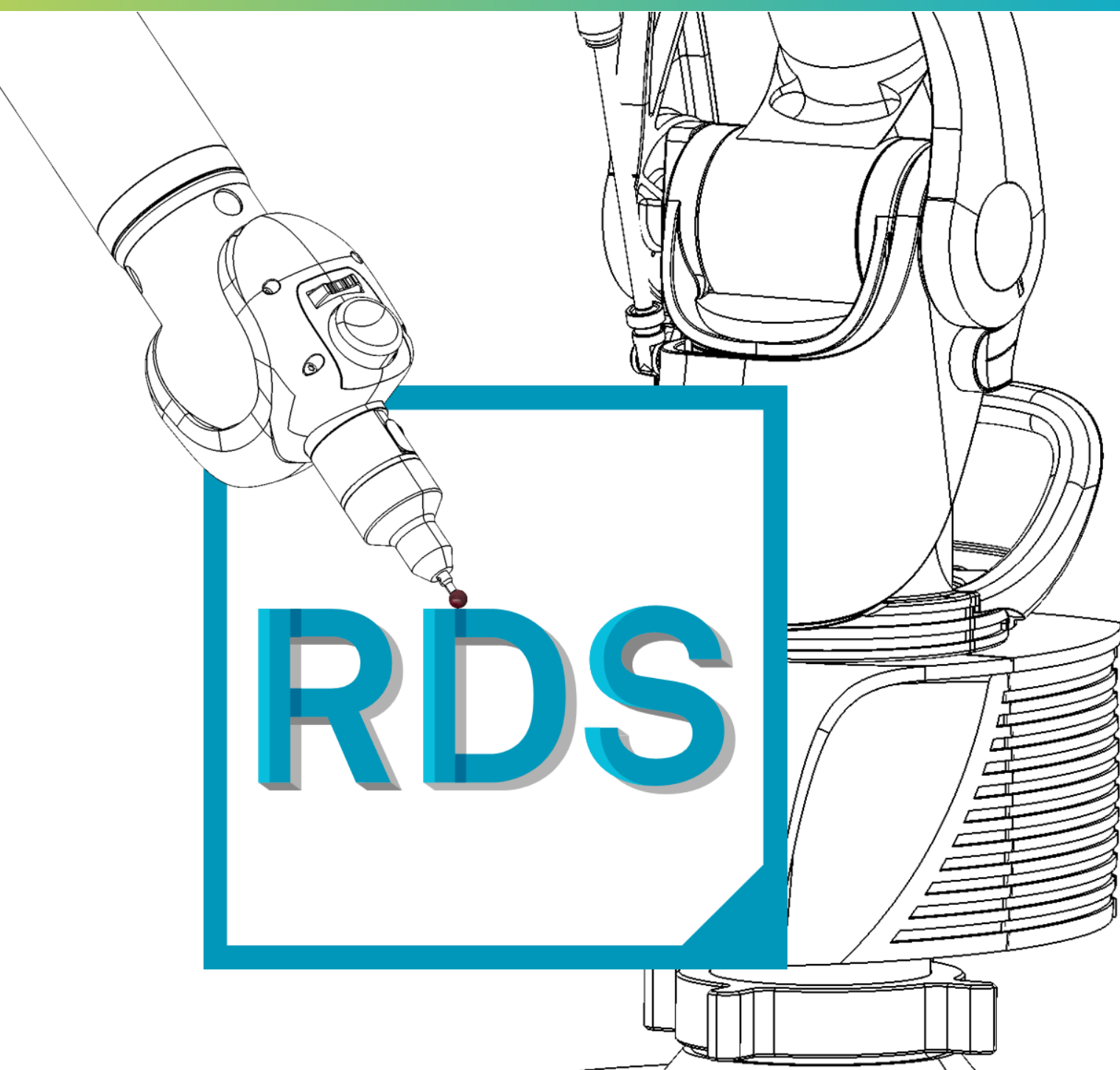


RDS Software

Reference Manual



RDS Software Reference Manual

Information, support

www.hexagon.com

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Introduction

Dear customer, thank you for purchasing this Hexagon product. Before you start using your new Hexagon Absolute Arm, please read these instructions.

This guide describes best practices for installing, configuring, and using your instrument.

For any other device or option not described in this manual please refer to other Hexagon product manuals available on the provided media. For further information, please contact your local Hexagon's agent.

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Patent Notice

Products described in this manual may be covered by one or more of the following U.S. patents 8122610; 7779548; 7908757; D643319; 8099877; 202112059; 2021123719; 2021122057; 2021122060 2021122058 and other U.S. and foreign patents pending.

Availability of the products on the markets

All the products described in this manual may not be available in all the countries. Please refer to your Hexagon agent.

Conventions Used in this Guide

This manual uses the following conventions to alert you to information that varies from optional to critical in nature. These guidelines are used to distinguish the difference between these passages.



WARNING

A Warning indicates a hazardous situation, which, if not avoided, could result in death or serious injury.



CAUTION

A Caution, used with the safety alert symbol, indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.



NOTICE

A Notice indicates useful advice about operation of your Hexagon system or its sub-parts. Information contained in a Notice is not safety related. Failing to heed this advice may result in damage to your Hexagon system or in inaccurate measurements.



Information indicates general advice or links to relevant documentation.

Moreover, the present document mostly respects the ISO 8601 (format of the dates), ANSI Z535 (Warnings) and ISO 7010 (Pictograms) international standards.

Pictures in the manual

Pictures presented in this manual are not contractual, especially regarding the colours that may change depending on the arm version or type.

Navigation

Links are available in this manual to jump to related chapters. They can be easily recognized as below:

[Link \(blue and underlined\)](#)

Just click on it to follow it. To go back to the original paragraph, use the shortcut **Alt + ←** (left arrow).

1. RDS Software Presentation

1.1. RDS Software Package

RDS is the Hexagon software package for the management of the Hexagon Portable Measuring Arms and Leica trackers (AT960) with Absolute Scanners.

It is the interface between the measuring systems (Absolute Arm and Cimcore arms, Leica AT960 with LAS, LAS-XL, AS1 and AS1-XL scanners) and all the application software.

RDS is compatible with most software for portable metrology applications. RDS is composed of 5 main modules.

RDS Agent	Main operator interface, always present on the screen and giving relevant information during the measurement. It gives the access to all other modules.
RDS Control Panel	Module for the settings of the arm, probes, scanner and system.
RDS Data Collector	Module for aligning probes and scanners, performing accuracy checks and so on.
RDS Toolbox	Module for surveying and investigating the state of the arm and perform maintenance operations.
RDS Quick Measure	Utility to quickly measure basic dimensions.

RDS Levels and Securities

There are different types of installations:

- Standard installation (End-User) – standard installation for end-user profile.
- Compensation installation – only for service profile (technicians).

Some functions are protected according to the RDS user level (see [1.6 - RDS User Profiles](#)).

1.2. System Requirements

The following information presents the computer **minimum** required specifications depending on the final application. Always ensure that the application software you are using is not requiring higher specifications.

Probing and Tubing

	Probing / Tube	Probing / Tube with CAD
Processor	4 Core / 2 GHz	6 Core / 2 GHz
RAM	2 GB	4 GB mini 👍 16 GB
Disk Space	30 GB	
Ports	2 × USB 3.0 Port	
Graphic card	512 MB (SVGA graphics card OpenGL capable) 👍 NVIDIA	
Screen	HD1080 (1920×1080)	
Operating System	Windows11 Pro/Enterprise 64-bits Windows Server 2016, 2019, 2022	
Wi-Fi card	Any card supporting IEEE802.11acx	
Internet connection	For SMART data exchange, an internet connection must be available, and firewall allows the connection to RDS Toolbox.	

👍 : Recommended for higher performances



Wireless connection to the RA7 with FP2 and FP3 is not more supported.

Scanning

	HP-L-8.9 / LAS / LAS-XL	RS2-5	AS1 / AS1-XL
Processor	4 Core	6 Core (17-8 th gen)	6 Core (17-10 th gen) 👍 16 Core (17-10 th gen)
RAM	16 GB mini 👍 32 GB	32 GB mini 👍 64 GB	64 GB
Disk Space	60 GB 👍 SSD		
Ethernet port	1 x LAN Port Gigabit (on-board) or provided USB-Ethernet adapter		
USB port			
Graphic card	SVGA graphics card capable of OpenGL representation (NVIDIA)		
	RTX3000	RTX A3000 RTX A4000	RTX A4000 👍 RTX A4500
Screen	HD1080 (1920×1080)		
Operating System	Windows11 Pro/Enterprise 64-bits Windows Server 2016, 2019, 2022		
Wi-Fi card	Not supported	Any card supporting 802.11ac	Any card supporting 802.11acx (CP-W only)
Internet connection	For SMART data exchange, an internet connection must be available, and firewall allows the connection to RDS Toolbox.		

👍 : Recommended for higher performances



*It is highly recommended to keep Windows up to date.
USB 2.0 to Ethernet adapters are prohibited. If necessary, use USB 3.0 or USB C adapters.*

1.3. Compatibilities

RDS Software supports the following instruments.

Measuring Arms

	Connection			Probing	Scanning		Tubing
							
Absolute Arm RA8	✓	✓	✓	✓	✓	✓	✓
ROMER Absolute Arm RA7	✓	✓	✓	✓	✓	✓	✓
Cimcore CA7		✓	✓	✓	✓	✓	✓

*: excepted HP-L-8.9

Any other measuring arm cannot be used with this version of RDS.



- Wireless connection to the RA7 with FP2 and FP3 is no longer supported.
- The RS1 laser scanner is not supported since RDS V5.0.
- Wireless scanning with RS6 / AS1 / AS1-XL on the RA7 (RA7 v5) is not supported.

Measuring Laser Trackers

	Reflector	T-Probe	T-Mac	T-Scan	LAS, LAS-XL	AS1, AS1-XL
AT960	✓	✓	✓	✗	✗	✗

Any other laser tracker system cannot be used with this version of RDS.

Partner Application Software

	Touch probe	Tube probe	RSx HP-L-8.9	AS1 AS1-XL
Pc-Dmis	✓	✗	✓	✓
Inspire	✓	✗	✓	✓
Bending Studio	✓	✓	✗	✓ *
Designer	✓	✗	✓	✓
Geomagic	✓	✗	✓	✓
TubeShaper	✓	✗	✗	✓
Cyclone 3DR	✓	✗	✓	✓
Visi	✓	✗	✓	✓
Apodius 3D	✓	✗	✗	✓
Romosoft	⊙	⊙	✗	✗
Docs	⊙	⊙	✗	✗
Spatial Analyzer	✓	✗	✓	⊙
Quindos	⊙	✗	✗	✗
TubeInspect	✓	✓	✓	✓
PolyWorks	✓	✗	✓	✓
Verisurf	⊙	✗	⊙	⊙

⊙: Implemented by the software, but not tested and validated by Hexagon | *: RS6/AS1 only

Other Application Software

	Touch probe	Tube probe	RSx HP-L-8.9	AS1 AS1-XL
3DTubeCAD	⊙	✕	⊙	⊙
Aberlink	⊙	✕	✕	✕
Arcocad	⊙	✕	✕	✕
BuildIT	⊙	✕	✕	✕
Calypso	⊙	✕	✕	✕
DezignWorks	⊙	✕	✕	✕
Inca3D	⊙	✕	⊙	⊙
Inspect 3D	⊙	✕	✕	✕
MCosmos	⊙	✕	✕	✕
Metrolog	⊙	✕	⊙	⊙
Metromec	⊙	✕	✕	✕
MetroSoft	⊙	✕	✕	✕
Point2CAD	⊙	✕	✕	✕
PowerInspect	⊙	✕	⊙	⊙
PowerShape	⊙	✕	✕	✕
Rapidform	⊙	✕	✕	✕
Reverse Eng.	⊙	✕	✕	✕
RevWorks	⊙	✕	✕	✕
Rhino	⊙	✕	✕	✕
SurferNT		✕	✕	✕
Tezet	⊙	✕	⊙	⊙
TopSolid	⊙	✕	✕	✕
TubeExpert	⊙	✕	✕	✕
VTube Laser	⊙	✕	⊙	⊙

⊙: Implemented by the software, but not tested and validated by Hexagon | *: RS6/AS1 only

1.4. RDS Software Installation



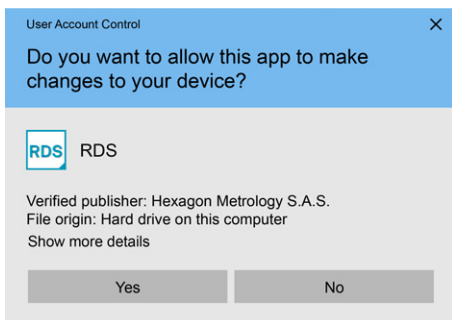
It is recommended to proceed Windows Update before the installation of RDS, to ensure the all the necessary components are installed.

It is advised to set the size of text in Windows to 100%.

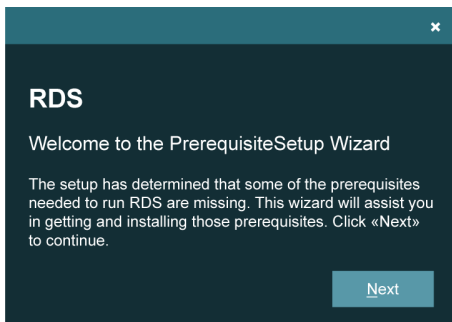


The measurement software (PCDMIS, TubeShaper, and any other software) can be installed before or after RDS. Please see in appendix or follow the instructions of the measurement software for this installation.

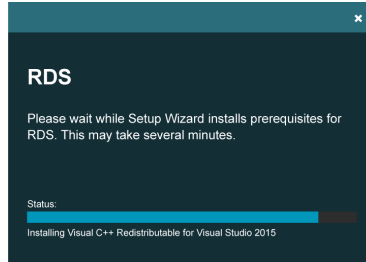
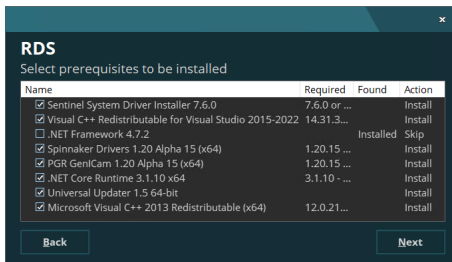
1. From the Installation media, run "Menu.exe" and select "Install RDS". RDS installation can be run also directly by running "RDS Installer V#. #. #. exe" located on the RDS folder or from a downloaded file.
2. Depending on the computer security settings (User Account Control), a confirmation may be asked. Press "Yes".



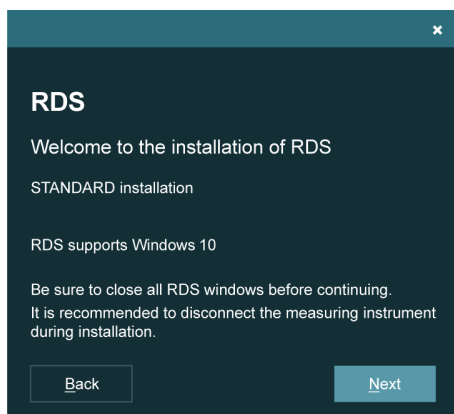
3. The following window appears. Click on {Next}.



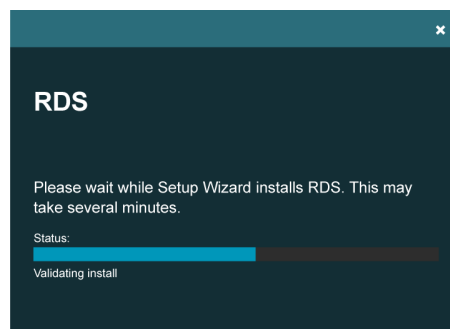
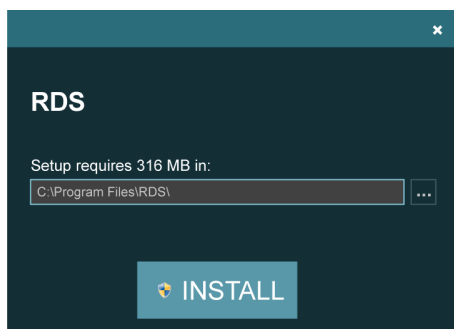
4. Prerequisites checking: check and select the appropriate needed tools and click on {Next} (the selected components are installed).



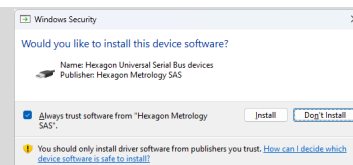
5. Once the dependencies are installed, click on next to proceed with the RDS installation.



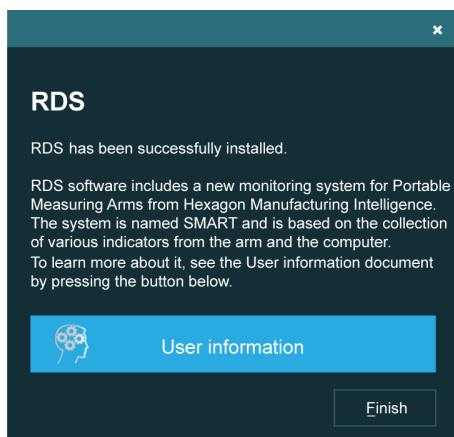
6. Select the destination path and click on next (let the installation proceeding).



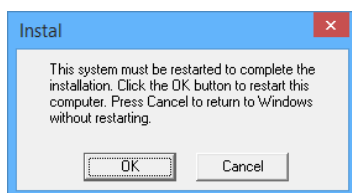
The installation of the USB drivers may require a confirmation.



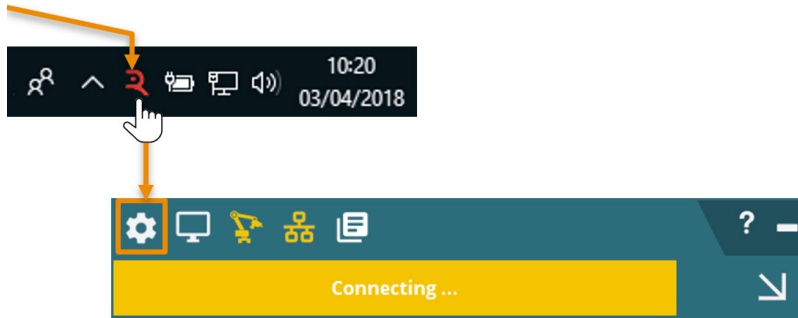
7. At the end of the installation, read the user information and press Finish.



8. If Windows prompts to restart the computer, press "OK".



9. Set-up the connection to the instrument.



NOTICE

Disabling transmission of SMART data to Hexagon is not advised. If you do this, it will make difficult diagnosing potential problems with your equipment. This could increase machine down-time.



RDS Toolbox requires the authorization to communicate with the networks to access the Hexagon Server. Ensure that RDS Toolbox is registered for Windows firewall or any other firewall to access internet through the network.



It is recommended to disable any firewall as it may prevent RDS from functioning properly.



Depending on the version of Windows, it may be necessary to confirm some message boxes or allow some installation such as Jungo driver installation, dotnetfx, netfx, Sentinel driver...



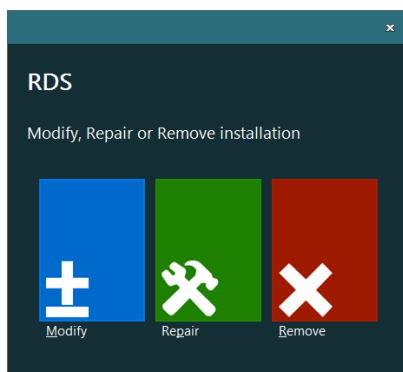
Windows .NET Framework 3.5 needs to be activated. If not, RDS installation will try to install it or prompt to activate it. Access Windows control panel > group "Programs" > "Turn Windows features on or off".



In case of using RDS on a user profile, Registry needs to be open in writing. Location on HKEY_LOCAL_MACHINE\SOFTWARE\ROMER.

Uninstall

When running the installer on a computer pre-equipped with RDS, several options are proposed.



Modify	Permits to choose components to keep or remove.
Repair	Reinstalls RDS keeping the settings
Remove	Removes the RDS software package.

1.5. Keep RDS Software up to date

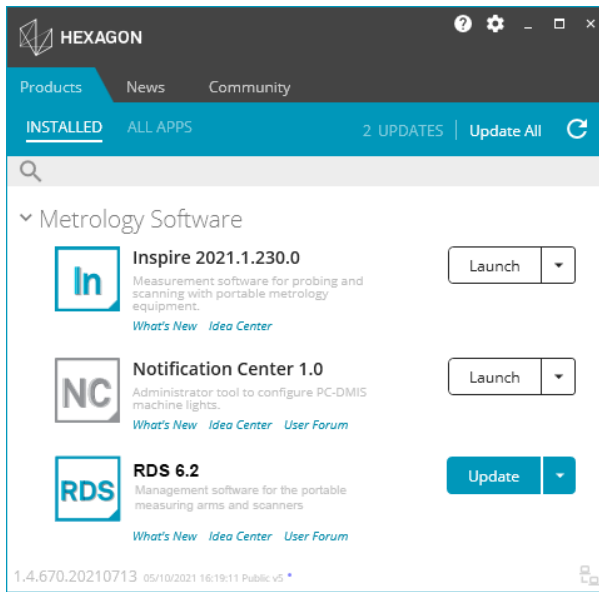
Once RDS software is installed on the PC, a dedicated tool is available, the “Hexagon Universal Updater”.

The Universal Updater is designed for all Hexagon software applications (including PC-DMIS, Inspire, BendingStudio and so on), so that you can update them from a single location.

As soon as a new RDS version is available, it will be shown on the Universal Updater icon in the notification bar. Click on it to open the tool.



Then simply press on “Update” to download and install the new version.



Downgrade is not possible with the Universal Updater.

1.6. RDS User Profiles

Different profiles exist to use RDS; according to the selected profile, functions may be available or not. This provides security on the configuration of the system.

According to the user profile, the prohibited functions or settings may concern advanced settings, alignment operations (in RDS Data Collector), and any function which could result on a risk of wrong measurements, or potential damage on the system.

Five levels of profiles are defined, respectively protectable or protected with a password or with an activation code.

	Standard	Advanced	Admin	Support	Service
Level	1	2	3	4	5
Protection	None	Password (default = "Advanced")	Password (default = "Administrator")	Feature Key / Password	Feature Key / Password
Verifications	✓	✓	✓	✓	✓
Alignments		✓	✓	✓	✓
Incorrect alignments				✓	✓
Basic settings	✓	✓	✓	✓	✓
Advanced settings		✓	✓	✓	✓
System parameters				✓	✓
Password change			✓	✓	✓
Service tools					✓

Activate a Profile

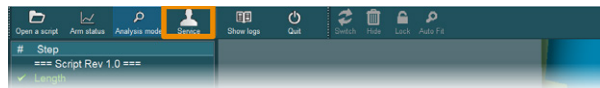
Standard user is the default profile.

RDS always starts with the default profile. When the user switches to another profile, this new selection remains active until a new selection is done or until RDS is restarted.

The selection of a User profile can be done indifferently in RDS Control Panel or in RDS Data Collector.



RDS Control Panel



RDS Data Collector



As soon as a Feature code is activated (and valid), then the corresponding profile (Support or Service) becomes the default one.

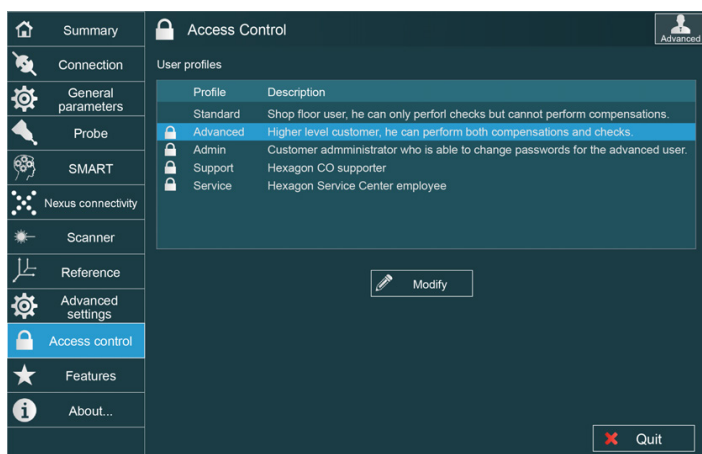
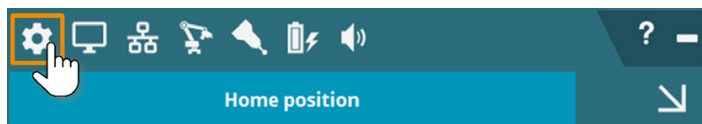
Activate Hidden Profile

By default, End-Users can access only Standard and Advanced user profiles (upper profiles – Admin, Support, and Service – are hidden).

To activate one upper profile, select the Advanced profile, and enter the appropriate password or enter the activation code in “Features” tab.

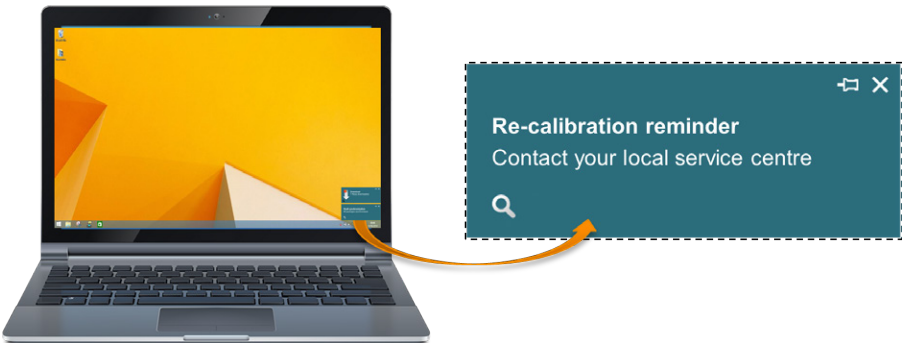
Change Passwords

To change the password of one profile, the Tab “[Access Control](#)” in RDS Control Panel can be used.



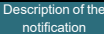
1.7. RDS Notifications

One aspect of RDS is to keep the user informed. This can concern warnings about the status of the arm or information about Hexagon news, or new available accessory, or software version, ...



The notification is display for some seconds, after what it is automatically hidden.

The notifications can be displayed again after a while.

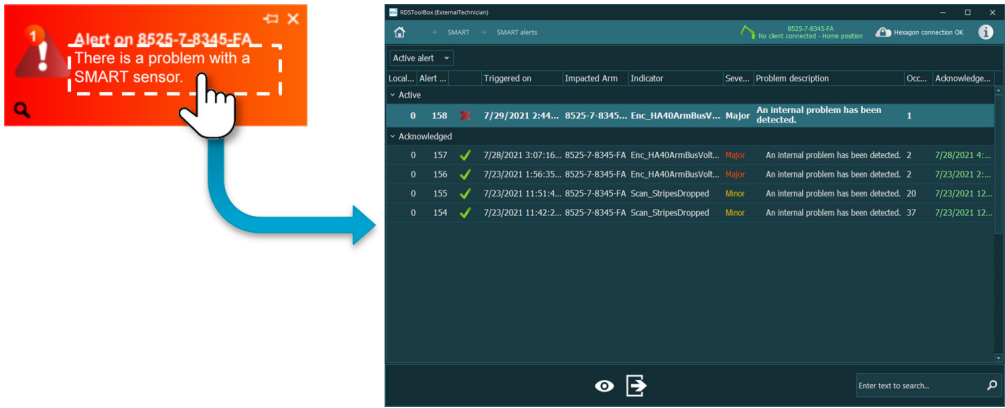
	Colour of the notification	Warning notification
		 Information notification
	Click on the text	Opens the notification in the appropriate panel
	Pin the notification	Pin the notification to keep it displayed (on the foreground) until it is unpinned or until the user click on it to open in RDS Toolbox.
	Unpin the notification	Unlock the notification and let it be hidden.
	Close the notification	
	Symbol of the notification	According to the type of notification.
	Details	Displays details in a window.
	Alert and news notifications pop-up only if the connected arm is in rest position or if no arm is connected.	

SMART Notifications

RDS SMART is designed to survey all the electronic indicators of the arm to detect any anomaly so prevent from any potential issue. As soon as an indicator becomes abnormal, RDS Toolbox displays a notification to warn the user about this defect.

The number of occurrences of the alert is shown under the form of icon (① / ② / ③ / ...)

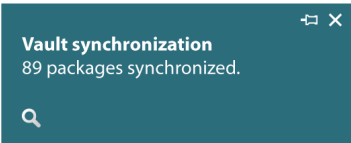
Click on the text of the notification to open the complete description and recommendations in [RDS Toolbox](#).



Depending on the priority of the notification, it will be reminded several times until it is acknowledged or postponed, or after a certain number of reminders.

Information Notifications

Some notifications may pop-up giving simple information regarding an event, ... A click on this pop-up will bring you to the details.



News Notifications

One aspect of RDS Toolbox is to provide latest news, information or useful links to the user. When the computer is connected to internet, the news is automatically downloaded and displayed by RDS Toolbox.



All the news can be found in the News & Links group of tiles, however as soon as one is downloaded by RDS Toolbox, a notification is displayed above Windows status icons.

As for the Alerts and information, the News notifications can be pinned, moved, and a click on the text of the notification directly opens the complete news in RDS Toolbox. Once opened, the notification will not pop-up again.

2. RDS Agent

RDS Agent is the main operator interface, always present on the screen to give relevant information during the measurement. It gives the access to all other modules.

2.1. Overview

2.1.1. Window Description

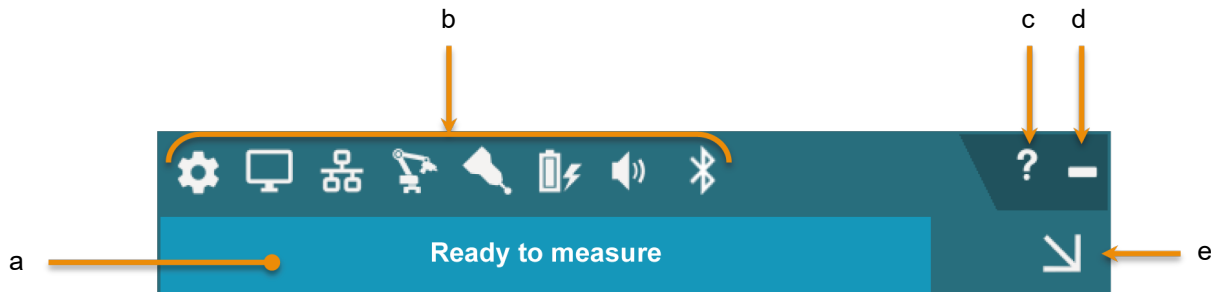
RDS Agent is the user entry door to RDS. It provides

- Basic status information
- Access to the RDS Tools
- Quick Access Menu (remotely controlled from the arm)

An icon on the status bar at the bottom of the screen gives access to its interface.



At any moment, it is possible to access those functions, by clicking on RDS icon in the task bar on the right bottom of the screen, the RDS Agent then appears.



- Global status
- Status icons overview and configuration
- Access to the documentation
- Window control (see below).
- Shortcuts to RDS tools

Window Control

	Switches the window size (reduced / medium / maximized)	(When using scanners)
	Closes the interface window (the agent remains active)	

2.1.2. Global Colours

One of the purposes of the RDS Agent is to quickly display main information about the status of the system. When the Agent appears, the global status is shown on the lower line.

Colour	Signification	Status example	
Blue	Operational mode	Ready	The instrument is operational (home position).
Green	Ready to measure	Press trigger...	The system is ready to measure.
Yellow	Scanning	Scanning	The system is currently digitizing with a Laser scanner.
	Non-critical warning	Axis over limit	The instrument is connected, but an event prevents from measuring - Encoder on its limit - No probe mounted ...
Red	Critical issue	Not connected	No instrument is connected, or issue of connection.

2.1.3. Status Icons Overview

On the left upper line, is shown the status of major components. Clicking on those icons shows the details or opens the appropriate set-up panel.



a	RDS Control Panel (opens the settings). 
b	Status and setup of the system 
c	Type and status of the connection to the machine 
d	Type and status of the instrument 
e	Type and status of the sensor 
f	Status of the battery 
g	Sound level 
h	Logbook* 
i	IP54 notifications* 
h	Bluetooth* 

*: only when needed

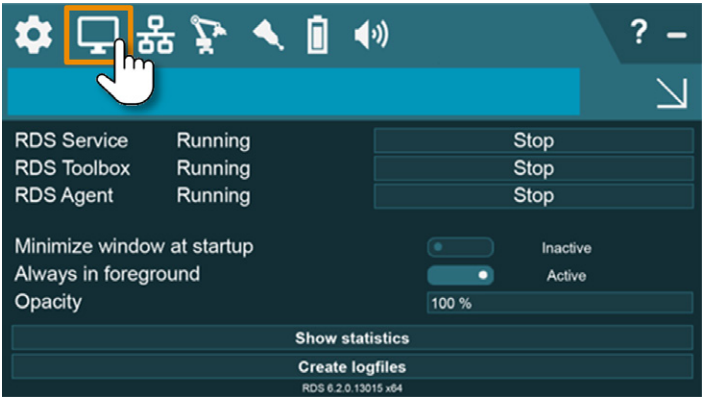
2.2. System Status

Status Icon

	RDS is functional
	Non-critical warning
	Critical issue (e.g. the RDS service is stopped)

Tab Details

Click on the system icon.



RDS Service	Running / Stopped	Stop* / Start	Shows the activity of the component and gives a quick way to restart it.
RDS Toolbox	Running / Stopped	Stop / Start	
RDS Agent		Stop	
Minimise at start-up	Active / Inactive <i>(default=inactive)</i>		Configuration of the RDS Agent window display.
Always on fore-ground	Active / Inactive <i>(default=inactive)</i>		
Opacity	Percentage of opacity <i>(default = 100%)</i>		
RDS 7.0.0	Current version of RDS		

*: Advanced user or upper

Create Log File

On the request of a support technician, this button dumps all necessary logs and system information into a single zip file that can be sent.

Once the button pressed, RDS collects all the information and opens the Windows explorer; highlighting the created file.

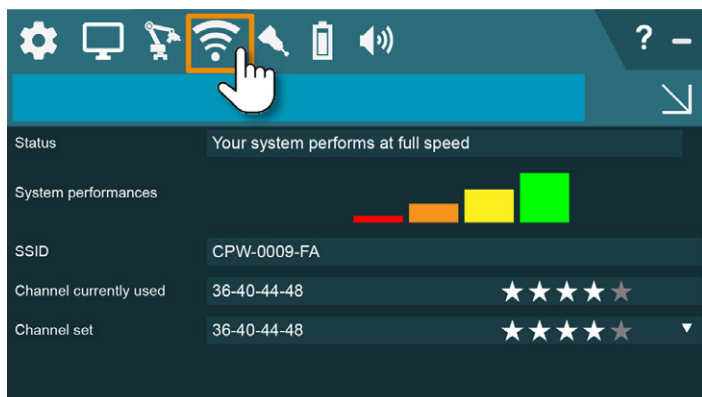
2.3. Connection Panel

Status Icon

	Instrument connected through WLAN
	Instrument connected through Wired Ethernet
	Instrument connected through USB
	WLAN signal strength
	Connection issue
	Maintenance connection by RDS Toolbox
	Wireless connection failed

Tab Details

Click on the connection status icon.



Status	  	Status of the connection. Indicates a low performance of the system when scanning
Solutions	 	If the performance is not optimal, solutions are proposed to solve the issue
System performances	 	When digitizing with a 3D scanner, the RDS Agent shows the level of performances with a bar graph.
SSID		Wi-Fi network name broadcasted by the CP-W.
Channel used		If a DFS* channel has been selected by the user, the currently used channel can be different.
Channels		Channel set by the user and selection of new channel.

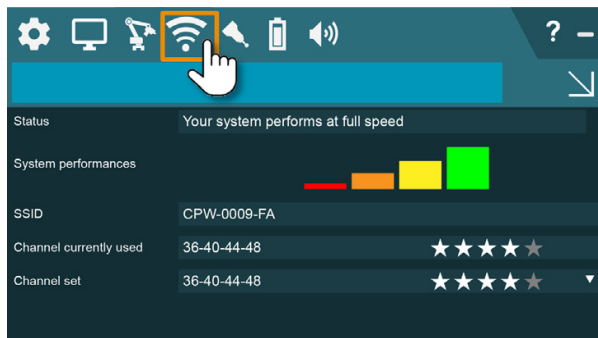


***: DFS Wi-Fi Channels**

When using the Dynamic Frequency Selection (DFS), the access point automatically selects frequency channels with low interference levels. The time to connect might be longer.

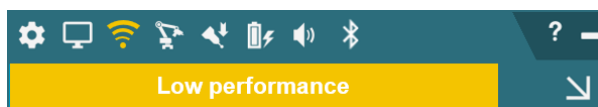
System Performance indicator

The RDS Agent provides feedback about the communication quality with a “System Performance” indicator. Open the “connection” tab on the RDS Agent while scanning.



	The system is running in an optimal way.
	The system runs smoothly but the user experience is not optimal. Some change is recommended. (e.g. change Wi-Fi Channel)
	Tuning some settings is highly recommended. (e.g. decrease the scanning frequency in RDS Control Panel)
	The system is critically low.

The RDS Agent warns the user as soon as the system performance becomes too low.



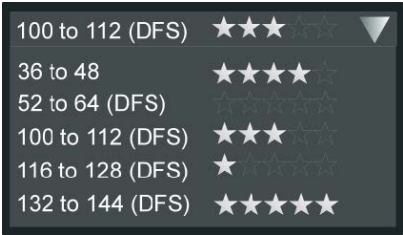
The system performance is displayed only while scanning. As soon as the acquisition is stopped, the performance graph disappears.

Channel selection

The choice of the channel has an importance on the performances the instrument can reach, especially when scanning.

RDS evaluates how efficient is each channel and shows a rating from 0 to 5 stars (5 is the best).

If the current channel is low rated, then a new channel should be used. Simply select an appropriate channel with the drop-down list.



2.4. Instrument Panel

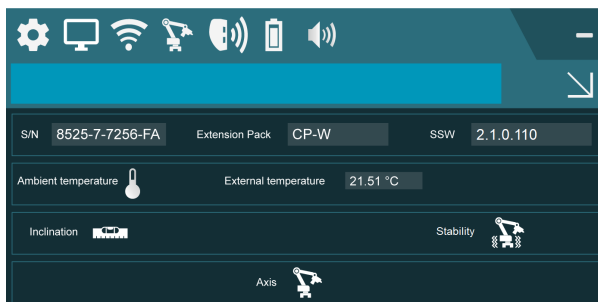
2.4.1. Instrument Status

Status Icon

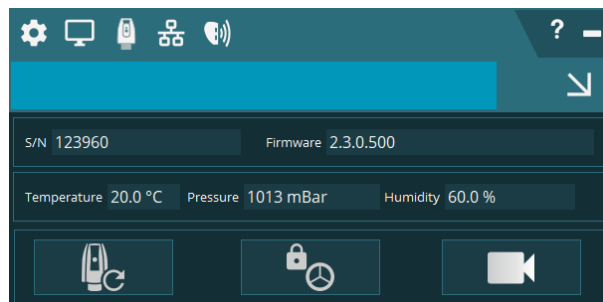
	The selected type of instrument is Arm.
	The selected type of instrument is Tracker.
	Issue with the instrument.
	No instrument of the selected type can be found.

Tab Details

Click on the system icon.



Instrument tab for an arm



Instrument tab for a tracker

S/N	 	Shows the serial number of the connected instrument.
Extension Pack		Shows the type of Controller or Control Pack.
SSW / Firmware	 	Shows the current system software of the instrument.
Temperature Humidity Pressure		Gives the current meteo values measured by a meteo station.
Temperature		Gives the current temperature status: - Ambient temperature status for monitoring - External temperature measured by an additional sensor.
Inclination Stability		Shows the stability status of the base.
Axis		Shows the status of stress applied on the axes.

2.4.2. Environmental Monitoring

When using the arm (RA8 v3), it is vital that both the arm and the part remain as stable as possible throughout the measurement process. Knowing the environmental challenges within the working environment gives the user a better understanding of what may affect the results and guides them toward a corrective action.

RDS includes environmental stress monitoring combined with stress sensors on the Absolute Arm.

2.4.2.1. Enable Environmental Monitoring

RDS can monitor all the stress indicators and then will warn the operator if one exceeds its limits.

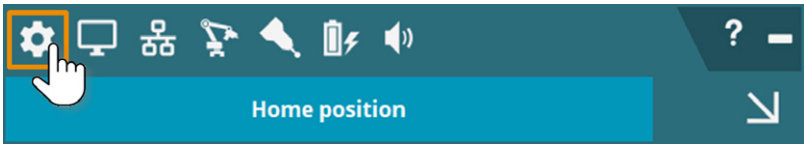
Alerts are displayed on the RDS Agent and on the Absolute Arm 7-axis wrist display. SMART Alerts are also then triggered.

Environmental Monitoring checks for several types of stress:

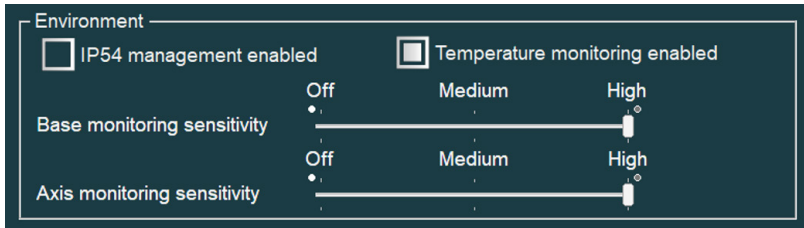
- Stability of the base (inclination, vibration, displacement)
- Stress of the Arm's axes
- Temperature gradient

Activation

1. Open the RDS Control Panel > General parameters.



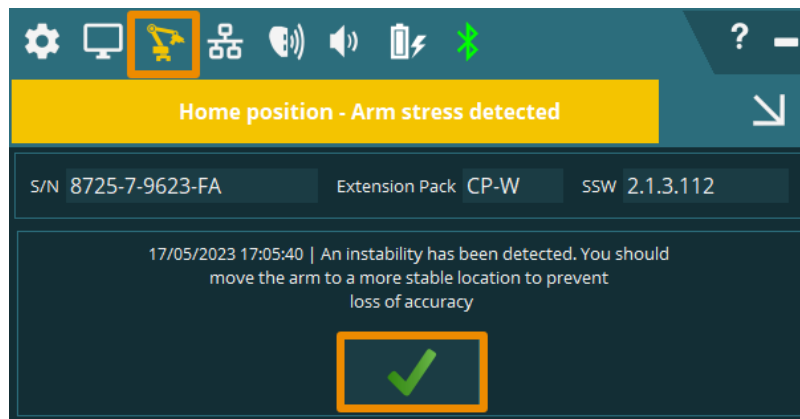
2. Set the wanted monitoring to the appropriate sensitivity.



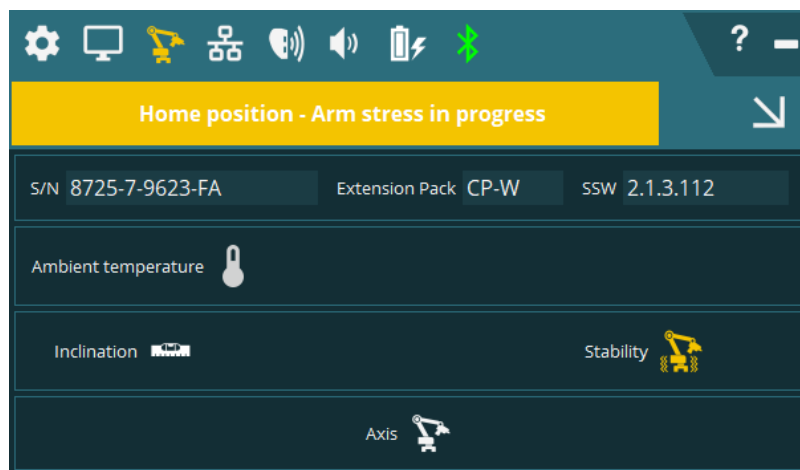
Off (default)	The monitoring is disabled, no alert will be triggered.
Medium	Medium sensitivity applied to the sensors. Suitable for most situations.
High	The system is defined as very sensitive. Suitable to ensure a careful handling when very accurate measurements are expected.

Environmental Alerts

When an environmental change or stress is detected, an alert is displayed on the RDS Agent. Open the Instrument tab to read the message and acknowledge the alert after taking the necessary corrective action.



If the cause of the alert is still present, the alert will remain visible until the corrective action is taken.



NOTICE

The environment monitoring by RDS is a security for your instrument. By ignoring the notifications displayed by RDS or de-activating the monitoring, you may be exposed to incorrect measurements.



The monitoring of the stress can be de-activated. Open the RDS Control Panel > General parameters and uncheck the wanted option.

2.4.2.2. Ambient Temperature

The Absolute Arm can be used between 5°C and 45°C in conditions of stable temperature. If the temperature is outside these limits, a deviation of the precision of measurement may occur. Also, if the variation of temperature evolves too quickly, it can affect part to be measured.

	The operating temperature is optimal
	Temperature variations were detected, evolving up or down. Wait until the temperature has stabilized before starting the measurement.
	The Arm is not working in the optimal temperature range. To achieve best accuracy, move to an environment with a stabilized temperature between 10°C and 30°C.
	The temperature exceeds the range. The measurement is forbidden. Move the measurement to where the temperature is within the operating range of the arm.
	Hardware issue



The temperature sensor is located at the base of the arm. Do not place any source of heat nearby the base to avoid any false alert.

2.4.2.3. Base Stability Monitoring

The arm contains sensors to check the relative tilt, vibrations and displacement of the arm base, and will alert the operator of any instability.



The inclination of the arm has changed.

- Verify the stability of the arm set-up.
- Ensure that the mounting ring is correctly tightened with the supplied hook wrench.
- Check that the mounting surface is clear.
- Check that the tripod is correctly tightened.

Vibrations have been detected.

- Check the stability of the floor or workstation.
- Check for anything that could be causing a vibration through the arm base (e.g. crane or forklift truck activity).

A potential displacement of the base has been detected.

- Ensure the solidity of the platform to mount the arm (e.g. magnets are ON, base plate is securely fastened).
- When using a tripod, alert others to your measurement activity by using barriers and/or signage. (Limit the risk of anyone accidentally kicking the tripod).

2.4.2.4. Inclination

The counterbalance of the arm is designed for a horizontal mounting ($\pm 5^\circ$). If the arm is not level, it may affect the zero-G counterbalance.



The workplane of the arm base is too inclined.

- Install the arm on a level work plane and reset the inclination.



The verification of the absolute inclination is done when powering the arm.

Inclination Sensor Reset

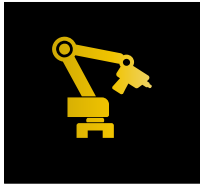
Following the detection of an inclination alert, a reset of the sensor is required once the corrective action has been performed. This will reset the current level as a reference to continue monitoring from.



A sensor reset is required when a station move is performed, and base monitoring is active. (Leapfrog, GridLOK...).

2.4.2.5. Axes Stress

When handling the arm, no stress must be applied to the axes at the risk of disrupting the measurement. The system will detect any such kind of stress and warns the user.



A stress is applied to one or several axes.

- Ensure that the whole arm is free to move on all the axes.
- Do not “pull” on the wrist during measurement.

2.4.3. Tracker Tools

Specific buttons are available when a tracker is connected.



Initialize

At start-up, the system is automatically initialized. During the initialization process, all the subsystems in the Absolute Tracker AT960 are initialized and are verified to be functional. During the initialization process the sensor moves to safety position. Once the system is ready it will return back to its initial position.



Disable PowerLock (Advanced User)

PowerLock allows the system to detect when a reflector is in view of the AT960 and automatically locks onto it without operator intervention.

The field of view of PowerLock is 10°, which corresponds to a spot size of 1750×1750 mm at 10 meters.

When PowerLock is enabled, the tracker moves automatically to lock onto the reflector when it is on the field of view.



Overview Camera

Once the tracker is connected, and active, it must focus on and lock the target (reflector, T-Probe or scanner).

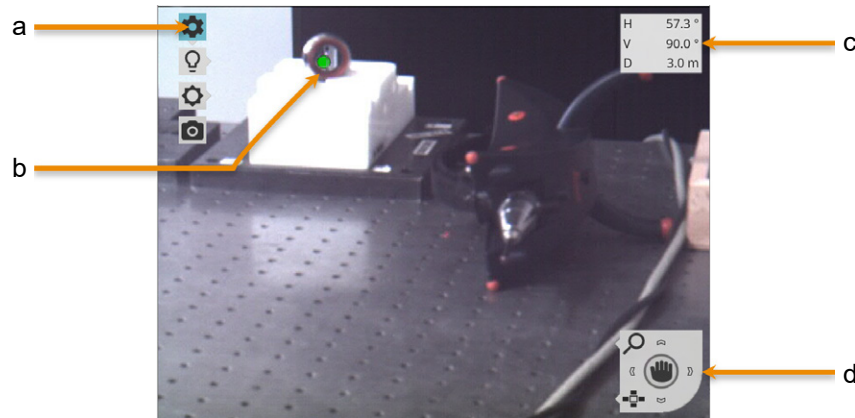
See next chapter for details.

2.4.4. Overview Camera

Once the tracker is connected, and active, it has to focus on and lock the target (reflector, T-Probe or scanner).

Either manually bring the target into the field of view of the tracker or help and guide the tracker to the target. Open the instrument tab and press on “Overview Camera” ().

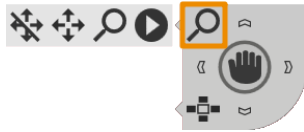
The Overview Camera (OVC) provides a coloured video stream in order to locate targets.



a	 Show / hide additional actions: <table><tr><td></td><td>Brightness</td><td>Adjusts the brightness of the view image by moving the slider.</td></tr><tr><td></td><td>Help</td><td>Shows the keyboard shortcuts for the OVC.</td></tr><tr><td></td><td>Save</td><td>Saves an image of the current view as *.jpg-File.</td></tr></table>		Brightness	Adjusts the brightness of the view image by moving the slider.		Help	Shows the keyboard shortcuts for the OVC.		Save	Saves an image of the current view as *.jpg-File.
	Brightness	Adjusts the brightness of the view image by moving the slider.								
	Help	Shows the keyboard shortcuts for the OVC.								
	Save	Saves an image of the current view as *.jpg-File.								
b	 Target The OVC image shows a green spot for each reflector in the field of view (FoV). Targets are shown in the field of view all the time whether the tracker is locked or not to a target.									
c	 Digital Readout stream <table><tr><td>H</td><td>357.3 °</td></tr><tr><td>V</td><td>93.4 °</td></tr><tr><td>D</td><td>6.7 m</td></tr></table>	H	357.3 °	V	93.4 °	D	6.7 m			
H	357.3 °									
V	93.4 °									
D	6.7 m									
d	 The Tracker head movement can be controlled with this pad. <table><tr><td></td><td>Moves the tracker head horizontally/vertically to the left/right resp. up/down from the tracker perspective with a mouse joystick.</td></tr><tr><td></td><td>Move the tracker head vertically down from the perspective of the Tracker with a step that can be chosen in the drop-down menu B.</td></tr><tr><td></td><td>Movement mode (see below)</td></tr><tr><td></td><td>Movement speed (see below)</td></tr></table>		Moves the tracker head horizontally/vertically to the left/right resp. up/down from the tracker perspective with a mouse joystick.		Move the tracker head vertically down from the perspective of the Tracker with a step that can be chosen in the drop-down menu B.		Movement mode (see below)		Movement speed (see below)	
	Moves the tracker head horizontally/vertically to the left/right resp. up/down from the tracker perspective with a mouse joystick.									
	Move the tracker head vertically down from the perspective of the Tracker with a step that can be chosen in the drop-down menu B.									
	Movement mode (see below)									
	Movement speed (see below)									

Movement modes

On the movement control pad, press the movement modes button to show the options.



Action



No action

- It isn't possible to move the tracker by clicking in the OVC image.
- The tracker can be moved by the OVC controls or keyboard functions.



Position to mouse click

- The tracker head moves to the clicked position in the OVC image.



Position to mouse click & lock on

- The tracker head moves to the clicked position in the OVC image and lock on to the next reflector.

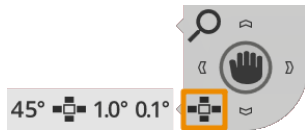


Position to mouse click & measure

- The tracker head moves to the clicked position in the OVC image and measure.

Movement speed

On the movement control pad, press the movement speed button to show the options.



Step

45° Extra large

- Moves the tracker head horizontally/vertically to the left/right resp. up/down from the Tracker perspective with a step of 45°.



Next image

- Moves the tracker head horizontally/vertically to the left/right resp. up/down from the Tracker perspective to the next image.

1.0° Fine

- Moves the tracker head horizontally/vertically to the left/right resp. up/down from the Tracker perspective with a step of 1.0°.

0.1° Extra fine

- Moves the tracker head horizontally/vertically to the left/right resp. up/down from the Tracker perspective with a step of 0.1°.

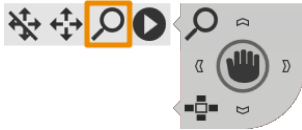
How to Find and Lock a Target

The purpose is to move the video in sort of placing the target at the middle of the view.

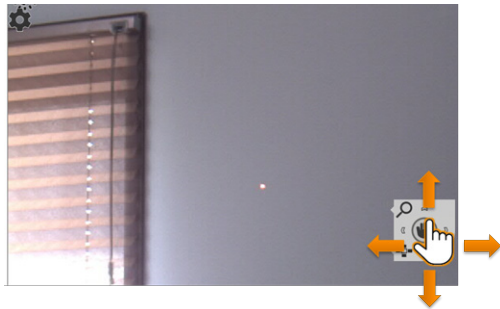
1. Open the OVC



2. Set the Movement mode to "Position to mouse click & lock on".

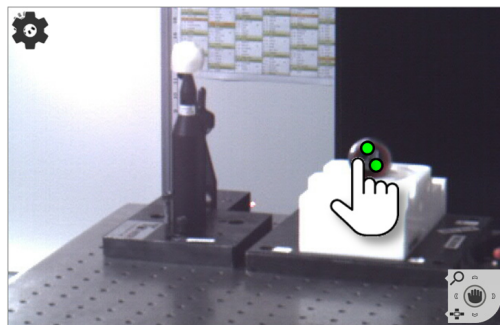


3. Move the tracker head.

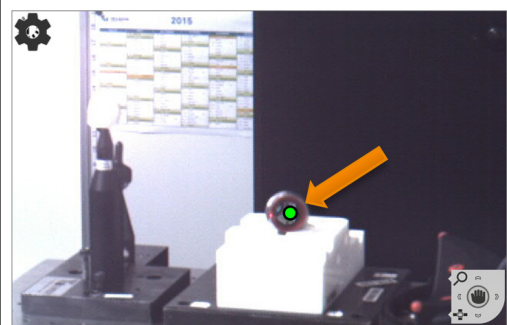


4. Once the target appears on the video, affine the position by clicking at the centre of the target: only one green dot is displayed on the target.

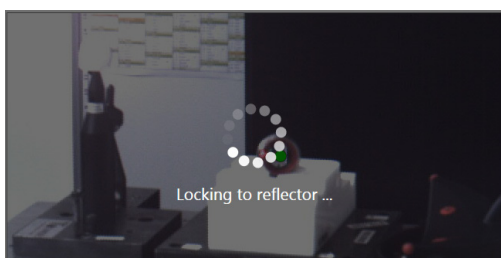
The target is not centred correctly: two green dots are displayed. Click on the target.



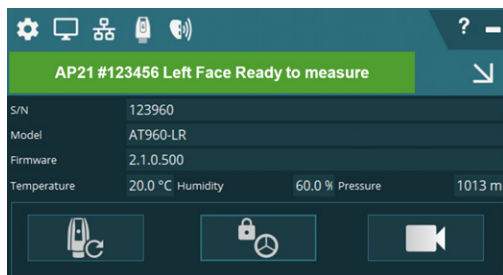
The view gets centred on the click point. Only one dot is displayed.



5. The tracker automatically adjusts and locks target.



6. Once the target is locked, RDS indicates the status (depending on the locked-on target).



7. Close the OVC

2.5. Sensors

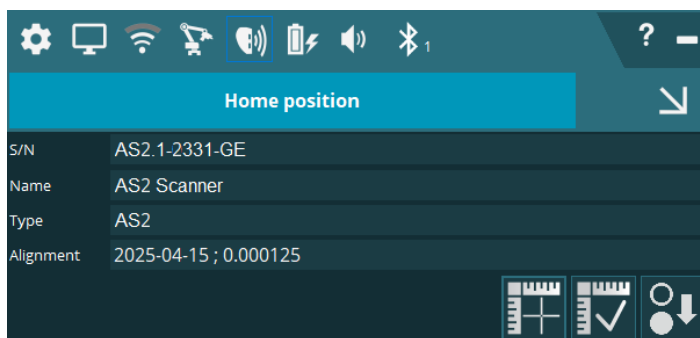
2.5.1. Touch Probes, Tube Probes & All Scanners

Status Icon

	The current sensor is a contact probe.
	The current sensor is a tube probe.
	The current sensor is a laser scanner.
	Issue with the sensor.
	No sensor is currently detected.

Tab Details

Click on the sensor icon.



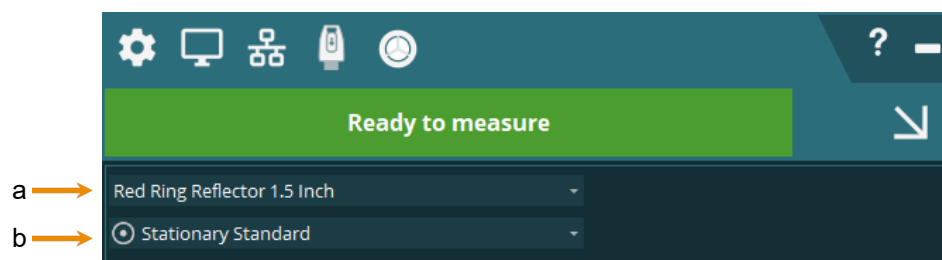
S/N	Serial number of the sensor (for scanners).
Name	Name given to the sensor.
Type	Shows the type of sensor (Contact probe / Scanner / NC Tube probe).
Alignment	Shows the date, time and calculation result of last alignment of the sensor.
	Runs the probe alignment process in RDS Data Collector.
	Runs the probe verification process in RDS Data Collector.
	Switch sensor selection (up / down): changes the probe / scanner selection (7-axis arm).
	Activates / deactivates the Depth sound guide for compatible scanners.

2.5.2. Reflectors, T-Probe & T-Mac

Status Icon (tracker)

	Reflector		T-Mac Inspect (TMC 30-I)
	AP21 (with no sensor)		T-Mac Multiface (TMC 30-M)
	T-Probe		T-Mac Extended (TMC 30-E)
	T-Mac Frame (TMC 30-F)		Issue with the sensor
	T-Mac Basic (TMC 30-B)		No sensor is currently detected

When using probing sensors on a tracker, the RDS Agent proposes some sensors options.

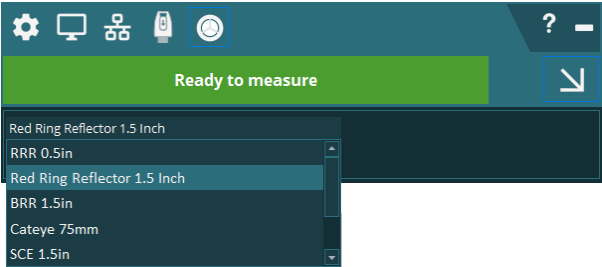


- Manual selection of the sensor (excepted T-Probe and LAS)
- Probing mode (see below)

Select a Target

Different kinds of measurement targets can be used. T-Probe and scanners are automatically recognized, no need to select. The SMR reflectors cannot be recognized and require to be selected in the list.

As soon as a target is locked on, it is displayed in the RDS Agent. The respective target information can be called up by clicking on the corresponding icon.

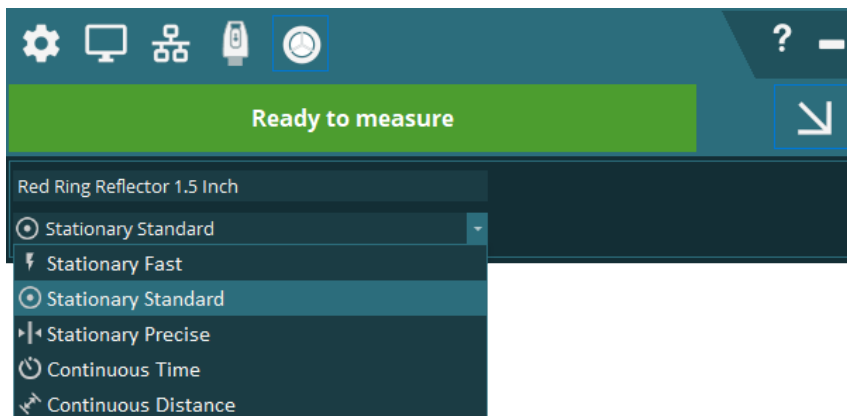
Target	Selection
T-Probe	Automatic
T-Mac	Automatic
Reflector	Click on the sensor icon to enter the reflector set-up tab and select the appropriate reflector in the list. 



The T-Probe only works with an attached and compensated tip.

Probing Mode

The mode enables the user to select the adequate measurement behaviour according to the application needs.



Stationary	“Single stationary points” is the standard manual way to measure. (The slower, the more accurate).	
	Fast	With this mode, the delay for each point is reduced. • Handheld • Rapid measurements • Typically achieves specified accuracy in controlled environment.
	Standard	This is the standard mode, a compromise between speed and accuracy. • Accuracy of application within manufacturers specification • Controlled environment.
	Precise	With this mode, the time to take each point is longer, but it provides a higher accuracy. • Measurements with high reliability such as move station point • Sensor checks and compensations.
Sequential	The points are triggered automatically according to a time or distance criteria.	
	Continous time	Frequency controlled scan probing (points are automatically triggered on a frequency defined with a specified period). The space between each point depends on the speed of movement (the faster it is, the more spaced the points are). The delay between each point can then be specified (default 500ms)
	Continous distance	Interval controlled scan probing (points are automatically triggered at a specified distance from the previous point). The space between each point is constant and does not depend on the speed of movement. The distance between each point can then be specified (default 1mm)

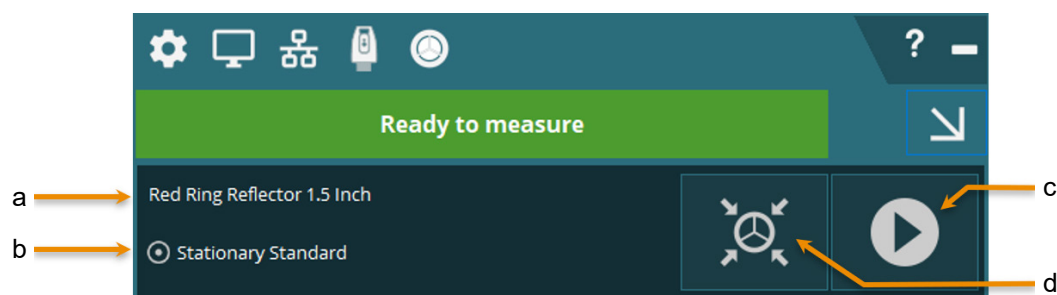
2.6. Probing Tab (tracker)

The tracker probing tab automatically appears as soon as a probing sensor is locked on:

- Reflectors
- T-Probe
- AP21 when no sensor is mounted on it
- T-Mac



Probing with RDS is available only with application software supporting this function.



- Current sensor/positioner and tip
- Current probing mode
- Start/Stop button
- Stable mode activation button



To define the current reflector or choose the probing mode, use the Sensor tab (see previous chapter)

Manual Probing (default)

When the probing mode is set to “Stationary”, the points are taken independently of the others.

Position the probe and click on the button (or press the trigger button on the T-Probe/AP21).



A single point is then taken.

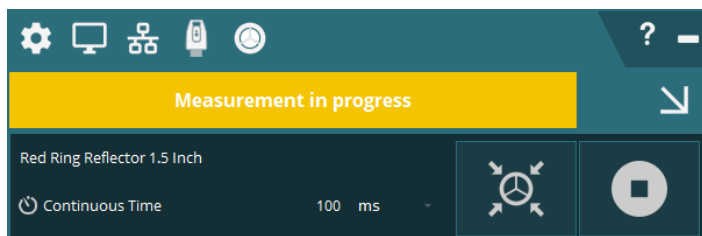
Scan Probing

When the probing mode is set to “Continuous time” or “Continuous distance”, the points are triggered automatically once the specified delay or distance is reached after the previous point.

Press the Measure button to start the automatic measurement.



Points are then automatically taken.



Then press the Stop button to pause.



Stable Probing (SMR only)

RDS provides the ability to trigger automatically a point when the probe stops moving. No need to press any button, move the probe to the desired position, as soon as it becomes stable, the point is automatically taken.

To activate the stable measurement, press the button.

	Stable probing is active
	Stable probing is inactive



The stable probing doesn't prevent from manual points with the button .

Laser Scanning

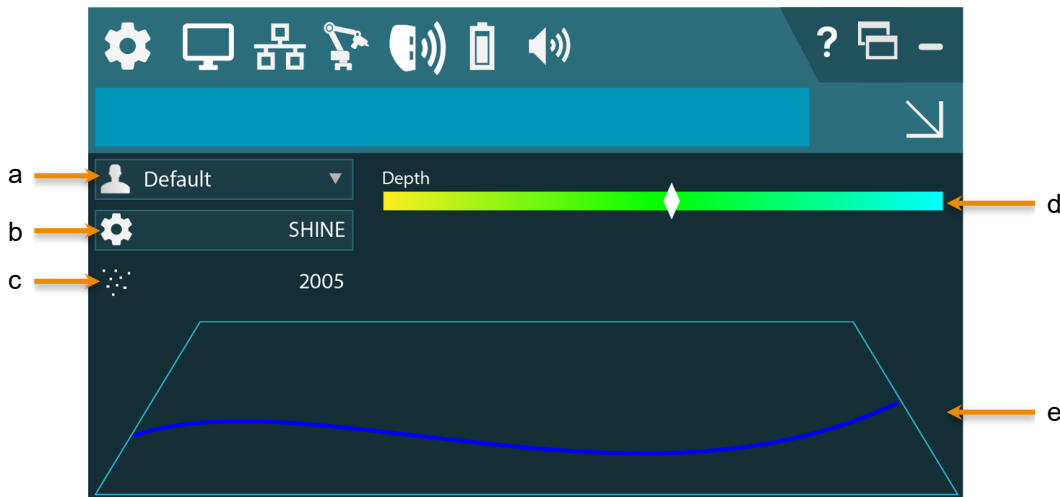
Please refer to the chapter [2.7 - Scanning Panel](#) for details on the use of the scanner.

2.7. Scanning Panel

When a scanner is detected on the arm, the RDS Agent provides useful tools for digitizing.

Description

Following information and options are available:



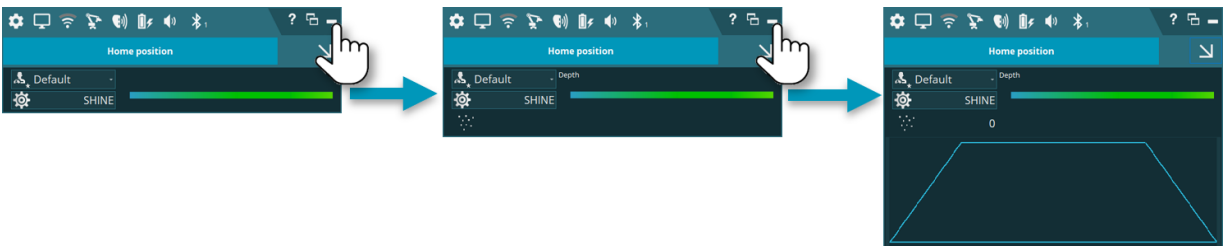
Item	Description
a  Default ▼	Current scanning profile and profile selection.
b  SHINE	Scanning mode / exposure and access to the settings.
c  2005 / 1609728	Nb of points per stripe (in preview) / total Nb of scanned points.
d Depth 	Indicator bar graph showing how target is placed against scanner Z-field (only in capture mode).
e 	2D view of the scan line.

Fig. 1: RDS Scanning Window description

For more details, refer to [3.5 - Scanner](#).

Minimum / Extended Window

The window size can be modified by clicking on the resize button (minimized by default).



Extended window can then be displayed with the video of the scanner added to the basic items.

2.8. Battery Panel

Status Icon

	Battery(ies) level (Low to High)
	The battery level is critical
	On power supply / the battery is charging
	No battery detected

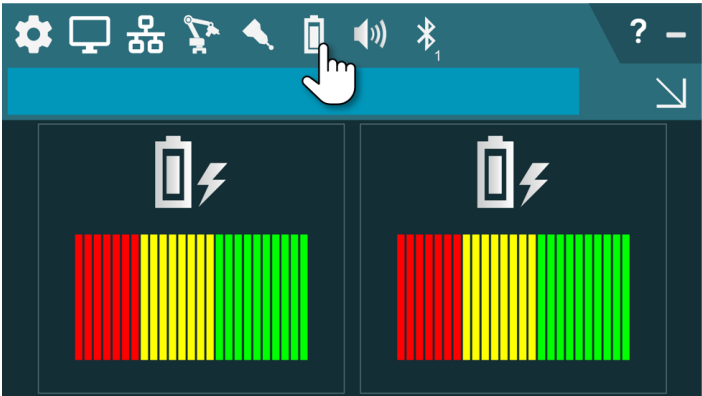
The level in % can be displayed by pointing the icon.



The battery status is not available when the tracker is on power supply.

Tab Details

Open the tab by clicking on the icon, the level and status of each battery are then displayed graphically.



2.9. Sound Panel (arm)

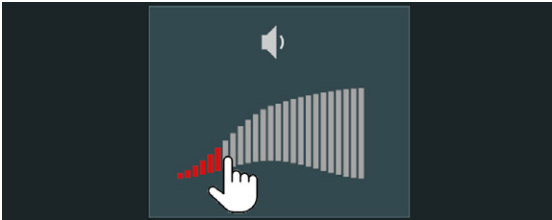
Status Icon

	The sound is on the instrument speakers.
	The sound is on the Bluetooth device.
	Sound volume set (Min to Max).
	Sound set to zero.

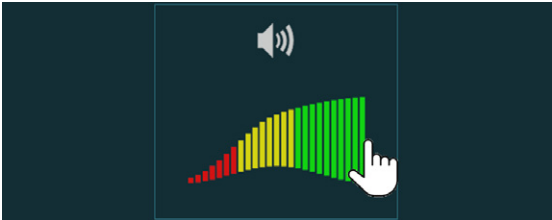
Tab Details

To change the sound level of the arm or the headset, click on the desired level.

Lower volume



Higher volume

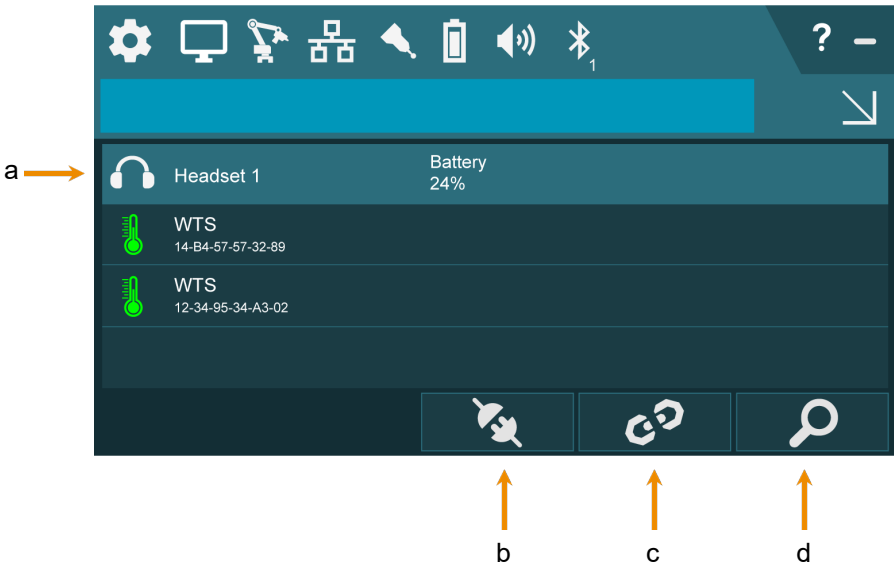


2.10. Bluetooth (arm)

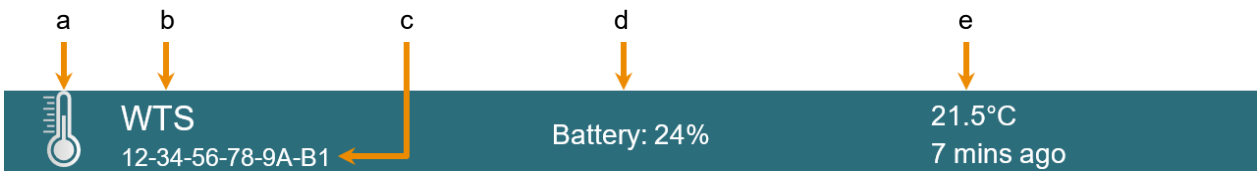
2.10.1. Tab details

Wireless accessories can be connected to the Absolute Arm (RA8 v1 and v2) or to the computer (RA8 v3 – Service profile for WTS only). Their connection is managed in the RDS Agent.

Click on the Bluetooth icon to display the list of available, connected or registered devices.



- a. Selected device
- b. Connect / disconnect the selected device
- c. Unsubscribe the selected device
- d. Seek again for new devices



a	Type of device	: Temperature sensor (WTS) : Speaker, headset, earphone...
b	Name of the device	
c	Address of the device	MAC address : always shown : show only on the selected device
d	Battery status	
e	Information returned by the device	: last temperature measured by the sensor : Sound level (when available)

2.10.2. Bluetooth Status

Subscription and Connection

Bluetooth peripheral can be used subscribed or connected.

	Subscription A subscription consists by getting data from the peripheral, but without a total control and monopole. Several arms can be subscribed to a peripheral at the same time, and then get data from it. If the device is no longer discovered, the subscription remains, and data can be collected from the device as soon as it is recovered.	WTS
	Connection A connection consists by taking full control of the peripheral. Usually, a connection requires also a subscription (this process is then automatically done by RDS). Only one arm can connect a peripheral. When the device is no longer discovered, the connection is stopped (but subscription remains).	Speaker Headphone ...

As soon as a device is subscribed (for a simple subscription or for a connection), it remains memorized in the list.

Device Status

The icon of the discovered Bluetooth devices shows their type and status.

	Discovered Device discovered (New or already subscribed) but not connected
	Subscribed Device already subscribed but not available (not discovered)
	Connected Device subscribed, discovered and connected

Bluetooth Functionality Icon Status

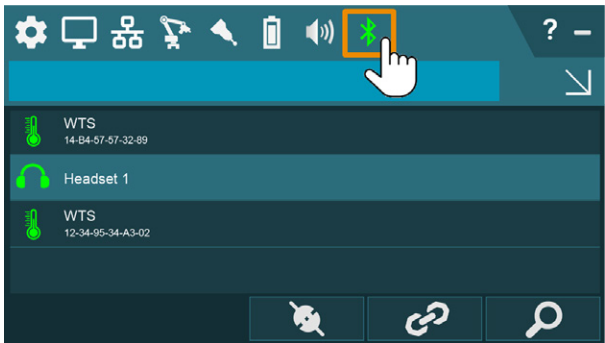
The Bluetooth functionality icon present on the RDS Agent, the Absolute Arm base and the wrist display of the Absolute Arm 7-axis, shows the current status.

	(blinking) Bluetooth initialising	(Startup of the arm)
	Bluetooth ready	The Arm is ready to discover, subscribe and connect devices.
	(blinking) Discovering	The arm is seeking for new devices.
	Subscribed	A device has been subscribed
	Discovered	One or several devices have been discovered and are ready to be connected
	(blinking) Connecting	
	Device connected	At least one device is connected.
	Bluetooth deactivated	(RA8 v3) Bluetooth is missing or deactivated on the computer.
	Error	

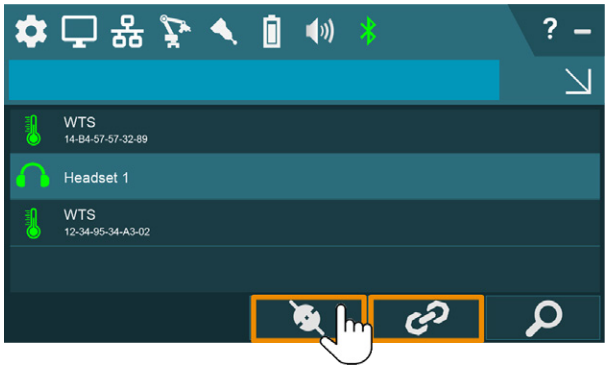
2.10.3. Subscribe/Connect a New Device

Bluetooth interface		Compatible device	
RA8 v1 / v2	Absolute Arm		
RA8 v3	Computer internal device or USB adapter		

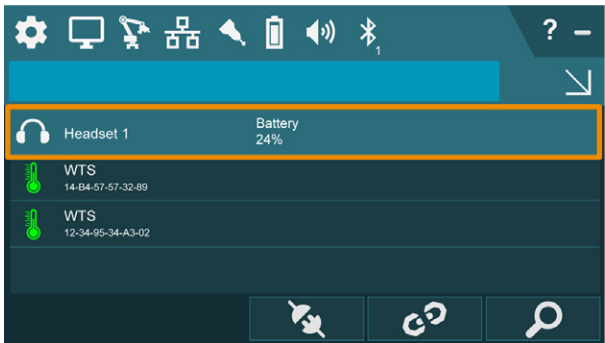
- Click on the Bluetooth tab to open the tab: the RDS Agent seeks for available devices and lists them.



- Select the wanted device and click on Subscribe or Connect (depending on the type of device).



- The device is now ready.



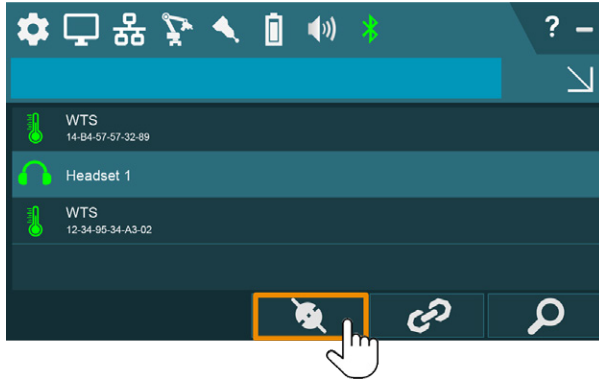
2.10.4. Connect a Subscribed Device

As soon as a device has been connected or subscribed once, it remains listed as subscribed until the user press the “Unsubscribe” button.

Then “Subscription only” devices are automatically back available when discovered by the arm.

The devices requesting a “Connection”, remain subscribed but need a new connection when discovered to be used.

Select the device and press “Connect”.



2.11. IP54 Monitoring (arm)

The RDS Agent provides a monitoring tool to detect any lack of protection to the system.

- When the arm is connected to the computer, RDS will verify if IP54 conditions are respected.
- If RDS detects that IP54 protection is missing (for example the Nose Cone is not installed on the 7-axis wrist), RDS will invite the user to intervene, to ensure that protection is maintained at all times.



The IP54 monitoring is only supported by the Absolute Arm (RA8) v2 and v3.



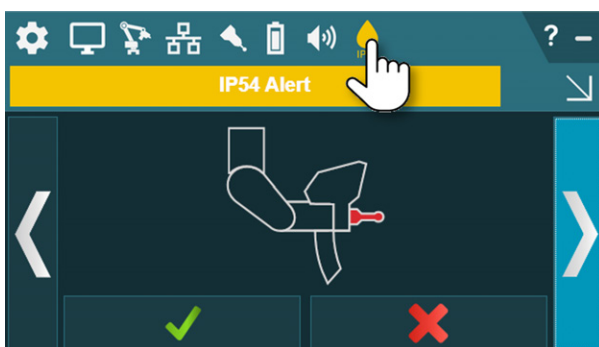
The IP54 monitoring can be de-activated. Open the RDS Control Panel > General parameters and uncheck the IP54 option.

IP54 Alerts

1. If the arm is not fully IP54 protected, the icon will show in the RDS Agent.



2. To find out where the arm is not protected, click on the IP54 icon. A diagram will be shown to indicate what part of the arm requires attention. If there are several locations, scroll through them, by clicking on the right and left arrows.



3. Depending on the action, mount an accessory, or a cap (and then acknowledge), or reject if there is no possibility to respect the protection (IP54 alert remains).



IP54

NOTICE

Any IP54 notification, acknowledgement or rejection is logged.



IP54

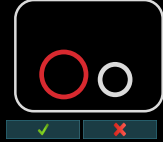
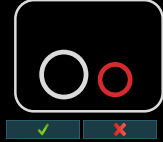
NOTICE

Rejection

If no protection on the specified component can be applied, the user then shall press the red cross to reject IP54 protection. In case of rejection, the user undertakes to use the instrument in IP54 conditions.



List of Potential Situations

	Status	Required action
	No Scanner or Nose Cone is mounted.	Mount a scanner or a Nose Cone.
	A scanner is mounted but not compliant with IP54 (RS5, RS6, earliest AS1's).	Mount a scanner compliant with IP54. If not possible, reject (the arm then is not protected).
	No probe is mounted on the TKJ connector.	Mount a probe compliant with IP54 or Mount the TKJ cap and acknowledge.
	A probe is mounted but not compliant with IP54 (probe V1, tube probe).	Mount a probe compliant with IP54.
	The arm is connected through Wi Fi.	Ensure that the LAN connector is protected by the cap and acknowledge.
	The arm is powered on battery.	Ensure that the power connector is protected by the cap.
	A Control Pack v1 is mounted.	Change to a Control Pack v2 (CP-C / CP-B / CP-W).
	The Pistol grip has been removed.	Place the Swivel Panel and acknowledge.

2.12. Logbook Panel

The Logbook in the RDS Agent warns the operator about events such as a connection failure or other specific information.

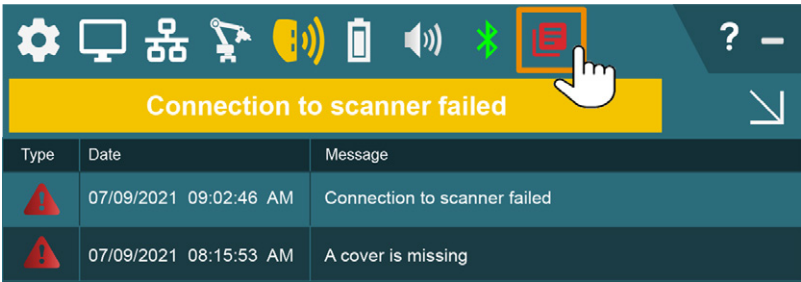
New Event

As soon as a new event is logged, the logbook status icon is flagged to the user by turning to red.



View the List of Events

Press on the logbook status icon to open the tab (the icon goes back to default-white).



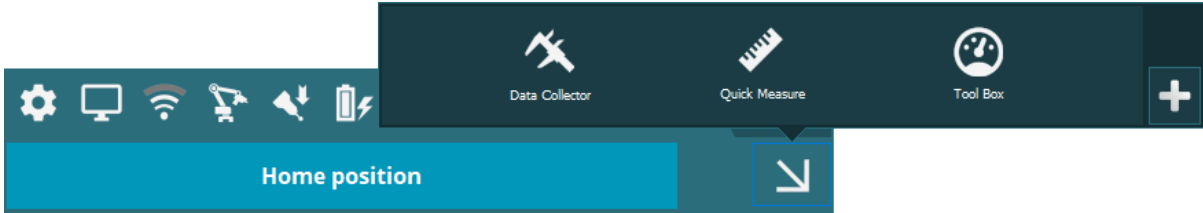
Type	
	Information
	Non-critical error
	Critical error



Only logs of the current session are displayed (last 24h).

2.13. Shortcuts

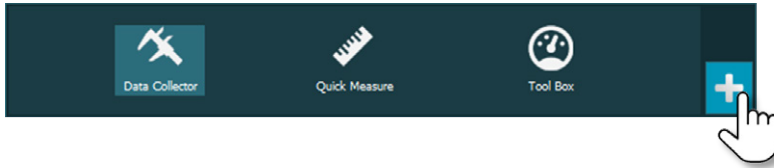
To access the RDS software components, click on the shortcuts icon.



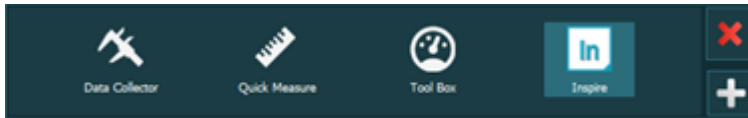
	Shortcuts	 	Access to the shortcuts
	RDS Data Collector		Instrument and accessories verification and alignment.
	RDS Quick measure	 	Tools to do basic measurements.
	RDS Toolbox	 	Main interface for the configuration and maintenance.
	Add a shortcut	 	Gives the possibility to add a customized shortcut.
	Remove a shortcut	 	<i>(Advanced profile)</i>

Add Customized Shortcuts

1. Press “+” to add a new shortcut.

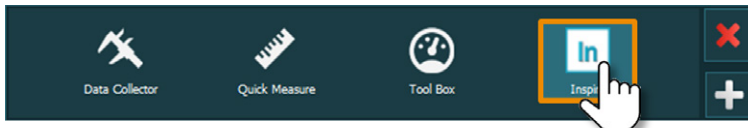


2. Browse and select the file (executable or not).

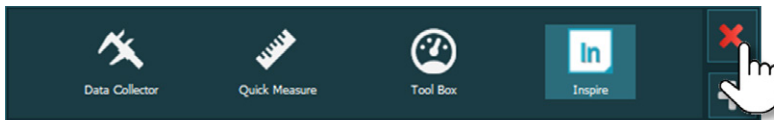


Remove Shortcuts

1. Select the shortcut to remove.



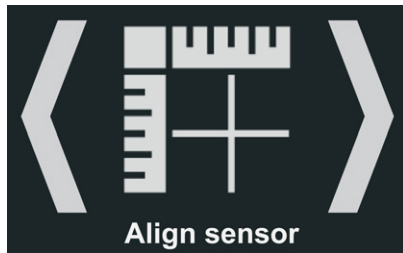
2. Press the red cross.



Only customized shortcuts can be removed.

2.14. Quick Access Menu (arm)

The Quick Access Menu ("Q.A.M.") is a functionality of the RDS Agent, providing main useful actions very easily from the wrist of the arm without the need of going back to the computer. The Quick Access Menu is similar on the Wrist Display on the RA8 – 7 axes.



Actions may be:

- Display system status information
- Access to verification or alignment
- Control main settings
- Real time feedback for scanning

The Quick Access Menu contains very basic and easy interface and use:

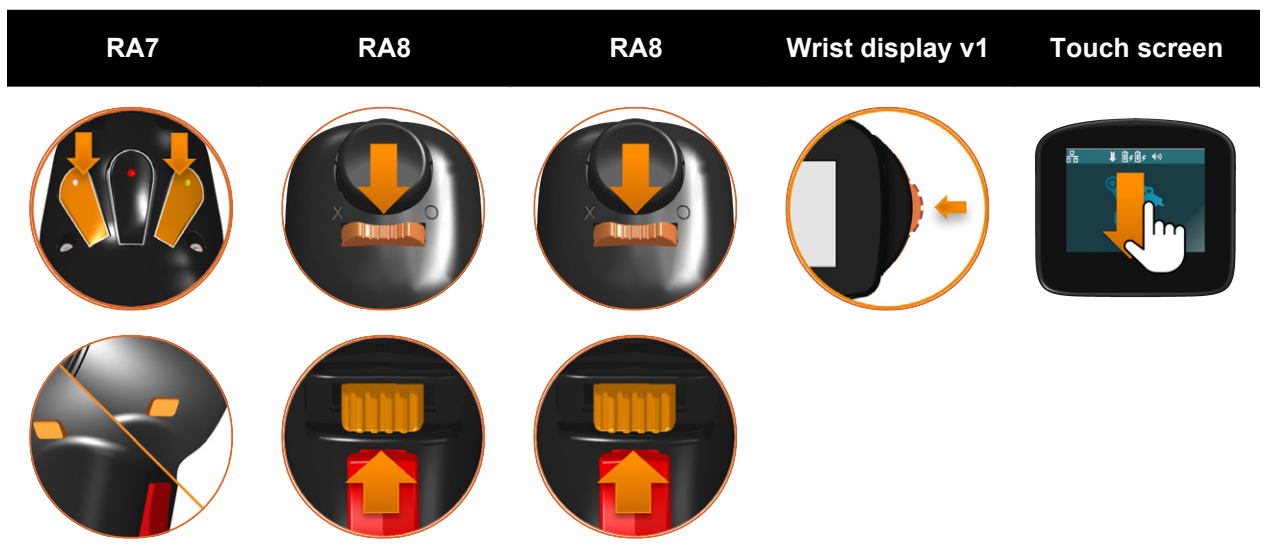
- Left-Right – make your choice
- Click – validates the choice.

2.14.1. Controlling the Q.A.M.

Open the Q.A.M.

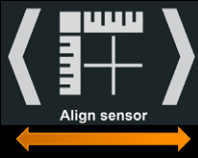
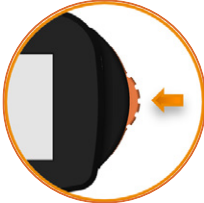
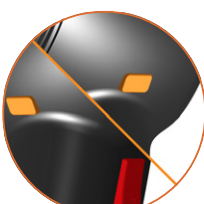
Press the 3-State Button (middle position) or swipe down the touch screen to activate the Quick Access Menu.

The menu appears then on the computer – and on the wrist display.



Navigate

The wanted action can be easily selected by going left or right with the buttons of the wrist.

	RA7	RA8	RA8	Wrist display / Touch screen
Previous – Next action 	Press (or swipe) left or right			
				
				
Validate the choice 	Press trigger	Press the 3-State button		Press the 3-State button or Tap
				
				
Exit the Q.A.M. 	Press left + right	Press the Trigger button		Swipe up
				
				

2.14.2. Available Actions

The settings and functions that can be reached from the Q.A.M. mainly depend on the type of arm (6 or 7 axes) and the type of sensor (contact probe, scanner, ...).

Some functions also can be used only in specific conditions:

- “Capture the exposure” is reachable only when the scanner is used in manual mode.
- Some actions are forbidden to Standard user profile (align sensor).
- Most scanning actions can be done only when the system is ready to measure.
 - Application software is connected to RDS
 - Arm not at home position

	Change scanning profile	Scanners	Offers the choice of profiles and activates the chosen one. Profile1 Profile2 ...
	Capture the exposure	Scanners	 Starts the capture of exposure. (only in Manual scanning mode)
	Switch exposure mode	Scanners	 Switches automatic-manual exposure modes.
	Switch sensor	RA8-7axis	Switches to the upper or lower sensor location.
	Align probe	All sensors	 Offers the choice of alignment method and runs the RDS Data Collector script: • Sphere / Sphere with reference • Plane / Plane with reference • Single point (contact probe only)
	Check probe	All sensors	Runs the appropriate script in RDS Data collector.
	Control Panel	All	Opens the RDS Control Panel for settings.

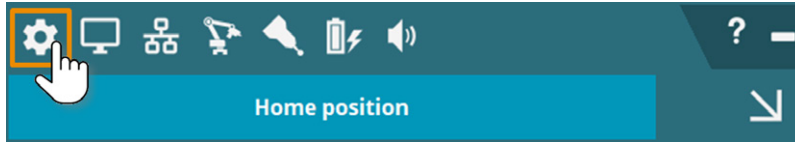
 : system status must be “Ready to measure” |  : Advanced user profile or upper is required

3. RDS Control Panel

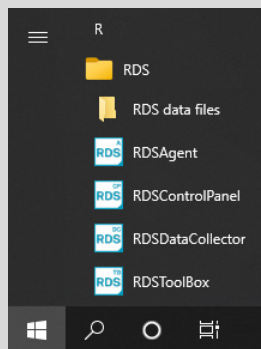
RDS Control Panel is the module for the settings of the instrument, probes, scanner and system.

Open RDS Control Panel

To access RDS Control Panel, open the RDS Agent (RDS icon on the notification bar) and select “Control Panel”.



RDS Control Panel can be also opened from “start menu > Programs > RDS > RDS control Panel”.



Components of the RDS Control Panel

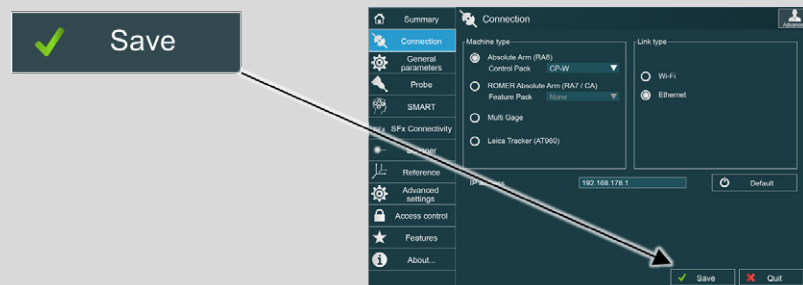
The RDS Control Panel is divided in several tabs, available according to the connected machine.

	<u>Summary</u>	 	Shows the status of the machine.
	<u>Connection</u>	 	Used to set up the connection with the instrument.
	<u>General parameters</u>	 	Language, units and settings for environment monitoring.
	<u>SMART</u>	 	Privacy statement and activation of SMART functionalities.
	<u>Nexus Connectivity</u>	 	Activation of the Metrology Asset Manager
	<u>Probe</u>	 	Shows current probe and available probe settings.
	<u>Reference</u>	 	Allows moving the device keeping the original reference.
	<u>Scanner</u>	 	Available when a Hexagon scanner is connected.
	<u>Advanced settings</u>	 	Various settings on arm for the buttons, mouse...
	<u>Access control</u>	 	Definition of the passwords for the User profiles.
	<u>Activations</u>	 	Management of the activation codes for protected features.
	<u>Video capture</u>	 	Management of the wrist camera (on equipped arms)
	<u>About</u>	 	Information on the system.

Available | Under condition



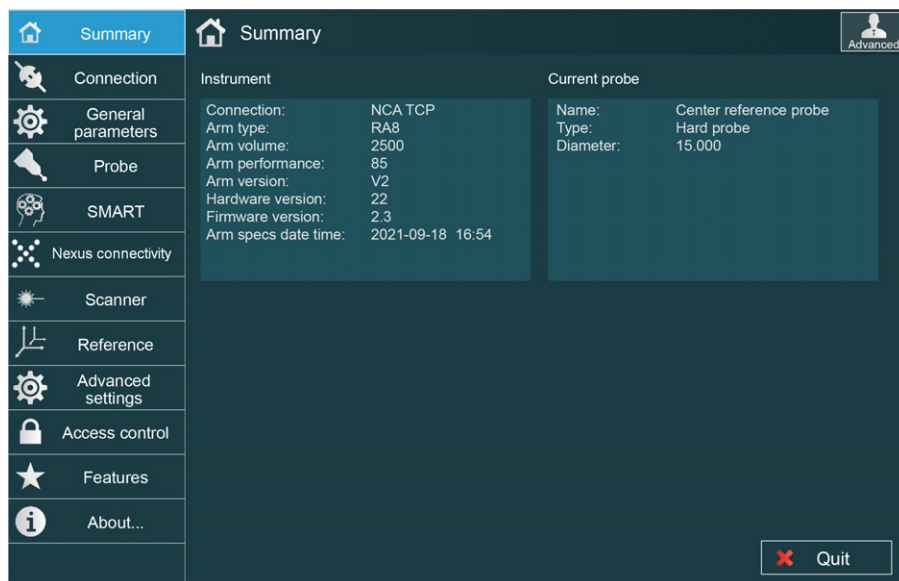
Any modification of the settings needs to be saved.



3.1. Summary

This page shows main information about the connected instrument.

3.1.1. Summary (arm)



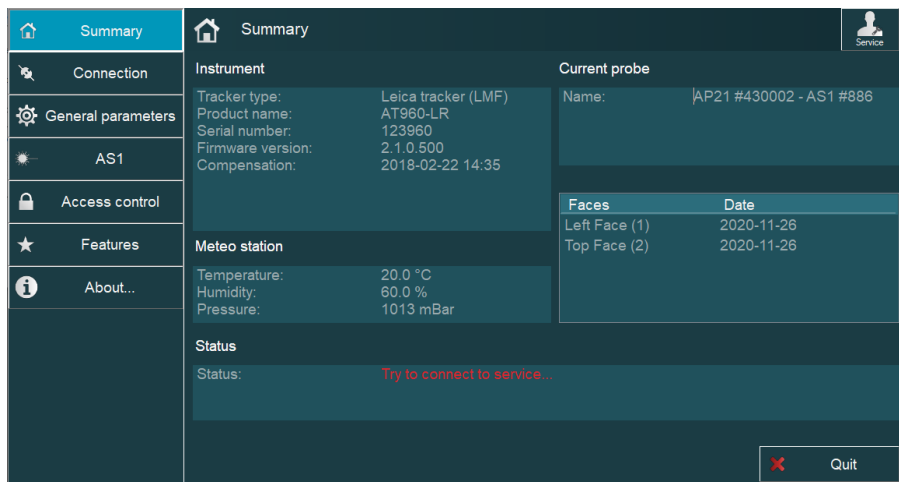
Instrument

Connection	Type of system (NCA) connection (WLAN / Wired Ethernet)
Type	Type of arm
Arm volume	Diameter of the spherical measurement volume in mm
Arm version	Version of the arm
Performance	Performance level of the arm
Hardware version	Version of arm
Firmware version	Version of electronic program in the arm
Armspecs date time	Date and time of last arm compensation

Current Probe

Name	Name of the probe (see 3.4 - Probes)
Type	Touch (contact), trigger, scanner, or NC-Tube probe
Diameter	Ball probe diameter

3.1.2. Summary (tracker)



Instrument

Tracker type	Type of tracker and interface
Product name	Tracker model
Serial number	Laser tracker unit number
Firmware version	Installed package version on the laser tracker
Compensation	Date and time of last tracker compensation

Meteo Station

Temperature	Ambient temperature measured by the instrument
Humidity	Relative humidity measured by the instrument
Pressure	Air pressure measured by the instrument

Current Probe

Locked on probe/positioner.

Name	Name of the positioner/sensor
Diameter*	 Ball probe diameter
Faces	 Date of alignment of each scanner faces

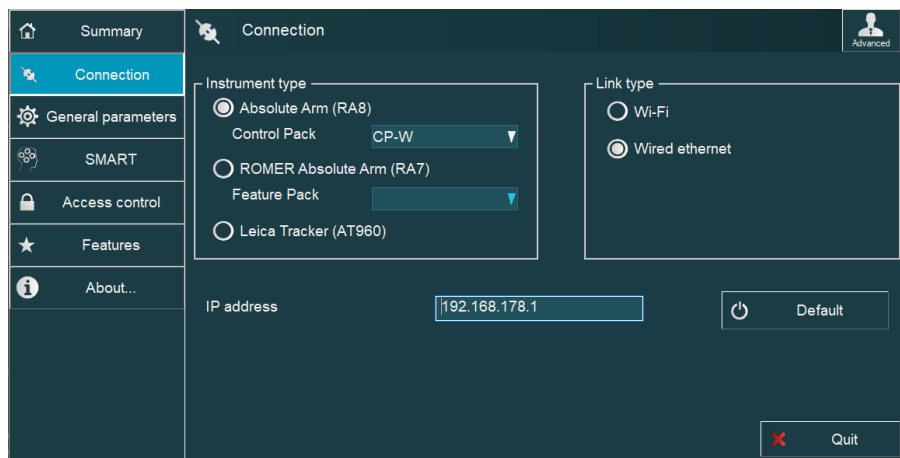
 : Reflectors and T-Probe only |  : Scanners only

Status

Status	Information about connection and status
--------	---

3.2. Connection

This tab is used to select the type of arm and type of connection between 4 types of instruments and 3 types of connections.



	Controller			
			Ad-hoc	Access pt
Absolute Arm (RA8)	CP0	✓		
	CP1	✓		
	CP2	✓		✓
	CP3	✓		✓
	CP-C			✓
	CP-B			✓
	CP-W		✓	✓
ROMER Absolute Arm	None	✓		
	FP1	✓		
	FP2	✓	✗	
	FP2+	✓		✓
	FP3	✓	✗	
	FP3+	✓	✓	✓
Leica Absolute Tracker (AT960)				✓

According to the selected type of connection, additional parameters may be displayed above.



- Please refer to the arm manual (Absolute Arm / ROMER Absolute arm) for complete description of WLAN connection.
- SSID, Channel, IP address and WEP can be modified. Refer to [6.7.4 - Connectivity Configuration](#).

3.2.1. Wired Ethernet Connection (arm / tracker)

Please follow the instruction below to connect RDS to the arm (Absolute Arm or Cimcore CA7 Arm with FP3+ / CP3 / CP-C / CP-B / CP-W) or the tracker through wired Ethernet.

Instrument setup

1. Power on the instrument.



2. Ensure that the Ethernet cable is correctly connected from the instrument to the computer.

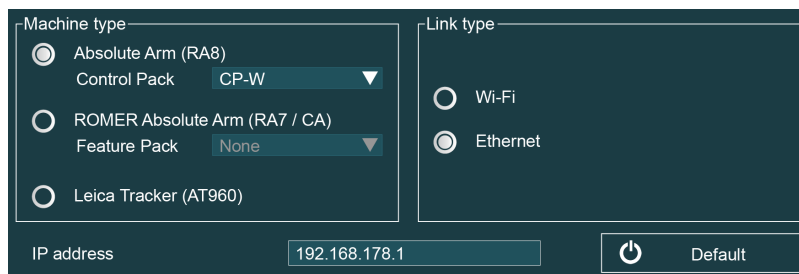


RDS setup

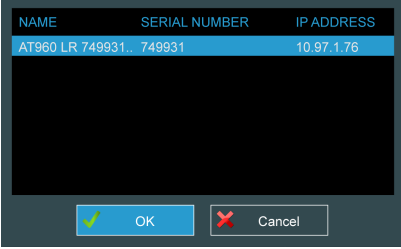
3. From the RDS Agent, open the RDS Control Panel and select the Connection tab.



4. Select the type of Instrument, type of Extension Pack (Absolute Arm) and "Wired Ethernet".



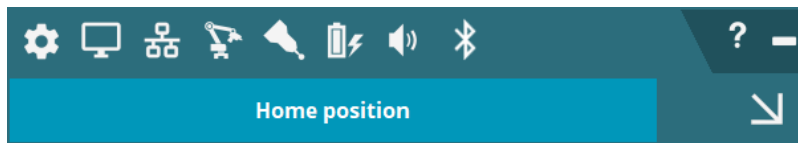
5. Use the default IP address or Set it up.

		
Enter the IP address of the Control Pack.	Click on “Discover”, select the tracker to connect and OK. 	Enter manually the IP address of the tracker.

6. Save the modifications.



7. Now RDS automatically connects to the instrument.



The tracker is connected only when a measurement software connects its RDS plug-in.



The “Default” button permits to get back the original default address.

3.2.2. Wireless Connection (arm)

Please follow the instruction below to connect RDS to the arm (Absolute Arm or Cimcore CA7 Arm with FP2+ / FP3+ / CP3 / CP-W).

3.2.2.1. Computer Wi-Fi Setup

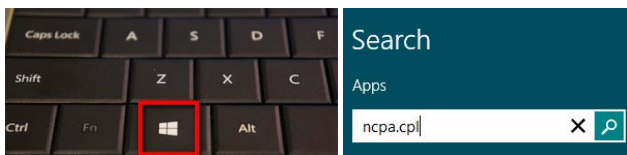
The following operation may be necessary before trying to connect RDS to any arm through Wi-Fi.



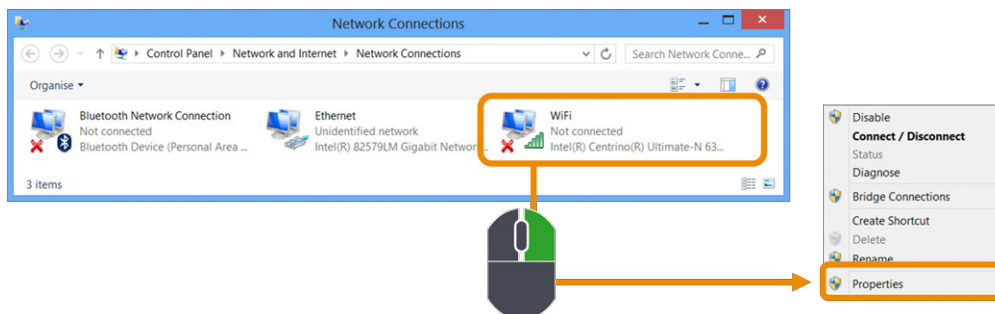
*The Wi-Fi chipset used for the wireless connection should be exclusively dedicated to it.
Please read in appendix the recommended settings for the Wi-Fi chipset.*

Wireless Device Setup

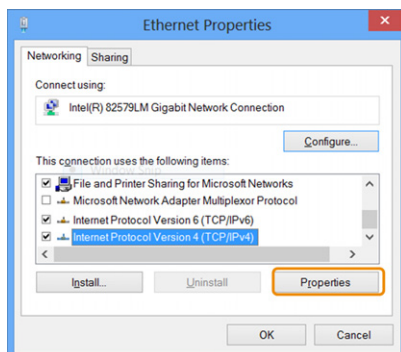
1. Switch on the computer's Wi-Fi adapter
2. Access the network settings: press the Windows logo touch on the keyboard and type in "ncpa.cpl".



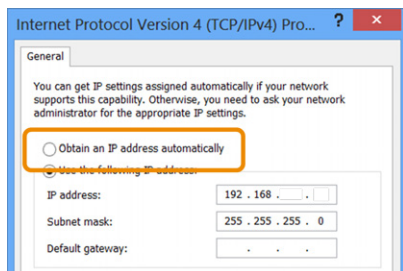
3. Right-click on the Wi-Fi device and select "Properties".



4. Select Internet Protocol (TCP/IPv4) > Properties.



5. Select “Obtain an IP address automatically” and then OK.



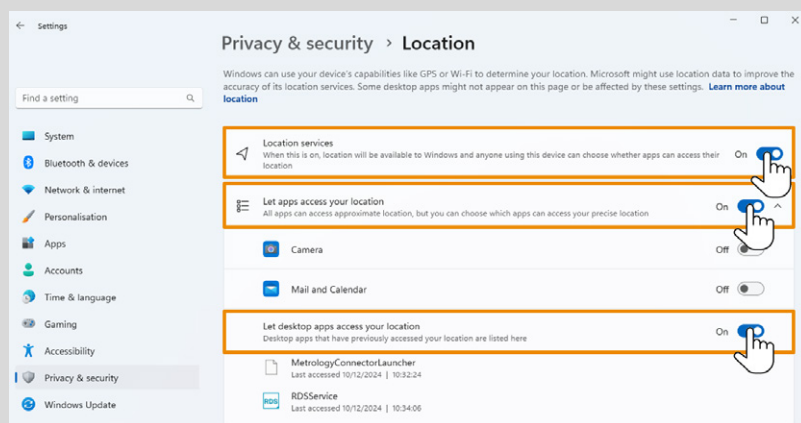
Windows security



NOTICE

With the latest versions of Windows 11 (since 24H2), the Location services must be enabled in the Windows settings to avoid any wireless connection issue.

When connecting the arm for the first, RDS will bring you to the activation of the location settings.



3.2.2.2. Wireless Connection

Instrument setup

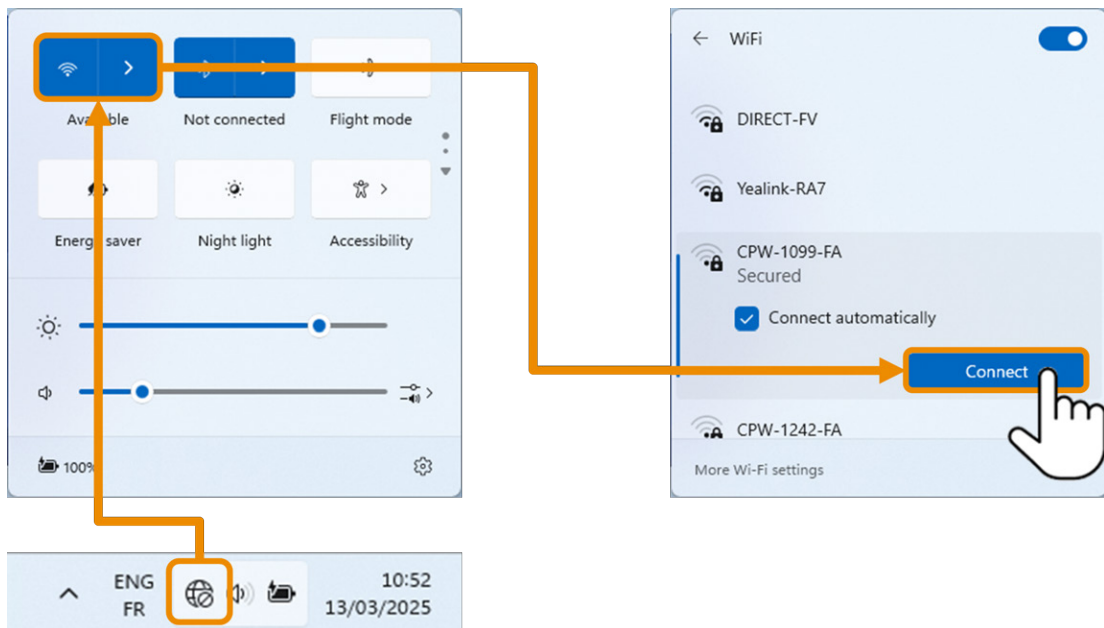
1. Power on the instrument.



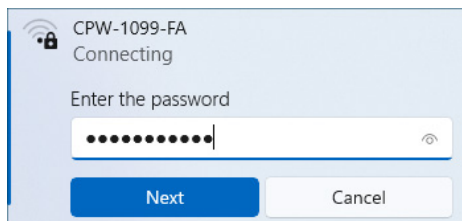
2. Ensure that no USB or Ethernet cable is connected from the instrument to the computer and that the Wi-Fi light on the front of the instrument is on.



3. Display the available wireless networks and connect the instrument (check “Automatically reconnect”).



4. If requested, enter the password (default = “AbsoluteArm”).

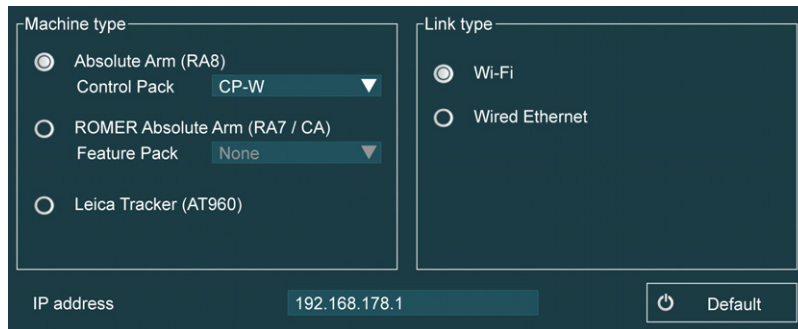


RDS setup

- From the RDS Agent, open the RDS Control Panel and select the Connection tab.



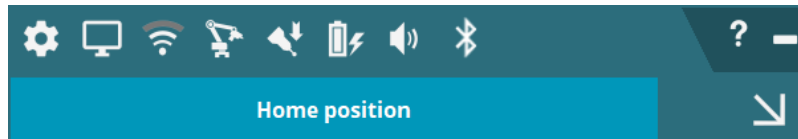
- Select the type of Instrument, type of Extension Pack (Absolute Arm) and “Wi-Fi” (use the default IP address or set it up).



- Save the modifications.



- Now RDS automatically connects to the instrument.



3.2.3. USB Connection (arm)

Please follow the instruction below to connect RDS to the arm through USB.

Instrument setup

1. Power on the instrument.



2. Ensure that the USB cable is correctly connected from the instrument to the computer.

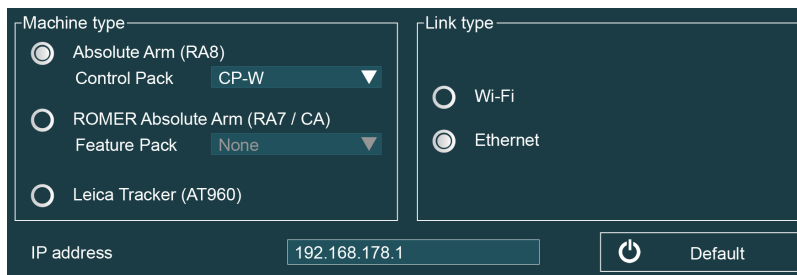


RDS setup

3. From the RDS Agent, open the RDS Control Panel and select the Connection tab.



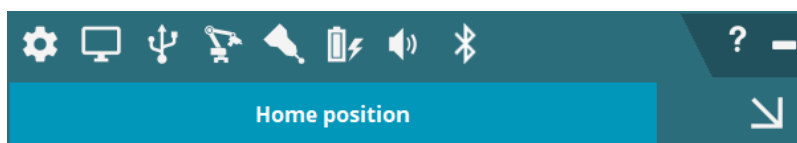
4. Select the type of Instrument, type of Extension Pack (Absolute Arm) and "USB".



5. Save the modifications.



6. Now RDS automatically connects to the instrument.

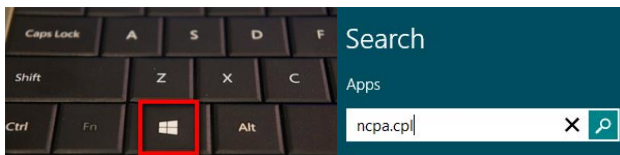


Scanner Connection

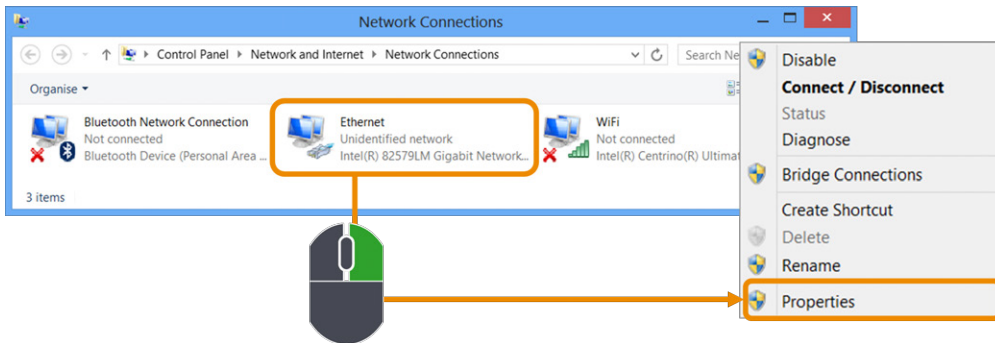
1. If the arm is used with a laser scanner, in addition to the USB cable, connect the Ethernet one and set the fixed IP address of the PC.



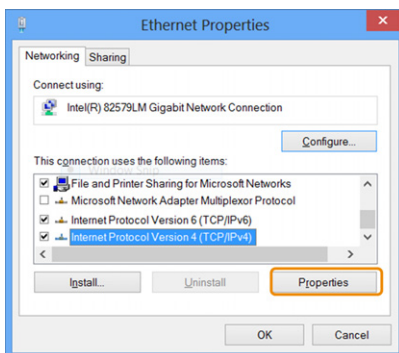
2. Access the network settings: press the Windows logo touch on the keyboard and type in “ncpa.cpl”.



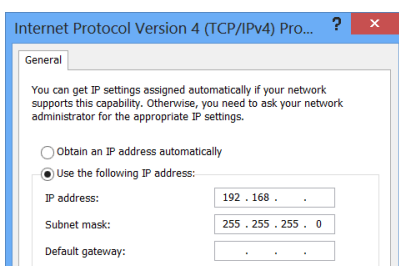
3. Right click on “Local Network” and select “Properties”.



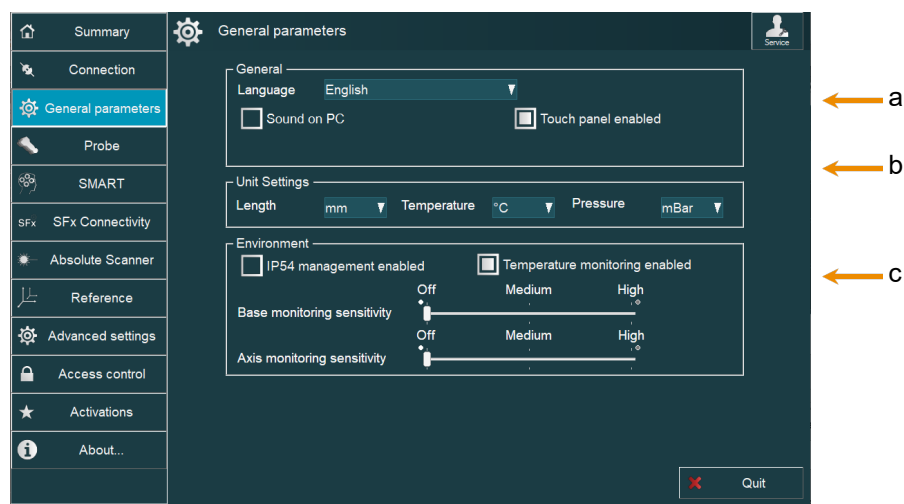
4. Select Internet Protocol (TCP/IPv4) > Properties.



5. Select “Use the following IP address” and set a correct address according to the type of scanner (192.168.178.1).



3.3. General Parameters



a	General	 	Generic settings.
b	Units	 	Change units displayed in RDS.
c	Environment	 	Choices for monitoring the arm.

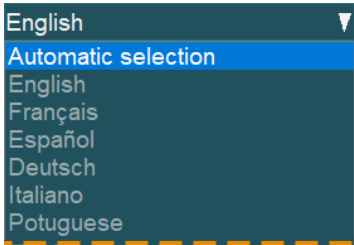
Available | Not available | Under condition



The sound level can be set directly on the [RDS Agent](#).

Language

By default, RDS automatically select the language depending on the language of the operating system. Select the wanted language, then save (validate the message asking for restart).

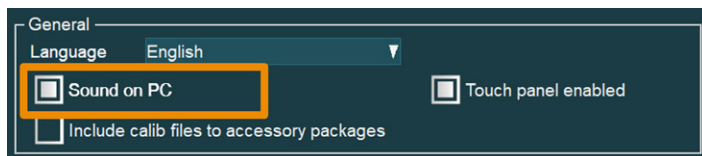


Once saved the change of language, RDS needs to be restarted.

- For RDS Control Panel or RDS Data Collector or RDS Quick Measure, simply close and open again.
- For all other tools (RDS Service, RDS Toolbox...), restart RDS Service itself or restart the computer.

Sound on PC (RA8)

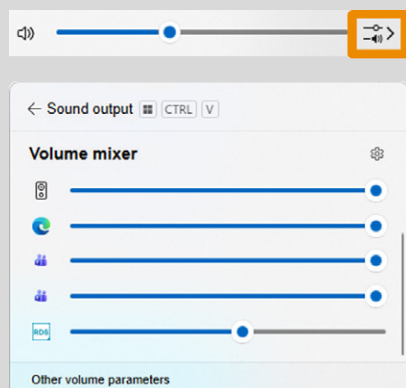
When the environment is very noisy, the sounds can be played on an external speaker or headset, through the PC audio system. Open the RDS Control Panel > General Parameters and check the option “Sound on PC”.



The sounds are then reproduced on the PC and any connected device (Bluetooth, Jack...).

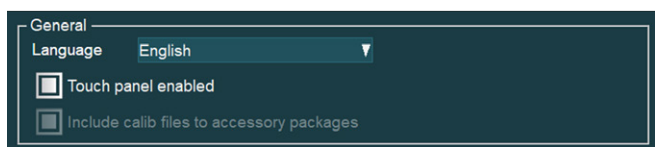


The sound level on the PC can be controlled independently from the arm using the standard Windows settings.



Touch Panel

The Absolute Arm 7-axis RA8 has a touch screen on its wrist. In some circumstances, to avoid actions on the screen, it can be useful to disable the touch actions.



Units

The units of lengths, temperature and pressure values displayed in RDS can be changed.

Length	<u>Millimetres</u> (mm)
	Inches (In)
Temperature	<u>Celsius</u> (°C)
	Fahrenheit (°F)
Pressure	<u>Millibar</u> (mBar)
	Hectopascal (hPa)

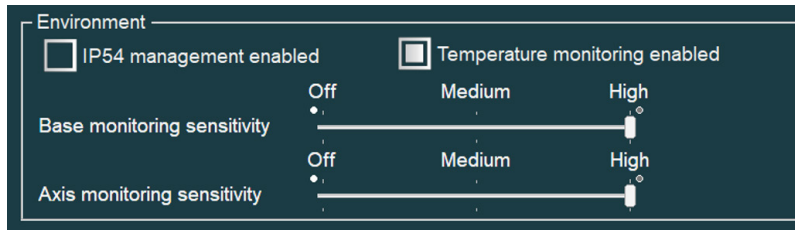
Underlined = default unit



*A restart of each RDS component is necessary to take account of the new units.
Some RDS screens remain displayed with the default units.*

Environment

RDS embeds a monitoring system to always ensure optimal conditions of measurement.

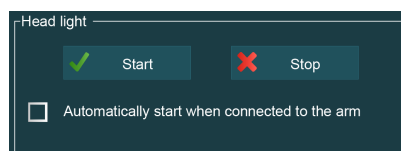


IP54 management	RDS checks that the arm is protected against dust and water drops.
Temperature monitoring	RDS checks that the ambient temperature is within the arm specifications.
Base monitoring	RDS monitors the tilt and stability of the arm base.
Axis monitoring	RDS monitors the stress on each axis of the arm.
Sensitivity	The sensitivity of the base and axis monitoring can be adjusted to fit with the measurement conditions.



For more details about the environment checking, read the Absolute Arm manual.

Head light (for equipped arms)



Starts-Stops the head light on the F axis

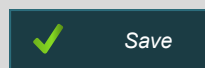
Activate-deactivate the auto start



This tab is displayed only for a 6 axes 75XX (V1-V2-V3) and 73xx V3 series ROMER Absolute arm.

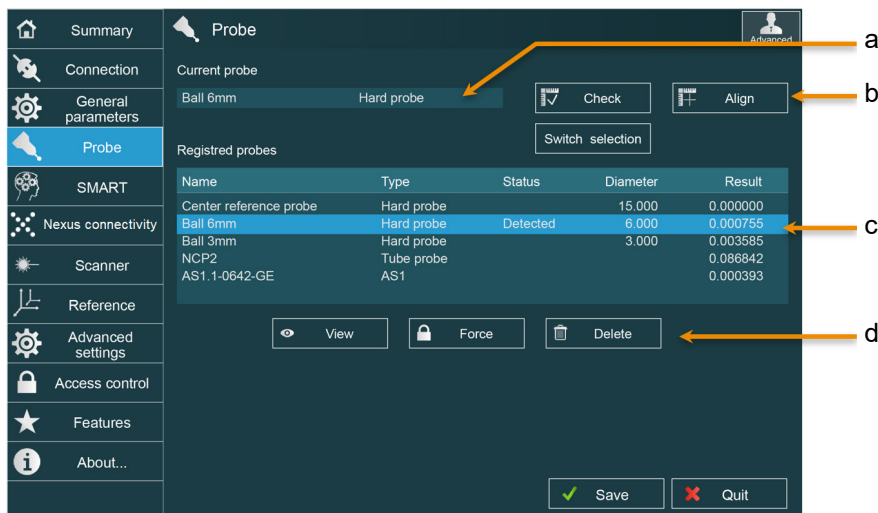


Do not forget to save the configuration after a modification.



3.4. Probes

This tab displays the current installed probe and allows selecting it manually.



a	Current probe	Shows the name and type of the current mounted probe on the arm (detected or forced).
b	Action buttons	Shortcuts to RDS Data Collector, automatically opening and running the verification or alignment scripts.
	Check	Runs a Probing Quick Check script through RDS Data Collector.
	Align	Runs the current probe alignment through RDS Data Collector (different available methods are proposed).
	Switch selection	Switches Centred probe <> Scanner (or Offset probe) (7axes only).
c	Registered probes	Displays the list of all the probes aligned and saved in the memory of the arm. Selected probe is highlighted in blue. (see next chapter for more details).
d	Action buttons	Management of the selected probe in the list. (see below)
	View	Displays the characteristics of the selected probe.
	Force	Gives access to edit it. Force the selected probe as current probe.
	Delete	Remove the selected probe from the memory of the arm.

: Advanced user or upper

3.4.1. Probe List and Selection

By default, the probe is automatically recognized and selected when plugged on the arm.

It is possible to deactivate and select manually the probe.

Name	Type	Status	Diameter	Result
Centre reference probe	Hard probe		15.000	0.000000
Ball 6mm	Hard probe	Detected	6.000	0.000755
Ball 3mm	Hard probe		3.000	0.003585
NCP2	Tube probe			0.086842
AS1.1-2642-GE	AS1			0.000393

In the sheet above, are shown all available probes, with all corresponding information.

Information	Description	Displayed value
Name	Name of the probe entered when aligned	name
Type	Shows the type of probe (contact, trigger, scanner, type Tube probe)	
Status	Current status (null / Detected / Forced)	status
Diameter	Diameter of the stylus	Diameter of the tip
Calculation result	Result of the last alignment of the selected probe	= " <i>Not aligned</i> " when the probe is not aligned.

3.4.2. View Selected Probe (Advanced user)

Once a probe is selected and settings saved, it is possible to edit the parameters of the probe.

Probe details

Probe

Name

Center reference probe

ID

2570210280797634739

Type

Hard contact

Repeatable probe

Yes

Custom probe

No

Dimensions

Diameter

15.000

mm

X deviation

15.000

mm

Length

50.000

mm

Y deviation

50.000

mm

Calculation result

0.000000

Created on

2014/09/09 16:58:09:751

Updated on

2014/09/09 16:58:09:751

Edit

Close

ID, Name, Type, Diameter, calculation result	All same values as before.
Custom probe	Defines if the probe is specific or standard. (Yes / No)
Repeatable probe	Shows if the probe is repeatable (TKJ probe) or not and then needs realignment each time it is mounted. (Yes / No)
X dev, Y dev, Length	X, Y and Z dimension according to TKJ axis.
"Created on"	Date of the first installation of the probe on the arm.
"Updated on"	Date of last modification (name or diameter change) or last alignment.
Edit	Use this button to modify either the name of the Probe, either the diameter, or the length (approx.), in case of change of the stylus.



When the operator simply changes the end sensor of the probe, this is not automatically detected, but probe alignment is necessary. Enter "View" button and edit the new diameter.



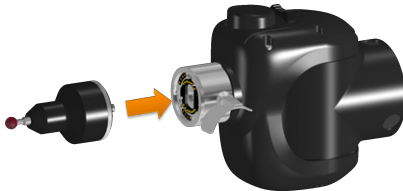
Only the installed probe can be modified. Once the name or diameter are modified, new values are automatically saved in the probe memory.

How to ... Edit the Settings of a Probe

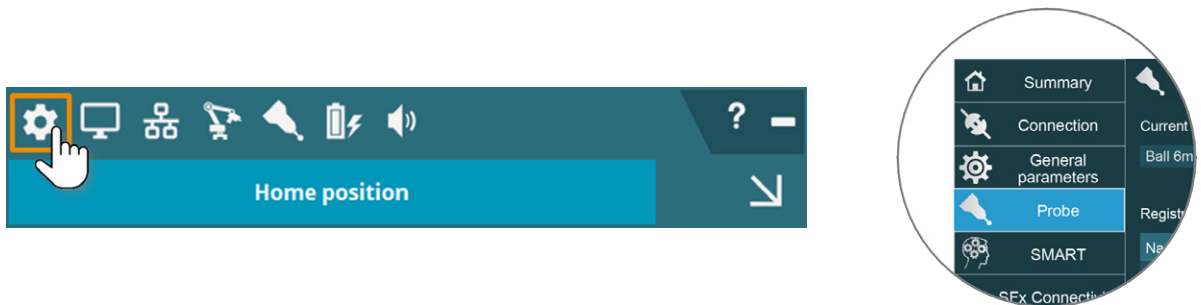
1. Connect the arm to RDS.



2. Mount the probe to edit.



3. From the RDS Agent, open the RDS Control Panel and select the "Probe" tab.



4. Select the probe to edit and click on "View".

Name	Type	Status	Diameter	Result
Center reference probe	Hard probe		15.000	0.000000
Ball 6mm	Hard probe	Detected	6.000	0.000755
Ball 3mm	Hard probe		3.000	0.003585
NCP2	Tube probe			0.086842
AS1.1-0642-GE	AS1			0.000393

 View
  Force
  Delete

5. Click on "Edit".

Probe

Name

Center reference probe

Repeatable probe

Yes

ID

2570210280797634739

Custom probe

No

Type

Hard contact

Dimensions

Diameter

15.000

mm

X deviation

15.000

mm

Length

50.000

mm

Y deviation

50.000

mm

Calculation result

0.000000

Created on

2014/09/09 16:58:09:751

Updated on

2014/09/09 16:58:09:751

Edit

Close

6. Modify the desired value(s) and click on “Save”.


Probe details

Probe

Name

Center reference probe

Repeatable probe

Yes

ID

2570210280797634739

Custom probe

No

Type

Hard contact

Dimensions

Diameter

15.000

mm

X deviation

15.000

mm

Length

50.000

mm

Y deviation

50.000

mm

Calculation result

0.000000

Created on

2014/09/09 16:58:09:751


Save

Updated on

2014/09/09 16:58:09:751


Close

7. Validate the warning message.



If you continue, you'll have to realign the probe.
 Are you sure you want to proceed?


Yes


No

8. Proceed with the probe alignment.



This probe is not aligned.
 Do you want to align it now?


Yes

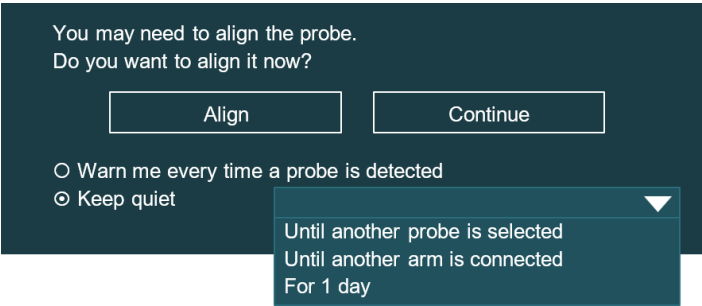

No

3.4.3. Non-Repeatable Probes

Some probes present the particularity not to be repeatable:

- Probe kit (the probe can be dismounted, to change the length, or configuration)
- Threaded probe (Romer Absolute Arm 71 series)

Such probes, as they are assembled or mounted through a screw, are not repeatable. It means that they must be realigned each time they are used. To prevent the operator from forgetting to realign, these types of probes are programmed as “non-repeatable” probes and each time they are plugged on the arm, RDS asked for realignment.



For the non-repeatable probes, specific parameters are automatically displayed in the RDS Control Panel, Probe tab.



Warn me every time a probe is detected	Each time a non-repeatable probe is connected on the arm, RDS remind the user to do a probe alignment. (Default – recommended)	
Keep quiet	RDS will skip the warning:	
	Until another probe is detected	If the probe is dismounted from the arm, then mounted again, no message will appear when mounting again the same probe, even if it is a non-repeatable probe. If another probe is mounted, then RDS will warn again when the non-repeatable probe will be mounted.
	Until another arm is connected	Even if another probe is mounted, then the non-repeatable probe again, RDS will not warn. Only once another arm is connected, then again, the arm with the non-repeatable probe, then RDS warn again
	For 1 day	RDS will not warn in any condition for 1 day or 1 week.
	For 1 week	
	Indefinitely	The notification functionality is deactivated. (not recommended)

TJK Probe Adapter Management

For the arms on which the probe is threaded (no TKJ connection neither M27 Probe nut) such as 71xx series arms, the probes don't have the same repeatability as TKJ probes or M27 probes. Moreover, some probes, are available only with TKJ or M27 connectors (such as NC Tube probes, Touch trigger Probes, ...) thus can't be mounted directly on those arms.

To be able to use all TKJ connector advantages on a 71 series arm, a TKJ adapter can be mounted. Such adapter is normally designed to be let on the arm to be able to use repeatable probes (that avoid realignment each time the probe is mounted) and to use NC Tube probes, touch-trigger probes, etc....

Once the TKJ adapter is mounted, the arm can use probes as a standard 73 or 75 series arm.

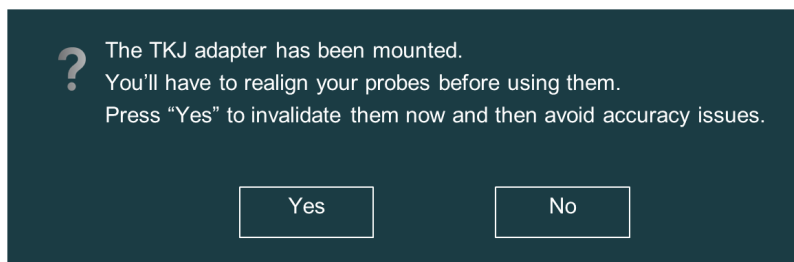


NOTICE

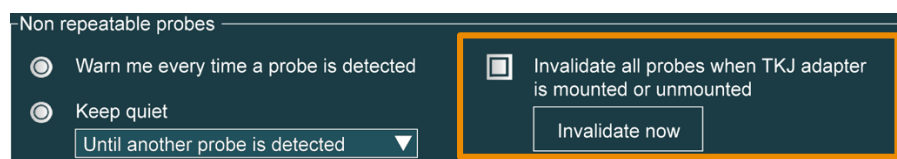
The TKJ adapter is dedicated to definitely replace the threaded connector by a TKJ connector on the 71xx series arm. Thus, all the existing threaded probes should be replaced by TKJ probes.

However, if the adapter is dismounted (e.g. to mount again a threaded probe), each time the TKJ adapter is mounted back on the arm (=screw = not repeatable), all probe alignments should be invalidated, and all probes realigned.

RDS automatically detect when the adapter has been dismounted and ask the question for full probes realignment.



For the TKJ adapter, specific parameters are automatically displayed in Control Panel probe tab.



Invalidate all probes when TKJ adapter is mounted or unmounted.	RDS recognizes when the TKJ adapter is dismounted from the arm and as soon as it is mounted back on the arm, all the probe alignments are automatically invalidated.
Invalidate now	In case the automatic invalidation was not active and the message to invalidate was refused, this button gives the way to invalidate the probes alignment at any moment.

3.4.4. Adding a New Probe

Standard Probes

If a new probe (that is not in the probes list) is mounted on the arm, RDS automatically detects it and asks user to align it. Then it runs RDS Data Collector to align the new probe. Only after that, the new probe is displayed in the list.

Legacy Scanners

Legacy types of scanners* may not have an ID. It means that only one scanner can be used at time on one arm.

*: RS2, RS3, RS4, and third-party scanners.

If no scanner exists in the list of probes, as soon as a scanner is mounted on the arm, RDS notifies the user that a scanner was detected and asks for the type of scanner.



Once this is informed, the scanner appears in the list of probes. In case of RSx, RDS connects it and asks for scanner alignment.



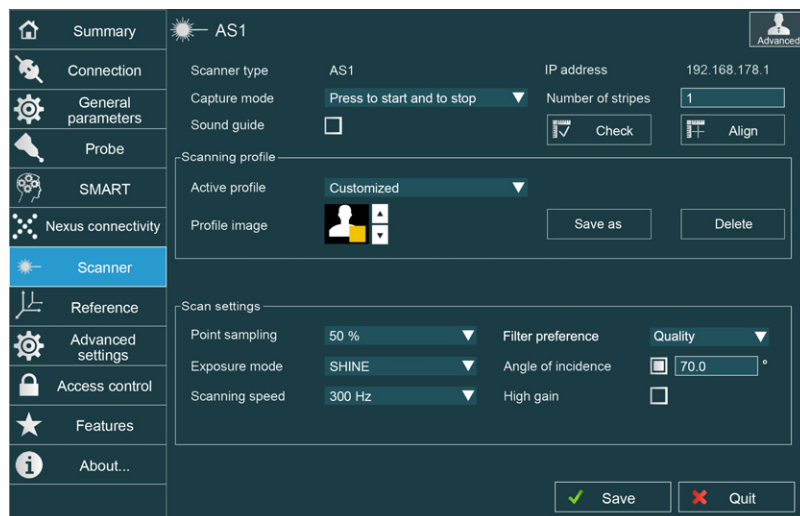
RDS can manage only one legacy scanner at a time. If a scanner already exists in the list of probes, it is no more possible to add another one.

To add a new one, it is then, necessary to delete the existing one in the list.

If a scanner (type1) already exists in the list, if another type (type 2) of scanner is plugged, then RDS will recognize it as the existing one and will try to connect it.

3.5. Scanner

The scanner tab appears only when a scanning sensor is detected on the arm.



The available scan settings depend on the type of scanner.

	HP-L-8.9	RS2	RS3	RS4/5	RS6 AS1	AS1-XL	LAS LAS-XL
Capture mode	✓	✓	✓	✓	✓	✓	✓
Scan profile	✓	✓	✓	✓	✓	✓	✓
Manual exposure	✓	✓	✓	✓	✓	✓	
Exposure capture	✓	✓	✓	✓	✓	✓	
Auto exposure		✓	✓	✓	✓	✓	✓
Points sampling			✓	✓	✓	✓	✓
Line sampling							✓
Filter preference					✓	✓	
Angle of incidence					✓	✓	
Gain					✓	✓	✓
Quality filter							✓

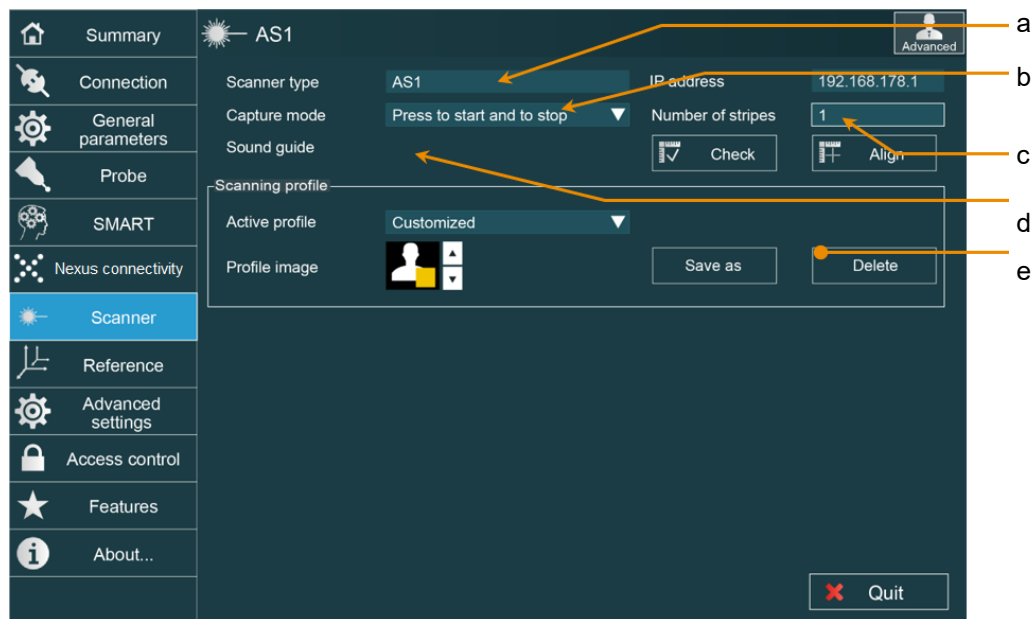
RDS User Profiles

Standard users can only select scan profiles.

Advanced users can set any parameters and save scanning profiles for the standard users.

User profile	Standard	Advanced and upper
Capture mode	✓	✓
Scanner alignment		✓
Scanner compensation		✓
Scanner check	✓	✓
Scan Profile management		✓
Scan Profile selection	✓	✓
Scan settings		✓

3.5.1. Common Items



a	Scanner type	Shows the type of scanner (AS1, AS1-XL, RSx, RS-SQUARED, HP-L-8.9, LAS, LAS XL)
b	Capture mode	Defines the way to use the button (Keep button pressed / Press to start and stop / n not empty stripes)
c	Nb Stripes	Number of scan lines above which the scan stops.
d	Sound guide	Emits a sound that helps to keep good height
e	Profile	This is used to save all the scanner settings into scanning profiles (see next chapter)

Capture Mode

The capture mode defines the way to start and stop digitizing:

- “Press button once to start and stop” – The button of the arm is used as a switch (one simple press-and-release to start digitizing, another one to stop).
- “Capture while button is pressed” – Press and hold the button to start and continue digitizing, release the button to stop.
- “Capture n not empty stripes” (Service user profile only) – Press the button to start digitizing, then RDS automatically stops when the defined number of stripes (“Number of stripes” parameter) is reached.

Depth Sound Guide

While digitizing, a sound can be emitted from the arm, giving information about the distance between the scanner and the surface to scan. When this option is activated, the closer the scanner is to the surface, the higher the sound frequency is, and no sound is emitted if the scanner is out of the scanning window.

3.5.2. Scanning Profiles

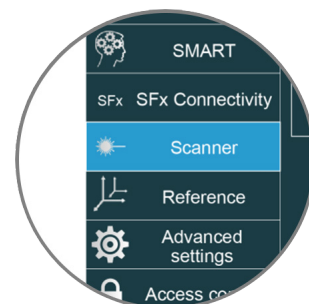
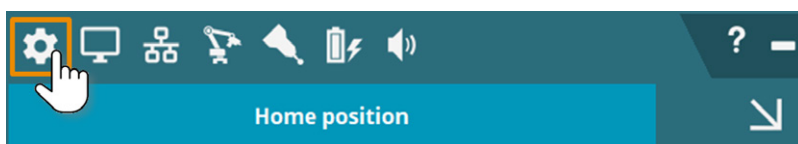
RDS can memorize scanning profiles for each type of laser scanner. It means that the set of parameters (scanning mode, filters...) can be saved into different configurations.

Most scanning parameters are memorized. The selection can be done either in RDS Control Panel, on the RDS scanning window, or even with the button on the machine.

Save a Profile (Advanced User)

Whatever the type of scanner, to save a new scanning profile:

1. From the RDS Agent, open the RDS Control Panel and select "Scanner" tab.

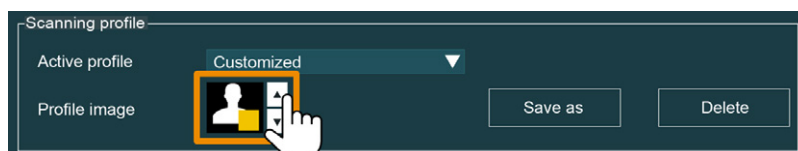


2. Select the profile to modify.

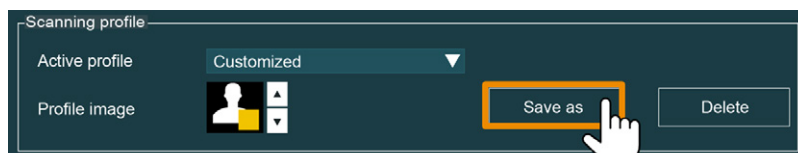


3. Set the parameters according to your needs (current profile becomes "Customized").

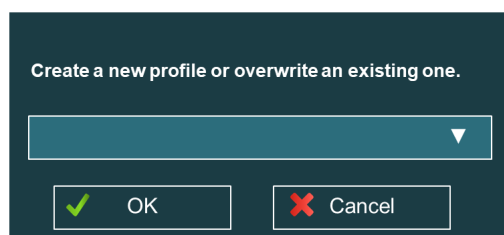
4. Choose an icon to associate with the profile.



5. Click on "Save".

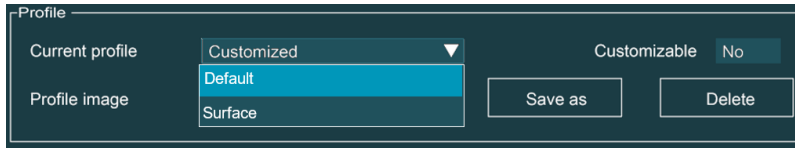


6. Give a name for the profile (the existing profile can be selected from the drop-down list to be overwritten) and press "OK".



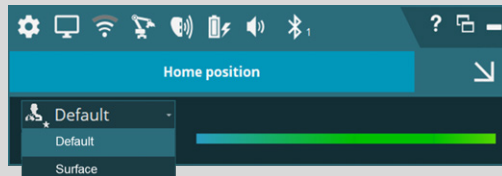
Use a Profile (all Users)

From the RDS Control Panel, tab “Scanner” simply select the wanted profile in the drop-down list (don’t forget to save the Control Panel).

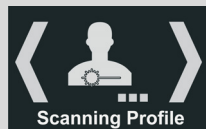


The scanning profile can also be directly selected

- *From the RDS Agent – scanning window.*



- *From the Quick Access Menu (arm)*



- *By a double click on the trigger button (LAS / LAS-XL)*

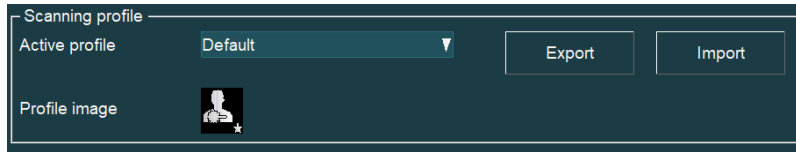


- *With the “E” button of the AP21 (AS1 / AS1-XL on the tracker)*



Exporting and Importing the Profiles

To facilitate the transfer of scanning profiles from one computer to another or to make backups, thereby avoiding the need to recreate the profiles, it is possible to export all the customized profiles of the current scanner.

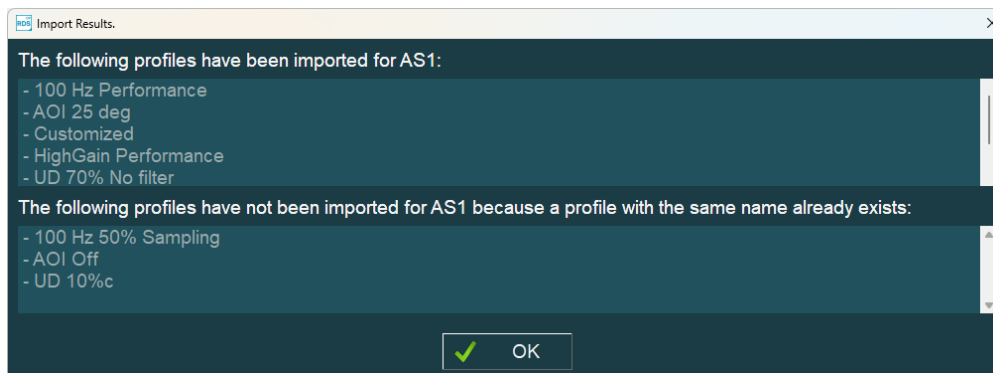


To export all the profiles for a type of scanner, connect the scanner and open the RDS Control Panel, scanner tab. Then press the “Export” button and select the folder where the package must be saved. All the custom profiles are then saved in a “*.scanprofiles” file.



- *It is not possible to export only some of the profiles.*
- *Non ASCII characters are not supported. Thus, it is no more possible to save profiles with such characters.*

To import a package of profiles from a backup, open the RDS Control Panel, scanner tab and press the “Import” button. Then simply browse and select the file to import. RDS then shows a summary of the imported profiles.



Default Scanning Profiles

	AS1 / RS2-6 HP-L-8.9	AS1-XL	LAS	LAS-XL	
Standard	✓	✓			Default profile for AS1 / AS1-XL (SHINE) and RS2-5 / HP-L-8.9 (manual exposure).
Sensitive		✓			This profile uses the SHINE HighSense mode instead of the standard SHINE mode, to provide further research of the exposure.
MaxGain		✓			In addition to the SHINE HighSense, the High Gain is enabled, to collect data on extreme digitizing needs.
"Edge"			✓		Profile for small details (highest resolution, but narrowest line).
"Feature"			✓	✓	Standard profile, mid-size part and some details.
"Surface"			✓	✓	Profile for large parts with a few details.



Specific scanning profiles are dedicated to the alignment or check of the scanner in RDS Data Collector. Those profiles are automatically selected by the processes and cannot be used for standard applications.

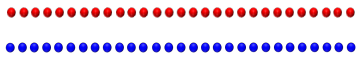
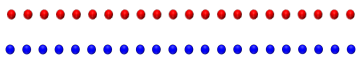
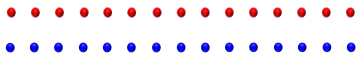
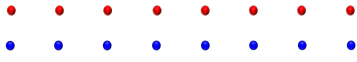
	Line width (mm)		Points spacing (mm)					
	LAS	LAS-XL	LAS	LAS-XL	Points*	Line*		
"Edge"	51	-	0.013	-	100%	100%	Normal	✓
"Feature"	63	228	0.013	0.226	100%	100%	Normal	✓
"Surface"	220	468	0.050	0.905	100%	100%	Normal	✓

 : Sampling |
  : Gain |
  : Quality filter | *: excepted for LAS-LX : 20%

3.5.3. Acquisition Rate

To improve the performance and speed of digitizing (depending on the performance of the computer and the final software), it is possible to setup the number of digitized points by regular sampling points or lines or adjusting the frames per seconds.

Points Sampling

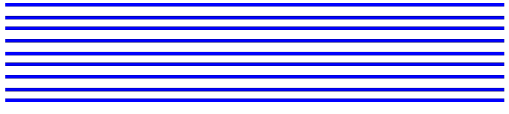
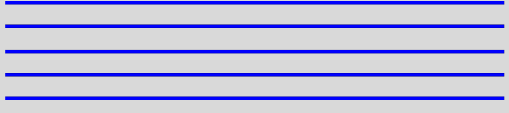
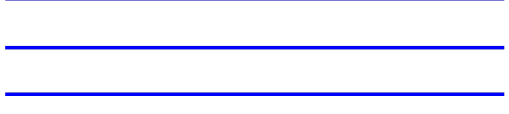
	RS3	RS4 RS5	RS6 AS1 AS1-XL	LAS LAS-XL	
100% (<i>keeps all the points</i>)	✓	✓	✓	✓	
80% (<i>4 pts/5</i>)	✓			✓	
75% (<i>3 pts/4</i>)		✓			
60% (<i>3 pts/5</i>)	✓			✓	
50% (<i>1 pt/2</i>)		✓	✓		
40% (<i>2 pts/5</i>)				✓	
25% (<i>1 pt/4</i>)		✓			
20% (<i>1 pt/5</i>)	✓			✓	
10% (<i>1 pt/10</i>)				✓	
5% (<i>1 pt/20</i>)				✓	...
2.5% (<i>1 pt/40</i>)				✓	
...					

Line Sampling (LAS, LAS-XL)

	LAS	LAS-XL	
100% (<i>keep all the lines</i>)	✓	✓	
50% (<i>1 line /2</i>)	✓	✓	
30% (<i>1 line /3</i>)	✓	✓	
Etc...			

Scanning Frequency

The frame rate can be set for the AS1 and AS1-XL scanners.

	RS6	AS1	AS1-XL	
300 Hz	✓	✓	✓	
200 HZ	✓	✓	✓	
100 Hz	✓	✓	✓	

3.5.4. Exposure

Exposure Modes

RDS provides two kinds of exposure modes:

- **Automatic** modes
 - **Auto** mode (RS2-5) – The exposure of the line changes dynamically as the scanner moves from a pale surface to a dark one. The exposure is managed in a way that needs no input from the user.
 - **SHINE** mode (AS1 / AS1-XL) – SHINE (Systematic High Intelligence Noise Elimination) mode dynamically adjusts the best exposure on each individual point to get the highest quality data in any condition without the need of any intervention for the user.
 - **SHINE HighSense** mode (AS1-XL) – The HighSense mode brings a higher definition of the exposure for difficult surfaces (shiny, dark...).

- **User Defined** mode

While scanning, the exposure is fixed. This is useful for a regular scanning, on a single colour material. The adjustment of the exposure can be operated by 2 ways:

- **Manual setup** – The exposure is setup manually defining the exposure value. It is not possible to setup while digitizing.
- **Capture the exposure** – RDS switches temporarily to an automatic exposure, until it is setup. It is not possible to setup while digitizing. Please read chapter [4.4 - Missing Points? Adjust the Exposure](#).

The mode can be selected in RDS Control Panel, scanner tab or switched through the [Quick Access Menu](#) (Q.A.M.).

		User defined	Auto	SHINE (AS1)	SHINE (AS1-XL)
Adjustment	Manual	✓			
	Capture	✓			
	Automatic		✓	✓	✓
Adjustment while scanning			✓	✓	✓
Standard surfaces		✓	✓	✓	Standard
Difficult surfaces		✓	✓	✓	HighSense

3.5.5. Scanning Modes (LAS, LAS-XL)

The LAS and LAS-XL scanners can digitize using different widths and resolutions, combined into scanning modes.

- Line length – defines the width of the laser (width in mm)
- Point Spacing – defines the resolution distance between digitized points (points spacing in mm).

LAS Scanning Modes

Line width	Laser line	Point spacing	Rate (Hz)
220		0.050	37
130		0.050	51
63		0.025	50
51		0.050	100
25		0.013	50

LAS scanning modes

LAS-XL Scanning Modes

Line width	Laser line	Point spacing	Rate (Hz)
468		0.050	51
228		0.025	50
182		0.013	28
91		0.050	100
		0.013	50

LAS-XL scanning modes

3.5.6. Angle of Incidence Filter (RS6 / AS1 / AS1-XL)

The Angle of Incidence (AOI) filter is designed to automatically eliminate any data at a large angle to the part surface. This is because points collected at significant angles can be erroneous, particularly if the part being scanned has a shiny surface. It is recommended to always keep the AOI active and deactivate only when necessary.

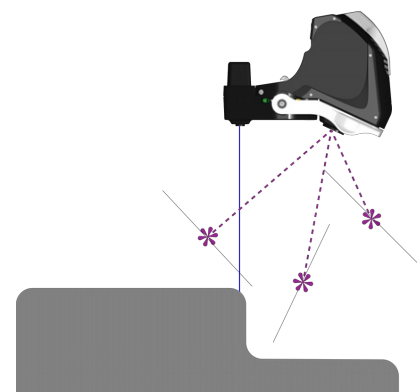
Diving Incidence

The diving incidence occurs when the angle between the normal vector of the surface and the laser plane becomes too high. In such case, the A.O.I filter removes the concerned points.



Here are some reasons of the utility of such filter:

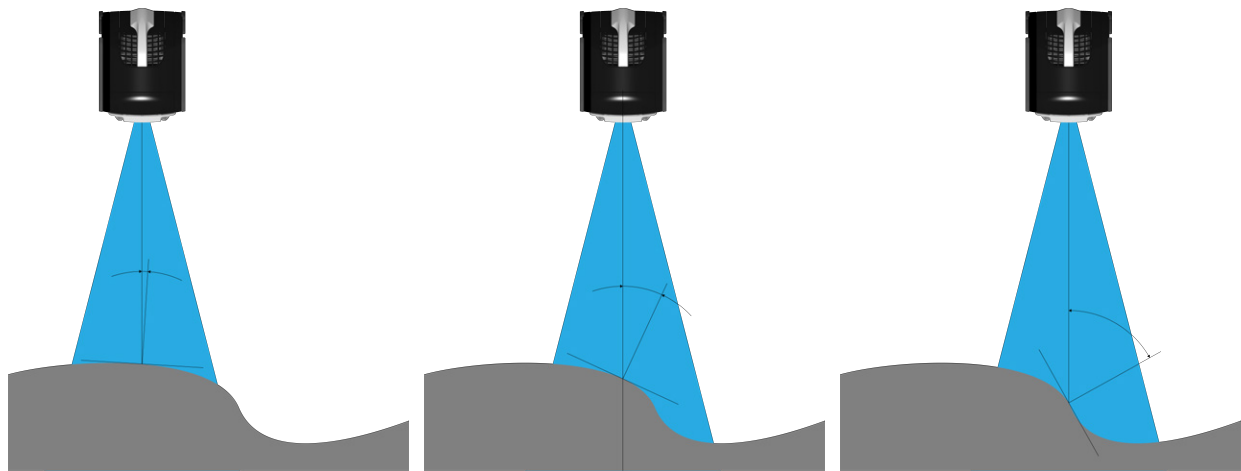
Quality	High incident of the laser may result in a larger laser line on the surface, and then a loss of quality. The A.O.I. filter keeps only points that provides a good quality.	
Noise & Outliers	Noise or outliers (e.g. due to reflection) usually present a high incidence with the scanner. Applying the A.O.I. filter is a very good way to avoid such unwanted points.	
Reflection	When scanning a part with round-chamfered edges, there may be total reflections of the beam. Removing incidence points can automatically remove such reflection.	



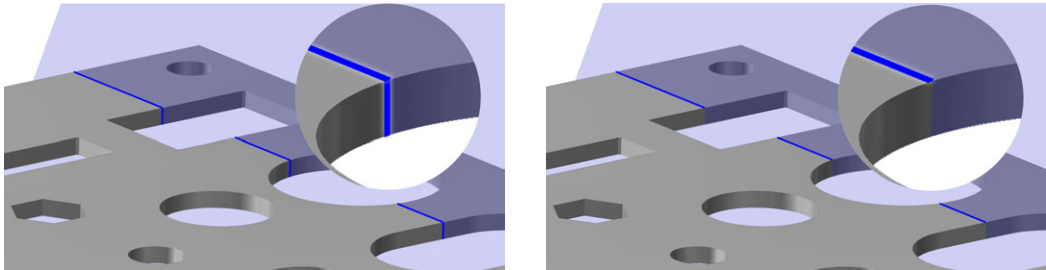
Lateral Incidence

As well as diving incidence, lateral incidence may have undesired effects.

The A.O.I. filter also checks the angle between the normal vector of the surface and the scanner orientation and drops incorrect points.



Here are main applications of the A.O.I. filter for lateral incidence:

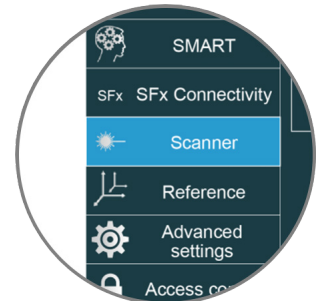
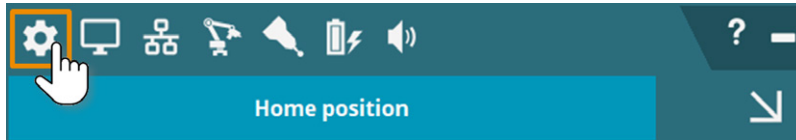
Quality	As well as diving incidence, lateral incidence may result on a loss of quality.
Remove the thickness	When scanning the top surface of parts like sheet metal parts, the user may not want to collect point in the thickness. As thickness is usually orthogonal to the top surface, by removing the points on the perpendicular surface, only the scan lines on the top surface are kept. 

Disable the AOI



AOI is enabled by default and highly recommended. By disabling this option, it may result in collecting noise, outliers or low-quality data.

1. Enter the RDS Control Panel, scanner tab.



2. In the "Scan settings", disable the Angle of incidence or adjust the angle to the wanted value.



3.5.7. High Gain

RS2	RS3	RS4	RS5	RS6	AS1	AS1-XL	LAS	LAS-XL
-	-	-	-	✓	✓	✓	✓	✓

The High Gain setting amplifies the signal of the scanner. This can be useful when scanning very challenging surfaces like high-gloss black, chrome or semi-transparent parts. However, activating the High Gain also increases the risk of noisy data, so by default it is not active. We recommend that it is only used in very extreme cases.

The sensor should typically be used with gain set to Normal. When measuring dark, glossy or translucent surfaces, in the event it is hard to capture data you can set the gain to High or Very High (excepted AS1, AS1-XL and RS6).



The metrological performance of the system can be affected when gain is set to High since the likelihood of low-quality data being generated is increased.

However, if the quality filter is enabled, these data should be automatically removed (excepted AS1 / AS1-XL / RS6).

3.5.8. Quality Filter (LAS / LAS-XL)

The sensor has a quality filter to remove points which are deemed to be low quality, including:

- Double reflections
- Poor quality data on edges
- Isolated points or outliers

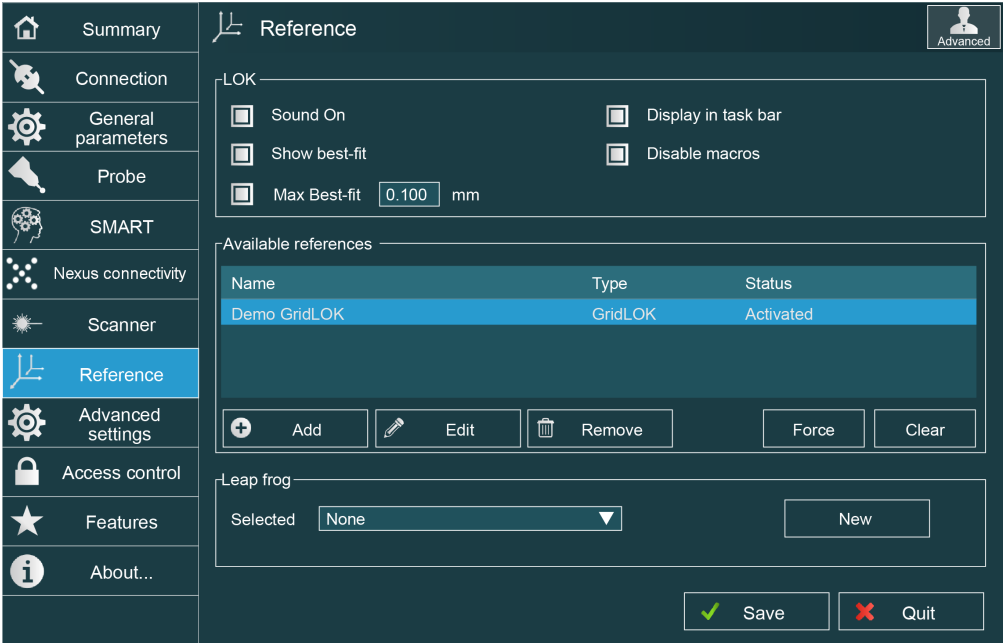
When measuring dark, glossy or translucent surfaces, in the event it is still difficult to capture data with gain set to High, you can also disable the quality filter at the cost of overall reduced data quality.



The metrological performance of the system is not guaranteed when this filter is disabled since low quality data may be generated.

3.6. Auxiliary Referencing

RDS control panel offers the possibility of positioning the arm on several places, linking the different positions by a reference, extending then the measurement volume.



Several solutions are available:

- **Simple arm Leapfrog** – Consists by taking common points before and after moving the arm.
- **GridLOK** – Permits to position the arm anywhere on the Lok floor and reference the position by taking Lok points.
- **SpaceLOK** – Permits to move the arm around the “Space Lok” tool.
- **PartLOK / ToolLOK** – Used to move around the part / tool.
- Load a reference from a file

3.6.1. Theory about Moving an Instrument

When the part to be measured is larger than the measuring instrument can do, it becomes necessary to find a way to move one (arm or part) to be able to measure the inaccessible zone.

To move the arm from one place to another, Leapfrog uses a script in RDS Data Collector. Click on “New”, RDS Data Collector appears, automatically executing a Leapfrog script.

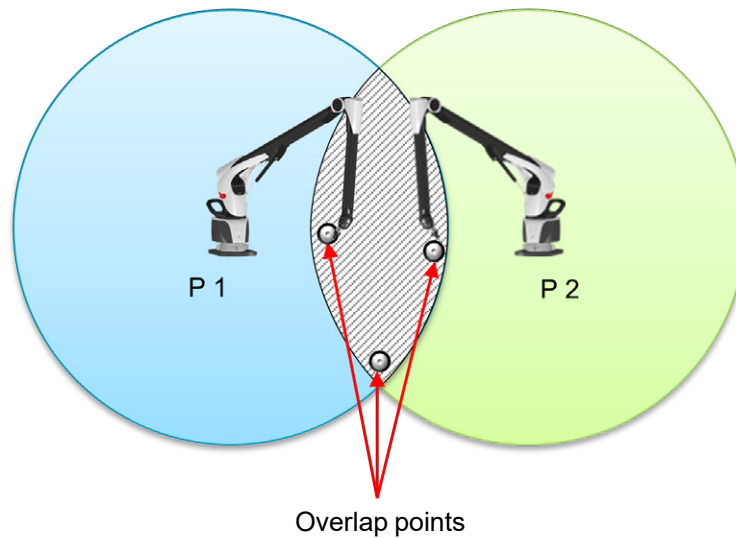
During a measurement, both parts that are the measurement system and the part to measure must be imperatively interdependent from each other, that means any displacement is forbidden.

That means moving “without moving”, having a perfect knowledge of the movement done (distance, orientations, offsets...)

Technically, such a displacement is a reference change (from a system of axes N°1 to a system of axes N°2), the start (Ref N°1), is then Machine reference. (RM).



To allow the software to know this displacement in all details, we use elements that will be accessible from both positions of the measuring instrument. Those elements measured from both positions, the software comparing them, will calculate a displacement “matrix” (displacement in X, Y and Z, of the origin point, and each rotation it underwent between both positions – along X, Y and Z).



The displacement method consists by an “Overlap” method, using geometric elements, probed identically from both positions.

Recommendations

Depending on the accuracy of the measurement instrument, this displacement will necessarily generate a loss of accuracy, as it results from two measurements of the elements.

To minimize this lost, it is important to optimize the method. Here are the main rules:

- Use the most accurate measurement instrument.
- Look for the positions of the measurement instrument as to have a lap area (accessible from both positions) as large as possible, as to “stabilize” as best as possible the displacement. (as the 4 feet of a table are on each extremity of the table, not at the centre).
- Use a maximum number of elements (geometric elements used for this Leapfrog) (a table is more stable on 4 feet than on 3).
- Use good quality elements (a machined bore will be much better than a tapping not clean).

The type of elements used will define the calculation method used by the software. “Leapfrog” name is often used.



Moving the measuring instrument or moving the part comes to the same process.

3.6.2. Description of the Reference Tab

LOK

☐ Sound On
 ☐ Display in task bar

☐ Show best-fit
 ☐ Disable macros

Max Best-Fit mm
 ☐ Disable the LOK disengagement

Sound On	Activate the sounds when LOK is used.
Show best-fit	Display the best-fit maximum error when the positioning is done.
Max Best-Fit	Maximum authorized best fit value, over which the reference is not accepted.
Display in task bar	Display an information status window in the task bar after the calculation.
Disable macro	
Disable LOK disengagement	Prevents from any disengagement (unlock) of the current LOK position.

Available References

Available references

Name	Type	Status
Demo GridLOK	GridLOK	Activated

	Description	Possible values
Available references	Display the list of all references.	
Name	Name given to the reference	
Type	Type of reference	Leapfrog GridLOK
	Memory	Permanent Temporary
Status	Shows which reference is engaged	Active (available) Engaged (used) Dongle detected (LOK)
Force	If the arm contains several LOK files, "Forcing" a LOK ensure to use the wanted one.	
Clear	Unforces a LOK	

Permanent / Temporary References

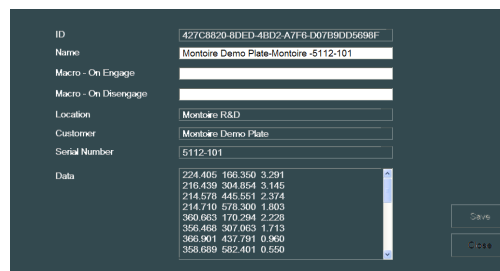
- **Permanent** – a reference can be memorized in the arm memory, for use it even after a restart of the system. This can be necessary if the work is not finished and has to be continued after a restart.
- **Temporary** – (default for Leapfrog) the reference is not memorized in the arm memory, but simply temporary on the computer, until the arm is restarted. Then the reference is lost. In case there could be a necessity to stop the work and restart the system, then it is recommended to define this reference as a permanent, to save it, and when the work is finished, to delete it.



All references notified as “Permanent” are saved in the arm memory. If the arm is connected on another computer, it is not necessary to reload those references.

Management of the Reference Files

+ Add  Edit  Remove	
Add	Use to add a reference from a file, or to add a configuration file for LOK
Edit	Displays the characteristics of the selected reference.
Remove	Use to delete a reference or LOK configuration from the memory of the arm.



Leapfrog Choice

Selected None ▼ New	
Selected	Use to select which of the active references is in-use
New	Use to move the arm by a Leap-Frog method.

3.6.3. Displace the Arm by a Leapfrog

Principle

RDS transmits the coordinates of probed points to final software.



By operating the Leapfrog at the level of RDS, the displacement becomes transparent to the final software. That means it's like if it was a very large measurement volume. We can then use the final software as if there was no displacement.

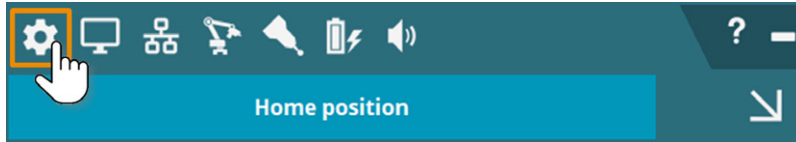
To do, we use a group of points as Leapfrog elements. It can be cones, holes or angles in which the ball probe is seated, or targets, at the centre of which the point probe is placed (attention, however this way is less accurate).

This group needs at least 3 points that will be probed **IN THE SAME ORDER** from position 1 and position 2. Only one probe can be used for this operation.

Process

In RDS Control Panel, access to new Leapfrog.

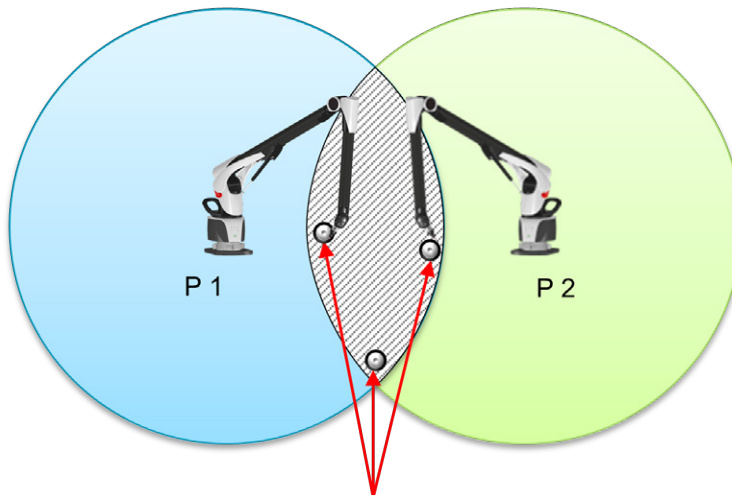
1. Open the RDS Control Panel > Tab Reference



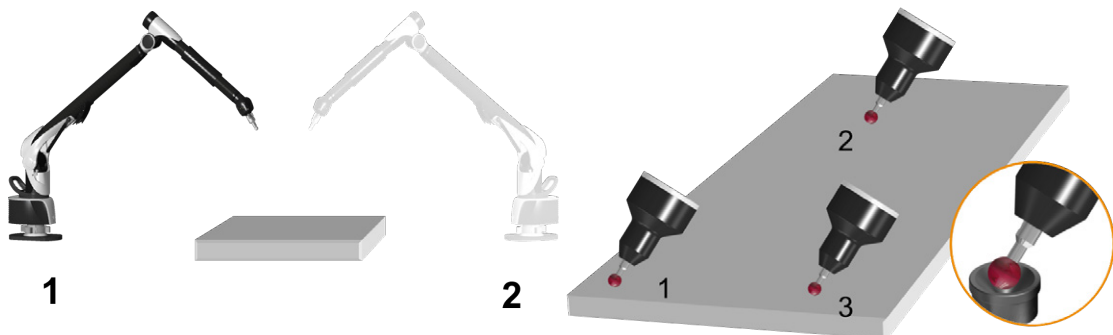
2. On the Leapfrog section, click on "New", [RDS Data Collector](#) opens, ready to measure the points.



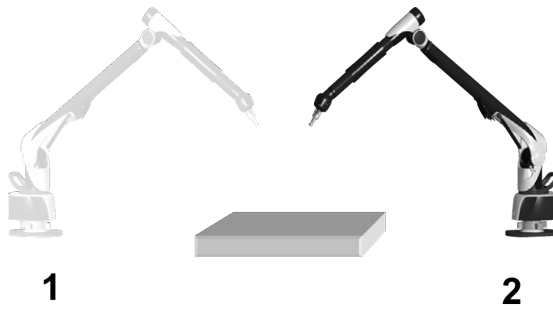
3. Place or correctly choose the points to probe, those points must be accurate points (cones, seats ...), not aligned and as distant as possible.



4. Probe the three points from the first position (notice the order).



5. When all points are probed, move the arm to the target position, (make sure it is correctly fixed) and probe again the points IN THE SAME ORDER.



6. Once all points are measured, RDS Data Collector calculates the displacement and provides a best-fit value. This value represents the loss of precision generated by this displacement.

Enter a name for this displacement and select if it is a temporary or permanent reference.

Best fit=0.0270974

Leap name	Leap1
Leap type	Value
	Temporary
	Permanent


OK


Cancel

7. Click on OK, it's over.



A second displacement is possible by the same way, then third ...however, a loss of accuracy may happen each time.

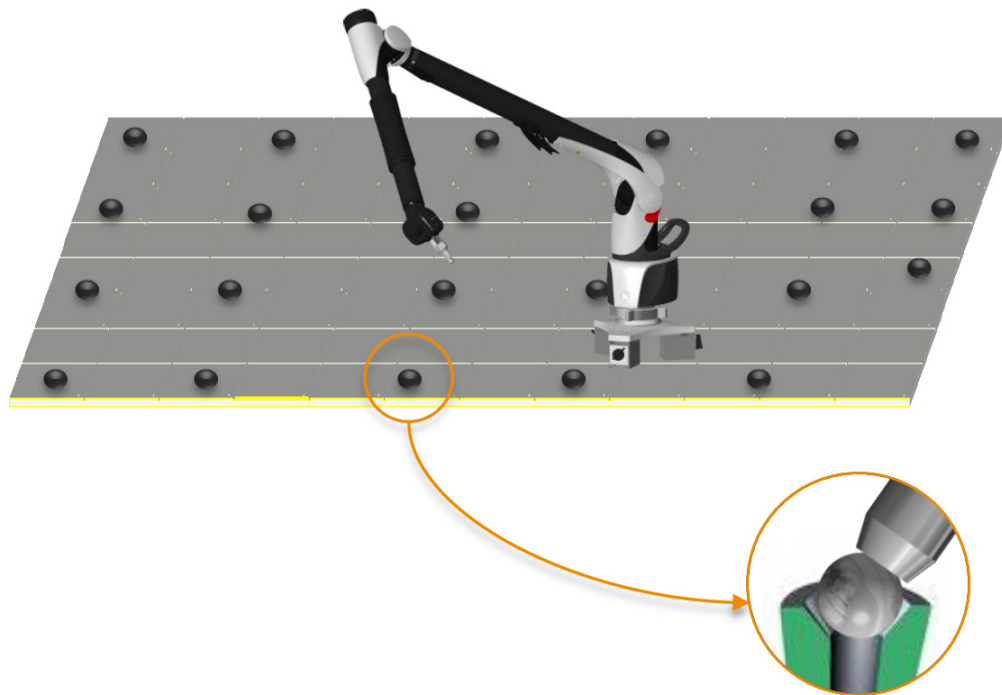
3.6.4. GridLOK / ToolLOK / SpaceLOK

Principles

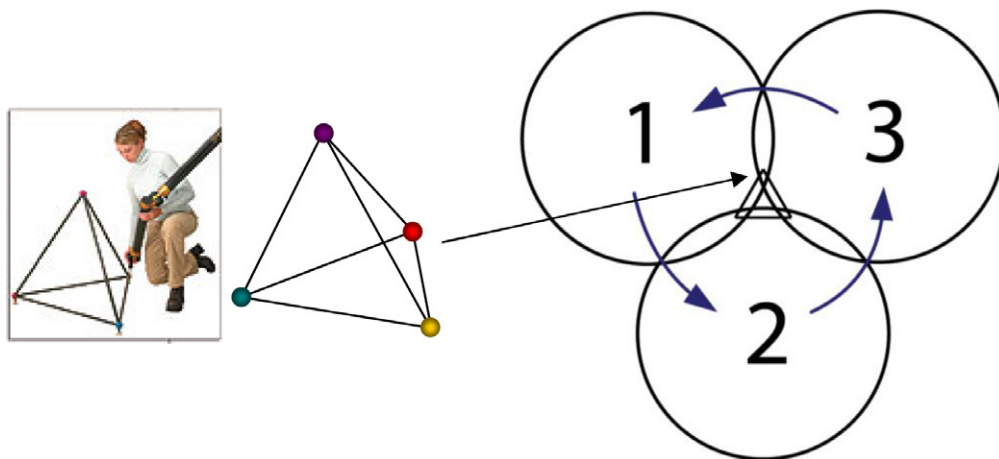
LOK systems are a way to automatically transfer the coordinate system from the arm reference to a specific one using known targets.

The principle of **GridLOK** is comprised of a grid system with conical seats installed in a concrete slab or steel plate and measured with a laser tracker. This means it can cover a very large volume.

Then at any moment, by taking points on 3 seats, RDS automatically calculates the position of the arm on the GridLOK. Measurements can be done, in any software, and the arm moved at any moment, only 3 points are necessary to take, without any button to press or click on, any other operation than hit 3 points on the seats.



SpaceLOK recalls the principle of GridLOK, but instead of a large grid of several seats on a floor, the only 4 seats are fixed on a triangular 3D pyramid, which can be displaced (and disassemble in some cases). This tool can then be placed at the centre of the part to measure, as to move the arm all around the SpaceLOK tool.



ToolLOK also recalls the same principle, but now using independent patterns of 3 points on a tooling, on a part or even on a floor. Its main purpose is to quickly reference the tool or the part, but it is also a way to move the arm around them.



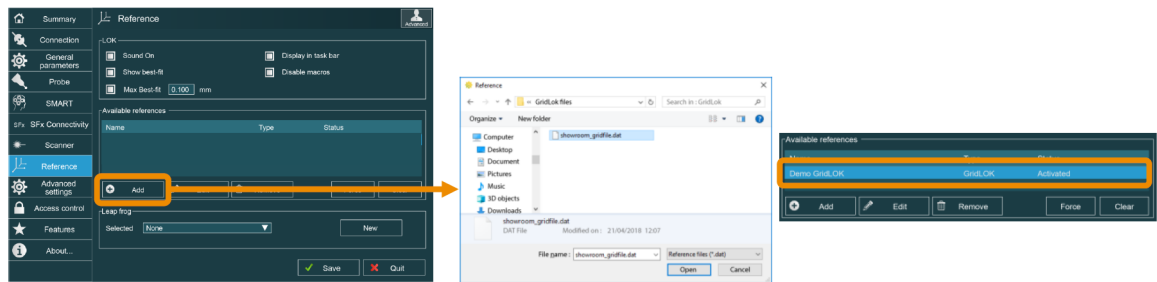
The GridLOK, SpaceLOK or ToolLOK need a configuration file, containing the reference coordinates, and a protection dongle to enable the functionality.

Engage a LOK

1. Plug-In the GridLOK Dongle on the USB Port of the Computer.

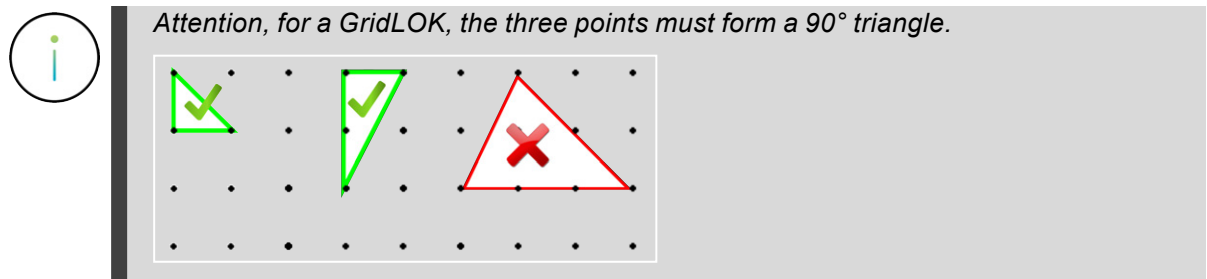
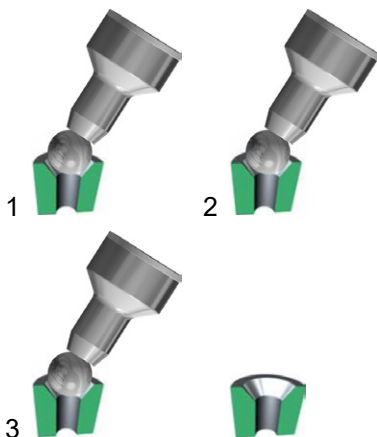


2. Open the RDS Control Panel, tab Reference and then load the LOK configuration file (*.dat). The LOK reference file becomes then “Available” in the list of references. Save and exit RDS.



3. At any moment, under any software or even out of any software mount the ball probe dedicated to the LOK on the arm, and probe 3 LOK points.

For each point, no need to hit the button, simply keep the probe seated in the target a few second, until a beep is emitted, then move to next target.



4. RDS instantly calculates the position of the arm on the workshop and display the best fit value on the screen.



- a. GridLOK file name
- b. GridLOK status (Locked / Unlocked)
- c. Best-fit value
- d. Representation of the GridLOK targets, highlighting the measured ones

5. In RDS Control Panel, Reference tab, the GridLOK reference appears as “Engaged”.

Disengage a LOK

To come back to original arm reference, take three times the point. Be sure to slightly pause between each point, then RDS will display status information on the screen.

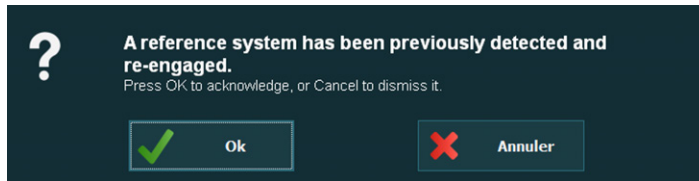


To prevent from any unwanted disengagement of the current LOK position, open the RDS Control Panel > Reference tab and check the option “Disable the LOK disengagement”. Then even taking 3 times the same point won’t disengage any LOK.



3.6.5. Persistence in Case of Disconnections

In case of short disconnection of the arm, the reference (Leapfrog, GridLOK or ToolLOK) is memorized and remains engaged when the arm becomes reconnected. No need to re-engage the LOK or any other action, just go on measuring.

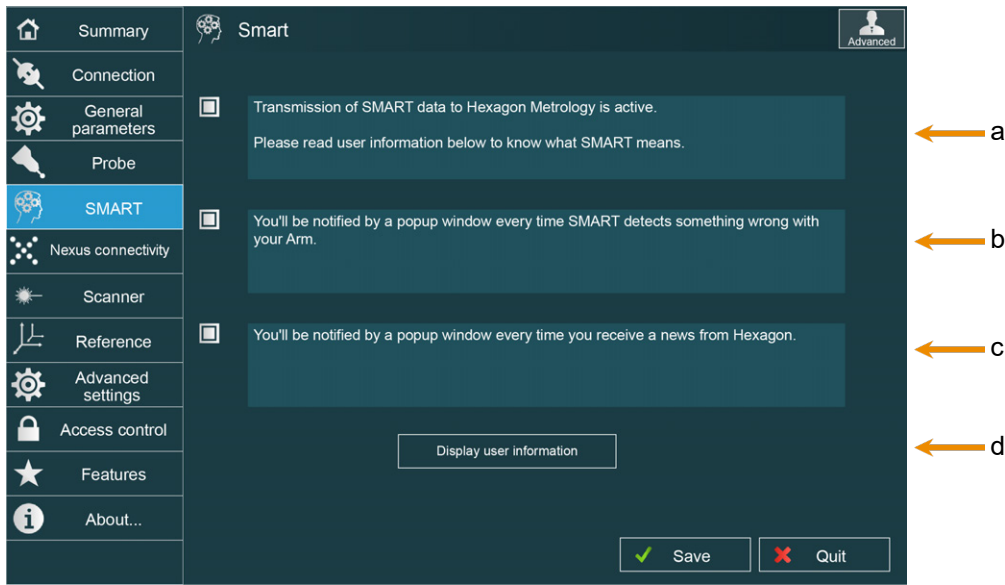


3.7. SMART



Find more details about SMART on [RDS Toolbox > SMART](#).

The SMART tab in RDS control Panel gives access to the activation of the SMART automatic components, as well as the user information.



a	Activation of the transmission of SMART data – When activated, RDS will automatically send SMART data to the Hexagon Server.
b	Activation of the SMART alerts – When activated, RDS will display a popup notification when a SMART alert is detected, or when an information is received.
c	Activation of the Hexagon news – When activated, RDS will be able to provide news regarding the product, new versions...
d	Display user information – Displays the official user information as during the installation of RDS.

*: All options are enabled by default.

To activate or deactivate an option, simply click on the check box:



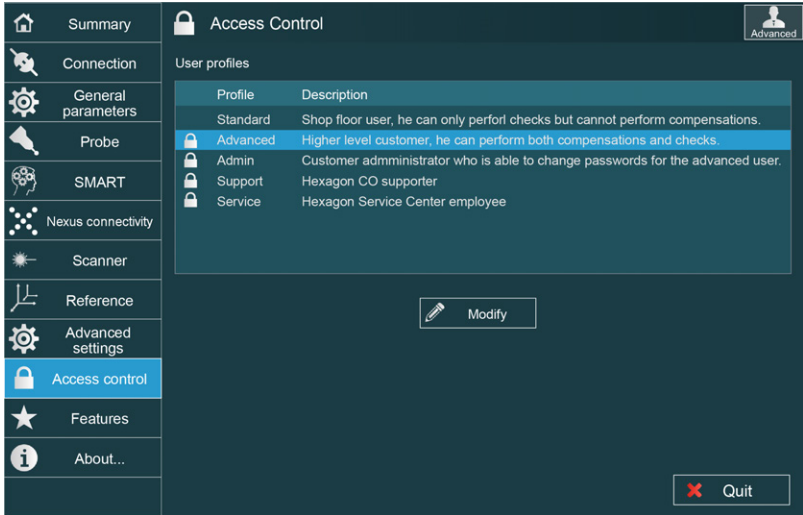
3.8. Access Control (advanced user)

User profiles define the levels of authorization in RDS.

Except the Standard profile, the access to the user profiles is protected by a password and/or a Feature code.

	Standard	Advanced	Admin	Support	Service
					
Level	1	2	3	4	5
Protection	None	Password (default = "Advanced")	Password (default = "Administrator")	Activation key	Activation key

The Access Control tab is used to manage those passwords.



Profiles can only be modified by users of the superior profile (so for example an Advanced User cannot modify an Administrator Profile because Advanced is "lower" than Administrator).

To be sure about the password that has been entered, click on "Show plain password", the asterisks are replaced by the real characters.

How to Modify the Protection of a Profile

1. Open RDS Control Panel, tab "Access Control" (use at least the Advanced profile).



2. Select the profile to change and {Modify}.

PROFILE	DESCRIPTION
Standard	Shop floor user, he can only perform checks but cannot perform compensations.
 Advanced	Higher level customer, can perform both compensations and checks.
 Admin	Customer administrator who is able to change passwords for the advanced user.
Support	Hexagon CO supporter

 **Modify**

3. Tick "Unlocked" to remove the protection or "Locked" to activate or modify the password.

Current status
☐ Unlocked
☒ Locked

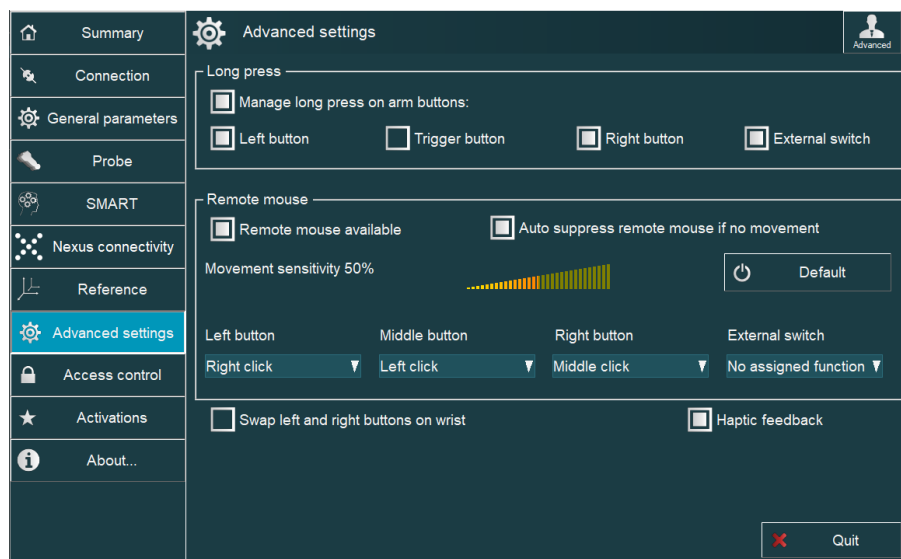
Password

☐ Show plain password

☒ **OK**
☐ **Cancel**

4. Enter or change the password if necessary ("Locked") and click on OK.

3.9. Advanced Settings



Manage Long Press on Arm Buttons

Some measuring software are using separately short click and long press on the button of the instrument. The limit between short and long press is approximately 1second. Then the function on the software will be different (validate / cancel, ...).

By default, RDS manages this feature, but some software (such as PolyWorks) already manages it. In this case, it is recommended to deactivate it in RDS.



The long press is not active when the mouse is active.

Remote Mouse

Through the last axes of the measuring instrument, the mouse in Windows can be controlled by the arm.

- Each button (button 0, 1, 2, 3) can be affected to a specific mouse function (Left Button, Middle Button, and Right Button).
- Movement sensibility (in % of highest sensibility) – defines the minimum movement speed of the arm to start moving the pointer. This is useful to manage double click.
- Remote mouse available – unselect to completely deactivate the mouse of the arm.
- Auto suppress remote mouse if no movement – if RDS detects no movement of the arm, remote mouse is automatically deactivated, and reactivated as soon as the arm moves again.

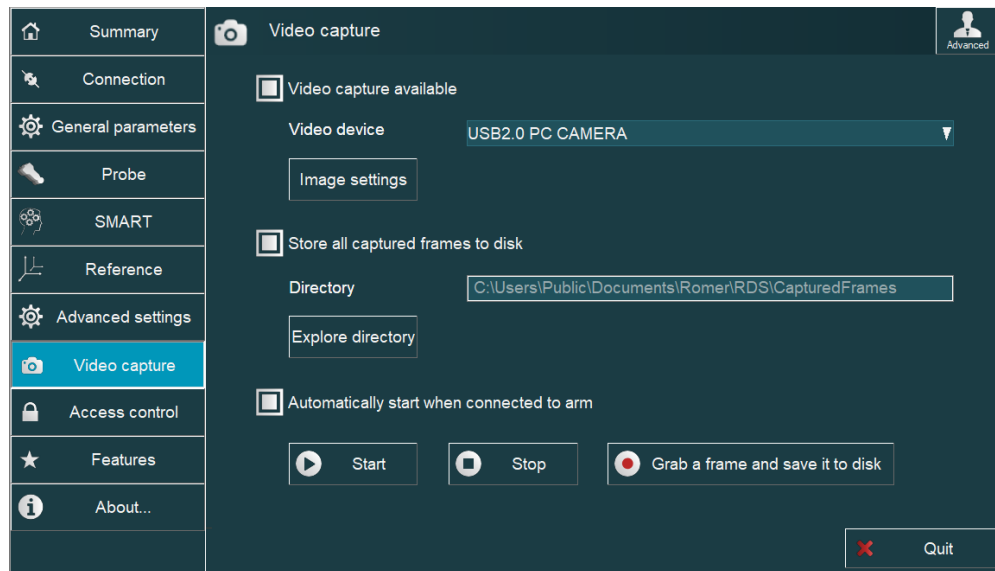
Additional options

Swap left and right buttons on wrist	This option permits to invert the behaviour of the left and right buttons (validations, cancellation...) for left handed people.
Haptic feedback	The arm is equipped with a haptic motor in the wrist, providing a feedback for warning the operator about specific events. This feedback can be deactivated with this option.

3.10. Video Capture (for equipped arms)

This tab is displayed only for a 6-axes 75 (V1-V2-V3) and 73/77 V3 series ROMER Absolute arm equipped with a camera on the wrist.

RDS can manage video pictures coming from USB video camera. The camera can be the one located on the wrist of the absolute arm or an external USB webcam.



Certain measurement software can manage, align the video camera and use the picture.

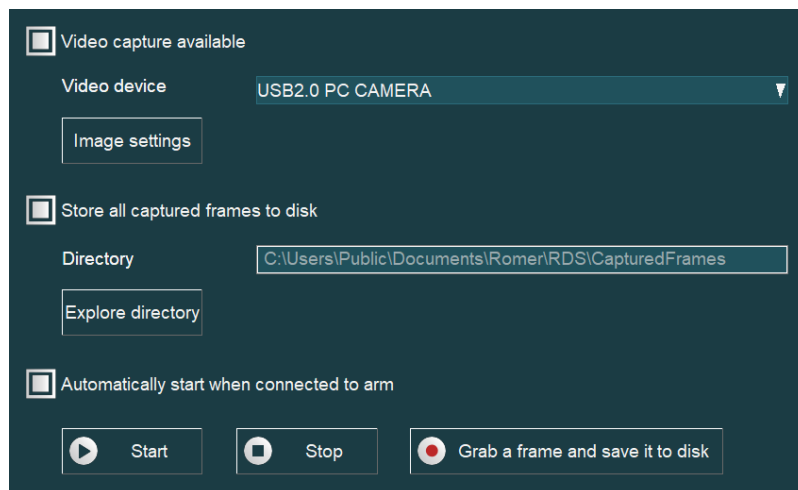


When Video capture is activated, a picture is automatically taken and sent to the measurement software each time a point is taken with a contact probe.

The picture can be also saved on the hard drive when this item is select in this RDS Tab.

This tab is then used to setup this management.

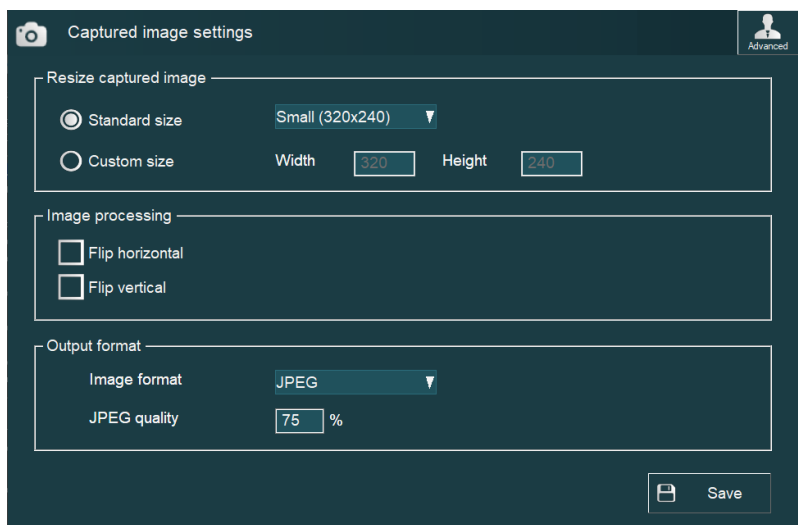
Main Settings



Video capture available	Activate the use of camera by RDS	
	Video device	Selection of the camera to be used.
	Image Settings	Gives access to change the parameters of the image (see next paragraph).
Store captured frames to disk	When this option is ticked, the taken picture is also saved on the computer, on the specified folder.	
	Directory	Path for stored frames and pictures (please contact your local agent for modification).
	Explore directory	Opens Windows explorer on the specified folder.
Start / Stop	Automatically start video ...	As soon as the arm is connected, video capture starts, and the video window is displayed.
	Start / Stop	Manually starts / stops the video.
	Grab a frame	Records a picture by pressing the button.

Image Settings

By clicking on “Image settings”, the user accesses to the parameters of the captured picture.



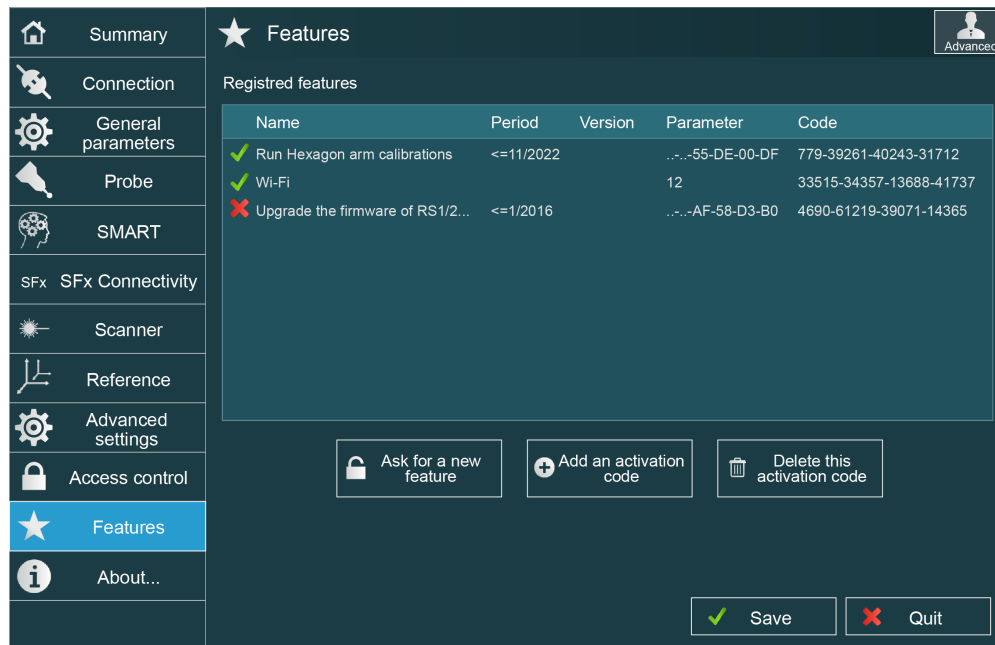
Resize captured image (definition of the resolution of the image, in pixels).

Item	Description		Values
Resize captured image	Standard size	Predefined sizes	Tiny (160×120) Small (320×240) Medium (480×360) Large (640×480)
	Custom size	Used for other resolutions	
	Width / height	Custom resolutions	In pixels
Image processing	Flip Horizontal Flip vertical	Used to mirror the image	
Output format	Format and quality of the shot picture		Jpeg Bmp

3.11. Features Activation (arm)

Some features of RDS are protected and request an activation code.

This tab is used to manage such options (Arm compensation / Servicing...).



Codes can be linked to either the S/N of the arm or the Mac address of the computer.

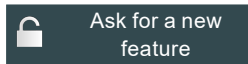
Temporary activations and version-limited activations are possible. Each parameter is displayed (period, Mac address, S/N, ...).

	Description	Displayed value
 Ask for a new feature	Button to get a request code for an option *	
 Add an activation code	Button to enter a new activation code *	
✓ / ✗	Shows if the option is valid or not	✓ (valid) ✗ (no longer valid)
Name	Type of option	Run all compensation Diagnosis tools Upgrade firmware
Period	Limitation date of the option (if limited)	
Version	Limitation version of the option (if limited)	
Parameter	Associated hardware identification	MAC address Serial number of the arm
Code	Activation code of the feature	

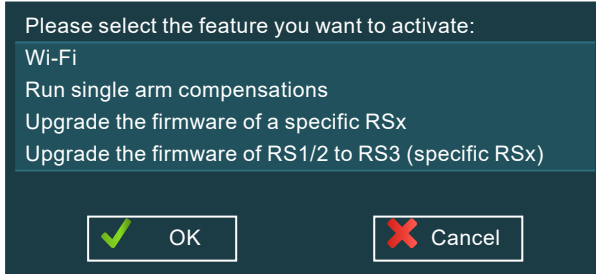
*: Advanced user profile or upper

Ask for a New Activation Code

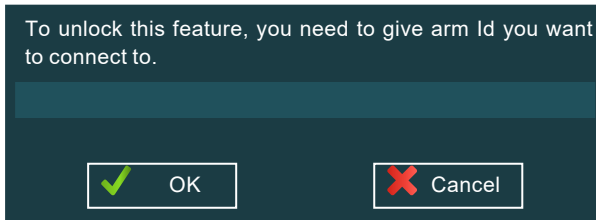
1. Click on “Ask for a new feature”.



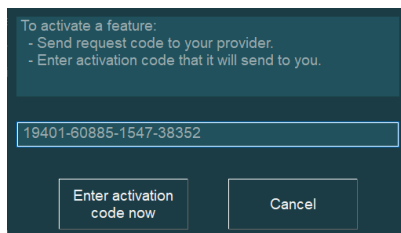
2. Then a choice of options is proposed. Select the type of feature to add, and then click on “OK”.



3. The following window appears. By default, the serial number of the current connected measuring system is displayed.



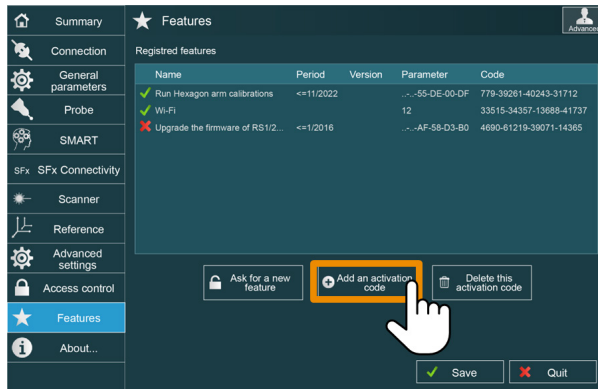
4. Enter the serial number of arm and press OK.
5. A request code is given.



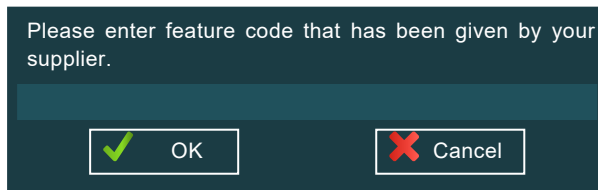
6. Send the request 20-digit code to your Hexagon contact, you'll then get back activation code.

Enter the Activation Code

- Once you have the activation code, click on “Add an activation code”.

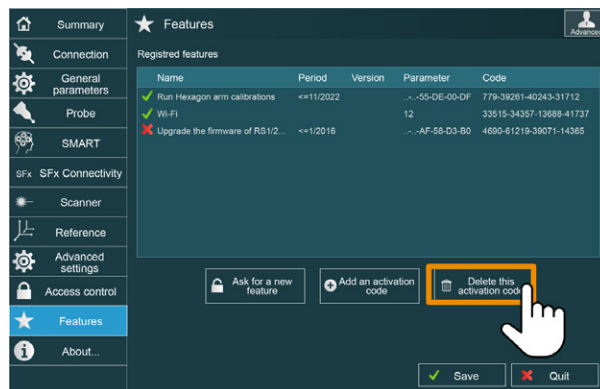


- Enter the code and click on “OK”.



Remove a Code

Select the code, then click on “Delete”.

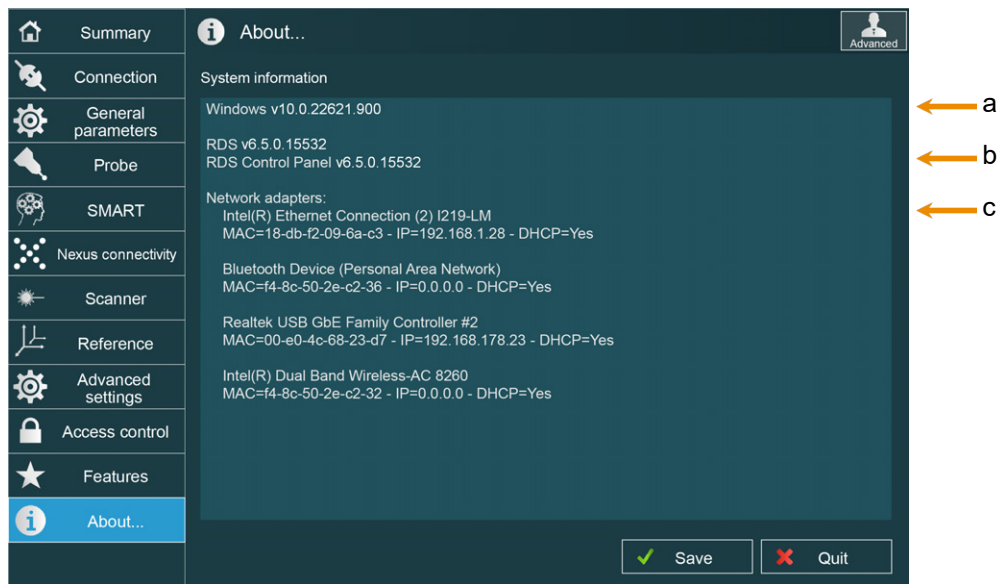


If RDS is reinstalled on same computer, it is not necessary to re-enter activation codes.

If RDS is reinstalled on a new computer, it is necessary to re-enter activation codes.

Make sure to keep those activation codes in a safe place

3.12. About



This tab displays useful information about the versions of RDS, Windows, and about the computer's adapters.

a	Windows ...	Operating system version
b	RDS v...	Details of RDS version
c	Network adapters	Checking and details of all available network devices on the computer (including Wi-Fi / wired RJ45 network).

4. Scanning Best Practices

4.1. Adjust the Density of Points to the Needs

The number of points that the system can collect may be very high. Even if scanning a high density is possible, it may not be necessary depending on the purpose. Even more, a very high number of points may slow down the computer due to the points processing.

This is why it is important to adapt the density and number of points to the purpose of the scan. A quick surface inspection on a large part will require much less density than a reverse engineering on a small part with a lot of details.

Most application software themselves have tools to do treatment on the acquired points to reduce the density regularly or according to the shape and keep only useful data, but the less points are transmitted to the application software, the fastest the post-treatment is.



High quantities of data can slow down the computer. Please see the [requirements](#) of laptops that should be used with our scanners.



To get benefits of very high-speed scanning, Gigabit ethernet component is necessary.

Speed of Movement

Depending on the speed of movement, more or less points and details may be caught. The faster the speed is, the lower the density of stripes will be.

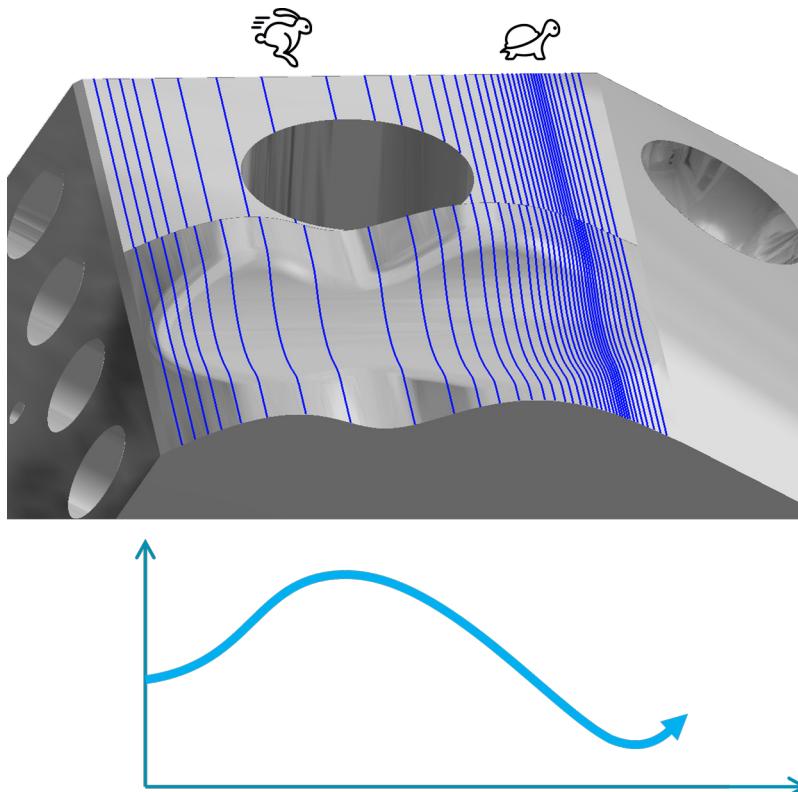
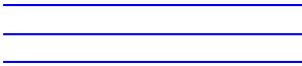
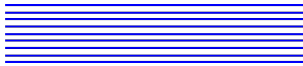


Fig. 2: Movement speed

Scanning Frequency (AS1 / AS1-XL)

Combined with the speed of movement, a lower frequency will lighten the final cloud, while preserving the details on each line.

A higher frequency will also permit to digitize a part faster (for the same details as a lower frequency).

	100 Hz	300 Hz	500 Hz
Details	 	 	 
Time to scan			
Weight of the cloud			

*: the "HighSense" exposure mode requires 100Hz

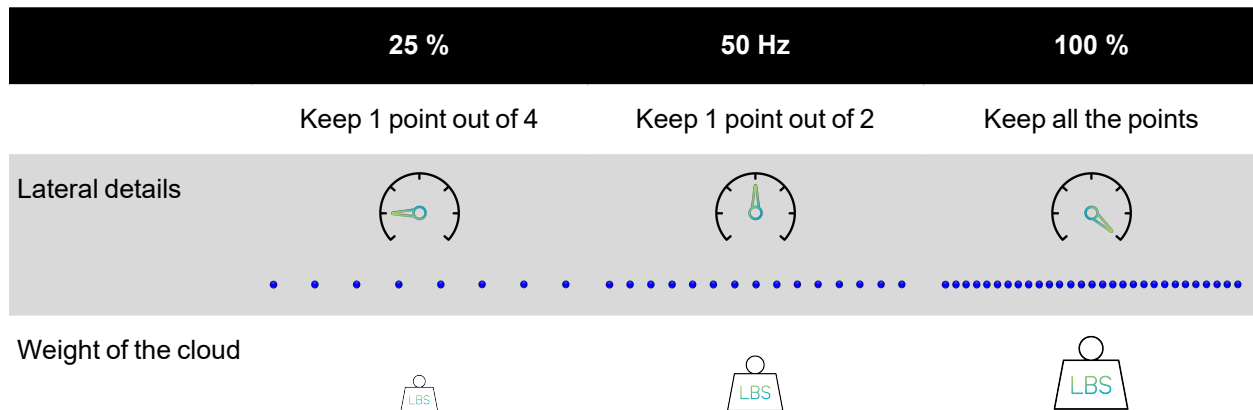
Line Sampling (LAS / LAS-XL)

As well as the frequency, sampling the collected lines will lighten the final cloud, while preserving the details on each line.

	30 %	50 Hz	100 %
Progress details	 	 	 
Time to scan			
Weight of the cloud			

Points Sampling

Independent of frame speed, the quantity of point per line can be reduced, to adjust the cloud to the level of details.



Point sampling for laser scanners

Use the Angle of Incidence (default)

As well as a point sampling, the AOI reduces the number of points per line, but instead of reducing regularly the points along the scan line, an intelligent filter retains only the useful details, lightening the areas lacking detail.

See chapter [4.6.2 - Angle of Incidence Filter \(RS6 / AS1 / AS1-XL\)](#).

Scanning Mode (LAS / LAS-XL)

The LAS and LAS-XL provide a set of scanning modes, adjusting the frame rate, the width of acquisition and the points spacing, to get the best according to the needs.

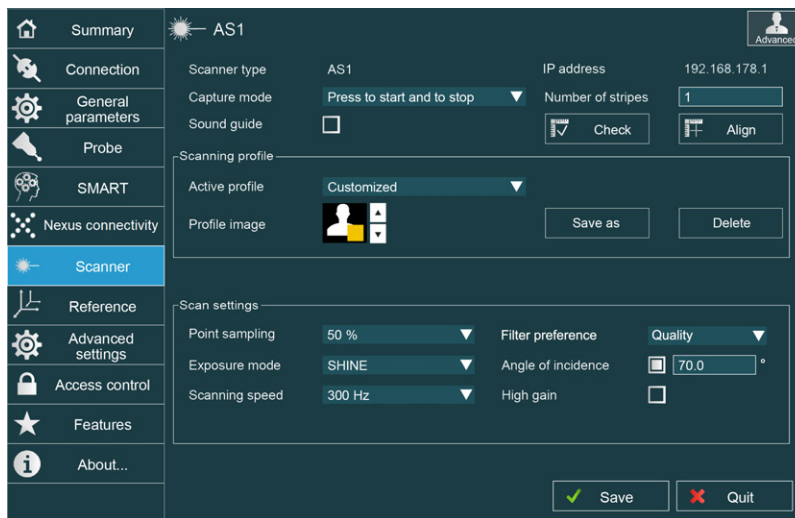
See how to select the wanted scanning mode in chapter [3.5.5 - Scanning Modes \(LAS, LAS-XL\)](#)

Setting the Rate of Acquisition in RDS

To set the frequency, and points or line sampling, from the RDS Agent, open the scanner settings.



Then set the appropriate parameter.



4.2. Get all the Wanted Details and Quality

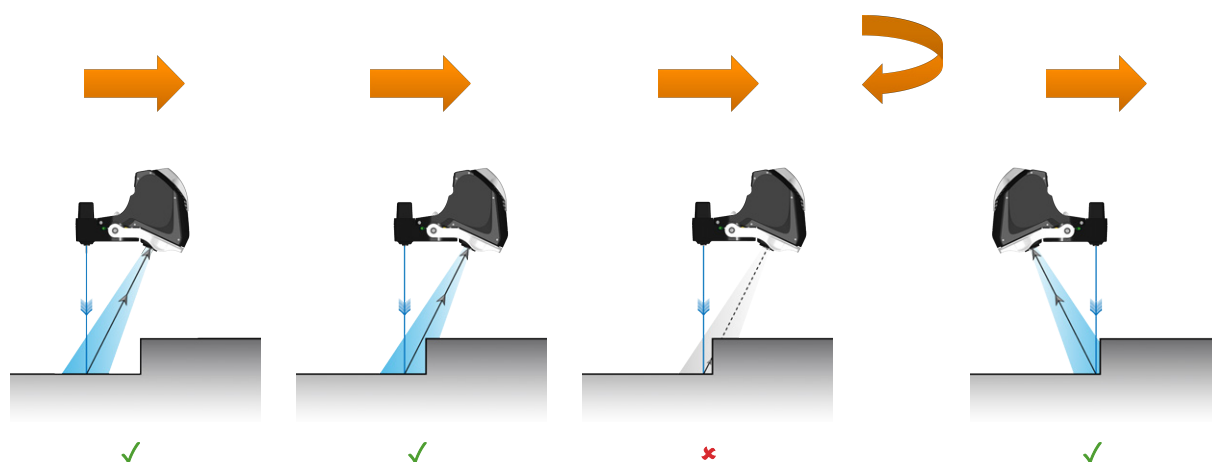
For any scanner, it is generally recommended to hold it perpendicular to the surface of the part being scanned. However, some parts have complex profiles, and so this section shows how to deal with them in a way that guarantees maximum coverage and detail.

Scanning Settings

To increase the quantity of collected points, first check all the settings provided by RDS, by adjusting the [exposure](#), the [gain](#) or even deactivating the [angle of incidence](#) or the quality filter.

Shadow Fields

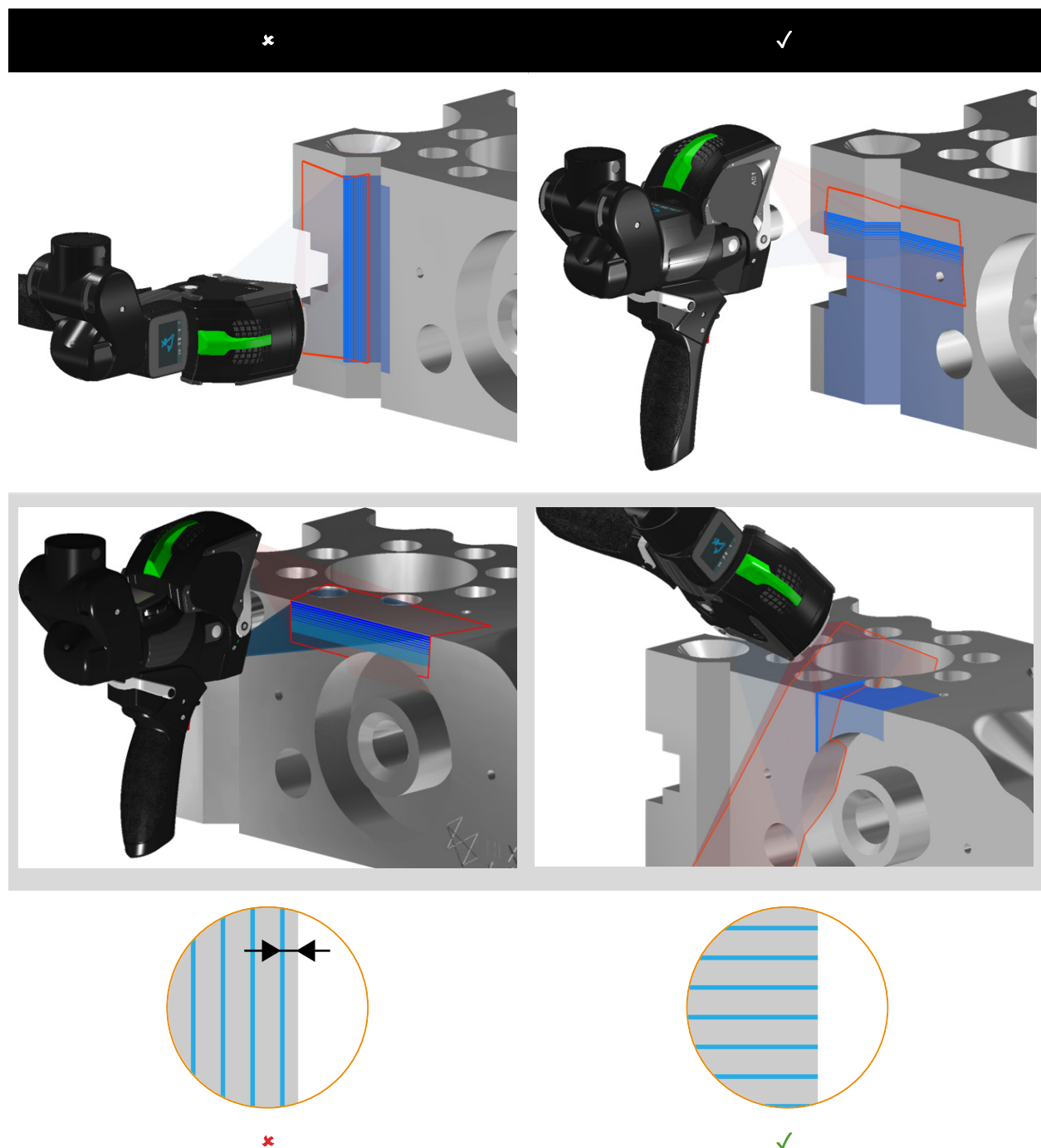
As there is an angle between the laser plane and the camera, depending on the relief, there can be areas where the object shadows the camera view. To get points in those areas, simply re-orientate the scanner and continue.



As a contact probe mounted on a 7-axis arm may occlude the field of view of the scanner, a very large shadow field may occur. It is highly recommended to remove any contact probe from the Swivel before scanning.

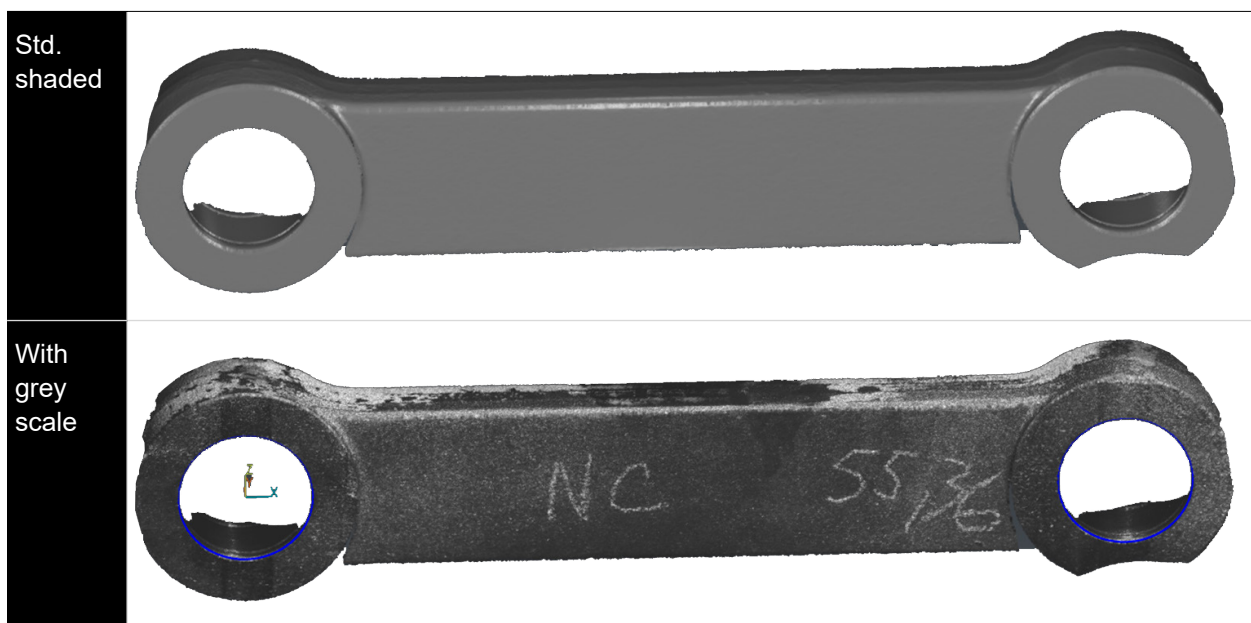
Edges, Slots and other 3D Shapes

When measuring an edge, to get all its details, orientate the laser at 90 degrees to the feature as shown on the right side.



4.3. Grey Scale Information

Digitizing with the AS1 and AS1-XL laser scanners permits to retrieve the grey scale value on each collected point. This feature allows to locate specific areas such as thermal impact on a part, colored areas, points marked by a cross, scratches...



Check if your application software is compatible with the grey scale feature.

Keep the scanner perpendicular

The darkness of the digitized part is sensitive to the environment: ambient light, reflection and orientation of the scanner to the light can affect the obtained grey value.

Keeping the scanner perpendicular to the surface reduces the sensitivity.

4.4. Missing Points? Adjust the Exposure



*The LAS and LAS-XL use a fully automatic exposure on each individual point.
The Automatic mode is not available for the HP-L-8.9 .*

Exposure Modes

RDS provides two kinds of exposure modes:

- Automatic modes**
 - SHINE mode** – SHINE (Systematic High Intelligence Noise Elimination) mode dynamically adjusts the best exposure on each individual point to get the highest quality data in any condition without the need of any intervention for the user.
 - SHINE HighSense mode (AS1-XL)** – The HighSense mode increases the exposure time of the camera for difficult surfaces (shiny, dark...).



Activating SHINE HighSense mode will automatically reduce the scanning speed to 100Hz. 200Hz and 300Hz cannot be used.

- User Defined mode** – While scanning, the exposure is fixed. This is useful for regular scanning, on a single-colour material. The adjustment of the exposure can be operated by 2 ways:
 - Manual setup:** the exposure level is set manually. It is not possible to set while digitizing.
 - Capture the exposure:** proceed with an automatic set of the exposure and memorizes it. It is not possible to set while digitizing.

The mode can be selected in the RDS Control Panel, scanner tab or switched through the [Quick Access Menu](#) (Q.A.M.).

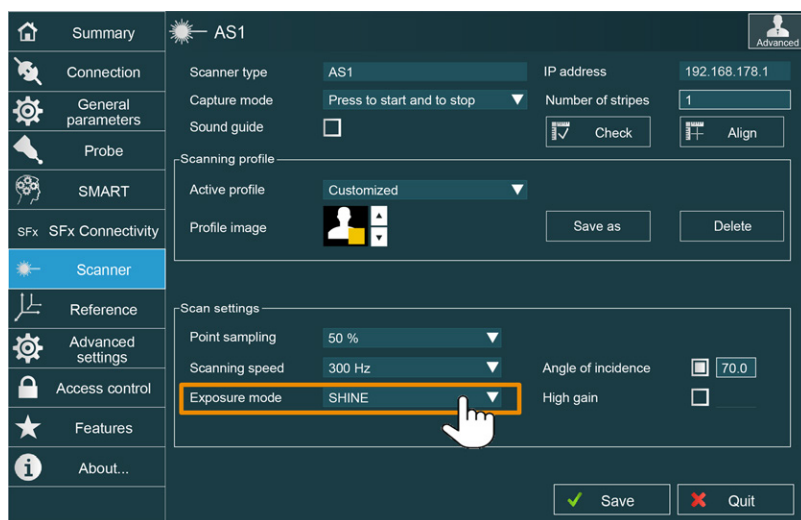
		Manual	Auto	SHINE (AS1)	SHINE (AS1-XL)
Adjustment	Manual	✓			
	Capture	✓			
	Automatic		✓	✓	✓
Adjustment while scanning			✓	✓	✓
Standard surfaces		✓	✓	✓	Standard
Difficult surfaces		✓	✓	✓	HighSense

See next chapters how to use the different exposure modes.

Switching the Exposure Mode

2 possibilities to select the exposure mode:

- Open RDS Control Panel > Scanner settings and set the exposure mode to “Manual /User Defined” or “Auto”/“SHINE”.



- From the portable measuring arm, access the Q.A.M. with a press on the 3-State button or the touch screen and select “Manual /User Defined” or “Auto”/“SHINE”.



Using the Automatic Modes

In most cases, the automatic exposure (Auto or SHINE) allows to collect data on almost any surface. Using Automatic exposure or SHINE is recommended whenever possible. With the AS1-XL, some types of surfaces may require a more sensitive exposure. The “SHINE HighSense” exposure mode can then be used.

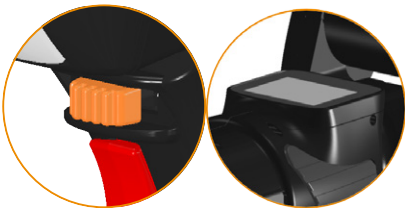


A specific [Sensitive] scanning profile is available with the AS1-XL to quickly switch to the SHINE HighSense mode.

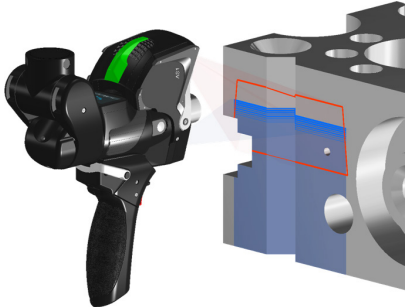
Capturing the Exposure (Manual / User Defined Mode)

RDS provides a process to setup automatically the manual exposure by pointing the scanner toward the surface to be digitized.

1. Initiate the process

	 (AS1)
Access the Q.A.M. with a press on the 3-State button or swipe down the touch screen and select "Capture the exposure".	Press "E" button on the AP21.
 	

2. Place the scanner over the surface, the scanner switches to a setup mode.

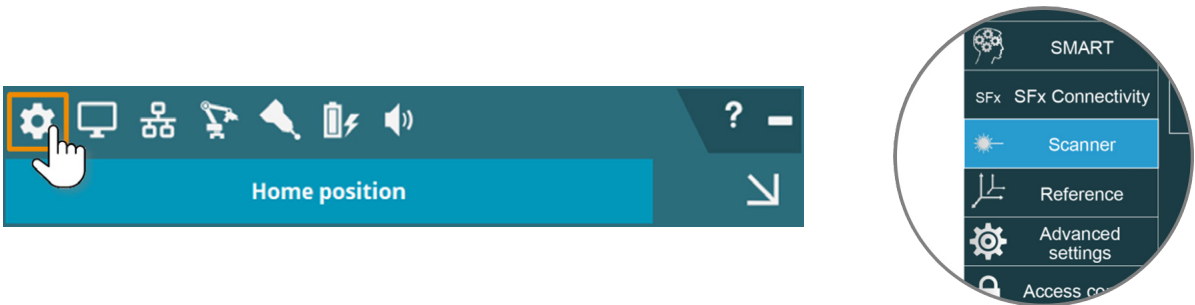


3. Wait until the adjustment is finished (the exposure value is stabilized, giving correct number of points).

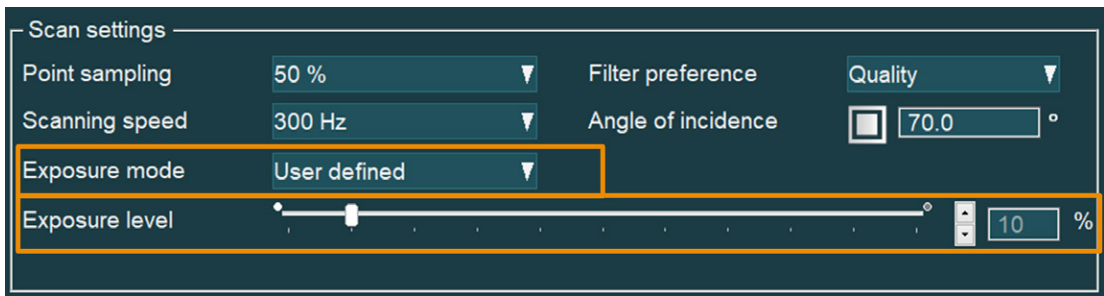
Setting the Exposure Manually (Manual/User Defined Mode)

The exposure can be set manually to be able to collect points on more challenging surfaces.

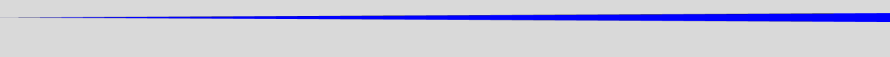
1. Enter the RDS Control Panel, scanner tab.



2. In the "Scan settings", set the exposure mode to "User defined". A scroll bar can be used to setup the exposure level of the scanner. The higher the value is, the longer the camera is opened.



This parameter must be set up according to the ambient light and the darkness of the surface. Set low value for clear surface and higher value for dark surface. However, a high value increases the risk of noise points. It is then necessary to adjust this parameter correctly.

Cursor					
Percentage	1%	25%	50%	75%	100%
Exp. time					
Light collected by the scanner					
Darkness of the part					
Laser power					
Noise					



If the scroll bar for the manual setup is not available, ensure that the User defined mode is selected.

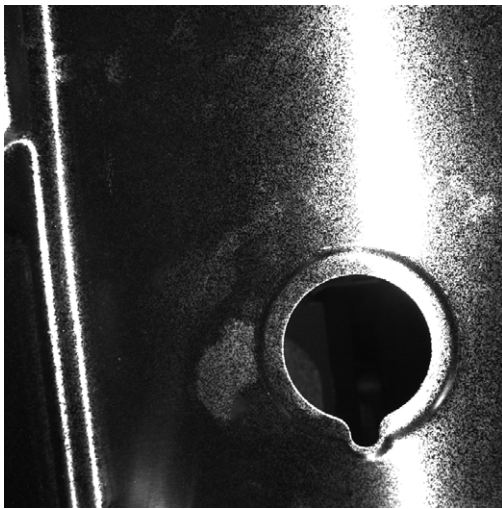


Very high exposure levels may slightly decrease the frame rate.

Under- and Over-Exposure

The adjustment of the exposure can face difficulties with very bright or shiny objects, or objects with slots or holes for which the exposure capture may focus on the extreme intensity.

In any difficult case, a [manual adjustment](#) should then be done.



4.5. Missing Surfaces? Use the High Gain

The "High Gain" is designed to allow the scanner to collect data on very challenging surfaces like glossy black. By default, the High Gain is deactivated. As High Gain increases the risk of spurious data or outliers, it must be used only as a last resort, where the scanner has not managed to collect any data.



The metrological performance of the system can be affected when gain is set to High since the likelihood of low-quality data being generated is increased.

1. Enter RDS Control Panel, scanner tab.



2. In the "Scan settings", enable the High gain.

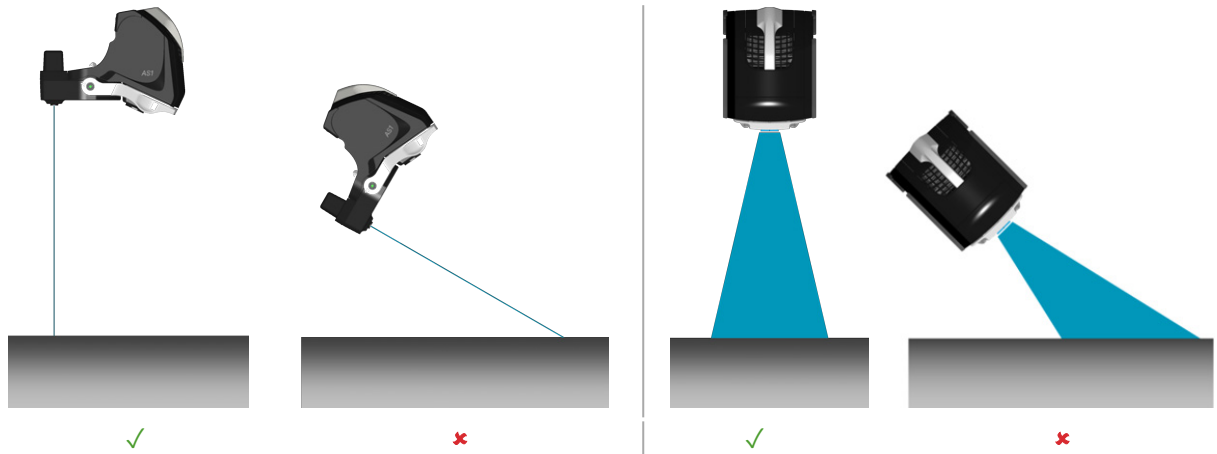


4.6. Missing Areas? Check the Orientation

4.6.1. Keep the Scanner Perpendicular

High angle of incidence can cause data to not be collected. High angle of incidence can be from curvature of the object being scanned, or because the user is holding the scanner at too steep of angle.

For best quality results, it is recommended to always keep the scanner perpendicular to the surface.



4.6.2. Angle of Incidence Filter (RS6 / AS1 / AS1-XL)

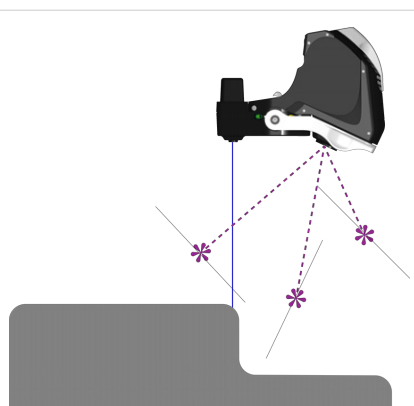
The Angle of Incidence (AOI) filter is designed to automatically eliminate any data at a large angle to the part surface. This is because points collected at significant angles can be erroneous, particularly if the part being scanned has a shiny surface. It is recommended to always keep the AOI active and deactivate only when necessary.

Diving Incidence

The diving incidence occurs when the angle between the normal vector of the surface and the laser plane becomes too high. In such case, the A.O.I filter removes the concerned points.



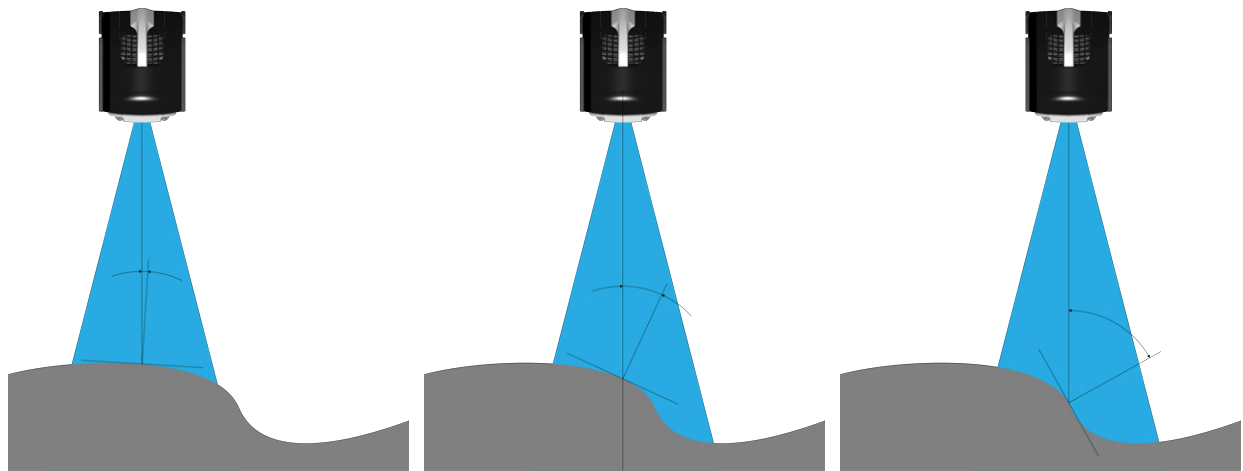
Here are some reasons of the utility of such filter:

Quality	High incident of the laser may result in a larger laser line on the surface, and then a loss of quality. The A.O.I. filter keeps only points that provides a good quality.	
Noise & Outliers	Noise or outliers (e.g. due to reflection) usually present a high incidence with the scanner. Applying the A.O.I. filter is a very good way to avoid such unwanted points.	
Reflection	When scanning a part with round-chamfered edges, there may be total reflections of the beam. Removing incidence points can automatically remove such reflection.	

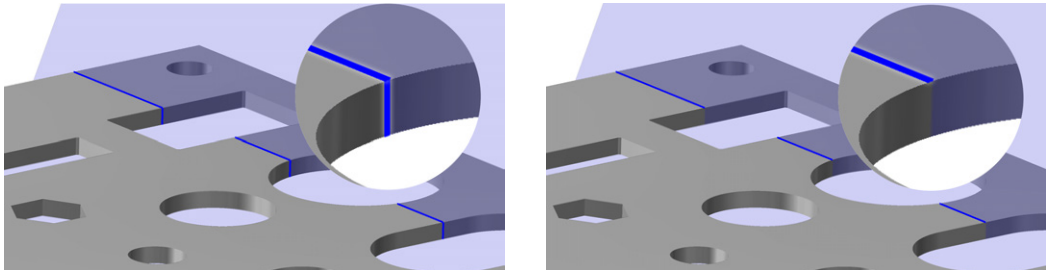
Lateral Incidence

As well as diving incidence, lateral incidence may have undesired effects.

The A.O.I. filter also checks the angle between the normal vector of the surface and the scanner orientation and drops incorrect points.



Here are main applications of the A.O.I. filter for lateral incidence:

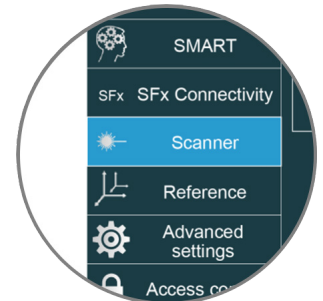
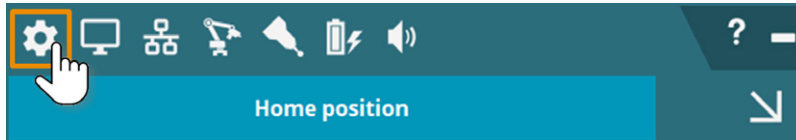
Quality	As well as diving incidence, lateral incidence may result on a loss of quality.
Remove the thickness	When scanning the top surface of parts like sheet metal parts, the user may not want to collect point in the thickness. As thickness is usually orthogonal to the top surface, by removing the points on the perpendicular surface, only the scan lines on the top surface are kept. 

Disable the AOI



AOI is enabled by default and highly recommended. By disabling this option, it may result in collecting noise, outliers or low-quality data.

1. Enter the RDS Control Panel, scanner tab.



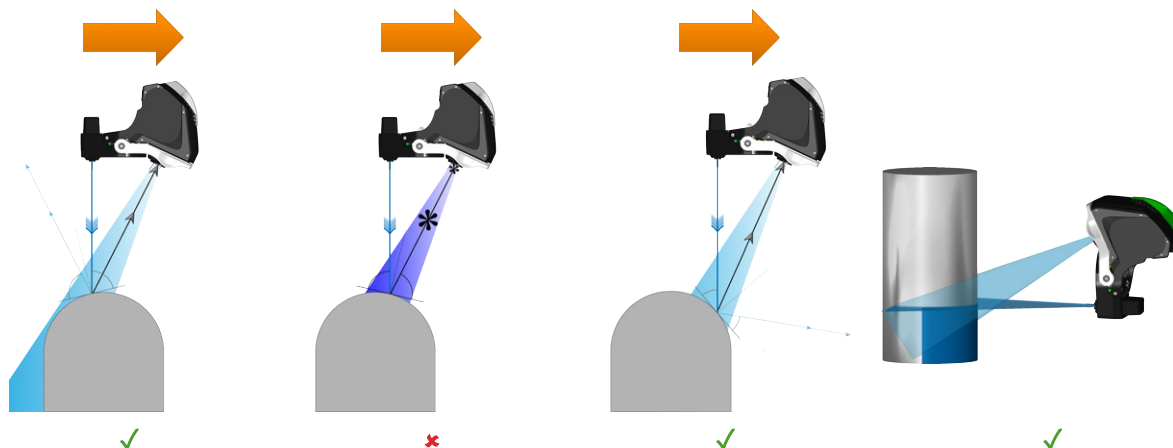
2. In the "Scan settings", disable the Angle of incidence or adjust the angle to the wanted value.



4.7. Avoid Unwanted Points

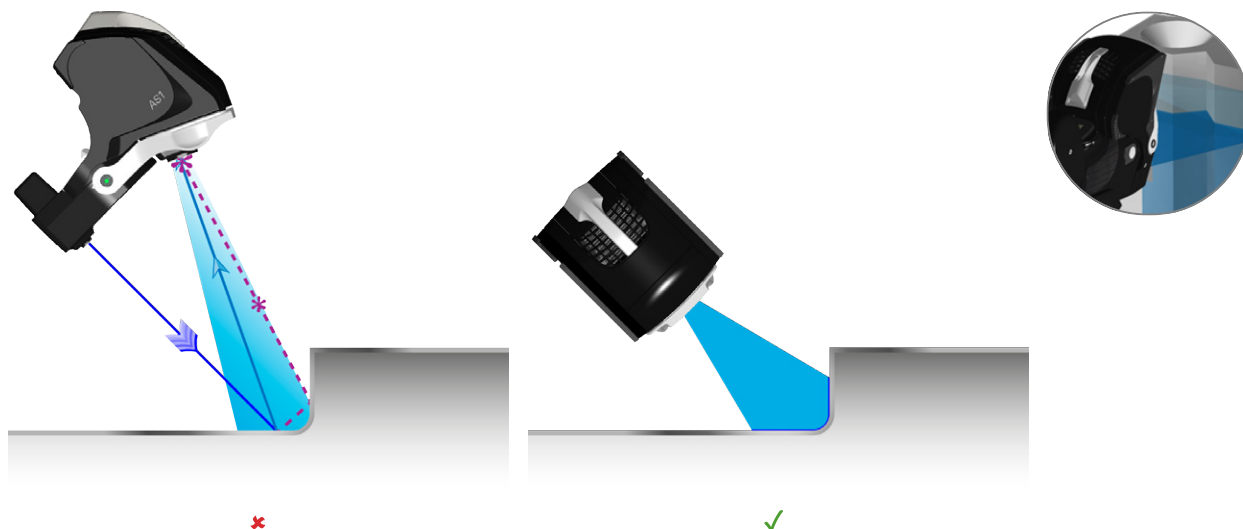
Total Reflection

Mirror like surfaces can cause a direct reflection from the laser to the camera; avoid these problems through careful orientation of the sensor as show below.



Secondary Reflection

Secondary reflections can occur on reflective, concave surfaces; avoid these problems through careful orientation of the sensor as show below.



Outliers - Noise

Translucent and high reflexion surfaces present a risk of outliers. The AOI (Angle Of Incidence) filter on the AS1 / AS1-XL removes efficiently such annoying points.

However, for some special cases, it may be useful to [deactivate the AOI](#) (foams which create scatter, scanning into deep cavities...).

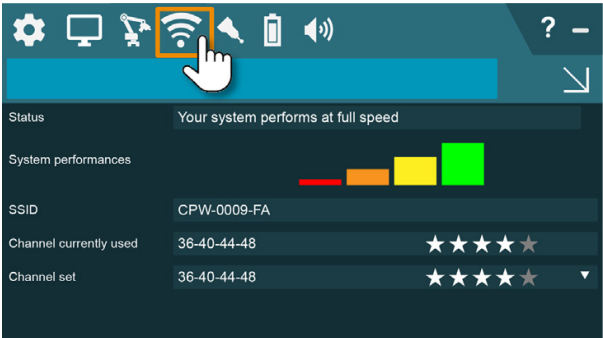


Always keep the AOI filter on by default to always ensure high quality data.

4.8. System Slowing Down?

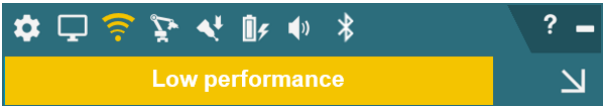
System Performance indicator

The RDS Agent provides feedback about the communication quality with a “System Performance” indicator. Open the “connection” tab on the RDS Agent while scanning.



	The system is running in an optimal way.
	The system runs smoothly but the user experience is not optimal. Some change is recommended. (e.g. change Wi-Fi Channel)
	Tuning some settings is highly recommended. (e.g. decrease the scanning frequency in RDS Control Panel)
	The system is critically low.

The RDS Agent warns the user as soon as the system performance becomes too low.



The system performance is displayed only while scanning. As soon as the acquisition is stopped, the performance graph disappears.

Data Processing and Computer Performances
The AS1 requires more processing power than most scanners because of its algorithms. It is recommended to close any unnecessary software applications while scanning, to ensure the best performance. In particular, any software that updates in real time (Teams, Skype, Outlook etc) can affect scanner performance because bandwidth is consumed.

Wi-Fi Mode



NOTICE

The HP-L-8.9 cannot be used wirelessly.



High Data Throughputs in wireless mode

When using high throughputs devices, such as the AS1, the flow of data may be reduced due to the number of devices using the same channel.

If the used channel starts to be overloaded, then some scan stripes and/or segments of stripes may be thrown away to keep a digitizing operation with good quality. However, if the channel is saturated, then the channel should be changed for a less loaded one.

The RDS Agent shows the performance of the system and recommends free channels when necessary.

Insufficient Resources

In some cases, “insufficient resources” may be displayed on the RDS Agent, due to a not powerful enough computer (see System Requirements) or a very demanding surface (translucid, very dark and bright, high density reflective foam...).

- Reducing the frequency to 200Hz permits to free enough resources for the points acquisition.
- Switching to the “Performance” filter reduces the use of the processor.

Scan settings

Point sampling

50 %

▼

Scanning speed

300 Hz

▼

Exposure mode

SHINE

▼

Filter preference

Performance

▼

Angle of incidence

☐

70.0

°

High gain

☐

4.9. Save Settings in Scanning Profiles

To facilitate the configuration of the scanning parameters when typical settings are used, RDS can record a set of parameters into a scanning profile.

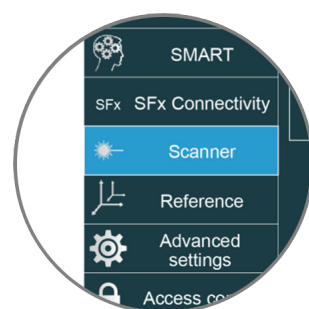
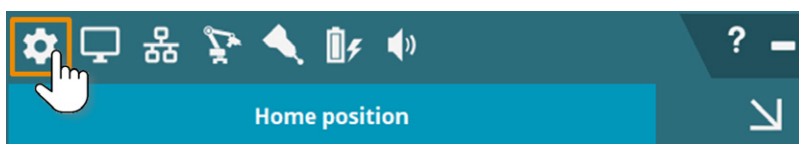
RDS can memorize scanning profiles for each type of laser scanner. It means that the set of parameters (scanning mode, filters...) can be saved into different configurations.

Default profiles are already proposed by RDS, but the operator can save new customized profiles, in order to quickly recall a configuration for a specific surface for instance.

Most scanning parameters are memorized. To easily enable one profile, the selection can be done either in RDS Control Panel, on the RDS scanning window, or even with the button on the machine.

How to Save a Profile (Advanced User Profile)

1. Open the RDS Control Panel, tab Scanner.

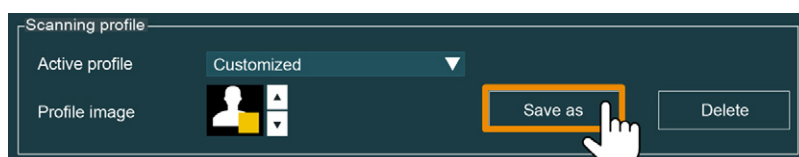


2. Select the profile to modify.

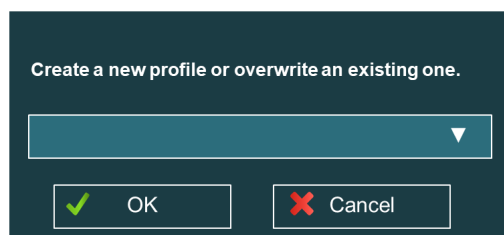


3. Set the parameters according to your needs (current profile becomes "Customized").

4. Click on "Save".



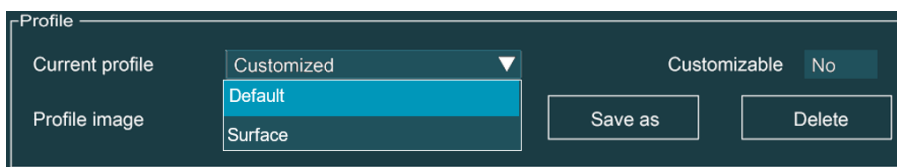
5. Give a name for the profile (existing profile can be selected from the drop-down list to be overwritten) and press "OK".



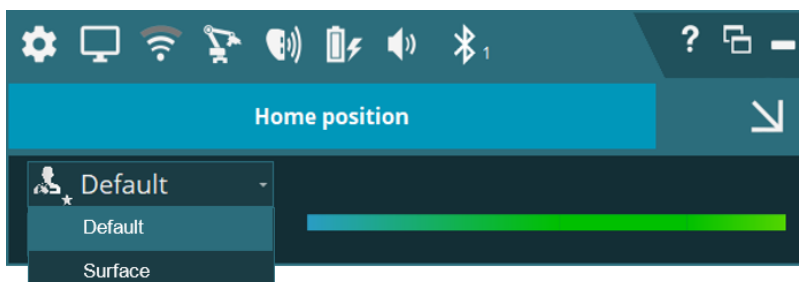
How to Use a Profile (all Users)

There are different ways to select and use a profile:

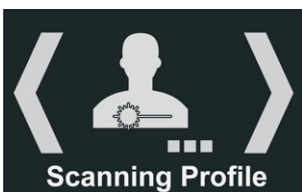
- From the RDS Control Panel – Access the tab “Scanner” and select the profile in the drop-down list (do not forget to save Control Panel).



- From the RDS Scanning window – Directly select the profile from the drop-down list on the RDS Scanning window.



- From the instrument.

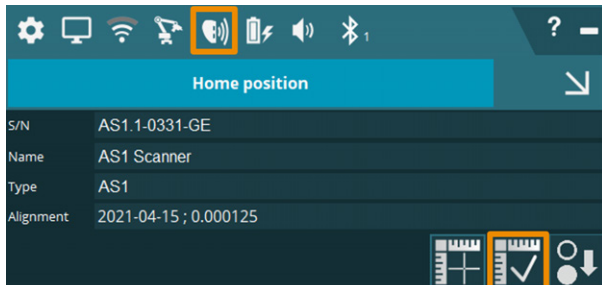
 LAS Use the Q.A.M. (or Wrist Display) to select the profile. 	 AP Double click on the Trigger button to switch to the next profile. 	 AP Press “E” button on the AP21. 
---	---	---

4.10. Verification and Alignment

Verification

As any measurement instrument, it is recommended to verify the accuracy periodically. RDS Data Collector provides a script to proceed a quick verification of the arm with the current scanner, “Scanner – Quick Check”.

From the RDS Agent > Sensor tab, press on “Check current probe”.

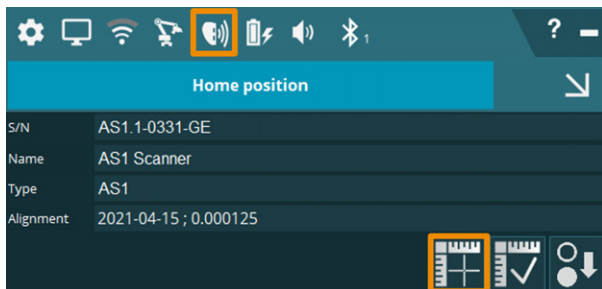


See chapter [5.7.2 - Verifying the Accuracy of Scanners](#) and follow the instructions.

Alignment

Prior to be used, a new scanner must first be aligned on the instrument. Also, in case of accuracy issue, the scanner can be re-aligned.

From the RDS Agent > Sensor tab, press on “Align current probe”.



See chapter [5.5 - Scanner Alignment](#) and follow the instructions.

5. RDS Data Collector

RDS Data Collector is the module for aligning probes and scanners, performing accuracy checks and so on.

5.1. Get Started

5.1.1. Terminology

For the sake of clarity, here are the definitions of the main terms used in the following chapter.

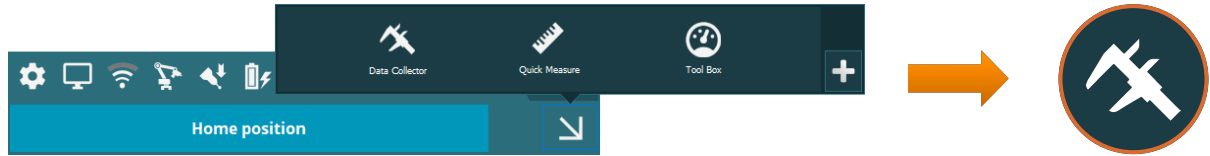
Term	Signification	Item
Alignment	This refers to the definition of the 3D position of an accessory relative to the measuring instrument. Ex: alignment of a probe on the arm.	Probe or scanner onto an arm
	It is a curative operation and results in a modification of the specs file.	
Compensation	This refers to the definition of the independent mathematic 3D model of an instrument or a complex accessory such as a laser scanner. This is not related to a combination of instrument and accessory. Ex: compensation of an arm.	Arm Laser scanner GridLOK
	It is a corrective operation and results on a modification of the specs file.	
Verification Checking	This refers to measurements operated with the system (instrument + accessory), to check its accuracy.	All systems
	This represents only measurements and does not affect the specs file.	
Calibration	This refers to measurements operated with the system (instrument + accessory) according to specific international standard, to check its accuracy and compare with its official specifications.	All systems
	This represents only measurements and does not affect the specs file.	



“Qualification” is not used.

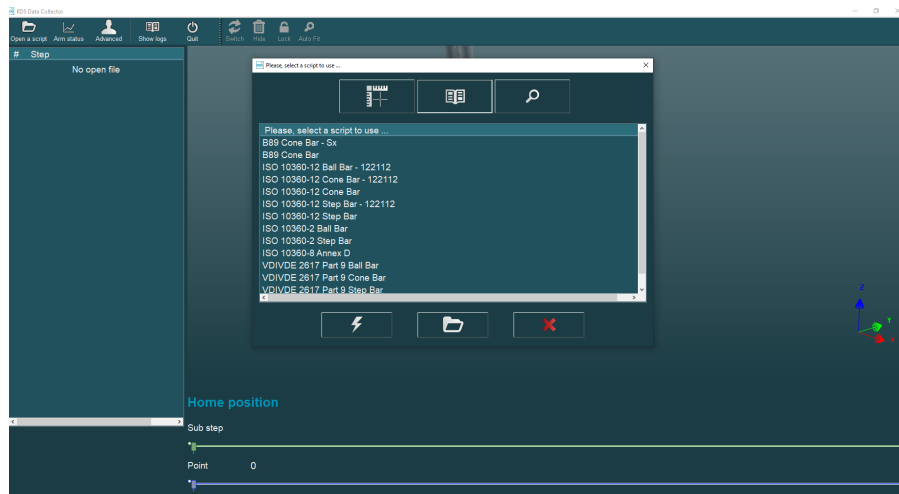
5.1.2. Open RDS Data Collector

To access RDS Data Collector, open the RDS Agent (RDS icon on the notification bar) and select “RDS Data Collector” in the shortcuts.



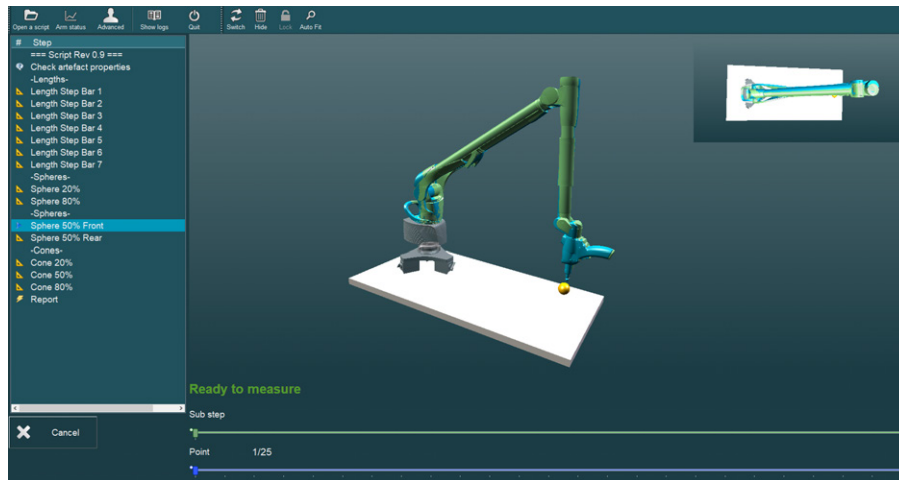
If the instrument status is “not connected” please refer to RDS User manual to connect the system.

Launch RDS Data Collector. After some seconds, script selection screen appears.



Then simply [run the script](#) to perform the wanted operation.

5.1.3. Overview of the Screen



		Menu Toolbar
		Auxiliary view toolbar
		Script content steps
		Main 3D graphic view
		Auxiliary graphic view
		Step description zone
		Action buttons

Toolbar

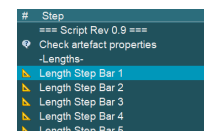


	Main toolbar
	Select the script to open
	Show the selection box for User profiles
	Switch to the off-line Analysis mode
	Toggle the information bar (rds.log)
	Close the application

	Auxiliary graphic view control
	Switch the main and auxiliary views on the fore/background
	Hide the auxiliary view
	Lock the auxiliary view
	When activated, automatically resize the view when starting a new step.

Script Content

Left list shows selected script name and all steps contained in the script.



During script execution, a status icon appears besides step as below.

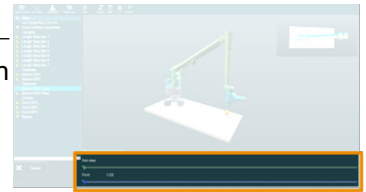
	No icon	Simple information
	Question bubble	Value entry step
	Yellow set square	Measurement step
	Yellow flash	Result step
	Root	Calculation step
	Blue play	It's the current step.
	Green check	Step has been correctly executed.
	Red cross	An error occurred during the execution of the step, or the step has been cancelled.

Action Buttons

	Play all	Every step is played sequentially.
	Play from	Execution begins at step selected by user.
	Play step	Only selected step is played.
	Export	Exports the measurements points and clouds in several available file formats.
	Cancel	Stops the execution (when a script is running).

Step Description Zone

At the bottom of the screen, user will find an area containing information regarding current step execution.



For instance, if we execute a points' capture sequence, area will show:

- Current sub step index and its description.
- Current point index versus amount of wanted points.
- A list showing important information concerning script execution.



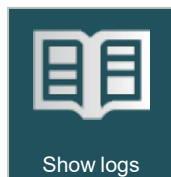
Sub step scroll shows the main operations of the current step. Point scroll shows the amount of ALL the points for the step, not only the current sub step.

Log Information Bar

This displays the log of events for RDS Data Collector. Each action, error (...) is memorized in the log file (RDS.log).



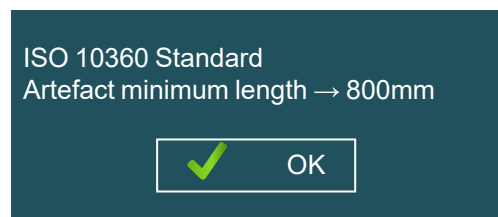
This zone can be hidden or shown with the button on the top Toolbar.



```
16:53:14:130 - Step 2 (Check Artifact Properties)
16:53:24:317 - Step 1 (Check environment)
16:53:24:331 - Step 2 (Length)
```

Message Box

It is a simple information dialog box. It gives to user some details about step execution.



5.1.4. Graphic View

A large window space is reserved to 3D representation. This part has several objectives:

In capturing mode,

- It provides to user a real-time representation of connected arm.
- It helps user to capture points by displaying an arm reference and optionally the measuring artefact (Length ball bar for instance).

In analysing mode (Service profile only),

- It gives the opportunity to graphically show how points have been taken.
- It is useful to compare taken points with reference positions.

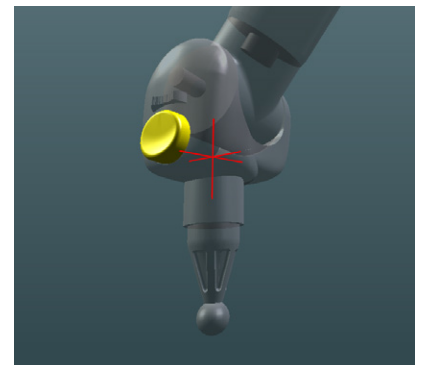
By default, when a script is played, scene camera is automatically moved to present the best view.

3D Scene Controls

	Mouse	Action
	Right mouse button + mouse move	Rotate scene toward pivot (red cross).
	Left and Right mouse button + mouse move	Translate scene
 + 	Left Shift key + Left and Right mouse button + mouse move	Translate scene along X
 + 	Right Shift key + Left and Right mouse button + mouse move	Translate scene along Y
 + 	Left Ctrl key + Left and Right mouse button + mouse move	Translate scene along Z
	Mouse wheel	in and out zoom
 + 	Shift key + Right mouse button + mouse move	in and out zoom

To help manipulating camera, a red cross appears at the centre of the screen when you rotate or translate the view.

- Cross represents scene pivot point; Rotations are done using this special point.
- To change the rotation centre, do a translation of the view and move the desired rotation centre to the centre of the screen.



It is also possible to control the view using the pad.

Key	Function
H	Display Help
A / Z	Rotate around X axis
Q / S	Rotate around Y axis
W / X	Rotate around Z axis
4 / 6 (← / →)	Horizontal camera pan
2 / 8 (↑ / ↓)	Vertical camera pan
+ / -	Zoom in / out
R	Display / Hide Axis

Several renderings are available for the arm.

Function pad	Rendering
F1	Points
F2	Flat wireframe
F3	Smoothed wireframe
F4	Flat Shading
F5	Smoothed Shading

Auxiliary Graphic View



A second graphic view is displayed to help the user on the location to measure.

- This view is automatically switched on the foreground when the probe approaches the target position.
- It can also be switched manually, and the orientation can be locked.
- The auxiliary view is automatically activated on arm compensation scripts and on scanners alignment scripts.
- On compensation scripts, it shows the scene from a top view.
- On scanner alignment scripts, it shows the laser and stripes.

5.2. Run a Script

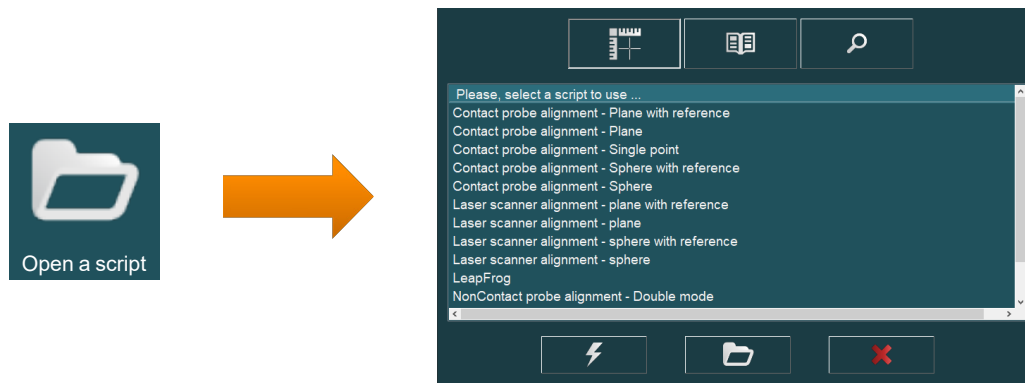
To run an operation the operator must execute a script, which is divided in steps and sub-steps. Steps may consist in:

- points measurement
- calculation process
- instruction messages
- warning messages
- information messages
- dialogue box to enter values.

Scripts can be executed all, or step by step, or from one step.

5.2.1. Open and Execute a Script

To select a script, press the “Open a script” button, the script selection screen is automatically displayed.



The script selection screen is automatically opened at the launch of RDS Data Collector.

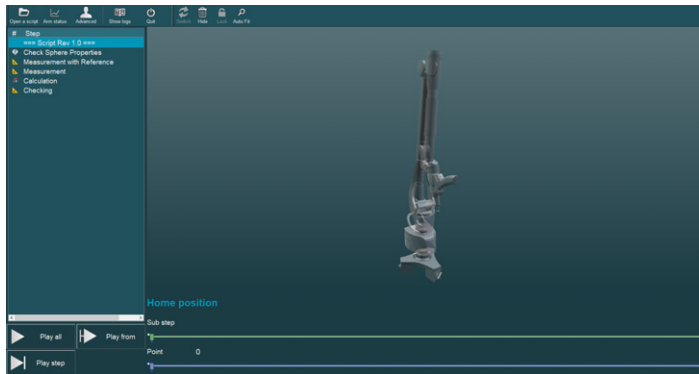
Scripts are sorted by categories:

	Accessories alignment	Alignment of probes, scanners and volume extensions
	Calibrations	Verifications and calibrations according to official standard (B89 / ISO10360)
	Diagnostic tools	Quick accuracy checks for probes, NCP and scanners.

Choose a category, a script and press “Open” button.



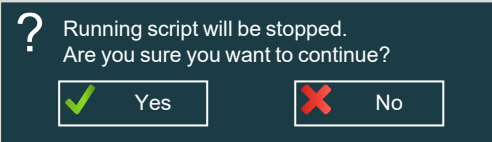
The main screen appears as below, the script is ready to be played.



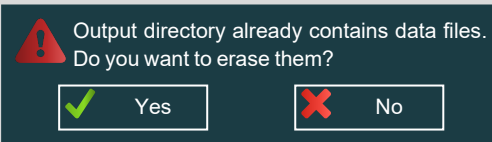
The script can be directly played when selected by double clicking on the script or by pressing “Run” button instead of “Open”.



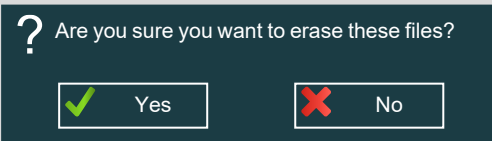
If a script is already running when pressing “Open a script”, RDS Data Collector asks to confirm stopping the script.



RDS Data Collector always memorizes data in Data Collection folder. If this folder already contains data when executing a script, the following message will appear (Service profile only).



If a script is already running when pressing “Open a script”, RDS Data Collector asks to confirm stopping the script.



5.2.2. Available Scripts

According to the type of machine and accessory, different types of scripts are available.

Scripts for Arms

		Touch probe	Touch trigger probe	Tube probe	AS1	AS1-XL
	Plane	✓	✓			
	Plane with reference	✓	✓			
	Single Point	✓				
	Sphere	✓	✓		✓	✓
	Sphere with reference	✓	✓			
	Tube			✓		
	ISO 10360-12 Cone bar	✓				
	ISO 10360-12 Step bar	✓	✓			
	ISO 10360-2 Step bar	✓	✓			
	ISO 10360-8 Sphere				✓	✓
	Sphere check	✓	✓		✓	✓
	Plane check	✓	✓		✓	✓
	Distance check	✓	✓		✓	✓
	Tube length check			✓		
	Free digitize				✓	✓

 : Alignments |  : Calibrations |  : Diagnostic tools

Scripts for Trackers

		AS1	AS1-XL	LAS	LAS-XL
	Plane – Measurement range	✓	✓		✓
	Sphere	✓	✓	✓	✓
	Sphere with reference		✓ *		✓ *
	Sphere check	✓	✓	✓	✓
	Plane check	✓	✓	✓	✓
	Free digitize	✓	✓		✓

: Alignments | : Calibrations | : Diagnostic tools | *: Back face alignment

5.2.3. Dialog Boxes

During the execution of the script, dialog boxes may be displayed.

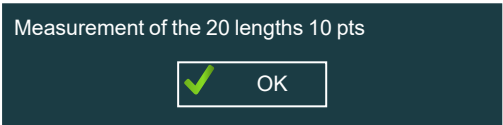
Dialog boxes can be validated or cancelled using mouse or pressing a long time (about 1 second) on the arm buttons.

	RA7	RA8	Touch screen*	AP21
Validate				
	Long press on the right button		Swipe right	"A"
Cancel				
	Long press on the left button		Swipe left	"D"

*: RA8 v2 7-axis

Message Box

Message boxes are displayed to give information or recommendations to the user.



Input Box

According to the artefact referenced by the script, some details are asked to user. In example below, user must fill out the real length bar value. Be aware that these values are saved in destination Data Collection file.



By pressing "Cancel", script execution is aborted.

5.2.4. Artefact Selection Box

When running a script, artefacts values can be memorized and stored in the computer. A dialog box appears to select the appropriate artefact and modify the values.

When RDS displays the artefact selection box, a drop-down list of artefacts is available. This list contains all the memorized artefacts, fitting with the type of selected script ("Cone bar" for compensation or calibration with cone bar, "Ball bar" for calibration with ball bar, ...).

Select an Artefact

Choose the artefact in the list and check / modify the values.

Artefact

Ball Bar.artefact ▼

Physical properties

Property	Value	Unit	Λ
L_01_02	100.000	mm	
L_01_03	200.000	mm	
L_01_04	300.000	mm	
L_01_05	400.000	mm	
L_01_06	500.000	mm	V

Other properties

Property	Value	Λ
Description	29 Balls	
Last calibration date	01/01/2015	
Modification date	03/07/2015	
Serial number	0	V

☐ 
☐ 



By default, one memorisable artefact is available for each type of artefact:

[Cone Bar – Default.artefact]

[Step Bar – Default.artefact]

[Ball Bar – Default.artefact]

[TBar – Default.artefact]

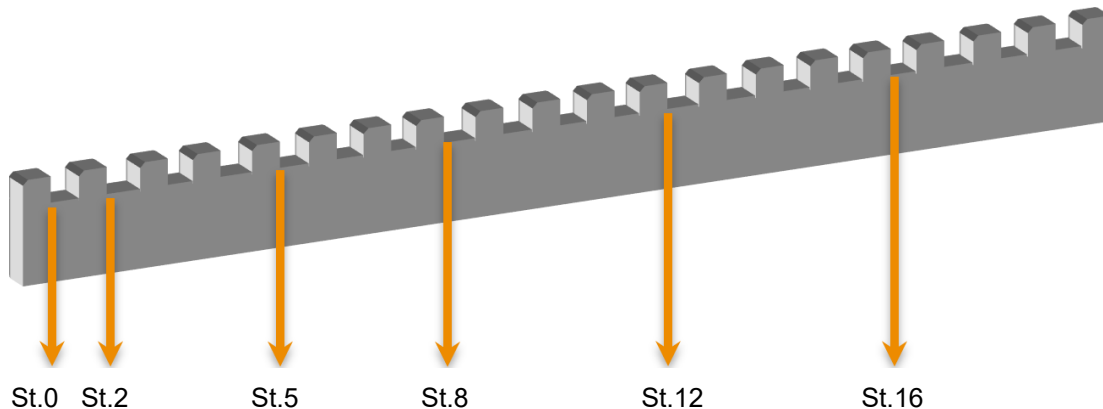
All other available artefact ([Cone Bar.artefact], [Step Bar.artefact], [Sphere Bar.artefact], [TBar.artefact]) are only temporary artefacts and are overwritten each time a script is run.

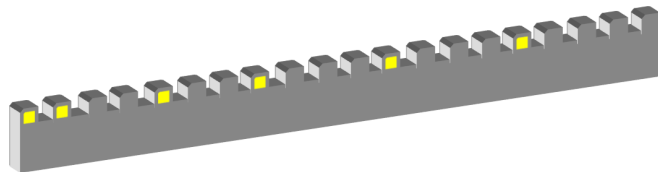
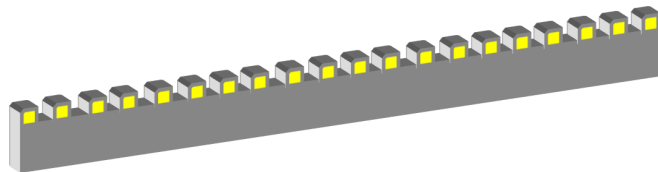
Number of Used Lengths

The standard artefacts allow entering up to 30 distances (even if the calibrations need only 5 lengths, it is possible to enter all 30 lengths, RDS automatically use the correct length).

Example: The step gage below has 20 steps, but only 6 are necessary to run a calibration.

The user decides to use (following the standard recommendations) steps N0, 2, 5, 8, 12 and 16.



Solutions																									
1	Only consider the 5 used lengths and miss the other ones.  Artefact Step Bar - Default.artefact Physical properties<table><thead><tr><th>Property</th><th>Value</th><th>Unit</th></tr></thead><tbody><tr><td>L_01_02</td><td>100</td><td>mm</td></tr><tr><td>L_01_03</td><td>400</td><td>mm</td></tr><tr><td>L_01_04</td><td>700</td><td>mm</td></tr><tr><td>L_01_05</td><td>1100</td><td>mm</td></tr><tr><td>L_01_06</td><td>0</td><td>mm</td></tr><tr><td>L_01_07</td><td>0</td><td>mm</td></tr><tr><td>L_01_08</td><td>0</td><td>mm</td></tr></tbody></table>	Property	Value	Unit	L_01_02	100	mm	L_01_03	400	mm	L_01_04	700	mm	L_01_05	1100	mm	L_01_06	0	mm	L_01_07	0	mm	L_01_08	0	mm
Property	Value	Unit																							
L_01_02	100	mm																							
L_01_03	400	mm																							
L_01_04	700	mm																							
L_01_05	1100	mm																							
L_01_06	0	mm																							
L_01_07	0	mm																							
L_01_08	0	mm																							
2	Consider all the lengths, RDS will automatically detect the correct values.  Artefact Step Bar - Default.artefact Physical properties<table><thead><tr><th>Property</th><th>Value</th><th>Unit</th></tr></thead><tbody><tr><td>L_01_02</td><td>100</td><td>mm</td></tr><tr><td>L_01_03</td><td>200</td><td>mm</td></tr><tr><td>L_01_04</td><td>300</td><td>mm</td></tr><tr><td>L_01_05</td><td>400</td><td>mm</td></tr><tr><td>L_01_06</td><td>500</td><td>mm</td></tr><tr><td>L_01_07</td><td>600</td><td>mm</td></tr><tr><td>L_01_08</td><td>700</td><td>mm</td></tr></tbody></table>	Property	Value	Unit	L_01_02	100	mm	L_01_03	200	mm	L_01_04	300	mm	L_01_05	400	mm	L_01_06	500	mm	L_01_07	600	mm	L_01_08	700	mm
Property	Value	Unit																							
L_01_02	100	mm																							
L_01_03	200	mm																							
L_01_04	300	mm																							
L_01_05	400	mm																							
L_01_06	500	mm																							
L_01_07	600	mm																							
L_01_08	700	mm																							

5.2.5. Thermal Compensation of the Artefact

A temperature compensation of the calibrated artefact can now be applied when performing probing or scanning quick checks or ISO calibrations in RDS Data Collector, on

- Length checks
- Sphere checks



The thermal compensation cannot be applied on the B89 scripts.

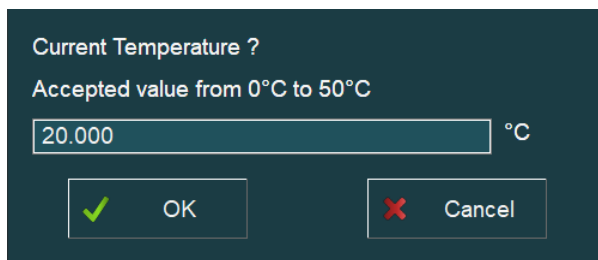
When executing a quick check or calibration script in RDS Data Collector, inputs are now required to enable the compensation of the temperature.

- Coefficient of temperature expansion of the material.
- Temperature of the artefact.

Current temperature

Enter the real temperature to be used for the compensation of the artefact.

The acceptable values must be within $0^{\circ}\text{C} \leq T^{\circ}\text{C} \leq 50^{\circ}\text{C}$.




*By typing values outside this range, the closest acceptable value will be taken into account.
Ex: typing -3°C , 0°C will be considered.*



NOTICE

The temperature entered manually is used for the entire calibration, thus it's the user's responsibility to ensure a stable temperature of the artefact all along the measurements.

CTE Value

The Coefficient of Thermal Expansion depends on the material of the artefact used.

- On Quick checks, the CTE must be entered manually when prompted.
- On ISO 10360-12, several artefact files can be saved to automatically recall the appropriate properties (dimensions and CTE).

Defaults thermal expansion coefficients have been implemented (for all other artefacts, the default value is set to zero).

Artefact	Used in	Material	Default CTE ($\mu\text{m.m}^{-1}.\text{°C}^{-1}$)
[AS1-XL alignment sphere]	AS1-XL scanner alignment - sphere with reference ISO 10360-8 Annex D - AS1-XL - Arms	Aluminium (matt grey sphere 90mm)	23.0
[B89 Length Cal Bar]	Probing - quick check	Steel (Std Verification Bar)	11.5
[B89 Sphere]	Contact probe alignment - Sphere with reference Contact probe alignment - Sphere Probing - quick check	Steel (shiny sphere 25.4mm)	11.5
[Step Bar]	All ISO 10360-12 Step Bar All ISO 10360-2 Step Bar	Steel (multi-lengths artefact)	11.5
[Cone Bar]	All ISO 10360-12 Cone Bar	Silicon Carbide (multi-lengths artefact)	4.4
[ISO Sphere]	All ISO 10360-12 All ISO 10360-2	Steel (shiny sphere 25.4mm)	11.5
[Scanner alignment sphere]	Laser scanner alignment - sphere with reference Laser scanner alignment - sphere	Tungsten carbide (matt grey sphere 25.4mm)	5.5
[Scanner verification sphere]	Scanner - Quick check ISO10360-8 Annex D	Tungsten carbide (matt grey sphere 25.4mm)	5.5
[Simple Length Bar]	Probing - Quick check	Steel (Std verification bar)	11.5

Result Using Thermal Compensation



No thermal compensation will be used in the following cases:

- Temperature = 20° (nominal temperature of calibration for artefacts)
- CTE = 0 $\mu\text{m} \cdot ^\circ\text{C}^{-1} \cdot \text{m}^{-1}$

When displaying the results, new information is provided.

Calibrated [mm]	Nominal [mm]	Measured [mm]	Deviation [mm]
25.4000	25.4005	25.3901	-0.0104

CTE [$\mu\text{m}/^\circ\text{C}/\text{m}$]	Temperature [$^\circ\text{C}$]
5.500	23.626

◀ Back
Next ▶

Calibrated value	Dimension given with the artefact (calibrated value at 20°C).
Nominal value	Compensated dimension of the artefact (calibrated value with the thermal compensation).
Measured	Dimension measured with the instrument.
Deviation	The error is now calculated between the current measurement and the compensated value.
CTE	Reminder of the entered coefficient of thermal expansion.
Temperature	Temperature used for the thermal compensation.

5.2.6. Customize an Artefact

In RDS Data collector, it may be useful to create customized artefacts to easily get the calibrated values of the artefact.

5.2.6.1. Available Artefacts

To access the artefact files, browse to C:\Users\Public\Documents\Romer\RDS\Artefacts and find the wanted artefact with the following table.

Category	Script	Artefact
Alignments	<i>[AS1-XL scanner alignment - sphere with reference]</i>	<i>[AS1-XL alignment sphere]</i>
	<i>[Contact probe alignment – Sphere]</i>	<i>[B89 Sphere]</i>
	<i>[Contact probe alignment - Sphere with reference]</i>	
	<i>[Laser scanner alignment – sphere]</i>	<i>[Scanner alignment sphere]</i>
	<i>[Laser scanner alignment - sphere with reference]</i>	
Calibrations	All <i>[B89]</i>	<i>[B89 Sphere]</i>
	All <i>[B89 Cone Bar]</i>	<i>[B89 Length Cal Bar]</i>
	All <i>[ISO 10360-x]</i>	<i>[ISO Sphere]</i>
	All <i>[ISO 10360-x Cone Bar]</i>	<i>[Cone Bar – Default]</i>
	All <i>[ISO 10360-x Step Bar]</i>	<i>[Step Bar – Default]</i>
	<i>[ISO 10360-8 Annex D - AS1-XL]</i>	<i>[AS1-XL alignment sphere]</i>
	<i>[ISO 10360-8 Annex D]</i>	<i>[Scanner verification sphere]</i>
Diagnostics	<i>[Probing - quick check]</i>	<i>[B89 Length Cal Bar]</i>
		<i>[B89 Sphere]</i>
		<i>[Simple Length Bar]</i>
	<i>[Scanner - Quick check]</i>	<i>[B89 Length Ball Bar]</i>
		<i>[Ball Bar]</i>
		<i>[Scanner verification sphere]</i>

Fig. 3: Default artefacts

5.2.6.2. Change Default Parameters

If most of the values (diameters, lengths...) contained in the artefact files can be set directly when executing a script, some need to be edited inside the text file (certification date, CTE...).

To do so, simply open the appropriate artefact file and adjust the wanted parameter.

5.2.6.3. Create a Customized Artefact

Some scripts in RDS Data Collector permit to choose the artefact to use. ISO 10360-12 or Tube probe alignment are such scripts.

The step for artefact properties displays a selection window in which the user can

- Select the artefact within the list of available ones
- Modify some properties

In addition to the default artefacts, it is possible to add personal artefacts and then get a list of all the artefacts.

Naming conventions

When giving a name to the new artefact, some rules must be respected so that it can be correctly listed by RDS Data Collector.

Type of artefact	The name must contain	Used by	Rules
Sphere	"Sphere"	ISO 10360-x calibrations Internal	1 diameter only
Cone bar	"Cone Bar"	ISO 10360-12 calibration	5 lengths min
Step bar	"Step Bar"	ISO 10360-x calibrations	5 lengths min
Tube artefact	"TBar"	Non-contact probe alignment	1 diameter only
		Non-contact probe quick check	1 length only
Tube gage	"ZBar"	Non-contact probe Z check	3 diameters 4 points (X, Y, Z)
Compensation bar	"Cal Bar"	Arm compensations	2 lengths

Dimensions

For cone and step bars, used for the ISO 10360-x calibrations, the number of lengths can be adapted to the real artefact.

Example:

```
<RDSArtefact v0.1>
3DObjectFile = Step Bar (600).elt
CTE = 11.50000000
Description = 6 Cones
L_01_02 = 25.17000000
L_01_03 = 75.08000000
L_01_04 = 125.16000000
L_01_05 = 200.00000000
L_01_06 = 250.07000000
Last certification date = 01/01/2012 00:00:00
Modification date = 06/06/2023 13:40:21
Serial number = 0
User name = Jean-Pierre Durand
```

In the above example, 5 lengths are set. Additional lengths can be used.

Simply add new lines “L_01_xx = yyyy.yyy”

xx	Index of the cone or step
yy	Value of the length in millimetres (= length from cone or step 01 to xx)

Example:

```
<RDSArtefact v0.1>
3DObjectFile = Step Bar (600).elt
CTE = 9.23
Description = Carbid Bar N°2 - 10 Cones
L_01_02 = 25.17000000
L_01_03 = 50.23640000
L_01_04 = 75.06420000
L_01_05 = 99.93400000
L_01_06 = 150.03200000
L_01_07 = 200.01920000
L_01_08 = 249.95300000
L_01_09 = 300.04200000
L_01_10 = 350.01320000
Last certification date = 06/04/2023 00:00:00
Modification date = 27/07/2023 13:40:21
Serial number = 32377-2
User name = Jean-Pierre Durand
```


Metadata

Several parameters can be set for the artefact.

Field	Explanation	Format
[CTE]	Coefficient of thermal expansion.	in $\mu\text{m.m}^{-1}.\text{°C}^{-1}$
[Description]	Field to describe the artefact.	Free text
[Last certification date]	Date used by RDS to warn if it exceeds one year.	dd/mm/yyyy hh-mm-ss
[Modification date]*	Date of last modification.	dd/mm/yyyy hh-mm-ss
[Serial number]	Field to show the serial number of the artefact.	Free text
[User name]*	Name of the user who modified the artefact.	Free text



The modification date and user name are automatically modified when the dimensions are modified in RDS Data Collector.

How to create a customized artefact

1. Open an existing artefact with a text editor (according to the [available artefacts](#), use the appropriate one).
2. Apply the customization (add or remove the wanted fields, set the wanted values...).
3. Save the file under a new name, respecting the naming conventions, on the same folder.

5.2.7. Collecting Data

Measuring in RDS Data Collector generates collected data files. Be aware that existing files will be updated if you capture points in this mode.

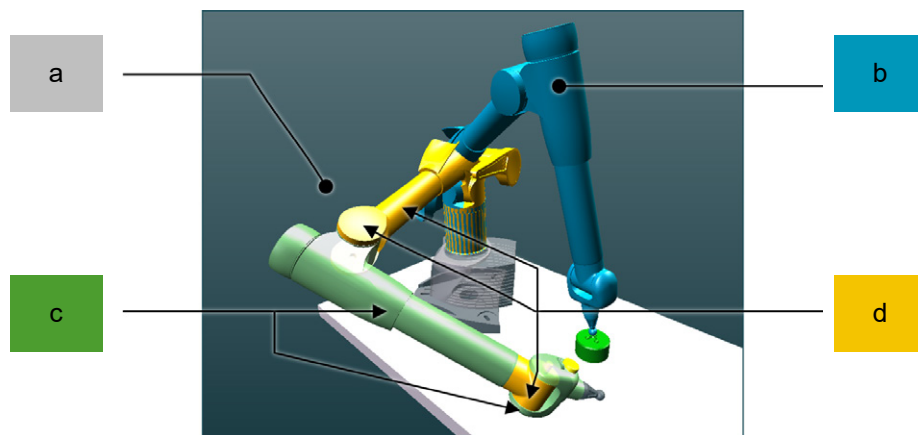
Once a script is open, the user can execute all, step by step, or from one selected step.

Capturing Points (arm)

Points capture is the most important action; it allows generating data collection files that will be used to compensate an arm, align a probe, generate a certificate, and so on.

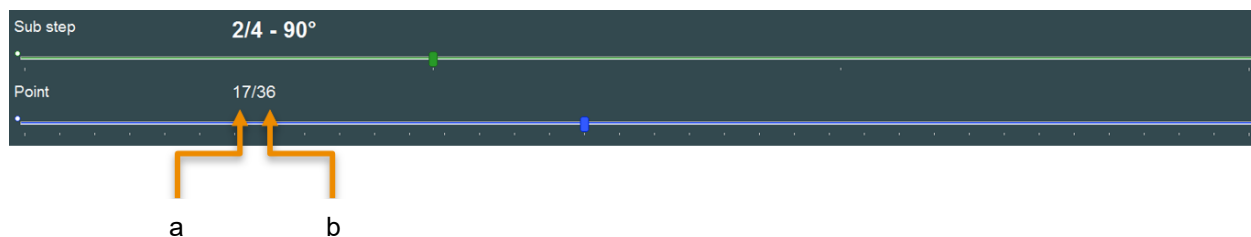
In this mode, several things happen:

- Real-time arm representation is enabled.
- If reference angles are stored in script files, reference arm is displayed. This blue-coloured arm shows for every point what the optimal position to capture point is.



- Phantom real-time arm
- Position arm to reach
- Axes have a correct angle
- Axes have an incorrect angle

Contextual bottom area has been updated, it contains now current point index and wanted number of points. In current example, we need to capture 17 points for sub-step, then 36 points before completing action.



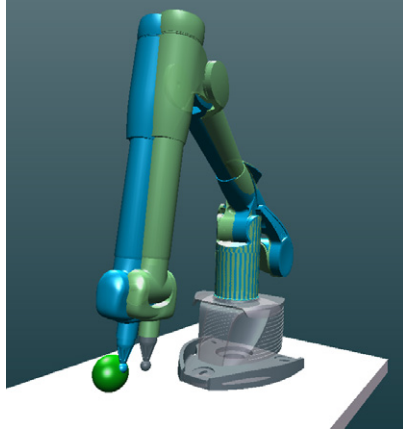
- Current point index
- Wanted amount of points

Points capture automatically ends up when wanted number of points is reached.

Positioning the Arm

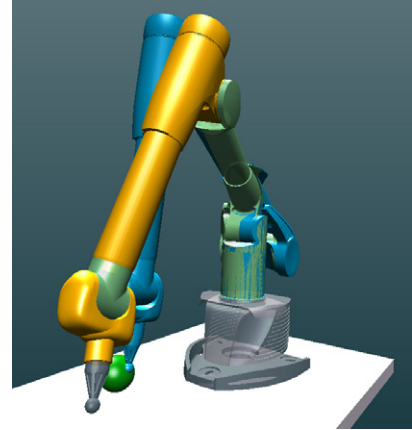
The objective will be to capture points by following displayed blue arm. To help user, real-time arm aspect, changes depending on its position. Indeed, an axis will appear in green colour if correctly positioned, in orange colour if not.

Example of a Correct Position



All axes are green.

Example of a Wrong Position



Some axes are yellow.
(D and F axes incorrect)



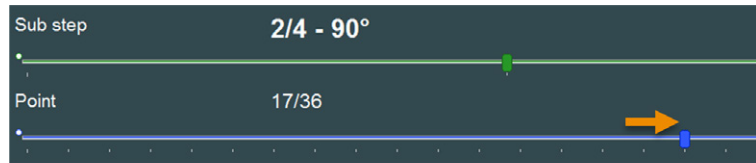
If the reference positions have not been respected, a warning will be displayed on the results window.



The axes of the arm were not in the recommended positions during the last step. We suggest running this step again to obtain an optimal probe alignment.

Measure a Point

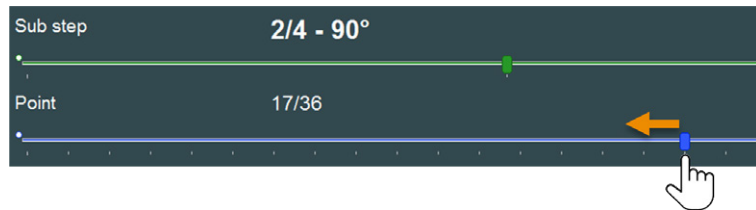
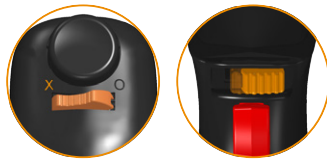
Press the Trigger Button to take a point. Current point index is updated in contextual area.



Cancel a Point

If you want to cancel a point to retake it for instance, press the 3-State button – B3S to the left.

Moreover, you can use scrollbar located below 3D representation area to go directly to an already taken point.



To cancel all points for the actual step, do a long click on left arm button or move completely back the scrollbar.



The touch screen can also be used to cancel one point by swiping to the left.



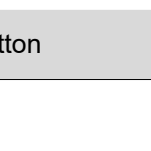
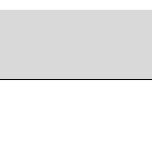
Digitize with a Laser Scanner

To take stripes of scan with Hexagon scanners, depending on the settings on Control Panel, press and hold main button to scan, and release it to stop, or press once to start and a second time to stop.

Several sequences can be performed before validating the cloud. Then a scan can be started and stopped, started again and stopped again, as many times as you want.

To validate the cloud, press “Next” button or press the right button on portable measuring arms.

	RA7	RA8	RA8	AP21	LAS / LAS-XL
Start-Stop scan					
	Trigger button				

	RA7	RA8	RA8	AP21	LAS / LAS-XL
Validate	 	  	  		
	Right button			"A"	Swipe right
Cancel	 	  	  		
	Left button			"D"	Swipe left

*: RA8 v2 7-axis



The validation cannot be done until the scan is not stopped.

Guided Scanning

For scanner alignment operations, the measurement is guided (a window guides you to place the laser at the correct position).

The scan can be started before or once the laser is inside the window, the stripes are collected only when the laser is inside the window.

5.2.8. Exporting the Data

When a script is done, all the measured points (for probing) or clouds (for scanning) are memorized in RDS files. Those files can be exported in special file formats, to be opened or imported by other software.

Process

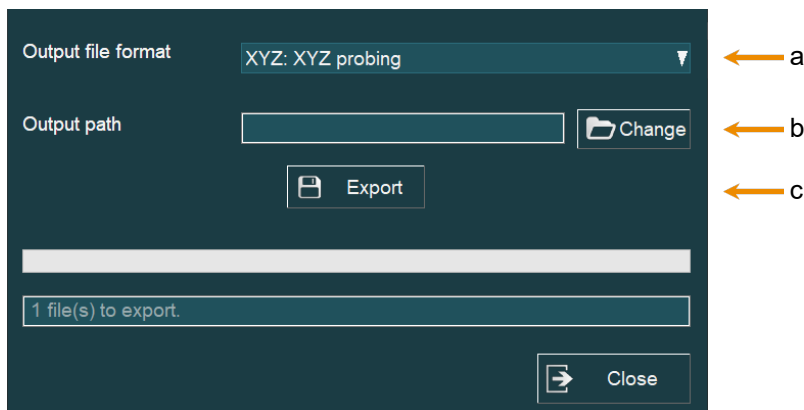
1. Select the script step(s) to export.



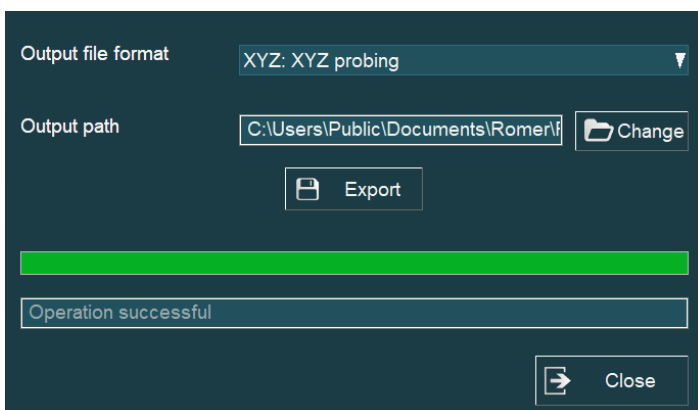
2. Click on the Export Button



3. The export window appears



4. Select the type of file to export.
5. Select the destination path.
6. Click on “Export” Button
7. Once the progress bar is over and the message “Operation successful” displayed, the file is ready.



Format of Exported files

Format	File extension	Probed points	Digitized clouds
PolyWorks point cloud	*.psl	✗	✓
ScanWorks point cloud	*.swl	✗	✓
<pre> 1 → 1.000000 ScanPass0 → 1 → 4067 Hexagon_Scanner:1 → 981 0 0 → 0.000000 → 0.000000 → 0.000000 → 0.000000 → 0.000000 411.790253 → 407.381775 → 110.880409 411.793823 → 407.428070 → 110.814781 411.795044 → 407.467316 → 110.721733 411.792694 → 407.479156 → 110.647804 411.795349 → 407.520264 → 110.562294 411.795441 → 407.531921 → 110.488716 411.801117 → 407.574524 → 110.410309 411.801819 → 407.585663 → 110.334618 411.807953 → 407.627350 → 110.252983 </pre>			
Ascii space separated point cloud	*.asc	✗	✓
<pre> 411.790253 407.381775 110.880409 411.793823 407.428070 110.814781 411.795044 407.467316 110.721733 411.792694 407.479156 110.647804 411.795349 407.520264 110.562294 411.795441 407.531921 110.488716 411.801117 407.574524 110.410309 411.801819 407.585663 110.334618 411.807953 407.627350 110.252983 </pre>			
Ascii ';' separated point cloud	*.csv	✗	✓
<pre> 411.790253;407.381775;110.880409 411.793823;407.428070;110.814781 411.795044;407.467316;110.721733 411.792694;407.479156;110.647804 411.795349;407.520264;110.562294 411.795441;407.531921;110.488716 411.801117;407.574524;110.410309 411.801819;407.585663;110.334618 411.807953;407.627350;110.252983 </pre>			
Ascii ';' separated point cloud	*.csv	✗	✓
<pre> 411.790253;407.381775;110.880409 411.793823;407.428070;110.814781 411.795044;407.467316;110.721733 411.792694;407.479156;110.647804 411.795349;407.520264;110.562294 411.795441;407.531921;110.488716 411.801117;407.574524;110.410309 411.801819;407.585663;110.334618 411.807953;407.627350;110.252983 </pre>			
XYZ point cloud	*.xyz	✗	✓
<pre> LR1 411.790253 ; 407.381775 ; 110.880409 411.793823 ; 407.428070 ; 110.814781 411.795044 ; 407.467316 ; 110.721733 411.792694 ; 407.479156 ; 110.647804 411.795349 ; 407.520264 ; 110.562294 411.795441 ; 407.531921 ; 110.488716 411.801117 ; 407.574524 ; 110.410309 411.801819 ; 407.585663 ; 110.334618 411.807953 ; 407.627350 ; 110.252983 </pre>			
XYZ probed points	*.xyz	✓	✗
<pre> LR1 411.790253 ; 407.381775 ; 110.880409 411.793823 ; 407.428070 ; 110.814781 411.795044 ; 407.467316 ; 110.721733 411.792694 ; 407.479156 ; 110.647804 411.795349 ; 407.520264 ; 110.562294 411.795441 ; 407.531921 ; 110.488716 411.801117 ; 407.574524 ; 110.410309 411.801819 ; 407.585663 ; 110.334618 411.807953 ; 407.627350 ; 110.252983 </pre>			

5.2.9. Analysis Mode (administrator profile)

Introduction

In a normal way of using RDS Data Collector, when a script is executed, capturing mode is used: when a point shall be taken, the user must take a point with the measuring instrument.

With Level 1 installation, it is possible to use the previous taken points instead of new points, and then see one by one the previous points. This mode has been realized to help user understanding results. Analysis mode allows replaying an already done script without modifying original files.

It means that points don't need to be remeasured. Even Arm connection is not necessary.

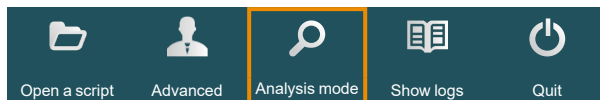
Example: B89 verification has been done and shows that the arm needs a re-compensation. Once the re-compensation has been done, new configuration files have been generated. Then it is possible to reedit the B89 test without remeasurement (all measurements have been already memorized and can be used to get results after the re-compensation).

Any measurement step can be simulated, using the previous data (previous axis information).

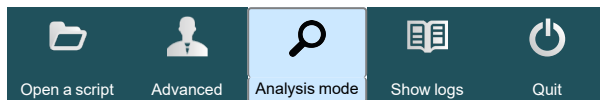
This mode is also useful to check if measurement positions have been correctly taken, by checking the colour of the axes for each position.

Switch to Analysis Mode

User switches to analysis mode by pressing the magnifying glass button.



The button becomes then highlighted.



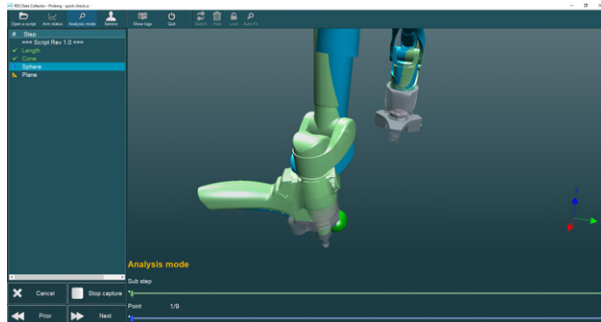
If script is already running, stop it before switching mode.

Press once again the same button to switch back to the standard capturing mode.

Process

The process is the same as for Capture mode. The choice between Capture mode and analysing mode only depends if the button is on or off.

1. Select and simply open the script.
2. Click on  to choose Analysis mode (the real-time arm disappears from the 3D view).
3. Then execute one or all steps. RDS Data Collector will read the memorized file corresponding to current position.
4. Then use the same way as “capture mode” to simulate taking or cancel points (instead of real time points, 3D display will show memorized position).



Action buttons:

	Prior	Can be used to jump to previous step
	Next	Can be used to jump to next step.
	Stop capture	Can be used to stop simulation and shows directly result with previous measurements and new compensation.
	Cancel	Can be used to stop and cancel the process

To navigate between taken points, use the bottom scrollbar below the 3D representation.

- Go to forward points:



- Go to backward points:



5.3. Touch Probe Alignment

5.3.1. Explanation

Contact Probe Alignment Overview

To obtain accurate measurement results, each probe must be aligned with the arm it is being used on. Each unique set of probe alignment data is stored in the memory on the arm. The arm checks each time when a probe was changed. If the new probe has not previously been aligned with this particular arm, the user will be prompted to proceed with the probe alignment procedure described below.

If the probe has been already aligned, when the operator connects the probe, RDS simply selects the correct probe file.

For contact probe alignment, several methods are available.

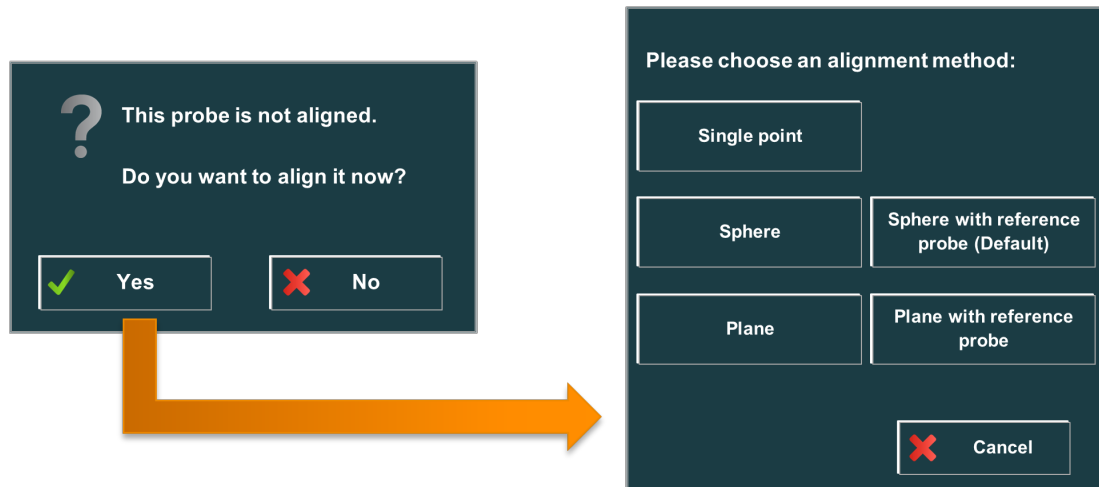
Sphere	Consists of measuring a calibrated sphere with the probe to align in different orientations.
Sphere with reference	Same as sphere, but the sphere is first measured with the reference probe (15 mm). Whenever possible, we recommend the “Sphere with reference” alignment method to be used for optimal measurements.
Plane	Consists of measuring a levelled plane with the probe to align in different orientations.
Plane with reference	Same as plane, but the plane is first measured with the reference probe (15 mm).
Single point	Consists of taking points, keeping the ball probe in a seat (cone).



In case of specific customized probe, a specific probe alignment script can be done. Contact your local agent.

New Probe

When a probe is connected to the arm for the first time, RDS requests its alignment, and shows the available process. Then RDS Data Collector automatically opens, starting the selected probe alignment process.



Single point method cannot be used with a Touch Trigger Probe



In case of bad accuracy, or change of sensor, it is possible to realign a probe already aligned, using RDS Data Collector



If the diameter of the final stylus has changed, then first access to RDS Control Panel to edit and modify the diameter of the probe (read RDS Service Manual).

Access the Probe Alignment Script

There are different reasons and ways to access to the probe alignment:

- **Probe is new**, then RDS automatically propose and give choice of the method, then the script is run automatically.
- **Probe** has been **already aligned** but has been damaged or gives bad results. The user should then access to the desired script.
- **Stylus** of the probe **has been changed**, and the diameter is no longer the same. The user should then enter the RDS Control Panel to edit the diameter and then access to the desired script.
- Access to a script can be done directly from the **application software**, asking for probe alignment.
- Access to a script can be done from the **RDS Agent**, clicking on “Align” button in Probes tab.
- Access to a script can be done from the **RDS Control Panel**, clicking on “Align” in Probes tab.

5.3.2. Contact Probe Alignment – Sphere Methods



The process is the same for both methods, however “Sphere” doesn’t use reference probe measurement.

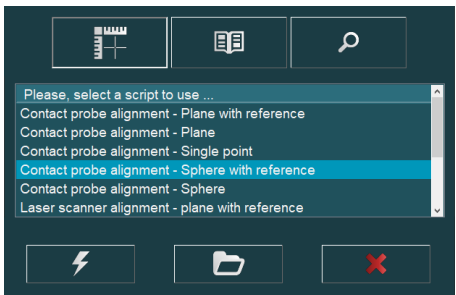
Principle

The Sphere alignment needs a certified artefact sphere (included in the arm case) and contains 3 main operations:

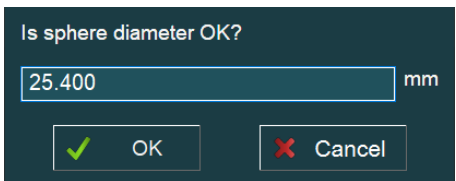
	Measurement of the sphere with reference probe (15mm Probe #1) (only “Sphere with reference” method)
	Measurement of the sphere with the probe to align
	Calculation and validation

Start up (step1)

1. Select the script, and then run. The System will prompt the user through each alignment step. Be sure to follow the instructions in each dialogue box.



2. Enter the alignment sphere size, in millimetres, in the box provided. The size of the sphere should be noted on the stem of the artefact. Click OK to continue.



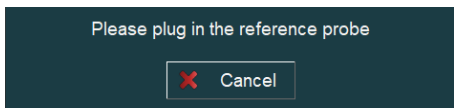
3. The artefact should be placed so that the forearm and the wrist point straight down at the pole of

the sphere, as shown below.

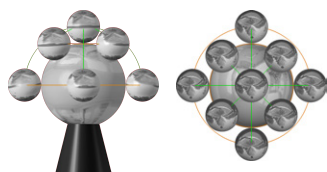


Measurement with Reference Probe (Sphere_with_Reference Method only) (step2)

4. When prompted, insert the 15mm steel reference probe (the prompt automatically closes when the probe is plugged in).



5. Take nine (9) points on the upper hemisphere of the artefact. The graphic shows the location of the points to be used.

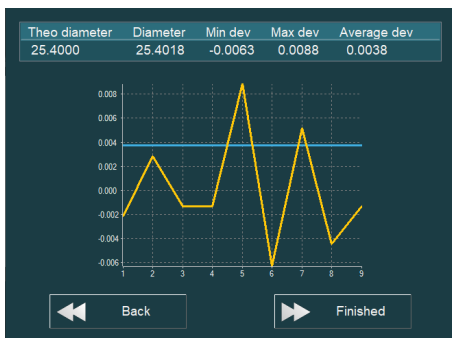


- 4 points on equator, equally distributed
- 4 points at 45° latitude, equally distributed, 45° rotated from equator points
- 1 point on top



Note the orientation of the wrist, the button side of the wrist should be pointing toward the base of the arm.

6. Once the 9 points have been taken, the deviations of the reference points will be shown.



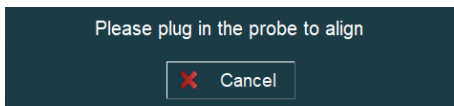
Incidental errors, with a few measurements significantly higher or lower than the rest, could be the result of improper probing (trigger pressed when the probe was not in contact with the alignment sphere, or too much pressure applied on the probe shaft...). Please re-execute the measurement.

Systematic error, consistence over or under size measurement, may be a result of the wrong parameters having been entered for the alignment sphere size. Restart the probe alignment and confirm that the correct sphere diameter was entered.

Measurement with the probe to align (step3)

7. Click on Finished to continue.

8. At the following prompt, remove the reference probe and insert the probe to be aligned (the prompt will automatically close when the probe is plugged in).



9. At this stage, 4 sets of the 9 points-pattern would need to be measured with the new probe. Each set represents a 90deg twist on the wrist. Please follow closely the wrist orientation display on the screen. A total of 36 points are needed.



Buttons toward the arm



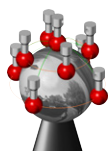
90° on E



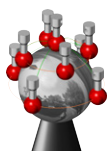
90° on E



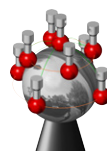
90° on E



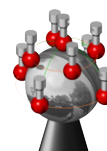
9 points



9 points

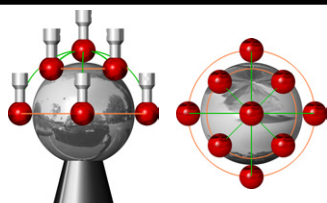


9 points



9 points

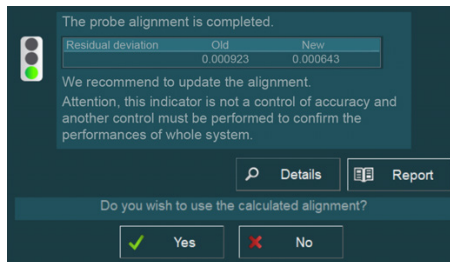
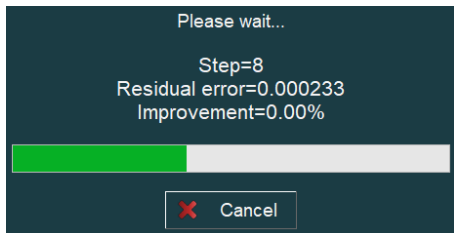
9 points pattern



- 4 points on equator, equally distributed
- 4 points at 45° latitude, equally distributed, 45° rotated from equator points
- 1 point on top

Calculation (step4)

10. Then the calculation starts. At the end of the calculation, the previous and new alignment result are compared.





The alignment result is correct, updating the alignment is allowed. Click on Yes to memorise the new alignment or No to cancel this calculation.



The alignment result is insufficient, updating is not possible and performing a new alignment is required. (Check the arm accuracy, the correct mounting of the arm and the artefact...)



Old or custom probes may not show the traffic light. The choice to validate or not the alignment can then be made based on the alignment value.



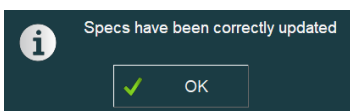
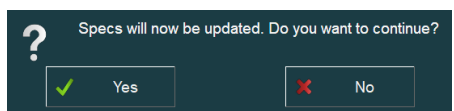
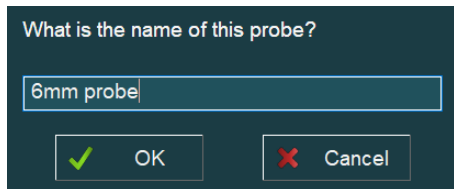
Residual deviation value for Sphere with reference method is:

$$\frac{\text{Best-fit} + \text{deviation diameter} + \text{deviation centre}}{3}$$

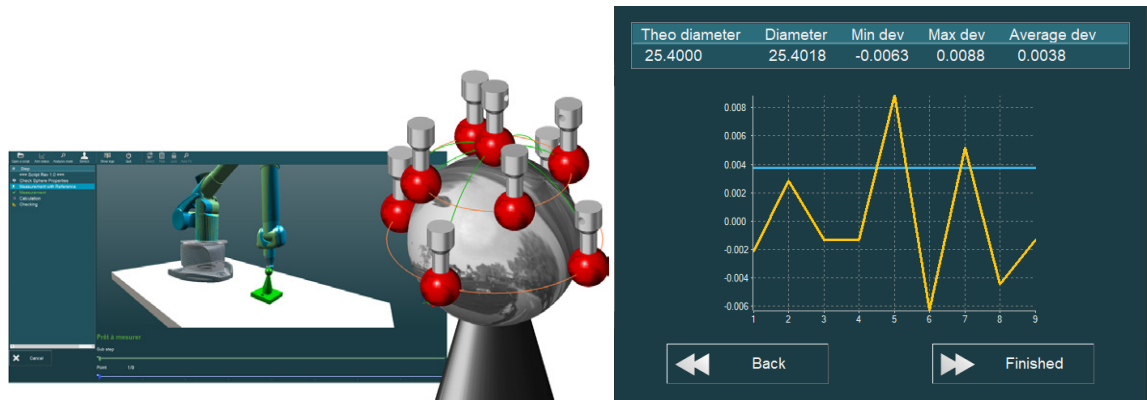
Residual deviation value for Sphere without reference method is:

$$\frac{\text{Best-fit} + \text{deviation diameter}}{2}$$

11. Once the “Yes” button is clicked, RDS asks for the name to give to the probe. Enter then the name to give to the probe and validate both next prompts to save the new alignment data into the memory of the arm.



12. Perform a Sphere checking: measure again the sphere respecting the shown orientations of the probe, to check the quality of the alignment.



5.3.3. Contact Probe Alignment – Plane Methods



The process is the same for both methods, however “Plane” doesn’t use reference probe measurement.

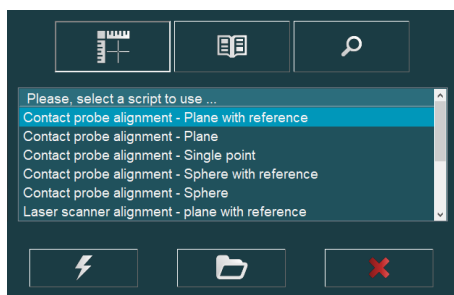
Principle

The Plane alignment needs a levelled artefact plane (some cm²) and contains 3 main operations:

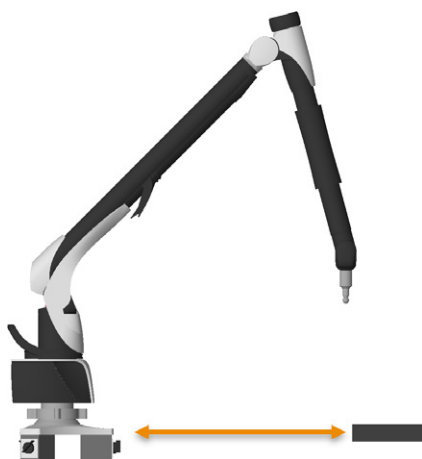
	Measurement of the plane with reference probe (15mm Probe #1) (only “Plane with reference” method)
	Measurement of the plane with the probe to align
	Calculation and validation

Start up (step1)

1. Select the script, and then run. The System will prompt the user through each alignment step. Be sure to follow the instructions in each dialogue box.

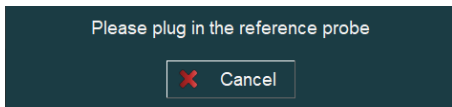


2. The artefact should be placed so that the forearm and the wrist point straight down at the plane, as shown below.



Measurement with Reference Probe (Plane_with_Reference Method only) (step2)

- When prompted, insert the 15mm steel reference probe (the prompt automatically closes when the probe is plugged in).

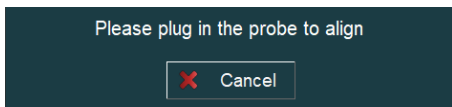


- Take three (3) points forming an equilateral triangle on the plane. The graphic shows the location of the points to be used.



Measurement with the probe to align (step3)

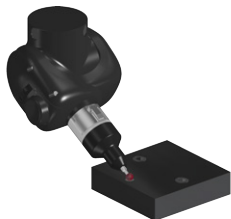
- At the following prompt, remove the reference probe and insert the probe to be aligned (the prompt will automatically close when the probe is plugged in).



- At this stage, 5 sets of the 3-points pattern would need to be measured with the new probe. Please follow closely the wrist orientation display on the screen (buttons side toward the base of the arm). A total of 15 points are needed.



Probe is vertical (3 points).



Probe is inclined 45°, buttons up (plane made by probe axis and F arm axis is normal to the artefact plane – 3 points).



Probe is inclined 45°, buttons down (plane made by probe axis and F arm axis is normal to the artefact plane – 3 points).



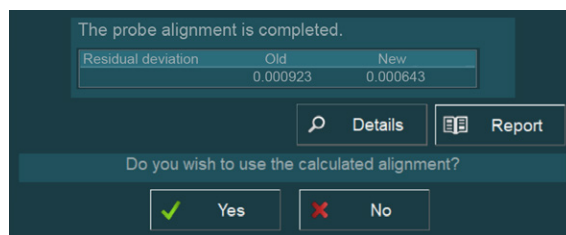
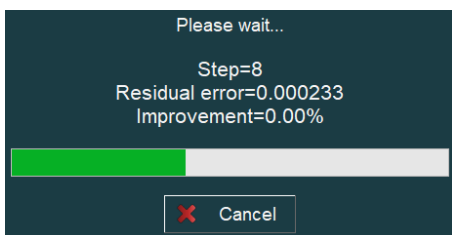
Probe is inclined 45°, F axis open (F arm axis parallel to the artefact plane – 3 points).



Probe is inclined 45°, F axis closed (F arm axis parallel to the artefact plane – 3 points).

Calculation (step4)

- Then the calculation starts. At the end of the calculation, the previous and new alignment result are compared.

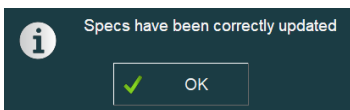
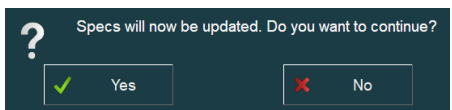
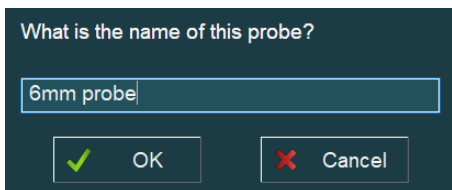


Residual deviation value for Plane with reference method is the maximum deviation between all the points and the reference plane.

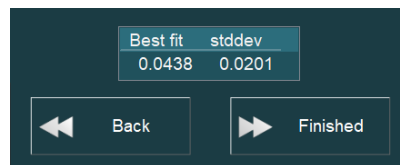
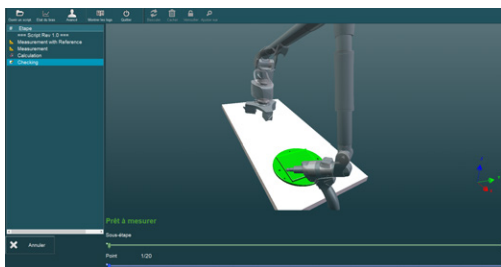
Residual deviation for Plane without reference is the standard deviation between all the points and the least-square calculated plane.

If this value is more than 1.0, probe is notified as “not aligned”.

- Once the “Yes” button is clicked, RDS asks for the name to give to the probe. Enter then the name to give to the probe and validate both next prompts to save the new alignment data into the memory of the arm.



- Perform a plane checking: measure again the with various orientations of the probe, to check the quality of the alignment.



5.3.4. Contact Probe Alignment – Single Point Method



The process is the same for both methods, however “Plane” doesn’t use reference probe measurement.

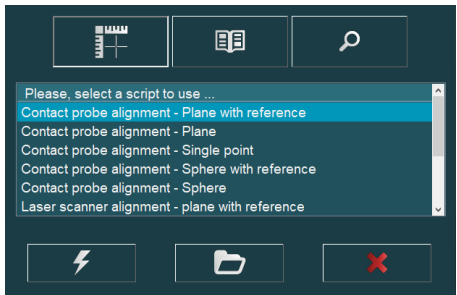
Principle

The Single Point alignment uses a seat (cone or corner) in which the ball of the probe is positioned and contains 2 main operations:

	Measurement of 20 points in the seat with the probe to align, turning the axes of the wrist.
	Calculation and validation

Start up (step1)

1. Select the script, and then run. The System will prompt the user through each alignment step. Be sure to follow the instructions in each dialogue box.



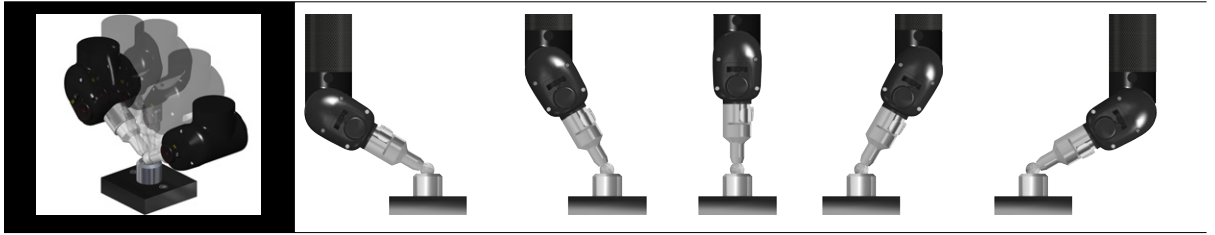
2. The artefact should be placed so that the forearm and the wrist point straight down at the seat, as shown below.



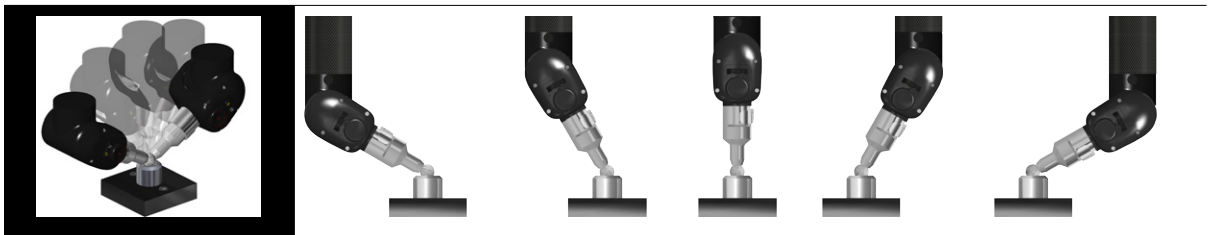
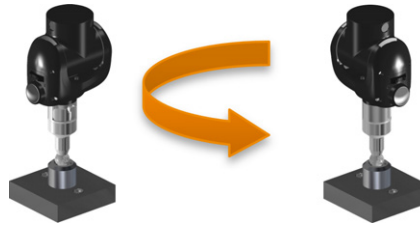
Measurement of the seat (step2)

The elbow is vertical ("12 O' Clock"), and 20 points are taken, moving only E and F Axes.

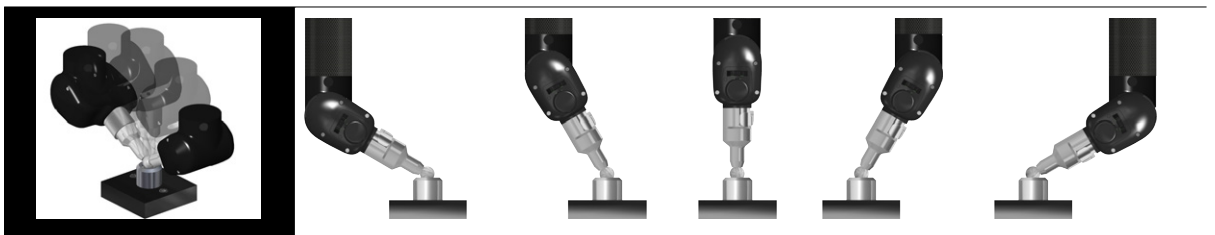
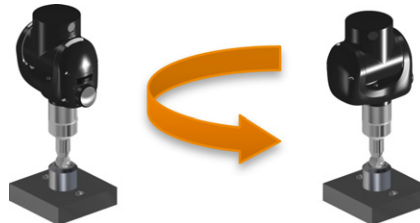
3. Measure 5 points, buttons on the left, turning F axis.



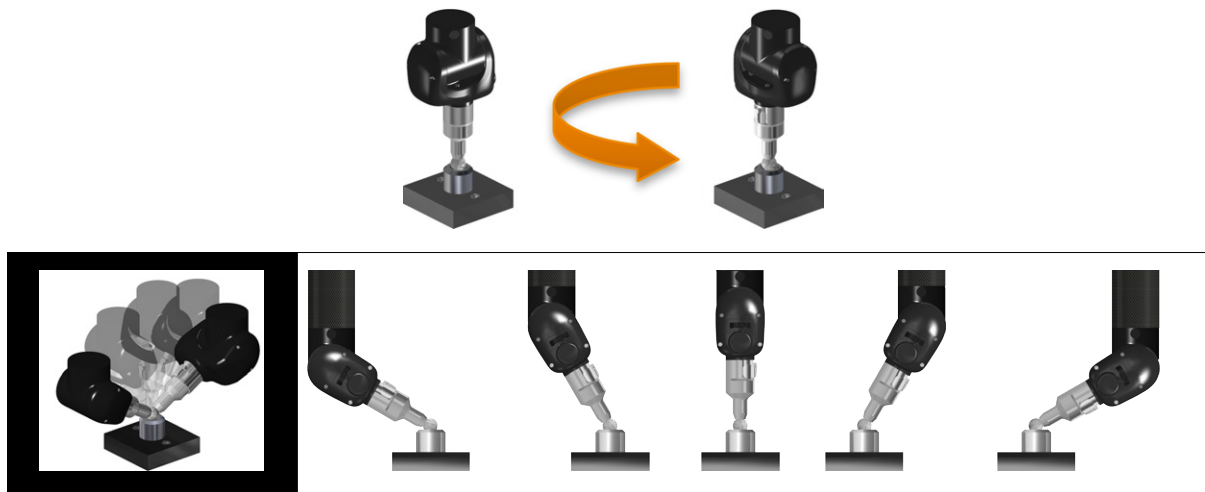
4. Then turn E axis with 90° (buttons opposite to the base) and measure again 5 points.



5. Then turn once again E axis with 90° (buttons to the right) and measure again 5 points.

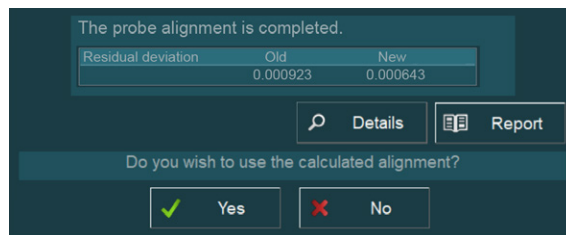
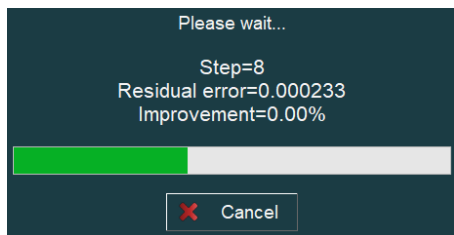


6. Then turn finally E axis with 90° (buttons face to the base) and measure again 5 points.



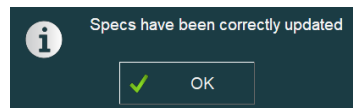
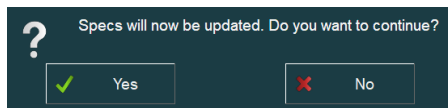
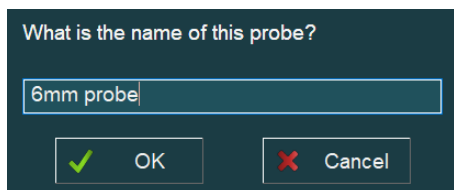
Calculation (step4)

7. Then the calculation starts. At the end of the calculation, the previous and new alignment result are compared.

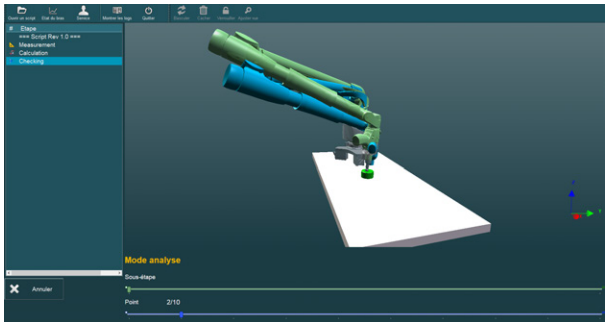


Residual deviation value is the best-fit value (=maximum deviation) between all the points and the calculated middle point.

8. Once the “Yes” button is clicked, RDS asks for the name to give to the probe. Enter then the name to give to the probe and validate both next prompts to save the new alignment data into the memory of the arm.



9. Perform a single point checking: measure again the seat respecting the shown orientations of the probe, to check the quality of the alignment.



5.4. Tube Probe Alignment

For the first time the probe is mounted, RDS recognises it and asks for alignment.

It is possible as well to access the alignment from RDS menu.

Tube probes (NCP) must be aligned on a T-tube artefact, perfectly straight, with a constant and known diameter, with ends perfectly perpendicular to the axis of the cylinder, and with a known horizontal length.

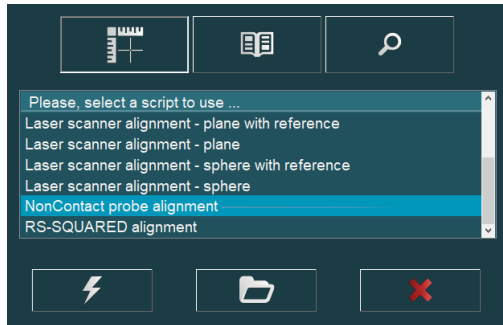
Probe size		Recommended diameter	Recommended length
12.5 mm		6.35 mm (¼")	100 mm
25 mm			
50 mm		12.7 mm (½")	100 mm
75 mm			
100 mm		25.4 mm (1")	100 mm
150 mm			

The process consists by measuring points on several sections and ends of the artefact, from different orientations of the probe.

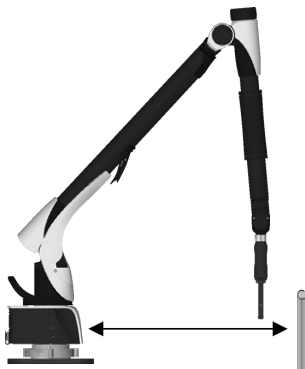
The measurements of the straights use the double mode. To measure a straight, the two beams of the probe must be blocked moving down then moving up ("double precision"). One beep is emitted each time a beam is blocked or released, that means 8 beeps (=8 events) for one point

Run the Alignment

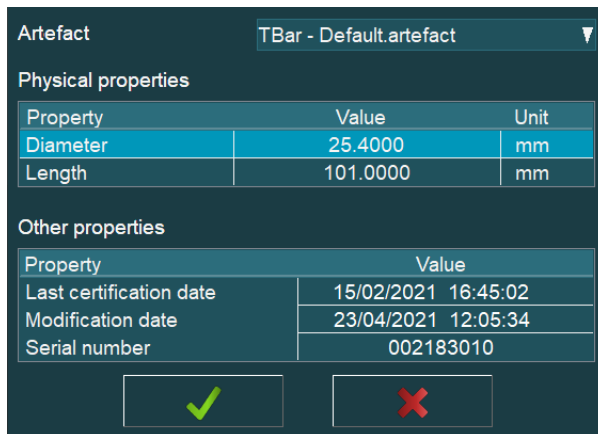
1. Open the script “Noncontact probe alignment.sc” and then play all. The system will prompt the user through each alignment step. Be sure to follow the instructions in each dialog box.



2. Place and fix the tube artefact in front of the arm, keeping the known length part of the tube in horizontal position.



3. RDS ask for the artefact. Select the correct artefact if it has been memorised, or enter the diameter and length, then press “select”.



The screenshot shows a dialog box titled 'Artefact' with a dropdown menu set to 'TBar - Default.artefact'. Below the dropdown are two sections: 'Physical properties' and 'Other properties'. The 'Physical properties' section contains a table with the following data:

Property	Value	Unit
Diameter	25.4000	mm
Length	101.0000	mm

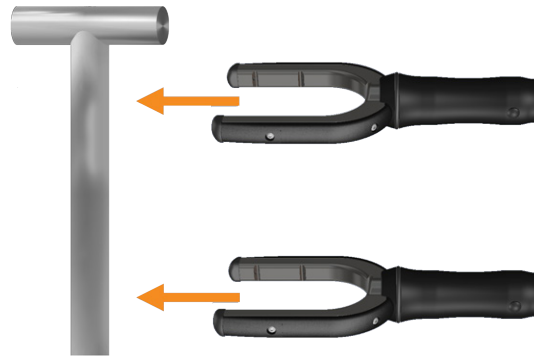
The 'Other properties' section contains a table with the following data:

Property	Value
Last certification date	15/02/2021 16:45:02
Modification date	23/04/2021 12:05:34
Serial number	002183010

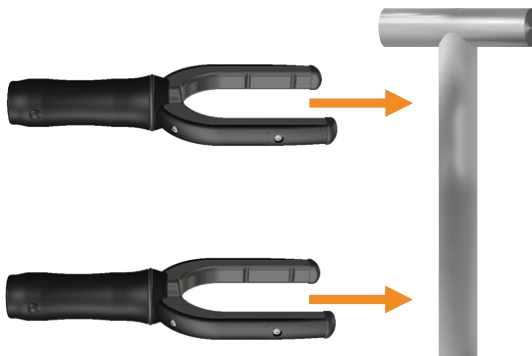
At the bottom of the dialog box are two buttons: a green checkmark icon and a red 'X' icon.

Measure the Vertical Tube

1. Measure one point (8 beeps = 8 steps) on the high section of the vertical tube from the right side of the tube, then one point (8 beeps = 8 steps) on the low section. Keep the probe as perpendicular as possible to the tube.



2. Measure one point (8 beeps = 8 steps) on the high section of the vertical tube from the left side of the tube (opposite to previous measurement), then one point (8 beeps = 8 steps) on the low section. Keep the probe as perpendicular as possible to the tube.

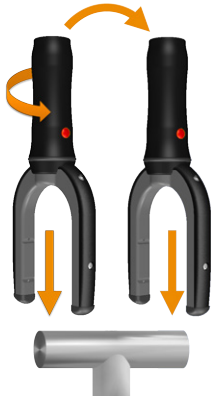


Measure the Horizontal Tube

Measure one point (8 beeps = 8 steps) on the right-end section of the horizontal tube, keeping the probe button toward the arm (INSIDE), then one point (8 beeps = 8 steps) on the left-end section, still with the probe button INSIDE. Keep the probe as perpendicular as possible to the tube.

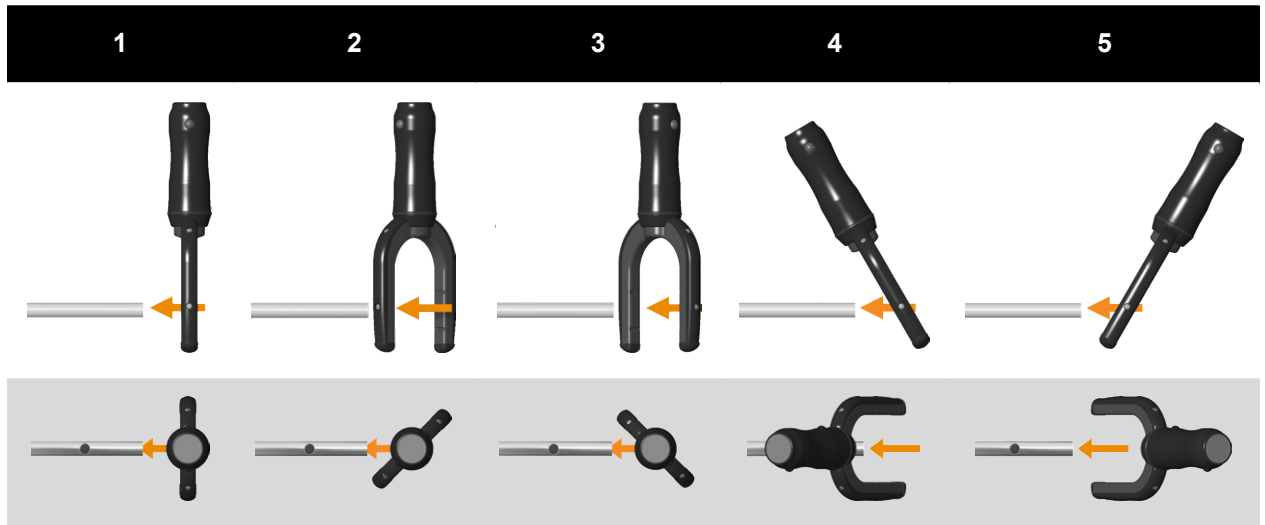


Measure one point (8 beeps = 8 steps) on the right-end section of the horizontal tube, keeping the probe button opposite from the arm (OUTSIDE), then one point (8 beeps = 8 steps) on the left-end section, still with the probe button OUTSIDE. Keep the probe as perpendicular as possible to the tube.



Measure the Extremities of the Horizontal Tube

For each measurement, the extremity of the tube must be measured 5 times, giving different orientations of the probe.



1. Measure 5 times the RIGHT extremity of the horizontal tube, giving different angles for each of the 5 times. Do the measurement keeping the probe button on the RIGHT then turn the probe 180° and do the measurement keeping the probe button on the LEFT.

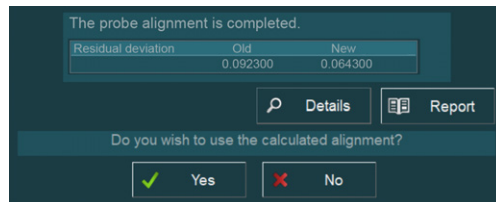
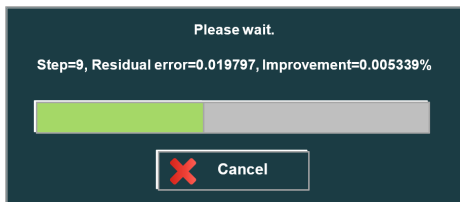


2. Measure 5 times the LEFT extremity of the horizontal tube, giving different angles for each of the 5 times. Do the measurement keeping the probe button on the RIGHT then turn the probe 180° and do the measurement keeping the probe button on the LEFT.

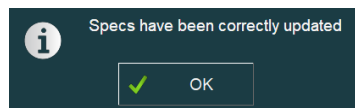
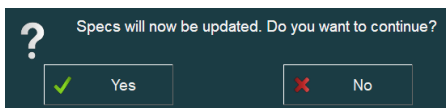
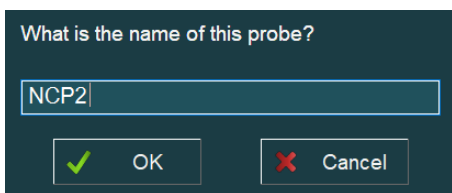


Calculation

- Then the calculation starts. At the end of the calculation, the previous and new alignment result are compared (press on “Details”).

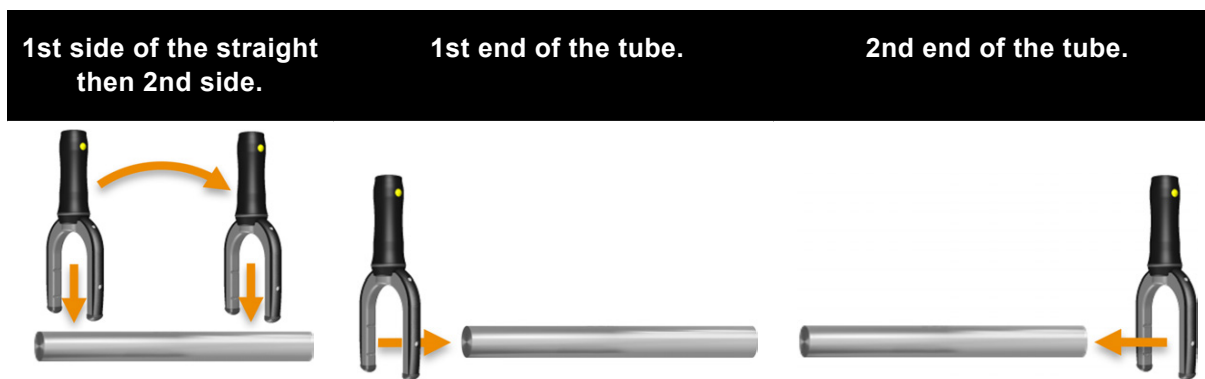


- Once the “Yes” button is clicked, RDS asks for the name to give to the probe. Enter then the name to give to the probe and validate both next prompts to save the new alignment data into the memory of the arm.

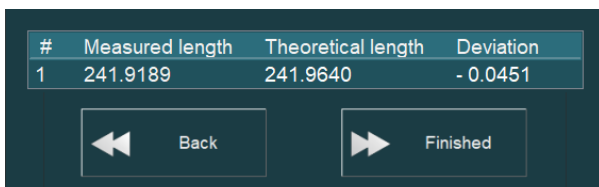


Verification of the Alignment

- Once the data saved, perform a tube probe verification by measuring:



- RDS displays the measured length. Check the deviations according to the specifications.



5.5. Scanner Alignment

5.5.1. Explanation

To obtain accurate measurement results, each scanner must be aligned with the arm it is being used on. This operation must be done in case of arm compensation, or if a new scanner is mounted on the machine, or also if the scanner itself has been repaired or re-compensated.

When should the scanner be aligned?

- **The scanner is new**, then RDS automatically propose and give choice of the method (the script is run automatically).
- **The scanner has been already aligned** but has been damaged or gives bad results. The user should realign the scanner.



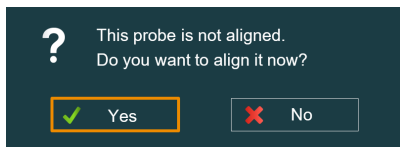
For Non-Hexagon Scanners, please refer to the appropriate documentation.

For laser scanners alignment, several methods are available.

Sphere	Consists by measuring a calibrated sphere with the probe to align in different orientations.
Sphere with reference	Same as sphere, but the sphere is first measured with the reference probe (15mm). Whenever possible, we recommend the “Sphere with reference” alignment method to be used for optimal measurements.
Plane	Consists of measuring a levelled plane with the probe to align in different orientations.
Plane with reference	Same as plane, but the plane is first measured with the reference probe (15mm).

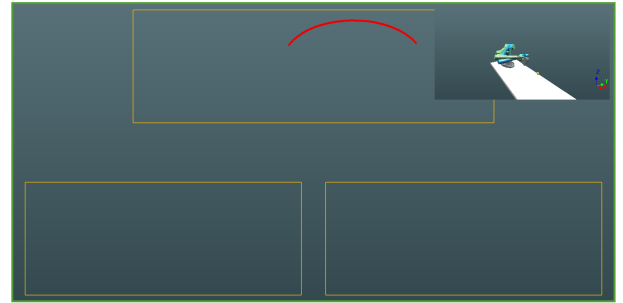
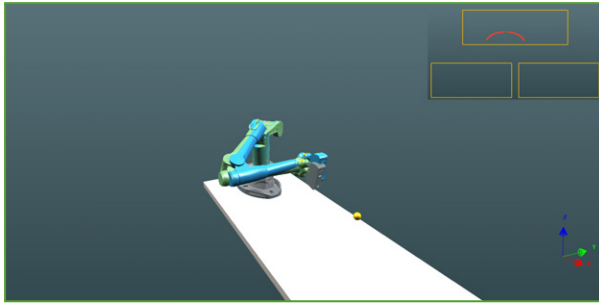
New Scanner

When a scanner is connected to the arm for the first time, RDS requests its alignment. Then RDS Data Collector automatically opens, starting the scanner alignment process.



Graphic View

The graphic view shows the orientation and position of scanner to reach. When approaching the target position, then RDS switches the main graphic view and the scan auxiliary graphic view, to help in detail the zone to scan, and shows the scan lines.



Focus on the main view, RDS shows how to orientate RDS Detects scanning lines and switches to the the arm. scan view.

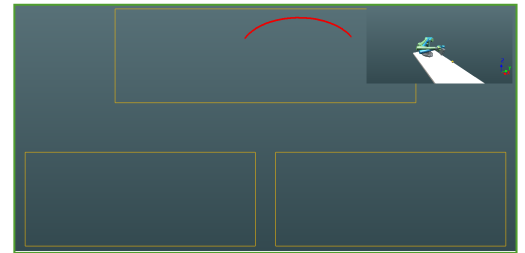


It is possible to switch manually and lock the focus on the scan view.



Get Scan Lines Inside the Target Zone

To obtain the best alignment result, the artefact digitizing needs to cover a sufficient range. RDS ensures this requirement by defining alignment zones, represented on the graphic view by rectangles.

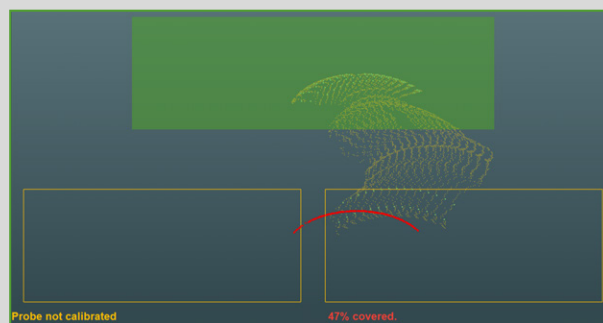


- While digitizing, RDS detects the scanning lines inside the target squares (highlighted in green) and indicates to the user the percentage of target coverage reached.

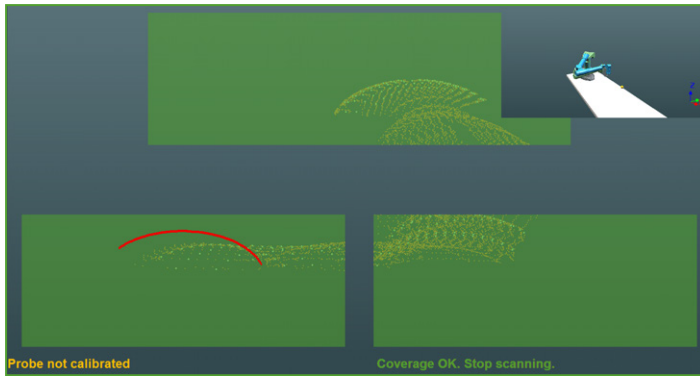
As soon as one target square is completed, it becomes green.

On the following example, the centred “top” target has been digitized enough (filled green), now the scanner is capturing scanning lines on the right “bottom” target, but not enough lines have been captured yet in it to validate it.

Only 47 % of the required zone have been reached, the user cannot go forward.



- Once all the target squares are completed (=green), the coverage is OK. RDS automatically stops the acquisition and asks the user to stop the scanner to go to the next step of alignment.



With the tracker, no need to press on the button. As soon as the coverage is completed, RDS stops the acquisition and jump to next step of the alignment.

5.5.2. Scanner Alignment – Sphere Method (AS1/AS1-XL on arm)

Principle

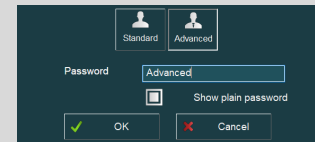
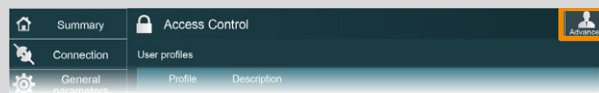
The standard laser scanner alignment requires a calibrated sphere and contains 4 steps.

	Scan from one side of the sphere, covering the field of view of the scanner to align
	Scan of the whole sphere.
	Calculation and validation
	Final checking

Start up



The probe alignment cannot be run with the “Standard” user profile. Open RDS Control Panel and set the user profile to “Advanced” (password = [Advanced]).

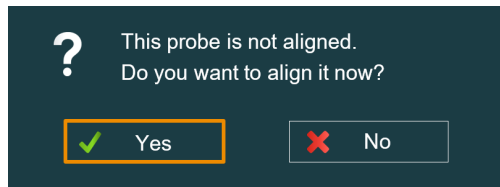


1. Launch the alignment:

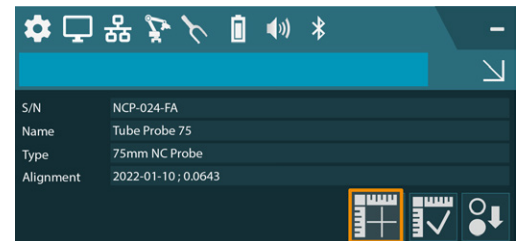
New or edited probe

Existing probe

Once the probe mounted and detected, RDS asks for its alignment: press “Yes”.

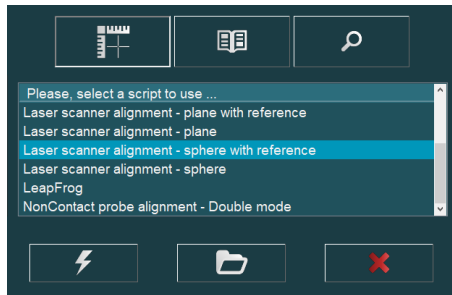


Open the RDS Agent > Sensor tab and press the “Align” button.

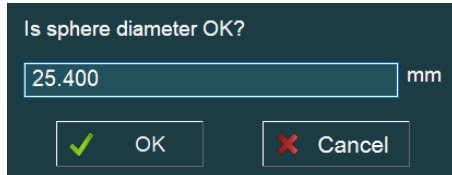


The alignment script can also be open from the RDS Control Panel, the Quick Access Menu or directly from RDS Data Collector.

2. Select the script, and then run. The System will prompt the user through each alignment step. Be sure to follow the instructions in each dialogue box.



3. When prompted, enter the diameter of the alignment sphere (the size of the sphere should be noted on the stem of the artefact). Click OK to continue.



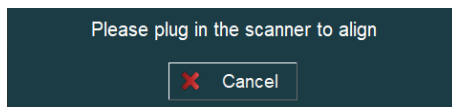
4. The artefact should be placed so that the forearm and the wrist point straight down at the pole of the sphere, as shown below.



Do not use other artefact sphere than the provided one; it has been designed to give optimal results.

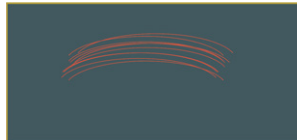
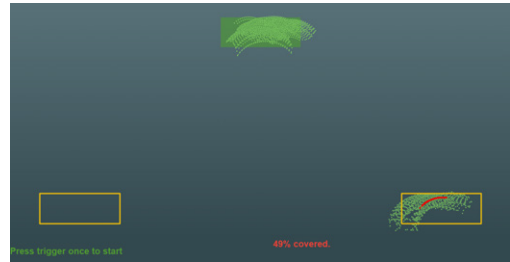
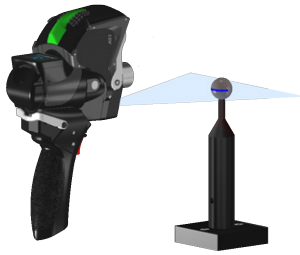
Measurement with the Scanner to Align

5. At the following prompt, remove the reference probe (for AS1) and wait for the scanner to be ready.

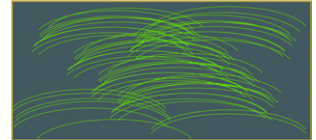


Field Measurement

- Position the scanner horizontally, from one side of the sphere, and scan, covering the target squares. Validate by stopping the acquisition (main button).



x

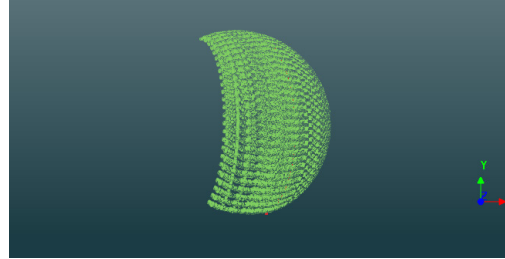


✓

AS1	AS1-XL
3 targets 1 near centred position (#1) 1 far left position (#2) 1 far right position (#3).	4 targets 1 near centred position (#1) 2 mid positions (left #2, right #3) 1 far centred position (#4)

Global Sphere Measurement

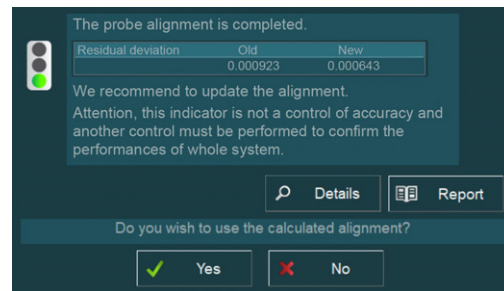
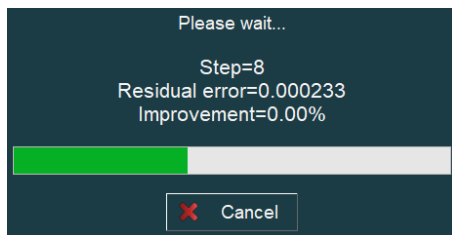
7. Digitize the whole sphere with the scanner(wait for the 80 % coverage at least to stop digitizing).
Validate by pressing on the right button.



It is still possible to continue scanning even once the covered is completed, to enhance the quality of alignment, however, the calculation may be longer.

Calculation

8. Then the calculation starts. At the end of the calculation, the previous and new alignment result are compared.



The alignment result is correct, updating the alignment is allowed. Click on Yes to memorise the new alignment or No to cancel this calculation.



The alignment result is insufficient, updating is not possible and performing a new alignment is required. (Check the arm accuracy, the correct mounting of the arm and the artefact...)



The residual error is Least Squares value of distances divided by data set number of points (to have a comparable value independent of number of points). The report details are memorized in a "Probe Alignment Report.txt" file on C:\User-s\Public\Documents\Romer\RDS\CalibData. For more details, please contact your local agent.

9. Once the “Yes” button is clicked, RDS asks for the name to give to the probe. Enter then the name to give to the probe and validate both next prompts to save the new alignment data into the memory of the arm.

What is the name of this probe?

☒ OK
 ☒ Cancel

? Specs will now be updated. Do you want to continue?

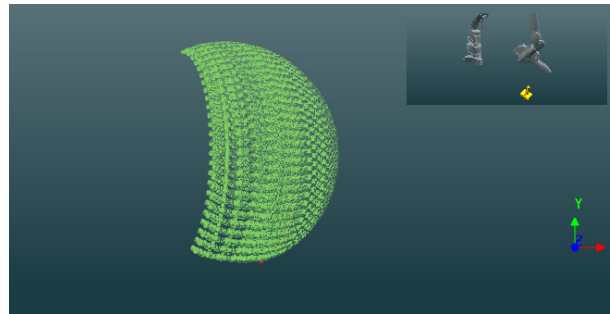
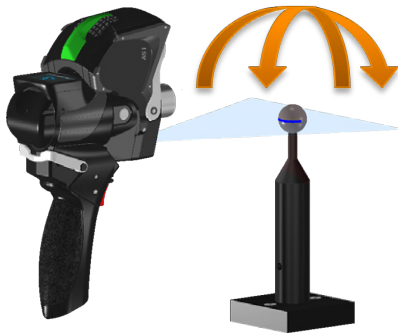
☒ Yes
 ☒ No

i Specs have been correctly updated

☒ OK

Checking

After the validation of the calculation, RDS proposes to do a checkout on the artefact sphere. Scan stripes over the alignment sphere and validate with the right button or click on “Next”.



Then deviations are displayed.

Calibrated [mm]	Nominal [mm]	Measured [mm]	Deviation [mm]
25.4000	25.4005	25.3901	-0.0104

☒ Back
 ☒ Next

5.5.3. Scanner Alignment – Sphere Method (arm)



The process is the same for both methods, however “Sphere” doesn’t use reference probe measurement.

Principle

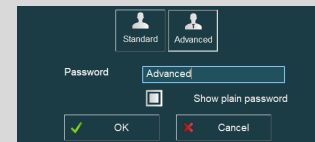
The standard laser scanner alignment requires a calibrated sphere and contains 4 steps.

	Measurement of the sphere with reference probe (15mm Probe #1) (only “Sphere with reference” method)
	Scan of 3 sides of the sphere, covering the field of view of the scanner to align
	Scan of the whole sphere.
	Calculation and validation
	Final checking

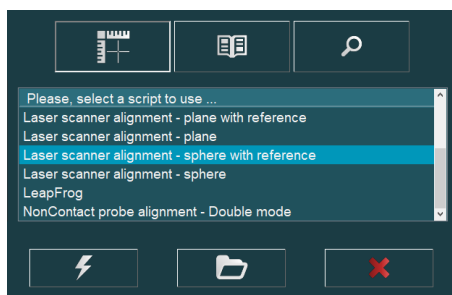
Start up (step1)



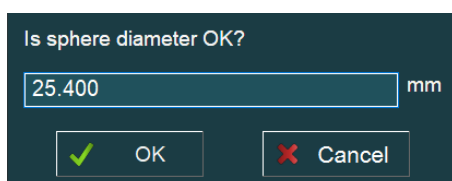
The probe alignment cannot be run with the “Standard” user profile. Open RDS Control Panel and set the user profile to “Advanced” (password = [Advanced]).



1. Select the script, and then run. The System will prompt the user through each alignment step. Be sure to follow the instructions in each dialogue box.



2. When prompted, enter the diameter of the alignment sphere (the size of the sphere should be noted on the stem of the artefact). Click OK to continue.



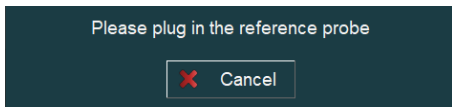
3. The artefact should be placed so that the forearm and the wrist point straight down at the pole of the sphere, as shown below.



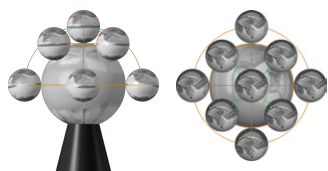
Do not use other artefact sphere than the provided one; it has been designed to give optimal results.

Measurement with Reference Probe (Sphere_with_Reference Method only)

- When prompted, insert the 15mm steel reference probe (the prompt automatically closes when the probe is plugged in).

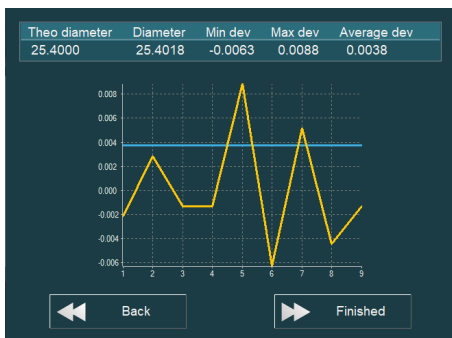


- Take nine (9) points on the upper hemisphere of the artefact. The graphic shows the location of the points to be used.



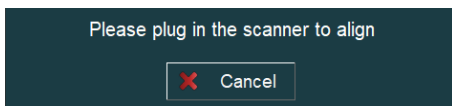
- 4 points on equator, equally distributed
- 4 points at 45° latitude, equally distributed, 45° rotated from equator points
- 1 point on top

- Once the 9 points have been taken, the deviations of the reference points will be shown. Check the values and press “Finished”.



Measurement with the Scanner to Align

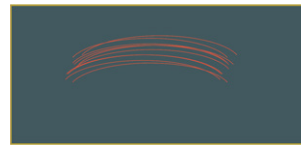
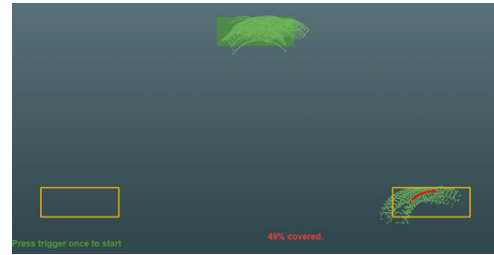
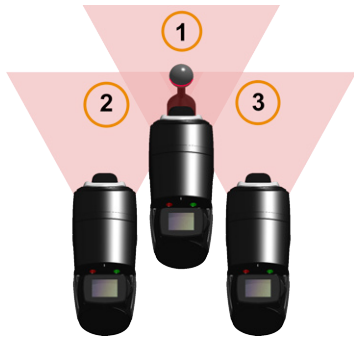
- At the following prompt, remove the reference probe (if needed, mount the scanner, the prompt will automatically close when the scanner is connected) and wait for the scanner to be ready.



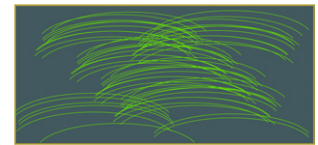
Field Measurement

For each of the 3 orientations of the scanner, scan the sphere to cover the target squares.

- 1 near centred position (#1)
- 1 far left position (#2)
- 1 far right position (#3).

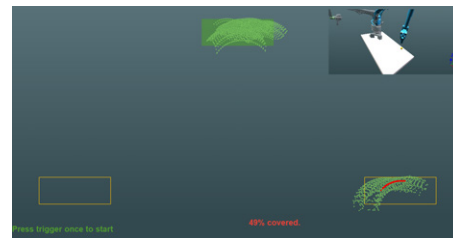


✗

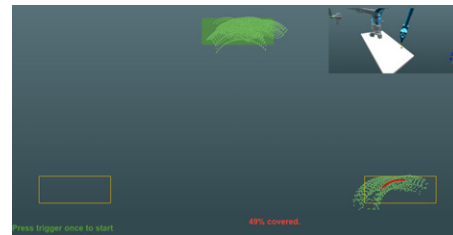


✓

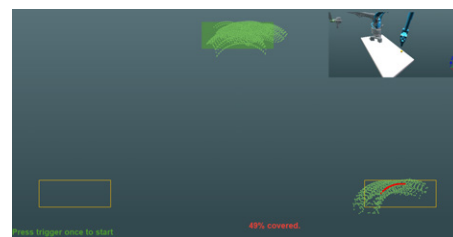
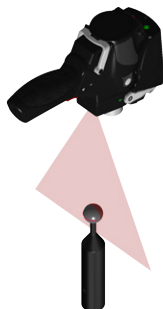
- Position the scanner horizontally, at 0°, and scan, covering the target squares.
Validate by stopping the acquisition (main button).



- Position the scanner horizontally, at 90°, and scan, covering the target squares.
Validate by stopping the acquisition (main button).

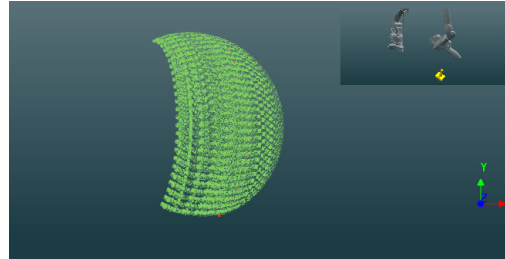


- Position the scanner vertically, at 0°, and scan, covering the target squares.
Validate by stopping the acquisition (main button).



Global Sphere Measurement

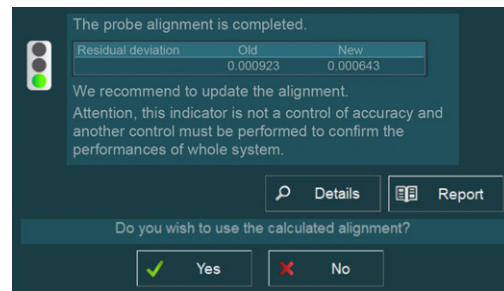
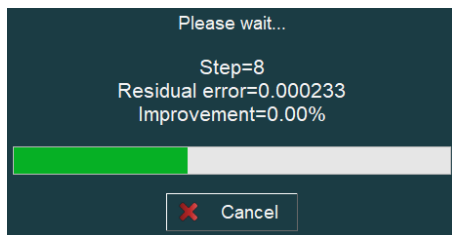
11. Digitize the whole sphere with the scanner(wait for the 85 % coverage at least to stop digitizing).
Validate by pressing on the right button.



It is still possible to continue scanning even once the covered is completed, to enhance the quality of alignment, however, the calculation may be longer.

Calculation

12. Then the calculation starts. At the end of the calculation, the previous and new alignment result are compared.



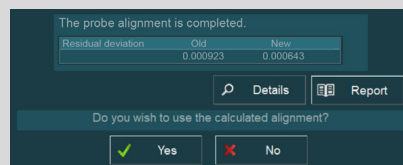
The alignment result is correct, updating the alignment is allowed. Click on Yes to memorise the new alignment or No to cancel this calculation.



The alignment result is insufficient, updating is not possible and performing a new alignment is required. (Check the arm accuracy, the correct mounting of the arm and the artefact...)



Old or custom probes may not show the traffic light. The choice to validate or not the alignment can then be made based on the alignment value.





The residual error is Least Squares value of distances divided by data set number of points (to have a comparable value independent of number of points). The report details are memorized in a "Probe Alignment Report.txt" file on C:\User-s\Public\Documents\Romer\RDS\CalibData. For more details, please contact your local agent.

- Once the "Yes" button is clicked, RDS asks for the name to give to the probe. Enter then the name to give to the probe and validate both next prompts to save the new alignment data into the memory of the arm.

What is the name of this probe?

AS Scanner

OK Cancel

? Specs will now be updated. Do you want to continue?

Yes No

i Specs have been correctly updated

OK

Checking

After the validation of the calculation, RDS proposes to do a checkout on the artefact sphere. Scan stripes over the alignment sphere and validate with the right button or click on "Next".



Then deviations are displayed.

Calibrated [mm]	Nominal [mm]	Measured [mm]	Deviation [mm]
25.4000	25.4005	25.3901	-0.0104

Back Next

5.5.4. Scanner Alignment – Plane Methods



The process is the same for both methods, however “Sphere” doesn’t use reference probe measurement.

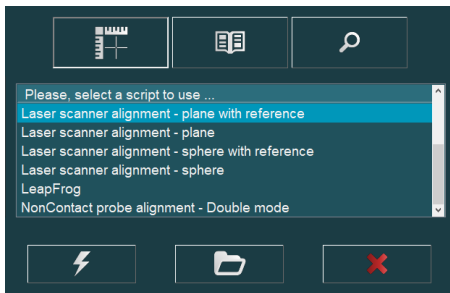
Principle

These methods consist by measuring a reference artefact plane with reference probe (only for Plane_with_reference method), then by scanning it moving the scanner around the plane, 3 stripes must be taken.

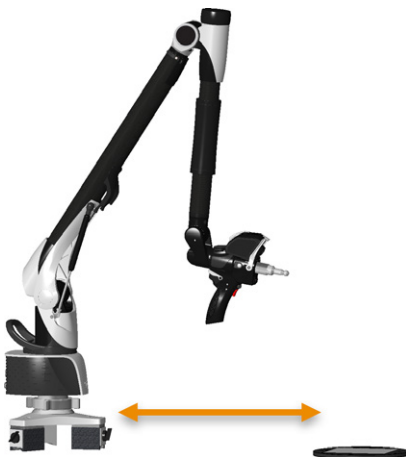
	Measurement of the sphere with reference probe (15 mm Probe #1) (only “Sphere with reference” method)
	Scan the plane, covering the field of view of the scanner to align
	Calculation and validation
	Final checking

Start up

1. Select the script, and then run. The System will prompt the user through each alignment step. Be sure to follow the instructions in each dialogue box.



2. The artefact should be placed so that the forearm and the wrist point straight down at the pole of the sphere, as shown below.



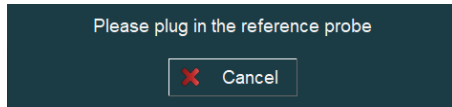


NOTICE

A low-quality plane may result in bad alignment. Do not use other artefact sphere than the provided one.

Measurement with Reference Probe (Plane_with_Reference Method only)

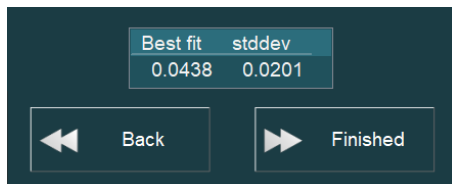
3. When prompted, insert the 15mm steel reference probe (the prompt automatically closes when the probe is plugged in).



4. Take five (5) points spread over the artefact plane. The graphic shows the location of the points to be used.

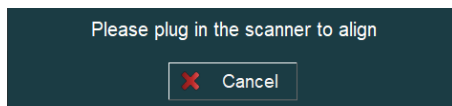


5. Once the 5 points have been taken, the deviations of the reference plane will be shown. Click on Finished to continue.



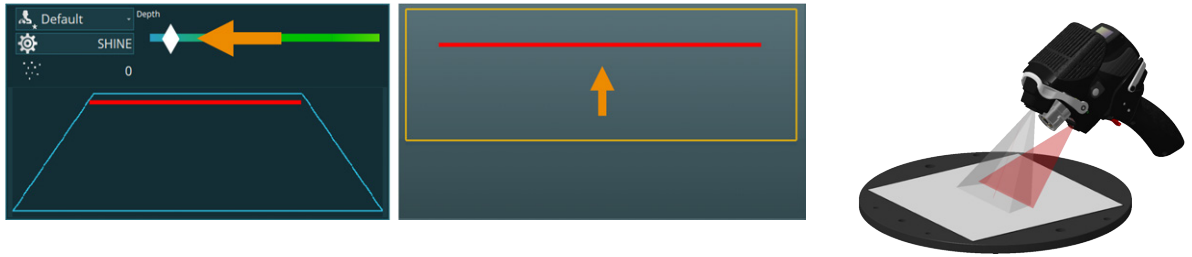
Measurement with the Scanner to Align

6. At the following prompt, remove the reference probe (if needed, mount the scanner) and wait for the scanner to be ready

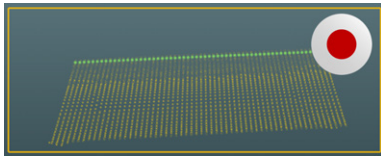


Take Low Position Scan Stripes (step3)

7. Orientate the scanner at about 45° to the plane, in low position (close to the plane).



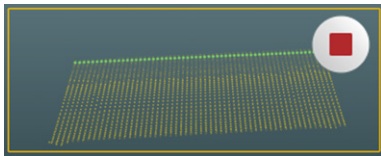
8. Start acquiring stripes.



9. Rotate the scanner 360° around the plane, keeping low position.



10. Only once the coverage is 100%, stop acquiring stripes to validate and jump to next step.

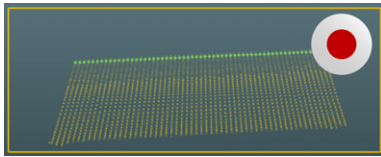


Take Medium Position Scan Stripes (step4)

11. Orientate the scanner at about 45° to the plane, in middle position (mid distance from the plane).



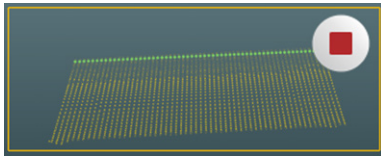
12. Start acquiring stripes.



13. Rotate the scanner 360° around the plane, keeping mid position.

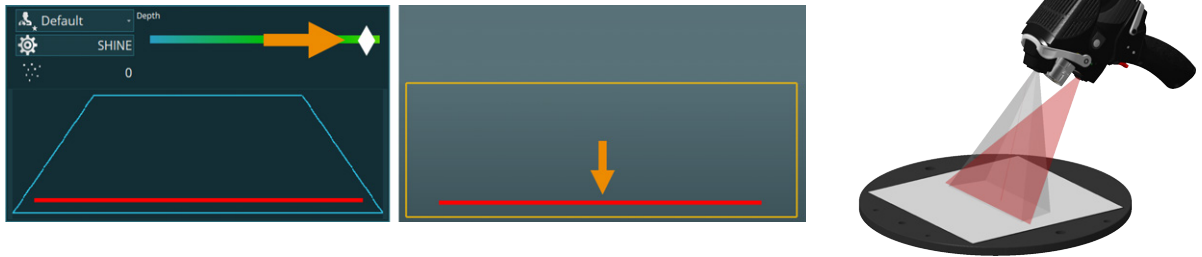


14. Only once the coverage is 100%, stop acquiring stripes to validate and jump to next step.

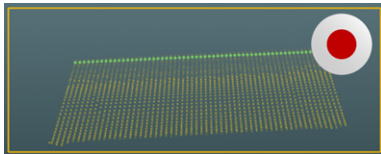


Take High Position Scan Stripes (step5)

15. Orientate the scanner at about 45° to the plane, in high position (far from the plane).



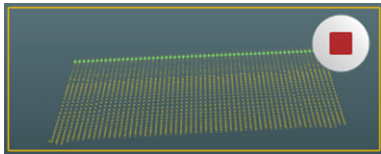
16. Start acquiring stripes.



17. Rotate the scanner 360° around the plane, keeping high position.

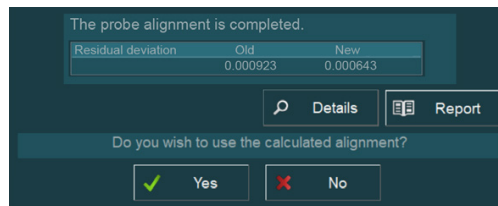
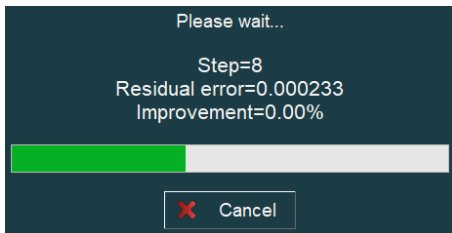


18. Only once the coverage is 100%, stop acquiring stripes to validate and jump to next step.



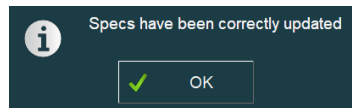
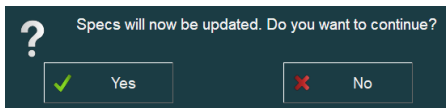
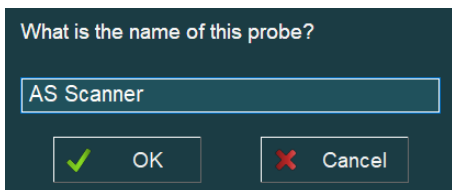
Calculation

19. Then the calculation starts. At the end of the calculation, the previous and new alignment result are compared.



The residual error is Least Squares value of distances divided by data set number of points (to have a comparable value independent of number of points). The report details are memorized in a "Probe Alignment Report.txt" file on C:\Users\Public\Documents\Romer\RDS\CalibData. For more details, please contact your local agent.

20. Once the "Yes" button is clicked, RDS asks for the name to give to the probe. Enter then the name to give to the probe and validate both next prompts to save the new alignment data into the memory of the arm.



Checking

After the validation of the calculation, RDS proposes to do a checkout on the artefact plane: scan stripes over the alignment plane and validate with the right button or click on "Next".



Then deviations are displayed.

Plane #	bestfit [mm]	stddev [mm]	X [mm]	Y [mm]	Z [mm]	I	J	K
1	0.0648	0.0099	505.8982	423.0310	-77.5748	0.0074	-0.0083	-0.9999

⏪ Back
⏩ Finished

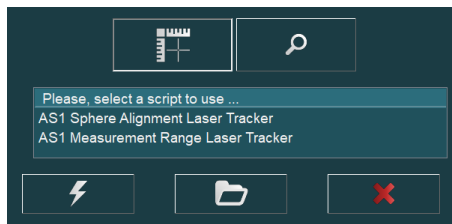
5.5.5. Scanner Measurement Range (tracker)

Prior and independently from the scanner alignment, Z-Scaling alignment can be operated. The alignment method consists by scanning a plane at 3 heights.

	Scan the plane from 3 heights (near, mid-range, far)
	Calculation and validation

Start up

1. Select the script, and then run. The System will prompt the user through each alignment step. Be sure to follow the instructions in each dialogue box.



2. The artefact should be placed between 3m and 5m from the tracker.



Plane Measurement

3. From the same orientation of the scanner, scan the plane to cover the 3 target squares.

- 1 near position
- 1 mid-range position
- 1 far position

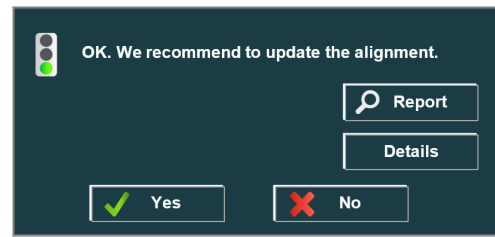
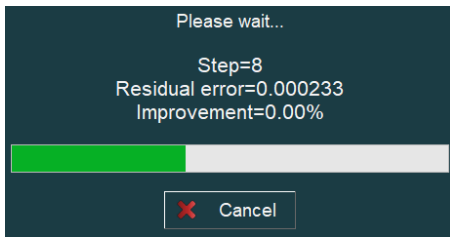


Once the coverage is completed in the background a verification of the plane quality and overlapping is done.

- If the check is passed, the calculation could be started.
- If the check failed the LAS-XL Data Validation dialog will be present showing the results of the check and providing the option to go back and remeasure the 3 planes.

Calculation

4. After all the measurements, the calculation automatically starts. When finished, RDS shows the status.



	The alignment result is correct, updating the alignment is allowed. Click on Yes to memorise the new alignment or No to cancel this calculation.
	The alignment result is insufficient, updating is not possible and performing a new alignment is required. (Check the arm accuracy, the correct mounting of the arm and the artefact...)

5.5.6. Scanner Alignment – Sphere Method (tracker)



This script can be applied for the AS1, LAS, and LAS-XL laser scanners on the trackers.

As the scanner contains several faces, each face must be aligned independently from the others. The user can decide to align one face only or several faces. In this second case, the alignment script must be played once for each face.

Once the process is started with one face, only this face can be used to complete the alignment.



This script is available for any face excepted the LAS-XL back face.

Principle

The alignment method consists by scanning a sphere.



Scan one side of the sphere, covering the field of view of the scanner to align



Scan of the whole sphere.

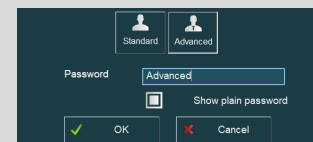
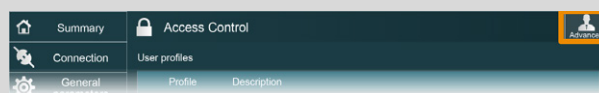


Calculation and validation

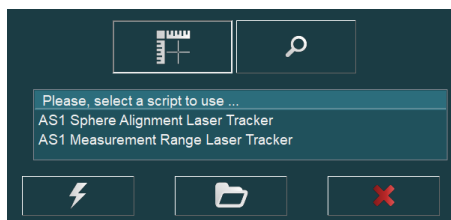
Start up (step1)



The probe alignment cannot be run with the “Standard” user profile. Open RDS Control Panel and set the user profile to “Advanced” (password = [Advanced]).



1. Select the script, and then run. The System will prompt the user through each alignment step. Be sure to follow the instructions in each dialogue box.



2. When prompted, enter the diameter of the alignment sphere (the size of the sphere should be noted on the stem of the artefact). Click OK to continue.

Is sphere diameter OK?

25.400 mm

OK Cancel

3. The artefact should be placed between 3m and 5m from the tracker.



Do not use other artefact sphere than the provided one; it has been designed to give optimal results.

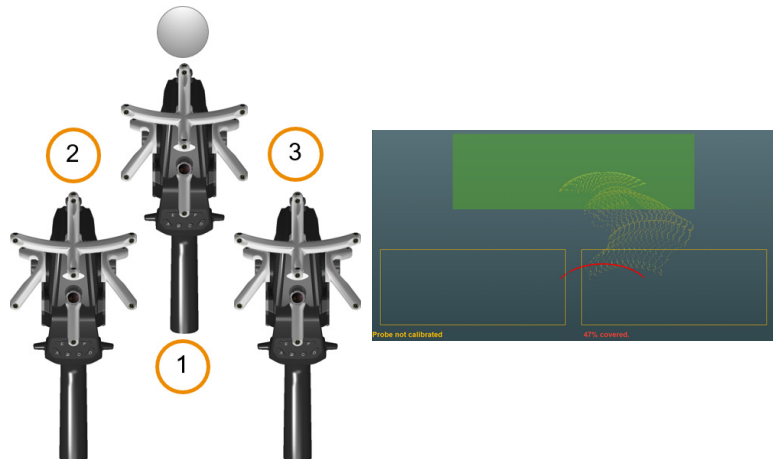


Any face of the scanner can be used, however, once the process started with one face, only this face becomes available.

Field Measurement (steps 3-5)

4. For the same orientation of the scanner, scan the sphere to cover the target squares.

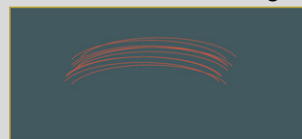
- 1 near centred position (#1)
- 1 far left position (#2)
- 1 far right position (#3).



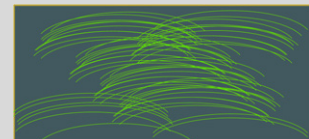
Once the coverage is completed and the button released, the script automatically jumps to the next step.



The scan lines must cover the target square.



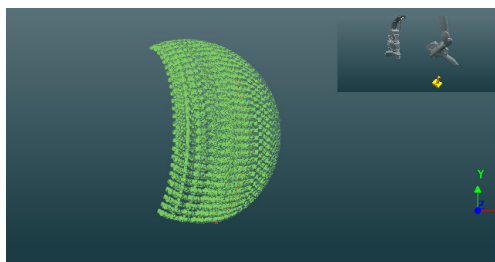
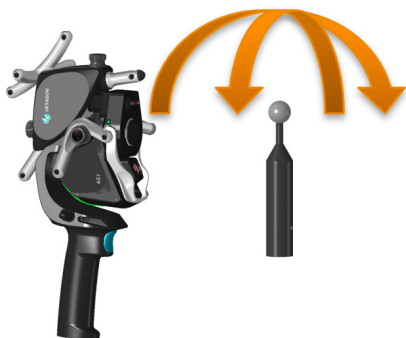
x



✓

Global Sphere Measurement

- Digitize the whole sphere with the scanner (wait for the 85 % coverage at least to stop digitizing).
Once the coverage is completed, press “Next” to validate the acquisition.

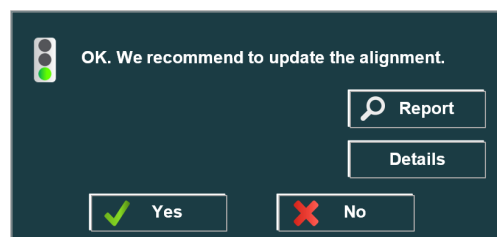
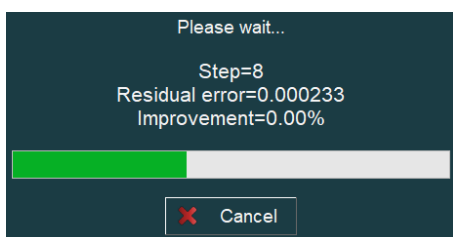


It is still possible to continue scanning even once the covered is completed, to enhance the quality of alignment, however, the calculation may be longer.

Also, the alignment will be enhanced if the entire scanline and the entire working range are used for the sphere measurement.

Calculation

- After all the measurements, the calculation automatically starts. When finished, RDS shows the status.



The alignment result is correct, updating the alignment is allowed. Click on Yes to memorise the new alignment or No to cancel this calculation.



The alignment result is insufficient, updating is not possible and performing a new alignment is required. (Check the arm accuracy, the correct mounting of the arm and the artefact...)



The residual error is Least Squares value of distances divided by data set number of points (to have a comparable value independent of number of points).

The report details are memorized in a “Probe Alignment Report.txt” file on C:\Users\Public\Documents\Romer\RDS\CalibData. For more details, please contact your local agent.

5.5.7. LAS-XL Alignment – Back Face (tracker)

The back face of the LAS-XL requires a specific script for its alignment.

Principle

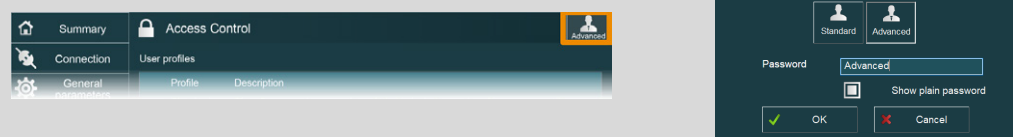
The alignment method is similar as for the other faces, but a preliminary step consists by scanning the artefact sphere with the other faces (sides and top) to get a reference sphere.

	Reference Scan of the sphere (any face of the scanner except back face).
	Scan of one side of the sphere, covering the field of view of the scanner to align (back face of the scanner only).
	Scan of the whole sphere (back face of the scanner).
	Calculation and validation

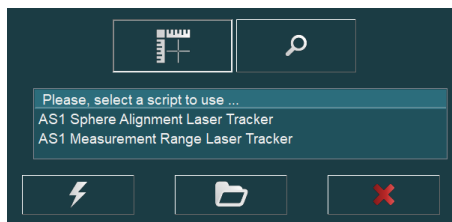
Start up (step1)



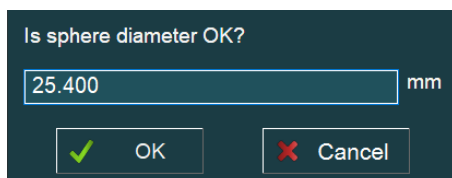
The probe alignment cannot be run with the “Standard” user profile. Open RDS Control Panel and set the user profile to “Advanced” (password = [Advanced]).



1. Select the script, and then run. The System will prompt the user through each alignment step. Be sure to follow the instructions in each dialogue box.



2. When prompted, enter the diameter of the alignment sphere (the size of the sphere should be noted on the stem of the artefact). Click OK to continue.



3. The artefact should be placed between 3m and 5m from the tracker.



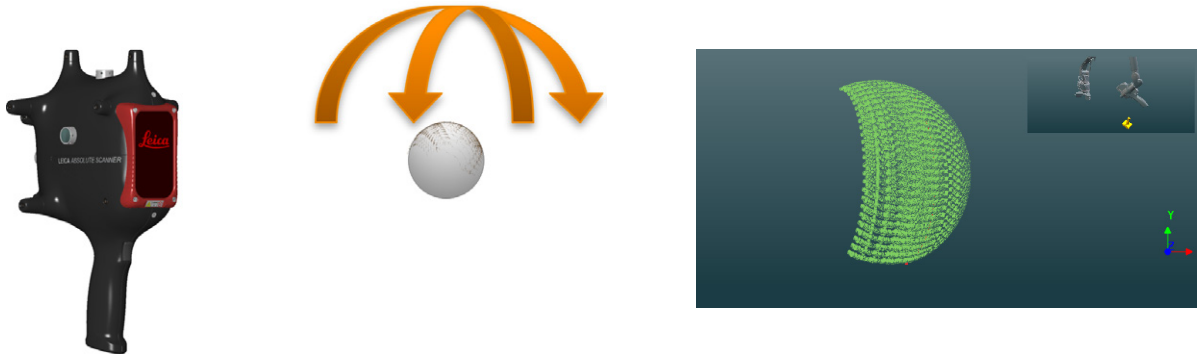
Do not use other artefact sphere than the provided one; it has been designed to give optimal results.

Reference Sphere Measurement



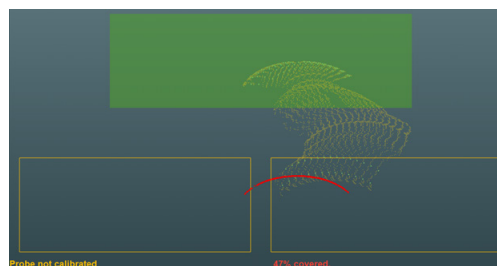
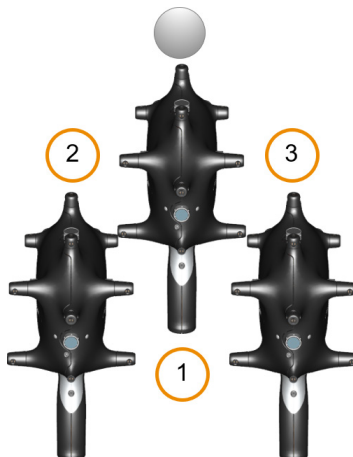
Any face of the scanner can be used, however, once the process started with one face, only this face becomes available.

4. Digitize the whole sphere with one of the sides or top faces of the scanner (wait for the 85 % coverage at least to stop digitizing). Once the coverage is completed, press “Next” to validate the acquisition.

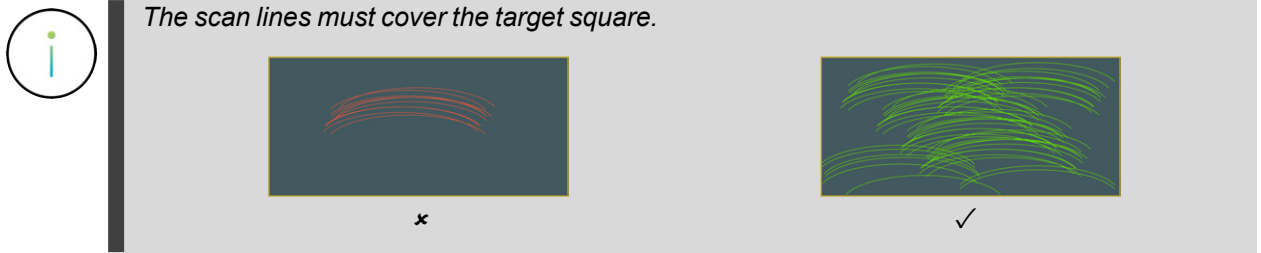


Field Measurement with the Back Face

5. Use the back face, and from the same orientation of the scanner, scan the sphere to cover the 3 target squares.
 - 1 near centred position (#1)
 - 1 far left position (#2)
 - 1 far right position (#3).

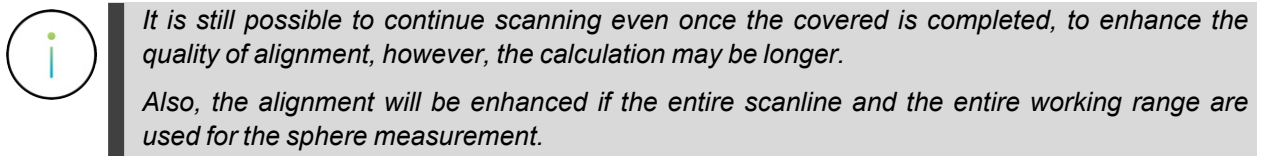
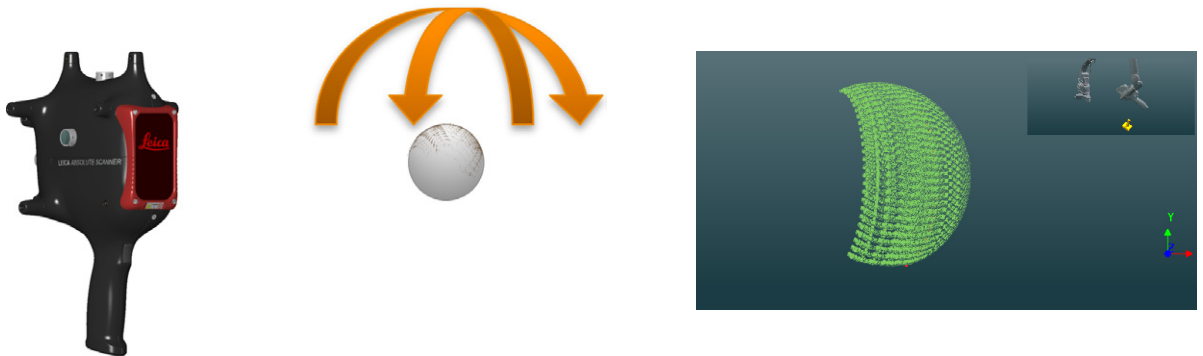


Once the coverage is completed and the button released, the script automatically jumps to the next step.



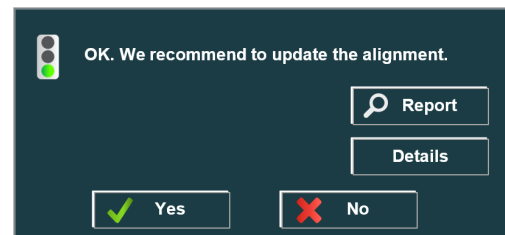
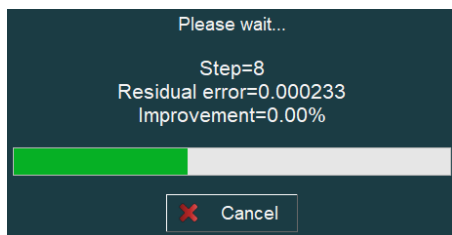
Global Sphere Measurement

6. Keeping the back face, digitize the whole sphere with the scanner (wait for the 85 % coverage at least to stop digitizing). Once the coverage is completed, press “Next” to validate the acquisition.



Calculation

7. After all the measurements, the calculation automatically starts. When finished, RDS shows the status.



	The alignment result is correct, updating the alignment is allowed. Click on Yes to memorise the new alignment or No to cancel this calculation.
	The alignment result is insufficient, updating is not possible and performing a new alignment is required. (Check the arm accuracy, the correct mounting of the arm and the artefact...)



The residual error is Least Squares value of distances divided by data set number of points (to have a comparable value independent of number of points).

The report details are memorized in a “Probe Alignment Report.txt” file on C:\Users\Public\Documents\Romer\RDS\CalibData. For more details, please contact your local agent.

5.6. Calibrations

5.6.1. Overview

RDS provides a list of scripts for a recalibration of the instrument. Main standard for articulated arms can be operated, but also specific scripts for scanner calibration.

	RA7	RA8	1.2 arms	
ISO 10360-12	✓	✓	✓	Probing size & form error – 20 points on a sphere (×2) Articulated location errors – 5×5 points on a sphere (×2) Length measurement errors – 3×5 distances on a length artefact (×7)
ISO 10360-2			✓	Probing error – 20 points on a sphere (×1) Length measurement errors – 3x5 distances on a length artefact (×7)
ISO 10360-8 Annex D	✓	✓		Calibration for scanners on a sphere.
ASME B89.4.22	✓			Single point articulation test – 10 points on a cone (×3) Effective diameter performance test – 9 Points on a sphere (×3) Volumetric performance test – 1 distance on a length artefact (×20)

In the following chapters are briefly described the processes for the above standards. For more details, please refer to the standard itself.

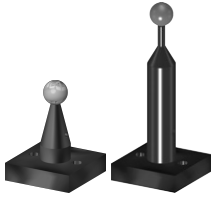


Calibration scripts for ASME B89.4.22 can be found in RDS Data Collector, but they are not suitable for the Absolute Arm RA8.

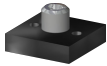
Artefacts

Specific artefact may be needed for the calibrations:

- Sphere artefact



- Seat (or cone)



- Steps bar



- Ball bar



- Cone bar



5.6.2. ISO 10360-12 Calibration

The ISO 10360-12 standard consists by 3 steps:

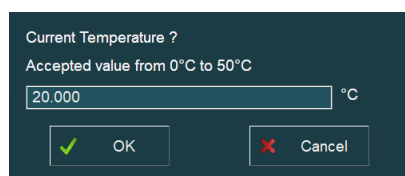
- Length measurement errors test ($E_{UNI.MPE}$) – 5 distances measured 3 times on a length artefact. This operation is repeated 7 times at different locations.
- Probing size ($P_{SIZE.Sph.1x25}$) and form errors ($P_{FORM.Sph.1x25}$) tests – 25 points measured on a sphere. This operation is repeated twice on 2 specific locations.
- Articulated location errors test ($L_{DIA.5x5.Art.MPE}$) – 5 points are measured 5 times on a sphere with different orientations of the wrist. This operation is repeated twice on 2 specific locations.

An optional test (ISO 10360-12 Annex D) is proposed:

- Single point articulation test (SPAT) – 10 points measured on a seat (cone) moving the elbow. This operation is repeated 3 times on 3 specific locations.

5.6.2.1. Artefact Temperature

To compensate the thermal expansion of the artefact, the current temperature of the artefact must be entered ($0^{\circ}\text{C} \leq T^{\circ}\text{C} \leq 50^{\circ}\text{C}$). To skip the compensation, simply leave 20°C and press OK.



Current Temperature ?

Accepted value from 0°C to 50°C

20.000 °C

OK Cancel

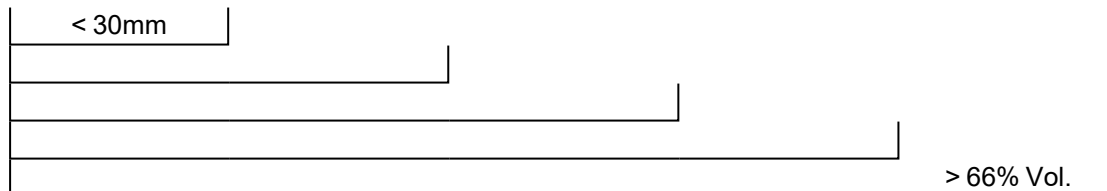
5.6.2.2. Artefact Properties

2 artefacts must be used, and their nominal dimensions must be entered.

Length bar

The length artefact must contain 6 features (cones, or steps), giving 5 lengths.

The shortest length must be less than 30mm, the greatest at least 66% of useful measurement range.



Size of arm	Shortest length	Recommended greatest length
1200	< 30 mm	792 mm
2000	< 30 mm	1000 mm
2500	< 30 mm	1400 mm
3000	< 30 mm	1700 mm
3500	< 30 mm	2000 mm
4000	< 30 mm	2700 mm
4500	< 30 mm	3000 mm

When prompted, select the artefact and enter the 5 distances.

Artefact
Step Bar - Default.artefact

Physical properties

Property	Value	Unit
L_01_02	20.0000	mm
L_01_03	40.0000	mm
L_01_04	300	mm
L_01_05	400	mm
L_01_06	500	mm

Other properties

Property	Value
Description	52 Steps
Last certification date	01/05/2021 12:00:00
Modification date	03/07/2021 17:08:02

☒
☐

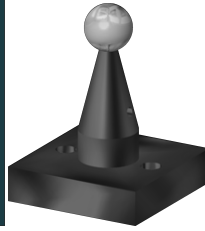
Sphere (10mm < Ø < 51mm)

Enter the diameter of the sphere.

Sphere Diameter:

Min = 10mm
Max = 51mm

 OK



5.6.2.3. Length Measurement Errors Test

Description

For each location, the 5 lengths of the length bar artefact are measured 3 times.

For the 7 measurements of the 5 lengths, all the combinations of elbow orientations must be used. However, for each of the 3 measurements of a length on one location of the bar, the same orientation must be used.

See example below.

Lg	Incorrect			Correct			Rule
	M1	M2	M3	M1	M2	M3	
1	◀◀	◀◀	◀◀	◀◀	◀◀	◀◀	Each of the 3 repeat measures uses the same orientation, but successive lengths must be different
2	◀◀	◀◀	◀◀	◀◀	◀◀	◀◀	
1	▶▶	▶▶	▶▶	▶▶	▶▶	▶▶	The 3 repeat measures of a length must use the same orientation.
2	▶▶	▶▶	▶▶	▶▶	▶▶	▶▶	

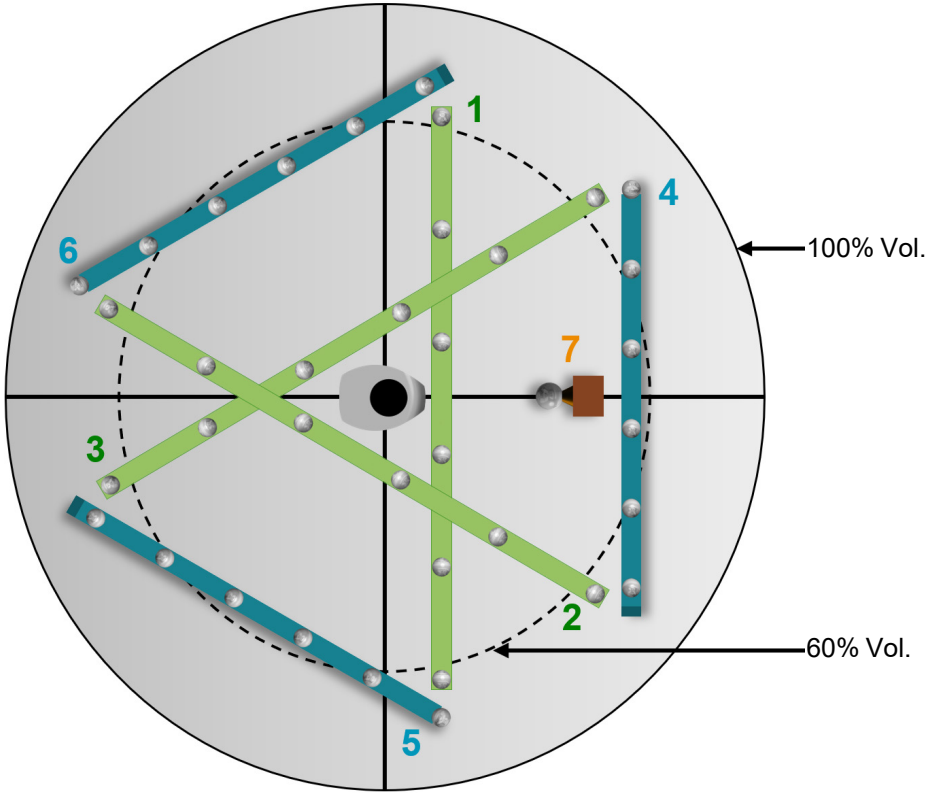
Mx: measurement N°x | ◀: elbow left | ▲: elbow overhead | ▶: elbow right



The scripts in RDS Data Collector show the appropriate orientations, always ensure to respect the RDS recommendations.

The length artefact is measured on 7 locations around the arm, respecting the description below.

	Pos.	Bar inclination	Dist. from arm	Height
	1	Horizontal	Near	Low
	2	Horizontal	Near	Low
	3	Horizontal	Near	Low
	4	45°	Medium	Mid
	5	45°	Medium	Mid
	6	45°	Medium	Mid
	7	Vertical	Medium	Mid



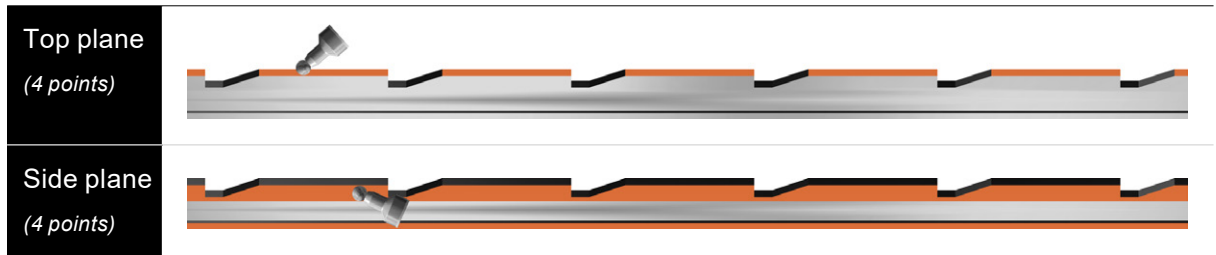
Remeasuring

Maximum 5 of the 35 sets of 3 repeated measurements may have one of the 3 values outside the acceptance criteria. Each such failed measurement shall be remeasured 3 times at the relevant position. All the remeasured values must respect the acceptance criteria.

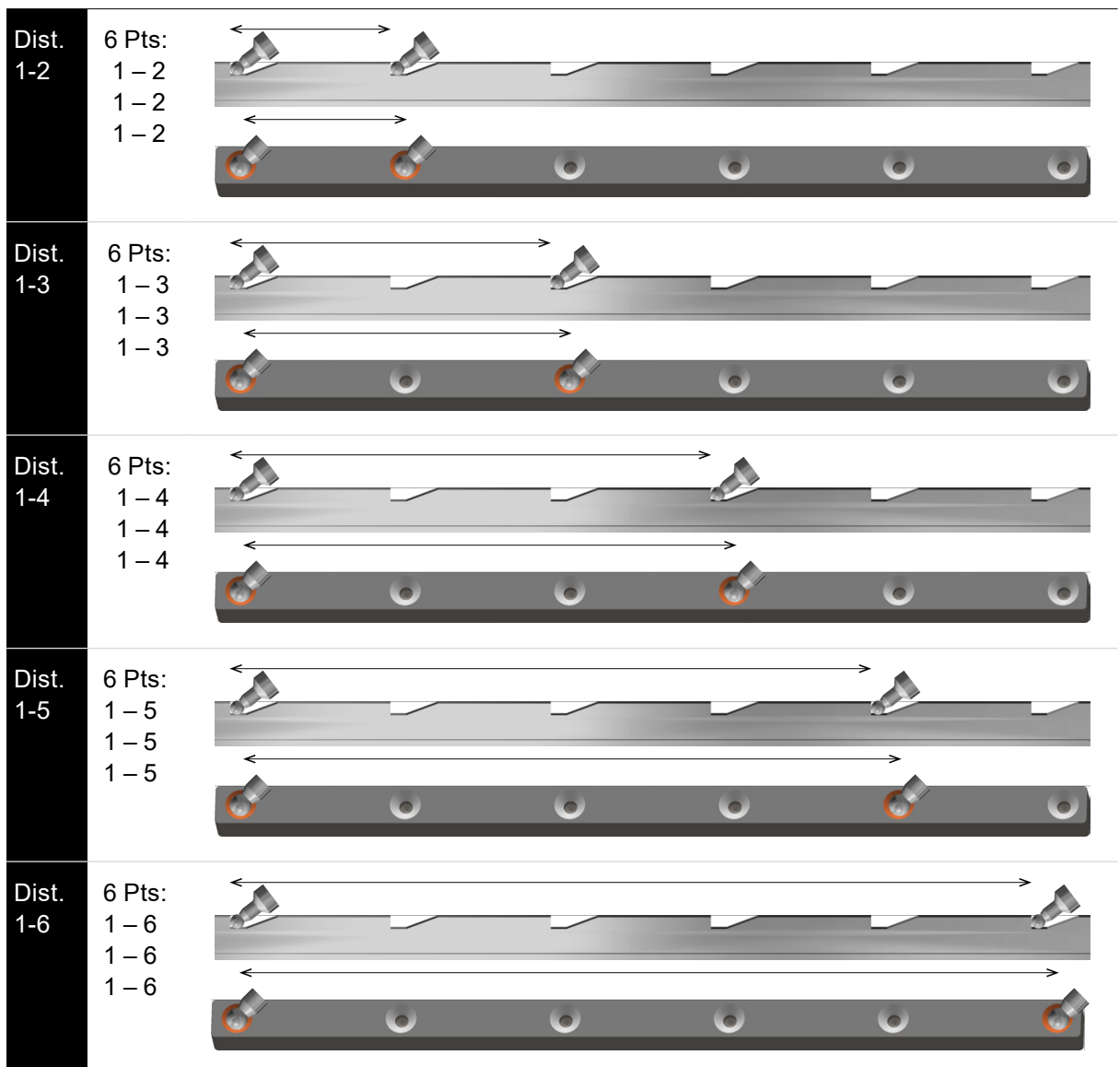
Measurement

Measure the 7 sets of 5 lengths. For each:

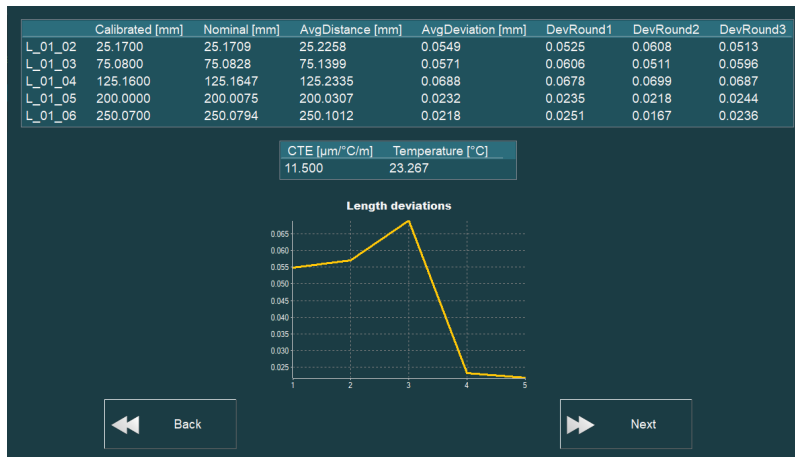
1. Measure first Top and Side planes (step bar only)



2. Then measure the 5 distances 3 times:



3. At the end of each position, RDS Data Collector shows the deviations.



Calibrated value	Dimension given with the artefact (calibrated value at 20°C).
Nominal value	Compensated dimension of the artefact (calibrated value with the thermal compensation).
Average distance	Measured average distance from the 3 measurements on the 2 steps of the artefact.
Average deviation	Difference between the average measured distance and the theoretical distance.
DevRound (1/2/3)	Details of the 3 deviations between the measurement and theoretical values.
Highlighted	Out of specs values are highlighted.
CTE / Temperature	Reminder of the thermal compensation value and the current temperature used for the compensation. (hidden if not used)
Graphic	Shows the 5 average deviations.
	According to the specifications of the instrument, RDS shows whether the step passed or not. (hidden if no specifications are available)

4. Press “Next” to go to next step, or “Back” to rerun the step.

5.6.2.4. Probing Size and Form Errors Test

2 Locations

The artefact sphere ($10\text{mm} < \varnothing < 51\text{mm}$) is in front of the instrument at short-range of the measuring volume, and then at long-range.



For each location, 25 Points must be measured on the sphere (without rotating the stylus or changing the direction of the stylus) following the rules below.

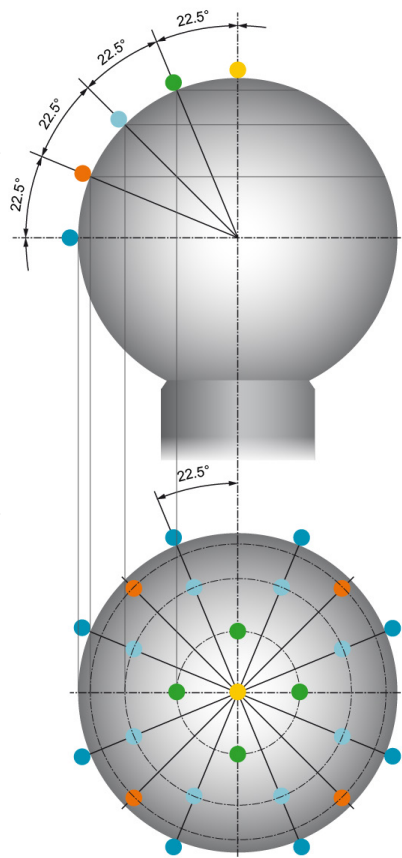
1 point on the pole

4 points, 22.5° below the pole

8 points, 45° below the pole and rotated 22.5° from previous group

4 points, 67.5° below the pole and rotated 22.5° from previous group

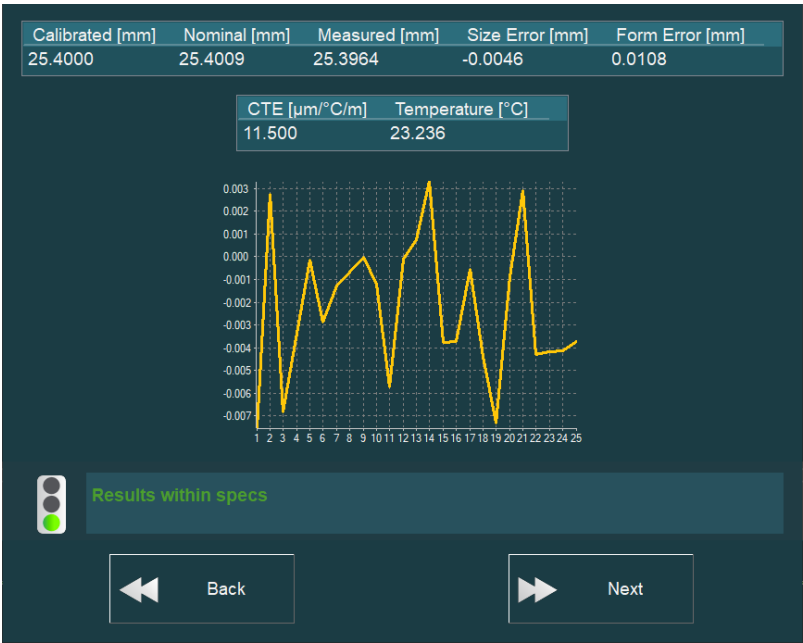
8 points on the equator, and rotated 22.5° from previous group



The probe tip must always be moved out from the artefact sphere for each point. Do not take the points by gliding the tip on the artefact sphere.

Process

Measure the sphere with the 25 specified points for both locations.
At the end of the step, RDS Data Collector shows the deviations.



Calibrated value	Dimension given with the artefact (calibrated value at 20°C).
Nominal value	Compensated dimension of the artefact (calibrated value with the thermal compensation).
Measured	Measured diameter (least square)
Size Error	Error of the diameter value (P_{SIZE})
Form Error	Extreme deviations from the 25 measured points (P_{FORM})
Highlighted	Out of specs values are highlighted.
CTE / Temperature	Reminder of the thermal compensation value and the current temperature used for the compensation. (hidden if not used)
Graphic	Shows the deviations of the 25 points.
	According to the specifications of the instrument, RDS shows whether the step passed or not. (hidden if no specifications are available)



Remeasuring

If the performance of probing form error or probing size error is not verified for both locations of the test, the relevant test shall be repeated once only at both locations of the test.

Press "Next" to go to next step, or "Back" to rerun the step.

5.6.2.5. Articulated Location Errors Test

2 locations

The artefact sphere (10mm < Ø < 51mm) is in front of the instrument at short-range of the measuring volume, and then at long-range.



For each location, points must be measured on the sphere from 5 sides of the sphere. For each side, 1 point on the pole plus 4 points on the equator, distributed at 90° each other.

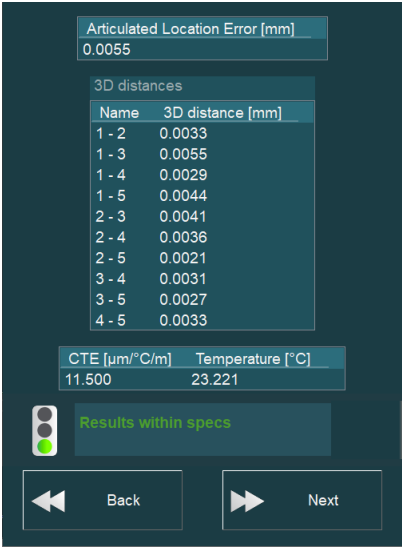
From top	From X-	From Y-	From X+	From Y+
5 points	5 points	5 points	5 points	5 points

The probe tip must always be moved out from the artefact sphere for each point. Do not take the points by gliding the tip on the artefact sphere.

Process

Measure the 5x5 points on the sphere with 5 specified orientations of the wrist. Proceed on both locations (near / far).

At the end of each step, RDS Data Collector shows the deviations.



Articulated Location Error	Error between the centres of spheres (L_{DIA} – diameter of the sphere made from the centres of the 5 spheres).
3D distances	Details of the sphere-to-sphere distances.
Highlighted	Out of specs values are highlighted.
CTE / Temperature	Reminder of the thermal compensation value and the current temperature used for the compensation. (hidden if not used)
	According to the specifications of the instrument, RDS shows whether the step passed or not. (hidden if no specifications are available)

Press “Next” to go to next step, or “Back” to rerun the step.



Remeasuring

If the performance of articulated location error is not verified for both locations of the test, the relevant test shall be repeated once only at both locations of the test.



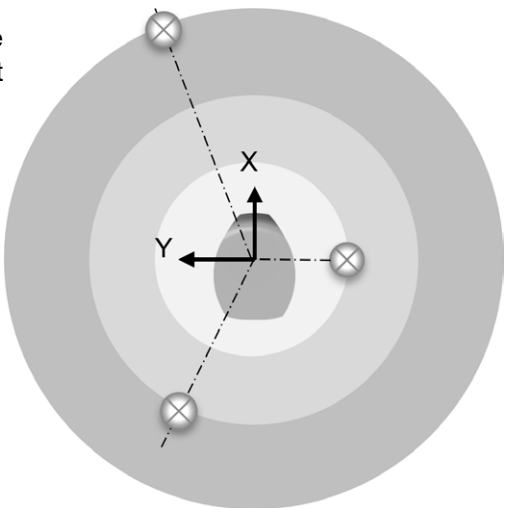
Check if all results are fitting with the specifications of the measuring system. If they do not, please contact your Service Centre.

5.6.2.6. Single Point Articulation Test (Annex D – optional)

10 points are measured on a seat (e.g. a cone), articulating the axes of the arm. This operation is repeated on 3 different locations:

- 20% Vol – 0° rotation
- 50% Vol – 120° rotation
- 80% Vol – 240° rotation

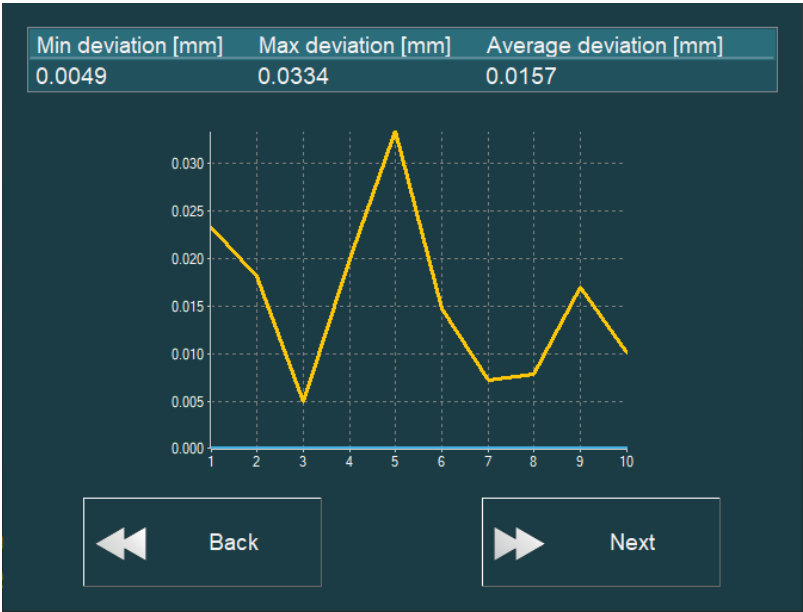
For each location, 10 points are measured:



Pt 1	Elbow left down	
Pt 2	Elbow left up	
Pt 3	Elbow overhead	
Pt 4	Elbow right up	
Pt 5	Elbow right down	
	Twist wrist 180° then same positions	
Pt 6	Elbow right down	
Pt 7	Elbow right up	
Pt 8	Elbow overhead	
Pt 9	Elbow left up	
Pt 10	Elbow left down	

Process

Measure the 10 points. At the end the step, RDS Data Collector shows the deviations.



Min / Max deviations	Extreme deviations from the 10 points and the middle point
Average deviation	Mean value from the 10 points to middle point
Graphic	Shows the deviations of all the 10 points, and mean value.

Press “Next” to go to next step, or “Back” to rerun the step.

5.6.2.7. Final Results

At the end of the process, RDS generates a report including all the results.

On this report, are shown:

Probing size and form errors	
$P_{\text{Form.Sph.1x25}}$	Form error
$P_{\text{Size.Sph.1x25}}$	Deviation on the measurement of the diameter.
Articulated location errors	
$L_{\text{Dia.5x5 Art}}$	Max centre error of the 5 sub-spheres for each location
Length measurement errors	
E_{Uni}	

5.6.3.

ISO 10360-2 Calibration (1.2 Arm)

The ISO 10360-2 standard can be used for 1.2 size arms and consists by 3 steps:

- Length measurement errors test ($E_{UNI.MPE}$) – 5 distances measured 3 times on a length artefact. This operation is repeated 7 times at different locations.
- Probing size ($P_{SIZE.Sph.1x25}$) and form errors ($P_{FORM.Sph.1x25}$) tests – 25 points measured on a sphere.

5.6.3.1.

Artefact Temperature

To compensate the thermal expansion of the artefact, the current temperature of the artefact must be entered ($0^{\circ}C \leq T^{\circ}C \leq 50^{\circ}C$). To skip the compensation, simply leave 20°C and press OK.

Current Temperature ?

Accepted value from 0°C to 50°C

°C

✓ OK

✗ Cancel

5.6.3.2.

Artefact Properties

2 artefacts must be used, and their nominal dimensions must be entered.

Length bar

The length artefact must contain 6 features (cones, or steps), giving 5 lengths.

The shortest length must be less than 30mm, the greatest at least 66% of useful measurement range.

< 30mm

> 66% Vol.



Size of arm	Shortest length	Recommended greatest length
1200	< 30mm	792 mm



Cone bar cannot be used for an ISO 10360-2 calibration

When prompted, select the artefact and enter the 5 distances.

Artefact
Step Bar - Default.artefact

Physical properties

Property	Value	Unit
L_01_02	20.0000	mm
L_01_03	40.0000	mm
L_01_04	300	mm
L_01_05	400	mm
L_01_06	500	mm

Other properties

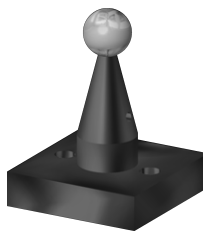
Property	Value
Description	52 Steps
Last certification date	01/05/2021 12:00:00
Modification date	03/07/2021 17:08:02

Sphere (10mm < Ø < 51mm)

Enter the diameter of the sphere.

Sphere Diameter:

Min = 10mm
Max = 51mm



5.6.3.3. Length Measurement Errors Test

Description

For each location, the 5 lengths of the length bar artefact are measured 3 times.

For the 7 measurements of the 5 lengths, the following orientations of the arm (elbow) must be respected:

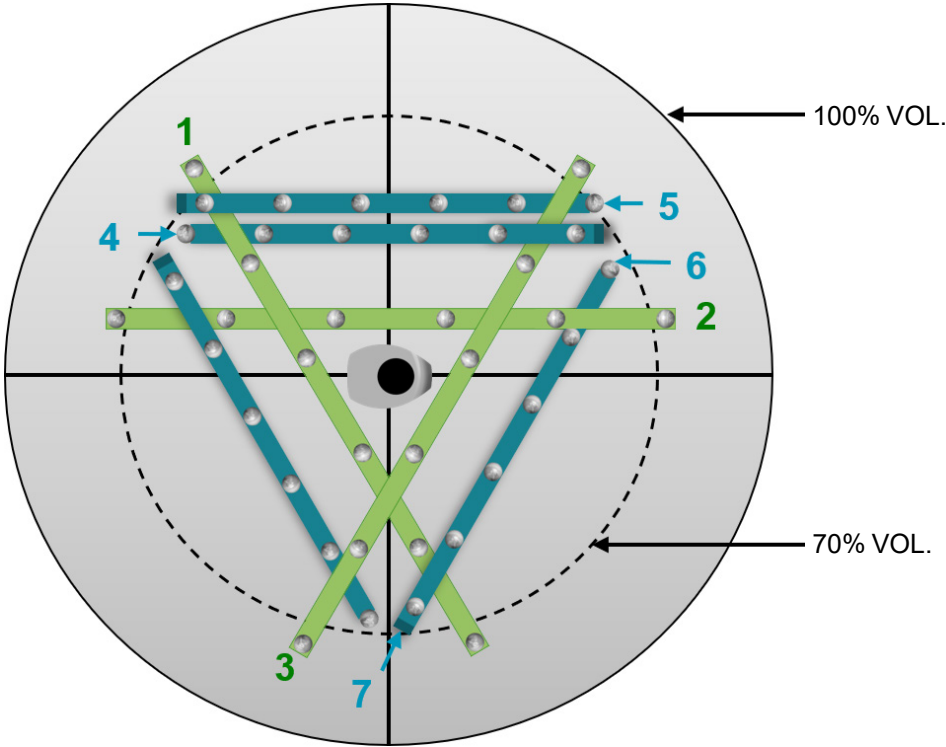
Measurement	Incorrect	
#1	Elbow left	Elbow right
#2	Elbow right	Elbow left
#3	Elbow left	Elbow left



The scripts in RDS Data Collector show the appropriate orientations, always ensure to respect the RDS recommendations.

The length artefact is measured on 7 locations around the arm, respecting the description below.

	Pos.	Bar inclination	Dist. from arm	Height
	1	Horizontal	Near	Low
	2	Horizontal	Near	Low
	3	Horizontal	Near	Low
	4	45°	Medium	Mid
	5	45°	Medium	Mid
	6	45°	Medium	Mid
	7	45°	Medium	Mid



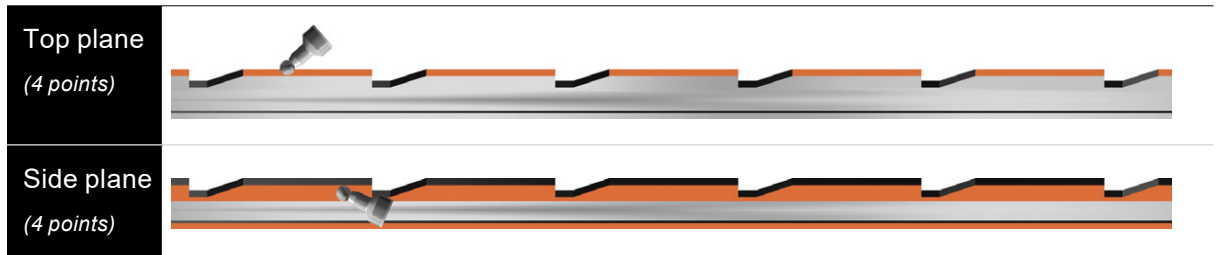
Remeasuring

Maximum 5 of the 35 sets of 3 repeated measurements may have one of the 3 values outside the acceptance criteria. Each such failed measurement shall be remeasured 3 times at the relevant position. All the remeasured values must respect the acceptance criteria.

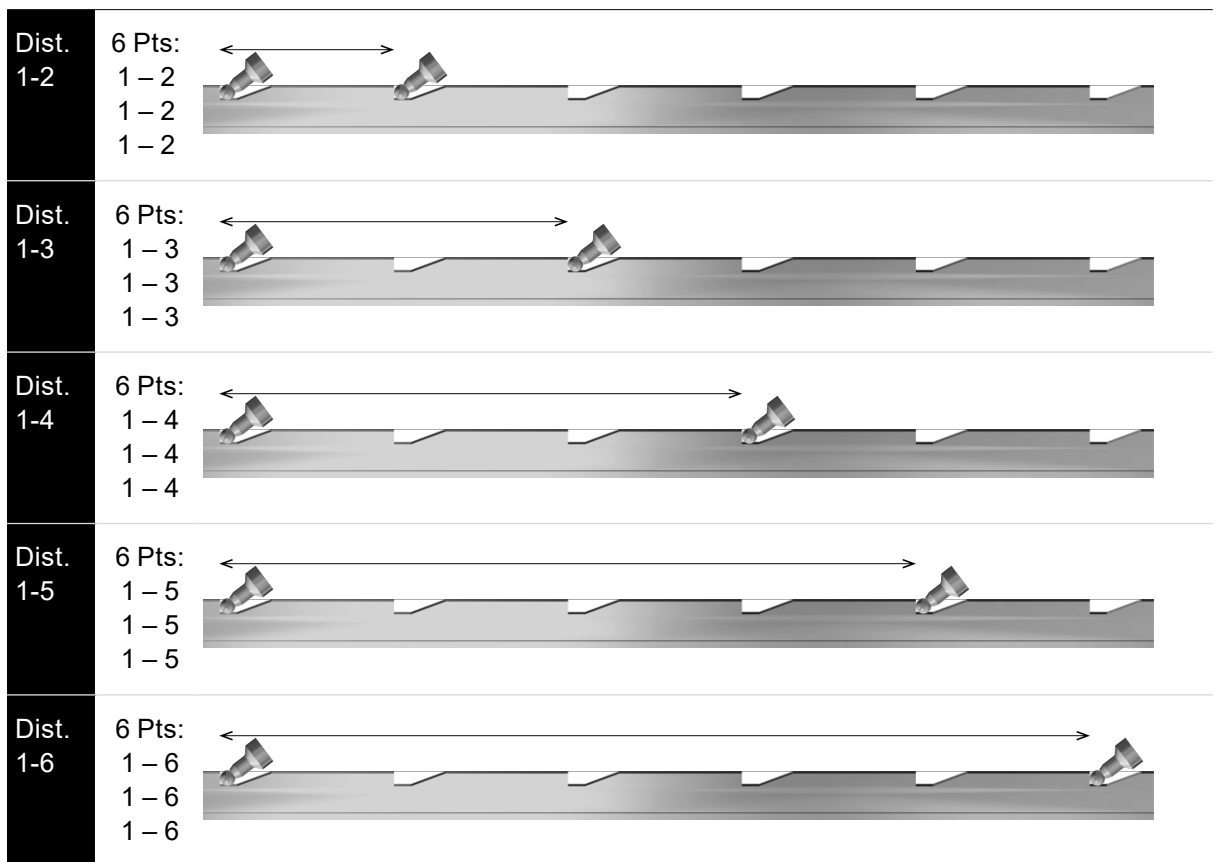
Measurement

Measure the 7 sets of 5 lengths. For each:

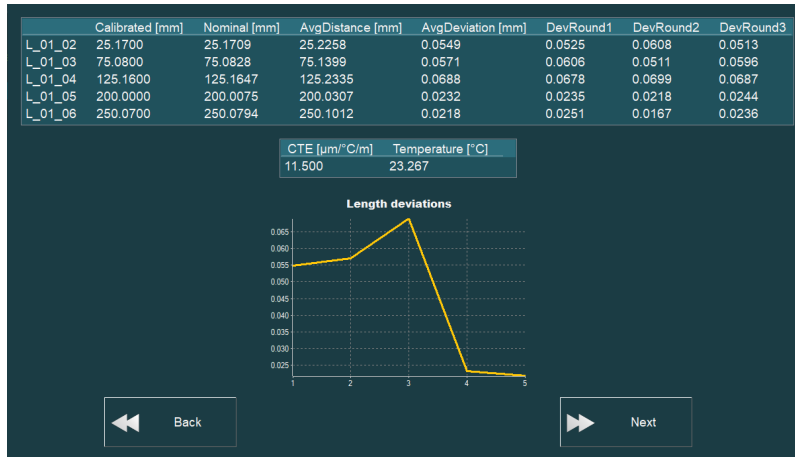
1. Measure first Top and Side planes.



2. Then measure the 5 distances 3 times:



- At the end of each position, RDS Data Collector shows the deviations.



Calibrated value	Dimension given with the artefact (calibrated value at 20°C).
Nominal value	Compensated dimension of the artefact (calibrated value with the thermal compensation).
Average distance	Measured average distance from the 3 measurements on the 2 steps of the artefact.
Average deviation	Difference between the average measured distance and the theoretical distance.
DevRound (1/2/3)	Details of the 3 deviations between the measurement and theoretical values.
Highlighted	Out of specs values are highlighted.
CTE / Temperature	Reminder of the thermal compensation value and the current temperature used for the compensation. (hidden if not used)
Graphic	Shows the 5 average deviations.

- Press "Next" to go to next step, or "Back" to rerun the step.

5.6.3.4. Probing Size and Form Errors Test

1 Location

The artefact sphere ($10\text{mm} < \varnothing < 51\text{mm}$) is in front of the instrument at short-range of the measuring volume, and then at long-range.



For each location, 25 Points must be measured on the sphere (without rotating the stylus or changing the direction of the stylus) following the rules below.

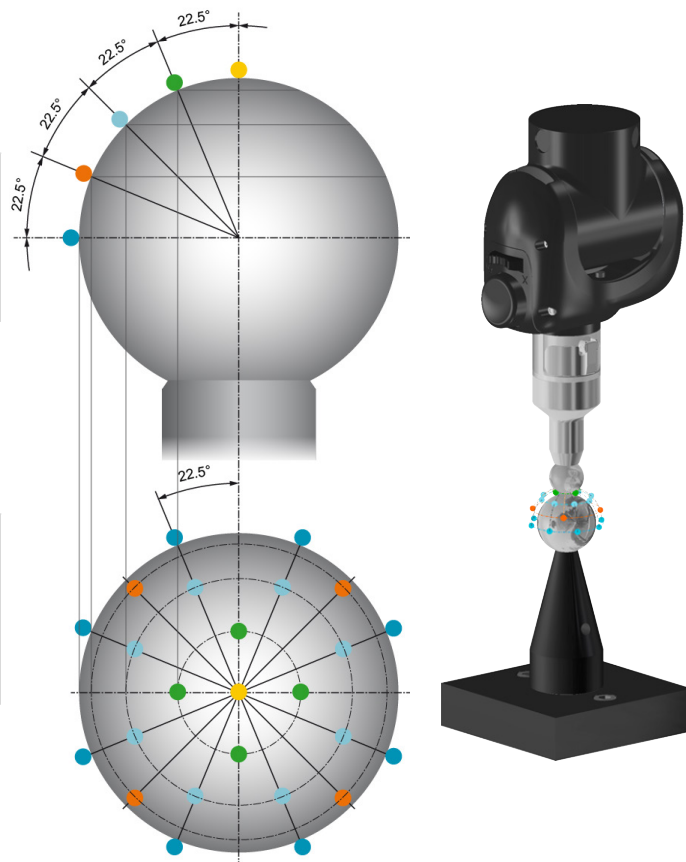
1 point on the pole

4 points, 22.5° below the pole

8 points, 45° below the pole and rotated 22.5° from previous group

4 points, 67.5° below the pole and rotated 22.5° from previous group

8 points on the equator, and rotated 22.5° from previous group



The probe tip must always be moved out from the artefact sphere for each point. Do not take the points by gliding the tip on the artefact sphere.

Process

Measure the sphere with the 25 specified points for both locations.

At the end of the step, RDS Data Collector shows the deviations.



Calibrated value	Dimension given with the artefact (calibrated value at 20°C).
Nominal value	Compensated dimension of the artefact (calibrated value with the thermal compensation).
Measured	Measured diameter (least square)
Size Error	Error of the diameter value (P_{SIZE})
Form Error	Extreme deviations from the 25 measured points (P_{FORM})
CTE / Temperature	Reminder of the thermal compensation value and the current temperature used for the compensation. (hidden if not used)
Graphic	Shows the deviations of the 25 points.



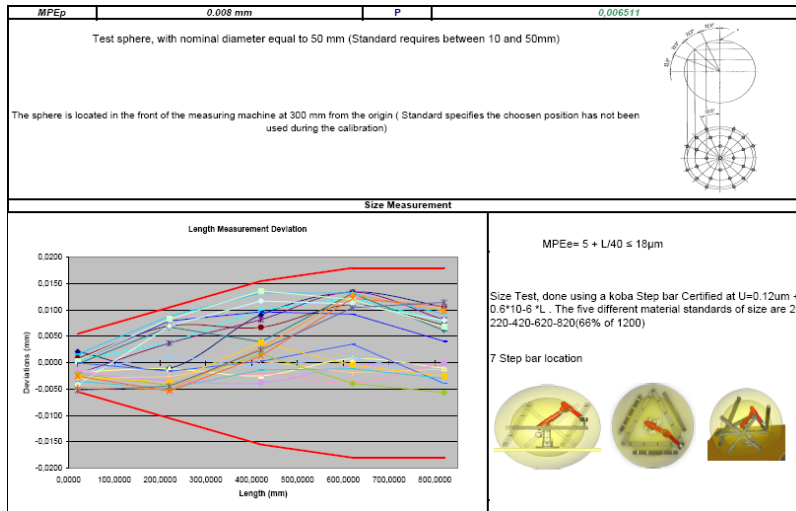
Remeasuring

If the performance of probing form error or probing size error is not verified for both locations of the test, the relevant test shall be repeated once only.

Press “Next” to go to next step, or “Back” to rerun the step.

5.6.3.5. Final Results

At the end of the process, RDS generates a report including all the results.



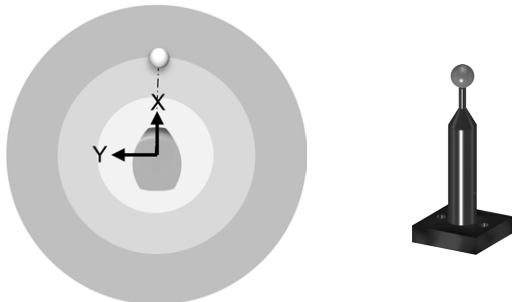
5.6.4. ISO 10360-8 Annex D Calibration

Description

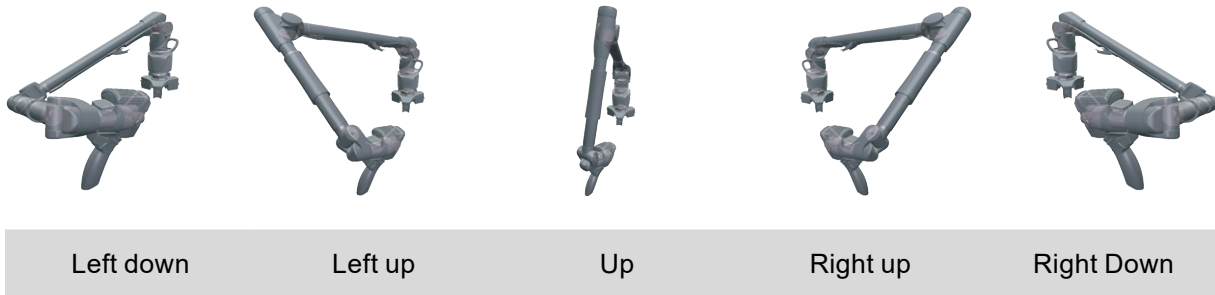
RDS Data Collector provides a script to perform the Scanner+Arm calibration on a sphere according to the ISO 10360-8 Annex D standard.

The script consists by scanning an artefact sphere at a mid-range location in front of the arm with 5 orientations of the elbow and 5 orientations of the scanner.

- 1 location – 50 % of the measurement volume of the arm



- 5 measurements must be done, according to 5 orientations of the elbow of the arm.

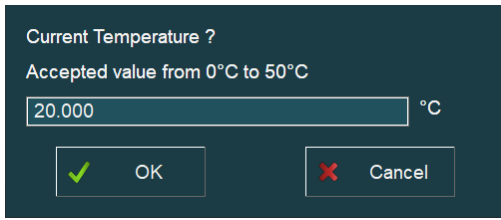


- For each elbow orientation (for #1 to #3), 5 orientations of the scanner.



Process

1. Run the calibration script "ISO 10360-8 Annex D.sc".
2. To compensate the thermal expansion of the artefact, the current temperature of the artefact must be entered ($0^{\circ}\text{C} \leq T^{\circ}\text{C} \leq 50^{\circ}\text{C}$). To skip the compensation, simply leave 20°C and press OK.

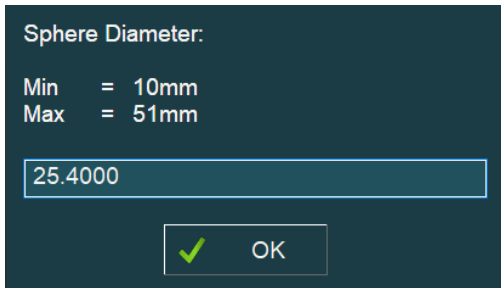


Current Temperature ?
Accepted value from 0°C to 50°C

20.000 °C

OK Cancel

3. Enter the nominal diameter of the artefact.



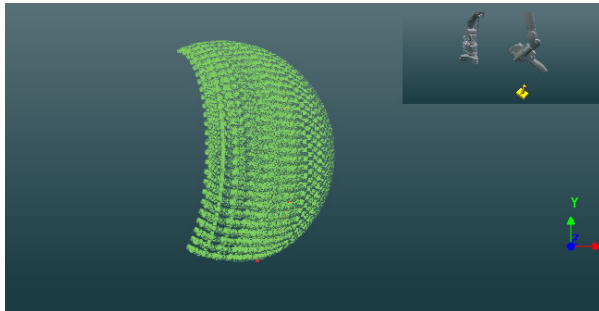
Sphere Diameter:

Min = 10mm
Max = 51mm

25.4000

OK

4. Scan the sphere from the 5 angles of the scanner for each of the 5 orientations of the elbow. Validate (right button) for each orientation of the arm (5 sub-spheres).



5. At the end of the measurement, RDS Data Collector shows the deviations.

LDIA	Error between the centres of spheres (LDIA – diameter of the sphere made from the centres of the 5 spheres).
CTE / Temperature	Reminder of the thermal compensation value and the current temperature used for the compensation. (hidden if not used)
	According to the specifications of the instrument, RDS shows whether the step passed or not. (hidden if no specifications are available)

6. Run the Excel report and fill-in the system and operator information (orange area).



The Excel macros must be enabled to run the report.

5.7. Accuracy Diagnostic Scripts

This script tab is used to quickly check the arm without doing a complete calibration.

Notice that the result given by a diagnostic cannot be used as a checking report. This is only used to diagnose quickly. These tests should be interpreted by the user.

3 types of scripts are available:

- Quick checks – to quickly diagnose if the [probe](#), [scanner](#) or non-contact [tube probe](#) are accurate
- [3 Planes distance](#) – for a diagnostic of the scanner
- [Digitize](#) – to simply scan a part and export the point cloud.

5.7.1. Verifying the Accuracy of Touch Probes (arm)

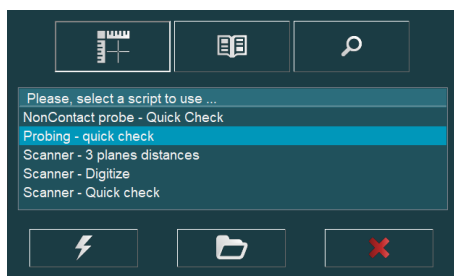
RDS Data Collector provides a script to perform a quick verification of the arm with the current contact probe, “Probing quick Check”. This script can be used any time the user needs to control the accuracy of the arm with any contact probe.

It contains 3 steps with different tests:

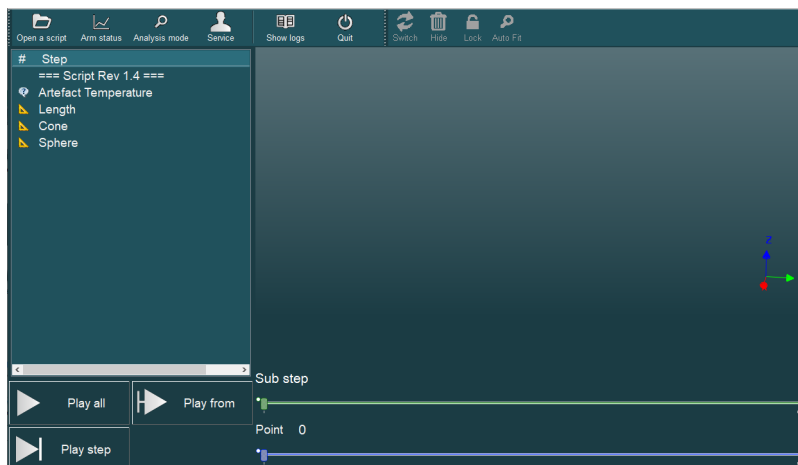
	Volumetric test <i>(only reference probe)</i>	5 measurements of the verification bar (option)
	Single point test	10 points on a seat
	Sphere test	9 points on the sphere

Start up

1. Select the script, and then run.



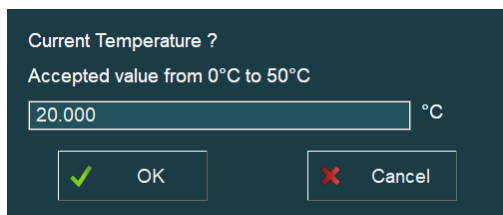
The System will prompt the user through each alignment step. Be sure to follow the instructions in each dialogue box.



Preliminary Step – Current Temperature

To check the accuracy with the best way, the thermal expansion of the artefact used can be considered.

2. Enter the current temperature.



Current Temperature ?
Accepted value from 0°C to 50°C
20.000 °C
OK Cancel

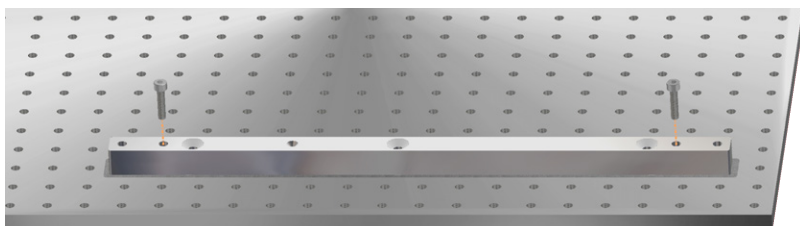


If the current temperature or the coefficient of expansion are unknown, keep the default temperature (20°C), then no compensation will be applied.

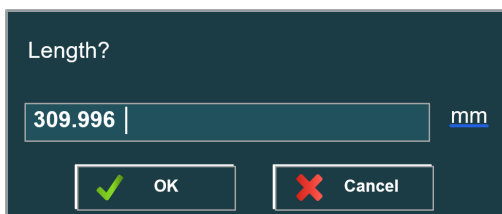
Volumetric Performance Test

2. Fix the verification bar, respecting the following conditions:

- Flatness of the support: 50µm max
- Tightening: 4N on each fixation holes.



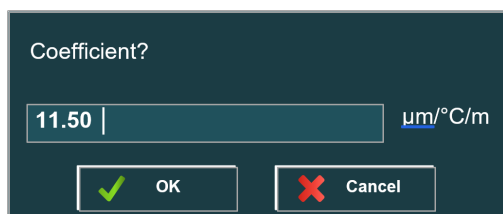
3. Enter the length value that will be used.



Length?
309.996 mm
OK Cancel



4. Enter the coefficient of thermal expansion of the artefact. If the coefficient is unknown, then 0 µm/°C/m shall be used to not apply any compensation.



Coefficient?
11.50 µm/°C/m
OK Cancel

5. Measure 5 times the length bar, moving each time the elbow of the arm.



6. After the last point, RDS Data Collector calculates and show deviations.

Name	Calibrated [mm]	Nominal [mm]	Measured [mm]	Deviation [mm]	Tolerance used [%]
0	309.9600	309.9600	309.9644	0.0044	23
1	309.9600	309.9600	309.9686	0.0086	45
2	309.9600	309.9600	309.9681	0.0081	42
3	309.9600	309.9600	309.9668	0.0068	36
4	309.9600	309.9600	309.9660	0.0060	31

CTE [$\mu\text{m}/^\circ\text{C}/\text{m}$]	Temperature [$^\circ\text{C}$]
11.500	20.000


Result within specs

Back
Next

	Results are within specs, the test passed.
	The results are within specs, but the measurement recommendations (reference positions, coverage of the artefact) were not respected. The test should be performed again.
	The results are too far from the specifications. The test can be run again. If the failure persists, contact your local service centre.

Press “Next” to go to next step, or “Back” to rerun the step.

Single Point Articulation Test

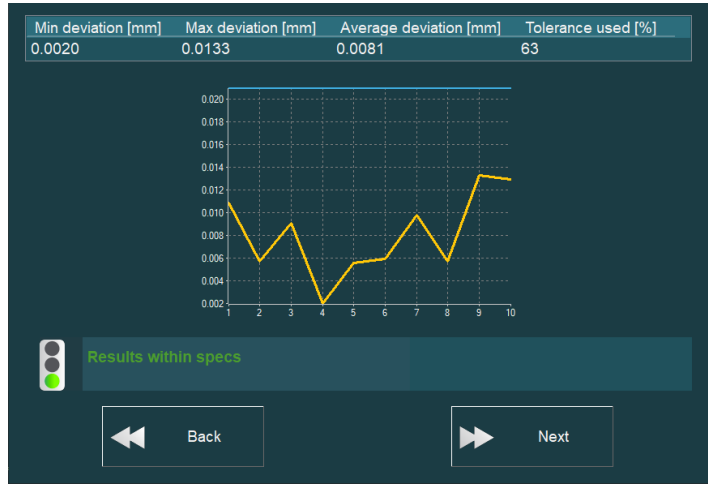
1. Fix a seat (cone) or use the cone available on the verification bar (option).



2. Measure the 10 points on the seat moving the axes of the arm as following:

Point		
Pt 1	Elbow left down	
Pt 2	Elbow left up	
Pt 3	Elbow overhead	
Pt 4	Elbow right up	
Pt 5	Elbow right down	
	Twist wrist 180° then same positions	
Pt 6	Elbow right down	
Pt 7	Elbow right up	
Pt 8	Elbow overhead	
Pt 9	Elbow left up	
Pt10	Elbow left down	

3. After the last point, RDS Data Collector calculates and show deviations.



	Results are within specs, the test passed.
	The results are within specs, but the measurement recommendations (reference positions, coverage of the artefact) were not respected. The test should be performed again.
	The results are too far from the specifications. The test can be run again. If the failure persists, contact your local service centre.

Press “Next” to go to next step, or “Back” to rerun the step.

Sphere Diameter Test

1. Fix the probing calibrated sphere (delivered with the arm) at mid-distance of the measuring range.



2. When prompted, enter the diameter of the sphere and validate.

Is sphere diameter OK?

 mm

☒ OK
 ☒ Cancel

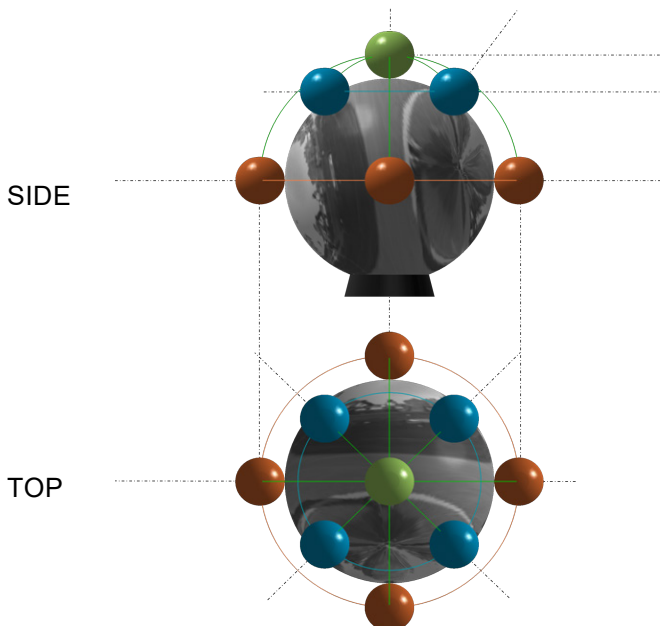
3. Enter the coefficient of thermal expansion of the artefact. If the coefficient is unknown, then 0 $\mu\text{m}/^\circ\text{C}/\text{m}$ shall be used to not apply any compensation.

Coefficient?

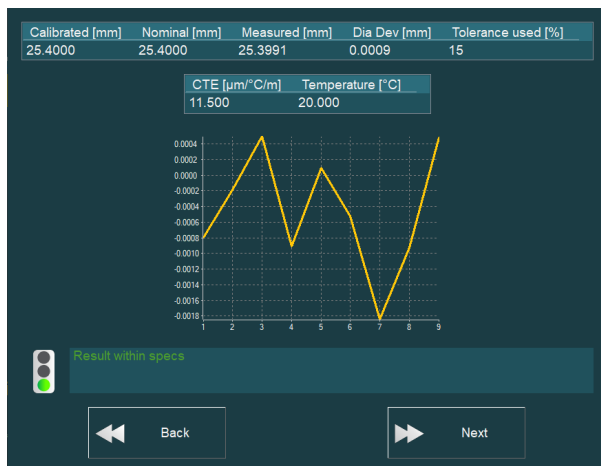
 $\mu\text{m}/^\circ\text{C}/\text{m}$

☒ OK
 ☒ Cancel

4. Measure 9 points on the sphere as followed:
 - 4 points on Equator equally distributed
 - 4 points at 45° Latitude, equally distributed, 45° rotated from Equator points
 - 1 point on top



5. After the last point, RDS Data Collector calculates and show deviations.



	Results are within specs, the test passed.
	The results are within specs, but the measurement recommendations (reference positions, coverage of the artefact) were not respected. The test should be performed again.
	The results are too far from the specifications. The test can be run again. If the failure persists, contact your local service centre.

Press “Next” to go to next step, or “Back” to rerun the step.

5.7.2. Verifying the Accuracy of Scanners

5.7.2.1. Scanner Quick Check

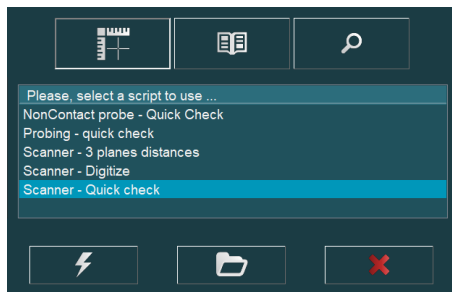
RDS Data Collector provides scripts to perform a quick verification of the scanner on the instrument. These scripts can be used any time the user needs to control the accuracy of scanning system.

Plane, sphere and distance tests can be performed.

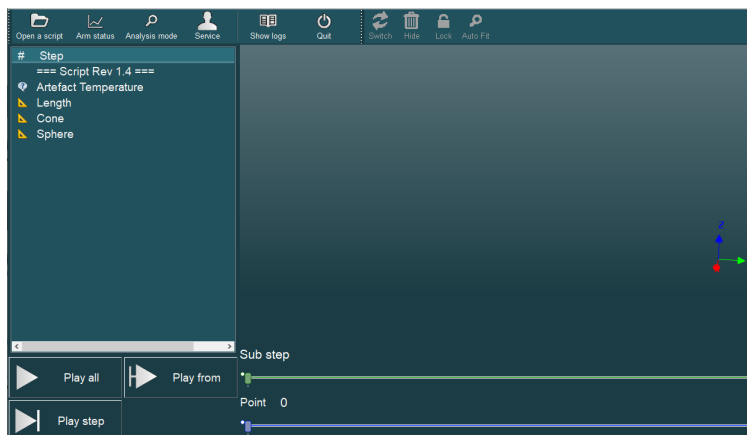
		Script			
RS2-6 / HP-L-8.9 AS1 / AS1-XL		'Scanner-Quick Check'	✓	✓	✓
AS1		'AS1 Sphere Check'		✓	
AS1-XL		'AS1-XL Sphere Check'		✓	
LAS		'LAS Sphere Check'		✓	
LAS-XL		'LAS-XL Sphere Check'		✓	

Start up

1. Select the script, and then run.



The System will prompt the user through each alignment step. Be sure to follow the instructions in each dialogue box.



Preliminary Step – Current Temperature

To check the accuracy with the best way, the thermal expansion of the artefact used can be considered.

Enter the current temperature.

Current Temperature ?

Accepted value from 0°C to 50°C

20.000

°C

✓ OK

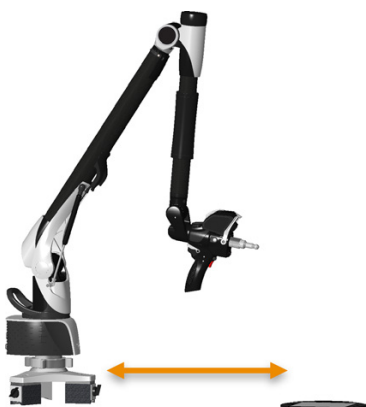
✗ Cancel



If the current temperature or the coefficient of expansion are unknown, keep the default temperature (20°C), then no compensation will be applied.

Plane Test (arm)

- Place the artefact plane at about half of the maximum reach of the arm.



- Take stripes on an artefact plane, giving several orientations to the scanner.



- Then RDS gives the deviations of the plane.

Plane #	bestfit [mm]	stddev [mm]	X [mm]	Y [mm]	Z [mm]	I	J	K
1	0.0648	0.0099	505.8982	423.0310	-77.5748	0.0074	-0.0083	-0.9999

⏪ Back

⏩ Finished

The standard deviation (stddev) is the most representative value to focus on. It gives a good evaluation of the scanning precision.

Sphere Test (arm)

1. Fix the calibrated sphere (delivered with the arm) at about half of the maximum reach of the arm.



2. When prompted, enter the diameter of the sphere and validate.

Is sphere diameter OK?

 mm

☒ OK
 ☒ Cancel

3. Enter the coefficient of thermal expansion of the artefact.

Coefficient?

 $\mu\text{m}/^{\circ}\text{C}/\text{m}$

☒ OK
 ☒ Cancel



If the coefficient is unknown, then 0 $\mu\text{m}/^{\circ}\text{C}/\text{m}$ shall be used to not apply any compensation.

4. Digitize the sphere, giving various orientations to the scanner and validate.



5. RDS Data Collector calculates and show deviations.

Calibrated [mm]	Nominal [mm]	Measured [mm]	Deviation [mm]
25.4000	25.4005	25.3901	-0.0104

CTE [$\mu\text{m}/^\circ\text{C}/\text{m}$]	Temperature [$^\circ\text{C}$]
5.500	23.626


Result within specs

⏪ Back
Next ⏩

	Results are within specs, the test passed.
	The results are within specs, but the measurement recommendations (reference positions, coverage of the artefact) were not respected. The test should be performed again.
	The results are too far from the specifications. The test can be run again. If the failure persists, contact your local service centre.

Press “Next” to go to next step, or “Back” to rerun the step.

Sphere Test (tracker)

- When prompted, enter the diameter of the sphere and validate.

Is sphere diameter OK?
 mm

☒ OK
 ☐ Cancel

- Then scan the sphere, giving several orientations to the scanner.



- RDS shows the errors, and each value is checked and highlighted according to the scanner specifications.

Face	RadDev (mm)	2 σ -STD (mm)	X	Y	Z	Coverage (%)
Left	0.177	0.263	-4716.043	1409.885	-122.492	55
Top	-0.571	0.406	-4715.937	1410.150	-122.298	61
Back	0.165	0.198	-4716.007	1410.453	-122.442	49
Right	0.115	0.233	-4715.701	1410.183	-122.337	61
All Faces	-0.136	0.488	-4715.782	1410.165	-122.233	87

☒ Finished

Face	Used face of the LAS	
DiaDev	Error of the diameter value	
2 σ -STD	Standard deviation of all the errors	
X;Y;Z	Coordinates of the digitized sphere	
Coverage	Percentage of the sphere digitized	
	No highlight	Coverage is fine
	Yellow	Coverage below the recommendations
Values check	On RadDev and 2 σ -STD	
	No highlight	Inside specs
	Yellow	Out of specs, repeat or realign the scanner (faulty face).

Volumetric Distance Test (arm)

1. Use a calibrated ball bar and place it at about half of the maximum reach of the arm.



2. Enter the calibrated distance between both spheres and enter their diameters.

Length? 309.996 mm ✓ OK ✗ Cancel	Is sphere diameter OK? 25.400 mm ✓ OK ✗ Cancel
---	---

3. Enter the coefficient of thermal expansion of the artefact.

Coefficient?

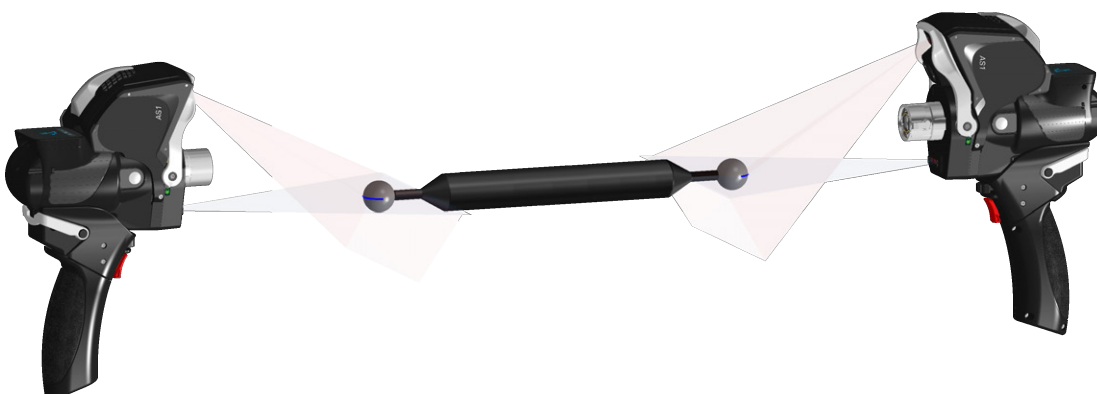
11.50 | $\mu\text{m}/^{\circ}\text{C}/\text{m}$

✓ OK ✗ Cancel



If the coefficient is unknown, then 0 $\mu\text{m}/^{\circ}\text{C}/\text{m}$ shall be used to not apply any compensation.

4. Scan both spheres (do not forget to validate each sphere with the right button).



5. RDS shows the errors on the length and on each sphere.

Length		
TheoLength	Length	Deviation
299.9750	299.9412	0.0338

Spheres quality						
Sphere#	Max	Average	StdDev	TheoDiameter	Diameter	Deviation
1	0.1671	0.0475	0.1231	25.4000	25.4267	0.0267
2	0.2446	0.0762	0.0775	25.4000	25.4345	0.0345

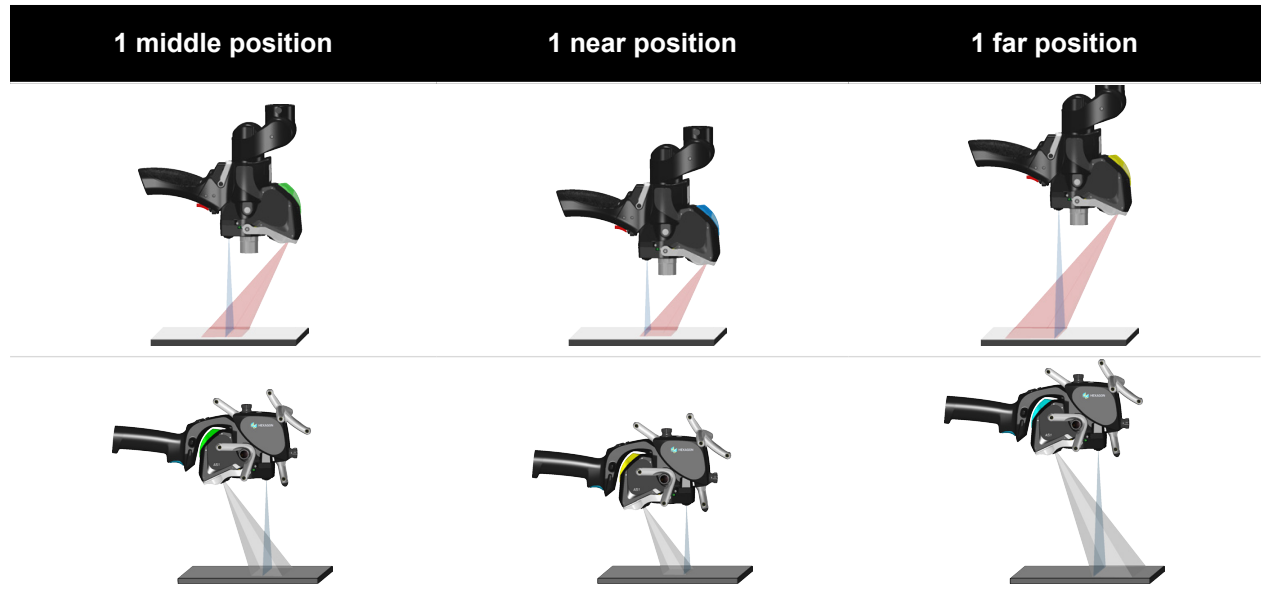
⏪ Back
 Next ⏩ Finished

The Length deviation is the most representative value for this test. It can be compared to the E_{UNI} specification.

Press “Next” to go to next step, or “Back” to rerun the step.

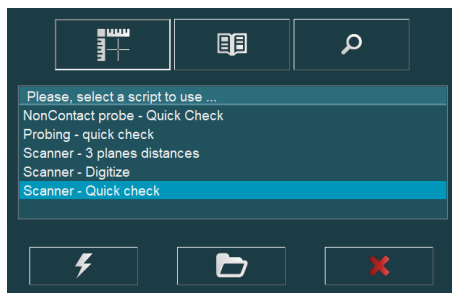
5.7.3. Scanner – 3 Planes Distance

A deeper test for scanners can be used to investigate on scanning loss of accuracy, consisting by scanning an artefact plane 3 times.

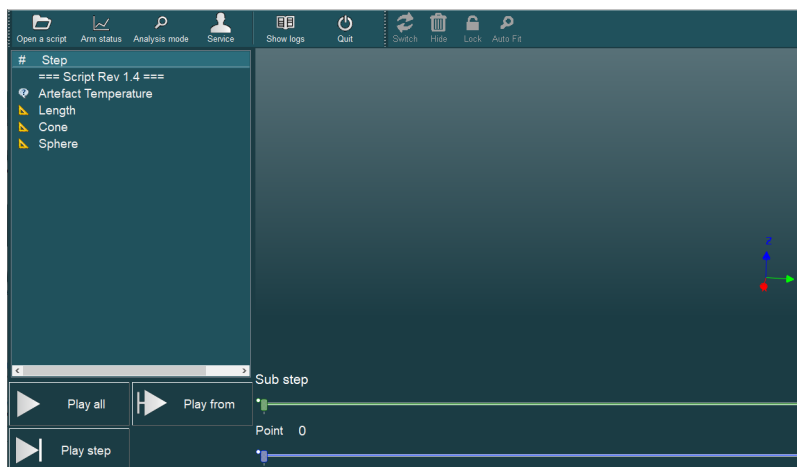


Start up

1. Select the script, and then run.



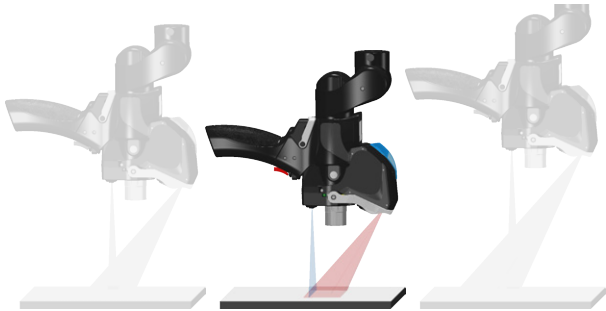
The System will prompt the user through each alignment step. Be sure to follow the instructions in each dialogue box.



- Digitize the plane, keeping the scanner at a mid-range distance from the plane, with one orientation only. Press Next or use right button on the arm to proceed next sub-step.



- Digitize again the plane, keeping the scanner near the plane, with the same unique orientation as before. Press Next or use right button on the arm to proceed next sub-step.



- Digitize again the plane, keeping the scanner far from the plane, with the same unique orientation as before. Press Next or use right button on the arm to proceed next sub-step.



- Once the 3 planes are digitized, RDS shows the errors of each plane and the deviations between each plane and the global one.

Step	BestFit	StdDev	Gap (mm)	Angle (°)
All Planes	0.084	0.031		
0	0.055	0.009	0.019	0.018
1	0.044	0.005	0.029	0.016
2	0.044	0.009	-0.034	0.004

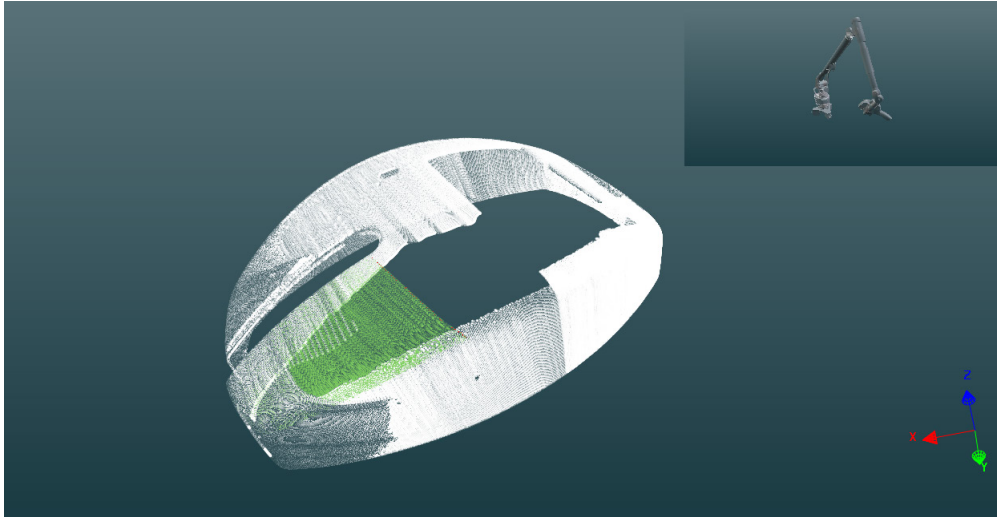
⏪ Back
⏩ Finished

No highlight	Inside specs
Yellow	Out of specs, repeat the check or realign the scanner from the faulty face.

5.7.4. Scanner – Digitize

In case the measurement software doesn't contain any RDS plug-in to scan directly in, or if the application software is not available, digitizing can be performed inside RDS Data Collector with a special script made for simply digitize and [export a cloud of points](#).

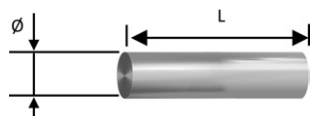
Simply run the script then proceed with the scan.



A second execution of the script overwrites the existing data. Only end the scan once you are certain not to forget data or export the existing data before running again.

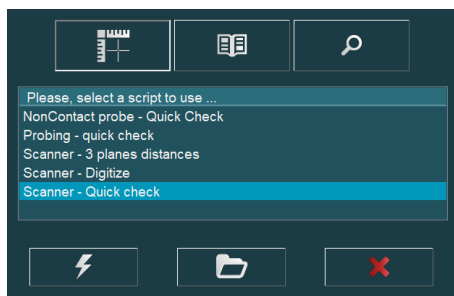
5.7.5. Verifying the Accuracy of the Tube Probe

Tube probes (NCP) should be checked on a straight tube artefact, with a constant and known diameter, with ends perfectly perpendicular to the axis of the cylinder, and with a known horizontal length.

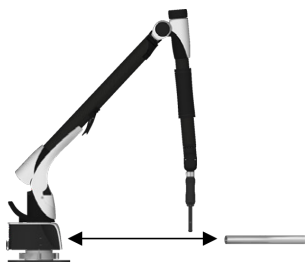


Preparation

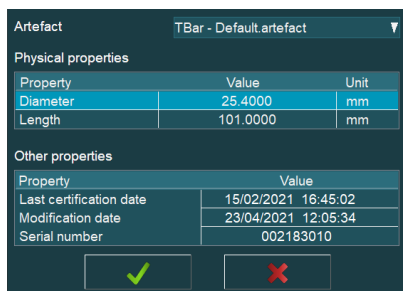
1. Select the script, and then run. The System will prompt the user through each alignment step. Be sure to follow the instructions in each dialogue box.



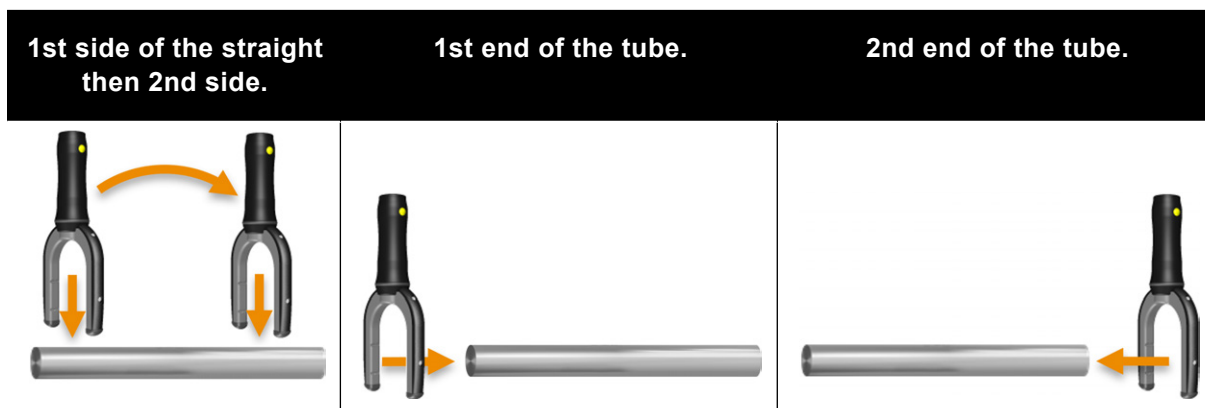
2. Place and fix the tube artefact in front of the arm.



3. Select the artefact and / or enter the diameter and length of the T-bar.



4. Measure both sides of the straight and then both extremities.



5. RDS displays the measured length. Check the deviations according to the specifications .

#	Measured length	Theoretical length	Deviation
1	241.9189	241.9640	- 0.0451


Back


Finished

Then press “Back” to measure again or “Finished” to proceed with the next step.

6. RDS Toolbox

6.1. Presentation



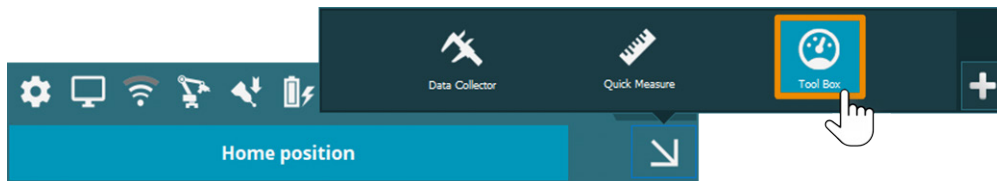
Windows® firewall must allow RDS Toolbox to communicate with networks. When Windows® prompt the security alert, click on “Allow Access”.



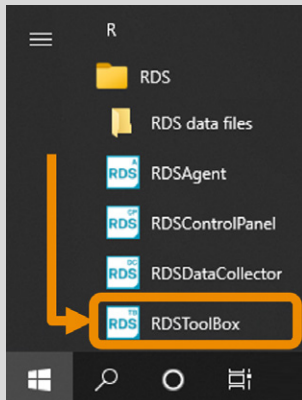
RDS Toolbox is the module for surveying and investigating the state of the arm and perform maintenance operations.

Open RDS Toolbox

To access RDS Toolbox, open the RDS Agent (RDS icon on the notification bar) and select “RDS Toolbox” in the shortcuts.



RDS Toolbox can be also opened from “start menu > Programs > RDS > RDS Toolbox”.



Components of RDS Toolbox

RDS toolbox provides 5 main usages:

Publications	Publication of various news and links
Control Panel	Access to the configuration of the arm
SMART	Powerful survey system to prevent or diagnose any issue
Vault	Management of saved data (including SMART data), synchronized with a server.
Maintenance	Maintenance and analyse tools, using direct connection to the arm or using the packages from the Vault.

3 groups of tiles give access to the different function panels.

- News tiles – RDS Toolbox can collect news and information from Hexagon Server database (internet connection required) to give advices to the user.
- Main arm configuration, Vault and SMART tiles.
- Other maintenance tiles – specific programming, diagnose and analyse functions.

User Profiles

Depending on the RDS User profile, RDS Toolbox provides 2 levels of tools.

	RDS Profile	Available tools	Activation
User	Standard Advanced Support	Standard tools	(default)
Technician	Service	Advanced tools for service	(requires a valid activation code).

This manual only describes the End-User profile.



For all the specific functions for Service profile, please read RDS Technician manual.

News & Links

To facilitate the routing of useful news regarding the instrument, the application, tips, ... RDS Toolbox receives and provides news and links to the user.

Arm Status

This tool is a quick view of the current status of the connected arm.

Control Panel

RDS Control Panel is dedicated to the configuration of the arm.

Vault

RDS collects data from compensations or calibrations processes, as well as many indicators in real time from the instrument (see after). RDS Vault is the exchange module, which synchronizes those packages of data to the Hexagon Portable arms server and allows downloading them for expertise goal.

In RDS Toolbox, the Vault is the tool to manage the packages download and use.

SMART

SMART is one of the main items of RDS Toolbox. SMART collects information from the instrument, and through the vault synchronizes them with the Hexagon Portable Arms database.

Then that information can be consulted at any time in RDS Toolbox, on the same computer, or even on any other computer via a download.

One first aim is to let the user of the maintenance people checking and analysing indicators of the arm, then to locate any issue or to survey the good health of the arm.

A second application is to warn the user in any case of potential damage. When an indicator goes outside the reasonable limits, RDS Toolbox shows immediately a warning.

Maintenance

RDS Toolbox contains a large part of maintenance tools. Used for programming components, surveying in real time the behaviour of electronic signals, consulting Log files, ...

Arm Selection

By default, RDS Toolbox always refers to the currently connected arm (the arm status shows the currently connected arm, SMART, shows information regarding the same connected arm...).

However, as RDS Toolbox can collect and memorize information from arms previously connected or even from other arm through the vault import, it is possible to view information regarding another arm. That is why a list of arms is available.



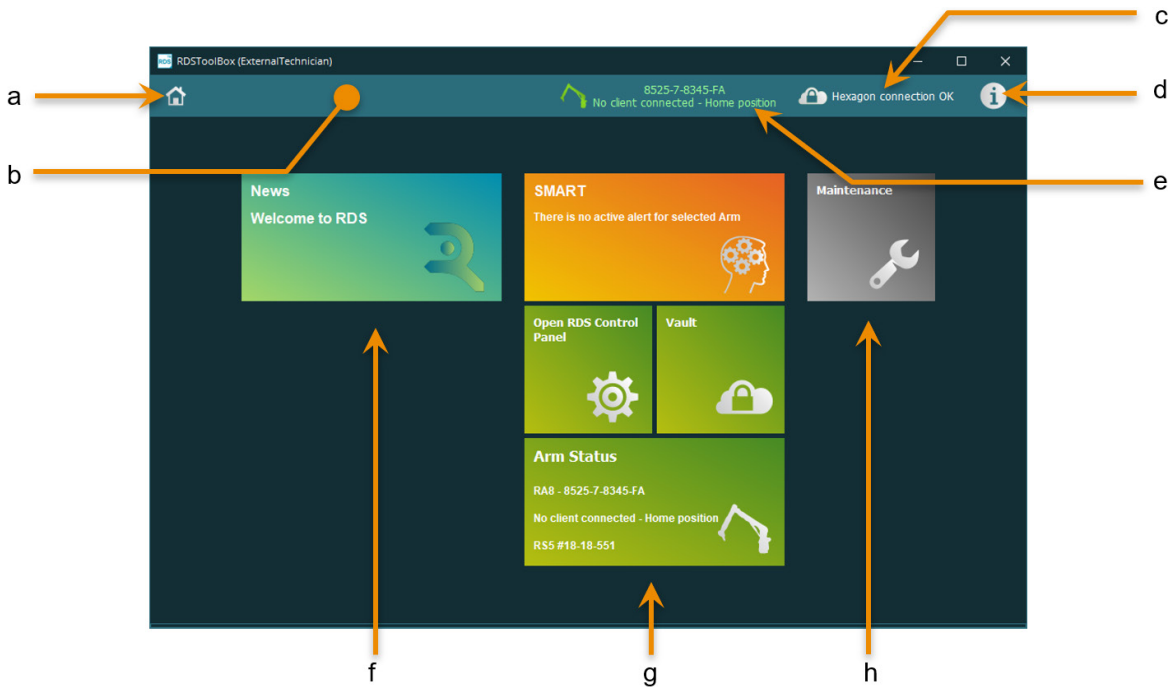
The legacy arms (Multi Gage, Infinite, Infinite2 and Stinger) are not supported by RDS Toolbox.

6.2. RDS Toolbox Interface

6.2.1. Main Panel

When entering RDS Toolbox, the main panel appears. It is mainly composed by 3 groups of tiles:

- News and links tiles
- Main tools
- Maintenance tiles
- 2 buttons at the top right can be used to select the arm and view the connection status.



a	Menu Control	Shows the current menu.
b	Ribbon	Displays the choice of arm...
c	Connection status	Shows if the computer is currently connected to the Hexagon Server.
d	Help	Button to display a tooltip about the current screen.
e	Arm selection	Shows the current arm and gives the ability to select another arm in the memory.
f	News & links tiles	Information tiles, contains all the received news and several official links.
g	Main tools tiles	This is the centre of RDS Toolbox, contains the main functions such as the current status of the arm, the access to RDS control panel, the management of the vault, and the management of SMART.
h	Maintenance tiles	Deployment of all the maintenance tiles.

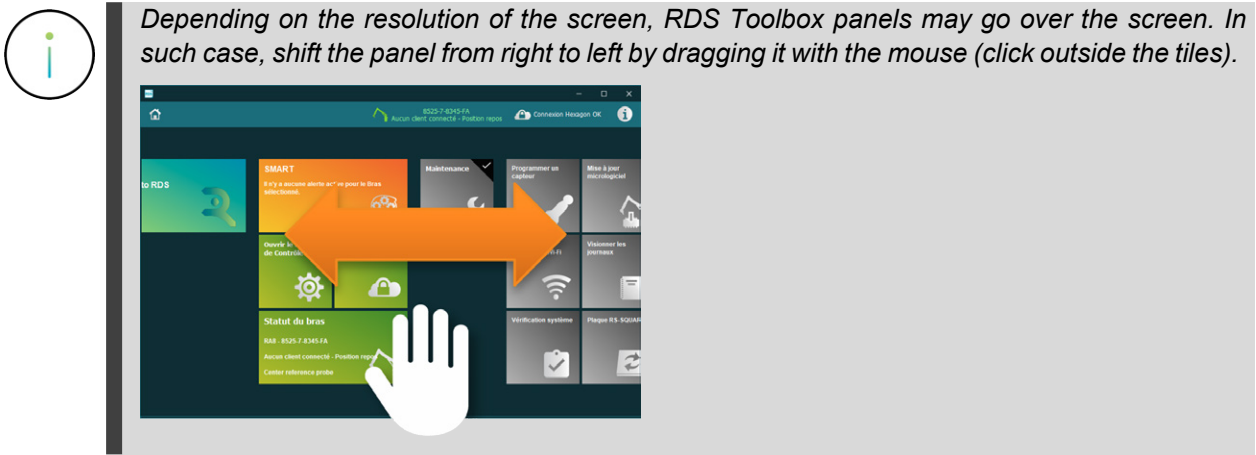
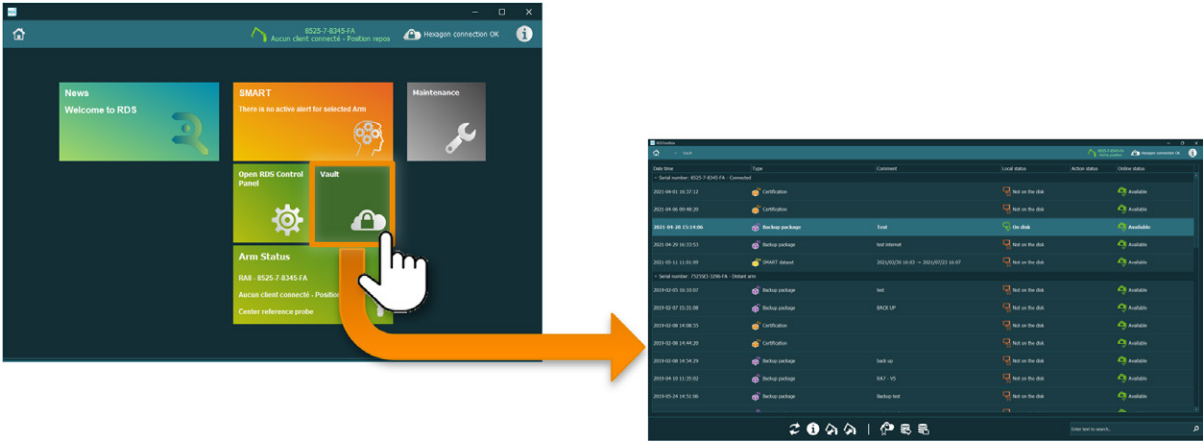
6.2.2. Menu Navigation

Quick Navigation Guide

Open a panel	Click on the tile Click on the Action line button	
Go back to the upper level	Click on the Exit button on the Action line	
Go back to the Home panel	Click on the Home button on the Ribbon	

Use Tiles

In RDS Toolbox, to open a panel, or activate a link, simply click on the desired tile.



Ribbon

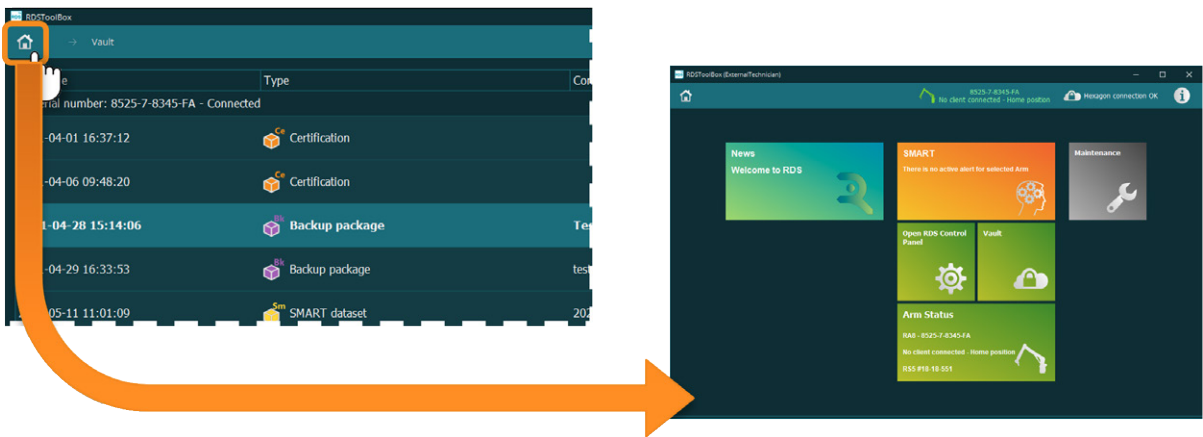
On the top of the screen, the current menu is displayed.



- a. Home, returns to the home panel (no ribbon choice)
- b. Menu levels
- c. Current panel, simply reminds the current menu (no ribbon choice)

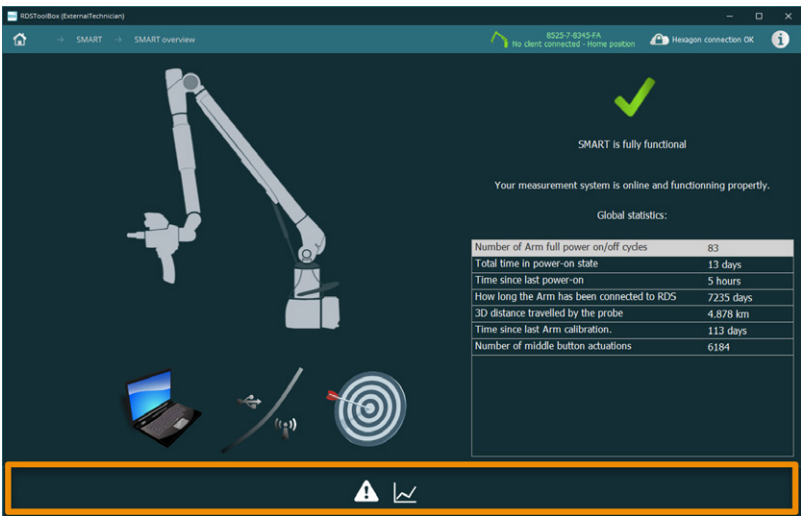
Click on Home to display the home panel and use the tiles.

To go back to the main panel, simply click on the Home button.



Action Line

On most panels, is located a band that contains the action buttons. RDS Toolbox automatically shows the useful buttons.



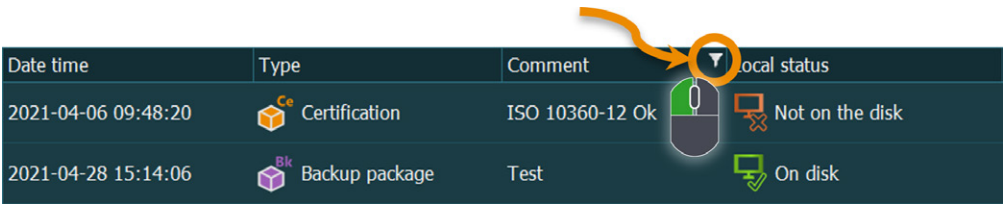
6.2.3. Spreadsheets Management – Search (Ctrl+F)

All over RDS Toolbox panels, items are displayed in a list. All the lists are managed the same way, and provide some tools to easily find the desired item:

- Filtering
- Sort by list
- Show / Hide

Lists Filtering

On most tables displayed in RDS Toolbox, filters can be applied to reduce it. Place the pointer over the column header and click on the filter symbol.



Date time	Type	Comment	Local status
2021-04-06 09:48:20	Certification	ISO 10360-12 Ok	Not on the disk
2021-04-28 15:14:06	Backup package	Test	On disk

Then select in list the wanted filter.

Available values

Values

Numeric Filters

Enter text to search...

☐ (All)
 ☐ Not on the disk
 ☒ On disk

Clear Filter

Close

Customized filtering

Values

Text Filters

Between

From

2012-10-01 15:57:18

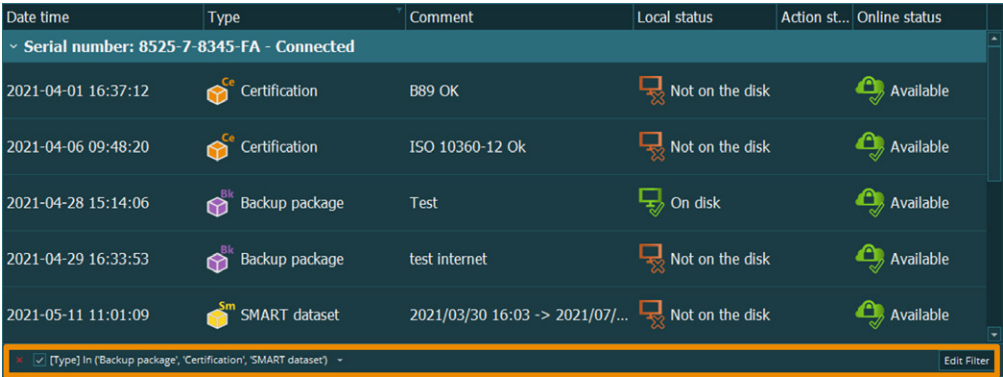
To

2021-07-20 16:36:36

Clear Filter

Close

At the bottom of the screen, is displayed the current filter, with possibilities to select, edit and remove.



Date time	Type	Comment	Local status	Action st...	Online status
Serial number: 8525-7-8345-FA - Connected					
2021-04-01 16:37:12	Certification	B89 OK	Not on the disk		Available
2021-04-06 09:48:20	Certification	ISO 10360-12 Ok	Not on the disk		Available
2021-04-28 15:14:06	Backup package	Test	On disk		Available
2021-04-29 16:33:53	Backup package	test internet	Not on the disk		Available
2021-05-11 11:01:09	SMART dataset	2021/03/30 16:03 -> 2021/07/...	Not on the disk		Available

☒ [Type] in ('Backup package', 'Certification', 'SMART dataset')

Edit Filter



Once a filter is activated, the filter symbol appears on the column header:



Lists Sorting

On some of the tables displayed in RDS Toolbox, the lists can be sorted by each item.

Click on the column header that has to be used to sort, a symbol on the column header (▼ / ▲) shows which column and which order is used.

Search (Ctrl + F)

As numbers of software, a quick search function can be used with the shortcut Ctrl + F. Even if no “Search” area is visible, Ctrl + F will provide a search function by keyword.

Any time the filter symbol is present, the search function can be activated:

1. On the keyboard press Ctrl + F: a search area appears.

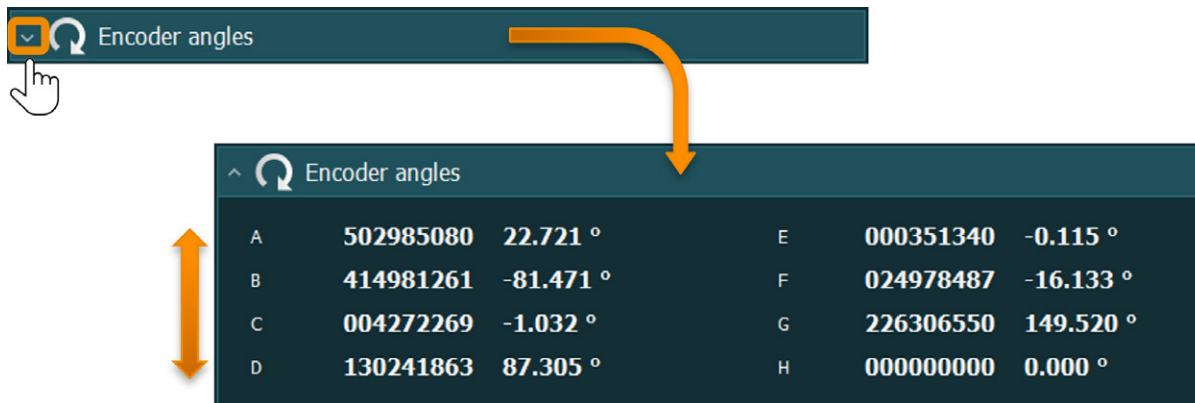


2. Enter the keyword: the list is automatically reduced.



Groups Expand / Reduce

In some panels, the information is grouped (ex: Arm status). In such case, it is possible to expand or hide the content of a group by clicking on the arrow on the left.



6.3. Arm Management

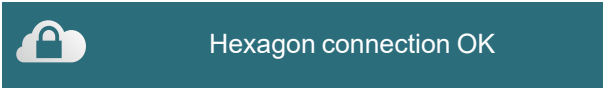
6.3.1. Connection to the Server

To be able to synchronize the Vault packages and the news, RDS Toolbox needs to be connected to the Hexagon Portable Arms Server (“Hexagon Server”). A simple standard internet connection is needed.

When the computer is not connected to internet, the SMART data and all the new Vault packages are stored locally on the computer, to be synchronized as soon as the computer gets a connection.

Once the computer is connected to internet, RDS Toolbox automatically synchronize the Vault content (packages up and down) and collects and displays any new publications.

On the top right corner of RDS Toolbox, is shown the status of the connection to the Hexagon Portable Arms server.



6.3.2. Local and Distant Arms

RDS Toolbox doesn’t manage only the currently connected arm but stores the history of all the connected arms on the computer. Thus, it is possible to get information of any arm that has been previously connected to the computer. All these “historic” arms constitute the local arms database.

However, the other arms (“Distant arms”) can still be managed by downloading their data from the Hexagon Server.

Type	Sub-type		
Local arms		Connected arm	Currently connected arm.
		Off-line arms	Arms that have been previously connected.

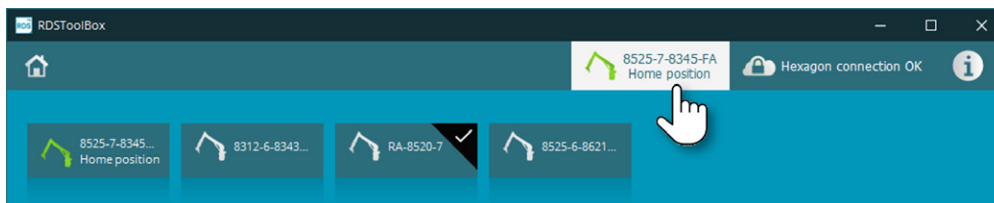
6.3.3. Arm Selection

RDS Toolbox is not limited to the currently connected arm but can be used to survey any local arm.

RDS Toolbox by default displays the information for the currently connected arm.

Especially for SMART purpose, RDS Toolbox memorizes all the previously connected arms, and can display information on those Off-line arms.

On the top right of the screen, an arm selection can be done: click on the Arm selection button, the ribbon shows all the available arms in memory.



Depending on the status of the selected arm, the icon colour changes:



The Arm is connected and ready



The Arm is connected, but a warning is currently displayed (Rest position, error, alert...) about it or Maintenance connection is in use.



The Arm is Off-line

Once an arm is selected, RDS Toolbox panels will display the information of this arm.



The selection of Off-line arms can be used only for SMART and Arm status functions, all other Panels are not accessible.



If the serial number of the local arm is not recognized, it is replaced in the list by the type and size of the arm, as it appears in the Arms selection list.



6.3.4. Maintenance Connection

Some tools of RDS Toolbox require a special connection. When using those tools, the arm enters in a “Maintenance connection status” and the connection with RDS service itself is temporary hung on.

The tools that are using this maintenance connection are:

Type			
Upgrade of Firmware			
Configure Wi-Fi chipset			
Program probe			
System Check			

The “Maintenance connection” is reminded on the Arm selection box.



Once the maintenance process is finished or cancelled, the arm goes back to a normal connected status.

6.4. RDS Toolbox Information Tiles

RDS Toolbox provides various information for the user:

- News& links about Hexagon products, new versions of software, possible hardware retrofits...
- Currently connected arm information

6.4.1. News & Publications

News Notifications

When the computer is connected to Internet, RDS Toolbox can receive publications of news. As soon as a new publication is received, a notification appears on the bottom right of the screen.

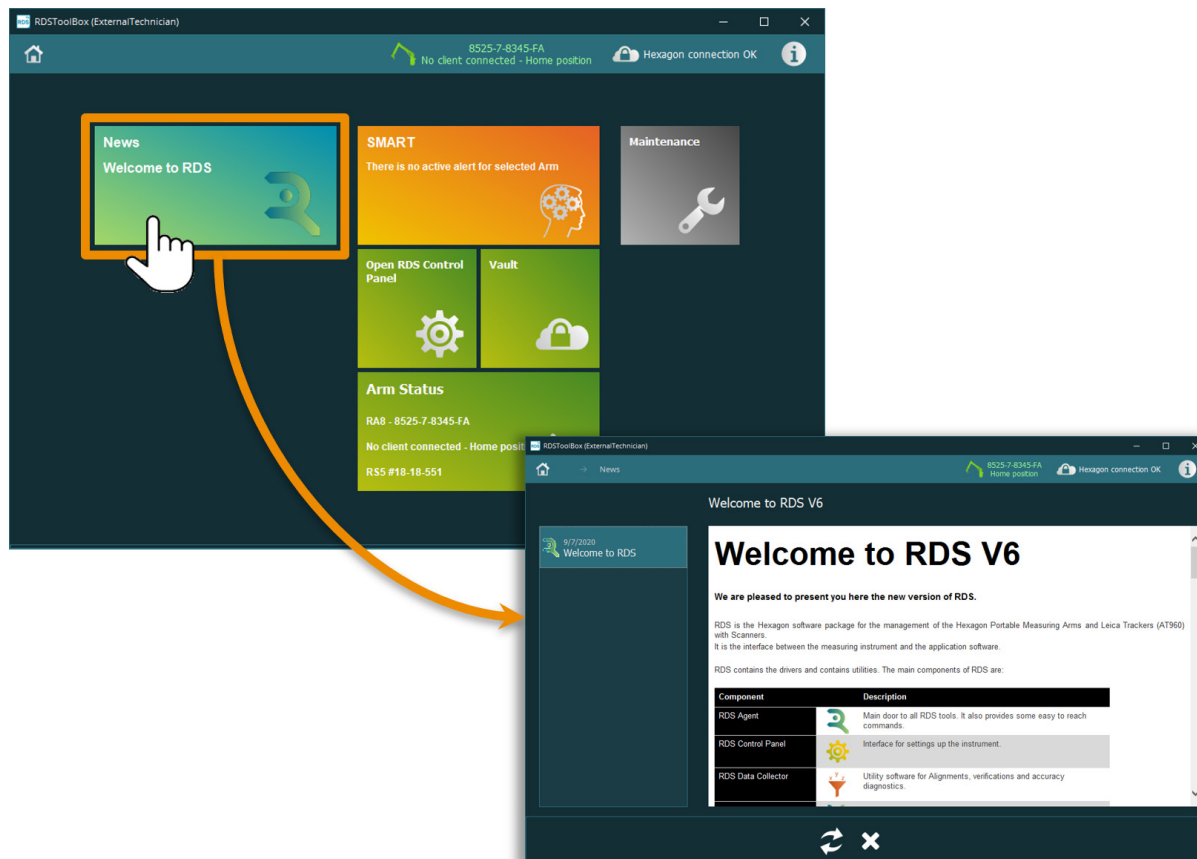
Click on the open button to see the details of the publication. (See [1.7 - RDS Notifications](#) for more details)



The publications of news can be deactivated in the [RDS Control Panel > SMART](#) tab.

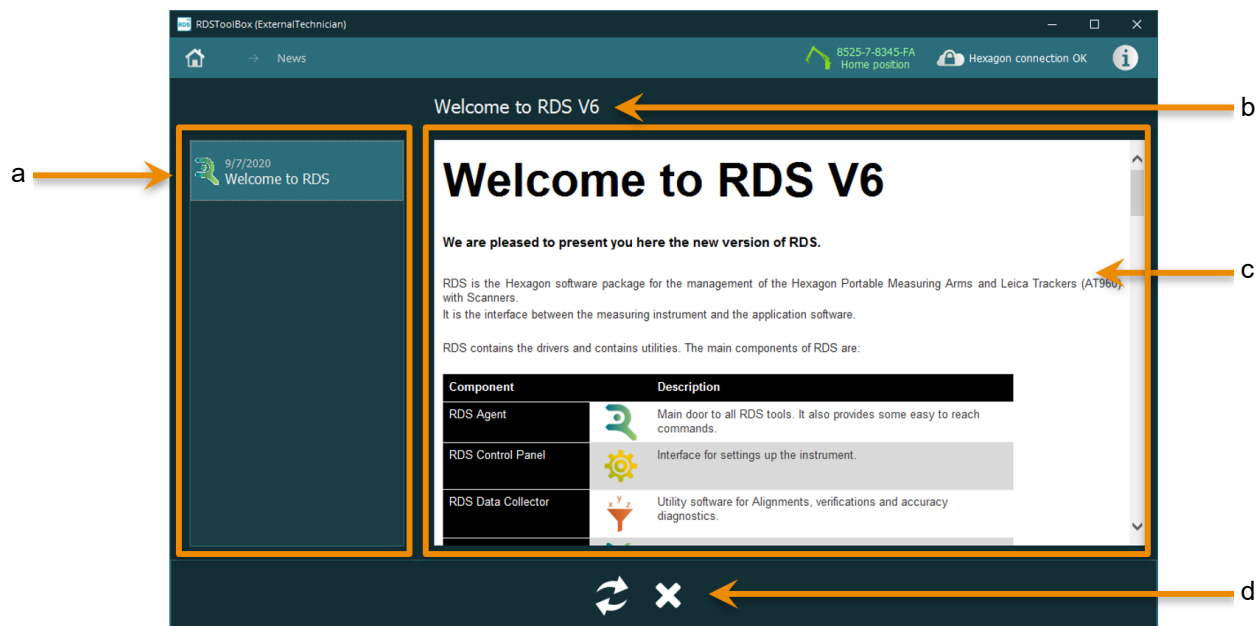
RDS Toolbox Home Panel

On the RDS Toolbox home panel, a tile is dedicated to the news (in which all the latest news titles are scrolling). Click on the tile to open the Publication panel (see after).



Publications Panel

From the Home panel, click on the News tile to open the publications screen:



Here are shown all the news and links publications.

- List of publications
- Title of the current publication
- Publication window
- Pages control buttons (Action line)

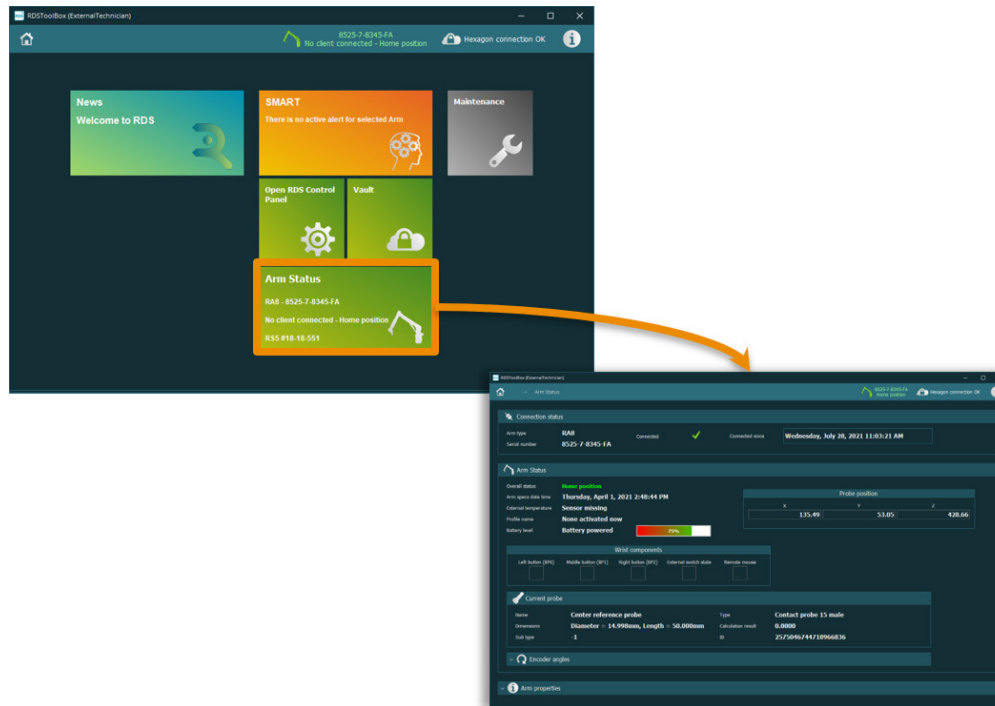
The list of news is sorted by publication date. Click on the news to display in the publication window.

The publication window behaves like an internet browser, the publications are html pages, with text, pictures and eventually internal or external internet links. For example, a publication may contain a link to the Hexagon web site.

	Return to previous web page
	Go again to the next page
	Refresh the current page
	Stop the scrolling

6.4.2. Arm Status

Click on the Arm status tile. This screen shows information about the selected arm.



The Arm Status can be used both for the currently connected arm and for an off-line arm.



6.4.2.1. Standard Information

Connection Status

Arm type		Type of system (NCA), connection (USB / Wi-Fi) and arm.
Serial number	 	Unit identification number of the arm (only once it is identified by the Hexagon Server) (see manual of the arm for the description).
Connected	 	Shows if the arm is connected or not.
Connected since		Date and time of the establishment of the current connection.
Seen last time on		Date and time of the end of connection of the Off-line arm.

Arm Status

Overall status		Information about connection and status (ex: "rest position").
Armspecs date time		Date and time of last arm compensation.
Profile name		Arm profile in use.
External temperature		Temperature measured by the arm.
Battery level	 	On power supply / on Battery + % of the full charge.
Position		XYZ Coordinates of the probe centre point.
Wrist buttons state		Shows if the button is pressed or released.
Remote mouse		Shows if the arm mouse is active or not.
Video capture		Shows if the wrist camera is on or not.
Head light		Shows if the wrist head light is on or not.

Current Probe

Name		Designation of the current probe
Type		Hard contact, trigger, scanner, or NC-Tube probe
Dimensions		Diameter and length of the probe
Calculation result		Precision of the probe (residual error of the last probe alignment)
Sub type		
ID		Identification number of the probe

Axes (deploy)

A to H		Raw value and angle (radians) of each encoder
--------	---	---

6.4.2.2. Arm Properties (deploy)

Main Properties

Serial number	 	Identification of the arm (see manual of the arm for the description)
Type	 	Type of arm (RA7 / RA7SE / RA7SI / RA8-6 / RA8-7...)
Connected first time on	 	Date and time of the first connection of the selected arm on the computer
Performance level	 	Level of equipment and accuracy of the arm (83 / 85 / 87...)
Brand	 	(Hexagon / Romer / Cimcore)
Volume	 	Measurement volume of the arm in mm
Revision	 	Version of arm
Component set	 	Steps of the history of arm (each time the hardware or firmware of one component is changed, a new set is created).
Type, address...	 	Properties of each electronic component of the arm.

6.5. RDS Toolbox Vault – Secured Area (arm)

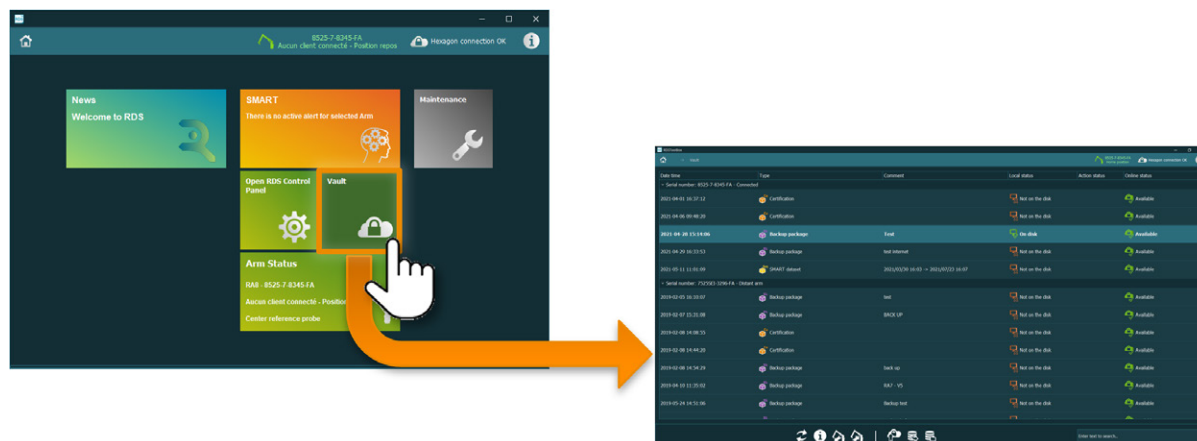
RDS Toolbox contains a security system that permits to create security packages in a vault.

This system permits do save arm compensation data, calibrations or arm compensation measurement (from RDS Data Collector), but also all the survey indicators memory (SMART) into such packages.

Those packages are in a first step stored locally on the computer, in order to be sent to the Hexagon Portable Arms server (Hexagon Server Database) through an internet connection. The synchronization of the data is automatic, no set-up to do.

In return, packages are available for downloaded from the Hexagon Server to a local computer. The vault of RDS Toolbox displays so the list of available packages for all the local arms. For that, the arm has to be added in the list of the available arms, then all the packages of this arm become available (but downloaded only when necessary).

To access, from the main menu of RDS Toolbox, click on the Vault tile.

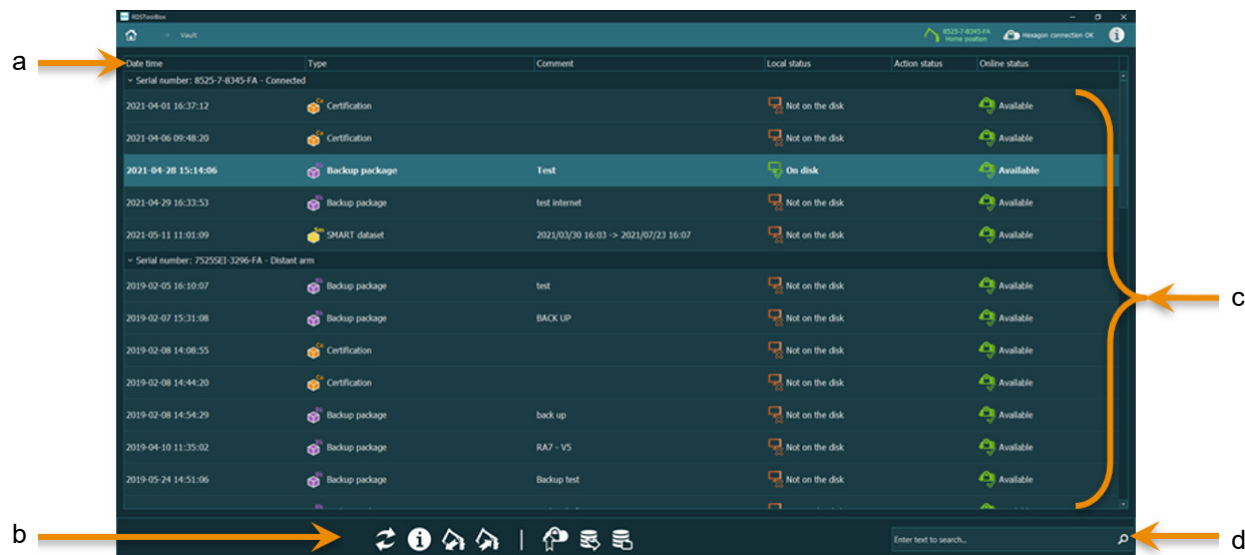


6.5.1. Vault Screen Description



Some items may be available only for Technician profile. Please refer to the Engineer manual.

When entering the vault, RDS toolbox shows the list of all the packages for the available arms. All the packages are grouped by arm. By default, only the local arms (connected or off-line) are displayed, and only the selected arm is deployed. However, the technician profile () gives the possibility to add any distant arm in the list of the vault.

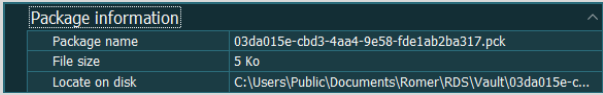


- Header of the list – filters by column
- Action buttons
- List of available packages grouped by arm
- Search filter (Ctrl+F) for available arms

Columns Description

Serial number	Serial number of the arm in the package.
Date time	Date and time of creation of the package.
Type	Type of package (Armspecs / Calibration / Profile / Diagnosis ...see after).
Comment	Comment entered at the creation of the package.
Local status	Shows if the package is present or not locally on the computer. If not on the disk, RDS Toolbox simply notifies that the package is available on Hexagon Server and can be downloaded. The package is downloaded only is necessary.
Action status	Notification about the packages locally present on the computer (Downloaded / Created / Synchronized...).
Online status	Only displayed when RDS Toolbox is online. Shows if the package is available or not on Hexagon Server database.

Buttons Description

	Refresh	Refreshes the current list of packages for all the current arms
	Package information	Gives details about the package ID and location (= right click on the package line) 
	Add Arm	
	Remove Arm	 Used to remove manually the selected DISTANT arm from the list.
	Download	Downloads the selected package locally on the computer
	Backup	Creates a backup of the memory of the connected arm
	Restore	Restores the memory of the arm with the selected package
	Extract content	 Extracts the content of the package into RDS Data Collector environment.
	Open report	Opens the calibration report
	Switch to SMART database	Switches RDS Toolbox in Database mode with the selected Dataset package
	Upload SMART dataset	Does a manual upload of the SMART dataset to the Hexagon Server (on the request of a Hexagon technician)
	Dump SMART dataset	Retrieves and compress the local SMART dataset and main Log files to a zip file, which can be sent to a Service centre.
	Open SMART dataset	Opens a SMART dataset (from a direct SMD dataset file or from a zip file)

6.5.2. Packages

A package (extension *.pck) is a group of files that can be backup, stored, uploaded, downloaded, restored. It can contain compensation data, armspecs, ... for any maintenance purpose.



The Memory of the arm is composed by 2 blocks:

- *A UserSpecs block (default used data)*
- *A Backup specs block (Last Service Centre compensation data)*

In case the UserSpecs block is damaged or not readable, RDS will try to use the Backup specs (and will prompt a warning). In case of wrong operation on the UserSpecs, the Backup Specs can be restored into the UserSpecs block and restore the memory as it was after the last compensation by the Service Centre. If the complete memory is damaged, it is possible to download the package and restore it.

6.5.2.1. Types of Packages

	Type	Description
Co	 Compensation	 RDS Data Collector raw data + Armspecs
Ac	 Accessory	 RDS Data Collector raw data from sensor alignment + Armspecs
Cal	 Calibration	RDS Data Collector Raw data + Armspecs
Op	 Optimization	 RDS Data Collector Raw data + Armspecs
Bk	 Backup	 Backup specs block of the arm
Pr	 Tune-up / Profile	
Fa	 Factory specs	  Original Backup + User specs blocks
Tc	 Temp compensation	
Sm	 SMART Data set	All SMART indicators for one period.

 *Technicians only*



Some other types of packages can be used only in Technician profile. Please refer to the RDS Technician manual.

Backup Package

A backup package is only manually created by the user in RDS Toolbox through the vault panel. It can be created at any moment, by end-user or by Technician profile.

A backup package contains only the user specs blob of the arm memory.

SMART Data Set Package

The SMART Data set packages can be considered as a complete backup of the whole system (Arms + computers) for a defined period. It may contain all the survey information for the arm.

It means that SMART collects data from the arm and from the computer. On a first step, the data are store on the memory of the arm and on the computer, then after the synchronization with the Hexagon Server, all the data concerning the arm (that may come from several computers) are merged into a SMART DATA SET package. One SMART DATA SET package refers to a period; Once the current SMART DATA SET package has reached a maximum size, a new package is automatically created, to collect new SMART data.

It means that for one arm, several SMART DATA SET Packages may be available, one per a certain period.

Period	Depending on the quantity of information
Arm concerned	Only the selected arm
Computer information	The package may contain information from several computers if the arm has been connected to several ones.
Arm information	All the SMART indicators

6.5.2.2. Status of a Package

Each package has a status flag. When a package is created on the vault, a “Not synchronized” status is given, until RDS automatically send it through internet. Then the status switches to “Synchronized”.

Local Status

	Not on disk	The package is available online but is not currently downloaded. To be able to use it, it must be downloaded.
	On disk	The package is currently on the local computer (downloaded or created on the computer) and can be used.

Online Status

	Available	The package is available online but is not currently downloaded. To be able to use it, it must be downloaded.
	Not online	The package is currently on the local computer (downloaded or created on the computer) and can be used.

Action Status

	Downloaded	The package has been successfully downloaded and can be used.
	Uploaded	The created package has been successfully uploaded to Hexagon Server
	Error	Last try to download / upload failed

Typical Situations

Local	Action	Online	Explanation
 Downloaded		 Available	The arm has been added to the list, and the package is available for download to be used.
 On disk	 Uploaded	 Not on line	The package has been created on the computer and has been successfully synchronized with Hexagon Server but has not been yet implemented.
 On disk	 Uploaded	 Available	The package has been created on the computer, synchronized with Hexagon Server and implemented for availability.
 On disk	 Downloaded	 Available	The package has been successfully downloaded from Hexagon Server and is currently ready to be used locally.

6.5.3. Manage Packages

Packages can be created from several operations, depending on its nature. Then they can be synchronized with the Hexagon Server, downloaded on other PC, removed locally...

6.5.3.1. Create a Package



Armspecs Backup

This manual operation can be used at any moment to make a security backup of the arm, in order to restore later the arm in the same configuration.

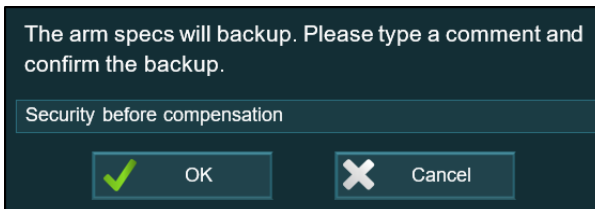
1. Ensure first that the arm is correctly connected.



2. Click on the Backup button.



3. At the prompt, enter a comment.



4. Press OK, the new “Backup” package appears in the list.

Date time	Type	Comment	Local status	Action status	Online status
~ Serial number: 8525-7-8345-FA - Connected					
2021-04-01 16:37:12	Certification		Not on the disk		Available
2021-04-06 09:48:20	Certification		Not on the disk		Available
2021-04-28 15:14:06	Backup package	Test	On disk		Available
2021-04-29 16:33:53	Backup package	test internet	Not on the disk		Available
2021-05-11 11:01:09	SMART dataset	2021/03/30 16:03 -> 2021/07/23 16:07	Not on the disk		Available
2021-07-28 15:42:54	Backup package	Security before calibration	On disk	Uploaded	
~ Serial number: 7525SEI-3296-FA - Distant arm					
2019-02-05 16:10:07	Backup package	test	Not on the disk		Available
2019-02-07 15:31:08	Backup package	BACK UP	Not on the disk		Available
2019-02-08 14:08:55	Certification		Not on the disk		Available



SMART Data Set Package

A SMART Data set package is automatically created periodically. It collects all the SMART indicators and computer information for the concerned period. The Smart Dataset packages appear only once the periodic set has been uploaded and implemented on the Hexagon Server.

6.5.3.2. Upload a Package

1. Once a package is created, it appears in the list on the vault as “On disk” in the Local status.
2. Forthwith RDS Toolbox tries to synchronize the package with Hexagon Server database.
 - If the computer is connected on internet, RDS Toolbox uploads the package securely on the Hexagon Server.
 - If no internet connection is available, the package is kept locally pending for a connection to the Hexagon Server.
3. The package becomes notified as “Uploaded” in the Action status.

Serial number: 8525-7-8345-FA - Connected				
2021-04-01 16:37:12	Certification		Not on the disk	Available
2021-04-06 09:48:20	Certification		Not on the disk	Available
2021-04-28 15:14:06	Backup package	Test	On disk	Available
2021-04-29 16:33:53	Backup package	test internet	Not on the disk	Available
2021-05-11 11:01:09	SMART dataset	2021/03/30 16:03 -> 2021/07/23 16:07	Not on the disk	Available
2021-07-28 15:42:54	Backup package	Security before calibration	On disk	Uploaded
Serial number: 7525SEI-3296-FA - Distant arm				
2019-02-05 16:10:07	Backup package	test	Not on the disk	Available
2019-02-07 15:31:08	Backup package	BACK UP	Not on the disk	Available

4. After a security check-out, the package becomes available (for any RDS Toolbox user on any computer).

Serial number: 8525-7-8345-FA - Connected				
2021-04-01 16:37:12	Certification		Not on the disk	Available
2021-04-06 09:48:20	Certification		Not on the disk	Available
2021-04-28 15:14:06	Backup package	Test	On disk	Available
2021-04-29 16:33:53	Backup package	test internet	Not on the disk	Available
2021-05-11 11:01:09	SMART dataset	2021/03/30 16:03 -> 2021/07/23 16:07	Not on the disk	Available
2021-07-28 15:42:54	Backup package	Security before calibration	On disk	Uploaded
2021-07-28 15:42:54	Backup package	Security before calibration	On disk	Available
Serial number: 7525SEI-3296-FA - Distant arm				
2019-02-05 16:10:07	Backup package	test	Not on the disk	Available
2019-02-07 15:31:08	Backup package	BACK UP	Not on the disk	Available

6.5.3.3. Synchronize the List of Packages

When a new arm is added to the list of the vault (new connected arm or manually added distant arm), RDS Toolbox automatically synchronizes the list of available packages with the Hexagon Server.

In case of a synchronization issue, a “Refresh” button (↻) permits a new manual synchronization.

6.5.3.4. Download locally a Package

To be used, a package needs to be “Locally On disk”. It means that the package needs to be downloaded from the Hexagon Server if it is not yet on the computer.



Once the package is downloaded, it stays available On-disk even if the computer is no longer connected to Hexagon Server.

1. Select the package

2. Click on “Download”



or Double click on the package



3. Its status becomes

Date	Type	Comment	Local status	Action status	Online status
{date}	{type}	{comment}	 On disk	 Downloaded	 On disk

4. Then the package becomes locally available to be used.



Several packages can be downloaded at the same time.

6.5.3.5. Remove a Package

Periodic Package Removals

By default, the packages “On disk” are automatically removed from the computer after 2 weeks. But they still remain available in the list of the vault.

Local status	Action status	Online status
 On disk	 Downloaded	 Available

 2 weeks later:

Local status	Action status	Online status
 Not on disk		 Available



Packages are only removed from the local computer, not from Hexagon Server data base



A local arm (connected or offline) cannot be removed from the list. RDS automatically removes it periodically if the arm hasn't been connected during the period.

6.5.4.

Use a Package

The purpose of the packages is to be able to reproduce a previous situation to analyse, or safely restore a status of the arm (depending on the profile, usage is available or not).

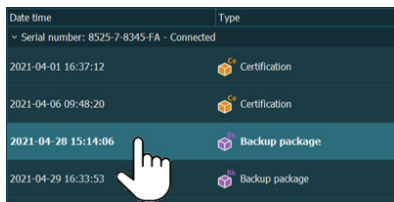
	Refresh		Backup
	Package information		Restore
	Remove Arm		Open Report
	Download		Switch to Smart database

6.5.4.1. Display the Information – Get the Package

RDS Toolbox can display the information of any package in the vault (whatever it is “On disk” or not).

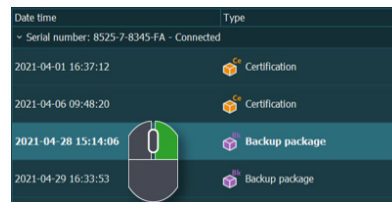
Moreover, for the “On Disk” packages, a button gives a direct access to the location folder of the packages files, so that it is possible to get back the package file and send it by E-Mail in case the computer cannot be connected to internet.

1. Select the package.



or

1. Do a right click on the package.



2. Click on “Package Information”.



Depending on the type of package and its Local status, various information can be found.

Common information

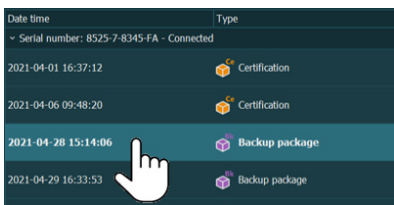
Package name	  Identification number of the package.
File size	 File size in KB
Locate on disk	 When clicking on this line, a link to the folder becomes available.  Opens the browser on the vault folder and pre-selects the package file.

: On disk | : Not on disk

Restore the Arm Data

If an error has been done on an alignment, or in case of a trouble, it is possible to restore a previous status of the memory of the arm. Any package contains the Arm data memory of the arm.

1. Select the package that contains the desired Arm data status.



2. Click on the “Restore” button



If the package doesn't match with the arm (the structure of the arm is different from the package one), RDS Toolbox displays a message.

6.5.4.2. Switch to SMART Dataset

To visualize the SMART data from a SMART dataset package, once the package is downloaded, simply use the action “Switch to SMART dataset”. RDS Toolbox then prompt a confirmation message and activate the selected package.

For more details, please refer to chapter [Local and Distant Arm - Database Mode](#).

6.5.5. Smart Dataset Manual Upload



NOTICE

A manual upload should be done only on the request of a Hexagon technician

In a standard way, RDS Toolbox automatically uploads the SMART dataset flow once a day.

However, on the request of a Hexagon technician, for a specific survey or diagnosis purpose, it may be necessary to provide the dataset to the technician.

- By uploading prematurely, the SMART dataset flow
- By creating a virtual image of the local SMART dataset into a zip file

6.5.5.1. Manual Upload of SMART Dataset

The period of synchronization (upload) of the SMART dataset to the Hexagon Server is 24h.

If an issue occurs, the Technician of the Hexagon Service Centre may have the need to investigate the situation and then to be able to consult the SMART dataset package before the term of 24 h.

An action button is available in the Vault panel to anticipate this periodic synchronization.

1. Enter the Vault and click on the action button “Extract and upload SMART dataset”.



2. Then the SMART dataset is sent to the Hexagon Server.



When uploading manually, the automatic daily synchronization is anticipated, and the current time is set as the new daily upload time



To avoid overloading the Hexagon Server activity, a minimum delay of 10mn is set between 2 successive uploads.

6.5.5.2. Dump SMART Dataset

In case the computer cannot be connected to internet (no available connection, IT policy, ...), the SMART Dataset can still be sent by E-Mail, within a zip file.

1. Select the arm for which the SMART dataset needs to be sent.
2. Enter the vault and click on the action button “dump SMART Dataset and Log file”.



3. Confirm the creation by clicking on “Yes”.
4. Then a zip file is created on “Public documents\ROMER\RDS\Temp” and the folder is open, pointing on the created file.
5. Copy the dump file on a removable support (USB memory, CD, ...) and send the file to the Hexagon technician.

The dump file contains the whole local SMART dataset plus all the log files and system information files.

6.5.5.3. Open a SMART Dataset

To be able to read a SMART dataset (from a dump file for example), a button is available in the vault.

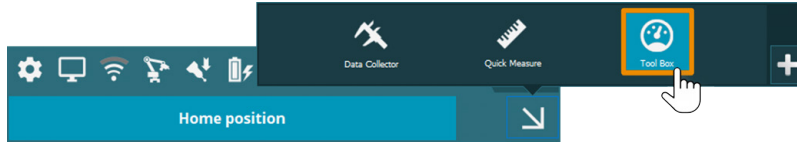
1. Unzip the dump file.
2. Enter the Vault and click on the action button “Open SMART dataset”.
3. RDS Toolbox then switches in a “SMART dataset” mode (see SMART chapter) to simulate the distant computer.
4. All the SMART information of the arms on the distant computer can be displayed and analysed.

6.5.6. Quick Vault Guide

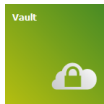
6.5.6.1. How to Find a Package

Find a Package with a Keyword

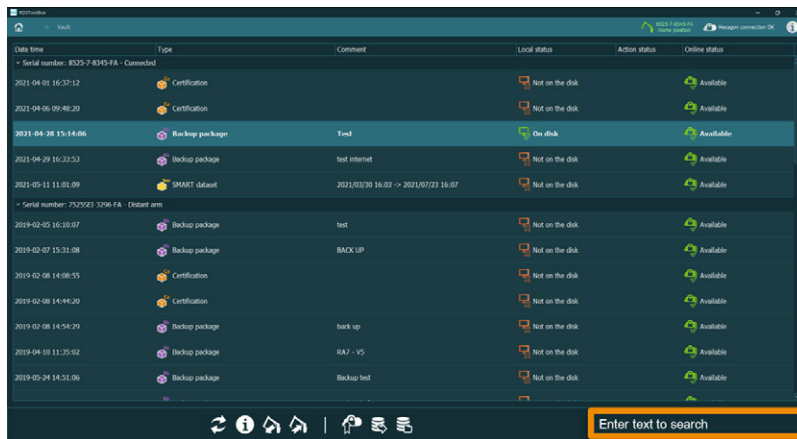
1. Open RDS Toolbox



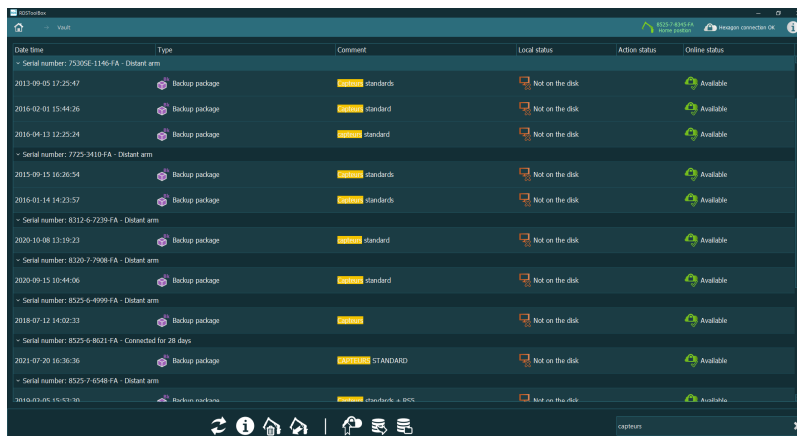
2. Select "Vault"



3. In the search window (Ctrl+F), type key words (arm S/N, type of package, comment, date...)

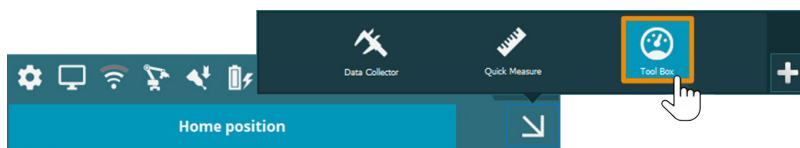


4. RDS Toolbox automatically reduces the list to the packages that contain the keywords, highlighting them.

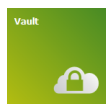


Find a Package with a Filter

1. Open RDS Toolbox



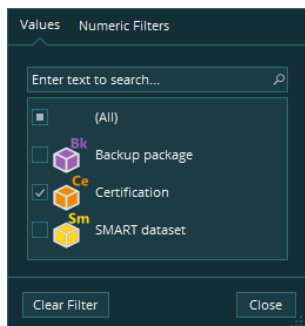
2. Select "Vault"



3. On the header of the column where to apply a filter, click on the filter icon (top left corner)

Date time	Type	Comment	Local status
2021-04-06 09:48:20	 Certification	ISO 10360-12 Ok	 Not on the disk
2021-04-28 15:14:06	 Backup package	Test	 On disk

4. Select the desired value (or choose "Custom" for advanced filter)



5. RDS Toolbox automatically reduces the list to the packages that fits with the filter.

Date time	Type	Comment	Local status	Action status	Online status
Serial number: 8525-7-8345-FA - Connected					
2021-04-01 16:37:12	 Certification		 Not on the disk		 Available
2021-04-06 09:48:20	 Certification		 Not on the disk		 Available
Serial number: 7525SEI-3296-FA - Distant arm					
2019-02-08 14:08:55	 Certification		 Not on the disk		 Available
2019-02-08 14:44:20	 Certification		 Not on the disk		 Available
Serial number: 7525SEI-3400-FA - Distant arm					
2015-09-04 08:57:14	 Certification		 Not on the disk		 Available
2015-12-07 09:13:12	 Certification		 Not on the disk		 Available
2016-01-14 10:03:51	 Certification		 Not on the disk		 Available
2016-01-20 10:28:47	 Certification		 Not on the disk		 Available
2016-05-12 13:43:39	 Certification		 Not on the disk		 Available
2019-10-22 08:49:22	 Certification		 Not on the disk		 Available
2020-09-17 09:06:46	 Certification		 Not on the disk		 Available

6.5.6.2. How to Get a Package File

In a standard way (computer connected to internet), when a package is created, it is immediately uploaded to the Hexagon Server and becomes available for a service aim.

In case the computer cannot be connected to internet, the package can be got back as a file, to be sent to a service centre by E-Mail.

1. Select the package.

Date time	Type
Serial number: 8525-7-8345-FA - Connected	
2021-04-01 16:37:12	Certification
2021-04-06 09:48:20	Certification
2021-04-28 15:14:06	Backup package
2021-04-29 16:33:53	Backup package

2. Download it.



3. Use the Information action button.



4. In the information window, notice the package identification name.

Package information	
Package name	03da015e-cbd3-4aa4-9e58-fde1ab2ba317.pck
File size	5 Ko
Locate on disk	C:\Users\Public\Documents\Romer\RDS\Vault\03da015e-c...

5. Select the line “Locate on disk” and click on the magnifying glass.



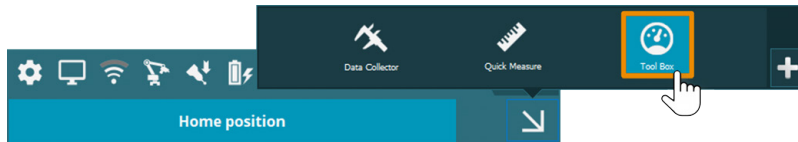
6. In the opened browse window, select the package with its identification name and copy it on a removable support.

6.5.6.3. How to Save the Arm Data

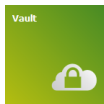
1. Establish a wired connection to the arm (Ethernet or USB).



2. Open RDS Toolbox



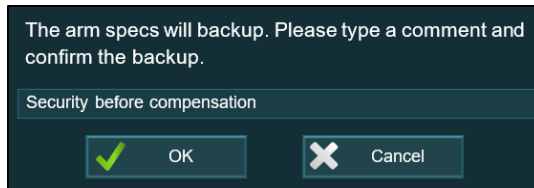
3. Select "Vault"



4. Click on "Backup".



5. Enter a comment.



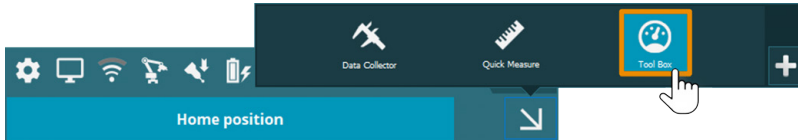
6. Press OK

6.5.6.4. How to Restore the Arm Data

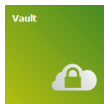
1. Establish a wired connection to the arm (Ethernet or USB).



2. Open RDS Toolbox



3. Select "Vault"



4. Select the package to restore (Backup, Compensation, Calibration).

Date time	Type
Serial number: 8525-7-8345-FA - Connected	
2021-04-01 16:37:12	Certification
2021-04-06 09:48:20	Certification
2021-04-28 15:14:06	Backup package
2021-04-29 16:33:53	Backup package

5. Click on "Download".



6. Click on "Restore".



7. Wait for the end of restoration (the arm restarts automatically).

6.6. SMART

6.6.1. SMART Presentation

6.6.1.1. What is SMART?

RDS software includes a new monitoring system for Hexagon arms named SMART (Self-Monitoring, Analysis and Reporting Technology). By collecting various indicators from the Arm and the computer, this system will help anticipating failures and loss of performances.

The strength of this feature is based on the consolidation by Hexagon and the process of information coming from all Hexagon Arms. Thanks to this centralized knowledge, thresholds are adjusted to improve the detection and prediction of potential failures and loss of performances.



NOTICE

SMART main purpose is to prevent from any breakdown or issue. Thus, it is important to let RDS Toolbox communicate the data to the Hexagon Server.

6.6.1.2. What type of Information does Hexagon collect?

RDS software gathers and stores into the host computer on periodic basis information below.

Standard Computer Information

Operating system version, CPU, RAM size, hard disk, graphical card, network adapters, version of RDS installed and your regional and language settings.

This information is generally not personally identifiable and is similar as the information your browser sends to each website you visit.

Configuration of the Arm

Identifiers, firmware versions, some properties coming from arm data as its type and its measuring volume.

System Indicators

Various indicators allowing detecting potential failures and loses of performance. There are ordered into different categories.

General statistics	How many times arm did a full power on/off cycle, total time in power-on state, how long the arm has been connected to RDS, temperature measured in the base, 3D distance travelled by the probe
Encoders	Information as temperatures, working status, count of errors and warnings, voltage
Accuracy	Time passed since the last compensation, time passed since the last probe alignment, result of last quick check and probe alignment
Communication	Information as how long the arm has been connected using USB or WLAN, count of communication warnings or errors
Battery	How many times the battery charger started, time this battery has been used, health of the battery, current charge level
Scanner	Time spent scanning, how long laser was on, how many stripes have been dropped while scanning
Wrist components	Information as time spent using the integrated camera and head light, how many times each button has been actuated
Environment	Measurements retrieved by SMART modules
RDS	Count of RDS Toolbox, RDS Data Collector and RDS Control Panel activations

Hexagon doesn't collect or process any personal data or any information which could be used to identify any individual. It certainly will not contain any personal or contact information about you (such as your name, address, or phone number).

No data about measurement activities is either collected by SMART.

6.6.1.3. How does Hexagon use the Collected Information?

Collected information will be used by Hexagon in different ways.

Firstly, all collected information will be used to tune the thresholds allowing the detection of potential failures and losses of performances. Adjusted thresholds are regularly sent to the field.

If potential problems are detected, one of our affiliates or subsidiaries (i.e. service centres) may contact your company to help you avoiding a complete breakdown of your system. Hexagon will provide those companies only the information they need to deliver the service. They are required to maintain the confidentiality of this information and are prohibited from using it for any other purpose.

Collected information is also used to propose you interesting news from Hexagon. These news are related to your system settings (Arm type, accessories mounted on the Arm, operating system language...). News are never sent to a specific customer but to a group or all of them.

Statistic reports will be generated. They will be used by Hexagon only to know how our products are used. It could lead to improvements of existing products and design of new ones.

6.6.1.4. Privacy Protection

Hexagon is committed to protect your privacy. Hence, we are not collecting or processing any personal data or information. This user information statement explains how Hexagon uses and protects the data and information we collect.

We may disclose collected information to affiliate partners (i.e. service centres) when we judge necessary to inform you about a possible failure or the need of maintenance services on our behalf.

We do not rent, sell or otherwise disclose collected information with unaffiliated third parties.

Hexagon has implemented reasonable physical, technical and administrative security standards to protect collect information from loss, misuse, alteration or destruction.

Our service providers and agents are contractually bound to maintain the confidentiality of collected information and may not use the information for any unauthorized purpose.

6.6.1.5. Deactivation

By default, the possibility to collect the above-mentioned information is enabled. You are entitled and able to disable this function at any time.

To disable this function and discontinue your participation as well as to enable, or to select participation at a later stage, please refer to [RDS Control Panel > SMART](#).



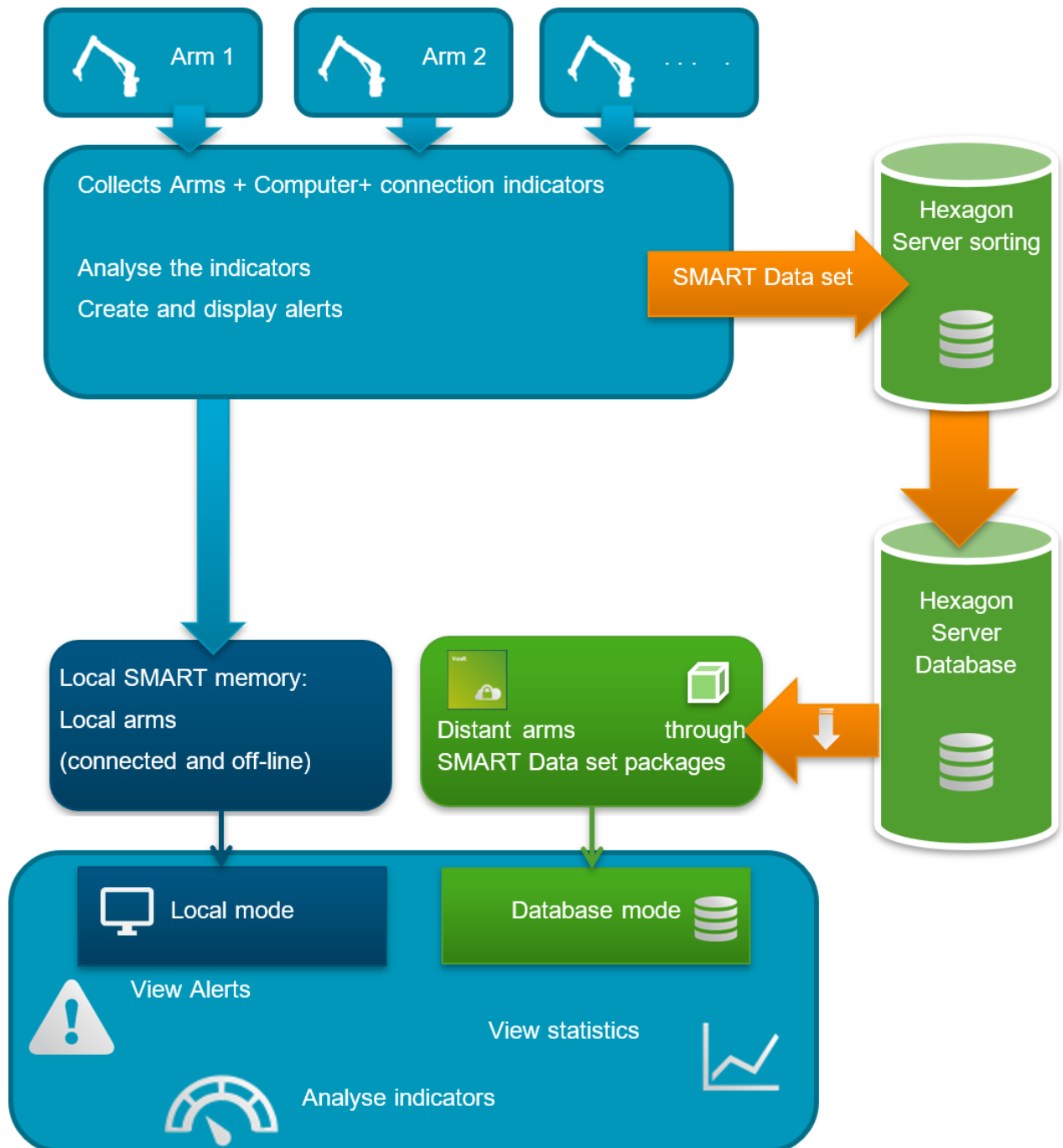
NOTICE

Disabling transmission of SMART data to Hexagon is not advised. If you do this, it will make difficult diagnosing potential problems with your equipment. This could increase machine downtime.

6.6.1.6. SMART Process

RDS collects all the SMART information every time an arm is connected to the computer. Thus, it is possible to have a look on the detailed status of all the previously connected arms (including the currently connected one) and components. This includes several indicators and possible alerts if some indicators overpass specified limits.

Several indicators get information from sensors on the arm; even when the arm is not connected, the sensors collect data. The data are synchronized with Hexagon Server through the computer (SMART Data set packages) as soon as the arm is connected to the computer.



6.6.1.7. Communication with the Hexagon Server

By default, when installing RDS, SMART establishes automatically the communication with the Hexagon Server, to send SMART data and receive news.

It is possible to deactivate this communication, as well as the popups. Refer to the [RDS Control Panel > SMART](#).

The whole SMART Data flow stored on the computer is uploaded automatically once a day, however, it is possible to upload manually through the [Vault > Dump SMART Dataset](#). Also, if the computer cannot be connected to internet, at the request of a Hexagon technician, it is possible to create a manual zip file that can be sent to the Hexagon Service Centre.

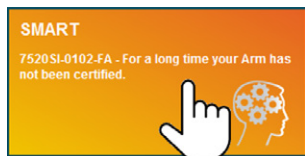
For the manual upload and zip file creation, please refer to the [RDS Toolbox Vault](#).

6.6.2. SMART Overview Panel

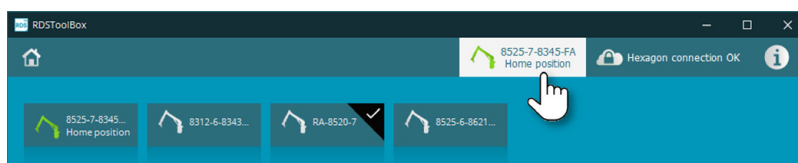
SMART Tile

In case of any important alert regarding any of the arms in the memory of the computer, notifications will be displayed alternatively on the SMART Tile itself.

1. Click on the Tile to open the SMART Overview Panel.



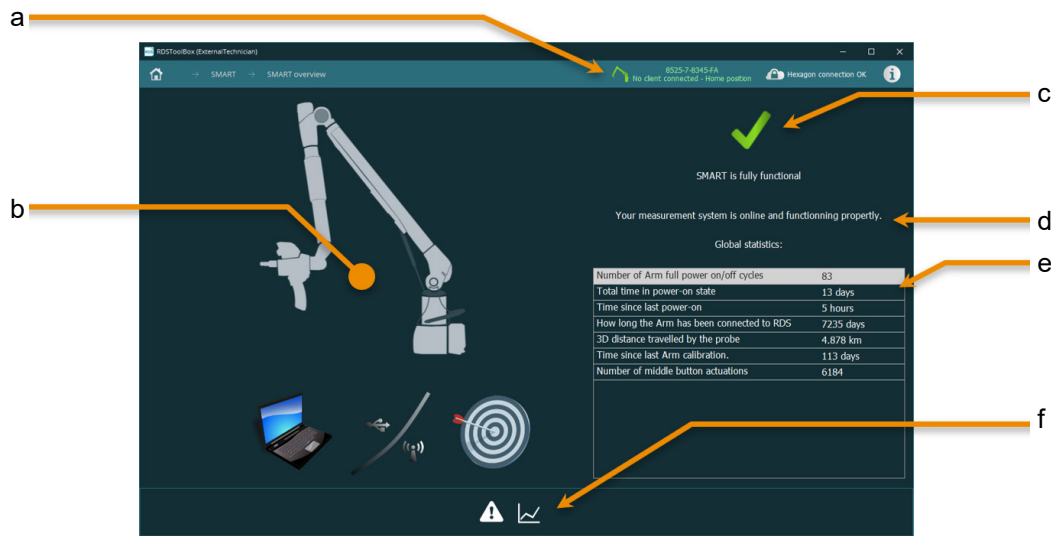
2. Select the arm to monitor.



To survey a distant arm, before opening the SMART panel, open the Vault panel, download the SMART Data set package of the arm for the desired period, and click on "Use the database".

The overview panel of SMART appears. It shows a global graphic view of all the components of the system, and some statistics and information about the status and use of the system.

Description

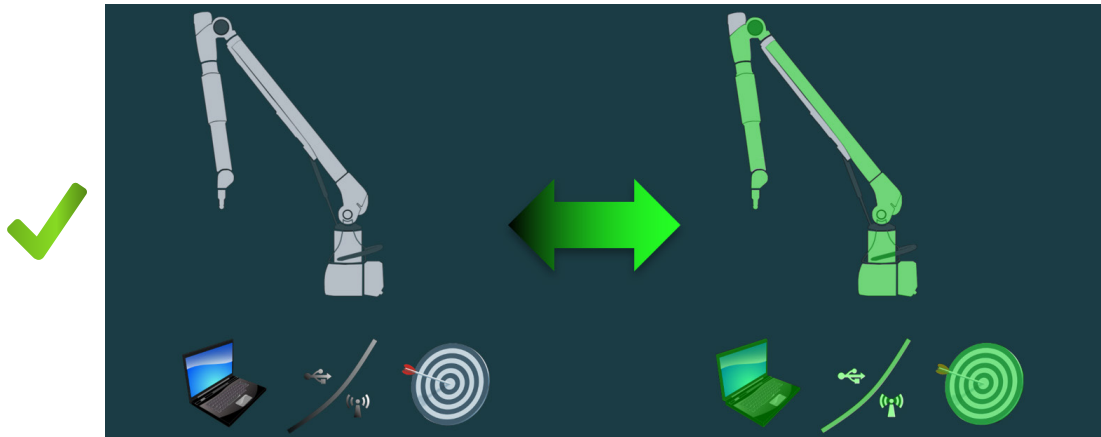


a	SMART dataset activated	Database mode	Reminds when the database mode is used.
	8730-6-10235-FA Offline	Arm selection	Local mode – permits to select which arm (connected or off-line) in the local mode to survey. Database mode – reminds which arm is displayed.
b		Components graphic view	Shows each component and highlight whether they are OK (green) or not (red).
c		Global status of the system	Shows very quickly if the system is OK or if one component requires an attention.
d		SMART status	Shows if SMART functionality is activated.
e		Statistics area	Several indicative statistics or short description of the alert on one component
f		Display alerts	Opens the list of alerts for the selected arm
		Analyse indicators	Opens the indicators screen for the selected arm.

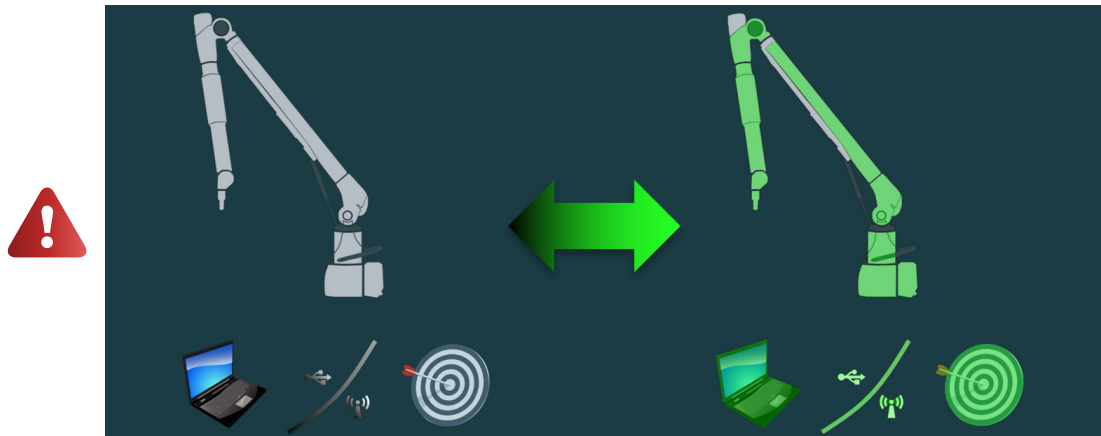
6.6.2.1. SMART Components Graphic View

The graphic view of the arm and accessories allows quickly locating an issue on one component.

- In a normal situation without any alert, each component is slowly flashing green.



- If RDS Toolbox gets a SMART alert from the system, the concerned component is shown red

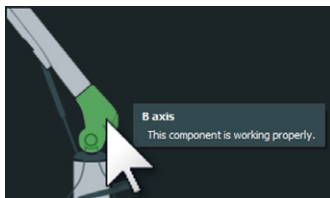


In the present case, 1 warning is shown, the Target (=accuracy).

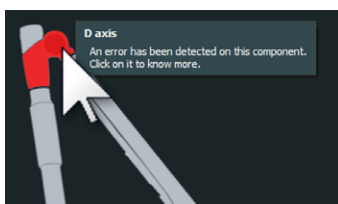
By Pointing the Component

The description of the component and its status are displayed on it.

- On a green component (component is working properly).

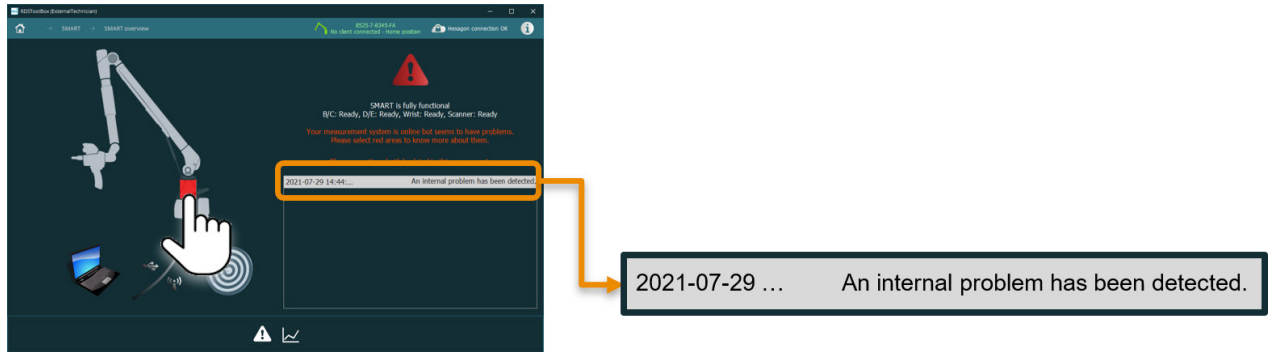


- On a red component (component presents an alert).



By Clicking on a Component

Some statistics (for green components) or the alert(s) (for red components) related to the component are displayed in the statistics area.



6.6.2.2. SMART Overview Components Description

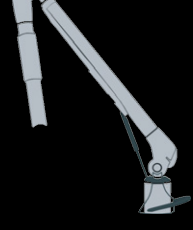
In the SMART overview, a sample of typical statistics can be displayed, depending on the selected component.

If an indicator of one component gets outside its limits, an alert is generated and displayed in the same statistics area instead of the statistics.



A complete list of statistics can be consulted through the “analyse Indicators” button.



	Example of statistics	
No selection		Number of Arm full power on/off cycles
	Accuracy	Time since last compensation
	Computer	Number of RDS Control Panel activations
	Comm_Link	Times and duration of connection
	Comm_USB	Times and duration of connection Count of errors
	Comm_Wi-Fi	
	Control / Feature Pack	Battery level
	Arm Base	Duration of use Temperature of the base
	All encoders	Encoders temperatures
	Wrist	Number of trigger button actuations
	Probe	Number of ran probe alignments

6.6.3. Select the Arm for SMART

6.6.3.1. Local Arm – Standard Mode

By default, provides the survey of all the arms that have been connected to the computer. This is the standard mode that uses the local memory.

Connected Arm

RDS Toolbox collects SMART indicators and information any time an arm is connected to the computer. All the previous SMART data in the memory of the arm are downloaded onto RDS Toolbox. Then, the data are periodically synchronized with Hexagon Server.

The SMART information from the currently connected arm is then directly accessible.

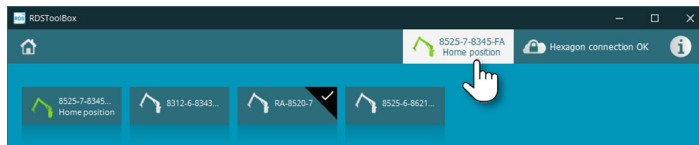
By default, SMART tile gives access to the current arm.

Off-line Arms

As RDS Toolbox collects and keep in memory all the SMART indicators of each arm that has been connected to the computer, it means that not only the currently connected arm can be surveyed, but also all the previously connected arms.

In fact, there is no difference between the connected arm or an Off-line arm, both are local arms.

To select the arm to survey, use the Arm selection button on top right of the screen.



The selection of the arm can be done before or after the selection of the SMART tile.



To survey old SMART Dataset, it becomes necessary to download and use the corresponding SMART package. See next chapter.

6.6.3.2. Local and Distant Arm – Database Mode

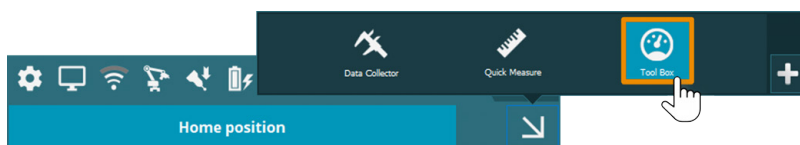
To survey a local arm (connected or Off-line) at a previous period than the available dataset, it is possible to use SMART packages.

By the same way as local arms, it is possible to survey a distant arm that has never been connected to the computer, by adding it in the Vault list and downloading SMART Data set packages (Technician profile only).

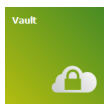
All the SMART Data set packages are used through a separate “Database mode”. RDS Toolbox switches from the standard “Live” mode to a SMART Package Database.

By using the Database Mode, all the SMART Data Set Packages “On Disk” can be surveyed.

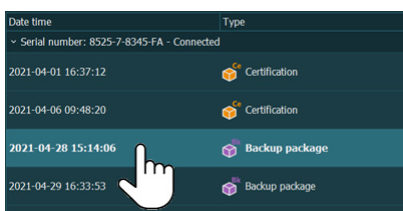
1. Open RDS Toolbox



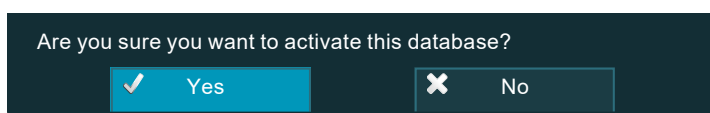
2. Select “Vault”



3. Select the wanted SMART Data Set Package and click on “Use database”.



4. A prompt is asking you for confirming the use of the selected database. Answer “Yes”



5. Then RDS Toolbox switches into a “Database Mode”. RDS Toolbox doesn’t use anymore the local memory, but only the database coming from the SMART Data set package.



6. Then a “SMART dataset activated” notification appears beside the arm selection. Press on it to return to the standard mode.



In the Database mode, only the SMART functions are available. Switch back to the standard local mode to enable the other tiles.

6.6.4.

SMART Alerts

Once the SMART indicators are collected, RDS Toolbox compares the values to warning and critical limits. As soon as one SMART indicator exceeds a limit, an alert is generated and shown by RDS itself.

Then several actions are operated:

On the screen of the computer	A notification of the alert is displayed regularly on the bottom right of the screen.
On the Home panel of RDS Toolbox	The alert is displayed on the SMART tile itself
On the SMART Overview panel	The faulty component becomes red. The global status icon switches to . A short description of the alert is displayed when clicking on the faulty component.
On the SMART Alerts panel	The description of the alert is added to the list of active alerts.

Purpose of an Alert

The aim is to warn the user that a problem occurs, a component may be damaged or may be about to be damaged. In any case, an alert must be checked to avoid a major issue.

It can be also a reminder for a late operation (too old compensation for example).

What to do When an Alert is Generated

When an alert is generated, a notification is displayed several times, in sort of ensure that the user can see it. In case it has not been seen, the user can still check in SMART Overview Panel the status of the arm.

In any case, it is important to display the description of the alert, to see the criticality, and get a suggestion to solve it.

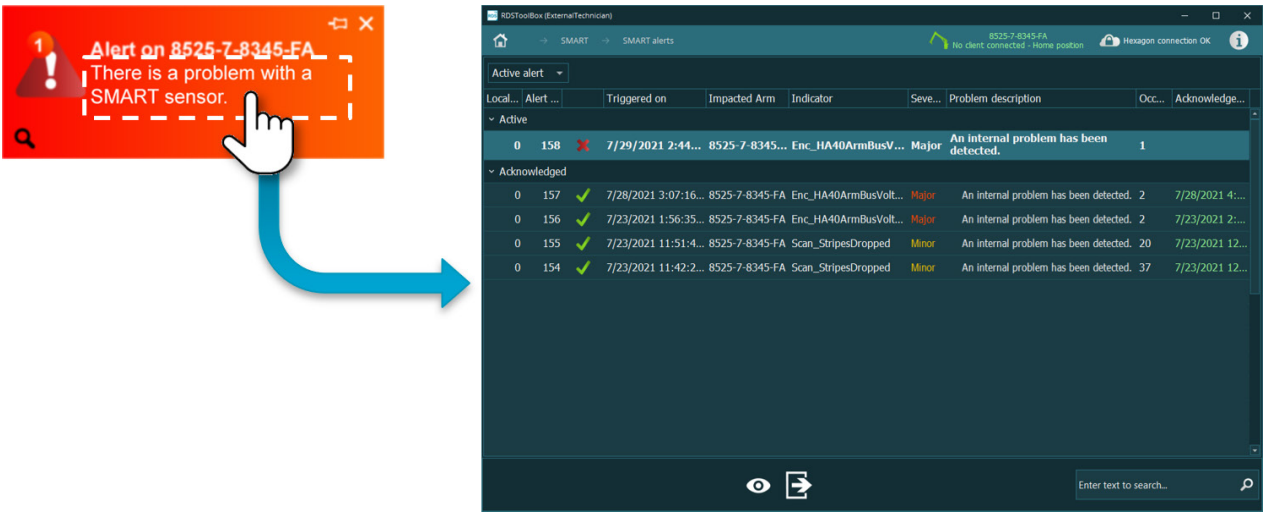
Depending on the criticality and the impact of the issue, several solutions:

- The alert can be postponed if the arm still needs to be used, but the user wants to be reminded.
- The alert can be validated, if the problem is minor, and doesn't represent a real danger, or if the problem has been solved.
- The faulty component can be analysed in detail, to diagnose.



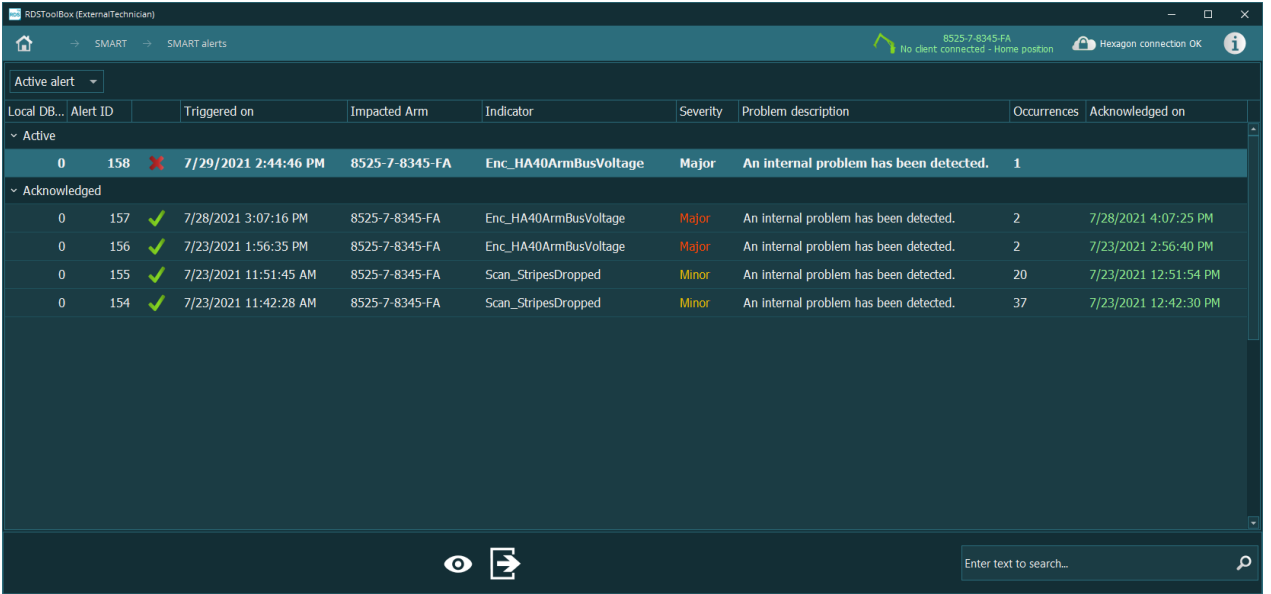
6.6.4.1. Alert Notifications

As soon as RDS generates an alert, a notification is displayed on the bottom right of the screen. Click on the alert to view the details in the SMART Alerts panel.



6.6.4.2. SMART Alerts Panel

By opening on a notification or through RDS Toolbox > SMART > Display alerts (and select the arm), the list of all the alerts concerning the selected arm appears.



Active alert	Button to sort or filter the list by the active or validated status of the alert
Alert ID	Identification number of the alert
Triggered on	Date and time of the alert
Impacted Arm	Serial number of the concerned arm
Criticality	Importance of the alert (Warning / Major / Critical).
Problem description	Short description
Occurrences	Number of times the problem occurred
Acknowledged on	Date and time of validation of an alert
View alert	Button to open the full details of the selected alert
Close	Closes this panel and return to the SMART overview panel.



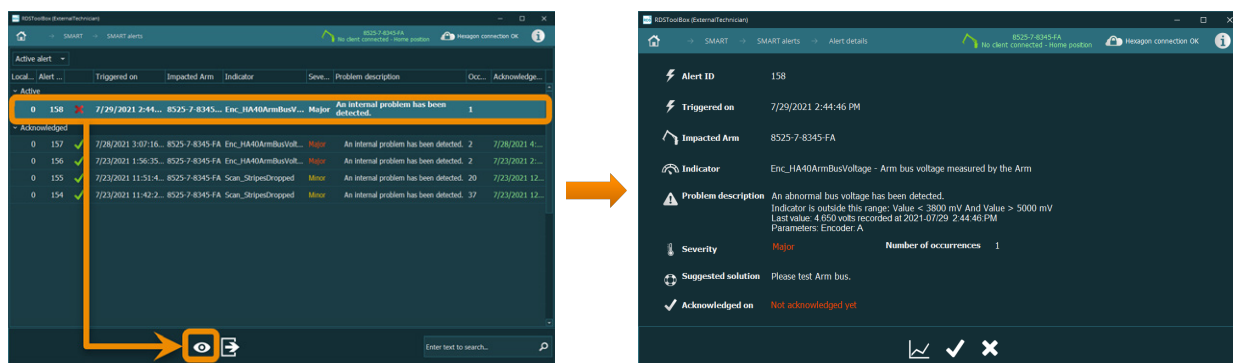
The “Warning” criticality does not generate an “alert” (no notification or alert in the SMART overview panel).

6.6.4.3. Alert Details

To view the details of one alert, select the alert and click on “View alert” or double click on the alert.



From the SMART overview panel, a click on a faulty component displays the list of alerts on the selected component, and then a click on one alert directly opens the details of the selected alert.



Information

	Triggered on	Date and time of the generation of the alert.
	Impacted Arm	Identification of the arm implied by the problem.
	Indicator	Exact SMART indicator of the faulty component – name and description.
	Problem description	Description and values of the indicator error.
	Criticality	Minor / Major / Critical.
	Suggested solution	Suggestion of checking, repair, contact... to try to solve or avoid the problem.
	Acknowledged on	Date and time of the validation of the alert.

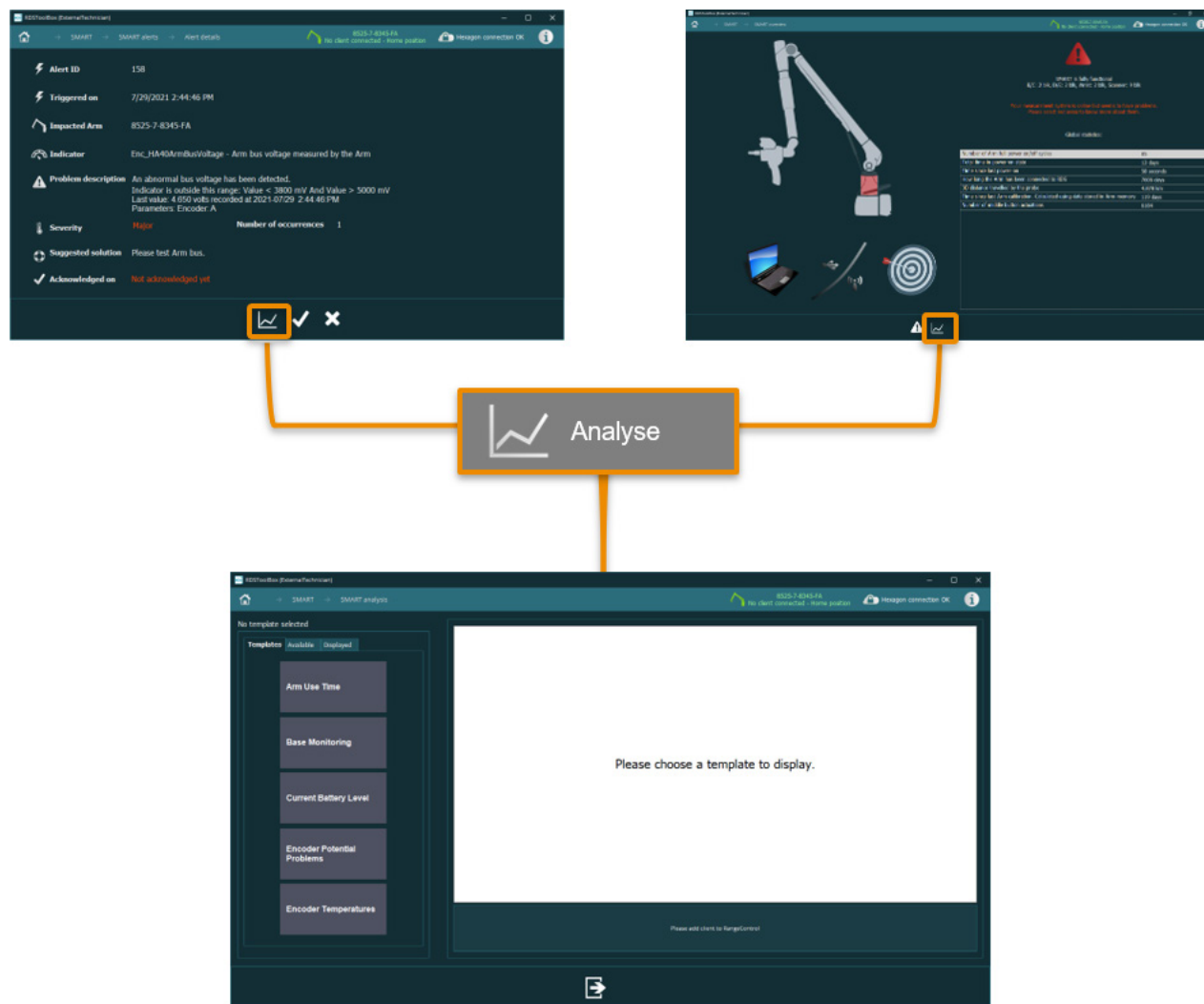
Actions

	Analyse	To go deeper in the analyse of the problem, access to all the SMART indicators, graphs, and values.
	Acknowledge (for active alerts)	Once the problem is solved, repaired, or to dismiss the alert, button to validate the alert.
	Postpone (for active alerts)	Button to keep a survey on the indicator. The alert is changed to standby mode, during a certain time the notification is suspended.
	Exit	Close the Alert details panel.

6.6.5. Analysing Indicators

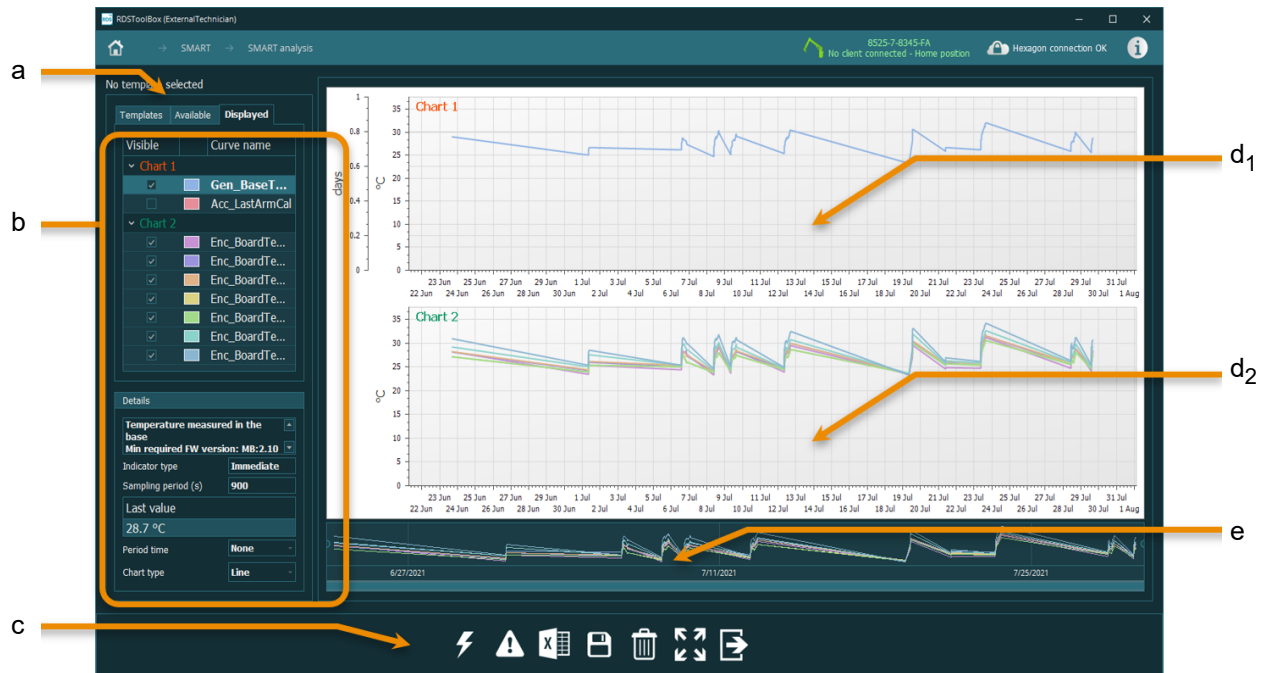
SMART monitoring is composed by several indicators about all the components of the arm, connection, computer, use of the system, or accuracy. The global status of those components is graphically displayed in the SMART overview screen. To go deeper in the analyse of those indicators, a complete panel provides the display of one or several SMART indicators, their current values and time graph. To give the best possibilities, the display is customizable.

From the SMART overview panel, or from the details of an alert, click on “Analyse indicators”.



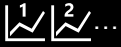
From SMART Overview, ‘Analyse’ panel opens automatically the templates tab. From Alerts details, ‘Analyse’ panel automatically focuses on the faulty indicator.

6.6.5.1. Description of the Panel



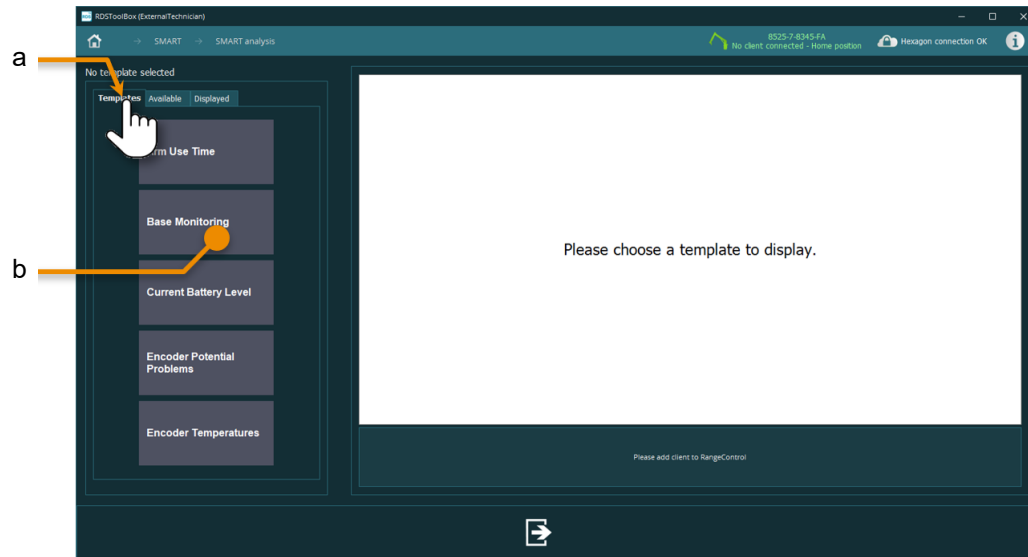
- User tabs
 - Templates – Displays the saved templates to use them
 - Available – Displays the list of all the available indicators and details to add the chart manually
 - Displayed – Shows the current indicators used in a chart
- Content of the tab
- Action line
- Charts (...up to 4 charts can be displayed)
- Graphic control of the time range

Actions

	Adds the current indicators selection on a new chart (up to 4 charts)
	Adds the current indicators selection on the existing chart Nb1 / 2 / 3 or 4
	Displays all the alerts on the charts
	Displays all the events on the impacted chart
	Exports the values of each graph into a separate excel file
	Removes all the charts and clear all the workspace
	Refits the charts to the entire time range
	Closes the panel and goes back to SMART Overview panel

6.6.5.2. Use a Template

When arriving in the SMART analysis panel, templates are proposed.



When installed, RDS Toolbox provides default predefined templates, which represent useful indicators. To use them, simply select the tab “Templates” (a) and click on the graph to display it (b).



If one or several graphs were already displayed, the whole view is overwritten with the new graph from the template.

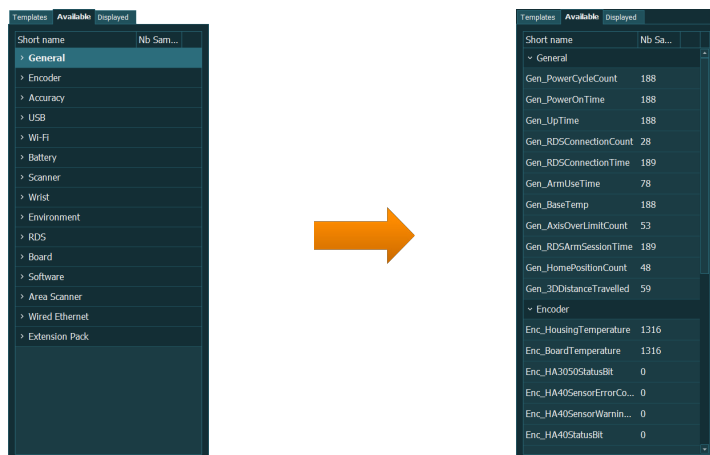


It is possible to get more templates. Ask your Service Centre.

6.6.5.3. Indicators

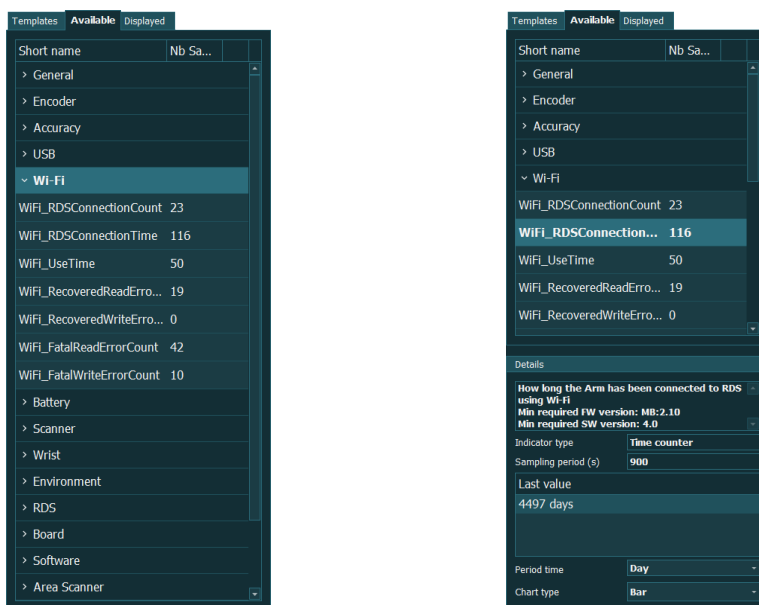
Select an Indicator

Select the “Available” tab to display the list of indicators. The list can be reduced or deployed by clicking on each expand button (>).



As soon as one indicator is selected, its details appear below the list:

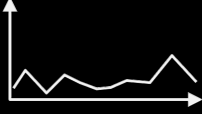
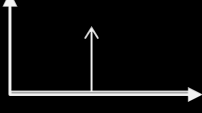
1. Deploy the group
2. Click on the indicator



The search by keyword function can be used with **Ctrl+F**. (click first on the header of the column).

Types of Indicators

Several types of indicators may be found.

Type	Default
Counter 	Bar A counter evaluates a number of occurrences or a distance. ⚙ A counter is increased only each time the SMART sensor is actuated. 📄 The name usually ends by "Count". The last value (details zone) represents the overall total. The chart can represent sub totals per hour, per day per month. It may also represent the overall total evolution (Period time = "None")
Time counter 	Bar A Time counter evaluates duration. ⚙ A Time counter is increased in real time as soon as the SMART sensor is active. 📄 The name usually ends by "Time". The last value (details zone) represents the overall total. The chart can represent sub totals per hour, per day per month. It may also represent the overall total evolution (Period time = "None")
Immediate 	Line An immediate indicator evaluates an instant value that can be measured at any moment – a temperature, a size, a voltage, a value (alignment result), a percentage (of loading) ... ⚙ An immediate value is automatically periodically measured by the SMART sensors.
Event 	Line An event memorizes specific unexpected or abnormal occurrences (shocks...) ⚙ An event is memorized only when the occurrence occurs, when one sensor exceeds a limit. 📄 The name usually ends by "Event"
On demand	Line

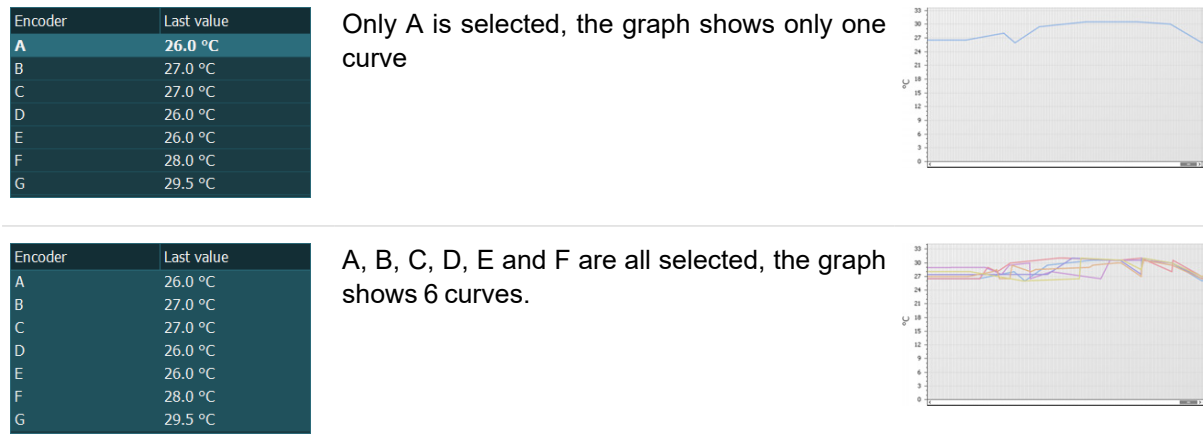
Indicator Index

Some indicators may provide not only one value but several indexes.

Indexes of an indicator may concern encoders indexes, probes indexes, ...

In such cases, several indexes can be selected and displayed at the same time (using Ctrl or ⬆ keys).

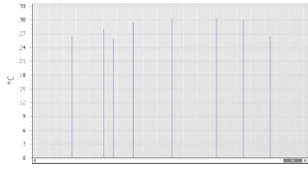
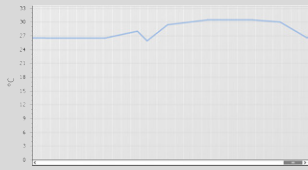
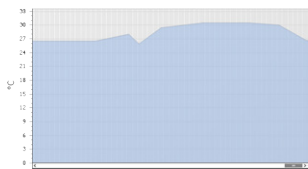
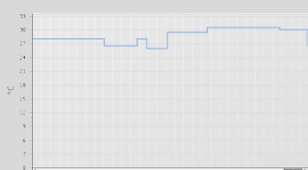
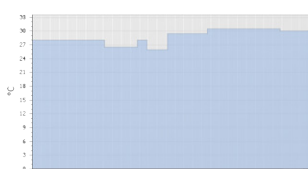
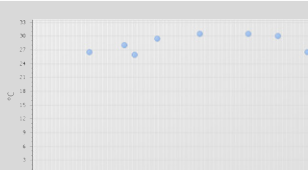
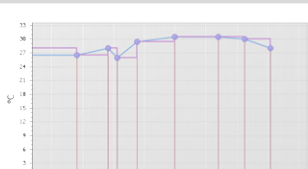
For example, the indicator “Enc_BoardTemperature” provides one value for each encoder.



6.6.5.4. Charts

Different kinds of graphs can be chosen. All are based on the points of the indicators; the difference is located on the way to link them.

Types of Charts

Bar		Pikes are displayed only on the points of the graph. This is useful for indicators to show abnormal occurrence such as shocks.
Line		All the points are linked by a straight segment. This is the typical way to represent immediate values (temperatures for example).
Area		Area is based on the Line chart, but all the area under the line is filled. It is useful to better see the graph, but not recommended for multiple lines on same graph.
Step line		All the points are linked through steps. This is more convenient for counters and time counters.
Step area		As for Area based on Line, Step area is based on Step line, and the field under the steps is filled. Here again the purpose is to better see the graph, but it is not advised for multiple steps on same graph.
Dots		Point chart is the basic mode, the points are simply displayed as dots and not linked.
Mixed		Several types can be displayed on the same graph by adding them one by one on an existing graph.



The Range graph is always displayed as "Line".

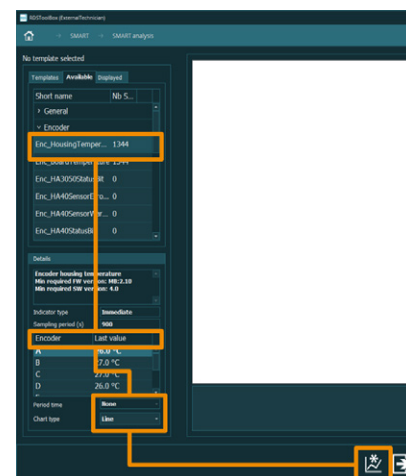
6.6.5.5. Add an Indicator

To analyse an indicator, it must be added on a chart, either a new or existing one.

Preliminary Selections

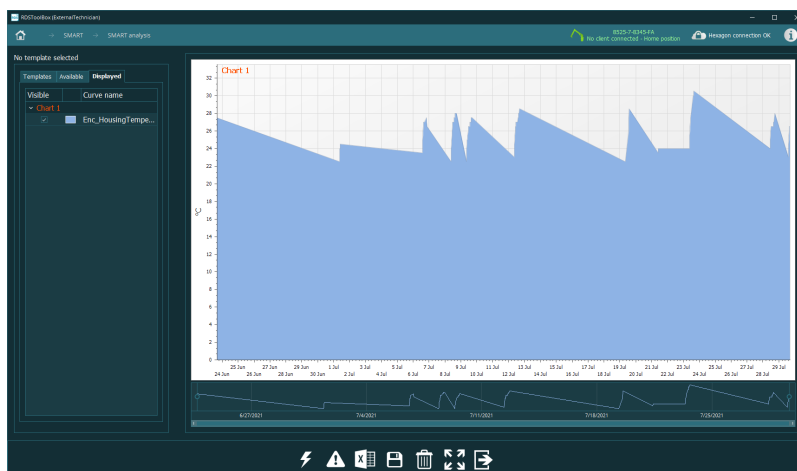
Before any display, the following selections or settings are necessary:

1. In the Available tab, select the wanted indicator
2. In the details of the indicator, select one or several indexes
3. For counters, choose the period time
4. Choose the type of chart



Display the Chart

1. Once the preliminary choice is done, add the selected indicator:
 - On a new chart
 - On an existing chart
2. Then the graph is displayed



On the left side, the “Available” tab is replaced by the list of indicators on each chart.



It is possible to add an indicator to an existing chart only if the type of graph is the same.



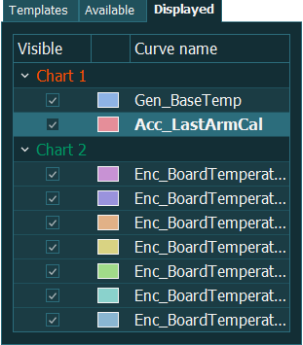
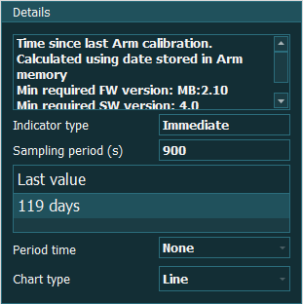
It is possible to add an indicator to a new chart by double clicking on it.

6.6.5.6. Explore a Graph – Details

“Displayed” Tab

Once an indicator has been added to a chart, the tab switches to “Displayed” tab. This shows the current charts and indicators.

As for the “Available” tab, the window is split.

List	List of the charts and indicators (the colours of the charts and graphs are reminded here).	
R	A check box permits for each indicator to be hidden or displayed.	
► / ◄	The list can be reduced or deployed.	
Details	Details of the selected indicator (reminds the description of the indicator and the chart type and period).	

Refine the Time Range

RDS Toolbox displays the data for all the date and time range available in the memory.

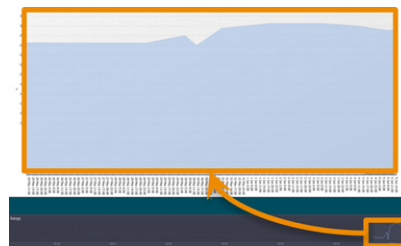
To reduce the time range, use the left and right cursors on the “Range” graph, or click on a position to zoom on it.

Left cursor



Move it to adjust the lower limit of the graph.

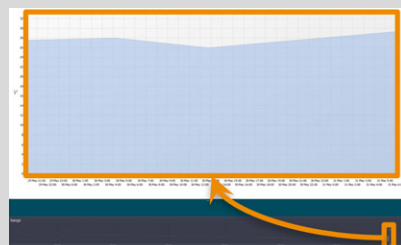
Right cursor



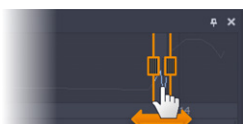
Click on a position



Click on a specific time position to reduce and zoom the graph to this position.



Translate the range



To translate the time position

- Pan the selection on the range graph
- Use the horizontal lift at the bottom of the chart
- Pan the chart itself.



View all



Refits the graph to all range.

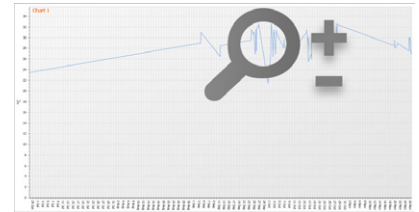
Zoom the Chart

In addition to the available cursors to control the time range, the mouse wheel can be used to zoom the chart, on X and Y axis. Then the middle button (wheel button) can be used to pan the graph.



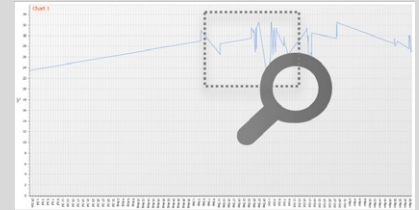
Mouse wheel

Zoom on X and Y axis scales on the pointer location



Shift key + Pan Left button

Zoom in a box



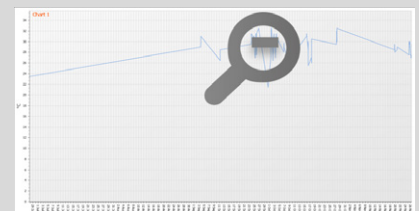
Shift key + Left click

Zoom in on the pointer location



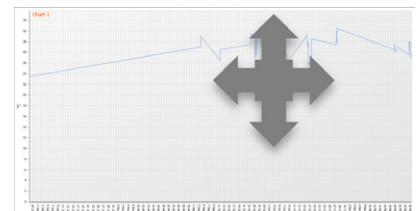
Alt key + Left click

Zoom out on the pointer location



Mouse middle button

Pan the zoom on X and Y axis

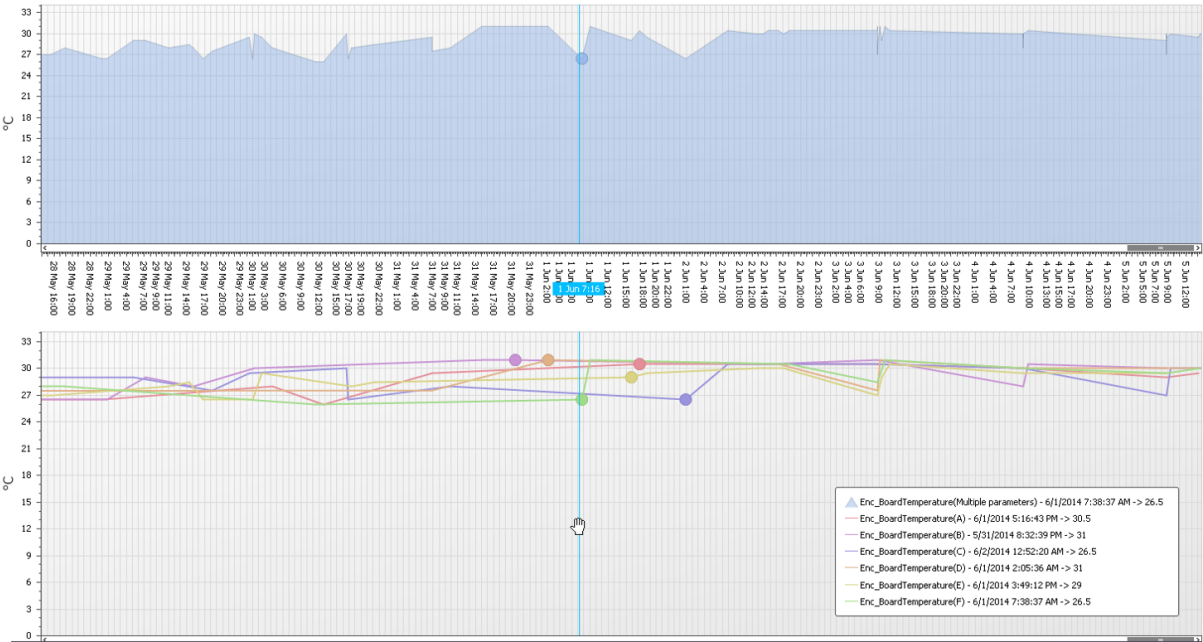


Action button

Refit to all the graph

Check the Values

Whatever one or several indicators are displayed on one or several graphs, to survey the graphs values, just place the pointer over the graph at the desired time position. A line shows the current position, and the nearest graph points are shown. A small window beside the pointer displays the values of all the curves for the current position.



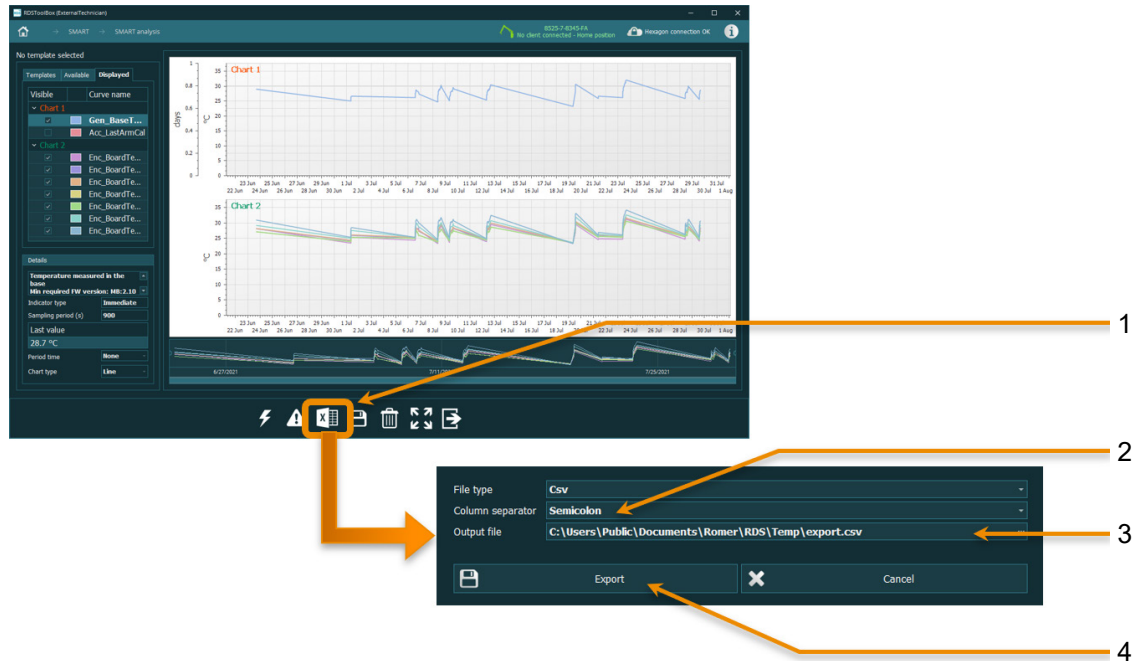
Display the Alerts and Events on the Chart

Over the chart, it is possible to show the SMART alerts, and events, to get a better understanding of why the event occurred.

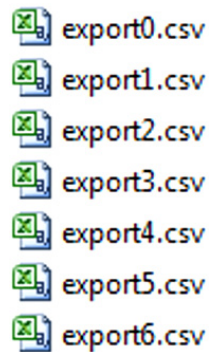
	Displays the events	All the events such as the start of a session are displayed on all the charts, to locate them and do a link between the indicators that may explain the cause of the alert.
	Displays the alerts	All the alerts notified for the current arm are displayed on the chart, to locate them.

Export the Values

For the displayed charts, each indicator set of values can be exported into a separate Excel file.



The target folder is displayed, showing as many CSV-Excel files as number of indicators.



6.6.6. Quick SMART Guide

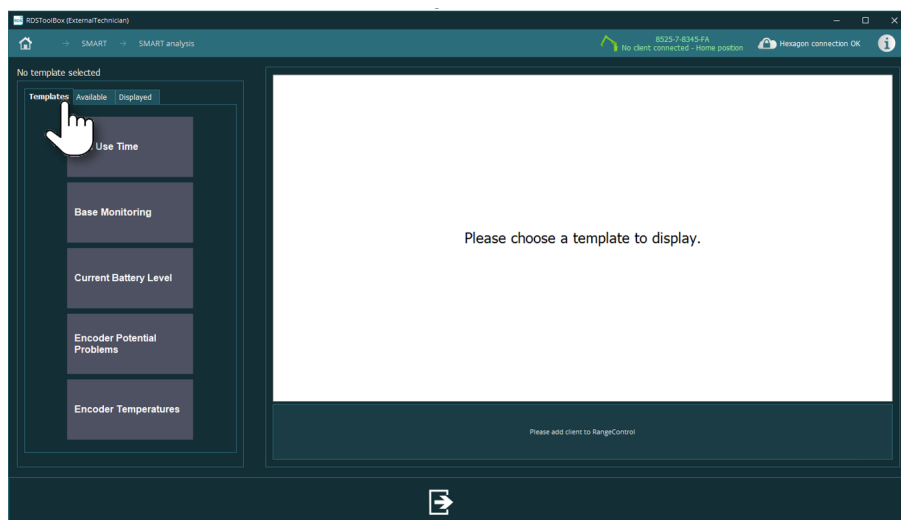
6.6.6.1. Quick Display – Use a Template

Analysing indicators can be done using templates. Default templates can be automatically proposed, and user templates can be created.

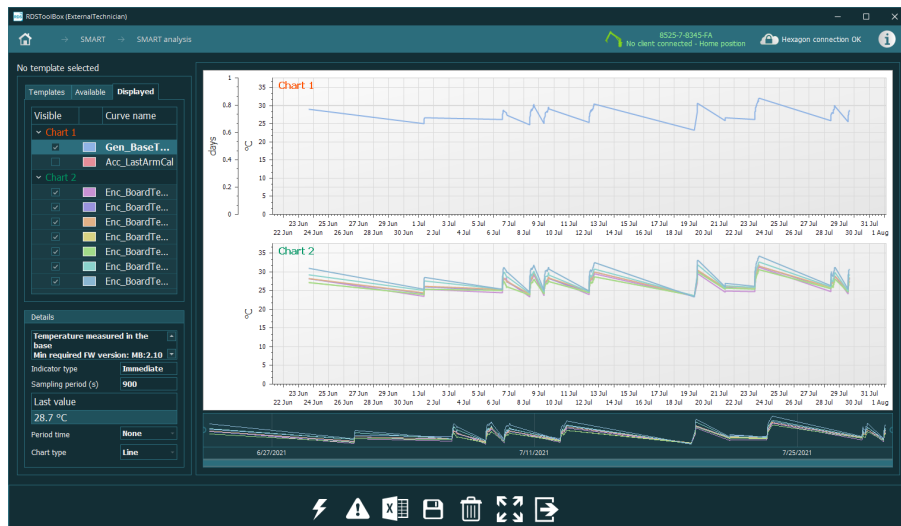
1. Open the SMART analysis panel



2. When entering the Analyse panel from the SMART Overview one, the templates are automatically displayed. Otherwise, click on the “Templates” tab.



3. Select the wanted template, the graph(s) is (are) automatically displayed with the updated values.

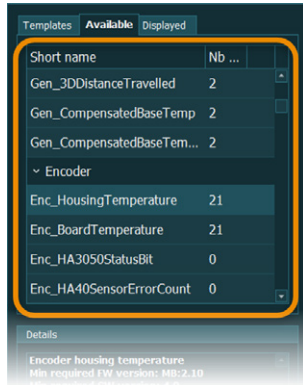


6.6.6.2. How to Add an Indicator Diagram to a Graph

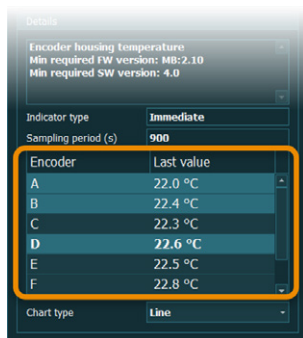
1. Open the SMART analysis panel.



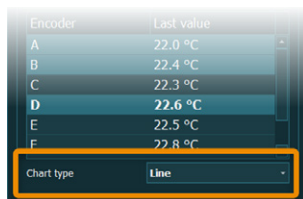
2. In the list of available indicators, select the wanted item.



3. In details zone, select the index(es) of the selected indicator (encoder index, probe index...).



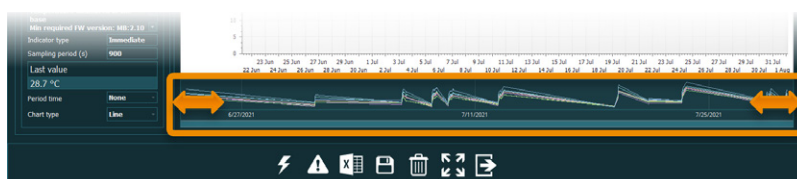
4. In details zone, select the type of graph (Bar / Area / Line / Step line / Step area / Point).



5. Click on a graph button to choose to add on a new graph or an existing one.



6. On the Control of the time range, scroll the left and right sides to define the start and end time.



6.7. RDS Toolbox – Maintenance



For arm, the maintenance tiles are hidden by default. Click on the Maintenance tile to deploy all the tiles (the number depends on the profile).

Program a probe 	 	Tool to reprogram a probe.
System check 	 	Auto-diagnostic for Arm and AS1/RS6 laser scanner
Configure connectivity 	 	Tool to customize the connection settings (Wi-Fi, TCP/IP).
System Software update 	 	Tool to automatically update all the boards of the arm and scanner.
Firmware update 	  	Tool to program the electronic boards of the arm or the scanner.
RS-SQUARED plate 	 	When the assigned artefact plate must be changed on the RS-SQUARED
View logs 		Tool to view the RDS Toolbox log.

: Advanced user profile or upper

6.7.1. System Check

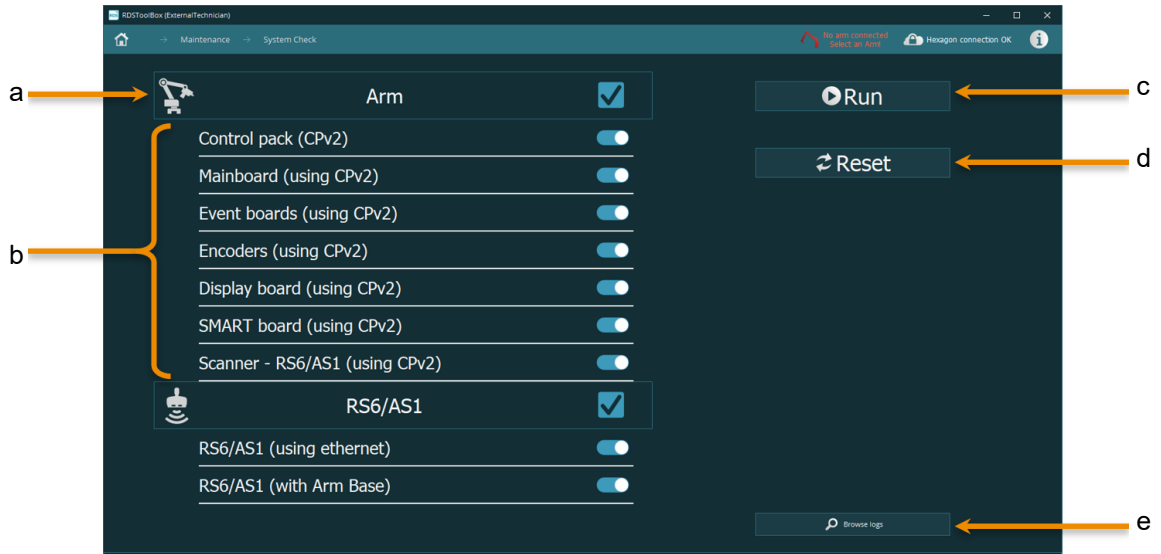
6.7.1.1. Description

RDS Toolbox provides an auto-diagnostic tool for the system.

It operates a check-up of the selected component, to detect potential failure.

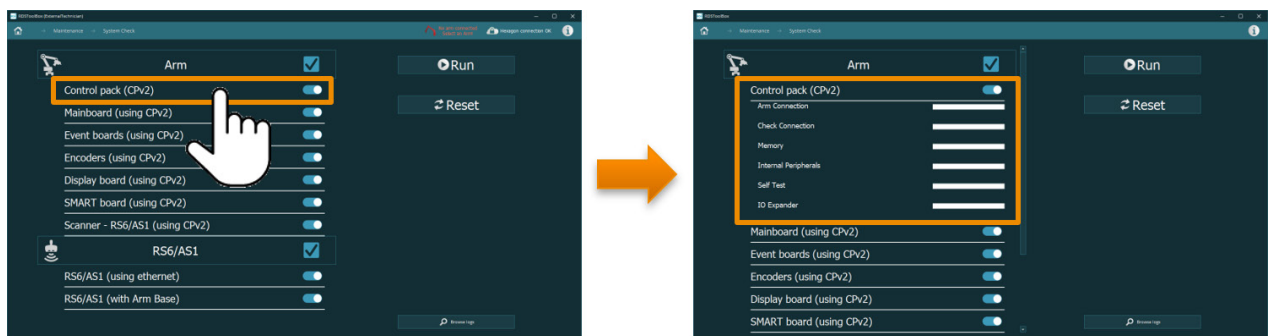


Not all indicators of the selected components are checked. Certain type of issues may not be detected by the system check.



- a. Main component
- b. Sub-categories test
- c. Run / stop the auto-diagnostic
- d. Reset the settings
- e. Display the logs

For each component to test, one or several sub-categories of test can be done. Click on the sub-category to view the details of the test.



6.7.1.2. Available Diagnostics

Arm Category

This regroups automatic tests for the arm itself.



Ensure that the selected tests fit with the connected hardware (version of arm, Control Pack...)

Mainboard	• Arm connection • Configuration • Sounds • Bluetooth • LEDs • SD Card Memory • FRAM Memory • ASID • Log File • Temperature
Event board	Status (versions, statuses, components, probe file)
Display board	Status
Encoders	For each axis: • Events • SMART (shocks) • Firmware and hardware versions • Voltage, temperature
SMART boards	For each board (CP, BC, DE and Wrist) • Voltage, temperature and accelerometer
Vibration Tilt board	At the base of the arm: • Vertical level, stability
Control Pack	• Arm connection • Check connection • Memory • Internal peripherals • Self-test • IO expander
AS1 / AS1-XL on arm	• Arm connection • Check connection • IO expander

AS1 / AS1-XL

This regroups automatic tests on the scanner for the arm and the tracker.

AS1 / AS1-XL (using ethernet)	• Check connection (TCP/IP, firmware) • Read serial number • Check sensor (components temperature, fan speed, laser brightness) • Check sensor compensation specs
AS1 / AS1-XL with arm base	• Scanner SMART board (voltage, temperature, accelerometer)

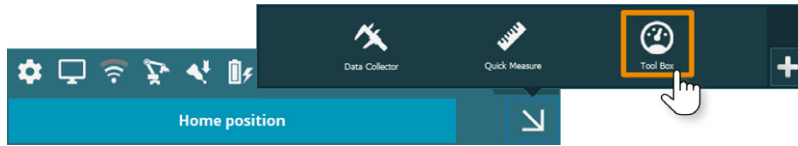
Advanced Checks (arm)

This provides a set of tests that require manual intervention from the user (press buttons...).

Wrist	Test to check if all the available buttons work correctly. • Press on each button as required.
Encoders	Test to search for encoders errors. • Rotate all axis and press “Continue”.
Vibration & Tilt	Test to check the correct setting of the Tilt sensor. • Move the B axis down until the requested angle (horizontal position). 

6.7.1.3. Process

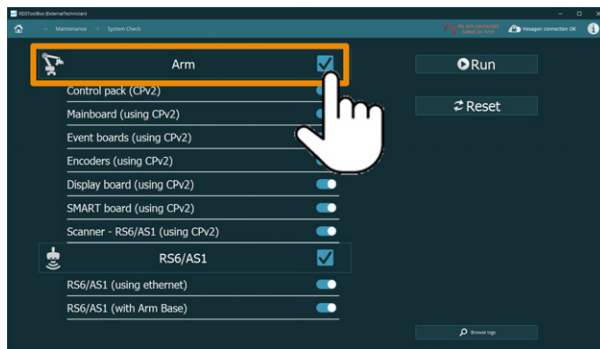
1. Open RDS Toolbox



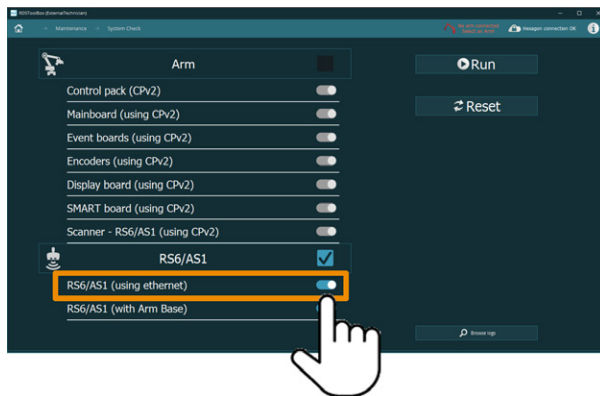
2. Select Maintenance > System Check



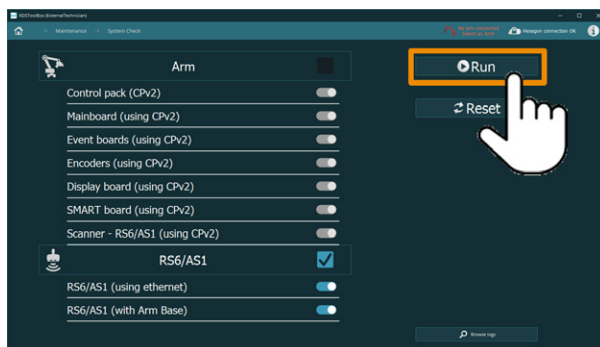
3. Check / uncheck the main component(s) to test



4. Select the tests to operate on the component(s)



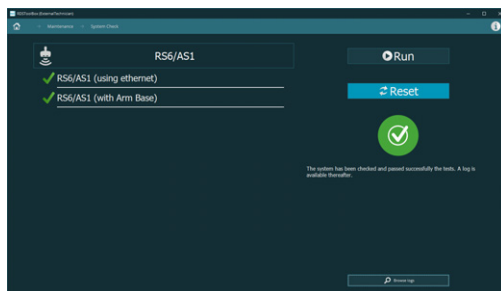
5. Run the auto-diagnostic



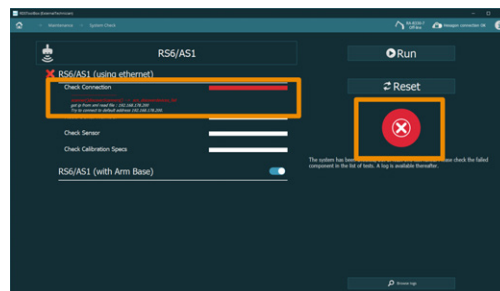
6. While running Arm (Advanced) tests, some manual intervention may be asked to the user (press the arm buttons, ...).
7. When finished, the test result is shown on the right side.



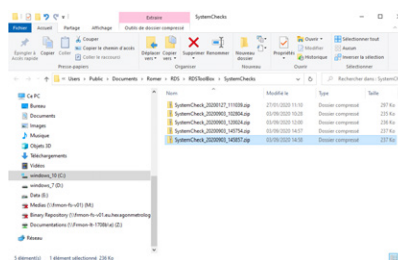
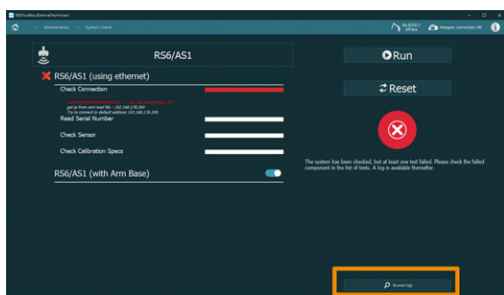
All is OK.



When failed, the faulty test is highlighted.



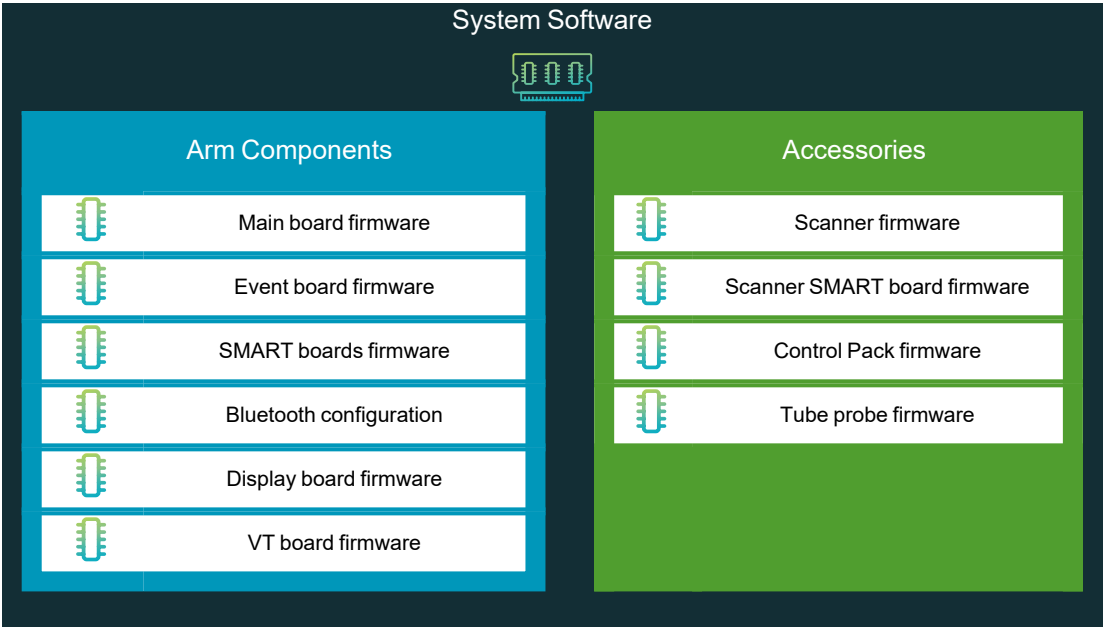
8. A set of logs becomes available, press “Browse Log”. The corresponding files are grouped in a zip file (current date and time). Transmit the log file to the local service centre.



6.7.2. System Software Update (RA8)

The RA8 system software is the set of all firmware on its electronic boards. RDS provides a system software file, which contains tested and compatible firmware.

Even if each board can be updated individually, the whole system software can be updated in once. It is highly advised to update a complete system software as it provides a set of compatible firmware.

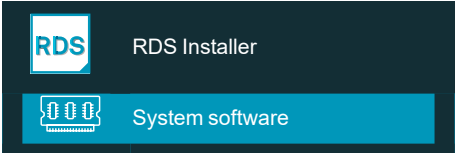


The System Software can be checked and updated through “System Software Update” tool in RDS Toolbox.

All system software functions only concern the RA8.

The RDS software package embeds the appropriate system software within its installation.

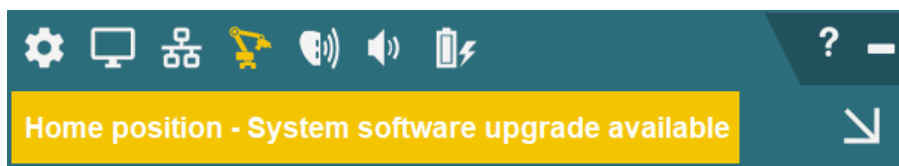
Once RDS is installed, the system software is then also automatically installed, no need to worry about it.



The system software must be manually copied onto the local folder C:\Users\Public\Documents\Romer\RDS\Firmwares.

In case a new system software becomes available between two RDS versions, then the technician can upload it manually.

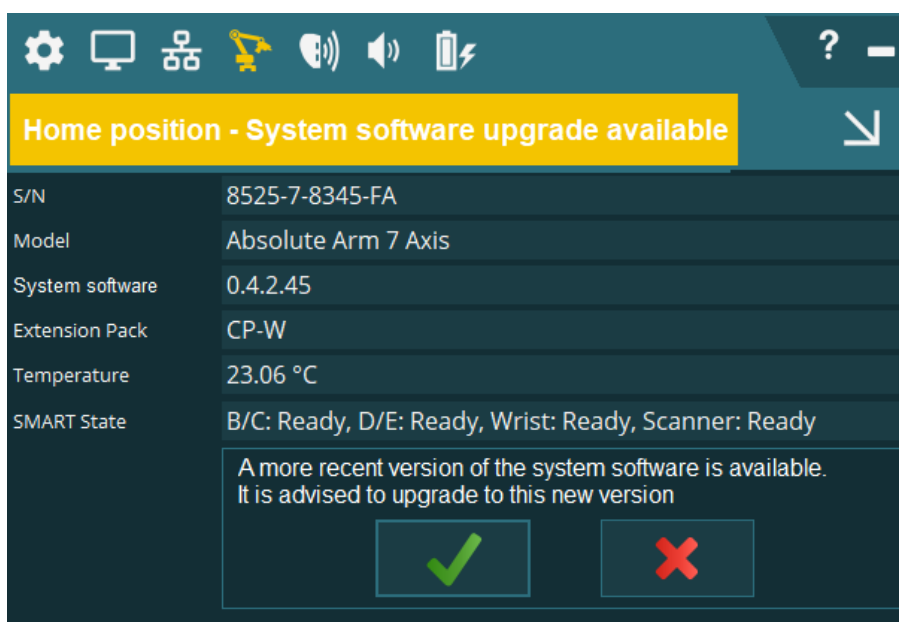
6.7.2.1. System Software Notifications



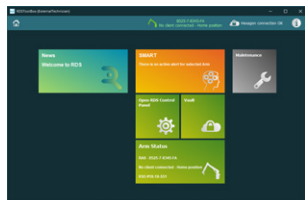
When connecting to the arm, RDS checks the current system software for any mismatch and if it is up to date. RDS will warn by a notification on the Agent in case of:

- The version of system software is up to date, but one component does not match
- All components match with the system software, but a new version of system software is available.

Then by opening the instrument tab on the RDS Agent, the user can choose between opening RDS Toolbox to update the system software or postpone the notification (1 week).



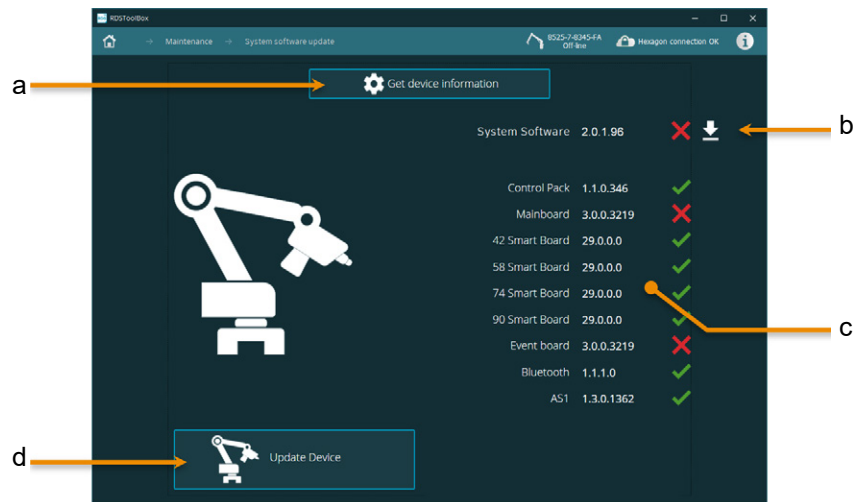
 Open RDS Toolbox to update the system software.



 Postpone the notification one week.

6.7.2.2. Updating the System Software

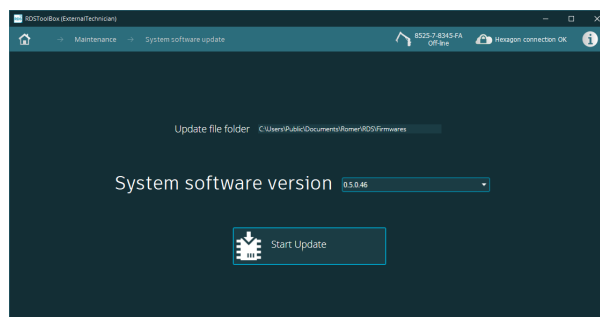
To update securely the system software, open RDS Toolbox > Maintenance > System Software Update. RDS then checks the current system software and each component.



- a. Rerun the detection of components
- b. System software status
- c. Detailed components of the system
- d. Fast system software update

	System software	Components
✓	The current system software is compatible.	The component match with the current system software.
✗	The current system software contains non compatible components.	The component does not match with the current system software.
↓	The current system software is not up to date, a new one is available.	

Simply press the button “Update device”, select the version of system software to upload on the arm and start.



The update may automatically restart the arm several times. Don't stop it.

6.7.3. Program a Probe (arm)



NOTICE

IP54 contact probes cannot be programmed with a ROMER Absolute Arm (RA7).

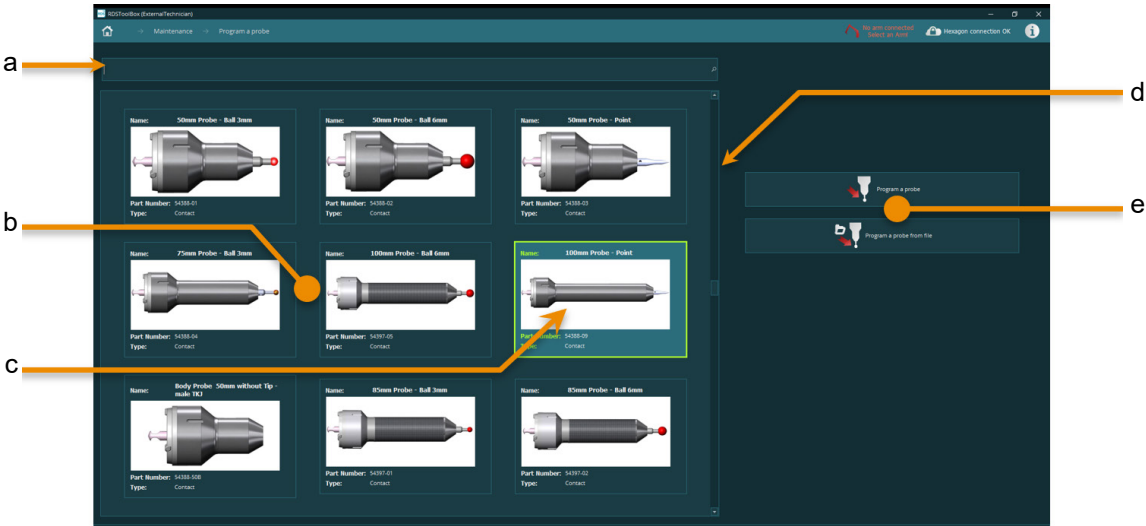


This panel shall be used to program or reprogram a probe in case of a programming problem. It defines in its memory the type of probe (contact, diameter, non-contact...).

The probes database is automatically updated as soon as the computer is connected to internet (synchronization with Hexagon Server database).



On first launch after the installation, the list of probes is empty, until the computer is connected to internet to update it.



- a. Search tool
- b. List of probes
- c. Selected Probe program (highlighted blue)
- d. Lift to scroll the probes
- e. Action buttons:



Start programming process

Program from a file



This tool needs a wired connection and arm plugged on power supply. Wi-Fi connection and battery-power not supported.



Probe Details

All the probes are described in a tile containing some information.

Name:

85mm Probe - Ball 4mm



Part Number:

H00000576-02

Type:

Contact

Name	Complete name of the probe file. The name contains the necessary information: Tip diameter Tip material Type of probe Length of the probe Type of arm (Absolute / Multi Gage) Angle (if not straight) Gender of TKJ
Picture	
Part Number	Refer to your catalogue to get the part number
Type	Type of probe: Hard contact probe Tube non-contact probe Touch trigger Probe

6.7.3.1. Find a Probe

RDS Toolbox provides several options to find easily the correct probe.

Use the Search Box (Ctrl+F)

This tool permits to reduce the list of probes with a research text.



Simply enter a part of the Name or the Part Number in the search box.



The list is automatically reduced to the search criteria.

X: Cancels the text filter

Use the Filters on the Probes Tiles.

For each of the details on the probes tiles, tools are available to filter or sort the list by the selected detail.

Move the pointer over one detail, two symbols appear:



	Filter	Click on it to reduce the list of probes to the selected type of detail.
	Sort by	Click on it to sort the list of probes by the selected type of detail (increasing). Click a second time to reverse the order (decreasing).

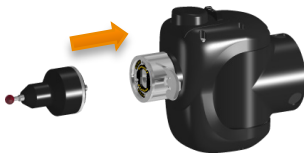
6.7.3.2. How to Program a Probe

Program from a Tile

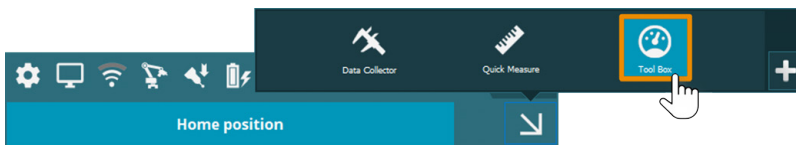
1. Establish a wired connection to the arm (Ethernet or USB).



2. Plug the probe through the TKJ connector



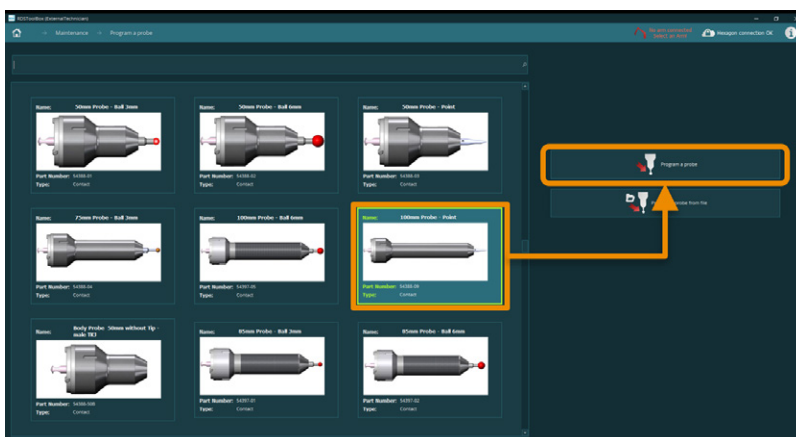
3. Open RDS Toolbox



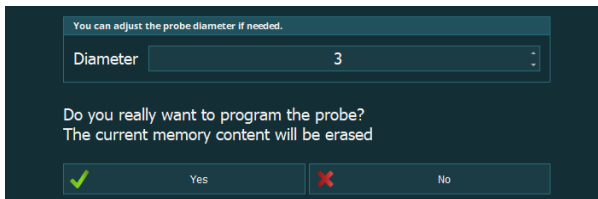
4. Select Maintenance > Program a probe



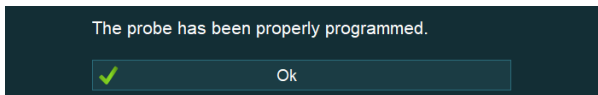
5. In the list of probes, select the appropriate one and click “Program a probe” button.



- Adjust the real diameter and confirm.



- RDS displays the information message.



The probe programming affects the memory of the probe itself, not the memory of the arm. If the probe was already in the memory of the arm, delete it to be recreated with the new programming.

Program from a File

For special custom probes, standard probe programs may not be available. Probe files provided by Hexagon can then be used.

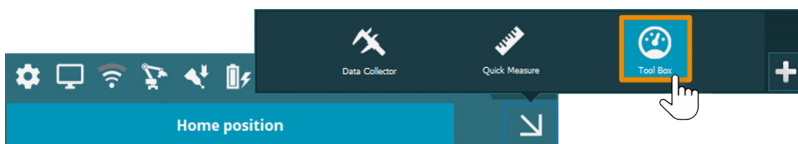
- Establish a wired connection to the arm (Ethernet or USB).



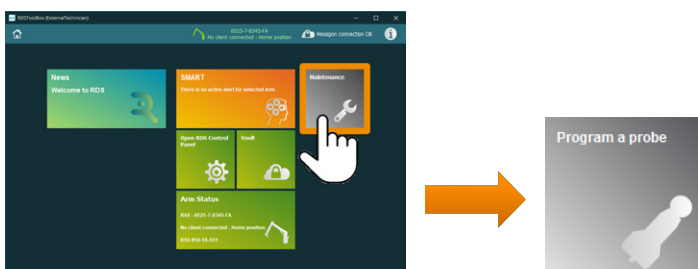
- Plug the probe through the TKJ connector



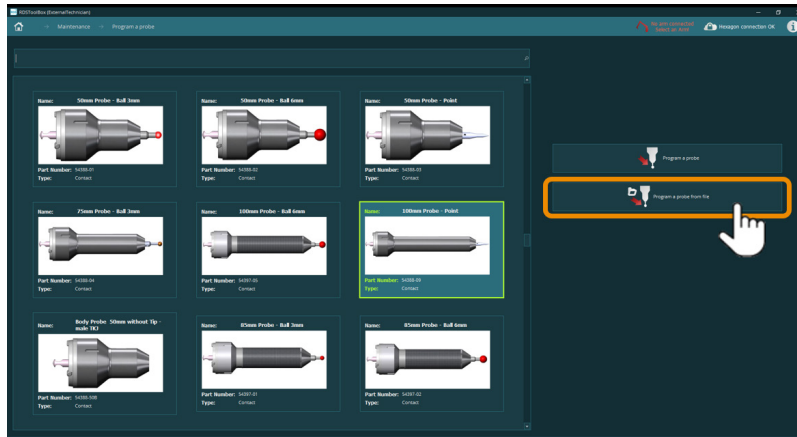
- Open RDS Toolbox



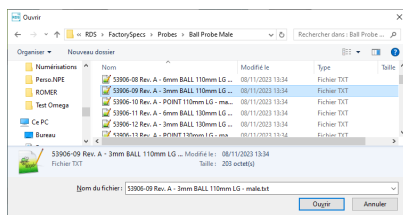
- Select Maintenance > Program a probe



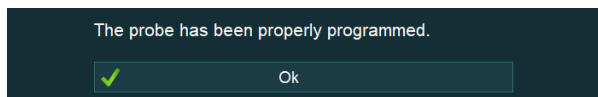
- Directly click on the “Program a probe from file” button.



- Browse and select the probe file provided by Hexagon.



- RDS displays the information message.



6.7.4. Connectivity Configuration

The configuration of the Control Pack can be changed, to meet customer's criteria, improve the efficiency or for dual use on a same computer.

This can be done on RDS Toolbox ► Connectivity configuration maintenance tool.



6.7.4.1. Network Address Configuration

The following network parameters can be set.

	Default value	Restrictions
IP Address	192.168.178.1	In case of DHCP, limited from X.X.X.1 to X.X.X.9 with a 24 bits mask (255.255.255.0).
Subnet mask	255.255.255.0	Last byte = 0 (X.X.X.0) for scanner connection.
DHCP Server	R	DHCP Client not supported.



NOTICE

To avoid any issue with the connection to the scanners, it is recommended to

- Use different IP ranges for each arm
- IP last byte ≠ 200; 201 (reserved to the scanner)
- Mask last byte = 0 (X.X.X.0)

(ex 192.168.178.1 and 192.168.177.1 with mask = 255.255.255.0)



NOTICE

The setup of the gateway is not possible.

If the gateway on the Control Pack had been configured with an older version of RDS, It will be automatically disabled.



The connected arm's gateway is enabled (192.168.178.10).
Due to legal restriction, it will be disabled when applying changes.

OK



NOTICE

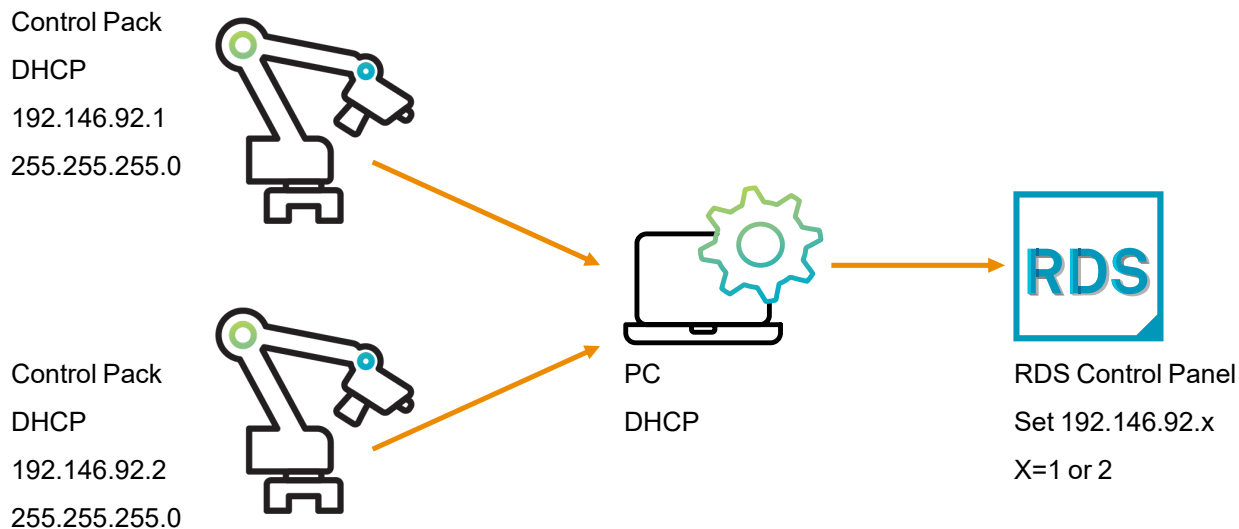
Scanning is a network intense case. Over a company network, performance issues can be encountered when using the system with its maximum performance settings.



The network configuration requires System Software v2.1 or higher.

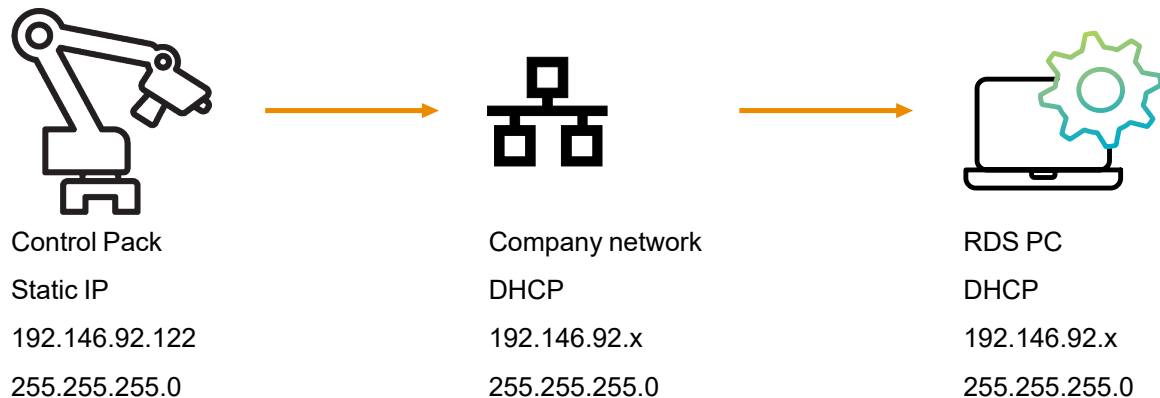
Multi arms connection

By setting several arms with different network configurations (for example simply different IP addresses), it is possible to keep all the arms connected and powered at the same time on the same PC. To switch from an arm to another one, you just need to indicate the new network configuration to RDS.



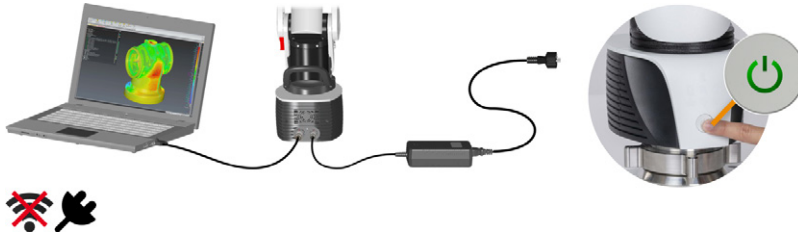
Connection through a company network

Using DHCP, the arm cannot be connected to the PC via the company network. However, using a static configuration ("DHCP Server" unchecked), this type of indirect connection can be used.

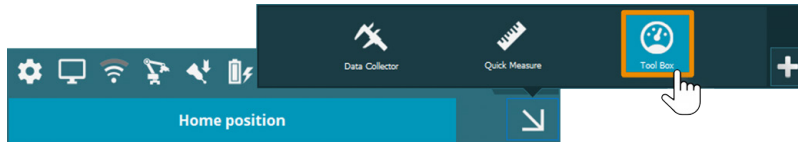


Process

1. Establish a wired connection to the arm.



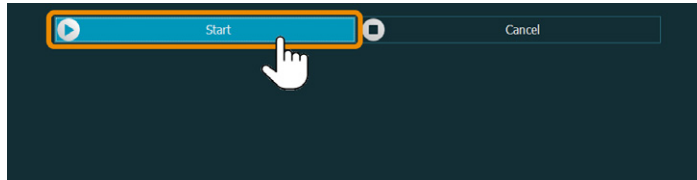
2. Open RDS Toolbox.



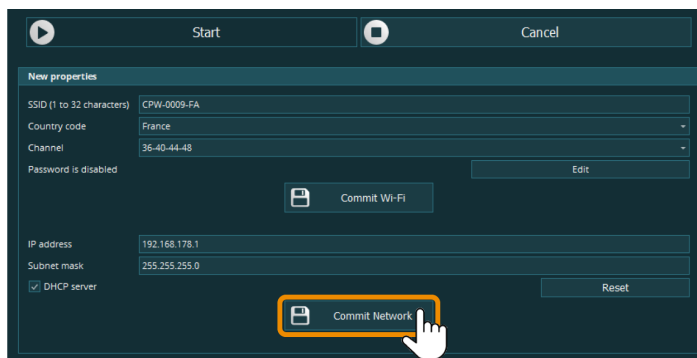
3. Select Maintenance > Connectivity configuration.



4. Click on “Start”.



5. Enter the values for each feature and press “Commit Network”.



6. Wait for the arm to be ready with the new settings.



When the network address has been customized, the Ethernet and Wi-Fi pictograms appear briefly orange during the initialization.





If the customized network configuration has been lost, a reset can be done:

- 1. Power on the arm.*
- 2. Once initialized, press 3 times on the power button, the Ethernet and Wi-Fi pictograms turn to orange.*
- 3. Again, press 3 times on the power button to reset the network configuration (if no action has been done before 10 seconds, the process is aborted).*
- 4. The arm then will restart.*

6.7.4.2. Wi-Fi Chipset Configuration

The Wi-Fi network of the arms (Wireless Pack – CP-W) can be changed, to meet the customer's Wi-Fi criteria, improve the efficiency by changing the channel, or increase the security by using a password key. Here are all the options that can be used and setup through RDS Toolbox.

	Default value	Change Chipset
SSID	"CPx-UN-FF" (Type, Serial number of the Control Pack and Factory)	Free (1 to 32 char.)
Country code		Select the appropriate country
Channel	Auto CP2-3: none	1 > 165 (according to the country code)
Password	CP-W: "AbsoluteArm"	Free (WPA2 - 8 to 63 char.)



NOTICE

The selection of the country is fundamental for the available allowed channels. It is the responsibility of the user to select the right choice according to his country regulation.



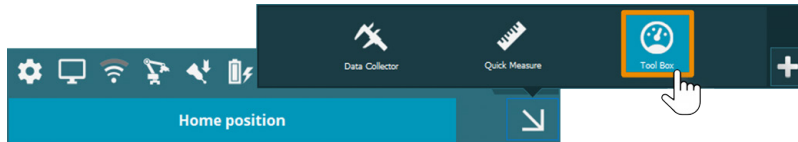
The configuration of the FP2+ and FP3+ must be operated through RDS Mobile.

Process

1. Establish a wired connection to the arm.



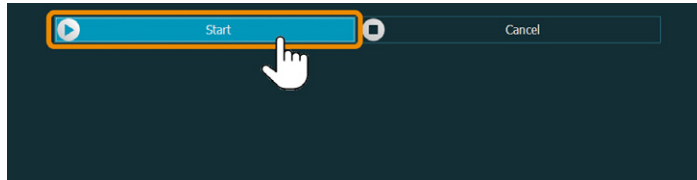
2. Open RDS Toolbox.



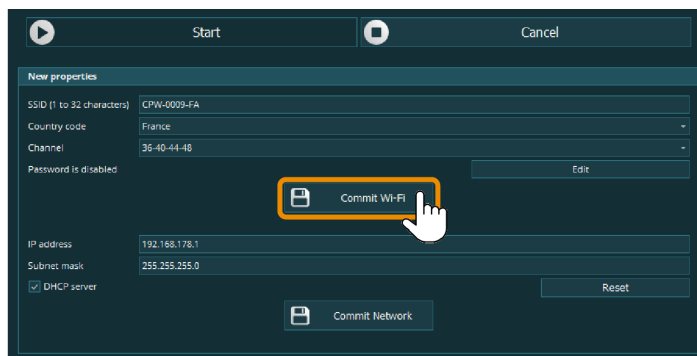
3. Select Maintenance > Connectivity configuration.



4. Click on “Start”.



5. Enter the values for each feature and press “Commit Wi-Fi”.



6. Wait for the arm to be ready with the new settings (Wi-Fi base pictogram steady).

6.7.5. Upgrade Firmware (RA7)

This tool can be used to reprogram the firmware of an electronic board. It mainly concerns the Absolute Arm, Extension Pack (FP / CP), or the scanners.

The electronic boards firmware should always be up-to-date, as a new version is always compatible with old boards.

Main / Mother board	*.iic	
Mother board PIC	*.fw	
Event board	*.fw	
Control / Feature Pack	*.gz	Check the latest version with your local Hexagon Service Centre.
SMART Board		
RS1-5 Scanner	*.swu	
AS1 / RS6		



This tool needs a wired connection and arm plugged on power supply. Wi-Fi connection and battery-power not supported.

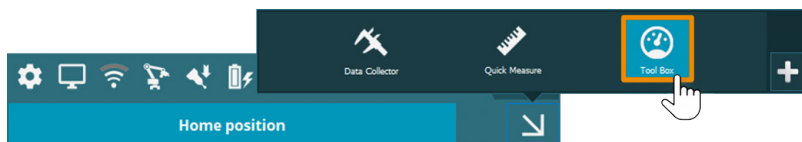


6.7.5.1. Check the Versions of the Firmware

1. Establish a wired connection to the instrument.



2. Open RDS Toolbox.



3. Select Maintenance > “Upgrade Firmware”.



4. Wait until the list of components is displayed

Address	Board Type	Serial Number	Hardware version	Boot version	Version	Action
0	Mainboard	22	2.0.1.1466	3.1.0.3233	3.1.0.3233	Upgrade firmware
11	Event board	13	3.0.0.3219	3.1.0.3233	3.1.0.3233	Upgrade firmware
42	Smart Board	3	4.0.0.0	29.0.0.0	29.0.0.0	Upgrade firmware
58	Smart Board	3	4.0.0.0	29.0.0.0	29.0.0.0	Upgrade firmware
74	Smart Board	3	4.0.0.0	29.0.0.0	29.0.0.0	Upgrade firmware
12	Display board	1	3.0.0.3219	3.1.0.3233	3.1.0.3233	Upgrade firmware
	Control Pack	CPW-0009-FA		2.0.0.365		Upgrade firmware
	RS5					Get more information
	Bluetooth			1.1.1.0		Configure Bluetooth module
	Embedded Images			3.1.0.3233		Write images



The list can be refreshed by clicking on “Check Firmware”



Check Firmware

5. Check the list, check the versions or send the list to the Hexagon technician.

6.7.5.2. Upgrade the Firmware

1. Copy the new firmware on C:\Users\Public\Documents\Romer\RDS\Firmwares.
2. Proceed with a Check Firmware (see previous page).
3. **Scanner only**, press “[Get More information](#)”, the serial number and version of the scanner are displayed.
4. Ensure that the upgrade is valid and press “[Upgrade firmware](#)” on the appropriate line.

Address	Board Type	Serial Number	Boot version	Version	Progress
0	Mainboard		1.0.0.0	4.3.1	Upgrade firmware

5. In the list select the new firmware and press “Pick out”.

Please select the firmware file

Firmware files location : C:\Users\Public\Documents\Romer\RDS\Firmwares

Refresh

Locate on disk

H00004502_RA8 FW-Mainboard 2.3.0.1481.fw

Pick out

Cancel

6. Validate both confirmation prompts.

Do you really want to upgrade the firmware?

Yes

No

7. Wait until the end of the upgrade, then validate the message.

Firmware upgrade successful.

OK



NOTICE

The upgrade may be long depending on the board. Don't switch off the arm before the end of the download.

8. The arm then automatically reboots (if not, switch off then on again to reboot the arm with the new firmware).

Please switch off/on the arm to apply changes.

OK




NOTICE

For RA8, in case of issue when programming the firmware of the mainboard, a boot on Safe mode is possible:

- *Press the Power button and then press again 4 times the button, the arm boots in a safe mode.*
- *Then proceed again with the firmware load operation.*


NOTICE
RS2 and RS3

It is necessary to delete the existing RSx “probe” from the memory of the arm and add it again with the correct data.

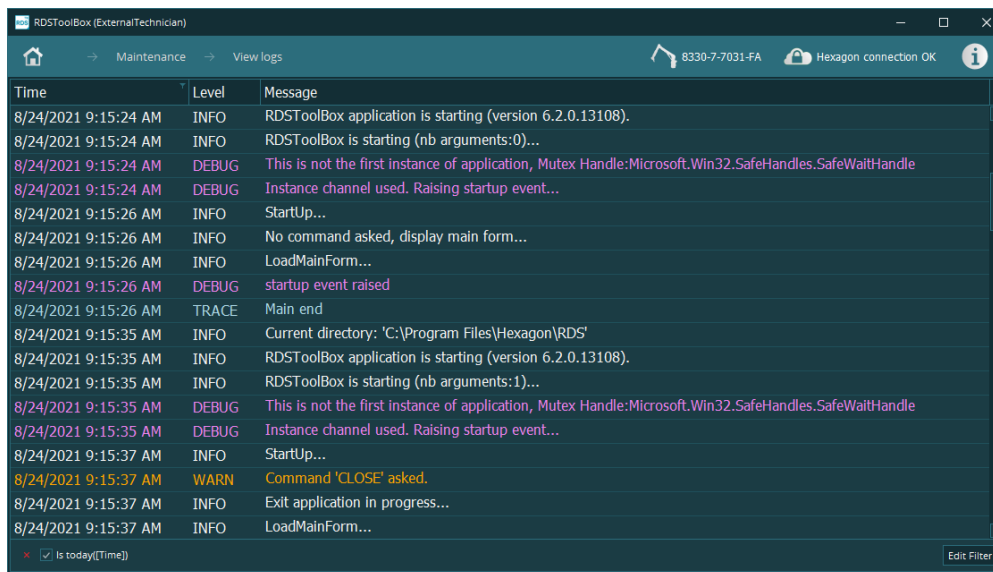


To correctly restart the scanner, shut down the arm and unplug the power cable.

6.7.6. View Logs

Each event in RDS Toolbox is notified in a log file; thus, it is possible to consult the list of the latest events.

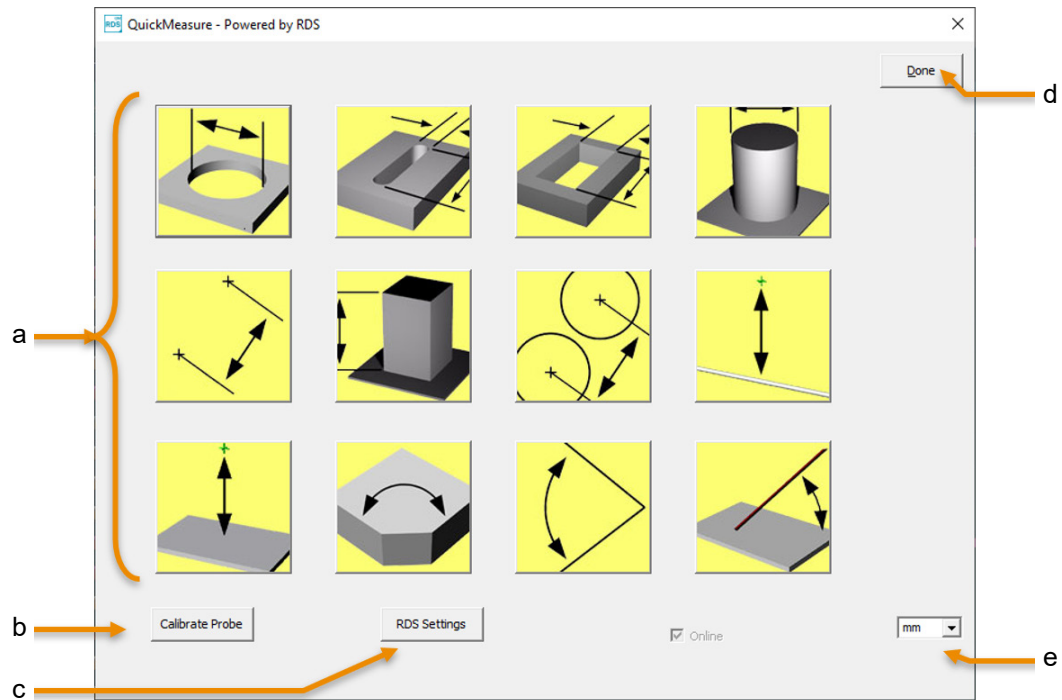
The events are classified by type and levels. For convenience, a default predefined filter is set when opening the panel.



Time	Date and time (local) of the event (default = Today)	
Level	Level of details event	INFO DEBUG WARN ERROR
Message	Description of the event itself	

7. RDS Quick Measure

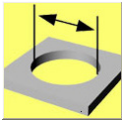
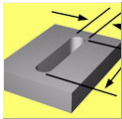
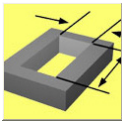
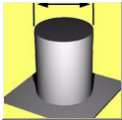
RDS Quick measure is a little tool to allow the user to very quickly measure simple dimensions.



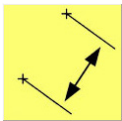
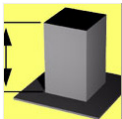
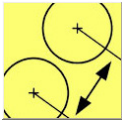
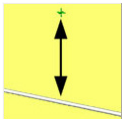
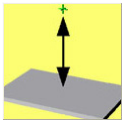
- a. Available features to measure
- b. Access probe alignment (see RDS Data Collector manual)
- c. Access to RDS Control Panel
- d. Exit Quick Measure tool
- e. Choose the units (mm / inch)

7.1. Available Features

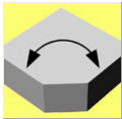
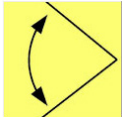
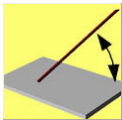
7.1.1. Dimensions

Measurement	Features to measure	Min Pts.
 Diameter of a hole circle	Plane (projection)	3
	Circle	3
 Width and length of a slot	Plane (projection)	3
	Slot	6 <i>(3 on each ½ circle)</i>
 Width and length of a rectangle	Plane (projection)	3
	Rectangle	5 <i>(2 Pts on major side, 1 on others)</i>
 Diameter of a shaft circle	Plane (projection)	3
	Circle	3

7.1.2. Distances

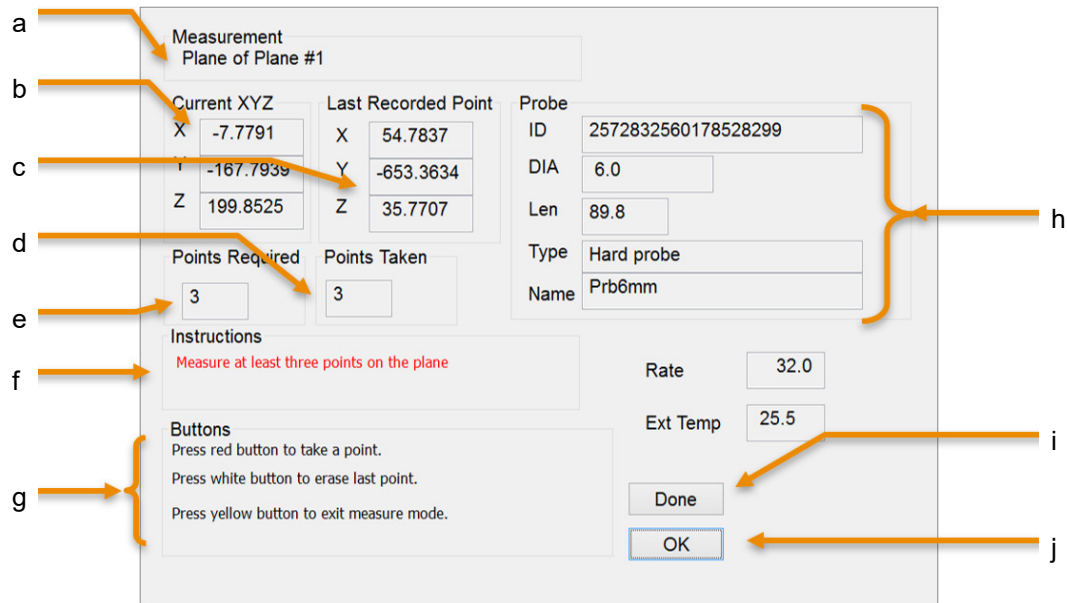
Measurement	Features to measure	Min Pts.
 Distance between 2 single points (not compensated)	Single point 1 (auto validation)	1
	Single point 2 (auto validation)	1
 Distance between 2 planes	Plane 1	3
	Plane 2	3
 Distance between 2 circles	Plane 1	3
	Circle 1	3
	Plane 2	3
	Circle 2	3
 Distance between a line and a point	Plane 1 (projection for line)	3
	Line	2
	Plane 2 (projection for point)	3
	Single point (auto validation)	1
 Distance between a plane and a point	Plane 1	3
	Plane 2 (projection for point)	3
	Single point (auto validation)	1

7.1.3. Angles

Measurement		Features to measure	Min Pts.
	Angle between 2 planes	Plane 1	3
		Plane 2	3
	Angle between 2 lines	Plane 1 (projection for line 1)	3
		Line 1	3
		Plane 2 (projection for line 2)	3
		Line 2	3
	Angle between a line and a plane	Plane 1	3
		Plane 2 (projection for point)	2
		Line	3

7.2. How to Do a Quick Measure

7.2.1. Description of the Measurement Window



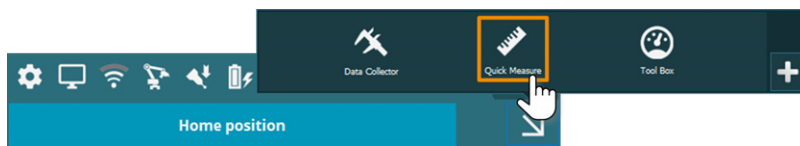
The screenshot shows the 'Measurement Plane of Plane #1' window. It contains several sections: 'Current XYZ' with X, Y, and Z coordinates; 'Last Recorded Point' with X, Y, and Z coordinates; 'Probe' specifications including ID, DIA, Len, Type, and Name; 'Points Required' and 'Points Taken' fields; 'Instructions' with a red text prompt; 'Buttons' with three instructions; 'Rate' and 'Ext Temp' fields; and 'Done' and 'OK' buttons. Orange arrows labeled a through j point to specific elements: a points to the title bar, b points to the Current XYZ X field, c points to the Last Recorded Point Y field, d points to the Points Taken field, e points to the Points Required field, f points to the Instructions section, g points to the Buttons section, h points to the Probe specifications section, i points to the Done button, and j points to the OK button.

Section	Field	Value
Current XYZ	X	-7.7791
	Y	-167.7939
	Z	199.8525
Last Recorded Point	X	54.7837
	Y	-653.3634
	Z	35.7707
Probe	ID	2572832560178528299
	DIA	6.0
	Len	89.8
	Type	Hard probe
	Name	Prb6mm
Points	Points Required	3
	Points Taken	3
Instructions	Measure at least three points on the plane	
	Buttons	
Buttons	Press red button to take a point.	
	Press white button to erase last point.	
	Press yellow button to exit measure mode.	
Rate and Temp	Rate	32.0
	Ext Temp	25.5
Buttons	Done	
	OK	

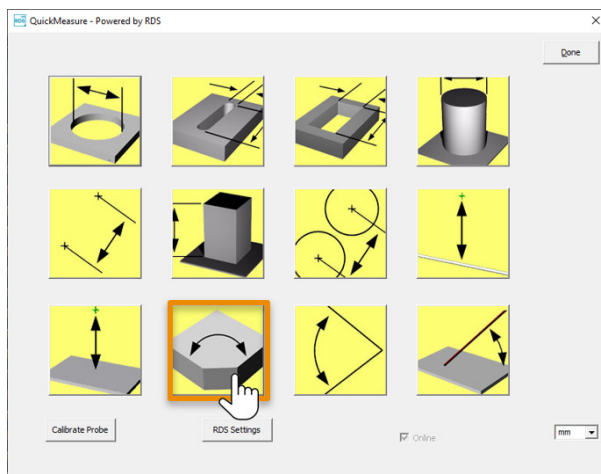
- a. Type of measurement
- b. Real time coordinates of the probe
- c. Coordinates of the last probed point
- d. Number of taken points (this must be at least equal to the minimum before validating the element).
- e. Minimum number of points
- f. Instructions to follow
- g. Reminder of the buttons functions
- h. Mounted probe specifications
- i. Validate the measured element (= wrist right button) or exit this menu
- j. Cancel – deletes last probed point
OK – validates the element

7.2.2. Measurement Procedure

1. Access to Quick Measure.



2. Select the desired measurement.



3. Follow the instructions:

Hit the points (respect the required number of points) for each feature and validate each measured feature (except single point).

Measurement Plane of Plane #1			
Current XYZ		Last Recorded Point	
X	-7.7791	X	54.7837
Y	-167.7939	Y	-653.3634
Z	199.8525	Z	35.7707
Points Required	3	Points Taken	3
Instructions Measure at least three points on the plane		Probe ID: 2572832560178528299 DIA: 6.0 Len: 89.8 Type: Hard probe Name: Prb6mm	
Buttons Press red button to take a point. Press white button to erase last point. Press yellow button to exit measure mode.		Rate: 32.0 Ext Temp: 25.5 Done OK	

4. After last measurement, the result is displayed.

Angle between planes is:	OK
110.6670 deg.	

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A.1. Advanced Installation

For industrialization purposes, arguments can be used with the RDS installer within a command line.

/qn	Silent mode
APPDIR=<cust. path>	Customized path installation

1. Open a command prompt in administrator mode.
2. Run your installer by specifying the wanted argument(s) (/qn or APPDIR=<your path>)

Example "RDS Installer_x64.exe" /qn APPDIR=C:\temp\RDSAPI



Running the installer without administrator privileges, the underlying msiexec.exe process will run but will stay stuck, waiting for user elevation answer.

	msedgeview2.exe	46292	Running	Jean-Paul ...	00	13,684 K	x64	Microsoft Outlook - W...
	msedgeview2.exe	35844	Running	Jean-Paul ...	00	10,080 K	x64	Microsoft Outlook - W...
	msiexec.exe	39520	Running	Système	00	4,156 K	x64	Windows® installer
	MsMpEng.exe	7284	Running	Système	00	245,288 K	x64	Antimalware Service E...
	MsSense.exe	7204	Running	Système	00	123,724 K	x64	Windows Defender Ad...

A.2. Setup the Application Software

The Absolute Arm is compatible with a wide range of measuring application software for probing, laser scanning, inspection, reverse engineering, tube bending inspection... PCDMIS, Geomagic, Bending Studio, or PolyWorks are examples of the most commonly used application software.

Ensure that the appropriate version and the necessary licence are installed (see with the application software reseller).

The application software can be installed before or after RDS (please follow the instructions below for setting up the software for the Absolute Arm).

Software				Instrument configuration
PC-DMIS	✓		✓	
Inspire	✓		✓	Add Absolute Arm interface
Bending Studio	✓	✓	✓	During installation, select Absolute Arm
Designer / REcreate	✓		✓	No need
SpatialAnalyzer	✓		✓	Add Absolute Arm interface
TubeShaper	✓	✓		No need
Quindos	✓			
Geomagic	⊙		⊙	Install "Absolute" plugin
Visi			✓	No need
Cyclone 3DR (3DR Meteor)	✓		✓	
GPad / GTube	✗	✗		Romosoftware is not supported by the RA8
Docs	✗	✗		Docs is no longer supported
PolyWorks	✓		✓	Select "Absolute Arm"
Metrolog	⊙		⊙	Select "Absolute RDS"
Verisurf	⊙		⊙	
3DTubeCAD	⊙			
Aberlink	⊙			
ArcoCAD	⊙			
AxelSystems	⊙			
BuildIT	⊙			

Software				Instrument configuration
				
Calypso	⊙			Select "ROMER->Absolute Arm"
CappsDMIS	⊙			
DesignWorks	⊙			
Inca3D	⊙		⊙	
MCosmos	⊙			
Metaio	⊙			
Metride	⊙			
Metromec	⊙			
Metrosoft	⊙			
Pema	⊙			
Point2CAD	⊙			
PowerInspect	⊙		⊙	Select "Hexagon RDS" interface
PowerShape	⊙		⊙	Select "Hexagon RDS" interface
Rapidform	⊙			
Reverseengineering.com	⊙		⊙	
RevWorks	⊙			
Rhino	⊙			Use "ROMER digitizer"
ScanWorks	⊙			Select "Absolute"
Tezet	⊙	⊙	⊙	
TopMes	⊙			
TopSolid	⊙			
TouchDMIS	⊙			
TubeExpert	⊙			
VTube-Laser			⊙	
WM Quartis	⊙			Add "Hexagon RDS" machine

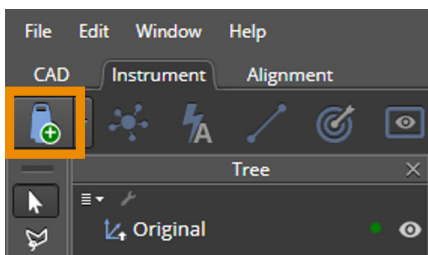
T. A-1: Application software

✓ : Certified by Hexagon | ⊙ : Implemented but not certified by Hexagon.

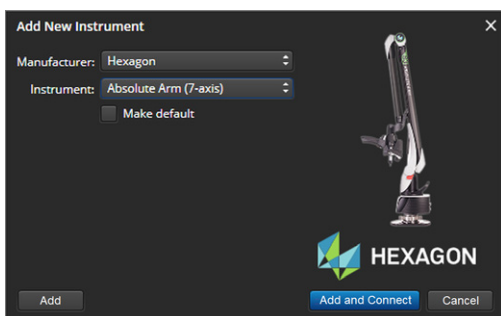
A.2.1. Inspire

Instrument Setup

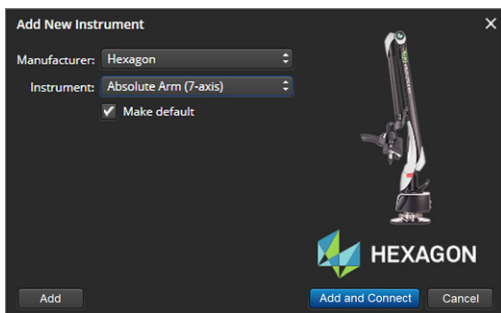
1. Run Inspire and select Instrument > Add.



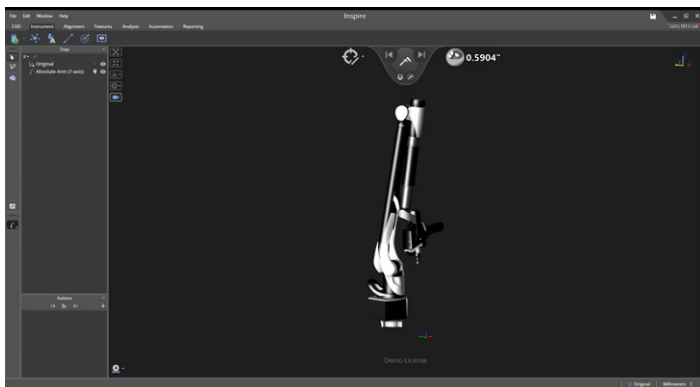
2. Choose “Portable CMMs > Hexagon” and select the appropriate instrument – Absolute Arm or Leica AT960 Laser Tracker.



3. Tick “Make default” and validate by pressing “Add and Connect”. (the instrument can be connected later by pressing “Add”).

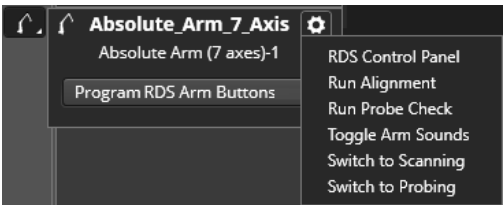


4. Now the arm can be displayed/hidden, connected/disconnected and use all the instrument tools embedded in Inspire.



Configuration

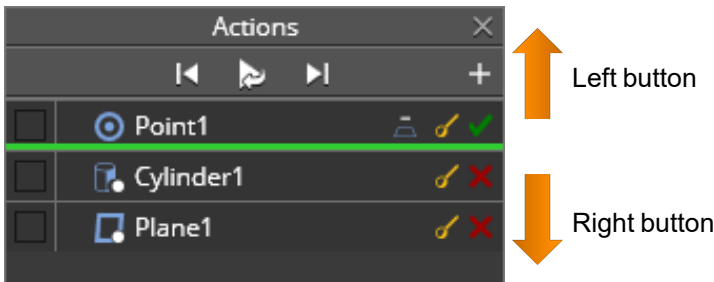
The following configuration can be done by pressing on the instrument button on the left toolbar.



RDS Control Panel	Opens RDS Control Panel for the arm configuration.
Run Alignment	Runs the probe alignment in RDS Data Collector.
Run Probe Check	Runs the quick check in RDS Data Collector.
Toggle Arm Sounds	Enable / Disable the feedback arm sounds when scanning.
Switch to Scanning / Probing	Automatically activate the scanner / touch probe. (7-axis arm only)

Specific Assignments of the Arm Buttons

When no measurement is in progress, the left and right buttons can be used to select existing actions.



Using the Wrist Display

When measuring with an Absolute Arm 7-axis, instructions and results are directly available on the wrist display. No need to have a look at the computer, the measurement goes faster (no setup is needed).



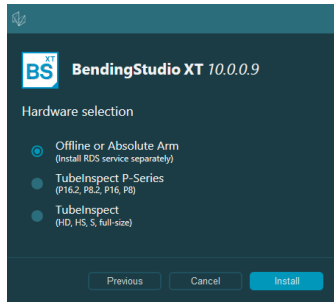
A.2.2. Bending Studio



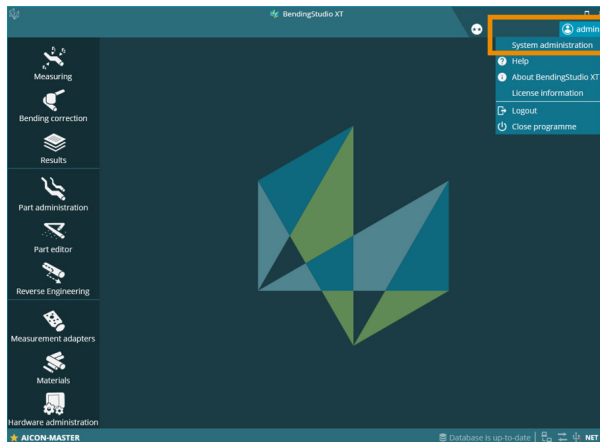
Only the AS1 and RS6 scanners are supported by Bending Studio.

Instrument Setup

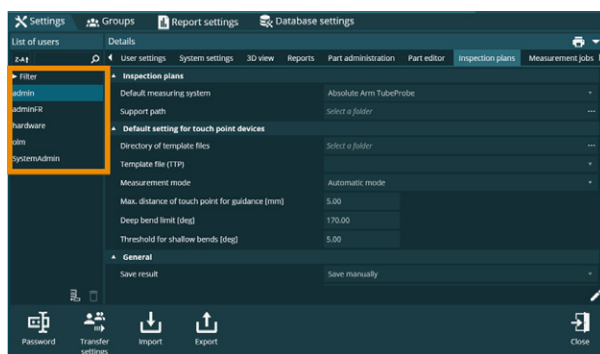
1. During the installation of the software, select “Absolute Arm”.



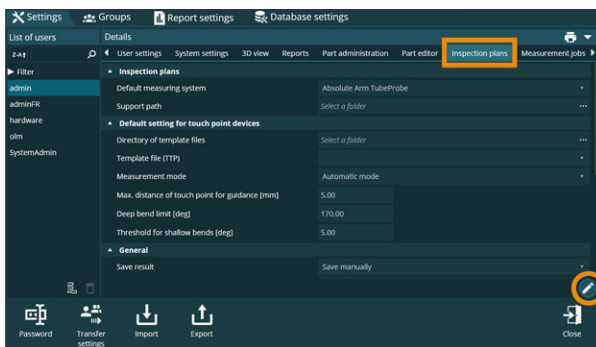
2. Click on the user button (left click) and select “System administration”.



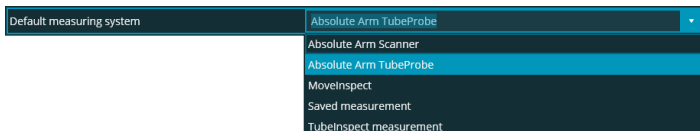
3. Select the user profile.



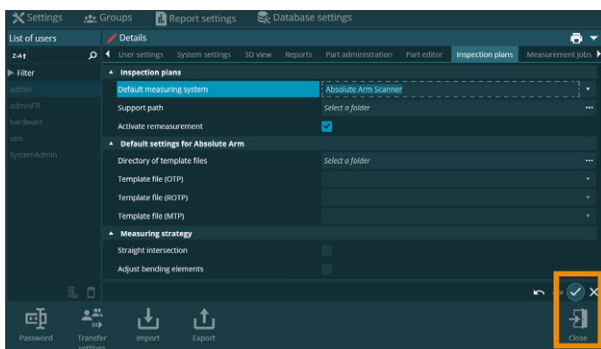
4. Display the tab “Inspection” and click on “Edit”.



5. Select the line “Default measuring system” and choose “Absolute Arm” in the drop-down list.

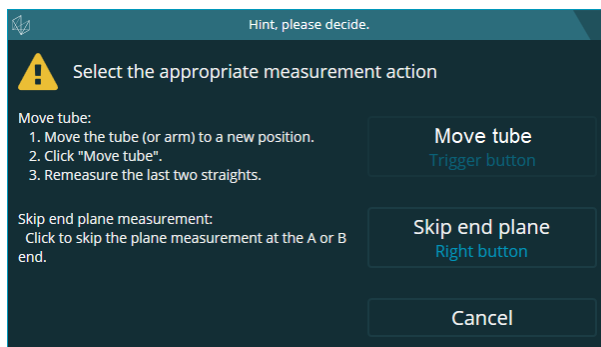


6. Click on “Validate” and exit the system administration menu.



Measurement Menu

When measuring a tube, a long press on the Trigger button opens a measurement menu to perform special operations.

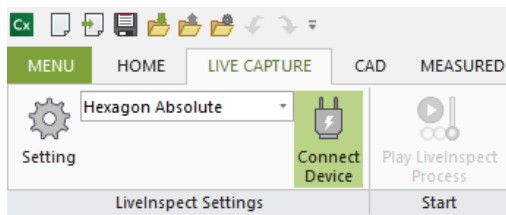


Then the arm buttons can be used accordingly to quickly move the tube or skip the end plane.

A.2.3. Geomagic

Setting up the Absolute Arm

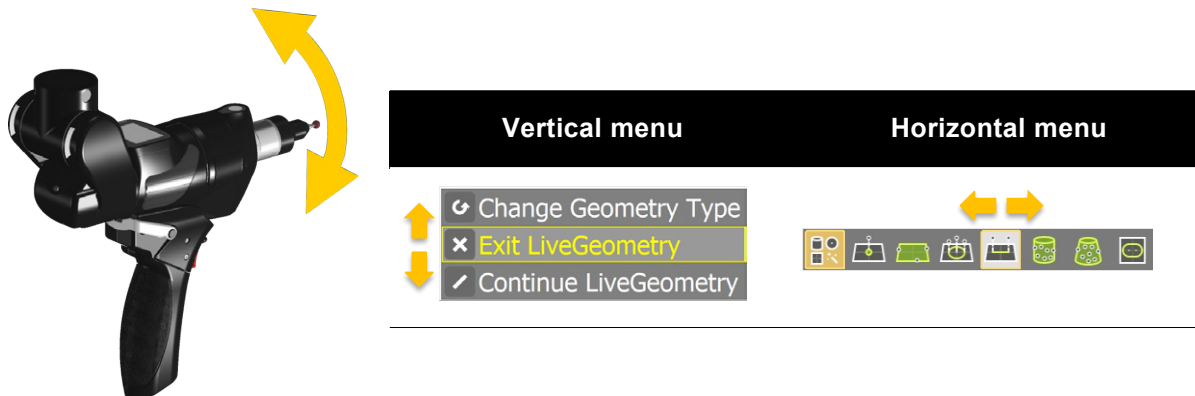
In Control X or Design X, select the tab “LIVE CAPTURE”, select the hardware “Hexagon Absolute” and then “Connect Device”.



Message Boxes

Geomagic may display dialog boxes during the measurement (for choosing the type of feature, or confirmation boxes). Such boxes (horizontal or vertical lists of choice) can be directly controlled with the wrist of the arm.

1. By moving the wrist up and down, highlight the wanted choice.



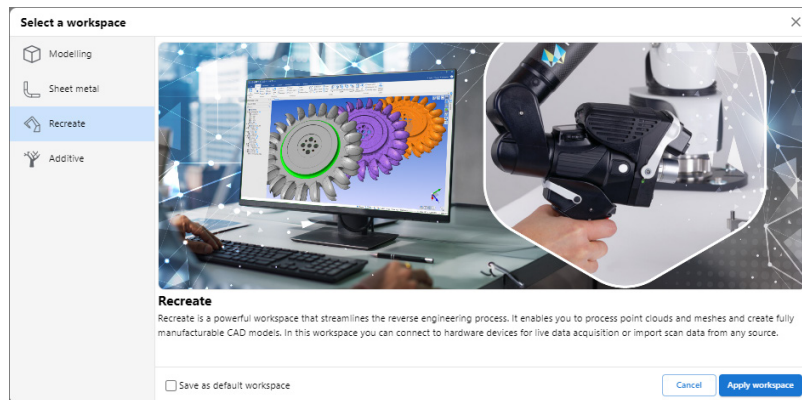
2. Press the trigger button to validate the choice.



A.2.4. Designer (Recreate)

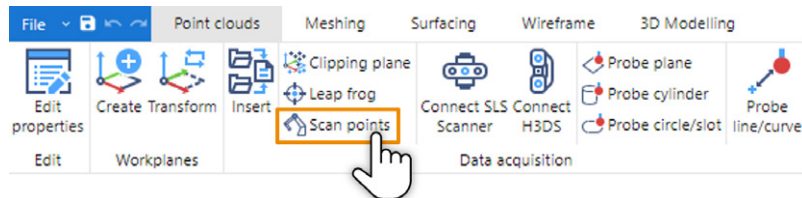
Instrument Setup

Once installed, the Absolute Arm is directly available, no setup is necessary. Just select the workspace “Recreate”.



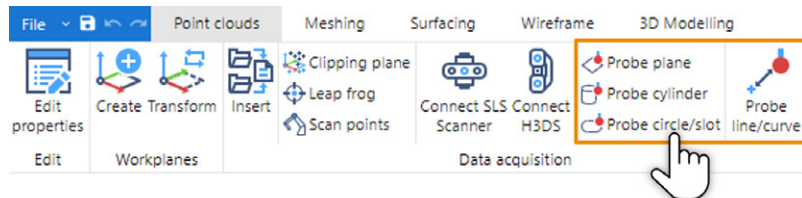
Scanning

On the ribbon, tab “Point clouds”, select “Scan Points” on the “Data acquisition” group.



Probing

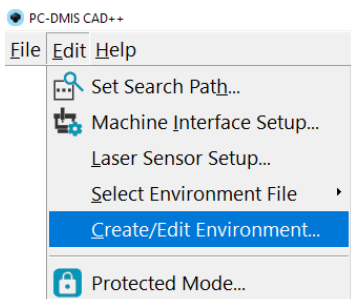
On the ribbon, tab “Point clouds”, select “Probe plane” (or cylinder, circle... according to the needs) on the “Data acquisition” group.



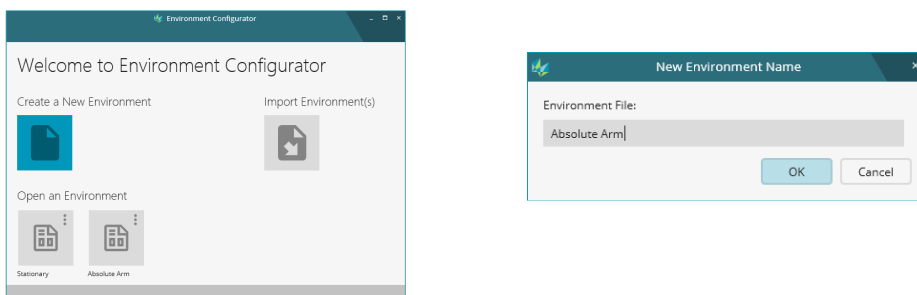
A.2.5. PC-DMIS

Instrument Setup (PC-DMIS 2023 and upper)

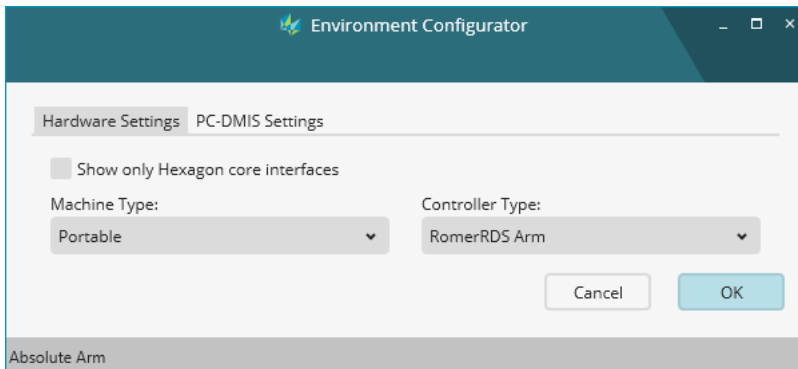
1. Run PC-DMIS (do not run any program) and select “Edit ►Create/Edit Environment”.



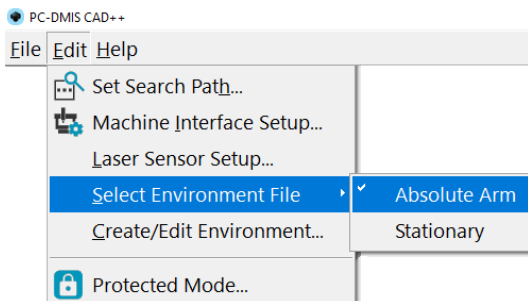
2. In the environment configurator, select “Create a New Environment” and enter a new name.



3. Select “Portable” for the machine type and “RomerRDS Arm” for the controller type.



4. Close the configurator and select the created environment.



Using the Wrist Display

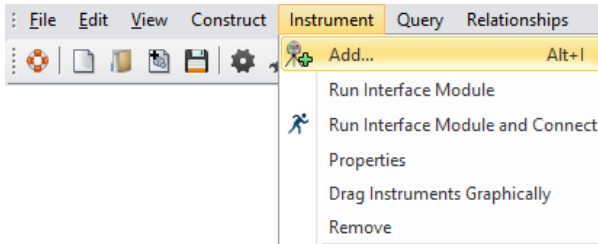
When measuring with an Absolute Arm 7-axis, instructions and results are directly available on the wrist display. No need to have a look at the computer, the measurement goes faster (no setup is needed).

Instructions	Results
	

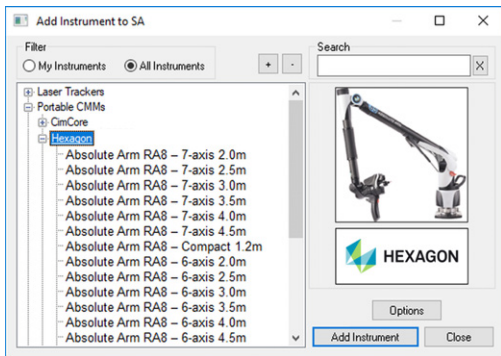
A.2.6. Spatial Analyzer

Instrument Setup

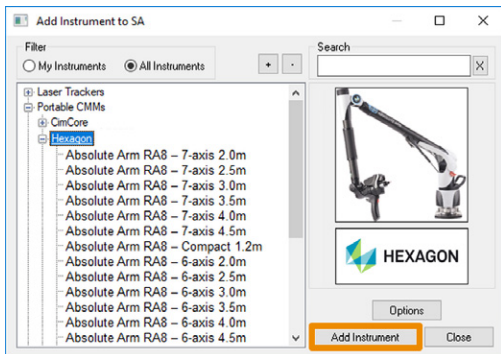
1. Run SA and select Instrument > Add.



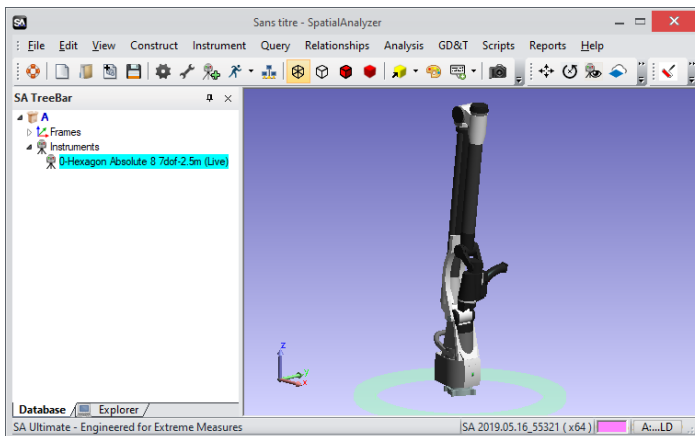
2. Choose “Portable CMMs > Hexagon” and select the appropriate instrument – Absolute Arm.



3. Tick “Make default” and validate by pressing “Add and Connect”. (the instrument can be connected later by pressing “Add”).



4. Now the arm can be displayed/hidden, connected/disconnected and use all the instrument tools embedded in Inspire.



A.2.7. Visi

Instrument Setup

Once installed, the Absolute Arm is directly available, no setup is necessary.

Scanning

1. In the menu, select “Reverse Engineering” > “Digitize points”.
2. Then a specific Digitize window is displayed. Set the wanted parameters and press “Start Scan”.
3. The system checks the connections with RDS and becomes ready to digitize.

A.2.8. Quindos

Instrument Setup

Upon Quindos/lppServer-startup the configuration menu is shown for arm settings, (for example the speaker volume). To make the new settings effective, press the SAVE-button and exit the configuration menu.

Specific Assignments of the Arm Buttons

	Trigger button	Left button	Right button
Short press	Take a point	Equivalent to POS-button on Leitz jogbox	Execute actual line
Long press	Take a burst of points	DELR (Del record)	END (Execute all following lines up to the end of the list)

Probing Scan

Only scanning of unknown contours is currently implemented.

The result points are sent to Quindos at the end of the scan or when a certain number of points is measured

Scanning ends when a point is reached that fulfils the stop condition.

Scanning also ends, when the red (main) button is released. This feature can be switched on and off with the registry entry “EndScanOnButtonUp” in the “Driver” section of the working environment.

Probe naming

The probe names in Quindos and RDS will differ due to different naming conventions.

RDS	“Centre reference probe”,	“6mm”,	“3mm”
Quindos	“_Centre_reference_probe”,	“_6mm”,	“_3mm”

(The name conversion is automatic)

Probe Alignment

If the realignment of one probe is needed, the user can execute the Quindos command ReQualifyTool; for detailed usage of the command, please see the Quindos user manual.

Please avoid renaming of probes during alignment. Use the predefined names!

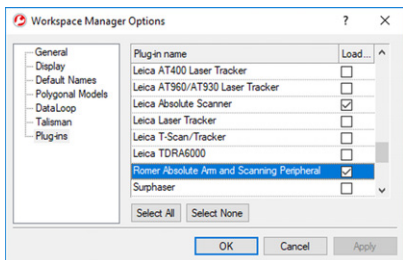
A.2.9. PolyWorks

Instrument Setup

1. In the Workspace Manager, access the options.



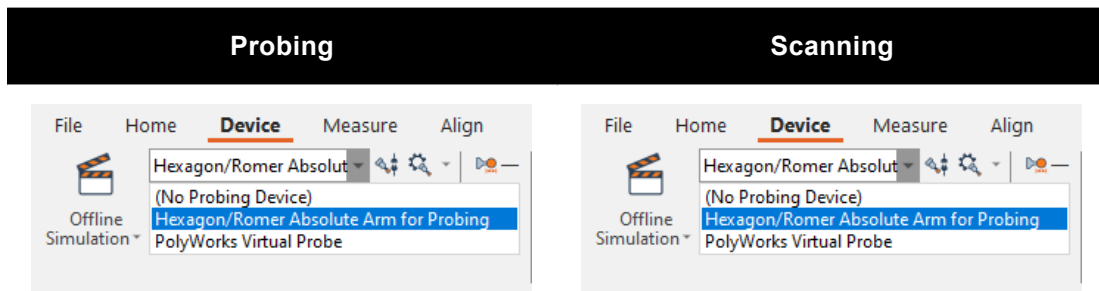
2. In the Plug-ins tab, select only “Absolute Arm and Scanning peripheral” or “Leica Absolute Scanner”.



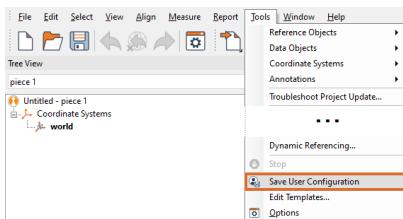
3. Start PolyWorks Inspector



4. In the menu “Device” > “Settings”, select “Absolute Arm for Probing” and “Absolute Arm for Scanning”.



5. Select and validate “Tools > Save User configuration” to memorise as default instrument.



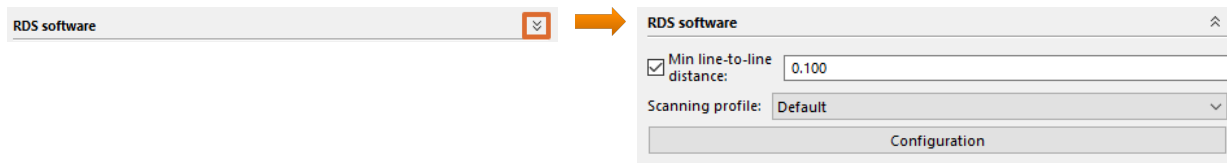
Arm Buttons Use for Message Boxes

When a message box appears, the arm buttons can be used to make a choice in the box:

- A short press on any button, switches to the next choice.
- A long press on any button validates this choice.

Specific Controls when Scanning

When using the Scan plugin, Polyworks provides some options for RDS (expand the “RDS software” hidden section).



Min line-to-line distance	Filter to skip scan lines below the specified interspace.
Scanning profile	Shows the current RDS scanning profile and permits a direct selection.
Configuration	Opens the RDS Control Panel.

Using the Wrist Display

When measuring with an Absolute Arm 7-axis, instructions and results are directly available on the wrist display. No need to have a look at the computer, the measurement goes faster (no setup is needed).



A.2.10. Verisurf

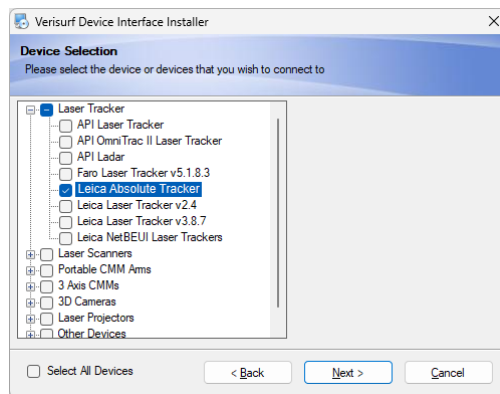
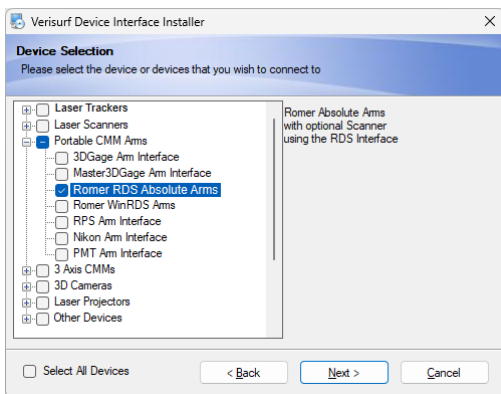
Instrument Setup – Software Installation

- At the end of the software installation, select “Open the Verisurf Device Interface Page” and “Run the Verisurf Device Interface install”.



- On the Device Selection window, according to the instrument, select:

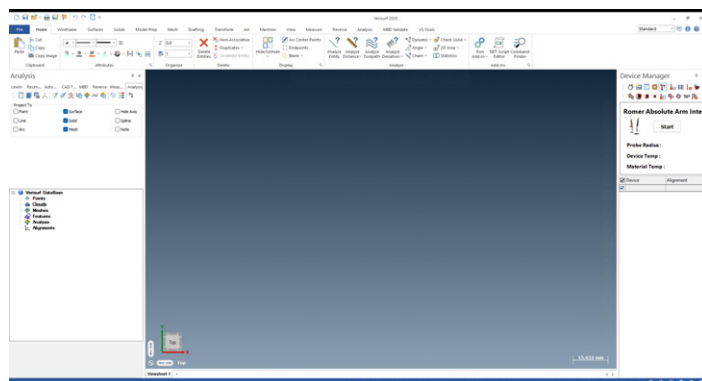
- “Portable CMM Arms” > “Romer RDS Absolute Arm”
- “Laser Trackers” > “Leica Absolute tracker”



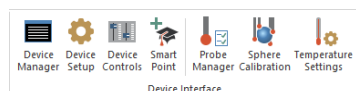
(finish the installation).

Device Setup & Start

The Verisurf Device Manager typically opens on the right side of the Verisurf program.

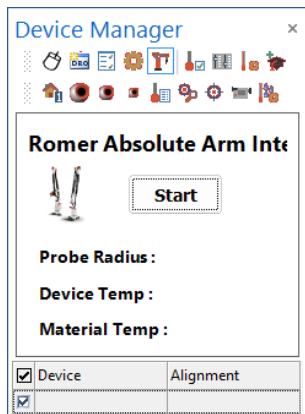


It may be accessed as well using the Device Interface group of the Measure Toolbar.

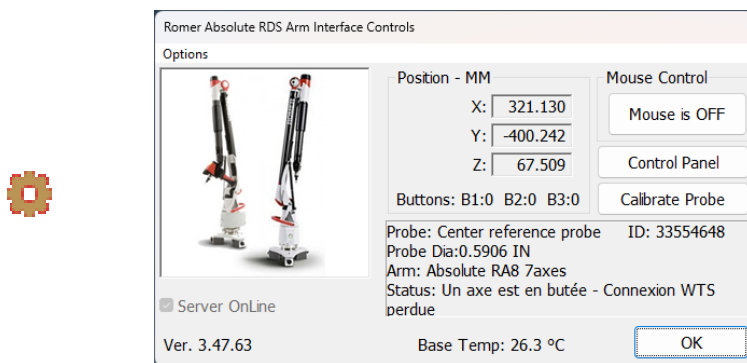


The RDS Arm must be connected to the Verisurf Device Manager, using the “Start” button in the Device Manager once the initial Device Setup has been completed.

On the first start of Verisurf, prior to measurement, the RDS arm must be assigned to the Verisurf Device Manager and started. Device Setup is accessed from the Device Manager Toolbar.



1. On the Device Manager Toolbar, choose the Device Setup button, the device Setup window opens.

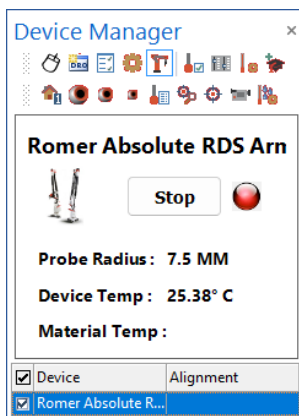
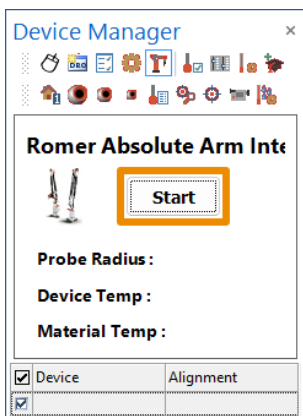


2. Select the number of devices.
3. On the tab of the Device (Device1, Device2 ...) that must be allocated to the RDS arm, select the appropriate RDS arm and press OK.



The primary instrument should be assigned to Device 1, it is not necessary to select more instruments than you have.

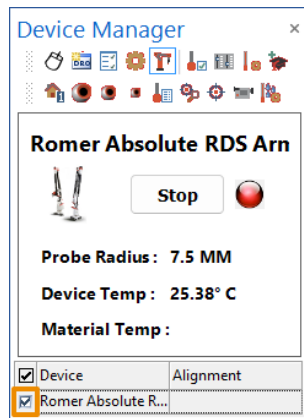
4. On the Device Manager, press “Start”, the arm is connected.



Activating a Device

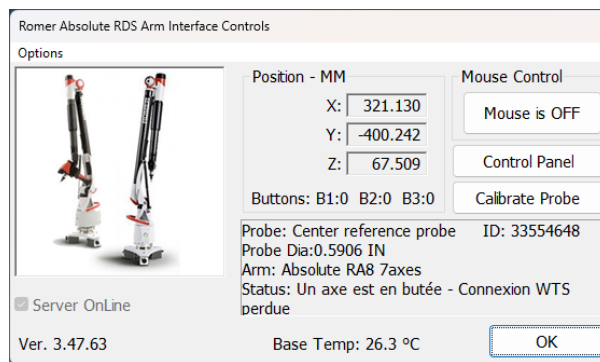
Starting a device doesn't mean make it active. As several devices can be started, it is necessary to activate the one to use.

In the list of devices, check or uncheck the one to activate or not.



Device Controls

From the Device Manager, press on “Show Device Controls” to access tools.



- Mouse – Control of the remote mouse
- Control Panel – Opens the RDS Control Panel
- Calibrate Probe – Access to the probe alignment
- “Button Control Option” – Permits to change the allocation of the left and right buttons of the arm.

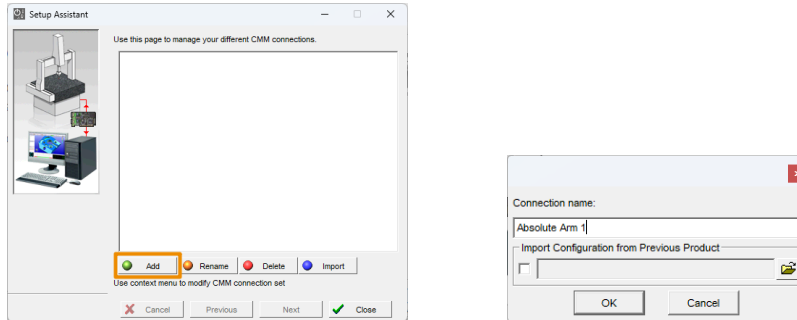
A.2.11. Metrolog

The following setup is effective for all the software of Metrolog suite (Metrolog, μ -Log, Silma X4).

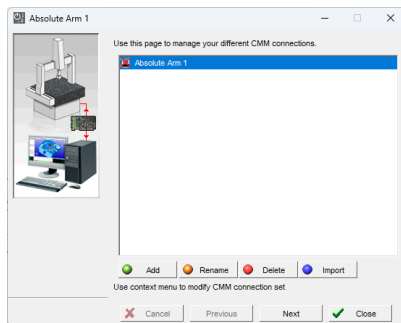
Instrument Setup

Once Metrolog is installed, run Metrolog configuration program (in case it doesn't start automatically, go to Start Menu > All Programs > Metrolog > Configuration Assistant).

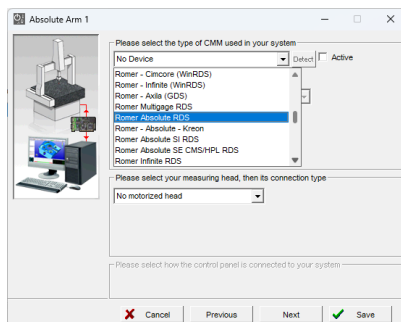
1. Press Add and enter the name to give to the instrument (press OK).



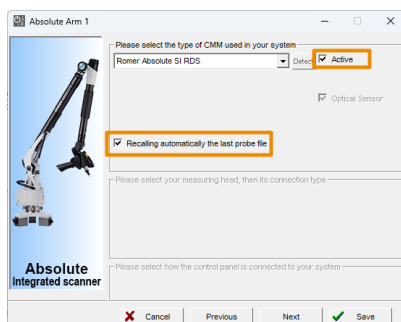
2. Select the new instrument and press Next.



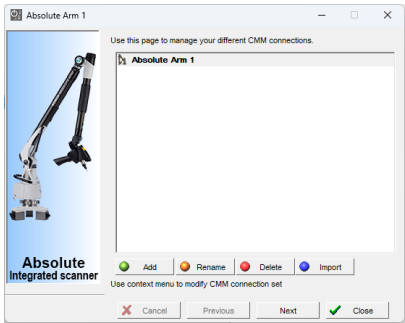
3. In the list of instruments, select "Romer Absolute RDS" (for 6-axis) or "Romer Absolute SI RDS" (for 7-axis).



4. Tick "Active" and "Recalling automatically the last probe file" and press "Save".



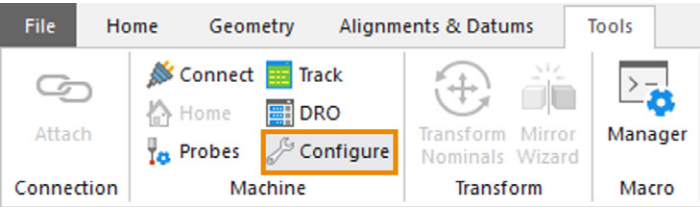
5. The new instrument now appears available.



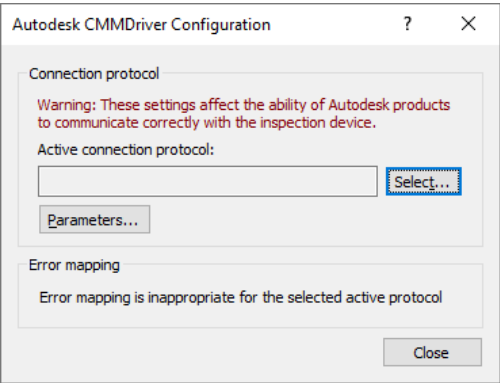
A.2.12. PowerInspect

Instrument Setup

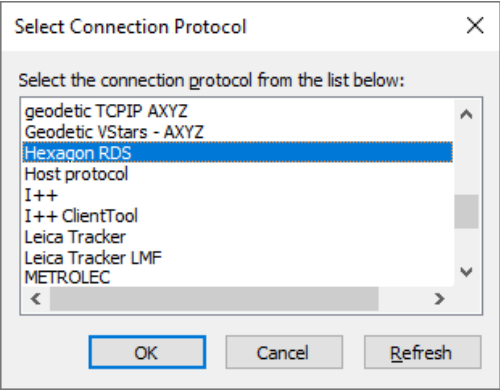
1. Run PowerInspect
2. Menu > tab “Tools”, select “Configure”.



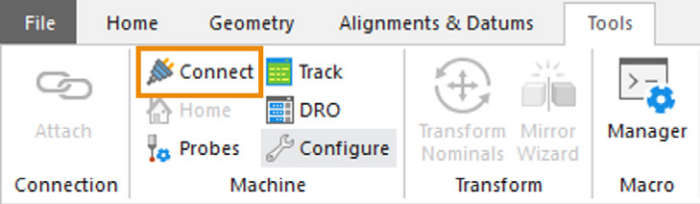
3. Open the list of protocols by clicking on “Select...”.



4. In the list of protocols, choose “Hexagon RDS”, and validate both windows.



5. Press “Connect”, “Machine OK” is shown on the status bar.



A.2.13. PowerShape

Instrument Setup

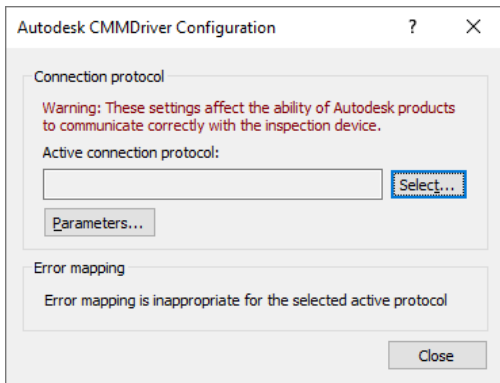
1. Click the Wizard tab > Devices panel > Scanner/Probe to display the Acquire Points toolbar.



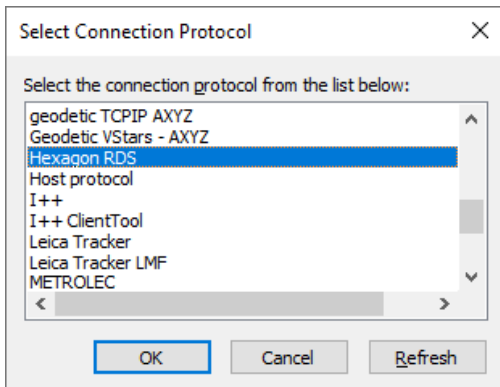
2. Click the Select driver button to open the CMM Driver Configuration dialog.



3. Open the list of protocols by clicking on "Select...".



4. In the list of protocols, choose "Hexagon RDS", and validate both windows.

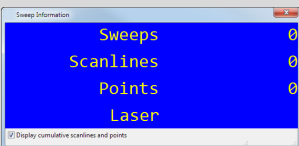
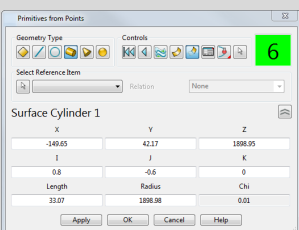


5. Click the Connect button to connect to the selected device. Status information is updated to **Connected**.



Acquire points Toolbar

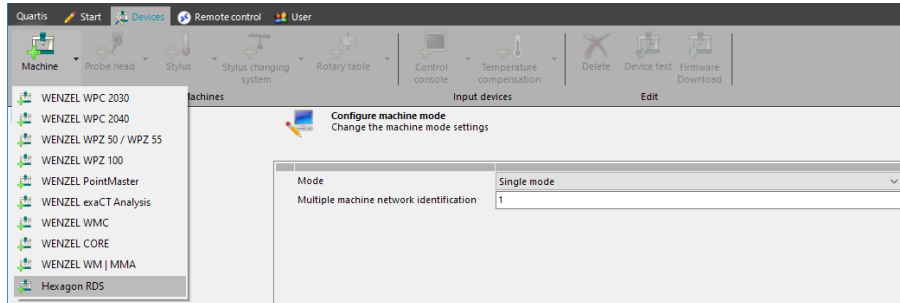


	Open the Autodesk driver CMM selection box.
	Connect to the arm.
	Access probe alignment.
Connected	Arm status.
	Cancel last scan cloud.
	Give a new colour for each new scan cloud.
	Lock the 3D view.
	Display the status window for the scan or probe. 
	Toggle probe compensation. If selected, the probed point is offset in the direction of the probe (not recommended).
	Display the dialog "Primitives from points". 

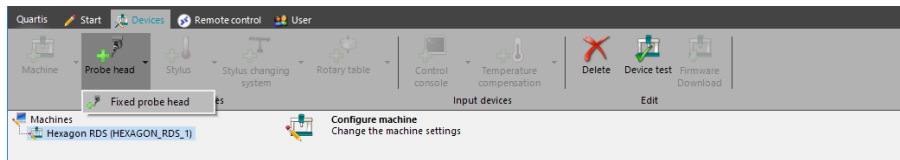
A.2.14. WM | Quartis

Instrument Setup

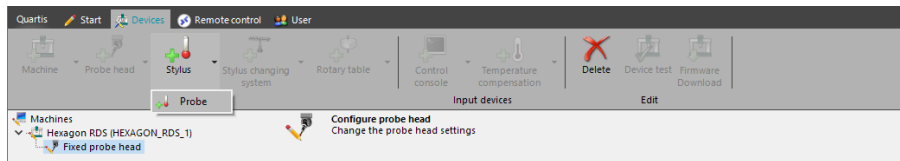
1. Run the software – Configuration program.
2. On Tab Devices, add the machine.



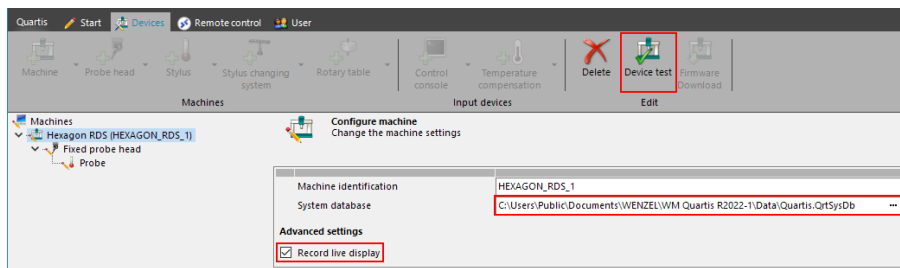
3. Select the machine and add a probe head.



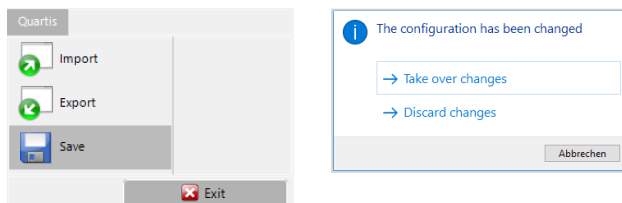
4. Select the created probe head and add a stylus.



5. Select the machine and define the settings.



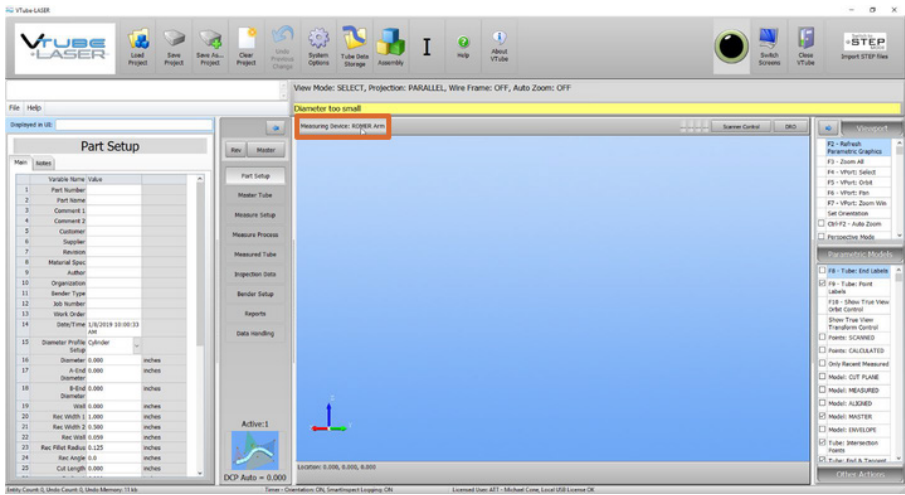
6. On “Quartis” tab, save the configuration.



A.2.15. VTube-Laser

Instrument Setup

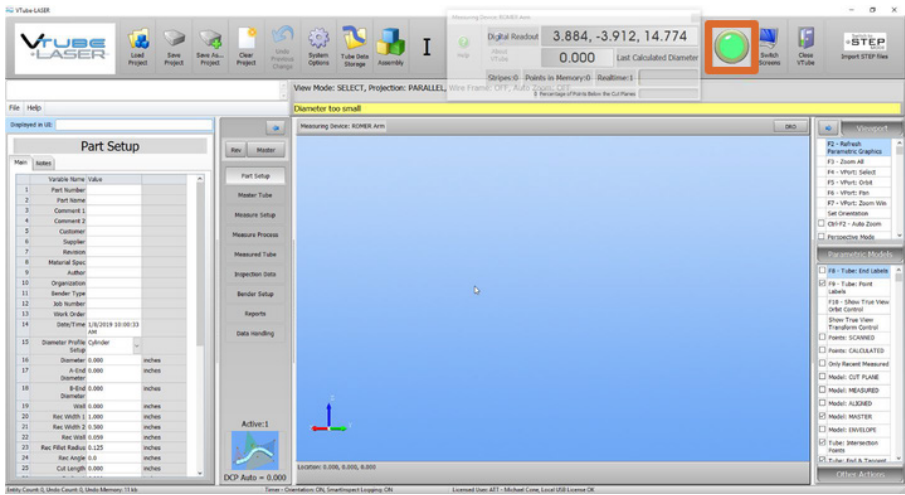
1. Ensure to use “setup_vtube_laser_vx.x.x_hexagon.exe”.
2. Click on the measuring device button.



3. Choose “Hexagon Absolute Arm and save.



4. Click on the LED to connect the arm.



A.3. Installation Other Requirements

A.3.1. TCP/IP Details

The connection of the scanners, the Wi-Fi connection, and Ethernet connection are using the TCP/IP V4 protocol.

By default, on all computers, the TCP/IP is set to “Obtain an IP address automatically” (DHCP sub protocol).



On specific cases, it may be necessary to setup this TCP/IP V4 to a fixed address (all masks = 255.255.255.0).

The time for connection may then be slightly longer.

Default TCP/IP Addresses

				
CP-C / CP-B	192.168.178.1	-	Auto-DHCP	-
CP-W	192.168.178.1	-	Auto-DHCP	Auto-DHCP
AT960	-	192.168.0.1	Auto-DHCP	-
HP-L-8.9	192.168.178.200	-	Auto-DHCP	-
RS5	192.168.178.200	-	Auto-DHCP	Auto-DHCP
AS1 / AS1-XL	192.168.178.200	192.168.0.2	Auto-DHCP	Auto-DHCP

Default TCP/IP addresses

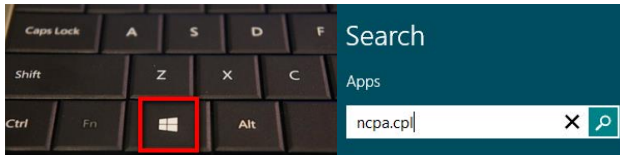


The IP address of the Control Pack is common for both wired and wireless modes. The DHCP server provides IP address from 192.168.178.10 to 192.168.178.40 to clients.

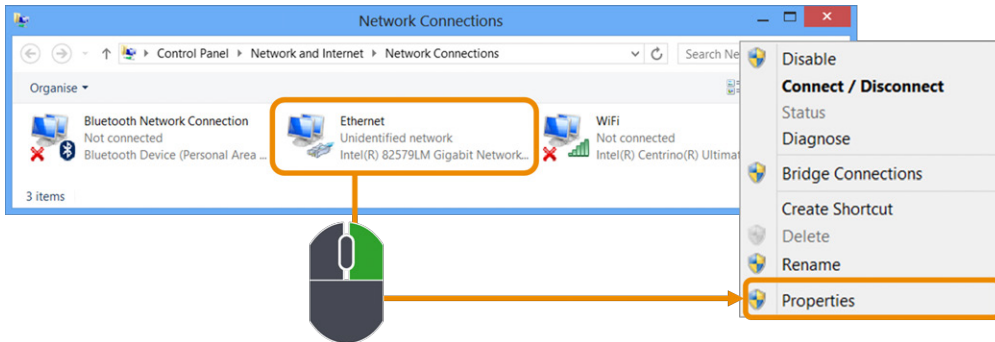
The TCP/IP configuration of the Control Pack can be modified with RDS Toolbox. Please see chapter [6.7.4.1 - Network Address Configuration](#).

How to Access the Network Settings

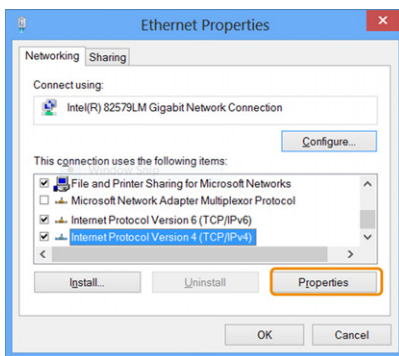
1. Access the network settings by pressing the Windows logo touch on the keyboard and typing in "ncpa.cpl".



2. Right click on "Local Network" and select "Properties".



3. Select Internet Protocol Version 4 (TCP/IPv4) > Properties.



A.3.2. TCP Ports

RDS components are using several ports for data transmission.

To avoid any issue, the following ports must be open to RDS.



The firewall rules below are automatically created when installing or running RDS with administrator rights.

Ports for RDS

Ports			Rule
4020	TCP	In	 RDS Agent
5160	TCP	In Out	 RDS Core - (.NET Core router/dealer pattern)
5161	TCP	In Out	 RDS Jobs - (Native router / dealer pattern)
4021	TCP	In	 RDS Toolbox
443	TCP	Out	- RDS Toolbox (exchange with servers)

: Protocol / : Firewall rule already defined by the RDS Installer

Ports for the Absolute Arm

Ports			Rule
4001-4002	TCP	Out	- ArmLib (RA8)
Ping	ICMP	In	 Control Pack v1 (CP2 / CP3) Necessary to allow CP operating system to detect if connection between CP and PC is established.
4003	TCP	Out	- Control Pack v2 (CP-C / CP-B / CP-W) (falconlib – with default IP 192.168.178.1, the connection uses the standard HTTPS 443 port)

: Protocol / : Firewall rule already defined by the RDS Installer

Ports for the Absolute Tracker

Ports			Rule
711	UDP	Out	- LMF (Tracker discovery broadcast request / wait for response)
820, 920	TCP	Out	- LMF (Standard GCOM connection to AT960 and CB21)
6502	TCP	Out	- OVC dialog

: Protocol / : Firewall rule already defined by the RDS Installer

Ports for the Absolute Scanner (RS6 / AS1 / AS1-XL)

Ports			Rule
65280-65286,	UDP	Out	- RS6 / AS1 scanner (scanlib)
15789	UDP	In	 RS6 / AS1 scanner (scanlib)
65520-65526	UDP	In	 RS6 / AS1 scanner (scanlib)

: Protocol / : Firewall rule already defined by the RDS Installer



NOTICE

All firewall exception rules must be set for domain, private and public profiles.



NOTICE

Ensure that no other layer of security stops the needed ports.

A.3.3. Installation Directories

Application	Default installation path
RDSService.exe	C:\Program Files\Hexagon
RDSToolbox.exe	C:\Program Files\Hexagon
RDSAgent.exe	C:\Program Files\Hexagon
Hexagon·RDS·Jobs·exe	C:\Program Files\Hexagon
Hexagon·RDS·Core·exe	C:\Program Files\Hexagon\Core

A.3.4. Redistributables, Libraries and Certificates

Digital Certificates

GlobalSign Root R6	Download Certificate (Binary/DER Encoded)
GlobalSign Secure Mail Root R45	Download Certificate (Binary/DER Encoded)

Redistributable and Libraries

The following tools are required for RDS. During the installation, RDS will install the missing one(s).

Tool	Min version	Editor	
Sentinel System Driver	7.6.0	Safenet	LOK dongle
Visual C++ for Visual Studio 2015-2019	14.25.28508	Microsoft	
Visual C++ 2013 Redistributable x64	12.0.21005	Microsoft	
.NET Framework	4.8	Microsoft	
.NET Desktop Runtime x64	8.0.14	Microsoft	
Spinnaker Drivers x64	1.20.15	Flir	RS-SQUARED
PGR GeniCam x64	1.20.15		RS-SQUARED
Universal Updater x64	1.4	Hexagon	
Newtonsoft Json			Control Pack
Xaml Behaviours Wpf		Microsoft	
Unity IoC Container		Apache	ArmSimulator RDS Control Panel
Ceres Solver		Google	RS-SQUARED
AsyncIO		Mozilla	
Boost		Boost	SMART
gflags.dll			RS-SQUARED
glog.dll		Google	RS-SQUARED
Magick++		ImageMagick	ArmSimulator
Xaml.Behaviors.Wpf		Microsoft	
NetMQ		GNU	

Tool	Min version	Editor
NaCl Net		Mozilla
Open CV		RS-SQUARED ArmSimulator
POCO C++		Control Pack
tbb.dll		Apache AS1



The licences can be found in C:\Users\Public\Documents\Romer\RDS\Licenses.

A.4. Troubleshooting

RDS cannot install	Check that no firewall prevents from installing RDS.
“No valid licence” message after an upgrade	The previous version was not uninstalled properly. Reinstall the previous version of RDS, make sure that no arm is physically connected and uninstall again.
The scanner connection fails	- If the arm is connected in USB mode, check that a correct fixed IP address has been set. - Check that TCP ports are open
The scanner stopped working	Scanners have a security against excessive temperatures. If the scanner becomes too warm, its lasers are stopped to preserve from potential damage.
Computer slow down very often	If the computer is very slow each time RDS Data Collector or any other 3D software are used, check if the driver of the graphic card is correct. (For ex if the driver display “VGA card”, then you should search for a better driver).
RDS cannot be uninstalled “Could not find RDS install Log”	Access the registry. “HKEY_ LOCAL_ MACHINE\SOFTWARE\Wow6432Node\Microsoft\Windows\CurrentVersion\Uninstall\RDS” and delete the RDS folder. Then RDS can be reinstalled properly.
In RDS Toolbox, maintenance functions can’t connect the arm	Most of the maintenance functions can be used only in wired connection mode and on mains power. If the current connection is Wi-Fi, use the Ethernet (or USB) cable to connect the arm to the computer.
Buttons, or texts are cropped	Check that Windows font size is set to 100%. Deactivate the Windows customized scaling. Try again to load the firmware.
The firmware update of the mainboard failed.	For the RA8, in case of issue when programming the Mainboard firmware, a boot on Safe mode is possible.
The RA8 arm cannot start after a firmware update	- Press the Power button and then press again 4 times the button, the arm boots in a safe mode. - Then proceed again with the firmware load operation.
Alignment process gives very high errors	Check the regional settings, group separator must be “space” character and decimal symbol must be a dot.
Contact or Touch Trigger Probe alignment gives a bad result	Check that the diameter of the stylus is correct.
“Cannot create or upgrade the database” appears when launching RDS Toolbox	The database local file may be corrupted. Delete the file “C:\Users\Public\Documents\Romer\RDS\RDSToolBox\RDSToolBox.smd” and restart.



Hexagon is a global leader in sensor, software and autonomous solutions.

We are putting data to work to boost efficiency, productivity, and quality across industrial, manufacturing, infrastructure, safety, and mobility applications.

Our technologies are shaping urban and production ecosystems to become increasingly connected and autonomous – ensuring a scalable, sustainable future.

Hexagon's Manufacturing Intelligence division provides solutions that utilise data from design and engineering, production and metrology to make manufacturing smarter. For more information, visit hexagon.com.

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RDS Software User Manual