

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

InteliGen[®]
InteliSys[®]

Software version IG-6.2, IS-3.4, August 2005



Application guide



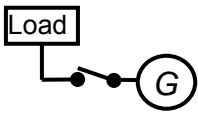
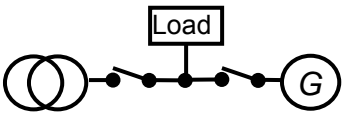
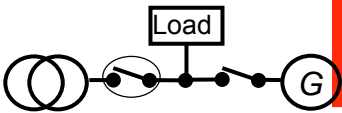
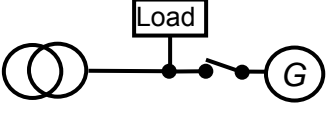
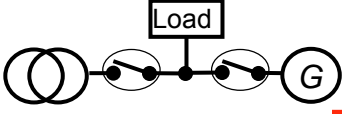
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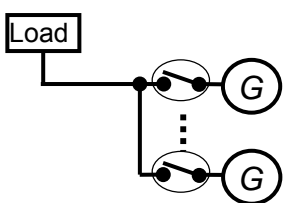
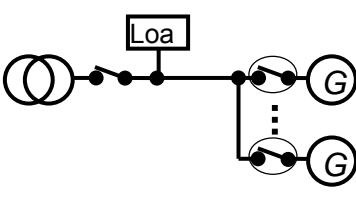
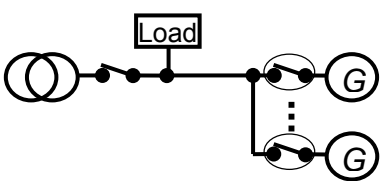
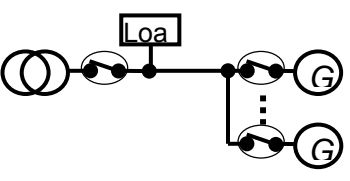
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1. IntelliGen, IntelliSys applications

1.1. Single set

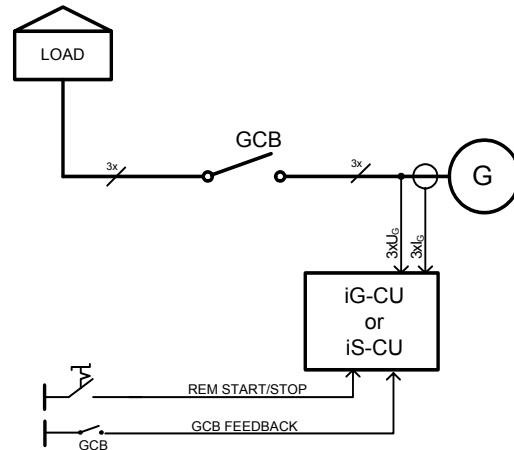
	No MCB	MCB Controlled	MCB Synchronized
GCB controlled	 <p>Single Prime Mover SPM</p>	 <p>Single Stand-by SSB</p>	 <p>Single Parallel to Mains SPtM</p>
GCB Synchronized		 <p>Single Parallel Island SPI</p>	 <p>Single Parallel to Mains SPtM</p>

1.2. Multiple sets

	No MCB	MCB Controlled	MCB Synchronized
No Parallel to Mains	 <p>Multiple Prime mover: MEXT, MINT</p>	 <p>Multiple Stand-by: MEXT, MINT</p>	
Parallel to Mains		 <p>Multiple Parallel to mains, Stand-by, MCB not synchronized: MEXT, MINT</p>	 <p>Multiple Parallel to mains, Stand-by, MCB synchronized: MEXT, MINT</p>

2. Single set

2.1. Single Prime Mover: SPM



Specification

- Automatic start-up and gen-set loading on external command

InteliGen hardware requirements

1x IG-CU

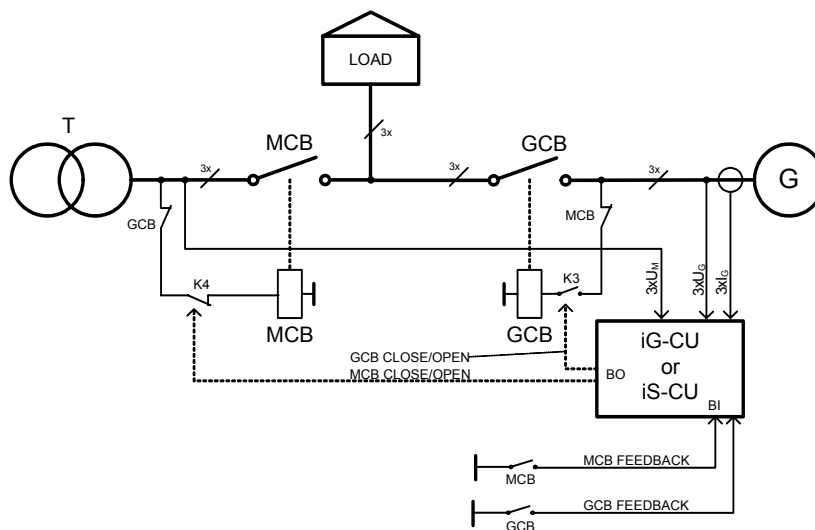
InteliSys hardware requirements

1x IS-CU

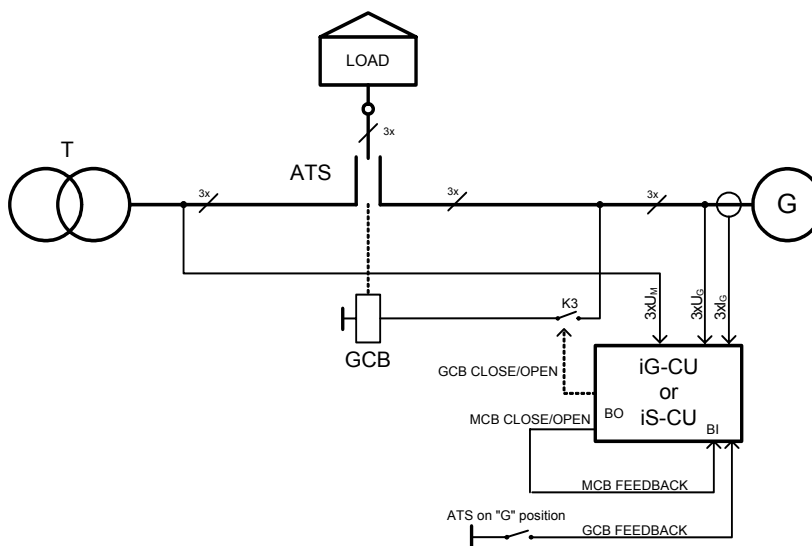
Software system configuration: Single Prime Mover (SPM)

2.2. Single Stand-by: SSB

2.2.1 Separate GCB and MCB



2.2.2 ATS



Specification

- Automatic start-up when the mains fails
- Reclosing after mains returns
- On Load Test function see in chapter 3.4 - SPtM

InteliGen hardware requirements

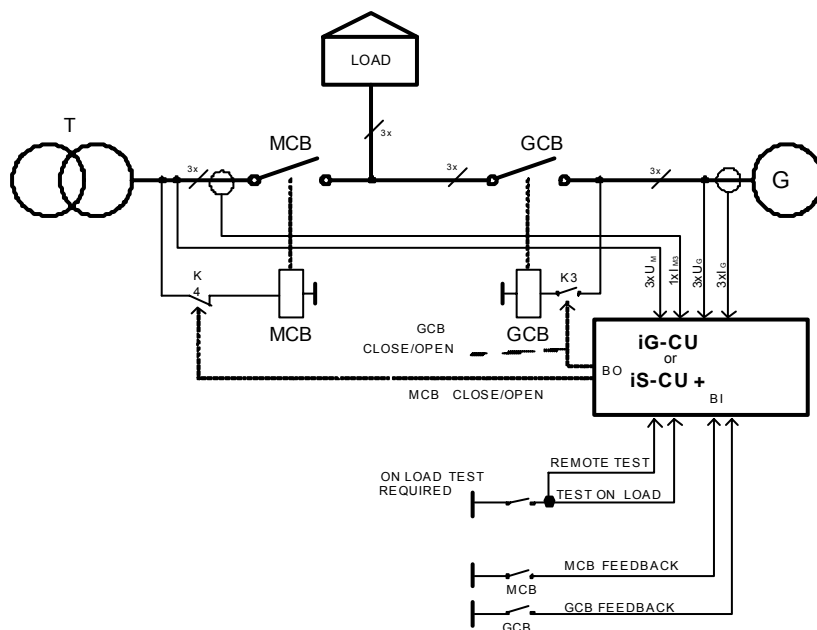
- 1x IG-CU
- 1x IG-MTU (Optional - refer to controller user manual)

InteliSys hardware requirements

- 1x IS-CU

Software system configuration: Single Stand-by (SSB)

2.2.3 SSB + On Load Test



Specification

- On Load Test - load transfer to genset with break (In TEST mode only)
- Automatic start-up when the mains fails
- Test mode
- Break transfer

InteliGen hardware requirements

- 1x IG-CU
- 1x IG-MTU (when mains and generator neutral separation is required)

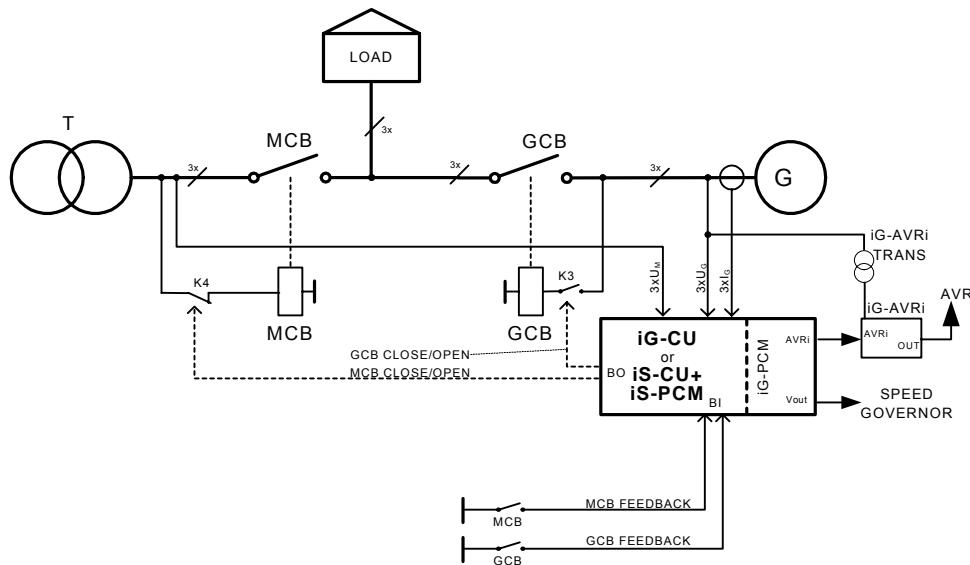
InteliSys hardware requirements

- 1x IS-CU InteliSys central unit

Software system configuration: Single Parallel to Mains (SSB)

2.3 Single Parallel to Mains: SPtM

2.3.1 Single short time parallel



Specification

- Automatic start-up when the mains fails
- MCB full control
- Short time parallel
- Reverse power protection
- Voltage matching (when is used AVRi)
- Generator Base load and PF control
- Soft transfer after mains returns
- Test mode
- Binary up, down outputs allows motorized potentiometer Sync/Load and Volt/PF control

InteliGen hardware requirements

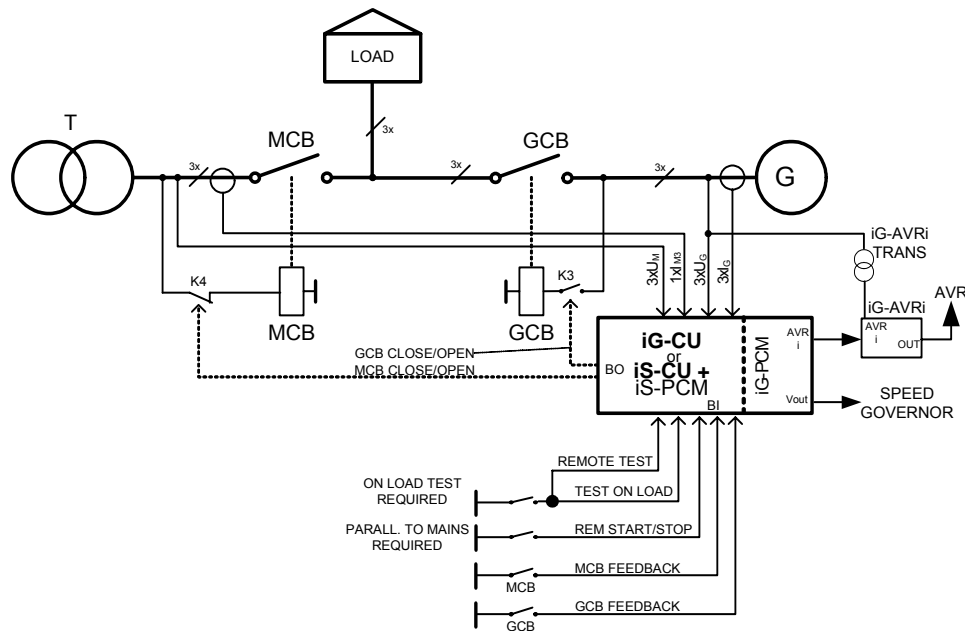
1x	IG-CU	
1x	IG-MTU	(when mains and generator neutral separation is required)
1x	IG-PCM	
1x	IG-AVRi	(when volt matching and PF control is required)
1x	IG-AVRi-TRANS	(when IG-AVRi is used)
1x	IG-MTU	(Optional - refer to controller user manual)

InteliSys hardware requirements

1x	IS-CU	InteliSys central unit
1x	IS-PCM	InteliSys Power Control Module DONGLE
1x	IG-AVRi	(when volt matching and PF control is required)
1x	IG-AVRi-TRANS	(when IG-AVRi is used)

Software system configuration: Single Parallel to Mains (SPtM)

2.3.2 SPtM + On Load Test



Specification

- On Load Test - load transfer to genset (In TEST mode only)
- Automatic start-up when the mains fails
- Test mode
- MCB full control
- Reverse power protection
- Voltage matching (when AVRi is connected)
- Mains Import / Export load and PF control
- Soft transfer after mains returns
- Binary up, down outputs allows motorized potentiometer Sync/Load and Volt/PF control

InteliGen hardware requirements

1x	IG-CU	
1x	IG-MTU	(when mains and generator neutral separation is required)
1x	IG-PCM	
1x	IG-AVRi	(when volt matching and PF control is required)
1x	IG-AVRi-TRANS	(when IG-AVRi is used)
1x	IG-MTU	(Optional - refer to controller user manual)

InteliSys hardware requirements

1x	IS-CU	InteliSys central unit
1x	IS-PCM	InteliSys Power Control Module DONGLE
1x	IG-AVRi	(when volt matching and PF control is required)
1x	IG-AVRi-TRANS	(when IG-AVRi is used)

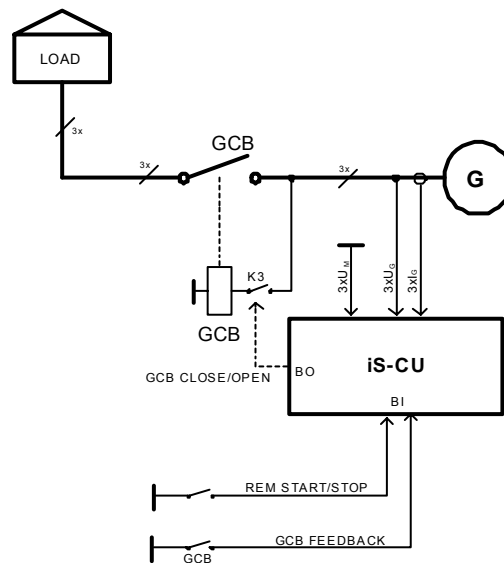
Software system configuration: Single Parallel to Mains (SPtM)

Hint:

On Load Test function is available in SSB as well.

3.5. Single Parallel Island: SPI

2.4.1 SPI – Island only (=SPM)



Specification:

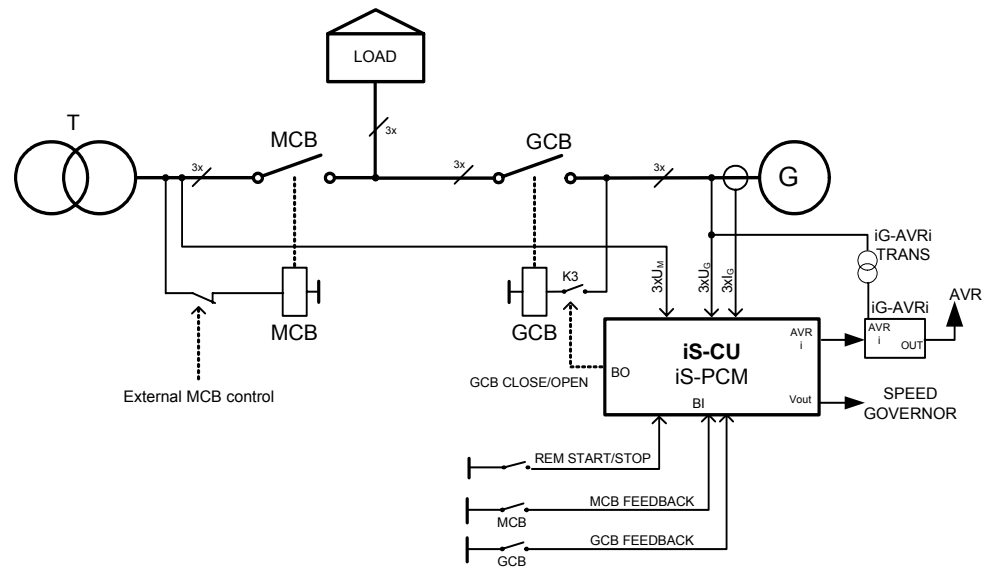
- No mains
- Automatic start-up when Binary input REM START/STOP is closed
- Closes GCB when generator voltage and frequency is within the limits
- GCB is blocked when Mains voltage value > 15V.

IntelliSys hardware requirements

1x IS-CU IntelliSys central unit

Software system configuration: Single Parallel Island (SPI)

2.4.3 SPI – External MCB / Island or Parallel



Specification

- No MCB control, MCB is controlled externally
- Automatic GCB control when Blackout
- Reverse power protection
- Voltage matching (when AVRi is connected)
- Mains Import / Export load and PF control or genset Baseload and Base PF control
- Soft transfer after mains returns
- Binary up, down outputs allows motorized potentiometer Sync/Load and Volt/PF control

IntelliSys hardware requirements

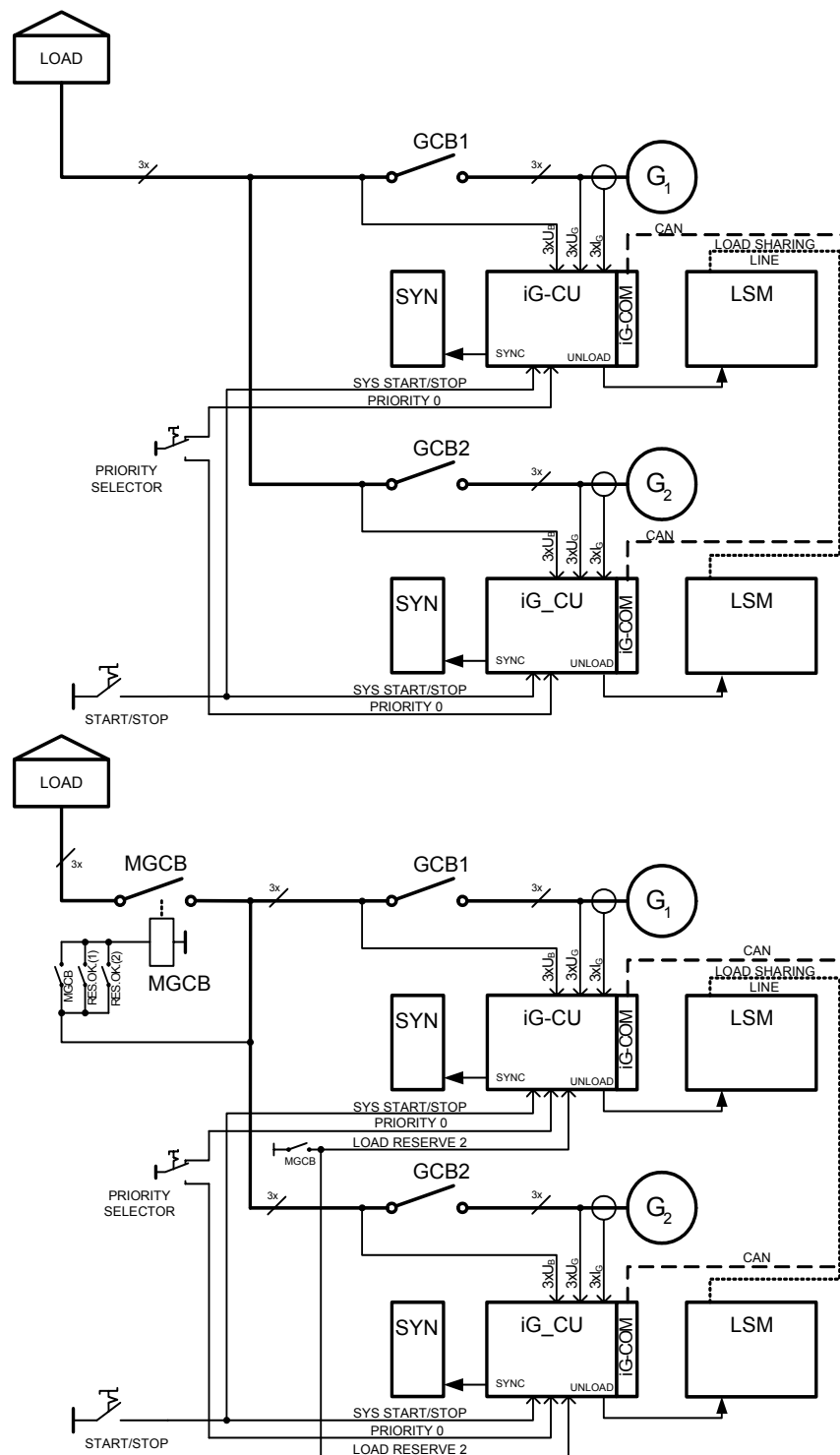
1x	IS-CU	IntelliSys central unit
1x	IS-PCM	IntelliSys Power Control Module DONGLE
1x	IG-AVRi	(when volt matching and PF control is required)
1x	IG-AVRi-TRANS	(when IG-AVRi is used)
1x	NPU	(when Vector surge protection is required)

Software system configuration: Single Parallel Island (SPI)

3. Multiple sets

3.1. Multiple Prime mover: MEXT, MINT

3.1.1. Multiple Prime mover - external Sync & LSM



Specification

- MGC1 support

- Gen-sets soft unload in island parallel (if the function is available in external LSM)
- Pwr management (if IG-COMs are installed)

InteliGen hardware requirements

nx	IG-CU	
nx	IG-COM	(Optional)
nx	External Synchronizer	
nx	External Load sharing module with soft unload function (if needed)	
nx	IG-MTU	(Optional - refer to controller user manual)
1x	IG-MU or IG-IB	(Optional - for connection to local or remote PC)

Hint:

IG-COM is necessary for Power management function and for Reactive power sharing (when no Droop AVR are used).

Software system configuration: Multiple External (MEXT)

Description without MGCB

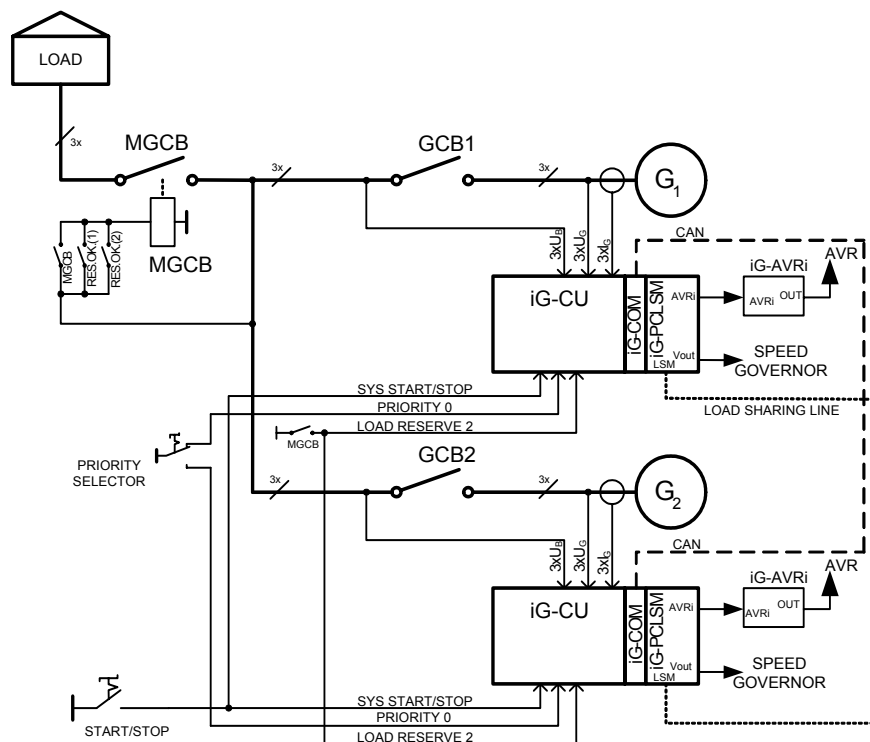
- 1) Start/Stop switch starts engines in Pwr management mode by closing of SYS START/STOP input.
- 2) PRIORITY 0 selects the gen-set priority regardless of the *Priority* setpoint, if needed.

Description with MGCB

- 1) Start/Stop switch starts engines in Pwr management mode by closing of SYS START/STOP input.
- 2) LOAD RESERVE 2 is controlled by MGCB, to differentiate the load reserve necessary before closing of MGCB (setpoints *LoadRes Strt 2* and *LoadRes Stp 2*), and load reserve while system is loaded (setpoints *LoadRes Strt 1* and *LoadRes Stp 1*).
- 3) MGCB is closed by LOAD RES OK of 1st or 2nd gen-set and then held by MGCB feedback. Loss of voltage at the bus opens MGCB.
- 4) PRIORITY 0 selects the gen-set priority regardless of the *Priority* setpoint, if needed.

Hints

Set *SysAMFstrt del* and *SysAMFstp del* setpoints at 1s for fast response
Input MCB FEEDBACK should not be configured.



Specification

- MGCB support
- Gen-sets unload in island parallel
- Pwr management (if IG-COMs are installed)
-

InteliGen hardware requirements

nx	IG-CU	
nx	IG-COM	(Optional)
nx	IG-PCLSM	
nx	IG-AVRi, IG-AVRi-TRANS	(Optional)
nx	IG-MTU	(Optional - refer to controller user manual)
1x	IG-MU or IG-IB	(Optional - for connection to local or remote PC)

Hint:

IG-COM is necessary for Power management function and for Reactive power sharing (when no Droop AVR are used).

InteliSys hardware requirements

nx	IS-CU	
nx	IS-PCLSM-PMS Dongle	(Optional)
nx	IS-PCLSM Dongle	(Optional - without Power management)
nx	IG-AVRi, IG-AVRi-TRANS	(Optional)

Software system configuration: Multiple Internal (MINT)

Description without MGCB

- 1) Start/Stop switch starts engines in Pwr management mode by closing of SYS START/STOP input.
- 2) PRIORITY 0 selects the gen-set priority regardless of the *Priority* setpoint, if needed.

Description with MGCB

- 1) Start/Stop switch starts engines in Pwr management mode by closing of SYS START/STOP input.
- 2) LOAD RESERVE 2 is controlled by MGCB, to differentiate the load reserve necessary before closing of MGCB (setpoints *LoadRes Strt 2* and *LoadRes Stp 2*), and load reserve while system is loaded (setpoints *LoadRes Strt 1* and *LoadRes Stp 1*).
- 3) MGCB is closed by LOAD RES OK of 1st or 2nd gen-set and then held by MGCB feedback. Loss of voltage at the bus opens MGCB.
- 4) PRIORITY 0 selects the gen-set priority regardless of the *Priority* setpoint, if needed.

Hints

Set *SysAMFstrt del* and *SysAMFstp del* setpoints at 1s for fast response
Input MCB FEEDBACK should not be configured

Application is supported by IntelliGen only.



Specification

- Automatic start-up when the mains fails
- Reclosing MCB after mains returns
- MGCB support
- Gen-sets soft unload in island parallel (if the function is available in external LSM)
- Pwr management (if IG-COMs are installed)

InteliGen hardware requirements

1x	Uf↑↓ relay (Mains decoupling relay) unit + MCB control
nx	IG-CU
nx	IG-COM (Optional)
nx	External Synchronizer
nx	External Load sharing module with soft unload function (if needed)
nx	IG-MTU (Optional - refer to controller user manual)
1x	IG-MU or IG-IB (Optional - for connection to local or remote PC)

Hint:

IG-COM is necessary for Power management function and for Reactive power sharing (when no Droop AVR are used).

Software system configuration: Multiple External (MEXT)

Description without MGCB

- 1) The Uf↑↓ relay opens MCB after the mains fails. At the same time the Uf↑↓ relay starts Pwr management by closing of SYS START/STOP input
- 2) When mains returns, Uf↑↓ relay opens SYS START/STOP and GCBs are opened.
- 3) Bus 3 phase voltage relay detects no voltage and with its time delay closes MCB
- 4) PRIORITY 0 selects the gen-set priority regardless of the *Priority* setpoint, if needed.

Description with MGCB

- 1) The Uf↑↓ relay opens MCB after the mains fails. At the same time the Uf↑↓ relay starts Pwr management by closing of SYS START/STOP input.
- 2) LOAD RESERVE 2 is controlled by MGCB, to differentiate the load reserve necessary before closing of MGCB (setpoints *LoadRes Strt 2* and *LoadRes Stp 2*), and load reserve while system is loaded (setpoints *LoadRes Strt 1* and *LoadRes Stp 1*).
- 3) MGCB is closed by LOAD RES OK of 1st or 2nd gen-set and then held by MGCB feedback.
- 4) When the mains returns, Uf↑↓ relay opens SYS START/STOP. Loss of voltage at the bus opens MGCB.
- 5) Bus 3-phase voltage relay detects no voltage and with its time, delay closes MCB.
- 6) PRIORITY 0 selects the gen-set priority regardless of the *Priority* setpoint, if needed.

Hints

Setpoint *SysAMFstrt del* is used for engines start delay after the mains fails. It is similar to setpoint *EmergStart del* in Single Stand-by.

Setpoint *SysAMFstp del* is used for GCB opening after the mains returns. It is similar to setpoint *Mains Ret del* in Single Stand-by.

Input MCB FEEDBACK should not be configured.

1. *Journal of Management Studies*, 1996, 33, 1, 1-14.



Specification

- Automatic start-up when the mains fails
- Reclosing MCB after mains returns
- MGCB support
- Gen-sets unload in island parallel
- Pwr management (if IG-COMs are installed)

InteliGen hardware requirements

1x	Uf↑↓ relay (Mains decoupling relay) unit + MCB control
nx	IG-CU
nx	IG-COM (Optional)
nx	IG-PCLSM
nx	IG-AVRi, IG-AVRi-TRANS (Optional)
nx	IG-MTU (Optional - refer to controller user manual)
1x	IG-MU or IG-IB (Optional - for connection to local or remote PC)

Hint:

IG-COM is necessary for Power management function and for Reactive power sharing (when no Droop AVR are used).

InteliSys hardware requirements

1x	Uf↑↓ relay (Mains decoupling relay) unit + MCB control
nx	IS-CU
nx	IS-PCLSM -PMS Dongle (Optional)
nx	IS-PCLSM Dongle (Optional - without Power management)
nx	IG-AVRi, IG-AVRi-TRANS (Optional)
1x	IG-MU or IG-IB (Optional - for connection to local or remote PC)

Software system configuration: Multiple Internal (MINT)

Description without MGCB

- 1) The Uf↑↓ relay opens MCB after the mains fails. At the same time the Uf↑↓ relay starts Pwr management by closing of SYS START/STOP input
- 2) When mains returns, Uf↑↓ relay opens SYS START/STOP and GCBs are opened.
- 3) Bus 3 phase voltage relay detects no voltage and with its time delay closes MCB
- 4) PRIORITY 0 selects the gen-set priority regardless of the *Priority* setpoint, if needed.

Description with MGCB

- 1) The Uf↑↓ relay opens MCB after the mains fails. At the same time the Uf↑↓ relay starts Pwr management by closing of SYS START/STOP input.
- 2) LOAD RESERVE 2 is controlled by MGCB, to differentiate the load reserve necessary before closing of MGCB (setpoints *LoadRes Strt 2* and *LoadRes Stp 2*), and load reserve when system is loaded (setpoints *LoadRes Strt 1* and *LoadRes Stp 1*).
- 3) MGCB is closed by LOAD RES OK of 1st or 2nd gen-set and then held by MGCB feedback.
- 4) When the mains return, Uf↑↓ relay opens SYS START/STOP. Loss of voltage at the bus opens MGCB.
- 5) Bus 3-phase voltage relay detects no voltage and with its time delay closes MCB.
- 6) PRIORITY 0 selects the gen-set priority regardless of the *Priority* setpoint, if needed.

Hint:

Setpoint *SysAMFstrt del* is used for engines start delay after the mains fails. It is similar to setpoint *EmergStart del* in Single Stand-by.

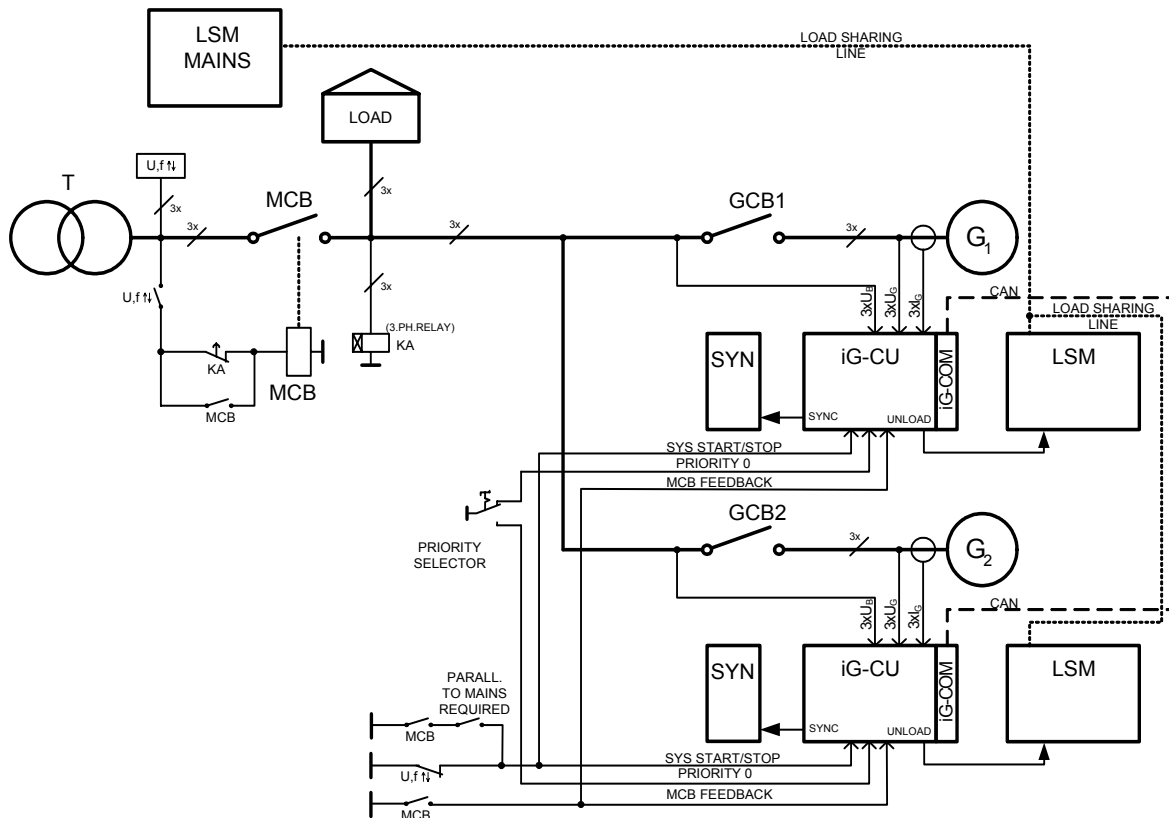
Setpoint *SysAMFstp del* is used for GCB opening after the mains returns. It is similar to setpoint *Mains Ret del* in Single Stand-by.

Input MCB FEEDBACK should not be configured.

3.3. Multiple Parallel to mains, Stand-by, no MCB synchronization: MEXT, MINT

3.3.1. Multiple Parallel to mains, Stand-by, no MCB synchronization - external Sync & LSM

Application is supported by IntelliGen only.



Specification

- Synchronize gen-sets to mains
- Import-Export or Base load power control
- Automatic start-up when the mains fails
- After mains returns GCBs opening, reclosing MCB and synchronizing gen-sets to mains
- Gen-sets soft unload (if the function is available in external LSM)
- Pwr management (if IG-COMs are installed)

IntelliGen hardware requirements

- 1x UfN relay unit (Mains decoupling relay) + MCB control
- 1x External Mains Load sharing module for Import-Export power control or Base load power control on local Load sharing modules
- 1x NPU (when Vector shift protection is required)
- nx IG-CU
- nx IG-COM (Optional)
- nx External Synchronizer
- nx External Load sharing module with soft unload function (if needed)
- nx IG-MTU (Optional - refer to controller user manual)
- 1x IG-MU or IG-IB (Optional - for connection to local or remote PC)

Hint:

IG-COM is necessary for Power management function and for Reactive power sharing (when no Droop AVR are used).

Software system configuration: Multiple External (MEXT)

Description

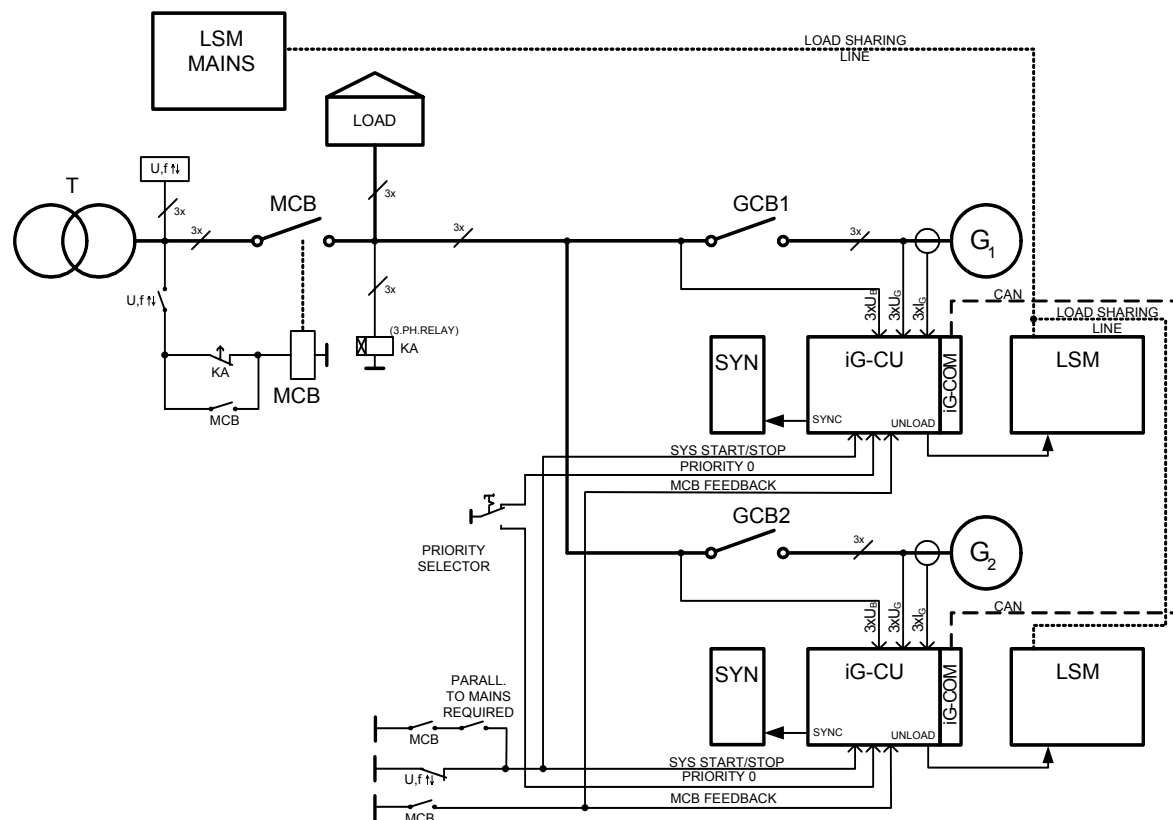
- 1) The system is started by the U_{fH} relay or by the switch "Parallel to mains required".
- 2) The U_{fH} relay opens MCB after the mains fails. At the same time the U_{fH} relay starts Pwr management by closing of SYS START/STOP input, if the gen-sets had not run in parallel to mains before.
- 3) When the mains returns, U_{fH} relay opens SYS START/STOP, and GCBs are opened.
- 4) Bus 3 phase voltage relay KA detects no voltage and with its time delay closes MCB
- 5) If the switch "Parallel to mains required" is closed, gen-sets are again synchronized to the bus.
- 6) To stop the gen-sets while running in parallel to mains open the switch "Parallel to mains required".
- 7) While stopping in parallel to mains, active MCB FEEDBACK ensures gen-sets soft unload (if the function is available in external LSM)
- 8) PRIORITY 0 selects the gen-set priority regardless of the *Priority* setpoint, if needed.

Hints

Setpoint *SysAMFstrtdel* is used for engines start delay after the mains fails. It is similar to setpoint *EmergStart del* in Single Stand-by. If the input MCB FEEDBACK is active, the delay is 1s.

Setpoint *SysAMFstp del* is used for GCB opening after the mains returns. It is similar to setpoint *Mains Ret del* in Single Stand-by. If the input MCB FEEDBACK is active, the delay for unloading is 1s.

3.3.2. Multiple Parallel to mains, Stand-by, no MCB synchronization - internal Sync & LSM



Specification

- Synchronize gen-sets to mains
- Import-Export or Base load power control
- Automatic start-up when the mains fails
- After mains returns GCBs opening, reclosing MCB and synchronizing gen-sets to mains
- Gen-sets unload
- Pwr management (if IG-COMs are installed)

InteliGen hardware requirements

- 1x Uf↑↓ relay unit (Mains decoupling relay) + MCB control
- 1x External Mains Load sharing module for Import-Export power control or Base load power control on local Load sharing modules
- 1x NPU (when Vector shift protection is required)
- nx IG-CU
- nx IG-COM (Optional)
- nx IG-PCLSM
- nx IG-AVRi, IG-AVRi-TRANS (Optional)
- nx IG-MTU (Optional - refer to controller user manual)
- 1x IG-MU or IG-IB (Optional - for connection to local or remote PC)

Hint:

IG-COM is necessary for Power management function and for Reactive power sharing (when no Droop AVR are used).

InteliSys hardware requirements

- 1x Uf↑↓ relay (Mains decoupling relay) unit + MCB control
- 1x External Mains Load sharing module for Import-Export power control or Base load power control on local Load sharing modules
- nx IS-CU
- nx IS-PCLSM-PMS Dongle (Optional)
- nx IS-PCLSM Dongle ((Optional - without Power management))
- nx IG-AVRi, IG-AVRi-TRANS (Optional)
- 1x NPU (when Vector shift protection is required)
- 1x IG-MU or IG-IB (Optional - for connection to local or remote PC)

Software system configuration: Multiple Internal (MINT)

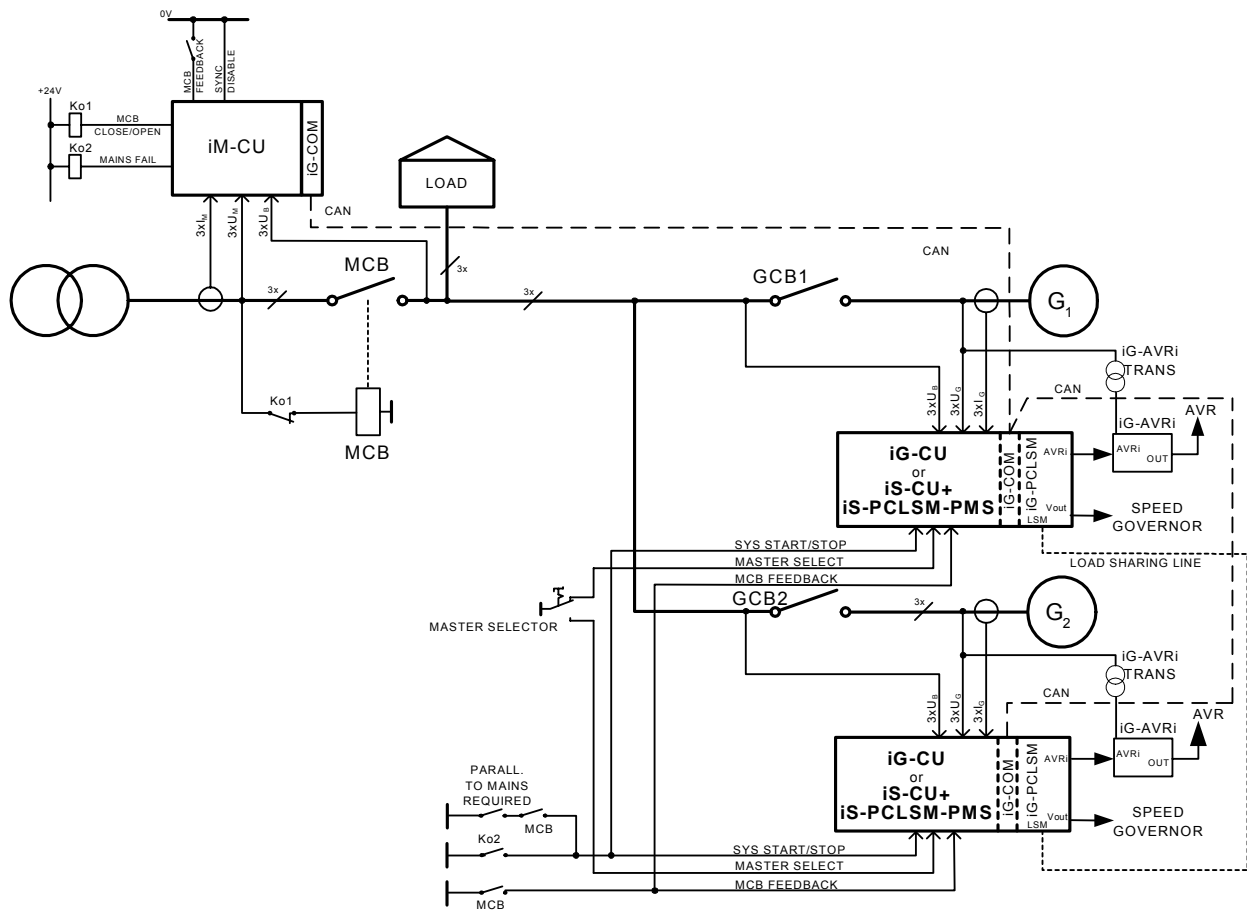
Description

- 1) The system is started by the Uf↑↓ relay or by the switch "Parallel to mains required".
- 2) The Uf↑↓ relay opens MCB after the mains fails. At the same time the Uf↑↓ relay starts Pwr management by closing of SYS START/STOP input, if the gen-sets had not run in parallel to mains before.
- 3) When the mains returns, Uf↑↓ relay opens SYS START/STOP, and GCBs are opened.
- 4) Bus 3 phase voltage relay KA detects no voltage and with its time delay closes MCB.
- 5) If the switch "Parallel to mains required" is closed, gen-sets are again synchronized to the bus.
- 6) To stop the gen-sets while running in parallel to mains open the switch "Parallel to mains required".
- 7) While stopping in parallel to mains, active MCB FEEDBACK ensures gen-sets soft unload
- 8) PRIORITY 0 selects the gen-set priority regardless of the *Priority* setpoint, if needed.

Hints

Setpoint *SysAMFstrt del* is used for engines start delay after the mains fails. It is similar to setpoint *EmergStart del* in Single Stand-by. If the input MCB FEEDBACK is active, the delay is 1s.
Setpoint *SysAMFstp del* is used for GCB opening after the mains returns. It is similar to setpoint *Mains Ret del* in Single Stand-by. If the input MCB FEEDBACK is active, the delay for unloading is 1s.

3.3.3. Multiple Parallel to mains, Stand-by, no MCB synchronization – internal Sync & LSM + IntelliMains



Specification

- Synchronize gen-sets to mains
- Import-Export or Base load power control
- Automatic start-up when mains fails
- After mains returns GCBs opening (BI SYNC DISABLE is closed), reclosing MCB and synchronizing gen-sets to mains
- Gen-sets unload
- Pwr management (if IG-COMs are installed)

InteliGen hardware requirements

1x	IM-CU	(Vector shift protection from version 5.1)
1x	IG-COM	(Optional)
nx	IG-CU	
nx	IG-COM	(Optional)
nx	IG-PCLSM	
nx	IG-AVRi, IG-AVRi-TRANS	(Optional)
nx	IG-MTU	(Optional - refer to controller user manual)
1x	IG-MU or IG-IB	(Optional - for connection to local or remote PC)

Hint:

IG-COM is necessary for Power management function and for Reactive power sharing (when no Droop AVR are used).

InteliSys hardware requirements

1x	IM-CU	(Vector shift protection from version 5.1)
1x	IG-COM (Optional)	
nx	IS-CU	
nx	IS-PCLSM-PMS Dongle	(Optional)
nx	IS-PCLSM Dongle	((Optional - without Power management))
nx	IG-AVRi, IG-AVRi-TRANS	(Optional)
1x	IG-MU or IG-IB	(Optional - for connection to local or remote PC)

Software system configuration: IM + Multiple Internal (MINT)

Description

- 1) InteliMains opens MCB after the mains fails.
- 2) At the same time the IM binary output MAINS FAIL starts Pwr management by closing of SYS START/STOP input, if the gen-sets had not run before.
- 3) When the mains returns, SYS START/STOP input opens and then GCB's opens.
- 4) InteliMains detects no voltage and with its time delay *MCB close del* closes MCB.
- 5) If the switch "Parallel to mains required" is closed, gen-sets are again synchronized to the bus.
- 6) To stop the gen-sets while running in parallel to mains open the switch "Parallel to mains required".
- 7) While stopping in parallel to mains, active MCB FEEDBACK ensures gen-sets soft unload
- 8) PRIORITY 0 (MASTER SELECT) selects the gen-set priority regardless of the *Priority* setpoint, if needed.

Hints

Setpoint *SysAMFstrt del* is used for engines start delay after the mains fails. It is similar to setpoint *EmergStart del* in Single Stand-by.

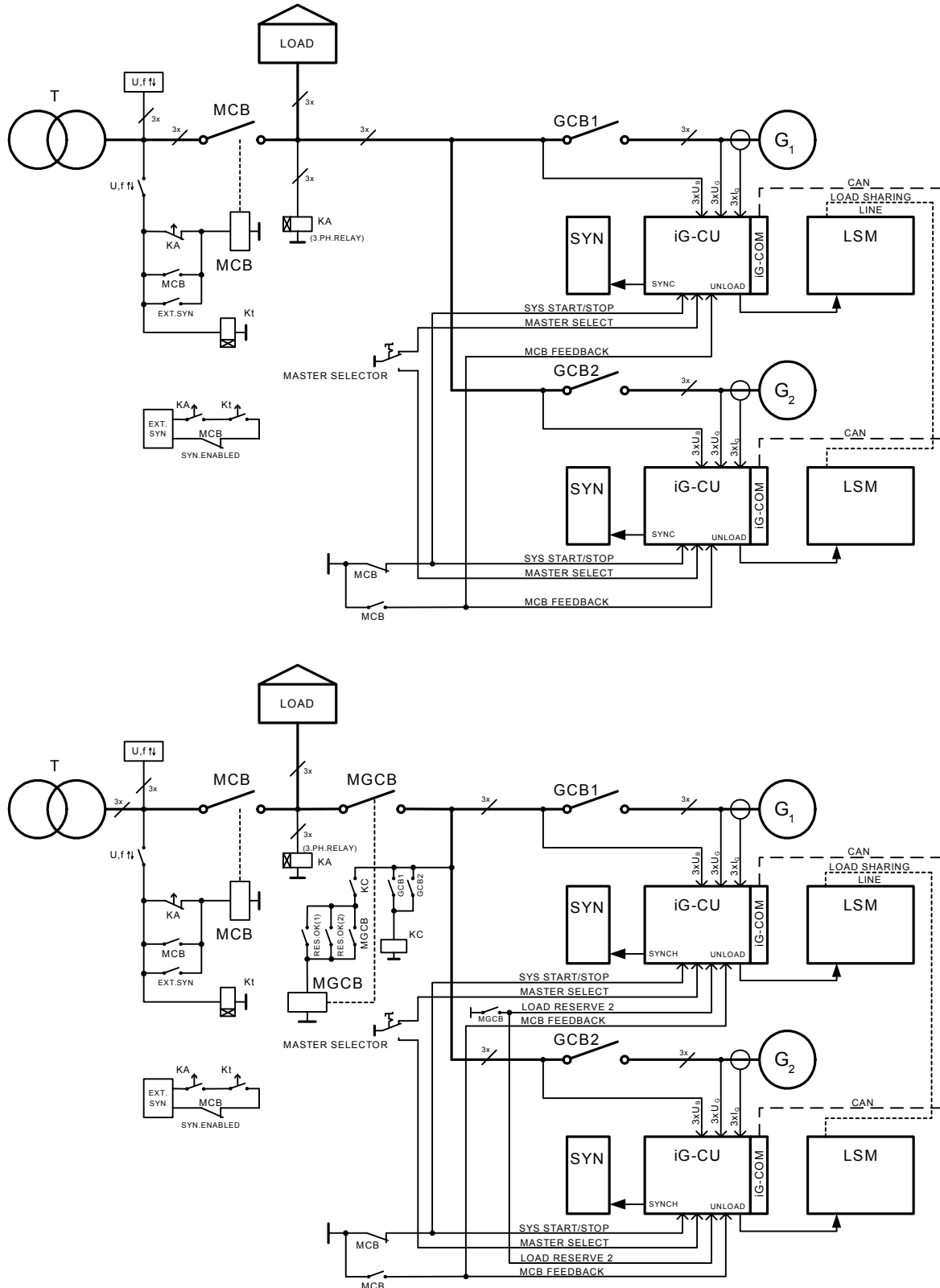
After MCB closing, the delay for gen-sets unloading is 1s (MCB FEEDBACK is closed).

Setpoint *SysAMFstp del* is not used in this case.

3.4. Multiple Parallel to mains, Stand-by, MCB synchronized: MEXT, MINT

3.4.1. Multiple Short time parallel to mains – external Sync & LSM

Application is supported by IntelliGen only.



Specification

- Automatic start-up when mains fails
- After mains returns MCB synchronizing
- Engines unload (if the function is available)
- One interrupt only stand-by
- MGCB support
- Gen-sets soft unload (if the function is available in external LSM)
- Pwr management (if IG-COMs are installed)

InteliGen hardware requirements

1x	Uf↑↓ relay unit (Mains decoupling relay) + MCB control
1x	External MCB Synchronizer
1x	NPU (when Vector shift protection is required)
nx	IG-CU
nx	IG-COM (Optional)
nx	External Synchronizer
nx	External Load sharing module with soft unload function (if needed)
nx	IG-MTU (Optional - refer to controller user manual)
1x	IG-MU or IG-IB (Optional - for connection to local or remote PC)

Hint:

IG-COM is necessary for Power management function and for Reactive power sharing (when no Droop AVR are used).

Software system configuration: Multiple External (MEXT)

Description without MGCB

- 1) The Uf↑↓ relay opens MCB after the mains fails. At the same time the Uf↑↓ relay starts Pwr management by closing of SYS START/STOP input.
- 2) When the mains returns, external synchronizer synchronizes gen-sets to the mains.
- 3) Closing of MCB stops the gen-sets by opening of SYS START/STOP.
- 4) If gen-sets are to be softly unloaded while stopping in parallel to mains, active MCB FEEDBACK ensures that.
- 5) PRIORITY 0 (MASTER SELECT) selects the gen-set priority regardless of the *Priority* setpoint, if needed.

Description with MGCB

- 1) The Uf↑↓ relay opens MCB after the mains fails. At the same time the Uf↑↓ relay starts Pwr management by closing of SYS START/STOP input.
- 2) LOAD RESERVE 2 is controlled by MGCB, to differentiate the load reserve necessary before closing of MGCB (setpoints *LoadRes Strt 2* and *LoadRes Stp 2*), and load reserve while system is loaded (setpoints *LoadRes Strt 1* and *LoadRes Stp 1*).
- 3) MGCB is closed by LOAD RES OK of 1st or 2nd gen-set and then held by MGCB feedback.
- 4) When the mains returns, external synchronizer synchronizes gen-sets to the mains.
- 5) Closing of MCB stops the gen-sets by opening of SYS START/STOP. Both GCBs are opened and consequently KC relay opens MGCB.
- 6) While stopping in parallel to mains, active MCB FEEDBACK ensures gen-sets soft unload (if the function is available in external LSM).
- 7) PRIORITY 0 (MASTER SELECT) selects the gen-set priority regardless of the *Priority* setpoint, if needed.
- 8) When the gensets are not ready for standby operation after the mains return the bus 3 phase voltage relay KA detects no voltage and with its time delay closes MCB.

Hints

Setpoint *SysAMFstrtdel* is used for engines start delay after the mains fails. It is similar to setpoint *EmergStart del* in Single Stand-by.

Time relay Kt is used for beginning of MCB synchronization after the mains returns. It is similar to setpoint *Mains Ret del* in Single Parallel to Mains (SPtM) application.

After MCB closing, the delay for gen-sets unloading is 1s (MCB FEEDBACK is closed).

Setpoint *SysAMFstp del* is not used in this case.

Specification

- Automatic start-up when mains fails
- After mains returns MCB synchronizing
- One interrupt only stand-by
- MGCB support
- Gen-sets unload
- Pwr management (if IG-COMs are installed)

InteliGen hardware requirements

1x	Uf↑↓ relay unit (Mains decoupling relay) + MCB control
1x	External MCB Synchronizer
1x	NPU (when Vector shift protection is required)
nx	IG-CU
nx	IG-COM (Optional)
nx	IG-PCLSM
nx	IG-AVRi, IG-AVRi-TRANS (Optional)
nx	IG-MTU (Optional - refer to controller user manual)
1x	IG-MU or IG-IB (Optional - for connection to local or remote PC)

Hint:

IG-COM is necessary for Power management function and for Reactive power sharing (when no Droop AVR are used).

InteliSys hardware requirements

1x	Uf↑↓ relay unit (Mains decoupling relay) + MCB control
1x	External MCB Synchronizer
nx	IS-CU
nx	IS-PCLSM-PMS Dongle (Optional)
nx	IS-PCLSM Dongle ((Optional - without Power management))
nx	IG-AVRi, IG-AVRi-TRANS (Optional)
1x	NPU (when Vector shift protection is required)
1x	IG-MU or IG-IB (Optional - for connection to local or remote PC)

Software system configuration: Multiple Internal (MINT)

Description without MGCB

- 1) The Uf↑↓ relay opens MCB after the mains fails. At the same time the Uf↑↓ relay starts Pwr management by closing of SYS START/STOP input.
- 2) When the mains returns, external synchronizer synchronizes gen-sets to the mains.
- 3) Closing of MCB stops the gen-sets by opening of SYS START/STOP.
- 4) While stopping in parallel to mains, active MCB FEEDBACK ensures gen-sets soft unload.
- 5) PRIORITY 0 (MASTER SELECT) selects the gen-set priority regardless of the *Priority* setpoint, if needed.

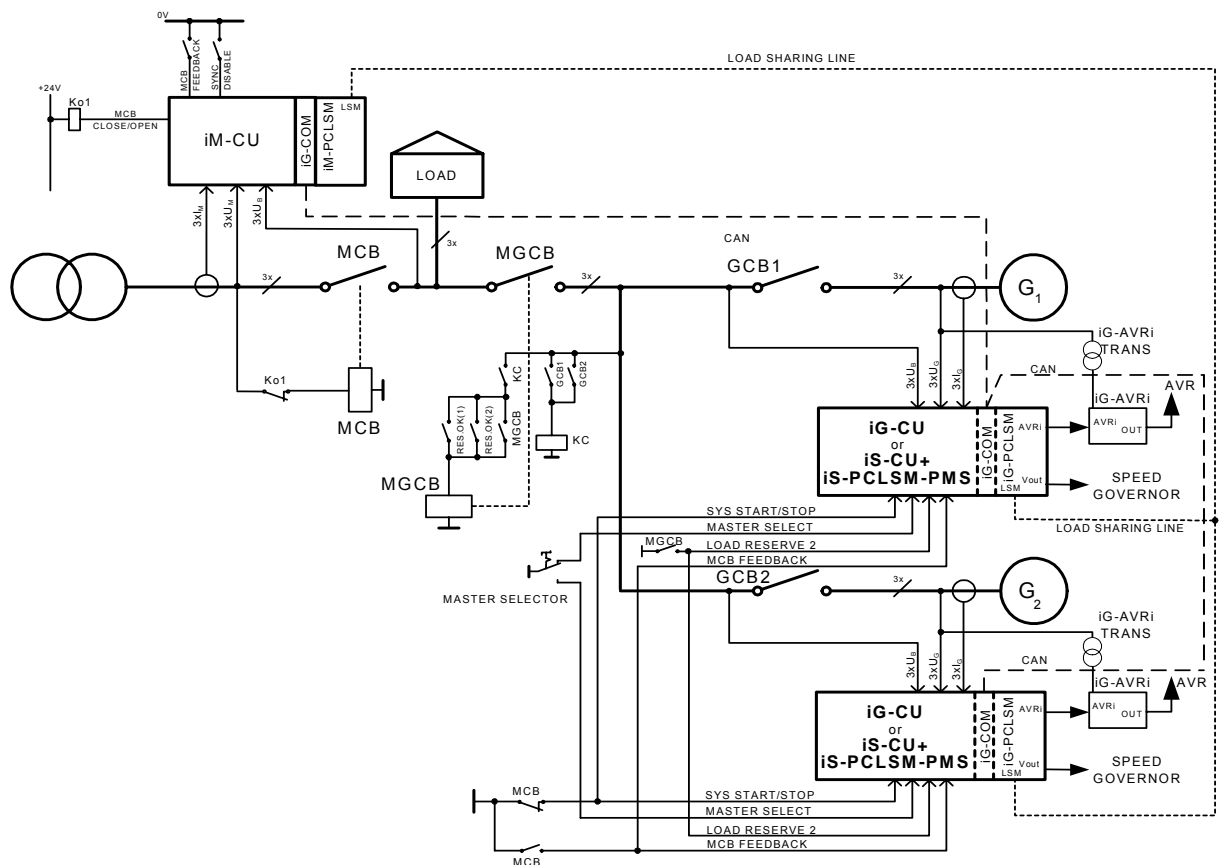
Description with MGCB

- 1) The Uf↑↓ relay opens MCB after the mains fails. At the same time the Uf↑↓ relay starts Pwr management by closing of SYS START/STOP input.
- 2) LOAD RESERVE 2 is controlled by MGCB, to differentiate the load reserve necessary before closing of MGCB (setpoints *LoadRes Strt 2* and *LoadRes Stp 2*), and load reserve while system is loaded (setpoints *LoadRes Strt 1* and *LoadRes Stp 1*).
- 3) MGCB is closed by LOAD RES OK of 1st or 2nd gen-set and then held by MGCB feedback.
- 4) When the mains returns, external synchronizer synchronizes gen-sets to the mains.
- 5) Closing of MCB stops the gen-sets by opening of SYS START/STOP. Both GCBs are opened and consequently KC relay opens MGCB.
- 6) While stopping in parallel to mains, active MCB FEEDBACK ensures gen-sets soft unload.
- 7) PRIORITY 0 (MASTER SELECT) selects the gen-set priority regardless of the *Priority* setpoint, if needed.
- 8) When the gensets are not ready for standby operation after the mains return the bus 3 phase voltage relay KA detects no voltage and with its time delay closes MCB.

Hint:

Setpoint *SysAMFstrt del* is used for engines start delay after the mains fails. It is similar to setpoint *EmergStart del* in Single Stand-by.

Time relay Kt is used for beginning of MCB synchronization after the mains returns. It is similar to setpoint *Mains Ret del* in Single Parallel to Mains (SPtM) application. After MCB closing, the delay for gen-sets unloading is 1s (MCB FEEDBACK is closed). Setpoint *SysAMFstp del* is not used in this case.



Specification

- Automatic start-up when mains fails
- After mains returns MCB synchronizing
- One interrupt only stand-by
- MGCB support
- Gen-sets unload
- Pwr management (if IG-COMs are installed)

InteliGen hardware requirements

1x	IM-CU (Vector shift protection from version 5.1)	
1x	IG-COM	(Optional)
1x	IM-PCLSM	
nx	IG-CU	
nx	IG-COM	(Optional)
nx	IG-PCLSM	
nx	IG-AVRi, IG-AVRi-TRANS	(Optional)
nx	IG-MTU	(Optional - refer to controller user manual)
1x	IG-MU or IG-IB	(Optional - for connection to local or remote PC)

Hint:

IG-COM is necessary for Power management function and for Reactive power sharing (when no Droop AVR are used).

InteliSys hardware requirements

1x	IM-CU (Vector shift protection from version 5.1)	
1x	IG-COM (Optional)	
nx	IS-CU	
nx	IS-PCLSM-PMS Dongle	(Optional)
nx	IS-PCLSM Dongle	((Optional - without Power management))
nx	IG-AVRi, IG-AVRi-TRANS	(Optional)
1x	IG-MU or IG-IB	(Optional - for connection to local or remote PC)

Software system configuration: IM + Multiple Internal (MINT)

Description without MGCB

- 1) The IM-CU opens MCB after the mains fails.
- 2) At the same time the MCB aux contact starts Pwr management by closing of SYS START/STOP input, if the gen-sets had not run before.
- 3) When the mains returns, InteliMains synchronizes gen-sets to the mains.
- 4) MCB aux contact opens SYS START/STOP input, gen-sets stop.
- 5) While stopping in parallel to mains, active MCB FEEDBACK ensures gen-sets soft unload
- 6) PRIORITY 0 (MASTER SELECT) selects the gen-set priority regardless of the *Priority* setpoint, if needed.

Description with MGCB

- 1) The IM-CU opens MCB after the mains fails.
- 2) At the same time the MCB aux contact starts Pwr management by closing of SYS START/STOP input, if the gen-sets had not run before.
- 3) LOAD RESERVE 2 is controlled by MGCB, to differentiate the load reserve necessary before closing of MGCB (setpoints *LoadRes Strt 2* and *LoadRes Stp 2*), and load reserve while system is loaded (setpoints *LoadRes Strt 1* and *LoadRes Stp 1*).
- 4) MGCB is closed by LOAD RES OK of 1st or 2nd gen-set and then held by MGCB feedback.
- 5) When the mains returns, InteliMains synchronizes gen-sets to the mains.
- 6) Closing of MCB stops the gen-sets by opening of SYS START/STOP. Both GCBs are opened and consequently KC relay opens also MGCB.
- 7) While stopping in parallel to mains, active MCB FEEDBACK ensures gen-sets soft unload
- 8) PRIORITY 0 (MASTER SELECT) selects the gen-set priority regardless of the *Priority* setpoint, if needed.

Hints

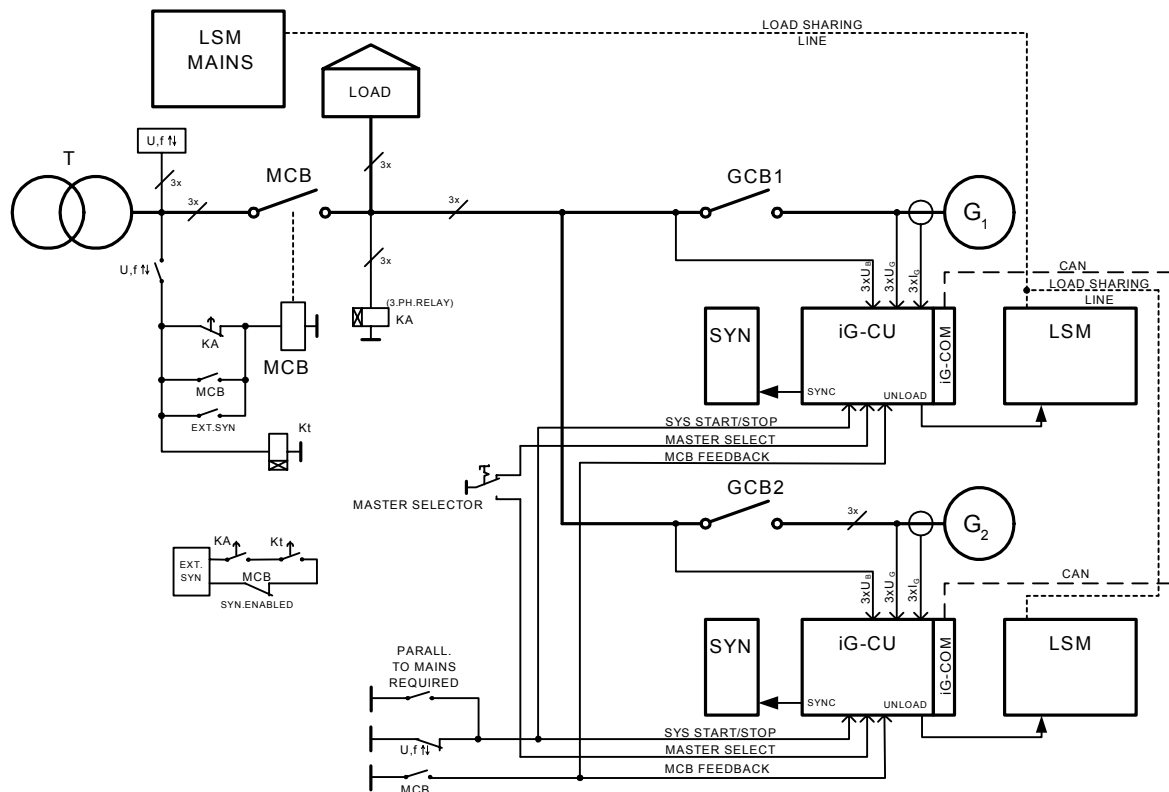
Setpoint *SysAMFstrtdel* is used for engines start delay after the mains fails. It is similar to setpoint *EmergStart del* in Single Stand-by.

After MCB closing, the delay for gen-sets unloading is 1s (MCB FEEDBACK is closed).

Setpoint *SysAMFstp del* is not used in this case.

3.4.4. Multiple Parallel to mains, Import-Export or Baseload control, Stand-by – external Sync & LSM

Application is supported by IntelliGen only.



Specification

- Synchronize gen-sets to mains
- Import-Export or Base load power control
- Uninterruptible stand-by
- After mains returns MCB synchronizing
- Automatic stand-by with Short time parallel to mains
- Gen-sets soft unload (if the function is available in external LSM)
- Pwr management (if IG-COMs are installed)

InteliGen hardware requirements

- 1x Uf $\uparrow\downarrow$ relay unit (Mains decoupling relay) + MCB control
- 1x External Mains Load sharing module for Import-Export power control or Base load power control on local Load sharing modules
- 1x External MCB Synchronizer
- 1x NPU (when Vector shift protection is required)
- nx IG-CU
- nx IG-COM (Optional)
- nx External Synchronizer
- nx External Load sharing module with soft unload function (if needed)
- nx IG-MTU (Optional - refer to controller user manual)
- 1x IG-MU or IG-IB (Optional - for connection to local or remote PC)

Hint:

IG-COM is necessary for Power management function and for Reactive power sharing (when no Droop AVR are used).

Software system configuration: Multiple External (MEXT)

Description

- 1) The system is started by the Uf $\uparrow\downarrow$ relay or by the switch "Parallel to mains required".
- 2) The Uf $\uparrow\downarrow$ relay opens MCB after the mains fails. At the same time the Uf $\uparrow\downarrow$ relay starts Pwr management by closing of SYS START/STOP input, if the gen-sets had not run before.
- 3) When the mains returns, external synchronizer synchronizes gen-sets to the mains.
- 4) To stop the gen-sets while running in parallel to mains open the switch "Parallel to mains required".
- 5) While stopping in parallel to mains, active MCB FEEDBACK ensures gen-sets soft unload (if the function is available in external LSM)
- 6) PRIORITY 0 (MASTER SELECT) selects the gen-set priority regardless of the *Priority* setpoint, if needed.
- 7) When the gensets are not ready for standby operation after the mains return the bus 3 phase voltage relay KA detects no voltage and with its time delay closes MCB.

Hints

Setpoint *SysAMFstrtdel* is used for engines start delay after the mains fails. It is similar to setpoint *EmergStartdel* in Single Stand-by.

Time relay Kt is used for beginning of MCB synchronization after the mains returns. It is similar to setpoint *MainsRetdel* in Single Parallel to Mains (SPtM) application.

After MCB closing, the delay for gen-sets unloading is 1s (MCB FEEDBACK is closed).

Setpoint *SysAMFstpdel* is not used in this case.

Specification

- Synchronize gen-sets to mains
- Import-Export or Base load power control
- Uninterruptible stand-by
- After mains returns MCB synchronizing
- Automatic stand-by with Short time parallel to mains
- Gen-sets soft unload
- Pwr management (if IG-COMs are installed)

InteliGen hardware requirements

- 1x Uf↑↓ relay unit (Mains decoupling relay) + MCB control
- 1x External Mains Load sharing module for Import-Export power control or Base load power control on local Load sharing modules
- 1x External MCB Synchronizer
- 1x NPU (when Vector shift protection is required)
- nx IG-CU
- nx IG-COM (Optional)
- nx IG-PCLSM
- nx IG-AVRi, IG-AVRi-TRANS (Optional)
- nx IG-MTU (Optional - refer to controller user manual)
- 1x IG-MU or IG-IB (Optional - for connection to local or remote PC)

Hint:

IG-COM is necessary for Power management function and for Reactive power sharing (when no Droop AVR are used).

InteliSys hardware requirements

- 1x Uf↑↓ relay unit (Mains decoupling relay) + MCB control
- 1x External Mains Load sharing module for Import-Export power control or Base load power control on local Load sharing modules
- 1x External MCB Synchronizer
- nx IS-CU
- nx IS-PCLSM-PMS Dongle (Optional)
- nx IS-PCLSM Dongle ((Optional - without Power management))
- nx IG-AVRi, IG-AVRi-TRANS (Optional)
- 1x NPU (when Vector shift protection is required)
- 1x IG-MU or IG-IB (Optional - for connection to local or remote PC)

Software system configuration: Multiple Internal (MINT)

Description without MGCB

- 1) The system is started by the Uf↑↓ relay or by the switch "Parallel to mains required".
- 2) The Uf↑↓ relay opens MCB after the mains fails. At the same time the Uf↑↓ relay starts Pwr management by closing of SYS START/STOP input, if the gen-sets had not run before.
- 3) When the mains returns, external synchronizer synchronizes gen-sets to the mains.
- 4) To stop the gen-sets while running in parallel to mains open the switch "Parallel to mains required".
- 5) While stopping in parallel to mains, active MCB FEEDBACK ensures gen-sets soft unload.
- 6) PRIORITY 0 (MASTER SELECT) selects the gen-set priority regardless of the *Priority* setpoint, if needed.
- 7) When the gensets are not ready for standby operation after the mains return the bus 3 phase voltage relay KA detects no voltage and with its time delay closes MCB.

Description with MGCB

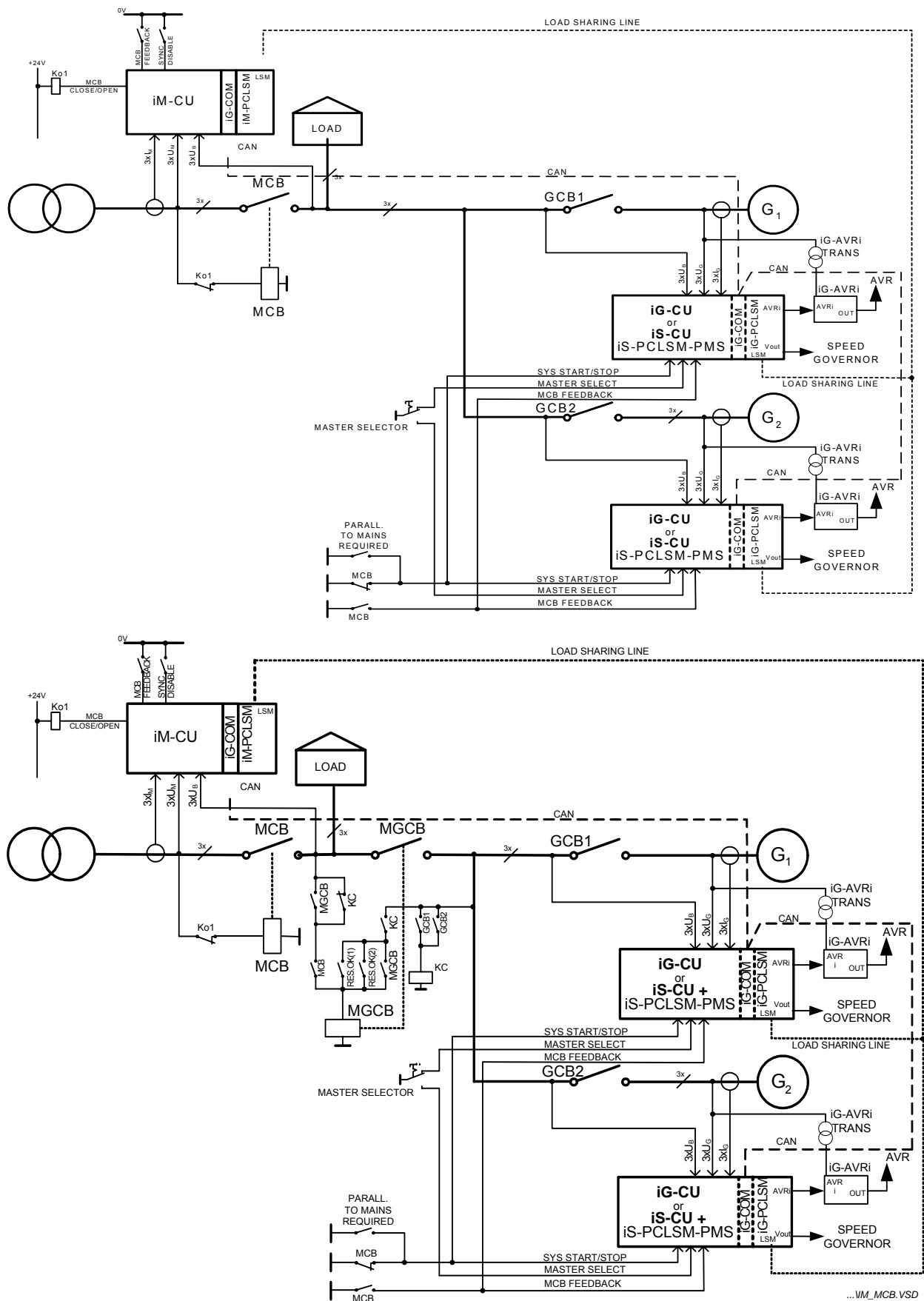
- 1) MGCB follows MCB to enable synchronizing to the mains when PARALLEL TO MAINS REQUIRED switch is closed.
- 2) The Uf↑↓ relay opens MCB and MGCB after the mains fails. At the same time the Uf↑↓ relay starts Pwr management by closing of SYS START/STOP input.
- 3) MGCB is closed by LOAD RES OK of 1st or 2nd gen-set and then held by MGCB feedback after the mains fail.

Hints

Setpoint *SysAMFstrtdel* is used for engines start delay after the mains fails. It is similar to setpoint *EmergStartdel* in Single Stand-by.

Time relay Kt is used for beginning of MCB synchronization after the mains returns. It is similar to setpoint *MainsRetdel* in Single Parallel to Mains (SPtM) application. After MCB closing, the delay for gen-sets unloading is 1s (MCB FEEDBACK is closed). Setpoint *SysAMFstpdel* is not used in this case.

3.4.6. Multiple Parallel to mains, Import-Export or Baseload control, Stand-by – internal Sync & LSM + InteliMains



Specification

- Synchronize gen-sets to mains
- Import-Export or Base load power control
- Uninterruptible stand-by
- After mains returns MCB synchronizing
- Automatic stand-by with Short time parallel to mains
- Gen-sets soft unload
- Pwr management

InteliGen hardware requirements

1x	IM-CU (Vector shift protection from version 5.1)
1x	IG-COM (Optional)
1x	IM-PCLSM
nx	IG-CU
nx	IG-COM (Optional)
nx	IG-PCLSM
nx	IG-AVRi, IG-AVRi-TRANS (Optional)
nx	IG-MTU (Optional - refer to controller user manual)
1x	IG-MU or IG-IB (Optional - for connection to local or remote PC)

Hint:

IG-COM is necessary for Power management function and for Reactive power sharing (when no Droop AVR are used).

InteliSys hardware requirements

1x	IM-CU (Vector shift protection from version 5.1)
1x	IG-COM (Optional)
1x	IM-PCLSM
nx	IS-CU
nx	IS-PCLSM-PMS Dongle (Optional)
nx	IS-PCLSM Dongle ((Optional - without Power management))
nx	IG-AVRi, IG-AVRi-TRANS (Optional)
1x	IG-MU or IG-IB (Optional - for connection to local or remote PC)

Software system configuration: IM + Multiple Internal (MINT)

Description without MGCB

- 1) The system is started by MCB opening or by the switch "Parallel to mains required".
- 2) The IM-CU opens MCB after the mains fails. At the same time the MCB aux contact starts Pwr management by closing of SYS START/STOP input, if the gen-sets had not run before.
- 3) When the mains returns, IM-PCLSM synchronizer synchronizes gen-sets to the mains.
- 4) To stop the gen-sets while running in parallel to mains open the switch "Parallel to mains required".
- 5) While stopping in parallel to mains, active MCB FEEDBACK ensures gen-sets soft unload
- 6) PRIORITY 0 (MASTER SELECT) selects the gen-set priority regardless of the *Priority* setpoint, if needed.

Description with MGCB

- 1) MGCB follows MCB to enable synchronizing to the mains when PARALLEL TO MAINS REQUIRED switch is closed.
- 2) The IM-CU opens MCB after the mains fails.
- 3) At the same time the MCB aux contact starts Pwr management by closing of SYS START/STOP input, if the gen-sets had not run before.
- 4) MGCB is closed by LOAD RES OK of 1st or 2nd gen-set and then held by MGCB feedback after the mains fail.
- 5) Closing of MCB stops the gen-sets by opening of SYS START/STOP. Both GCBs are opened and consequently KC relay opens also MGCB.

See paragraph 3.4.8. – MGCB control from InteliMains.

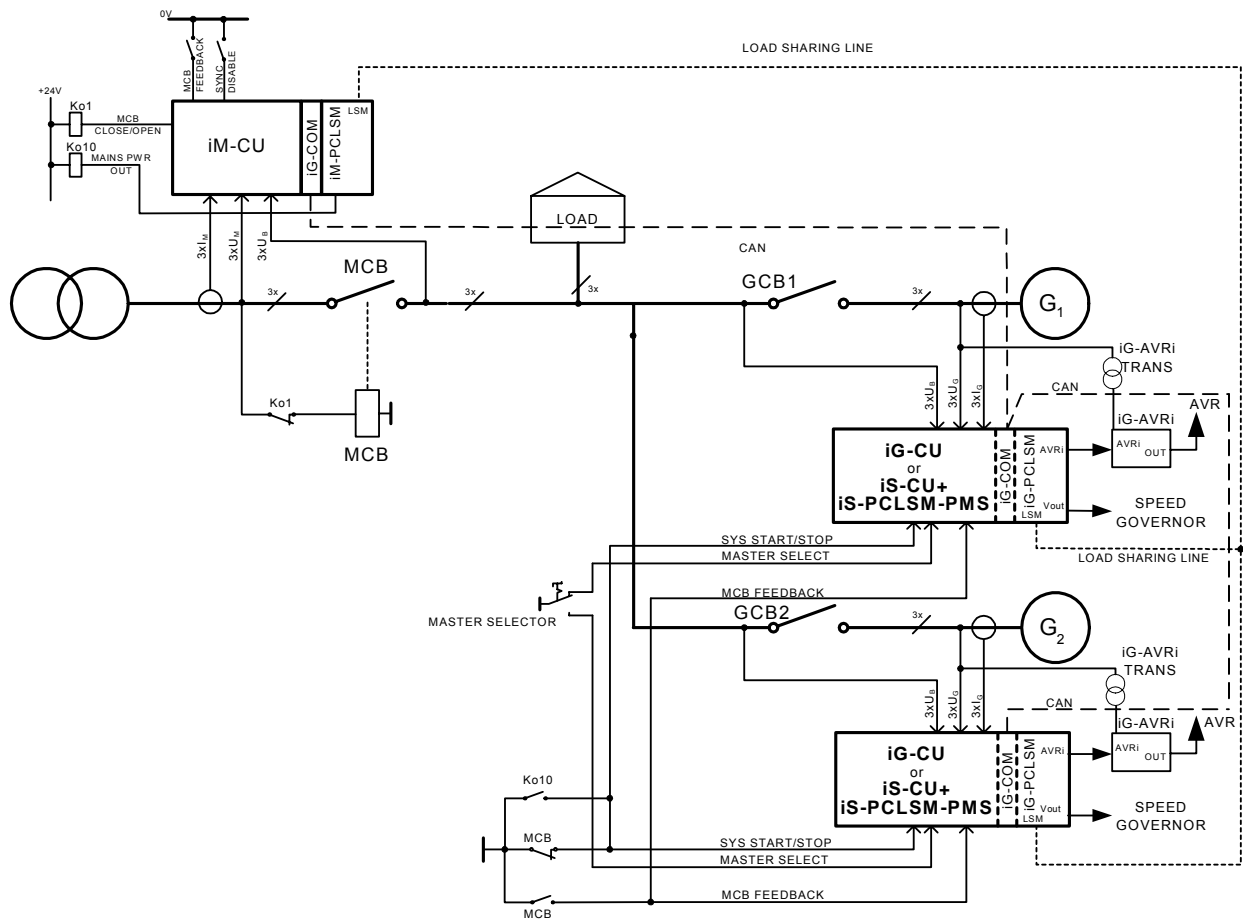
Hints

Setpoint *SysAMFstrtdel* is used for engines start delay after the mains fails. It is similar to setpoint *EmergStartdel* in Single Stand-by.

After MCB closing, the delay for gen-sets unloading is 1s (MCB FEEDBACK is closed).

Setpoint *SysAMFstpdel* is not used in this case.

3.4.7. Multiple Parallel to mains, Peak shaving, Import-Export or Baseload control, Stand-by – internal Sync & LSM + IntelliMains



Specification

- Peak shaving
- Synchronize gen-sets to mains
- Import-Export or Base load power control
- Uninterruptible stand-by
- After mains returns MCB synchronizing
- Automatic stand-by with Short time parallel to mains
- Gen-sets unload
- Pwr management

InteliGen hardware requirements

1x	IM-CU (Vector shift protection from version 5.1)	
1x	IG-COM	(Optional)
1x	IM-PCLSM	
nx	IG-CU	
nx	IG-COM	(Optional)
nx	IG-PCLSM	
nx	IG-AVRi, IG-AVRi-TRANS	(Optional)
nx	IG-MTU	(Optional - refer to controller user manual)
1x	IG-MU or IG-IB	(Optional - for connection to local or remote PC)

Hint:

IG-COM is necessary for Power management function and for Reactive power sharing (when no Droop AVR are used).

InteliSys hardware requirements

1x	IM-CU (Vector shift protection from version 5.1)	
1x	IG-COM	(Optional)
1x	IM-PCLSM	
nx	IS-CU	
nx	IS-PCLSM-PMS Dongle	(Optional)
nx	IS-PCLSM Dongle	((Optional - without Power management))
nx	IG-AVRi, IG-AVRi-TRANS	(Optional)
1x	IG-MU or IG-IB	(Optional - for connection to local or remote PC)

Software system configuration: IM + Multiple Internal (MINT)

Description without MGCB

- 1) The system is started by MCB opening or by the IM-CU controlled MAINS PWR OUT relay when mains imported power exceeds adjusted limit *Mains ON Pwr*.
- 2) The IM-CU opens MCB after the mains fails. At the same time the MCB aux contact starts Pwr management by closing of SYS START/STOP input, if the gen-sets had not run before.
- 3) When the main returns, IM-PCLSM synchronizer synchronizes gen-sets to the mains or when mains imported power decreases bellow adjusted limit *Mains OFF Pwr*, IM-CU binary output MAINS PWR OUT opens SYS START/STOP on the gen-sets.
- 4) While stopping in parallel to mains, active MCB FEEDBACK ensures gen-sets soft unload.
- 5) PRIORITY 0 (MASTER SELECT) selects the gen-set priority regardless of the *Priority* setpoint, if needed.

Description with MGCB

- 1) MGCB follows MCB to enable synchronizing to the mains.
- 2) The system is started by MCB opening or by the IM-CU controlled MAINS PWR OUT relay when mains imported power exceeds adjusted limit *Mains ON Pwr*.
- 3) At the same time the MCB aux contact starts Pwr management by closing of SYS START/STOP input, if the gen-sets had not run before.
- 4) When the main returns, IM-PCLSM synchronizer synchronizes gen-sets to the mains or when mains imported power decreases bellow adjusted limit *Mains OFF Pwr*, IM-CU binary output MAINS PWR OUT opens SYS START/STOP on the gen-sets.

Hint:

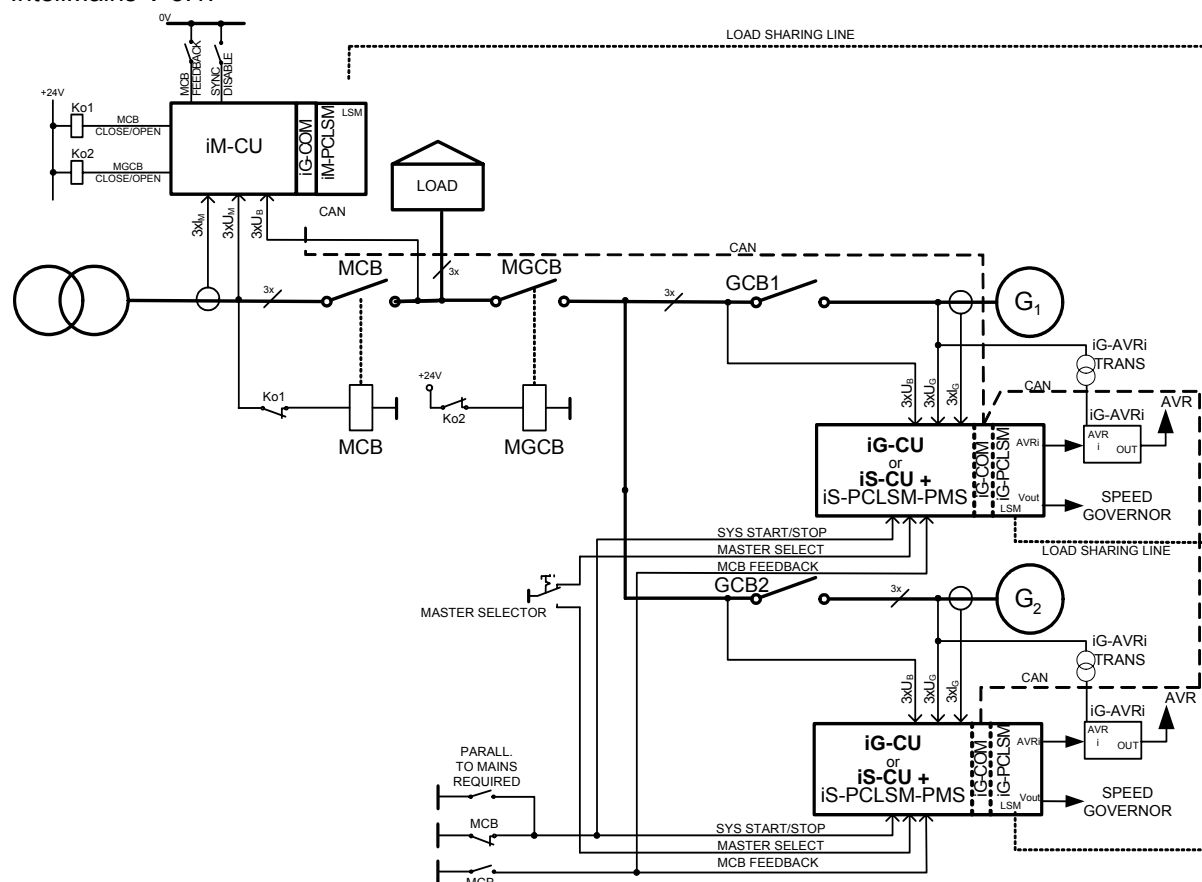
Setpoint *SysAMFstrtdel* is used for engines start delay after the mains fails. It is similar to setpoint *EmergStart del* in Single Stand-by.

After MCB closing, the delay for gen-sets unloading is 1s (MCB FEEDBACK is closed).

Setpoint *SysAMFstp del* is not used in this case.

3.4.8. Multiple Parallel to mains, MGCB control from IntelliMains

Following example corresponds to paragraph 3.4.6. but MGCB is controlled from IntelliMains – available from IntelliMains V 5.1.



Software system configuration: IM + Multiple Internal (MINT)

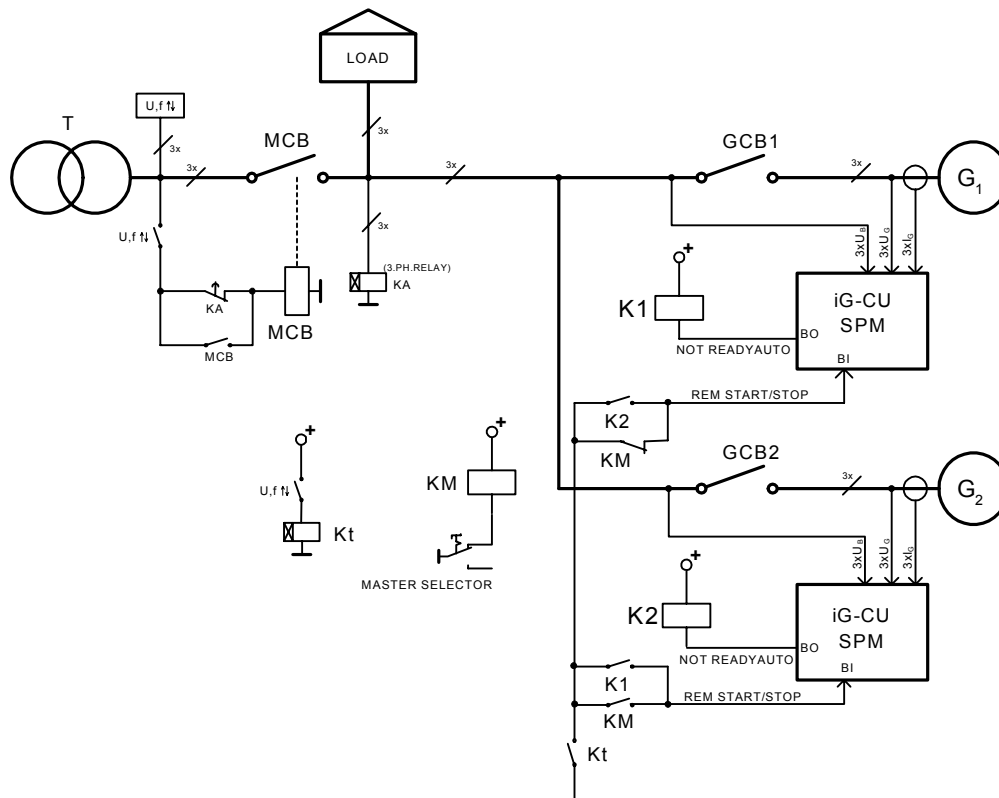
Description with MGCB

- 1) IM closes MGCB when MCB is closed to enable synchronizing to the mains when PARALLEL TO MAINS REQUIRED switch is closed.
- 2) The IM-CU opens MCB and MGCB after the mains fails.
- 3) At the same time the MCB aux contact starts Pwr management by closing of SYS START/STOP input, if the gen-sets had not run before.
- 4) MGCB is closed by IM when selected load reserve is achieved (enough engines are running) and IM keeps it closed when at least one GCB is closed.
- 5) Closing of MCB stops the gen-sets by opening of SYS START/STOP. Both gensets are unloaded to mains, then both GCBs are opened and engines stopped.

4. Examples

4.1. Stand-by redundancy gen-sets

Two IntelliGen - SPM controllers are connected as Stand-by redundancy gen-sets.



Specification

- Automatic start-up when the mains fails
- Reclosing after mains returns
- Master genset is selected by Master selector switch.
- When selected gen-set fails the second one starts.
- Bus voltage measuring protects genset against GCB closing to energized bus.

IG IntelliGen hardware requirements

- | | |
|----|--|
| 1x | Uf↑↓ relay (Mains decoupling relay) unit + MCB control |
| 2x | IG-CU |
| 2x | IG-MTU (Optional - refer to controller user manual) |

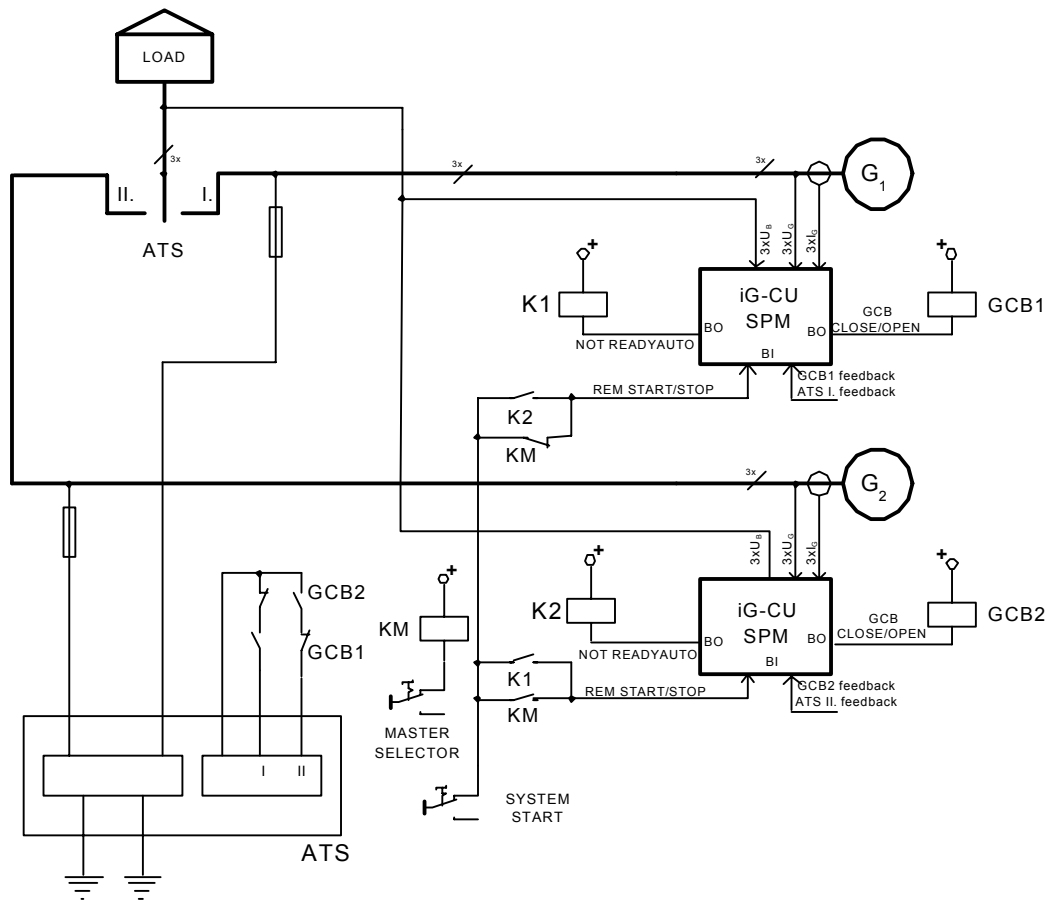
Software system configuration: SPM

Description

- 1) The Uf↑↓ relay opens MCB after the mains fails.
- 2) With the time delay given by Kt relay the master genset is started
- 3) If the master is not ready or fails during the operation the second genset is started
- 4) When the mains returns Kt relay stops the running set with its delay.
- 5) Bus 3 phase voltage relay detects no voltage and with its time delay closes MCB

4.2 SPM redundancy with ATS

Two IntelliGen - SPM (IntelliLite) controllers are connected as Stand-by redundancy gen-sets.



Specification

- Start on request by SYSTEM START switch
- Master genset is selected by Master selector switch.
- When selected gen-set fails the second one starts.
- Bus (load) voltage measuring protects genset against GCB closing to energized bus.

IG IntelliGen hardware requirements

2x IG-CU

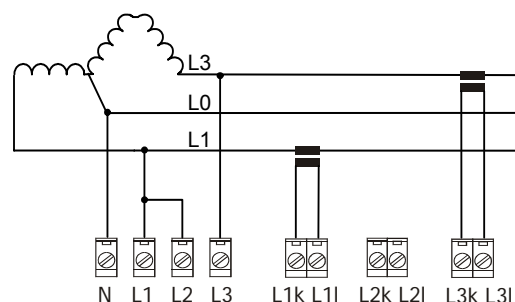
Software system configuration: SPM

Description

- 1) Selected master genset is started after SYSTEM START is closed
- 2) If the master is not ready or fails during the operation the second genset is started

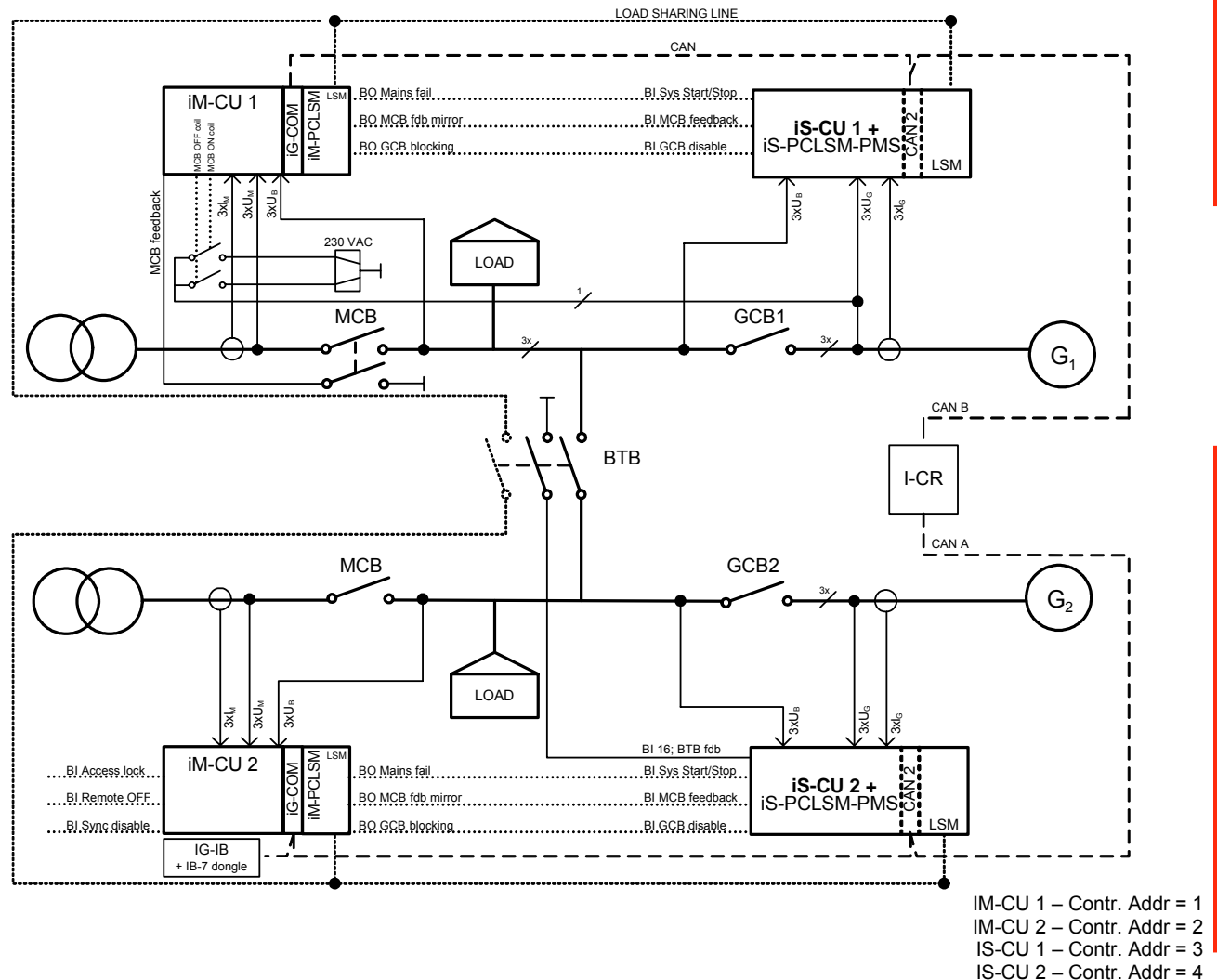
4.3 Two phase genset connection

Connect voltage and current terminals according following drawing.



4.4 Bus-tie breaker (BTB) application

Two Mains incomers and two gen-sets are separated by a bus-tie breaker. When one or both Mains fail, the BTB closes and Load can be supplied from the healthy Mains or from the gen-sets.



Specification

- Mains circuit breaker (MCB) is operated by 230V AC coil so it can be opened only after the voltage on the generator is present. GCB cannot be closed before MCB is opened.
- Therefore the BO MCB fdb mirror and GCB blocking from IM are connected to BI MCB feedback and GCB disable of IS (see IM-6.1 and IS-MINT-3.3 manuals for detailed description).
- Related settings are:
IS: **ProcessControl**:#SysLdCtrl PtM = BASELOAD
IS: **ProcessControl**:#SysPFCtrl PtM = BASEPF
IM: **Mains protect**:MCB opens on = GENRUN
IM: **Mains protect**:VectorS prot = GENRUN
IM: **Pwr management**:#SysAMFstpDel > **Mains protect**:Mains ret del
- I-CR** module is used for separating two parts of the CAN bus when BTB is opened – it has jumper P4 closed which means that IS-CU 2 (Contr. Addr = 4) gives I-CR information about BTB feedback. BTB feedback is 16 binary input of IS-CU 2 (see Inteli-communication guide for detailed description of I-CR possibilities). Thanks to I-CR module IG-IB is able to monitor all controllers (IM 1 and 2, IS 1 and 2) even if the BTB is opened.

Hardware requirements

2x IS-CU
2x IS-PCLSM-PMS
2x IM-CU
2x IG-COM
2x IM-PCLSM
1x IG-IB
1x IB-7 dongle
1x I-CR

Software system configuration: IS-MINT-3.3, IM-6.1

5. Speed governor interface

Hint:

Read carefully Speed governor instructions before connecting IntelliGen or IntelliSys Speed governor interface!

Electronic engines interface

All below mentioned interface examples describes 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. Please ask your local distributor for more details.

IntelliSys ECU interface

I-CB unit is an interface between IntelliSys 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/CAT-Diesel	CAT
I-CB/CAT-Gas	CAT

IntelliGen ECU interface

There exist some IntelliGen customer branches that support ECU. Please ask your local distributor for more details.

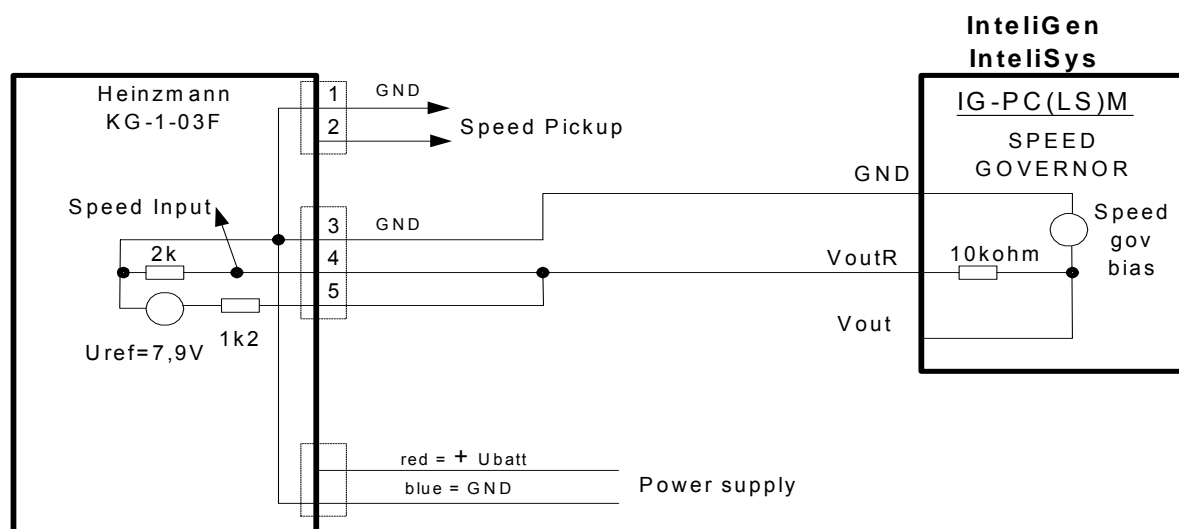
Controller Speed reg out voltage limit

Please note there is a new setpoint in IntelliSys-3.1 controller (no in IG-6.1): **Sync/Ld ctrl: SpeedGovLowLim** [0,01V]. Setpoint limits low level of output voltage. E.g. instead of full -10V to +10V Speed governor output range can be set **SpeedGovLowLim** = 0,00 to reduce output range from 0 to 10V.

Hint:

SpeedGovLim setpoint is available from IS version 3.1 !

Heinzmann E1-F and E2F

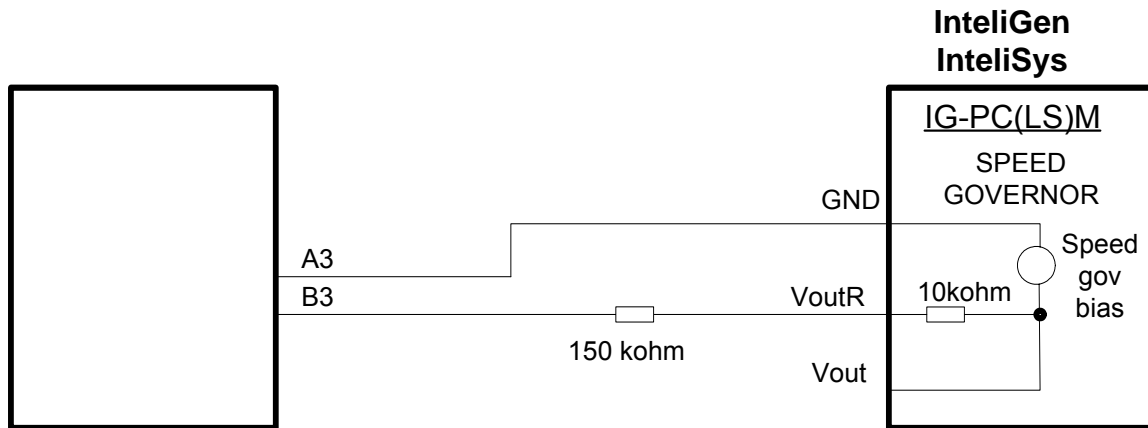


Adjusting

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

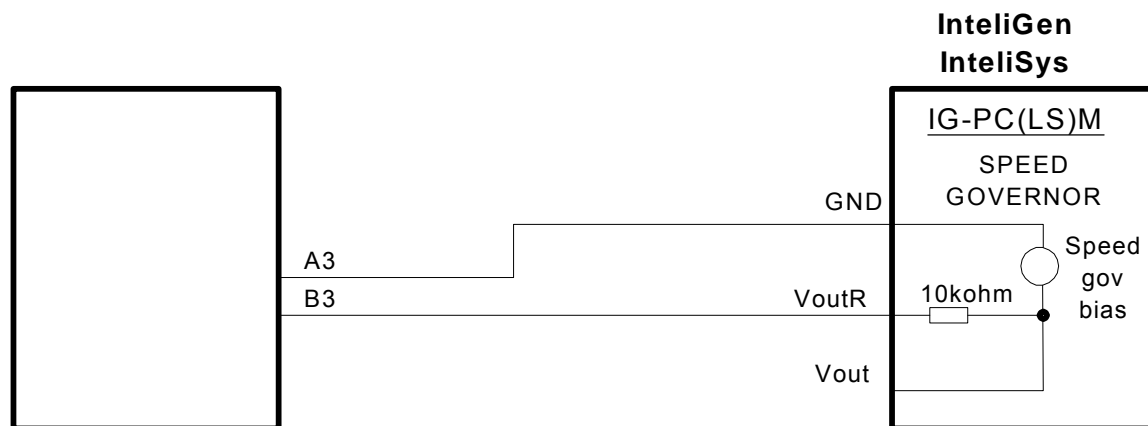
SpeedRegChar = POSITIVE

Heinzmann E6, E10



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

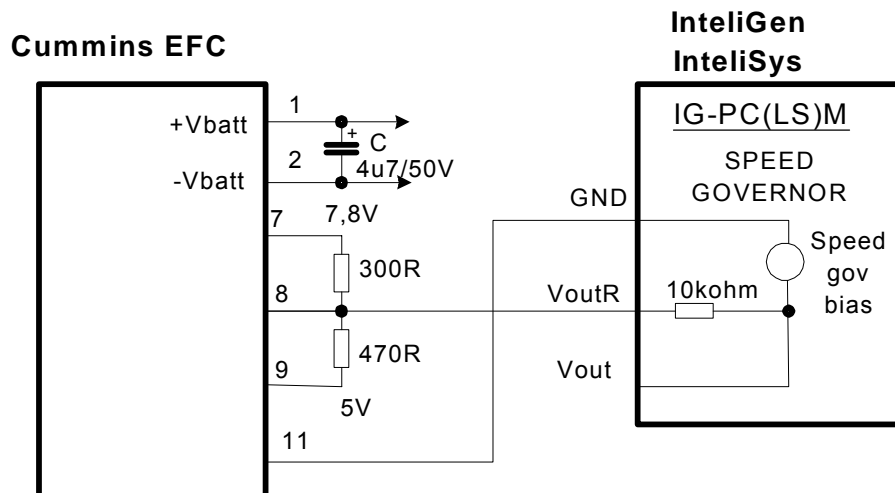
Heinzmann E16



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

Cummins

EFC



Hint:

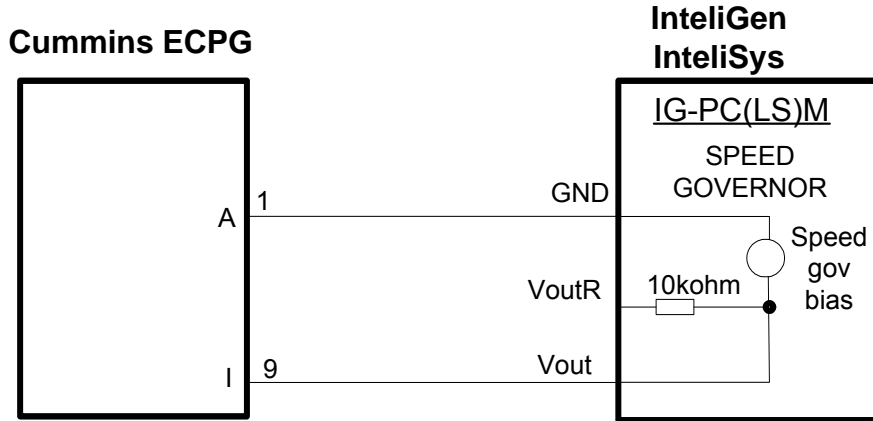
Spurious operation of the IntelliGen push buttons is caused by excessive interference from the speed controller when capacitor is not connected between power supply terminals 1 and 2.

Adjusting

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

SpeedRegChar = POSITIVE

ECPG

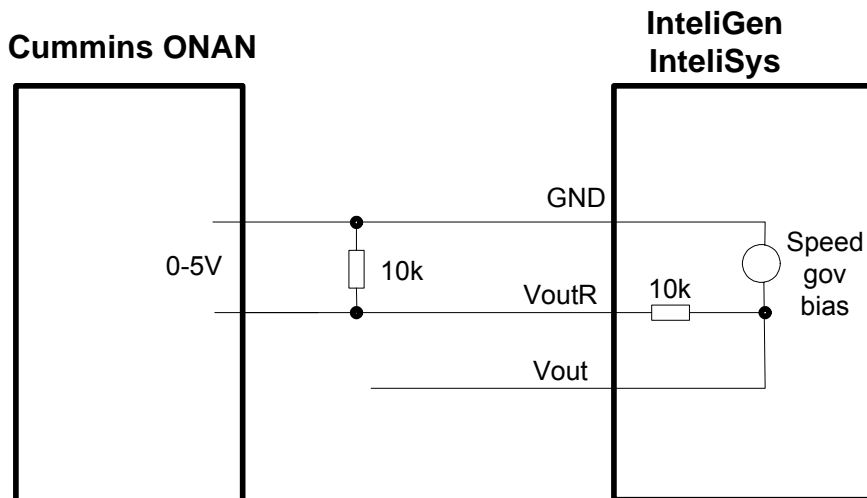


Adjusting

Sync/Load ctrl: *Speed gov bias* = 2.5VDC

SpeedRegChar = POSITIVE

ONAN

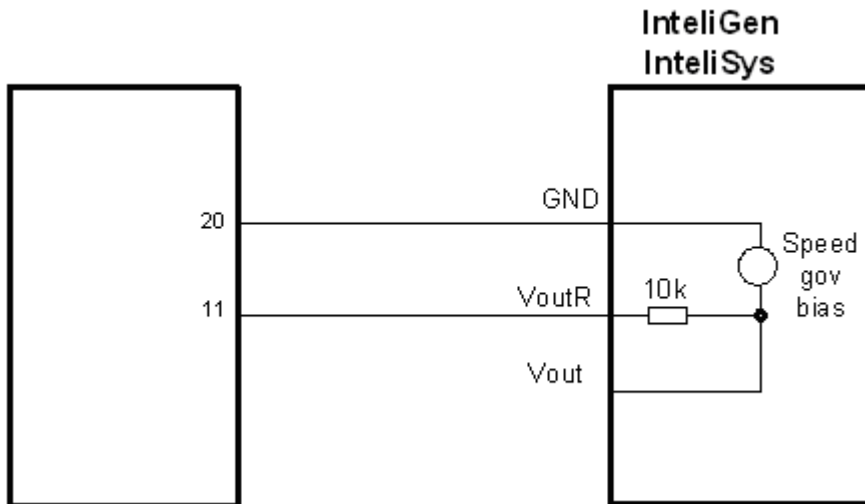


Adjusting

Sync/Load ctrl: *Speed gov bias* = 2.5VDC

SpeedRegChar = POSITIVE

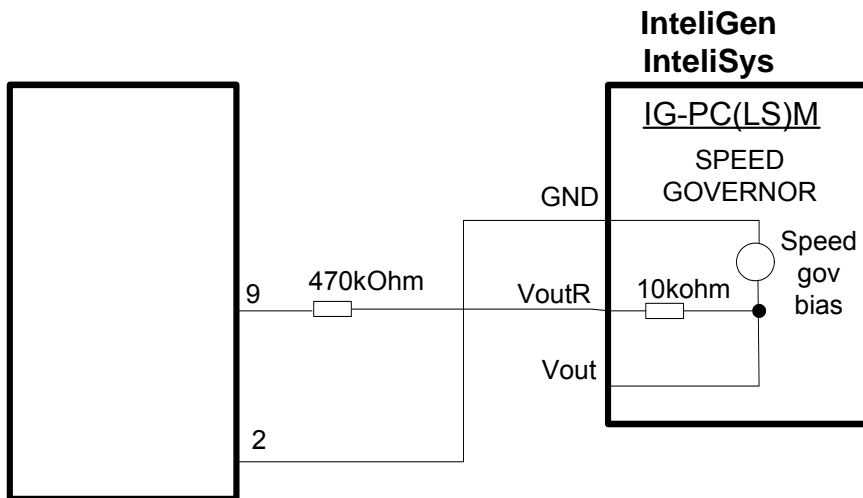
QST30^[TJ1]



Adjusting
Sync/Load ctrl: *Speed gov bias* = 5 VDC
SpeedRegChar = POSITIVE

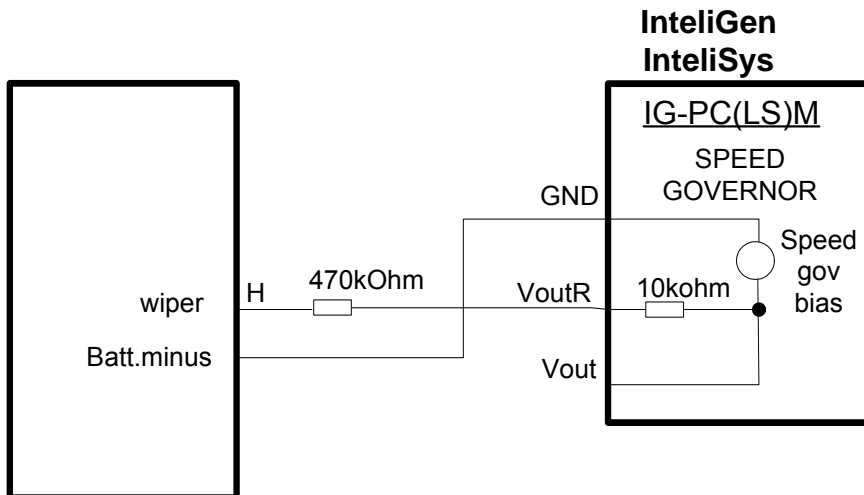
Barber colman

DYNA 8000



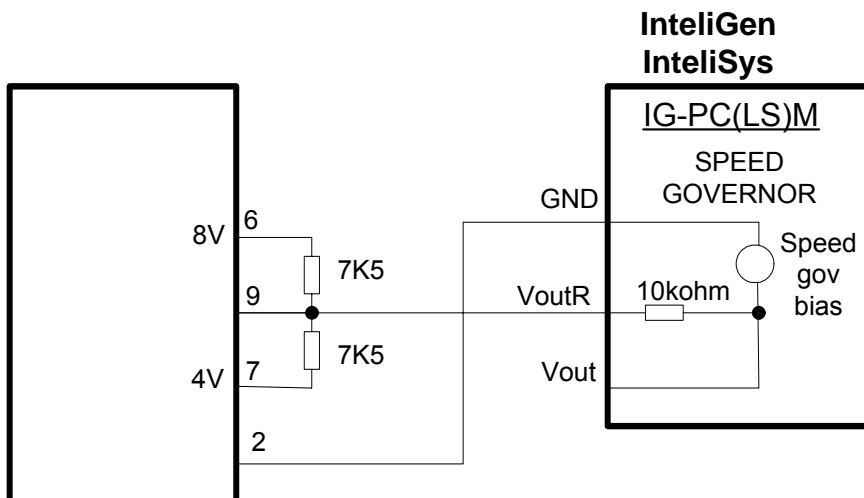
Adjusting
Sync/Load ctrl: *Speed gov bias* = 4V
SpeedRegChar = POSITIVE

DYN1



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

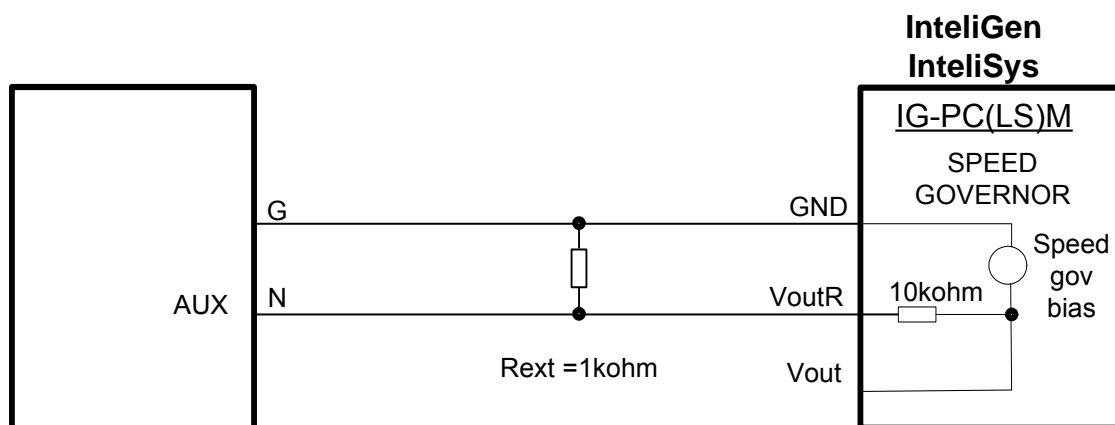
DYN1 10684



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

GAC

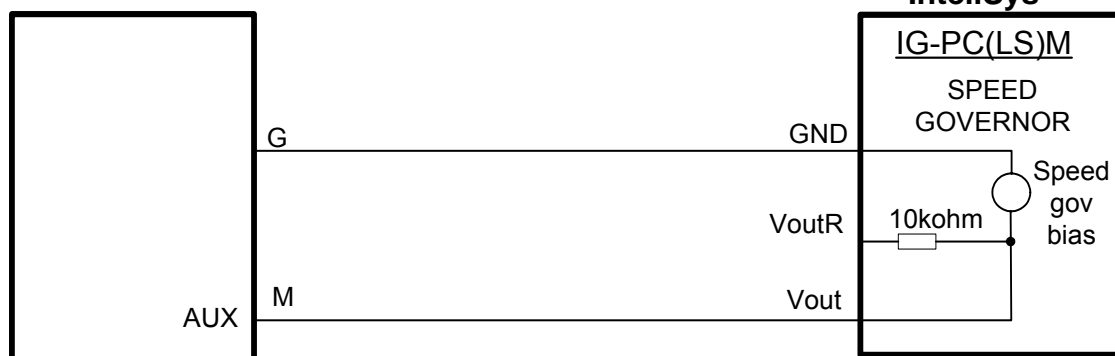
GAC ESD 5500 series



Adjusting

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

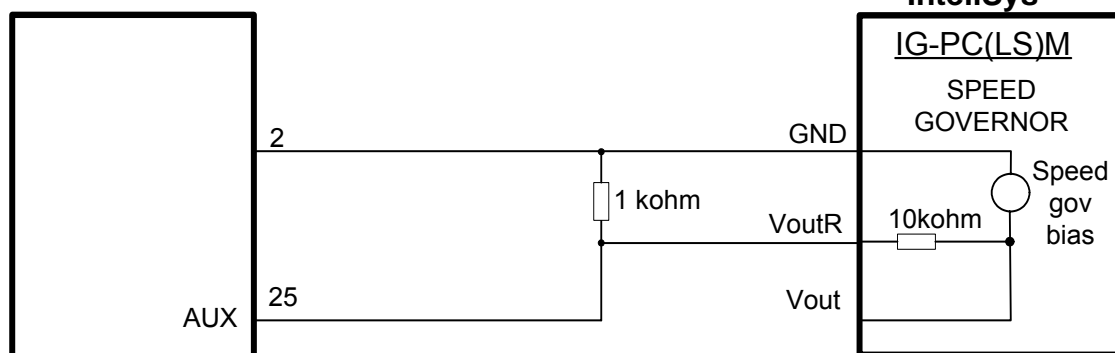
ESD 5330



Adjusting

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

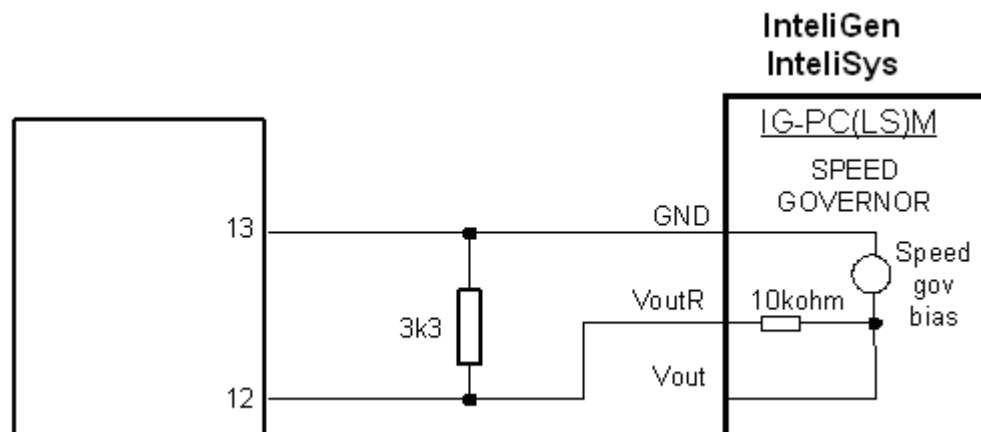
EGS 104B



Adjusting

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

ProAct II - Digital Speed Control System



Adjusting

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

EPG - Electrically Powered Governors

EPG	IG/IS -PC(LS)M
11 +	VoutR
12 -	GND
Shielding connected on EPG side only	

Adjusting

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

2301A Speed Controls

2301A	IG/IS -PC(LS)M
15 ±	VoutR
16 COM	GND
17 =Shielding is connected on 2301A side only	

Adjusting

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

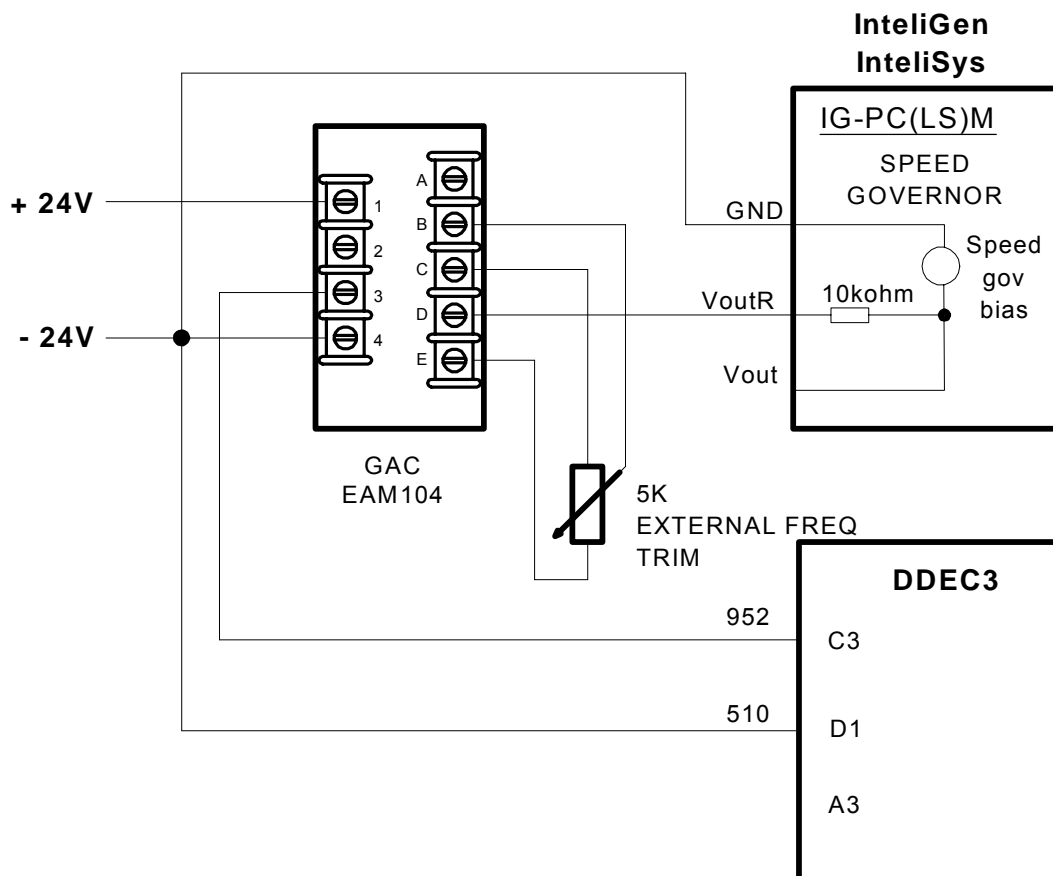
2301A Load Sharing and Speed control

2301A	IG/IS -PC(LS)M
25 +	VoutR
26 -	GND
27 =Shielding is connected on 2301A side only	

Adjusting

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

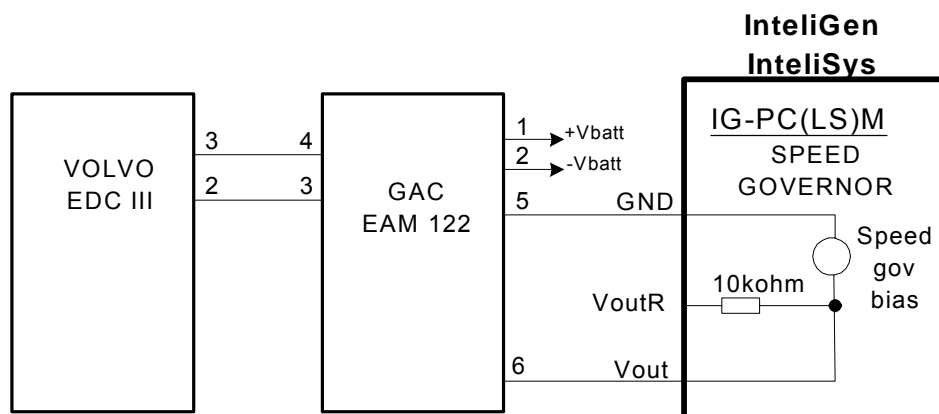
Detroit diesel - DDEC3



Adjusting

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

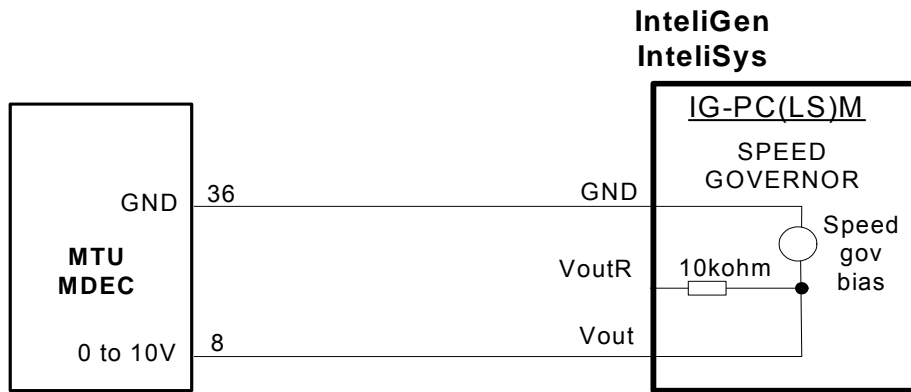
Volvo Penta EDC III



Adjusting

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

MTU MDEC 2000 , 4000



Adjusting

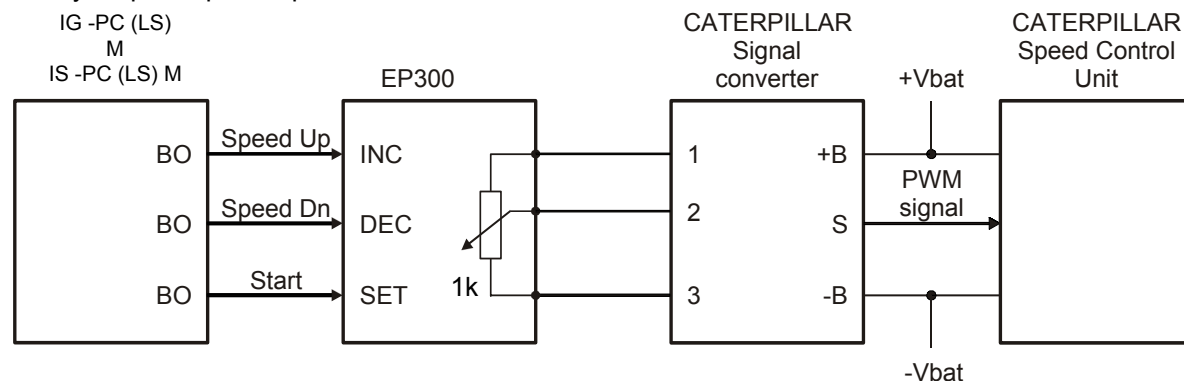
Sync/Load ctrl: *Speed gov bias* = 4,9 V
SpeedRegChar = POSITIVE

Caterpillar

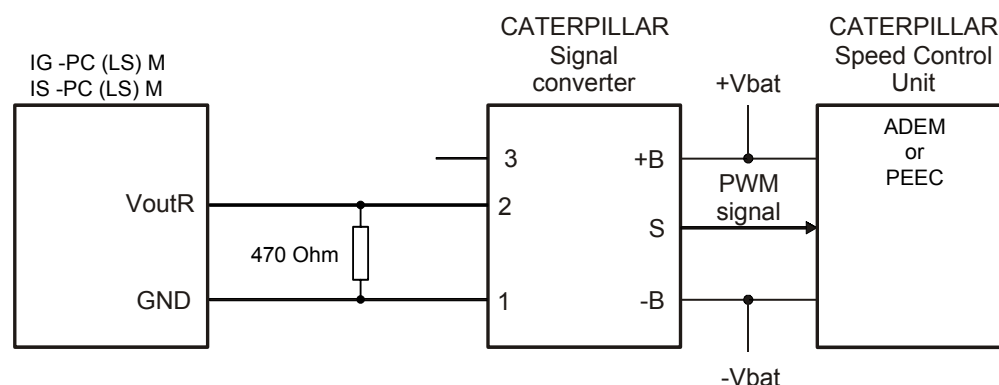
Following is an example of interface to Speed control unit with PWM input for synchronizing.

Interface with EP300

There is used Analog to PWM signal converter and Electronic potentiometer EP300 which is controlled by Binary outputs Speed Up and Down from controller.



Interface without EP300

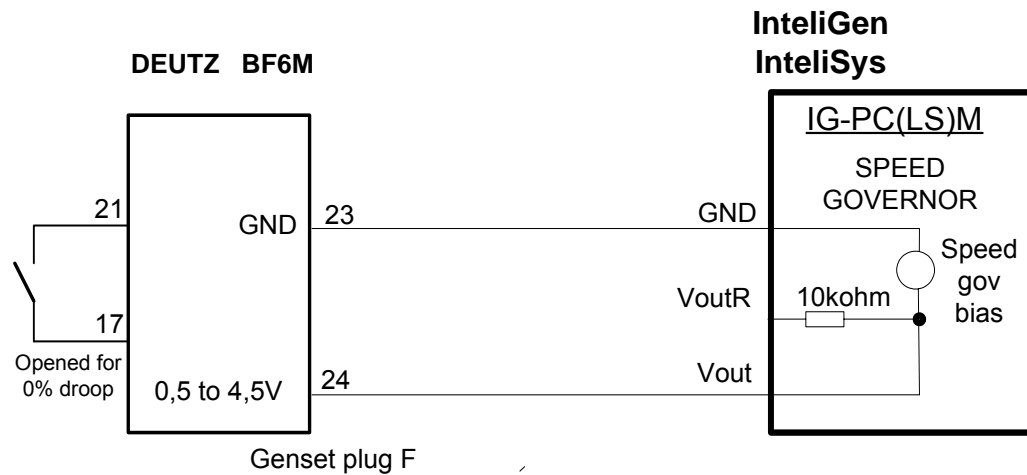


Adjusting

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

Deutz BF6M engine

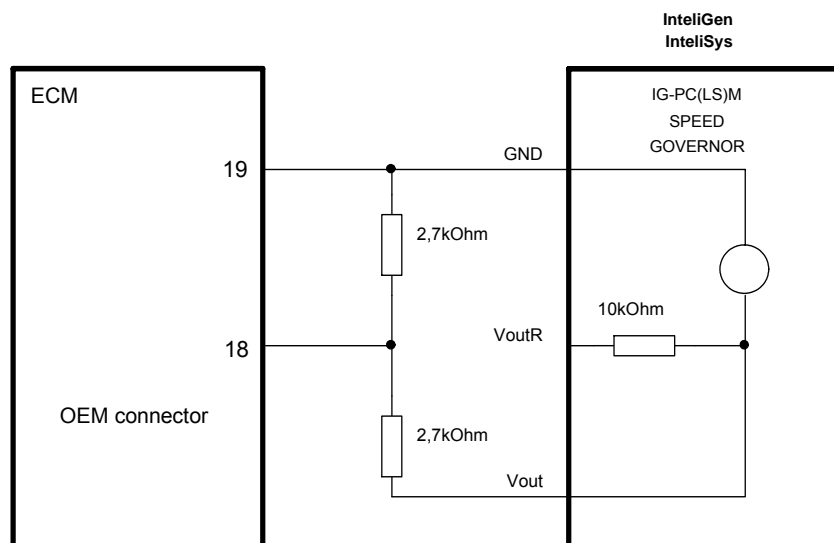
Example of interface to DEUTZ electronic injection system.



Adjusting
Sync/Load ctrl: *Speed gov bias* = 2,5 V
SpeedRegChar = POSITIVE

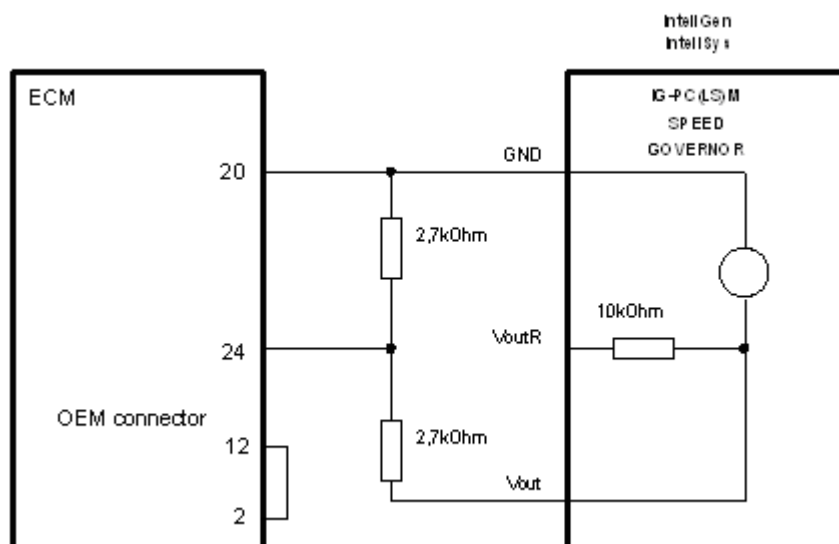
Perkins

Perkins 4016 E61 TRS



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

Perkins series 2300, 2800



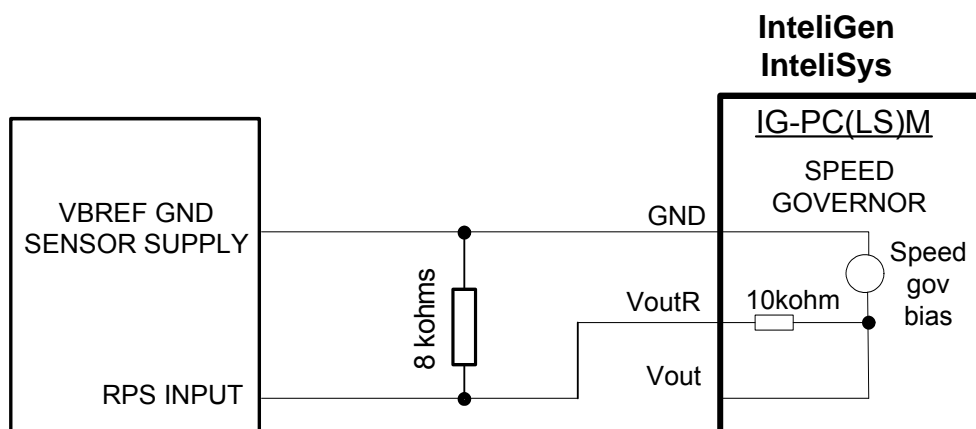
Adjusting

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

Hint:

For external speed setting terminals 2 and 12 on ECM have to be interconnected.

Perkins 1300 Series EDi

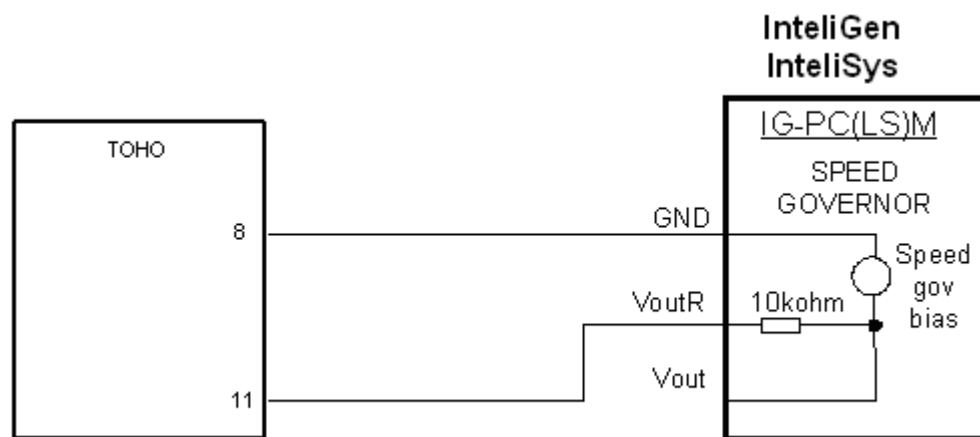
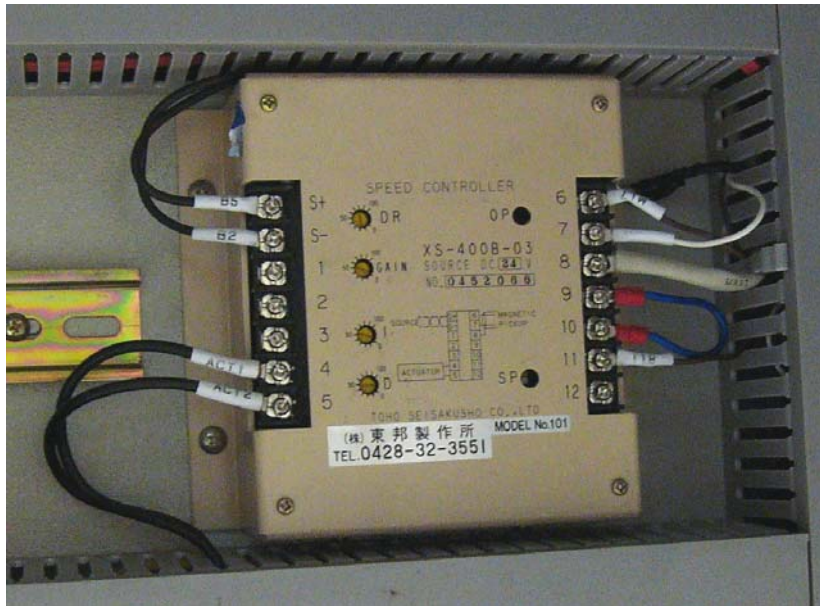


Adjusting

Sync/Load ctrl: Speed gov bias = app. 5,6 V
SpeedRegChar = POSITIVE

TOHO

XS-400B-03



Adjusting

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

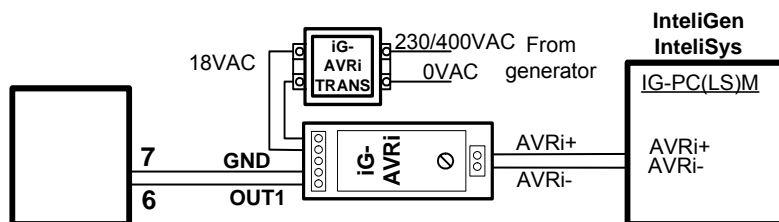
6. AVR interface

Hint:

Read carefully AVR instructions before connecting to IntelliGen or IntelliSys controller!

Basler

Basler APR63-5, AEC 63-7, KR-FX, KR-FFX



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

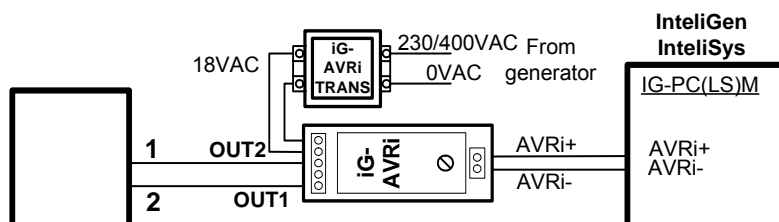
Adjusting

AVRi trim to minimum counterclockwise.

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

Stamford

STAMFORD SX460



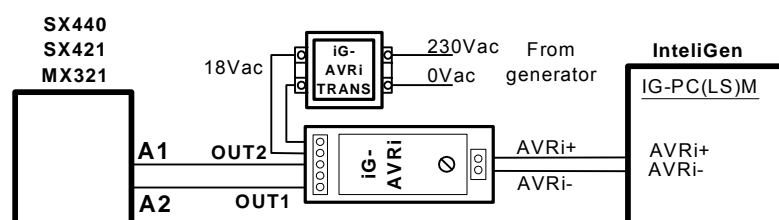
AVRi output is connected instead of external resistor for voltage adjusting.

Adjusting

AVRi trim to minimum counterclockwise.

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

STAMFORD SX440, SX 460, MX321, MX341, SX421



AVRi output is connected to auxiliary voltage input A1, A2.

Adjusting

AVRi trim to minimum counterclockwise.

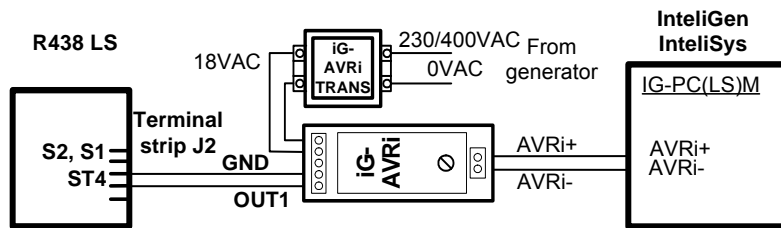
Volt/PF ctrl: AVR DCout bias = 50%
VoltRegChar = POSITIVE

Hint:

Inputs 1 and 2 for external trim must be shorted for control via analog inputs A1, A2.

Leroy Sommer

R438 LS, R448



AVRi output is connected instead Remote voltage trimmer 470 ohm to terminals ST4.

Adjusting

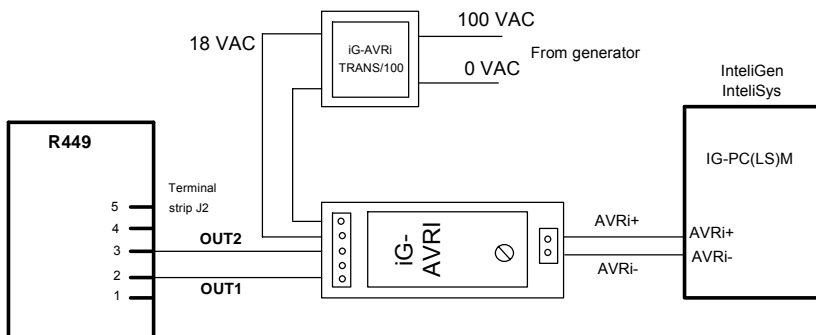
AVRi trim to minimum counterclockwise.

Volt/PF ctrl: AVR DCo_{ut} bias = 50%
VoltRegChar = POSITIVE

R449

Leroy Sommer

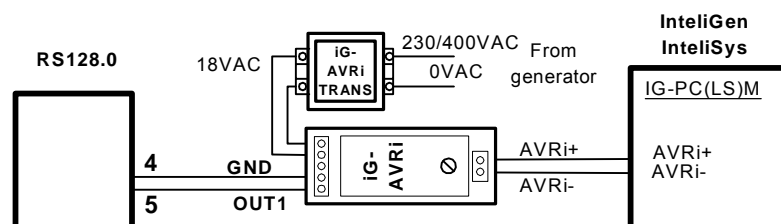
R 449



AVR D_{co}ut bias = 50%

VoltRegChar = POSITIVE

RS128



AVRi output is connected instead Remote voltage trimmer 470 ohm to terminals 4, 5.

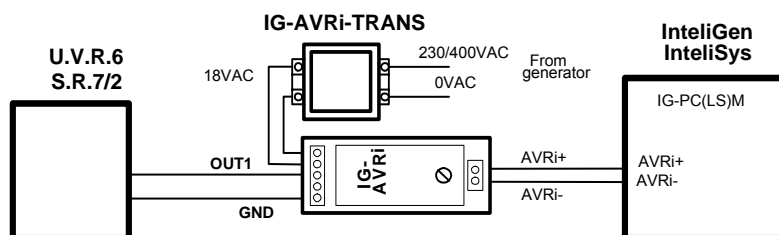
Adjusting

AVRi trim to minimum counterclockwise.

Volt/PF ctrl: AVR DCo_{ut} bias = 50%
VoltRegChar = POSITIVE

Mecc Alte Spa

S.R.7/2, U.V.R.6



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

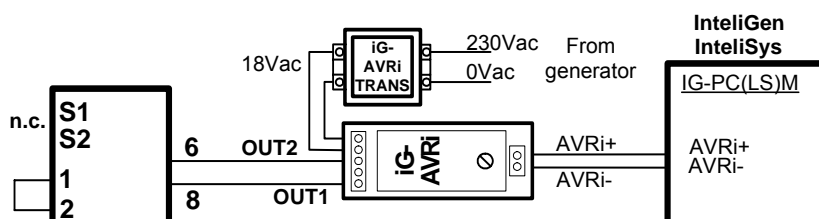
Adjusting

AVRi trim to maximum counterclockwise.

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



Marelli AVR



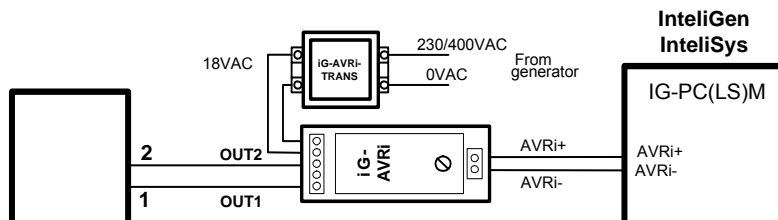
- Use pin 1 and 2 with link (remote voltage trim)
- Disconnect Droop C/T (S1, S2)

Adjusting

AVRi trimpot in middle position.

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

Piller



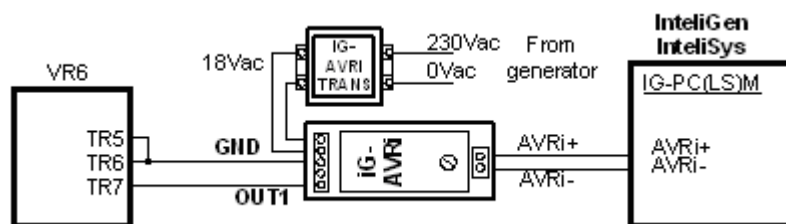
AVRi output is connected instead Remote voltage trimmer 100Kohm.

Adjusting

AVRi trim to minimum counterclockwise.

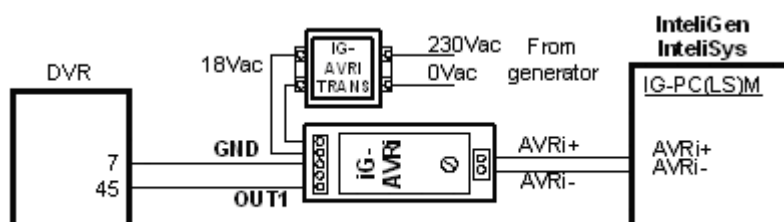
Volt/PF ctrl: AVR DCout bias = 39%
VoltRegChar = POSITIVE

VR6



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

DVR



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

Hint:

IG-AVRi trim in about ¼ position.

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

7. Abbreviations

AMF	Auto Mains Failure (controller starts automatically on mains failure)
ATS	Automatic Transfer Switch (switches the load to actually supplied bus (by mains or generators))
AVR	Automatic Voltage Regulator
GCB	Generator Circuit Breaker
CHP	Combined Heat & Power - cogeneration application, usually with gas engine
IG	InteliGen gen-set controller
IG-AVRi	IG Automatic Voltage Regulator interface
IG-COM	IG Communication module - enables to interconnect the IG controllers in multiple applications via CAN bus and connecting the communication modules (IG-MU, IG-IB)
IG-IB	IG Internet Bridge - for internet/ethernet communication
IG-MU	IG Modem Unit - for direct or modem control of multiple gen-sets
IG-PCLSM	IG Power Control and Load Sharing Module - for synchronizing and power control for multiple isolated parallel operation
IG-PCM	IG Power Control Module - for synchronizing and power control of a single gen-set running in parallel to mains
IM	InteliMains - Mains supervision controller
IS	InteliSys gen-set controller
LS	Load Sharing - analog load sharing line to interconnect the gen-sets on the site (for isolated parallel or mains parallel of multiple gen-sets)
LSM	Load Sharing Module
MCB	Mains Circuit Breaker
MEXT	Multiple application with EXTERNAL control loops - for multiple gen-sets in island parallel or mains parallel operation; external synchronizer & load sharer modules expected; PMS available
MGCB	Master Generator Circuit Breaker (sometimes used with multiple gen-sets in island parallel or mains parallel operation)
MINT	Multiple application with INTERNAL control loops - for multiple gen-sets in island parallel or mains parallel operation; Load Sharing and VAr Sharing controlled internally; PMS available
NPU	Mains protection relay (voltage, frequency, vector shift protections)
PMS	Power Management System - ensures optimization of running gen-sets on the site with multiple gen-sets; based on kW spinning reserve or on relative (%) load; no-master system ensures high reliability
SPI	Single Parallel Island application - for single gen-sets in parallel with mains or in island operation; suitable for CHP application; no MCB control
SPM	Single Prime Mover application - for single gen-sets without mains
SPtM	Single Parallel to Mains application - for single gen-sets in parallel with mains or in island operation, with AMF support; both MCB and GCB controlled
SSB	Single Stand-By application - for single gen-sets with mains and break transfer gen-set to mains
VS	VAr Sharing - ensures VAr sharing between the gen-sets on the site via CAN bus (for isolated parallel or mains parallel of multiple gen-sets)