

Translation of the Original Operating and Maintenance Manual

Type: Parylene P6/P8

Serial number: 120159

Year of manufacture: 2020



P
A
R
Y
L
E
N
E
C
O
A
T
I
N
G
S
Y
S
T
E
M

Please read this operating manual attentively before using the system!
This operating and maintenance manual must be stored with the system!

Parylene coating is used for coating surfaces with a thin, transparent parylene film. The coating is used in electronics, aviation and aerospace, sensor technology, medical/pharmaceuticals, industry and automotive engineering.

This parylene coating system can be used for the deposition of parylene N, parylene C, parylene D and parylene F-VT4. Layer thicknesses of 0.05 to 20 micrometres can be reached depending on the parylene type.

In parylene coating, the dimers are vaporised in a vacuum. In the next stage, the dimers are thermally split into monomers on the hot walls of the pyrolysis tube. Now the monomers polymerise primarily on the colder areas in the recipient and on the component surfaces. It is a very gentle process with virtually no temperature increase of the substrate surfaces.



Preliminary remarks

This operating and maintenance manual is an essential part of the product and describes the safe and proper use of the system. It contains important information regarding operating safety, and therefore has to be:

- Read attentively prior to use
- Kept for the entire service life of the system
- Made accessible to the operating and maintenance personnel at all times
- Passed on to all subsequent users
- Updated for all amendments received from the manufacturers

All information and instructions are provided in all conscience based on our past experience and insights.

However, the information contained in this operating and maintenance manual and the supplied documentation is not guaranteed to be complete and free of errors. Photos and other illustrations in particular may contain components that are not included in the scope of delivery of Diener electronic GmbH & Co. KG.

	<p>This operating and maintenance manual was prepared based on the requirements of the EC Machinery Directive.</p> <p>This operating and maintenance manual applies to the scope of work of Diener electronic GmbH and provides you with <u>basic information</u> about the function and proper use of the system as well as possible hazards that may arise during system operation.</p> <p>See the supplied documents of the component manufacturers for further information and requirements.</p> <p>Note the supplied documentation/operating and maintenance manuals of the component manufacturers, for example safety and hazard notices, safety datasheets, plans, schematics etc.!</p> <p>The requirements in the operating and maintenance manuals of the component manufacturers take precedence over the basic information provided here.</p> <p><i>Equipment that is not included in the scope of work of Diener electronic GmbH & Co. KG is disregarded.</i></p> <p><i>This operating and maintenance manual must be stored with the system!</i></p>
	<p><i>Diener electronic GmbH & Co. KG assumes no liability for damages due to other than intended use.</i></p> <p><i>The German version of this operating and maintenance manual is binding.</i></p>

Terms/glossary

The use of technical terminology specific to the technology is not avoidable in this operating and maintenance manual.

Explanations of the most important terms are found on our website at <https://www.plasma.com/en/plasmatechnik/lexikon/>

Table of contents

Preliminary remarks	3
1.0 General information – EC declaration of conformity – intended use	10
1.1 Product identification	10
1.2 Manufacturer information	11
1.3 Copyright	11
1.4 EC declaration of conformity	12
1.5 Intended use/limits of use.....	14
1.6 System hazards	25
1.7 Warranty/liability.....	28
2.0 General safety and accident prevention instructions	29
2.1 Explanation of symbols.....	29
2.2 General information/notices	31
2.2.1 Notices according to the Work Equipment Directive	32
2.2.2 Obligations of the operating company/personnel	32
2.2.3 Qualified personnel	33
2.3 Personal protective equipment.....	33
2.4 Notices from the section “Intended use”	34
2.5 Emergency stop devices/shutting down the system in case of emergency	38
2.6 Work on electrical installations	39
2.7 Working on systems that are pressurised/under pressure/used to conduct media	41
2.8 Notices of specific hazards – hazardous substances	42
3.0 General description.....	44
3.1 Using the system/functions.....	45
3.2 Overview of the system and its components	48
3.3 Installation location and allowable ambient conditions	49
3.4 Workstations.....	49
3.5 Danger areas/safety concept.....	50
3.5.1 Emergency stop devices.....	51
3.5.2 Safety-related system functions.....	53
3.5.3 Master switch	53
3.5.4 Access to the system interior.....	54
3.6 System description	55
3.6.1 Vaporiser.....	55

3.6.2 Silane Vaporizer.....	56
3.6.3 Pyrolysis oven.....	57
3.6.4 Coating chamber.....	58
3.6.5 Connection panel.....	59
3.6.6 Pressure measurement.....	60
3.6.7 Venting system	61
3.6.8 Vacuum generation – pump.....	62
3.6.9 Cooling trap.....	64
3.6.10 Seals	66
3.7 Work pieces and product carriers	67
3.8 Controlling the system/parylene reactor control (PRC).....	69
4.0 Overview of technical data/approved processes and substances	73
4.1 Ambient conditions and installation location	73
4.2 System cabinet dimensions	74
4.3 Coating chamber.....	75
4.4 Electrical network connection	76
4.5 Pump.....	77
4.6 Pressure sensor.....	78
4.7 Temperature measurement	78
4.8 Process development – processes and process substances that are used/permitted ..	79
4.9 Process development – substances used	80
5 Training and instruction of the operating company’s personnel	82
5.1 Requirements for personnel.....	84
5.2 Initiating/coordinating and carrying out measures in case of alarms.....	88
5.3 Passwords/keys	88
6.0 Commissioning, transportation, setup, disassembly	89
6.1 Safety instructions for disassembly, transportation, setup and connection	89
6.2 Commissioning and instruction of the operating company	91
6.3 Transportation, setup/installation of the system, disassembling the system	95
6.3.1 Preparing for transportation/disconnecting the assemblies.....	96
6.3.2 Packaging	97
6.3.3 Lifting/transportation with lift truck	97
6.3.4 Transport position and transportation safety devices	98
6.3.5 Special transportation and storage instructions.....	98
6.3.6 Internal transportation.....	99

6.3.7 Installation location	100
6.3.8 Setup.....	101
6.4 Connecting the system	102
6.5 Decommissioning the system – recommissioning	104
7.0 Setting up.....	106
7.1 Safety instructions for setting up	106
7.2 Overview of processes for setting up.....	106
7.3 Setting up/loading work pieces	107
7.4 Filling the cooling trap	108
7.5 Filling the Silane evaporator.....	108
7.6 Filling the vaporiser	109
7.7 extend/shorten the chamber	110
8.0 Operation – controller/PRC	111
8.1 Safety instructions for operating the system	111
8.2 Controlling the system/parylene reactor control (PRC).....	113
8.3 Operation.....	114
9.0 Troubleshooting/inspection/cleaning and maintenance/repair	115
9.1 Safety instructions for troubleshooting/inspection/cleaning/maintenance/ repair ...	115
9.2 Faults and troubleshooting/error messages	118
9.3 Cleaning	122
9.4 Recurring/repeated inspections.....	127
9.5 Inspection and maintenance plan – overview.....	129
9.6 Repair.....	136
9.7 Inspection after the completion of troubleshooting, inspection, cleaning, maintenance and repair work	138
10.0 Process/auxiliary materials and supplies – overview and disposal	139
10.1 Safety instructions for process/auxiliary materials and supplies.....	139
10.2 Handling of process/auxiliary materials and supplies.....	141
10.3 Disposal of system components/disassembly.....	143
11.0 Fire protection – conduct in case of fire	144
11.1 General information on fire prevention and conduct in case of fire	144
11.2 Hazards due to fire water	148
11.3 Conduct in case of fire on the system	148

12.0 Replacement parts	149
13. Wear parts.....	151
14.0 After-sales service	153
15.0 Returns.....	154
16.0 Sample program for parylene C.....	155

List of figures

Figure 1: Type plate example.....	10
Figure 2: Emergency stop	38
Figure 3: Danger area	50
Figure 4: Emergency stop button	52
Figure 5: Master switch	53
Figure 6: Vaporiser door (left) and open vaporiser with dimer container	55
Figure 7: Filling Silane evaporator	56
Figure 8: Pyrolysis oven (example)	57
Figure 9: Coating chamber.....	58
Figure 10: Connection panel.....	59
Figure 11: Pump connection.....	62
Figure 12: Cooling trap	64
Figure 13: Carousel	68
Figure 14: Indicator lamp.....	72
Figure 15: Vacuum pump connections (pump may vary).....	102
Figure 16: Network connections.....	103
figure 17: long baffle plates.....	110
figure 18: cover for long baffle plates	110

1.0 General information – EC declaration of conformity – intended use

1.1 Product identification

Please specify the serial number and year of manufacture of your system for enquiries. The serial number and year of manufacture are found on the type plate on the system and on the cover sheet of this operating and maintenance manual.

If you have more than one of our systems in operation, check whether the operating and maintenance manual matches the serial number of the system prior to use. The equipment and operation may differ even between systems of the same type with a similar appearance.



Figure 1: Type plate example

1.2 Manufacturer information

Diener electronic GmbH & Co. KG

Nagolder Str. 61

D - 72224 Ebhausen

Telephone +49 (0) 7458 / 999 31 - 0

Fax +49 (0) 7458 / 999 31 - 50

E-mail: info@plasma.de

Internet: www.plasma.com

1.3 Copyright

This documentation is copyrighted by Diener electronic GmbH & Co. KG, and in part by the suppliers of the third-party documentation.

The information it contains is intended exclusively for the operating company of the systems delivered by us and may not be modified, expanded, duplicated, stored/disseminated in IT systems or otherwise used contrary to other legitimate interests without our prior written consent.

Copyright © Diener electronic GmbH & Co. KG, December 16

1.4 EC declaration of conformity

We hereby declare that the system designated below

System type	Parylene coating system
Type	Tabletop unit P6/P8
Serial no.	120159
Year of manufacture	2020
Customer	University of Arizona

based on its design and in the version brought to market by us

- conforms to the applicable provisions of the EC Machinery Directive including the amendments applicable on the date of the declaration
- meets the fundamental safety and health requirements of the EC Machinery Directive for the interfaces described in the operating and maintenance manual
- conforms to the applicable provisions of the following additional EC directives including the amendments applicable on the date of the declaration:

Applied EC directives:

2006/42/EC	EC – Machinery Directive – Fundamental safety requirements, annex I
2014/35/EU	EC – Low-Voltage Directive
2014/30/EU	EMC Directive
2002/95/EC	RoHS Directive

Applied harmonised standards, in particular*:

DIN EN ISO 12100:2011	Safety of machinery – General principles for design – Risk assessment and risk reduction
DIN EN 60204-1:2006/A1:2009	Safety of machinery – Electrical equipment of machines – General requirements
EN 61000-6-2:2005	Electromagnetic compatibility (EMC) generic standards – Interference resistance for industrial areas (EMC interference resistance)
EN 61000-6-4:2007 + A1:2011	Electromagnetic compatibility (EMC) generic standards – Emitted interference for industrial areas (IEC 61000-6-4:2006 + A1:2010); German version EN 61000-6-4 (EMC interference resistance)
EN 61000-4-3:2006 + A1:2008 + A2:2010	Electromagnetic compatibility (EMC) – Part 4-3: Inspection and measuring methods – Testing interference resistance against high-frequency electromagnetic fields

* Standards were applied with the issue date applicable on the date of this declaration; the directives and standards named in the EC declarations of the suppliers are not listed; see the EC declarations of the suppliers.

If any changes are made to the system without our consent, this declaration becomes null and void.

Date: 06.04.2020	Diener electronic GmbH & Co. KG Nagolder Str. 61 D - 72224 Ebhausen
------------------	---

Signature

Handwritten signature of Christof Diener in black ink, consisting of the letters 'C. Diener' followed by a long, sweeping horizontal line.

Christof Diener
Managing Director

Telephone +49 (0) 7458 / 999 31 - 0

Fax +49 (0) 7458 / 999 31 - 50

E-mail: info@plasma.de

Internet: www.plasma.com

1.5 Intended use/limits of use

In general, Diener electronic GmbH & Co. KG provides a system for producing a parylene coating.



Possible fields of application are:




- Coating tool surfaces

Based on the order-specific



- coating characteristics and
- work piece characteristics,

each coating system is individually equipped for the requirements of the specified processes in the course of "process development".

	<p>The description of the</p> <ul style="list-style-type: none">• possible processing methods, and• approved dimers <p>for the system based on process development conducted by Diener electronic GmbH is found in the section "Overview of technical data/Approved processes, gases and substances".</p>
	<p>ATTENTION! <i>Only processes that have been approved for the system by Diener electronic GmbH & Co. KG may be run.</i></p> <p>DANGER! <i>Carrying out processes and using substances other than those the system is designed and equipped for can lead to severe system damage, hazards and serious injuries!</i></p>

	<p><i>The system can only be used as intended when process development has been carried out by or in cooperation with Diener electronic GmbH & Co. KG and the process with its settings has been approved in writing by Diener electronic GmbH & Co. KG.</i></p> <p><i>If processes are modified or new processes configured and carried out by the operating company, this is done under the sole responsibility of the operating company. This also voids all liability and/or warranties of Diener electronic GmbH & Co. KG with immediate effect.</i></p> <p><i>This applies correspondingly when protected safety functions and parameters are enabled by Diener electronic GmbH & Co. KG on request of the operating company or safety-related passwords are shared with or made accessible to persons who have not been authorised and instructed by Diener electronic GmbH & Co. KG.</i></p>
	<p><i>Diener electronic GmbH & Co. KG assumes no liability for direct and indirect damages due to other than intended use of the system.</i></p>
	<p><i>Please note the supplied documents, plans and schematics, controller documentation, electric circuit diagrams and the documentation of the component manufacturers that are applicable for the intended use of the system.</i></p>

General requirements for proper operation

	<p>The system may only be operated if safe operation is assured. This includes among other things:</p> <ul style="list-style-type: none">- Setup, connection, commissioning, shut-down and dismantling of the system only by qualified personnel of the operating company that has been instructed by Diener electronic GmbH & Co. KG- The integrity and function of all safety devices (such as safety switches, complete and correct attachment of all covers, system cabinet door closed and locked etc.)- The reliable functioning of EMERGENCY STOP devices, annunciators and alarm devices- The undamaged, sound condition and reliable functioning of all components and fittings installed in the system- Adequate tightness of the vacuum system The seals on the chamber door and feedthroughs in the chamber must be undamaged and tight.- Operation of and work on the system only by instructed and adequately qualified personnel- Sufficient expertise and training of persons entrusted with the handling of the substances/gases that are used- Sufficient expertise and instruction by Diener electronic GmbH & Co. KG for persons who change process and system parameters, so that the processes can be carried out safely and adequately in accordance with the system (also see the section "Training/Instruction")- Observing the information in the safety datasheets for the media and materials used- Using the required personal protective equipment- Ensuring that the gases/substances that are used, the work pieces and the chosen process and system parameters are suitable for the processes being carried out and cannot lead to any hazards and/or damage (see the section "Process development")- Ensuring that the correct program is selected and the correct settings for all process parameters are verified- Ensuring that the dimer is in the intended containers in the system- Ensuring that the system is properly set up in regards to the work piece carriers and work pieces; suitable work piece carriers that hold the work pieces securely in their intended position must be used
	<ul style="list-style-type: none">- Observing the hazard and safety notices in this operating and maintenance manual, the safety notices posted on site on the system and/or its components, and the information in the documentation of the component manufacturers <p>Mobile systems and components have to be set up so that:</p> <ul style="list-style-type: none">- They cannot be damaged, for example by choosing a suitable site, installing guards etc.- They are held securely in their intended location; attachment of the pump- Hazards are avoided, for example due to tripping, lines tearing off etc. Strain relief is required for all lines (electrical, exhaust gases).

Additional prerequisites for proper use and operation include:

- Compliance with the applicable legal regulations and directives of authorised institutions
- Compliance with the information in the section "Technical data". The system must be operated under normal conditions (permissible temperature and relative humidity)
- Performance of inspections and maintenance tasks, properly and in a timely manner
- Only using wear and replacement parts, materials and supplies such as oil, lubricants and cleaning agents that have been approved by Diener electronic GmbH & Co. KG for the components of the system
- The proper technical condition of the system and in particular all safety devices, unchanged from the time of delivery.

Process development

Process development carried out by Diener electronic GmbH & Co. KG and the related equipment of the system and/or the approval of the substances that are used are part of the intended use of the system.

A parylene system is only

- functional, serviceable,
- safe and
- environmentally friendly

when numerous possible influencing variables and parameters have been coordinated.

The system must be configured and equipped for the intended processes and the gases/substances that are used so that the system can be used as intended, safely and in an environmentally friendly manner.

This includes criteria that have to be observed, such as determining and selecting

- the dimers,
- the required type of vacuum generation (pumps and other equipment),
- the required materials for the system and its equipment (vaporiser, pyrolysis oven, coating chamber, seals, pumps, valves etc.),
- the required safety and protective equipment for the system and work environment,
- the required measuring and control devices,
- the process and system parameters and settings,
- the required exhaust air purification (pump protection, cooling trap, noise control, exhaust duct), and
- taking into account the ambient conditions at the installation location and the production environment,
- etc.



Further information on the setup and function of the system is found among other things in the section "General description" in this operating and maintenance manual.

Information on the gases and substances that are used/permitted based on process development carried out by/with Diener electronic GmbH & Co. KG is found in the section "Technical data".

Changing setting parameters, programs etc. in the system's controller

Observe our instructions in the sections "General requirements for proper operation", "Process development" and "Training and instruction of the operating company's personnel".

No changes may be made to the programs created/delivered by Diener electronic GmbH & Co. KG and the limit values set by Diener electronic GmbH & Co. KG.

When programs and/or updates are freely available, these may only be installed with the written consent of Diener electronic GmbH & Co. KG.

Setting parameters and programs that may be changed by the operating company must only be changed by authorised and instructed, qualified personnel within the permissible set values/operating range.

A change outside the set values (min./max.) set by Diener GmbH & Co. KG is not permitted. Doing so without the written approval of Diener electronic GmbH & Co. KG, voids all guarantees and liability of Diener electronic GmbH & Co. KG.



DANGER!

Errors when changing/setting parameters for the processes and system and/or errors in adjusting the gas mixtures can lead to serious damage and hazards!

Manually adjustable setting parameters on the system, for example on the pump stand etc., may only be changed by authorised, qualified personnel within the allowable operating range.

In doing so, it is essential to ensure that the changes cannot cause any damage or hazards. Where applicable, the set values are specified directly on the components or specified in this operating and maintenance manual or the documentation of the component manufacturer. Settings with special protection such as safety devices/seals etc. may only be changed with the written consent of Diener electronic GmbH & Co. KG.



NEVER

change settings that are protected by seals or safety devices!

There is a risk of malfunctions, damage and possibly serious injuries!

System changes and modifications

Using the system other than intended as described in section 1.8.ff and changes to the system without the written approval of Diener electronic GmbH & Co. KG are not permitted.

Interventions in the circuitry to change the hardware or software, as well as electrical and mechanical changes or extensions of the system design, may only be carried out by service technicians of Diener electronic GmbH & Co. KG.

Structural changes and add-ons to the scope of delivery of Diener electronic GmbH & Co. KG. are not permitted.

When procuring replacement components, only the makes and types specified by Diener electronic GmbH & Co. KG may be used.

Decommissioning the system

Also see the section "Decommissioning the system – recommissioning".

Within the guarantee/warranty term, decommissioning may only be carried out by the Service department of Diener electronic GmbH & Co. KG.

Outside the guarantee/warranty term, decommissioning may only be carried out by qualified personnel instructed by Diener electronic GmbH & Co. KG with written documentation of said instruction. Instruction must not be more than 2 years ago. Decommissioning by the operating company excludes any liability of Diener electronic GmbH & Co. KG.

Recommissioning the system after decommissioning within the guarantee/warranty term and after a shut-down of more than 6 months may only be carried out by the Service department of Diener electronic GmbH & Co. KG.

Recommissioning after a shut-down of less than 6 months outside the guarantee/warranty term may only be carried out by qualified personnel trained by Diener electronic GmbH & Co. KG with written documentation of said instruction. Instruction must not be more than 2 years ago. Establishing and verifying that the system can be operated safely and properly is required.

Recommissioning by the operating company excludes any liability of Diener electronic GmbH & Co. KG.

Disassembling the system or parts thereof voids the declaration of conformity, any guarantees, warranties and liability of Diener electronic GmbH & Co. KG effective with the start of disassembly.

Interfaces/responsibilities of the operating company

The responsibilities of the operating company include:

- Selecting the installation location;
our information in the sections "Technical data" and "Commissioning/transportation, setup, decommissioning/disassembly" also applies.
- The safe setup of the system and its components (pump, filter etc.).
- The safe installation of lines, e.g. for the electrical connection;
supply lines to the system connection point have to be installed so that they are protected, with strain relief, cannot tear off, and so that tripping hazards are avoided.
- The safe and ergonomic design of the workstations;
adequate freedom of movement for the work to be carried out, no tripping hazards etc.
- Adequate lighting and ventilation at the workstations.
- The conceptual design and implementation of the required safety measures for hazards that may arise from the interfaces to the operating procedures and production, such as the installation of guards in case of installation on traffic routes etc.



*The system may not be damaged or exposed to prohibited stresses.
If the system/components are installed on traffic routes etc., these require additional protection.
Damage to system components may lead to hazards for people and/or the environment!
The operating company has to provide a clean and obstacle-free production environment to ensure proper functionality and safe operation.*

- Providing personal protective equipment and safety datasheets
Personal protective equipment and safety datasheets for the substances that are used must be provided to the operator on site by the operating company and always have to be on hand.



*Note the safety datasheets when handling the dimers that are used!
Always use the personal protective equipment required for the work tasks!*

Instruction and training of the employees

The operating company is responsible for ensuring and verifying that all persons working on the system are adequately trained/qualified and instructed for their respective activities. Sufficient experience is essential for operating the controller/PRC. If this requirement is not met, the operating company has to arrange repeat instruction by the Service department of Diener electronic GmbH & Co. KG.



Only instructed and adequately qualified personnel is permitted to operate and work on the system.

Persons who change the processes and the process and system parameters must be instructed by Diener electronic GmbH & Co. KG and require sufficient expertise so that the processes can be carried out safely and adequately in accordance with the system.

Language skills

The operator must know the language (German, English, agreed language according to the specifications etc.) used for the system interface and programs, and if applicable the language of the operating manual.



Note the information in the section "Training and instruction of the operating company's personnel".

Handling dimers

Various dimers are used on the system depending on the process.



DANGER!

Lack of knowledge about the substances that are used can result in hazards and serious injuries in case of improper handling!

The personnel entrusted with handling the substances that are used must have sufficient expertise and training.

The personnel must be familiar with the contents of the safety datasheets and observe the safety and hazard notices they contain!

Misconduct/misuse

Misconduct/misuse results from the following among other things:

- *Employing personnel on the system without the required expertise/training and/or a lack of (adequate) instruction*
- *Failing to observe the hazard and safety notices in this operating and maintenance manual, on the individual components, and in the operating and maintenance manuals of the component manufacturers*
- *Processes that the system was not designed and built for (see the section "Intended use/Process development" in the operating and maintenance manual)*
- *Misuse of the system or its components*
- *Negligent/intentional activation/triggering of system functions, for example while working inside the system cabinet etc.*
- *Deactivating safety devices*
- *etc.*



The system supervisor/operator is responsible for ensuring the safe operation of the system and its components at all times!

Misuse and misconduct on the system must be prevented!

Reporting safety-related faults and events



Safety-related faults and events must be reported to Diener electronic GmbH & Co. KG promptly!

Proper use of the system from Diener electronic GmbH & Co. KG includes the timely reporting of safety-related faults and events that occur during operation, handling, inspection, maintenance, overhauling, repair and disassembly of the system.

If the system or one of its components has been exposed to unusual stresses, for example damaging system components etc., the system must be shut down immediately and the extent of damage has to be assessed by an expert who has to determine whether the safe and proper continued operation of the system is possible.

If the extent of damage and/or consequences cannot be determined without any doubt that proper and safe operation is possible, contact the Service department of Diener electronic GmbH & Co. KG promptly.






If the system continues to be operated after being damaged and/or exposed to severe stresses without the written approval of Diener electronic GmbH & Co. KG, this automatically and immediately voids any guarantees, warranties and liability of Diener electronic GmbH & Co. KG.





1.6 System hazards


The system has been designed and built according to the state of the art, the recognised safety-related rules and the applicable mechanical engineering regulations. Nevertheless, it is not possible to exclude all hazards to life and limb for the users and third parties as well as damage to the system and other assets.

However, the greatest possible safety is assured when:

- The system is only used as intended.
- The system is only operated with complete and functioning protective and safety devices, alarm systems and annunciators.
- Access to danger areas by unauthorised personnel is prevented.
- The person responsible for system supervision is always notified before persons enter the system's danger area, when they have left this area again, and when work is to be carried out on the system or within the safety enclosure.
- All work is carried out by qualified personnel with adequate training for these activities.
- The generally applicable and specific safety and accident prevention and operating instructions of Diener electronic GmbH & Co. KG are followed.
- No unauthorised changes are made to the system.
- Inspection and maintenance tasks, and recurring/repeated inspections where applicable, are carried out diligently and on time.
- The system is operated carefully and responsibly, so that signs of wear and ageing can be identified and rectified early on.

    	<p>Hazards for personnel may arise on the system, for example:</p> <ul style="list-style-type: none">• When using dimers and liquid nitrogen in case of leaking containers, screw connections, systems, exhaust air filters and ducts etc.• In case of leaks in the vacuum system, for example on the chamber door etc.• On accessible hot system components, for example on the interior walls and door to the vaporiser, when they have not cooled adequately.• During work inside the system cabinet and on the pump and filter when the system has not been shut down and has not cooled adequately.• Due to moving system components inside the coating chamber.• On functional sharp edges on the guides and work piece carriers.
---	---

	<ul style="list-style-type: none">• While closing the door of the vaporiser and coating chamber.
	<ul style="list-style-type: none">• Due to pressurised system components (containers etc.) when they are not de-pressurised prior to maintenance and repairs.
	<ul style="list-style-type: none">• Due to falling because of the unsafe installation of supply lines to the system.
	<ul style="list-style-type: none">• Due to contact with electrical systems that have not been de-energised or that are unprotected/damaged. <p>ATTENTION! <i>The system contains live components!</i></p>

	<p>Please note the information in the section “General safety and accident prevention instructions” and in the various sections of this operating and maintenance manual, as well as the documentation of the component manufacturers.</p>
--	--

Environmental damage

- Electrical energy as the main supply for system operation; for the energy type and quantity, see the type plates on the control cabinet and the documentation of the component manufacturers.
- Pneumatic energy from the operating company's compressed air network. Air consumption is process-dependent.
The noise level on the system during normal operation is listed in the section "Technical data".
- Before the gaseous monomers are released into the exhaust air,

additional precautions have to be taken depending on the gases/substances that are used, for example in case of subsequent processes during the system operating time.

1.7 Warranty/liability

The confirmed agreements in the contract between Diener electronic GmbH & Co. KG and the contractual partner/operating company take precedence.

Contractual partner	Manufacturer	Diener electronic GmbH & Co. KG
	Customer	University of Arizona
Serial number		120159

Unless otherwise agreed, the warranty term is 12 months from the invoice date. Wear parts and components exposed to corrosive media are excluded from the warranty unless expressly specified in the order.

Furthermore, warranty and liability claims are excluded when caused by one or more of the following conditions:


- Force majeure and external influences
- Improper use and handling of the system (see the section "Intended use" in the operating and maintenance manual)
- Processes that the system was not designed and built for (see the section "Intended use/Process development" in the operating and maintenance manual)
- Failure to observe the general and specific safety, accident prevention, hazard and operating notices
- Unsupervised presence of personnel in the danger area or unsupervised operation of the system
- Improper or unauthorised handling during: operation, inspection, maintenance, overhauling, repair and disassembly
- Failure to complete prescribed inspections
- Failure to adhere to the prescribed (statutory) maintenance, care and inspection intervals
- Failure to monitor signs of wear and ageing
- Making changes and altering the use of the system or its programs/controllers without the written approval of Diener electronic GmbH & Co. KG
- Failure to report safety-related faults and events that occur during operation, handling, inspection, maintenance, overhauling, repair and disassembly of the system in a hasty manner or at all

Any further liability is excluded unless prescribed by law. In no case is Diener electronic GmbH & Co. KG liable for loss of use, lost profits, loss of orders, loss of goodwill and opportunities, lost production, loss of efficiency, cost of idleness and other indirect damages or consequential damages. This also extends to employees, representatives and subcontractors of Diener electronic GmbH & Co. KG.

The disclaimers and limitations of liability of Diener electronic GmbH & Co. KG do not apply in case of intent or malicious fraud.







Possible compensation claims expire two years after the damage event occurs.






2.0 General safety and accident prevention instructions

	<p>This section contains “general safety and accident prevention instructions” and a selection of safety and accident prevention instructions and excerpts from individual sections of this operating and maintenance manual, for example from the sections “Intended use”, “General description” etc.</p> <p>The safety and accident prevention instructions in the individual sections have to be observed!</p>
---	---

2.1 Explanation of symbols

Graphical symbols are used in the operating manual in order to alert the system user to specific safety and operating situations. The meanings of the symbols are as follows:

	<p>General notices, useful tips and procedural information.</p> <p><i>These notices contain information for better handling of the system and/or refer to other applicable documents or to notices in other sections of this operating manual.</i></p>
	<p><i>Impending hazards to life, limb and assets.</i></p> <p><i>Failure to observe these notices can have effects that are hazardous to health and may lead to potentially fatal injuries as well as damage to equipment and assets.</i></p> <p><i>The notices may be supplemented by signal words such as DANGER TO LIFE, DANGER, CAUTION, WARNING etc. depending on the risk level.</i></p>
	<p><i>Impending danger due to electrical energy.</i></p> <p><i>Failure to observe these notices can have effects that are hazardous to health and may lead to potentially fatal injuries due to electrical energy as well as damage to equipment and assets.</i></p>
	<p><i>Warning of hazardous substances</i></p>
	<p><i>Warning of hot surface</i></p>
	<p><i>Warning of crushing wheels/rotating components</i></p>

	<p><i>Warning of crushing the hands</i></p>
	<p><i>Risk of slipping</i></p>
	<p><i>Risk of tripping</i></p>
	<p><i>Access by unauthorised persons prohibited</i></p>
	<p><i>Danger for persons with pacemakers and/or active implants</i></p>

2.2 General information/notices

The layout of the system is state of the art; it is designed and manufactured under consideration of the generally applicable rules and regulations for plant engineering. However, the greatest possible operational safety is only achieved if the system is properly operated exclusively by trained, responsible personnel and only used as intended.

The safe and error-free performance of activities and interventions is only assured with specialised expertise for these activities, and if the information and specifications in our system documentation and the documentation of the component manufacturers are observed.

The safety precautions in the documentation of Diener electronic GmbH & Co. KG make no claim of completeness and refer exclusively to the handling of our products and/or scope of work.

Complying with the additional regulations and laws in the respective country that are valid **for special procedures** is mandatory in addition without a request from us, and takes precedence over our instructions.

Diener electronic GmbH & Co. KG assumes no liability for incurred direct and indirect damages due to improper use or the failure to observe our hazard and safety notices (see the section "Warranty/liability" in the operating and maintenance manual).



Before commencing work, note our hazard and safety notices in the sections

- *"Intended use"*
- *"General description"*
- *"Technical data"*
- *"Training and instruction of the operating company's personnel"*
- *"Commissioning, transportation, setup, decommissioning, disassembly"*
- *"Setting up"*
- *"Operation"*
- *"Maintenance"*
- *"Process materials, auxiliary materials and supplies, disposal"*
- *"Fire protection"*

and the supplied

- *operating and maintenance manuals of the component manufacturers*

2.2.1 Notices according to the Work Equipment Directive

The operating company for a machine/system in the territory of the European Union is obligated to implement the requirements of the EU Work Equipment Directive.

It is implemented according to national laws, regulations etc.

In Germany the Work Equipment Directive is implemented through the application of the Industrial Safety Directive (BetrSichV) and the Occupational Safety and Health Act (ArbSchG).

The operating company is obligated to integrate the machine/system into its production environment in accordance with national laws and regulations so that no avoidable hazards and/or malfunctions will occur.

Diener electronic GmbH & Co. KG in accordance with applicable laws assumes that the operating company meets its obligations.



Note the information in the section "Inspection and maintenance instructions" regarding the intervals for repeated inspections!

2.2.2 Obligations of the operating company/personnel

The operating company is obligated to only allow personnel to work on the machine that is familiar with the fundamental occupational safety and health/accident prevention regulations and has been trained to operate the system. Furthermore, the section on safety and the warnings in the operating and maintenance manual and in the supplied documentation for assemblies and system elements must be read and understood. The instruction must be documented in writing.

Only use trained or instructed personnel. Establish the responsibilities of personnel for disassembly/transportation/setup/connection, operation, setting up, inspection, maintenance, overhauling, cleaning, decommissioning and disassembly of the system.

The system manufacturer assumes that only personnel that has mastered the working methods and processes supported by the system so that this work is carried out without hazards will work on the system. Personnel that has not been instructed must be kept away from the system. The employer is obligated to comply with the Occupational Safety and Health Act (ArbSchG) in setting up the workstations.

All personnel entrusted with work on the system obligates itself to comply with the fundamental occupational safety and accident prevention regulations, and to read the section on safety and the warnings in this operating manual and the supplied documentation for assemblies and system elements before commencing work.

2.2.3 Qualified personnel

Qualified personnel has knowledge of the applicable standards, provisions and accident prevention regulations based on technical training, experience and instruction.

The qualified personnel must be able to assess the assigned tasks and identify possible hazards. Qualified personnel must be authorised to carry out the corresponding work.



Note the information in the section "Training and instruction"!

2.3 Personal protective equipment






Always use the personal protective equipment required for the work tasks!

Note the safety datasheets when handling the process gases and substances that are used!




2.4 Notices from the section “Intended use”



Process development

	<p>Note the information in the section “Intended use/Process development”.</p> <p>The substances approved for the system are found in the section “Technical data/Process development”.</p>
	<p><i>The system can only be used as intended when process development has been carried out by or in cooperation with Diener electronic GmbH & Co. KG and the process with its settings has been approved in writing by Diener electronic GmbH & Co. KG.</i></p> <p><i>If processes are modified or new processes configured and carried out by the operating company, this is done under the sole responsibility of the operating company.</i></p> <p><i>This also voids all liability and/or warranties of Diener electronic GmbH & Co. KG with immediate effect.</i></p> <p><i>This applies correspondingly when protected safety functions and parameters are enabled by Diener electronic GmbH & Co. KG on request of the operating company or safety-related passwords are shared with or made accessible to persons who have not been authorised and instructed by Diener electronic GmbH & Co. KG.</i></p>
	<p>ATTENTION!</p> <p><i>Only processes that have been approved for the system by Diener electronic GmbH & Co. KG may be run.</i></p> <p>DANGER!</p> <p><i>Carrying out processes and using substances other than those the system is designed and equipped for can lead to severe system damage, hazards and serious injuries!</i></p>



General requirements for proper operation

	<p>The system may only be operated if safe operation is assured. This includes among other things:</p> <ul style="list-style-type: none">- The integrity and function of all safety devices (such as safety switches, complete and correct attachment of all covers, etc.)- The reliable functioning of EMERGENCY STOP devices, annunciators and alarm devices- The undamaged, sound condition and reliable functioning of all components and fittings installed in the system- Adequate tightness of the vacuum system The seals on the chamber door and feedthroughs in the chamber must be undamaged and tight.- Operation of and work on the system only by instructed and adequately qualified personnel- Sufficient expertise and training of persons entrusted with the handling of the substances that are used- Sufficient expertise and instruction by Diener electronic GmbH & Co. KG for persons who change process and system parameters, so that the processes can be carried out safely and adequately in accordance with the system (also see the section "Training/Instruction")- Observing the information in the safety datasheets for the media and materials used- Using the required personal protective equipment- Ensuring that the substances that are used, the work pieces and the chosen process and system parameters are suitable for the processes being carried out and cannot lead to any hazards and/or damage (see the section "Process development")- Ensuring that the correct program is selected and the correct settings for all process parameters are verified- Ensuring that the system is properly set up in regards to the work piece carriers and work pieces; suitable work piece carriers that hold the work pieces securely in their intended position must be used- Observing the hazard and safety notices in this operating and maintenance manual, the safety notices posted on site on the system and/or its components, and the information in the documentation of the component manufacturers <p>Mobile systems and components have to be set up so that:</p> <ul style="list-style-type: none">- They cannot be damaged, for example by choosing a suitable site, installing guards etc.- They are held securely in their intended location; attachment of the pump components for example- Hazards are avoided, for example due to tripping, lines tearing off etc. Strain relief is required for all lines.
---	--


Changing setting parameters, programs etc. in the system's controller

	<p>DANGER! <i>Errors when changing/setting parameters for the processes and system and/or errors in adjusting the gas mixtures can lead to serious damage and hazards!</i></p>
	<p>NEVER <i>change settings that are protected by seals or safety devices! There is a risk of malfunctions, damage and possibly serious injuries!</i></p>


Interfaces/responsibilities of the operating company

	<p><i>The system may not be damaged or exposed to prohibited stresses. If the system/components are installed on traffic routes etc., these require additional protection. Damage to system components may lead to hazards for people and/or the environment! The operating company has to provide a clean and obstacle-free production environment to ensure proper functionality and safe operation.</i></p>
	<p><i>Note the safety datasheets when handling the process substances that are used! Always use the personal protective equipment required for the work tasks!</i></p>











Instruction and training of the employees

	<p><i>Only instructed and adequately qualified personnel is permitted to operate and work on the system. Persons who change the processes and the process and system parameters must be instructed by Diener electronic GmbH & Co. KG and require sufficient expertise so that the processes can be carried out safely and adequately in accordance with the system.</i></p>
---	--

Misconduct/misuse

	<p><i>The system supervisor/operator is responsible for ensuring the safe operation of the system and its components at all times! Misuse and misconduct on the system must be prevented!</i></p>
---	---

Notices from the section “Intended use/System hazards”

        	<p>Hazards for personnel may arise on the system, for example:</p> <ul style="list-style-type: none"> • When using hazardous substances in case of leaking containers, screw connections, pipework, exhaust air filters and ducts etc. • When handling liquid nitrogen. • In case of leaks in the vacuum system, for example on the chamber door etc. • On accessible hot system components, for example on the interior walls and door to the vaporiser, when they have not cooled adequately. • During work inside the system cabinet and on the pump and filter when the system has not been shut down and has not cooled adequately. • Due to moving system components, for example inside the coating chamber, when using a revolving drum. • On functional sharp edges on the guides and work piece carriers. • When closing the doors. • Due to pressurised system components (equipment etc.) when they are not de-pressurised prior to maintenance and repairs. • When the door to the system interior is not closed and locked. • Due to falling because of the unsafe installation of supply lines to the system. • Due to contact with electrical systems that have not been de-energised or that are unprotected/damaged. <p>ATTENTION! The system contains live components!</p>
	<p>Note the information in the section “General description – Danger areas/safety concept”.</p>

2.5 Emergency stop devices/shutting down the system in case of emergency



Emergency stop devices are identified by a red button on a yellow background.

The button is locked upon activation. After rectifying the situation that led to the emergency stop, the button has to be unlocked before restarting the system.



Figure 2: Emergency stop


Safety-related system states and parameters are monitored by the controller/PRC. When a problem is reported with a safety-related system function, the system enters a fault state (also see the section “General description/safety-related system functions”).

	<p><i>The emergency stop devices must be freely accessible at all times and objects are not permitted to block the paths to the emergency stop devices.</i></p> <p><i>Never use emergency stop devices to shut down the system!</i></p> <p><i>After eliminating the cause of the emergency stop situation, the proper and safe operation of the system has to be verified.</i></p> <p><i>Emergency stop situations may only be rectified by trained, qualified personnel and/or licensed electricians!</i></p>
	<p>Note the information in the section “General description – emergency stop devices”.</p>



2.6 Work on electrical installations

Notices of specific hazards – electrical energy

- *Only a licensed electrician is permitted to open the system cabinet and work on electrical systems or equipment, subject to compliance with the corresponding electrical engineering rules.*
- *Secure the system or system components so they cannot be turned on again!*

	<p><i>The system is disconnected from the energy supply by pulling the mains plug. The master switch (QB1) is located on the rear of the system. Even when the master switch is in the position "0" or "OFF", the following components for example are still live with potentially fatal voltage:</i></p> <ul style="list-style-type: none">- <i>Feeder</i>- <i>Master switch</i>- <i>All locations marked by a warning sign</i>
---	--




- *Always keep the system cabinet/control cabinet locked and store the key in a safe place!*
- *Always note the supplied circuit diagrams!*
- *Before making electrical connections, verify that all lines and assemblies that contain liquid media are tight.*
- *Before carrying out inspections, maintenance and repairs on system components, they must be disconnected on all terminals and secured so they cannot be turned on again unintentionally. First verify that the disconnected components have been de-energised, then ground and short-circuit them and insulate adjacent live components!*
- *If work has to be performed on live components, a second person should be called in to activate the emergency stop or turn off the master switch with shunt tripping in case of emergency. Block off the work area with a red and white safety chain and a warning sign.*
- *Only use original fuses with the prescribed amperage! In case of problems with the supply of electrical energy, shut down the system immediately!*
- *Note the minimum cross-sections and the circuit diagram/BOMs!*
- *The electrical installations of the system have to be inspected/checked regularly. Defects such as loose connections and damaged cables have to be eliminated immediately.*
- *After leaks/spills/media discharge, check whether this may pose hazards for work on the electrical installations.*

	<p>ATTENTION! <i>Never disconnect the mains plug from the outlet by pulling on the cord!</i> <i>If the cord is damaged, the system has to be shut down immediately and the cord must be replaced!</i></p>
	<p><i>Repairs on electrical installations may only be made by the Service department of Diener electronic GmbH & Co. KG.</i></p> <p>NEVER <i>open housings etc.!</i></p>

2.7 Working on systems that are pressurised/under pressure/used to conduct media



Notices of specific hazards

- System components that are pressurised/under-pressurised have to be inspected/checked regularly
- In case of leaks or defects in the generation of pressure/vacuum, the system must be taken out of operation immediately and professionally repaired!
- Regularly compare the displayed actual values to the specified set values. Set values and/or specified maximum values must not be exceeded!
- Always note the supplied schematics/plans!


	<p>DANGER! Even after</p> <ul style="list-style-type: none"> - shutting down the system, - when the system is in standby mode, or - after an emergency stop situation, <p>system components may still be under high pressure/vacuum!</p> <p>Before disconnecting system components, ensure that the system is de-pressurised/vented. Failing to (properly) relieve pressure and drain and/or vent the system can lead to hazards, for example:</p> <ul style="list-style-type: none"> • In case of media discharge and whipping hose lines etc. due to overpressure • Very high noise levels and the suctioning of body parts and objects in case of vacuum - <p><u>ALWAYS</u> ensure pressure equalisation! <u>NEVER</u> open connections, lines and components by force and always secure shut-off devices/shut-off valves that have to be closed for work on the system to prevent them from being operated unintentionally.</p>
	<p>ATTENTION! Media such as hazardous substances may be present in the cooling trap and coating system, and can cause hazards in case of discharge and/or contact. Therefore, wait until the temperature drops below 40°C before opening the system. Note the supplied safety datasheets and use the required personal protective equipment!</p>
	<p>DANGER! Electrical installations that may be in the vicinity of splashed water, for example for the pump, have to be protected accordingly!</p>

- Pneumatically driven or controlled devices always have to be de-pressurised and secured to prevent them from being turned on again unintentionally before working on them.
- Before pressurising and/or generating vacuum, ensure that the entire system is tight and that all shut-off devices are in the correct position!
- Only use original replacement parts!


2.8 Notices of specific hazards – hazardous substances

	<p>The substances approved for coating are found in the section "Technical data/Process development".</p> <p>The auxiliary materials and supplies required for the system are found in the section "Technical data – overview of technical data for select system elements" and the supplied documentation of the component manufacturers.</p>
	<p><i>Hazardous substances may be present in the system, for example in the system components such as the pumps, and can cause hazards and injuries in case of discharge or contact.</i></p> <p><i>In general, the following applies for handling hazardous substances/media:</i></p> <ul style="list-style-type: none"> - <i>Before starting work on the system, check what hazardous substances are currently in the system and/or system components.</i> - <i>Observe the safety datasheets and use the required personal protective equipment!</i> - <i>The substances must be disposed of properly in an environmentally friendly manner and in compliance with the applicable legal regulations!</i> - <i>Process substances</i> <i>Only substances defined in process development and corresponding to the specifications and requirements of Diener electronic GmbH & Co. KG may be used. Changing the substances requires the prior written approval of Diener electronic GmbH & Co. KG.</i> - <i>Auxiliary materials and supplies</i> <i>Only auxiliary materials and supplies that meet the specifications and requirements of the component manufacturers may be used. Changing the auxiliary materials requires the prior written approval of Diener electronic GmbH & Co. KG.</i> - <i>Information in the documentation of the component manufacturers and safety datasheets must be observed!</i> - <i>The operating company is responsible for complying with occupational safety and health as well as environmental protection requirements when using hazardous substances and auxiliary materials.</i>




Handling hazardous substances

	<p>DANGER! <i>Lack of knowledge about the substances that are used can result in hazards and serious injuries in case of improper handling!</i></p> <p><i>The personnel entrusted with handling the substances that are used must have sufficient expertise and training.</i></p> <p><i>The personnel must be familiar with the contents of the safety datasheets and observe the safety and hazard notices they contain!</i></p>
---	--

System tightness

	<p>DANGER! <i>Depending on the substances that are used, leaks in the coating system/exhaust air system may lead to the discharge of volatile substances/contamination of the ambient air, resulting in hazards for personnel and/or the environment.</i></p> <p><i>The coating system and exhaust air system always have to be leak-tight!</i></p>
---	--

3.0 General description

 	<p>This section contains general information on the functioning of the system and the components/assemblies installed in the system.</p> <p><i>Note the information in the sections "Intended use" and "Safety and accident prevention instructions"!</i></p> <p><i>Inform yourself about the components in the supplied operating and maintenance manuals of the component manufacturers.</i></p> <p><i>A selection of the most important technical data is found in the section "Technical data".</i></p> <p><i>General information about inspection/maintenance/cleaning/repair is found in the section "Inspection/maintenance/cleaning/repair".</i></p> <p><i>The information in the supplied documentation of the component manufacturers is decisive!</i></p> <p><i>Regarding the functionality, note the supplied circuit diagrams, schematics and documentation of the component manufacturers!</i></p>
	<p><i>Interventions by unauthorised personnel without comprehensive expertise may lead to significant damage on the assemblies and equipment, and in extreme cases to hazards for life and limb.</i></p>

3.1 Using the system/functions

In general, Diener electronic GmbH & Co. KG provides a system for producing a parylene



Possible fields of application are:

- Coating tool surfaces

Based on the order-specific

- coating characteristics and
- work piece characteristics,

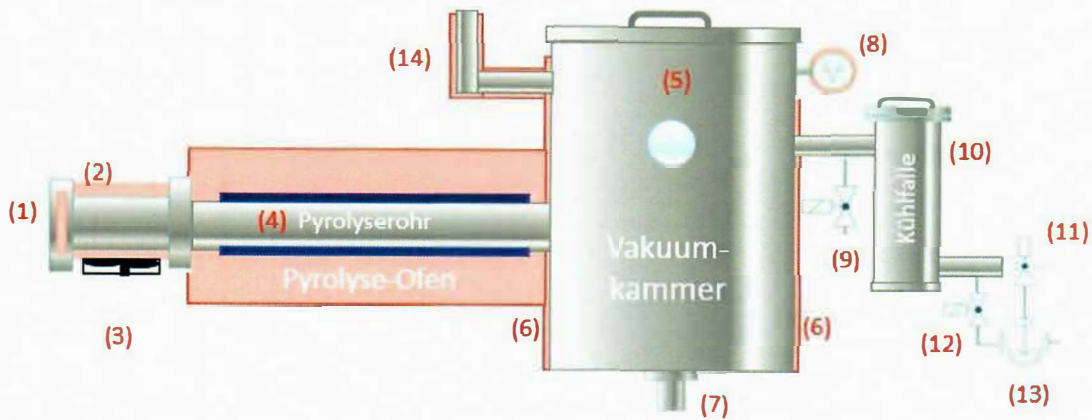
each parylene system is individually equipped for the requirements of the specified processes in the course of "process development".



Note the information in the section "***Intended use/Limits of use***"

The description of the

- possible processing methods, and
 - the approved substances
- for the system based on process development conducted by Diener electronic GmbH & Co. KG is found in the section "Technical data".



- (1) Vaporiser door
- (2) Vaporiser
- (3) Fan (PWM)
- (4) Pyrolysis oven and pyrolysis tube
- (5) Vacuum chamber/recipient
- (6) Chamber heating for the optimised deposition of parylene D (optional)
- (7) Rotation drive for the carousel
- (8) Heatable Pirani on the vacuum chamber
- (9) Venting valve
- (10) Cooling trap – optionally with hand valve on the outlet flange for reducing the pump speed/process adjustment for type N and F-VT4 volatile monomers
- (11) Edge valve to the vacuum pump
- (12) Bypass for soft-pump function
- (13) Vacuum pump
- (14) Silane evaporator

*Red surfaces indicate heated zones

Functional principle:

The crucible filled with dimer powder is loaded into the vaporiser. After closing the door, the vaporiser door, pyrolysis tube and pressure gauge are heated to a set value and a vacuum is generated. Finally the vaporiser is continuously heated in a controlled process (pressure controlled). The heat and vacuum sublimates the dimers and splits them into monomers in the pyrolysis oven. The pump transports the gaseous monomers on into the vacuum chamber. In the vacuum chamber, the temperature is close to room temperature. This temperature drop causes the monomers to resublimates on the surfaces and they react with each other to form parylene. Excess monomers are caught in the cooling trap. It is filled with liquid nitrogen. Due to the temperature of -180°C , the remaining monomers also resublimates and react to form parylene before they can reach the vacuum pump.


3.2 Overview of the system and its components

The system essentially consists of the following assemblies/components:

	Assembly/ component	Brief description of the equipment/function
1	System cabinet/ housing	<ul style="list-style-type: none"> - Housing that holds equipment such as the vaporiser, pyrolysis oven and coating chamber, electrical engineering (master switch, screen, fan, emergency stop button)... - Connection for the energy supply and vacuum pump - Indicator lamp (option)
2b	Vaporiser	In the vaporiser, the dimer is heated at approximately 0.01 mbar of vacuum. Sublimation of the dimer begins at a temperature of approximately 80 °C and the compound changes from the solid to the gaseous state.
4	Pyrolysis oven	The temperature in the pyrolysis oven goes up to 750 °C. This causes thermal splitting of the gaseous dimers to form monomers, primarily on the hot walls of the pyrolysis tube.
5	Coating System	The ambient temperature in the coating system is about 25-30 °C. Polymerisation of the gaseous monomers occurs preferably on cold surfaces of the work pieces and chamber walls, forming parylene. The work pieces lie on a carousel. It turns regularly to achieve even coating.
8	Venting system	The venting system equalises the pressure between the coating chamber and the environment.
12	Vacuum generation	Vacuum pump for generating the vacuum in the coating chamber Water cooling is needed depending on the type of pump.
	Exhaust air system	For exhaust gas purification
9	Cooling trap	There is a container filled with liquid nitrogen in the cooling trap. The low temperature causes the monomers that did not polymerise in the coating chamber to condense on the outside of the container filled with liquid nitrogen. This prevents the pump from being coated with parylene and/or plugging, which would impair its functionality or break the pump. There always has to be liquid nitrogen in the cooling trap.
	Controller/parylene reactor control (PRC)	Operation is fully automated via the operator panel on the front. PRC is used to control the system functions and configure the processes. Only the fill level in the cooling trap has to be checked every so often and topped up with liquid nitrogen as needed.
	Compressed air system	Option – used to control the compressed air-driven valves

3.3 Installation location and allowable ambient conditions

A suitable installation location for the system is chosen by the operating company.


	Requirements for the installation location and ambient conditions are found in the sections "Intended use", "Technical data" and "Transportation/setup".
---	--

3.4 Workstations

For the workstation design, see the section "Interfaces/responsibilities of the operating company".


Workstations for system operation are located:

- On the front of the system (vaporiser door and operator panel of the controller)
- On the right side of the system for filling the cooling trap with liquid nitrogen

	<p><i>Hazards may occur at the workstations:</i></p> <ul style="list-style-type: none">- <i>When opening/closing the vaporiser door, due to movements of the door</i>- <i>When loading and unloading the work pieces and cleaning the coating system, due to hot zones inside the system</i>- <i>When filling/handling liquid nitrogen</i>
--	--

Personal protective equipment

Use the required personal protective equipment for all work, such as safety goggles, gloves, safety footwear and a hard hat.

	<p><i>Always use the personal protective equipment required for the work tasks!</i></p> <p><i>Note the safety datasheets when handling the process gases and substances that are used!</i></p>
---	--

3.5 Danger areas/safety concept

Danger areas on the system are as follows:

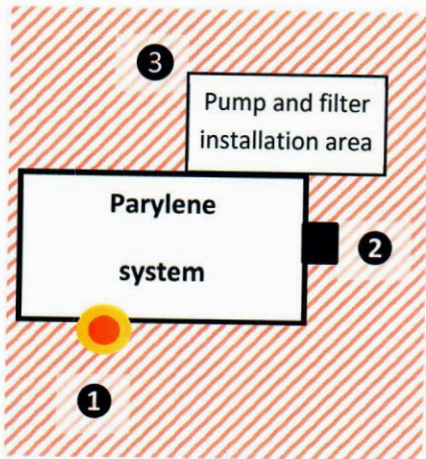



Figure 3: Danger area

Item	Danger area Possible tasks	Presence Safety measures
①	In front of the vaporiser with the door open <ul style="list-style-type: none"> - Observation during operation - Work on the controller/PRC In front of the coating chamber with the door open <ul style="list-style-type: none"> - Setting up the work pieces - Inspection, cleaning, maintenance, repair 	In "Automatic" operating mode In "Standby" operating mode Only with the master switch in the "OFF" position
②	Cooling trap <ul style="list-style-type: none"> - Refilling the container with liquid nitrogen 	 Danger! <i>Risk of burns due to liquid nitrogen.</i>
③	Inside the system <ul style="list-style-type: none"> - Inspection, cleaning, maintenance, repair 	Only with the master switch in the "OFF" position

- **Note the information in the section "General safety and accident prevention instructions" and "Intended use/System hazards"!**

3.5.1 Emergency stop devices




(Also see the section “General safety and accident prevention instructions/Emergency stop devices/Shutting down the system in case of emergency”).

The following emergency stop devices (emergency stop buttons) are installed on the system:

- On the front of the system cabinet

Tripping an emergency stop device:

- Terminates the process.
- However, the coating process continues running as long as the heating elements are hot.
- The system is de-energised up to the terminal clamps of the master switch in the system cabinet, meaning the pump is shut off.
The controller **is not disconnected from the mains network** and remains functional.
- The controller displays a corresponding notice.
- The indicator lamp – if present – lights up red to indicate a fault


	<p><i>The emergency stop devices are intended solely for emergencies and must not be used for shutting down the system normally!</i></p> <p>ATTENTION! <i>There is a risk of damage and hazards when tripping an emergency stop device!</i></p>
	<p>ATTENTION! <i>Tripping an emergency stop device terminates a process that is currently running. However, the coating process continues running as long as the heating elements are hot.</i></p>
	<p><i>After tripping an emergency stop device, components inside the control cabinet remain live with potentially fatal voltage, including the following components:</i></p> <ul style="list-style-type: none">- Feeder- Master switch

Rectifying emergency stop situations

After an emergency stop situation, it needs to be rectified so the system can be started again.

Procedure

1. Eliminate the cause of the error and, if applicable, the consequences of the shut-down. Check whether the process can be restarted after rectification, e.g. whether the work pieces are still usable and if other measures such as repairs, cleaning, readjustment etc. are required.

	<p>Emergency stop situations may only be rectified by trained, qualified personnel and/or licensed electricians! Consult the Service department of Diener electronic GmbH & Co. KG if necessary (also see the section "Intended use/Reporting safety-related faults and events").</p> <p>DANGER! Residues of gaseous monomers may be present in the system components after an emergency stop situation. To avoid inhalation of the coating substances, wait until the vaporiser reaches the standby temperature of approximately 40 °C before venting the system.</p> <p>After eliminating the cause of the emergency stop situation, the proper and safe operation of the system has to be verified.</p>
---	---

2. Unlock the emergency stop button.
3. Acknowledge the rectification of the emergency stop situation via the controller.
4. Open the edge valve. The remaining gaseous monomers are pumped out.
5. Restart the process
The system can only be restarted after any pending alarms are reset.



Figure 4: Emergency stop button

3.5.2 Safety-related system functions

Safety-related system states and parameters are monitored by the controller/PRS. These include for example:

- Emergency stop
- Compressed air switch
- Switch for vaporiser when exceeding upper limit of temperature
- Switch for pyrolysis oven when exceeding upper limit of temperature

When a safety-related system function is reported as not OK, the system enters a fault state. The emergency stop function is tripped if necessary (see the section “Emergency stop devices”).

3.5.3 Master switch

The master switch is on the front of the system.



Figure 5: Master switch



Even when the master switch is in the position “0” or “OFF”, the following components in the system cabinet for example are still live with potentially fatal voltage:

- Feeder
- Master switch

3.5.4 Access to the system interior

(Also see the section "General safety and accident prevention instructions").

The interior of the system is accessible via the removable cover.

The components are mounted directly on the housing or fixed intermediate floors.

Due to the desired compact design, the visibility and accessibility are restricted.

Access to the components inside the cabinet is only required in exceptional cases, for example during repairs/troubleshooting by the qualified personnel of Diener electronic GmbH & Co. KG.



The system cabinet may only be opened by trained, licensed electricians!

DANGER TO LIFE!

The inside of the housing is live with potentially fatal voltage when the cover is open!

3.6 System description

3.6.1 Vaporiser

The key features of the vaporiser are:

- Heater installed in the door
- Door swinging sideways
- Door guard control with threaded connection
- Rubber seals between door and vaporiser

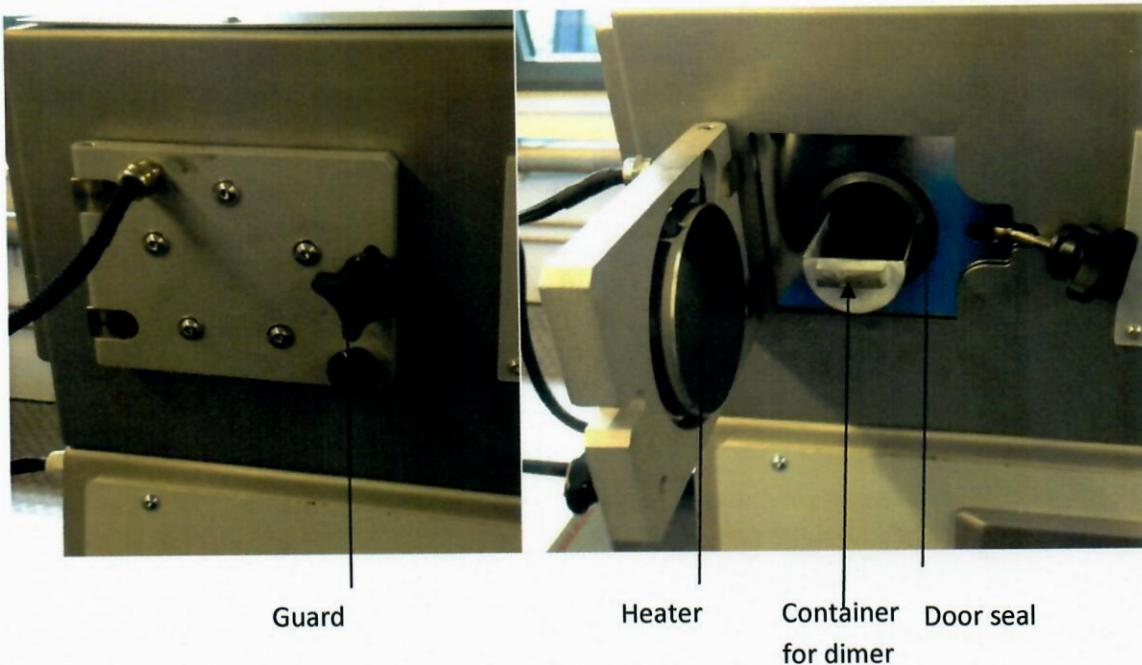



Figure 6: Vaporiser door (left) and open vaporiser with dimer container

The chamber door swings sideways for unimpeded loading and unloading.

Seals/tightness of the door

The vaporiser door has to seal tightly so the required vacuum can be built up. Seals are installed for this purpose in the door and its contact surfaces.

If the door is not tight, carrying out the process is not possible or more difficult.

	<p>DANGER! <i>If the door is not tight, there is a risk of suctioning body parts and objects when generating the vacuum!</i></p>
---	---

- **Note the information in the section “General description/Seals”.**

Guard control with threaded connection/prevents the door from swinging open during venting

Guard control with permanent magnets ensures that the door is properly closed and prevents it from swinging open during venting.

If the chamber door opens during venting, the guard control magnets have to be replaced.

3.6.2 Silane Vaporizer

Key features:

- 14 mm Swagelock inlet on the topside of the system.
- Heating for silane vaporizer chamber and pipe
- Filling with 1 ml syringe
- Must be heated in all coating processes (Min. 130°C)

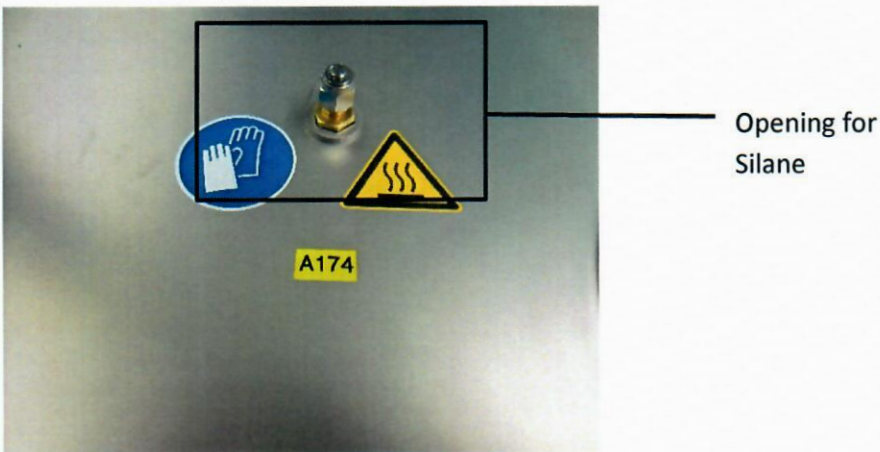


Figure 7: Filling Silane evaporator

3.6.3 Pyrolysis oven


Key features:

- Heating 750 °C
- Made of stainless steel
- Connects the vaporiser and coating chamber



Figure 8: Pyrolysis oven (example)

Pyrolysis oven

	<p>DANGER! <i>Risk of burns when touching the pyrolysis oven</i></p>
---	---

3.6.4 Coating chamber

The key features of the coating chamber are:

- Door that swings open
- Inspection glass for observing the coating process
- Rubber seals between door and chamber
- Turntable to rotate the carousel

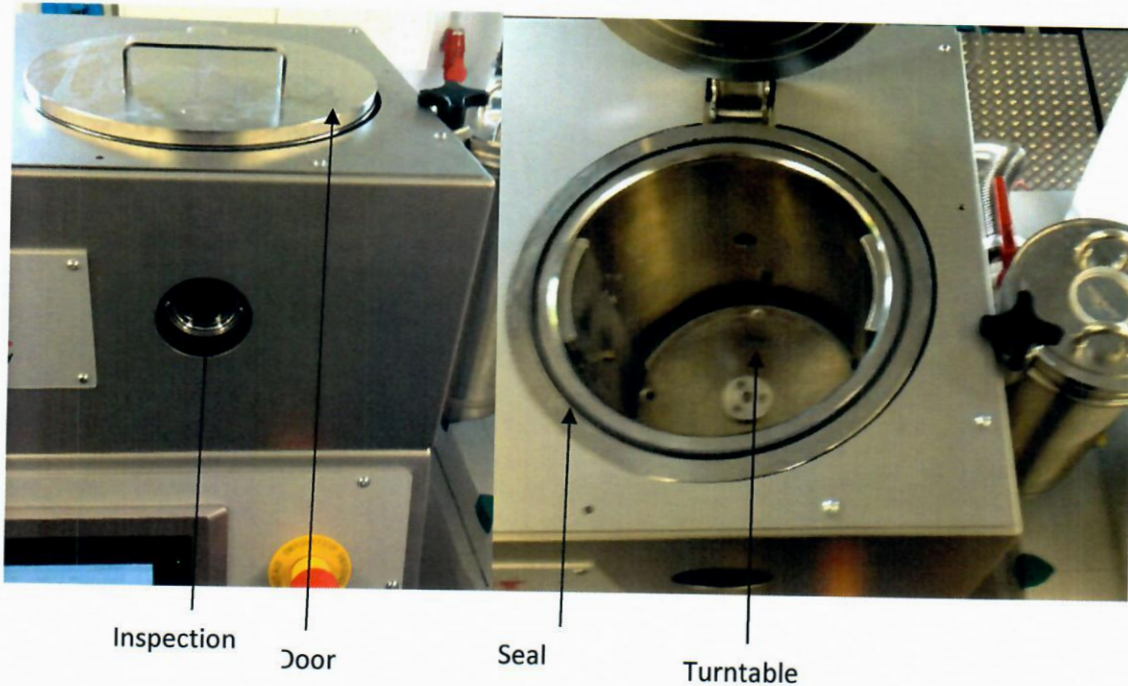


Figure 9: Coating chamber



Chamber extension:

The chamber can be extended via longer baffle plates and an extension cover

Seals/tightness of the door

The coating chamber door has to seal tightly so the required vacuum can be built up. Seals are installed for this purpose in the door and its contact surfaces.

If the door is not tight, carrying out the process is not possible or more difficult.

	DANGER! <i>If the door is not tight, there is a risk of suctioning body parts and objects when generating the vacuum!</i>
	Danger! <i>The door is pulled in when the vacuum is generated. Risk of crushing fingers.</i>

- **Note the information in the section “General description/Seals”**

3.6.5 Connection panel

There is a connection panel for supply media on the rear wall (electrical connection of the parylene system to the mains network, vacuum pump, LAN connections. USB is on the front side)



Figure 10: Connection panel

Supply lines to the system connection point have to be installed so that they are protected, with strain relief, cannot tear off, and so that tripping hazards are avoided.



*Ensure that all connections are properly attached.
There is a risk of malfunctions, damage, environmental damage and possibly serious injuries!*

3.6.6 Pressure measurement

VGC301 pressure gauge with Pirani CVG101

Pressure measurement of vacuum systems

Technical data:

- Pressure range that can be measured: 0.0001 to 1 Torr
- Absolute tolerance: 10%
- Heating temperature: 150°C
- Power supply: 24 +/- 10% V DC
- Current input max.: 150mA
- Mass (sensor head): 85g
- Mass (controller): 250g
- Flange connection: KF 16

Interface: RS485 or RS232 for embedded mode in process control is available.

3.6.7 Venting system

The venting system is part of the overall system.

Functional principle

The venting system equalises the pressure between the coating system and the environment.

Venting is realised via venting valves with a filter.

Functional principle of slow venting

The venting system equalises the pressure between the coating system and the environment.

Venting is realised via venting valves with a filter. This filter is so fine that the pressure in the vacuum chamber only rises slowly and components cannot swirl around.

(Also see "Gas flow diagram" in the system documentation)

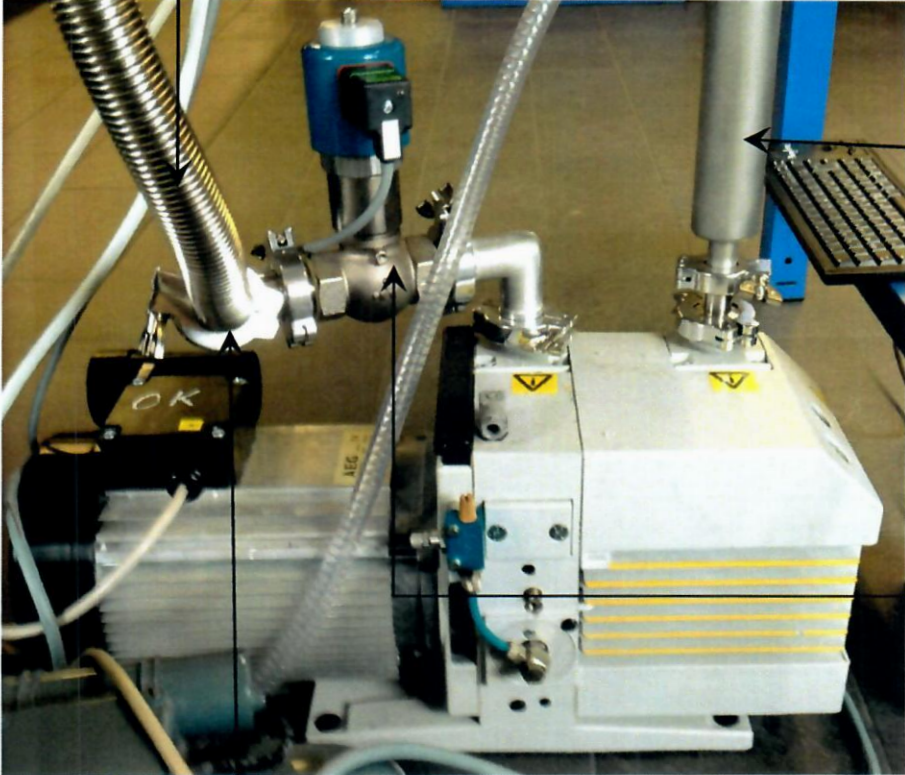


ATTENTION!

The venting valve may be hot!

3.6.8 Vacuum generation – pump

Vacuum hose



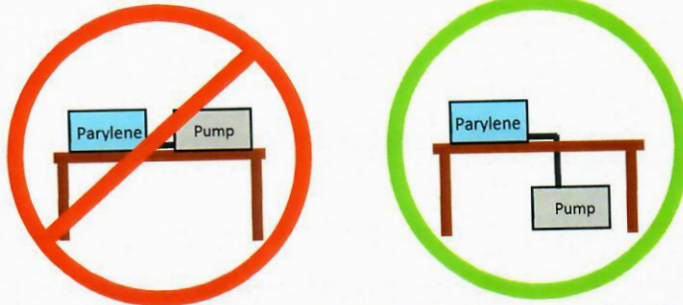
Exhaust gas hose with filter

Edge valve

Connection
Vacuum hose

Figure 11: Pump connection

Connect the vacuum pump to the chamber. Set the pump onto the floor. Otherwise, there is a risk of pump oil flowing into the chamber in case of a pump malfunction (for example due to reversed phases on the electrical connection).



Connect the exhaust air hose. Exhaust air has to be discharged to the outdoors.

- Connect the pump to the "Pump" jack.
- Install the pump lines and hoses so they are protected, with strain relief, and cannot tear off.

Functional principle

The pump is connected to the parylene system and is operated via the controller.

The pump is enabled when the following conditions among others are met:

- Emergency stop not activated
- Vacuum generation enabled via controller

Functional principle of slow evacuation

The pump is operated via the controller.

The valves are enabled when the following conditions among others are met:

- Emergency stop not activated
- Vacuum generation enabled via controller

Slow evacuation via the hand valve or optional soft pump valve prevents small components from whirling about in the chamber and displacing the dimer powder from the vaporiser into the pyrolysis oven or chamber.

	<p>Information on the delivered pump type and manufacturer is found in the section "Technical data".</p> <p>Further information about the functionality, operation, inspection and maintenance etc. is found in the supplied documents from the manufacturer.</p>
	<p>ATTENTION!</p> <p>There may be hot zones on the pump and pipework! Risk of burns!</p>

3.6.9 Cooling trap

The cooling trap purifies the exhaust air from the coating chamber and upstream systems.

Exhaust air always has to be discharged unimpeded to the outdoors. The exhaust air openings must be kept clear.



ATTENTION!

*There may be cold zones on the components of the exhaust air system!
Risk of cold burns!*

The cooling trap is installed directly after the coating chamber. Monomers that do not polymerise in the deposition process are captured by stainless steel walls cooled with liquid nitrogen in the cooling trap. The monomers fully condense on the cold surfaces before they can continue on towards the vacuum pump.

A positive side effect of the cooling trap is the additional pumping effect, so that the required base pressure – usually about 0.01 mbar – can be reached more quickly.

The cooling trap has to be refilled regularly during the process. Filling the cooling trap at a pressure of less than 0.1 mbar is recommended.

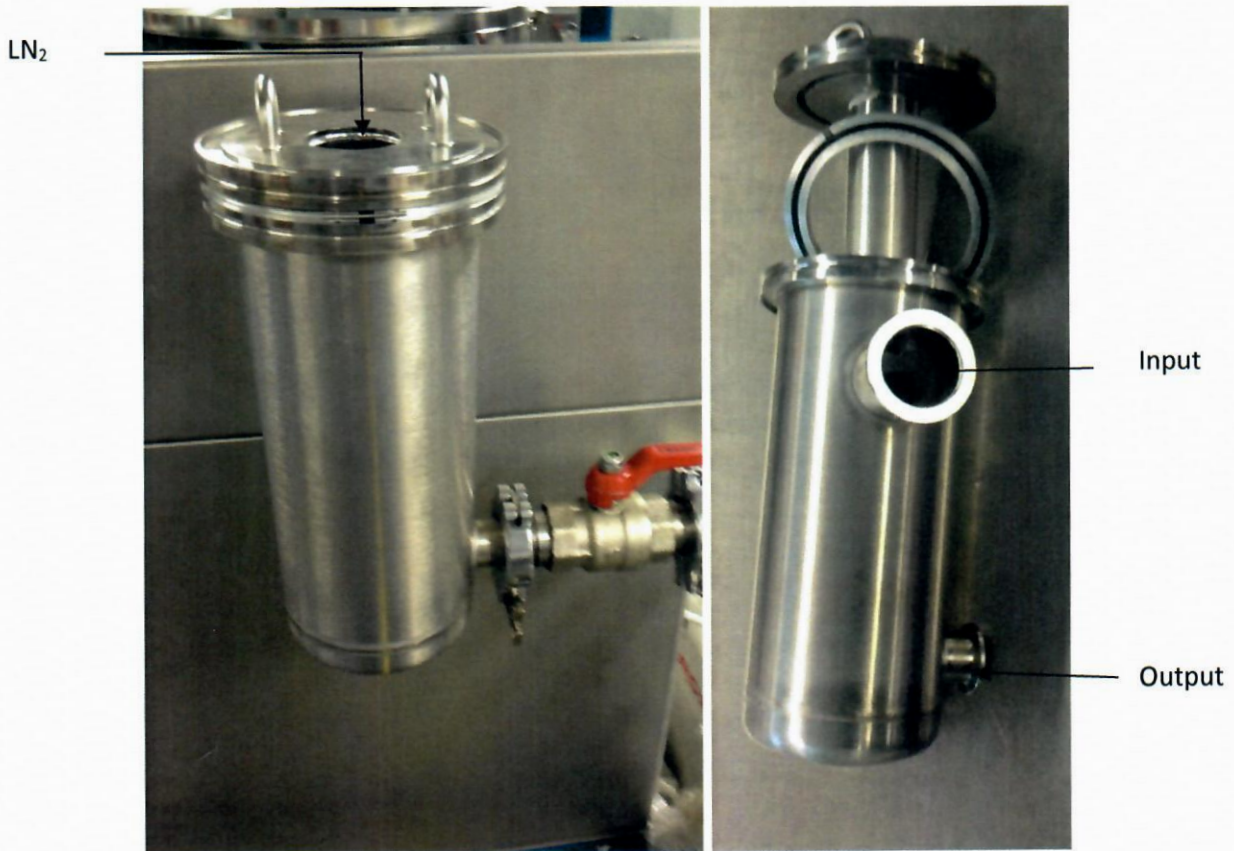





Figure 12: Cooling trap

	<p><i>The cooling trap has to be cleaned after each coating process. All of the white, porous solid material must be removed. See the section "Troubleshooting/inspection/cleaning and maintenance/repair" for further information.</i></p>
	<p><i>Observe the safety datasheets and use personal protective equipment for handling liquid nitrogen!</i></p>
	<p><i>Maintenance and repairs on the cooling trap may only be carried out by qualified personnel of Diener electronic GmbH & Co. KG. Failure to comply voids the warranty.</i></p>

3.6.10 Seals

The seals are of special importance in a parylene system since they can significantly influence the error and failure rate of the system.

Leaks on the system increase the risk of injury due to the suctioning of body parts or objects.

All seals, e.g.

- on the doors,
- on inspection glasses,
- on apertures/bores in the chamber housing for sensors,
- etc.

are made of a material that withstands the expected mechanical and thermal stresses, with characteristics that are not significantly changed by the dimers that are used.

They are selected under consideration of the project-specific conditions and requirements.

The service life of the seals is limited depending on the conditions of use.

Indications that the seals need to be replaced:

- A higher than normal leakage rate in the system.
- Cracks or other signs of damage.

Complying with the inspection and cleaning intervals specified in the section "Inspection/cleaning" is mandatory.

Damaged seals may only be replaced by the Service department of Diener electronic GmbH & Co. KG.

3.7 Work pieces and product carriers

Examining the requirements for the system based on the work piece characteristics is part of process development.

General requirements for the work pieces and product carriers on the system side:

1. No release of particles/substances that can impair the functioning of the system/process, e.g.:
 - Damage
 - Process impairment (coating)
 - Falsification of measurements/damage to measuring probes etc.
 - Reaction with the monomers that are used
 - Hazardous (to health/the environment)
2. The work pieces:
 - Are not permitted to release hazardous substances
 - No adhesions etc.
 - Must have the correct/allowable dimensions and weights
 - Must not touch the chamber walls
 - Have to withstand the temperatures in the chamber without altering their properties
 - Must be held securely in the processing position, for example by suitable product carriers (forces during venting and vacuum generation)
 - Must not be subject to capacitive charging → **Possible DANGER TO LIFE!**
3. Product carriers:
 - Are loaded into a carousel.
 - The carousel is loaded into the deposition chamber by a guide.



Note the information in the section "General description"!

The work pieces being processed/treated must be suitable for the configured max. temperature so that they are not damaged and their properties are not impaired.

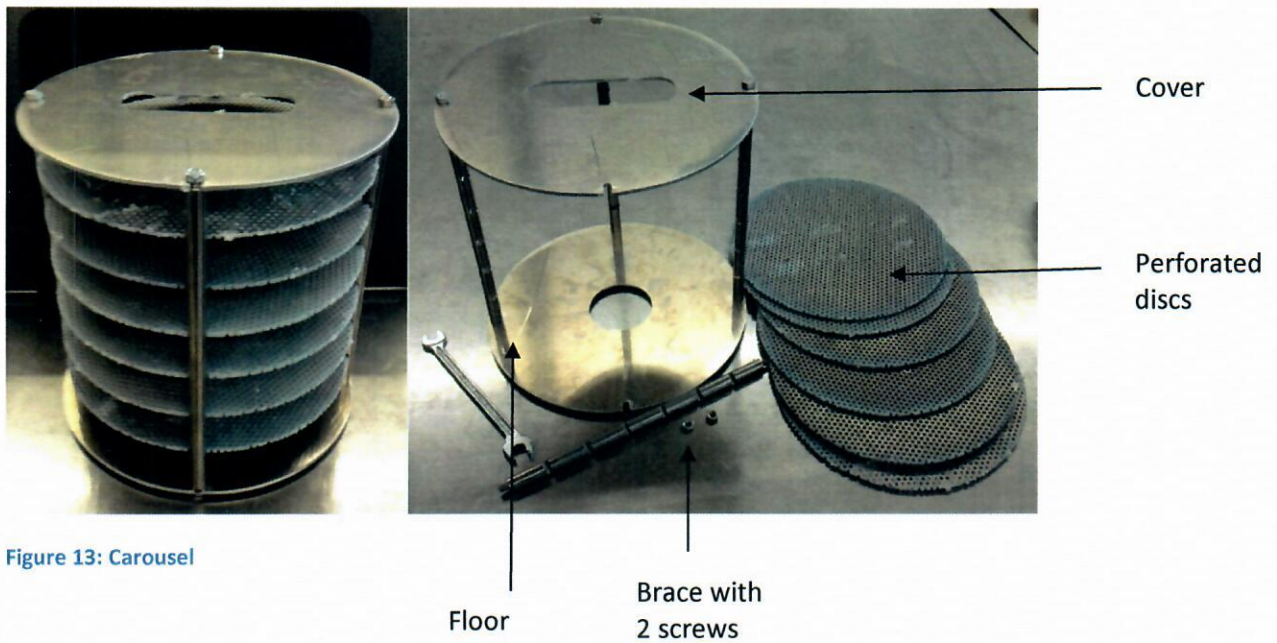
Carousel

1-6 perforated discs can be loaded into the carousel in the standard version.

The carousel has to be taken out of the coating chamber for loading and unloading. Discs are put in or taken out individually.

To take the discs out of the carousel, 2x M4 screws must be removed, respectively one from the floor and cover. The brace can be removed.

The speed of the carousel should be even and depends on the desired result.



*Note the maximum load capacity!
(See the section "Technical data")*

Always close the carousel properly!

ATTENTION!

*There may be sharp edges on the carousel due to its functionality!
Wear personal protective equipment (gloves)!*

3.8 Controlling the system/parylene reactor control (PRC)



Note the information in the section "Intended use"

- *Process development*
- *Changing setting parameters, programs etc. in the system's controller*
- *Instruction and training of the employees*

The system is controlled via the screen.

Function

- For the emergency stop devices, see the section "General description/Emergency stop devices"
- For the master switch, see the section "General description/Master switch/Circuit breaker"

Starting up the system is only possible when:



- The master switch is in the "ON" position and the controller is operating.
- All start-up conditions queried by the controller are OK.

System control is realised internally in the system cabinet, with operation via a touch screen. The PRC (parylene reactor control) user control system as the operating interface is used for:

- Process control, that is:
 - Calling up and changing processes within the defined limit values
→ **Automatic operating mode**
 - Setting up new processes – to the extent permitted by the operating company
- Outputting operating, fault and error messages
- Changing the process control limit values and intervening in system control
→ **Manual operating mode**
Manual operating mode is only available to the Service department of Diener electronic GmbH & Co. KG.

The functions permitted for the operating company are protected with personal passwords.

Passwords must be kept secure.

	<i>For a description of parylene reactor control (PRC) operation, see the section "Operation/control" and the separate PRC documentation.</i>
	<i>Only qualified personnel instructed by Diener electronic GmbH & Co. KG is permitted to operate the controller/PRC. The instruction must be documented in writing.</i>

Operating states/operating modes

The operating states/operating modes for the system are as follows:

- **The system is de-energised**; the master switch on the system cabinet is turned off, or the mains plug of the system is disconnected from the mains network.
- **The master switch is "ON"**
Also see the section "General description/Master switch".
 - The PC starts up, the display turns on and the start screen is displayed. Use the "Start" button to go to the PRC main picture.
 - **All other system components are off/de-energised**
- **Standby, all programs/processes have been ended, no program/process has been started**
 - **All system components are in a safe state, e.g.:**
 - No gases in the coating chamber and systems
 - The coating system can be vented or evacuated
 - Pump is off
 - etc.

Also see the section "General description/Safety-related system functions".

The operating modes for the system are as follows:

- **Automatic operating mode**
To prepare for automatic mode, existing programs can be called up in PRC via the menu selection "Automatic operating mode" and the configured, enabled parameters can be changed within the established limit values; program versions can be saved/created.

Possible parameters include:

- Preparation
- Coating
- Cooling and venting

After the process has been created and is within the allowable set values, it can be called up and started.

The system must be fully set up and configured for automatic mode, and the desired program has to be loaded.

Automatic mode can only be started when

- all safety devices are active,
- all defined and safety-related parameters are in the nominal range, and
- the controller "ON" button is pressed.

Pressing the "Program start" button starts operation and the system is now in **automatic operating mode**.

- **Manual operating mode**

Manual operating mode is only intended for commissioning and service. It is only available to the Service department of Diener GmbH & Co. KG. **Certain functions may be available to the operating company** if they have been expressly enabled by Diener electronic GmbH und Co. KG.

A password for these functions is provided to personnel with corresponding training.

Examples of functions that may be enabled:

- Changing the working pressure and base pressure in the chamber
- Rotary plate for the carousel
 - Changing the rotational speed
- Vaporiser
 - Changing the door temperature
 - Changing the end temperature of the vaporiser
 - Changing the temperature of the additional installed heating pad
- Pyrolysis oven
 - Changing the temperature
- Pump
 - Opening the valves installed in the chamber and manually activating the pump
 - Vacuum generation in the chamber

Safety-related settings are specifically protected and can only be changed by the Service department of Diener electronic GmbH & Co. KG.

Operating states – indicator lamp/horn – option

The system operating states are indicated as follows:

- In the controller/PRC as operating, fault and error messages, for example via:
 - Display fields (red/green)
 - Dialogue boxes
 - Highlights and text fields where applicable
- By an indicator lamp
- Faults in addition by the horn

Indicator lamp – option

Green: Automatic mode

Yellow: System in standby mode or manual operating mode

Red: Fault



Figure 14: Indicator lamp


Fault messages are reset with the Acknowledge button after rectification.

If no safety-related errors are pending, the system enters standby mode, the yellow signal lamp lights up and the horn turns off. The system can be restarted.

If a fault cannot be reset, contact the Service department of Diener electronic GmbH & Co. KG.




4.0 Overview of technical data/approved processes and substances

This section provides an overview of the key technical data for the system.


	<p><i>This section provides an informational overview of the performance data for select system components.</i></p> <p><i>Note the supplied documentation of the component manufacturers!</i></p> <p><i>The information in the documentation of the component manufacturers is binding!</i></p> <p>Additional technical data for the components are found in the system documentation.</p>
---	--

4.1 Ambient conditions and installation location


System installation location	Enclosed/air-conditioned building. Note the information in section 5 "Transportation/setup".
Allowable ambient temperature for operation and the idle system [°C] ±	20-25 °C
Max. relative humidity [% r.H.] ±	40-50%
Allowable geographical altitude	1000 m ASL
Atmosphere	No aggressive air; no potentially explosive atmosphere.
Purity of the room air	Normal, uncontaminated outside air, free of particles and foreign objects. No hazardous impurities/concentrations of toxic and/or combustible/explosive substances, media, dusts
Floor conditions	Level floor with sufficient load bearing capacity; oil-resistant paint/coating that binds dust.

Sound emissions	<p>Measured sound pressure level at the workstation, height 1600mm.</p> <p>Process step: venting</p> <p>Lp= approx. 75 db(A)</p>	
		<i>The operating company is responsible for determining the actual sound pressure level and posting notices regarding the need for hearing protection where applicable, and for providing the operator with hearing protection.</i>
		The specific sound values for the installed devices are found in the supplied documentation of the component manufacturer.
Min. lighting intensity for the workstations	Min. 500 lux	
		<i>The operating company is responsible for providing adequate lighting.</i>



4.2 System cabinet dimensions

System configuration		
Type A	Unit	Description
Width	mm	850
Height	mm	750
Depth	mm	500
	For the dimensions and weights of the single components that are supplied (such as the pump), see the supplied itemisations and documentation of the component manufacturers.	


4.3 Coating chamber

Chamber configuration		
Type	Unit	Description
Round stainless steel coating chamber		
Diameter	mm	200
Height	mm	200
Door		Manual door made of aluminium/stainless steel
Carousel configuration		
Type C	Unit	Description
Made of stainless steel with 4 removable braces		
Diameter	mm	176
Height	mm	172
		6 levels, approximately 22.5 mm apart.
Product carrier configuration		
Perforated discs		
Diameter	mm	Approx. 158
Dimer container configuration		
Stainless steel container		
Volume	cm ³	Approx. 72
Seals		
Material	Silicone or Viton	
	Stainless steel/Kalrez	
	Stainless steel pipework	
	Note the information in the section "General description/Seals"!	


4.4 Electrical network connection

Control cabinet	
Operating voltage	230V/16A
Frequency	50/60 Hz
	 <p>For the electrical supply data of the single components, please see the supplied itemisations and documents of the component manufacturers.</p>
Protection against splashed water	
<i>Protection class</i>	IP 44 or better For all equipment/assemblies not installed in the system cabinet
	 <p><i>Cleaning with water/steam cleaning etc. is not permitted!</i></p>
Electrical loads	
	<p>All electrical loads are supplied by the mains connection for the system.</p> <ul style="list-style-type: none"> • Vacuum pump
Thermal load	
<i>Thermal load of the heating elements [W]</i>	<ul style="list-style-type: none"> • Heater band 100W • Cartridge heater 100W • Cartridge heater 1600W

4.5 Pump

Type A	
Manufacturer	Leybold
Name	D16B LVO 100
Designation	Rotary vane pump
Throughput	16 m ³ /h
Oil type	Mineral oil
Exhaust filter	✓
Al₂O₃ oil filter	-
Operation with oxygen, argon and other process gases is possible	✓
Suitable for corrosive gas	-
Water cooling required	-
Illustration	



4.6 Pressure sensor

Type X	
Designation	Pirani with controller
Manufacturer	InstruTech
Quantity	2
Measuring range	0.0001 to 1 Torr
	 Additional specifications are found in the supplied datasheets of the component manufacturers.

4.7 Temperature measurement

Temperature sensor	
Type K thermal element	Measuring range: -100 to 1100°C

4.8 Process development – processes and process substances that are used/permitted

	<p>The system was designed and built exclusively for the following substances and work pieces.</p> <p>Using other substances requires the written approval of Diener electronic GmbH & Co. KG.</p> <p><i>Note the information in the section "Intended use" and "General description"!</i></p> <p><i>Note the safety datasheets for the substances that are used!</i></p> <p><i>Use the required personal protective equipment!</i></p>
	<p>DANGER!</p> <p><i>If substances not approved by Diener electronic GmbH & Co. KG are used, there is a risk of poor process results, malfunctions, damage, environmental damage and possibly serious injuries!</i></p> <p><i>If substances other than those the system was designed and built for are used, or for which the system and processes have been approved, this is done under the sole responsibility of the operating company and immediately voids all warranties and liability of Diener electronic GmbH & Co. KG.</i></p>

Legend/meaning of the footnotes/information to be observed

*1	CAS	An international designation standard for chemical substances. There is a <i>unique CAS number</i> for every chemical substance registered in the CAS database (including biosequences, alloys and polymers).
*2	Pressure	Primary gas pressure at the pressure regulator
*3	Approved materials	For fundamental requirements, see the section "General description/General requirements for the work pieces and product carriers". The following materials are permitted subject to observing the general requirements:
*4	Pressure	PRC setting

4.9 Process development – substances used

Liquid nitrogen	
Use	Used in the cooling trap
Identification / CAS no.	28804-46-8
Specification	Purity 95%
Gas connection no.	Manual filling of the cooling trap
Methacrylsäure-3-trimethoxysilylpropylester (Silane)	
Verwendung	Bonding agent
Identifikation / CAS-Nr.	2530-85-0
Dichloro – [2,2] – paracyclophane for the deposition of parylene C	
Use	Coatings
Identification / CAS no.	28804-46-8
Specification	Purity >=98.5%
[2,2] – paracyclophane for the deposition of parylene N	
<i>Use</i>	Coatings
<i>Identification / CAS no.</i>	1633-22-3
<i>Specification</i>	Purity >=99%
Octafluoro – [2,2] – paracyclophane for the deposition of parylene F-VT4	
<i>Use</i>	Coatings
<i>Identification / CAS no.</i>	1785-64-4
<i>Specification</i>	Purity >=98%
Tetrachloro – [2,2] – paracyclophane for the deposition of parylene D	
<i>Use</i>	Coatings
<i>Identification / CAS no.</i>	30501-29-2
<i>Specification</i>	Purity >=85%



Wash hands after handling. Wash contaminated clothing before wearing it again.

Avoid contact with the eyes, skin and clothing.

Observe the supplied safety datasheets!


5 Training and instruction of the operating company's personnel

The instruction of personnel can be carried out by Diener electronic GmbH & Co. KG in the course of commissioning.

Operation of and work on the system only by instructed and adequately qualified personnel is a condition for proper use.

If the owner/operating company for the system and/or the personnel changes, instruction must be carried out according to the table that follows.

All instruction must be documented in writing.

	<p><i>Operation and working directly on the system components, for example transportation, setup and connection, setting up, inspection, cleaning and the maintenance of system components require specialised technical knowledge.</i></p> <p><i>Therefore, all work may only be carried out by qualified personnel that:</i></p> <ul style="list-style-type: none">• <i>Has sufficient expertise according to the task and/or the required education and can provide documentation</i>• <i>Has knowledge of the "general accident prevention regulations", the special safety regulations required for the task and the occupational safety and health regulations</i>• <i>Is adequately qualified for working in the danger areas, or instructed and supervised by a competent person</i>• <i>Has been instructed by Diener electronic GmbH & Co. KG with written documentation of said instruction.</i> <p><i>This is a prerequisite for correct and safe operation and for transportation, installation, connection, setting up, inspection, cleaning and maintenance work on the system and/or system components, and for the safe operation of the system.</i></p> <p><u><i>Special requirements apply for example:</i></u></p> <ul style="list-style-type: none">• <i>For the disassembly, transportation, setup and connection of the system</i>• <i>For operation according to the processes defined in PRC</i>• <i>For changing setting parameters</i>• <i>For the correct handling and use of the substances that are used</i> <p><i>For changing processes or setting up new processes (for example new substances, work pieces etc.), insofar as this has been approved by Diener electronic GmbH & Co. KG in writing</i></p>
---	---

Continued



These activities may only be carried out by personnel with corresponding qualifications and training.

Personnel without these qualifications is not permitted to work on the system!

The following are differentiated:

- Competent person
- Licensed electrician, permitted to work on the electrical installation
- Operator
- Assistant for loading and unloading the product carriers and for cleaning

The employed personnel has to be familiar with the language (agreed language according to the specification etc.) of the program interfaces and the operating manual.

The responsibility for ensuring that only personnel with sufficient technical expertise for the respective activities is employed rests with the superiors of the respective employees, and with the operating company's safety representative.

5.1 Requirements for personnel



Note the information in the sections

- “Intended use”
- “General safety and accident prevention instructions”
- “General description”!

	Personnel	Tasks	Requirements	Instruction by
FK1	Competent person	<ul style="list-style-type: none"> - Operating the controller/PRC - Changing setting parameters within the defined limit values - Straightforward troubleshooting according to PRC messages Inspections and maintenance - Supervision of the system and all work in the protection zones; automatic operation, setting up, changing substances 	<p>Education/training for operation of the controller/PRC, and the functions and correct operation of the overall system, its components and assemblies.</p> <p>The controller/PRC operator must have sufficient expertise and experience, and has to be experienced in handling the controller/PRC so the system can be operated safely.</p> <p>The operator must be able to draw the correct conclusions from the operating, fault and error messages, and to initiate suitable measures.</p>	Diener electronic GmbH & Co. KG
FK2	Competent person	<ul style="list-style-type: none"> - Handling dimers and parylene - Handling liquid nitrogen. 	<p>Training/knowledge/instruction regarding the hazards and the safety and accident prevention measures etc. for working with and handling hazardous substances, e.g.</p> <ul style="list-style-type: none"> • Knowledge of the contents of the safety datasheets for the gases/substances used • Required personal protective equipment and accident prevention measures • Technical Guideline for the Handling of Hazardous Materials (TRGS) 509 – storage of hazardous substances in non-portable containers • Technical Guideline for the Handling of Hazardous Materials (TRGS) 510 – storage of hazardous substances in portable containers • Technical Guideline for the Handling of Hazardous Materials (TRGS) 800 – fire protection measures 	<p>Competent person of the operating company</p> <p>Safety representative</p> <p>Competent person for hazardous substances</p>

	Personnel	Tasks	Requirements	Instruction by
FK3	Qualified personnel Technicians Engineers	<ul style="list-style-type: none"> - Setting up new processes/programs for approved substances, work pieces etc. within the defined limit values 	<p>Training/education by Diener electronic GmbH & Co. KG; e.g.</p> <p>Note the information in the sections</p> <ul style="list-style-type: none"> • "Intended use/Process development" • "Intended use/Changing setting parameters, programs etc. in the system's controller" <p>-</p>	Diener electronic GmbH & Co. KG
FK4	Technicians Engineers	<ul style="list-style-type: none"> - Selecting new processes 	<p>Training regarding the hazards and the safety and accident prevention measures etc. for working with and handling hazardous substances.</p> <ul style="list-style-type: none"> • Knowledge of regulations, standards and technical rules, e.g. Technical Guideline for the Handling of Hazardous Materials (TRGS) 407 – working with gases • TRGS 400 – hazard assessment for working with hazardous substances <p>Note the information in the sections</p> <ul style="list-style-type: none"> • "Intended use/Process development" • "Intended use/Changing setting parameters, programs etc. in the system's controller" <p>-</p>	The operating company has to verify that the personnel has sufficient qualifications or ensure that these activities are only carried out by adequately qualified personnel!
B	Operator	<ul style="list-style-type: none"> - System operation <ul style="list-style-type: none"> - In automatic mode - Without changing setting parameters etc. - Loading and unloading after the end of the process - Restarting automatic mode in the process after loading 	<p>Instruction so that all work can be carried out safely and properly.</p> <p>Imparting the safety and hazard notices is mandatory.</p> <p>Supervised by the competent person.</p>	Instructed, qualified personnel of the operating company

	Personnel	Tasks	Requirements	Instruction by
H1	Assistant	<ul style="list-style-type: none"> - Handling hazardous substances, e.g. <ul style="list-style-type: none"> o Storage and transportation o Cleaning up discharged substances - etc. 	<p>Instruction regarding the hazards and the safety and accident prevention measures etc. for working with and handling hazardous substances, e.g.</p> <ul style="list-style-type: none"> • Knowledge of the contents of the safety datasheets for the gases/substances used • Required personal protective equipment and accident prevention measures • Technical Guideline for the Handling of Hazardous Materials (TRGS) 509 – storage of hazardous substances in non-portable containers • Technical Guideline for the Handling of Hazardous Materials (TRGS) 510 – storage of hazardous substances in portable containers • Technical Guideline for the Handling of Hazardous Materials (TRGS) 800 – fire protection measures 	<p>Competent person of the operating company</p> <p>Safety representative</p> <p>Competent person for hazardous substances</p>
H2		<ul style="list-style-type: none"> - Cleaning the coating system - Refilling liquid nitrogen - Cleaning up/disposing of auxiliary materials 	<p>Instruction regarding the hazards and the safety and accident prevention measures</p> <p>Knowledge of the proper handling of the substances contained in the system, especially the hazardous substances.</p> <p>Knowledge of the accident prevention and safety regulations/content of the safety datasheets</p>	<p>Qualified personnel of the operating company and supervision</p>
For transportation, connection/disconnection, inspection, maintenance, repairs				
IH1	Competent person	<ul style="list-style-type: none"> - General inspections and maintenance tasks <p>Basis: Operating and maintenance manual for the system, and/or operating and maintenance manuals of the component manufacturers</p>	<p>Qualified personnel with practical experience for inspection/maintenance; instruction so that all work can be carried out safely and properly.</p> <p>Imparting the safety and hazard notices is mandatory.</p>	<p>Diener electronic GmbH & Co. KG</p>

	Personnel	Tasks	Requirements	Instruction by
IH4	Licensed electrician	- Connecting/disconnecting the system and its components	Recognised training as a licensed electrician	
IH5	Competent person IH1, IH2, IH3 Licensed electrician IH4	- Carrying out decommissioning < 6 months Duration or recommissioning after decommissioning < 6 months Duration	Instruction so that all work can be carried out safely and properly. Imparting the safety and hazard notices is mandatory. Note the information in the section "Intended use/Decommissioning the system". ATTENTION! Instruction must not be more than 2 years ago.	Diener electronic GmbH & Co. KG



The instruction of qualified personnel, operators and assistants as well as its content must be documented and kept up to date.

Instruction records have to be retained and submitted on request.

5.2 Initiating/coordinating and carrying out measures in case of alarms



One or more persons appointed by the operating company who are able to assess the situation in case of an alarm/fault and initiate the required measures have to be present.

The person(s) must supervise the system when personnel is present in the protection zones!

Initiating and coordinating measures has to be simulated using concrete case studies.

5.3 Passwords/keys

Trained and instructed personnel is assigned a password in accordance with the level of training for operating the system.

The password structure is hierarchical so that only functions according to the level of training can be activated.

Passwords and keys must be kept secure and must not be freely accessible!

6.0 Commissioning, transportation, setup, disassembly

6.1 Safety instructions for disassembly, transportation, setup and connection



Before commencing work, note the information in the sections

- *“Intended use”*
- *“General safety and accident prevention instructions”*
- *“General description”*
- *“Technical data”*
- *“Training and instruction of the operating company’s personnel”*
- *“Operation”*
- *“Maintenance”*

and the supplied

- *operating and maintenance manuals of the component manufacturers*
- *plans and schematics, and*
- *safety datasheets.*

Specialised technical knowledge is required for disassembling, transporting, installing, connecting, commissioning and decommissioning the system. Therefore, all work may only be carried out by instructed, qualified personnel.

DANGER!

Having work performed by unauthorised personnel without sufficient technical knowledge can lead to significant damage to the system and its components, and to serious injuries!

DANGER!

Failure to observe the hazard and safety notices in the sections of this operating and maintenance manual and in the documentation of the component manufacturers can lead to hazards and serious injuries!



The applicable national laws and regulations that are relevant for the work must be followed and take precedence over our notices.

Compliance with the safety and accident prevention notices is the responsibility of the operating company.

- Depending on the activities to be completed, corresponding personal protective equipment (such as protective gloves, safety footwear, hard hat, safety goggles etc.) must be used.
- The system has to be disconnected from the components such as the pump as specified.
- All system components that can move have to be brought into a safe position and adequately secured mechanically with wire, wedges etc. in addition as required.
- System components with sharp edges have to be adequately covered (padding material).
- The system cabinet may only be lifted at the specified points!
- The work equipment that is used (hoisting equipment, lift truck etc.) has to be adequately dimensioned for the loads being transported.
- Transporting an unpackaged system with a crane and cables/straps etc. is not permitted due to the high risk of damage.



ATTENTION!

There is a risk of tipping due to the system's centre of gravity!

- Before and after transportation, suitable steps must be taken to secure the goods to be conveyed against shifting, tipping and turning, for example by placing non-skid mats onto the forks of the lift truck, using straps and wooden securing members, screwing to the pallet etc.
- Transportation must be carried out slowly, in a controlled manner and without colliding with other objects.
- Only use tools and load handling devices in flawless condition!



ATTENTION!

Improper transportation of systems and system components leads to a risk of damage and serious injuries!

DANGER!

NEVER reach under the goods to be conveyed with your hands or step under suspended loads!

Adequately secure the goods to be conveyed!

Maintain adequate safety distances when rotating/manoeuvring the goods to be conveyed in confined spaces!

6.2 Commissioning and instruction of the operating company

Commissioning is carried out in the facilities of Diener electronic GmbH & Co. KG.

This includes setting up and connecting the required components such as the pump.

Inspections are carried out before or during commissioning, such as:

- Safety inspection of the electrical installation.
- Inspection of the safety devices.
- A test run is also carried out with the testing of all system functions.
- The processes are run and optimised on request (process development).

In the course of commissioning, qualified personnel of Diener electronic GmbH & Co. KG instructs the qualified personnel of the operating company (also see the section "Training and instruction of the operating company's personnel").

Commissioning can be carried out at the customer's facility on request.

Inspections

The inspections listed below are performed during commissioning.

Inspections that are designated as such have to be performed in case of relocation.

If the inspection results differ from the target state, the system must not be put into operation!

Note the information in the section "Recommissioning after decommissioning"!

No	Inspection	Inspections to be carried out after relocation	
			Comments
P1	<ul style="list-style-type: none"> - Damage inspection of all equipment that may be damaged during transportation, such as: <ul style="list-style-type: none"> - Table housing - Cables and lines - Operator panel, indicator lamp - Pump - Seals - Coating chamber viewing window, installed safety guards if applicable - System accessories 	X	Visual inspection
P2	<ul style="list-style-type: none"> - No foreign objects/contamination/damage/loose components etc. inside the table housing, correct installation/implementation and mounting of the components 	X	Visual inspection of the interior of the system cabinet
P3	<ul style="list-style-type: none"> - Inspection for proper mounting 	X	Visual inspection of mounting/pump setup etc.
P4	<ul style="list-style-type: none"> - No sharp edges, cutting points etc. on the components 	X	Visual inspection for damage
P5	<ul style="list-style-type: none"> - Inspection of the components according to the manufacturer's instructions 	X	Pump
P6	<ul style="list-style-type: none"> - Inspection of the installation location <ul style="list-style-type: none"> - Adequate accessibility - Protection of the system components against damage - Stability/mounting (pump etc.) 	X	Visual inspection
P7	<ul style="list-style-type: none"> - Correct connection of the components and system, for example: <ul style="list-style-type: none"> - Pump (gas ballast, N2 flushing) - Connection points on the system - Filters, discharge of the exhaust air to the outdoors - Effectiveness of the extraction system – if needed 	X	Visual inspection by competent person and licensed electrician

Table continued

No.	Inspection	Inspections to be carried out after relocation	
			Comments
P8	- Protected installation and correct attachment of electrical lines (no tripping, chafe and/or pinch points)	X	Visual inspection
P9	- Electrical engineering inspections according to DIN EN 60204-1	X	Visual inspection by a licensed electrician
P10	- Vacuum system tightness and pressure losses Comment: The leakage rate is measured during the test run.	X	Determination of the leakage rate via PRC; in case of deviations that are not allowable, contact Diener electronic GmbH & Co. KG.
P11	- Correct settings	X	Review of the settings in PRC
P12	- Functioning of the emergency stop chain (emergency stop buttons; door switches)	X	Test and/or display via PRC
P13	- Functioning venting	X	Test and/or display via PRC
P14	- Protective devices/covers etc. are correctly and fully mounted	X	Functioning of the system cabinet door
P15	- Functioning of annunciators and alarm devices	X	Test and/or display via PRC
P16	- Checking for the development of oscillations and vibrations that may affect functioning and/or stability	X	Selection of the installation location so that no vibrations are transferred from the production environment
P17	- Noise development and effectiveness of sound insulation	X	Checking the noise level
P18	- Correct labelling, e.g. hazard notices, component designations	X	Visual inspection
P19	- Conformity of the system with the documentation	X	Visual inspection
P20	- Inspection of the pneumatics/compressed air supply according to DIN EN 4414	X	Visual inspection of the lines, maintenance unit etc.

Inspection of the controller/programs

The correct and safe functioning of the programs is tested in the course of commissioning and/or the test runs of the system functions and processes.

Defective programs/modules are modified.

Practical test of the logic, for example:

- Correct functioning of the processes
- Correct functioning of the safety devices
- Correct limit values
- Protection of the limit values and programs/modules that may not be changed by the operating company
- etc.

Test run of the system functions

System parameters are set and optimised during the test run of the system functions.

The functions of the system and the emergency functions are tested in the process.

A test run includes inspecting the vaporiser/pyrolysis system, vacuum generation and exhaust air system for leak tightness, and determining the leakage rate via the PRC output value.



The test reports are found in the system documentation.

Test run, processes

Note the information in the section “Intended use/Process development”.

The process and setting parameters are configured and optimised for the processes delivered by Diener electronic GmbH & Co. KG.

The set limit values are checked.

Approval

After ensuring that the system works properly and can be operated safely, the acceptance record/commissioning report is issued and the system is approved by the customer.

6.3 Transportation, setup/installation of the system, disassembling the system

Since the system is portable, the operating company can change the installation location.

The system needs to be dissembled in order to relocate/install it in a different location or to put it into storage.

Disassembling, reinstalling and connecting the components is carried out

- **by instructed, qualified personnel of the operating company,**
- **based on the supplied documentation of Diener electronic GmbH & Co. KG and the component manufacturers**
- **on the basis of the existing circuit diagrams and schematics.**



We recommend engaging Diener electronic GmbH for the initial installation and subsequent installations in your facility.

Diener GmbH & Co. KG assumes no warranties and/or liability for defects and direct or indirect damages caused by transportation, for example by errors during setup, connection and commissioning, and during disassembly of the system and its components by the operating company.

DANGER!

Failing to follow proper procedures leads to hazards and a risk of associated injuries!

Always used the required protective equipment!

6.3.1 Preparing for transportation/disconnecting the assemblies

Requirements

(Also see the section “Decommissioning the system – recommissioning”)

- There are no hazardous substances in the system; the cooling trap has been emptied
- The system has been cleaned
- All loose components such as product carriers etc. have been removed

For transportation, the system has to be separated into the following assemblies:

- housing
- Cooling trap
- Pump
- Filter
- Hose lines
 - Cabinet – pump
The hose stays connected to the system and is only disconnected on the pump.
Protect the hose against damage for transportation, for example by attaching it to the system cabinet etc.
 - Pump – exhaust air filter
 - Exhaust air filter if applicable – discharge from the room
- The indicator lamp may have to be disassembled (only by a trained, licensed electrician)

Please note:

- All open connections have to be closed
- Close doors and secure them if necessary
- Protect cables and lines
- Remove all loose parts from the chamber or secure them



ATTENTION!

Pad all connections for the display and control elements so they cannot be damaged during transportation!

6.3.2 Packaging

Protection of the system components/assemblies against damage during transportation.

Packaging under consideration of the applicable requirements, such as the shipping method/route, ambient conditions etc., for example protection against external forces, dirt, wetness/condensation etc.

Pad parts of the system that may get damaged or cause injuries during transportation.

Packaging recommendations

Table top unit	On a pallet in a sturdy crate; sealed in welded film and/or with desiccant if necessary
Accessories	In crates, padded as needed.

6.3.3 Lifting/transportation with lift truck

The system cabinet may only be lifted with a forklift or lift truck. There is a risk of damage when using cables etc.

- The cover plates on the bottom of the system cabinet have to be removed before supporting it from below.
- ***The system housing has to be secured against tipping before and while lifting and during transportation.***

6.3.4 Transport position and transportation safety devices

The table housing may only be transported upright.

Recommended transportation safety devices

- Use the supplied crate for the system.
- Secure the system to prevent shifting. For example, use wooden blocks or other filler material.
- The vaporiser door is kept closed by guard control in the door. Secure the chamber door in addition, for example with tape.

6.3.5 Special transportation and storage instructions

Transportation must be carried out under consideration of the applicable national regulations and laws for accident prevention and transportation.

Choose the packaging, means of transport and route so that the system cannot be damaged by external influences during transportation, such as heat, high relative humidity, vibrations/impacts, invasion of rodents/insects etc.

The requirements in the section "Technical data/Ambient conditions and installation location" apply for storage and transportation.



ATTENTION!

The system components must not be exposed to vibrations/shocks during transportation/shipment!

Vibrations/shocks can damage system components, such as parts of the electronics/ electrical engineering components.

6.3.6 Internal transportation

To change the installation location internally within the operating establishment, the system cabinet can usually be transported using a lift truck. Make sure that the housing cannot tip.

Units mounted on casters can be disconnected and rolled to a new installation location.

Requirements

- Only in the fully disassembled state (see "Preparing for transportation/Disconnecting the assemblies")
- Transport route free of barriers
- Parts of the system padded as needed





ATTENTION!

When transporting the system cabinet, there is a risk of tipping due to the unfavourable application of force!

The transportation route has to be free of obstacles so the housing cannot tip!

6.3.7 Installation location

Also see the section "Recommissioning after decommissioning"

	<p><i>The system was designed and built specially for the required functions and ambient conditions.</i></p> <p><i>Changes/deviations from the concept may lead to hazards regarding the functioning and safety of the system.</i></p>
	<p><i>Note the information in the section "Technical data".</i></p>

A suitable installation location for the system is chosen by the operating company.

The following conditions for the system installation location have to be met and/or the installation location must be chosen so that:

- It is level and free of obstacles.
 - The system cannot be damaged, e.g. setup on traffic routes, influences of adjacent production areas etc.
 - All work locations are accessible and there is sufficient freedom of movement to work safely.
 - Adequate lighting, ventilation and if applicable extraction is provided.
 - Exposure to electrical interference sources,
 - vibrations and oscillations,
 - contamination of the supply air and ambient air,
 - static and dynamic loads, and
 - sources of heat, cold and/or moisture
- is prevented for the system and its components etc.!

Exhaust air from the system always has to be discharged unimpeded to the outdoors.

The system must be operated under normal conditions (permissible temperature and relative humidity, see the section "Technical data"). The system is not designed for operation in a potentially combustible and/or explosive atmosphere.

If the working environment for the system is changed, for example in case of conversions or when equipment is installed in the vicinity of the system, the operating company has to verify that the installation conditions continue to be met and whether protective measures for the system are required.


- When hazardous substances are used, the operating company has to review whether suitable extraction at the connection points is required.

6.3.8 Setup


The system and its accessories must be set up so that all operating and maintenance points are accessible without hazards.

The system and its components must be set up so that:


- Sufficient working space is available
- Tripping and impact points are avoided
 - The pump is set up as close as possible to the system
 - Lines are covered, for example with bridges for walking/driving over them
 - Strain relief is installed where applicable

	<p>DANGER TO LIFE! <i>Tearing off electrical lines or damaging connections, for example due to tripping points, can pose a DANGER TO LIFE!</i></p>
---	---

- The possibility of damage is excluded, for example due to walking on components, setting loads onto lines etc.
- Good accessibility to all working and maintenance points is assured
- The system is in the line of sight
- The fans in the system cabinet are not obstructed

	<p>ATTENTION! <i>All casters on the system cabinet always need to be locked! Only unlock the casters when transporting the system.</i></p>
---	---

Inspections

	<p>ATTENTION! <i>In the course of installation, the system and its components have to be inspected for damage (see the sections "Inspections" and "Recommissioning after decommissioning")!</i></p>
---	--

6.4 Connecting the system

Requirements

- The system is set up in the intended location
- The pump has been set on the floor

Procedure

1. Connect the pump to the system
2. Connect the filter to the pump
3. Connect the system to the mains network
4. Turn the pump master switch ON
5. Turn the master switch ON

Connect the pump to the system

Procedure

1. Inspect the pump for damage.
2. Remove the cover caps from the pump connections on the pump and system.
3. Install the gasket between the corrugated hose and pump input. Secure the corrugated hose on the pump with a clip.
4. Install the gasket between the exhaust gas filter and pump output. Secure the exhaust gas filter on the pump with a clip. With a dry running pump, the filter is not needed and the exhaust gas hose can be connected directly to the pump output.
5. Check the oil level and top it up if required (see the documentation of the pump manufacturer).
6. Connect the power supply for the pump to the system (plug).
7. After completing all work before powering up the system:
 - Turn on the master switch on the pump

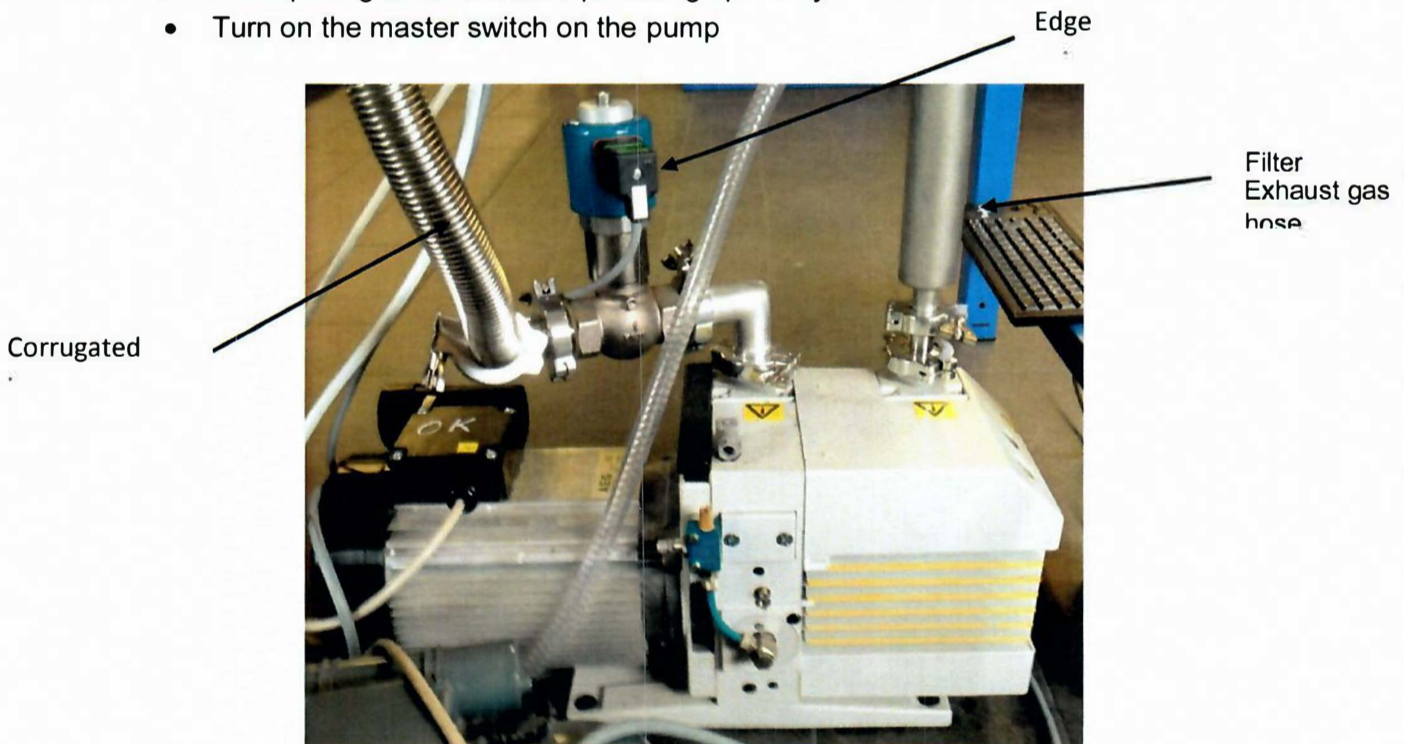


Figure 15: Vacuum pump connections (pump may vary).

Electrical connection

The system is connected to the mains network with a plug.
Also see the section "General description/Master switch"; "Technical data".

Network connections, USB

There are additional connections on the connection panel on the right side and below the PC, e.g. for an external network, USB

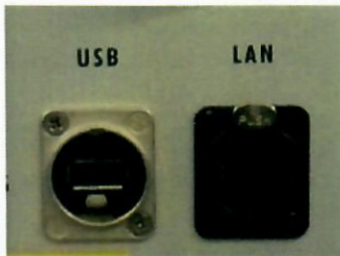


Figure 16: Network connections


Designation	Function
USB	For saving programs and data
Network connection	Permits access to the system using TeamViewer or similar software, and sending data to internal computers over a LAN connection, e.g. for: <ul style="list-style-type: none">- Remote maintenance- Data storage

6.5 Decommissioning the system – recommissioning

Also see the section “Preparing for transportation/disconnecting the assemblies”.


If the system will not be used for an extended period of time, or to transport it to a different location, precautions have to be taken so the system components and assemblies are not damaged due to the shut-down.

The instructions of the component manufacturers in the supplied documentation have to be observed.

	<p><i>Within the guarantee/warranty term, decommissioning may only be carried out by the Service department of Diener electronic GmbH & Co. KG.</i></p> <p><i>Outside the guarantee/warranty term, decommissioning may only be carried out by qualified personnel instructed by Diener electronic GmbH & Co. KG with written documentation of said instruction. Instruction must not be more than 2 years ago. Decommissioning by the operating company excludes any liability of Diener electronic GmbH & Co. KG.</i></p> <p><i>Note the information in the sections “Intended use/Decommissioning the system” and “Training and instruction of the operating company’s personnel”!</i></p>
---	--

The following tasks among others have to be completed for decommissioning:

- Evacuation of all substances contained in the system.
 - Backing up the system and process data.
 - Shutting down/turning off PRC.
 - Pump switch “OFF”.
 - Master switch “OFF” and secured to prevent switching it on unintentionally.
 - Electrical connection cable (plug) disconnected from the mains network.
 - Check whether the housing is closed.
 - Remove product carriers and clean the system (see the section “Maintenance/cleaning”).
 - Perform decommissioning and preservation tasks on the pump (see the operating and maintenance manual of the pump manufacturer).
 - Clean the exterior of the system and protect it against contamination, e.g. by covering it and closing connections/covers.
 - Install and securely attach all covers.
 - Apply visible and permanent notices on the system indicating that it has been decommissioned and that a thorough prior inspection and possibly repeated inspections are required prior to recommissioning.
- Visibly and permanently mark the system with the decommissioning date.

	<p><i>The system must be kept within the allowable temperature range while it is decommissioned!</i></p> <p><i>Decommissioning must be carried out so that the formation of condensate (condensation) in the housing and on the electrical components is excluded.</i></p>
---	--

Recommissioning after decommissioning

Also see the section "Installation location, setting up and connecting the system".

For recommissioning the system, the changes made for decommissioning have to be reversed.

In doing so, the system and all its components must be thoroughly inspected for damage and the prescribed inspections according to the section "Inspections" have to be carried out.

The condition of all seals must be checked in addition.



Recommissioning the system after decommissioning within the guarantee/warranty term and after a shut-down of more than 6 months may only be carried out by the Service department of Diener electronic GmbH & Co. KG.

Recommissioning after a shut-down of less than 6 months outside the guarantee/warranty term may only be carried out by qualified personnel trained by Diener electronic GmbH & Co. KG with written documentation of said instruction. Instruction must not be more than 2 years ago. Establishing and verifying that the system can be operated safely and properly is required.

Recommissioning by the operating company excludes any liability of Diener electronic GmbH & Co. KG.

Note the information in the sections "Intended use/Decommissioning the system" and "Training and instruction of the operating company's personnel"!





ATTENTION!

Repeated inspections depending on the duration of the shut-down are mandatory before recommissioning!

*Please contact us to coordinate the proper procedure.
This is essential to ensure safe recommissioning.*

7.0 Setting up


7.1 Safety instructions for setting up



 	<p><i>Before commencing work, note the information in the sections</i></p> <ul style="list-style-type: none">• <i>“Intended use”</i>• <i>“General safety and accident prevention instructions”</i>• <i>“General description”</i>• <i>“Technical data”, “Approved processes, gases and substances”</i>• <i>“Training and instruction of the operating company’s personnel”</i>• <i>“Initial installation and commissioning, transportation, setup, decommissioning, disassembly”</i> <p><i>DANGER!</i> <i>Having work performed by unauthorised personnel without sufficient technical knowledge can lead to significant damage to the system and its components, and to serious injuries!</i></p>
--	---

7.2 Overview of processes for setting up


- Load the work pieces into the chamber
- Fill the cooling trap
- Fill the vaporiser


7.3 Setting up/loading work pieces

	<p>For information about the requirements for work pieces and work piece carriers, see the section "General description/General requirements for the work pieces and product carriers".</p> <p>Requirements for the installation location and ambient conditions are found in the sections "Intended use", "Technical data" and "Transportation/setup".</p>
---	---


No.	Description and notices
1.	<p>Initial situation/prerequisites</p> <ul style="list-style-type: none"> • The correct program is loaded in PRC and all parameters are set correctly, the previous program has ended. The system is in standby mode (master switch "ON" + PRC "ON", main picture). • All components have cooled so that working safely is possible. • The coating chamber and cooling trap are clean.
2.	<p>Procedure</p> <ul style="list-style-type: none"> • Remove the loading rod. • Load the perforated discs. • Load the work pieces on the perforated discs. • Load the carousel into the coating chamber. • Close the door, ensuring that the door is in contact with the chamber and the switch on the chamber door is activated.
	<div style="display: flex; flex-direction: column; gap: 10px;"> <div style="display: flex; align-items: flex-start;">  <div style="margin-left: 10px;"> <p>ATTENTION! <i>Make sure that the work pieces do not touch the chamber wall!</i></p> </div> </div> <div style="display: flex; align-items: flex-start;">  <div style="margin-left: 10px;"> <p><i>Sharp edges may be encountered during handling/working due to the products/functions! Risk of cuts!</i></p> <p><i>Wear protective gloves!</i></p> </div> </div> </div>


7.4 Filling the cooling trap

	Information on the approved gases/substances is found in the section "Process development – processes and process substances that are used/permitted" and the section "Commissioning and instruction of the operating company".
---	---


No.	Description and notices
1.	<p>Initial situation/prerequisites</p> <ul style="list-style-type: none"> • The cooling trap was cleaned after the last coating cycle. • A pressure of 0.1 mbar or less has been reached. • The process is started.
2.	<p>Procedure</p> <p>Fill the cooling container with liquid nitrogen.</p>
	<div style="display: flex; align-items: center;">  <p>ATTENTION! Liquid nitrogen can cause burns! Observe the safety datasheets and use the required personal protective equipment!</p> </div>


7.5 Filling the Silane evaporator

	Information on the approved gases/substances is found in the section "Process development – processes and process substances that are used/permitted" and the section "Commissioning and instruction of the operating company".
---	---


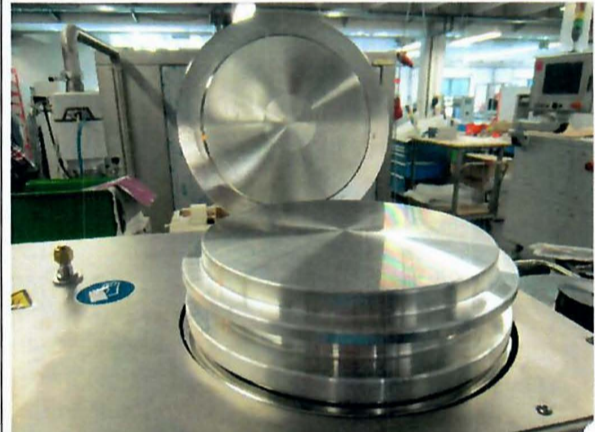

Nr.	Beschreibung und Hinweise
1.	<p>Initial situation/prerequisites</p> <ul style="list-style-type: none"> • System is in stand-by. Vaporizer has about 20°C or max. 40°C • For Start with Silane coating min 1 Process without Silane has to be done.
2.	<p>Procedure</p> <p>Filling the Silane pipe with Silane trough the 14 mm Swagelok connector using a syringe.</p>
	<div style="display: flex; align-items: center;">  <p>Attention! Observe the safety datasheets and use the required personal protective equipment!</p> </div>


7.6 Filling the vaporiser

	<p>The substances approved for the system are found in the section "Technical data/Process development".</p>
---	--

No.	Description and notices
1.	<p>Initial situation/prerequisites</p> <ul style="list-style-type: none"> • The vaporiser is at room temperature or no higher than 40 °C • The seals on the vaporiser door are clean • The stainless steel container has been cleaned
2.	<p>Procedure</p> <ul style="list-style-type: none"> • Line the container with aluminium foil • Add the required quantity of dimer • Make sure that no dimer projects beyond the edge on the opening side of the container • Load the container into the vaporiser, ensuring that it is not in direct contact with the door (optimum distances to door approximately 0.5 to 1 cm) • Close the door and lock it with the guard control
	<div style="display: flex; align-items: center;">  <div> <p>ATTENTION! <i>Use caution when handling dimer.</i></p> <p><i>Avoid contact with the eyes and do not inhale the dust.</i></p> <p><i>Observe the safety datasheets and use the required personal protective equipment!</i></p> </div> </div>



7.7 extend/shorten the chamber

Nr.	Beschreibung und Hinweise	
1.	Initial situation/prerequisites <ul style="list-style-type: none">• The correct program is loaded in PRC and all parameters are set correctly, the previous program has ended. The system is in standby mode (master switch "ON" + PRC "ON", main picture).• All components have cooled so that working safely is possible.• The coating chamber and cooling trap are clean.	
2.	Procedure chamber extension: <ul style="list-style-type: none">• Remove the baffle plates• Place the longer baffle plates in the chamber• The chamber extension cover is placed over the baffle plates and located in a centric way on the Viton gasket	
	 A photograph showing a stainless steel chamber with its lid open. Inside, several long, curved baffle plates are visible, arranged in a circular pattern. The background shows a workshop with shelves of tools.	 A photograph showing the same stainless steel chamber with its lid open. A large, circular, multi-layered metal cover is placed over the baffle plates. The background is the same workshop.
	 <p>Attention! <u>Never</u> use the long baffle plates with the integrated cover! Only use the additional cover!</p>	


3.	<p>Procedure shorten the chamber:</p> <ul style="list-style-type: none"> • Remove the baffle plates • Place the short baffle plates in the chamber • Use the integrated cover
	<div style="display: flex; align-items: center;">  <div> <p>Attention!</p> <p><u>Never</u> use the baffle plates with the additional cover!</p> <p>Only use the integrated cover!!</p> </div> </div>

8.0 Operation – controller/PRC


8.1 Safety instructions for operating the system

<div style="text-align: center; margin-bottom: 20px;">  </div> <div style="text-align: center;">  </div>	<p><i>Before commencing work, note the information in the sections</i></p> <ul style="list-style-type: none"> • “Intended use” • “General safety and accident prevention instructions” • “General description” • “Technical data” • “Training and instruction of the operating company’s personnel” • “Commissioning/transportation/setup” • “Setting up” • Safety datasheets. <p><i>Operating the system and its components requires specialised technical knowledge. Therefore, all work may only be carried out by instructed, qualified personnel.</i></p> <p>DANGER! <i>Having work performed by unauthorised personnel without sufficient technical knowledge can lead to significant damage to the system and its components, and to severe injuries!</i></p> <p>DANGER! <i>Failure to observe the hazard and safety notices in the sections of this operating and maintenance manual and in the documentation of the component manufacturers can lead to hazards and serious injuries!</i></p>
--	--

Programming, setting up/changing processes and settings – general requirements

	<p>DANGER!</p> <p><i>Programming and setting up processes, and setting and adjusting process parameters, requires extensive technical expertise regarding the process substances, materials and allowable ambient conditions and process parameters!</i></p> <p><i>Without this knowledge, or if knowledge is insufficient, severe incidents may occur with serious injuries and possibly death.</i></p> <p><i>Therefore, this work may only be carried out by personnel with sufficient, documented expertise and adequate experience with handling the system and its programs, and written instruction from Diener!</i></p> <p><i>Instruction must be repeated at least every 2 years.</i></p>
---	--

Safe system state

	<p><i>Before starting production (automatic mode), verify that the system has been set up correctly (see the section "Setting up") and that the system and its components are in a safe state free of errors.</i></p> <p><i>All safety and protective devices must be present and fully functional, and must never be bypassed or deactivated.</i></p>
--	--

8.2 Controlling the system/parylene reactor control (PRC)

System operation is fully automatic, which means continuous operation or monitoring is not required. No changes have to be made in automatic mode.

The operator workstation is at the system operator panel (also see the section "General description/Workstations").

The system is controlled via the screen.

Process steps:

Regardless of the controller type, there are **5 process steps for all systems:**

1a.	Evacuation	The chamber is evacuated to the configured base pressure usually 0.01 mbar
1b.	Silanisation (optional)	Silane evaporation pipe is heated. After all Silane is evaporated and the base pressure (usually 0.01 mbar) is reached again, next process is started
2.	Heating	The pyrolysis oven (720 – 750 °C – depending on dimer type), heating on Pirani sensor (130 °C). Once the aforementioned components have reached their set temperature, the door of the vaporiser is heated to its set value (170 °C).
3.	Coating process	Once all set values for evacuation and the heating phase have been reached, the coating process starts. The vaporiser is heated using pressure control and the actual value that is measured with the heated Pirani pressure sensor on the vacuum chamber. Vaporisation of the dimer begins at around 80 °C. The configured maximum heating temperature or end temperature of the vaporiser is reached when the dimer is used up. Then the chamber pressure drops to a pressure below the base/start pressure.
4.	Cooling the vaporiser	The pump runs and the vaporiser with door is cooled to approximately 40 °C.
5.	Wait time and venting	A wait time (usually 30 minutes) for venting the chamber can be set since it is advantageous for the coating quality to let the parylene rest in the vacuum for some time after the process.



8.3 Operation




The complete documentation on how to control your coating system type P6/P8 with the serial number 120159 can be found attached to this operating manual.

9.0 Troubleshooting/inspection/cleaning and maintenance/repair



9.1 Safety instructions for troubleshooting/inspection/cleaning/maintenance/repair

	<p>Before commencing work, note the information in the sections</p> <ul style="list-style-type: none">• “Intended use”• “General safety and accident prevention instructions”• “General description”• “Technical data”• “Training and instruction of the operating company’s personnel”• “Commissioning”• “Operation” <p>and the supplied</p> <ul style="list-style-type: none">• operating and maintenance manuals of the component manufacturers• plans and schematics, and• safety datasheets. <p>Specialised technical knowledge is required for troubleshooting, inspection, cleaning, maintenance and repairs on the system and/or its components. Therefore, all work may only be carried out by instructed, qualified personnel.</p> <p>DANGER! <i>Having work performed by unauthorised personnel without sufficient technical knowledge can lead to significant damage to the system and its components, and to severe injuries!</i></p>
	<p>DANGER! <i>Failure to observe the hazard and safety notices in the sections of this operating and maintenance manual and in the documentation of the component manufacturers can lead to hazards and serious injuries!</i></p>

Repairs and maintenance work



	<p><i>Repairs and maintenance work may only be carried out by employees of Diener electronic GmbH & Co. KG or, subject to approval, by the component manufacturer or other specialist firms approved by Diener electronic GmbH & Co. KG in writing!</i></p>
---	---

Safe system state


 	<p>Before commencing troubleshooting, inspection, cleaning, maintenance and repair work, verify the following:</p> <ul style="list-style-type: none">• That the system and its components are in a safe and error-free state <p>Or, in case of faults, defects, etc.:</p> <ul style="list-style-type: none">• What the faults, defects etc. are• What safety and accident prevention steps have to be taken before starting the work, and how to complete the work safely and properly <p>For troubleshooting, inspection, cleaning, maintenance and repair work, the master switch for the system must be turned "OFF" or, if necessary, the system has to be in standby operating mode.</p> <p>Depending on the task, the system has to be turned off with the master switch in the control cabinet or the system has to be disconnected from the energy supply.</p> <p>ATTENTION! There may be hot zones on the system! Allow the system to cool down before starting the work!</p>
--	--

Hazards/access and supervised presence in the danger areas


The work locations may be difficult to see from the operator panel. Also, personnel may work at work locations where they cannot be seen.

 	<p>The presence of personnel in the danger areas always has to be monitored by a second person as a supervisor.</p> <p>Keep the door of the housing closed!</p> <p>Only open the interior of the housing if this is mandatory for the task!</p> <p>Work inside the housing with the system powered up may only be carried out by a trained, licensed electrician!</p> <p>ATTENTION! DANGER TO LIFE! When the master switch is ON, system components are live!</p>
--	--


Work in elevated work locations

	<p>Use suitable ladders and scaffolding for work in elevated work locations!</p> <p>DANGER! Never climb on system components! There is a risk of damage and serious injuries!</p>
---	--

Completing the work


	<p>To complete the work, the responsible competent person has to check and determine that the work was carried out correctly and the system can be operated properly and safely.</p> <p>Note the information in the section "Inspection after the completion of troubleshooting, inspection, cleaning, maintenance and repair work"!</p>
---	--

Wear and replacement parts, materials and supplies





	<p>Only use wear and replacement parts and supplies approved by Diener electronic GmbH & Co. KG, for example seals, cleaning agents for the seals, filters, oil for the pumps, lubricants etc.!</p> <p>ATTENTION!</p> <p>Using unsuitable wear and replacement parts and supplies can lead to severe damage to the system, malfunctions and possibly hazards!</p>
---	---

Reporting safety-related faults and events

Note the information in the section "Intended use"!

	<p>Safety-related faults and events must be reported to Diener electronic GmbH & Co. KG promptly!</p>
---	---

9.2 Faults and troubleshooting/error messages

	<p>The system controller/PRC displays error/fault and operating messages (also see the section "General description/Operating states/operating modes").</p> <p>When error/fault messages are displayed, the error has to be eliminated promptly. Note that troubleshooting (inspection) and error correction may only be carried out with the system in a safe state so that no hazards occur.</p> <p>Since only some of the possible errors can be captured by the PRC diagnosis system, regular additional inspections of the system components in the form of visual inspections and in part also by disassembling some components are essential.</p> <p>A description of the error messages is found in the section "Operation/control – description of error messages".</p>
	<p>The set values for the settings are stored in PRC and/or found in the section "Technical data", the supplied documentation of the component manufacturers, the controller/PRC displays or notices directly on the components.</p>
	<p><i>For troubleshooting, cleaning, maintenance and repair work, the system has to be de-energised and secured so it cannot be turned on again! (See the section "Maintenance/safe system state")</i></p> <p>DANGER! <i>Fault elimination may only be carried out by trained, qualified personnel and/or licensed electricians.</i></p> <p><i>Ensure that troubleshooting can be carried out safely and properly.</i></p> <p><i>In case of doubt, please contact the Service department of Diener electronic GmbH & Co. KG!</i></p>
	<p>Information about the rectification of faults is found in the section "Operation/control – operating and error messages/troubleshooting" and in this section under "Inspection and maintenance plan – overview" as well as the supplied documentation of the component manufacturers.</p>

Faults – software message examples

	Fault	Possible cause	Correction
1.	The maximum evacuation duration has been exceeded	Edge valve or soft pump valve is not opening	Check whether the edge valve or soft pump valve is jammed – only by the Service department of Diener electronic GmbH & Co. KG Check whether 24VDC is applied to the valve – only by the Service department of Diener electronic GmbH & Co. KG
		Evacuation duration setting too short	Increase evacuation duration.
		Pump turned off	See the point “Pump does not run” under hardware faults
2.	The actual pressure is too low	Set pressure error limit setting incorrect	Check limits in the program under “Coating”
		Dimer initial weight is too low to reach the actual pressure	Check limits in the program under “Coating” and reduce if necessary
3.	The actual value is too high	Too much dimer in the dimer container	Only use enough dimer so the powder does not extend beyond the edge of the container’s opening side
		The filled dimer container is in direct contact with the hot vaporiser door	Maintain a gap of 0.5 to 1 cm between the dimer container and vaporiser door
		Set pressure limits/tolerance settings in the program too low	Check limits in the program under “Coating” and increase if necessary

	Fault	Possible cause	Correction
4.	The actual pressure is less than 1 mbar and the vacuum switch is not on	Vacuum switch defective	<p>Bypass the vacuum switch to test – only by the Service department of Diener electronic GmbH & Co. KG</p> <p>Install a new vacuum switch – only by the Service department of Diener electronic GmbH & Co. KG</p>
Pirani sensor defective		Wait until all heating elements have cooled, vent the chamber and evacuate. If the pressure does not change, replace the Pirani/Baratron – only by the Service department of Diener electronic GmbH & Co. KG	
<u>Possible causes of a defective Pirani sensor/Baratron:</u> Heating element and/or temperature sensor defective and therefore coated with parylene		Functional test of the heating element and temperature sensor on the Pirani pressure gauge, replace if needed – only by the Service department of Diener electronic GmbH & Co. KG	

Faults – hardware examples



	Fault	Possible cause	Correction
1.	Chamber door cannot be opened	Venting valve does not respond	Check venting valve
			Check power supply to the valve
2.	Pump motor overload switch trips	Pump is too cold (room temperature < 20° C)	Maintain a room temperature > 20 °C
	Pump does not run	Pump master switch is off	Switch on the pump
		Pump motor overload switch has tripped	Check pump, turn motor overload switch back on
3.	A heating element turns off or does not turn on	Short circuit	Check supply lines, eliminate short circuit

9.3 Cleaning


The system must be operated in a “clean” environment so that severe contamination from the environment is unlikely.

Dry exterior cleaning should be carried out in case of visible external contamination.


The vaporiser and vaporiser door, O-ring and bearing surfaces on the vaporiser and vacuum chamber cover must be freed of the parylene film as far as possible after each coating process. Also, the cooling fingers of the cooling trap. The coating chamber and its components such as the carousel, rotary plate, inspection glass and stainless steel plates at the entrance to pyrolysis and exit to the cooling trap have to be cleaned at certain intervals. This applies correspondingly for pyrolysis.

	<p><i>Cleaning tasks on the system may only be carried out by trained personnel and have to be supervised by a competent person.</i></p> <p><i>Ensure that troubleshooting can be carried out safely and properly. Applicable occupational safety and health regulations have to be observed!</i></p> <p><i>It is also assumed that the competent person selects correct, safe cleaning methods and cleaning agents for the components.</i></p>
	<p><i>For troubleshooting, cleaning, maintenance and repair work, the system has to be de-energised and secured so it cannot be turned on again! (See the section “Maintenance/safe system state”)</i></p> <p><i>Cleaning tasks on the electrical installations may only be carried out by a licensed electrician.</i></p>

Substances

	<p>ATTENTION!</p> <p><i>Before cleaning up discharged media, check the safety datasheets to determine the required cleaning methods, personal protective equipment and safety measures! Using breathing protection is generally recommended!</i></p>
---	---

Cleaning methods for select system components

	<p>NEVER</p> <p><i>clean the system with water from a hose, pressure washer, compressed air or steam!</i></p> <p>DANGER!</p> <p><i>Due to the uncontrolled distribution of solid, liquid or gaseous substances, these can get into system components and cause malfunctions (short circuit, contamination, corrosion etc.). Risk of serious injuries!</i></p>
---	---

Observe the instructions of Diener electronic GmbH & Co. KG and the component manufacturers!

The cleaning agents that are used must not be hazardous to health and/or the environment, and must be selected according to these criteria.

If using substances that are hazardous to health or the environment cannot be avoided, consult the corresponding safety datasheets and comply with their requirements.

The cleaning agents are chosen by a competent person according to the current cleaning needs and the instructions of the component manufacturers and/or in coordination with them.

The agents that are used must not damage the system components etc.

Time periods

Cleaning is required:

- When contamination is noted, for example during setting up etc.
- Prior to inspection, maintenance and repair work.
- According to the inspection and maintenance plan.
- According to the instructions of the component manufacturer.
- After completing a coating process.


Legend


b	As needed
r	Regularly after 300 to 500 g dimer
p	After each process

Completed by (further information is found in the section "Commissioning/Instruction")


FK1/FK2/FK3/FK4	Qualified personnel
B	Operator
H1/H2	Assistant
IH1/IH2/IH3	Competent person
IH4	Licensed electrician
IH5	Competent person/licensed electrician
DFK	Competent person/Service of Diener electronic GmbH & Co. KG

Item	System component	Procedure/comments	Responsible	Interval
1.	Cooling trap	If liquid nitrogen remains in the container/cooling fingers, it must be brought to room temperature. To do so, remove the container from the cooling trap under consideration of the safety datasheets. Then hold the container under water. Preferably under a fume cupboard. Then the container can be cleaned with dish liquid and dried.	H2	p
2.	Vaporiser	Remove the parylene film from the seal, container and contact surfaces with a cloth moistened with alcohol. Remove the parylene layer with a sponge. Then wipe with a cloth soaked in alcohol.	H2 H2	p r
3.	Silane Vaporizer	Filling with isopropanol every 50 evaporations to dissolve possible residues. Open Swagelok screw and blow free from chamber side with pressured air or nitrogen.	H2	b
4	Pyrolysis oven	Allow to cool before cleaning. Remove the KF50 clamping ring, disassemble the heat shield. Make sure the spacers do not break. Clean accessible parts with a rough sponge and then wipe with a cloth soaked in alcohol. Use a suitable rotary brush to clean the tube. Residues can be cleaned up with a vacuum cleaner and then wiped out with a cloth.	H2	r
5	Coating chamber and carousel	Remove the carousel and rotary plate. Remove all 8xM4 screws from the carousel. Spray the four braces and the outer solid plates of the carousel (not the perforated plates – these are consumables) and the rotary plate with parting agent. Remove both stainless steel cover plates and spray them with parting agent. Spray all other parts with parting agent. Cover the pyrolysis opening with adhesive tape. The place all parts into the vacuum chamber and close the door.	H2	r

Item	System component	Procedure/comments	Responsible	Interval
5.	Coating chamber, continued	<p>Now allow the parting agent to work for 1 to several hours.</p> <p>Then remove the parylene film. To do so, take all parts out of the coating chamber. The individual components may be encapsulated in parylene. In this case, the layer has to be carefully removed or peeled off, for example with a razor blade or scalpel. Clean all components to remove the parylene coating.</p> <p>You can cut into the film on the edges. This makes it easier to remove.</p> <p>Remove/disconnect the threaded connection to the venting valve. Clean the PTFE hose. The hose has to be replaced if it is excessively soiled.</p> <p>Finally, remove the parting agent from the single components under water. Then wipe them with a cloth moistened with alcohol and remove minor residue with a vacuum cleaner.</p>	H2	r
6.	Seals	Cloth lightly moistened with cleaning agent. The seals must be replaced when needed.	H2	b
	Approved cleaning agents for the system	Isopropanol or ethanol Parting agent for parylene		
	 <i>The cleaning agent depends on the characteristics of the seals that are used! Special cleaning agents may be required for the seals! Note the information in the section "General description/Seals"!</i>			
7.	Inspection glass	Wipe with a damp cloth in case of minor soiling. In case of heavy soiling, carefully remove the parylene layer with a knife or razor blade.	H2	r
8.	Venting valve	Remove and clean the hose. Replace the hose in case of heavy soiling.	H2	r

Item	System component	Procedure/comments	Responsible	Interval
9.	Cleaning the interior of the housing and electrical installation; replacing the filter mats in the housing etc.	Only in case of heavy soiling, e.g. usually after conversion measures etc. Disconnection of all terminals for the system from the network (master switch "OFF" and mains plug pulled) Dry cleaning or vacuuming.	DFK	b
10.	Exterior of the parylene system	Damp cloth	H2	b
11.	All points where leaks have occurred, for example oil discharged from the pump etc.	Cloths, oil binder if necessary	H2	b
		<i>In case of leaks on the pump, shut down the system and pump immediately! Do not continue operating the system! Have the pump repaired by the manufacturer!</i>		


9.4 Recurring/repeated inspections

	<p>ATTENTION!</p> <p><i>Regular repeated inspections are prescribed for the system, for example after a relocation, upon reaching a prescribed service life, after an extended shut-down or after repairing or modifying the system and/or system elements.</i></p> <p><i>Note the information in the section "Commissioning, transportation, setup/Inspections"!</i></p> <p><i>Inspections may only be carried out by personnel with the required and documented, prescribed special qualifications.</i></p> <p>The requirements of the component manufacturers and EU laws such as the Work Equipment Directive, Pressure Equipment Directive etc. and national regulations and laws as well as the applicable standards and technical rules have to be observed.</p>
---	--

Repeated inspections are prescribed in order to ensure that the system can be operated properly and safely.

Furthermore, repeated inspections have to be carried out among other things:

- After a relocation.
- According to the requirements of the component manufacturers, e.g. for safety switches etc.
- After work that impairs stability.
- After an extended shut-down of more than 6 months (also see the section "Intended use – Decommissioning/partial decommissioning of the system or its components").
- After replacing/repairing components such as valves, assemblies, pumps, drives/motors and instrumentation/measuring and control equipment etc.
- After working on the electrical supply and instrumentation and control system.

	<p><i>Inform yourself about the content, requirements and intervals based on the applicable original texts of the directives and standards.</i></p> <p><i>Note the information in the operating manuals of the component manufacturers and other applicable reports, acceptance records etc.</i></p>
---	--

Implementation of EU directives according to national law

Recurring inspections, for example for pressure equipment based on the EC Pressure Equipment Directive and for containers that contain hazardous substances, are prescribed by national regulations aimed at the operating company.

For example, the EC Pressure Equipment Directive is implemented in Germany by the Industrial Safety Directive (BetrSichV) and Ordinance on Hazardous Substances.



Among other things, they prescribe recurring inspections for systems that require monitoring. The Industrial Safety Directive (BetrSichV) references pressure equipment, pressurised systems and potentially explosive areas among other things. Inspections and inspection intervals for pressure equipment are also specified according to their assignment to categories.

The Industrial Safety Directive (BetrSichV) is implemented in concrete terms in national technical rules such as the Technical Rules for Pressure Vessels (TRB) and Technical Guideline for the Handling of Hazardous Materials (TRGS) 407 for activities with gases, etc.



We recommend using the following tables for the inspections and inspection intervals when the applicable national regulations or the documents of the manufacturers define no or lesser requirements.

9.5 Inspection and maintenance plan – overview

	<p>The inspection and maintenance plan defined here provides a fundamental overview of the work to be carried out on the system components.</p> <p>The overview is based</p> <ul style="list-style-type: none">- on the results of the risk assessments conducted for the overall system, and- contains additional information and excerpts from the maintenance manuals of the component manufacturers were applicable, and makes no claim of completeness. <p><i>The documentation of the component manufacturers may contain additional notices/inspection and maintenance tasks, safety instructions and procedures that have to be observed.</i></p> <p><i>Note the supplied documentation/operating and maintenance manuals of the component manufacturers.</i></p> <p><i>Defective elements may only be repaired and replaced by Diener electronic GmbH & Co. KG!</i></p>
	<p>The documentation/operating and maintenance manuals of the component manufacturers are found in the system documentation.</p>

The purpose of inspections is to identify deviations from the target state before a fault occurs. Inspections also include repeated inspections.

Operating and maintenance manuals are supplied for the components that are used. The requirements of the component manufacturers apply for inspections and maintenance.

Maintenance includes for example readjustment, cleaning to maintain functionality, preservation, topping up or replacing operating materials or consumables, and scheduled replacement of wear parts.

PRC

A red display field flashes in the main picture next to the maintenance button when maintenance is due.




Time periods


d	Daily
R	With every setting up/installation/removal
w	Weekly
m	Monthly
y	Yearly
b	As needed







Completed by (further information is found in the section "Commissioning/Instruction")


FK1/FK2/FK3/FK4	Qualified personnel
B	Operator
H1/H2	Assistant
IH1/IH2/IH3	Competent person
IH4	Licensed electrician
IH5	Competent person/licensed electrician
DFK	Competent person/Service of Diener electronic GmbH & Co. KG



The inspection intervals given here are minimum values. Shortening the inspection intervals may be necessary depending on local conditions and processes.

Item	System component	Comments	Responsible	Interval
1. Protective devices				
1.1	Door of the system cabinet and covers etc.	Function check – locking and function of the safety switch Visual inspection - for integrity - correct attachment, and - damage	B	d
1.2	Emergency stop button	Visual inspection for damage	B	d
		Function check (test)	B	w
1.3	Indicator lamp/horn	Visual inspection	B	d
		Functional test	B	w
1.4	Door switches	Visual inspection for damage and function	EFK/IH 4	m
		Functional tests, see "Controller/operator panel".		
2. Chamber/vaporiser				
2.2	Guard control	Check for proper functionality	B	r
2.3	Seals	Also see "Leakage rate measurement".		
		<i>The cleaning agent depends on the characteristics of the seals that are used! Special cleaning agents may be required for the seals! Note the information in the section "General description/Seals"!</i>		
		ATTENTION! <i>The substances that are used may damage the seals! The door seals and the seals in the chamber have to be in flawless condition at all times and the system always has to seal properly. This is essential for trouble-free and safe process sequences! Therefore, the door seals and if applicable the seals in the chamber must be replaced regularly! The seals have to be replaced promptly in case of visible cracks or damage! Replacement may only be carried out by Diener electronic GmbH & Co. KG!</i>		

Item	System component	Comments	Responsible	Interval
2.3.1	Door seals	Visual inspection for damage	H2 FK1	r/d m
		Replacing the door seals	DFK	b
2.3.2	Seals on the chamber - Inspection glasses - Feedthroughs/connections for cables, venting - Fittings - etc.	Inspection, replacement as needed	DFK	1/2 y
2.4	Chamber inspection glass	Visual inspection for damage (scratches etc.)	B FK1	r m
		Replacement	DFK	b
3. Tightness test vacuum system				
3.1	Leakage rate measurement	The tightness of the vacuum system is tested with the "Leakage rate measurement" in PRC. A change in the leakage rate is indicative of the condition of seals in the system.	FK1/DF K	m Min. 1/2 y
		<i>Leaks can also be identified by the noise made by flowing exterior air. DANGER! NEVER touch possible suction zones/suspected leaks! There is a risk of suctioning body parts and objects!</i>		
4. Inspection/maintenance of the venting system				
4.1	Lines/connections etc.	Visual inspection for damage, e.g. cracks etc.	FK1	m Min. 1/2 y
6. Inspection of the cooling trap				
6.1	Connections/container	Visual inspection for damage, e.g. cracks etc.	FK1	m
		Inspection	DFK	1/2y
7. Inspection of the exhaust air system				
7.1	Lines/connections etc.	Visual inspection for damage, e.g. cracks etc.	FK1	m



Item	System component	Comments	Responsible	Interval
9. Inspection/maintenance of the pump				
		ATTENTION! <i>Allow the system/pump to cool down before commencing the work! Components of the pump and parts in its vicinity may get hot! There is a risk of injury due to hot zones and a risk of spillage when topping up oil!</i>		
9.1	Leaks	Visual inspection for leaks etc.	FK1	w
		In case of leaks on the pump, shut down the system and pump immediately! Do not continue operating the system! Have the pump repaired by the manufacturer!		
9.2	Oil level 	Check the oil level The oil level has to be between Min. and Max. Top up oil as needed. See the manufacturer's documentation for the type of oil!	IH2	w
9.3	Pump	Inspection and maintenance tasks according to the requirements of the manufacturer and the experience of Diener electronic GmbH & Co. KG.	DFK	1/2 y
		The inspection and maintenance interval is stored in PRC. When it is due, a message is displayed in PRC and the remaining time can be viewed.		
		Note the supplied documentation of the manufacturer.		
		ATTENTION! Maintenance tasks on the pump require specialised technical knowledge regarding the functioning and requirements of pumps that convey hazardous gases (for example regarding tightness etc.). Improper maintenance can cause leaks and severe damage to the pump! Inspection and maintenance tasks may only be carried out by the Service department of Diener electronic GmbH & Co. KG! ATTENTION! Failure to carry out the prescribed inspection and maintenance tasks voids all guarantees and liability of Diener electronic GmbH & Co. KG.		
9.4		Overhauling the pumps	Manufacturer/ DFK	6 y

Item	System component	Comments	Responsible	Interval
10. Inspection/testing the electrical installations and measuring technology				
		<p>All work including cleaning inside the housing and/or on electrical installations may only be carried out by a licensed electrician!</p> <p>Equipment to be cleaned must be turned off, disconnected from the network on all terminals and secured against turning on!</p> <p>Note the information under "Work on electrical installations"!</p>		
10.1	Inspection/testing of safety-related sensors.	Display in PRC	DFK	1/2y
		Tripping test No approval issued if the contactors are not bridged.	DFK	1/2y
	- Door switch	Attachment of the switch and its normally open contact	DFK	1/2y
		Attachment and condition of the cables	DFK	1/2y
		Switch function	DFK EFK/IH4	1/2y m
	- Emergency stop button	State	EFK/IH4	m
		Function	EFK/IH4	m
10.3	Inspection of measuring technology devices; Depending on use: - Baratron - Pirani	Calibration	DFK	b
		Condition of the lines and plugs on the system cabinet	DFK	y
		Condition of the connection cables and plugs	DFK	1/2y
10.4	Inspection/testing/ maintenance work inside the housing and on electrical equipment e.g. - Cleaning fans in housings - Contact points in case of heavy soiling - etc. (Also see the section "Cleaning")	Check control cabinet ventilation, clean and replace the filter mats as needed	EFK/IH4	m
		Check all screw connections on electrical equipment (motors, couplings, buttons, switches, plug connections etc.), especially the earth conductor connection points, for firm fit. Dry cleaning or vacuuming	DFK	y
		Check all screw connections on electrical equipment (motors, couplings, buttons, switches, plug connections etc.), especially the earth conductor connection points, for firm fit. Dry cleaning or vacuuming	DFK	

Item	System component	Comments	Responsible	Interval
11.1	Safety-related components of controllers <ul style="list-style-type: none"> - Electrical equipment such as emergency stop switches, safety switches etc. - Safety, shut-off and cut-off valves 	Safety-related parts of controllers have to be replaced before reaching the end of the predetermined service life. Unless specified by the manufacturer or Diener electronic GmbH & Co. KG, the components have to be replaced no later than after 10 years. Only original replacement parts with the same or better category/PL according to EN 13849-1,2 may be used.	DFK	b 10y
12. Controller/operator panel				
12.1	Operator panel	Inspection of all control elements for damage, e.g. <ul style="list-style-type: none"> - Emergency stop button - Master switch - etc. 		
12.2	Emergency stop devices	Functional test of emergency stop devices	EFK/IH4	m
		<i>The system tests/functional tests may only be carried out by a trained, licensed electrician.</i> <i>The emergency stop button must be functional and freely accessible at all times!</i>		
12.3	System test/functional test of the controller		EFK/IH4	d
		<i>The system tests/functional tests may only be carried out by a trained, licensed electrician.</i>		

9.6 Repair

If the system inspection reveals wear or damage on system components, they have to be restored to their target state.


	<p><i>Repairs and maintenance work may only be carried out by employees of Diener electronic GmbH & Co. KG or, subject to approval, by the component manufacturer or other specialist firms approved by Diener electronic GmbH & Co. KG in writing!</i></p>
	<p><i>The system must be de-energised and de-pressurised prior to all repairs.</i></p> <p><i>Changes to the programs and controller may only be made by employees of Diener electronic GmbH & Co. KG!</i></p> <p><i>Note the information in the documentation/operating manuals of the component manufacturers!</i></p> <p><i>Before carrying out certain activities, the corresponding information as well as the special safety instructions in the corresponding sections of the system documentation must be observed.</i></p> <p><i>Only use original replacement parts from Diener electronic GmbH & Co. KG and the component manufacturers.</i></p>

Overhauling electrical components

Overhauling electrical components has to include repeated inspections to determine the effects of ageing, wear or mechanical stresses on these components.

Repeated inspections according to EN 60204-1 also have to be carried out.

Replacing safety-related parts of controllers

	<p><i>Only original components approved by Diener electronic GmbH & Co. KG may be used, with the required performance level (PLr) according to DIN EN ISO 13849-1.</i></p> <p><i>Replacement may only be carried out by Diener electronic GmbH & Co. KG or a specialist firm authorised by Diener electronic GmbH & Co. KG!</i></p>
---	---

Repair/replacement of parts according to the requirements of the Pressure Equipment Directive

When overhauling components or replacing parts that are subject to the Pressure Equipment Directive, carrying out the repeated inspections defined in the directive and the applicable standards is mandatory.

Also see the section "Recurring inspections of pressure equipment".

Overhauling the vacuum/ pressure system

After overhauling the pressure/vacuum system, the required repeated inspections according to EN ISO 4414 have to be carried out by a competent person.

9.7 Inspection after the completion of troubleshooting, inspection, cleaning, maintenance and repair work



After the completion of troubleshooting, inspection, cleaning, maintenance and repair work, the responsible competent person has to inspect the system and verify that it can be operated properly and safely.

This includes:

- *Properly completing the work*
- *The proper condition and attachment of all protective devices, and the correct functioning of safety switches and emergency stop switches.
There is a risk of serious injuries when protective devices are out of operation (for example in the system's danger area)!*
- *Checking the attachment of all components, connections etc. on the frame that were loosened or removed in the course of the work and reinstalled.*
- *The correct position of manually operated fittings, in particular after troubleshooting, setting up, maintenance and repair work, for example shut-off devices of the individual supply systems.*
- *Proper filling and pressurising*
- *Verifying that the system is properly set up (see the section "Setting up")*
- *Reviewing the parameters and controller programs that were called up/changed/entered*
- *Reviewing manually adjusted positions*
- *Carrying out functional tests*
- *Trial operation*

Production/automatic operation may only start after ensuring that the system and processes can run properly and safely!

10.0 Process/auxiliary materials and supplies – overview and disposal

10.1 Safety instructions for process/auxiliary materials and supplies



Before commencing work, note the information in the sections

- *“Intended use”*
- *“General safety and accident prevention instructions”*
- *“General description”*
- *“Technical data”*
- *“Training and instruction”*
- *“Setting up”*
- *“Maintenance”*
- *Safety datasheets.*

For the handling of process/auxiliary materials and supplies

Hazardous substances may be present in the system and can cause hazards and injuries in case of discharge or contact.

In general, the following applies for handling hazardous substances/media:

- *Before starting work on the system, check what hazardous substances are currently in the system and/or system components.*
- *Observe the safety datasheets and use the required personal protective equipment!*
- *The substances must be disposed of properly in an environmentally friendly manner and in compliance with the applicable legal regulations!*
- *Process substances*
Only substances defined in process development and corresponding to the specifications and requirements of Diener electronic GmbH & Co. KG may be used. Changing the substances requires the prior written approval of Diener electronic GmbH & Co. KG.
- *Auxiliary materials and supplies*
Only auxiliary materials and supplies that meet the specifications and requirements of the component manufacturers may be used. Changing the auxiliary materials requires the prior written approval of Diener electronic GmbH & Co. KG.
- *Information in the documentation of the component manufacturers and safety datasheets must be observed!*
- *The operating company is responsible for complying with occupational safety and health as well as environmental protection requirements when using hazardous substances, auxiliary materials and supplies.*





For the substances that are used, the

- *suppliers and product characteristics*
 - *laws and regulations*
- may change.*




The information in the operating and maintenance manual is up to date at the time this operating and maintenance manual was prepared.

Always note the currently valid safety datasheets!

10.2 Handling of process/auxiliary materials and supplies

(With no guarantee of completeness)

All substances have to be properly reclaimed, reused and/or disposed of.

	<p>ATTENTION! <i>Substances with hazardous characteristics that may be classified as hazardous substances can be present in the system!</i></p>
	<p><i>To prevent mixing up the substances, posting a notice regarding the substance that is used on the container is recommended.</i></p>
	<p><i>The substances approved for the system and the information for the required auxiliary materials and supplies is found in the section "Technical data – process development".</i></p>

Process substances

Process substances are usually used up. Parylene that is not used up has to be disposed of.

Auxiliary materials and supplies

Auxiliary materials and supplies have to be replaced when they no longer have the desired/required characteristics. The criteria for replacement are usually given by the suppliers of the system components containing the auxiliary materials and supplies, for example changing the oil after an established period of use and/or testing/assessing the auxiliary materials and supplies.

Auxiliary materials and supplies	Contents	Information on contents and disposal	Location Comments
Lubricating oil pump	-	See the section "Technical data" and safety datasheets	Information on changing the oil and draining the pump is found in the manufacturer's documentation.

10.3 Disposal of system components/disassembly

Before disassembling system components, the process, operating and auxiliary materials they contain have to be removed and disposed of in an environmentally friendly manner. The systems being disassembled have to be cleaned according to the substance characteristics and system design.

All parts of the system have to be properly reclaimed, reused and/or disposed of.

The system among other things consists of



Materials of the system components	Examples	Comments
Metals	<ul style="list-style-type: none"> - Basic structure of the system - Chamber, pyrolysis oven, vaporiser - Covers - Pipework - etc. 	<p>Note the applicable disposal codes!</p>
Plastics	<ul style="list-style-type: none"> - Covers - Cable guides - etc. 	
Composites	<ul style="list-style-type: none"> - Insulation 	
Electric/electronic equipment and devices	<ul style="list-style-type: none"> - PC - Display - Switchgear - Cabling - etc. 	<p>Note the applicable disposal codes!</p> <p>Special additional regulations apply for electrical/electronic equipment and devices, for example according to the WEEE Directive for electrical and electronic appliances.</p>

11.0 Fire protection – conduct in case of fire

Note:

This section is intended for persons responsible for fire protection and firefighting.




11.1 General information on fire prevention and conduct in case of fire

 	<p>DANGER!</p> <p><i>There may be substances in the system that can cause hazards for persons and/or the environment in case of fire, e.g.</i></p> <ul style="list-style-type: none">- <i>Process substances</i>- <i>Auxiliary materials and supplies in the system, for example substances in filters, lubricating grease and oil etc.</i>- <i>Construction materials/insulation etc.</i> <p>ATTENTION!</p> <p><i>The system contains pressurised containers and components/systems that may be under pressure!</i></p> <p><i>Note the information and specifications</i></p> <ul style="list-style-type: none">- <i>in the sections “Intended use” and “System hazards”</i>- <i>in the section “General safety and accident prevention instructions”</i>- <i>in the section “General description”</i>- <i>in the section “Technical data”, and</i>- <i>in the supplied safety datasheets and documentation of the component manufacturers for the substances that are used etc.</i>- <i>in the corresponding legal regulations.</i>
--	--



The system components are designed and built according to the specifications agreed between Diener electronic GmbH & Co. KG and the operating company (see the section “Intended use”).

Fire detection and extinguishing systems etc. are not included in the scope of work of Diener electronic GmbH & Co. KG and have to be provided by the operating company as needed.

Process/auxiliary materials and supplies contained in the system

	<p><i>The process/auxiliary materials and supplies contained in the scope of delivery of Diener electronic GmbH & Co. KG are found in the sections "Auxiliary materials and supplies", "Intended use/Process development" and "Technical data".</i></p> <p><i>Note the supplied safety datasheets and manufacturer documentation! The information they contain is binding.</i></p>
	<p>ATTENTION! <i>The system contains</i></p> <ul style="list-style-type: none">• <i>pressurised system components, for example components connected to the vacuum system.</i>
	<p>ATTENTION! <i>Only process/auxiliary materials and supplies may be used that do not damage the system and/or its components, or impair its function and/or safety!</i></p> <p><i>The substances must not be easily combustible and/or explosive, and/or the system has to be expressly designed and built for the use of these substances! (See the section "Intended use")</i></p> <p><i>Otherwise there is a risk of component failure with possibly hazardous system states and the risk that hazardous atmospheres may develop!</i></p> <p><i>Using process/auxiliary materials and supplies not approved by Diener electronic GmbH & Co. KG is under the sole responsibility of the operating company, with no warranties and/or liability on the part of Diener electronic GmbH & Co. KG.</i></p> <p><i>The operating company has to prepare and implement a fire protection concept/emergency plan based on the characteristics and quantities of the process/auxiliary materials and supplies that are used.</i></p>


Firefighting and hazards due to the substances used

	<p><i>Please read the supplied safety datasheets and the documentation of the component manufacturers!</i></p>
	<p>The safety datasheets for the substances that are used contain information about fire and explosion protection as well as firefighting.</p>


Suitable firefighting equipment, the firefighting method and the required safety and emergency measures have to be established in advance and communicated according to the type and location of damage and the affected system components. We recommend preparing emergency plans.

To avoid impeding firefighting efforts, only the materials and equipment needed for current operation are permitted to be present on the system. Storing process/auxiliary materials and supplies on site is prohibited.

Traffic and access routes to the system components have to be kept clear at all times!


	<p><i>Breathing protection with an independent air supply is required for firefighting. Fire fighters should wear a respirator mask and protective clothing to avoid contact with the skin and/or eyes.</i></p>
---	---

Obstacles to firefighting due to guards

	<p><i>Firefighting is impeded by the system design. The door to the interior of the system is locked and can only be opened with a key.</i></p>
---	---

Process substances/gases, auxiliary materials and supplies


There may be gases/process substances in the system with a special hazard potential regarding the outbreak of a fire and/or firefighting.

	<i>The process substances approved for the system and the information for the required auxiliary materials and supplies is found in the section "Technical data/Process development".</i>
---	---


Materials of the system components

Materials of the system components	Examples	Comments
Metals	<ul style="list-style-type: none">- Basic structure of the system- Coating chamber- Pyrolysis oven- Vaporiser- Covers- Pipework- etc.	
Plastics	<ul style="list-style-type: none">- Covers- Cable guides- etc.	
Composites	<ul style="list-style-type: none">- Insulation	
Electric/electronic equipment and devices	<ul style="list-style-type: none">- PC- Display- Switchgear- Cabling- etc.	ATTENTION! Live electrical equipment!


11.2 Hazards due to fire water

	<p>DANGER TO LIFE! <i>Even when the electrical equipment has been disconnected from the power supply, electrical equipment may still be live!</i></p> <p>ATTENTION! <i>Live electrical equipment under high voltage!</i></p> <p><i>Contact of fire water with electrical equipment poses a danger to life!</i></p>
---	--

The system/system components and all affected electrical equipment must be inspected for fire water and if applicable fire damage by the manufacturer's qualified personnel. The system/electrical equipment may only be put back into operation after ensuring that there are no hazards.

	<p><i>Fire water must not get into the groundwater; discharged substances/media and fire water must be disposed of in an environmentally friendly manner.</i></p>
---	---

11.3 Conduct in case of fire on the system



	<p><i>In case of messages/alarms, proceeding as follows is recommended</i> <i>(the emergency plan prepared by the operating company is decisive):</i></p> <p>On site:</p> <ul style="list-style-type: none">- <i>Evacuate the danger areas immediately</i>- <i>Make sure all personnel leaves the danger area</i>- <i>Press the emergency stop button if there is time to do so</i> <p>By the supervising employee:</p> <ul style="list-style-type: none">- <i>Contact the fire brigade</i>- <i>Turn off and/or de-energise any additional equipment</i>
---	--

12.0 Replacement parts

Designation	Delivery times	Order-no.
2/2-way valve 214A Viton	about 2–3 working days (Germany) about 5 working days (in the EU) about 10 working days (outside of the EU)	100002050
2/2-way valve 210A Viton	about 2–3 working days (Germany) about 5 working days (in the EU) about 10 working days (outside of the EU)	100014914
Edge valve 850A KF25 Viton	about 2–3 working days (Germany) about 5 working days (in the EU) about 10 working days (outside of the EU)	100007178
Heating rod 100W	about 2–3 working days (Germany) about 5 working days (in the EU) about 10 working days (outside of the EU)	100016026
Heating rod 1600W	about 2–3 working days (Germany) about 5 working days (in the EU) about 10 working days (outside of the EU)	100016973
Heater band	No details possible	100017024
Heating jacket	No details possible	100022845
Temperature sensor	about 2–3 working days (Germany) about 5 working days (in the EU) about 10 working days (outside of the EU)	100002455
Temperature sensor	about 2–3 working days (Germany) about 5 working days (in the EU) about 10 working days (outside of the EU)	100019139
Converter type 212K	about 2–3 working days (Germany) about 5 working days (in the EU) about 10 working days (outside of the EU)	100004582
Converter type L 0-800°C	about 2–3 working days (Germany) about 5 working days (in the EU) about 10 working days (outside of the EU)	100004583
Fan 24VDC	about 2–3 working days (Germany) about 5 working days (in the EU) about 10 working days (outside of the EU)	100006434
Power supply 120W (DR-120-24)	about 2–3 working days (Germany) about 5 working days (in the EU) about 10 working days (outside of the EU)	100001132
Temperature switch 200°C	about 2–3 working days (Germany) about 5 working days (in the EU) about 10 working days (outside of the EU)	100018003
15" PC	about 2–3 working days (Germany) about 5 working days (in the EU) about 10 working days (outside of the EU)	10017637

Designation	Delivery times	Order-no.
Vacuum pump 16.00m ³ 230V Leybold D16B		100000343
Monomer	about 2–3 working days <i>(Germany)</i> about 5 working days <i>(in the EU)</i> about 10 working days <i>(outside of the EU)</i>	-
Product carrier carousel (P6)	No details possible	100021810
Carousel tray (P6)	No details possible	100013903
Product carrier carousel (P8)	No details possible	100023903
Carousel tray (P8)	No details possible	100013903

Last update: 06 April 2020
Minimum order value: EUR 100.00



	<p>All aforementioned spare parts must only be installed by specialists from Diener electronic GmbH & Co. KG. If the installation is performed by the operator or a third person without authorisation from Diener electronic GmbH & Co. KG any guarantee and liability by Diener electronic GmbH & Co. KG will immediately become void.</p>
	<p>* Delivery times subject to change For the latest price, please contact our services department at service@plasma.com</p>

13. Wear parts

Designation	Delivery times	Order-no.
Pirani sensor		100012899
Window sealing	about 2–3 working days <i>(Germany)</i> about 5 working days <i>(in the EU)</i> about 10 working days <i>(outside of the EU)</i>	100021081
Window KF 16 (Borosilicate)	about 2–3 working days <i>(Germany)</i> about 5 working days <i>(in the EU)</i> about 10 working days <i>(outside of the EU)</i>	100021034
Seal KF16 FKM	about 2–3 working days <i>(Germany)</i> about 5 working days <i>(in the EU)</i> about 10 working days <i>(outside of the EU)</i>	100000691
Seal KF16 FFKM	No details possible	100006109
Centring ring KF16 VA	about 2–3 working days <i>(Germany)</i> about 5 working days <i>(in the EU)</i> about 10 working days <i>(outside of the EU)</i>	100001247
Centring ring with O ring KF16	about 2–3 working days <i>(Germany)</i> about 5 working days <i>(in the EU)</i> about 10 working days <i>(outside of the EU)</i>	100002947
Hose clip KF16	about 2–3 working days <i>(Germany)</i> about 5 working days <i>(in the EU)</i> about 10 working days <i>(outside of the EU)</i>	100000693
Seal KF25 FKM	about 2–3 working days <i>(Germany)</i> about 5 working days <i>(in the EU)</i> about 10 working days <i>(outside of the EU)</i>	100002214
Seal KF25 FFKM	No details possible	100004868
Centring ring KF25	about 2–3 working days <i>(Germany)</i> about 5 working days <i>(in the EU)</i> about 10 working days <i>(outside of the EU)</i>	100001248
Centring ring with O ring KF 25	about 2–3 working days <i>(Germany)</i> about 5 working days <i>(in the EU)</i> about 10 working days <i>(outside of the EU)</i>	100003259
Hose clip KF25	about 2–3 working days <i>(Germany)</i> about 5 working days <i>(in the EU)</i> about 10 working days <i>(outside of the EU)</i>	100000548
Corrugated hose KF25	about 2–3 working days <i>(Germany)</i> about 5 working days <i>(in the EU)</i> about 10 working days <i>(outside of the EU)</i>	100001910
Seal KF40 FFKM	about 2–3 working days <i>(Germany)</i> about 5 working days <i>(in the EU)</i> about 10 working days <i>(outside of the EU)</i>	100006108
Seal KF40 FKM	about 2–3 working days <i>(Germany)</i> about 5 working days <i>(in the EU)</i> about 10 working days <i>(outside of the EU)</i>	100002215

Designation	Delivery times	Order-no.
Centring ring KF40	about 2–3 working days <i>(Germany)</i> about 5 working days <i>(in the EU)</i> about 10 working days <i>(outside of the EU)</i>	100001249
Centring ring with O ring KF40	about 2–3 working days <i>(Germany)</i> about 5 working days <i>(in the EU)</i> about 10 working days <i>(outside of the EU)</i>	100002187
Hose clip KF40	about 2–3 working days <i>(Germany)</i> about 5 working days <i>(in the EU)</i> about 10 working days <i>(outside of the EU)</i>	100002311

Last update: 06 April 2020
Minimum order value: EUR 100.00

	<i>All aforementioned spare parts must only be installed by specialists from Diener electronic GmbH & Co. KG. If the installation is performed by the operator or a third person without authorisation from Diener electronic GmbH & Co. KG any guarantee and liability by Diener electronic GmbH & Co. KG will immediately become void.</i>
	<i>* Delivery times subject to change</i> <i>For the latest price, please contact our services department at service@plasma.com</i>

14.0 After-sales service

What we offer:

Maintenance contracts

- Annual maintenance is recommended to ensure the proper operation of your parylene system.
- For average use of more than 4 hours daily, we recommend maintenance every six months.
- The next maintenance date is marked on the rear of your system.

Calibration of various components

- Pirani sensor

Inspection of various components

- Vacuum pump
- Tightness test

Fast delivery times

- Our extensive inventories guarantee timely shipment

Service technicians

- Our service technicians will gladly visit you on site
- For the best possible service, our service technicians are always in contact with our head office via Facetime

Telephone support

- Telephone assistance for minor problems

Contact:

Telephone: 07458/99931-200
E-mail: service@plasma.de

15.0 Returns

If you should note a defect on your parylene system during or also after the warranty period, please contact our Service department:

Telephone: 07458/99931-200
E-mail: service@plasma.de

Our Service department will let you know if correcting a problem over the telephone is not possible.

To return your system, please complete the enclosed "FB019: Retourenschein / Return Form".
It has to be attached to the system.

For repairs, package your parylene system well and send it to:

Diener electronic GmbH + Co. KG
Service department
Nagolder Str. 61
72224 Ebhausen
Germany

Please specify the serial number of your parylene system as the reference number on the wooden crate.

16.0 Sample program for parylene C

- Configure the following settings on the Program tab:

Preparation time:

The screenshot shows the 'Programs' tab in the Diener software interface. The program name is 'Parylene-C' and the program number is '1'. The interface is divided into three sections: Preparation, Coating, and Cooling/Venting. The Preparation section contains the following settings:



Parameter	Value	Unit
Pumping down pressure:	0.010	mbar
Softpump start duration:	100	sec
Max. pumping down time:	30	min
Set temperature Door:	170	°C
Set temperature Pyrolysis:	720	°C
Set temperature chamber:	25	°C
Set temperature Pressure sensor:	130	°C
Set temperature Silane vaporizer:	130	°C
Max. heating up time:	30	min

A note indicates a tolerance of $\pm 10^{\circ}\text{C}$ within 10 seconds for the chamber, pressure sensor, and silane vaporizer temperatures.

The Silanization section includes the following settings:

Parameter	Value	Unit
Silanization:	<input type="checkbox"/> Execute	
Silane tube pre-heating temperature:	80	°C
Pre-heat waiting time:	90	sec
Silane evaporation temperature:	140	°C

Coating time:

diener electronics   **Programs** 12.12.2017
14:29:31

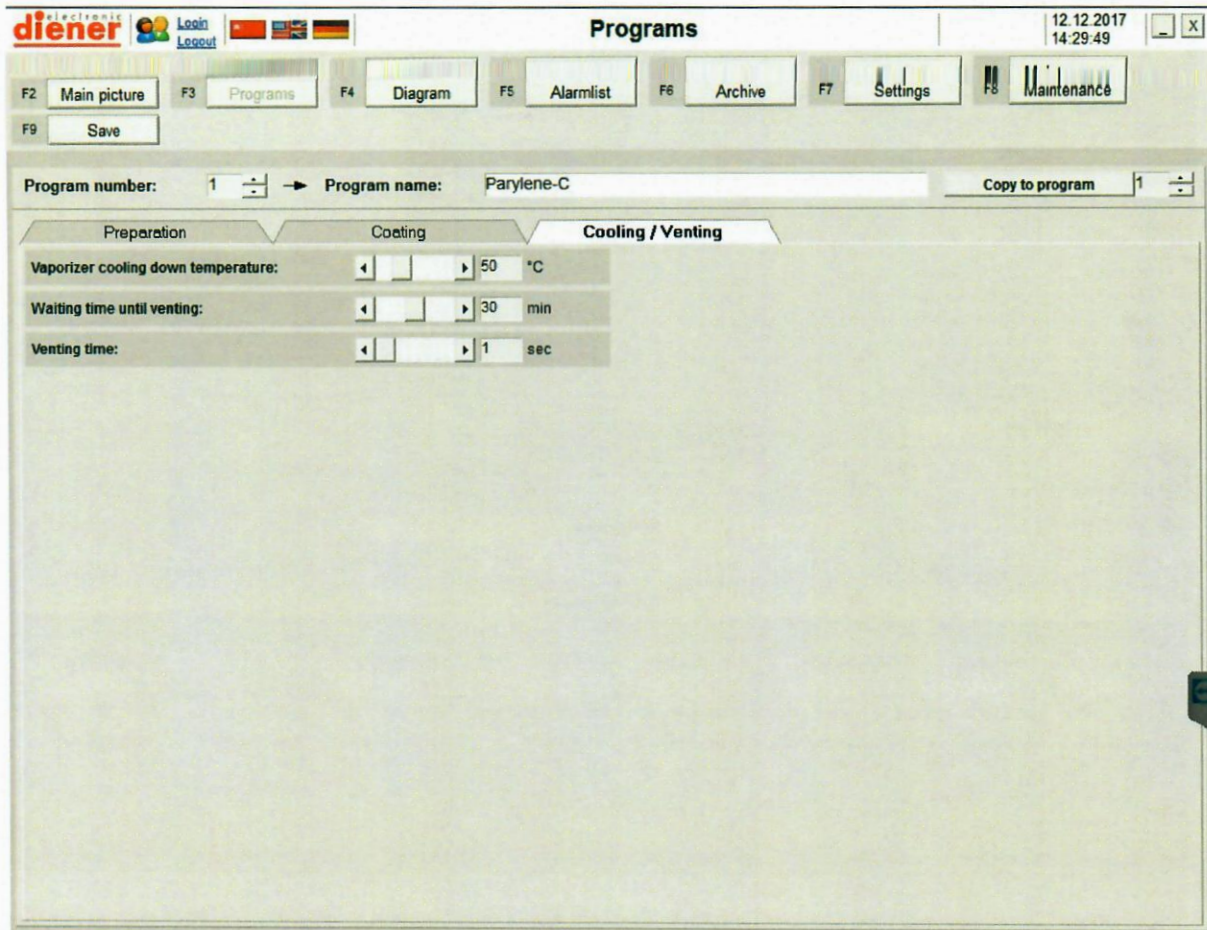
F2 Main picture F3 Programs F4 Diagram F5 Alarmlist F6 Archive F7 Settings F8 Maintenance

F9 Save

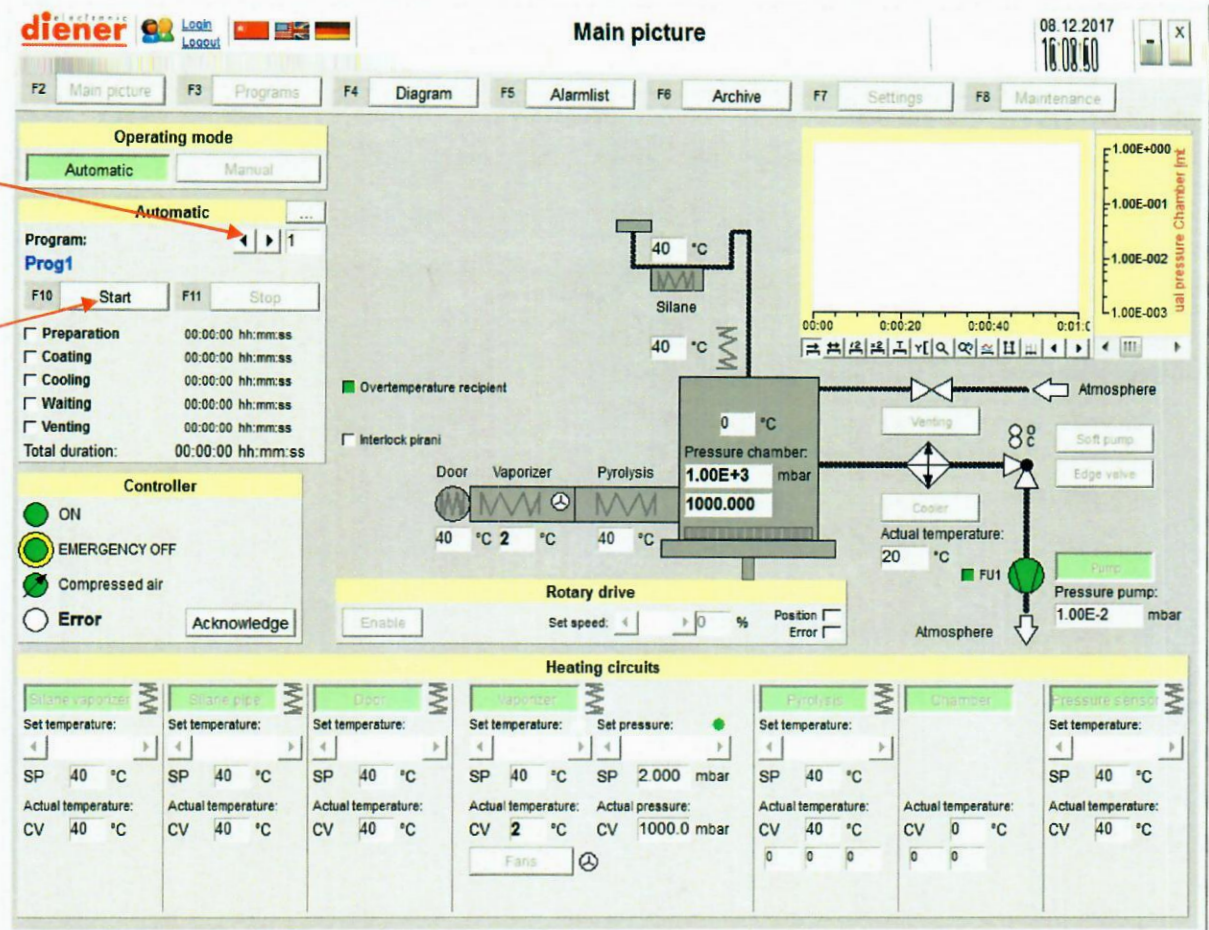
Program number: 1 → Program name: Parylene-C Copy to program 1

Preparation	Coating	Cooling / Venting
Pump valve: <input type="text" value="Edge valve"/>		Max. pressure deviation Vaporizer: Warning: + <input type="text" value="0.020"/> mbar <input type="text" value="30"/> sec Abort: + <input type="text" value="0.060"/> mbar <input type="text" value="30"/> sec
Vaporizer:	Set pressure: <input type="text" value="0.030"/> mbar Set temperature: <input type="text" value="170"/> °C	Max. temperature deviation Door: Warning: +/- <input type="text" value="10"/> °C <input type="text" value="30"/> sec Abort: +/- <input type="text" value="20"/> °C <input type="text" value="30"/> sec
Maximum coating duration: <input type="text" value="600"/> min		Max. temperature deviation Post-Pyro: Warning: +/- <input type="text" value="10"/> °C <input type="text" value="30"/> sec Abort: +/- <input type="text" value="20"/> °C <input type="text" value="30"/> sec
Set rotation speed rotary drive: <input type="text" value="80"/> %		Max. temperature deviation Pressure sensor: Warning: +/- <input type="text" value="10"/> °C <input type="text" value="30"/> sec Abort: +/- <input type="text" value="20"/> °C <input type="text" value="30"/> sec
		Max. temperature deviation Chamber: Warning: +/- <input type="text" value="10"/> °C <input type="text" value="30"/> sec Abort: +/- <input type="text" value="20"/> °C <input type="text" value="30"/> sec
		Max. temperature deviation Silane vaporizer: Warning: +/- <input type="text" value="10"/> °C <input type="text" value="10"/> sec Abort: +/- <input type="text" value="20"/> °C <input type="text" value="10"/> sec

Venting time:



- Now fill your monomer container and load it into the vaporiser. Then load the coating chamber with your work pieces and close the cover.
- In the main picture, select the program you configured above and press Start.



- You can remove your coated work pieces from the coating chamber after the program finishes.