

UNIMA-KS

Development & production of control equipment
Visualization, measurement and regulation SW

WWW.UNIMA-KS.CZ unima-ks@unima-ks.cz

Ing. Z.Králůvský

Petr 457
675 22 STAREČ

Tel.: 568 870982

Fax: 568 870982

e-mail: kralovsky@unima-ks.cz

Ing. Petr Štol

Okrajová 1356
674 01 TŘEBÍČ

Tel.: 568 848179

Cell: 777 753753

e-mail: stol@unima-ks.cz

UniGEN AP

User Manual



May 2015

1. Using	2
2. Actuating of the CU	3
2.1 Control panel	3
2.2 CU mode selection	6
2.3 Description of the indicating LEDs.....	8
3. CU display map	9
3.1 Generator.....	10
3.1.1 1/1 GENERATOR.....	10
3.1.2 1/2 GENERATOR (Measure).....	10
3.1.3 1/3 GENERATOR (protections)	10
3.1.4 1/4 GENERATOR (Statistics)	11
3.1.5 1/5 GENERATOR (Alarms)	11
3.2 Mains	12
3.2.1 2/1 MAINS	12
3.2.2 2/2 MAINS (Measure).....	12
3.2.3 2/3 MAINS (Protections).....	12
3.3 Synchronization	13
3.3.1 3/1 MAINS SYNCHRONIZATION.....	13
3.4 Measure.....	13
3.4.1 4/1 MEASURE (Cyl.tem.)	13
3.5 User defined screens.....	13

1. Using

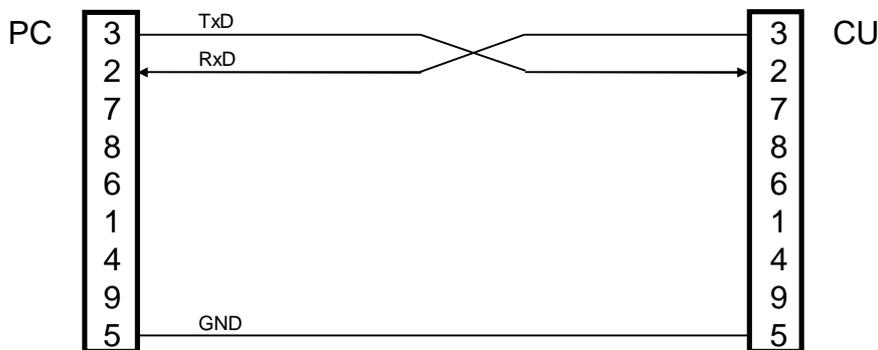
Control system (CU) is designed to control motor-generator sets with phasing generators to the distribution network, supports different modes of cooperation with the network contains network protection, generator and motor protections.

With user-defined functions (gates, flip-flops, analog members, PID controllers, control blocks for three-way valves, etc.) is possible the basic firmware easily extended with additional functionality (see documentation "ManagerAP a mapping function") ..

For technical specifications of the device (HW description, count and types of inputs and outputs, communication interfaces e.t.c.) see documentation "Specification UniGEN AP HW VN".

Using RS-232 interface is possible to connect device to PC, control, visualize and configure it using program "ManagerAP". See documentation "Manager AP user manual".

For connection CU to PC use 3-wire cross-over cable (2-3, 3-2, 5-5, "nullmodem") with CANNON 9F.

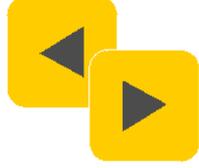


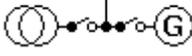
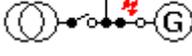
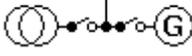
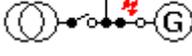
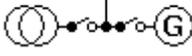
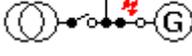
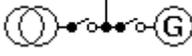
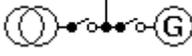
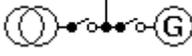
Using communication bus can be connected to control system expansion modules of inputs and outputs, speed controller USC, UIS voltage regulator, ignition UIS1÷4. All these components can be parameterized by one service program over a single connection to the control system. CU have these devices exchange the necessary information, so in addition to the communication bus is not necessary to further interconnection components.

2. Actuating of the CU

2.1 Control panel

Control panel includes 12 control keys, graphics display 240x128 pixels and 6 two-colour LEDs for state indication.

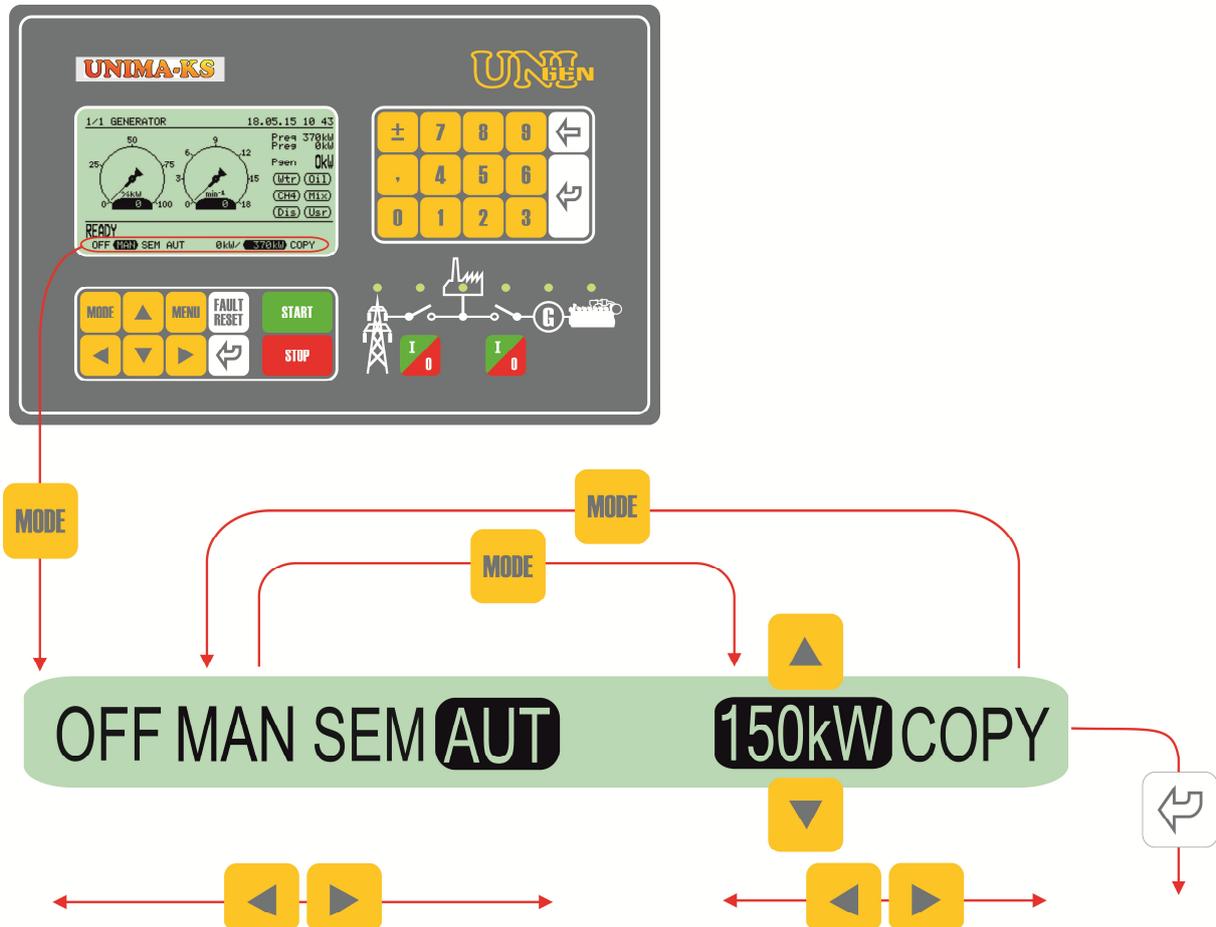
	<p>Selection of CU mode, control mode (OFF-MAN-SEM-AUT) and power mode (COPY – constant power)</p>
	<p>Input for menu CU MENU: Pressing again in the menu causes return to the main screen PARAMETERS: return back to the main screen</p>
	<p>Keys upwards and downwards, on main screen they serve for switching of sub-screens. MENU: serve for menu item selection PARAMETERS: serve for parameter selection</p>
	<p>Keys left and right, on main screen they serve for switching of sub-screens. Press and hold of the right key enables to pass over to the list of alarms (1/5). Press and hold of the left key enables to pass over to the home screen of the generator (1/1). PARAMETERS: serve for selected parameter value change</p>
	<p>Key for fault deactivation after the fault source has gone off</p>
	<p>„Enter“ key, MENU: confirmation of selected item in menu PARAMETERS: return back to main screen (confirmation of parameter value entered from numeric keyboard)</p>
	<p>Start of the aggregate in manual or semi-automatic mode – activating the demand for aggregate run. Is there a start block, the start is taking place immediately after the reason for blocking has gone off. In case there is a semi-automatic mode set, CU will either pass on to parallel operation (net deion is shows on-state) or pass on into operation under load (net deion shows off-state). If there is a manual mode actual, CU goes over immediately after start only to nominal speed operation mode. Keystroke during the relieving phase (i.e. the demand for successive unloading) causes the return to the parallel (island) operation.</p>
	<p>Initiation of shut-down and semi-automatic mode transition (provided this was actual in automatic mode). It activates releasing and after a time-out expiry desynchronizes (in parallel mode) or disengages generator contactor (in solitary mode) and after cooling evokes Stop. Keystroke during the relieving phase results in immediate contactor disengaging and cooling run transition. Keystroke during the cooling run results in immediate stopping of cooling run and unit halt.</p>

 <p>MCB (left)</p>	<p>Operating of net deion. Controlling of net deion is possible in manual mode only, and in only a few modes under net cooperation (E, P+I and P+E). In cooperation modes P and I is this key blocked, panel LED indicator of the net deion in P-mode is lighting constantly, in I-mode is not lighting constantly.</p> <p>In cooperation mode P+I can be selected by means of key whether the generator will be working in solitary or parallel operation (unless the deion-controlling is blocked through the parameter “MCBCrtIPI” from the CU-key board), automatic mode does not actuate the deion status.</p> <p>In E and P+E cooperation mode as well as in CU-automatic mode is the output governed according to CU-algorithm.</p> <table border="1"> <tbody> <tr> <td>  </td> <td> <p>Touch of button activates the deion-grids (irrespective the generator operation status).</p> </td> </tr> <tr> <td>  </td> <td> <p>Touch of button deactivates the deion-net (irrespective the generator operation status).</p> </td> </tr> <tr> <td>  </td> <td> <p>Touch of button activates backwards synchronizing towards the net and subsequently parallel operation with the net. The retouch during the backwards synchronizing towards the net will defeat the backwards synchronizing. Overrun of warning or emergency limits of some of the net or generator parameters (U, f, phase) will block deion contact making which can lead to malfunction of the “not in time synchronized”.</p> </td> </tr> <tr> <td>  </td> <td> <p>Touch of button deactivates the deion-net and causes generator transition from parallel to solitary operation (operation on-load).</p> </td> </tr> </tbody> </table>		<p>Touch of button activates the deion-grids (irrespective the generator operation status).</p>		<p>Touch of button deactivates the deion-net (irrespective the generator operation status).</p>		<p>Touch of button activates backwards synchronizing towards the net and subsequently parallel operation with the net. The retouch during the backwards synchronizing towards the net will defeat the backwards synchronizing. Overrun of warning or emergency limits of some of the net or generator parameters (U, f, phase) will block deion contact making which can lead to malfunction of the “not in time synchronized”.</p>		<p>Touch of button deactivates the deion-net and causes generator transition from parallel to solitary operation (operation on-load).</p>
	<p>Touch of button activates the deion-grids (irrespective the generator operation status).</p>								
	<p>Touch of button deactivates the deion-net (irrespective the generator operation status).</p>								
	<p>Touch of button activates backwards synchronizing towards the net and subsequently parallel operation with the net. The retouch during the backwards synchronizing towards the net will defeat the backwards synchronizing. Overrun of warning or emergency limits of some of the net or generator parameters (U, f, phase) will block deion contact making which can lead to malfunction of the “not in time synchronized”.</p>								
	<p>Touch of button deactivates the deion-net and causes generator transition from parallel to solitary operation (operation on-load).</p>								
 <p>GCB (right)</p>	<p>Operating of generator deion. It is possible to govern the deion in manual mode only (it is governed automatically according to CU-algorithm in the automatic mode).</p> <table border="1"> <tbody> <tr> <td>  </td> <td> <p>If the generator is running with nominal speed the touch of button causes attachment of load and passing on into operating on-load</p> </td> </tr> <tr> <td>  </td> <td> <p>If the generator is running with nominal speed the touch of button activates synchronization toward the net (provided emergency limits of net parameters are not exceeded). The re-touch during the synchronizing will annul the synchronizing. Overrun of warning or emergency limits of some of the net or generator parameters (U, f, phase) will block contact making for deion which can lead to malfunction of the “not in time synchronized”.</p> </td> </tr> <tr> <td>  </td> <td> <p>Touch of button will disconnect the load and courses transition from running on-load into unloaded run at nominal speed.</p> </td> </tr> <tr> <td>  </td> <td> <p>Touch of button causes generator desynchronizing and transition to parallel operation with unloaded run at nominal speed.</p> </td> </tr> </tbody> </table>		<p>If the generator is running with nominal speed the touch of button causes attachment of load and passing on into operating on-load</p>		<p>If the generator is running with nominal speed the touch of button activates synchronization toward the net (provided emergency limits of net parameters are not exceeded). The re-touch during the synchronizing will annul the synchronizing. Overrun of warning or emergency limits of some of the net or generator parameters (U, f, phase) will block contact making for deion which can lead to malfunction of the “not in time synchronized”.</p>		<p>Touch of button will disconnect the load and courses transition from running on-load into unloaded run at nominal speed.</p>		<p>Touch of button causes generator desynchronizing and transition to parallel operation with unloaded run at nominal speed.</p>
	<p>If the generator is running with nominal speed the touch of button causes attachment of load and passing on into operating on-load</p>								
	<p>If the generator is running with nominal speed the touch of button activates synchronization toward the net (provided emergency limits of net parameters are not exceeded). The re-touch during the synchronizing will annul the synchronizing. Overrun of warning or emergency limits of some of the net or generator parameters (U, f, phase) will block contact making for deion which can lead to malfunction of the “not in time synchronized”.</p>								
	<p>Touch of button will disconnect the load and courses transition from running on-load into unloaded run at nominal speed.</p>								
	<p>Touch of button causes generator desynchronizing and transition to parallel operation with unloaded run at nominal speed.</p>								

	<p>Numeric keyboard, MENU: In menu serve for fast manu item selection (replaces select up and down keys and press "Enter"). PARAMETERS: Entering the parameter value directly by numerical value (replaces select of parameter value by up and down keys). CU RESET: after CU reset holding of keys combination 2&7 cause activation of internet-bridge terminal MODEM DIAGNOSTICS: keys 0,1,2,3 and 9 serve for modem command send during modem diagnostics</p>
	<p>Key plus(minus), PARAMETERS: Parameter sign selection when is value entering directly by numeric keyboard.</p>
	<p>Decimal point key, PARAMETERS: Insertion of the decimal point of parameter when is value entering directly by numeric keyboard.</p>
	<p>Key „back“, PARAMETERS: Deleting of the last value digit when is value entering directly by numeric keyboard.</p>

2.2 CU mode selection

Selection of this mode is activated by key-stroke “MODE”. After having press this key for the first time it follows the flashing of the machine mode indicating arrows left and right and you can make your selection among “OFF-MAN-SEM-AUT” (meaning: set off - manual mode – semi-automatic mode – automatic mode). Another press of MODE-key causes flashing of the machine performance mode “30kW-COPY”, selection is made using the arrows left and right. Provided the fix performance is selected (no “COPY”), the desired performance can be set using the arrows up-and-down. For mode confirmation it is necessary to press the key “ENTER”.

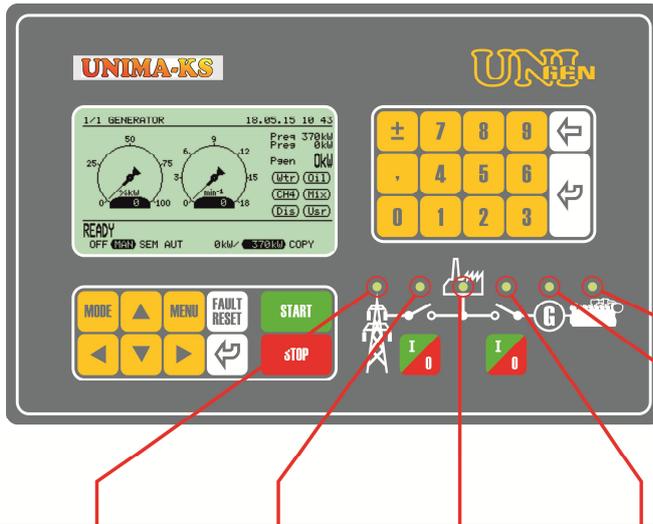


CU mode	OFF	CU is not active; signal “Ready” will not be released, even if there would be no blocking or malfunction. CU does not respond to any “START”-stroke (neither in manual nor in semi-automatic mode). There is the logic sign “ModeOFF” active.
	MAN	Manual Mode; CHP is starting however it is not passing on to synchronizing stage automatically. From CU key-board it is possible to operate manually GCB and MCB. Provided “COPY” mode is selected at the same time, the unit can be started irrespective the value of desired performance; if the desired level is low the CHP is running with the min. power (in parallel).
	SEM	Semi-automatic Mode; Start and Stop of the unit occurs using the keys START/STOP, nevertheless further it is running fully automatic, i.e. in the same way as in automatic mode. GCB and MCB operation from the CU key-board is locked.. Provided the “COPY” mode is selected at the same time and the net deion is switched ON the starting and stopping of the unit occurs in accordance with the power desired.

	AUT	Automatic Mode; The CHP is running fully automatic, based on Entry operational requirement (input logical signal HDO). Provided the "COPY" mode is selected at the same time and the net deion is switched ON the starting and stopping of the unit occurs in accordance with the power desired.
Power mode	150k W	Constant power mode; the CHP is running based on the set-power (provided no power limited protection is active).
	COPY	Copy Mode; the CHP is imitating the entity consumption (i.e. the value of the power desired).

Key-stroke of STOP in automatic mode will cause the unit transition into the semi-automatic mode.

2.3 Description of the indicating LEDs



Net	MCB	Consumer	GCB	Generator	Engine	LED colour
Net voltage is lower than 25V in all phases (measured by CU) and there are no external net protections active	Deion disconnected, back coupling OK	Neither MCB nor GCB are connected	Deion disconnected, back coupling OK	Generator voltage is lower than 25V in all phases	Engine stopped, reary to run	Not emitting
Net parameter OK	Deion connected, back coupling OK	There is connected either MCB or GCB	Deion connected, back coupling OK	Generator parameters OK	Engine running	Green
-	Back synchronizing towards the net is running	-	Synchronizing towards the net is running	-	-	Green (blinking)
Warning net parameters have been exceeded	Feedback failure, deion disconnected (despite of requirement to connect)	-	Synchronizing towards the net is running	Warning generator parameters have been exceeded	Engine start blocking, putting- asside, other engine states	Orange
Emergency net parameters have been exceeded (measured by CU) or there are external net protections active	Feedback failure, deion connected (despite of no requirement to connect)	-	Feedback failure, deion connected (despite of no requirement to connect)	Emergency generator parameters have been exceeded	Engine error	Red

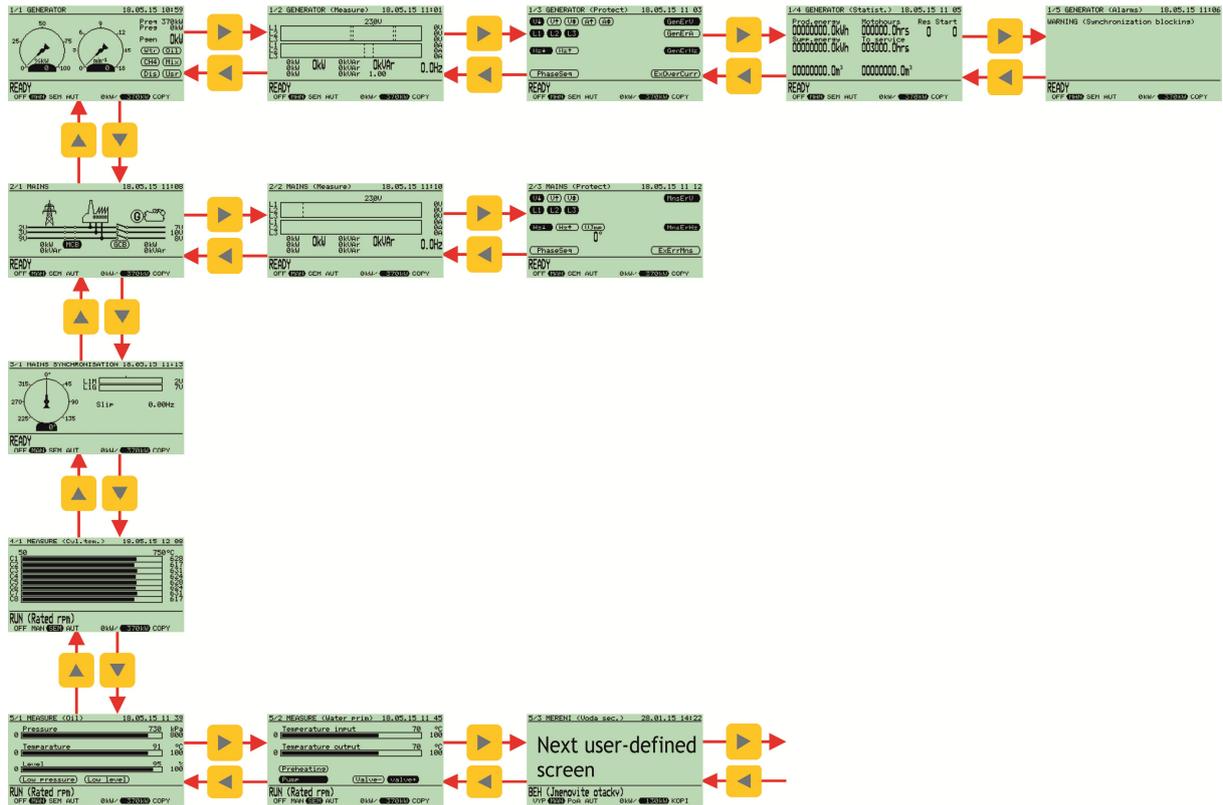
3. CU display map

Information on the display of control system can be selected using the arrow keys or the Menu / Display. The main screen displays (Generator - Network - Phasing - Measurement - User screens) are selected using the arrow keys up and down. With cursor keys right and left can be opened further additional screens (if any)

The lower two lines of the screen (status bar and mode) remain unchanged irrespective of the screen.

Flashing warning triangle in the lower right corner of the screen indicates a warning or emergency messages to alarmlist.

Screens map:

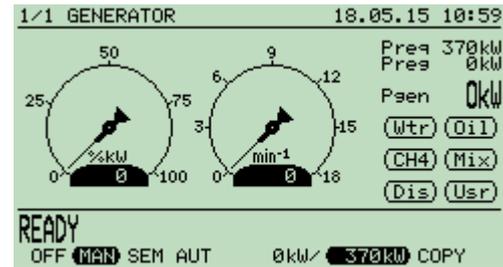


3.1 Generator

Basic information and measuring of the generator

3.1.1 1/1 GENERATOR

Main screen generator contains two analog indicators. Relative power (the percentage of the actual performance of the nominal power) and genset speed.



Informations at the right side are:

- Preq: requested power
- Preg: power to which is regulated
- Pgen: actual generator power in kW
- Wtr: power limitation indicator due to high water temperature
- Oil: power limitation indicator due to low oil temperature
- CH4: power limitation indicator due to low methane level
- Mix: power limitation indicator due to high mixture temperature
- Dis: power limitation by energy distributor
- Usr: power limitation by user algorithm

Information about compromising performance may vary depending on the firmware version, there may be other indicators, such as .:

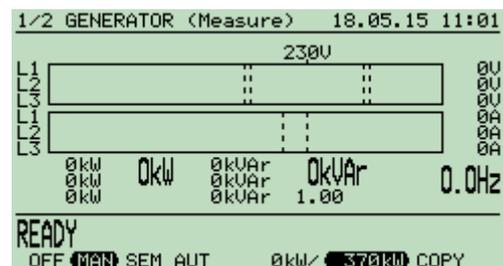
- Wei: power limitation due to low weir level (firmware MVE)
- Pre: power limitation due to high steam pressure (firmware ORC)

Requested power can be fixed internal parameter (XXXkW mode) or external requirement for entering into a logic control system via analog input "External power request (Copy)" (COPY mode). Input "External power request (copy)" can be mapped e.g.to network active power (in this case will follow the power value measured on the network) to the physical current input 20 mA, at the output of user functions etc.

If during operation no active power limitation value Preg will have the same value as Preq. In the event power limitation Preg value defines at what value the performance is reduced.

3.1.2 1/2 GENERATOR (Measure)

Information about voltage, current, active and reactive power at the various stages of the generator, the total active and reactive power, power factor and frequency generator. The bar-graph shows the nominal voltage grid voltage warning and emergency limits and under-voltage (surges). The current bar-graph is displayed warning and emergency generator overcurrent limit.



3.1.3 1/3 GENERATOR (protections)

Generator protection. Flashing lights indicate exceeded warning limits, a continuously lights indicate exceeded emergency thresholds.

- V↓: undervoltage (without delay)
- V↑: overvoltage (without delay)
- V↑↓: voltage unbalance (without delay)
- A↑: overcurrent (without delay)



- A↑: current unbalance (without delay)
- L1-L3: indicate phase in which is out of limits
- Hz↓: underfrequency (without delay)
- Hz↑: overfrequency (without delay)
- ExOverCurr: external overcurrent information (external input)
- GenErV: overall generator voltage error (the sum of partial voltage failures with delay)
- GenErA: overall generator voltage error (the sum of partial voltage failures with delay)
- GenErHz: overall generator frequency error (the sum of partial voltage failures with delay)
- PhaseSeq: indicator of wrong phases sequence on generator

3.1.4 1/4 GENERATOR (Statistics)

Statistical information on the operation of the generator.

- Prod.energy: counting of energy produced by generator
- Supp.energy: counting of energy supplied to the mains
- Res: resets count (counting up to 255)
- Start: genset starts count (counting up to 65535)
- Energymeter (gasometer): two user-configurable counters. By mapping of the logical binary inputs "Impulse Counter A (B)" you can count the incoming pulses. User ("Parameters / Meters") can set the name of counter unit value of one impulse.

1/4 GENERATOR (Statistic.) 18.05.15 11 05			
Prod.energy	Motohours	Res	Start
00000000.0kWh	000000.0hrs	0	0
Supp.energy	To service		
00000000.0kWh	003000.0hrs		
00000000.0m ³	00000000.0m ³		
READY			
OFF MAN SEM AUT 0kW/ 370kW COPY			

Reset of all counters and can be done from the keyboard of control system by selecting "Menu / Service / Counter Reset". So this option has been made available must be logged on user with access password L2.

3.1.5 1/5 GENERATOR (Alarms)

List of warning and emergency conditions of genset. Flashing warning triangle in the lower right corner (visible in all screens) indicates that the alarm list is not empty.

Emergency conditions (faults) can remove from the alarm by fault acknowledgments (if the cause does not continue), a warning from the alarm will disappear after the resolution causes automatically.

The alarm list can be quickly viewed by holding down the right cursor key.

1/5 GENERATOR (Alarms) 18.05.15 11:06	
WARNING (Synchronization blocking)	
READY	
OFF MAN SEM AUT 0kW/ 370kW COPY	

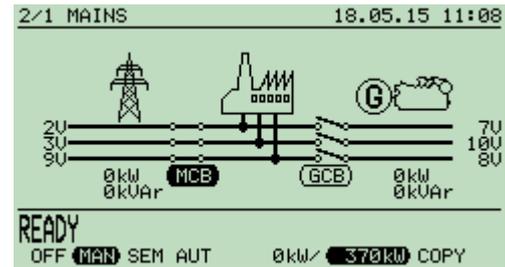
3.2 Mains

Basic information and measuring of the mains, deions state.

3.2.1 2/1 MAINS

Summary information about mains voltage, generator voltage, active and reactive power on mains as well on generator

- MCB: mains deion control (switch state indicate real state)
- GCB: generator deion control (switch state indicate real state)



3.2.2 2/2 MAINS (Measure)

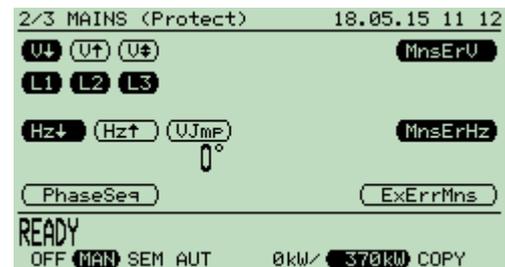
Information about voltage, current, active and reactive power in all phases of network, the total active and reactive power, frequency. The bar-graph shows the nominal voltage grid voltage warning and emergency limits and under-voltage (surges).



3.2.3 2/3 MAINS (Protections)

Mains protections. Flashing lights indicate exceeded warning limits, a continuously lights indicate exceeded emergency thresholds.

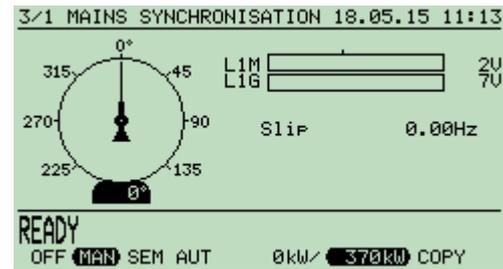
- V↓: undervoltage (without delay)
- V↑: overvoltage (without delay)
- V↕: voltage unbalance (without delay)
- L1-L3: indicate phase in which is out of limits
- Hz↓: underfrequency (without delay)
- Hz↑: overfrequency (without delay)
- ExErrMns: External information about mains error (external input)
- VJmp: indicator of vector jump, numeric value under indicator shows the actual value of vector jump (value is indicated 5s after maximum of vector jump is detected)
- GenErA: overall mains voltage error (the sum of partial voltage failures with delay)
- GenErHz: overall mains frequency error (the sum of partial voltage failures with delay)
- PhaseSeq: indicator of wrong phases sequence on mains



3.3 Synchronization

3.3.1 3/1 MAINS SYNCHRONIZATION

Information about synchronizing the generator to the network. Analog indicator on the left shows the phase difference between the L1 grid and generator. Bar graph arrays indicate the amount of voltage in L1 network (L1M) and phase generator (L1G). The bar-graph voltage networks are indicated emergency voltage limits, the bar-graph generator voltage limits are indicated with the desired voltage generator (middle band corresponds to the voltage + parameter "RegVgD").

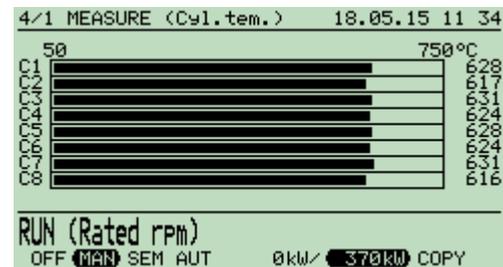


3.4 Measure

Information about other measured values. This screen is added to the firmware type.

3.4.1 4/1 MEASURE (Cyl.tem.)

E.g. in CHP firmware version is on this screen indicated cylinders temperatures.



3.5 User defined screens

The last fifth row of eight screens can be user-defined by program ManagerAP. Here you can view analog or digital indicators according to customer requirements.

