

Gammatec NDT Supplies SOC LTD

Group	Logistics	Assembly of “NEW” or “REPAIR” Guide and Extension Tubes		
Document	Work Instruction			
Document No.	5.1.66.0			
Revision No.	2	Effective from	7 October 2019	Page 1 of 17

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DISTRIBUTION

DEPT
MWS
QA/QC

NAME	DEPT

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1. **PURPOSE/OBJECTIVES**

The objectives of this Work Instruction are:

- 1.1 To outline the different steps taken in the Assembly of Gammatec Guide/Extension Tube.

2. **SCOPE**

This procedure is applicable to all personnel within Gammatec NDT Supplies SOC Ltd.

3. **RESPONSIBILITIES AND AUTHORITIES**

3.1 **Managing Director**

It is the responsibility of the Managing Director to ensure that the necessary responsibilities and authorities are defined, assigned and communicated to the applicable personnel within the company.

3.2 **MWS Manager/Supervisor**

- Is responsible for ensuring that the necessary responsibilities and authorities are assigned and communicated to the applicable personnel.
- Is responsible for ensuring that this work instruction is available at point of use.
- Is responsible for ensuring that tools and resources are identified and provided as required.
- Is responsible for the training, and certification of technicians in accordance with the approved Quality Policy and Work instructions.
- Is responsible for regular reviewing and updating of this Work Instruction to ensure that it remains current.
- Is responsible for the prompt implementation of corrective/preventive measures regarding any non-conformances originating from the MWS.

3.3 **MWS Technician**

- Is responsible for adherence to the requirements this work instruction.
- Is responsible for ensuring that the required resources and tools are correctly maintained.
- Is responsible for prompt reporting of any non-conforming situation to the MWS Manager for advice or resolution.

3.4 **QC Supervisor**

- Is responsible for ensuring that the necessary responsibilities and authorities are understood and adhered to.
- Is responsible for ensuring that this work instruction is available at point of use.
- Is responsible for supervision and delegation of tasks to the QC Inspectors.
- Is responsible for ensuring that the required resources and tools are correctly maintained.

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- Is responsible for prompt resolution of any reported quality problems reported.
- Is responsible for prompt reporting of any non-conforming situation to the SHEQ Manager for advice or resolution.

3.5 QC Inspector

- Is responsible for adherence to the requirements of this work instruction.
- Is responsible for ensuring that the required resources and tools are correctly maintained.
- Is responsible for prompt reporting of any non-conforming situation to the QC Supervisor for advice or resolution.

3.6 Company Accountant

Is responsible for authorising the disposal of any records that have reached their maximum retention period.

4. REFERENCES

- 4.1 ISO 9001 Quality Management System.
- 4.2 Applicable procedures and work instructions within Gammatec NDT Supplies SOC Ltd.
- 4.3 Regulatory requirements as applicable within Gammatec NDT Supplies SOC Ltd.

5. DEFINITIONS

- 5.1 MWS – Mechanical Workshop
- 5.2 QC – Quality Control

6. PROCEDURE

6.1 Discussion of the process – Assembly of “New” Gammatec Guide Tube/Extension Tube.

- 6.1.1 Stores issue a Production Order together with Spares to MWS requesting assembly of Guide/Extension Tube. The Stock Codes and descriptions of the Spares required for the assembly are written in first with the Stock Code and description of the Guide/Extension Tube to be assembled.
- 6.1.2 MWS Technician verifies the Production order with physical Spares issued by Stores that all are correct, then accepts the Production Order by signing and dating the hand over register.
- 6.1.3 Assembly of Guide Tube/Extension is now “work in progress”.
- 6.1.4 On completion of the work, MWS Technician signs off the Production Order and attaches Assessment Checklist.
- 6.1.5 MWS Technician requests QC for Guide/Extension Tube by sending a mail to QC and hands over the Production Order with attached Assessment Checklist.

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- 6.1.6 Upon QC pass, MWS receives a confirmation mail from QC. Production Order is returned to MWS with “QC pass” stamped and dated by QC Inspector (Assessment Checklist remains with QC).
- 6.1.7 MWS Technician hands over both Guide/Extension Tube and Production Order to Stores.
NB: make a copy of the Production Order stamped “QC pass” and file it.
- 6.1.8 Assembly of Guide/Extension Tube is now “work completed”

6.2 Discussion of the process - Assembly of “Repair” Gammatec Guide Tube/Extension Tube

- 6.2.1 Customer Service Goods receiving issue a job card and the Guide/Extension Tube for repair to MWS. Ensure that Repair Calibration Instruction (RCI) form is attached to the Job Card.
Note: Pictures of the state in which the Guide/Extension Tube was received are attached to Fusion software, not the Job Card.
- 6.2.2 MWS Technician signs and dates the Job Card as proof of receipt “unit received by workshop”. MWS Technician signs hand over register from Goods receiving acknowledging receipt of the Guide/Extension Tube and Job Card.
- 6.2.3 MWS Technician carries out assessment on the Guide/Extension Tube to establish what spares will be required for repairs.
- 6.2.4 MWS Technician updates the Job Card with spares needed for the repairs indicating the **Type** and **Quantity** of each spare with the associated **Stock Code**. Inputs the spares recorded on the Job Card into SAP/Fusion under Sales Quotation link and saves the updates.
- 6.2.5 MWS Technician signs the Job Card “Sales to quote and date”. Changes the status of the Job Card on SAP/Fusion “Sales to quote” and saves the update.
- 6.2.6 MWS Technician hands over the Job Card to Customer Service to process the Quotes to Customer. Hand over control register must be signed by the Customer Service Administrator receiving the Job Card.
- 6.2.7 Upon receiving the Go-ahead from Customer, Customer Service will issue the Job card to MWS with “Sales Order” attached indicating the same spares as quoted initially on the Job Card. Hand over control register to be signed by MWS Technician.
- 6.2.8 MWS Technician changes the status of the Job Card on SAP/Fusion “MWS Spares requested” and saves the update. Hands over the Job Card to Stores to issue spares as per Quotes on the Job Card and Sales Order, not only the Job Card. Job Card must be signed

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under “spares requested and date” by MWS Technician. Hand over control register must be signed by Storeman receiving the Job Card.

- 6.2.9** Stores will issue spares as per “Job Card” and “Sales Order” to MWS with the correct quantity of spares. Job Card will be attached to Stock Transfer as proof of the spares issued to MWS. Storeman will sign and date the Stock Transfer (correct warehouse for MWS is WH04), verifies correctly used linked “Sales Order number” and “quantity of spares” transferred with the “Sales Order”.

- 6.2.10** MWS Technician, if satisfied, will accept the spares and sign the Stock Transfer copy.

- 6.2.11** Repair of Guide/Extension Tube is now “work in progress” (all spares quoted must be replaced accordingly). The timing of repair depends upon the priority list in place and updated accordingly.

- 6.2.12** Upon completion of repairs, MWS Technician will sign off the Job Card “Complete” and attach the Assessment Checklist to the Job Card.

- 6.2.13** MWS Technician changes the status of the Job Card on SAP/Fusion “MWS QC requested” and sends mail to QC. Hands over the Job Card with attached Assessment Checklist to QC. Control register must be signed by the QC Inspector receiving the Job Card.

- 6.2.14** Upon QC pass, MWS receives confirmation mail from QC. Job Card is returned by QC with “QC pass” stamped, signed and dated.

- 6.2.15** MWS Technician transfers spares from WH04 (if spares replaced were stock items) to Dispatch (correct warehouse for Dispatch is WH03) and attaches copy of Stock Transfer to the Job Card. Transfer must be signed and dated by MWS Technician. Status of the Job Card on SAP/Fusion “QC to Stores/Dispatch”.

- 6.2.16** MWS Technician hands over the Guide/Extension Tube to Dispatch together with Job Card (with Stock Transfer if spares replaced were not consumables).

- 6.2.17** MWS Technician retains a copy of Sales Order and Stock Transfer signed by Dispatch and files copies as proof of Guide/Extension Tube handed over to Dispatch.

- 6.2.18** Repair of Guide/Extension Tube is now “work completed”.

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6.3 Spares required for Assembly of Gammatec Guide/Extension Tube.

NCT0039 - 2.1m Yellow G/Tube Exertus & G/mat Projector




Item No.	Part	No.	Description	QTY
1		TUBE-ST0028	Blank 2.1m Yellow Guide Tube	1
2		INSERT-SI0005	Sentinel Yellow Guide and Ext Tube Insert	2
3		FITTING-SF0009	M18 x 1.5 to fit G/mat Yellow Guide Tube-Engraved	2

Table 1

NCT0511 – 7' Yellow G/Tube Sentinel, IR100 Projector

NCT0030 - 7' Yellow Extension Tube - Sentinel / IR100 Projector






Item No.	Part	No.	Description	QTY
1		TUBE-ST0028	Blank 2.1m Yellow Guide Tube	1
2		INSERT-SI0005	Sentinel Yellow Guide and Ext Tube Insert	2
3		FITTING-SF0001	1" x 18TPI Male to fit Yellow Guide Tube - Engraved	1
4		FITTING-SF0018	1" x 18TPI Female to fit Yellow Ext Tube	1
5		TIP-ST0055	65mm Sent Yellow Guide Tube Tip (Swage) Rev 1	1

Table 2

6.4 Preparation

6.4.1 Equipment required:

- Bench Vice

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- Small Hammer
- Crimping Block (as specified in procedure)
- Hydraulic Press
- Gloves
- Cotton Waste
- Lacquer Thinners
- Electric Heat Gun
- Buff Tag with Rubber band
- PVC or Masking tape
- 19mm Black Shrink Hose
- Test dummy pigtail
- Hand file (round)



- Always wear Eye Protection when working with Hand Tools, Thinners and grinding!!
- Beware of "pinch points" when using the vice and Hydraulic Press.
- Keep Thinners away from open flames and heat sources.
- Use Latex gloves when handling or working with Thinners.

6.4.2 Cleaning of Guide/Extension Tube: use Lacquer Thinners to clean dirt on the surface of the Tube.

6.4.3 For **repair** only: cut the marked area where the damage has been spotted (Figure 1).



Figure 1

6.5 Discussion of the process – Assembly of "New" or "Repair" Gammatec Guide/Extension Tube

NB: This procedure describes a generic process to be followed. Although there are differences in the various models of Guide Tube the assembly procedure remains the same.

6.5.1 Place a piece of a rag/cloth over the two vice clamps to avoid marking the PVC cover

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(Figure 2) and lightly clamp the Guide Tube horizontally in a vice. Over tightening may damage the PVC and/or cause the inside diameter of the Tube to collapse. The Tube end to be fitted should protrude approximately 40mm from the vice.



Figure 2



Figure 3

6.5.2 Use around file to remove any burrs on the internal diameter of the Tube that might have been caused by the cutting process (Figure 3). Clean out the tube before proceeding with the next step.

6.5.3 Fit the Insert into the Tube ensuring that it enters until the shoulder of the Insert is against the edge of the Tube. Use sharp nose pliers to push the Insert in, applying circular movements to ensure it enters the Tube easier (Figures 4 & 5).



Figure 4



Figure 5

6.5.4 Push the Fitting over the Tube outer diameter until the entire internal length of the Fitting is in contact with the edge of the Insert. NB: start with the Fitting serialized (Figures 6 & 7).

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Figure 6



Figure 7

- 6.5.5** Drag the wire hook along the internal diameter of the Fitting and Insert. The hook should not catch or get stuck between the Fitting and the Insert (Figure 8).



Figure 8

- 6.5.6** Select the correct Swage Block for this operation as set out in **PM/GSA/LOG-005.01.066.001 BOM for Guide and Extension Tube Assembly**.

- 6.5.7** Place the Fitting in the Swage Block ensuring no gap between the Insert and Fitting. The shoulder of the Fitting must be against the edge of the swage block. Place the top half on the swage block. Take care not to get fingers between the swage block halves (Figures 9 & 10).



Figure 9



Figure 10

- 6.5.8** Press the swage block until the two halves are in contact to ensure the Fitting is crimped on the Tube (Figure 11).

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Figure 11

- 6.5.9** Insert two black shrink sleeves (± 20 mm longer than swage length of Fittings) over the outer diameter of the Tube end with no Fitting (Figure 12). Please note that for TUBE-NCT0511 only one piece is required as the one side will have TIP-ST0055 fitted and no shrink sleeve will be required.



Figure 12

- 6.5.10** To fit the second Fitting and Insert, follow steps **6.5.1** to **6.5.8** and use the same swage block.

- 6.5.11** Now slide each shrink sleeve up to the shoulder of the Fitting and use a heat gun to shrink the sleeve over the Fitting. Take care not to burn or melt the sleeve by holding the heat gun too close to the sleeve (Figure 13).



Figure 13

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6.6 Quality Control of New/Repair Gammatec Guide Tube/Extension

6.6.1 Verify the serial number; it should be clearly visible and legible (Figures 14 & 15).



Figure 14



Figure 15

6.6.2 Visually inspect tube for cracks, kinks or other damage (Figure 16).

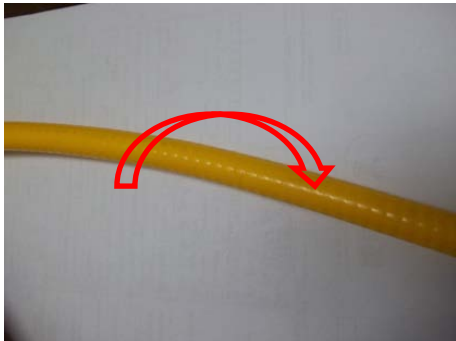


Figure 16



Figure 17

6.6.3 Visually inspect Tip crimping (free of damage and deformation)(Figure 17).

6.6.4 Visually inspect shrink-hose (Properly shrunk and covering the Fitting)(Figure18)



Figure 18

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6.6.5 Fitting and tip must not be loose (Figures 19 & 20)



Figure 19

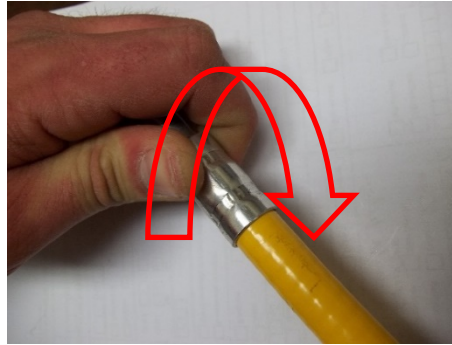


Figure 20

6.6.6 Visually inspect fitting and tip for any damage (thread damage, dents/cracks) (Figures 21 & 22)



Figure 21



Figure 22

6.6.7 Test the Tube by passing a dummy Pigtail (relevant to the model of Guide Tube/Extension Tube being assembled) through the Tube. It should pass through the Tube without any resistance or sticking (Figure 23).



Figure 23

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6.7 Tensile Test – ONLY applicable to NEW Guide/Extension Tubes

Tensile testing, as required by ISO3999, will be carried out on a "batch" basis driven by Production Orders for the assembly of new Guide/Extension Tubes.

A sample tube, ± 300 mm long with the same fittings used for the new Guide/Extension Tubes being assembled, will be made up for tensile testing to represent the batch.

NOTE: A video must be taken to record the tensile process where the production order number, Serial number of the sample tube and Tensile strength (Nm) on the torque wrench must be captured as well. This needs to be attached to the production order in SAP.

- Place the batch sample tube in the test block.



- Feed the drive cable with ballpoint through the adaptor and connect the adaptor to the Guide Tube Fitting.

Sentinel 880



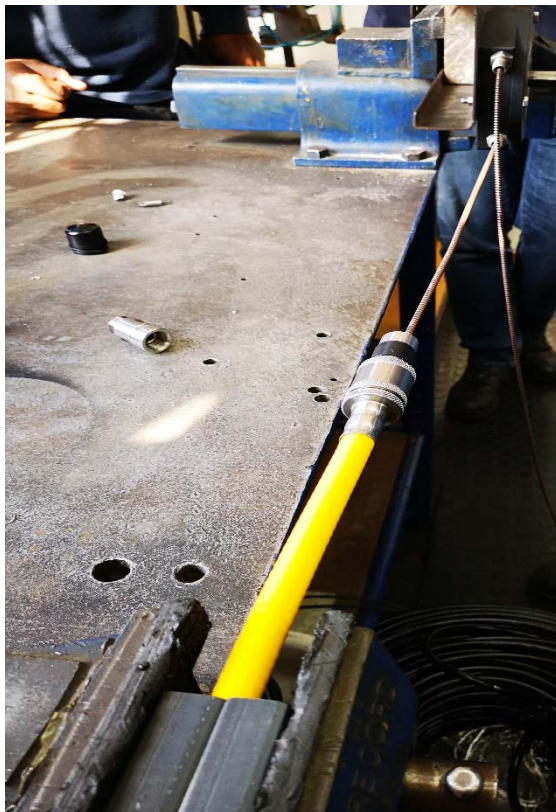
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Exertus



- Insert the drive cable into the test gearbox.



- Perform ten (10) pull tests at 30 Nm (500N) with calibrated torque wrench. No crimp movement or failure is permitted.

NOTE: A batch test piece will be provided once every month.

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6.8 Ensure that the serial number of batch test piece is recorded in the Remarks section of Examination Record (Appendix 1).

6.9 Record all other test results on the Examination Record (Appendix 1).

7. RECORDS

Records generated by this Work Instruction are as follows:

Record	Location/Responsible	Retention Period
Production Order	Stores	3 Months
Examination Record	MWS/Archive	5 Years


8. RECORD OF REVISION /RECORD OF CHANGES

RECORD OF CHANGES, REVISIONS AND CANCELLATIONS		
DATE	NATURE /DETAIL OF CHANGE	REV. NO.
26 June 2012	New Issue	0
2 October 2013	Revised 6.2	1
7 October 2019	Revised to incorporate WI/GSA/LOG-005.01.062.000 and WI/GSA/LOG-005.01.093.000	2

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Appendix 1

	SYSTEMS PROCEDURE CUSTOMER PROPERTY PM/GSA/LOG-005.01.066.002	REV 0	ISSUE DATE Sept'19
Examination Record - Guide/Extension tubes			
PRODUCTION ORDER / JOBCARD No.		SERIAL NUMBER	
CLIENT			
MAKE			
MODEL			
LENGTH			
EXAMINATION OF	ACCEPT (✓)	REJECT (X)	REMARKS
Verify the serial number is clearly visible and legible			
Visually inspect hose for cracks, cuts or any other damage			
Visually inspect Fitting and/or Tip crimping (free of damage and deformation)			
Visually inspect shrink-hose (Properly shrunk and Fittings covered)			
Fittings and/or tip must not be loose.			
Visually inspect Fittings and/or Tip for any damage.			
Test pigtail must move freely, without dragging or hooking from one end to the other (to the Tip for Sentinel model) making a click noise as it slide			
Sample tube Tensile Test			Serial Number -
Technician Stamp		QC Stamp	