# Dichtomatik O-Ring Handbook



DICHTOMATIK

Nu-Seals INCORPORATED

TCM®

# THE DICHTOMATIK O-RING HANDBOOK

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Special thanks to the Dichtomatik associates and customers who offered their assistance and expertise in the creation of this handbook.

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DICHTOMATIK
*NORTH AMERICA*

## LETTER FROM THE PRESIDENT

Dear Customers and Friends of Dichtomatik,

In our continuous effort to improve our service to you, we have created this O-Ring Handbook. There are many unique features that can help you select the right Dichtomatik o-ring seal for your application:

- Size listings for the seven dominant international o-ring standards.
- A master size list sorted by cross-section and inside diameter for locating a particular size, with a cross reference to the size standard.
- Chemical compatibility guide with more than 1,100 chemical media and 15 elastomer groups.
- A pictorial o-ring trouble-shooting guide, and many more features.

With our new family members Transcom–Dichtomatik and Nu-Seals–Dichtomatik we have organized Dichtomatik North America to become your true ***One-Stop Shop*** for sealing products. We now offer a broad variety of products including:

- Oil Seals
- O-Rings
- Hydraulic and Fluid Power Seals
- Custom Molded Seals and Parts

Please see Section 8 of this handbook for more details, or call one of our service centers for information on our competitively priced quality sealing products.

We will continue to work hard in serving you in line with our motto **"Any Seal. Any Time."**

Kind Regards,



Jorg Schneewind

President

Please contact Matt Gadlage for additional copies of this handbook, for Dichtomatik o-ring price lists or to offer comments and suggestions.

Call Matt at (734) 354-5552 (9 am–5 pm ET, M–F) or email: mgadlage@dichtomatik.us

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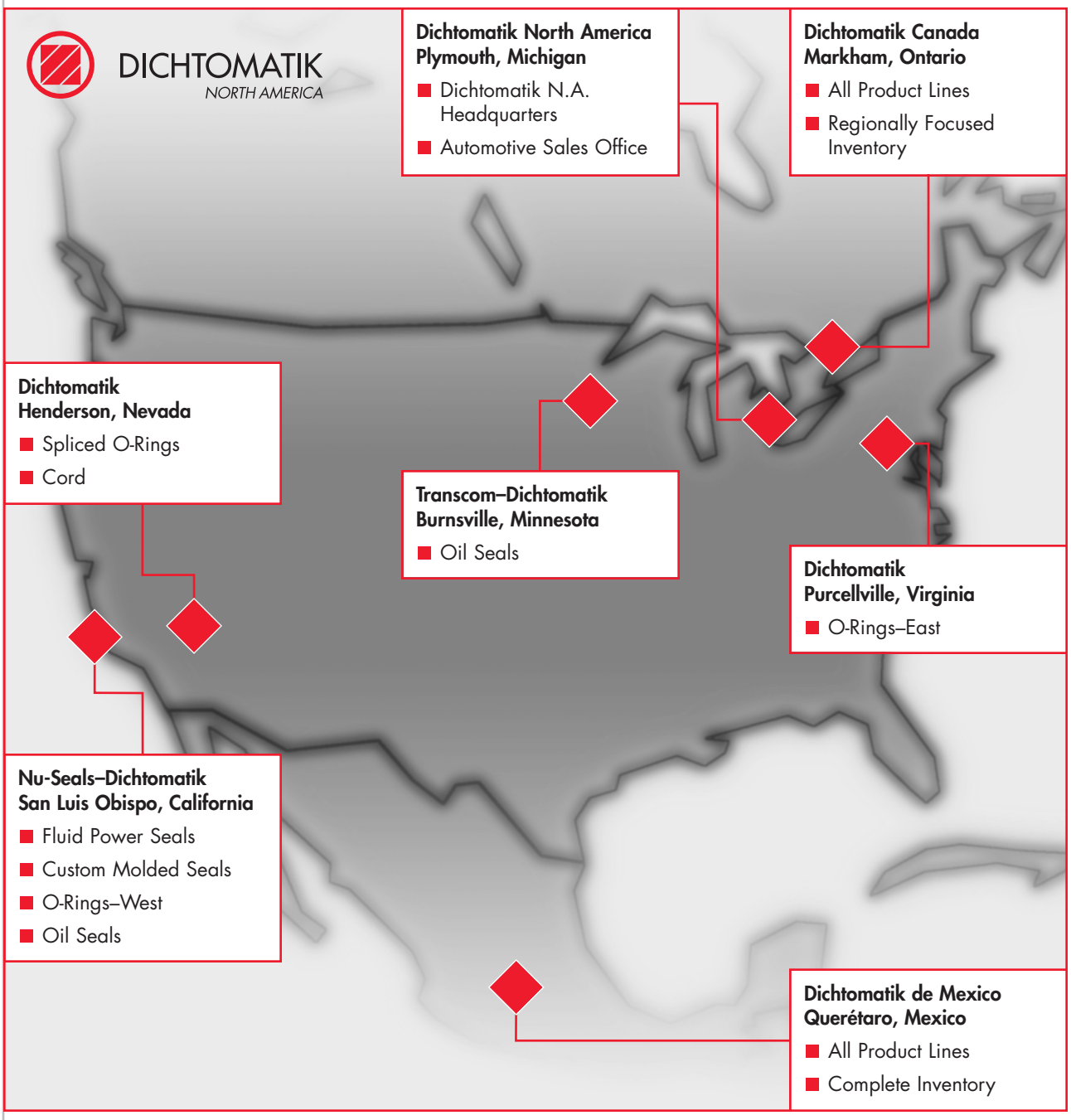
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# DICHTOMATIK NORTH AMERICA

## THE DICHTOMATIK FAMILY




## OUR MISSION...

Become the preferred ***One-Stop Shop*** for sealing products in North America by offering the broadest line of quality products combined with the best service and availability in the industry.

## OUR GOAL...

**Any Seal. Any Time.**

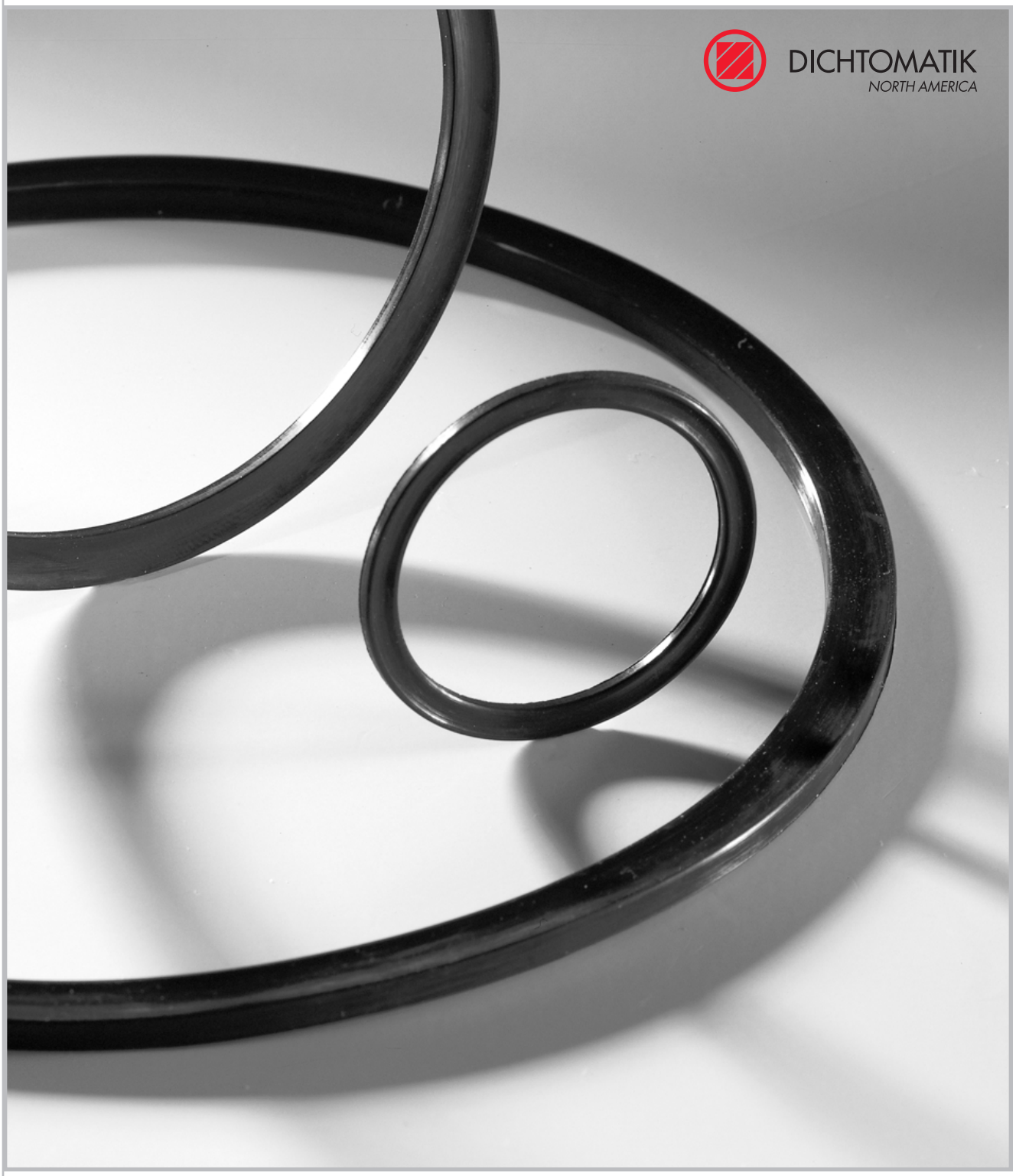
# THE O-RING HANDBOOK QUICK INDEX

## USING THE QUICK INDEX

To quickly access certain reference sections in the Dichtomatik O-Ring Handbook, locate the section title below, fan the pages of the handbook and turn to the section with edge markings that line up with the section title.

The AS568 Sizes, Master Size List and Chemical Compatibility Guide sections are indicated in red so that they can be found even more easily.


- O-Ring Gland Design
- AS568 Sizes
- ISO 3601 Sizes
- DIN 3771 Sizes
- BS 4518 Sizes
- BS 1806 Sizes
- JIS B 2401 Sizes
- NF T47-501 Sizes
- Master Size List
- Sealing Elastomers
- Chemical Compatibility Guide
- Surface Quality Standards
- O-Ring Troubleshooting
- Unit Conversions


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SECTION ONE

# INTRODUCTION TO THE O-RING HANDBOOK

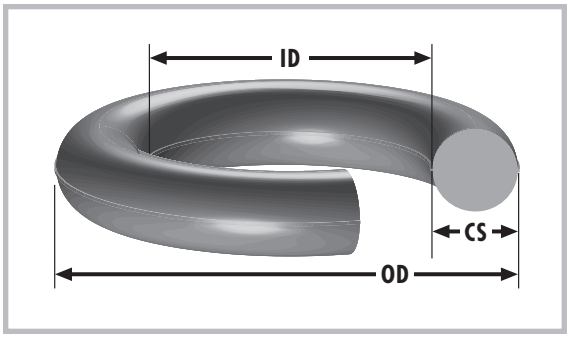
- What Is an O-Ring?
- What Is an O-Ring Seal?
- O-Ring Seal Types
- Organization of the Dichtomatik O-Ring Handbook

# INTRODUCTION TO THE DICHTOMATIK O-RING HANDBOOK

## WHAT IS AN O-RING?

From a sealing standpoint, two characteristics make an o-ring an o-ring—the shape and the material of construction.

The shape is a circular torus or doughnut-shaped ring (see diagram at right). As can be seen, only two of the three primary dimensions—the inner diameter (ID), the outer diameter (OD) and the cross-section (CS)—are required to completely specify the size of an o-ring.




The materials used in o-rings for sealing are elastomers. Elastomers are synthetic or natural materials with resilience or memory sufficient to return to their original shape after a major or minor distortion. Other materials, such as PTFE, nylon or even metal, can be fashioned into the circular torus shape, but for the purposes of this book, the term o-ring will only be used to describe an elastomeric circular torus.

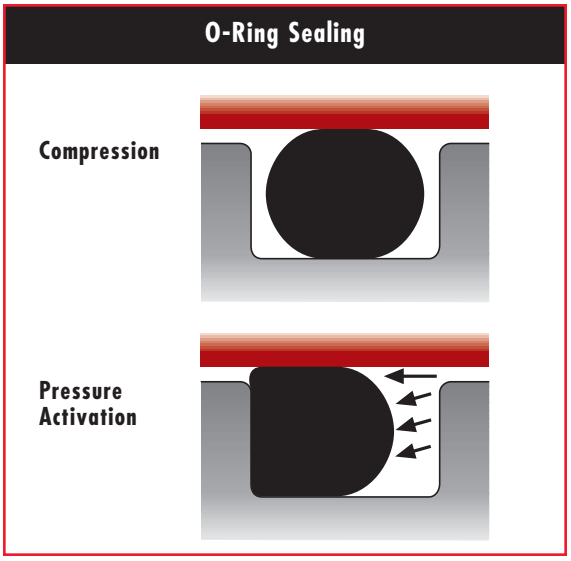
## WHAT IS AN O-RING SEAL?

An o-ring seal has two basic components:

- The o-ring
- The enclosed space that both compresses and contains the o-ring

The compression (or more accurately the deformation) of the o-ring provides part of the sealing function. An additional sealing function is realized when the o-ring is activated by the pressure of the gas or liquid that the o-ring serves to contain.

The containment ensures that the sealing function is maintained by keeping the o-ring where it needs to be.



## O-RING SEAL TYPES

The majority of o-ring seals can be categorized into one of the three following physical arrangements.

### Male Gland Seal



For male gland seals, an o-ring is installed in a groove that is machined into the OD of the "piston." The piston and the installed o-ring are then inserted into the bore. The o-ring seals radially.

### Female Gland Seal



With female gland seals, an o-ring is first installed into a groove that is machined into the ID of the bore. The rod is then inserted into the bore through the o-ring. The o-ring seals radially.

### Face Seal



For face seals, an o-ring is installed in a groove that is machined into a flat face around a hole. A second flat face then seals against the o-ring. The o-ring seals axially.

Other arrangements, such as triangular seals (see diagram below) or variations on the above three arrangements with dovetail or half-dovetail grooves, are encountered but are much less common. For technical assistance with any of these alternate arrangements, please contact Dichtomatik North America.

### Triangular Seal



# INTRODUCTION TO THE DICHTOMATIK O-RING HANDBOOK

## HOW THIS HANDBOOK IS ORGANIZED

The remainder of this handbook is divided into these eight sections:

***Section 2—O-Ring Gland Design Guidelines***

Section Two covers basic o-ring seal design guidelines for male gland, female gland and face o-ring seals. This section should serve as an excellent starting point for adding an o-ring seal to an application.

***Section 3—Global O-Ring Size Reference Guide***

Inch and metric dimensions with tolerances for most major, global o-ring size standards can be found in Section Three. O-rings can be supplied in most of these sizes without a tooling charge. Dichtomatik is also tooled on a large number of non-standard sizes and can certainly make a tool for any size that is required, usually for a very modest tooling charge.

***Section 4—O-Ring Sealing Elastomers***

This section offers a very brief introduction to the world of sealing elastomers. Volumes have been written on elastomers and new materials are constantly being developed. This section is intended to cover just the basics. For further assistance in selecting an elastomer for your application, please contact Dichtomatik North America.

***Section 5—Chemical Compatibility Guide***

Section Five offers ratings for several elastomer families when in contact with the listed chemicals and fluids. There is sometimes a great deal of variation in terms of chemical compatibility within an elastomer family, but this guide will serve as a good starting point.

***Section 6—Quality Assurance***

The quality assurance section deals mostly with surface quality defect standards for o-rings. It also touches on manufacturing quality systems and storage and shelf life recommendations.

***Section 7—Troubleshooting & Failure Analysis***

Occasionally, problems with an o-ring seal will arise. Section Seven provides an overview of the most common o-ring failure modes and offers possible causes and solutions for each.

***Section 8—Other Related Products***

Dichtomatik North America can supply a great deal more than o-rings. Section Eight provides an overview of most of the other product lines that are available. Make Dichtomatik your ***One-Stop Shop*** for all of your sealing needs.

***Section 9—Technical Reference***

Section Nine contains several technical resources that may be useful when dealing with sealing applications.

**IMPORTANT NOTE:** The information contained in this guide has been accumulated from several industry publications and authorities. At the time of publication all data was accurate to the best of our knowledge. It is the customer's responsibility to verify the accuracy and applicability of all data relevant to the particular application. Additionally, we strongly recommend that the selected seal be tested rigorously in the actual application prior to any production use.