RoMan MANUFACTURING

UNIVERSAL PRODUCT MANUAL

INTRODUCTION

This manual intends to be a guide for the majority of the RoMan Manufacturing products. This document will cover RoMan's general guide to troubleshooting, maintenance, and the basic standards that RoMan follows. Additionally, all safety precautions listed in this document must be supplemental to all local laws and standards.

For more information, please refer to specific documentation for your model of transformer, or other RoMan publications pertaining to your specific product.

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SAFETY

Prior to installation, commissioning, operation, maintenance, or decommissioning of the transformer, it is recommended that a risk assessment be conducted to identify how the transformer is to be used, maintained and operated.
NFPA 70E, Article 110.16 requires that an arc flash label be affixed to the transformer to warn Qualified Personnel of the potential arc flash hazards. The arc flash label shall comply with the requirements of NFPA 70E.

HAZARD IDENTIFICATION

	**Danger:** Indicates an imminently hazardous situation that, if not avoided, will result in death or serious injury. This signal word is to be limited to the most extreme situations.
	**Warning:** Indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury.
	**Caution:** Indicates a potentially hazardous situation that, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

The transformer is supplied with various hazard warning labels that are designed to ANSI Z535.4 requirements. All hazard labels indicate the hazard, the severity of the hazard, and methods of avoiding interaction with the hazard within the transformer.

INTENDED USE

QUALIFIED PERSONNEL
Any persons who assemble, operate, disassemble, or service our product must not be under the influence of alcohol, drugs, or other medication that may influence their responsiveness.

INAPPROPRIATE USE
Any use other than that described as intended use is considered inappropriate use, and is inadmissible. RoMan Manufacturing does not assume any liability for damage caused by inappropriate use. The risks resulting from inappropriate use are to be assumed by the operator/user alone.

INSTALLATION

The transformer installer (Qualified Personnel) should perform the following steps to ensure a safe and quality installation. Please read this manual before starting the installation of the transformer.

These instructions do not replace national or local electrical codes. Check all applicable electrical codes to ensure compliance.

Installation of the transformer should be performed only by Qualified Personnel.

UNPACKING

UNPACKING AND PRELIMINARY INSPECTION

Inspect the shipping crate(s) for damage or signs of mishandling before unpacking the transformer.

Remove any securing bands and cardboard packing materials and inspect the transformer for any obvious shipping damages. If any damage as a result of shipping is observed, immediately file a claim with the shipping agency and forward a copy to RoMan Manufacturing.

HANDLING CONSIDERATIONS

Transformers come in various shapes and sizes. Check the size and weight of the transformer, as well as the proper lifting points as found in your specific product documentation, before attempting to lift with a forklift or pallet jack.

If the transformer is going to be lifted using an overhead crane, it is recommended that a lift plan be developed prior to moving the transformer.

STORAGE

The transformer should be stored in a clean, dry environment. Storage temperature range is -10 °C to 65 °C. Care should be taken to avoid condensation. All packing and shipping materials should be left intact until the transformer is ready for final installation. If the transformer has been stored for an extended period of time, the transformer should be cleaned and carefully inspected before placing into service.

In the case that the transformer is being stored after it has already been in service, ensure that water passages are clear and dried.

ENVIRONMENT

RoMan Manufacturing transformers are designed for operation indoors in ambient temperatures of 10ºC to +50ºC with a relative humidity of 0% to 95% (non-condensing) as a standard. Other ratings may exist per user agreement.

SERVICE CLEARANCES

Service clearances are needed for all transformers to allow maintenance to be completed safely. The clearance distances must also consider the maximum voltage capability. The clearance distances recommended is detailed in NFPA 70.

MOUNTING

Refer to associated drawings for mounting dimensions.

The secondary pads are not intended to be load-bearing. Appling physical load to the secondary pads may cause coolant leaking, or malfunction of the transformer's operation over time.

LABELING

On all RoMan Manufacturing transformers is a label containing all the basic characteristics of your transformer. As seen below, the label includes everything from the customer product order number to the serial number of the specific transformer. It also gives you the turns ratios for each tap. This is the best resource to double check the rated kVA and Duty Cycle, the required water flow rate, and the turns ratio of the tap that you are using or want to use.

RoMan MANUFACTURING
Grand Rapids, MI (616) 530-8641

Built in USA
QMS Certified to ISO 9001

CUST PO#:

MODEL#:

CUST. MODEL#:

SPEC#: **SO#:**

KVA: **AT** **DUTY CYCLE**

WATERFLOW: **GPM**

155 DEGREE C INSULATION

PRI.VOLT.:

FREQUENCY: **(Hz)** **PHASE**

SEC. V. MIN.: **SEC. V. MAX.:**

SERIAL #: **DATE:**

LO Volt. Turns Ratio	HI Volt.Turns Ratio
TAP 1	TAP 1
TAP 2	TAP 2
TAP 3	TAP 3
TAP 4	TAP 4
TAP 5	TAP 5
TAP 6	TAP 6
TAP 7	TAP 7
TAP 8	TAP 8

INSTALLATION

Prior to installation, all energy sources (electrical, air, vacuum, water, etc.) shall be locked and tagged in accordance with OSHA 29 CFR 1910.147.

NOTE: Installation shall be conducted by Qualified Personnel.

SYSTEM EARTHING (GROUNDING) & BONDING

The performance and safety of the transformer is dependent on proper earthing (grounding) and bonding. Earthing (grounding) is required primarily for safety. All electrical circuits to the transformer should include an earthing (grounding) conductor as required by the NFPA 70 and local codes. If the secondary is to be grounded, it is suggested that the negative pad is grounded.

To prevent circulating currents and nuisance shock, ensure that the power circuit is not grounded more than once.

ELECTRICAL INSTALLATION

Ensure all fittings are appropriate for the size, material, and type of conduit or cable tray. It is recommended by RoMan Manufacturing that on all bolted joints, a flat washer is used on each side, and a Bellville washer on the nut side.

Ensure that the electrical source provided to the transformer has the correct voltage, number of phases, and ampacity.

PROCESS POWER

All input conductors shall be equipped with a lockable disconnecting means that complies with the lockout tagout (LOTO) requirements in OSHA 29 CFR 1910.147.

Route input conductors to an over-current production device. The range of conductor sizes are noted in the accompanying schematics or drawings. All conductors shall comply with bend radius requirements detailed in NFPA 70.

Install Phase A (Line 1), Phase B (Line 2), Phase C (Line 3), Neutral, and Ground conductors into the main circuit breaker (as appropriate). Do not trim the number of conductor strands as this can reduce the ampacity of the conductor.

Ensure all installed conductors are tightened per the torque specification detailed on the circuit breaker. Route output conductors to the output terminal blocks or bus bars. The range of conductor sizes are noted in the accompanying schematics or drawings.

WATER INSTALLATION

All input hoses shall be equipped with a lockable disconnecting means that complies with the lockout tagout (LOTO) requirements in OSHA 29 CFR 1910.147.

Install input/output water hose lines to the connections noted on the transformer schematics or drawings.

Install Teflon tape or other approved sealing medium between air/vacuum hoses. Ensure that there are no leaks in the water circuit.

Ensure that coolant flow and quality requirements are met as noted in RWMA Bulletin 14 and your specific product documentation. These requirements can be found in Appendix B.

OPERATION

COMISSIONING

Prior to applying electrical power ensure proper safety labeling is applied on the transformer.

The order of commissioning is important to the overall safety, reliability, and performance of the transformer.

WATER COMMISSIONING

1. Remove lockout tagout equipment from water source.
2. Activate water source allowing water to flow through the transformer.
3. Inspect transformer for leaks or pressure drops.

ELECTRICAL POWER COMMISSIONING

1. Ensure all circuit breakers and switches are in the OFF position.
2. Place all tap switches in the desired location; based on the anticipated load.
3. Remove lockout tagout equipment from the power source.
4. Measure the voltage at the Process Power main circuit breaker.
5. If the voltage at the Process Power main circuit breaker is within tolerance, as noted on the transformer schematics or drawings, energize sub-circuits individually (as appropriate).
6. Measure the voltage at the Process Power output terminal or the process load (as appropriate)

OPERATIONAL SAFETY

During regular operation of transformers, there are strong magnetic fields present. This may affect the function of cardiac pacemakers, various implants, hearing aids and other electronics

Hazardous voltage present during operation. Use proper lockout tagout (LOTO) equipment as found in OSHA 29 CFR 1910.147 and use appropriate Personal Protective Equipment (PPE).

MAINTAINENCE

Hazardous voltage present. Use proper lockout tagout (LOTO) procedure and use appropriate Personal Protective Equipment (PPE). Before performing any maintenance, shut down all power to the system and be sure that all voltages have been reduced to harmless levels.

SUGGESTED MAINTENANCE

According to RWMA Bulletin 14, maintenance should be performed as follows:

MONTHLY PERIODIC INSPECTION AND SERVICE

- Check for water flow
- Check for water leaks; repair if necessary
- Check secondary connections and ensure they are secure
- Check water hoses for deterioration
- Check for loose or broken components
- Ensure secure mounting

QUARTERLY MAINTENANCE

- Thoroughly check water system and replace worn or corroded components
- Remove any grease, rust, corrosion, or welding flash from all secondary contact surfaces using a fine grade scouring pad
- Tighten all connections to the proper torque specifications
- Ensure functionality of all protective devices

ANNUAL MAINTENANCE

- Remove all grease and rust from the transformer
- Check all electrical connections for secure connections
- Reverse-flush the cooling system and replace any hoses as necessary

DISPOSAL

If you have a transformer that you believe is no longer usable, or one you do not have any use for, contact RoMan Manufacturing. Our service and repair department will evaluate it for possible refurbishment or offer to responsibly recycle and dispose of the transformer free of charge in compliance with ISO 14001-2004 to prevent pollution.

TROUBLESHOOTING

SYMPTOMS	CHECK POINTS	SOLUTION
Transformer will not turn on	Ensure that primary cables are properly connected	Connect the primary power to the transformer
	Ensure breakers are turned on	Put breakers in the on position
	Ensure the control is receiving power	Connect the proper power input to the control and turn on the proper breakers
Transformer is overheating	Ensure the total load is within the transformer's kVA rating	Reduce load or replace with a larger transformer
	Ensure there is no discoloration in the cables due to heating	Cable connections should be cleaned and tightened regularly
	Ensure the transformer is operating within the rated current range and rated duty cycle.	Adjust the duty cycle of the transformer to be at or below the rated duty cycle found in your product documentation
	Ensure water flow and quality are within specifications	Ensure the proper amount of water is flowing through the transformer per the physical drawing by using an external flow meter on the output of the water circuit
		Blow out the water lines with compressed air to clear water and any debris
	Ensure all temperature sensing connections are transmitting the proper signal	Verify the temperature measurement circuit is working properly
Secondary voltage is too high	Ensure that the transformer is wired correctly per the input voltage	Verify the transformer being installed is the correct volt-age for the application
	Confirm turns ratio	Verify that the taps are set correctly
		Verify that conductors are connected per the physical drawing

SYMPTOMS	CHECK POINTS	SOLUTION
Secondary voltage is too low	Ensure the transformer is wired correctly per the input voltage	Verify the transformer being installed is the correct voltage for the application
	Ensure all connection points are tightened per the torque chart in Appendix A, smooth, and cleaned of any insulation, corrosion, or debris	Replace any damaged cables or connections. Verify any mechanical components are tight
	Ensure the turns ratio is as expected in comparison to product documentation	Verify that the taps are set correctly
		Verify that conductors are connected per the physical drawing
	Ensure primary and secondary conductors are appropriate for the load	Replace conductors as necessary to properly accommodate the desired output
Reduced Secondary Current	Ensure that proper grounding protocol is adhered to	Comply with a proper grounding scheme
	Ensure the secondary is not shunted, and does not have an increased secondary impedance	Ensure the load is within the rated capacity of the transformer
	Ensure the correct turns ratio is programmed into the control	Confirm the turns ratio of the transformer, and reprogram the correct turns ratio into the control
	Ensure primary and secondary conductors are appropriate for the load	Replace conductors as necessary to properly accommodate the desired output

SYMPTOMS	CHECK POINTS	SOLUTION
Loss of secondary current	Ensure all connection points are tightened per the torque chart in Appendix A, smooth, and cleaned of any insulation, corrosion, or debris	Ensure secure bolted connections
	Ensure the secondary pads are not supporting a physical load	Remove physical load from secondary pads, or support the load externally
	Ensure circuit breakers are working properly and are not tripped	Turn on all circuit breakers to allow operation
	Ensure all electrical joints are clear of any buildup or debris that may insulate the connection	Clear all joints of buildup that may insulate the conductors
	Ensure there is adequate primary current	Ensure primary current is being properly delivered to the transformer
Temperature of outgoing water and secondary terminals is high (>60ºC)	Ensure adequate water flow and appropriate water temperature	Ensure water flow and temperature are in compliance with RoMan Manufacturing standards
Condensation on transformer secondary components on humid days	Ensure the insulation is adequately insulating components	Shut off water when transformer not in use
	Ensure water temperature is above the dew point	Heat the water as necessary to remain above the dew point
Fluids on equipment	Ensure all bolted joints are secure	Torque all bolted joints as listed in Appendix A
	Ensure the secondary pads are not supporting a physical load	Remove physical load from secondary pads, or support the load externally
	Ensure all “O” ring connections are properly sealed	Replace “O” rings as necessary

APPENDIX A: BOLTS, WASHERS, AND TORQUES

RoMan Manufacturing recommends dry bolted connections, but this chart will also cover any lubricated bolts.

Diameter (in)	Diameter (mm)	Engagement	Hardware Material Type	Suggested Torque (ft.lbs)
1/4-20	M6	Threaded Hole	Grade 5	6
			Stainless Steel	
		Through Hole	Grade 5	8
			Stainless Steel	6
5/16-18	M8	Threaded Hole	Grade 5	11
			Stainless Steel	
		Through Hole	Grade 5	17
			Stainless Steel	11
3/8-16	M10	Threaded Hole	Grade 5	20
			Stainless Steel	
		Through Hole	Grade 5	30
			Stainless Steel	20
1/2-13	M12	Threaded Hole	Grade 5	43
			Stainless Steel	
		Through Hole	Grade 5	75
			Stainless Steel	43
5/8-11	M16	Threaded Hole	Grade 5	75
			Stainless Steel	
		Through Hole	Grade 5	140
			Stainless Steel	92

If not covered by this chart, please refer to the manufacturer's recommendations

- Electrical connections should have a pair of Belleville spring washers.
- Mechanical connections should use Belleville washers, lock washers or an equivalent method, i.e. Loctite.
- Robifix Pins should be torqued to 40 inch - pounds per the manufacturer's recommendation.
- For Riv-Nuts and helicoils, use the threaded hole values.

APPENDIX B: REFERENCED DOCUMENTS

ROMAN DOCUMENTS

- Your Specific Product Documentation
- Troubleshooting Guide
- RoMan Manufacturing Grounding and Secondary Current Guide
- RoMan Manufacturing Tap Switch Manual

STANDARDS

- NFPA 70
- NFPA 70E
- NFPA 70E Article 110.16
- ANSI Z535.4
- OSHA 29 CFR 1910.147
- ISO 14001-2004
- AWS J1.2M/J1.2:2016

APPENDIX C: TAP SWITCH MANUAL

This manual was released by RoMan Manufacturing in 2008.

INSTALLATION

1. The tap switch should be removed from its shipping container and inspected for shipping damage or other possible non-conformance.

2. Rotate the handle in a clockwise direction until it stops and the plunger pin locks into place. The handle may be difficult to rotate without the tap switch being mounted, therefore, the base should be firmly held for this operation.

3. Remove the socket head cap screw from the handle as well as the (4) phillips round head screws from the corners of the front plate. Retain these parts for installation. Pull the Front Plate and Handle from the switch assembly. Remove the (4) spacers (nylon washers) from behind the front plate. The spacers can be discarded. (They are not used in the customer installation but are used at the factory to simulate the thickness of the customer panel).

4. Mount the front plate and handle on the front of the panel, and the switch assembly behind the panel. Install and tighten the (4) phillips round head screws through the front plate to attach the tap switch assembly in place. Install and tighten the socket head cap screw in the handle to hold in place.

5. Rotate the handle in a counter-clockwise direction. The plunger pin should snap in place for each position on the front plate and the handle should not be able to rotate unless the trigger is squeezed to withdraw the plunger pin.

6. When possible, extra flexible lead wire of the proper gauge should be used.
   All leads to the switch terminals should be supported to prevent undue mechanical loads on the switch.

ALL SOURCES OF POWER MUST BE DISCONNECTED, AND PROPER LOCKOUT TAGOUT (LOTO) PROCEDURES FOLLOWED FOR INSTALLATION AND/OR MAINTENANCEOF THE TAP SWITCH. LOCAL, STATE, AND FEDERAL SAFETY PRECAUTIONS MUST BE FOLLOWED WHEN WORKING WITH ELECTRICAL POWER EQUIPMENT.

SERVICE & MAINTENANCE

SERVICE AND MAINTENANCE OF ELECTRICAL EQUIPMENT MUST BE PERFORMED BY TRAINED AND QUALIFIED PERSONNEL. ALL SOURCES OF POWER MUST BE DISCONNECTED, AND PROPER LOCKOUT TAGOUT (LOTO) PROCEDURES FOLLOWED FOR INSTALLATION AND/OR MAINTENANCE OF THE TAP SWITCH. LOCAL, STATE, AND FEDERAL SAFETY PRECAUTIONS MUST BE FOLLOWED WHEN WORKING WITH ELECTRICAL POWER EQUIPMENT.

The RoMan Type RS Rotary Tap Switch is designed, manufactured, and tested to provide long service life. The interval at which service or maintenance of the tap switch is required will be dependent on the operating conditions and environment. Dirt, moisture, and heat are the most common causes of failure with electrical equipment. Periodic maintenance can prevent these items from causing equipment failure. A periodic maintenance procedure consisting of the following steps is recommended.

1. Dry cleaning of the tap switch assembly using vacuum or air to remove dust, dirt, etc. To remove excessive dirt build-up, the tap switch Assembly can be washed using a solvent designed to clean electrical apparatus or a mild soap and water solution can be used as well. **WARNING:** The tap switch assembly must be removed from the equipment if it is to be washed and must be thoroughly dried before installation and energizing.

2. Lubricate the contact surfaces of the terminals. A non-insulating, high melting temperature grease can be used. LUBRIPLATE DS-ES is used in the manufacture of the tap switch. Do not over lubricate; excess grease will cause dirt to accumulate on the tap switch assembly. **CAUTION:** Do not use other surface preparation materials such as those designed to prevent oxidation as they are not intended to be lubricants. If the tap switch is completely disassembled, lubricate the rotor assembly where it goes through the base and where it makes contact with the common strap.

3. Tighten all connecting hardware on the terminals and common strap.

4. Operate the tap switch to change tap positions manually by means of the dandle. The contact pressure between the rotor blades and the terminals, and between the rotor and common strap is factory adjusted. Although the contact pressures are field adjustable, adjustment should not be required during the life of the tap switch. Increasing contact pressure will only increase the operating effort and will not affect the contact efficiency.

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