



- 1992** ADL Analoge & Digitale Leistungselektronik GmbH was founded
- 2001** ADL opened a second site to enlarge the production capacities
- 2011** Both locations moved into a company owned building in Darmstadt (South of Frankfurt Airport)
- 2017** Celebration of the 25th company anniversary

Welcome to ADL – a view inside I



Entrance Hall



Hall A



PCB Mounting



Sub-Assembly

© Abb.: ADL

Welcome to ADL – a view inside II



Production area: Final Assembly



Mechanics



Testing Department



Vacuum Coating Plant

ADL is a developer and manufacturer of power supplies and generators for thin film coating, for industrial applications and research institutes.

ADL stands for *Innovation, Reliability, Longevity, Quality.*

ADL achieves this through excellent engineering and in-house capacities in

- **Transformer manufacturing**
- **Cable and connector assembly**
- **Sub-assembly**
- **PCB-mounting**
- **Final assembly**
- **Mechanical production with modern CNC machines**
- **R & D and Coating Laboratory for Applications and Testing**

This makes ADL faster in R & D, construction, production and reaction towards customer applications.

Reliable cooling - even in hot ambient temperature



Solid housing



“Sandwich” PCB mounting



“Plug and Play” - easy handling through fully automatic functions

Secure and save connection and fast mounting through standardized industry connectors



The classic DC-Power Supplies

Air Cooled, ½ 19" :

GS 05 – GS 30 – up to 3 kW
GS 60 – GS 150 – up to 15 W

Water Cooled, ½ 19"

GX 50 – GX 150 – up to 15 kW
GSW 100 – GSW 300 – up to 30 kW
HX 150 – HX 350 – up to 35 kW



GS 05 - 30



GS 60 – GS 150



GX



GSW



HX

When you need a lot of DC-Power ...

Water Cooled, in a cabinet

HX 900 – HX 1400 – up to 140 kW

- Non-reactive coating processes for cathodes up to 4 m length
- Very fast elimination of oxide films
- Automatic arc management (up to 40.000 Arcs/sec)
- Automatic power compensation up to 2.000 arcs/sec
- Water cooling
- High efficiency (95 % at nominal power)



© Abb.: ADL

Power Supplies for Ion Sources

Power Supplies for Ion Sources, 1/2 19" :

GG 03, GG 3.1, GG 08 – Accelerator
GG12, GG 12.1 – Beam
GIP 10, GIP 10.1 – Neutralizer
GDI 09 – Discharge
GC 10 – Cathode



Discharge



Neutralizer



Accelerator



Beam



Cathode

The revolutionary Pulse Generators

Unipolar, 1/2 19"

SD 30 – SD 300 – up to 30 kW
SD 151 / SD 351 – up to 35 kW



SD

Bipolar, 1/2 19"

GXB 50 – up to 5 kW
SB 150 / SB 300 – up to 35 W



GXB



SB

© Abb.: ADL

Bipolar Pulse Generator GXB 50 – Two in One

- Input: 3 x 400 V
- Output power 5 kW, AC
- Current ratio controller
- Automatic arc handling
- Water cooling
- Very compact design
- 1/2 19"-case, 3 HU



The Big Ones



DC + Unipolar Pulse
HXD 901 – HXB 1401
– up to 140 kW

DC + Bipolar Pulse
HXB 900 – HXB 1400
– up to 140 kW

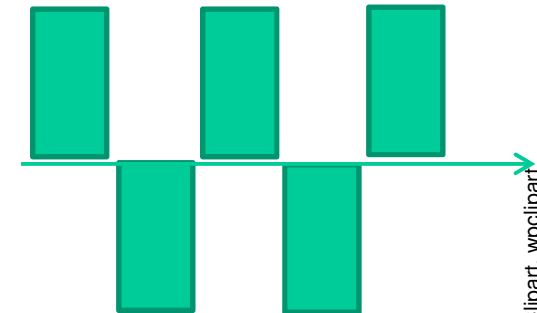
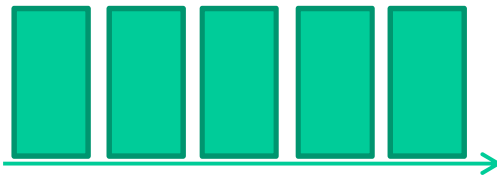


© Abb.: ADL

Do you want to have a Sine Wave Oldtimer or ...



a Trend-setting Square Wave ADL Pulse Generator? ...



© Abb.: Clipart, wpcipart

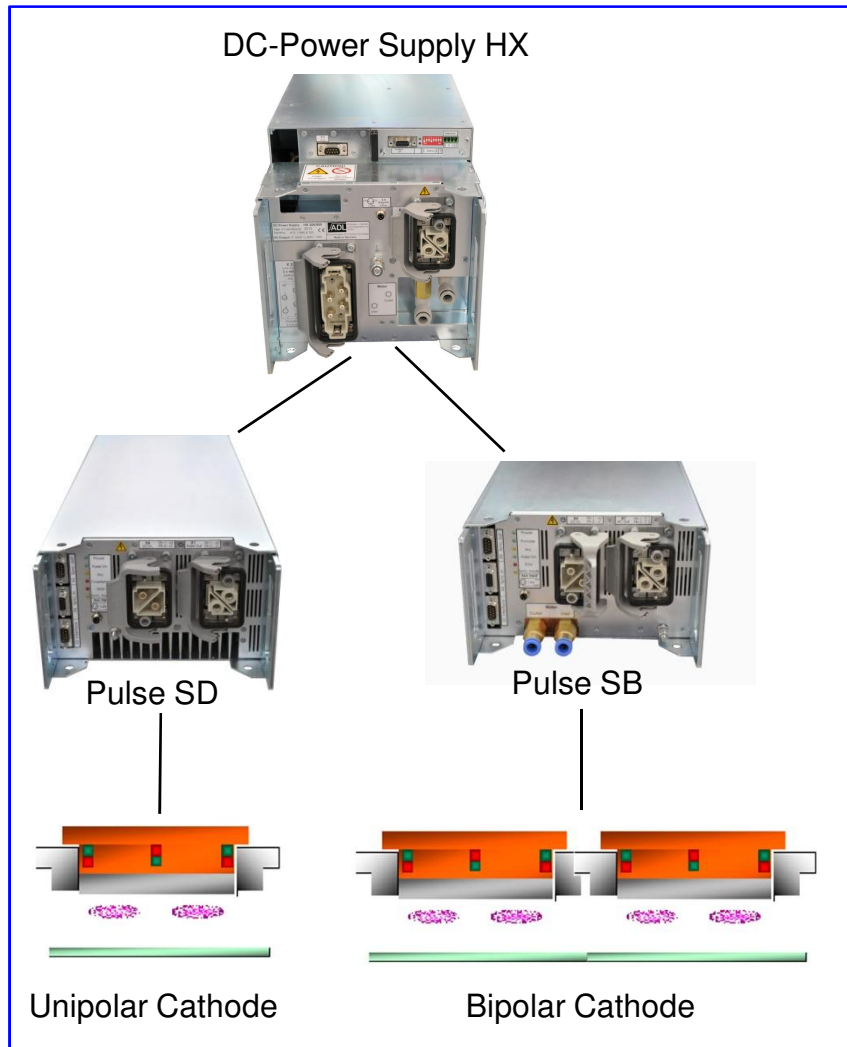
UNRIVALED: ADL Unipolar and Bipolar Pulse Generators!

A must-have for reactive Processes!

Applications:

- Wide sputtering range with low conductive targets
- excellent process control for semi oxidized targets e.g. TiOx, NbOx ...
- Stable processing with Arc critical targets like AZO
- Unipolar full reactive coating processes like SiO₂, Si₃O₄, Al₂O₃, TiO₂ for target sizes up to 300 mm diameter
- improvement of material performance
- others ...

Possible combination for perfect customized solutions



Advantages of the ADL pulse systems:

- DC-Power Supply can be combined with unipolar or bipolar pulse
- Combination of units in Master/Slave or parallel up to 240 kW
- Compact design 1/2 19"
- Each pulse is power controlled, this guarantees:

Absolute symmetric sputtering!

- Fastest and full automatic Arc-management
(not possible in sine wave systems)
- Process Reproducibility: better than 1 - 2 %

Bipolar Pulse SB 300 - 20 kHz

Applications:

- Bipolar full reactive coating processes like SiO_2 , Si_3N_4 , Al_2O_3 , TiO_2 for cathodes up to 4 m
- Excellent process control for semi oxidized targets, e.g. TiO_x , NbO_x ...
- Duty cycle adjustable on 2 cathodes from 50:50 % up to 10:90 %
- others ...

Bipolar Pulse Generators



Analoge & Digitale
Leistungselektronik
GmbH

One Example for High Power: e.g. 120 kW

4 x HX 300



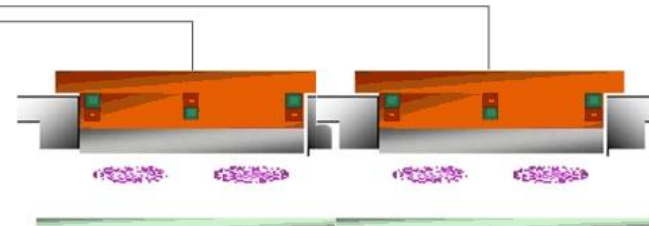
4 x SB 300



120 kW

Cathode 1

Cathode 2



Single units: Low space needed

Low power losses because of high efficiency (~95%)

Or alternatively in a Cabinet: Middlefrequency/Bipolar Pulse Generator HXB 900 – HXB 1400 e.g. for large glass panels

- Reactive coating processes for cathodes up to 4 meter length
- Automatic balancing of cathode power
- Power ratio controller for asymmetric pulse power (up to 10 : 90 %)
- Fully automatic Arc-Management (0.3 mJ/kW)
- Automatic power compensation up to 2000 Arcs / sec
- Process reproducibility better 2 %



© Abb.: ADL, Natalya Guskova – Fotolia.com

Unipolar Pulse Generator HXD 901 - HXD 1401 e.g. for Analogue & Digital Power Electronics

- Reactive coating processes for cathodes up to 4 meter length
- Stable processing with arc-critical targets
- Fully automatic Arc-Management (0.3 mJ/kW)
- Automatic power compensation up to 2000 Arcs / sec
- Fast discharge with reverse pulse



© Abb.: ADL, Raimundas Fotolia.com

Why an ADL Cabinet Solution? For your own comfort!!!

All components are **pre-installed in a Rittal Cabinet :**

- DC-power supplies & Pulse generators
- Cables & connectors
- Water connections & water pipes
- Displays

PLUG and PLAY in a **few steps:**

Fastly connect the cabinet to your system and start coating!

Exchange of a unit – for check up or up-date/upgrade:

Remove it and run your coating plant with less power or

Remove and replace it with a back-up supply in **shortest time**.



© Abb.: ADL

Individualize your System

Accessories:

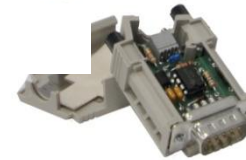
Interfaces and Interface Combiner
Master Oscillators and Test Oscillator
Plugs and Cables
Couplings for Water Cooling and
Magnetic Valves
Remote Control
Cathode Clamp Diode



Master Oscillators



Interface Combiner



Test Oscillators OT 40

Remote Control



Profibus



RS 232/RS 485



Magnetic Valve

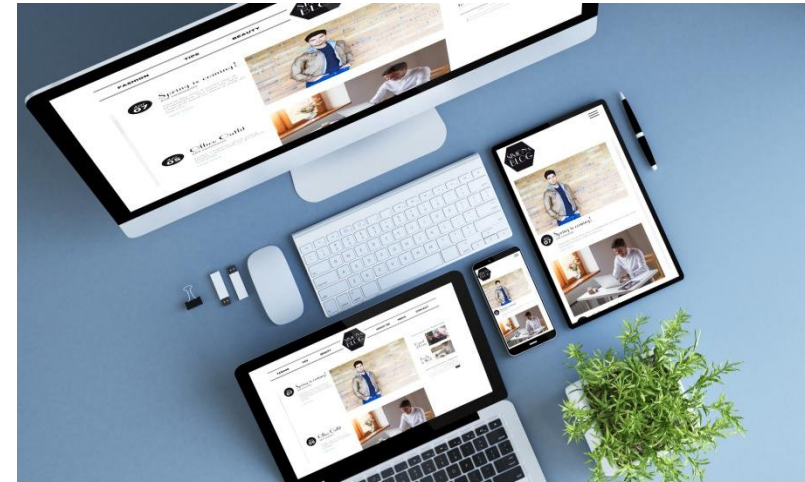
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Sputtering Expert for more than 27 years I



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- Display Technology up to Gen 11
- Glass Coating
- Hard Coating
- Tools and Decorative Coating
- Micro-Electronics
- CD Production
- and others...



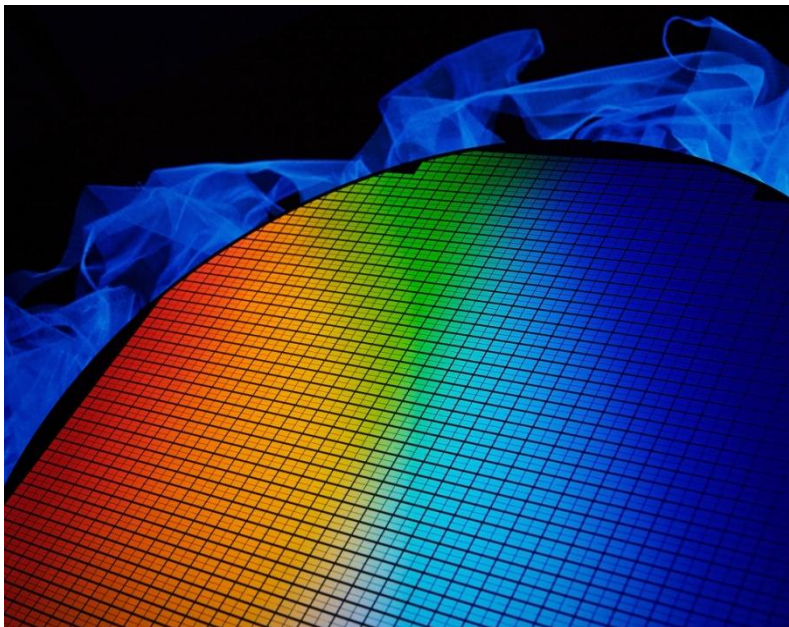
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Sputtering Expert for more than 27 years II



Analoge & Digitale
Leistungselektronik
GmbH

- Tools and Decorative Coating
- Micro-Electronics
- CD Production
- and others...



© Abb.: Rainer, DariuszO, magraphics -fotolia.com

We can help you!

You need a specific coating?

Profit by our knowledge and experience in the development and testing of customized exclusive coatings!

Want a proof for the quality of your coatings?

Get your benefit from our coating laboratory with Applications and Testing!

The unique quality of the coatings can be verified at the nanoscale!

Want to experience the extraordinary characteristics of ADL power supplies?

All coatings are developed and refined with ADL power supplies, during operation in the company owned coating laboratory.



© Abb.: ADL/WE Wurczinger Engineering

We can help you!

ADL Partner
Canada



ADL Partners in China, Korea,
Japan, Taiwan and India



ADL Headquarter in Germany and
worldwide, except **ADL Partners** in
France, Netherlands and Russia



ADL Team – All together for success



Analoge & Digitale
Leistungselektronik
GmbH

Director / CEO, Head of R & D

Dipl. Ing. Michael Houben

Consulting & Support

Dipl. Ing. Ralf Comtesse
Dipl. Ing. Holger Rückert
Claudia Best

Purchasing Dept.

Tobias Keller

Accounting

Regina Prisl

Shipping Dept.

Michael Scheuermann
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Production

PCB Mounting

Sub-Assembly

Andreas Fornoff
Kerstin Illgner

Final Assembly

Andreas Fornoff
Kerstin Illgner

Mechanics & Mech. Construction

Bastian Putter

Electronics Construction, R & D

Dipl. Ing. Jörn Scharfscheer
Dipl. Ing. Sebastian Fandrey

Electronics Laboratory Testing Dept.

Dipl. Ing. Gerhard Rohm

Coating Laboratory for Applications & Testing

In Cooperation with
WURCZINGER ENGINEERING

Communication & Documentation Human Resources

Birgit Cordt MA, BA (USA)

Work Safety

Data Safety

Quality Control

Apprenticeships

Health Management

Fire Protection

Darmstadt – City of Art and Science I



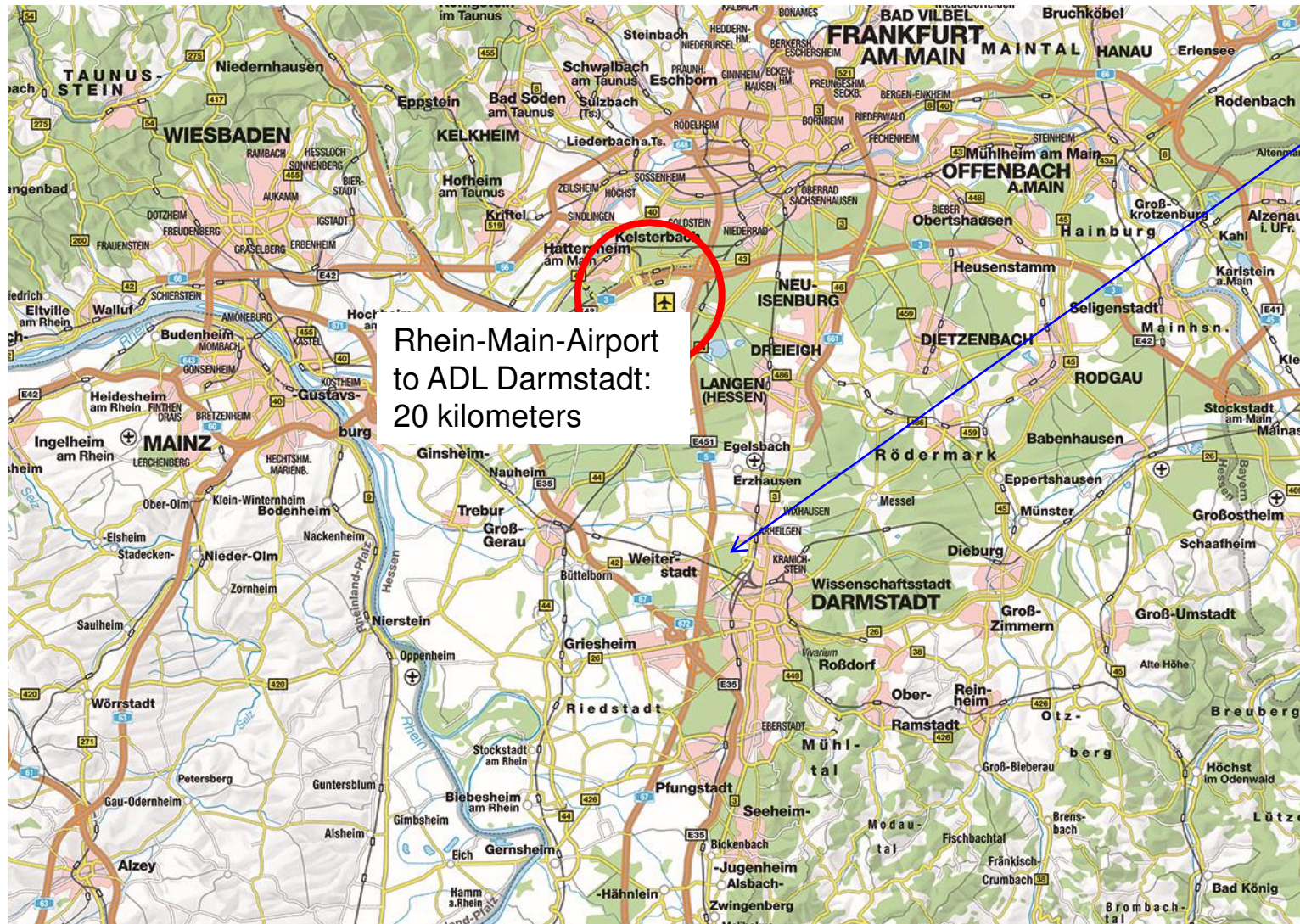
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© Fotos: ADL



You find us very close to FRA Port



A large blue rectangular area with a white geometric shape on the left side. The white shape consists of a horizontal line at the top, a diagonal line sloping down to the left, and a horizontal line at the bottom. The text 'Thank You For Your Attention' is written in white, sans-serif font, centered within the blue area.

Thank You For Your
Attention

Sinewave - Pulse: Comparing different Technologies



Analoge & Digitale
Leistungselektronik
GmbH

	Sine-Wave	Actual Competitors Bip-Power Supplies	Bipolar ADL Bip-Power Supplies
Ignition Voltage	1600 -2000V	1600 -2000V	500-1000V
Waveform Voltage	Sine (distorted)	Trapeze descending after voltage peak	rectangle
Waveform Current	Sine	Rectangle (distorted)	Trapeze ascending
Highest Arc-Probability	Mid of Half-Wave 90° and 270°	Start of Half-Wave 0° and 180°	End of Half-Wave 180° and 360°
Arc-Energy	big	low	low
Voltage-Difference Cathode 1/2	medium	big	low
Power-Difference Cathode 1/2	low (Balanced with AC-coupling)	big (Simple control)	very low (Power ratio controller)
Over-Voltage Stress	low (Sine)	big (Voltage peaks)	no (Square wave)
Dimensions	big	medium	small

Pure DC: Comparing different Technologies

	DC-Series Actual Competition	ADL DC-Series GSW, GX and HX
Ignition Voltage	1000 -1600V	500-1000V
Arc-Detection Time	low	instantly
Max. Arc-Rate	2,000 Arcs/s (std), 8,000 Arcs/s (option)	40,000 Arcs/s (std), 80,000 Arcs/s (option)
Arc Energy	low	medium
Pre-Sputtering	very slow	fast
Arc-Parameter-Setting	manual	Fully automatic process adaption
Frontpanel Control	No	Option (GSW)
Modularity	medium	high
Pulse Upgrade Possibility	Complete replacement	Easy extendable
Line Voltage	3 x 400 – 480 V	3 x 400 V, 440 V, 480 V
Cooling Valve Control	optional	Standard (HX), optional (GSW, GX)
PLC-Interfaces	Analogue, Profibus, RS232/485, EtherCAT	Analogue, Profibus, RS232/485, EtherCAT
Efficiency	92 %	95 %
Dimensions	big	small
Weight	high	medium
Mounting position	19“ Rack mounting only	Fully flexible