

Plasma for perfect printing



Introduction

Peter van Steenacker

Electronics engineer

Sales Manager since 1998 for plasma systems. Extensive experience with plasma nozzles (APPJ), DBD-Plasma and vacuum plasma.

Extensive experience in lecturing regarding plasma treatment, with presentations, seminars, webinars and training.

Head of PlasmaXperience, the platform from TIGRES for plasma know-how

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TIGRES GmbH has been established in **1993** as an **independent, family owned** technology based company

Targets:

- ✓ **Development**
- ✓ **Production**
- ✓ **Sales**

of atmospheric plasma (AP) units

- AP Plasma devices for narrow and wide plasma application
- AP Plasma in different power categories
- AP Plasma with different temperatures
- Generators

TIGRES GmbH Germany

- Appr. 25 Employees
- Main office and production in Marschacht (near Hamburg)
- Sales office near Stuttgart
- Appr. 14 sales agents world wide



[Picture from OpenClipart-Vectors auf Pixabay](#)

Printing industry

Printing

- Inkjet
- UV/UV Inkjet
- Tampon print
- Silkscreen print
- Thermal transfer print
- Offset print
- Flexo print



Plasma for printing



Process preparation

- **Cleaning** like effect on contamination/residues in a controlled process
- Heating effect **dries moisture**
- **Removal of chem./phys. bound water** from surface (metals etc.)
- Ionisation **neutralises static charges** from the surface of polymeres. **No dust attraction, no deflection of ink jet droplets** through electrostatic charges



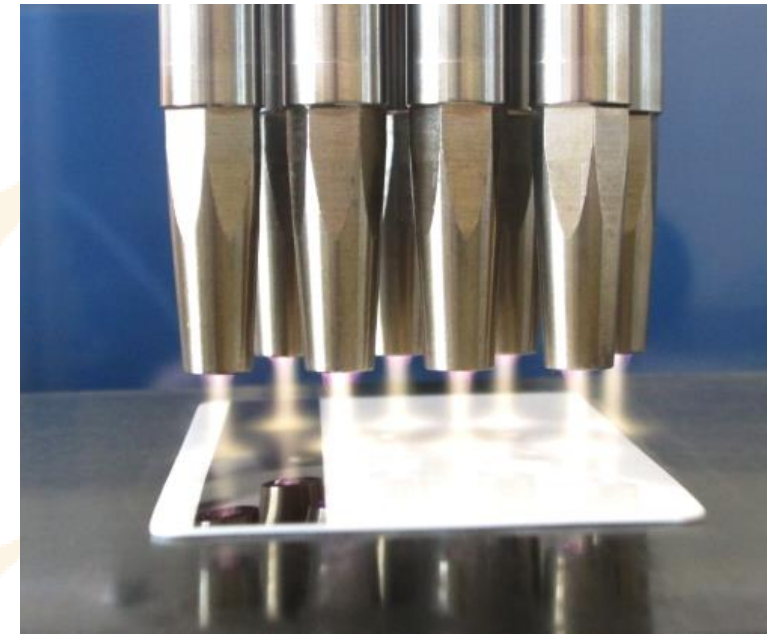
Activation

- **Improvement of adhesion** of ink and varnish to the surface
- **Improved wettability** leads to increased print quality with higher sharpness, high resolution, color brilliance and intensity
 - **Saving of ink (20%)** possible

Perfect printing with plasma treatment

Advantages of plasma treatment for printing

- Optimised cross cut
- Optimised adhesion
- Manuell cleaning sometimes replaceable
- Higher process reliability
- Higher process speed
- Up to 20 % less ink needed (Inkjet)



Example: Cleaning and activating with plasma for Inkjet printing

The german company Friedrich Richter Messwerkzeugfabrik GmbH & Co. KG in Speichersdorf in Germany is a pioneer for water levels.

The wide scale of products require different coding and pictures f.e.

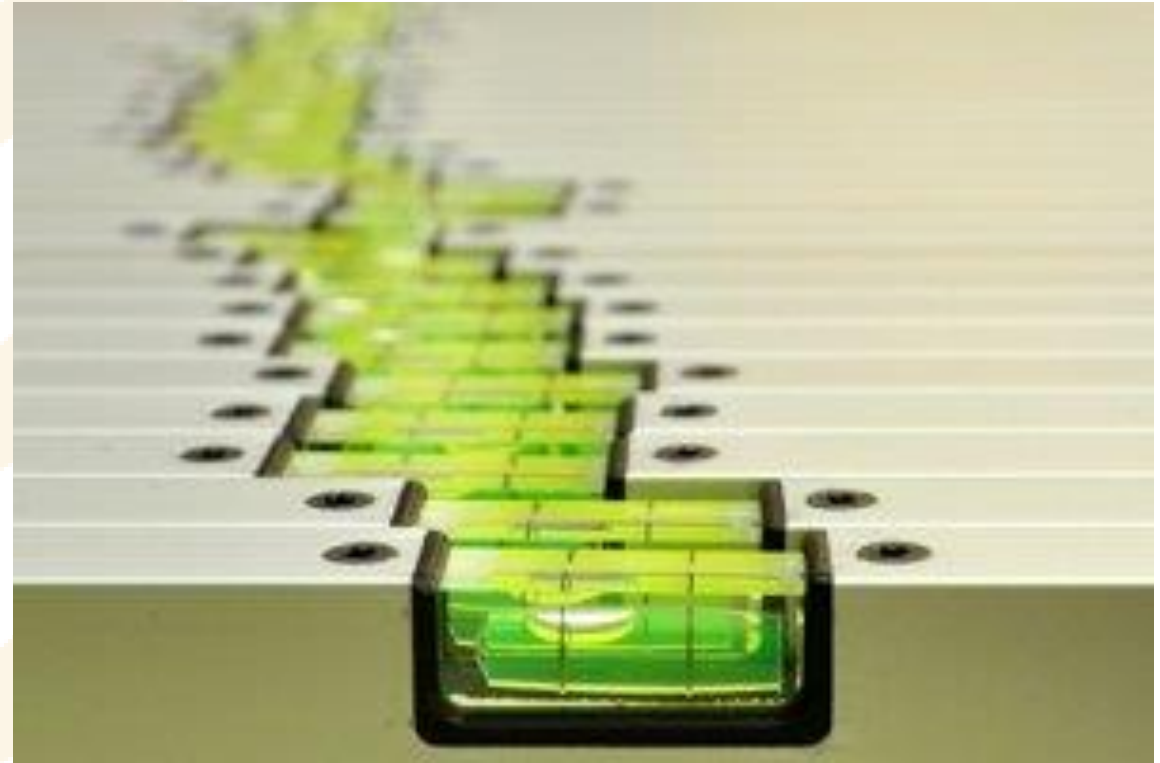
- Printed scale
- Product name and branding
- Barcode + QR-Code

The printing has to be permanent and very good readable for scanners

Example: Improvement of water levels

Purpose:

- Cleaning
- Improvement of adhesion of inkjet print



Solution development of cleaning/treatment process

For **cleaning** of oil and **improved adhesion** and **scratch resistance** of the ink at a speed of **20 m/min** a plasma dose of **600 W** were sufficient.

Two CAT600 plasma systems with **slot nozzles** were used, to clean and treat a width of **50 mm**



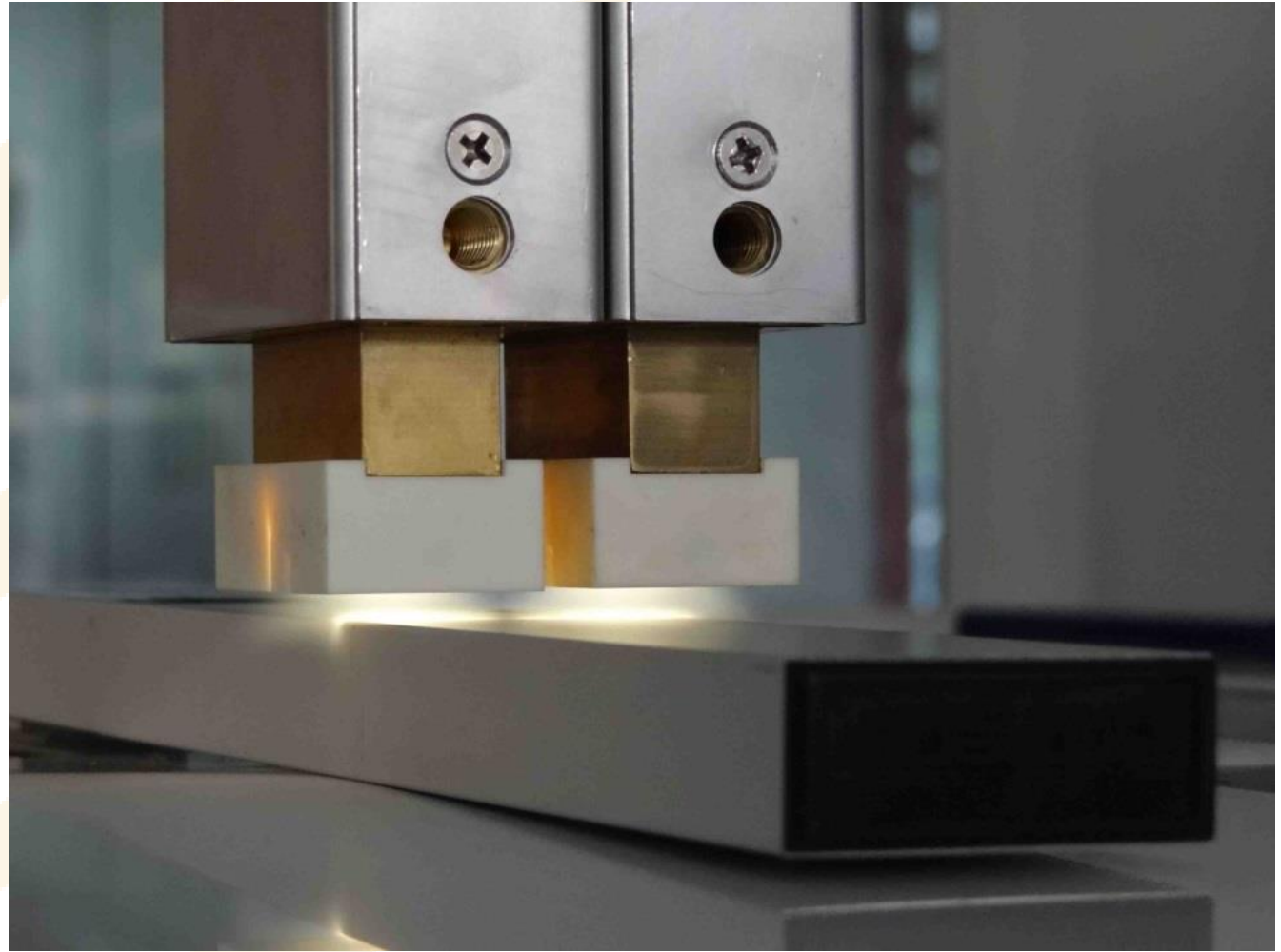
Test: From lab to production line

2 x plasma tools with 600 W each were used

Two systems were used side by side, with a offset of app. 2 mm

After positive result:

Trials could be made in production line



Result: Process reliability and time saving

Barcode: For readability a good printing result is necessary

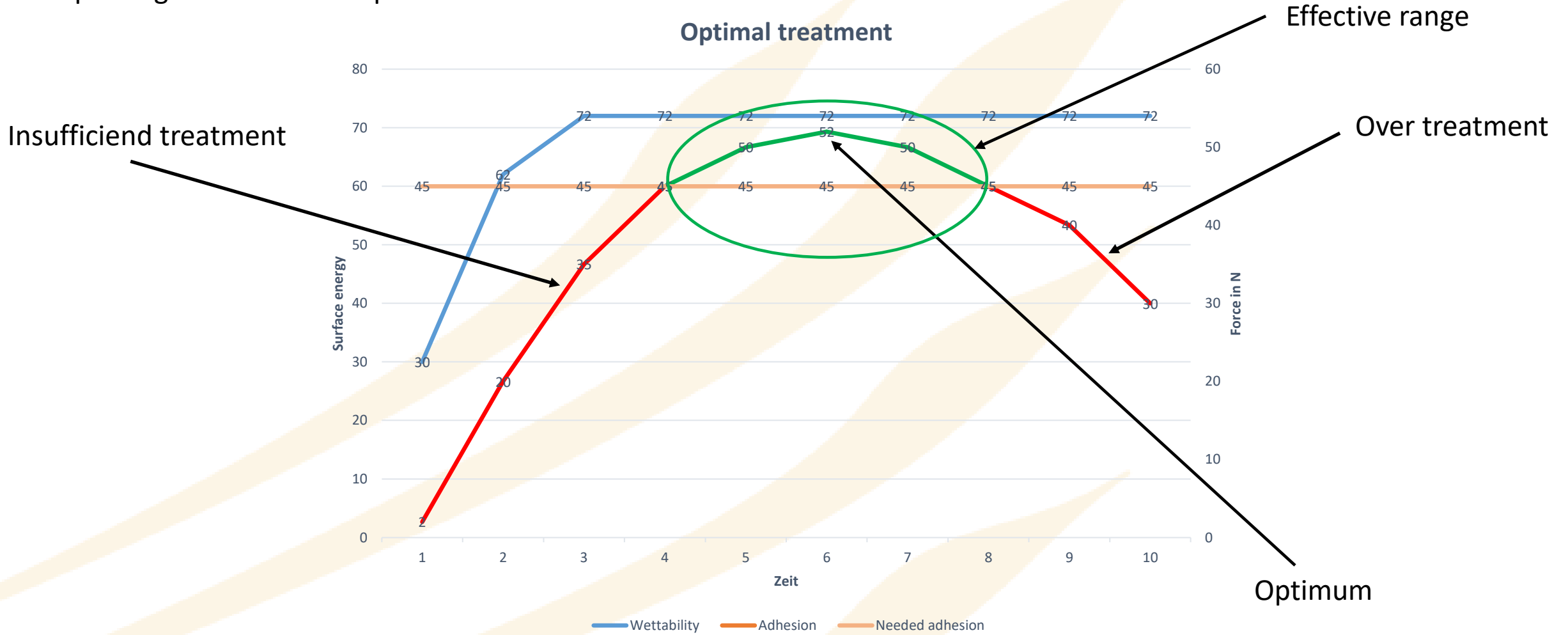
- Manual cleaning process was replaced
- Increased process reliability
- Improved cleaning time

Water levels, from 20 cm to 200 cm length, are now treated at a line speed of 20 m/min.



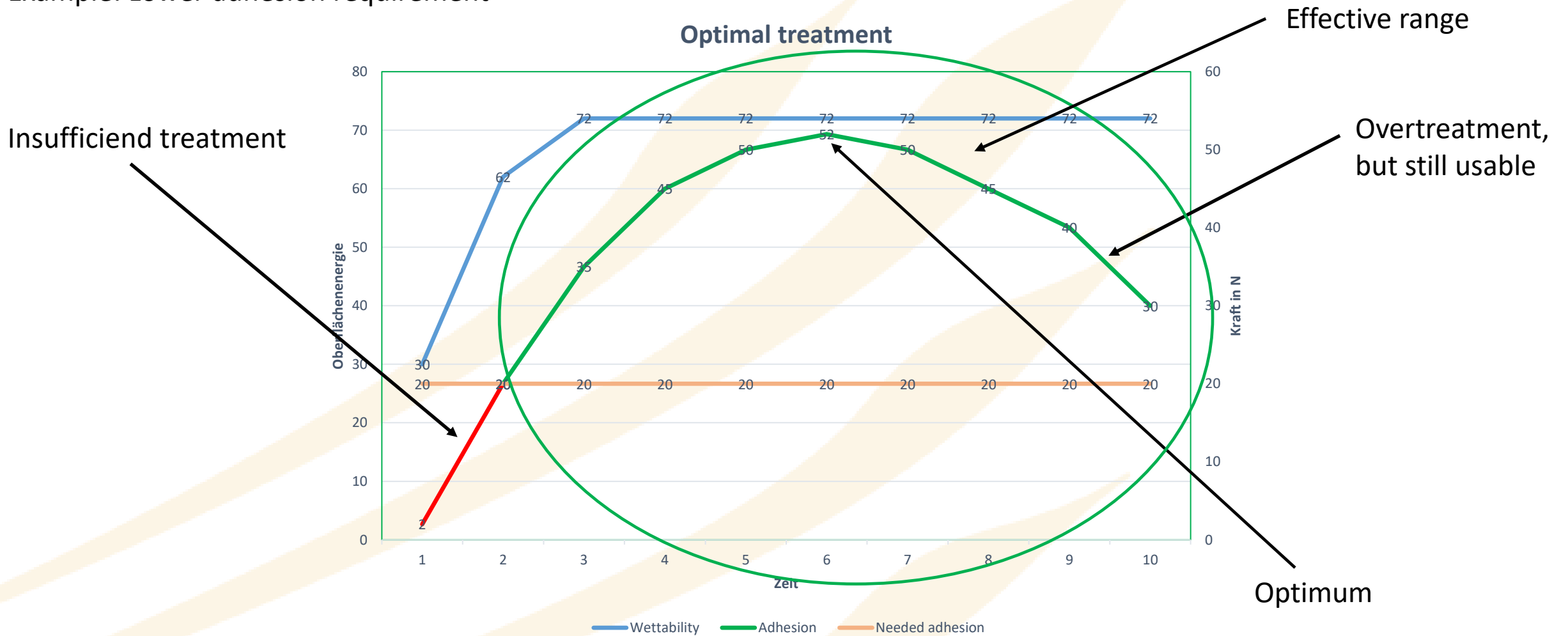
Optimising plasma: Adjustable plasma power for the perfect plasma dose

Example: Higher adhesion requirement



Optimising plasma: Adjustable plasma power for the perfect plasma dose

Example: Lower adhesion requirement



How to optimise plasma treatment?

Possibilities to influence the plasma dose:

☹️ **Adjust distance of nozzle to surface**

Cons:

1. Normaly very smal process window of a few mm
2. Unpractical for different power levels with fixed nozzles

😐 **Change of treatment speed of nozzles or material**

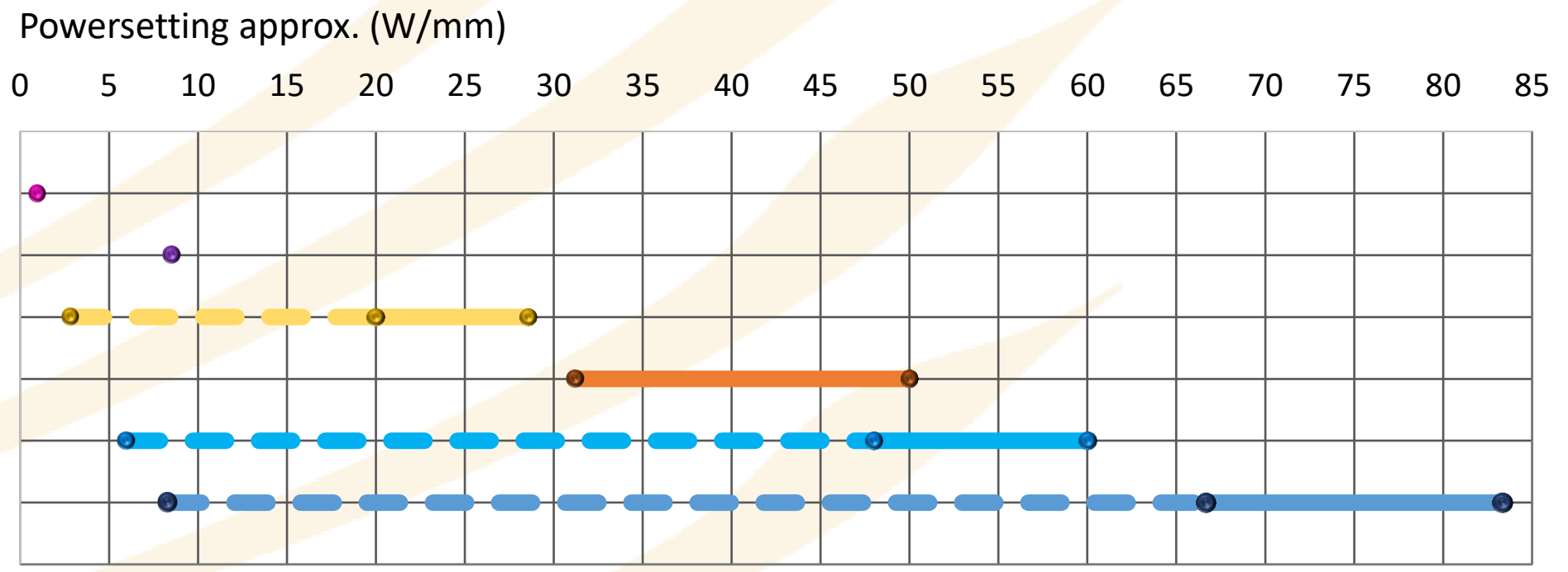
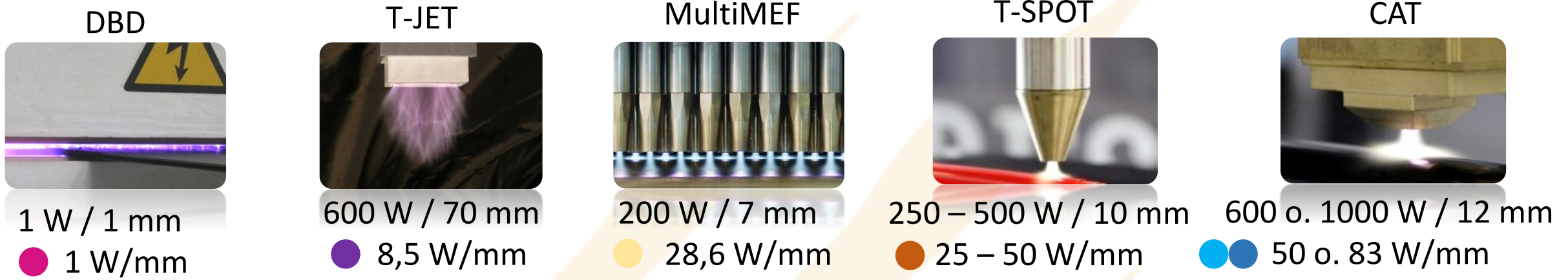
Cons:

1. Only possible, if needed process speed can be achieved (f.e. to fast or to slow)
2. Difficult in some productions (f. e. extrusion)

😊 **Power adjustment via generator**

Advantage: Can be adjusted directly in generator according to the need, if process windows is suitable.
Can be adjusted on the fly, online. Also also via I/O and BUS.

Plasma tools, power ratio according to the customers needs



General structure of standard devices

Power supply

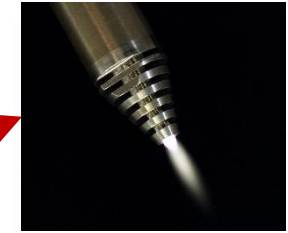
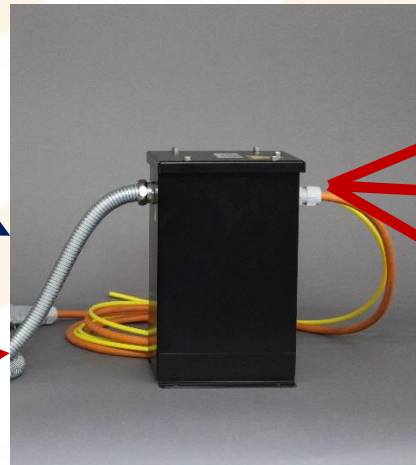
Tool

+

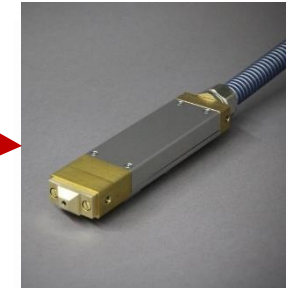
Generator

Transformer
(internal / external)

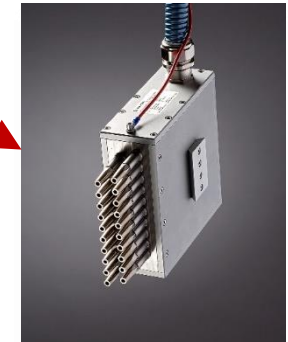
+



T-SPOT



CAT



MEF

Tool T-SPOT S3

Plasma power:

App. **250 - 500 W per nozzle**,
(app. 375 – 500 W for slot nozzle)

Nozzles are convertible

HV-Cable length: 2 m

Compressed air:

App. **30 l/min** per nozzle

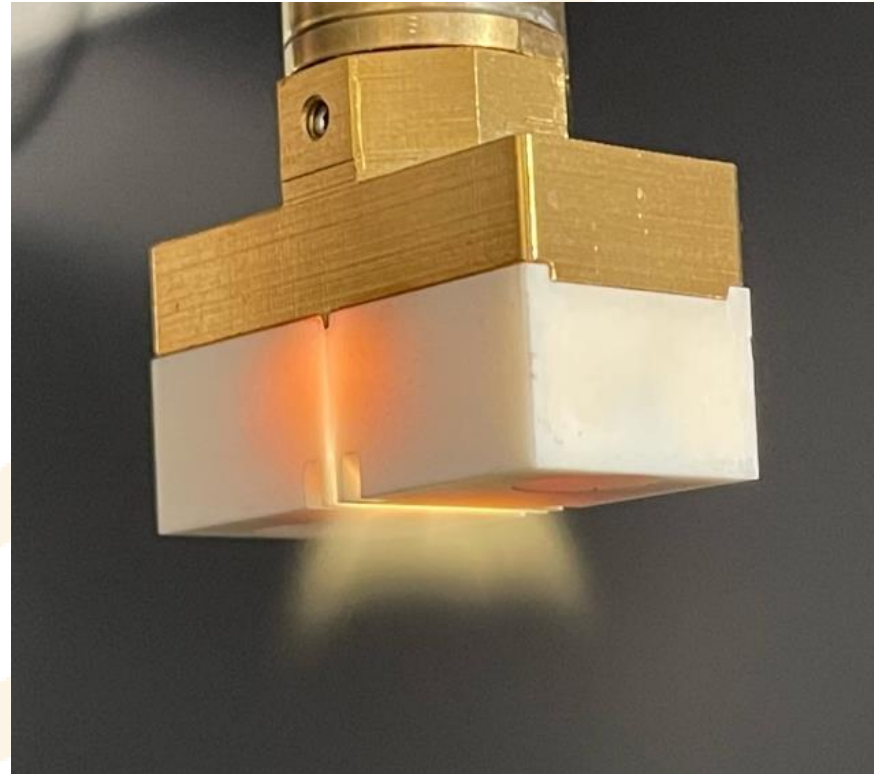
Weight:

App. **200 g**, focus nozzle (FD)

App. **315 g**, slot nozzle (SD)

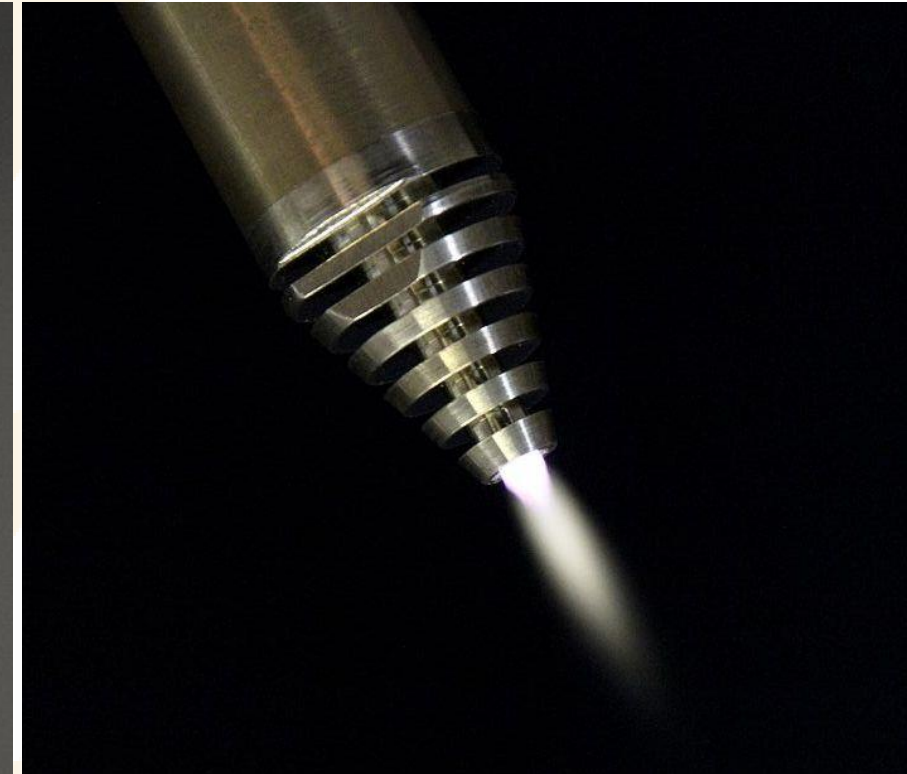
Lifetime electrode:

Up to **2.000 h**



Treatment width slot nozzle:

Up to 20 mm per head, 25 max.
Depth: app. 1-8 mm



Treatment width focus nozzle:

App. 8-12 mm per head
Depth: app. 5-15 mm

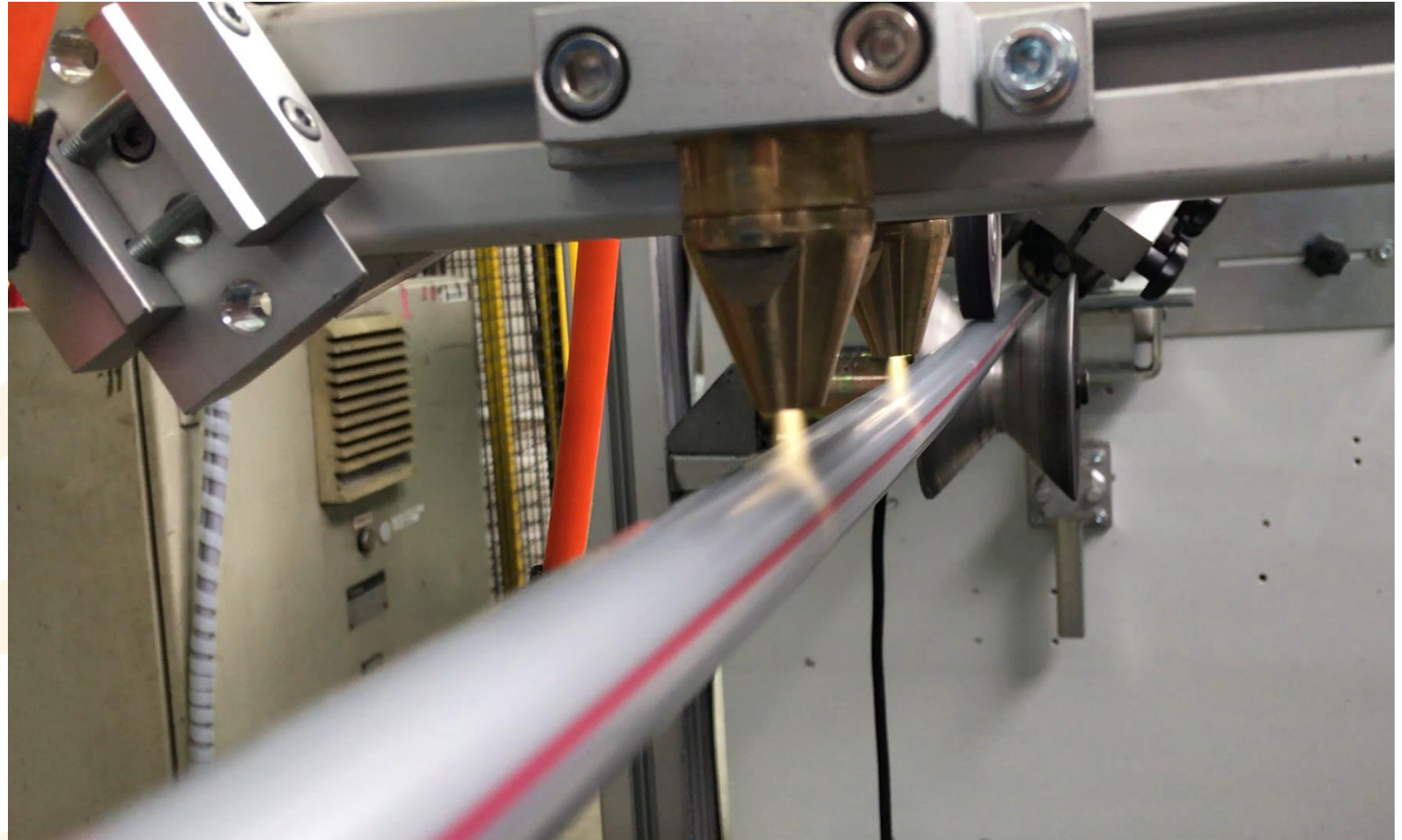
Application T-SPOT: Tubes

Treatment of tubes
prior to inkjet printing

Material: PE

Speed: 30 m/min

tape test ok with one
nozzle and 60 % power



Picture: Roth Werke GmbH

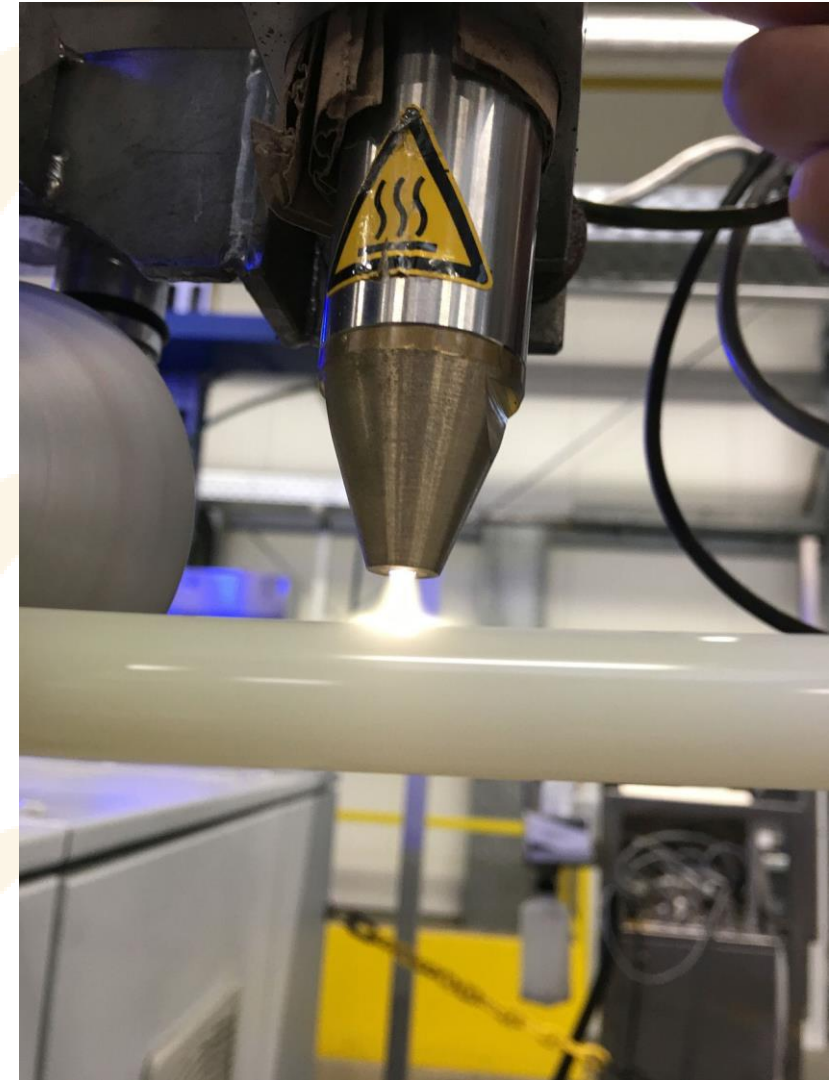
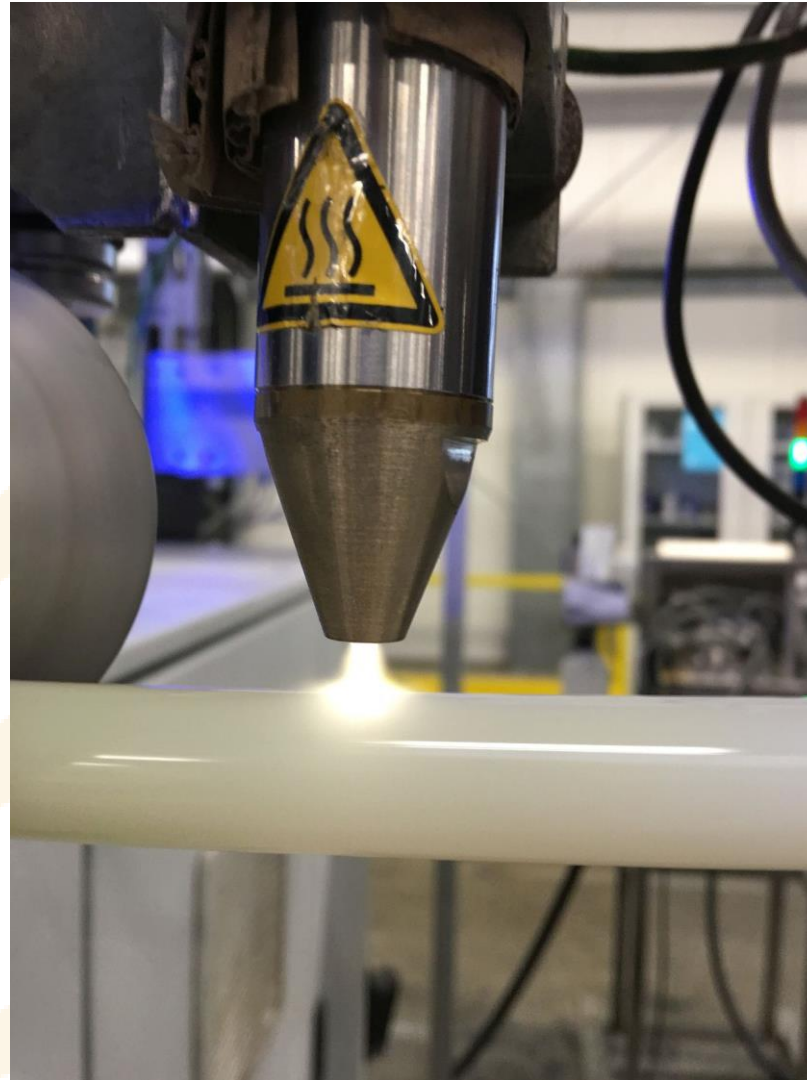
Application T-SPOT: Tubes

Treatment of tubes
prior to inkjet printing

Material: **PEX**

Speed:

> 200 m/min



Picture: Becker Plastics GmbH

Application T-SPOT: Adhesion of ink jet on PE

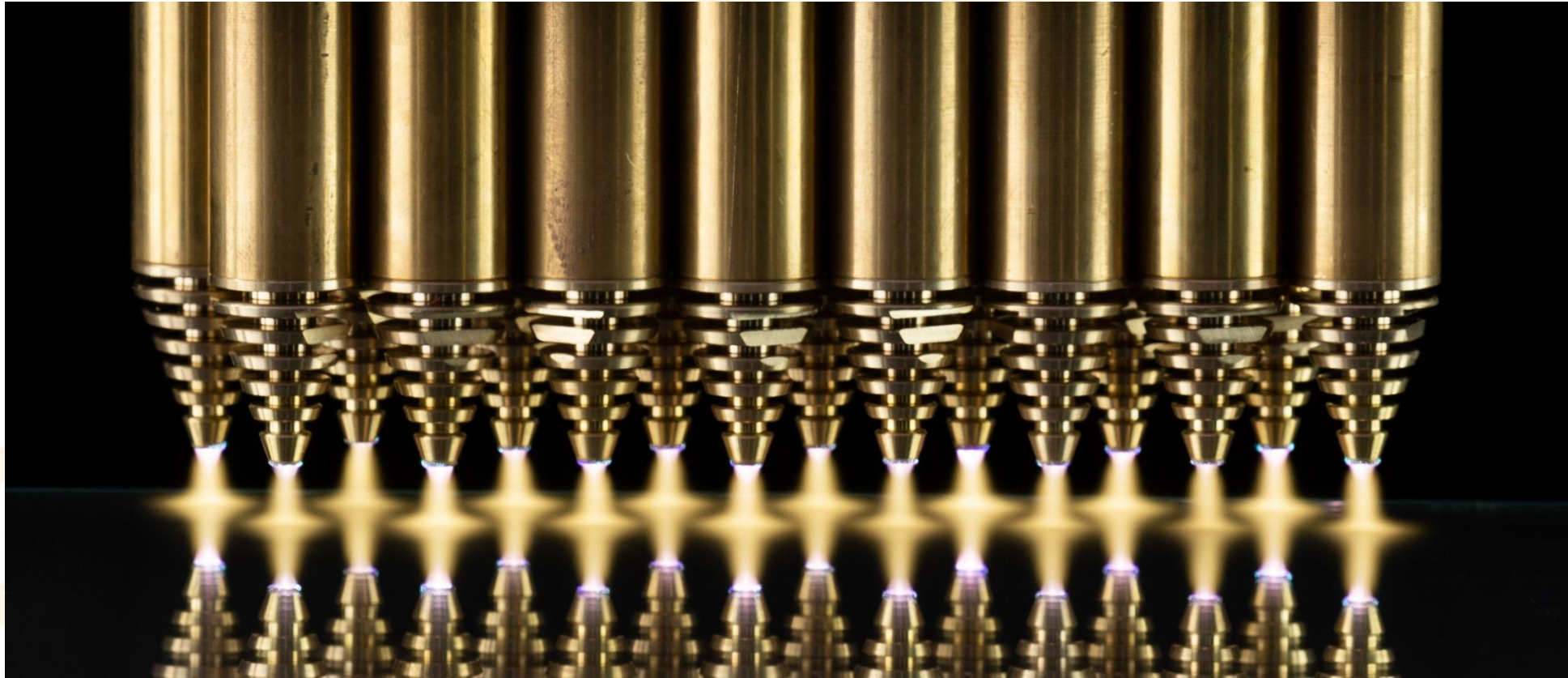


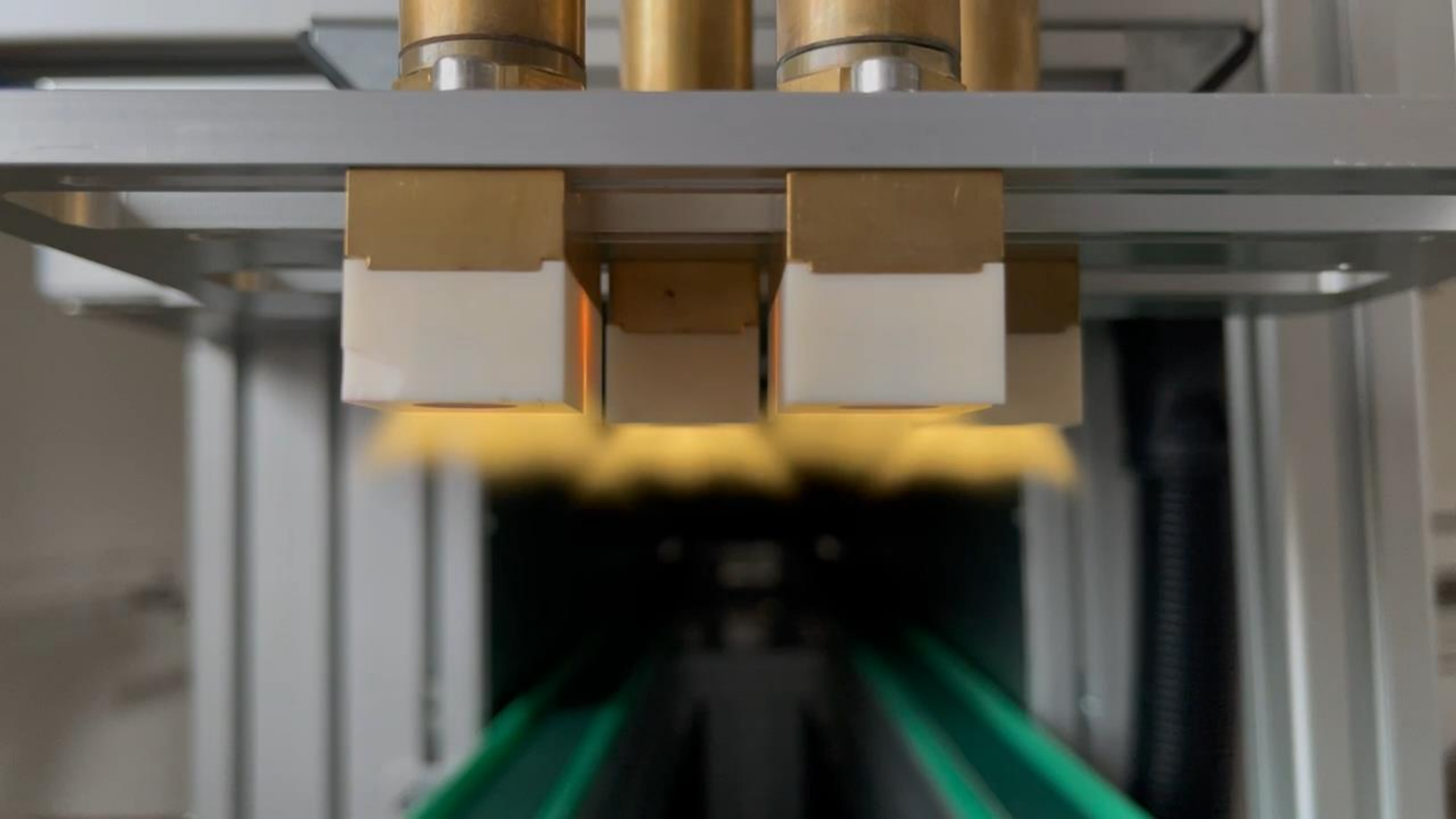
Picture: Wiedenbach Apparatebau GmbH / Domino Industrial

Standard tool T-Spot S3 SD

The new plasma nozzle S3 is available in unlimited width.

Full process control, monitoring, adjustment for each nozzle for all process parameters.





Application T-SPOT SD: UV-Inkjet printing on cards



T-SPOT S3 2k SD

Treatment width plasma:

Ca. 50 mm

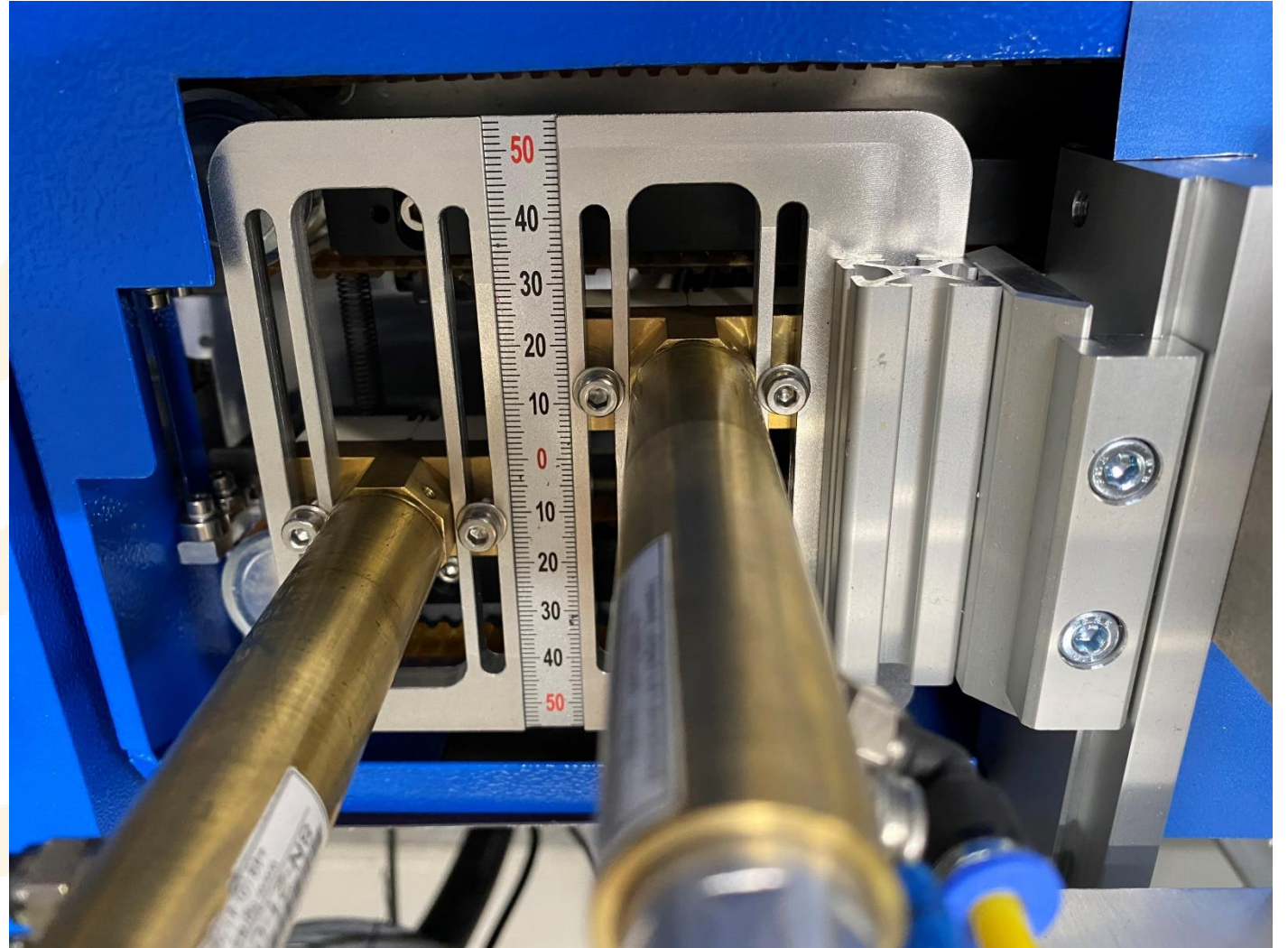
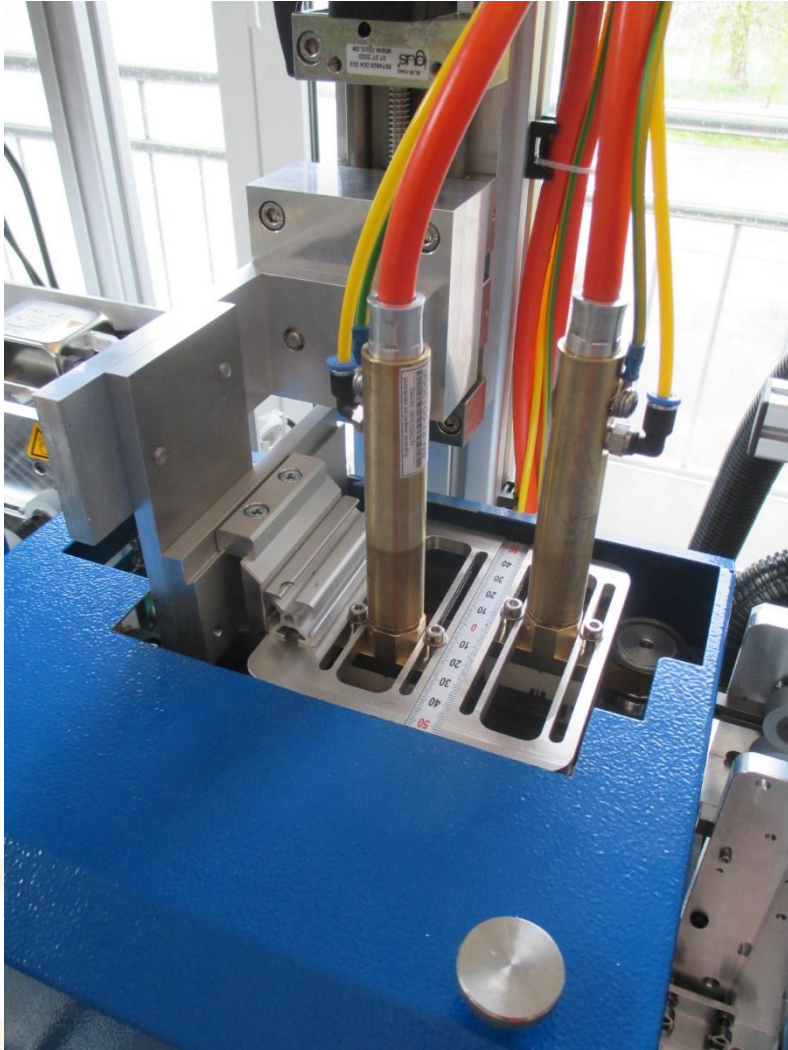
Speed:

9.000 cpm



Picture: Rinas Gerätetechnik GmbH

Application T-SPOT SD: UV-Inkjet printing on cards



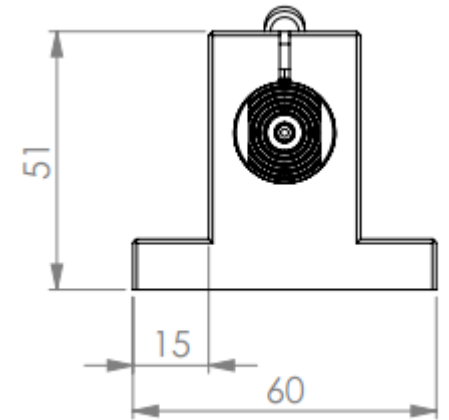
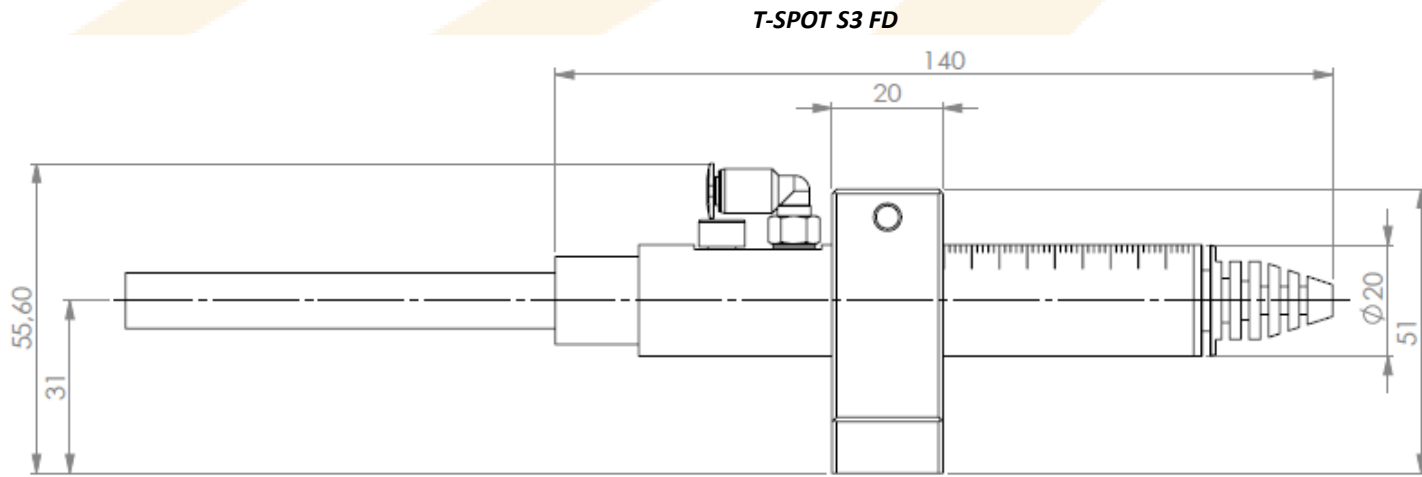
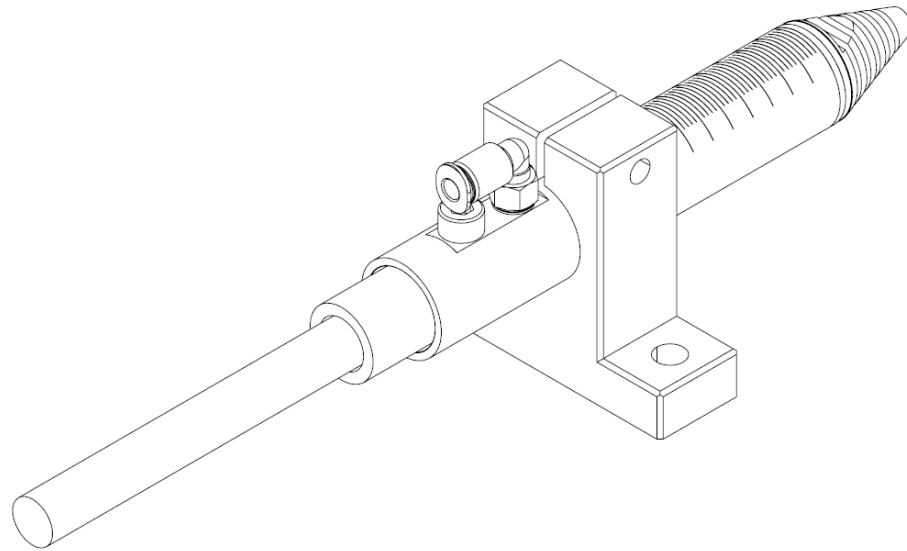
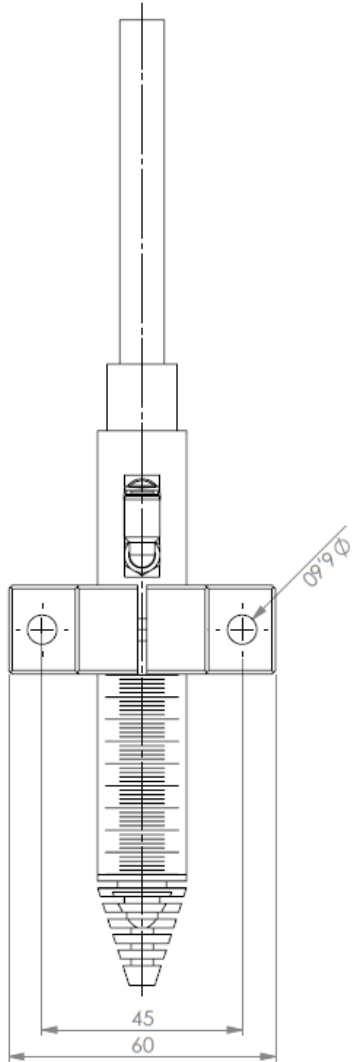
Pictures: Rinas Gerätetechnik GmbH

T-SPOT S3: Technical specification

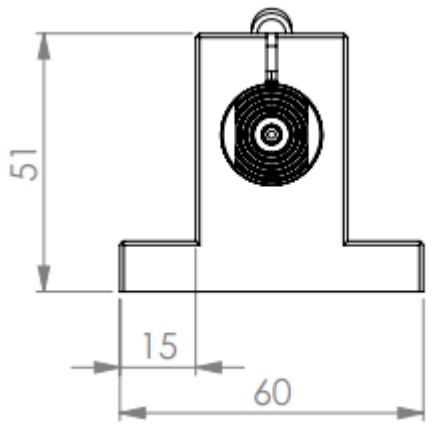
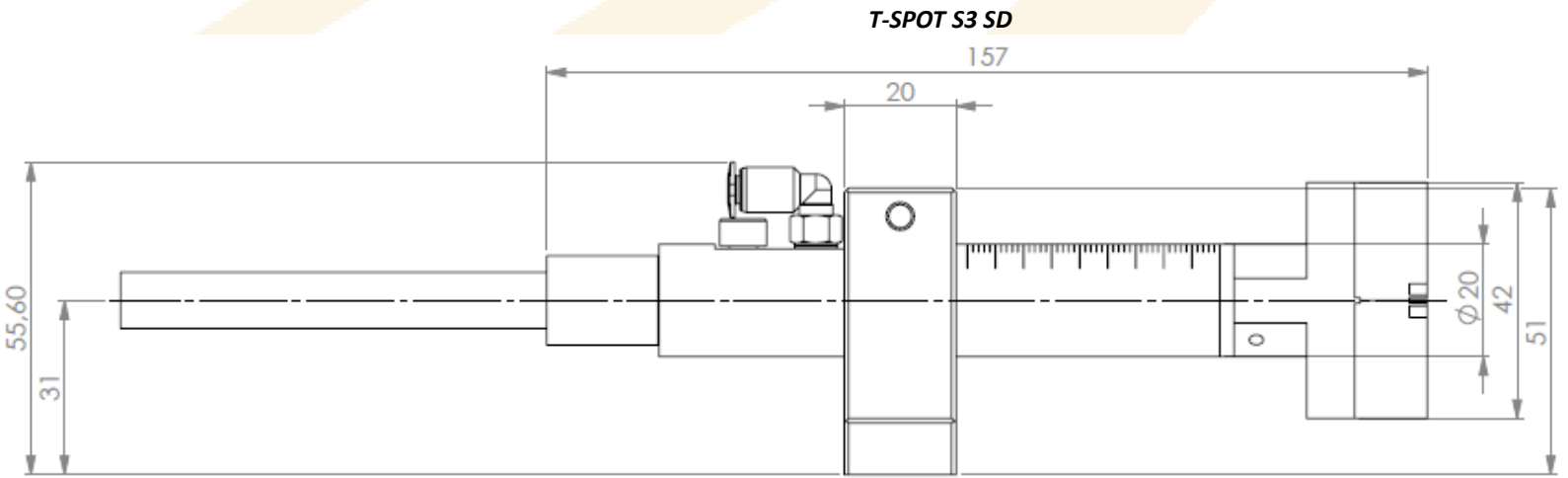
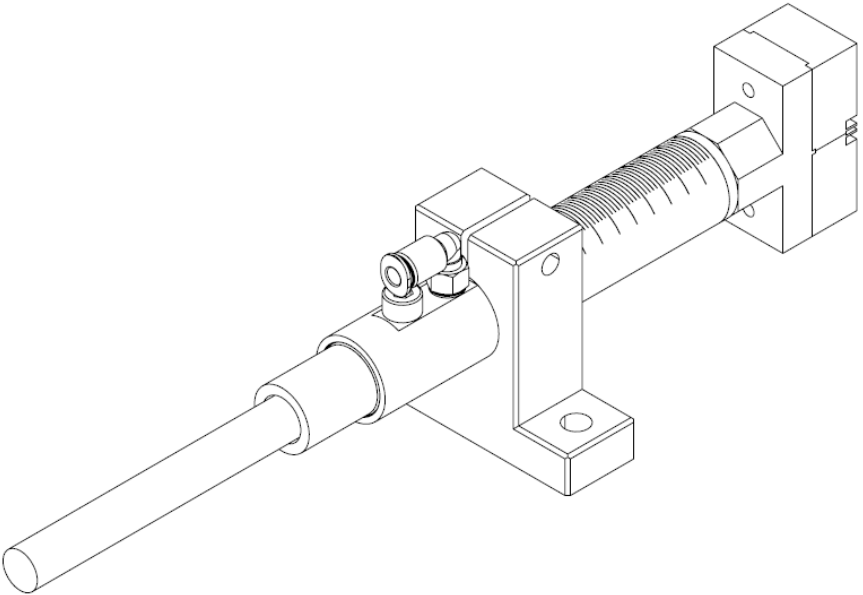
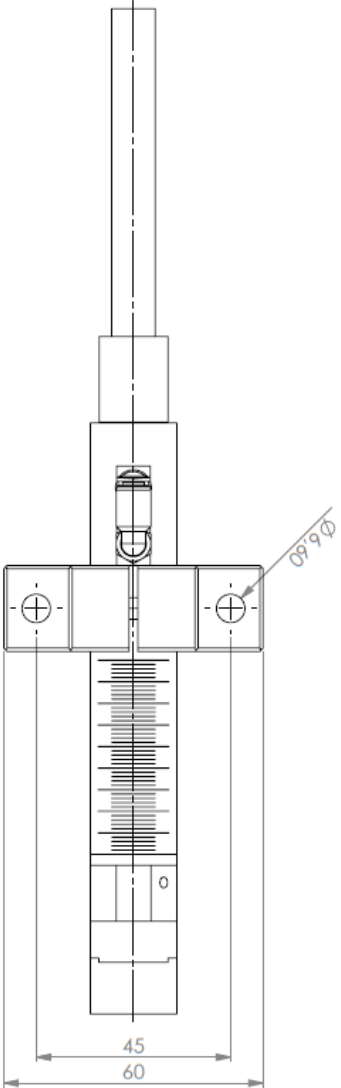
Tool	T-SPOT S3 500 1K	T-SPOT S3 500 2K	T-SPOT S3 500 3K	T-SPOT S3 500 4K
Treatment width ¹⁾	Up to app 12 mm (Focus) per nozzle up to app. 22 mm (Slot) per nozzle			
Working distance ²⁾	Focus : app. 3 – 15 mm, Slot : app. 1 – 7 mm			
Dimensions (h/Ø) app. in mm	182/45/22	(2x) 182/45/22	(3x) 182/45/22	(4x) 182/45/22
Weight app.	App. 200 g, 850 g with cable and bracket	(2x) 200 g, 850 g with cable and bracket	(3x) 200 g, 850 g with cable and bracket	(4x) 200 g, 850 g with cable and bracket
Generator	M1, 2, 4	M2, 4	M4	M4
Power	250 - 500 W	2 x 250 - 500 W	3 x 250 - 500 W	4 x 250 - 500 W
Power supply	400 V 3~; 16 A 50/60 Hz	400 V 3~; 16 A 50/60 Hz	400 V 3~; 16 A 50/60 Hz	400 V 3~; 16 A 50/60 Hz
Dimensions (h/w/d) app. in mm min. mounting depth	250/271/618	250/456/580	250/456/580	250/456/580
Weight app.	12 kg	14,4 kg	21,7 kg	21,7 kg
Supply cable	3 m	3 m	3 m	3 m
HV-Cable	2 m	2 m	2 m	2 m
Primary cable	3 m, max. 10 m possible	3 m, max. 10 m possible	3 m, max. 10 m possible	3 m, max. 10 m possible
Display	ja	ja	ja	ja
Remote control	ja	ja	Ja	ja
Compressed air, 6 bar	30 l/min	30 l/min per tool	30 l/min per tool	30 l/min per tool
Transfomer	external	(2x) external	(3x) external	(4x) external
Dimensions (H/W/D) app. in mm	136,4/147/190	136,4/147/190	136,4/147/190	136,4/147/190
Weight app.	3 kg, with nozzle and cable 4,2 kg	3 kg, with nozzle and cable 4,2 kg	3 kg, with nozzle and cable 4,2 kg	3 kg, with nozzle and cable 4,2 kg
Options				
HV-cable nozzle	3 m, power app. 300 - 500 W	3 m, power app. 300 - 500 W	3 m, power app. 300 - 500 W	3 m, power app. 300 - 500 W

Depending on the application: ¹⁾material, ²⁾treatment speed, ³⁾Working distance

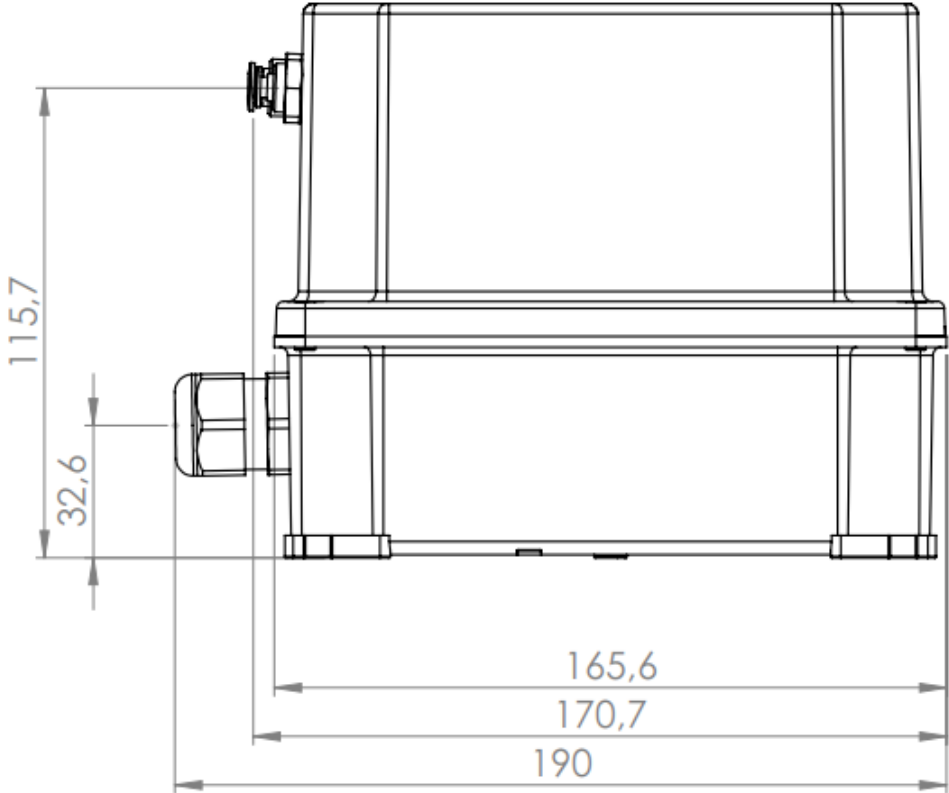
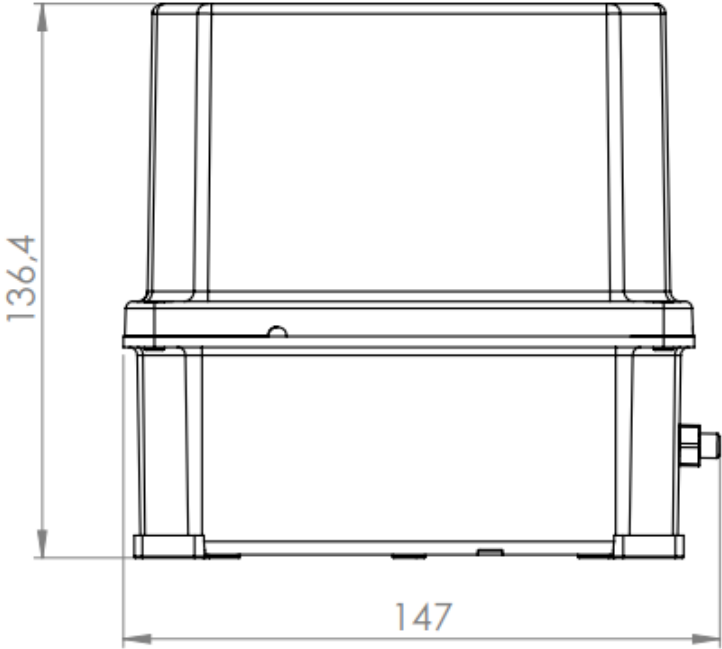
T-SPOT: Drawings tool S3 focus nozzle



T-SPOT: Drawings tool S3 slot nozzle



Transformer T-SPOT: Drawings

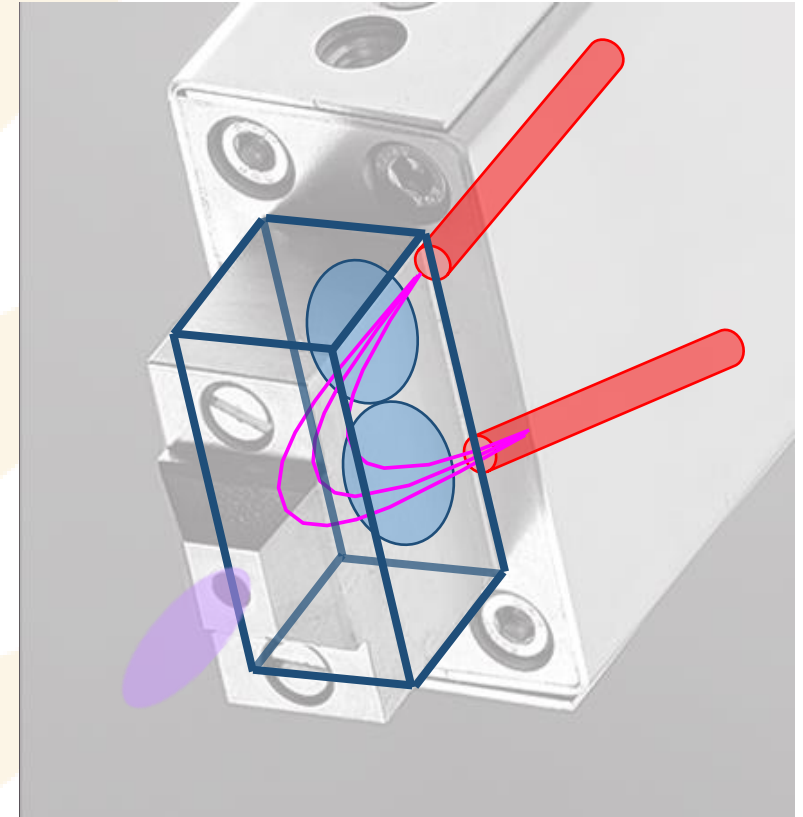


Tool CAT

Plasma is generated by two arcs, whereby the counter arc also acts as the counter electrode = minimizing the effects of wear on plasma generation.

1000 [W] / Nozzle
50 [l/min] / Nozzle
(CAT 1000)

600 [W] / Nozzle
30 [l/min] / Nozzle
(CAT 600)



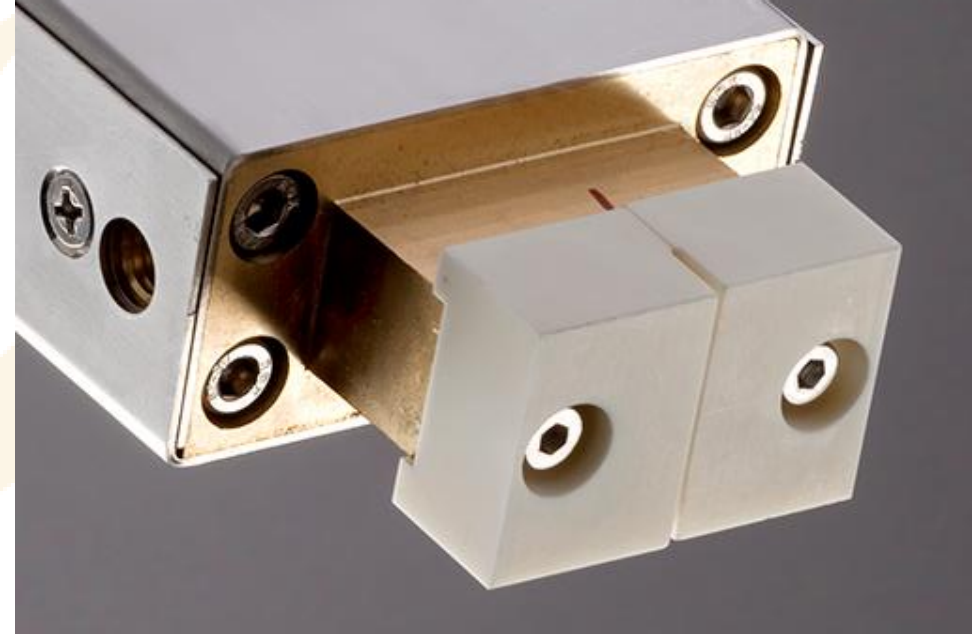
Tool CAT: Focus and Slot Nozzle



Fokus nozzle, 4 mm standard,
3 and 6 mm and others available

Treatment width:
CAT1000: Ca. 14-18 mm

Treatment depth:
CAT1000: Ca. 18-25 mm



Slot nozzle

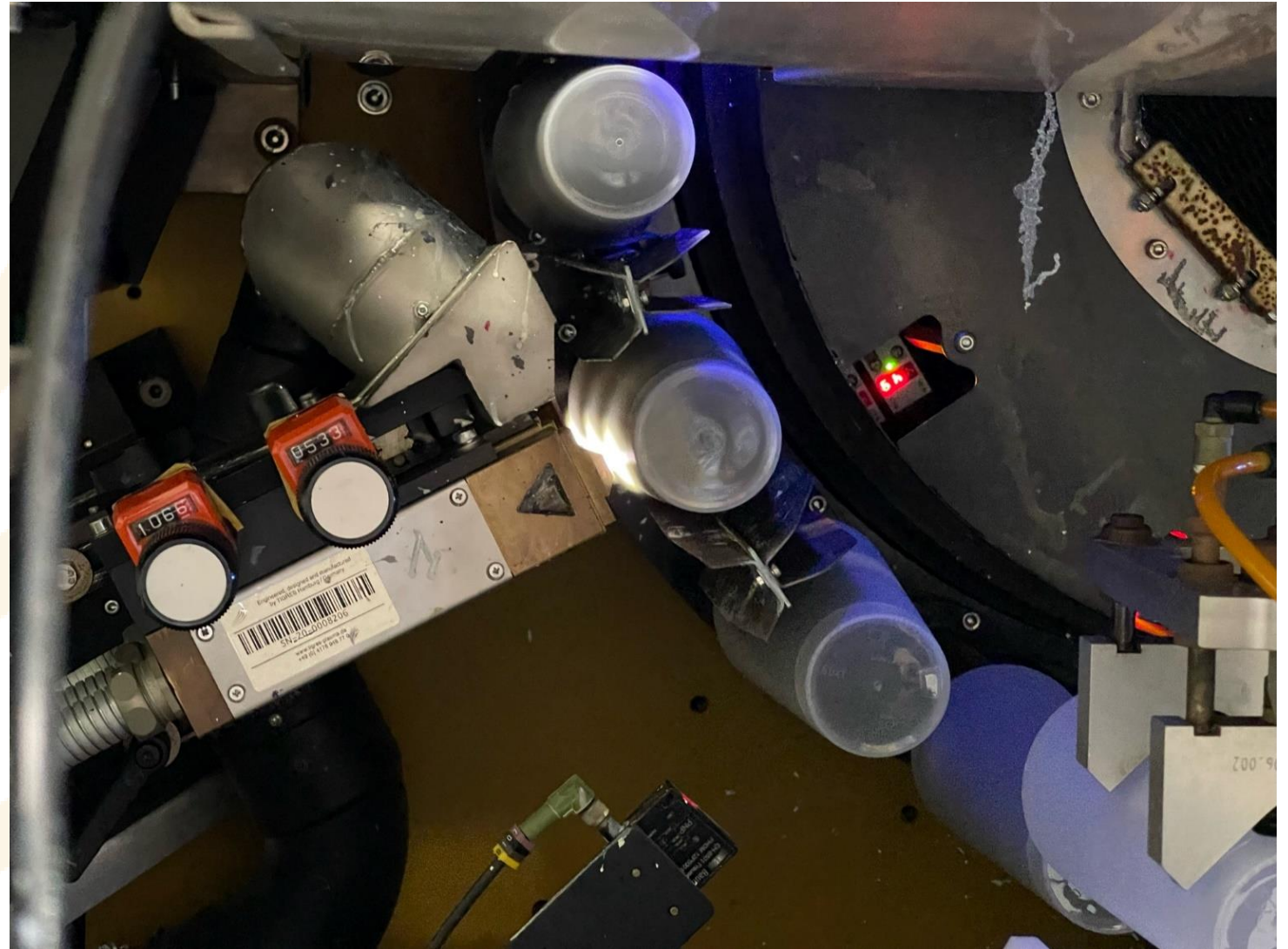
Treatment width:
CAT1000: Ca. 25-32 mm

Treatment depth:
CAT1000: Ca. 4-8 mm

Application CAT: Digital printing machine

Treatment of mugs prior to digital direct printing

Material: **PE**



Application CAT: Tubes high speed

Treatment of tubes prior to inkjet printing

Material: **PEX**

Speed: > 200 m/min



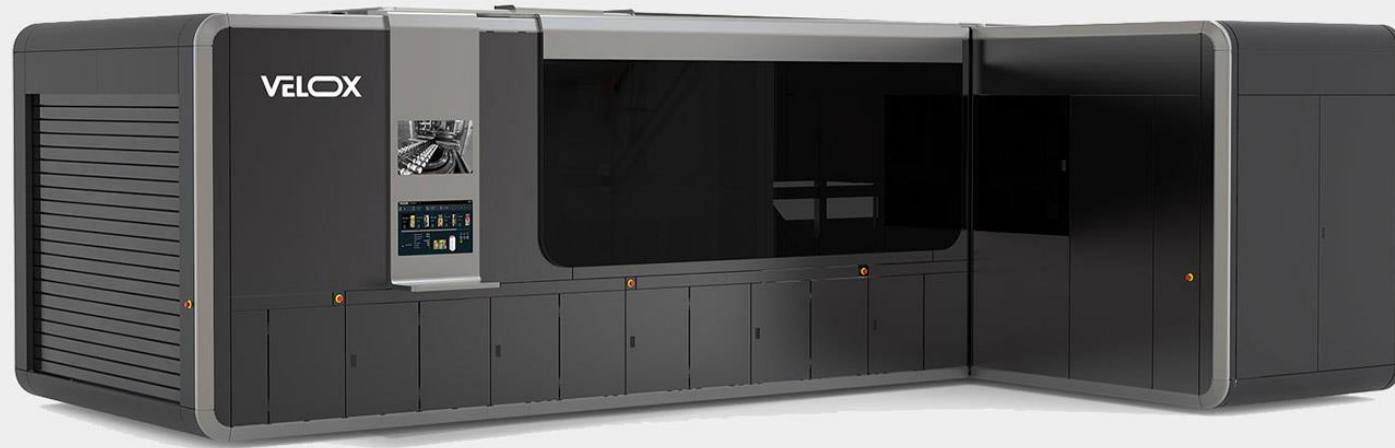
Picture: Hewing GmbH

CAT600: Printing of cans



Picture: Quantix digital

CAT1000: Printing of cans, tubes, cartouches etc.



Pictures: Velox digital

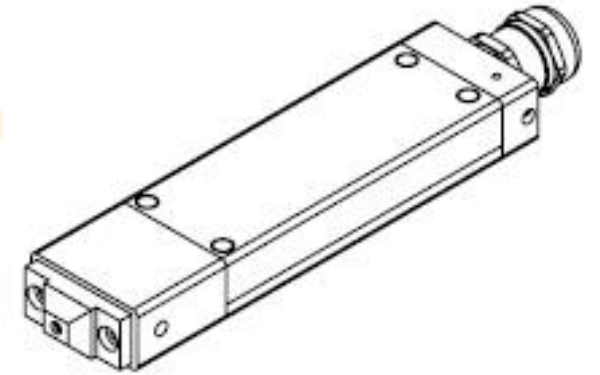
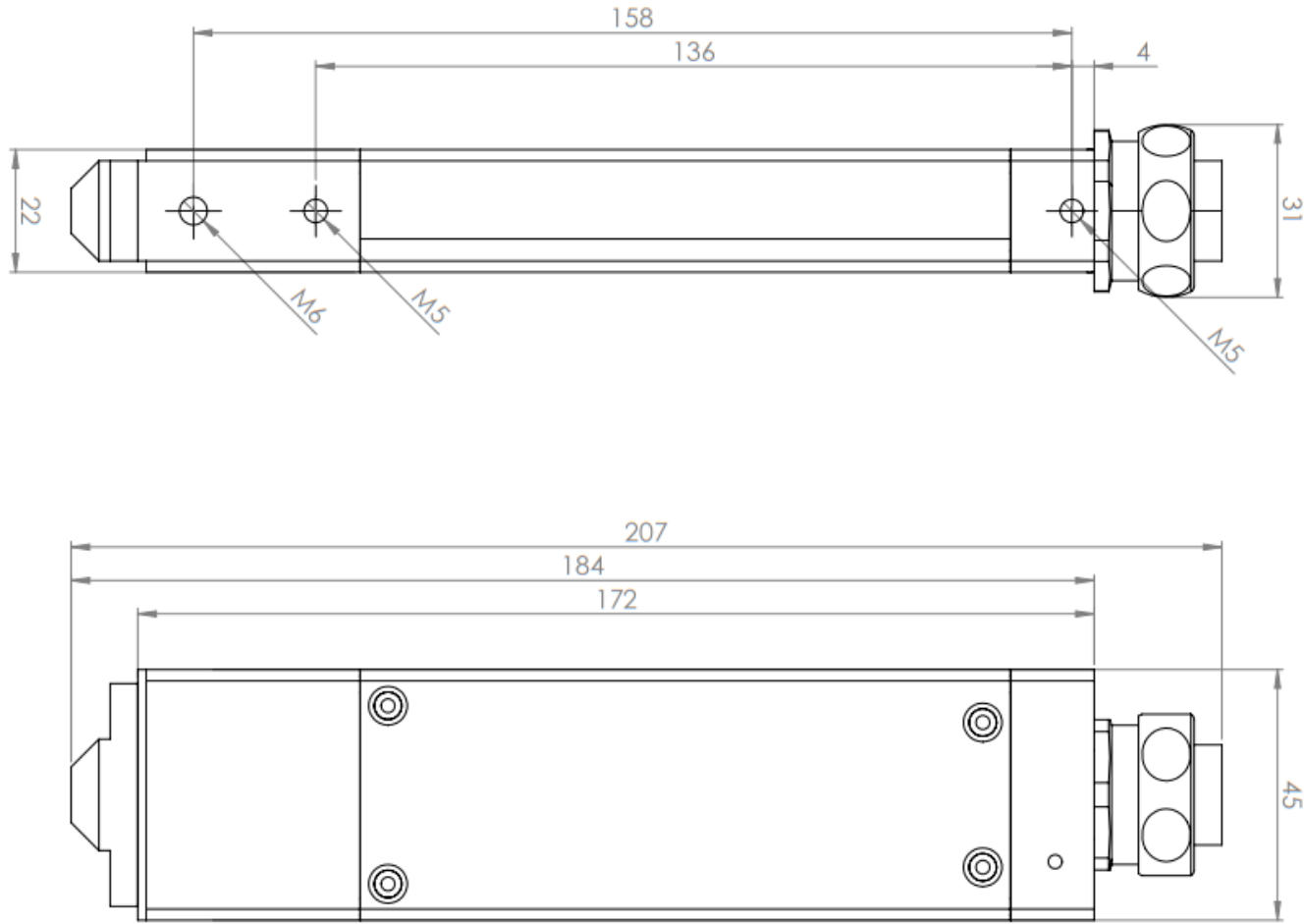
CAT1000: Technical specification

Plasma head	CAT1000 1K	CAT1000 2K	CAT1000 3K	CAT1000 4K
Treatment width ¹⁾ per nozzle, focus and slot	Up to app. 18 mm (Focus) per plasma head Up to app. 30 mm (Slot) per plasma head			
Working distance ²⁾	Focus : 3 – 20 mm, Slot : 2 – 5 mm			
Dimensions (h/w/d) app. in mm	182/45/22	(2x) 182/45/22	(3x) 182/45/22	(4x) 182/45/22
Weight app.	850 g	(2x) 850 g	(3x) 850 g	(4x) 850 g
Generator	M1	M2	M4	M4
Power	1000 W	2 x 1000 W	3 x 1000 W	4 x 1000 W
Power supply	400 V 3~; 10 A 50/60 Hz	400 V 3~; 10 A 50/60 Hz	400 V 3~; 10 A 50/60 Hz	400 V 3~; 16 A 50/60 Hz
Dimesions (h/w/d)app. in mm min. mounting depth	250/381/436 630 / 63 TE	250/381/436 630 / 63 TE	250/436/524 630	250/436/524 630
Weight app.	12 kg	14,4 kg	21,7 kg	21,7 kg
Supply cable	3 m, up to 10 m optional	3 m, up to 10 m optional	3 m, up to 10 m optional	3 m, up to 10 m optional
HV-Cable	2 m	2 m	2 m	2 m
Primary cable	3 m, min. 6 m possible	3 m, min. 6 m possible	3 m, min. 6 m possible	3 m, min. 6 m possible
Display	Yes	Yes	Yes	Yes
Remote control	Yes	Yes	Yes	Yes
Compressed air, 6 bar	55 l/min	55 l/min per tool	55 l/min per tool	55 l/min per tool
Transformer	External	(2x) external	(3x) external	(4x) external
Dimesions (h/w/d) app. in mm	270/145/160	270/145/160	270/145/160	270/145/160
Weight ca.	7 kg	7 kg	7 kg	7 kg

Depending on the application:¹⁾material, ²⁾treatment speed, ³⁾working distance

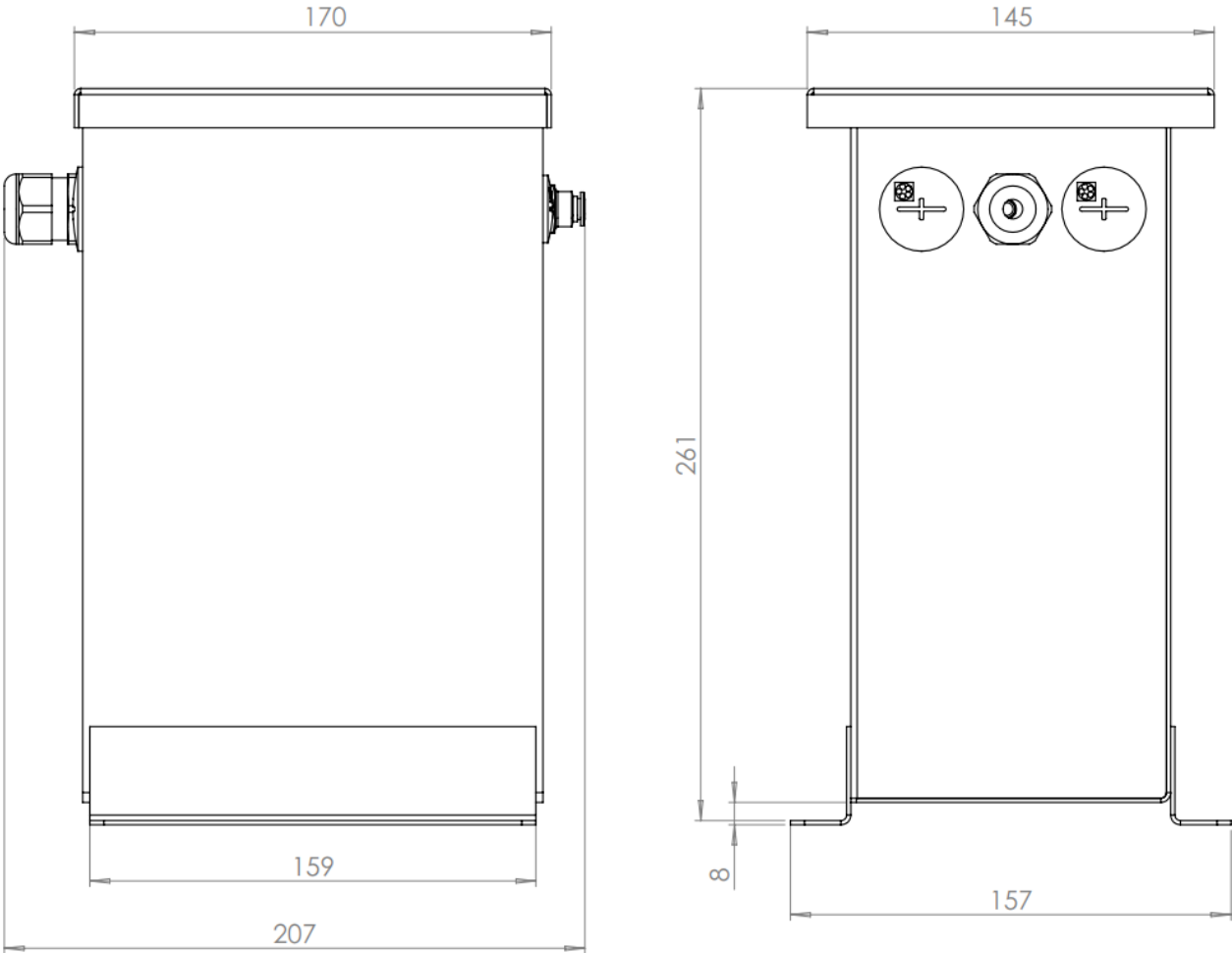
CAT1000: Drawings

CAT1000

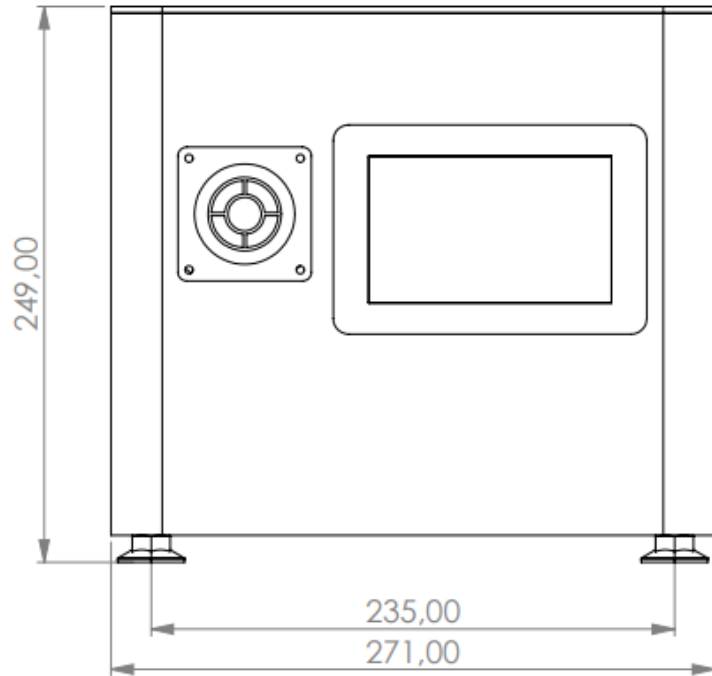


Drawings and step-files available

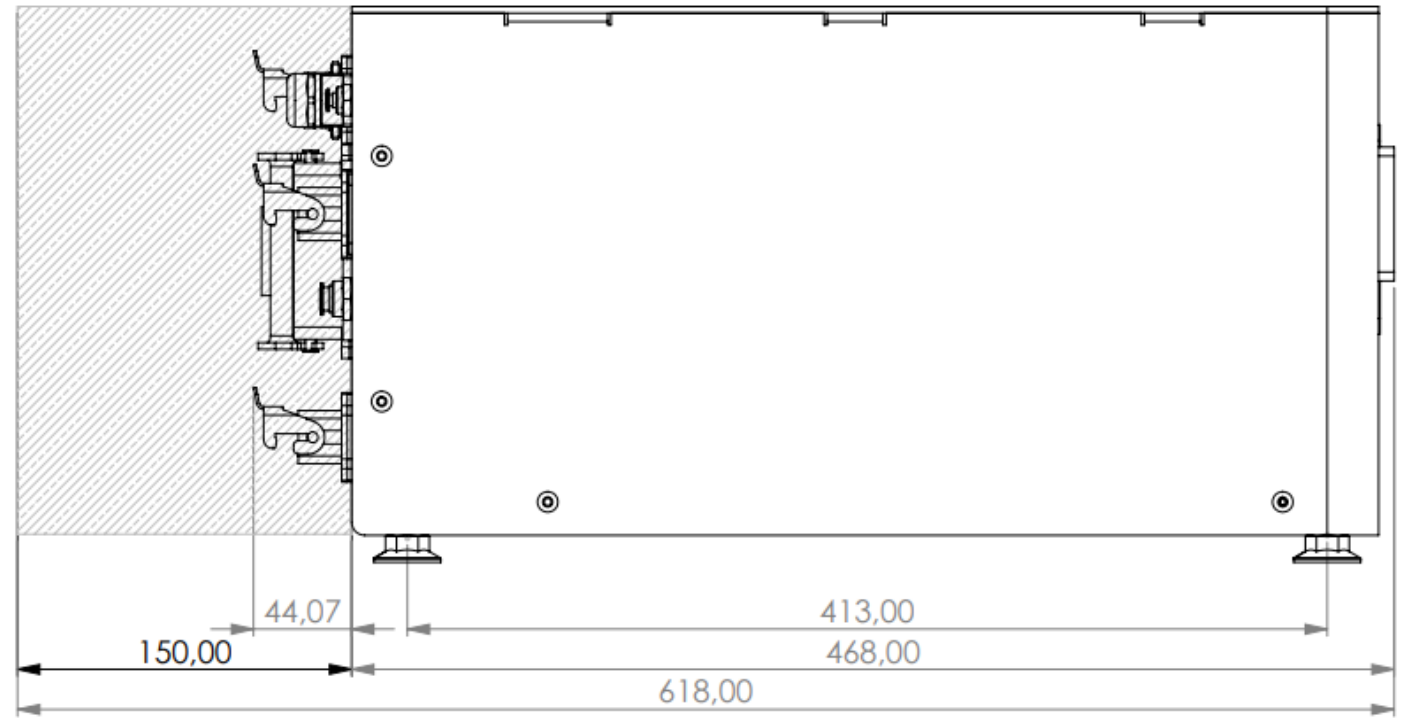
Transformer CAT: Drawings



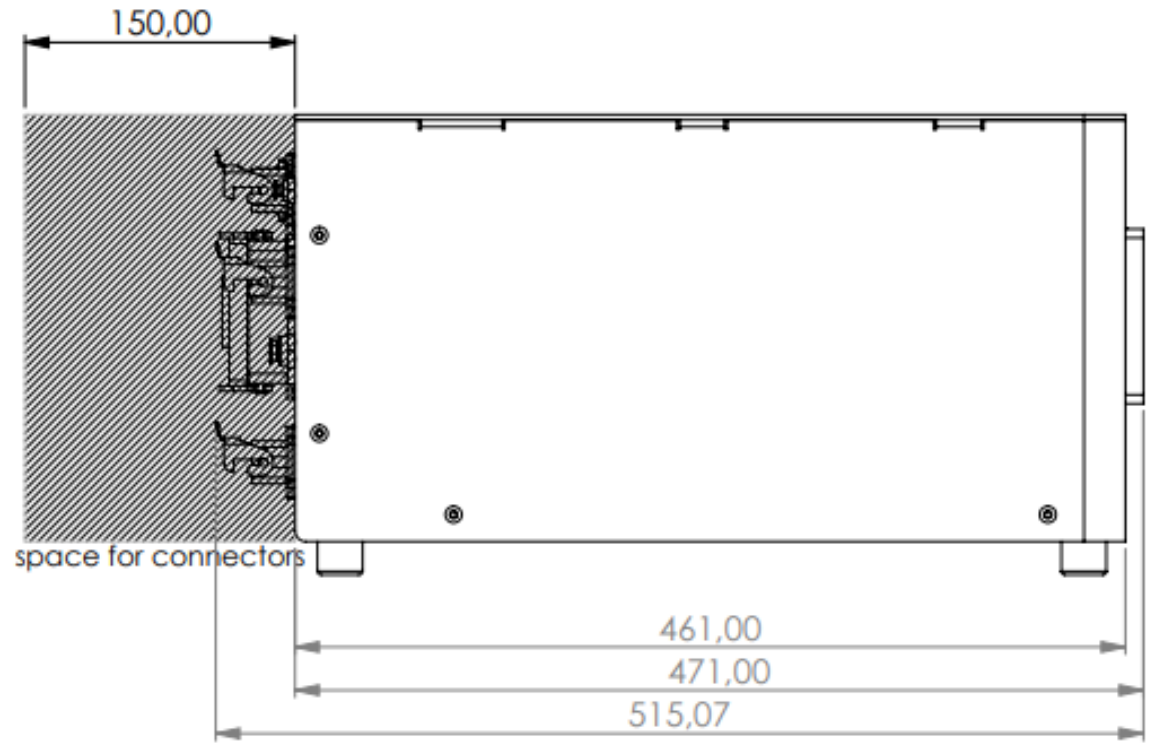
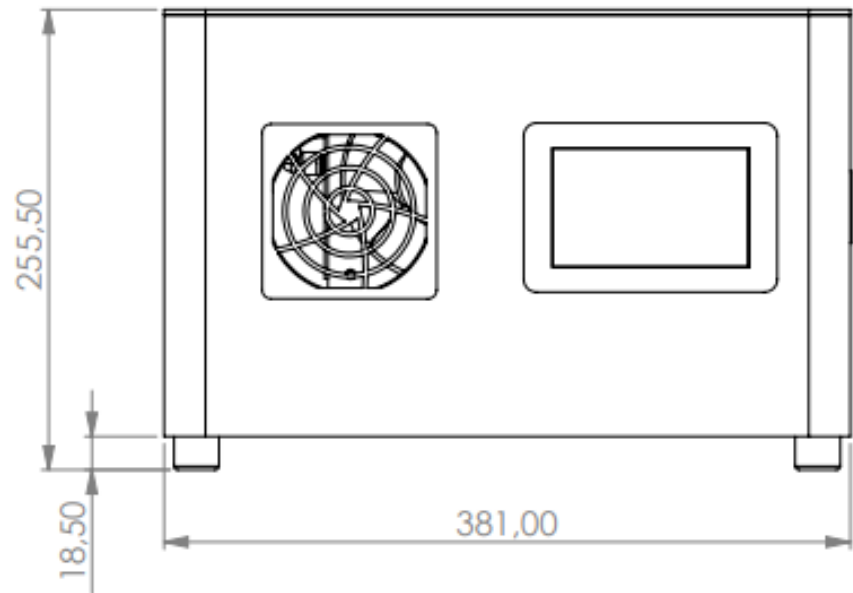
M1 Generator: Drawings



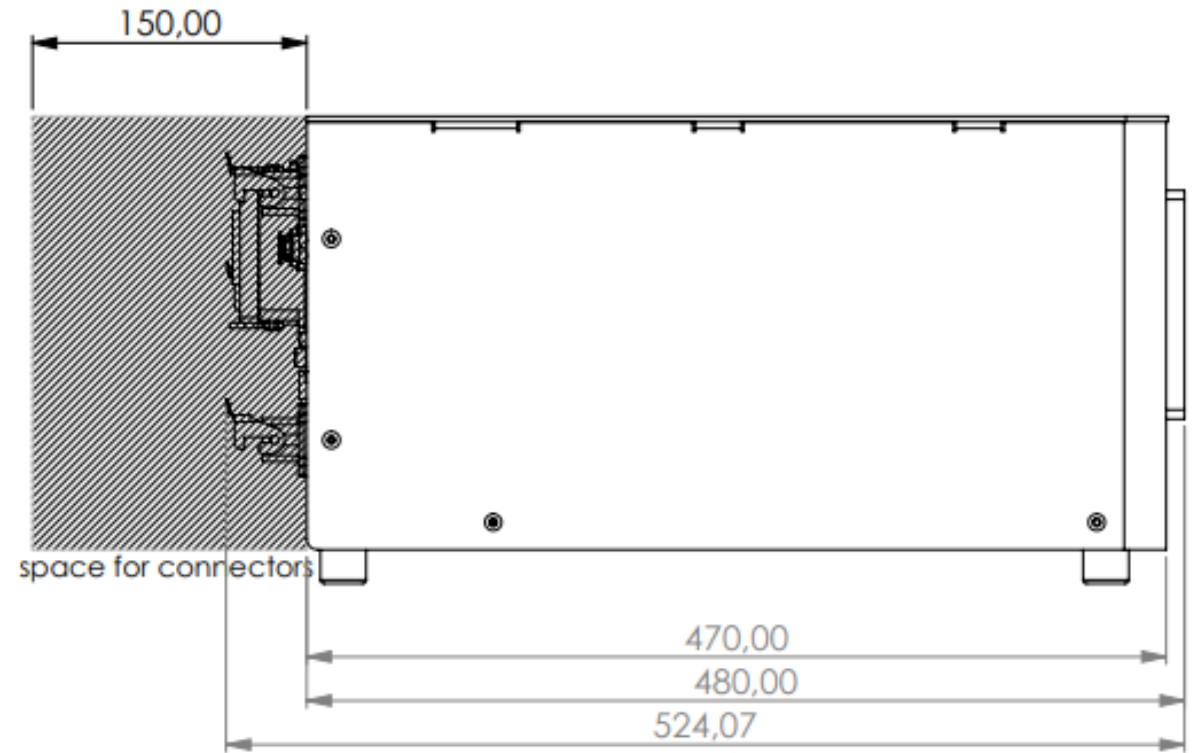
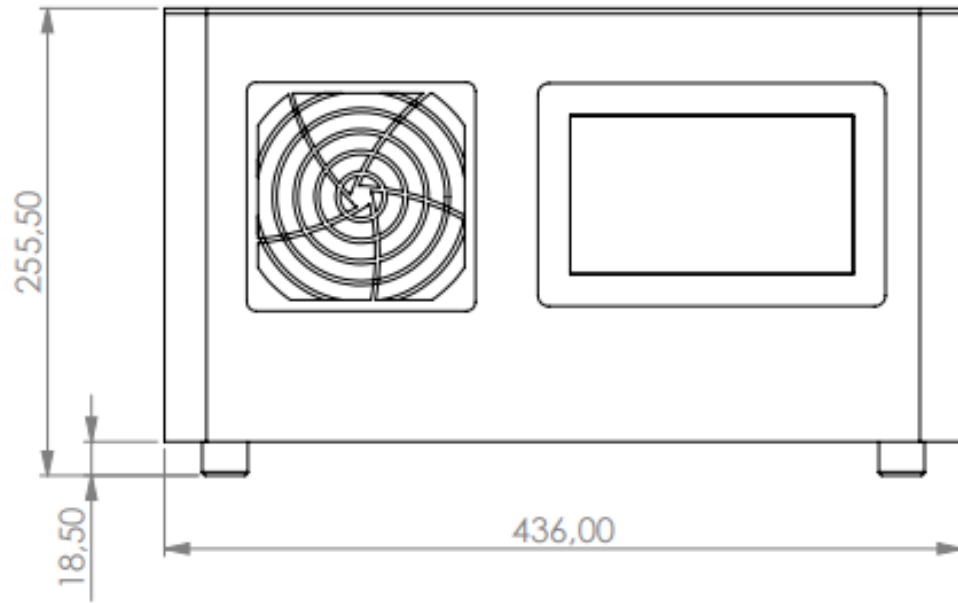
Anschlussbereich für Stecker



M2 Generator: Drawings



M4 Generator: Drawings

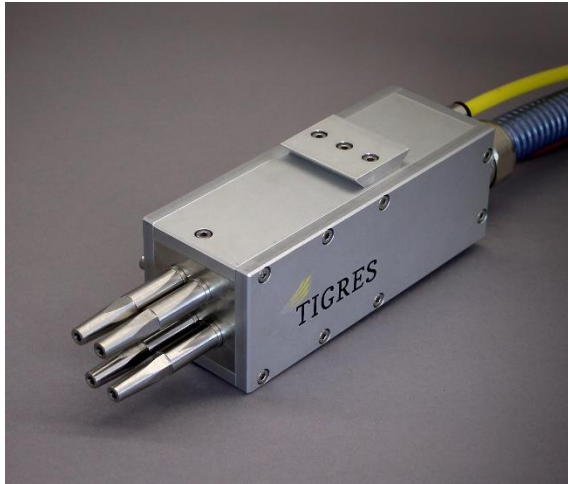


Standard tool MEF



Standard tool MEF

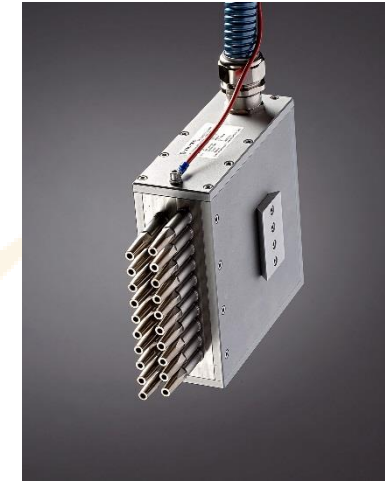
Adjustable and scalable Plasma treatment



MEF 7-28



MEF 7-56



MEF 7-140

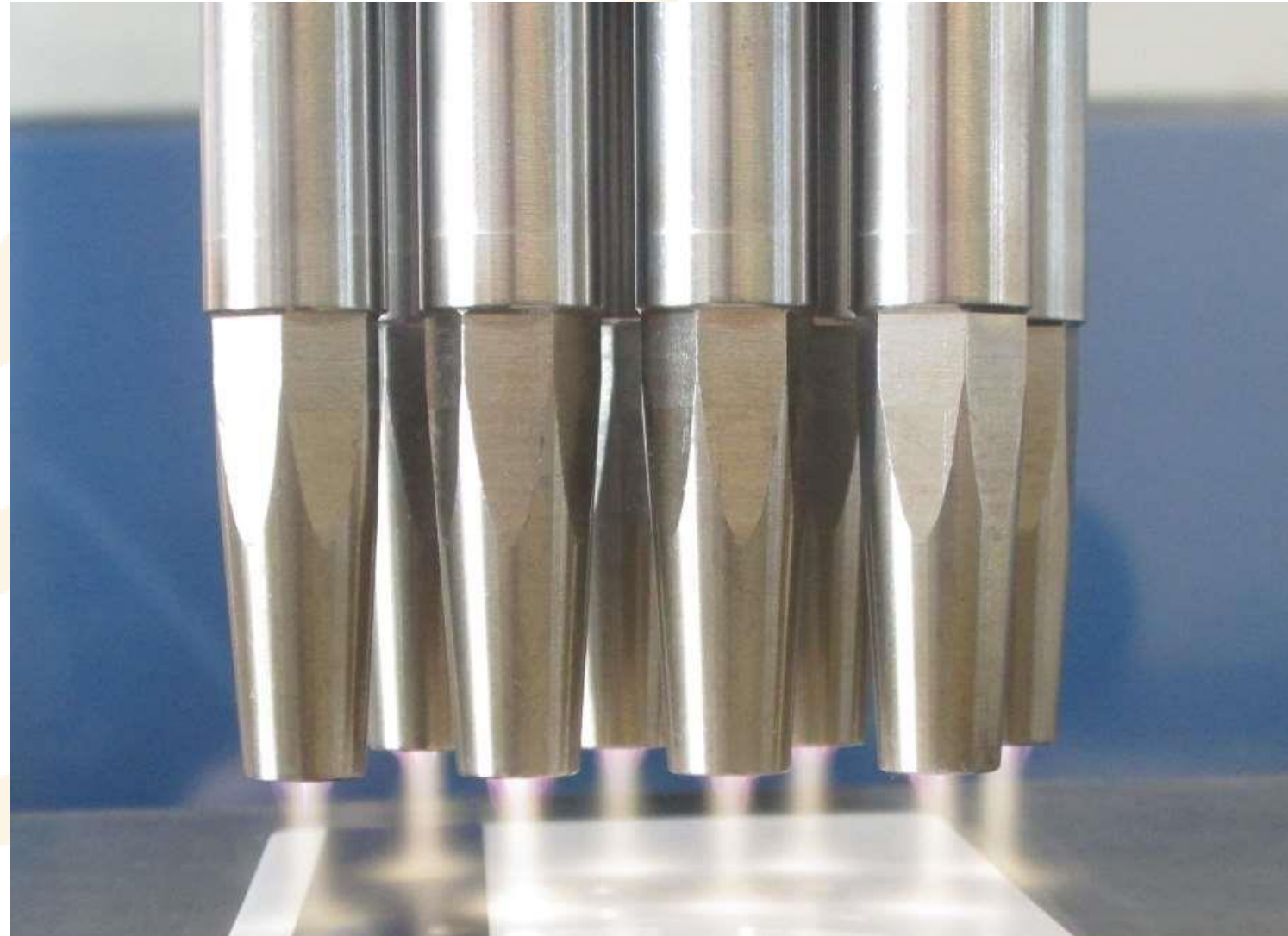
Standard: from 28 to 140 mm, in 7 mm steps

Option: EDC

Standard tool MEF

- ✓ More than 10 years on the market
- ✓ More than 600 installations
- ✓ Treatment width available in 7 mm steps*: **28 - 140 mm**
- ✓ Plasma head with two rows of nozzles (4 –20 Nozzles/head)
→ consistent treatment width with on plasma head
- ✓ Power/nozzle = **200 W; adjustable from 80-100 % power**
- ✓ Connection via I/O, seriell interface or BUS

* The treatment width depends on speed, material, distance and needed effect



Standard tool MEF: Card printing with UV-Inkjet

**Atlantic
ZEISER**

a coesia company

PERSOMASTER Banking Card

EMV banking card
personalization
system - first with
DoD inkjet technology
(up to 4,200
cards/hour)

**Treatment width 56
mm**

MEF7/56



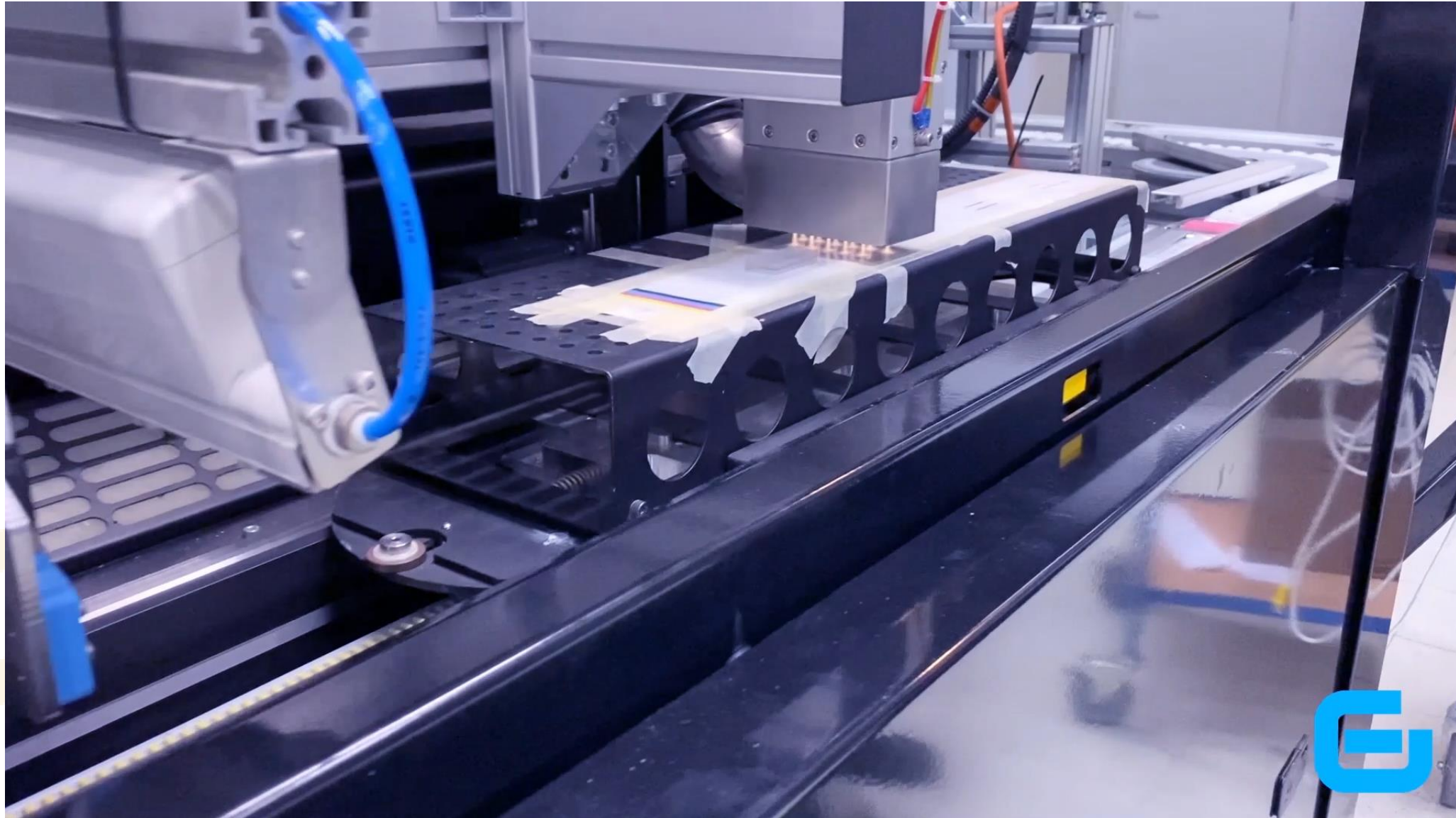
<https://www.atlanticzeiser.com/en/solutions/product/persomaster-banking-card>

Standard tool Multi-MEF: UV-Inkjet printing



DIGI-Series

<https://www.bergstein.nl/>



Standard tool Multi-MEF: UV-Silcscreen printing

HURST+
SCHRÖDER
GMBH 

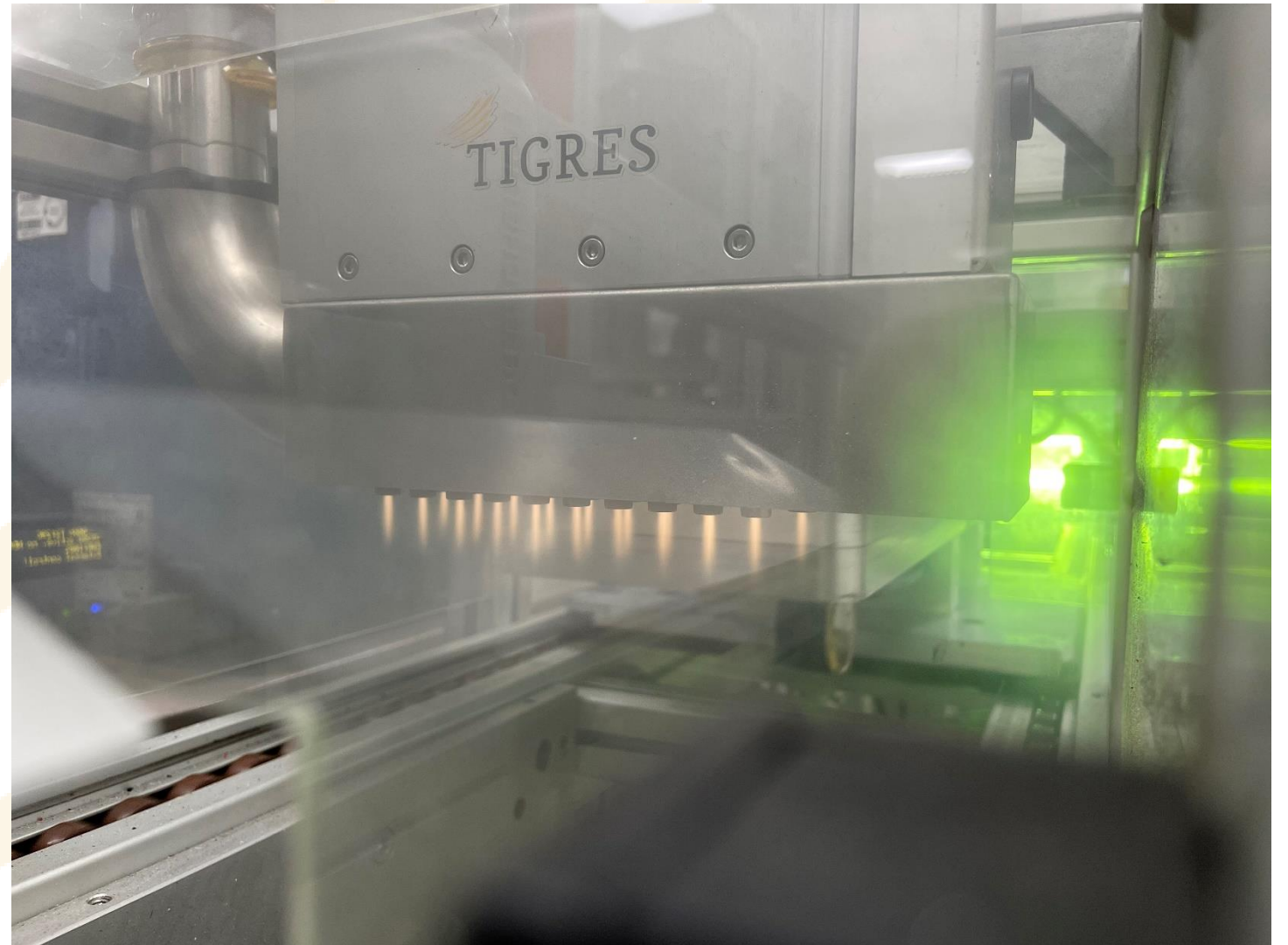
UV-Silcscreen printing

MEF7/140

Treatment width 140 mm

Speed:

App. 20-30 m/min



Standard tool Multi-MEF: UV-Silcscreen printing

HURST+
SCHRÖDER
GMBH 

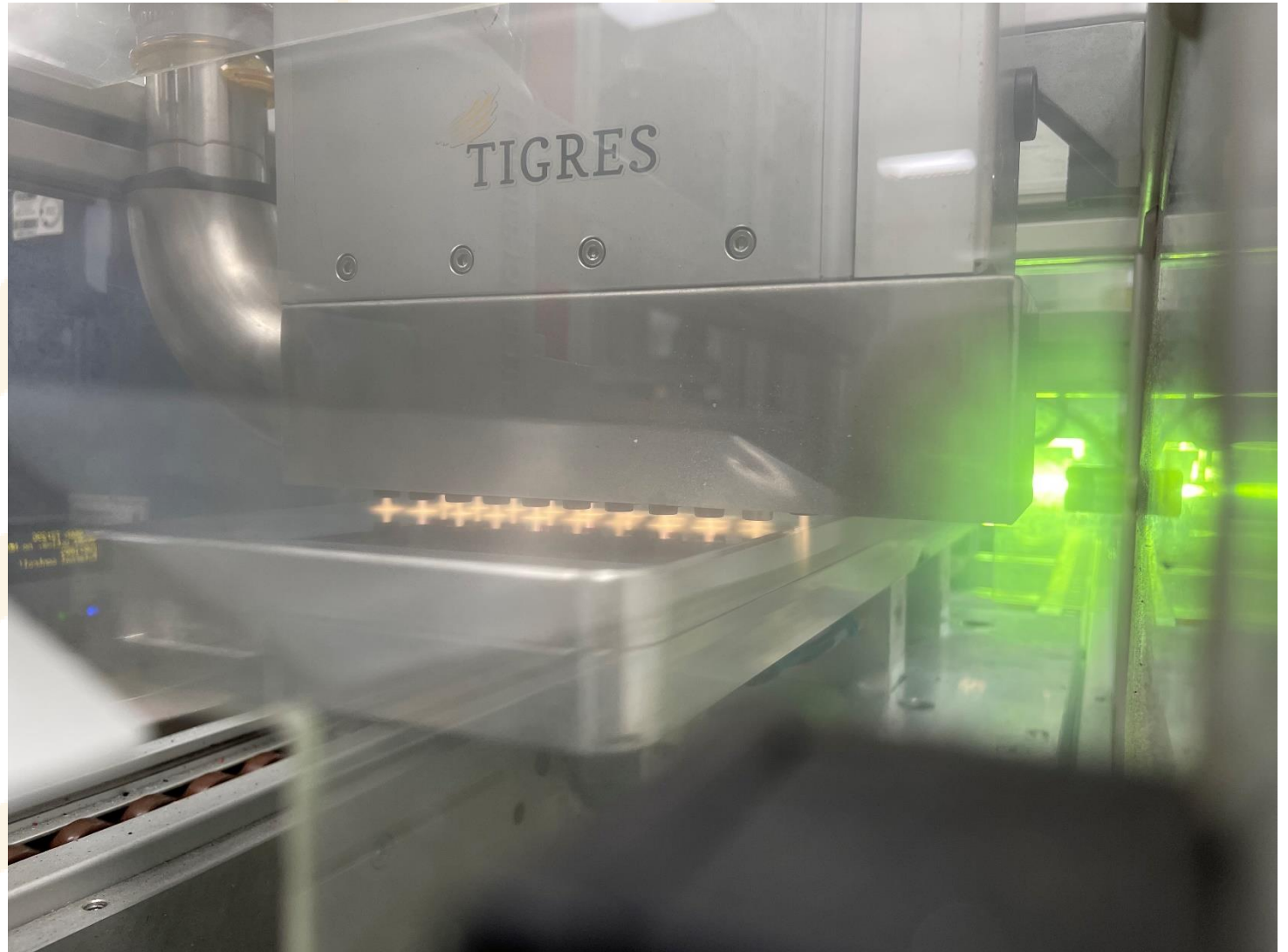
UV-Silcscreen printing

MEF7/140

Treatment width 140 mm

Speed:

App. 20-30 m/min



MEF: Technical Data

Available treatment widths:

56 head	105 head Blower for air supply possible	140 head Blower for air supply possible
28 mm	63 mm	112 mm
35 mm	70 mm	126 mm
42 mm	77 mm	140 mm
49 mm	84 mm	
56 mm	91 mm	
	98 mm	
	105 mm	

Plasma head	MEF 7-28	MEFK 7-56	MEF 7-140
Treatment width ¹⁾	28 mm	56 mm	140 mm
Working distance ²⁾	5 mm	5 mm	5 mm
Sizes (h/w/d) approx.in mm	280/67/82	280/95/82	280/177/82
incl. NDC2	280/102/82	280/130/82	280/213/82
Weight approx.	2 – 3 kg	3 – 4 kg	6 – 7 kg
Generator	V40/M1	V40/M1	V40/M1
Power	800 W	1600 W	4000 W
Power supply	400 V 3~; 10 A 50/60 Hz	400 V 3~; 10 A 50/60 Hz	400 V 3~; 16 A 50/60 Hz
Sizes (h/w/d) approx.in mm	183/450/453	183/450/453	183/450/453
min. mounting depth	603 / 84 TE	603 / 84 TE	603 / 84 TE
Weight approx.	14 kg	18 kg	18 kg
Supply cable	3 m	3 m	3 m
HV-cable	2 m	2 m	2 m
Primary cable	3m	3 m	3 m
Display	yes	yes	yes
Remote Control	yes	yes	yes
Compressed air, 6 bar	26 l/min / nozzle	26 l/min / nozzle	26 l/min / nozzle
Transformer	external	external	external
Sizes (h/w/d) approx.in mm	210/160/140	210/250/250	210/250/250
Weight approx.	8 kg	12 kg	12 kg
Options			
EDC (only for 2 m HV cable version)	possible	possible	possible
Generator IP 54 / only with external transformer	-	-	-
HV-cable	4 m	4 m	4 m
Nozzles in V-layout	possible	possible	possible

Depending on the application: ¹⁾material, ²⁾treatment speed, ¹⁾working distance

Corona: Tool T-JET

Counter electrode free corona treatment

Standard version:

400 W/Nozzle

no compressed air needed

Treating width: app. 50 mm

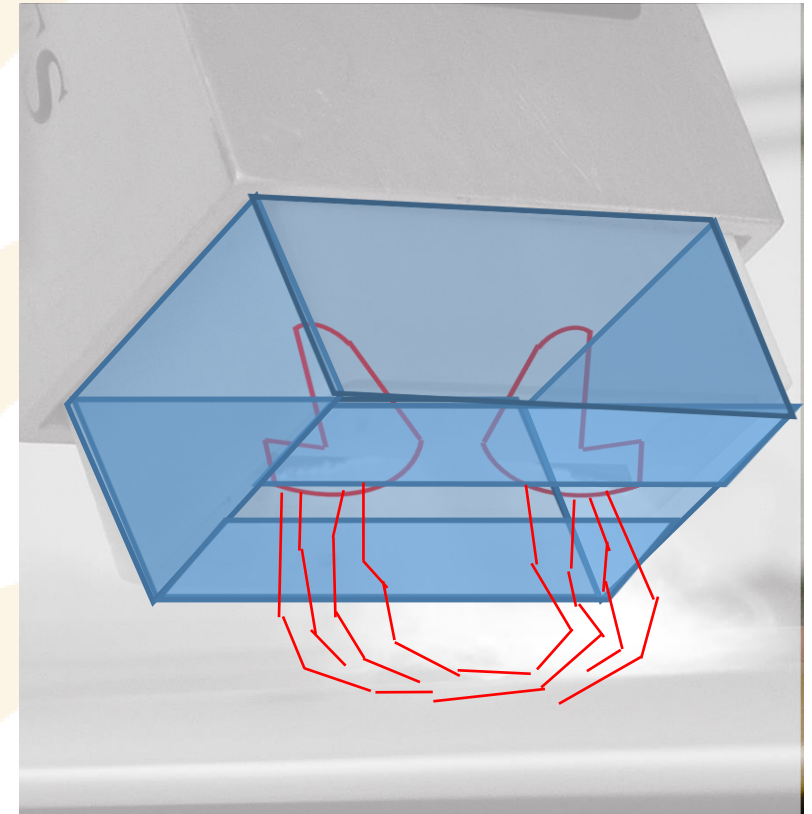
New:

XW version:

600 W/Nozzle

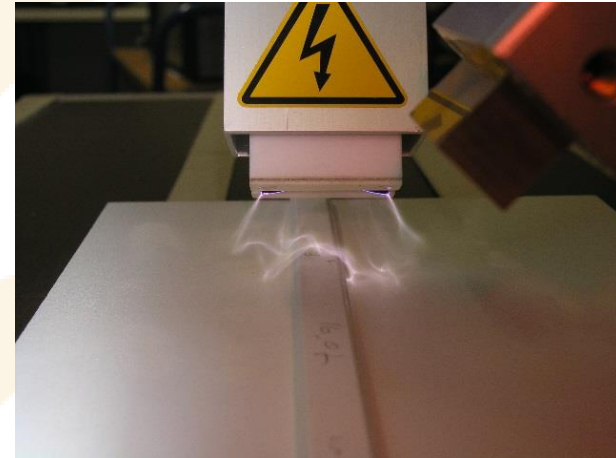
no compressed air needed

Treating width: app. 70 mm



Tool T-JET

Indirect corona treatment with very little heat being transferred to the surface - ideal for pretreating heat-sensitive substrates.



Application example: activation, PET bottles



Power: 400 W
distance: ca. 15 mm
velocity: app. 3-5 m/min



T-JET: Treatment of hoses prior to printing

Habia Cable

Pretreatment of **FEP** prior to ink jet printing

Diameter: App. 5 - 30 mm

Speed: < 10 m/min



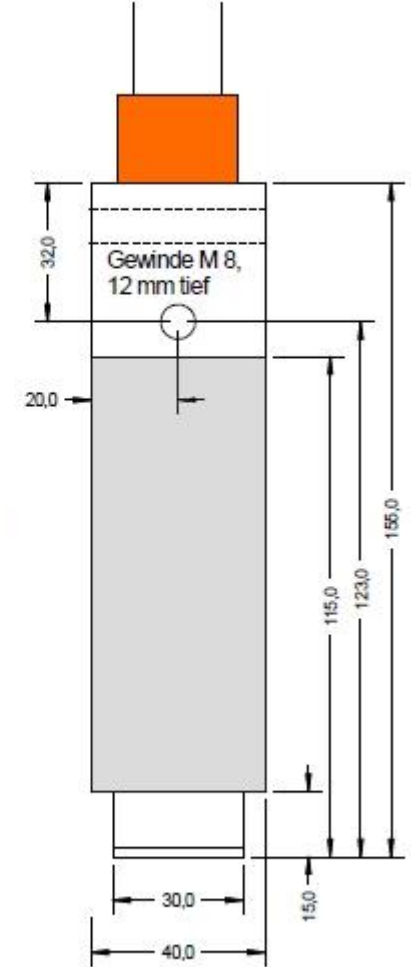
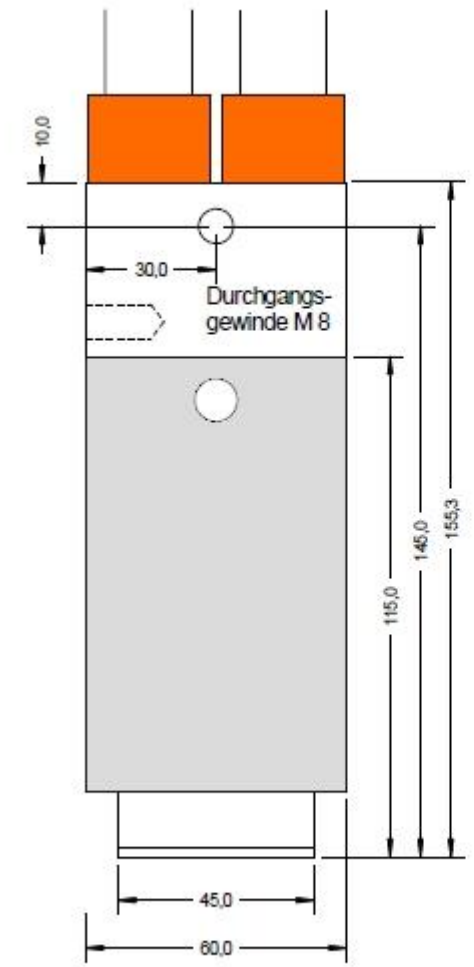
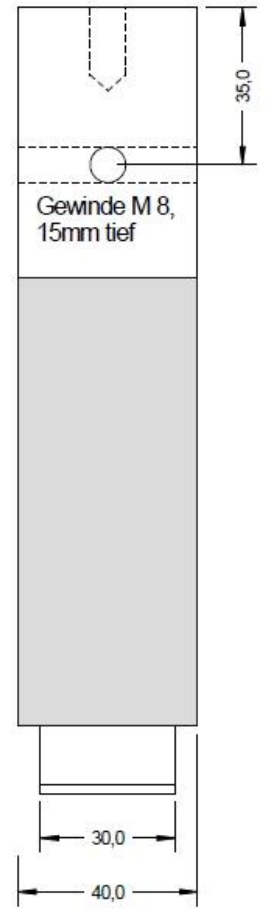
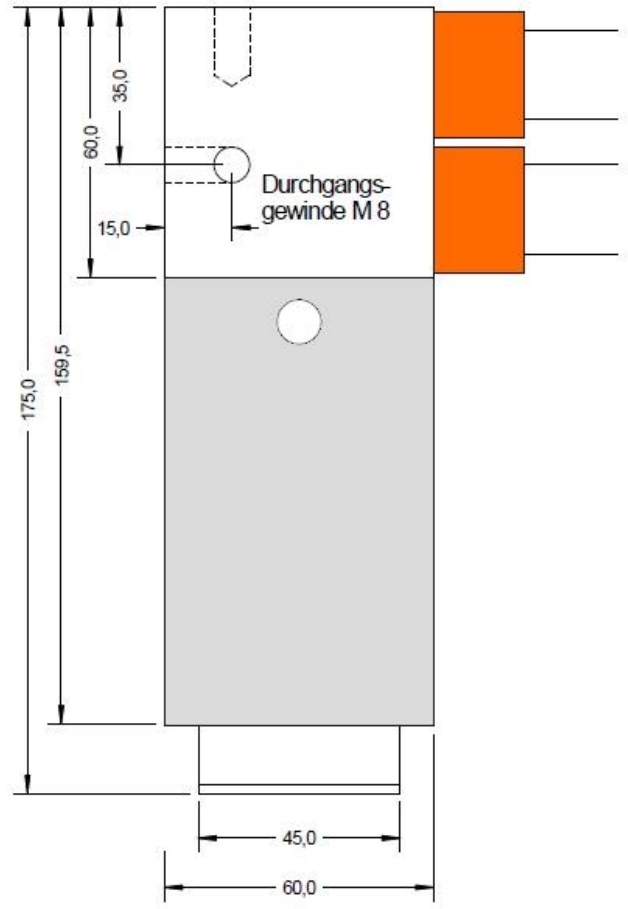
Picture: Habia

T-JET: Technical Data

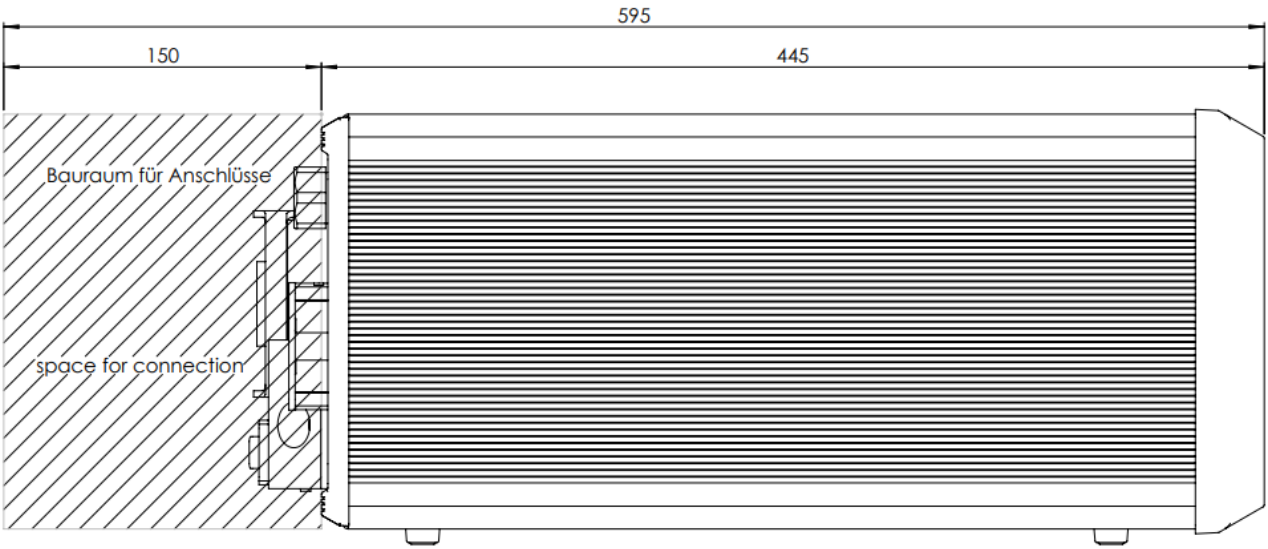
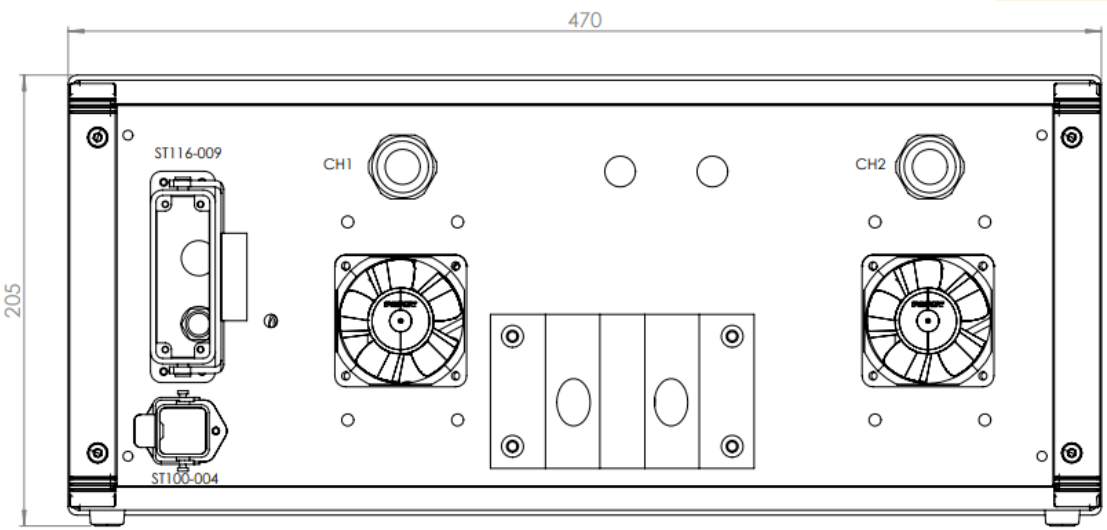
Plasma head	T-JET 1K	T-JET 2K
Treatment width ¹⁾	up to 50 mm	up to 50 mm
Working distance ²⁾	up to approx. 25 mm	up to approx. 25 mm
Sizes (h/w/d) approx. in mm (A or B without supply)	153/60/40 (A) 175/60/40 (C)	153/60/40 (A) 175/60/40 (C)
Weight approx.	1 kg	1 kg
Treatment speed	up to approx. 20 m/min	up to approx. 20 m/min
Generator	W20	W20
Power	400 W	800 W
Power supply	230 V; 16 A, 50/60 Hz	230 V; 16 A, 50/60 Hz
Sizes (h/w/d) approx. in mm min. mounting depth/housing	210/470/445 545 / 84 TE	210/470/445 545 / 84 TE
Weight approx.	18 kg	21 kg
Supply cable	3 m	3 m
HV cable	2 m	2 m
Display	no	no
Remote control	yes	yes
Options		
HV-connection to the head	From top-side (A) or lateral (C)	From top-side (A) or lateral (C)

Depending on the application: ¹⁾Working distance, treatment speed ¹⁾²⁾material

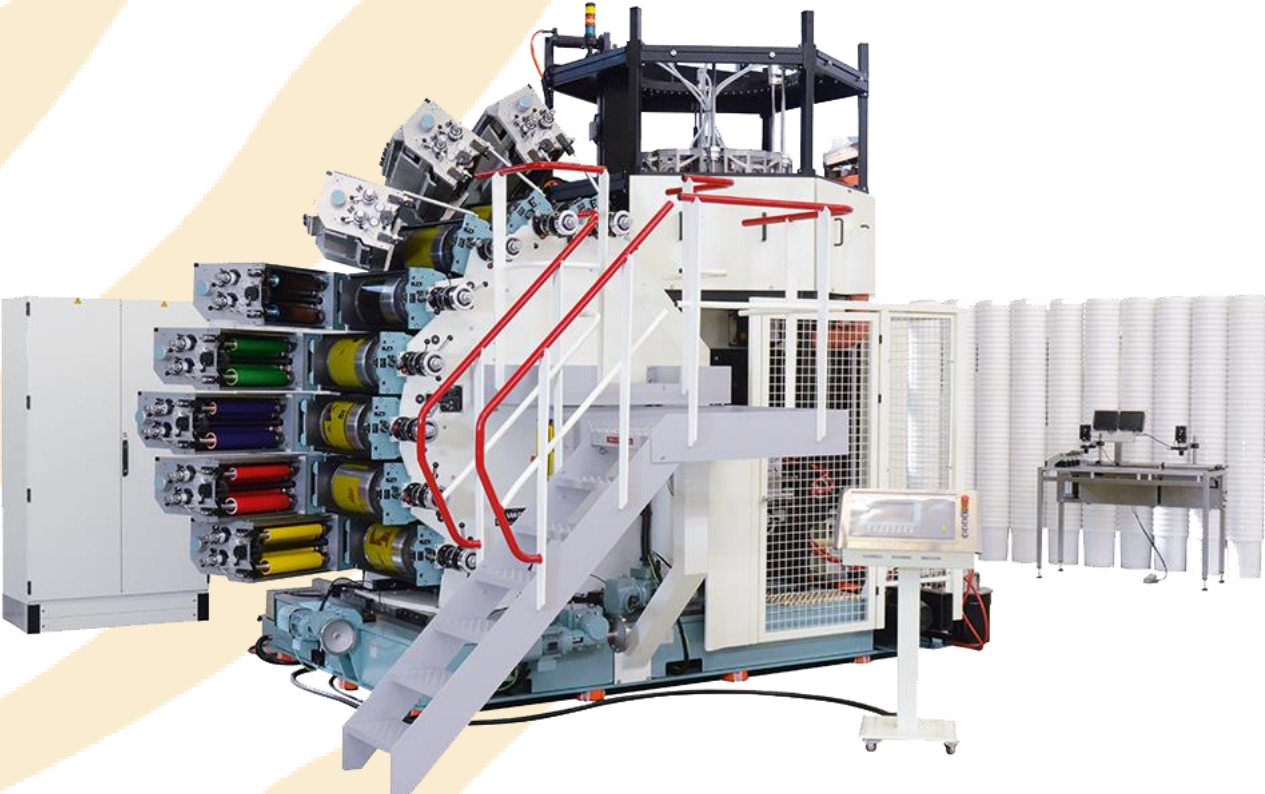
T-Jet: Drawings



T-Jet: Drawings



Application example DBD: Cup printing



Printing speed: App. 20 pcs./sek

Application example DBD: Cup printing

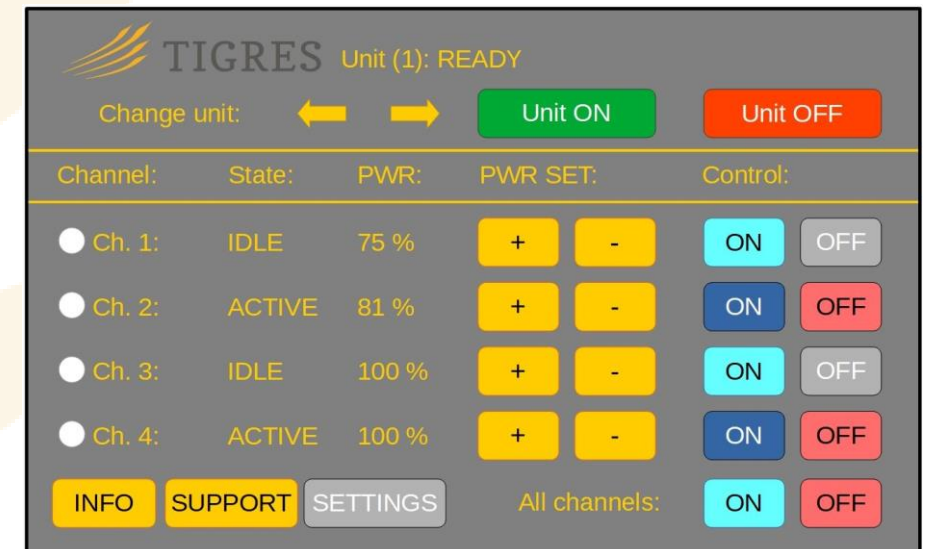
Printing speed: App. 20 pcs./sek



[Complete video: https://www.youtube.com/watch?v=K19jwBsXpP8&t=15s](https://www.youtube.com/watch?v=K19jwBsXpP8&t=15s)

M-Generator

- ✓ **Modular, compact design**, removable external transformer
- ✓ **Up to four nozzles per generator** (M1/M2/M4)
- ✓ **Each nozzle separatly controlled and adjustable**
- ✓ **Mixing of nozzles types** possible (f.e. T-SPOT and CAT)
- ✓ **High prozess reliability** by monitoring of relevant system values for each single nozzle
- ✓ **Homogenius plasma** through SQI (System quality index):
Monitoring index of closed loop controller to ensure homogenius plasma power
- ✓ **Efficient trouble shooting** by detailed error log with functionality analyses and full text display
- ✓ **Real time remote monitoring and maintenance** via RSU (Remote Service Unit)



M-Generator: Process reliability

#1 Real power control

#2 Real Time Monitoring with SQI (System Quality Index)

#3 Error Log with analysis functionality

#4 Process gas monitoring



Process reliability: Real power control

Key Feature #1: Real Power Control for each plasma head

The M-Generator controls each plasma head individually with a closed loop controller.

The controller not only measures the plasma power, but controls the power of the plasma within a specified window.

The controller turns off the plasma when the specified setpoint cannot be maintained.

What is controlled?

✓ Current

How: The frequency controls the current

Monitored:

✓ Line voltage Measurement

Process reliability: Real power monitoring with SQI

Key Feature #2: Real time monitoring with System Quality Index (SQI)

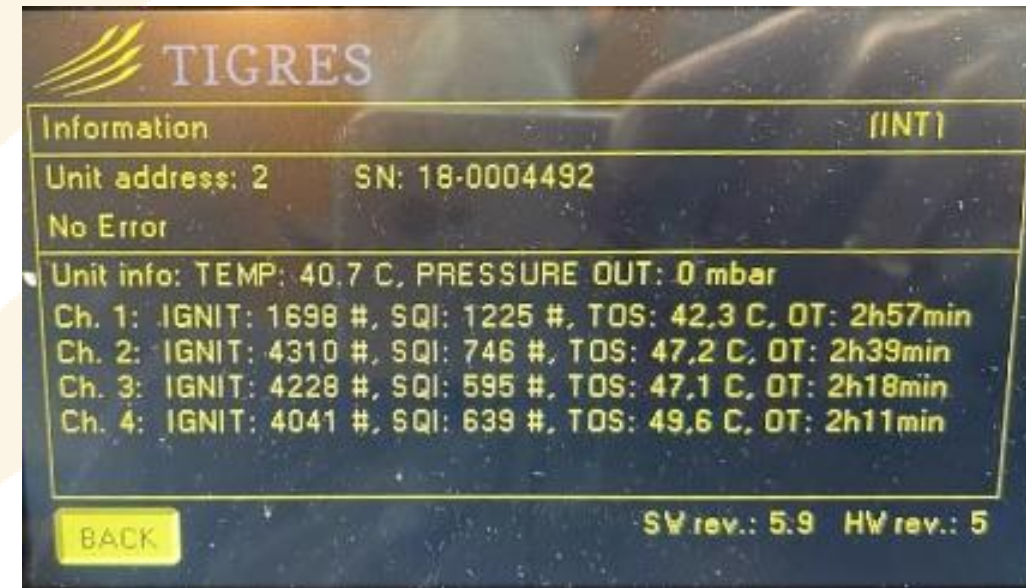
The M-Generator **controls the plasma** discharge and **calculates an SQI factor**.

1. DC-Current feedback output stage
2. Working frequency (controls the DC-current)
3. Setpoint control values: Input display/interface (f.e. 500 W)
4. Primary current

Out of the values 1 and 3 the SQI factor is calculated

The limit of the SQI can be adjusted in the display/BUS to the need of the application.

(Very low for very sensitive processes, very high for very insensitive processes)

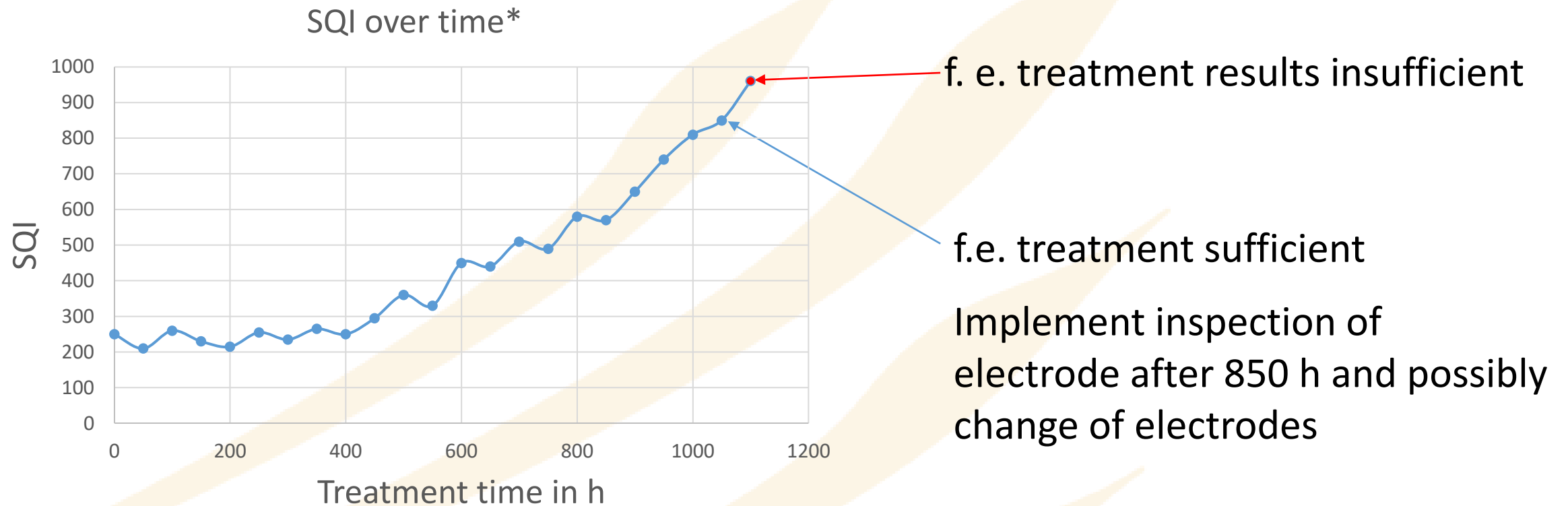


Example: Worn down electrodes start to flicker. SQI increases about factor 3-4.

Process reliability: Example worn out electrodes

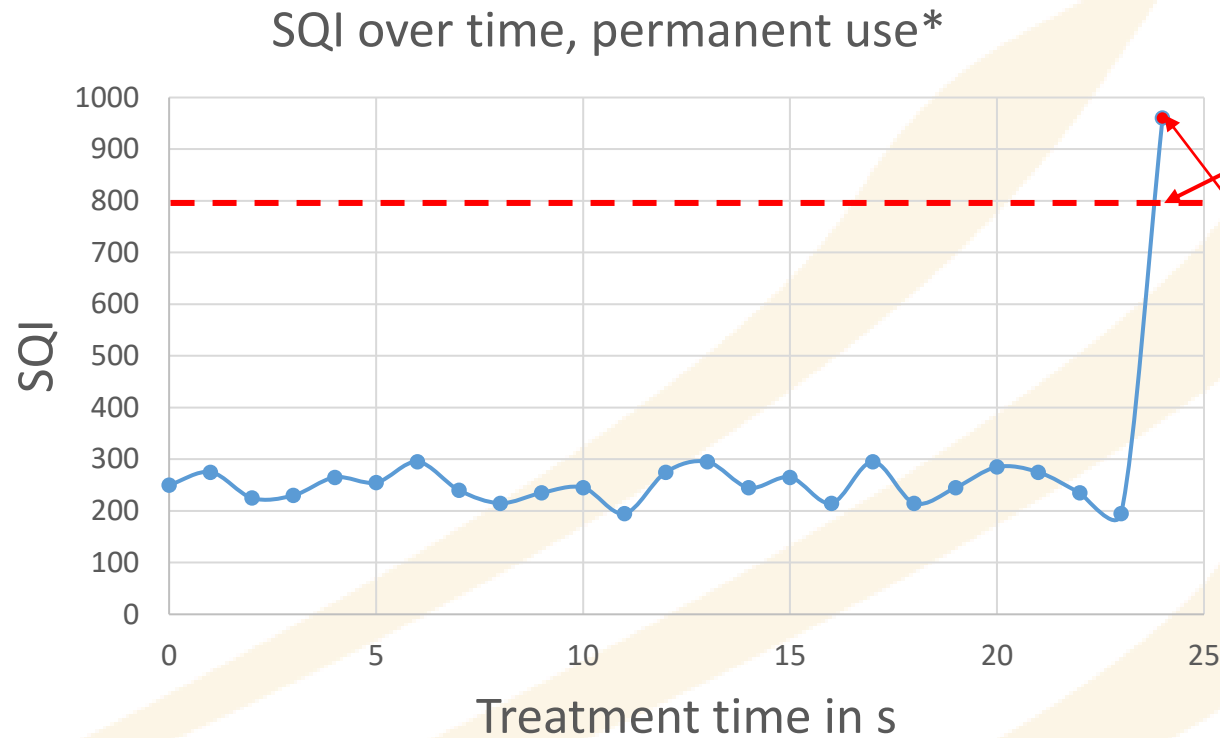


Example SQI over time



*Example, SQI values are not memorised. Values have to be noted or evaluated via optional BUS connection.

Example SQL limit



In the example an SQL limit of 800 is set

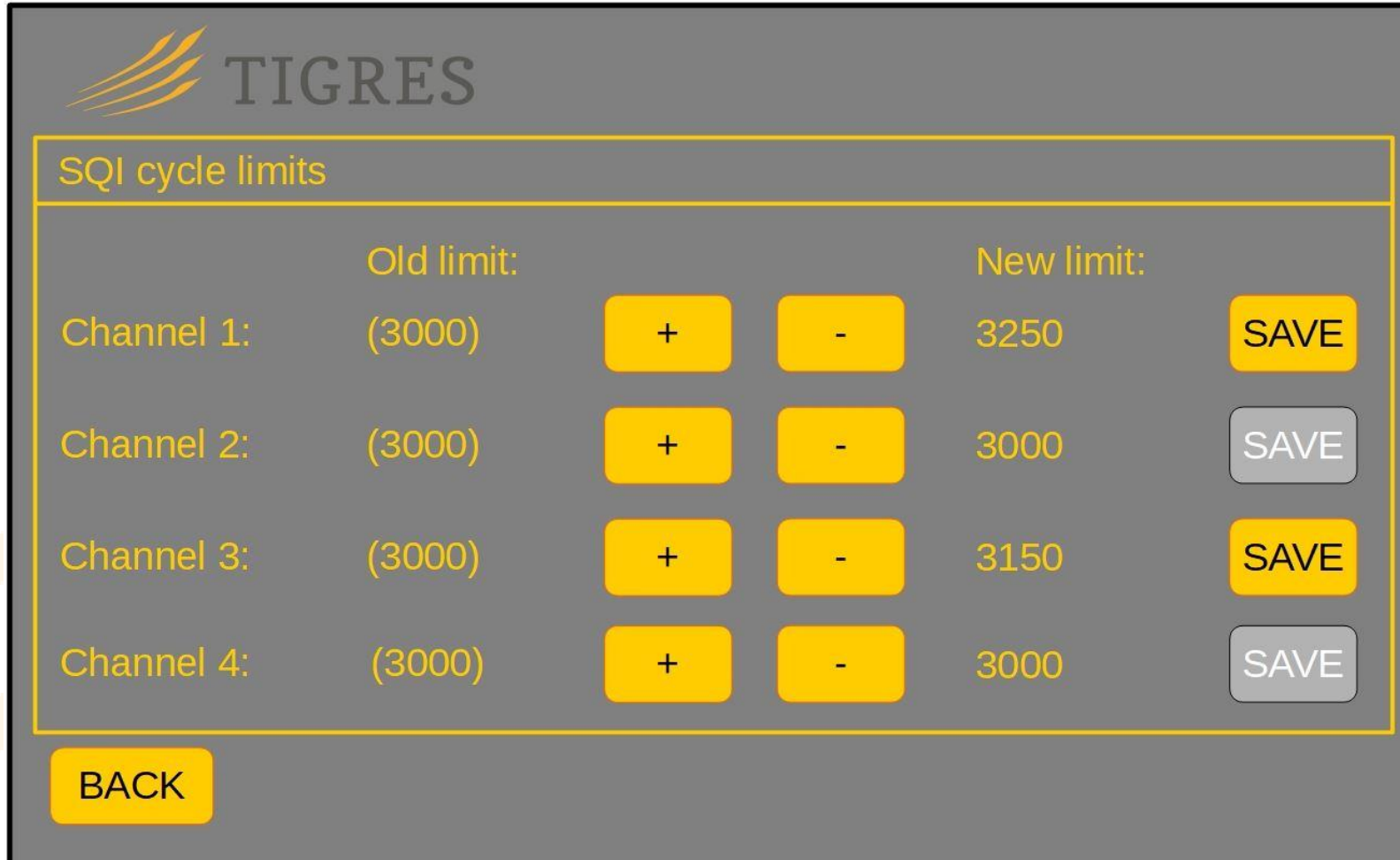
Plasma not ideal (f.e. air hose blocked), SQL-Value > 800

Immediately after exceeding of SQL the system stops and shows an error

*Example, SQL values are not memorised. Values have to be noted or evaluated via optional BUS connection.

Process reliability: Real power monitoring with SQI

Key Feature #2: Real time monitoring with System Quality Index (SQI)



The screenshot displays the TIGRES control interface for adjusting SQI cycle limits. The interface is titled "TIGRES" and "SQI cycle limits". It features a table with four rows, each representing a channel. Each row includes an "Old limit" value, two yellow buttons for "+" and "-", a "New limit" value, and a "SAVE" button. The "SAVE" buttons for Channel 1 and Channel 3 are highlighted in yellow, while those for Channel 2 and Channel 4 are greyed out. A "BACK" button is located at the bottom left of the interface.

	Old limit:			New limit:	
Channel 1:	(3000)	+	-	3250	SAVE
Channel 2:	(3000)	+	-	3000	SAVE
Channel 3:	(3000)	+	-	3150	SAVE
Channel 4:	(3000)	+	-	3000	SAVE

BACK

Process reliability: Error log

Key Feature #3: Error log with analysis functionality

In case of an error, the error Log saves a data set consisting of:

- Detailed error code (> 85 internal specified)
- Each error log contains of error code + a set of parameters at the time of occurrence
- 50 errors logged in display (EEPROM)
- All internal errors are stored on an SD-card
- Software tool for full data log enables a systematic trouble shooting



Process reliability: Process gas monitoring

Key Feature #4: Process gas monitoring

- ✓ Monitoring of the process gas or air pressure within critical limits
- ✓ In case of out of within margins, the plasma system switches off and an error is generated

TIGRES Remote Service Unit RSU

RSU - *Remote Service Unit*

- RSU enables:
 - ✓ Real time remote maintenance
 - ✓ Remote change of configuration
 - ✓ Data logging
 - Data base enables better trouble shooting, optimization/individualization of the configuration
- Secure communication RSU \leftrightarrow TIGRES Server

→ Enables minimal downtime of trouble shooting cases due to instant access



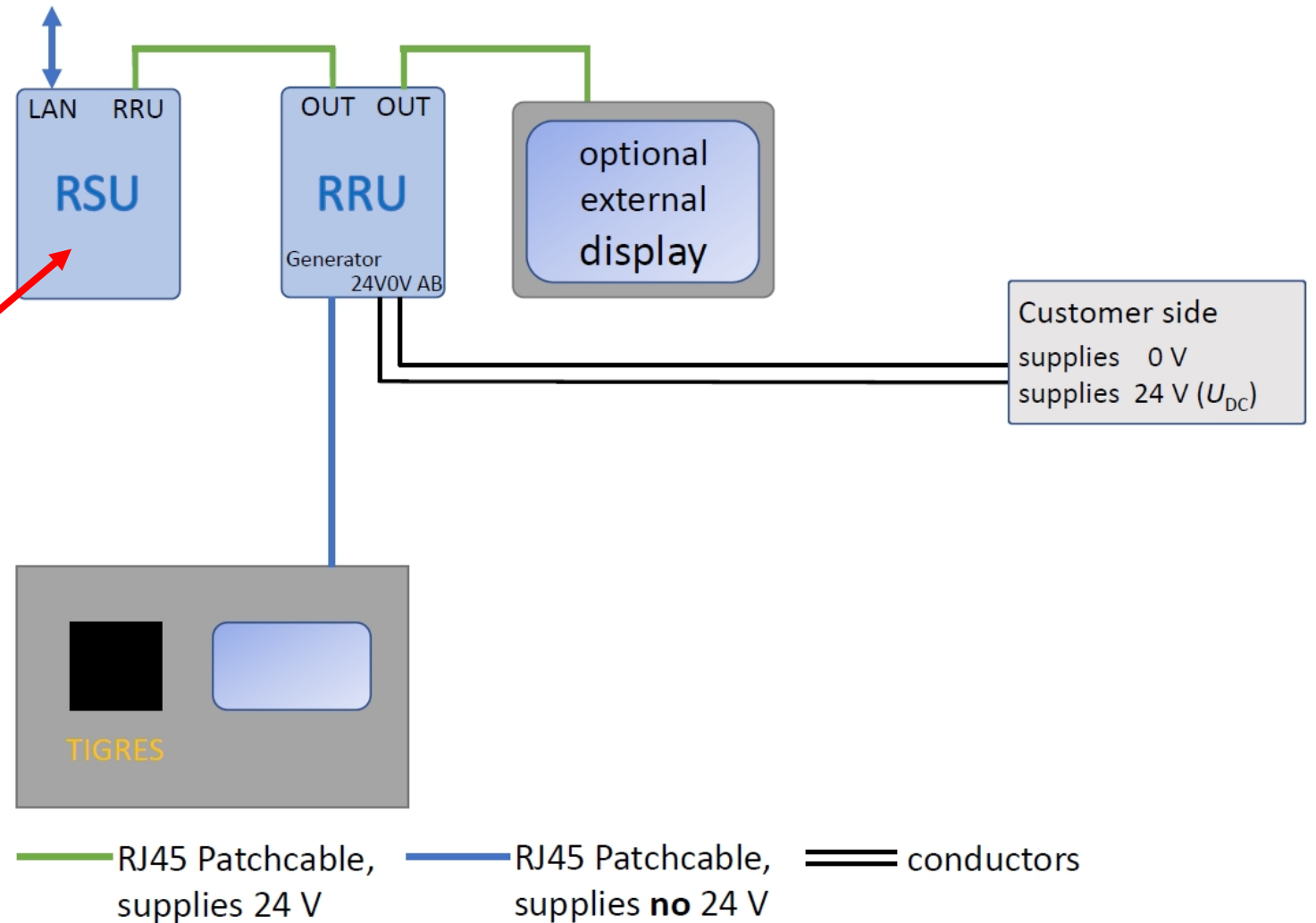
TIGRES Remote Service Unit RSU in real time

TIGRES RSU (Remote Service Unit)

Enables online process monitoring

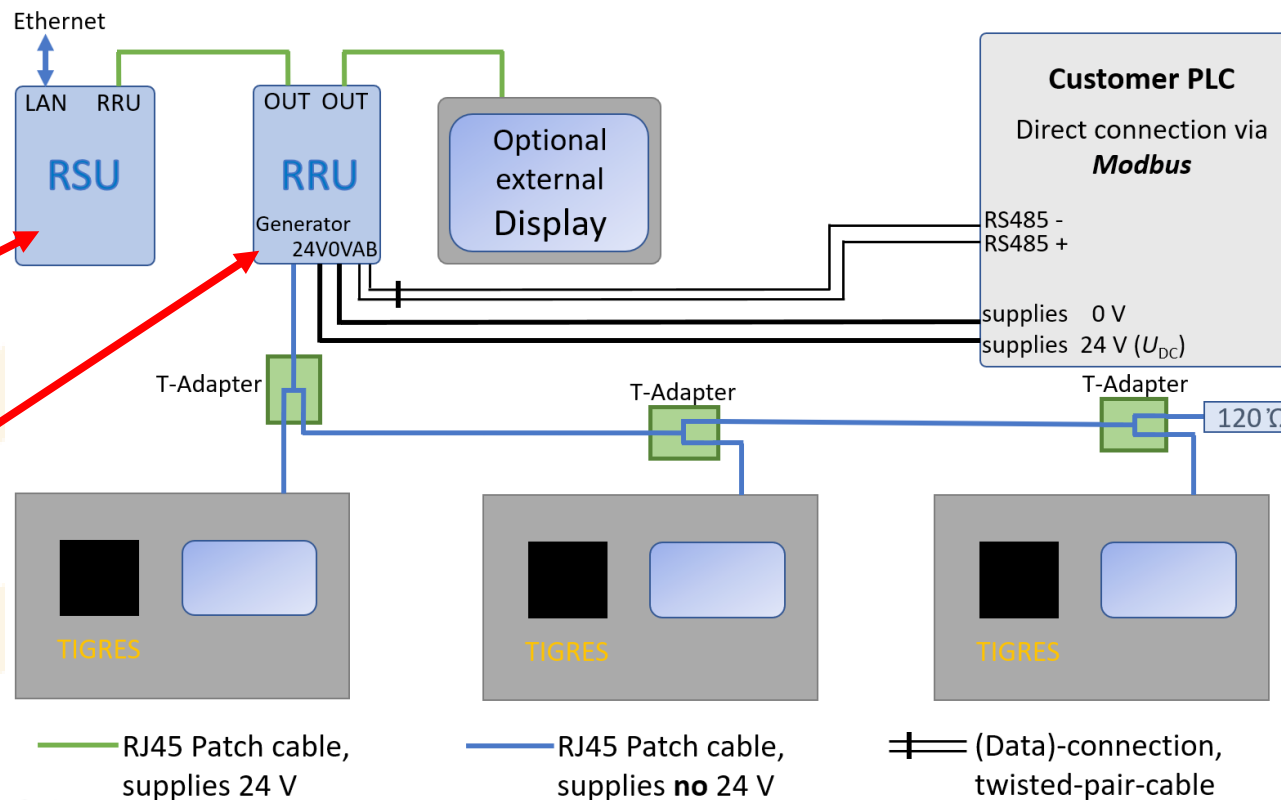
For:

- ✓ Start up
- ✓ Diagnoses
- ✓ Remote service
- ✓ Service support
- ✓ Parameter setting



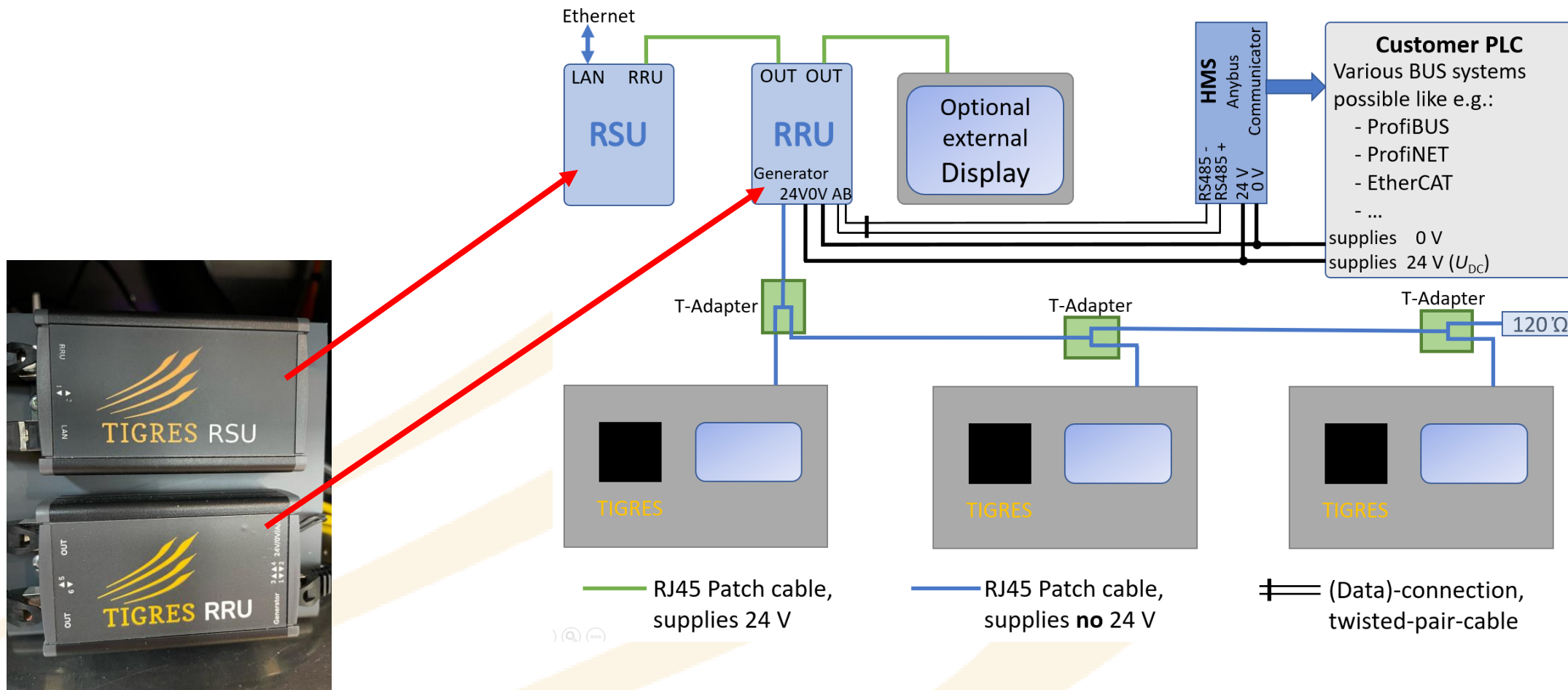
RSU and Modbus: Overview

Connecting via Modbus

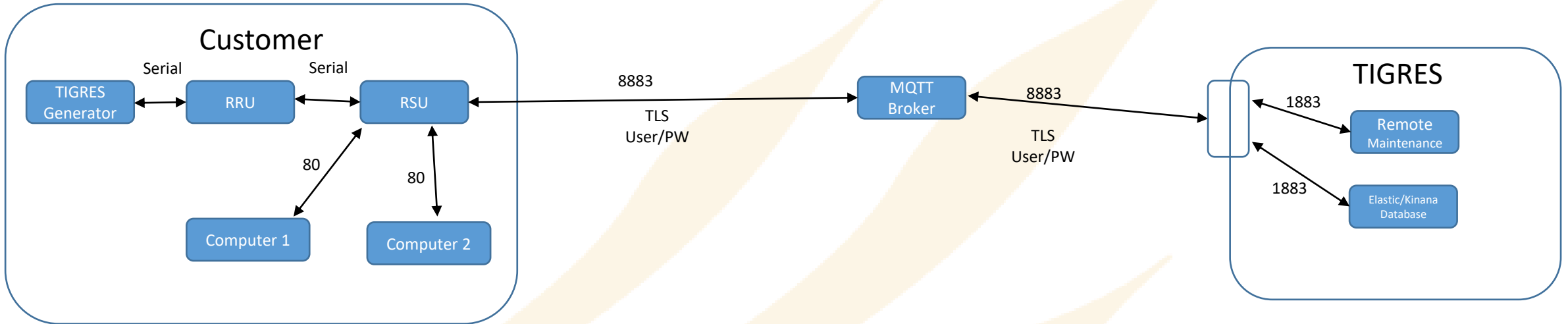


RSU and bus systems via HMS: Overview

Connecting via Anybus



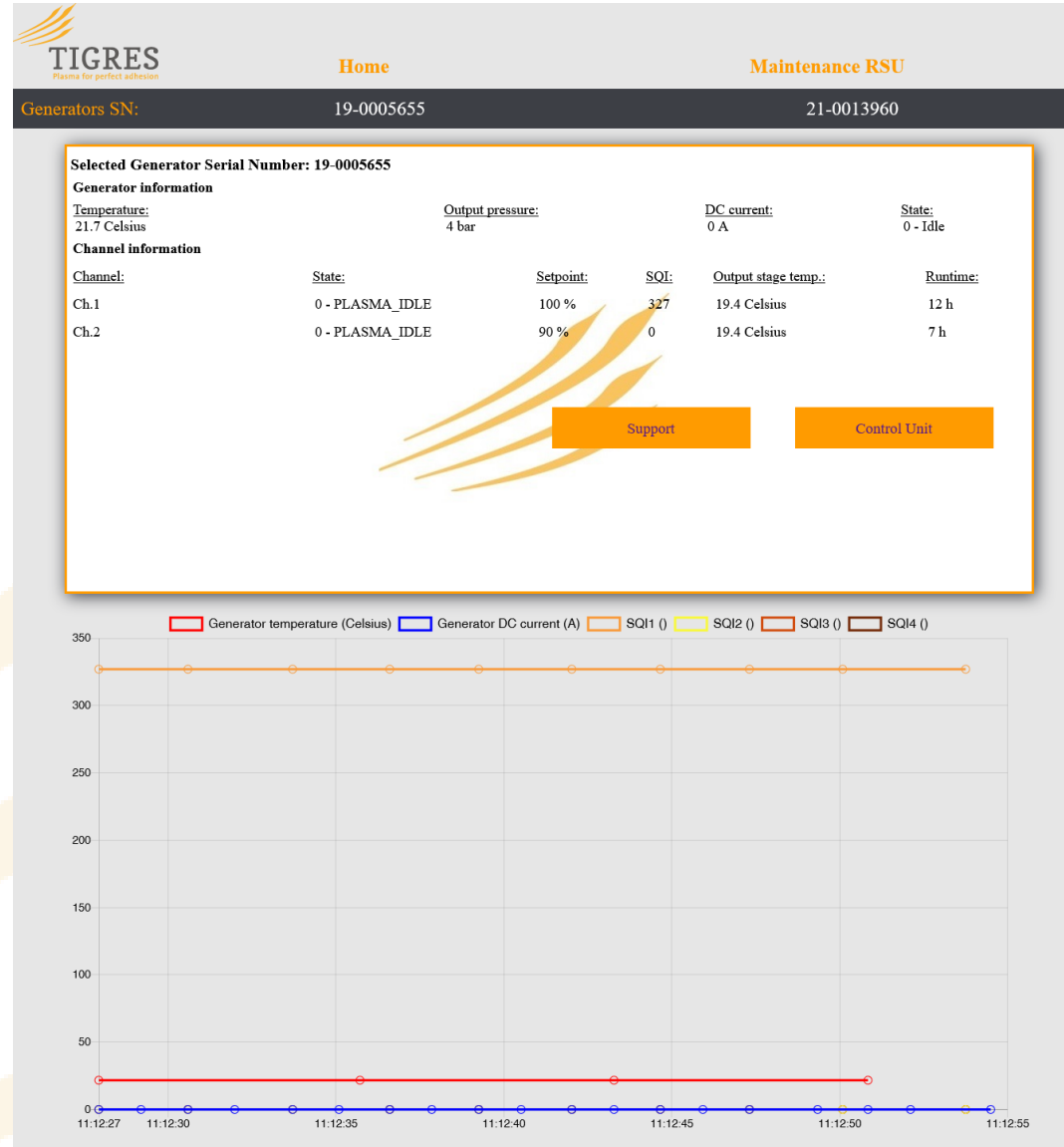
TIGRES Remote maintenance via RSU



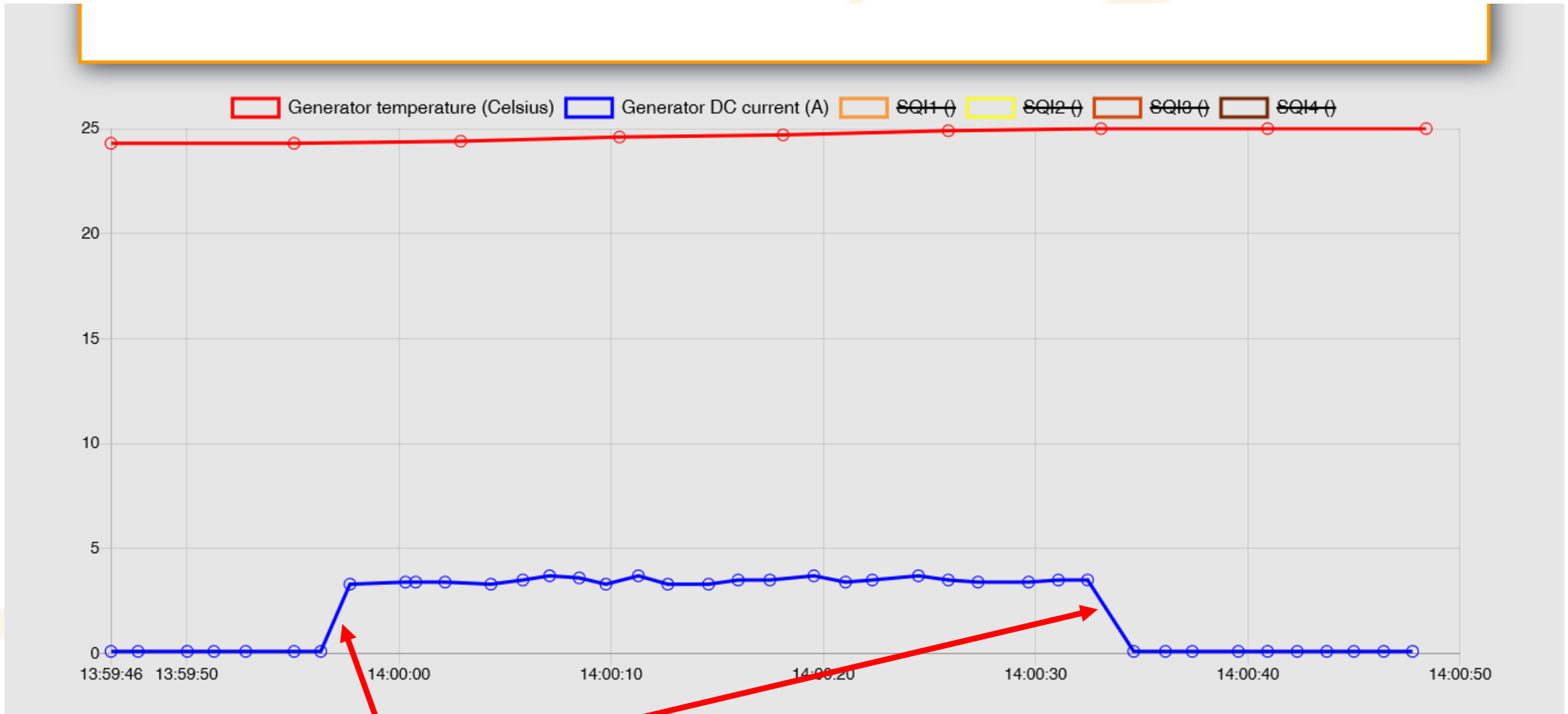
- RSU delivers data to TIGRES only about status of generator
- Data only available for TIGRES only after approval from customer

RSU = Remote Service Unit, GateKeeper
RRU = Round Robin Unit, Switch box

TIGRES Remote maintenance: What the customer sees

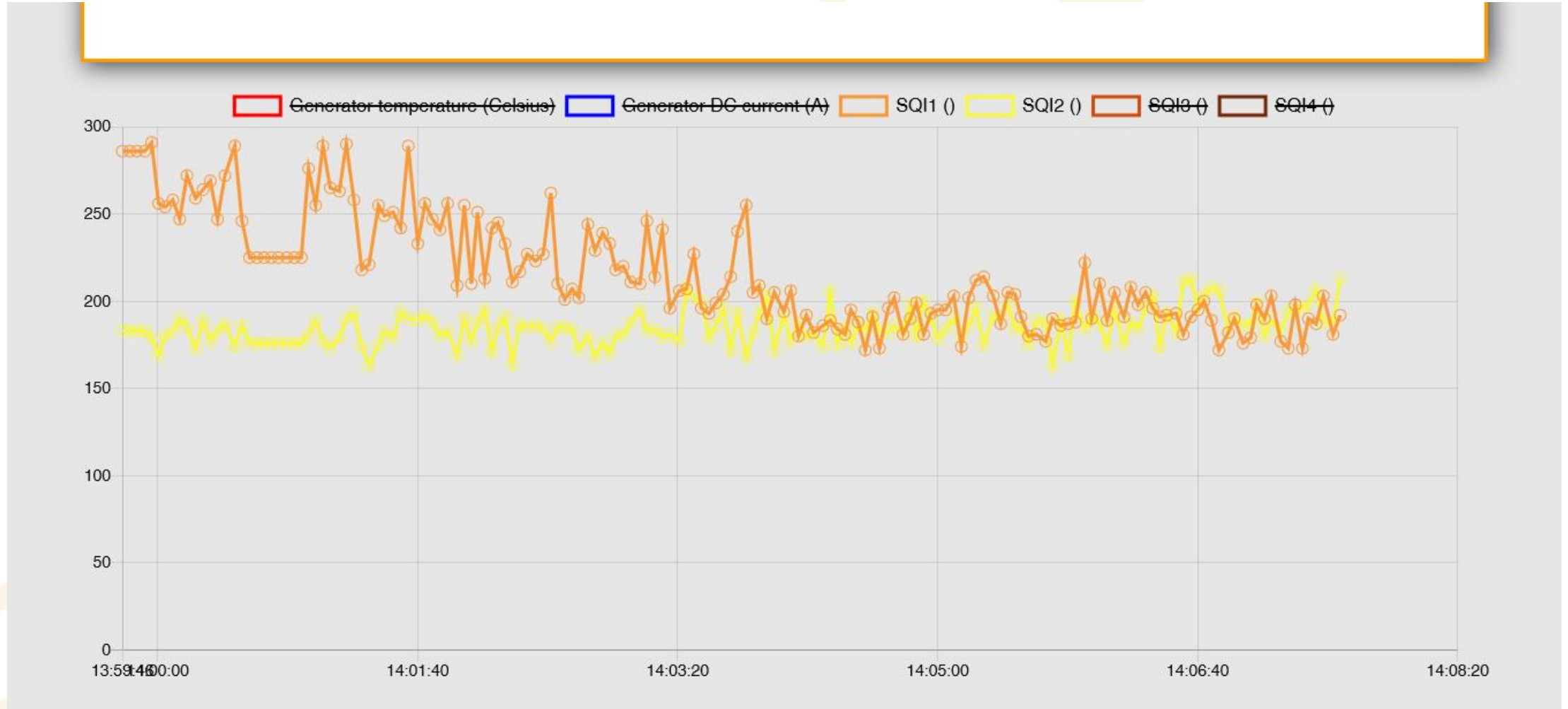


TIGRES Remote maintenance: What the customer sees

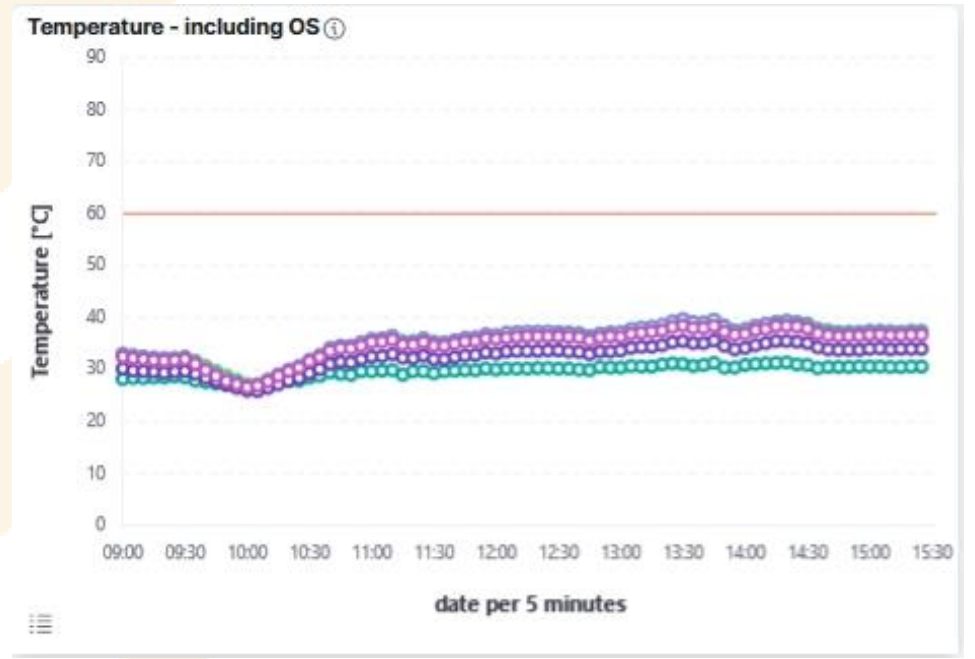
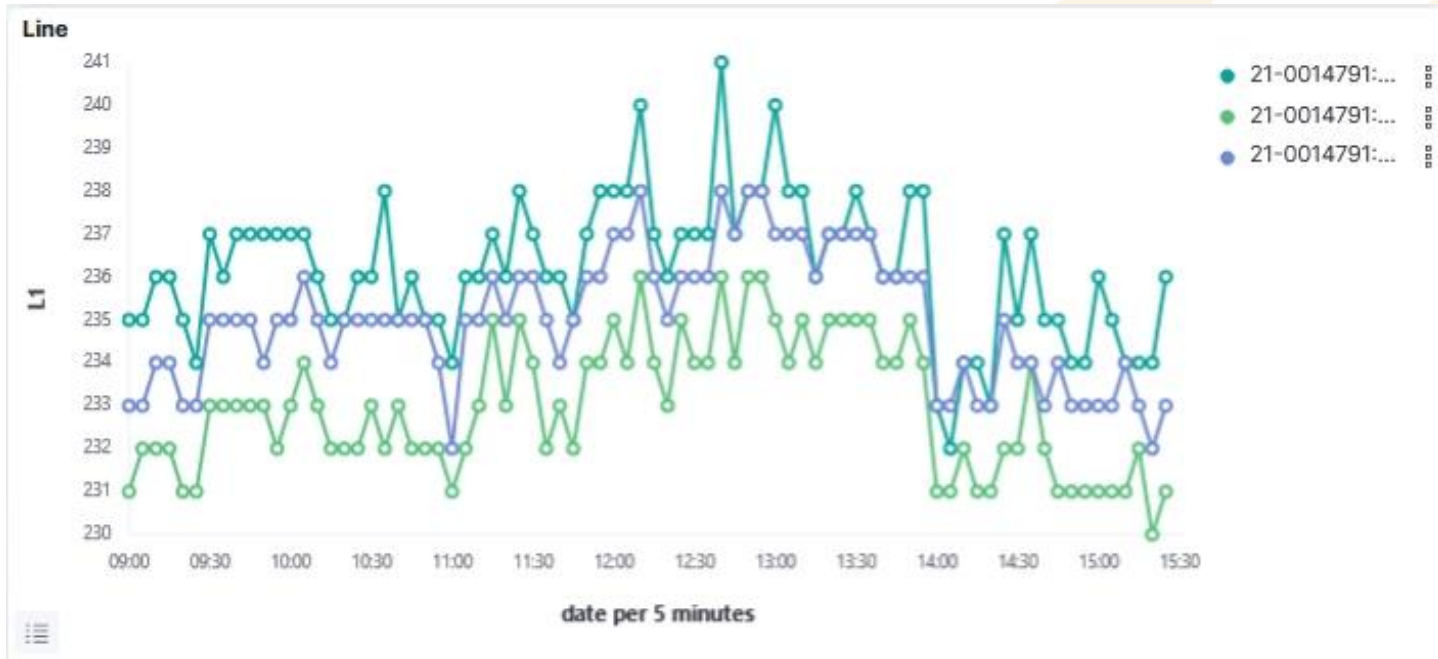


Data visible online, f. e. start and stop of discharge

TIGRES Remote maintenance: What the customer sees



TIGRES Remote maintenance: What TIGRES sees



Needed compressed air quality for plasma nozzles

The fields highlighted in gray in the following table of purity classes indicate the minimum requirements for the compressed air fed into TIGRES systems for each of the types of contaminants.

Compressed air purity class <u>DIN ISO 8573-1:2010 [3-4-2]</u>					
	Particles		Water		Oil
Class	Article size max. in μm	Particl edensity max. in mg/m^3	Pressure dewpoint in $^{\circ}\text{C}$	Concentration of liquid water in mg/m^3	Concentration of remaining oil in mg/m^3
1	0.1	0,1	-70	3	0.01
2	1	1	-40	120	0.1
3	5	5	-20	880	1
4	15	8	3	6000	5
5	40	10	7	7800	25
6			10	9400	

Maintenance

Maintenance

- Build for 100ED (24/7)
- Wearing parts: Electrodes
- Lifetime of electrodes:
 - T-SPOT: Lifetime: Up to app. 2.000 h
 - CAT: Lifetime: Up to app. 10.000 h
 - MEF: Lifetime: Up to app. 2.000 h
- Electrodes can be changed by maintenance personnel. Video instruction available.



Easy change made easy:

Voiceless online video available via QR-Code and smartphone

<https://www.tigres-cloud.de/public>



Support

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+49(0)4176-94877-0
mail: tigres@tigres.de
www.tigres-plasma.de

QR-code for
> exchange electrode < video



BACK ERRORLOG

Application: Safety

1. **Exhaustion** recommended for removal of:

1. Nitrous gases
2. (Ozone only for corona system, mostly if using DBD corona)

2. **Protection against contact:**

1. Heat
2. (Electricity) Corona!

3. **EMC** (electromagnetic compatability):

1. Shielding (Corona, mostly DBD)
2. Sufficient grounding



Testing TIGRES Plasma: On site, with test equipment, in the lab

Testing at **your production facility:**

We support you with process consulting and in the testing with plasma systems at **your production facility.**

Rental systems:

More than 20 **rental systems are available for testing.** Training included (Videokon).

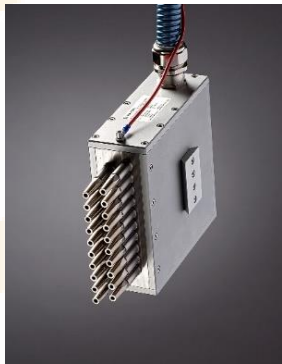
T-SPOT



CAT



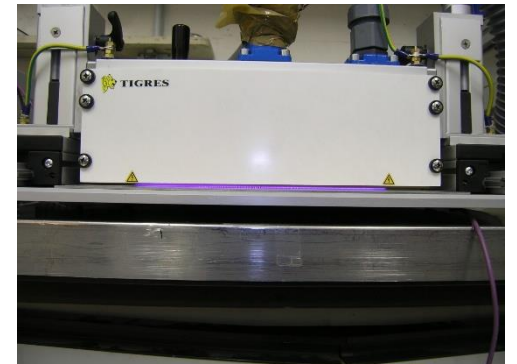
MEF



T-JET



DBD



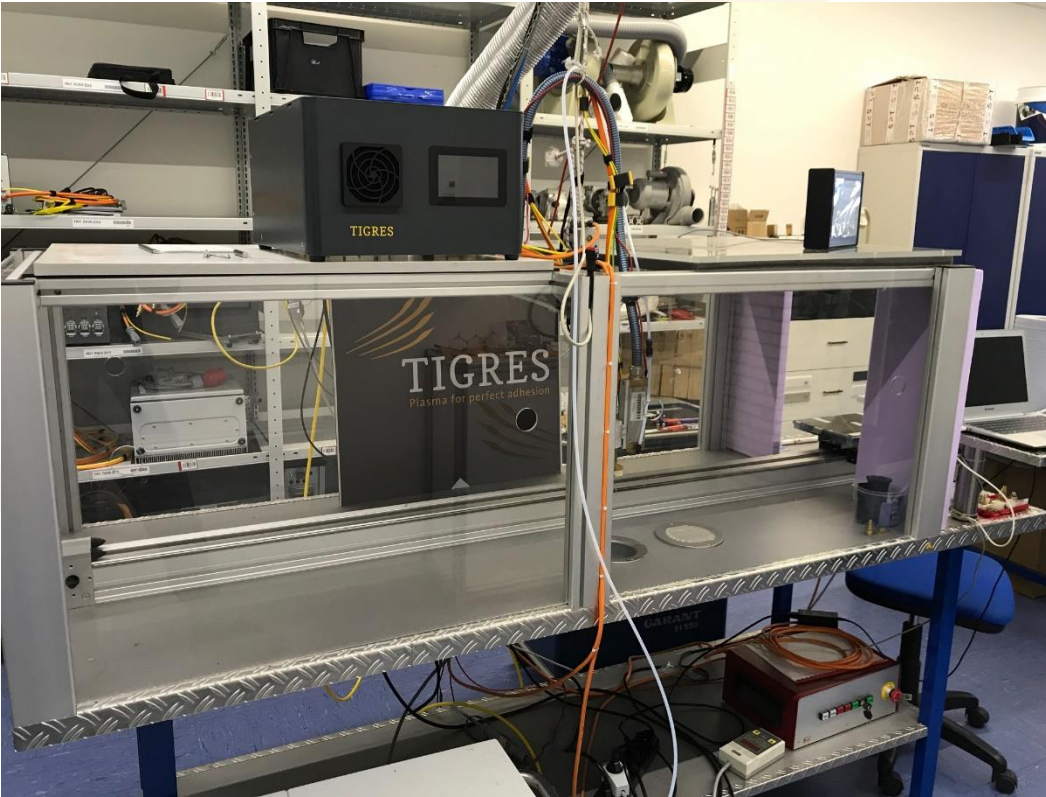
Testing TIGRES Plasma: In the lab

Processing of your samples:

Processing and analysing of samples for or with you, with verification and documentation of the results.

Practical training how to use plasma equipment for:

Activation, Cleaning, Deburring and plasma coating



Contact:

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[DUNS-Nr: 34-233-7813 \(UPIK\)](#)



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