AUTOMATIC ELECTRIC CONTROL PANEL

FOR GENERATING SETS

GENERAL INFORMATION: The electric control board, herewith mentioned, is designed to control emergency automatic Generating Sets to ensure delivery of electric energy within an adjustable time from electric main network failure.

CARPENTRY: 15/10 thick steel sheet floor type cabinet. The colour tone is RAL 7032. Standard protection degree IP 44.

THE PANEL PERFORMANCES ARE:

Control of the mains by voltage transformers interfaced to μp card. Max. and min. operating voltages can be set even on one phase only.

Automatic starting of the Generating Set when the above mentioned condition happens after an adjustable delay action;

Automatic Gen. Set connection with the loads (when the alternator reaches the rated voltage value), if the changeover is included in our supply, otherwise pre-arrangement (2NA+2NC) to control the switching not provided by us;

Automatic monitoring of the diesel engine and alternator by means of suitable protections;

Automatic Gen. Set disconnection from the loads at the mains voltage return after an adjustable delay action;

Automatic Gen. Set stop after an adjustable period for the diesel engine cooling;

Pre-arrangement for a new starting;

Diesel engine pre-heating **control and protection** to facilitate the Generating Set starting and to ensure an immediate power supply.

THE FOLLOWING CONTROL EQUIPMENT IS PROVIDED:

1 control and signalling unit type GG 962, fixed on the front side for:

SIGNALLING LAMPS WITH ACOUSTIC ALARMS:

- *Low lube oil pressure*
- *High engine temperature*
- *Overspeed*
- *Battery undervoltage*
- *Generator overload*
- *Low fuel level*
- *Starting failure*
- *Low radiator water level*
- *Battery charging generator voltage*
- *Pre-heating failure*
- *Gen. set undervoltage*
- *Max. gen. set voltage*

- *Max gen. set frequency*

OTHER SIGNALS FOR GENERATING SET CONDITION:

- *card feed*
- *starting*
- *generator switch (on/off)*
- *network contactor open*
- *network contactor closed*
- *gen. set contactor open*
- *gen. set contactor closed*
- *main network voltage*
- *generator voltage*
- *emergency turned on*
- *fuel electropump running* (if electropump is included)
- *tank overflow* (if electropump is included)
- *pre-heating turned on*
- *plant status*

MEASURING and CONTROL INSTRUMENTS :

- **1 Alphanumeric display** reporting the gen. set's status
- **1 Display** for the electric parameters of the gen. set (voltages, currents and frequency)
- **1** Cooling water **Thermometer** or engine thermometer (air cooled engines)
- **1 Oil pressure gauge**
- **1 Fuel level gauge**

- *Manual starting push button*
- *Manual stop push button*
- *Selectors controlling mains / gen. set contactors*
- *Mushroom-head push button for emergency stop*
- *Automatic battery charger*
- *Interface cards for voltmeter and ammeter signallings*
- *Fuel electropump control and protection circuit (if electropump is included)*
- *Siren*
- *Alarm reset button*
- *Failure reset button*
- *Work hour meter*
- *Battery system voltage and current*
- *Selector to choose the gen. set's operations:* **LOCKED, MANUAL, AUTOMATIC, TEST**.

LOCKED: Any function, either manual or automatic, is locked; if the gen. set is running, it is stopped

MANUAL: the user manually selects the starting and stop operations by means of STARTING and STOP push buttons. In this position the engine's protections are connected.

AUTOMATIC: all the operations of starting, stop, changeover and alarm are automatically selected

TEST: it allows the gen. set starting and the relative control operations but it is not possible to operate

the mains/gen.set commutation; during the test running a possible mains failure will induce the automatic mains / gen.set changeover

Removable keyboard to enter the parameters mentioned in table 1.
Contacts on terminal board for emergency stop. Contacts on terminal board for general alarms.
Prearrangement for parallel operation with other gen. sets.

Programming parameters

Parameter's name	measure	min. value	max. val.	default v.
Mains failure time	(second)	1	180	3
Mains return time	(second)	1	999	60
Glow plug connection time	(second)	0	20	0
Starting time	(second)	1	10	6
Time between two startings	(second)	4	20	6
Starting attempt number	(unit)	1	10	4
Stop time at the end of cycle	(second)	5	60	20
Low oil pressure alarm delay	(second)	1	20	5
Engine cooling delay	(second)	1	999	120
Frequency limit	(Hertz)	10	60	30
Failure sensing delay	(second)	1	30	2
Time to reach the steady running	(second)	2	180	2
Min. network voltage	(Volt)	100	500	350
Max. network voltage	(Volt)	100	500	450
Min. gen. set voltage	(Volt)	100	500	350
Max. gen. set voltage	(Volt)	100	500	450
Periodic startings no=0 yes=1				0
Periodic starting delay	(minute)	5	9999	7000
Periodic starting time	(minute)	1	20	5
Led display operating no=0 yes=1				1
Card address		1	255	1

Table 1. Programming parameters card GG962.

- **MAINS FAILURE TIME:** It shows the time the gen. set waits for before starting the start procedure since the mains voltage has not been within the programmed values (table 1).
- **MAINS RETURN TIME:** It shows the time the gen. set runs loaded ignoring possible false voltage returns, so the opposite changeover from gen. set to mains will not take place until the mains voltage returns to the right values for the programmed time.
- **GLOW PLUG CONNECTION TIME:** It is the time taken by the glow plugs to warm up (only for engines equipped with them) and it is added to the mains failure time.
- **STARTING TIME:** It shows the max. time of the automatic or manual starting pulse. It is adjusted so as to prevent the starting motor from blowing out.
- **TIME BETWEEN TWO STARTINGS:** It is the time interval between two startings, necessary for the starting motor to cool.
- **STARTING ATTEMPT NUMBER:** It shows how many times the gen. set attempts to start before signalling the starting failure.
- **STOP TIME AT THE END OF CYCLE:** It is the stop system's stay time necessary to stop the gen. set completely (If the gen. set takes 10 sec. to stop, the stop time will not be less than 12/13 sec.)
- **LOW OIL PRESSURE ALARM DELAY:** It shows the time when the GG962 card is prevented from starting by this alarm. It completely depends on the gen. set's type and the oil's fluidity.
- **ENGINE COOLING DELAY:** It shows the time the gen. set keeps running after the opposite gen. set / means changeover. It is necessary for the engine to cool especially if it ran heavily loaded.

- **FREQUENCY LIMIT:** It is the max. frequency that enables the starting motor to disconnect itself not to breakdown
- **FAILURE SENSING DELAY:** It is the time the GG962 card waits for before stopping the gen. set after a failure. That does not consider microfailures or false alarms.
- **TIME TO REACH THE STEADY RUNNING:** The time the gen. set takes from the changeover to reach the rated rpm.
- **MINIMUM NETWORK VOLTAGE:** It is the mains voltage value that enables the gen. set to start when the load working is not regular.
- **MAXIMUM NETWORK VOLTAGE:** It is the mains voltage value that enables the gen. set to start when the load working is not regular.
- **MINIMUM GEN. SET VOLTAGE:** It is the gen. set's voltage value that enables the gen. set to disconnect the load and to stop.
- **MAXIMUM GEN. SET VOLTAGE:** It is the gen. set's voltage value that enables the gen. set to disconnect the load and to stop.
- **PERIODIC STARTING DELAY (on request):** It is the time between two automatic periodic startings. It is recommended no more than one a week.
- **PERIODIC STARTING TIME:** It is connected to the periodic starting delay and it is the time the gen. set keeps running automatically when started in this way.
- **CARD ADDRESS:** It is the serial exit's address necessary for interfacing to the PC equipped with MARGEN software (optional).

ACCESSORIES:

☒ Included ☐Not Included

☐ **SOFTWARE** This program has been studied by **MARGEN** specially to interface the main gen. set's functions and controls by PC. It is possible to manage over thirty gen. sets at the same time monitoring the state and the condition of any connected gen. set. System requirements are as follows: Windows 98, 486dx processor, 8Mb of RAM, 5Mb hard drive space. The data transmission from GG 962 card to PC is via RS 232 or RS 422 serial line or through RS 485 adapter, changeable over direct to the card. Please see the run book, enclosed to the program, for any further details about the software's installation and operating and about the gen. set's managing possibilities.

☐ **PERIODIC GEN. SET TEST:** It is an automatic test which can be provided, on request, inside the card program, in order that the gen. set can start automatically without the user's presence with periods and duration programmable by the user

☐ **REMOTE SYNOPTIC CARD:** It enable the user to remotely check the main condition of the gen. set by a LED card repeating the signals transmitted by the GG 962 card as far as about 1km.

☐ **EMERGENCY CARD:** In the case of serious GG 962 failure, it enables the manual starting and stop even though it doesn't control the alarms and the various operating times.

☐ **FAILURE RESETTING IN EITHER MANUAL OR AUTOMATIC POSITION:** It is a programmed during the acceptance test giving the following possibilities:

☐ **FAILURE RESETTING IN MANUAL POSITION:** After a Gen. Set's alarm and its signalling, once the siren has been silenced, it is necessary to reset the operation pushing the lighted ALARM RESET button; to reset the alarm first of all it is necessary to turn the SAI selector in MANUAL position (recommended)

☐ **FAILURE RESETTING IN AUTOMATIC POSITION:** This way does not required to turn the SAI selector in MANUAL position, as the reset is directly got in possible in automatic position. The only difference is the gen. set immediately starts as soon as it is reset (provided that there still a mains failure and any other alarm is operating).

☐ **CARD FOR REMOTE ALARMS:** by means of digital interface (output with a single joint wire), 5A contacts.

POWER CIRCUIT :

Quadripole magnetic thermal switch with magnetic regulation suitable for the alternator's short circuit current, fixed directly on the gen. set or in separate cabinet.

For some types of gen. sets the changeover system can be included either in the control board or in separate box.