configured on that specific Site. If no Analyzer is configured for a Site, no sub-tab will be displayed for it. Each Analyzer sub-tab displays the list of tests configured on the Analyzer itself. Each test has a checkbox on its left side.

To configure permissions, a User must be first selected in the User ID menu. Then, checking the tests in the various tabs and lists of the page, the User will receive action permissions on the selected tests. The `Undo` button will restore the checkbox selections to the latest saved configuration. To save the new permissions, use the `Save` button.

NOTE

After that the new selections are saved, it is no more possible to restore the previous configured selections using the `Undo` button.

NOTE

The two additional buttons `Save Template` and `Load Template`, reserved to the technical assistance staff, allow to save the set of permissions of specific users in form of `templates` . Each template can be saved with a name for easier identification. The configuration of a user, then, can be copied and replicated on other users by selecting the new user, loading the relevant template to be applied, and then pressing the `Save` button.

4.9.4.4 Automated Qc

This functionality allows the laboratories that perform Quality Controls (QCs) with a very high frequency for each Analyzer to load QC tubes (or Controls) on Automation and store them in a dedicated Storage Module until they have to be sent to the proper Analyzer.

DMS will schedule the QC controls according a set frequency (time/number of samples processed by the instrument). It's possible to send all controls in one run, or single controls.

Some general considerations before enabling Automated QC:

- The QC control IDs (barcode IDs) cannot be shared among different physical analyzers. For example, it is not possible to run the same QC control on two different Centaur XPT instruments
- It is necessary to define individual barcode IDs for the single instrument.
- The instrument runs the QC controls assuming they're patient tubes. The reply to a query from the instrument is the same for normal, patient tubes. Therefore, the instrument doesn't know it's running a QC, and will return a standard result. DMS modifies the result into a QC, and sends the QC result to LIS. However, no QC results will be found in the instrument database.
- The Automation System needs a Recapper Module and a Storage Module to manage the QC tubes.
- Recapper and Storage modules are not needed in case the automated QCs are one-shot - i.e. they run only once, and then go to the IOM for refill/ replacement.
- The frequency of execution of an automated QC could depends on the number of times the test has been executed, the samples for which Data Management Software has downloaded the order to the Analyzer and/or the configured time frame.
- When at least a configured threshold is reached, Data Management Software will run the Automated QC tube that has the oldest `Date/Time of last run`. If there are two or many tubes that have the same execution date, Data Management Software follows the alphabetical order of the SIDs for running them.

If the user does not manually run the QC level, it will be processed when one of the following conditions are verified:

- when the maximum number of test executions (`max Runs`) is reached
- when the maximum number of patient sample tubes for which DMS has downloaded the order to the Analyzer (`Run threshold`) is reached
- after the configured timeout (`Run every minutes`).

Every time an automated QC starts its run (manually or automatically) its full trace log is reset in order to track only the events related to the current run. Runs and Run threshold are counted starting from the query time of the previous run of any level of the same Automated QC.

The `Automated Qc` screen contains the following items.

Item	Description
Automated Qc code	Code that identifies the Automated QC control. It can be anything, but choose a catchy name. Example: QCTestXYZDXI1
Automated Qc Description	Verbose description of the Automated QC control. Example: QC for test XYZ on DXI1
ID	Analyzer on which the QC will be performed. If the QC should run on more than one Analyzer, create another Automated QC. Example: select from combo box the right Analyzer. ARNLDX1 (... or the right naming convention). However, if the same QC needs to run also on analyzer DXI2, another QC called QCTestXYZDXI2 needs to be created, although any other name could be possible.
Input sorting	Sorting test used to store the Automated QC tubes after every run (sorting test destination could be an available Storage Module or other automation Module).
Output sorting	Sorting test used to sort out the Automated QC tubes in order to be removed from the Automation for refill (sorting test destination could be an Input Output Module or other automation Module).
Error sorting	Sorting test used to collect the Automated QC tubes in error condition (sorting test destination could be an Input Output Module or other automation Module).
max Runs	Maximum number of runs on the Automated QC tube after which the sorting output test is added (for refilling). This value is mandatory. Max number allowed is 20. Example: after 8 runs of the QC tubes, QC tubes can be considered as empty, and therefore in need of a replacement, or refill. This value depends on many things: number of tests configured per each tube, amount of liquid that the Analyzer takes for each analysis, original control, etc.
Run every minutes	Timeout after which the Automated QC tube should be performed again on instrument. Max configurable minutes are 1440 (24 hours).

Item	Description
	Example: after 30 hours that no QC was run on DXI1 for test XYZ, resend that QC to the Analyzer. Note that the rule is activated if no QC was run for the past 30 hours.
`Run threshold`	the number of tubes processed by the Analyzer before re-sending the QC tubes to the Analyzer for analysis. This information is not mandatory. Example: the threshold is equal to 200. That means that after 200 tubes processed by the Analyzer DXI1, on any test, the software will schedule the QC for test XYZ on Analyzer DXI1. Note that if a QC for test XYZ was sent at processed tube #150 - due to other configured thresholds - the QC will not be sent at processed tube #200. The counter for this rule is re-started at #150.
`Max allowed time`	Maximum time (in minutes) allowed for the Automated QC tube to remain on the Automation System without receiving any query from the scheduled instrument and in case no errors occur. Max configurable minutes are 1440 (24 hours). Once configured time is reached, Automated QC tube is marked as `EXPIRED`.
`Group`	Checkbox that allows the user to automatically run all Automated QC tubes which belong to the same Control together. If it is not checked, DMS software runs an Automated QC level at a time, following a fixed order of execution. It is always possible to manually run a single level at a time even if they are grouped.
`Spare tubes`	Number of backup tubes to run when the main Automated QC tube goes in error condition. Max configurable number is 9. It's better to leave this value to 0. Backup tubes can be added later. Spare tubes are tubes with the same barcode ID as the main QC controls, with a suffix starting with 01. Example: the main QC control is called CHM1OA . The first backup tube is CHM1OA01 , the second will be CHM1OA02 , and so on.

Table 133: Automated QC icons

Panel	Icon	Description
Auto QC Tubes		Run now. Allows to run the selected Automated QC tubes on the configured analyzer.
		Go to sample. Allows to quickly access the Validation screen of the selected QC sample. A popup appears and the User can confirm the action. No results will be displayed for QC tests.
		Refill. The User can force the QC tube to be sent to the IOM output lane for sorting configured for the related control. If the tube is running when the User clicks the Refill button, the QC tubr is no more considered online and the next QC tube is run.
		Reset. Allows to reset the Total runs counter.
		Close. The User can close the QC tube. If it is running, the QC tube will be no more considered online and the next QC tube is activated, if present.
		Edit. Allows to edit the selected record.
		Delete. Allows to delete the selected record.

Table 133 Automated QC icons (cont'd.)

Panel	Icon	Description
Auto QC test		Delete. Allows to delete the analytical test associated to the Automated QC tube (the action needs to be confirmed). When the row is deleted, the test is shown again in the Test to select panel.

4.9.4.4.1 Status of QC tubes (or Controls)

Each QC is identified by a color code:

Color	Description
White	no QC tubes are active or in error
Green	at least one QC tubes is running and no tubes are in error
Gold	one or more QC tubes are in error. For the types of error conditions, refer to 4.9.4.4.1.2 *Errors in QC tubes*, page 247.

4.9.4.4.1.2 Errors in QC tubes

When an Automated QC tube is in error status, it is highlighted in gold color. Hovering the mouse cursor over the Automated Qc tube, DMS shows a tooltip that states the reason for the error.

Error reason	Description
MISSING	this error is generated when an Automated QC tube that has to be sent to the Analyzer is not present on the Automation System, either on the track or in a node. The error is not set in case the automated QC tube has been manually run.
EXPIRED	this error is raised up when the Max allowed timeconfigured for the related control is reached and the Automated QC tube is still running on the Automation System without receiving any query from the scheduled analyzer.

Error reason	Description
MANUAL	this error is generated when a user applies the Close action to an Automated QC tube in running status, before it has been completed. Refer to Table 133 *Automated QC icons*, page 246.
INSTRUMENT EXCEPTION	when an Instrument Exception or an Automation error is received for an Automated QC tube by Data Management Software, it is displayed in the tooltip of the related row.

When an Automated QC tube is marked with an error, Data Management Software automatically sends the test of error sorting configured for the related control to the Automation System and the tube is sorted out in the configured lane. The IOM lane used to sort out the Automated QC tubes in error status can be configured in 4.10.4.12 *Settings*, page 294, inserting the required value in the IOM Sorting Lane for QC Sample Errors option.

A customized error code could be set on an Automated QC tube by General Event Manager (GEM): to configure the GEM, select the Set error on Automated QC tube option among the Actions list in the Editor window and type the desired error code to be set on tube.

By default, when the EXPIRED error occurs, DMS runs the next QC level of the same control, even if spare tubes are available for the tube involved in the error condition.

When a tube is manually closed, a popup allows the user to choose if run the spare tube (flag the option send backup tube) or the next QC tube.

In case an error different from EXPIRED or MANUAL occurs on the Automated QC tube, DMS will run the first backup tube available or the next Automated QC tube, if the QC is not configured to use spare tubes, when a threshold is reached.

4.9.4.4.3 Rejected QC results

If the QC result received by the analyzer is not valid, the test for which the QC failed is considered rejected and disabled on the configured analyzer.

NOTE

A test result can be rejected due to a QC failure only if the Instrument Option Reject Result by QC for the specific Instrument that produced this result is set to “YES”.

When a QC test is rejected, it is shown in the list of rejected test in 4.8.4 *Rejected*, page 144.

4.9.4.5 Decision Making

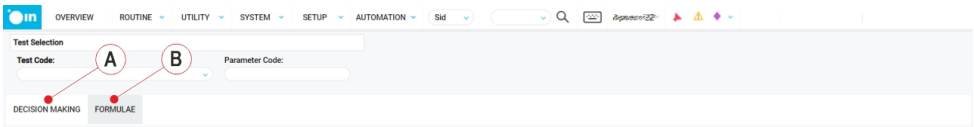
The Decision Making screen allows the creation of rules for the management and automatic processing of results for each test.

Rules can be of two types.

Rule type	Description
Formulae	rules that can perform numerical calculations on results received for a certain test, writing the new output values (or constant values) as new result for the received test or for another test
Decision Making	when the result of a configured test (trigger test) arrives, if the results of one or more tests, or other variables associated to the order, meet certain conditions, specific actions can be carried out (rerun, validation, etc)

Depending on the rule type selected, screen is divided in the following sections.

Figure 48:



Rule type	Section	Description
Decision Making (Figure 48 – A)	Test Selection	Test code that triggers the Decision Making conditions evaluation when a result is received for it. Test Code contains the list of tests configured in DMS and, in case a test has already got a configured Decision Making rule, it is marked with a “D” next to the Parameter Code.
	Available Decision Making	List of configured Decision Making rules for the selected test, with Decision Making name, username of the operator that made the last change and a checkbox stating that if the Decision Making rule is enabled or not.
	Conditions	List of conditions to be verified when the Decision Making rule is triggered
	Rules	List of rules to be applied when the configured rule conditions are verified.

Rule type	Section	Description
Formulae (Figure 48 – B)	Test Selection	Test code that triggers the Formula application when a result is received for it. Test Code contains the list of tests configured in DMS and, in case a test has already got a configured Formula, it is marked with a “F” next to the Parameter Code.
	Available Formulae	List of configured Formulae for the selected test, with Formula name, username of the operator that made the last change and a checkbox stating that if the Formulae is enabled or not.
	Calculates	List of calculations to be done then the formula is triggered.
	Actions	List of actions to be applied on test that triggered the formula.

4.9.4.5.1 Rules evaluation

Rules are evaluated sequentially: first the Formulas and then the Decision Making . Formulas have no conditional decisions and are always performed (for example: a Formula that sums the value “10” to a result will be performed in any case). Decision Making, instead, is based on conditions.

Each time a result for a certain test arrives from an Analyzer, the rules related to that test are evaluated in a progressive numerical sequence, from lower numbers (on the top of the lists) to higher numbers (on the bottom). User can move the items in the lists up or down using the related buttons, to increase or decrease the priority of the item.

NOTE

Rules written for a selected test (e.g. Test A) cannot perform certain actions on a different test (e.g. Test B). For example, when writing rules for Test A:

1. it is possible to configure actions on Test A basing on Test B results;
2. it is not possible to configure certain actions on Test B basing on the results arrived for the Test A.

The only actions that can be performed on the test B in the case 2) are the enabling/disabling of Test B, the reflex of Test B, the result setting of test B and the enabling/disabling of an another instrument (different from the one where the Test A was received.

The actions that cannot be performed in case 2) are validation, hold or rerun of Test B, deliver of the sample tube with Test B, set a warning for Test B.

In the case 1) above, anyway, it is important that Test B results always arrive before Test A results, otherwise, when Test A results are evaluated, the Test B results will be missing and the actions on Test A will not be applied.

NOTE

To perform the allowable rules of case 2) above on a certain target test (e.g. Test X) based on the results of 2 or more trigger tests (e.g. Test A, Test B, Test C, ...), it is necessary to write the same rule (same conditions and actions) on all the trigger tests, specifying conditions related to the results of all the involved trigger tests. At each trigger test result arrival, the rule will be evaluated and discarded if any other trigger result is missing (so that the conditions cannot be evaluated). The rule will be applied only at the last trigger result arrival, when all the other trigger results are already available and the conditions can be eventually evaluated.

4.9.4.6 GEM editor

The General Event Manager allows to configure actions that the Data Management Software operates as a consequence of particular events. The use of this function is restricted to technical assistance staff.

4.9.4.6.1 Default Rules

The Data Management Software provides a series of GEM rules that are preconfigured in any new installation and that are enabled by default.

Table 134: Default GEM rules

Rule	GEM Description	Triggered	Effect
1	`Send complete command on tube with all results`	At Automation check-in message (L001)	If all the results for a sample tube are received, the sample tube is marked as Completed on the Automation System.
2	`Resend incomplete test on first U09 - OR - After 3 times receives U09 send command delivery`	When there is an exception or a warning on the Automation that requires the notification to DMS or LIS (S004 massage)	If a test is incomplete due to a U09 exception, the test is sent again to the Automation System. If the exception appears for 3 times, the sample tube is then asked to be delivered into the Automation Priority Output racks.
3	`When tube has all results and has been in track then send command complete`	When the status of the tube changes	If all the results for a sample tube are received and the sample tube has been loaded on the track, the sample tube is marked as Completed.
4	`When tube is in Storage and a test status is requested or received then resend to automation`	At Automation location message (S001)	If the tube is in a Storage Module and a test is requested, the test is sent again to the Automation System.
5	`When tube is in Storage and has test SERO then send command KEEP`	At Automation location message (S001)	If the sample tube has a SERO test, the sample tube is kept in the Storage Module.

Table 134 Default GEM rules (cont'd.)

Rule	GEM Description	Triggered	Effect
6	`Test has result and is not a sorting test then send cancel test to automation`	At Automation check-in message (L001)	If a test on a sample tube loaded on the Automation System has a result and is not a sorting test, then a Cancel message is sent to the Automation system for that test.
7	`Default test on unknown tube`	At Automation check-in message (L001)	If the sample tube does not exist in the DMS database, an UNKNOWN patient and an UNK test are created and associated to that sample tube.

4.9.4.7 Automation Tests

The `Automation Tests` screen is divided in the following sub-screen.

Sub-screen	Description
`Sorting Test`	Displays the list of tests that can be sorted to Modules.
`Aliquot Test`	Displays the list of tests involving the creation of aliquots at the Aliquoter Module (if available) and allows relevant configuration. Sub-screen available only if an Aliquoter is installed.
`Aliquot Tubes`	Displays the list of secondary tubes types used for creating aliquots at the Aliquoter Module (if available) and allows relevant configuration. Sub-screen available only if an Aliquoter is installed.
`Default Prog`	Displays the list of the default Tests that can be performed by the connected Analyzers.
`Test Codes`	List of the Analyzer Test Codes.

In the each sub-screen, the following function buttons are available.

Function button	Description
`Add`	The User may add an entry to the list box.
`Delete`	The User deletes the selected entry of the list box.
`Delete All`	The User deletes all entries of the list box.
`Save`	The User saves the changes made in the list box.

4.9.4.7.1 Sorting Tests

Item	Description
ASTM Code	Contains the ASTM Test Code as received from LIS, or the Error Code (preceded by the # character) for Error Sorting, or the pre-defined #LTS Code for Long Term Storage Sorting, or ! followed by the Aliquot Tube Type to sort Duplicate Sample Tubes generated by Aliquoter Module. **NOTE:** Differently than Aliquot Tubes with suffix, for which the Sample Request is received from Host LIS, Aliquot Tubes with the same Sample ID as the Primary Tube will be delivered to the Sorted Output Rack configured for Sorting Test !x where x is the Aliquot Tube Type of the Secondary Tube.
Test Code	Contains the Test Code, or the Error Code (preceded by the # character) for Error Sorting, or the pre-defined #LTS Code for Long Term Storage Sorting, or ! followed by the Aliquot Tube Type to sort Duplicate Sample Tubes generated by Aliquoter Module.
Test Description	Contains the Test Description (name). **NOTE:** If the Test Description contains one of the following strings between square brackets, the string is considered as Storage Disposal Time for the relevant Sorting Test, instead of the generic Storage Default Dwell Time or High Volume Storage Default Dwell Time of the Settings Screen: • [x Workdays] (x = number of days not counting Holidays (e.g. New Year's Day) and days not set as Working Days (e.g. Saturdays and Sundays) as configured in the Calendar Screen). • [x Days] (x = number of calendar days also counting Holidays, Sundays, etc.) • [x Hours] (x = number of hours) • [x Minutes] (x = number of minutes) **NOTE:**

Item	Description
	If the `Test Description` contains a number between braces ({}), and the `Tube Processing` requires Centrifugation, the Tubes with this Sorting Test will be routed to the specific Centrifuge Module indicated between braces (for instance {1} indicates Centrifuge Module 1, {2} indicates Centrifuge Module 2, etc.). In case of two or more Centrifuge Modules (with instances 1,2,X), the correct syntax is {1,2,X}.
`Sorting Lanes`	Refer to 4.9.4.7.1.2 *Sorting Lanes*, page 256.
`Tube Processing`	Refer to 4.9.4.7.1.3 *Tube Processing*, page 257.

4.9.4.7.1.2 Sorting Lanes

The information indicates which are the available Sorted Output lanes that can be used. The value can be:

- a list of Input/Output Module lanes (e.g. 1, 2, 3, etc.) or lanes/columns (e.g. 1A, 1B, 1C, 1D, 2A, 2B, etc.) or, for installations with multiple IOMs, a list of IOM instance numbers, followed by a dash, followed by the lanes or lanes/columns (e.g. 1-16, 1-1A, 1-15D, 2-1A, 2-15D), separated by blanks, where the sample with the relevant test will be sorted to.

  NOTE:

  The lane must be configured as a Sorted Output lane.

  NOTE:

  If the IOM instance is not specified, the lane configuration is applicable to all installed IOMs.

- P if the Test is Parking Test (sorted to generic Incomplete Output lane)
- S if the Test has to be sorted to Storage or S followed by the Storage Module number (e.g. S1) for a specific Storage destination or a list of Storage Modules, separated by blanks (e.g. S1 S2...)

  NOTE:

  S, S1, S2 S3,... Sorting Lane are not allowed for Duplicate Tubes Sorting (sorting tests with Test Code equal to !x).

- a list of SP strings followed by the Module instance for parking to Storage Module (e.g. SP1 SP2).

  NOTE:

  SP1, SP2,... Sorting Lanes are not allowed for Duplicate Tube Sorting (sorting tests with Test Code equal to !x).

  Any SPx entry mixed with any other entry of other sorting Module Types (i.e. x-y for IOM, Sx for Storage Complete Output) is not allowed.

- For Sorting of Aliquot Secondary Tubes with the same ID of the Primary Tube (Test Code = !x), the allowable destinations are the IOM lanes.

For Sorting By Error:

- it is possible to configure specific error codes (preceded by the # prefix) to be sorted to specific Sorted Output lanes or lanes/columns. **NOTE:**

  The Test Codes preceded by # are not downloaded by Host LIS but specific Error Codes generated by Automation System.

4.9.4.7.1.3 Tube Processing

Contains the Tube Processing according to the relevant Test.

Tube Processing	Meaning	Description
N	None	if the Tube has to be sorted without any centrifuging and decapping.
C	Centrifuge	if the Tube needs to centrifuged (but not decapped) before sorting.
2C	Double Centrifuge	if the Tube needs to be centrifuged twice (but not decapped) before sorting.
D	Decap	if the Tube needs to be (eventually centrifuged and) decapped before sorting.
2D	Double Centrifuge and Decap	if the Tube needs to centrifuged twice and decapped before sorting.
S	Seal	if the Tube needs to be (decapped and) sealed before sorting.
P	Priority	if the Tube has to be sorted for the test before being centrifuged, decapped or sent to on-track analyzers. In case of tube processing P the sample tube is unsealed (if sealed).
A	Any	the Tube will have a processing dictated to the definition of the other tests.
E	Error	if the Tube has to sorted to Priority Output Rack with error SC046.
X	Deseal	if the Tube needs to be desealed before sorting.

Tube Processing	Meaning	Description
K	Delayed Sorting	• If the tube is located in a Storage when the sorting test order with tube processing K is received, the tube is kept in Storage for its dwell time and then it is automatically retrieved and brought to the destination for the Delayed Sorting Test. • If the tube is not located in a Storage when the sorting test order with tube processing K is received, the tube is routed immediately to its destination for delayed sorting test without going into the Storage.
SC	Skip Centrifuge and Decap	if the Tube needs to skip centrifugation and then be decapped. **NOTE:** tests with this tube processing will override the “U” (unspun flag) in the test order.

4.9.4.7.4 Aliquot Tests

Item	Description
ASTM Code	Contains the ASTM Test Code as received from LIS.
Test Code	Contains the Test Code
Test Description	Contains the Test Description (name) as displayed by Automation System GUI. **NOTE:** If the Test Description contains one of the following strings between square brackets, the string is considered as Storage Disposal Time for the relevant Aliquoting Test, instead of the generic Storage Default Dwell Time of the Settings Screen: • [x Workdays] (x=number of days not counting Holidays (e.g. New Year's Day) and days not set as Working Days (e.g. Saturdays and Sundays) as configured in the Calendar Screen). • [x Days] (x=number of calendar days also counting Holidays, Sundays, etc.) • [x Hours] (x=number of hours) • [x Minutes] (x=number of minutes)
Aliquot Tube Type	Contains the secondary tube type code (A..Z) for the relevant test.
Microliters	The number of microliters to be aliquoted and dispensed for the relevant test.

4.9.4.7.5 Aliquot Tubes

Item	Description
`Aliquot Tube`	Contains the Secondary Tube Type (A. Z).
`Prefix/Suffix`	Contains the Barcode Prefix or Suffix of the relevant Secondary Tube Type.
`Prefix/Suffix Depth`	Contains the number of digits to be eliminated from the Primary Tube barcode before adding Prefix (from the barcode beginning) or the Suffix (from the barcode end).
`Dead Volume`	Contains the dead volume (in microliters) of the relevant Secondary Tube Type.
`Destination`	Contains a string to be printed on the relevant Secondary Tube Type.

4.9.4.7.6 Default Prog

Item	Description
`Cap/Prefix/Suffix`	Contains the Cap Color Code (numeric) as detected by Tube Identification Module, or N for uncapped tubes, or C for generic capped tubes, or #x (where x is a Sample ID suffix string) for Secondary Tube suffixes, or !x (where x is a Sample ID prefix string) for Primary Tube prefixes, or S for sealed tubes. **NOTE:** It is possible to specify the string S018/x (where x=1-8) to automatically generate a S018 comment message to create x aliquot tubes with 100 microliters of sample or the string S018/x/y (x=1-8, y=number of microliters, default is 100), to automatically generate a S018 comment message to create x aliquot tubes with y microliters of sample. **NOTE:** It is possible to specify the string {{D}}. In this case, the relevant Default Sample Programming will be associated to Aliquot Tubes that are NOT duplicate of their Primary Tube (in that case they will get the !A, !B, etc. Sorting Test), but they are duplicate of another tube that is currently on-line. **NOTE:** It is possible to specify the string {{U}}. In this case, the relevant Default Sample Programming will be associated to Tubes which Sample Programming contains the U (Unspun) flag. Those Tests associated to the {{U}} entry will be automatically added to Tubes having the U flag. Once a Tube has been spun, the U flag is deleted (the Tube is not spun again if reloaded as prespun).
`Description`	Contains the Cap Color description, for reference only.
`Tests`	Contains the Test Codes (separated by blanks) to be automatically generated if a tube with the specified cap color or primary tube sample ID prefix or secondary sample ID suffix is detected (if the Test Code is preceded by the ! character, the Test Order is temporary, i.e. it will be deleted as

Item	Description
	soon as the real Sample Programming arrives from Host LIS).

4.9.4.7.7 Test Codes

Item	Description
Type	Analyzer Type
Analyzer Code	Test Code as reported by the Analyzer in the Reagent Inventory Message.
Astm Code	ASTM Code as reported by the Host LIS
Description	Mnemonic Test Description.
Ignore Reagent Inventory	• Yes whether the Reagent Inventory value should be ignored for this Test Code and the Test may be scheduled for the Analyzer despite zero inventory; • No whether the Reagent Inventory value should not be ignored for this Test Code
Combi Tests	If Ignore Reagent Inventory is Yes, list of Combi Test Codes (separated by blanks) that should be considered with the same Reagent Inventory value as received for the Test indicated in the Analyzer Code

4.10 Automation

The `Automation` menu allows the User to access additional functions and settings of the Automation System.

The menu is made up of the following items.

Screen	Access Level	Description
`Counters`	Guest	Displays statistics about the usage and the workload of the Automation System.
`Exceptions`	Guest	Displays a list with the latest warnings and the errors occurred on the Automation System.
`System`	Refer to 4.10.3 *System*, page 267	Displays general information about the Automation System configuration and provides commands to manage, backup and restore Automation System configurations and sample tubes data.
`Configuration`	Guest	Displays the various settings of the Automation System and the sample tube processing.

4.10.1 Counters

The `Counters` screen displays statistics about the usage and the workload of the Automation System.

The screen is divided in the following panels.

Panel	Description
`Computer`	Displays number of Sample records in Database and Computer memory usage.
`Track Status`	Displays the number of carriers and tubes currently present on the Automation System, track, module buffers and Storage Modules.

Besides, the screen is divided in the following sub-screen.

Sub-screen	Description
`Tube Count`	Displays number of tubes processed by each Module of the Automation System during the day (Today) and in total (since software installation).
`Gate Cycles`	Displays the number of cycles processed by the gates of each Module of the Automation System during the day (Today) and in total (since software installation).
`Overload`	Displays the carrier overload counter and status for each Analyzer.
`Consumable Statistics`	Displays the number of consumable used during a selected period of time.
`Methods`	Display each Analyzer that is configured to support Method Segregation.

4.10.2 Exceptions

The Exceptions screen displays the latest 500 Errors and/or Warnings occurred on the Automation System within a 24-hour period only.

The complete list of Errors is included in the ERROR Log.

Item	Description
Timestamp	Displays the Timestamp when the Error or Warning has occurred.
Analyzer / Module	Displays the Analyzer or Module where the Error or Warning has occurred.
Error	Displays the Error or Warning Code.
Error Message	Displays the text content of the Error Message.
Type	Displays whether the relevant entry is an Error or Warning.
Sample/Carrier ID	Contains the ID of the Sample or the Carrier (if any) involved in the Error or Warning.

In the Exceptions screen there are the following function buttons.

Function button	Description
Explain	Allows the User to enter an Error or Warning Code and display the relevant Error Explanation Box
Delete All	Allows deleting all the Error or Warning entries from the list box. **NOTE:** The relevant entries are NOT deleted from the ERROR Log.
Go To Sample	Displays the related Sample Screen Snapshot pop-up with the location of the sample involved in the error.
Print	Prints the content of the list box

Refer to 5.1.15 *How to manage the error recoveries*, page 350 for carrying out the error recoveries.

4.10.3 System

The `System` screen is divided in sub-screens.

Sub-screen		Access Level	Description
`Analyzers`		Guest	Displays the main configurations of the connected Analyzers.
`Software/Firmware`		FSE	Displays software/firmware versions installed on Automation Modules and Interface Modules.
`Maintenance`		Guest	Displays preventive maintenance activities.
`Exercise`		Refer to Table 135 *Exercise Function button*, page 272	Displays the current Exercise status of each Module and Interface Module that supports Exercise.
`Utilities`	Commands	Refer to Table 136 *Commands section*, page 272	Displays a set of commands that can be sent to start/stop/shutdown the Automation System, purge sample tubes, flush logs, reload Configuration files, check if there is any incomplete sample tube at IOM to be reloaded on Track, to send a test e-mail.
	Backup	Refer to Table 137 *Backup section*, page 274	Allows backup/restore of configuration files, Database information and log files.
	Reserved	Refer to Table 138 *Reserved section*, page 274	Displays a set of advanced commands.
`LIS`		Physician	Allows to send a set of LIS messages to the Automation System for test purposes.
`Direct Command`		Physician	Allows to send direct commands to the Automation System.
`SDO R/W`		FSE	Allows to read or write values at the Index and SubIndex of the SDO for the specified Automation Module.

4.10.3.1 Analyzers

The `Analyzers` sub-screen displays part of the contents of the *Analyzers.ini* file that collects the main Analyzer configuration for each Analyzer Type.

Item	Description
`Analyzers`	Analyzers type.
`Class - Max Empties`	POS (Point of Space) or PNP (Pick and Place) followed by maximum number of carriers in buffer to deliver an empty carrier (only for PNP).
`Tube Processing`	• `N` (None) if there is no tube processing. • `D` (Decap) if the Tube needs to be decapped before being delivered to Analyzer. • `C` (Centrifuge) if the tube needs to be centrifuged but not decapped before being delivered to Analyzer. • `A` (Any) if the Tube pre-analytical Processing is unknown and will be dictated by sorting tests contained in the order. In this way, it is possible to manage different pre-analytical processes for samples addressed to the specific Analyzer type (e.g., a Sorting Test with Tube Processing set to `D` indicating that the Tube must be centrifuged and decapped, or `SD` indicating that the Tube must be shaken and decapped). **NOTE:** If no Sorting Test with a valid Tube Processing is received, the Tube is flagged with SC07B `Unspecified Pre-Analytical Process`.
`Tube Types`	Restrictions (if any) on Tube Type processing
`Auto-reflex`	`Yes` if eventual Tests that are added after the tube enters the Analyzer buffer are to be considered as processed after the Tube is returned to Track, `No` otherwise.

4.10.3.2 Software/Firmware

The `Software/Firmware` sub-screen displays the software/firmware version of each Node.

Item	Description
Node ID	Identifier of the Analyzer/Module.
Analyzer / Module	Description of the Analyzer/Module.
Item	Description of the software/firmware version.
Software / Firmware Versions	Software/firmware version installed.
Status	It is displayed: • OK if the software/firmware version is compatible with the current software/firmware installed • the new software/firmware version available (highlighted in yellow) • N/A if no information is available

4.10.3.3 Maintenance

The Maintenance sub-screen displays the preventive maintenance activities.

Item	Description
Timestamp	Timestamp (YYYY/MM/DD/ HH:MM) when the preventive maintenance activity is scheduled.
Node ID	ID of the Node where to execute the preventive maintenance activity.
Node Type	Node Type/Instance.
Description	Description of the preventive maintenance activity. Refer to 8 *Maintenance procedures*, page 565 for further information.
Status	Maintenance status: • Scheduled: the preventive maintenance activity is scheduled to be done but its timeout has not been reached yet. • Due: the preventive maintenance activity is scheduled to be done and its timeout has expired. • Overdue: the preventive maintenance activity is scheduled to be done and its timeout has expired of at least double the configured time (e.g. if the scheduling for this activity was one week, at least two weeks have passed from the latest time the Maintenance task was executed).

Selecting one preventive maintenance activity (either in `Scheduled`, `Due` or `Overdue` state), a pop up appears asking the User to confirm whether the selected maintenance activity has been executed. If the User confirms, then the preventive maintenance activity is scheduled in the future at the selected timeout (for instance, if its timeout is one week, it will be scheduled to a timestamp of one week in the future), while in the *Preventive-Maintenance.ini* file the execution of the maintenance activity is registered as `Done` including its timestamp and the User Name of who selected and confirmed the activity itself.

4.10.3.4 Exercise

The `Exercise` sub-screen displays the current Exercise status of each Node that supports Exercise.

Note that:

- If a Node is in Exercise Mode, then the relevant card in the `Overview` / `Cards` screen is Yellow and the Node Error SC038 `Exercise in Progress` is displayed.
- If at least one node is in Exercise Mode, the `System Exercise in Progress` warning is displayed in all screens and the Overview button is Yellow (provided that it is not Red or Yellow due to an error or warning respectively).

NOTICE
Do not use the Exercise functionality during the working session.

Item	Description
`Node ID`	Indicates the Node ID (numeric)
`Node Type`	Indicates the Node Type (string)

Item	Description
Exercise Type	Indicates the allowable Exercise Type of each Node: • Do Not Pause (for Track only): if this Exercise Type is enabled, the Track never enters Pause mode. • Send Empty Carriers (for Decapper, Desealer, Sealer, Recapper and Track NCCLS Modules only): if this Exercise Type is enabled, empty carriers are routed to the Node (the empty carrier percentage is defined in the Automation / Configuration / Empty Carrier tab) to exercise its gates. • Stress Test (for Centrifuge Modules, Aliquoter and Analyzers only): if this Exercise Type is enabled, all Sample Tubes that are routed to and returned from the Node are considered as not processed, such that the same Sample Tubes can be routed to the same (or equivalent) Module or Analyzer over and over. • Random Retrieval (for Storage Modules and Input/Output Module only): if this Exercise Type is enabled, the Sample Tubes located in the Storage Module are randomly retrieved from the Node to Track, and then sent to the same or equivalent Module. • Tube Motion (for IOM only): if this Exercise Type is enabled, the IOM moves the tube located at the position 1 of the Rack placed in the Lane 1 to the position 1 of the racks placed in the other Lanes. **NOTE:** The Exercise requires all IOM locations, except Rack Lane 1, position 1, to be empty before starting the Exercise. The Exercise loops until disabled.
Exercise Status	Enabled or Disabled depending whether the Exercise Mode is enabled or disabled on the relevant Node.

Table 135: Exercise Function button

Function button	Access Level	Description
`Save`	Guest	Allows to save the changes made in the list box.
`Change Type`	FSE	Allows to change the Exercise Type for the selected Node
`Enable`/`Disable`	Guest	Allows to enable/disable the Exercise mode.
`Enable All`/`Disable All`	Guest	Allows to enable the Exercise mode on all Nodes in the list box.
`Print`	Guest	Allows to print the content of the list box.
`Export CSV`	Guest	Allows to export the information to file.

4.10.3.5 Utilities

The `Utilities` sub-screen groups three sub-sections:

- `Commands`
- `Backup`
- `Reserved`

Table 136: Commands section

Item	Access Level	Description
`Start`	Guest	Starts the Automation System.
`Pause`	Guest	Pauses the Automation System.
`Shutdown`	Guest	Pressing the `Shutdown` function button, the System enters the Shutdown Mode (the system shuts down). **NOTE:** During Shutdown Mode, the Shutdown in Progress warning is displayed.
`Purge`	Guest	The System enters the Purge Mode (all sample tubes, including the new tubes loaded, are delivered to PO Racks). **NOTE:**

Table 136 Commands section (cont'd.)

Item	Access Level	Description
		During Purge Mode, the `Sample Purge in Progress` warning is displayed.
`Flush Logs`	Laboratory Supervisor	Current TXT Log Files are flushed to XML format.
`Reload Configuration from File`	Laboratory Supervisor	Configuration Files are reloaded. When this command is given, Dream sends to DMS/Middleware the I004 and I008 messages with all reagents reset to zero and reagent inventory of all Analyzers supporting this function is reset by reloading the Test Map files. Inventories will be brought to the correct value and DMS/Host LIS will be notified with the reagent levels after receiving from Analyzers the next reagent update. The reset is sent in order to have Dream synchronized with DMS/Host LIS for what concerns reagent inventory. **NOTE:** It is suggested not to execute this command during the working session. It is suggested to perform it at least 1 hour before the beginning of the working session.
`Sample Check`	Laboratory Supervisor	The System checks whether there are Samples to be reloaded to Track from the IOM Racks. This function is automatically performed by Automation System every 5 minutes. Confirming this popup, it is possible to proceed with the check right away.

Table 136 Commands section (cont'd.)

Item	Access Level	Description
`Send Test e-mail`	Laboratory Supervisor	A Test e-mail is sent to the Report Recipient Address as configured in the *Email.ini* configuration File.
`Reset Sample Database Communication` [27]	Laboratory Supervisor	Database Communication is reset in case of communication lost.
`All analyzers`	Laboratory Supervisor	• `Set On-line`: it allows to set all Analyzer Interface Modules to On-line. • `Set Off-line`: it allows to set all Analyzer Interface Modules to Off-line.

Table 137: Backup section

Item	Access Level	Description
`Backup`	Physician	Backup of Module firmware configurations, IOM database and Storage database. See 4.10.3.5.1 *Backup Button*, page 276.
`Repair Sample Database` [27]	Physician	Repairs the Samples database of the Automation System in case of corruption.
`Restore`	Physician	Restore of Module firmware configurations, IOM database and Storage database. See 4.10.3.5.2 *Restore Button*, page 277.

Table 138: Reserved section

Item	Access Level	Description
`Fake Error`	Physician	Allows to generate a fake error by entering the Node ID and an Error Code.
`Sample Database`	Physician	Allows to optimize the Sample Database.

27. Not displayed in case SMS database is installed remotely.

Table 138 Reserved section (cont'd.)

Item	Access Level	Description
		NOTE: the Sample Database is automatically optimized every day at midnight or at Software startup.
`Sample`	Physician	Allows to: • `Get Storage Tube for LTS` : gets a specific Sample Tube from Storage as it was requested by Host LIS for Long Term Storage Rack. • `Keep Sample in Storage` : marks a specific Sample Tube in Storage as it was requested by Host LIS for Long Term Storage when Sample Disposal Time elapses.
`LIS`	Physician	• `Disable LIS Simulator` : the LIS Simulator is disabled if it was previously enabled. • `Restart LIS Driver` : the Host LIS Software Driver is restarted. **NOTE:** restarting the LIS Driver, messages being currently exchanged between Host LIS and Automation software may be lost.
`Reset Hematology Island Racks`	Physician	Sends the RESET-RACK command to the Hematology Island.
`Delete Motor Logs`	Physician	Allows to delete the Log Files for the UTC Node ID entered.
`Reload Layout`	Physician	Allows to send the command “RESERVED RELOAD-LAYOUT".

4.10.3.5.1 Backup Button

Table 139: Backup sub-functions

Item	Description
`Backup All Node Settings`	Firmware Node Settings of all Nodes are backed up into the *Backup* sub-folder of the Automation Software installation folder (same as pressing the `Backup` Button in the `Status` screens for all Nodes).
`Backup Configuration Files`	Configuration files are backed up into the *Backup\Config* sub-folder of the Automation Software installation folder.
`Backup IOM Lane Configuration`	IOM Lane Configuration is backed up in the *Lane-Config.ini* file in the *Backup* sub-folder of the Automation Software installation folder.
`Backup Sample Database` [28]	Sample Database is backed up in the *backup_db.sql* file in the *Backup* sub-folder of the Automation Software installation folder.
`Export Storage Database`	Storage Database is exported to the *Storage-X-Backup-YYYYMMDDHHMMSS.txt* file of the *Backup\Config* sub-folder of the Automation Software installation folder (where X is the Node ID of the Module).

NOTE

When the backup (or restore) operation is not executed, the `Backup Error` (or `Restore Error`) pop-up appears. When the backup (or restore) operations is partially executed, the `Backup partially executed` (or `Restore partially executed`) pop-up appears.

28. Not displayed in case SMS database is installed remotely.

4.10.3.5.2 Restore Button

Table 140: Restore sub-functions

Item	Description
`Restore Configuration Files`	Configuration files are restored from the *Backup\Config* sub-folder of the Automation Software installation folder. **NOTICE** Press the button `Reload Configuration from File` to restore the Automation System functionality.
`Restore IOM Lane Configuration`	IOM Lane Configuration is restored from the Lane-Config.ini file in the *Backup* sub-folder of the Automation Software installation folder.
`Restore Sample Database` [29]	Sample Database is restored from the backup_db.sql file in the *Backup* sub-folder of the Automation Software installation folder.

NOTE

When the backup (or restore) operation is not executed, the `Backup Error` (or `Restore Error`) pop-up appears. When the backup (or restore) operations is partially executed, the `Backup partially executed` (or `Restore partially executed`) pop-up appears.

29. Not displayed in case SMS database is installed remotely.

4.10.4 Configuration

The Configuration screen is divided in the following panels.

Panel	Description
Calendar	Displays configured data related to the Working Days and Holidays of the Laboratory.
Laboratory	Displays configured data related to the Laboratory.

Besides, the screen is divided in the following sub-screen.

Sub-screen	Description
Cap Color	Allows the user to configure the allowable cap color for Test Codes.
Computer	Displays configured data related to Automation System computer.
Consumables	Displays configured data related to consumable materials.
Database	Displays configured data related to the samples Database.
Empty Carrier	Allows the User to configure the percentage of Empty Carriers (from 0 to 100) to be routed to each Module.
Layout	Allows the User to configure Automation System layout.
LIS	Displays the configured data related to LIS Communication.
Log Files	Displays configured data related to log files.
Overload	Displays configured data related to samples workload distribution thresholds and overload management for each connected Analyzer type.
Settings	Displays configured data related to the system settings.
Vision System	Allows the User to enable or disable the Tube Identification Module for each Module that support it (Input/Output Module, Bulk Input Module, Rack Input Module).

In the Configuration screen, the following function buttons are available.

Function button	Access Level	Description
Save Config	Laboratory Supervisor	Pressing the Save Config button, a pop-up appears requesting to save the current configuration settings, IOM lane configuration and sorting test configuration as Day Configuration or Night Configuration (to be eventually restored later using the Switch Config button).
Switch Config	Laboratory Supervisor	Pressing the Switch Config button, a pop-up appears requesting to discard the current configuration settings, IOM lane configuration and sorting test configuration and switch to the configuration settings, IOM lane configuration and sorting test configuration previously saved as Day Configuration or Night Configuration. It is necessary to unlock all IOM racks to restore previously saved configurations if the two sets of saved IOM lane configurations (day and night) are different).
Print	Guest	Allows to print the content of the list box.
Export CSV	Guest	Allows to export the content of the list box to file.

4.10.4.1 Calendar

Allows the User to configure days considered as Holidays and the working days of the week.

The following entries can be changed only with Supervisor Access Level.

Item	Value
Holidays	• List of calendar days (DD/MM) to be considered as Holidays and not counted when calculating the Working Days for the Storing Time of a Sample. • Default value is the empty string.

Working Days	• Indicates the Working Days of the week to be counted when calculating the Working Days for Storing Time of a Sample.
	• Valid values are:
	  • Monday to Friday
	  • Monday to Saturday
	  • Monday to Sunday
	  • Sunday to Thursday
	  • Sunday to Friday
	• Default value is Monday to Friday.

4.10.4.2 Laboratory

This entry is a string indicating the Laboratory Name, which is printed on all Automation System printouts and written in Log Files and Reports.

The default value is an empty string. This entry can be changed with Supervisor Access Level.

4.10.4.3 Cap Color

This sub-screen allows to configure allowable Cap Color Codes for tests accepting a specific cap color only (displayed on a single row).

Parameter	Description
Test	Test Code that accept specific cap color only.
Cap Colors	List of cap color codes, separated by blanks, allowable for the relevant test code.

If a Sample Tube has only Test Orders that are not defined in this Screen or the Cap Color is defined as allowed in this Screen, then the Sample Tube is regularly processed.

If a Sample Tube has a Test Order that is defined in this Screen, but the detected Cap Color is not associated to the relevant Test Code, then the Sample Tube is rejected with Sample Error SC010 Cap Type Inconsistent with Tests.

Table 141: Cap Colors function button

Function button	Access Level	Description
Add	Laboratory Supervisor	It possible to add a new Test Code associated with its allowable Cap Color Codes (separated by blanks).
Delete	Laboratory Supervisor	It possible to delete the selected entry (Test Codes associated with its allowable Cap Color Codes).

4.10.4.4 Computer

This sub-screen displays data related to the Automation System computer.

The following entries can be changed only with FSE Access Level.

Item	Value
Backup Folder	• Allow configuration of computer folder to be for backup and restore.
Controlled Shutdown for UPS Errors	• If Yes , Automation System automatically shuts-down after the Controlled Shutdown Timeout (seconds) in case of UPS errors. • If No , Automation System does not automatically shuts-down in case of UPS errors. • Default value is No .
Controlled Shutdown Timeout (seconds)	• Number of seconds after which, in case of UPS Error, Automation System automatically shuts-down. This entry is used only in case Controlled Shutdown in case of UPS Errors is set to Yes. • Default value is “600” .
Memory Threshold (MB)	• Max amount of memory in MB used by Application before giving a warning (SC009) • Default value is “500” .
System ID	• ID of the System (written in log files)

4.10.4.5 Consumables

The following entries can be changed only with Supervisor Access Level.

Item	Value
BOM Tube Box Capacity	• Max Number of Tubes that can be accommodated in the Bulk Output Module Tube Box. • This entry is shown only in case a Bulk Output Module is installed. • Default value is “600” . • Valid values are from “1” to “600”.
BOM Tubes to Box Full Threshold	• Maximum number of available spaces in the Bulk Output Module Tube Box before giving a warning (SC064) • This entry is shown only in case a Bulk Output Module is installed. • Default value is “60” .
Sealer Reel Capacity	• Max Number of Seals available in the Sealer Reel. • This entry is shown only in case a Sealer is installed. • Default value is “16000” .
Sealer Seals To Reel End Threshold	• Maximum number of available Seals in the Sealer Reel before giving a warning (SC007). • This entry is shown only in case a Sealer is installed. • Default value is “100” .
Decapper Waste Capacity	• Max Number of Caps disposable in the Decapper Cap Waste. • This entry is shown only in case a Decapper is installed. • Default value is “2000” .
Decapper Caps To Waste Full Threshold	• Maximum number of available spaces in the Decapper Cap Waste before giving a warning (SC006). • This entry is shown only in case a Decapper is installed. • Default value is “100” .
Desealer Waste Capacity	• Max Number of Foils disposable in the Desealer Foil Waste. • This entry is shown only in case a Desealer is installed. • Default value is “10000” .
Desealer Seals To Waste Full Threshold	• Maximum number of available spaces in the Desealer Foil Waste before giving a warning (SC008)

Item	Value
	that indicates the incoming waste full condition. • This entry is shown only in case a Desealer is installed. • Default value is “100” .
`Aliquoter Tip Waste Capacity`	• Max Number of Tips disposable in the Aliquoter Cap Waste. • This entry is shown only in case an Aliquoter is installed. • Default value is “2500” .
`Aliquoter Tips To Waste Full Threshold`	• Maximum number of available spaces in the Aliquoter Tip Waste before giving a warning (SC019). • This entry is shown only in case an Aliquoter is installed. • Default value is “100” .

4.10.4.6 Database

The following entries can be changed only with Supervisor Access Level.

Item	Value
`Aliquot Request Records Dwell Time (hrs)`	• Maximum number of hours an Aliquot Request received via the S018 message is kept in the Automation System Database. • Valid Values: “1-720” . • Default value is “48” .
`Complete Records Dwell Time (hrs)`	• Maximum number of hour a Complete and Off-line Sample Record is kept in the Automation System Database. • Valid Values: “1-720” . • Default value is “24” .
`Expected Records Dwell Time (hrs)`	• Maximum number of hour an Expected and Off-line Sample Record is kept in the Automation System Database. • Default value is “48” .
`Holidays`	• List of calendar days (DD/MM) to be considered as Holidays and not counted when calculating the Working Days for the Storing Time of a Sample • Default value is the empty string.

Item	Value
	• Displayed only if at least a Wide Belt Carrier Buffer Module is installed.
`Incomplete Records Dwell Time (hrs)`	• Maximum number of hour an Incomplete and Off-line Sample Record is kept in the Automation System Database. • Valid Values: “1-720” . • Default value is “48” .
`Patient Demographics Check`	• If set to `Yes` , the Software automatically checks Patient ID and Name in Sample Order Patient data and, if there is a mismatch between two Sample Orders of the same Sample, the Sample Tube is sent to Priority Output Rack with error SC049 (`Patient Demographics Mismatch`). • If set to `No` , no Patient demographics mismatch check is done. • Default value is `No` .

`Working Days`	• Indicates the Working Days of the week to be counted when calculating the Working Days for Storing Time of a Sample.
	• Valid values are:
	  • `Monday to Friday` ;
	  • `Monday to Saturday` ;
	  • `Monday to Sunday` ;
	  • `Sunday to Thursday` ;
	  • `Sunday to Friday` .
	• Default value is `Monday to Friday` .
	• Displayed only if at least a Wide Belt Carrier Buffer Module is installed.

4.10.4.7 Empty Carrier

In this sub-screen it is possible to configure the percentage of Empty Carriers (from 0 to 100) to be routed to each Module.

The empty carrier percentage for Modules that not need empties, as the Decapper or the Sealer, is used only in Exercise Mode.

The empty carrier percentage can be changed only with Supervisor Access Level.

4.10.4.8 Layout

This sub-screen allows to configure the Automation System layout.

Item	Description
Node ID	Contains the Node ID.
Node Type	Contains the Node Type Code and description
Next/Jump Node ID	Contains the Next Node ID in the Layout and the Jump Node ID (only for Track Switches) in the Layout
STAT Reserve	Contains the number of slots reserved for STATs in the Node Carrier Buffer
Track Length	Contains the Track Length (expressed in number of Carriers) from the Node to the Next Node

Table 142: Layout function buttons

Function button	Access Level	Description
Add	Laboratory Supervisor	Allowing the User to enter a new Node.
Delete	Laboratory Supervisor	The selected Node is deleted.

When pressing the Add button, a popup with the following item is displayed.

Item	Description
Node Category	Allows changing the Node Category.
Node ID	Allows changing the Node ID (it is not possible to change the Node ID when modifying an existing Node).
Node Type	Allows changing the Node Type, depending on Node Category.
Track Length	(Displayed for all Node Categories except Track Controllers) Allows changing the total Track Length (expressed in number of Carriers) from the Node to the Next Node.
Next Node ID	(Displayed for all Node Categories except Track Controllers) Allows changing the ID of the Next Node in the Layout.
Jump Node ID	(Displayed only for Track Switches) Allows changing the ID of the Jump Node (shorter route) in the Layout.
STAT Reserve	(Displayed for all Node Categories except Track Controllers) Allows changing the number of slots reserved for STATS in the Node.

Item	Description
Save	The new configured Node is saved and added to the Layout.
Cancel	Allows closing the pop-up without saving any changes.

4.10.4.9 LIS

In this sub-screen it is possible to view the Host/LIS communication configuration.

Refer to the Automation-DMS Interface specifications for more details.

The following entries can be changed only with FSE Access Level.

Item	Value
LIS Additional Field for Duplicate Tubes	• Enabled, if the LIS messages must include the additional field for duplicated tubes in L001, S001, S004 and S005 message. • Disabled ,otherwise. • Default is Enabled.
LIS Allow Requesting Centrifugation	• Allows the Host LIS sending the “U” flag in the ORDER to force sample centrifugation even in case the tube is loaded at an input module or IOM lane configured for Centrifuged Input. • Valid values: Enabled/Disabled. • Default is Disabled.
LIS Channels	• Number of LIS Channels used. • Valid values: “1” and “2” .
LIS Database Access	Configuration of DMS Database for direct access.

LIS Enhanced Protocol	• Valid values: Enabled or Disabled .
	• If set to Enabled, the following additional parameters are sent in the relevant messages to DMS:
	  • L001/L002/L003/L004/L005/L006/S003 messages: additional field <*Carrier ID*>
	  • S001 message: additional fields <*Expected-Disposal-Timestamp*> and <*PNP-Expiration-Timestamp*>
	  • S005 messages: additional fields <*Carrier ID*>, <*Shaking-Expiration-Time*> and <*Number of Sealings*>

Item	Value
	• S005 message: addional events IN-BUFFER and OUT-BUFFER • If set to `Disabled`, the above additional parameters are not sent in the relevant messages to DMS, for backward compatibility. • Default is `Disabled`.
`LIS Frequency Polling (milliseconds)`	• Number of milliseconds to wait until a new query to dispatch table is done. • Valid values included in a range between 10 and 2000 milliseconds. • Default value: 10 ms
`LIS Include Carrier ID in L001 Message`	• Valid values: `Enabled` or `Disabled` . • If set to `Enabled`, the Carrier ID field will be included in L001 message, provided that `LIS Enhanced Protocol` is enabled • If set to `Disabled`, the Carrier ID field will not be included in L001 message, even if `LIS Enhanced Protocol` is enabled. This will speed up sending the L001 message in case `LIS Enhanced Protocol` is enabled, as the Automation software would not need to wait to receive the carrier ID from the Module along with the RETURNED message, but is would send the L001 message to DMS immediately after receiving from the Module the SAMPLE-DETECTED message. • Default is `Disabled`.
`LIS Include Lane in L001 and L002 Messages`	• Valid values: `Enabled` or `Disabled` . • If set to `Enabled`, the Input-Lane field is included in the L001 and L002 comments. • Default is `Disabled` .
`LIS Include Node ID in S005 Message`	• Valid values: `Enabled` or `Disabled` . • If set to `Enabled` , the field Node-ID is included in the S005 comment. • Default is `Disabled`.
`LIS Name`	LIS Name (any string) displayed in the `Overview` screen.

Item	Value
`LIS Packed Comments`	• Maximum number of ASTM Comment Records to be packed together in the same ASTM transaction. • Default is “1”.
`LIS S004 Field for Error Codes`	• Enables/disables the additional field in S004 message for Automation Error Codes. • Valid values: `Enabled`/`Disabled`. • Default is `Disabled`.
`LIS xxxx Comment`	• Enables/disables sending the relevant Comment to Host LIS (xxxx = L001, L002, L003, L004, L005[30], L006, I002, I007, I008, S001, S003, S013[31], S014, S015, S021[32], S022). • Valid values: `Enabled`/`Brief`/ `Disabled` (`Brief` is for retro-compatibility support with old Automation Protocol).
`LIS S005 REMOVED Comment`	Enables/disables the REMOVE Comment event.
`LIS S006 Comment`	• Enables/disables sending the relevant Comment to Host LIS or enables it for specific Instrument Types only • Valid values: `Enabled` /`Disabled` or a list of Instrument Type Codes separated by blanks.
`LIS Enhanced S006 Comment`	• Enables/disables sending the list of scheduled Tests in the S006 comment • Valid values: `Enabled` /`Disabled`.
`LIS Enhanced I004 Comment`	• If `Enabled`, the I004 message is sent to DMS with the extra “Module ID” parameter, if available. <Module-IDi> is the Analyzer Module ID, as communicated by the Analyzer via INVENTORY message. This parameter is sent only from software version R22 and in case the message is sent to DMS via LIS connection (and thus not via GUI/ IUI socket)

30. If “LIS L005 Comment” is “Enabled”, the Sample Receipt message for any aliquot sample generated at Aliquoter Module will be L005 instead of L001.
31. If “LIS S013 Comment” is “Enabled”, the S013 message also includes the list of aliquoted tests that caused the generation of the aliquot tubes; if "LIS S013 Comment" is set to “Brief” (default), the S013 message does not include the list of aliquoted tests.
32. If “LIS S021 Comment” is “Enabled”, ensure to enable the S021 management on DMS software as well.

Item	Value
	• Valid values: `Enabled` /`Disabled`. • Default value is `Disabled`.
`LIS S007 Comment`	Enables/disables sending the message related to the sample priority upgrading. The message is sent when a sample priority is upgraded to ASAP or STAT when it loaded from an ASAP/STAT lane respectively or when the priority is manually upgraded from User by IUI. • If set to `Enable`, the message is composed of the parameter “New-Priority”. “New-Priority” can be “A” or “S” if the sample priority is upgraded to ASAP or STAT, respectively. • If set to `Brief`, the message is not composed of the parameter “New-Priority” and it is sent only in case the sample priority is upgraded to STAT. • If set to `Disabled`, the message is not sent.
`LISx Communication Parameters`	Communication parameters for communication with Channel x (x=1,2) of Host LIS.
`LISx Sender ID`	Sender ID to be used in ASTM Header Record for communication with Host LIS Channel x (x=1,2)
`LIS Send I004 Comment Automatically`	• If `Disabled`, the I004 message (Test Inventory Notification) is sent only upon reception of I003 message (Test Inventory Request). • If `Enabled`, the I004 message (Test Inventory Notification) is sent not only upon reception of I003 message (Test Inventory Request), but also automatically whenever there is an Inventory Update. • Default value is `Disabled`.
`LIS Use L002 and L003 Messages`	• If `Enabled`, L002 message is sent to Host LIS/Middleware instead of L001 for Sample Tube Reload and L003 message is sent to Host LIS/Middleware instead of L001 for Sample Re-identification, and L001 is sent to Host LIS/Middleware only in case of new Samples loaded. • If `Disabled`, L002 and L003 messages are not used, and in case of

Item	Value
	Sample Reload or Sample Re-identification, the L001 is sent to Host LIS/Middleware as well. • Default value is `Disabled`.
`LIS Use Alternative Event Table`	• If `Enabled`, in case Automation software is configured to direct access to DMS Database, a new Table *exchangeautomation* is used to send events to DMS. • If `Disabled`, in case Automation software is configured to direct access to DMS Database, the standard *eventautomation* table is used. • Default value is `Disabled`. Make sure to check the option `Use dedicated table for automation messages` in DMS settings to allow the communication between DMS and Automation software via *exchangeautomation* table.
`LIS I004 Timeout (seconds)`	• Minimum number of seconds to wait before sending an I004 message to DMS after receiving an INVENTORY or an INVENTORY-UPDATE message from an Analyzer. • It is suggested to set from “0” to “300” seconds. • Default is 0, so that the I004 message is immediately sent (in case `LIS Send I004 Comment Automatically` is enabled). • If this entry is set to a number greater than “0”, any INVENTORY or INVENTORY-UPDATE message received from an Analyzer before the timeout expires does not cause any immediate I004 message to be sent to DMS; this entails that the I004 message to be sent to DMS (when the timeout is expired) will contains all the inventory updates received in the elapsed period of time since the last I004 message had been sent.
`LIS I004 with 0 Inventory`	To enable this option, insert the list of Analyzer (nodes), separated by space, that not send to SMS the reagent level for tests when it is zero. In this manner, SMS will force the sending of the reagent level equal to zero to DMS (through the I004

Item	Value
	message) for these tests configured on the Analyzer. This entry is set to `N/A` by default and it is disabled for all node types.
`LIS Disable S005 Events`	• Valid values: `N/A` or list of S005 events separated by blanks, default is `N/A` . • If set to a list of Events , those Events are NOT sent to Host LIS/ Middleware (it is possible to disable `LIS S005 REMOVED Comment` also disabling the `LIS S005 Comment` entry). • If set to `N/A`, no S005 Event is disabled.
`LIS Database Port`	• Port used to access the DMS database. • Valid values included in a range between 1 and 65535. • Default value is 3306. • A value different than the default can be used only if the new Data Definition Language (DDL) *SMS.DL.BC.Runtime.dll* is used for the database connection.
`LIS send Highest Priority Messages First`	• Valid values: `Enabled` /`Disabled`, default is `Disabled`. • If configured to `Enabled`, S004 messages will be sent by Automation System to Host LIS/Middleware prioritized over all the other messages. • If configured to `Disabled`, S004 messages will be sent along with the other messages, without any prioritization.
`LIS Send Messages in the Most Compact Form`	• Valid values: `Enabled` /`Disabled` , default is `Disabled` . • If set to `Enabled`, the Automation System will send messages to Host LIS/Middleware in a single frame (up to 65535 byte-long) whenever possible. • If set to `Disabled`, the Automation System will send messages to Host LIS/Middleware in multiple 240-character frames.

Item	Value
	in case of RS-232 Serial Communication, set `LIS Send Messages in the Most Compact Form` to Disabled.
`Node xx ID`	Node IDs for each Analyzer or Automation Module to be used in communication with Host LIS when referring to a specific Node.
`LIS Send Internal Tube Diameter`	• Allows to enable/disable sending the Internal Diameter to DMS. • valid values: `Enabled`/`Disabled`. • Default is `Disabled`.

4.10.4.10 Log Files

This sub-screen displays configured data related to log files.

The following entries can be changed only with FSE Access Level.

Item	Value
`CAN Debug Logs`	• If `Brief` or `Verbose` , the CAN Communication Log Files are written in the *Log* / *True* folder. • If `No` , the CAN Communication Log Files are not written to file. • Default value is `Brief` .
`Carrier PASS Logs`	• If `Brief` or `Verbose` , the Carrier PASS Log Files are written in the Log folder. • If `No` , the Carrier PASS Log Files are not written • Default value is `No` .
`LIS Communication Logs`	• If `Brief` or `Verbose` , the LIS Communication Log Files are written in the *Log* / *LIS* folder • If `No` , the LIS Communication Log Files are not written • Default value is `No` .
`Log Deletion Timeout (days)`	• Indicates the minimum number of days after which Dream Log files (including Config logs and Debug logs) are automatically deleted. • Valid values: from “31” to “366”. • Default value is “31” .
`Memory Logs`	• If `Brief` or `Verbose` , the Memory Logs are written in the *Log* / *Debug* folder.

Item	Value
	• If `No` , the Memory Log Files are not written. • Default value is `Verbose` .
`Remove Patient Name from Log Files`	• If `Yes` , Patient Names are completely removed from all XML and low level log files. • If `No` , Patient Names are completely removed from all XML log files, but logged in `LIS` and `Demographics` low level log files. • Default value is `Yes` .
`UPS Logs`	• If `Brief` or `Verbose` , the UPS Communication Logs are written in the *Log* / *True* folder (TRUE Logs). • If `No` , the UPS Communication Log Files are not written. • Default value is `No` .

4.10.4.11 Overload

For each connected Analyzers, the following settings are displayed.

These entries can be changed only with Supervisor Access Level.

Item	Description
`Type`	Analyzer Type Code.
`Analyzers`	Analyzer Type Name.

Item	Description
Overload Threshold	• Overload setting (max number of Carriers on Track transporting Samples destined to an Analyzer of the relevant Type, calculated by summing up the Carriers with Sample Tube located in the Analyzer buffer and the number of Sample Tubes circulating on Main Track destined to that Analyzer): if this number is above the threshold, exceeding tubes are unloaded to the IOM Racks (sample tubes are parked into the IOM Incomplete Racks) until the Carrier Number returns back below the threshold; when this occurs, samples are automatically reloaded back to Track from the IOM. • Default value is “999” .
Optional Split	• If configured as Yes (default), Tests of the same Sample may be distributed among equivalent Analyzer taking into account only the number of Samples in Analyzer Buffer, and not maximizing the number of Tests to be done in the same Analyzer. • If configured as No , Tests of the same Samples are distributed among equivalent Analyzer taking into account also (and maximizing) the number of Tests to be done on the same Analyzer.

4.10.4.12 Settings

The following configuration entries are displayed

These entries can be changed only with Supervisor Access Level (unless otherwise specified).

In case the User tries to configure an option with an invalid value, a popup with Invalid Entry message is shown.

Item	Description
Aliquoter Label Date Format	• Format of the date in Aliquoter Module labels. • Valid values: YYYYMMDD, DD/MM/YY, MM/DD/YY.
Aliquoter Label Sample ID Maximum Length	• Maximum length of Aliquoter Module tube labels. • Default value is “12” .

Item	Description
`Aliquoter Last Aliquot with Remaining Volume`	• If set to `Yes` , the Aliquot Tubes of Aliquot Tube Type ZZZ are aspirated with an amount of microliters equal to the remaining volume of the primary tube (as detected by the Sample Volume Detection Module) minus the value expressed by the Aliquoter Last Aliquot Unused Volume (microliters) configuration entry. For instance, if the Primary Tube volume detected is 3000 microliters and Aliquoter Last Aliquot Unused Volume (microliters) is equal to 200 and three Aliquot Tubes are ordered, the first two of them being of 500 microliters, and the last one being Aliquot Tube Type ZZZ, this latest aliquot tube will be generated taking from the Primary Tube 3000-500-500-200= 1800 microliters. **NOTE:** if the volume to be aspirated is greater than the AQM Max Volume entry configured in the *Reserved.ini* file, only the volume configured in the AQM Max Volume is aspirated, and the rest of the sample is left inside the Primary Tube. • If set to `No` , the volume associated to the Aliquot Tube Type ZZZ (if it exists) is the one expressed in its configuration entry, as for all the other Aliquot Tube Types. • This entry is shown only in case an Aliquoter is installed. Valid values are `Yes`/`No` . • Default value is `No` .
`Aliquoter Last Aliquot Unused Volume (microliters)`	• Number of microliters to be left in the primary tube when aspirating the Last Aliquot with Remaining Volume (see Aliquoter Last Aliquot with Remaining Volume Configuration entry). • This entry is shown only in case an Aliquoter is installed. Valid values are “0-3000”. • Default value is “150” .
`Aliquoter Overload Threshold`	• When the number of tubes on main track destined to Aliquoter Modules plus the number of primary tubes already diverted to Aliquoter Modules is greater than the `Aliquoter Overload Threshold` entry multiplied by the number of Aliquoter Modules currently online and not in error state, the Tubes destined to Aliquoter Modules are sent to the configured WBBs. • When the number of primary tubes on main track destined to Aliquoter Modules plus the number of primary tubes already diverted to Aliquoter Modules is lower than the `Aliquoter Overload Threshold` entry

Item	Description
	multiplied by the number of Aliquoter Modules currently on-line and not in error state, the tubes currently located in the WBBs configured for Aliquoter Module are returned to main track. • Tubes with Aliquot Tests only will be counted in the Aliquoter Module overload count (4.10.1 *Counters*, page 265). Tubes with both Aliquoter an Analytical Tests will be counted in the Aliquoter overload count if and only if `Aliquoter Priority over Analyzers` is set to `Aliquoter`. • This functionality applies to both AQM and ALQ versions of the Aliquoter Module and to Aliquoting Tests ordered both via S018 message and via IUI/GUI configuration. • If no WBB is configured or available for Aliquoter Module, if the number of tubes to be aliquoted exceeds the configured threshold, those tubes will keep circulating on track and they will not parked into the IOM. • If the Aliquoter Modules are not available (e.g. off-line or in error condition), the tubes to be aliquoted will be flagged with sample error SC034 `No Aliquoter Available` and sorted to the configured sorted output or IOM PO racks and they will not be sent to WBB configured for Aliquoter Module, if any. • Also the tubes with completed or sorting tests will be considered in the Aliquoter Module overload count (4.10.1 *Counters*, page 265), if those tubes have at least an Aliquoting Test to do. • A tube with tests to do on Aliquoter Module is NOT diverted to a WBB configured for Aliquoter Module if there are tests to do on Analyzers and `Aliquoter Priority over Analyzers` is not set to `Aliquoter`. • A tube with tests to do on an Analyzer is NOT diverted to a WBB configured for that Analyzer if there are tests to do on Aliquoter Module and `Aliquoter Priority over Analyzers` is set to `Aliquoter`. • A tube is counted for Aliquoter Module overload count (4.10.1 *Counters*, page 265) even if it is added but not diverted to an Aliquoter Module. • This entry is shown only in case at least one Aliquoter Module is installed. • Default value is 999.
`Aliquoter Proportional Aliquoting`	• If set to `Yes`, the volume of secondary tubes (that is received from LIS) is recalculated for

Item	Description
	the Aliquoter Module, after the measure of the Volume performed by the Sample Volume Detection (SVD) or Sample Integrity Module (SIM). Dream software updates the volume of the aliquote tubes for each secondary tube *j*, according to the following formula: *V'_exp_j = V_exp_j * (Vreal/sum(V_exp_k))* where *k* goes from 1 to n (total number of secondary tubes requested by LIS), *Vreal* is the volume of the primary tube volume measured by the Sample Volume Detection (SVD). • This entry is shown only in case an Aliquoter Module and a Sample Volume Detection (SVD) or Sample Integrity Module (SIM) are installed. • Default value is `No`.
`Aliquoter Proportional Aliquoting Override Test`	• Test Code that the LIS needs to order to the primary sample tube, if the `Aliquoter Proportional Aliquoting` is enabled but the proportional aliquoting needs to be avoided. When `Aliquoter Proportional Aliquoting` is set to `Yes`, but LIS requires to perform a regular (i.e. not proportional) aliquoting on a specific sample ID, it is necessary to order a dummy sorting test with test code equal to the test code specified in this entry. • In Sorting-Test.ini file, the ASTM Test code sent by LIS and the Test code used by SMS must be present. The override test should be equal to the Test Code in the Sorting-Test.ini file. • This entry is shown only in case an Aliquoter Module and a Sample Volume Detection (SVD) or Sample Integrity Module (SIM) are installed. • Default value is an empty string.
`Aliquoter Print Date on Label`	• If set to `Birth Date` , Patient Birth Date is printed on Secondary Tube labels generated by Aliquoter Module. • If set to `Draw Date` , Sample Collection Date is printed on Secondary Tube labels generated by Aliquoter Module. • If set to `Both` , Patient Birth Date and Sample Collection Date are printed on Secondary Tube labels generated by Aliquoter Module. • If set to `No` , Patient Birth Date and Sample Collection Date are not printed on Secondary Tube labels generated by Aliquoter Module. • This entry is shown only in case an Aliquoter is installed.

Item	Description
	• Default value is `Birth Date`.
`Aliquoter Print Demographics on Label`	• If set to `Yes`, Patient Surname and Name are printed on Secondary Tube labels generated by Aliquoter Module. • If set to `No`, Patient demographics data are not printed on Secondary Tube labels. • This entry is shown only in case an Aliquoter Module is installed. • Default value is `Yes`.
`Aliquoter Print Destination on Label`	• If set to `Yes`, Destination is printed on Secondary Tube labels generated by Aliquoter Module. • If set to `No`, Destination is not printed on Secondary Tube labels. • This entry is shown only in case an Aliquoter Module is installed. • Default value is `Yes`.
`Aliquoter Print Gender on Label`	• If set to `Yes`, Patient Gender, as received from Host LIS, is printed on Secondary Tube labels generated by Aliquoter Module. • If set to `No`, Patient Gender is not printed on Secondary Tube labels. • This entry is shown only in case an Aliquoter Module is installed. • Default value is `Yes`.
`Aliquoter Print Patient ID on Label`	• If set to `Yes`, Patient ID, as received from Host LIS, is printed on Secondary Tube labels generated by Aliquoter Module. • If set to `No`, Patient ID is not printed on Secondary Tube labels. • This entry is shown only in case an Aliquoter Module is installed. • Default value is `Yes`.
`Aliquoter Print Sample Material on Label`	• If set to `Yes`, Sample Material will be printed on Secondary Tube labels generated by Aliquoter Module. • If set to `No`, Sample Material will not printed on Secondary Tube labels. • This entry is shown only in case an Aliquoter is installed. • Default value is `No`.
`Aliquoter Print Sample Priority on Label`	• If set to `Yes`, Sample Priority (S for STAT or R for Routine, as received from Host LIS) is printed on Secondary Tube labels generated by Aliquoter Module.

Item	Description
	• If set to `No` , Sample Priority is not printed on Secondary Tube labels. • This entry is shown only in case an Aliquoter Module is installed. • Default value is `No` .
`Aliquoter Print Sample Volume on Label`	• If set to `Yes` , sample volume is printed on Secondary Tube labels generated by Aliquoter Module. • If set to `No` , sample volume is not printed on Secondary Tube labels. • This entry is shown only in case an Aliquoter Module is installed. • Default Value is `No` .
`Aliquoter Print Test Codes on Label`	• If set to `Yes` , Test Codes are printed on Secondary Tube labels generated by Aliquoter Module. • If set to `No` , Test Codes are not printed on Secondary Tube labels. • This entry is shown only in case an Aliquoter Module is installed. • Default value is `Yes` .
`Aliquoter Priority over Analyzers`	• If set to `Aliquoter` , Aliquoting has priority over Analyzer Sampling. • If set to `Analyzers` , Analyzer Sampling has priority over Aliquoting. • If set to `n/a` , Aliquoting and Analyzer sampling have the same Priority. • This entry is shown only in case an Aliquoter Module is installed. • Default value is `n/a` .
`Aliquoter Send Tube to Volume Detector First`	• If set to `Yes` , all tubes destined to Aliquoter Module are sent to Sample Volume Detection Module first, if available. • If set to `No` , all tubes destined to Aliquoter Module are not sent to Sample Volume Detection Module first. • This entry is shown only in case an Aliquoter and a Sample Volume Detection Module are installed. • Default value is `Yes` .
`Automation System Lamp`	• If set to `Yes` , the Automation System Lamp lights are automatically turned on and off depending on the Automation overall status: • Overview status Red and at least an On-line Module in Yellow State: Red and Yellow lights on, Green light off;

Item	Description
	• Overview status Red and no On-line Module in Yellow State: Red light on, Yellow and Green lights off; • Overview status Yellow: Yellow light on, Red and Green lights off; • Overview status Pink or Green: Green light on, Red and Yellow lights off. • If set to `No` , the Automation System Lamp lights are not automatically turned on or off. • This entry is shown only in case a Power Supply Controller (PSC) is installed and at FSE level at least. • Default value is `No` .
`BIM Allow Loading Tubes with RIM Pre-Spun Prefix`	• If set to `Yes` , Tubes with a Sample ID including a RIM Pre-Spun Prefix may be loaded from BIM. • If set to `No` , Tubes with a Sample ID including a RIM Pre-Spun Prefix loaded at BIM will be flagged with error SC073 (`Tube with configured RIM Sample ID for Pre-Spun Tubes prefix loaded at BIM`). • Default is `Yes` .
`BOM X Sample Tube Configuration (X=1..9)`	• If this entry is set to `Complete` , Complete Samples will be unloaded to the Bulk Output Module with instance X (X=1..9) • If this entry is set to `n/a` , Complete Samples will not be unloaded to the Bulk Output Module with instance X(X=1..9) • These entries are shown only in case the relevant BOMs are installed. • Default value is `n/a` . • Only the first 9 BOM instance can be configured with this parameter.
`CM Bucket Maximum Spin Cycles`	• Numeric, indicating the Maximum Spin Cycles after which the Error SC057 `Replace Centrifuge Buckets` is displayed, requiring replacement of Centrifuge Buckets. • This entry is shown only in case at least one Centrifuge Module (CM) is installed and at FSE level at least. • Default value is “200000” .
`CM Tube Weight Minimum Threshold (mg)`	• Configuration used by SMS once the sample tube weight is known: if the weight is under this threshold, tubes are sent to PO racks with error SC054 `Tube Weight Too Low`. • This entry is shown only in case a Centrifuge Module is installed.

Item	Description
	• Valid values are “0..20000” • Default value is “0”.
CM Route STAT to Shortest Remaining Spin Time	• If set to Yes, STAT tubes to be spinned are sent to the Centrifuge Module with shortest remaining spin time. **NOTE:** It is not possible to set this item to Yes if there are CM Instances configured in the *Analyzer-Configuration.ini* file. • If set to No , STAT tubes to be spinned are sent to the Centrifuge Modules according to work-load balancing. • This entry is shown only in case at least one Centrifuge Module (CM) is installed. • Default value is No .
CM Bucket Spin Cycle Threshold	• Numeric, indicating the Spin Cycle Threshold under which the Warning SC058 Spin Cycle Threshold Exceeded is displayed, suggesting to replace Centrifuge Buckets. • This entry is shown only in case at least one Centrifuge Module (CM) is installed and at FSE level at least. • Default value is “20000” .
Desealer Maximum Tube Age (hours)	• Maximum number of hours starting from Sample Collection Date/Time (as transmitted by Host LIS, or considered equal to the Sample Receipt Time on the Automation System in case the Host LIS does not transmit any Sample Collection Time) for which a tube may be sent to Desealer for automatic desealing (if this parameter is exceeded, the tube is sent to PO for manual unseal with SC020 error). • This entry is shown only in case a Desealer Module is installed. • Default Value is “9999” .
Desealer Maximum Number of Seals	• Maximum number of seals for which a tube may be sent to Desealer for automatic desealing (if this parameter is exceeded, the tube is sent to PO for manual unseal with SC021 error). • This entry is shown only in case a Desealer Module is installed. • Default value is “1” .
Desealer Send Tubes to PO before/after Desealing	• If set to Before , all Tubes to be desealed will be sent to Priority Output Racks (or Sorting Rack if configured) with Sample Error SC05B (Sample Needs Inspection before

Item	Description
	Desealing): those Tubes need to be visually inspected by the User and loaded back into a Sealed Input Lane (or, as an alternative, manually unsealed and loaded back into an Uncapped Input Lane). • If set to After , all Tubes to be desealed will be automatically desealed and then sent to Priority Output Racks (or Sorting Rack if configured) with Sample Error SC05C (Sample Needs Inspection after Desealing): those Tubes need to be visually inspected by the User and loaded back into an Uncapped Input Lane. • If set to No , all Tubes to be desealed will be automatically desealed and then processed according to their needs. • This entry is shown only in case a Desealer Module is installed. • Default value is No .
Desealer Unseals Tubes Despite Analyzer Not Available	• If set to Yes , the sealed Tubes that need to be sent to Analyzers that are all Off-line or in Error State will be automatically desealed before being parked in an Incomplete Output Rack. • If set to No , the sealed Tubes that need to be sent to Analyzers that are all Off-line or in Error state will be sent to an Incomplete Output Rack without being desealed (they will be desealed only when one of the relevant Analyzer is back On-line and not in Error state). • This entry is shown only in case a Desealer Module is installed. • Default value is No .

High Volume Storage Default Dwell Time	• Storing Time before waste for samples unloaded to High Volume Storage that do not have a specific Dwell Time set.
	• This entry is shown only in case a m High Volume Storage Module is installed.
	• Selectable values:
	  • x Workdays (x=number of days not counting Holidays (e.g. New Year's Day) and days not set as Working Days (e.g. Saturdays and Sundays) as configured in the Advanced Configuration/Calendar Screen). [Valid range “1..45”]
	  • x Days (x=number of calendar days also counting Holidays, Sundays, etc.) [Valid range “1..45”]
	  • x Hours (x=number of hours) [Valid range “1..1092”]

Item	Description
	• x Minutes (x=number of minutes) [Valid range “1..65535”] • Default value is “7 Days”.
`High Volume Storage Reset Dwell Time`	• If set to `Yes` , Sample Tube Dwell Time is reset to maximum Test Dwell Time value once a Tube is loaded again into a High Volume Storage Module after a retrieval. • If set to `No` , Sample Tube Dwell Time is re-calculated as the remaining time, calculated from the first time it went to the High Volume Storage, once a Tube is loaded again into a High Volume Storage Module after a retrieval. • This entry is shown only in case a m High Volume Storage Module is installed. • Default value is `Yes`.
`IOM Automatic Printing Language`	• This entry indicates the Language used for automatic printouts (see IOM Automatic Printing of Priority Output Racks and IOM Automatic Printing of Sorted Output Racks entries). • This entry is shown only in case a Input/Output Module is installed. • Default value is `English` .
`IOM Automatic Printing of Priority Output Racks`	• If set to `Yes` , the Sample List of non-empty IOM Priority Output Racks is automatically printed on the default Printer when the Rack is removed. • If set to `No` : the Sample List of non-empty IOM Priority Output Racks is not automatically printed on the default Printer when the Rack is removed. • This entry is shown only in case a Input/Output Module is installed. • Default value is `No` .
`IOM Automatic Printing of Sorted Output Racks`	• If set to `Yes` , the Sample List of non-empty IOM Sorted Output Racks is automatically printed on the default Printer when the Rack is removed. • If set to `No` , the Sample List of non-empty IOM Sorted Output Racks is not automatically printed on the default Printer when the Rack is removed. • This entry is shown only in case a Input/Output Module is installed. • Default value is `No` .
`IOM Axis X and Y Scale`	• Allows selecting the scale for IOM Robot movement along X and Y axis. • Allows selecting `1/1000` or `1/10`.

Item	Description
IOM Generic Sorting Tests	• List of Test Codes (separated by blank characters) for which a Generic Sorted Output Rack Lane is used instead of Incomplete Output Rack Lane. • This entry is shown only in case an Input/Output Module is installed. • Default value is the empty string.
IOM Helps Storage to Unload Tubes	• If set to Yes , Complete Samples may be unloaded to IOM Complete Output Rack in case one or more Storages (but not all of them) are in error state or Off-line. • This entry is shown only in case an Input/Output Module and a Storage Module are installed. • Default value is No .
IOM Immediately Park Samples Without Test Orders	• If set to Yes, Samples without any Test Orders may be immediately parked into an Incomplete Ouput lane or into a Priority Output lane (depending upon the IOM Samples Without Test Orders Go To Incomplete Racks entry) of the Input/Output Module (if any) next to the Input Module where they have been loaded. • If set to No, Samples without any Test Orders are not immediately parked on the Input/Output Module (if any) next to the Input Module where they have been loaded but they have to wait to be parked at least until two Nodes after the Input Module where they have been loaded (in order to allow the Sample Programming to be received from the Host LIS). • This entry is shown only in case an IOM is installed. Default value is No.
IOM Instance for Complete Tubes without Analyzer Tests	• If set to a number greater than “0”, the entry indicates the IOM Instance where to send Complete Tubes without Analyzer Tests. • If the entry is set to “0” , Complete Tubes without Analyzer Tests are sent to the first available IOM. • This entry is shown only in case two or more Input/Output Modules are installed. • Default value is “0” .
IOM Instance for Tubes without Test Orders	• If set to a number greater than “0”, the entry indicates the IOM Instance where to send Tubes without Test Orders. • If the entry is set to “0” , Tubes without Test Orders are sent to the first available IOM.

Item	Description
	• This entry is shown only in case two or more Input/Output Modules are installed. • Default value is “0” .
`IOM Tubes to Incomplete Rack if VTM unavailable`	• If set to `Yes` , in case of VTM unavailability, tubes to be sent to another track of the same automation system are sorted to Incomplete Racks. • If set to `No` , in case of VTM unavailability, tubes to be sent to another track of the same automation system are sorted to Priority Output Racks. • Tubes will be automatically retrieved and set to VTM as soon as it becomes available. • This entry is shown only in case a VTM and an Input/Output Module are installed. • Default value is `No` .
`IOM Samples Without Test Orders Go To Incomplete Racks`	• If set to `Yes` , Samples without any Test Orders are parked to IOM Incomplete Racks waiting for a Sample Programming • If set to `No` , Samples without any Test Orders are sorted to IOM Priority Output Racks. • This entry is shown only in case an Input/Output Module is installed. • Default value is `Yes` .
`IOM Samples Without Test Orders Overdue Timeout (mins)`	• Number of minutes before a Sample Tube without Test Orders is sent to Priority Output Rack with Sample Error SC016 `Overdue Incomplete Sample`. • This entry is shown only in case an IOM is installed. • Default value is 10000. In case of Vertical Transportation Module (VTM) installed, this parameter should be set to at least 5 minutes higher on the Primary FlexLab than on the Secondary FlexLab. It is not possible to configure a Sorting Test by Error for a destination different than the IOM for the SC016 error. In case the sorting by error is not available, the sample tube flagged with SC016 error will be sorted, by default, to a specific lane of the Input/Output Module configured for delivery (#SC001), if present. When the sorting rack dedicated to SC016 error is available again, the sample tube will be automatically moved to its correct destination.
`IOM Send Conflicting Sorting Tubes to PO Racks`	• If set to `Yes` , Sample Tubes with conflicting sorting rules (i.e. for different Sorted Output Racks) are sent to PO rack with SC044 error. For example, Tubes with an Aliquoting/

Item	Description
	Analyzer Test and two Sorting Tests for different IOM lanes are flagged with error SC044 `Conflicting sorting rules`. • If set to `No`, Samples with conflicting sorting rules are sorted to the leftmost IOM Sorting Lane and then to the other lanes when reloaded (multisorting function). • This entry is shown only in case an Input/Output Module is installed. • Default value is `No`.
`IOM Send Duplicate Tubes to PO if Sorting Rack Unavailable`	• If set to `Yes`, duplicate aliquot tubes are sent to Priority Output Rack if Sorting Rack is unavailable. • If set to `No`, duplicate aliquot tubes are sent to the configured sorting racks only. • This entry is shown only in case an Input/Output Module is installed. • Default value is `Yes`.
`IOM Send Error Tubes to PO if Sorting Rack Unavailable`	• If set to `Yes`, sample tubes destined to a Sorted Output Rack that is currently missing or full, are sent to a Priority Output Rack instead, with Sample Error SC036 `Sorting Rack Missing or Full`. • If set to `No`, sample tubes destined to a Sorted Output Rack that is currently missing or full, re-circulate on Track. • If set to `IOM only`, sample tubes flagged with error destined to an IOM Sorting Rack are sent to a Priority Output Rack if the Sorting Rack is unavailable, while Sample Tubes flagged with error destined to a ROM/ROM-400 or BOM are not sent to a Priority Output Rack if the Module is unavailable. • If set to `ROM only`, sample tubes flagged with error destined to a ROM/ROM-400 are sent to a Priority Output Rack if the Module is unavailable, while sample tubes flagged with error destined to an IOM Sorting Rack or BOM are not sent to a Priority Output Rack if the Sorting Rack is unavailable. **NOTE:** This option is shown only in case a ROM/ROM-400 is installed. • If set to `BOM only`, sample tubes flagged with error destined to a BOM are sent to a Priority Output Rack if the Module is unavailable, while sample tubes flagged with error destined to an IOM Sorting Rack or ROM/ROM400 are not sent to a Priority Output Rack if the Sorting Rack is unavailable.

Item	Description
	NOTE: This option is shown only in case a BOM is installed. • This entry is shown only in case an Input/Output Module is installed. • Default value is `Yes` .
`IOM Send Tubes to PO if Sorting Rack Unavailable`	• If set to `Yes` , Sample Tubes destined to a Sorted Output Rack that is currently missing or full are sent to PO Rack instead with Sample Error SC036 `Sorting Rack Missing or Full` . • If set to `No` , Sample Tubes destined to a Sorted Output Rack that is currently missing or full re-circulate on Track, • This entry is shown only in case an Input/Output Module is installed. • Default value is `Yes` .
`IOM Sorting Lane for QC Sample Errors`	To sort the Automated QC Samples with Error to the Sorted Output Lane, it is necessary: • insert IOM Rack Sorted Output Lane (1-16 or x-y where x is the IOM instance and y is the IOM lane) to be used instead of the Priority Output Lanes for Errors of Automated QC Samples. • configure a sorting test by SC0AB error. Moreover: • If configured to “0” or empty string, Automated QC Samples with Error are sorted to appropriate Sorted Output Rack specific for Error Code (as configured) or to Priority Output Rack. • This entry is shown only in case an Input/Output Module is installed. • Default value is the empty string.
`IOM Sorting Lane For STAT Sample Errors`	To sort the STAT Samples with Error to the Sorted Output Lane, it is necessary: • insert IOM Rack Sorted Output Lane (1-16 or x-y where x is the IOM instance and y is the IOM lane) to be used instead of the Priority Output Lanes for Errors of Automated QC Samples. • configure a sorting test by SC0AA error. Moreover: • If configured to “0” or empty string, STAT Samples with Error are sorted to appropriate Sorted Output Rack specific for Error Code (as configured) or to Priority Output Rack.

Item	Description
	• This entry is shown only in case an Input/Output Module is installed. • Default is the empty string.
`IOM Tubes to Complete Rack if Recapper unavailable`	• If set to `Yes` , in case of Recapper Module (or Pressure Recapper Module) unavailability, complete tubes to be recapped and then sent to configured Complete Output lanes are sorted to IOM Complete racks as uncapped instead of being flagged with the error `No Recapper Available` . • If set to `No` , in case of Recapper Module (or Pressure Recapper Module) unavailability, complete tubes to be recapped and then sent to configured Complete Output lanes are sorted to IOM Priority Output racks or configured Sorting by Error rack with the error `No Recapper Available` . • This entry is shown only in case a Recapper (or Pressure Recapper) and an Input/Output Module are installed. • Default value is `Yes` .
`IOM Tubes to Complete Rack if Sealer unavailable`	• If set to `Yes` , in case of Sealer Module unavailability, complete tubes to be sealed and then sent to configured Complete Output lanes are sorted to IOM Complete racks as unsealed instead of being flagged with the error `No Sealer Available` . • If set to `No` , in case of Sealer Module unavailability, complete tubes to be sealed and then sent to configured Complete Output lanes are sorted to IOM Priority Output racks or configured Sorting by Error rack with the error `No Sealer Available` . • This entry is shown only in case a Sealer and an Input/Output Module are installed. • Default value is `Yes` .
`IOM Tubes to Incomplete Rack if Aliquoter unavailable`	• If set to `Yes` , in case of Aliquoter Module unavailability, tubes to be aliquoted are sorted to Incomplete Racks. • If set to `No` , in case of Aliquoter Module unavailability, tubes to be aliquoted are sorted to Priority Output Racks. • This entry is shown only in case an Aliquoter Module and an Input/Output Module are installed. • Default value is `Yes` .
`IOM Tubes to Incomplete Rack if Centrifuge unavailable`	• If set to `Yes` , in case of Centrifuge Module unavailability, tubes to be spun are sorted to Incomplete Racks.

Item	Description
	• If set to `Send to PO`, in case of Centrifuge Module unavailability, tubes to be spun are sorted to Priority Output Racks. • If set to `Keep on Track`, in case of Centrifuge Module unavailability, tubes to be spun will remain on Track. • This entry is shown only in case a Centrifuge Module and an Input/Output Module are installed. • Default value is `Send to PO`.
`IOM Tubes to Incomplete Rack if Decapper unavailable`	• If set to `Yes`, in case of Decapper Module unavailability, tubes to be decapped are sorted to Incomplete Racks. • If set to `No`, in case of Decapper Module unavailability, tubes to be decapped are sorted to Priority Output Racks. • This entry is shown only in case a Decapper Module and an Input/Output Module are installed. • Default value is `No`.
`IOM Tubes to Incomplete Rack if Recapper unavailable`	• If set to `Yes`, in case of Recapper Module (or Pressure Recapper Module) unavailability, tubes to be recapped are sorted to Incomplete Racks and automatically retrieved and sent to Recapper (or Pressure Recapper) when its availability is restored. • If set to `No`, in case of Recapper Module (or Pressure Recapper Module) unavailability, tubes to be recapped are sorted to Priority Output Racks and are not automatically retrieved nor sent to Recapper (or Pressure Recapper) when its availability is restored. • This entry is shown only in case a Recapper Module (or a Pressure Recapper Module) and an Input/Output Module are installed. • Default value is `No`. • Duplicate aliquot tubes will not be sent to Incomplete Output Racks even if the entry is set to `Yes`.
`IOM Tubes to Incomplete Rack if Sealer unavailable`	• If set to `Yes`, in case of Sealer Module unavailability, tubes to be sealed are sorted to Incomplete Racks and automatically retrieved and sent to Sealer Module when its availability is restored. • If set to `No`,in case of Sealer Module unavailability, tubes to be sealed are sorted to Priority Output Racks and are neither automatically retrieved nor sent to Sealer when its availability is restored.

Item	Description
	• This entry is shown only in case a Sealer and an Input/Output Module are installed. • Default value is `No` .
`Maximum Carriers on Main Track`	• Maximum number of carriers on Main Track: as long as this threshold has exceeded, no more carriers can be retrieved by any Wide Belt Carrier Buffer Module. • If the Vertical Transportation Module is installed and the number of carriers on Main Track exceeds this threshold, the connected Automation System is automatically notified not to send more carriers. • This entry is shown only in case a Wide Belt Carrier Buffer Module or a Vertical Transportation Module is installed. • Valid Values are from “1” to “9999”. • Default value is “9999”.
`Maximum Empty Carriers on Main Track`	• Maximum number of empty carriers on Main Track: if this threshold is exceeded, Carriers are sent to any Wide Belt Carrier Buffer Module configured for Empty Carriers • In case the number of empty carriers on Main Track is lower than the configured threshold, the system automatically calls out from the carrier buffer the number of empty carriers to have the number of empty carriers on Track be the same number of the configured `Maximum Empty Carriers on Main Track` threshold. • If the Vertical Transportation Module is installed and the number of carriers on Main Track exceeds this threshold, the connected Automation System is automatically notified not to send more empty carriers. • This entry is shown only in case a Wide Belt Carrier Buffer Module or a Vertical Transportation Module is installed. • Valid Values are from “1” to “9999”. • Default number is “9999”.
`Minimum Empty Carriers on Main Track`	• Minimum number of empty carriers on main track: if this threshold is exceeded, no more empty carriers are sent to any Vertical Transportation Module and, in case the `Stop Loading Tubes if Insufficient Empty Carriers` is set to `Yes` , even to Rack Input and Bulk Input Modules. • The Software shall send empty carriers to Wide Belt Carrier Buffer Module when `Maximum Carriers on Main Track` threshold is exceeded, if the number of empty carriers on

Item	Description
	track is higher than the configured `Minimum Empty Carriers on Main Track` threshold. • This entry is shown only in case a Vertical Transportation Module or a Rack Input Module or a Bulk Input Module or a Wide Belt Carrier Buffer is installed. • Valid values: from “1” to “9999”. • Default value is “9999”.
`Stop Loading Tubes if Insufficient Empty Carriers`	• If set to `Yes` , no more empty carriers are sent to any Rack Input and Bulk Input Modules as long as the number of empty carriers on main track is lower than the threshold value set in the `Minimum Empty Carriers on Main Track` entry. • This entry is shown only in case a Rack Input Module or a Bulk Input Module is installed.
`Method Batch Critical Mass (number of Samples)`	• Maximum Number of Samples per Method that can be parked in Input Output Modules for an Analyzer that supports Method Segregation: if the number of Samples parked for Method X exceeds this threshold, the Current Method automatically switches to Method X. • This configuration entry is displayed only in case at least one Analyzer that supports Method segregation is installed. • Valid Values are from “1” to “9999”. • Default value is “9999” (in this case, no Method switch is done).
`Method Batch Timeout (minutes)`	• Maximum Number of minutes that the Software waits from the moment the Current Method is switched to Method X for an Analyzer that supports Method Segregation: if the waiting time exceeds this timeout, the Current Method automatically switches to another Method, provided that there are Samples for other Methods waiting in IOM Incomplete Racks. • This configuration entry is displayed only in case at least one Analyzer that supports Method Segregation is installed. • Valid Values are from “1” to “9999”. • Default value is “9999” (in this case, no Method switch is done).
`Prioritize ASAP Samples`	• If set to `Yes`, ASAP Samples will be prioritized over Routine Samples as follows: • ASAP Samples can use the places in Track queues reserved for STATs.