

	Doc or ECO #:	ECO-MNP-ASSM-P4-001	Date:	4/3/2019	Author:	JK
	Rev. #:	A				
Engineering Change Order (ECO)	Engineering Approval:	Aeg	Date:	5/6/2019	Quality Approval	DO

P/N #:	MNP-ASSM-P4	Effective Date:	April 15, 2019
Title:	Manipulator Interference Remediation		

1.0 Purpose / Summary

Issues were presenting when assembling Manipulator (Pro4) **[MNP-ASSM-P4]** due to the possibility for inference between parts at the tolerance extremes. Tolerancing on Manipulator Part Main Tube (Pro4) **[MNP-019-4]**, Manipulator Part Gear Plate **[MNP-016]**, Manipulator Part Motor Clutch **[MNP-014]**, Manipulator Part Connector Cap **[MNP-020]** was updated.

2.0 Parts Affected

Part Number	Notes	Removed	Added	Modified	REV
MNP-014	Update OD, Oring Groove, Bore Tolerances, Remove Coating Specifications Sheet, Add Anodize Sheet	☐	☐	☒	D
MNP-016	Remove Cerakote Specification, Update Drawing Notes, Switch to Limit Tolerances, Add Anodize Sheet, Update Tolerances for Type II Anodize Build Up	☐	☐	☒	D
MNP-019-4	Update .656 Bore Tolerance, Correct Dimension Extending Off Page, Correct 13/16-28 Minor Diameter, Update .656, .825 Bore Tolerances, Add Coated Tolerance .656, .7465, .8245 Bores	☐	☐	☒	C
MNP-020	Update Coating Mask	☐	☐	☒	C

3.0 Detail

The Bore of Manipulator Part Motor Clutch **[MNP-014]** was oversized, when the setscrew was tightened the part would be shifted too far off the centerline off the gear box shaft causing it to grind on the bore of Manipulator Part Housing **[MNP-018]**. Historically the buildup tolerance from Cerakote was too large and inconsistent to allow the full coating **[MNP-014]** so the oring groove was masked limiting the utility of the coating, the cerakote on the outer diameter of the **[MNP-014]** was also too wide to maintain recommended oring extrusion gap width. All these issues were addressed by removing the Cerakote specification and replacing it with Micralox which could be applied in the oring groove and proper oring extrusion gap could be achieve at both tolerance extremes.

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Manipulator Part Gear Plate **[MNP-016]** interfered with Manipulator Part Main Tube (Pro4) **[MNP-019-4]** at the tolerance extremes. Manipulator Part Gear Plate **[MNP-016]** is inside the housing and is not exposed to seawater so the cerakote spec was removed and the tolerances updated, a type II anodize was specified.

Manipulator Part Main Tube (Pro4) **[MNP-019-4]** was interfering with Manipulator Part Connector Cap **[MNP-020]**. This was rectified by updating the masking on Manipulator Part Connector Cap and updating the tolerance on the mating bore of Manipulator Part Main Tube (Pro4) **[MNP-019-4]**. The reference dimension for 13/16-28 thread minor diameter was incorrect, the tight tolerance dimensions were not adjusted to reflect the type II anodizing buildup on Manipulator Part Main Tube (Pro4) **[MNP-019-4]** drawing, these issues were corrected with Revision C.

Note that work instructions and full QA inspection procedures are still lacking at this time.

4.0 Disposition of Material

All legacy parts should be removed from inventory and transferred to Engineering.

5.0 Action Items

Action	Department	Acknowledgement Initials
Update Revision in Epicor	Engineering	RN
Transfer Legacy Inventory to Engineering	Inventory	SL

6.0 Modified / Referenced Documents:

Document	Current Revision
Click here to enter text.	Click here to enter text.

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7.0 Revision History

Date Revised (mm-dd-yyyy)	Location of Change (section, paragraph no., step no., etc.)	Description of Change Made	Name of Person making the Change
4/3/2019	-	Initial Draft	JK
4/15/2019	2.0, 3.0	Add Rev C to MNP-019-4	JK