



Ultrasonic-Cleaning Systems for Precision Optics

- Cleaning ready for inspection
- Cleaning ready for coating



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Manufacturing process in the Precision Optics

Blank



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

Fillers, protection lacquers, pitch, polishing agents of grinding, polishing and centering processes resp, 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 resp. 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: Dust, finger prints.

Process: Half-watery process for the cleaning ready for coating of the lenses.

Cleaning chemistry: elma clean products.

Periphery: Clean water circulation equipment.

Throughput: Equipment capacity: 8- 12 batches/h

Machine speciality:

- Ultrasonic multi frequency 35/130 kHz depending on the lense 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: Precision optics.

Material: Different qualities of lenses.

Pollution: Grinding oil, cooling lubricants, waxes, fillers, lacquers.

Process: Half-watery process for the cleaning ready for inspection and ready for coating with hot air resp. centrifugal drying.

Cleaning chemistry: NMP, elma clean 300 and elma clean 310

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, 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: 4 batches/h

Machine speciality:

Combined dryer with filtered hot air and infrared radiators.



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 lense 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 resp. 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



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

Water treatment plant for the generation of softened city water, reosmosis water resp. 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

Berliner Glas
Carl Zeiss
Carl Zeiss
Carl Zeiss
Isco Optik
Leica Camera

Berlin
Jena
Oberkochen
Wetzlar
Göttingen
Famalicao

Germany
Germany
Germany
Germany
Germany
Portugal

Leica Camera
Leica Geosystems
Steiner Optik
DELTA Lys&Optics
Hensold

Solms
Herrbrug
Bayreuth
Lyngby
Wetzlar

Germany
Switzerland
Germany
Denmark
Germany

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, to 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.





Cleaning concentrates for the aqueous cleaning of precision & infrared optics

Optical elements (frameless)					
Kind of parts	Preceding process step	Contaminations supposed to be removed	Cleaning agent	Properties of cleaning agent	Recommended range of concentration; pH-value
Elements from mineral glass*1)					
Cleaning ready for inspection					
Glass types insensitive to alkaline media	Solvent-based removal of protective laquer, putty, pitch & (if necessary) adhesive	Residues of colophonium-based protective laquer, putty & pitch, of grinding & polishing suspension, fingerprints, dust.	elma clean 335 (EC 335)	For the ultrasonic dip-cleaning, NaOH-based, emulsifying.	1 - 4 vol%; alkaline; pH: 12,5 - 13.
Also glass types sensitive to alkaline media	Solvent-based removal of protective laquer, putty, pitch & (if necessary) adhesive	Traces of colophonium-based protective laquer & putty, of grinding & polishing suspension, fingerprints, dust.	elma clean 310 (EC 310)	For the ultrasonic dip-cleaning, emulsifying.	2 - 5 vol%; very mildly alkaline, pH: 8.
Also glass types very sensitive to alkaline media	Solvent-based removal of protective laquer, putty, pitch & (if necessary) adhesive	Traces of colophonium-based protective laquer & putty, of grinding & polishing suspension, lime soaps, fingerprints, dust.	elma clean 260 dip&splash (EC 260 d&s)	Zur Ultraschall-Tauch- und Spritzreinigung (> 55-60°C), überwiegend demulgierend.	1 - 2 vol%; neutral, pH: 7 - 8.
Glass types moderately sensitive to alkaline media	Solvent-based removal of protective laquer, putty, pitch & (if necessary) adhesive	Residues of grinding & polishing suspension, lime soaps, fingerprints, dust.	elma clean 290 (EC 290 tf)	Speziell zur tensidfreien Ultraschall-Tauch- und Spritzreinigung, demulgierend.	0,5-2 vol%; alkaline; pH: -11.
Cleaning ready for coating					
Glass types insensitive to alkaline media	Cleaning ready for inspection, inspection	Storage dirt, fingerprint, dust	elma clean 300 (EC 300)	For ultrasonic dip- & for splash-cleaning (splashing: < 0.5 vol% or with foam-inhibiting additive), KOH-based, emulsifying.	-2 vol% (dipping); alkaline, pH: 11,5 - 12.
Glass types moderately sensitive to alkaline media	Cleaning ready for inspection, inspection	Storage dirt, lime soaps (drying spots), fingerprint, dust	elma clean 270 dip&splash (EC 270 d&s)	For ultrasonic dip- & for splash-cleaning (splashing: > 55-60°C), KOH-based, predominantly demulsifying.	0.5 - 2 vol%; mildly alkaline, pH: 9-10.
Also glass types sensitive to alkaline media	Cleaning ready for inspection, inspection	Traces of putty, fingerprints, dust	elma clean 310 (EC 310)	For the ultrasonic dip-cleaning, emulsifying.	2 - 5 vol%; very mildly alkaline, pH: 8.
Also glass types very sensitive to alkaline media	Cleaning ready for inspection, inspection	storage dirt, lime soaps (drying spots), fingerprint, dust	elma clean 260 dip&splash (EC 260 d&s)	For ultrasonic dip- & for splash-cleaning (splashing: > 55-60°C), predominantly demulsifying.	1 - 2 vol%; neutral, pH: 7 - 8.

*1) *1) If precision optics made from given mineral glass type could be cleaned in aqueous media or not, depends on its chemical resistances to pure water (rinsing steps) and to the alkaline or acidic cleaning solutions. 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 >- 52.2 for example requires special measures for the rinsing using pure deionized water or this glass can not 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 bathes.

Optical elements (frameless)					
Kind of parts	Preceding process step	Contaminations supposed to be removed	Cleaning agent	Properties of cleaning agent	Recommended range of concentration; pH-value
Elements of Infrared optics					
Cleaning ready for inspection					
Ge, Si ²⁾ , CaF ₂	Solvent-based removal of protective laquer, pitch & putty	Residues of grinding & polishing suspension, storage dirt, fingerprint, dust.	elma clean 300 (EC 300)	For ultrasonic dip- & for splash-cleaning (splashing: < 0.5 vol% or with foam-inhibiting additive), KOH-based, emulsifying.	-2 vol% (dipping); alkaline, pH: 11,5 - 12.
Also glass types sensitive to alkaline media	Solvent-based removal of protective laquer, pitch & putty	Traces of colophonium-based protective laquer & putty, of grinding & polishing suspension, fingerprints, dust.	elma clean 310 (EC 310)	For the ultrasonic dip-cleaning, emulsifying.	2 - 5 vol%; very mildly alkaline, pH: 8.
Al ³⁾ , Cu/Ni ³⁾ , Ge, Si, ZnS (Cleartran), ZnSe, AMTIR, CaF ₂	Solvent-based removal of protective laquer, pitch & putty	Traces of colophonium-based protective laquer & putty; grinding & polishing suspension, lime soaps, fingerprints, dust.	elma clean 260 dip&splash (EC 260 d&s)	For ultrasonic dip- & for splash-cleaning (splashing: > 55-60°C), predominantly demulsifying.	1 - 2 vol%; neutral, pH: 7 - 8.
Cleaning ready for coating					
Ge, Si ²⁾ , CaF ₂	Cleaning ready for inspection, inspection	Storage dirt, fingerprint, dust.	elma clean 300 (EC 300)	For ultrasonic dip- & for splash-cleaning (splashing: < 0.5 vol% or with foam-inhibiting additive), KOH-based, emulsifying.	-2 vol% (dipping); alkaline, pH: 11,5 - 12.
Also glass types sensitive to alkaline media	Cleaning ready for inspection, inspection	Fingerprints, dust.	elma clean 310 (EC 310)	For the ultrasonic dip-cleaning, emulsifying.	2 - 5 vol%; very mildly alkaline, pH: 8.
Al ³⁾ , Cu/Ni ³⁾ , Ge, Si, ZnS (Cleartran), ZnSe, AMTIR, CaF ₂	Cleaning ready for inspection, inspection	Storage dirt, lime soaps (drying spots), fingerprint, dust.	elma clean 260 dip&splash (EC 260 d&s)	For ultrasonic dip- & for splash-cleaning (splashing: > 55-60°C), predominantly demulsifying.	1 - 2 vol%; neutral, pH: 7 - 8.

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.

³⁾ Ultrasonic treatment of Aluminium-mirrors requires higher ultrasonic frequencies and restricted ultrasonic power. For Cu/Ni-mirrors this holds also, but to a lower extent.

Framed optics / optical assemblies					
Kind of parts	Preceding process step	Contaminations supposed to be removed	Cleaning agent	Properties of cleaning agent	Recommended range of concentration; pH-value
Frames & elements from mineral glass*1)					
Cleaning ready for assembling					
Also glass types & frames sensitive to alkaline media	Framing, preassembling with cleaned elements, sticking	Residues of adhesive (not cured), oil, grease, storage dirt, fingerprints, dust.	elma clean 335 (EC 335)	For the ultrasonic dip-cleaning, NaOH-based, emulsifying.	1 - 4 vol%; alkaline; pH: 12,5 - 13.
Also glass types & frames sensitive to alkaline media	Framing, preassembling with cleaned elements, sticking	Traces of adhesive (not cured), oil, grease, storage dirt, fingerprints, dust.	elma clean 225 sonic (EC 225sonic)	For the ultrasonic dip-cleaning, emulsifying.	2-10 vol%; mildly alkaline, pH: 9-10.
Also glass types & frames sensitive to alkaline media	Framing, preassembling with cleaned elements, sticking	Traces of adhesive (not cured), oil, grease, storage dirt, fingerprints, dust.	elma clean 225 spray (EC 225spray)	For splash-cleaning, emulsifying.	1-3 vol%; mildly alkaline, pH: 9-9.5.
Also glass types & frames very sensitive to alkaline media	Framing, preassembling with cleaned elements, sticking	Traces of adhesive (not cured), lime soaps, fingerprints, dust.	elma clean 260 dip&splash (EC 260 d&s)	For ultrasonic dip- & for splash-cleaning (splashing: > 55-60°C), predominantly demulsifying.	1 - 2 vol%; neutral, pH: 7 - 8.
Glass types moderately sensitive to alkaline media	Framing, preassembling with cleaned elements, sticking	Lime soaps, fingerprints, dust.	elma clean 290 tensidfrei (EC 290 tf)	For the surfactant-free dip- & splash-cleaning, demulsifying.	0,5-2 vol%; alkaline; pH: -11.