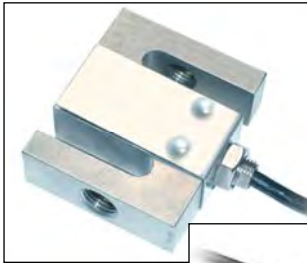




# **Ω OMEGA™** **User's Guide**



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**Series RLC & RTQ Force & Torque Sensors**  
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The information contained in this document is believed to be correct, but OMEGA accepts no liability for any errors it contains, and reserves the right to alter specifications without notice.

## *Thank you...*

Thank you for purchasing an Omega remote sensor, designed for use with models DFG-RS3 and DFG-RS5 force/torque indicators.

With proper usage, we are confident that you will get many years of great service with this product. Omega sensors are ruggedly built for many years of service in laboratory and industrial environments.

This User's Guide provides setup, safety, and operation instructions for each individual sensor series. Instructions for using the indicators are available in their respective user's guides. For additional information or answers to your questions, please do not hesitate to contact us. Our technical support and engineering teams are eager to assist you.

**Before use, each person who is to use Omega sensors and indicators should be fully trained in appropriate operation and safety procedures.**

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## 1 OVERVIEW

### 1.1 General Overview

Several series sensors are available to accommodate numerous force and torque measurement requirements. These sensors can be handheld or mounted to a fixture or test stand for more sophisticated testing requirements.

Series RLC and RTQ sensors are used with Models DFG-RS5 and DFG-RS3 indicators. They may be disconnected from one indicator and connected to another without the need for re-calibration or re-configuration. All such data is saved within a PCB located inside the smart connector.

The model number, serial number, and capacity of the sensor are identified in the rectangular label located on the sensor connector. The model and serial numbers are also identified in the **Information** screen of the indicator. Refer to the indicator user's guides for more information.

### 1.2 Accuracy and Resolution

Indicator accuracy must be combined with sensor accuracy to determine the total accuracy of the system. Since sensors may be used with the DFG-RS5 or DFG-RS3 indicators, the accuracy of the indicator being used must be identified and taken into account, as follows:

Indicator Model	Accuracy
DFG-RS5	±0.1% of full scale
DFG-RS3	±0.2% of full scale

The total system accuracy can be calculated by adding the sensor accuracy and indicator accuracy. Refer to the following examples:

#### Example 1

*Model RLC01-100 sensor with Model DFG-RS5 Indicator*

<b>RLC01-100</b> ±0.15% of full scale	+	<b>DFG-RS5</b> ±0.1% of full scale	=	<b>Total</b> ±0.25% of full scale
--	---	---------------------------------------	---	--------------------------------------

This translates into a fixed error of up to:  
 $0.25\% \times 100 \text{ lbF} = 0.25 \text{ lbF}$

#### Example 2

*Model RTQ-50Z sensor with Model DFG-RS3 Indicator*

<b>RTQ50-50Z</b> ±0.35% of full scale	+	<b>DFG-RS3</b> ±0.2% of full scale	=	<b>Total</b> ±0.55% of full scale
--	---	---------------------------------------	---	--------------------------------------

This translates into a fixed error of up to:  
 $0.55\% \times 50 \text{ ozF} = 0.275 \text{ ozF}$

Because accuracy is defined as a *percentage of full scale*, the fixed error is possible anywhere on the scale from 0 to the capacity. As such, this value represents an increasingly large error as *percentage of reading* towards the low end of the scale. It is, therefore, recommended that a sensor is selected with capacity as close as possible to the expected load.

The resolution may be different for some sensors depending on which indicator is being used. For example, a Series RLC01 force sensor will display finer resolution when connected to a DFG-RS5

indicator than when connected to a DFG-RS3 indicator. Resolution information is shown in the following sections.

## 2 SAFETY / PROPER USAGE

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Read through the following safety instructions thoroughly before using a sensor:

1. Note the sensor's capacity before use and ensure that the capacity is not exceeded. Producing a load greater than the indicated safe overload value can damage the sensor. An overload can occur whether the sensor's indicator is powered on or off.
2. In order to extend the life of the sensor, avoid repetitive shock and impact loading.
3. When moving the sensor to another location, never lift from the cable or strain relief. This can cause damage to the sensor. Always lift the sensor housing itself.
4. Always ensure that load is applied axially with respect to the sensor.
5. Ensure that the sensor is kept away from water or any other electrically conductive liquids at all times.
6. The sensor and indicator should be serviced by a trained technician only. AC power must be disconnected and the indicator must be powered off before the housing is opened.
7. Always consider the characteristics of the sample being tested before initiating a test. A risk assessment should be carried out beforehand to ensure that all safety measures have been addressed and implemented.
8. Typical materials able to be tested include many manufactured items, such as springs, electronic components, fasteners, caps, films, mechanical assemblies, and many others. Items that should not be used with the sensor include potentially flammable substances or products, items that can shatter in an unsafe manner, and any other components that can present an exceedingly hazardous situation when acted upon by a force. Always wear eye and face protection when testing, especially in aforementioned hazardous cases. Extra bodily protection should be worn if a destructive failure of a test sample is possible.
9. In aforementioned hazardous situations, it is strongly recommended that a machine guarding system be employed to protect the operator and others in the vicinity from shards or debris.
10. Sensors have threaded holes or chucks, designed for the mounting of grips, fixtures, or attachments. If any such accessories are used, ensure they are mounted firmly to prevent a potential safety risk to the operator and others in the vicinity. If using an accessory from a supplier other than Mark-10, ensure that it is constructed of suitably rugged materials and components. Similar precautions should be taken when mounting the sensor to a test stand, work bench, or other piece of equipment.

### 3 SETUP

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Insert the connector into the receptacle in the indicator, as shown in Fig. 3.1 below. When fully inserted, the connector will lock into place with a “click”.

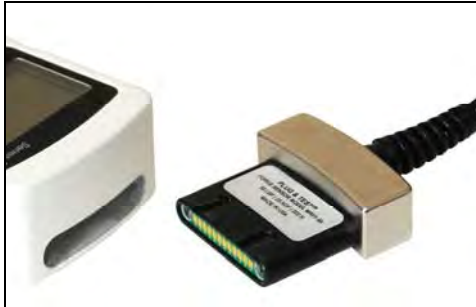


Fig. 3.1  
Appropriate orientation of the connector.

To release the connector, press both buttons on either side of the indicator housing to release the sensor, as shown in Fig. 3.2 below. Pull the connector completely out of the indicator by holding the curved aluminum section. **DO NOT** pull on the cable or strain relief.



Fig. 3.2  
Press both buttons on either side of the indicator housing to release the connector.

## 4 SERIES RLC01 FORCE SENSORS



### 4.1 Unpacking and Assembly

Carefully remove the sensor from the box. No assembly is required.

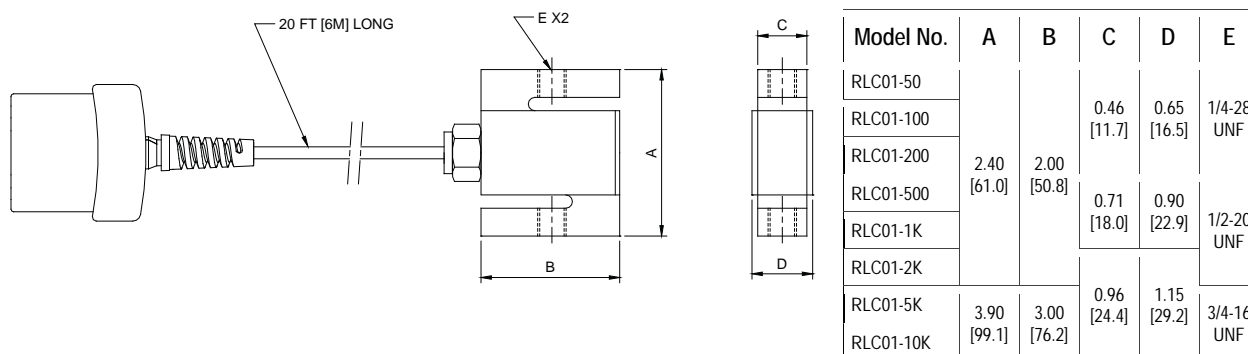
### 4.2 Overview

Tension and compression force may be applied to the surfaces with threaded holes. Attachments may be threaded into these holes. These holes also allow for mounting as required.

### 4.3 Specifications

Accuracy:	±0.15% of full scale
Safe overload:	150% of full scale
Operating temperature:	40°F – 100°F [5°C – 38°C]
Operating humidity:	96% max. (non-condensating)
Weight:	1.9 to 3.0 lb [0.9 to 1.4 kg], depending on model

### 4.4 Dimensions (in[mm])



### 4.5 Capacity x Resolution

Model No.	With Model DFG-RS5 Indicator						With Model DFG-RS3 Indicator			
	lbF	ozF	gF	kgF	N	kN	lbF	kgF	N	kN
RLC01-50	50 x 0.02	800 x 0.5	25000 x 10	25 x 0.01	250 x 0.1	-	50 x 0.05	25 x 0.02	250 x 0.2	-
RLC01-100	100 x 0.05	1600 x 1	50000 x 20	50 x 0.02	500 x 0.2	-	100 x 0.1	50 x 0.05	500 x 0.5	-
RLC01-200	200 x 0.1	3200 x 2	-	100 x 0.05	1000 x 0.5	1 x 0.0005	200 x 0.2	100 x 0.1	1000 x 1	-
RLC01-500	500 x 0.2	8000 x 5	-	250 x 0.1	2500 x 1	2.5 x 0.001	500 x 0.5	250 x 0.2	2500 x 2	-
RLC01-1K	1000 x 0.5	16000 x 10	-	500 x 0.2	5000 x 2	5 x 0.002	1000 x 1	500 x 0.5	5000 x 5	-
RLC01-2K	2000 x 1	32000 x 20	-	1000 x 0.5	10000 x 5	10 x 0.005	2000 x 2	1000 x 1	10000 x 10	-
RLC01-5K	5000 x 2	-	-	2500 x 1	25000 x 10	25 x 0.01	5000 x 5	2500 x 2	-	25 x 0.02
RLC01-10K	10000 x 5	-	-	5000 x 2	50000 x 25	50 x 0.02	10000 x 10	5000 x 5	-	50 x 0.05

## 5 SERIES RLC02 FORCE SENSORS



### 5.1 Unpacking and Assembly

Carefully remove the sensor from the box. No assembly is required.

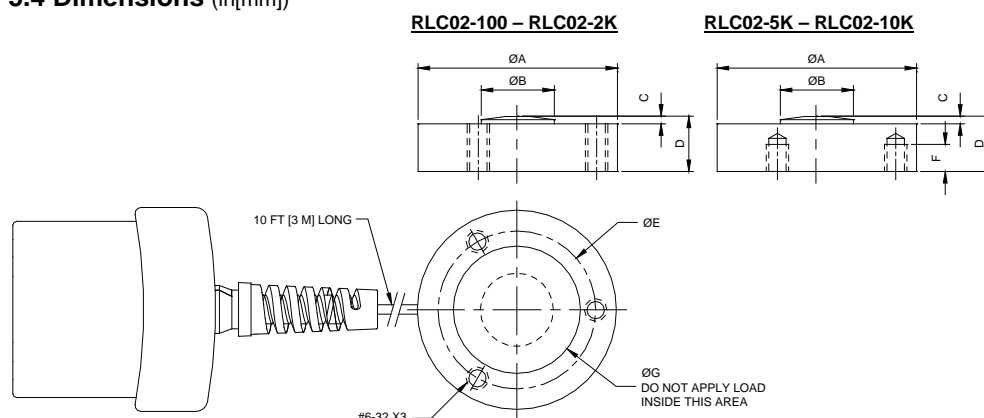
### 5.2 Overview

Compression force may be applied to the button in the center of the top surface of the sensor (visible in the picture above). **DO NOT** apply load to the cover on the underside of the sensor. Threaded holes are supplied to permit mounting to various surfaces.

### 5.3 Specifications

Accuracy:	±0.5% of full scale
Safe overload:	150% of full scale
Operating temperature:	40°F – 100°F [5°C – 38°C]
Operating humidity:	96% max. (non-condensating)
Weight:	RLC02-100 - RLC02-2K: 0.3 lb [0.1 kg] RLC02-5K - RLC02-10K: 0.5 lb [0.2 kg]

### 5.4 Dimensions (in[mm])



Model	ØA	ØB	C	D	ØE	F	ØG
RLC02-100 – RLC02-2K	1.23 [31.3]	0.32 [8.1]	0.05 [1.3]	0.39 [9.9]	1.0 [25.4]	-	0.83 [21.1]
RLC02-5K – RLC02-10K	1.48 [37.6]	0.43 [10.9]	0.07 [1.8]	0.62 [15.8]	1.25 [31.8]	0.25 [6.4]	1.08 [27.4]

### 5.5 Capacity x Resolution

Model No.	With Model DFG-RS5 Indicator						With Model DFG-RS3 Indicator			
	lbF	ozF	gF	kgF	N	kN	lbF	kgF	N	kN
RLC02-100	100 x 0.05	1600 x 1	50000 x 20	50 x 0.02	500 x 0.2	-	100 x 0.1	50 x 0.05	500 x 0.5	-
RLC02-200	200 x 0.1	3200 x 2	-	100 x 0.05	1000 x 0.5	1 x 0.0005	200 x 0.2	100 x 0.1	1000 x 1	-
RLC02-500	500 x 0.2	8000 x 5	-	250 x 0.1	2500 x 1	2.5 x 0.001	500 x 0.5	250 x 0.2	2500 x 2	-
RLC02-1K	1000 x 0.5	16000 x 10	-	500 x 0.2	5000 x 2	5 x 0.002	1000 x 1	500 x 0.5	5000 x 5	-
RLC02-2K	2000 x 1	32000 x 20	-	1000 x 0.5	10000 x 5	10 x 0.005	2000 x 2	1000 x 1	10000 x 10	-
RLC02-5K	5000 x 2	-	-	2500 x 1	25000 x 10	25 x 0.01	5000 x 5	2500 x 2	-	25 x 0.02
RLC02-10K	10000 x 5	-	-	5000 x 2	50000 x 25	50 x 0.02	10000 x 10	5000 x 5	-	50 x 0.05

## 6 SERIES RLC03 FORCE SENSORS



### 6.1 Unpacking and Assembly

Carefully remove the sensor from the box. Extra care should be taken for very low capacity models. No assembly is required.

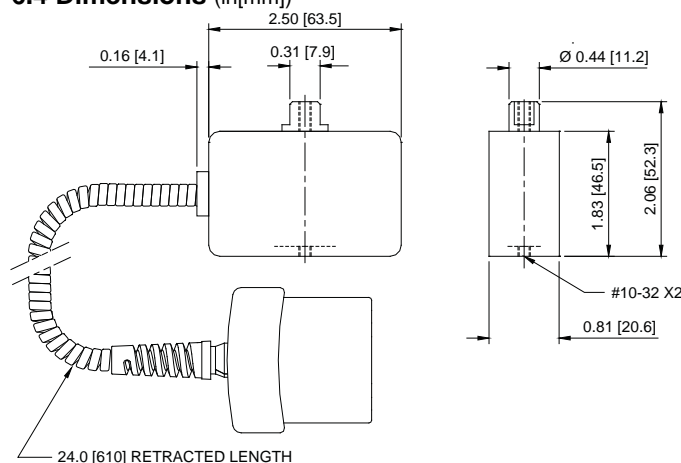
### 6.2 Overview

Tension and compression force may be applied to the threaded holes in the load cell shaft and opposite flat surface. Attachments may be threaded into these holes. **Finger-tighten only.** These holes also allow for mounting as required.

### 6.3 Specifications

Accuracy:	±0.15% of full scale
Safe overload:	RLC03-0.25 – RLC03-2: 200% of full scale RLC03-5 – RLC03-100: 150% of full scale
Operating temperature:	40°F – 100°F [5°C – 38°C]
Operating humidity:	96% max. (non-condensating)
Weight:	0.4 lb [0.2 kg]

### 6.4 Dimensions (in[mm])



### 6.5 Capacity x Resolution

Model No.	With Model DFG-RS5 Indicator						With Model DFG-RS3 Indicator			
	lbF	ozF	gF	kgF	N	mN	lbF	gF	kgF	N
RLC03-0.25	0.25 x 0.0001	4 x 0.002	100 x 0.05	-	1 x 0.0005	1000 x 0.5	0.25 x 0.0002	100 x 0.1	-	1 x 0.001
RLC03-0.5	0.5 x 0.0002	8 x 0.005	250 x 0.1	-	2.5 x 0.001	2500 x 1	0.5 x 0.0005	250 x 0.2	-	2.5 x 0.002
RLC03-2	2 x 0.001	32 x 0.02	1000 x 0.5	1 x 0.0005	10 x 0.005	-	2 x 0.002	-	1 x 0.001	10 x 0.01
RLC03-5	5 x 0.002	80 x 0.05	2500 x 1	2.5 x 0.001	25 x 0.01	-	5 x 0.005	-	2.5 x 0.002	25 x 0.02
RLC03-10	10 x 0.005	160 x 0.1	5000 x 2	5 x 0.002	50 x 0.02	-	10 x 0.01	-	5 x 0.005	50 x 0.05
RLC03-20	20 x 0.01	320 x 0.2	10000 x 5	10 x 0.005	100 x 0.05	-	20 x 0.02	-	10 x 0.01	100 x 0.1
RLC03-50	50 x 0.02	800 x 0.5	25000 x 10	25 x 0.01	250 x 0.1	-	50 x 0.05	-	25 x 0.02	250 x 0.2
RLC03-100	100 x 0.05	1600 x 1	50000 x 20	50 x 0.02	500 x 0.2	-	100 x 0.1	-	50 x 0.05	500 x 0.5

## 7 SERIES R04 FORCE SENSORS



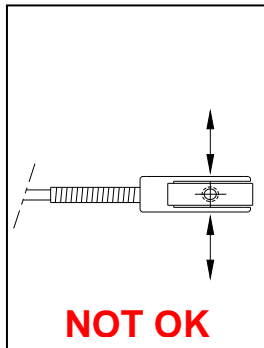
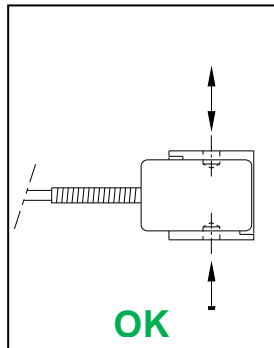
### 7.1 Unpacking and Assembly

Carefully remove the sensor from the box. Extra care should be taken for very low capacity models. No assembly is required.

### 7.2 Overview

Tension and compression force may be applied to the surfaces with threaded holes. Attachments may be threaded into these holes.

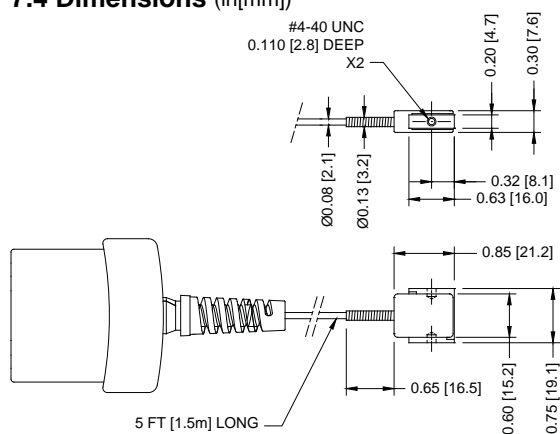
**Finger-tighten only.** These holes also allow for mounting as required.



### 7.3 Specifications

Accuracy:	±0.2% of full scale
Safe overload:	200% of full scale
Operating temperature:	40°F – 100°F [5°C – 38°C]
Operating humidity:	96% max. (non-condensating)
Weight:	0.015 lb [0.007 kg]

### 7.4 Dimensions (in[mm])



### 7.5 Capacity x Resolution

Model No.	With Model DFG-RS5 Indicator						With Model DFG-RS3 Indicator			
	lbF	ozF	gF	kgF	N	mN	lbF	gF	kgF	N
RLC04-0.25	0.25 x 0.0001	4 x 0.002	100 x 0.05	-	1 x 0.0005	1000 x 0.5	0.25 x 0.0002	100 x 0.1	-	1 x 0.001
RLC04-0.5	0.5 x 0.0002	8 x 0.005	250 x 0.1	-	2.5 x 0.001	2500 x 1	0.5 x 0.0005	250 x 0.2	-	2.5 x 0.002
RLC04-2	2 x 0.001	32 x 0.02	1000 x 0.5	1 x 0.0005	10 x 0.005	-	2 x 0.002	-	1 x 0.001	10 x 0.01
RLC04-5	5 x 0.002	80 x 0.05	1000 x 0.5	2.5 x 0.001	25 x 0.01	-	5 x 0.005	-	2.5 x 0.002	25 x 0.02
RLC04-10	10 x 0.005	160 x 0.1	5000 x 2	5 x 0.002	50 x 0.02	-	10 x 0.01	-	5 x 0.005	50 x 0.05
RLC04-20	20 x 0.01	320 x 0.2	10000 x 5	10 x 0.005	100 x 0.05	-	20 x 0.02	-	10 x 0.01	100 x 0.1
RLC04-50	50 x 0.02	800 x 0.5	25000 x 10	25 x 0.01	250 x 0.1	-	50 x 0.05	-	25 x 0.02	250 x 0.2
RLC04-100	100 x 0.05	1600 x 1	50000 x 20	50 x 0.02	500 x 0.2	-	100 x 0.1	-	50 x 0.05	500 x 0.5

## 8 SERIES R50 TORQUE SENSORS



### 8.1 Unpacking and Assembly

Carefully remove the sensor from the box. For models RTQ50-10Z, RTQ50-20Z, and RTQ50-50Z, remove the protective tubing inserted around the chuck. Save it for future transportation needs. No assembly is required.

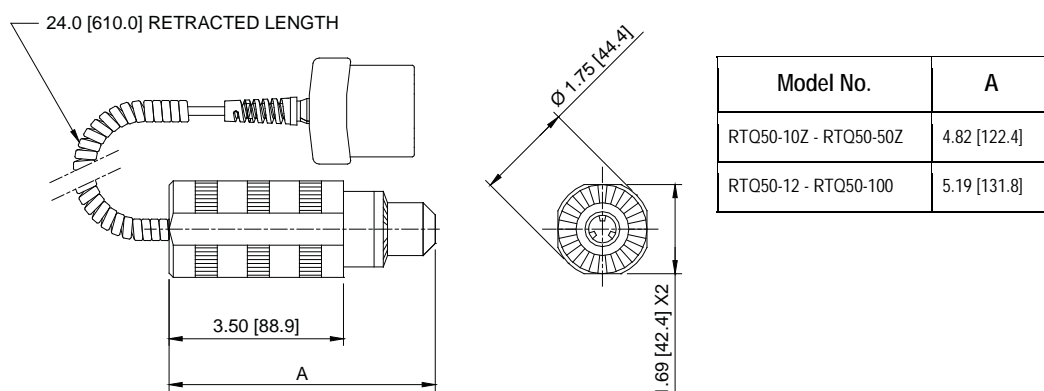
### 8.2 Overview

Designed for clockwise and counter-clockwise torque testing. The sensor may be handheld or mounted to a test stand, fixture, or other equipment. Bits or fixtures may be placed in the chuck, although extra care should be taken when handling low capacity models.

### 8.3 Specifications

Accuracy:	±0.35% of full scale
Safe overload:	RTQ50-10Z - RTQ50-50Z: 300% of full scale RTQ50-12 - RTQ50-100: 150% of full scale
Chuck opening range:	RTQ50-10Z - RTQ50-50Z: 0.062 - 0.375 in [1.6 - 9.5 mm] RTQ50-12 - RTQ50-100: 0.078 - 0.5 in [2.0 - 12.7 mm]
Operating temperature:	40°F – 100°F [5°C – 38°C]
Operating humidity:	96% max. (non-condensating)
Weight:	From 1.4 lb [0.6 kg]

### 8.4 Dimensions (in[mm])



### 8.5 Capacity x Resolution

Model No.	With Model DFG-RS5 Indicator								With Model DFG-RS3 Indicator			
	ozFin	lbFin	lbFft	gFcm	kgFmm	Nmm	Ncm	Nm	ozFin	lbFin	kgFmm	Ncm
RTQ50-10Z	10 x 0.005	-	-	700 x 0.5	7 x 0.005	70 x 0.05	7 x 0.005	-	10 x 0.01	-	7 x 0.005	7 x 0.005
RTQ50-20Z	20 x 0.01	-	-	1400 x 1	14 x 0.01	140 x 0.1	14 x 0.01	-	20 x 0.02	-	14 x 0.01	14 x 0.01
RTQ50-50Z	50 x 0.02	-	-	3600 x 2	36 x 0.02	350 x 0.2	35 x 0.02	-	50 x 0.05	-	36 x 0.05	35 x 0.05
RTQ50-12	-	12 x 0.005	1 x 0.0005	-	140 x 0.1	-	135 x 0.1	1.35 x 0.001	-	12 x 0.01	140 x 0.1	135 x 0.1
RTQ50-50	-	50 x 0.02	4 x 0.002	-	580 x 0.5	-	570 x 0.5	5.7 x 0.005	-	50 x 0.05	580 x 0.5	570 x 0.5
RTQ50-100	-	100 x 0.05	8 x 0.005	-	1150 x 0.5	-	1150 x 0.5	11.5 x 0.005	-	100 x 0.1	1150 x 1	1150 x 1

## WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **13 months** from date of purchase. OMEGA's WARRANTY adds an additional one (1) month grace period to the normal **one (1) year product warranty** to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

If the unit malfunctions, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective, it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of having been damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components in which wear is not warranted, include but are not limited to contact points, fuses, and triacs.

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## RETURN REQUESTS/INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR **WARRANTY** RETURNS, please have the following information available BEFORE contacting OMEGA:

1. Purchase Order number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR **NON-WARRANTY** REPAIRS, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:

1. Purchase Order number to cover the COST of the repair,
2. Model and serial number of the product, and
3. Repair instructions and/or specific problems relative to the product.

OMEGA's policy is to make running changes, not model changes, whenever an improvement is possible. This affords our customers the latest in technology and engineering.

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## **ENVIRONMENTAL MONITORING AND CONTROL**

- ☑ Metering & Control Instrumentation
- ☑ Refractometers
- ☑ Pumps & Tubing
- ☑ Air, Soil & Water Monitors
- ☑ Industrial Water & Wastewater Treatment
- ☑ pH, Conductivity & Dissolved Oxygen Instruments