

InteliLite

# **InteliLite<sup>®</sup> AMF**

## **Modular Gen-set Controller**

Compact Controller for Stand-by Operating Gen-sets

(IL-CU AMF20/25 unit)

SW version 2.2, November 2004



## **User guide**



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# General guidelines

## ***What describes this manual?***

---

This manual describes „AMF 20/25“ software, which is designed for single set, stand-by applications.

What is the purpose of the manual?

This manual provides general information how to install and operate IntelliLite AMF20/25 controller.

*This manual is dedicated for*

Operators of gen-sets

Gen-set control panel builders

For everybody who is concerned with installation, operation and maintenance of the gen-set

## ***!! Warnings !!***

---

### **Remote control**

IntelliLite controller can be remotely controlled. In case of the work on the gen-set check, that nobody can remotely start the engine.

To be sure:

Disconnect remote control via RS232 line

Disconnect input REMOTE START/STOP

or

Disconnect output STARTER and outputs GCB CLOSE/OPEN and MCB CLOSE/OPEN

Because of large variety of IntelliLite parameters settings, it is not possible to describe any combination. Some of IntelliLite functions are subject of changes depend on SW version. The data in this manual only describes the product and are not warranty of performance or characteristic.

## ***Text***

---

**PAGE**

(Capital letters in the frame) buttons on the front panel

*Break Return*

(Italic) set points

**Generator protections**

(Bold) Set point group

REMOTE START/STOP

(Capital letters) binary inputs and outputs

\*Something

(Symbol \* before text) valid only for iL AMF 25

**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.

**Note:**

SW and HW must be compatible (AMF25 firmware and AMF25 HW) otherwise the function will be disabled. If wrong software is downloaded, message **HARDWARE INCOMPATIBLE** appears on controller screen. In this case use Boot load (jumper) programming – close Boot jumper and follow instructions in LiteEdit, download correct software.  
Similarly use only Chinese HW together with Chinese SW.

**WARNING – VERY IMPORTANT !!!**

Every time you want disconnect following IntelliLite controller terminals:

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

Switch IntelliLite to MAN or OFF mode or disconnect the Binary outputs Starter and Fuel to avoid unexpected automatic start of genset and GCB closing.

**!!! CAUTION !!!*****Dangerous voltage***

In no case touch the terminals for voltage and current measurement!  
Always connect grounding terminals!  
In any case do not disconnect IntelliLite CT terminals !

***Adjust set points***

All parameters are preadjusted to their typical values. But the set points 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 !!!**

# General description

## ***Description of the controller system (with all options)***

---

InteliLite iL-CU AMF20/25 is a comprehensive AMF-controller for single generating sets operating in stand-by mode. IL-CU AMF 25 features extended support of electronic engines.

InteliLite 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.

InteliLite 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.

InteliLite provides gas engine support without ventilation.

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

## ***What is in the package?***

---

Accessories	Description	Optional / Obligatory
IL – AMF	InteliLite central unit	Obligatory
iGL -RA15	Remote annunciator	Optional for AMF25
iG-IOM/PTM	I/O extension module	Optional for AMF25
AT-LINK-CONV	External RS232 interface	Optional for AMF20

## ***Remote annunciator iGL - RA15***

---

The remote annunciator iGL-RA15 can be connected to the AMF25 unit via CAN bus. Any of the binary outputs can be configured (using LiteEdit software) to each LED diode on the RA15. The module can be also enabled or disabled using LiteEdit software.

**See the documentation of RA15 for the technical and function description.**

## ***iG IOM/PTM module***

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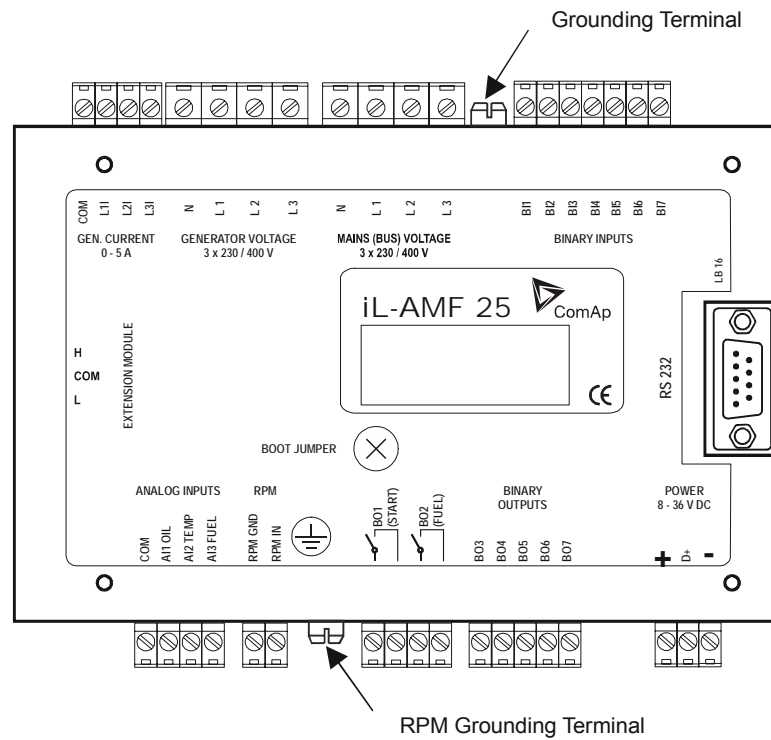
iG-IOM and iGS-PTM modules are I/O extension modules equipped with 8 binary inputs, 8 binary outputs, 4 analogue inputs and one analogue output. The module can be used for AMF25 only.

- Binary inputs and outputs are configurable the same way like inputs and outputs on iL.
- Analogue inputs are configurable like iL with the limitation that the binary and tristate mode can not be used on PTM module.
- The protection of analogue IOM/PTM inputs is activated by overcrossing the limits, active only when the engine is running.
- iG-IOM analogue inputs are resistive (the same parameters like iL) 0 Ω-2,4 kΩ. The module IOM is designed for especially VDO resistive sensors.
- iGS-PTM analogue inputs are configurable by jumpers to ranges 0-250Ω, 0-100mV, 0-20mA. The module can be used especially for Pt100 sensors and current sensors. The module PTM is not suitable for VDO temperature sensor.

**See the documentation of iGS-PTM for the technical and function description.**

# Terminals and dimensions

## IL-CU Terminals

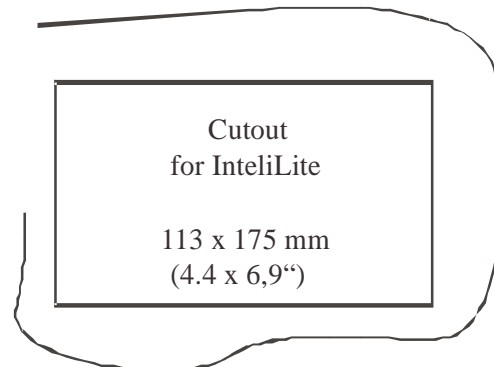
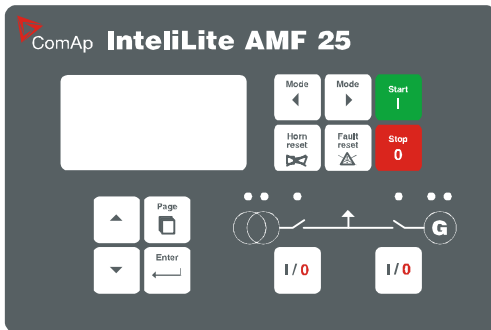


**Hint:**

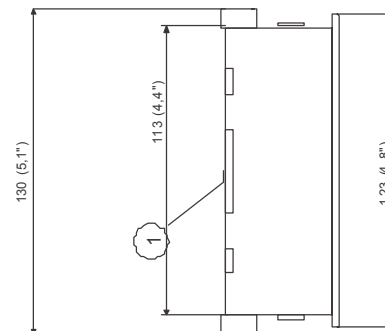
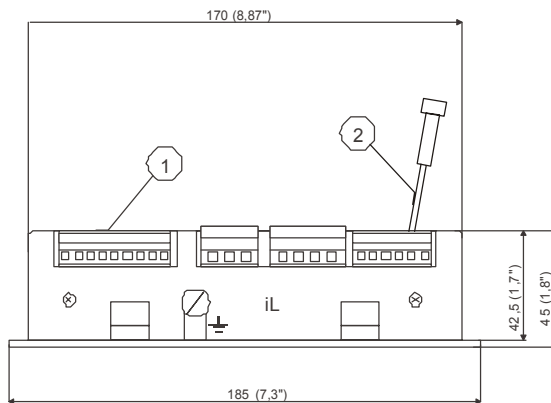
EXTENSION MODULE and TEST PORT serves for Extension IGS-PTM or IG-IOM and IGL-RA15 CAN bus connection only. This port is used for production tests as well.

## Dimensions

### IL-CU

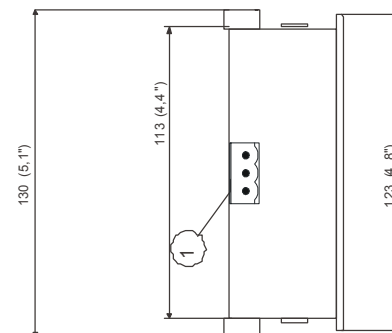
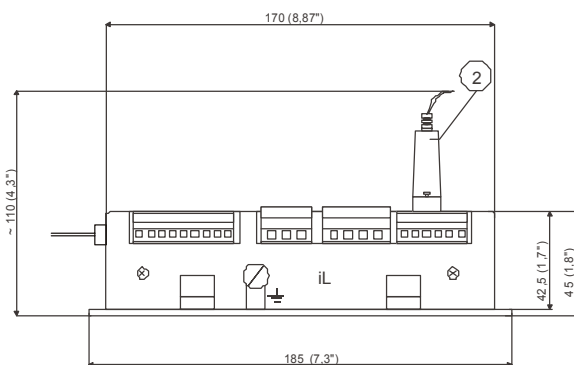


### IL-AMF 20



- ① Only for service purpose
- ② AT-LINK-CONV

### IL-AMF 25

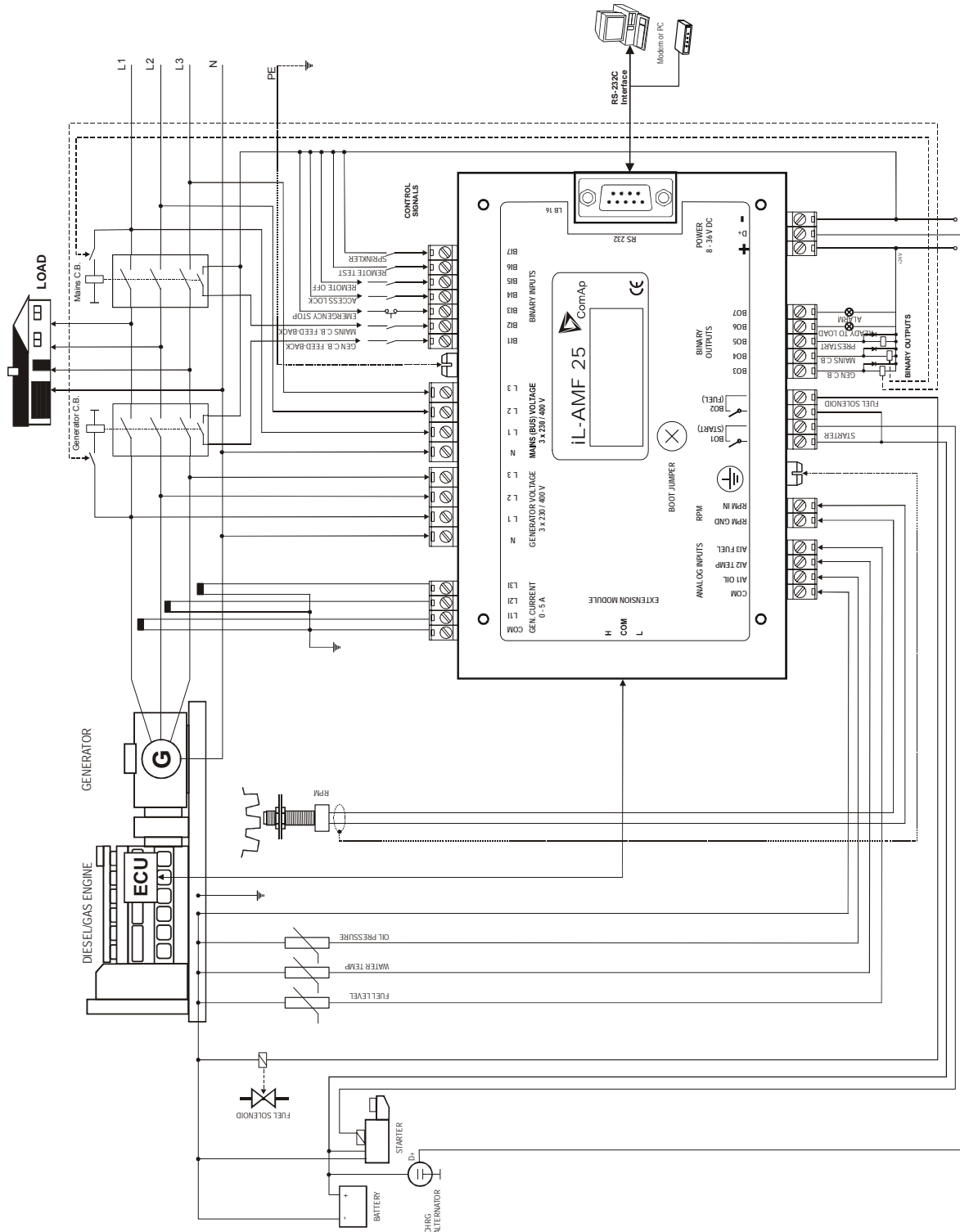


- ① Extension module via CAN bus
- ② RS 232 Cable



# Recommended wiring

## AMF – Wiring Diagram

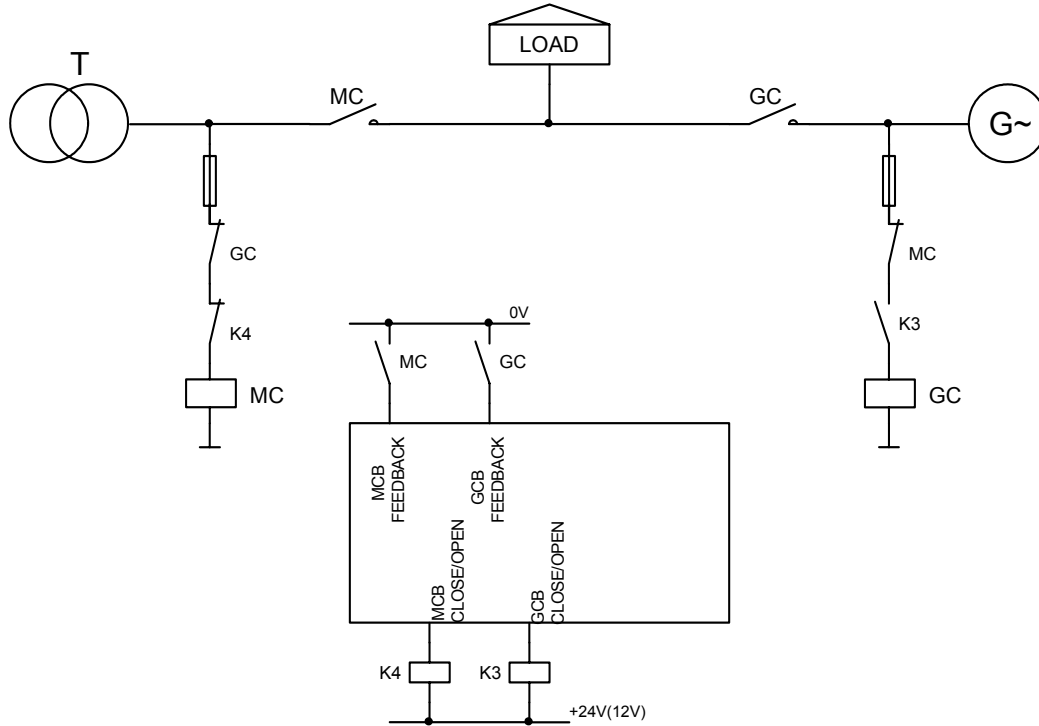


**Hint:**

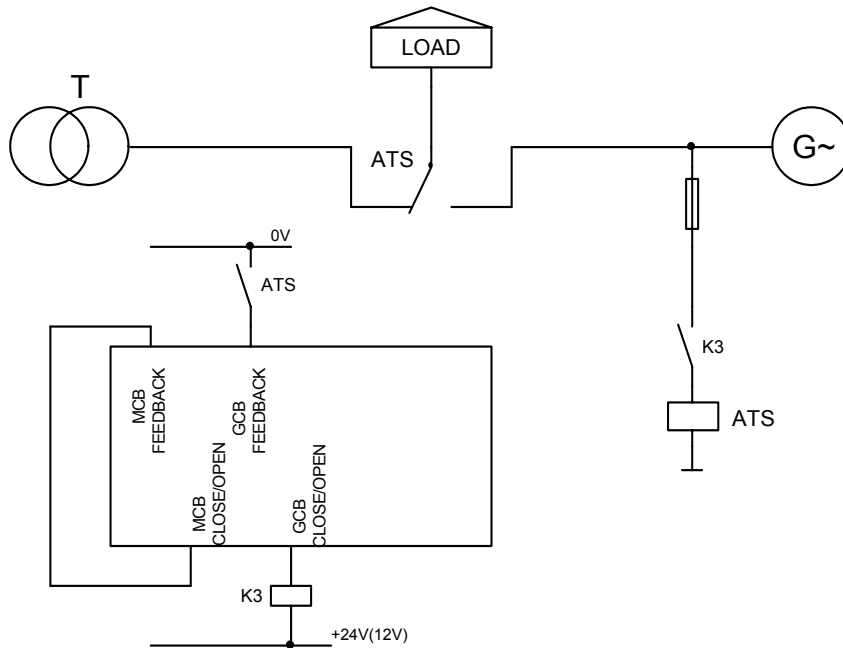
MCB and GCB is recommended to be mechanically interlocked.  
 From IL-2.1 it is possible to start Volvo and Scania engines via CAN bus. See [Engines started via CAN bus.](#)

# Stand-by applications

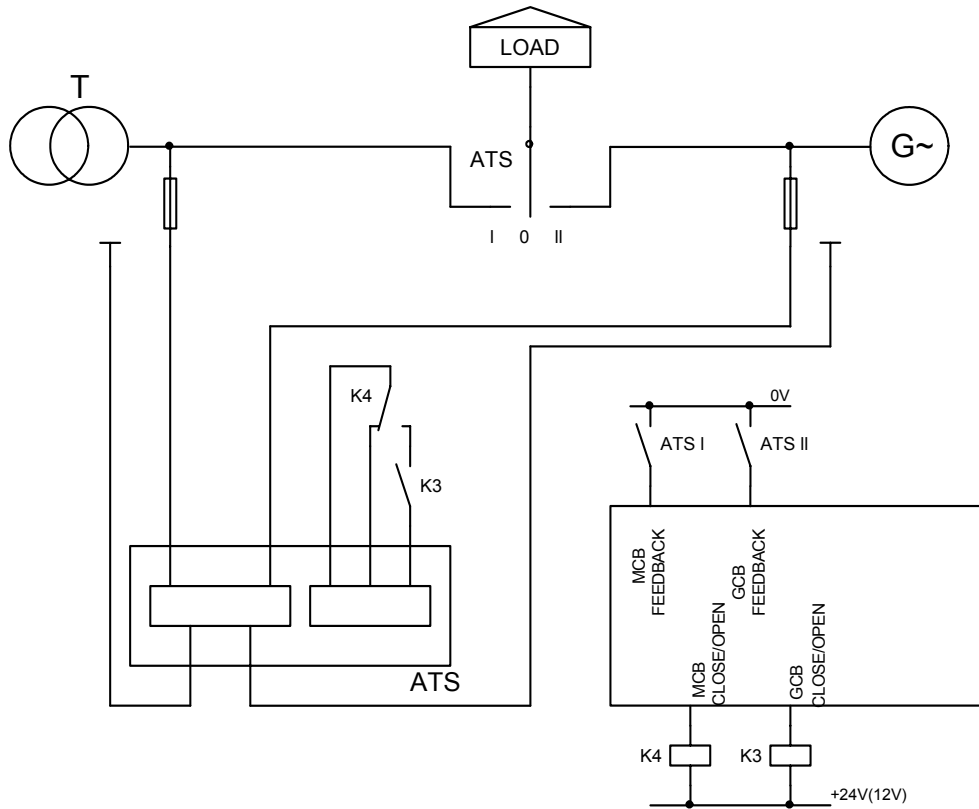
## Contactor (set point MCB Logic = "CLOSE-OFF")



## ATS with two stable positions (set point MCB Logic = "CLOSE-ON")



**ATS with three stable positions (set point MCB Logic = "CLOSE-OFF")**



# Getting started

## How to install

### General

To ensure proper function:

Use grounding terminals.

Wiring for binary inputs and analog inputs must not be run with power cables.

Analog and binary inputs should use shielded cables, especially when length >3m.

### Power supply

To ensure proper function:

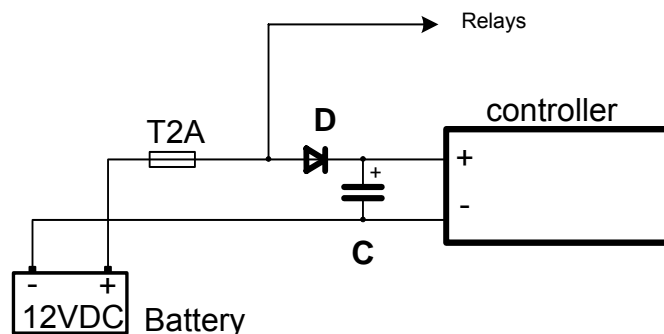
Use min. power supply cable of 1.5mm<sup>2</sup>

Maximum continuous DC power supply voltage is 36VDC. Maximum allowable power supply voltage is 39VDC. The IntelliLite's power supply terminals are protected against large pulse power disturbances. When there is a potential risk of the controller being subjected to conditions outside its capabilities, an outside protection device should be used.

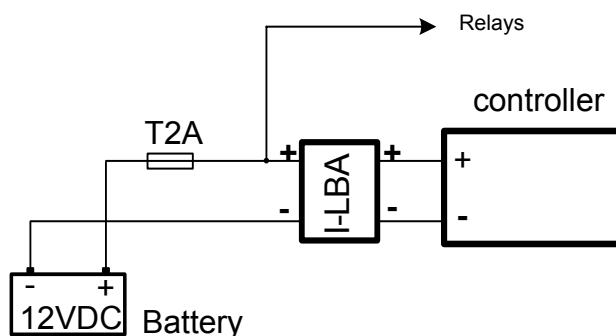
*Hint:*

The IntelliLite controller should be grounded properly in order to protect against lightning strikes!!  
The maximum allowable current through the controller's negative terminal is 4A (this is dependent on binary output load).

For the connections with 12VDC power supply, the IntelliLite includes internal capacitors that allow the controller to continue operation during cranking if the battery voltage dip occurs. If the voltage before dip is 10V, after 50ms the voltage recovers to 7 V, the controller continues operating. During this voltage dip the controller screen backlight can turn off and on but the controller keeps operating. It is possible to further support the controller by connecting the external capacitor and separating diode:



The capacitor size depends on required time. It shall be approximately thousands of microFarads. Or by connecting special I-LBA module:

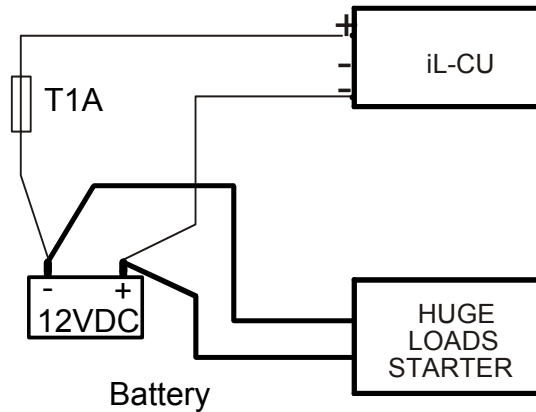


## Power supply fusing

A one-amp fuse should be connected in-line with the battery positive terminal to the controller and modules. These items should never be connected directly to the starting battery.

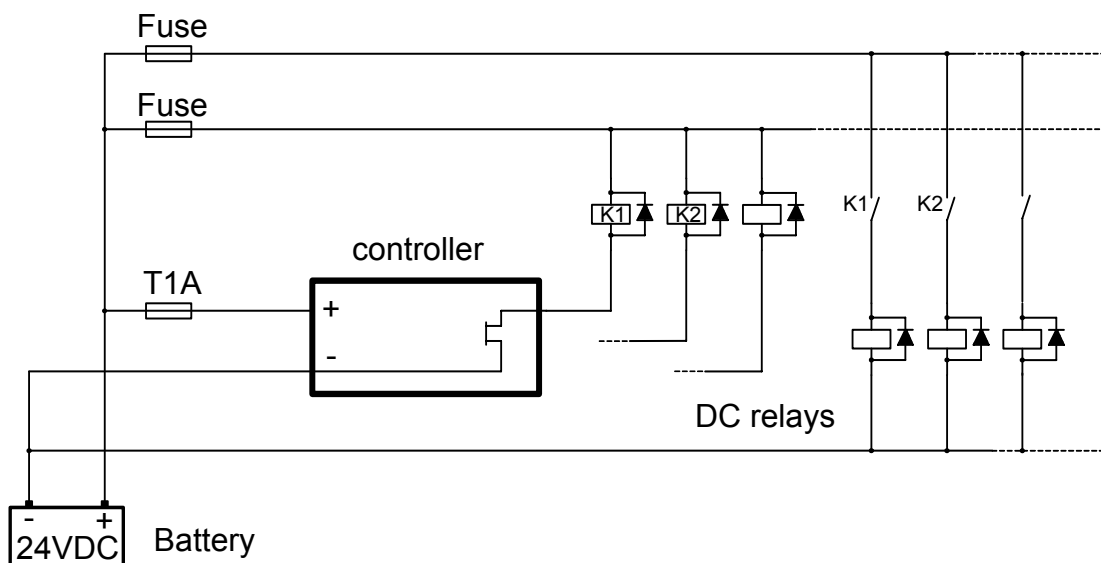
Fuse value and type depends on number of connected devices and wire length.

Recommended fuse (not fast) type - T1A. Not fast due to internal capacitors charging during power up.



## Binary output protections

Do not connect binary outputs directly to DC relays without protection diodes, even if they are not connected directly to controller outputs.



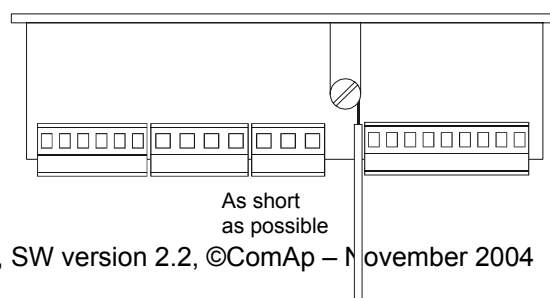
## Grounding

To ensure proper function:

Use as short as possible cable to the grounding point on the switchboard

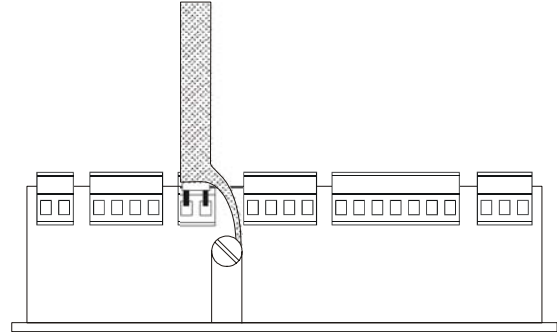
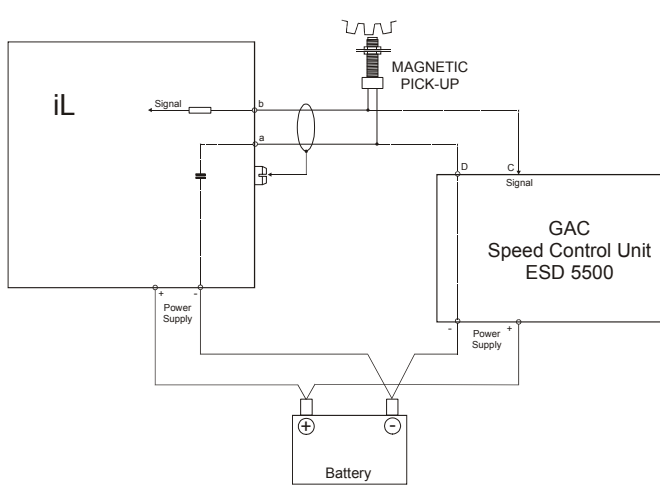
Use cable min. 2,5mm<sup>2</sup>

The "-" terminal of the battery has to be properly grounded



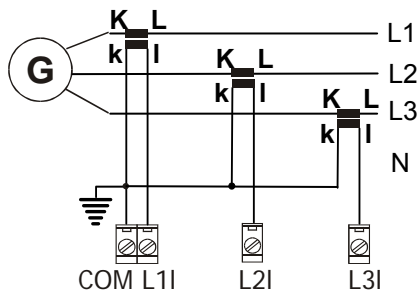
## Magnetic pick-up

To ensure proper function:  
Use a shielded cable

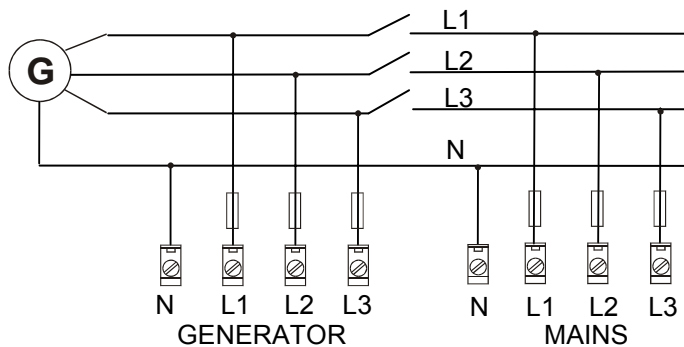


## Current measurement

To ensure proper function  
Use cables of 2,5mm<sup>2</sup>  
Use transformers to 5A  
Connect CT according to following drawings



## Voltage measurement



*Hint:*

Switchboard lighting strikes protection according standard regulation is expected !!!

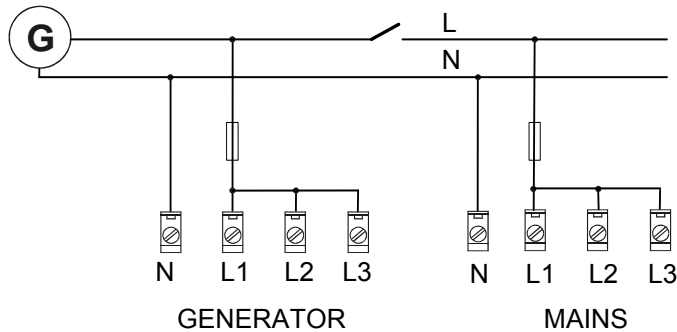
## Single phase applications

There is not a separate archive file for single-phase applications. Use standard ail archives.

### Recommended wirings

Generator (and mains) single-phase voltage has to be connected to all three-voltage terminals L1, L2 and L3. Generator current has to be connected to L1I and COM terminals only.

### Voltage measurement



#### Hint:

Switchboard lighting strikes protection according standard regulation is expected !!!

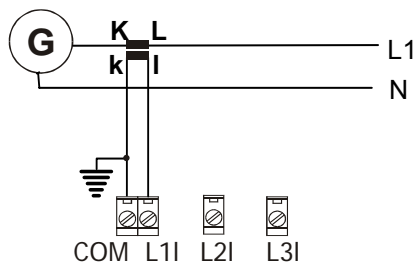
### Current measurement

To ensure proper function

Use cables of 2,5mm<sup>2</sup>

Use transformers to 5A

Connect CT according to following drawings. Terminals L2I and L3I are opened.



### Set points adjustment

To run a single-phase application, the following set points have to be set:

**Gener protect:** *Curr unbal* to 200 %

**Gener protect:** *Curr unbal del* to 60,0 s

#### Hint:

In version 1.4 and lower increase **Basic setting:** *Nomin current* to avoid activation of current unbalance protection after 1 minute full load running. (Current unbalance limit is 100% of *Nomin current* in IL version 1.4 and lower.)

## Analog inputs

Three analog inputs are available on the IL-CU

### Configuration

Each analog input can be configured by LiteEdit software following way.

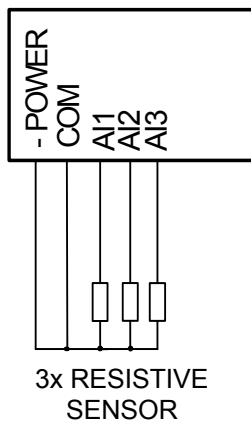
Analog input item	LiteEdit			Possibility
Type	Type	Not used Alarm		Analog input isn't used
Analog input name	Name			Up to 14 ASCII characters
Config of input	Config	Analog  Binary (not supp. by PTM) Tri-state (not supp. by PTM)  ECU		Analog measuring in specified range. Binary: open/close - threshold 750 Ω. Three-state: open/close - threshold 750 Ω, Failure <10 Ω or > 2400 Ω Value is read from ECU
Physical dimension	Dim	bar,%,°C, ...		Up to 3 ASCII characters (Valid only for analog inputs)
Polarity	Contact type	NC  NO		Valid only for binary and three-state inputs Valid only for binary and three-state inputs
Protection direction	Protection	Over		Overstep. Sensor fail does not activate protection.
		Over+Fls		Overstep and Sensor fail activates protection.
		Under		Under step. Sensor fail does not activate protection.
		Under+Fls		Under step and Sensor fail activates protection.
Sensor characteristic	Sensor	Curve A	iL, IOM,PTM	User curve A
		Curve B	iL, IOM,PTM	User curve B
		Curve C	iL, IOM,PTM	User curve C
		PT 1000	iL, IOM	IEC 751, range -20 to 120 °C
		NI 1000	iL, IOM	DIN 43760, range -20 to 120 °C
		VDO Temp	iL, IOM	°C
		VDO Press	iL, IOM,PTM	See chapter sensor specification
		VDO Level	iL, IOM,PTM	20mA/10.0Bar, ext. R 120 Ω
		4-20mA/100	iL, IOM	20mA/6.0Bar ext R 120 Ω
		4-20mA/ 60	iL, IOM	
Pt100	PTM			
Ni100	PTM			
0-20mA/100	PTM	0-20mA/10.0Bar		
4-20mA/100	PTM	4-20mA/10.0Bar		
0-100mV/100	PTM			
Decimal points	Dec	0, 1, 2		Number of decimal points (Valid only for analog inputs)

User Curve A, B, C are adjustable in LiteEdit.

Each Analog input has separate set points for two level alarm setting. Analog input alarm levels and delay adjust in **Engine protect** group.

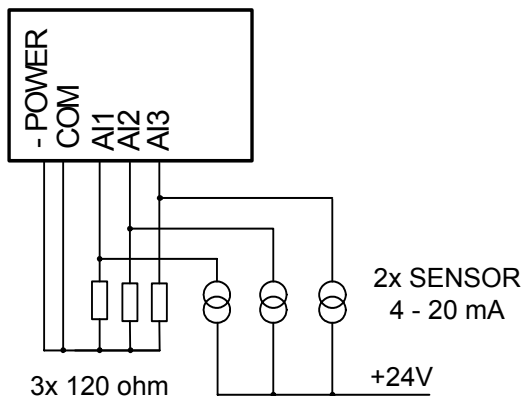


## Connection of IL-CU analog inputs



Standard connection of three resistive sensors to analog inputs.

Common point of resistive sensors is connected to COM terminal for accurate measuring.

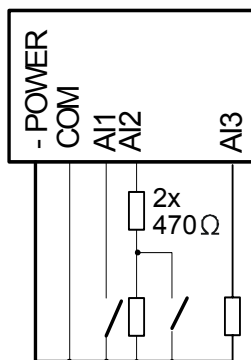


Three current output sensors connection to IntelLite.

External resistors 120 ohms each are connected between minus power supply terminal of IL-CU and analog inputs.

Current sensor connecting reduces the analog input resolution by less than 50% against resistive sensor.

Analog input common terminal COM has to be connected to IL minus Power supply terminal.



Mixed connection of IntelLite analog inputs:

AI1 – binary input

AI2 – three state input

AI3 – analog resistive input

Common point of IL-CU analog inputs is connected to COM terminal.

Analog inputs are designed for resistive sensors with resistance in range of 0Ω to 2,4kΩ. To ensure a proper function use shielded cables, especially for length over >3m.

## Current output transducers

**IL-CU analog inputs are mainly designed for resistor sensors.**

In special case transducers to 4-20mA output can be used for oil measuring (10.0Bar or 6.0Bar). Use predefined 4-20mA/100 or 4-20mA/60 sensors.

**This method reduces the input resolution by less than 50%.** Some types of transducers are not suitable for connection to IntelLite analog inputs because of influencing by IntelLite analog input.

### As binary input

Open, close state are detected, threshold level is 750 Ω.

### As three state input

Open, close and failure state are detected. Threshold level is 750 Ω, failure is detected when circuit resistance is <10 Ω or > 2400 Ω.

**Hint:**

Protections on binary and three state inputs are following:					
<i>IL-CU:</i>	AI1	Shutdown	<i>IG-IOM:</i>	AI1	Shutdown
	AI2	Shutdown		AI2	Shutdown
	AI3	Warning		AI3	Shutdown
				AI4	Shutdown

## Unused analog inputs

Configure Type = Not used

## Example of analog input configuration

Configure Oil press input for measuring in Bar, VDO oil pressure sensor, range 0 to 10.0 bars. Alarm protection level set to 3.5 bars, shut down level 1.2 bars.

Start LiteEdit and select – Controller - Configuration – Modify – Oil Press.

Set configuration for Oil Press analog input:

**Type:** selection between Not used and Alarm

“Not used” – analog input isn’t used

”Alarm” – analog input is used

Set to: Alarm

**Config:** selection between Analog, Binary Tri-state input.

“Analog” – resistor sensor is connected to Analog input.

“Binary” – open/close contact is connected between Analog input and COM terminal of Analog inputs.

Analog input detects only open/close state.

“Tri-state” – open/close contact is connected parallel to one of two serial resistors between Analog input and COM terminal of Analog inputs.

Set to: Analog

**Dim:** Physical dimension of measured value (°C, %, Bar, ..) Maximal dimension length is three characters.

Set to: Bar

**Contact type:** selection of polarity only when analog input is configured as Binary or Tri-state. When is analog input configured as analog this setting has no sense.

„NC” – polarity of binary or tri-state input

„NO” – polarity of binary or tri-state input

**Sensor:** selection of sensor characteristic

„Unused input” - when Analog input is not used. On the IntelliLite screen is displayed „#####” value, no alarm is detected.

„Curve A” – User curve A is defined in LiteEdit (default VDO temperature sensor)

„Curve B” – User curve B is defined in LiteEdit (default VDO pressure sensor)

„Curve C” – User curve C is defined in LiteEdit (default VDO fuel level sensor)

„Pt1000” – PT1000 sensor characteristic according to IEC 751

„Ni1000” – Ni1000 sensor characteristic according to DIN 43 760

„VDO temp” – VDO temperature sensor

„VDO press” – VDO pressure sensor

„VDO level” – VDO level sensor

„4-20mA/60” – current output sensor characteristic – requires external resistor 120 ohms between Analog input and COM terminal of Analog inputs

„4-20mA/100” – current output sensor characteristic – requires external resistor 120 ohms between Analog input and COM terminal of Analog inputs

Set to: VDO press

**Decimals:** setting of number of decimal points of measured value.

„0” - e.g. 360 kPa, 100%, 50 °C

„1” – e.g. 3.6 Bar

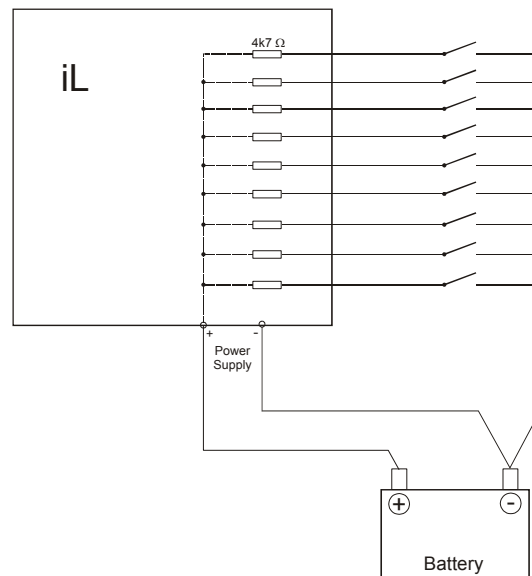
„2“ - e.g. 0.36 MPa  
 „3“ - e.g. 0.366 MPa  
 Set to: 1

When Analog input configuration is finished set the setpoints *Wrn Oil press*, *Sd Oil press*, *Oil press del* in **Engine protection** group.

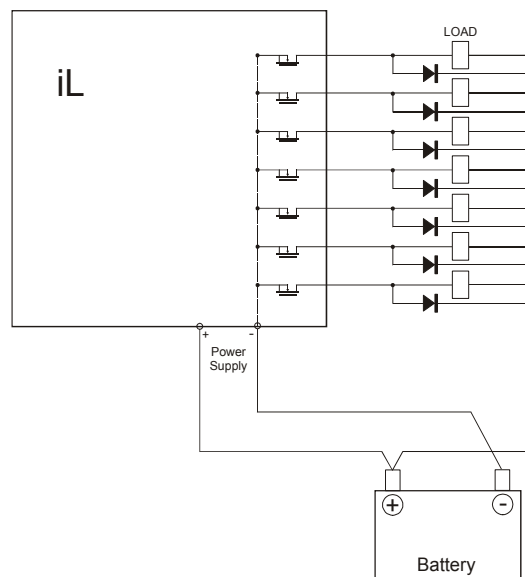
Each Analog input has separate triplet of setpoints: *Wrn level*, *Sd level*, *Anl Inp del*. Names of these setpoints are fix defined

Number of decimal points of *Wrn level1* and *Sd level* is the same as the configured number of decimal points of measured value.

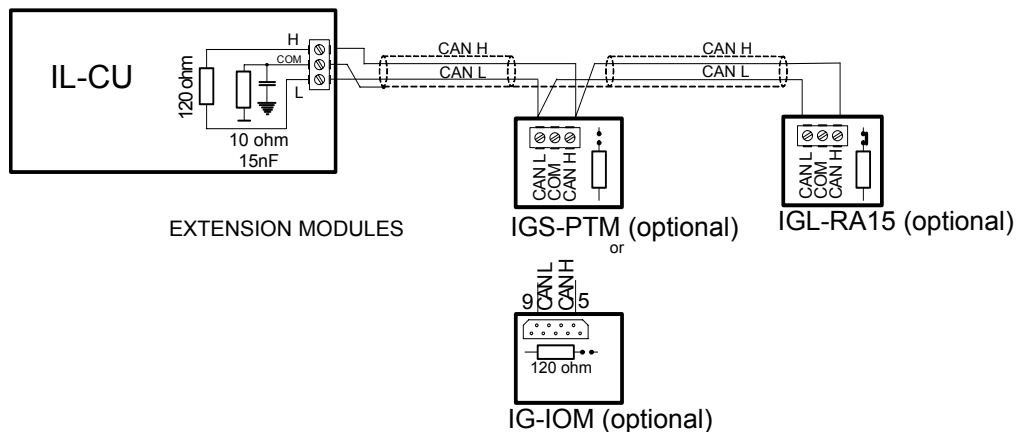
## Binary inputs



## Binary outputs



## Extension modules (CAN bus) connection



### Connection rules

CAN bus line must be connected in series, from one unit to the next (no star, no cable stubs, no branches) both ends must be by the 120-ohm (internal or external) resistor terminated. Maximal CAN bus length is up to 200 meters.

For CAN data cables details see chapter Technical data – Communication interface. CAN cable shielding connect to IL-CU COM terminal.

IL-CU contains internal fix 120-ohm resistor and must be located on the CAN bus end.

New IG-IOM and IGS-PTM units contain internal jumper removable 120-ohm resistor (in older IOM types are fix resistors). To be sure check resistor presence by ohmmeter. Unit with internal resistor connect to the end of CAN line.

Following connections are supported (IOM, PTM, ECU order is not important).

- IL-CU – IG-IOM
- IL-CU – IGS-PTM
- IL-CU – IGL-RA15
- IL-CU – IG-IOM – IGL-RA15
- IL-CU – IGS-PTM – IGL-RA15

It is possible to connect only one IG-IOM or IGS-PTM and one IGL-RA15 to IL-CU.

# Inputs and outputs

*Hint:*

Any Binary input or output can be configured to any IL-CU controller terminal or changed to different function by LiteEdit software. There is fix 1 sec delay when any binary input is configured as protection.

## ***Binary inputs IL-CU - default***

---

- BI1 GCB feedback**
- BI2 MCB feedback**
- BI3 Emergency stop**
- BI4 Access lock**
- BI5 Remote OFF**
- BI6 Remote TEST**
- BI7 Sprinkler**

## ***Binary inputs – list***

---

### **Not used**

Binary input has no function. Use this configuration when Binary input is not connected.

### **Alarm**

If the input is closed (or opened) selected alarm is activated.

Binary Alarm configuration items

Name		14 characters ASCII string
Contact type	NC	Normally closed
	NO	Normally opened
Alarm type	Warning	
	Shut down	
Alarm active	All the time	
	Engine running only	

### **GCB feedback**

Use this input for indication, whether the generator circuit breaker is open or closed.

If the feedback is not used, connect this input to the output GCB CLOSE/OPEN

### **MCB feedback**

This input indicate, whether the gen-sets group operate in parallel to mains (MCB FEEDBACK is closed) or parallel isolated (MCB FEEDBACK is open) .

### **Emergency stop**

If the input is opened, shut down is immediately activated. Input is inverted (normally closed) in default configuration.

Hint:

In case of controller hardware or software fail, safe stop of the engine doesn't have to be ensured. To back-up the Emergency stop function it is recommended to connect separate circuit for disconnection of Fuel solenoid and Starter signals.

## Sprinkler

If the input is closed all alarms are disabled except the binary input EMERGENCY STOP and "engine overspeed protection".

- all IL alarms are detected,
- IL front panel gen-set RED LED blinks or lights,
- alarm is recorded on the IL alarm list screen,
- BUT gen-set remains running.

Hint:

Warning *SprinklActive* is indicated in the AlarmList if sprinkler mode active to inform the operator that the engine is not protected.

## Access lock

If the input is closed, no setpoints can be adjusted from controller front panel and gen-set mode (OFF-MAN-AUT-TEST) cannot be changed.

Hint:

Access lock does not protect setpoints and mode changing from LiteEdit. To avoid unqualified changes the selected setpoints can be password protected.

## Remote OFF

If closed, iL is switched to OFF mode (there are four modes OFF-MAN-AUT-TEST). When opens controller is switched back to previous mode.

Hint:

This binary input should be connected to schedule timer switch, to avoid start of engine.

## Remote TEST

If closed, iL is switched to TEST mode (there are four modes OFF-MAN-AUT-TEST). When opens controller is switched back to previous mode.

## Remote MAN

If the input is active, MAN mode is forced to the controller independently on the position of the MODE selector. If another of „remote“ inputs is active, then the *Remote MAN* input has the lowest priority.

## RemControlLock

If the input is active, setpoints writing or command sending from the external terminal is disabled.

## Emergency manual

If the input is activated the controller behaves like when switched to OFF mode. Opens all binary outputs. There is one exception – Stop solenoid doesn't activate on this transition.

Detection of "running" engine and subsequent alarm message "Sd Stop fail" is blocked.

The controller shows "Emerg Man" state and the engine can not be started.

Generator current and power measurement is active in this mode, regardless of the actual state of the engine.

After the input is open again, the controller recovers to previous state and behaves according to the actual situation .

Unction is active in any controller mode and activation of the input is written to history.

## TestOnLoad

Affects the behaviour in TEST mode. When input is closed, the controller automatically transfers load from the mains to the genset. Setpoint AutoMainsFail: Ret from test must be set to MANUAL. Load is automatically transferred back to the mains when any genset shut down protection activates.

## Start button

Binary input has the same function as **Start** button on the IntelliLite front panel. It is active in MAN mode only.

## Stop button

Binary input has the same function as **Stop** button on the IntelliLite front panel. It is active in MAN mode only.

## FaultResButton

Binary input has the same function as **Fault reset** button on the IntelliLite front panel.

## HornResButton

Binary input has the same function as **Horn reset** button on the IntelliLite front panel.

## GCB button

Binary input has the same function as **GCB** button on the IntelliLite front panel. It is active in MAN mode only.

## MCB button

Binary input has the same function as **MCB** button on the IntelliLite front panel. It is active in MAN mode only.

## ***Binary outputs IL-CU - default***

---

<b>BO1</b>	<b>Starter (relay output)</b>
<b>BO2</b>	<b>Fuel solenoid (relay output)</b>
<b>BO3</b>	<b>GCB close/open</b>
<b>BO4</b>	<b>MCB close/open</b>
<b>BO5</b>	<b>Prestart</b>
<b>BO6</b>	<b>Read to Load</b>
<b>BO7</b>	<b>Alarm</b>

## ***Binary outputs - list***

---

### **Not used**

Output has no function.

### **Starter**

The closed relay energizes the starter motor.

The relay opens if:

- the “firing” speed is reached or
- maximum time of cranking is exceeded or
- request to stop comes up

## Fuel solenoid

Closed output opens the fuel solenoid and enables the engine start.

The output opens if:

- Emergency stop comes or
- Cooled gen-set is stopped or
- in pause between repeated starts

## Ignition

The output closes after reaching value of CrankRPM, fixed 30RPM. Opens after stopping of the engine or in pause during repeated start.

## Prestart

The output closes prior to the engine start (*Prestart*) and opens when START RPM speed is reached. During repeated crank attempts the output is closed too.

The output could be used for pre-glow, pre-heat or prelubrication.

## Idle/Nominal

The output *Idle/Nominal* closes after the timer *Idle time* elapses. The *Idle time* counter starts to countdown when *Start speed* reached. The *Underspeed* protection is not evaluated during idle period. A *Start fail* protection occurs if the RPM drop below 2RPM during idle.

Hint:

Connect Binary output IDLE RATED to speed governor to switch the speed: opened = IDLE, closed=RATED. If the IDLE contact not supported on the governor, set the *Idle time* nevertheless to minimum 5s to avoid *Underspeed* possibly caused by instability of the engine short after start.

## GCB close/open

The output controls the generator circuit breaker.

Hint:

Supposed time to close (reaction time) of GCB is 0,1 sec.

## GCB on coil

The output activates Generator Circuit Breaker coil.

## GCB off coil

The output deactivates Generator Circuit Breaker coil.

## GCB UV coil

The output controls Generator Circuit Breaker coil after voltage drop-out.

## MCB close/open

The output controls the mains circuit breaker.

## MCB on coil

The output activates Mains Circuit Breaker coil.

## MCB off coil

The output deactivates Mains Circuit Breaker coil.

## MCB UV coil

The output controls Mains Circuit Breaker coil after voltage drop-out.



## Air valves

Closes together with *Prestart*. Opens after the engine is stopped.  
Stopped engine conditions: RPM = 0, **Engine params**: *Starting Poil*, D+ (when enabled).

## GenParamsOK

The output is copy of generator status LED on iL front panel. The output is closed if genset is running and all genset electric values are in limits.

## Alarm

The output closes if :

- any alarm comes up or
- the gen-set malfunctions

The output opens if

- **FAULT RESET** is pressed

The output closes again if a new fault comes up.

## Horn

The output closes if:

- any alarm comes up or
- the gen-set malfunctions

The output opens if:

- **FAULT RESET** is pressed or
- **HORN RESET** is pressed or
- Max time of HORN is exceeded (*Horn timeout*)

The output closes again if a new fault comes up.

## Ready to AMF

The output is active if the controller is able to run the engine (the output Ready to run is active) and simultaneously the controller is in AUT mode.

## Ready

The output is closed if following conditions are fulfilled:

- Gen-set is not running and
- No Shut down or Slow stop alarm is active
- Controller is not in OFF mode

## Ready to load

The output is closed if genset is running and all electric values are in limits no alarm is active - it is possible to close GCB or it is already closed. The output opens during cooling state.

## Stop solenoid

The closed output energizes stop solenoid to stop the engine.

The output is active at least for *Stop time*, if the stop lasts longer, it stays active until all symptoms say the engine is stopped.

The engine is stopped if:

- RPM < 2 and
- Generator voltage < 10V and
- Oil pressure < **Engine params**: *StartingPoil*.

### Hint:

The engine can be started anytime, if all symptoms say the engine is steady regardless of the fact the *Stop solenoid* can still be active (in that case it is deactivated before cranking).

## MainsParams OK

The output is copy of mains status LED on IL front panel. The output is closed if mains voltage and frequency are within limits.

## Vgen fail

The output closes if the generator over/under voltage alarm or voltage asymmetry alarm activates.  
The output opens, if

- alarm is not active and
- **FAULT RESET** is pressed

## fgen fail

Output closes if the generator over/under frequency alarm activates.  
The output opens, if

- alarm is not active and
- **FAULT RESET** is pressed

## Vmains fail

The output closes if the mains over/under voltage alarm or voltage asymmetry alarm activates.  
The output opens, if

- alarm is not active and
- **FAULT RESET** is pressed

## fmains fail

Output closes if the mains over/under frequency alarm activates.  
The output opens, if

- alarm is not active and
- **FAULT RESET** is pressed

## Overload

Output closes if the generator overload alarm activates.  
The output opens, if

- alarm is not active and
- **FAULT RESET** is pressed

## Stop fail

Output closes when the engine have to be stopped, but speed or frequency or voltage or oil pressure is detected. This protection goes active 60s after stop command. With start goes this protection inactive.

The output opens, if

- alarm is not active and
- **FAULT RESET** is pressed

## Overspeed

Output closes if the gen-set overspeed alarm activates.

The output opens, if

- alarm is not active and
- **FAULT RESET** is pressed

## Underspeed

Output closes if the gen-set underspeed alarm activates.

The output opens, if

- alarm is not active and
- **FAULT RESET** is pressed

## Start fail

Output closes after the gen-set start-up fails.

The output opens, if

- alarm is not active and
- **FAULT RESET** is pressed

## Overcurrent

Output closes if the generator  
\*IDMT over current or  
current unbalance or  
short current alarm activates.

The output opens, if  
Alarm is not active and  
**FAULT RESET** is pressed

## Battery flat

Output closes when iL preforms reset during start procedure (probably due to weak battery).

The output opens, if

- alarm is not active and
- **FAULT RESET** is pressed

## V batt failed

Output closes when battery over/under voltage warning appears.

The output opens, if

- alarm is not active and
- **FAULT RESET** is pressed

## OilPress

Output closes if the oil pressure shutdown alarm activates.

The output opens, if

- alarm is not active and
- **FAULT RESET** is pressed

## OilPressWrn

Output closes if the oil pressure warning alarm activates.

The output opens, if

- alarm is not active and
- **FAULT RESET** is pressed

## WaterTemp

Output closes if the water temperature shutdown alarm activates.

The output opens, if

- alarm is not active and
- **FAULT RESET** is pressed

## WaterTempWrn

Output closes if the water temperature warning alarm activates.

The output opens, if

- alarm is not active and
- **FAULT RESET** is pressed

## FuelLevel

Output closes if the Fuel level shutdown alarm activates.

## FuelLevelWrn

Output closes if the Fuel level warning alarm activates.

## Running

Output closes if the engine is in Running state.

## Common Wrn

Output closes when any warning alarm appears.  
The output opens, if

- No warning alarm is active and
- **FAULT RESET** is pressed

## Common Sd

Output closes when any shut-down alarm appears.  
The output opens, if

- No sd alarm is active and
- **FAULT RESET** is pressed

## Common Fls

Output closes when any sensor fail alarm appears.  
The output opens, if

- No warning alarm is active and
- **FAULT RESET** is pressed

## OFF mode

The output is closed, if OFF mode is selected.

## MAN mode

The output is closed, if MAN mode is selected.

## AUT mode

The output is closed, if AUT mode is selected.

## TEST mode

The output is closed, if TEST mode is selected.

The output opens, if  
Alarm is not active and  
**FAULT RESET** is pressed

## ChrgAlternFail

Output closes if gen-set is running and D+ input not energized.

The output opens, if

- alarm is not active and
- **FAULT RESET** is pressed

*Hint:*

Treshhold level for D+ input is 80% supply voltage.

## ServiceTime

Output closes if the ServiceTime alarm activates.

The output opens, if

- alarm is not active and
- **FAULT RESET** is pressed

## ECU CommOK

If the ECU is not communicating and all values from ECU show ##### the output is not active. If the ECU communicates the output is active.

## ECU PwrRelay

The output closes at the beginning of prestart and opens if the engine shall be stopped.

## ECU YellowLamp

The output copies warning information from ECU.

## ECU RedLamp

The output copies shutdown information from ECU.

## CtrlHeartBeat

Output signalizes watchdog reset. In a healthy state it blinks at 500ms : 500ms rate. When watchdog reset occurs, it stops blinking.

## Stop Pulse

Output is active for 1 second after *Stop solenoid* output activation. This signal is sent to ECU in case of engine stop request.

## ECU CommError

The output is an inversion of binary output *ECU CommOK*, i.e. the output is closed when ECU is not communicating and all values from ECU show #####. Communication error causes stop of the engine.

## BI1..7 – stat

### \*BI1..8IOM - stat

The outputs give an information about the assigned binary input. In case the assigned binary input is configured to alarm type, then the output closes when the alarm activates. It opens if

- alarm is not active and
- **FAULT RESET** is pressed

In case the assigned binary input is configured to any control function, the output propagates the state of the input.

### \*AnInIOM1..4 Wrn

Output closes if warning alarm on the appropriate IOM/PTM analog input activates. The output opens, if

- alarm is not active and
- **FAULT RESET** is pressed

### \*AnInIOM1..4 Sd

Output closes if shutdown alarm on the appropriate IOM/PTM analog input activates. The output opens, if

- alarm is not active and
- **FAULT RESET** is pressed

## Analog inputs

---

Three analog inputs for resistive sensor 0 to 2400  $\Omega$  measuring. Each analog input can be adjusted to convert resistor measured value to displayed value in bars or other dimensions. Warning and shutdown limits are adjusted in **Engine protect** group.

Since version 2.0 the analog inputs are configurable. Default configuration is:

### Oil press

Oil pressure analog input. Default range 0 to 10.0 bars.

## **Water temp**

Water temperature analog input. Default range 0 to 100 °C.

## **Fuel level**

Fuel level analog input. Default VDO sensor 0-180R = 0-100%

### *Hint:*

For further information about analog inputs' configuration see [Analog inputs](#).

# Setpoints

## Password

---

### EnterPassword

Password is a four-digit number. Password enables change of relevant protected set points Use  $\uparrow$  or  $\downarrow$  keys to set and **ENTER** key to enter the password.

### ChangePassword

Use  $\uparrow$  or  $\downarrow$  keys to set and **ENTER** key to change the password.

#### *Hint:*

At first the Password has to be entered before the new Password can be changed.

## Basic settings

---

### Gen-set name

User defined name, used for IntelliLite identification at remote phone or mobile connection. *Gen-set name* is max 14 characters long and have to be entered using LiteEdit software.

### Nomin power [kW]

Nominal power of the generator

Step: 1kW

Range: 1 – 4000 kW

### Nomin current [ A ]

It is current limit for generator \*IDMT over current and short current protection and means maximal continuous generator current. See **Generator protections**: \**Inom del*, *Ishort* setpoints.

*Nominal current* can be different from generator rated current value.

Step: 1 A

Range: 1 - 5000 A

### CT Ratio [/5A]

Gen-set phases current transformers ratio.

Step: 1 A

Range: 1 – 5000 A / 5A

### \*PT ratio [/1]

Gen-set potential transformers ratio.

Step: 0,1 V / V

Range: 0,1 – 500,0 V / V

### \*Vm PT ratio [/1]

Mains potential transformers ratio.

Step: 0,1 V / V

Range: 0,1 – 500,0 V / V

### Nomin voltage [V]

Nominal generator voltage (phase to neutral)

Step: 1V  
Range: 100 – 300 V

### **Nominal freq [Hz]**

Nominal generator frequency (usually 50 or 60 Hz )  
Step: 1Hz  
Range: 45 – 65 Hz

### **Gear teeth [-]**

Number of teeth on the engine gear for the pick-up.  
Set to zero, if no pick-up is used. Engine speed is counted from the generator frequency.  
Step: 1  
Range: 0 – 500

Hint:

Generator frequency can be used only when generator voltage (min 5V) is present before reaching of the firing speed (*Starting RPM*) after start.

### **Nominal RPM [RPM]**

Nominal engine speed.  
Step: 1RPM  
Range: 100 – 4000 RPM

### **FltResGoToMAN [ENABLED/DISABLED]**

DISABLED: Controller stays in AUT mode after Fault reset .  
ENABLED: Automatic switch from AUT (or TEST) to MAN mode after Fault reset to avoid automatic engine start. This function is active for Shut down protection only.

### **DispBaklightTO [min]**

Timeout after which the display backlight is switched off.  
Step: 1 min  
Range: 0 – 60 min  
Default value: 0 ... means that the display lights all the time

### **ControllerMode [ OFF, MAN, AUT,\*TEST ]**

Equivalent to Controller mode changes by  or  buttons.

Hint:

Controller Mode change can be separately password protected.

### **\* RS232 mode [STANDARD/MODBUS/CumminsMB]**

Communication protocol switch.  
Standard: LiteEdit communication protocol.  
Modbus: Modbus protocol.  
CumminsMB: Protocol for communication with Cummins engines via Modbus.

Hint:

For detail description see chapter Modbus protocol.

### **\*NumberRings AA [-]**

Number of rings prior to open modem connection.  
Step: 1  
Range: 1 – 30

Hint:

*NumberRings AA* change is not activated immediately. It is activated after controller is switched on or when modem is connected to controller.



## Engine params

---

### Starting RPM [%]

“Firing” speed when iL controller stops cranking (starter goes OFF).

Step: 1% of nominal RPM

Range: 5 – 50 %

### Starting POil [Bar]

When reached controller stops cranking (starter goes OFF).

Step: 0,1 bar

Range: -10,0 – 1000,0

#### *Hint:*

There are three conditions for stop cranking: Starting RPM, StartingPOil and D+ (when enabled). Starter goes off when any of these conditions is void.

### Prestart time [s]

Time of closing of the PRE-START output prior to the engine start.

Set to zero if you want to leave the output PRE-START open.

Step: 1s

Range: 0 – 600 s

### MaxCrank time [s]

Maximum time limit of cranking.

Step: 1s

Range: 1 – 60 s

### CrnkFail pause [s]

Pause between crank attempts.

Step: 1s

Range: 5 – 60 s

### Crank attemps [-]

Max number of crank attempts.

Step: 1

Range: 1 – 10

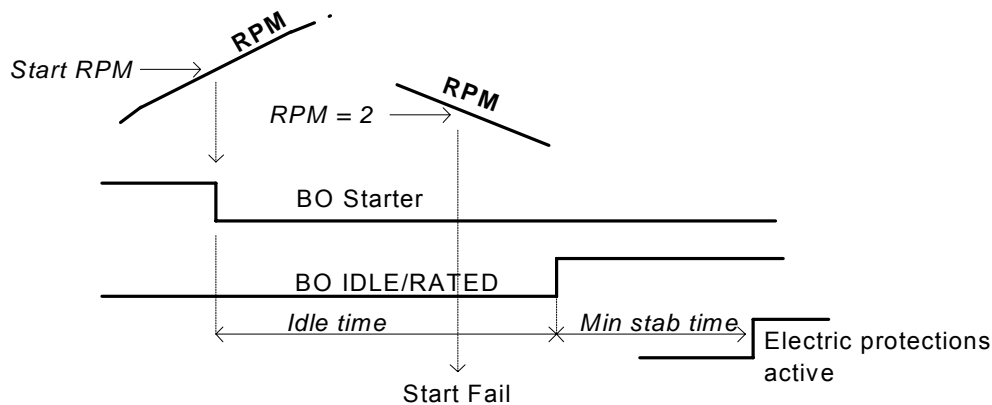
### Idle time [s]

Idle time delay starts when RPM exceeds *Start RPM* . Start fail is detected when during Idle state RPM decreases below 2.

During the *Idle time* timer running the binary output IDLE/NOMINAL is opened, when it elapses the IDLE/NOMINAL output closes. Binary output IDLE/NOMINAL opens during Cooling period again.

Step: 1 s

Range: 0 – 600 s



**Hint:**

If the IDLE function not supported on the governor, set the *Idle time* nevertheless to minimum 5s to avoid *Underspeed* possibly caused by instability of the engine short after start.

**Min stab time [s]**

Minimum time after reaching of defined level of RPM to the closing GCB.

Step: 1s  
Range: 0 – 300 s

**Max stab time [s]**

Maximum time after start to get proper voltage level of the generator.

Step: 1s  
Range: 0 – 300 s

**Hint:**

When generator voltage within *Max stab time* does not reach defined limits (Generator protection group) , an alarm occurs and the genset will shut down

**Stop time [s]**

Under normal conditions the engine must certainly stop within this period. The period starts by issuing stop command.

Step: 1s  
Range: 0 – 600 s

**Hint:**

Stop of engine is detected when all following conditions are met: RPM <2, Oil pressure < *StartingPOil* and Generator voltage < 10 VAC.

Stop fail is detected when there is difference between those conditions, e.g RPM<2 and Generator voltage > 10V.

**Cooling time [s]**

Runtime of the unloaded gen-set to cool the engine before stop.

Step: 1s  
Range: 0 – 3600 s

**Cooling speed [ NOMINAL / IDLE ]**

Selects the function of the Binary output IDLE/NOMINAL during engine Cooling state.

NOMINAL : Cooling is executed at Nominal speed and generator protections are active.  
IDLE: Cooling is executed at Idle speed and generator protections are switched off.

**Hint:**

Binary output IDLE/NOMINAL must be configured and connected to speed governor. Engine Idle speed must be adjusted on speed governor.

## Fuel solenoid [ DIESEL / GAS ]

Determines behavior of the Binary output FUEL SOLENOID.

DIESEL: Output closes 1 sec before Binary output STARTER.

The output opens if Emergency stop comes or Cooled gen-set is stopped and in pause between repeated starts.

GAS: Output closes together with Binary output IGNITION if RPM is over the 30 RPM (fix value).

Output opens after stop command or in pause between repeated start.

## D+ function [ENABLED/CHRGFAIL/DISABLED]

ENABLED: The D+ terminal is used for both functions – “running engine” detection and charge fail detection.

CHRGFAIL: The D+ terminal is used for charge fail detection only

DISABLED: The D+ terminal is not used.

### Hint:

The magnetization current is provided independently on this setpoint value.

The D+ charge fail protection becomes active after **Engine params: Idle time** reaches zero.

## ECU FreqSelect [PRIMARY/SECONDARY/DEFAULT]

This setpoint should be used only for Volvo and Scania engines.

**Volvo – “Volvo-MarineD12 Aux” is selected in ECU configuration:**

Primary or secondary engine speed is set by *Frequency select* bits in **VP Status** frame.

**Scania – “Scania S6 Singlespeed” is selected in ECU configuration:**

Nominal engine speed is chosen by *Nominal speed switch 1* and *2* from **DLN1** frame when the engine is running on nominal speed, i.e. binary output *Idle/Nominal* is active. When the output is not active (engine is running on Idle speed), the setpoint *ECU FreqSelect* is not taken into account.

## Engine protect

---

### Eng prot del [s]

During the start of the gen-set, some engine protections have to be blocked (e.g. Oil pressure).

The protections are unblocked after the *Protection del* time. The time starts after reaching *Start RPM*.

Step: 1s

Range: 0 – 300 s

### Horn timeout [s]

Max time limit of horn sounding. Set to zero if you want to leave the output HORN open.

Step: 1s

Range: 0 – 600 s

### Overspeed [%]

Threshold for over speed protection

Step: 1% of nominal RPM

Range: 100 – 150%

### AnlInp1 level1 [ Bar]

Warning threshold level for ANALOG INPUT 1

Step: 0,1 bar

Range: AnlInp1 level2 – 10000

### AnlInp1 level2 [ Bar]

Shutdown threshold level for ANALOG INPUT 1

Step: 0,1 bar

Range: -100 – AnlInp1 level1

**AnlInp1 del** [s]

Delay for ANALOG INPUT 1

Step: 1 s

Range: 0 – 180 s

**AnlInp2 level1** [ ]

Warning threshold level for ANALOG INPUT 2

Step: 1 °C

Range: -100 – AnlInp2 level2

**AnlInp2 level2** [ ]

Shutdown threshold level for ANALOG INPUT 2

Step: 1 °C

Range: AnlInp2 level1 – 10000

**AnlInp2 del** [s]

Delay for ANALOG INPUT 2 alarm.

Step: 1 s

Range: 0 – 180 s

**AnlInp3 level1** [ ]

Warning threshold level for ANALOG INPUT 3

Step: 1 %

Range: AnlInp3 level2 – 10000

**AnlInp3 level2** [ ]

Shutdown threshold level for ANALOG INPUT 3

Step: 1 %

Range: -100 – AnlInp3 level1

**AnlInp3 del** [s]

Delay for ANALOG INPUT 3

Step: 1 s

Range: 0 – 180 s

**Batt undervolt** [V]

Warning threshold for low battery voltage.

Step: 0,1 V

Range: 8V – Batt overvolt

**Batt overvolt** [V]

Warning threshold for high battery voltage.

Step: 0,1 V

Range: Batt undervolt – 40 V

**Batt volt del** [s]

Delay for low battery voltage alarm.

Step: 1s

Range: 0 – 600 s

**NextServTime** [h]

Counts down when engine running. If reaches zero, an alarm appears.

Step: 1h

Range: 0 – 65535h

## Gener protect

Hint:

All electric protections when activated result in shutdown.

### Overload [%]

Threshold for generator overload (in % of Nominal power)

Step: 1% of Nominal power

Range: 0 – 200%

### Overload del [s]

Delay for generator overload alarm.

Step: 0.1s

Range: 0 – 60.0 s

### \*2Inom del [ s ]

IDMT curve shape selection. *2Inom del* is Reaction time of IDMT protection for 200% overcurrent

$I_{gen} = 2 \cdot \text{Nominal current}$ .

Step: 0,1 s

Range: 0,1 - 20 s

IDMT is “very inverse” generator over current protection. Reaction time is not constant but depends on generator over current level according following formula.

$$\text{Reaction time} = \frac{2Inom\ del \cdot \text{Nomin current}}{I_{gen} - \text{Nomin current}}$$

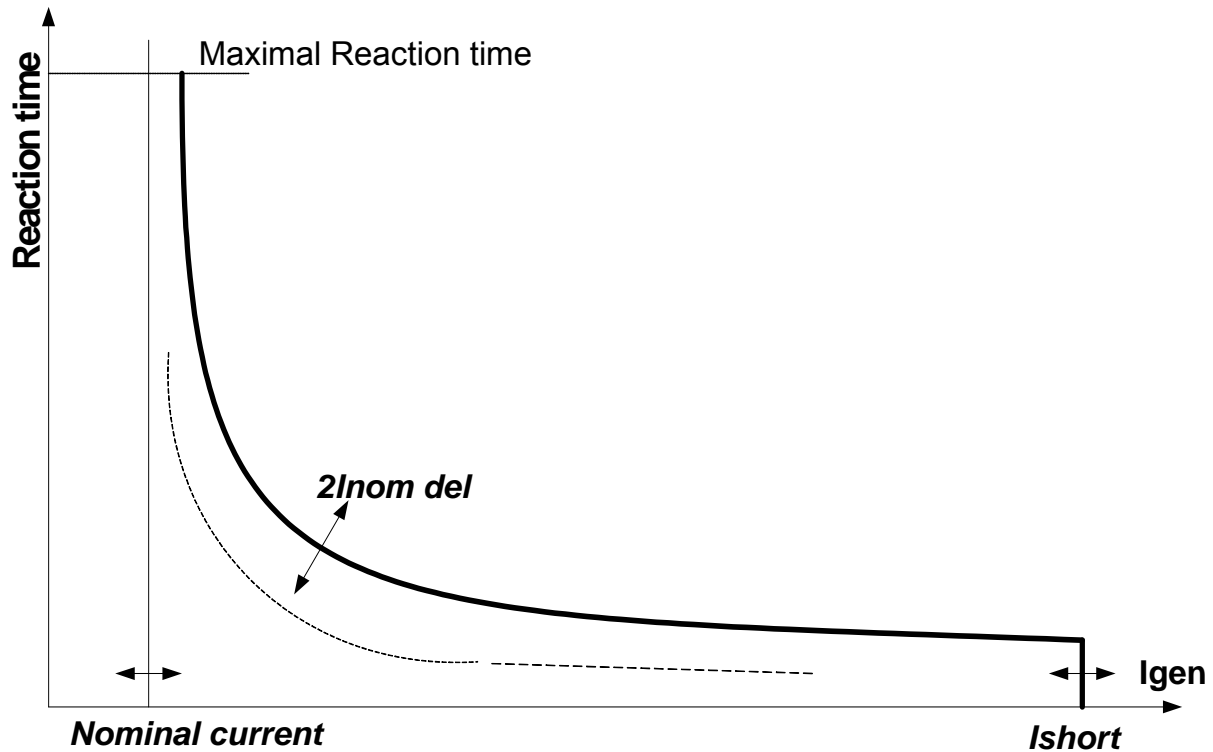
Hint:

Reaction time is limited up to 900 sec = 15 minutes. IDMT protection is not active for Reaction time values longer than 15 minutes.

$I_{gen}$  is maximal value of all measured phases of generator current.

EXAMPLE of Reaction time for different over current levels. Values in column 200% are *2Inom del*.

	Overcurrent			
	200 % = <b>2Inom del</b>	≤ 100 %	101 %	110 %
Reaction time	<b>0,2 s</b>	No action	20 s	2 s
	<b>2 s</b>	No action	200 s	20 s
	<b>20 s</b>	No action	No action (time > 900 s)	200 s



### **Ishort** [ % ]

Shutdown occurs when short circuit limit *Ishort* limit is reached.

Step: 1 % of *Nominal current*

Range: 100 - 500 %

### **Curr unbal** [%]

Threshold for generator current asymmetric (unbalance).

Step: 1% of *Nominal current*

Range: 1 – 200% of *Nominal current*

### **Curr unbal del** [s]

Delay for generator current unbalance

Step: 0.1 s

Range: 0 – 60.0 s

### **Gen >V Sd** [%]

Threshold for generator overvoltage. All three phases are checked. Maximum out of three is used.

Step: 1% of *Nominal voltage*

Range: *Gen <V* – 200%

### **Gen <V Sd** [%]

Threshold for generator undervoltage. All three phases are checked. Minimum out of three is used.

Step: 1% of *Nominal voltage*

Range: 0% – *Gen >V*

### **Gen V del** [s]

Delay for generator undervoltage and overvoltage alarm

Step: 0.1s

Range: 0 – 60 s

### **Volt unbal** [%]

Threshold for generator voltage unbalance alarm.  
 Step: 1% of Nominal voltage  
 Range: 0 – 100% of Nominal voltage

### **Volt unbal del** [s]

Delay for generator voltage unbalance alarm.  
 Step: 0.1s  
 Range: 0 – 60.0 s

### **Gen >f** [%]

Threshold for generator phase L3 overfrequency.  
 Step: 0.1% of Nominal frequency  
 Range: Gen <f – 200.0%

### **Gen <f** [%]

Threshold for generator phase L3 underfrequency.  
 Step: 0.1% of Nominal frequency  
 Range: 0.0 – Gen >f of Nominal frequency

### **Gen f del** [s]

Delay for generator underfrequency and overfrequency alarm.  
 Step: 0.1s  
 Range: 0 – 60.0 s

## **Auto Mains Fail**

---

### **Ret fromIsland** [ MANUAL, AUTO ]

MANUAL: After closing GCB, iL goes to MAN mode automatically.  
 AUTO: No automatic switching to MAN mode.

### **EmergStart del** [s]

Delay after the mains failure to the start of the gen-set  
 Step: 1s  
 Range: 0 – 300 s

### **Mains ret del** [s]

Delay after the mains return to the GCB opening.  
 Step: 1s  
 Range: 1 – 3600 s

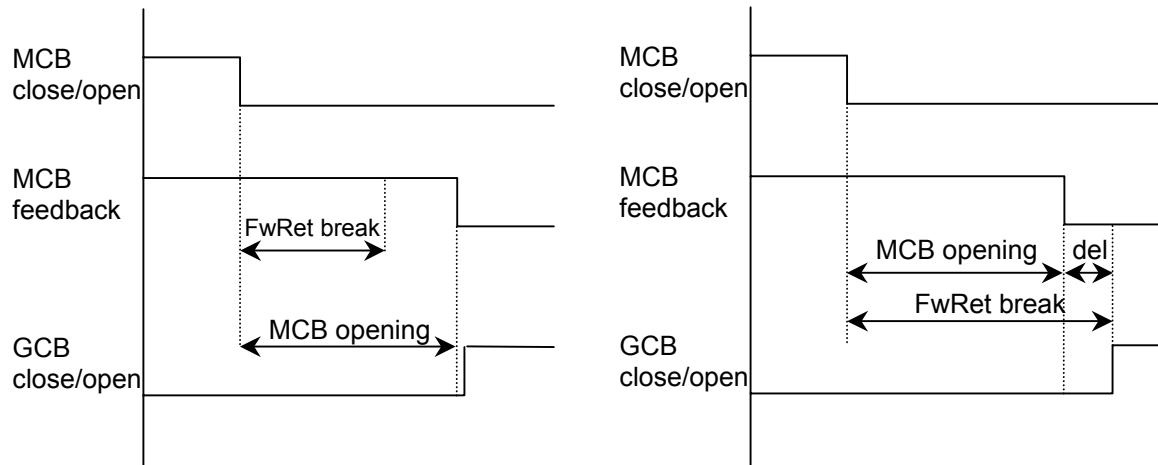
### **FwRet break** [s]

Delay after GCB opening to MCB closing during the return procedure.  
 Delay after MCB opening to GCB closing if the setpoint *MCB opening* set to GEN START  
 Step: 0.1s  
 Range: 0 – 600.0 s

The time charts bellow show recommended setting of **AutoMains fail**: *FwRet break* setpoint.

If the *FwRet break* setpoint is set shorter than the time required for opening of the circuit breaker, the controller closes *GCB close/open* output straight away (100 ms) after the *MCB feedback* input deactivates.

If some delay between *MCB feedback* deactivation and closing of *GCB close/open* output is required, then the *FwRet break* must be set to sum of “*MCB opening*” + “*del*” time.



### MCB close del [s]

Delay after mains returns to MCB closing, if gen-set is not running (e.g. is in start-up procedure)

Step: 0.1s

Range: 0 – 60.0 s

### Mains >V [%]

Threshold for mains overvoltage. All three phases are checked. Maximum out of three is used.

Step: 1% of Nominal voltage

Range: Mains <V – 200%

### Mains <V [%]

Threshold for mains undervoltage. All three phases are checked. Maximum out of three is used.

Step: 1% of nominal voltage

Range: 0% – Mains >V

### Mains V del [s]

Delay for mains undervoltage and overvoltage

Step: 0.1 s

Range: 0 – 60 s

### MVlt unbal [%]

Threshold for mains voltage unbalance

Step: 1% of Nominal voltage

Range: 1 – 150%

### MVltUnbal del [s]

Delay for mains voltage unbalance

Step: 0.1 s

Range: 0- 60.0

### Mains >f [%]

Threshold for mains overfrequency. All three phases are checked. Maximum out of three is used.

Step: 0.1% of Nominal frequency

Range: Mains <f – 200.0%

### Mains <f [%]

Threshold for mains underfrequency. All three phases are checked. Maximum out of three is used.

Step: 0.1% of nominal frequency

Range: 0% – Mains >f



## Mains f del [s]

Delay for mains underfrequency and overfrequency

Step: 0.1s

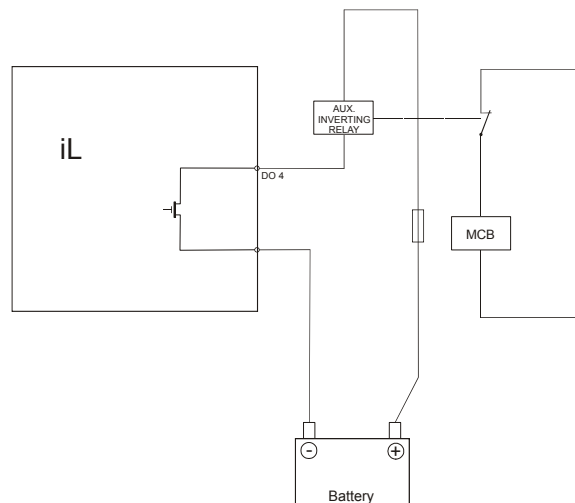
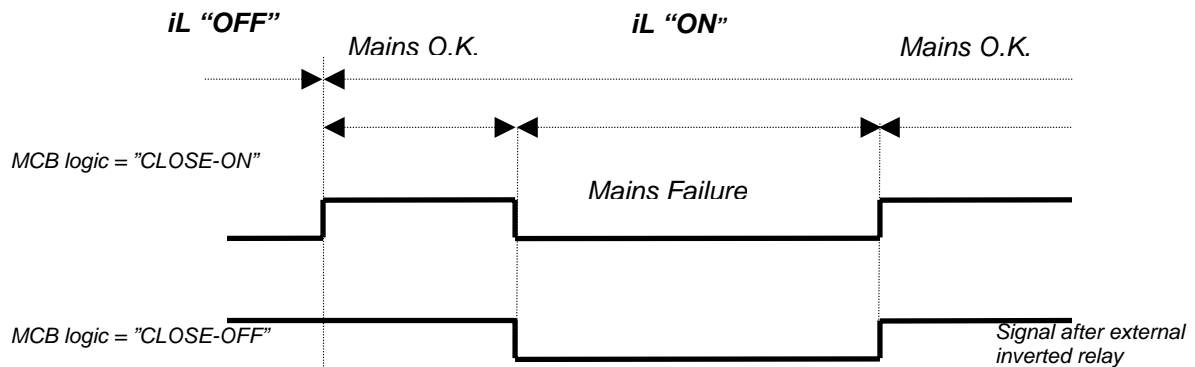
Range: 0 – 60.0 s

## MCB Logic [CLOSE-ON / CLOSE-OFF]

The set point influences the behavior of the output MCB CLOSE/OPEN

CLOSE-ON: When the output MCB CLOSE/OPEN is closed – MCB should be closed.

CLOSE-OFF: When the output MCB CLOSE/OPEN is closed – MCB should be opened.



### Hint:

In the case **MCB logic** = "CLOSE-OFF" it is necessary to change externally the polarity of the output signal.

## Ret from test [MANUAL / AUTO]

The set point influences the behavior of the TEST mode.

### MANUAL:

- 1) Select TEST, gen-sets starts and running unloaded
- 2) To transfer load from mains to the gen-set press **MCB ON/OFF** or wait for power-cut.
- 3) When mains recovers, the gen-set remains running loaded.
- 4) To stop the gen-set select AUT mode
- 5) In AUT mode:
  - a) After the *MainsReturn del* IntelliLite opens the GCB
  - b) After the *Return Break* delay IntelliLite closes the MCB.

- c) The gen-set is cooled and stopped

AUTO:

- 1) Select TEST, gen-sets starts and running unloaded
- 2) To transfer load from mains to the gen-set wait for the power-cut. the controller does not response for **MCB ON/OFF** button.
- 3) When the mains recovers:
  - a) After the *MainsReturn del* the controller opens the GCB
  - b) After the *Return Break* delay the controller closes the MCB.
- 4) The gen-set remains running.
- 5) To stop the gen-set select a different mode than TEST.

## MCB opened

**[MAINSFAIL / GENRUN]**

MAINSFAIL

The command to open the MCB is given immediately after mains fail condition evaluated.

GEN START

The command to open the MCB is not given till the Genset starts (with respecting the setpoint *EmergStart del*), reaches *Running* state, reaches proper voltage and frequency and *MinStabTime* elapses. After that, the MCB is opened, *FwRet break* timer is started and the GCB is closed after the timer elapses.

Hint:

This option should be used for MCBs using 230V control and not equipped with the undervoltage coil.

## Sensor spec

---

### Calibr AI1,AI2,AI3

**[...]**

Calibrating constant to adjust the measured value of IL analog inputs. Physical dimension of calibrating constant is corresponding to Analog input.

Step: 1  
Range: -1000 – +1000

Hint:

Calibration constants have to be adjusted when measured value is near the alarm level. User curves A, B, C can be defined by LiteEdit software.

## \*IOM module

---

### AnOut-kW/20mA

**[kW/20mA]**

Conversion coefficient from gen-set power to IG-IOM, IGS-PTM analog output – in kW to full output scale 20 mA.

Step: 1 kW / 20mA  
Range: 1 - 32000 kW / 20mA

### AnInIOM1 lev1

**[ ]**

The level for IOM ANALOG INPUT 1 alarm detection.

Step: 1  
Range: -100 - +10000

### AnInIOM1 lev2

**[ ]**

The level for IOM ANALOG INPUT 1 alarm detection.

Step: 1  
Range: -100 - +10000

**AnIInIOM1 del [s]**

Delay for IOM ANALOG INPUT 1 alarm.

Step: 1 s  
Range: 0 - 180 s

**AnIInIOM2 lev1 [ ]**

The level for IOM ANALOG INPUT 2 alarm detection.

Step: 1  
Range: -100 - +10000

**AnIInIOM2 lev2 [ ]**

The level for IOM ANALOG INPUT 2 alarm detection.

Step: 1  
Range: -100 - +10000

**AnIInIOM2 del [s]**

Delay for IOM ANALOG INPUT 2 alarm.

Step: 1 s  
Range: 0 - 180 s

**AnIInIOM3 lev1 [ ]**

The level for IOM ANALOG INPUT 3 alarm detection.

Step: 1  
Range: -100 - +10000

**AnIInIOM3 lev2 [ ]**

The level for IOM ANALOG INPUT 3 alarm detection.

Step: 1  
Range: -100 - +10000

**AnIInIOM3 del [s]**

Delay for IOM ANALOG INPUT 3 alarm.

Step: 1 s  
Range: 0 - 180 s

**AnIInIOM4 lev1 [ ]**

The level for IOM ANALOG INPUT 4 alarm detection.

Step: 1  
Range: -100 - +10000

**AnIInIOM4 lev2 [ ]**

The level for IOM ANALOG INPUT 4 alarm detection.

Step: 1  
Range: -100 - +10000

**AnIInIOM4 del [s]**

Delay for IOM ANALOG INPUT 4 alarm.

Step: 1 s  
Range: 0 - 180 s

The protection of IOM/PTM inputs is activated by overcrossing the limits.

**Calibr AI4,AI5,AI6,AI7 [...]**

Calibrating constant to adjust the measured value of IOM/PTM analog inputs. Physical dimension of calibrating constant is corresponding to Analog input.


Step: 1  
Range: -1000 - +1000

## \*ECU-controlled engine support

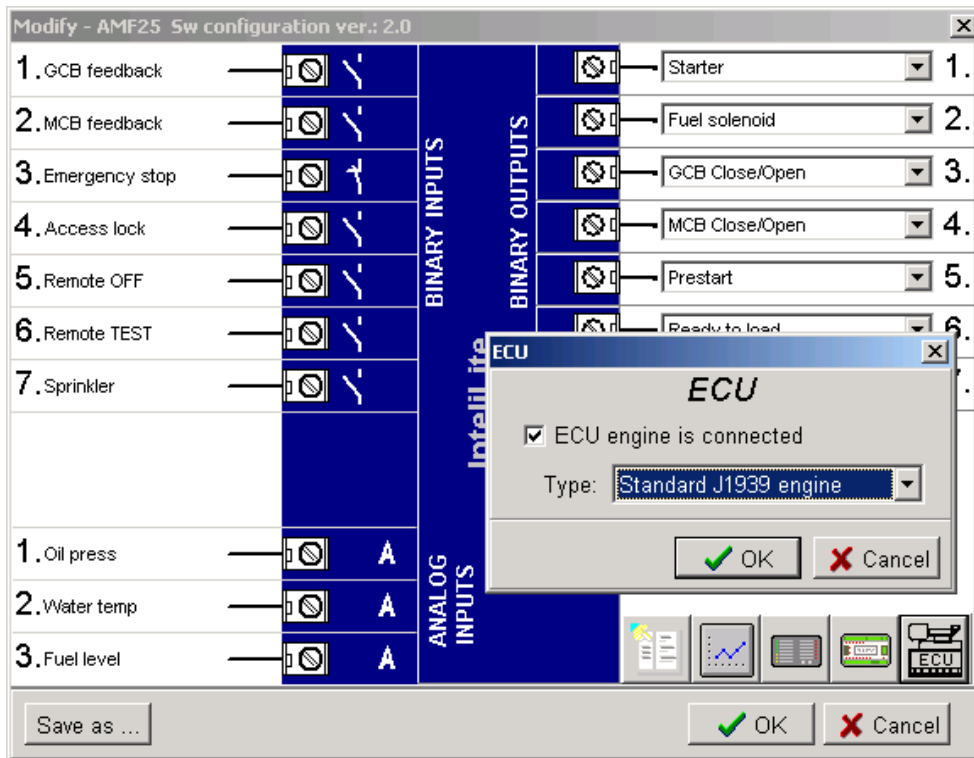
There exists only one firmware branch for both standard and electronic controlled (monitored) engines.

Presence of the ECU on the CAN bus/RS232 is configured via LiteEdit like other peripherals (iG-IOM,



iGL-RA15). Pressing the  button in Configuration window of LiteEdit (version 2.0 and higher), opens ECU dialog window where the appropriate engine/ECU type should be selected. There are several groups of engine/ECU types:

- Standard J1939 engines
- Volvo engines
- Scania S6
- Cummins-MODBUS



If the connected engine is Cummins communicating via RS232, it is necessary to set the setpoint **Basic settings:RS232 mode = CUMMINSMB.**

Loss of communication causes shutdown of the running engine. On the contrary, the ECU can be switched off at quiescent engine, that means not-communicating ECU is in that moment normal situation. All values from ECU shall show #####, but no alarm is displayed. The output *ECU CommOK* follows the real situation, that means it is not active anytime when the ECU does not communicate.

The output *ECU PwrRelay* closes at the beginning of prestart and opens if the engine shall be stopped.

The engine is started via standard contact output or via CAN bus (for Volvo and Scania engines). For other engines J1939 is used for monitoring only.

## Values read from ECU

---

### Standard J1939 engines and Scania

When “Standard J1939 engines” and “Scania S6” options are selected, following values are read from standard J1939 frames:

- 5.2.1.9 Engine speed (frame 5.3.7 EEC1)
- 5.2.5.28 Engine oil pressure (frame 5.3.29 Engine Fluid Level/Pressure)
- 5.2.5.5 Engine coolant temperature (frame 5.3.28 Engine Temperature)
- 5.2.5.61 Total engine hours (frame 5.3.19 Engine Hours, Revolutions)
- 5.2.1.7 Percent load at current speed (frame 5.3.6 EEC2)
- 5.2.5.63 Fuel rate (frame 5.3.32 Fuel Economy)
- 5.2.5.36 Boost pressure (frame 5.3.36 Inlet/Exhaust Conditions)
- 5.2.5.4 Intake manifold 1 temperature (frame 5.3.36 Inlet/Exhaust Conditions)

### Cummins MODBUS

When “Cummins-Modbus” option is selected, following values are read from Modbus Register Data (for QSK15, QSK45, QSK60):

- Engine Speed (Register Address:30001)
- Oil Pressure (Register Address:30003)
- Coolant Temperature (Register Address:30002)
- Engine Running Time (Register Address:30008-30009)
- Fuel Consumption Rate (Register Address:30018)
- Intake Manifold Absolute Pressure (Register Address:30530 (QSK45, QSK60 only))
- Intake Manifold Temperature (Register Address:30531 (QSK45, QSK60 only))

## Diagnostic messages read from ECU

---

Diagnostic messages are read and displayed in extra [ECU Alarm list](#). For Standard J1939 SPN (Suspect Parameter Number), FMI (Failure Mode Identifier) and OC (Occurrence Counter) are shown together with verbal description if available.

One SPN (Suspect Parameter Number) / FMI (Failure Mode Identify) couple describes one fail information. If FMI is equal to 0 or 1, WRN is displayed in the ECU Alarm list. For any other FMI values, FLS is displayed.

Detail SPN/FMI code specification see in:

- SAE Truck and Bus Control and Communications Network Standards Manual, SAE HS-1939 Publication
- Or refer to corresponding engine manufacturer’s ECU error codes list.

Following messages are displayed with the description:

- SPN:100 EngOil Press
- SPN:102 Boost Press
- SPN:105 Intake Temp
- SPN:110 EngCool Temp
- SPN:175 EngOil Temp
- SPN:629 Controller#1
- SPN:636 PositionSensor
- SPN:637 TimingSensor
- SPN:651 InjectorCyl#1
- SPN:652 InjectorCyl#2
- SPN:653 InjectorCyl#3
- SPN:654 InjectorCyl#4
- SPN:655 InjectorCyl#5
- SPN:656 InjectorCyl#6
- SPN:677 EngStartRelay
- SPN:1485 ECU MainRelay

For Scania Fault codes (FC) are displayed. Following messages are available for particular groups of Fault codes:

- FC:1000-1001 Overspeed
- FC:1100-1107 EngSpdSensor1
- FC:1200-1207 EngSpdSensor2
- FC:2000-2002 WtrTempSensor
- FC:2100-2102 ChrgAirTmpSens
- FC:2200-2202 ChrgAirPrsSens
- FC:2400-2403 OilPressSensor
- FC:2600-2601 SensorSupply1
- FC:2700-2701 SensorSupply2
- FC:2800-2802 ExtrAnalogInp
- FC:3200-3205 BatteryVoltage
- FC:4300-4303 HW Watchdog
- FC:6200-6201 FanActuator
- FC:6400-6401 WasteGateAct
- FC:6600-6601 StarterActuatr
- FC:6A00-6A01 ExhaustBrkAct
- FC:B000-B001 OilPressProt
- FC:B100-B101 CoolantLevProt
- FC:B200 OverheatCoolWt
- FC:B300 EmergencyStop
- FC:C000-C006 PDEInjctorCyl1
- FC:C100-C106 PDEInjctorCyl2
- FC:C200-C206 PDEInjctorCyl3
- FC:C300-C306 PDEInjctorCyl4
- FC:C400-C406 PDEInjctorCyl5
- FC:C500-C506 PDEInjctorCyl6
- FC:C600-C606 PDEInjctorCyl7
- FC:C700-C706 PDEInjctorCyl8
- FC:E200 OverheatProt
- FC:E600 CoordEmergStop

## **Analog inputs**

---

Reading of mentioned values from ECU enables to use analog inputs of the unit for other purposes, e.g. measuring, displaying and alarm activation related to various quantities. The configuration thus allows to use three analog inputs on the central unit and four analog inputs on IG-IOM/IGS-PTM module if connected.

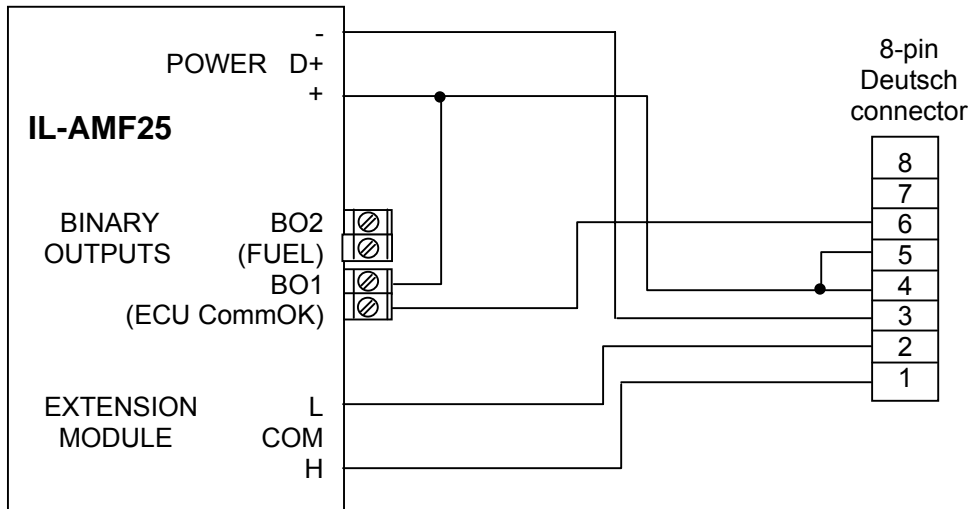
If the engine without ECU is controlled by IntelliLite, the first analog input is permanently configured to Oil pressure, other analog inputs remain freely configurable.

## J1939 connection description

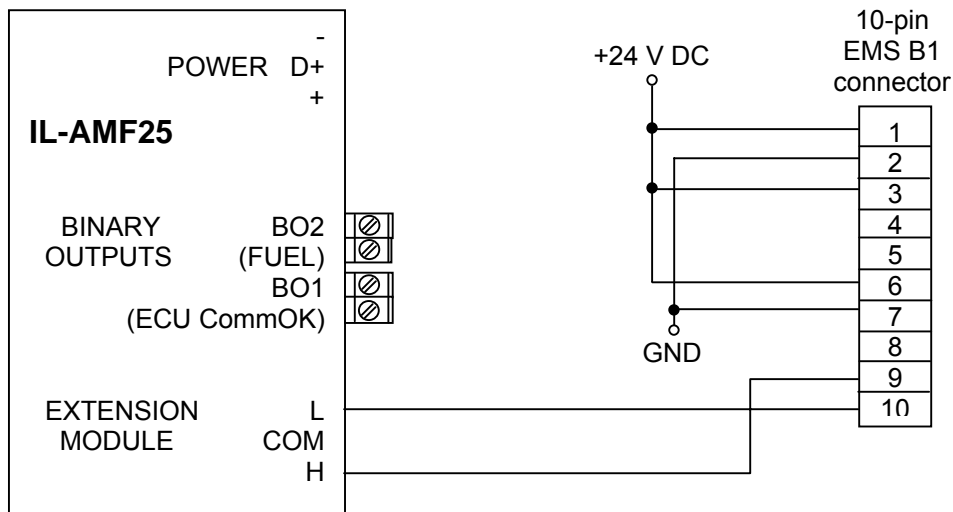
The following diagrams show how to connect the engine control unit to the IntelliLite controller:

### Engines started via CAN bus

**VOLVO PENTA engines (EMS I, EMS II, EDC III units)**



### SCANIA S6



### Engines not started via CAN bus

#### PERKINS 2800 series

IL-CU binary output description	Perkins Customer interface connector
Start output	connects directly to engine starter solenoid
Fuel output	1, 10, 15, 33, 34 powers up ECU and enables the injectors

IL-CU CAN description	Perkins Customer interface connector
CAN bus common	Screen for the J1939 cable.
CAN bus H	31
CAN bus L	32

**JOHN DEERE**

IL-CU binary output description	John Deere 21 pin Deutsch connector
Start output	D
Fuel output	G (switched ECU power),J (ignition)

IL-CU CAN description	John Deere 21 pin Deutsch connector
CAN bus common	Screen for the J1939 cable.
CAN bus H	V
CAN bus L	U

**CUMMINS ISB/ISBE**

IL-CU binary output description	Cummins ISB OEM Harness connector B
Start output	connects directly to engine starter solenoid
Fuel output	39

IL-CU CAN description	Cummins ISB 9 pin Deutsch connector
CAN bus common	SAE J1939 shield - screen for J1939 cable.
CAN bus H	SAE J1939 signal
CAN bus L	SAE J1939 return



# Sensor specification

## Background of the sensor calibration

To correct measuring error of each analog input (pressure, temperature, level) calibrating constants within 10 % of measure range should be set. Three (seven) calibrating constants are set in physical units - bar, °C, % . From these constants are counted equivalent calibrating resistance which are internally (in software) add to sensor resistance.

At the moment of calibration (ENTER pressing) is calculated (and in memory saved) calibrating resistance (in Ω). This value is added to measured sensor resistance before calculation of the AI1 (AI2 or AI3) value.

**Example:** iL-CU display Temperature 70 °C and real value is 73 °C.

After setting *Calibr AI1* to +3 °C (and pressing ENTER) IntelliLite calculates corresponding resistance (e.g. 5Ω) and saves this value into the memory. The resistance is then added to all calculations (e.g. instead of 70°C -> 73°C, or e.g. instead of 5°C -> 6°C).

Hint:

The calibration must be done at the operational point of the analog input (e.g. 80°C, 4.0Bar etc..)

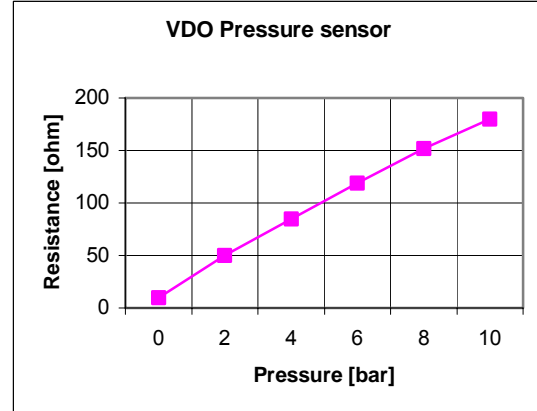
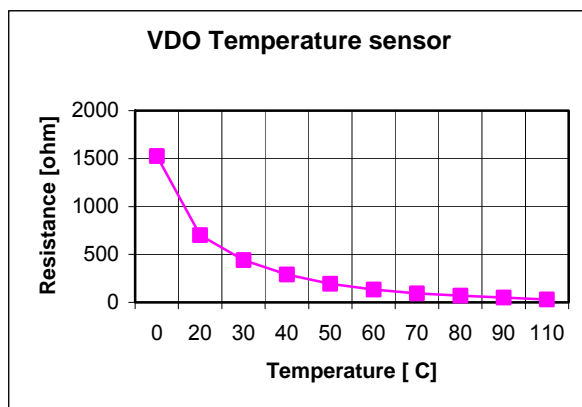
## Default sensor settings

Analog input 1: 6 points VDO characteristic, pressure measuring in bar

Analog input 2: 10 points VDO characteristic, temperature measuring in °C

Analog input 3: 2 points VDO fuel level sensor, 0% = 10Ω, 100% = 180Ω

For VDO sensor characteristic see chapter Value and set points codes.



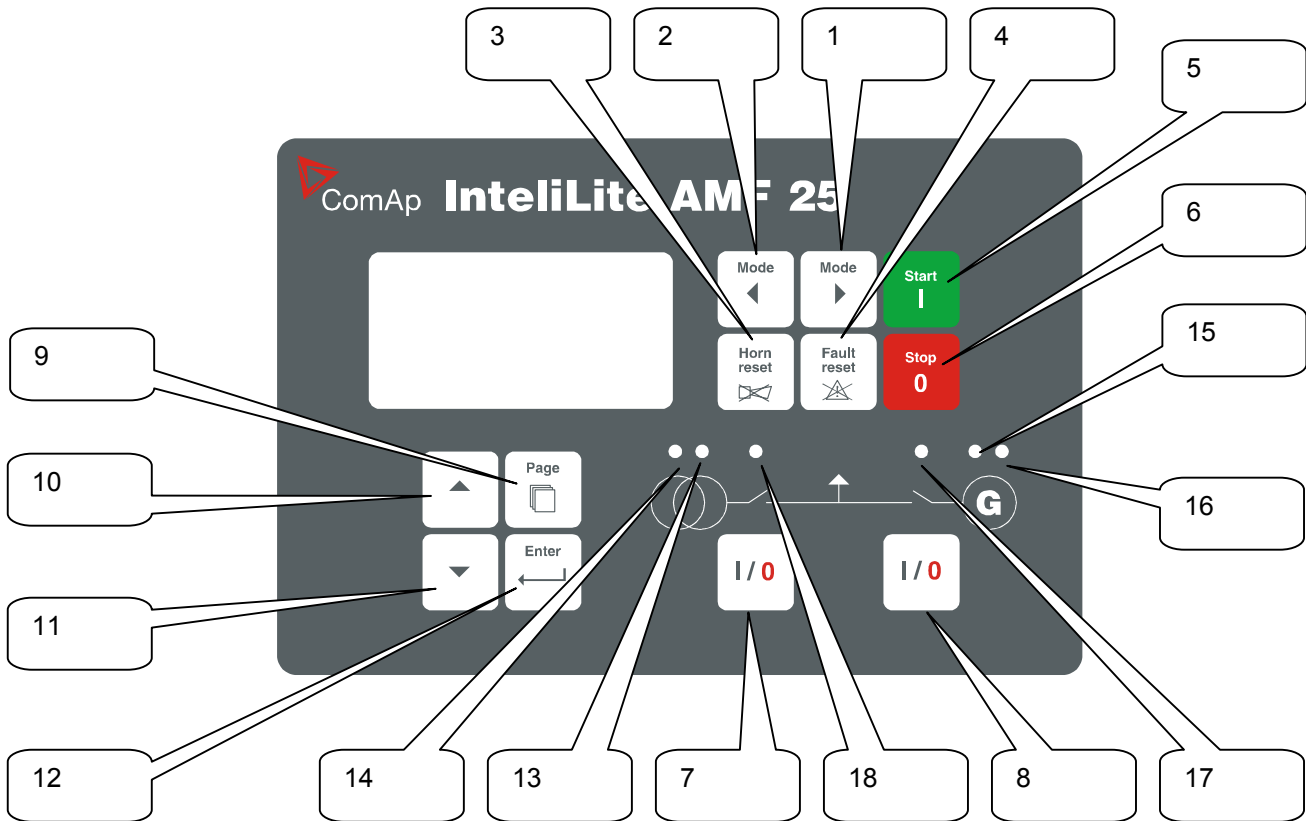
Temperature °C	Pt 1000 ohm	Ni 1000 ohm
-20	922	893
-10	961	946
0	1000	1000
30	1117	1171
60	1232	1353
80	1309	1483
90	1347	1549
100	1385	1618
110	1423	1688
120	1461	1760
0	-1	-1

Hint:

When measured value is 6% out of range the Sensor fail FLS is detected.

# Operator interface

## Pushbuttons and LEDs



### Pushbuttons

1. **MODE→** Cyclic forward selection the gen-set operation mode (OFF -> MAN -> AUT -> TEST)
2. **←MODE** Cyclic backward selection the gen-set operation mode (TEST -> AUT -> MAN ->OFF )
3. **HORN RESET** Deactivates the HORN
4. **FAULT RESET** Acknowledges faults and alarms
5. **START** Start of the gen-set
6. **STOP** Stop of the gen-set
7. **MCB ON/OFF** Manual open/close of the Mains circuit breaker
8. **GCB ON/OFF** Manual open/close of the Generator circuit breaker
9. **PAGE** Cyclic selection of the display mode(MEASUREMENT->ADJUSTEMENT)
10. Select the set point, select the screen or increase set point value
11. Select the set point, select the screen or decrease set point value
12. **ENTER** Confirm set point value

### LEDs

13. MAINS PRESENT: GREEN LED is on, if mains is present and within limits
14. 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.
15. GEN VOLTAGE PRESENT: GREEN LED is on, if gen. voltage is present and within limits
16. GEN-SET FAILURE: RED LED starts flashing when gen-set failure occurs. After **FAULT RESET** button is pressed, goes to steady light (if an alarm is still active) or is off (if no alarm is active)
17. GCB ON: GREEN LED is on, if GCB is closed. Driven by the feedback signal.
18. MCB ON: GREEN LED is on, if MCB is closed. Driven by the feedback signal.

## How to select the gen-set mode ?

---

Use **MODE→** or **←MODE** to select requested gen-set operation mode (OFF – MAN – AUT – TEST)

## When to use buttons **GCB ON/OFF** and **MCB ON/OFF**?

---

In AUT mode these buttons are disabled.

In MAN mode are enabled, but before closing of any circuit breaker, voltage must be within limits.

Internal protection against closing of both circuit breakers is implemented.

In TEST mode **MCB OFF** is enabled, to allow test with load.

## Display menus

---

There are 2 display menus available: MEASUREMENT and ADJUSTMENT

Each menu consists of several screens. Press repeatedly **PAGE** button to select requested menu.

## How to view measured data?

---

1. Use repeatedly **PAGE** button to select the MEASUREMENT menu.
2. Use **↑** and **↓** to select the screen with requested data.

## How to view and edit set points?

---

1. Use repeatedly **PAGE** button to select the ADJUSTMENT menu.
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 is activated.
8. Press **ENTER** to confirm or **PAGE** to leave without change.
9. Press **PAGE** to leave selected set points group.

## How to change the display contrast ?

Press **ENTER** and **↑** or **↓** at the same time to adjust the best display contrast

*Hint:*

Only in MEASUREMENT menu

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

Press **ENTER** and then **PAGE**. On the display you can see IntelliLite INFO screen for 10 seconds.

IntelliLite INFO screen contains :

- 1) *Controller name* (see **Basic setting** group)
- 2) IntelliLite serial number (8 character number)
- 3) SW version: the first is the firmware version number, the second is configuration table number.
- 4) Application: AMF25
- 5) Branch: Standard

*Hint:*

Only in MEASUREMENT menu.

## How to find active alarms ?

---

Active alarm list is the last screen in the MEASUREMENT menu.

Select MEASUREMENT menu. Press  $\uparrow$  You will see the list of all active alarms with the number of alarms at the top-right corner. Three state alarms are introduced:

Versions 1.4 and lower	Version 2.0 and higher	Description
Wrn Water temp	* Wrn Water temp	Active not accepted alarm
Wrn Water temp	Wrn Water temp	Active accepted alarm
Wrn Water temp	* Wrn Water temp	Inactive not accepted alarm
		Inactive accepted alarm

Press **FAULT RESET** accepts all alarms. Non-active alarms immediately disappear from the list. Active alarm list appears on the screen when a new alarm comes up and Main MEASUREMENT screen is active.

*Hint:*

Alarm list does not activate when you are reviewing the values or setpoints.

In AMF25 since version 2.0 second alarm list for ECU alarms is added. It is displayed one screen above the standard alarm list on the controller display or under the standard alarm list in Control window of LiteEdit (also since version 2.0).

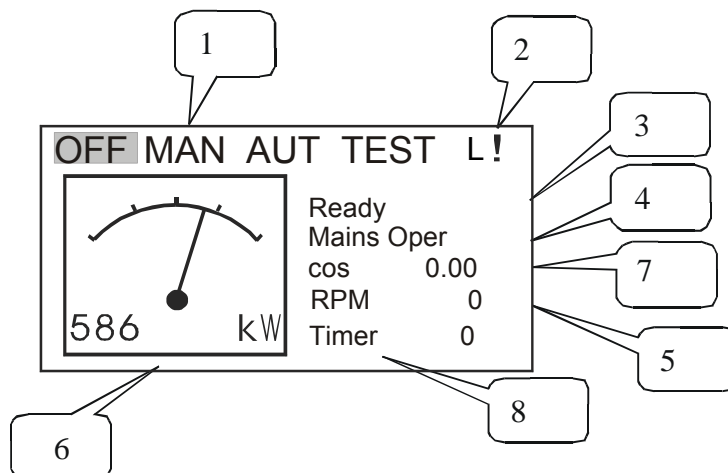
If an alarm appears in this alarm list, it is signalized in the standard alarm list and by exclamation mark on the main measure screen.

Control from the front panel:

$\uparrow\downarrow$	One screen up/down
Enter	Cursor move within the ECU alarm list
Enter + Fault reset	ECU fault code reset

## MEASUREMENT screens description

### Main measure screen



1. Operation mode of the gen-set
2. Indication of active access lock, Remote OFF or Remote TEST L and alarm !
3. Status of the gen-set
4. Actual condition
5. RPM of the gen-set
6. Active power
7. Power factor
8. Timer - event s counting time (e.g. prestart, cooling, etc.)

## Generator screen

Gen freq  
 Gen V1-2, V2-3, V3-1 ph-ph  
 Gen V1, V2, V3 ph-N  
 Gen I1, I2, I3 (triple bargraph)

## Mains screen

Mains freq  
  
 Mains V1-2, V2-3, V3-1 ph-ph  
 Mains V1, V2, V3 ph-N (triple bargraph)

## IL-CU Analog inputs screen

(depends on configuration)  
 Oil pressure (single bargraph)  
 Water temperature (single bargraph)  
 Fuel level (single bargraph)  
 Battery voltage (single bargraph)

## IL-CU binary inputs

BI1 to BI7

## IL-CU binary outputs

BO1 to BO7

## \*ECU state

ECU YellowLamp  
 ECU RedLamp  
 WaitToStart

### Hint:

This screen is shown/hidden depending on whether the ECU is configured or not.

## \*ECUValues

Oil press  
 Water temp  
 PercLoadAtCS  
 Boost pressure  
 ManifoldTemp  
 Fuel rate

### Hint:

This screen is shown/hidden depending on whether the ECU is configured or not.

## Gen-set power screen

Active power (total and per phase)  
 Power factor (total and per phase)  
 React power (total and per phase)  
 Appar power (total and per phase)

## Statistic

Run hours  
 Number of starts  
  
 \*Kilowatt-hours kWh (total)  
 \*Reactive power hours kVAh (total only)  
  
 NextServTime

## \*ECU AlarmList

Diagnostic messages are read from ECU and displayed in this second alarm list. For Standard J1939 engines SPN (Suspect Parameter Number), FMI (Failure Mode Identifier) and OC (Occurrence Counter) are shown together with verbal description if available.

Following image shows displaying of ECU alarms in the second alarm list. The additional information for the row selected by cursor is on the last row (SPN, OC and FMI codes).

If the verbal description of alarm is not available, the SPN (decimal and hexadecimal) is displayed.

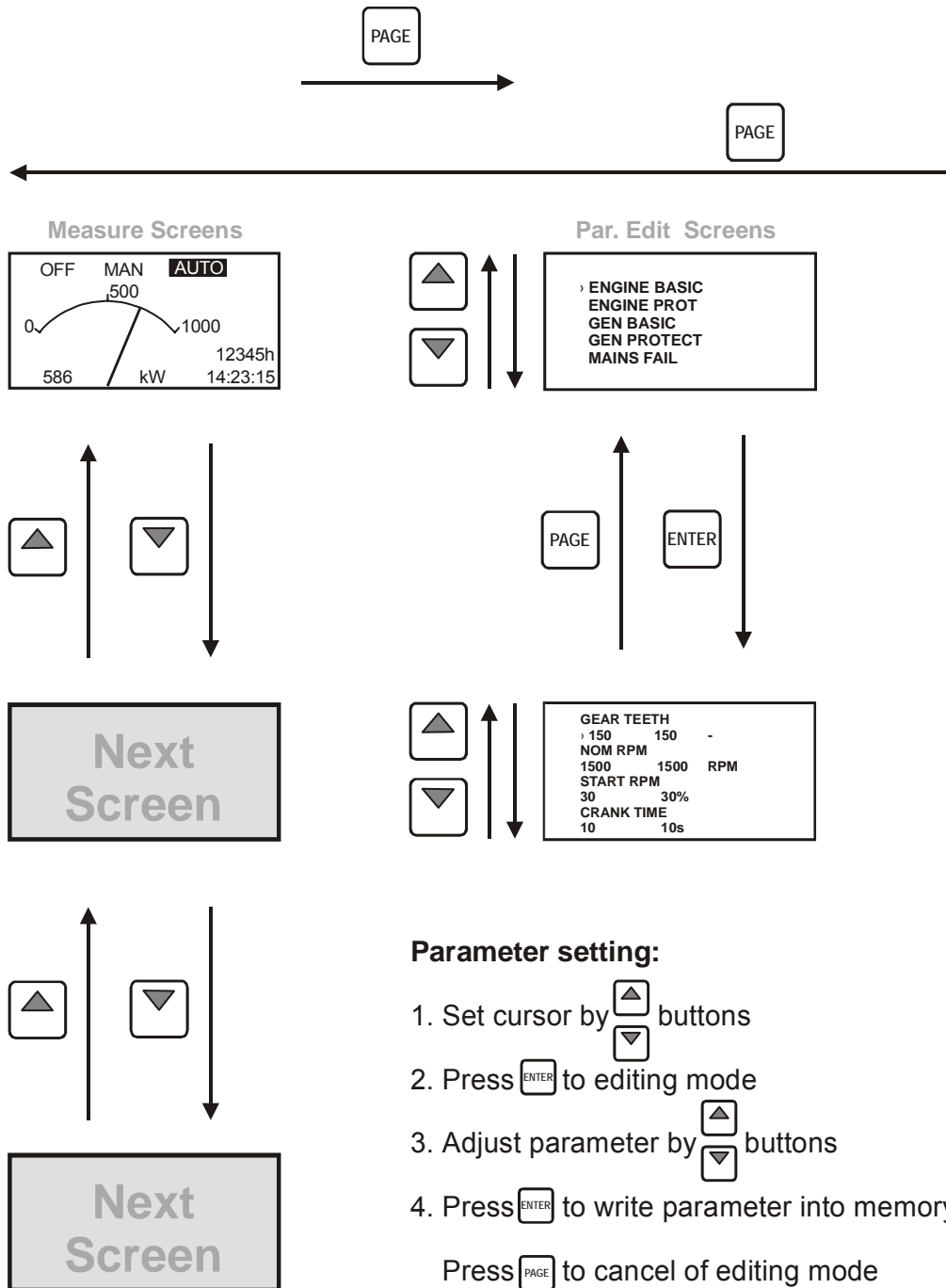
EngOilPress	WRN
BoostPress	FLS
EngOilTemp	FLS
629 (275h)	FLS
Controller#1	
EngCoolTemp	WRN
SPN:110 OC:7 FMI:3	

### Hint:

For FMI = 0 and 1, WRN is displayed. For other FMI codes, FLS is displayed.

## Alarm list

## Chart guide to menus and pushbutton's operation



# Function description

## 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**, **MCB ON/OFF** are pressed.

When power-cut comes, MCB CLOSE/OPEN opens. After mains returns, MCB CLOSE/OPEN closes with *MCB close del.*

## MAN mode

**START** - starts the gen-set.

**GCB ON/OFF**

- The controller closes GCB to dead bus.
- The controller opens GCB when closed.
- If the generator voltage is out of the limits, the controller does not to respond to the **GCB ON/OFF**

**MCB ON/OFF**

- The controller closes MCB to dead bus.
- The controller opens MCB when closed.

**STOP** stops the gen-set.

### Hint:

The engine can run without load unlimited time.

The controller does not automatically stop the running gen-set in MAN mode.

The controller does not start the gen-set when power cut comes.

**!! The controller provides interlock between GCB and MCB, it means it is never possible to close both CB together**

## Start-stop sequence (simplified)

MODE = MAN (Engine start/stop request is given by pressing buttons **START** and **STOP**)

MODE = AUT (Engine start/stop request is evaluated form Mains failure/return)

State	Condition of the transition	Action	Next state
Ready	Start request	PRESTART on <i>Prestart time counter started</i>	<i>Prestart</i>
	RPM > 2 or Oil pressure detected or Gen voltage > 10V		<i>Stop (Stop fail)</i>
	OFF mode selected or Shut down alarm active		<i>Not Ready</i>
Not Ready	RPM < 2, Oil pressure not detected, Vgen < 10V, no shutdown alarm active, other than OFF mode selected		<i>Ready</i>
Prestart <sup>3</sup>	<i>Prestart time elapsed</i>	<i>STARTER on</i> <i>FUEL SOLENOID on<sup>4</sup></i> <i>MaxCrank time counter started</i>	<i>Cranking</i>



State	Condition of the transition	Action	Next state
Cranking <sup>3</sup>	<i>RPM &gt; Start RPM</i>	<i>STARTER off PRESTART off</i>	<i>Starting</i>
	<i>D+ input activated or oil pressure detected or Gen voltage &gt; 25% Vgnom</i>	<i>STARTER off PRESTART off</i>	<i>Cranking</i>
	<i>MaxCrank time elapsed, 1st attempt</i>	<i>STARTER off FUEL SOLENOID off STOP SOLENOID on CrankFail pause timer started</i>	<i>Crank pause</i>
	<i>MaxCrank time elapsed, last attempt</i>	<i>STARTER off PRESTART off</i>	<i>Shutdown (Start fail)</i>
Crank pause <sup>3</sup>	<i>CrankFail pause elapsed</i>	<i>STARTER on FUEL SOLENOID on<sup>4</sup> STOP SOLENOID off MaxCrank time counter started</i>	<i>Cranking</i>
Starting <sup>3</sup>	<i>80% Nominal speed reached</i>	<i>READY TO LOAD on<sup>1</sup> Min, MaxStabTime counter started</i>	<i>Running</i>
	<i>RPM = 0 or any other shutdown condition</i>	<i>FUEL SOLENOID off STOP SOLENOID on</i>	<i>Shutdown</i>
	<i>60 sec. Elapsed</i>	<i>FUEL SOLENOID off STOP SOLENOID on</i>	<i>Shutdown (Start fail)</i>
Running	<i>Stop request</i>	<i>READY TO LOAD off Cooling time timer started</i>	<i>Cooling</i>
	<i>RPM = 0 or any other shutdown condition</i>	<i>READY TO LOAD off<sup>2</sup> FUEL SOLENOID off</i>	<i>Shutdown</i>
	<i>GCB CLOSE/OPEN closed</i>		<i>Loaded</i>
Loaded	<i>GCB CLOSE/OPEN opened</i>		<i>Running</i>
	<i>RPM = 0 or any other shutdown condition</i>	<i>FUEL SOLENOID off STOP SOLENOID on READY TO LOAD off</i>	<i>Shutdown</i>
Cooling	<i>Cooling time elapsed</i>	<i>FUEL SOLENOID off STOP SOLENOID on</i>	<i>Stop</i>
	<i>RPM = 0 or any other shutdown condition</i>	<i>FUEL SOLENOID off STOP SOLENOID on</i>	<i>Shutdown</i>
	<i>Start request</i>	<i>READY TO LOAD on<sup>1</sup></i>	<i>Running</i>
Stop	<i>RPM = 0, Oil pressure not detected, Vgen &lt; 10V</i>		<i>Ready</i>
	<i>60 sec. Elapsed</i>		<i>Stop (Stop fail)</i>

<sup>1</sup> if all generator parameters OK and MinStab Time elapsed, indicates that GCB is possible to close. In AUT mode closes in this moment GCB automatically.

<sup>2</sup> If GCB output used GCB opens automatically

<sup>3</sup> The start-up sequence can be interrupted in any time by coming stop request

<sup>4</sup> Fuel solenoid is switched on with time advance of 1s fixed before starter motor is switched on.

Hint:

Threshold level for D+ input is 80% supply voltage, activation delay is 1s (to override short firings during cranking – for example in cold conditions).

## AUT mode

The controller does not respond to buttons **START**, **STOP**, **MCB ON/OFF**, **GCB ON/OFF**. Engine start/stop request is evaluated from Mains failure/return.

### AMF sequence (simplified)

State	Condition of the transition	Action	Next state
Mains operation	Mains failed <sup>1</sup> or MCB feedback dropout <i>MCB opening</i> = MAINSFAIL	MCB CLOSE/OPEN off <i>EmergStart del</i> timer started	Mains failure
	Mains failed <sup>1</sup> or MCB feedback dropout <i>MCB opening</i> = GEN START	<i>EmergStart del</i> timer started	Mains failure
Mains failure	Mains voltage and frequency OK <i>MCB opening</i> = MAINSFAIL	After elapsing <i>MCB close del</i> MCB CLOSE/OPEN on	Mains operation
	Mains voltage and frequency OK <i>MCB opening</i> = GEN START	None	Mains operation
	<i>EmergStart del</i> elapsed <i>MCB opening</i> = MAINSFAIL	Engine start sequence performed, then GCB CLOSE/OPEN on <sup>2</sup>	Island operation
	<i>EmergStart del</i> elapsed <i>MCB opening</i> = GEN START	Engine start sequence performed, then MCB CLOSE/OPEN off, time delay <i>FwRet break</i> performed and GCB CLOSE/OPEN on <sup>2</sup>	Island operation
Island operation	Mains voltage and frequency OK	<i>Mains ret del</i> timer started	Mains return
Mains return	Mains failed		Island operation
	<i>Mains ret del</i> elapsed	GCB CLOSE/OPEN off, then after <i>Return break</i> MCB CLOSE/OPEN on and then engine stop sequence performed <sup>3</sup>	Mains operation

<sup>1</sup> **Mains failed** means mains over/under -voltage, over/under -frequency, voltage assymetry (preset delay must elapse)

<sup>2</sup> If during start-up sequence mains returns, then MCB is reclosed with delay *MCB close del* (if opened, depending on *MCB opening* setpoint) and start-up sequence is interrupted.

<sup>3</sup> If mains fails during stop procedure (cooling) again, stop sequence is interrupted, MCB opened and GCB reclosed with delay *Return break*.

See also chapter **Circuit breakers timing**.

## TEST mode

The setpoint *Ret from test* influences the behavior of TEST mode.

**Caution:** The genset starts automatically and is always running in TEST mode!

### The setpoint *Ret from test* = MANUAL

While TEST mode is selected, gen-set starts and is running unloaded.  
To load the gen-set

- a) Power cut comes or
- b) **MCB ON/OFF** is pressed

When power cut: MCB is opened, after *Return break* elapses, GCB is closed.

When the mains recovers gen-set stays supplying island load. To transfer the load back to the healthy mains, switch the controller to AUT mode.

*Hint:*

The controller does not respond to **GCB ON/OFF** , **STOP**, **START**

The load is automatically transferred back to the mains when any genset shut down protection activates.

## Test on load

When binary input TestOnLoad is closed, the controller automatically (if TEST mode selected) transfers load from the mains to the genset. Setpoint AutoMainsFail: Ret from test must be set to MANUAL.

## The setpoint *Ret from test* = AUTO

While TEST mode is selected, gen-set is running unloaded.

When power cut comes the controller opens MCB.

After *Return break* elapses, GCB is closed.

When the mains recovers:

- a) After *MainsReturn del* the controller opens the GCB
- b) After *Return break* delay MCB is closed.
- c) The engine stays running

To stop the gen-set select other mode than TEST

*Hint:*

The controller does not respond to **GCB ON/OFF** , **MCB ON/OFF** , **STOP**, **START**

## Circuit breakers timing

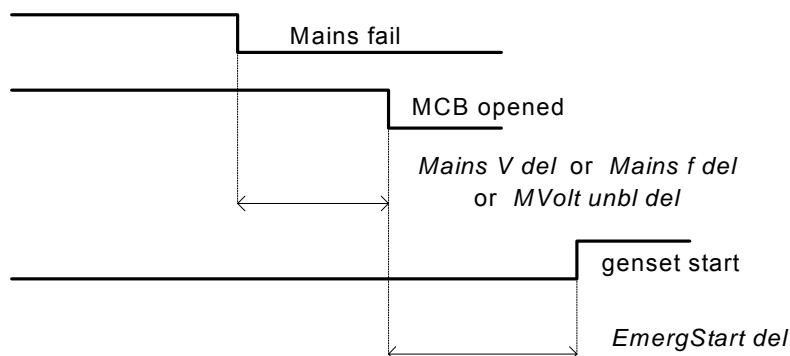
### Relation between Mains fail and MCB and start of genset

*MCB open* = MAINSFAIL:

Mains fail is detected as Mains <V, Mains >V, MVolt unbl, Mains <f, Mains >f. After detection MCB is opened.

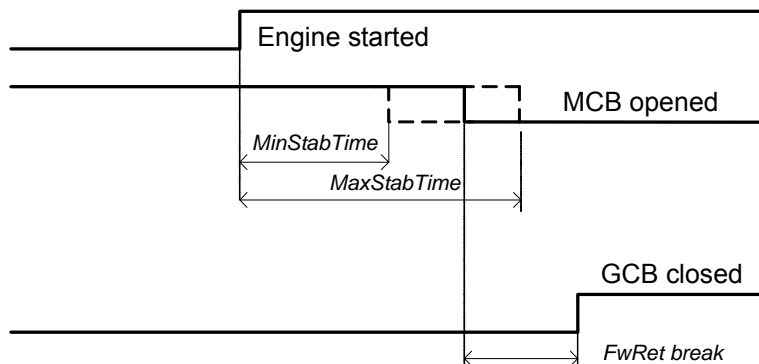
*Hint:*

When MCB feedback drop-out and measured mains electrical limits (voltage, frequency) are still in limits, the controller switches MCB ON again.



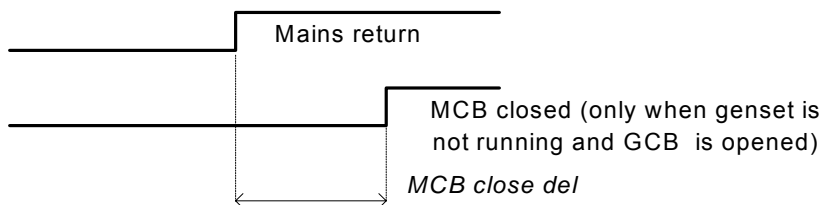
MCB open = GEN START:

The MCB is not opened till the engine starts and gets ready to take the load.



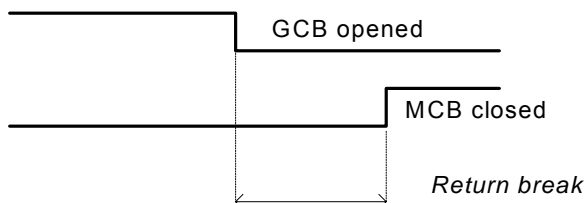
### Relation between Mains return and MCB

OFF mode, GCB and MCB are opened



### Relation between GCB and MCB

Conditions: AUT mode, Mains =off, MCB = opened, GCB = closed, genset loaded.  
Mains returns: GCB opens (according 3., *Mains ret del*), MCB closes (*Return break*)



### Relation between GCB and MCB (Test mode)

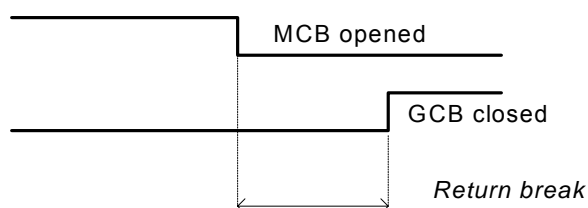
**Situation 1:** Mains =OK, MCB = closed, GCB = opened, RPM=0.

Change mode to TEST: genset starts, GCB = opened.

Mains cut: MCB opens (according 1.) , GCB closes (*Return break*)

**Situation 2:** *Ret from test*=MANUAL, Mains =OK, MCB is closed, genset is running.

Press MCB on/off -> MCB opens, GCB closes (*Return break*), genset is running loaded.



# Alarm management

Following alarms are available:

- Sensor fail
- Warning
- Shut down
- Mains failure

## ***Sensor fail (FLS)***

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Sensor fail is detected when measured value is 6% out of selected sensor characteristic. Sensor fail is indicated by ##### symbol instead measured value.

## ***Warning (WRN)***

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When warning comes up, only alarm outputs and common warning output are closed.

### **Possible warnings:**

See [List of possible events](#)

## ***Shut down (SD)***

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When the shut-down alarm comes up, IntelliLite opens outputs GCB CLOSE/OPEN, FUEL SOLENOID, STARTER and PRESTART to stop the engine immediately. Alarm outputs and common shutdown output are closed. Active or not reset protection disables start.

### **Possible shut-down alarms:**

See [List of possible events](#)

## ***Mains failure (MF)***

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Mains failure detection depends on **Auto mains failure** setpoints (levels and delays) adjusting. When the mains failure comes up, mains circuit breaker is opened.

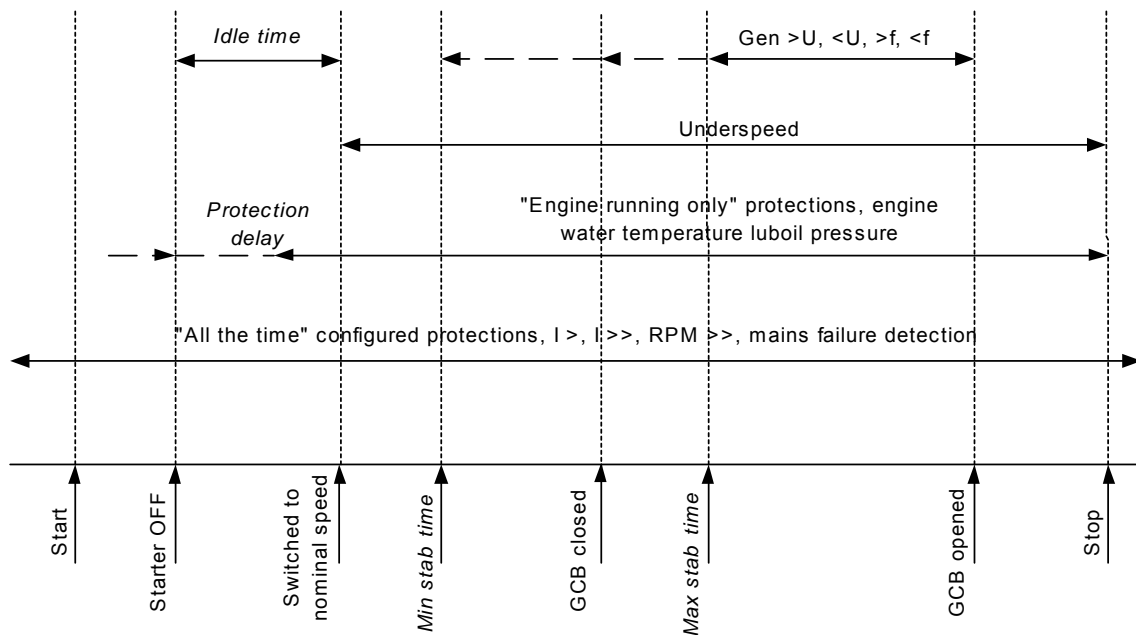
### **Possible mains failure reasons:**

See [List of possible events](#)

#### *Hint:*

Mains failure is not written to alarm list!

## Alarm time chart



## Voltage phase sequence detection

InteliLite controller detects phase sequence on both generator and mains/bus voltage terminals. This protections are important after controller installation to avoid wrong voltage phases phase connection. Following alarms can be detected:

### Wrong phase sequence

There is fix defined phase sequence in InteliLite controller L1, L2, L3. When the phases are connected in different order (e.g. L1,L3,L2 or L2,L1,L3) following alarms are detected:

- G ph opposed = wrong generator phase sequence
- M ph opposed = wrong mains phase sequence
- B ph opposed = wrong bus phase sequence

### Inverted phase polarity

inverted phase polarity can be detected due to wrong connection of separation transformers between controller and generator / mains / bus voltage. Phase sequence is OK but some phase(s) is connected in opposite way (180° shift).

Following alarms can be detected:

- GEN L1 neg = generator phase L1 is inverted
- GEN L2 neg = generator phase L2 is inverted
- GEN L3 neg = generator phase L3 is inverted
- M L1 neg = mains phase L1 is inverted
- M L2 neg = mains phase L2 is inverted
- M L3 neg = mains phase L3 is inverted

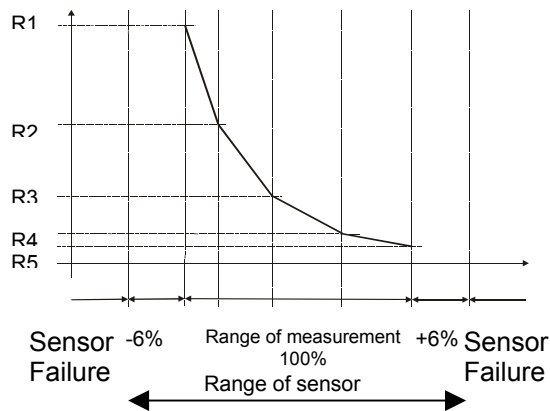
### Wrong phase sequence and inverted polarity

It is combination of both previous alarms

- G ph+L1 neg = wrong generator phase sequence and phase L1 is inverted
- G ph+L2 neg = wrong generator phase sequence and phase L2 is inverted
- G ph+L3 neg = wrong generator phase sequence and phase L3 is inverted
- M ph+L1 neg = wrong mains phase sequence and phase L1 is inverted
- M ph+L2 neg = wrong mains phase sequence and phase L2 is inverted
- M ph+L3 neg = wrong mains phase sequence and phase L3 is inverted

## Sensor fail detection

Sensor fail FIs is detected when measured value is 6,2 percent out of range. Controller screen displays in this case string ##### instead measured value.

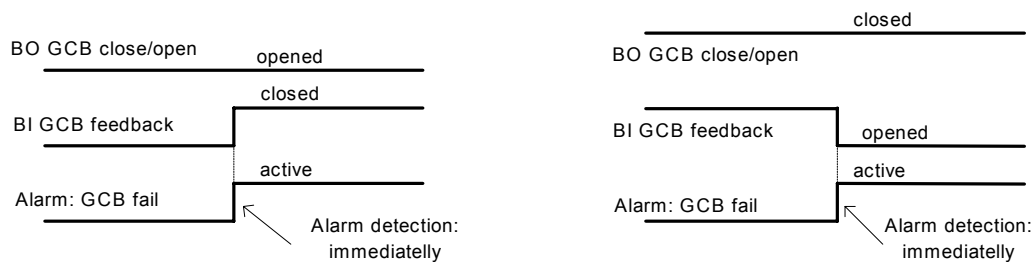


## GCB, MCB fail detection

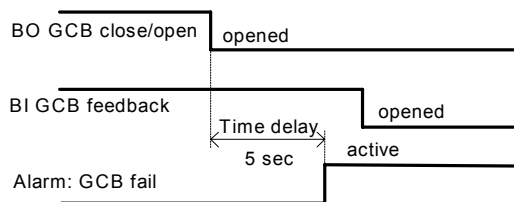
MCB or GCB fail detection is based on binary output CB close/open comparing with binary input CB feedback.

There are three different time delays for CB fail detection – see following diagrams.

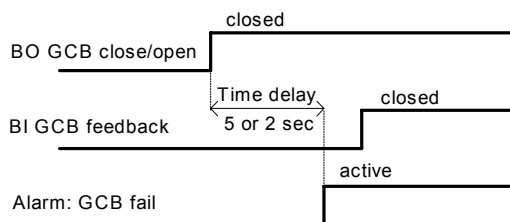
When is BO GCB close/open (MCB close/open) in steady state and GCB feedback (MCB feedback) is changed the GCB fail is detected immediatelly (no delay).



When BO GCB close/open (MCB close/open) opens there is 5 sec delay for GCB fail (MCB fail) detection.



When BO GCB close/open (MCB close/open) closes, there is 5sec delay for GCB fail (MCB fail) detection:



# Gen-set operation states

## Engine state machine

Init	Autotest during controller power on
Not ready	Genset is not ready to start
Prestart	Prestart sequence in process, Prestart output is closed
Cranking	Engine is cranking
Pause	Pause between start attempts
Starting	Starting speed is reached and the <i>Idle timer</i> is running
Running	Genset is running at nominal speed
Loaded	Genset is running at nominal speed and GCB OPEN/CLOSE is closed
Stop	Stop
Shutdown	Shut-down alarm activated
Ready	Genset is ready to run
Cooling	Genset is cooling before stop (at idle speed)

## Electric state machine

MainsOper	Mains is present
MainsFlt	Mains cut off – immediate state
ValidFlt	Mains cut off – takes EmergStart del
IslOper	Island operation
MainsRet	Mains recover
Brks Off	GCB, MCB opened

## List of possible alarms

Events specification	Protection type	Information on binary output available (See list of <a href="#">Binary outputs</a> )	Description
Oil Press Wrn	WRN	YES	Oil pressure is smaller than <i>Wrn Oil press</i> setpoint.
Oil Press Sd	SD	NO	Oil pressure is smaller than <i>Sd Oil press</i> setpoint.
Water Temp Wrn	WRN	YES	Water temperature is greater than <i>Wrn Water temp</i> setpoint.
Water Temp Sd	SD	NO	Water temperature is greater than <i>Sd Water temp</i> setpoint.
Fuel Level Wrn	WRN	YES	Fuel level is smaller than <i>Wrn Fuel Level</i> setpoint.
Fuel Level Sd	SD	NO	Fuel level is smaller than <i>Sd Fuel Level</i> setpoint.
Analog inp IOM/PTM - Wrn	WRN	YES	Warning alarm configurable on the input of IG-IOM/IGS-PTM.
Analog inp IOM/PTM - Sd	SD	YES	Shutdown alarm configurable on the input of IG-IOM/IGS-PTM.
Binary input	Configurable	YES	Configurable Warning/Shutdown alarms on the inputs of IL-CU.
Battery voltage <, >	WRN	YES	Battery voltage is out of limits given by <i>Batt overvolt</i> and <i>Batt undervolt</i> setpoints.



Events specification	Protection type	Information on binary output available (See list of <a href="#">Binary outputs</a> )	Description
Battery flat	SD	YES	If the controller switches off during starting sequence due to bad battery condition it doesn't try to start again and activates this protection.
Start failed	SD	YES	Gen-set start failed.
ParamFail	NONE	NO	Wrong checksum of parameters. Happends typically after downloading new firmware or changing of the parameter. The controller stays in INIT mode. Check all parameters, write at least one new parameter.
Vgen <, >	SD	YES	The generator voltage is out of limits given by <i>Gen &lt;V</i> and <i>Gen &gt;V</i> setpoints.
Vgen unbl	SD	NO	The generator voltage is unbalanced more than the value of <i>Volt unbal</i> setpoint.
Fgen <,>	SD	YES	The generator frequency is out of limits given by <i>Gen &gt;f</i> and <i>Gen &lt;f</i> setpoints.
Igen unbl	SD	NO	The generator current is unbalanced.
Overload	SD	YES	The load is greater than the value given by <i>Overload</i> setpoint.
Overspeed	SD	YES	The protection comes active if the speed is greater than <i>Overspeed</i> setpoint.
Underspeed	SD	YES	During starting of the engine when the RPM reache the value of <i>Start RPM</i> setpoint the starter is switched off and the speed of the engine can drop under <i>Start RPM</i> again. Than the Underspeed protection comes active.
EmergencyStop	SD	NO	If the input <i>Emergency stop</i> is opened shutdown is immediately activated.
GCB fail	SD	NO	Failure of generator circuit breaker.
MCB fail	MF	NO	Failure of mains circuit breaker.
PickupFault	SD	NO	Failure of magnetic pick-up sensor for speed measurement.
Stop fail	SD	YES	Gen-set stop failed.
WrnServiceTime	WRN	NO	The period for servicing is set by the <i>NextServTime</i> setpoint. The protection comes active if the running hours of the engine reach this value.
ChrgAlternFail	WRN	YES	Failure of alternator for charging the battery.
SprinklActive	WRN	NO	The protection is active if the output <i>Sprinkler</i> is closed.
*Wrn RA15 fail	WRN	NO	Warning alarm in case of lost connection to IGL-RA15 module.
*Sd IOM fail	SD	NO	Shutdown alarm in case of lost connection to IG-IOM/IGS-PTM module.
Wrn ECU Alarm	WRN	NO	<a href="#">ECU alarm list</a> is not empty

# Remote control and data logging

## ***Direct connection to the PC***

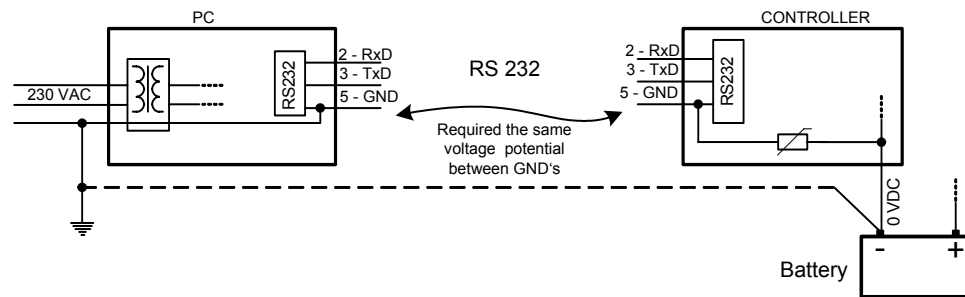
InteliLite can be connected directly with PC via RS232 interface.

- iL AMF25 is equipped built-in RS232 interface
- iL AMF20 needs external RS232 interface AT-LINK-CONV (ordered separately)

Use the standard serial cable to connect PC with InteliLite.

### *Hint:*

Make sure the grounding system on controller and PC – COM port (negative of the PC DC supply) are identical – before the first direct connection. There must not be any voltage between these two points otherwise the internal resistor in controller burns out. The simple solution is to assure, that the PC supply 240/20V is ground free (GND terminal is not connected).



## ***PC software - LiteEdit***

On the PC (for direct or modem connection) has to be installed the ComAp's software package LiteEdit. (based on Windows 95 or newer platform)

LiteEdit enables:

- read the quantities
- adjust all set points
- control the engine
- configure the controller
- select software configuration
- modify alarm inputs and outputs
- modify password, commands protections
- direct or \*modem communication

## ***Modbus protocol***

The selection of the function of iL serial port is done via the setpoint *RS232 mode* in *Basic settings*

- 9600 bps, 8 data bits, 1 stop bit, no parity
- Transfer mode RTU
- Function 3 (Read Multiple Registers)
- Function 6 (Write Single Register)
- Function 16 (Write Multiple Registers)
- The response to an incoming message is sent with minimum 4.096 ms delay after message reception

The complete description of Modbus communication protocol can be found in *Modbus Protocol Reference Guide PI-MBUS-300* and *Open Modbus Specification Release 1.0*. Both documents are available from web site at <http://www.modicon.com/openmbus/>.

Communication object vs. Register

All the data intended for communication has its representation as communication objects in the controller. The communication object is represented by the n-byte array in the controller memory and identified by the unique 16-bit communication object number. The register, according to Modbus communication protocol, represents a two-byte data and in communication functions is referenced by 16-bit register address. Further in the description of communication functions **the communication object number will always be used as a register address** and length of the communication object will be expressed by number of registers. **Just one communication object can be read or written by one communication function.**

Hint:

To obtain communication object numbers it is possible to download the Actual IL controller description on-line from controller or from (ail) archive and use “export data” function from LiteEdit software.

Communication object list (exported from default archive)

**Setpoints:**

Name	Firmware ver.	Application	Date	App. ver.	Ser. num.	Filename		
InteliLite	IL-2.1 R:10.11.2004	AMF25	30.11.2004	2,1	0200FFFF	AMF25-2.1.ail		
Group	Name	Value	Dimension	Password	Com. obj.	Low limit	High limit	Data type
Basic settings	Gen-set name	InteliLite		No	8637			Short string
Basic settings	Nomin power	200	kW	No	8276	1	4000	Unsigned 16
Basic settings	Nomin current	350	A	No	8275	1	5000	Unsigned 16
Basic settings	CT ratio	2000	/5A	No	8274	1	5000	Unsigned 16
Basic settings	PT ratio	1,0	/1	No	9579	0,1	500,0	Unsigned 16
Basic settings	Vm PT ratio	1,0	/1	No	9580	0,1	500,0	Unsigned 16
Basic settings	Nomin voltage	231	V	No	8277	100	22000	Unsigned 16
Basic settings	Nominal freq	50	Hz	No	8278	45	65	Unsigned 16
Basic settings	Gear teeth	120		No	8252	0	500	Unsigned 16
Basic settings	Nominal RPM	1500	RPM	No	8253	100	4000	Unsigned 16
Basic settings	FitResGoToMAN	DISABLED		No	9983			String list
Basic settings	DispBaklightTO	0	min	No	10121	0	60	Unsigned 8
Basic settings	ControllerMode	OFF		No	8315			String list
Basic settings	RS232 mode	STANDARD		Yes	24522			String list
Basic settings	NumberRings AA	3		Yes	24512	1	30	Unsigned 8
Engine params	Starting RPM	25	%	No	8254	5	50	Unsigned 8
Engine params	Starting POil	4,5	Bar	No	9681	-10,0	1000,0	Integer 16
Engine params	Prestart time	2	s	No	8394	0	600	Unsigned 16

Engine params	MaxCrank time	5 s	No	8256	1	60	Unsigned 8
Engine params	CrnkFail pause	8 s	No	8257	5	60	Unsigned 8
Engine params	Crank attempts	3	No	8255	1	10	Unsigned 8
Engine params	Idle time	12 s	No	9097	0	600	Unsigned 16
Engine params	Min stab time	2 s	No	8259	0	300	Unsigned 16
Engine params	Max stab time	10 s	No	8313	0	300	Unsigned 16
Engine params	Stop time	60 s	No	9815	0	600	Unsigned 16
Engine params	Cooling time	30 s	No	8258	0	3600	Unsigned 16
Engine params	Cooling speed	NOMINAL	No	10046			String list
Engine params	Fuel solenoid	DIESEL	No	9100			String list
Engine params	D+ function	DISABLED	No	9683			String list
Engine params	ECU FreqSelect	PRIMARY	No	10266			String list
Engine protect	Eng prot del	5 s	No	8262	0	300	Unsigned 16
Engine protect	Horn timeout	10 s	No	8264	0	600	Unsigned 16
Engine protect	Overspeed	115 %	No	8263	50	150	Unsigned 16
Engine protect	AnInp1 level1	2,0 Bar	No	8369	1,0	1000,0	Integer 16
Engine protect	AnInp1 level2	1,0 Bar	No	8370	-10,0	2,0	Integer 16
Engine protect	AnInp1 del	3 s	No	8365	0	180	Unsigned 16
Engine protect	AnInp2 level1	80 °C	No	8375	-100	90	Integer 16
Engine protect	AnInp2 level2	90 °C	No	8376	80	10000	Integer 16
Engine protect	AnInp2 del	5 s	No	8371	0	180	Unsigned 16
Engine protect	AnInp3 level1	20 %	No	8381	10	10000	Integer 16
Engine protect	AnInp3 level2	10 %	No	8382	-100	20	Integer 16
Engine protect	AnInp3 del	10 s	No	8377	0	180	Unsigned 16
Engine protect	Batt overvolt	36,0 V	No	9587	18,0	40,0	Integer 16
Engine protect	Batt undervolt	18,0 V	No	8387	8,0	36,0	Integer 16
Engine protect	Batt volt del	5 s	No	8383	0	600	Unsigned 16
Engine protect	NextServTime	65534 h	No	9648	0	65535	Unsigned 16
Gener protect	Overload	120 %	No	8280	0	200	Unsigned 16
Gener protect	Overload del	5,0 s	No	8281	0,0	60,0	Unsigned 16
Gener protect	Ishort	250 %	No	8282	100	500	Unsigned 16
Gener protect	2Inom del	4,0 s	No	8283	0,1	20,0	Unsigned 16
Gener protect	Curr unbal	50 %	No	8284	1	200	Unsigned 16

Gener protect	Curr unbal del	5,0	s	No	8285	0,0	60,0	Unsigned 16
Gener protect	Gen >V Sd	110	%	No	8291	70	200	Unsigned 16
Gener protect	Gen <V Sd	70	%	No	8293	0	110	Unsigned 16
Gener protect	Gen V del	3,0	s	No	8292	0,0	60,0	Unsigned 16
Gener protect	Volt unbal	10	%	No	8288	1	100	Unsigned 16
Gener protect	Volt unbal del	3,0	s	No	8289	0,0	60,0	Unsigned 16
Gener protect	Gen >f	110,0	%	No	8296	85,0	200,0	Unsigned 16
Gener protect	Gen <f	85,0	%	No	8298	0,0	110,0	Unsigned 16
Gener protect	Gen f del	3,0	s	No	8297	0,0	60,0	Unsigned 16
AutoMains Fail	Ret fromIsland	AUTO		No	9590			String list
AutoMains Fail	EmergStart del	5	s	No	8301	0	600	Unsigned 16
AutoMains Fail	Mains ret del	20	s	No	8302	1	3600	Unsigned 16
AutoMains Fail	FwRet break	1,0	s	No	8303	0,0	600,0	Unsigned 16
AutoMains Fail	MCB close del	1,0	s	No	8389	0,0	60,0	Unsigned 16
AutoMains Fail	Mains >V	110	%	No	8305	60	200	Unsigned 16
AutoMains Fail	Mains <V	60	%	No	8307	0	110	Unsigned 16
AutoMains Fail	Mains V del	2,0	s	No	8306	0,0	60,0	Unsigned 16
AutoMains Fail	MVolt unbal	10	%	No	8446	1	150	Unsigned 16
AutoMains Fail	MVoltUnbal del	2,0	s	No	8447	0,0	60,0	Unsigned 16
AutoMains Fail	Mains >f	102,0	%	No	8310	98,0	200,0	Unsigned 16
AutoMains Fail	Mains <f	98,0	%	No	8312	0,0	102,0	Unsigned 16
AutoMains Fail	Mains f del	0,5	s	No	8311	0,0	60,0	Unsigned 16
AutoMains Fail	MCB Logic	CLOSE-OFF		No	8444			String list
AutoMains Fail	Ret from test	MANUAL		No	8618			String list
AutoMains Fail	MCB opened	GENRUN		No	9850			String list
Sensors spec	Calibr AI 1	0,0	Bar	No	8431	-100,0	100,0	Integer 16
Sensors spec	Calibr AI 2	0	°C	No	8407	-1000	1000	Integer 16
Sensors spec	Calibr AI 3	0	%	No	8467	-1000	1000	Integer 16
IOM/PTM module	AnOut-kW/20mA	200		No	9019	1	32000	Integer 16
IOM/PTM module	AnInIOM1 lev1	0	U4	No	8762	-100	10000	Integer 16
IOM/PTM	AnInIOM1 lev2	0	U4	No	8766	-100	10000	Integer 16

module								
IOM/PTM module	AnInIOM1 del	0	s	No	8770	0	180	Unsigned 16
IOM/PTM module	AnInIOM2 lev1	0	U5	No	8763	-100	10000	Integer 16
IOM/PTM module	AnInIOM2 lev2	0	U5	No	8767	-100	10000	Integer 16
IOM/PTM module	AnInIOM2 del	0	s	No	8771	0	180	Unsigned 16
IOM/PTM module	AnInIOM3 lev1	0	U6	No	8764	-100	10000	Integer 16
IOM/PTM module	AnInIOM3 lev2	0	U6	No	8768	-100	10000	Integer 16
IOM/PTM module	AnInIOM3 del	0	s	No	8772	0	180	Unsigned 16
IOM/PTM module	AnInIOM4 lev1	0	U7	No	8765	-100	10000	Integer 16
IOM/PTM module	AnInIOM4 lev2	0	U7	No	8769	-100	10000	Integer 16
IOM/PTM module	AnInIOM4 del	0	s	No	8773	0	180	Unsigned 16
IOM/PTM module	CalibrAlnIOM 1	0	U4	No	8793	-1000	1000	Integer 16
IOM/PTM module	CalibrAlnIOM 2	0	U5	No	8794	-1000	1000	Integer 16
IOM/PTM module	CalibrAlnIOM 3	0	U6	No	8795	-1000	1000	Integer 16
IOM/PTM module	CalibrAlnIOM 4	0	U7	No	8796	-1000	1000	Integer 16

**Values:**

Name	Firmware ver.	Application	Date	App. ver.	Ser. num.
InteliLite	IL-2.1 R:10.11.2004	AMF25	30.11.2004	2,1	0200FFFF
Group	Name	Value	Dimension	Com. obj.	Data type
Engine params	Engine Speed	0	RPM	8209	Unsigned 16
Engine params	ECU State	000		10034	Binary 8
Analog	Batt volt	27,0	V	8213	Integer 16
Analog	Oil press	3,5	Bar	8227	Integer 16
Analog	Water temp	15	°C	8228	Integer 16
Analog	Fuel level	#####	%	8229	Integer 16
Generator	Act power	0	kW	8202	Integer 16
Generator	Act pwr L1	0	kW	8524	Integer 16
Generator	Act pwr L2	0	kW	8525	Integer 16
Generator	Act pwr L3	0	kW	8526	Integer 16
Generator	React pwr kVAr	0		8203	Integer 16
Generator	React pwr L1	0		8527	Integer 16
Generator	React pwr L2	0		8528	Integer 16

Generator	React pwr L3	0		8529	Integer 16
Generator	Appar pwr	0	kVA	8565	Integer 16
Generator	Appar pwr L1	0	kVA	8530	Integer 16
Generator	Appar pwr L2	0	kVA	8531	Integer 16
Generator	Appar pwr L3	0	kVA	8532	Integer 16
Generator	Pwr factor	0,00		8204	Integer 8
Generator	Pwr factor L1	0,00		8533	Integer 8
Generator	Pwr factor L2	0,00		8534	Integer 8
Generator	Pwr factor L3	0,00		8535	Integer 8
Generator	Load char			8395	Char
Generator	Load char 1			8626	Char
Generator	Load char 2			8627	Char
Generator	Load char 3			8628	Char
Generator	Gen freq	0,0	Hz	8210	Unsigned 16
Generator	Gen V L1-N	0	V	8192	Unsigned 16
Generator	Gen V L2-N	0	V	8193	Unsigned 16
Generator	Gen V L3-N	0	V	8194	Unsigned 16
Generator	Gen V L1-L2	0	V	9628	Unsigned 16
Generator	Gen V L2-L3	0	V	9629	Unsigned 16
Generator	Gen V L3-L1	0	V	9630	Unsigned 16
Generator	Gen curr L1	0	A	8198	Unsigned 16
Generator	Gen curr L2	0	A	8199	Unsigned 16
Generator	Gen curr L3	0	A	8200	Unsigned 16
Mains	Mains freq	0,0	Hz	8211	Unsigned 16
Mains	Mns V L1-N	0	V	8195	Unsigned 16
Mains	Mns V L2-N	0	V	8196	Unsigned 16
Mains	Mns V L3-N	0	V	8197	Unsigned 16
Mains	Mns V L1-L2	0	V	9631	Unsigned 16
Mains	Mns V L2-L3	0	V	9632	Unsigned 16
Mains	Mns V L3-L1	0	V	9633	Unsigned 16
Binary I/O	BInpIL	0110000		8235	Binary 16
Binary I/O	BOutIL	0001001		8239	Binary 16
Statistics	kWhours	0		8205	Integer 32
Statistics	kVAhours	0		8539	Integer 32
Statistics	NumStarts	0		8207	Unsigned 16
Statistics	RunHours	0	h	8206	Integer 32
Statistics	NextServTime	65534	h	9648	Unsigned 16

IL info	TimerText	Ready		8954	Unsigned 16
IL info	TimerValue	0	s	8955	Unsigned 16
IL info	SW version	2,1		8393	Unsigned 8
IL info	SW branch	1		8707	Unsigned 8
IL info	Application	6		8480	Unsigned 8
IL info	ControllerMode	0		9651	Unsigned 8
IL info	DiagData	0		10050	Unsigned 32
IL info	PasswordDecode	2481875985		9090	Unsigned 32
RA15 module	BOutRA15	0000100000000000		9849	Binary 16
IOM/PTM module	AnInIOM 1	0	U4	8978	Integer 16
IOM/PTM module	AnInIOM 2	0	U5	8759	Integer 16
IOM/PTM module	AnInIOM 3	0	U6	8760	Integer 16
IOM/PTM module	AnInIOM 4	0	U7	8761	Integer 16
IOM/PTM module	BInIOM	00000000		8602	Binary 16
IOM/PTM module	BOutIOM	00000000		8604	Binary 16
ECU	Fuel rate	#####	L/h	9860	Unsigned 16
ECU	Water temp	#####	°C	9855	Integer 16
ECU	ManifoldTemp	#####	°C	9878	Integer 16
ECU	Oil press	#####	Bar	9929	Unsigned 16
ECU	Boost pressure	0,0	Bar	9877	Unsigned 8
ECU	PercLoadAtCS	0	%	9925	Unsigned 8

<sup>1</sup> In case of software malfunction DiagData shows the value that enables to locate possible bug in software. Include this number when reporting a software problem.



# Remote communication

## ***\*Recommended ISDN modem***

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- Askey TAS-200E
- ASUScom TA-220ST

## ***\*Recommended GSM modem***

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- Wavecom M1200 (previously WMOD2; baud rate to 9600 bps)
- Siemens M20
- Siemens TC35
- FALCOM A2D

## **GSM Modem setup**

Prior to start work with GSM modem run following program for GSM proper setup.

Program writes all the necessary AT commands to configure the GSM modem properly for use with IL-CU.

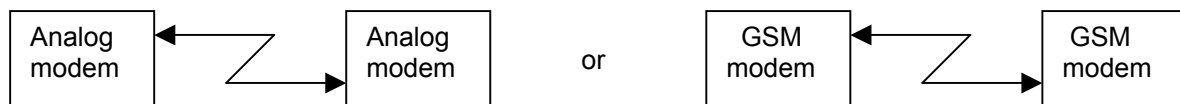
This program runs independent on LiteEdit:

- Start MS Windows-Start-Program files - LiteEdit -Gm\_setup.exe.
- Select COM port
- Select iG-CU (=IS-CU) or iG-MU unit
- Press Setup button
- Follow commands in GSM Modem Setup window

Typical real baud rate for GSM data communication is 80 to 90 Bps.

### *Hint:*

It is strongly recommended to use the same type of modem on the both sides (IL and PC) of connection.



## ***\*Mobile SIM card setting***

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Adjust SIM card in GSM modem following way:  
 enable data connection (when required)  
 no PIN code

# Technical data

## Power supply

Voltage supply	8-36V DC
Consumption	0,5-0,1A depend on supply voltage
Allowed supply voltage drop-out:	50ms from min. 10V, return to min. 8V (valid for IntelliLite of hardware version 3.2 and higher)
Battery voltage measurement tolerance	2 % at 24V

### Hint:

For the supply voltage less than 7V the backlight of the display is switched off.

## Operating conditions

Operating temperature IL-CU	-20..+70°C
Operating temperature IL-CU-LT <sup>#</sup>	-30..+70°C
Storage temperature	-30..+80°C
Protection front panel	IP65
Humidity	95% without condensation
Standard conformity	
Low Voltage Directive	EN 61010-1:95 +A1:97
Electromagnetic Compatibility	EN 50081-1:94, EN 50081-2:96 EN 50082-1:99, EN 50082-2:97
Vibration	5 - 25 Hz, ±1,6mm 25 - 100 Hz, a = 4 g
Shocks	a = 200 m/s <sup>2</sup>

## #Low Temperature modification

LCD display limits controller operating temperature range to -20 °C - + 70 °C even if the other electronic components work in wider temperature range.

Internal preheating foil is mounted in IntelliLite LT to extend display operational temperature range.

Preheating starts at temperature below 5 °C and preheating power depends on temperature and power supply voltage.

## Technical data

	IL-CU Standard	Order code:IL-CU-LT
Operating temperature	-20 °C..+70°C	-30 °C..+70°C
Storage temperature	-30 °C..+80°C	-30 °C..+80°C

Preheating foil increases controller current consumption

Controller consumption at	No preheating	Preheating at ambient temperature		
		0 °C	-15 °C	-30 °C
12VDC	360 mA	+50 mA	+180 mA	+300 mA
24VDC	230 mA	+25 mA	+85 mA	+150 mA
36VDC	100 mA	+20 mA	+65 mA	+100 mA

IntelliLite LT works immediately after switch on at -30 °C and display becomes visible after a few minutes.

Short-term voltage drops (e.g. during the engine cranking) do not affect the operation at all.

## ***Dimensions and weight***

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Dimensions	180x120x55mm
Weight	800g

## ***Mains and generator***

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Nominal frequency	50-60Hz
Frequency measurement tolerance	0,1Hz

## **Current inputs**

Nominal input current (from CT)	5 A
Load (CT output impedance)	< 0,1 $\Omega$
CT input burden	< 0,2 VA per phase (In=5A)
Max. measured current from CT	10 A
Current measurement tolerance	2% from the Nominal current
Max. peak current from CT	150 A / 1s
Max. continuous current	12 A

## **Voltage inputs**

Measuring voltage	231VAC phase to neutral 400VAC phase to phase
Maximal measured voltage	290VAC phase to neutral
Input resistance	0,6 M $\Omega$ phase to phase 0,3 M $\Omega$ phase to neutral
Voltage measurement tolerance	2 % from the Nominal voltage
Overvoltage class	III (EN61010)

## ***Binary inputs and outputs***

### **Binary inputs**

Number of inputs	7
Input resistance	4,7 k $\Omega$
Input range	0-36 VDC
Switching voltage level for close contact indication	0-2 V
Max voltage level for open contact indication	8-36 V

### **Contact relay outputs**

Number of outputs	2
Electric life cycle	min 100.000 switching cycles
Maximum current	12 A DC resistive load 4 A DC inductive load
Maximum switching voltage	36 VDC
Minimum load	24 V / 0,1 A
Insulation voltage	500 Veff

### **Binary open collector outputs**

Number of outputs	5
Maximum current	0,5 A
Maximum switching voltage	36 VDC

## ***Analog inputs***

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Not electrically separated	
Resolution	10 bits
Sensor resistance range	0 $\Omega$ -2,4 k $\Omega$
Resistance measurement tolerance	4 % $\pm$ 2 $\Omega$ out of measured value

## ***Speed pick-up input***

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Type of sensor	magnetic pick-up (connection by shielded cable is recommended)
Minimum input voltage	2 Vpk-pk (from 4 Hz to 4 kHz)
Maximum input voltage	50 Veff
Minimum measured frequency	4 Hz
Maximum measured frequency	10 kHz (min. input voltage 6Vpk-pk)
Frequency measurement tolerance	1,5 %

## ***\*RS232 interface***

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Maximal distance	10m
Speed	19.2kBd (STD) 9.6kBd (MODBUS)

Recommend external converter:

ADVANTECH – ADAM 4520: RS232 to RS422/485 converter, DIN rail, automatic RS485 bus supervision, no external data flow control signals, galvanic isolated.

Recommended internal converter:

ADVANTECH – PCL-745B or PCL745S : Dual port RS422/485 Interface card, automatic RS485 bus supervision, no external data flow control signals, galvanic isolated.

## ***\*CAN bus interface***

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Galvanically separated	
Maximal CAN bus length	200m
Speed	250kBd
Nominal impedance	120Ω
Cable type	twisted pair (shielded)

Following dynamic cable parameters are important especially for maximal 200 meters CAN bus length and 32 iS-COM units connected:

Nominal Velocity of Propagation	min. 75% (max. 4,4 ns/m)
Wire crosscut	min.0,25 mm <sup>2</sup>
Maximal attenuation (at 1 MHz)	2 dB / 100m

Recommended Industrial Automation & Process Control Cables:

BELDEN (see <http://www.belden.com>):

- 3082A DeviceBus for Allen-Bradley DeviceNet
- 3083A DeviceBus for Allen-Bradley DeviceNet
- 3086A DeviceBus for Honeywell SDS
- 3087A DeviceBus for Honeywell SDS
- 3084A DeviceBus for Allen-Bradley DeviceNet
- 3085A DeviceBus for Allen-Bradley DeviceNet
- 3105A Paired EIA Industrial RS485 cable

LAPP CABLE (see <http://www.lappcable.com>)

- Unitronic BUS DeviceNet Trunk Cable
- Unitronic BUS DeviceNet Drop Cable
- Unitronic BUS CAN
- Unitronic-FD BUS P CAN UL/CSA