



HST-X04

Manual Weld TOFD Scanner

User's Manual

DMTA020-01EN — Rev. C
March 2014

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.

Olympus NDT, 48 Woerd Avenue, Waltham, MA 02453, USA

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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.

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Labels and Symbols

The rating label location of the HST-X04 scanner is shown in Figure i-1 on page 1. If any or all of the labels or symbols are missing or illegible, please contact Olympus. The descriptions of the symbols are provided in Table 1 on page 2.

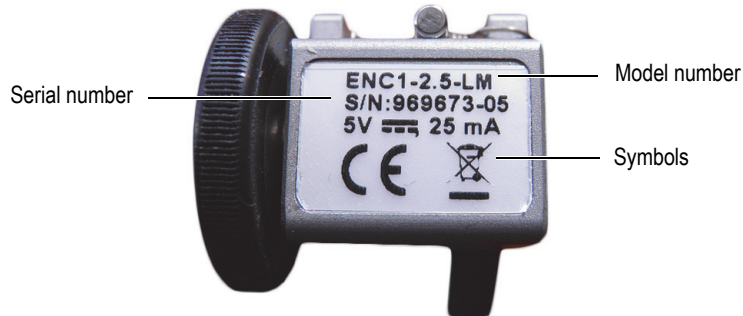


Figure i-1 Label and symbols on the Mini-Wheel encoder

Table 1 Symbols on rating labels

| | |
|---------------------------------|--|
| Mini-Wheel encoder rating label | |
| Content of rating label | |
| | 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 direct current symbol. |
| S/N | The serial number. |

Important Information — Please Read Before Use

Intended Use

The HST-X04 scanner is designed to perform nondestructive inspections on welds using TOFD or pulse-echo techniques.



DANGER

Do not use the HST-X04 scanner for any purpose other than its intended use. It must never be used to inspect or examine human or animal body parts.

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 illustrated in this manual may differ from the components installed on your instrument. However, the operating principles remain the same.

Instrument Compatibility

The HST-X04 scanner is compatible with the Olympus ancillary equipment listed in Table 2 on page 4.

Table 2 Ancillary equipment

| Part number | Item Number | Description |
|-------------------|-------------|--|
| 5682 | U8120006 | 5682 preamplifier and 9 V battery. |
| 5682-KIT01 | U8120038 | preamplifier, one 2.5 m UT probe cable (LEMO 00 to LEMO 00), one 2.5 m power supply cable linking to the OmniScan, and a belt case. |
| 5682-A-PWRC-OM-5M | U8775119 | One 5 m power supply cable linking to the OmniScan. |
| AAIX202 | U8775085 | Scanner with a 150 mm frame, and a supplementary 250 mm frame for wider probe center separation. |
| ENC1-2.5-LM | U8775295 | OmniScan Mini-Wheel encoder LEMO - 2.5M |
| Omni-A2-ADP20 | U8775201 | Scanner interface adaptor to connect scanners encoder cables with DE-15 connector to OmniScan MX2 with LEMO connector scanner interface. |

Table 2 Ancillary equipment (continued)

| Part number | Item Number | Description |
|-------------------------|-------------|--|
| Omni-A-ADP27 | U8780329 | Scanner interface adaptor to connect scanners encoder cables with LEMO connector to OmniScan MX with DE-15 connector scanner interface. |
| C1-LF-BXM-0.3M | U8769010 | 0.3 m long adapter LEMO female to Bendix male linking LEMO encoder cable to FOCUS LT. |
| C1-DE15F-BXM-0.30M | U8767107 | 0.3 m long adapter DE-15 female to Bendix male linking DE-15 encoder cable to FOCUS LT. |
| Probes | — | Various probes, combined with wedges, can be mounted on the HST-X04 scanner. For more information, see section “Probes” on page 17. |
| Wedges | — | Various wedges, combined with probes, can be mounted on the HST-X04 scanner. For more information, see section “Wedges” on page 18. |
| OmniScan PA or FOCUS LT | — | Many OmniScan and FOCUS LT instrument models can be used. Note: An encoder cable adaptor may be required (see Table 9 on page 26). |

**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 HST-X04 scanner does not contain any user-serviceable parts. Opening the scanner or its components 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.



High voltage warning symbol

This symbol is used to alert the user to potential electric shock hazards greater than 1000 volts. 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, could 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, could 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 safety 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 using the product, 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.

WEEE Directive



In accordance with European Directive 2002/96/EC 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.

EMC Directive Compliance

This equipment generates and uses radio-frequency energy and, if not installed and used properly (that is, in strict accordance with the manufacturer's instructions), may cause interference. The HST-X04 scanner has been tested and found to comply with the limits for an industrial device in accordance with the specifications of the EMC directive.

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 NDT 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>.

1. Setting Up and Operating the HST-X04 Scanner

The HST-X04 scanner is a versatile pipe and plate scanner, which can be used to inspect welds using TOFD or pulse-echo techniques.

1.1 Description

The HST-X04 scanner is composed of two probe holders mounted on a bar. A mini-encoder is installed on one of the probe holders (see Figure 1-1 on page 11).

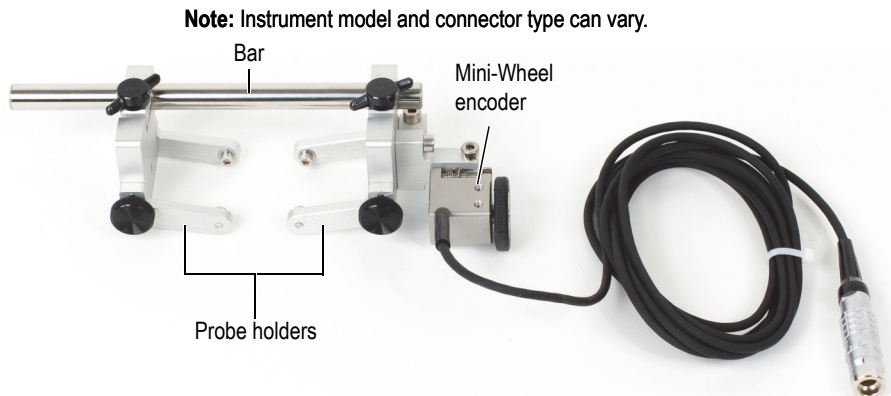


Figure 1-1 The HST-X04 scanner

1.2 Assembling the Scanner

This section presents the assembly procedures for the HST-X04 scanner, which include installing a probe and wedge in a probe holder, installing and adjusting a probe holder, and installing the Mini-Wheel encoder.

1.2.1 Installing a Probe and Wedge in a Probe Holder

To install a probe and wedge in a probe holder

1. On the side of the fork, unscrew the wing screw enough so that you can pull the fork arm away from the probe holder (see Figure 1-2 on page 12).

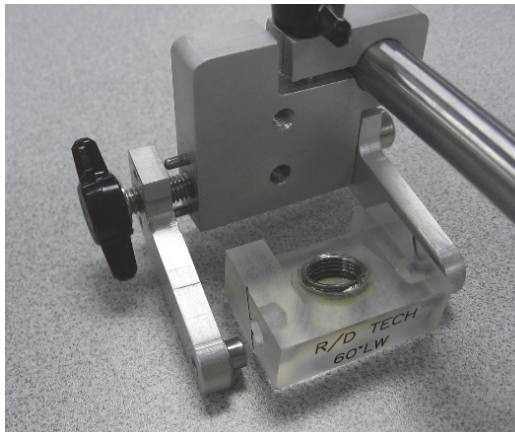


Figure 1-2 Pulling the fork arm away from the probe holder

2. Install the probe and wedge between the two fork arms and push the fork arm in order to place the arm guiding pin into the wedge side hole.

| |
|-------------|
| NOTE |
|-------------|

Before installing a new probe into a probe holder, make sure there is enough couplant between the probe face and the wedge.

3. Screw the wing screw until it holds the fork arm tight against the holder.
-

1.2.2 Installing a Probe Holder

To install a probe holder on the bar

1. On top of the holder, unscrew the wing screw enough to loosen the bar socket (see Figure 1-3 on page 13).

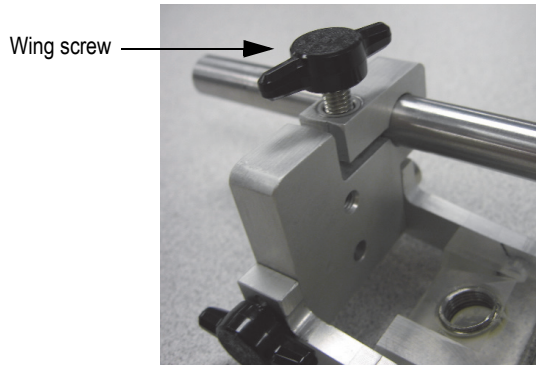


Figure 1-3 Loosening the bar socket

2. Move the probe holder on the bar to the desired position and screw the wing screw tight enough to hold the probe holder in place.

1.2.3 Installing an Encoder

The Mini-Wheel encoder (see Figure 1-4 on page 14) can be installed two different ways according to the scanning direction needed.



Figure 1-4 The Mini-Wheel encoder and cable

When the probes are perpendicular to the weld and the scanning direction is parallel to the weld, the Mini-Wheel encoder is installed on the outside of the encoder holder (see Figure 1-5 on page 14).

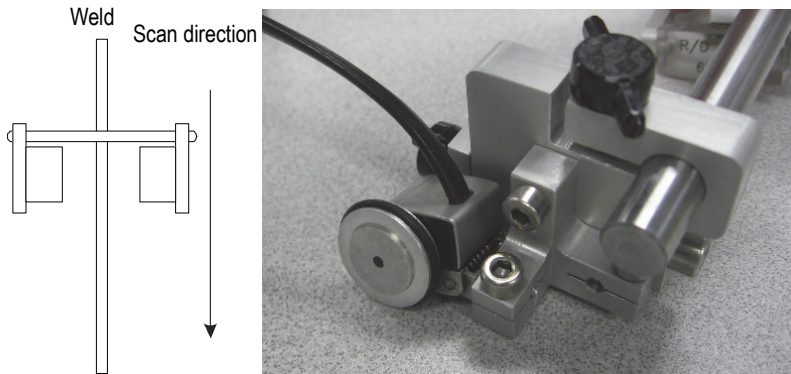


Figure 1-5 The Mini-Wheel encoder installed on the outside of the encoder holder

When the probes are parallel to the weld and the scanning direction is parallel to the weld or when the probes are perpendicular to the weld and the scanning direction is also perpendicular to the weld, the Mini-Wheel encoder is installed on the inside of the encoder holder (see Figure 1-6 on page 15).

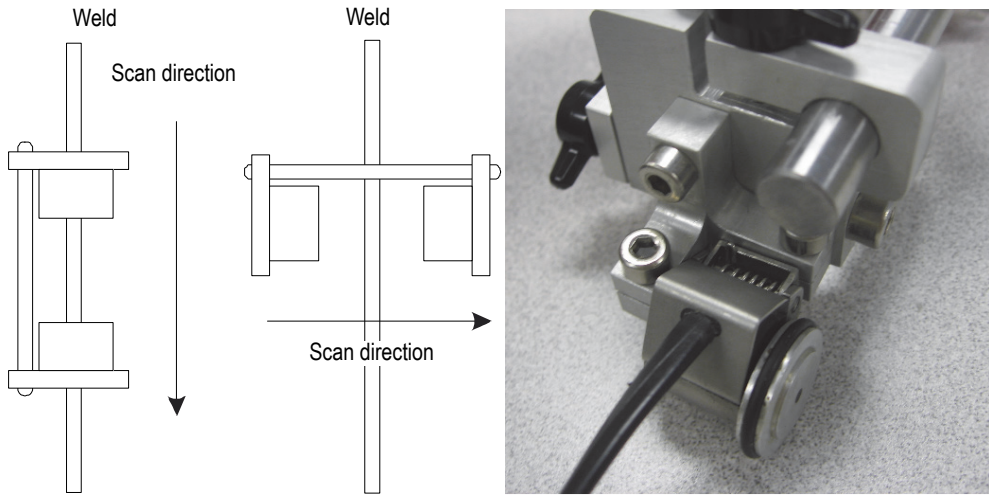


Figure 1-6 The Mini-Wheel encoder installed on the inside of the encoder holder

To install the encoder

1. Use the hexagonal key to loosen the screw securing the Mini-Wheel encoder pin into the encoder holder (see Figure 1-7 on page 15).

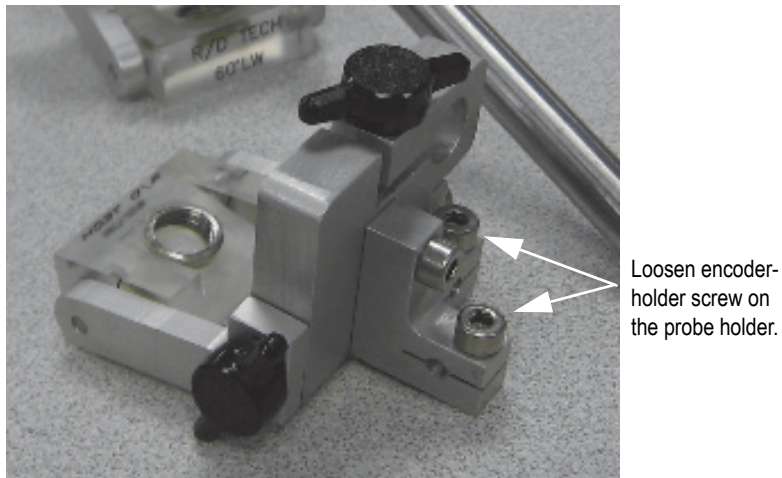


Figure 1-7 The two encoder holder screws

2. Slide the Mini-Wheel encoder pin into the encoder holder and secure it with the hexagonal head screw.

1.3 Operating the Scanner

The HST-X04 scanner is designed for manual use, and is straightforward to operate.

Once the HST-X04 scanner is setup for the size of pipe or plate you wish to inspect (see section “Assembling the Scanner” on page 12), use the following procedure to operate the scanner.

To operate the scanner

1. Hold the scanner above the inspection surface, and then align the scanner so that the inspection area is centered between the probes.

| |
|-------------|
| NOTE |
|-------------|

Depending on the type of probe or transducer used, some fine-tuning can be required to adjust the distance between probes. Also, some situations may require the surface being inspected to be off-centered between the probes (see section “Installing a Probe Holder” on page 13).



| |
|----------------|
| CAUTION |
|----------------|

All carbide wear pins should be flush with the wedge surface.

2. Next, push or pull the scanner in the desired inspection direction.

2. Probes, Wedges, and Ordering Part Numbers

This chapter presents a list of probes and wedges that can be used with the HST-X04 scanner and describes the parts that are included in the scanner kit.

2.1 Probes

Table 3 on page 17 describes the probes used for inspections made with the HST-X04 scanner.

Table 3 Miniature Screw-in TOFD Transducers

| Frequency | Nominal element size | | Transducer part numbers | Case type | Case thread pitch |
|-----------|----------------------|-------|-------------------------|-----------|-------------------|
| | MHz | mm | | | |
| 2.25 | 6 | 0.25 | C542-XX ^a | ST1 | 3/8 - 32 |
| | 9.5 | 0.375 | C566-XX ^a | ST2 | 11/16 - 24 |
| | 12 | 0.5 | C540-XX ^a | ST2 | 11/16 - 24 |
| 5.0 | 3 | 0.125 | C567-XX ^a | ST1 | 3/8 - 32 |
| | 6 | 0.25 | C543-XX ^a | ST1 | 3/8 - 32 |
| | 9.5 | 0.375 | C568-XX ^a | ST2 | 11/16 - 24 |
| | 12 | 0.5 | C541-XX ^a | ST2 | 11/16 - 24 |

Table 3 Miniature Screw-in TOFD Transducers (continued)

| Frequency | Nominal element size | | Transducer part numbers | Case type | Case thread pitch |
|-----------|----------------------|-------|-------------------------|-----------|-------------------|
| | MHz | mm | | | |
| 10 | 3 | 0.125 | C563-XX ^a | ST1 | 3/8 - 32 |
| | 6 | 0.25 | C544-XX ^a | ST1 | 3/8 - 32 |
| 15 | 3 | 0.125 | C564-XX ^a | ST1 | 3/8 - 32 |

- a. The XX part of the transducer part number indicates that two types of connectors are available: SM (Microdot connectors) or SL (LEMO 00 connectors)

2.2 Wedges

Table 4 on page 18 describes the wedges used for inspections made with the HST-X04 scanner.

Table 4 Miniature TOFD Screw-in Wedges

| ST1 wedge type | ST2 wedge type | Refracted longitudinal angle (°) |
|--------------------------|--------------------------|----------------------------------|
| ST1-45L ^a | ST2-45L ^a | 45 |
| ST1-45L-IHC ^b | ST2-45L-IHC ^b | 45 |
| ST1-45L-IHS ^c | — | 45 |
| ST1-60L ^a | ST2-60L ^a | 60 |
| ST1-60L-IHC ^b | ST2-60L-IHC ^b | 60 |
| ST1-60L-IHS ^c | — | 60 |
| ST1-70L ^a | ST2-70L ^a | 70 |
| ST1-70L-IHC ^b | ST2-70L-IHC ^b | 70 |
| ST1-70L-IHS ^c | — | 70 |

- a. Comes standard with scanner holes.
- b. IHC: Irrigation, scanner holes, and carbides.
- c. IHS: Irrigation, scanner holes, and stainless steel frame.

| |
|-------------|
| NOTE |
|-------------|

The HST-X04 scanner can also be fitted with SPE wedges. However, probes with a LEMO connector cannot be used in combination with SPE wedges, due to mechanical interference.

2.3 Ordering Part Numbers

To order replacement parts for the HST-X04 scanner, please refer to Table 5 on page 19 below.

Table 5 HST-X04 scanner ordering part numbers

| Quantity | Part number | Item Number | Description |
|----------|-------------|-------------|--|
| 1 | AAIX202 | U8775085 | Scanner with a 150 mm frame, and a supplementary 250 mm frame for wider probe center separation. |
| 1 | ENC1-2.5-LM | U8775295 | OmniScan Mini-Wheel encoder LEMO - 2.5M |
| 2 | C563-SM | U8435028 | 10 MHz (3 mm element diameter) CentraScan composite TOFD probes. |
| 2 | C543-SM | U8435020 | 5 MHz (6 mm element diameter) CentraScan composite TOFD probes. |
| 2 | ABWX385 | U8710004 | ST1-60L-IHC wedge |
| 2 | ABWX386 | U8710002 | ST1-45L-IHC wedge |
| 2 | ABWX387 | U8710006 | ST1-70L-IHC wedge |

Table 5 HST-X04 scanner ordering part numbers (continued)

| Quantity | Part number | Item Number | Description |
|-----------------|--------------------|--------------------|-------------------------------------|
| 2 | C174-LM-UDOT-2.5M | U8800388 | LEMO to U-DOT 2.5 m cable. |
| 2 | — | — | Two sizes of hexagonal key |
| 2 | 21AB0062 | U8767012 | LEMO 00 female to BNC male adaptor. |
| 1 | DMTA020-01EN | — | User manual |

3. Maintenance

This chapter deals with the basic maintenance that an operator can apply to the HST-X04 scanner. The maintenance operations explained as follows helps keep the product in good physical and working condition. Due to its design, the HST-X04 scanner requires only a minimum of maintenance. This chapter covers preventive maintenance and unit cleaning.

3.1 Preventive Maintenance

The HST-X04 does not require preventive maintenance. Only a regular inspection of the product is recommended to ensure that the HST-X04 scanner functions correctly.

3.2 Unit Cleaning

The HST-X04 scanner external surfaces can be cleaned when needed. This section provides the procedure for the appropriate cleaning of the product.

To clean the unit

1. Disconnect and remove all cables, probes, and wedges.
2. To bring the instrument back to its original finish, clean the housing with a soft cloth.
3. To remove persistent stains, use a damp cloth with a soft, soapy solution. Do not use abrasive products or powerful solvents that could damage the finish.

4. Spare Parts

A list of spare parts for the HST-X04 scanner is provided in Table 6 on page 23.

Table 6 HST-X04 scanner spare part list

| Part number | Item Number | Description |
|-------------|-------------|--|
| AAIX202 | U8775085 | Scanner with a 150 mm frame, and a supplementary 250 mm frame for wider probe center separation. |
| ENC1-2.5-LM | U8775295 | OmniScan Mini-Wheel encoder LEMO - 2.5M |

5. Specifications

This chapter presents the general and operating specifications for the HST-X04 scanner (see Table 7 on page 25 and Table 8 on page 25).

5.1 General and Environment Specifications

Table 7 General specifications

| Parameter | Value |
|-----------|---|
| Length | 175 mm (6.9 in.) with the 150 mm bar and the Mini-Wheel encoder installed on the inside of the encoder holder. 275 mm (10.8 in.) with the 250 mm bar and the Mini-Wheel encoder installed on the inside of the encoder holder. |
| Width | 60 mm (2.4 in.) with the Mini-Wheel encoder installed on the outside of the encoder holder. |
| Height | 50 mm (2 in.) |
| Voltage | 5 V |
| Current | 25 mA maximum |
| Frequency | 0–1.5 kHz (maximum displacement velocity of 100 mm/s [4 in./s]) |

Table 8 Operating environment specifications

| Parameter | Value |
|------------------------|------------------------------------|
| Operating temperature | –10 °C to 55 °C (14 °F to 131 °F) |
| Storage temperature | –30 °C to 60 °C (–22 °F to 140 °F) |
| Relative humidity (RH) | Max. 85 % RH noncondensing |

Table 8 Operating environment specifications (continued)

| Parameter | Value |
|-----------------|------------------------------------|
| Wet location | Yes |
| Altitude | Up to 2000 m |
| Outdoor use | Yes |
| Pollution level | 1 |
| IP rating | Waterproof (designed to meet IP67) |

5.2 Connector Reference

HST-X04 scanners sold after July 2013 come standard with the LEMO connector which is compatible with the OmniScan MX2 and SX instruments. For use with a different instrument, an optional adaptor is required (see Table 9 on page 26).

Table 9 Required encoder cable adaptor

| Scanner Connector | Instrument | | | |
|------------------------------|-------------------------|--------------------------|--------------------------|-------------------------------|
| | OmniScan MX | OmniScan MX2 | OmniScan SX | TomoScan FOCUS LT |
| LEMO (from July 2013 onward) | Omni-A-ADP27 [U8780329] | — | — | C1-LF-BXM-0.3M [U8769010] |
| DE15 (Prior to July 2013) | — | Omni-A2-ADP20 [U8775201] | Omni-A2-ADP20 [U8775201] | C1-DE15F-BXM-0.30M [U8767107] |

Figure 5-1 on page 27 contains the pinout for the LEMO connector used on the OmniScan MX2 model.

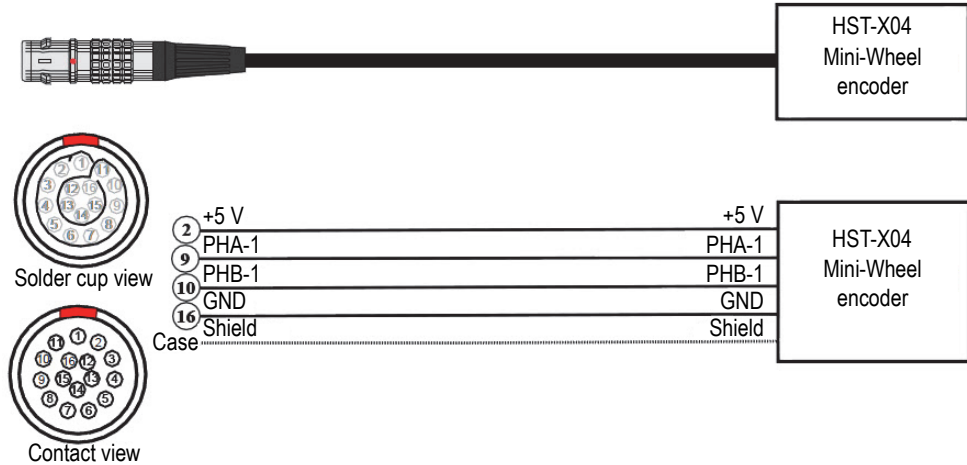


Figure 5-1 LEMO connector pinout diagram

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