Ultrasonic-Cleaning Systems for Precision Optics

- Cleaning ready for inspection
- Cleaning ready for coating
Manufacturing process in the Precision Optics

Reapplying of filler, protection lacquer, pitch for further process step

Fillers, protection lacquers, pitch, polishing agents of grinding, polishing and centering processes rsp, cooling lubricants of diamond turning.

Cleaning ready for inspection
For the manufacturing of geometrical different precision optics several grinding, polishing, turning and centering processes are required. Fillers are used for the necessary mechanic fixation as well as lacquers to protect the already finished surfaces. The key competence of Elma is to develop an optimal and proved cleaning procedure, depending also on the glass qualities. Pure water based, as well water based with solvent steps are carried out by using Elma chemicals.

Cleaning ready for coating
A successful finishing of precision optics by a vacuum coating is based on a ready for coating cleaning quality. The optics have to possess a defined cleanliness and have to be free of particles for the coating. Before assembling the optics to construction units a cleaning free of particles is the basis for an exact functionality.

Finishing of surfaces / Final assembly
- finishing of surfaces by vacuum technology
- assembly to construction units

Precision optics with coating
Products for cleaning ready for inspection (Pre- and intermediate cleaning)

Solvent device
X-tra LSM 250 / 550

Ultrasonic equipments for cleaning with solvent (flash point >55°C) to remove protective lacquers. The X-tra LSM devices are available with a bath volume of 25 rsp. 55 liters. They can be combined with Flex 1, 2 and x-tra Line products. Ultrasonic equipment is available in the multi frequency version 25/45 kHz. Accessories: Agitation, pump filter unit for constant filtration.

Flex 1 and 2
X-tra 250 / 550 / 800 / 1200 / 1600

Ultrasonic and rinsing equipments for cleaning ready for inspection of optics with water based cleaners including following rinsing. Ultrasonic available in two multifrequency versions 25/45 kHz, 35/130 kHz. Accessories: Agitation, pump filter unit for constant filtration.

X-tra Line 250 / 550 / 800 / 1200 / 1600

Modular system with standard devices. Can be individually combined according to the process requirements for the cleaning ready for inspection with integrated deblocking and decomposition of alcacryl foils. From manual devices to fully automatic versions with transport robot.

Advantages:
– Proved industrial series devices in different sizes and versions.
– From the single device to the automated equipment.
– Elma X-tra line can be extended step by step according to your needs and available budget. Modular system for different cleaning requirements.
– Extensive range of options and peripheral devices.
– Short delivery time.
– Plug & Clean.
– Choice of different cleaning programs in connection with transport system.
– Interchangeable devices and options for later modification and upgrade of cleaning requirements possible.
– Upgrade of the modules and devices is possible at any time.
– Solvent device can be integrated.
Fully automatic standard ultrasonic cleaning equipments of modular construction units for the cleaning ready for inspection or ready for coating

**STC/MTC 50-200**

Advantages of the standard equipments:
- Modular system depending on the individual process requirements.
- Ultrasonic equipment with multi frequency technology for the different sensitive products.
- Flexible integration into the production process (in line solution).
- Process related flexibility of cleaning line and application.
- Well proven components.
- Graphically designed control system.
- Process control production for constant quality.
- Lower investment costs through standardization.
- Adjustment of investment costs to the shortened product lifecycles.

**STC 50-8-WLT**

Type: Robot device for the cleaning ready for coating.
Cleaning product: Precision optics.
Material: Different glass qualities.
Pollution: Grinding oil, cooling lubricants, waxes, fillers, lacquers.
Cleaning chemistry: NMP, elma clean 300 and elma clean 310
Periphery: Clean water circulation equipment.
Throughput: Equipment capacity: 8-12 batches/h
Machine speciality:
- Ultrasonic multi frequency 35/130 kHz depending on the lens quality
- Laminar flow for covering the last rinsing and drying steps.

**STC 50-9-WLT-Rot**

Type: Robot device for the cleaning ready for coating
Cleaning product: Glass substrates
Material: BSC7, Y-50, RG830, R-60, Sio2, BG3, BG 390
Pollution: Finger prints, dust
Process: Water-based with hot air drying
Cleaning chemistry: elma clean products
Periphery: Clean water circulation equipment
Throughput: Capacity of equipment: 3 - 4 batches/h
Machine speciality:
- Second transport robot with rotation drive for the transport of covered carriers through the equipment. System specially developed for small product geometries.
- Ultrasonic multi frequency 35/130 kHz

**STC 100/5-WLT**

Type: Robot device for the cleaning ready for coating
Cleaning product: Glass substrates
Material: BSC7, Y-50, RGB30, R-60, Sio2, BG3, BG 390
Pollution: Finger prints, dust
Process: Water-based with hot air drying
Cleaning chemistry: elma clean products
Periphery: Clean water circulation equipment
Throughput: 4 batches/h
Machine speciality:
Combined dryer with filtered hot air and infrared radiators.
Individual equipments

According to product range, throughput and integration requirements into the production process, Elma is manufacturing individual equipments for water, half-watery or solvent-based systems with different drying technologies. For the transport of the partly very sensitive parts to clean, you have the choice of most different automation concepts.

**Workingplace for small optical parts**
Type: Ultrasonic cleaning equipment with 4 tanks for the cleaning free of particles and ready for coating.
Cleaning product: Small optical components, f.e. optical lenses, mounted lenses, optical construction units.
Material: Different lens qualities
Pollution: Dust, finger prints
Process: Water-based system with centrifugal drying
Cleaning chemistry: elma clean products
Periphery: Laminarflow
Throughput: 5-8 batches/h
Machine speciality:
Optical lenses can be cleaned and handled immediately. The advantage of this system is that the highly clean parts for the assembly can be kept under clean room conditions. The carrier is turning in the cleaning bath. The turning speed is individually adjustable in every tank position. After bringing out of the last tank the centrifugal drying with a free selectable turning speed of 500 to 1800 U/min is starting.

**HS 300/450/300/8-WLT**
Type: Lift-push device for the cleaning ready for coating
Cleaning product: Precision optics
Material: SK 16 lenses
Pollution: Protective lacquer, dust, finger prints
Process: Half-water based system with hot air drying
Cleaning chemistry: NEP and elma clean 310
Periphery: Clean water circulation equipment
Throughput: 30 batches /h
Machine speciality:
Lift-push technology for a high throughput.
**NA 300/400/360/8-WLT**
Type: Robot device for the cleaning ready for coating
Cleaning product: Fine optical elements and mounted trinovid prism with air gap
Pollution: Dust, grease, finger prints
Cleaning result: Final cleaning before the assembly
Process: Water-based system with hot air drying
Cleaning chemistry: elma clean products
Throughput: Different according to parts to clean
Fixed cycle: 90 sec / batch
Transport: Robot in turning operation
Periphery: Clean water circulation equipment
Machine speciality: Automatic basket locking system at the robot device for the fast basket transport between the process chambers.

**NA 300/300/400/10-ALR**
Type: Robot device for the cleaning ready for coating
Cleaning product: Lenses for endoscopes
Pollution: Dust, finger prints, rests of protective lacquers
Cleaning result: Final cleaning before the assembly
Process: Half-water based system with centrifugal drying
Cleaning chemistry: NEP and Elma clean products
Throughput: 10 batches / day
Transport: Robot with rotation drive
Periphery: Clean water circulation equipment
Machine speciality: Robot device with rotation drive for the transport of disc carriers through the process chambers rsp. for the drying of the products by centrifugal technology.

**HSO 350/350/300/9-WLT**
Type: Push-lift device for the cleaning ready for coating
Cleaning product: Fine optical elements and prism
Pollution: Fillers, grinding oil, dust, finger prints
Cleaning result: Final cleaning before the assembly
Process: Water-based system with hot air drying
Cleaning chemistry: elma clean products
Throughput: 5 -12 batches / h
Transport: Lift-push technology
Periphery: Clean water circulation equipment
Machine speciality: Twin-section device for the separated transport of the products from the single process steps.
Accessories

Besides the cleaning devices and equipments Elma offers a wide range of accessories.

Water treatment plant for the generation of softened city water, roesmosis water rsp. pure water for the circulation in different classes of performances of 100 – 2400 l/h.

Pump-filter units for the continuous bath filtration of cleaning and rinsing tanks.

Treatment of solvent by separating of soluble contaminations as f.e. fillers, pitches, protection.

Laminar flow modules for the generation of clean room conditions within closed cleaning equipments.

Reference list

<table>
<thead>
<tr>
<th>Company</th>
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<tbody>
<tr>
<td>Berliner Glas</td>
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<td>Isco Optik</td>
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<tr>
<td>Leica Camera</td>
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<td>Portugal</td>
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<td>Steiner Optik</td>
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We about us

Highly specialized, and yet innovative in multiple ways – this is ELMA, a company which has successfully been on the market with their ultrasonic technology for more than 50 years now. ELMA started in 1948 with only 2 people who had an idea for a totally new watch cleaning machine. They kept looking for the perfect cleaning technology which eventually led them to try ultrasound.

Constant research and permanent technical improvement of the products in the ultrasonic and process technology department have always been the core competence of the company. The product range contains a large number of serial units, modular cleaning lines and special customer-made cleaning installations. Cleaning chemicals, developed, tested and produced in our own chemical laboratory round off the ELMA product range and help to solve even the most difficult cleaning jobs in various business sectors.

ELMA are exporters of customized state-of-the-art technology into more than 70 countries all over the world, distributing their products to watchmakers and jewellers, dental and research laboratories, to companies in the medical and optics sector and to industrial businesses. You can find ELMA products on more than 100 international trade shows. Numerous distributors around the world recommend the ELMA technology to their customers and rely on the ELMA quality standard „Made in Germany“.

There is a staff of more than 200 people working in the research and production departments at three company sites in Singen in the South of Germany.

With ELMA, quality and service enjoy top priority! In addition to the main business with ultrasonic technology, we have been highly competent as a partner for watchmakers and jewellers, looking back on a long tradition in this sector. There are special machines for all purposes around the valuable watches and jewellery: for manufacturing, for testing, for servicing and for cleaning and the ELMA engineers are constantly working on the development and design of new machines.
**Optical elements (Frameless)**

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<td>Elements from mineral glass*1</td>
<td>Cleaning ready for inspection</td>
<td>Storage dirt, fingerprint, dust.</td>
<td>elma clean 300 (EC 300)</td>
<td>For ultrasonic dip-cleaning; splashing: &gt; 55-60°C, KOH-based, emulsifying.</td>
<td>0.5 - 2 vol%; neutral, pH: 7 - 8.</td>
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<td>elma clean 310 (EC 310)</td>
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<td>elma clean 300 (EC 300)</td>
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<td>Glass types moderately sensitive to alkaline media</td>
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*1) If precision optics made from given mineral glass type could be cleaned in aqueous media or not, depends on its chemical resistance to pure water, deionized water and the alkaline or acidic cleaning solu-
tions. These resistances are given by parameters, i.e. according to Schott for the resistance to acidic (SR, ISO 8424:1987) or to alkaline (AR, ISO 10629:1996) aqueous media and other properties of aqueous media. Mineral glass with SR > 52 for example requires special measures for the rinsing using pure deionized water or this glass can not be rinsed in pure deionized water at all. Further on one has to take into account the linear coefficient of thermal expansion of the glass types for the temperature differences between the dipping baths.

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<td>elma clean 310 (EC 310)</td>
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*2) An alkaline cleaning may include slight etching. It should be restricted by limiting the dipping time to a thinning of the outer SiO2-layer only.

**Framed optics / optical assemblies**

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<tr>
<td>Frames &amp; elements from mineral glass*1</td>
<td>Cleaning ready for assembling</td>
<td>Traces of colophonium-based protective laquer &amp; putty, grinding &amp; polishing suspension, fingerprint, dust.</td>
<td>elma clean 310 (EC 310)</td>
<td>For the ultrasonic dip-cleaning; splashing: &gt; 55-60°C, KOH-based, emulsifying.</td>
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<td>Cleaning ready for assembling</td>
<td>Traces of colophonium-based protective laquer &amp; putty, fingerprint, dust.</td>
<td>elma clean 260 (EC 260 dda)</td>
<td>For ultrasonic dip- &amp; for splash-cleaning (dipping: &lt; 0.5 vol%; or with foam-inhibiting additive), KOH-based, emulsifying.</td>
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<td>Cleaning ready for assembling</td>
<td>Traces of colophonium-based protective laquer &amp; putty, grinding &amp; polishing suspension, lime soaps, fingerprints, dust.</td>
<td>elma clean 260 (EC 260 dda)</td>
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