

Compact Controller for Stand-by and Parallel Operating Gen-sets

# InteliGen<sup>NT</sup>, InteliSys<sup>NT</sup>

## Modular Gen-set Controller

### Operator guide for SPI, SPtM, MINT, COX

IG-NT, IG-NTC, IG-EE, IG-EEC, IS-NT

Software version IGS-NT-2.0, September 2006

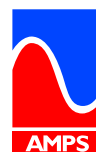


# OPERATOR GUIDE



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**ComAp, spol. s r.o.**  
Světova 7, 180 00 Praha 8, Czech Republic  
Tel: +420 266 790 611, Fax: +420 266 316 647  
E-mail: [info@comap.cz](mailto:info@comap.cz), [www.comap.cz](http://www.comap.cz)



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# General guidelines

This manual provides general information on how to operate the IG/IS-NT controller. This manual is intended for everybody who is concerned with operation and maintenance of the gen-set.

## ***Description of the controller system***

NT family controllers are comprehensive AMF-controllers for single and multiple generating sets operating in stand-by or parallel modes. Synchronizer, isochronous load sharer, Mains and Generator protections allow for a total integrated solution for gen-sets in stand-by and parallel modes with multiple engine support.

NT family controllers are equipped with a powerful graphic display showing icons, symbols and bar-graphs for intuitive operation, which sets, together with high functionality, new standards in gen-set controls.

The controller automatically starts the gen-set, closes the gen-set C.B. when all conditions are met, then stops the engine on external signal or by pressing push buttons.

Parallel to Mains operation can be achieved without additional HW. Forward and reverse synchronizing, Mains protection including vector shift, load and power factor control, earth fault protection are the major functions provided. Interfacing to foreign synchronizers and load sharers is supported.

The key feature of NT family controllers is their easy-to-use installation and operation. Predefined configurations for typical applications are available as well as user-defined configurations for special applications.

## **Default applications**

There are four default applications: SPI, SPtM, MINT, COX.

SPI	<b>S</b> ingle <b>P</b> arallel <b>I</b> sland application - for single gen-sets in parallel with mains or in island operation; suitable for CHP application; no MCB control
SPtM	<b>S</b> ingle <b>P</b> arallel to <b>M</b> ains application - for single gen-sets in parallel with mains or in island operation, with AMF support; both MCB and GCB controlled
MINT	<b>M</b> ultiple application with <b>I</b> Nternal control loops - for multiple gen-sets in island parallel or mains parallel operation; Load Sharing and VAr Sharing controlled internally; PMS available
COX	A special application intended for <b>C</b> Ooperation with an <b>e</b> Xternal supervisory control system, e.g. PLC. Most internal control sequences are removed or reduced, all major actions (synchronizing, load control type) are initiated via binary inputs to the NT controller.

### *Hint:*

Text with cyan background is valid for IntelliSys<sup>NT</sup> only!

# Available documentation

## *Inteli NT general manuals*

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### **IGS-NT-2.0-Application guide.pdf**

Dedicated to gen-set control panel builders and project designers.

Covers above all following items:

- IG/IS-NT hardware options
- Comparison of number of I/O and communication ports in different HW modifications
- Order codes overview
- Applications overview – purpose, connection recommendations, function description
- PLC functions description
- Virtual peripherals – principle and usage

### **IGS-NT-2.0-Installation guide.pdf**

Dedicated to gen-set control panel builders and everybody concerned with installation of the gen-set.

Includes information about following topics:

- Terminals and dimensions of all controllers and peripheral modules
- Recommended wirings
- Controllers' interface options
- Default sensors
- Speed governor interfaces
- AVR interfaces
- Technical data

### **IGS-NT-2.0-Operator guide.pdf**

Dedicated to everybody concerned with operation and maintenance of the gen-set.

It describes

- Operator interface
- Measurement screens of the NT family controllers
- Modes and function of the controller.
- IG/IS-NT Available documentation list

### **IGS-NT-2.0-Troubleshooting guide.pdf**

Includes description of possible troubles during configuration, adjustment and operation of the controller.

Consists of two parts:

- List of troubles and their solution
- How to ... section with recommended procedures in some typical situations

## *Inteli NT application manuals*

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For each application an appropriate manual is available:

### **IGS-NT-SPTM-2.0.pdf**

### **IGS-NT-SPI-2.0.pdf**

### **IGS-NT-MINT-2.0.pdf**

### **IGS-NT-COX-2.0.pdf**

They include these sections:

- Modes description (OFF, MAN, AUT, ...)
- Functions description (e.g. Load shedding, Power management, Start/Stop sequences)
- Protections and alarm management
- Gen-set operation states
- Inputs and outputs
- Setpoints
- List of abbreviations

## ***Inteli NT PC tools manuals***

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### **InteliMonitor-2.0.pdf**

This manual describes InteliMonitor monitoring PC tool in the following chapters:

- Connection to the controller (Direct, Modem, Internet)
- InteliDDE Server
- Menus description
- Password and access code

### **GenConfig-2.0.pdf**

This manual describes GenConfig configuration PC tool in the following chapters:

- Connection to the controller (Direct, Modem, Internet)
- InteliDDE Server
- Menus description
- Controller configuration steps (Modules, I/O, Setpoints, Protections, History,...)

## ***Inteli common manuals***

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### **InteliCommunicationGuide – September 06.pdf**

This manual covers communication topics not only regarding IG/IS-NT controllers but also InteliLite and InteliDrive controllers. It applies to communication between the controller and superior service or monitoring system but not to communication among the controllers or between the controller and it's peripherals (extension modules, ECU).

It is divided into following chapters:

- Local connection
- Remote connection
- Modem connection
- Internet connection
- Active call, SMS, email
- Modbus description
- I-LB, IG-IB communication units
- Modem recommendations
- Recommended converters

## Conformity declaration



Following described machine complies with the appropriate basic safety and health requirement of the EC Low Voltage Directive No: 73/23 / EEC and EC Electromagnetic Compatibility Directive 89/336 / EEC based on its design and type, as brought into circulation by us.

## !! Warnings !!

**Be aware that the binary outputs can change state during and after software reprogramming (before the controller is used again ensure that the proper configuration and setpoint settings are set in the controller)!!!**

**Be aware that gen-set can automatically or remotely start when following controller terminals are disconnected !!!**

- Mains voltage measuring and / or
- Binary outputs for MCB control and / or
- MCB feedback

Switch IntelliGen<sup>NT</sup> to OFF mode and disconnect the Binary outputs Starter and Fuel to avoid unexpected automatic start of gen-set and GCB closing.

## !!! CAUTION !!!

### ***Dangerous voltage***

In no case touch the terminals for voltage and current measurement!  
Always properly connect grounding terminals!

Take care when disconnecting In/Im3 terminals when the gen-set is stopped.  
For safety connect parallel to controller In/Im3 terminals two anti parallel diodes 10A/100V.

In any case do not disconnect generator CT terminals when the gen-set is loaded.

### ***Adjust set points***

All setpoints are preadjusted to their typical values. But the setpoints in the “**Basic settings**” settings group **!!must!!** be adjusted before the first startup of the gen-set.

**!!! WRONG ADJUSTMENT OF BASIC PARAMETERS  
CAN DESTROY THE GEN-SET !!!**

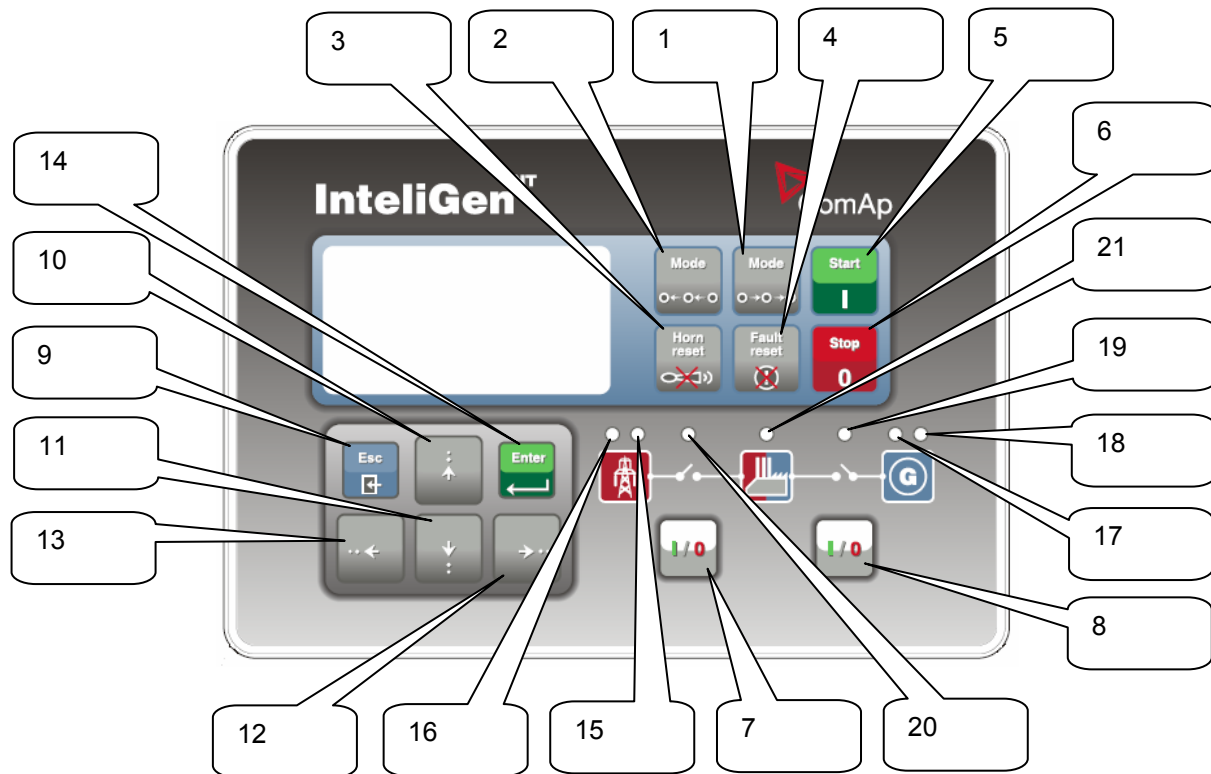
**The following instructions are for qualified personnel only.  
To avoid personal injury do not perform any action not specified in this User guide !!!**

### **Note:**

ComAp believes that all information provided herein is correct and reliable and reserves the right to update at any time. ComAp does not assume any responsibility for its use unless otherwise expressly undertaken.

# Operator interface






## InteliGen<sup>NT</sup> pushbuttons and LEDs




### Pushbuttons:







1. **MODE→** Cycle forward through gen-set operation modes OFF→MAN→ AUT→ TEST.
2. **←MODE** Cycle backward through gen-set operation modes OFF←MAN ←AUT←TEST.
3. **HORN RESET** Deactivates the HORN (AUDIBLE ALARM).
4. **FAULT RESET** Acknowledges faults and alarms.
5. **START** Starts the gen-set in MAN mode.
6. **STOP** Stops the gen-set in MAN mode.
7. **MCB ON/OFF** Opens and closes (synchronizes) the Mains circuit breaker in MAN mode.
8. **GCB ON/OFF** Opens and closes (synchronizes) the Generator circuit breaker in MAN mode.
9. **ESC**











Where	Function
Measurement screens, Alarm list	Go to Menu screen
Setpoints screen	Go to Menu screen; within setpoint group, go to group list
Setpoint edit	Leave setpoint edit without changes
History screen	Go to Menu screen
FastEdit screen	Fast edit exit (to previous measurement screen) without changes
Language screen	Language screen exit (to menu) without save

10.  Select the setpoint, select the screen, select history record or increase setpoint value.
11.  Select the setpoint, select the screen, select history record or decrease setpoint value.
12.  Moves history record displayed columns to the right, 5% increase of edited setpoint's value (step given by the setpoint range), go back from Alarm list.
13.  Moves history record displayed columns to the left, 5% decrease of edited setpoint's value (step given by the setpoint range), view Alarm list from measurement screens.
14. 

Where	Function
Menu screen	Go to selected display group (Measurement CU, Measurement IO, ...)
Measurement screens, Alarm list	Go to FastEdit screen (hold  for 4 sec.) – then it is possible to adjust selected setpoint (typically Base load for standard SPtM)
Setpoints screen	Go to selected setpoint group
Setpoint edit	Start setpoint edit / save changes
History screen	Go to the first column of the first history record
FastEdit screen	FastEdit exit (to previous measurement screen) with setpoint change
Language screen	Language screen exit (to menu) and save selection

## Pushbuttons' combinations

Following table determines controller functions when , , , ,  and  buttons' combination is pressed:



Where	Pushbutton combination	Function
Measurement screens, Alarm list	 + 	Contrast increase
	 + 	Contrast decrease
	 + 	Info screen
Info screen	 + 	Backlight increase
	 + 	Backlight decrease

## LEDs

15. MAINS VOLTAGE PRESENT: GREEN LED is on, if voltage on the mains terminals is present (in SPI and SPtM). LED is not active in MINT, COX.

16. MAINS FAILURE: RED LED starts flashing when the mains failure occurs and gen-set does not run, goes to steady light when the gen-set starts and goes off when the mains restores.

17. GEN VOLTAGE PRESENT: GREEN LED is on, if gen. voltage is present and within limits.

18. GEN-SET FAILURE: RED LED starts flashing when any failure occurs. After   button is pressed, goes to steady light (if an alarm is still active) or is off (if no alarm is active).

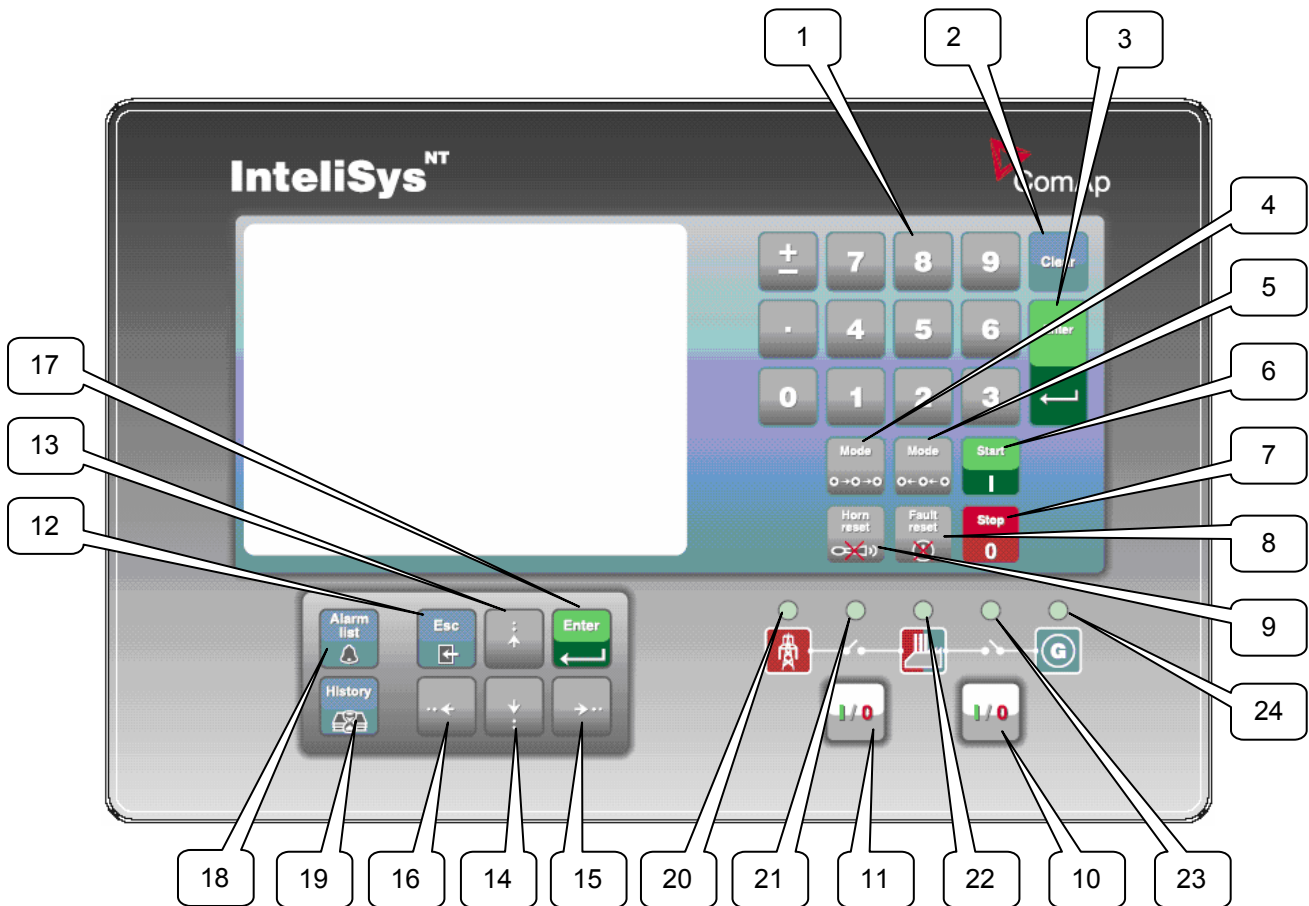
19. GCB ON: GREEN LED is on, if GCB feedback is active. Flashes during synchronizing.

20. MCB ON: GREEN LED is on, if MCB feedback is active. Flashes during reverse synchronizing (synchronizing of the loaded gen-set back to the restored mains).

21. Bus – GREEN LED is on if bus voltage is present and within limits.



## InteliSys<sup>NT</sup> pushbuttons and LEDs



### Pushbuttons:

1. Numeric keypad

Where	Function
Setpoints screen	Change setpoint value
Menu screen	Go to selected display group directly
Measurement screens	Go to another screen directly
Language screen	Select language directly
History screen	If pressed $\pm$ button a $\text{H}$ symbol appears on the display (bottom right corner) and it is possible to move by one page of records using arrow buttons

2. 
3. 

Clears character on the left side of the cursor, exits from menu

Where	Function
Menu screen	Go to selected display group (Measurement CU, Measurement IO, ...)
Measurement screens, Alarm list	Go to FastEdit screen (hold <b>ENTER</b> for 4 sec.) – then it is possible to adjust selected setpoint (typically Base load for standard SPtM)
Setpoints screen	Go to selected setpoint group
Setpoint edit	Start setpoint edit / save changes
History screen	Go to the first column of the first history record
FastEdit screen	FastEdit exit (to previous measurement screen) with setpoint change
Language screen	Language screen exit (to menu) and save selection

4. **Mode→** Cycle forward through gen-set operation modes OFF→MAN→ SEM→ AUT→ TEST.
5. **←Mode** Cycle backward through gen-set operation modes OFF←MAN←SEM←AUT ←TEST.
6. **START** Starts the gen-set in MAN or SEM mode.
7. **STOP** Stops the gen-set in MAN or SEM mode.
8. **FAULT RESET** Acknowledges faults and alarms.
9. **HORN RESET** Deactivates the horn (audible alarm).
10. **MCB ON/OFF** Opens and closes (synchronizes) the Mains circuit breaker in MAN mode (SPTM application only).
11. **GCB ON/OFF** Opens and closes (synchronizes) the Generator circuit breaker in MAN mode.
12. **ESC**

Where	Function
Measurement screens, Alarm list	Go to Menu screen
Setpoints screen	Go to Menu screen; within setpoint group, go to group list
Setpoint edit	Leave setpoint edit without changes
History screen	Go to Menu screen
FastEdit screen	Fast edit exit (to previous measurement screen) without changes
Language screen	Language screen exit (to menu) without save
Table of characters	Jump among table of characters, menu and text line

13. **↑** Select the setpoint, setpoint group, select the screen, select history record, increase setpoint value, edit stringlist value, select language
14. **↓** Select the setpoint, setpoint group, select the screen, select history record, decrease setpoint value, edit stringlist value, select language
15. **→** In AlarmList screen, shift the Alarm list page down (if more than 7 items), moves history record displayed columns to the right
16. **←** In AlarmList screen, shift the Alarm list page up (if more than 7 items), moves history record displayed columns to the left, go to Info screen
17. **Enter** Same as 3.
18. **Alarm list** Shortcut to Alarm list screen from any other screen
19. **History** Shortcut to History screen from any other screen

## Pushbuttons' combinations

Following table determines controller functions when **↑**, **↓**, **←**, **→**, **ENTER** and **PAGE** buttons' combination is pressed:

Where	Pushbutton combination	Function
Measurement screens, Alarm list	<b>ENTER</b> + <b>↑</b>	Contrast increase
	<b>ENTER</b> + <b>↓</b>	Contrast decrease
	<b>ENTER</b> + <b>ESC</b>	Info screen
Info screen	<b>ENTER</b> + <b>↑</b>	Backlight increase
	<b>ENTER</b> + <b>↓</b>	Backlight decrease
History screen	number + <b>ENTER</b>	Go to record with this number

## LEDs:

20. Mains status LED
21. MCB status LED
22. Load status LED
23. GCB status LED
24. Gen-set status LED

## How to select gen-set mode?

Use **MODE→** or **←MODE** to select requested gen-set operation mode OFF – MAN – **SEM** – AUT – TEST. It is not possible to go directly from OFF to AUT or TEST.

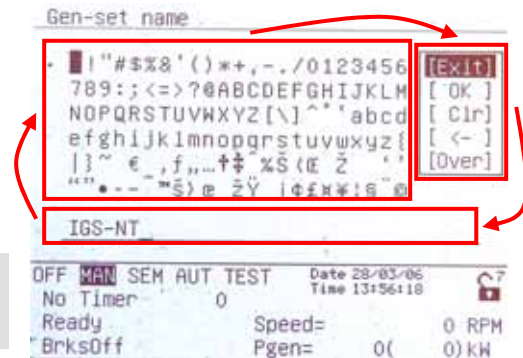
## Display menus

There are several display menus (functions) available: ALARMLIST, MEASUREMENT CU, MEASUREMENT IO, SETPOINTS, HISTORY, PASSWORD and LANGUAGE.

Each menu consists of several screens. Pressing the **ESC** (repeatedly when necessary) button the menu screen will be displayed.

### Hint:

IS-NT – When pressing **ESC** on the screen with characters, focus jumps from menu to bottom line and table of characters. See picture on the right.



## How to view Alarm list?

1. Select the ALARMLIST menu item and press **ENTER** or press **←** in measurements' screens to go directly to the Alarm list.

## How to view measured data?

1. Select the MEASUREMENT CU menu item and press **ENTER**.
2. Use **↑** and **↓** to select the screen with requested data.

## How to view IO values?

1. Select the MEASUREMENT IO menu item and press **ENTER**.
2. Use **↑** and **↓** to select the screen with requested data.

## How to view and edit setpoints?

1. Select SETPOINTS menu item and press **ENTER**.
2. Use **↑** or **↓** to select requested set points group.
3. Press **ENTER** to confirm.
4. Use **↑** or **↓** to select requested set point.
5. Set points marked **Ⓟ** are password protected.
6. Press **ENTER** to edit.
7. Use **↑** or **↓** to modify the set point. When **↑** or **↓** is pressed for 2 sec, auto repeat function and speedup is activated. Use **←** or **→** to change the setpoint value by 5% of it's range.
8. Press **ENTER** to confirm or **ESC** to leave without change.
9. Press **ESC** to leave selected set points group.

## How to view the HISTORY menu?

1. Select HISTORY menu item and press **ENTER**
2. Use **↑** or **↓** to select a requested record.
3. Use **→** or **←** to cycle forward/backward through columns of the record.
4. Press **±** to cycle through the whole screens of columns/rows.

## How to change password?

1. Select USERS/PASSWORD menu item and press **ENTER**.
2. Use **↑** or **↓** to select User.
3. Press **ENTER** to confirm.

4. Select ChangePassword and press **ENTER**
5. Use **↑** or **↓** or **←** or **→** to set new password
6. Press **ENTER** to confirm password

## How to set Language?

1. Select LANGUAGE menu item (if not already selected) and press **ENTER**
2. Use **↑** or **↓** to select a requested Language.
3. Press **ENTER** to confirm.

### Hint:

If binary inputs *Lang sel int A,B,C* (for IG-NT/EE internal display and IS-Display with address 1) or *Lang sel #2 A,B,C* (for IG-Display and **IS-Display with address 2**) or *Lang sel #3 A,B,C* (for IS-Display with address 3) are used, it is **not** possible to change languages from Language screen.

Language	0	1	2	3	4	5	6	7
Lang sel xxx A	0	1	0	1	0	1	0	1
Lang sel xxx B	0	0	1	1	0	0	1	1
Lang sel xxx C	0	0	0	0	1	1	1	1

## How to change the display contrast?

Press and hold **ENTER** and use **↑** or **↓** to adjust the best display contrast.

### Hint:

Available from the MEASUREMENT screens only.

## How to check the serial number and software revision?

Hold down the **ENTER** and then press **ESC**. On the display you can see controller INFO screen for 10 seconds.

InteliGen <sup>NT</sup>	InteliSys <sup>NT</sup>
Controller INFO screen contains: <ol style="list-style-type: none"> <li>1. Controller name (see <b>Basic settings</b> group)</li> <li>2. Controller serial number (8 character number), SW version, ID string and release date</li> <li>3. Application: SPTM, SPI, COX...</li> </ol> Using <b>→</b> you can view the INFO2 screen which contains: <ol style="list-style-type: none"> <li>1. Display SW version</li> <li>2. ID chip and Dongle content</li> <li>3. Password decoding string</li> </ol>	Controller INFO screen contains: <ol style="list-style-type: none"> <li>1. Controller name (see <b>Basic settings</b> group)</li> <li>2. Firmware and release date</li> <li>3. Controller serial number (8 character number)</li> <li>4. Application: SPTM, SPI, COX...</li> <li>5. Password decode number</li> <li>6. IS-Display version and release date</li> <li>7. Encoding: available character sets</li> </ol> Using <b>→</b> you can view the INFO2 screen which contains: <ol style="list-style-type: none"> <li>1. IDch: ID string</li> <li>2. Dngl: connected dongle</li> <li>3. Supported code pages</li> </ol> Using <b>→</b> again you can view the INFO3 screen which contains: <ol style="list-style-type: none"> <li>1. IS-Display IDchip: ID string</li> </ol>

### Hint:

Available from the MEASUREMENT screens only.

## How to view Connection screen on IG-Display?

Press **↑** button when in Info screen to see information about IG-Display hardware version and properties and actual state of communication with the master controller.

## How to change the display backlight intensity?

Hold down the **ENTER** and then press **ESC**. On the display you can see Controller INFO screen for 10 seconds.

Press and hold **ENTER** when in INFO screen and use **↑** or **↓** to adjust the best display backlight.

Backlight intensity is set for one of the two modes, depending on the activity of configurable binary input *Alt brightness* (IG-NT/EE and modifications). For IG-Display and IS-Display modules, this binary input is located in the Power connector and it's function is fixed (not configurable). IS-Display with address 1 reads analog input *LCD brightness* on IS-NT-BB and changes accordingly display backlight intensity in the range 0-100%.

*Hint:*

Backlight intensity change available from the MEASUREMENT screens only.

## How to find active alarms?

Select Alarmlist menu item and press **ENTER** or press **←** in MEASUREMENT IO or MEASUREMENT CU menu.

Inverted alarms are still active. Non-inverted alarms are not active, but not yet confirmed.

Press **FAULT RESET** to accept all alarms (an asterisk mark disappears when an alarm is accepted by **FAULT RESET**). Non-active alarms immediately disappear from the list.

Active alarm list appears on the screen automatically when a new alarm comes up and Main MEASUREMENT screen was selected.

*Hint:*

Alarm list does not activate automatically if the display is switched to any other screen than the first one of MEASUREMENT (typically the screen that shows menu selector on the upper). The automatic jump to the alarm list screen will not occur if you are listing through the measured values, set points or history!

If setpoint **Engine protect:ResetActAlarms** is set to DISABLED, only inactive alarms can be reset.

If an active alarm is present in the alarm list, controller display blinks every 30 seconds.

## When to use **GCB ON/OFF** button?

The button is disabled in AUT mode.

In MAN and TEST modes it is enabled, but before closing of the circuit breaker, generator voltage and frequency must be within limits. The controller has internal protection to avoid the breaker closure without synchronizing.

The controller recognizes automatically:

- if there is mains / bus voltage and the gen-set shall be synchronized before closing the GCB
- or if there is no voltage on the bus and the GCB can be closed without synchronizing.

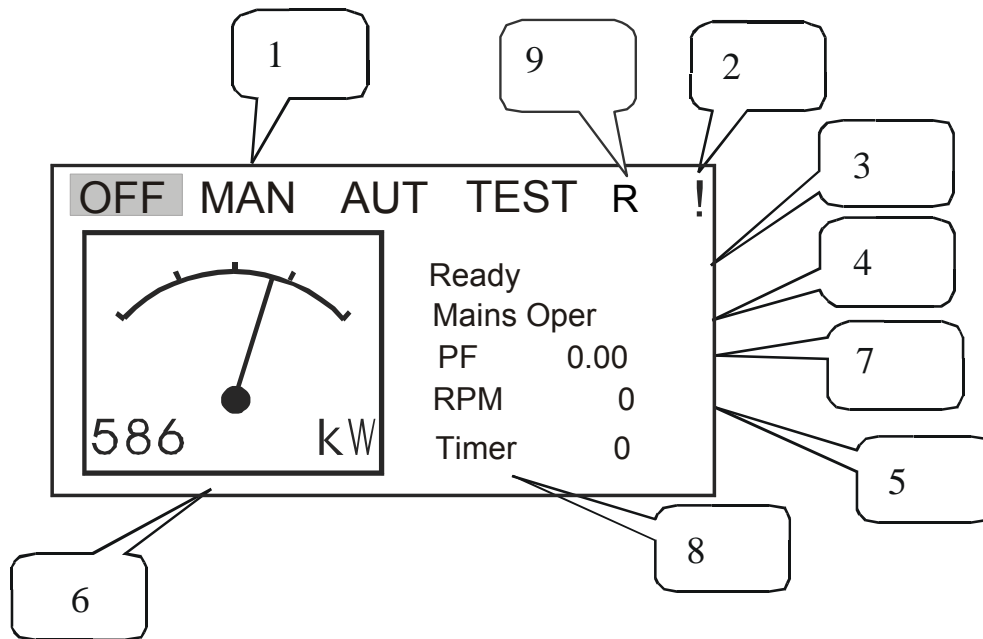
## When to use **MCB ON/OFF** button?

The button is disabled in AUT mode.

Use this button in MAN or TEST mode to close or open the MCB. **Be careful while doing this, because you can disconnect the load from the mains!!!**

## Description of IntelliGen<sup>NT</sup> MEASUREMENT screens

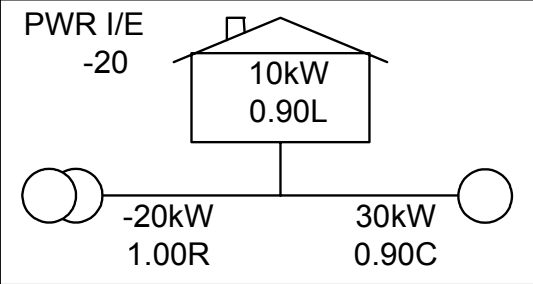
### Main measure screen



1. Operation mode of the gen-set
2. Indication of active alarm
3. Status of the gen-set
4. Actual electric condition
5. RPM of the gen-set
6. Active power
7. Power factor
8. Timer – event's counting time (e.g. prestart, cooling, ...)
9. Signalizes, when any remote connection to controller is active

Following table contains an example of MINT and SPtM MEASUREMENT screens. Other applications can be slightly different.

### Measurement CU

MINT	SPtM
	<p><b>Total power screen</b></p>  <p>Left up corner: Actual power control mode None or Base or Imp/Exp and required power values.</p> <p>Load:           Actual value of active power.                   Actual value of PF</p> <p>Mains:           Actual value of active power.                   Actual value of PF</p> <p>Gen-set:         Actual value of active power.                   Actual value of PF</p>
<p><b>Generator (frequency, voltage)</b> Gen freq Gen V1, V2, V3 ph-N (triple bargraph) Gen V12, V23, V31 ph-ph (triple bargraph)</p>	<p><b>Generator (frequency, voltage)</b> Gen freq Gen V1, V2, V3 ph-N (triple bargraph) Gen V12, V23, V31 ph-ph (triple bargraph)</p>
<p><b>Generator (current)</b> Gen I1, I2, I3 (triple bargraph)</p>	<p><b>Generator (current)</b> Gen I1, I2, I3 (triple bargraph)</p>
<p><b>Bus (frequency, voltage)</b> Bus freq Bus V1, V2, V3 ph-N (triple bargraph) Bus V12, V23, V31 ph-ph (triple bargraph)</p>	<p><b>Mains (frequency, voltage)</b> Mains freq Mains V1, V2, V3 ph-N (triple bargraph) Mains V12, V23, V31 ph-ph (triple bargraph)</p>
<p><b>Bus (current)</b> Im3/EarthFC (single bargraph)</p>	<p><b>Mains (current, power, PF)</b> Im3/EarthFC (single bargraph) P mains Q mains Mains PF MaxVectorS</p>
<p><b>Gen-set power</b> Active power (total and per phase) Power factor (total and per phase) Reactive power kVAr (total and per phase) Apparent power (total and per phase)</p>	<p><b>Gen-set power</b> Active power (total and per phase) Power factor (total and per phase) Reactive power kVAr (total and per phase) Apparent power (total and per phase)</p>
<p><b>IG-CU Analog inputs</b> Battery voltage (single bargraph) CPU temp (single bargraph) Dplus (single bargraph)</p>	<p><b>IG-CU Analog inputs</b> Battery voltage (single bargraph) CPU temp (single bargraph) Dplus (single bargraph)</p>
<p><b>Synchroscope</b> Slip frequency Synchroscope V1g Generator first phase voltage V1b Bus first phase voltage SRO Speed regulator output indication in the range 0 to ±10,00V VRO Voltage regulator output indication in the range 0 to 100%.</p>	<p><b>Synchroscope</b> Slip frequency Synchroscope V1g Generator first phase voltage V1m Mains first phase voltage SRO Speed regulator output indication in the range 0 to ±10,00V VRO Voltage regulator output indication in the range 0 to 100%.</p>

<b>Statistic</b> Run hours Number of starts Number of unsuccessful starts Service time 1 Service time 2 Service time 3 Service time 4	<b>Statistic</b> Run hours Number of starts Number of unsuccessful starts Service time 1 Service time 2 Service time 3 Service time 4
<b>Statistic</b> kWhours kVAhours Time <b>Date</b>	<b>Statistic</b> kWhours kVAhours Time Date
<b>Power management</b> Engine priority Total running actual power Actual reserve (single barograph) CAN16 CAN32	

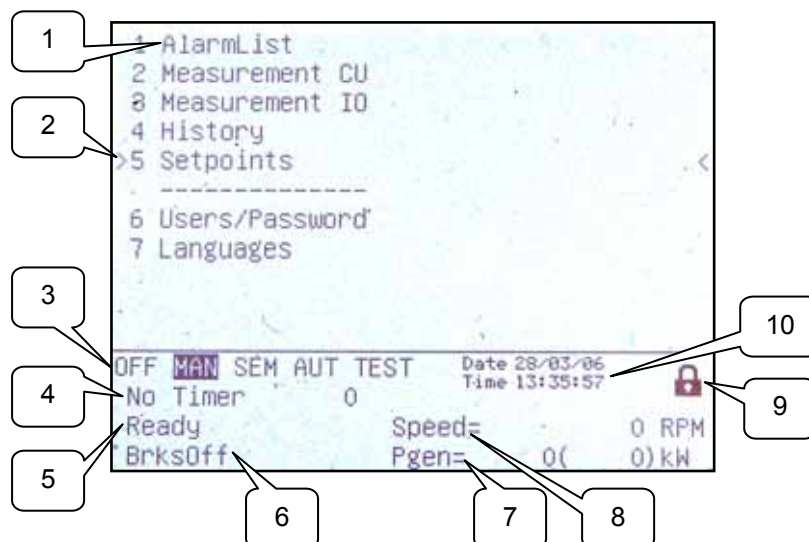
## Measurement IO

<b>IG-CU analog inputs</b> AI1 to AI3	<b>IG-CU analog inputs</b> AI1 to AI3
--	--

+ inputs/outputs of connected ECU and/or modules, depending on actual configuration.

## *Description of IntelliSys<sup>NT</sup> MEASUREMENT screens*



### Main menu screen



1. Selection of alarm list, measurement, history, setpoints, languages or user screen.
2. Cursor shows actual selection.
3. Controller mode indication. Black background indicates active mode (MAN mode in the above example).
4. Timer – events counting time (e.g. prestart, cooling).
5. Engine machine state indication.
6. Electric machine state indication.
7. Actual gen-set power (requested gen-set power).

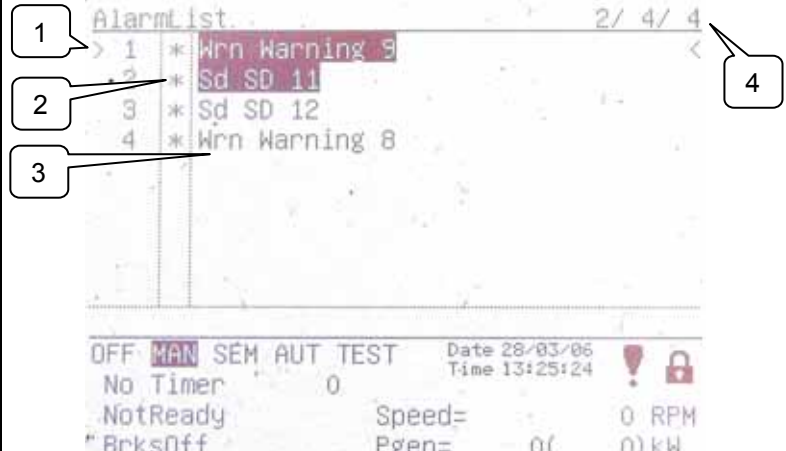


8. Actual RPM.
9. Indication of access level from the controller panel:

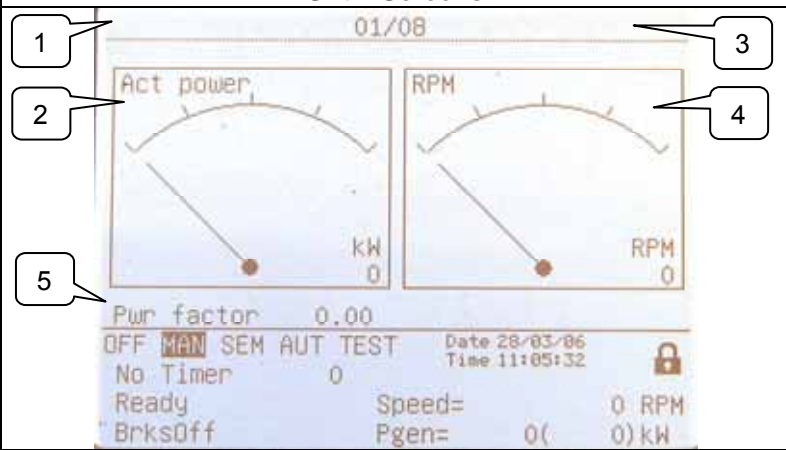
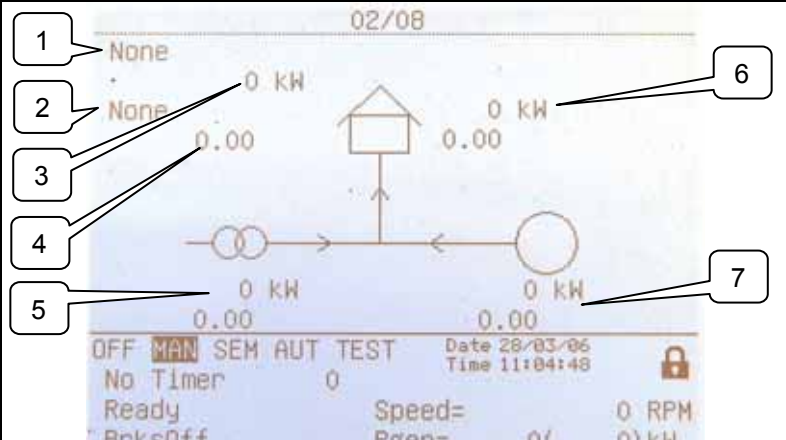
	Closed lock	No password set
	Opened lock	Password is set. Password level is visible in opened lock.

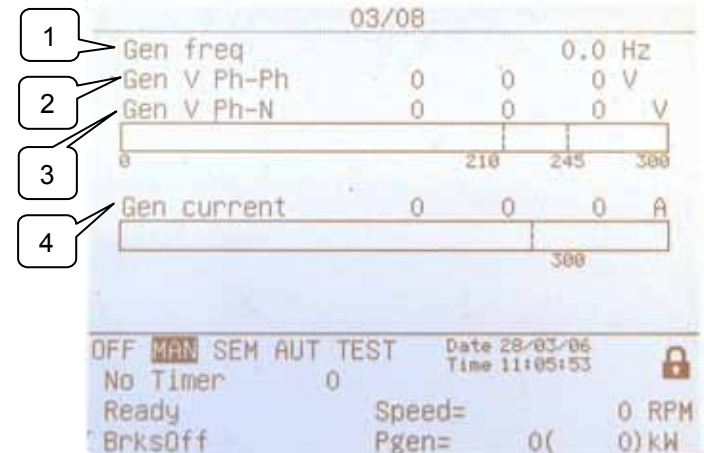
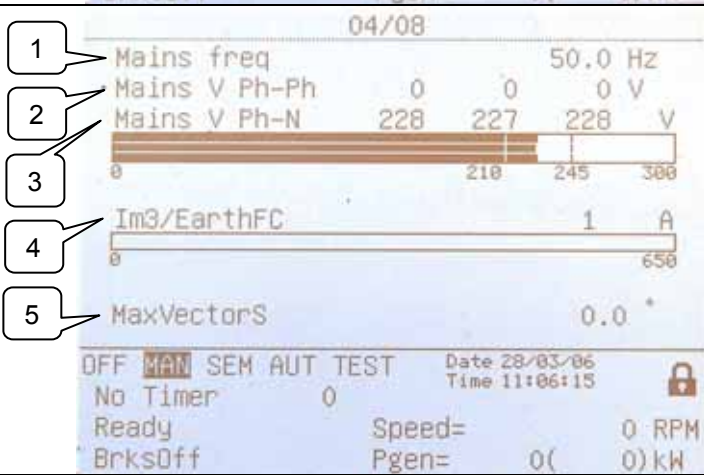

10. Controller date and time. Can be set in **Date/Time** group of setpoints.

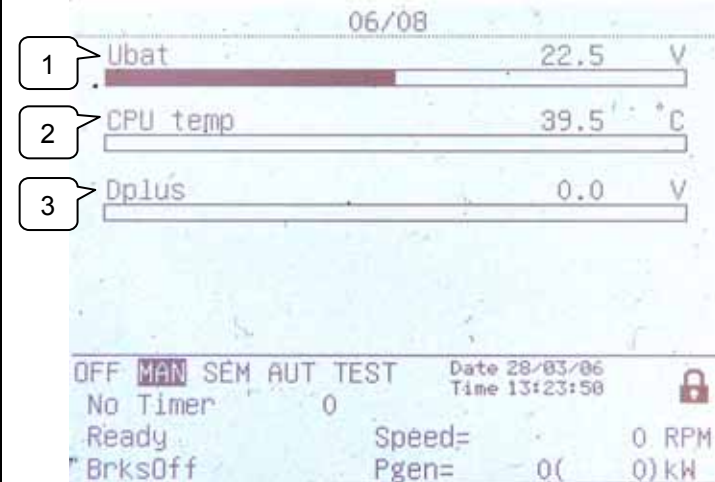
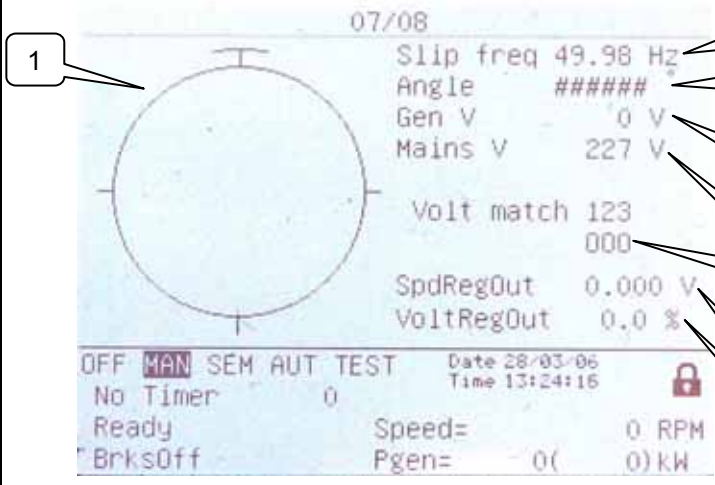
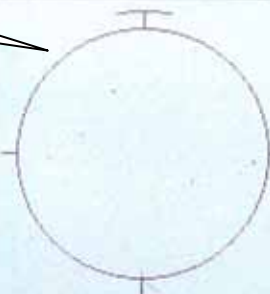

## Alarm list

	<ol style="list-style-type: none"> <li>1. Details of the alarm from ECU indicated by the cursor are displayed at the bottom line (SPN, FMI, OC numbers)</li> <li>2. Asterisk indicates not accepted alarms (Fault reset has not been performed)</li> <li>3. Alarms displayed inverted are active</li> <li>4. Number of active / not accepted / all alarms</li> </ol>
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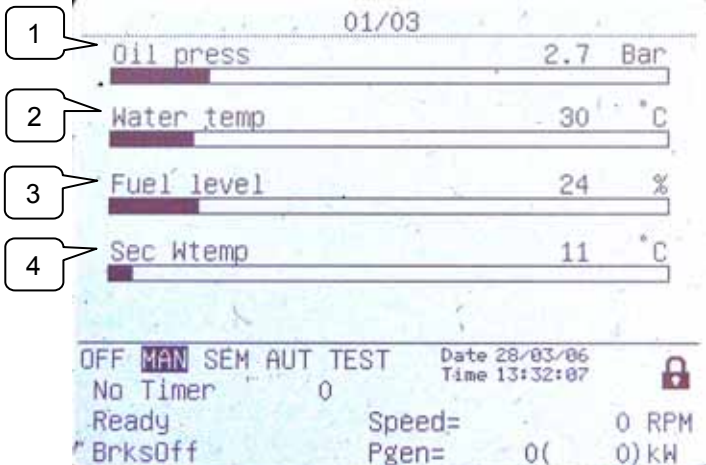
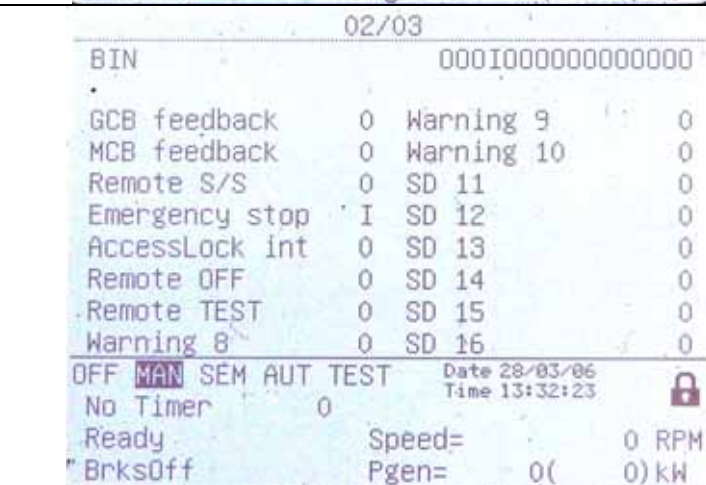

## Measurement CU

SPtM Screens	Description
	<ol style="list-style-type: none"> <li>1. Remote communication indication and access lock indication (symbol is visible when Access lock BI is active).</li> <li>2. Actual gen-set power.</li> <li>3. Measure screen address. For jump to this screen set this number from the numeric keypad.</li> <li>4. Actual engine RPM.</li> <li>5. Actual power factor.</li> </ol>
	<ol style="list-style-type: none"> <li>1. Power control mode (Island / BaseLd / BldEmLm / PwrI/E / TbyPwr)</li> <li>2. PF control mode (Island / BasePF / PF I/E)</li> <li>3. Required power value</li> <li>4. Required PF value</li> <li>5. Actual Mains active power and PF values</li> <li>6. Actual load active power and PF values</li> <li>7. Actual gen-set active power and PF values</li> </ol>

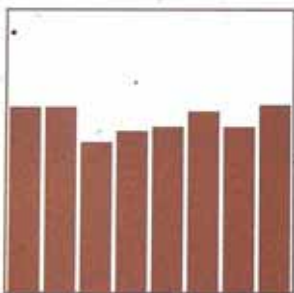
 <p>03/08</p> <p>1 Gen freq 0.0 Hz</p> <p>2 Gen V Ph-Ph 0 0 0 V</p> <p>3 Gen V Ph-N 0 0 0 V</p> <p>4 Gen current 0 0 0 A</p> <p>OFF <b>MAN</b> SEM AUT TEST Date 28/03/06 Time 11:05:53</p> <p>No Timer 0</p> <p>Ready Speed= 0 RPM</p> <p>BrksOff Pgen= 0( 0) kW</p>	<ol style="list-style-type: none"> <li>1. Generator frequency</li> <li>2. Generator voltage phase-phase</li> <li>3. Generator voltage phase-neutral + triple bargraph</li> <li>4. Generator current + triple bargraph</li> </ol>
 <p>04/08</p> <p>1 Mains freq 50.0 Hz</p> <p>2 Mains V Ph-Ph 0 0 0 V</p> <p>3 Mains V Ph-N 228 227 228 V</p> <p>4 Im3/EarthFC 1 A</p> <p>5 MaxVectorS 0.0 °</p> <p>OFF <b>MAN</b> SEM AUT TEST Date 28/03/06 Time 11:06:15</p> <p>No Timer 0</p> <p>Ready Speed= 0 RPM</p> <p>BrksOff Pgen= 0( 0) kW</p>	<ol style="list-style-type: none"> <li>1. Mains frequency</li> <li>2. Mains voltage phase-phase</li> <li>3. Mains voltage phase-neutral + triple bargraph</li> <li>4. Mains current (3<sup>rd</sup> phase)/ Earth fault current</li> <li>5. Maximal vector shift</li> </ol>
 <p>05/08</p> <p>1 Act power 0 kW</p> <p>2 Pwr factor 0.00</p> <p>3 React power 0.00 0.00 0.00 kVAr</p> <p>4 Appar pwr 0 0 0 kVA</p> <p>OFF <b>MAN</b> SEM AUT TEST Date 28/03/06 Time 11:06:48</p> <p>No Timer 0</p> <p>Ready Speed= 0 RPM</p> <p>BrksOff Pgen= 0( 0) kW</p>	<ol style="list-style-type: none"> <li>1. Active power (total and per phase)</li> <li>2. Power factor (total and per phase)</li> <li>3. Reactive power (total and per phase)</li> <li>4. Apparent power (total and per phase)</li> </ol>

 <p>06/08</p> <p>1 Ubat 22.5 V</p> <p>2 CPU temp 39.5 °C</p> <p>3 Dplus 0.0 V</p> <p>OFF <b>MAN</b> SEM AUT TEST Date 28/03/06 Time 13:23:58</p> <p>No Timer 0</p> <p>Ready Speed= 0 RPM</p> <p>BrksOff Pgen= 0( 0)kW</p>	<ol style="list-style-type: none"> <li>1. Battery voltage</li> <li>2. CPU temperature</li> <li>3. D+ voltage</li> </ol>
 <p>07/08</p> <p>1 </p> <p>2 Slip freq 49.98 Hz</p> <p>3 Angle #####</p> <p>4 Gen V 0 V</p> <p>5 Mains V 227 V</p> <p>6 Volt match 123 000</p> <p>7 SpdRegOut 0.000 V</p> <p>8 VoltRegOut 0.0 %</p> <p>OFF <b>MAN</b> SEM AUT TEST Date 28/03/06 Time 13:24:16</p> <p>No Timer 0</p> <p>Ready Speed= 0 RPM</p> <p>BrksOff Pgen= 0( 0)kW</p>	<ol style="list-style-type: none"> <li>1. Synchroscope</li> <li>2. Slip frequency</li> <li>3. Actual angle between generator and mains voltage</li> <li>4. Generator first phase voltage</li> <li>5. Mains first phase voltage</li> <li>6. Voltage match of all three phases (0 – doesn't match; 1 – OK)</li> <li>7. SRO – Speed Regulator Output indication in the range SpeedGovLowLim – SpeedGovHiLim</li> <li>8. VRO – Voltage Regulator Output indication in the range 0 – 100%</li> </ol>
 <p>08/08</p> <p>1 Run hours 1469 h</p> <p>2 Num starts 253</p> <p>3 NumUnscStarts 53</p> <p>4 Service time 1 400 h</p> <p>5 Service time 2 800 h</p> <p>6 Service time 3 65534 h</p> <p>7 Service time 4 65534 h</p> <p>8 kWhours 1256</p> <p>9 kVARhours 1658</p> <p>OFF <b>MAN</b> SEM AUT TEST Date 28/03/06 Time 13:54:53</p> <p>No Timer 0</p> <p>Ready Speed= 0 RPM</p> <p>BrksOff Pgen= 0( 0)kW</p>	<p>Statistics</p> <ol style="list-style-type: none"> <li>1. Total engine running hours</li> <li>2. Total number of starts</li> <li>3. Total number of unsuccessful starts</li> <li>4. Service times (set in <b>Engine protect</b> group of setpoints)</li> <li>5. Total gen-set kW hours</li> <li>6. Total gen-set kVAR hours</li> </ol> <p><u>Note:</u> Statistics can be set in IntelliMonitor → Set statistics... after password of User 0 is entered.</p>

## Measurement IO

SPtM Screens	Description
 <p>01/03</p> <p>Oil press 2.7 Bar</p> <p>Water temp 30 °C</p> <p>Fuel level 24 %</p> <p>Sec Wtemp 11 °C</p> <p>OFF <b>MAN</b> SEM AUT TEST Date 28/03/06 Time 13:32:07</p> <p>No Timer 0</p> <p>Ready Speed= 0 RPM</p> <p>BrksOff Pgen= 0( 0) kW</p>	<p>IS-NT analog inputs</p> <ol style="list-style-type: none"> <li>1. Analog input 1 (e.g. Oil pressure)</li> <li>2. Analog input 2 (e.g. Primary water temperature)</li> <li>3. Analog input 3 (e.g. Fuel level)</li> <li>4. analog input 4 (e.g. Secondary water temperature)</li> </ol>
 <p>02/03</p> <p>BIN 000I0000000000000</p> <p>GCB feedback 0 Warning 9 0</p> <p>MCB feedback 0 Warning 10 0</p> <p>Remote S/S 0 SD 11 0</p> <p>Emergency stop I SD 12 0</p> <p>AccessLock int 0 SD 13 0</p> <p>Remote OFF 0 SD 14 0</p> <p>Remote TEST 0 SD 15 0</p> <p>Warning 8 0 SD 16 0</p> <p>OFF <b>MAN</b> SEM AUT TEST Date 28/03/06 Time 13:32:23</p> <p>No Timer 0</p> <p>Ready Speed= 0 RPM</p> <p>BrksOff Pgen= 0( 0) kW</p>	<p>IS-NT binary inputs indication</p>
 <p>03/03</p> <p>BOUT 00000000I0000000</p> <p>Starter 0 Ready I</p> <p>Fuel solenoid 0 Running 0</p> <p>GCB close/open 0 Ready to load 0</p> <p>MCB close/open 0 Cooling pump 0</p> <p>Alarm 0 Bin OUT 13 0</p> <p>Horn 0 Bin OUT 14 0</p> <p>Prestart 0 Bin OUT 15 0</p> <p>Idle/Nominal 0 Bin OUT 16 0</p> <p>OFF <b>MAN</b> SEM AUT TEST Date 28/03/06 Time 13:32:41</p> <p>No Timer 0</p> <p>Ready Speed= 0 RPM</p> <p>BrksOff Pgen= 0( 0) kW</p>	<p>IS-NT binary outputs indication</p>

05/06



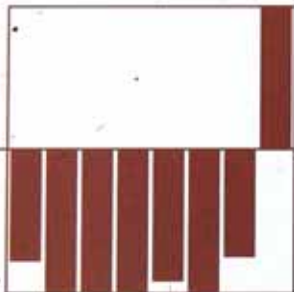
165.7-  
 165.7-  
 133.7-  
 144.5-  
 147.7-  
 162.0-  
 148.2-  
 166.4-

OFF MAN SEM AUT TEST
04/04/06 09:55:16 ! 🔒

No Timer 0
Speed= 0 RPM

\* MainsOper
Pgen= 0( 0) kW

06/06



-19.7-  
 -51.7-  
 -40.9-  
 -37.7-  
 -23.3-  
 -37.2-  
 -19.1-  
 229.8-

OFF MAN SEM AUT TEST
04/04/06 09:56:21 🔒

No Timer 0
Speed= 0 RPM

\* MainsOper
Pgen= 0( 0) kW

Further screens are automatically added if I/O extension modules or ECU are connected to the controller.

If the temperatures of cylinders are configured/measured it is possible to see bargraphs of these temperatures on the separate screen.

Another screen shows the differences of cylinder temperatures from the average temperature.


## History

No.	Reason	Time	Date
0	Mrn Warning 8	13:25:13.8	28/03/2006
-1	Sd SD 12	13:25:06.4	28/03/2006
-2	Not ready	13:25:02.4	28/03/2006
-3	Sd SD 11	13:25:02.4	28/03/2006
-4	Mrn Warning 9	13:25:00.9	28/03/2006
-5	Terminal	13:07:16.8	28/03/2006
-6	Ready	13:07:16.8	28/03/2006
-7	Switched On	13:07:15.5	28/03/2006
-8	Ready	13:07:06.3	28/03/2006
-9	Fault reset	13:07:06.3	28/03/2006
-10	Not ready	11:50:59.3	28/03/2006
-11	Start fail	11:50:57.2	28/03/2006
-12	Gen start	11:49:39.2	28/03/2006
-13	Terminal	10:50:47.4	28/03/2006
-14	Ready	10:50:47.3	28/03/2006
-15	Switched On	10:50:46.1	28/03/2006
-16	Ready	10:45:33.0	28/03/2006
-17	Fault reset	10:45:33.0	28/03/2006
-18	Not ready	10:45:29.1	28/03/2006
-19	Start fail	10:45:27.0	28/03/2006
-20	Gen start	10:44:53.7	28/03/2006
-21	Terminal	10:37:24.5	28/03/2006
-22	Ready	10:37:24.4	28/03/2006

No. 8 Date 28/03/2006  
 Reason Mrn Warn Time 13:25:13.8

1. Bottom lines show record number, reason, date and time even if other columns are actually displayed


## Users/Password

<pre> &gt;0 - U0 1 - John 2 - Peter 3 - George 4 - ----- 5 - ----- 6 - ----- 7 - ----- </pre> <hr/> <p> OFF <b>MAN</b> SEM AUT TEST      Date 28/03/06  No Timer                      0                      Time 13:53:09   Ready                              Speed=                      0 RPM  BrksOff                            Pgen=                      0(                      0)kW </p>	<p>This screen shows list of users. To enter or change password of selected user press Enter.</p>
---	---

## Users and Passwords

Up to 8 users can be defined in the system. Every user has its own defined level of access rights. There are seven levels of password protection. User 0 – Administrator has always level 7.



### Hint:



The lock mark  appears before a set point name (on controller screen) if the setpoint is password protected. The lock mark is removed only when the password is set from controller's front panel. The lock mark is still visible on controller screen even if the password is set from different terminal. Even though one level may have been set from the front panel, the affected set points are not accessible from IntelliMonitor (direct or Modem) until this level is set in IntelliMonitor (direct or Modem). Set point screen opened from front panel is automatically closed 15 minutes after the last key has been pressed.

It is possible to protect remote Start, Stop, GCB and MCB commands from IntelliMonitor. This seven level command protection can be configured in GenConfig.

## EnterPassword

Password is a five-digit number (0 - 65535). Only setpoints associated with the entered password level can be modified.

Use  or  to select the desired password and then press **ENTER**.

Use  or  to move the value by 5% of the range.

# Mode and function description

There are four gen-set operation modes: OFF - MAN – AUT – TEST in SPtM application. There are three gen-set operation modes: OFF - MAN – AUT in SPI, COX and MINT application.

To select the mode use **MODE→** or **←MODE**.

## OFF mode

- No start of the gen-set is possible. Outputs STARTER, GCB CLOSE/OPEN and FUEL SOLENOID are not energized.
- No reaction if buttons **START**, **STOP**, **GCB ON/OFF** are pressed.
- MCB behavior depends on **AMF settings**: *MCB opens on setpoint*:  
 MAINSFAIL: When power-cut comes, MCB opens. After Mains returns, MCB closes with *MCB close del.*  
 GEN RUNNING: When power-cut comes, MCB stays closed until the gen-set starts and produces voltage within limits.

## MAN mode

- 1) To start the gen-set press **START**.
- 2) When the generator voltage is within limits (adjusted in the setpoints group **Generator protections**) GCB green LED on the front panel lights.
- 3) Press **GCB ON/OFF** to close the GCB. If the generator voltage is out of the limits, controller does not respond to the **GCB ON/OFF**.
  - a) If controller detects dead bus, immediately closes GCB OPEN/CLOSE output.
  - b) If controller detects voltage on the bus, starts synchronizing.
- 4) To stop the engine press **STOP**
  - a) controller unloads the gen-set, opens GCB CLOSE/OPEN. Unloading is active only when binary input MCB feedback is closed or other gen-set is connected to bus. In other case GCB CLOSE/OPEN opens immediately.
  - b) Gen-set is cooled down and stopped.

### Hint:

Controller does not respond to external signals and/or conditions. The gen-set is fully in manual control; there is no automatic way to stop it (except protections). The gen-set stays running until STOP button is pressed.

Controller does not take place in Power management in MINT application

## AUT mode

Gen-set is controlled based on external signals (Rem start/stop, Sys start/stop) or conditions (AMF, Peak shaving, Power management system, ...).

### Hint:

Engine does not stop, if other condition for automatic starts is active.

Example: If peak stop condition occurs, but REMOTE START/STOP is active, engine stays running.

Controller does not respond to **GCB ON/OFF**, **MCB ON/OFF**, **STOP**, **START** buttons and corresponding remote IntelliMonitor or Modbus commands.

**Set Basic setting:** *FltRes GoToMAN* = ENABLED to avoid automatic engine start when pressing **FAULT RESET** after Shut down or Slow stop alarm.

**!!!! VERY IMPORTANT !!!!!**

Engine can start automatically without warning when pressing **FAULT RESET** after shut down alarm.

## TEST mode (SPtM only)

Use TEST mode for Gen-set start test if the Mains is OK or to transfer the load to the gen-set when Mains fail is announced in advance.

### Hint:

The controller does not respond to **GCB ON/OFF**, **STOP**, **START** in *Ret from test* = AUTO.

Engine automatically starts, when TEST mode is selected.

Engine can start automatically without warning when pressing **FAULT RESET** after shut down alarm.

## SEM mode

**START** – starts the gen-set.

- The controller closes GCB to dead bus.
- If the Mains is within limits and MCB is closed, the controller starts synchronizing and closes GCB when synchronizing conditions are met. Gen-set remains running in parallel.
- If Mains failure is recognized during parallel operation the controller opens MCB.
- After Mains recovers the controller synchronizes MCB and returns to parallel operation

**STOP** – unloads the gen-set, opens GCB, cools down the engine and stops.

AMF function – If the Mains fails while the gen-set is not running, the controller automatically starts and closes GCB.

Other automatic starts/stops (e.g. due to peak shaving, BI Rem start/stop activation) are not performed in SEM mode.

## Baseload

**Process control:** *Load ctrl PtM* = BASELOAD

Gen-set power is kept at value given by **Process control:** *Base load* setpoint.

## Internal Import export

**ProcessControl:** *Load ctrl PtM* = IMP/EXP

**Process control:** *IE measurement* = IM3 CT INPUT

Gen-set power is controlled to keep the import load at the level given by setpoint **Process control:** *Import load* value.

Controller measures Import/Export value via current transformers connected to In/Im3 terminal. The value of L3 is then multiplied by 3 to give an estimation of the actual Imp/Exp.



# List of abbreviations

AMF	Auto Mains Failure (controller starts automatically on mains failure)
AI	Analog Input
AO	Analog Output
ATS	Automatic Transfer Switch (switches the load to actually supplied bus (by mains or generators))
AVR	Automatic Voltage Regulator
BI	Binary Input
BO	Binary Output
BOC	Breaker Open & Cool-down - protection type (see application manual for details)
BTB	Bus-Tie Breaker
CAN1	CAN bus for extension modules connection (e.g. IGS-PTM, IS-BIN8/16, IS-AIN8, I-AOUT8, I-CB, IGL-RA15)
CAN2	CAN bus for intercontroller communication (in multiple applications) and monitoring (connection of I-LB, IG-IB)
COX	Application for Complex Systems where actions are taken by a PLC and the controller only follows the orders => needs an external driver (cox)
ESF	Engine Specific File
FMI	Failure Mode Identifier
GC	Graphical Characters - option for additional support of one "graphical" language
GCB	Generator Circuit Breaker
CHP	Combined Heat & Power - cogeneration application, usually with gas engine
I-AOUT8	Extension module with 8 AO
I-CB	Communication Bridge - interfaces IS, IG/IS-NT, ID controllers and non-standard engine ECU
IG-AVRi	IG Automatic Voltage Regulator interface
IG-EE	InteliGen for Electronic Engines (HW optimized for connection to an engine equipped with ECU)
IG-EEC	InteliGen EE controller with extended communication possibilities + switchable sensing ranges of AC voltages and currents
IG-IB	IG Internet Bridge - for internet/ethernet communication
IGL-RA15	Indication panel with LEDs signaling state of 15 BO
IG-NT	InteliGen New Technology gen-set controller
IG-NTC	InteliGen NT controller with extended communication possibilities + switchable sensing ranges of AC voltages and currents
IGS-NT-LSM+PMS	Dongle for IG-XX and IS-NT to enable Load Sharing control loops and PMS
IGS-PTM	Extension module with 8 BI/BO, 4 AI and 1 AO
I-LB	Local Bridge – for direct and modem monitoring and control of multiple gen-sets
IM-NT	InteliMains New Technology - Mains supervision controller; the same controller in a different SW configuration can work as a bus-tie synchronizer
I-RB	Relay Board
IS-AIN8	Extension module with 8 AI.
IS-BIN8/16	Extension module with 8 BO and 16 BI.
IS-NT	InteliSys New technology gen-set controller
IS-NT-BB	InteliSys New Technology Basic Box (without display)
KWP2000	Key Word Protocol of Scania S6 unit (for engine diagnostics)
LS	Load Sharing - analog load sharing line to interconnect the gen-sets on the site (for isolated parallel or mains parallel of multiple gen-sets); IG/IS-NT controllers use digital Load Sharing via

	CAN2 bus
LSM	Load Sharing Module
LT	Option for Low Temperature modification (display equipped with heating foil)
MCB	Mains Circuit Breaker
MGCB	Master Generator Circuit Breaker (sometimes used with multiple gen-sets in island parallel or mains parallel operation)
MINT	Multiple application with INTERNAL control loops - for multiple gen-sets in island parallel or mains parallel operation; Load Sharing and VAR Sharing controlled internally; PMS available
MP	Mains protection
NPU	Mains protection relay (voltage, frequency, vector shift protections)
OC	Occurrence Count (number of fault occurrences transmitted in diagnostic frame from ECU)
OfL	Off load - protection type (see application manual for details)
PGN	Parameter Group Number (refer to SAE J1939-71)
PMS	Power Management System - ensures optimization of running gen-sets on the site with multiple gen-sets; based on kW/kVA spinning reserve or on relative (%) load; no-master system ensures high reliability
SHAIN	Shared (virtual) Analog INput module
SHAOUT	Shared (virtual) Analog OUTput module
SHBIN	SHared (virtual) Binary INput module
SHBOUT	SHared (virtual) Binary OUTput module
SPI	Single Parallel Island application - for single gen-sets in parallel with mains or in island operation; suitable for CHP application; no MCB control
SPM	Single Prime Mover application - for single gen-sets without mains
SPN	Suspect Parameter Number (refer to SAE J1939-71)
SPtM	Single Parallel to Mains application - for single gen-sets in parallel with mains or in island operation, with AMF support; both MCB and GCB controlled
SSB	Single Stand-By application - for single gen-sets with mains and break transfer gen-set to mains
VPIO	Virtual periphery I/O module – internal “SW wires” linking binary outputs to inputs
VS	VAR Sharing - ensures VAR sharing between the gen-sets on the site via CAN bus (for isolated parallel or mains parallel of multiple gen-sets)