



Parts Cleaning. Systems and Solutions.



High cleanliness values for
enormous variety of parts:
MAFAC PALMA at Trumpf GmbH

TRUMPF



User report

TRUMPF Lasertechnologie

High cleanliness values for enormous variety of parts

TRUMPF Laser GmbH in Schramberg is going into repetition: Due to the constantly growing volume of parts and increasing cleanliness requirements, the technology company recently had a second PALMA parts cleaning system installed by MAFAC. Like the first MAFAC PALMA, the new one is also equipped with various special features.

The second system has been in operation at Trumpf Laser in Schramberg for several weeks now and, like the system installed in 2012, is also part of the process chain. Up to 10,000 different work-piece types in many sizes, materials and geometries are assembled there under invariably clean room conditions. These precision mechanical components are first cleaned in the MAFAC PALMA until they are finally integrated into solid-state lasers. Since this also means an extreme variety of parts with highly complex geometries and many material variants for the second cleaning system, the new cleaning system was individually adapted to TRUMPF Laser's requirements and specially adapted to the conditions of clean room production.

Trumpf Laser GmbH

Trumpf Laser GmbH was founded in 1972 as a company for laser technology in Schramberg and has been a member of the TRUMPF Group since 1992. Solid state lasers for material processing are developed and produced at this exact location of the world's leading manufacturer of

industrial lasers and laser systems, which currently employs around 1200 people. The TRUMPF solid-state lasers are suitable for a large range of applications in industrial material processing. With capacities between 20 and 16,000 Watt, the lasers are used for welding, cutting, drilling, or micro processing. The wide variety of the range of applications makes the TRUMPF products made in Schramberg suitable for buyers from many different industries.

Cleaning - an important process for laser technology

"Cleaning is an important key process for us. If it is not done properly, our lasers won't work", says Christof Fehrenbach from the Process Development division at TRUMPF Laser. Due to the optical elements in the laser, ever higher demands are placed on component cleanliness, both in terms of film and particles. "This is particularly true for the parts which deliver the laser beam. They must be absolutely free of contamination by particles and films", Fehrenbach explains. For this reason, the solid-state lasers are manufactured under clean-room conditions. This makes the cleaning system part of a sensitive production area in which it must also cover an extreme variety of parts. The part sizes range from one millimetre to 500 x 300 x 250 millimetres. Many of the parts have highly complex geometries, for example tiny bore holes, and are made from different materials such as aluminium, brass, copper, bronze, stainless steel, non-ferrous metals and premium plastics.



TRUMPF Laser in Schramberg relied on the know-how of MAFAC a second time and installed a MAFAC PALMA adapted to the specific needs of clean room production.



The system is equipped with many extras - the fully automatic transfer system is clearly visible and of particular importance for clean room technology.

Good experiences support the new MAFAC PALMA

Since its commissioning in 2012, MAFAC PALMA has met these high requirements to an above-average degree. The decision to purchase a second system of the same design was therefore easy: "For more than six years, the cleaning machine has been operating extremely reliably and copes with a high throughput with a consistently high cleaning quality," explains Fehrenbach. The findings gathered by the production team in Schramberg from the many cleanliness analyses of recent years and months also spoke in favour of an aqueous-based system. The second purchase was based on the experience gained in 2012 and was able to add process steps to the new plant with which even higher component cleanliness can be achieved. This applies in particular to small and deep threaded holes: "The process verification was much easier this time than in 2012, since we already knew the achievable parts cleanliness, both in terms of particles and film," says Fehrenbach. In addition, the close proximity to MAFAC in Alpirsbach is much appreciated and the high level of expertise of the application engineers has left a very positive impression.

The equipment features of the MAFAC MALTA

Like the system from 2012, the new MAFAC PALMA is not an off-the-shelf machine. It was designed in the same way as the plant purchased in 2012 and is also higher, longer and heavier than the basic model. "The identical design of the second system gives us the advantage that we only have to stock one spare parts package. Consumables such as filters and other accessories are also the same, which makes technical maintenance much easier for us," explains Christof Fehrenbach. Due to the high number of parts and the different batches, the cleaning cell was enlarged so that two pick-up baskets can be placed next to each other. The cleaning material is manually stacked in a clean manner next to each other in sev-

eral small batches. The parts in the baskets are marked using a sophisticated identification system so that they can be correctly assigned to the respective machining step after cleaning.

"A big number of different parts is collected at the "Cleaning Machine Node". Our employees have to work very precisely so that the next process step can follow smoothly," the TRUMPF expert knows. The cleaning process must be just as thorough. To ensure that the surfaces of the parts meet the high purity values, the system is equipped with four medium tanks for the maintenance of the cleaning and rinsing water. Cascading the first three tanks reduces the entrainment of media and thus avoids back contamination by detached particles and impurities in the media circuit. For this purpose, all three medium tanks are equipped with several graduated cartridge filters in full flow as well as in bypass. As a result, the media are permanently filtered and the MAFAC PALMA has almost unlimited bath service lives in which the high cleaning quality remains guaranteed in continuous operation. The integrated coalescence oil separator is also part of the permanent water treatment. It separates foreign particles carried in into the fluid and collects them in a separate container. In addition, high-end air filters are installed for hot air and compressed air drying. A water treatment plant and a reverse osmosis plant, which are used for fresh water filling and bypass water treatment, make a further contribution. Accordingly, the conductance of the DI water in tank 2 and 3 is extremely low. Finally, medium tank four ensures further water treatment.

The fully automatic transfer system of the machine is of particular importance for the clean room environment. It contains an elevator, via which the charging baskets are transported into the cleaning cell of the machine. The loading baskets are filled at table height. "There were ergonomic reasons behind this specification by TRUMPF," says Sascha Klos, sales representative at MAFAC. After cleaning is completed, the parts are transported by lift and

closed transfer system to a buffer zone with mini flow boxes for up to six baskets. Here, clean room air flows through the cleaning material so that the cleaned parts are temporarily stored under clean room conditions until further processing.

A program for the highest demands

"As the highest cleanliness requirements apply for every basket batch of workpieces, we run our machine practically all the time with the same program: that which meets the highest level of cleanliness. But it goes without saying that a variety of programs can be stored and selected in the MAFAC PALMA; for example for homogeneous batches of parts with special sensitive coatings or alloys," he adds.

In detail, cleaning and the use of the three cleaning tanks proceeds as follows: The components are cleaned by spray flooding with the medium from tank one, to which a highly concentrated cleaning additive is added. Simultaneously, the ultrasonic unit (an optional accessory for the MAFAC PALMA) is employed. Next, the parts are rinsed with the fluid from bath 2. The rinse water is then discharged to bath 1. To meet the high cleanliness requirements, several more rinsing processes follow. The cleaning chamber can be flooded completely for all wet processes. During the entire program phase, the basket receptacle system performs a gentle rocking movement while the spray system rotates. In the MAFAC PALMA, the patented process technology of spray flooding developed by MAFAC is used to full benefit.

After the cleaning phase, drying takes place. Here, the hot air pulse blowing system is used. The workpieces are blown off by a rotating blowing system with highly pure compressed air in a pulsed manner; optionally, the simultaneous application of ultra-finely filtered hot air can be enabled. For final drying, the TRUMPF system has been equipped with a more powerful vacuum pump than the standard machine. As an additional option, the system was equipped with a nozzle control

system for the spraying and drying arms. This allows for free programming not only of the movement of the basket, but also for that of the spray-and-drying arm.

High cleanliness values for the parts, relief for the employees

With the MAFAC PALMA, process managers at TRUMPF have found a basic model that already offers many options and equipment options in series production. Some of these have been fully exploited and supplemented by further extras. The result is a high-quality solution for ultra-fine cleaning. The new acquisition will also greatly reduce the workload for employees: The older MAFAC cleaning system from TRUMPF has been running in two-shift operation over the last few months due to the high order volume. By purchasing a second, identical system, it is initially possible to return to one-shift operation, with which the employees working there are very satisfied.



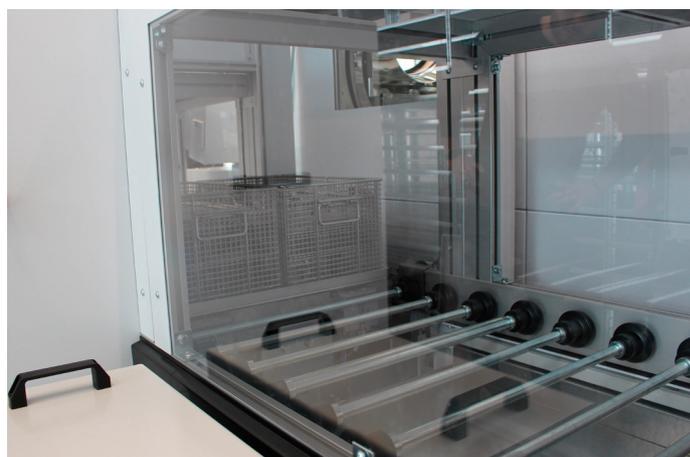
The cleaning cell of the MAFAC PALMA is considerably larger, so that two batch baskets can be placed next to each other, which helps with the high and very different volume of parts. These are carefully filled into several layers.



Loading and cleaning program start are still carried out under normal room conditions. The loading area and control panel are ergonomically positioned at hip height.



The transfer system guides the material to be cleaned into the cleaning chamber of the machine by means of an elevator. A process that is closed off from its immediate surroundings begins.



After cleaning, the components are transferred to the clean room zone via the transfer system. A buffer zone with cleanroom ventilation enables cleanroom compatible intermediate storage of the cleaned parts.



The cleaning material is received under clean room conditions and fed into the further production process.



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