

# **Technical Specification**

**AMF Control with mains parallel operation  
630 kVA, 415 / 240 V, 60 Hz**

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## **Item B Mode of Operation**

### **AMF Operation**

- Power supply from mains to load output
- Three-phase mains voltage supervision.
- On mains failure: Automatic disconnecting of the mains cb
- Automatic start of Diesel-gen.-set
- The set reaching nominal voltage and frequency: switching ON to load output
- Monitoring of Diesel-engine and protection of alternator
- After mains restoring: Delayed synchronized, uninterrupted changeover of load from gen.-set to mains
- Cooling down of Diesel-engine
- Stop.

### **Mains parallel on load test operation**

- If selected the gen.-set starts automatically and synchronizes to the mains
- Closing of generator c.b.
- Generator take over a pre-adjusted load
- If on-load test is de-selected the generator will be de-loaded, the generator c.b. opens and the gen.-set will stop after re-cooling
- If mains fails during on-load test the mains c.b. will be tripped and generator continues to supply the loads

Partial or all automatic function can be made manually as well.

## Item C    **General Information**

### **Ambient conditions**

Ambient Temperature:            50° C

Max. humidity:                    90 %

Altitude:                            Up to 1000 m above sea level

### **Standards**

All material offered complies with the relevant Standards:

IEC  
ISO  
VDE  
DIN/EN

The products and system described in this specification are manufactured and marketed using a quality system certified by TÜV Rheinland and based on German Standard DIN ISO 9001/EN29001.

## Drawings and Documentation

Drawings and documentation will be issued to the above mentioned standards.

3-fold in DIN A4 size, English language.

Drawings will be generated with our engineering system CAE 33.

Preparation of documents used in Electric Technology Part 2:

Function-oriented diagrams acc. to DIN/EN 61082-1-3 (IEC 1082-1-3)

Diagrams, charts, tables:

Item designation acc. to DIN 40 719-2 (IEC 750).

Graphical symbols of diagrams acc. to DIN 40 900-1.....12  
(IEC 617-1.....12).

## Normal colour codes of the wiring as follows:

black	- the 3 phases and normal control wiring and secondary winding of p.t.'s
light blue	- neutral
yellow/green	- earthing
red	- DC-wiring 24 V+
blue	- DC-wiring 24 V-
brown	- DC-wiring 110 V+
violet	- DC-wiring 110 V-
grey	- secondary wiring of c.t.'s
white	- wiring for potential free contacts.

## LV-Wirings

All secondary circuits are wired with PVC-insulated flexible copper wires, with a minimum cross section of 0.75 sq.mm. The wiring is laid in plastic trunking and in flexible PVC conduit for crossover of wiring to door-mounted components.

## **Terminals**

All terminals of "non hygroscopic" material. The terminals have a minimum rating of at least 1.5 at operating intensity. Terminals for the secondaries of p.t.'s and c.t.'s are designed as test terminals.

## **Measuring Transformers**

Are of cast resin types. Current/voltage transformers are dimensioned according to load and accuracy requirements and according to the short-circuit capacity of the switchboard.

## **Measuring Instruments**

Are flush-mounted, frame size 96x96 mm, with 90° scale deflection, accuracy class 1,5

## **LV Switchboard design:**

Factory built and tested switchboard acc. to DIN EN 60439, classification VDE 0660, part 500 for indoor installation in enclosed electrical work shops as partial type tested switchboard (PTSK).

Designed as free-standing type in a steel plated frame construction, with front doors, with rubber profile gasket and sash fasteners.

Universally enclosed with 1.5 mm sheet steel, doors 2 mm thick, primer with respective pretreatment and finishing paint with structural lacquer.

Bottom open for mounting on a cable duct to be mounted on site for incoming and outgoing cables.

For protective measures, rigid earthing is provided according to VDE 0110 with total potential balance, N- and PE busbars are layed separately, N busbar isolated

## Item 1    **Alternator Control Part**

The alternator control board is assembled in metal enclosed cubicles with front doors for floor mounting.

Flush-mounted instruments, indication lamps, push buttons, switches will be door mounted.

### **Ratings:**

Voltage:	Up to 660 V
Frequency:	60 Hz
Control voltages:	24 V DC 415/240 V AC
Protection class:	IP 42 acc. to IEC and DIN, for non hazardous area
Colour:	RAL 7032
Switchboard design:	Form I        acc. to DIN EN 60439

### **Outside Panel Dimensions (approx.):**

Height:	2000 mm
Width:	1200 mm
Depth:	600 mm

## **The Alternator Control Panels consisting of :**

- 1 Double - Voltmeter
- 1 Voltmeter selector switch
- 1 Double - Frequency meter
- 3 Ammeters
- 1 kW-meter
- 1 Micro processor controlled start, supervision and stop unit with:

### Metering:

- Generator voltage
- Generator frequency
- Generator currents
- Battery voltage
- Operating hours
- Engine speed
- Active Power
- Power factor
- Kwh counter
- KVarh counter
- Start counter
- Mains voltage
- Mains frequency

### Protection:

- 7 Inputs for PT 100, for generator winding and bearing temperature supervision and indication
- Overcurrent/Short circuit 50/51
- Over- and undervoltage 27/59
- Over- and underfrequency 81
- Reverse Power 32
- Mains decoupling 27/59/81/78

### Function:

- All the necessary functions for automatic start, supervision and stop
- 20 Supervision circuits for engine and electrical alarms
- Indication of operating status and alarms on LCD display
- Load regulation at on-load test

Push buttons:

- off
- automatic service
- test
- manual service
- manual start
- manual stop
- horn off
- reset / lamp test
- alternator c.b. ON
- alternator c.b. OFF
- mains c.b. ON
- mains c.b. OFF

- 1 Emergency OFF push button
- 1 Control switch "On-Load Test"
- 1 Synchronoscope with integrated syncro check function
- 1 Voltage adjuster, motorized
- 1 Frequency adjuster, motorized
- 1 Horn
- 1 Set of potential free contacts
  - Common alarm
  - Common trip
  - Engine running
  - Engine ready for automatic operation

Compl. control and power circuits for the auxiliary drives of Diesel-engine in accordance to engine manufacturers standard.

- 1 battery charger, 24 VDC, 18 A , with IU characteristic
- 1 Battery voltmeter
- 1 Battery charger output ammeter

## Item 2 Alternator Power Part

1 Low voltage station board is assembled in metal enclosed cubicles with front doors for floor mounting.

Flush-mounted instruments, indication lamps, push buttons, switches will be door mounted.

### Ratings:

Voltage:	Up to 660 V
Frequency:	60 Hz
Control voltages:	24 V DC 415/240 V AC
Busbar system:	3 phases, double bus, tinned, 35kA 3 sec, + N+E-conductors
Protection class:	IP 42 acc. to IEC and DIN
Colour:	RAL 7032
Switchboard design:	Form 1 acc. to DIN EN 60439, segregation IP40

### The switchboard consisting of:

- 1 Mains incoming
- 1 Alternator incoming
- 1 Outgoing

### Outside Panel Dimensions (approx.):

Height:	2000 mm
Width:	(subject to necessary design engineering)
Depth:	600 mm

### **The mains Incoming consisting of :**

- 1 Busbar system
- 1 Air circuit breaker, triple-pole, 1000 A, motor operated, with thermal overcurrent relay and magn. short circuit protection device, withdrawable

### **The alternator incomer consisting of :**

- 1 Busbar system
- 1 Air circuit breaker, triple-pole, 1000 A, motor operated, with thermal overcurrent relay and magn. short circuit protection device, as generator c.b
- 3 Current transformers, class 5P4 for protection and measuring
- 1 Reactance for reducing 3<sup>rd</sup> harmonic currents in neutral during mains parallel operation (if required)

### **The outgoing consisting of :**

- 1 Busbar system