



MASTERFLEX® L/S® 07528-40, shown with 77200-30

OPERATING MANUAL:

## L/S® PRECISION VARIABLE SPEED DRIVES

Model Nos.

**07528-40**

**07528-45**

**07528-50**

**07528-55**

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# **PUMP FOR LIQUIDS ORIGINAL INSTRUCTIONS**

## SAFETY PRECAUTIONS



**DANGER:** Remove power from the pump before any cleaning operation is started.



**WARNINGS:** Remove power from the pump before attempting any maintenance.

**A contactor or other device that routinely disconnects and reapplies the AC line to the drive to start and stop the motor can cause drive hardware damage. The drive is designed to use control input signals that will start and stop the motor.**



**WARNINGS:** Tubing breakage may result in fluid being sprayed from pump. Use appropriate measures to protect operator and equipment.

**Turn Pump System off before removing or installing tubing. Fingers or loose clothing could get caught in drive mechanism.**

**Pump Heads not equipped with OHS (open head sensor) will not actuate the OHS feature. If Non-OHS Pump Heads are used, the shorting plug must be installed and locked into the OHS socket on the front of the drive for drive to operate.**



**CAUTIONS:** When changing flow direction, allow the pump to come to a complete stop before starting again. Failure to do so could cause permanent damage to the motor.

**Replace the fuse only with one of the same type and rating. The fuse rating and type are stated on the rear panel.**

**Do not contaminate the lubricant in the container, on the shaft or on the seal with foreign material.**

**Failure to observe this precaution may result in damage to the seal and premature failure of the seal.**

**No foreign matter should be allowed under the gasket on the back of the front plate or under the heads of the screws.**

**Failure to observe this precaution may result in leakage during washdown of the drive.**



**CAUTION:** To avoid electrical shock, the power cord protective grounding conductor must be connected to ground. Not for operation in wet locations as defined by EN61010-1.

**If the product is not used in a manner specified in the instructions, the protection provided by the equipment may be impaired.**

## Explanation of Symbols



**CAUTION:** Risk of Danger. Consult Operator's manual for nature of hazard and corrective actions.



**CAUTION:** Risk of crushing. Keep fingers away from rotor while pump is in operation. Stop pump before loading or unloading tubing.



**CAUTION:** Hot Surface. Do not touch.



**CAUTION:** Risk of electric shock. Consult Operator's manual for nature of hazard and corrective actions.

## WARNING: Product Use



This product is not designed for, nor intended for use in patient connected applications; including, but not limited to, medical and dental use, and accordingly has not been submitted for FDA approval.

This product is not designed for, nor intended for use in hazardous duty areas as defined by ATEX or the NEC (National Electrical Code); including, but not limited to use with flammable liquids.

## Safety

1. Read instructions before operating the unit.
2. Observe safety precautions at all times, especially when pumping dangerous liquids.
3. If the pump runs unusually noisy or if bunching of the tubing in the pump can be observed, make sure the tubing is clamped down tightly and/or replace it with a new piece of tubing.
4. The L/S Precision Variable-Speed Drives must be well-grounded at all times.
5. The L/S Precision Variable-Speed Drives are equipped with a current-limiting circuit that will shut the motor down if any of the following conditions exist:
  - a. Tubing that is too hard is loaded in the pump.
  - b. Incorrect tubing size or wall thickness is loaded in the pump.
  - c. Tubing is improperly loaded into the Pump Head.
6. The unit is fused and grounded to protect the operator in the event of short circuits that could be caused by liquid entering the case.



***CAUTION: Replace the fuse only with one of the same type and rating. The fuse rating and type are stated on the rear panel.***

7. The L/S Precision Variable-Speed Drives should not be used in outdoor or hazardous locations.
8. The L/S Precision Variable-Speed Drives Equipped with OHS (Open Head Sensor) must use OHS equipped Pump Head. If Non-OHS equipped Pump Head is used, the shorting plug must be installed in OHS socket and locked for the drive to operate properly.



# Table of Contents

	<b>Page</b>
<b>Section 1 INTRODUCTION</b> .....	<b>1-1</b>
General Description .....	1-1
Application Solutions .....	1-1
Controls, Indicators and Connectors .....	1-2
<b>Section 2 INSTALLATION AND SETUP</b> .....	<b>2-1</b>
Before Starting Drive .....	2-1
Mounting the Pump Head .....	2-2
<b>Section 3 OPERATION</b> .....	<b>3-1</b>
Inserting Tubing .....	3-1
Tubing Inspection and Replacement .....	3-1
Pump Controls .....	3-1
Keypad Lockout Enable/Disable .....	3-2
External Operation .....	3-2
External Inputs .....	3-3
<b>Section 4 MAINTENANCE</b> .....	<b>4-1</b>
Replacement Parts .....	4-1
Fuse Replacement .....	4-2
Motor Gear and Brush Replacement .....	4-3
Shaft Seal Inspection .....	4-3
Cleaning .....	4-4
<b>Section 5 TROUBLESHOOTING</b> .....	<b>5-1</b>
Troubleshooting Chart .....	5-1
<b>Section 6 ACCESSORIES</b> .....	<b>6-1</b>
Accessories .....	6-1
<b>Section 7 SPECIFICATIONS</b> .....	<b>7-1</b>

# Table of Contents (continued)

	<b>Page</b>
<b>Section 8    WARRANTY, PRODUCT RETURN and TECHNICAL ASSISTANCE . . .</b>	<b>8-1</b>
Warranty . . . . .	8-1
Product Return . . . . .	8-2
Technical Assistance . . . . .	8-2



# Figures

	<b>Page</b>
Controls, Indicators and Connectors .....	1-2
18-Pin Connector Configuration with Wiring Scheme .....	3-2
Fuse Replacement .....	4-2
Motor Gear and Brush Replacement .....	4-3
Shaft Seal Inspection .....	4-3



## Section 1 Introduction

### General Description

The L/S Precision Variable-Speed Drives control the speed of MASTERFLEX® Pump Heads to provide flow rates from 0.06 to 3400 mL/min.

The 600 rpm L/S Precision Variable-Speed drives can mount one (1) MASTERFLEX Pump Head with OHS (open head sensor).  
*See Installation and Setup for information on Multi-channel operation.*

The 100 rpm L/S Precision Variable-Speed drives can mount one (1) MASTERFLEX Pump Head with OHS (open head sensor).  
*See Installation and Setup for information on Multi-channel operation.*

### Application Solutions

#### Advantages of Peristaltic Pumps:

- Handle abrasive slurries and corrosive fluids with minimal wear. Ideal for titanium dioxide or diatomaceous earth filter aid applications.
- Low maintenance; sealless and valveless design.
- Valveless design prevents clogging.
- Inner surfaces are smooth and easy to clean.
- Contamination free; fluid contacts only the tubing or tube material.
- Suction lift and priming up to 8.8m water column at sea level.
- Low shearing for handling the most shear sensitive of fluids such as latex or fire fighting foam.
- Capable of running dry and pumping fluids with high quantities of entrained air, such as black liquor soap.
- High volumetric efficiency allows operation in metering or dosing applications where high accuracy is required.
- Handles extremely viscous fluids.
- Availability of tubing and tube materials that are suitable for food and pharmaceutical use.

## Controls, Indicators and Connectors



**Figure 1-1.** Controls, Indicators and Connectors

- A. POWER (ON/OFF) SWITCH:** Turns the unit ON or OFF.
- B. SPEED KEYS:** Sets the speed of the pump. The higher the number, the faster the speed of the pump. When the speed key is depressed the smallest speed units change first followed by an increasing rate of change.
- C. FLOW DIRECTION KEY:** Sets the direction of pump rotation Clockwise/Counterclockwise. An LED annunciator indicates the active direction. The motor is brought to a controlled stop before reversing direction.
- D. INTERNAL/EXTERNAL KEY:** Changes the drive operation mode. Internal (Local) operation from the front panel keypad is designated by INT, external (Remote) operation is designated by EXT. In INT mode, START/STOP, FLOW DIRECTION, and SPEED keys on the front panel determine operating state. Depression and release of keys enables toggling between the two operating states.
- E. START/STOP KEY:** Upon depression, key toggles the motor ON/OFF during INT mode. This key will not start the drive if in EXT mode. If pressed while operating in EXT mode (stop desired), the button will always stop the drive and a toggle of the EXT Start/Stop is required to restart the drive.
- F. EXTERNAL/REMOTE CONNECTOR:** Utilized to connect wiring for remote control operation with a 18-Pin Round connector.
- G. IEC Power Entry Module/Line Cord:** Utilized to connect line cord to drive. See *page 4-1* for alternative cords.
- H. OHS (Open Head Sensor) Socket:** For use with OHS equipped MASTERFLEX Pump Heads.

## Section 2 Installation and Setup

### Before Starting Drive

- The drive should be mounted on a flat horizontal surface. Up to a maximum of one (1) Pump Head can be used for 100 rpm and 600 rpm drives equipped with OHS (open head sensor).
- Multi-Channel operation will accommodate only one (1) Pump Head with OHS (open head sensor), all other Pump Heads must be Non-OHS.



**WARNING: Pump Heads NOT equipped with OHS (open head sensor) will not actuate the OHS feature. If Non-OHS Pump Heads are used, the shorting plug must be installed and locked into the OHS socket on the front of the drive for drive to operate.**

- The ambient air temperature should not exceed 104° F (40° C) and adequate air flow should be provided for.
- The drives are provided with a grounded plug. If used in a GFCI protected circuit, nuisance tripping may occur.
- Tubing should be clean and routed so that bend radii are at a minimum four (4) times the tube diameter and as short as possible.



**WARNING: Turn drive off before removing or installing tubing. Fingers or loose clothing could get caught in drive mechanism.**

- Use a tube size of appropriate diameter for the flow rate and viscosity required.
- For tubing selection and compatibility, see Tubing Selection Guide within this flash drive or on the web.
- For Pump Head information, see *OHS (open head sensor) Pump Head* datasheets within this flash drive or on the web.
- Before cleaning or conducting maintenance on unit remove power from the drive.



**DANGER: High voltages exist and are accessible. Use extreme caution when servicing internal components.**

## Section 2

### Installation and Setup

# Mounting the Pump Head

Mount Pump Head and load tubing (See *Pump Head* datasheets within this flash drive or on the web). Check to ensure that rollers are clean and free of defects.

- Ensure that OHS (open head sensor) cable is plugged in and locked.

## Section 3 Operation

### Inserting Tubing



**WARNINGS:** *Tubing breakage may result in fluid being sprayed from pump. Use appropriate measures to protect operator and equipment.*

**Turn Pump System off before removing or installing tubing. Fingers or loose clothing could be caught in the pump mechanism.**



**CAUTION:** *To avoid electrical shock, the power cord protective grounding conductor must be connected to ground. Not for operation in wet locations as defined by EN61010-1.*

**If the product is not used in a manner specified in the instructions, the protection provided by the equipment may be impaired.**

### Tubing Inspection and Replacement

Tubing should be inspected periodically for tears, cracks, cut marks, abrasions, inability to hold pressure, bubbles in the flow stream and reduction or loss of flow.

Tubing life may be extended by periodically moving the worn tubing inside the occlusion bed of the pump to the outside of the occlusion bed to the suction side of the pump. This will avoid excessive tubing wear at any specific point.

Always move the worn tubing to the suction side of the pump.

### Pump Controls



**CAUTION:** *When changing flow direction, allow the pump to come to a complete stop before starting again. Failure to do so could cause permanent damage to the motor.*

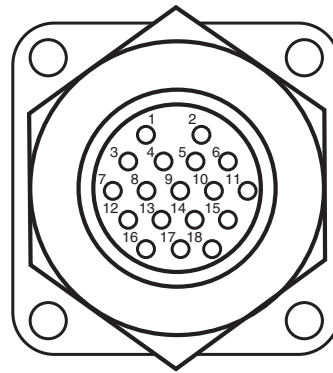
1. Make sure the speed is set to the minimum setting.
2. Turn the power switch ON. Increase the speed to start the pump action. The higher the rpm setting, the faster the speed of the pump.
3. The L/S Precision Variable-Speed Drives are self-priming. To begin pumping, select a flow direction with the flow direction button, insert the intake and output tubing into a reservoir, and turn the unit ON. Prime the tubing for at least 5 minutes. If accurate flow control is important, allow the pump to prime for approximately 20 minutes for more stable flow conditions.

## Keypad Lockout Enable/Disable

Press and hold the INT/EXT key. After five (5) seconds, display will change to all dashes. Release INT/EXT key and press UP ARROW key (▲) five (5) times. Repeat this process to unlock the keypad. When the keypad is locked out, display will change to display all dashes (- - - -) when a key is depressed.

## External Operation

Bench top models are equipped with inputs that can be controlled by external signals connected at the rear panel 18-pin round connector. The external inputs permit control of the pump by remote equipment or accessories. Figure 3-1 indicates the signal locations in the connector.



**Figure 3-1.** 18-Pin Connector Configuration with Wiring Scheme

**Note:** Jumpers “A” and “B” are optional. See *page 3-3 External Inputs* for correct usage.

Description	Pin No.
Speed Control Voltage Input (0–10V) (+) input	1 (black)
Speed Control Current Input (4–20 mA) (+) input	3 (white)
Speed Control Input Reference Common	5 (orange)
Local/Remote Speed Control	14 (red/yellow)
Local/Remote Speed Control Reference	10 (grey)
Start/Stop and CW/CCW Reference	8 (yellow)
Start/Stop (+) Control	4 (green)
CW/CCW	6 (blue)
Chassis (Earth) Ground	9 (violet)

**NOTE:** Colors are those of the Remote Cable, Cat. number MN-77300-32.



## External Inputs

The front INT/EXT key enables external functions. Switching to INT on the display disables the external functions, allowing the front panel controls to operate the pump.

When the INT/EXT key is in the EXT position, starting and stopping the pump is controlled by an external contact closure between pins 4 and 8 (Jumper B), and the pump speed is determined by an externally supplied 0–10V or 4–20 mA source. Connection must be made between pins 4 and 8 to Start/Stop the drive and a control voltage greater than 0V between pins 1 and 5 or a control current greater than 4 mA between pins 3 and 5 must be applied for the pump to run.

If setting the speed from the front panel is desired with external Start/Stop contact operation, the INT/EXT key must again be in the EXT position. In addition, Jumper A should be in place. Jumper A connects pin 14 (Local/Remote) to pin 10 (Local/Remote Reference). Start/Stop will then be controlled from the rear panel (Jumper B), and the pump speed will be controlled from the front panel.

**NOTE:** The signal common for the speed control voltage and current inputs is not referenced to earth ground.

The START/STOP, CW/CCW and Local/Remote are digital inputs. They are internally pulled up to +5 V with respect to earth ground via pins 8 and 10. They can alternately be driven with open collector logic. For increased noise immunity, use of contact closures is recommended



**WARNING:** *A contactor or other device that routinely disconnects and reapplies the AC line to the drive to start and stop the motor can cause drive hardware damage. The drive is designed to use control input signals that will start and stop the motor.*



## Section 4 Maintenance

### Replacement Parts



**WARNING:** Remove power from the pump before attempting any maintenance.

Description	Part Number
Brushes (set of 2)	07520-04
Brush Cap Holder	07520-03
Fuse-T3.15A, 5 x 20 mm	77500-25
Gear Service Kit (600)	07553-06
Gear Only (600 rpm)	07553-09
Gear Service Kit (100 rpm)	07553-08
Ferrite, Line Cord Snap-on, (CE Required)	B-3689-CR
Line Cord, Australia	50001-60
Line Cord, Denmark	50001-62
Line Cord, India	50001-64
Line Cord (115V), United States	50001-68
Line Cord, Israel	50001-69
Line Cord, Europe	50001-70
Line Cord, England	50001-72
Line Cord, Switzerland	50001-74
Line Cord, Italy	50001-76
Line Cord (230V), United States	50001-78
Line Cord, China	50001-79
Replacement seal kit (NEMA)	07575-01
Replacement gear and shaft kit (NEMA)	07575-02
Replacement sensor shorting plug	07528-82

## Fuse Replacement

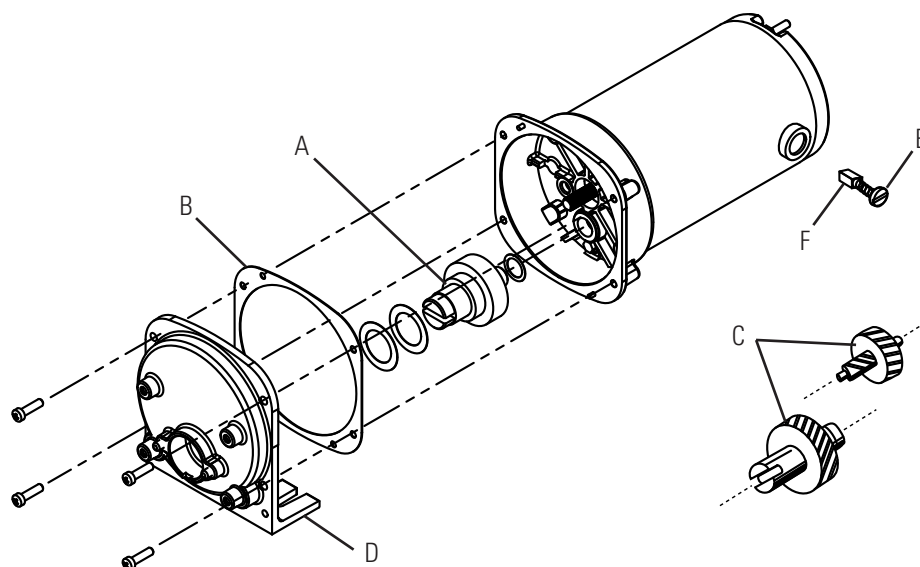
1. Place the power switch in the off position.
2. Disconnect the AC power input line cord from the receptacle.
3. Remove and check the fuse and replace if defective.



Figure 4-1. Fuse Replacement

Item	Description
A	I/O Receptacle 18-pin Round
B	IEC Power Entry Module / Line Cord
C	T3.15A (5 × 20 mm) Fuse - Do <b>Not</b> Substitute
D	Power Switch - All settings are retained in memory

## Motor Gear and Brush Replacement

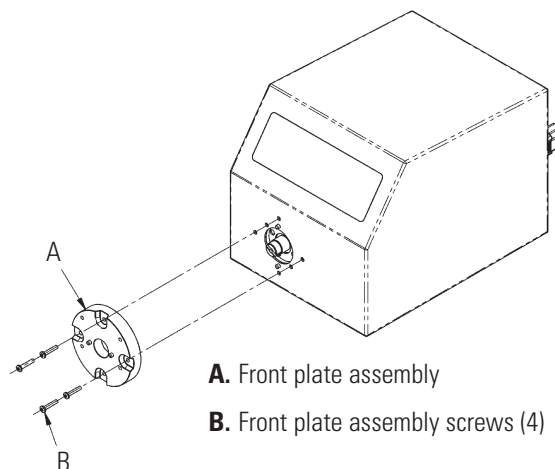


- A. 6-600 rpm gear assembly (included in service kit 07553-06)
- B. Gasket
- C. 1-100 rpm gear set (included in service kit 07553-08)
- D. Gear Case cover assembly
- E. Brush Cap
- F. Motor Brush (set of two included in 07520-04)

**Figure 4-2.** Motor Gear and Brush Replacement

## Shaft Seal Inspection

1. Remove any pump(s) attached to the front of the drive. Clean any foreign material from the outside diameter of the drive shaft.
2. Remove the four (4) screws (see Figure 4-3, Item B) that hold the front plate assembly (see Figure 4-3, Item A) to the drive, and pull the front plate assembly off the drive. #8-32 screws may be installed in the pump-mounting holes to provide handles for pulling the plate assembly off. Retain Item B screws for Step 8. **DO NOT** substitute screws.



- A. Front plate assembly
- B. Front plate assembly screws (4)

**Figure 4-3.** Shaft Seal Inspection

## Shaft Seal Inspection (continued)

3. Turn the front plate over so that the seal is visible. Wipe the elastomeric seal lips with a clean cloth to remove any grease and foreign material.
4. Inspect the elastomeric seal lips for tears or cuts or missing material. If any of the above mentioned conditions exist, replace the seal assembly using the 07575-01 replacement seal kit.
5. Wipe the exposed part of the drive shaft with a clean cloth. Wipe from the drive outward, to remove all grease and foreign matter.
6. Inspect the shaft surface, in the area touched by the seal. Look for a rough finish, or grooves parallel to the shaft length. If the shaft end is worn or damaged as described above, replace the gear and shaft with the 07575-02 kit. A polished groove, concentric to the outside of the shaft, is not a defect, as long as the groove is no more than 0.002 inches deep.
7. Prior to re-assembly, re-lubricate the shaft and the seal with the food-grade lubricant provided with the unit.



**CAUTION: Do not contaminate the lubricant in the container, on the shaft or on the seal with foreign material.**

**Failure to observe this precaution may result in damage to the seal and premature failure of the seal.**

8. Slide the front plate assembly back over the shaft and onto the locating pins, in the orientation desired. (4 configurations, each 90 degrees of rotation apart, are possible.) Reinstall the four (4) screws, removed in step 2 (see Figure 4-3).



**CAUTION: No foreign matter should be allowed under the gasket on the back of the front plate or under the heads of the screws.**

**Failure to observe this precaution may result in leakage during washdown of the drive.**

## Cleaning



**DANGER: Remove power from the pump before any cleaning operation is started.**

Keep the drive enclosure clean with mild detergents. Do not immerse or use excessive fluid when cleaning.

## Section 5 Troubleshooting

### Troubleshooting Chart

Symptom	Remedy
Unit will not turn on.	If the unit is plugged into a GFCI protected circuit verify that the circuit has not been tripped or reset the circuit.
	Verify that the unit is plugged into a functioning outlet.
	Verify that the power cord is firmly attached to the unit.
	Verify that the fuse for the incoming voltage is not blown (located in the slot next to the power cord).
Unit will turn on but pump will not spin.	Check the tubing. Tubing should be snug, but not tight, against the rollers.
	Verify that the mode EXT/INT is set correctly.
Error XX is displayed on the screen.	Err's 3 & 10, check pump for obstructions, all other Errs return unit for repair.
Unit will turn on but display would dim and pump will not spin.	Verify that the incoming voltage meets the required minimum of 90Vrms.
Unit vibrates excessively when pump is running.	Check that the tubing was loaded properly.
Unit will turn on, display shows ready, drive will not run after pressing start.	Check that OHS (Open Head Sensor) cable on Pump Head is plugged into drive.





## Section 6 Accessories

### Accessories

- |    |              |          |
|----|--------------|----------|
| 1. | Foot Switch  | 07595-43 |
| 2. | Remote Cable | 77300-32 |



## Section 7 Specifications

### Output:

#### Speed:

600 rpm models	0.1 to 600 rpm
100 rpm models	0.02 to 100 rpm

#### Torque output, Maximum:

600 rpm models	180 oz-in (13 kg•cm), 540 oz-in Starting
100 rpm models	360 oz-in (26 kg•cm), 1080 oz-in Starting

#### Speed regulation:

All models	Line $\pm 0.1\%$ F.S. Load $\pm 0.1\%$ F.S. Drift $\pm 0.1\%$ F.S.
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### Input:

Operating Voltage/Frequency:	90-260Vrms, 50/60 Hz, 2.2A @ 115Vrms, 1.1A @ 230 Vrms
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### External Inputs:

START/STOP, CW/CCW, Remote/Local Speed Control	Contact closure
Voltage input	0–10V DC @ 10 kohm,
Accuracy:	$\pm 0.5\%$ Full Scale Current
Input	4–20 mA @ 250 ohm,
Accuracy:	$\pm 0.5\%$ Full Scale

### Construction:

Models w/stainless steel or powder coated steel enclosure	14.0 in x 9 in x 9.5 in (356 × 229 × 241 mm)
Weight:	
Models w/stainless steel or powder coated steel enclosure	26 lb (11.8 kg)
Enclosure Rating:	
Models w/stainless steel or powder coated steel enclosure	IP 66 per IEC 60529/NEMA 4X -indoor use

**Environment:**

Temperature, Operating: All models	0° to 40°C (32° to 104°F)
Temperature, Storage: All models	-25° to 65°C ( -13° to 149°F)
Humidity (non-condensing): Models w/plastic enclosure	10% to 90%
Models w/stainless steel or powder coated steel enclosure	10% to 100%
Altitude: All models	Less than 2000 m
Pollution Degree: Models w/stainless steel or powder coated steel enclosure	Pollution Degree 3 (Indoor use -- Sheltered locations)
Chemical Resistance: Models w/stainless steel or powder coated steel enclosure	Exposed material is 316 enclosure stainless steel, vinyl and powder coated steel

**Compliance:**

Conforms to ANSI/UL Std 61010-1  
Certified to CAN/CSA Std C22.2  
No. 61010-1. This product has been  
tested to the requirements of  
CAN/CSA-C22.2  
No. 61010-1, second edition, including  
Amendment 1, or a later version of the  
same standard incorporating the same  
level of testing requirements.  
(For CE Mark):  
EN61010-1 (EU Low Voltage Directive)  
and EN61326 (EU EMC Directive)

## Section 8 Warranty, Product Return and Technical Assistance

### Warranty

*Use only MASTERFLEX precision tubing with MASTERFLEX pumps to ensure optimum performance. Use of other tubing may void applicable warranties.*

This product is warranted against defects in material or workmanship, and at the option of the manufacturer or distributor, any defective product will be repaired or replaced at no charge, or the purchase price will be refunded to the purchaser, provided that: (a) the warranty claim is made in writing within the period of time specified on the warranty card, (b) proof of purchase by bill of sale or receipted invoice is submitted concurrently with the claim and shows that the product is within the applicable warranty period, and (c) the purchaser complies with procedures for returns set forth in the general terms and conditions contained in the manufacturer's or distributor's most recent catalog.

This warranty shall not apply to: (a) defects or damage resulting from: (i) misuse of the product, (ii) use of the product in other than its normal and customary manner, (iii) accident or neglect, (iv) improper testing, operation, maintenance, service, repair, installation, or storage, (v) unauthorized alteration or modification, or (b) post-expiration dated materials.

THIS WARRANTY IS THE EXCLUSIVE REMEDY OF THE PURCHASER, AND THE MANUFACTURER AND DISTRIBUTOR DISCLAIM ALL OTHER WARRANTIES, WHETHER EXPRESS, IMPLIED, OR STATUTORY, INCLUDING WITHOUT LIMITATION, WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. NO EMPLOYEE, AGENT, OR REPRESENTATIVE OF THE MANUFACTURER OR DISTRIBUTOR IS AUTHORIZED TO BIND THE MANUFACTURER OR DISTRIBUTOR TO ANY OTHER WARRANTY. IN NO EVENT SHALL THE MANUFACTURER OR DISTRIBUTOR BE LIABLE FOR INCIDENTAL, INDIRECT, SPECIAL OR CONSEQUENTIAL DAMAGES.

*The warranty period for this product is two (2) years from date of purchase.*

## **Section 8**

Warranty, Product Return and  
Technical Assistance

### **Product Return**

To limit charges and delays, contact the Manufacturer or authorized seller for authorization and shipping instructions before returning the product, either within or outside of the warranty period. When returning the product, please state the reason for the return. For your protection, pack the product carefully and insure it against possible damage or loss. Any damages resulting from improper packaging are your responsibility.

### **Technical Assistance**

If you have any questions about the use of this product, contact the Manufacturer or authorized seller.



**US & Canada only**

Toll Free 1-800-MASTERFLEX | 1-800-637-3739

**Outside US & Canada**

1-847-549-7600 | 1-847-381-7050

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