

# COMAR

Optics for the real world

## Quality assurance



OEM Custom Services

[comaroptics.com](http://comaroptics.com)

# Our unique approach

## Dependable quality

Whether your product ends up on Mars or in microscopes, the last thing you want is for it to fail in the hands of your customer. Intensive in-house inspection ensures you receive quality you can depend on. Every time.

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# Quality matters

The quality of a product or service has far reaching implications inside and outside an organisation. Internally an absence of rejects will prevent downtime, and externally a quality product will strengthen your brand.

An understanding of this basic principle is at the root of Comar's success, and is the one of the reasons we are still trading after almost 40 years in business. We've found that reliable quality requires attention and dedication at every stage of every process; from product specification and design through to packaging and despatch.

Today we are investing more time and money into our quality control procedures than ever before, and are promoting a culture of continuous improvement. We are constantly reviewing and improving our quality management system to ensure you receive the parts you need; on time, in spec, and on budget.

We have a 0% tolerance on defective parts. Everything we do is measured by this standard.

0%  
defective parts

*"Comar can be relied on to supply quality products that have been properly tested."*

*Senior R&D Engineer, Medical Instrument OEM*

# Specification

When we are working with a customer to design an optical component, we ensure the specification is realistic. Often overlooked as part of the quality procedure, the specification of a component is one of the most important aspects.

# Sourcing

As with specification, the importance of intelligent sourcing as a quality control is often overlooked. To ensure control of this important stage, we manufacture in-house or by working with our network of chosen supply partners. All optics produced are made to strict manufacturing procedures to ensure we deliver to the specification required.

Both manufacturing routes are closely monitored by our purchasing team. Our supply partners are constantly evaluated and their performance is recorded and shared with them. This constructive relationship is a key part of our quality control procedure.

# Technical inspection

Every batch of products we handle goes through a sample technical inspection, according to a statistically based sampling table. Should any product fail on any parameter, the whole batch will be quarantined and a 100% technical inspection will be taken. Defective parts will then either be removed from the batch, or the entire batch will be rejected.

Comar has a well-equipped metrology lab and dark-room for the technical inspection of components. We comprehensively test all products against the specification, and can supply you with any inspection data you may require.

## Dimensional testing

Dimensional testing is the most basic and straightforward of the parameters tested, but nevertheless is of critical importance. We have a variety of tools from simple calipers and micrometers up to non-contact measuring systems for performing dimensional checks down to the micron level accuracy.

### Interferometric testing

Interferometric testing is the measurement of the worst peak-to-valley deviation of a surface compared to a perfect flat or sphere. Our interferometers are mounted on a vibration-isolated table, and are set up for the analysis of both flat and spherical surfaces. Our Zygo interferometer has a dedicated PC which analyses data with Durango software, allowing a resolution of 0.01 - 0.02 waves; more than sufficient for testing flatness or figure to 1/20 of a wave. Computer analysis of the data eliminates operator error.

### Focal length and centration testing

Our test instrument permits simultaneous checking of focal length and centration (which defines the distance between the mechanical and optical axes of a lens). It is capable of resolving focal length differences of 0.05mm (dependent upon focal length).

### Spectrophotometry

Spectrophotometry is the quantitative measurement of the reflection or transmission properties of a material as a function of wavelength. We have two dual-beam spectrophotometers. One is a Cary 5000 from Agilent, and the other a PerkinElmer spectrophotometer. The Cary 5000 is capable of scanning from 190nm to 3,300nm to an accuracy of better than 0.1nm (0.2nm in NIR), and can measure optical densities up to around 8 or 9. It is also equipped with the UMA (Universal Measurement Accessory) which greatly increases its capabilities, enabling reflection and transmission scans at any angle of incidence, and scans with light polarized at any angle.

### Angle testing

For angle testing autocollimators are used, sometimes in conjunction with a high precision rotary table, to check angles of prisms to single arc second accuracy.

### Parallelism

Parallelism refers to the accuracy of alignment of the two faces of a window, mirror or optical flat. We use three different methods to measure this, and will choose the most appropriate method on a case-by-case basis. Highest resolution is attained by analysis of an interferometric fringe pattern between surfaces, using our Zygo interferometer. This permits parallelisms to be measured to sub-arc second accuracies.

### Material testing

Material verification is a crucial part of the test procedure. The main methods we use are spectrophotometry and refractometry. Spectrophotometry is typically used for filters, although it can also be used as an indication for clear

glasses. Refractive index testing is done on an Abbe refractometer, which gives an accurate measurement of the refractive index of the material in question.

### Optical retardation

We have developed specialist techniques to align polarisers and optical retarders to arc minute accuracies. We can also measure the retardation of a wave plate to 0.002 waves.

### Maintenance and inspection

All lab equipment is maintained to a high standard and regularly checked for calibration, in strict accordance with the procedures set out in ISO 9001:2008.

## Cosmetic inspection

100% of optical components we supply have been cosmetically inspected in-house by our skilled technicians and will meet the cosmetic standard as set out in the specification. We recognize both the American standard MIL-O-13830 (scratch-dig standard) and the European standard ISO 10110.

### Identification and traceability

We can identify each separate batch of products by a unique batch code on the product label. This gives key inspection data and allows traceability once the part has been placed in stock.

### Visual inspection

Inspection is undertaken by our trained technicians under controlled darkfield illumination. For products with a tighter specification a microscope and very intense illumination is used.

### Cleaning

Optical components are typically cleaned with a solvent and specialist materials, which removes all traces of surface contaminants such as grease, dirt or dust and leaves no residue or marks on the surface. For removing watermarks a mild acid is used. Our trained technicians take great care to ensure no optics are damaged at the cleaning stage.

### Packaging

Packaging is perhaps the most critical stage of the process, as the packaging and delivery stage is where optics are often prone to damage. Small items will typically be wrapped in optical tissue and placed inside a crystal bag. These

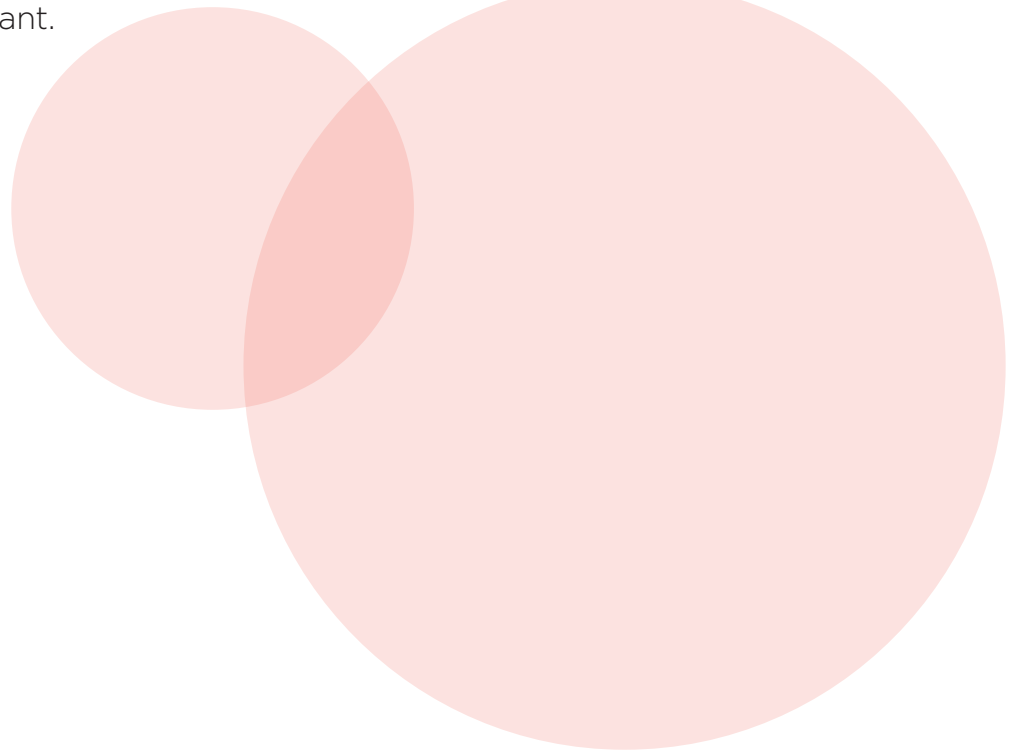
bags will then be stored in a small envelope or cardboard box. Moisture-sensitive filters are heat-sealed into foil packaging to prevent damage to the coatings.

For delivery, all items are packed into larger boxes and suitably shock-protected. Special packaging by customer request can easily be arranged. Options include individual polystyrene boxes, gelatine capsules, membrane boxes and others.

## ISO9001

Comar is accredited for ISO 9001:2008 for Quality Management Systems. ISO 9001 sets out the criteria for a quality management system within an organisation and the documentation needed in order to demonstrate the effective implementation, planning and control of its processes and the continual improvement of its QMS.

Our team have compiled a quality manual that complies to the requirements of the ISO 9001. Our quality manual comprehensively documents our quality processes, procedures, controls, audits and corrective actions. The system requires we undertake both internal monitoring and external assessments to remain compliant.



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