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Legal information

Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

DANGER

indicates that death or severe personal injury **will** result if proper precautions are not taken.

WARNING

indicates that death or severe personal injury **may** result if proper precautions are not taken.

CAUTION

indicates that minor personal injury can result if proper precautions are not taken.

NOTICE

indicates that property damage can result if proper precautions are not taken.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

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The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

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WARNING

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We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

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Introduction

1.1 Introduction

Insights Hub Intralogistics helps you to optimize your internal logistic processes through the calculation of relevant parameters and to monitor material channel health. The application enables you to reduce material related downtimes and understand internal material supply. Insights Hub Intralogistics offers the following core capabilities:

- Calculation and visualization of material replenishment and consumption times on material channels to gain insights into your production process.
- Automatic detection and issue generation in different scenarios to increase the uptime of the material supply. Following issues are automatically tracked:
 - Empty material channels
 - Material channels below the minimum fill level
 - Material out of position
 - Consumption time is quicker than the replenishment time
- Automatic exclusion of useless datapoints, e.g., replenishment or consumption times calculated during planned shut-downs.
- Built in Overview Dashboard to provide current status of material supply.

Insights Hub Intralogistics is mainly targeting two different personas – on the one hand the Intralogistics Process Manager (IPM) and on the other hand the Operations Manager (OM). Both have different tasks and challenges and therefore require different solutions. The goal of Insights Hub Intralogistics is to help to resolve some of the issues.

The job of the IPM is to optimize and design the intralogistics processes to keep the material related downtimes as low and short as possible. Each downtime is costly, and therefore should be avoided by default. Their biggest challenge in design and set up of the processes, is the lack of transparency over different topics. They are not completely aware of how material is being consumed in their factory, e.g., in which frequency. Therefore, they talk to the shopfloor workers to get their experience and views, and based on these opinions, try to optimize the existing processes.

The OM is more hands-on, and works on the shopfloor. Their main duty is to supervise the tugger train drivers and line feeders, workers that walk material boxes to the close-by stations. They have to make sure that material is being handled properly and on time. Their challenges

differ from those of the IPM. They are taking care of daily firefighting to keep the E-Kanban system running (you will learn more about E-Kanban systems later) and are constantly battling that material is delivered and handled on time.

The core capabilities of Insights Hub Intralogistics will help both personas to improve their work and help to reduce material related downtimes.

In the following chapters of this documentation, you will learn more about the prerequisites for Insights Hub Intralogistics, how the issues described above can be understood, and what needs to be configured to make use of Insights Hub Intralogistics.

Prerequisites

2

2.1 Prerequisites

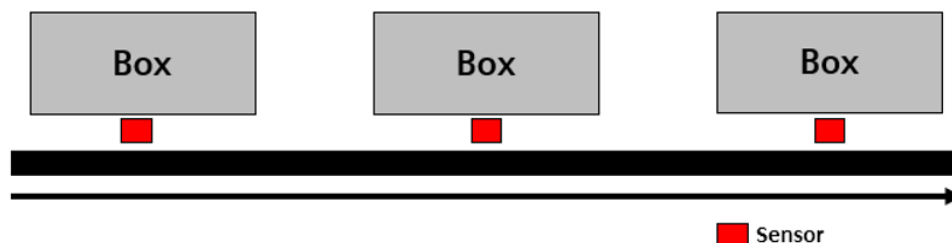
Insights Hub Intralogistics requires you meet certain criteria to properly use this solution. Insights Hub Intralogistics does not require special devices to collect data from sensors. The only mandatory condition is that the data is stored in the timeseries database and properly structured. Examples on how the asset structure should look are given later in this chapter.

2.2 E-Kanban

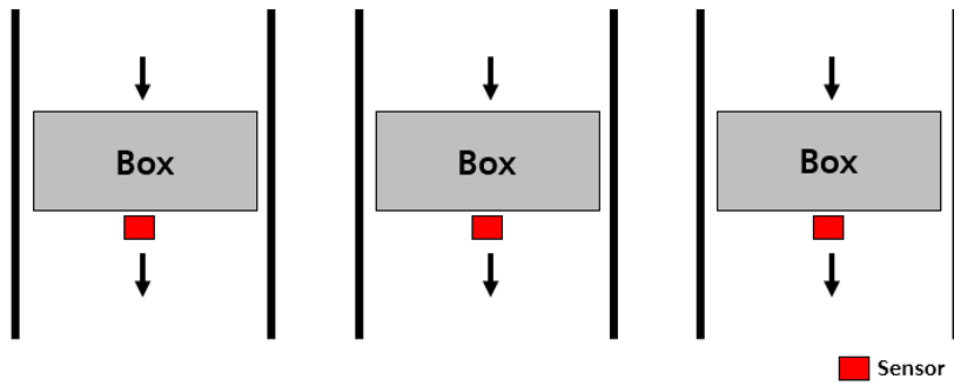
An E-Kanban system is quite common in lean manufacturing environments. Based on a traditional Kanban system, the E-Kanban system is a progression of the typical Kanban system. Here, sensors and software are used to help automate the Kanban process. In a nutshell, before the use of an E-Kanban system, the Kanban process to reorder material was manual. Now, with the use of a sensor-based E-Kanban system, the process is enhanced so that the new material is automatically reordered by the system once a certain threshold / minimum level of containers is reached, within a material channel.

A material channel represents a physical way to store material containers. A material channel also consists of multiple positions, where material containers can be located. There are two ways to align these material channels. You can imagine multiple containers containing production material either one after another, or next to each other. (PICTURES OF TWO TYPES).

FIFO Channel (material boxes flow in a single direction):



Parallel Channel (material flows in a single direction from multiple lanes):



The pictures above show the two different types of material channels supported by the application. In the first picture, the material in the containers flows in one direction following the FIFO (first in first out principle). In the second picture, the containers are in parallel lanes, and it doesn't matter in which order material is being consumed in the channel.

To make use of Insights Hub Intralogistics it is necessary, to have an E-Kanban solution, which automatically retriggers the material supply for the material channel to ensure a proper material flow. Following this prerequisite, it is necessary that the sensor information is accessible, in order to determine if the container position in the material channel is empty or filled.

2.3 Required Input Data

In order to perform proper replenishment time and consumption time calculations, and to detect the issues that are described in detail in the Insights Hub Intralogistics Basics Chapter, the following input data is required.

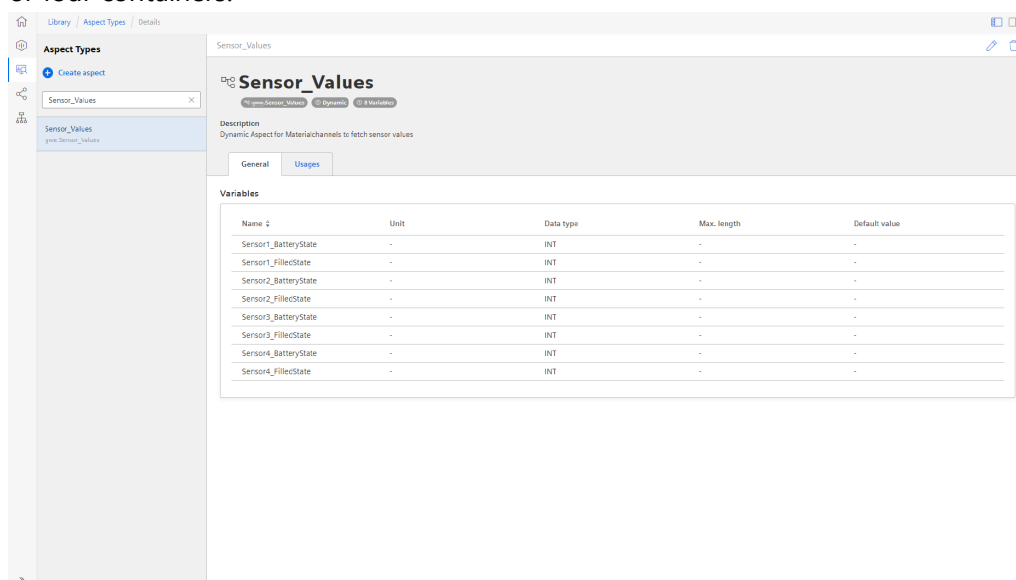
Variable	Common Datatype	Mandatory	Comment
Channel Name	STRING/INT	Yes	Reflects the Name
Channel Length	INT	Yes	Describes the number of containers in the material channel
Channel Type	STRING	Yes	Can either be FIFO or Parallel (PAR)
Minimum Fill Level	INT	Yes	Describes the minimum amount of containers in the material channel. Once this is reached a reordering is triggered by the E-Kanban system
Replenishment Time	INT	Yes	Is the system given replenishment time until material, once it is reordered, has to be back at the channel
Location	STRING/INT	No	Shows the location in the factory

Variable	Common Datatype	Mandatory	Comment
Production Line	STRING/INT	No	Gives the Production Line name
Sensor IDs	STRING/INT	No	Sensor IDs can be added to the system
Sensor values	INT	Yes	Shows the current status of the position in a material channel. If the position is filled with a container the value should be 1, if the position is empty the value should be 0
Battery Status	INT/DOUBLE	No	Enables the tracking of the battery status of sensors. Value should be between 0 and 100%

2.4 Aspect / Asset Configuration

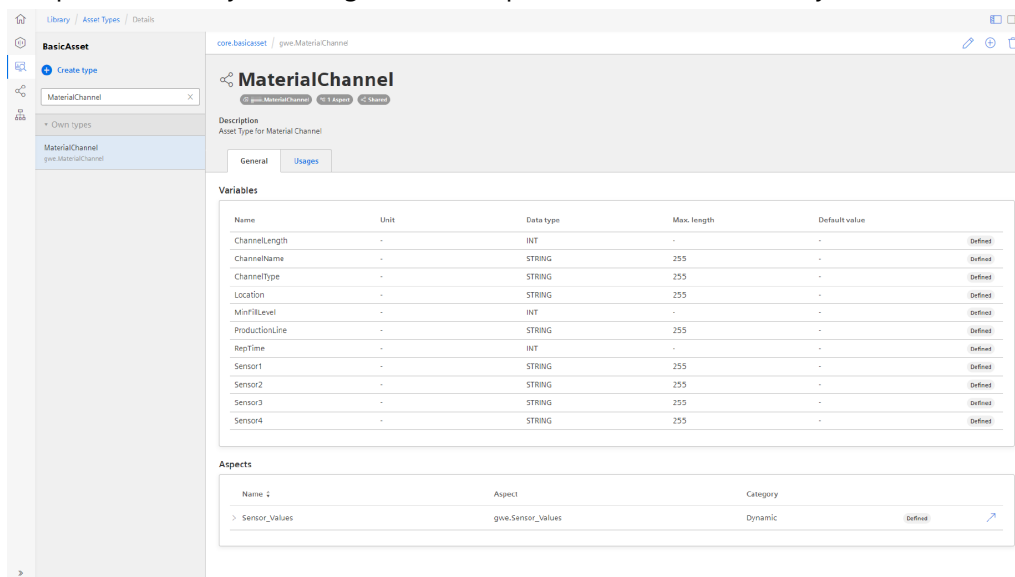
Insights Hub Intralogistics requires a special Asset / Aspect Configuration for the material channels, which is also the metric that is being measured by the application. The number of the connected material channels counts against your quota.

First, you need to define an aspect, which holds all the relevant dynamic sensor information. In this case, we are looking at the Sensor Values and Battery Status variables in detail. The following example shows how the aspect is defined for a factory, where the maximum material channel length is four. This means, the factory has material channels which contain either one, two, three or four containers.



In the picture above you can see the definition of the aspect called "Sensor_Values". In this aspect, eight variables are defined. All of them are of the datatype INTEGER. As the channels can have up to four positions, therefore for each position a variable pair of FilledState and BatteryState were defined. If your maximum channel length in your factory is longer or shorter, please adjust the number of variable pairs according to your maximum channel length.

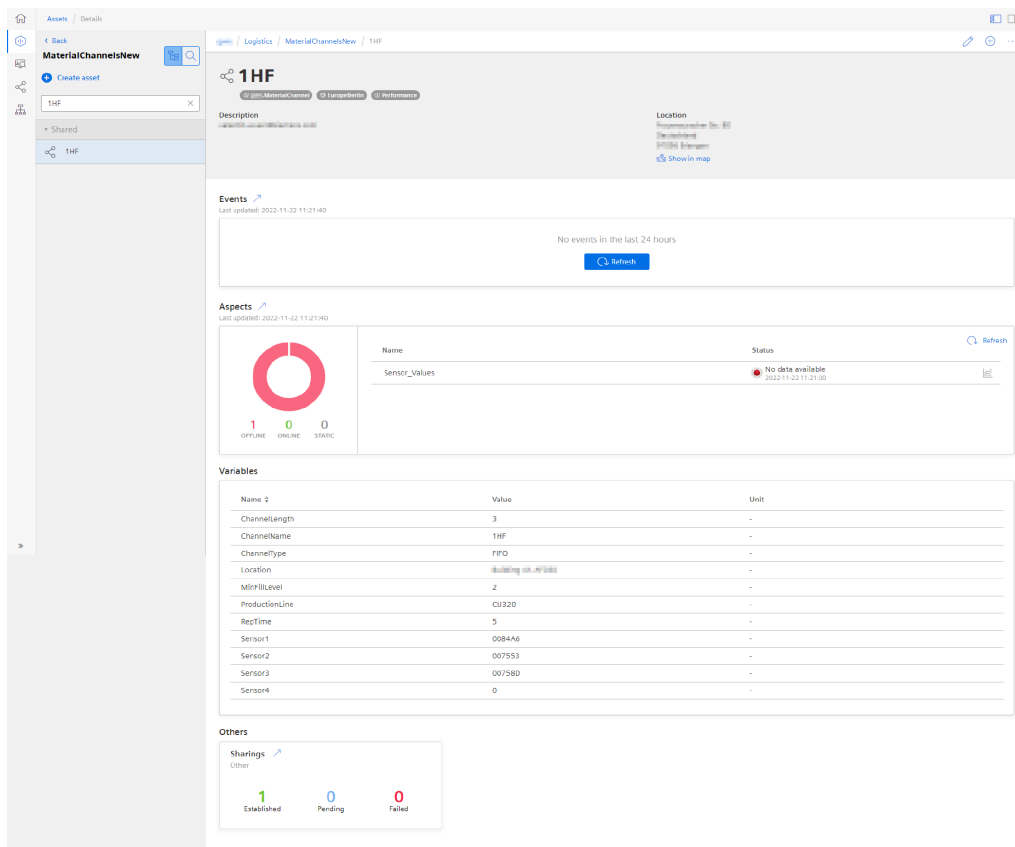
In the next step, you have to create an asset type, which represents your material channels. In the picture below you see again an example from our demo factory.



The material channel asset type in the screenshot above consists of the defined aspect and multiple static variables. The static variables are:

- ChannelLength
- ChannelName
- ChannelType
- Location
- MinFillLevel
- ProductionLine
- RepTime
- Sensor1 -> holds the ID of the Sensor
- Sensor2 -> holds the ID of the Sensor
- Sensor3 -> holds the ID of the Sensor
- Sensor4 -> holds the ID of the Sensor

Once you have defined this Material Channel asset type, you can start to create your material channel instances. Please find a filled example of a material channel below:

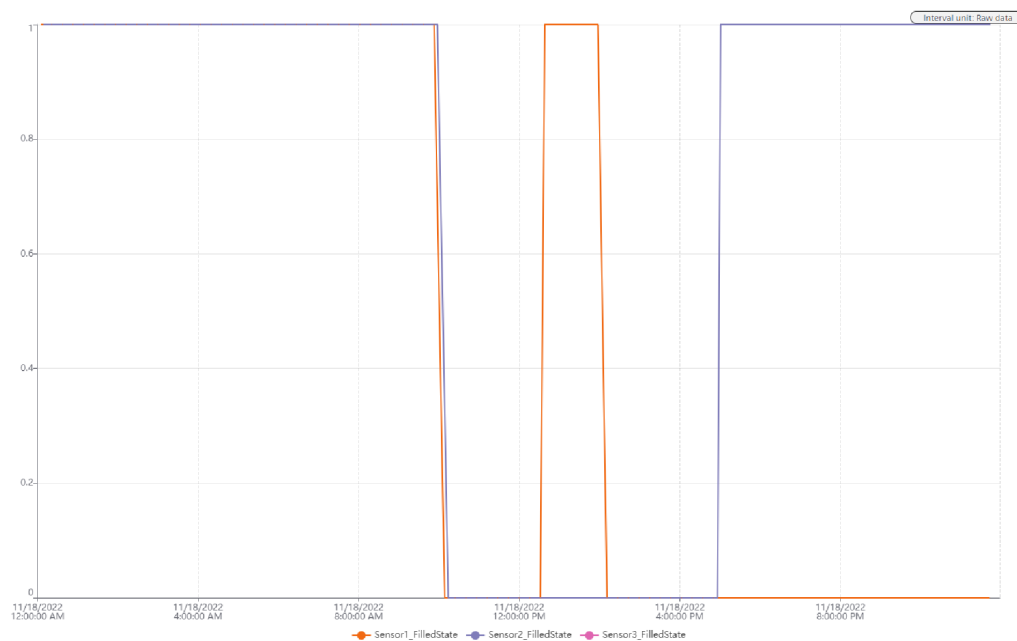


The picture above tells us the following about the material channel configuration:

- The ChannelLength is 3, the channel can fit up to three containers
- The ChannelName is 1HF
- The ChannelType is FIFO, so the containers are added from one side to the channel and taken out of it from the other side
- The MinFillLevel equals 2. Once only 2 containers remain in the channel, one additional box is reordered by the E-Kanban system
- RepTime is 5. This means, that the ordered container must be at the material channel no later than in 5 hours
- Sensor1, Sensor2 and Sensor3 give information on the associated Sensor IDs installed in the material channel.

As you can see above, all relevant data as described in the Required Input Data chapter, has been added to the asset.

Example sensor state data for a specific material channel looks like this:



The datapoint for Sensor1_FilledState was toggling a couple of times between 1 and 0 throughout the day, whereas the other two FilledStates were always at 1 in that day. Example battery level data for the sensors look like this on the described asset:



Here, we see that the battery for all three sensors was at 100%.



It is important to configure the same aspect and assettype as shown in the screenshots above, in order to avoid issues moving forward, especially in the Configuration chapter.

Please refer to the asset and aspect configuration in the Asset Manager to understand in detail how aspects, asset types and assets are created.

User Rights in Intralogistics Hub

3

3.1 User Rights

Insights Hub Intralogistics application adopts user rights from Settings. The user rights depend on the following user roles:

- `mdsp:solution:intralogistics.admin`
- `mdsp:solution:intralogistics.user`

The following table gives an overview of the permissions for the Admin and User roles:

Permission	Admin	User
Configure Asset-Filter	X	
Configure Prefix for Sensor IDs	X	
Configure aspect type for sensor data	X	
Configure wake-up time between events	X	
Exclude sensor data from calculation	X	
Manage Users in Application	X	
View Factory Overview Dashboard	X	X
View Material Channel Details	X	X
Mark issue as "Under Maintenance"	X	X
Mark issue as "Solved"	X	X
Update Material Channel Information	X	X

User Interface of Intralogistics Hub

4

4.1 User Interface

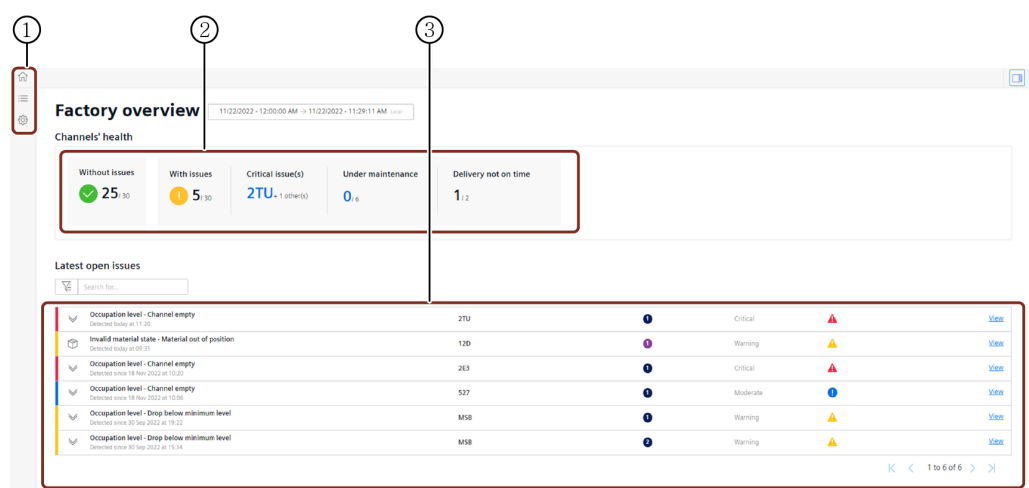
Insights Hub Intralogistics application can be accessed from the Launchpad by clicking the following icon:



4.2 Data Visualization User Interface

Once you launch the Insights Hub Intralogistics application from the Launchpad, you will land on the Factory Overview in the UI. If you are in the configuration area of the application, you can go back to the screen below by clicking on the “Home” icon in the navigation tab.

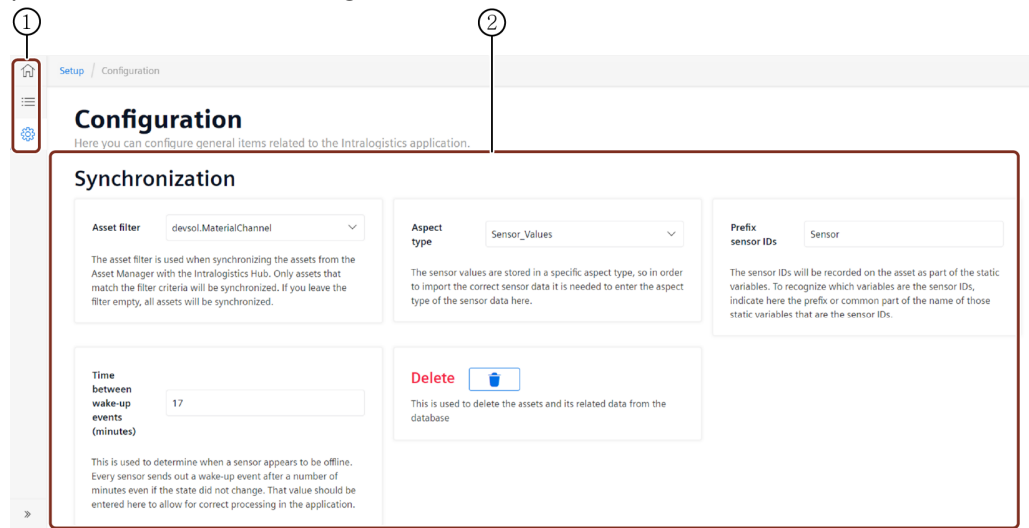
4.3 Configuration User Interface



- ① Navigation Tab
- ② Data filter operations
- ③ Hide/Expose functionality

4.3 Configuration User Interface

By clicking the gear icon in the navigation tab and selecting “Configuration”, you will be presented with the following screen.



- ① Navigation Tab
- ② Available Configuration Options

5.1 Insights Hub Intralogistics Basics

In this chapter you will learn about the implemented logic to calculate replenishment and consumption times and how and which issues are being detected automatically through the system.

5.2 Calculation Logic

Insights Hub Intralogistics automatically calculates the two different metrics for the user – the consumption time for material and the replenishment time. Both times describe different events at the material channel and are solely based on the sensor signals.

5.3 Consumption Time

The consumption time of a material channel is determined by the time between the consumption of boxes. This means that whenever a container is pulled out, a timer is started, and this timer finishes when another container is pulled out of the same channel - regardless of any replenishment events in between.

Example:

A worker in the factory pulls out a container at 12:00 pm. After he finished working with the goods in the box, he pulls out another one at 04:00 pm. Hence, the calculated consumption time is 4 hours in this case. As described before, newly added boxes to the channel do not have an impact on the consumption time.

In addition to the consumption time, the application also calculates two additional KPIs related to the consumption time:

- Average of the consumption times
- Standard deviation of the consumption times

Average:

The average consumption time is calculated by taking all consumption events of the last 4 weeks, without the excluded data points based on the configuration, and averaging the time of

these events. You will learn about data point exclusion in the chapter Configuration.

Standard deviation:

The standard deviation of the consumption time is calculated by taking all consumption events of the last 4 weeks, without the excluded data points based on the configuration, and calculating the standard deviation of the time of these events.

Calculated consumption times, the average and standard deviation are important statistical measures which are also displayed in the charts. You can learn more about charts in the chapter "Data Visualization".

5.4 Replenishment Time

The consumption time of a material channel is determined by the time between the reorder point and the replenishment of a material channel. This means that whenever a box is pulled out that triggers a reorder, a timer is started, and this timer finishes when that reorder is fulfilled, and the channel is replenished - regardless of any consumption events in between.

Example:

Once a reorder is triggered through the E-Kanban system, e.g., at 12:00 pm and the number of boxes arrives at the channel at 04:00 pm, then the calculated replenishment time is 4 hours. Any consumption event that occurs between 12:00 - 4:00, does not have an impact on the calculation of the replenishment time.

Average:

The average replenishment time is calculated by taking all replenishment events of the last 4 weeks, without the excluded data points based on the configuration, and averaging the time of these events. You will learn about data point exclusion in the chapter Configuration.

Standard Deviation:

The standard deviation of the replenishment time is calculated by taking all replenishment events of the last 4 weeks, without the excluded data points based on the configuration, and calculating the standard deviation of the time of these events.

Calculated replenishment times, the average and standard deviation are important statistical measures which are also displayed in the charts. You can learn more about charts in the chapter "Data Visualization".

5.5 Reorder Events

The calculation of the replenishment events is based on the determination of reorder events. For this, the logic is as follows:

- Whenever a box is consumed and the current fill level of the channel is above the minimum fill level, no reorder event is created.

- Whenever a box is consumed and the current fill level of the channel is equal to the minimum fill level, a reorder event is created for the amount boxes needed to fully fill the channel.
- Whenever a box is consumed and the current fill level of the channel is below the minimum fill level, a reorder event is created for one box.

Example scenario:

A material channel has a channel length of 4 and the minimum level of the channel is 2. This means, material will be reordered for the first time when the channel has only 2 boxes left. In this case, two boxes are reordered through the E-Kanban system. If the channel still has three boxes, no reorder is triggered through the system. Once the material channel only carries one box, the channel fill level is below the minimum level, then only one additional box is reordered through the system. Hence, in the two cases described above, two timers are started. The first one (minimum level of 2 boxes reached) will be stopped once the two ordered boxes arrive at the channel. The second timer will be stopped after later ordered box is added to the channel.

5.6 Automatic Issue Detection

Insights Hub Intralogistics also automatically detects different issues, and generates an event. These events can be viewed for details, if someone picks up the task, they can be marked as "Under Maintenance" and also as "Solved", if you choose to acknowledge these events. You will learn more about these options in the "Data Visualization" chapter.

In general, the different issue types can be categorized in four high-level issue types that all contain one or more low-levels of issue types.

5.7 Sensor Issue

This high-level issue type is concerned with issue types related to individual sensors.

Low on battery:

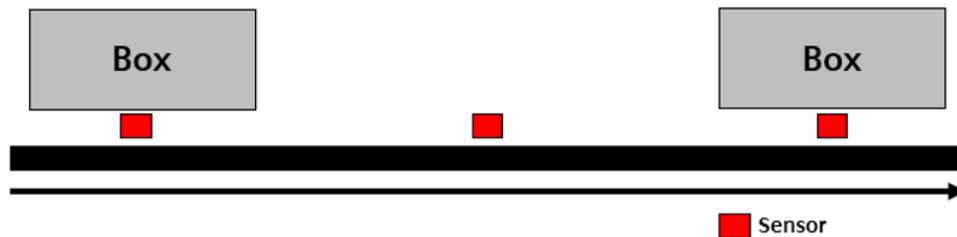
Whenever the battery of a sensor drops to or below 10%, an issue is generated. This issue is a warning. For every new detection of the low battery state for the same sensor, the number of occurrences on the issue will increase while the issue remains unresolved. When the battery is replaced, the application automatically solves the issue and will be removed from the "Open Issues" list.

5.8 Invalid Material State

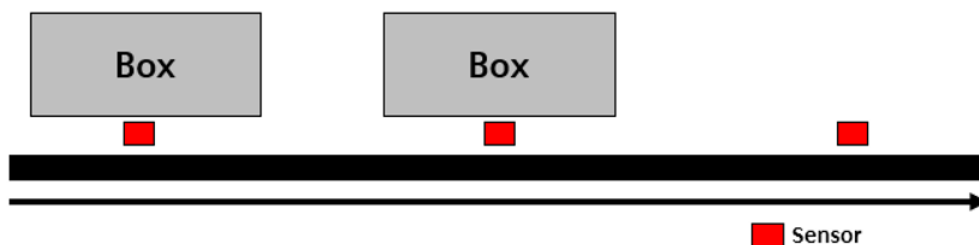
This high-level issue type is concerned with issue types related to boxes that are in an invalid position.

Material out of position:

Whenever the boxes in a material channel are in an invalid position, an issue is generated. The picture below shows a valid material state and an invalid material state.



Whenever there is a gap between boxes in a material channel, this is automatically an issue. The same also applies to another scenario, where the worker pulls out a box, if that is in the closest position. The picture below also depicts this situation.



This generated issue is a warning. When the box is pulled down by a worker, the application automatically solves the issue.

These issues can only appear on FIFO channels, not for parallel channels.

5.9 Occupation Level

This high-level issue type is concerned with issue types related to the fill level of the material channels.

Drop below minimum level:

Whenever the current fill level of a channel drops below the minimum level for that channel, an issue is generated. This issue is a warning. For consecutive detections of this issue, the number of occurrences on the issue will increase while the issue remains unresolved. When the channel is replenished, and the fill level is on or above the minimum level again, the issue will be automatically solved by the application. This issue is only generated for channels with a minimum level of at least 2 boxes.

Channel empty:

Whenever a channel is fully empty, an issue is generated. This issue is critical. For consecutive detections of this issue, the number of occurrences on the issue will increase while the issue remains unresolved. When the channel is replenished, the issue will be automatically solved by the application.

When the maximum capacity of a channel is only 1 box, the issue will not be critical, it will be moderate instead.

5.10 Channel Behavior

This high-level issue type is concerned with issue types related to the consumption and replenishment time of the channel.

Irregular consumption time:

Whenever a consumption event that occurs is irregular, an issue is generated. An event is irregular when the consumption time of the event deviates more than 3 times the standard deviation from the average. This issue is a warning. Each time this occurs, a new issue will be generated as these are separate, individual events. Also, the issues of this type must be manually marked as solved.

Consumption quicker than replenishment time:

Whenever the average consumption time of a material channel drops below the system replenishment time of that channel, an issue is generated. This alerts users of a systematic issue within the channel, as it will be consumed quicker than it is being replenished. This issue is a warning. For consecutive detections of this issue, the number of occurrences on the issue will increase while the issue remains unresolved. Also, issues of this type must be manually marked as solved.

Configuration

6

6.1 Configuration

Insights Hub Intralogistics provides some configuration possibilities for the user to adjust it to their given circumstances. To access the two different configuration pages, you must have the intralogistics.admin permission assigned to your account.

To see the configuration pages, please click on the gear icon in the navigation bar.

6.2 Configuration

Once you have selected the page “Configuration” after clicking the gear icon in the navigation bar, the following page will open and present you with the available configuration options.

6.3 Asset Filter

The asset filter is used when synchronizing the assets in Insights Hub with the Intralogistics application. Only assets that match the filter criteria will be synchronized. If you leave the filter empty, all assets will be synchronized. Please follow the following syntax to fill this input field:

`{"typeId": "tenantname.assettype"}`

You should use the assettype here, that you have created following the instructions from the Aspect / Asset configuration section of the [Prerequisites](#) chapter.

6.4 Prefix Sensor IDs

This is used when synchronizing assets from Industrial IoT. The sensor IDs will be recorded on the asset in Insights Hub as part of the static variables. To recognize which variables are the sensor IDs, indicate here the prefix or common part of the name of those static variables that are the sensor IDs.

MaterialChannel

Description
Asset Type for Material Channel

General | Usages

Name	Unit	Data type	Max. length	Default value
ChannelLength	-	INT	-	Defined
ChannelName	-	STRING	255	Defined
ChannelType	-	STRING	255	Defined
Location	-	STRING	255	Defined
MinFillLevel	-	INT	-	Defined
ProductionLine	-	STRING	255	Defined
RepTime	-	INT	-	Defined
Sensor1	-	STRING	255	Defined
Sensor2	-	STRING	255	Defined
Sensor3	-	STRING	255	Defined
Sensor4	-	STRING	255	Defined

Aspects

Name	Aspect	Category
Sensor_values	give.Sensor_values	Dynamic

When we have a look at the configured asset type from the Aspect / Asset configuration section of the Prerequisites chapter, we can see that the Prefix for the SensorIDs is equal to "Sensor". Hence, the input values of Sensor1, Sensor2, Sensor3, Sensor4 will be the associated IDs of the sensor. Of course, if your material channel has more positions, please add additional static variables following the same schema "SensorX" (where X equals a number).

6.5 Aspect type sensor data

This is used when retrieving time series data from Insights Hub. The sensor values are stored in a specific aspect type, so in order to import the correct sensor data, it is necessary to enter the aspect type of the sensor data here.

Aspect type sensor data

Sensor_values

In the example shown above the aspect name equals "Sensor_values".



We recommend that you build the asset structure as shown in the screenshots of the Aspect / Asset configuration section of the Prerequisites chapter to avoid any configuration issues.

6.6 Time between wake-up events (minutes)

This configuration option can be used to determine the online/offline of the sensors. Some sensors send out a wake-up event after a number of minutes even if the state did not change. That value should be entered here to allow for correct processing in the application.

6.7 Delete

By clicking on the trash can icon, you can delete all assets and their related data from the database.



Please be careful, when using this option, as the data cannot be restored afterwards.

6.8 Excluded Sensor Data

Once you have selected the page “Excluded sensor data” after clicking the gear icon in the navigation bar, the following page will open and present you a couple of options.

The purpose of these configurations is to ensure a higher data quality in the calculation of average and standard deviation values. Throughout the production cycles it can happen, that shifts are cancelled or production is stopped on the weekend. This will automatically lead to longer consumption and replenishment times, as most of the times during these periods, no material is consumed or delivered to the stations. To avoid that the higher calculated times can manipulate the standard deviation and averages, you can define periods when data should be considered or also exclude certain days.

6.9 Shift Definition

In the upper left corner you can define “Shift for average calculations”. This means, that you can define a timeframe in which you always assume that values are correct. As an example, you can imagine a three shift production process. Depending on orders, it can happen that the afternoon and night shift are cancelled from time to time. However, the morning shift will always be carried out. In this case, you could define the shift start of 06:00 am and a shift end at 02:30 pm as depicted below.

All other calculated values will not be considered for the average and standard deviation calculation. If you want to include all values, you must set it up from 12:00 am to 11:59 pm. This is also depicted below.

Shift for average calculations

Start

End

00:00

23:59

6.10 Exclude days of the week

With this setting it is possible to exclude whole days out of the average and standard deviations calculations.

Exclude days of the week

Mon

Tue

Wed

Thu

Fri

Sat

Sun

☐

☐

☐

☐

☐

☐

☐

For example, if your company only operates on weekdays, you can use this setting so every value that is calculated on the weekend, e.g, Saturday or Sunday, will be ignored. The following picture shows the proper configuration for the above example.

Exclude days of the week

Mon

Tue

Wed

Thu

Fri

Sat

Sun

☐

☐


☐

☐


☐

☒

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All sensor events will be ignored for Saturdays



All sensor events will be ignored for Sundays

6.11 Exclude sensor data

The two prior settings describe ways to exclude datapoints that apply to all connected material channels. This possibility offers a more fine-grained way to exclude datapoints from the calculation. The intention is to exclude datapoints from public holidays throughout the week, or if shifts are canceled for certain production lines. It should help to avoid discarding too many reasonable datapoints. To use this capability, please click either on “Add new excluded shift or holiday” in the upper right corner of the screen or in the middle of the screen.

Exclude sensor data and events

Use this to exclude data points generated by the sensors. These can be for example holidays, weekends or other periods in time that affect the calculation of the average replenishment and consumption times negatively.

[Add new excluded shift or holiday](#)

Once you clicked one of the two options, you are presented the following dialogue:

Exclude sensor data and events

Use this to exclude data points generated by the sensors. These can be for example holidays, weekends or other periods in time that affect the calculation of the average replenishment and consumption times negatively.

[Add new excluded shift or holiday](#) [Delete](#)

In the first step please select the relevant timeframe from the timepicker below the headline “Start and end date”. Once you have done this, please put in a reason for the exclusion. In the example, which you can see below, a Public Holiday was configured, which should apply also to all material channels and production lines.

Exclude sensor data and events

Use this to exclude data points generated by the sensors. These can be for example holidays, weekends or other periods in time that affect the calculation of the average replenishment and consumption times negatively.

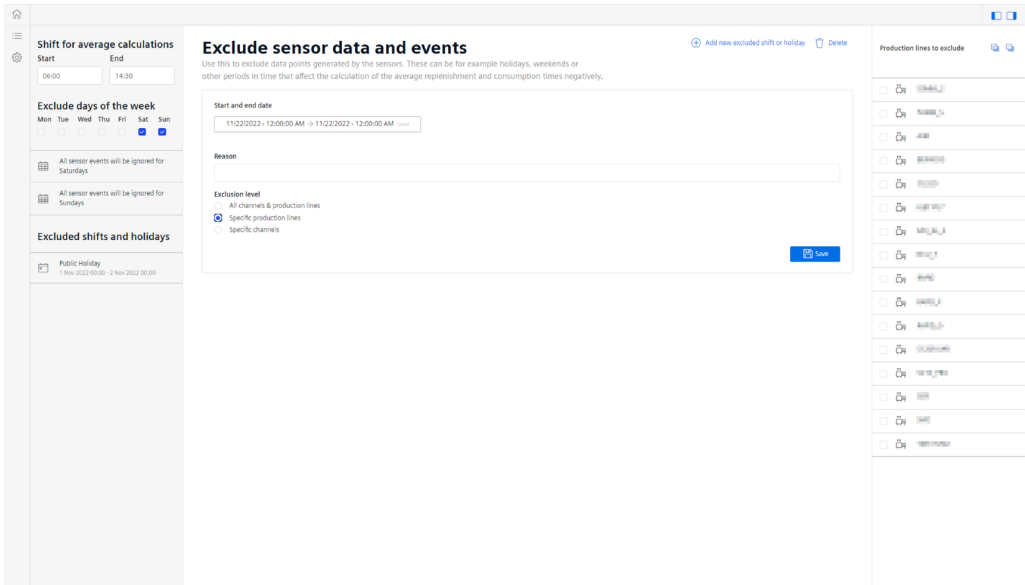
[Add new excluded shift or holiday](#) [Delete](#)

Besides the “All channels & production lines” option, there are also two other options available through the radio button:

- Specific production lines
- Specific channels

When you select “Specific production lines”, you will be presented with the different production lines, that can be found in the configured assets. If this property is not specified on the assets, this filtering will not apply:

6.11 Exclude sensor data

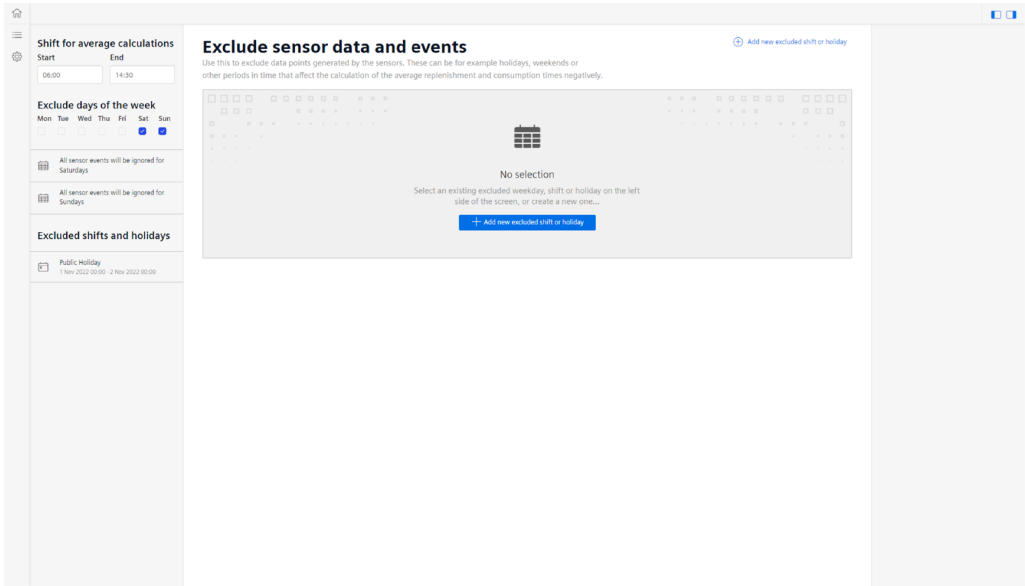


To proceed, please select the relevant production lines and click save.

The third option is the “Specific channels” option. When you select the specific channels option, you will be presented with all available material channels on the right hand side.

To proceed with this option, please select the relevant material channels and then click save.

Once you have saved an entry, it will also populate in the list on the right hand side as shown below.



Data Visualization

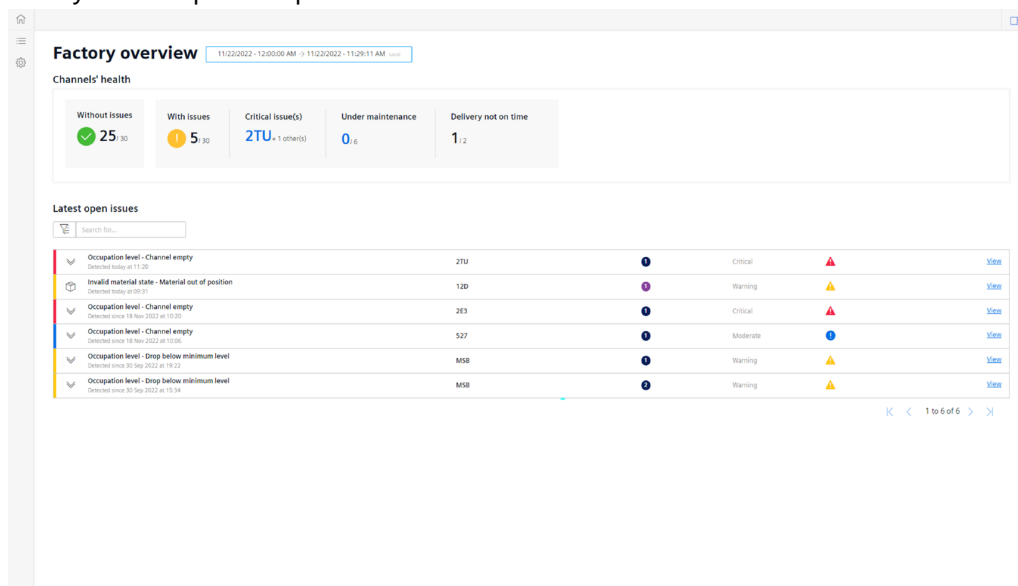
7

7.1 Data Visualization

Insights Hub Intralogistics offers you out of the box data visualization around intralogistics, mainly targeting two different personas. On the one hand, it is targeting the intralogistics process manager and on the other hand the operational manager, who is part of the shopfloor logistics team. Their specific challenges are already described in the Introduction chapter.

7.2 Factory Overview

When you open the application, the application will show you a factory overview dashboard and offer you a couple of capabilities.



In the top, you can find a timepicker, which allows you to set the time. Once you have modified this setting, the dashboard below will update the data. Below the timepicker, you find a couple of boxes, which show you a range of key KPIs:

- Without Issues: gives you the number of channels without issues.
- With Issues: gives you the number of channels that have issues.
- Critical Issues: gives you a number of currently open critical issues. The severity of the different issues is described in the chapter “Automatic Issue Detection”

- Under maintenance: As a user of the application and if you pick up a task from the application, you can mark a material channel as “Under maintenance”. This will always show a number x out of the number of open issues.
- Delivery not on time: Once a replenishment of a channel takes longer then system given replenishment time, a delivery will be counted as “not on time”. The application counts the number of deliveries for all material channels and also determines which were not on time in the given timeframe.

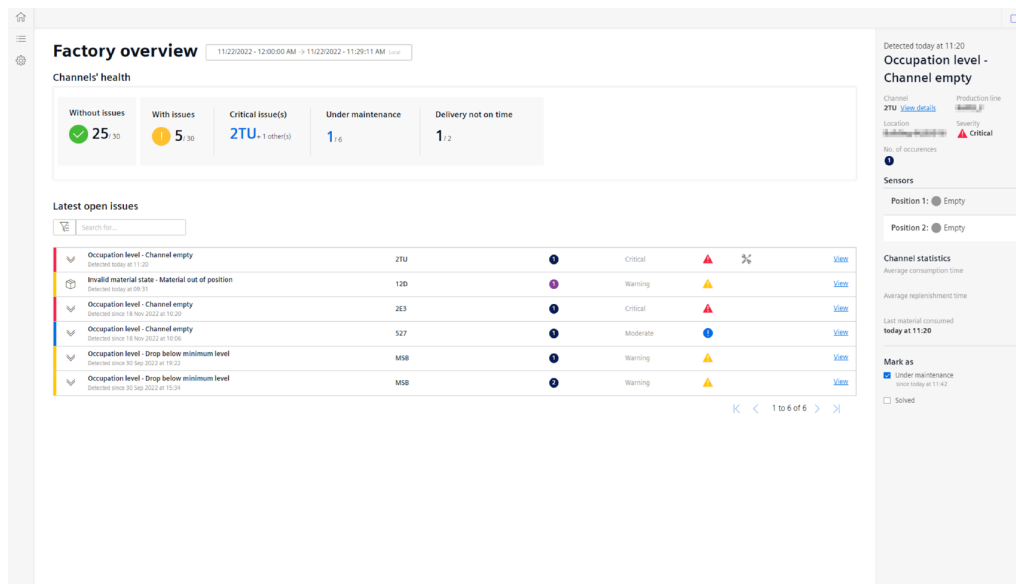
Below of the KPI section, you can find a section about the latest open issues. This table lists all open issues on all material channels for the selected timeframe. In the screenshot above, you can see that there are currently a couple of open issues. Every entry in this table shows the same information:

- Colorcoding
 - Blue – Moderate
 - Yellow – Warning
 - Red – Critical
- Issue type description including timestamp of detection
- Material Channel Name
- Number of counts (this concept is described in the section “Automatic Issue Detection”)
- Issue Severity
- Issue Symbol
 - Moderate (Blue Icon)
 - Warning (Yellow Triangle Icon)
 - Critical (Red Icon)
- Option to view more details on the issue


Below the table you can find navigation options. Here you will again find the number of issues that occur in a specific timeframe with the navigation button that allow you to change pages in the table.

7.3 View Issue Panel

If you want to find out more about a certain issue, you can click the “View” button on the specific item of the table. This will open a panel on the right side of the screen.

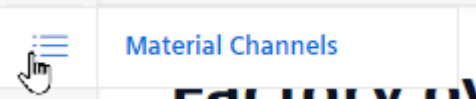


The side panel shows the following information:

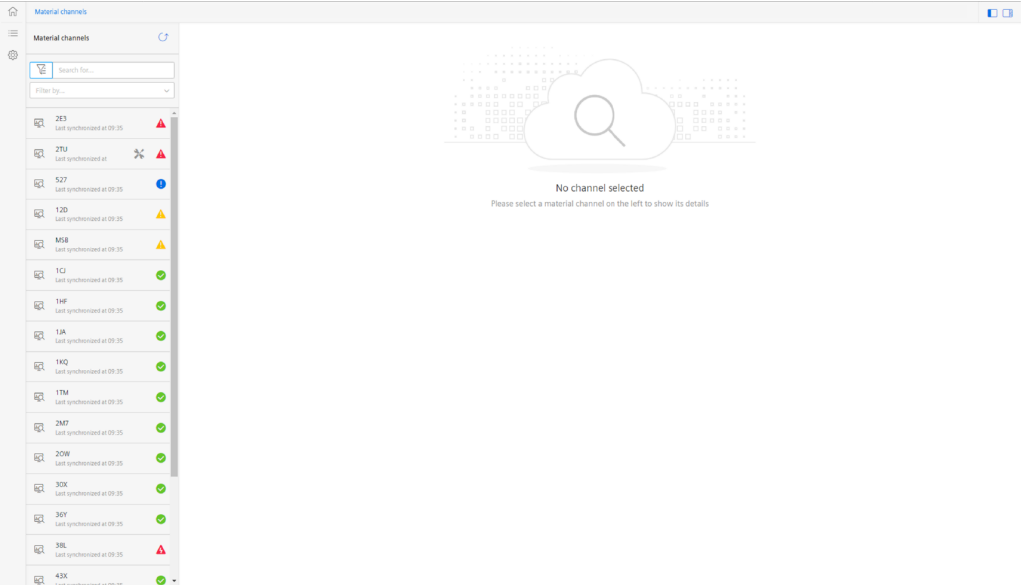
- Timestamp of issue detection
- Issue Name
- Channel, on which the issue occurred
- Production Line Name
- Location
- Severity
- Number of occurrences
- Sensor states when the issue occurred, in the screenshot you can see that position 1 and 2 were filled, and 3 and 4 were empty on the issue occurrence
- Channel Statistics with the channel average consumption and replenishment time
- Last material consumed
- Light Ticketing System – “Mark as”
 - Under Maintenance: once you pick up an issue, you can tick the box and set the channel as under maintenance. Once you have resolved the issue a timestamp will appear under the check box and the following icon will be added to the table entry . In addition the “Under Maintenance” counter in the KPI section above will be counted up.
 - Solved: Once you tick this checkbox the item will be removed from the open issues table. This can be used, if you want to acknowledge a certain issue or have actually solved it.

7.4 Material Channel Details

To open the material channels details, there are two ways to do this – either through the side panel, when you are investigating an issue (View details button next to the channel name), or through the second button in the navigation bar.

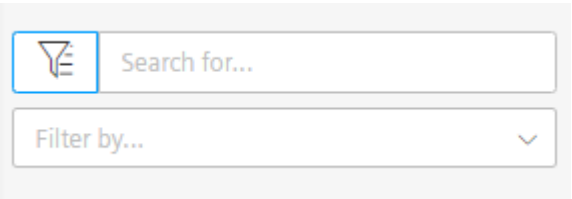


Once the screen loaded, you will be presented with the following view:



7.5 Asset List

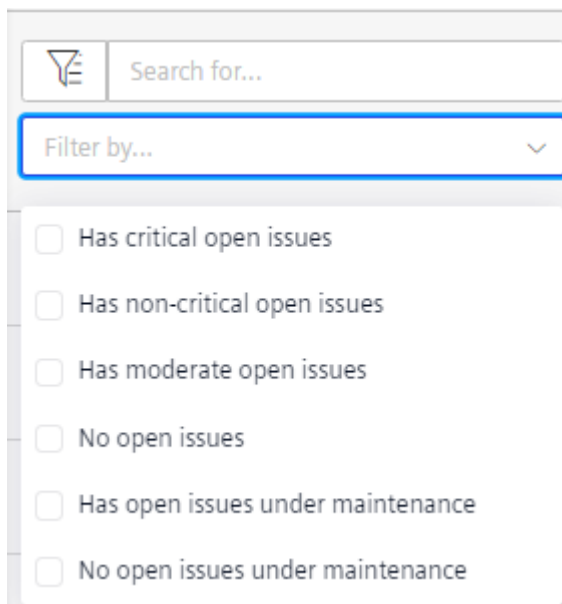
On the left side, you can see a list of all available material channels. On top of that list, there is also a search functionality implemented, which helps you to find channels faster.



You can search for the following parameters:

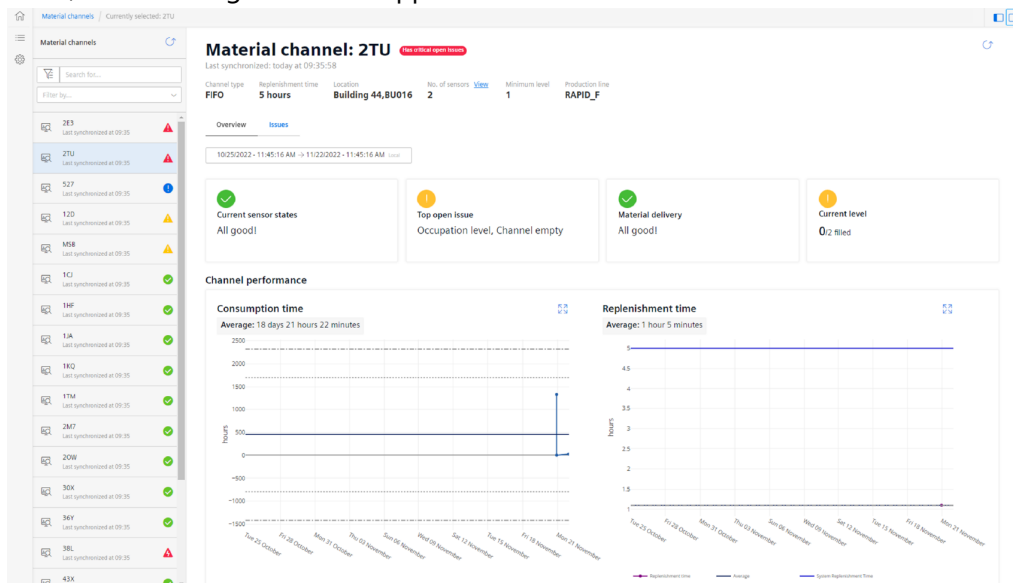
- Material Channel Name
- Production Line Name
- Location

Below the search bar, there are also filter options, that can be applied after you clicked on the arrow down button in the "Filter by..." bar:



This filtering helps to reduce the number of entries in the list view.

To see more information in the screen, you have to select a channel from the list. Once this is done, the following screen will appear.



In the top right corner in the screen, you will find an option to hide the material channel list. Please click on the left of the two buttons to hide and unhide the asset list.



7.6 Material Channel Information

On the top of the screen, you can see material channel related information, like the channel name, channel time, replenishment time, location, number of sensors, the minimum level and the associated production line. In addition to that, next to the channel name, different labels can be added:

- Has open issues (yellow label)

- Has critical open issues (red label)
- No open issues (green label)
- Invalid configuration (red label)
- Under maintenance (grey label)

Below the channel information you will find a time picker, which influences the content of everything below of it. The first information you can notice, are the following four boxes:

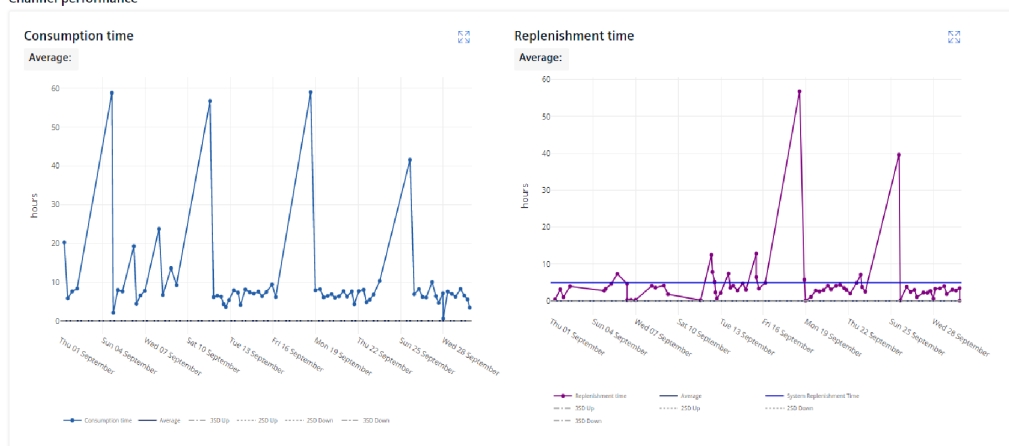
- Current Sensor states (this will tell if some of the sensors are currently not working, e.g., because they seem to be offline)
- Top open issue: the top open issue name will be displayed here
- Material Delivery: this will tell how many deliveries were not on time
- Current Level: Will display the current fill level of the material channel

7.7 Material Channel Performance

In the next section, you will find two charts. One is displaying the consumption times over a period of time, and the second one shows the replenishment times. Both charts also have an average value associated.

The charts itself show the measured times over time, and not how the average developed over time.

Channel performance



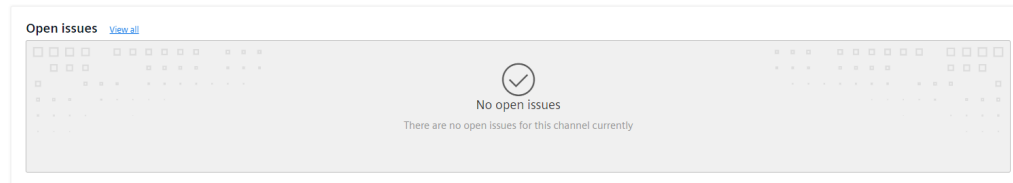
In addition to the measured times, you will also see additional lines in the chart:

- The calculated average value
- 3 times of standard deviation above and below the average
- 2 times of standard deviation above and below the average
- The replenishment time chart, also carries the system replenishment time

Both charts can be expanded by clicking the following button.

7.8 Material Channel – Open Issues

The last section on this page shows the open issues of the current material channel. You will see the same table as in the factory overview – only filtered by the current material channel.



Two actions can be performed in this section:

- **View all:** this will switch the content of the page to the Issues Tab (learn more about that in the Material Channel – Issue Tab section)
- **View:** this will open the same panel with more issue details compared to opening it from the Factory overview screen. You can close the panel by clicking the right button in the upper right corner.



7.9 Material Channel – Sensor Information

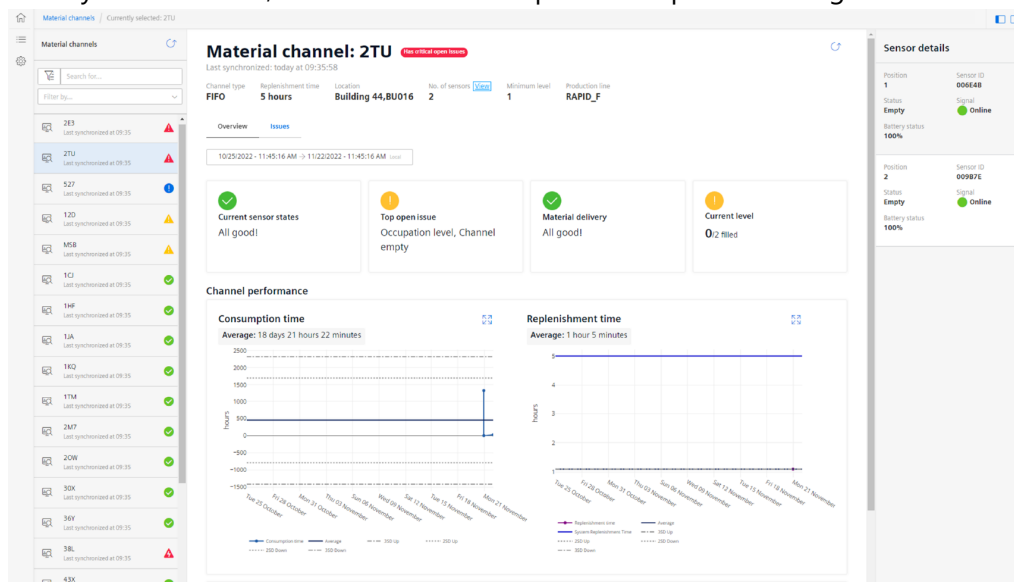
In the top of the screen in the material channel information section, you can find another view option next to the “No. of sensors” label.

Material channel: 2TU Has critical open Issues

Last synchronized: today at 09:35:58

Channel type **FIFO** Replenishment time **5 hours** Location **Building 44, BU016** No. of sensors **2** [View](#) Minimum level **1** Production line **RAPID_F**

Once you click “view”, another information panel will open on the right side.



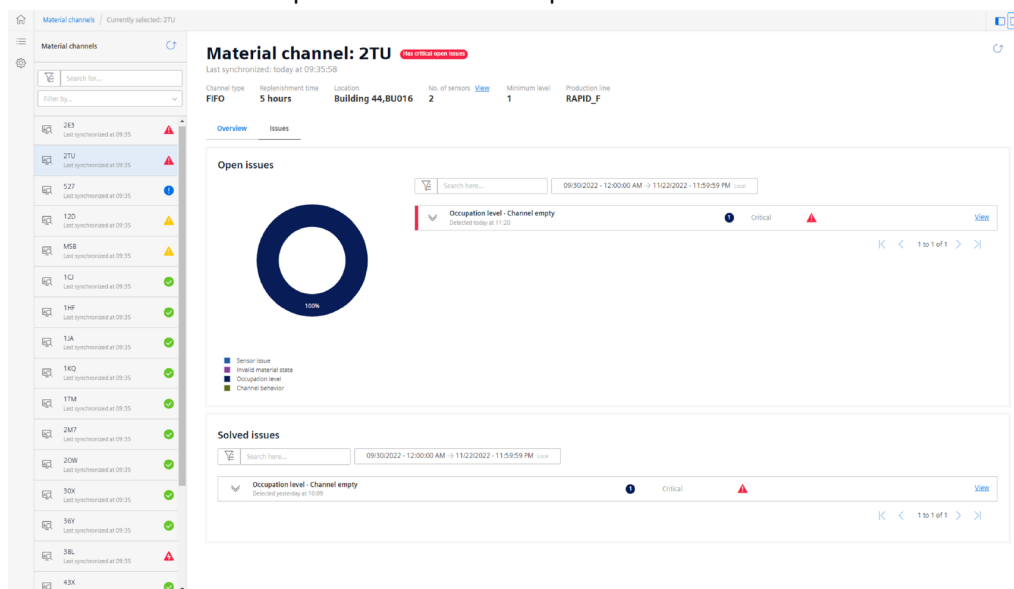
This panel carries the following information per sensor:

- Position
- Status (Filled or empty)
- Battery Status (0-100%)
- Sensor ID
- Signal (Online, Offline, Unknown)

7.10 Material Channel – Issues Tab

In the material channel overview, two tabs are present. The first one called “Overview” was described in the sections before. The second tab called “Issues” will be described in this section. Once you clicked it, the screen content will be adjusted and two page sections will appear. The open issues section is similar to what you have already seen where introduced before. You will see a table with the currently open issues. Next to this, you can see a donut chart, showing you the distribution of the different issues that occurred in the selected timeframe from the timepicker above the list. The list itself can also be filtered again.

The second section of this screen handles the solved issues. Here, you will only find issues, that were marked as “solved” in the issue details panel. Similar to the open issue section, you can also select the relevant timeperiod and filter for specific issues.



7.11 Update functionality

If you have updated the information on one of the material channels in the asset, e.g., adjusted the channel replenishment time or channel length, you need to synchronize that information

with the application. The application offers you three possibilities. Every day an automatic refresh is done at midnight and all channel information is synced. The second option is to update all channels manually. To do this you, have to click the refresh button in the top left corner next to the “Material Channels” label. The third option, updating only a single channel is also depicted in the application screenshot below. This can be achieved by clicking the update icon in the top right corner.

