ComAp
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# IGS-NT

SW version 3.1.0

## Installation guide for

**IG-NT(C), IG-NT(C)-BB, IS-NT, IS-NTC-BB, IM-NT, IM-NT(C)-BB,**



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# Installation Guide

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# 1. Document information

**Inteli New Technology – Installation guide**
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DOCUMENT HISTORY

| REVISION NUMBER | RELATED SW. VERSION | DATE |
|---|---|---|
| 1 | 3.1.0 | 31.8.2014 |
| 2 | 3.1.0 | 13.8.2018 |
| 3 | 3.1.0 | 8.8.2019 |
| 4 | 3.1.0 | 18.9.2019 |
| | | |
| | | |

## 1.1. Clarification of notation

***HINT***
This type of paragraph points out details to help user installation/configuration.

**NOTE:**
This type of paragraph calls readers' attention to a notice or related theme.

**CAUTION!**
This type of paragraph highlights a procedure, adjustment, etc. which may cause damage or improper functioning of the equipment if not carried out correctly and may not be clear at first sight.

**WARNING!**
This type of paragraph indicates things, procedures, adjustments, etc. which demand a high level of attention, otherwise personal injury or death may occur.

| TYPE | TEXT NOTATION |
|---|---|
| Setpoints in the text | **SetpointGroup:***SetpointName* |
| Values in the text | **ValueGroup:***ValueName* |
| Logical Binary/Analog Input/Output functions in the text | LOGICALFUNCTION |
| Setpoint setting option | OPTION |

## 1.2. Symbols

Symbols used in this manual:


Grounding point symbol


AC voltage symbol


DC voltage symbol

## 1.3. Conformity Declaration

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

## 1.4. Revision Notes

The revised version contains updated information about external component from Weidmueller on page 17.

# 2. Available related documentation

| PDF files | Description |
|---|---|
| IGS-NT-SPTM-3.1.0 Reference Guide.pdf | General description of SPtM applications for InteliGen NT and InteliSys NT. Contains description of engine and generator control, control of power in parallel to mains operation, list of all Setpoints, Values, Logical Binary Inputs and Logical Binary Output. |
| IGS-NT-SPI-3.1.0 Reference Guide.pdf | General description of SPI applications for InteliGen NT and InteliSys NT. Contains description of engine and generator control, control of power in parallel to mains operation, list of all Setpoints, Values, Logical Binary Inputs and Logical Binary Output. |
| IGS-NT-MINT-3.1.0 Reference Guide.pdf | General description of MINT applications for InteliGen NT and InteliSys NT. Contains description of engine and generator control, powermanagement, list of all Setpoints, Values, Logical Binary Inputs and Logical Binary Output. |
| IGS-NT-Combi-3.1.0 Reference Guide.pdf | General description of Combi applications for InteliGen NT and InteliSys NT. Contains description of engine, and generator control in SPTM, SPI and MINT mode, powermanagement, list of all Setpoints, Values, Logical Binary Inputs and Logical Binary Output. |
| IGS-NT-COX-3.1.0 Reference Guide.pdf | General description of COX applications for InteliGen NT and InteliSys NT. Contains description of engine and generator control, powermanagement, list of all Setpoints, Values, Logical Binary Inputs and Logical Binary Output. |
| IGS-NT Application Guide 05-2013.pdf | Applications of InteliGen NT, InteliSys NT and InteliMains NT, examples of connection, description of PLC functions, Virtual and Shared peripheries. |
| IGS-NT Operator Guide 01-2014.pdf | Operator Guide for all hardware variation of InteliGen NT and InteliSys NT, InteliVision 5 and InteliVision 8. |

| | |
|---|---|
| IGS-NT Installation Guide 08-2014.pdf | Thorough description of installation and technical information about InteliGen NT, InteliSys NT and InteliMains NT and related accessories. |
| IGS-NT Communication Guide 05-2013.pdf | Thorough description of connectivity and communication for InteliGen NT, InteliSys NT and InteliMains NT and related accessories. |
| IGS-NT Troubleshooting Guide 08-2014.pdf | How to solve most common troubles with InteliGen NT and InteliSys NT controllers. Including the list of alarm massages. |
| IGS-NT & ID-DCU Accessory Modules 07-2014.pdf | Thorough description of accessory modules for IGS-NT family, technical data, information about installation of the modules, how to connect them to controller and set them properly. |

# 3. General Guidelines

## 3.1. Safety Instructions

### IMPORTANT SAFETY INSTRUCTIONS

**SAVE THESE INSTRUCTION -** This manual contains important instructions for IGS-NT controllers family that shall be followed during installation and maintenance of the Inteli NT genset controllers.

It is intended for use by Gen-set control panel builders and for everybody who is concerned with installation, operation and maintenance of the gen-set.

### WARNING

#### Remote control

The controller can be remotely controlled. In the event that maintenance needs to be done to the gen-set, check the following to ensure that the engine cannot be started.

To be sure:

- Disconnect remote control via RS232 or another communication line
- Disconnect input REMOTE START/STOP

or

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

Be aware the unqualified manipulation can disconnect the object from the power supply source.

**CAUTION!**
The controller contains a large number of configurable setpoints, because of this it is impossible to describe all applications. Controller functions are subject to change from SW version to SW version. This manual only describes the product and is not guaranteed to be set for your application on arrival.

**!!! CAUTION !!!**

#### Dangerous voltage

The terminals for voltage and current measurement should never be touched.

Properly connect the grounding terminals.

Do not disconnect the Controller CT terminals for any reason.

#### Adjust set points

All parameters are djusted 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 !!!**

**WARNING – VERY IMPORTANT !!!**

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

Every time you want to disconnect following controller terminals:

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

**Be aware that the MCB can be switched off and gen-set can start !!!**

Switch controller to MAN mode and disconnect the Binary outputs Starter and Fuel or press EMERGENCY STOP button to avoid unexpected automatic start of gen-set and GCB closing during any work or maintenance on the gen-set or switchboard.

# 3.2. Required and Optional Modules

## 3.2.1. Inteli New Technology Controllers

| Controller | Description | Standard / Optional |
|---|---|---|
| IG-NT<br>IG-NTC<br>IM-NT | Controller Central Units with internal display | Standard |
| IG-NT-BB<br>IG-NTC-BB<br>IS-NT-BB<br>IS-NTC-BB<br>IM-NT-BB<br>IM-NTC-BB | Controller Central Unit without internal display | Standard |

## 3.2.2. Accessories

| Accessories and modules | Description | Standard / Optional |
|---|---|---|
| IG-Display | Additional display for IG-NT/NTC/EE/EEC, IM-NT | Optional |
| IS-Display | Additional display for IS-NT-BB | Optional |
| InteliVision 5 | Additional colour display for IS-NT-BB, IG-NT/NTC/EE/EEC, IM-NT, IS-NTC-BB, IG-NT-BB, IG-NTC-BB | Optional |
| InteliVision 8 | Additional colour display for for IS-NT-BB, IG-NT/NTC/EE/EEC, IM-NT, IS-NTC-BB, IG-NT-BB, IG-NTC-BB | Optional |

| | | |
|---|---|---|
| IG-AVRi | Controller AVR interface | **Optional** |
| IG-AVRi-TRANS/LV<br>IG-AVRi-TRANS/100 | Voltage transformer for supplying AVRi module | **Optional** |
| AT LINK-CABLE 1,8m | RS232 (InteliMonitor, GenConfig) communication cable<br>(It is not a part of controller delivery.) | **Optional** |
| IS-AIN8 | External analog inputs unit | **Optional** |
| IS-BIN16/8 | External binary I/O unit | **Optional** |
| I-LB+ | Replaces IG-MU and I-LB (RS232/RS485 communication speed increased to 57600 bps); communication with multiple controllers to a local PC. | **Optional** |
| IG-IB | Internet bridge | **Optional** |
| I-CB/CAT-Gas<br>I-CB/CAT-Diesel<br>I-CB/MTU<br>I-CB/MTU-SIAM4000<br>I-CB/DeutzTEMe | Inteli - Communication Bridge:<br>Interface unit for some types of engines with ECU (without J1939) | **Optional** |
| IGL-RA15 | Remote annunciator | **Optional** |
| IGS-PTM | External analog, binary I/O unit | **Optional** |
| I-AOUT8 | 8 analog outputs unit | **Optional** |
| IG-MTU | Voltage transformer unit to separate mains and generator voltage measurement | **Optional** |
| IG-MTU-2-1 | Voltage transformer unit with voltage ratio 2:1 to separate mains and generator voltage measurement | **Optional** |

***HINT***
Controller central unit contains complete hardware for all applications. Number of inputs and outputs can be expanded by additional modules IS-AIN8, IS-BIN16/8, IGS-PTM, IGL-RA15, I-AOUT8.

### 3.2.3. Dongle overview

| Dongle | Function |
|---|---|
| None | No dongle for Single Parallel to Mains (SPtM) is required. No dongle for Single Prime Mover (MINT in SPM application) is required. |
| IGS-NT-LSM+PMS | Dongle for multiple applications MINT with Load sharing, Var sharing and Power management function. This dongle should be used for SUS and GeCon MINT applications from versions SUS-1.3 and GeCon-3.0 (Marine and Landbased) |
| IGS-NT-SUS-LSM+PMS | Obsolute. Dongle for multiple application SUS MINT with Load sharing, Var sharing and Power management function |
| IGS-NT-SUS-PCM | Obsolute. Dongle for SUS in Single Parallel to Mains application.<br>**Not needed from version SUS-1.3** |
| IGS-NT-GeCon-LSM+PMS | Obsolute. Dongle for multiple application GeCon MINT with Load sharing, Var sharing and Power management function |

| | |
|---|---|
| IGS-NT-SUS-PCM | Obsolute. Dongle for GeCon in Single Parallel to Mains application.<br>**Not needed from version GeCon-3.0 (Marine and Landbased)** |

See chapter Dongle installation to learn how to place the dongle into the controller.

### 3.2.4. Available PC software

| Name | Function |
|---|---|
| GenConfig | Common IGS-NT and IM-NT family configuration (off-line) tool. |
| InteliMonitor | Common IGS-NT and IM-NT family monitoring (on-line) tool. |
| WinScope | Graphic monitoring-recording tool. |
| IGS-Log | Common IGS-NT family logging PC SW. |
| IBConfig | Internet Bridge configuration tool. |
| Gm_setup | GSM modem setup tool. |
| ICBEdit | I-CB configuration tool. |

# 4. Marine Application Notes

The IGS-NT system and components can be used as Control, Monitoring and Protection for single and multiple generator applications according to Marine Type Approval Regulation

Controller is tested and approved:

- For location in Machinery spaces and Control room – Location class B.
- According the EMC rules for general power distribution zones.

## 4.1. Safety requirements

Additional, independent safety and protection devices **are necessary** to meet safety requirements of Rules and Regulations of Marine Classification Societies. The sensors and circuits utilized for the second stage alarm and automatic shutdown are to be independent of those required for the first stage alarm (LR Rulefinder 2008 - V9.10).

**NOTE:**
The project designer is responsible to follow Marine regulations in project design wiring and InteliGen-NT or InteliSys-NT controller configuration and setpoint setting.

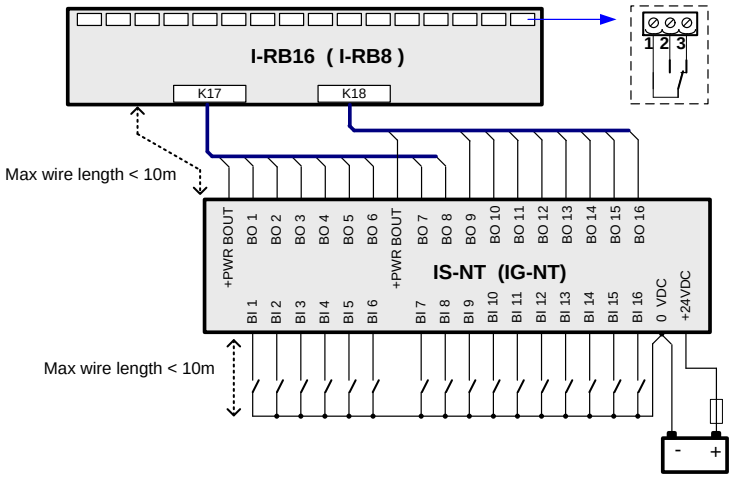
Usually is necessary to use additional, independent equipment for Emergency stop, Overspeed, Low oil pressure and Overcurrent protection.

Oil mist and engine bearing temperature monitoring are to be provided when arrangements are fitted to override the automatic shutdown for excessive reduction of the lubrication oil pressure (or for engines above 2250 kW). The Overriding of this protection is to be independent.

Required alarms and safeguards for auxiliary engines.

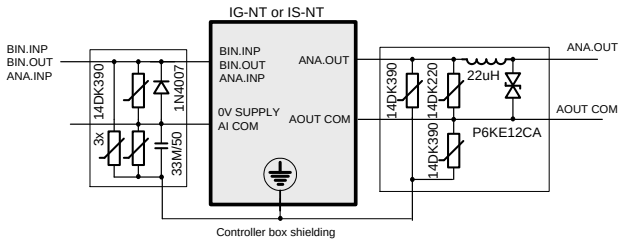
| |
|---|
| Lubrication oil inlet temperature high |
| Lubrication oil inlet pressure low |
| Coolant outlet temperature high |
| Coolant pressure or flow low |
| Exhaust gas temperature high |

The maximal wire length for Binary (Analog) inputs and outputs should be less than 10 meters, otherwise the separation relay or additional protection has to be used.



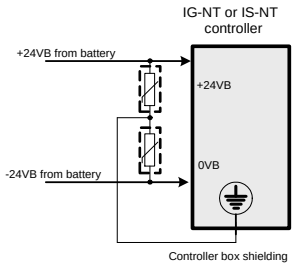

In the case of longer distance wires the additional protection has to be used for Signal inputs and

Outputs close to controller terminals. ~~Protection is available on request in ComAp.~~

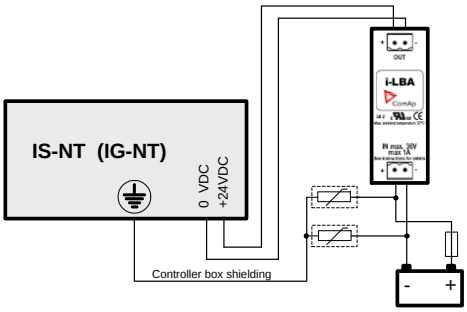



## 4.1.1. Power supply

To have full Surge protection ±2kV for controller power supply terminals the external component (e.g. two VSSC4 MOV 48VAC/DC from Weidmueller for DIN rail) has to be connected.



The I-LBA (low battery adaptor) module is to be used when power supply voltage dip up to 200ms is required. The up to 100ms supply voltage dip is acceptable by IG-NT or IS-NT controller itself.




# 4.2. Default configuration

**CAUTION!**
Use the default IG-MINT-Marine-2.3.ant (or higher) or IS-MINT-Marine-2.3.ant (or higher) to avoid incorrect system setting and configuration.

Default configuration can be modified using the GenConfig-2.3 (or higher) PC tool. Please take care of following items that are included in default configuration file:

- The function "Virtual Peripheries" shall not be used for marine application.
- An automatic start of the generator after acknowledgement of alarm shall be prevented (**Basic settings**: *FltResGoToMAN* = ENABLED).
- Common alarm contacts interfacing the machinery alarm system shall be re-triggered in case of occurring new alarm" (BO5 = Alarm flashing).

## 4.2.1. Override function

The “Sd override” (Shut-down override) function is included in default configuration on Binary input BI7. Active Override is indicated by a " **!** " mark on the display and on Binary output BO4 Common SdOvr.

The default Override function blocks all protections except the Overspeed, Emergency stop and all Analog or Binary protections configured as SD Override.

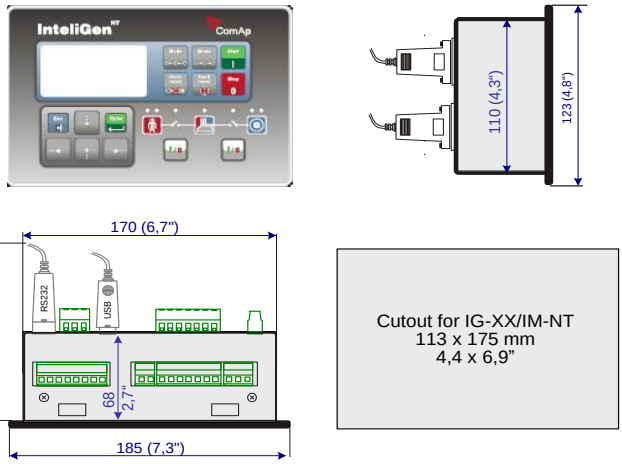
***HINT***
It is strongly recommended to modify names of such values to begin or finish with letters SDO – e.g. WaterTemp SDO.

Use internal PLC function when the independent override protection e.g. for Bearing temperature is required.

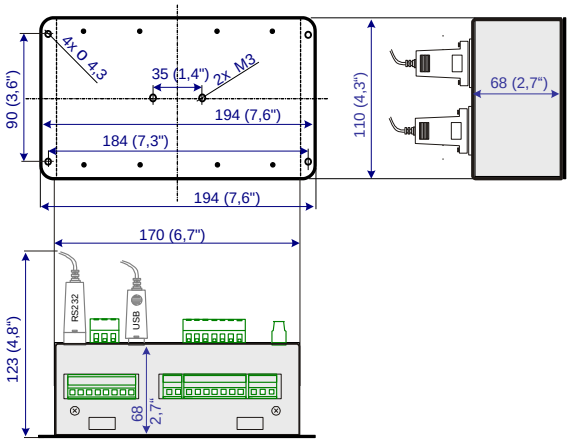
# 5. Terminals and Dimensions

## 5.1. Controller terminals and dimensions

### 5.1.1. IG-NT, IG-NTC, IM-NT

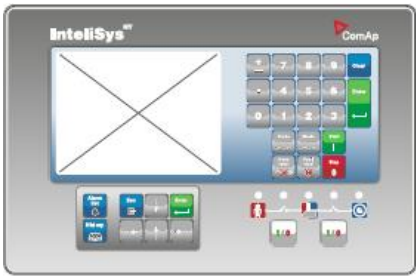


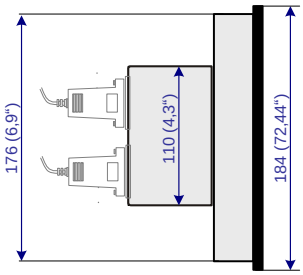

### 5.1.2. IS-NT-BB

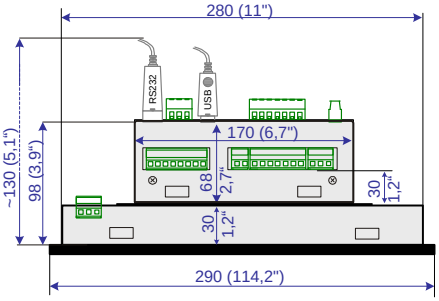



**CAUTION!**
In the environment rich on vibrations it is not recommended to fix IS-NT-BB on the DIN rail but to screw it down on to the switchboard rear side.

### 5.1.2.1. IS-NT with IS-Display

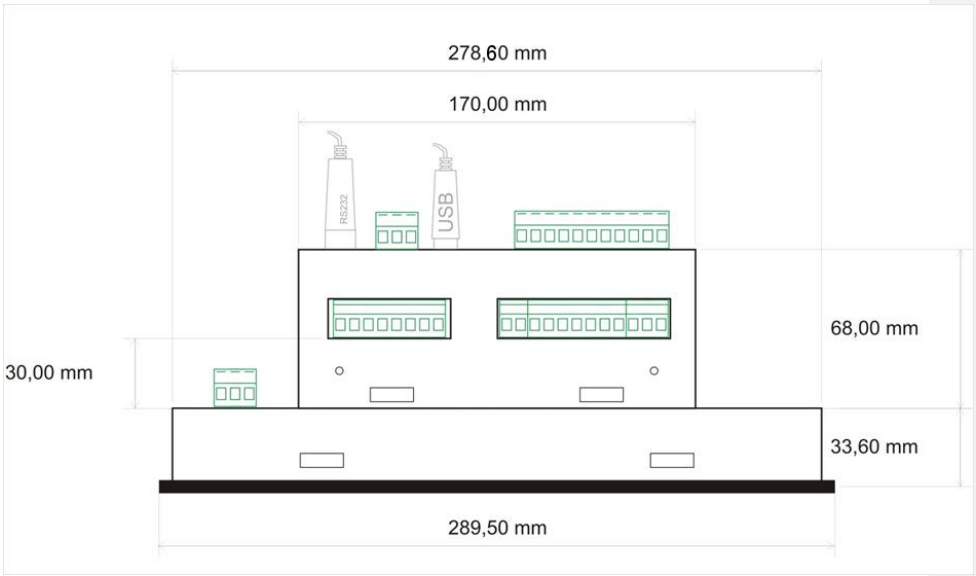


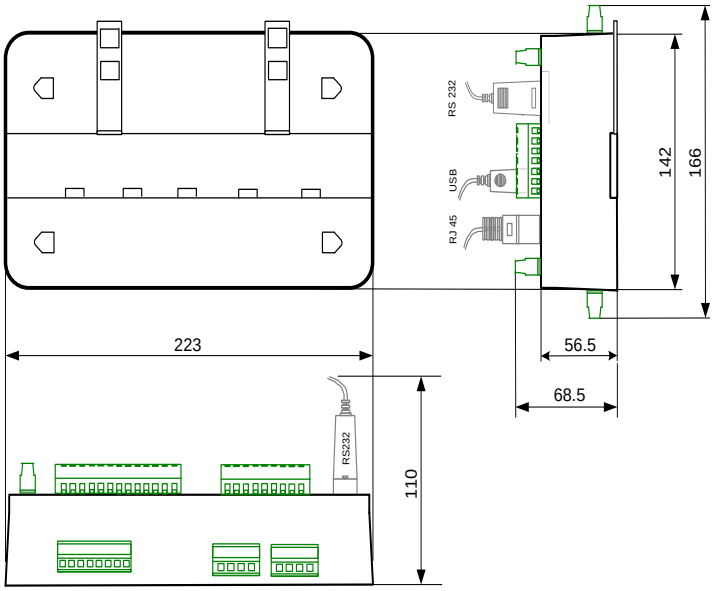




Cutout for IS-NT
178 x 282
7,0 x 11,1”

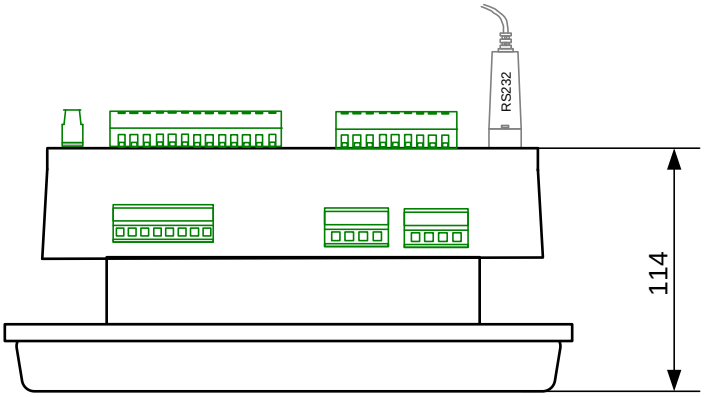
### 5.1.2.2. IS-NT with InteliVision 8



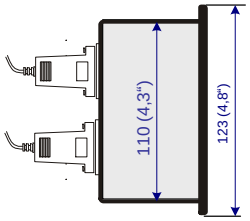
### 5.1.3. IG-NT-BB (IG-NTC-BB, IS-NTC-BB)

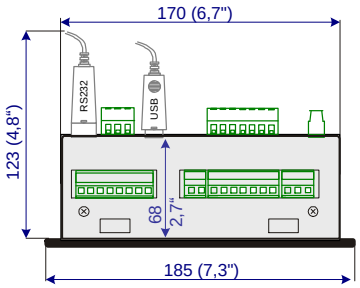



#### 5.1.3.1. IG-NT-BB with InteliVision 5



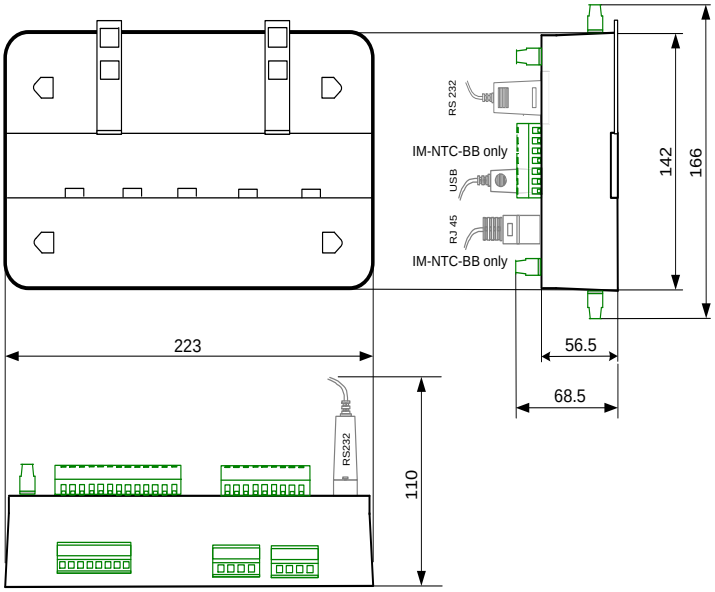
### 5.1.4. IM-NT

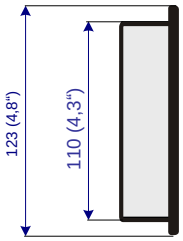

Cutout for IG-XX/IM-NT
113 x 175 mm
4,4 x 6,9"

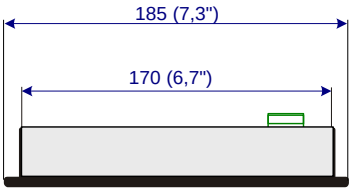
### 5.1.5. IM-NT-BB and IM-NTC-BB



## 5.2. Display terminals and dimensions

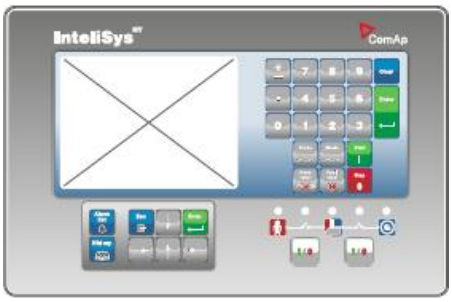
### 5.2.1. IG-Display

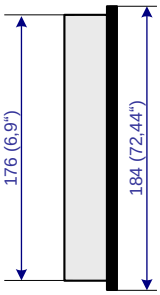



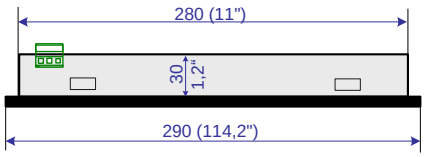




Cutout for IG-DISPLAY
113 x 175 mm
4,4 x 6,9”

### 5.2.2. IS-Display

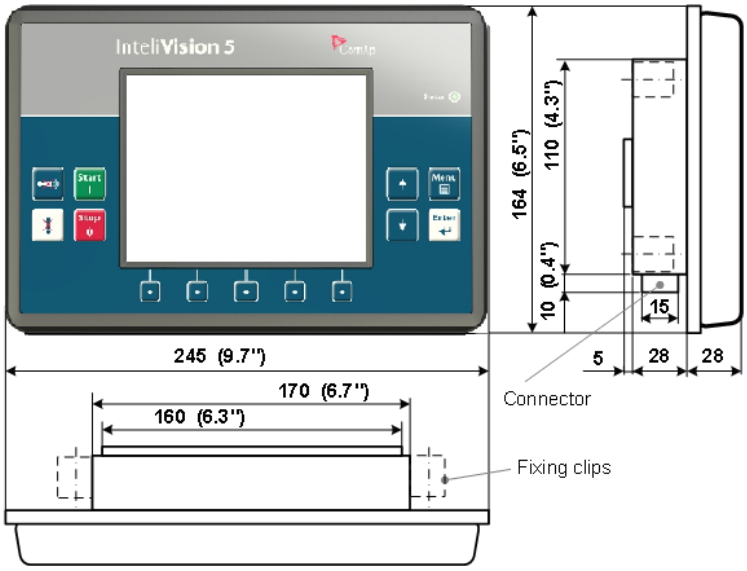


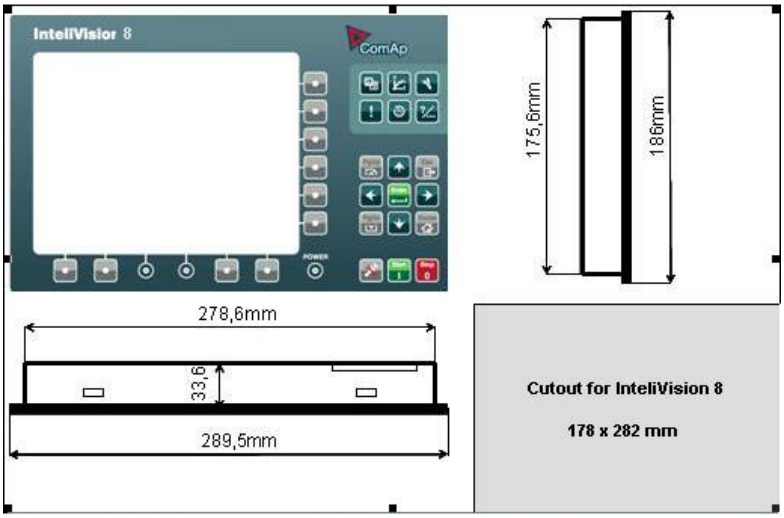




Cutout for IS-DISPLAY
178 x 282
7,0 x 11,1”

### 5.2.3. InteliVision 5

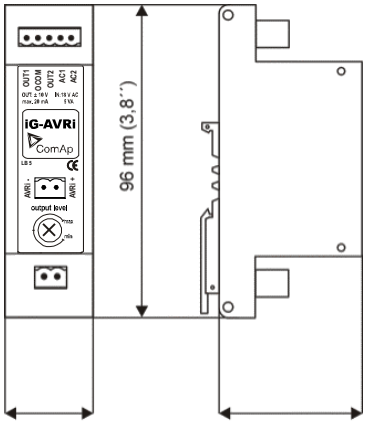



### 5.2.4. InteliVision 8



# 5.3. Peripheral modules terminals and dimension

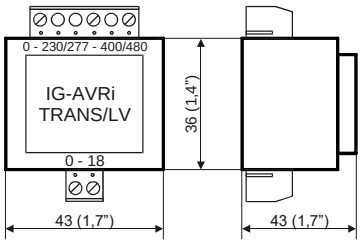
## 5.3.1. IG-AVRi + IG-AVRi TRANS




Primary terminals

230-277 VAC / 400-480 VAC

Freq: 50 – 60 – 400Hz

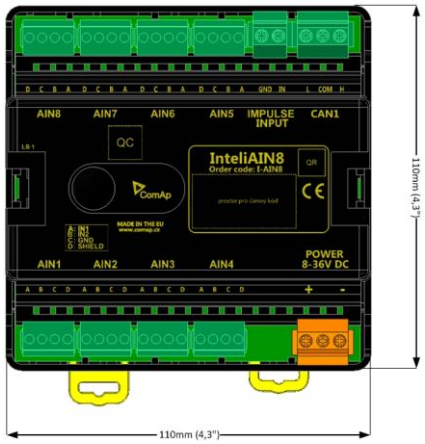


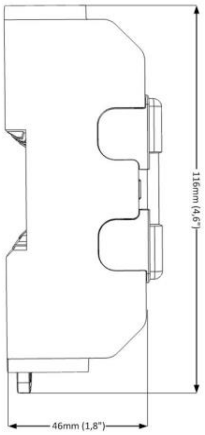

Secondary terminals

18 VAC

Both units can be mounted on **DIN rail (35mm)**.

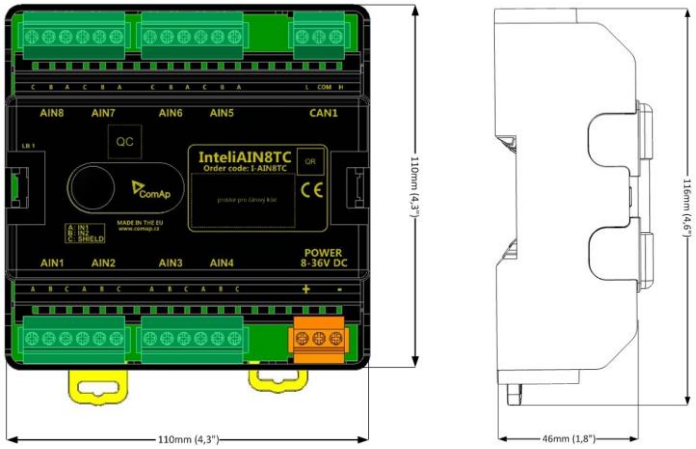
## 5.3.2. Inteli AIN8



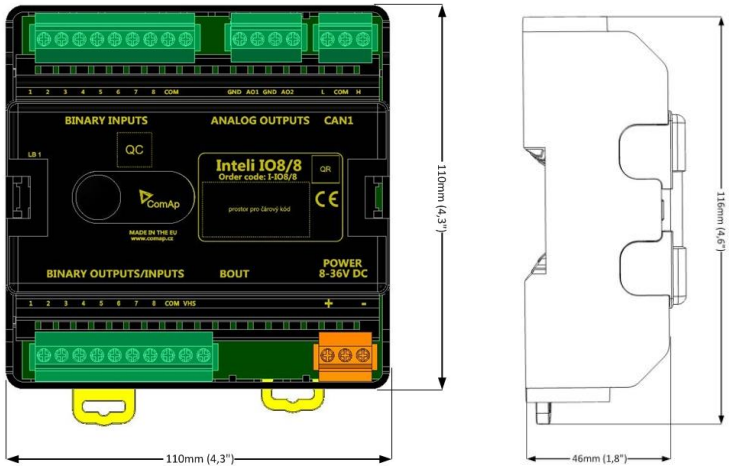

Inteli AIN8 unit can be mounted on **DIN rail (35mm)**.

### 5.3.3. Inteli Ain8TC



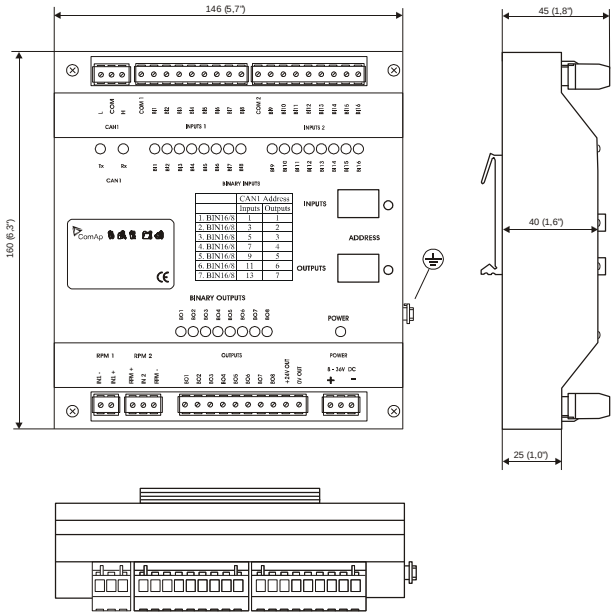

Inteli AIN8TC unit can be mounted on **DIN rail (35mm)**.

### 5.3.4. Inteli IO8/8 (can be switched to IO16/0)



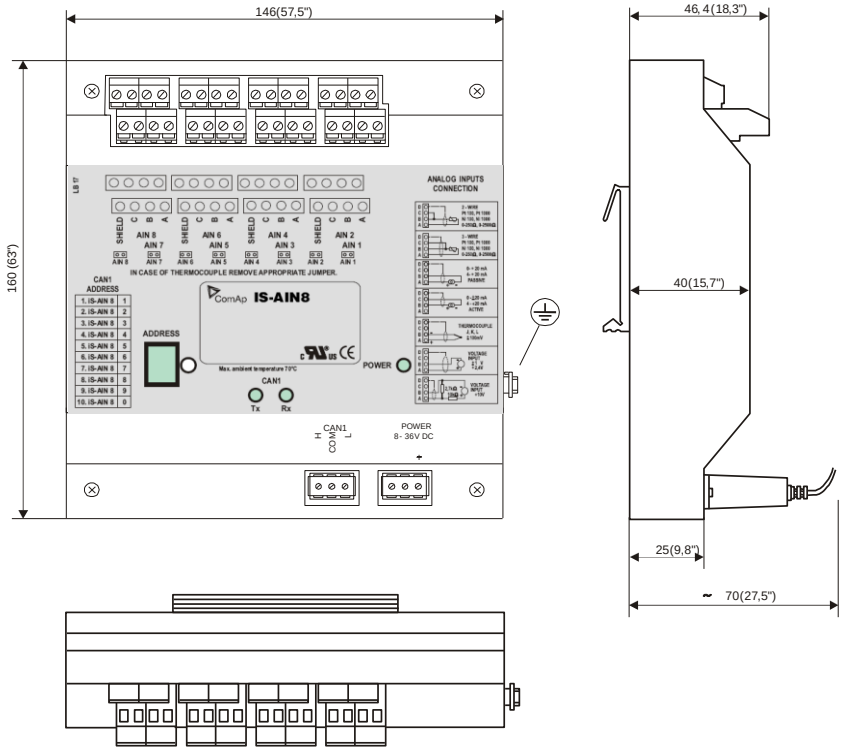

Inteli IO8/8 unit can be mounted on **DIN rail (35mm)**.

## 5.3.5. IS-BIN16/8




IS-BIN16/8 unit can be mounted on **DIN rail (35mm)**.

## 5.3.6. IS-AIN8



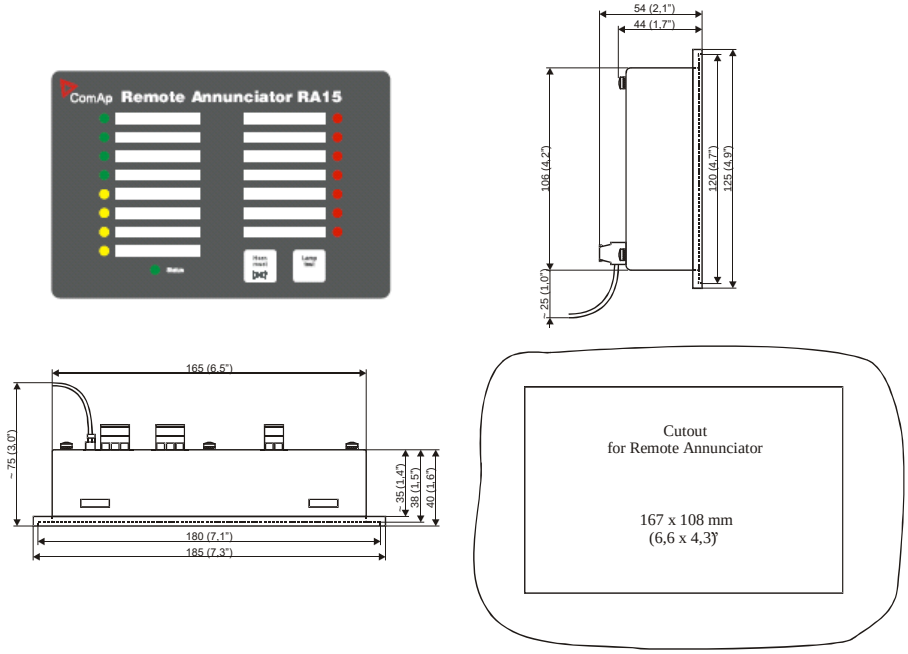

IS-AIN8 unit can be mounted on **DIN rail (35mm)**.

## 5.3.7. IGL-RA15 Remote annunciator

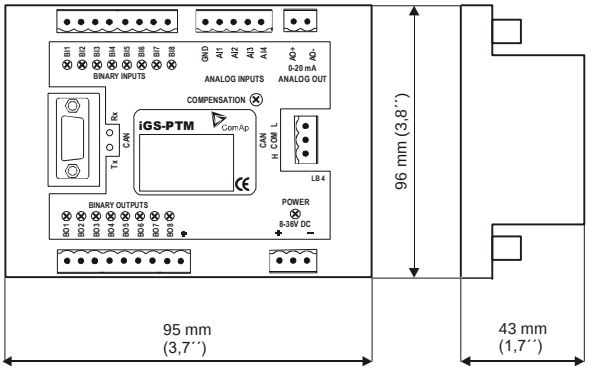
Remote (CAN bus, up to 200 meters) 15 LED states indicator. IGL-RA15 unit can be connected to controller via CAN as Binary output group with addresses 1+2 or 3+4 or 5+6 or 7+8.

To configure IGL-RA15 use GenConfig -> Modules -> Available modules, select IGL-RA15 module and add it using Insert button. GenConfig automatically adds IGL-RA15 binary outputs to the configuration.

For more information about IGL-RA15 consult manual (IGL-RA15-2.0.pdf) and New features list (IGL-RA15-2.0-New features.pdf).

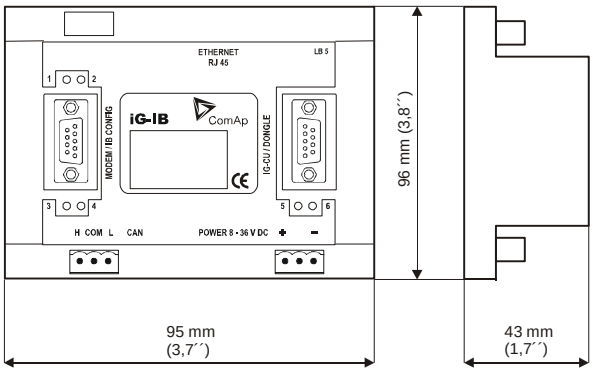



## 5.3.8. IGS-PTM




IGS-PTM unit can be mounted on **DIN rail (35mm)**.

## 5.3.9. IG-IB Internet bridge




***HINT***

See InteliCommunicationGuide for further information.

It is recommended to use IG-IB firmware version 2.0.

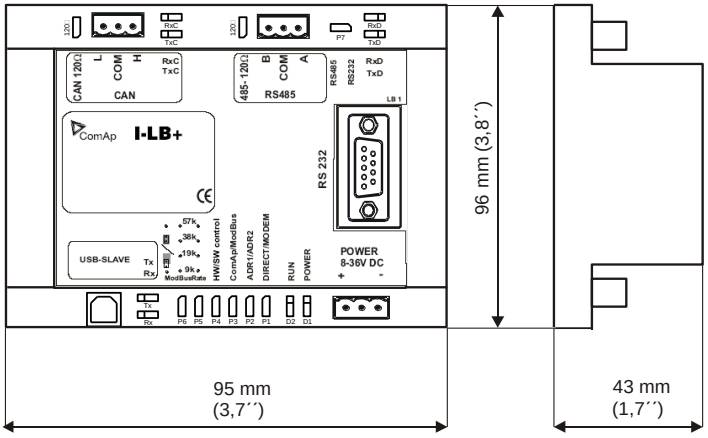
IG-IB unit can be mounted on **DIN rail (35 mm)**.

## 5.3.10. I-LB+ Local Bridge

I-LB+ is a successor of the IG-MU and I-LB units designed to be used with IG/IS-NT and IM-NT controllers.

It therefore provides additional communication port and higher communication speed.

Speed for direct/modem connection can be up to 57600 bps (IG-MU provided only 19200 bps).



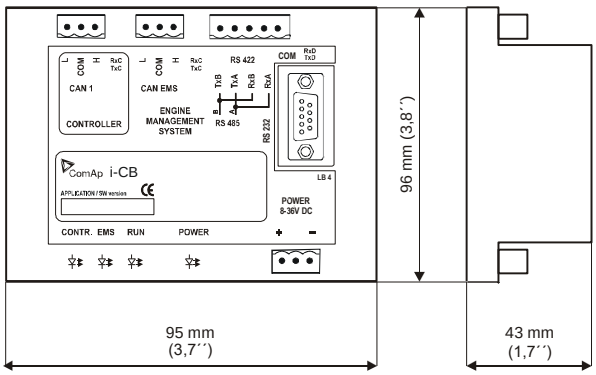

Indication LED:

| | |
|---|---|
| TxC, RxC | Indicates data transfer on the CAN line. |
| TxD, RxD | Indicates data transfer on the RS232 line. |

| | |
|---|---|
| Tx, Rx | Indicates data transfer on USB |
| RUN | Lights when at least one other unit is active on the CAN bus.<br>Blinks when no unit is communicated on the CAN bus (during communication speed detection). |
| PWR | Lights All the time when power supply is switched on. |

I-LB+ unit can be mounted on **DIN rail (35 mm)**.

## 5.3.11. I-CB Communication Bridge



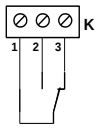

I-CB (Communication bridge) is CAN bus interface between Controller and Engine Control Unit (ECU) that has not standard J1939 communication (MTU, CAT etc.). Engine values (RPM, Oil pressure and other) are received from ECU via CAN and corresponding sensors are not needed on controller. Use ICBEdit software for I-CB configuration (included in installation package).

I-CB unit can be mounted on **DIN rail (35 mm)**.

## 5.3.12. I-RB16, I-RB16/231 relay board

Relay board contains 16 relays for binary (open collector) output separation. All relays are placed in sockets.

Number relays: 16 in socket
Nominal voltage: 24 VDC
Voltage range: 16,8 – 36 VDC
Relay opens at: 10% of nominal voltage
Electric / mechanic cycles: 100 000 (when switching 16A) / 10 000 000
Operating temperature range: - 40°C to 70°C
Maximal load: 16A resistive load
4A inductive load
Contacts protection: varistor 14DK390
Relay-connector connection:



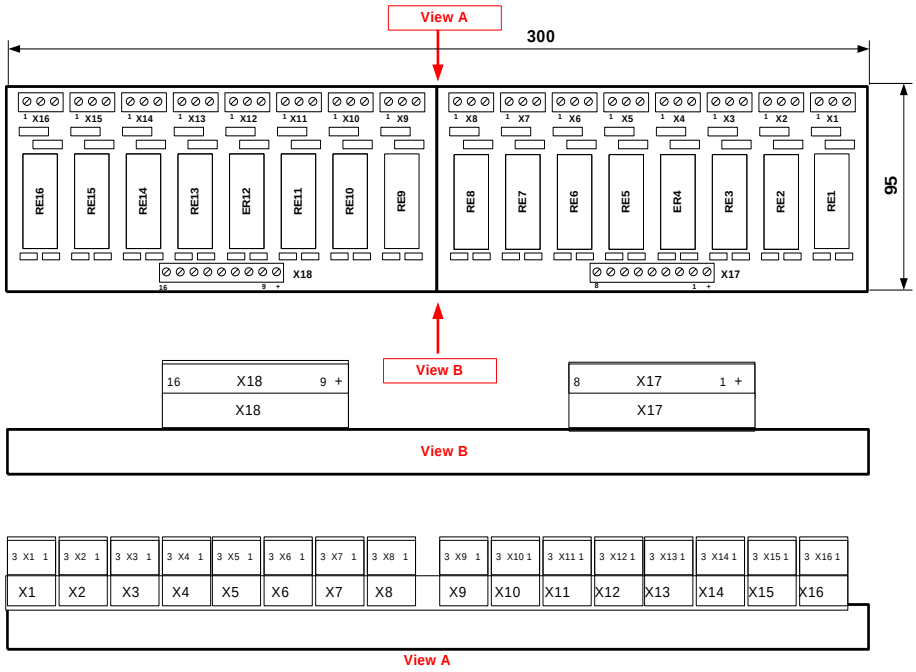

1 – 2 n.o.

1 – 3 n.c.

I-RB16/231 board contains relays that can switch 231 VAC load.

I-RB16 can be mounted on **DIN rail (35 mm)**. One unit contains two parts (separate PCBs). There are 8 relays on each part which is located on common plastic base.

I-RB16 is 60mm high from DIN rail base.




***HINT***

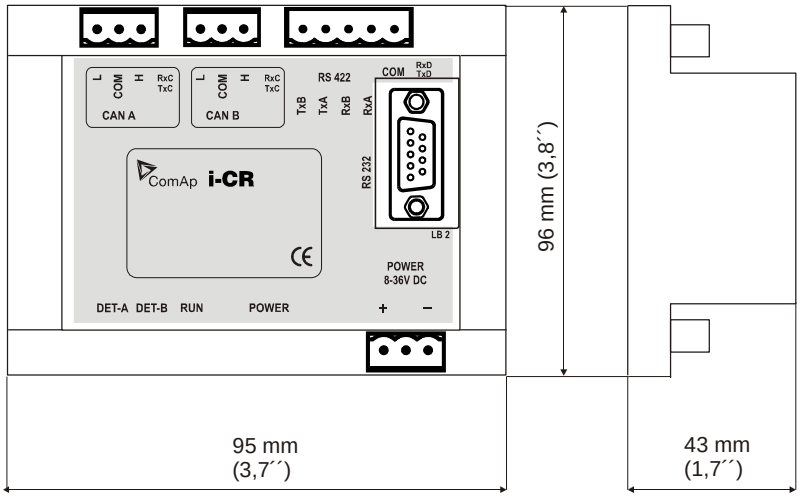
I-RB contains two separate boards, 8 relays on each. It can be ordered as I-RB8 as well.

## 5.3.13. I-CR CAN Repeater

I-CR module enables to extend CAN bus line of

- extension modules CAN1 to more than 200 meters
- intercontroller CAN2 to more than 200/900 meters (in 32C/8C mode)

More application details are in separate manual “Extending the CAN bus” and in Communication guide for IGS and IM controllers.




I-CR can be mounted on **DIN rail (35 mm)**.

## 5.3.14. I-AOUT8

### 5.3.14.1. General Description

I-AOUT8 is an extension unit with 8 analog outputs. Each analog output can be switched by jumper for.

- 0 to 20 mA
- 0 to 10 VDC
- PWM (Pulse With Modulation on 1,2 kHz)

I-AOUT8 module is connected on IGS-NT or IM-NT CAN1 (peripheral) bus. The corresponding module Address 1 to 4 (default 1) must be set on module (by Adr.1 and Adr.2 jumpers) and in controller configuration. Communication fail is indicated in controller Alarm list and by binary output. Use GenConfig PC tool for controller configuration.

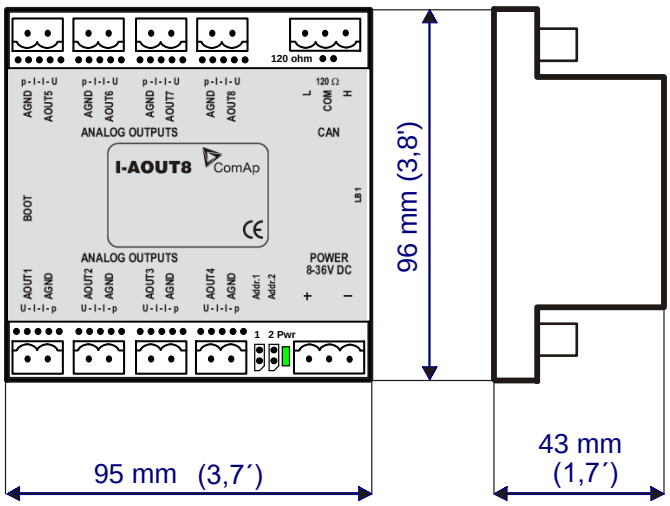
It is possible to connect up to four I-AOUT8 units to one controller.

I-AOUT8 unit can be mounted on **DIN rail (35 mm)**.

CAN1 terminating 120 ohm resistor jumper is connected in default. AGND terminals are on the same potential.

| | | |
|---|---|---|
| Number of analog outputs | 8, no galvanic separation | |
| Type of analog outputs (jumper selectable) | U<br>I<br>p | 0 to 10VDC ± 1% , max 5 mA<br>0 to 20 mA ± 1% , max 500 ohms<br>pwm 1200 Hz, 5V level, max 10 mA |
| Power supply | 8 to 36 VDC | |
| Current consumption | 100 ÷ 300 mA at 24 VDC | |
| Communication interface | CAN1, with jumper selectable address 1 to 4<br>Jumper selectable terminating resistor 120 ohms. | |
| RS232 interface | TTL, firmware upgrade via AT-link. | |
| Operating temperature range | -40°C to +70°C | |

| | |
|---|---|
| Analog outputs refreshment | Max. 300 ms |




### 5.3.14.2. Connection of Multiple Units

Up to four modules can be connected to one controller. Set module CAN address corresponding to configuration according table below.

| CAN Address | Jumper 1 | Jumper 2 |
|---|---|---|
| 1 | No | No |
| 2 | Yes | No |
| 3 | No | Yes |
| 4 | Yes | Yes |

### 5.3.14.3. Analog Output Modification (U, I, PWM)

Follow the p-I-I-U symbols on the module sticker. There are two equivalent positions for mA measuring.

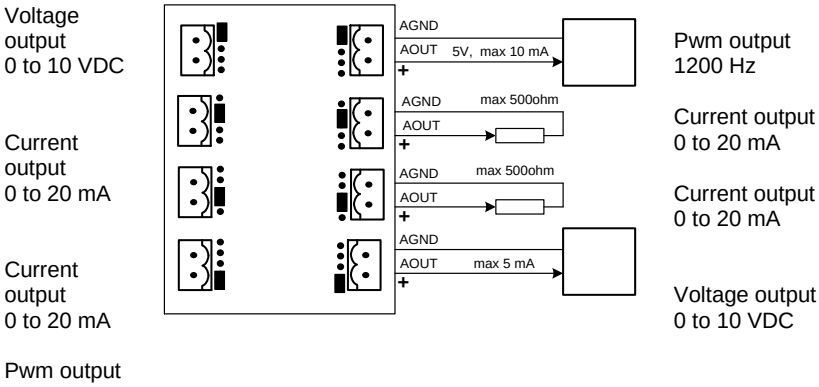
| AOUT jumper | Symbol | Function |
|---|---|---|
|  | p | Pwm Pulse-Width-Modulation |
|  | I | 0 to 20 mA |
|  | U | 0 to 10 VDC |

### 5.3.14.4. LED Indication

Green LED is located near the power supply connector.

| I-AOUT8 module state | LED Pwr |
|---|---|
| No power supply | Dark |
| Memory fail | Fast blink (100/100 ms) |
| Communication fail | Slow blink (300/300 ms) |
| OK | Continuous light |

### 5.3.14.5. Wiring and jumper setting example

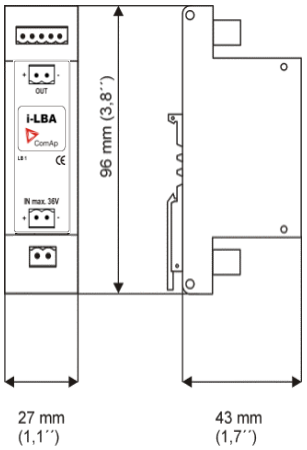



## 5.3.15. I-LBA

For the connections with 12VDC power supply an I-LBA module can be connected to controller power terminals in order to allow the controller to continue operation during cranking if the battery voltage dip occurs.

Controllers which may be supplied from I-LBA module:

| Controller | IG-NT/ IG-NT-BB | IG-NTC/ IG-NTC-BB | IS-NT-BB/ IS-NTC-BB | IS-NT | IG-CU | IS-CU | IL-CU/ IL-NT |
|---|---|---|---|---|---|---|---|
| Connection applicable | YES | YES | YES | NO | YES | NO | YES |




***HINT***

The I-LBA unit is intended to supply one controller unit only at the same time.

It is not recommended to use +PWR BOUT outputs on the controller as a source for relays, as their consumption would exhaust I-LBA capacitors very fast.

It is also not recommended to supply any kind of above controllers with LT (Low Temperature) display because of the high current consumption of the LT display.

See also chapter Power supply fusing.

# 6. Interface

**NOTE:**
Standard Front panels of controllers and InteliVision displayes are shown in this manual. There may be application modifications (e.g. controller in MINT application controls only one breaker) and also customer modification of Front panels of controllers and InteliVision displayes.

## 6.1. Front Panels

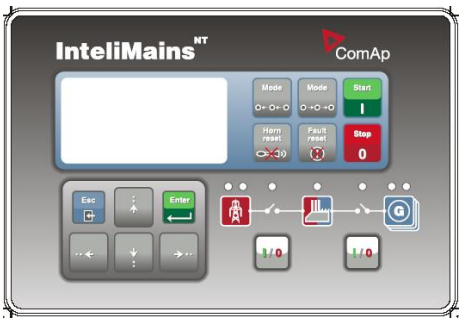
**NOTE:**
Images are not in scale to the real product.

### 6.1.1. InteliGen NT controller

| | |
|---|---|
| InteliGen controller types | IG-NT, IG-NTC |
| InteliGen – Remote Display | IG-DISPLAY, INTELIVISION 5 and 8 |
| Available for applications | SPI, SPTM, MINT, COX, CombiI |

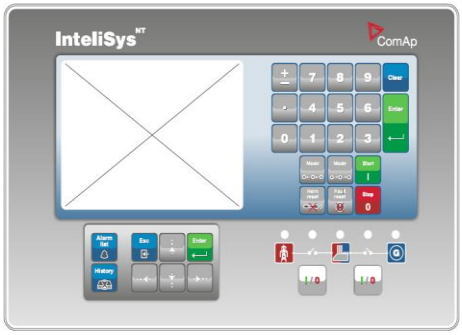

### 1.1.1InteliMains NT controller

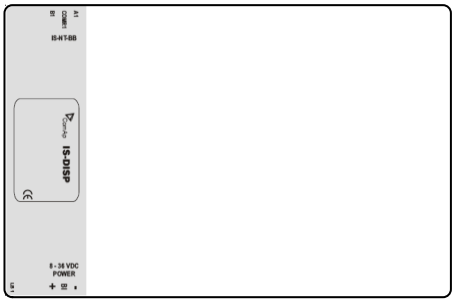
| | |
|---|---|
| InteliMains controller types | IM-NT |
| InteliMains – Remote Display | IG-DISPLAY, INTELIVISION 5 and 8 |
| Available for applications | MCB, MGCB, BTB |



### 6.1.2. InteliSys NT controller

| | |
|---|---|
| InteliSys controller types | IS-NT |
| InteliSys – Remote Display | IS-DISPLAY, INTELIVISION 5 and 8 |
| Available for applications | SPI, SPTM, MINT, COX, Combi |

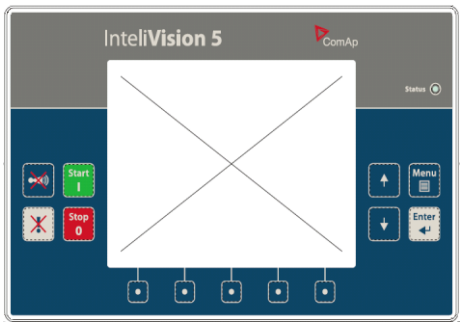



### 6.1.3. InteliVision 5

Colour detachable display. Available for units:

| UNIT | NUMBER OF DISPLAYS | DISPLAY ADDRESS |
|---|---|---|
| IG-NT(C)-BB | 2 | 1 and 2 |
| IS-NTC-BB | 3 | 1, 2, 3 |
| IM-NT(C)-BB | 2 | 1 and 2 |
| IG-NT(C) | 1 | 2 |
| IS-NT-BB | 3 | 1, 2 ,3 |
| IM-NT | 1 | 2 |




***HINT***
Display is connected via RS-485 only! Use the RS485 socket which is dedicated for communication with displays.

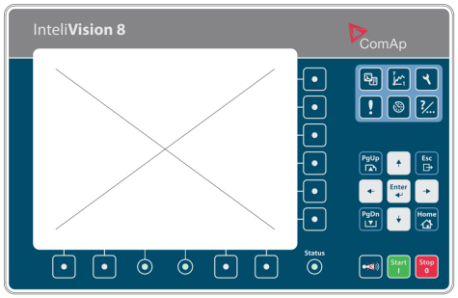
### 6.1.4. InteliVision 8

Colour detachable display. Available for all InteliGen, InteliSys and InteliMains controllers.

Connection type: CAN2, RS 485, RS 232.

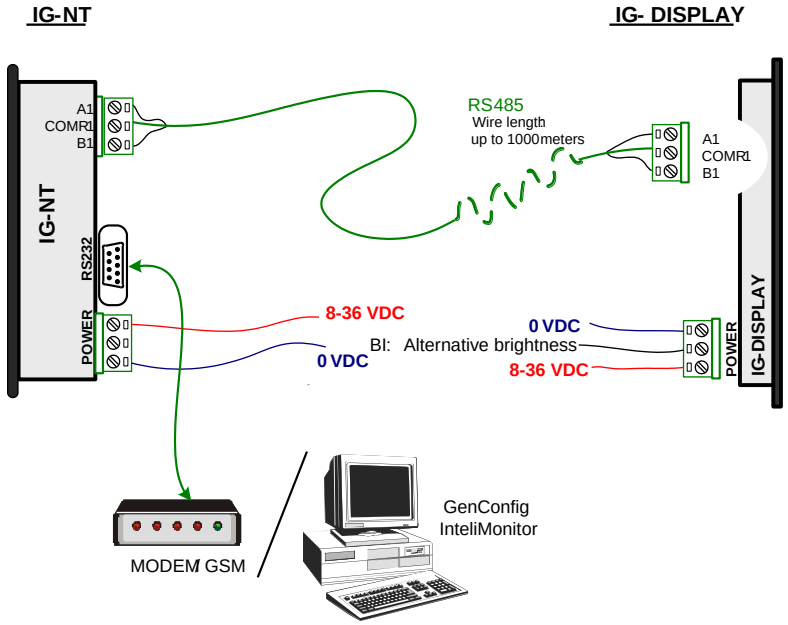
| UNIT | RS232 | RS485(2) | DISPLAY – RS485(1) | CAN2 |
|---|---|---|---|---|
| **IG-NT and IM-NT** | 1 | N/A | 1 | 4 |
| **IG-NT-BB and IM-NT-BB** | 1 | N/A | 2 | 4 |
| **IG-NTC-BB and IM-NTC-BB** | 1 | 1 | 2 | 4 |
| **IS-NT-BB** | 1-2* | 0*-1 | 3 | 4 |
| **IS-NTC-BB** | 1 | 1 | 3 | 4 |

* Port RS232 and RS485 is shared (so it can be set either to 485(2) or to RS232



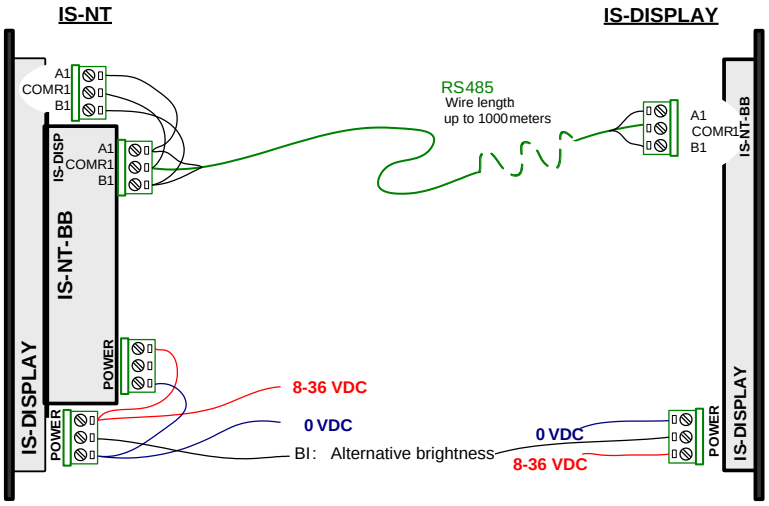
# 1.1 Display Wiring

## 6.1.5. IG-Display wiring

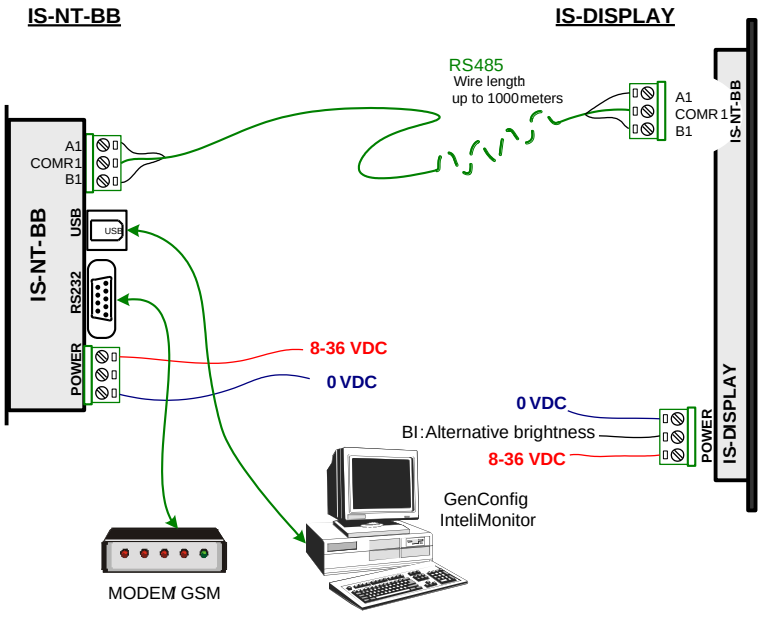


## 6.1.6. IS-Display Wiring

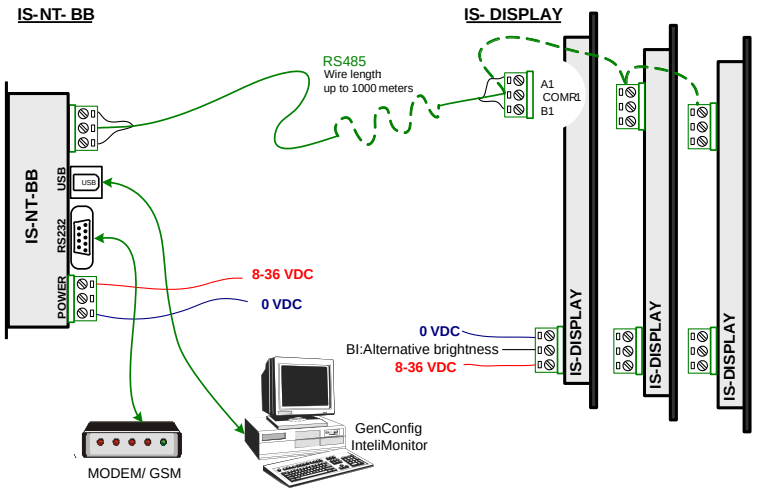
### 6.1.6.1. Attached and Remote Display




### 6.1.6.2. Single Remote Display



### 6.1.6.3. Multiple Remote Displays

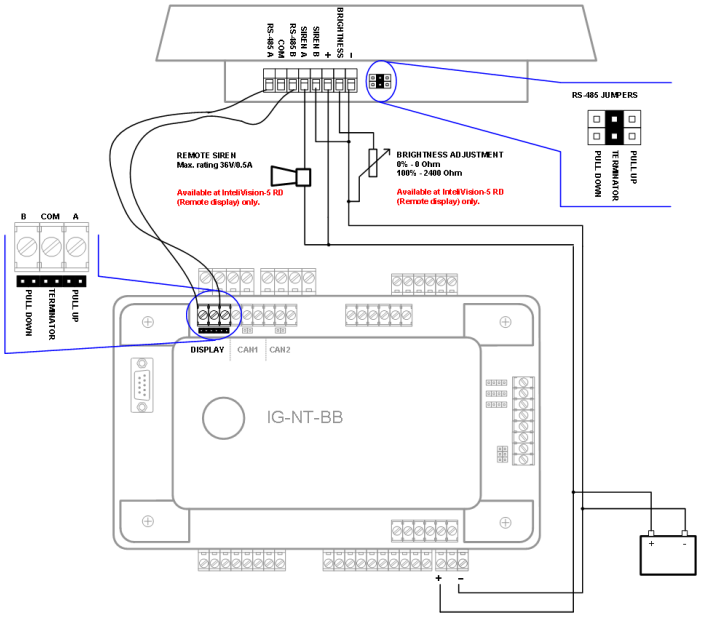



***HINT***

The state of BI Alternative brightness only influences the particular display.

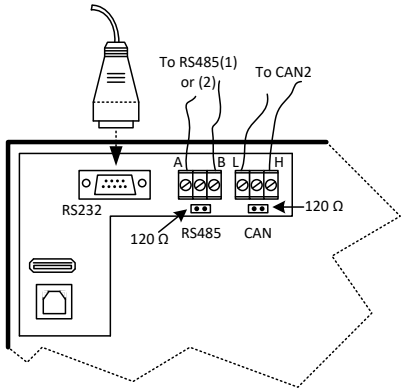
IS-NT-BB unit doesn't include internal display. For IG/IS-NT hardware options consult IGS-NT-x.y-Application guide.pdf.

## 6.1.7. InteliVision 5 Wiring

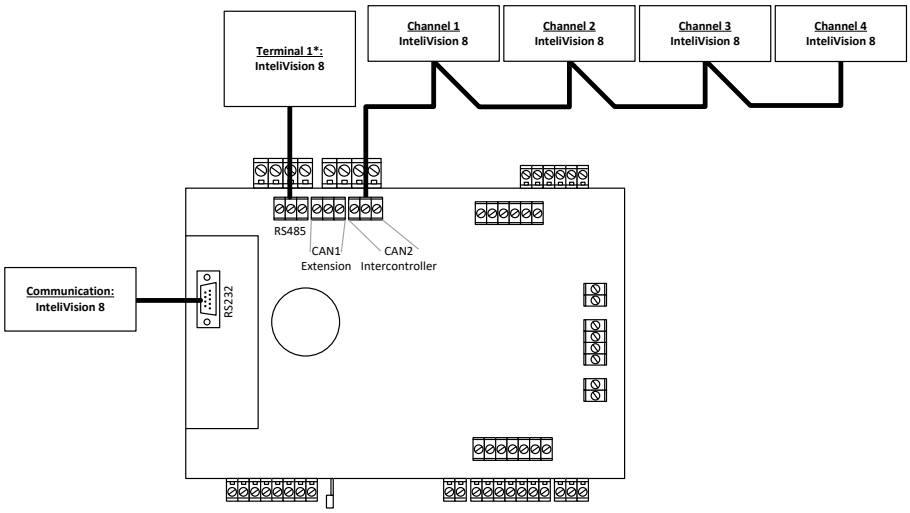


## 6.1.8. InteliVision 8 Wiring

### 6.1.8.1. General Guidelines

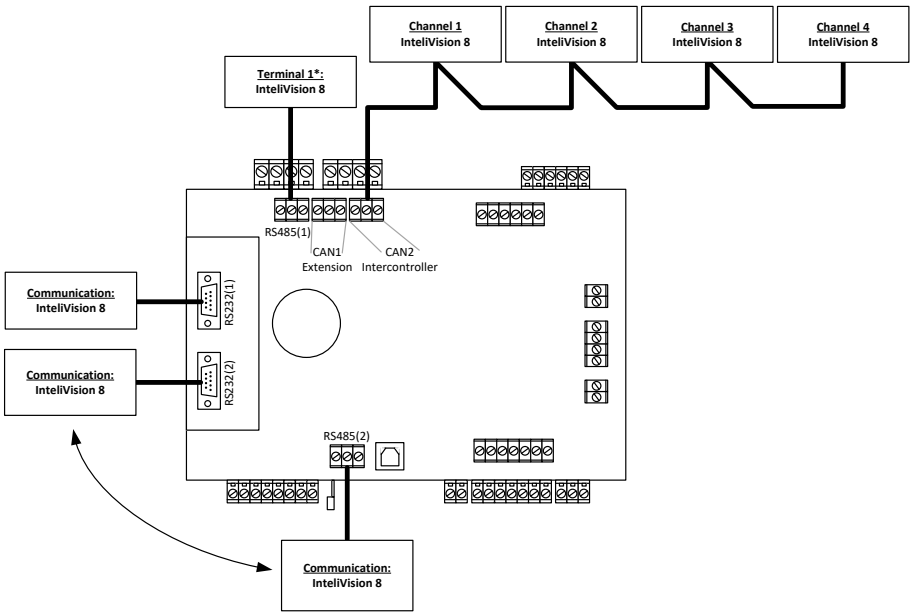



### 6.1.8.2. Connection to IG-NT



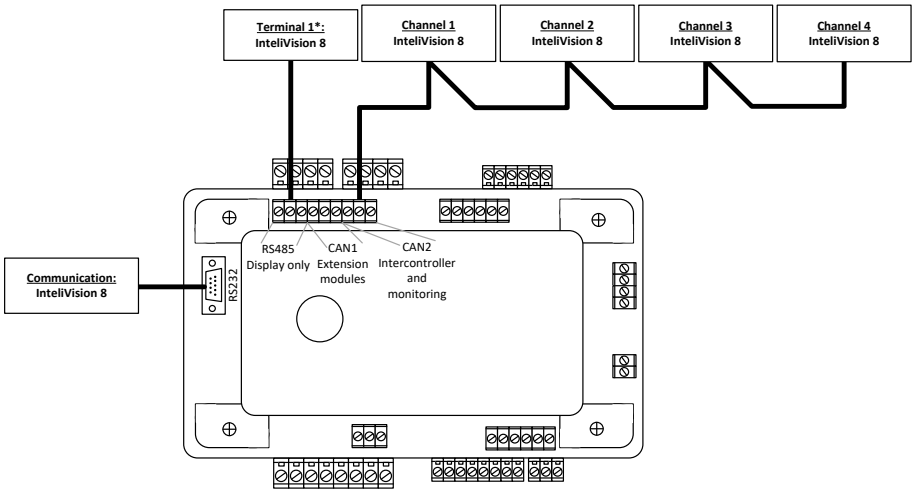

***HINT***
*Only one external display can be connected to the control unit via RS485(1) – IG-DISP port.

### 6.1.8.3. Connection to IG-NTC



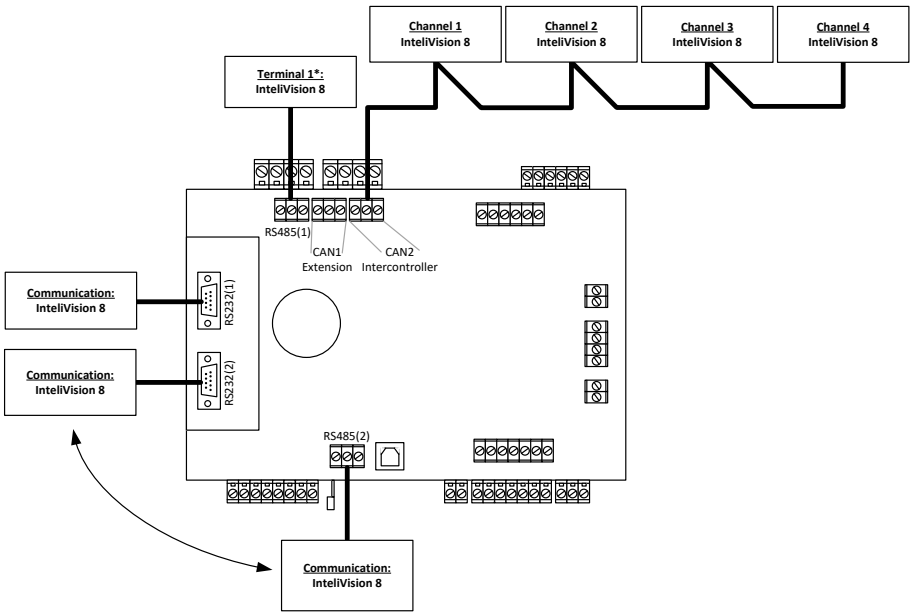

***HINT***
*Only one external display can be connected to the control unit via RS485(1) – IG-DISP port.

### 6.1.8.4. Connection to IG-NT-BB




***HINT***
* Two displays can be connected to the IG-NT-BB control unit via RS485 (display terminal) with addresses 1 and 2.

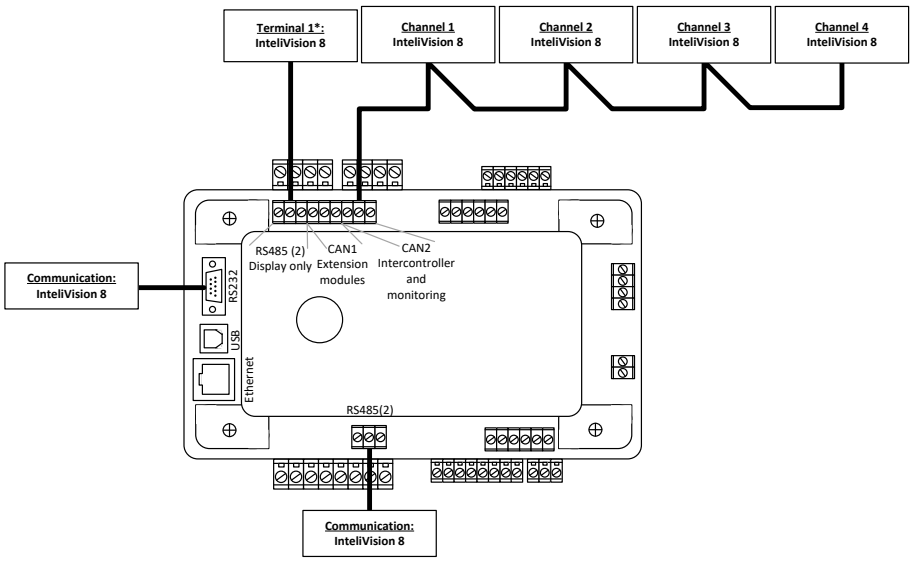
### 6.1.8.5. Connection to IS-NT-BB




***HINT***

*Up to three displays could be connected with IS-NTC-BB via RS 485(1) – Display. Communication on RS232(2) can be switched to RS485(2) so one InteliVision can be connected to these two ports only.

### 6.1.8.6. Connection to IG-NTC-BB and IS-NTC-BB



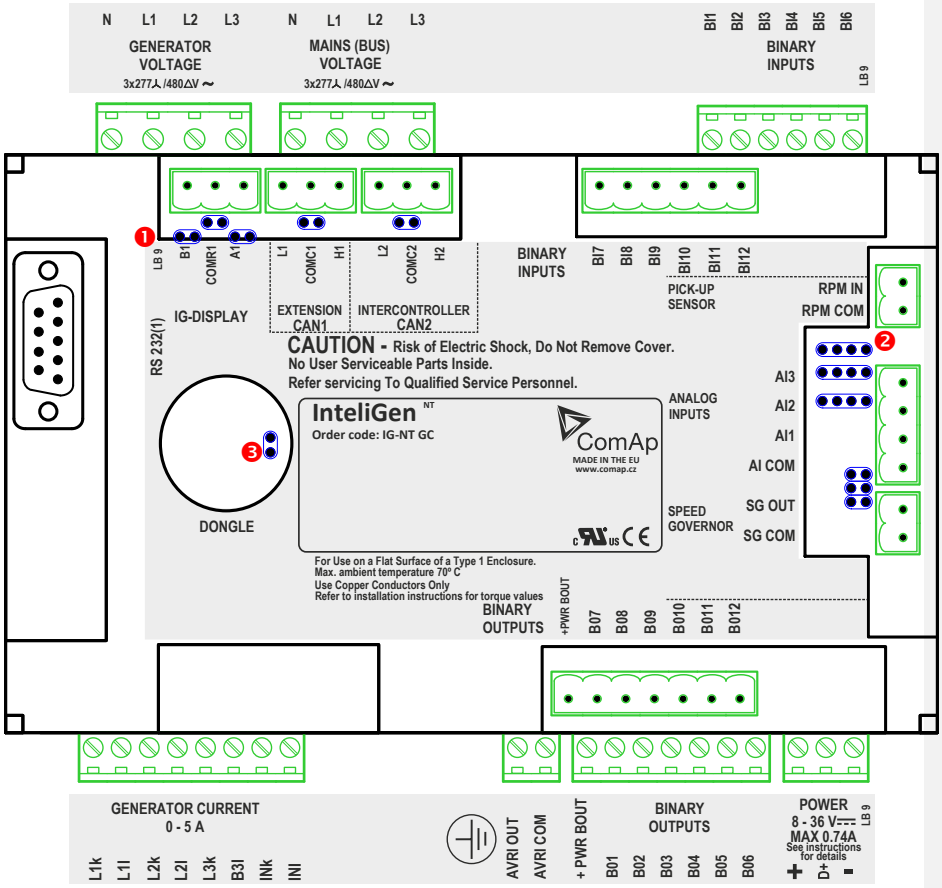

***HINT***

* Up to three displays can be connected with IS-NTC-BB via RS 485(1) - Display. Two displays can be connected with IG-NTC-BB via RS 485(1) – Display. One InteliVision can be connected to RS485(2) port.

# 7. Terminals, Jumpers and I/O overview

## 7.1. IG-NT GC

### 7.1.1. Schematics




| | | |
|---|---|---|
| ❶ | Left to right: Pull down Bias / 120Ω / Pull up Bias / 120Ω / 120Ω | |
| ❷ | Down: AI3 setting / AI2 setting / AI1 setting<br>Current input 0-25mA<br>Voltage input 0-5V | SG OUT setting<br>PWM VoutR VOut |

| | | |
|---|---|---|
| | Resistance input 0-2400 Ω | For more info see the chapter Speed Governor Output |
| ❸ | Boot jumper | |

## 7.1.2. Terminals, Inputs and Outputs

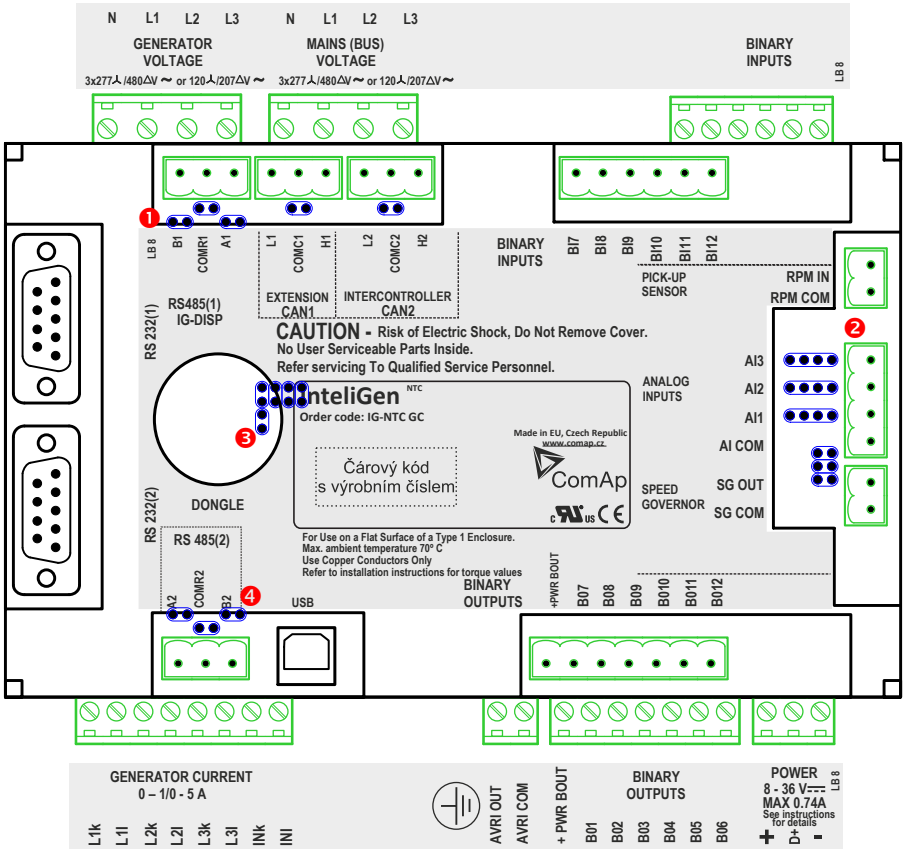
| Function | Terminals | Note |
|---|---|---|
| Generator voltage | L1,L2,L3, (N) | 3x 277 Ph-N or 480 Ph-Ph VAC (neutral not needed), max 350 / 600VAC *, CAT III |
| Mains/Bus voltage | L1,L2,L3, (N) | 3x 277 Ph-N or 480 Ph-Ph VAC (neutral not needed), max 350 / 600VAC, CAT III |
| Generator current | L1k,L1l, L2k,L2l, L3k,L3l | 0 ÷ 5 Amps, max 10 A all time, 150 A for 1 sec |
| Neutral/Mains current | LNk,LNl | 0 ÷ 5 Amps, max 10 A all time, 150 A for 1 sec |
| IG-AVRi interface | AVRI-OUT, AVRI-COM | TTL (5V PWM) interface to IG-AVRi |
| Power supply | + , - | 8 ÷ 36 VDC |
| D+ | | D plus |
| **Inputs and outputs** | | |
| Binary inputs | BI1 ÷ BI6<br>BI7 ÷ BI12 | Activation to minus power supply. |
| Binary outputs | BO1 ÷ BO6<br>BO7 ÷ BO12 | Load is connected to plus power supply. |
| Analog inputs | AI1 ÷ AI3 | Ohms, mA, Volts sensors |
| Analog outputs | SG-OUT, SG-COM | Speed governor output interface (±10V / 5V PWM; 500 – 3000Hz) |
| RPM | RPM-IN, RPM-COM | Min 2 Vpk-pk (from 4 Hz to 4 kHz) |
| **Communication interface** | | |
| RS232 (1) | D SUB9 (male) | PC: InteliMonitor, GenConfig or Modem, GSM modem or ECU (e.g. Cummins ModBus) or InteliVision 8 |
| RS485 (1) ** | A1, B1, COMR1 | IG-Display (Remote display) or InteliVision 8 (remote display) or for PC (via RS485 converter) = redirected RS232 (1) see **Basic settings:** *RS485(1)conv.* For IG-Display and InteliVision 8, the setpoint RS485 (1) conv has to be set to **DISABLED** value. |
| CAN1 | L1, H1, COMC1 | Extension modules: IS-AIN, IS-BIN,IGS-PTM, IGL-RA15, I-AOUT |
| CAN2 | L2, H2, COMC2 | Intercontroller (Load&VAR sharing, Power management) and monitoring (IG-IB, I-LB) and up to 4 InteliVision 8 displays |

**NOTE:**
* IG-MTU or IG-MTU-2-1 can be used for three wire systems, systems with separated Neutral or when galvanic separation between generator or mains voltage and controller is required.

** When more devices are connected to RS485, only one bias resistor jumpers should be closed.

# 7.2. IG-NTC GC

## 7.2.1. Schematics




| | | |
|---|---|---|
| ❶ | Left to right: Pull down Bias / 120Ω / Pull up Bias / 120Ω / 120Ω | |
| ❷ | Down: AI3 setting / AI2 setting / AI1 setting<br>Current input 0-25mA<br>Voltage input 0-5V<br>Resistance input 0-2400 Ω | SG OUT setting<br>PWM VoutR VOut<br>For more info see the chapter Speed Governor Output |
| ❸ | Boot jumper (lower one, rest of the jumpers is for internal use only) | |
| ❹ | Left to right: Pull up Bias / 120Ω / Pull down Bias | |

### 7.2.2. Terminals, Inputs and Outputs

| Function | Terminals | Note |
|---|---|---|
| Generator voltage | L1,L2,L3, (N) | 3x120 / 277 Ph-N or 208 / 480 Ph-Ph VAC<br>(neutral not needed), max 350 / 600VAC *, CAT III |
| Mains/Bus voltage | L1,L2,L3, (N) | 3x120 / 277 Ph-N or 208 / 480 Ph-Ph VAC<br>(neutral not needed), max 350 / 600VAC, CAT III |
| Generator current | L1k,L1l, L2k,L2l, L3k,L3l | 0 ÷ 5 Amps, max 10 A all time, 150 A for 1 sec<br>0 ÷ 1 Amp, max 2 Amps all time |
| Neutral/Mains current | LNk,LNl | 0 ÷ 5 Amps, max 10 A all time, 150 A for 1 sec<br>0 ÷ 1 Amp, max 2 Amps all time |
| IG-AVRi interface | AVRI-OUT, AVRI-COM | TTL (5V PWM) interface to IG-AVRi |
| Power supply | + , - | 8 ÷ 36 VDC |
| D+ | | D plus |
| Inputs and outputs | | |
| Binary inputs | BI1 ÷ BI6<br>BI7 ÷ BI12 | Activation to minus power supply. |
| Binary outputs | BO1 ÷ BO6<br>BO7 ÷ BO12 | Load is connected to plus power supply. |
| Analog inputs | AI1 ÷ AI3 | Ohms, mA, Volts sensors |
| Analog outputs | SG-OUT, SG-COM | Speed governor output interface (±10V / 5V PWM; 500 – 3000Hz) |
| RPM | RPM-IN, RPM-COM | Min 2 Vpk-pk (from 4 Hz to 4 kHz) |
| Communication interface | | |
| RS232 (1) | D SUB9 (male) | PC: InteliMonitor, GenConfig or<br>Modem, GSM modem or<br>ECU (e.g. Cummins ModBus) or InteliVision 8 |
| RS232 (2) | D SUB9 (male) | PC: InteliMonitor, GenConfig or<br>Modem, GSM modem or InteliVision 8 |
| RS485 (1) **<br>non isolated | A1, B1, COMR1 | IG-Display (Remote display) or InteliVision 8 (remote display) or<br>for PC (via RS485 converter) = redirected RS232 (1) |

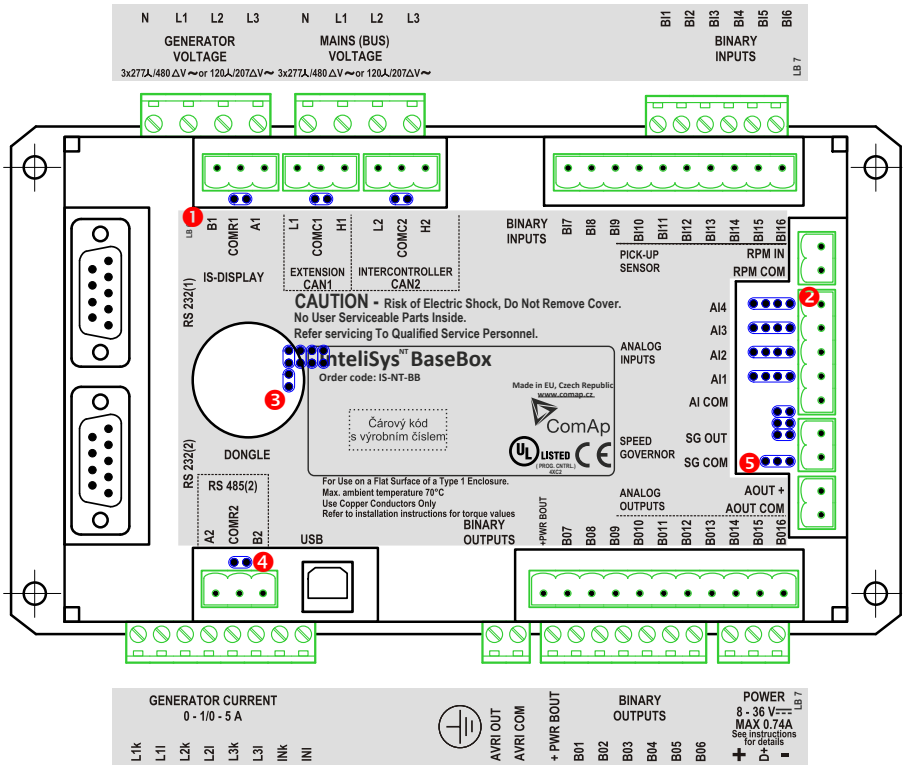
| | | |
|---|---|---|
| | | see Basic settings: *RS485(1)conv.*<br>For IG-Display and InteliVision 8, the setpoint RS485 (1) conv has to be set to DISABLED value. |
| RS485 (2) **<br>isolated | A2, B2, COMR2 | Redirected RS232 (2) - see Basic settings: *RS485(2)conv.*<br>PC: InteliMonitor, GenConfig<br>or Modem, GSM modem or InteliVision 8 |
| USB | 2.0 slave | PC: InteliMonitor, GenConfig |
| CAN1 | L1, H1, COMC1 | Extension modules: IS-AIN, IS-BIN,IGS-PTM, IGL-RA15, I-AOUT |
| CAN2 | L2, H2, COMC2 | Intercontroller (Load&VAR sharing, Power management) and monitoring (IG-IB, I-LB) and up to 4 InteliVision 8 displays |

**NOTE:**
* IG-MTU or IG-MTU-2-1 can be used for three wire systems, systems with separated Neutral or when galvanic separation between generator or mains voltage and controller is required.

** When more devices connected to RS485 bias resistor jumpers should be closed only on one of them.

# 7.3. IS-NT-BB

## 7.3.1. Schematics




| | |
|---|---|
| ❶ | Left to right: Pull down Bias / 120Ω / Pull up Bias / 120Ω / 120Ω |
| ❷ | Down: AI4 setting / AI3 setting / AI2 setting / AI1 setting<br>Current input 0-25mA<br>Voltage input 0-5V<br>Resistance input 0-2400 Ω<br>SG OUT setting<br>PWM VoutR VOut<br>For more info see the chapter Speed Governor Output |
| ❸ | Boot jumper (lower one, rest of the jumpers is for internal use only) |
| ❹ | Left to right: Pull up Bias / 120Ω / Pull down Bias |
| ❺ | AOUT setting<br>Voltage 0-10VDC<br>Current 0-20mA |

### 7.3.2. Terminals, Inputs and Outputs

| Function | Terminals | Note |
|---|---|---|
| Generator voltage | L1,L2,L3, (N) | 3x120 / 277 Ph-N or 208 / 480 Ph-Ph VAC, CAT III<br>(neutral not needed), max 350 / 600VAC * |
| Mains/Bus voltage | L1,L2,L3, (N) | 3x120 / 277 Ph-N or 208 / 480 Ph-Ph VAC<br>(neutral not needed), max 350 / 600VAC, CAT III |
| Generator current | L1k,L1l, L2k,L2l, L3k,L3l | 0 ÷ 5 Amps, max 7,5 A all time, 10 A for 1 sec<br>0 ÷ 1 Amps, max 1,5 A all time, 2 A for 30 sec |
| Neutral/Mains current | LNk,LNl | 0 ÷ 5 Amps, max 7,5 A all time, 10 A for 1 sec<br>0 ÷ 1 Amps, max 1,5 A all time, 2 A for 30 sec |
| IG-AVRi interface | AVRI-OUT, AVRI-COM | TTL (5V PWM) interface to IG-AVRi |
| Power supply | + , - | 8 ÷ 36 VDC |
| D+ | | D plus |
| Inputs and outputs | | |
| Binary inputs | BI1 ÷ BI6<br>BI7 ÷ BI16 | Activation to minus power supply. |
| Binary outputs | BO1 ÷ BO6<br>BO7 ÷ BO16 | Load is connected to plus power supply. |
| Analog inputs | AI1 ÷ AI4 | Ohms, mA, Volts sensors |
| Analog outputs | SG-OUT, SG-COM<br>AOUT+, AOUT-COM | Speed governor output interface (±10V / 5V PWM; 500 – 3000Hz)<br>Configurable analog output, mA, V. |
| RPM | RPM-IN, RPM-COM | Min 2 Vpk-pk (from 4 Hz to 4 kHz) |
| Communication interface | | |
| RS232 (1) | D SUB9 (male) | PC: InteliMonitor, GenConfig or<br>Modem, GSM modem or<br>ECU (e.g. Cummins ModBus) or InteliVision 8 |
| RS232 (2) | D SUB9 (male) | PC: InteliMonitor, GenConfig<br>or Modem, GSM modem or InteliVision 8 |

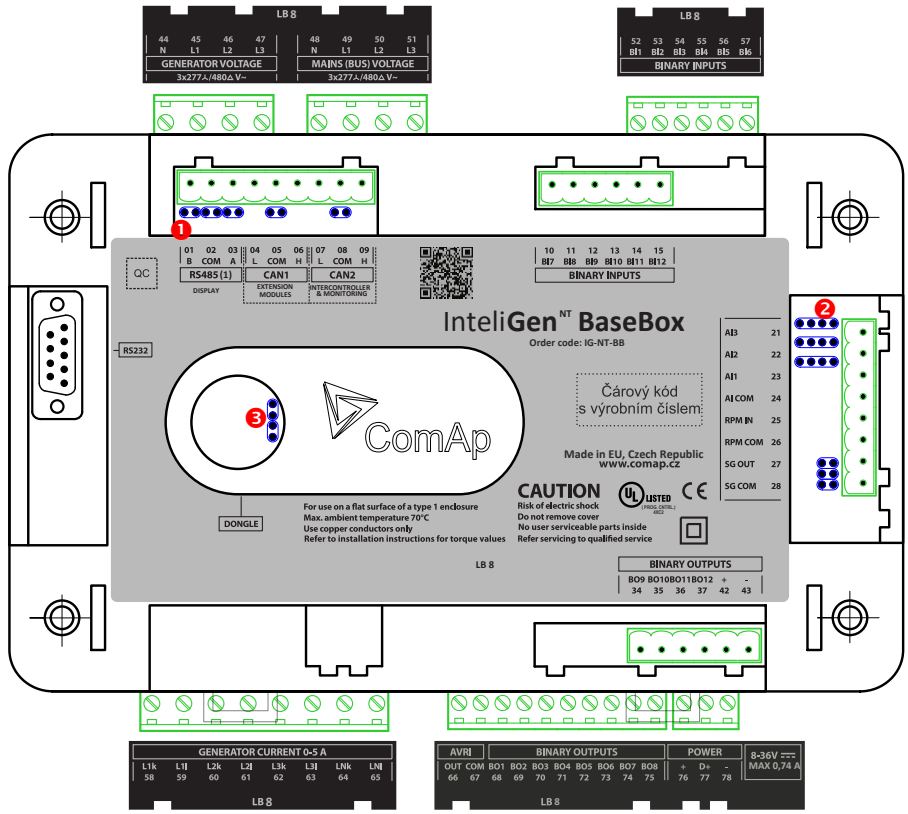
| | | |
|---|---|---|
| RS485 (1) ** | A1, B1, COMR1 | Up to 3 IS-Displays (Remote display), up to 3 InteliVision 8 displays (remote display) |
| RS485 (2) ** | A2 ,B2 ,COMR2 | Redirected RS232 (2) - see Basic settings: *RS485(2)conv.*<br>PC: InteliMonitor, GenConfig<br>or Modem, GSM modem or InteliVision 8 |
| USB<br>Non isolated | 2.0 slave | PC: InteliMonitor, GenConfig |
| CAN1 | L1, H1, COMC1 | Extension modules: IS-AIN, IS-BIN,IGS-PTM, IGL-RA15, I-AOUT |
| CAN2 | L2, H2, COMC2 | Intercontroller (Load&VAR sharing, Power management), monitoring (IG-IB, I-LB) and up to 4 InteliVision 8 |

**NOTE:**
* IG-MTU or IG-MTU-2-1 can be used for three wire systems, systems with separated Neutral or when galvanic separation between generator or mains voltage and controller is required.

** When more devices connected to RS485 bias resistor jumpers should be closed only on one of them.

# 7.4. IG-NT-BB

## 7.4.1. Schematics




| | | |
|---|---|---|
| ❶ | Left to right: Pull down Bias / 120Ω / Pull up Bias / 120Ω / 120Ω | |
| ❷ | Down: AI4 setting / AI3 setting / AI2 setting / AI1 setting<br>Current input 0-25mA<br>Voltage input 0-5V<br>Resistance input 0-2400 Ω | SG OUT setting<br>PWM VoutR VOut<br>For more info see the chapter Speed Governor Output |
| ❸ | Boot jumper (upper one, rest of the jumpers is for internal use only) | |

### 7.4.2. Terminals, Inputs and Outputs

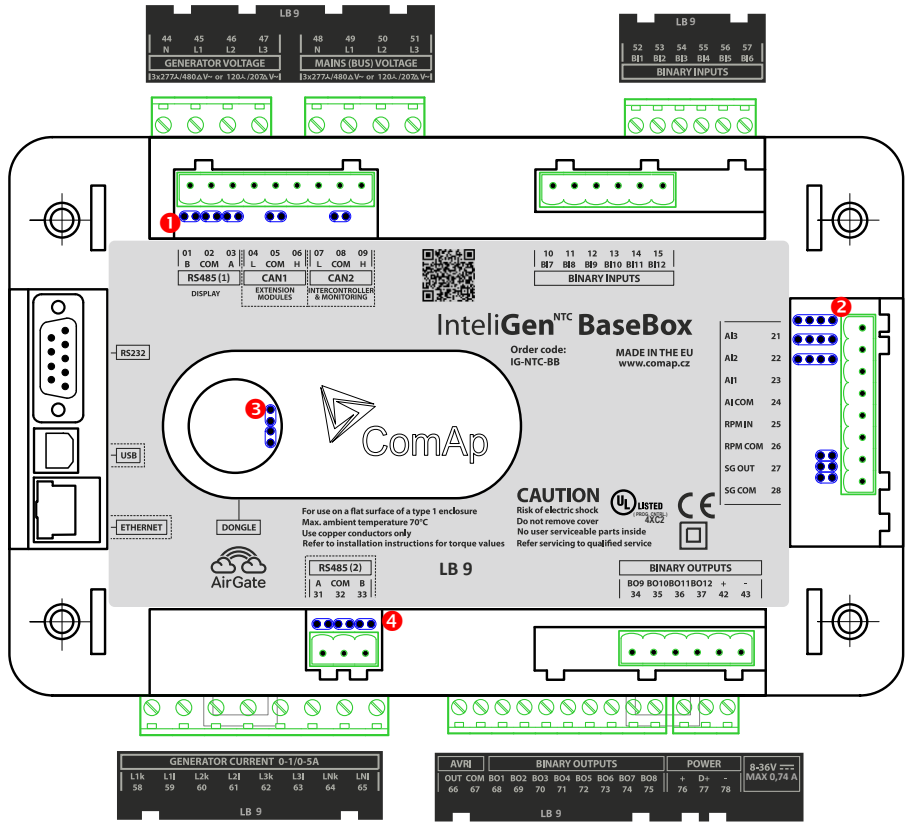
| Function | Terminals | Note |
|---|---|---|
| Mains voltage | L1,L2,L3, (N) | 277 Ph-N or 480 Ph-Ph VAC (neutral not needed), max 600VAC *, CAT III |
| Bus voltage | L1,L2,L3, (N) | 277 Ph-N or 480 Ph-Ph VAC (neutral not needed), max 600VAC, CAT III |
| Generator current | L1k,L1l, L2k,L2l, L3k,L3l | 0 ÷ 5 Amps, max 10 A all time, 150 A for 1 sec |
| Neutral/Mains current | INk,INl | 0 ÷ 5 Amps, max 10 A all time, 150 A for 1 sec |
| IG-AVRi interface | AVRI-OUT, AVRI-COM | TTL (5V PWM) interface to IG-AVRi |
| Power supply | + , - | 8 ÷ 36 VDC |
| D+ | | D plus |
| **Inputs and outputs** | | |
| Binary inputs | BI1 ÷ BI6 | Activation to minus power supply. |
| Binary outputs | BO1 ÷ BO6<br>BO7 ÷ BO12 | Load is connected to plus or minus power supply (defined in GenConfig). |
| Analog inputs | AI1 ÷ AI3 | Ohms, mA, Volts sensors |
| Analog outputs | SG-OUT, SG-COM | Speed governor output interface (±10V / 5V PWM; 500 – 3000Hz) |
| RPM | RPM-IN, RPM-COM | Min 2 Vpk-pk (from 4 Hz to 4 kHz) |
| **Communication interface** | | |
| RS232 (1) | D SUB9 (male) | PC: InteliMonitor, GenConfig or Modem, GSM modem or ECU (e.g. Cummins ModBus) or InteliVision 8 |
| RS485 (Display) ** non isolated | A , B, COM | IG-Display (Remote display) or InteliVision 8 (remote display) or for PC (via RS485 converter) = redirected RS232 (1) see **Basic settings:** *RS485(1)conv.* For IG-Display and InteliVision 8, the setpoint RS485 (1) conv has to be set to **DISABLED** value. |
| CAN1 | L, H, COM | Extension modules: IS-AIN8, IS-BIN16/8,IGS-PTM, IGL-RA15, I-AOUT8, ECU |
| CAN2 | L, H, COM | Intercontroller (Load&VAR sharing, Power management) and monitoring (IG-IB, I-LB) and up to 4 InteliVision 8 displays |

**NOTE:**
* IG-MTU or IG-MTU-2-1 can be used for three wire systems, systems with separated Neutral or when galvanic separation between generator or mains voltage and controller is required.

** When more devices connected to RS485 bias resistor jumpers should be closed only on one of them.

# 7.5. IG-NTC-BB

## 7.5.1. Schematics




| | | |
|---|---|---|
| ❶ | Left to right: Pull down Bias / 120Ω / Pull up Bias / 120Ω / 120Ω | |
| ❷ | Down: AI4 setting / AI3 setting / AI2 setting / AI1 setting<br>Current input 0-25mA<br>Voltage input 0-5V<br>Resistance input 0-2400 Ω | SG OUT setting<br>PWM VoutR VOut<br>For more info see the chapter Speed Governor Output |
| ❸ | Boot jumper (upper one, rest of the jumpers is for internal use only) | |
| ❹ | Left to right: Pull up Bias / 120Ω / Pull down Bias | |

### 7.5.2. Terminals, Inputs and Outputs

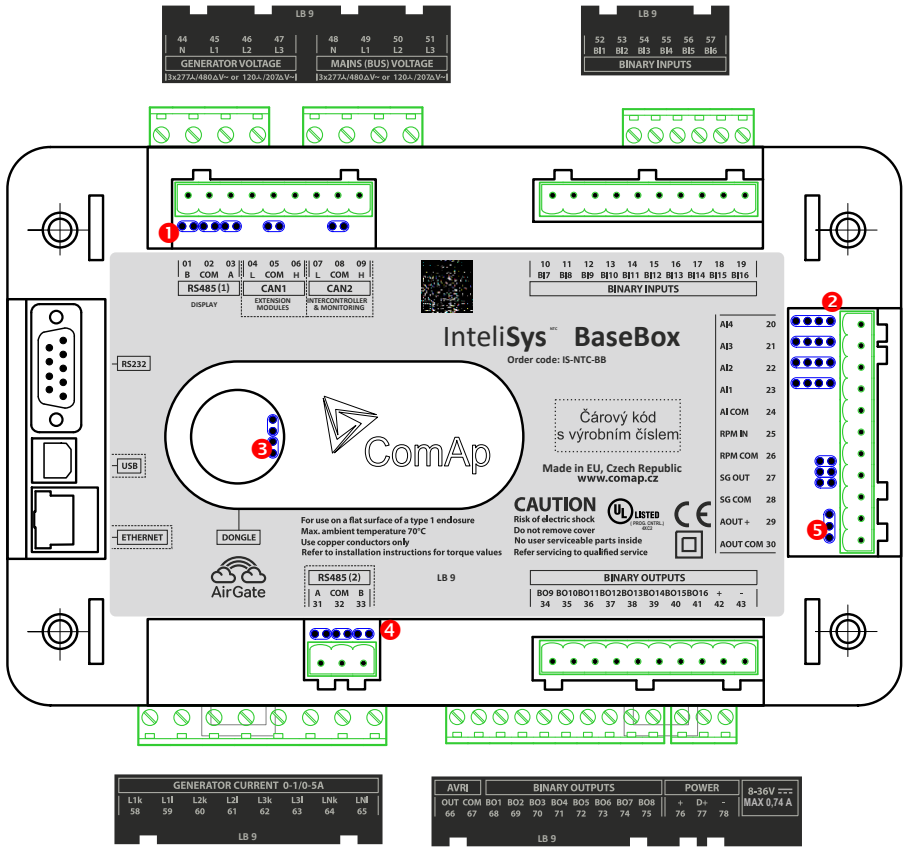
| Function | Terminals | Note |
|---|---|---|
| Generator voltage | L1,L2,L3, (N) | 3x120 / 277 Ph-N or 207 / 480 Ph-Ph VAC (neutral not needed), max 350 / 600VAC *, CAT III |
| Mains/Bus voltage | L1,L2,L3, (N) | 3x120 / 277 Ph-N or 207 / 480 Ph-Ph VAC (neutral not needed), max 350 / 600VAC, CAT III |
| Generator current | L1k,L1l, L2k,L2l, L3k,L3l | 0 ÷ 5 Amps, max 10 A all time, 150 A for 1 sec<br>0 ÷ 1 Amp, max 2 Amps all time |
| Neutral/Mains current | LNk,LNl | 0 ÷ 5 Amps, max 10 A all time, 150 A for 1 sec<br>0 ÷ 1 Amp, max 2 Amps all time |
| IG-AVRi interface | AVRI-OUT, AVRI-COM | TTL (5V PWM) interface to IG-AVRi |
| Power supply | + , - | 8 ÷ 36 VDC |
| D+ | | D plus |
| **Inputs and outputs** | | |
| Binary inputs | BI1 ÷ BI6<br>BI7 ÷ BI12 | Activation to minus power supply. |
| Binary outputs | BO1 ÷ BO6<br>BO7 ÷ BO12 | Load is connected to plus or to minus power supply. (defined in GenConfig). |
| Analog inputs | AI1 ÷ AI4 | Ohms, mA, Volts sensors |
| Analog outputs | SG-OUT, SG-COM | Speed governor output interface (±10V / 5V PWM; 500 – 3000Hz) |
| RPM | RPM-IN, RPM-COM | Min 2 Vpk-pk (from 4 Hz to 4 kHz) |
| **Communication interface** | | |
| RS232 (1) | D SUB9 (male) | PC: InteliMonitor, GenConfig or Modem, GSM modem or ECU (e.g. Cummins ModBus) or InteliVision 8 |
| RS485 (Display) ** | A, B, COM | Up to 3 IS-Displays (Remote display), up to 3 InteliVision 8 displays (remote display) or 3 InteliVision 5. |
| RS485 (2) ** | A ,B ,COM | Redirected RS232 (2) – see **Basic settings:** *RS485(2)conv.*<br>PC: InteliMonitor, GenConfig or Modem, GSM modem or InteliVision 8 |
| USB Electrical isolated | 2.0 slave | PC: InteliMonitor, GenConfig |
| CAN1 | L, H, COM | Extension modules: IS-AIN, IS-BIN,IGS-PTM, IGL-RA15, I-AOUT |
| CAN2 | L, H, COM | Intercontroller (Load&VAR sharing, Power management), monitoring (IG-IB, I-LB) and up to 4 InteliVision 8 |
| RJ45 (Ethernet) | Ethernet cable | Remote monitoring via Ethernet, InteliMonitor, WebSupervisor and etc… |

**NOTE:**
* IG-MTU or IG-MTU-2-1 can be used for three wire systems, systems with separated Neutral or when galvanic separation between generator or mains voltage and controller is required.

** When more devices connected to RS485 bias resistor jumpers should be closed only on one of them.

# 7.6. IS-NTC-BB

## 7.6.1. Schematics




| | | |
|---|---|---|
| ❶ | Left to right: Pull down Bias / 120Ω / Pull up Bias / 120Ω / 120Ω | |
| ❷ | Down: AI4 setting / AI3 setting / AI2 setting / AI1 setting<br>Current input 0-25mA<br>Voltage input 0-5V | SG OUT setting<br>PWM VoutR VOut |

| | | |
|---|---|---|
| |  Resistance input 0-2400 Ω | For more info see the chapter Speed Governor Output |
| ❸ | Boot jumper (upper one, rest of the jumpers is for internal use only) | |
| ❹ | Left to right: Pull up Bias / 120Ω / Pull down Bias | |
| ❺ | AOUT setting<br>  Voltage 0-10VDC  Current 0-20mA | |

## 7.6.2. Terminals, Inputs and Outputs

| Function | Terminals | Note |
|---|---|---|
| Generator voltage | L1,L2,L3, (N) | 3x120 / 277 Ph-N or 207 / 480 Ph-Ph VAC<br>(neutral not needed), max 350 / 600VAC *, CAT III |
| Mains/Bus voltage | L1,L2,L3, (N) | 3x120 / 277 Ph-N or 207 / 480 Ph-Ph VAC<br>(neutral not needed), max 350 / 600VAC, CAT III |
| Generator current | L1k,L1l, L2k,L2l, L3k,L3l | 0 ÷ 5 Amps, max 10 A all time, 150 A for 1 sec<br>0 ÷ 1 Amp, max 2 Amps all time |
| Neutral/Mains current | LNk,LNl | 0 ÷ 5 Amps, max 10 A all time, 150 A for 1 sec<br>0 ÷ 1 Amp, max 2 Amps all time |
| IG-AVRi interface | AVRI-OUT, AVRI-COM | TTL (5V PWM) interface to IG-AVRi |
| Power supply | + , - | 8 ÷ 36 VDC |
| D+ | | D plus |
| Inputs and outputs | | |
| Binary inputs | BI1 ÷ BI6<br>BI7 ÷ BI16 | Activation to minus power supply. |
| Binary outputs | BO1 ÷ BO6<br>BO7 ÷ BO16 | Load is connected to plus or to minus power supply. (defined in GenConfig). |
| Analog inputs | AI1 ÷ AI4 | Ohms, mA, Volts sensors |
| Analog outputs | SG-OUT, SG-COM<br>AOUT+, AOUT-COM | Speed governor output interface (±10V / 5V PWM; 500 – 3000Hz)<br>Configurable analog output, mA, V. |
| RPM | RPM-IN, RPM-COM | Min 2 Vpk-pk (from 4 Hz to 4 kHz) |
| Communication interface | | |
| RS232 (1) | D SUB9 (male) | PC: InteliMonitor, GenConfig or |

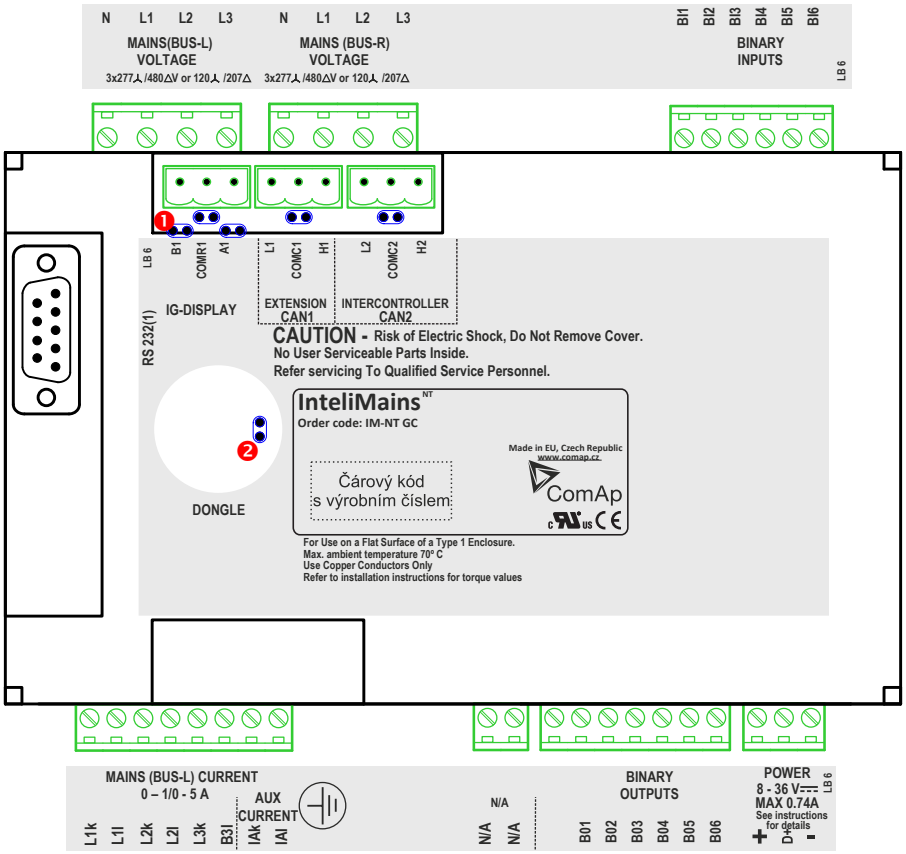
| | | |
|---|---|---|
| | | Modem, GSM modem or<br>ECU (e.g. Cummins ModBus) or InteliVision 8 |
| RS485 (Display) ** | A, B, COM | Up to 3 IS-Displays (Remote display), up to 3 InteliVision 8 displays (remote display) or 3 InteliVision 5. |
| RS485 (2) ** | A ,B ,COM | Redirected RS232 (2) – see Basic settings: *RS485(2)conv.*<br>PC: InteliMonitor, GenConfig<br>or Modem, GSM modem or InteliVision 8 |
| USB<br>Electrical isolated | 2.0 slave | PC: InteliMonitor, GenConfig |
| CAN1 | L, H, COM | Extension modules: IS-AIN, IS-BIN,IGS-PTM, IGL-RA15, I-AOUT |
| CAN2 | L, H, COM | Intercontroller (Load&VAR sharing, Power management), monitoring (IG-IB, I-LB) and up to 4 InteliVision 8 |
| RJ45 (Ethernet) | Ethernet cable | Remote monitoring via Ethernet, InteliMonitor, WebSupervisor and etc… |

**NOTE:**
* IG-MTU or IG-MTU-2-1 can be used for three wire systems, systems with separated Neutral or when galvanic separation between generator or mains voltage and controller is required.

** When more devices connected to RS485 bias resistor jumpers should be closed only on one of them.

# 7.7. IM-NT

## 7.7.1. Schematics




| | |
|---|---|
| ❶ | Left to right: Pull down Bias / 120Ω / Pull up Bias / 120Ω / 120Ω |
| ❷ | Boot jumper |

## 7.7.2. Terminals, Inputs and Outputs

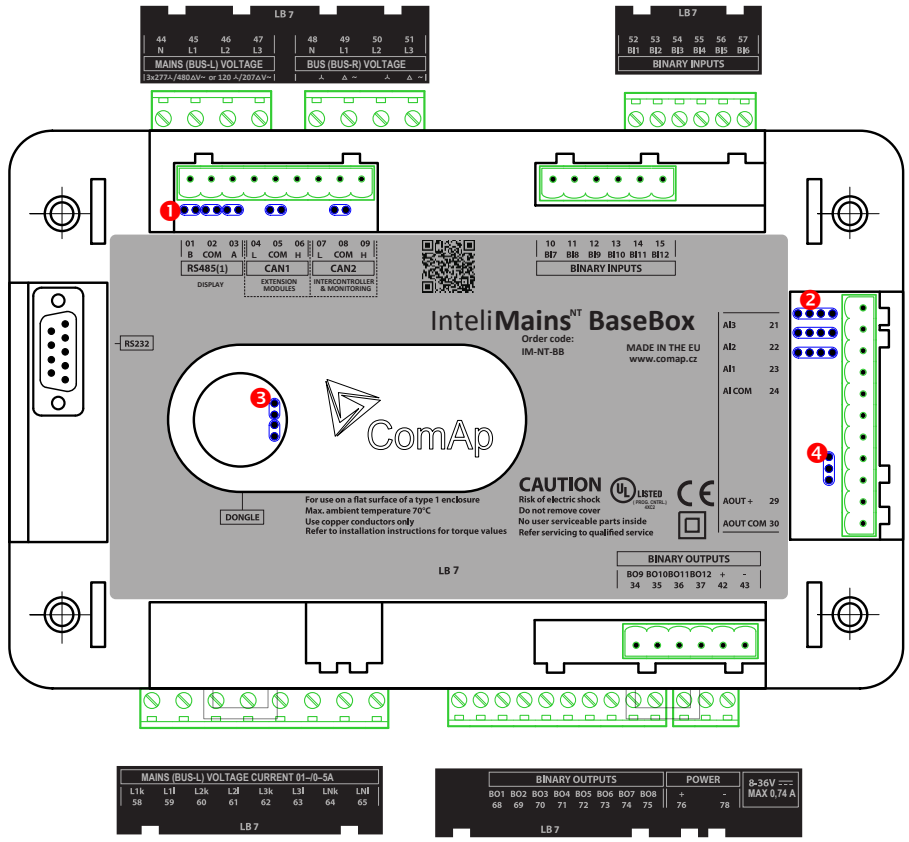
| Function | Terminals | Note |
|---|---|---|
| Mains voltage | L1,L2,L3, (N) | 3x120 / 277 Ph-N or 207 / 480 Ph-Ph VAC (neutral not needed), max 350 / 600VAC*, CAT III |
| Bus voltage | L1,L2,L3, (N) | 3x120 / 277 Ph-N or 207 / 480 Ph-Ph VAC (neutral not needed), max 350 / 600VAC, CAT III |
| Mains current | L1k,L1l, L2k,L2l, L3k,L3l | 0 ÷ 5 Amps, max 10 A all time, 150 A for 1 sec<br>0 ÷ 1 Amp, max 2 Amps all time |
| Aux current | IAk,IAl | 0 ÷ 5 Amps, max 10 A all time, 150 A for 1 sec<br>0 ÷ 1 Amp, max 2 Amps all time |
| Power supply | + , - | 8 ÷ 36 VDC |
| **Inputs and outputs** | | |
| Binary inputs | BI1 ÷ BI6 | Activation to minus power supply. |
| Binary outputs | BO1 ÷ BO6 | Load is connected to plus power supply. |
| **Communication interface** | | |
| RS232 (1) | D SUB9 (male) | PC: InteliMonitor, GenConfig or Modem, GSM modem or ECU (e.g. Cummins ModBus) or InteliVision 8 |
| RS232(2) | None | |
| RS485 (1) ** non isolated | A1, B1 ,COMR1 | IG-Display (Remote display) or InteliVision 8 (remote display) or for PC (via RS485 converter) = redirected RS232 (1)<br>see **Basic settings:** *RS485(1)conv.*<br>For IG-Display and InteliVision 8, the setpoint RS485 (1) conv has to be set to **DISABLED** value. |
| CAN1 | L1, H1, COMC1 | Extension modules: IS-AIN8, IS-BIN16/8,IGS-PTM, IGL-RA15, I-AOUT8 |
| CAN2 | L2, H2, COMC2 | Intercontroller (Load&VAR sharing, Power management) and monitoring (IG-IB, I-LB) and up to 4 InteliVision 8 displays |

**NOTE:**
* IG-MTU or IG-MTU-2-1 can be used for three wire systems, systems with separated Neutral or when galvanic separation between generator or mains voltage and controller is required.

** When more devices connected to RS485 bias resistor jumpers should be closed only on one of them.

# 7.8. IM-NT-BB

## 7.8.1. Schematics




| | |
|---|---|
| 1 | Left to right: Pull down Bias / 120Ω / Pull up Bias / 120Ω / 120Ω |
| 2 | Down: AI4 setting / AI3 setting / AI2 setting / AI1 setting<br>Current input 0-25mA<br>Voltage input 0-5V<br>Resistance input 0-2400 Ω |
| 3 | Boot jumper (upper one, rest of the jumpers is for internal use only) |
| 4 | AOUT setting<br>Voltage 0-10VDC  Current 0-20mA |

## 7.8.2. Terminals, Inputs and Outputs

| Function | Terminals | Note |
|---|---|---|
| Mains voltage | L1,L2,L3, (N) | 3x120 / 277 Ph-N or 207 / 480 Ph-Ph VAC (neutral not needed), max 350 / 600VAC*, CAT III |
| Bus voltage | L1,L2,L3, (N) | 3x120 / 277 Ph-N or 207 / 480 Ph-Ph VAC (neutral not needed), max 350 / 600VAC, CAT III |
| Mains current | L1k,L1l, L2k,L2l, L3k,L3l | 0 ÷ 5 Amps, max 10 A all time, 150 A for 1 sec<br>0 ÷ 1 Amp, max 2 Amps all time |
| Aux current | IAk,IAl | 0 ÷ 5 Amps, max 10 A all time, 150 A for 1 sec<br>0 ÷ 1 Amp, max 2 Amps all time |
| Power supply | + , - | 8 ÷ 36 VDC |
| **Inputs and outputs** | | |
| Binary inputs | BI1 ÷ BI12 | Activation to minus power supply. |
| Binary outputs | BO1 ÷ BO12 | Load is connected to plus power supply. |
| Analog inputs | AI1 ÷ AI3 | Ohms, mA, Volts sensors |
| Analog outputs | AOUT-, AOUT-COM | Configurable analog output, mA, V. |
| | | |
| **Communication interface** | | |
| RS232 (1) | D SUB9 (male) | PC: InteliMonitor, GenConfig or Modem, GSM modem or ECU (e.g. Cummins ModBus) or InteliVision 8 |
| RS485 (Display) ** | A1,B1,COMR1 | Up to 3 IS-Displays (Remote display), up to 3 InteliVision 8 displays (remote display) or 3 InteliVision 5. |
| RS485 (2) ** | A2,B2,COMR2 | Redirected RS232 (2) – see **Basic settings:** *RS485(2)conv.*<br>PC: InteliMonitor, GenConfig or Modem, GSM modem or InteliVision 8 |
| USB<br>Electrical isolated | 2.0 slave | PC: InteliMonitor, GenConfig |
| CAN1 | L1,H1,COMC1 | Extension modules: IS-AIN, IS-BIN,IGS-PTM, IGL-RA15, I-AOUT |
| CAN2 | L2,H2,CONC2 | Intercontroller (Load&VAR sharing, Power management), monitoring (IG-IB, I-LB) and up to 4 InteliVision 8 |
| RJ45 (Ethernet) | Ethernet cable | Remote monitoring via Ethernet, InteliMonitor, WebSupervisor and etc… |

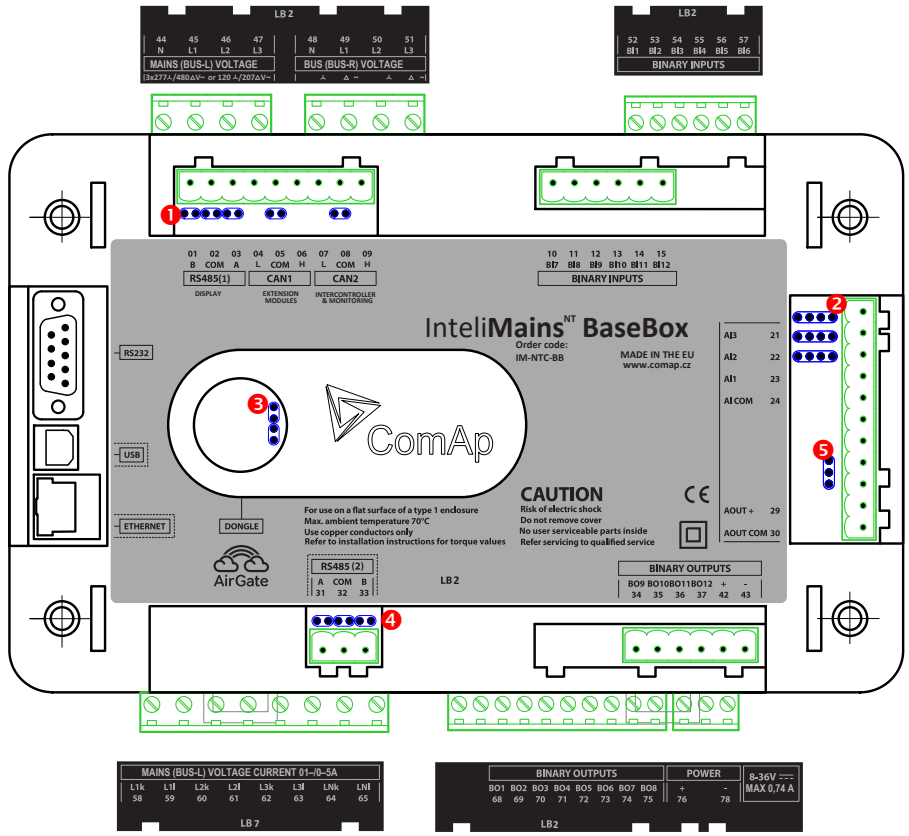
**NOTE:**
Light blue – IM-NTC-BB only.

* IG-MTU or IG-MTU-2-1 can be used for three wire systems, systems with separated Neutral or when galvanic separation between generator or mains voltage and controller is required.

** When more devices connected to RS485 bias resistor jumpers should be closed only on one of them.

# 7.9. IM-NTC-BB

## 7.9.1. Schematics




| | |
|---|---|
| ❶ | Left to right: Pull down Bias / 120Ω / Pull up Bias / 120Ω / 120Ω |
| ❷ | Down: AI4 setting / AI3 setting / AI2 setting / AI1 setting<br>Current input 0-25mA<br>Voltage input 0-5V<br>Resistance input 0-2400 Ω |
| ❸ | Boot jumper (upper one, rest of the jumpers is for internal use only) |
| ❹ | Left to right: Pull up Bias / 120Ω / Pull down Bias |
| ❺ | AOUT setting<br>Voltage 0-10VDC<br>Current 0-20mA |

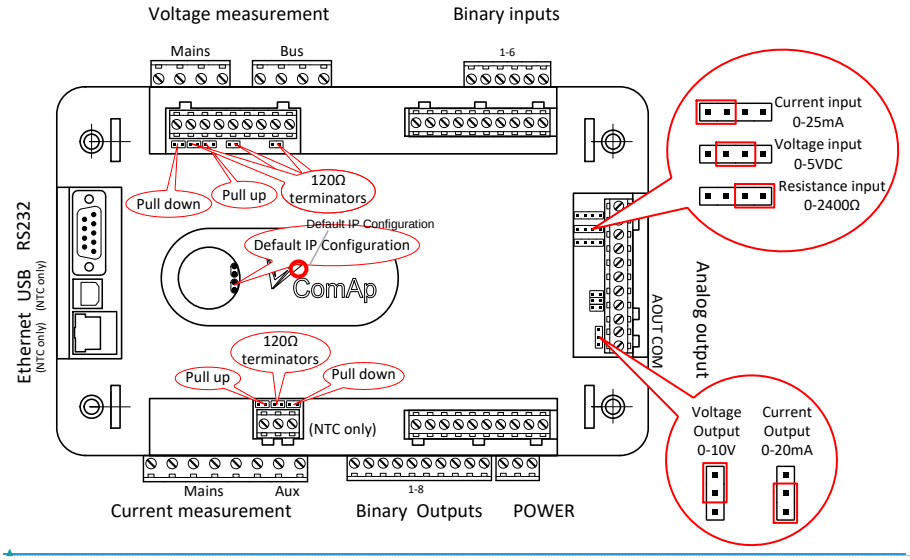
# 7.10. General Jumper Settings

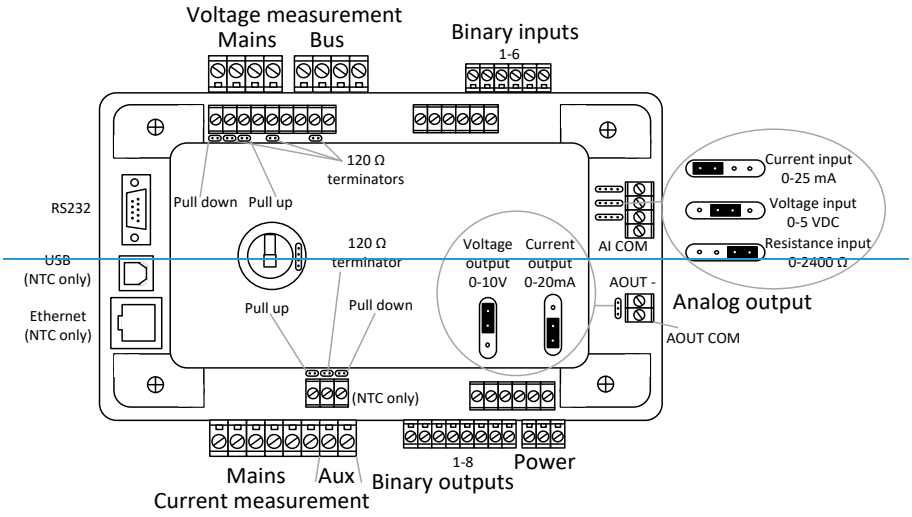
## 7.10.1. Analog Inputs and Outputs

This schematic shows general jumper settings of Analog Inputs and Outputs for all the controllers. Some components are available only for specific controllers (refer to the information above).

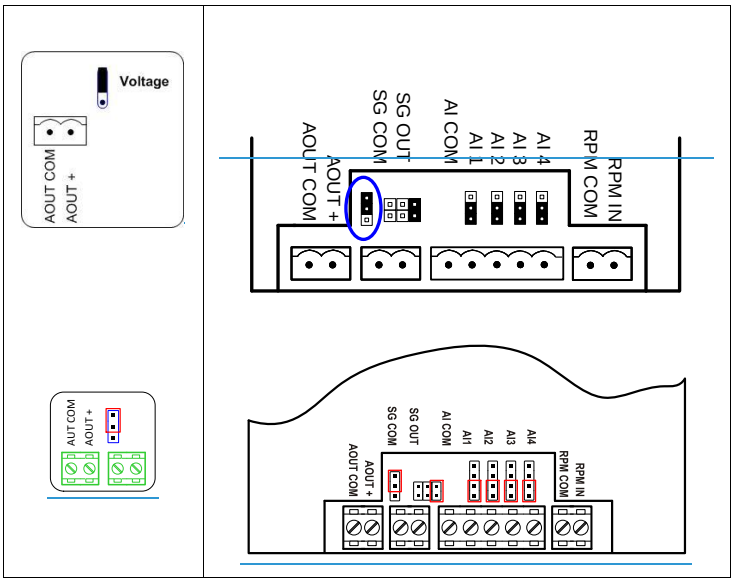
### 7.10.1.1. IS-NTC-BB (and IG-NT-BB, IG-NTC-BB, IM-NT-BB and IM-NTC-BB)

Field Code Changed



### 7.10.1.2. IS-NT-BB (and IG-NT, IG-NTC, IM-NT)

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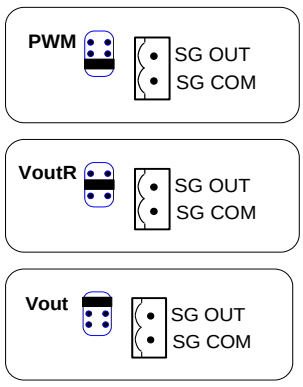
**NOTE:**
Jumper settings for Analog Inputs and Outputs is the same for all the controllers. Not all analog inputs and outputs are available in all hardware modifications.

AOUT COM is internally connected to controller 0 VDC power supply.

## 7.10.2. Speed Governor Output




Pulse Width Modulation 500÷3000 Hz / 5V / 10mA max (default frequency 1200 Hz, may be changed by setpoint
**Sync/Load ctrl:***SpdGovPWM rate*)

V-outR range: ± 10 VDC via 10 kΩ

V-out range: ± 10 VDC

***HINT***
SG COM is internally connected to controller 0VDC power supply. IS-NT-BB and IS-NTC-BB have the same jumper position.

# 8. Measurement and Power Supply Wiring

## 8.1. 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 the length is more than 3 m.

Tightening torque, allowable wire size and type, for the Field-Wiring Terminals:

- For Mains(Bus) Voltage, Generator Voltage a Current terminals
  - Specified tightening torque is 0,56Nm (5,0 In-lb)
  - Use only diameter 2,0-0,5mm (12-26AWG) conductor, rated for 90°C minimum.

- For other controller field wiring terminals
  - Specified tightening torque 0,79Nm (7,0 In-lb)
  - Use only diameter 2,0-0,5mm (12-26AWG) conductor, rated for 75°C minimum.
  - Use copper conductors only.

## 8.2. Grounding

The shortest possible piece of wire should be used for controller grounding. Use cable min. 2.5 $mm^2$. A brass M4x10 screw with star washer securing ring type grounding terminal shall be used.

The negative "-" battery terminal must be properly grounded.

**Switchboard and engine must be grounded at a common point. Use as short a cable as possible to the grounding point.**

## 8.3. Power supply

To ensure proper function:

- Use power supply cable min. 2,5 $mm^2$
- Use fuse 2 amps for IGS-NT
- Maximal continuous DC power supply voltage is 36VDC.

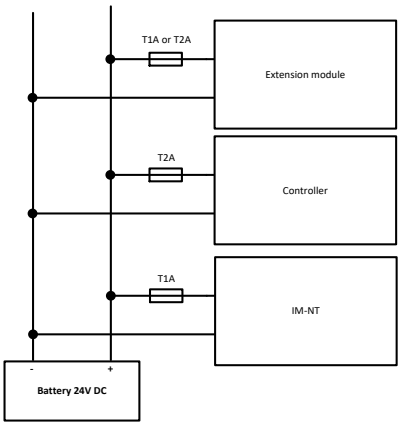
**CAUTION!**
Switchboard lightning strikes protection according standard regulation is expected!!!

The maximum allowable current through the controller negative terminal is 3 to 8A (depends on the
controller type and binary output load).

## 8.4. Power supply fusing

Always use according fuse (1Amp or 2Amps) when connection controller, extension modules or relays to a power source.

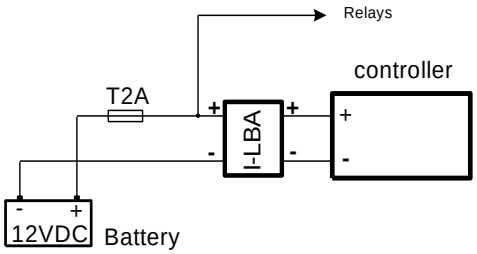
See the diagram for proper fusing.




For more extension units use separate fusing according to the table above.

Controller power supply should never be connected to starter terminals.

For the connections with 12VDC power supply an I-LBA module can be connected to controller power terminals in order to allow the controller to continue operation during cranking if the battery voltage dip occurs. In this case, it is not recommended to use +PWR BOUT outputs on the controller as a source for relays, as their consumption would exhaust I-LBA capacitors very fast.




## 8.5. Magnetic pick-up

To ensure proper function:

Use a shielded cable.

Take care to interference signal when one common speed pick-up is used for both Speed governor and Controller. When some problems occur:

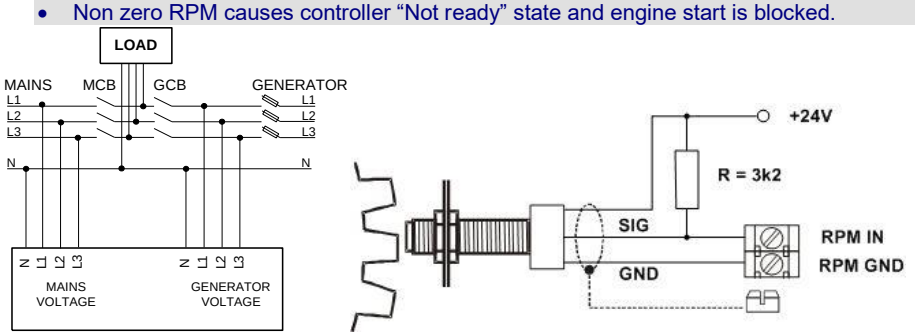
- check grounding connection from pick-up to controllers, disconnect ground connection to one of them.
- use separate pick-up for Speed governor and Controller.

Controller indicates "Sd Underspeed" + "Pickup fault" after engine start when the pickup signal is good for start and low speed but too strong for higher speed (loss of signal due to RPM input saturation).

Increase gap between pickup and engine flywheel or change pickup type.

***HINT***
If RPM is measured from the generator voltage (Gear teeth = 0), controller can detect RPM on no running gen-set when:

- Controller generator voltage terminals are opened (e.g. due to opening of fuse switch)
- Non zero RPM causes controller “Not ready” state and engine start is blocked.




Active NPN pick-up sensor recommended connection

# 8.6. Voltage and current inputs

## 8.6.1. Measurement Wiring

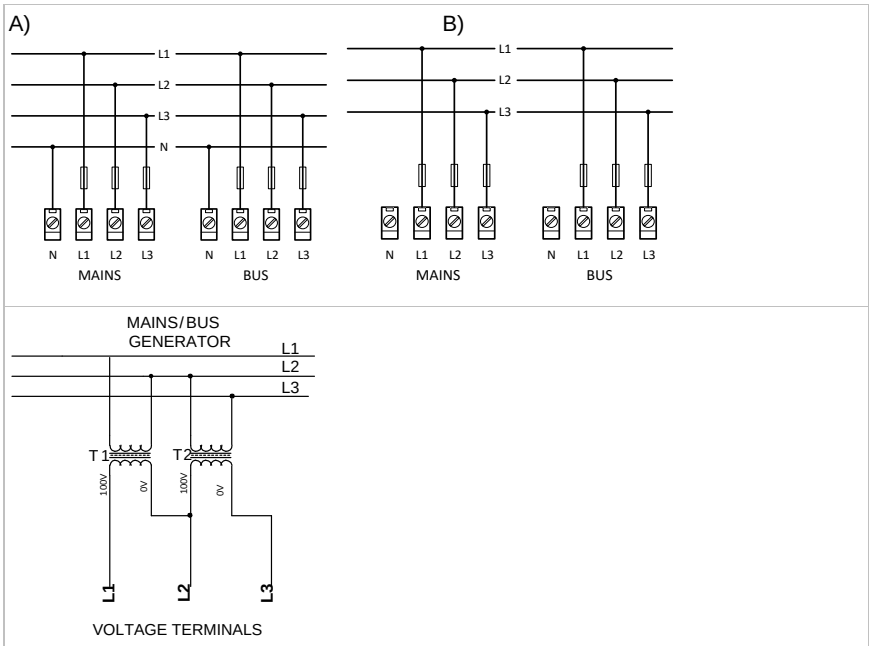
**WARNING!**
Risk of personal injury due to electric shock when manipulating voltage terminals under voltage! Be sure the terminals are not under voltage before touching them.

**WARNING!**
Do not open the secondary circuit of current transformers when the primary circuit is closed!!! Open the primary circuit first!

Use **1.5 mm²** cables for voltage connection and **2.5 mm²** for current transformers connection.

Adjust nominal voltage, nominal current, CT ratio and PT ratio by appropriate setpoints in the Basic Settings group.

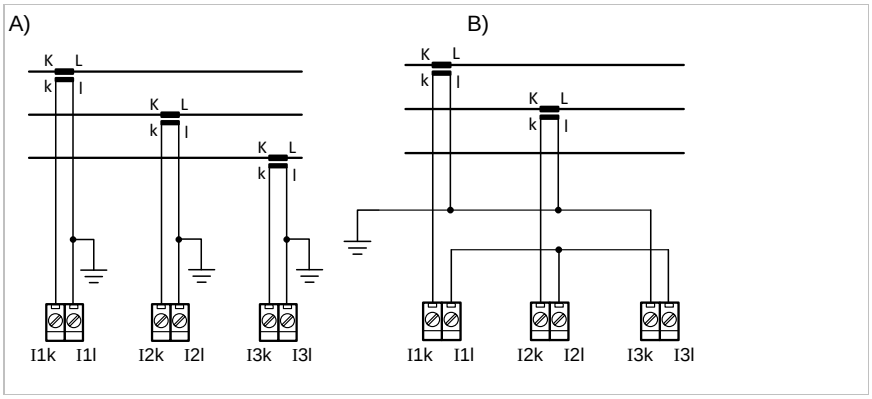
VOLTAGE MEASUREMENT WIRING




Principle of two transformers measuring

- typical wiring for high voltage application
spare of one transformer.

## CURRENT MEASUREMENT WIRING




**CAUTION!**
Check measurement connections carefully! Failure is possible if phases are connected in wrong order (WrongPhSequence detected by the controller) but this is not detected if the phases are just rotated (i.e. instead of phase sequence L1, L2, L3, phase sequence is e.g. L2, L3, L1.

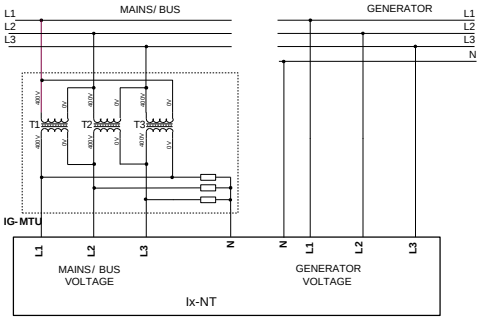
## 8.6.2. Voltage measurement separation

For optional separation of Mains/bus and generator voltage from the controller (e.g. on ships) use IG-MTU.

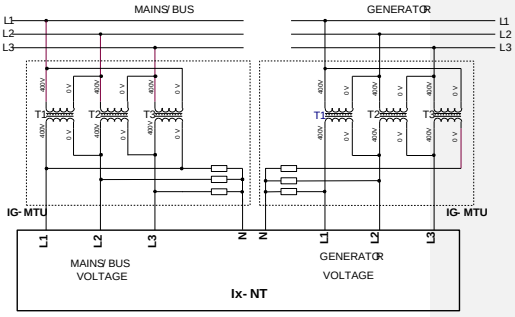
### 8.6.2.1. IG MTU

Connect one or two IG-MTU units to separate generator and Mains/bus voltage from controller.

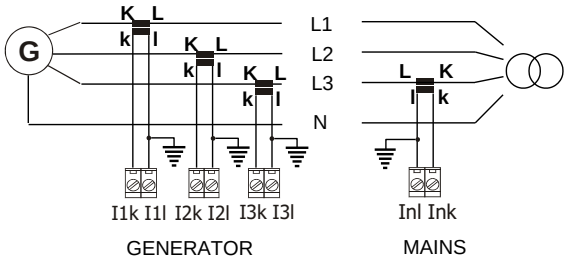
Three wire mains




Three wire mains and three wire genset or electric separation



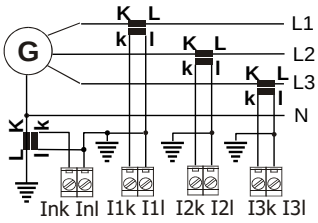

## 8.6.3. Mains power and PF measuring in IGS (e.g. SPtM application)



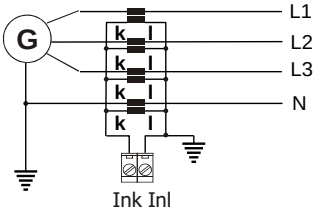

## 8.6.4. Earth fault protection (e.g. MINT application)

Earth fault current protection is active only when **Process control:** *IE measurement* = ANALOG INPUT or NONE.

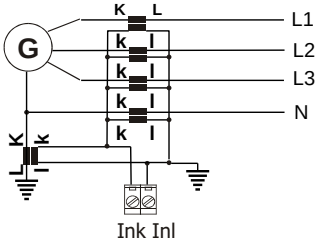
Connect separate current transformer to gen-set neutral. Adjust *EarthFltCurrCT* in **Basic settings** and *EarthFaultCurr* and *EthFltCurr del* limits in **Generator protection** group.



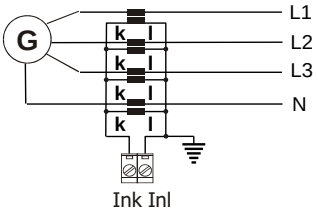

The simplest arrangement covers all zones from the generator windings to the final circuits in the load network.




This arrangement covers earth faults in the load network only.



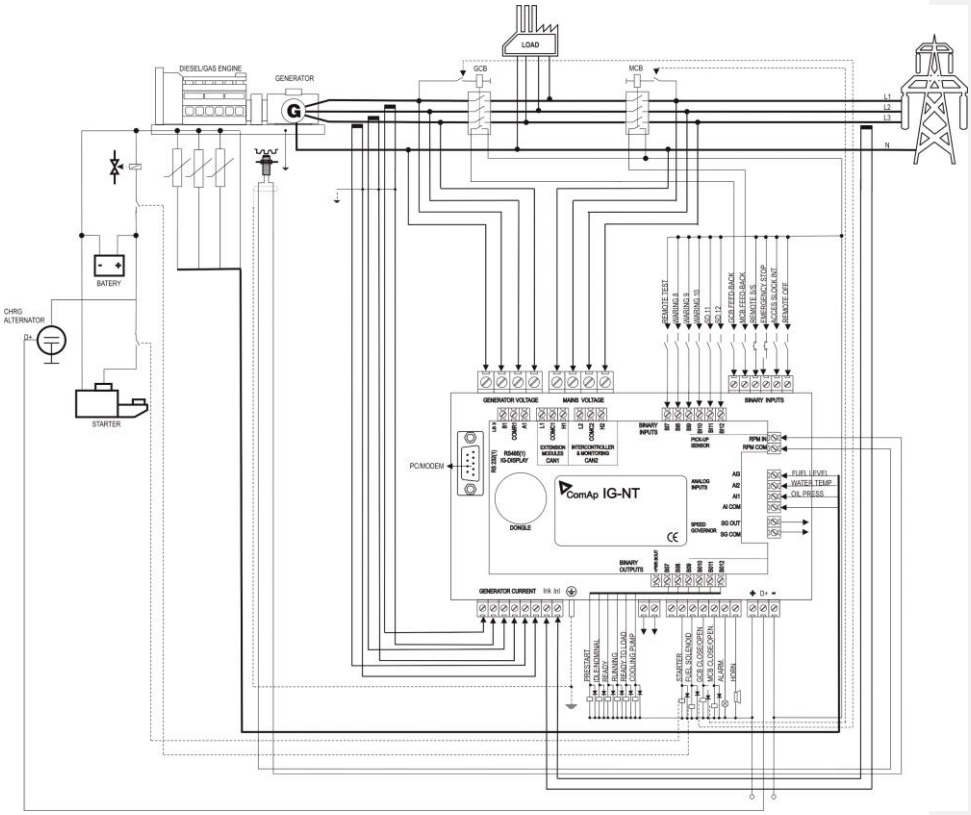

This arrangement necessary for restricted earth fault protection. The location of the neutral earthing point in relation to the protection current transformers in the neutral conductor determines whether four or five current transformers are employed.



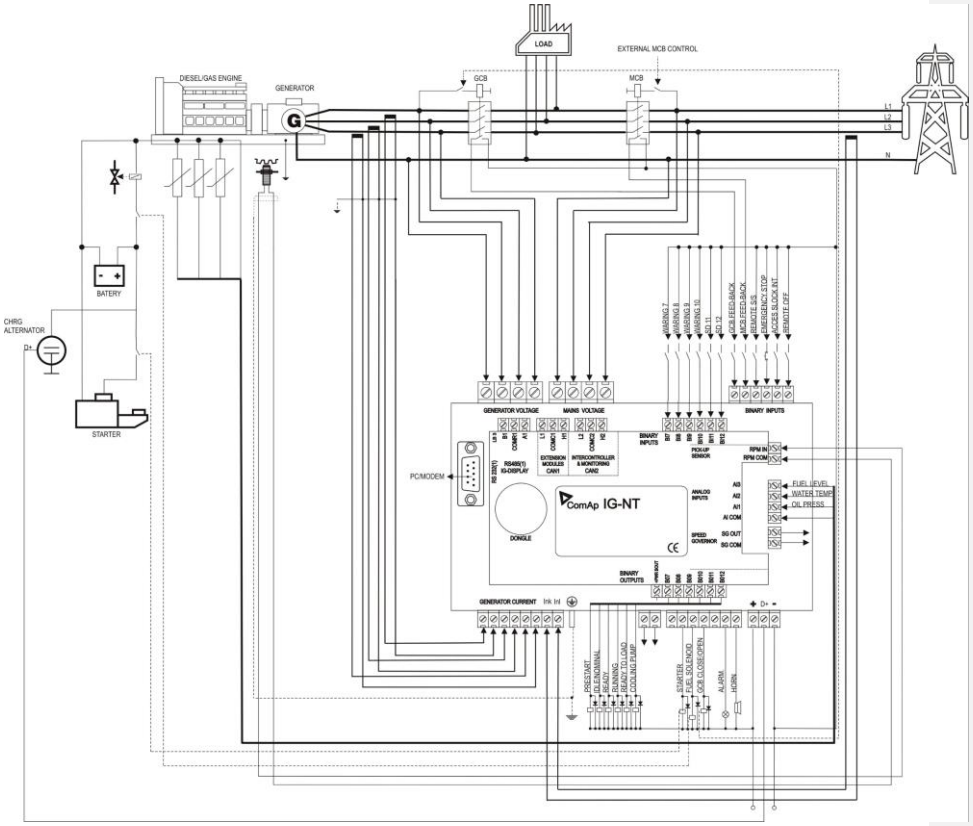

This arrangement necessary for restricted earth fault protection. The location of the neutral earthing point in relation to the protection current transformers in the neutral conductor determines whether four or five current transformers are employed.

# 9. Recommended Wiring

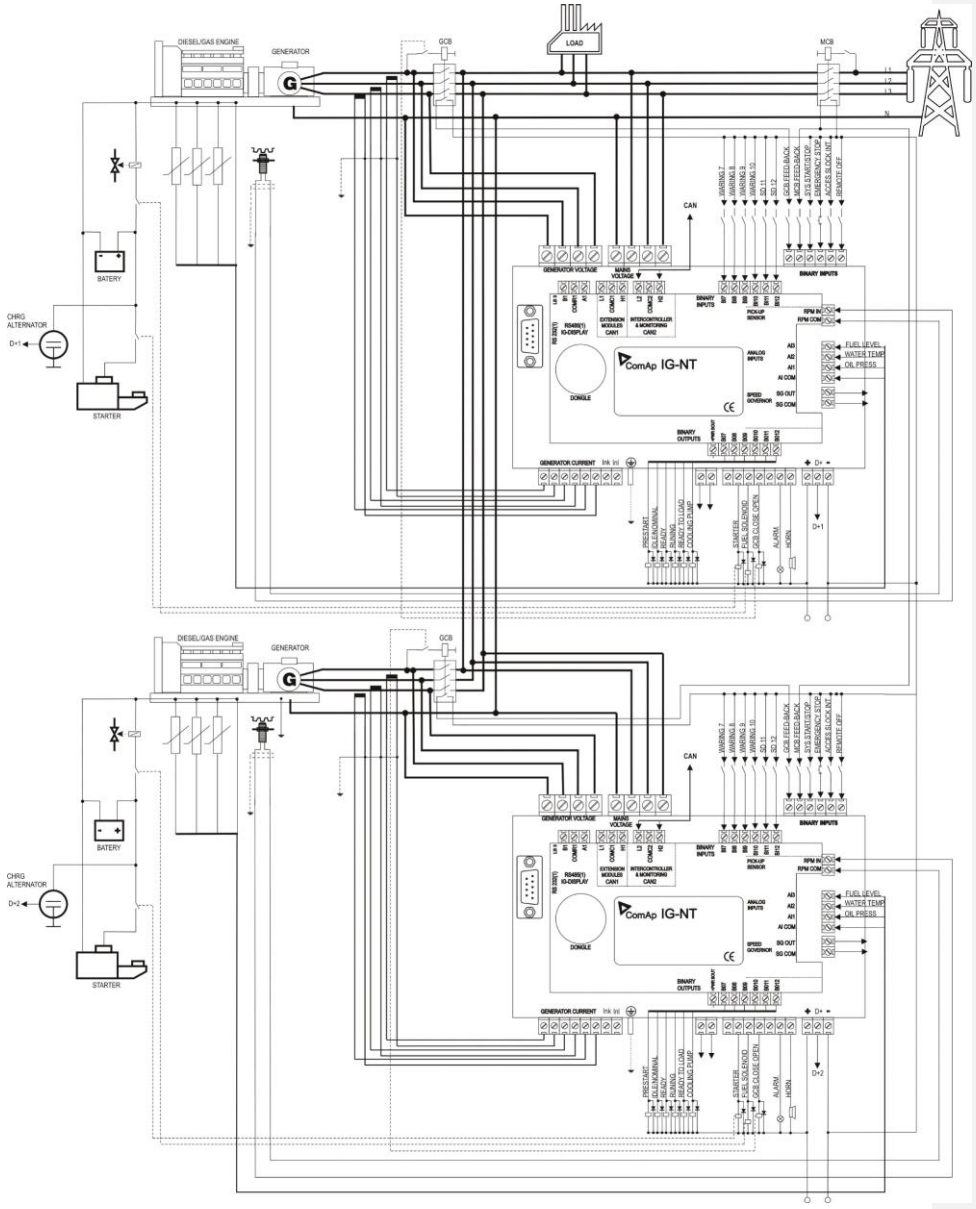
## 9.1. SPtM application



## 9.2. SPI application



## 9.3. MINT application



# 9.4. Single Phase Applications

There is no special archive file or software for single phase applications. Use standard archive.

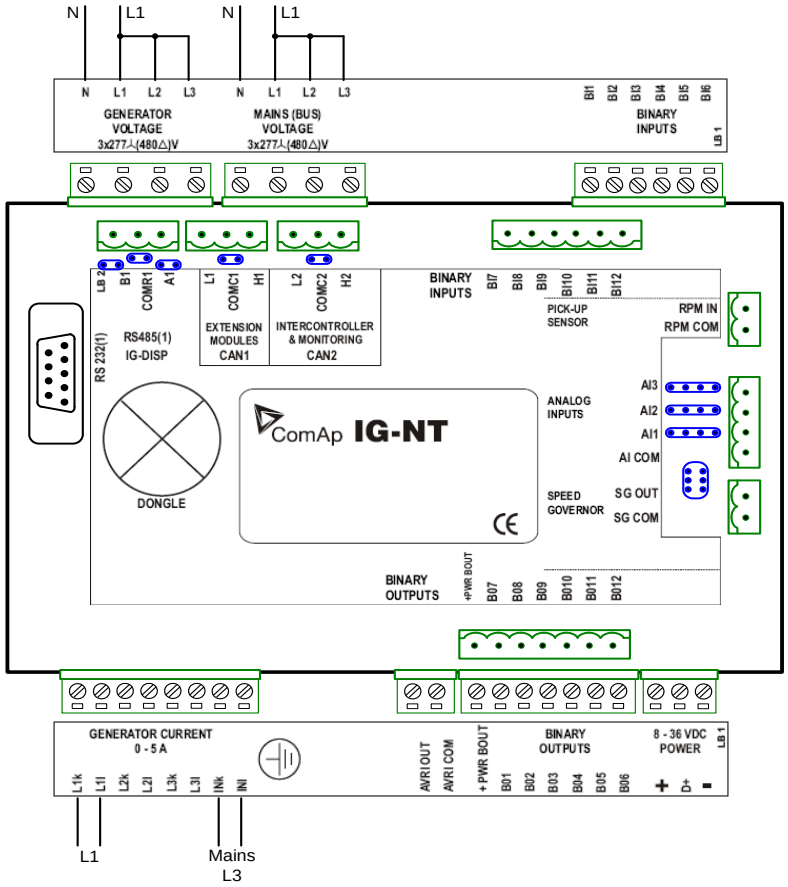
## 9.4.1. Recommended wiring

Generator (Mains) single phase voltage has to be connected to all three voltage terminals L1, L2, L3.

Generator current has to be connected to L1k, L1l terminals only.

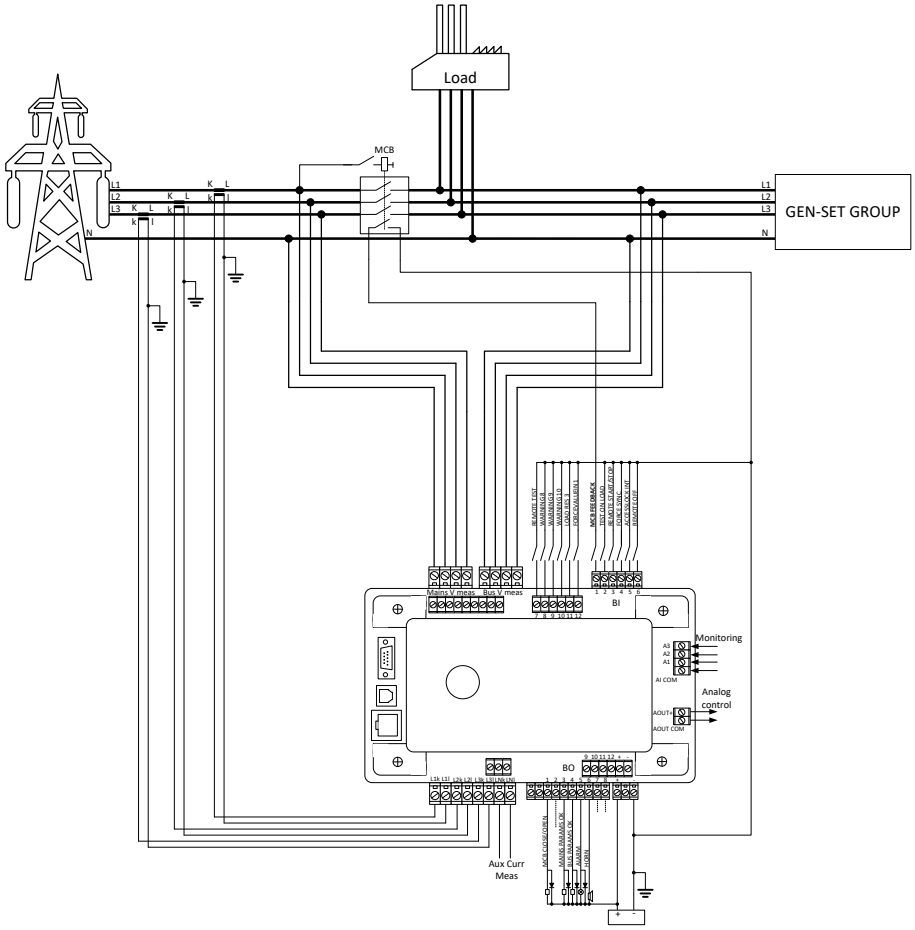
Adjust setpoint **Gener protect**:*Gen I unbal* to 200%.

For single phase measurement of Mains import/export power connect L3 current transformer to Ink and Inl terminals of the controller. Measured power is internally multiplied by 3. Adjust correctly setpoints **Basic settings**:*Im3/ErFlCurCTp* and *Im3/ErFlCurCTs*.



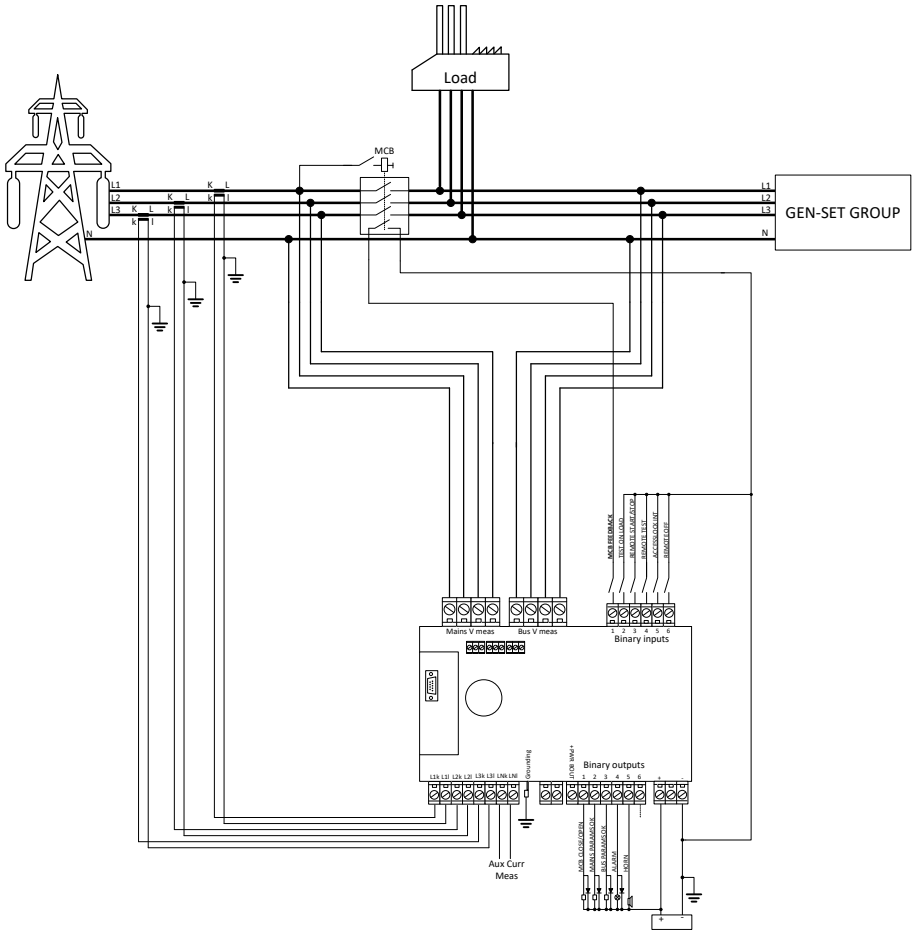
# 9.5. InteliMains – MCB Application

## 9.5.1. BaseBox controller




**NOTE:**
Binary Input MCB FEEDBACK and Binary Output MCB OPEN/CLOSE are the only compulsory BI and BO in this application. Other Binary Inputs and Outputs in the schematics are only recommended or suggested for basic and advanced functions of the controller.

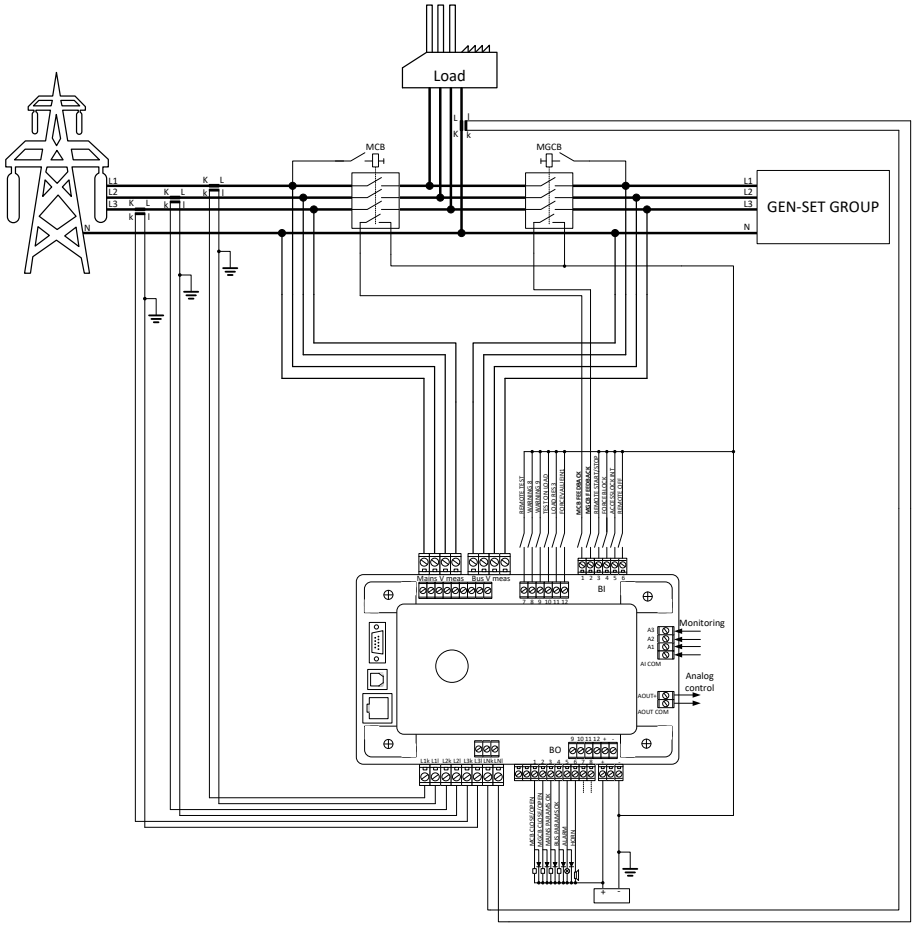
## 9.5.2. Controller with built-in display




**NOTE:**
Binary Input MCB FEEDBACK and Binary Output MCB OPEN/CLOSE are the only compulsory BI and BO in this application. Other Binary Inputs and Outputs in the schematics are only recommended or suggested for basic and advanced functions of the controller.

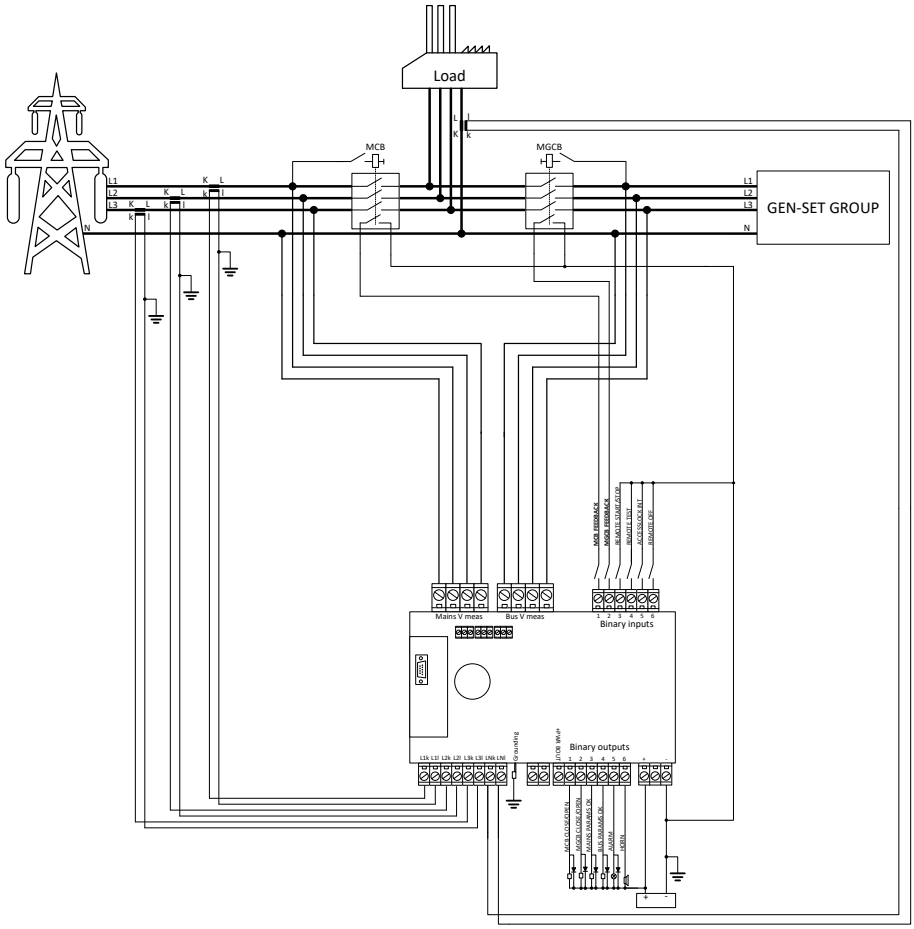
# 9.6. InteliMains – MGCB Application

## 9.6.1. BaseBox controller




**NOTE:**
Binary Inputs MCB FEEDBACK and MGCB FEEDBACK and Binary Outputs MCB OPEN/CLOSE and MGCB OPEN/CLOSE are the only compulsory BI and BO in this application. Other Binary Inputs and Outputs in the schematics are only recommended or suggested for basic and advanced functions of the controller.

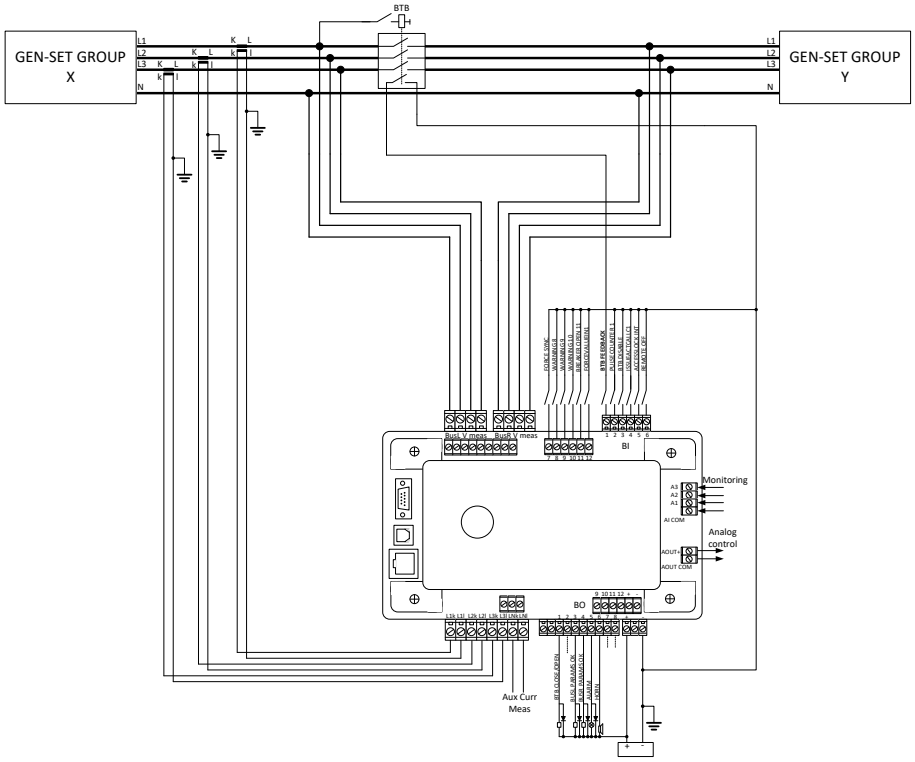
## 9.6.2. Controller with built-in display




**NOTE:**
Binary Inputs MCB FEEDBACK and MGCB FEEDBACK and Binary Outputs MCB OPEN/CLOSE and MGCB OPEN/CLOSE are the only compulsory BI and BO in this application. Other Binary Inputs and Outputs in the schematics are only recommended or suggested for basic and advanced functions of the controller.

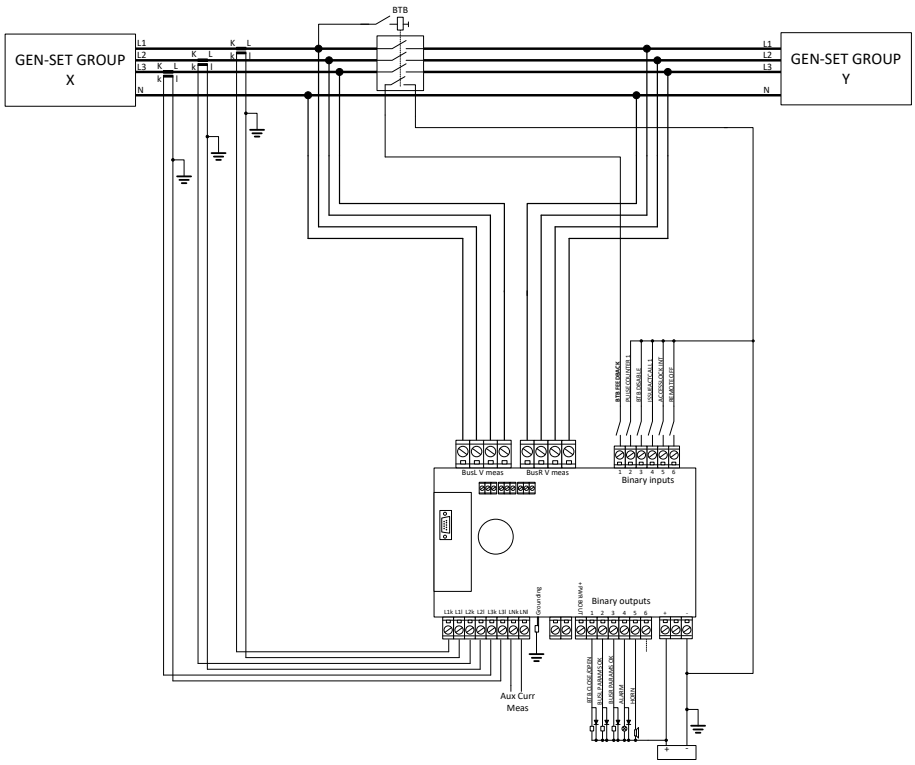
# 9.7. InteliMains – BTB Application

## 9.7.1. BaseBox controller




**NOTE:**
Binary Input BTB FEEDBACK and Binary Output BTB OPEN/CLOSE are the only compulsory BI and BO in this application. Other Binary Inputs and Outputs in the schematics are only recommended or suggested for basic and advanced functions of the controller.

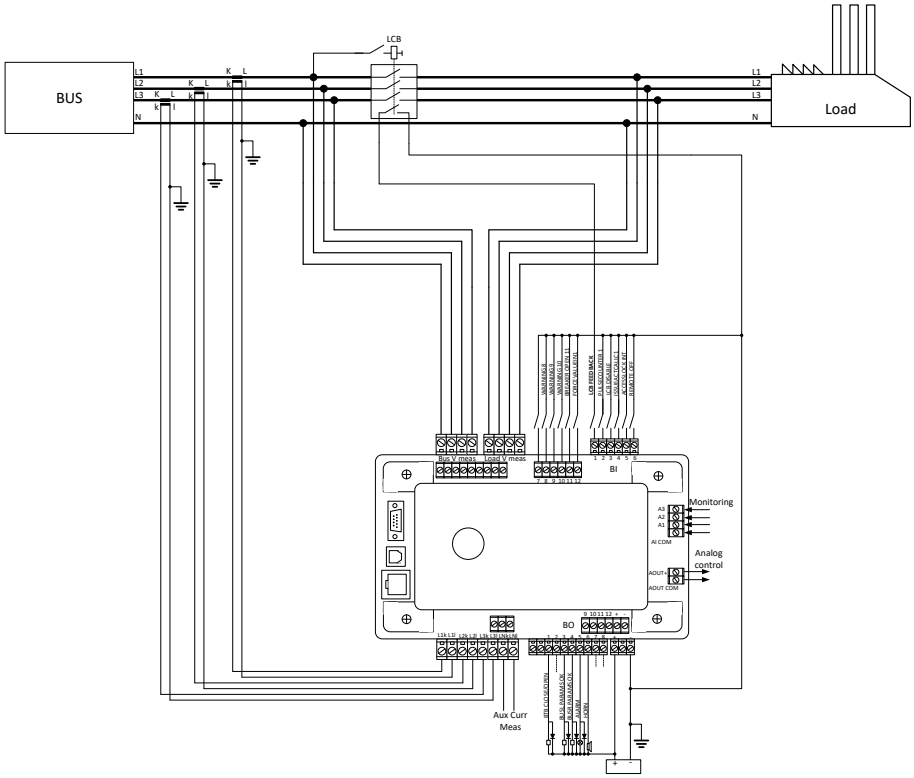
## 9.7.2. Controller with built-in display




**NOTE:**
Binary Input BTB FEEDBACK and Binary Output BTB OPEN/CLOSE are the only compulsory BI and BO in this application. Other Binary Inputs and Outputs in the schematics are only recommended or suggested for basic and advanced functions of the controller.

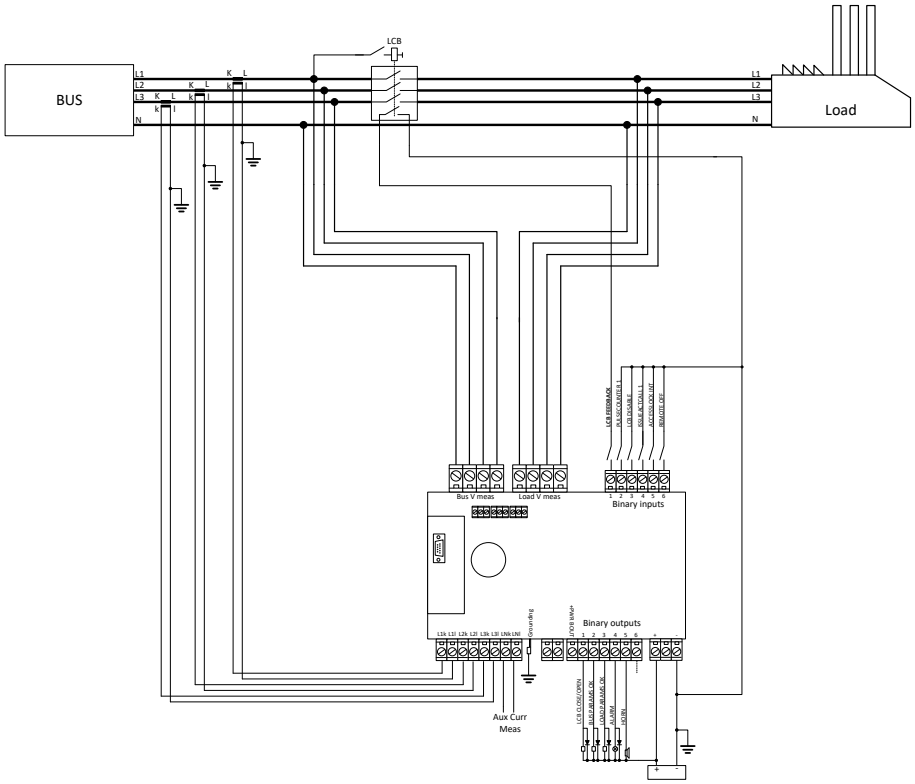
## 9.8. InteliMains – FDR Application

### 9.8.1. BaseBox controller




**NOTE:**
Binary Input LCB FEEDBACK and Binary Output LCB OPEN/CLOSE are the only compulsory BI and BO in this application. Other Binary Inputs and Outputs in the schematics are only recommended or suggested for basic and advanced functions of the controller.

## 9.8.2. Controller with built-in display

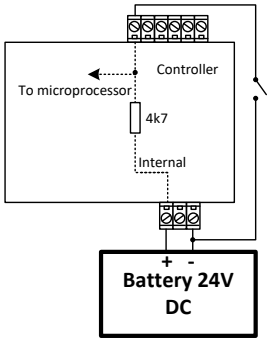



**NOTE:**
Binary Input LCB FEEDBACK and Binary Output LCB OPEN/CLOSE are the only compulsory BI and BO in this application. Other Binary Inputs and Outputs in the schematics are only recommended or suggested for basic and advanced functions of the controller.

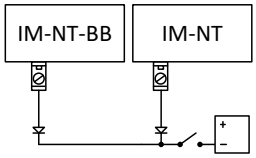
# 9.9. Binary Input wiring

Use min. **1 mm²** cables for wiring of binary inputs.

**NOTE:**
The name and function or alarm type for each binary input have to be assigned during the configuration. Binary inputs may be used in built-in PLC as well. Please refer to the manual of GenConfig for more information.




It is recommended to use separation diodes when multiple binary input terminals are connected together to prevent unwanted activation of binary input when one of the controllers is switched off.

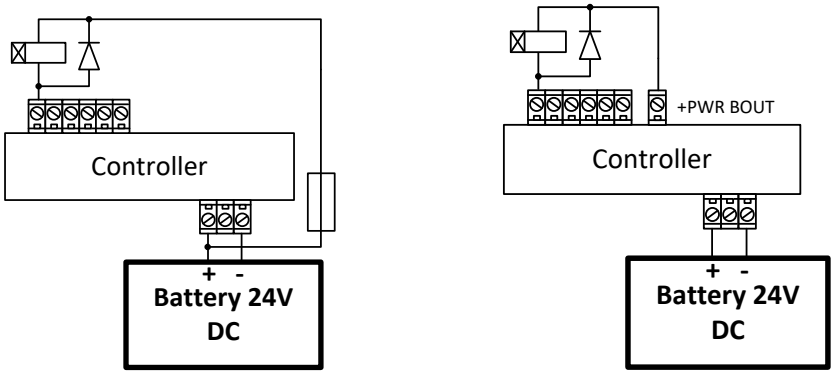



# 9.10. Binary Output wiring

## 9.10.1. Controllers without High-Side Low-Side Switch

This portion of Instalation instructions is dedicated to controllers without High-Side Low-Side Switch. These controllers include: IG-NT (and variations), IG-NTC (and variations), IS-NT-BB, IM-NT

Correct wiring for Binary output is shown in the diagram below. On the left +PWR BOUT is not used, on the right +PWR BOUT is used. If Binary outputs are connected directly to the power source, additional fuse should be used.




**NOTE:**
If +PWR BOUT is used, it increases power consumption of the controller.

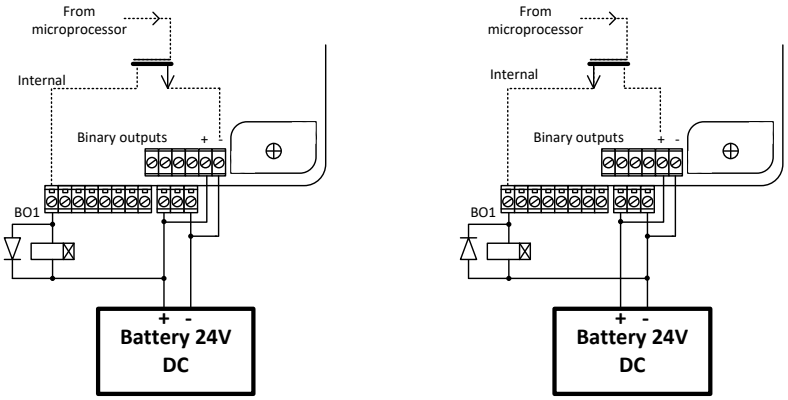
Outputs can provide steady current of up to 2A. Every single binary output can provide up to 0.5A of steady current unless the total current of group of outputs does not exceed 2A.

### 9.10.2. Controllers with High-Side Low-Side Switch

This portion of Instalation instructions is dedicated to controllers with High-Side Low-Side Switch. These controllers include: IG-NT-BB, IG-NTC-BB, IS-NTC-BB, IM-NT-BB and IM-NTC-BB

It is possible to use binary outputs as low side switch or high side switch in BaseBox type of controller. For correct wiring in both cases please refer to the following diagrams.

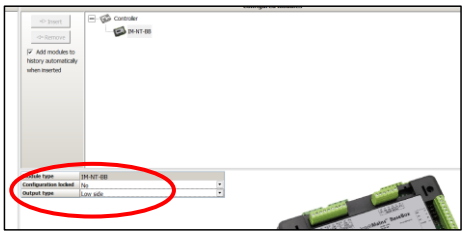
**Low side switch** **High side switch**




**CAUTION!**
Both power supply sockets for binary outputs need to be connected to ensure proper function of binary outputs.

Never use DC relays without protection diods!

Low side or High side function of binary outputs can be chosen in configuration tool GenConfig in Modules tab. This configuration is used for all binary inputs available on the controller.

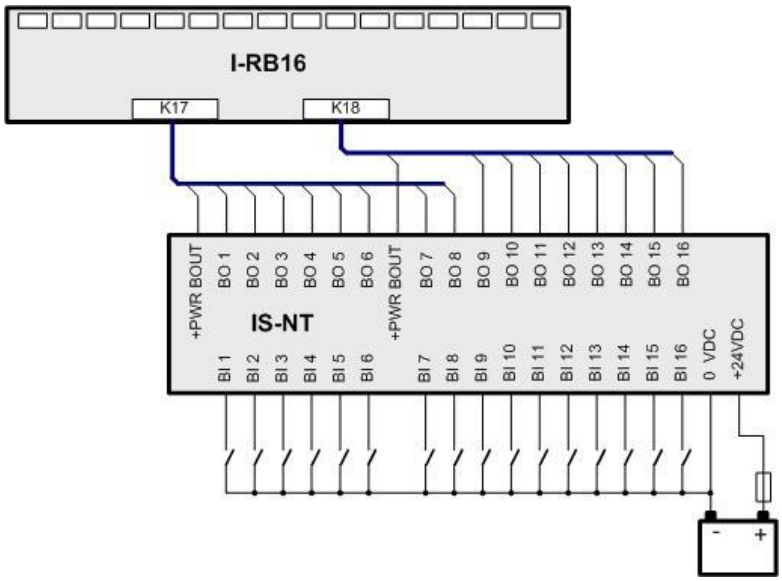


**NOTE:**
Every group of outputs (i.e. 1..8 and 9..12) can provide steady current of up to 2A. Every single binary output can provide up to 0.5A of steady current unless the total current of group of outputs does not exceed 2A.

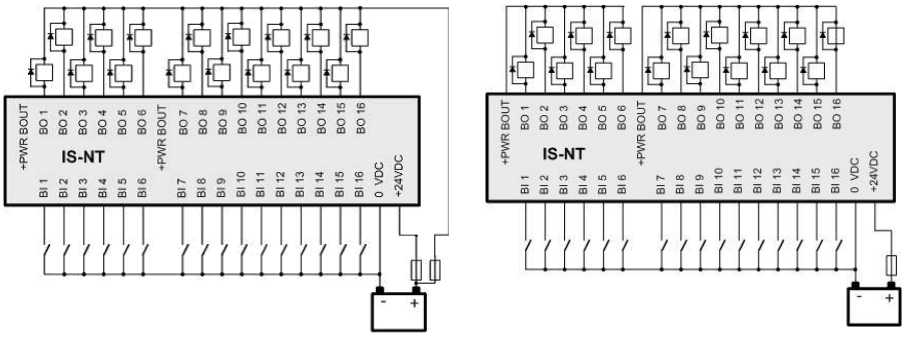
**CAUTION!**
Both "+" and "-" terminals on the IS-NTC-BB, IG-NT-BB, IG-NTC-BB, IM-NT-BB and IM-NTC-BB need to be connected at all times to ensure the proper function of Binary Ouptuts 9 to 12(16)!

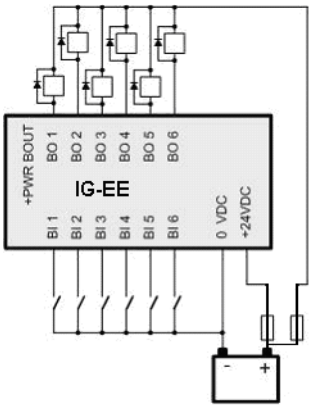
## 9.11. Examples of BI and BO Wiring

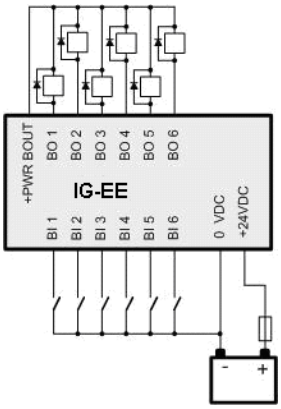
### 9.11.1. Binary Outputs Wiring with I-RB16




### 9.11.2. Binary Inputs and Outputs Wiring





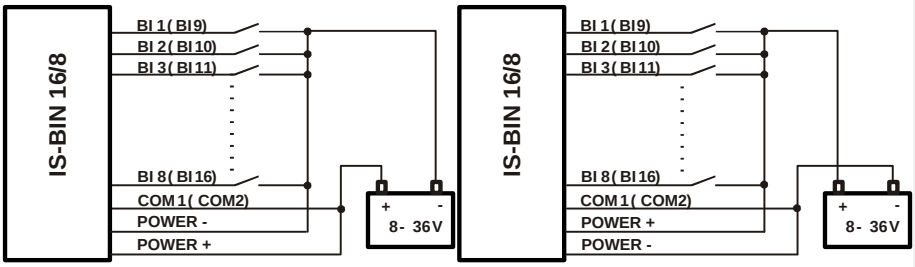

# 9.12. Binary I/O on IS-BIN16/8

## 9.12.1. Binary inputs on IS-BIN16/8

There are two groups of eight Binary inputs BI1 to BI8 and BI9 to BI16. Each group has a separate Common terminal COM1 and COM2. The Common terminal can be connected to positive or negative pole – see following drawing. Binary inputs are galvanically separated from IS-BIN16/8 power supply.

A Binary inputs Common terminal is connected to **positive** supply terminal, Binary inputs contacts are closed to **negative** supply terminals.

Binary inputs common terminal is connected to **negative** supply terminal, Binary inputs contacts are closed to **positive** supply terminals.



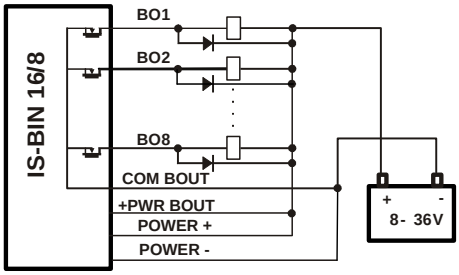

Input voltage range for opened contact is from 8 VDC to Power supply VDC. Input voltage range for closed contact is from 0 to 2 VDC. Voltage level is defined between Binary input and Binary input COM terminal and does not depend on “positive” or “negative” connection.

Impulse inputs do not work with IGS-NT controller.

### 9.12.2. Binary outputs on IS-BIN16/8

IS-BIN16/8 binary outputs are galvanically separated from IS-BIN16/8 power supply. It is necessary to connect plus 24 VDC (power supply ) to IS-BIN16/8 terminal according to following drawing.

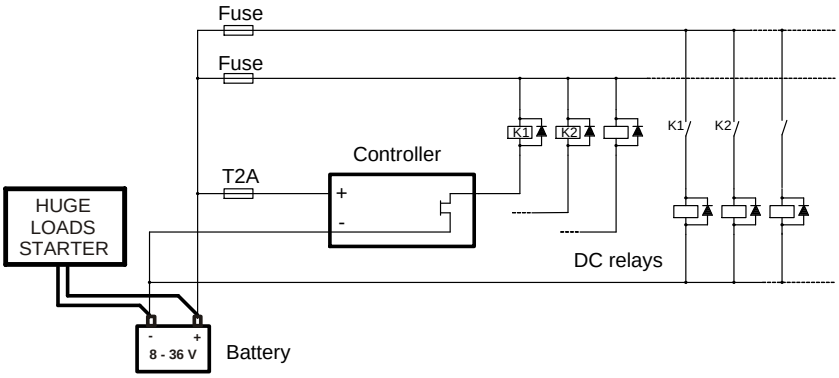
The maximum load values are 0.5 A / 36V for one output.




## 9.13. Binary output protections

Controller inputs and outputs terminals are protected against transient disturbance. Protection capability is limited.

Never use DC relays without protection diodes. Use protection diodes at all relays in the switchboard even if they are not connected directly to controller Binary outputs.



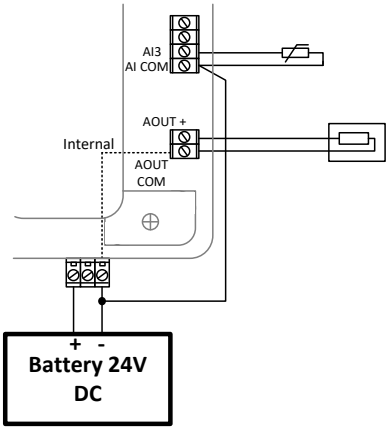

Example of controller protection

# 9.14. Analog Input and Output wiring

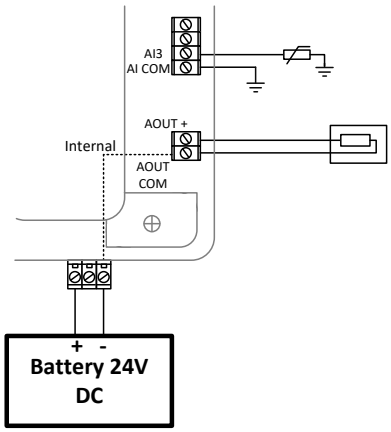
Note that Analog Inputs and Outputs are available only in some types of hardware.

***HINT***
For more information on technical data regarding supply, inputs, outputs etc. please refer to
For jumper setting of Analog inputs please refer to the section **Jumper settings**.

Resistive sensor on Analog input 3 and Analog output wiring

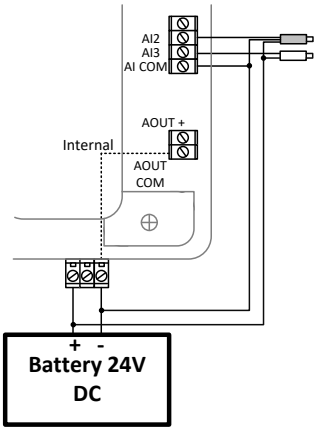


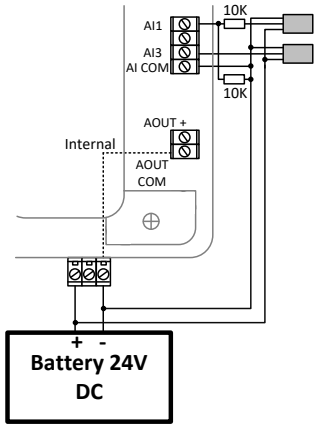

Resistive sensor with grounding on Analog input 3 and Analog output wiring. **Note, that battery should be also grounded to common ground in all cases!**




Passive Current sensor on Analog input 3 and Active Current sensor on Analog input 2

Voltage sensors on Analog input 1 and 3



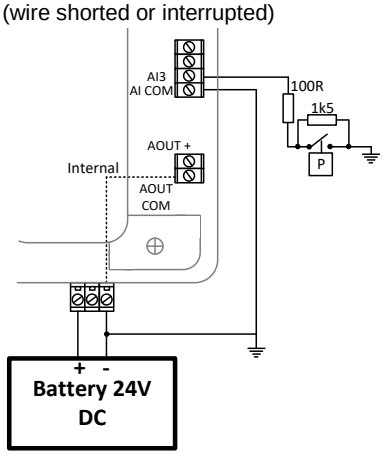




Tristate sensor (binary sensor with fail detection) on Analog input 3

**Below 750Ω** = Inactive

**Between 750Ω and 2400Ω** = Active

**Below 10 Ω or Over 2400Ω** = sensor failure (wire shorted or interrupted)



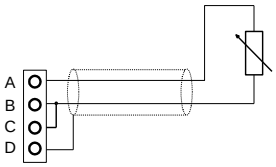

## 9.15. Analog Inputs on IS-AIN8

IS-AIN8 extension module analog inputs can be configured to

- Resistor two wire input
- Resistor three wire input
- Current input

- Thermocouple input
- Voltage input

Select sensor characteristic from the list or define user sensor characteristic in PC configuration tool.

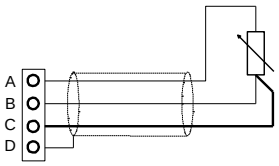



Resistor sensor input – two wire connection.

Range 0 to 2400 ohms.

Pt100, Pt1000, Ni100, Ni1000

D terminal is shielding

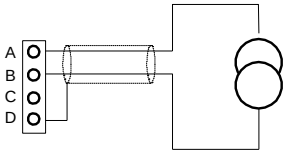



Resistor sensor input – three wire connection.

Range 0 to 2400 ohms.

Pt100, Pt1000, Ni100, Ni1000 – recomended.

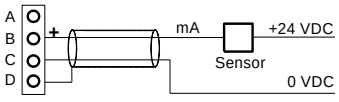
D terminal is shielding




Passive current sensor (current source is in IS-AIN8)

Range 0 to + 20 mA or 4 to + 20 mA

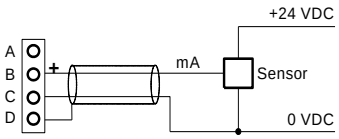
D terminal is shielding

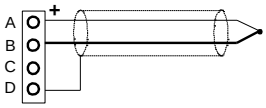



Active current sensor (current source is in sensor)

Range –20mA to +20 mA or 4 to + 20 mA

D terminal is shielding

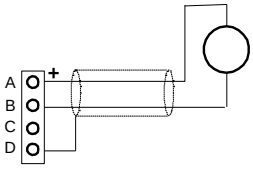



Thermocouple J, K, L

D terminal is shielding

From IS-AIN8 hardware version 5.1 can be B terminal grounded to frame

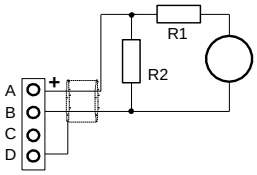



Voltage input

Range 0 to + 2500 mV.

Voltage range is 0 to ± 1000 mV.

D terminal is shielding




For 10V input voltage range connect external resistors R1, R2 and select sensor characteristic 10V.

R1=10 kohm, R2=2,7 kohm.

D terminal is shielding

**CAUTION!**

Thermocouples connected to IS-AIN8 hardware versions below 5.0 must be galvanically separated from the frame.

If the thermocouples are connected to IS-AIN8, appropriate jumpers must be removed (see rear sticker).

# 10. Outputs refresh rates

There are the following refresh rates for binary and analog outputs.

| Type | Refresh rate |
|---|---|
| Analog Output on a controller | 100ms |
| Binary Output on a controller | 100ms @ minimum puls length 20ms<br>On demand if there is a „fast“ protection configured on this output |
| Analog Output on an external module | 80ms times available modules for configuration (i.e. 4 modules available in standard FW results in 320ms period) |
| Binary Output on an external module | On demand when there is a change in binary state<br>with period 100ms times available modules for configuration if there are no changes in binary states (i.e. 12 modules available in standard FW results in 1200ms if there are no changes) |
| Speed Governor Output | Once per voltage period (20ms@50Hz) |
| AVRi | Once per voltage period (20ms@50Hz) |

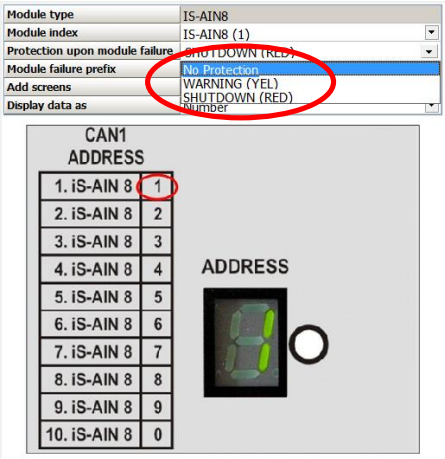
# 11. External modules connection

For all information on External modules please refer to the IGS-NT & ID-DCU Accessory Modules.

## 11.1. Lost Communication Protection

Error message (e.g. SD BOUT2) appears on Controller screen when Binary input or output Address x is configured but corresponding unit is not recognized (no message is received from CAN bus). Check IGS or IM configuration and corresponding external IS-AIN, IS-BIN unit address setting.

You can change the related protection for each external module in GenConfig.




## 11.2. IS-BIN16/8 and IS-AIN8

IS-BIN16/8 is an extension module with 16 binary inputs and 8 binary outputs. IS-AIN8 is an extension module with 8 analog inputs. All I/O can be configured to any logical function or protection. It is possible to connect up to 10 IS-AIN8 and 4 IS-BIN16/8 external units to one controller.

External modules IS-BIN16/8 and IS-AIN8 are connected to **CONTROLLER CAN1 bus**.

Controllers are connected to **CONTROLLER CAN2 bus** in multiple applications.

To operate external modules

- Connect all external modules to CAN1 bus line
- On each module adjust I/O CAN1 address in the range of 1 to 7 for IS-BIN16/8 inputs, 1 to 4 for IS- BIN16/8 outputs (address 0 switches corresponding communication OFF) or 0 to 9 for IS-AIN8 (0 has address meaning of 10).

- Input output address is displayed on the front panel LED's
- Use PC configuration tool to configure controller according external modules setting

IS-BIN16/8 module has two separate CAN1 addresses for binary inputs Group 1, Group 2 and binary outputs Group (total three addresses). The CAN1 address for BI Group 1 and for BO Group 2 can be adjusted on the IS-BIN16/8. The address for BI Group 2 is set automatically to the address following BI Group 1.

***HINT***
If part of IS-BIN16/8 is not required for use, CAN address 0 disables corresponding CAN message (group data are not send).

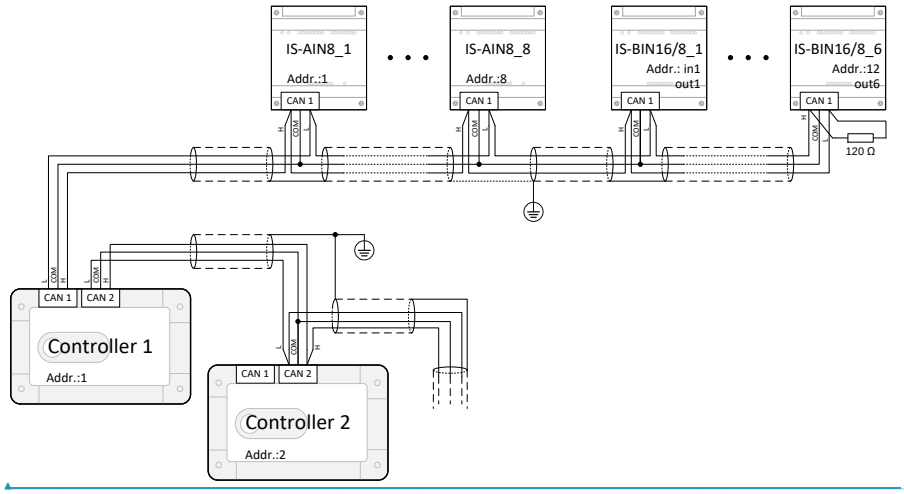
## 11.2.1. IS-AIN8, IS-BIN8/16 address setting

- Press Address button during IS-AIN8 power supply on to switch to addressing mode.
- Then repeatedly press or keep pressed address button to adjust required address according to controller configuration.
- After setting requested address, release the buttons and wait until the digits blink – it indicates write the changed address to EEPROM memory.

## 11.2.2. IS-AIN8, IS-BIN8/16 SW version check

Let suppose IS-AIN8 of SW version 1.4 for this example. Shortly press address button. Following sequence appears on the display: number "1", one second pause, number "4", two second pause, number "1", one second pause, number "4", two second pause and finally IS-AIN8 actual address.

## 11.2.3. Example of Wiring

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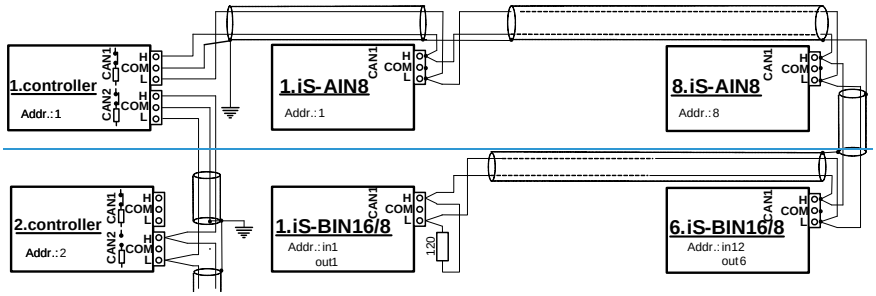
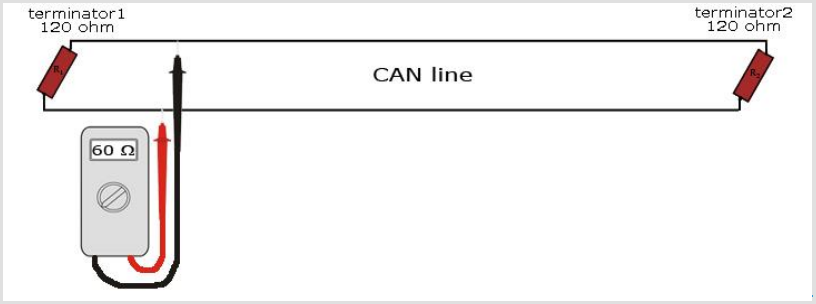
Field Code Changed

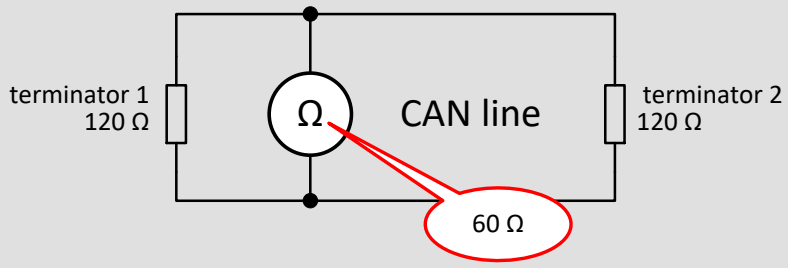



**CAUTION!**

CAN bus line has to be terminated by 120 ohm resistors on the both ends.

Always check the number and placement of terminating resistors in the CAN bus line, only correct wiring ensures reliable operation! Resistors must be placed at either end of the line (see picture), and correct number of resistors must be used! Correct number can be checked using ohmmeter - when power supply for ALL devices on the CAN bus line (including third party, e.g. ECU) is switched off, the resistance measured between A and B wire should be 60 Ohms.




Field Code Changed

For longer distances is recommended to connect one CAN COM terminal (one connection for whole site) and cable shielding to the ground in one point.

External units can be connected on the CAN bus line in any order, but line arrangement (no tails, no star) is necessary.

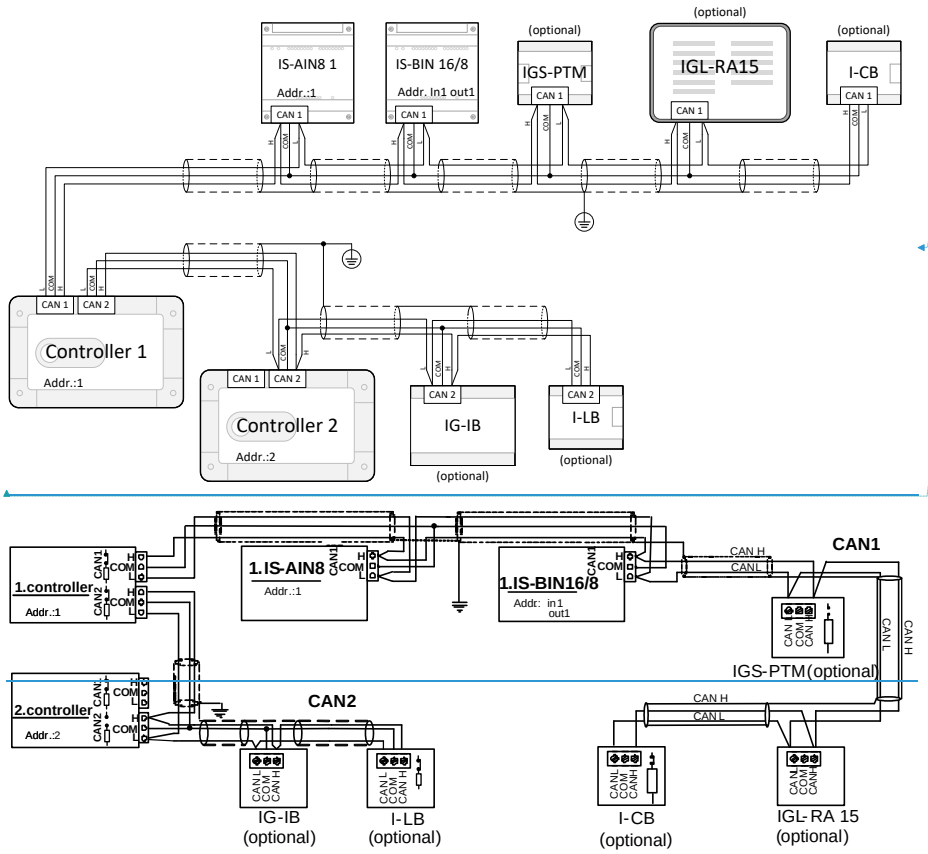
Recommended CAN bus data cables see in Chapter Technical data.

IG-MU and IG-IB units are connected to CONTROLLER CAN2 bus.

# 11.3. IGS-PTM and IGL-RA15

It is possible to connect up to four IGS-PTM and one IGL-RA15 to one controller. IGS-PTM can be connected to the controller like IS-AIN8 and IS-BIN16. IGS-PTM behaves like IS-AIN8 and IS-BIN16/8 modules in one unit. IGS-PTM and IGL-RA15 units contain internal jumper removable 120-ohm resistor.

## 11.3.1. Example of Wiring

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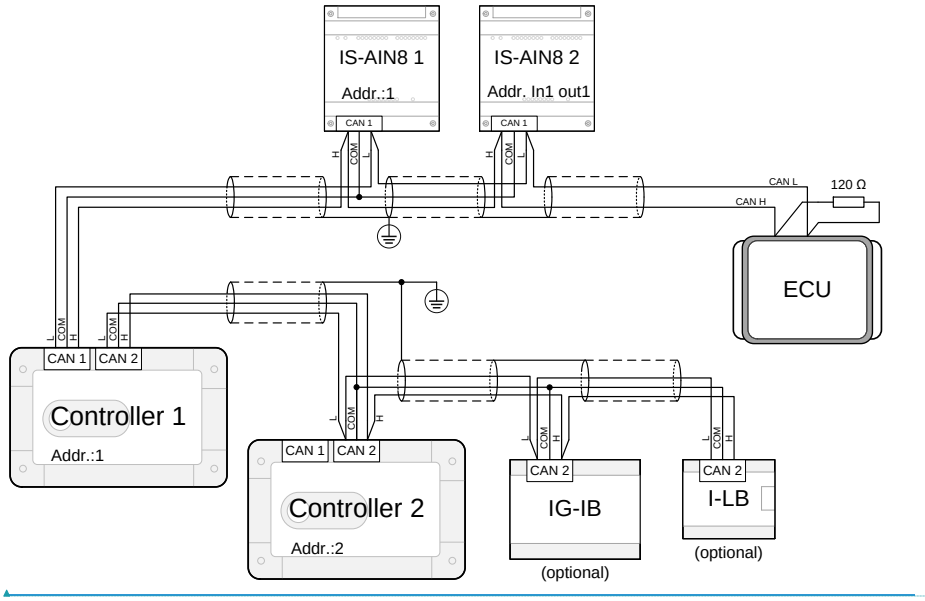
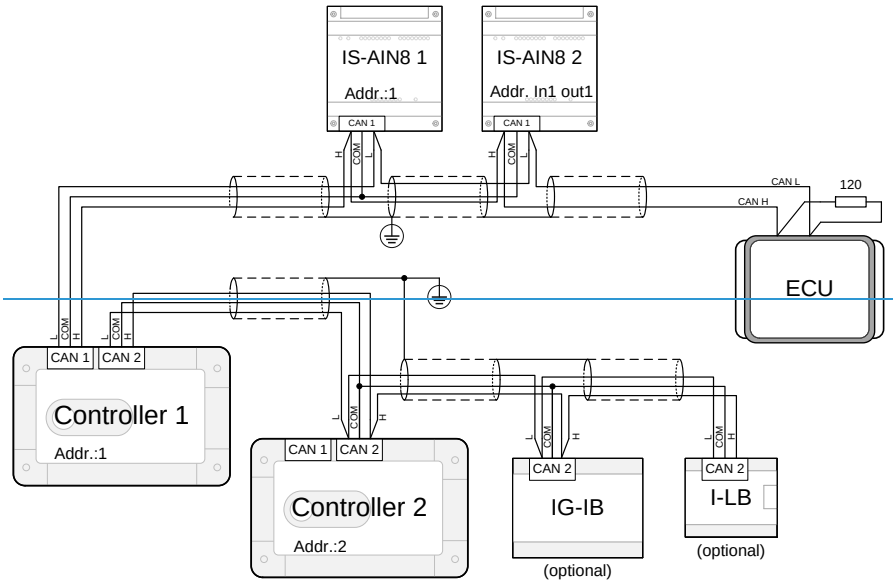
Field Code Changed

# 11.4. Connection of ECU on CAN1 with Other Modules Connected

Field Code Changed

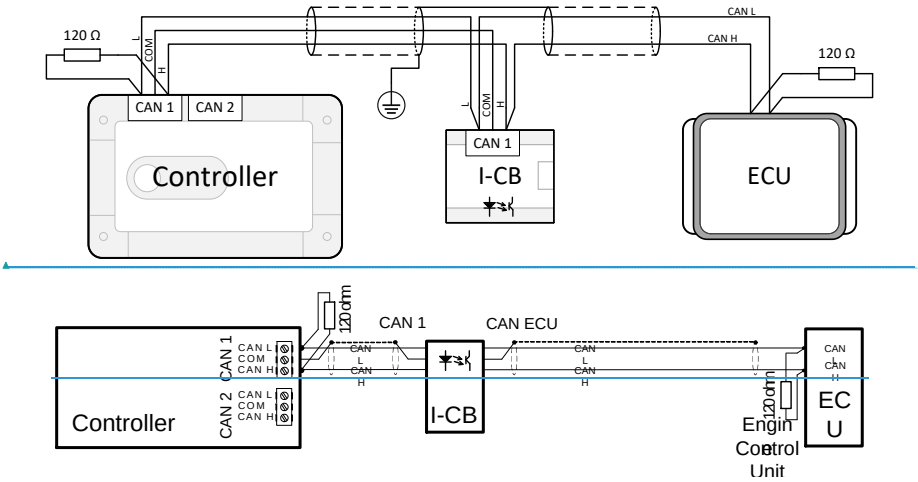



ECU communicating over the CAN bus is connected to CAN1 port of the controller and other ComAp modules can be connected to this CAN bus as well. For detailed description of connection of various ECUs refer to ComAp Electronic Engines Support manual.

## 11.4.1. I-CB wiring and configuration

Field Code Changed




1. Configure I-CB using I-CBEdit software. Configured I-CB behaves like fictive IS-AIN and IS-BIN units. I-CB configuration associates selected values (from ECU database) received from Engine Control Unit to selected CAN addressees (fictive IS-AIN, IS-BIN inputs and outputs).
2. Configure corresponding controller CAN addresses and tick ☑ I-CB in PC configuration tool.
3. Configure separate inputs and outputs in corresponding Analog, Binary inputs, outputs in PC configuration tool.

***HINT***
In case of CAT engines, there is RS232 connection between I-CB and CCM.

# 12. Communications

## 12.1. Available Communication Ports

| Hardware Type | Communication Ports |
|---|---|
| **IG-NT** | RS232(1) ←→ RS485(1) – multipurpose<br>CAN1<br>CAN2 |
| **IG-NTC** | RS232(1) ←→ RS485(1) – multipurpose<br>RS232(2) ←→ RS485(2) – multipurpose<br>USB<br>CAN1<br>CAN2 |
| **IG-NT-BB** | RS232(1) ←→ RS485(1) – display dedicated<br>CAN1<br>CAN2 |
| **IG-NTC-BB** | RS232(1) ←→ RS485(1) – display dedicated<br>RS485(2) – multipurpose<br>USB<br>Ethernet<br>CAN1<br>CAN2 |
| **IS-NT-BB** | RS232(1) ←→ RS485(1) – display dedicated<br>RS232(2) ←→ RS485(2) – multipurpose<br>USB<br>CAN1<br>CAN2 |
| **IS-NTC-BB** | RS232(1) ←→ RS485(1) – display dedicated<br>RS485(2) – multipurpose<br>USB<br>Ethernet<br>CAN1<br>CAN2 |
| **IM-NT** | RS232(1) ←→ RS485(1) – multipurpose<br>CAN1<br>CAN2 |
| **IM-NT-BB** | RS232(1) ←→ RS485(1) – display dedicated<br>CAN1<br>CAN2 |
| **IM-NTC-BB** | RS232(1) ←→ RS485(1) – display dedicated<br>RS485(2) – multipurpose<br>USB<br>Ethernet<br>CAN1<br>CAN2 |

**NOTE:**
RS232(1) – RS485(1) and RS232(2) – RS485(2) can be switched and only one port at a time is available for communication.

## 12.2. Possible Connections per Port

| Port Type | On Hardware | Number of Connections | Available Connections |
|---|---|---|---|
| **RS232(1)** | Any | 1 | InteliVision 8<br>PC<br>Modbus terminal<br>Modem |
| **RS485(1)** | IG-NT-BB<br>IG-NTC-BB<br>IM-NT-BB<br>IM-NTC-BB | 2 | InteliVision 8<br>InteliVision 5<br>IG-Display |
| **RS485(1)** | IS-NT-BB<br>IS-NTC-BB | 3 | InteliVision 8<br>InteliVision 5<br>IS-Display |
| **RS485(1)** | IG-NT<br>IG-NTC<br>IM-NT | 1 | InteliVision 8<br>PC<br>Modbus terminal<br>Modem |
| **RS232(2)** | Where available | 1 | InteliVision 8<br>PC<br>Modbus terminal<br>Modem |
| **RS485(2)** | Where available | 1 | InteliVision 8<br>PC<br>Modbus terminal<br>Modem |
| **CAN1** | Any | 45 | AIN (10x)<br>BIN (12x)<br>AOUT (4x)<br>BOUT (12x)<br>DENOX20 (1x)<br>ECON3 (1x)<br>ECON4 (1x)<br>Other specialized HW |
| **CAN2** | Any | 35 | Controllers<br>InteliVision 8<br>IG-IB<br>I-LB+<br>InternetBridge-NT |
| **USB** | Where available | 1 | PC |
| **Ethernet** | Where available | 2 | Standard Ethernet Connection |

**NOTE:**
RS232(1) – RS485(1) and RS232(2) – RS485(2) can be switched and only one port at a time is available for communication.

# 13. CAN Bus

## 13.1. CAN bus Tx, Rx LED indication

Tx and Rx LED is connected directly to Tx and Rx signal.

| Status | Tx | Rx |
|---|---|---|
| Communication is OK | Fast flashing – data transfer | |
| | | |
| CAN bus is interrupted | Continuous light | Continuous light |
| Short connection H – L | Fine flashing | Dark |
| Short connection L – COM | Dark | Dark |
| Short connection H – COM | Fine flashing | Dark |
| Wrong connection H – H, L – L | Synchro flashing | |

## 13.2. CAN and RS485 bus wiring

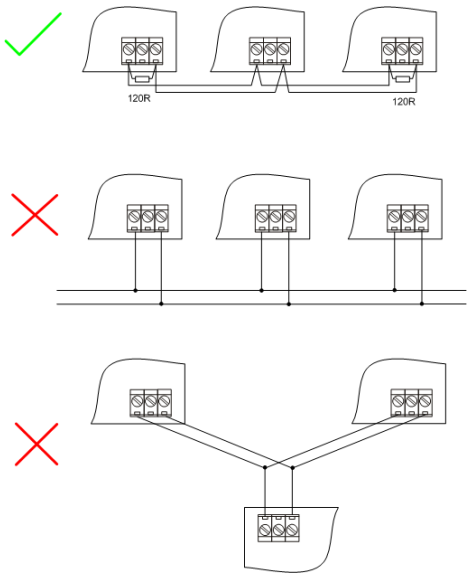
The wiring of the CAN bus communication should be provided in such a way that the following rules are observed:

- The maximum length of the CAN bus depends on the communication speed. For a speed of 250 kbps, which is used on the CAN1 bus (extension modules, ECU) and CAN2 bus if it is switched to 32C mode, the maximum length is 200 m. If the CAN2 bus is switched to 8C mode the speed is 50 kbps and the maximum length is 800 m.
- The maximum length of the RS485 bus is 1000 m
- The bus (CAN and RS485) must be wired in linear form with termination resistors at both ends. No nodes are allowed except on the controller terminals.

  **NOTE:**
  A termination resistors at the CAN and RS485 are already implemented on the PCB. For connecting, close the jumper near the appropriate CAN or RS485 terminal. For more information on jumper settings please refer to the section **3.1.4 Jumper setting**.

- Use a cable with following parameters:

| | |
|---|---|
| Cable type | Shielded twisted pair |
| Impedance | 120 Ω |
| Propagation velocity | ≥ 75% (delay ≤ 4.4 ns/m) |
| Wire crosscut | ≥ 0.25 $mm^2$ |
| Attenuation (@1MHz) | ≤ 2dB/100 m |




CAN AND RS485 BUS TOPOLOGY

**NOTE:**
See the website www.can-cia.org for information about the CAN bus, specifications, etc.

### 13.2.1. Wiring examples

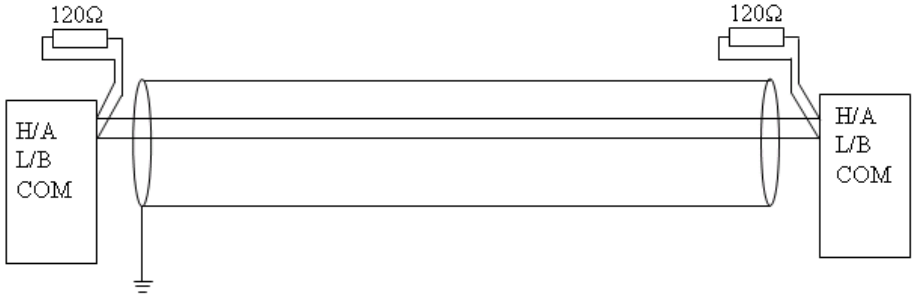
1. For shorter distances (all network components within one room) – picture 1 interconnect A and B; shielding connect to PE on controller side
2. For longer distances (connection between rooms within one building) – picture 2 interconnect A, B, COM; shielding connect to PE at one point
3. In case of surge hazard (connection out of building in case of storm etc.) – picture 3

   We recommend using the following protections:

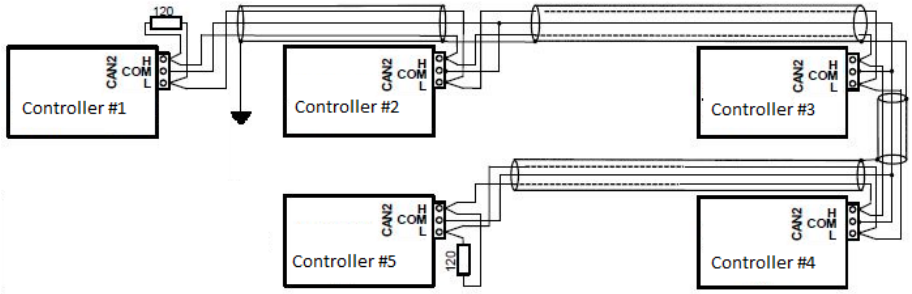
   - Phoenix Contact (http://www.phoenixcontact.com): PT 5-HF-5DC-ST with PT2x2-BE (base element)(or MT-RS485-TTL)
   - Saltek (http://www.saltek.cz): DM-006/2 R DJ

Recommended data cables: BELDEN (http://www.belden.com)

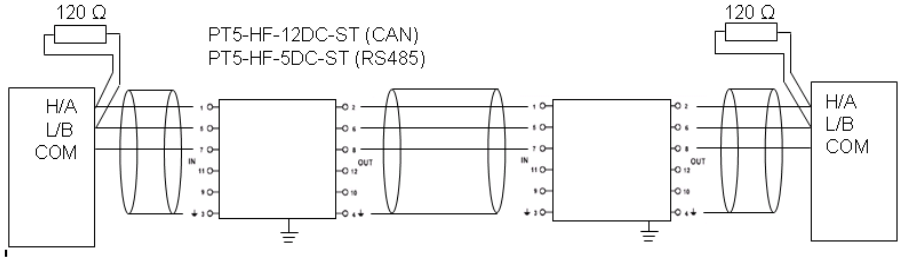
1. For shorter distances: 3105A Paired – EIA Industrial RS-485 PLTC/CM (1x2 conductors)
2. For shorter distances: 3105A Paired – EIA Industrial RS-485 PLTC/CM (1x2 conductors)
3. In case of surge hazard: 3106A Paired – EIA Industrial RS-485 PLTC/CM (1x2+1 conductors)




PICTURE 1 – SHORTER DISTANCES (ALL NETWORK COMPONENTS WITHIN ONE ROOM)



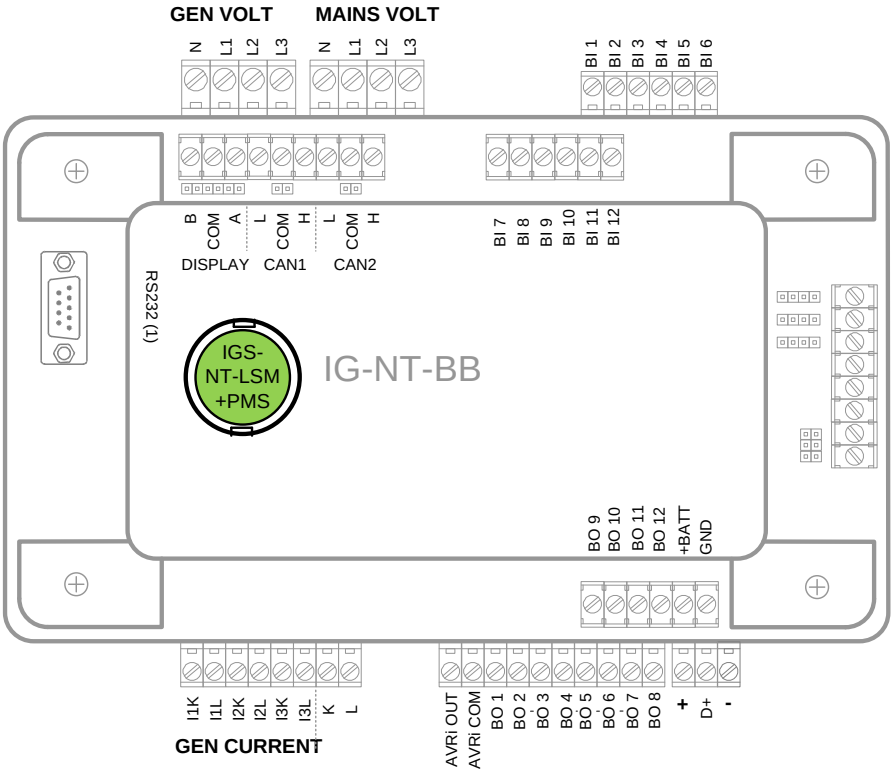

PICTURE 2 – LONGER DISTANCES (CONNECTION BETWEEN ROOMS WITHIN ONE BUILDING)




PICTURE 3 – SURGE HAZARD (CONNECTION OUT OF BUILDING IN CASE OF STORM ETC.)

# 14. Dongle installation

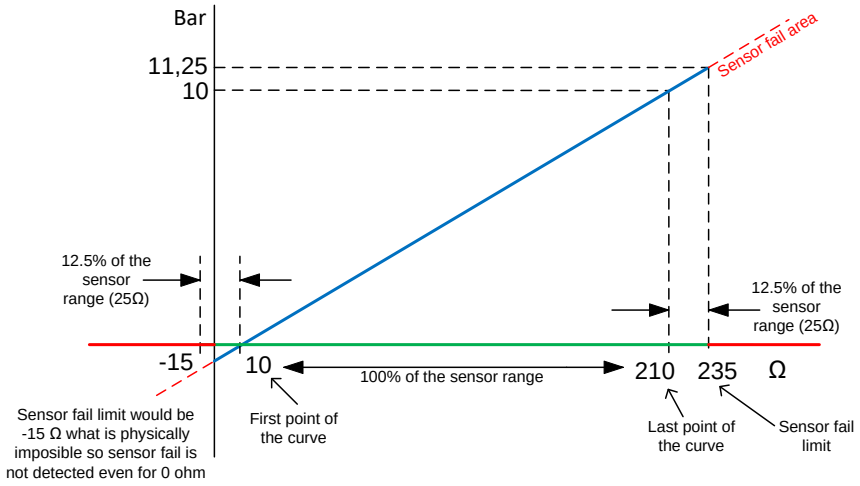
Dongle for load sharing, power management and additional PLC functions should be installed from the rear side of the controller under the rubber plug. Insert dongle so the dongle label remains visible as shown on the picture.



# 15. Sensors

## 15.1. Sensor fail detection (FLS)

If the measured resistance, voltage or current on an analog input gets out of valid range, the sensor fail will be detected and a sensor fail message will appear in the alarmlist. The valid range is defined by the most-left ($R_L$) and most-right ($R_H$) points of the sensor characteristic ±12.5% from $R_H$-$R_L$.




***HINT***

The sensor fail alarm does not influence the gen-set operation. Sensor fail does not activate Binary output Alarm.

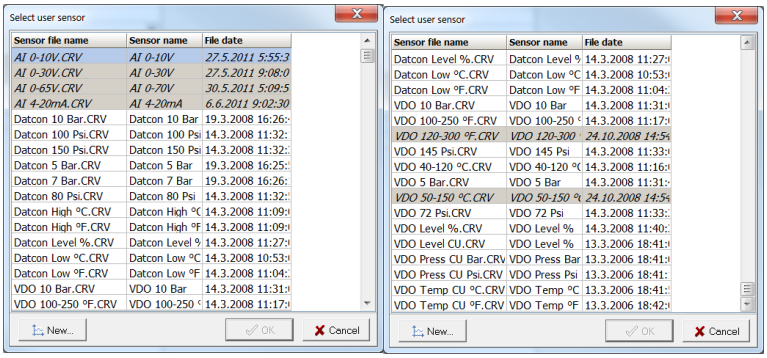
If engine shutdown/stop is required when Fls appears, configure in GenConfig -> Inputs/Outputs -> Analog inputs -> Protection -> property “Active when” to Under/Over limit + Fls.

## 15.2. Default Sensors

There are several predefined sensors which can be used for connection of particular sensor to analog inputs of the controller. The following list shows predefined standard sensors which are available in the roller menu.

PT100/°C, PT1000/°C, PT100/°F, PT1000/°F, NI1000/°C, NI1000/°F, 4-20mA active (linear), 0-2400ohm (linear), 0-2.4V (linear), Tristate (for definition please see the chapter about wiring Analog Inputs)

If you click on Other sensors, following dialog is shown:




In this dialog you can choose from available sensors or define your own (click on New).

All sensor curves in this dialog can be found in:

c:\Documents and Settings\All Users\Dokumenty\ComAp PC Suite\Curves\ (for Windows XP)

c:\Users\Public\Documents\ComAp PC Suite\Curves\ (for Windows 7)

**NOTE:**
You can choose “Electronic” sensor for SHAIN (Shared Analog Inputs). This sensor is used for decoding shared analog values via Intercontroller communication.

# 16. Regulation loops

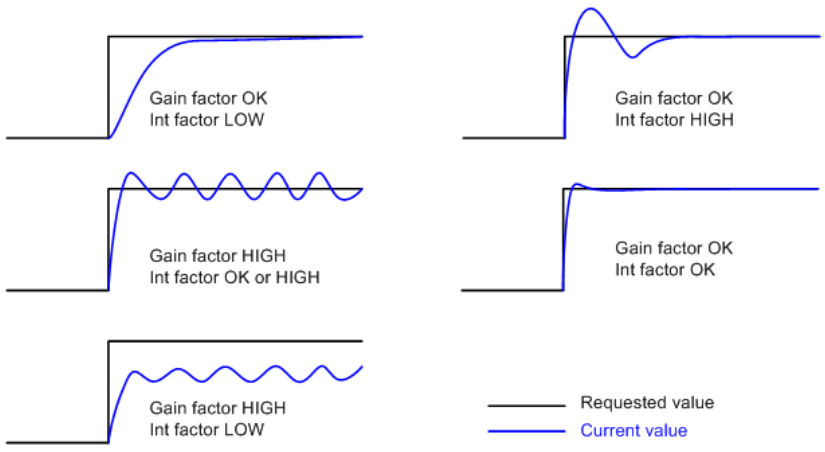
There are following regulation loops bulit-in in the controller. All of them are PI type except angle loop, which is P type.

| | |
|---|---|
| **Frequency loop** | The frequency loop is active in the first phase of synchronization when the generator frequency is regulated to match the mains/bus frequency. This loop can be also active while the gen-set is running without load at nominal speed and/or in single-island operation. See the setpoint *Freq Reg Loop* |
| **Angle loop** | The differential angle control loop is active during the synchronization when the "near to zero" slip frequency has been successfuly achieved and then the differential angle between generator and mains/bus voltage shall be controlled to the value adjusted by the setpoint *GtoM AngleReg*. |
| **Load control loop** | This regulation loop is active when single gen-set is running in parallel with mains and during load transfers from mains to generator or vice versa.<br><br>This regulation loop is also active when multiple gen-sets are running in parallel with mains when InteliMains NT is not in charge and it is also active in multiple-parallel operation if the load is controlled from an IM-NT (i.e. the setpoint *#SysLdCtrl PtM* is in LDSHARING position). |
| **Load sharing loop** | The load sharing loop is active in multiple-island operation (while the input *MCB feedback* is not active).<br><br>This loop is also active (using P,I factors multiplied by 0.1) on the "background" while load sharing is beeing performed (multiple-island operation) to maintain the group frequency at nominal value.<br><br>This regulation loop is also active if the gen-set is running in multiple island mode, however it is running in local baseload mode instead of load sharing. |
| **Voltage loop** | The voltage control loop is active during synchronization (the generator voltage is matched to the mains/bus voltage - see the example below) and during the island operation in SPtM (the gen-set voltage is maintained at the nominal voltage).<br><br>Example:<br>*GenNomV* is set to 220V and *MainsNomV* is set to 230V. During the synchronization measured voltage on Mains/Bus is 235V. Controller regulates the generator voltage to the |

| | |
|---|---|
| | following value: 235/230 = 1.02174*220 = **225V**. This enables usage of transformators between the measurement terminals. |
| **Cos-phi loop** | This regulation loop is active when single gen-set is running in parallel with the mains.<br><br>This regulation loop is also active when multiple gen-sets are running in parallel with mains in BASEPF mode i.e. there is no IM-NT in charge of cos phi regulation (e.g. import/export control). |
| **VAr sharing loop** | The VAr sharing loop is active in multiple-island operation (while the input *MCB feedback* is not active) or in multiple-parallel operation if the cos phi is controlled from an IM-NT (i.e. the setpoint *#SysPFCtrl PtM* is in VSHARING position).<br><br>This loop is also active in the controller with the lowest CAN address in the control groop (using P,I factors multiplied by 0.1) on the "background" while VAr sharing is beeing performed (multiple-island operation) to maintain the group voltage at nominal value. |

## 16.1. PI regulation adjustment

The regulation loops have two adjustable factors: P-factor and I-factor (except angle regulation loop, which has P-factor only). The P-factor (gain) influences the stability and overshoot of the regulation loop and the I-factor influences the steady-state error as well as the settling time. See the picture below for typical responses of a PI regulation loop.




Typical responses of a PI regulator

For manual tunning of a control loop use following method:

1. Set both the I-factor and P-factor to 0.
2. Increase the P-factor slightly until the system starts to oscillate.
3. Adjust the P-factor back to approx. one half of the value where the oscillations started.
4. Increase the I-factor slightly to achieve optimal resulting response.

**Note:**
It may be helpful to disable issuing the GCB close command when adjusting synchronization loops. Adjust the setpoint *Phase window* to 0 to disable it. Adjust the setpoint back to it's original value after the adjustment is finished.

**Caution!**

Be ready to press emergency stop button in case the regulation loop would start to behave unacceptable while it is beeing adjusted.

# 17. Speed governor and AVR general settings

## 17.1. Sync/load control adjustment

*Hint:*

Use isochronous speed governor.

Two wire shielded connection from IGS-NT SPEED GOVERNOR output (SG OUT, SG COM) to Speed governor auxiliary input is recommended.

A full range change of the IGS-NT speed governor output (from *SpeedGovLowLim* to *SpeedGovHiLim*) should cause 5-10% change of the engine speed (*SpeedGovLowLim* ~ 95% $RPM_{nom}$, *Speed gov bias* ~ 100% $RPM_{nom}$, *SpeedGovHiLim* ~ 105% $RPM_{nom}$.

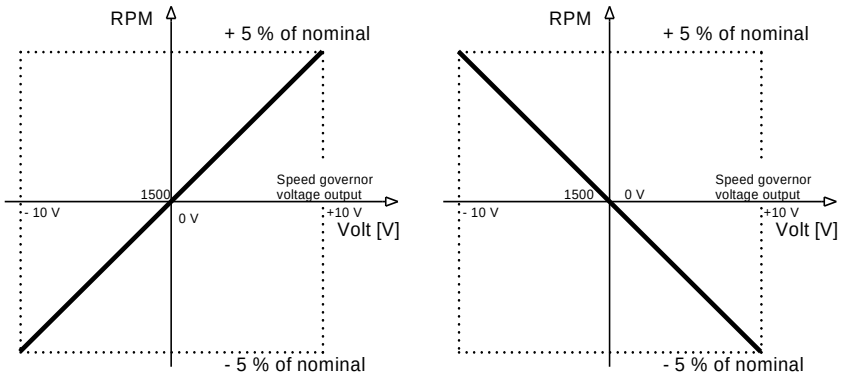
**IMPORTANT**

**Speed governor has to be adjusted for optimum performance before Sync / load control adjusting.**

**Check generator phase sequence before the first GCB connection.**

**Before optimal sync/load control settings are adjusted, please disconnect GCB OPEN/CLOSE output or set *Phase window* = 0 to avoid paralleling when adjusting settings.**

### 17.1.1. Speed governor output characteristics




*SpeedRegChar* = POSITIVE

*SpeedRegChar* = NEGATIVE

### 17.1.2. Synchronizer adjustment

1) Start the engine in MAN Mode.

2) Set the engine RPM by speed trim on speed governor or by *Speed gov bias* and *SpeedGovLowLim* and *SpeedGovHiLim* to reach Nominal frequency.
3) To start synchronizing press GCB ON/OFF button. GCB LED starts to flash to indicate synchronization. To stop synchronization press again GCB ON/OFF.

Slip control adjusting:

4) Adjust *Freq gain* to unstable speed control and decrease value by 30 % to insure stable performance.
5) Adjust *Freq int* to stable (fast and smooth) slip control. Synchroscope movement on the controller measure screen should slow down and stop (in any position, because Angle control is off).

Angle control adjusting:

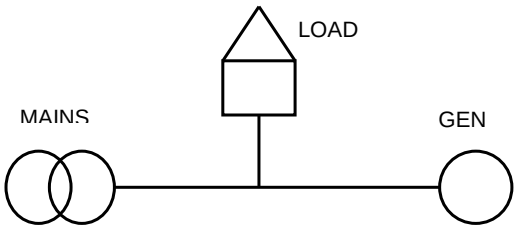
6) Set *Angle gain*. Synchroscope on the controller measure screen should move slowly and stop in "up" position. Set *Angle gain* to unstable value (synchroscope swings) and decrease value by 30 % to insure stable performance.

### 17.1.3. Load control adjustment

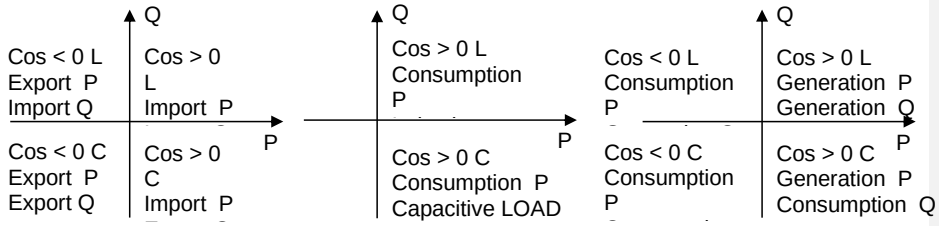
Prior to Sync/Load control adjustment, the Volt/PF control has to be adjusted! Load control loop is active in parallel to mains mode only (MCB feedback closed). Switch off other engines while adjusting.

1) Set #*SysLdCtrl PtM* = Baseload, set *Baseload* value to 30 % of Nominal power of one gen-set.
2) Set *Load gain* to the same value as *Slip freq gain*. Set *Load int* to zero.
3) Start the gen-set in MAN Mode, press GCB ON/OFF button to synchronize and close gen-set to mains.
4) When GCB is closed, gen-set load slowly increases to *Base load* value. Check that gen-set power is positive (CT polarity!).
5) Increase *Load gain* to unstable load control and decrease value by 30 % to insure stable performance. When *Load int* factor is set to zero gen-set load can differ from required Baseload.
6) To adjust and optimize *Load int* change several times *Base load* between 30 and 70 % of Nominal power. Usually setting *Load int* to 100% gives optimal performance.
7) When gen-set is running full load check if
   a. Speed governor output voltage value is not limited (not reached *SpeedGovLowLim* or *SpeedGovHiLim*)
   b. Speed governor actuator isn't mechanically limited or operates in small section of throttle range.

### 17.1.4. Active and reactive power terminology



| MAINS | LOAD | GEN |
|---|---|---|
| P > 0 Import | P > 0 Consumption | P> 0 Generation |
| Q> 0 Import | Q> 0 Consumption | Q> 0 Generation |




#### 17.1.4.1. Mains

Exported active power is supplied to the mains. It is displayed in negative numbers e.g. –20kW.

Imported active power is consumed from the mains. It is displayed in positive numbers e.g. +20kW.

When reactive power is imported (>0) InteliMains-NT displays L (inductive) character of the load.

When reactive power is exported (<0) InteliMains-NT displays C (capacitive) character of the load.

#### 17.1.4.2. Load

Active power consumed by Load is displayed in positive numbers e.g. 20kW.

When reactive power is positive (>0) InteliMains-NT displays L (inductive) character of the load.

When reactive power is negative (<0) InteliMains-NT displays C (capacitive) character of the load.

#### 17.1.4.3. Genset

Generated active power is displayed in positive numbers e.g. 20kW.

When reactive power is positive (>0) IGS-NT displays L (inductive) character of the load.

When reactive power is negative (<0) IGS-NT displays C (capacitive) character of the load.

## 17.2. Volt/PF control adjustment

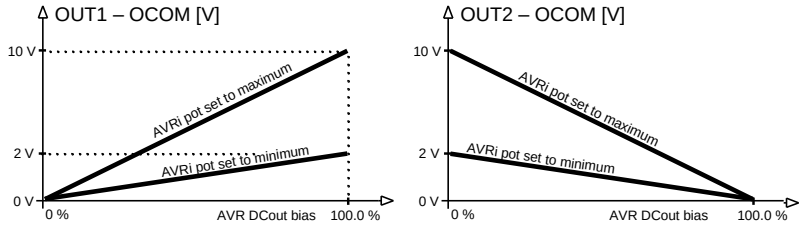
### 17.2.1. IG-AVRi output connection

Every time refer to corresponding AVR manual before interface connecting. Do not use AVR with Droop activated.

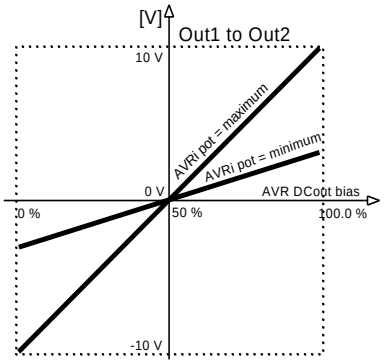
IG-AVRi-TRANS (AC power supply for AVRi) has to be supplied from gen-set voltage.

AVRi outputs can be connected as symmetric: OUT1-OUT2 or asymmetric OUT1-OCOM or OUT2-OCOM.

- Potentiometer on the AVRi defines maximum OUT1, OUT2 voltage range.
- Use symmetric (OUT1,OUT2) AVRi output to connect the AVRi to AVR auxiliary voltage input.
- Use asymmetric output if an external AVR potentiometer has to be replaced with AVRi.
- AVRi output voltage should change generator voltage typically in range ± 10 % of Nominal voltage.
- For more details please refer to Installation guide – chapter AVR interface examples.




AVRi Out1 or Out 2 to GND output voltage depends on AVRi trim setting




AVRi output voltage

| | Out1 - OCOM | | Out2 - OCOM | | Out1 – Out2 | |
|---|---|---|---|---|---|---|
| **Bias \ Pot** | Min | Max | Min | Max | Min | Max |
| 0 % | 0 | 0 | 2 | 10 | - 2 V | -10 V |
| 50 % | 1 | 5 | 1 | 5 | 0 V | 0 V |
| 100 % | 2 | 10 | 0 | 0 | + 2 V | 10 V |

AVRi Out1 to Out 2 output voltage

## 17.2.2. Voltage control adjustment

1) Set *Voltage gain*, *Voltage int* to zero and *AVR DCout bias* to 50%.
2) Start always with AVRi pot min adjustment (fully counterclockwise).
3) Start the gen-set in MAN Mode to nominal speed, without load.
4) Adjust generator voltage to nominal value by the potentiometer present on the AVR. If there is no potentiometer on the AVR, use setpoint *AVR DCout bias* to adjust the nominal voltage.
5) Change *AVR DCout bias* to 0% and 100% to check generator voltage control range (typically ± 10 % of nominal voltage). Adjust voltage control range by AVRi trim.
6) Set *AVR DCout bias* to be Nominal voltage on generator (50%).

7) When gen-set is running unloaded increase carefully *Voltage gain* to unstable point and then decrease value by 30 % to insure stable performance.
8) Adjust *Voltage int* (usually setting to 100% gives optimal performance).

*Hint:*

To judge optimal adjusting induce generator voltage jumps by *AVR DCout bias* change or by *Nominal voltage* change.

AVRi output *OCOM* is a common output. GND was used instead of OCOM

### 17.2.3. PF control adjustment

The genset should be cca 30 % loaded in parallel to mains and baseload mode.

1) Set the same values *PF gain, PF int* as in voltage control loop.
2) Set **Process control**: *#SysLdCtrl PtM* = BASELOAD, #Sys*BaseLoad* = 30 % of Nominal load, *#SysPFCtrl PtM* = BASEPF, *#SysPwrFactor* = 1.0.
3) Start and synchronize the gen-set in MAN Mode by pressing GCB ON/OFF
4) When running in parallel 30% loaded increase slowly *PF gain* to unstable point and then decrease value by 30 % to insure stable performance.
5) Adjust *PF int* (usually setting to 100% gives optimal performance).

*Hint:*

To judge optimal adjusting induce generator power jumps by *SysBaseLoad* change or by soft changes of *AVR DCout bias*.

# 18. Speed Governor Interface List

***HINT***
Read carefully Speed governor instructions before connecting controller Speed governor interface!

## 18.1. Electronic engines interface

All below mentioned interface examples describe analog interface even if they are (in some cases) used

for Electronic Control Units (Electronic engines) with CAN data bus.

There are several possibilities to connect CAN bus interface between Electronic engine and ComAp controller. Refer to ComAp Electronic Engines Support manual.

### 18.1.1. Communication Bridge Unit

I-CB unit is an interface between Controller and Electronic engine. Following I-CB types are available:

For more details see I-CB-ICBEdit-1.1.pdf manual.

| I-CB type | Engine |
|---|---|
| I-CB/MTU | MTU |
| I-CB/MTU-SIAM4000 | MTU |
| I-CB/CAT-Diesel | CAT |
| I-CB/CAT-Gas | CAT |
| I-CB/DeutzTEMe | Deutz |

## 18.2. Speed governor interface

### 18.2.1. Controller Speed reg out voltage limits

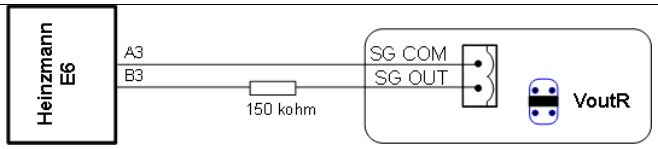
Setpoints **Sync/Ld ctrl**: *SpeedGovLowLim* [0,01V] and *SpeedGovHiLim* [0,01V] limit low and high levels of output voltage. E.g. instead of full –10V to +10V Speed governor output range can be set *SpeedGovLowLim* = 0,00 V and *SpeedGovHiLim* = 5,00 V to reduce the output range from 0 to 5V.

### 18.2.2. Interface List

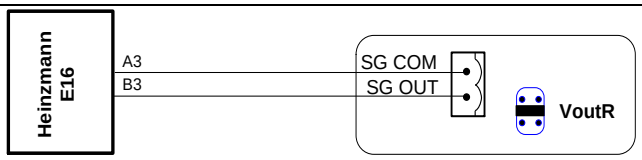
Following chapter describes analog interface to engines with standard electronic speed governors.

**Heinzmann**

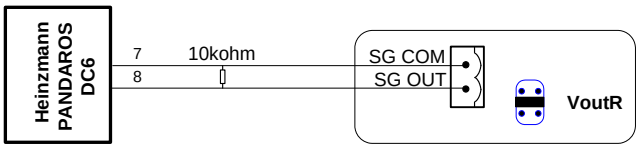

**Sync/Load ctrl**:
*Speed gov bias* = 0,00 V
*SpeedRegChar* = POSITIVE




**Sync/Load ctrl**:
*Speed gov bias* = 5,00 V
*SpeedRegChar* = POSITIVE

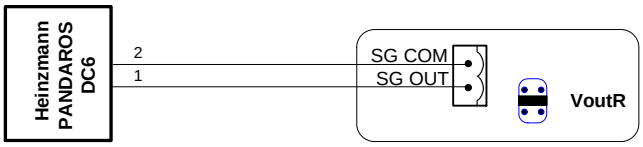



**Sync/Load ctrl**:
*Speed gov bias* = 0,00 V
*SpeedRegChar* = POSITIVE



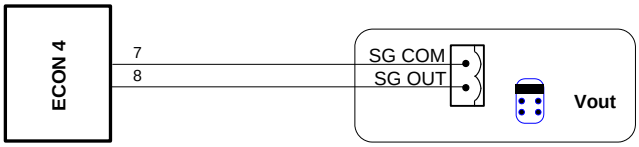

**Sync/Load ctrl**:
*Speed gov bias* = 5V
*SpeedRegChar* = POSITIVE
*SpeedGovLowLim* = 0,8V
For connection w/o resistor refer to the next setting

Terminals A3 and B3 are on OEM 14-pin connector.
Mounted on Perkins 40xx engines.



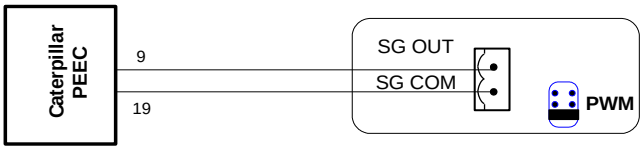

**Sync/Load ctrl:**
Speed gov bias = 2,7V
SpeedRegChar = POSITIVE
SpeedGovLowLim = 0V
SpeedGovHighLim = 6V

**ComAp**




**Sync/Load ctrl**:
*Speed gov bias* = 5,1V
*SpeedRegChar* = POSITIVE
*SpeedGovLowLim* = 0,0V
*SpeedGovHiLim* = 10V

**Caterpillar PEEC**

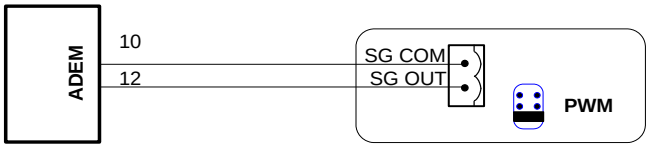



**Sync/Load ctrl**:
*SpdGovPWM rate = 500 Hz*

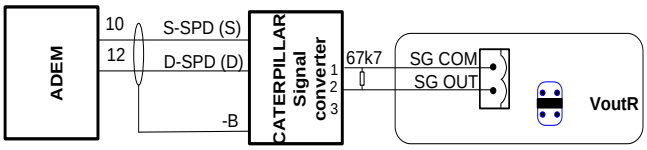
*Pay attention to the connector and jumper orientation.*

**Caterpillar Signal Converter**

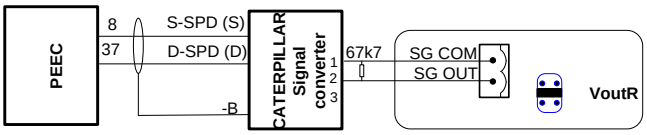
It is not necessary to use Caterpillar Signal Converter with controller from NT family (InteliGen$^{NT}$ and InteliSys$^{NT}$). Use direct PWM output instead.



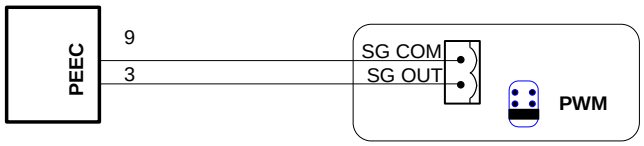

**Sync/Load ctrl**:
*Speed gov bias* = 5,10 V
*SpeedRegChar* = POSITIVE
*SpeedGovLowLim* = 0V
*SpeedGovHiLim* = 10V




**Sync/Load ctrl**:
*Speed gov bias* = 5,10 V
*SpeedRegChar* = POSITIVE
*SpeedGovLowLim* = 0V
*SpeedGovHiLim* = 10V

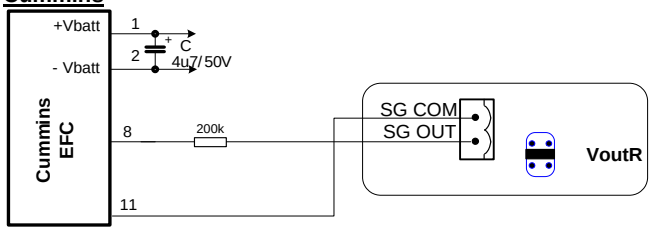



**Sync/Load ctrl**:
*Speed gov bias* = 5,10 V
*SpeedRegChar* = POSITIVE
*SpeedGovLowLim* = 0V
*SpeedGovHiLim* = 10V



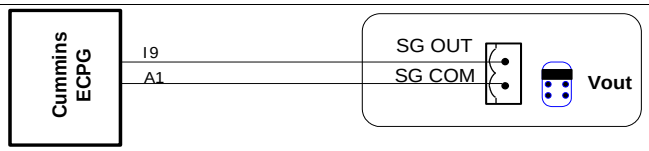

**Sync/Load ctrl**:
*SpdGovPWM rate = 500 Hz*

**Cummins**




**Sync/Load ctrl**:
*Speed gov bias* = 6,40 V
*SpeedRegChar* = POSITIVE
*SpeedGovLowLim* = 5V
*SpeedGovHiLim* = 7,8V

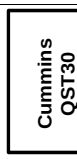
Spurious operation of the controller push buttons is caused by excessive interference from the speed controller when capacitor is not connected between power supply terminals 1 and 2.



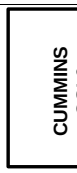

**Sync/Load ctrl**:
*Speed gov bias* = 2,50 V
*SpeedRegChar* = POSITIVE

*Pay attention to the connector and jumper orientation.*

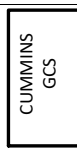

**Sync/Load ctrl**:
*Speed gov bias* = 2,50 V
*SpeedRegChar* = POSITIVE
*SpeedGovLowLim* = 0V
*SpeedGovHiLim* = 5V




**Sync/Load ctrl**:
*Speed gov bias* = 5,00 V
*SpeedRegChar* = POSITIVE




**Sync/Load ctrl**:
*Speed gov bias* = 3,50 V
*SpeedRegChar* = POSITIVE
*SpeedGovLowLim* = 2,5V
*SpeedGovHiLim* = 5V



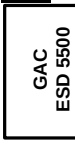

**Sync/Load ctrl**:
*Speed gov bias* = 5,00 V
*SpeedRegChar* = POSITIVE
*SpeedGovLowLim* = 2,5V
*SpeedGovHiLim* = 7,5V

**Barber Colman**

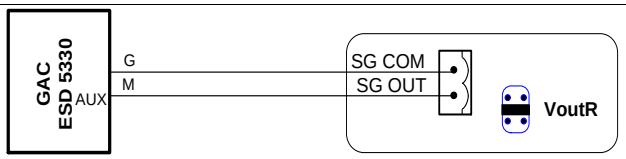

**Sync/Load ctrl**:
*Speed gov bias* = 6,00 V
*SpeedRegChar* = POSITIVE
*SpeedGovLowLim* = 4V
*SpeedGovHiLim* = 8V


**Sync/Load ctrl**:
*Speed gov bias* = 6,00 V
*SpeedRegChar* = POSITIVE
*SpeedGovLowLim* = 4V
*SpeedGovHiLim* = 8V

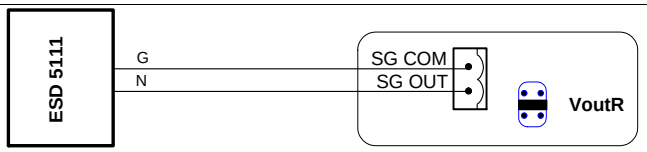
**GAC**



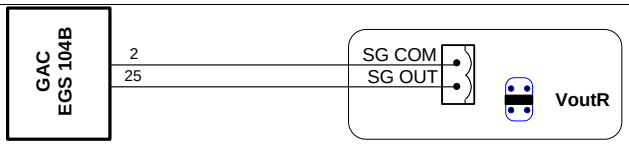

**Sync/Load ctrl**:
*Speed gov bias* = 5,00 V
*SpeedRegChar* = NEGATIVE
*SpeedGovLowLim* = 4V
*SpeedGovHiLim* = 6V



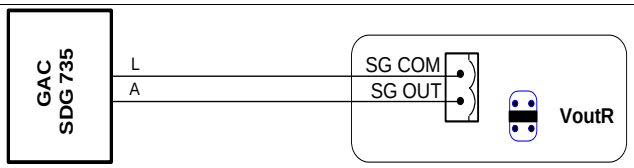

**Sync/Load ctrl**:
*Speed gov bias* = 5,00 V
*SpeedRegChar* = NEGATIVE




**Sync/Load Ctrl:**
*Speed Gov Bias* = 5.00 V
*SpeedGovChar* = NEGATIVE
*SpeedGovLowLim* = 4 V
*SpeedGovHiLim* = 6 V

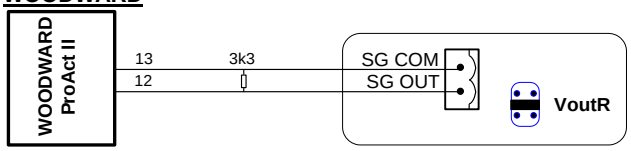



**Sync/Load ctrl**:
*Speed gov bias* = 5,00 V
*SpeedRegChar* = NEGATIVE
*SpeedGovLowLim* = 4V
*SpeedGovHiLim* = 6V

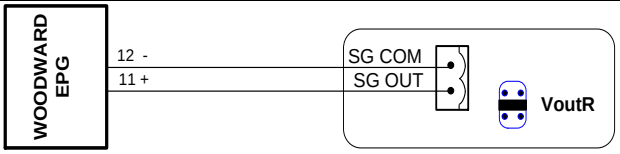



**Sync/Load ctrl**:
*Speed gov bias* = 5,00 V
*SpeedRegChar* = NEGATIVE
*SpeedGovLowLim* = 2,5V
*SpeedGovHiLim* = 7,5V
*Tau act.= 1*

**WOODWARD**

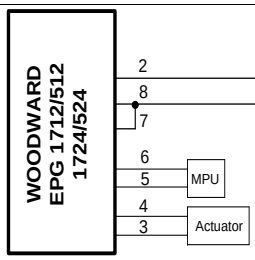



**Sync/Load ctrl**:
*Speed gov bias* = 0,00 V
*SpeedRegChar* = POSITIVE
*SpeedGovLowLim* = -2,5V
*SpeedGovHiLim* = 2,5V

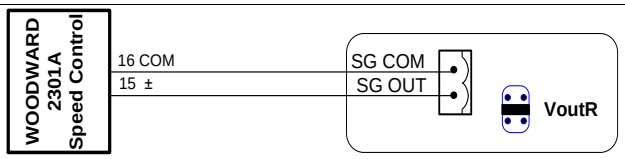



**Sync/Load ctrl**:
*Speed gov bias* =0 V
*SpeedRegChar* = POSITIVE
*SpeedGovLowLim* = -3 V
*SpeedGovHiLim* = 3 V

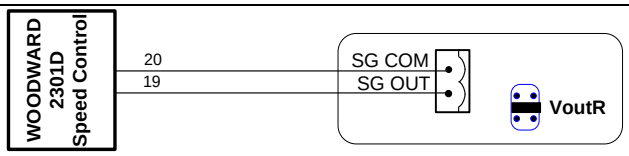
*Hint:*
For Woodward EPG speed governor (revision F) are limits:
SpeedGovLowLim = -3V
*SpeedGovHiLim* = +2V
*Speed gov bias* = -0,5 V




**Sync/Load ctrl**:
*Speed gov bias* = 3,1 V
*SpeedRegChar* = POSITIVE
*SpeedGovLowLim* = 6,5 V
*SpeedGovHiLim* = 0,0 V

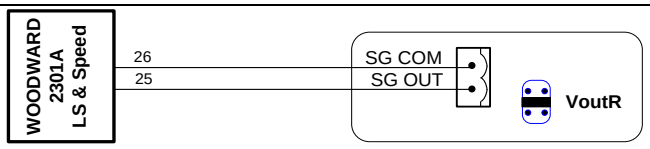



**Sync/Load ctrl**:
*Speed gov bias* = 5,00 V
*SpeedRegChar* = POSITIVE

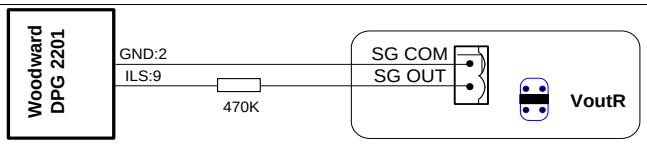



**Sync/Load ctrl**:
*Speed gov bias* = 5,00 V
*SpeedRegChar* = POSITIVE

Terminals 19 and 20 are marked as analog inputs # 1.
25,26 = Speed Signal Inputs

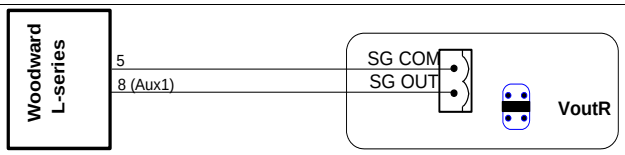



**Sync/Load ctrl**:
*Speed gov bias* = 5,00 V
*SpeedRegChar* = POSITIVE

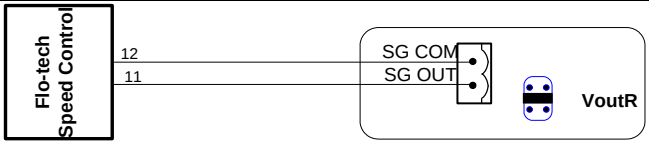



For Woodward DPG 2223 the ILS terminal is 10.

**Sync/Load ctrl:**
Speed gov bias = 2,50 V
SpeedRegChar = POSITIVE
SpeedGovLowLim = 0V
SpeedGovHiLim = 5V

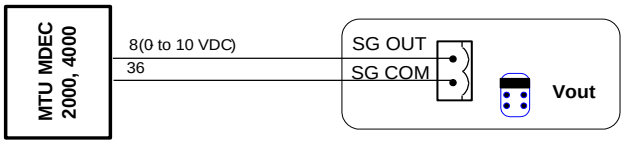



**Sync/Load ctrl:**
Speed gov bias = 2,50 V
SpeedRegChar = POSITIVE
SpeedGovLowLim = 0V
SpeedGovHiLim = 5V




**Sync/Load ctrl:**
Speed gov bias = 0 V

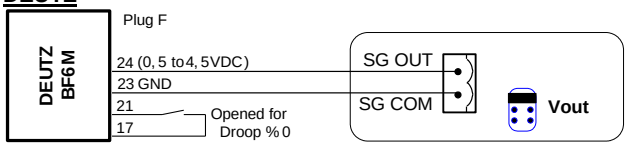
**MTU**




*Pay attention to the connector and jumper orientation.*

**Sync/Load ctrl**:
*Speed gov bias* = 4,90 V
*SpeedRegChar* = POSITIVE
*SpeedGovLowLim* = 0V
*SpeedGovHiLim* = 10V

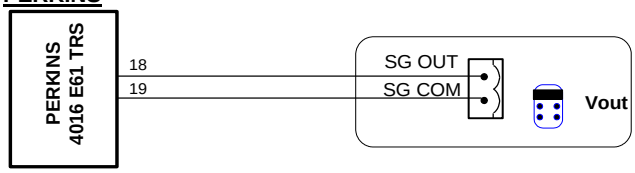
**DEUTZ**




*Pay attention to the connector and jumper orientation.*

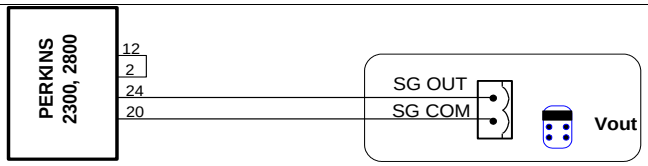
**Sync/Load ctrl**:
*Speed gov bias* = 2,50 V
*SpeedRegChar* = POSITIVE
*SpeedGovLowLim* = 0,5V
*SpeedGovHiLim* = 4,5V

**PERKINS**



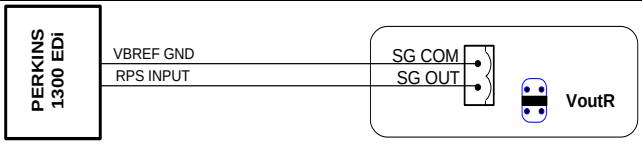

*Pay attention to the connector and jumper orientation.*

**Sync/Load ctrl**:
*Speed gov bias* = 5,00 V
*SpeedRegChar* = POSITIVE
*SpeedGovLowLim* = 2,5V
*SpeedGovHiLim* = 7,5V



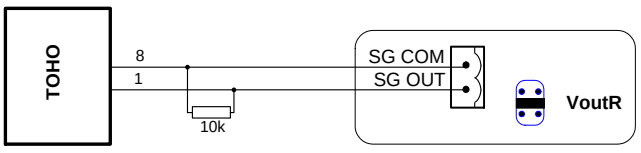

*Pay attention to the connector and jumper orientation.*
Above mentioned pin numbers refer to the Customer Interface Connector. The J1 connector on ECM has the following numbering:
20 = J1/3; 24 = J1/17

**Sync/Load ctrl**:
*Speed gov bias* = 2,50 V
*SpeedRegChar* = POSITIVE
*SpeedGovLowLim* = 0,5V
*SpeedGovHiLim* = 4,5V



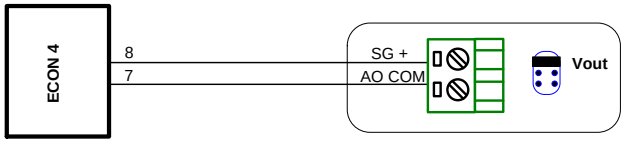

**Sync/Load ctrl**:
*Speed gov bias* = 2,5 V
*SpeedRegChar* = POSITIVE
*SpeedGovLowLim* = 0,8V
*SpeedGovHiLim* = 4,5V

**TOHO**




**Sync/Load ctrl**:
*Speed gov bias* = 4,00 V
*SpeedRegChar* = POSITIVE

DGC-2007
**ComAp**

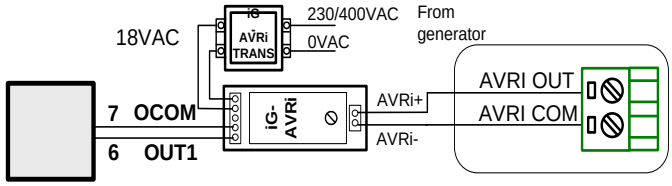



**Sync/Load Ctrl:**
*Speed Gov Bias* = 5.1 V
*SpeedGovChar* = POSITIVE
*SpeedGovLowLim* = 0 V
*SpeedGovHiLim* = 10 V

# 19. AVR Interface List

Read carefully AVR instructions before connecting to controller!

**Basler: APR 63-5, AEC 63-7, KR-FX, KR-FFX**

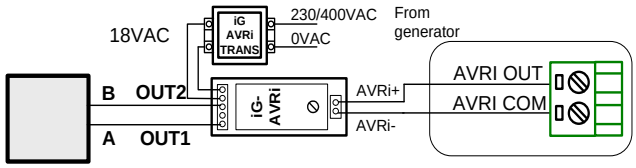



AVRi output is connected instead of external resistor for voltage adjusting.

AVRi trim to minimum counter clockwise.

**Volt/PF ctrl**:
*AVR DCout bias* = 50%
*VoltRegChar* = POSITIVE

**Basler: DECS 100**

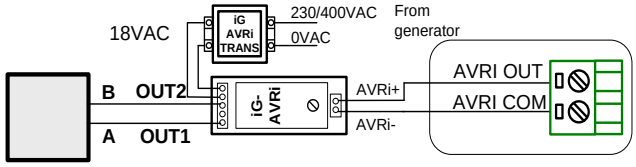



AVRi output is connected instead of external resistor for voltage adjusting.

AVRi trim to minimum counter clockwise.

**Volt/PF ctrl**:
*AVR DCout bias* = 50%
*VoltRegChar* = POSITIVE

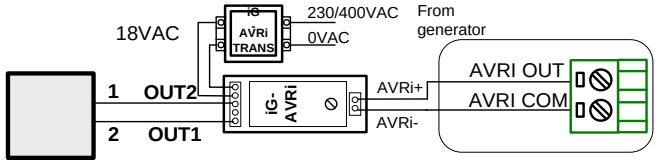
**BASLER: DESC 200**




AVRi trim to minimum counter clockwise.

**Volt/PF ctrl**:
*AVR DCout bias* = 50%
*VoltRegChar* = POSITIVE

**Stamford SX 460**

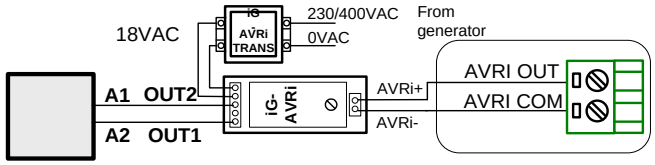



AVRi output is connected instead of external resistor for voltage adjusting.

AVRi trim to minimum counter clockwise.

**Volt/PF ctrl**:
*AVR DCout bias* = 50%
*VoltRegChar* = POSITIVE

**STAMFORD SX 440, AS440, MX 321, SX 421**

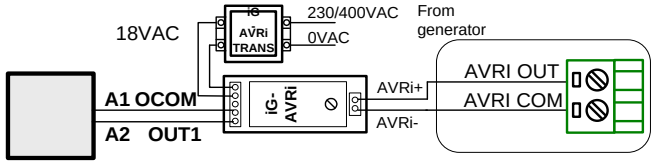



PFC3 module is not required.

AVRi trim to minimum counter clockwise.

**Volt/PF ctrl**:
*AVR DCout bias* = 50%
*VoltRegChar* = POSITIVE

**STAMFORD MX 341**



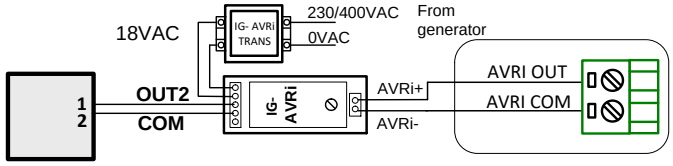

AVRi trim to minimum counter clockwise.

**Volt/PF ctrl**:
*AVR DCout bias* = 50%
*VoltRegChar* = POSITIVE

*Hint:*

Disconnect the droop CT (terminal S1 & S2) and short the droop CT leads
short the terminal S1,S2 on the AVR

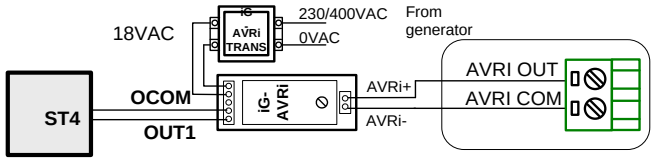
**Stamford AS480**




**Volt/PF ctrl**:
*AVR DCout bias* = 30%
*VoltRegChar* = POSITIVE

AVRi output is connected instead of external resistor for voltage adjusting.

**Kutai EA448**

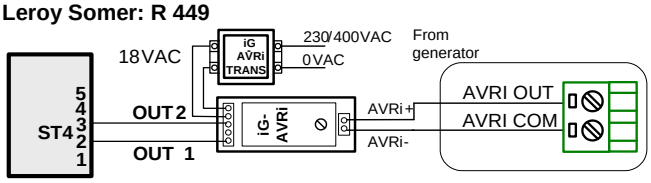



AVRi trim to minimum counter clockwise.

**Volt/PF ctrl**:
*AVR DCout bias* = 50%
*VoltRegChar* = POSITIVE

AVRi output is connected instead Remote voltage trimmer 470 ohm to terminals ST4. Module R726 is not required.

**Leroy Somer: R 449**

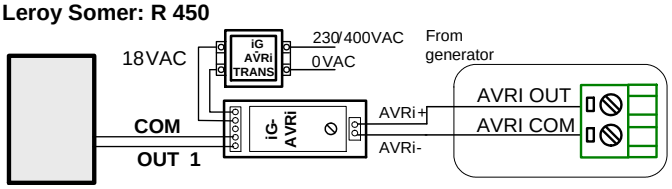



AVRi trim to minimum counter clockwise.

**Volt/PF ctrl**:
*AVR DCout bias* = 50%
*VoltRegChar* = POSITIVE

Module R726 is not required.

**Leroy Somer: R 450**



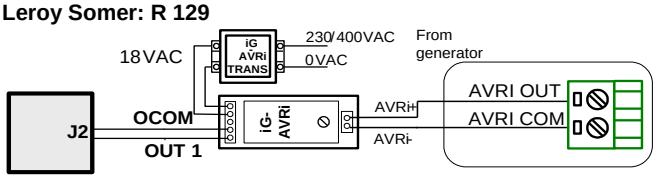

AVRi trim to minimum counter clockwise.

**Volt/PF ctrl**:
*AVR DCout bias* = 50%
*VoltRegChar* = POSITIVE

*Hint:*

*Use AVRi instead of potentiometer 1000 Ohm*
*Read Leroy Somer R450 manual before use*

**Leroy Somer: R 129**

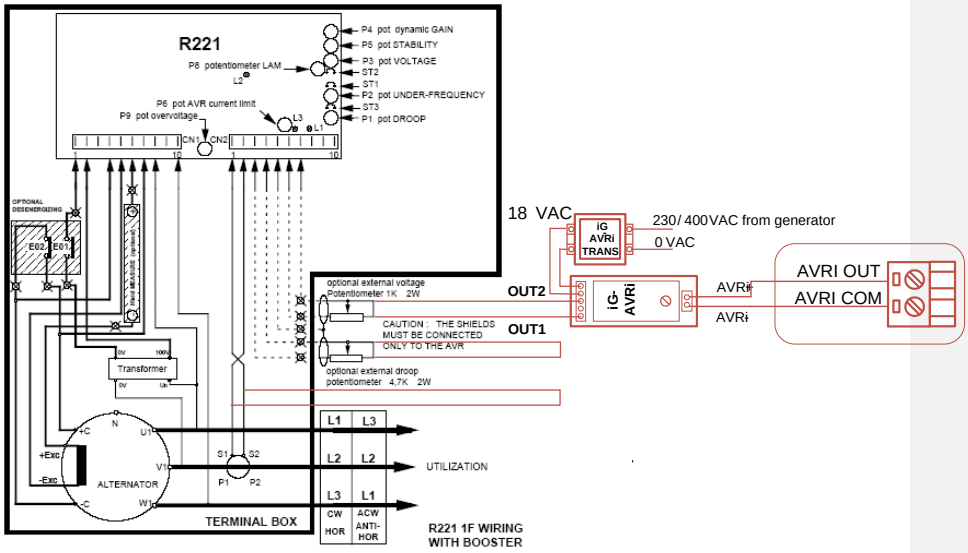



AVRi output is connected instead Remote voltage trimmer 470 ohm to terminal J2. Module R726 is not required.

AVRi trim to minimum counter clockwise.

**Volt/PF ctrl**:
*AVR DCout bias* = 50%
*VoltRegChar* = POSITIVE

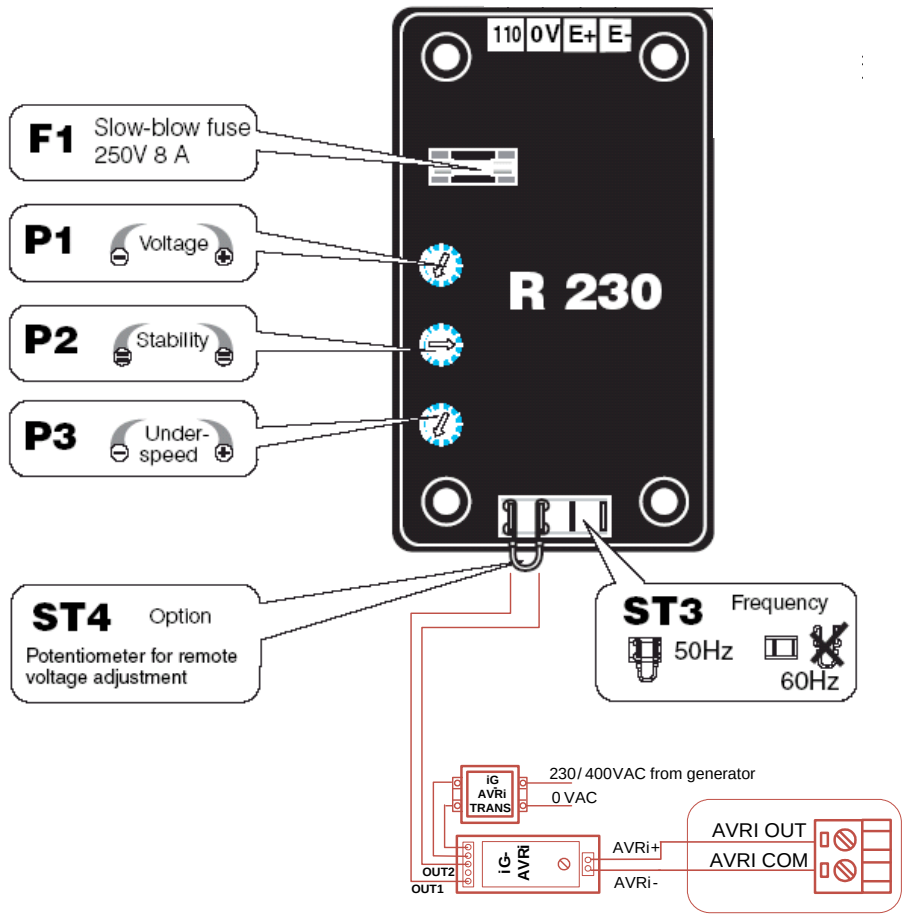
**Leroy Somer: R 221, R 222**




Module R726 is not required.
AVRi trim to minimum counter clockwise +5%.

**Volt/PF ctrl**:
*AVR DCout bias* = 24%
*VoltRegChar* = POSITIVE

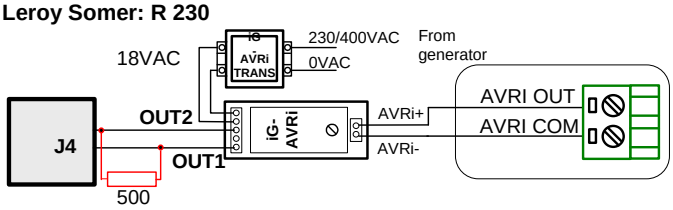
**Leroy Somer: R 230**




Module R726 is not required.
AVRi trim to minimum counter clockwise.

**Volt/PF ctrl:**
AVR DCout bias = 50%
VoltRegChar = POSITIVE

**Leroy Somer: R 230**



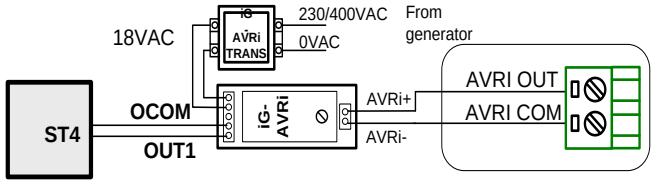

AVRi trim to minimum counter clockwise.

**Volt/PF ctrl:**
AVR DCout bias = 50%
VoltRegChar = POSITIVE

Remove Link J4 and replace through R500
Primary voltage setting with resistors connected: 230V

*Hint:*
Disconnect one wire (OUT 1), set voltage on running Generator to U = nom.
Measure Voltage over Resistor
Depending on Value increase AVRi potentiometer to get Range.
Set exact Value with Bias Voltage//PF regulation (gain=0)
Stop gen-set and connect when equal Voltage and polarity is achieved.
Set again in regulation loop on demand

**Leroy Somer: R 438 LS, R448**

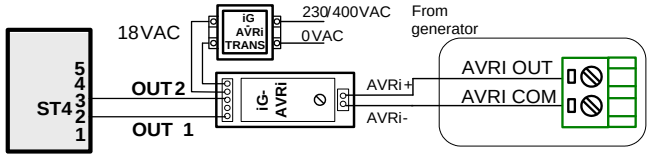



AVRi trim to minimum counter clockwise.

**Volt/PF ctrl**:
*AVR DCout bias* = 50%
*VoltRegChar* = POSITIVE

AVRi output is connected instead Remote voltage trimmer 470 ohm to terminals ST4.
Module R726 is not required.

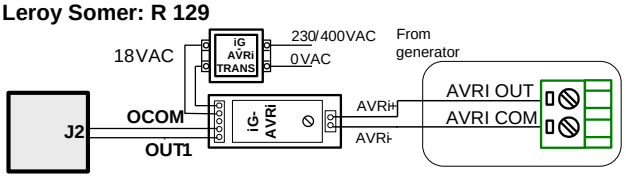
**Leroy Somer: R 449**




AVRi trim to minimum counter clockwise.

**Volt/PF ctrl**:
*AVR DCout bias* = 50%
*VoltRegChar* = POSITIVE

**Leroy Somer: R 129**

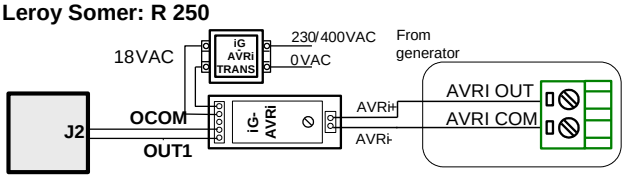



AVRi trim to minimum counter clockwise.

**Volt/PF ctrl**:
*AVR DCout bias* = 50%
*VoltRegChar* = POSITIVE

AVRi output is connected instead Remote voltage trimmer 470 ohm to terminal J2.

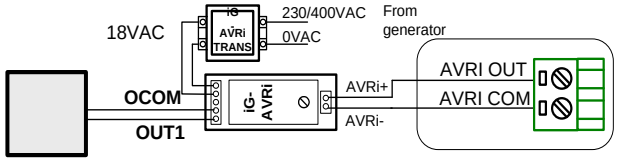
**Leroy Somer: R 250**




AVRi trim to minimum counter clockwise.

*VoltRegChar* = POSITIVE
*AVRDCout bias* = 50%

**Mecc Alte Spa: U.V.R.6**



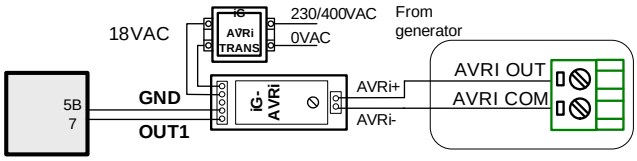

AVRi output is connected instead Remote voltage trimmer 100Kohm (OUT1=top position wire and GND =second top position).

AVRi trim to maximum clockwise.

**Volt/PF ctrl**:
*AVR DCout bias* = 75%
*VoltRegChar* = NEGATIVE

*Hint:*
*VoltRegChar* = POSITIVE is achived with IG-AVRi OUT2 and GND connection.

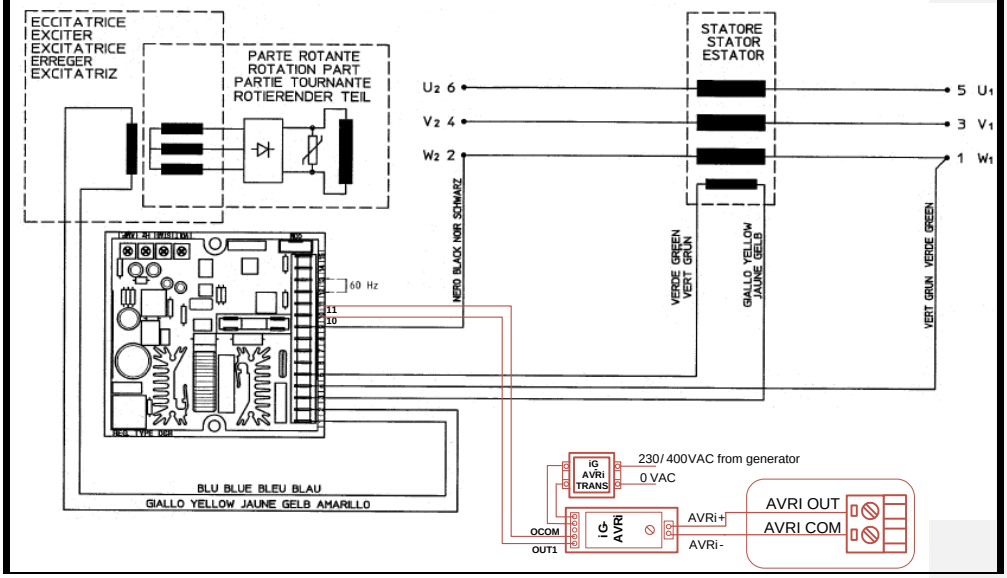
**Mecc Alte Spa: S.R.7/2**

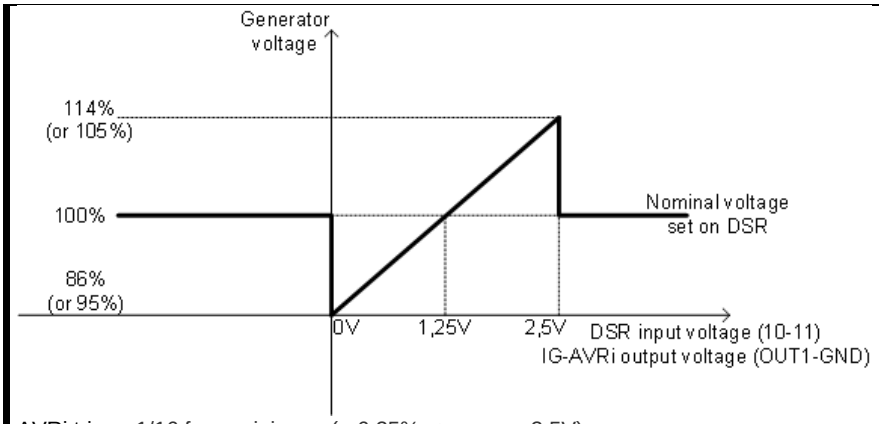



AVRi trim to maximum clockwise.

**Volt/PF ctrl**:
*AVR DCout bias* = 75%
*VoltRegChar* = NEGATIVE

**Mecc Alte DSR**



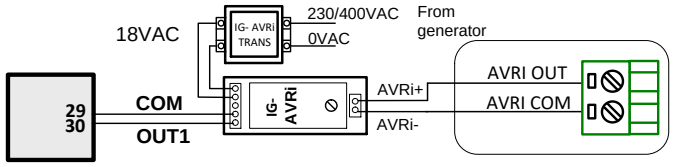



AVRi trim = 1/16 from minimum ( =6,25% => max. = 2,5V).

**Volt/PF ctrl**:
*AVR DCout bias* = 50%
*VoltRegChar* = POSITIVE

The Vext input (connector CN1 – terminals 10 and 11) permits analogical remote control of output voltage with a programmable variation range of up to ±10% (parameter 16, by default the setting is ±5%) with respect to the value set. If you want to use continuous voltage, it will be effective if it is in the range between 0V and +2,5V. The input tolerates voltages from –5V to +5V, but for values exceeding the limits of 0V / +2,5V (or in the event of disconnection) it is automatically disabled and the voltage adjustment goes back to the value set through the trimmer (if enabled) or through parameter 19 (as shown on the picture).
Changing of DSR parameters requires PC with dedicated software and DI1-DSR unit!
DSR automatically detects presence of transformer for parallel operation (if used it works with droop, if not used it works isochronous).

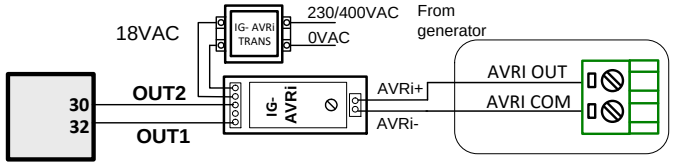
**MECC ALTE DER1**




AVRi trim = 1/16 from minimum

**Volt/PF ctrl**:
*AVR DCout bias* = 50%
*VoltRegChar* = POSITIVE

Alternative connection for **DER1**

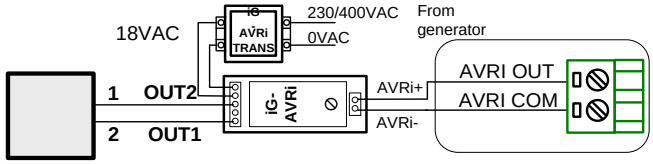



AVRi trim = maximum

**Volt/PF ctrl**:
*AVR DCout bias* = 50%
*VoltRegChar* = POSITIVE

Remove jumpers connecting input 27 to 28 and input 31 to 32.

**Piller**

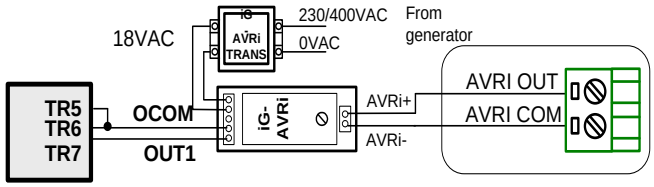



AVRi output is connected instead Remote voltage trimmer 100Kohm.

AVRi trim to minimum counter clockwise.

**Volt/PF ctrl**:
*AVR DCout bias* = 39%
*VoltRegChar* = POSITIVE

**Catterpillar VR6, VR3F**

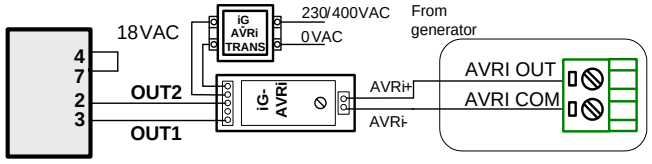



For VR3F link 4-7 has to be removed.

AVRi trim to minimum counter clockwise.

**Volt/PF ctrl**:
*AVR DCout bias* = 50%
*VoltRegChar* = POSITIVE

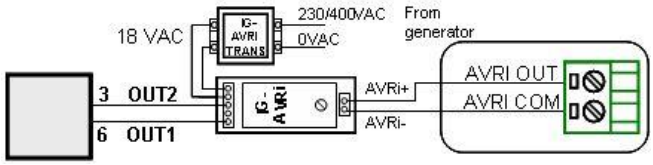
**Caterpillar VR6-B**




AVRi trim to minimum counter clockwise.

**Volt/PF ctrl**:
*AVR DCout bias* = 0%
*VoltRegChar* = POSITIVE
Voltage range (-2V; 2V)

**Caterpillar CDVR**

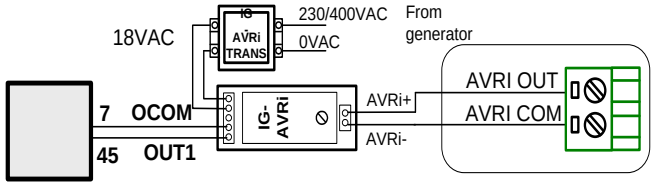



Pin 44 on DVR – PF regulation directly from DVR is not connected.

AVRi trim to 50%

**Volt/PF ctrl**:
*AVR DCout bias* = 50%
*VoltRegChar* = POSITIVE

**Catterpillar DVR**

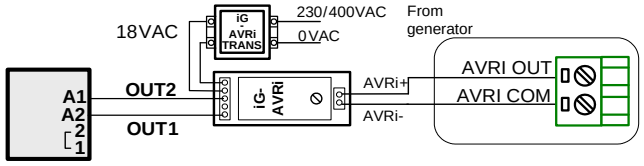



Pin 44 on DVR – PF regulation directly from DVR is not connected.

AVRi trim to 25%

**Volt/PF ctrl**:
*AVR DCout bias* = 50%
*VoltRegChar* = POSITIVE

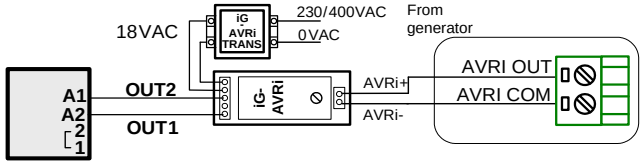
**AVK Newage MA330, 327, 321, 341**




AVRi trim to minimum counter clockwise

**Volt/PF ctrl**:
*AVR DCout bias* = 50%
*VoltRegChar* = POSITIVE

**Newer Leroy Somer**

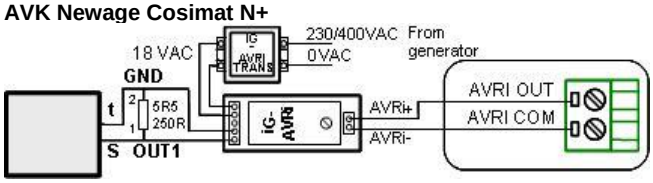



AVRi trim to minimum counter clockwise

**Volt/PF ctrl**:
*AVR DCout bias* = 50%
*VoltRegChar* = POSITIVE

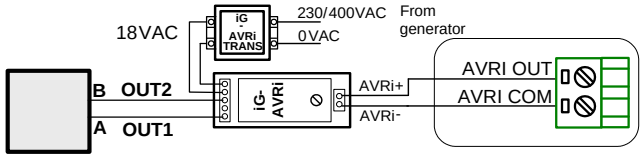
Regulation signal +/- 0..2,5V

**AVK Newage Cosimat N+**




**Volt/PF ctrl**:
*AVR DCout bias* = 25%
*VoltRegChar* = NEGATIVE

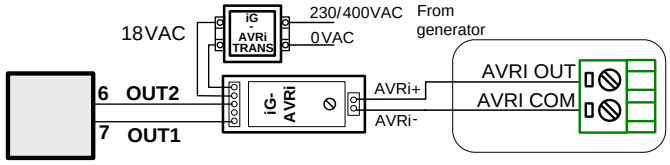
**Marathon DVR2000E**




AVRi trim to 1/3 clockwise

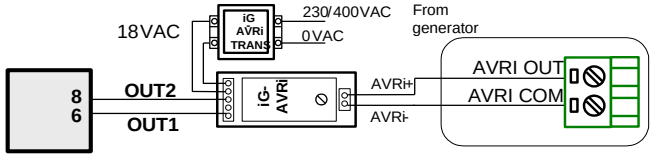
**Volt/PF ctrl**:
*AVR DCout bias* = 50%
*VoltRegChar* = POSITIVE

**Marathon PM100, 200**




**Volt/PF ctrl**:
*AVR DCout bias* = 50%
*VoltRegChar* = POSITIVE

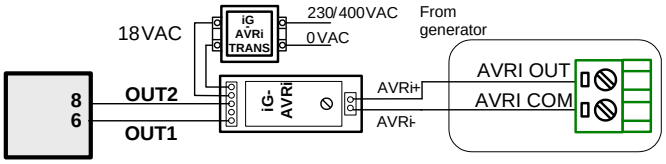
**MarelliMotori Mark I (M40FA640A/A)**




AVRi trim to 20%

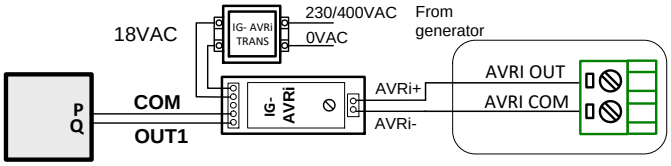
**Volt/PF ctrl**:
*AVR DCout bias* = 50%
*VoltRegChar* = POSITIVE

**MarelliMotori (M40FA610A)**




**Volt/PF ctrl**:
*AVR DCout bias* = 50%
*VoltRegChar* = POSITIVE

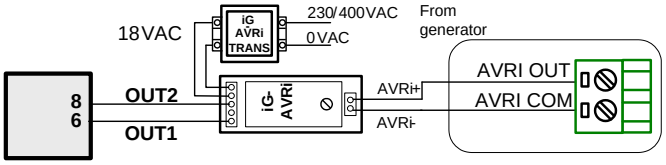
**MarelliGenerators MARK 5 (M16FA655A)**




AVRi trim to ¼ position

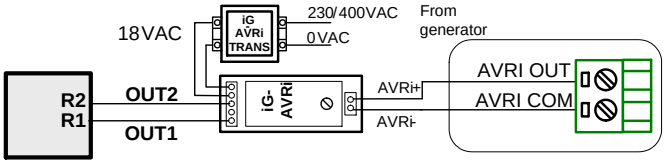
**Volt/PF ctrl:**
*AVR DCout bias* = 15%
*VoltRegChar* = POSITIVE

**KATO KCR 360**




**Volt/PF ctrl**:
*AVR DCout bias* = 50%
*VoltRegChar* = POSITIVE

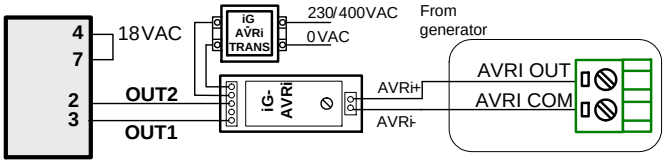
**KATO KCR 760**




AVRi trim to minimum position (fully counterclockwise)

**Volt/PF ctrl**:
*AVR DCout bias* = 45%
*VoltRegChar* = POSITIVE

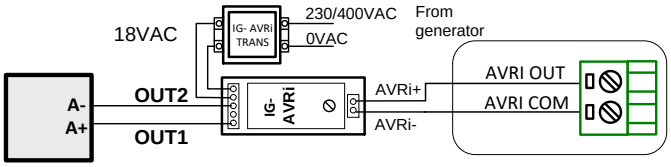
**KATO K-65-12B**




AVRi trim to minimum position (fully counterclockwise)

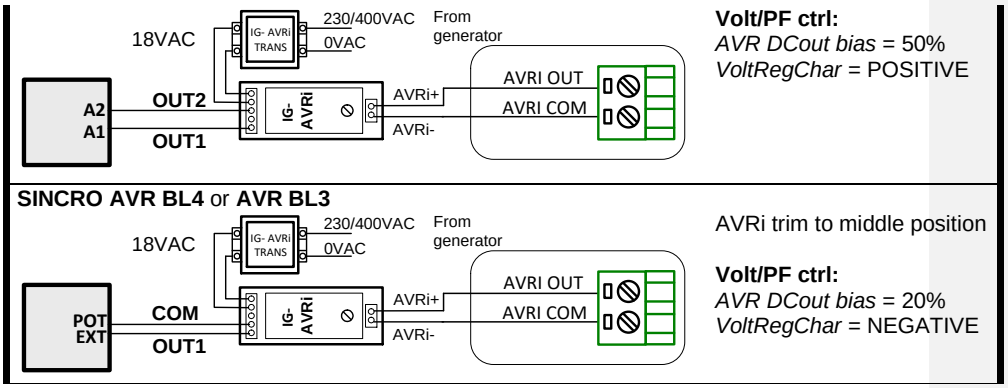
**Volt/PF ctrl**:
*AVR DCout bias* = 50%
*VoltRegChar* = POSITIVE

**ENGGA WT-2**




**Volt/PF ctrl:**
*AVR DCout bias* = 50%
*VoltRegChar* = POSITIVE

**ENGGA WT-3**




**Volt/PF ctrl:**
*AVR DCout bias* = 50%
*VoltRegChar* = POSITIVE

**SINCRO AVR BL4** or **AVR BL3**




AVRi trim to middle position

**Volt/PF ctrl:**
*AVR DCout bias* = 20%
*VoltRegChar* = NEGATIVE

# 20. Technical Data

## 20.1. Power supply

| | Controller | IS-Display | IG-Display | InteliVision 8 | InteliVision 5 |
|---|---|---|---|---|---|
| **Voltage supply** | 8-36V DC | 8-36V DC | 8-36V DC | 8-36V DC | 8-36V DC |
| **Consumption depends on supply voltage** | 0,4A at 8VDC | 0,3A at 8VDC | 0,4A at 8VDC | 1A at 8VDC | 0.7 A at 8VDC |
| | 0,15 A at 24VDC | 0,1 A at 24VDC | 0,14 A at 24VDC | 0,35A at 24VDC | 0.55 A at 24VDC |
| | 0,1A at 36VDC | 0,09A at 30VDC | 0,12A at 30VDC | 0,25A at 36VDC | 0.45 A at 36VDC |
| **Battery voltage measurement tolerance** | 2 % at 24V | | | | |
| **RTC battery life-cycle** | 10 year | | | | |

***HINT***
When internal RTC battery becomes flat, controller function (e.g. Ready for stand by) does not change until controller power supply is switched off. Some time before the battery is completely exhausted, a warning message appears in Alarmlist: "RTCbatteryFlat".

After the next power switch on (with flat battery already) controller:

Stays in the INIT state (not possible to run genset)

All History records disappear except of “System log: SetpointCS err” record

Time and Date values are set to zero

Statistics values are random

## 20.2. Operating conditions

| | |
|---|---|
| IG-NT, IG-NTC, IM-NT | -20 +70°C |
| IG-NT-LT, IG-NTC-LT, IM-NT-LT | -40 +70°C |
| IS-NT-system** operating temperature | -20..+70ºC * |
| IS-NT-BB operating temperature | -40..+70ºC * |
| IG/IS/IM BB NT and NTC versions (operating temperature) | -30 +70°C |
| IG/IS/IM BB NT and NTC versions (storage temperature) | -40 +80°C |
| IS-NT*** operating temperature (LT version) | -40..+70ºC * |
| Storage temperature | -30..+80ºC |

| | |
|---|---|
| Storage temperature IS-NT-BB | -40..+80°C |
| Flash memory data retention time | 10 years |
| Protection front panel (built-panel) | IP65 |
| Humidity | 95% without condensation |
| IEC/EN 60068-2-30 | |
| | |
| Standard conformity | |
| Low Voltage Directive | EN 61010-1:95 +A1:97 |
| Electromagnetic Compatibility | EN 50081-1:94 (EN 61000-6-3)<br>EN 50081-2:96 (EN 61000-6-4)<br>EN 50082-1:99 (EN 61000-6-1)<br>EN 50082-2:97 (EN 61000-6-2) |
| Vibration | 5 - 25 Hz, ±1,6mm<br>25 - 100 Hz, a = 4 g |
| Shocks | a = 200 m/s$^2$ |

**NOTE:**
* USB port should be used only above 0°C.

** IS-NT – including IS-Display and InteliVision 8

*** IS-NT – including IS-Display

## 20.3. Dimensions and weight

| | |
|---|---|
| Dimensions | See Terminals and Dimensions chapter |
| Weight (IG-NTC-BB) | 950g |

## 20.4. Measurements

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

### 20.4.1. Current inputs

| | IG-NT / IG-NT-BB | IG-NTC / IG-NTC-BB / IS-NT-BB, IS-NTC-BB / IM-NT |
|---|---|---|
| Nominal input current (from CT) | 0 ÷ 5 Amps, max 7,5 A all time, 10 A for 30 sec | 0 ÷ 5 Amps, max 7,5 A all time, 10 A for 30 sec<br>0 ÷ 1 Amps, max 1,5 A all time, 2 A for 30 sec |
| Load (CT output impedance) | < 0,1 Ω | < 0,1 Ω |
| CT input burden | < 0,2 VA per phase (Inom=5A) | < 0,1 VA per phase (Inom=1A)<br>< 0,2 VA per phase (Inom=5A) |
| Max. measured current from CT | 10 A | 2 A / 10 A |
| Current measurement tolerance | 2% from the Nominal current | 2% from the Nominal current |

| | | |
|---|---|---|
| Max. peak current from CT | 150 A / 1s | 150 A / 1s |
| Max. short term current | 12 A (for 30s) | 2,4 A / 12 A (for 30s) |
| Max. continuous current | 5 A | 1 A / 5 A |

### 20.4.2. Voltage inputs – IG/IS-NT and modifications

| | IG-NT / IG-NT-BB | IG-NTC / IG-NTC-BB / IS-NT-BB, IS-NTC-BB / IM-NT |
|---|---|---|
| Nominal voltage (ph-N / ph-ph) | 277/480 VAC | 120/207 or 277/480 VAC |
| Maximal measured/allowed voltage | 346/600 VAC | 150/260 or 346/600 VAC |
| Input resistance | 0,6 MΩ phase to phase | 0,6 MΩ phase to phase |
| | 0,3 MΩ phase to neutral | 0,3 MΩ phase to neutral |
| Voltage measurement tolerance | 1 % from the Nominal voltage | 1 % from the Nominal voltage |
| Over voltage class | III / 2 (EN61010) | III / 2 (EN61010) |

***HINT***
kW, kWh, Load sharing, VAr sharing measurement tolerance is 3%.

## 20.5. Binary inputs and outputs

### 20.5.1. Binary inputs

| | IG-NT / IG-NTC / IG-NT-BB / IG-NTC-BB | IM-NT | IS-NT-BB IS-NTC-BB |
|---|---|---|---|
| Number of inputs | 12 | 6 | 16 |
| Input resistance | 4,7 kΩ | 4,7 kΩ | 4,7 kΩ |
| Input range | 0-36 VDC | 0-36 VDC | 0-36 VDC |
| Switching voltage level for close contact indication | 0-2 V | 0-2 V | 0-2 V |
| Max voltage level for open contact indication | 8-36 V | 8-36 V | 8-36 V |

### 20.5.2. Binary open collector outputs

| | IG-NT / IG-NTC / IG-NT-BB / IG-NTC-BB | IM-NT | IS-NT-BB IS-NTC-BB |
|---|---|---|---|
| Number of outputs | 12 | 6 | 16 |
| Maximum current | 0,5 A | 0,5 A | 0,5 A |

| | | | |
|---|---|---|---|
| Maximum switching voltage | 36 VDC | 36 VDC | 36 VDC |

## 20.6. Analog inputs

| | |
|---|---|
| Not electrically separated | |
| Number of inputs | 3 / 0 / 4 unipolar ( IG-NT(x), IG-NT(x)-BB/ IM-NT / IS-NT-BB,IS-NTC-BB ) |
| Resolution | 10 bits |
| Jumper selectable range | V, ohm, mA |
| Maximal resistance range | 2500 Ω |
| Maximal voltage range | 5 V |
| Maximal current range | 0 – 20 mA |
| Input impedance | 180 Ω for mA measuring |
| Input impedance | > 100 kΩ for V measuring |
| Resistance measurement tolerance | ± 2 % ± 2 Ω out of measured value |
| Voltage measurement tolerance | ± 1 % ± 1mV out of measured value |
| Current measurement tolerance | ± 1 % ± 0,5mA out of measured value |

## 20.7. D+ function

| | |
|---|---|
| Max. D+ output current | 300 mA |
| Guaranteed level for signal Charging OK | 80% of supply voltage |

## 20.8. Speed pick-up input

| | |
|---|---|
| Type of sensor | magnetic pick-up |
| 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 | 0,2 % |

## 20.9. Communication interface

### 20.9.1. RS232 interface

| | |
|---|---|
| Maximal distance | 10m |
| Speed | up to 57.6kBd |

### 20.9.2. RS485 interface

| | |
|---|---|
| Maximal distance | 1000m |
| Speed | up to 57.6kBd |

### 20.9.3. CAN bus interface

| | |
|---|---|
| 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 $mm^2$ |
| 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

## 20.10. Analog outputs

| | |
|---|---|
| Speed governor output max. 15 mA | ± 10 V DC / 5 V PWM (500 – 3000Hz), |
| AVRi outputs | PWM to IG-AVRi |
| Current output | 0 – 20 mA ± 0,3mA |
| Voltage output | 0 – 10 V DC, max. 15 mA |
| Max load resistance | 470R at 9,4V |

## 20.11. IG-AVRi

| | |
|---|---|
| Power supply: Trans/100 | 18V AC from IG-AVRi Trans/LV or IG-AVRi |
| Absolutely maximum power supply range: | 15 - 25 VAC |
| Inputs: | +AVR, -AVR (two wires, PWM from IG-CU) |
| Outputs: source. | OUT1, OUT2 floating (potential free) voltage |
| AVRi output voltage range: DC. | potentiometer adjustable from +- 1V to +-10V |
| AVRi output current: | max 15 mA. |

| | |
|---|---|
| Mechanical dimensions: | 96 x 27 x 43 mm , DIN rail (35 mm) mounted |

### 20.11.1. IG-AVRi Trans/LV

| | |
|---|---|
| Primary voltage 1: | 230-277 VAC |
| Absolute low limit: | 230 VAC – 20% |
| Absolute high limit: | 277 VAC + 20% |
| | |
| Primary voltage 2: | 400-480 VAC |
| Absolute low limit: | 400 VAC – 20% |
| Absolute high limit: | 480 VAC + 20% |
| | |
| Frequency: | 50 – 60 - 400 Hz |
| Secondary voltage: | 18 V AC, 5 VA |
| Operating temperature | -30..+70ºC |

### 20.11.2. IG-AVRi Trans/100

| | |
|---|---|
| Primary voltage: | 100 – 120 VAC |
| Absolute low limit: | 100 VAC – 20% |
| Absolute high limit: | 120 VAC + 20% |
| | |
| Frequency: | 50 - 60 – 400Hz |
| Secondary voltage: | 18 V AC |
| Operating temperature | -30..+70ºC |

## 20.12. IGS-PTM

| | |
|---|---|
| Voltage supply | 8-36V DC |
| Consumption | 0,1A depend on supply voltage |
| Mechanical dimensions: | 40 x 9 x 45 mm , DIN rail (35 mm) mounted |
| Interface to controller | CAN |
| Operating temperature | -30..+70ºC |

### 20.12.1. Binary inputs

| | |
|---|---|
| Number of inputs | 8 |
| Input resistance | 4,7 kΩ |
| 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 |

### 20.12.2. Binary open collector outputs

| | |
|---|---|
| Number of outputs | 8 |
| Maximum current | 0,5 A |
| Maximum switching voltage | 36 VDC |

### 20.12.3. Analog inputs

| | |
|---|---|
| Not electrically separated | |
| Number of inputs | 4 |
| Resolution | 10 bits |
| Maximal resistance range | 0 – 250 Ω |
| Maximal voltage range | 0 – 100 mV |
| Maximal current range | 0 – 20 mA |
| Resistance measurement tolerance | 1 % ± 2 Ω out of measured value |
| Voltage measurement tolerance | 1,5 % ± 1mV out of measured value |
| Current measurement tolerance | 2,5 % ±0,5mA out of measured value |

### 20.12.4. Analog output

| | |
|---|---|
| Not electrically separated | |
| Number of inputs | 1 |
| Resolution | 10 bits |
| Output range | 0 to 20 mA ± 0,33 mA |

## 20.13. IS-AIN8

| | |
|---|---|
| Nominal power supply | 24 VDC |
| Power supply range | 8 – 36 VDC |
| Max. consumption | 250 mA |
| Mechanical dimensions: | 150 x 160 x 50 mm ,<br>DIN rail (35 mm) mounted |
| Connection to controller (galvanically separated) | CAN1 |
| | |
| Operating temperature | -40..+70°C |
| Storage temperature | -40..+80°C |
| Protection front panel | IP 20 |
| Humidity | 95% without condensation |
| Standard conformity | |
| Low Voltage Directive | EN 61010-1:95 +A1:97 |
| Electromagnetic Compatibility | EN 50081-1:94 (EN 61000-6-3)<br>EN 50081-2:96 (EN 61000-6-4)<br>EN 50082-1:99 (EN 61000-6-1)<br>EN 50082-2:97 (EN 61000-6-2) |

### 20.13.1. Analog inputs

| | |
|---|---|
| Nominal power supply | 24 VDC |
| Power supply range | 8 – 36 VDC |
| Number of inputs | 8 |
| Not galvanic separated | |
| Resolution | 16 bits |

Each analog input can be software configured to:

| | | Measuring range From | to | Accuracy |
|---|---|---|---|---|
| Resistance | | 0 Ω | 2400 Ω | ± 0,5 % |
| | | 0 Ω | 250 Ω | ± 1,0 % |
| Current | Passive | 0 / 4 mA | 20 mA | ± 0,5 % |
| | Active | 4 mA | 20 mA | ± 0,5 % |
| | Active | 0 mA | ± 20 mA | ± 0,5 % |
| Voltage | Thermocouples J, K, L type | | | ± 0,2 % |
| | | 0 mV | 100 mV | ± 0,2 % |
| | | - 1000 mV | + 1000 mV | ± 0,5 % |
| | | 0 mV | 2500 mV | ± 0,5 % |

***HINT***
Sensors must be isolated from the engine body (except for thermocouples (since HW version 5.0)). Follow rear sticker description and remove the appropriate jumpers in case of thermocouples not isolated from the engine body.

It's possible to connect voltage up to 10V to an analog input if an external volt box which is described on p.53 is used.

## 20.14. I-AOUT8

| | |
|---|---|
| Voltage supply | 8-36V DC |
| Consumption | 0,1A depend on supply voltage |
| Mechanical dimensions: | 40 x 95 x 45 mm , 35 mm DIN rail |
| mounted | |
| Interface to controller | CAN |
| Operating temperature | -30..+70ºC |
| Number of analog outputs | 8 (not electrically separated) |
| Output range | 0 to 10 VDC |
| | 0 to 20 mA |
| | PWM (1200 Hz) |

## 20.15. IS-BIN16/8

| | |
|---|---|
| Nominal power supply | 24 VDC |
| Power supply range | 8 – 36 VDC |
| Max. consumption | 250 mA |
| Mechanical dimensions: | 150 x 160 x 50 mm , |
| | DIN rail (35 mm) mounted |
| Connection to controller (galvanically separated) | CAN1 |
| | |
| Operating temperature | -30..+70ºC |
| Storage temperature | -40..+80ºC |
| Protection front panel | IP 20 |
| Humidity | 95% without condensation |
| Standard conformity | |
| Low Voltage Directive | EN 61010-1:95 +A1:97 |

| | |
|---|---|
| Electromagnetic Compatibility | EN 50081-1:94 (EN 61000-6-3)<br>EN 50081-2:96 (EN 61000-6-4)<br>EN 50082-1:99 (EN 61000-6-1)<br>EN 50082-2:97 (EN 61000-6-2) |

### 20.15.1. Binary inputs

| | |
|---|---|
| Galvanically separated two groups | |
| Number of inputs | 8 + 8 |
| Input resistance | 3 kΩ |
| Input voltage range | 0-36 VDC |
| | |
| Input voltage level for open contact | 8 to Power supply VDC |
| Input voltage level for close contact | 0 to 2 VDC |

Voltage level is defined between Binary input and Binary input COM terminal.

### 20.15.2. Open collector outputs

| | |
|---|---|
| Number of outputs (galvanically separated) | 8 |
| Maximum current | 0,5 A |
| Maximum switching voltage | 36 VDC |

### 20.15.3. Frequency inputs

| | |
|---|---|
| Number of inputs | 2 (RPM1, RPM2) |
| **RPM1** | |
| Type of sensor | magnetic pick-up |
| Minimum input voltage | 2 Vpk-pk (from 4 Hz to 4 kHz) |
| Maximum input voltage | 50 Veff |
| Maximum measured frequency | 8 kHz (min. input voltage 6Vpk-pk), frequency mode |
| **RPM2** | |
| Type of sensor | Contact or Active sensor |
| Minimal pulse width | 10 ms, integration mode |
| Maximum measured frequency | 60 Hz, integration mode |

**NOTE:**
RPM1, RPM2 are available from IS SW version 2.6

## 20.16. IGL-RA15

### 20.16.1. Power supply

| | |
|---|---|
| Voltage supply | 8-36V DC |
| Consumption | 0,35-0,1A (+1A max horn output) |

Depend on supply voltage

### 20.16.2. Operating conditions

| | |
|---|---|
| Operating temperature | -20..+70ºC |
| Storage temperature | -30..+80ºC |
| Protection front panel | IP65 |

### 20.16.3. Dimensions and weight

| | |
|---|---|
| Dimensions | 180x120x55mm |
| Weight | 950g |

### 20.16.4. Horn output

| | |
|---|---|
| Maximum current | 1 A |
| Maximum switching voltage | 36 VDC |

## 20.17. I-CB, I-CR

### 20.17.1. Power supply

| | |
|---|---|
| Voltage input | 8-36V DC |
| Consumption | 0.1A depend on power supply |

### 20.17.2. Operating conditions

| | |
|---|---|
| Operating temperature | -20 ÷ +70 °C |
| Storage temperature | -30 ÷ +80 °C |
| | |
| Humidity | 85% without condensation |
| Protection | IP20 |

### 20.17.3. Dimensions and weight

| | |
|---|---|
| Dimensions | 95x96x43 mm, DIN rail (35 mm) mounted |
| Weight | 300g |

### 20.17.4. CAN bus interface

| | |
|---|---|
| Galvanic separated | |
| Maximal CAN bus length | 200m |
| Speed | up to 250kBd (depends on ECU type connected) |
| Nominal impedance | 0Ω |
| Cable type for iS connection | sted pair (shielded) |

### 20.17.5. RS232 interface

| | |
|---|---|
| Maximal distance | 0m |
| Speed | p to 19.2kbps (depends on ECU type |
| connected) | |

## 20.18. I-LB

| | |
|---|---|
| Voltage supply | -36V DC |
| Consumption | ,1A depend on supply voltage |
| Operating temperature | -30..+70ºC |
| Mechanical dimensions: | 5 x 96 x 43 mm , DIN rail (35 mm) |
| mounted | |
| Interface to modem or PC | S232, RS422, RS485, (USB – I-LB+ |
| version) | |
| Interface to controller | AN |

## 20.19. IG-IB

| | |
|---|---|
| Voltage supply | -36V DC |
| Consumption | ,1A depend on supply voltage |
| Mechanical dimensions: | 5 x 96 x 43 mm , DIN rail (35 mm) |
| mounted | |
| Interface to controller | S232 or CAN |
| Interface to modem | S232 |
| Interface to Ethernet | J45 (10baseT) |
| Operating temperature | -30..+70ºC |
| Storage temperature | -30..+70ºC |

## 20.20. I-RBxx

| | |
|---|---|
| Number of relays: | 6 or 8 in sockets |
| Nominal voltage: | 4 VDC |
| Voltage range: | 6,8 – 36 VDC |
| Relay opens at: | 0% of nominal voltage |
| Electric / mechanic cycles: | 00 000 / 10 000 000 |
| Operating temperature range: | 40°C to 70°C |
| Maximal load: | 6 A resistive load at 24VDC |
| | 4 A inductive load at 24 VDC |
| (I-RBxx-231) | 2 A at 231VAC |
| Contacts protection: | aristor 14DK390 |

## 20.21. IG-MTU

| | |
|---|---|
| Primary voltage Ph-Ph | x400 VAC / 50Hz (3x480 VAC / 60 Hz) |
| Secondary voltage Ph-N | x 230 V AC ( 3x277 VAC / 60 Hz) , 5 VA |
| Mechanical dimensions: | 5 x 95 x 60 mm , DIN rail (35 mm) |
| mounted | |

| | |
|---|---|
| Primary/secondary Phase shift | 1° |
| Operating temperature | -30..+70ºC |

## 20.22. IG-MTU-2-1

| | |
|---|---|
| Primary voltage Ph-Ph | x600 VAC / 50Hz (3x720 VAC / 60 Hz) |
| Secondary voltage Ph-N | x 173 V AC ( 3x208 VAC / 60 Hz) , 5 VA |
| Mechanical dimensions: | 55 x 95 x 60 mm , DIN rail (35 mm) |
| mounted | |
| Primary/secondary Phase shift | 1° |
| Operating temperature | -30..+70ºC |