Weidmüller
Applications in Wind Power Industry

Our Endeavours for Wind Power Installations

Electrical and electronics components are our core business.

Our optimum price-performance ratio and technological innovations are achieved by focusing our endeavours on our core business.

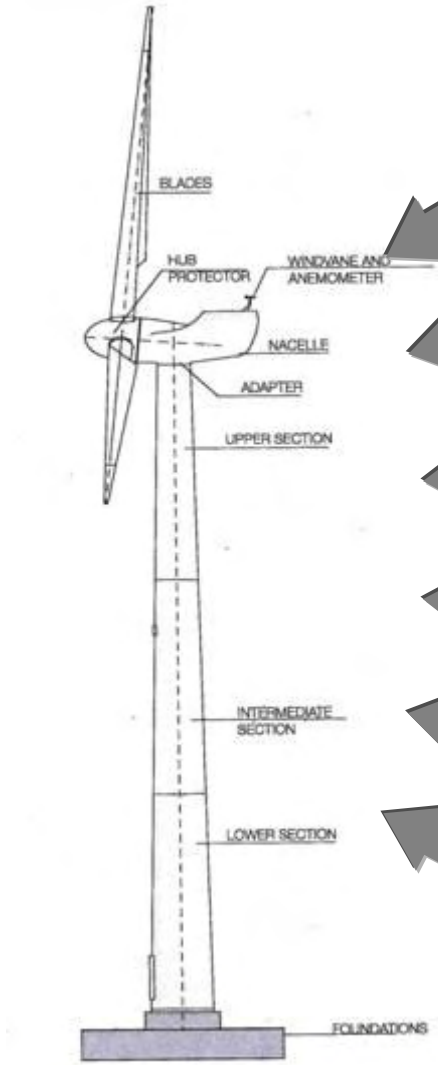
To serve your company, we combine our core business with application know-how, service and logistics, forward-looking concepts and our global activities.

Identifying with the challenges you face is our contribution towards improving the environment - we want our solutions to promote your competitive advantage.

Technological Trends in Wind Power Installations

- **Performances will increase to multi-MW installations (5 MW in 2005, 10 MW in 2007)**
  - Reduce production and investment costs per kWH
  - More offshore installations, changes to product requirements (IP68, GL tested)
  - More electronics for measuring, monitoring and safeguarding investments
- **Modular, electronics concepts with Plug and Play solutions**
  - Reduce costs: in particular for building and commissioning of offshore installations
  - Standardise modules and components
  - Pluggable connections for signals and outputs
- **Greater voltage yield from towers**
  - Increase from 690 V to kV range; less power loss
  - Electrical technology fully accommodated in the nacelle
- **Use of fieldbus systems in MW range**
  - Simplify cabling
  - Improved diagnostics
- **Better safety concepts and greater installation transparency**
  - Lightning protection, redundant sensors/actuators
  - Remote diagnosis

Products for Winder Power Installations



Terminal technology

Signal conditioners

Power supply

Overvoltage protection

SAI modules and cables

Industrial Ethernet

Heavy-duty connectors

http://catalog.weidmueller.com

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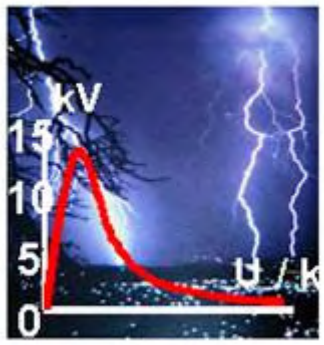
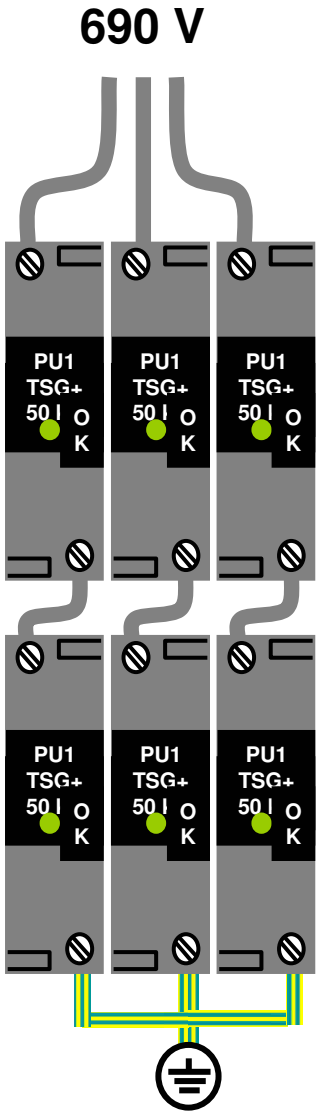
Components for Overvoltage Protection





PU1 TSG + 50kA

- **Triggered spark gap**
- **Uc: 440 V**
- **50 kA discharge current**
- **<1µs response time**
- **LED indicators**
- **UL/KEMA approvals**
- **Series connection possible**

Applications for 690-V IT-systems, hub height > 60 m

To be used between LPZ zone 0 and zone 1, e.g. in bottom box

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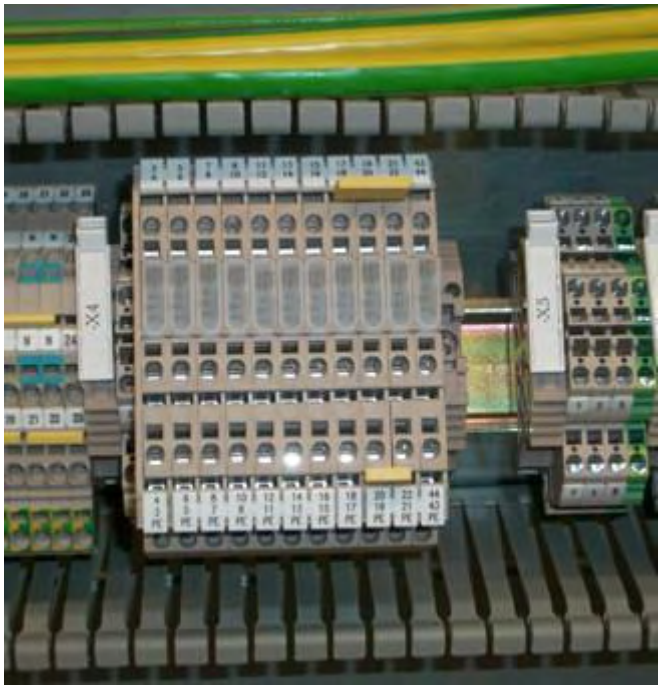
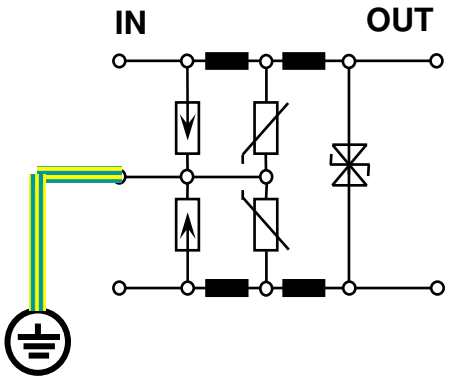
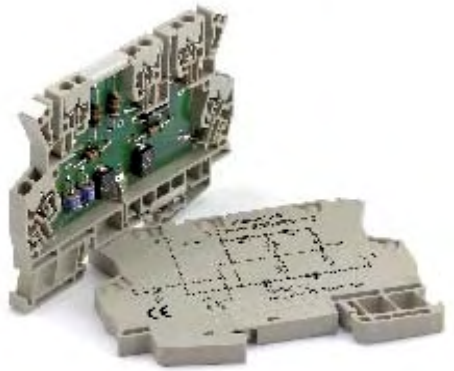
Overvoltage Protection for Instrumentation & Control





MCZ OVP...

- **3-stage surge protection**
- **Integrated PE contacting**
- **6-mm design width**
- **Tension clamp connection**
- **Low height design**
- **Vibration proof**



To protect control systems; installation in top box, bottom box or switchboxes

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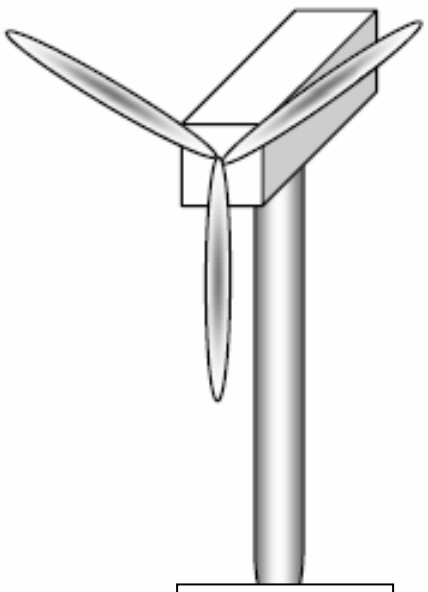
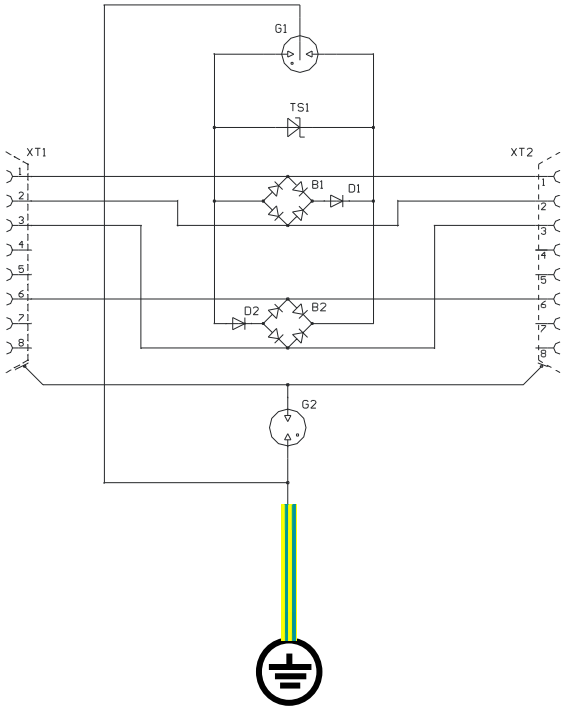
Overvoltage Protection for Ethernet Cat.5



Ethernet



DME 100TX-4-RJ

- **Ethernet Standard Cat.5**
- **Network connection 10Base-T / 100Base-TX**
- **RJ45 connection**
- **Plug and Play with patch cables**
- **Compact dimensions**

To protect Ethernet data lines carrying up to 100M Bit/s; universal installation

Overvoltage Protection for Industrial Ethernet

Surge protection for Cat.5 cabling (up to 100 MHz)

DME 100Tx-4RJ

DME 100Tx-4RJ TS 35

Jackpac ovp Cat.5 M12

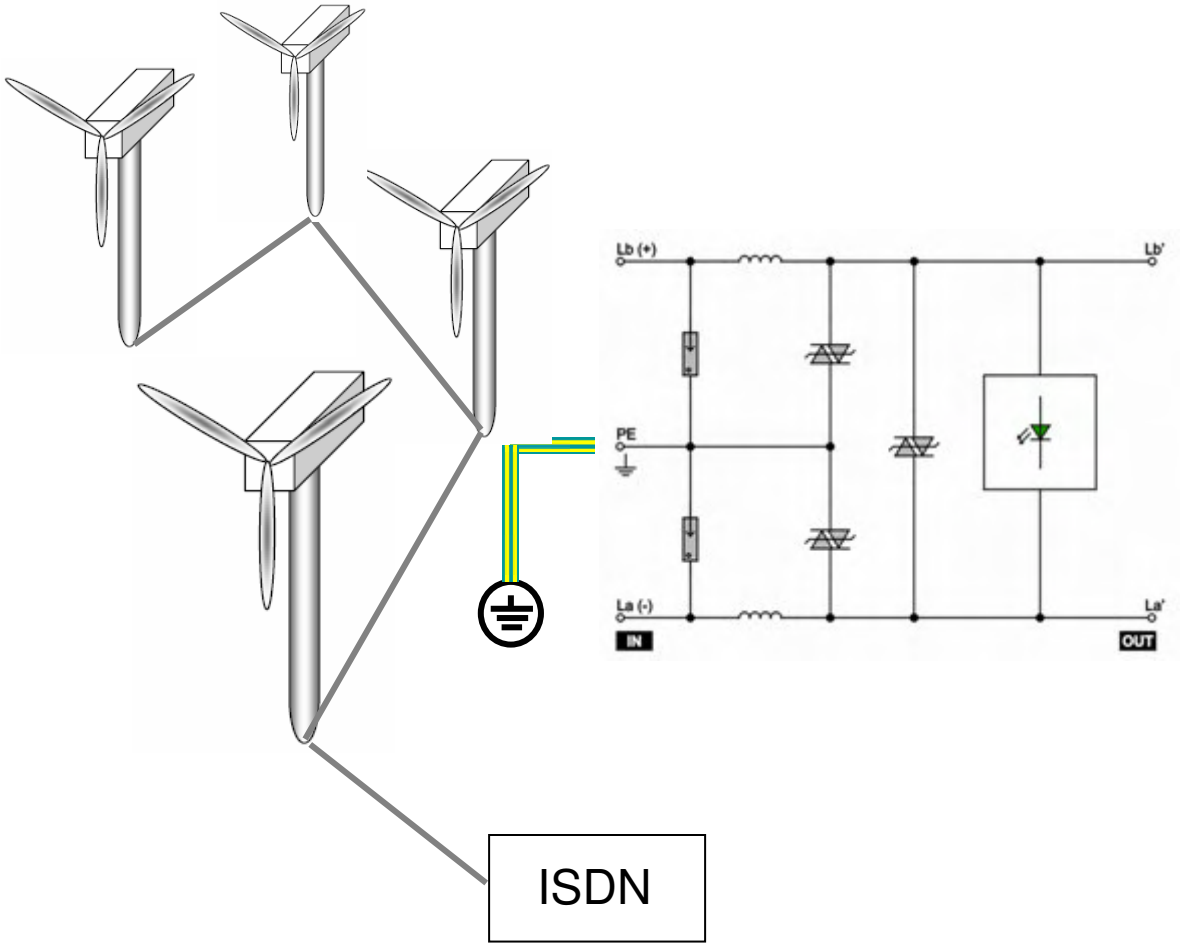
Surge protection for Cat.6 cabling (up to 250 MHz)

PU D ZS Cat.6 230V 16A

Jackpac ovp Cat.6 IP 20

Jackpac ovp Cat.6 IP 67

Overvoltage Protection for Telecommunications

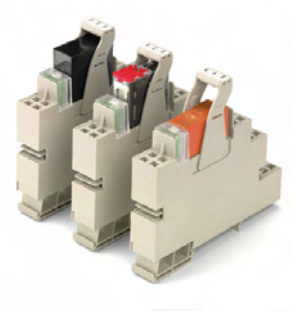


TAE OVP...

- **Overvoltage protection for ISDN or analogue telephone connections**
- **Gas discharge tube diverts high power surges**
- **Special transil diodes ensure low residual voltage**
- **High transmission speeds through lower component capacitance**
- **TAE-NFN surface-mount socket**

To protect telephone system (NTBA, modem); install in, e.g., interface to telecommunications network

Relay Technology for General Requirements



Type: PRZ

- Pluggable relays
- Max. 2 CO contacts
- Tension clamp/screws
- Switching current up to 16 A

Type: micro relays

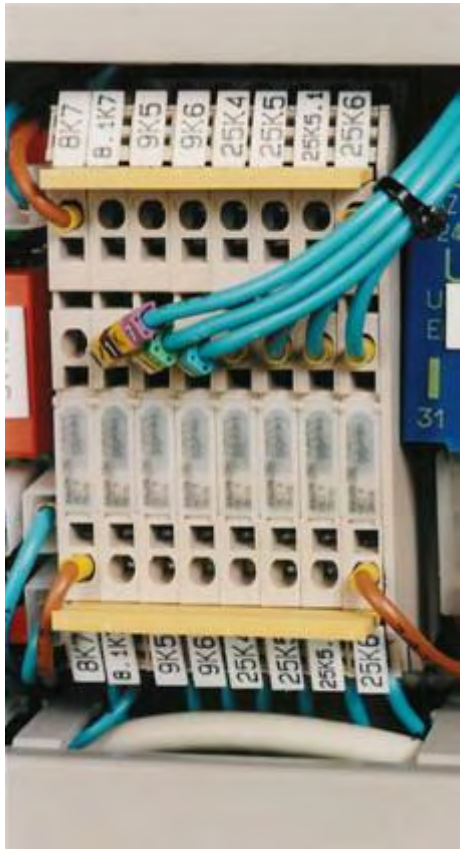
- 6-mm design size
- Pluggable relays
- 1 CO contact
- Tension clamp/screws
- Switching current up to 6A

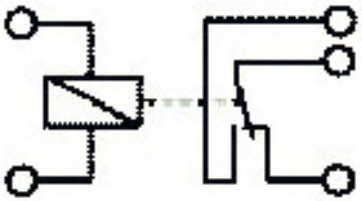
Type: industrial plug

- Max. 4 CO contacts
- Pluggable industrial relays
- Tension clamp/screws
- Switching current up to 4x5 A

To switch loads or as auxiliary relays in general applications

Relay Technology for Extreme Demands



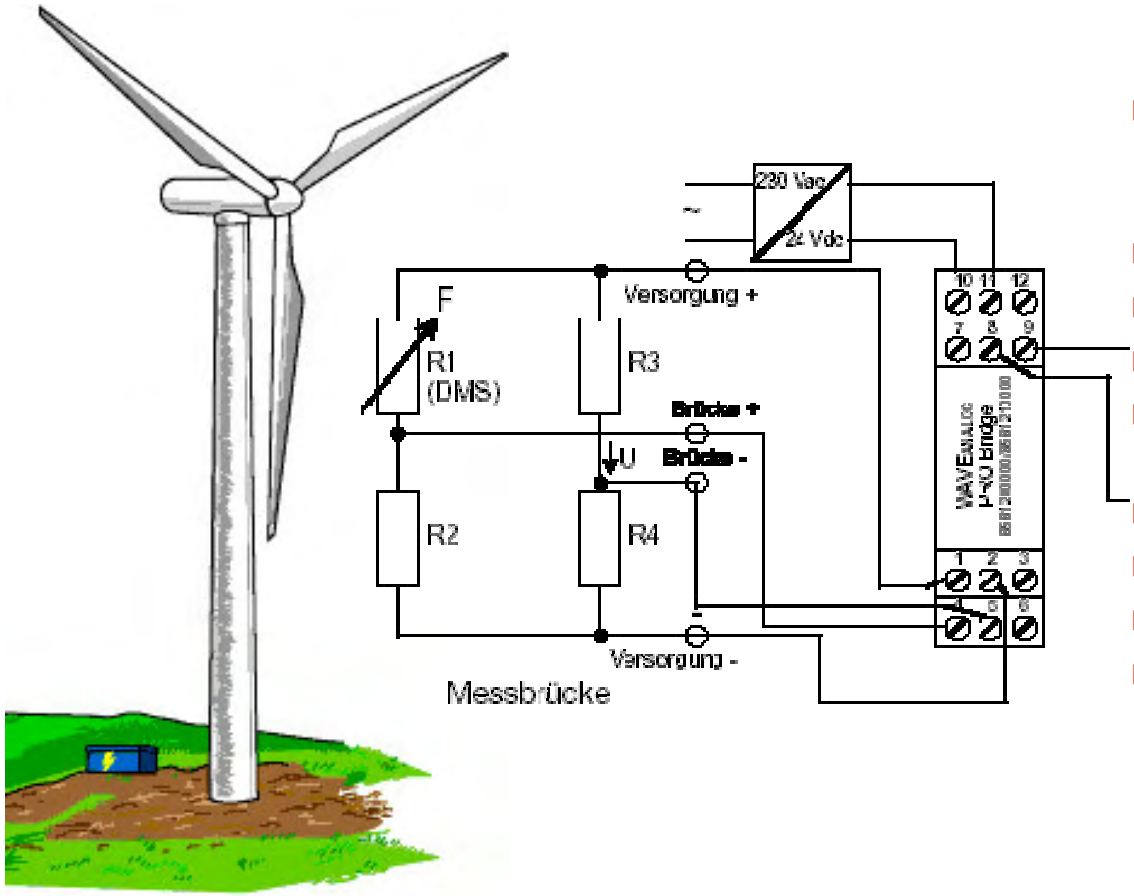


Relay MCZR (Trac)

- **1 CO contact 400 V / 6 Amp**
- **Ta = -25…+70 °C**
- **Pluggable cross-connector**
- **6-mm design width**
- **Tension clamp connection**
- **Low height design**
- **Vibration- and jolt-proof**
- **Trac version suitable for extreme applications**

To switch loads in extreme temperatures and environmental conditions; soldered relays, vibration-proof design and connection technology

Measuring Transducers for Strain Gauges

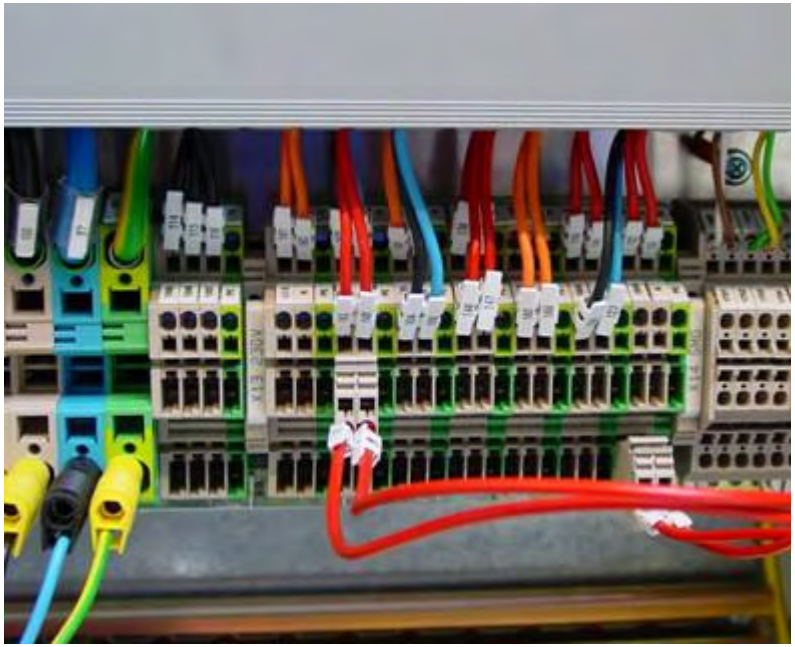


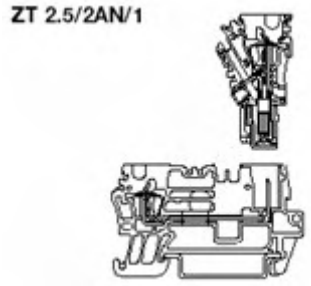
WAS/WAZ Pro BRIDGE

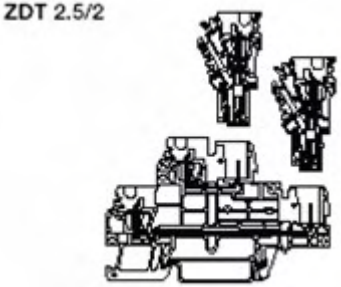
- **12 measurement ranges: min. 0-10 mV, max. -500 mV … +500mV, DIL switch selection**
- **Input resistance > 1 MOhm**
- **Open-circuit recognition**
- **Accuracy 0.3 %, drift max. 250 ppm/K**
- **Adjustable strain gauge supply 4.8V…10V, max. 40mA**
- **4 selectable output signals, invertible**
- **24 Vdc supply, +/-25%**
- **LEDs indicate operating status**
- **Tension clamp/screw connections**

To accept and condition strain-gauge signals
e.g. for measuring torsion of the blades of a turbine

Pluggable Top Box Connection up to 690 V



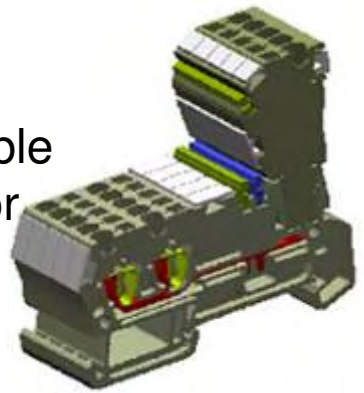




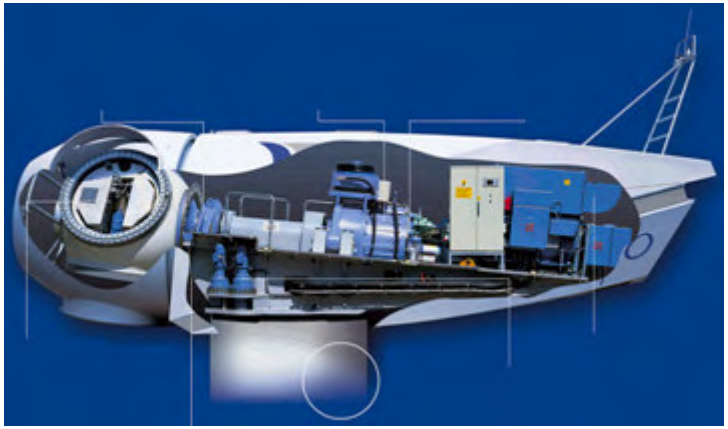
WeiCoS system

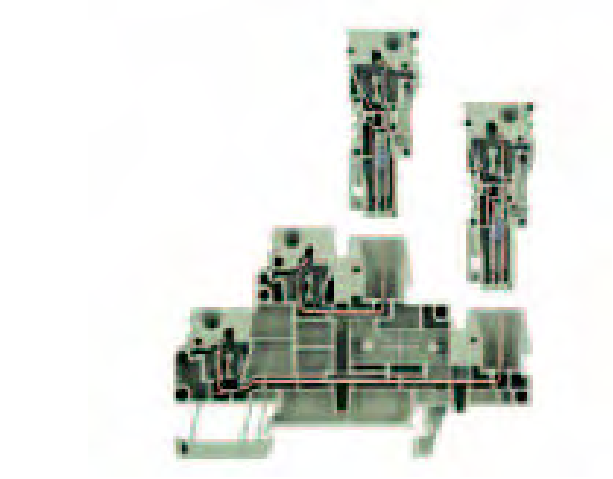
- **<u>Vibration proof connectors</u> through externally-tensioned contact**
- **<u>690 V / 24 A</u> when plugged, 2.5 mm2 conductors (with ferrules)**
- **Limited UL ratings: 575 V / 5 A, 400 V / 5 A, 230 V / 24 A**
- **5-mm wide terminals**
- **Integrated PE connection**
- **Two-tier terminals for high-density solutions**
- **Large, easily visible standard markers**
- **Locking clips offer keying options and stop plugged connectors working loose**

Suitable as power and signal terminals with pluggable connections for use with prefabricated cable sets for rapid installation



WeiCoS for Power and Signals





5-mm wide pluggable terminals with tension clamp technology, conductors up to 4 mm2 without ferules

WeiCoS top box connections

Power

- **690 V**
  - **Gearbox heating systems**
  - **Gearbox oil coolers**
  - **Gearbox oil pumps**
  - **Azimuth motors**
  - **Hazard beacons**
  - **Inverter, 690-Volt power supply**
- **400V**
  - **Azimuth brakes**
  - **Chain hoist**
  - **Inverter, 400V-Volt power supply**
- **230V**
  - **Lubricating pump, azimuth and rotor bearings**
  - **Heating systems**
  - **Light**

Signals

- **Sensors**
  - **Dig. Signal inverters**
  - **Analog. Signal inverters**
  - **Wind speed/wind vanes**
  - **Rotor bearing temperature**
  - **Inverter temperature**
  - **Outside temperature**
  - **Nacelle temperature**
  - **Tower oscillation**
  - **Drive train vibration**
  - **Generator temperature**
  - **Ice sensor**
  - **Rotor speed**
  - **Hub pitch digit**
  - **…..**

WeiCoS Detailed Planning (excerpt)

X11 690V		Klemmen unten		Stecker unten	Stecker oben	X11 690V		Klemmen oben	
S1.4252a	1	1001	1			**S1.4252b**	1	1101	1
Getriebe-	2	1002	2	875072	875091	Getriebe-	2	1102	2
Heizung 1	3	1003	3			Heizung 2	3	1103	3
	gn/ge	PE	4				gn/ge	PE	4
S1.4250	1	1007	1			**S1.4251**	1	1107	1
Getriebe-	2	1008	2	875074	875093	Getriebe-	2	1108	2
Ölkühler	3	1009	3			Ölpumpe	3	1109	3
	gn/ge	PE	4				gn/ge	PE	4
S1.4050	1	1010	1			**S1.4051**	1	1110	1
Azimut-	2	1011	2	875075	875094	Azimut-	2	1111	2
Motor 1	3	1012	3			Motor 3	3	1112	3
	gn/ge	PE	4				gn/ge	PE	4
S1.4350	1	1016	1			**S1.4700**	1	1116	1
Hydraulik-	2	1017	2	875077	875096	Gefahren-	2	1117	2
Pumpe	3	1018	3			feuer	3	1118	3
	gn/ge	PE	4				gn/ge	PE	4
S1.4254	1	1019	1			**S1.4202**	1	1119	1
Neben-	2	1020	2	875078	875097	2. Lüfter-	2	1120	2
stromfilter	3	1021	3			Generator	3	1121	3
	gn/ge	PE	4			nur MM	gn/ge	PE	4
S1.4200	1	1022	1			**S1.4203**	1	1122	1
Lüfter-	2	1023	2	875079	875098	3. Lüfter-	2	1123	2
Generator	3	1024	3			Generator	3	1124	3
	gn/ge	PE	4			nur MM	gn/ge	PE	4
U1.4050	1	L1 A	Ae						
5x16	2	L2 A	Ae						
Umrichter	3	L3 A	Ae						
690 Einsp.	4	N	Ae						
	gn/ge	PE	Ae						

WeiCoS top box connections

- **Two-level terminals for compact configurations**

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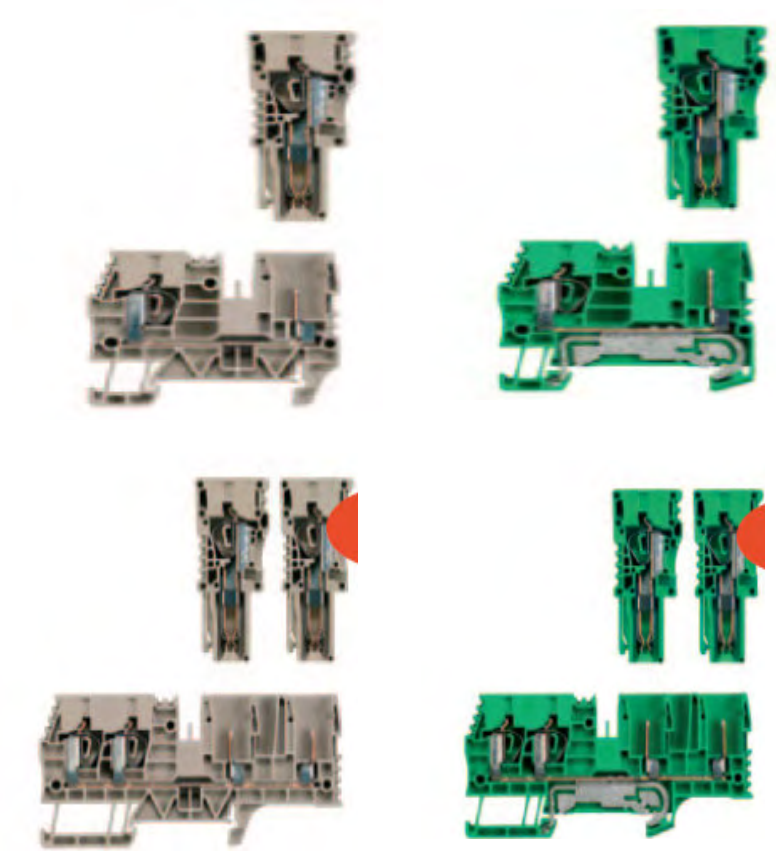
WeiCoS 4 for UL/CSA-Approvals 575 V



WeiCoS 4 top box connections

- **IEC: 800 V / 32 A**
- **UL/CSA: 600 V / 32 A**
- **Terminal 6.5-mm wide, pluggable**
- **Terminal cross-section 0.5….4 mm2 (with ferrules)**
- **Terminal cross-section up to 6 mm2 without ferrules**
- **All other characteristics the same as WeiCoS 2.5**

Suitable for use as power terminal with pluggable connections for US versions with 575 V; suitable for use with prefabricated cable sets for rapid installation

Tension Clamp Connection Technology for WPI

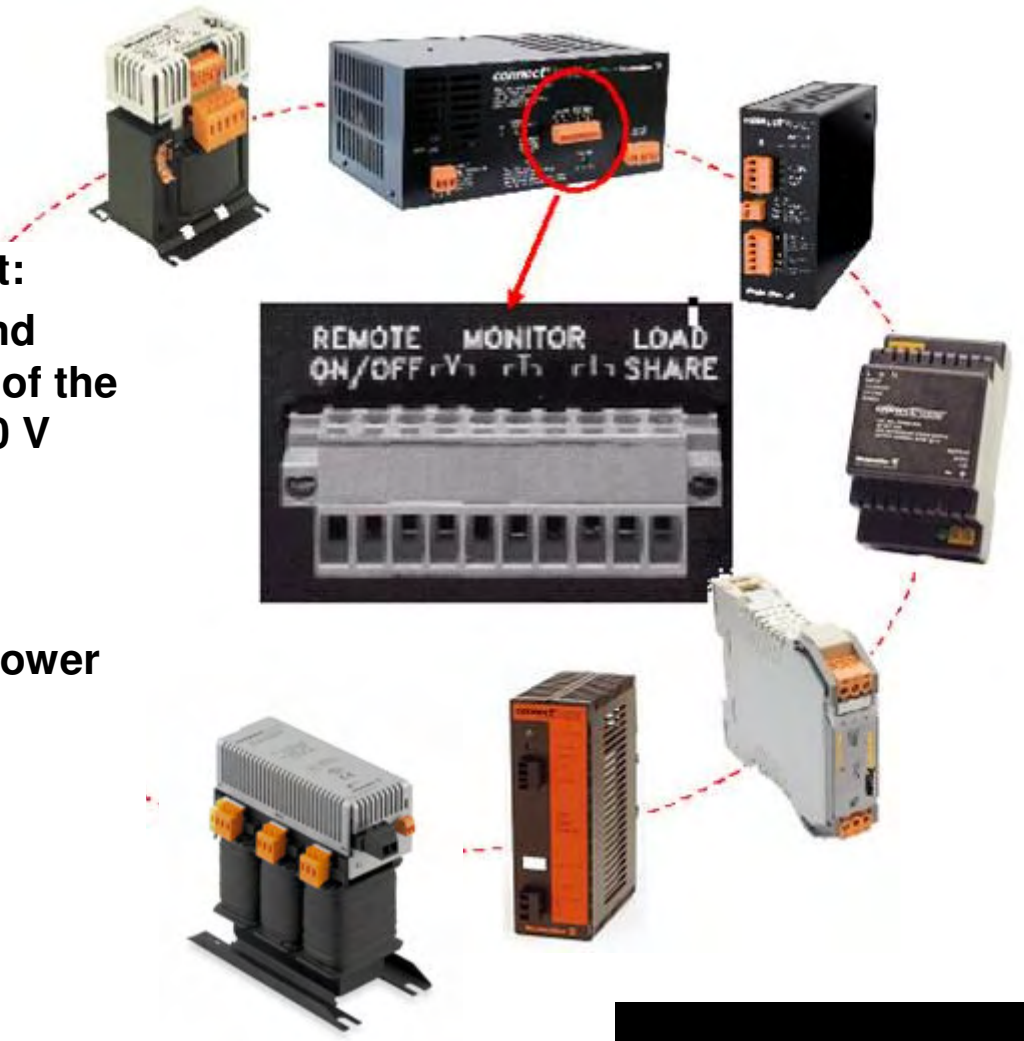
Z-Series terminals

- **Tension clamp technology for a jolt- and vibration-proof connection**
- **Extensive assortment from 0.21 mm2 through to 35 mm2 connections**
- **Compact designs**
- **Large, easily visible standard markers**
- **Pluggable cross-connections**
- **Extensive range of accessories, e.g. test adapters**
- **High voltage ratings**
- **Wide-ranging approvals, also for marine engineering applications (GL/LR/NV)**

Standard connection terminals to meet demanding requirements in windpower industry

24-Vdc Power Supplies for WPI

connectPower
POWER FOR AUTOMATION



- **Monitoring the 12.5 A power supply unit:**

  The device performs a self diagnosis and sends the U_{out}, I_{out} and the temperature of the power supply unit to the analogue 0...10 V outputs. Possible error statuses can be recognised.

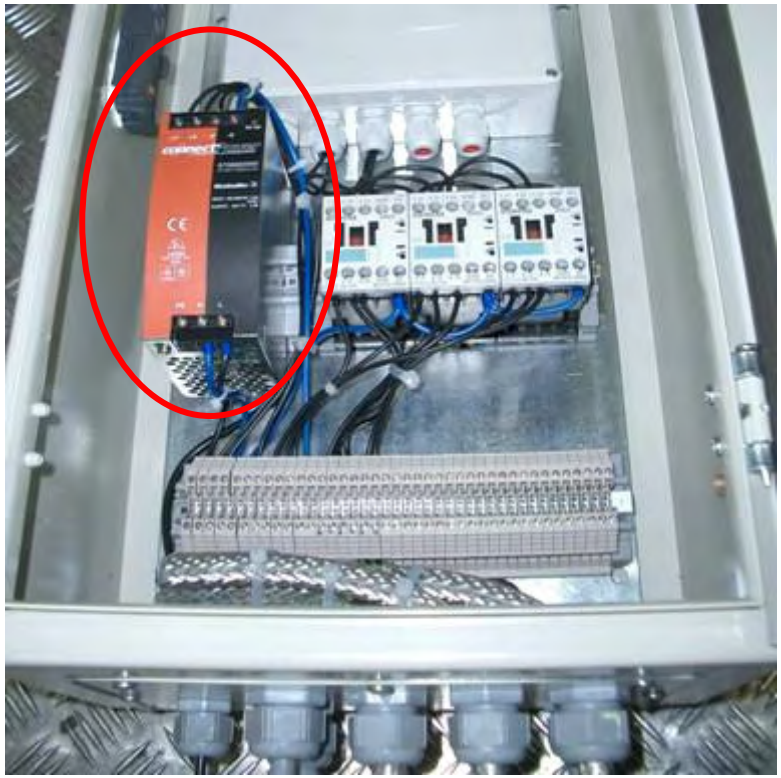
- **Redundant power supplies:**

  Parallel connection of switched-mode power supply units

- **Accessories:**

  Battery-powered back-up unit for uninterruptible supply of power to, e.g., hazard beacons

24 Vdc Power Supply from DC Battery Voltage



24 Vdc power supply from DC battery pack to supply periphery equipment for emergency pitch control

Ecoline power supply

- **85…265 Vac / 120…370 Vdc input**
- **24…28 Vdc adjustable output**
- **-10...60 °C at 60% output load 0...50 °C at 100% output load**
- **Max. residual ripple: 150 mVss**
- **Closed-loop control 1% between 10% and 100% load**
- **Standard: EN 60950**
- **Approvals: UL/UR / CE / UL/LIST**

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ECOLINE 1-phase 3A, 5A, 10A, 20A Technical Data

ECOLINE

Input:
85...264 Vac 47...63 Hz; 120...370 Vac

Output:
24…28 Vdc 3A
24…28 Vdc 5A
24…28 Vdc 10 A
24…28 Vdc 20 A

Overload protection Output current limitation
Power Boost up to 35%

Parallel utilisation: Yes (for redundancy and increasing current), with separate diode module

Efficiency: >= 80%

International approvals

Diagnostics connection:
Monitor output

ECOLINE 3-phase 10 A, 20 A, 40 A Technical Data

Input:
3 x 400 Vac 47...63 Hz

Output:
24…28 Vdc 10 A
24…28 Vdc 20 A
24…28 Vdc 40 A

Overload protection: Output current limitation

Parallel utilisation: Yes (for redundancy and increasing current), with separate diode module

Efficiency: >= 80%

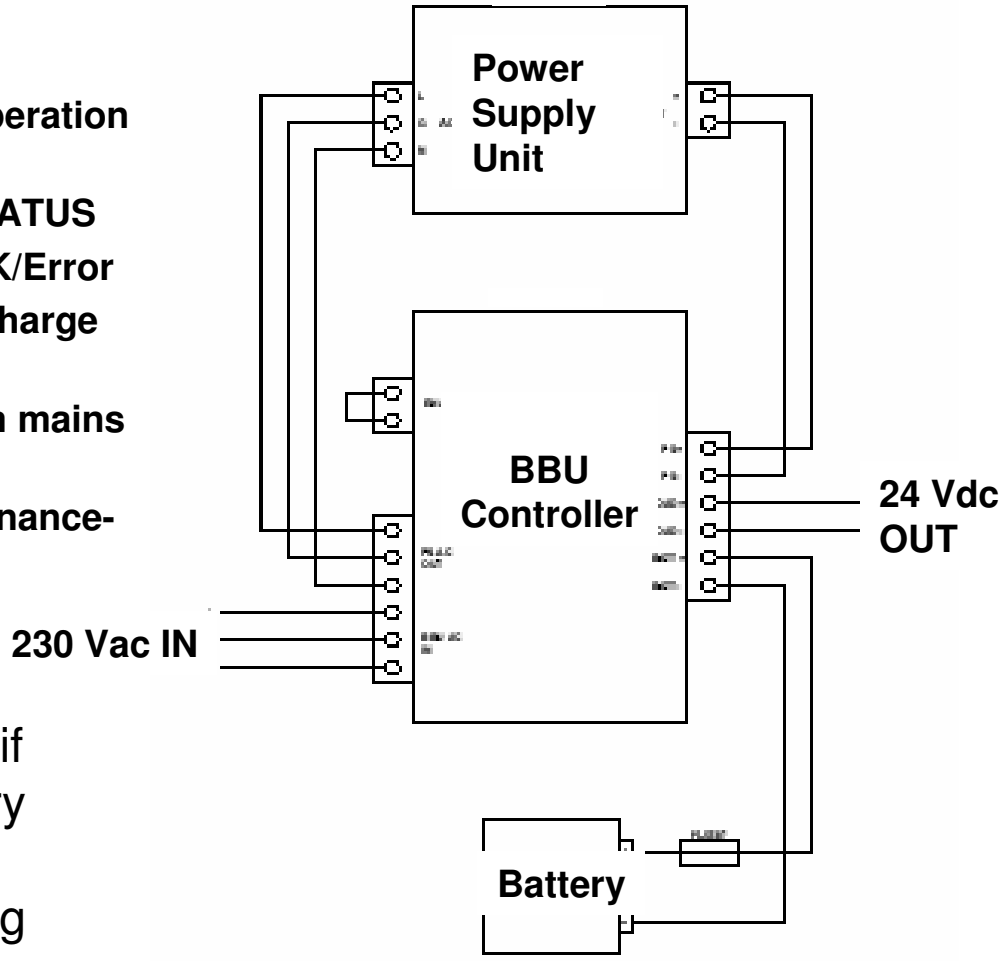
International approvals

Diagnostics connection:
Monitor output

Controller for Modular 24-V UPS Systems

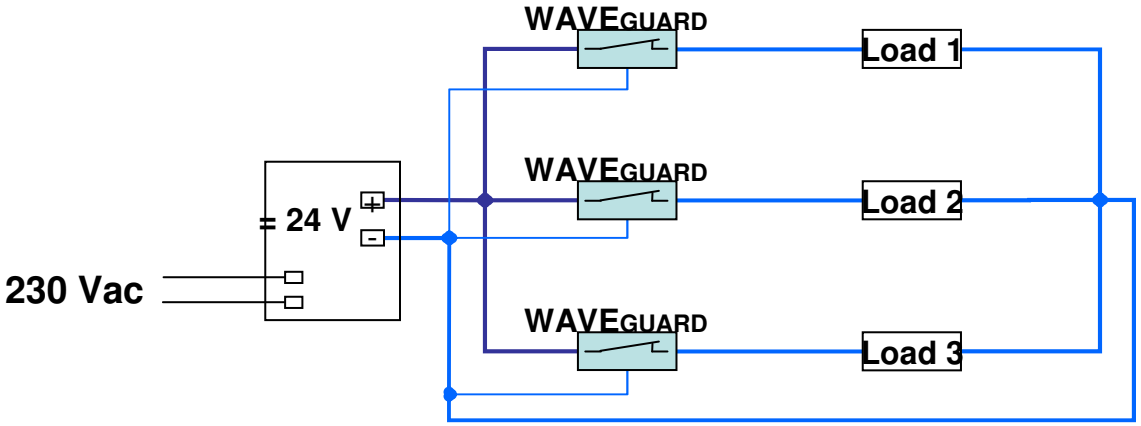
BBU - Battery Backed-Up Power Supply

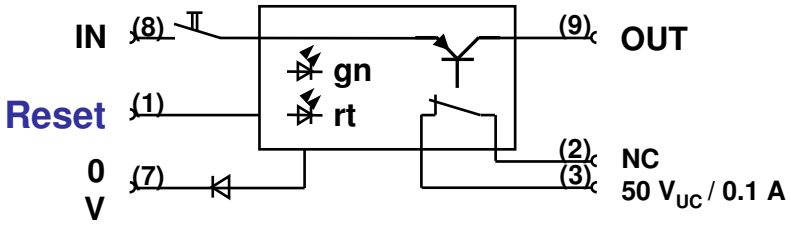
- **85…265 Vac input**
- **Control inputs for battery operation ON/OFF**
- **Relay contact for battery STATUS**
- **Relay contact for System OK/Error**
- **LED indicators for state of charge and battery status**
- **<1 ms changeover time from mains to battery operation**
- **Suitable for use with maintenance-free lead-acid batteries**



Back-up device guarantees supply of power if there is a mains failure by switching to battery operations; this is particularly important for communications systems and aircraft warning lights

Electronic Fusing with Remote Reset



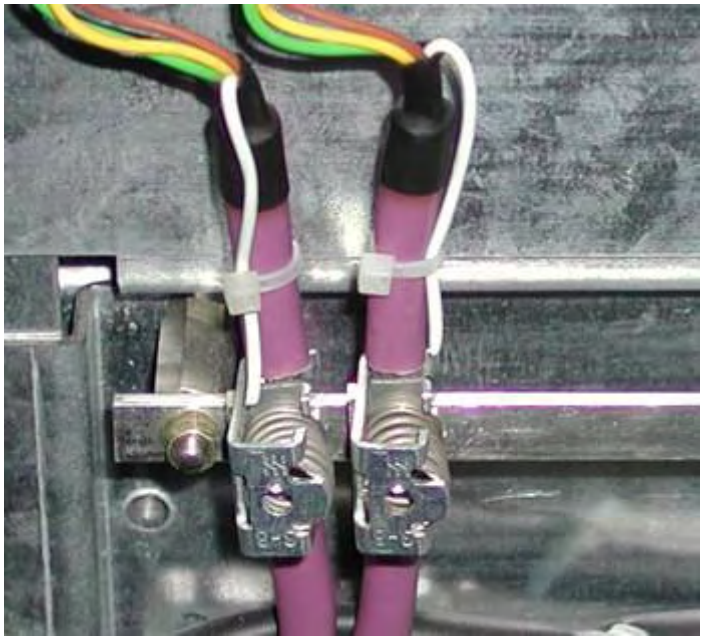


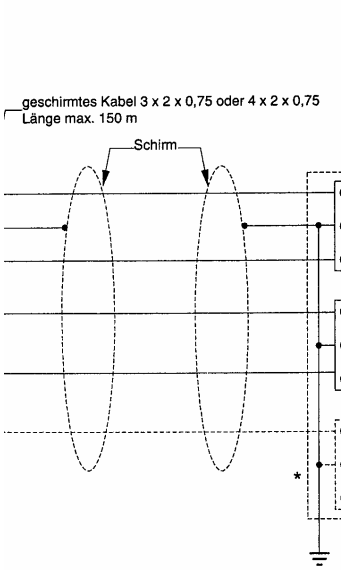
Waveguard

- **Dynamic and selective fusing of 24 Vdc circuits supplied by switched-mode power supply units**
- **<u>Remote control inputs/outputs</u> reset via controls**
- **Optionally available with user adjustable current limiter 0.5-5 A**
- **Green and red LEDs, potential-free feed-back contact**

Designed as 24 Vdc electronic fuse for switched-mode power supply units with remote-controlled reset function; e.g. to reactivate via the controls.

Reliably Contacting Shielded Cables





Shield connection terminal KLBÜ

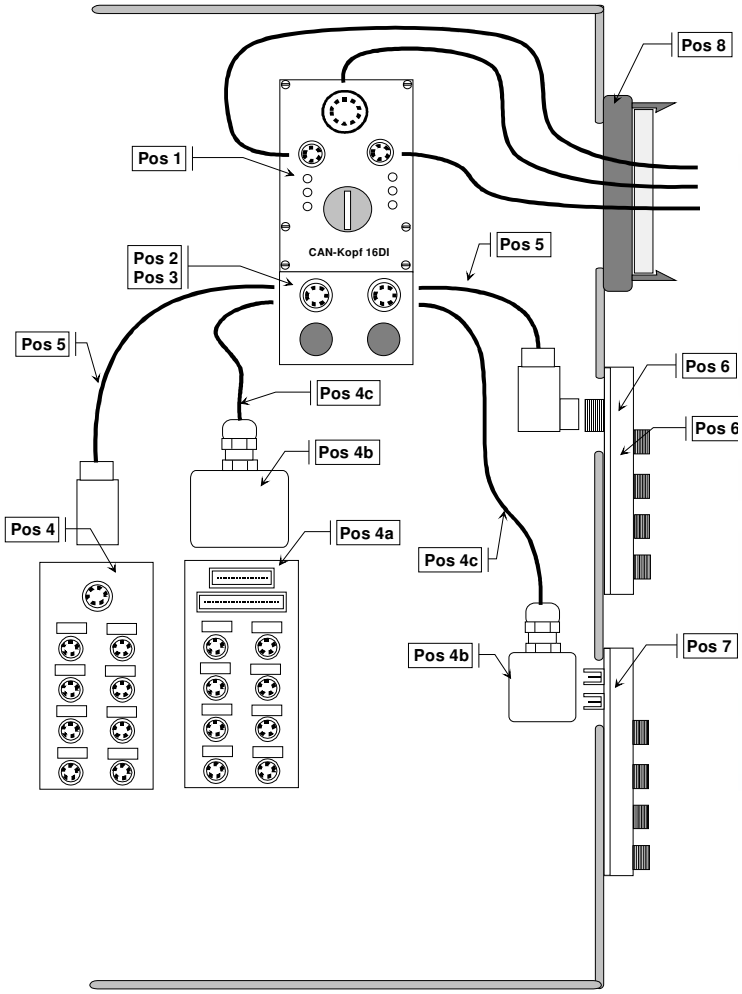
- **For cables from 2...32 mm2**
- **Reliable connecting of shielding for, for example, data lines (CAN, Ethernet)**
- **Diverse installation options including thread-cutting screw for direct mounting**
- **Large contact surfaces, permanent contact pressure**
- **Easy to handle without tools thanks to pressure spring**

Resilient contacting of the shielding braid of communications cables or shielded sensor cables

PCB products for pitch control system

- PCB components for the baseplate of the Pitch control system, which is a drive control system for the blade position of windturbines
- LUP 12,7 2+4 pole
- Ratings: 1000V (IEC), 600V (UL), 76Amp (IEC), 63Amp (UL), 0,5…16qmm

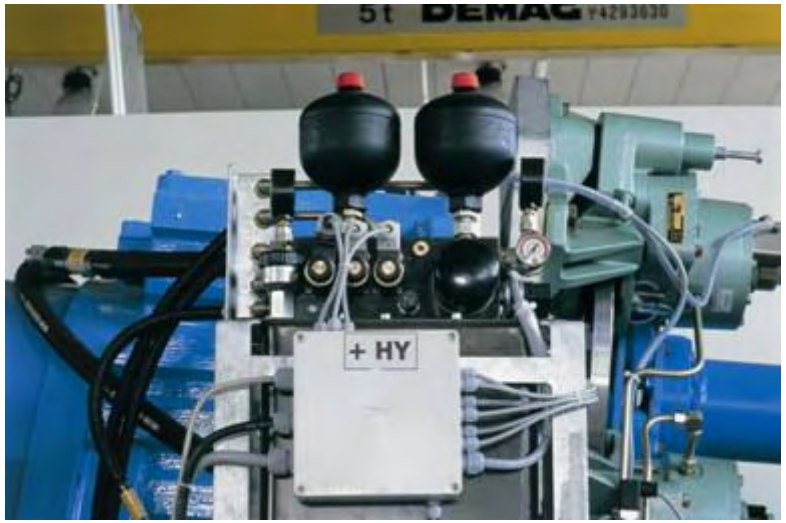
Ethernet I/O with Protection Class IP67

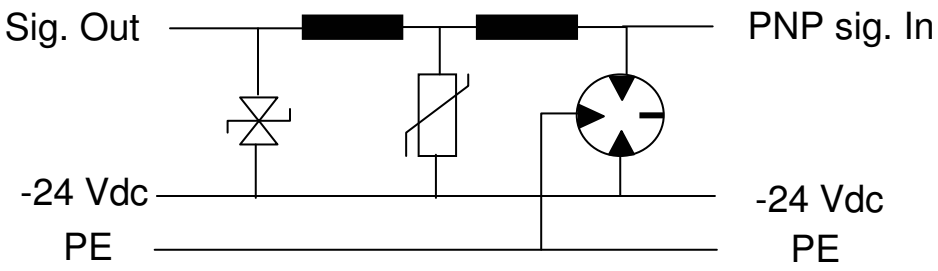


SAI Active universal

- **Direct mounting in environments up to IP67**
- **Ethernet-I/O for digital and analogue signals**
- **M12 or M8 connections**
- **Versions for analogue and digital signals**
- **Versions:**
  - **16DI**
  - **16DI (8DO)**
  - **4DI, 4AI (2AO)**
- **Power rating up to 2 Amp/DO**
- **Individual channel diagnosis**
- **Extensive range of accessories available**
- **Illuminated address section**
- **Innovative: individual channel LEDs changes colour when status alters**

SAI Distributors IP68 with Overvoltage Protection





Alternative to terminal boxes for digital sensors and actuators, see above, with integrated protection against surges

SAI-8-M12 OVP

- **3-stage protection combination with gas discharge tube, varistor and suppressor diode**
- **For 8 inputs or outputs up to 500 mA**
- **Pluggable connection hood for the bus cable**
- **Protection class IP68**
- **Reliable PE contacting when securing the housing**
- **M12 circular connectors**
- **Temperature range -25...+70 °C**
- **GL approval applied**

Sensor-Actuator Cables

M12

- 3, 4, 5-pole
- Straight and angled
- Female/male
- Snap-lock fixing
- Unterminated cable ends
- Project specs: Lengths
- 1.5m; 3m; 5m; 10m
- PVC and PUR
- UL approved

M8

- 3 and 4-pole
- Straight and angled
- Female/male
- Snap-lock fixing
- Unterminated cable ends
- Project specs: Lengths
- 1.5m; 3m; 5m; 10m
- PVC and PUR
- UL approved

M5

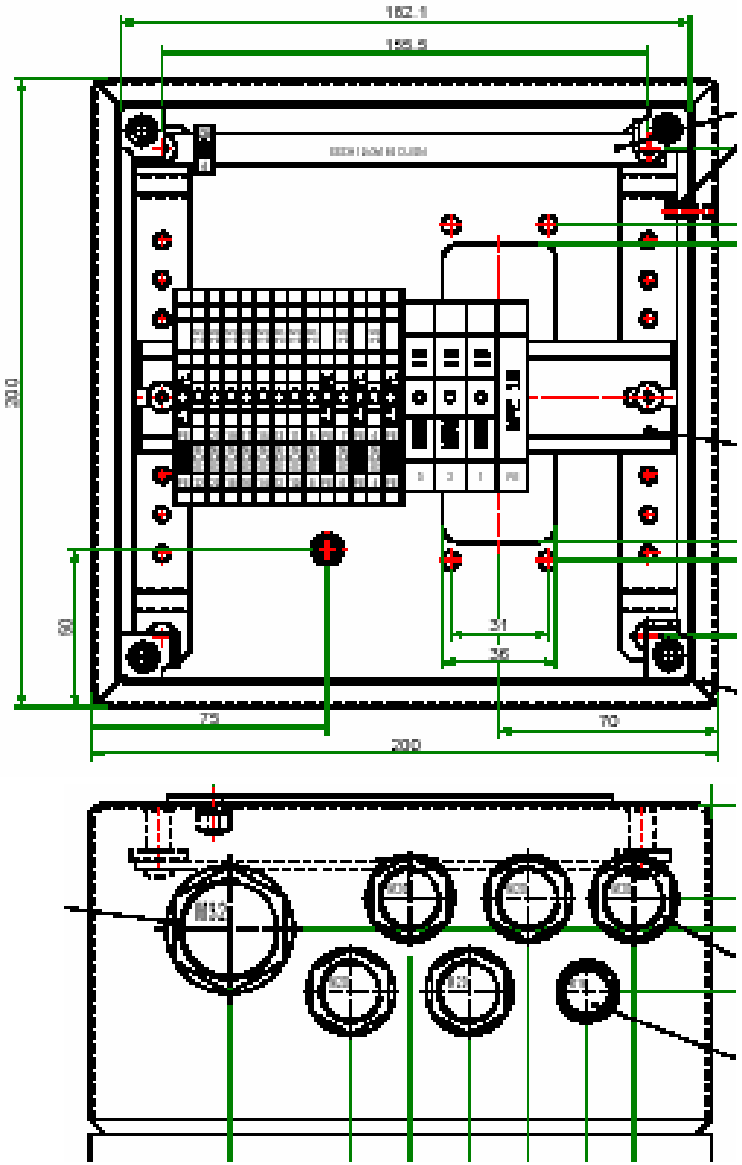
- 3 and 4-pole
- Straight and angled
- Female/male
- Snap-lock fixing
- Unterminated cable ends
- Project specs: Lengths
- 1.5m; 3m; 5m; 10m
- PVC and PUR
- UL approved

M12 and M8 Sensor-Actuator Cables

- **Our strength: 3 cable materials**
  - 1. PVC/PVC cables: for oil-free installation
  - 2. PVC/PVC cables: inner sheath PVC, outer sheath PUR
  - **3. PUR halogen-free cables** **inner sheath PVC, outer sheath PUR**

  - Silicon-free
  - UL approved
  - Suitable for use in environments exposed to sea air
  - Shielded cables also available
  - Cable markers included

Project-Specific Current-Collector Box



Terminal housing – current collect
200 x 200 x 120 mm steel plate

- **For terminations behind the slip-ring assemblies**
- **1x 400 V + PE for pitch motors**
- **3 x 230 V + PE**
- **16 x digital signals**
- **Signal terminals in two-tier design**
- **PE busbar 10 x 3 mm**
- **Additional steel plate on base of housing for vibration-proof mounting**

Terminal housing for current collect as an example of customised ready-for-installation solutions

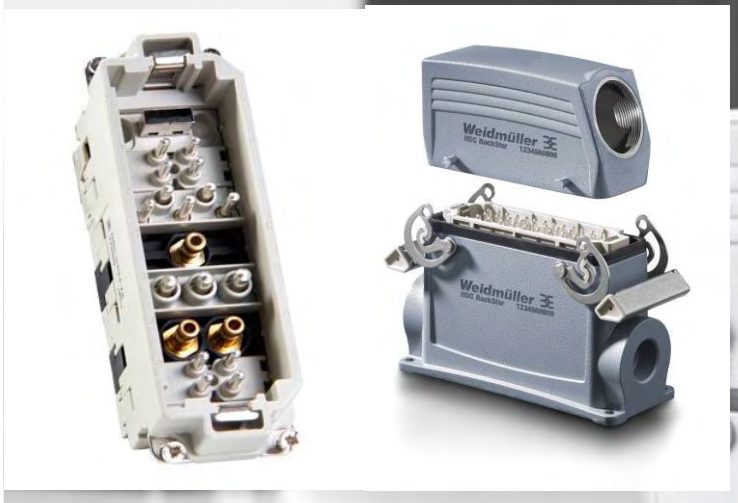
Cable Connection Technology - Cabtite

Cabtite - cable entry system

- **Cable entries for prefabricated cable harnesses in conjunction with standard cut-outs and insertion techniques**
- **Cost benefits**
- **Different grommets for cable diameter flexibility**
- **Rapid mounting solution**
- **Snap-close version**
- **Protection class IP54**
- **Shielding rails available as accessory**

Weidmüller

Cable Connection Technology - RockStar



RockStar heavy-duty connectors

- **Stainless steel as standard**
  No plastic - all clips are made of corrosion-proof stainless steel
- **Corrosion proof body**
  Special surface for extreme levels of resistance from standard version upwards
- **Patented clip-lock system**
  Shock and impact-resistant locking system. Extremely robust and easy to handle.
- **International**
  First US NEMA approved HDC on the market for extreme ambient conditions

Pluggable connections and cable harnesses for pitch control

Industrial Ethernet

- Segments of Weidmüller's product portfolio

Network functions

Connect

- Components for physically structuring the network

1. Cables and connectors
2. Mechanical converters

Convert

- Fibre-optics to copper and vice-versa

3. Media converters

Manage

- Devices and components to operate a network

4. Switches
   Routers

Support functions

Install

- Tools and aids to assist installation

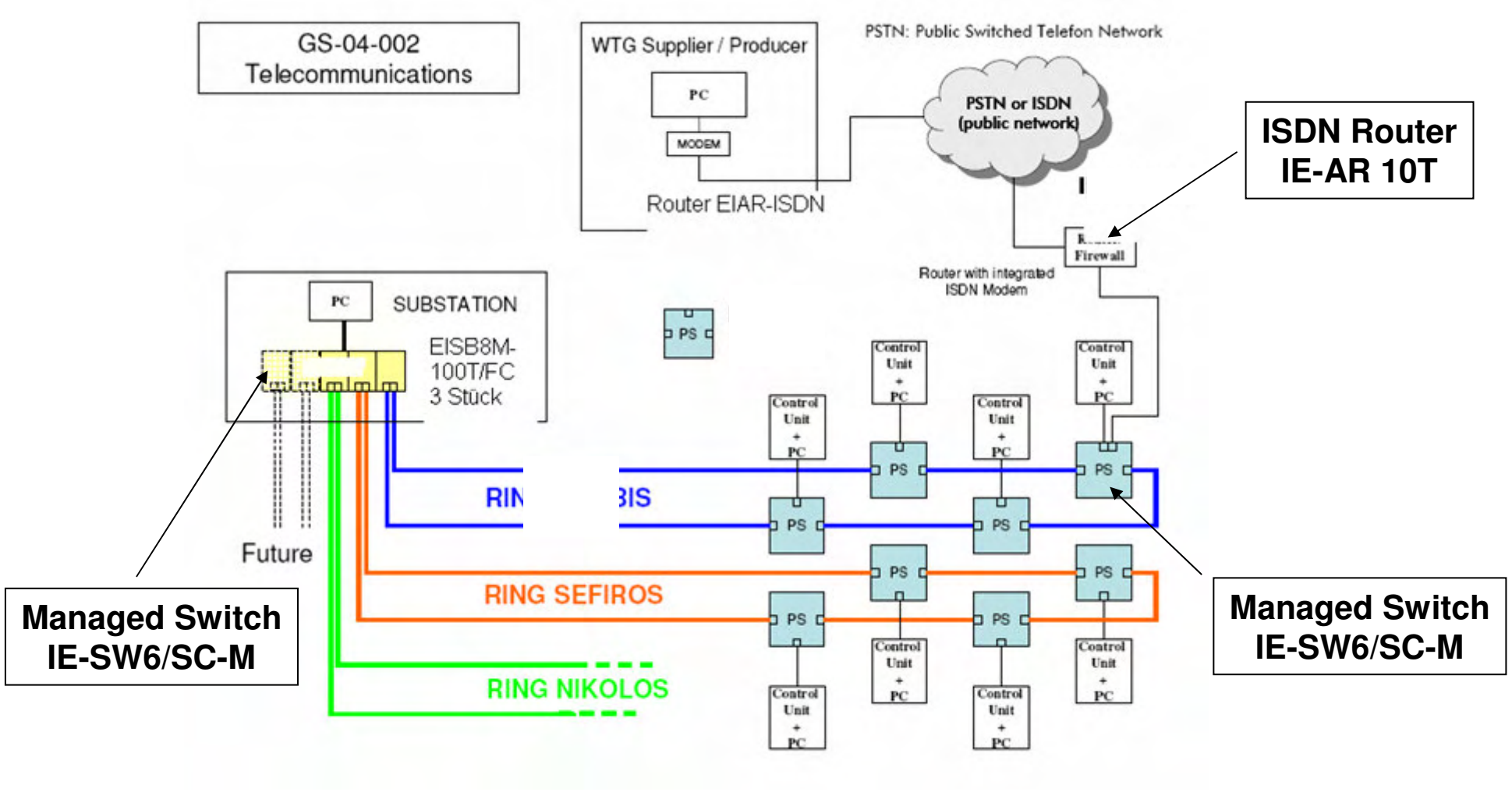
5. Tools
6. Cable testers
7. Other accessories

Protect

- Protect the devices against voltage spikes

8. Surge protection

Industrial Ethernet in Wind Farms



Weidmüller's – 5 and 8 Port Switch ECO

Eco Line – 5 and 8 port switches

Application / benefit

- Inexpensive Plug and Play unmanaged switches available with 5 or 8 Ethernet ports
- Robust, metal housing for mounting-rail installation
- Automatic recognition and negotiation of data transmission rate (10 MBit/s and 100 MBit/s: auto-negotiation) allows different devices to be used in the same network without prior configuration
- Clearly visible indicators indicate connection status, activity and data transmission rate

Additional technical information

- Wide power supply range for AC or DC
- Support crossover or straight-through cables (auto-crossing)
- Conform to ANSI / IEEE 802.3
- Segment lengths up to 100 m
- UL - listed

Weidmüller's – 8 to 24-Port Managed Switches

Managed switches

Operating temp. -40...+75 °C

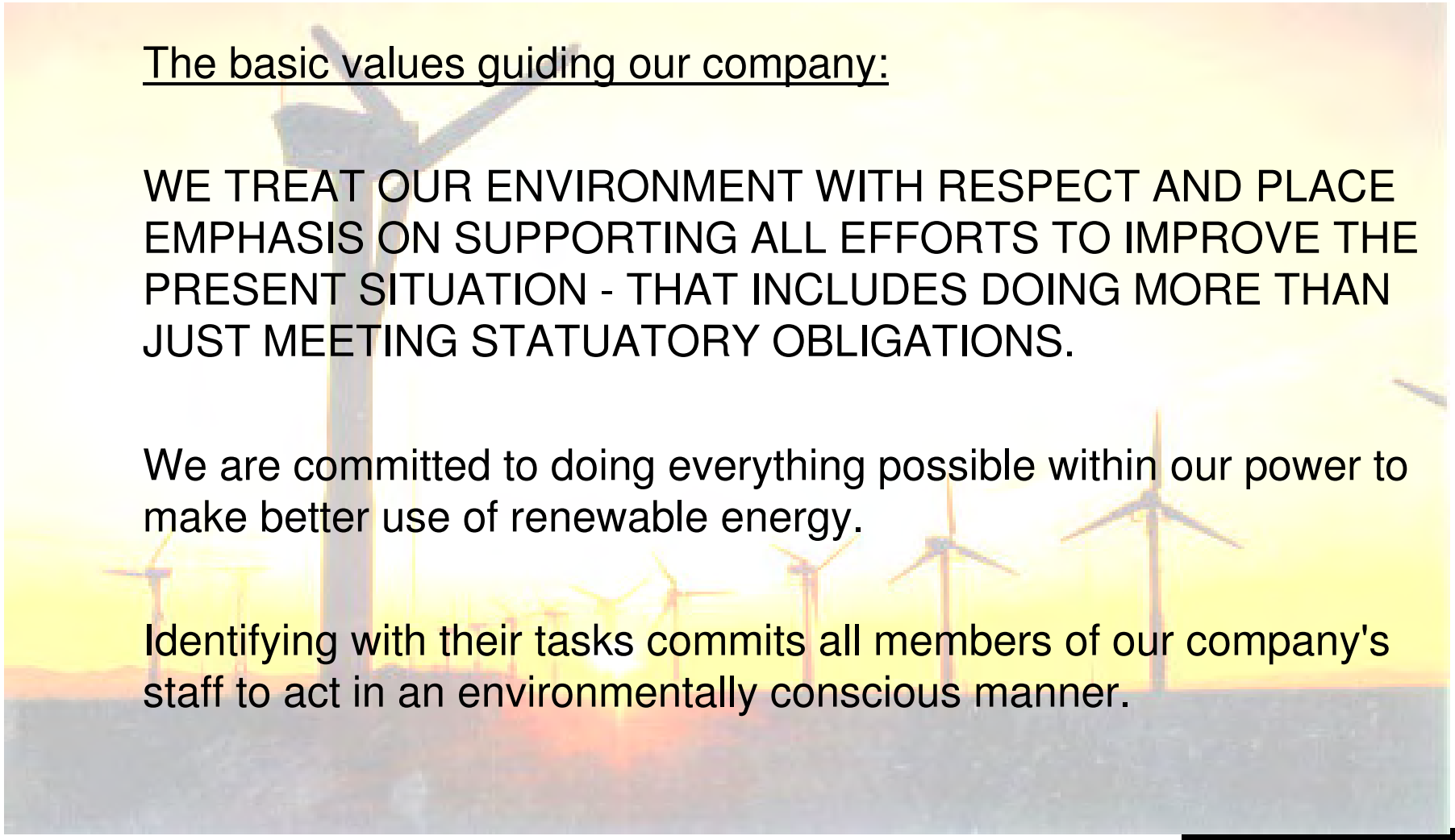
Application / benefit

- Configurable switches up to 24 ports
- Versions available with and without fibre-optic connections (SC/ST connectors)
- Robust, metal housing for mounting on mounting rails
- Space-saving, compact housing (44 mm)
- Automatic recognition and negotiation of data transmission rate (10 MBit/s and 100 MBit/s: auto-negotiation)
- Clearly visible indication of connection status, activity and data transmission rate ...

Additional technical information

- SNMP V1 and RapidRing
- VLAN, QoS, Trunking
- 256 kbyte 4 K MAC addresses per 8-port buffer
- Conform to ANSI / IEEE 802.3X
- Segment length, copper: up to 100 m
- Segment length, fibre optics: up to 2 km (multimode)
- Error relay
- UL - listed

Environmental Policy / Values Guiding Our Company



The basic values guiding our company:

WE TREAT OUR ENVIRONMENT WITH RESPECT AND PLACE EMPHASIS ON SUPPORTING ALL EFFORTS TO IMPROVE THE PRESENT SITUATION - THAT INCLUDES DOING MORE THAN JUST MEETING STATUATORY OBLIGATIONS.

We are committed to doing everything possible within our power to make better use of renewable energy.

Identifying with their tasks commits all members of our company's staff to act in an environmentally conscious manner.