



HEXAGON
MANUFACTURING INTELLIGENCE

February 2019

ABSOLUTE ARM USER MANUAL



ABSOLUTE ARM

User Manual

Information, support:
www.HexagonMI.com

CONTENTS

Contents	2
Introduction	4
Important safety note.....	6
Main topics quick access	9
A. Absolute Arm presentation	10
A.1 Overview	10
A.2 Levels & Features of Absolute Arm.....	13
A.3 Identification	17
B. Components description	21
B.1 Arm description	21
B.2 Base – Control Pack.....	26
B.3 Cables - Communication.....	35
B.4 6 Axes Wrist description.....	38
B.5 7 Axes Wrist description.....	39
B.6 Standard Probes	52
B.7 Counterbalance	57
B.8 Travel Case	61
B.9 External Laser scanners.....	64
C. RDS Software Package	66
C.1 Presentation	66
C.2 Software setup	66
C.3 RDS Agent	69
D. Installation	72
D.1 Mounting base.....	72
D.2 Arm installation.....	83
D.3 Tube inspection arm installation.....	90
E. Connection.....	91
E.1 Common features.....	91
E.2 USB Connection (Arm only)	95
E.3 USB Connection (Arm + Integrated Scanner).....	96
E.4 Wireless connection (Arm / scanner)	98
E.5 Ethernet Connection (Arm / Scanner)	102
E.6 External scanners connection	105
F. Measure with the arm.....	115
F.1 How to use the arm	115
F.2 Wrist feedback.....	125
F.3 Quick Access Menu.....	126
F.4 How to use contact probes.....	127
F.5 How to use NC-Probes for tube	140
F.6 How to use Scanners	145
G. Accessories	164
G.1 Bluetooth wireless accessories	164
G.2 Wi-Fi Chipset configuration	165
G.3 Mounting Ring kit (1.2 series - option)	166
H. Maintenance & Troubleshoot	168
H.1 10 years Serviceability	168
H.2 Arm storage, use and transport.....	169
H.3 Cleaning	170
H.4 Standard maintenance	172

H.5	Accuracy verification / calibration.....	173
H.6	WLAN Connection.....	174
H.7	Others.....	177
I.	Appendix	180
I.1	Terminology, Symbols.....	180
I.2	Configuration for end-software.....	181
I.3	Technical specifications	202
I.4	Hexagon® scanners specifications.....	220
I.5	Bluetooth certified equipment.....	228
I.6	European Union (and EEA) only recycling.....	230
I.7	Patents details.....	231
I.8	Illustration table	232

INTRODUCTION

Dear customer, thank you for purchasing a HEXAGON® product. Before you start using your new HEXAGON® 3D measuring arm, please read these instructions.

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

For any other device or option not described in this manual please refer to other HEXAGON® product manuals (e.g. RDS Data Collector, RDS User) available on the provided media.

For further information, please contact your local Hexagon Manufacturing Intelligence agent.

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DISCLAIMER NOTE

All non-authorised modification, repair or bad use of the HEXAGON® system will automatically void the original manufacturer's guaranty. The manufacturer is not responsible for damages to the software or hardware caused by unauthorised handling, or use, of this material. For information regarding the warranty, repair, technical assistance, latest updates and current information prices, please contact your local Hexagon Manufacturing Intelligence agent.

PATENT NOTICE

Products described in this manual may be covered by one or more of the following U.S. patents 5,829,148; 6,598,306; 7,003,892; 7,568,293; 7,779,548; 7,908,757; D643,319; 8,174,682; 8,151,477; 8,407,907; 8,701,299 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 Manufacturing Intelligence 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 following international standard: ISO 8601 (format of the dates),

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.

Complete documentation

For more detailed information, please read complete manuals:

RDS	RDS manuals (RDS User, RDS Data Collector, RDS What's New)
Maintenance	Technicians manuals (Absolute Arm Technician, RDS Technician, RDS DC Technician)
Accessories	Accessory guide
Application software	Software user manual (TubeShaper, Romosoft, GPad, GTube, DOCS, Pc-Dmis, Pc-DmisTouch, 3DReshaper, Quindos, Spatial Analyzer...)

IMPORTANT SAFETY NOTE

The following directions should enable the person responsible for the product and the person using the product to anticipate and avoid operational hazards.

The person responsible for the product must ensure that all users understand these directions and adhere to them.

The user of the product must read carefully all notes regarding mechanical and electrical safety, battery operation, correct use of the product and all other safety information before unpacking the system.



WARNING

Incorrect use can lead to personal injury, equipment malfunction and/or damage. The person responsible for the product should inform the user about hazards and how to counteract them. The product should not be operated until the user has been instructed on correct use.

Responsibilities

Manufacturer of the product

Hexagon Manufacturing Intelligence, is responsible for supplying the product, including the user manual and original accessories, in a complete and safe condition.

Manufacturer of non-HEXAGON® accessories

The manufacturer of non-HEXAGON® accessories for the product is responsible for developing, implementing and communicating safety concepts for their products, and is also responsible for the effectiveness of those safety concepts in combination with the HEXAGON® product.

Person in charge of the product

The person in charge of the product has the following responsibilities:

- To understand the product's safety instructions and user manual instructions.
- To be familiar with local regulations relating to safety and accident prevention.
- To inform Hexagon Manufacturing Intelligence immediately if the product and the application becomes unsafe.
- To ensure that the national laws, regulations and conditions for the operation of radio transmitters are respected.



WARNING

The person responsible for the product must ensure it is used in accordance with these instructions. This person is also accountable for the training and the deployment of personnel who use the product and for the safety of the equipment in use.

Environment

The product is suitable for use in an atmosphere appropriate for permanent human habitation. The product is not suitable for use in harsh or explosive environments.



WARNING

The person in charge of the product should contact local safety authorities and safety experts before working in any hazardous areas or near electrical installations.

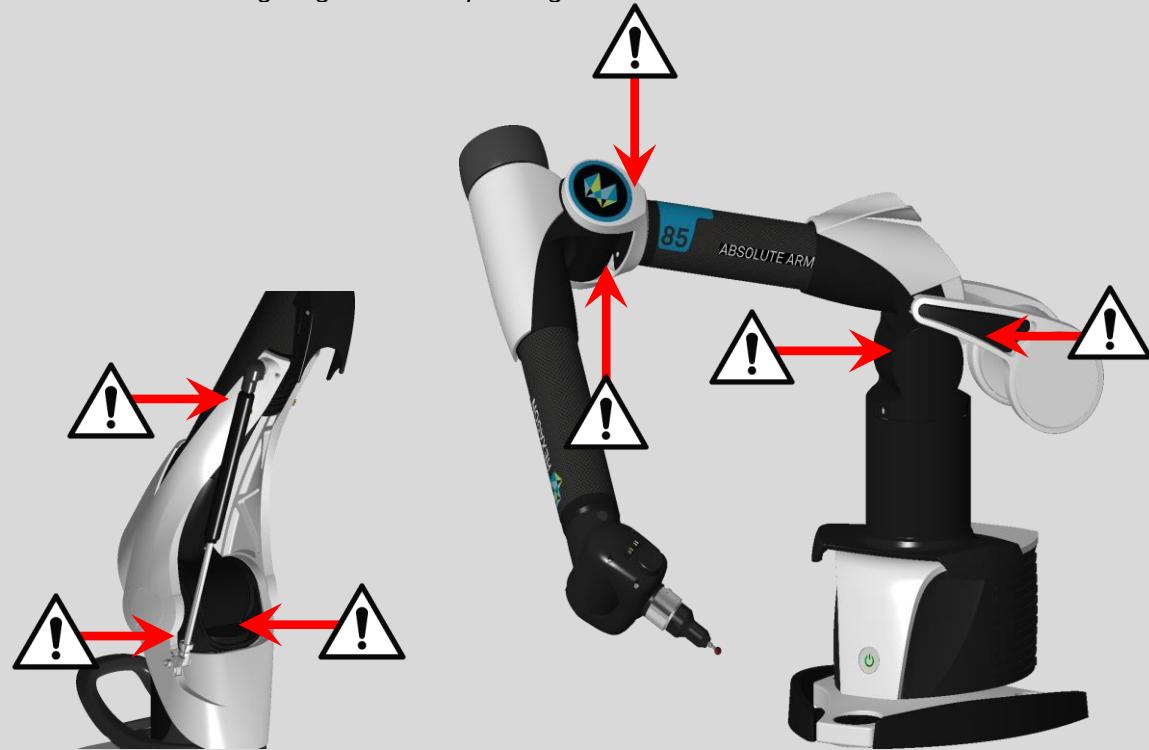
AC power supplies are suitable for use in dry environments only and not under adverse conditions.

Mechanical safety

CAUTION

Mechanical closing locations: Danger of pinch points

While the risk of personal injury is low, for your personal safety, avoid handling the areas of the device shown in the following diagram while operating the device



CAUTION

1.2 counterweight: Heavy part

- When handling, mounting or removing the counterweight, pay attention to the heaviness of the component.



NOTICE

Arm installation: Fall or drop of the device

The base of the ABSOLUTE ARM is designed to provide a reliable measurement platform when placed on a level and stable work surface. The Mounting ring also can be fixed on a plate to a rigid support via the fixing holes.

- Always ensure that the arm is correctly and strongly fixed to the base
- Always ensure that the base is correctly and strongly fixed to the support

NOTICE

Arm use: Accuracy deterioration

- Before any use, always ensure nothing adverse happened on the arm (accuracy verification, counterbalance pressure, buttons response)
- When moving the arm, always pay attention to obstacles that may damage the device.
- The arm and the computer should be put in their respective cases when not in use or during transportation to avoid any damage that may affect the precision
- Moreover, for any transport by plane, boat, train or truck, the product should be packed in foam for protection, with shock detectors
- Do not modify counterbalance pressure or strength as this will affect the arm calibration

Battery safety

WARNING

Battery parts: Risk of chemical injury!

- ▶ *Do not attempt to service or open the battery*
- ▶ *Do not short-circuit the battery*
- ▶ *Do not try to load with any other battery loader other than the Arm Control Pack*

WARNING

Transport: Fire Hazard

During the transport, shipping or disposal of batteries it is possible for inappropriate mechanical influences to constitute a fire hazard.

Before shipping the product or disposing it, discharge the batteries by the product until they are flat.

When transporting or shipping batteries, the person in charge of the product must ensure that the applicable national and international rules and regulations are observed. Before transportation or shipping contact your local passenger or freight transport company.

WARNING

High mechanical stress, high ambient temperatures or immersion into fluids can cause leakage, fire or explosions of the batteries.

- ▶ *Protect the batteries from mechanical influences and high ambient temperatures.*
- ▶ *Do not drop or immerse batteries into fluids.*

NOTICE

Battery parts: Risk of damage to the system!

The arm should only be operated with the battery cover properly installed Failure to properly install the protective battery cover may result in environmental contamination of the battery enclosure, accidental damage to the battery, and / or loss of data if the battery is inadvertently dislodged during arm operation

Power safety

WARNING

The plug on the power supply cord is the disconnect device. Do not position the plug where it is difficult to disconnect.

WARNING

If the equipment is used in a manner not specified by Hexagon Manufacturing Intelligence, the protection provided by the equipment may be impaired.

WARNING

Power supply parts: Risk of electric shock!

- ▶ *Do not attempt to service or open DC power supply*
- ▶ *Do not short-circuit the power supply*
- ▶ *Do not use if cable is visibly damaged or insulation is worn*
- ▶ *Do not plug any other power supply into the arm power jack*
- ▶ *Use the product only in dry environments, such as buildings or vehicles. Indoor only.*
- ▶ *Protect the product against humidity. If the product becomes humid, it must not be used!*

CAUTION

Power Supply parts: Risk of electric shock!

- ▶ *Do not attempt to service or open the power supply*
- ▶ *Do not short-circuit the power supply*
- ▶ *Do not use if cable is visibly damaged or insulation is worn*

NOTICE

Low quality power supply: Components deterioration

- ▶ *Use of a UPS*
- ▶ *In case of a very low-quality power supply (current or voltage spikes, no ground ...), it is recommended to use a Universal Power Supply device, to ensure the protection of the components of the arm (Arm power supply, electronic boards).*

Laser safety

**CAUTION**

Laser Scanner RS5: Laser Guide Product Class 2M

Exposure toward the eye can result in eye injury

- ▶ *Pay attention not to expose the eye to the laser guide when laser is on.*

**CAUTION**

Non-Contact Tube Probe (Laser Guide Product Class 2M): Risk of eye injury!

- ▶ *Do not stare into laser guide beam or view directly with optical instruments*

Other safety care

**WARNING**

Transport: Risk of body injury!

- ▶ *Use proper posture when lifting the arm from the case, placing the arm in the case, or moving the case*

**WARNING**

Servicing

- ▶ *Only Hexagon certified service centres are allowed to service the Absolute arm or its accessories.*
- ▶ *Do not open any part of the arm or its accessories.*

NOTICE

Arm use: Components deterioration

- ▶ *Do not switch on ABSOLUTE ARM when covers have been removed*
- ▶ *Do not use outdoors*
- ▶ *Do not remove any axis covers*
- ▶ *Do not cut or twist any cable*
- ▶ *Always carefully plug and unplug each connector*
- ▶ *When using the arm, always pay attention to obstacles that may damage the device*
- ▶ *Do not store the arm, computer, or case in a place where there is risk of:*
 - *Significant heat or cold*
 - *Significant moisture*
 - *Electromagnetic or vibratory disturbance*

A. ABSOLUTE ARM PRESENTATION

A.1 OVERVIEW

The ABSOLUTE ARM is a portable poly-articulated 3D coordinate measurement device, constructed from high-grade carbon fibre, which is inherently temperature stable.

The arm – from 1200mm to 4500mm measurement volume – is available in 6 or 7 axes. The difference is located on the wrist of the arm: 6 axes are generally enough for most of the probing or tubing applications, while 7 axes are better for scanning applications.

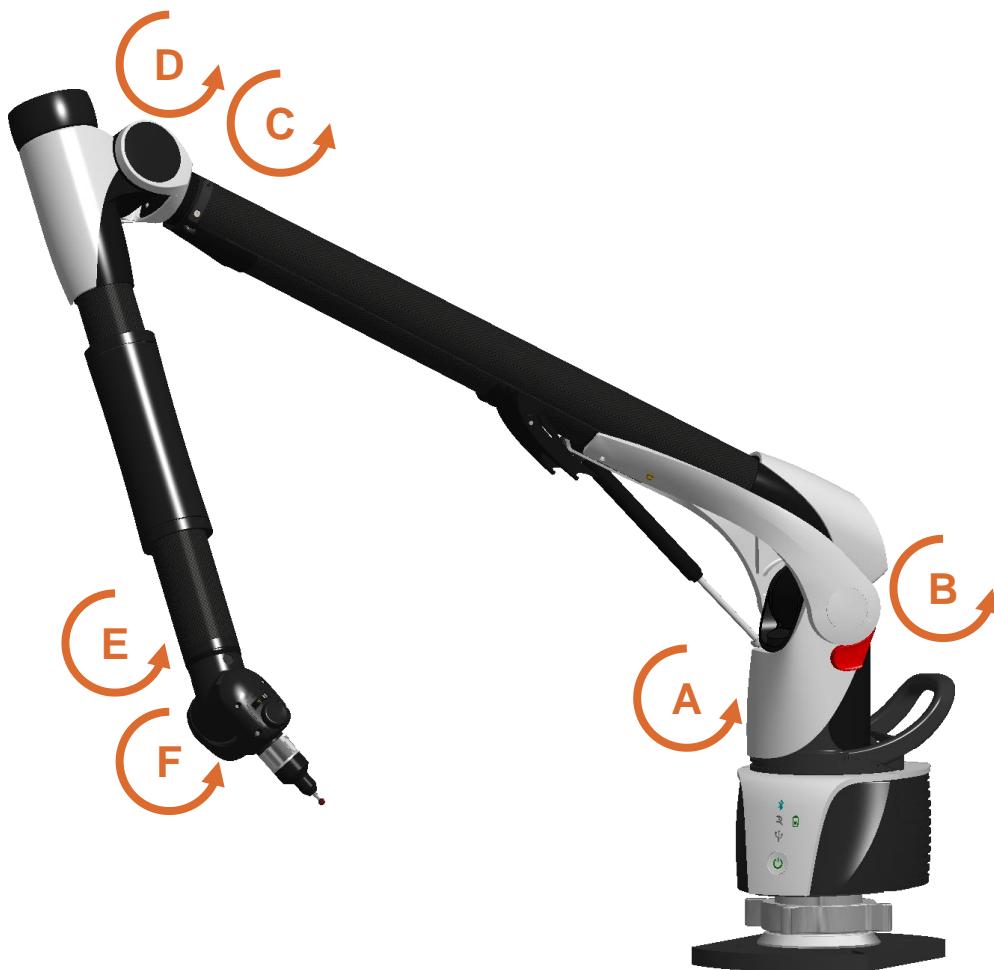
6 or 7 axes

The device duplicates and enhances the movement and reach of the human arm (shoulder, elbow, and wrist). Each element offers several degrees of freedom (2 on shoulder, 2 on elbow, 2 or 3 on wrist).

This means 6 or 7 rotation axes depending on the type (6axes / SE / SI). These axes conventionally are named A / B / C / D / E / F and G. A and B are the Shoulder of the arm, C and D the Elbow and E F and G the wrist.

On each axis, an encoder is giving the axis angle from which the coordinates of the probe centre are calculated.

A, C, E and G axes have infinite rotation, allowing ergonomic comfort of use.



At the end of the arm (i.e. on F or G axis), a probe can be attached through a TKJ connector and is automatically recognized and selected by the software.

The wrist or handle also has 3 buttons which can be used to take measurement points, delete erroneous data, validate message boxes and perform other functions within software.

Accessories (headphones, speakers...) can be connected through Bluetooth wireless technology.

It also contains a haptic feedback motor, to warn the user through vibrations on some events.

6-axis wrist

The 6 axes wrist can receive all male contact or non-contact Tube probes as well as male laser scanners.



Fig. 1 : Arm wrist

7-axis wrist

The 7 axes wrist is a modular component, available either for its integrated scanner, either for any other external scanner ("SE" configuration) such as the Hexagon® HP-L-20.8 laser scanner.

As well as the 6-axis wrist, the 7-axis wrists can receive all male contact or non-contact Tube probes.



Fig. 2: SI Wrist

Compact – 1.2 size

The smallest size arm (1200mm) is designed to be an easy-to-setup arm: simply put it down on the work plane, no clamping or other kind of fixation is necessary.

On the 1.2, the gas pump counterbalance is replaced by a counterweight.

The Absolute Arm 1.2 is available only in 6 axes configuration (8312 and 8512).



Tube inspection arm (83 only)

A specific configuration of Absolute Arm is designed specifically for the tube control in tube production workshop. This configuration is available only in level 83, 6 axes in the 2 following sizes:



The arm is installed on a raiser, available in 2 heights: small (250mm) and large (500mm).



This tube inspection arm configuration differs from a standard 83 series arm only on the counterbalance higher pressure: the arm is designed to stay counterbalanced itself even without any handling. The operator can then quickly grab and lower the arm for tube inspection, then release the arm back into its rest position.

RDS

The Absolute Arm is managed by RDS, which is the interface server between the arm and the final measurement software. RDS allows to configure the arm functions, the communication protocol, probe alignments, system verifications, and perform many other functions.

A.2 LEVELS & FEATURES OF ABSOLUTE ARM

A.2.1 STANDARD ACCESSORIES AND OPTIONS

The Absolute Arm is available in 3 levels of performance: 83, 85 and 87.

The following table shows standard and optional configurations for each arm level. Some features may be possible under accessory condition:

✓ : Standard item

◎ : depends on the option.

★ : additional optional accessory

○ : the option is available only if a Mounting ring adaptor is mounted on the 1.2 arm

SE / SI: the option is available only for the specified type

Item	Description	83 1200 6 axes 7 axes	85 1200 6 axes 7 axes	87 6 axes 7 axes
Theme		Green	Blue	Chrome
Removable wrist handle		✗ ✗ ✓	✗ ✗ ✓	✗ ✓
Integrated scanner		✗ ✗ ◎	✗ ✗ ◎	✗ ◎
SE adapter plate		✗ ✗ SE	✗ ✗ SE	✗ SE
Nose Cone		✗ ✗ ◎	✗ ✗ ◎	✗ ◎
Wrist display		✗ ✗ ✓	✗ ✗ ✓	✗ ✓
Haptic feedback	Feedback vibrations on the wrist	✓	✓	✓
Spin Knob		—	✓	✓
Spin Grip		—	— ✓ ✓	✓
Arm	CP0	Probing pack	✓ ✓ —	—
	CP1	Scanning Pack	★ ★ ✓	✓ ✓ ✓
	CP2	Wireless Probing Pack	★	★ ★ —
	CP3	Wireless Scanning Pack	★	★
	FP4 adapter	Adapter for HP-LC-20.8	— — ◎	— ◎
Cables	USB	Single specific USB cable	✓ ✓ ★	✓ ✓ ★
	USB / LAN	Twin cable for arm and scanner	— — ✓	— — ✓
	Power		✓	✓

Item	Description	1200	83	1200	85	87
		6 axes	7 axes	6 axes	7 axes	6 axes 7 axes
Mounting solutions	Mounting ring		◎ ○ ○	◎ ○ ○	○	
	1.2 arm base		✓ - -	✓ - -	-	
	Basic plate		○ ✓ ✓	○ ✓ ✓	✓	
	3 points Magnetic base		○ ★ ★	○ ★ ★	★	
	Tripod		○ ★ ★	○ ★ ★	★	
	Magnetic Anchors		✓ - -	✓ - -	-	
	3 Magnets		★ - -	★ - -	-	
	Circular Magnetic Base		○ ★ ★	○ ★ ★	★	
Probes & scanners	Vacuum base		○ ★ ★	○ ★ ★	★	
	Standard TKJ probes		✓	✓	✓	
			✓	✓	✓	
			✓	✓	✓	
	RS5		- - ○	- - ○	- ○	
	HP-L-20.8		- - ★	- - ★	- ★	
Others	HP-L-8.9		★ ★ -	★ ★ -	★ -	
	Trigger probe		★	★	★	
	Hard case		✓	✓	✓	
	Accessory case		✓	✓	✓	
	Dust cover		✓	✓	✓	
Others	Verification plate		★	★	★	
	Sphere artefact for probing		✓	✓	✓	
	Sphere artefact for probing and scanning		- - SI	- - SI	- SI	

Item	Description	1200	83	85	87
		6 axes	7 axes	6 axes	7 axes
Verification. bar Quick Installation Guide		★		★	✓
		✓		✓	✓
	(full documentation on installation disk)				
Installation stick		Contains Software installation and product documentation.	✓	✓	✓
Certification	ISO 10360-12		✓	✓	✓
	ISO 10360-02	★	- - -	★	- - -



A catalogue with the complete list of accessories is available on the provided media or on the www.HexagonMI.com web site

A.2.2 SIZE OF ARMS

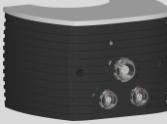
The Absolute Arms are available from 1200mm to 4500mm. This size represents the diameter of the spherical measurement volume.

		1200	2000	2500	3000	3500	4000	4500
83	6 axes	✓	✓	✓	✓	✓	✓	✓
	7 axes	-	✓	✓	✓	✓	✓	✓
85	6 axes	✓	✓	✓	✓	✓	✓	✓
	7 axes	-	✓	✓	✓	✓	✓	✓
87	6 axes	-	-	✓	✓	✓	✓	✓
	7 axes	-	-	✓	✓	✓	✓	✓

✓: Size available

A.2.3 CONTROL PACKS

At the base of the arm a special module defines the connection capabilities of connection of the arm: this is the "Control Pack" ("CP"). According to which type of Control Pack is mounted, the arm can be used in wired, wireless mode, with probes or scanners.

				Connection		Power
	CP0	Probing Pack	Probing / Tubing	✓	-	-
			Scanning	-	-	-
	CP1	Scanning Pack	Probing / Tubing	✓	-	-
			Scanning (RS5 / HP-L-8.9)	✓	-	-
	CP2	Wireless Probing Pack	Probing / Tubing	✓	✓	-
			Scanning (RS5 / HP-L-8.9)	✓	-	-
	CP3	Wireless Scanning Pack	Probing / Tubing	✓	✓	✓
			Scanning RS5 HP-L-8.9	✓	✓	✓
	FP4 adapter	HP-LC-20.8 Scanning Pack	Probing / Tubing	✓	-	✓
			Scanning (HP-L-20.8 only)	✓	-	✓

⌚ : wired connection / ⚡ : wireless connection / ☰ : full ethernet connection / 🌐 : on power supply / 🔋 : on battery

A.3 IDENTIFICATION

A.3.1 ARM IDENTIFICATION

Each Absolute Arm unit has a serial number. This number is the identity of your arm, and any operation such as Hexagon Manufacturing Intelligence verification and repair, or request to your local agent will refer to it.

The serial number is on a label located in two places: on the base of the Absolute Arm and in the front of the travel case. The serial number can also be found in supporting documents received with the arm, such as the arm certification.

Label on the case



Label on the arm



Fig. 3 : Label location on the A-axis

To view the label on the arm, turn the A-axis back to view the label on the front of the A-axis. The label on the arm includes important other information such as arm type, size and date of manufacture.



Fig. 4 : Arm label

N°	Item	Description					
a	S/N	Serial Number of the arm:	{L}	{V}	- {T}	- {UN}	- {F}
		{L} Performance level (83 / 85 / 87)					
		{V} Size of measurement volume (25 = 2500mm)					
		{T} Arm type (6 = 6 axes / 7 = 7 axes / T = Tube config.)					
		{UN} Unit Number					
		{FF} Factory (FA = Montoire / UC = Oceanside)					
b	Type	Shows the type of arm:	RA8	{V°}			
		RA8 HEXAGON Arm					
		{V°} Version of arm					
c	Factory	Brand and factory of the arm (see complete address in page 2)					
d	Date	Date of manufacture of the arm					
e	Made in	Country of the factory					
f	Patents	Patents numbers					
g	Manual	Recommendation to read manual.					
h	Power	Power consumption					
i	Wireless	Bluetooth identification					
j	 R	Giteki Japanese certification					
		Chinese certification					
i	CE	Product conformity					
j	Recycling	European recycling (see Appendix)					

A.3.2 CONTROL PACK IDENTIFICATION

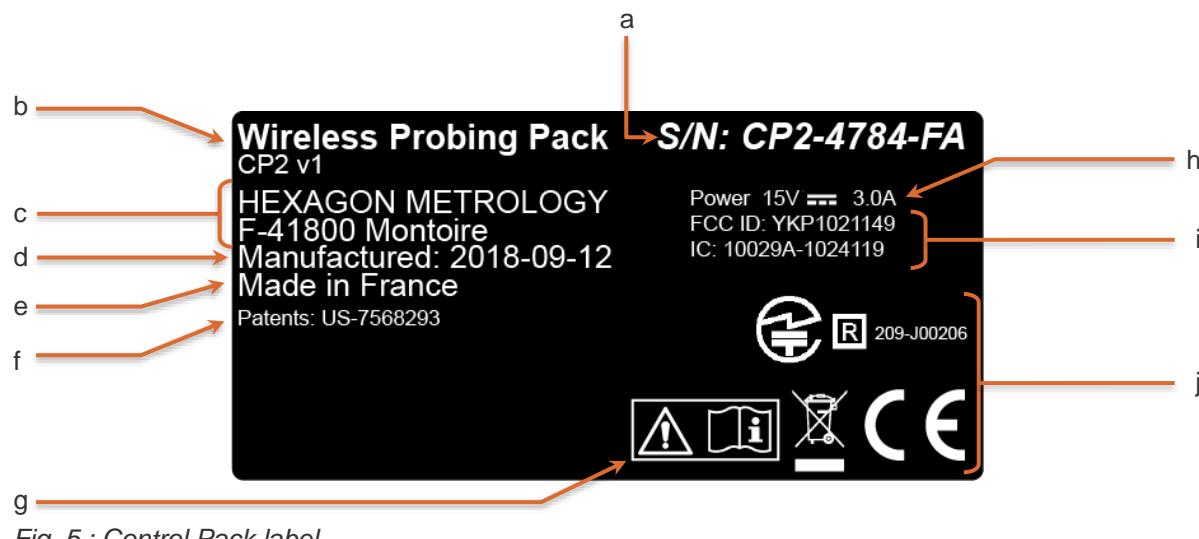


Fig. 5 : Control Pack label

N°	Item	Description		
a	ID	Serial Number of the Control Pack:	{CP} - {UN} - {F}	
		{CP}	Type of Control Pack (CP0 / CP1 / CP2 / CP3)	
		{UN}	Unit Number	
		{FF}	Factory (FA = Montoiré / UC = Oceanside)	
b	Type	Designation		
		Type and version of Control Pack		
c	Factory	Factory of the arm (see complete address in page 2)		
d	Date	Date of manufacture of the Control Pack		
e	Made in	Country of the factory		
f	Patents	Patents numbers (see appendix)		
g	Manual	Recommendation to read the manual.		
h	Power	Power consumption		
i	Wireless	Wireless device registration (CP2 / CP3 only)		
j	Compliance	Giteki Recycling CE	Japan conformity (CP2 / CP3 only) European recycling (see Appendix) European conformity	

A.3.3 SCANNER IDENTIFICATION

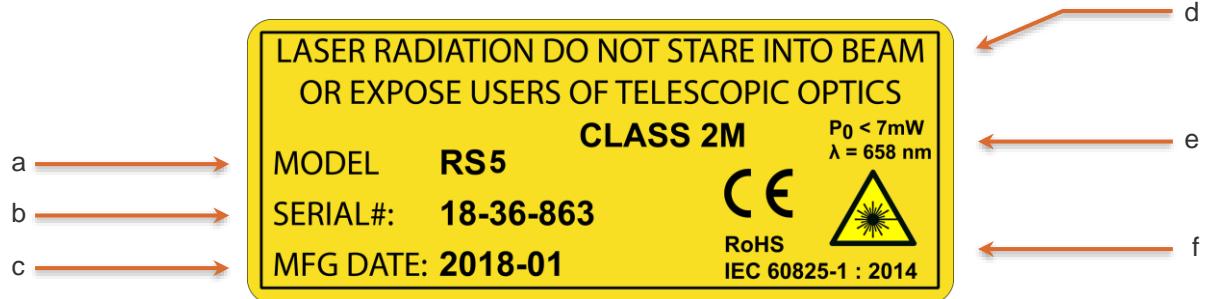


Fig. 6 : RS5 label

N°	Item	Description						
a	Model	Type of scanner						
b	S/N	Serial Number of the scanner: {Year} - {Version} - {Unit}						
c	MFG Date	Date of manufacture of the scanner						
d	Safety	Recommendation about the laser						
e	Laser specifications	<table> <tr> <td>Class</td> <td>2M</td> </tr> <tr> <td>P₀</td> <td>Max output power</td> </tr> <tr> <td>λ</td> <td>Wave length</td> </tr> </table>	Class	2M	P ₀	Max output power	λ	Wave length
Class	2M							
P ₀	Max output power							
λ	Wave length							
f	Compliancy	CE, RoHS and Laser pictogram.						

B. COMPONENTS DESCRIPTION

B.1 ARM DESCRIPTION

Absolute Arm 83 series

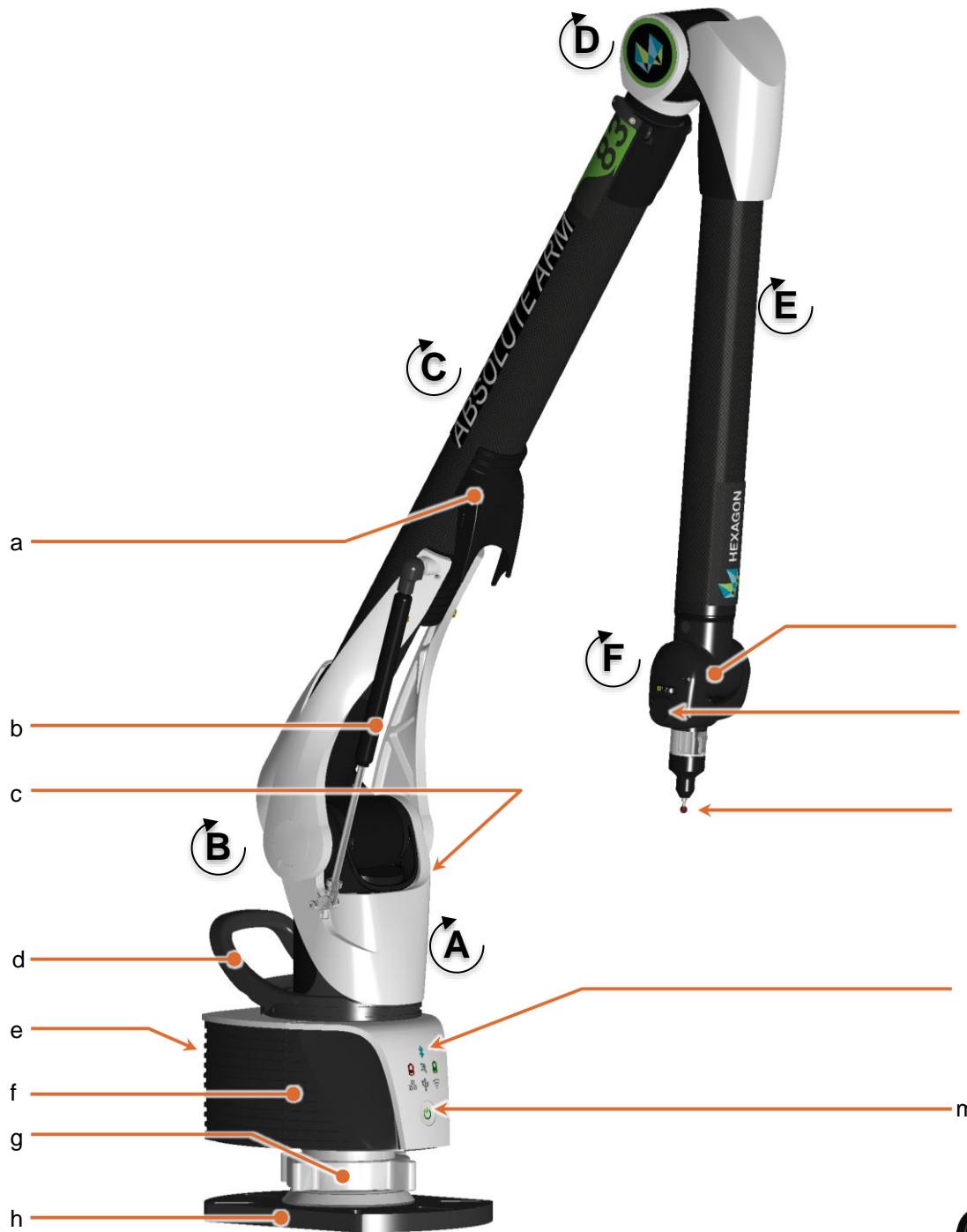


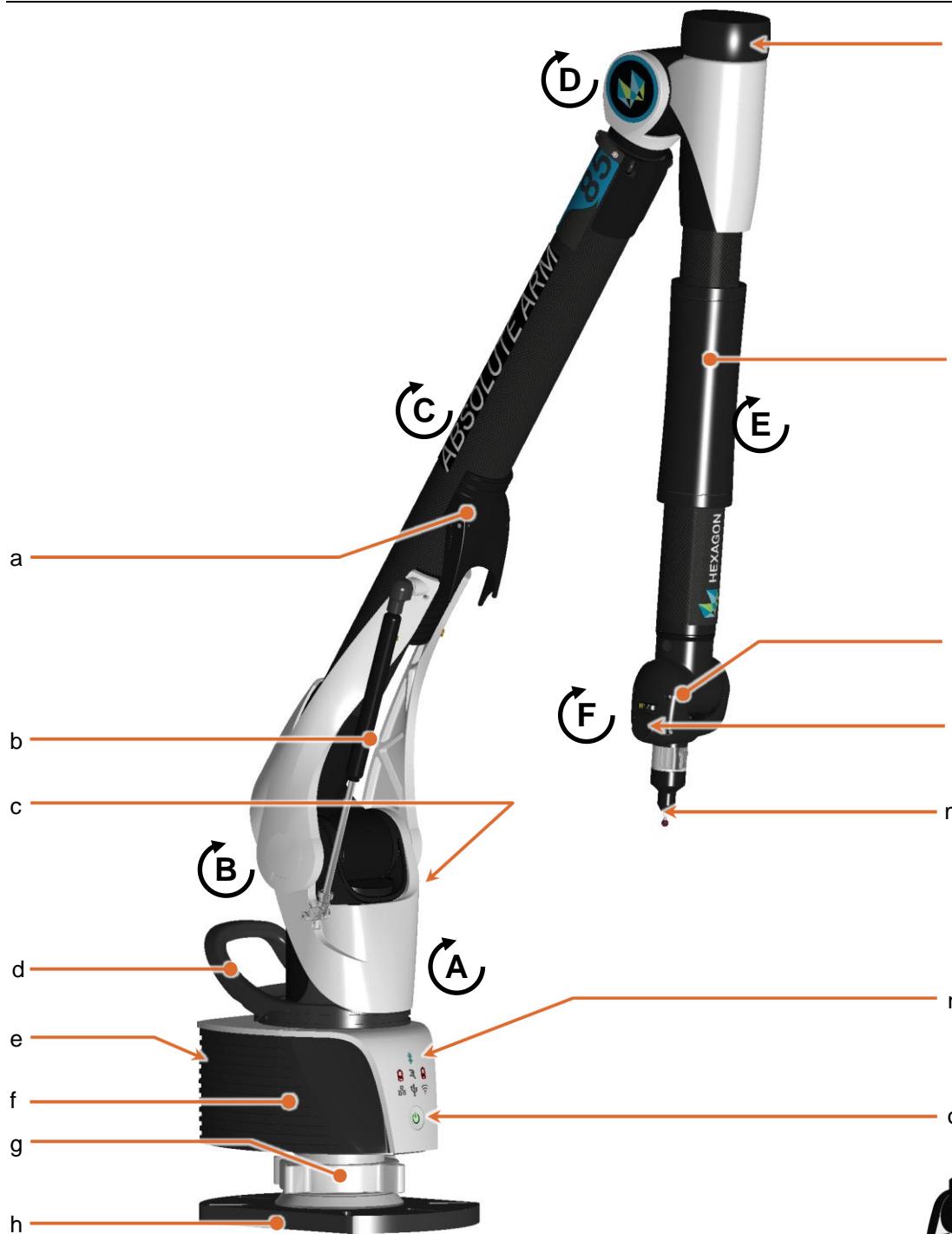
Fig. 9 : Absolute Arm 83 overview

- | | |
|--|----------------------|
| a. Counterbalance cradle | i. Arm wrist |
| b. "Zero-G" counterbalance | j. Buttons |
| c. Counterbalance lock | k. TKJ probe |
| d. Arm handle | l. Status pictograms |
| e. Control Pack | m. On/Off button |
| f. Base of the arm | |
| g. Mounting ring nut | |
| h. Mounting base (depending on the option) | |



Fig. 10 : 7-axes Wrist

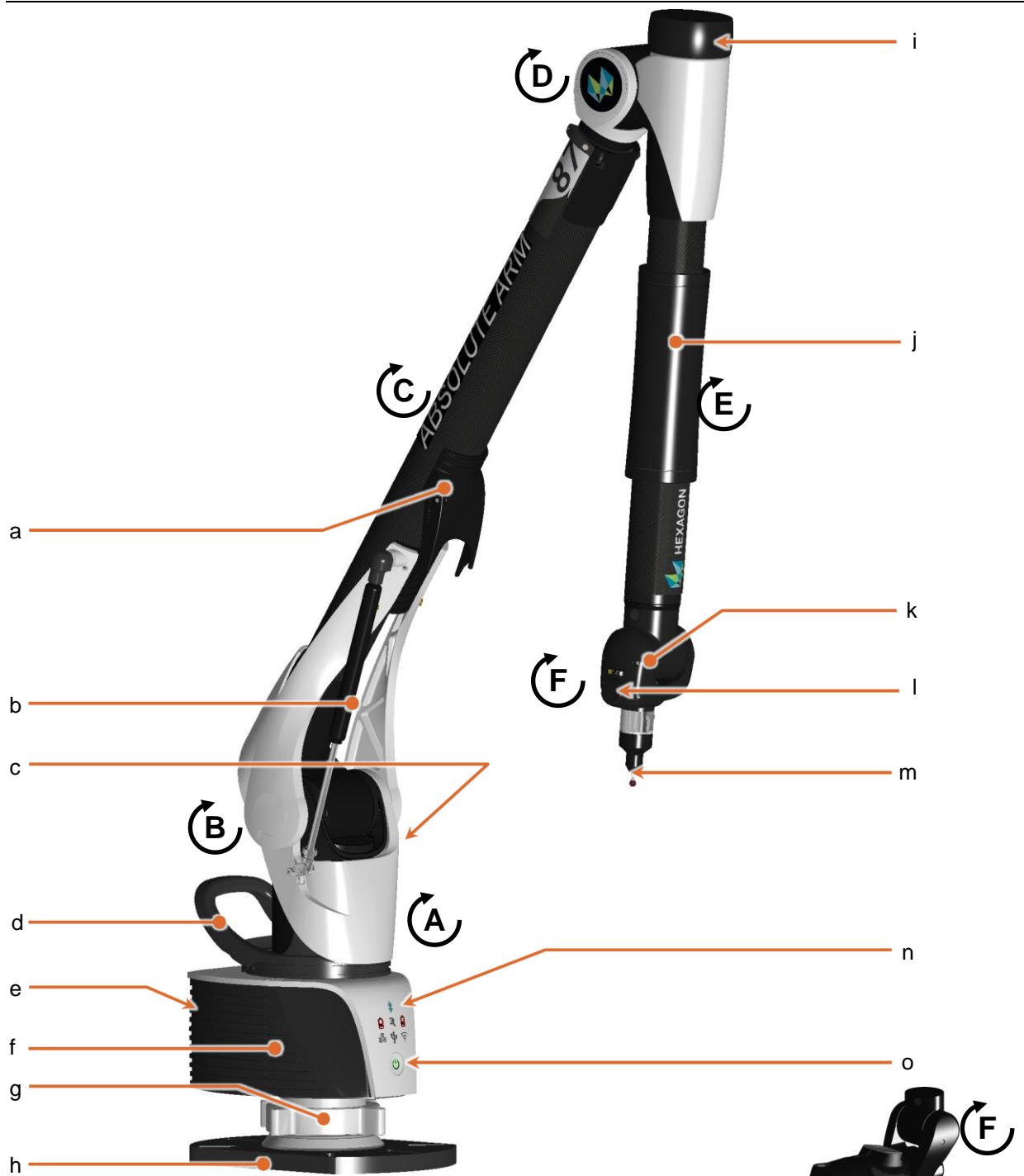
Absolute Arm 85 series


Fig. 11 : Absolute Arm 85 overview

- a. Counterbalance cradle
- b. "Zero-G" counterbalance
- c. Counterbalance lock
- d. Arm handle
- e. Control Pack
- f. Base of the arm
- g. Mounting ring nut
- h. Mounting base (depending on the option)
- i. Spin Knob
- j. Spin Grip
- k. Arm wrist
- l. Buttons
- m. Contact probe
- n. Status pictograms
- o. On/Off button


Fig. 12 : 7-axes Wrist

Absolute Arm 87 series


Fig. 13 : Absolute Arm 87 overview

- a. Counterbalance cradle
- b. "Zero-G" counterbalance
- c. Counterbalance lock
- d. Arm handle
- e. Control Pack
- f. Base of the arm
- g. Mounting ring nut
- h. Mounting base (depending on the option)
- i. Spin Knob
- j. Spin Grip
- k. Arm wrist
- l. Buttons
- m. Contact probe
- n. Status pictograms
- o. On/Off button

Fig. 14 : 7-axes Wrist


Absolute Arm Compact 1.2 (83 / 85 – 6axes only)

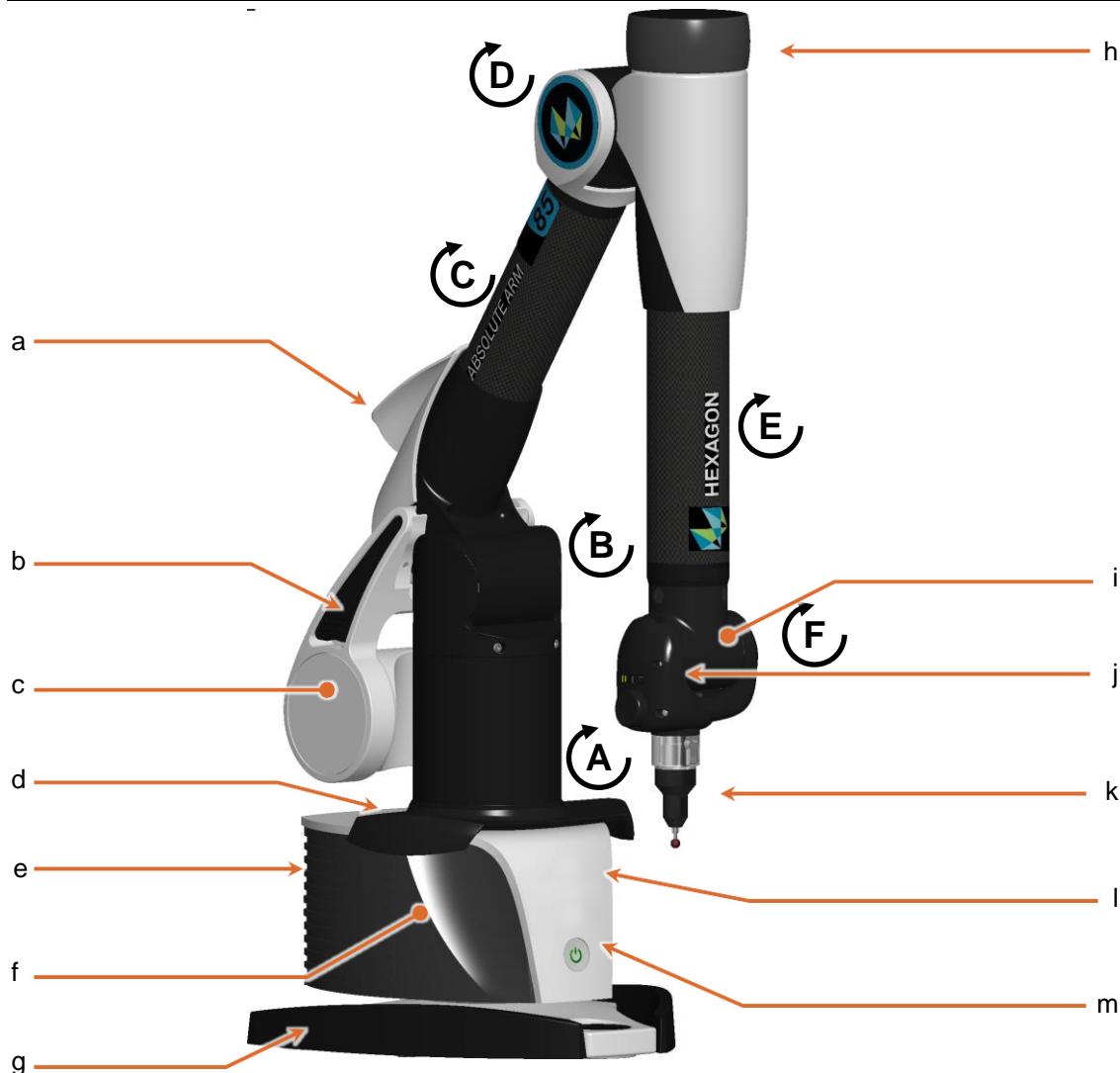


Fig. 15 : Absolute Arm Compact 8512 overview

- a. Rest support
- b. Counterweight unlock buttons
- c. Counterweight
- d. Handling skirt
- e. Control Pack
- f. Base of the arm
- g. Base plate
- h. Spin Knob (8512 only)
- i. Arm wrist
- j. Buttons
- k. Contact probe
- l. Status pictograms
- m. On/Off button

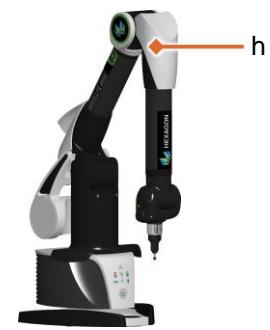


Fig. 16 : Absolute Arm Compact 8312 overview

Machine reference

The arm sends points (for touch probing, tube measurement or laser scanning) with 3D coordinates which are based on its own coordinate system. The reference origin and axes are the following:

- Origin: located on the A axis of the arm, at the table level.
- X axis is pointing toward the front of the arm (on/off button)
- Y axis is pointing toward the left side of the arm
- Z axis is pointing toward the top of the arm (along the A axis of the arm)



B.2 BASE – CONTROL PACK

B.2.1 BASE DESCRIPTION

Front panel

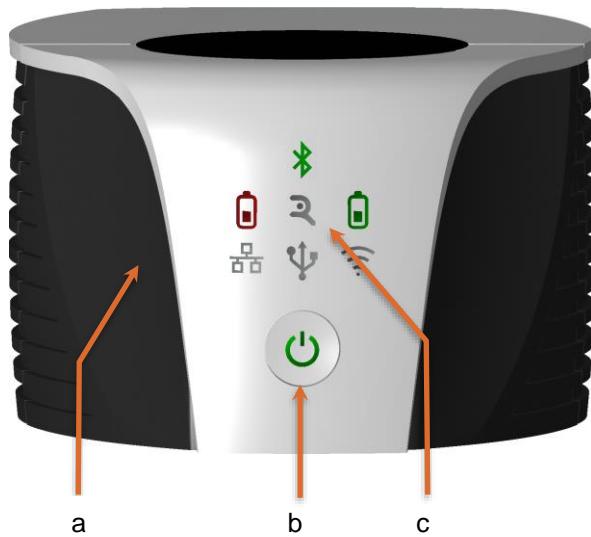


Fig. 17 : Base-Front

- a. Sound Speaker
- b. Power-On Button/Light
- c. Status Pictograms

Back panel - Control Pack (except FP4)

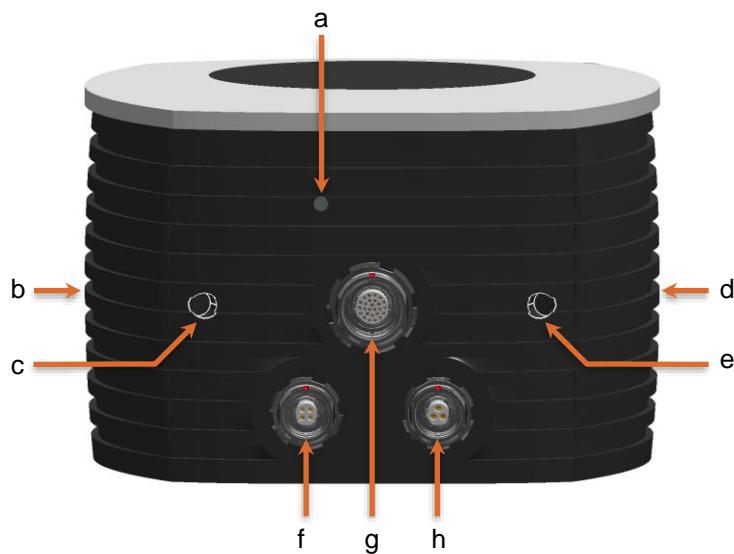


Fig. 18 : Base-Back

- a. Ambient light sensor
- b. Left battery socket (CP3 only)
- c. Access to unlock the left battery socket
- d. Right battery socket (CP2 / CP3 only)
- e. Access to unlock the right battery socket
- f. USB connector to computer
- g. Accessory connector (CP1 / CP2 / CP3 only)
- h. DC power in

Status Pictograms

Description			
	Power-On	Green	 Arm powered on
		Red	 Arm initialising / stopping / critical issue
		Blinking red	 Firmware upgrade processing
	USB	Blinking	 Initialising – Connected to the PC
		Light grey	 Ready
		White	 The arm is connected to RDS through USB
	Wi-Fi (CP2 / CP3 only)	Blinking	 Initialising – Connected to the PC
		Light grey	 Ready
		White	 The arm is connected to RDS through Wi-Fi
	Wired Ethernet (CP3 only)	Blinking	 Initialising – Connected to the PC
		Light grey	 Ready
		White	 The arm is connected to RDS through wired Ethernet
	Battery level (left / right)	Blinking	 The arm is on battery
		Steady	 The arm is on power supply (charging)
		White	 Battery level OK
		Orange	 Low battery / Battery issue
		Red	 Critical level
		Light grey	 Battery is missing
	RDS	White	 The system is ready and connected to an application software.
	Bluetooth	Blinking	 Discovering devices
		Green	 Device is ready to connect.
		White	 The arm is connected to a Bluetooth device

Table 1: Status pictograms

Control Pack connections

		CP0	CP1	CP2	CP3	FP4
Power	AC					
	Battery			 Probing only		
Arm connection	USB Arm					
	Wired Ethernet					
	Wireless (Wi-Fi)					
Scanner connection	Wired Ethernet					
	Wireless (Wi-Fi)					
Twin Arm + Scanner connection	Wired Ethernet					
	Wireless (Wi-Fi)					
Scanners	RS5		✓	✓	✓	
	HP-L-8.9		✓	✓		
	HP-L-20.8					✓
	Other		✓	✓		



TCP IP @:

All automatic addresses except scanners independent ethernet connection (arm connected through USB)

Adapter for HP-L-20.8 Scanning Pack (FP4) (Absolute SE)

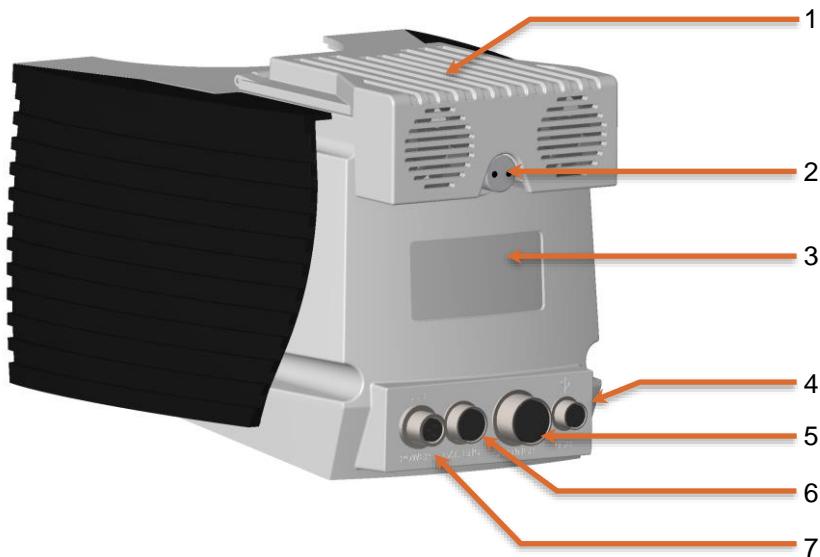
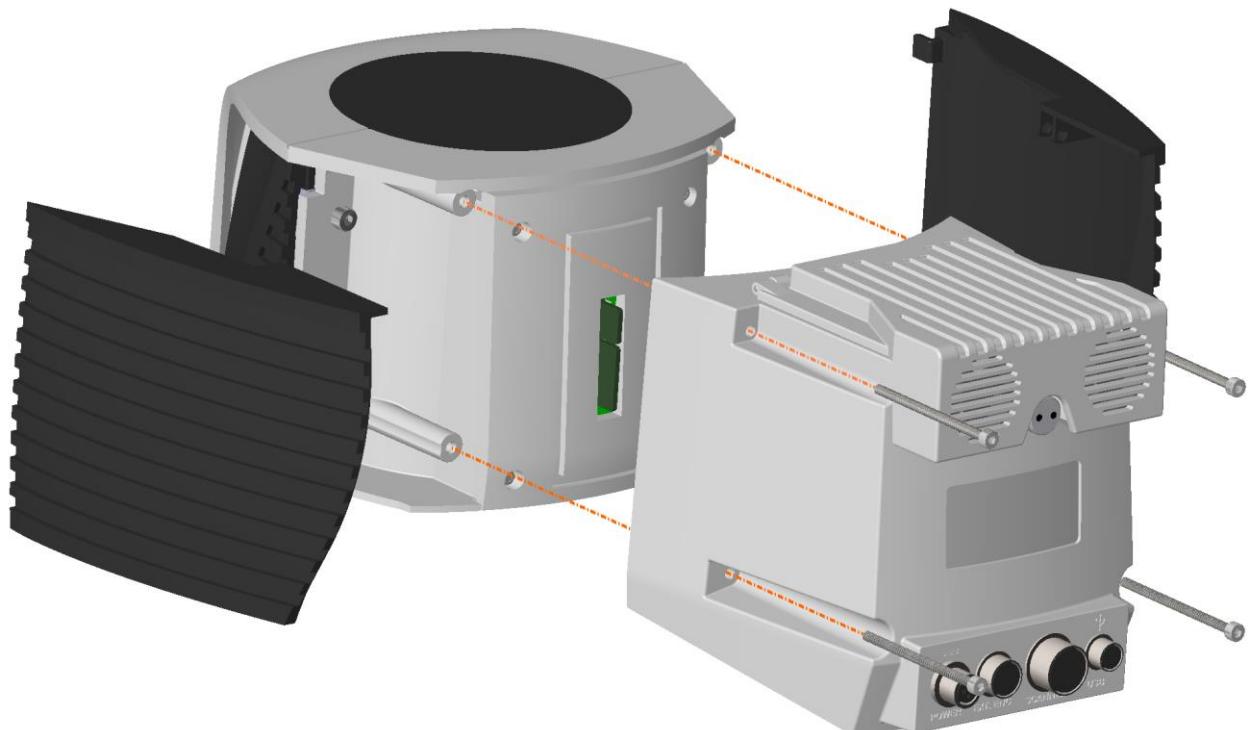


Fig. 19 : FP4 (HP-LC-200) description

- a. Air coolers
- b. Maintenance lock
- c. Identification label
- d. USB-to computer connector
- e. Ethernet (scanner) connector
- f. External accessory connector
- g. Power connector

The FP4 (HP-LC-200) is designed to use the Absolute SE arm with HP-L-20.8 scanner (probing and scanning). A specific adapter is necessary to mount the FP4 on the arm.



B.2.2 BATTERY CHANGE ON CONTROL PACK

The CP2 and CP3 are equipped with 1 or 2 batteries.

- To change one battery, use a screw driver to unlock the battery cover.



- Push with the screw driver and open the cover



- Pull the battery to change with the strip

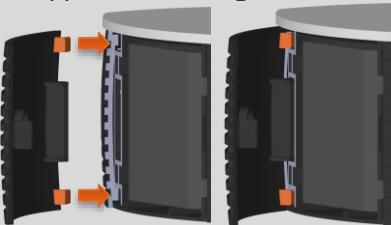


- On the CP3, proceed the same way with the other side.

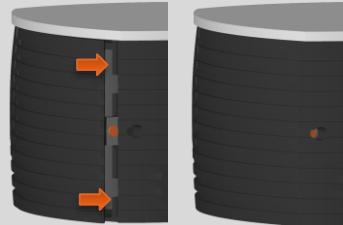
NOTICE

Close correctly the door:

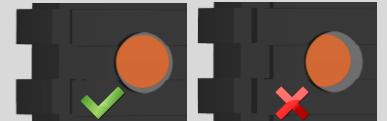
- Approach the hinge



- Close the door



- Ensure that the clip is well closed



B.2.3 LEVEL OF THE BATTERIES

On the batteries, an indicator shows the level of charge:



Battery fully charged



Battery half charged



Battery low level: plug in the power cable

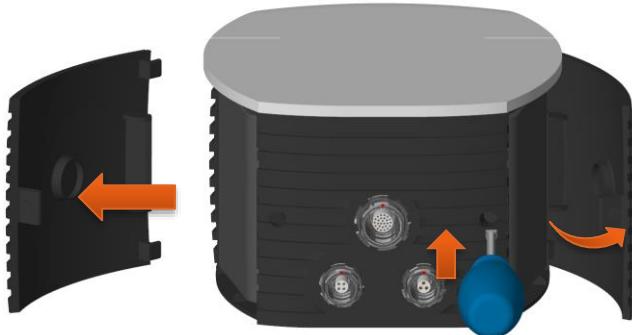


B.2.4 CONTROL PACK CHANGE

By default, the Control Pack is already installed on the arm at the delivery.

In case of upgrade to another FP, or for service, to install or take off from the arm, please read the following instructions.

- With a screw driver, unlock and open the side doors.



- Remove the batteries (CP2 and CP3 only)



- Remove the 4 screws to release the Control Pack (2 on each side)

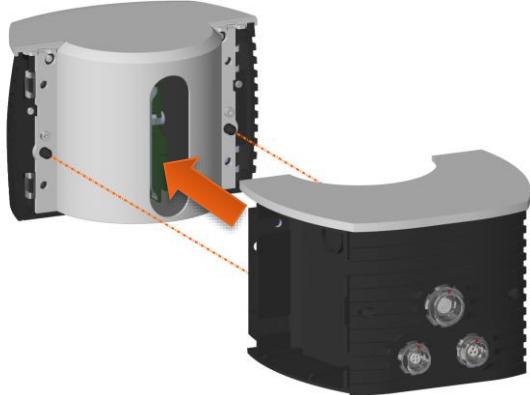


- Take off the Control Pack



- On the new Control Pack, open the side doors and remove the batteries (CP2 / CP3).

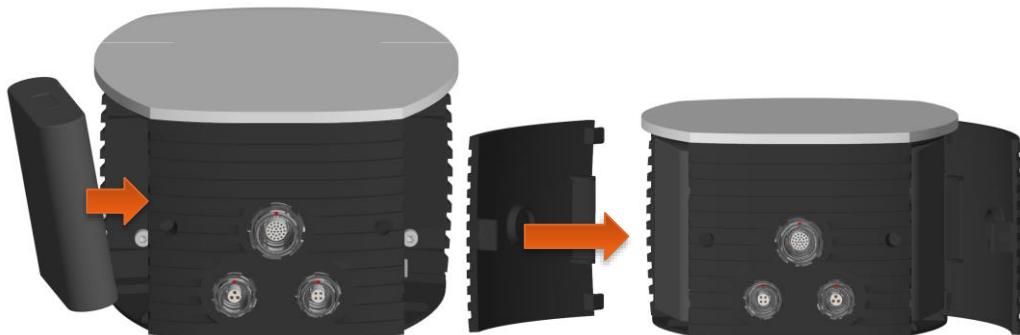
6. Approach the new Control Pack and position it by inserting fingers into the centring holes.



7. Tighten the 4 screws



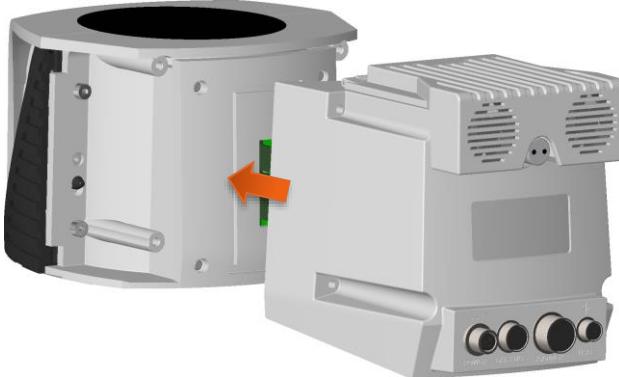
8. Place the battery and close the side doors.



B.2.5 FP4 SETUP

The HP-LC-200 (FP4) must be mounted on and dismounted from the FP4 adapter each time the arm needs to be placed in its case.

1. Approach and plug the FP4 to the Data port.



2. Insert the hinges of the doors in the notches and close the doors.



3. Insert and tighten each of the 4 screws.



B.3 CABLES - COMMUNICATION

The Absolute Arm uses wired or wireless connection

	Wired	Wireless
Arm – Computer	USB Ethernet	Wi-Fi
Arm – Accessory		Bluetooth
Scanner – Computer	Ethernet	Wi-Fi

Each cable provided with the arm can be used only for the Absolute Arm. Each one has a different type of end connector to avoid any plugging error.

Standard Cables

Power Supply			Cable to give power to the arm.	
USB			Cable to connect the arm to the user computer. (USB 3.0 recommended for full speed).	
Ethernet			Cable to connect the arm (CP3 only) or the scanner to the computer.	

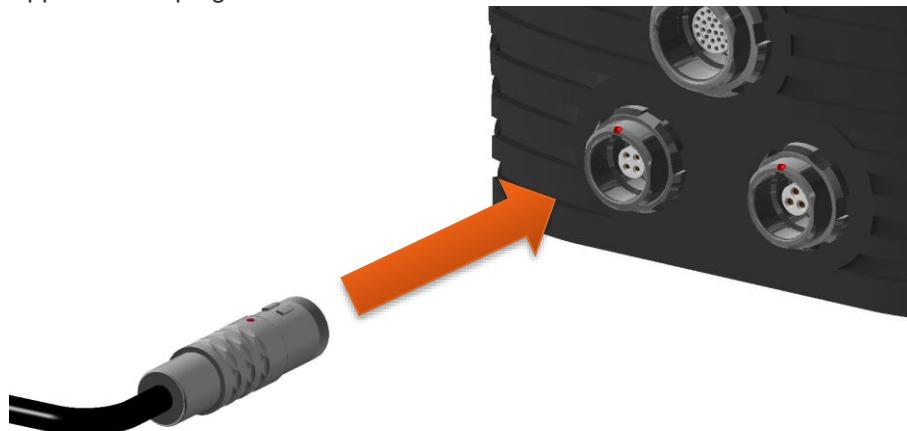
B.3.1 CONNECTION / DISCONNECTION OF THE PLUGS

The arm is equipped with high-reliability and IP certified plugs.

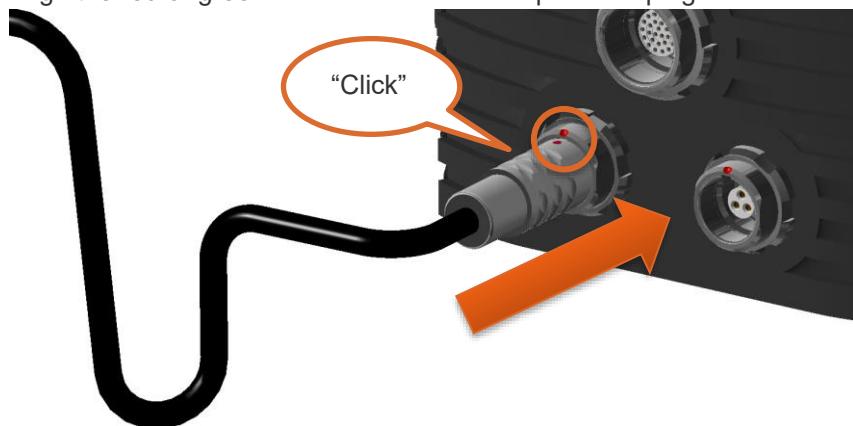
Only cables provided by Hexagon Manufacturing Intelligence can be used on the arm.

To connect a cable,

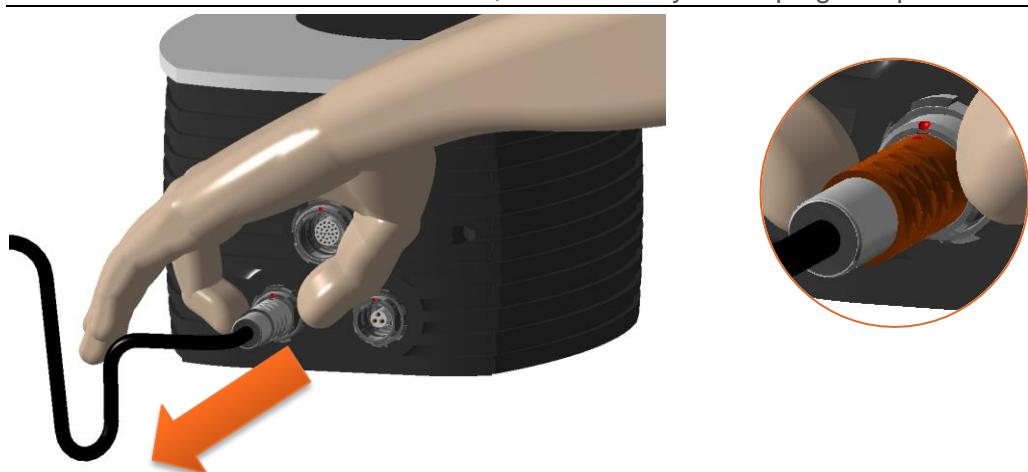
1. Approach the plug to the connector of the arm



2. Align the red or green dot on both sides and push the plug until a "click" can be heard.



To disconnect the cable from the arm, hold the body of the plug and pull it back.



B.3.2 BLUETOOTH WIRELESS ACCESSORIES

The Absolute Arm can communicate with external Bluetooth wireless technology accessories, such as

- Headphone
- Speaker

Please refer to the chapter “Accessories”.

B.4 6 AXES WRIST DESCRIPTION

The Absolute Arm 6-axes Wrist is designed to receive contact probes, touch trigger probes or non-contact probes for tubes, as well as Laser scanners.

On the wrist, one probe connector is available.

A Trigger Button (BT) is used to measure points, start / stop scan.

A 3-State button (B3S) is used to control the operations:

- Right for validation purposes
- Centre for activating navigation on the Quick Access Menu
- Left for cancel purposes

For more details about the use of the buttons, please jump to chapter F.1.7



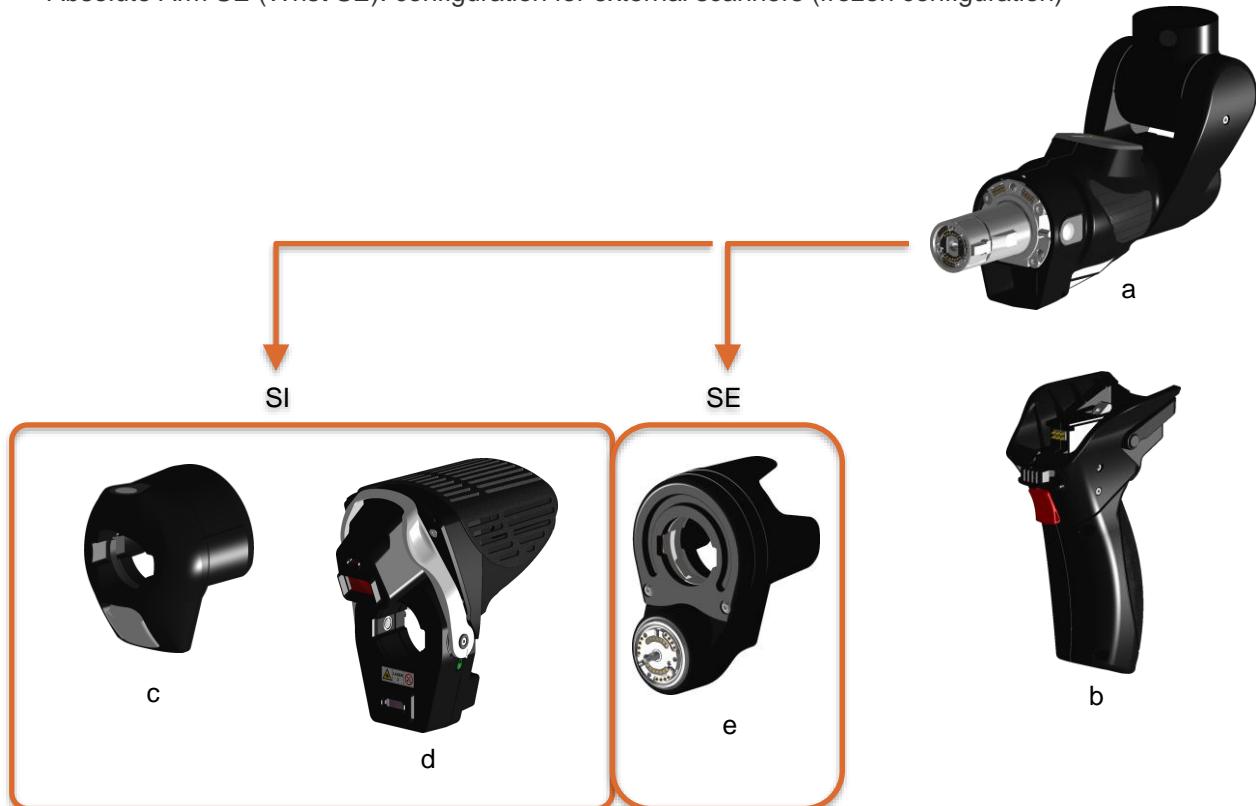
Fig. 20 : Wrist description

- a. 3 State button (B3S)
- b. Trigger button (BT)
- c. TKJ lock
- d. TKJ 26 probe connector

B.5 7 AXES WRIST DESCRIPTION

The wrist of the Absolute Arm 7-axes is a modular wrist: its elements can be removed at any moment. 2 separate configurations should be considered:

- Absolute Arm SI (Wrist SI): configuration for integrated scanner
- Absolute Arm SE (Wrist SE): configuration for external scanners (frozen configuration)



		SI	SE	
a	Swivel	✓	✓	Basic wrist. Includes the 7 th axis, a TKJ connector for probes, integrated buttons, and a wrist display.
b	Detachable Pistol grip	✓	✓	Ergonomic handle for a comfortable use, and removable to access difficult areas.
c	Nose Cone	✓	-	Basic cover for the SI configuration when no scanner is mounted.
d	Integrated scanner	✓	-	Integrated laser scanner. Can be removed for specific probing or tubing operations to access difficult areas.
e	SE adapter	-	✓	Fixed module on SE configuration. Provides a TKJ-M connector for external laser scanner with female TKJ connector.

B.5.1 BASIC WRIST

The standard basic wrist is made of the Swivel, the Pistol grip and the Nose Cone. Contact probes and Tube probes (NCP) can be used on it, with or without the Pistol grip.

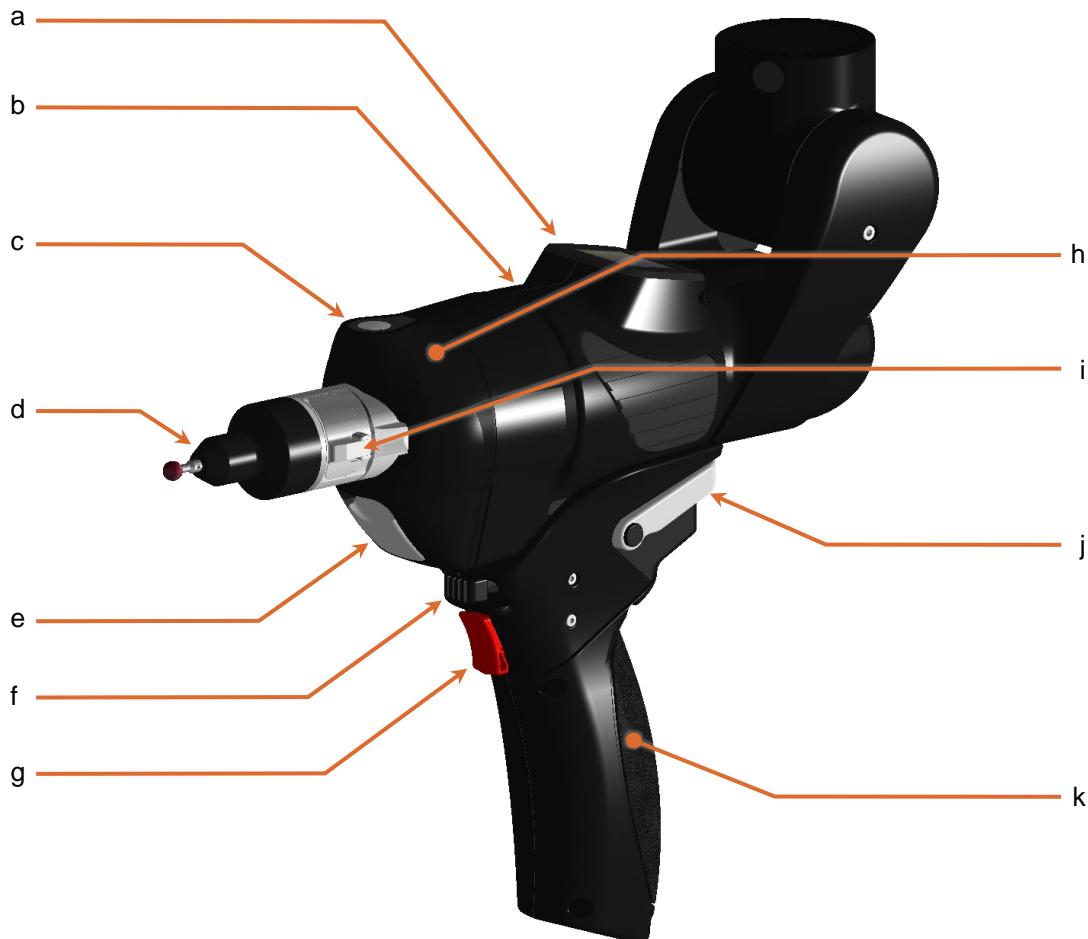


Fig. 21 : Wrist description

- a. Wrist display
- b. 3 State button (B3S) on Wrist display
- c. Trigger button (BT) for the slim configuration
- d. TKJ probe
- e. Nose Cone Locking knob
- f. 3 State button (B3S) on the Pistol Grip
- g. Trigger button (BT) on the Pistol Grip
- h. Nose Cone
- i. TKJ lock
- j. Pistol Grip Mounting lever
- k. Ergonomic & detachable Pistol Grip

The Absolute Arm 7-axes Wrist is designed to receive contact probes, touch trigger probes or non-contact probes for tubes through a TKJ connector, and Laser scanners (integrated or through the TKJ connector). In any configuration, standard buttons are available:

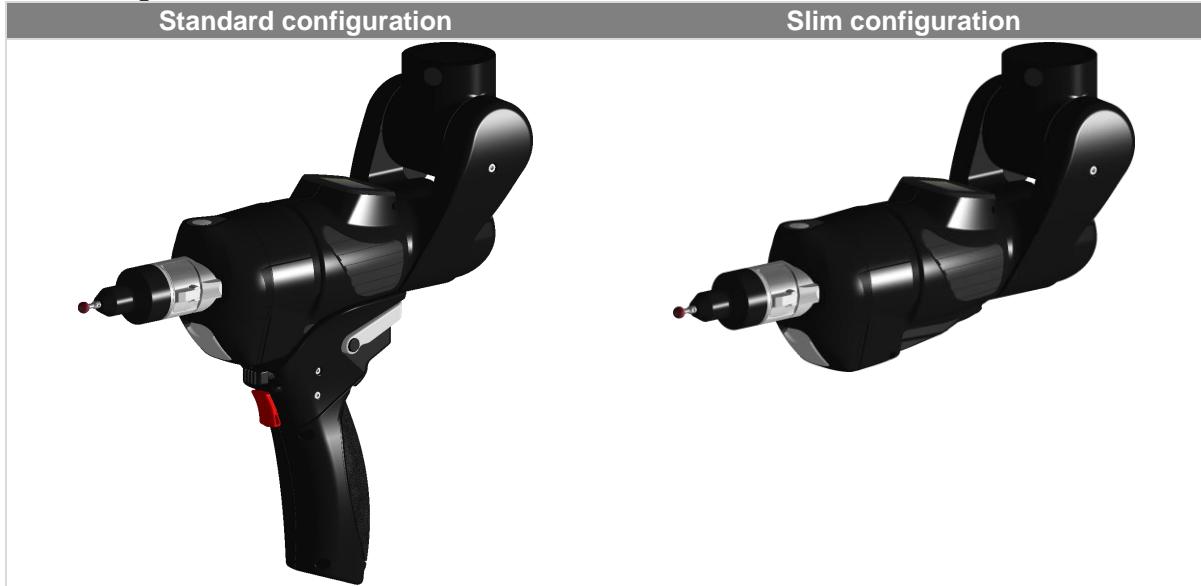
- A Trigger button (BT) is used to measure points, start / stop scan.
- A 3-State button (B3S) is used to control the operations:
 - Right for validation purposes
 - Centre for activating navigation on the Quick Access Menu
 - Left for cancel purposes

On the top of the wrist is located a display to provide information or control of the system. The buttons can be used indifferently on the Swivel/Nose Cone or on the Pistol Grip itself.

B.5.2 PISTOL GRIP

The pistol grip of the 7 axes wrist can be customized:

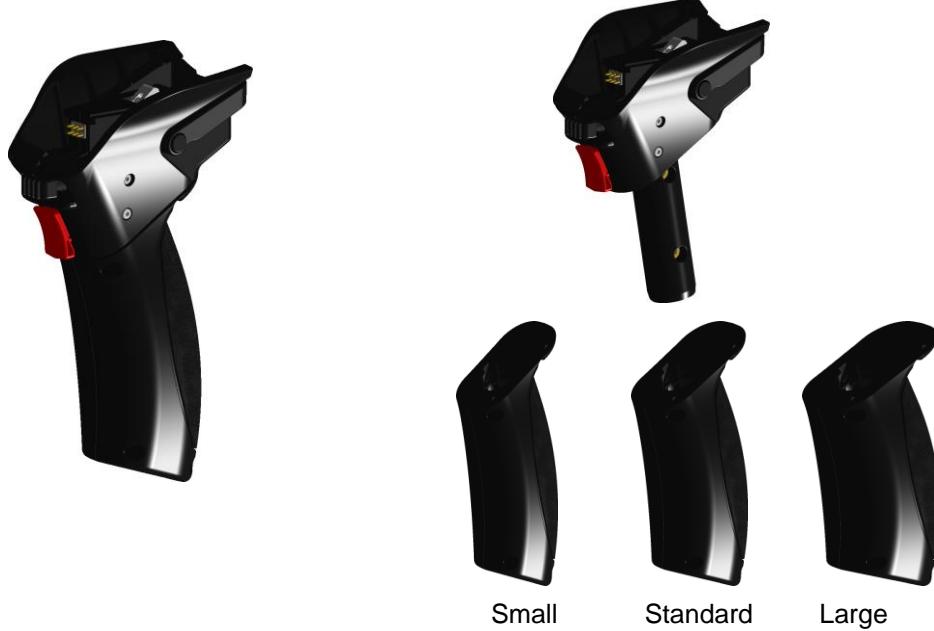
- For measurements with a difficult access, the pistol grip can be easily removed from the wrist, getting a slim configuration.



NOTICE

When using the Slim configuration, put the hands on the Nose Cone.

- To adjust the ergonomics to the user, 3 sizes of hand grip are available and can be easily switched.



Change the size of Hand grip

The size of hand grip can be changed very easily:

1. Remove the fixing screw (SHCS 4x16 –BTR KeyM3) under the handle and pull down the grip



2. Insert the grip to use and tighten the fixing screw.



*Special custom-made hand grips can be made and mounted on the pistol base.
(see Pistol base dimensions in Appendix)*

Remove/Mount the Pistol Grip (except SE configuration)

To access narrow locations, it can be useful to take off the complete Pistol Grip from the wrist, providing then a smaller wrist.

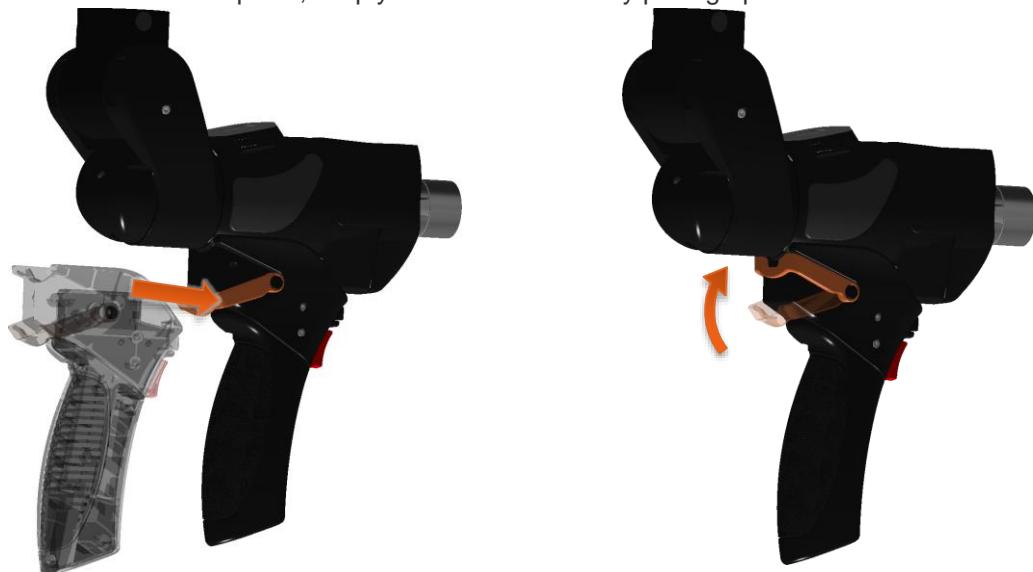
1. Release the pistol by pulling down the Locking lever



2. Remove the pistol by sliding it back.



3. To mount back the pistol, simply slide it and lock it by pulling up the lever.

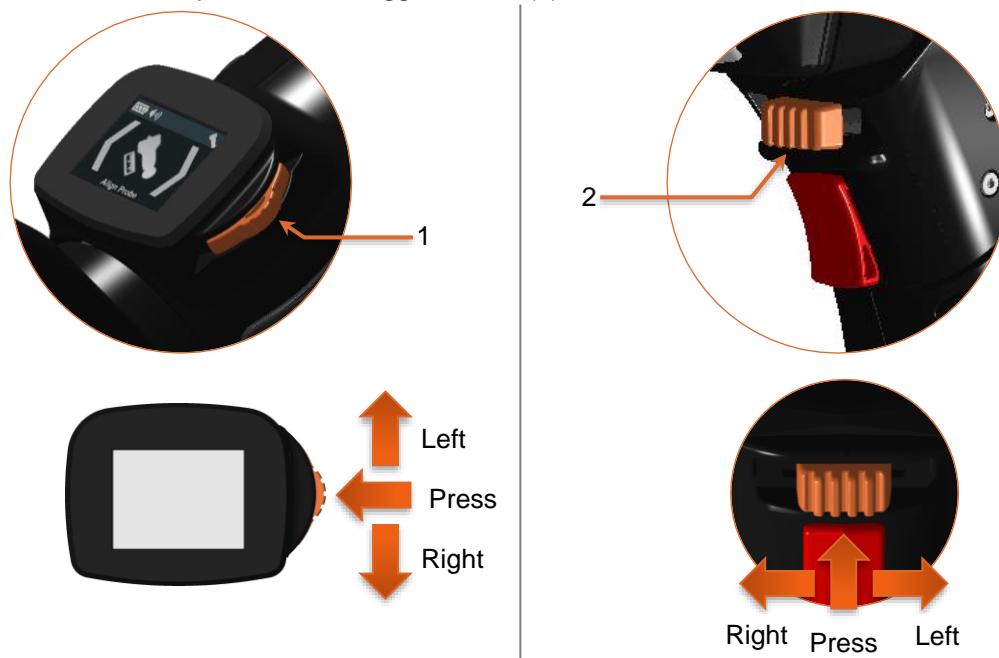


B.5.3 WRIST DISPLAY

The 7-axes wrist is equipped with a helpful control display.

This Wrist Display permits an easy access to the main settings and status information of the arm.

The Display can be controlled by the 3-State button (B3S), located on its right side (1) or the one located on the Pistol Grip, above the Trigger Button (2).



The Wrist Display remotely embeds the Quick Access Menu of the RDS Agent.

Connection

Until the arm is connected, as the base pictograms, the Wrist display shows the available types of connection.



Status

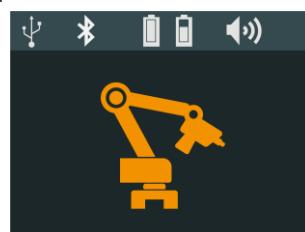
Once connected, the Wrist Display shows the status of the arm.



System is ready



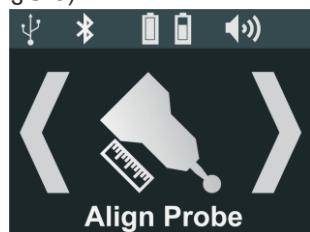
Measurement in progress



System not ready

Quick Access Menu

As the RDS agent, the Wrist Display remotely embeds the Quick Access Menu of the RDS Agent. (see §G.3)



Screen saver

After 30s of inactivity, the Wrist Display automatically switches off.
The display comes back as soon as the arm is moved or the status changes.

B.5.4 NOSE CONE

The Nose Cone must be fixed on the Swivel when no scanner is mounted.

It provides a Trigger Button near the probe and an ergonomic handling when the Swivel is used in slim configuration.

Mount / Remove the Nose Cone

1. Pull down the mounting lever



2. Remove the Nose Cone



NOTICE

Do not let the wrist without any protection on its end: either the scanner either the Nose Cone must be mounted.

To mount the Nose Cone, place it back and secure it with the lever.



B.5.5 INTEGRATED LASER LINE SCANNER – RS5 (SI ONLY)

The Absolute Arm can be used with an integrated scanner – the RS5, simply mounted in place of the Nose Cone.

The RS5 is a Laser Line 3D Scanner collecting line stripes of a laser projected on the surface.

It is composed by a laser emitter and a camera and a second laser guides the user about the correct distance from the part.



a. Visual guide laser emitter

b. Camera

c. Laser warning label (2M)

d. Laser line emitter

e. Rear cover

f. Status LEDs

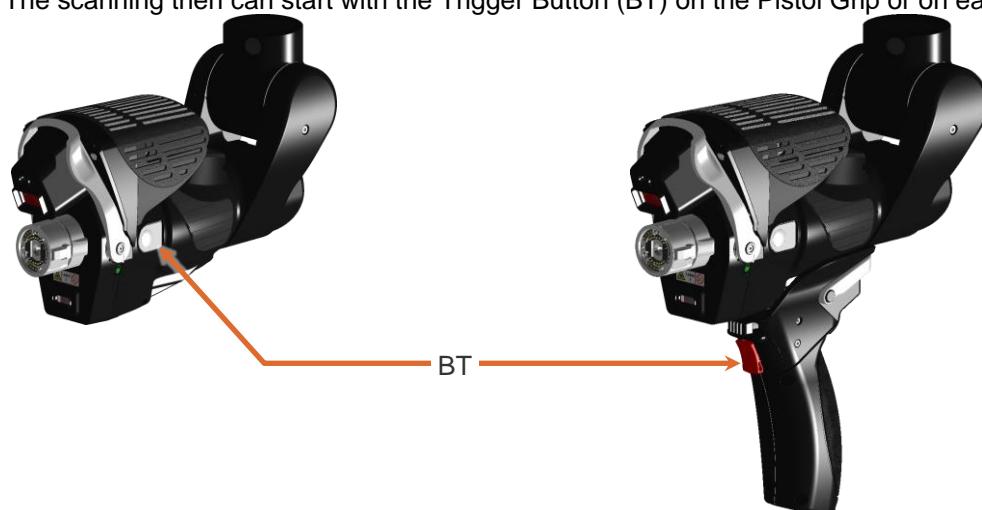
g. Locking lever

h. Identification label

i. Locking status

The Scanner can be used with or without the Pistol Grip.

The scanning then can start with the Trigger Button (BT) on the Pistol Grip or on each side of the wrist.



Mount the Scanner

1. Remove the Nose Cone.



2. Hold the scanner and pull the Locking lever down to the safe position.



3. Bring the scanner on the wrist.



4. Press the scanner against the wrist: the scanner goes to a safe-not locked status



5. Lift the lever up to the locked position



NOTICE

When mounting the scanner, ensure that the lever is correctly locked

Remove the scanner

In most of the cases, the Scanner can be left permanently on the wrist, even when tactile probe or non-Contact Tube probe need to be used. However, to access narrow locations, as well as the Pistol grip, it can be useful to take off the scanner from the wrist, providing then a smaller wrist.

1. To remove the scanner, pull down the Locking lever to the unlocked status.



2. Take off the scanner



3. Then place back the Nose Cone.



NOTICE

Do not let the wrist without any protection on it: when no scanner is mounted, always place back the Nose Cone.

Status indicator

Boot Up Time		Running time
		Boot-up: Stage 1
		Boot-up: Stage 2
		Boot-up error
: On : Blinking (3s) : Off		Waiting for connection
		Sensor connected
		Acquisition
		Error

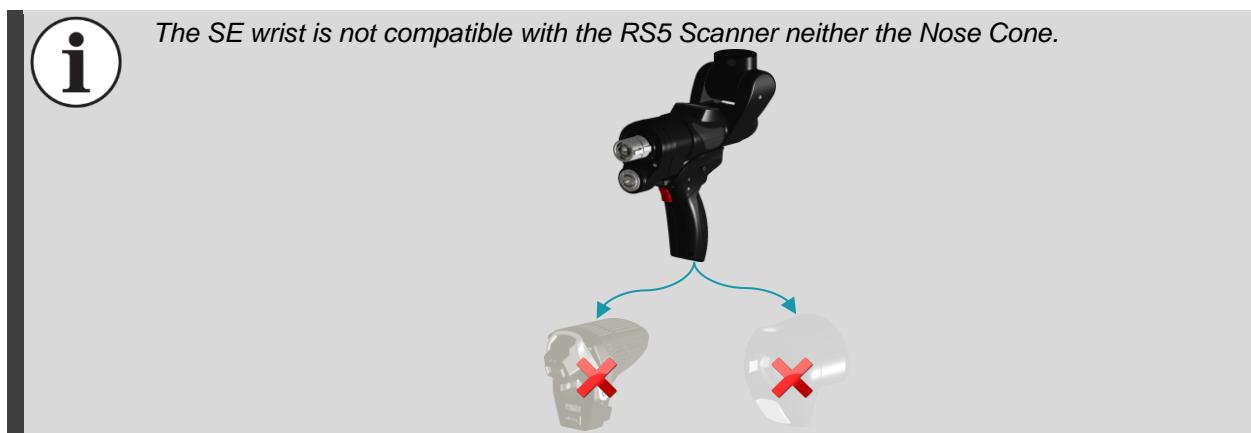
B.5.6 SE CONFIGURATION

The Absolute Arm SE is the 7 axes configuration for a use with an external scanner such as the HP-L-20.8.

For this purpose, a second TKJ probe connector is available on the wrist through a fixed SE adapter.

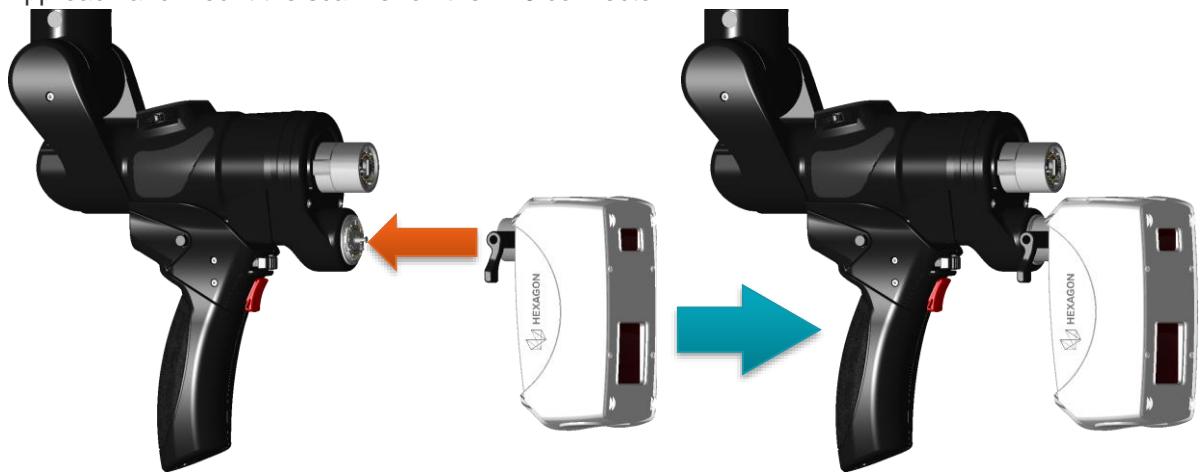


- a. Wrist display
- b. 3 State button (B3S) on Wrist display
- c. Main TKJ Lock
- d. Main (centred) TKJ-26 probe connector
- e. Offset TKJF-13 probe connector for external scanners
- f. 3 State button (B3S) on Pistol Grip
- g. Trigger button (BT) on Pistol Grip
- h. Pistol Grip locking lever
- i. Fixed Pistol Grip

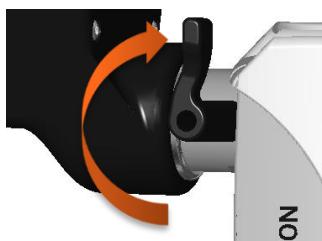


Mount scanners or probes on the offset location

1. Approach and mount the scanner on the TKJ connector



2. Lock the scanner with the key or with the lever.



3. Select the scanner location



B.6 STANDARD PROBES

At the end of the Absolute Arm is mounted the final sensor: the probe or the scanner. It may be contact probe (hard or trigger), tube Non-Contact probe, or scanner.



*For Tube probes description and all probes use and alignment, refer to next chapter.
 For RS5 scanner description, refer to the 7 axes wrist description chapter.
 For external scanners description, refer to the scanner manual.*

B.6.1 CONTACT PROBES

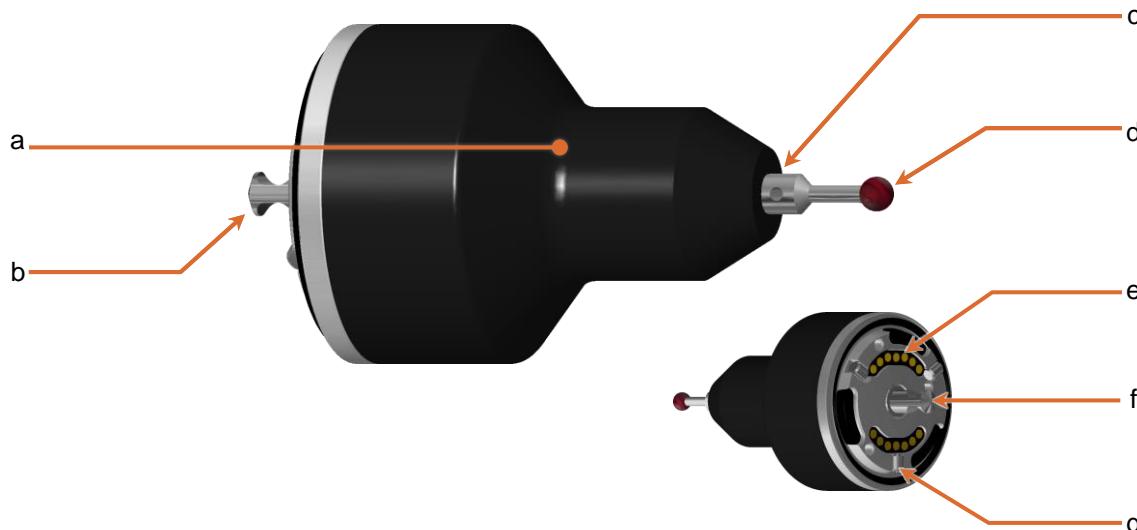


Fig. 22 : Contact probe description

- a. Probe body
- b. TKJ Mounting interface
- c. M3 stylus thread (except ball Ø ≥ 10mm)
- d. Stylus probing ball
- e. Connector contacts to the arm
- f. (TKJ) locking grip
- g. (TKJ) Repeatable plots

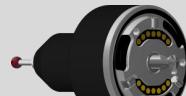
The standard contact probes are composed by a mounting interface (TKJ or thread), a body and a tip stylus. The stylus is mounted on the body through a M3 thread. Any kind of M3 stylus can be mounted on the body.

NOTICE

The accuracy specifications of the arm are guaranteed only with the standard probes. Check the rigidity of the stylus stem before any operation.

NOTICE

TKJ probes V1 can still be used on the arm.



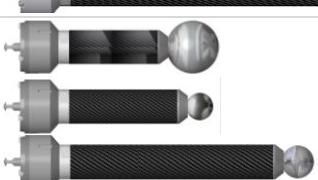
Standard TKJ probe V2



TKJ probe V1

Other kind of contact probes

Hexagon Manufacturing Intelligence provides several kinds of contact probes, compatible with the Absolute Arm. These probes can be used to extend the volume, to probe features on difficult access, get around obstacles...

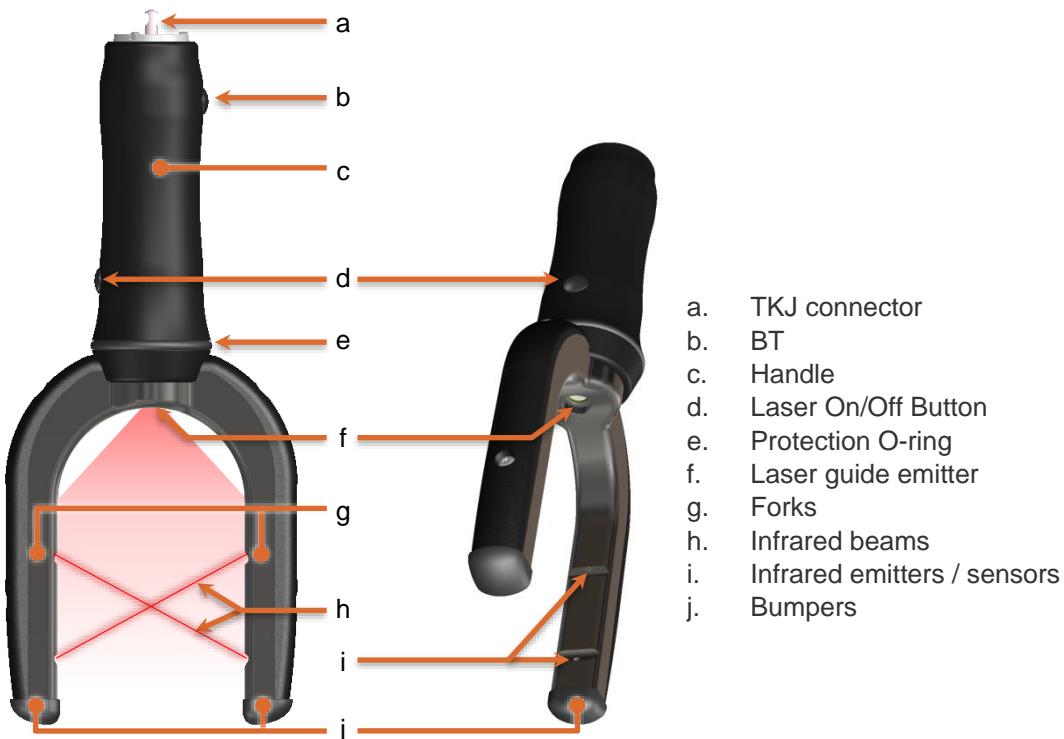
Type of probe	Picture	Comment
Straight probes		Aluminium or carbon body.
Large diameter probes		Fixed ball from 10mm to 25mm.
Angle probes		45°, 60° or 90°, to access a difficult feature.
Touch trigger probes		
Magnetic ball probe		12.7mm ball on magnetic seat, can be used for Laser Trackers balls.



Standard balls with a diameter over 10mm are not M3 stylus, but fixed steel balls

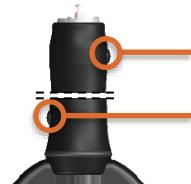
B.6.2 NON-CONTACT TUBE PROBES

Non-contact tube probes are designed for tube measurement with dedicated software. The two infrared beams allow measurement without touching the tube.



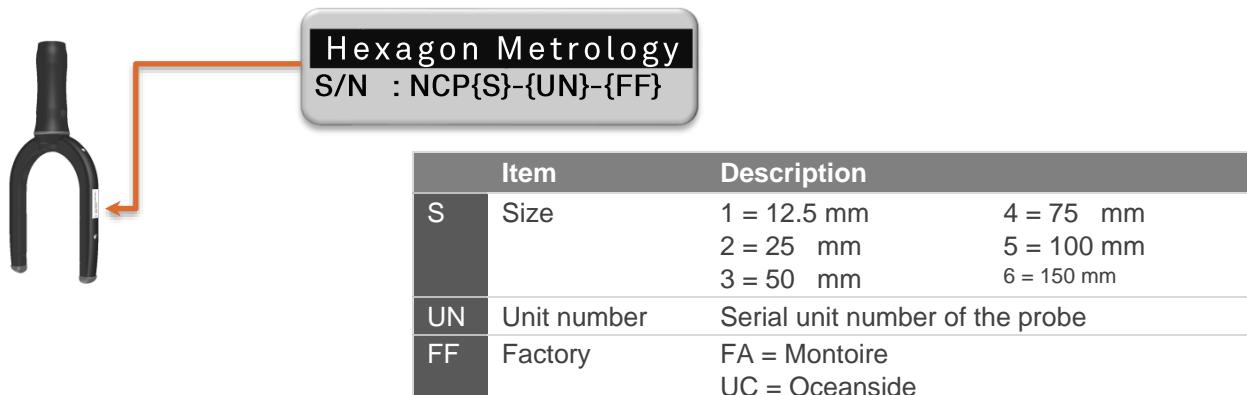
Buttons

2 buttons are available on the NCT probes:



- Trigger Button: This is the same function as the Trigger button on the arm. Its closer location makes easier the use of BT when handling the NCT probe.
- Laser On/Off: button to display / hide the laser guide

Identification (serial number)



Laser guidance

A laser can be switched on, to guide the user about the location the point will be taken. Press on the laser button to switch on: a laser is projected on the tube.



CAUTION

*Laser Product Class 2M: Exposure toward the eye can result in eye injury
Pay attention not to expose the eye to the laser guide when laser is on.*

Sounds:

When the beams are cut, beeps are emitted

- | | |
|--------------------------|--------------------------|
| • Beam1 is blocked down | • Beam2 is blocked down |
| • Beam1 is released down | • Beam2 is released down |
| • Beam1 is blocked up | • Beam2 is blocked up |
| • Beam1 is released up | • Beam2 is released up |

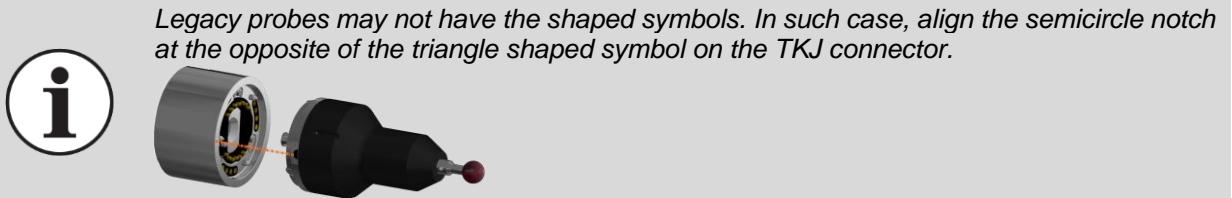
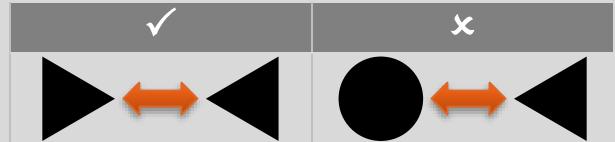
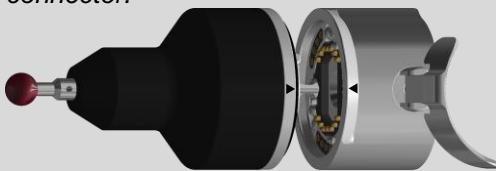
Sizes of probes and tubes

Size	Recommended tube diameters	Alignment artefact	
		Ø	Lg
1 12.5 mm	4-13 mm (0.15-0.5")	6.35 mm (0.25-0.75")	100 mm (1/4")
2 25 mm	6-20 mm (0.25-0.75")	6.35 mm (0.25-0.75")	100 mm (1/4")
3 50 mm	10-40 mm (0.40-1.6")	12.7 mm (0.5-2.5")	100 mm (1/2")
4 75 mm	12-65 mm (0.5-2.5")	12.7 mm (0.5-2.5")	100 mm (1/2")
5 100 mm	20-85 mm (0.75-3.3")	25.4 mm (1")	100 mm (1")
6 150 mm	30-130 mm (1.2-5.1")	25.4 mm (1")	100 mm (1")

B.6.3 MOUNT THE PROBE ON THE ARM

NOTICE

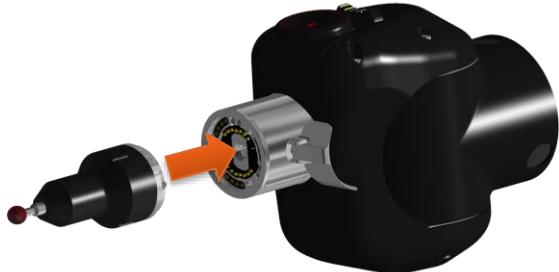
The probe must be mounted with the correct orientation: align the symbols of the probe and the TKJ connector.



1. Release the lever and unlock the TKJ connector



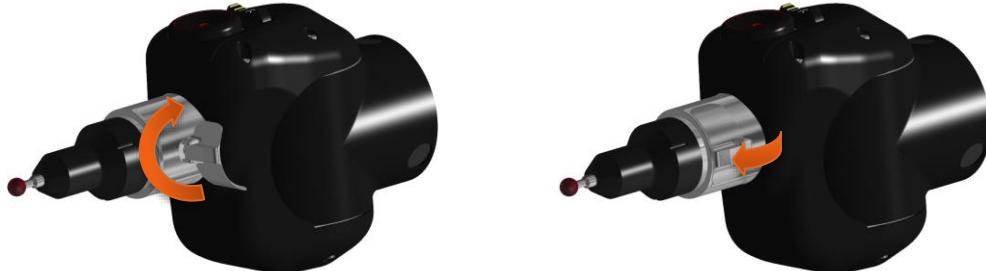
2. Approach the probe and check the orientation



3. Install the probe in the socket

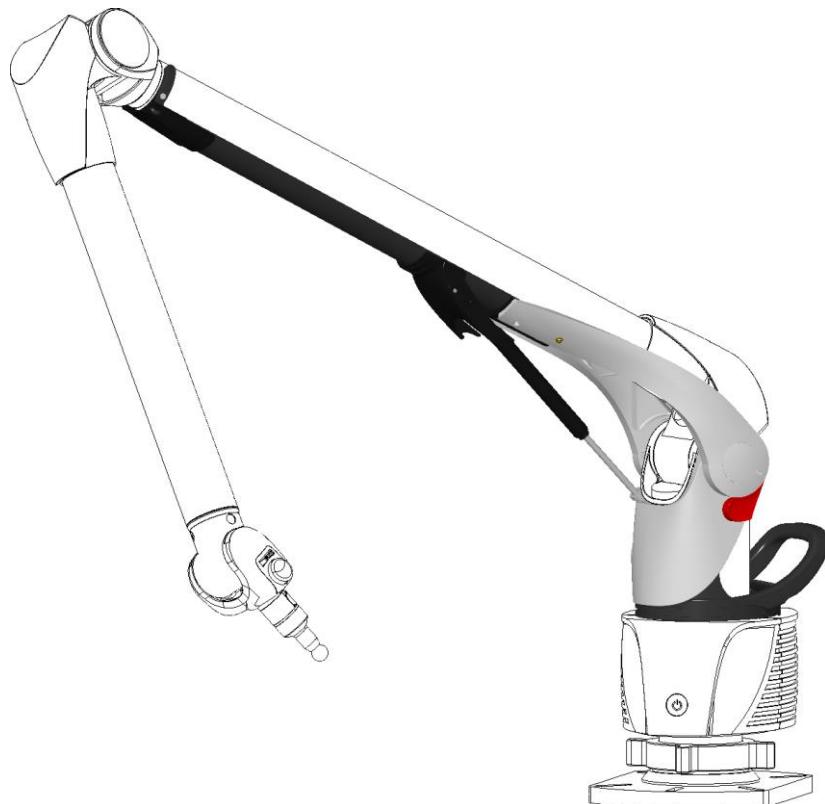


4. Lock the probe and close the lever



B.7 COUNTERBALANCE

B.7.1 GAS PUMP COUNTERBALANCE LOCKING SYSTEM



The Absolute Arm is equipped with a zero-G counterbalance, facilitating the manipulation of the arm, thus a better focus on the measurements.

SmartLock

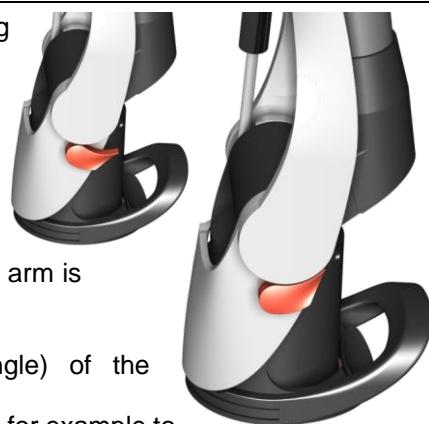
The counterbalance of the Absolute Arm contains a smart locking system to prevent the counterbalance to move down. A locking button on the side of the arm is used to lock or unlock the counterbalance.

When the counterbalance is unlocked (standard operating position), then whatever the position and the orientation of the wrist is, the elbow of the arm will always be counterbalanced and follow the imposed movement.

The unlock position is only an operating position and as soon as the arm is left in its rest position, the counterbalance should be locked.

When the counterbalance is locked, then the position (= angle) of the counterbalance is fixe and the arm is secured (it cannot fall).

This "locked" position can be also used to impose a height to the arm, for example to prevent any obstacle above the arm.

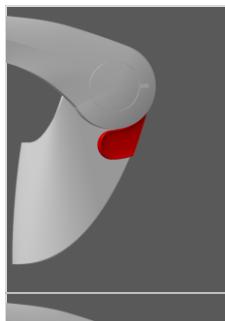


To avoid hitting the elbow of the arm against an obstacle above the arm, it may be helpful to lock the counterbalance with the lever.

The lock position also can be used to hold the arm in an angled position (e.g. 45°) to avoid hitting a low ceiling, or when a small part needs to be measured or digitized: move down the elbow of the arm and lock it, to get a comfortable position.

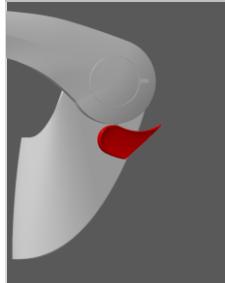


The 4.0 and 4.5 sizes arms cannot be locked on other angle than home position.



Unlocked position:

- Standard operating way to use the arm



Locked position:

- Arm left for a long time
- An object above the arm hinders vertical movement
- The part to probe or scan is very small
- To place back the arm in its case



Fig. 23 : Smart locking system

When the arm is placed in its case, the counterbalance should be locked, to prevent any mistake when taking it out.

Home Dock

For a secured home position of the arm, the wrist is equipped with a blocking system. The Home Dock avoids the wrist from moving, and the probe or scanner from hitting the base of the arm.

1. Bring the arm to its home position.



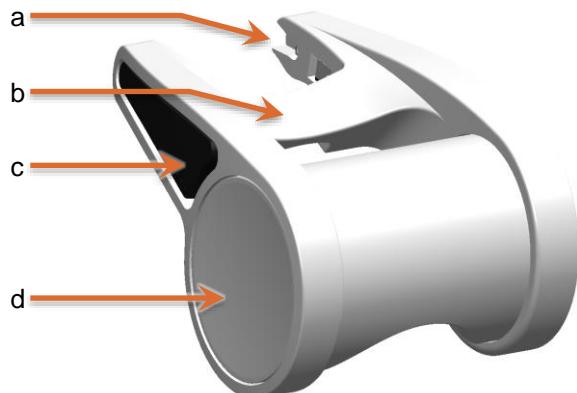
2. 7 Axes wrists: Turn the wrist as shown



3. Position the notch of the wrist on stop on the Home Dock.



B.7.2 COUNTERWEIGHT (1.2 ARM)



- a. Guide and lock to the arm
- b. Handling side
- c. Unlock button
- d. counterweight

The 1.2 arm is balanced by a removable counterweight at the back of the arm, which makes handling "Zero-G" and easy.

This counterweight is to be removed when put back in its transport case.

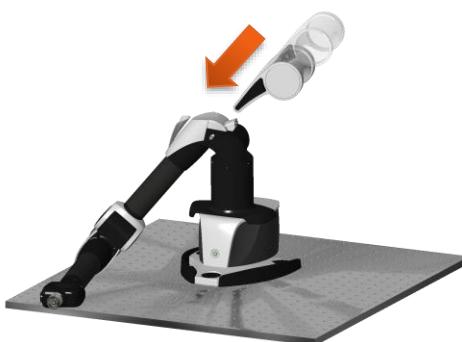
The mounting and dismounting of the counterweight is very easy:

Setup

First ensure that the 1.2 arm is correctly and safely laid on a levelled and stable work surface.

Hold the counterweight by the back.

Approach the counterweight on the back of the arm until it is locked (double "Click").

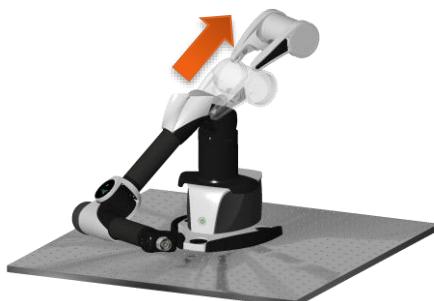
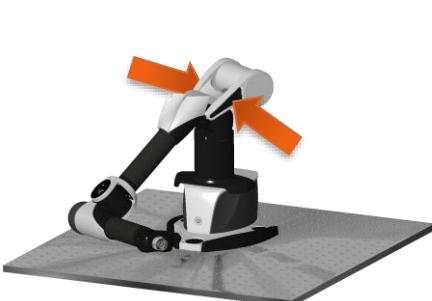


Dismounting

Before any removal operation, first ensure that the 1.2 arm is correctly and safely laid on the work surface.

With both hands, hold the counterweight and press simultaneously on each side unlock buttons.

Then remove the counterweight.



B.8 TRAVEL CASE

The Absolute Arm is delivered in a robust and easy handling travel case. For the manipulation, the case is equipped with 3 handles, and 2 enforced wheels

Overview



Fig. 24 : Travel case description.

- a. Lid
- b. Identification of the arm
- c. Opening locks
- d. Handles
- e. Wheels

Inside components (except 1.2 series)

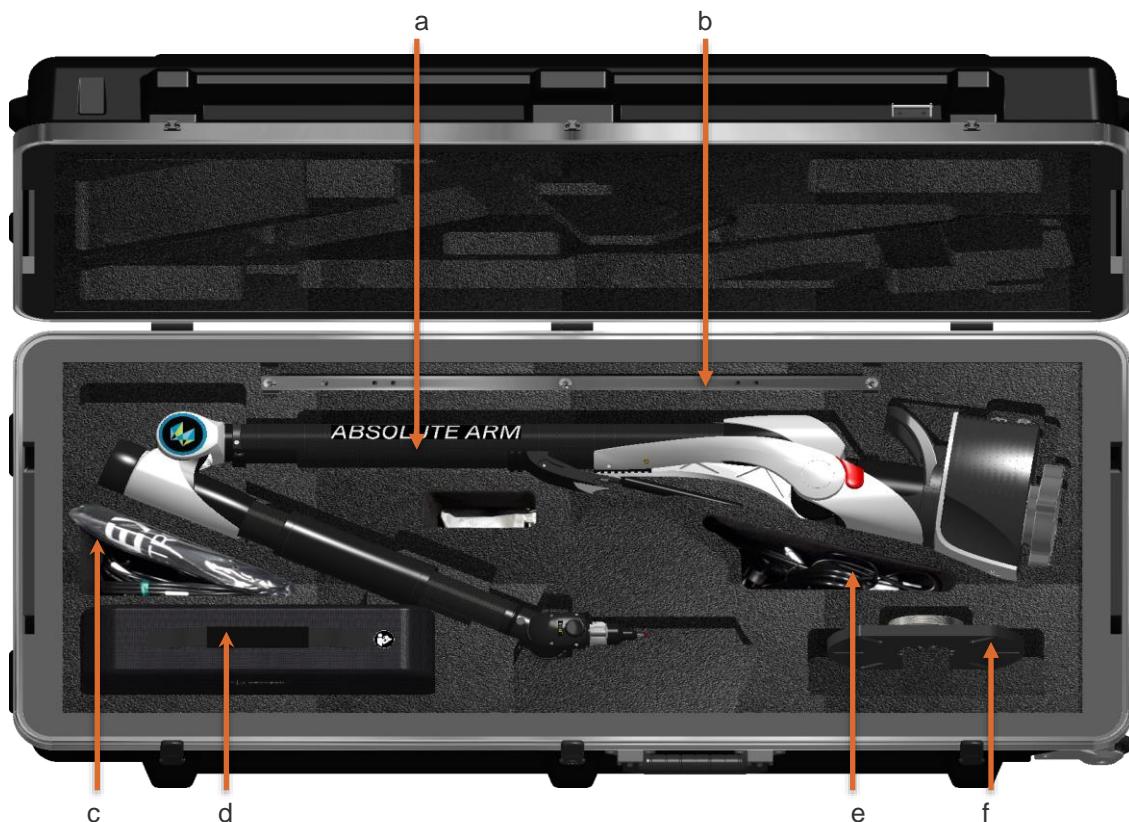


Fig. 25 : Travel case description

- a. Absolute Arm.
- b. Verification bar (depends on the options)
- c. Cables + Dust protection cover
- d. Accessories case
- e. Cables
- f. Mounting base

Absolute Arm Compact 1.2

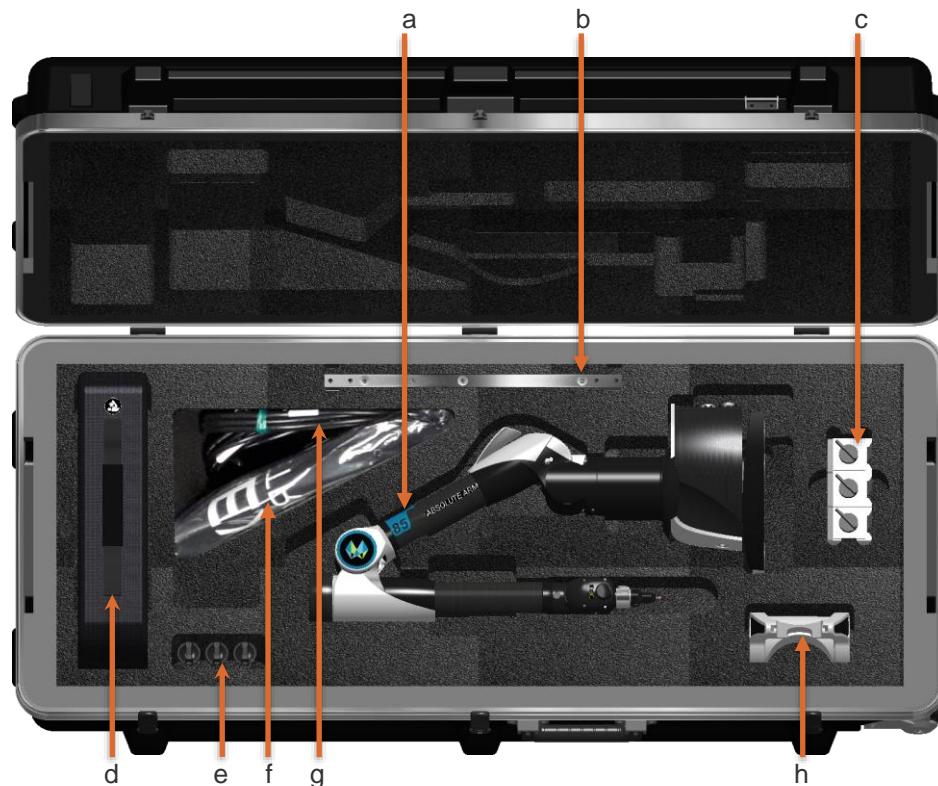
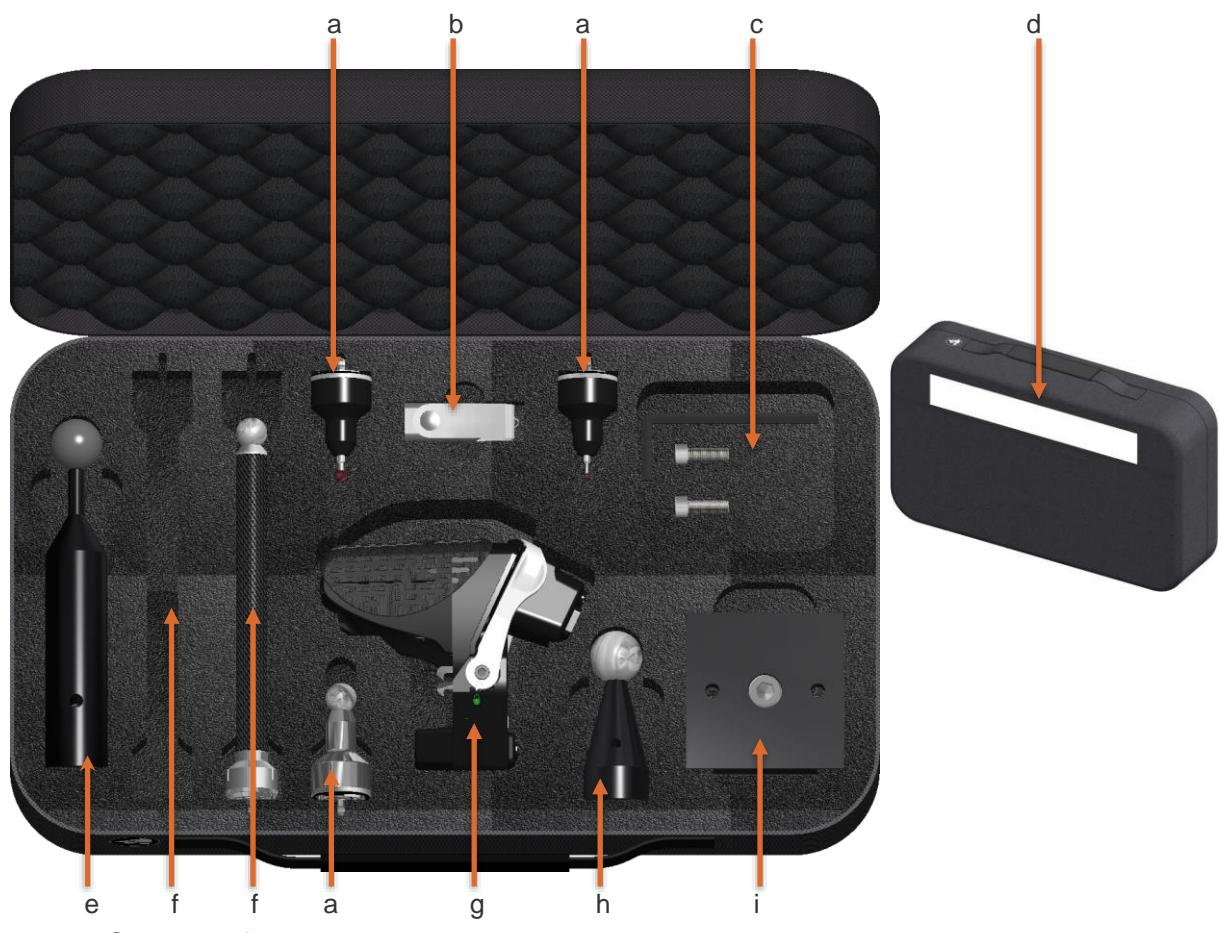


Fig. 26 : 1.2 Arm Travel case description

- a. Absolute Arm
- b. Verification bar (depends on the options)
- c. Magnets for the base plate (option)
- d. Accessories case
- e. Magnetic anchors
- f. Dust protection cover
- g. Cables
- h. Removable counterweight

Accessories case



- a. Contact probes
- b. USB installation stick
- c. Tools (Allen key + screws)
- d. Documentation (Certificates of the arm and the sphere, Quick Installation Guide)
- e. Certified sphere for probes and scanner alignment and verification (depends on the options)
- f. Locations for long or additional probes (not included)
- g. RS5 Scanner or Nose Cone (depends on the options)
- h. Certified sphere for contact probes alignment and verification (depends on the options)
- i. Plate for the certified sphere

B.9 EXTERNAL LASER SCANNERS

B.9.1 HP-L-20.8

LEDs - Sensor		
	LASER	Laser status (on/off)
	POWER	Sensor power status (on/off)

LEDs - Control Pack		
	LASER ON	The laser is currently active
	PC COM	Controller and PC communication status (ok/off)
	SENSOR COM	Sensor and controller communication status (ok/off)
	SENSOR POWER	Sensor power status (on/off)
	UNIT POWER	Control unit power status (on/off)

B.9.2 HP-L-8.9



- a. Stand-off colour guide
- b. TKJ connector
- c. Scanner cable connector
- d. Scanner camera
- e. Laser warning sticker
- f. Laser emitter



Power-On / Warm-up / Status LED

The scanner is powered by the arm itself, simply switch on the arm.

Once the whole system is installed, connected and powered, to ensure the quality of the digitizing, a warm-up time of 5mn minimum (15mn recommended) is necessary before any scanning operation.



Item	Attribute	User indicator (colour code)
Boot time (time until factory mode ready)	2 seconds	● RED
Boot time (time until application mode ready)	7 seconds	● Orange
System ready time (time when measuring can start via SDK)	20 seconds (depends on Windows network connection)	● Green flashing
Warm-up time (time to reach 90% accuracy)	5 minutes	● Green fixed
Sensor fault indicator	(remaining colour options /flashing)	

C. RDS SOFTWARE PACKAGE

C.1 PRESENTATION

The arm is managed by a driver: RDS. A maintenance software is also necessary to be able to do all maintenance operations (probe alignment, arm verification ...): "RDS Data Collector".

RDS is available as soon as the computer starts and is always available for any application software: the application software simply connects to RDS.

RDS contains "RDS Toolbox", main interface, also containing maintenance tools, "RDS Control Panel" for configuration, "RDS Data Collector", for verification and alignment.

For further information about RDS, refer to "RDS User" and "RDS Data Collector" manuals.

NOTICE

Always ensure that the latest version of RDS is installed on the computer.

RDS News

RDS May inform the user about useful tips through notification with RDS Toolbox: stay connected to get benefits of it.

C.2 SOFTWARE SETUP

Prerequisites

RDS can be installed on a computer supplied with Windows10®Pro or Windows7®, 32bit or 64bit operating system. No specific software dongle is necessary to use RDS.

RDS by default is installed on C:\Program Files\RDS or C:\Program files (x86) \RDS.

Depending on the connection, a USB port, a Wi-Fi device, or an Ethernet port are necessary to connect the arm to the computer through RDS.

For more details about the compatibilities of RDS, please read the "RDS User" manual.

Installation

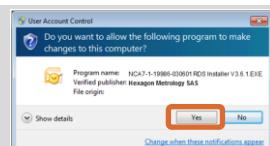
Application Software:

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.



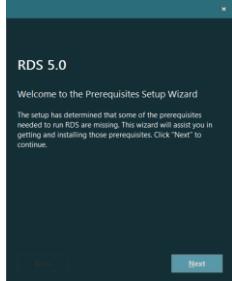
If a legacy version of RDS (up to RDS V4) is already install, you need to uninstall it manually.

1. Insert the installation USB stick into the drive
2. Run "Menu.exe" or "Setup.exe" on the USB stick. RDS installation can be run also directly by running "RDS Installer V#.#.#.exe" located on the RDS folder or from a downloaded file.

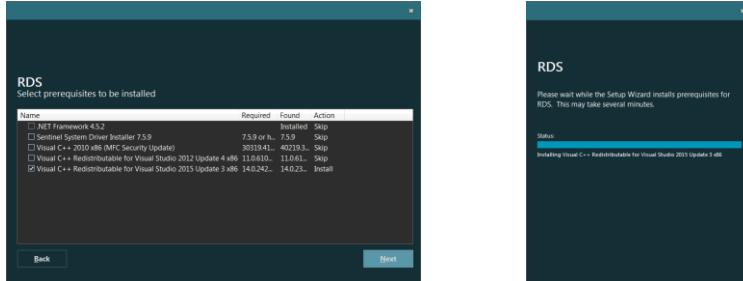


Depending on the computer security settings (User Account Control), a confirmation may be asked: press "Yes".

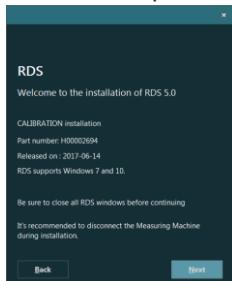
3. Select “Install RDS”: the following window appears. Click on {next}.



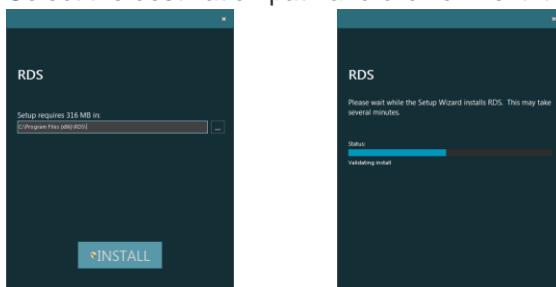
4. Prerequisites checking: check and select the appropriate needed tools and click on {next} (the selected components are installed).



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



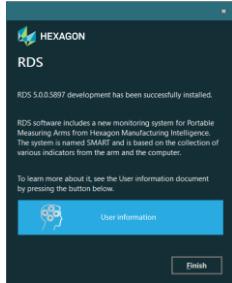
6. Select the destination path and click on next: the installation starts



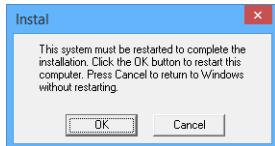
- The installation of the USB drivers may require a confirmation.



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



8. If Windows® asks for computer restart, press "OK".



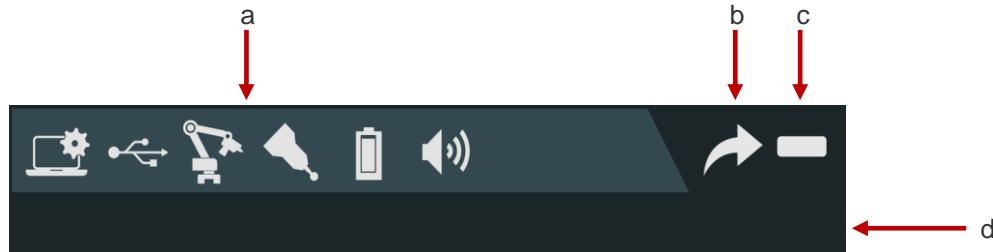
It is recommended to disable any firewall as it may prevent RDS from functioning properly.

C.3 RDS AGENT

RDS Agent is one component of RDS software package.

Its role is dedicated to an easy interface providing fundamental information and setup to the operator.

C.3.1 DESCRIPTION OF THE INTERFACE



- a. Status of the components
- b. Links to RDS tools
- c. Minimize
- d. Global status

C.3.2 COMPONENTS

The RDS Agent automatically detects and shows the available components.

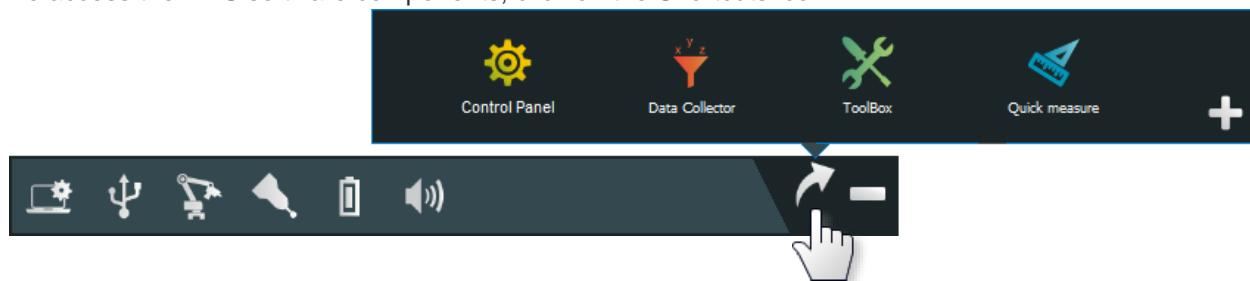
Hover the icon to display a quick status of the component.

Click on the wanted icon to display other information and settings (automatically reduced when leaving).

	Information	Settings
 System		Start / Stop RDS Service Start / Stop RDS Toolbox Stop RDS Agent Window options (Minimize the window at the start up / Always on foreground / Opacity)
 Connection		Connection settings (RDS Control Panel)
 Arm	Type of arm External temperature	Summary panel (RDS Control Panel)
 Probe	Name of the current probe Type of probe Diameter of the probe	Probe panel (RDS Control Panel) Align the probe (RDS Data collector) Check the probe (RDS Data collector)
 Scanner	Name of the scanner Type of scanner	Scanning profile Scanner settings (RDS Control Panel)
 Battery	Health of the battery(ies) Charging level	
 Sound		Volume level

C.3.3 SHORTCUTS

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



	RDS Control Panel	Full arm and RDS configuration.
	RDS Toolbox	Main interface for the configuration and maintenance.
	RDS Quick measure	Tools to do basic measurements.
	RDS Data collector	Arm and accessories verification, calibration (arm) and alignment (probes).
	Add a shortcut	Gives the possibility to add a customized shortcut.



For more information, please read the RDS User manual or RDS Data Collector manual.

C.3.4 QUICK ACCESS MENU

With a simple press on the 3-State button of the arm, the RDS Agent provides to the operator a menu for main operations. This quick access menu (Q.A.M.) is displayed both on the computer and on the Wrist display on 7-axis arms.

Thus, main settings can be very easily reached with this menu.



For more details, please refer to chapter G.3

C.3.5 RDS MESSAGES

Connection messages (Status)

When the arm is just connected, or disconnected, RDS automatically shows a status message
If no probe is connected to arm, the arm status is “No probe connected”

Warning messages:

Warning messages are displayed for a few seconds, to warn the user about an event

Message	Description
Mechanical stop	When one axis comes to its mechanical limit (B, D or F), mouse is automatically stopped, and a message indicates which axis is at limit
Battery	When battery becomes low level

Other messages

RDS also shows messages in a window for some events, such as if a new probe is connected.

D. INSTALLATION



WARNING

Do not set-up the device where liquids or chemicals are used. Ensure that no liquids are spilled into the unit.

D.1 MOUNTING BASE

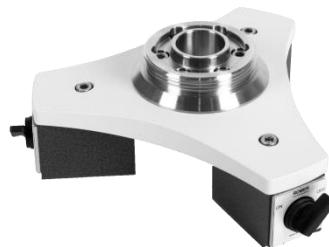
The Absolute Arm offers several different mounting possibilities.

Standard base is a simple Mounting ring on a base plate. Optional supports are available (Standard Magnetic base, Circular magnetic base, mobile stand, heavy base, complete worktable, raisers, vertical support ...).

The Absolute Arm 1.2 series is normally using a fixed base plate but can also be mounted on all the standard supports through an accessory mounting ring adapter (option).



Standard base-plate



Standard magnetic base



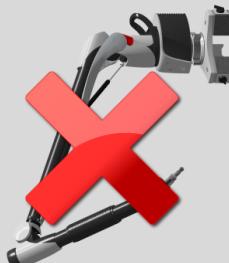
Circular magnetic base



Vacuum base

NOTICE

The arm is designed to be used in a standing-up position. Hexagon Manufacturing Intelligence cannot guarantee any damage due to incorrect orientation of the arm, or incorrect measurement accuracy.

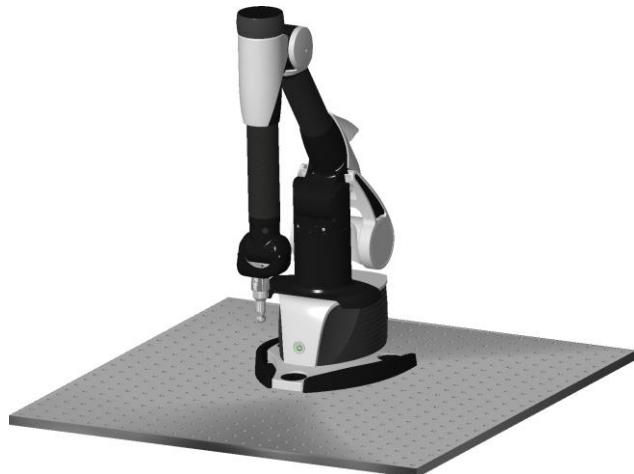


*For a complete list of accessories, consult the product catalogue.
For further details on each accessory, please read the applicable technical sheet.*

D.1.1 ABSOLUTE ARM COMPACT 1.2 BASE

Default use

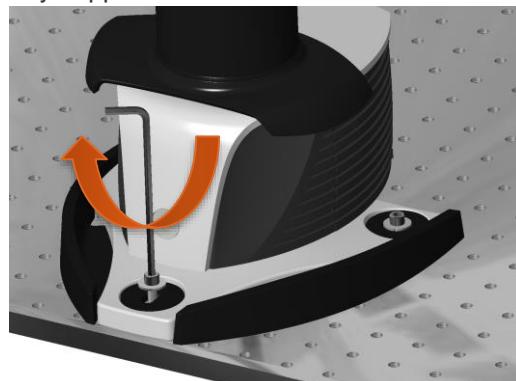
The 1.2 series arms are designed to be used simply laid on a stable work surface. It means that it normally doesn't need to be fixed.



However, in some circumstances, it may be advised to get more security regarding the stability. The 1.2 series arm provides several possibilities to securely fix the arm.

Fix with screws

3 holes are available on the base plate of the 1.2 series arm to be able to fix it using screws. Each slot hole is located on a mobile (rotating) and removable circular plate, that allow freedom, to fit on any support.



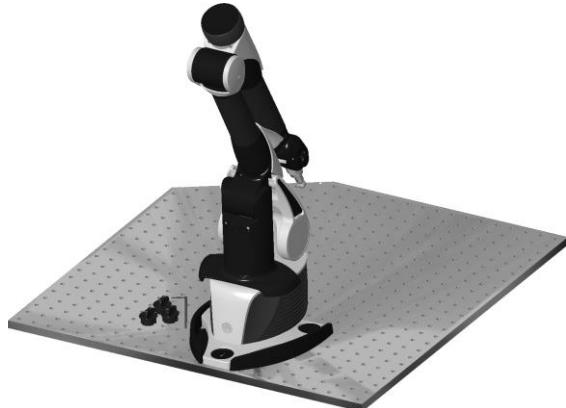
Use magnetic anchors

The 1.2 arm is delivered with 3 accessory magnetic anchors that can enhance the stability of the arm on a ferro-magnetic surface.

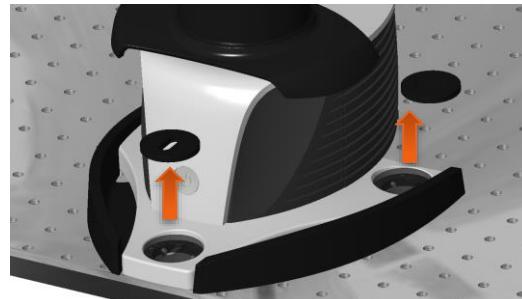
NOTICE

Non-plane or low-magnetism surfaces may result in a poor stability of the arm and then in a loss of accuracy.

1. Put down the arm on the work surface.



2. Remove the 3 circular plates.



3. Insert and lock the magnetic anchors in the free holes: the arm is safely placed.



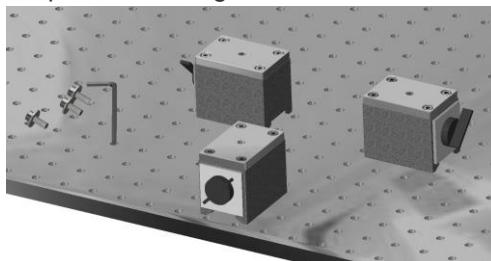
4. To free the arm, simply turn off the anchors

5. To remove the anchors from the arm, rotate the anchors mid-way and pull them up

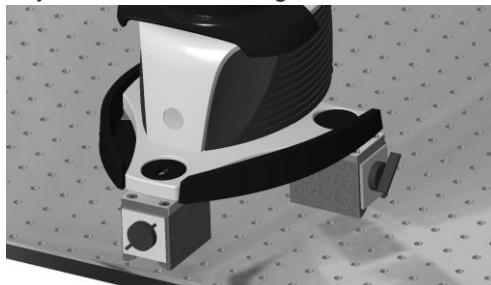
Use magnets (option)

A set of 3 accessory magnets can be fixed under the base plate, providing a good and easy way to install the arm on a ferromagnetic surface.

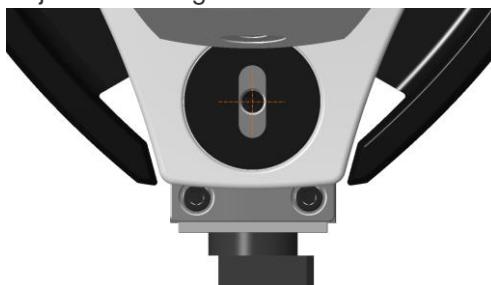
1. Prepare the 3 magnets at a correct distance on a levelled and stable work surface.



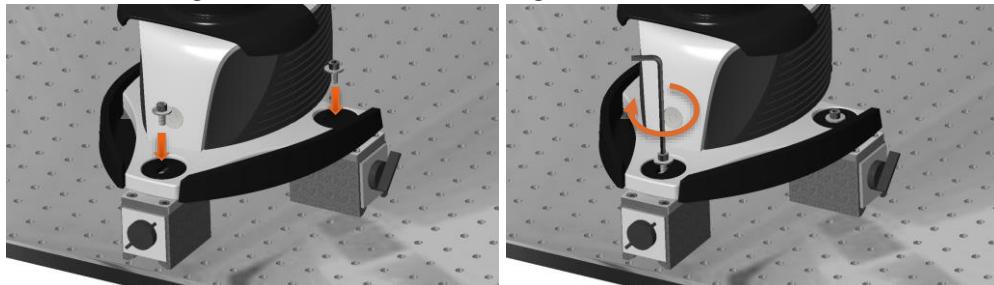
2. Lay the arm on the magnets.



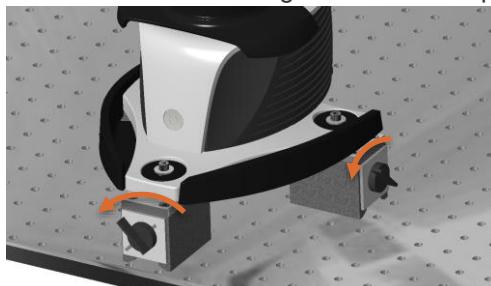
3. Adjust the 3 magnets so that the slot hole of the washer fits over the threaded hole of the magnet.



4. Introduce and tighten the 3 screws in the magnets



5. Turn the lock of the magnets to lock the position of the arm.



Always Remove the magnets before placing back the arm in its transport case.

D.1.2 MOUNTING RING



The 1.2 series is equipped with a fixed base plate. For an installation on another kind of support, the Mounting Ring Adapter option can be used.

The mounting ring is the interface between the different kinds of supports and the arm itself. This ring can be fixed through 6 bolts (M6) on any kind of optional support or even directly on a customized support made by the customer; tighten securely with 17 n/m.

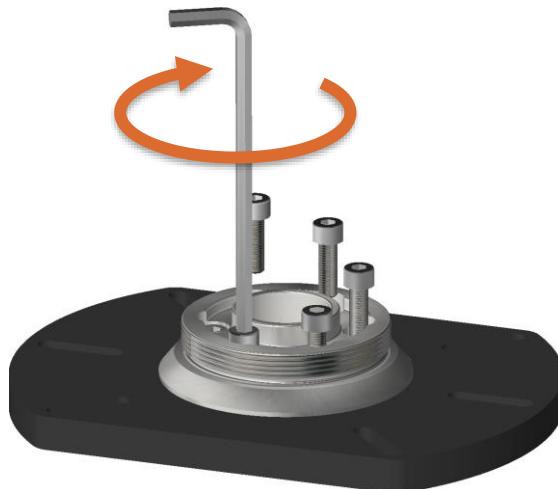


Fig. 27 : Mounting Ring

The arm is positioned onto this base and is then locked with a main nut at the base of the arm.

NOTICE

*It is very important that the main screw is fastened securely to ensure stability of the arm.
Also, the operator must make sure that the 6 screws of the base are well tightened on the support.*



See in appendix the characteristics of the Mounting Ring base.

D.1.3 STANDARD BASE-PLATE

1. Place the plate on a level and stable surface.

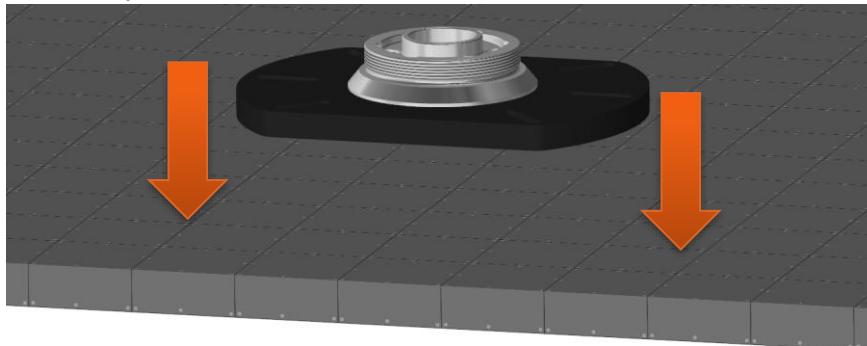
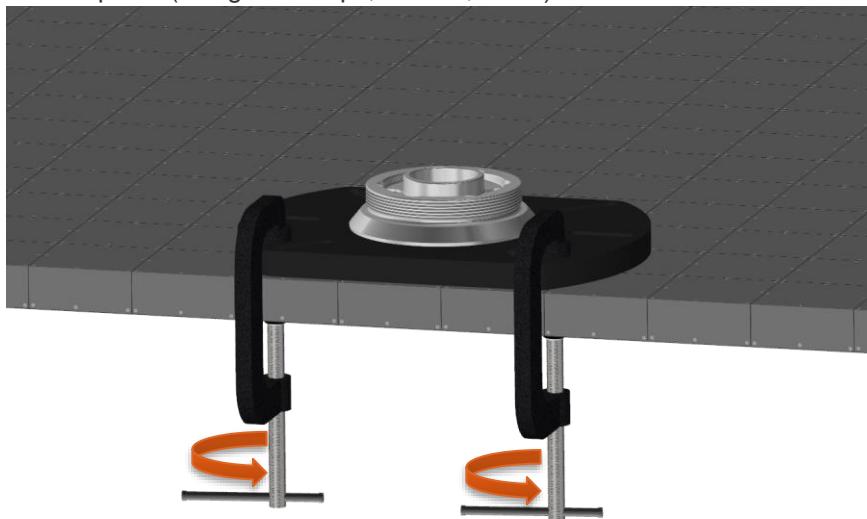


Fig. 28 : Mounting plate installation

2. Fix it in place (using C-Clamps, screws, etc...)



D.1.4 STANDARD MAGNETIC BASE (OPTION)

1. Place the base on a level and stable magnetic surface

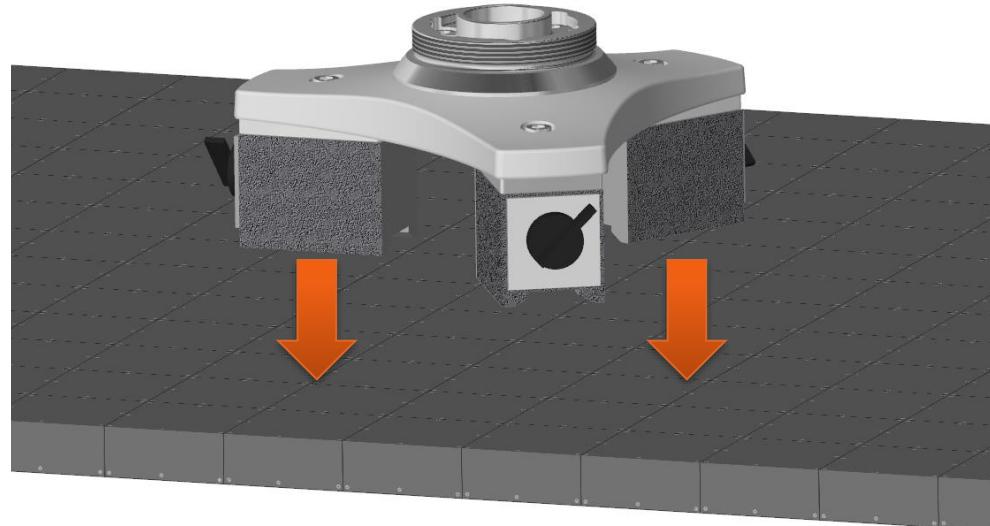
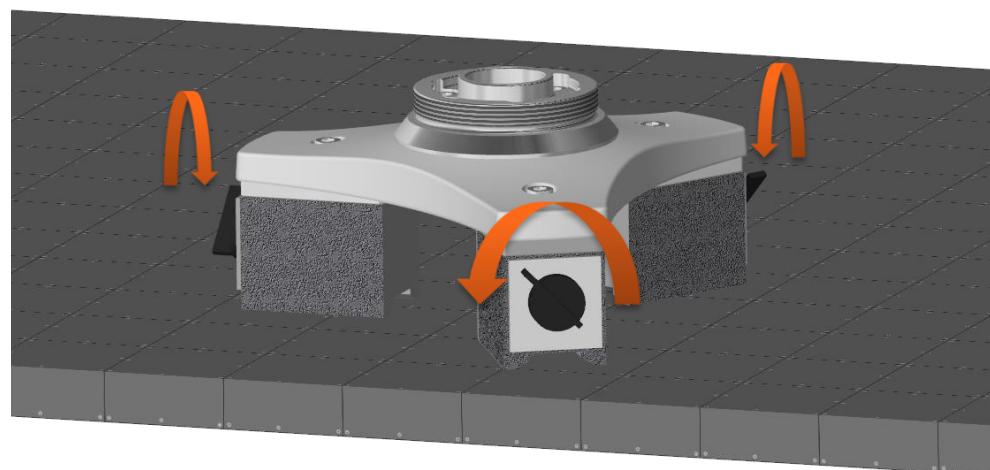


Fig. 29 : Standard magnetic support installation

2. Lock the magnets



D.1.5 CIRCULAR MAGNETIC BASE (OPTION)

Fix the Mounting Ring on the circular base; place the complete base on a level and stable magnetic surface, then lock the magnet by turning the key.

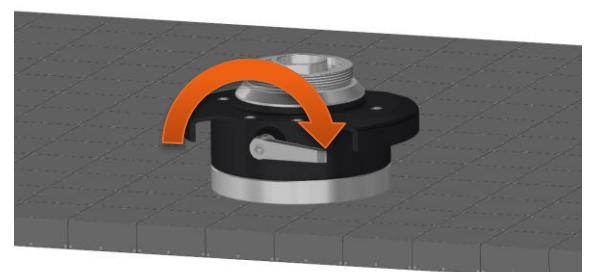
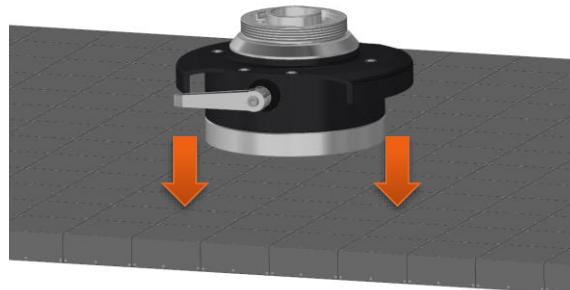


Fig. 30 : Circular magnetic base installation

D.1.6 VACUUM BASE (OPTION)

WARNING

For all safety related information, please read the complete vacuum base manual.

NOTICE

The vacuum base can be used with arm sizes up 2.5m only.

Overview

The vacuum base is designed to be placed on a perfect plane surface with no asperity:



Fig. 31 : Vacuum base description

Item	Description	
a	Battery LEDs	
		low battery, charge immediately
		battery half charged, charge shortly
		battery fully charged, optimal conditions for use
b	On/Off button	Powers on the vacuum pump
c	Power supply	Plug into power supply to charge the battery
d	Ventilation	To release the air under the base
e	Top plate	Threaded holes to fix the Mounting ring
f	Manometer	Ensure pressure is constantly -12, 32 psi (-0.85 bar) during operation.
g	Base	Including vacuum holes

Quick installation

1. Fix the Mounting Ring on the vacuum base.
2. Ensure the worktable is air-impermeable, smooth and clean.
3. Place the base on the work table
4. Plug into the power supply
5. Switch on the vacuum
6. The base is ready for arm installation.

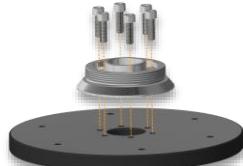


For more information, please read the complete vacuum base manual.

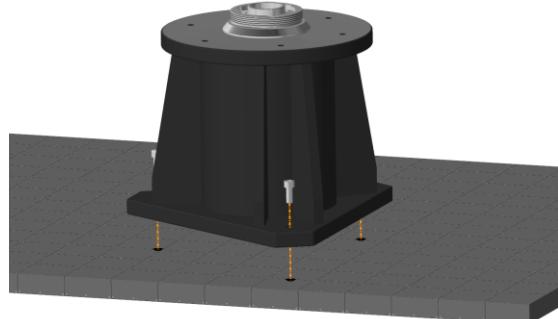
D.1.7 SPECIAL RAISERS

The Mounting ring can be installed on a height extension, to get the arm on a higher place. Those raisers are available in 2 sizes (250mm and 500mm):

1. Fix the mounting ring on the raiser

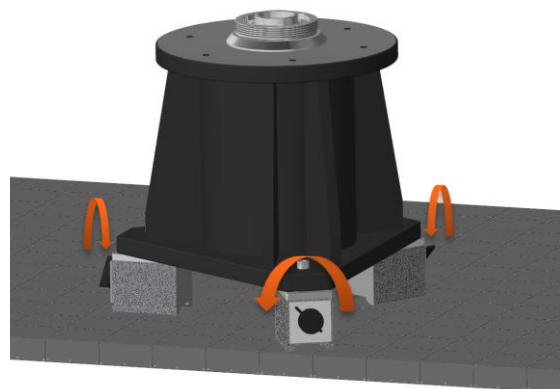
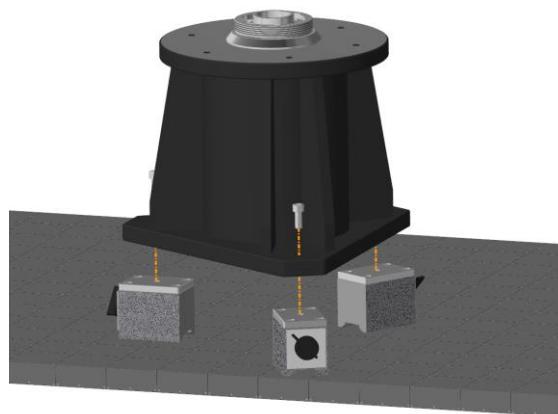


2. Fix the raiser on the work plane through the 3 holes at the base of the raiser



Raisers on magnets

Three magnets can be fixed on the base of the raiser, to be able to place and lock it on a magnetic worktable.



NOTICE

Low quality steel work floor: Loss of accuracy

A low-quality steel support (bad flatness) or any support that may result in a bad quality magnetism can result in instability of the arm, and inaccurate measurement

Always ensure that the support or surface on which the raiser is fixed can guarantee a good stability.

NOTICE

When fixing, the Mounting nut, the steel plate or the magnets, ensure that all the screws are tightened securely.

D.1.8 STANDS

Adjust the stand to the desired height and ensure its rigidity, then install the arm on the mounting ring.

NOTICE***Bad installation or stability: Wrong measurements***

- *Read carefully the manual of your stand to ensure it is installed securely*

Light Tetralock portable stand

**NOTICE**

- *The Tetralock can be used only for arms up to 3.5m size.*
- *Always ensure that feet, height adjustments and locking horizontal bars are well tightened before any measurement campaign.*
- *Place the tripod on a stable and clean floor.*

Heavy duty stands

**NOTICE**

Always ensure that the wheels are “off” and Height setting is locked before any measurement campaign.

M-series carbon graphite portable stand

**NOTICE**

- ▶ Always ensure that feet and height adjustments are well tightened before any measurement campaign.
- ▶ Place the tripod on a stable and clean floor.

D.2 ARM INSTALLATION

D.2.1 RECOMMENDATIONS ABOUT HANDLING THE ARM

The Absolute Arm is designed to be handled at specific locations for installation, uninstallation, or displacement.

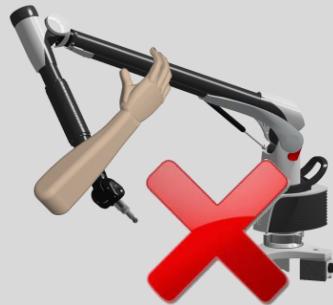
2.0m to 4.5m arms

When handling the arm, both hands must be used: one holding the base handle, the other one holding the E tube of the arm.



NOTICE

When carrying the arm, don't hold the neither by the grip on E tube neither by the C axis



NOTICE

To carry the arm with the magnetic support or any kind of heavy support, always hold the support itself instead of the handle on the base of the arm



Carry an Absolute Arm Compact 1.2

The 8312 and 8512 portable measuring arms have got a carrying skirt at the place of the standard handle. First put the arm in its back-rest position, and then simply hold the arm on each side of the skirt.



NOTICE

Always ensure that the arm is in safe back rest position before carrying the arm.



D.2.2 EXTRACT THE ARM FROM THE CASE

1. Carry the case by the handle, case on the wheels



2. Open the 4 locks



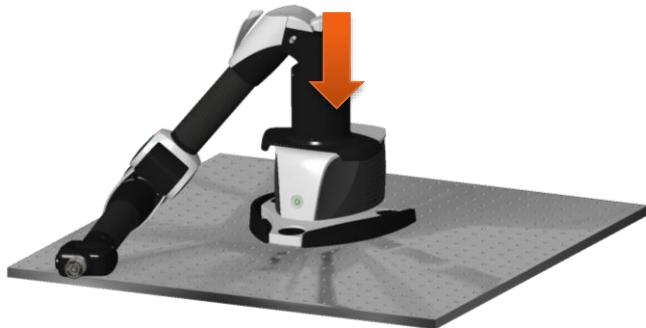
3. Hold the A axis and the E axis and lift the arm straight from the case



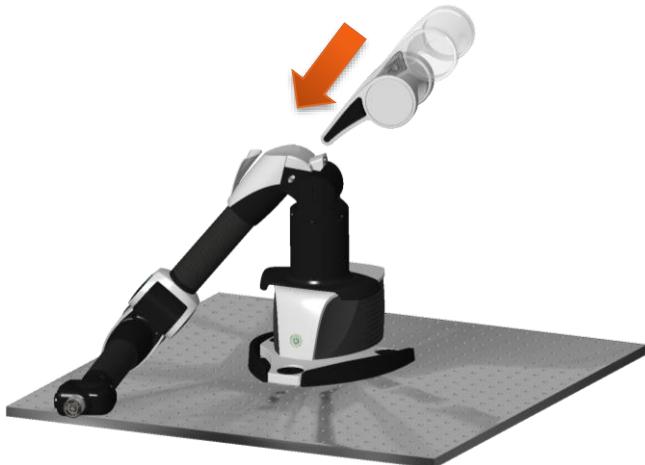
D.2.3 SETUP THE ARM

Absolute Arm Compact (1.2)

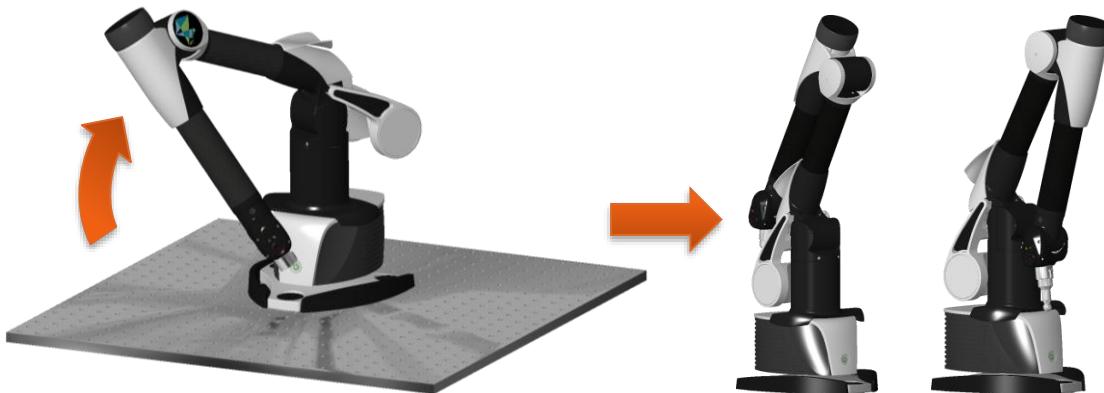
1. Extract the arm from the case
2. Simply put down the arm and lay down its elbow on a level and stable surface



3. Extract the counterweight from the case
4. Approach the counterweight from the back of the arm and clip it.



Lift up the arm and bring it in its rest position (front or back)

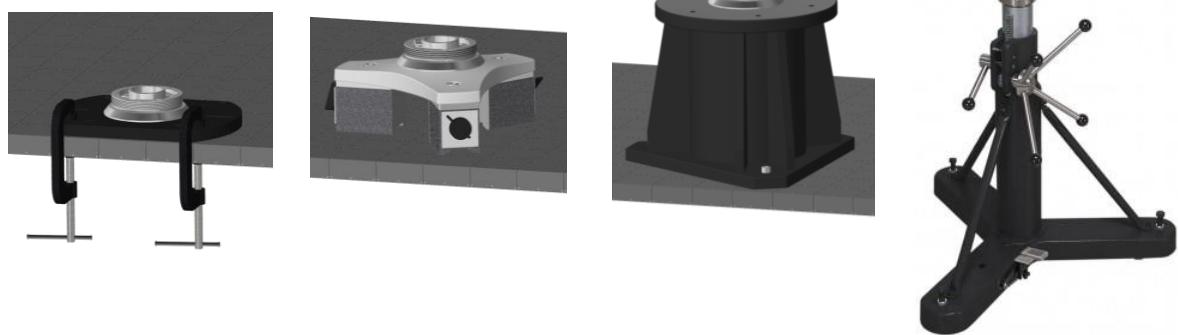


NOTICE

The 1.2 arm doesn't need to be fixed to the work surface. However, in case of a low-quality surface (slippery surface, not stable ...), it is highly recommended to fix the arm (screws, magnets...)

Absolute Arm (2.0 to 4.5)

1. Place and fix the mounting base or the stand



2. Position the arm over the mounting ring



3. Tighten the mounting ring nut

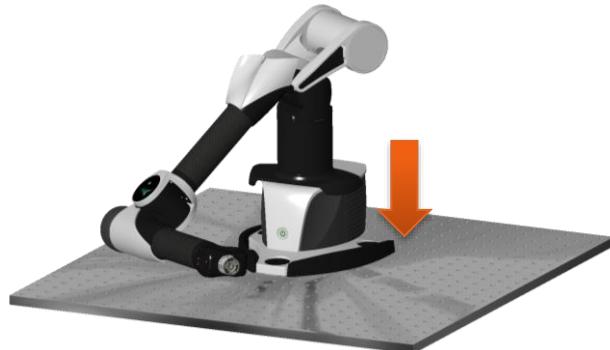
**NOTICE**

It is very important that the nut is securely tightened to ensure the accuracy and stability of the arm. It is also important to ensure the 6 screws on the mounting ring are well-tightened.

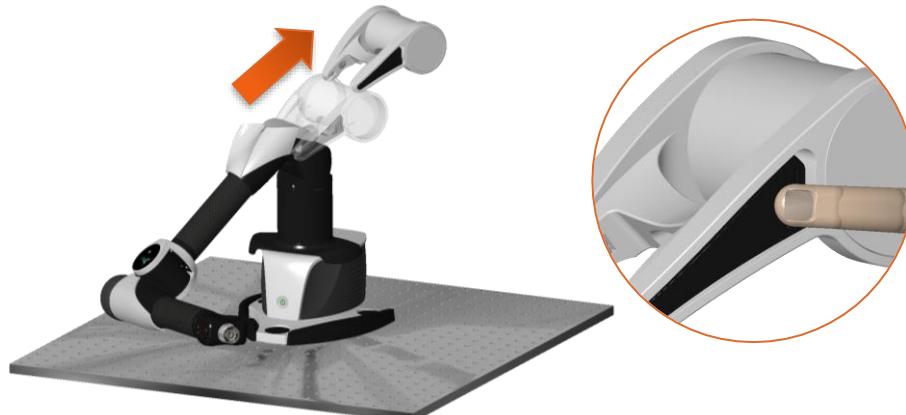
D.2.4 PACK THE ARM

Absolute Arm Compact (1.2)

1. Lay the elbow of the arm carefully on the work plane



2. With both hands, hold the counterweight and press on the Unlock button to release the counterweight



3. Place back correctly the counterweight in the case
4. Carefully hold the arm with both hands to place it in the case.



NOTICE

Don't forget to close all the locks of the suitcase.



Absolute Arm (2.0 to 4.5)

1. Bring the arm to its rest position and lock the counterbalance.



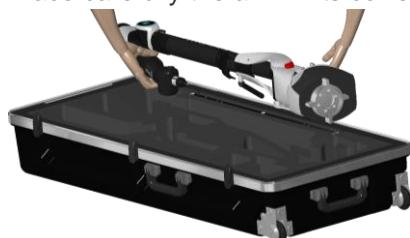
2. While holding the arm, unscrew the Mounting ring nut from the base support.



3. Lift up the arm over the base to bring it to the case



4. Place carefully the arm in its correct position in the case



NOTICE

Don't forget to close all the locks of the suitcase.



D.3 TUBE INSPECTION ARM INSTALLATION

Arm Tube Raisers

The tube inspection arm special configuration is installed on top of a specific raiser, available in 2 sizes (250mm and 500mm):



NOTICE

Low quality work floor: loss of accuracy

Always ensure that the support or surface on which the raiser is fixed can guarantee a good stability.



For more details regarding the raisers, please refer to § Special raisers

Arm Tube installation-uninstallation

Due to its stronger counterbalance, the tube inspection arm must be installed or uninstalled by a trained people.



E. CONNECTION

E.1 COMMON FEATURES

E.1.1 AVAILABLE – EFFECTIVE CONNECTIONS

When not connected, the arm shows the available types of connection:

- On the base pictograms



- On the Wrist Display (RA8-7 only)



If the desired connection is not visible, check the plugged cables and the type of Control Pack.

Once connected, the effective type of connection only remains.

E.1.2 POWER / BATTERY

Power supply (all arms)

Insert the plug of the power supply in the connector and move on until “Click” can be heard.
 To remove the plug, simply pull the body of the plug.



Fig. 32 : Power supply connection

NOTICE

Only use the provided power supply.

The Power supply must always be connected to an easy-access power terminal with a ground connection.

Battery (CP2 / CP3)

The Wireless Probing Pack and Wireless Scanning Pack are provided with 1 (CP2) or 2 (CP3) batteries which give the possibility to be fully stand-alone.

It means that the arm can be used for hours completely unplugged.

To charge the battery or to use the arm on power supply, simply connect the power supply to the arm.

E.1.3 TCP/IP ACCESS 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” (DCHP sub protocol). Depending on the type of Control Pack or scanner, it may be necessary to setup this TCP/IP V4 to a fix address.

	Address of the FP / Scanner	Arm connection USB + Scanner	Wired Ethernet	Wi-Fi .
CP1	-	See Scanners	-	-
CP2	192.168.178.1	See Scanners	-	Arm only DHCP
CP3	192.168.178.1	RS5: DHCP	Arm & RS5: DHCP	Arm & RS5: DHCP
RS5	192.168.178.200	192.168.178.x (x ≠ 200)	192.168.178.x (x ≠ 200)	192.168.178.x (x ≠ 200)
HP-L-20.8	192.168.150.100	192.168.150.x (x ≠ 100)		-
HP-L-8.9	192.168.178.200	192.168.150.x (x ≠ 200)		-

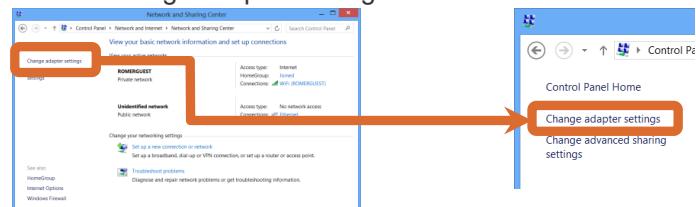
All masks 255.255.255.0

How to access the network settings:

- On the task bar, do a right click on network icon and select “Open Network and Sharing Centre”.



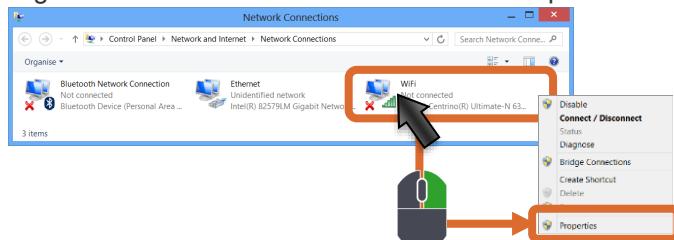
- Select “Change adapter settings”



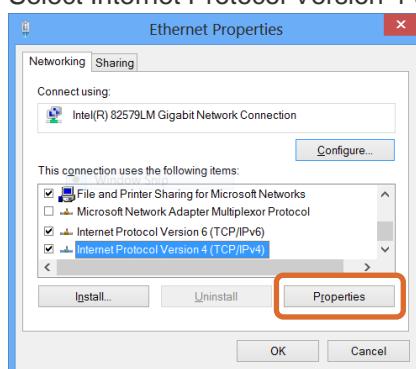
If the Network icon is not visible, press the Windows® logo touch on the keyboard and type in "ncpa.cpl".



- Right click on “Local Network” and select “Properties”:



- Select Internet Protocol Version 4 (TCP/IPv4) > Properties



E.2 USB CONNECTION (ARM ONLY)

E.2.1 ARM SETUP

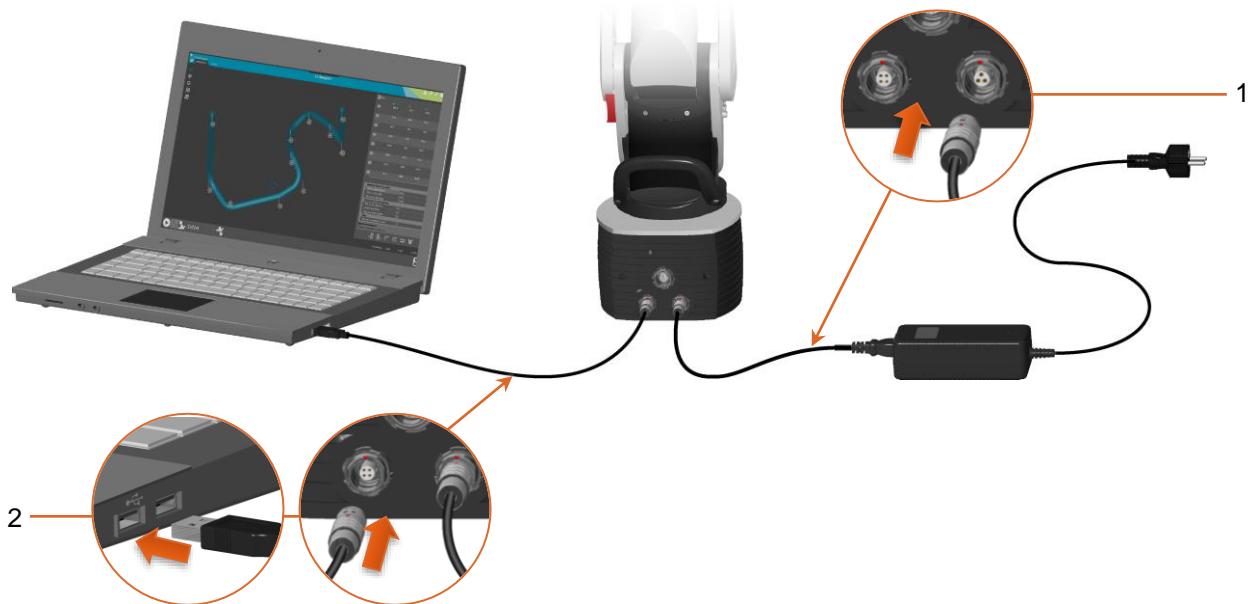


Fig. 33 : USB connection

1. Connect the power supply to the arm. (Or use on battery for CP2 / CP3)
2. Connect the USB cable from the arm to the computer.
3. Power on the arm by holding the power button for at least 1 second.



E.2.2 RDS SETUP (DEFAULT)

1. Enter RDS Control Panel, Tab “Connection”
2. Select the type: “Absolute Arm” > Select the appropriate Control Pack > USB
3. Save and Exit

E.3 USB CONNECTION (ARM + INTEGRATED SCANNER)



Wired connection: to get benefits from the high-speed scanning, an on-board Gigabit network device is necessary.

E.3.1 ARM SETUP



Fig. 34 : USB + Scanner connection

1. Ensure that at least a Scanning Pack (CP1 / CP2 or CP3) is mounted.
2. Connect the power supply to the arm. (Or use on battery for CP3)
3. Connect the USB cable from the arm to the computer
4. Connect the Ethernet cable from the arm to the computer
5. Power on the arm by holding the power button for at least 1 second.

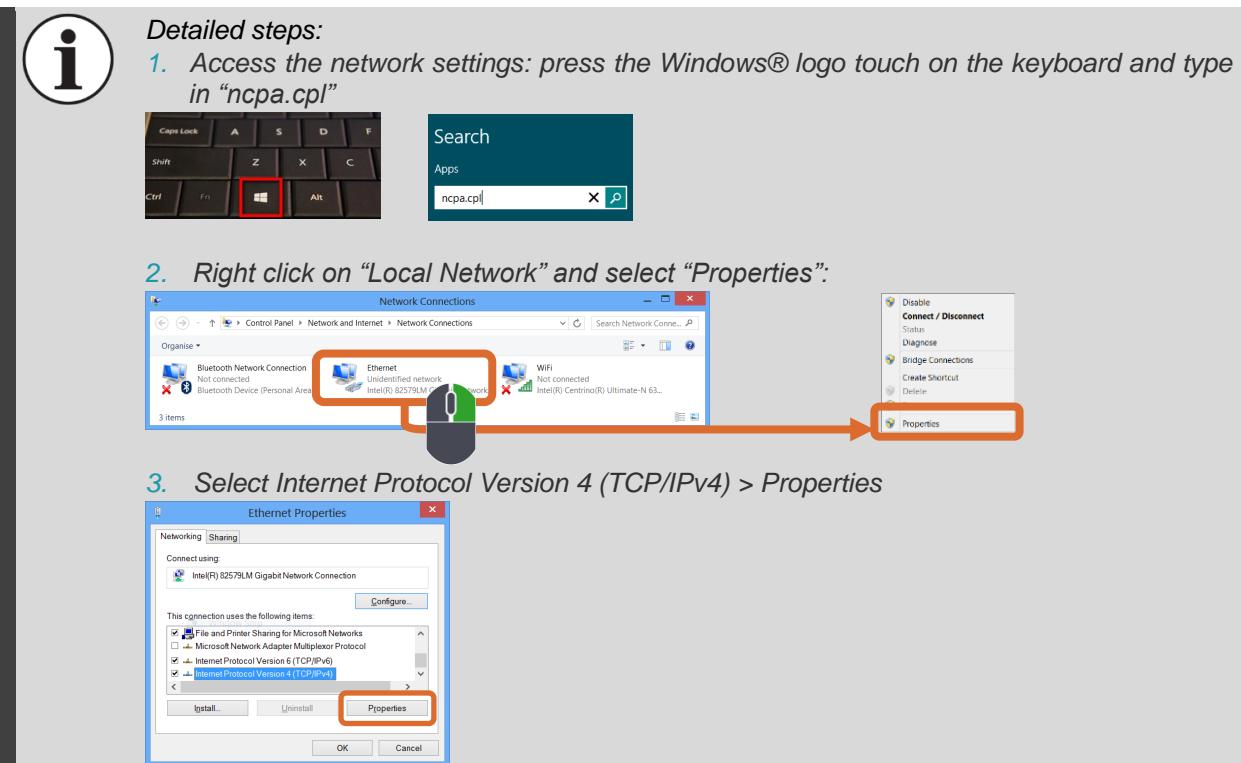
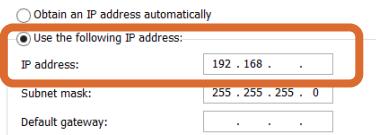


E.3.2 RDS SETUP (DEFAULT)

1. Enter RDS Control Panel, Tab “Connection”
2. Select the type: “Absolute Arm” > Select the appropriate Control Pack > USB
3. Save and Exit

E.3.3 COMPUTER SETUP FOR THE SCANNER

Setup the TCP/IP address V4 of the computer: "Use the following IP address": 192.168.178.1



E.4 WIRELESS CONNECTION (ARM / SCANNER)

E.4.1 NOTE ABOUT WI-FI

Control Pack network

The SSID (identification) of your Control Pack is its serial number (for instance “CP3P-2824-FA”).

The WLAN provided by the Control Pack is an “Access-Point” Wi-Fi network, complying with 802.11 a/b/g/n bands.

Customized setup - Authorized channels

The Control Packs (CP2 and CP3) are delivered with a default Wi-Fi setup.

For robustness and versatility, the Control Pack can operate on two different wireless frequency bands, the 2.4 GHz band or the 5 GHz band. Depending on your work environment and application, you can choose the best frequency band.

Each frequency band is subdivided into channels (frequency ranges). The CP offers channels 1 through 11 for the 2.4 GHz band and channel 36 for the 5 GHz band. The CP is set to channel 8 by default.

Band	Channels	Advantages	Disadvantages
2.4 GHz	1 – 13 (default = 8)	<ul style="list-style-type: none"> • Longer range • Penetrates walls and floors • Use indoors and outdoors 	<ul style="list-style-type: none"> • Slower speed • More susceptible to interference from other wireless sources
5 GHz	36 – 165	<ul style="list-style-type: none"> • Faster speed • Less susceptible to interference from other wireless sources 	<ul style="list-style-type: none"> • Shorter range • Cannot penetrate solid objects • Use indoors only

Before you change your CP to the 5GHz frequency band, check your local regulations. Some countries forbid the 5 GHz band and others limit the 5 GHz band to indoor-only.



In EU, 5 GHz channels are limited to 36-48. The Wi-Fi chipset must be changed accordingly with RDS Toolbox.

For Wi-Fi setup, please read the RDS User manual.



The people in charge of the setup of the Control Pack must ensure that the specified band and channel is authorized in his country.

Hexagon Manufacturing intelligence is not responsible of a wrong use of the Wi-Fi channels.

Wi-Fi advanced settings



The Wi-Fi of the computer may be managed by specific software for the device. In this case, refer to its manual to connect to the ABSOLUTE ARM network and setup the IP address.



If the Wi-Fi of the computer manages preferred order for networks, make sure that “CP{x}-{xxxx}-{xx}” network is at the top of the list.

Ex: if Windows® manages the Wi-Fi, in the wireless configuration, select “change the order of preferred networks”, select then the Control Pack Network and click on “Move up” until it becomes at the top of the list.

E.4.2 ARM SETUP



Fig. 35 : Wireless connection

1. Ensure that a Wireless Probing Pack (CP2) or a Wireless Scanning Pack (CP3 for integrated scanner) is mounted.
2. Connect the power supply to the arm. (Or use on battery)
3. Activate the WLAN interface on the computer
4. Ensure that both USB and Ethernet cables are unplugged from the Control Pack. If not, disconnect them.
5. Power on the arm by holding the power button for at least 1 second.



6. After some seconds, the WLAN pictogram appears, showing that the Arm is ready to connect.



WLAN is available only when USB and Ethernet cables are unplugged.

E.4.3 RDS SETUP

- Enter RDS Control Panel



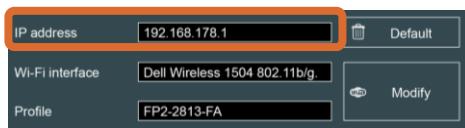
- Select Connection tab



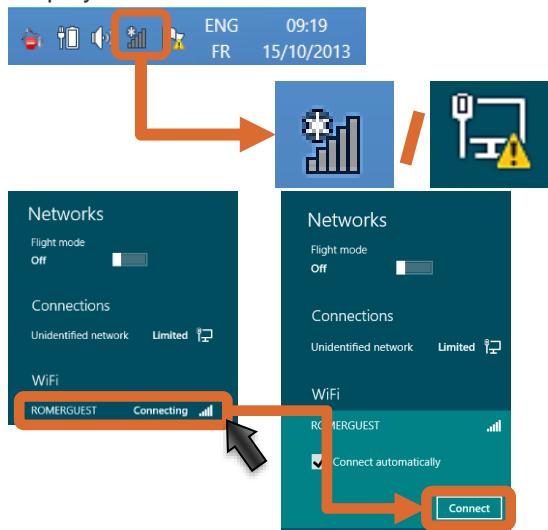
- Select the type of Machine, Control Pack and "WLAN"



- If the Control Pack address has been modified, enter the TCP/IP address.



- Display the available wireless networks and connect the Control Pack



- Save the modifications.



E.4.4 COMPUTER SETUP

1. Switch on the computer's WLAN adapter
2. Setup the TCP/IP address V4 of the WLAN device of the computer: "Obtain an IP address automatically" (default)



TCP/IP Detailed steps:

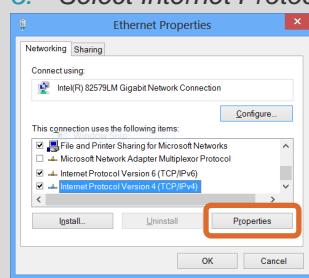
1. Access the network settings: press the Windows® logo touch on the keyboard and type in "ncpa.cpl"


Search bar: ncpa.cpl

2. Right click on "Local Network" and select "Properties":



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



E.5 ETHERNET CONNECTION (ARM / SCANNER)



Wired connection: to get benefits from the high-speed scanning, an on-board Gigabit network device is necessary.

E.5.1 ARM SETUP

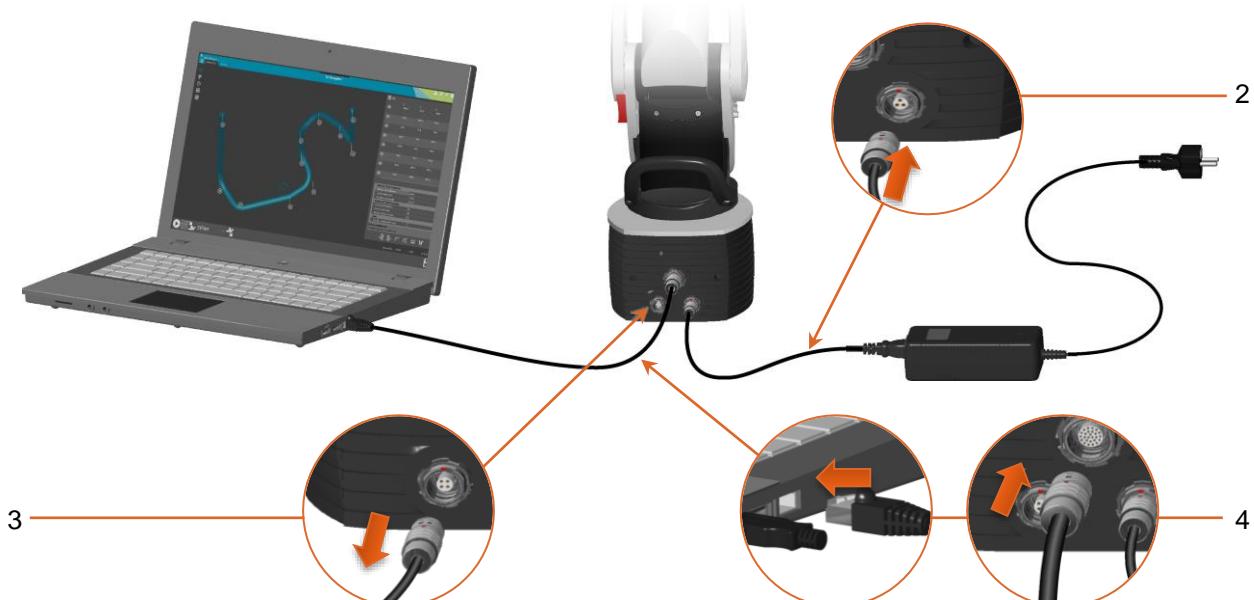


Fig. 36 : USB + Scanner connection

1. Ensure that a Wireless Scanning Pack (CP3) is mounted.
2. Connect the power supply to the arm. (Or use on battery)
3. Connect the Ethernet cable from the arm to the computer
4. Disconnect any USB cable from the Control Pack
5. Power on the arm by holding the power button for at least 1 second.



6. After some seconds, the Ethernet pictogram appears, showing that the Arm is ready to connect.



Ethernet is available only when the USB cable is unplugged.

E.5.2 RDS SETUP

1. Enter RDS Control Panel



2. Select Connection tab



Connection

3. Select the type of machine and Wired Ethernet link type



Machine type

ROMER Absolute Arm / Cimcore CA7
Feature Pack **FP3+**

Multi Gage

Infinite / Stinger

Leica Tracker (AT960)

Link type

USB

Wi-Fi

Ethernet

IP address **192.168.178.1**

Default

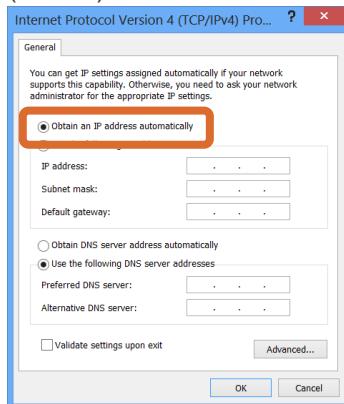
4. Use the default IP address or Set it up

5. Save the modifications.



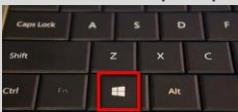
E.5.3 COMPUTER SETUP

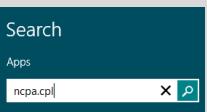
Ensure that the Ethernet Local Network TCP/IPv4 is set to “Obtain an IP address automatically” (DHCP) (default).



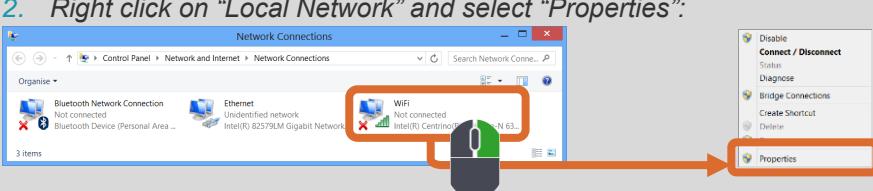
TCP/IP Detailed steps:

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

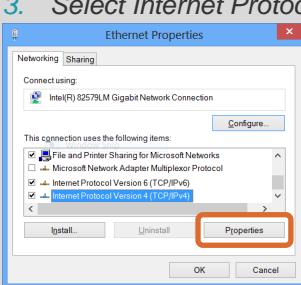




2. Right click on “Local Network” and select “Properties”:



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



E.6 EXTERNAL SCANNERS CONNECTION

Several kinds of 3D digitizing scanners can be used with Absolute arm: HEXAGON® Scanners HP-L-20.8, HP-L-8.9, RS5, or other third-party system. First Install the arm as described in this manual, and then refer to the appropriate section for the scanner installation and setup.

Please read carefully the appropriate section to connect the scanner.



RS5 (Absolute SI only):

The RS5 is an integrated scanner; for the details of the connection, please refer to the arm connection.

E.6.1 HEXAGON® HP-L-20.8 SCANNER (ARMS WITH SE ADAPTER)

NOTICE

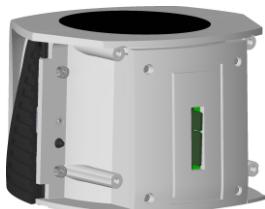
Before removing the scanner from the portable measuring arm, ALWAYS ensure that it is no more powered.

NOTICE

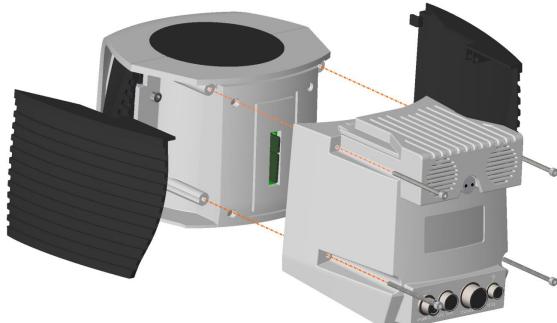
In case a HP-L-20.8 scanner is mounted in replacement of another one, the alignment procedure must be launched manually

Hardware connection:

1. Ensure that a FP4 adapter is mounted.



2. Setup the HP-LC-20.8 (FP4) on the FP adapter (see chapter C.2.5).



3. Connect the power cable, Hirose-type (see below).
4. Connect the USB cable, Hirose-type (see below).
5. Connect the Scanner Ethernet cable, Hirose-type.

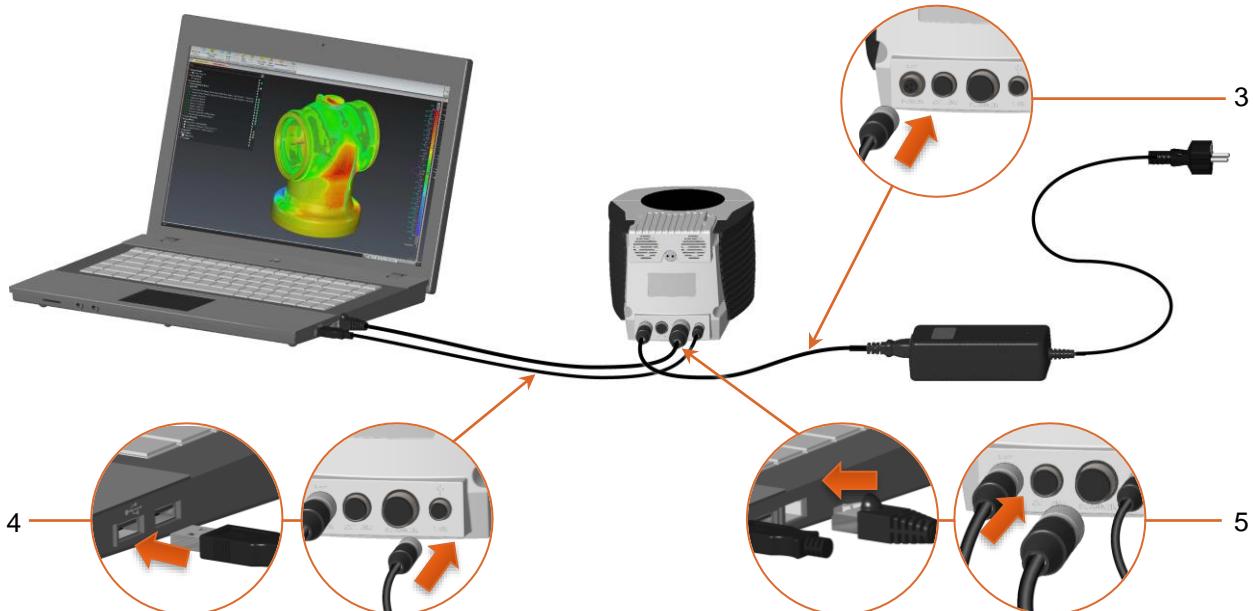
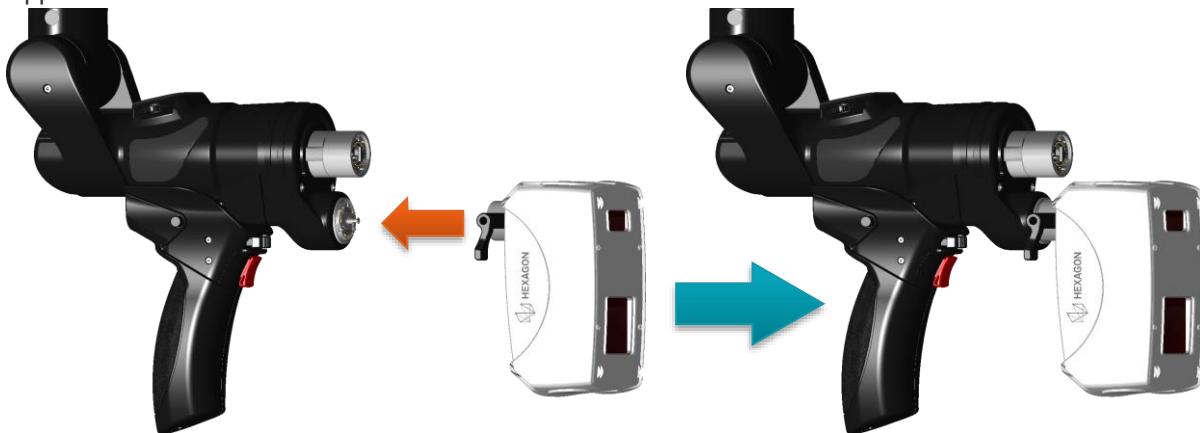
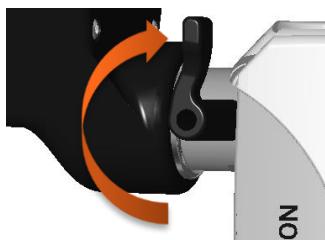


Fig. 37 : HP-L-20.8 connection

6. Approach and mount the scanner on the TKJ connector



7. Lock the scanner with the lever.



8. Power on the arm by holding the power button for at least 1 second.

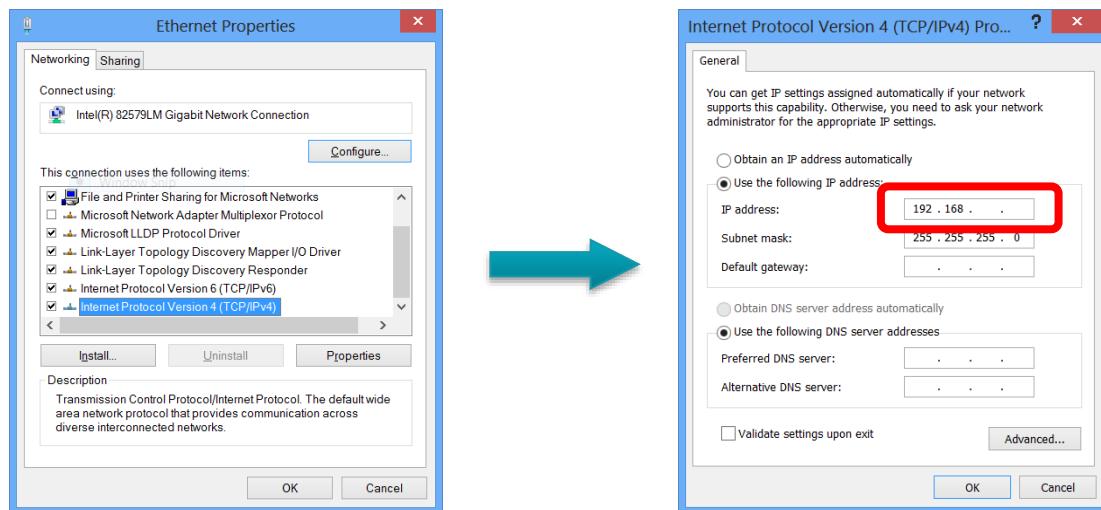


9. Select the scanner location



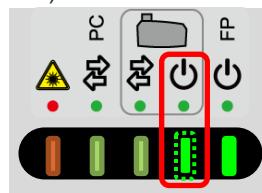
Computer Setup:

Setup on-board Ethernet port as 192.168.150.1 (controller @ = 192.168.150.100)



LEDs:

The Sensor Power LED on the Control Pack indicates if the sensor is ready to use or not. The LED is blinking until the system is warmed up (~5mn).



Wait for the Sensor Power LEDs stops blinking before a correct use.



The warm-up time of the sensor may vary of 5 to 20 minutes depending on starting sensor temperature and the ambient temperature.

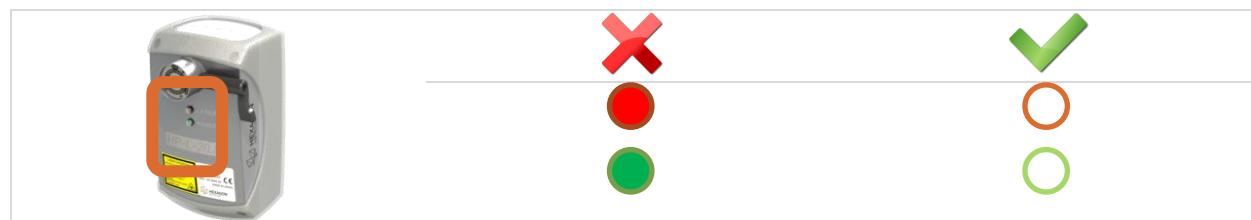
Management Software

The HP-L-20.8 scanner is directly managed by RDS, no more installation is necessary.

Remove the scanner

Before removing the scanner from the arm, ALWAYS ensure that it is no more powered:

- Switch off the portable measuring arm
- Or
- Press the “Switch off Scanner” button in RDS Scanning window or in the RDS Menu.



E.6.2 HEXAGON® HP-L-8.9 SCANNER

The HP-L-8.9 is designed to be mounted on 6 axes Absolute Arms through its Male TKJ connector.
Hardware Setup:

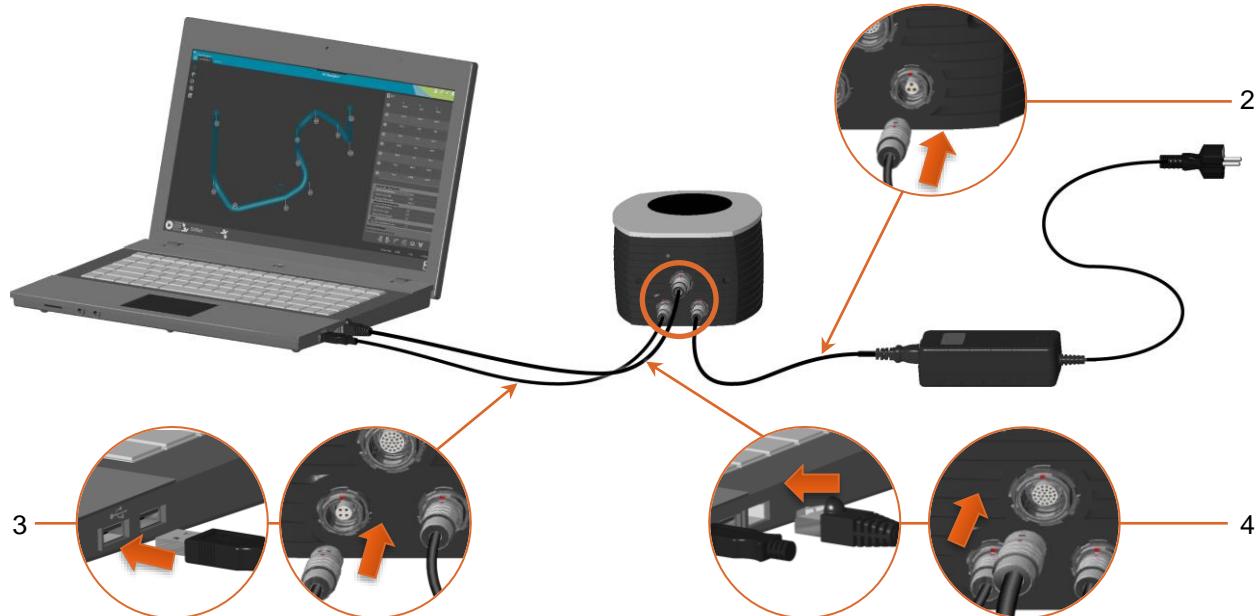


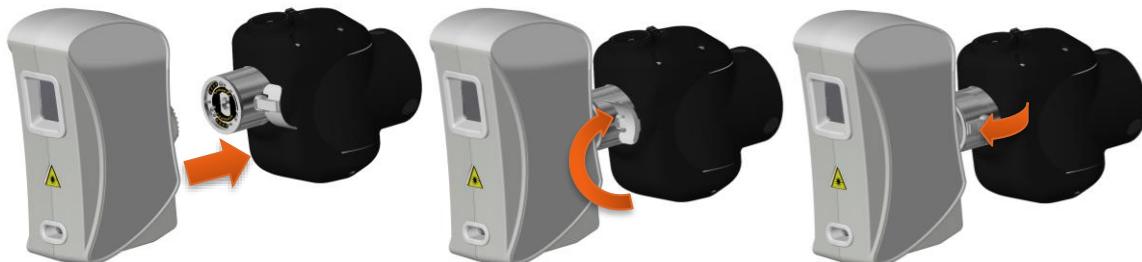
Fig. 38 : USB + Scanner connection

1. Ensure that at least a Scanning Pack (CP1 / CP2 or CP3) is mounted.
2. Connect the power supply to the arm. (Or use on battery for CP3)
3. Connect the USB cable from the arm to the computer
4. Connect the Scanner Ethernet cable from the arm to the computer



The dual-external cable, provided with the scanner is not used.

5. Mount the scanner on the TKJ connector and remove the protection foam from the sensor

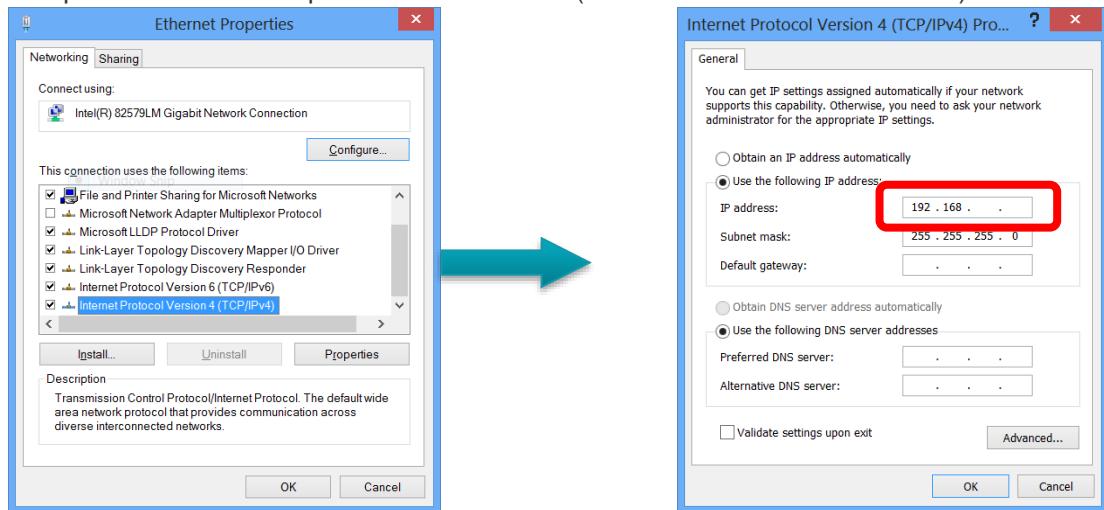


6. Power on the arm by holding the power button for at least 1 second.



Computer Setup:

7. Setup on-board Ethernet port as 192.168.178.1 (controller @ = 192.168.178.200)



E.6.3 PERCEPTRON V5 SCANNER (ABSOLUTE SE ONLY)

Hardware installation:



*1 Ethernet port must be available
Install the arm as described in this manual.*

1. Mount the V5 Perceptron scanner through the TKJ connector



2. Lock the TKJ connector

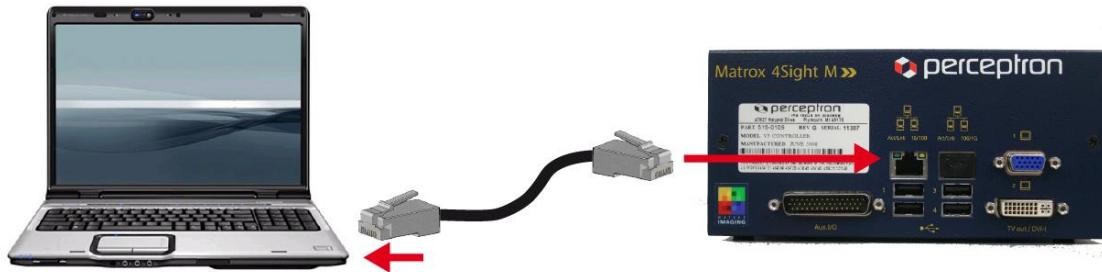


3. Select the Scanner



Cables connection

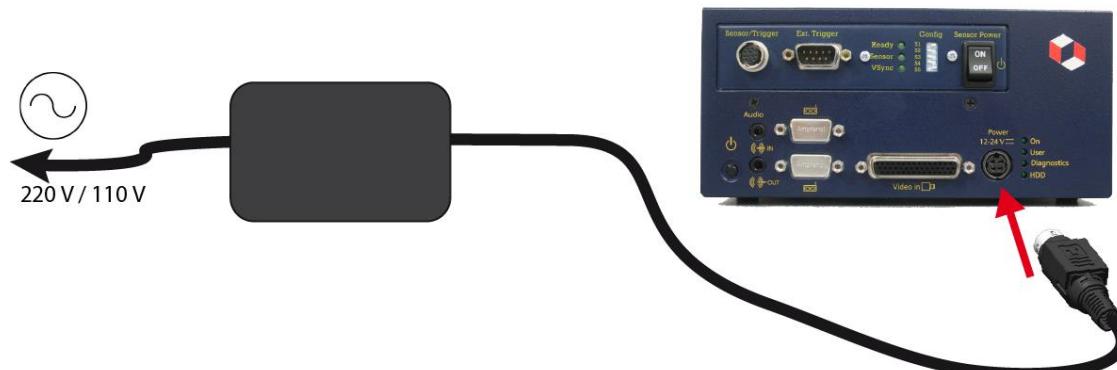
4. Connect Perceptron Ethernet cable between Ethernet port of the computer and the Blue Box for the Scanner



5. Connect Scanner cable between the Scanner connector on the Control Pack of the arm, and the Blue Box.



6. Connect power supply to the Perceptron Blue Box



7. Switch on sensor Power (1), then press on system power (2).

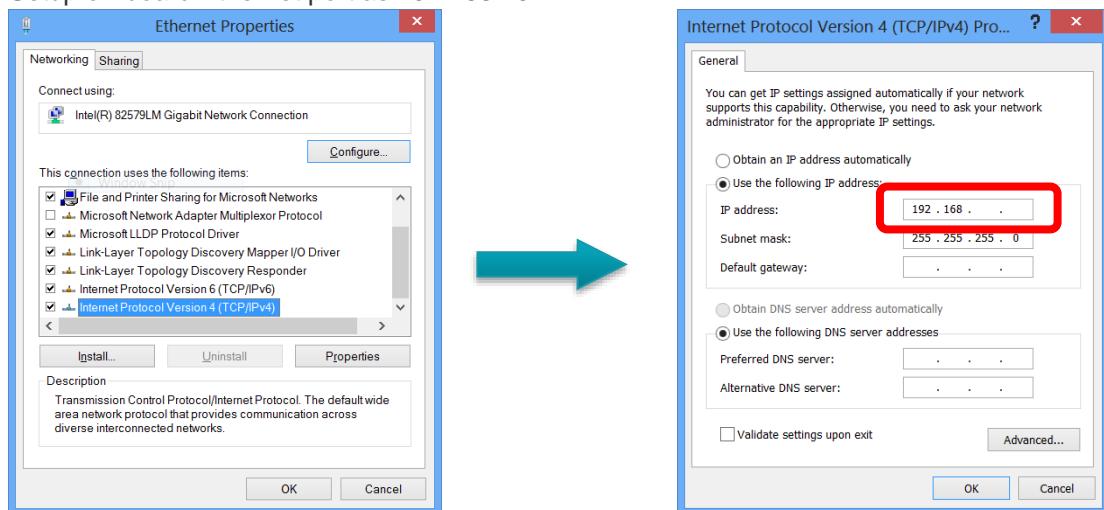


Software Installation:

1. Install Scanworks (type of device, select "ROMER NCA").



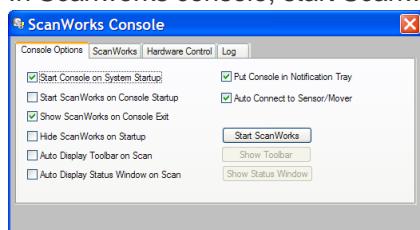
2. Setup on-board Ethernet port as 192.168.19.1



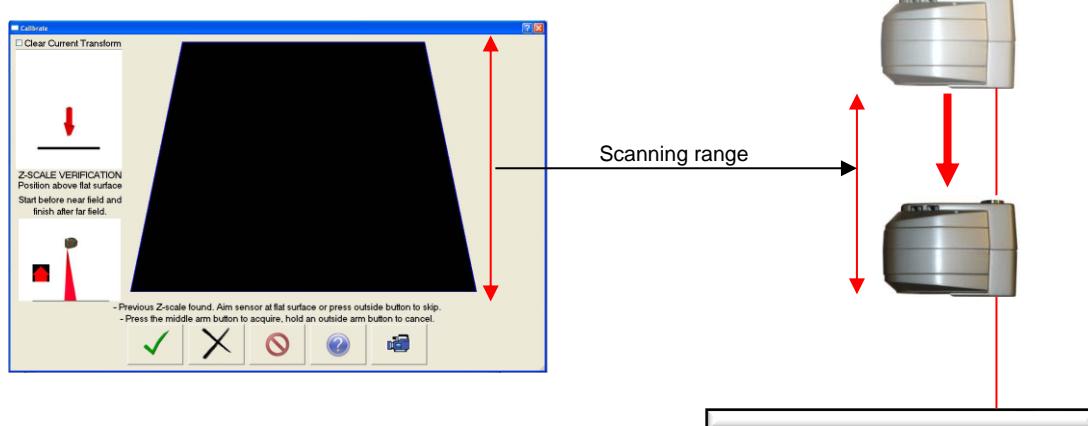
Scanworks console automatically starts: the device is ready to use.

Scanner qualification

1. In Scanworks console, start Scanworks



2. Run the qualification window by Menu "Setup" > "Calibration"
3. Z-Scale verification: place the scanner above a plane surface, and do an Up-to-Down scan, including all height range, then validate

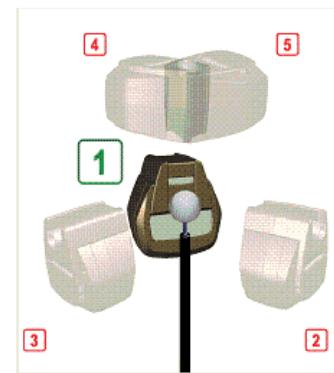
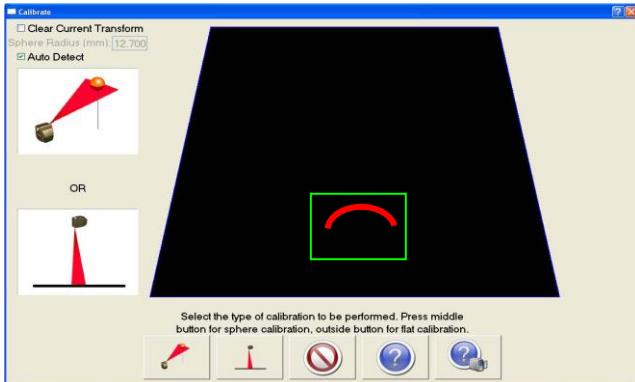


Sphere calibration:

1. Choose “Sphere calibration”: it consists by taking a scan line on the calibration sphere, from 5 orientations and 3 times for each:



2. Start at a horizontal position (1), orientate the laser on the sphere 3 times, reaching each time the square on the screen.
3. Then repeat same operation from a 120° position (2)
4. Repeat operation from a 240° position (3),
5. Repeat operation from the top 0° (4)
6. Repeat operation from the top 90° (5)



At the end, Scanworks calculates the calibration.



For further details about Perceptron setup, characteristics and calibration, please refer to the Perceptron and Scanworks manual.

F. MEASURE WITH THE ARM

F.1 HOW TO USE THE ARM

F.1.1 REST POSITIONS

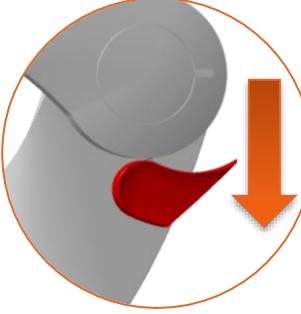
Standard rest positions

When not in use, the arm should be put in its rest position. The arm naturally rests in a vertical position with the elbow bent nearly 180°: move the arm up to highest level: the arm now can stay itself in its rest position.



Secured rest position

If the arm needs to stay for a prolonged period in rest position, or to move the arm on a short distance, the rest position needs to be secured.

1.2 Compact arm	2.0 to 4.5 arms
Back rest position: approach the arm to its highest level and turn the C axis to place the wrist on the back of the arm, then place the wrist in the HomeRest. 	SmartLock use: Bring the arm to its rest position and lock the counterbalance with the SmartLock lever 

F.1.2 HOLDING THE ARM

NOTICE

Never apply any constraint on the arm, especially with the 1.2 arm when not fixed on the work surface. A constraint or an excessive pull on a 1.2 arm may displace the base of the arm, especially if the surface is slippery.

The Absolute Arm is designed to be held with one hand only. Left-handed or right-handed users should hold the wrist of the Absolute Arm with their main hand and put their thumb or forefinger on the buttons.



The second hand of the user can then be used to guide the ball of the probe precisely.



NOTICE

Always ensure that the arm and the part to measure don't move relative to each other.

The lock position also can be used to hold the arm in an angled position (e.g. 45°) to avoid hitting a low ceiling, or when a small part should be measured or digitized: move down the elbow of the arm and lock it, to get a comfortable position.

Hand grips (85 / 87 series)

On the Absolute Arms 85 and 87 series, the second hand can hold the grips of the arm (SpinGrip or SpinKnob).



Then the orientation of the axes can be imposed to the arm.



NOTICE

When holding the grips, keep taking care not to apply any constraint on the axes of the arm.

Counterbalance

The Absolute Arm is counterbalanced; it means that there is no need in holding the elbow of the arm when measuring: let the counterbalance working alone, and simply hold the wrist of the arm to approach the probe to the part and to press the button for points capture.



However, it may be necessary in some conditions to maintain the elbow of the arm: to avoid hitting the arm to an environmental part, to use the remote-control mouse with the arm in horizontal position ...
In such case, simply hold the grip, ensuring not to apply constraint on the axes of the arm.

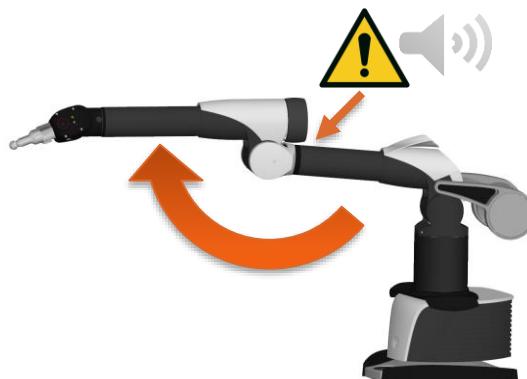


F.1.3 ORIENTATION AND LIMITS OF THE AXES

The arm is a poly-articulated device with rotation axes. It means that each axis can be used in any permitted angle. As soon as the angle of one axis may reduce the performances of the arm (because it makes a constraint on the axis or on the arm itself), a security operates, making a signal and preventing any measurement.

A, C, E and G axes are infinite rotation, it means that they can be turned with no limitation.

B, D and F axes have a mechanical limitation and an electronic security limitation to avoid constraints on the arm. When reaching the limit of one axis (B, D or F), the measurement is prevented, and a sound is emitted to warn the user about the situation.

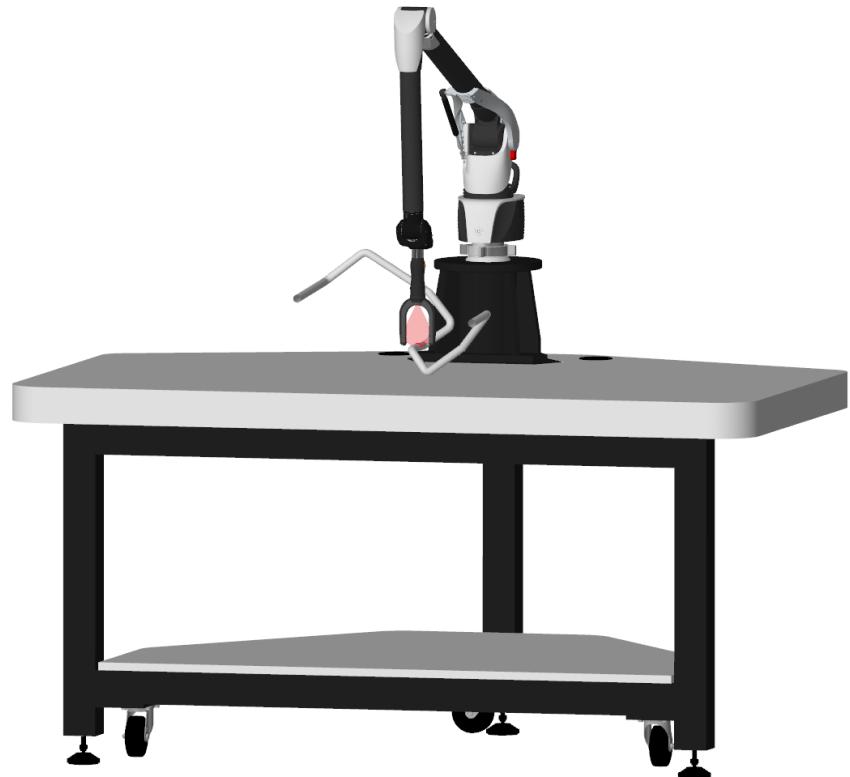


As soon as the axes respect the security limitation, any orientation of all the axes can be used. Thus, it helps to do the measurement in the best conditions.



F.1.4 TUBE INSPECTION ARM HANDLING

The tube inspection configuration is designed to keep the elbow up, then facilitate the measurement of the tube following easily the orientation of the axis of the tube. Simply hold the tube probe itself and move it down onto the tube.



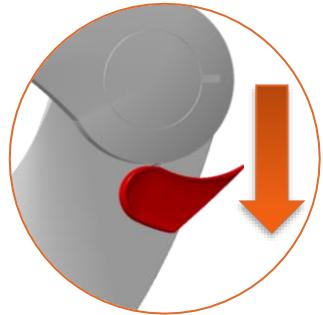
F.1.5 CARRYING THE ARM

When the arm needs to be moved from one place to another one, it is advised to place the arm in its carrying case; however, for short distance displacements, the arm can be simply carried by hand.

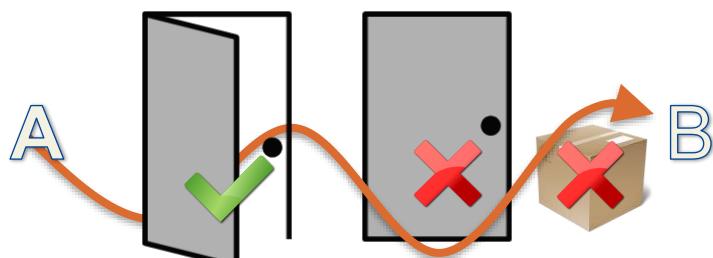
1. Disconnect all the cables



2. Ensure that the arm is in the secured rest position

1.2 Compact arm	2.0 to 4.5 arms
Back rest position 	SmartLock locked 

3. Ensure that the way to the destination is clear (open doors, no obstruction...).



4. Hold the arm, respecting the same recommendations as for the installation.

1.2 Compact arm	2.0 to 4.5 arms
Hold the skirt of the arm with both hands. 	Both hands must be used: one holding the base handle, the other one holding the E tube of the arm. 

5. Raise carefully the arm and move it to the destination.

NOTICE

When carrying the arm, don't hold the nether by the grip on E tube neither by the C axis

**NOTICE**

To carry the arm with the magnetic support or any kind of heavy support, hold the support itself instead of the handle on the base of the arm or remove the arm from the base, moving both separately.



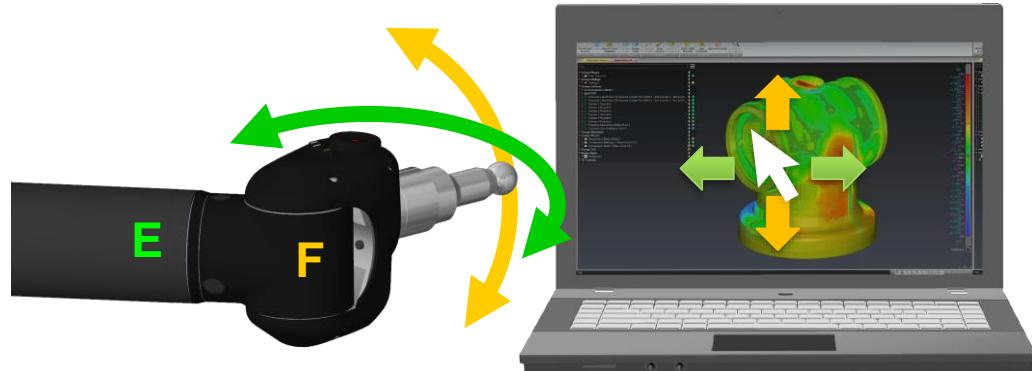
F.1.6 HOW TO USE THE ARM REMOTE MOUSE

The pointer on the computer can be remote controlled by the arm. This functionality allows the user to control the measurement software functions without returning to the computer.

The arm E and F axes control respectively movement:

On a 6 axes arm (horizontal position of the elbow)

- Rotate E axis around a central position to move the pointer up and down from the centre of the screen
- Rotate F axis around a 90° position, to move the pointer left and right around the centre of the screen
- The use of E and F axis is toggled for a vertical position.



On SE / SI arm (vertical position of the elbow)

- Rotate F axis around a central position to move the pointer up and down from the centre of the screen
- Rotate E axis around a 90° position, to move the pointer left and right around the centre of the screen
- The use of E and F axis are toggled for a horizontal position.



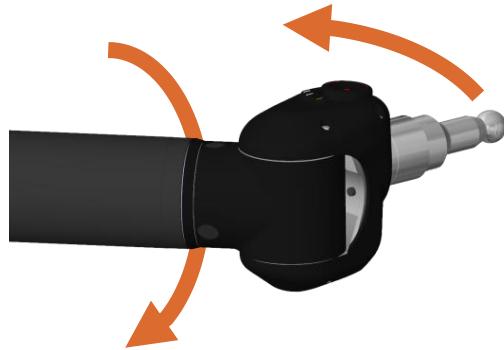
Buttons:

By default, the Trigger button is the left click



Activate / deactivate the remote mouse:

- Put and keep F axis at its mechanical stop
- Rotate E axis about 90°.



The arm remote mouse settings (buttons and switch on/off mouse) can be configured. Please refer to RDS User manual.

On 7-axes arms, as for the 6 axes, to reactivate the remote mouse, the F axis must reach its mechanical stop. Due to the 7-axes wrist, the mechanical stop of F axis can be reached only one side from the back:



F.1.7 HOW TO USE THE ARM BUTTONS

Whatever the configuration is, the buttons present on the wrist have dedicated aims. The Trigger Button is the “measurement” button, and the 3-State button, used for control.

Trigger Button (BT)

This main button is the one used to take points, start or stop scanning...



3-State Button (B3S)

This special button can be used for validating or cancelling (points, messages...) or for controlling the Quick Access Menu.

Usually, the button is defined as the following:

action	6 axes	7 axes	Duration of click	Measure action	Mouse action
Left			Short click	Cancel a point	Right click
			Long click	Cancel points	
Press			Short click	Activate the Menu	Left click
			Long click	Validate the choice	
Right			Short click	Validation	Middle click
			Long click		

Fig. 39 : 3-State button

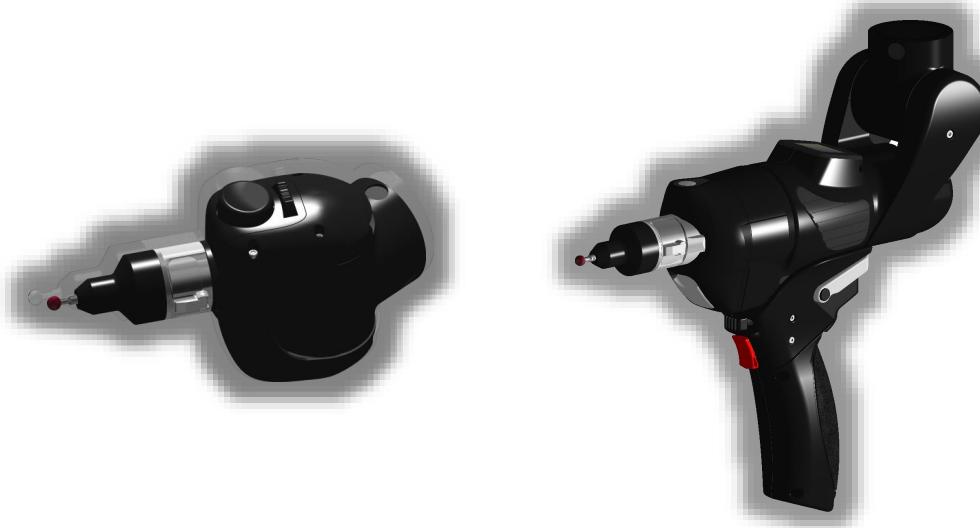
However, depending on the software, the use of the buttons may be different. Please refer to the appendix for specific application software setup.

F.2 WRIST FEEDBACK

F.2.1 HAPTIC FEEDBACK

On the wrist (6 or 7 axes), a device provides a feedback to the user on some events such as mechanical stops. To warn the user on the event, a motor emits vibrations on the wrist.

In RDS Control Panel (advanced tab), an option allows the user to activate or not the haptic feedback.



F.2.2 HOW TO INTERPRET THE ARM SOUNDS

When taking points, validating features, or performing other operations with the arm, the arm emits sounds. Low-pitch sounds usually mean cancel, go back, down, or delete. High-pitch sounds usually mean validate, go forward, up, or complete. Many sounds are context sensitive and will become more familiar to the user with daily use.

The volume can be controlled from RDS control Panel.

An external speaker or earphone can be added for more volume (Bluetooth).

F.3 QUICK ACCESS MENU

F.3.1 DESCRIPTION OF THE MENU

To perform usual operations very easily, a Quick Access Menu (Q.A.M.) can be remote controlled directly from the Arm, at any moment on the screen of the computer and on the Wrist Display of a 7-axis arm without any specific movement or going back to the computer.

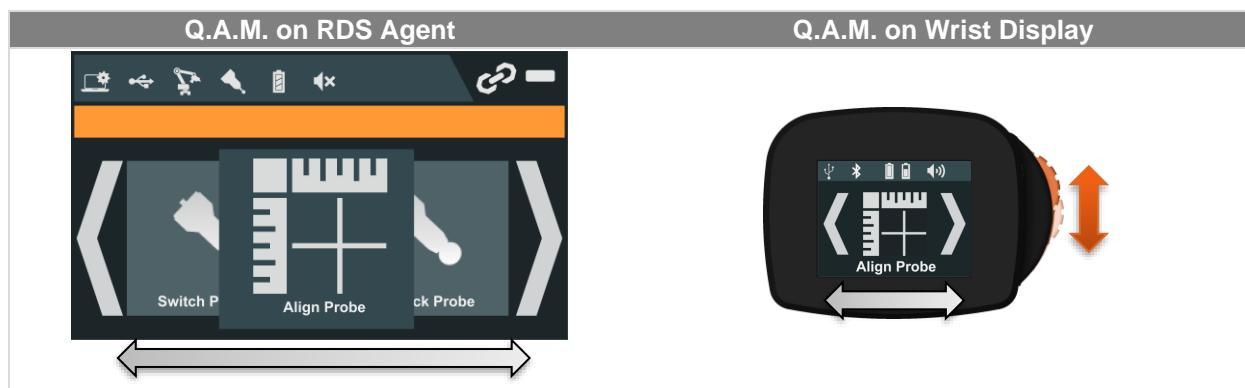
F.3.2 ACTIVATION / NAVIGATION

Press the 3-State Button (middle position) to activate the Quick Access Menu.

The menu appears then on the computer – and on the Wrist Display.



By moving left/right the 3-State button, select the wanted operation, and then press again the button to validate the choice and run the action or choose next sub-menu.



F.3.3 AVAILABLE ACTIONS

The Quick Access Menu depends on the available features on the arm (Control Pack, mounted probe...).

F.4 HOW TO USE CONTACT PROBES

F.4.1 PROBES RECOGNITION AND ALIGNMENT

NOTICE

The accuracy performances cannot be guaranteed if the requested realignment is disabled.

Each probe has a specific serial number that is recognized as soon as the probe is mounted on the arm. It means no need to select the probe in a list, whatever the software is.

Due to their reliable and repeatable TKJ connector, any probe can be dismounted and mounted again without the need of realignment. Simply connect the probe, the arm is ready to operate.

Only when the mounted probe is a new one, RDS automatically asks for probe alignment. Also, if the stylus has been changed the new diameter needs to be defined and the probe realigned.

NOTICE

Any removal of stylus must be followed by a realignment of the probe.

NOTICE

Always ensure to use a correctly aligned, clean and not damaged probe.

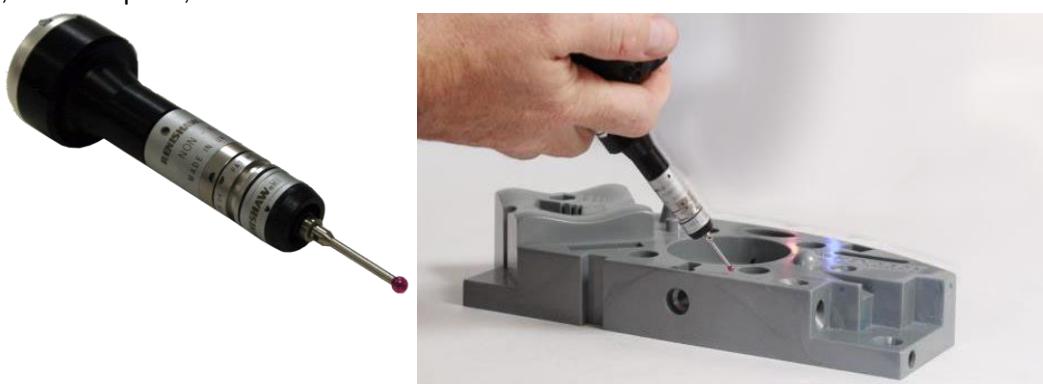
F.4.2 USE THE CONTACT PROBE

Unlock the counterbalance to free the arm and hold the arm wrist in one hand. Approach the part with the probe, ensure the ball is touching the surface and press the trigger button on the arm to record a measurement point (XYZ coordinate).



F.4.3 TOUCH TRIGGERING PROBE

Touch triggering probes (TTP) automatically take points when the ball of the probe touches the surface. Those probes reduce the effort when the probe is in contact with the surface. This is very useful for soft surfaces, movable parts, etc...



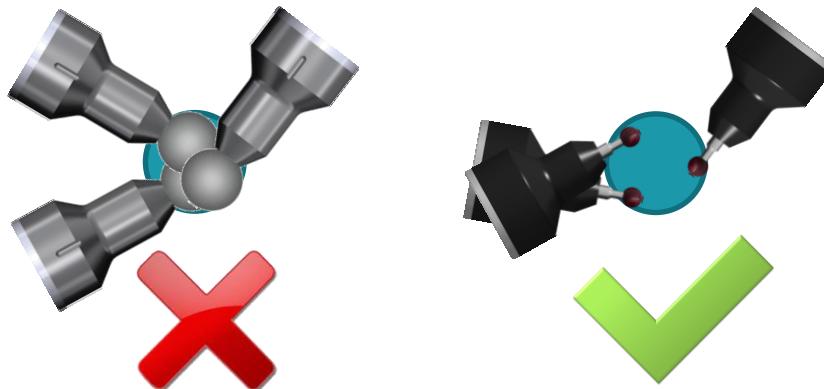
The TTP is composed of a TKJ TTP base, on which a M8 Trigger sensor (such as TesaStar) can be mounted.

F.4.4 PROBING TIPS AND TRICKS

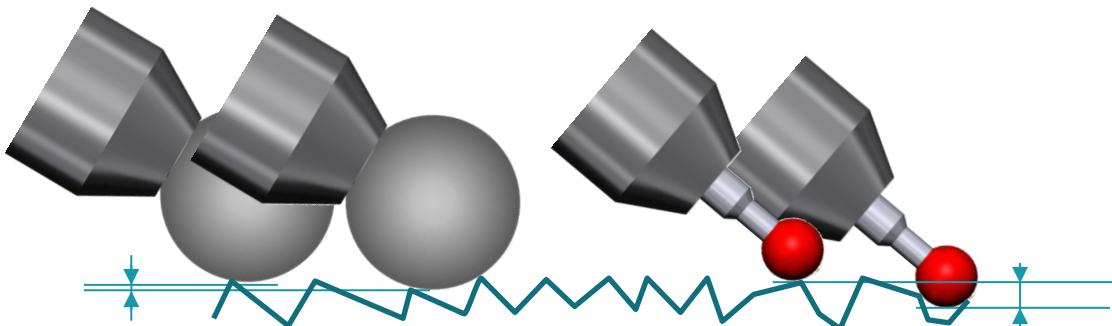
Which tip diameter to use

Any tip diameter can be used on an Absolute Arm. The choice of one probe or another one depends mainly on the application of the probing:

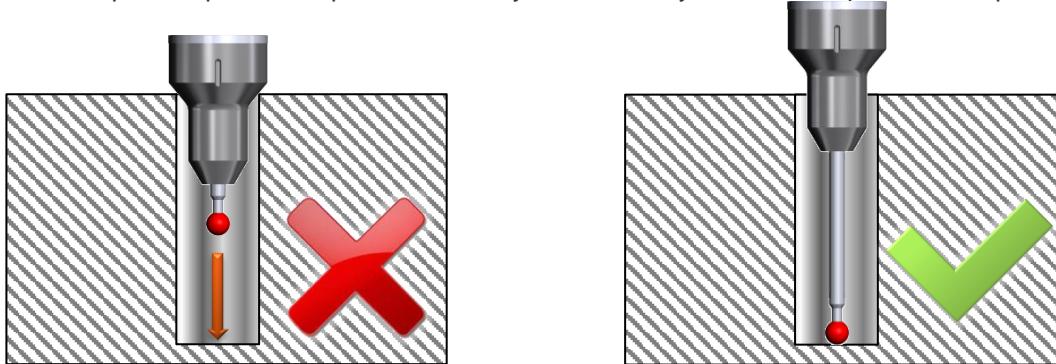
- What size is the feature to probe? The tip diameter must be adapted to the feature to probe.



- How rough is the part surface? A large tip diameter will skip asperities, while a small one will integrate them in the measurement.

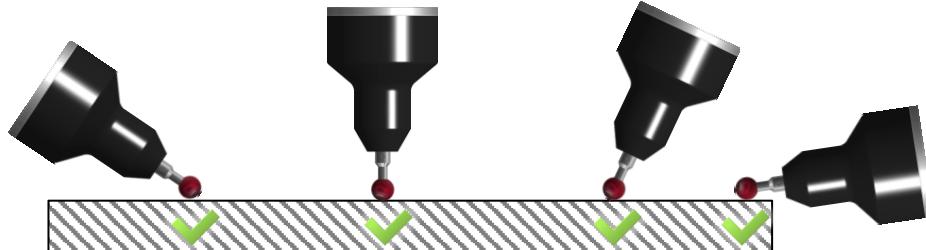


- How deep is the part? M3 tip extension may be necessary to reach deep areas of a part.



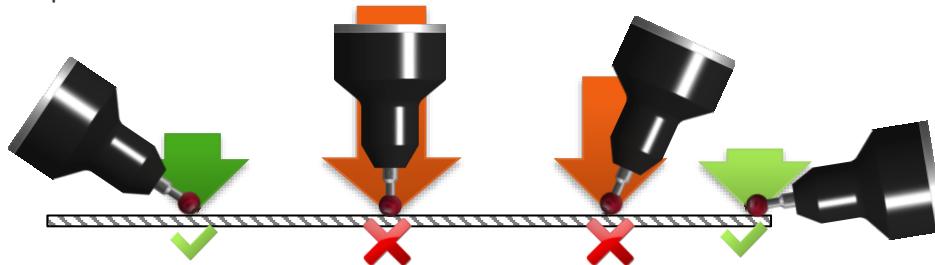
Probe orientation

Any contact probe is aligned to integrate all its deviations, so that no matter how probe is oriented, the coordinates of the ball probe will remain the same: there is no need to pay attention to keep the probe orthogonal to the surface.

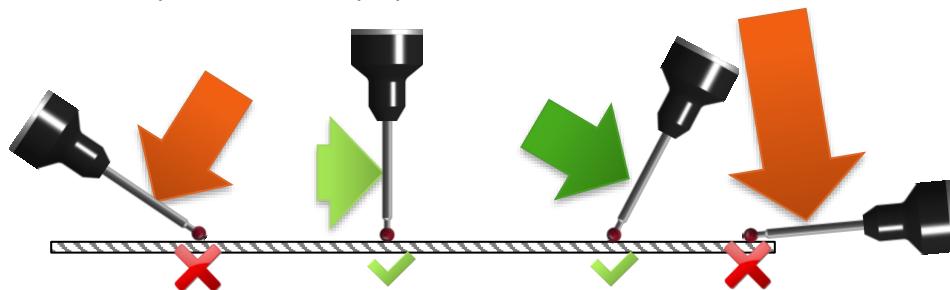


However, a few recommendations should be followed in some cases:

- If the material is a bit soft, or if the part can move easily, incline the probe to reduce the pressure on the part surface.



- If a probe extension has been added, it is advised to reduce the effort on this stem, and then the flexion. For that, the probe should be perpendicular to the surface



- To take burst points, the probe must slip easily along the surface: it is misadvised to get the probe perpendicular to the surface, to avoid friction.



- Depending on the software and options, the probe must look toward the surface side. (see "Probe radius compensation")

Number of points to probe

From a purely theoretical point of view, each type of feature needs a minimum number of points to be calculated.

For example, a plane needs at least 3 points to give a value.

However, it is vital to take at least one additional point (for ex. 4 points for a plane), to control the shape error, due to the feature itself or to the measurement.

Item	Pts. required		Recommendations
	Theo	Real	
Plane	3	5	One on each corner + one at the centre of the plane
Circle	3	4	Regularly distributed at 90° each other
Single Pt.	1	1	
Cylinder	6	10	4 on each end (at 90° each other) + 2 at the middle of the cylinder
Line	2	3	One on end + one at the middle of the line
Cone	6	10	4 on each end (at 90° each other) + 2 at the middle of the cone
Sphere	4	9	4 on the hemisphere + 4 at 45° latitude and rotated 45° from the hemisphere points + summit
Surface Pt.	1	1	Each point is independent.
Polyline	2	2	

The more points taken, the better the measurement will be; 1000 points will give a better average calculation than 5 points. Using burst points (keeping BT pressed) is a quick and easy way to take such a high number of points. However, during burst points, the user must take care to always keep the probe in contact with the part surface.

Most of the time, it is not necessary to take such a high number of points (the measurement stabilizes after a certain number of points), except if the feature to measure has very bad shape error, or if it is very small ... (see after).

Depending on the functionality and size of the feature, on the expected accuracy, more or less points have should be probed, from 4 to 500 for example.

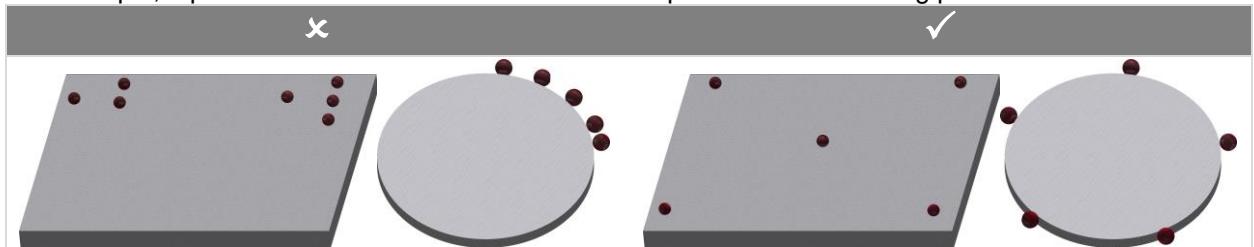
Special case	explanation
Bad shape error	
Small radius	
Small arc angle	

Location of probed points

The repartition of the points is as important as the number of point.

The way to locate the points must follow the functionality of the feature.

For example, a plane should be measure with at least 5 points as the following picture



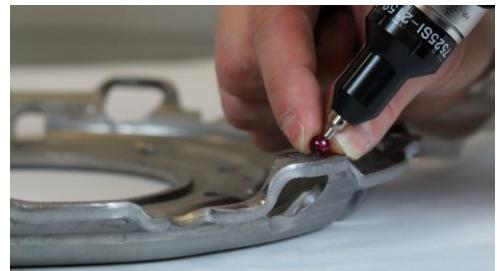
In a generic way, the location of the points must respect a uniform repartition of them, not to favour one area of the feature to the detriment of another one.

Probe guidance

Some software provide special functions, to guide the user to take points at the predetermined location. This may be helpful to probe a very thin circle for example, or to search for a specific XYZ coordinate ...

A sound is then emitted, and the point is taken as soon as the probe is inside the guide tolerance.

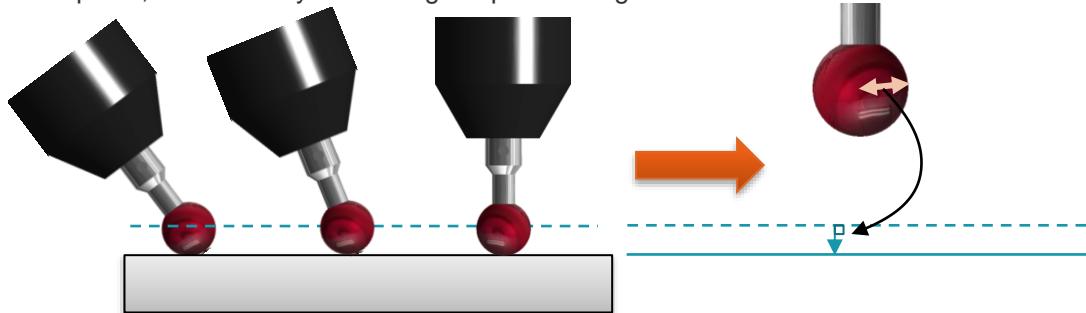
For those functions and for any other case, it may be useful to manually guide the end of the probe (= the tip) with at second hand, to locate it accurately. The closer the hand is to the tip of the probe, the more stable the measurement will be, and the more accurate the location will be.



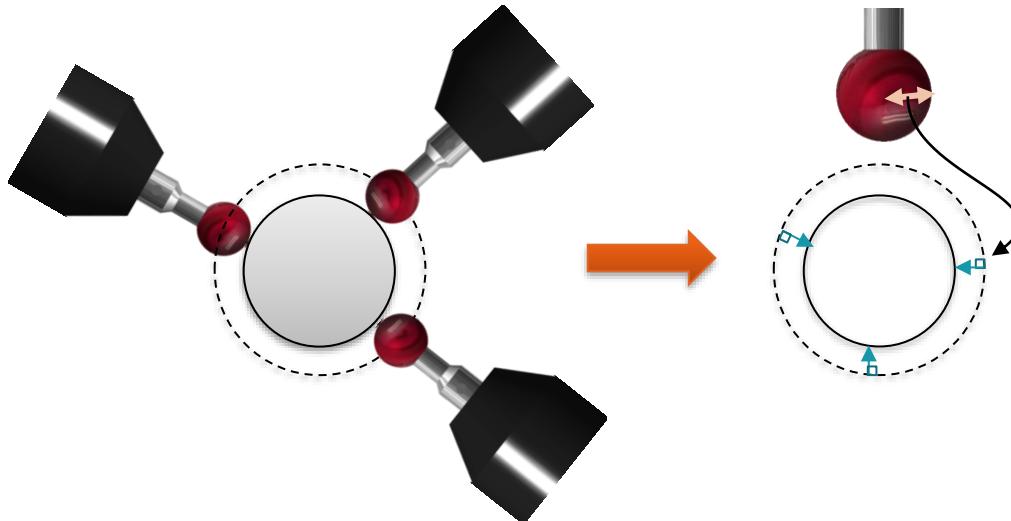
Probe radius compensation

When probing, the software uses the centre ball point coordinates for feature calculation, not the contact point. The software then calculates the feature that has been selected and adds or compensates for the probe radius:

- For a plane, it consists by translating the plane along its own vector with the radius value



- For a circle, cylinder, sphere, or similar item, it consists by adding or subtracting the probe diameter to the feature diameter.



- For a surface inspection point, it consists by translating the point along the nominal surface vector with the radius value
- For a simple 3D point, there is no way to know the contact side and so no compensation is possible.
- Even if the probe doesn't need to be perpendicular to the surface, a minimum orientation of the probe is necessary to get correct probe radius compensation: the probe has to point toward the material.

Please refer to the applicable measurement software user manual for more details about probe compensation.

Measurement best-fit

Except for individual points features (single point, surface points ...) each geometric feature is calculated using a specific method (least square, minimum radius ...). Once the feature is calculated, each probe point is compared to the result feature, to get the shape error (flatness, circularity ...). Most of the software can give the maximum error value, after each new point once the feature is validated. This maximum error value ("best-fit") gives very useful information to make sure that the feature has been correctly probed.

F.4.5 STYLUS CHANGE

When the stylus needs to be changed on the probe, RDS cannot detect it automatically. The operator has then to define the new stylus diameter (in case it has changed) and run the probe realignment.

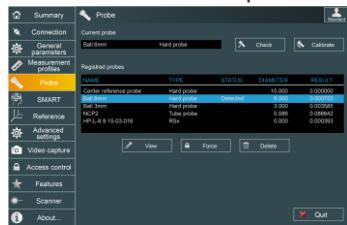
- Mount the probe on the arm



- Access RDS Control Panel and select "Probe" tab



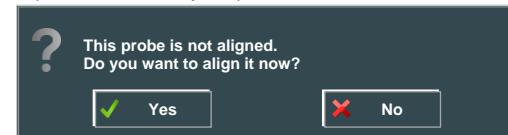
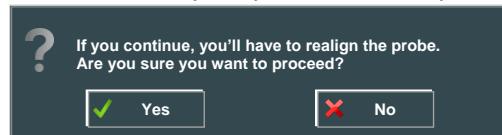
- Select the mounted probe and click on "View"



- Click on "Edit", change the diameter value and validate



- Validate next 2 prompts and run the probe alignment (see next chapter).



F.4.6 CONTACT PROBE ALIGNMENT (SPHERE WITH REFERENCE)

To obtain accurate measurement results, each probe must be aligned with the Absolute Arm it is being used on. Each unique set of probe alignment data is stored in the Absolute Arm memory. The arm checks each time when a probe is 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.

The described method hereafter is the default recommended one: Sphere with Reference method.



It is possible to use other methods of alignment than default ones: run RDS Data Collector, to choose the appropriate method (simple plane / plane with reference plane / simple sphere / sphere with reference sphere (default) / seat). Refer to RDS data collector manual for full description of all methods.



In case of poor accuracy, or a probe tip change, it is possible to realign a probe, using RDS Data Collector.



In case of poor accuracy even after a probe realignment, mount the probe 15mm on the arm, and do a probing quick check on the verification bar, artefact sphere or verification plate.

Principle

Default probe alignment requires a certified sphere and contains 3 (83/85/87) steps:

- Measurement of the sphere with reference probe (15mm)
- Measurement of the sphere with the probe to align
- Calculation and validation

Alignment short description (sphere with reference method)

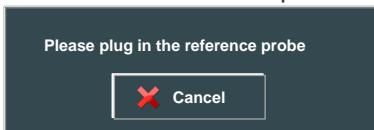
1. From the measurement software or RDS menu, access probe alignment (or for a new probe, RDS automatically asks for the alignment)
2. In the choice window, select “Sphere with reference”.
3. Place the sphere at mid-range from the arm.



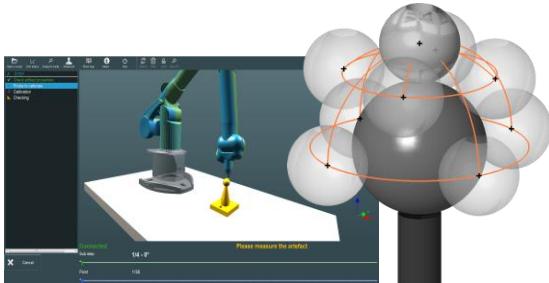
4. Enter the diameter



5. Insert 15mm reference probe



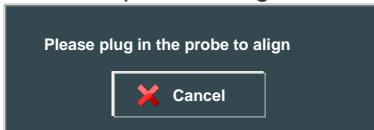
6. Take 9 points on sphere with 15mm probe



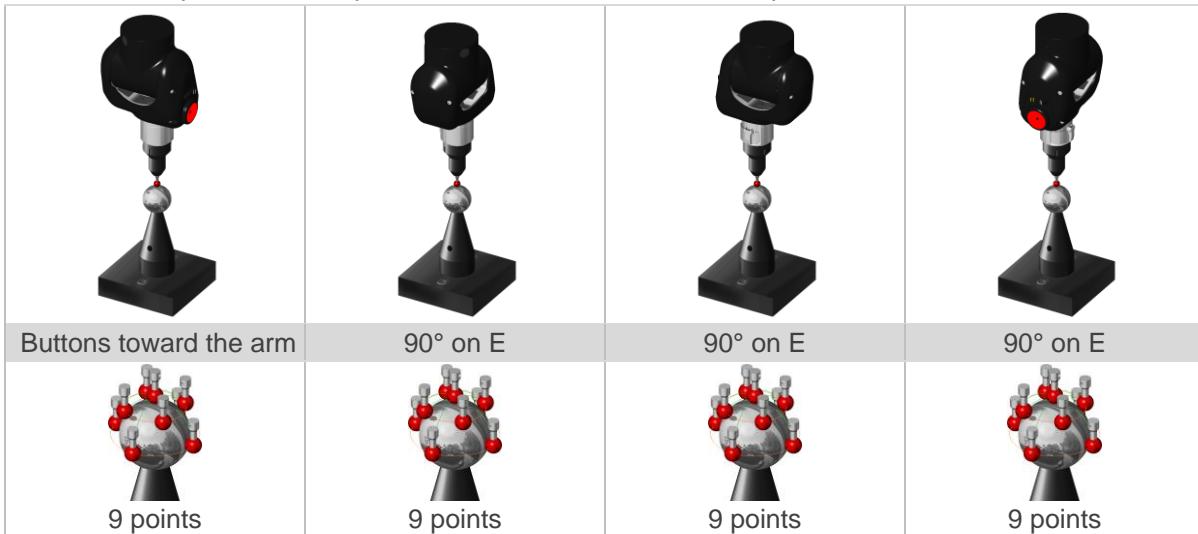
7. Check reference sphere results and "OK"



8. Insert the probe to align



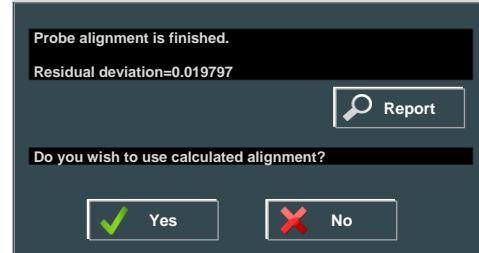
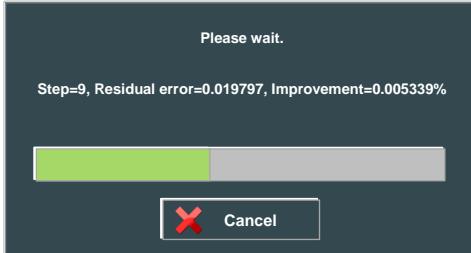
9. Measure 4 x 9 points on the sphere with the 4 orientations of the probe



10. Validate the results of the measurement to start calculation.



11. At the end of calculation, click on yes



Residual deviation value for sphere with reference method is:

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

For more details, please refer to RDS Data Collector manual.

F.4.7 CONTACT PROBE VERIFICATION

RDS Data Collector provides a script to proceed a quick verification of the arm with the current contact probe: "Probing quick Check".

This script can be used anytime the user needs to control the accuracy of the arm with any contact probe. It contains 4 steps with different tests:

- Volumetric test (reference probe needed): 5 measurements of the verification bar (see options)
- Single point test: 10 points on a seat (on verification bar – see options)
- Sphere test: 9 points on the sphere
- Plane test: 9 points on a plane (not provided)

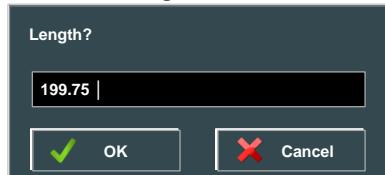
From RDS Menu, access "Check current probe".

Step 1: Volumetric Performance Test:

1. Fix the verification bar, respecting the following conditions:

- Flatness of the support: 50µm max
- Tightening: 4N on each fixation holes.

2. Enter the length value that will be used



3. Measure 5 times the length bar, moving each time the elbow of the arm

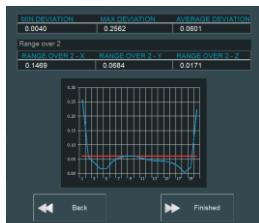


4. Check the deviations according to the specifications of the arm (see in appendix)

MEASURES	VALUE
Artefact Length	711.0000
1-2	711.0213
3-4	710.9832
5-6	711.0412
7-8	711.0123
9-10	710.9735
Minimum	710.9735
Maximum	711.0412
Average	711.0003
Min dev	-0.0265
Max dev	0.0412
Range2	0.03385
Std.dev	0.0277

Step 2: Single point test

1. Measure the 10 points on a cone moving the axes of the arm as shown on the graphic view.
2. Check the deviations according to the specifications of the arm (see in appendix)



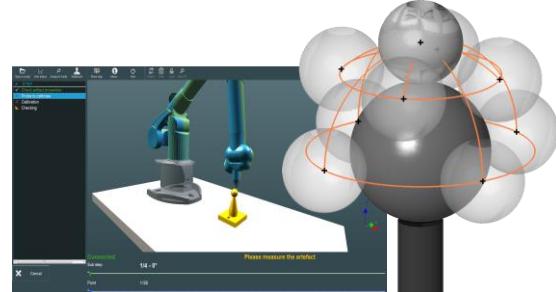
Step 3: Sphere diameter test:

1. Enter the diameter of the sphere.

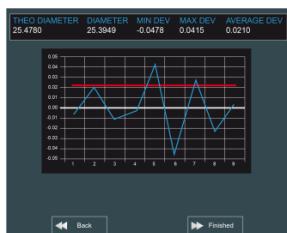
Diameter ?

OK Cancel

2. 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



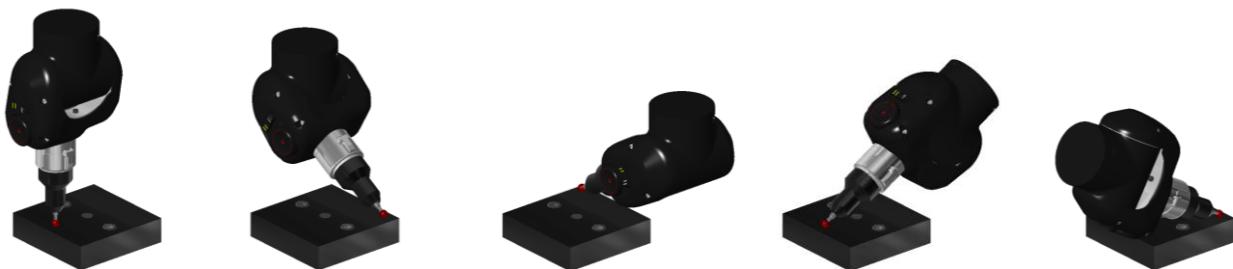
3. Check the deviations according to the specifications of the arm (see in appendix)



Step 4: plane test

This test consists by measuring a levelled plane by 9 points, and then the best-fit of the measured plane is displayed.

The purpose is to give different orientations of the axes of the arm for each point.



Then RDS gives the flatness results:



F.5 HOW TO USE NC-PROBES FOR TUBE

F.5.1 MEASURING A TUBE

Straight measurement

To measure a straight, the two beams of the probe have to be cut moving down then moving up.

One beep is emitted each time a beam is cut or released, that means 8 beeps (=8 events) for one point

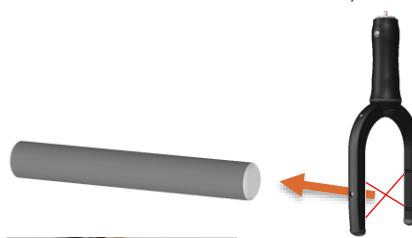


2 modes can be used: Single mode and double mode.



End measurement

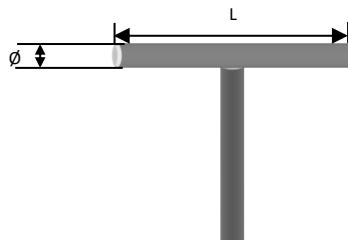
To measure the end of a tube, the beams must be cut at their intersection (simple mode only)



F.5.2 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. (See previous chart for recommended dimensions of artefact)



Non-contact Tube Probe process consists by measuring points on several sections and ends of the artefact, from different orientations of the probe.

Preparation

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



Artefact properties (step1)

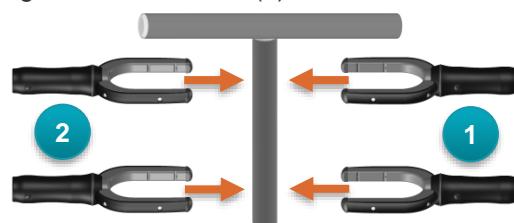
RDS ask for the artefact characteristics: enter the diameter and length, and press "select".



Vertical tube measurement

Measure one point on the high section of the vertical tube, then one point on the low section, keeping the probe as perpendicular as possible to the tube.

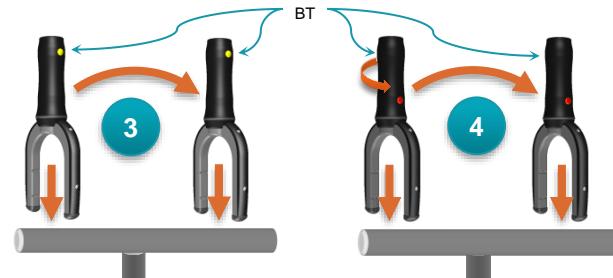
Do the measurement from the right side of the tube (1) then from the left side (2)



Horizontal tube measurement

Measure one point on the right-end section of the horizontal tube then one point on the left-end section, keeping the probe as perpendicular as possible to the tube.

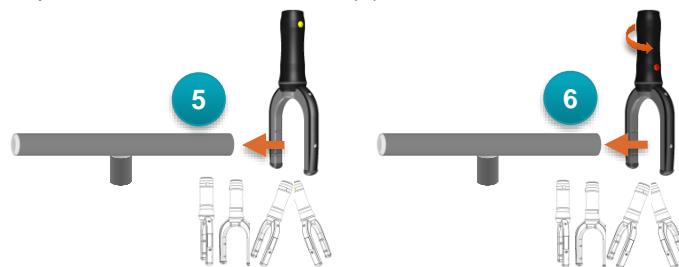
Do the measurement keeping the probe button toward the arm (INSIDE) (3), then turn the probe 180° and do the measurement with the probe button opposite from the arm (OUTSIDE) (4).



Horizontal tube right extremity measurement

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 (5) then turn the probe 180° and do the measurement keeping the probe button on the LEFT (6).



Horizontal tube left extremity measurement

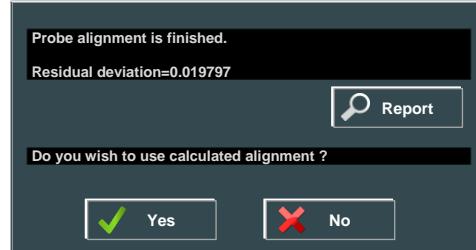
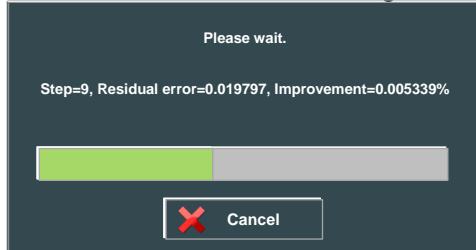
Measure 5 times the LEFT extremity of the horizontal tube, giving different angles for each of the 5 times.

Do the measurement keeping the probe button on the RIGHT (7) then turn the probe 180° and do the measurement keeping the probe button on the LEFT (8).



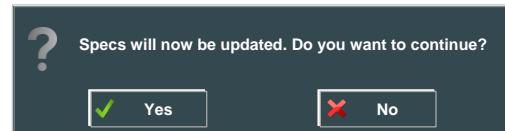
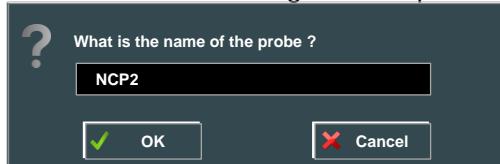
Calculation

RDS calculates now the new alignment of the probe and shows the result.



Check and validate the result.

Enter then the name to give to the probe and validate both next prompts



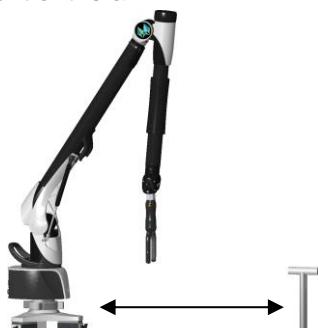
F.5.3 TUBE PROBE VERIFICATION

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

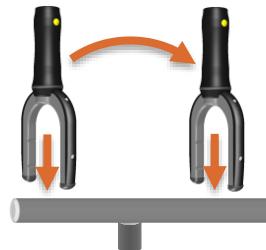
1. Place and fix the tube artefact in front of the arm.



2. Run RDS Data collector, in the Diagnostic scripts, select “NonContact probe - Quick Check - Double mode”.
3. Select the artefact and / or enter the diameter and length of the T-bar.



4. Measure the 1st side of the straight then the 2nd side



5. Measure the 1st end of the tube then the 2nd one.



6. RDS displays the measured length: check the deviations according to the specifications.

THEO LENGTH	LENGTH	DIFFERENCE	
299.9750	299.9412	0.0338	
	Back		Finished

F.6 HOW TO USE SCANNERS

F.6.1 WARM-UP

All external laser scanners need warm-up time before optimal performance.

Depending on the scanner, a minimum of 5mn or more may be necessary. Please refer to the scanner manual for more details.

F.6.2 START / STOP SCAN

Unlock counterbalance lever to free the arm and hold the wrist of the arm in one hand, approach the scanner to the part, respecting the standoff distance (sound and graphics will assist you), then press the Trigger Button (BT) to start and stop scanning.



The Trigger Button can be configured in one of two ways:

- Press to start and press again to stop scanning.
- Press and hold to scan

For details on the buttons use, refer to chapter § F.1.7 How to use the arm buttons.



It is possible to digitize even if a male contact probe is mounted. However the probe may prevent the camera to see the laser or may disturb the handling.

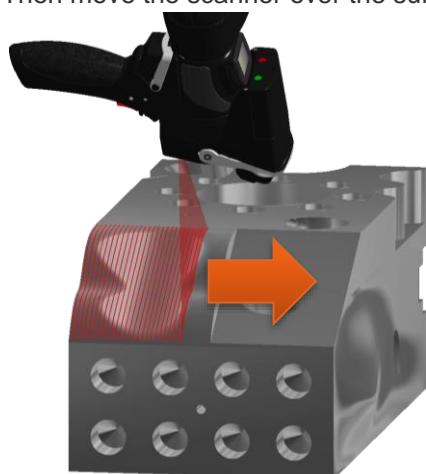
F.6.3 HOW TO HANDLE AND DIGITIZE

Excepted the HP-L-8.9, scanners are mounted on a 7 axes arm (fixed for RS5 or through TKJ). Thus, the operator should handle the wrist of the arm and not the scanner itself.

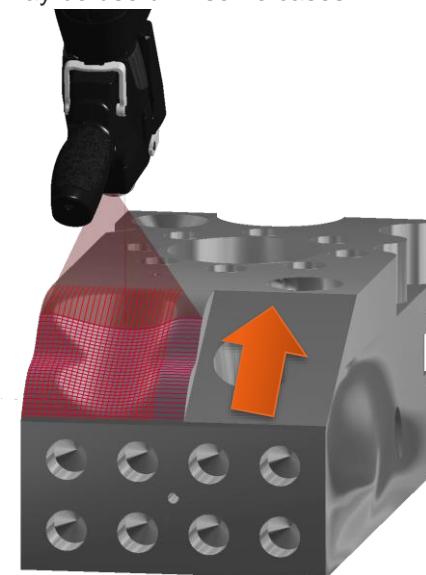


Fig. 40 : Scanner handling.

By holding the wrist of the arm, place the scanner over the surface to digitize, at a correct distance. The scanner may guide you about the correct distance with a guiding laser point or a colour indicator. Then move the scanner over the surface with a translation movement as a spray gun.



Pay attention to orientate correctly the scanner in order to get all the necessary detail. A cross movement may be useful in some cases



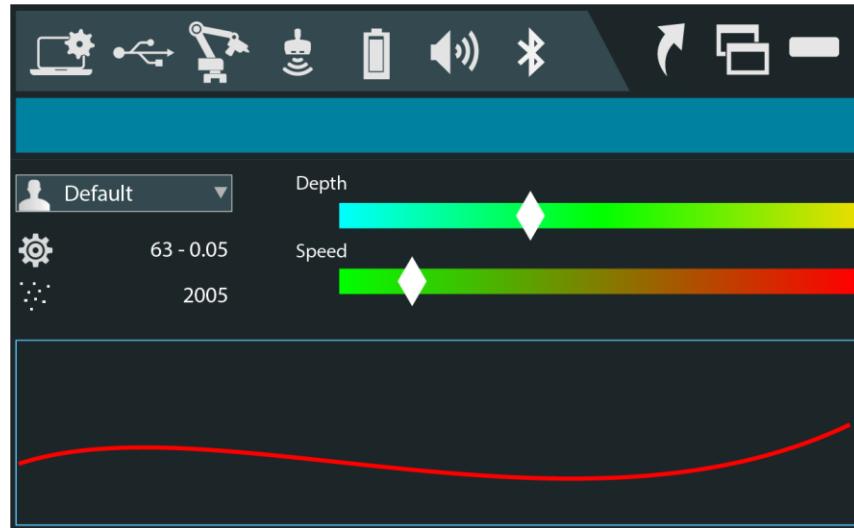
NOTICE

Dirt may affect the scanning results: do not put fingers on the lens and always ensure to keep clean and greaseless lenses.

F.6.4 SCANNING WINDOW (HEXAGON® SCANNERS ONLY)

Description

When using a scanner RS5, HP-L-20.8 or HP-L-8.9 managed by RDS, the RDS agent shows a window, to help scanning.



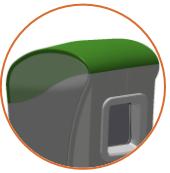
Item	Description
	Current scanning profile and profile selection.
	2D view of the scan line
1024 / 1609728	Nb of points per stripe (in preview) / total Nb of scanned points
Auto	Scanning mode and access to the settings
	Depth: Indicator bar graph showing how target is placed against scanner Z-field. Only in capture mode
	Speed: Bar graph indicator telling if the operator is moving the arm too fast while scanning. If the bar is out of range, RDS prevents getting points.

When scanning, a sound also gives indication about the distance to the object.
For more information about this widget, please refer to RDS User Manual.

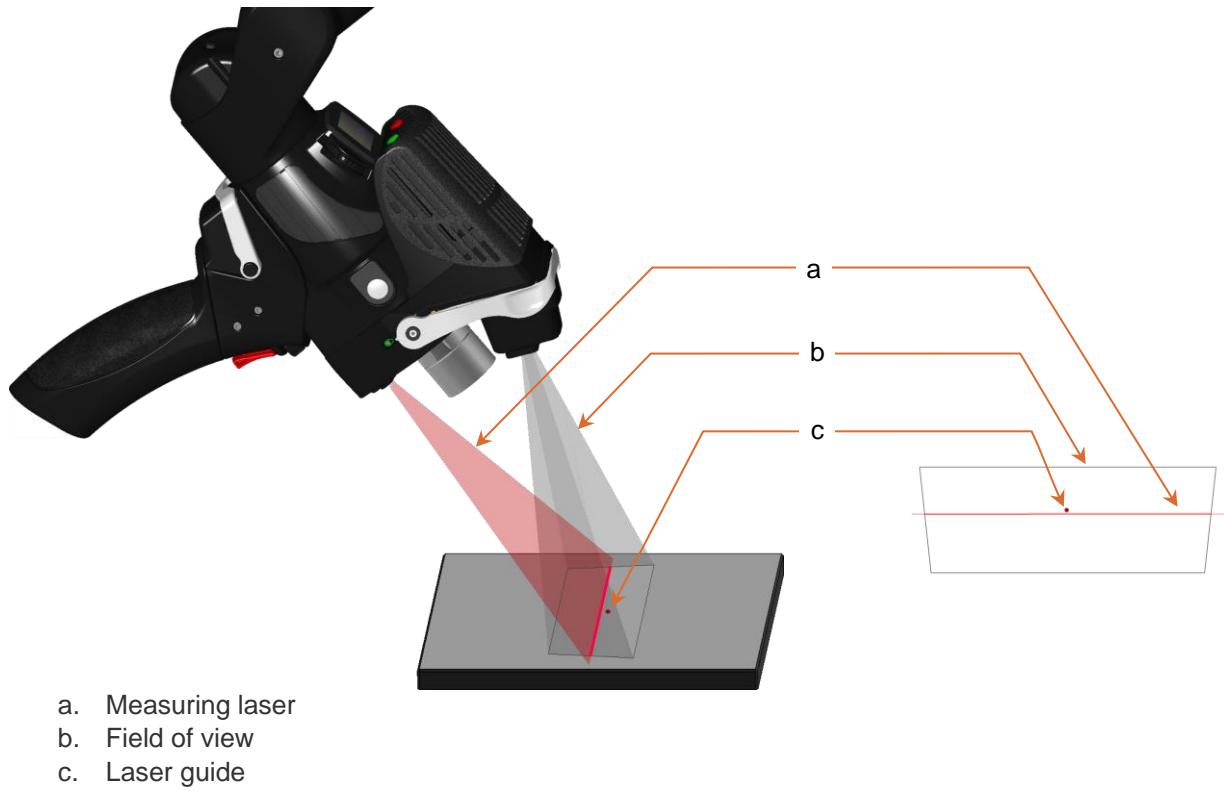
F.6.5 CAMERA DISTANCE

The scanners have a certain field of view inside which scan lines are visible; outside the camera doesn't see the laser line.

Several tools help to keep the best distance:

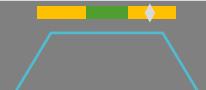
			Description	Tip
Colour indicator		✓		A colour indicator on the scanner Keep it green
Centre projection	✓	✓		A projected point or line representing the centre of the field of view onto the surface Align the laser line with the point (or line)
RDS Bar graph	✓	✓		A Bar Graph in RDS Agent with the representation of the laser line Keep the cursor in the green area
Sound	✓	✓		The arm emits a sound depending on the distance Keep a high-pitched sound.

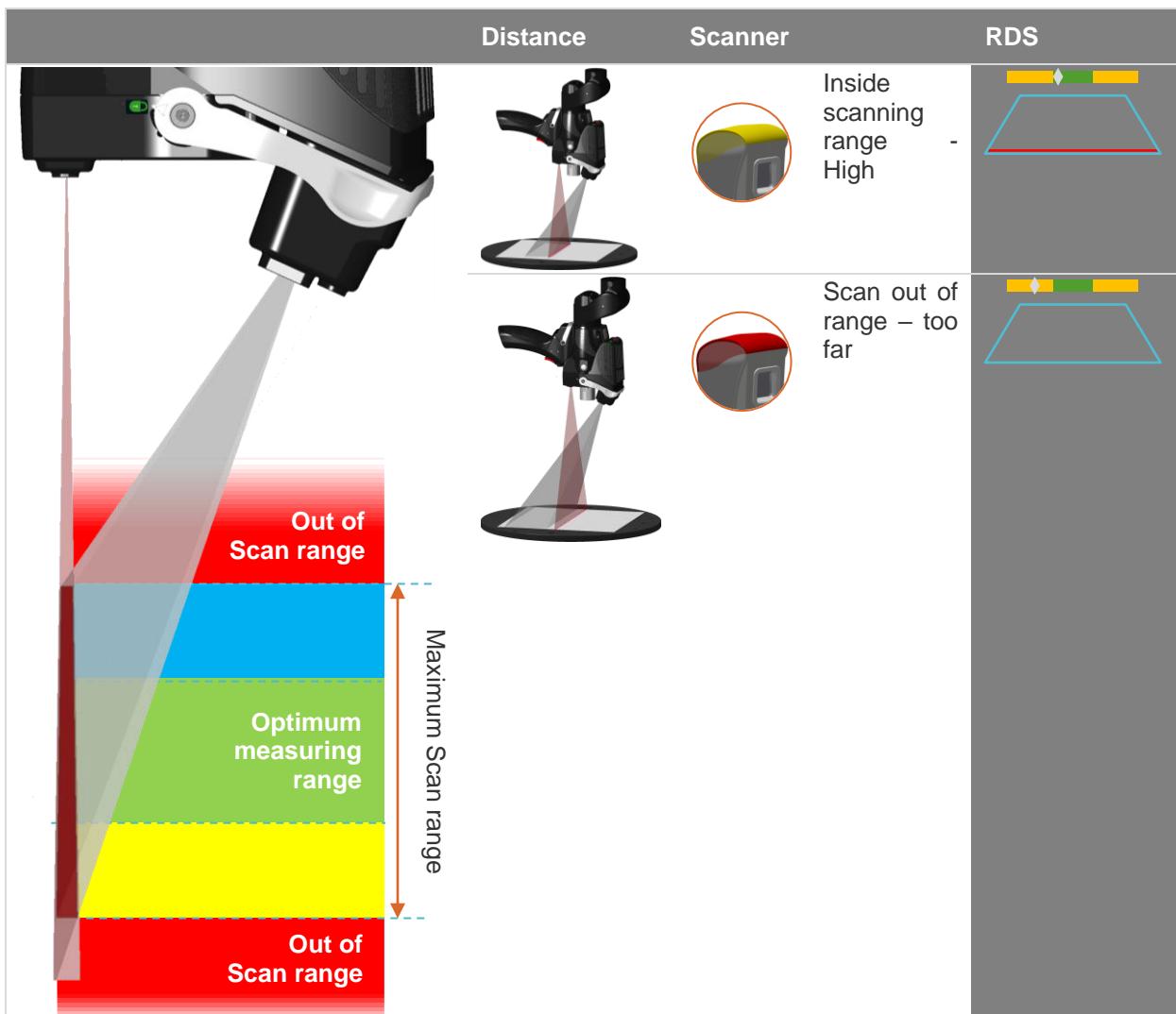
RS5 Field of view



When digitizing, align the measuring laser line with the laser point guide.

Scanning Z-scales

Distance	Scanner	RDS
	 Scan out of range – too close	
	 Inside scanning range - Low	
	 Inside scanning range – Optimum range	

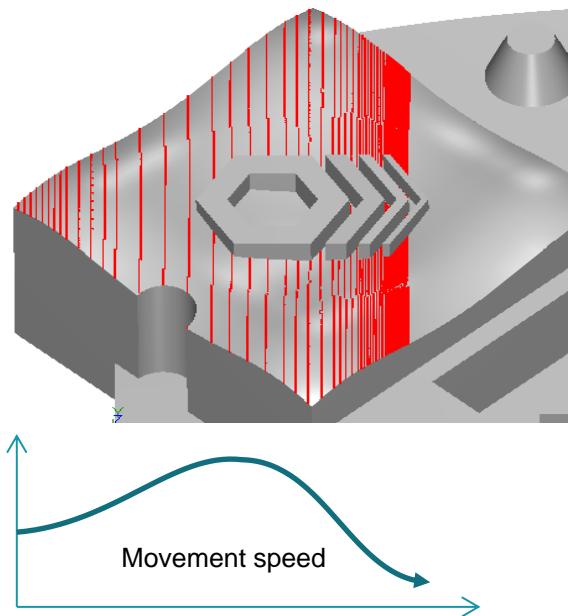


If the scanner moves too fast (bottom bar), RDS emits a signal and prevents from taking points.

F.6.6 SCANNING TIPS AND TRICKS

Speed

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.



Points density

The amount 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 amount of points may slow down the computer due to the points processing.

This is why it is important to adapt the density and amount of point 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.

RDS provides settings to reduce the scanning density, keeping a fast digitizing.

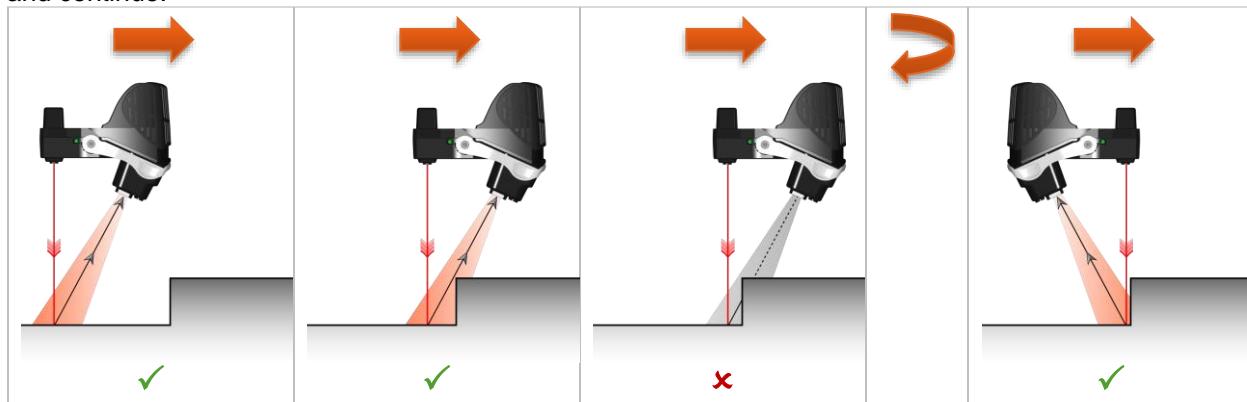
Most of the application software themselves have tools to do treatment on the acquired points to reduce the density regularly or according to the shape and keep only useful data.

Camera orientations

For any scanner, it is recommended to keep the laser perpendicular to the surface.

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 SI arm may occlude the field of view of the RS5 scanner, a very large shadow field may occur. It is highly recommended to remove any contact probe from the SI handle before scanning with the RS5.

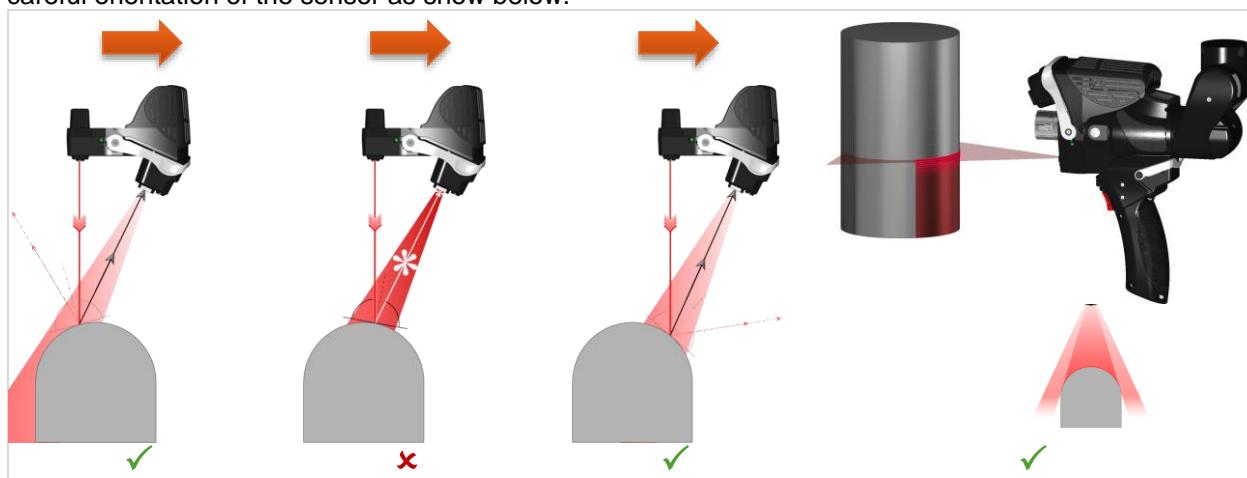
Over Exposure (RS5 / HP-L-8.9)

Overexposure may result in higher noise points, due to higher risk of reflection. Thus, on shiny, translucent parts, it is recommended to adjust manually the exposure.

To avoid any reflection or diffusion into the material, it is recommended to reduce manually the exposure.

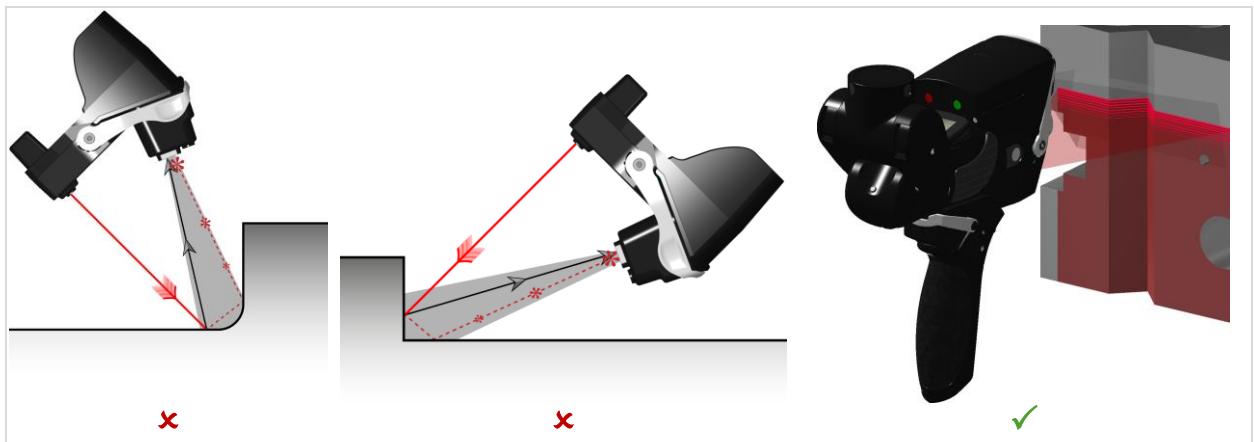
Total Reflection

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



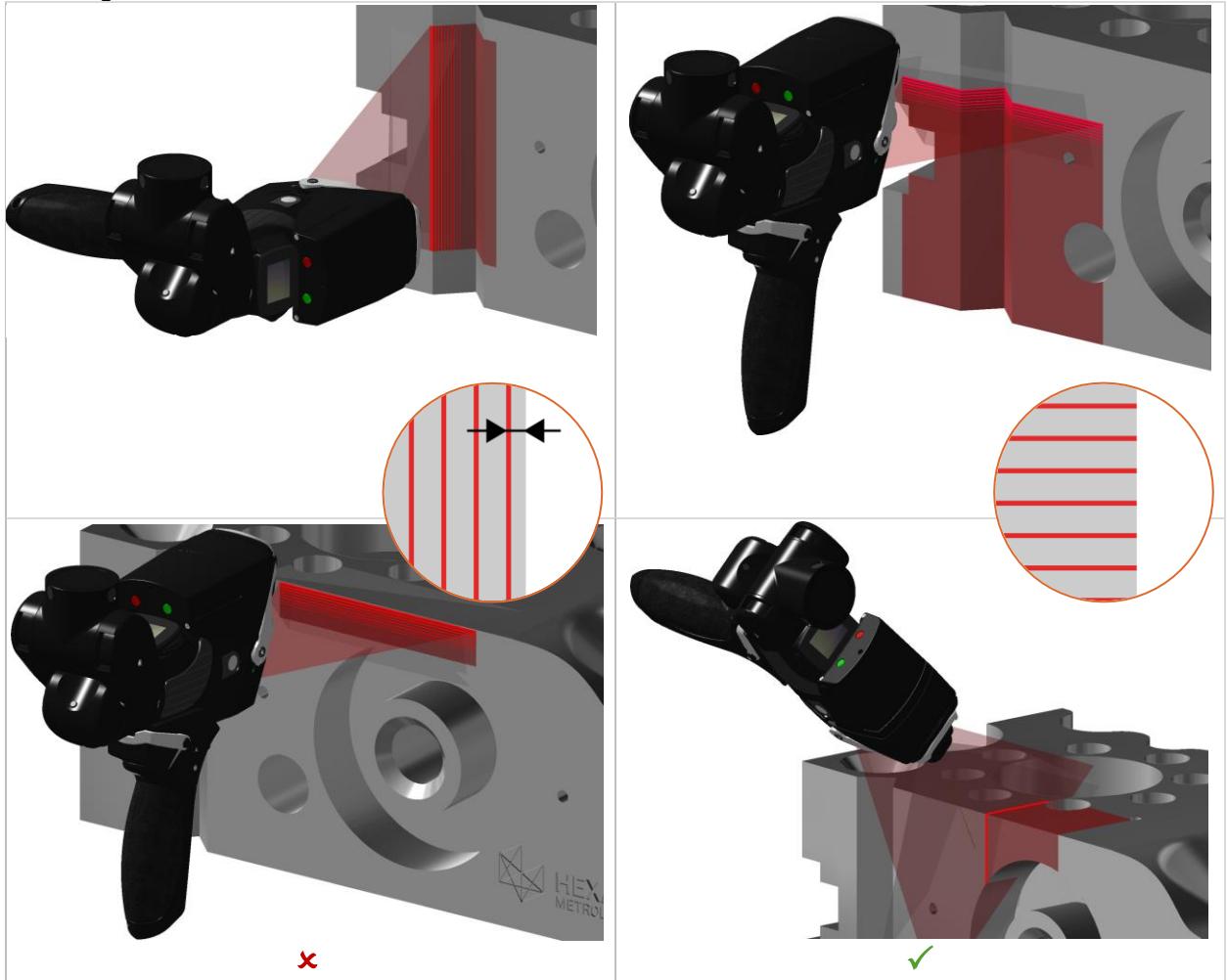
Secondary Reflection

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



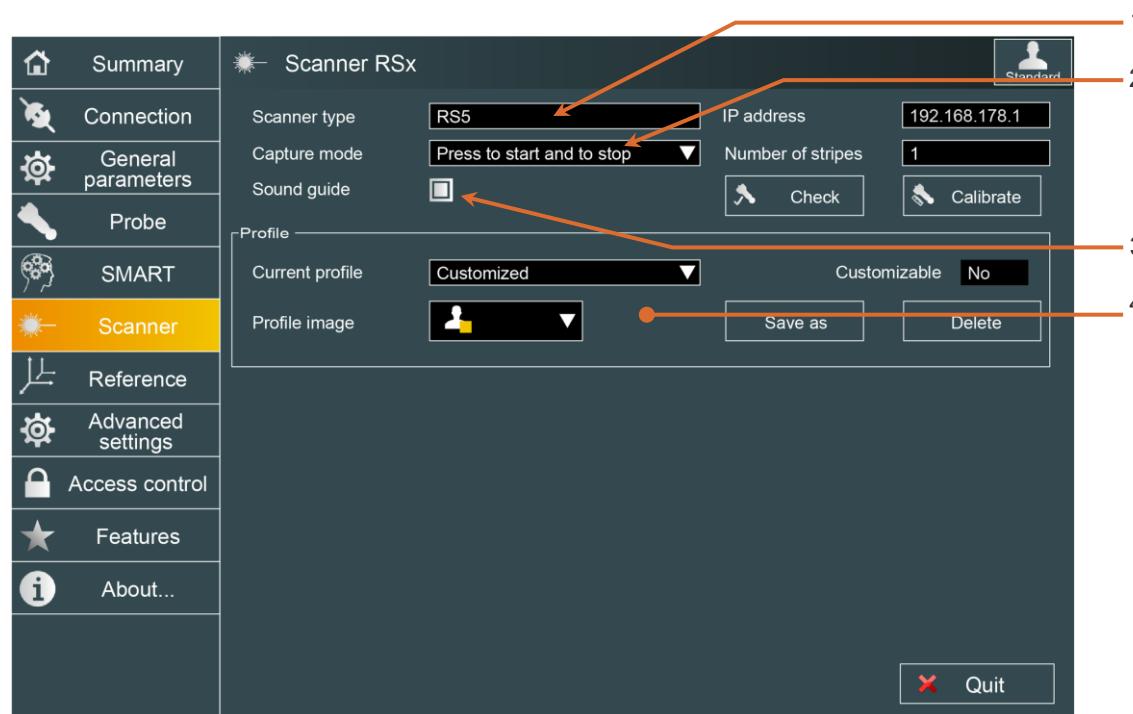
Edges

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



F.6.8 HEXAGON® SCANNERS COMMON SETTINGS

In RDS Control Panel, the scanner's settings can be controlled: access to RDS Control Panel, then select Scanner's Tab.



1	Scanner type	Shows the type of scanner (RS5, HP-L-20.8, HP-L-8.9)
2	Capture mode	Defines the way to use the button (Keep button pressed / Press to start and stop)
3	Sound guide	Emits a sound that helps to keep good height
4	Profile	This is used to save all the scanner settings into scanning profiles (see next chapter)

F.6.9 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.

Save a profile (Advanced user profile)

1. Access RDS Control Panel, Tab Scanner



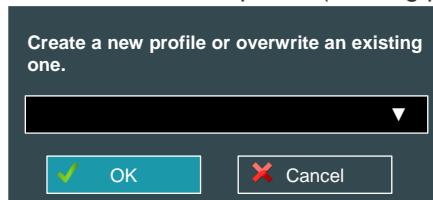
2. Select the profile to modify

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)



6. Click on "Validate"

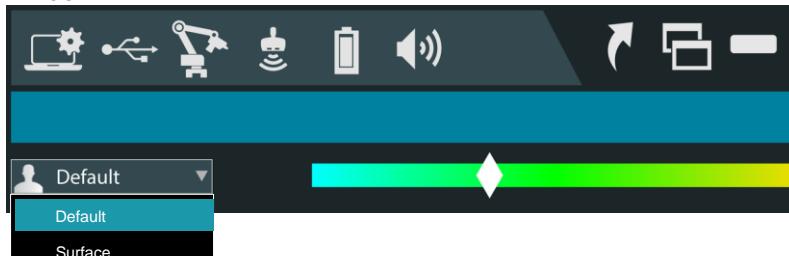
Use a profile (all users)

There are different ways to select and use a profile:

- From RDS Control Panel: access the tab "Scanner" and select the profile in the drop-down list (don't 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 Quick Access Menu

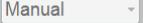
F.6.10 SAMPLING FILTERS (RS5 / HP-L-20.8)

To improve the performance and speed of digitizing (depending on the performance of the computer and the final software), it is possible to reduce the number of digitized points by skipping a regular percentage of points, points by points or line by line.

Points sampling	RS5	HP-L-20.8
None =keep all the points (100 %)	✓	✓ 
80 % = keep 4 points on 5	✓	✓ 
75 % = keep 3 points on 4	✓	✓ 
60 % = keep 3 points on 5	✓	✓ 
50 % = keep 1 point on 2	✓	✓ 
40 % = keep 2 points on 5	✓	✓ 
33 % = keep 1 point on 3		✓ 
25 % = keep 1 point on 4	✓	✓ 
20 % = keep 1 point on 5	✓	✓ 
10 % = keep 1 point on 10	✓	✓ 
5 % = keep 1 point on 20	✓	... 
2.5 % = keep 1 Point on 40	✓	

Line sampling	HP-L-20.8
None = keep all the lines	✓ 
1/2 = keep 1 line on 2 (50% remain)	✓ 
1/3 = keep 1 line on 3 (33% remain)	✓ 
Etc....	

F.6.11 EXPOSURE (HP-L-8.9 / RS5)

Behaviour when pressing left and right buttons	Capture the current exposure time
Exposure mode	Manual  49 %

Exposure modes

RDS provides 2 exposure modes:

- **Static 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.
- **Auto Dynamic mode (RS5 only):** the exposure is setup automatically in real time even while digitizing: no need to take care about set it up.

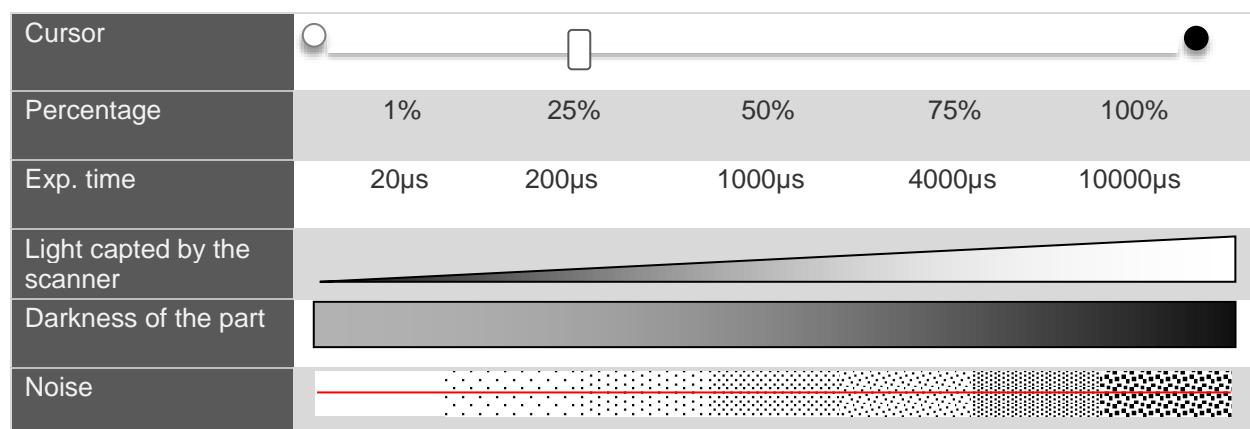
The mode can be selected in RDS Control Panel, scanner tab or switched through the Quick Access Menu (Q.A.M., see § D.3.4).

		Static mode	Dynamic mode
Adjustment	Manual	✓	
	Capture	✓	
	Automatic		✓
Adjustment while scanning			✓

Manual setup (static mode)

Enter RDS Control Panel, scanner tab: a scroll bar can be used to setup of the exposure time of the camera. 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.



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

Capture the exposure (static mode)

RDS provides a process to setup automatically the exposure.

This exposure can be done with through the Quick Access Menu (Q.A.M.).

Access the Q.A.M. with a press on the 3-States button and select "Capture the exposure".

Place the scanner over the surface: the scanner switches to a setup mode. Wait until the adjustment is finished (the exposure value is stabilized, giving correct number of points): the arm emits 2 beeps.

Manage the exposure through the Quick Access Menu

1. Press the 3-State button to enter the Q.A.M.
2. Navigate with the 3-State button and select the wanted action

Dynamic mode /	Switch to the appropriate mode
Static mode	

Capture the exposure	Adjusts the exposure
----------------------	----------------------

F.6.12 SCANNING MODES HP-L-20.8



The HP-L-20.8 scanners can digitize using different widths and resolutions.

Line length: defines the width of the laser (width in mm).

Point Spacing: defines the resolution distance between digitized points (points spacing in mm)

Line width (mm)	Laser line	Point spacing	Rate (Hz)
220	-----	0.055	37
130	-----	0.052	51
63	-----	0.025	50
51	0.013	28
25	0.013	50

Table 2 : HP-L-20.8 scanning modes

F.6.13 GAIN – QUALITY FILTER (HP-L-20.8)

Gain (Normal/High/Very High)

The gain permits to improve the ability of the scanner to get points in difficult conditions. 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.



*The metrological performance of the system can be affected when gain is set to High or Very 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*

Quality filter

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/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

F.6.14 HEXAGON SCANNERS ALIGNMENT

All RS5 / HP-L-20.8 and HP-L-8.9 scanners must be aligned prior to use. This operation must be done in case of arm recalibration, or if a new HP-L scanner is mounted on the arm.

New Scanner

If a new scanner is mounted on the arm, once powered, RDS recognizes it as a new mounted scanner, and ask following questions:

- Type of probe: RDS recognizes a new probe and ask for the type: HP-L-20.8 or External Trigger (Perception, Kreon ...).



The RS5 and HP-L-8.9 are automatically recognized and don't request to select the type.

- In case of a HEXAGON® scanner, RDS proposes to align it and several methods are available:
 - Plane without reference method.
 - Plane with reference method (measuring ref plane with Reference probe).
 - Sphere without reference method
 - Sphere with reference method (measuring ref sphere with Reference probe).

The recommended method is sphere with reference. For other methods, please refer to RDS Data Collector manual.

Run the script

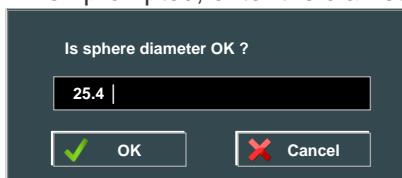
1. In case the script needs to be run manually, run RDS data Collector, then open the script in "Accessories Alignment".
2. Then click on "Play All".

Artefact Properties

3. The sphere artefact should be placed at 50% of the measurement volume.



4. When prompted, enter the diameter value



NOTICE

Do not use other artefact sphere than the provided mate one; it has been designed to give optimal results.

Reference Sphere

5. Insert 15mm Ref Probe



6. Take 9 points on sphere with 15mm probe



7. Check reference sphere results and click on "OK"



Use Scanner

8. Mount the scanner to align (Absolute Arm SE) or simply remove the reference probe (Absolute Arm SI)

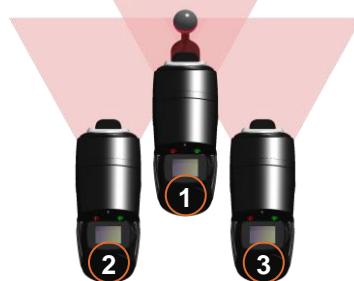


9. Wait for the scanner to be ready: RDS automatically select an “Alignment” scanning profile with the appropriate settings for the scanner sphere artefact.

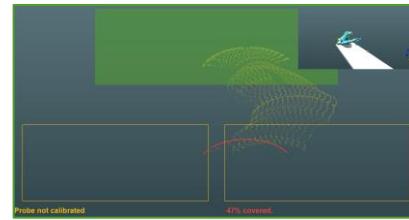
Field measurement

10. For each of the 3 orientations of the scanner, scan the sphere to cover the 3 target squares:

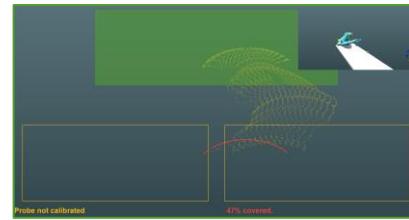
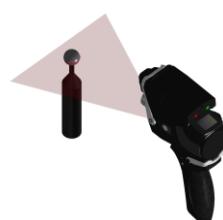
- 1 near centred position (#1)
- 1 far left position (#2)
- 1 far right position (#3).



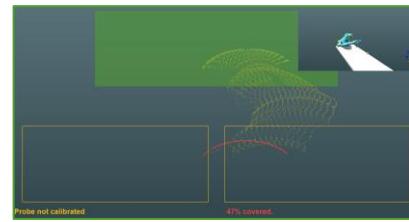
11. Position the scanner horizontally, at 0°, and scan, covering the 3 target squares.
Validate by pressing stopping the scan (right button).



12. Position the scanner horizontally, at 90°, and scan, covering the 3 target squares.
Validate by pressing stopping the scan (right button).

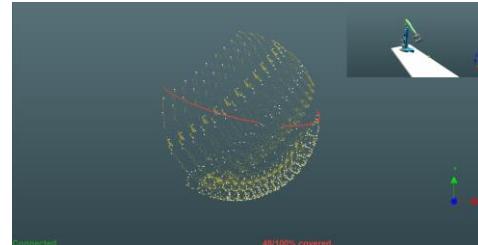


13. Position the scanner vertically, at 0°, and scan, covering the 3 target squares.
Validate by pressing stopping the scan (right button).



Global sphere measurement

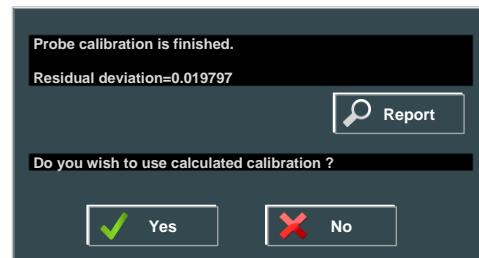
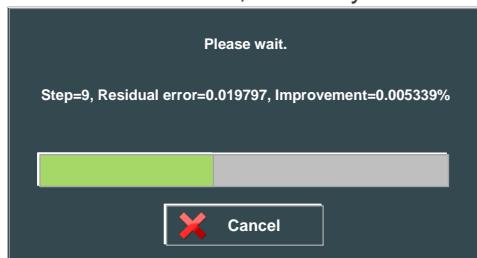
14. Digitize the whole sphere with the scanner: wait for the 85 % coverage at least to stop digitizing.
Validate by pressing on BP2 (right button).



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

15. After all the measurements, the calculation automatically starts.
At the end of calculation, click on yes.



*The residual error is Least Squares value of distances divided by data set amount of points
(to have a comparable value independent of amount of points)
The report details are memorized in a "Probe Calibration Report.txt" file on
C:\Users\Public\Documents\Romer\RDS\CalibData.*

G. ACCESSORIES

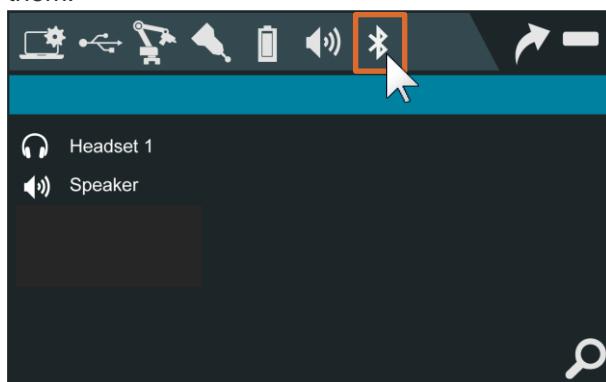
G.1 BLUETOOTH WIRELESS ACCESSORIES

The Absolute Arm has a Bluetooth wireless interface, permitting the connection of wireless accessories such as:

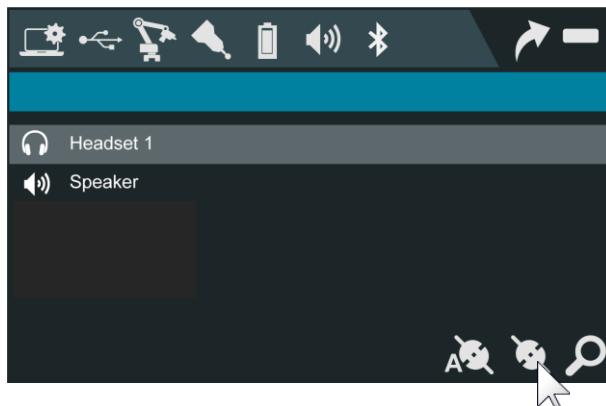
- Headphone
- Speaker

G.1.1 CONNECT AN ACCESSORY

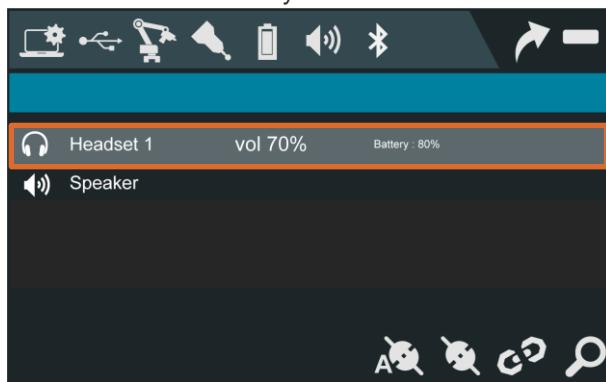
RDS Agent: Click on the Bluetooth tab to open the panel: RDS Agent seeks for available devices and lists them.



Select the wanted device and click on Connect.



The device is now ready.



G.1.2 USE THE ACCESSORY

When connected, the sound is sent to the speaker or headset instead of the arm.

G.2 WI-FI CHIPSET CONFIGURATION

The Wi-Fi network of the arms (Control Pack {CP2-CP3}) can be modified, in order to follow customer's specifications for Wi-Fi, to improve the efficiency by changing the channel, or enhance the security by using a Wep key.

Here are all the possibilities that can be used and setup through RDS Toolbox:

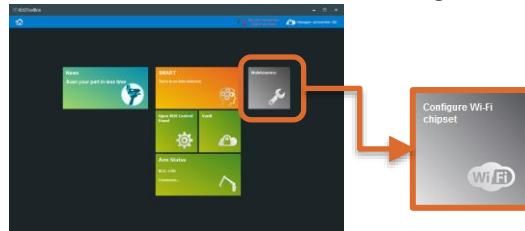
Available feature	Default value	Change Chipset
SSID	"T-UN-FF" T: type of Control Pack UN: serial number of the Control Pack FF: Factory	- Free (1 to 32 char.)
Country code		Select the appropriate country
Channel	Auto	According to the country code - 1 > 165
Password	None	- Free (8 to 63 char.)

Process

- Establish the USB connection to the arm.



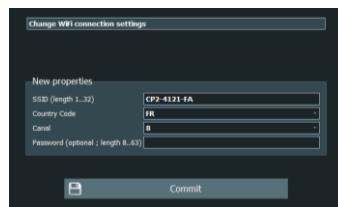
- Run RDS Toolbox and select "Configure Wi-Fi Chipset".



- Click on "Start"



- Enter the values for each feature and press "Commit"



- Switch off then on again to reboot the arm with the new settings.

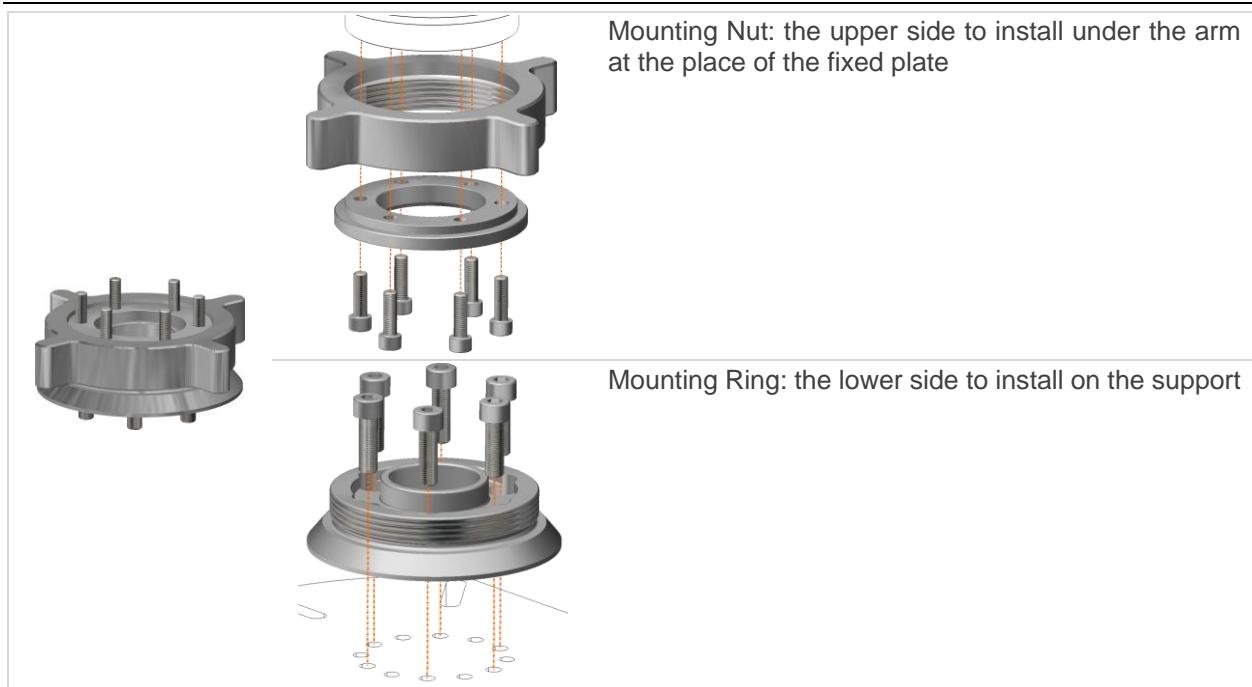
G.3 MOUNTING RING KIT (1.2 SERIES - OPTION)

The Mounting Ring kit allows to change the standard fixed plate of the 1.2 series arms by a standard Mounting nut and thus to install the arm on any support containing a Mounting Ring.

NOTICE

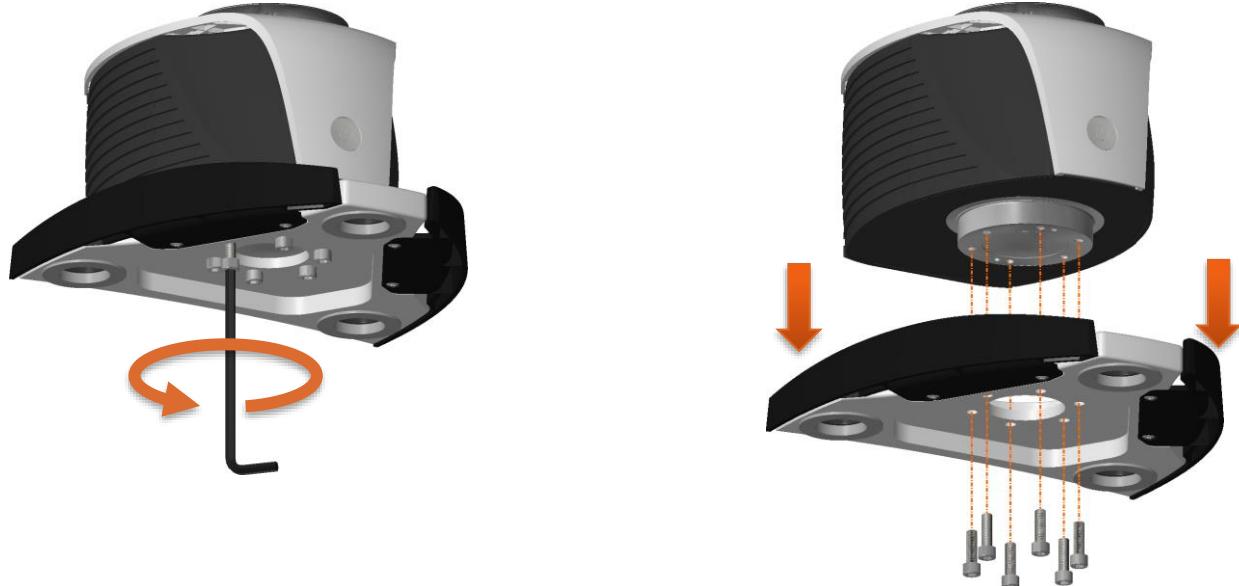
The operations to install the Mounting Ring kit, must be done with precautions, avoiding any damage on the arm.

Description of the Kit

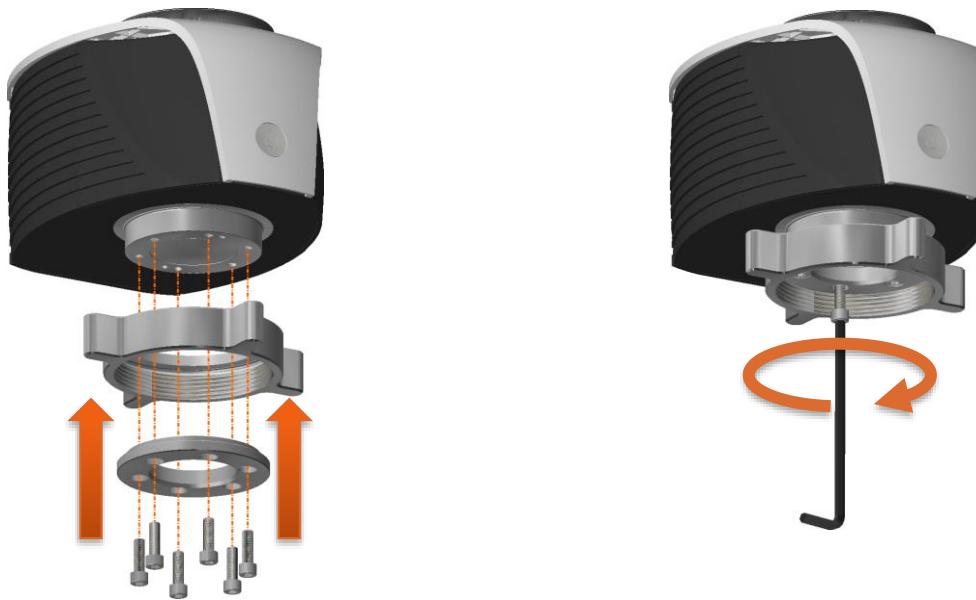


Setup

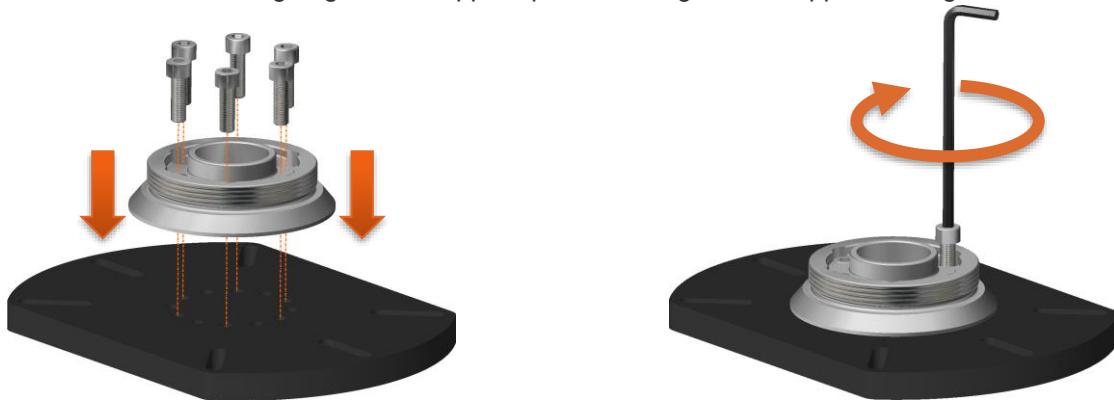
1. Remove the 6 M6-BTR screws under the plate to remove it



2. Install the Mounting nut on the arm: approach the nut and tighten the 6xM6-BTR screws at 12.5 Nm.



3. Install the Mounting ring on the support: place the ring on the support and tighten the 6 screws.



4. Fix the support and mount the arm on it: follow standard steps (chapter D.2.3) to install securely the arm on the base.

H. MAINTENANCE & TROUBLESHOOT

H.1 10 YEARS SERVICEABILITY

The Absolute Arm product range is provided with 10 years of serviceability.

This means that Hexagon Manufacturing Intelligence ensures that a service solution is always available for any Absolute Arm, 10 years after its production date. (After 10 years, arms will be supported on a case-by-case basis).

With the greatest number of service centres worldwide following arm factory processes, we ensure a best in class quality and efficient service during at least this product life-time.

For any additional information, please contact your local Portable Measuring Arms representative.

H.2 ARM STORAGE, USE AND TRANSPORT

Measurement arm and computer

Arms and computers are delivered in cases specially designed and tested to avoid any damage during their transport. It is advised to place the arm and the computer in their respective cases when not in use or at the time of the transport, to avoid any risk to the calibration of the arm.

Especially do not modify counterbalance pressure or strength.

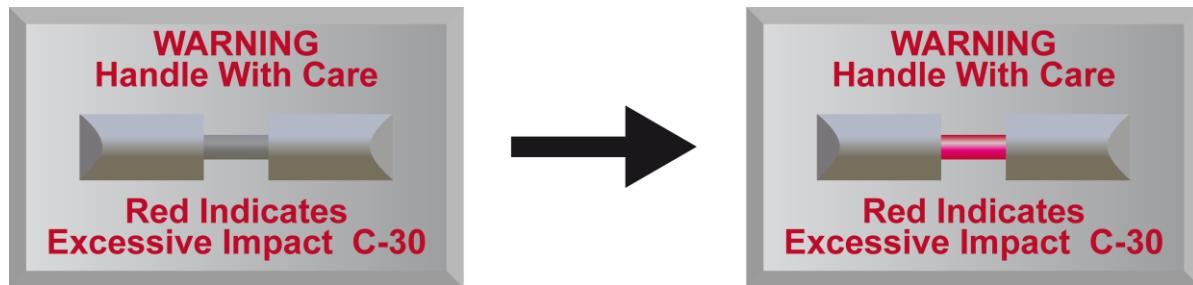
Storage place

Do not store the arm case and the computer case in a place where there would be a risk of:

- Significant heat or freezing.
- Significant moisture.
- Electromagnetic or vibratory disturbance.

Delivery of the measurement arm

Products are packed in foam for protection and shipped with shock detectors



Transport of the measurement arm

- It is advised to place the measurement arm and the computer in their respective cases each time they are transported.
- Moreover, for any transport by plane, boat, train or truck, pack the products tightly in foam for protection and with shock detectors.

H.3 CLEANING

H.3.1 CLEANING THE ARM



WARNING

Before cleaning, switch off the system, and disconnect the power supply cable.

- When unused, protect the arm from the dust with the provided dust cover.
- When unused, place back the accessories in the provided accessory case.
- When needed, clean the arm
 - clean with a soft rag, lightly dampened with pure water or water diluted with a soft detergent.
 - do not use other detergents, solvent or alcohol to avoid any risk of damage.
 - use compressed air to remove loose particles.
 - for removing tough pollutions, use wadded-cotton tips.

NOTICE

When cleaning the Wrist display on the 7-axis arm, do not press on the glass.

H.3.2 CLEANING THE SCANNER

Requirements

- Lens pen (e.g. "MicroPro" from Hama)
- Or
- Microfiber cloth (Important: low linting; non-scratching on optical components)
(e.g.: 3M - Scotch Brite, Professional High-Performance Cloth, Part No.: 07926)
- Cotton bud (Q-Tip) (Important: low linting; non-scratching on optical components)
- Compressed air (Important: high purity, dry, oil-free)



For severe dust/dirt:

- Soft cleaning alcohol (e.g. Isopropanol)
Important: maximum 90% Isopropanol (+10% distilled, purified water), (e.g.: 3M VHB Surface Cleaner)



Cleaning

1. Use a microfiber cloth to clean the glass. Apply VERY LIGHT pressure to the lens when cleaning! If there is some adhesive dirt use a “soft” cleaning alcohol like Isopropanol to remove the dirt.

2. Move and rotate the cloth to get best results



3. Use a cotton bud (Q-Tip) and a microfiber cloth to clean the glass in front of the laser. Apply VERY LIGHT pressure to the lens when cleaning!

4. If there is some adhesive dirt use a “soft” cleaning alcohol like Isopropanol to remove it.



5. Use compressed air to remove the remaining dust from the glasses.



(If you use compressed air from a fingertip dispenser please be aware that in some cases the spray could contain also parts of the propellant which causes pollutions).

H.4 STANDARD MAINTENANCE

Visual inspection

- Check that probes styli are not bent or broken

NOTICE

When changing a stylus, use Loctite, and proceed with the realignment of the probe.

- Check that each cover is in place and not broken
- Check that the cables are not damaged

NOTICE

Any damaged cover, part or cable must be replaced. Contact your local Service Centre.

Manual inspection

- Magnetic bases:
 - ensure that each magnet is working properly
 - ensure that the lock is not damaged.
 - check that the magnetic surface is clean
- Mounting bases: check that all the screws are well tightened (Mounting ring, magnets, tripod elements...).
- Check that all the covers are correctly fixed on the arm.
- Check that the base handle is well fixed on the arm.
- Test and check that the SmartLock work correctly on the counterbalance
 - the counterbalance is free when unlocked
 - the counterbalance is stopped when locked
- Test (with RDS Toolbox) and check the correct function of all the wrist buttons
 - Main trigger button
 - 3-States button
- Rotate all the axes of the arm and check their correct free rotation
 - No difficulty to rotate
 - No hard point
 - Do not use any grease or lubricant on the arm or its accessories.

Advanced inspection

- With RDS Toolbox > SMART, check the global status of the arm

Parts replacement

Any broken part must be replaced.

- Probe stylus

NOTICE

When changing a stylus, proceed with the realignment of the probe.

- Magnets:
 - On the Standard magnetic base, if a magnet is broken (knob, thread, ...), the complete set of 3 magnets must be replaced (the 3 magnets are calibrated all together).
 - Use only set of 3 magnets provided by Hexagon Manufacturing Intelligence.
 - Apply Loctite 243 and tighten the 3 M8x20 screws at 25Nm.

H.5 ACCURACY VERIFICATION / CALIBRATION

As any other precision measuring device, the Absolute Arm must be checked periodically. Depending on the intensity of use, and on the number of users, this period of verification may vary from a systematic verification to an annual recertification. In fact, 3 levels of verification should be understood:

User systematic checking

The user “systematic” control: every time the arm is used, a quick check out is recommended, to ensure that the arm keeps safe since last use. Indeed, it is important to ensure good measurement, so in case of any issue (shock, damage ...), a quick check avoids starting a session of wrong measurement.

RDS provides tools to do such verification, for probing, tubing or scanning. (Refer to RDS Data Collector manual).

Furthermore, a control program can include a quick verification at the beginning (to avoid start wrong measures) and at the end (to ensure that the system was OK all along the measurements) of the program.

This must be an easy and quick process, such as a gage block or a gage ring measurement (the comparison of the centre point between the start and the end verifications can ensure that nothing moved during the session).

Customer's periodic control

According to the intensity of use, a periodic deeper control is recommended; this can consist by a complete certification process in RDS data collector, a customized gage measurement process, or even a simpler measurement.

NOTICE

Any complete certification (B89, ISO10360...) must respect the standards in terms of environment, artefact, operations...

Annual recertification by Hexagon Manufacturing Intelligence.

Finally, depending on the quality policy of the company, or in case of doubt, a complete recertification according to the B89, ISO10360-12 or VDIVDE standard, in Hexagon Manufacturing Intelligence precision centres, can be done every 6 months, every year, or every 2 years. This recertification is done in all the recommended conditions.

RDS procedures

RDS Data Collector has multiple “Quick-check” procedures the user can perform to verify arm and accessories accuracy, and alignment. It also has full certification procedures such as the B89.

Please refer to RDS Data Collector manual for full descriptions of each procedure.

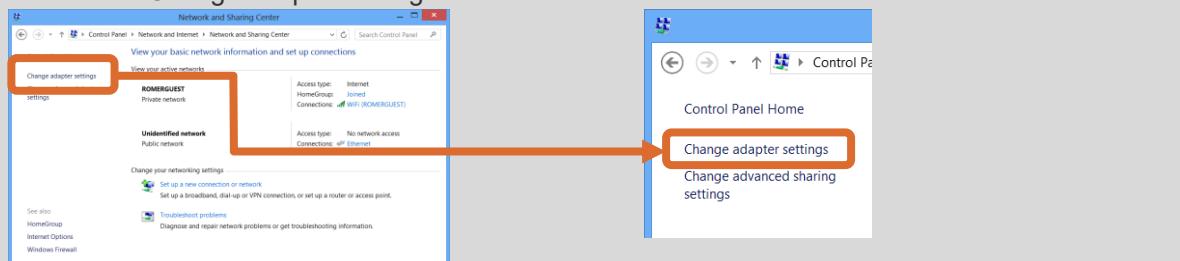
H.6 WLAN CONNECTION

In case of troubles with WLAN connection, please check the following settings:

- Access the network settings: On the task bar, do a right click on network icon and select “Open Network and Sharing Centre”.

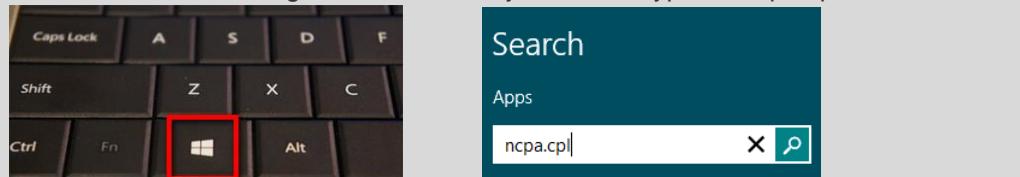


- Select “Change adapter settings”

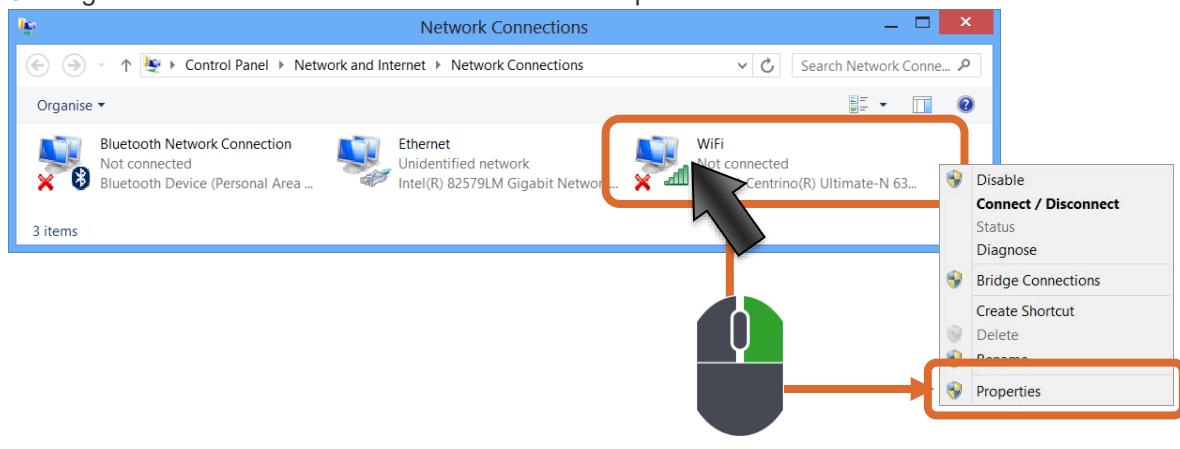


If the Network icon is not visible:

Press the Windows® logo touch on the keyboard and type in “ncpa.cpl”



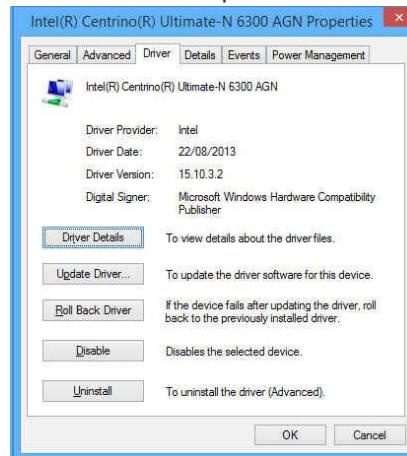
- Right click on “Wireless Network” and select “Properties”:



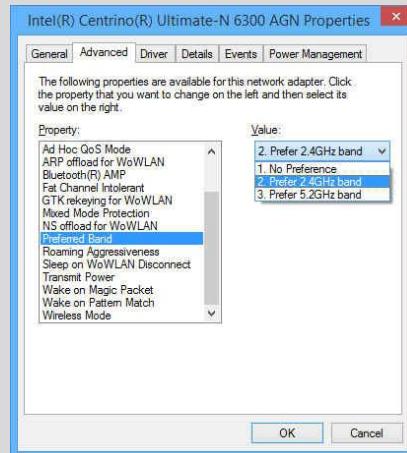
- Click on “Configure”



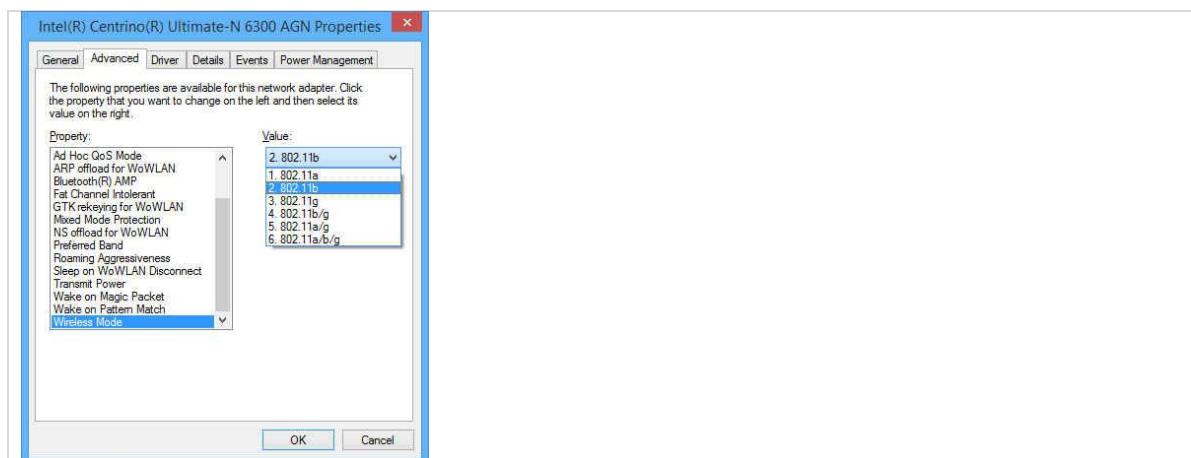
5. Drivers tab: Update to the latest drivers



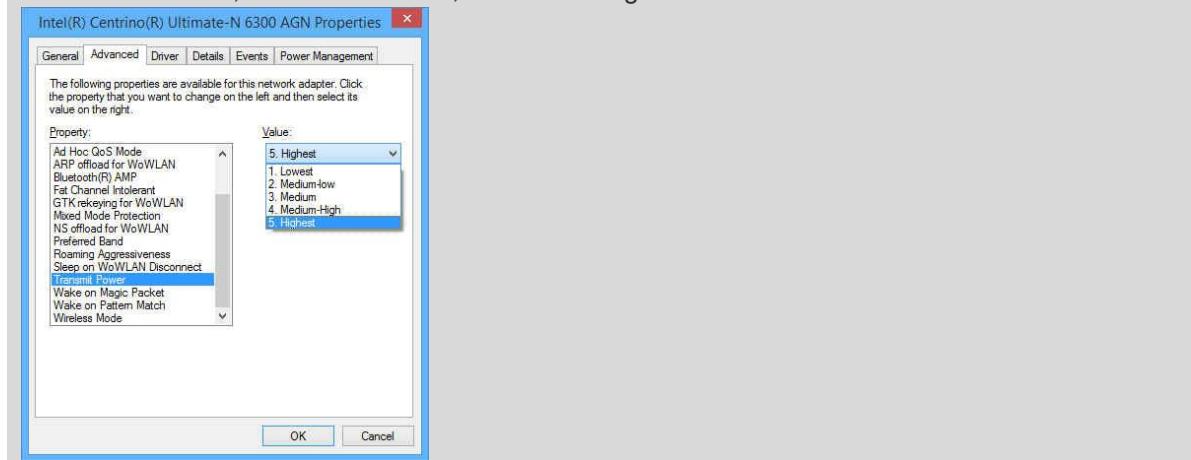
6. Advanced tab, “Preferred Band”, choose “2. Prefer 2.4GHz band”



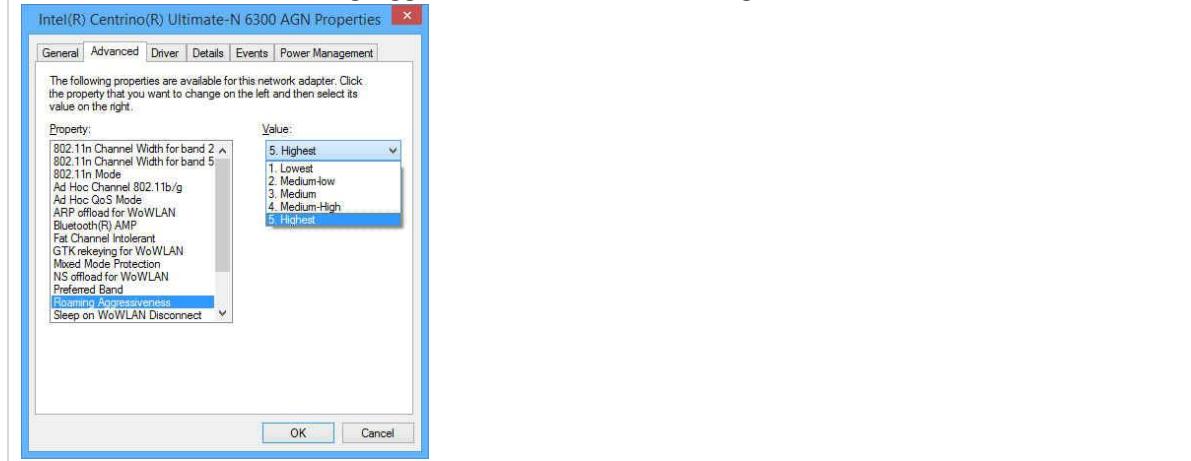
7. Advanced tab, “Wireless Mode”, choose “2. 802.11b”



8. Advanced tab, “Transmit Power”, choose “5. Highest”



9. Advanced tab, “Roaming Aggressiveness”, choose “5. Highest”



10. Close all windows and restart the computer.

H.7 OTHERS

	Question	Answer
Connection	<p>No connection to the arm</p> <p>The LED is Off</p> <p>Frequent USB disconnections</p>	<p>Is the LED on the arm, switched on? Is the USB cable between the arm and computer in good state? Is the USB cable correctly plugged in? Check power is on and all cables connected correctly Use correct cable</p> <p>Are the cables correctly plugged in? Is the arm button switched on?</p> <p>In some environments, when the voltage difference between the table, part and probe tip build up enough it can cause an arc. This can sometimes affect the USB Signal. An improvement is to connect the grounds of the computer, arm and table together.</p> <p>Ensure that the arm is plugged on a 3 really connected prong plug. Ensure the PC has a 3-prong plug. Certain computers are not always this way.</p>
		 
		<p>Plug the PC and Arm into the same surge protector. Connecting to the same ground is best. If the Arm and part are on a metal table then it is also helpful to ground the table or part to the same ground as the arm and PC.</p> <p>Additionally, some factories where heavy equipment is present (Arc welders, etc.) can cause surges on the input power. It is recommended to use a different ground for the Arm than is used for the arc welder. Also, a power conditioner that will filter the power supply will help in this case. Arm and Computer should be plugged into power conditioner.</p>
Measure	With my NC tube probe, the points are not taken correctly	Check that the environment light doesn't interfere with the infra-red beams.
SEI conversion	When I converted from SI to SE, I saw that a 15mm probe was saved for the offset position in the list of probes. Why is this?	This is because any 7 axes arm needs one centred probe and one offset probe to be calibrated. Any 7 axes arm (V1, V2, V3, SE, SI, SEI) always contains 2 reference probes

	Question	Answer
RDS	Can a RA8 arm be used in RDS 4.3 or earlier?	You can definitely not use an Absolute Arm RA8 (6 or 7 axes) with RDS 4.3. V5.0 is the minimum version to be used with a RA8. In general, you should always update with the latest version of RDS, available for free on Hexagon Manufacturing Intelligence web site.
Probe alignment	What residual error values should the probes have in RDS?	The result of alignment in RDS only shows a global error which definition depends on the type of probe and method. Any operator should display the alignment details, to see if the probe results are correct or not.

If the arm still has problems:

Contact your regional agent with the following information:

- The following page filled out
- RDS.log file (on C:\Users\Public\Documents\Romer\RDS\LogFiles)

ARM	Type	<input type="checkbox"/> 83	<input type="checkbox"/> 85	<input type="checkbox"/> 87	
	Serial Number				
	Your Company name				
Connection	Type	<input type="checkbox"/> USB	<input type="checkbox"/> Wi-Fi	<input type="checkbox"/> Ethernet	
	CPU TCP/IP @	-----			
	RDS TCP/IP @	-----			
Accessories	SSID				
	Scanner				
	CPU IP@ for Scanner	-----			
Boards versions	LEDs status				
	Mother Board				
	MB PIC				
	Event Board				
Diagnostic information	Control Pack				
	Sounds				
	Status of the LEDs				
	Tests with different hardware				
	Ping answer				
	Other information				
SOFTWARE	Software	<input type="checkbox"/> PC-DMIS	<input type="checkbox"/> TubeShaper	<input type="checkbox"/> SA	<input type="checkbox"/> 3DReshaper
		<input type="checkbox"/> Inspire	<input type="checkbox"/> Docs	<input type="checkbox"/> Pc-Dmis Touch	
		<input type="checkbox"/> PolyWorks	<input type="checkbox"/> PowerInspect	<input type="checkbox"/> Metrolog	
		<input type="checkbox"/> Other:			
Version					
Operating system	<input type="checkbox"/> Windows7®	<input type="checkbox"/> 32 Bits			
	<input type="checkbox"/> Windows10®	<input type="checkbox"/> 64 Bits			

I. APPENDIX

I.1 TERMINOLOGY, SYMBOLS

Terminology

	Description
6axes	Applies to all 6 axes arms (83, 85 and 87 series)
SE arms	Applies to all 7 axes SE arms (83, 85 and 87 series)
SI arms	Applies to all 7 axes SI arms (83, 85 and 87 series)
83	Applies to all 83 series arms (6 axes, SE, SI)
85	Applies to all 85 series arms (6 axes, SE, SI)
87	Applies to all 87 series arms (6 axes, SE, SI)
1.2	Applies to the specific 1200 size arm.
83-6	Applies to a specific type of arm
85-6	
83SE	
87SI	
...	

Symbols

Symbol	Description		
	General danger		Standard feature Correct operation
	Electric risk	Opt.	Feature is optional
	Chemical risk		Incorrect operation
	Pinch Risk		IEC 60417-5031: Direct Current
	Cutting Risk		For Absolute Arm, specific USB cable only
	Laser risk		Read the manual before use

I.2 CONFIGURATION FOR END-SOFTWARE

The ABSOLUTE ARM can be used with the following measurement software.

Ensure the appropriate version is installed.

Some software need special configuration. Please read carefully the corresponding section.

Software	V° Min.				Required license	Settings
Pc-Dmis	2011	✓		✓	"RDS"	Demo license: Use "RDS" interface
Pc-Dmis Touch	v1.0	✓				
TubeShaper	v1.0	✓	✓		No	No configuration
3DReshaper	v6.3	✓		✓	"RDS"	Install RDS plug-in
SpatialAnalyzer	2011. 10.20	✓				Select Absolute Arm
Quindos	Q7	✓				
Bending Studio				✓		
Visi	2018 R2			✓		
GPad / GTube		✗	✗	✗	ROMOSOFT is not supported by the RA8	
Docs	v3.0	✓	✓		No	No configuration
PolyWorks	12.0.7	✓		✓	No	Select "Absolute Arm"
PowerInspect	2012	✓		✓	"Hexagon RDS"	Select "Hexagon RDS" interface
PowerShape	2013	◎		◎		Select "Hexagon RDS"
Verisurf	X5	◎		◎		
3DTubeCAD		◎				
Aberlink	v30.30	◎				
ArcoCAD		◎				
AxelSystems		◎				
BuildIT		◎				
Calypso	v6.0	◎				Select "ROMER->Absolute Arm"
CappsDMIS		◎				
DezignWorks		◎				
Geomagic	v11.0	◎		◎		Install "Absolute" plugin
Inca3D		◎		◎		
MCosmos	v3.2	◎				

Software	V° Min.				Required license	Settings
Metaio		◎				
Metride		◎				
Metrolog	Xg13	◎		◎	"ROMER Arm"	Select "ROMER RDS"
Metromec		◎				
Metrosoft		◎				
Pema		◎				
Point2CAD		◎				
Polygonia	v30.12	◎				
Rapidform		◎				
Reverseengineering.com		◎		◎		
RevWorks		◎				
Rhino	v5.0	◎				Use "ROMER digitizer"
ScanWorks	v5.5	◎				Select "Hexagon Absolute"
Tezet		◎	◎	◎		
TopMes		◎				
TopSolid	v7.7	◎				
TouchDMIS		◎				
TubeExpert		◎				
VTube Laser			◎			

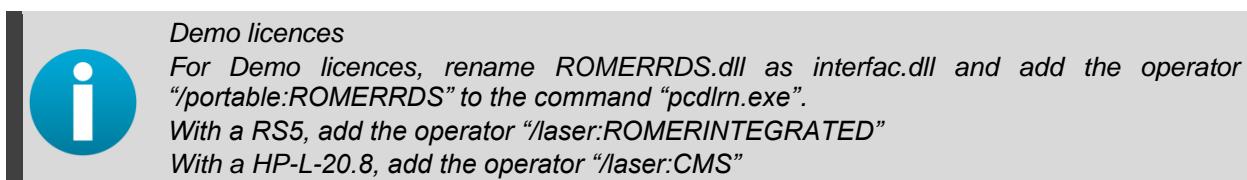
✓ : Certified by Hexagon Manufacturing Intelligence | ◎ : Implemented but not certified by Hexagon Manufacturing Intelligence.

I.2.1 PC-DMIS

	Trigger button	3-States button - Left	3-States button - Right
Short	Hit Pt. / Scan	Del Pt. / Cancel	Validate / OK
Long	Burst Pts / Scan		

Contact probing

Probes are automatically created in PCDMIS. Any time a new probe is mounted on the arm, PCDMIS selects the probe and receives all information about it from RDS.



HEXAGON® Scanners

For customer's licences, no more configuration is necessary to use one of the HEXAGON® scanners, as any contact probe, the scanners managed by RDS will be automatically recognized.

I.2.2 TUBESHAPER

	Trigger button	3-States button - Left	3-States button - Right
Short	Hit Pt.	Del Pt. / Cancel	Validate / OK
Long	Measurement menu		

I.2.3 3DRESHAPER

	Trigger button	3-States button - Left	3-States button - Right
Short	Hit Pt. / Scan	Del last patch	Validate
Long	Burst Pts / Scan		

During the 3DReshaper installation, select the RDS plug-in (for legacy versions, install the 3DReshaper RDS Plug-In).

Then when access to "Measure / Digitize", choose "RDS" (only if several plug-ins are installed).

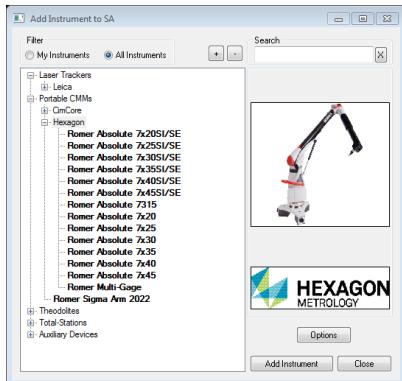
The tuning button gives access to RDS control Panel (Settings) or RDS data collector (Alignment).



I.2.4 SPATIAL ANALYZER

	Trigger button	3-States button - Left	3-States button - Right
Short	Hit Pt. / Scan		Validate
Long	Burst Pts		

Once SA is installed, access “Instrument > Add” and select the appropriate device.



I.2.5 QUINDOS7

Configuration for probing

Upon Quindos/IppServer-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.

	Trigger button	3-States button - Left	3-States button - Right
Short	Take a probing point	Equivalent to POS-button on Leitz jogbox	Execute actual line
Long	Take burst probing points until released	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 amount of points is measured. Scanning ends when a point is reached that fulfills 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!

I.2.6 ROMOSOFT (GPAD / GTUBE)

Romosoft (GPad / GTube) is not supported by the Absolute Arm.

I.2.7 DOCS

	Trigger button	3-States button - Left	3-States button - Right
Short	Hits point	Del last point	Del last point
Long	Enter measurement menu		

I.2.8 POLYWORKS

	Trigger button	3-States button - Left	3-States button - Right
Short	Hit Pt. / Scan	Delete last point / scan patch	Validate
Long	Burst Pts / Scan	Delete all points	

Device activation

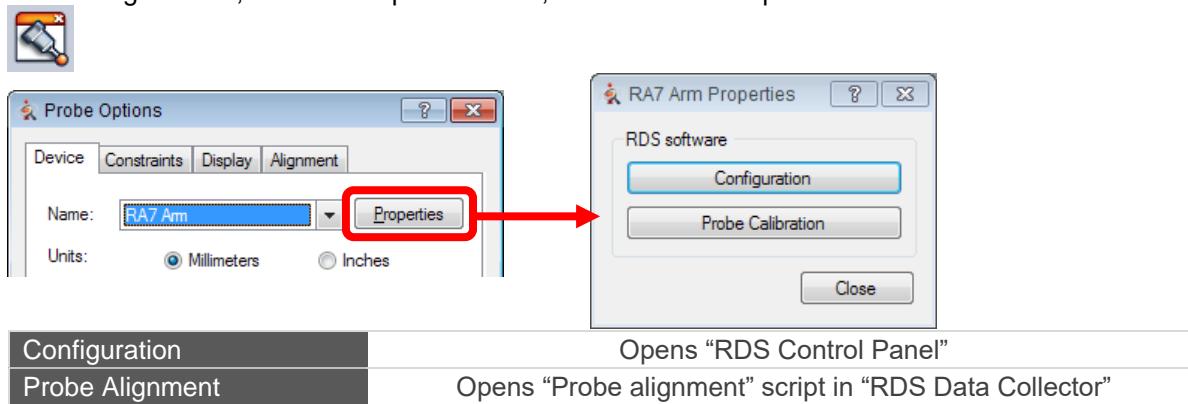
1. In the Workspace Manager, access the options > tab “Plug-ins” 
2. In the Plug-ins tab, select only “Absolute Arm and Scanning peripheral” (plus “Perceptron” in case of a Perceptron scanner).

Configuration for contact Probe (ImInspect only)

3. Start PolyWorks, then IMInspect
4. In IMInspect “Probing toolbar”, select “Absolute Arm” 
5. Click on the connection button to connect to the Arm 

Absolute Arm settings:

In “Probing toolbar”, click on the probe button, then click on “Properties”:



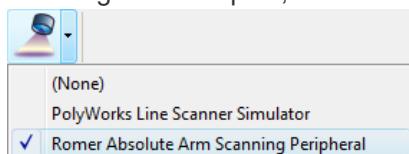
Arm buttons use for message boxes:

When a message box appears, the arm buttons can be used to make a choice in the box:

- A short press on any button (BT, B3S), switches to the next choice.
- A long press on any button validates this choice.

Configuration for HEXAGON® Scanners (RS5 / HP-L-20.8)

In ImAlign or ImInspect, click on the “Scanning” button and select “Absolute Arm Scanning Peripherals”

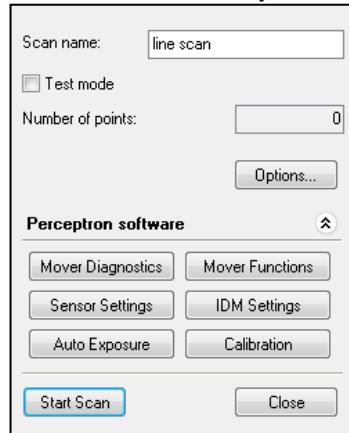


Configuration button in Absolute Arm section gives access to RDS control Panel.

- |  If toolbar is not reachable, *in the menu*, select “Tools > Plug-Ins > ROMER > Absolute Arm Scanning Peripherals”
- |  Don’t forget to save the configuration to keep it as default configuration for new projects.

Configuration for Perceptron scanner

In ImAlign or ImInspect, in the menu, select “Plug-Ins > Perceptron > Contour Probe”: Scanworks starts, then scanning, and all Scanworks tools are available directly from PolyWorks.



I.2.9 VERISURF

Trigger button		3-States button - Left		3-States button - Right	
Short	Short	Long	Long	Short	Long
Hit Pt. / Scan					

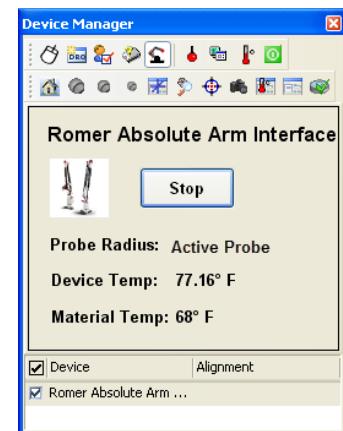
Device Setup & start

The Verisurf Device Manager typically opens on the right side of the Verisurf program. It may be accessed as well using the DRO tool button on the Measure Manager 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: 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.

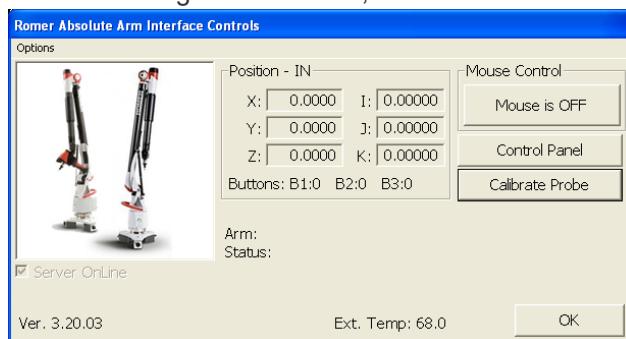


The primary instrument should be assigned to Device 1, it is not necessary to select more instruments than you have

4. Start Device – launch the “Device” directly from the “Device Setup” using the Start Device button.



5. When selecting “Start Device”, the Absolute Arm Interface Controls dialog box appears.



6. In this dialog (right), the Options menu provides access to controls for the ROMER RDS Arms.



The same controls can be quickly accessed by selecting the Buttons available in the Absolute Arm Interface Controls dialog.

There are two methods for Starting the connection:

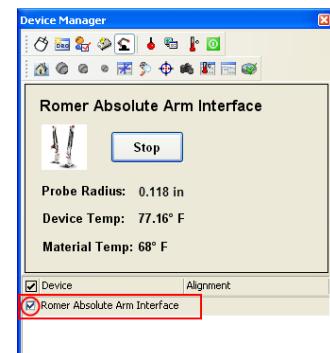
- Select the Start button in the control area.
- On the Device List, right-click on the device that you want to activate, and then choose Start Device from the speed menu (right).

Verisurf starts the device.

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.

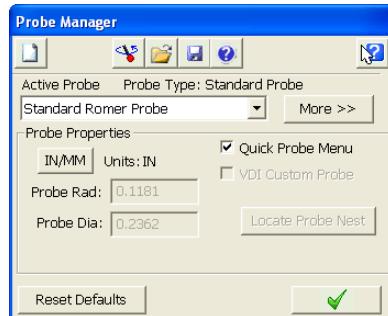
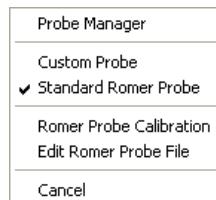
In the list of devices, check or uncheck the one to activate or not.



Probe Management

The Probe Manager allows the operator to create and manage Custom Probes. (Edit, duplicate, rename, align ...).

From the Device Manager select the Probe Icon  to open the Probe Manager quick menu, and then select Probe Manager to access the Probe Manager dialog.

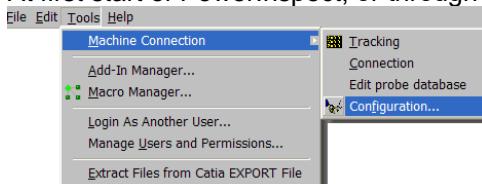


	Create/Copy Probe	Creates a new probe based on the current one. Simply rename it.
	Renaming a Probe	Available for Custom Probes only. All the probes must have a unique name.
	Deleting a Probe	Available for Custom Probes only. Delete cannot be undone.
	Align Probe	Opens RDS Data Collector.
	Loading Probe Sets	To recall a saved Probe set (*.prb file).
	Save a Probe Set	Used to save the current Probe Set to an ASCII File (*.prb file). This is useful to backup or archive your probes for loading or restoring later.
	Help	

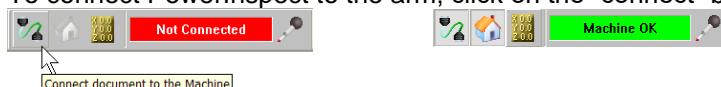
I.2.10 POWERINSPECT

	Trigger button	3-States button - Left	3-States button - Right
Short	Hit Pt. / Scan	Delete last point	Validate
Long	Burst Pts / Scan	Delete all points	

At first start of PowerInspect, or through the menu, select the type of measuring system: "**Hexagon RDS**".



To connect PowerInspect to the arm, click on the “connect” button.



Wait few seconds after press buttons to start first scan.



It is strongly recommended to use scanner filters to decrease the number of points for geometric items.

I.2.11 POWERSHAPE

	Trigger button	3State button - Left	3State button - Right
Short	Hit Pt. / Scan	Del Pt. / Cancel	Validate / OK
Long	Burst Pts / Scan		

Configuration for contact probes

Basic version of PowerShape can be used with contact probes.

After PowerShape installation (V2013 minimum), install the CMM driver provided by Autodesk.

Once PowerShape is run, click on the Arm connection button on the bottom toolbar. The system is ready



Configuration for Scanners

PowerShape Pro is necessary to be used with HEXAGON® arm scanners.

After PowerShape installation (V2013 minimum), install the CMM driver provided by Autodesk.

Once PowerShape-Pro is run, click on the Arm connection button for Probing or on the laser button for scanning. The system is ready



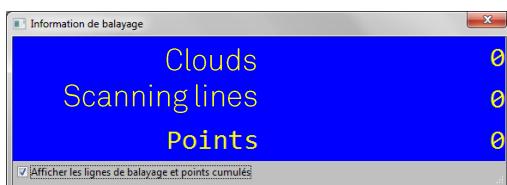
CMM toolbar

Once the arm (contact probe) or scanner are connected, a toolbar is available:



- Close the toolbar
- Open the Autodesk driver CMM selection box
- Connect to the arm
- Access probe alignment
- 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

The status window for the scan Shows the stripes information in real time:



Number of clouds
Total amount of stripes
Total amount of scan points for the current cloud

I.2.12 METROLOG / µLOG

	Trigger button	3State button - Left	3State button - Right
Short	Hit Pt. / Scan	Validate	Validate
Long	Burst Pts		

Configuration for contact Probe

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. Enter user name and password then Next



2. Skip following window by "Next"



3. On next window, select "type of machine": "Absolute RDS" and check "Automatically recall last probes file" then click on "Next".



4. Finish the configuration by clicking on "Save"



5. Run Metrolog Xg software, the probe is automatically recognized and activated, and the system is ready to use.

Configuration for HEXAGON® scanners (RS5 / HP-L-20.8)

Once Metrolog is installed, run Metrolog configuration program (in case it doesn't start automatically: Start Menu > All Programs > Metrolog > Configuration Assistant).

1. Enter your user name and password then Next



2. Skip following window by "Next"



3. On next window, select "type of machine": "ROMER Absolute SI RDS" or "ROMER Absolute SE CMS108 RDS" and tick "Automatically recall last probes file" then click on "Next".



4. Finish the configuration by clicking on "Save"



5. Run Metrolog software, probe is automatically recognized and activated, the system is ready to use.

Configuration for Perceptron

Once Metrolog is installed, run Metrolog configuration program (in case it doesn't start automatically: Start Menu > All Programs > Metrolog XG > Configuration Assistant).

1. Enter your user name and password then Next



2. Skip following window by "Next"



3. On next window, select “type of machine”: “Perceptron via Scanworks”



4. On same window, for Protocol version, choose “ROMER RDS”.
5. Tick “Automatically recall last probes file” then click on “Next”.
6. Finish the configuration by clicking on “Save”



I.2.13 GEOMAGIC

	Trigger button	3State button - Left	3State button - Right
Short	Hit Pt. / Scan		Validate / OK
Long			

Configuration for probing or HEXAGON® scanners

After Geomagic installation, install “Absolute Probing” and “Absolute Scanning” plug-ins
In Qualify or Studio, «material» tab, select “Hexagon Absolute Probing” or “Hexagon Absolute Scanning”



Configuration for Perceptron

After Geomagic installation, run “Perceptron SetUp.exe” plug-ins installation.
In Qualify or Studio, «material» tab, select “Perceptron Plug-ins”:



I.2.14 ABERLINK

	Trigger button	3State button - Left	3State button - Right
Short	Hit Pt	Cancel	Validate
Long	Burst Pts		

Aberlink3D

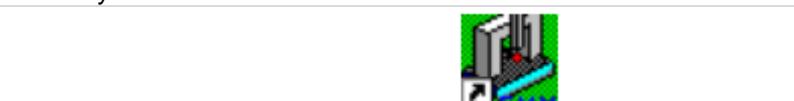
Aberlink3D is designed to work with many different kinds of measuring devices including manual CMM's, CNC's, arms and vision systems. Installation is the same whatever device you are using. The Green Keylock Dongle will define which options can be accessed by Aberlink3D via machine set up -> scales. Please see "Aberlink3D Keylock Installation".

Run the setup.exe from the CD. Click next until you come to the select components - custom installation. Choose "Retrofit". In practice it makes no functional difference which option you choose. This option only sets the reference picture and relevant section of the language file, neither of which is used by the Absolute Arm. Click through the next windows. Various other packages will be installed i.e. .Net framework etc. Again, these are standard installs, just follow the prompts and select the default settings.

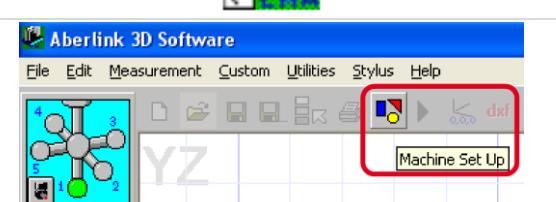
Configuring Aberlink3D

The following steps must be carried out by an administrator.

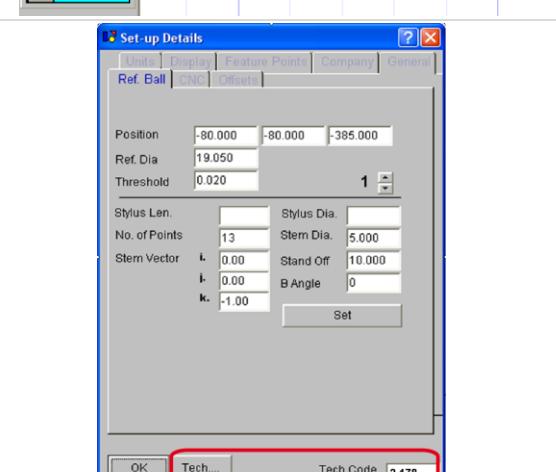
Start Aberlink 3D



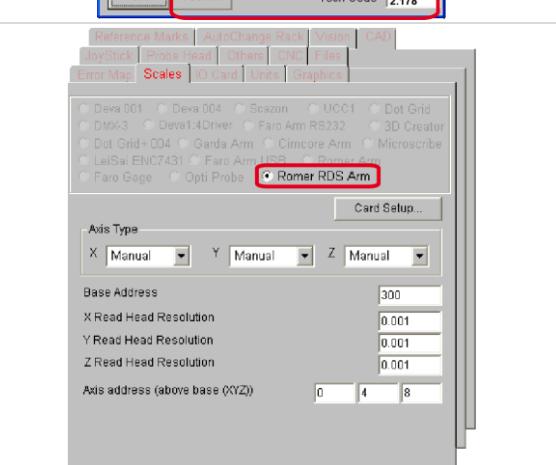
Open the 'Setup' form (using the  button).



Use the 'Tech...' button (code 2.718) to open the technical details side of the form.



Use the default settings you will need to check

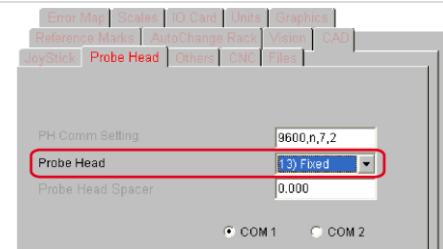


Tab Scales - set the 'ROMER RDS Arm' radio button.

Tab Reference Marks - Reference Marks used is unticked



Tab Probe Head - 13) Fixed

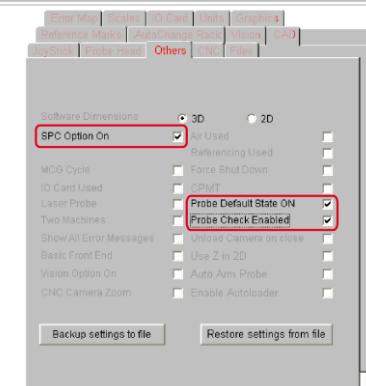


Tab Others - All options unticked - except

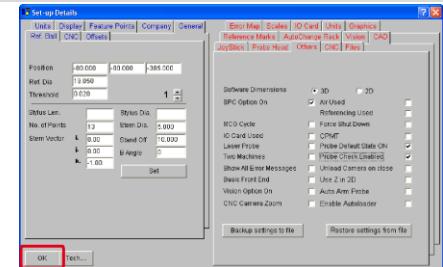
SPC option is ticked

Probe default state is ticked

Probe check enabled is ticked

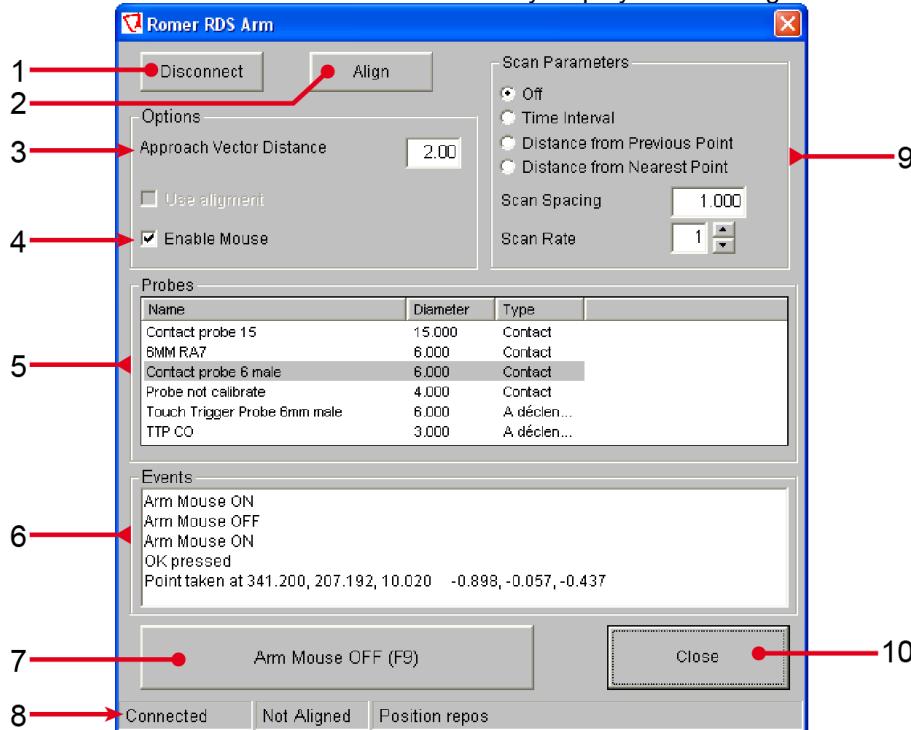


Close the setup form then close down and restart
Aberlink3D



Using Aberlink3D

A ROMER RDS Arm window is automatically displayed to manage the Arm.



1 Disconnect / Connect This button can be used to disconnect the ROMER RDS Arm. This is not normally required. When disconnected, this button changes to a 'Connect' button

2 Align This button brings up the XYAlign form that allows the user to define a new (approximate) reference frame by taking measurements at the new origin, at a point on the positive X axis and at a point on the XY plane with a positive Y value. Once an alignment has been set up, the 'Use alignment' check box is enabled and checked. Whilst the check box is checked, all measurements taken will be mapped from raw arm coordinates to the new reference frame. The user can set up a new alignment at any time (using the Align button) or disable an existing alignment by un-checking the 'Use alignment' check box.



Note that this function is generally used to define an approximate alignment frame – with final alignments set by measuring features and setting them as references within the Aberlink 3D measurement software in the usual way.

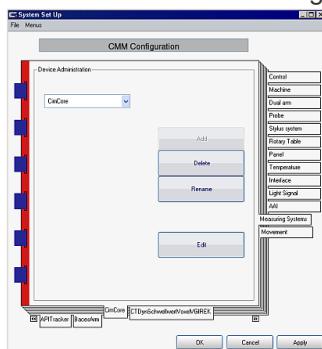
3	Approach vector distance	For correct probe tip diameter compensation, Aberlink 3D uses the 'approach vector' to the measurement, i.e. the direction in which the probe moved to reach the measurement point. The approach vector is calculated from the measurement point and a recent probe position at least that is at least the 'approach distance' away from the measured point. When a measurement is taken with the arm, it is common for the probe to 'skate' a small distance on the surface around the measurement point. Since small probe movements less than approach distance do not affect the approach vector, these skating movements do not matter. A typical value for this setting is 2mm.
4	Enable Mouse	This checkbox can be used to enable/disable the arm's remote mouse functionality.
5	Probes	The list box contains details of all the probes in the memory of the arm.
6	Event History	The window to the left of the Close button displays a history of recent arm events. For measurements, the coordinates are shown and also the approach vector. The most recent event is at the top of the window.
8	Mouse Control Button	This button can be used to change between Measure mode and Mouse mode. Its caption changes to indicate what will happen if it is pressed. The same effect can be obtained by pressing the F9 key on the keyboard.
9	Scan parameters	<p>In this context, 'scanning' means taking multiple measurements by holding down the Button 1 and moving the probe.</p> <p>Off: To disable scanning, choose this option.</p> <p>Time Interval: In this mode, Aberlink 3D will take a measurement at a regular interval whilst Button 1 is depressed, at a rate controlled by the 'Scan Rate' setting. This may be set from 1 (one measurement per second) to 10 (ten measurements per second).</p> <p>Distance from Previous Point: In this mode, Aberlink 3D will take a measurement when the probe has moved by at least 'Scan Spacing' from the previous point and whilst Button 1 is depressed.</p> <p>The spacing is set in mm or inches, depending on whether Aberlink 3D is configured for metric or imperial units.</p> <p>Distance from Nearest Point: In this mode, Aberlink 3D will take a measurement when the probe is at least 'Scan Spacing' from the nearest point already measured in the current feature and whilst the Button 1 is depressed.</p> <p>The spacing is set in mm or inches, depending on whether Aberlink 3D is configured for metric or imperial units.</p>
9	Status bar	The status bar at the bottom the ROMER Arm form shows the connection status and the alignment status.
10	Close	This button causes the ROMER Arm form to be minimised on the task bar.

I.2.15 CALYPSO

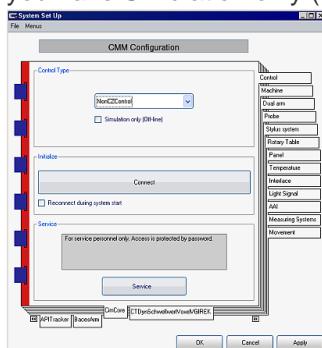
	Trigger button	3State button - Left	3State button - Right
Short	Hit Pt. / Scan		Validate
Long			

Always press the "Apply" button before switching to a different tab when you have made any changes.

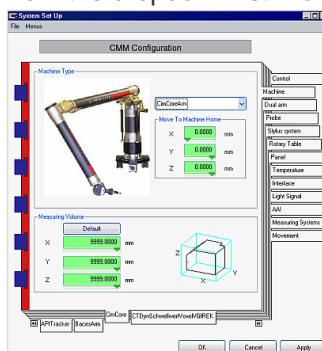
- To define a new CMM in the Administration tab create a new controller by typing a name and pressing Enter and then clicking the Add button.



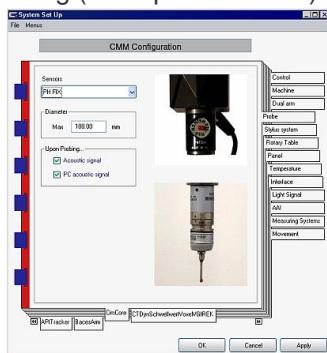
- In the Control tab define the controller: Select NonCZControl from the Controller selection. Make sure you have Simulation only (offline) unchecked.



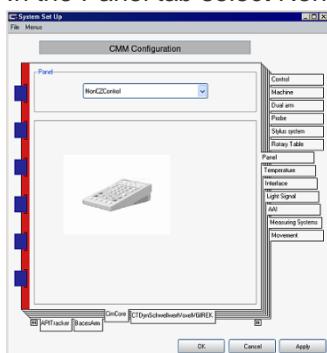
- In the Machine tab define the machine properties. Please select Non-CZControl ® ROMERRDSArm from the dropdown list. For more details see the Calypso User Guide.



4. In the Probe tab select PH FIX® TPxx as the probing system regardless of what probe you are actually using (Solid probe or TP2).

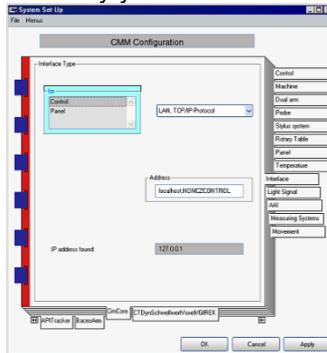


5. In the Panel tab select NonCZControl as control panel.



6. Define the connection parameters: On the tab Interface you enter the hostname of the computer, on which the ROMER Interface is installed.

Normally you enter "localhost, NONCZCONTROL" in the address field while Control is selected.



The settings for Panel don't need to be changed.

I.2.16 RHINOCEROS

	Trigger button	3State button - Left	3State button - Right
Short	Hit Pt.		Validate
Long	Burst Pts		

Configuration for contact probes

In the menu of Rhino V5 select “Tools > 3D digitizer > Connect”

Then select the type of digitizer: “ROMER digitizer”.

I.3 TECHNICAL SPECIFICATIONS

I.3.1 DIMENSIONS AND WEIGHTS:

Arm dimensions and weights (C & E lengths: see after)

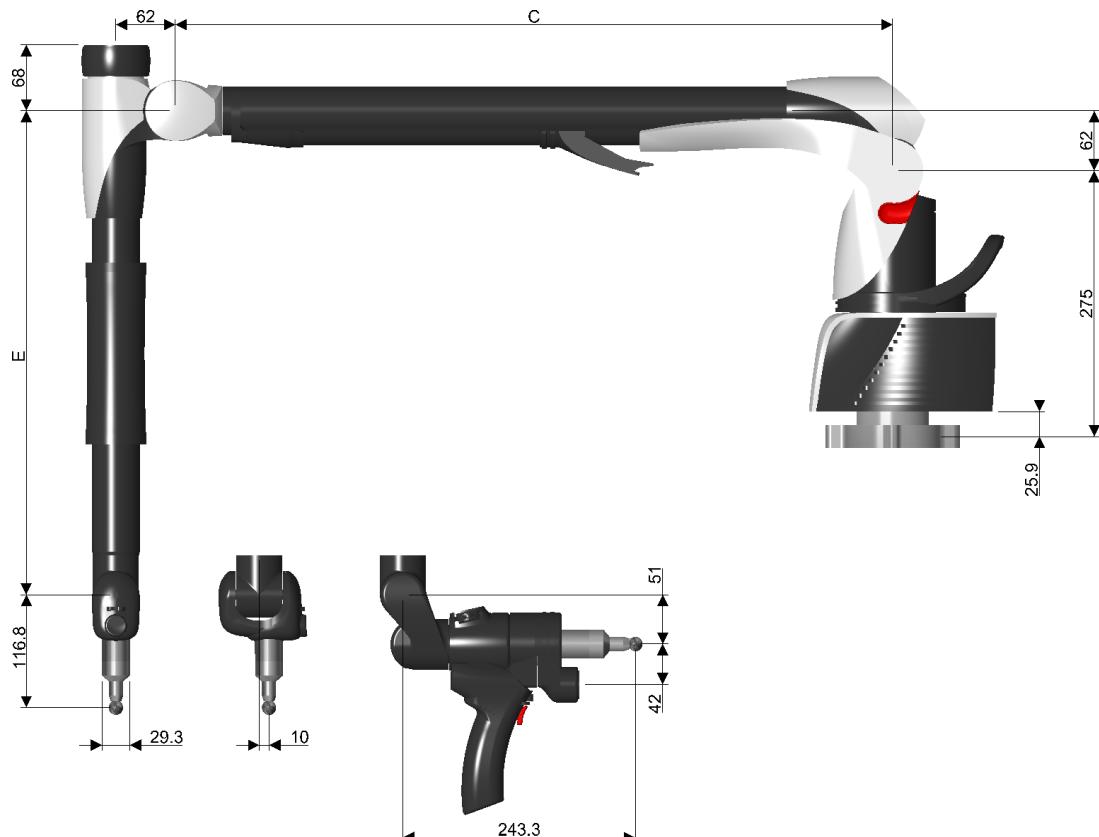


Fig. 41 : Absolute Arm 2.0 to 4.5 dimensions (mm)

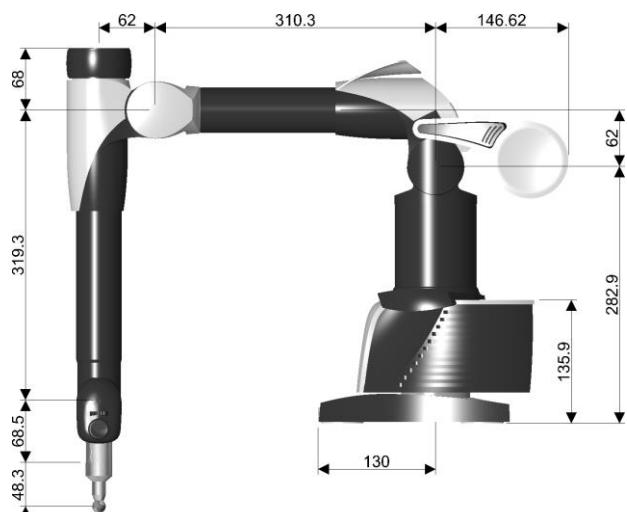


Fig. 42 : Absolute Arm Compact 1.2 dimensions (mm)

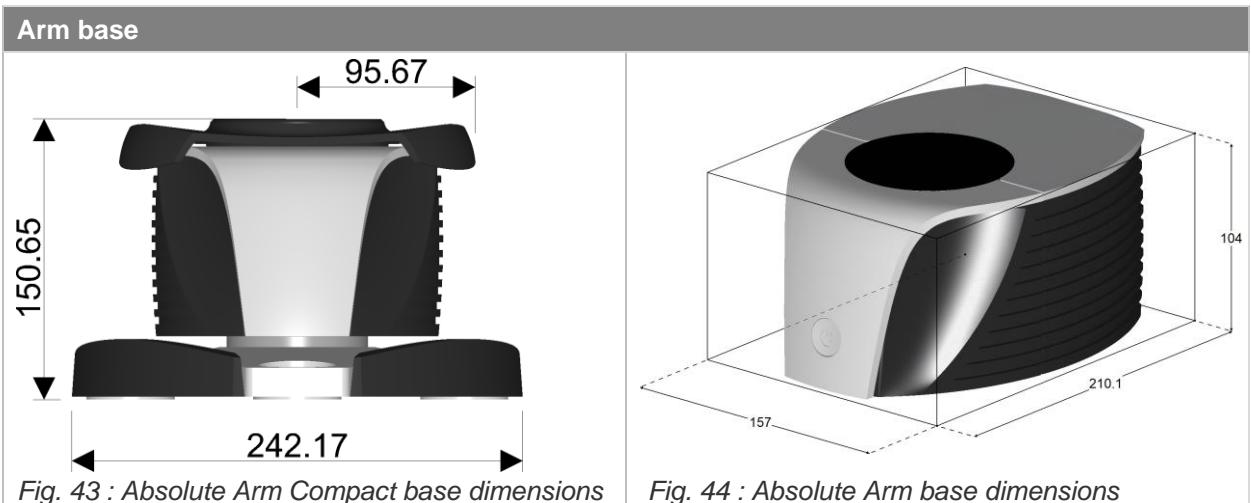
Arm	Tubes lengths (mm)				Weights (kg)*				
					6 axes		7 axes**		
	C	E	83-6	85-6	87-6	83-7	85-7	87-7	
1200	310	319	12.1	12.2	-	-	-	-	-
2000	600	400	7.8	8	-	8.8	9	-	-
2500	750	500	8.1	8.3	8.3	9.1	9.3	9.3	
3000	900	600	8.4	8.6	8.6	9.4	9.6	9.6	
3500	1050	700	8.7	8.9	8.9	9.7	9.9	9.9	
4000	1200	800	9	9.2	9.2	10	10.2	10.2	
4500	1350	900	9.3	9.5	9.5	10.3	10.5	10.5	

* : weights with no Mounting base, no Control Pack, no probe

**: weights with a RS5

Axes Permissible Angles and Resolutions				
Axis	Min angle (rd.)	Max Angle (rd.)	Accuracy	Resolution
A	∞ infinite rotation		0.5 "	0.07 "
B	-0.94	1.42	0.5 "	0.07 "
C	∞ infinite rotation		0.5 "	0.07 "
D	-1.35	1.22	0.5 "	0.07 "
E	∞ infinite rotation		0.5 "	0.07 "
F	6 axes	-1.71	1.71	0.5 "
	7 axes			0.5 "
G	∞ infinite rotation		0.5 "	0.07 "

	CP0	CP1	CP2	CP3	1 Battery
Weight	335g	440g	760g	1000g	245g



Travel case dimensions and weights

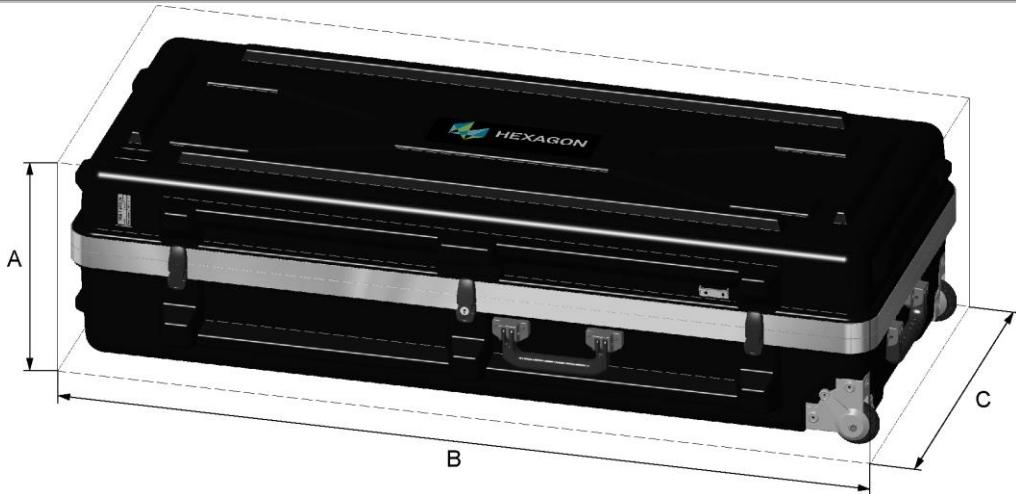
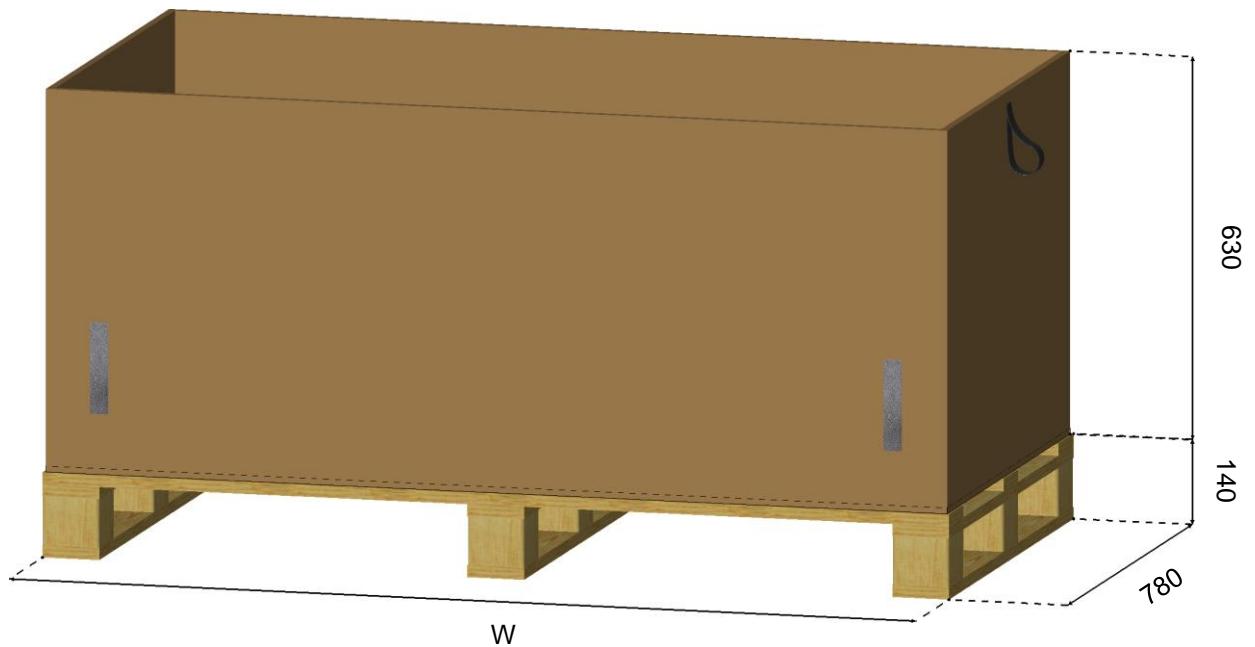


Fig. 45: Travel case dimensions

Arm size	Size (mm)	Weight ^(*) (kg)	
	A x B x C	83	85
1200			87
2000	360 x 1330 x 605		
2500			
3000	360 x 1630 x 605		
3500			
4000	360 x 1930 x 605		
4500			
Accessory case	101 x 420 x 260		

^{*}: The weight of the travel case includes all accessories inside the case

Wrap expedition box



Arm size		Inside dimensions	Overall dimensions
1200			
2000	Small	1485 x 745 x 620	1520 x 780 x 783
2500			
3000	Medium	1780 x 745 x 620	1810 x 780 x 783
3500			
4000	Large	2080 x 745 x 620	2110 x 780 x 783
4500			

Mounting ring

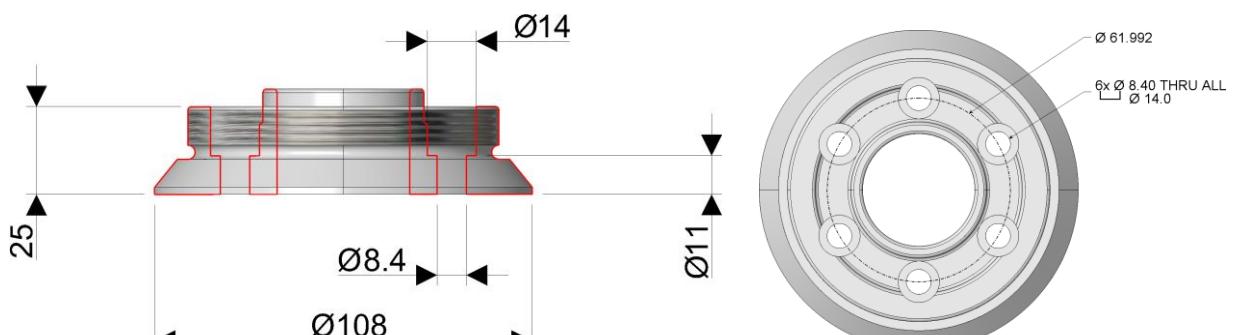
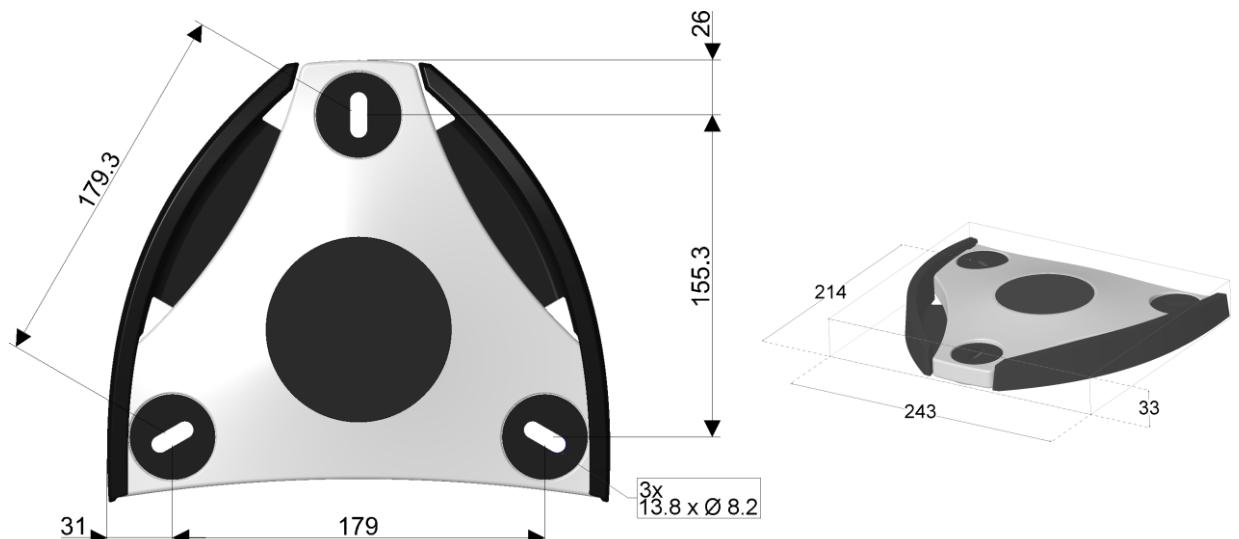
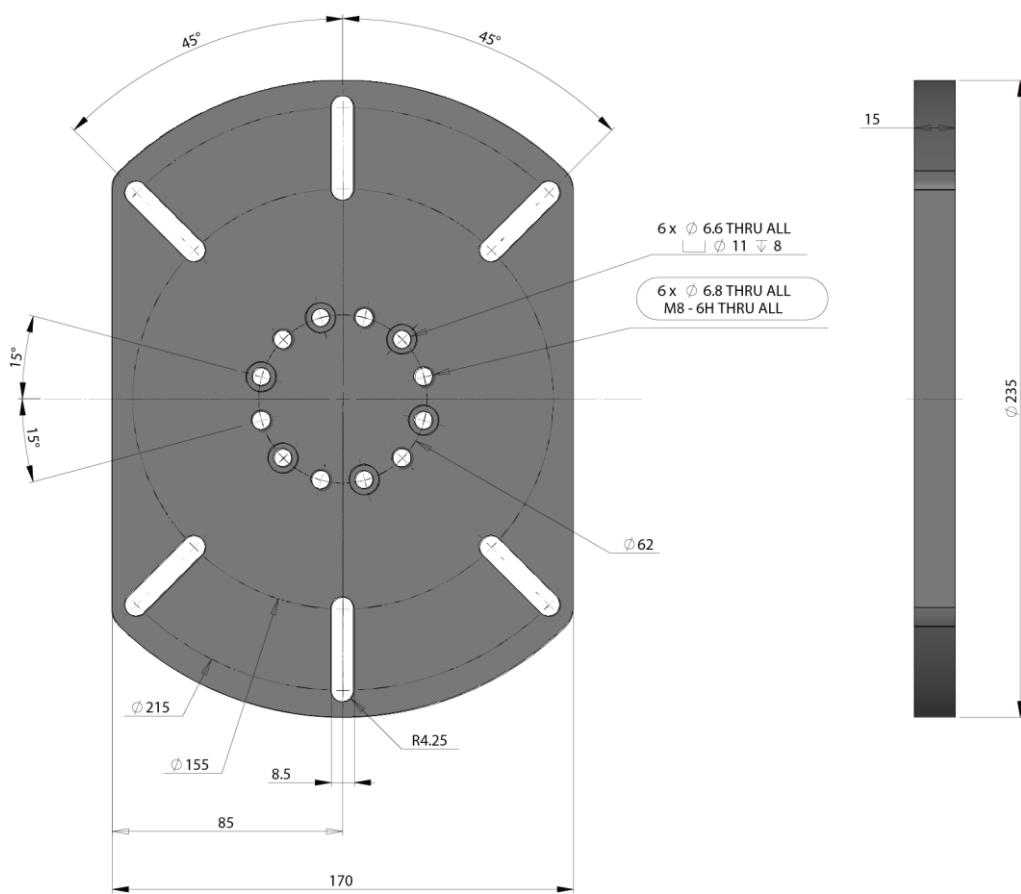


Fig. 46 : Mounting ring dimensions

Absolute Arm Compact base

Fig. 47 : Absolute Arm Compact base plate dimensions
Mounting Plate

Fig. 48 : Base plate dimensions

Magnetic Base

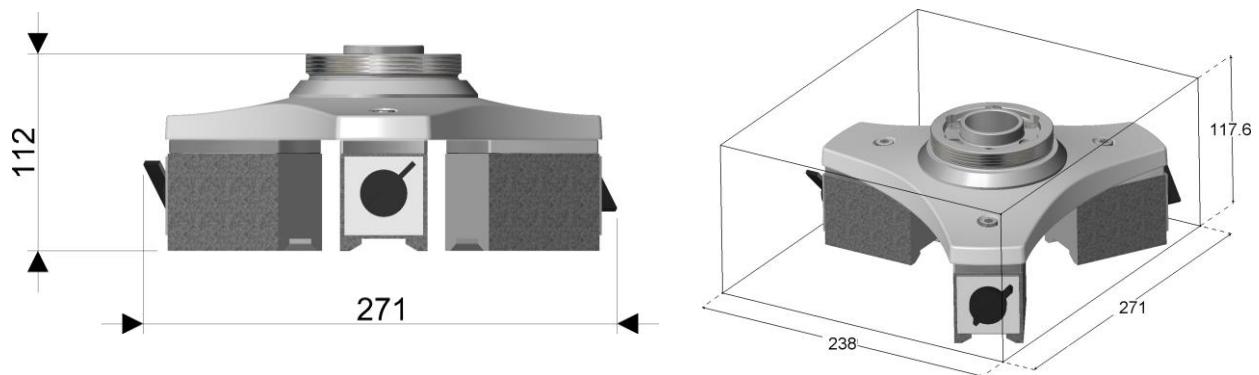


Fig. 49 : Magnetic Base dimensions

Vacuum mounting base

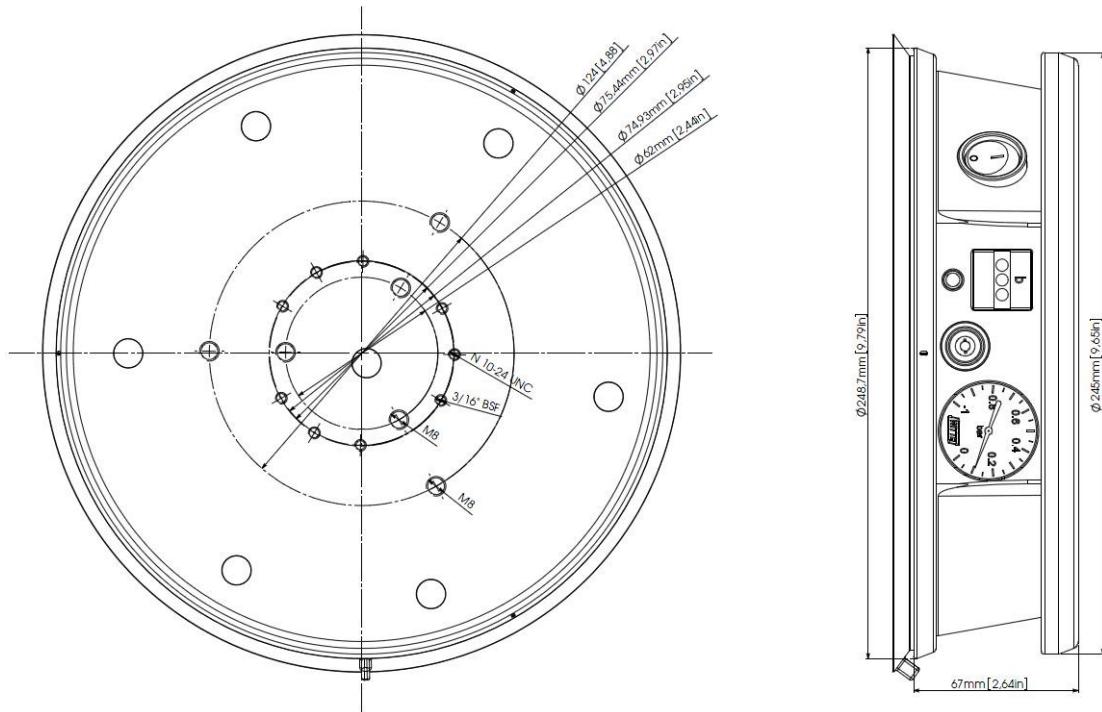


Fig. 50 : Vacuum base dimensions

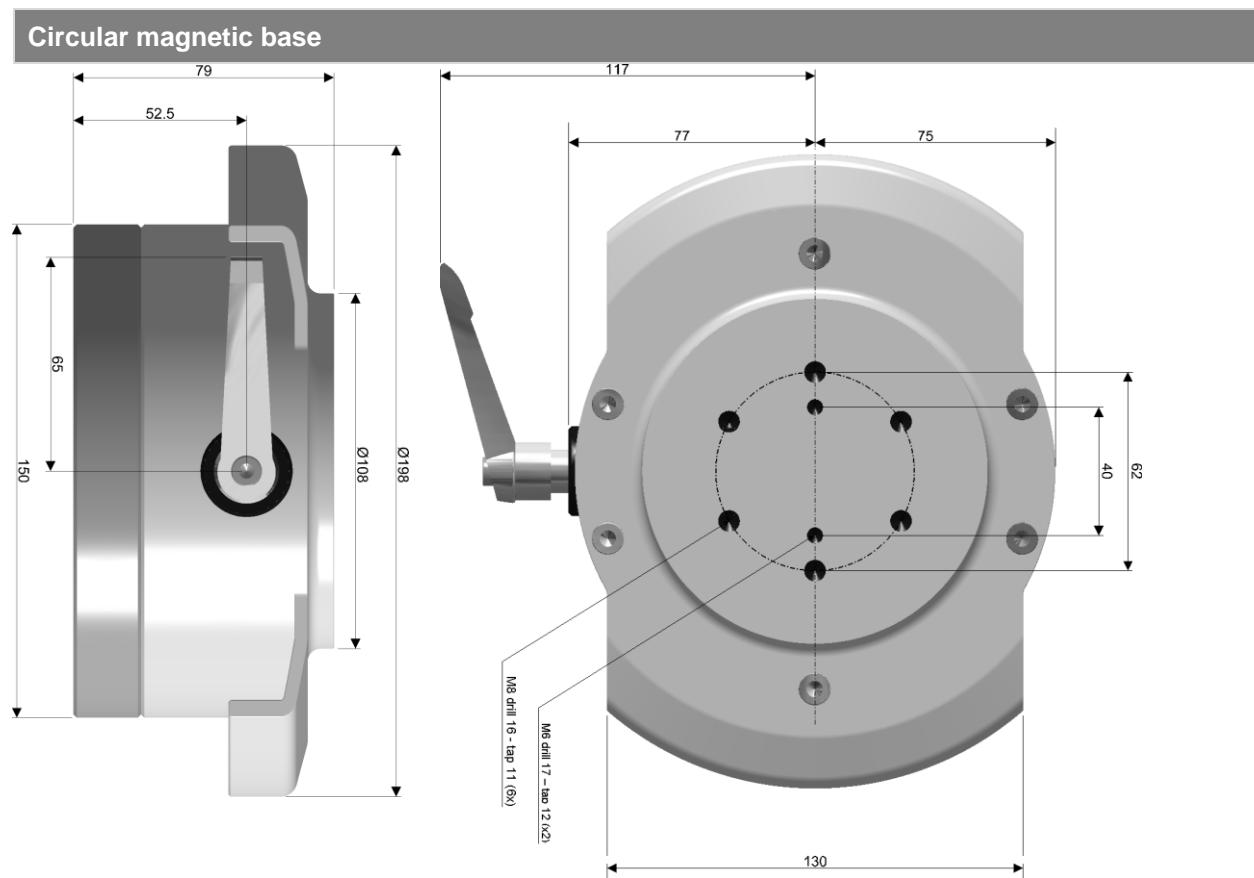
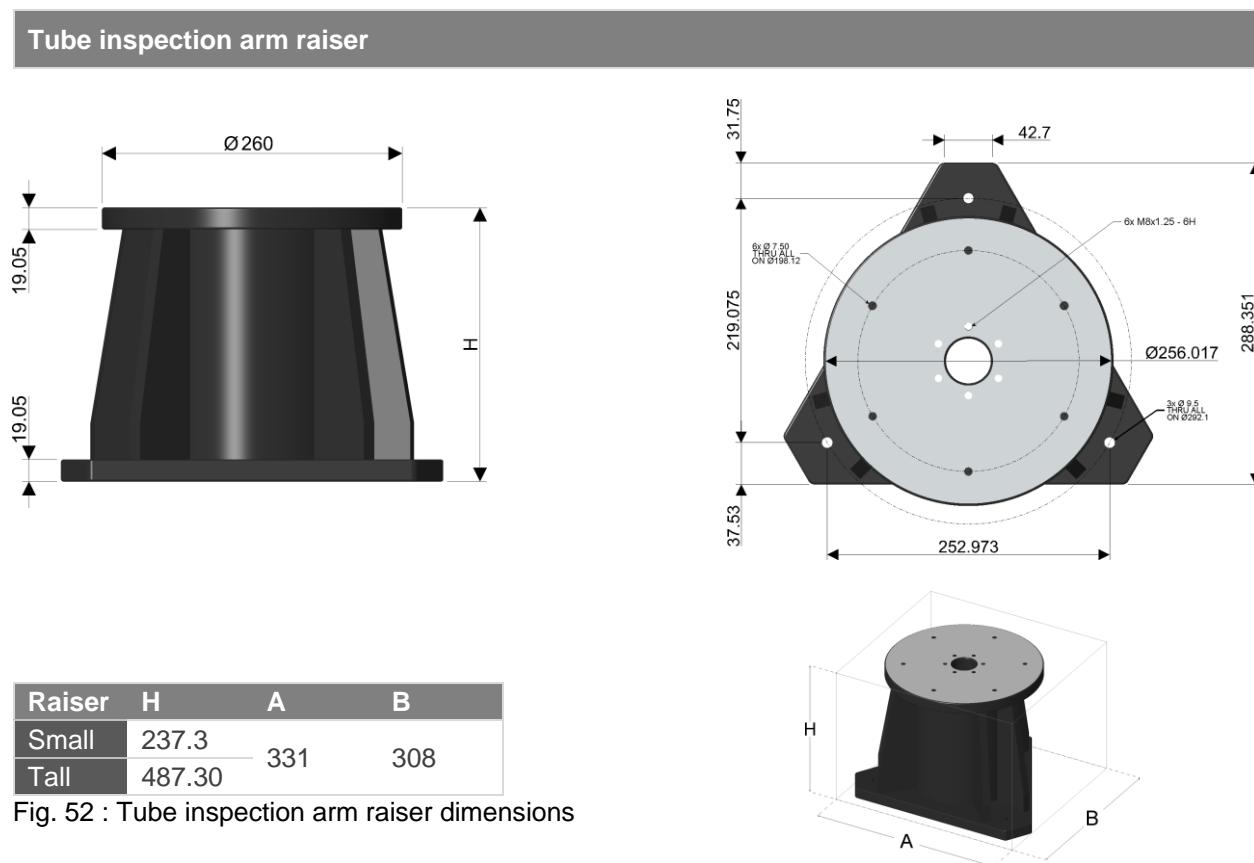
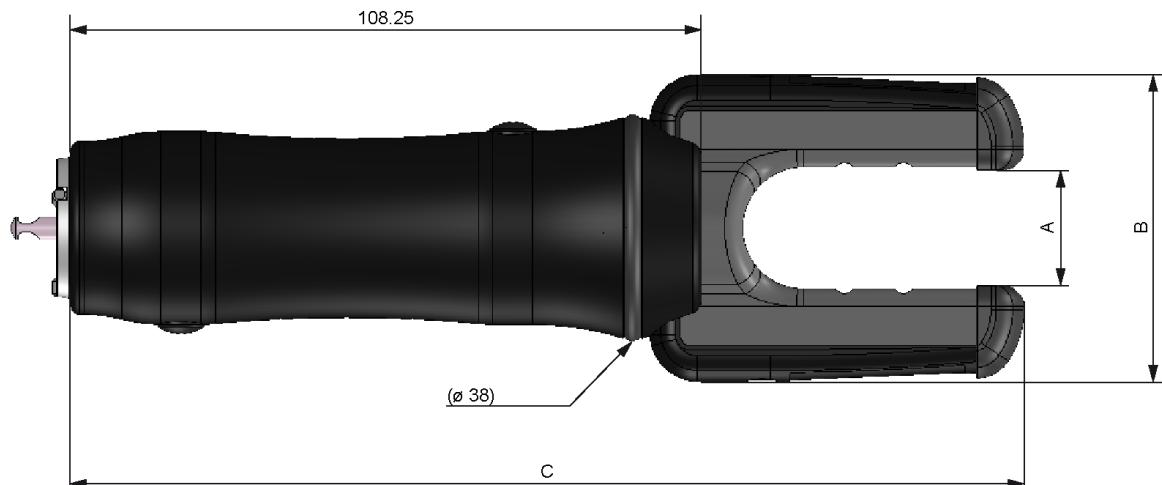


Fig. 51 : Circular magnetic base dimensions



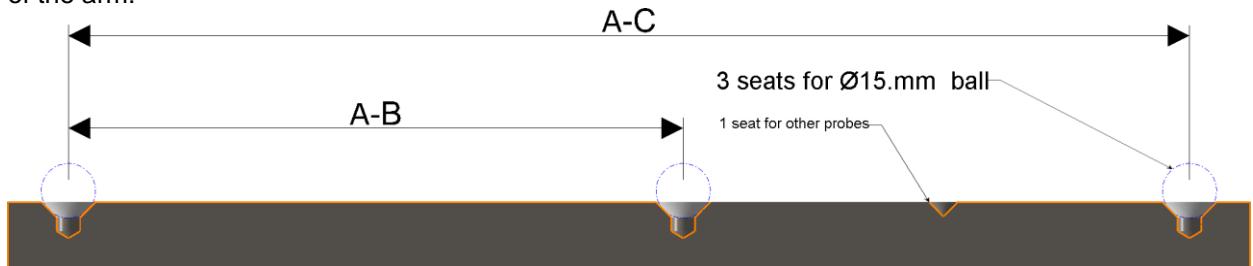
Tube probes



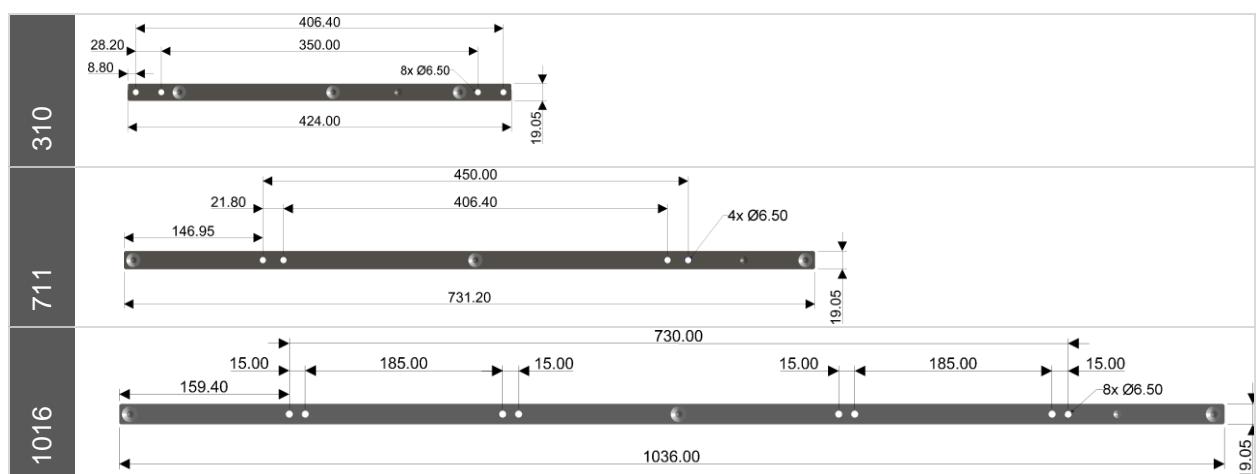
NCP	Size	A	B	C
1	(12.5)	19	51.5	160.25
2	(25)	31	65	177
3	(50)	57	91	212.5
4	(75)	82	117	246
5	(100)	107	143	280
6	(150)	157	194	348.5

Verifications bars (87)

The standard steel verification bars, included in all the 87 cases, have different size according to the size of the arm:



Arm size	Bar size (mm)	A-B	A-C	Exact lengths
1.2	310	(170)	(310)	
2.0				
2.5	711	(362)	(711)	
3.0				See the exact values on the bar.
3.5				
4.0	1016	(515)	(1016)	
4.5				



Calibrated values at 20°. Bars in steel, with a Coefficient of Thermal Expansion of 13 µm.m⁻¹.°C⁻¹ ± 2µm

I.3.2 ISO 10360-12 PROBING SPECIFICATIONS

The following data represent the accuracies of the different sizes and levels of Absolute Arm.



ISO 10360-2 specifications for the 1.2 arm:

MPE _p	MPEe
8312 8 µm	5 + L/40 ≤ 18 µm
8512 6 µm	5 + L/65 ≤ 15 µm

Absolute Arm 6-Axis probing accuracy and size specifications

Type	Size	E _{UNI.MPE} (mm)	P _{SIZE.Sph.1x25} (mm)	L _{Dia.5X5.Art.MPE} (mm)	P _{FORM.Sph.1x25} (mm)
83 series	8312-6 1.2m (3.9ft)	0.024	0.010	0.021	0.018
	8320-6 2.0m (6.5ft)	0.040	0.013	0.042	0.026
	8325-6 2.5m (8.2ft)	0.046	0.020	0.053	0.038
	8330-6 3.0m (9.8ft)	0.067	0.029	0.071	0.054
	8335-6 3.5m (11.5ft)	0.085	0.038	0.090	0.063
	8340-6 4.0m (13.1ft)	0.100	0.046	0.105	0.077
	8345-6 4.5m (14.8ft)	0.120	0.052	0.110	0.086
85 series	8512-6 1.2m (3.9ft)	0.019	0.006	0.016	0.012
	8520-6 2.0m (6.5ft)	0.023	0.008	0.030	0.017
	8525-6 2.5m (8.2ft)	0.028	0.010	0.035	0.020
	8530-6 3.0m (9.8ft)	0.042	0.015	0.053	0.030
	8535-6 3.5m (11.5ft)	0.055	0.020	0.069	0.040
	8540-6 4.0m (13.1ft)	0.067	0.024	0.085	0.045
	8545-6 4.5m (14.8ft)	0.080	0.028	0.102	0.050
87 series	8725-6 2.5m (8.2ft)	0.026	0.009	0.032	0.018
	8730-6 3.0m (9.8ft)	0.039	0.014	0.048	0.028
	8735-6 3.5m (11.5ft)	0.052	0.018	0.064	0.037
	8740-6 4.0m (13.1ft)	0.063	0.022	0.079	0.041
	8745-6 4.5m (14.8ft)	0.074	0.026	0.094	0.046

Absolute Arm 7-Axis probing accuracy and size specifications

	Type	Size	E _{UNI.MPE} (mm)	P _{SIZE.Sph.1x25} (mm)	L _{Dia.5X5.Art.MPE} (mm)	P _{FORM.Sph.1x25} (mm)
83 series	8320-7	2.0m (6.5ft)	0.043	0.016	0.054	0.033
	8325-7	2.5m (8.2ft)	0.048	0.023	0.060	0.043
	8330-7	3.0m (9.8ft)	0.078	0.034	0.090	0.058
	8335-7	3.5m (11.5ft)	0.092	0.042	0.115	0.067
	8340-7	4.0m (13.1ft)	0.114	0.051	0.140	0.084
	8345-7	4.5m (14.8ft)	0.158	0.078	0.168	0.106
85 series	8520-7	2.0m (6.5ft)	0.029	0.010	0.038	0.021
	8525-7	2.5m (8.2ft)	0.031	0.012	0.048	0.025
	8530-7	3.0m (9.8ft)	0.057	0.020	0.083	0.038
	8535-7	3.5m (11.5ft)	0.069	0.024	0.099	0.045
	8540-7	4.0m (13.1ft)	0.084	0.030	0.120	0.050
	8545-7	4.5m (14.8ft)	0.113	0.048	0.140	0.065
87 series	8725-7	2.5m (8.2ft)	0.029	0.011	0.044	0.023
	8730-7	3.0m (9.8ft)	0.053	0.018	0.076	0.035
	8735-7	3.5m (11.5ft)	0.064	0.022	0.092	0.041
	8740-7	4.0m (13.1ft)	0.078	0.028	0.110	0.046
	8745-7	4.5m (14.8ft)	0.104	0.044	0.125	0.060

Absolute Arm -T probing accuracy and size specifications

	Type	Size	E _{UNI.MPE} (mm)	P _{SIZE.Sph.1x25} (mm)	L _{Dia.5X5.Art.MPE} (mm)	P _{FORM.Sph.1x25} (mm)
83-T series	8325-T	2.5m (8.2ft)	0.058	0.025	0.066	0.048
	8330-T	3.0m (9.8ft)	0.084	0.036	0.089	0.068

I.3.3 ISO 10360-8 ANNEX D SCANNING SYSTEM ACCURACY

The following data represent the accuracies of the different sizes and levels of Absolute Arm, according to the ISO 10360-8 Annex D standard.

Precision test is done on a grey sphere, scanned from 5 orientations of the arm. The result is the 3D max distance (centre to centre) from the 5 spheres.

All RS5 scanning specifications are achieved with an Absolute Arm mounted on a base plate or magnetic base plate and a matte grey sphere artefact of 25.4mm diameter under stable environment conditions.

All HP-L-20.8 scanning specifications are achieved with an Absolute Arm mounted on a base plate or magnetic base plate and using a HP-L-20.8 zoom setting 2A (mid-range scan width 63mm) and a matte grey sphere artefact of 25.4mm diameter under stable environment conditions.

The accuracy specifications are not guaranteed for a use with any other accessory such as stand.

Absolute Arm 7-Axis Scanning System Accuracy (L_{DIA})

Model	Size	RS5 L_{DIA} (mm)	HP-L-20.8 L_{DIA} (mm)
83 series	8320-7 2.0m (6.5ft)	0.062	0.062
	8325-7 2.5m (8.2ft)	0.068	0.068
	8330-7 3.0m (9.8ft)	0.092	0.092
	8335-7 3.5m (11.5ft)	0.105	0.105
	8340-7 4.0m (13.1ft)	0.122	0.122
	8345-7 4.5m (14.8ft)	0.172	0.172
85 series	8520-7 2.0m (6.5ft)	0.045	0.045
	8525-7 2.5m (8.2ft)	0.048	0.048
	8530-7 3.0m (9.8ft)	0.066	0.066
	8535-7 3.5m (11.5ft)	0.080	0.080
	8540-7 4.0m (13.1ft)	0.091	0.091
	8545-7 4.5m (14.8ft)	0.148	0.148
87 series	8725-7 2.5m (8.2ft)	0.044	0.044
	8730-7 3.0m (9.8ft)	0.058	0.058
	8735-7 3.5m (11.5ft)	0.071	0.071
	8740-7 4.0m (13.1ft)	0.082	0.082
	8745-7 4.5m (14.8ft)	0.127	0.127

I.3.4 TUBE PROBES SPECIFICATIONS

The full tube measurement system accuracy is defined exclusively with the new tube probe generation (rebranded tube probes) and can't be applied with the previous tube probe versions.

Type	Size	Tube probe alone accuracy	Global accuracy on the arm with Tube probe
1	12.5		
2	25		
3	50		
4	75	± 0.1 mm	E_{UNI.MPE} + 0.1mm
5	100		
6	150		

The tube measurement system accuracy is defined as following:

Accuracy = Volumetric arm accuracy ($E_{UNI.MPE}$) + Tube probe accuracy

E.g. Tube measurement system accuracy with an Absolute Arm 8325T:

Accuracy = 0.058mm + 0.1mm = 0.158mm

I.3.5 CE COMPLIANCY AND OTHER SPECIFICATIONS:

Temperature	
Storage temperature	-30°C to 70°C (-20°C to 50°C if battery is installed) (-22°F – 158°F)
Ambient temperature for probing and scanning operations	5°C to 40°C (41°F – 104°F)

Permissible Environment Conditions		
Use	Indoor only	
Humidity	Maximum relative humidity 80 % for temperatures up to 31 °C decreasing linearly to 50 % relative humidity at 40°C 95% non-condensing.	
Pollution	Degree 2	
Vibration	(55 to 2000Hz): <= 100m/s ²	EN 60 068-2-6
Shock	(6ms): <=1000m/s ²	EN 60 068-2-27
Altitude	Up to 2000m (6000 ft.)	
Vibration during transportation	(Arm in hard case) ISO 9022-3:1998-0710 to 150 Hz ± 0.15 mm, 2g . 20 sweeps/ axis at 1 octave/min	

Acceleration	
Permissible angular	105rad/s ²
Vibration maximum	55-2000Hz (IEC 68-2-27)
Shock and Impact	6ms (IEC 68-2-27) Safety

Electrical Rating of the Arm	
Main voltage	15 VDC
Max current.	3.0 Amps
Mains supply voltage	up to ±10% of the nominal fluctuations
Oversupply	Category II

Wired Communication		
USB	Type	Type 2.0 HS
	Speed	High (480Mb/s)
		Auxiliary sensor passes through data bus on selected 7 axes models (CP1, CP2)
	Connector	4-pin / contact dia. 0.9mm
Ethernet	Type	High speed Ethernet 1000 Base-T

Wi-Fi	
Antenna	Built-in antenna
Frequency	<ul style="list-style-type: none"> • IEEE802.11g (2.4 GHz): channels 1 - 13 (2412 - 2484 MHz) • IEEE802.11a (5 GHz): channels 36 - 165 (5180 - 5824 MHz). <p>Some channels may not be authorised in some countries, the configuration must be changed with RDS Toolbox (please refer to the RDS user manual). Especially for Europe, the user must select his appropriate country. Then the band will be automatically reduced to the authorized frequency (for 5 GHz band: 5180 – 5250 MHz).</p>
Radio Norms	2.4 GHz: EN 300 328 V2.1.1: 2016 5 GHz: EN 301 893 V2.1.1: 2017
Max power	+17.6dBm (802.11a/g/n)
Radio module	<p>FCC Caution: This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:</p> <ul style="list-style-type: none"> • this device may not cause harmful interference • this device must accept any interference received, including interference that may cause undesired operation. <p>Industry Canada Caution: Operation of the radio module is subject to the following two conditions:</p> <ul style="list-style-type: none"> • the device may not cause interference • it must accept any interference, including interference that may cause undesired operation of the device. <p>Avertissement Industrie Canada : L'utilisation du module radio est soumise aux deux conditions suivantes : <ul style="list-style-type: none"> • L'appareil ne doit pas causer d'interférences • Il doit accepter toutes interférences reçues, y compris celles susceptibles d'avoir des effets indésirables sur son fonctionnement. </p>
Canada - IC	

Bluetooth	
	Bluetooth Certified 4.0 Audio module
Dual mode	Bluetooth and Bluetooth Low Energy (BLE)
Backwards compatibility	Bluetooth versions 1.1, 2.0, 2.1 + EDR and 3.0
Support	<ul style="list-style-type: none"> • HFP, A2DP, AVRCP, PBAP and SPP • IAP1/IAP2 profiles for connection to iOS devices
Operating Range	20m to 30m
Band	2402 MHz – 2480 MHz
Max Power	<ul style="list-style-type: none"> • BER/EDR Class2 < 4dBm • BLE <10dBm
Component	BC127 (SIERRA – Blue Creation)
FCC ID	SSS-BC127
Declaration ID	D041583
Radio module	<p>FCC Caution: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that</p>

Bluetooth

	<p>interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:</p> <ul style="list-style-type: none"> ● reorient or relocate the receiving antenna; ● increase the separation between the equipment and receiver ● connect the equipment into an outlet on a circuit different from that to which the receiver is connected <p>Consult the dealer or an experienced radio/TV technician for help.</p> <p>To satisfy FCC RF Exposure requirements for mobile and base station transmission devices, a separation distance of 20 cm or more should be maintained between the antenna of this device and persons during operation. To ensure compliance, operation at closer than this distance is not recommended. The antenna(s) used for this transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.</p>
Canada - IC	<p>This device complies with Industry Canada license exempt RSS standard(s). Operation is subject to the following two conditions:</p> <ul style="list-style-type: none"> ● this device may not cause interference, ● this device must accept any interference, including interference that may cause undesired operation of the device. <p>Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.</p> <p>Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :</p> <ul style="list-style-type: none"> ● l'appareil ne doit pas produire de brouillage ● l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement. <p>Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante</p>

Power supply Specification Summary (for all Absolute Arm Series)

Manufacturer	GlobTek® Inc.	
Model	GT-46600-6015-T3	
Part Number (GlobTek®)	TR9CG4000AISON(R6B)	
HEXAGON Part Number	H00003236	
Class	Class VI	
AC Input	100V-240V AC, 50-60Hz, 1.5A max.	
DC Output	15V, 4.0A, 60W	
Safety	Do not attempt to service or open DC power supply. Do not short-circuit the power supply. Do not use if cable is visibly damaged or insulation is worn. Do not plug any other power supply in to the Arm power jack.	

Power supply Specification Summary (for all Absolute Arm Series)

The Power supply must always be connected to the ground

Replace power supply with GlobTek® model number H00003236 provided by Hexagon Manufacturing Intelligence only.

CP2 / CP3 Battery Pack Specification Summary	
Manufacturer	Inspired Energy
Model Number	ND2057QE34
Capacity	6.8 Ah (49 Wh)
Run / Charging time	4h / 3.5h
Chemistry	Lithium Ion
Voltage	7.2 V Nominal
Max discharge Current	2A Continuous
Weight	245g
Communications	SMBus compatible
Height/Length/Width	23 / 85.4 / 77.7 (mm)
Storage	Store in a cool, dry and well-ventilated area.
Replace battery with Inspired Energy, model number ND2057QE34 Only.	

Regulatory information	
Electromagnetic Compatibility	Compliant with EMC directive 2014/30/EU Harmonized Norm: EN 61326-1: 2013 Draft ETSI EN 301 489-1 V2.2.0: 2017 Draft ETSI EN 301 489-17 V3.2.0: 2017
Radio	2.4 GHz: EN 300 328 V2.1.1: 2016 5 GHz: EN 301 893 V2.1.1: 2017 EN 62479: 2010
Safety Compliance	Compliant with low voltage directive 2014/35/EU Harmonized Norm: EN/IEC 61010-1 :2010 CB Scheme certification: IEC 61010-1 Ed. 3.0
FCC / ID	Applicable norms: FCC 47 CFR PART 15 :2017 ICES-003/NMB-003 version 6 :2016

RoHS2 Conformance
This product and supplements meet the ROHS2 guidelines for electronic components and hardware. This complies with the requirements of the EU directive for banned substances (2011/65/EU).

I.4 HEXAGON® SCANNERS SPECIFICATIONS

I.4.1 RS5 SCANNER SPECIFICATIONS

Technical Specifications		
Stand Off	165 ± 50 mm	
Laser line length	115 mm	
Max USB scanning rate	100 Hz	
Automatic exposure	Not available	
Max Points per stripe	7524	
Line resolution (mid-range)	0.015	
Max Data rate	752 400 pts/s	
Scanner accuracy	30 µm	
Ambient light immunity	10 000 Lux	
Triangulation angle	24°	
Weight	440 g	
Available Temperature	5 to 40° C	
PC Communication	Ethernet LAN! On-board Gigabit required.	
Storage Temperature	-25 to 70 °C	
	Laser Line	Laser Point Guide
Laser class	2M	2
Maximum optical output	7 mW	< 0.8 mW
Wavelength	658nm	635nm
Cleaning	To clean the front glasses of the RS5 Scanner, use compressed air to remove loose particles. (If you use compressed air from a fingertip dispenser please be aware that in some cases the spray could contain also parts of the propellant which causes pollutions). For removing tough pollutions, use wadded-cotton tips. These tips have to be used in a careful way and only with very less pressure to avoid injuring the surface of the glass. Cleaning alcohol such as 3M® “Surface cleaner” can be used.	

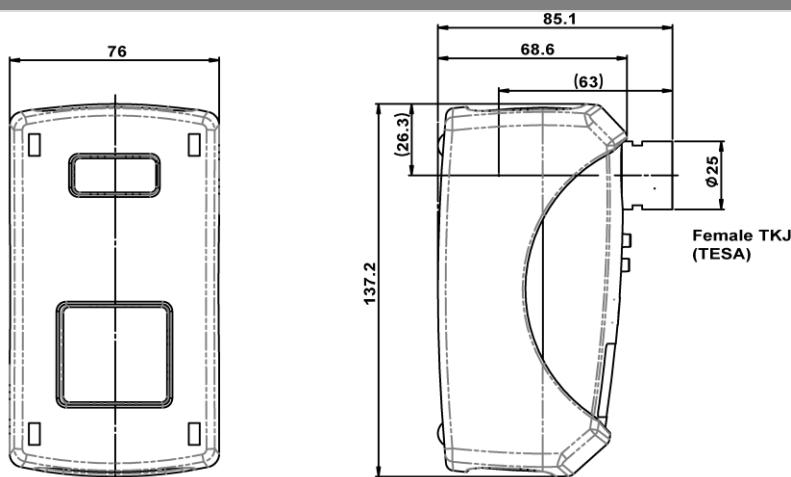
RS5 Scanner safety care

Class 2M laser	The laser built into the product produces a visible red laser beam which emerges from the bottom of the product.
Class 2 laser	<p>The visual guide produces a visible red beam which emerges from the top of the product.</p> <p>Product in accordance with: IEC 60825-1: 2014, "Safety of Laser Products."</p>
	<p>It complies with FDA performance standards for laser products except for deviations pursuant to Laser Notice No. 50, Dated June 24, 2007.</p>
Class 2 / 2M Laser Products	These products are safe for momentary exposure but can be hazardous if you deliberately stare into the beam.
Warning	From a safety perspective, class 2/2M laser products are not inherently safe for the eyes.
Precautions	<p>Avoid staring into the beam or pointing the beam at other people</p> <p>Before all handling of RS5 Scanner for the assembly, disassembling, cleaning etc., check that the lasers are turn off.</p>
	<p>Attention with use the RS5 Scanner sensor for the measurement of reflective surface (specular), the use of a product to make surface matt is strongly recommended.</p>
Cleaning / handling	<p>Do not touch the optical window on the camera.</p> <p>To clean the front glasses of the RS5 Scanner, use compressed air to remove loose particles.</p> <p>(If you use compressed air from a fingertip dispenser please be aware that in some cases the spray could contain also parts of the propellant which causes pollutions).</p> <p>For removing tough pollutions, use wadded-cotton tips. These tips should be used in a careful way and only with very less pressure to avoid injuring the surface of the glass.</p> <p>Cleaning alcohol such as 3M® "Surface cleaner" can be used.</p>
	<p>Do not use solvents.</p>

The personnel user of the RS5 Scanner sensor must be sensitized with laser safety and must have taken knowledge of this manual.

I.4.2 HP-L-20.8 SCANNER SPECIFICATIONS

Dimensions



Scan mode max Points

Mode	Line width (mm)	20 % (HD1)	40 % (HD2)	60 % (HD3)	80 % (HD4)	100 % (HD5)
0C	220	801	1601	2401	3201	4001
1C	130	501	1001	1501	2001	2501
2B		501	1001	1501	2001	2501
	63					
2A		1001	2001	3001	4001	5001
3C	51	201	401	601	801	1001
4A	25	401	801	1201	1601	2001

(2.5% / 5% / and 10 % are subdivisions of HD1-20%)

Scan mode Pitch

Mode	Line width (mm)	20 %	40 %	60 %	80 %	100 %
0C	220	0.275	0.137	0.092	0.069	0.055
1C	130	0.250	0.125	0.083	0.062	0.052
2B		0.120	0.060	0.040	0.030	0.025
	63					
2A		0.063	0.031	0.021	0.016	0.013
3C	51	0.252	0.126	0.084	0.063	0.050
4A	25	0.063	0.031	0.021	0.016	0.013

Scan mode max Points rate (Pts/s)

Mode	Line width (mm)	20 %	40 %	60 %	80 %	100 %
0C	220	30037	60037	90037	120037	150037
1C	130	25450	50850	76250	101650	127050
2B		25050	50050	75050	100050	125050
	63					
2A		28528	57028	85528	114028	142528
3C	51	20100	40100	60100	80100	100100
4A	25	20050	40050	60050	80050	100050

Scan mode lines					
Mode	Width (mm)			Angle (°)	Line Rate (Hz)
	Nominal	Min	Max		
0C	219.90	176	231	57.6	37.5
1C	129.97	104	148	36.0	50.8
2B	63.35	51	75	18.0	50.0
2A					28.5
3C	50.53	40	60	14.4	100.0
4A	25.17	20	30	7.2	50.0

Other specifications	
TCPIP address	192.168.150.100
TCPIP port	53584

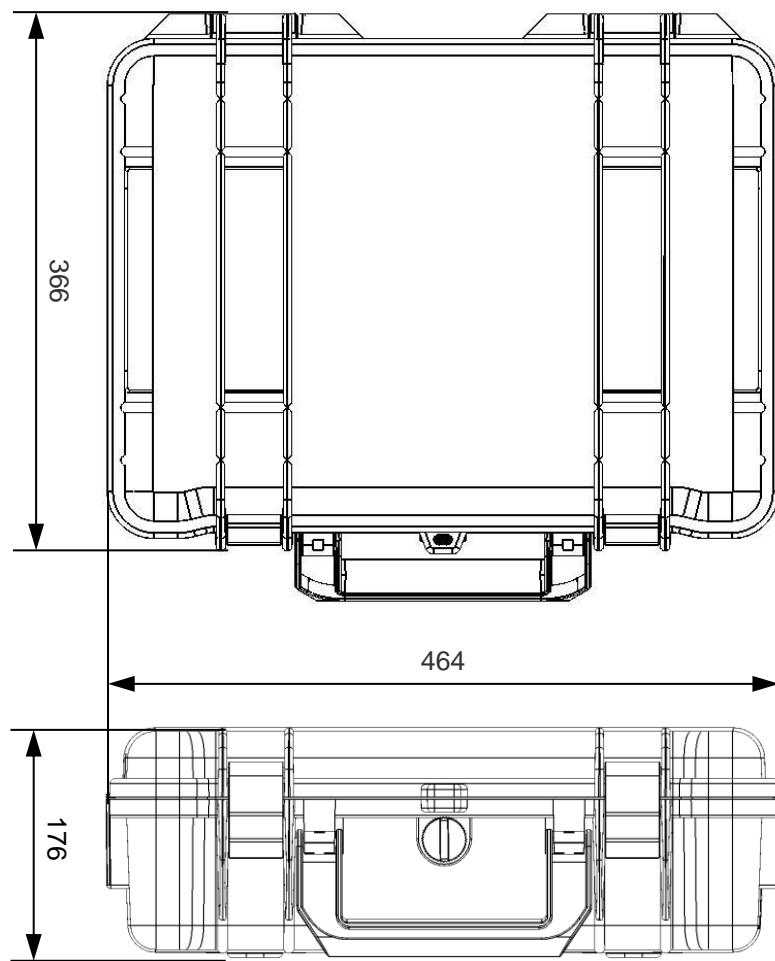
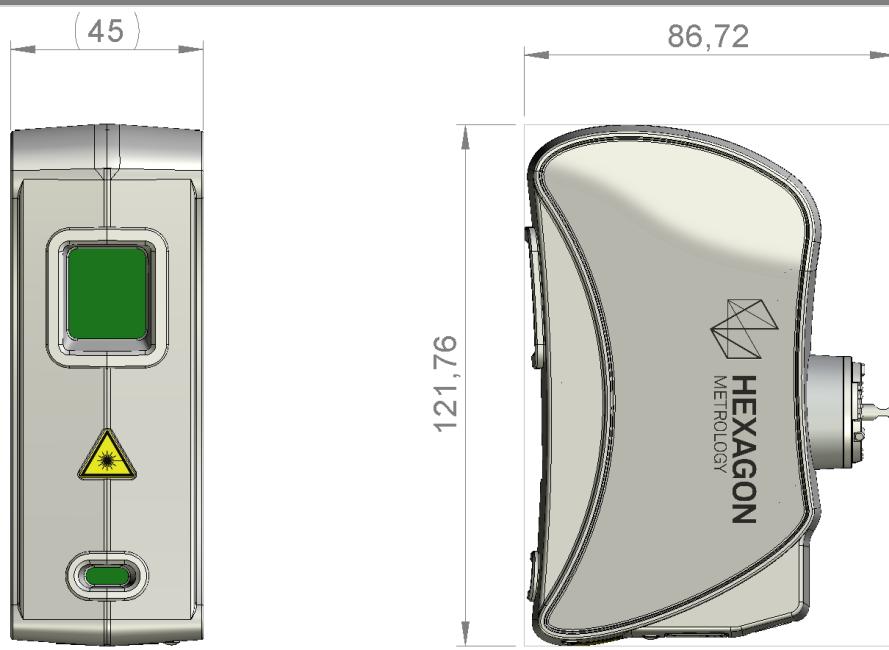
Warm-up time

The Power LED on the sensor indicates readiness to measure. Once the LED is solid, the sensor is ready to measure within specified accuracy limits. While the LED is flashing, the sensor is warming up. Using the sensor while the LED is flashing means results may be out of specification.

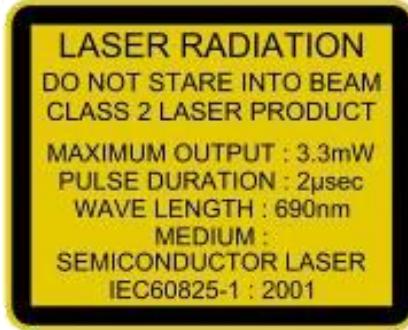
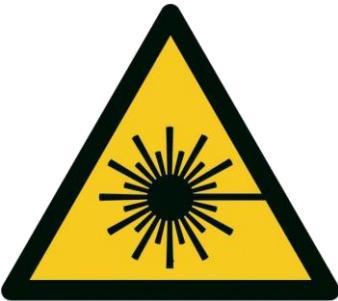
The maximum warm-up time for 208 in an ambient temperature between 12°C and 32°C is 5 minutes. If the ambient temperature is lower than 12°C, the warm-up time is longer.

I.4.3 HP-L-8.9 SCANNER SPECIFICATIONS

Dimensions



Technical specifications	
Standard	EN 60825-1 : 2007
TCPIP address	192.168.178.200
TCPIP Port	40
class	2M
Wave length	650nm
Line width (mid field)	80 mm (min 65 / max 98)
Point acquisition rate	45 000 points / sec
Points per line	750
Line rate	60 Hz
Min Point spacing	0.08 mm
Stand off	133 mm ± 45mm
Warm up time	< 10 min
RMS Average	0.020 mm
Distance variation within 10mm	0.015 mm
Laser power adjustment	Semi-automatic
Output power	< 1mW
Admission angle	60° fan angle
Operating Temperature	5°C to +40°C (32°F – 122°F)(open double check)
Storage Temperature	-30°C to +70°C
Altitude	up to 2000 m
Shock without case	50 mm drop (used for design validation)
Shock in transport case	1m drop
Vibration in transport case	ISO 9022-3:1998 10 to 150 Hz ± 0.15 mm, 2g. 20 sweeps/ axis at 1 octave/min
Humidity	maximum 95% non-condensing
IP Rating	IP 50
Weight	322 g
2-sigma accuracy	0.038 mm

HP-L-8.9 Scanner Compliance and safety care	
CE Compliance	conformance with CEM directive 2004/108/EC and low voltage directive 2006/95/EC Harmonized Norm: EN 61326-1:2006
	Conformance with IEC 60825-1:2007 and CDRH standards.
	Compliant with directive RoHS 2 (directive 2011/65/EU)
Class 2 laser	  <p>Class 2 laser product according to IEC60825-1. Do not stare into beam directly or indirectly via mirror-like surfaces.</p>
Precautions	<p>High precision instrument – avoid drops or impact damage to prevent accuracy and sensitivity degradation.</p> <p>Avoid attaching/detaching electrical connectors when controller is powered up.</p> <p>Do not touch the optical windows on the front cover.</p> <p>Do not cover the air inlet and output vent of the controller unit.</p> <p>Avoid storage at high temperatures, for example, in a car in hot weather</p> <p>Ensure adequate electrical grounding of the controller.</p> <p>Avoid circumstances leading to condensation e.g. rapid changes of temperature as deposits on the optical elements may render the unit inoperable and invalidate warranty</p> <p>No user serviceable parts – opening the sensor or controller invalidates warranty</p>
Cleaning	<p>Do not use solvents to clean the sensor case.</p> <p>To clean the front glasses of the RS5 Scanner, use compressed air to remove loose particles.</p> <p>(If you use compressed air from a fingertip dispenser please be aware that in some cases the spray could contain also parts of the propellant which causes pollutions).</p> <p>For removing tough pollutions, use wadded-cotton tips. These tips should be used in a careful way and only with very less pressure to avoid injuring the surface of the glass.</p> <p>Cleaning alcohol such as 3M® "Surface cleaner" can be used.</p>

I.5 BLUETOOTH CERTIFIED EQUIPMENT

Below are Bluetooth peripherals, tested and approved by Hexagon Manufacturing Intelligence for the Absolute Arm.

Model	Type	Profiles	COD**	BT	Comments	
Amazon Basic s BTv4		A2DP, AVRCP	240414		Volume difficult to set	
Anker A7908		A2DP, AVRCP, HSP, HFP	240404	4.0		
Divoom Timebox		A2DP	240404	4.0	Intelligent pixel speaker. Lights may result in latency	
JBL Clip 2		A2DP V1.3 (Codec SBC & aptX), AVRCP V1.6, HFP V1.6, HSP V1.2	240414	4.2	Latencies may occur	
Philips BT2200B/00		A2DP, AVRCP, HFP	240414	4.0		
Philips SB300/00		A2DP (Codec SBC), AVRCP, HFP	240414	4.0	Speaker with ambiance light Waterproof IPX7 Range=20m	
Philips BT6000/12		A2DP 1.2 (Codec SBC), AVRCP 1.4, HFP1.5	240414	4.0	Characteristic s: NFC Output 2x6W Volume set by rotative button Range=10m IPx4	
Ultimate Ears (Logitech) Boom 2/3		A2DP (Codec SBC), AVRCP, HFP 1.5	240404	4.0	IPX7 (waterproof 1m)	
AKG N60NC		A2DP (Codec aptX & AAC) AVRCP, HFP, HSP	240414	4.0		

Model	Type	Profiles	COD**	BT	Comments
Avanca AVBS-0100	 	A2DP, AVRCP, HFP, HSP	240404	3.0	
Jabra ROX	 	A2DP V1.2, AVRCP V1.4, HFP V1.6, HSP V1.2	240404	4.0	
Philips SHQ7900	 	A2DP, AVRCP, HFP, HSP	???	4.1	Bluetooth 4.1

: Speaker | : Mono headset |  : earphone |  : Headset

**COD: Class of device

I.6 EUROPEAN UNION (AND EEA) ONLY RECYCLING

This symbol indicates that this product is not to be disposed of with household waste, according to the WEEE Directive (2012/19/EU) and national law. This product should be handed over to a designated collection point, e.g., on an authorised one-for-one basis when buying a new similar product or to an authorised collection site for recycling waste electrical and electronic equipment (EEE).



Improper handling of this type of waste could have a possible negative impact on the environment and human health due to potentially hazardous substances that are generally associated with EEE. At the same time, cooperation in the correct disposal of this product will contribute to the effective usage of natural resources. For more information about where to drop off waste equipment for recycling, please contact the local city office, waste authority, approved WEEE scheme or household waste disposal service.
(EEE: Norway, Iceland and Liechtenstein)

I.7 PATENTS DETAILS

Patent	Description	83	85	87	83SI	85SI	87SI
5829148	Infinite rotation	✓	✓	✓	✓	✓	✓
7779548	Spin Grip		✓	✓		✓	✓
8122610	1-Wire	✓	✓	✓	✓	✓	✓
7908757	Integrated Scanner				✓	✓	✓
8099877	RS5 Scanner Trigger Signals				✓	✓	✓

Patent	Description	HP-L-20.8	CP1	CP2	CP2	CP3	CP3	FP4
8151477					✓		✓	
8407907					✓		✓	
8701299					✓		✓	
8174682	HP-L-20.8 / prism	✓						

I.8 ILLUSTRATION TABLE

Fig. 1 : Arm wrist	11
Fig. 2: SI Wrist	11
Fig. 3 : Label location on the A-axis.....	17
Fig. 4 : Arm label.....	18
Fig. 5 : Control Pack label.....	19
Fig. 6 : RS5 label	20
Fig. 7 : Absolute Arm 83 overview	21
Fig. 8 : 7-axes Wrist.....	21
Fig. 9 : Absolute Arm 85 overview	22
Fig. 10 : 7-axes Wrist.....	22
Fig. 11 : Absolute Arm 87 overview	23
Fig. 12 : 7-axes Wrist.....	23
Fig. 13 : Absolute Arm Compact 8512 overview	24
Fig. 14 : Absolute Arm Compact 8312 overview	24
Fig. 15 : Base-Front	26
Fig. 16 : Base-Back	26
Fig. 17 : FP4 (HP-LC-200) description	29
Fig. 18 : Wrist description	38
Fig. 19 : Wrist description	40
Fig. 20 : Contact probe description.....	52
Fig. 21 : Smart locking system.....	58
Fig. 22 : Travel case description.....	61
Fig. 23 : Travel case description	61
Fig. 24 : 1.2 Arm Travel case description	62
Fig. 25 : Mounting Ring.....	76
Fig. 26 : Mounting plate installation	77
Fig. 27 : Standard magnetic support installation	78
Fig. 28 : Circular magnetic base installation.....	78
Fig. 29 : Vacuum base description	79
Fig. 30 : Power supply connection.....	92
Fig. 31 : USB connection	95
Fig. 32 : USB + Scanner connection	96
Fig. 33 : Wireless connection.....	99
Fig. 34 : USB + Scanner connection	102
Fig. 35 : HP-L-20.8 connection	106
Fig. 36 : USB + Scanner connection	109
Fig. 37 : 3-State button	124
Fig. 38 : Scanner handling	146
Fig. 39 : Absolute Arm 2.0 to 4.5 dimensions (mm)	202
Fig. 40 : Absolute Arm Compact 1.2 dimensions (mm)	202
Fig. 41 : Absolute Arm Compact base dimensions.....	204
Fig. 42 : Absolute Arm base dimensions	204
Fig. 43: Travel case dimensions	204
Fig. 44 : Mounting ring dimensions.....	205
Fig. 45 : Absolute Arm Compact base plate dimensions.....	206
Fig. 46 : Base plate dimensions.....	206
Fig. 47 : Magnetic Base dimensions.....	207
Fig. 48 : Vacuum base dimensions.....	207
Fig. 49 : Circular magnetic base dimensions.....	208
Fig. 50 : Tube inspection arm raiser dimensions	208



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