

## High-Throughput Protective Coating of Electronic Assemblies



Electronic assemblies are the final product of the so-called PRODUCTRONICS. Wherever reliable functioning and long lasting operational periods are requested, coatings with a protective varnish play an important role.

The coating principle to be applied depends on the geometry and the protection requirements of each electronic assembly. [ 1 ]

and 50.000 units per year, decision has to be taken whether to coat the assemblies in offline or online systems.

The following details refer exclusively to online equipment:

For "large" and "extra large" throughputs, KNÖDEL offers 2 different dip coating plants. Such plants have already been in operation for many years, and have been used for a number of different coating applications. The experience gained in more than 18 years of manufacturing assembly coating equipment and the many practical recommendations made by plant operators, are reflected in today's equipment layout.

The two machine systems referred to, are of totally different constructional executions. They both have, however, in common to be engineered for operation by one person, for online operation of coater and dryer and for the selected application of differing coating systems. Furthermore, they have in common the execution of the varnish dryer according to EN prescriptions, the modular construction and the availability of a number of optional extras.

The machine systems offer advantages when it comes to investment, because

- shipment can be effected "in one piece", so that at site no reassembly is necessary, neither mechanical nor electrical,
- start-up of the machine is relatively easy as performance tests have been run before shipment.

### Over All Coating

double sided,  
all surface  
- dip coating (conformal)  
- vapor deposition coating (conformal)

### Partial Coating

single sided,  
complete surface  
- spray coating  
- flood/curtain coating  
- wave coating

single sided,  
partial surface  
- partial spray coating  
- partial dip coating  
- wave coating (conformal)



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Coating systems

Not only the coating principle to be applied decides which coating system has to be used, but also the assembly throughput. "Small" are throughputs up to approximately 25.000 assemblies per year. "Large" are those of up to 3 million assemblies yearly and more.

When it comes to throughputs of between 25.000



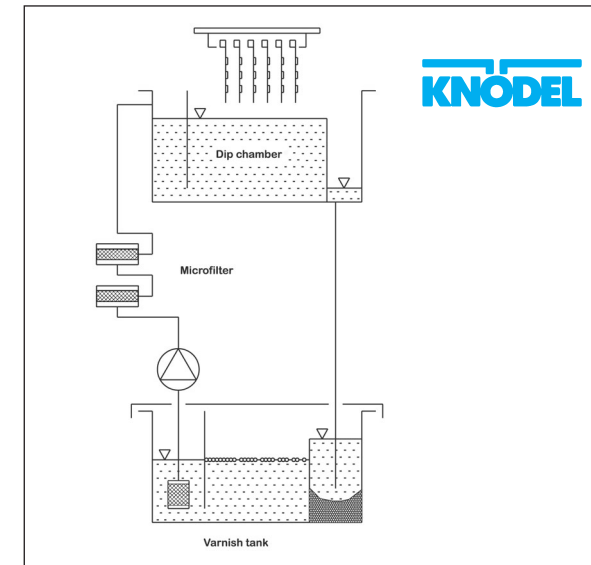
Dip Coating Plant KNÖDEL perfecta®NT



Dip Coating Plant KNÖDEL modula®

Protective coating systems for high throughputs

floating in the varnish are separated by partition walls, filter screen and microfilters. The system of the varnish cleaning in the KNÖDEL modula® models are nearly identically.



Varnish circulation

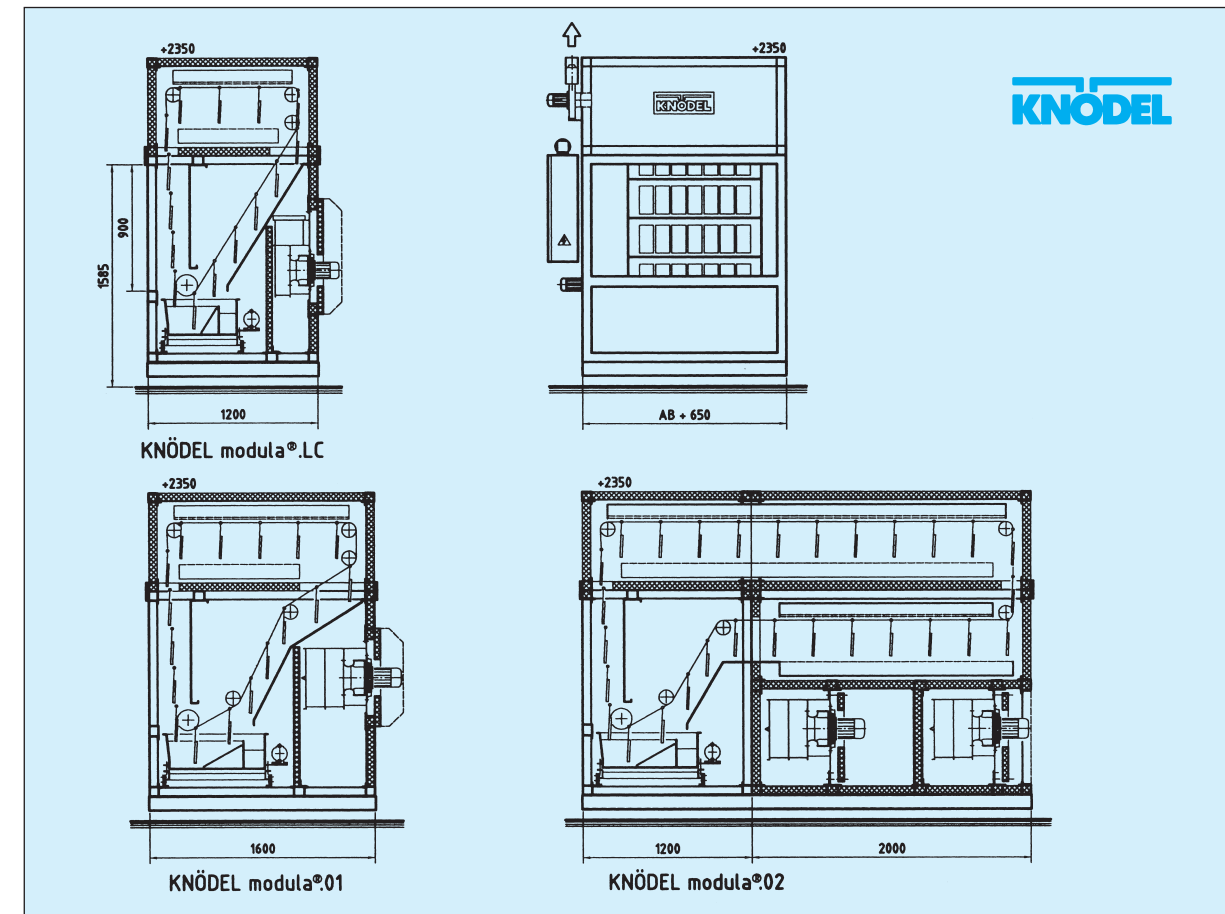
## Final remarks

For "large" and "very large" throughputs, dip coating is the ideal solution when the assemblies may partially or totally be dipped. The process offers lowest possible costs not only due to the coating of both faces of each assembly but also due to the simultaneous coating of between 10 and 30 and more assemblies at a time.

The machines presented offer completely safe and harmless working conditions during both, varnish application and varnish drying. High accuracy with narrow tolerances during dipping processes and repetitions guarantee a trouble-free production in accordance with existing regulations.

## Literature

[1] P.A. Knödel – Schutzlackierung von bestückten Leiterplatten „METALLOBERFLÄCHE“ 1989/4+5



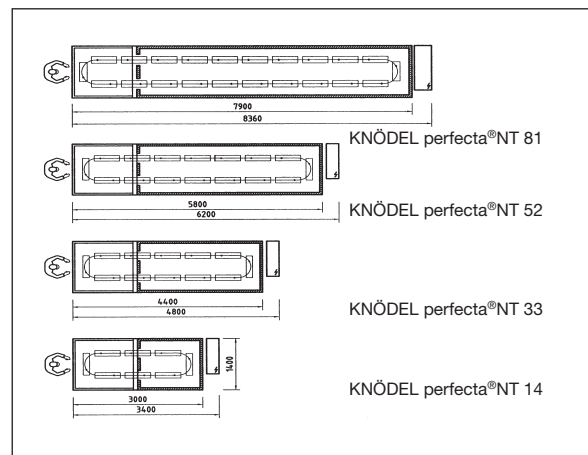
KNÖDEL modula® basic machines

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## KNÖDEL perfecta®NT main features

- Online sequence of the following process steps: Loading – Dipping and Tilting – Pre-drying – Drying and Curing – Cooling – Unloading.
- Conveyor chain with universally applicable conveying unit to receive differing fixtures for a number of different-sized assemblies.
- Exact assembly dipping positions through especially engineered fixtures.
- Easy setting of all process values at the control panel.
- Simultaneous operation of differing assemblies.
- Utilization of the machine for a number of assembly generations through easy exchange of fixtures.
- Extension of basic machines to arrive at increased plant systems by adding standard machine modules. The addition of cleaning modules allows the online-operation of cleaning and varnishing.



KNÖDEL perfecta®NT, basic machines

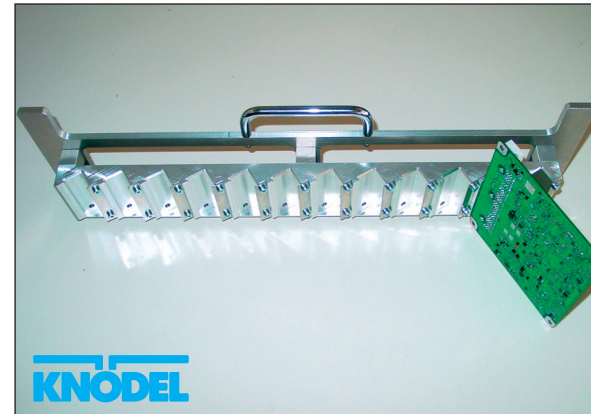
## Throughputs of perfecta NT

Which throughputs can be achieved with these machines is shown by the following example,



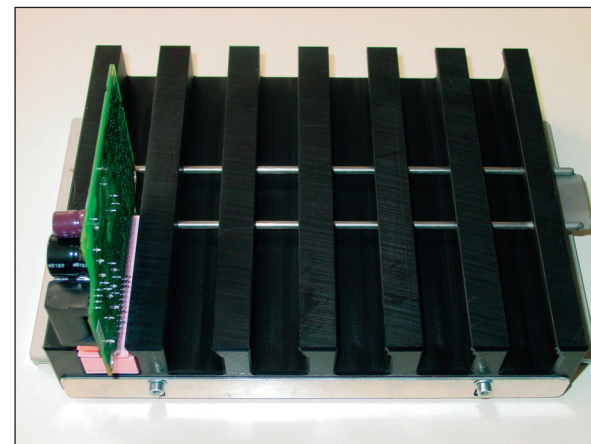
Assembly fixture for KNÖDEL perfecta®

using a KNÖDEL perfecta®NT 52 as reference. The hourly throughput is 52,8 assembly fixtures. When each fixture carries e.g. 12 standard European-sized assemblies, the hourly output is 625 assemblies. In the course of a three-shift operation, 12.500 assemblies can be handled. Based on 250 working days p.a., more than 3 million assemblies can be coated every year.

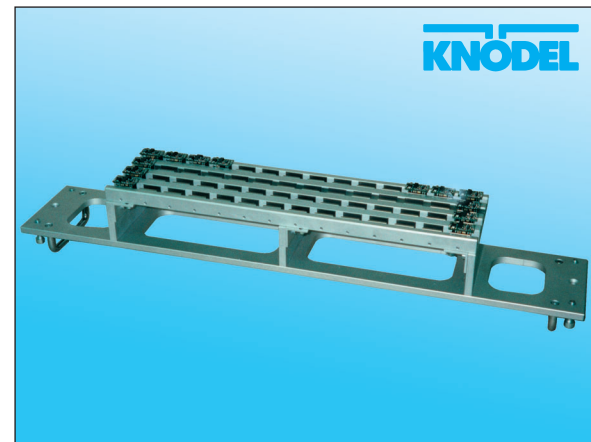


Assembly fixture for KNÖDEL perfecta®

The throughputs which can be achieved with the other basic machines can be calculated accordingly. Loading and unloading by hand are the only limitations in output. To overcome this obstacle, the fixtures unloading and loading can be done outside the machine.



Assembly fixture for KNÖDEL perfecta®



Assembly fixture for KNÖDEL perfecta®

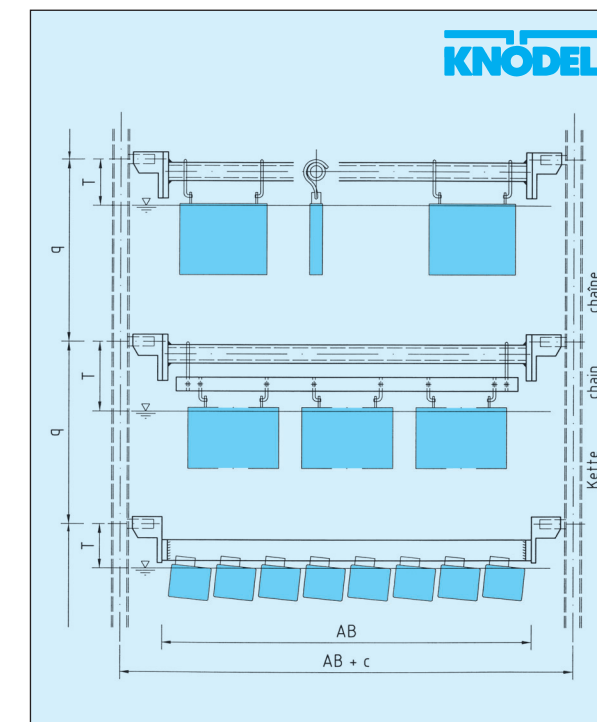
## KNÖDEL modula® main features

The model KNÖDEL modula® demands a lower investment compared to the machine system KNÖDEL perfecta®NT. Its application is limited by the fact, that only those assemblies can be handled with this unit which do not demand special dipping positions or varnish drip-offs (tilting). The required throughputs will be achieved by choosing the correct working width of the machine.

The dip coating machine KNÖDEL modula®LC has been engineered in such a way that its price is almost equal to the one for an offline coating plant comprising a stand-by coater plus varnish dryer.

The special features of the KNÖDEL modula® are:

- Online sequence of the following process steps: Loading – Dipping – Pre-drying – Drying and Curing – Unloading.
- Conveyor with double chain and multiple-use carriers.
- Exact assembly dipping positions through especially engineered fixtures.
- Easy setting of all process values at the control panel.
- Simultaneous coating of differing assemblies using different carriers.
- Use of the machine during several assembly generations through exchange of carriers.
- Numerous plant components as options.
- Machine system upgrades through adding different basic machine modules to meet throughput requirements.



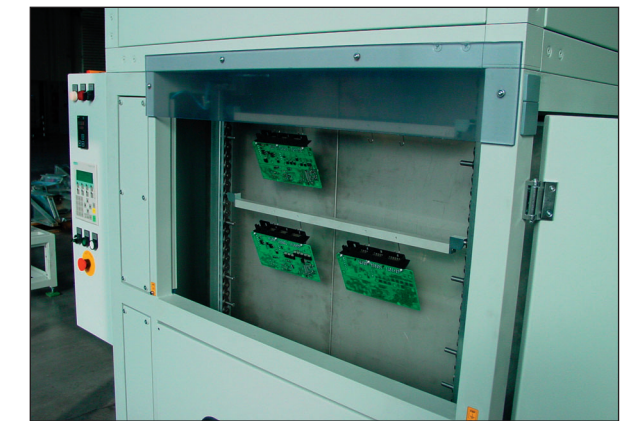
Assembly carrier variants used in KNÖDEL modula®

## Throughputs of the modula

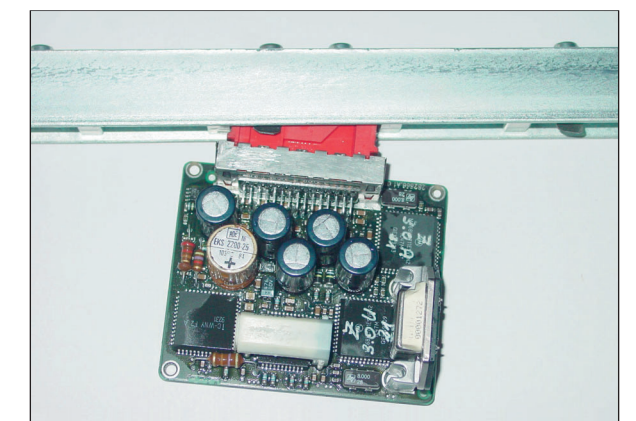
The throughputs which can be achieved with these machines depend on the working width of each model, the size of the assemblies to be coated and, as a result, the cross bar loading rate.

The following example, using a modula.01 shows the possible throughput.

With a working width of 1000 mm, a withdrawal speed of 1 mm per second and the use of standard European-sized assemblies we arrive at a throughput of 35 cross bars per hour. Loading each cross bar with 9 assemblies gives us an hourly capacity of more than 300 assemblies. Based on a 3-shift operation and 250 working days per year, a total annual throughput of more than 1.5 million assemblies can be achieved. Throughputs of other machine sizes can be calculated accordingly.



Assembly carrier used in KNÖDEL modula®



Assembly carrier used in KNÖDEL modula®

## Clean dip coating

The achievement of perfect coated assemblies depends essentially on the avoidance of contamination in the varnish circulation. The picture shows the cleaning system in the KNÖDEL perfecta®'s varnish circulation. Contaminations brought-in by the assemblies, whether heavier than varnish, swimming or