



**SCHMIDT  
KRANZ GROUP**

# **HYDROGEN SOLUTIONS FOR THE MINING INDUSTRY**

VDMA



## EFFICIENCY FIRST

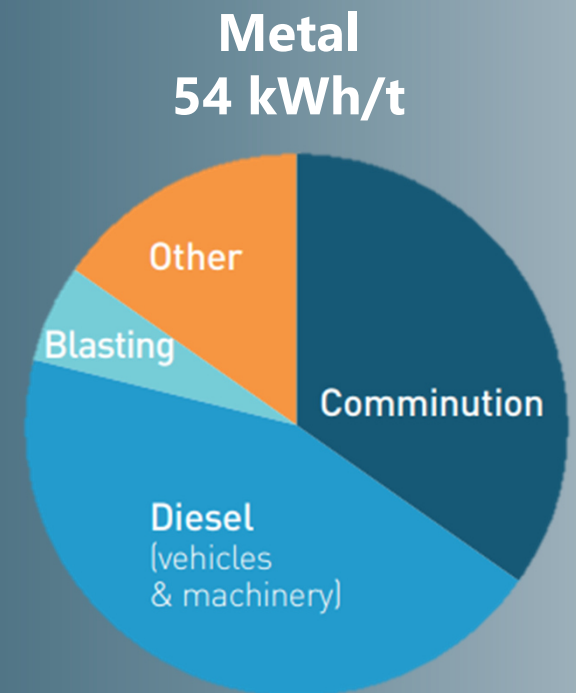


- Schmidt Kranz Group is a family-owned group of small- and medium sized enterprises from selected industries and services
- We deliver innovative technical solutions that enable our customers to enhance their efficiency
- Main fields of activity: underground mining and tunneling, mineral processing and recycling, hydraulic and pneumatics, automation & control and services
- Headquarters: Velbert-Langenberg, NRW, Germany
- International presence in over 25 countries



# THE MINING INDUSTRY IS CHANGING

- Climate change is the biggest challenge in the today's world
- Mining has with more than 7% of total CO<sub>2</sub> Emission significant impact
- Decarbonization = Electrification
- Mobile equipment needs a change in drive technology
  - Battery system
  - Fuel cell (Hydrogen)



## GHH GROUP: A TOTAL SOLUTION PROVIDER



GHH Group develops and manufactures vehicles for underground mining and tunneling. It offers customer-specific solutions for the full mining cycle drilling, loading and hauling to ground consolidation.

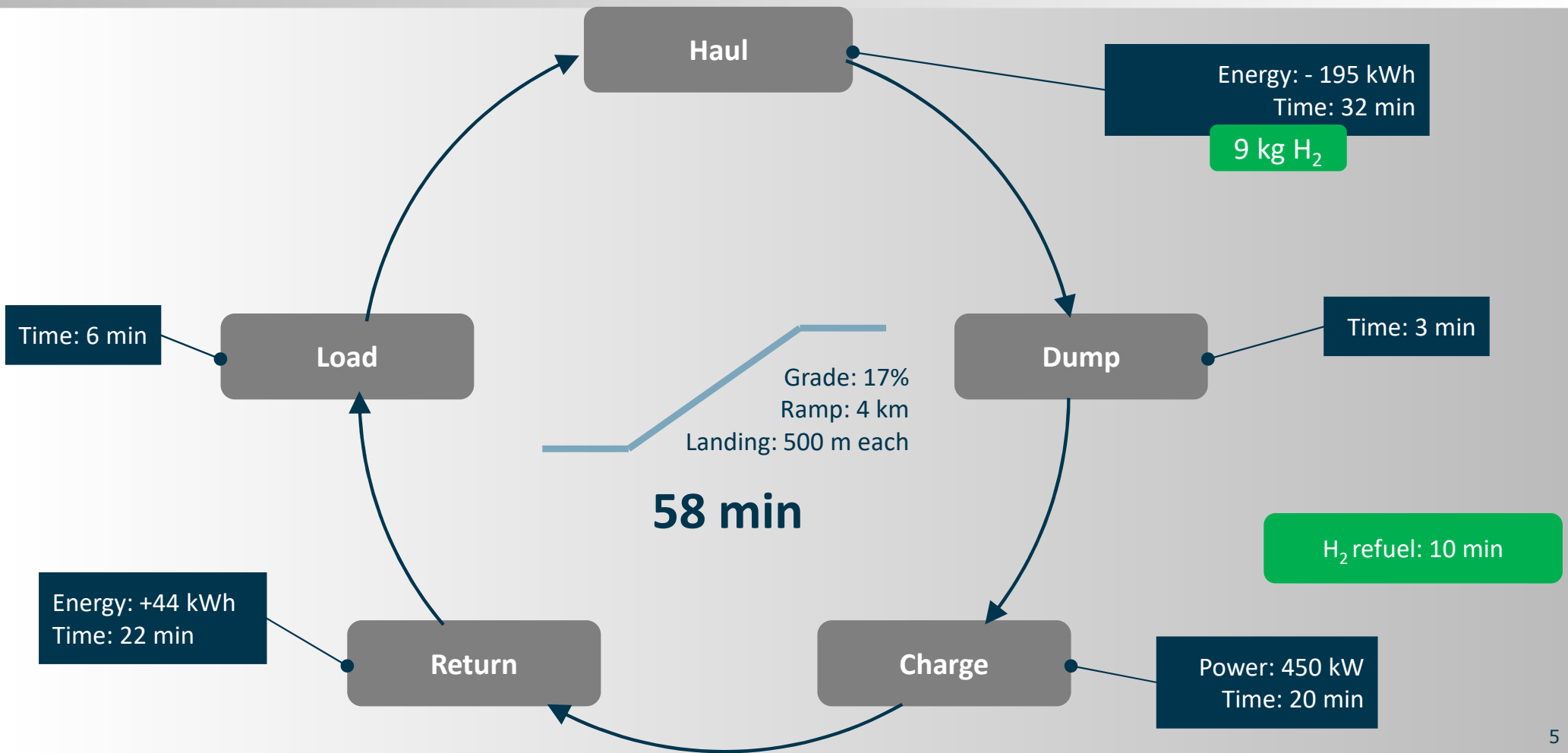
### Product Range:

- LHDs 3-21 tons
- Face, long hole, and narrow vein drills, roof bolters
- Dump trucks 15-42 tons
- Mining utility vehicles
- Vehicles for soft and hard rock environments
- Spare parts and consumables
- Resin capsules
- Full scale service solutions





# ENDURANCE TEST FOR NEW DRIVES



# SUCCESS STORY IN SWITZERLAND

Trucks '21: >50  
Trucks '25: >1500  
Stations. '25: ca. 100  
Reach.: 400km  
Weight.: 34t  
Pay-per-use



ausgewählter Zeitraum 1.7.2021 – 31.7.2021			
CSV			
Anzahl Betankungen	Ø Betankungsmenge	Ø Betankungszeit	Gesamte Betankungsmenge
Anzahl: 410 Erfolgreich: 151 Abgebrochen: 259	9.77 Kilogramm Min: 0.00kg Max: 27.11kg	04:39min Min: 00:00min Max: 11:50min	4005.65 Kilogramm



# THERE IS A SPOT FOR FUEL-CELL DRIVEN MASCHINES IN MINING

## Battery

Charging time reduces operation time

High investment due to redundant batteries

Mine grid must be significantly expanded

Extinguishing concept for batteries not fully developed

Capacity for heavy machinery is currently not sufficient for 8-12 h shift

Battery weight reduces payload

## Fuel cell

Efficiency?

High investment in fueling infrastructure

Hydrogen production needs high amount of available green energy sources

No lighthouse project for underground mines

WORKING TOGETHER TO MAKE HYDROGEN HAPPEN

# GREEN HYDROGEN SOLUTIONS



1. The total eco system has to be considered
2. For green hydrogen the:
  - Energy has to come 100% from RE
  - Energy has to be produced locally (on mine site)



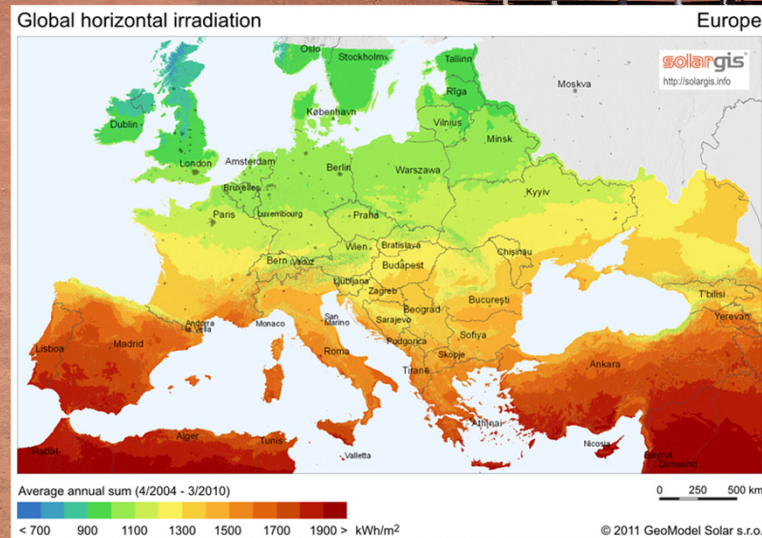
# AUSTRALIA HAS HIGH POTENTIAL

- Irradiation is excellent
- Industry open for hydrogen solutions
- 10% of total energy use in OZ for mining

Australian mining operations explore renewable energy potential with Engenium

**BLOOMBERG - DIESEL IMPORTS FALL AS AUSTRALIAN MINERS SHIFT TO RENEWABLES**

**OZ MINERALS SEEKING AFFORDABLE POWER TO USE 80% RENEWABLES**



## OUR FUTURE: SELF SUFFICIENT MINES

In-house green energy production: solar, hydro, biomass or wind power



Stored in

- Batteries (short term)
- Hydrogen (seasonal)



- Fuel cell powered heavy equipment
- Battery powered light equipment

- + no power cuts due to local problems, no dependencies
- + no regional infrastructure required (diesel trucks, power lines,...)
- + green footprint, no CO2 tax
- + less ventilation requirements

- Mobile equipment not yet available

**More sustainable AND cost efficient**



## ACTIVITIES

# OUR CORE BUSINESS AREAS



### UNDERGROUND MINING & TUNNELING



### MINERAL PROCESSING & RECYCLING



### SERVICES TRAINING & EDUCATION SALT & WASTE



### AUTOMATIC & CONTROL, HYDROGEN SYSTEMS



### HYDRAULICS & PNEUMATICS, HYDROGEN FUEL STATIONS



# H2 OFFERING OF SK GROUP



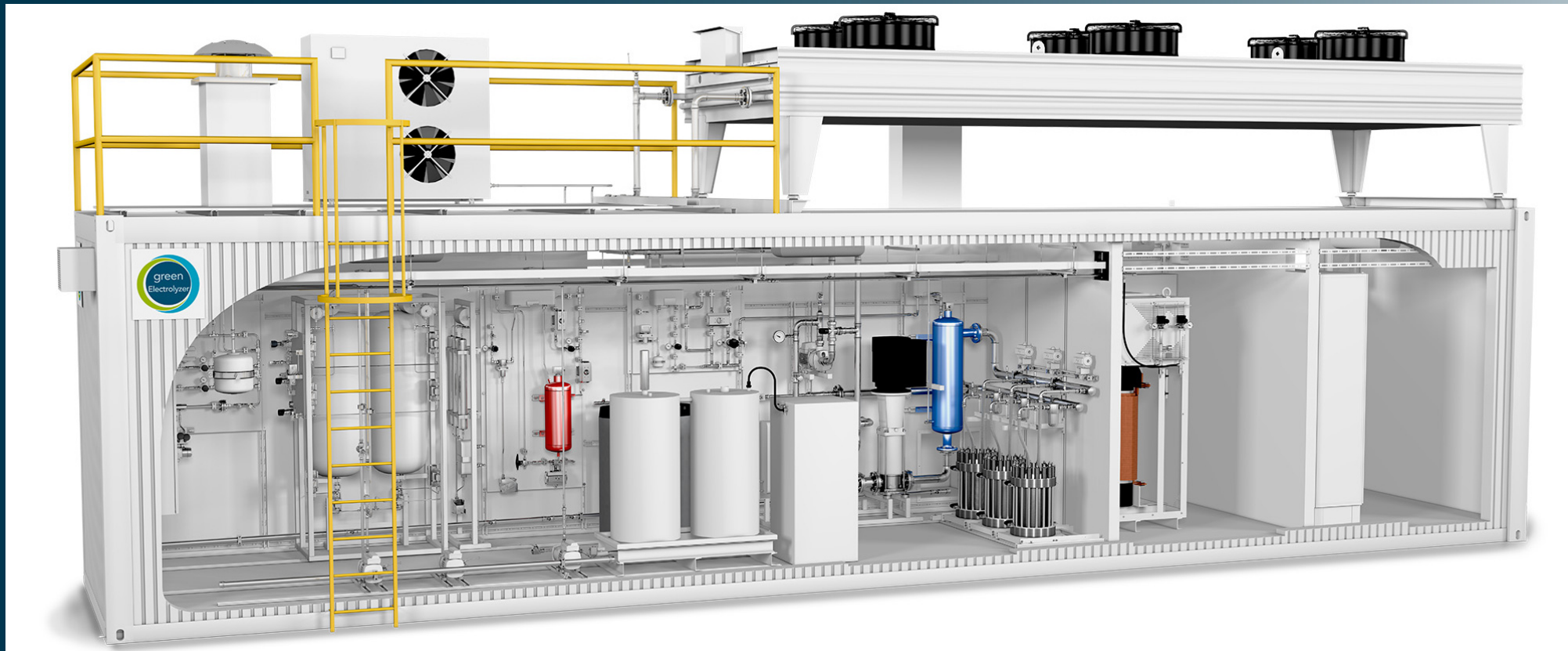
## Electrolyser Characteristics:

- Turn Key Systems
- 25 kW to 30 MW
- Indoor & Outdoor Design
- High System Efficiency:
  - > 68 % at 100 % nom. Capacity
  - > 74 % at 50 % nom. Capacity
- High gas purity up to 99,999 Vol%
- Availability
  - Stack > 80.000 h/y
  - System > 25 years
- Low Maintenance Costs of approx. 1% of investment /y



HYDROGEN PRODUCTION

## GENERAL DESIGN- GREEN ELECTROLYSER: 500 KW OUTDOOR



# H2 OFFERING OF SK GROUP





## MAXIMATOR HYDROGEN

MAXIMATOR Hydrogen was founded in 2019, to strengthen the focus on the hydrogen technology business. Today it is one of the leading suppliers of cost effective and high-quality hydrogen refueling stations, offering high pressure and test technology up to 25,000 bar.

### Product Range:

- Complete Solution hydrogen refueling stations for trucks/buses/cars
- Max-Service: extensive service and maintenance package, including all safety and function-related inspections and tests at 6 different levels monthly to annually.

### Patented Technology:

- Max-Compression, with 2 stages for continuous hydrogen compression up to 1,000 bar
- ASX – Automatic Seal Exchange of the H<sub>2</sub> high pressure seal, minimizing unplanned downtime.
- OIIML-guidelines approved dispenser, with pressure range 700 bar (cars) and 350 bar (trucks and buses)



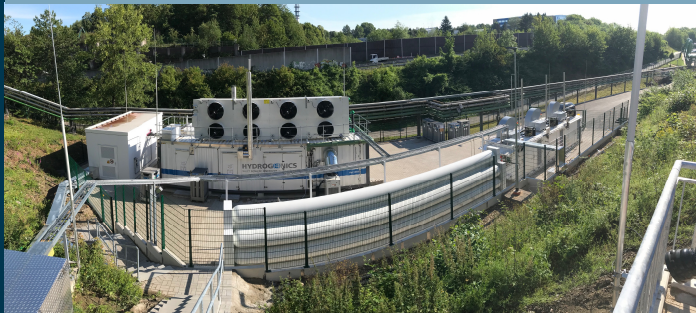




Turnkey project incl. 1,5MW Electrolyser and HRS for the H<sub>2</sub> infrastructure and refueling stations for up to 40 green-hydrogen powered buses in Wuppertal, Germany (2020).



Opening of the first hydrogen refueling station in Switzerland, AVIA St. Gallen and AGROLA in Rothenburg, CH.(2021)



WORKING TOGETHER TO MAKE HYDROGEN HAPPEN

# GREEN HYDROGEN SOLUTIONS



1. Hydrogen is the future for sustainable and green energy
2. The key to success is to consider the whole eco system
3. SK provides all needed expertise for delivering hydrogen solution to mining
4. We must start today, for being successful in 2030!

# SK GROUP WORLD-WIDE



SCHMIDT  
KRANZ GROUP

## ● ADVANCED TRAINING TECHNOLOGIES, CASTROP-RAUXEL, GERMANY

- **FEST GROUP, Goslar, Germany**
- FEST, Lipetz, Russia
- FEST Technology, Bergisch Gladbach, Germany
- FEST Wien, Austria
- FEST-Consult, Mumbai, India
- IPS-FEST, Sinzig, Germany
- Dr. Ecklebe, Wernigerode, Germany

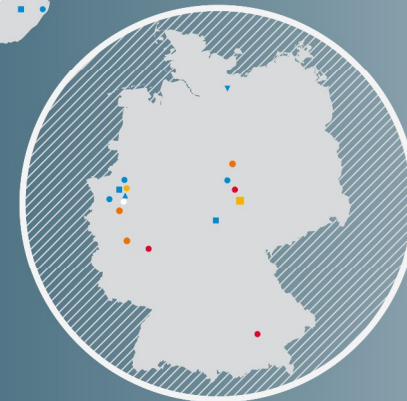
- **GHH GROUP, Gelsenkirchen, Germany**
- BAT Bergbau Service, Merkers-Kieselbach, Germany
- GHH Australia, Ellenbrook
- GHH Chile, Santiago de Chile
- GHH Fahrzeuge, Moscow, Russia
- GHH Fahrzeuge, Gelsenkirchen, Germany
- GHH India Mining and Tunneling Equipment, Uttar Pradesh
- GHH Machinery, Beijing, China
- GHH Mining and Tunneling North America, Toledo, USA
- GHH Mining Machines, Boksburg, South Africa
- Mine Master, Wilkow, Poland
- SCHMIDT KRANZ GHH Kazakhstan, Karaganda

- **GSES Beteiligungsgesellschaft,  
Sondershausen, Germany**
- Erlebnisbergwerk Betreibergesellschaft,  
Sondershausen, Germany
- Glückauf Sondershausen Entwicklungs- und  
Sicherungsgesellschaft, Sondershausen, Germany
- HABES - Gesellschaft für Haldenbewirtschaftung,  
Sondershausen, Germany

- **HAZEMAG GROUP, Dülmen, Germany**
- allmineral Aufbereitungstechnik, Düsseldorf, Germany
- allmineral LLC, Alpharette, USA
- allmineral Spolka, Warsaw, Poland
- HAZEMAG allmineral Australia, Mirrabooka
- HAZEMAG allmineral India, Kolkata
- HAZEMAG Canada, Ontario
- HAZEMAG Machinery Trading, Beijing, China
- HAZEMAG Maroc, Casablanca, Morocco
- HAZEMAG Mining, Dülmen, Germany
- HAZEMAG Systems, Düsseldorf, Germany
- HAZEMAG USA, Uniontown
- HUSA Holdings, Toronto, Canada
- IMS Botswana, Gaborone
- IMS ENGINEERING, Spartan, South Africa

- **MAXIMATOR, Nordhausen, Germany**
- Maximator Advanced Technology, Wien, Austria
- Maximator Australia, Queensland
- Maximator AIM, Withmore Lake, USA
- Maximator Benelux, P3 Wateringen, Netherlands
- Maximator Far East, Singapore
- Maximator Fluid Engineering, Shanghai, China
- Maximator Fluid Technologies, Tokyo, Japan
- Maximator Gas Solutions, Altendiez, Germany
- Maximator Hochdrucktechnik, Marchtrenk, Austria
- Maximator Hydrogen, Nordhausen, Germany
- Maximator Hydrogen, San Francisco, USA
- Maximator Iberica, Barcelona, Spain
- Maximator India, Mumbai
- Maximator Italy, Villa d'Adda
- Maximator Korea, Seongnam, South Korea
- Maximator Maximum Pressure, Winsford, Great Britain
- Maximator Randaberg, Norway
- Maximator Rantigny, France
- Maximator Schweiz, Düringen
- Maximator South America, Indaiatuba/SP, Brazil
- Maximator Test, Illinois, USA
- Maximator Yulkesek Basine Sistemleri, Bursa, Turkey
- Maxpro South, Houston, Texas, USA
- Maxpro Technologies, Fairview, USA
- TestNet Maximator, Garching, Germany

- ▼ **MTS Microtunnelling Systems, Lüttow-Valluhn, Germany**
- ▲ **Nerospec SK, Velbert-Langenberg, Germany**
- **PERFORATOR, Walkenried, Germany**
- **Schmidt Kranz Group, Velbert-Langenberg, Germany**
- ▲ **Delano Schmidt & Kranz, Mexico City, Mexico**





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