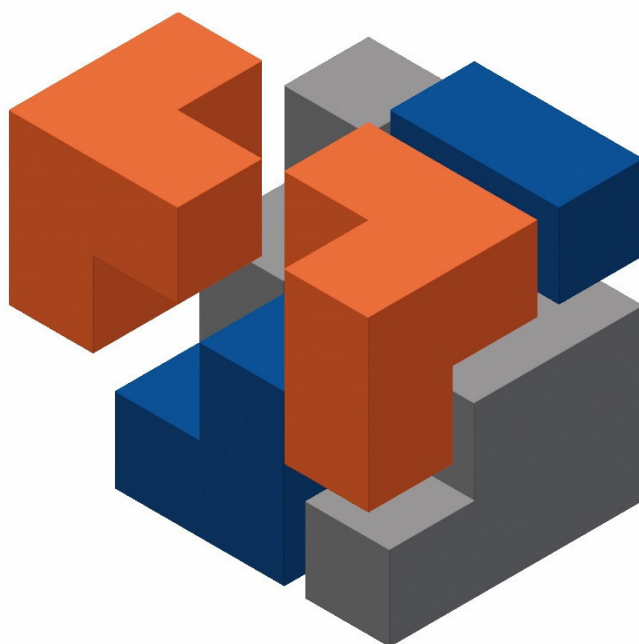


# Operating Manual

# WÄRTSILÄ JOVYLOAD CONCEPT 100 kW - 500 kW



**BAX 5485\_en\_135223**



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## Important notes

### Please read these instructions carefully

These instructions contain specifications concerning safety, installation and work procedures that will help you put our product to optimal use. They must be read carefully before beginning assembly and installation of the product. They must be accessible to both the product's assembler and operator.

### Please keep these instructions in a safe place

They contain important specifications and notes concerning use of the product as well as notes concerning questions and problems.

### Validity

Our goods and services are subject to the general terms of delivery for products of the electronics industry as well as our general sales conditions. We reserve the right to make changes to these instructions – in particular as regards the technical data, operating instructions and the weights and dimensions – at any time. These instructions correspond to the product's technical version at the time of publication. Their contents are not part of any contract but are for information purposes only.

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### Complaints

Complaints must be submitted to the supplier at the latest eight days after delivery of the product.

### Copyright

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# 1 Safety Regulations

## 1.1 Important Instructions and Explanations

The instructions for operation and maintenance as well as the following safety regulations must be complied with to safeguard the safety of personnel as well as the functioning of the unit. All personnel installing/dismantling, starting up, and servicing the unit must be familiar with and observe these safety regulations. Only qualified personnel may perform the described work using suitable and intact tools, equipment, test equipment and materials.

Important instructions are highlighted by "CAUTION:", "ATTENTION:", "NOTE:" and indented text.



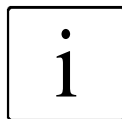
### **CAUTION:**

This symbol identifies all working and operational procedures requiring absolute compliance to avoid any danger to personnel.



### **ATTENTION:**

This symbol identifies all working and operational procedures requiring absolute compliance to prevent any damage, irreparable or otherwise, to the discharging station or its components.



### **NOTE:**

This symbol identifies technical requirements and additional information requiring the operator's attention.

## 1.2 Safety Notes / Precautions

Operation and maintenance procedures must be performed only by qualified personnel. The following discharging station operation and maintenance requirements must be observed at all times to ensure maximum safety and performance.

Operate, service, and maintain the units as described in this manual.

Thoroughly understand unit and system operation and functions.

Understand all controls, indicators, and operating limits.

Before operating the discharging station, learn the significance of possible malfunctions and be prepared to take appropriate action if one occurs.

Understand and observe the following safety notices and precautions.

## 1.3 Electrical Safety Precautions

The discharging station must be considered energized unless all sources of input power have been removed and circuits are checked for voltage by an independent voltmeter.

Capacitors can retain voltage for long periods of time. All capacitors should be discharged with an adequate device by qualified personnel before maintenance, troubleshooting or repair is performed.

When switches have been opened or fuses removed to de-energize a circuit for maintenance, the switches and fuses should be tagged out to prevent accidental closure or replacement.

For maximum safety, all discharging station maintenance should be conducted with external power removed.

When it is absolutely necessary to work on energized equipment, the following precautions must be observed:

- Never earth test equipment to live buses.

- Insulate all surrounding circuitry not under inspection with sheet rubber or dry heavy weight paper.
- Stand only on rubber matting.
- Use one hand only and wear insulating rubber gloves.
- Wear safety glasses.
- Never work alone.
- Personnel qualified in CPR (cardiopulmonary resuscitation) should be readily available.

For personnel safety and equipment protection keep all access doors and panels securely fastened or locked at all times.

For personnel safety and equipment protection never remove a printed circuit board or fuse from an energized circuit.

Never override or bypass an interlock or safety device during operation.



**ATTENTION:**

The discharging station must be considered energized unless input isolation and output isolation switch is confirmed open.

## 1.4 Handling of Electrostatic Discharge Sensitive Assemblies

Electrostatic discharge (ESD) precautions must be observed when troubleshooting, handling, aligning, adjusting, removing, repairing, replacing, unpacking, or repackaging ESD sensitive items. The following items are considered ESD sensitive:

- Printed wiring board assemblies.
- All parts, assemblies, and equipment marked ESD sensitive.
- Internal and external cable connectors when one end is still attached to an ESD sensitive item.
- Drawers or panels when open, disconnected, or removed from the top assembly.

### 1.4.1 General Information

The following general instructions are given as a reminder for personnel trained in ESD prevention. These ESD instructions do not represent a complete list of precautionary measures which must be observed to prevent ESD damage.

Only personnel trained in the use of ESD preventive devices, tools, and techniques are to handle ESD sensitive items.

Synthetic clothing is not to be worn when handling ESD sensitive items. Synthetic cloth is not to be used as cleaning rags, all cotton cloth is preferred.

A properly earthed ESD wrist strap which makes contact with bare skin is to be worn when handling ESD sensitive items.

ESD sensitive items will be placed only on properly grounded ESD protective matting when not installed in equipment.

ESD sensitive items are not to be transported without proper ESD protective coverings, packaging and markings.

Do not damage or discard materials used to package ESD sensitive items. The packing material can be re-used to return defective items.

Do not allow connector pins of ESD sensitive items to contact a non-ESD protected surface.

## 1.5 Accident Prevention Regulations

Compliance with the accident prevention regulations valid in the country of application and the general safety regulations in accordance with IEC 364 is mandatory.

The following must be observed prior to any work on the discharging station:

- disconnect the power supply,
- secure against reactivation,
- verify that the unit is disconnected from the power supply,
- earth and short the circuit,
- cover or isolate any neighbouring power-supplied units.

## 1.6 Danger Entailed During Maintenance and Repair Work



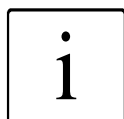
### CAUTION:

The voltage applied to the discharging station can be fatal. Prior to start-up or maintenance work always disconnect the discharging station from the power supply and ensure that the unit cannot be switched on. Freestanding and movable components can enter the work area and cause injuries.



### ATTENTION:

Considerable damage can be caused to equipment if unsuitable spare parts are used during repair work, if work is carried out by unauthorised personnel or the safety regulations are not observed.



### NOTE:

Only trained and qualified personnel may work on or around the discharging station while strictly observing the safety regulations.

## 1.7 Fire Hazard

### Structure of fireproof enclosures (EN 60950)

If the discharging station is installed in areas with inflammable floors (e.g. textile, wood, PVC), a floor plate must also be installed. The assembler is responsible for proper installation.



### CAUTION:

If smoke is detected or a fire breaks out, immediately disconnect the discharging station from the power supply and inform the maintenance personnel.

## 1.8 Qualified Personnel

The discharging station may only be transported, installed, connected, started, serviced and operated by qualified personnel who are familiar with the pertinent safety and installation regulations. All work performed must be inspected by responsible experts.

The qualified personnel must be authorised to perform the work by the competent safety officer.

Qualified personnel is defined as personnel:

- having completed training and gained experience in the respective field,

- familiar with the pertinent standards, rules and regulations and accident prevention regulations,
- having received instruction on the mode of operation and operating conditions of the discharging station.
- capable of recognising and preventing dangers.
- Regulations and definitions for qualified personnel are contained in DIN 57105/VDE 0105, Part 1.

## 1.9 Safety Awareness

The personnel defined in the section above are responsible for safety and must ensure that only suitably qualified persons are permitted access to the safety area or to be in the proximity of the discharging station. The following points must be observed:

- **All** working procedures are prohibited which are detrimental to the safety and operation of the discharging station in **any way**.
- The discharging station may only be operated in perfect working condition.
- Never remove or render inoperable any safety devices.

All necessary operational measures must be initiated prior to deactivation of any safety devices for maintenance, servicing or any other work on the unit.

Safety awareness also entails informing colleagues of any unsuitable behaviour and reporting any detected faults to the respective authority or person.

## 1.10 Application

The discharging station may only be used to discharge submarine batteries with the maximum connected loads permissible in accordance with these operating instructions and in the described mode of installation and operating mode. The device may only be used for this intended purpose. It is not permitted to make any unauthorised modifications to the discharging station or to use any spare parts and replacement parts not approved by JOVYATLAS GmbH or to use the device for any other purpose.

The person responsible for the installation must ensure that:

- safety instructions and operating instructions are readily available and are complied with,
- operating conditions and technical data are observed,
- safety devices are employed,
- the prescribed maintenance work is performed,
- maintenance personnel is informed or that the device is shut down immediately in the event of abnormal voltages or noises, high temperatures, vibration or any similar effects in order to detect the cause.

These operating instructions contain all information required by qualified personnel for operation of the discharging station. Additional information for unqualified personnel and for the use of the discharging station in non-industrial applications is not included in these operating instructions.

The warranty obligations of the manufacturer are only applicable when these operating instructions are complied with.

## 1.11 Liability

No liability is accepted if the discharging station is used for applications not intended by the manufacturer. Any necessary measures for prevention of injury or damage to equipment is the responsibility of the operator or user. In the event of any claims in connection with the discharging station please contact us quoting:

- the type designation,
- works number,
- reason for claim,
- period of use,
- ambient conditions,
- operating mode.

## 1.12 Regulations

The discharging station devices comply with current DIN and VDE regulations. VBG4 is met on the basis of compliance with regulation VDE 0106, Part 100.

The CE sign on the device confirms conformance with the basic EC regulations for -72/23 EEC - Low voltage and for -89/336 EEC - Electromagnetic compatibility, if the installation and commissioning instructions described in the operating manual are observed!



## 2 Technical data (order-based)

Order no.	: 135223
Type	: JOVYLOAD Concept 500/5kW
Power	: 500 kW
Load step resolution	: 5 kW
Nominal voltage	: 3 x 400 V; 50 Hz
Duty cycle	: 100 %
Cooling	: vertical forced ventilation
Lüfterspannung	: 3 x 400 V; 50 Hz
Air flow monitoring	: Difference pressure controller
Resistor material (wire)	: Ni/Cr 8020
Temperature rise	: R cold / R hot $\leq$ 3 %
Manufacturing tolerance	: + / - 5 %
Ambient temperature	: -25°C ... + 45°C
Resistor enclosure	: zinc plated steel with powder painting
Switch gear	: Rittal AE
Varnishing	: RAL 1019 (grey-beige)
Protection degree	: IP 55
Acoustic noise level	: < 70dB(A) in 5,0m
Dimensions, approx.	: W 1100 mm H 2040 mm D 1240 mm
Weight, approx.	: 500 kg

Including switch gear with:

- Fuses for loadsteps
- Rotary switch for each load step
- Fan control
- EM CY button at switch gear
- Resistors in star connection
- Star point wired on busbar (for 100% current)
- Stillstand heater (with thermostat)
- Switch over for internal/ external aux. voltage
- Multifunctional measuring instrument  
JANITZA UMG96L incl. current transformer

Load connection on copper bars with wholes  $\varnothing$ 14mm inside switchgear

Aux. voltage via CEE plug 3~400/230V 50Hz, 16A, 6h, at bottom/ outside of switchgear.

Weather protected construction for outdoor use with protection degree IP55 for complete unit.

Enclosure of resistor elements, element holders, and thermal isolation inside loadtunnel are made from stainless steel.

This ensures long service life.

Maximum precision of resistor values is assured by use of nickel/ chrome 80/20 for the resistor wire.

Including 4 castors (2 rotary castors with stop function) and forklift pockets (available from front and rear side)

Including PVC covering for complete loadbank for storage and transport.

## 3 System description

### 3.1 Introduction

This manual describes the installation, operation, service and maintenance of the load resistor, as well as troubleshooting.

The "JOVYLOAD CONCEPT" load bank range is a modular system with many different options. There are stationary versions, as well as mobile versions with transport frame, rollers or as a car trailer in a wide performance range.

There are also many different solutions for controlling the load bank. Anything is possible, from rotary switch control, PLC-based controls with different operating panels, local control on the device or remote control, through to web browser control.

In this manual, the "Technical data" section and the annex are adapted to the relevant order. The other sections are either generally valid or a specific version is addressed in the relevant subsections.

### 3.2 General

The base unit consists of a control cabinet with rear-mounted tubular heating elements (THE). Within the switchgear, there are load contactors, load safety devices, the connection area and all components required for the control.

The components of the switchgear are installed on a mounting plate that can be swivelled to the front. This makes it easier to check and replace individual resistor elements.

The resistor unit is located behind the control cabinet. This area is double-walled for thermal insulation.

The outer shell is made from galvanized sheet steel and a powder coating in exterior quality. The colour can be selected by the customer from a wide range of RAL colours.

The inner air duct, holding plates for the tubular heating elements and structures, such as protective grilles, air scoops or high roofs, are made from durable stainless steel.

The resistance wire made from NiCr 8020 is located inside the tubular heating element. This material has an extremely low temperature deviation and guarantees the high level of precision of the load levels in continuous operation.

The outer shell of the tubular heating elements is made from high-quality stainless steel. The tubular heating elements are filled with magnesium oxide to insulate the resistance wire.

The tubular heating elements are maintenance-free and robust.

If checks or repairs are required, however, the mounting plate in the control cabinet is folded forwards approx. 30° and the rear housing cover is removed. The resistor elements are then easily accessible and can be replaced easily.

Because the resistor elements are hermetically sealed on the outside and are mounted in the rear wall of the control cabinet in fixed installation, protection class IP55 can be guaranteed.

If load banks from the "JOVYLOAD CONCEPT" range are used outside permanently (stationary), we also recommend mounting a high roof or an air scoop with weather protection grid on the air outlet.

Inside the resistor unit, electric energy is transformed into heat. On account of their low mass, the resistor elements can only absorb part of the heat themselves, with the majority of it released into the ambient air. A suitable fan is installed to dissipate the heat.

The resistor unit has forced vertical ventilation. This means that a large area does not have to be cordoned off around the system for the escaping hot air. The fan installed below the tubular heating elements has an extremely low noise level, making it easier to use close to residential areas, for example.

To increase the service life of the resistor elements and to keep the danger caused by escaping hot air to a minimum, the JOVYLOAD CONCEPT works with a high air throughput.

High temperatures may still occur, however, depending on the output and proximity to the air outlet. The device must therefore be installed in such a way that objects which are sensitive to heat or flammable are not affected by the heated outlet air.

The ventilation is designed according to the requirements of the resistor subassemblies. The fan operation is monitored with a differential pressure switch. This is supplied via a motor protection switch to protect the fan motor. The maximum air intake temperature must not exceed 45°C.

Once the load test is complete, the fan must run on for at least 120s so that energy stored in the resistor group can be discharged and to prevent damage. The fan run-on must be guaranteed by the user.

When not in use, mobile systems should be stored in a dry and well ventilated room. After the cool-down phase, the PVC protective cover should be mounted again where present.

Load banks that are used permanently outdoors should be fitted with a high roof or an air scoop for additional weather protection and to prolong the service life.

For devices that are operated outdoors or stored in unheated rooms, we recommend using standstill heating (optional).

The standstill heating is thermostat-controlled and is supplied via the auxiliary voltage supply. When the load resistor is not in use, the mains supply for the standstill heating must be guaranteed.

## 4 Transportation, storage and installation

### 4.1 General

This section describes the installation of the device as a whole, including positioning, set up and connection. The relevant drawings are to be found in the Annex to this manual.

### 4.2 Visual inspection

Prior to installing the device at the destination, a thorough visual inspection must be carried out. All individual parts must be checked for damage and other abnormal alterations. All modules and components should be checked to ensure they are firmly seated. All markings on flaps, covers and modules should be readable. Notify the manufacturer immediately in the event of any claims or complaints.

### 4.3 Transport

The correct transport of the JOVYLOAD CONCEPT depends on the relevant version. Devices for stationary installation, for example, are usually delivered on pallets and can be moved with a forklift truck or lift truck.

If suitable lugs are mounted on the top of the device, transport by crane is also possible. If devices are intended for use in different locations, a stable transport frame and an impact frame with load rings, where applicable, are recommended.

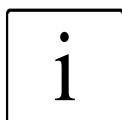
The different options are explained in the following subsections.

#### 4.3.1 Transportation by forklift or hand lift truck



**ATTENTION:**

Prior to transporting items by forklift or hand lift truck, make sure the transport equipment is capable of supporting the load of the relevant device.



**NOTE:**

Particularly on assembly platforms and/or on uneven ground, transportation by forklift or hand lift truck should be restricted to the unavoidable minimum.

Preparation:

- Leave the device on the transport pallet.
- For devices with mounted forklift pockets, the transport pallet can be removed.



**ATTENTION:**

**Pay attention to the device's centre of gravity!**

The forks must be of adequate length and far enough apart.

Transportation procedure:

- Carefully lift the device and transport it to its intended location.
- Carefully lower the device, without bumping.
- Move back the forklift or hand lift truck.

### 4.3.2 Crane transport



**CAUTION:**

**Do not walk beneath suspended loads!**

Wear personal protective equipment, such as a helmet, safety shoes and work gloves!

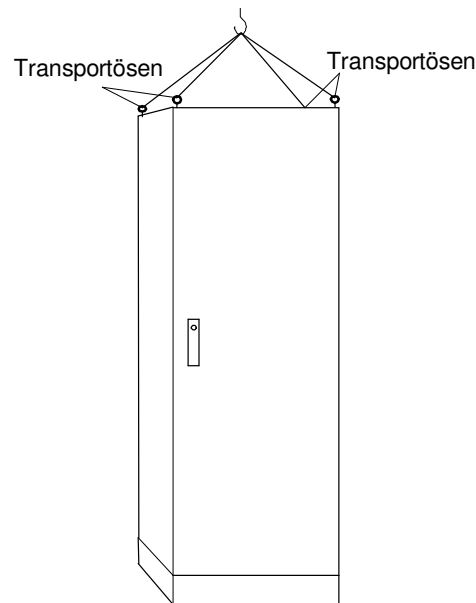
Transport items with due care and attention, observing the safety rules!



**ATTENTION:**

The device must only be transported **upright!**

Do not **tip** or **tilt** it; avoid shifting its centre of gravity!



The length of the load-carrying cables should be set so as to produce an angle of 45° between the cable and the top of the cabinet (DIN 580). The load-bearing capacity per cable must support at least  $\geq 0.5 \times$  the cabinet weight (DIN 580). For the weight of the relevant device, refer to the technical data. Attach one cable to each transportation hoop.

Procedure for transportation by crane:

- Check that the transport hoops on the top of the cabinet are securely fixed.
- Attach the cables to the hoops on the top of the cabinet.
- Carefully lift the device and transport it to its intended location.
- Carefully lower the device, without bumping.
- Remove the cables and transportation hoops.

### 4.3.3 Trailer



#### Notice:

- The trailer is equipped with a ball head coupling for car transport or a towing eye for lorry transport. Before transport, ensure that the towing vehicle is suitable for pulling this trailer.
- Plug the trailer connector into the socket on the towing vehicle.
- Raise the supports and lock in place.
- Ensure that all flaps and doors on the trailer are closed correctly!
- Check that the lights on the trailer are working correctly before starting the journey!
- Check the tyre pressure before setting off!

### 4.4 Requirements at the point of installation



#### ATTENTION:

Surfaces exposed to the air outlet side must be made of non-flammable materials.

Requirements at the point of installation:

- The ambient air must be free of conductive dust.
- There must be no escaping caustic or acid fumes.
- The maximum device supply air temperature is 45°C.
- Air vents must not be covered as a result of construction measures or any other conditions.



#### Notice:

Trailers must be positioned at the site so that safe working conditions are guaranteed.

When operating in connected and disconnected state, always ensure that the trailer can not roll away (handbrake on the towing vehicle, wheel chocks, etc.)

## 4.5 Storage

Units that are not intended for permanent use outdoors (stationary) should be stored in a dry and well ventilated room when not in use. After the cool-down phase, the PVC protective cover should be mounted again (where present). Standstill heating (optional) is recommended for all load banks stored in unheated rooms or used outdoors. For devices with standstill heating (thermostat-controlled), the mains supply must be guaranteed via the auxiliary power supply.

## 4.6 Installation and cable connections

### 4.6.1 General instructions

Ensure there is adequate air inflow and outflow.

When dimensioning the necessary cable cross-sections, accurate on-site dimensioning is essential. For larger distances, cables must be dimensioned in accordance with the permitted voltage drop, the ambient temperature and the cable bundling as laid down in VDE regulations.

Local regulations with regard to protective earthing and connector cross-sections for cables must be observed.

### 4.6.2 Connecting up the device



#### **CAUTION:**

First ensure the cables for cutting are isolated from the power supply and safeguard the external switches from being turned back on.

See the circuit diagrams in the annex of this operating manual. Some assemblies are marked as "optional" in the circuit diagrams. Please also refer to the technical data for your load bank.

The test load is connected via the connection cables in the bottom section of the control cabinet. The auxiliary voltage is connected either at the bottom right in the control cabinet on the designated terminal blocks, or below the cabinet via a CEE socket outlet (optional).

On the trailer versions, an earthing rod is present in the console (rear) for local earthing if no earthing connection is possible on the generator/test specimen.

The auxiliary voltage supply is used to supply the control, the fan and the standstill heating, where present.



#### **ATTENTION:**

**Ensure clockwise phase sequence!**

If the phase sequence is not correct, the fan runs with the wrong direction of rotation!

The check can be carried out with a rotating field measuring device or with a sheet of paper held carefully under the fan for a short time, for example. The air flow direction is upwards, i.e. the paper is sucked in.



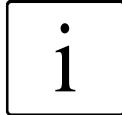
**ATTENTION:**

The operator assumes responsibility for fusing the overall system current.

The resistor levels are fused in the load bank (but not the connector panel).

Check that adequate grounding is in place!

## 5 Commissioning and control

**NOTE:**

When commissioning for the first time, smoke may develop briefly from the resistor elements due to oil on the resistor elements being released.

### 5.1 Preconditions

- All connection and installation steps have been performed as described in the 'Transport, storage and installation' section.
- PVC protective hood removed (if present)
- Motor circuit breaker and fuses switched on.
- The emergency OFF button is released.
- The test load is connected.
- Earthing (earthing rod) in place.
- The mains supply corresponds to the required input voltage (see technical data).
- All control cabinet doors are closed.
- The air intake and outlet vents are not covered. Remove any foreign bodies as required.
- A suitable barrier is in place where required to prevent injury and material damage.

**CAUTION:**

Air exiting the resistor system during operation is hot. Observe the personal protection requirements!

It is the responsibility of the operator to cordon off this safety area.

## 5.2 Load bank control

The JOVYLOAD CONCEPT load bank range comes with different controls. The control can take place on the device, via a remote control or via a web browser control.

The load bank can be operated via rotary switches, various touch panels or a PC depending on the version.

There is also a choice of different measuring devices.

Because the range is being developed constantly, new or amended controls are introduced all the time. If you can't find something in the following subsections, feel free to ask us about it.

### 5.2.1 Rotary switch control

The rotary switch is located in the left control cabinet door.

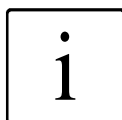
Various multifunctional measuring devices are available as options. The instructions for one of these multifunctional measuring devices can be found in the annex for this manual.

To ensure fault-free operation, the sequence outlined below must be observed.

- Supply air and exhaust openings are free from obstructions.
- Before commissioning the load bank, the load selection switches must be set to the OFF position. This prevents unwanted impact loading of the test specimen.
- Once the electrical connections are established, the load bank is ready for operation.  
**Ensure that there is a right rotating field**
- Pressing the "Start" button releases the control and starts the fan motor. This is signalled by the green indicator light on the double pushbutton.
- The desired load can be switched on with the load selection switches. The load is applied on the test specimen according to the selected load level. Further load levels can be applied or switched off as desired.
- Switching off the load selection switch ends the load test.

**To discharge the residual heat stored in the resistor elements, the fan must be run on for at least 120 seconds!**

Only then is the system shut down with the "Stop" button.



**ATTENTION:**

The load selection switches should be switched off to prevent the load levels from being activated unintentionally during the next commissioning

### 5.3 Fault

Possible faults may include:

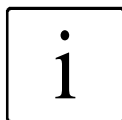
- The fan monitoring (differential pressure switch) signals an interruption in the flow for min. 2s.
- The motor circuit breaker of the fan motor has triggered.

If one of the above faults occurs, the applied load is discarded immediately or can not be selected at all.

Once the cause of the fault has been removed, the load bank can continue operation.

## 6 Maintenance

## 7 Spare parts and customer service



**NOTE:**

When ordering spare parts, please quote the name (position/component) and device number.

Please be advised that spare parts not supplied by us are neither tested nor approved. Consequently, the fitting of such spare parts may negatively impact the functional performance and passive safety of the device. We assume no liability for any resultant loss suffered.

Our Customer Service department will of course be glad to send you a complete replacement part list for your device.

To request a parts list, or if you have any other questions or suggestions, please contact us at the following address:

 **Wärtsilä JOVYATLAS EUROATLAS GmbH**

**Fennenweg 4**

**D-26844 Jemgum**

**☎ 04958 - 9394 - 30**

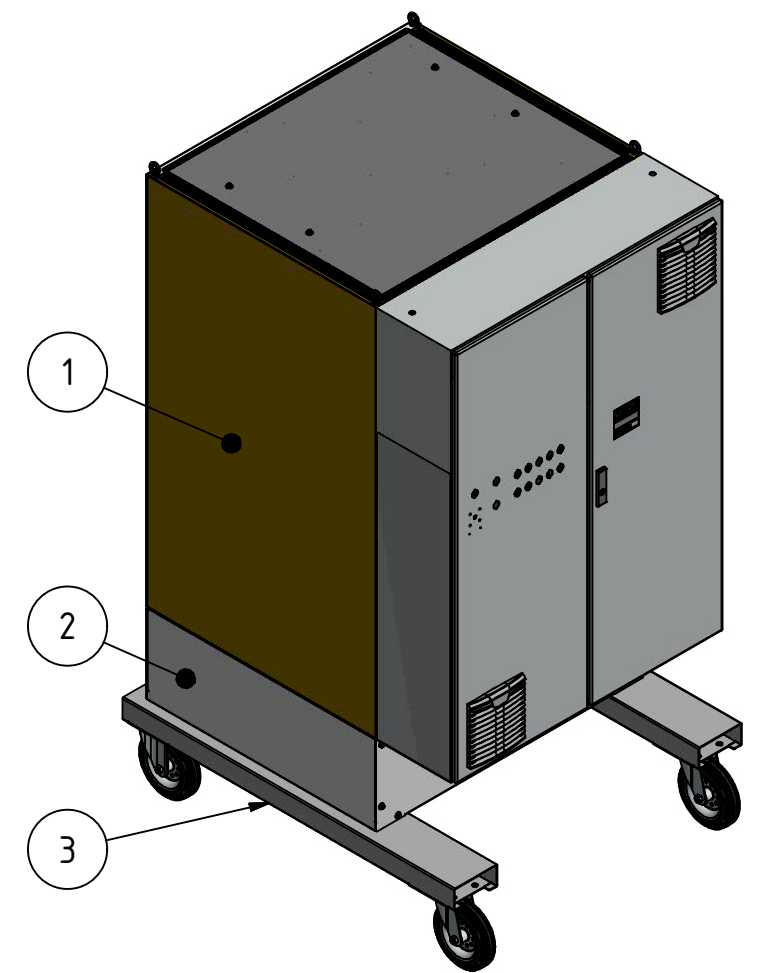
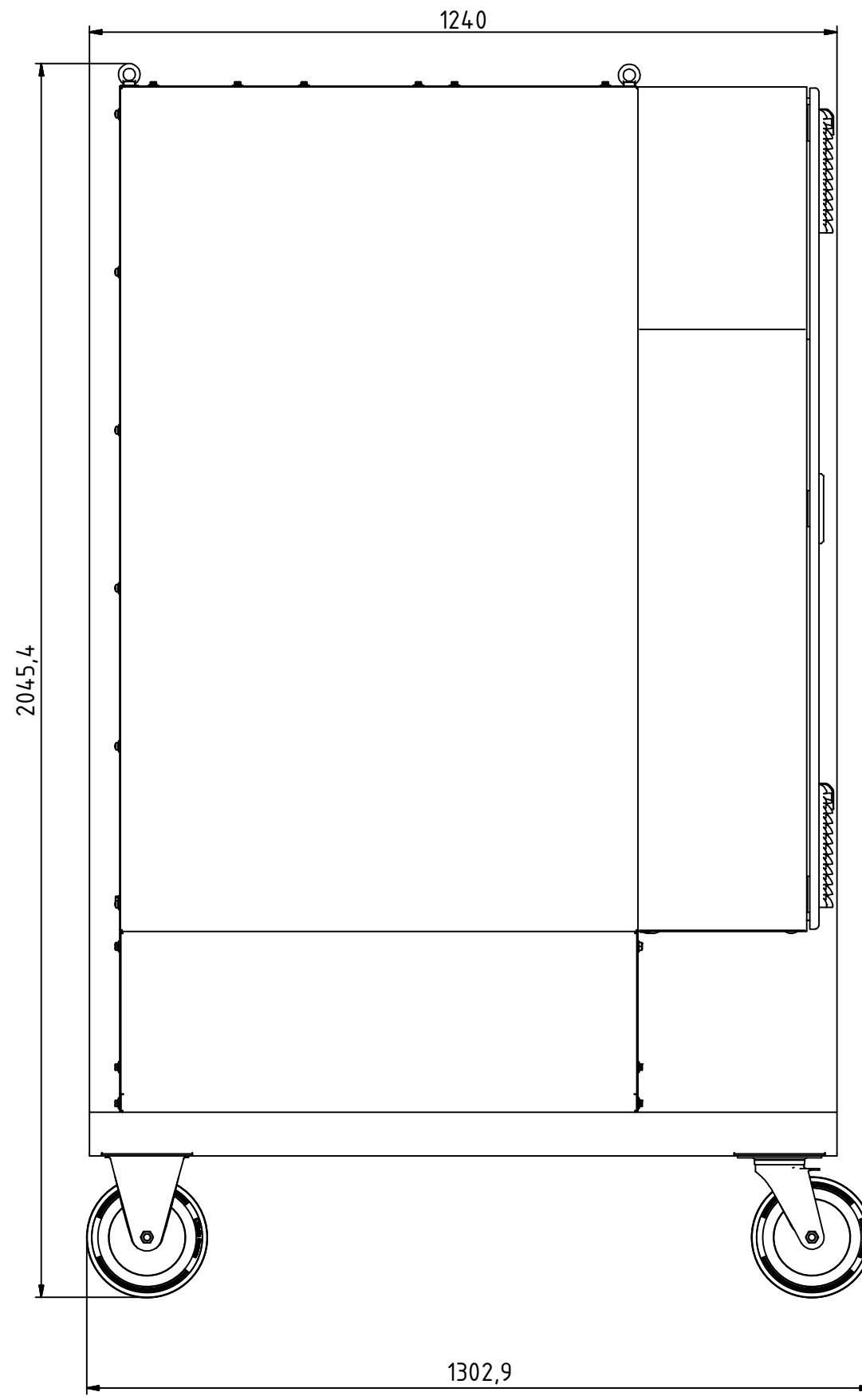
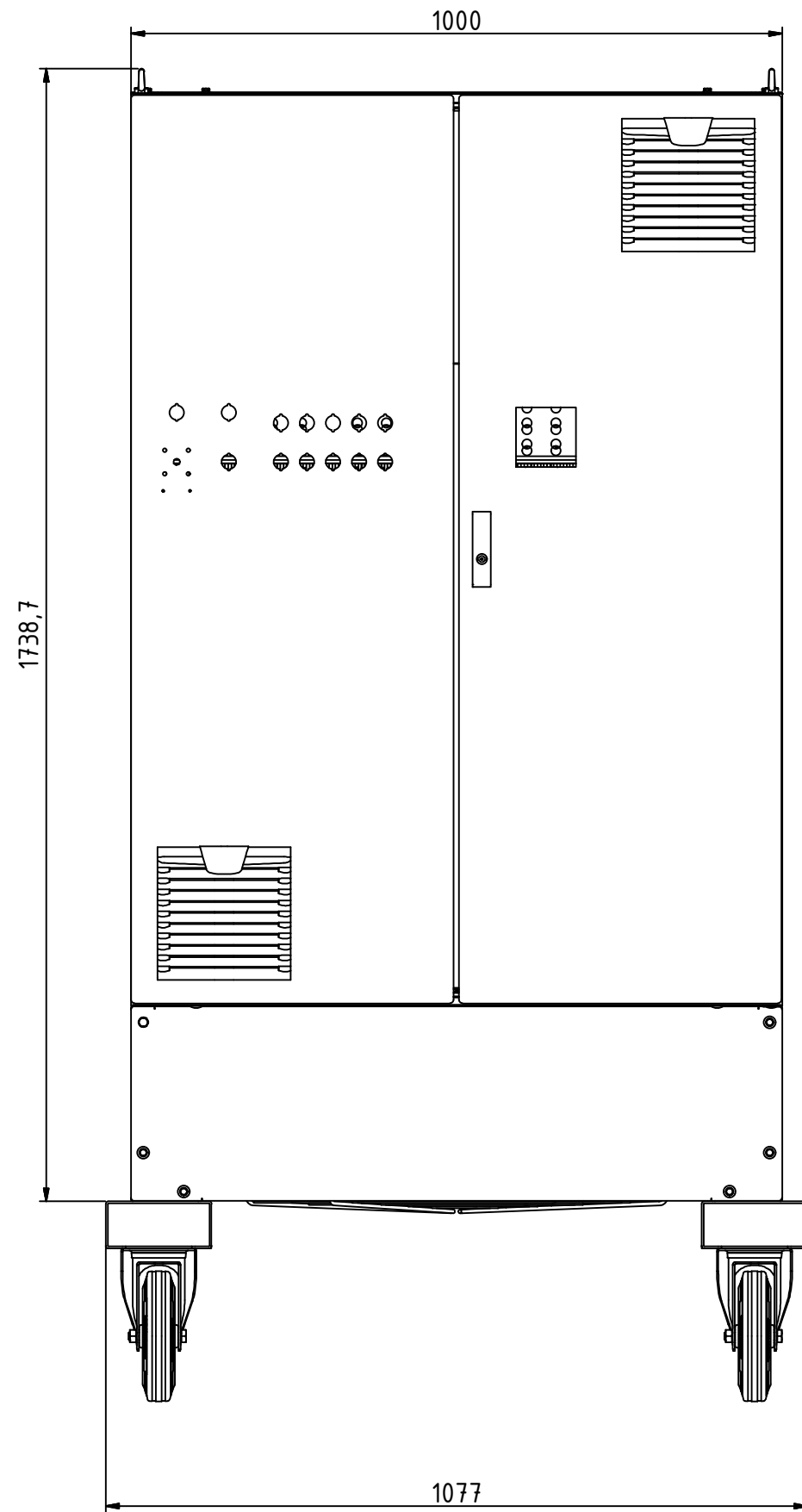
**FAX 04958 - 9394 - 10**

<http://www.JOVYATLAS.de>

E-mail: [service.jovyatlas@wartsila.com](mailto:service.jovyatlas@wartsila.com)

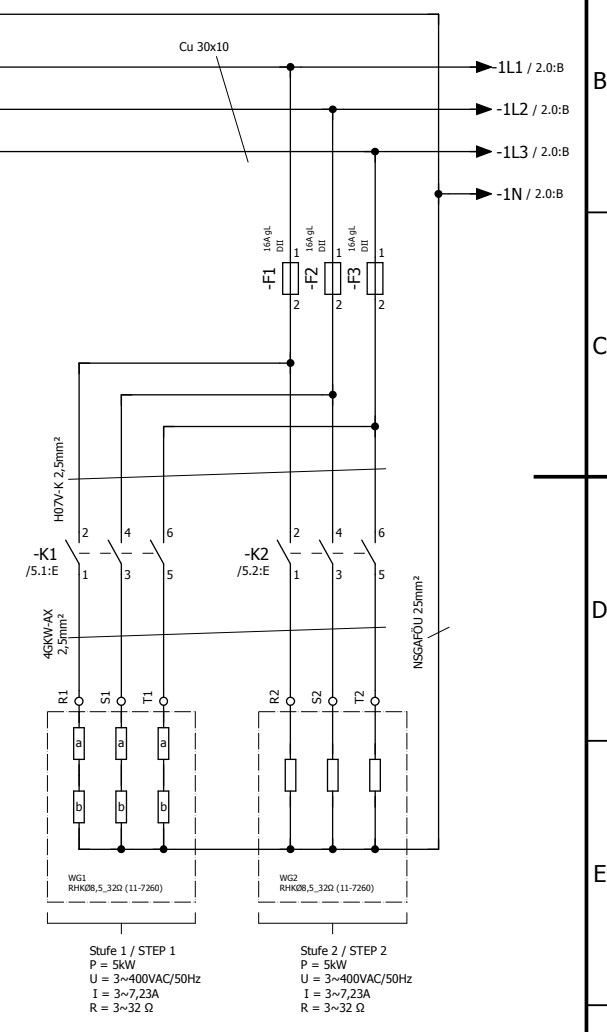
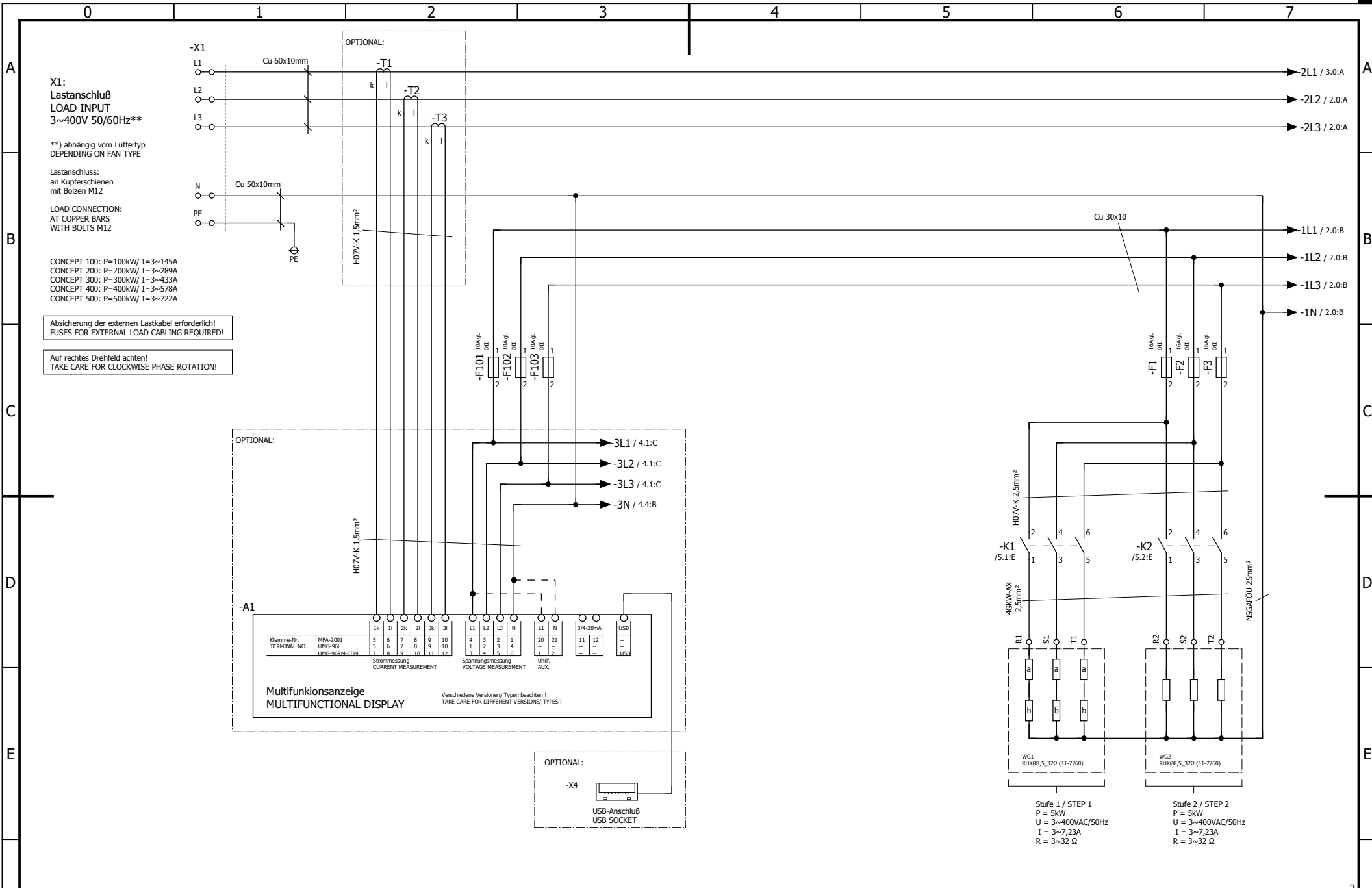
## 8 Annex (order-specific)

- Dimensional drawing
- Circuit diagram
- Operating manual multifunctional meter

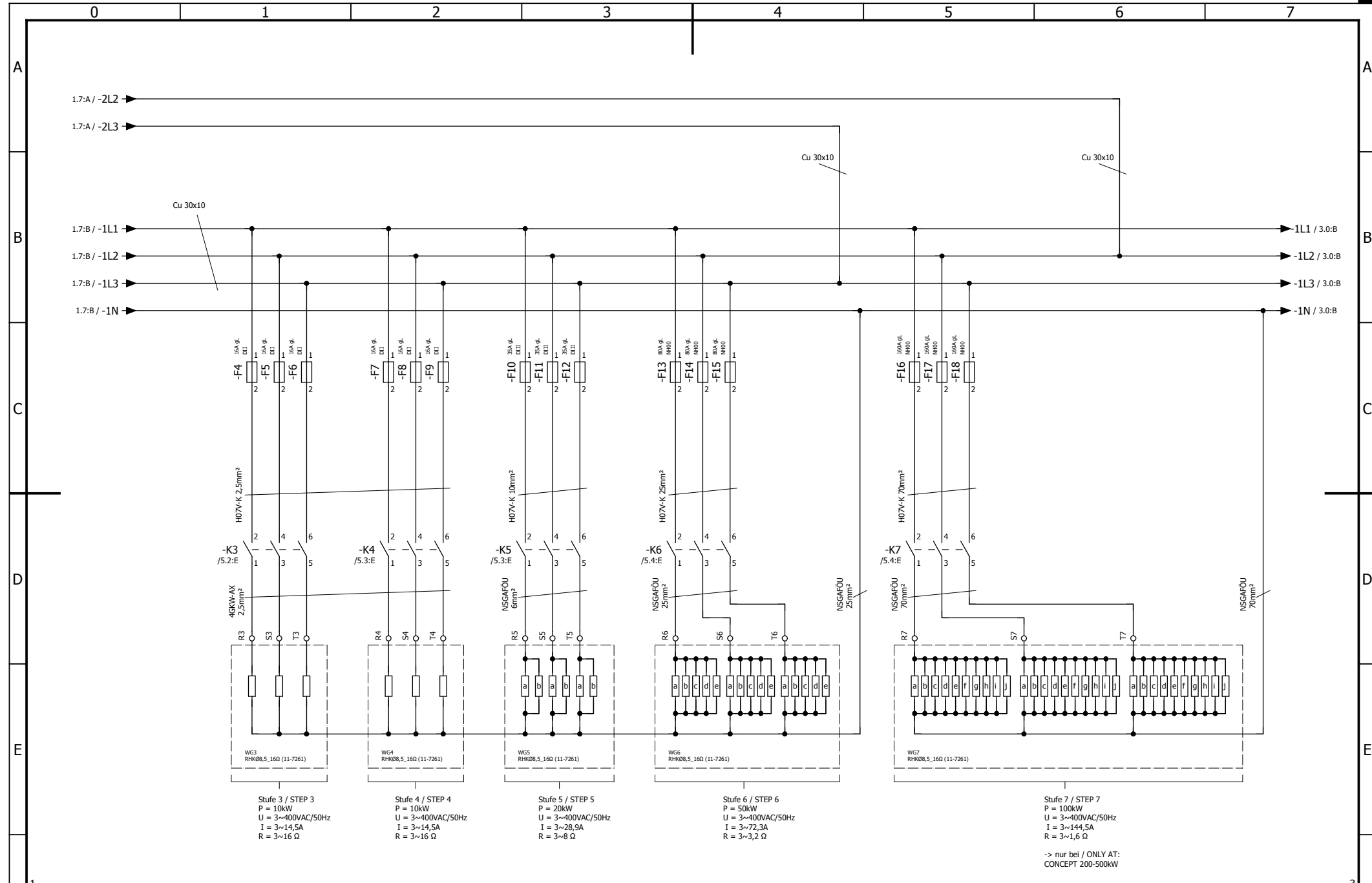


3	1	R6010300	Lasttunnel Concept 500/1kW, inkl. Schaltschrank
2	1	R6009200	Grundrahmen mit Lüfter 2,6kW / 50Hz, CC 300
1	1	R6001520	Gehäuse CC 500, 500kW
Pos.	Menge	Zeichnungs-Nr.	Bezeichnung

c			Datum: 30.11.2015	Allgemeintoleranzen: DIN ISO 2768-m	Werkstoffbearbeitung: entgratet	Wärtsilä JOVYATLAS EUROATLAS GmbH Fennienweg 4, 26844 Jemgum, Germany www.jovyatlas.de	Allgemeine Bezeichnung / General description: Lasttunnel CONCEPT 500/5kW	Maßstab: 1 : 10	Gewicht: -
b			Name: A.Schwarzkopf QC	Werkstoffart:	Werkstoffdicke:		Fläche / Area: -	Fläche / Area: -	Gewicht / Weight: -
a			Geprüft:	Oberflächenbehandlung:	Lackierung:		Abwicklungsabmessungen / Dimensions of flat projection: - x -	Zeichnungs-Nr.: 135223	Abwicklungsabmessungen / Dimensions of flat projection: - x -
Zustand: Revision:	Datum: Date:	Name:	Geprüft: Checked:	Werkzeug Kantbank: Tool metal bender:	Program-Nr. Kantbank: Prog.no. metal bender:	Auftrags-Nr.: Order-no.:	Lager-Nr.: Stock-no.:	Format: A3	Blatt: 1 von 1 Page: 1 of 1

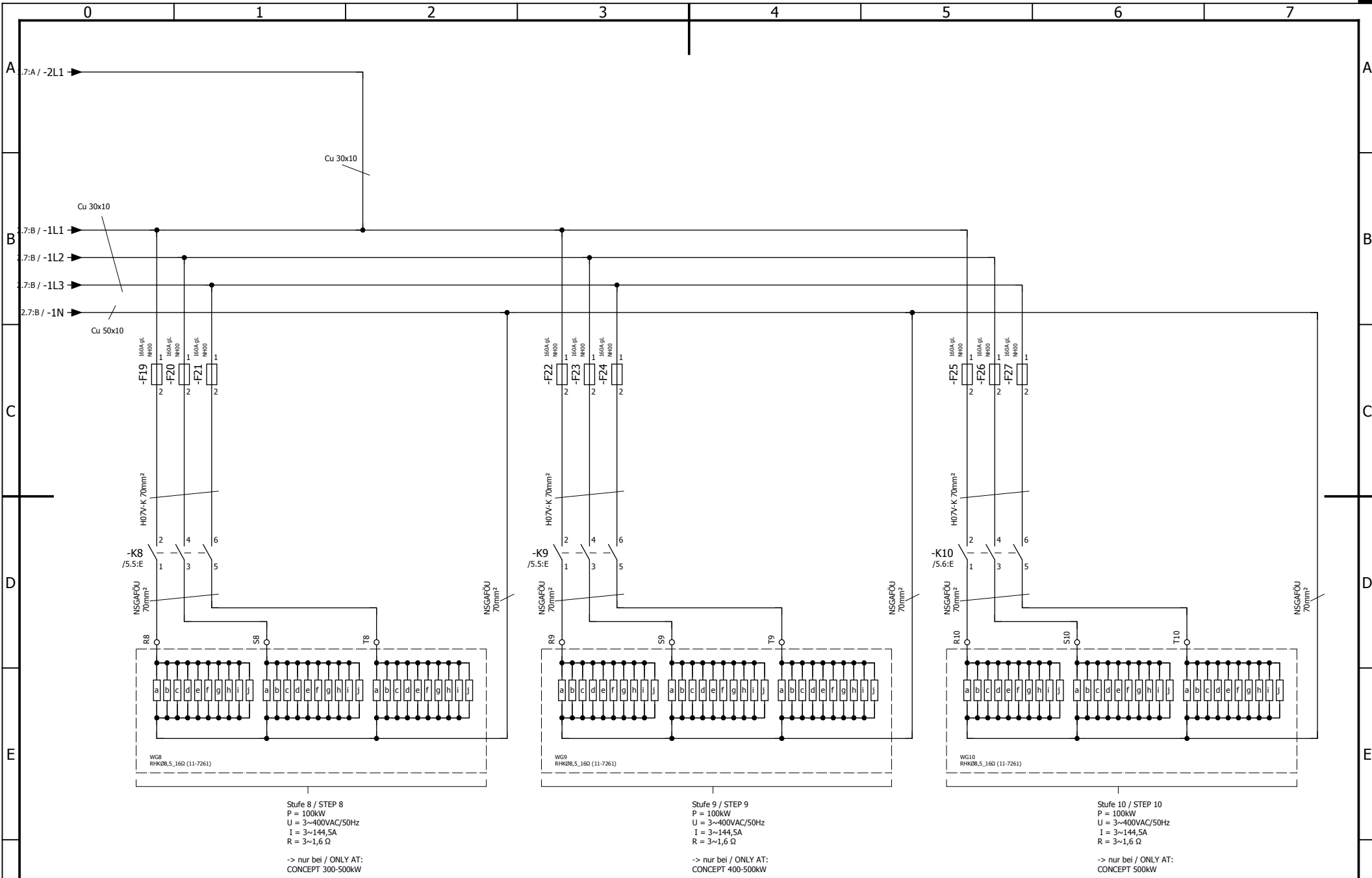


F	c		Datum: 28.04.2016	Kunde:	Wärtsilä JOVYATLAS EUROATLAS GmbH Fennenweg 4, 26844 Jemgum, Germany www.jovyatlas.com	Beschreibung / Description: Lastwiderstand/ Load bank CONCEPT 100/5kW-500/5kW Steuerung Drehschalter/ Rotary switches	Allgemeine Bezeichnung / General description: Stromlaufplan/ Circuit diagram	=		
	b		Name: W. Pastoor	Client:					Zeichnungs-Nr.: R60 005 01. Order-no.:	Blatt: 1 von 5
	a		Geprüft: W. Pastoor	Ersetzt durch:						
	Zustand:	Datum:	Name:	Ursprung:	Ersetzt von:	Ersetzt durch:				



1			Datum: 28.04.2016	Kunde:	
c			Name: W. Pastoor	Client:	
b			Geprüft: W. Pastoor		
a			Ursprung:		
Zustand: Revision:	Datum: Date:	Name: Name:	Ursprung: Origin:	Ersatz von: Substitution of:	Ersetzt durch: Substituted by:

<p>Wärtsilä JOVYATLAS EUROATLAS GmbH Fennenweg 4, 26844 Jemgum, Germany www.jovyatlas.com</p>	<p>Beschreibung / Description: Lastwiderstand/ Load bank CONCEPT 100/5kW-500/5kW Steuerung Drehschalter/ Rotary switches</p>	<p>Allgemeine Bezeichnung / General description: Stromlaufplan/ Circuit diagram</p>	=
		<p>Zeichnungs-Nr.: R60 005 01. Auftrags-Nr.:</p>	+
		Blatt: 2 von 5	



Stufe 8 / STEP 8  
 P = 100kW  
 U = 3~400VAC/50Hz  
 I = 3~144,5A  
 R = 3~1,6 Ω

Stufe 9 / STEP 9  
 P = 100kW  
 U = 3~400VAC/50Hz  
 I = 3~144,5A  
 R = 3~1,6 Ω

Stufe 10 / STEP 10  
 P = 100kW  
 U = 3~400VAC/50Hz  
 I = 3~144,5A  
 R = 3~1,6 Ω

-> nur bel / ONLY AT:  
 CONCEPT 300-500kW

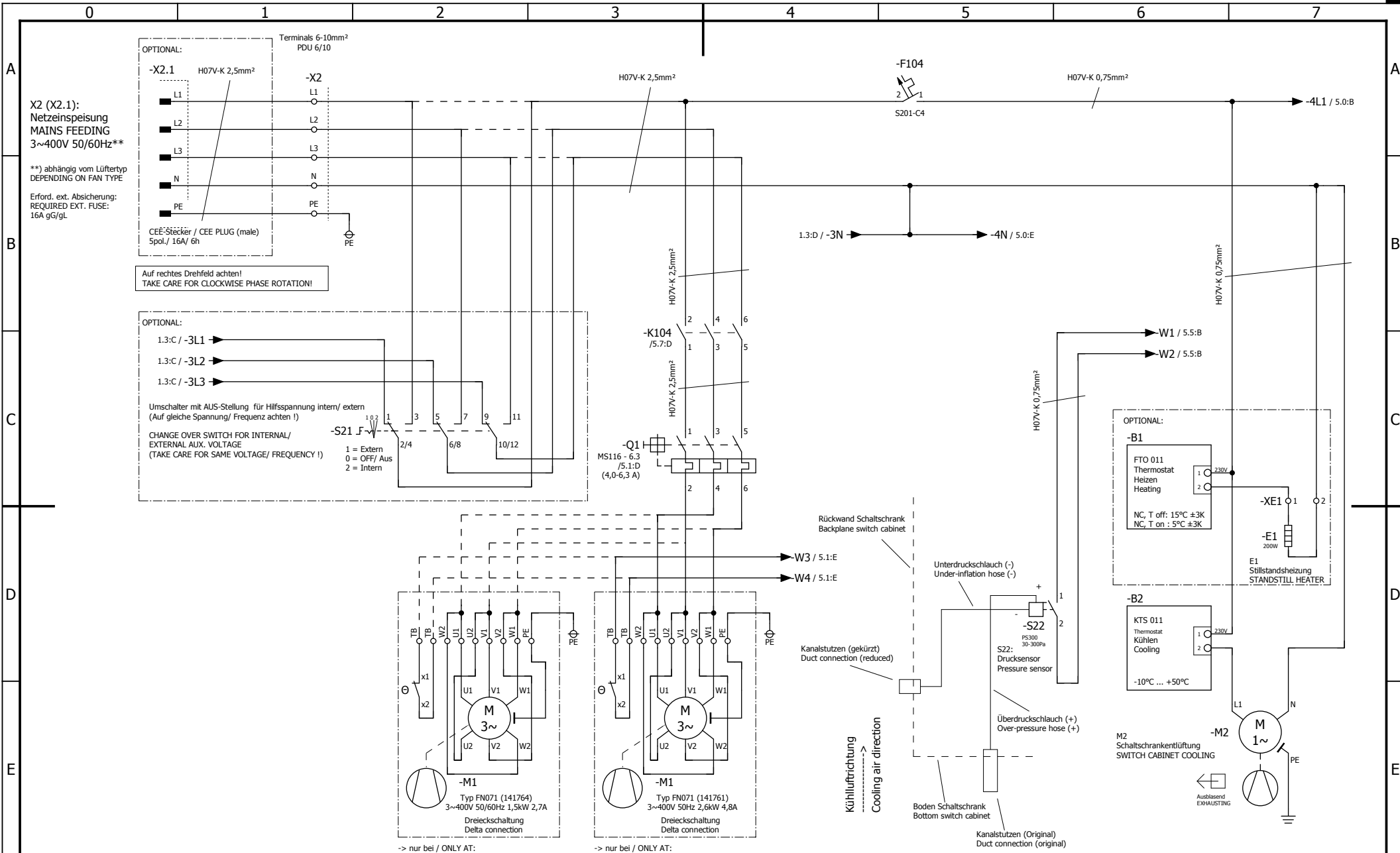
-> nur bel / ONLY AT:  
 CONCEPT 400-500kW

-> nur bel / ONLY AT:  
 CONCEPT 500kW

2			Datum: 28.04.2016	Kunde:
c			Name: W. Pastoor	Client:
b			Geprüft: W. Pastoor	
a			Ursprung:	
Zustand:	Datum:	Name:	Ersetzt von:	Ersetzt durch:
Revision:	Date:	Name:	Substitution of:	Substituted by:

Wärtsilä JOVYATLAS EUROATLAS GmbH Fennenweg 4, 26844 Jemgum, Germany www.jovyatlas.com	Beschreibung / Description: Lastwiderstand/ Load bank CONCEPT 100/5kW-500/5kW Steuerung Drehschalter/ Rotary switches	Allgemeine Bezeichnung / General description: Stromlaufplan/ Circuit diagram	=
		Zeichnungs-Nr.: R60 005 01. Auftrags-Nr.:	+
		Blatt: 3 von 5 Page: of	





**Kühlung Lastwiderstand**  
 Load resistor cooling

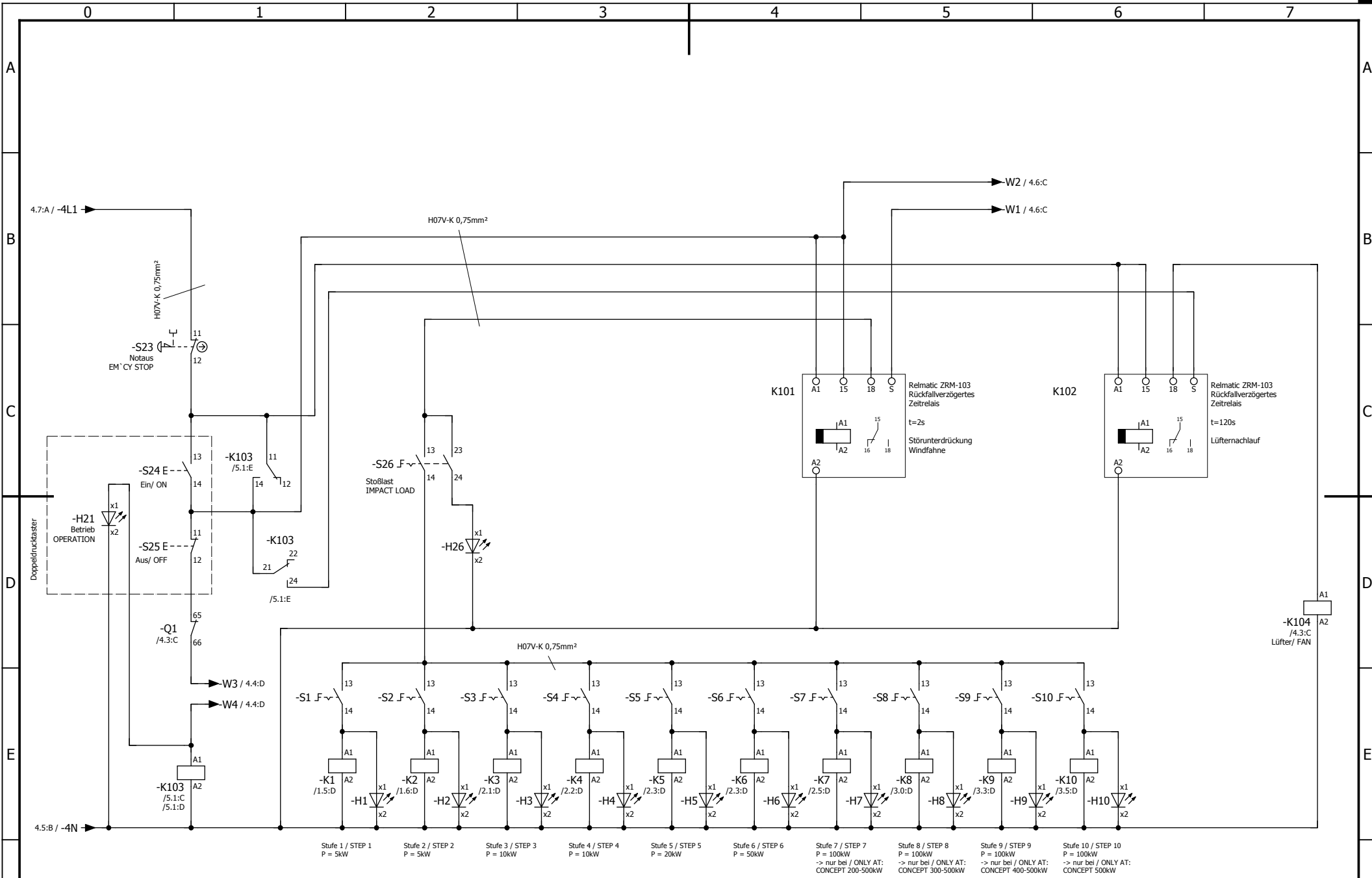
**Überwachung Lüfter M1**  
 Monitoring fan M1

**Schaltschrankklimatisierung**  
 Switch cabinet air-conditioning

3		Datum: 28.04.2016		Kunde:		Beschreibung / Description:		Allgemeine Bezeichnung / General description:	
c		Name: W. Pastoor		Client:		Lastwiderstand/ Load bank		Stromlaufplan/ Circuit diagram	
b		Geprüft: W. Pastoor				CONCEPT 100/5kW-500/5kW		=	
a		Ursprung: Origin:		Ersetzt von: Substitution of:		Steuerung Drehschalter/ Rotary switches		+	
Zustand: Revision:		Datum: Date:		Name: Name:		Ersetzt durch: Substituted by:		Zeichnungs-Nr.: R60 005 01.	
0		1		2		3		Auftrags-Nr.: Order-no.:	
0		1		2		3		Blatt: 4 von 5	
0		1		2		3		Page: 4 of 5	



Zeichnungs-Nr.: R60 005 01.  
 Auftrags-Nr.: Order-no.:



4		Datum: 28.04.2016		Kunde: Client:		Beschreibung / Description:		Allgemeine Bezeichnung / General description:	
c		Name: W. Pastoor				Lastwiderstand/ Load bank		Stromlaufplan/ Circuit diagram	
b		Geprüft/ Checked: W. Pastoor				CONCEPT 100/5kW-500/5kW		Zeichnungs-Nr.: R60 005 01.	
a		Ursprung/ Origin:		Ersatz von/ Substitution of:		Steuerung Drehschalter/ Rotary switches		Auftrags-Nr.: Blatt: 5 von 5	
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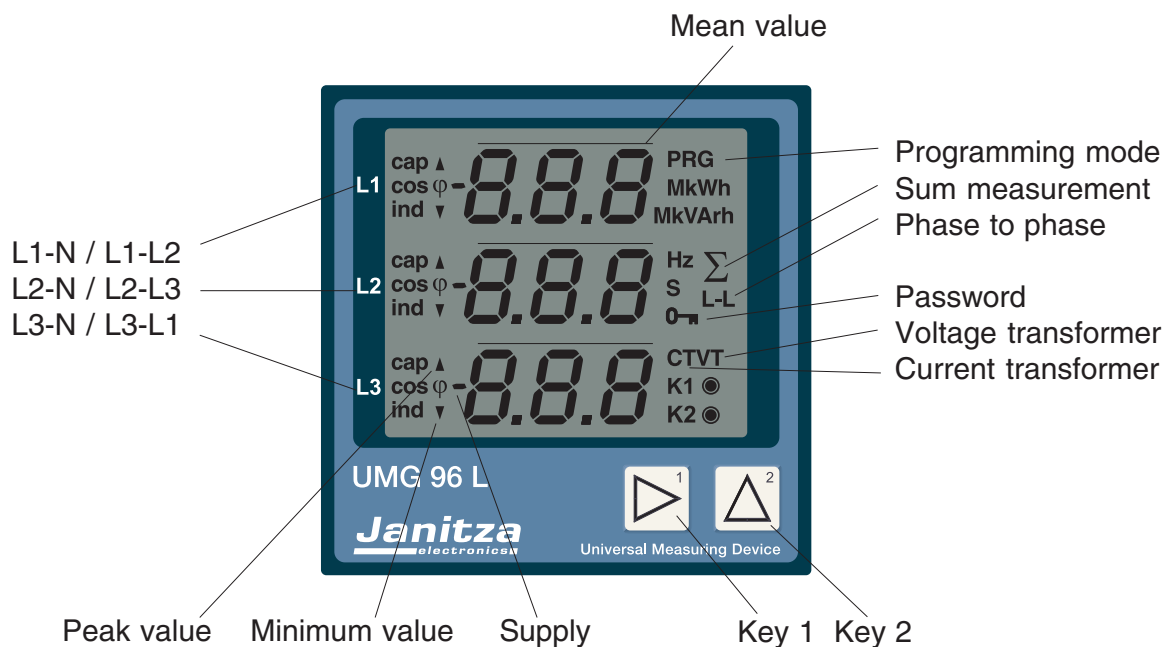
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# Universal Measuring Device UMG96L

## Operating Instructions

Brief instructions see last page



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Issue Note  
13.01.2004      First Edition.

## The meaning of symbols

The symbols, which are used in this manual, have the following meaning:



Beware of dangerous electrical voltage.



This symbol shall warn you about possible danger, which can occur during installation, putting into service and usage.

## Hints for the user

This device may be inserted and used by qualified personnel only according to the safety regulations. Please follow the legal and safety regulations for the corresponding application while using the device.

Qualified personnel are persons, who are familiar with installation, mounting, putting into service and operation of the product and have qualifications according to their occupation, for example:

- Education or instruction resp. the right to switch on or off, ground or characterize current circuits or devices according to the standards of safety techniques.
- Education or instruction in care and use of safety equipment according to the standard safety techniques.



### Attention!

If the device is not used according to this manual, a safe use cannot be granted, and the instrument might cause danger.



### Attention!

If a UMG 96L is installed in panels of metal, the panel must be earthed.

## Receipt control

In order to ensure a perfect and safe use of the device, a proper transport, expert storage, erection and mounting and careful usage and maintenance is required. In case that a safe operation can no longer be granted, the device has to be put out of service and has to be protected against unintentional putting into service.

A safe operation can no longer be assumed, if the device

- shows visible damage,
- does not work in spite of intact net supply,
- has been exposed to disadvantageous conditions for a longer time (e.g. storage beyond allowed climate without adaption to the room climate, dew etc.) or transport use (e.g. falling from great height, even without visible damage).

Please test the contents of delivery for completion, before starting the installation of the device.

### Contents of delivery

- 1 pc. UMG96L,
- 2 pcs. fixing brackets,
- 1 pc. manual.

As an option, a seal with part no. 29.01.907 can be delivered.

All delivered options and versions are listed on the delivery papers.



This manual also describes options, which have not been delivered and do not belong to the contents of delivery.

## Hints for maintenance

Before delivery the device is tested in various safety checks and marked with a seal. If the device is opened, these checks must be repeated.

For instruments, which are opened outside the manufacturing works, no warranty is granted whatsoever.

### Repairing and calibration

Repairing and calibration work can be carried out in the manufacturing works only.

#### Front foil

The cleaning of the front foil has to be effected with a soft cloth using a common cleansing agent. Acid or acidic agents are not allowed for cleaning.

### Waste management

The UMG96L can be disposed and recycled as electrical waste according to the legal regulations.

## Service

If there are questions, which are not described in this manual, please contact us directly.

For an efficient handling we need the following information:

- Description of device (see type plate),
- Serial digit (see type plate),
- Software Release,
- Measuring and operating voltage and
- detailed description of error.

You can reach us:

Monday until Thursday

between 07:00 and 15:00

and Friday

between 07:00 and 12:00

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# Product description

## Intended use

The UMG96L is suitable for fix mounting and the measurement of voltage, current, power etc. in low voltage switchgear. The measurement is designed for 3 phase systems with neutral conductor (TN and TT-mains).

The UMG96L is suitable for mounting in fix and weather protected panels. Conducting panels must be earthed.

Due to the high resistance against interference, the UMG 96L is suitable for continuous and unsupervised operation.

As the UMG96L receives its power from phase L1 of the measuring voltage, at least phase L1 and the neutral conductor N must be connected.

The attached voltage must be within the range of the measuring and operation voltage shown on type plate.

Either  $\dots/5A$  or  $\dots/1A$  current transformers can be connected to the current measuring inputs.

The connection of the measuring and operating voltage is carried out on the back side of the UMG96L via all-insulated spring power clamps.

The measuring and operating voltages must be connected to the UMG 96L via a separation (switch or power switch) and an overcurrent protection fuse (2-10A) in the building installation. The separation (switch or power switch) must be near the UMG 96L and easily accessible.

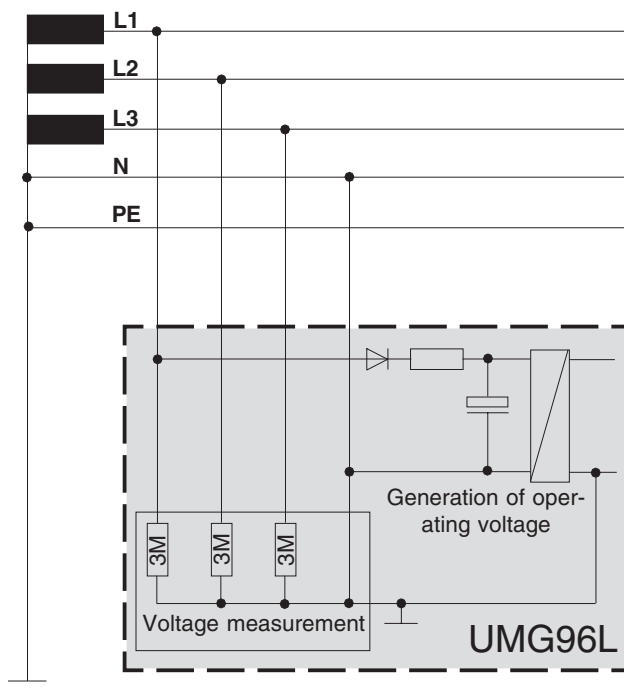
## Functional description

The electrical three phase measurement system determines and digitalizes the effective values of voltages and currents in 50/60 Hz networks.

The operating voltage for operation of UMG96L is generated by the measuring voltage L1-N. A random test measurement is carried out each second at all current and voltage inputs. Measuring signal interruptions, which last longer than one second are safely recognized.

For each random test one period is scanned. From those sampled values the microprocessor calculates the electric quantities. These measured values are indicated within the programmable display. The energy as well as the minimum and maximum values are stored every 15 minutes whereas the programmed data are stored immediately in a non-volatile memory (EEPROM).

The scanning frequency for all measuring inputs is calculated from the net frequency of phase 1. At a net frequency of 50Hz the scanning frequency is 2,5kHz and for 60Hz it is 3,0kHz.



Diagr. Generation of the operating voltage from measurement voltage.

# Installation

## Mounting place

The UMG96L is suitable for a fix insertion into low and medium voltage switchgear. Any mounting position is possible.

## Measuring and operating voltage

The operating voltage of the UMG96L is generated by the measuring voltage. The measurement is designed for three phase systems with neutral conductor (TN and TT mains). The measuring and operating voltages must be connected to the UMG 96L via a separation (switch or power switch) and an overcurrent protection (2-10A) within the building installation. The connection of the measuring and operating voltages is carried out at the back side of the UMG 96L via shock protected spring clamps.

### 230V/400V Standard version

Phase L1 and the neutral conductor N must be connected, and the attached voltage must be within the range of the measuring and operating voltage.

### 120V/220V Special version

Phase L1 and the neutral conductor N must be connected, and the attached voltage must be within the range of the measuring and operating voltage.

### 60V/110V Special version

Phase L1 and the neutral conductor N must be connected, and the attached voltage must be within the range of the measuring and operating voltage.

- The connection wires for the operating voltage leading to the UMG96L must be suitable for voltages up to 300V against ground.

- The measuring and operating voltage has to be protected by a fuse, which must be in the range of **2A to 10A**.

- A switch or power switch for the operating voltage must be provided within the building installation.

- The switch has to be near the instrument and easily accessible.

- The switch must be marked as separation for this instrument.



#### Attention!

The limits indicated in the technical data may not be exceeded, not even while checking and putting into service of the UMG 96L.



#### Attention!

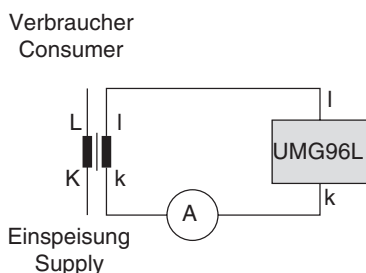
Before the device is connected to voltage for the first time, it should be deposited the installation room for at least 2 hours, to create a temperature assimilation and avoid condensation and dew.



## Current measurement

The current measurement is carried out via  $\dots/5A$  or  $\dots/1A$  current transformers. In case that the current has to be measured by an Amperemeter in addition to the UMG96L, the Amperemeter has to be connected in series to the UMG96L.

In mains with voltage up to 300VAC against ground, currents up to 5A can be connected and measured directly to the UMG 96L.



Diagr. Connection example: UMG96L with Amperemeter in series.

### Inaccuracy

The inaccuracy of the current measuring input is  $\pm 1\%$  of the measuring range (5A). Therefore, the inaccuracy of the current measurement is  $\pm 50mA$ .

#### Example: Inaccuracy

With a current transformer 200/5A, the measuring range is 200A. The inaccuracy is  $\pm 1\%$  of 200A =  $\pm 2A$ .

### Resolution

The maximum resolution of the current measuring inputs is 10mA. The indication changes in 0.01A steps.

#### Example: Resolution current transformer 200/5A

With a current transformer ratio of 200/5A, a resolution of  $10mA \cdot 40 = 400mA$  is effected. The display changes in 0.4A steps.

### Small currents

The minimum working current is 20mA. At short circuited or open current measurement input, the UMG 96L can indicate a small current. This current is within the range of the allowed measurement inaccuracy.

## Sum current measurement

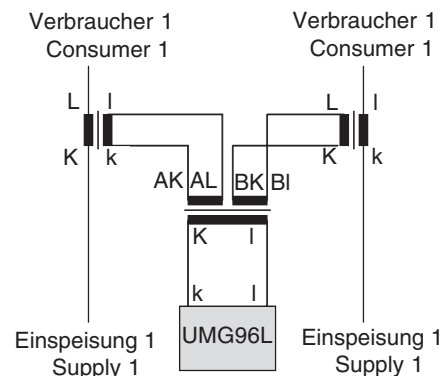
If the current measurement is carried out via two current transformers, the total transformer ratio must be set to the UMG96L.

#### Example: Sum current transformer

A current measurement is carried out via one current transformer with a ratio of 1000/5A and another one with a ratio of 200/5A. The sum measurement is carried out with a sum transformer 5+5/5A.

The UMG96L has to be programmed as follows:

Primary current:  $1000A + 200A = 1200A$   
 Secondary current: **5A**



#### Attention!

Current transformers may not be handled in open condition of the secondary, as the secondary clamps can lead live voltage.



#### Attention!

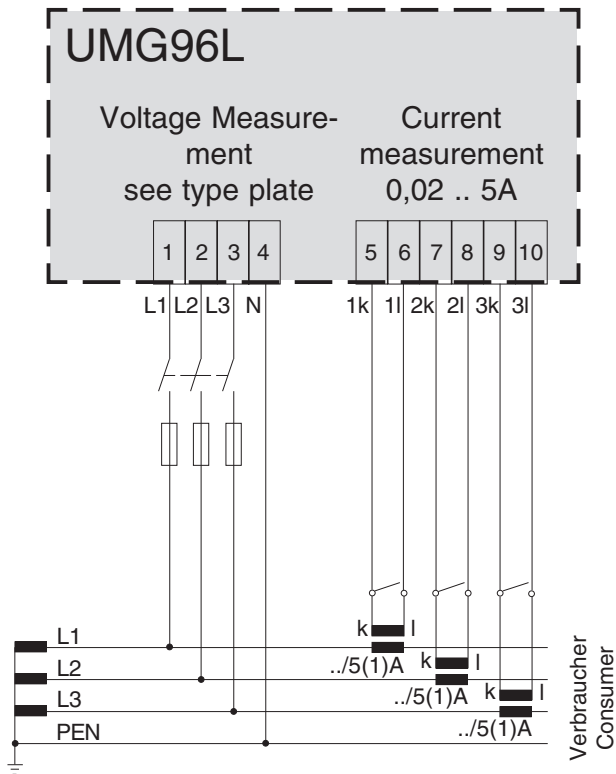
Prior to connecting or exchanging the UMG 96L, the secondary clamps of the external current transformers have to be short circuited.



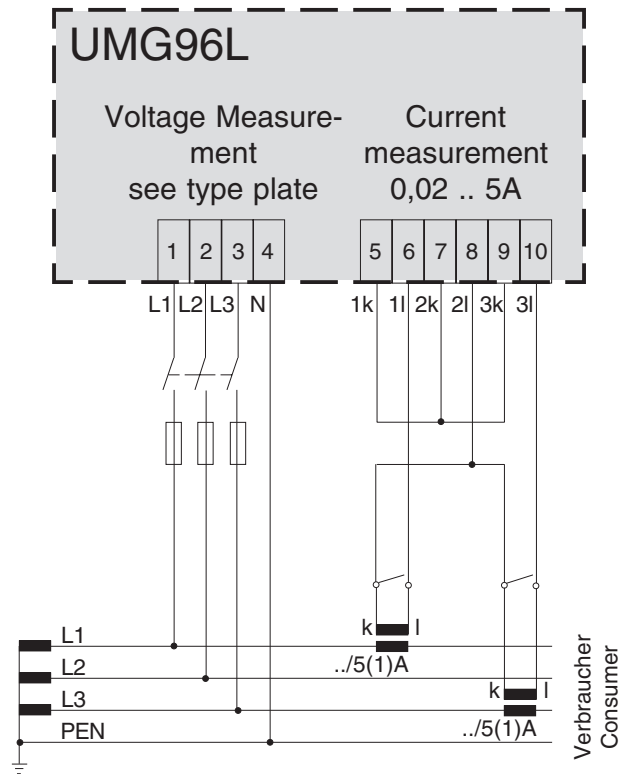
#### Attention!

The program allows current and voltage transformer ratio setting only, if the maximum phase power can reach up to 50.0MW and the sum power can reach a maximum value of 150.0MW.

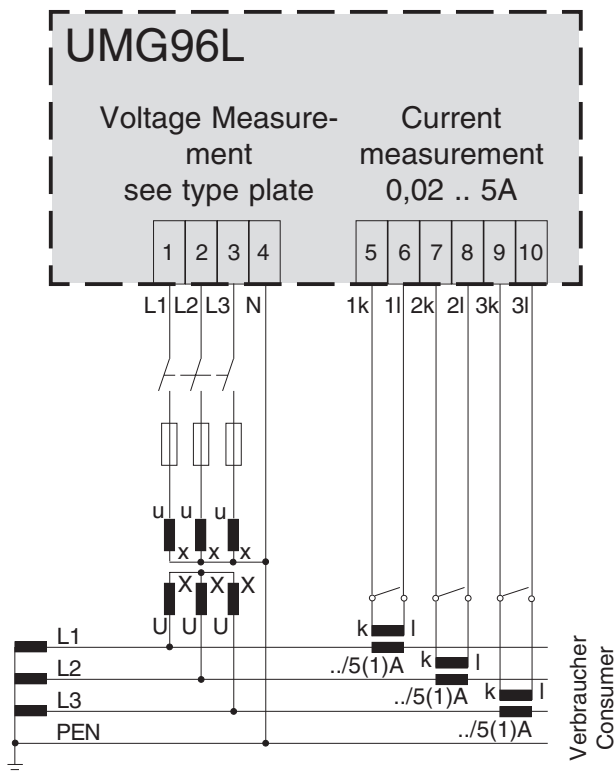
## Connecting options



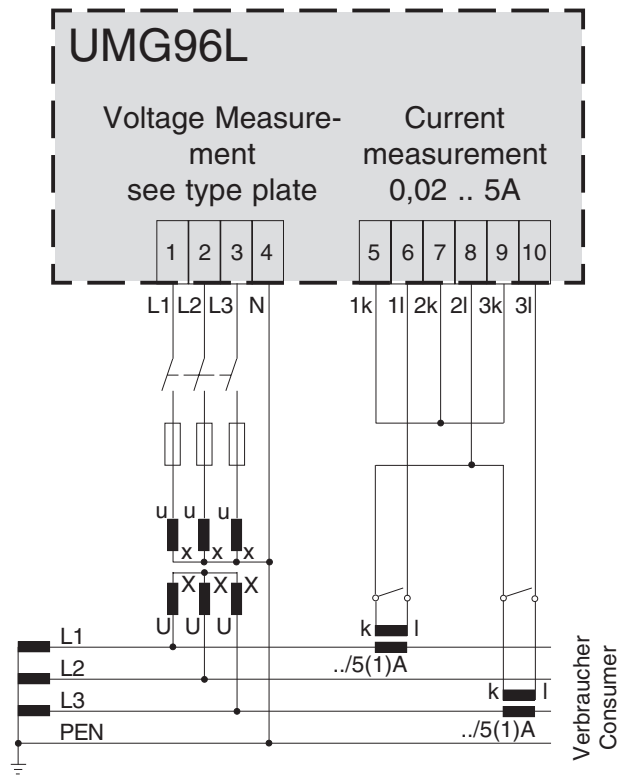
Diagr.: Connection example 1  
Four wire measurement with three current transformers



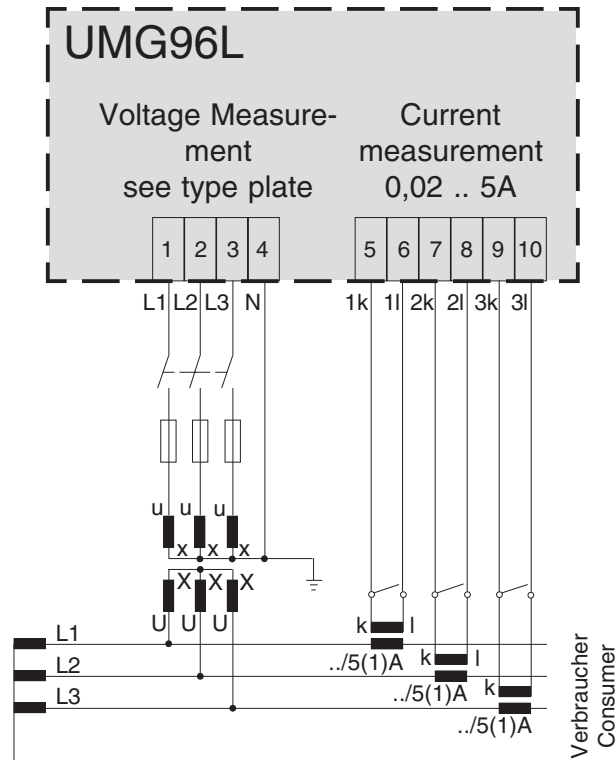
Diagr: Connection example 2. Four wire measurement with two current transformers.



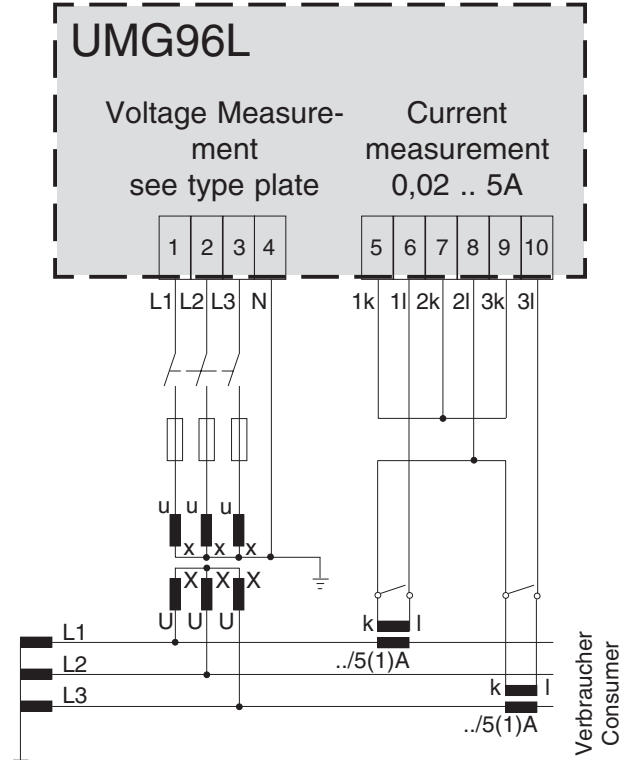
Diagr.: Connection example 3  
Measurement with three voltage transformers and three current transformers.



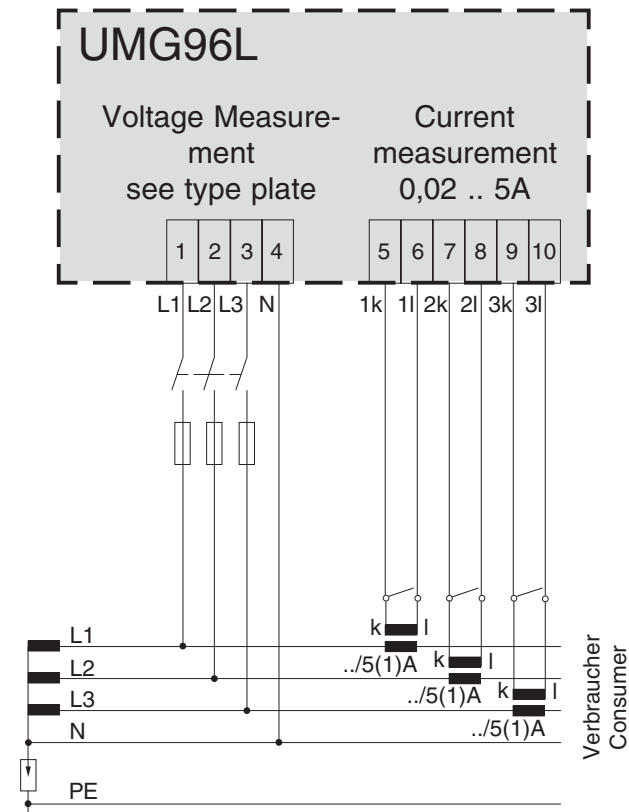
Diagr.: Connection example 4  
Measurement with three voltage transformers and two current transformers.



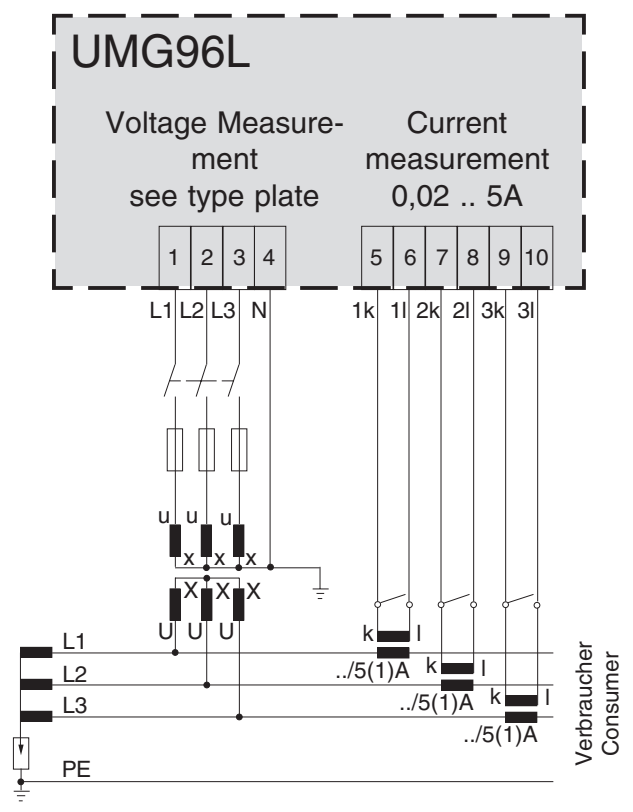
Diagr.: Connection example 5  
Medium voltage measurement with three voltage transformers and three current transformers.



Diagr.: Connection example 6  
Medium voltage measurement with three voltage transformers and two current transformers.



Diagr.: Connection example 7  
Measurement in **IT networks** via three current transformers.



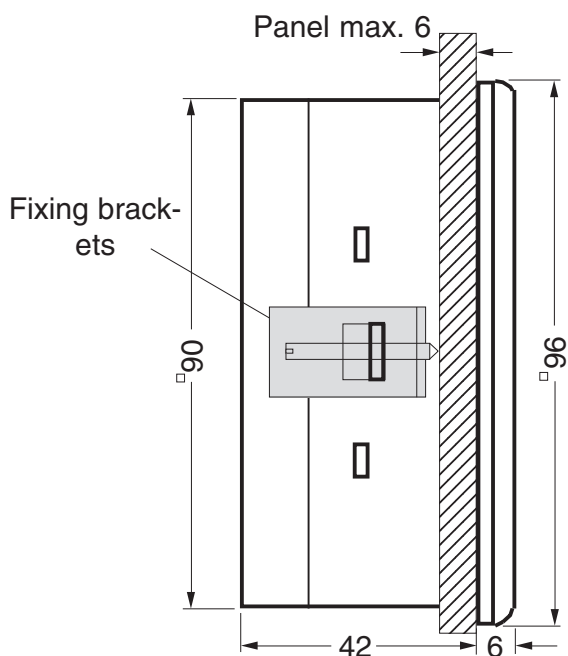
Diagr.: Connection example 8  
Measurement in **IT networks** with three voltage transformers and three current transformers.

## Putting into service

The putting into service of the UMG 96L should be carried out as follows:

### Installation

The UMG96L is designed for mounting in low voltage distributions, which contain overvoltage in measurement category III. The UMG96L is suitable for installation in fixed and weather proof panels. Conducting panels must be earthed. Any mounting position is possible. For mounting on front panels or doors, the delivered fixing brackets have to be used.



Diagr. Side view

### Attach measuring and operating voltage

The allowed measuring and operating voltage of UMG 96L is indicated on the type plate.



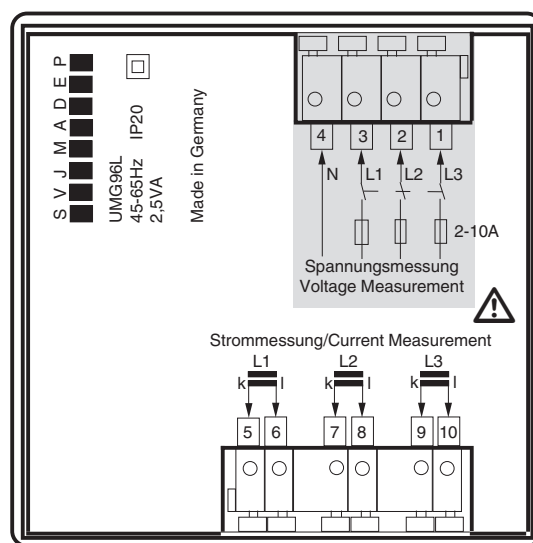
#### Attention!

Mesuring and operating voltage, which do not correspond to the indication on the type plate, can lead to malfunction and damage of the instrument.

The connection wires for measuring voltage leading to the UMG96L must be suitable for voltages up to 300V against ground and 520V phase to phase.

After connecting the stated measuring and operating voltage to the UMG 96L, all segments of the display appear. After approx. two seconds, the UMG 96L switches to the first measured value indication.

In case that no indication appears, please check, if the attached operating voltage is within the rated voltage range.



### Program current and voltage transformers

When the device leaves the manufacturer, a current transformer of 5/5A is set.

The set voltage transformer ratio has to be changed only, if a voltage transformer is connected.

When connecting voltage transformers, please observe the allowed measuring and operating voltage stated on type plate!

### Connect measuring current

The UMG96L is designed for the connection of  $\dots/1A$  and  $\dots/5A$  current transformers. With the current inputs, only alternating current but no direct current can be measured.

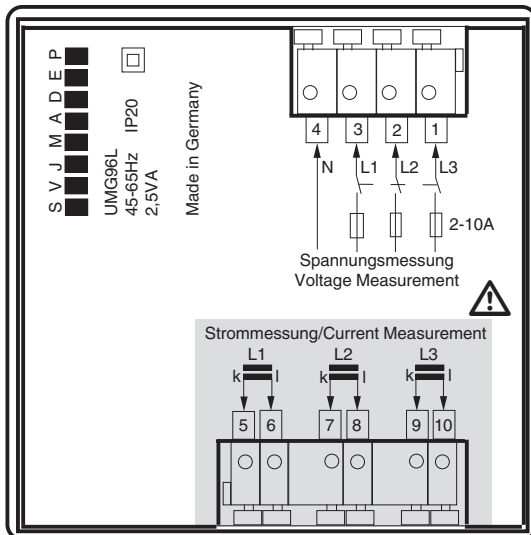


#### Attention!

Current transformers may not be handled in open condition, as there might be live voltage at the secondaries.

Please connect the current inputs one after the other, and compare the indicated current of the display with the actual current. Please note, that the current transformer ratio is set to 5/5A and has to be adapted to the existing current transformers.

In case that the current transformer is short circuited on the secondary, the indicated current at the corresponding conductor at UMG 96L has to decrease to a value, that corresponds to the secondary current plus tolerance. The current indicated by UMG 96L, has to conform to the input current, under consideration of the current transformer and tolerance.



### Check phase assignment

The assignment of the outer conductors to the current transformer is correct, if a current transformer is short circuited on the secondary, and the indicated current in the corresponding phase decreases to a value at the UMG96L, which corresponds to the secondary current plus tolerance.

### Check current direction

Short circuit two current transformers on the secondary. The real power in the connected phase has to be:

Positive (+) for consumption of real power and negative (-) for supply of real power (power station service).

In case that no real power is indicated, the assignment of voltages and currents may be wrong.

### Check measurement

Provided that all voltage and current inputs are connected correctly, the phase and sum power is calculated and displayed correctly.

### Check phase power

In case that a current transformer is assigned to the wrong outer conductor, the corresponding power is measured and indicated incorrectly.

The assignment of the outer conductor and current transformer is correct, if no voltage is measured between the outer conductor and the primary of the corresponding current transformer.

To ensure that the outer conductor at the voltage input is assigned to the right current transformer, please short circuit the secondary of the corresponding current transformer. The apparent power of this phase at UMG 96L must be indicated by zero.

If the apparent power is indicated correctly, but the real power has a „-“ sign, the current transformer clamps are interchanged, or power is supplied to the energy supplier.

### Check sum power

Provided that all voltage, current and power in the corresponding phase is indicated correctly, the sum power must be displayed correctly by UMG 96L either.

For verification, the sum power measured by UMG96L should be compared to the energy stated by the real and reactive energy counters of the supplier.

## Elimination of errors

Error	Reason	Elimination
Display dark.	Prefuse released. Device defective.	Insert fuse. Send the device to the producer for repair.
Measured value cannot be called up.	The indication has been deleted from measured value selection.	Add the required measured value indication to the measured value selection.
No current indication.	Corresponding voltage is not connected.	Connect corresponding voltage.
Current too small.	Current measurement in wrong phase	Check and correct connection.
Current incorrect.	Current measurement in wrong phase Current transformer programmed incorrectly. Measuring range exceeded.	Check and correct connection. Read ratio of current transformer and program accordingly. Insert a current transformer with a higher ratio.
	The current peak at measuring input was exceeded caused by harmonic waves.	Insert a current transformer with a higher ratio. Attention! Please ensure, that the measuring inputs are not overloaded. Insert a current transformer with a smaller ratio.
	The current at measuring input was below measuring range.	Check and correct connection.
Voltage L-N incorrect.	Measurement in wrong phase. Voltage transformer ratio programmed incorrectly.	Check and correct connection. Read the voltage transformer ratio at the voltage transformer and program accordingly.
Voltage L-L too small / too high.	Phase conductors interchanged. N not connected. Voltage transformer ratio programmed incorrectly.	Check and correct connection. Check and correct connection. Read voltage transformer ratio at the voltage transformer and program accordingly.

Error	Reason	Elimination
Phase shift ind/cap.	Current path is assigned to the wrong voltage path.	Check and correct connection.
Programmed data get lost.	The device was exposed to electro magnetical disturbance, which was higher than those mentioned in the technical data.	Improve external protection measures such as protection, filtering, earthing and local separation.
Real power too small / too high.	Current transformer ratio is programmed incorrectly. Current path is assigned to the wrong voltage path.	Read current transformer ratio and program accordingly. Check and correct connection.
Real power supply / consumption interchanged.	At least one current transformer connection is interchanged. Current path is assigned to the wrong voltage path.	Check and correct connection. Check and correct connection.
„Err“ in display.	See „error messages“	
The device does not operate in spite of the above.	Device defective.	Please send the device back to the producer with a detailed description of the error.

## Error messages

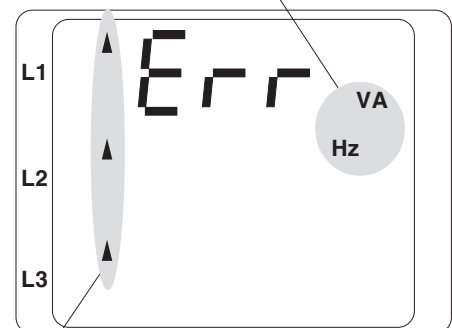
While exceeding an allowed measured value range, the UMG 96L indicates the error message „Err“.

An exceeding of a measured value range arises, if at least one of the three existing current or voltage inputs or the frequency is out of the specified measuring range.

The symbols "V", "A" and „Hz“ indicate, which measured value is out of range.

The phase is marked by the arrows upwards in which the exceeding occurred.

A = Current path  
V = Voltage path  
Hz = Frequency



Exceeding of measuring range in phase L1/L2/L3



### Attention!

Voltage and current beyond the specifications may destroy the device.

## Usage and indication

The usage of the UMG96L is carried out via the keys one and two. Measured values and programming data are indicated on the liquid crystal display. You must distinguish between

Indication mode and  
Programming mode.

By entering a password, you can avoid unintentional change of programming data.

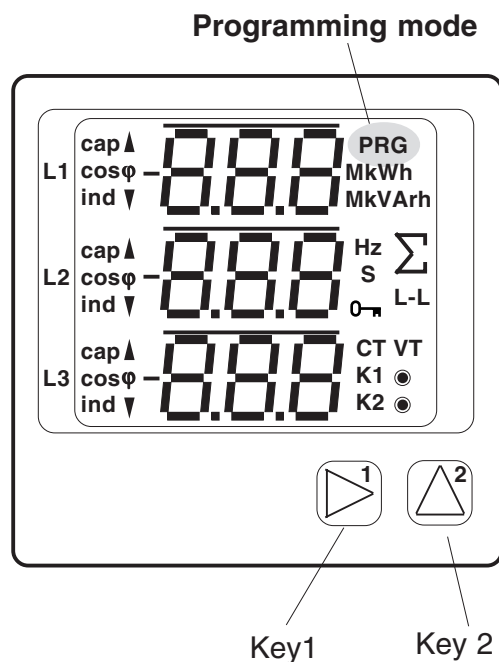
### Indication mode

In indication mode please scroll through the programmed measured value indications by using the keys 1 and 2. When the device is delivered, you can call up all measured values shown in table 1. For each measured value indication, up to three measured values are indicated. The measured value rotation allows to indicate all selected measured values on an alternate basis with a selectable changing time.

### Programming mode

In programming mode the settings, which are necessary for the operation of the UMG96L, can be indicated and changed. Pressing the keys 1 and 2 simultaneously for about 1 second, you reach programming mode via the password indication. If no user password is programmed, you reach the first programming menu directly. The programming mode is marked with the text „PRG“ in the display. With key 2 you can shift between the programming menus.

If you are in the programming mode and no keys are pressed for 60 seconds, or you press the keys 1 or 2 simultaneously for approx. 1 second, you return to the indication mode.



#### Programming menus:

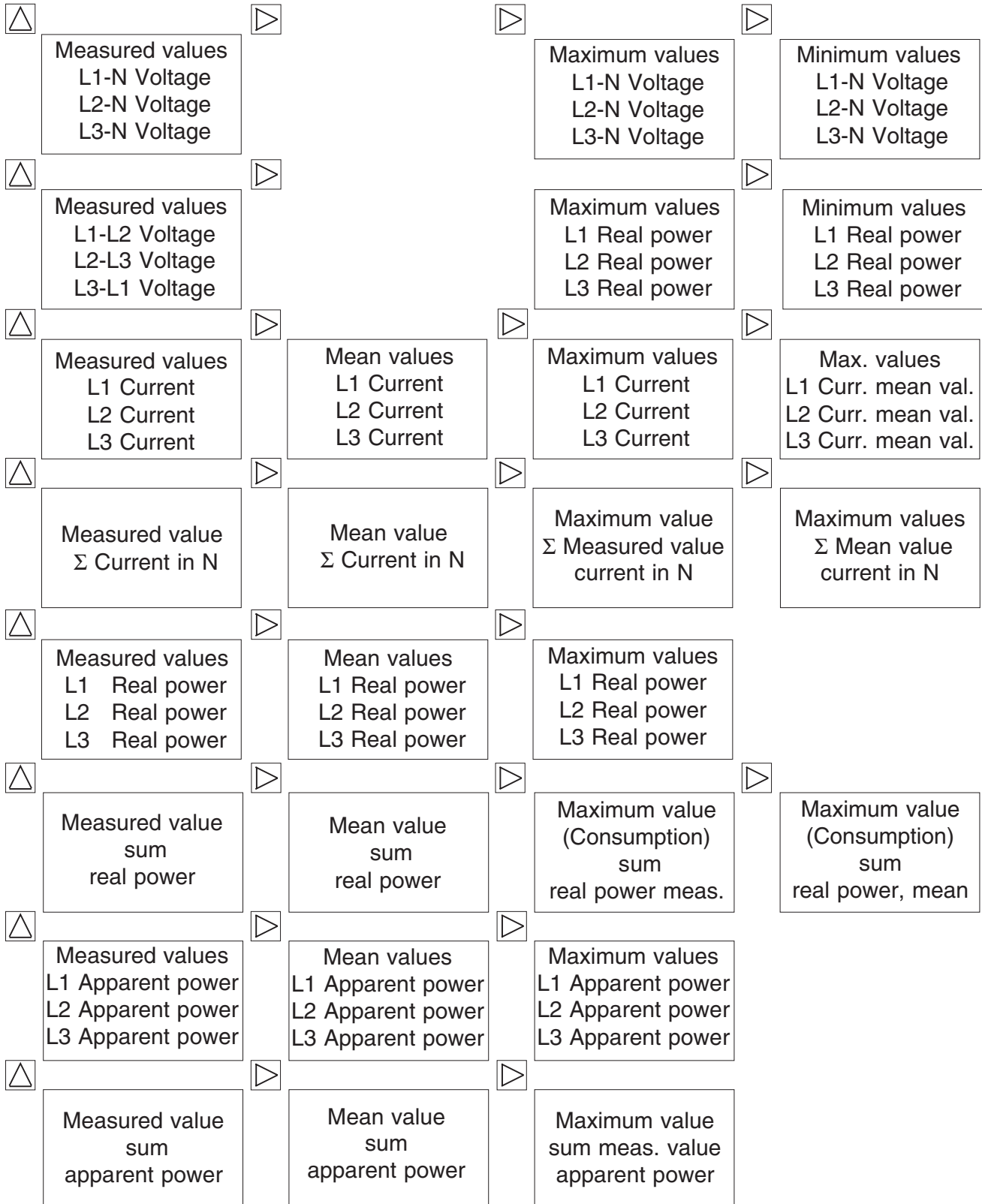
- Current transformer,
- Voltage transformer,
- Averaging times,
- Measured value indications**
  - Changing time,
  - Measured value selection,
  - Measured value rotation,
- Delete minimum and peak values,
  - Delete energy,
  - LCD contrast,
  - Software Release,
  - User password.

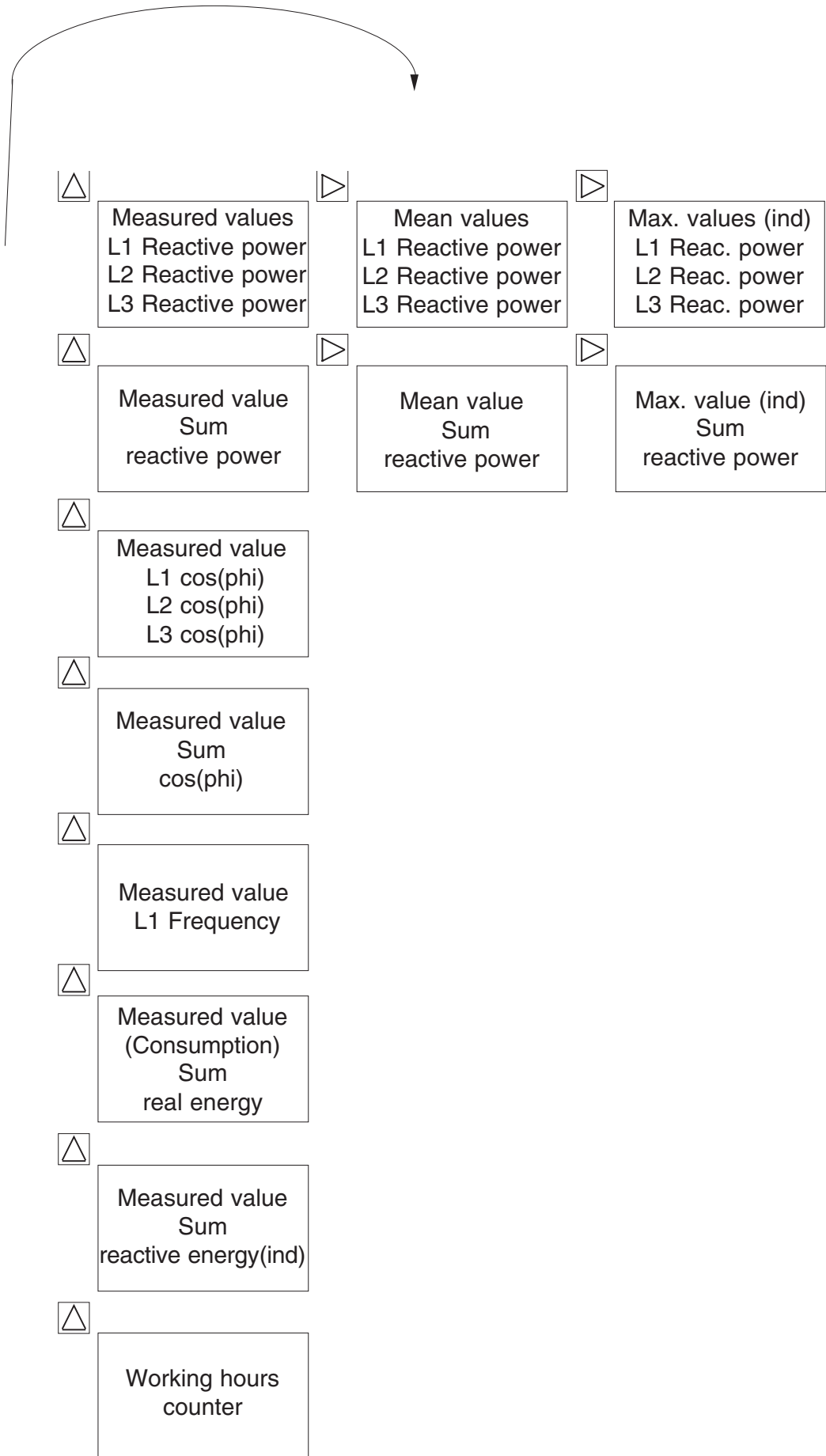


# Key functions

	Indication mode	Password	Programming mode
Change mode	<p>simultaneous</p> <p>simultaneous</p>		
Scroll			
Programming			

## Table, measured value indication





## Current transformer

Current transformers with either 1A or 5A secondary can be connected to the UMG96L.

A transformer ratio of 5A/5A is preset by the manufacturer. In programming mode the current transformer setting is marked by the symbol „CT“.

### Programming

In programming mode please scroll to the current transformer ratio by pressing key 2. Confirm the selection by pressing key 1.

The first digit of the primary current flashes and can be changed by pressing key 2.

If key 1 pressed again the next digit will be selected and flashes now.

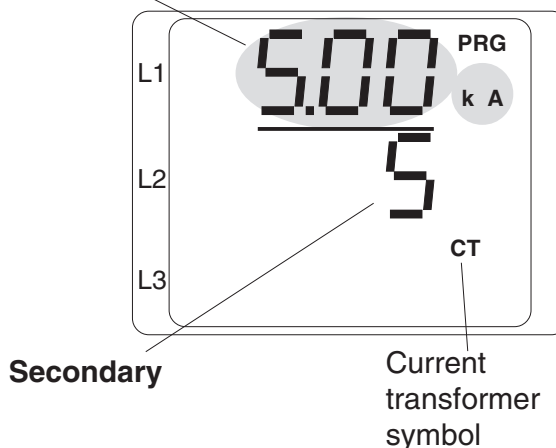
If the entire digit flashes, the decimal point can be moved.

Press key 2 shortly - The decimal point moves to the right.

Press key 2 longer - The decimal point moves to the left.

If no digit flashes anymore, you can shift to the indication of the voltage transformer.

Primary (5.00kA = 5000A)



### Example: Sum current transformer

A current measurement is carried out via two current transformers, one with a ratio of 1000/5A and another transformer with a ratio of 200/5A. The sum measurement is carried out with a sum current transformer 5+5/5A.

The UMG96L has to be programmed with the following values:

Primary current:  $1000A + 200A = 1200A$   
Secondary current: **5A**



### Attention!

The program allows current and voltage transformer ratio setting only, if the maximum phase power can reach up to 50.0MW and the sum power can reach a maximum value of 150.0MW.

## Voltage transformer

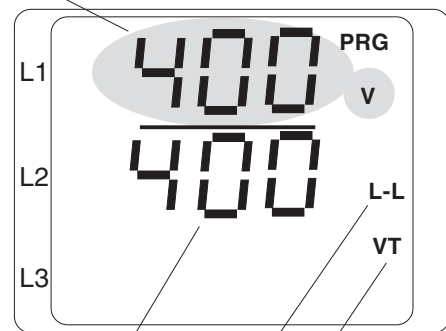
The phase to phase voltage (L-L) is indicated on display of the UMG 96L as secondary and primary voltage. The transformer ratio is calculated from the programmed primary and secondary voltage. In programming mode, the voltage transformer settings are marked by the symbol „VT“.

The standard version is preset by the manufacturer with a ratio of 400V/400V.

The **secondary voltage** is always indicated in „V“. The corresponding symbol „V“ is **not** displayed.

The **primary voltage** is indicated in „V“ or „kV“. The corresponding symbol is displayed in „V“ or „kV“.

### Primary voltage



### Secondary voltage

Phase to phase  
Voltage transformer ratio

UMG96L		Setting range voltage transformer	
Version	Type plate	L-L secondary	L-L primary
<b>Standard version</b>	<b>196 .. 255V</b>	<b>400V</b>	100V .. 60kV ( <b>400V</b> )
Special version	90 .. 160V	<b>200V, 220V</b>	100V .. 60kV ( <b>200V</b> )
Special version	45 .. 80V	<b>100V, 110V</b>	100V .. 60kV ( <b>100V</b> )

## Programming

In programming mode, please scroll to the voltage transformer setting by pressing key 2. Confirm selection with key 1.

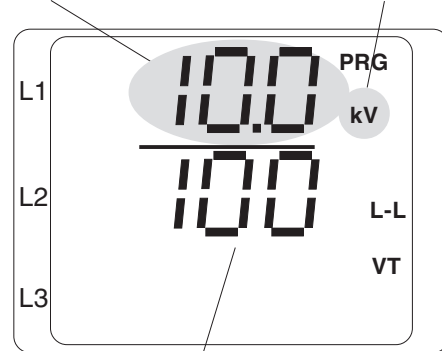
The first digit of the primary voltage flashes and can be changed by pressing key 2.

If key 1 is pressed again the next digit will be selected and flashes.

If the entire digit flashes, you can move the decimal point.

If no digit flashes anymore, you may shift to indication and programming of the outputs by pressing key 2.

### Primary voltage is 10,0kV



### Secondary voltage is 100V

*Example: Voltage transformer ratio 100V/10kV*



### Attention!

The program allows current and voltage transformer ratio setting only, if the maximum phase power can reach up to 50.0MW and the sum power can reach a maximum value of 150.0MW.

## Averaging times

A mean value is calculated for the most at the current and power values. A common averaging time for the current measured values L1, L2, L3 and N , as well as one for power measured values, real power, apparent power and reactive power is programmable.

Presettings:

Averaging time of currents = 900 seconds

Averaging time of power = 900 seconds

The following averaging times are selectable:  
5, 10, 30, 60, 300, 480, 900 seconds

## Programming of averaging time

### Averaging time for real power

In programming mode please scroll to the averaging time for power with key 2. Confirm selection by pressing key 1.

The averaging time flashes and can be changed by pressing key 2. Confirm changed averaging time with key 1.

The averaging time stops flashing. The averaging time for power has been programmed.

By using key 2 you can now shift to programming menu „Averaging time for current“.

### Averaging time for Currents

In programming menu please scroll to the averaging time for currents. Confirm selection by pressing key 1.

The averaging time flashes and can be changed by pressing key 2. Confirm changed averaging time with key 1. The averaging time stops flashing. The averaging time for currents has been programmed. By using key 2 you can now shift to programming menu „Rotation time“.

## Method of taking the mean

The used exponential method reaches at least 95% of the measured value after the set averaging time.

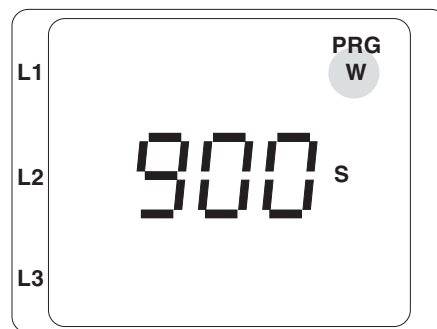
$$ME_n = ME_{n-1} + (MA - ME_{n-1}) / N$$

$ME_n$  = indicated mean value

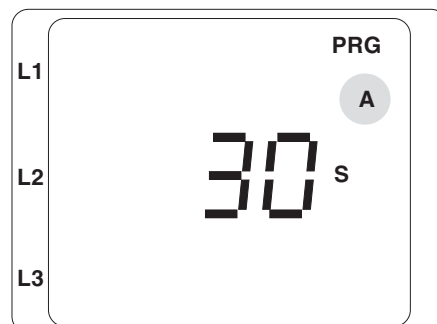
MA = measured value

n = consecutive digit

N = digit of measured values, of witch mean values shall be built.



Example for the averaging time of real power mean value, here 900 seconds.



Example for the averaging time of current mean value, here 30 seconds.

## Measured value indication

Once in a second all measured values are calculated and can be indicated on the display. Two methods are available for calling up the measured value indications (see table 1).

- The selection of measured value indications via the keys 1 and 2, herein called **measured value selection**.

- The automatically rotating indications of selected measured value indications, herein called **measured value rotation**.

A **measured value rotation time** has to be programmed additionally for the measured value rotation.

All measured values for the measured value selection are preset by the manufacturer. For the automatic rotation nothing is preset by the manufacturer. The rotation time is preset with 0 seconds.

## Measured value rotation time

Both methods are available simultaneously. The measured value rotation is programmed, if at least one measured value indication and one measured value rotation time bigger than 0 seconds is programmed. If no key is pressed for about 60 seconds, an automatic change to rotation mode will be carried out, and all programmed measured values will be indicated one after the other.

Setting range of measured value rotation time:  
0 .. 250 seconds

If 0 seconds are programmed, no rotation will be carried out. Nevertheless, measured value indications which are not programmed in the *measured value selection*, can be used for measured value rotation.

Rotation time in seconds indicated

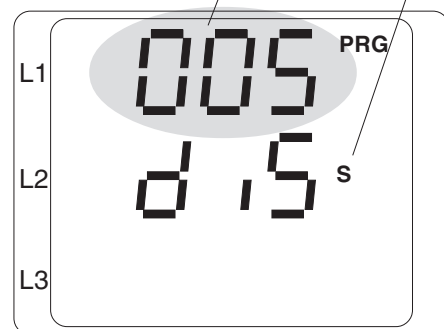


Abb.

## Programming

In programming mode please scroll to the menu measured value rotation, by using key 2. Confirm selection with key 1.

The first digit of the rotation time flashes and can be changed by pressing key 2. By pressing key 1 again the next digit will be selected and flashes.

If no digit flashes anymore, you can shift to programming menu „*Measured value selection*“ by pressing key 2.

## Measured value selection

All measured values stated in table 1 (see page 16 and 17) can either be displayed via keep 1 and 2 **measured value selection** or automatically **measured value rotation**.

All measured values for the **measured value selection** are preset by the manufacturer. For the automatic **measured value rotation** nothing is preset by the manufacturer.

The condition of the selection is indicated by the output symbols. These symbols have the following meaning:

### Measured value selection

- **K1** The indication can be reached via the keys.
- **K1** The indication cannot be reached via keys.

### Measured value rotation

- **K2** The indication changes automatically.
- **K2** The indication does not change automatically.

## Programming

In programming mode please scroll to programming menu **measured value indication** by pressing key 2.

Confirm selection by pressing key 1.

The first measured value indicated stated in table 1 (see page 16 and 17) occurs.

A selection of the measured value indication is carried out by pressing the keys quickly.

Key 1 - Scroll to the right within the measured value indications.

Key 2 - Scroll downwards within the measured value indications.

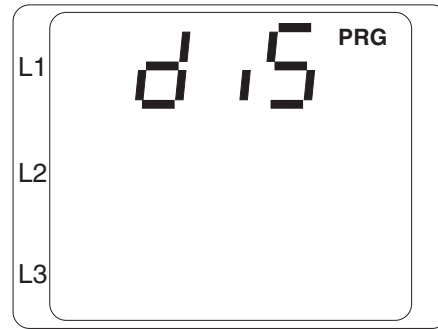
For the selected measured value indication, it can now be determined whether it will be available for measured value selection and for automatic rotation.

The selection is carried out by an extended push on keys 1 or 2.

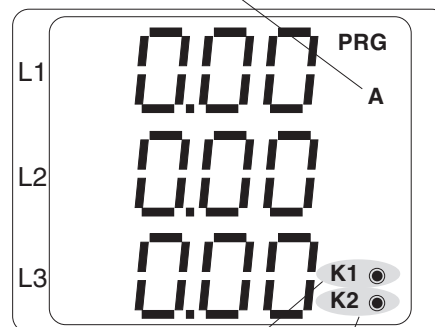
Key 1 - Measured value selection.

Key 2 - Automatic rotation.

Once the programming is finished, you return to indication mode by pressing keys 1 and 2 simultaneously.



Measured value indication of the current values



Measured value selection

Measured value rotation



## Delete minimum and maximum values

In programming mode, „Deletion of minimum and maximum values“ is marked by arrows upwards and downwards. All minimum and maximum values will be deleted simultaneously in menu „Deletion of minimum and maximum values“.

An exception is the maximum value of the current mean value. The maximum value of the current mean value can also be deleted directly in indication menu by an extended pressing of key 2.

### Delete

In programming mode please scroll to “*Deletion of minimum and maximum values*” by pressing key 2.

With key 1 you can shift between the indicated digits 0 and 1. These digits have the following meaning:

- 0 = Minimum and maximum values **not** to be deleted.
- 1 = Minimum and maximum values to be deleted.

Leave menu “Deletion of minimum and maximum values” by pressing key 2. In case that digit 1 was displayed, all minimum and maximum values were deleted.

## Delete energy

The real and reactive energy can only be deleted together via the keys.

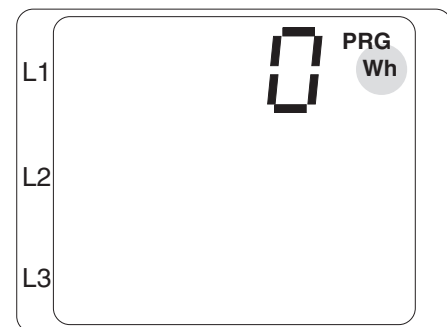
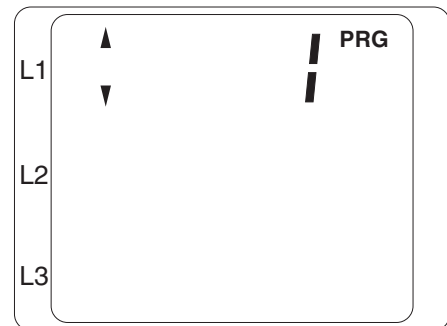
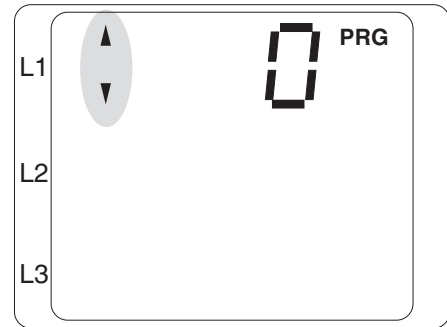
### Delete

In programming mode please scroll to the menu “*delete energy*” by using key 2.

By pressing key 1 you can shift between digits 0 and 1. These digits have the following meaning:

- 0 = Real and reactive energy **not** to be deleted.
- 1 = Real and reactive energy to be deleted.

Leave menu “Delete energy” by pressing key 2. In case that digit 1 was displayed real and reactive energy were deleted.



## Working hours counter

The working hours counter detects the time, in which the UMG96L measures and indicates data. The time is measured with a resolution of 15 minutes and is indicated in hours. The working hours counter cannot be deleted.



*Display example: The UMG96L indicates 40201 working hours.*

## LCD contrast

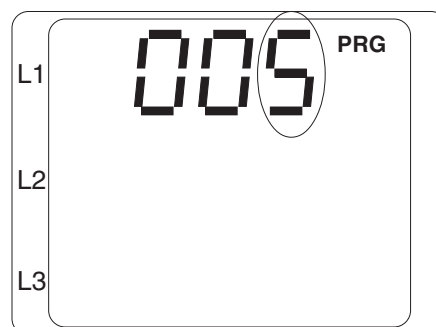
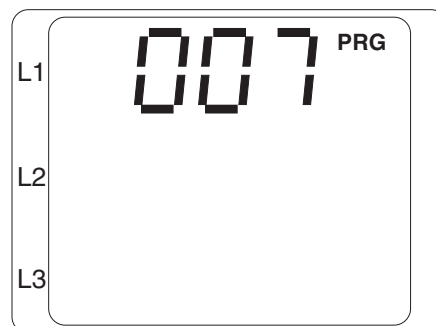
The favoured view for the LCD display is from below. The LCD contrast of the LCD display can be adapted by the user. The contrast setting is possible in the range from 0 to 7.

- 0 = very light
- 7 = very dark

### Programming

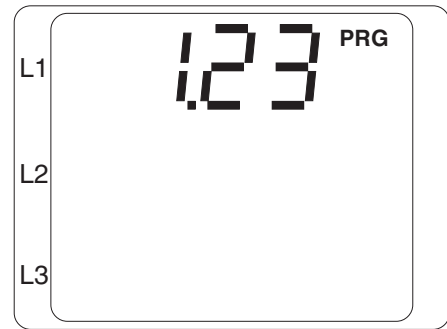
In programming mode please scroll to LCD contrast by pressing key 2. Confirm selection with key 1.

The first digit of the contrast setting is flashing. Move to the right digit with key 1. Now you can change the digit with key 2. Afterwards you can shift to programming menu „user password“ by pressing key 2.



## Software Release

The internal software of the UMG96L will be improved and extended continuously. The software update is registered in the device by a specific number the so called software release. The software release cannot be changed by the user.



*Example: In UMG96L, the software release 1.23 is installed.*

## User password

A user password can be programmed in order to avoid an unintentional change of programming data. Only after entering the correct password, a shifting into the following programming menus possible.

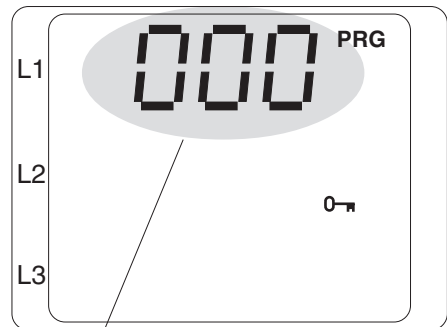
No user password by the manufacturer is pre-set (000). In this case, the password menu will be skipped and you reach the current transformer menu directly.

In case that a user password was programmed, a „000“ appears in the display of the password menu.

The first digit of the password menu flashes and can be changed with key 2. By pressing key 1, the next digit will be selected and flashes.

Only after the correct password was entered, you reach the programming menu for the current transformer.

In case that a changed password is not known anymore, the device must be sent back to the manufacturer.



User password

## Uncertainty of measurement

Quantity	Indicating range	Measuring range <sup>1)</sup>	tolerance allowance <sup>2)</sup>
<b>Meas. and auxiliary volt. 195..255V</b>			
Voltage L-N	0 .. 34kV	196 .. 255V	+/-1,0% rng
Voltage L-L	0 .. 60kV	340 .. 442V	+/-2,0% rng
Current	0,00 .. 9,99kA	0,02 .. 6,00A	+/-1,0% rng
Current in N	0,00 .. 9,99kA	0,06 .. 18,00A	+/-3,0% rng
Real power, consumption, sum	0,00W .. 150MW	3,9W .. 3,825kW	+/-1,5% rng
Real power, supply, sum	-0,00W .. -150MW	-3,9W .. -3,825kW	+/-1,5% rng
Apparent power, sum	0,00VA .. 150MVA	3,9VA .. 3,825kVA	+/-1,5% rng
Reactive power (Q0), sum	0,00var .. 150Mvar	3,9var .. 3,825kvar	+/-1,5% rng
<b>Meas. and aux. volt. 90 .. 160V</b>			
Voltage L-N	0 .. 34kV	90 .. 160V	+/-1,0% rng
Voltage L-L	0 .. 60kV	156 .. 277V	+/-2,0% rng
Current	0,00 .. 9,99kA	0,02 .. 6,00A	+/-1,0% rng
Current in N	0,00 .. 9,99kA	0,06 .. 18,00A	+/-3,0% rng
Real power, consumption, sum	0,00W .. 150MW	1,8W .. 2,4kW	+/-1,5% rng
Real power, supply, sum	-0,00W .. -150MW	-1,8W .. -2,4kW	+/-1,5% rng
Apparent power, sum	0,00VA .. 150MVA	1,8VA .. 2,4kVA	+/-1,5% rng
Reactive power (Q0), sum	0,00var .. 150Mvar	1,8var .. 2,4kvar	+/-1,5% rng
<b>Meas. and aux. volt. 45 .. 80V</b>			
Voltage L-N	0 .. 34kV	45 .. 80V	+/-1,0% rng
Voltage L-L	0 .. 60kV	78 .. 139V	+/-2,0% rng
Current	0,00 .. 9,99kA	0,02 .. 6,00A	+/-1,0% rng
Current in N	0,00 .. 9,99kA	0,06 .. 18,00A	+/-3,0% rng
Real power, consumption, sum	0,00W .. 150MW	0,9W .. 1,2kW	+/-1,5% rng
Real power, supply, sum	-0,00W .. -150MW	-0,9W .. -1,2kW	+/-1,5% rng
Apparent power, sum	0,00VA .. 150MVA	0,9VA .. 1,2kVA	+/-1,5% rng
Reactive power (Q0), sum	0,00var .. 150Mvar	0,9var .. 1,2kvar	+/-1,5% rng
cos(phi)	0,00i .. 1.00 .. 0,00c		3)
Frequency (of voltage)	45,0 .. 65,0Hz		+/-1,5% rdg
Reactive energy, inductive			
$v^{5)} < 10$	0..999 999 9.99kvarh		class 2 <sup>4)</sup>
$v^{5)} < 100$	0..999 999 99.9kvarh		class 2 <sup>4)</sup>
$v^{5)} \geq 100$	0..999 999 999kvarh		class 2 <sup>4)</sup>
Real energy, consumption			
$v^{5)} < 10$	0..999 999 9.99kWh		class 2 <sup>4)</sup>
$v^{5)} < 100$	0..999 999 99.9kWh		class 2 <sup>4)</sup>
$v^{5)} \geq 100$	0..999 999 999kWh		class 2 <sup>4)</sup>
Working hours counter	0..999 999 999h		+/-2Min./Day



### Attention!

The program allows current and voltage transformer ratio setting only, if the maximum phase power can reach up to 50.0MW and the sum power can reach a maximum value of 150.0MW.

These specifications presuppose a yearly calibration and a warm up time of 10 minutes.

Used abbreviations:

rng = of measuring range

rdg = of measured value

1) Measuring range with scale factor = 1, (Current transformer = 5/5A, 1/1A)

2) In the range of -10..18°C and 28..55°C, an additional error of +0,5‰ of measured value has to be considered per K.

3) If the measured apparent power is in the range of 1% .. 100% of the measuring range,  $\cos(\phi)$  is indicated with an accuracy of +3%.

4) Accuracy class according to DIN EN61036:2001-01, VDE0418part 7, IEC61036:1996 + A1:2000

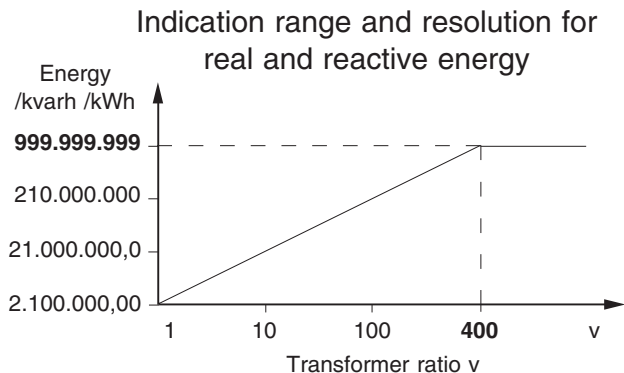
5) The maximum indication range and the resolution of real and reactive energy depends on

**Transformer ratio  $v = v_i * v_u$ .**


**$v_i$**  = Transformer ratio of current transformer.

**$v_u$**  = Transformer ratio of voltage transformer.

Example: 200/5A ->  $v_i = 40$   
1000/100V ->  $v_u = 10$   
 $v = v_i * v_u$   
 $v = 40 * 10$   
 $v = 400$



## Configuration data

Description	Display	Setting range	Presettings
Current transf., primary	<b>CT</b>	1A .. 10,0kA	5A
Current transf., secondary	<b>CT</b>	1A, 5A	5A
Voltage transf., primary			
Type plate, 196 .. 255V	<b>VT</b>	100V .. 60.0kV	<b>400V</b>
Type plate, 90 .. 160V	<b>VT</b>	100V .. 60.0kV	200V
Type plate, 45 .. 80V	<b>VT</b>	100V .. 60.0kV	100V
Voltage transformer, sec.			
Type plate, 196.. 255V	<b>VT</b>	400V (not changeable)	<b>400V</b>
Type plate, 90 .. 160V	<b>VT</b>	200V, 220V	200V
Type plate, 45 .. 80V	<b>VT</b>	100V, 110V	100V
Averaging time, current		5, 10, .. 900Sec.	900Sec.
Averaging time, power		5, 10, .. 900Sec.	900Sec.
Measured value rotation		0 .. 250seconds	0 = no rotation
Measured value selection		All indications	all indications
LCD contrast		0 .. 7	3
Software Release		not changeable	x.xx
User passwort		000 .. 999	„000“ = no password
Working hours counter		not changeable	0h

## Declaration of conformity

The UMG96L fulfills the protection guidelines of:

**Guideline 89/336/EWG** in combination with **DIN EN61326 (2002-03)** as well as **Guideline 73/23/EWG** and **93/68/EWG** in combination with **EN 61010-1 (2002-08)**

## Safety guidelines

Safety requirements for electrical equipment for measurement, control, and laboratory use

Part1: General requirements : EN61010-1:2001, IEC 61010-1:2001

## Test voltage

Enclosure against measuring inputs : 2kV AC

Between the inputs for measuring and auxiliary voltage and the current inputs exists a functional separation of 2000V AC.

## EMC requirements

**Electromagnetic emission**

: DIN EN61326:2002-03, table 4, class B

**Electromagnetic immunity**

: DIN EN61326:2002-03, table A.1

Enclosure

: ESD test, IEC61000-4-2:2001 (4kV/8kV)

: Electromagnetic RF-field, IEC61000-4-3:2002 (10V/m)

: Netfrequent magnetic field, IEC61000-4-8:2000 (120A/m)

AC-power line

: AC-Power variation and dropout, IEC61000-4-11:2000

: Fast transients (Burst), IEC61000-4-4:2001 (2kV)

: Powerful pulse (Surge), IEC61000-4-5:2000 (1kV L- N)

: RF induced on lines, IEC61000-4-6:2000 (3V)

Current transformer inputs

: Fast transients (Burst), IEC61000-4-4:2001 (2kV)

: Powerful pulse (Surge), IEC61000-4-5:2000 (1kV)

: RF induced on lines, IEC61000-4-6:2000 (3V)

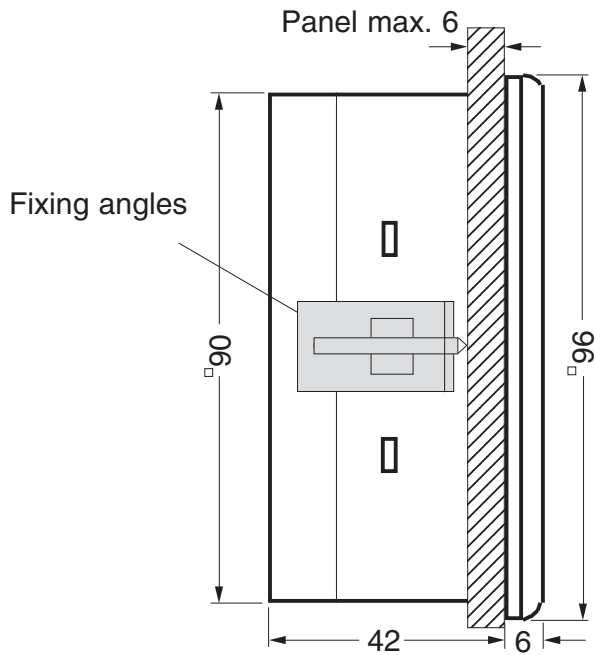
## Technical data

Weight	: 250g
Calorific value	: 2,2MJ (610Wh)
<b>Ambient conditions</b>	
Measurement category	: III (Measurement within building installation)
Pollution degree	: 2
Protection class	: II = with protective earth
Ambient temperature	: -10°C .. +55°C
Storage temperature	: -20°C .. +70°C
Humidity	: 15% up to 95% without dew
Protection class	
Front	: IP50 according to IEC60529
Front with seal (Option)	: IP65 according to IEC60529
Back side	: IP20 according to IEC60529
Mounting position	: random
Operating height	: 0 .. 2000m over sea level
<b>Measurement</b>	
<b>Measuring inputs</b>	
Measuring rate	: 1 measurement per second
Rated pulse voltage	: 4kV
Signal frequency	: 45Hz .. 1000Hz
Scanning frequency	: 2,5kHz/3,0kHz (Net frequency 50Hz/60Hz)
<b>Measuring and operating voltage</b>	: see type plate
Fuse	: 2A .. 10A (medium time lag type)
Frequency of fundamental	: 45Hz .. 65Hz
Power consumption Phase (L1-N)	: ca. 2,5VA
<b>230V/400V Standard version</b>	
Range L-N	: 196 .. 255V AC
Range L-L	: 340 .. 442V AC
<b>120V/220V Special version</b>	
Range L-N	: 90 .. 160V AC
Range L-L	: 156 .. 277V AC
<b>60V/120V Special version</b>	
Range L-N	: 45 .. 80V AC
Range L-L	: 78 .. 139V AC
<b>Current measurement</b>	
Power consumption	: approx. 0,2VA
Rated current at ../5A (../1A)	: 5A (1A)
Minimum working current	: 20mA
Current limit at ../1A	: 1,2A (sinus shape)
Current limit at ../5A	: 6A (sinus shape)
Overload	: 150A for 2 Sec.
<b>Accuracy class of energy measurement</b>	: class 2
<b>Connectable cables</b>	
One wire, multiple-wire, fine wire	: 0,08 - 2,5mm <sup>2</sup>
Pin contacts	: 1,5mm <sup>2</sup> , only one conductor may be connected per terminal!

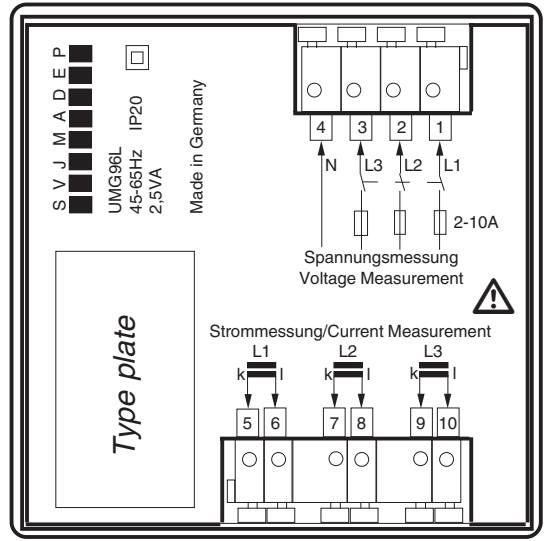


# Dimensions

Cut out:  $92^{+0,8} \times 92^{+0,8}$  mm



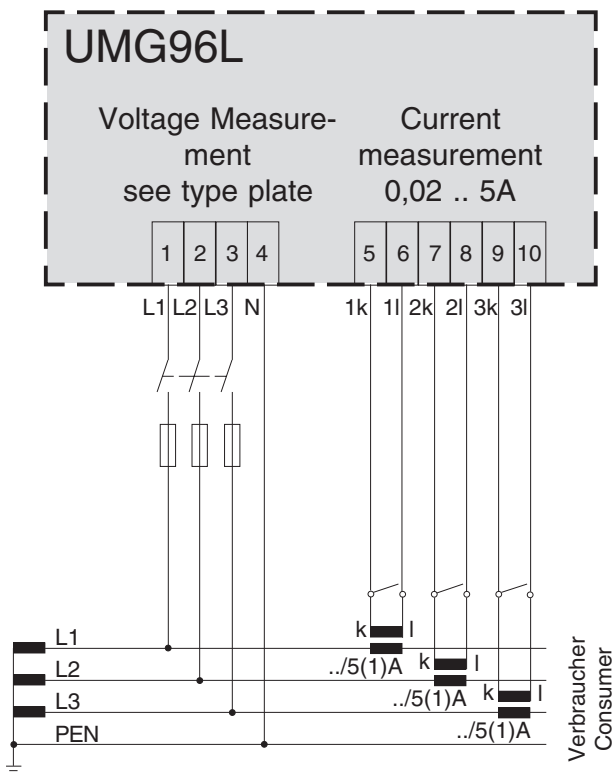
Diagr. Side view



Diagr. Back view

All dimensions in mm

# Connection example



Diagr.: Connection example 1  
Four wire measurement with three current transformers.

## Brief instructions

### Change current transformer ratio

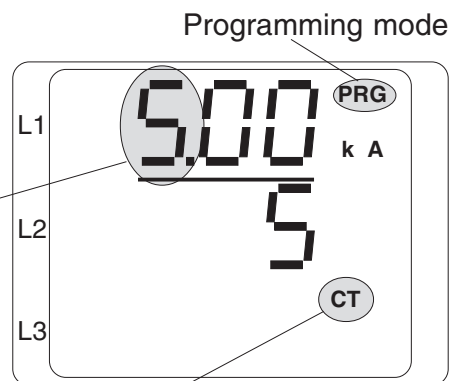
#### Shift to programming mode

If you are in the indication mode please press the keys 1 and 2 simultaneously for approx. 1 second. Now you reach programming mode.

The symbols for programming mode **PRG** and for the current transformer **CT** appear.

Confirm selection with key 1.

The first digit of the primary flashes.



Current transformer symbol



#### Change primary current:

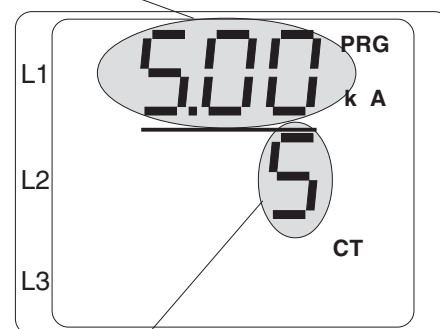
Change the flashing digit with key 2.

Select the next digit to be changed by pressing key 1.

The selected digit flashes.

If the entire number flashes, the decimal point can be moved.

Primary current



Secondary current



#### Change secondary current:

Only 1A or 5A can be set as secondary current.

Select secondary current with key 1.

Change flashing digit with key 2.

#### Leave programming mode:

Press both keys simultaneously for approx. 1 second.

The current transformer setting will be stored and you return to indication mode.

### Call up measured values

#### Shift to indication mode

If you are in programming mode please press the keys 1 and 2 simultaneously for approx. 1 second. Now you reach the indication mode.

The symbol **PRG** for programming mode does not appear in the display and the first measured value indication, e.g. for the voltage appears.

#### Key 2

With key 2 you scroll between the different measured value indications for current, voltage, power etc.

#### Key 1

With key 1 you scroll between the mean values, maximum values etc., related to the corresponding measured value.

