User Manual

LM Dental Tracking System™ Reader

This manual is valid for:

LM DTS™ Tray Reader
LM DTS™ Unit Reader

LM Dental Tracking System™ Tray and Unit Reader Software version 8.2.0 or higher.
LM Dental Tracking System™ Server version 8.3.0 or higher.

Manufacturer, Marketing and Sales

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1. INTRODUCTION

Foreword

This is a user manual for LM Dental Tracking System™ Tray and Unit Reader (hereinafter "LM DTS™ Reader"). Read and understand this manual before you use the product. If there are any questions regarding the contents of this manual, please contact LM-Instruments Oy (hereinafter "LM"). Ensure this user manual is easily available for all users.

LM DTS™ Readers are a cutting edge multi-read UHF (Ultra High Frequency) RFID read point solutions that offer ease in deployment due to theirs small size. With the antenna, cables and reader enclosed in a single reader it can be placed in any environment with minimal effect on the surroundings. Readers can be wall mounted in case you don't have table space.

RFID technology

LM DTS™ Reader uses UHF (Ultra High Frequency) RFID technology to efficiently track, monitor and control instruments and materials. The RFID tag can be attached to any material from different manufacturers enabling complete traceability of the materials by scanning them with the LM DTS™ readers. Instruments, handpieces, filling materials, implants etc. are wirelessly read in just a few seconds. Integration to LM DTS™ cloud server is made via Ethernet cable or WLAN connection.

Tray vs. Unit Reader

LM DTS™ Unit Reader is specifically designed to be close to a dental treatment unit. It's intended use is to read and record activity for instruments or other assets one by one. This will allow the detailed tracking of individual asset and its use.

LM DTS™ Tray Reader is intended to use to read and record activity for groups of assets, like cassette of instruments or group of materials. Therefore, these are usually located in a hallway or a room describing the location where you want to record your activity.

The tray readers are configured through the server and they support single or multiple activities depending on the workflow requirements.

Both readers can communicate over Ethernet or WiFi to the LM DTS™ Server through encrypted HTTPS creating the system environment, as a cloud service or local server.

How to use this manual

- Read Chapter "2. SAFETY INSTRUCTIONS" to learn about safety issues.
- Read Chapter "3. CONTENTS OF DELIVERY" to familiarize the basic parts and accessories of the LM DTS™ Reader.
- Read Chapter "4.INSTALLATION OF THE READER" to learn about the user interface. to learn the steps in installing the LM DTS™ Reader
- Read Chapter "5. USING THE READER" to learn about the user interface.
- Read Chapter "6. ACTIVITIES" to learn about the different activities.
- Read Chapter "7. ERROR SITUATIONS" to learn about the common error situations and how to react to them.
- Read Chapter "8. CLEANING AND MAINTENANCE" to learn how to carry out the cleaning and maintenance.
- Read Chapter "9. TROUBLESHOOTING" to learn about common problems and how to resolve them.
- Read Chapter "10. TECHNICAL DATA" to familiarize the technical details and environmental requirements of the LM DTS™ Reader.
- Read Chapter "11. SYSTEM GLOSSARY" to learn about the glossary when using the LM DTS™ Reader.
- Read Chapter "12. WARRANTY TERMS" to familiarize the warranty terms that apply to the LM DTS™ Reader.

Service

Service of the product is only to be performed by authorized service personnel. Maintenance measures that are introduced in this manual are for the user and those should be followed to maintain safe and efficient use of the product.

Other manuals

Other essential manuals are either abbreviated in this manual or delivered separately. If there are any manuals missing which you feel are necessary for the operation or maintenance of the device, please contact LM DTS™ Support.

2. SAFETY INSTRUCTIONS

2.1. Signal words

The following signal words are used to identify safety messages in these instructions:

⚠	**Caution** *Description: To indicate that caution is necessary when operating the device or control close to where the symbol is placed, or to indicate that the current situation needs operator awareness or operator action in order to avoid undesirable consequences.*
⚠	**General warning sign** *Description: Risk to people supplied by the supplementary sign or text. This safety sign cannot be used on its own and requires a supplementary sign to give further information about the hazard.*
❗	**General mandatory action sign** *Description: To signify a mandatory action. Risk to people not following the mandatory action specified by the supplementary sign. Carrying out the mandatory action specified by the supplementary sign.*

2.2. General safety instructions for the reader

Warnings

⚠	**Keep all metal articles (including metal tray/shelf above the reader) away from the LM DTS™ Reader as they will reflect the radio signals leading to reading of unwanted tags for all articles nearby**
⚠	**Keep all articles (instruments or dental material) with RFID tags away from the LM DTS™ Reader. This prevents reading of unwanted RFID tags (articles) by the LM DTS™ Reader.**
⚠	**Do not open the bottom plate of the LM DTS™ Reader.**
⚠	**The product must be connected to electricity meeting the requirements specified in chapter "11. TECHNICAL DATA". Connecting the unit to the power supply can only be done with appropriate professional knowledge**
⚠	**Do not step on the LM DTS™ Reader.**
⚠	**No modification of this equipment is allowed.**

Cautions

⚠	**Do not sit on the LM DTS™ Reader. Maximum load of 5 pounds or 2 kilograms allowed.**
⚠	**If the LM DTS™ Reader has been in the cold, allow it to warm up at room temperature for at least 6 hours before switching on, in order to allow condensation formed to evaporate.**
⚠	**Always check that the LM DTS™ Reader's cables and connectors are in operational use. If the LM DTS™ Reader's cables or connectors are damaged, do not use the LM DTS™ Reader.**
⚠	**The LM DTS™ Reader is intended for indoor use only.**
⚠	**Portable and mobile RF (Radio Frequency) communications equipment can have an unwanted effect on the product.**

Mandatory actions

❗	**System is not used for medical treatment decisions.**
❗	**Basic recommendation is that the reader is on all the time. However, the user may turn it off before transportation.**
❗	**Device is not intended for use in conjunction with flammable agents or anesthetics.**
❗	**Turning on the LM DTS™ Reader takes up to 30 s and display is black during startup.**
❗	**A warning that the LM DTS™ Reader should not be used adjacent to or stacked with other equipment and that if adjacent or stacked use is necessary, the LM DTS™ Reader should be observed to verify normal operation in the configuration in which it will be used.**

Note

The manufacturer of the LM DTS™ Reader may provide a description or list of equipment with which the LM DTS™ Reader has been tested in a stacked or adjacent configuration and with which stacked or adjacent use is permitted.

2.3. Electromagnetic compatibility

This product is compliant with the national standards regarding conducted and radiated emissions.

Please see chapter 10. Technical data.

Important Note

To comply with the FCC RF exposure compliance requirements, no change to the antenna or the device is permitted. Any change to the antenna or the device could result in the device exceeding the RF exposure requirements and void user's authority to operate the device.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in an installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

RF Exposure compliance was demonstrated at a distance of 20 cm or greater between the human body and the device antenna. For your safety, this minimum distance should be maintained while using the equipment.

2.4. Safety considerations for the LM DTS™ Reader

Installation and usage must comply with all safety instructions and warnings in this manual. Installation and usage must also follow all applicable local or national statutory requirements and safety standards.

Service of the product is only to be performed by authorized service personnel.

In this manual are shown all the allowed maintenance actions for the user. Any other procedures are strictly prohibited. Before carrying out any maintenance work, read and understand the maintenance instructions.

2.5. User pre-requirements

a good working knowledge of the LM DTS™. It is assumed that the administrator has received the necessary

This manual assumes that the local administrator is familiar with the operation of the LM DTS™ Reader and has training from LM™.

The local LM DTS™ administrator should provide necessary training for all other personnel who will be working with the LM DTS™ system.

2.6. Intended and prohibited uses of the product

LM DTS™ Reader is used to record and track (chosen) activities made to articles registered in the LM DTS™. Articles can be dental hand instruments or dental materials.

Do not use LM DTS™ Reader where it is not intended to be used. If you are unsure about your operation, please contact your local dealer or place of purchase. The LM DTS™ Reader is not intended for use in any of the following situations:

- In hazardous (explosive) atmosphere
- In situations where the LM DTS™ Reader may come in contact with water
- In situations where the LM DTS™ Reader will be subject to extremes of heat or humidity. See the

specifications for the allowable temperature and the humidity ranges.

The users will use the LM DTS™ Reader as per the instructions provided in the user manual, if the equipment is used in a manner not specified by LM-Instruments Oy the protection provided by the equipment may be impaired. Any software installations to LM DTS™ Reader are strictly forbidden without the manufacturer's written permission.

2.7. Disposal of the LM DTS™ Reader

Please follow local regulations for disposal. Use the return and collection systems available in your country for the disposal of this product. The equipment can also be returned to the manufacturer for disposal.

3. CONTENTS OF DELIVERY

3.1. Contents of the packages

LM DTS™ Tray Reader package

LM DTS™ Tray Reader delivery package contains a tray reader with loose blue, washable silicone mat and power supply unit with area specific AC-adapter.

Contents of the LM DTS™ Tray Reader package	
1	Silicone mat
2	Reader
3	Power Supply Unit with area specific AC-adapter

LM DTS™ Unit Reader package

LM DTS™ Unit Reader delivery package contains a unit reader and power supply unit with area specific AC-adapter.

Contents of the LM DTS™ Unit Reader package	
1	Reader
2	Power Supply Unit with area specific AC-adapter

3.2. LM DTS™ Tray Reader connection ports

Top

Right

Left

Bottom
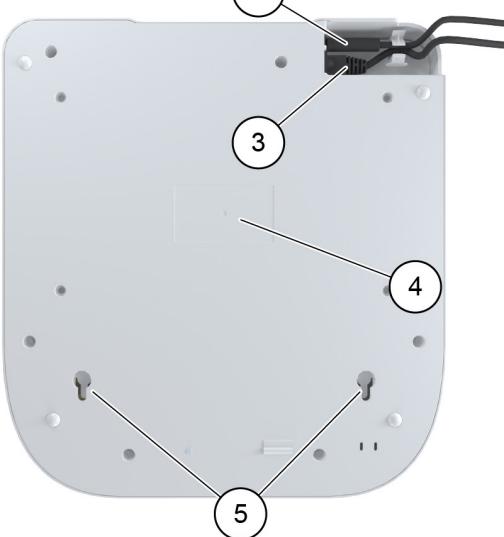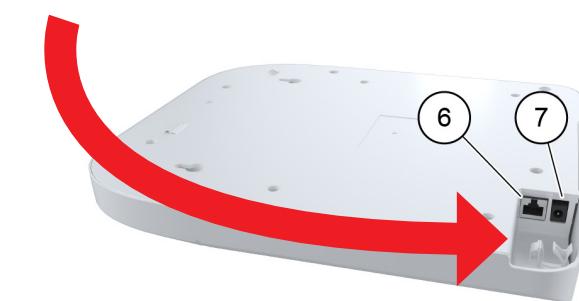
Back
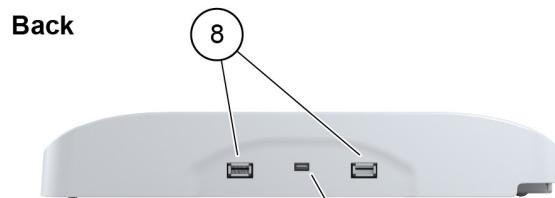
Front

LM DTS™ tray reader's connection ports			
1	Touch screen	6	Ethernet cable port, power over ethernet enabled
2	Power source cable	7	Power source cable port
3	Ethernet cable (e.g. UTP CAT5 cable)	8	USB Host port type A (only high-speed USB 2.0 cable may be used)
4	Data sticker, see chapter 11. "Technical data"	9	HID port Mini-B (only high-speed USB 2.0 cable may be used)
5	Mounting screw holes		

Note: There is also the warranty seal on the backside of the reader. If this seal is broken the warranty is no longer valid.

3.3. LM DTS™ Unit Reader connection ports

Unit reader`s connection ports can be found on side of the reader under the cover.
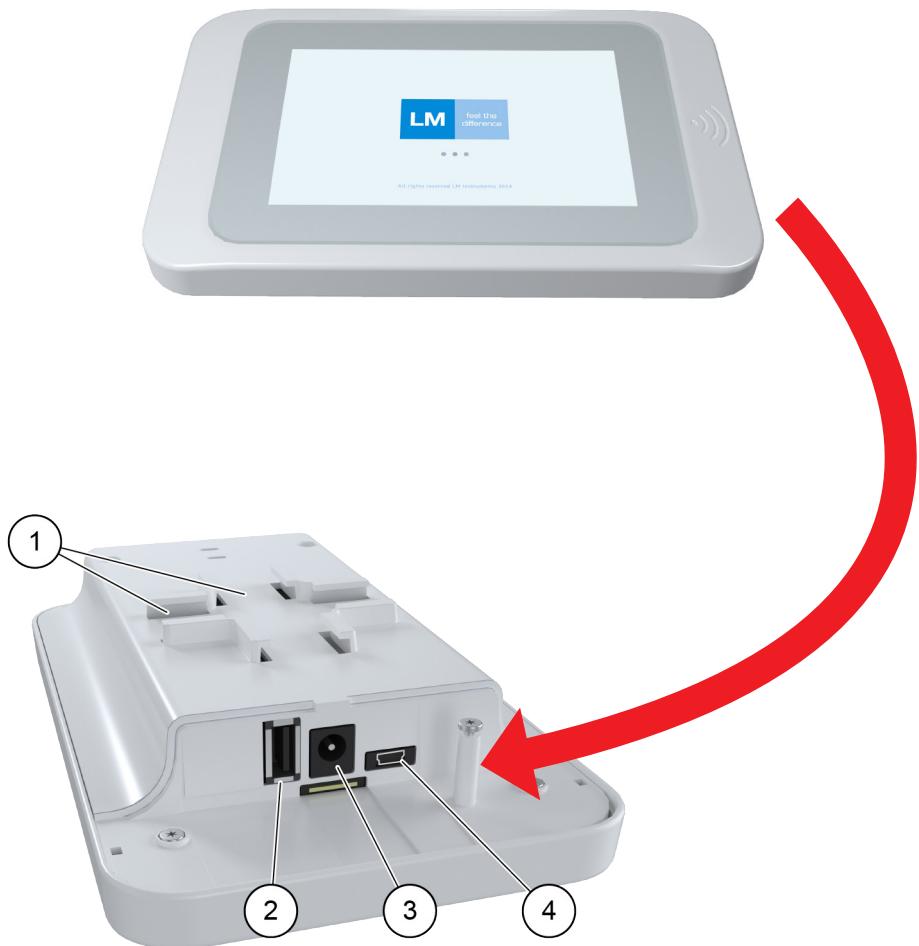
LM DTS™ unit reader's connection ports	
1	Slots for wall mounting bracket
2	USB Host port type A (only high-speed USB 2.0 cable may be used)
3	Power source cable port
4	HID port Mini-B (only high-speed USB 2.0 cable may be used)

4. INSTALLATION OF THE READER

4.1. Wall mountings

The unit reader

Determine the position of the reader on the wall and mark the bracket position. For the average person the recommended height for the bracket is ≤ 2000 mm from the floor.

Use 6 mm pan headed screws to fasten the bracket to the wall. Ensure the bracket is securely fastened to the wall.

Slide the unit reader onto the bracket so that the unit reader is positioned horizontally or vertically.

Vertical position

Horizontal position

Wall brackets
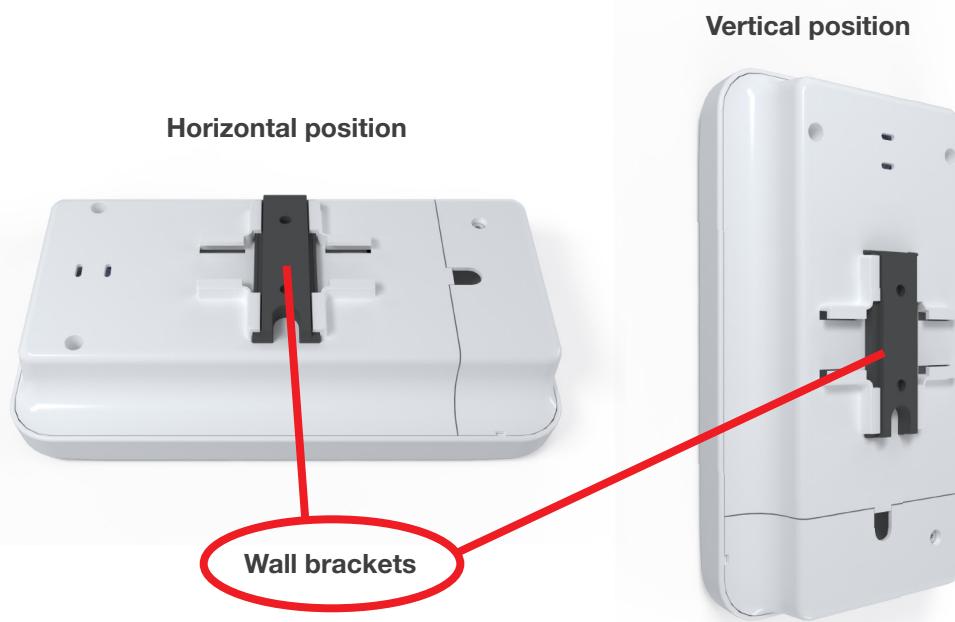
The tray reader

Determine the position of the reader on the wall and mark the screw positions. For the average person the recommended height for the screw is ≤ 2000 mm from the floor. Use 6 mm pan headed screws. Ensure the screws are securely fastened to the wall. Mount the reader on the screws. Admin user can flip the display for wall installation from the server, please see the Server user manual for more detailed instructions.

Screw holes

Note: The screws need to hold a minimum of 5 kg on the wall.

4.2. Power and ethernet

- Verify that the voltage rating shown on the base of the reader matches the voltage of the AC power outlet.
- Verify that the AC power outlet is provided with the protective ground.
- Connect the DTS Reader to AC power (110 V / 230 V) via the power cable or the Power over Ethernet (PoE) cable (PoE only available in LM DTS™ Tray reader, not supported in Prod Code 70010).

Tray reader

Unit reader

Ethernet cable port

AC power ports
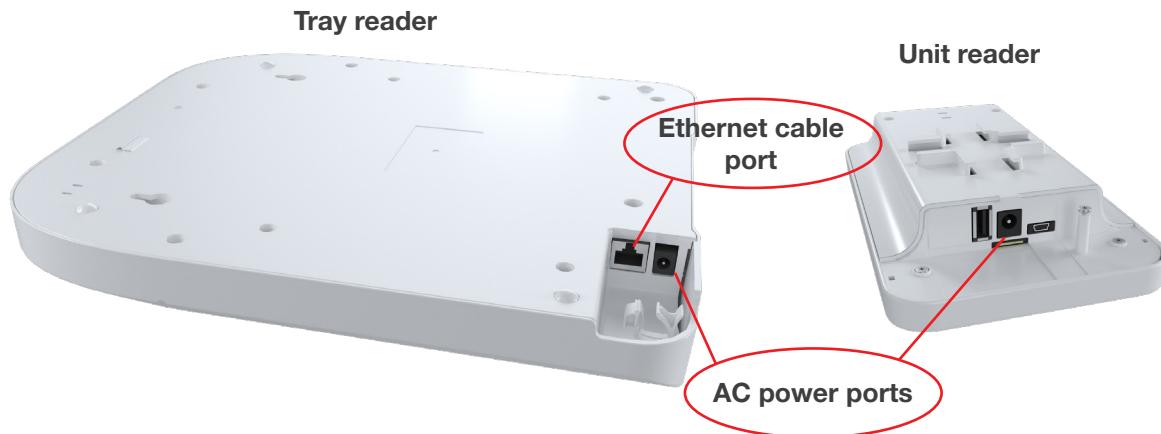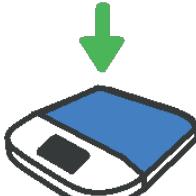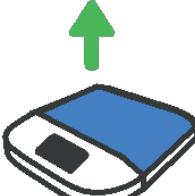
- After connecting the power check that the touch screen is turned on (Might take up to 30 s).
- The device starts and establishes a connection with the network automatically.

4.3. User interface of the reader
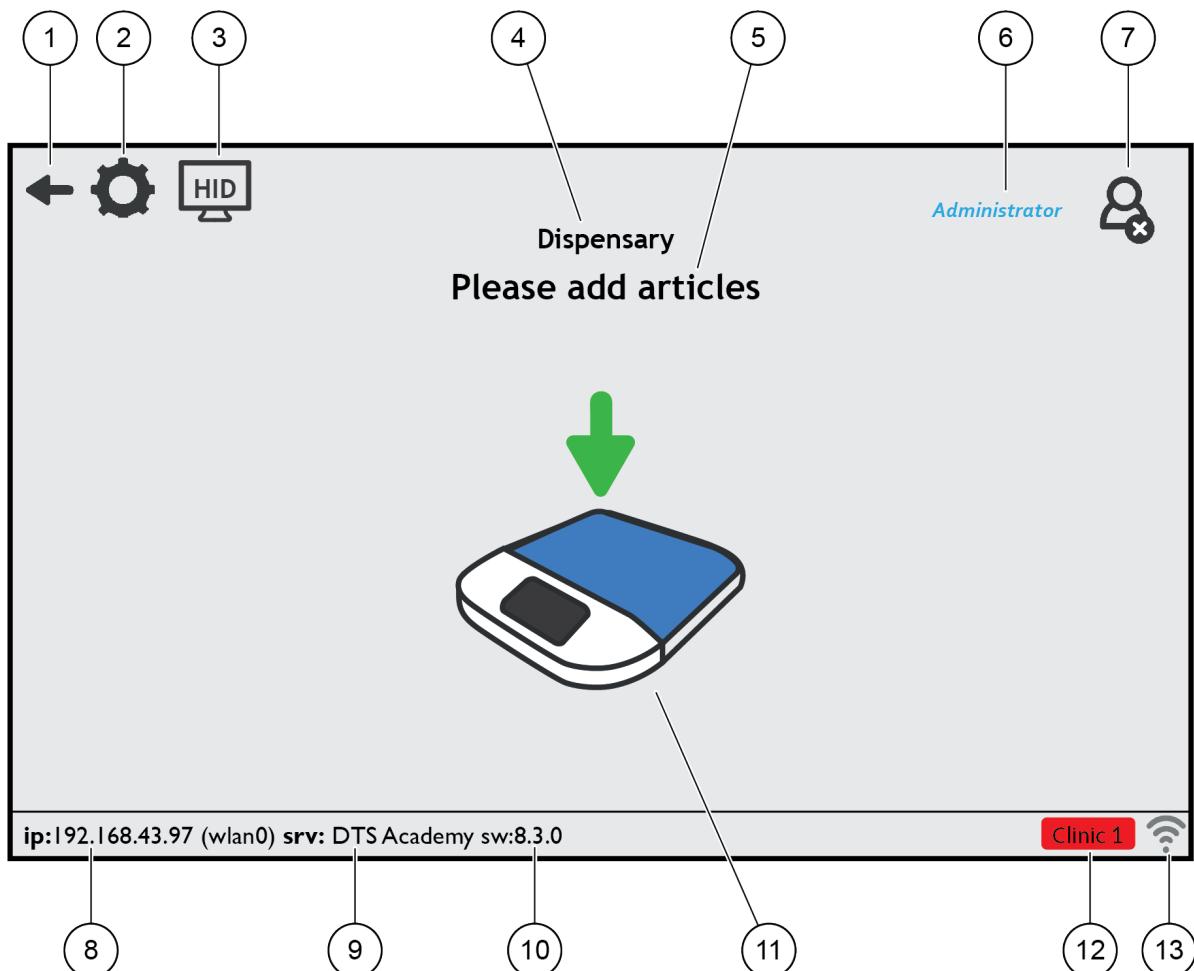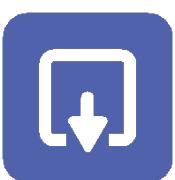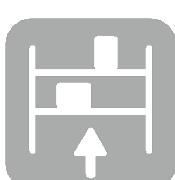
Touch screen view			
1	Back	8	IP address and connection type
2	Settings	9	Server which the reader is connected
3	HID mode	10	Reader software version
4	Info area	11	Main content area
5	Guidance area	12	Organisation
6	User name	13	Connection information
7	Log out		

Reader UI icons

Log out	Back	Green back	Settings/gear
HID - mode	Information	Note/Help	Connection
Card User	Successful	Warning	Error
Reader	Insert articles	Remove articles	Refresh
Instruments	Sets	Materials	Unknown
Encounters	Container	Insert articles	Waiting for encounter

Activity icons

Rinse	Washing machine	Autoclaving	Maintenance
Clinical use	Ultrasonic	Check-in	Check-out
End of life	Registering	Sharpening	Packing
Storage in	Storage out	Transport	Overlay exit
Example of exit overlay	Logging overlay	Cleaning	Bin out
Bin in			

4.4. WIFI and server setup

- Connect the keyboard to the USB ports located at the base of the readers.

- For WLAN connection turn on the LM DTS™ Reader by plugging the main plug into power outlet
- Press the "**Settings**" icon located on the upper menu bar of your touch screen.

- Fill the WI-FI name
- Optional security types
- » Contact your IT administrator for local information
- Fill the WI-FI password.

- Press "**Save**" to save the WI-FI connection settings
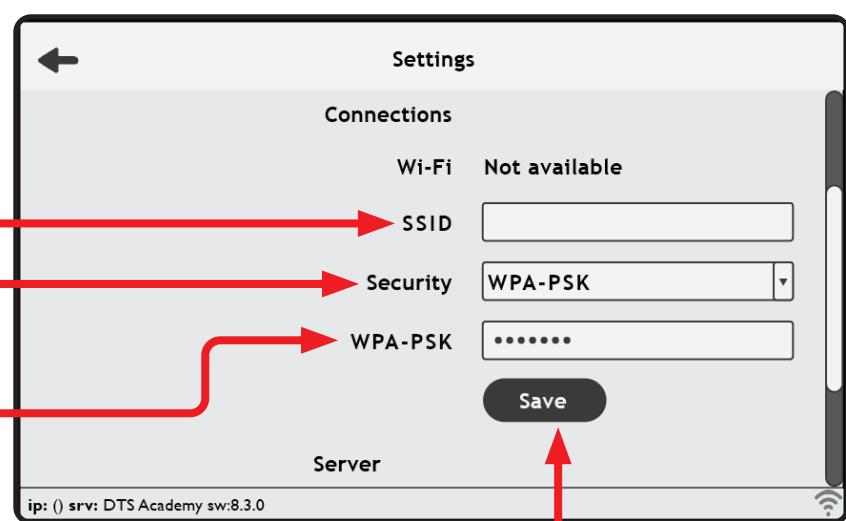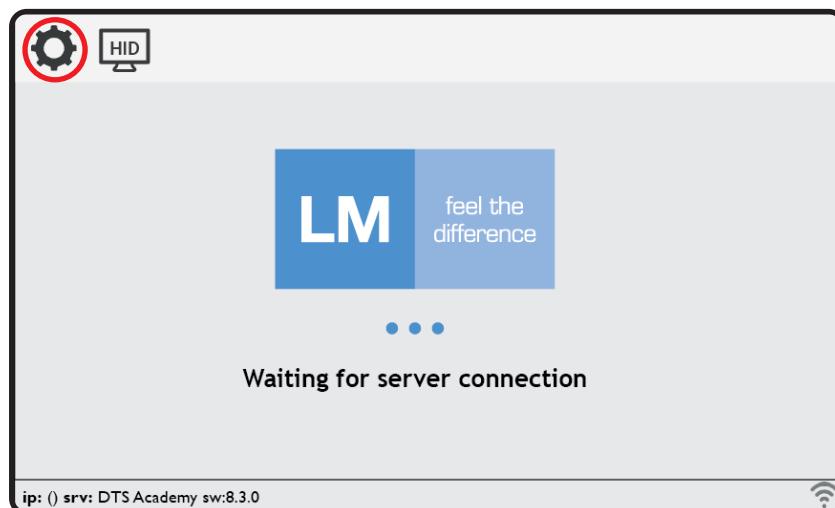
- Lastly, select your server from the Server drop-down menu. For server information contact your system admin.
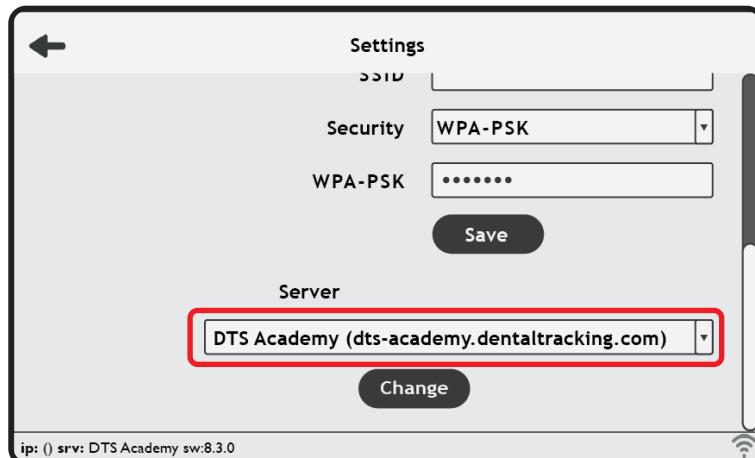
- Reader software is pre-installed. Software updates are delivered by LM-Instruments Oy when needed. Update might start right after first time connection to your server.
- If the WLAN connection has already been saved to reader, LM DTS™ application will be automatically started to login view.
- To login user needs to use a PIN code provided by the system administrator.
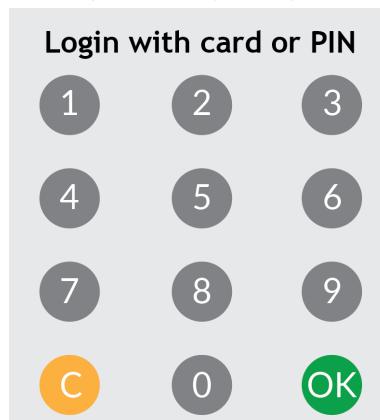
4.5. Reader device info

Press the "**Open**" button in "Device info" row to open the "Device info" window, which displays additional information on the device.
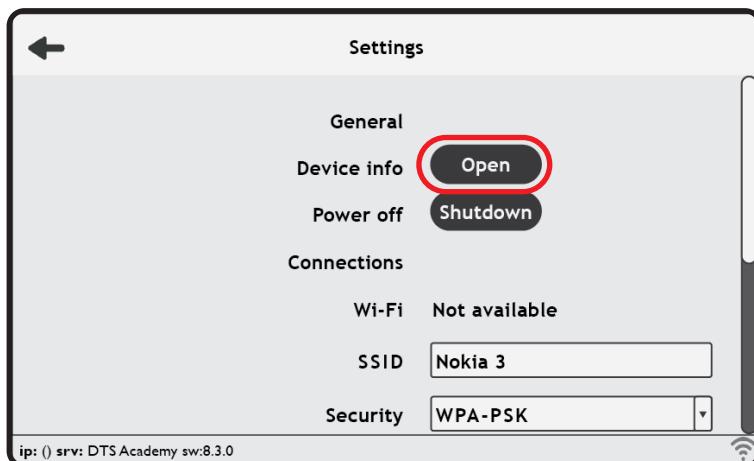
The information includes for example the device name, which comes from the server, and the HW ID, which is the device's individual ID.

Device info contains also MAC address (Ethernet or WiFi) details. MAC address info is needed if you are connecting LM DTS reader into the restricted network.

Needed details for firewall: Server's IP address, MAC address and port 443.
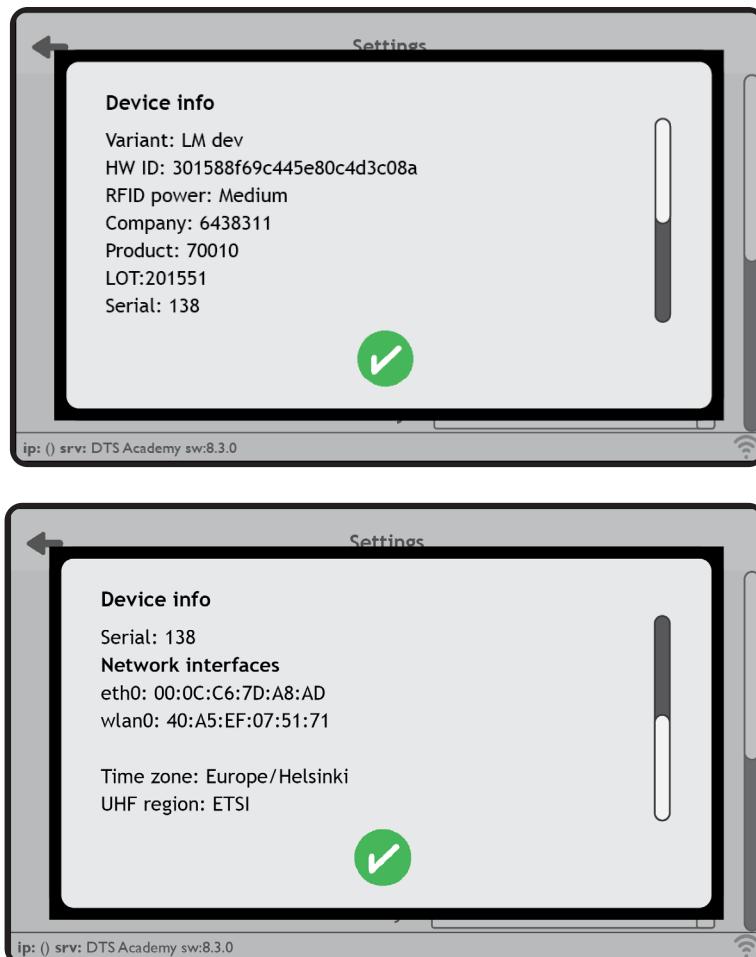
5. USING THE READER

5.1. First time use

The device is started by connecting the power cable, see the chapter "Power and ethernet". Before connecting, check that the cable and power source are intact.

When using the reader for first time the following warning message will appear to the reader screen:
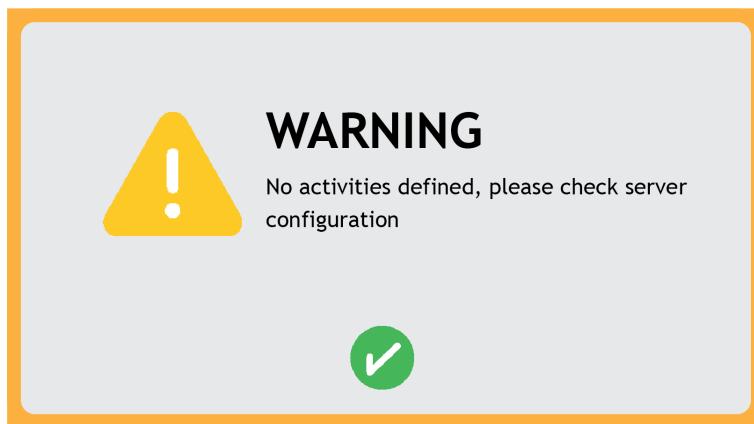
Press the green icon to acknowledge the warning.

The following display will appear to reader screen:

Define the activities to the reader from the server. You can define up to six activities for the reader. To define activities, please see the Server user manual for detailed instructions.

5.2. Normal use

Log in using a PIN code, using an RFID card, using a PIN code and an RFID card or using a PIN code or an RFID card, depending on the selected login policy.

If RFID is selected as the only login policy, you will only be able to log in using a card. Log in to the system by placing the card on the reader. If the id card does not support the UHF System, then external readers that are USB HID compatible can also be used for login.

After the log in the available activities will appear on the reader display. When the reader is configured for only one activity, its name will appear at the top of the display.
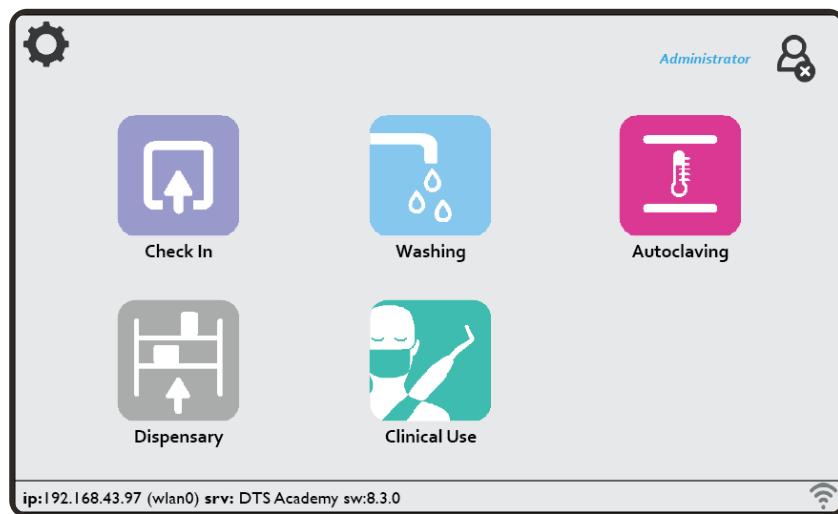
Select your desired activity and place the articles to be read on the reader. The reader will read the articles and state their amount.
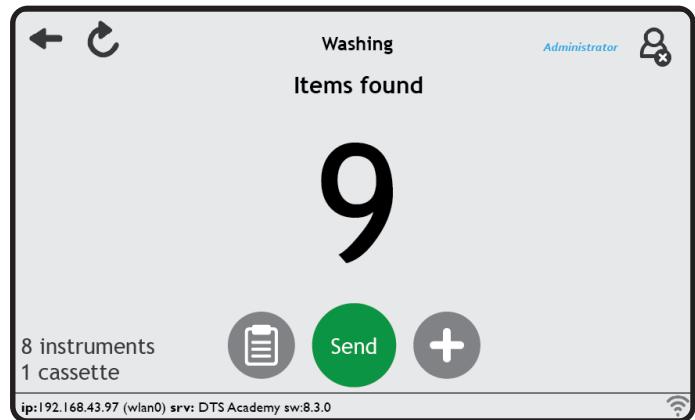
If the amount and item description on the left bottom corner are correct, press the "Send" icon. If they do not match, please see trouble shooting paragraph.

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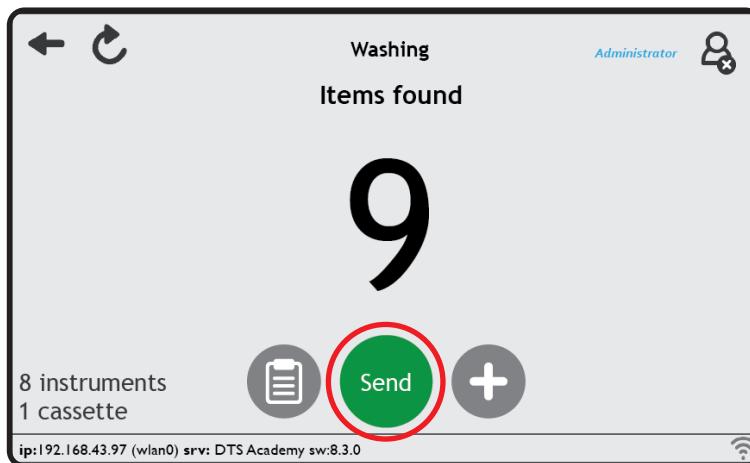
Remove the articles from the reader when it prompts you to do so. Once this is done, log out by pressing the "**Log out**" icon located on the upper right corner.

5.3. Technical references

Technical reference can be used to link scanned activity to external system e.g. patient health system or detailed autoclaving result logs.

Select the activity and scan. Press (+) icon on the reader's screen.
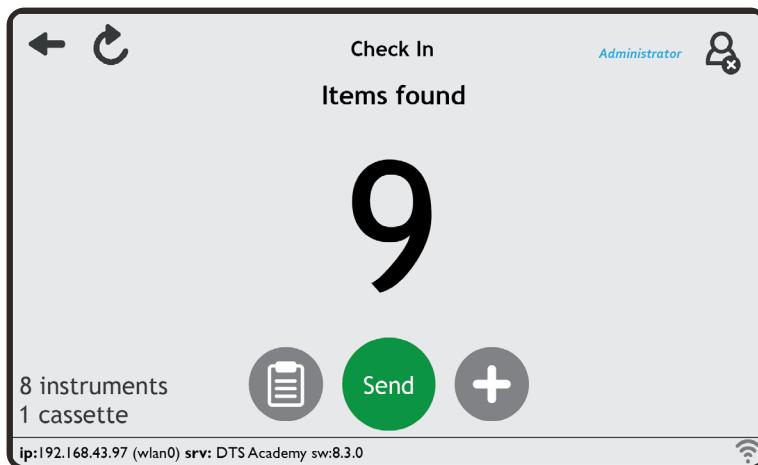
Scan external ex. barcode or QR code with barcode/qr-code reader. Press green icon to confirm technical reference.

Note: capital letters are not allowed with the technical references but special characters are.
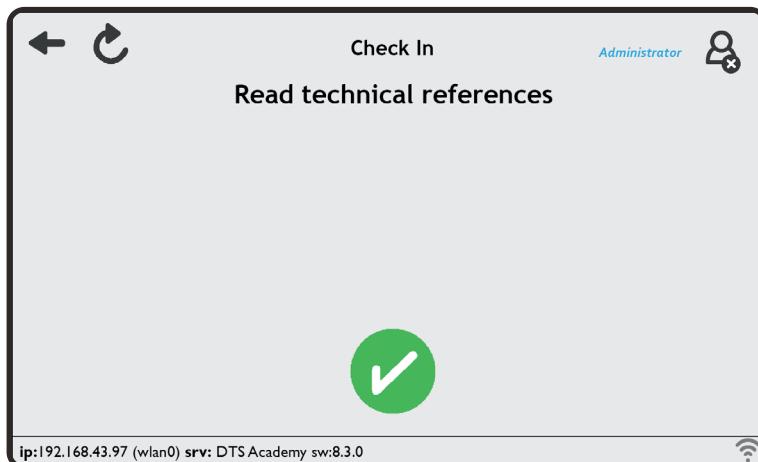
Press send. Technical reference information can be found from the log view.

5.4. Type Tag Logs

Article type identifier can be used to follow the inventory levels, how many articles the user is checking out from the storage. The identifier can be used if some of the clinic's articles are not unique RFID tagged (e.g. 100 cotton sticks or 50 rubber cloves).
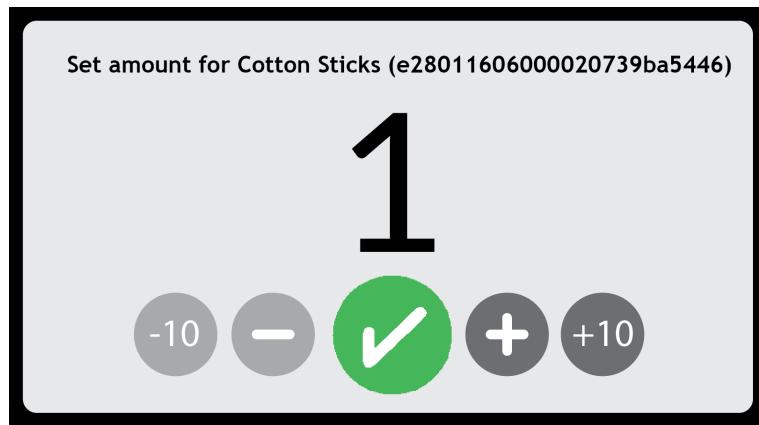
Select number of items by pressing + or +10.

Type tag logs scanning does not require any process to validate transactions.

Check from the Server user manual how to define identifier for the article type.

Encounter

"Encounter" is the feature to log which articles are used during the patient appointment at the clinic. The events can be link to the external patient management system.

See more information from the Server user manual and/or contact LM DTS™ support.

5.5. Information search

You can use the reader to find information on a set or instruments in the following manner:

If there are multiple activities, first select an activity on the reader, otherwise place the set on the reader. Press the "**Information**" icon.
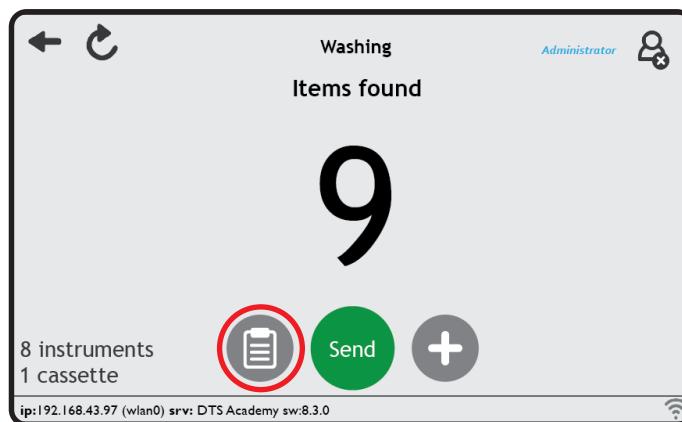
The instrument information will appear on the display.
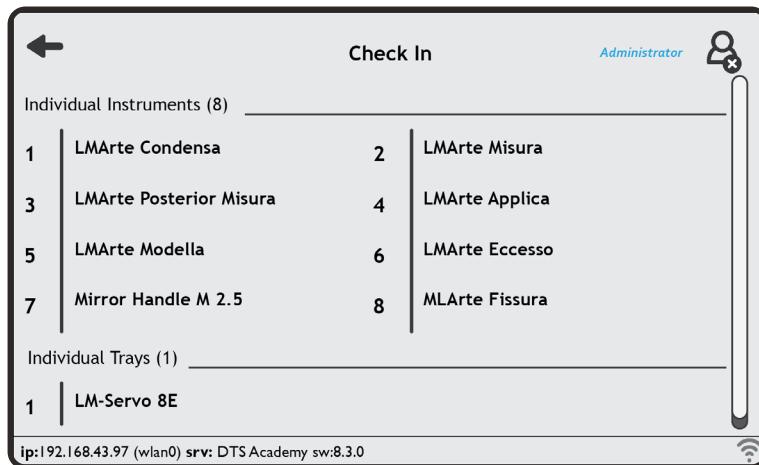
You can access more detailed information on each instrument or container by pressing on its name. Individual instrument or container information will appear on the display.
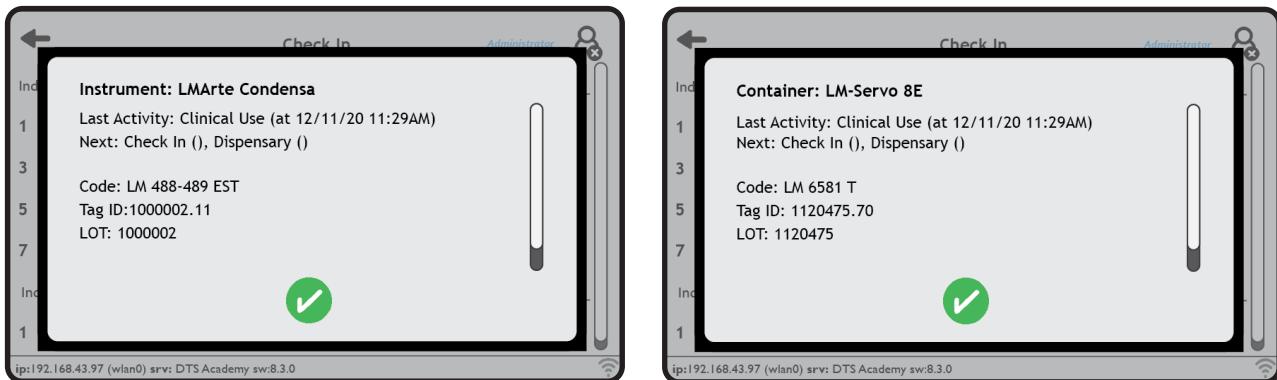
5.6. Reading articles with an auxiliary device connected to the reader

The system can also be used to track articles which do not have UHF RFID tags. An auxiliary device must be connected to the reader for this purpose. The auxiliary device may be a barcode reader/data matrix reader or an RFID reader using a different frequency. A USB keyboard may also be used as an auxiliary device for manually entering IDs.

In order for the auxiliary device to be used as an external reader, it must be USB HID compatible.

5.7. Reader HID mode use and adding new instruments and materials through the server

Tagging the items

An RFID (Radio Frequency Identification) system consists of three components: a scanning antenna and transceiver (often combined into one reader, also known as an interrogator) and a transponder, the RFID tag. The RFID tag consists of a microchip and antenna. The tag contains electronically-stored information which is read with a reader.

Any materials at a dental clinic can be connected to LM Dental Tracking System™ for tracking and monitoring by attaching stickers with built-in RFID tags to packages. There are different type of stickers for different materials and sizes of packages.

For cardboard and plastic packages, for example boxes of filling materials or implant packages the tag can be placed in any flat surface. Tag should not be bent or cut smaller, because it will reduce the read performance for the tag. Read performance is a key to reliable reading results. For tagging of packages made of glass or metal, or consisting liquids, it's recommended to place the package inside a plastic pouch/bag before tagging, while these materials will block the RF signal.

You can also tag a metallic instrument cassette with a special RFID tag.

Reader HID mode

When the reader is in HID mode, it is connected to a computer. To connect the reader to the computer you need a cable with one end equipped with a mini usb connection and the other with a usb connection. Connect one end of the cable to the reader's mini-usb port and the other end to the laptop's usb port. Below is shown the mini usb ports of the readers.

In HID mode, unknown articles, such as those from a manufacturer other than LM-Instruments Oy, may be added to the system through the server in the following manner:

Select HID mode by pressing the HID icon found in the upper left-hand corner of the reader display. Also, ensure that the reader is connected to the computer.
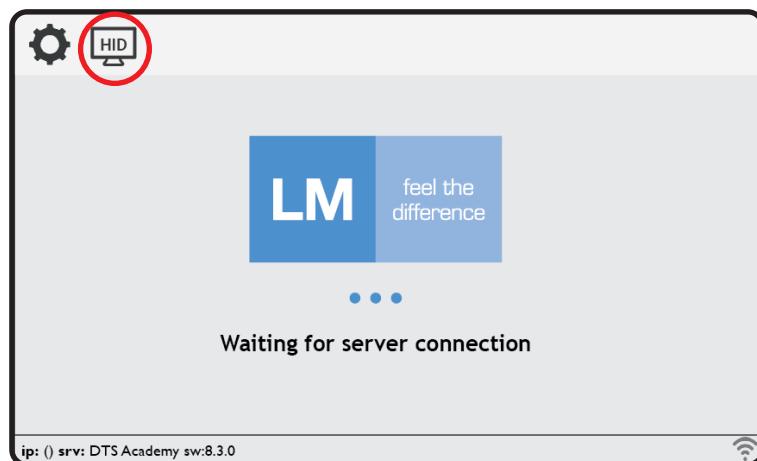
Adding the new items

Log in to the server and go to the Instruments, materials or containers view. Click on the "**Add**" ⊕ icon. This will open the "Add new" window. Activate the "Tag ID" field by clicking on it.
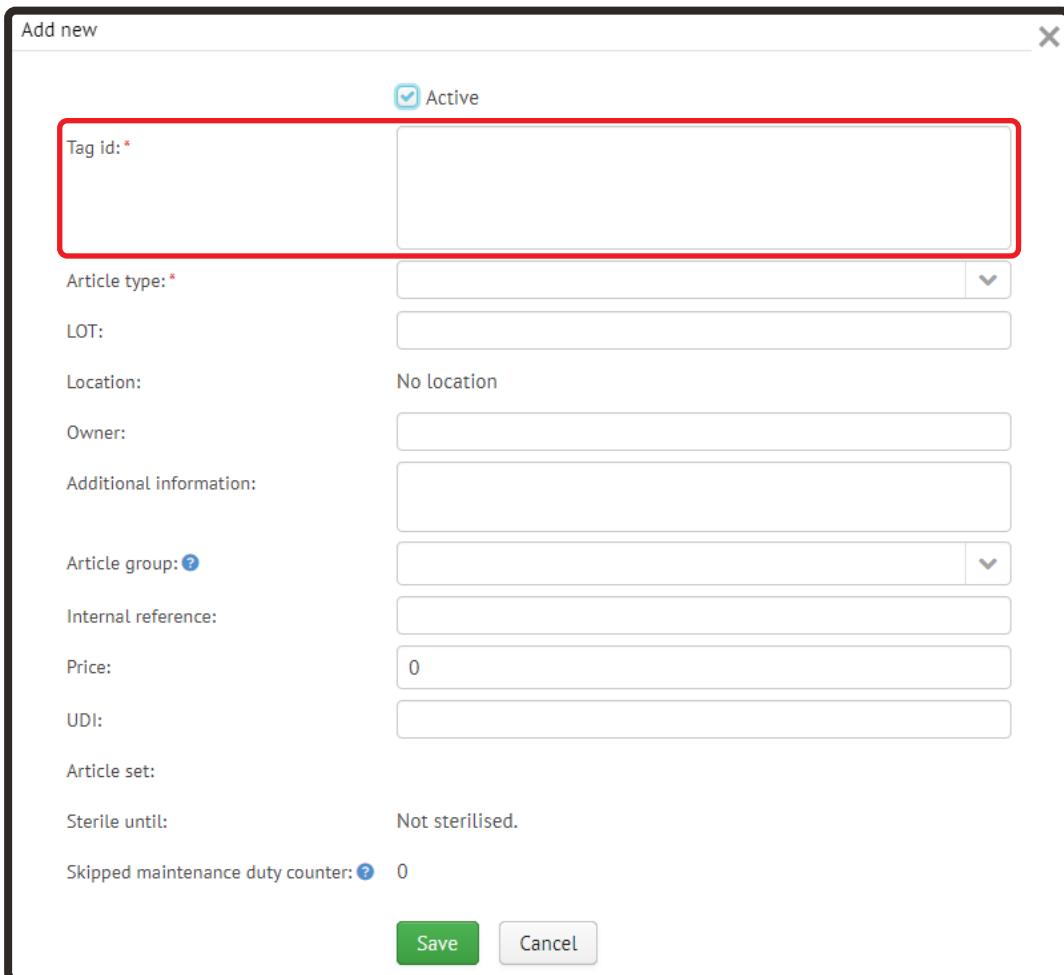
Place the article(s) belonging the on the reader. Notice that the articles must belong to same article type. The reader will display the number of articles it recognizes and the Tag IDs will appear in the Tag ID field.

Enter the required information in the other "Add new" window fields and then click on the "**Save**" button. This will close the window and the server will return to the Instruments, materials or containers view. The added instruments, materials or containers will now appear in the list.

Once this is done, you can take the reader out of HID mode and log in to the reader.

5.8. Registering the new items

A new item with LM instrument information will be registered with the reader by performing a start activity like "Registration". "Registration" activity needs to be one-off activity. This means that one rfid tag information can be scanned only once into the LM DTS™. Use only one specific registration activity to register all your new articles (LM-Dental, 3rd party and retrotagged) into the LM DTS™. You can register multiple items at once.

When a new LM instrument is read by the reader for the first time, reader shows "Unknown item" on the screen.
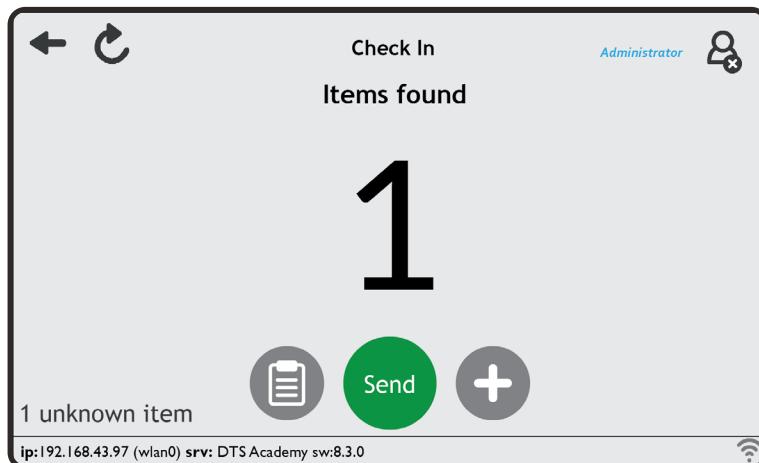
After completing the registration activity (Send), the instrument will be registered and follows the process which is defined for the certain article group. For retro-tagged instruments, refer to chapter "Reader HID mode use and registering new instruments through the server"

You can check to see whether the instrument has been successfully registered by re-reading the instrument after completing the first activity. Press the "information" icon to ensure that the instrument is no longer unknown

5.9. Shutting down the reader

The device is designed to always be on, but if it needs to be powered off, it is recommended to shut it down by pressing the "**Shutdown**" button in the settings menu.
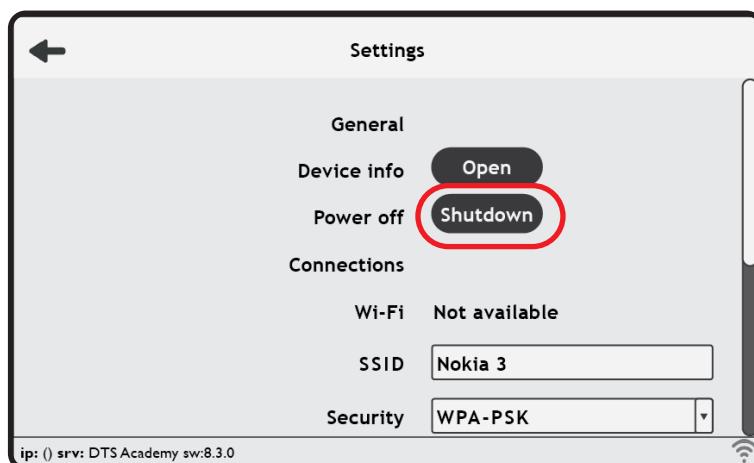
While the device shuts down, the color of the display varies. This is normal. When the display is off, the device can safely be disconnected.

6.   ACTIVITIES

There are three kind of activities;

Process activity

- Process activity is common activity for the processes.

- The activity is named based on the readers locations.

- Process activity can be for example "Registration" and "Autoclaving"

Logging only activity

- "Logging only activity" is for example "Cleaning". You need to just press cleaning activity icon in the reader's screen and it will store logs activity automatically without tag.

Independent activity

- Reset set activity
  » Reset set activity will unlink all linkages inside article set and assemble set (container, instruments and materials).

- Redefine set activity
  » Redefine set activity will change to content of Article set. It will remove or add articles into the Article set.
  » Administrator or supervisor credentials needed to execute redefine activity on the reader.

7.   ERROR SITUATIONS

7.1.   Error use case

When the reader issues an activity error notification, you will see which article the error concerns in the reader Info view.

If you have "Administrator", "Supervisor" or "Forcing user" level user rights, you can force the scanning result by pressing the "Force" button.

If there are any errors a popup screen will appear with the associated errors
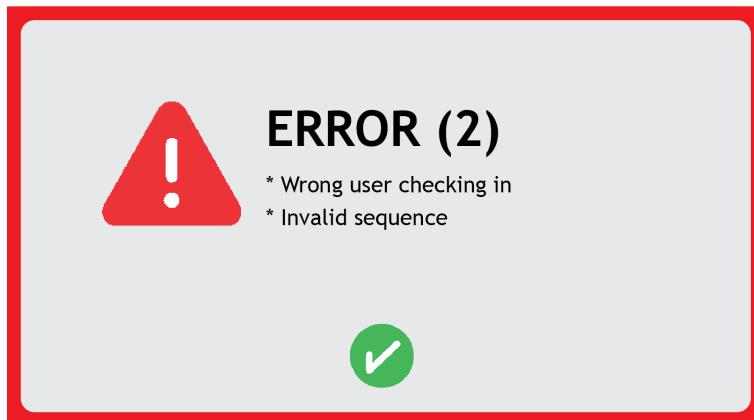
You can look at the errors in more detail by pressing the detailed view.
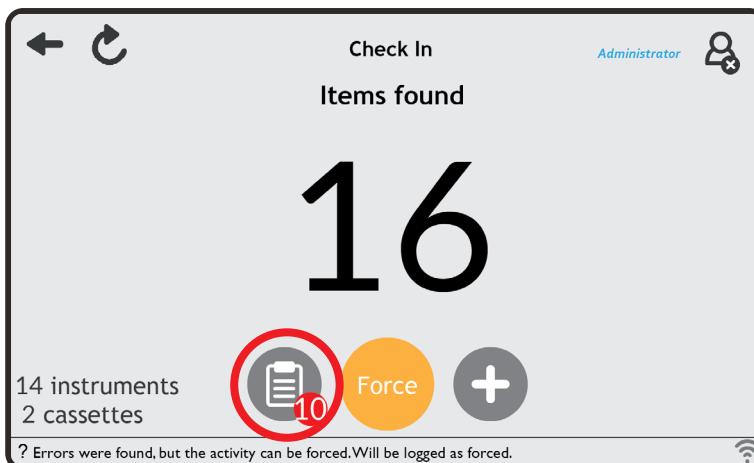
When the details view is pressed you will see the items that have an error in red.
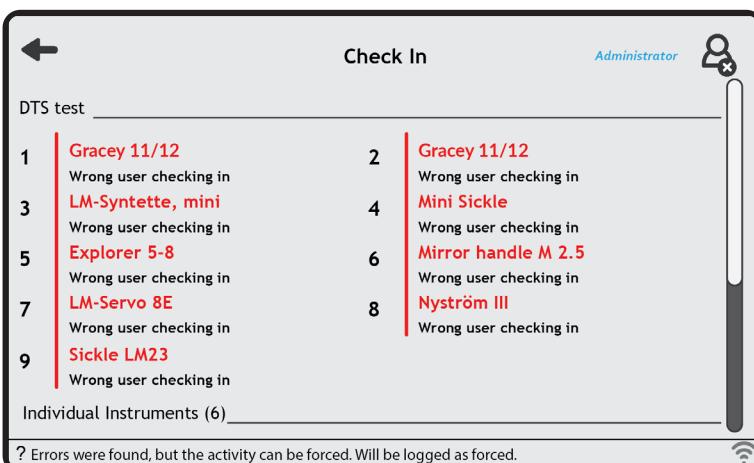
By pressing the red item you will get more information about the error.

Container: LM-Servo 8E

Last Activity: Clinical Use (at 12/16/20 1:47PM)
Next: Check In (), Dispensary ()

Code: LM 6582 T
Tag ID: 1120473.79
LOT: 1120473

Container: LM-Servo 8E
Code: LM 6582 T
Tag ID: 1120473.79
LOT: 1120473

Set: DTS Test

Error: Wrong user checking in
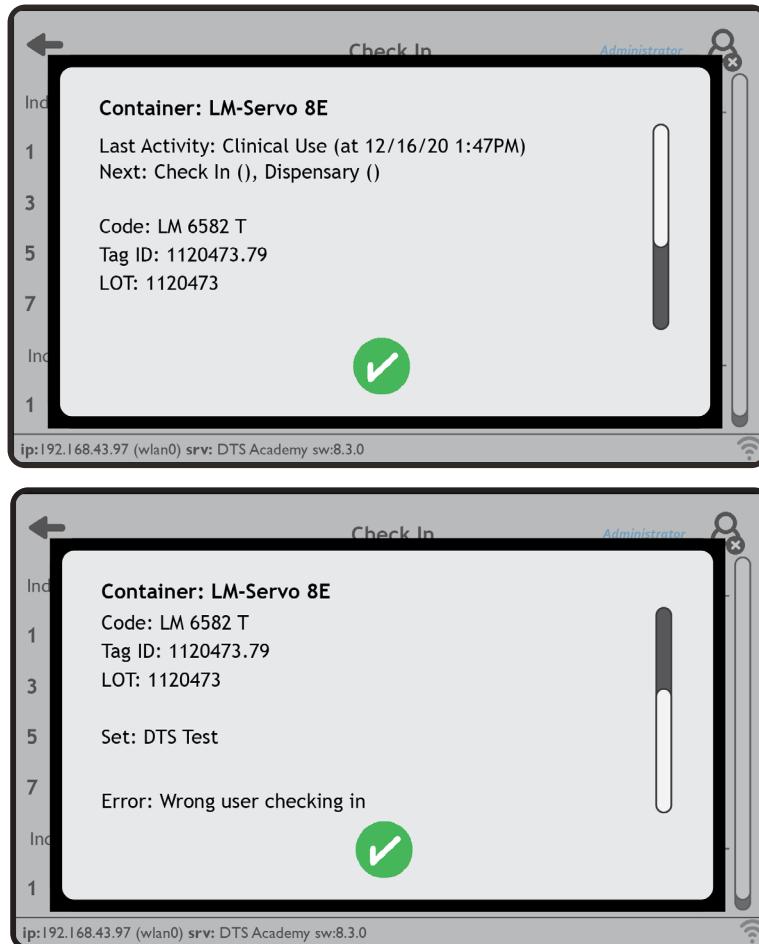
The error can be forced by pressing the yellow force button.

Check In

Items found

16

14 instruments
2 cassettes

Force

? Errors were found, but the activity can be forced. Will be logged as forced.
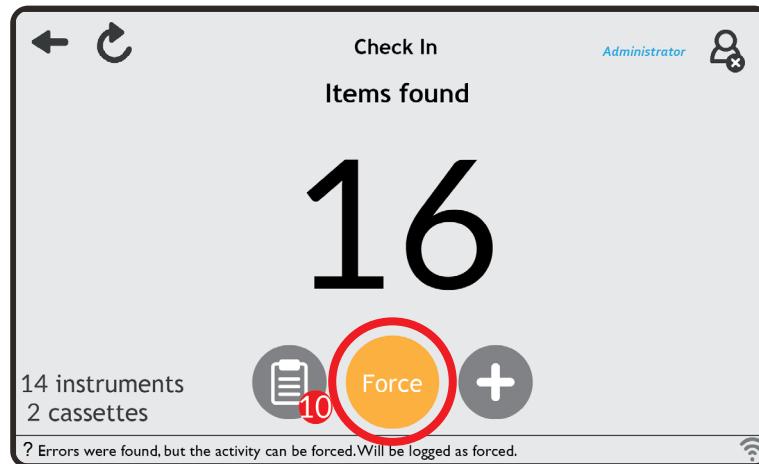
If the original person who logged in has an user access rights the reader will request a supervisor credentials to complete the force.
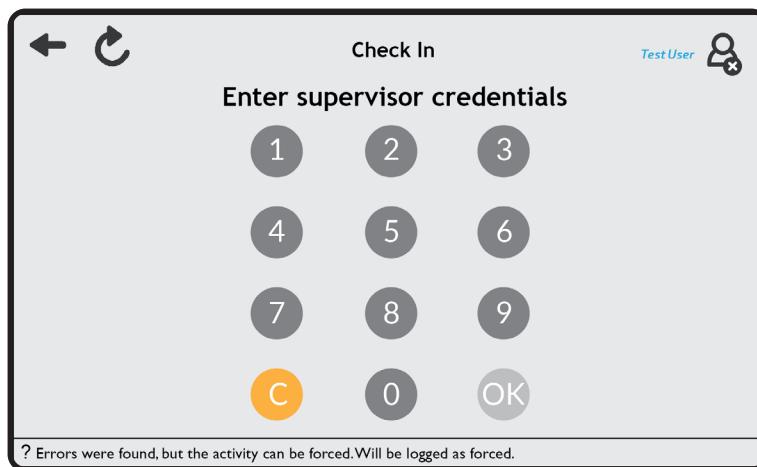
7.2.   Error descriptions

Already checked out
- Someone has already checked out same article(s) and article(s) have been taken into use.
- You can check from the reader's info screen which articles caused the error.

Article disabled
- Item is disabled: no further readings possible.
- » Activate article (instrument, material or container) again in the article view on server UI.

Article expired
- Article expiration date is expired. You can check from the server or reader's info screen when the article has expired.

Article in another assembled set when assembling set
- Articles which you are trying to assemble into the assembled set have already been assembled with another assembled set container.
- » Check from the reader's info screen which article(s) are part of the another set and disassemble article(s) from assembled set or remove article(s) from your current assembled set.

Assembled set assembled without assembled set container
- Assembled set container missing when creating the assembled set.
- » Use the assembled set container when creating the assembled set. If the assembled set container does not exist create a new one in the container view in server UI.

Assembled set assemble with multiple assembled set containers
- Only one assembled set container is allowed when assembling the articles.

Assembled set disassemble with multiple assembled set containers
- Only one assembled set container is allowed when disassembling the articles.

Assembled set disassemble without assembled article set
- You are trying to disassemble articles which are not part of the assemble set or some of the articles from the assembled set are missing when disassembling the set.
- » Use the complete assembled set (all assembled articles which are belonging to that set) when disassembling.

Encounter id given for ignore encounter activity

- Someone changes the activity status to "ignore encounter" when encounter has been activated on the reader and user is logged in and try to scan articles thought the same activity.

Encounter not enabled for reader

- Encounter policy has been disabled from the reader when user has been logged in the reader.

Forbidden activity

- Forbidden activity for the article. Activity does not belong to process of scanned article.

Incomplete set content

- » Read the full set.

Article Set:

- The set must have exactly the same article tag ids as defined in the article set view or redefine activity on the reader. Example: Error occurs if one article is missing or it has been replaced by another same kind of article.

Assembled Set:

- Container tag is missing when scanning the assembled set through the selected activity.

- » Check from the reader's info screen which article(s) are missing or are not part of the set and try to find the expected article(s) from the clinic.

Incomplete set content when disassembling set

- All the articles which are belonging to the assembled set need to be part of the scanning when disassembling.

- » Check from the reader's info screen which article(s) are missing or are not part of the set and try to find the expected article(s) from the clinic.

Incomplete template set content

- » Read the correct template set. Make sure that the template set which you are scanning contains the correct amount of the specific articles (article codes). Template sets are defined in template set view in server UI.

Incorrect PIN code

- Contact admin if you have forgotten your PIN code.

Invalid user

- The user who has logged in has been deactivated.

- » Activate the user before the next login.

Invalid sequence

- Previous activity does not allow this activity.

- » Check from the process or reader's info screen which was last activity, and which is the next allowed activity in cycle. It might be that some important steps are skipped in the process and the articles need to be returned to e.g. washing or autoclave.

Material already used

- Quantity of material is 0. Item has been already checked out for Clinical use.

- » Return the item to "Check in" activity if it is not used.

No process defined for the article

- » Create default process or specific process for the needed article group.

No process start activities defined

- Process does not have any start activity defined

- » Define the starting activity for the selected process in the process view on server UI.

Not a supervisor
- Person with the "User" access rights cannot force the error cases on the reader. "Administrator", "Supervisor" and "Forcing user" have the forcing rights to handle the error cases.

One-off activity already executed
- Item has already been registered into the LM DTS™.
- » Scan item through the next available activity in process flow. Check from the process or reader's info screen which is the next allowed activity in the process cycle.

Repeating of activity not allowed
- You cannot scan twice in a row through the selected activity.
- » Check from the process or reader's info screen which is the next allowed activity in the process cycle.

Sterile expired
- Instrument or container sterile period has expired.
- » Perform the sterile activity to sterile articles. You can check from the server or reader's info screen when the sterility has expired.

Unknown item (not registered)
- Article(s) tag ids are not added to the LM DTS™ yet.
- » After the articles has been added to the LM DTS™ from the server UI then scan through the register activity.

User not allowed to check out more articles
- » User needs to check in or deactivate articles. Admin can also unblock/edit blockage of user and after that check out is again possible for user.

Wrong user check in
- Same person needs to check in / check out articles if option is defined to process.
- You can check from the reader's info screen which articles caused the error.

In case of the following errors the "Force" button is disabled and the errors cannot be forced.
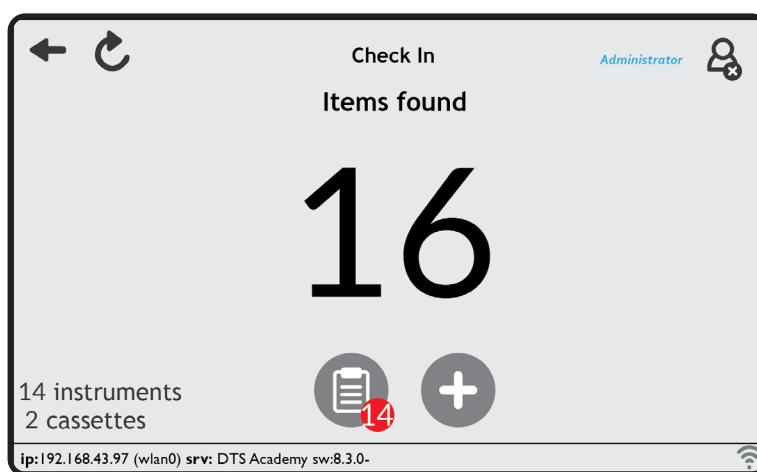
Forbidden activity
- Forbidden activity for the article. Activity does not belong to the process of the scanned article.

Redefine set - ? No set found, cannot redefine set
- Use LM DTS™ Server to add at least one tag id manually into the article set.

Error codes

Error code 1

- DTS Azure Server unavailable.
- » Please contact to LM DTS™ Support to fix LM DTS™ server issue.
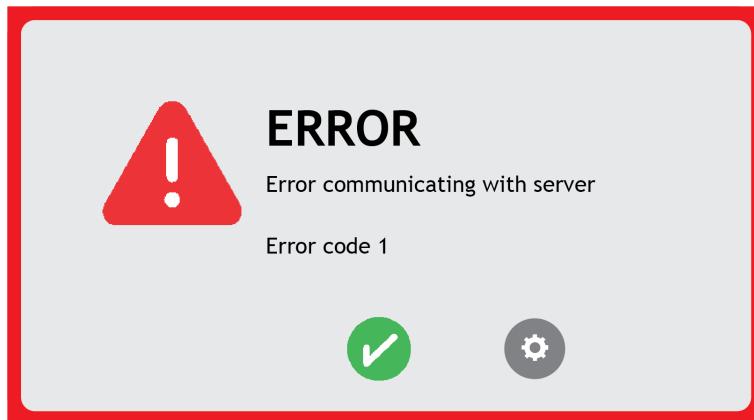
Error codes 2, 3 or 4

- Internal network issues.
- » Please contact your IT-department to check network connections.
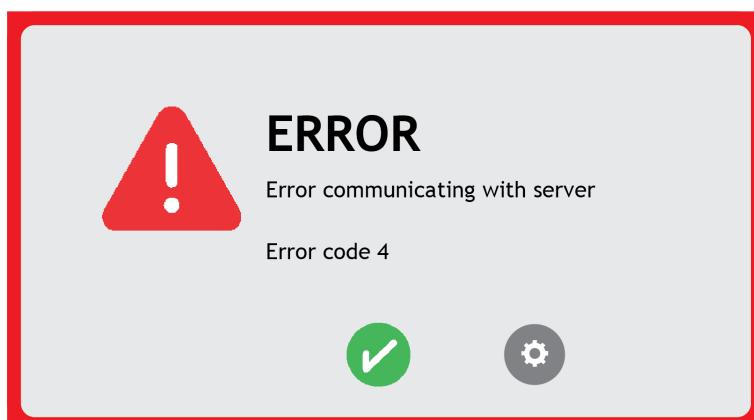
7.3. Warnings

Warning messages appear on the display in a yellow-bordered box stating the reason for the error/alert warning. Warnings can be acknowledged also with user access rights.
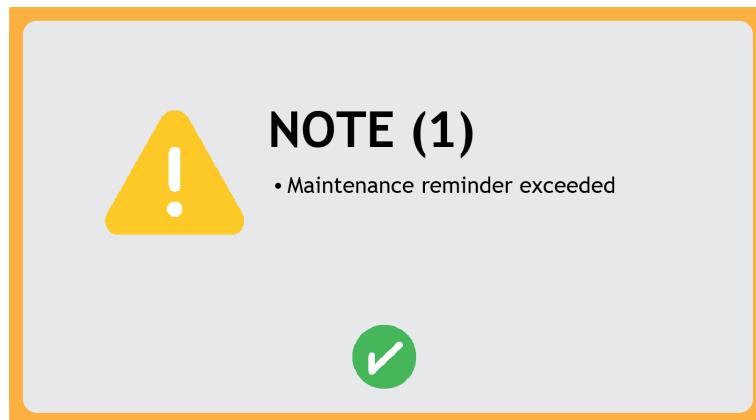
The reader may issue warning messages concerning maintenance reminders or if no activities were defined.

Maintenance reminder exceeded
>> Go to maintenance activity to reset maintenance counter.

No activities defined
>> Check the server configuration.

8. CLEANING AND MAINTENANCE

8.1. Recommended cleaning procedures

Reader:

Turn off the reader and disconnect the power supply before cleaning the LM DTS™ Reader. Clean with a soft cloth and if needed, use a ≤ 20% ethanol-based surface disinfectant or ≤ 70% isopropyl alcohol (IPA) disinfectant suitable for cleaning hard plastics.

Tray reader silicone mat:

All cleaning and maintenance procedures meant for LM™ hand instruments can be used with the silicone mat as well. For instructions for maintenance please visit www.lm-dental.com.

Do not use disinfectants including amines!

Before use:

If needed, clean the reader and the silicone mat with above mentioned methods.

Avoid using detergents near connectors, however, detergents maybe used to clean the display screen.

Water/liquid drops on LM DTS™ Readers display will disable the touch, thus ensure to wipe the display screen dry.

8.2. Maintenance

For maintenance related issues please contact LM-Instruments Oy.

Please note if the seal in the back of the reader is broken the warranty is no longer valid.

9. TROUBLESHOOTING

9.1. Network failure

If the network connection is lost, the reader will notify you of the error. If this happens, record the content of the error notification and the error code and then contact the administrator. The administrator may ask for information on the error notification, as this information can be helpful in pinpointing the error.

On the server, the reader status will be listed as being disconnected. This information will appear under Status.

The error will be displayed on the server after no more than a two-minute delay.

9.2. Reading the incorrect amount of the RFID tags

In case you face problems getting the correct amount of read tags, you can move or shake the cassette slightly to get more robust reading. If you constantly get larger amounts than you place on the tray, please see the DTS tray reader surroundings for any additional RFID tagged items. Note that some large tags can be read from a as far as 3 meters away in special circumstances.

10. TECHNICAL DATA

LM DTS™ Reader	
Manufacturer	LM-Instruments Oy, Norrbyn rantatie 8, FI-21600 Parainen, FINLAND
Model	LM DTS™ Tray Reader
	LM DTS™ Unit Reader
W x D x H	310 x 340 x 55 mm (12,20 x 13,39 x 2,17 in) (LM DTS™ Tray Reader)
	180 x 110 x 32 mm (7,09 x 4,33 x 1,26 in) (LM DTS™ Unit Reader)
Weight	2.1 kg including power supply and silicone mat (LM DTS™ Tray Reader)
	500 g including power supply (LM DTS™ Unit Reader)
Mains input voltage	100-240 V ±10%
Mains input frequency	50-60 Hz
Mains input current	0.6 A
Mains output voltage	12 V
Power consumption	12 W

Statement of the range of environmental conditions	
Storage temperature range	0 °C to 50 °C
Operating temperature range	10 °C to 35 °C
Relative humidity range:	10% to 85%
Altitude	<2000m
Rated pollution degree	II

RFID specifications	
Frequency band	865.6 - 867.6 MHz (ETSI)
	917.1 - 926.6 MHz (FCC)
RFID technology	EPC Gen2 UHF multi-tag reading
RFID capability	ServoMAX tray (DIN13999 184 x 285 mm)
Power output	Max 27dBm (EIRP)
	• High 23dBm
	• Medium 20dBm
	• Low 17dBm
Modulation	PR-ASK
Antennas	Tray Reader: Linearly polarized antennas mounted at various angles
	Unit Reader: Custom high-performance omnidirectional PCB

Display	
Size	5"
Resolution	800 x 480 pixels
Touch screen	Capacitive touch screen with Meet AGC 6H Glass
Protection against electric shock	Class III equipment
Classification of applied parts	No applied parts

Safety requirements for electrical equipment for laboratory use:

The Tray Reader and Unit Reader has been tested according to the requirements of IEC 61010-1 + A1 including the national deviations for Canada and USA.

This device complies with Part 15 of the FCC rules, Industry Canada's license-exempt RSS Standard(s) and EU Directive 2014/53/EU.

1. This device may not cause harmful interference, and

2. This device must accept any interference received, including interference that may cause undesired operation.

11. SYSTEM GLOSSARY

Activity

An activity can be performed on individual articles or article sets. Activities are usually part of one or more activity processes, but they can also be configured without a process.

Article

An article is a taggable dental instrument, material or container. A tag is an identifier, which can be e.g. RFID, barcode or some other unique identifier.

Article group

Articles can belong to only one article group. Groups are used to separate different types of articles, e.g. diagnostic and restoration instruments. Article group is automatically created for LM product but needs to be created 3rd party tagged products manually.

Article type

Article type contains code, type and manufacture details of article. Article type is automatically created for LM products but needs to be created 3rd party tagged products manually.

Article type identifier

Article type identifier used only with the type tag log feature. The identifier defines the article type (e.g. barcodes) if some of articles on the clinic do not have unique RFID tag.

Check out restriction

Restrictive process definition which limits for the articles being checked out by a user group. Checkouts within the grace period are not counted towards the limit.

Container

A container is a cassette. Use of instrument cassettes provides an efficient and safe way to process, sterilize and organize instruments in dental clinic by minimizing manual handling of individual instruments and rationalizing the maintenance process.

Container can be also e.g. requisition sheet when tracking article set of materials.

Encounter

Patient appointment at the clinic.

Encounter policy

The policy defines how to link between LM DTS™ and external patient treatment system is generated.

Error

If a process is set for a group and an activity is performed in violation of the process rules, errors will be displayed on the reader. Most of the errors can be forced. However you have to be at least "forcing user"-level user to force the error.

HID mode

When the reader is in HID (Hardware Interface Device) mode, it is connected to a computer. In HID mode, unknown articles, such as those from a manufacturer other than LM-Instruments Oy, may be added to the system.

Instrument

An instrument is the most typical type of article.

Location

Place where the reader is located.

Material

A material has the same attributes as an instrument, with quantity and expiry date as additional properties.

Organisation

Organisation will be taken into the use if same activity needs to be used several times in the same process.

Process

A process can be set for each article group. A process is an ordered list of activities which need to be executed for an article. Activities can be configured to be executed only once and marked as required or optional. Activities not part of a process are thus not allowed for articles belonging to the group, except in activities without a process.

You can define many options for the process, e.g. "maintenance reminder" or "sterile expiration". When a maintenance reminder is set for a process, skipping that activity a set number of times will result in a user warning. When the sterile expiration is set for an activity (usually autoclaving) in a process which validates the sterility, the next non-sterile activity will give the error message if the time limit for the "sterile expiration" is exceeded.

Reader

A reader is an UHF (Ultra High Frequency) RFID (Radio Frequency Identification) (Gen2) reader device which communicates with a server. A reader needs to be configured for allowed activities which can be performed on it.

Table and unit readers are available. A table reader is meant for multi reading, while a unit reader is meant for reading one article at a time.

Reading transaction

Reading transactions are stored centrally on a server. A reading transaction contains for example the information of the date and time of the reading and which activity was performed.

Server

Communicates with the readers. Logs activities and e.g. verifies activity processes. All communication is initiated by the reader, i.e. the server can only send information to the readers as responses to messages from the readers.

Sets

Article set

An article set contains individual (tagged) articles. Once set for an article, all activities must contain all articles from a set. A process can disable the set enforcement for some (optional) activities.

Example:

A set can contain cutting and non-cutting instruments. The process for the cutting instruments includes a sharpening activity, which is not applicable to the non-cutting instruments. In this case, the set enforcement can be disabled for the sharpening activity, as it cannot be performed on all the instruments in the set.

The container (cassette) of a set can be tagged, in which case the cassette must also remain the same. This is optional.

Template set

Defines a set of instruments, identified by the instrument code and quantity. A template set can be thought of as a "loose" set. Set enforcement disabling applies to template sets the same way as normal sets.

A tagged container should be defined for a template set. Alternatively, the user can define one template set without tag. This means that then each reading must match the content of the defined set without a tag.

Assembled set

Assembled set can contain articles (instruments, materials or containers) Container needs to specify as an assembled set container. Assembled set is created according to the process in Assemble activity and disassemble in Disassemble activity on LM DTS tray reader.

Technical reference

Technical reference can be used to link scanned activity to external system.

Type tag log

Article type log can be used if some of the clinic's articles are not RFID tagged when following the inventory levels.

UDI (DI)

The UDI-DI is the device identifier. It identifies a specific device on your portfolio.

Users

Local user management is supported. Users are divided into four different groups according to the user rights.

User groups

User

- Reader: Can perform normal activities. Cannot force the error codes.
- Server: Can view information. Users view: Can only edit own information, cannot change user group.

Forcing user

- Reader: Can force certain process error codes.
- Server: Can view information. Users view: Can only edit own information, cannot change user group.

Supervisor

- Reader: Can force certain process error codes.
- Server: Can add/edit instruments, materials, containers and locations infomation. Users view: Can only edit own information, cannot change user group.

Administrator

- Reader: Can force certain process error codes.
- Server: Full access on server. Can edit and remove all the information on user interface.

Warning

Warnings can be occurred if activities have not been defined to the reader or maintenance limit is exceeded (defined in process). Warning related to maintenance reminder does not prevent the performing of an activity.

12. WARRANTY TERMS

The following warranty terms apply to the sale of LM-Instrument Oy's products (hereinafter "Products") to a purchasing company or individual by LM-Instruments Oy (hereinafter "LM").

LM hereby warrants that the Products will be free from defects arising from faulty materials or workmanship for a period of twenty four (24) months from the date of purchase by a customer from LM's authorized dealer (hereinafter "Authorized Dealer"). The warranty period is exceptionally three (3) months for products with a life inherently shorter than 24 months due to normal wear and tear (for example tips of hand instruments, tips of ultrasonic scalers, tips of endodontic files, front surface mirrors and grinding stones of sharpening devices) and for RFID tags to dental instruments manufactured by third party manufacturer (hereinafter "Third Party").

This warranty shall not apply to Products or parts thereof;

    a. which have been subject to abuse, misuse, negligence or accident or are not connected to proper power supply,

    b. to which any modification, alteration or attachment has been made without written consent of LM or

    c. which are installed or operated violating instructions for installation, use and maintenance.

End-user is entitled to install RFID tags to dental instruments manufactured by Third Party. When installing RFID tags to the dental instruments manufactured by Third Party (hereinafter "Instruments"), end-user is liable to check warranty terms and product information of the Instruments to ensure that instalment does not have adverse effect to Instruments or to the terms and conditions applied between end-user and its suppliers. End-user shall install RFID tags to Instruments or get those installed by LM or other party at its own risk. LM shall not be liable for any damages accrued due to the instalment of RFID tags to Instruments. This limitation of liability does not apply in respect of damage caused by

    a. negligence of LM when installing the RFID tags to Instruments,

    b. RFID tags defective at the time of delivery to end-user or

    c. to personal private property, or personal injury or death.

The sole and exclusive remedy under this warranty shall be limited to correct or circumvent the errors or to repair or replacement of defective parts of Products, EXW LM's factory, providing that a written claim of the defect is sent to LM within the warranty period and the original part is returned to LM's factory by the Authorized Dealer, and LM's inspection establishes the existence of such a defect.

The end customer must contact the Authorized Dealer from whom the Products were purchased to request repair or replacement under this warranty and a written claim of the defects and send the original Product to the Authorized Dealer. This warranty is void if service or repair is performed by persons not authorized by LM.

Any products not manufactured by LM, carries only such warranty, if any, as given by any manufacturer thereof.

This warranty is the LM's only warranty in respect of the Products and LM disclaims all other warranties, whether of merchantability, fitness for particular purpose or otherwise, guarantees and liabilities, express or implied, arising by law or otherwise. In no event shall LM be liable for any general, consequential or incidental damages, loss of use or loss of profits by reason of LM's negligence or otherwise in connection with the sale, delivery, installation, repair or use of the Products.

LM shall have no liability whatsoever to the Authorized Dealer or end customer or any other person for or on account of any injury, loss or damage of any kind or nature, sustained by, or any damages assessed or asserted against, or any other liability incurred by or imposed upon the handling, use, operation, maintenance or repairs of Products by anyone other than LM. This exclusion of liability does not apply pursuant to the laws on product liability in case of personal injury and property damage to privately used objects resulting from the Products.

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