Schulz Electronic
Professional Power Supplies

PHOTONICS SOLUTIONS
SUCCESS STORIES
PRODUCTS

01. INDIVIDUAL REQUIREMENTS.

INDIVIDUAL SOLUTIONS.

We are your development partner

OUR COMPETENCE FOR YOUR SUCCESS

For the laser market of the future, Schulz-Electronic develops and produces customer-specific solutions for innovative applications in the industrial, security, mobility and medical sectors.

We want to understand your application; and realise the potential of your development together with you. Based on proven technological components, we develop solutions for your applications that go far beyond the standard ones available on the market. Whether you require the modification of an already existing solution or the integrated development of a concept – at Schulz-Electronic we can provide exactly what you need for your individual application.

Our aim is to develop forward-looking technologies that are in tune with the times. Because innovative ideas require innovative solutions.

3+1
locations (Germany, Switzerland and authorized dealer in Shanghai)

40
committed solution specialists

>10
worldwide distributed sales areas

>40
years of experience

We analyze your requirements and develop the ideal solution.

THE PROCESS

1. STEP

LOOKING AT REQUIREMENTS FOR THE APPLICATION

Let us understand what you need. Whether you already have a detailed specification or just a rough concept of your vision in mind, together with you we will work out the necessary requirements for your application to become reality.

2. STEP

SOLUTION-ORIENTED ANALYSIS OF REQUIREMENTS

Our aim is to find the optimal solution for you. Depending on your requirements, we assess whether we have a suitable product for your application in our portfolio which may need application-specific modification, or whether the solution is an individual new development.

3. STEP

PREPARATION OF REQUIREMENT AND TARGET SPECIFICATIONS

In fixing your project, we strike a balance between the project-based requirements and technical feasibility, so you benefit from a common consensus. Through our extensive partner network, we will be able to develop the ideal solution for you.

4. STEP

INDIVIDUAL DEVELOPMENT OF THE APPLICATION

Our highly specialised experts develop solutions for you that go beyond the modification of standard products. We use our know-how and our experience to align all process steps with your requirements and provide you with the best possible support in developing your application.

5. STEP

DELIVERY AND, IF REQUESTED, ON-SITE INTEGRATION

We give you comprehensive support. Rely on a dependable partner who will support you from development and quality assurance, to production and logistics. We will gladly help you on site and support you in integrating your new system.

6. STEP

AFTER SALES BUSINESS AND CUSTOMER SUPPORT

For us, comprehensive means that after your purchase you benefit from our extensive after-sales services, including not only personal customer support, but also support from our development team, who show you the possibilities for further developing your application.

02. MASTERED CHALLENGES.

OUR SUCCESS STORIES.

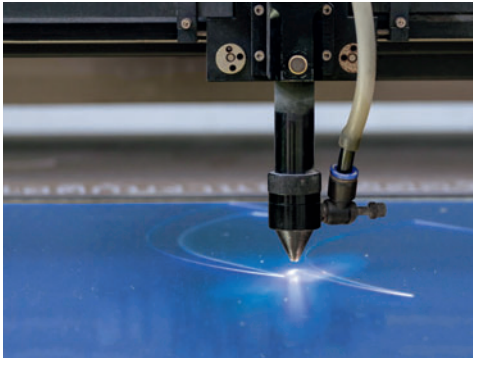
Implemented systems

01. CAPACITOR CHARGERS FOR EXIMER LASERS

02. DRONE DEFENSE FOR SAFE FLIGHT

03. DIODE LASER STACKS
WITH SPECIAL PULSE REGIME

04. INNOVATIVE FIBRE LASERS



05. PLASTIC LASER WELDING PLATFORM

CAPACITOR CHARGERS FOR EXCIMER LASERS

High power lasers with short pulses in the UV wavelength range

TASK

Market requirements remain sophisticated. The demand is for high-resultion, flexible displays for tomorrow's generation of mobiles.

In order to enable appropriate manufacture of displays, our customer developed an innovative excimer laser. Thanks to its extremely short wavelengths and high power density in short pulses, it is able to exposure so-called OLEDs in such a way that sealed large-scale displays, now also with flexible design, can be manufactured.
The excimer laser, as one of the most flexible, most powerful light sources of coherent radiation in the ultraviolet range in recent times, is the ideal tool for this.

SOLUTION

A precise, high-performance HV source individually developed for this type of display manufacturing.

The solution of Schulz-Electronic is the provision by our development partner LUMINA POWER of a capacitor charger especially adapted to this laser. At present the extremely high-precision pulse repetition accuracy of LUMINA's capacitor chargers in the kHz range down to 0.01% makes them global state-of-the-art. Thus with a power of 20 kJ/s and cascadability of the chargers to many times of 20 kJ/s, especially stable operation of the excimer laser is ensured, so that it can be used to exposure the displays according to the necessary operating parameters.

SPEZIFICATION

- High voltage capacitor chargers to 15 kV
- OEM models for integration 3phase AC input models to 20 kJ/s and higher
- Voltage repeatability < 0.5 % standard
- High precision custom models down to < 0.01 % voltage repeatability available

YOUR CONTACT

JOHANNES WOLF
SEGMENT MANAGER LASER

◄ QUESTIONS?

Scan and store contact data directly.

DRONE DEFENCE FOR SAFE FLIGHT

High power fibre laser for airborne safety

TASK

Unmanned flight systems like drones increasingly pose a potentially serious threat to conventional air traffic.

In order to provide the necessary safety, flight defence systems are being developed that are able to eliminate unauthorised flying objects entering a plane's air space by the targeted use of a laser cannon. This makes it possible to actively pre-empt unforeseen disruptions in order to maintain the safety of passenger aircraft at landing and takeoff. The extensive areas to be covered require mobile operation for fast intervention.

SOLUTION

The solution is a special driver unit which has to be sufficiently robustly constructed and mounted for use in the field on a mobilelaser firing platform.

Schulz-Electronic constructed a special highly stable rack with built-in suspension, certified according to military standards, in order to withstand even the roughest environment. Additionally DC/DC drivers with 48 V input and inverter technology were developed and certified in order to supply the multiple 14 A/80 V drivers for the optical pump module of the fibre laser by means of 48 V batteries with an input of max. 250 A, even when in mobile operation and independently of the power grid. The strongly focused light from the fibre laser can then be used to put the airborne threat out of action efficiently and accurately.

SPEZIFICATION

Battery input: 48 VDC/12 kW

DC output to laser diodes:
Output safety according EN ISO 13849-1 PL e

YOUR CONTACT

HEIKO SEEL
PRODUCT MANAGER LASER

◄ QUESTIONS?

Scan and store
contact data directly.

DIODE LASER STACKS WITH SPECIAL PULSE REGIME

For advanced dermatology

TASK

Non-invasive, gentle treatment for the skin using innovative technologies is an established part of dermatology.

The problem is a complex one: a laser used to treat skin must direct the light exclusively to a well-defined area, and the light must be strongly homogenised by an optical funnel to produce the desired effect on the living tissue. Intensity, pulse duration and pulse frequency influence the interaction of the laser beam with tissue with a wide range of skin tones, and depending on this factor and on the depth of treatment, these parameters have to be adjusted for each individual application.

SOLUTION

Special pulse regime for gentle treatment.

With an optical, beam-compacted diode laser stack, and with operating regimes in pulse mode adapted to individual skin types and specific effects, the skin has to be treated in such a way that the surrounding tissue is not damaged while the colour particles of a tattoo, hair roots or other blemishes are removed. The application-specific pulse regime is realised using a diode laser driver which, as a pulsed high current source, supplies the stack with correctly dosed currents, in order to treat the relevant areas of the skin gently but with permanent effect.

SPEZIFICATION

High power & high current QCW-laser diode driver

OEM AC/DC and DC/DC units for medical and industrial applications

For special medical wavelenghts pulses to 1.000 A

YOUR CONTACT

JOHANNES WOLF
SEGMENT MANAGER LASER

◄ QUESTIONS?

Scan and store contact data directly.

INNOVATIVE FIBRE LASERS

Drilling, cutting and deep welding

TASK

The high power fibre laser takes over from conventional lasers like disk lasers and rod lasers.

For this special, innovative high power laser type, special pump sources are required which are mostly single-chip-based, and very many of these single-chips are needed to generate the power required by the fibre laser. The focus here is on applications that need very high output densities, such as the drilling, cutting and deep welding of metals. Thick materials and the processing of free forms in particular make additional demands on the power supply.

SOLUTION

The solution of Schulz-Electronic is a diode laser driver specially developed for single-chip operation.

Following a pilot project with excellent test results, this is already being serially produced. The product, which was specially developed to pump fibre lasers, is known as the LASY power supply; we had it developed by our cooperation partner PBF, and it enables the fibre laser to work in a way that makes the applications of deep welding, drilling and cutting of thick sheet metals possible.
Fast pulse operation in kHz regime as well as high DC power are needed for this.

SPEZIFICATION
Up to 12 channel diode driver, each channel max. 18 A/50 V
Total 11 kW from water-cooled 3U
Pulsed operation to 10 kHz
EN ISO 13849-1 PL e current output safety

YOUR CONTACT

HEIKO SEEL
PRODUCT MANAGER LASER

◄ QUESTIONS?

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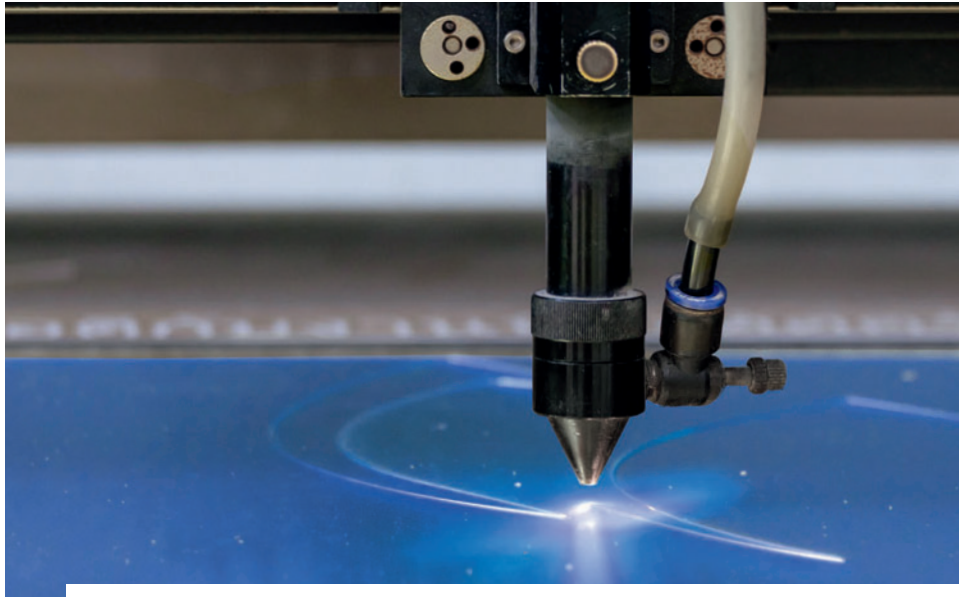


PLASTIC LASER WELDING PLATFORM

System platform for application-specific choice of diodes

TASK

In system development: cost optimisation combined with maximum flexibility of application is fundamental to competitiveness

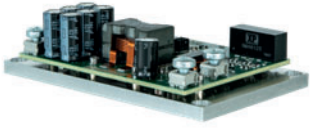
For manufacturers and users, it is an enormous economic advantage to be able to adapt laser systems flexibly to individual applications, once they have been developed, without having to make basic modifications to the system. One of our customers envisaged the direct use of various diode lasers for a system platform, based on multi-single emitters, but with a broad performance / voltage range. For compatibility reasons, as far as possible only a standard 36 V auxiliary supply was to be used.

SOLUTION

A DC/DC current driver with a broad compliance power range that can supply diode laser modules in small, medium and high voltage ranges.

An innovative DC/DC buck/boost driver topology enables laser diodes to be supplied with a compliance voltage considerably below, the same or even above the fixed voltage of the DC auxiliary supply. As a result of cooperation with our development partner Dr. Heller Elektronik, this innovative concept now enables the use of a broad palette of laser diode types, exactly meeting the physical requirements of individual applications without any great system adaptations. The fast rise time of typ 150 µs also opens up possibilities for use in fast plastic welding applications with open contours.

SPEZIFICATION
Up to 55 V Output from 24/48 VDC-in
Opt. to 70 V compliance voltage
Max. 20 A DC, suitable for all single-emitter diode types
Efficiency of up to 99 % makes high cooling requirements unnecessary



YOUR CONTACT

JOHANNES WOLF
SEGMENT MANAGER LASER

◄ QUESTIONS?

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03. SCHULZ-ELECTRONIC SOLUTIONS.

FOR VERSATILE APPLICATIONS.

With system to the optimum result

CW DRIVERS

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CW TO QCW DRIVERS

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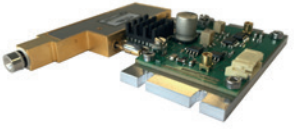
ULTRA-SHORT PULSE DRIVERS

PAGE 22



CUSTOM DEVELOPMENT & SYSTEM SOLUTIONS

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PULSE DELAY AND SIGNAL GENERATORS

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CAPACITOR CHARGERS & HV SUPPLIES

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ACCESSORY, CONTROLLERS & AUXILIARY PSUS

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DIODE DRIVERS CW DC TO 500 µs

cw drivers are designed for full power continuous operation of diode lasers at their nominal power level.

Many cw applications nonetheless need a fast response time and a fast pulsed operation. For a laser diode 500 µs pulse width is still a "long" time interval, but for a standard DC source this might be a challenging task. Schulz-Electronic cw drivers combine high DC performance, e.g. very low output ripple/noise, whilst also allowing for fast rise/fall times to be used for sophisticated tasks such as e.g. laser plastic welding with a very high workpiece throughput.

CW DIODE DRIVERS

for diode operation from ca. 500 µs to cw for stacks and single emitter modules

- → diode drivers to 1 kA and higher
  stack voltage to >200 V
- → driver output safety performance level e (PL e) / SIL 3
- → max. flexibility for output configuration to meet any –
- → common or special – laser diode input requirement

LUMINA POWER, LDD
LUMINA POWER, LDN
DELTA ELEKTRONIKA, SM SERIES

CW BUCK/BOOST DC/DC DIODE DRIVER LDDP-20-55

for single emitter module operation
from ca. 500 µs to CW

- multi single emitter buck/boost DC/DC diode driver up to 20 A/55 V
- DC/DC boost operation $U_{out} > U_{in}$, e.g. 40 V U_{comp} from 24 VDC supply
- highest efficiency to 99%
- typ. 150 µs rise/fall time

DR. HELLER ELEKTRONIK, LDDP-20-55

CW LABORATORY & INDUSTRIAL DIODE LASER SUPPLIES

- cw operation with high speed rise/fall times <100 µs
- min. cw current ripple $< 5 \times 10^{-4}$ (pp) / 5×10^{-5} (RMS)
- from 150 W to 15 kW constant power mode (covering 31.5 kW virtual power range) CC/CV from 3U
- master/slave to hundreds of kW
- contamination protected electronics
- 2Q source/sink operation

DELTA ELEKTRONIKA, SM SERIES
DELTA ELEKTRONIKA, ES SERIES

DIODE DRIVERS
CW TO QCW / DC TO 5 µs

cw to qcw drivers combine two seemingly mutually exclusive timing regimes from µs pulse width to DC operation.

The more application fields laser technology advances into, the more challenging technical requirements become.
For quasi simultaneous plastic welding, and particularly for increasingly modern medical treatments, as well as for certain pumping tasks in MOPA fibre laser amplifier stages, standard cw pulse regimes no longer suffice. Beside DC operation, even faster pulses down to a few µs are required. There is also a demand for high average power in combination with high pulsed peak powers.

CW TO QCW
AC/DC & DC/DC DRIVER SOLUTIONS

- → from 5 µs to DC
- → 1.000 A pulsed to 100 A DC
- → to 6 kW avg. power
- → up to 300 J/pulse
- → from 2 µs rise time
- → ideal for industrial and medical application

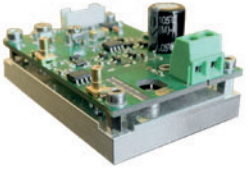
LUMINA POWER, LDP SERIES
LUMINA POWER, HPP SERIES
LUMINA POWER, LDQPC
LUMINA POWER, DDPC

MULTI-CHANNEL CW TO QCW FIBER LASER SUPPLIES

- → from DC to multi kHz QCW pulse operation
- → configurations ideal for fiber laser pumping
- → configurations for high current stacked single-chips
- → performance level e (PL e) / SIL 3
- → 4 to 21 kW direct diode operation from DC to pulsed 10 kHz @ up to 12 floating channels
- → total output combination to 540 A or up to 270 V
- → for welding and cutting applications

PBF, LASY18A-xC

PBF, LAaPS21000



SHORT PULSE TO CW DC/DC DRIVER SOLUTION

- → pulse width 150 ns to cw
- → from 50 ns rise/fall time
- → from single diodes to >200 V
- → from mA to 50 A
- → to 2 MHz pulse & modulation

DR. HELLER ELEKTRONIK, QCW500

DR. HELLER ELEKTRONIK, HPCD

ULTRA-SHORT-PULSE DRIVERS

Current pulses from sub-nano-second to microseconds.

Optical EOM or AOM techniques are standard ways to create pulses of nanoseconds and below.

Direct electrical high peak power pulse-generation for direct diode operation is maybe the most challenging application. Using state-of- the-art semiconductor switches and sophisticated electrical topologies, our drivers allow for high power current pulses operating at the limits of physical feasibility.

SHORT & ULTRA-SHORT-PULSE DRIVERS

- → from 500 ps to µs
- → amplitude 10 A/ns
- → OEM sub-ns seed pulse drivers
- → custom inductance minimized diode driver connection
- → high temperature automotive laser testing applications
- → LIDAR pulse drivers – peak current beyond 1 kA
- → for characterisation, spectroscopy, etc..

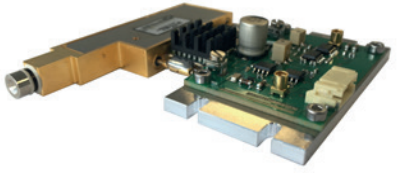
HEAD ELECTRONIC, PLD SERIES

DR. HELLER ELEKTRONIK, UFLD

CUSTOM DRIVER DEVELOPMENT

From DC drivers to ultra-short pulse generators.

Special parameter regimes, tailored mechanics, custom interfaces: many system setups require a unique adaption of standard driver designs. Whether microsecond pulses passing through metres of unique load cables are required, or ultra-short-pulse driving of standard DC diodes, or combining driver topologies to enable new applications – Schulz-Electronic thinks outside the box to create unconventional solutions. We do not stop at the driver output, but also take care of control and load inclusion. If no existing technique fits, we start on the development of completely new driver topologies.



CUSTOM DEVELOPMENT & CUSTOM MODIFICATION FROM 1 PIECE

- → pulse and short pulse drivers with custom diode-to-driver connection
- → load specific inductance optimized stripline connections
- → electrical & mechanical customization
- → taylored cw drivers and TEC controllers
- → development of complete new power supplies, capacitor chargers and diode drivers
- → modification of standard products to meet specific demands

SCHULZ-ELECTRONIC & DEVELOPMENT PARTNERS

CUSTOM SYSTEM SOLUTIONS

From system assembly groups and custom drawers to rack supply solutions.

Using products from our portfolio and beyond, Schulz-Electronic system production offers custom products from 1 piece to series production. We combine external and proprietary components to adapt the system environment for a user-specific load and application.

There are virtually no limits to combining required techniques, electronics and accessories to finally obtain exactly the solution that meets all the user's demands.

CUSTOM LASER DIODE SUPPLY SYSTEMS

- → complete system supply drawers including AC/DC safety monitoring, digital timing generators, Peltier heatsinks, etc.
- → high power laser rack systems up to 13849-1 PL e safety
- → IP54 supply systems including high power chillers/heat exchangers custom sized
- → custom PLC setups and interfaces to adapt to individual user control
- → tailored rack constructions

SCHULZ-ELECTRONIC, SYSTEM PRODUCTION

PULSE & DELAY GENERATORS

Timing and synchronisation demands in laser, research and industrial applications.

Pulsed laser applications not only require precise and powerful current sources, but also often the synchronisation of many additional basic components like AOM, EOM or individual laser sources in pump-probe experiments.

Spectroscopy, particle accelerators, etc. have similarly high timing needs and these are optimally supplied by our pulse generators.

PULSE DELAY GENERATORS

- up to 8-channel delay generators
- down to 5 ps resolution
- laboratory and industrial OEM use
- sub-ns jitter
- electrical & optical I/Os
- ideal for laser pulse-picking, PIV, ion traps, ...

QUANTUM COMPOSERS

SIGNAL AND CURRENT PULSE GENERATORS

- laboratory pulse signal and pulse current generators
- ps to ms regime
- from HV models or to 500 A pulsed
- semiconductor test pulsers
- custom models and sockets to match individual loads

AVTECH ELECTROSYSTEMS
QUANTUM COMPOSERS

CAPACITOR CHARGERS

Traditional capacitor charging power supplies have been limited to pulse-pulse-repeatability of 0.5 % that can only be achieved at very low repetition rates.

By contrast, CCPF topology can be configured to be operated at repetition rates to up to 5 kHz whilst providing an outstanding 0.01 % voltage repeatability. This unique specification especially benefits applications in semiconductor lithography processing, pulse power research, and precision laser applications using flash lamps and excimer lasers. The CCPF series provides models in a standardised platform, but they are custom configured ex factory for individual applications.

CAPACITOR CHARGERS

- → OEM HV cap.chargers to 20 kW and beyond
- → parallel/cascaded operation to widely extend total power
- → worldwide unique: Pulse-to-pulse repeatability down to 0.01%(!)
- → individual customer selectable steady U/I output configuration to optimize output power to each specific application
- → optimization for partial and full discharge applications: Ouptut is custom modified to allow for full nominal power operation regardless of the voltage and discharge regime

LUMINA POWER, CCPF
LUMINA POWER, CCHP
TECHNIX, CCR

HV SUPPLIES

Nearly 20 years of experience in manufacturing HV supplies enables TECHNIX to unlock even the most challenging applications.

Whether creating sophisticated laboratory setups or supplying kilometre-long particle accelerators, the extremely wide range of output power of our HV supplies enables continuously high output performance from 300 Watt to installations of 1 Megawatt!

High wall plug efficiency and the highest reliability offer cost optimisation, thanks to minimised service costs and low cost of ownership – especially in the high power regime.

HV SUPPLIES

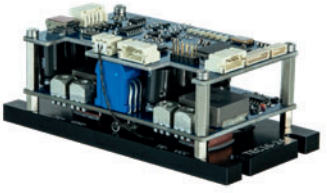
- → HV supplies for laboratory and industrial applications
- → output voltage up to 350 kV and higher
- → output power up to 1 MW
- → arc management with arc detection and counting available
- → low stored output energy facilitates safe operation
- → numerous analog and digital interfaces available
- → application dependent output regulation available for standard HV supplies and capacitor chargers

SCHULZ-ELECTRONIC & DEVELOPMENT PARTNERS

ACCESSORIES AND AUXILIARY SUPPLIES

We complete our portfolio as a provider of laser supply solutions by providing laser system accessories.

TEC controllers for high precision diode and optical crystal cooling extend our range of laser products beyond the pure power supply. Auxiliary voltage sources to power DC/DC driver solutions and TEC systems allow our customers to acquire complete component-based one-stop solutions. The fastest and most direct diode driver control – even in the era of "laser 4.0" – is still performed by analog regulation. Intelligent digital controllers for operating and timing functions allow analog drivers to be used in a digital communication environment.



TEC CONTROLLERS

- bipolar heating & cooling operation up to ±36 A / 30 V
- true regulated current source! No PWM technology, but true high frequency switching buck converter topology
- gentle peltier operation for lowest stress to avoid micro cracks and ceramic n-p couple degeneration
- series models with increasing power steps to match individual power demands
- ultra fast step response also for applications with fast periodic hot/cold cycles
- high efficiency typ. 97%
- optional 4-wire measurement for highest absolute accuracy
- optional user display for manual setpoint temperature control and monitoring

HEAD ELECTRONIC

AUXILIARY SUPPLIES

- standard fixed 12, 15, 24, 36 or 48 VDC supplies from 100 W to multi KW
- non-standard voltages to 30, 60, 90, 150 or 300 V
- U and I regulated auxiliary sources
- PFC 400 V AC-frontends to supply DC/DC power brick modules
- conductively cooled multi-kW voltage and current sources designed to supply fiber laser systems in fast pulsed operation
- industrial 19" sources 1.000 A/15 kW from 3U

CAMTEC

PBF

TDK LAMBDA

CONTROLLERS

- handheld controller 1550-LDDC to convert analog laser diode drivers to quasi-laboratory units
- individual user-settings to match scaling of virtually any U/I driver output configuration
- internal clock/pulse generation also for control of pulse/burst/duty cycle operation
- digital RS232/RS485/USB interface to convert an analog driver into a fully digital remote controlled driver unit
- board level controllers for short pulse trigger signal generation, nanoseconds to miliseconds

QUANTUM COMPOSERS

HEAD ELECTRONIC

04. COMPLEX REQUIREMENTS.

IMPLEMENTED ACROSS INDUSTRIES.

Far-reaching qualification

OUR EXTENDED PORTFOLIO

Our portfolio is based on your wishes – that is why we often develop highly specific special solutions.

Whether your project involves a standard equipment brand, or a complex system tailored to highly specialised project requirements – as a customer of Schulz-Electronic, you benefit first and foremost from a team that will gladly advise you, show you possible solutions and is always at your side – both before the project starts (e.g. with test equipment), during the project (e.g. providing on-site support) and later with extensive after-sales services.

With Schulz-Electronic, you have a strong, sectorally-independent partner at your side. True to our motto:

"There is only one solution. The best."

INDUSTRIES

INDUSTRY

SOLAR

RESEARCH & DEVELOPMENT

RAILWAY

AUTOMOTIVE

AEROSPACE

OUR PARTNERS

Delta Power Supplies

High power laboratory &
industrial PSUs and diode drivers

Lumina Power, INC.

Capacitor chargers
High power pulsed to cw laser
diode drivers
Lamp ballasts

DR. HELLER ELEKTRONIK KG
OPTO | RF | POWER

Pulsed to cw and fast modulated
DC/DC diode drivers
Ultra short pulse drivers

Quantum Composers

Pulse delay generators
Laser diode controllers
Pulse current generators

AVTECH

Ultra high speed pulse generators
Function generators
Semiconductor test pulsers

TECHNIX

High voltage power supplies
Capacitor chargers

head electronic

TEC controllers
Ultra-short-pulse drivers
Board-level signal generators

PBF SFC ENERGY GROUP

Multi-channel diode drivers
Fast pulsed to cw high power diode drivers
High power auxiliary supplies

H&H Höcherl & Hackl The electronic load

Electronic Loads

TDK·Lambda

AC/DC power supplies
Programmable voltage & current sources

OUR SERVICE

PURCHASE, HIRE OR LEASING

SUPPORT HOTLINE

HIGH-PRECISION CALIBRATION SERVICE

DEMO UNITS

COMPREHENSIVE PORTFOLIO

REPAIR SERVICE

Schulz Electronic
Professional Power Supplies

LOCATIONS

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