



MagnaFORM

Eddy Current Array Weld Inspection Scanner

User's Manual

DMTA-20099-01EN [Q2700040] — Rev. A
September 2016

This instruction manual contains essential information on how to use this Olympus product safely and effectively. Before using this product, thoroughly review this instruction manual. Use the product as instructed. Keep this instruction manual in a safe, accessible location.

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This document was prepared with particular attention to usage to ensure the accuracy of the information contained therein, and corresponds to the version of the product manufactured prior to the date appearing on the title page. There could, however, be some differences between the manual and the product if the product was modified thereafter.

The information contained in this document is subject to change without notice.

Part number: DMTA-20099-01EN [Q2700040]

Rev. A

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List of Abbreviations

CE	European Community
ECA	eddy current array
EFUP	environment-friendly use period
ID	identification
ID	internal diameter
N/A	not applicable
OD	outer diameter
RH	relative humidity
WEEE	waste electrical and electronics equipment

Labels and Symbols

Safety-related labels and symbols are attached to the product at the locations shown in Figure i-1 on page 1, Figure i-2 on page 1, and Figure i-3 on page 2. If any or all of the labels or symbols are missing or illegible, please contact Olympus.

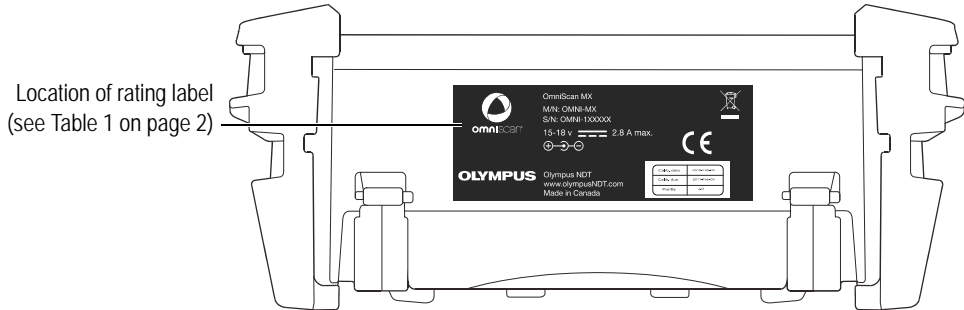


Figure i-1 Label location – OmniScan MX



Figure i-2 Label locations – probe



Figure i-3 Label locations – adaptor

Table 1 Content of the rating labels

<p>OmniScan MX</p>	
<p>Probe</p>	

Table 1 Content of the rating labels (*continued*)










Adaptor	
Content	
	The CE marking is a declaration that this product conforms to all the applicable directives of the European Community. See the <i>Declaration of Conformity</i> for details. Contact your Olympus representative for more information.
	The WEEE symbol indicates that the product must not be disposed of as unsorted municipal waste, but should be collected separately.
	The regulatory compliance mark (RCM) label indicates that the product complies with all applicable standards, and has been registered with the Australian Communications and Media Authority (ACMA) for placement on the Australian market.
	The China RoHS mark indicates the product's Environment-Friendly Use Period (EFUP). The EFUP is defined as the number of years for which listed controlled substances will not leak or chemically deteriorate while in the product. The EFUP for the MagnaFORM has been determined to be 15 years. Note: The Environment-Friendly Use Period (EFUP) is not meant to be interpreted as the period assuring functionality and product performance.

Table 1 Content of the rating labels (continued)

	<p>Seller and user shall be noticed that this equipment is suitable for electromagnetic equipment for office work (class A) and it can be used outside home.</p> <p>The MSIP code for the MagnaFORM is the following: MSIP-REM-OYN-MAGNAFORM-016.</p>
	<p>The warning symbol indicates that the user must read the user's manual in order to find out the nature of the potential hazards and any actions to avoid them.</p>
	<p>The direct current symbol.</p>
	<p>The DC adaptor polarity symbol.</p>
<p>Mfg Date</p>	<p>The manufacturing date.</p>
<p>M/N</p>	<p>The model number.</p>
<p>S/N</p>	<p>The serial number.</p>
<p>Calib. Date</p>	<p>Indicates the date on which the unit was calibrated.</p>
<p>Calib. Due</p>	<p>Indicates the date on which the next calibration must be performed.</p>
<p>Par/By</p>	<p>Initials of the person who calibrated the instrument.</p>

Important Information — Please Read Before Use

Intended Use

The MagnaFORM is designed to perform nondestructive inspections on industrial and commercial materials.



WARNING

Do not use the MagnaFORM for any purpose other than its intended use. It must never be used to inspect or examine human or animal body parts.

IMPORTANT

The MagnaFORM is NOT intended for the inspection of heat exchanger tubes in steam generators in nuclear applications, nuclear-specific inspections, inner inspection of tubes under 50.8 mm (2 in.) in diameter, or any combination of these applications.

Instruction Manual

This instruction manual contains essential information on how to use this Olympus product safely and effectively. Before using this product, thoroughly review this instruction manual. Use the product as instructed.

Keep this instruction manual in a safe, accessible location.

IMPORTANT

Some of the details of components and/or software images in this manual may differ from your instrument's components or software display. However, the principles remain the same.

Instrument Compatibility

See the details provided in "Equipment and Accessories" on page 17 to confirm that the MagnaFORM is compatible with the ancillary equipment being used.



CAUTION

Always use equipment and accessories that meet Olympus specifications. Using incompatible equipment could cause equipment malfunction and/or damage, or human injury.

Repair and Modification

The MagnaFORM does not contain any user-serviceable parts. Opening the instrument might void the warranty.



CAUTION

In order to prevent human injury and/or equipment damage, do not disassemble, modify, or attempt to repair the instrument.

Safety Symbols

The following safety symbols might appear on the instrument and in the instruction manual:



General warning symbol

This symbol is used to alert the user to potential hazards. All safety messages that follow this symbol shall be obeyed to avoid possible harm or material damage.



Finger crushing warning symbol

This symbol is used to alert the user to potential hazards to fingers from crushing by magnetic wheels. All safety messages that follow this symbol shall be obeyed to avoid possible harm.



Magnetic field warning symbol

This symbol is used to alert the user to potentially strong magnetic fields. All safety messages that follow this symbol shall be obeyed to avoid possible harm.

Safety Signal Words

The following safety symbols might appear in the documentation of the instrument:



DANGER

The DANGER signal word indicates an imminently hazardous situation. It calls attention to a procedure, practice, or the like, which, if not correctly performed or adhered to, will result in death or serious personal injury. Do not proceed beyond a DANGER signal word until the indicated conditions are fully understood and met.



WARNING

The **WARNING** signal word indicates a potentially hazardous situation. It calls attention to a procedure, practice, or the like, which, if not correctly performed or adhered to, could result in death or serious personal injury. Do not proceed beyond a **WARNING** signal word until the indicated conditions are fully understood and met.



CAUTION

The **CAUTION** signal word indicates a potentially hazardous situation. It calls attention to an operating procedure, practice, or the like, which, if not correctly performed or adhered to, may result in minor or moderate personal injury, material damage, particularly to the product, destruction of part or all of the product, or loss of data. Do not proceed beyond a **CAUTION** signal word until the indicated conditions are fully understood and met.

Note Signal Words

The following symbols could appear in the documentation of the instrument:

IMPORTANT

The **IMPORTANT** signal word calls attention to a note that provides important information, or information essential to the completion of a task.

NOTE

The **NOTE** signal word calls attention to an operating procedure, practice, or the like, which requires special attention. A note also denotes related parenthetical information that is useful, but not imperative.

TIP

The **TIP** signal word calls attention to a type of note that helps you apply the techniques and procedures described in the manual to your specific needs, or provides hints on how to effectively use the capabilities of the product.

Safety

Before turning on the instrument, verify that the correct safety precautions have been taken (see the following warnings). In addition, note the external markings on the instrument, which are described under “Safety Symbols.”

Warnings



WARNING

General Warnings

- Carefully read the instructions contained in this instruction manual prior to turning on the instrument.
- Keep this instruction manual in a safe place for further reference.
- Follow the installation and operation procedures.
- It is imperative to respect the safety warnings on the instrument and in this instruction manual.
- If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment could be impaired.
- Do not install substitute parts or perform any unauthorized modification to the instrument.
- Service instructions, when applicable, are for trained service personnel. To avoid the risk of electric shock, do not perform any work on the instrument unless qualified to do so. For any problem or question regarding this instrument, contact Olympus or an authorized Olympus representative.
- Do not touch the connectors directly by hand. Otherwise, a malfunction or electric shock may result.
- Do not allow metallic or foreign objects to enter the device through connectors or any other openings. Otherwise, a malfunction or electric shock may result.
- Make sure no MagnaFORM components (screws, straps, etc.) have come loose or are lost in critical equipment being inspected. Thoroughly check your inspection area before and after an inspection to prevent foreign-object debris (FOD) that could potentially cause equipment damage, injuries, or loss of life.

Equipment Disposal

Before disposing of the MagnaFORM, check your local laws, rules, and regulations, and follow them accordingly.

CE (European Community)



This device complies with the requirements of both directive 2014/30/EU concerning electromagnetic compatibility and directive 2014/35/EC concerning low voltage. The CE marking indicates compliance with the above directives.

WEEE Directive



In accordance with European Directive 2012/19/EU on Waste Electrical and Electronic Equipment (WEEE), this symbol indicates that the product must not be disposed of as unsorted municipal waste, but should be collected separately. Refer to your local Olympus distributor for return and/or collection systems available in your country.

China RoHS

China RoHS is the term used by industry generally to describe legislation implemented by the Ministry of Information Industry (MII) in the People's Republic of China for the control of pollution by electronic information products (EIP).



The China RoHS mark indicates the product's Environment-Friendly Use Period (EFUP). The EFUP is defined as the number of years for which listed controlled substances will not leak or chemically deteriorate while in the product. The EFUP for the MagnaFORM has been determined to be 15 years.

Note: The Environment-Friendly Use Period (EFUP) is not meant to be interpreted as the period assuring functionality and product performance.

“中国 RoHS”是一个工业术语，一般用于描述中华人民共和国信息工业部（MII）针对控制电子信息产品（EIP）的污染所实行的法令。



电气电子产品
有害物质
限制使用标识

中国 RoHS 标识是根据“电器电子产品有害物质限制使用管理办法”以及“电子电气产品有害物质限制使用标识要求”的规定，适用于在中国销售的电气电子产品上的电气电子产品有害物质限制使用标识。

注意：电气电子产品有害物质限制使用标识内的数字为在正常的使用条件下有害物质不会泄漏的年限，不是保证产品功能性的年限。

产品中有害物质的名称及含量

部件名称		有害物质					
		铅及其化合物 (Pb)	汞及其化合物 (Hg)	镉及其化合物 (Cd)	六价铬及其化合物 (Cr(VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
主体	机构部件	×	○	○	○	○	○
	光学部件	×	○	○	○	○	○
	电气部件	×	○	○	○	○	○
附件		×	○	○	○	○	○

本表格依据 SJ/T 11364 的规定编制。

○：表示该有害物质在该部件所有均质材料中的含量均在 GB/T26572 规定的限量要求以下。

×：表示该有害物质至少在该部件的某一均质材料中的含量超出 GB/T26572 规定的限量要求。

Korea Communications Commission (KCC)

A 급 기기 (업무용 방송통신기자재)

이 기기는 업무용 (A 급) 전자파적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다.

FCC (USA) Compliance

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

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

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

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instruction manual, might cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case you will be required to correct the interference at your own expense.

ICES-001 (Canada) Compliance

This Class A digital apparatus complies with Canadian ICES-001.

Cet appareil numérique de la classe A est conforme à la norme NMB-001 du Canada.

Warranty Information

Olympus guarantees your Olympus product to be free from defects in materials and workmanship for a specific period, and in accordance with conditions specified in the *Olympus Scientific Solutions Americas Inc. Terms and Conditions* available at <http://www.olympus-ims.com/en/terms/>.

The Olympus warranty only covers equipment that has been used in a proper manner, as described in this instruction manual, and that has not been subjected to excessive abuse, attempted unauthorized repair, or modification.

Inspect materials thoroughly on receipt for evidence of external or internal damage that might have occurred during shipment. Immediately notify the carrier making the delivery of any damage, because the carrier is normally liable for damage during shipment. Retain packing materials, waybills, and other shipping documentation needed in order to file a damage claim. After notifying the carrier, contact Olympus for assistance with the damage claim and equipment replacement, if necessary.

This instruction manual explains the proper operation of your Olympus product. The information contained herein is intended solely as a teaching aid, and shall not be used in any particular application without independent testing and/or verification by the operator or the supervisor. Such independent verification of procedures becomes increasingly important as the criticality of the application increases. For this reason, Olympus makes no warranty, expressed or implied, that the techniques, examples, or procedures described herein are consistent with industry standards, nor that they meet the requirements of any particular application.

Olympus reserves the right to modify any product without incurring the responsibility for modifying previously manufactured products.

Technical Support

Olympus is firmly committed to providing the highest level of customer service and product support. If you experience any difficulties when using our product, or if it fails to operate as described in the documentation, first consult the user's manual, and then, if you are still in need of assistance, contact our After-Sales Service. To locate the nearest service center, visit the Service Centers page at: <http://www.olympus-ims.com>.

Introduction

The MagnaFORM is an eddy current flaw detection system designed for the inspection of welds on industrial components. Typical applications include detection of surface breaking cracks in carbon steel pressure vessel welds and detection of surface breaking cracks in pipeline welds.

The inspection equipment consists of the OmniScan MX with ECA module, OmniScan MXE Weld software, adaptor, cable, encoder, MagnaFORM scanner, and probe.

NOTE

The purpose of this manual is to streamline the inspection setup process for the MagnaFORM. This manual is not intended to replace the *OmniScan MXE 3.0 Software User's Manual* or the *OmniScan MX and MX2 User's Manual*. Thorough knowledge of the OmniScan MX instrument and its manual are required to proceed with an inspection using the MagnaFORM. The OmniScan MXE software manual contains descriptions of certain OmniScan MXE Weld software menus; refer to it when needed or where indicated in this document.

The MagnaFORM inspection system includes C-scan imaging (for improved detection quality and precision), a strip chart, and an impedance plane. The MagnaFORM probe is intended to be used only with the OmniScan MXE Weld software.

1. Overview

This chapter provides an overview of the MagnaFORM.

1.1 Equipment and Accessories

An example of an inspection setup is shown in Figure 1-1 on page 17. Required equipment and compatible accessories are listed in Table 2 on page 18.



Figure 1-1 An example of an inspection setup

Table 2 Required equipment and accessories

Category	Item	Order number
Instrument	OmniScan MX	U8100026
	ECA module	U8100014
	OmniScan MX plus ECA module	U8100027
MagnaFORM kit – Manual (for manual inspections without an optional scanner) [Q2500591]	Dynamic lift-off compensation ECA probe, 8 mm coils, 16 + 16 channels	Q2500590
	D-shaped rubber contact piece	Q2700033
	Flat contact piece for MagnaFORM	Q7500018
	12 in. outer diameter contact piece for MagnaFORM	Q7500019
	24 in. outer diameter contact piece for MagnaFORM	Q7500020
	24 in. inner diameter contact piece for MagnaFORM	Q7500021
	Wear face Velcro for MagnaFORM	Q2700034
	Cable adaptor for MagnaFORM	Q2700035
	MagnaFORM 5 m probe cable	Q2700036
	MagnaFORM 5 m encoder cable	Q2700038
	Mini encoder with gear	Q7500024
	Carbon steel reference standard for MagnaFORM	Q2500581
	<i>MagnaFORM Eddy Current Array Weld Inspection User's Manual</i>	Varies according to language
	MagnaFORM cart with gear tooth encoder (AAIX0654-006)	N/A
	MagnaFORM transport case	N/A

Table 2 Required equipment and accessories (continued)

Category	Item	Order number
MagnaFORM kit – Scanners (for inspections using an optional scanner) [Q2500592]	Dynamic lift-off compensation ECA probe, 8 mm coils, 16 + 16 channels	Q2500590
	Flat contact piece for MagnaFORM	Q7500018
	Wear face Velcro for MagnaFORM	Q2700034
	D-shaped rubber contact piece	Q2700033
	Cable adaptor for MagnaFORM	Q2700035
	MagnaFORM 5 m probe cable	Q2700036
	MagnaFORM 5 m encoder cable	Q2700038
	Yoke to attach MagnaFORM onto MapSCANNER and MapROVER	Q7500022
	Scanner adaptor for OmniScan MX	U8780329
	Encoder bracket for MagnaFORM ECA probe	Q7500023
	Mini encoder with gear	Q7500024
	Carbon steel reference standard for MagnaFORM	Q2500581
	<i>MagnaFORM Eddy Current Array Weld Inspection User's Manual</i>	Varies according to language
	MagnaFORM cart with encoder and rubber wheels	N/A
	MagnaFORM transport case	N/A
Software	OmniScan MXE Weld software	N/A
Optional scanners	MapROVER one-axis, motorized scanner	Q7500003
	MapSCANNER manual two-axis scanner	Q7500006
Spare parts	Kit of 5 × D-shaped rubber replacements	Q2700041
	Kit of 5 × wear face Velcros for MagnaFORM	Q2700042

1.2 Operating Environment

The MagnaFORM may be used in harsh environments with temperatures ranging between $-20\text{ }^{\circ}\text{C}$ and $85\text{ }^{\circ}\text{C}$.

- The MagnaFORM adaptor is compliant to IP53.
- The MagnaFORM probe is compliant to IP54:
 - Protected against dust ingress so that instrument operation remains satisfactory.
 - Protected against water splashing from any direction (5 minutes duration at 50 kPa to 150 kPa water pressure).

For more operating environment details, see Table 6 on page 53.



CAUTION

Olympus cannot guarantee any level of ingress protection if the instrument seals have been manipulated. Seal manipulation could impair the ingress protection provided by the equipment. You must use sound judgment and take proper precautions before exposing the instrument to harsh environments.

To maintain the original level of ingress protection, you are responsible for the proper care of all routinely exposed membrane seals. Additionally, you are responsible for returning the instrument to an authorized Olympus service center once a year to ensure that the instrument seals are properly maintained.

2. Component Connections and Setup

The probe, MagnaFORM, adaptor, and OmniScan MX must be properly connected and set up to enable inspection.

2.1 Wheels

The MagnaFORM can be fitted with either regular or magnetic types of wheels.

2.1.1 Magnetic Wheel Safety

The magnetic attraction forces around magnetic wheels may pose certain safety risks, depending on use and operating conditions.



CAUTION



Magnetic wheels present a risk of finger crushing if fingers are placed under the wheels and placed onto a magnetic surface.

The magnetic wheels have a magnetic field strength of 0.5 milligauss at a distance of 2.1 m (7 ft) away from the wheels. This is below the 2 milligauss limit at which a product would be considered to be a magnetic material requiring special handling during shipment by air. The field strength is 0.0000676 gauss (68 microgauss) at a distance of 4.6 m (15 ft), which is well below the absolute limit of 5 milligauss. This means that the MagnaFORM can be shipped by air without restrictions.



WARNING



The magnetic wheels can generate a magnetic field strong enough to affect pacemakers, watches, and other sensitive electronic devices, and anyone wearing or depending on such devices should keep a safe distance away from the wheels to avoid the risk of serious injuries or death. This magnetic field can also demagnetize credit cards, magnetic ID (identification) badges, etc.



CAUTION



Sharp filings or other ferromagnetic objects can be attracted to the magnetic wheels, which can cause equipment malfunction or injuries. It is important to keep the wheels clean (see “Cleaning the Magnetic Wheels” on page 48).

2.1.2 Changing the Wheels

Manual scanning requires two (2) rubber wheels and two (2) magnetic wheels installed diagonally opposed (see Figure 2-1 on page 23). For inspections using an optional scanner, four (4) rubber wheels are required.

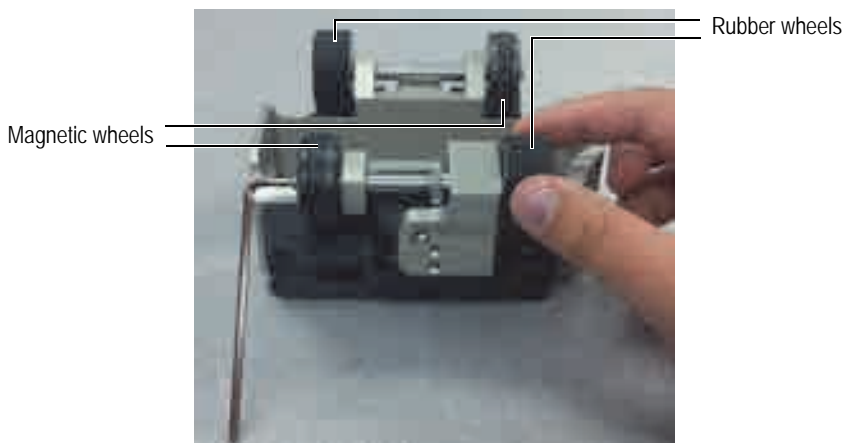


Figure 2-1 Changing a wheel



WARNING



To avoid injuries or equipment damage when handling magnetic wheels, take note of the magnetic attraction forces around the wheels, and observe the safety notes outlined in “Magnetic Wheel Safety” on page 21.

To change the wheels

1. Remove the probe and encoder cable from the MagnaFORM.
2. Turn the MagnaFORM upside down so that the wheels are facing upwards.
3. Insert the hex key into the end of the wheel axle opposite to the wheel you want to remove (see Figure 2-1 on page 23).
4. Hold the hex key with one hand so that the shaft remains stationary, and then use your other hand to unscrew the wheel.
5. Orient the new wheel so its threaded portion faces outwards (see Figure 2-2 on page 24), screw it onto the axle, and hand-tighten it.



Figure 2-2 Threaded portion of wheel faces outwards

6. Repeat the above steps for the next wheel that you want to change.
All wheels can be removed and changed, as required (see Figure 2-3 on page 24):

For manual scanning, the two magnetic and two rubber wheels must diagonally oppose each other.



Figure 2-3 The wheels removed

2.2 Setting Up for Manual Scanning

Before use, the flexible portion of the probe must be installed against a wedge that provides the desired shape (see Figure 2-4 on page 25).

For manual scanning, two (2) rubber wheels and two (2) magnetic wheels must be installed diagonally opposed on the MagnaFORM cart (for details, see “Changing the Wheels” on page 22).



Figure 2-4 The probe, Velcro strap, and wedge

To set up for manual scanning

1. Install the wedge on the probe:
 - a) Pull back the Velcro on the probe and slide the wedge into the slot (see Figure 2-5 on page 26).



Figure 2-5 Sliding the wedge onto the probe

- b) Pull the flexible portion of the probe around the contour of the wedge.
- c) Wrap the Velcro strap around the flexible portion of the probe and secure it on each end of the probe base (see Figure 2-6 on page 26).



Figure 2-6 The Velcro strap wrapped around the probe and wedge

2. Align the red dots on the cable and probe connectors, and then connect the cable to the probe (see Figure 2-7 on page 27).

The cable should easily snap into place when the red dots are correctly aligned.



Figure 2-7 Connecting the cable to the probe

3. Install the probe assembly onto the MagnaFORM, and fasten the wing bolt tightly using your fingers (do not over-tighten) [see Figure 2-8 on page 28].



Figure 2-8 Installing the probe onto the MagnaFORM

4. Join the two sections of the encoder cable, with red dots aligned on the connectors (see Figure 2-9 on page 29).



Figure 2-9 Joining the sections of the encoder cable

5. Connect the other end of the cable to the adaptor, with red dots aligned (see Figure 2-10 on page 29).



Figure 2-10 Connecting the cable to the adaptor

6. Connect the adaptor to the OMNI-M-ECA4-32 module on the OmniScan MX instrument (see Figure 2-11 on page 30).



Figure 2-11 Connecting the adaptor to the OmniScan MX

7. Connect the encoder to the OmniScan MX (see Figure 2-12 on page 30).



Figure 2-12 Connecting the encoder cable to the OmniScan MX

8. Insert the CompactFlash card that contains the MagnaFORM software into the OmniScan MX instrument, and then turn on the instrument.
9. Select **ECA Weld [version number]** by pressing the appropriate function (“F”) key on the OmniScan MX.

10. Wait until the program is loaded, and then follow the on-screen instructions.
11. Raise the probe when prompted to do so by the on-screen instructions, and then

press the Accept key ().

The default settings are as follows:

- a) Frequency: 200 kHz
- b) Probe Drive: 2.0 V
- c) Gain: 35 dB
- d) Rotation: 0
- e) Angle: 0
- f) Scan Type: Encoder
- g) Encoder Resolution: 5.06 steps/mm
- h) Encoder Polarity: Normal
- i) Scan Area: 250 mm

2.3 Installing the MagnaFORM on an Optional Scanner

The MagnaFORM can be installed on an optional scanner using the provided mounting arms. Four (4) rubber wheels must be installed on the MagnaFORM cart if it is used with a scanner (for details, see “Changing the Wheels” on page 22).

To install the MagnaFORM on an optional scanner

1. Loosen the knob on the scanner’s probe holder and slide the probe holder off the dovetail slide (see Figure 2-13 on page 32).

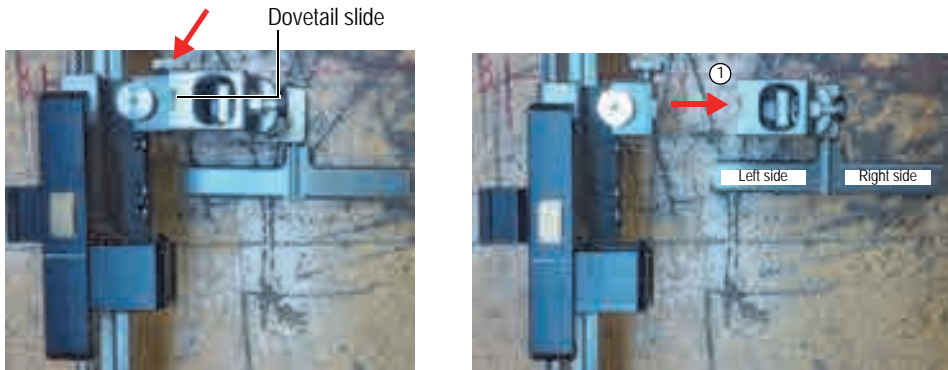


Figure 2-13 Loosening the knob (*left*) to remove the probe holder (*right*)

2. Attach the straight mounting arm (corresponding to the left side) to the probe holder using the provided clamp, and insert its screw head into the hole on the side of the MagnaFORM (see Figure 2-14 on page 32).

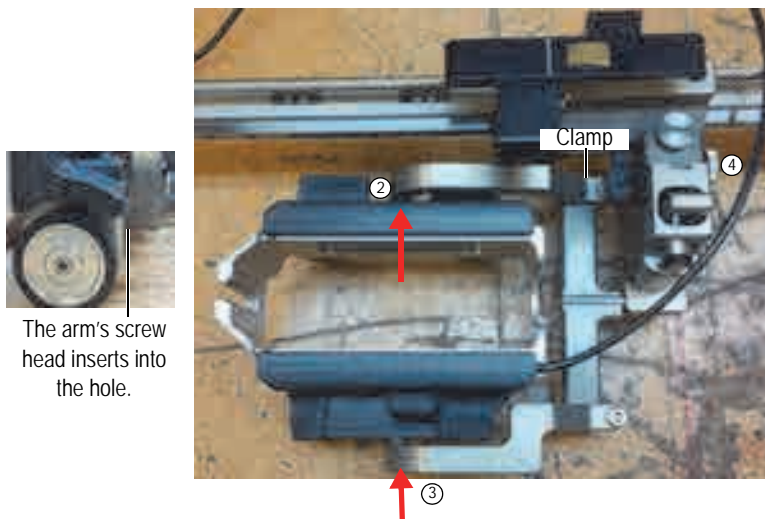


Figure 2-14 The MagnaFORM held on the scanner with mounting arms

3. Attach the curved mounting arm:

- a) Align the mounting arm's screw head and clamp with the MagnaFORM's hole and probe holder's rod.
 - b) Carefully slide the parts together.
 - c) Make sure the arms are tightly holding the MagnaFORM, and then tighten the clamp.
4. Reattach the probe holder to the scanner, and tighten the knob.
Be sure to carefully align the dovetails during reassembly and knob tightening.
 5. Connect the scanner's encoder output to the OmniScan's encoder input.
 6. Assemble the probe according to steps 1–2 on page 25 in "To set up for manual scanning."
 7. Connect the probe cable to the adaptor, and then connect the adaptor to the OmniScan (for details, see steps 5–6 on page 29 in "To set up for manual scanning").
 8. Place the scanner on the inspection surface, and then install the probe into the MagnaFORM and correctly adjust its height (for height adjustment details, see "To inspect a part" on page 45).
 9. Check the MagnaFORM's movement and, if necessary, readjust the parts (for example, to diminish excessive play) to ensure smooth and stable motion.
When parts are correctly adjusted and movement is smooth, you can start inspecting.
-

**CAUTION**

To avoid damage to the probe and MagnaFORM, make sure that the MagnaFORM is correctly mounted on the scanner and does not move erratically or wobble.

2.4 Operating Safety

If you are operating the MagnaFORM on a surface higher than 2 m (6 ft), you must first secure it using an appropriate lanyard that is held taut at all times. The inspection surface must be free of rust, debris, or obstructions. Additionally, if you are inspecting a ferromagnetic surface using magnetic wheels, the surface must be continuously ferromagnetic (uninterrupted).



WARNING

To prevent injury and equipment damage when operating the MagnaFORM in an elevated position, secure it with a lanyard that is held taut. Also ensure the inspection surface is free of rust, debris, or obstructions, and, when using magnetic wheels, is continuously ferromagnetic.

3. Software

The software menus and reference information are provided in Table 3 on page 35.

Table 3 Software menus

Menu	Submenu	Category	Reference
Weld Inspection	Eddy Current	Frequency	Section 15.1.1, OmniScan MXE 3.0 manual, page 298
		Gain	
		Rotation	
		Vertical Gain	
	Special	Filter	Section 15.1.2, OmniScan MXE 3.0 manual, page 299
		Probe Drive	Section 15.1.1, OmniScan MXE 3.0 manual, page 298
		Horizontal Pos.	Section 15.4.2, OmniScan MXE 3.0 manual, page 320
		Vertical Pos.	

Table 3 Software menus (continued)

Menu	Submenu	Category	Reference
Weld Inspection (continued)	Cursors	Scan Start	Section 15.2.2, OmniScan MXE 3.0 manual, page 307
		Index Start	
		Length Selection	
		Angle Selection	
	Encoders (Simplified)	Scan From	Section 15.6.2, OmniScan MXE 3.0 manual, page 327
		Continuous	
		Length	
		Enc. Resol.	
		Enc. Direction	
		Probe Orientation	
	Display	Single Channel Mode	Turns on or off the mode
		Channel	Selects the single channel
		Display Mode	Selects between SI, C, and C+SI
Load Palette		Section 15.4.5, OmniScan MXE 3.0 manual, page 324.	
Measurement	Reading	Mode	Section 15.2.1, OmniScan MXE 3.0 manual, page 302. Analysis now contains: Length X, Length Y, Depth, and SZ-AMPL
		Readings 1, 2, 3, and 4	

Table 3 Software menus (continued)

Menu	Submenu	Category	Reference
Alarm	Output	Enable	Section 15.3, OmniScan MXE 3.0 manual, page 310.
	Alarm Setup	Select	
		Top	
		Bottom	
		Left	
		Right	
Encoders (Advanced)	Inspection	Type	Section 15.6, OmniScan MXE 3.0 manual, page 326
		Acq. Rate	
	Encoder	Encoder	
		Type	
		Enc. Resol.	
		Origin	
		Preset	
	Area	Scan Start	
		Length	
		Scan Res.	
		Scan Tracking	
	Start	Start Mode	
		Start	
		Pause	

Table 3 Software menus (continued)

Menu	Submenu	Category	Reference
Calibration	Sensitivity	Start	Starts the Sensitivity calibration.
		Clear Compensation	Erases a previous calibration.
	Sizing	Start	Starts the Sizing calibration.
		Clear	Clears any previous calibration.
		Clear Null	Clears any previous null.
	Lift Off Alarm	Set	Sets the alarms.
		Clear	Clears any previous alarm.
File	Identical to OmniScan MXE 3.0R2; refer to OmniScan MXE 3.0 manual		Section 15.8, OmniScan MXE 3.0 manual, page 343
Preferences	Identical to OmniScan MXE 3.0R2; refer to OmniScan MXE 3.0 manual.		Section 15.9, OmniScan MXE 3.0 manual, page 347




4. Probe Calibration

A probe calibration consists of a sensitivity compensation and a defect sizing calibration.

4.1 Compensating for Sensitivity

Before starting the sensitivity compensation, the system components must be connected and set up, as detailed in “Component Connections and Setup” on page 21.

To compensate for sensitivity

1. On the OmniScan MX instrument, press the Menu key () , and then select the **Calibration** menu using the knob.
2. Press the F8 key () to initiate the sensitivity compensation procedure.
3. Raise the probe in the air, and then press the Accept key () .
4. Place the probe on the reference standard (see Figure 4-1 on page 40), and then proceed as follows:
 - ◆ If you are using the supplied calibration reference standard, press F8 (**Next**).

OR

If you are using a different calibration reference standard, it is strongly recommended to null your probe on the reference standard: make sure you are displaying defect-free data on the instrument, then press F9 to null the probe, followed by F8.

By default the angle is set to **65°**, and the amplitude is set to **9.0 V**. You can later modify these values if necessary.

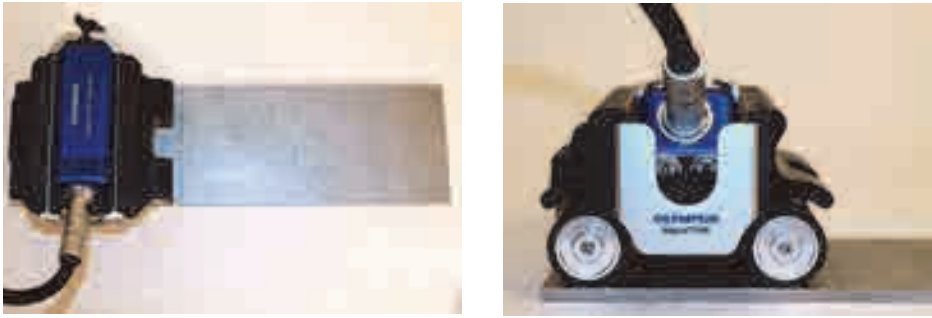


Figure 4-1 The probe on the reference standard

5. Ensure that the probe is well placed on the reference standard (and wheels are aligned with edge of reference standard, as shown in Figure 4-1 on page 40), and then press F9 to initiate the data acquisition.
6. Scan the entire reference standard, and then press F10 to stop the data acquisition, followed by F8 to proceed to the next step.
7. Place the cursors around the full length of the defect, select **Compensate Lift-Off** and then press F8 (**Next**) [see Figure 4-2 on page 41].

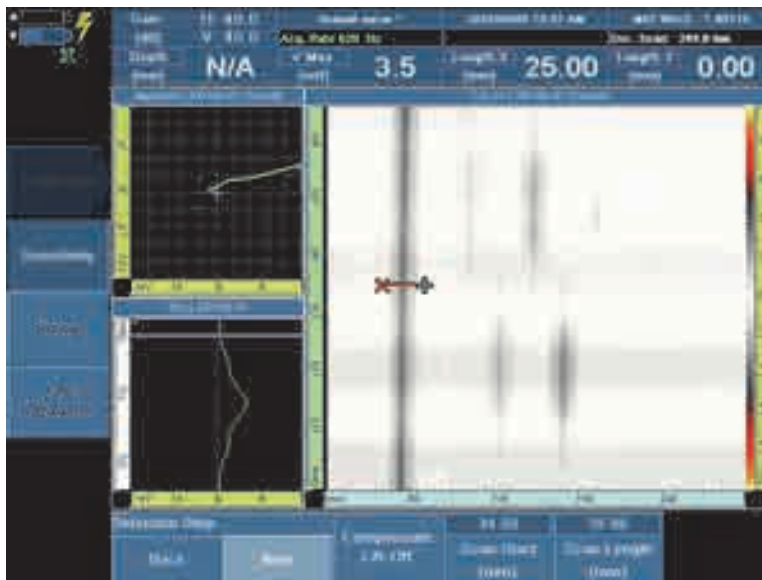


Figure 4-2 Placing the cursors around the first notch (colors may vary)

8. Rescan the reference standard (use F9 to initiate the data acquisition), and after completing the scan press F10, then press F8 (**Next**).
9. Place the cursors around the full length of the defect, and then press F8 (**Next**).
10. Press F9 to start the compensation.
11. After the compensation has been completed, press F8 to exit the wizard.
An example of a completed compensation is shown in Figure 4-3 on page 42.

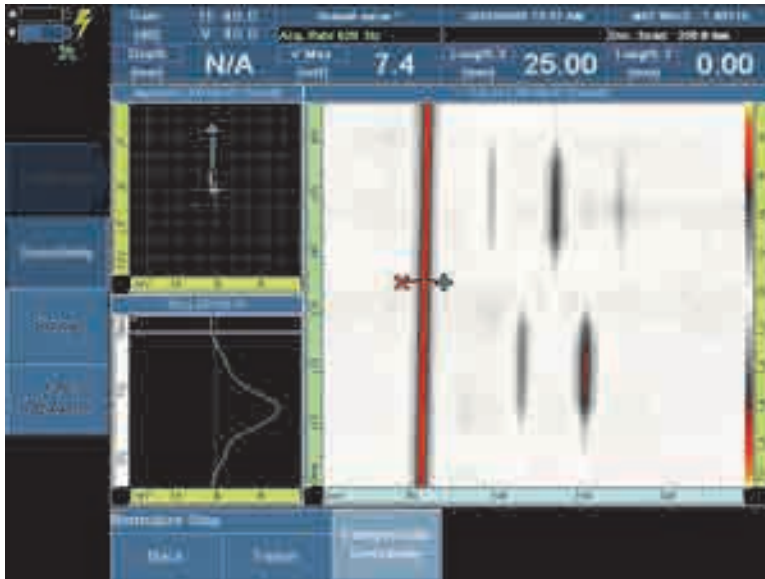



Figure 4-3 The compensated sensitivity

4.2 Calibrating the Probe for Defect Size

NOTE

The “sizing” (defect size) calibration is only possible if an encoder is used. It is recommended to increase the gain to 42 dB to ensure proper sizing.

To calibrate the probe for defect size

1. On the OmniScan MX instrument, press the Menu key (), then select the **Calibration** menu using the knob and press F3 to open the **Sizing** submenu.
2. Press F8 to initiate the sizing calibration procedure.
3. Place the probe on the reference standard, and then press F9 to null the probe.
4. Press F10 to start the data acquisition.

5. Scan the entire reference standard, and after completing it press F11 to stop the data acquisition, followed by F8 to proceed to the next step.
6. Place the cursors around the 0.5 mm defect depth, and then press F8 to register the defect (see Figure 4-4 on page 43).

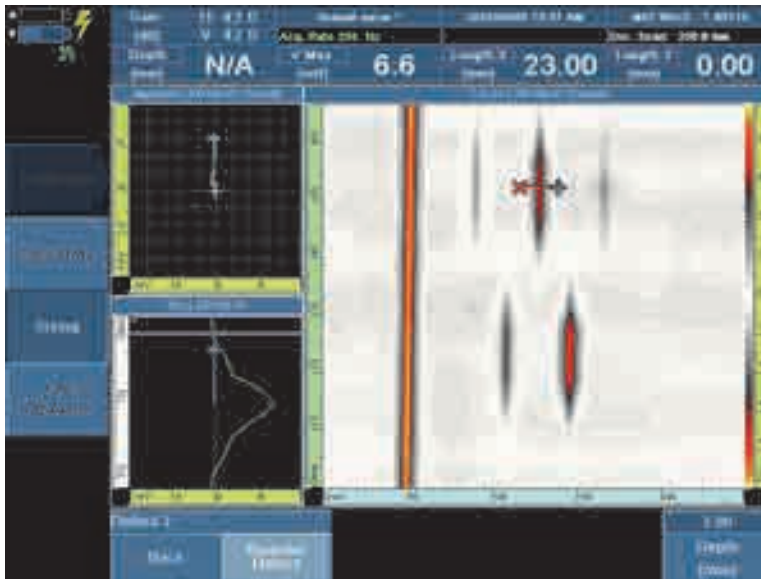


Figure 4-4 Placing the cursors to register the defect (2 mm defect depth shown)

7. Repeat step 6 for the 1 mm, 2 mm, 3 mm, and 4 mm defect depths.
8. After defect registration is completed, press F8 to exit the wizard.
The instrument is now ready to size your defects.

5. Inspection

Before starting an inspection, it is recommended to first perform a sensitivity calibration. For details about connections and calibration, see “Component Connections and Setup” on page 21 and “Probe Calibration” on page 39.

To inspect a part

1. Make sure that the probe is securely in place on the MagnaFORM and that all connections have been correctly made.
2. Carefully place the MagnaFORM on the part you are inspecting, and make sure that the probe does not extend below the wheels if you are using magnetic wheels (see Figure 5-1 on page 45).



Figure 5-1 Examples of good (*left*) and bad (*right* — too low) probe positions




CAUTION

Make sure that the probe does not extend lower than the magnetic wheels. If the probe is too low, the magnetic wheel force could cause damage to the probe.

3. Loosen the wing bolt and adjust the position of the probe on the inspection surface so that it rests firmly against the surface. Apply light pressure on the probe to obtain a tight fit against the inspection surface and weld, and then tighten the wing bolt (see Figure 5-2 on page 46).



Figure 5-2 The probe's shape against the weld (red line)

4. Press the Play key () to set the encoder position to zero.
5. While lightly pressing down on the probe, move the MagnaFORM over the inspection surface and observe the display to make sure all data has been captured.

Black lines on the display indicate areas where data is missing.

6. Press the Freeze key () to go to Analysis mode.
7. Use the cursors to analyze your data on the display.

6. Maintenance and Troubleshooting

This chapter outlines basic maintenance to keep the product in good physical and working condition.

6.1 Preventive Maintenance

Because there aren't many moving parts, the product does not require much preventive maintenance. Only regular inspection of the product is recommended to ensure that it is functioning correctly.

6.2 Cleaning the Product

The product's external surfaces may be cleaned when needed.

To clean the product

1. Make sure that the instrument is turned off and the power cord is disconnected.
2. Disconnect all cables.
3. To bring the product back to its original finish, clean it with a soft cloth.
4. To get rid of persistent stains, use a damp cloth and a soft soapy solution. Do not use abrasive products or powerful solvents that might damage the finish.
5. Make sure that the connectors are dry before reconnecting them. If they are not dry, either dry them off using a dry cloth, or wait until they dry on their own.

6.3 Cleaning the Magnetic Wheels

The magnetic wheels can attract sharp filings or other ferromagnetic objects. The wheels need periodic cleaning to avoid accumulation of any foreign objects that can cause injuries or equipment malfunction. The cleaning frequency depends on your operating conditions.

Required materials:

- Work gloves
- Clean cloth



CAUTION



To avoid injuries or equipment damage when handling magnetic wheels, take note of the magnetic attraction forces around the wheels, and observe the safety notes outlined in “Magnetic Wheel Safety” on page 21.

To clean the magnetic wheels

1. Put on your work gloves.
2. While turning the wheel, hold the clean cloth against it to remove particles.
3. Repeat the above step for each wheel.

6.4 Troubleshooting

NOTE

For instrument start-up and battery-related problems, refer to the troubleshooting section in the *OmniScan MX and MX2 User's Manual*.

Table 4 on page 49 lists some problems that may arise, possible causes, and suggested solutions.

Table 4 Troubleshooting guide

Problem	Possible cause	Solution
The connector does not function properly.	The connector is dirty.	Wash the connector with a 99 % alcohol solution.
	The probe or probe cable is damaged and does not work properly.	Use a different probe and cable.
Start-up message “No module detected”.	The acquisition module is incorrectly connected.	Make sure the acquisition module is correctly attached to the base unit on the instrument.
Software crashes.	Wrong software was loaded.	Shut down the instrument and restart with correct software.
No C-scan displayed.	There is no encoder connection.	Check encoder connections between MagnaFORM and instrument.
	A cable is loose.	Check cable connection between MagnaFORM probe and instrument.
Black lines on C-scan.	Scanning is too fast.	Reduce scanning speed.

6.5 Replacing the Velcro Strap

Depending on operating conditions and frequency of use, the Velcro strap that holds the probe may eventually wear out and need to be replaced.

To replace the Velcro strap

1. Remove the probe from the MagnaFORM.
2. Remove the worn Velcro strap.
3. Install a new Velcro strap.
4. Reinstall the probe onto the MagnaFORM.

6.6 Spare Parts for MagnaFORM Cart

The spare parts for the MagnaFORM cart are illustrated in Figure 6-1 on page 50 and listed in Table 5 on page 50.

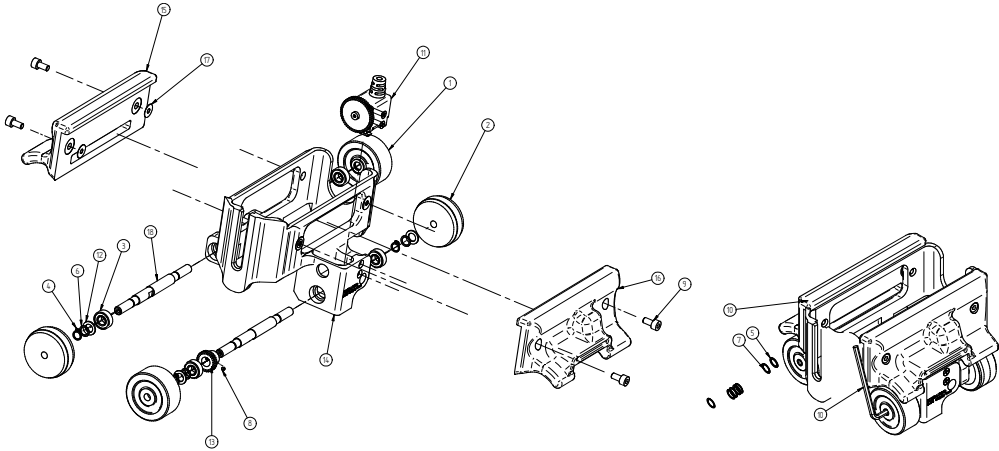


Figure 6-1 Exploded view

Table 5 Parts list

Item	Part number	Description
1	U8775189	Rubber wheel (Note: order quantity is one wheel)
2	U8779383	Magnetic wheel (Note: order quantity is one wheel)
3	Q8300533	Bearing, ID 6 mm, OD 13 mm, with 5 mm rubber seal
4	Q8300964	External retaining ring, 6 mm
5	U8909245	Spacer, ID 6 mm, OD 8 mm, W 0.4 mm
6	Q8300536	Spacer, ID 6 mm, OD 8 mm, W 0.25 mm
7	Q8300537	Spacer, ID 6 mm, OD 8 mm, W 0.10 mm
8	Q8300965	Hex set screw, M2 × 2 mm, stainless steel
9	U8906821	Hex screw, M4 × 8 mm, stainless steel

Table 5 Parts list (continued)

Item	Part number	Description
10	Q8300966	Allen (hex) key, 2.5 mm
11	Q7500024	Detachable encoder
12	Q8300538	Spacer (modified), ID 6 mm, OD 10 mm, W 1 mm, stainless steel
13	Q8300967	Gear (modified), 0.5 MOD, 28 teeth, aluminum
14	Q8300968	Cart frame
15	Q8300969	Handle
16	Q8300970	Handle
17	Q8300971	Washer (polyolefin), 0.127 mm (0.005 in.) thick
18	Q8300051	Wheel shaft

7. Specifications

Table 6 on page 53 contains the general specifications for the MagnaFORM.

Table 6 General specifications

Category	Specification	Value
General	Size, probe (L × W × H)	153.8 mm × 44.5 mm × 76.5 mm
	Size, probe + MagnaFORM	157.7 mm × 127.5 mm × 90.1 mm
	Weight, probe	364 g
	Weight, MagnaFORM only	601 g
	Weight, probe + MagnaFORM	965 g
	Probe recognition	Automatic, via chip ID
Environment	Operating temperature	-20 °C to 85 °C
	Storage temperature	-20 °C to 60 °C
	Altitude	Up to 2000 m
	Relative humidity	70 % RH at 45 °C noncondensing
	Outdoor use	Yes
	Wet locations	Yes
	Ingress protection	Probe: compliant to IP54 Adaptor: compliant to IP53
Voltage and current	Voltage	+9 V to -9 V
	Current	100 mA

Encoder input connectors

Description

DE-15 connector

Manufacturer, number

Amphenol, 17EHD-015-SAA-000

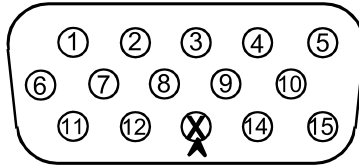


Figure 7-1 The scanner interface adaptor DE-15 connector (solder-cup view)

Table 7 Scanner interface adaptor pinout (DE-15 to LEMO)

LEMO pin #	Signal	DE-15 pin #
1	Analog In	4
2	+5 V	3
3	DIN1	1
4	DIN2	2
5	DIN3	5
6	N.U. ^a	
7	DOUT1	6
8	DOUT2	14
9	PHA-1	9
10	PHB-1	10
11	PHB-2	12
12	PHA-2	11

Table 7 Scanner interface adaptor pinout (DE-15 to LEMO) (continued)

LEMO pin #	Signal	DE-15 pin #
13	Connector keying (index)	13 (removed)
14	RX	7
15	TX	8
16	GND	15
Casing	Shield	Casing

a. N.U. = Not used

Description

LEMO 16-pin connector

Manufacturer; number

LEMO (male); FGA.2K.316.CLAK11

LEMO (female); EEA.2K.316.CLN

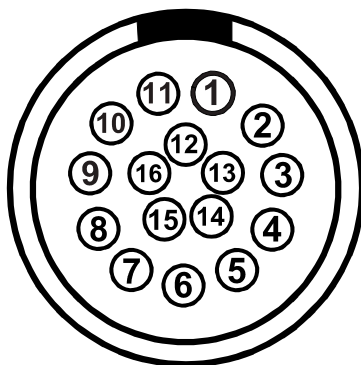


Figure 7-2 The scanner interface adaptor LEMO connector (male pin view)

Table 8 Scanner interface adaptor LEMO pinout

Pin #	Signal (connector side)
2	Generator Out
12	Generator Gnd
3	MUX0
4	MUX1
5	MUX2
6	MUX3
11	Probe ID
13	HOTSWAP
10	Positive Supply
1	Negative Supply
16	IN1 + Gnd
8	IN1+ (ECA)
9	IN1- (ECA)
15	IN1 Gnd
7	IN2+ (Lift off)
14	IN2 Gnd

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