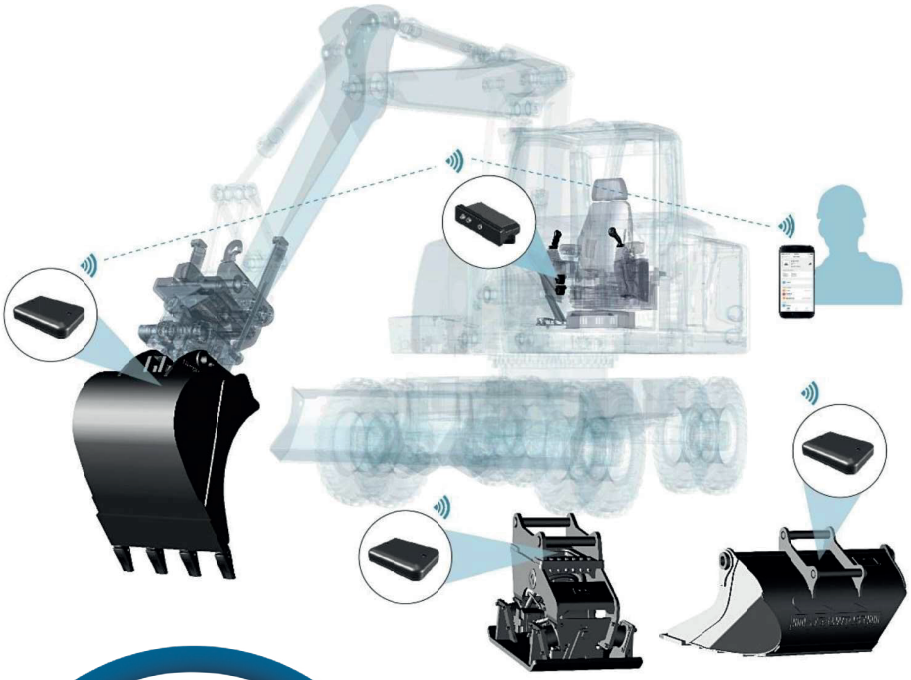
# Quantum Tool Recognition
# User manual



Control • Communication • Joysticks • Sensors • Actuators

SVAB

QUANTUM

Excavator Efficiency Functions

SVAB

Excavator Control Systems

# Content

**Introduction** **4**
General 4
Support 5
Approved areas of use 5
Environment 6
**Technical Description** **7**
System overview 7
Main parts 8
Technical data TRM 9
Technical data HUB 10
Funktion 11
**Start using Quantum ToolRec** **12**
Start the Quantum hub 12
Quantum App 13
Service 20
**Maintenance** **21**
Maintenance schedule 21
Maintenance instructions 21
Recommended spare parts 24
Recycling 24

# Introduction

## General

Quantum Tool Recognition is a system for wireless toolrecognition on excavators. This is the only usage intended for this product. All other usages of this machine, without written permission from SVAB, are strictly prohibited.

This document gives instructions how to do installation work on a Quantum Tool Recognition system. SVAB reserves the right to change the contents of this instruction at any time without further notice.

SVAB develops and produces their products in accordance to european legislation and teh macinery directive 2006/42/EG. The CE marking shows that the system fulfills the directive of electromagnetic compatibility EMC, RoHS and radiodirective RED.

This installation instruction shall be used in the technical file which will be the base for the final CE marking of the machine. Therefore, the checklist in this instruction shall be thouroughly performed, completely filled out and signed by responsible fitter. Save this instruction in the technical file.

The installation of the system referred to in this document is to be performed by experienced personnel. If there's unclarities regarding the use, installation, understanding of the system or regarding this document - disengage the installation work and contact the system provider for information. By using common sense you can avoid accidents from happening yourself.

This instruction is protected by copyright and may not be reproduced, distributed or altered. Violation of the law may lead to prosecutions and fines, imprisonment or duty to pay compensation to the creator / proprietor.

**FCC and ISED**

Changes or modifications to the equipment not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

To comply with FCC/IC RF exposure limits for general population / uncontrolled exposure, the antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from any persons and must not be co-located or operating in conjunction with any other antenna or transmitter.

NOTE: 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 a particular 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.

RSS standard
This equipment is exempt from the routine RF exposure evaluation requirement of RSS-102. This equipment should be installed and operated with a minimum distance of 20 cm between the antenna and the user or bystanders. This device contains licence-exempt transmitter(s)/ receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:
(1) This device may not cause interference.
(2) This device must accept any interference, including interference that may cause undesired operation of the device.

Ce matériel n'est pas sujet à l'évaluation habituelle d'exposition RF selon RSS102. Ce matériel devrait être installé et exploité en gardant une distance minimale de 20 cm entre l'antenne et l'utilisateur ou lesspectateurs.
L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :
(1) L'appareil ne doit pas produire de brouillage;
(2) L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

CAN ICES-3 (B)/NMB-3(B)

## Support

Contact SVAB at:

SVAB, Ulvsättersgatan 2SE-694 35 Hallsberg

Phone: +46 (0)582 152 30 (main)  +46 (0)0582 152 33 (Support)

On our website www.svab.se you will find additional information.

## Approved areas of use

If you are unsure whether the function is allowed to control, always ask a technician from your system provider.

Approved areas of use for Quantum ToolRec:

- Tool recognition on excavator

- Provide input signal to compatible systems

Quantum shall only be used for approved areas of use and functions as mentioned above. SVAB will not take part in injuries or accidents that occurs due to unauthorized use.

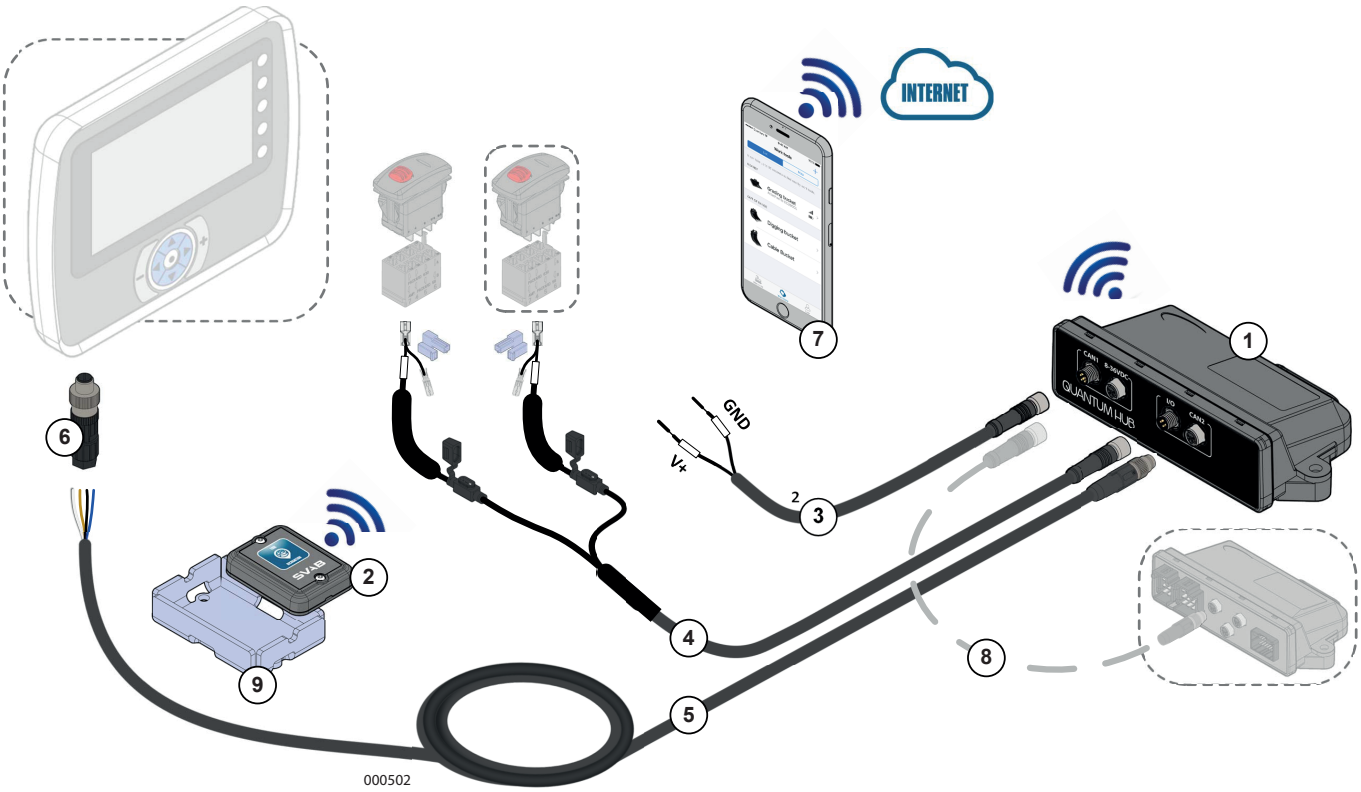
## Environment

As part of our environmental commitment, we strive for our products to have as little environmental impact as possible throughout the lifecycle. This means there are things to consider during the installation.

- All assembly / disassembly must be done according to national requirements and local regulations.
- Recycle waste ccording to national requirements and local regulations.
-

# Technical Description

## System overview

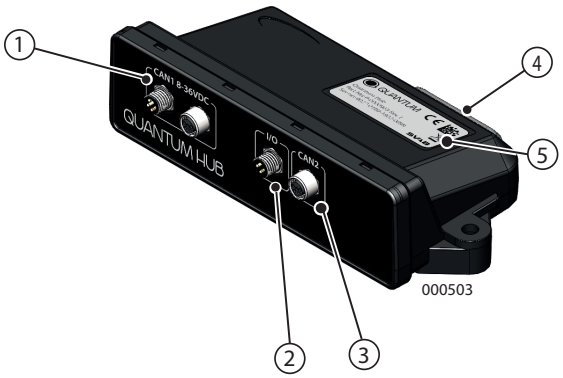



| Pos | Artikel | Benämning |
|---|---|---|
| 1 | P-0000963 | Quantum hub |
| 2 | P-0000966 | TRM |
| 3 | P-0001345 | Cable supply Quantum Hub |
| 4 | P-0001346 | Cable Quick coupler signal Quantum Hub |
| 5 | P-0000585 | Connecting cable Digging system |
| 6 | P-0000723 | M12 Connector male, straight 5 - pole |
| 7 | n/a | Quantum App (Google Play/App store) |
| 8a | 200586 | Jumper cable M8, 0,3 m |
| 8b | 149209 | Jumper cable M8, 1 m |
| 8c | 149207 | Jumper cable M8, 2 m |
| 9 | P-0001304 | Cover TRM |

# Main parts

## Quantum hub

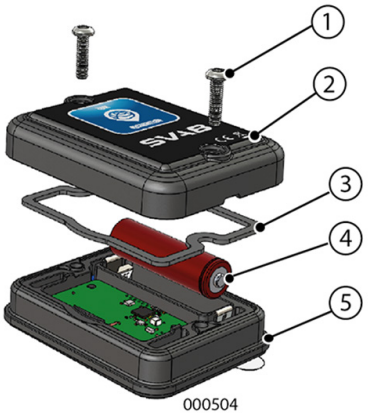
The hub consists of following main parts:




1. CAN1 / 8-36 VDC
2. I/O
3. CAN2
4. Diodes
5. Name plate

## TRM (tool Recognition Module)

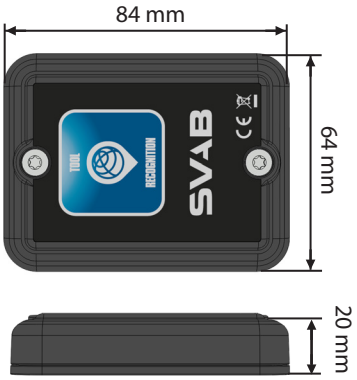
The TRM consists of following main parts:




1. Screw
2. Cover
3. Seal
4. Battery
5. Lower part

# Technical data TRM

## Dimensions



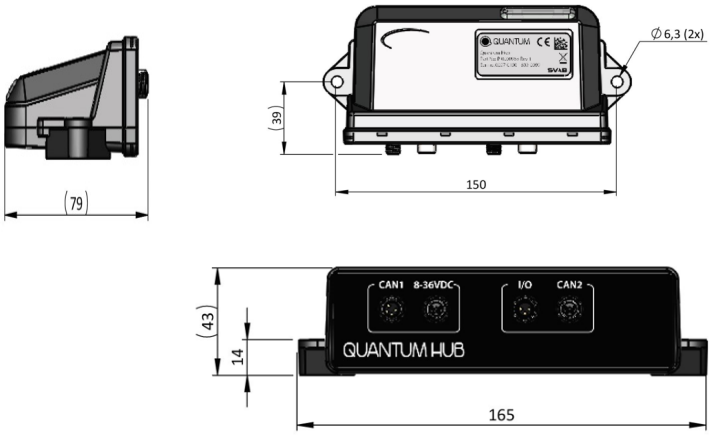

## System

| | | | | Unit | Remark |
|---|---|---|---|---|---|
| | Min | Nom | Max | | |
| Mass | | 90 | | g | |
| Material | | PC/PBT | | | |
| Operating temp | - 40 | | + 70 | C | |
| Storage temp | - 40 | | + 85 | C | |
| Voltage feed | 1.8 | 3.6 | 3.9 | V | |
| Battery time | | | 5 | år | Up to 5 years, depending on degree of use and environment |
| IP-rating | | IP67 | | | |

## Bluetooth

| Description | Kommentar |
|---|---|
| Bluetooth | Bluetooth 4.1 |
| Frequency | From 2.4 GHz to 2.4835 GHz (ISM band) |
| Range | up tol 30 m |

## Technical data HUB




### System

| | | | | Enhet | Kommentar |
|---|---|---|---|---|---|
| | Min | Nom | Max | | |
| **Vikt** | | 180 | | g | |
| **Material** | | PA6 | | | |
| **Driftstemp** | - 20 | | + 70 | C | |
| **Förvaringstemp** | - 20 | | + 85 | C | |
| **Spänningsmatn** | 7.5 | 12/24 | 36 | V | |
| **CAN motstånd** | | | | | Software selectable 120 Ω, 600 Ω, not terminated |
| **IP-klassning** | | IP50 | | | |

### Bluetooth

| Description | Kommentar |
|---|---|
| **Bluetooth** | **Bluetooth 4.1** |
| **Frequency** | From 2.4 GHz to 2.4835 GHz (ISM band) |
| **Range** | up tol 30 m |

# Funktion

## Tool recognition

Quantum Tool Recognition is a system for wireless toolrecognition on excavators. The system identifies which tool is connected to the excavator's attachment or to the tiltrotator's attachment. Tool Recognition is based on each tool being equipped with a compact and robust battery-powered device (TRM) that communicates wirelessly with a controller in the cabin(Quantum HUB).

The tiltrotator and / or machine quick coupler is connected to the system to detect when a change of tools occurs. In cases where the machine is equipped with a Quantum or MACS RT based tiltrotator control system, the information is shared when a tool change under the tiltrotator through the CAN bus. When initiating a change, the system starts scanning for moving tools. The system uses several smart conditions to identify the correct tools.

### CAN-bus - interface towards external systems

The system hub can transmit the information to other control systems in the excavator via the CAN bus. This way, these systems can adapt to each tool. An example of function is to automatically indicate the correct tool for the machine's GPS / 3D excavation system without the operator having to manually enter it, or to automatically change settings in a Tiltrotator control system based on the tool type.

### Tracking of tools and machine

The system stores the user's smartphone GPS position in the cloud and connects it to the tool and machine shown on a map in the app, provided that the user has:

- Downloaded the Quantum app to his/her smarthphone
- Approved that the app has access to location information
- Bluetooth connection with HUB and/or TRM devices
- Internet Access

The information about the position of a tool or machine is also shared by other users who have a Bluetooth connection with any Quantum HUB or TRM device. It is enough for someone who has the Quantum app installed on their smartphone to pass a HUB or TRM and get connected via Bluetooth to update the location in the cloud. The information is sent anonymously and is displayed only for those users who registered the current machine or device in their app.

## Operating time and servicei ntervals

Quantum Tool Recognition together with the Quantum app also keeps track of the machine and tool's operating time. The machine's operating time is measured in time as the hub has been powered, the tool's operating time is measured in time as the TRM unit has been connected to the HUB and at the same time been in motion.

In the app, you can define multiple service intervals for both the machine and the tool, the app will then notify via notifications to it when it's time for service.

# Start using Quantum ToolRec

1. Quantum starts when the machines electronics is activated by the ignition.

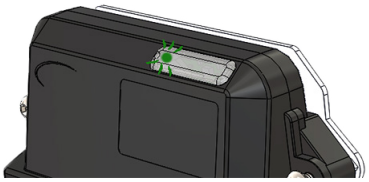
## Start the Quantum hub

Power up the machine

Quantum hub will start and the diodes will start to flash. The LEDs are called (from the left):

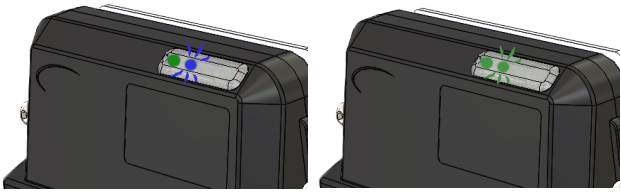
LED 1, LED 2, LED 3, LED 4.

LED 1 (Heartbeat), LED 2(TOOLREC-searching), LED 3 (quickcoupler), LED 4 (TOOLREC-status)

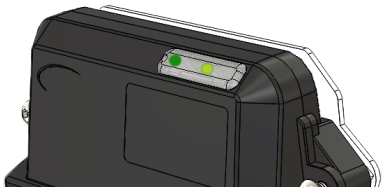


2. Check that LED 1 is flashing green. As long as the hub is running, the led will flash.

3. LED 2 flashes blue when searching for a tool. If LED 2 flashes green, it searches for a tiltrotator. If LED 2 flashes blue and green respectively, it searches for both tiltrotator and tools.

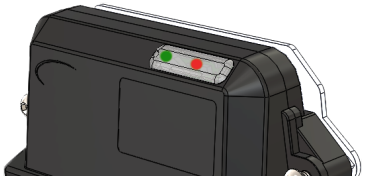


4. Check lower coupler function by activating it. LED 3 lights up with a green steady light.



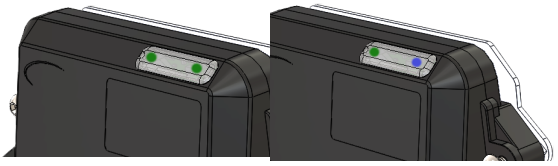
5. Check upper coupler function by activating it. LED 3 lights up with a red steady light.

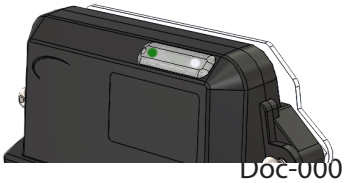
If both couplers are open, LED 4 lights up with a yellow light.



6. When a tiltrotator has been identified, LED 4 lights up with a green steady light. When a tool has been identified, LED 4 lights up with a blue steady light.

7. LED 4 lights up with a steady white light when both tiltrotator and a tool has been idenftified.





# Quantum App

## Registration of users, machines and tools

### Register an user

Download the SVAB Quantum app from App Store or Google Play.

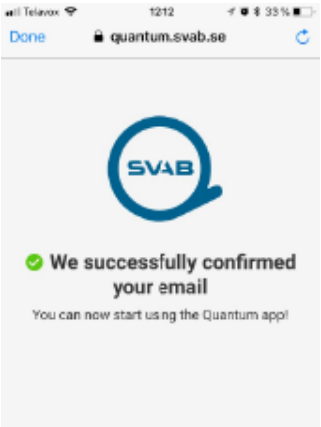
1. Start by creating a new user.

2. Enter user information and password. Click "Next".

You need to accept the licence agreeent in order to get to the next step in the registration.

3. Wait for a confirmation mail and follow the instructions in the mail.

4. Your registration will be confirmed




**Add a pre-registred machine**

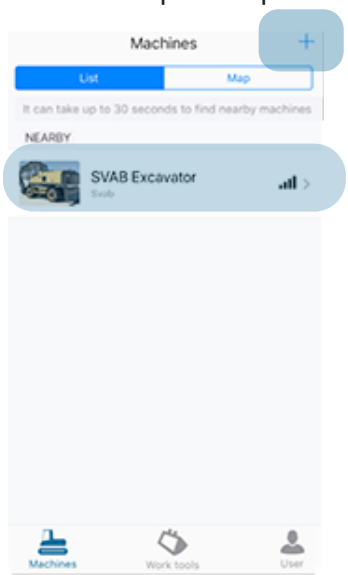
1. Go to "Machines" to register a new machine.

Please note that the machine must be running in order for the system to function

2. Press the + sign to scan for and register machines.

If your machine was configured in a work shop, your machine will show up as a machine nearby.

3. Click on the machine to open the profile.




4. To edit the given information, click on "Edit". From here, you can change the name and change or add a picture..

5. Press "Save" when you are done. The machine is added to your list..

### Register a new machine

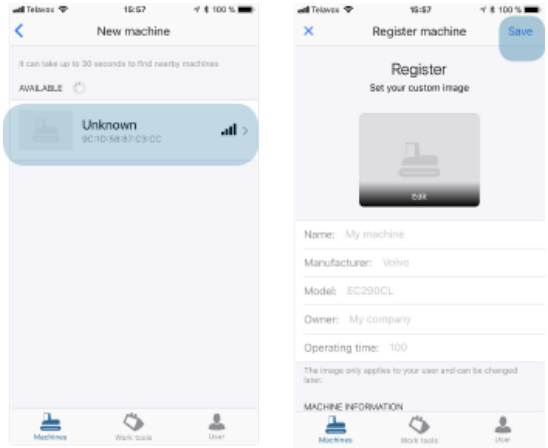
If the machine hasn't been registered before, it needs to registered from start.

1. Go to "Machines" to register a new machine

Please note that the machine must be running in order for the system to function

2. Press the + - sign to scan for and register machines

3. The machine will show up as unknown machine. Click on the machine to register. Name the machine and add a picture if desired.




4. Press "Save" when you are done. The machine is added to your list.

### Add a pre-registered tool

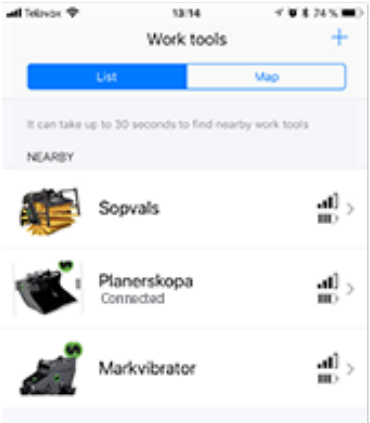
1. Go to "Work tools" to register a tool.

Please note that the machine must be running in order for the system to function

If your machine was configured in a work shop, one or several tools will be available in the app.

2. Press the + - sign to scan and register for a tool.

3. Click on the tool to be registered.



4. To edit given information, press ”Edit”. From here, you can change name or add or change a picture if desired .

5. Press ”Save” when you are done. The tool will be added to your list.

**Register a new tool**

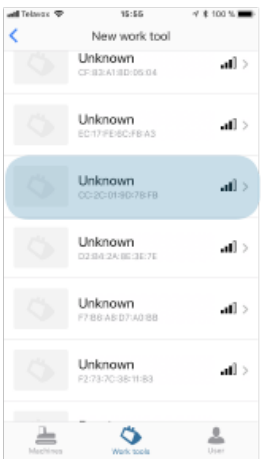
If the tool hasn’t been registered before, it needs to registered from the start.

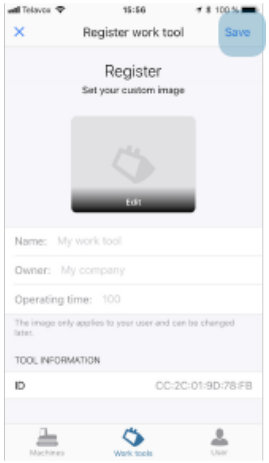
1. Go to ”Work tools” to register a tool.

2. Press the + - sign to scan and register for a tool.

3. The tool will show up as ”Unknown” , with a MAC-adress. Compare the numbers on the installed TRM-module.

4. Select the tool to be registered. Name the tool and add a picture if desired.

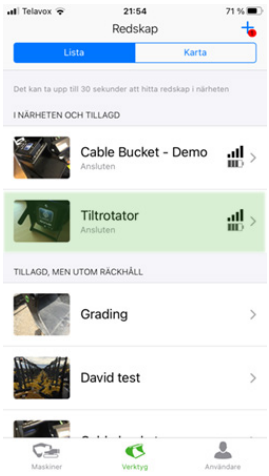



5. Press ”Save” when you are done. The tool will be added to your list.

**Tiltrotator TRM**

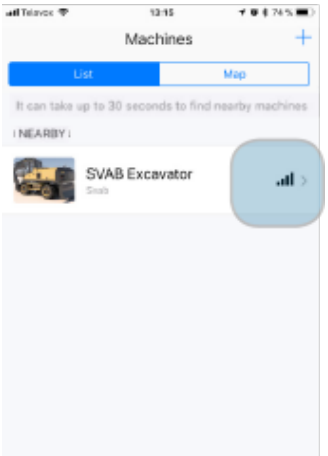
The Tiltrotator TRM is predifined from factory and will show up on the screen



## Connect machines and tools

### Connect a machine

You can have several machines added to your list. When you start your machine, Quantum hub will start up and scan for machines and tools.




You can see if your machine is available looking at the strength of the signal, to the right.

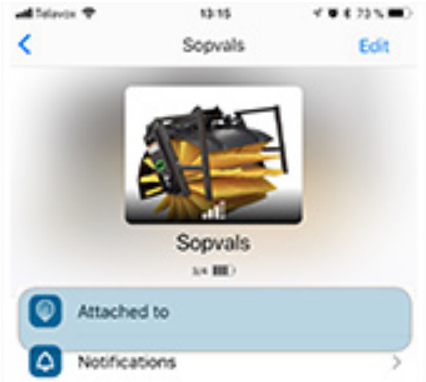
### Connect a tool

1. Start the machine.

2. Activate quick coupler and lock to a tool.

3. Quantum Toolrec will now start to scan for and connect to the tool in the app.

4. You can verify that the tool is connected to your machine under ”Working tools”.

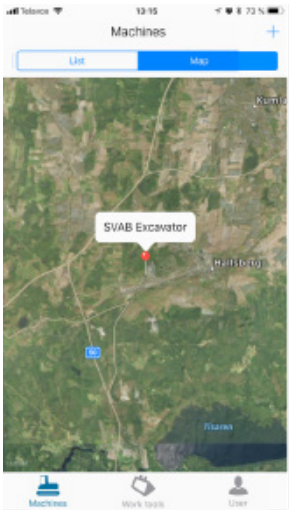


**Change tools**

1. Activate the quick coupler and release the tool.
2. Lock on to the new tool.
3. Qunatum ToolRec will start a new scan and connects to the tool.

## Map

Under ”Map” the position of each machine and tool is shown.

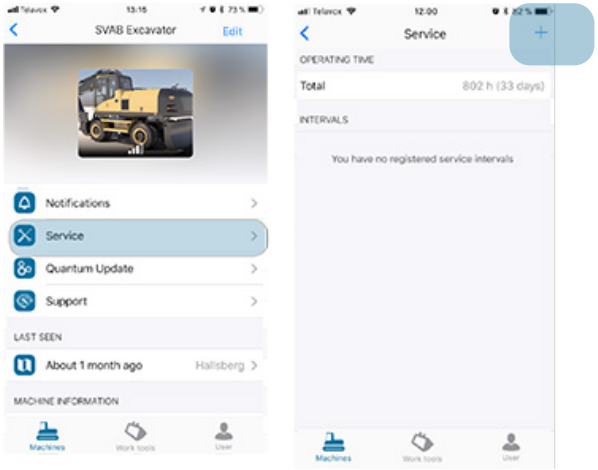


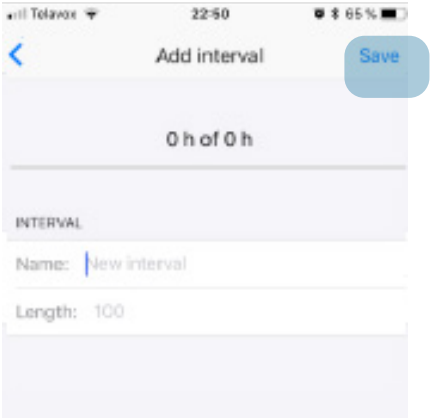
## Service

Under "Service" you can enter service intervals and measures for your machine or for your tool. These will end up under "Notifications" when it's time to perform a measure. You can also see the operating time for your machine or tool.

1. Press the +-sign to create an activity.

2. Name the activity and the hours for the interval. Press "Save".



# Maintenance

## Maintenance schedule

| Description | Maintenance | Interval | Remark |
|---|---|---|---|
| TRM | REplace battery | 5 yrs | |
| | Replace cover | When necessary | |
| | Replace TRM | When necessary | |

## Maintenance instructions

Prepartions before maintenance

1. Make sure that the machine is turned off and the excavator boom is lowered.

2. Clean the area around the TRM to avoid dirt from entering the module when dismounting.

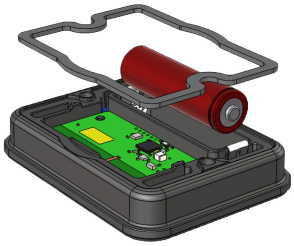
Replace battery

1. Remove two screws holding the cover.

2. Use a screwdriver to separate the cover from the lower part.

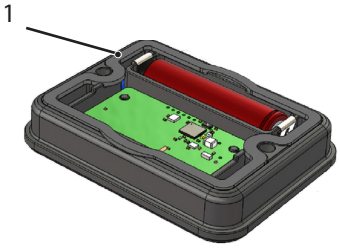
3. Remove the seal between the cover and lower part.

4. Replace battery in the unit.



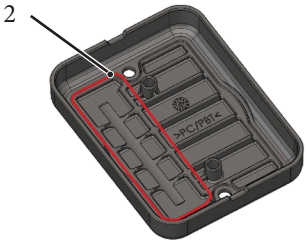
Make sure to only use original batteries from SVAB. The unit willnot work with ordinary 1.5 V batteries.

5. Install new seal [1] between cover and lower part.




Make sure that the seal fits the groove properly.

6. Put the cover back.
Make sure to turn the cover in correct position so the notch [2] fits the battery.




7. Reinstall the 2 screws. Tightening torque 0.8 Nm.

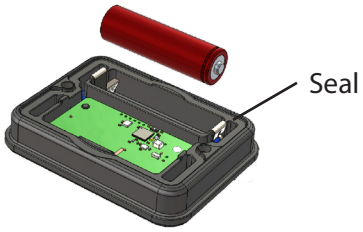
Replace TRM

The TRM-module should be mounted on the tool in room temperature for best result. The temperature may not go under - 10 grader C.

The module is delivered with the battery, sealing and screws on the side.

1. Remove the old TRM from the tool
2. Clean the surface before mounting the new module.
3. Remove the cover on the module and install the battery.

Install the seal.

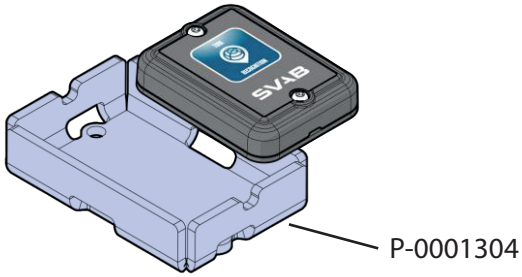



Make sure that the seal fits the groove properly.

4. Put the cover back.

Make sure to turn the cover in correct position so the notch [2] fits the battery.

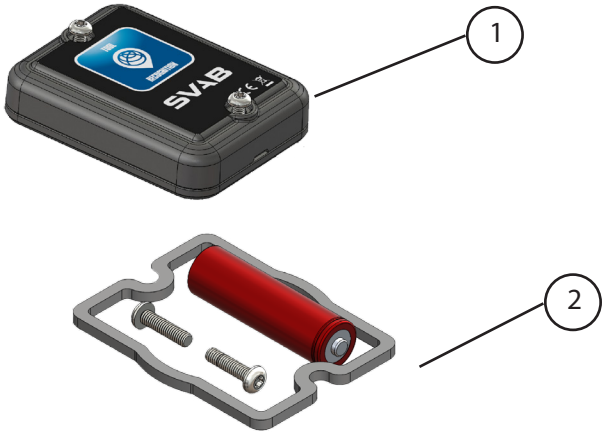
5. Note the MAC-adress on the module. This number will show up in the app later on. You will find the label on the side of the module. Example of a MAC-adress: C6:6D:D5:27:4F:B5.




6. Install with optional cover:
   Weld or screw the cover to the clean surface.
   Remove the tape underneath the module and press the module to the bottom of the cover.
7. Install without optional cover:
   Remove the tape underneath the module and press the module to the clean surface

## Recommended spare parts

### TRM




| Pos | Part | Description |
|---|---|---|
| 1 | P-0001366 | TRM |
| 2 | P-0000967 | Battery kit |

## Recycling

Replaced parts are recycled according to local laws and regulations or are returned to SVAB.

SVAB

Excavator Control Systems