

M.O.E. GmbH
Certification body

Accredited by

DIN EN ISO/ IEC 17065: 2013

DAkkS registration number: DE-ZE-12005-01-00



Component certificate

No.: MOE 19-EZE-0041-02

Revision: 2.0

Manufacturer

ComAp a.s.

Type of component

PGU controller for Type 1 generating units

Technical specifications

refer to Table 2-1

VDE code of practice

VDE-AR-N 4110:2018-11 "TAR
Mittelspannung"

Certification programme

FGW Technical guideline part 8 Rev. 9

Applicable standards and guidelines

FGW Technical guideline part 3 Rev. 25

The PGU controllers as stated above conform to the requirements of **VDE-AR-N 4110:2018-11 "TAR Mittelspannung"** (medium voltage).

The following restrictions and deviations apply: refer to Restrictions
Table **5-1**

The manufacturer has demonstrated certification of the quality management systems of their production facility according to ISO 9001.

This certificate contains the following information:

- Technical specifications of the PGU controller and valid software versions
- block diagram of the PGU controller
- summary data about the properties of the PGU controller;

This certificate comprises 14 pages and the following annexes:

- **Annex I: Evaluation report MOE-19-EZE-0041-01, Rev. 2.0**

This certificate is valid until 2025-01-30.

Itzehoe, **2020-02-20**



Dipl.-Ing. (FH) Michael Voß
Head of the certification body

Dr. Rainer Zimmermann
Senior expert of the certification body

M.O.E. GmbH certification body, Fraunhoferstraße 3, D-25524 Itzehoe, info@moe-service.com

Excerpts from this certificate may only be reproduced with written permission of M.O.E. GmbH. This certificate is only valid in conjunction with the Annexes listed above.

Revision history

rev.	date	changes	issued by	approved by
1.0	2020-01-31	First issue	RZ	JaM
2.0	2020-02-20	<p>General:</p> <ul style="list-style-type: none"> Reference to new revision 2.0 of evaluation report, refer to list of changes therein <p>2 Technical specifications: Revised type specific software versions</p> <p>5 Restrictions</p> <ul style="list-style-type: none"> Removed restriction (former No. 7) concerning resolution of $\cos \varphi$ settings Removed hint (former No. 9) concerning deactivation for voltage protection while FRT curves are active (no longer applies to software 1.6.0) Restriction No.10: added additional parameter requirement Changed restriction No. 12 concerning P(f) power gradient into restriction concerning parameter settings. 	RZ	MV

Contents

1	Description of the component.....	4
2	Technical specifications.....	5
3	Structure of the PGU controller.....	7
4	Summary data about the properties of the PGU controller.....	8
5	Restrictions	9

1 Description of the component

The PGU controller is designed, among other functions, to control active power, reactive power, fault ride through, cut-in conditions and grid protection in accordance with VDE AR-N 4110:2018, as a component of a power generating unit (PGU or genset) consisting of a synchronous alternator typically driven by a gas engine.

Furthermore, the controller contains functions to internally calculate reactive power set-points required by VDE AR-N 4110:2018 for the system level at the medium voltage connection point (PCC) and use these set-points to control the reactive power of the genset accordingly.

The controller controls an external voltage regulator (AVR) in order to control reactive power, and a speed governor in order to control generator speed (in the startup phase) and engine power (in grid parallel operation). It also controls the generator circuit breaker for synchronisation and protection functions.

A number of signal inputs (not shown in block diagram) allows provision of external set-point signals or measurements.

A diagram of a typical application within a PGU is shown in Figure 1-1.

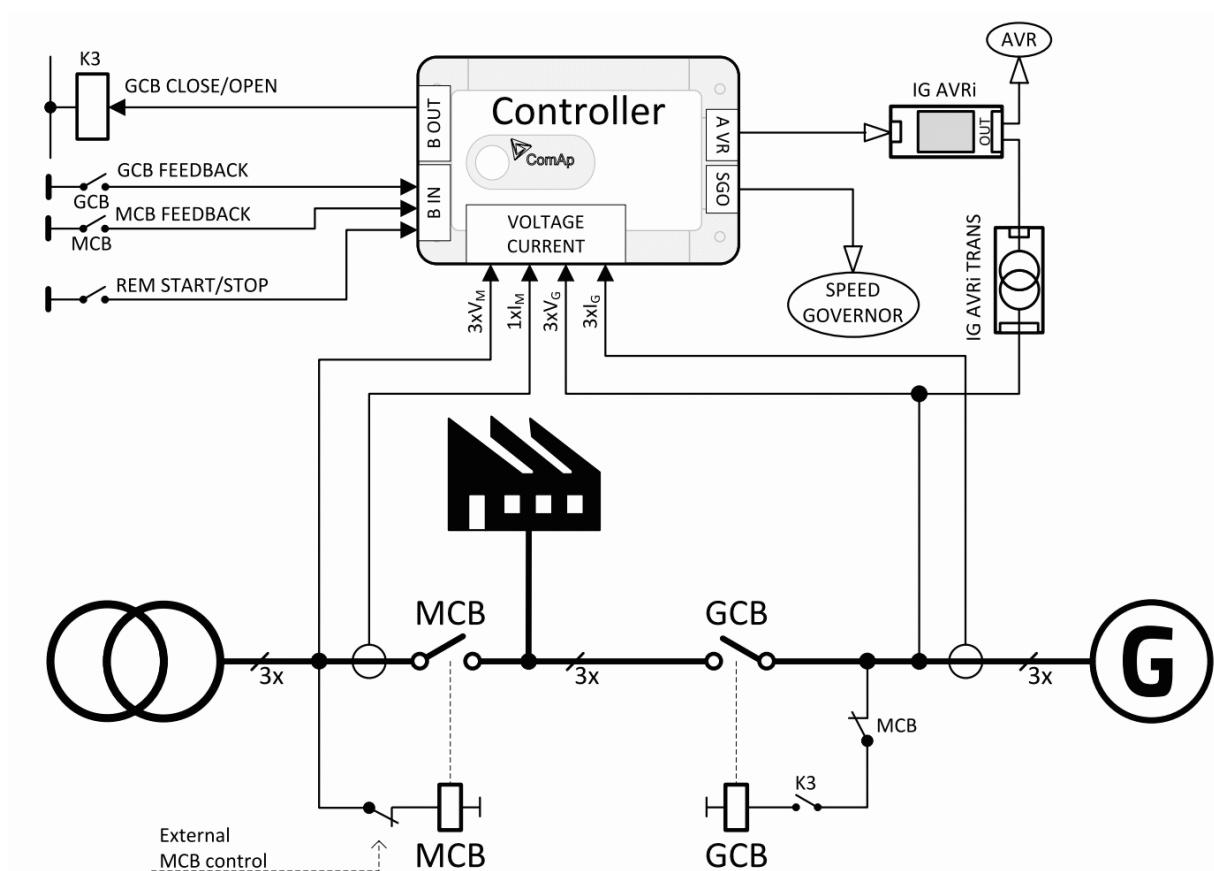


Figure 1-1: Block diagram of the PGU controller in the context of a generating unit (Genset)

2 Technical specifications

Table 2-1: Technical data of the PGU controllers

Designation	Manufacturer	ComAp a.s.
	Type	InteliSys Gas AIO-Gas InteliSys GSC-C InteliGen GSC-C InteliGen GSC
Area of application	-	Type 1 power generating units
Technical description of the PGU controller	Control areas:	<ul style="list-style-type: none"> Active power control Reactive power control
	Active power control:	<ul style="list-style-type: none"> Active power set-point control (power curtailment by grid operator, control by third parties) Active power control depending on grid frequency
	Methods for reactive power control:	According to VDE-AR-N 4110:2018: <ul style="list-style-type: none"> Q(U) characteristic Q(P) characteristic Q control with voltage limitation functions cos φ set-point control
	Other functions:	<ul style="list-style-type: none"> Supervision of cut-in voltage and frequency conditions in normal operations and after a grid protection trip (VDE-AR-N 4110:2018) Grid protection (voltage and frequency) at the PGU according to VDE-AR-N 4110:2018
	Measurement data acquisition:	Measurement values <ul style="list-style-type: none"> Generator voltage Generator current Grid frequency Generator active power Generator reactive power External mains voltage
Technical description of the PGU controller	Interfaces for set-point control:	<ul style="list-style-type: none"> Q- und cos φ set-points, $U_{Q0,ref}$, and Q_{ref} via internal variables; Q set-point via analogue interface U-measurement value and $U_{Q0,ref}$ set-point for Q(U) characteristic via analogue interface U measurement value and Q_{ref} set-point for Q with voltage limitation function („Qref/Ulim“) via analogue interface
	Output interfaces:	<ul style="list-style-type: none"> Voltage offset to voltage regulator (AVR)

		<ul style="list-style-type: none">Speed governor control (speed and load control)Control of circuit breaker													
	Valid software version:	<table><tr><th>Controller</th><th>Software version</th></tr><tr><td>InteliSys Gas</td><td>IS2GASXX-1.6.0</td></tr><tr><td>AIO-GAS</td><td>AIO-GAS-1.6.0</td></tr><tr><td>InteliSys GSC-C</td><td>IS2GSC-1.1.0</td></tr><tr><td>InteliGen GSC-C</td><td>IG2GSC-1.1.0</td></tr><tr><td>InteliGen GSC</td><td>IG2GSC-1.1.0</td></tr></table>		Controller	Software version	InteliSys Gas	IS2GASXX-1.6.0	AIO-GAS	AIO-GAS-1.6.0	InteliSys GSC-C	IS2GSC-1.1.0	InteliGen GSC-C	IG2GSC-1.1.0	InteliGen GSC	IG2GSC-1.1.0
		Controller	Software version												
		InteliSys Gas	IS2GASXX-1.6.0												
		AIO-GAS	AIO-GAS-1.6.0												
		InteliSys GSC-C	IS2GSC-1.1.0												
		InteliGen GSC-C	IG2GSC-1.1.0												
	InteliGen GSC	IG2GSC-1.1.0													
	Electrical data (power supply)														
	Supply voltage range	8 – 38 V (DC)	V												
Nominal frequency	-	Hz													
Frequency operating range	-	Hz													
Power consumption (controller)	3.6	W													
Environmental operating conditions															
Operating temperature	-40 ... +70	°C													
Compatibility requirements for system components	-														

3 Structure of the PGU controller

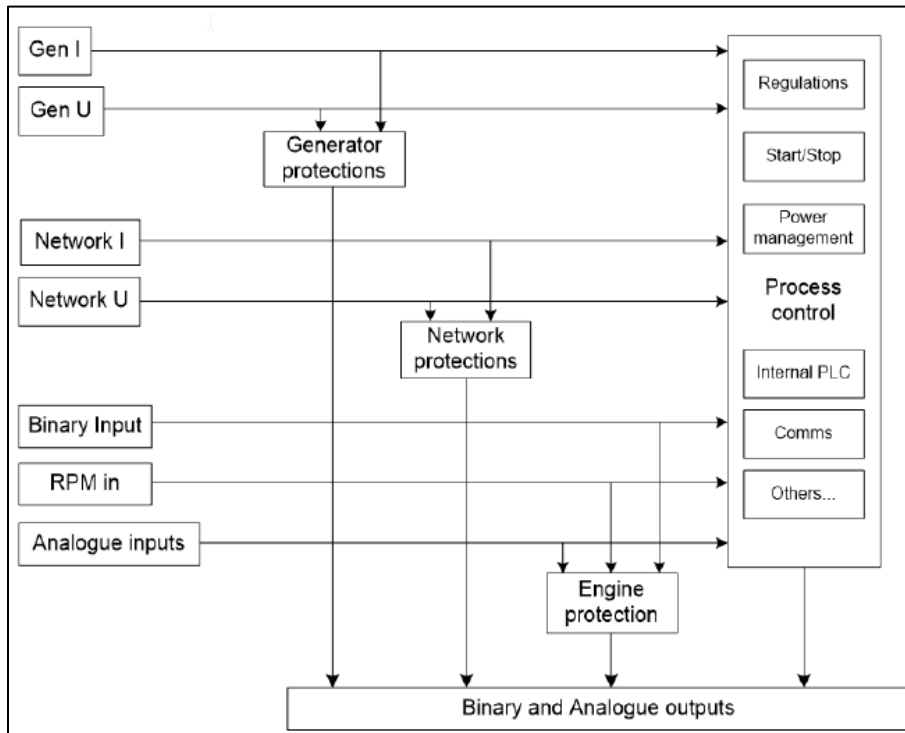


Figure 3-1: Block diagram of the controller

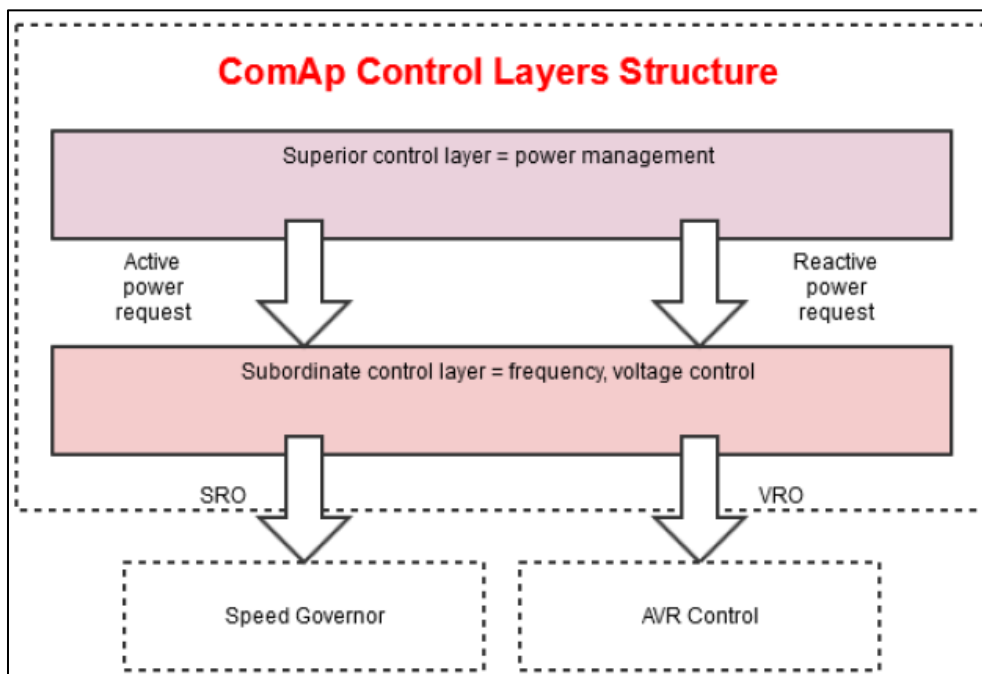


Figure 3-2: Internal control levels of the active and reactive power control functions

4 Summary data about the properties of the PGU controller

Table 4-1: Evaluation summary

Requirements	compliant	Remarks / Hints
Reactive power control according to VDE-AR-N 4110:2018: <ul style="list-style-type: none"> Q(U) characteristic Q(P) characteristic Q control with voltage limitation functions cos ϕ set-point control 	<input type="checkbox"/>	Partial evaluation of conformity; refer to conditions in Restrictions Table 5-1
Dynamic grid support / Fault ride through	<input type="checkbox"/>	Partial evaluation of conformity; refer to conditions in Restrictions Table 5-1
Active power control by grid operator	<input type="checkbox"/>	Partial evaluation of conformity; refer to conditions in Restrictions Table 5-1
Active power control depending on grid frequency	<input type="checkbox"/>	Partial evaluation of conformity; refer to conditions in Restrictions Table 5-1
Provision of primary control power	<input type="checkbox"/>	not evaluated (optional for VDE AR-N 4110)
Grid protection functions and settings	<input type="checkbox"/>	Partial evaluation of conformity; refer to conditions in Restrictions Table 5-1
Cut-in conditions and active power ramp after loss of grid voltage	<input type="checkbox"/>	Active power ramp: Partial evaluation of conformity; refer to conditions in Restrictions Table 5-1
Synchronisation	<input type="checkbox"/>	not evaluated
Overall result		
Compliant (within the scope of the partial evaluation)		
Restrictions of validity		
refer to Restrictions Table 5-1		

This certificate states conditions, hints and remarks concerning the properties of the PGU controller. The following provisions must be respected by the user:

- Hint: explanations of issues that should be considered during application on the PGU or system level.
- Remark: Informative Statement on properties of the controller
- Restriction: Mandatory conditions to fulfil compliance with requirements.

5 Restrictions

Table 5-1: Detailed descriptions of Restrictions and Hints

Evaluation item (section in evaluation report)	Description of Restrictions
Reactive power control (5.1.2.2)	<ol style="list-style-type: none"> 1) The influence of the external interfaces to the Q or $\cos \varphi$ setpoint specification was not measured and must be considered separately if necessary. The test results are only valid for specification via internal setpoint variables. 2) The reactive power control loop of the controller was not part of the test scope.
Reactive power control methods (5.1.2.2)	<ol style="list-style-type: none"> 3) Since the Q-control loop and the interfaces for external setpoint input were not included in the test scope, it must be noted that these may cause additional deviations and time delays. This is to be evaluated within the scope of the unit certification. 4) Additional deviations are caused by the plant network (cables and transformers). For the control methods "Q(U) characteristic" and "Q with voltage limitation", an external voltage measurement at the grid connection point must be provided, as otherwise considerable inaccuracies would occur. These must also be taken into account. 5) If the total deviation at the PCC exceeds the respective tolerance ($\pm 2\% P_{b,inst}$ or $\pm 4\% P_{b,inst}$), the approval of the grid operator must be obtained. 6) The reference voltage of the Q(U) characteristic, $U_{Q0,ref}$, can be changed in steps of $1\% U_r$ only, in deviation from the requirement ($\leq 0.5\% U_r$); this must be approved by the grid operator when using the function.

Evaluation item (section in evaluation report)	Description of Restrictions
Fault Ride Through (5.2.2.3)	<p>7) The evaluation result only covers partial conformity for the FRT protection function contained in the DUT as described in section 5.2.2.1 of the evaluation report, under condition of the parameter settings described in Table 5-27 therein. Within the scope of unit certification, it does not replace the prescribed FRT tests on the complete generation unit and other assessments required for this purpose.</p> <p>8) Other characteristics relevant to certification, including the control behaviour for active and reactive current during and after the fault, the short-circuit current contribution and the behaviour in the event of multiple faults are determined by other components of the PGU (AVR, generator, power control) and must therefore be determined by the PGU tests. Other components, especially protection devices, can also cause the PGU to disconnect.</p>
Active power output and network security management (5.3.3)	<p>9) Please note that the test results only refer to the subsystem "Superior control layer" in the control system. The setpoint transfer via an external interface, the control loop as well as the measurement value acquisition of a real PGU can cause additional control deviations, transients and communication delays. The results should therefore not be regarded as representative of a real PGU and do not replace the corresponding tests on the complete PGU as part of the unit certification procedure.</p> <p>10) In order to ensure that the behaviour of the PGU conforms to the guidelines, the target gradient "Load Ramp" must be set in the range $0.34 \% P_{TE} \dots 0.65 \% P_{TE}$. In addition, the Parameter „LoadReduct“ has to be set to „Load Ramp“.</p>
Active power control depending on the grid frequency (5.4.3)	<p>11) The present evaluation only covers the functionality of the P(f) characteristic with associated power gradients; the control loop for implementing the performance specification is not included in the scope of evaluation and may generate additional control deviations or time delays. This must be evaluated within the scope of unit certification.</p> <p>12) Parameter „Fast Load Ramp“ in Group „ActPwrRamps“ must be set to a value $\leq 86 \text{ s}$ for use with gensets $P_{TE} \leq 2 \text{ MW}$, or $\leq 289 \text{ s}$ for gensets with $P_{TE} > 2 \text{ MW}$.</p> <p>13) If the technical minimum power of the PGU is $< 0.37 P_{TE}$, an additional confirmation by the manufacturer is required that a reduction of active power at overfrequency up to the technical minimum power is possible.</p>

Evaluation item (section in evaluation report)	Description of Restrictions
Protection facilities and protection settings (5.5.2)	<p>14) As partial conformity, only the grid protection function of the controller was assessed. Other requirements listed above for the protection functions are to be assessed within the scope of unit certification for the complete generation unit.</p> <p>15) The control unit shall be used in conjunction with a Dy machine transformer.</p> <p>16) Other protection requirements listed in Table 5 55 of the evaluation report shall be evaluated for the complete generation unit as part of the unit certification process.</p>
Cut-in conditions and active power ramp after loss of grid voltage (5.6.3)	<p>17) With regard to the active power gradient (evaluation items 2.X in Table 5.61 of the evaluation report), the present evaluation only covers the functionality of the setpoint ramp; the control loop for the implementation of the target power value is not included in the scope of evaluation and may require additional control deviations and time delays. This needs to be evaluated in the context of unit certification.</p>