APPLICATION NOTE
#45034_A, 03/2026

easYgen-3000XT compliance with EN-50549-1/2

easYgen manuals :

easYgen-3400XT-P2 / 3500XT-P2 / 3500XT-P2-LT
Release 2.17-0 Document ID: B37581, Revision N - Build 54801

easYgen-3400XT-P1 / 3500XT-P1 / 3500XT-P1-LT

Release 2.17-0 Document ID: B37580, Revision P - Build 54802

easYgen-3100XT-P1 / 3200XT-P1 / 3200XT-P1-LT
Release 2.17-0 Document ID: B37574, Revision U - Build 54812

Based on standards:

BS EN 50549-1:2019+A1:2023
Requirements for generating plants to be connected in parallel with distribution networks
Part 1: Connection to a LV distribution network-Generating plants up to and including Type B

BS EN 50549-2:2019+A1:2023
Requirements for generating plants to be connected in parallel with distribution networks
Part 2: Connection to a MV distribution network - Generating plants up to and including Type B

General Information

The following alert boxes can be used in this publication:

"DANGER" indicates a hazardous situation which, if not avoided, will result in death or serious injury.

"WARNING" indicates a hazardous situation which, if not avoided, could result in death or serious injury.

"CAUTION", used with the safety alert symbol, indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

"NOTICE" is used to address practices not related to personal injury.

"IMPORTANT" is used to address practices not related to personal injury.

Personnel

WARNING!
Hazards due to insufficiently qualified personnel!

If unqualified personnel perform work on or with the control unit hazards may arise which can cause serious injury and substantial damage to property.

- Therefore, all work must only be carried out by appropriately qualified personnel.

For further Product Support Options, Product Service Options, Returning Equipment for Repair, and/or Engineering Services please download application note #37573.

Requirements

⚠WARNING

Read this entire application note and all other publications pertaining to the work to be performed before installing, operating, or servicing this equipment.
Practice all plant and safety instructions and precautions.
Failure to follow instructions can cause personal injury and/or property damage!

Any unauthorized modifications to or use of this equipment outside its specified mechanical, electrical, or other operating limits may cause personal injury and/or property damage, including damage to the equipment.
Any such unauthorized modifications: constitute "misuse" and/or "negligence" within the meaning of the product warranty thereby excluding warranty coverage for any resulting damage, and invalidate product certifications or listings.

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1. Introduction

The easYgen-3000XT controller has been designed to meet the requirements of modern network standards, also aligns with the requirements of the standard EN 50549-1/2. Although the controller natively meets most of the requirements specified in EN 50549-1 (LV) and EN 50549-2 (MV), some clauses require external measures or specific parameters to ensure full compliance of the facility with the standards. This document presents the compliance status and necessary countermeasures at the system level.

The easYgen-3000XT controller is primarily intended for synchronous generators. Therefore, in the application note, we did not focus on analyzing its compatibility with non-synchronous generators.

The standard has also not been checked for compatibility with the requirements for PV sources.

2. Parameters that easYgen meets

The table below shows the requirements set by the standard, which are met by the easYgen-3000XT controller.

Chapter of the standard	**Subsection**	**Requirements from standard**	**Chapter of the easYgen manual meeting the requirement**
4.4 Normal Operating range	4.4.2 Operating frequency range	The generating plant shall be capable of operating continuously when the frequency at the point of connection stays within the range of 49 Hz to 51 Hz.	4.5.3.3.1 General Mains Operating Range
	4.4.4 Continuous operating voltage range	When generating power, the generating plant shall be capable of operating continuously when the voltage at the point of connection stays within the range of 85 % Un to 110 % Un.	4.5.3.3.1 General Mains Operating Range

4.5 Immunity to disturbances	4.5.1 General	Generating plants should contribute to overall power system stability by providing immunity towards dynamic voltage changes unless safety standards require a disconnection.	easYgen meets these requirements
	4.5.2 ROCOF	The generating modules in a generating plant shall have ROCOF immunity to ROCOF equal or exceeding the value specified by the responsible party. If no ROCOF immunity value is specified, at least 2 Hz/s shall apply. The ROCOF immunity is defined with a sliding measurement window of 500 ms.	4.5.3.12 Change Of Frequency
	4.5.3.2 Generating plant with non-synchronous generating technology	Generating modules shall be capable of remaining connected to the distribution network as long as the voltage at the point of connection remains above the voltage-time curve specified in standard.	4.5.3.10 Mains Time-Dependent Voltage
	4.5.3.3 Generating plant with synchronous generating technology	Generating modules shall be capable of remaining connected to the distribution network as long as the voltage at the point of connection remains above the voltage-time curve specified in standard.	4.5.3.10 Mains Time-Dependent Voltage
	4.5.4 Over-voltage ride through (OVRT)	Generating modules shall be capable of staying connected to the distribution network as long as the voltage at the point of connection remains below the voltage-time curve specified in standard	4.5.3.10 Mains Time-Dependent Voltage

4.6 Active response to frequency deviation	4.6.1 Power response to overfrequency	Generating plants shall be capable of activating active power response to overfrequency at a programmable frequency threshold f1 at least between and including 50,2 Hz and 52 Hz with a programmable droop in a range of at least s=2 % to s=12 %.	4.4.4.5.6 Active Power-Frequency Function P(f)
	4.6.2 Power response to underfrequency	EES units shall be capable of activating active power response to underfrequency. Other generating units/plants should be capable of activating active power response to underfrequency	
4.7 Power response to voltage changes	4.7.2.3 Control modes	The generating plant/unit shall be capable of operating in the control modes • Q setpoint mode • Q (U) • Cos phi setpoint mode • Cos phi (P)	easYgen meets these requirements
	4.7.2.3.2 Setpoint control modes	Q setpoint mode and cos phi setpoint mode control the reactive power output and the cos phi of the output respectively, according to a set point set in the control of the generating plant/unit.	4.4.4.2 Power Factor Control
	4.7.2.3.2 Voltage related control modes	The voltage related control mode Q (U) controls the reactive power output as a function of the voltage.	4.4.4.2.6.3 Reactive Power Q(V) limit
	4.7.2.3.4 Power related control mode	The power related control mode cos cp (P) controls the cos cp of the output as a function of the active power output.	4.4.4.2.4.1 Power factor characteristic PF(P)
	4.7.3 Voltage related active power reduction	Generating plants/units are allowed to reduce active power output as a function of this rising voltage.	4.4.4.5.5 Voltage Depending Derating of Power with PT1 Dynamic

4.8 EMC and power quality		Similar to any other apparatus or fixed installation, generating units shall comply with the requirements on electromagnetic compatibility established in Directive 2014/30/EU or 2014/53/EU, whichever applies.	8.1.8 Approvals
4.9 Interface protection	4.9.1 General	Automatic switching shall be provided to disconnect the generating plant from the distribution network in the event of loss of that supply or deviation of the voltage or frequency at the supply terminals from values declared for normal supply.	easYgen meets these requirements
	4.9.3.3 Overvoltage protection [59]	Overvoltage protection may be implemented with two completely independent protection thresholds. Overvoltage threshold stage 1 [59>] /stage 2 [59>>]	4.5.3.7 Mains Overvoltage (Level 1 & 2) ANSI# 59
	4.9.3.4 Overvoltage 10min mean protection	Function shall be based on the calculation of the square root of the arithmetic mean of the squared input values over 10 min.The calculation of a new 10 min value at least every 3 s is sufficient, which is then to be compared with the threshold value.	4.5.3.9 Mains Voltage Increase
	4.9.5 Digital input to the interface protection	If required by the DSO, the interface protection shall have at least two configurable digital inputs. These inputs can for example be used to allow transfer trip.	4.5.3.4 Mains Decoupling

4.10 Connection and starting to generate electrical power	4.10.1 General	Connection and starting to generate electrical power is only allowed after voltage and frequency are within the allowed voltage and frequency ranges for at least the specified observation time.	4.5.3.3.2 Reconnecting Mains Operating Range
	4.10.2 Automatic reconnection after tripping	The frequency range, the voltage range, the observation time shall be adjustable in the range according to Table specified in standard	4.5.3.3.2 Reconnecting Mains Operating Range
	4.10.3 Starting to generate electrical power	The frequency range, the voltage range, the observation time shall be adjustable in the range according to Table specified in standard	
	4.10.4 Synchronization	Synchronizing a generating plant/unit with the distribution network shall be fully automatic	4.4.3.1.2 Synchronization GCB/MCB
4.11 Ceasing and reduction of active power on set point	4.11.2 Reduction of active power on set point -	Generating plants with a maximum capacity of 0,8 kW or more shall be capable of reducing their active power to a limit value provided remotely by the DSO.	4.4.4.5.4 Derating and Uprating Of Power

3. Parameters that are slightly different from the required ones

The table below summarizes the requirements where the controller settings deviate slightly from the standard. In most cases, the available range is functionally equivalent for security coordination. We recommend checking subsequent revisions of the easYgen manual to see if this has been corrected.

Chapter of the standard	Requirements	Controller capabilities
4.9.3.1 General	One of the minimum protection accuracy requirements is that the reset time shall be ≤50 ms.	The easYgen device has a fixed reset delay time of 80 [ms].
4.9.3.2 Undervoltage protection [27]	The required time range for undervoltage detection is 0.1-100 [s]	The available range in the controller is 0.0-99.99[s]
4.9.3.5 Underfrequency protection [81<]	The required time range for underfrequency detection is 0.1-100 [s]	The available range in the controller is 0.0-99.99[s]
	The frequency protection shall function correctly in the input voltage range between 20 % Un and 120 % Un and shall be inhibited for input voltages of less than 20 % Un.	Minimum Voltage in the controller is 10% Un instead of required 20% We don't have parameter for max voltage
4.9.3.6 Overfrequency protection [81>]	The required time range for overfrequency detection is 0.1-100 [s]	The available range in the controller is 0.0-99.99[s]
	The frequency protection shall function correctly in the input voltage range between 20 % Un and 120 % Un and shall be inhibited for input voltages of less than 20 % Un.	Minimum Voltage in the controller is 10% Un instead of required 20% We don't have parameter for max voltage

4. Non-compliance with the requirements of the standard

The table below shows the requirements that our controllers do not meet.

Chapter of the standard	Requirements	Controller capabilities
4.4.3 Minimal requirement for active power delivery at underfrequency	A generating plant shall be resilient to the reduction of frequency at the point of connection while reducing the maximum active power as little as possible.	The easYgen does not have such a functionality to reduce the available active power with decreasing frequency.
4.5.5 Phase jump immunity	After the phase jump, 90 % of pre-fault power or available power whichever is the smallest shall be resumed as fast as possible, but at the latest within 3 s in case of synchronous generating technologies and within 1 s in case of non-synchronous generating technologies.	After phase jump (decoupling) and reconnecting the easYgen uses ramps to the actual active power setpoint. The easYgen does not store the pre-fault power.
4.6.1 Power response to overfrequency	Deactivation time „tstop" with adjustment range 0 to 600s	The easYgen does not have an adjustable deactivation time. (tstop = 0s)
4.6.2 Power response to underfrequency	An intentional initial delay shall be programmable to adjust the dead time to a value between the intrinsic dead time and 2 s.	The easYgen does not have an adjustable intentional initial delay time (t = 0s).
4.7.2.3.3 Voltage related control mode	One of the following methods should be used: - positive sequence component of the fundamental - average of the voltages measured independently for each phase to neutral or phase to phase - phase independently the voltage of every phase to determine the reactive power for every phase	The easYgen uses the voltage phase L1-L2.
	To limit the reactive power at low active power two methods shall be configurable: - minimal cos phi shall be configurable in the range of 0-0,95;	The easYgen does not have any low limit configuration for cos phi or reactive power at low active power.

	- two active power levels shall be configurable both at least in the range of 0 % to 100 % of Po. The lock-in value turns the Q(U) mode on, the lock-out value turns Q(U) off. If lock-in is larger than lock-out a hysteresis is given.	
4.9.4.3 Switch to narrow frequency band	In case of local phenomena the DSO in coordination with the responsible party may require a switch to a narrow frequency band to increase the interface protection relay sensitivity.	Not available in easYgen

5. Requirements for generating plants to be connected in parallel to a MV distribution network

The EN 50549-2 standard for MV contains requirements that are not included in the EN 50549-1 standard for LV. Those elements that easYgen is unable to meet are listed in the table below.

Chapter of the standard	Requirements	Controller capabilities
4.9.3.7 Positive sequence undervoltage protection [27D]	The positive sequence component of the fundamental voltage undervoltage protection might be configured to operate the interface protection or to change to the narrow frequency band according to 4.9.4.3.	Not available in easYgen. Monitoring is based on true RMS measurement instead of Symmetric components
4.9.3.8 Negative sequence overvoltage protection [47]	The negative sequence component of the fundamental voltage overvoltage protection might be configured to operate the interface protection or to change to the narrow frequency band according to 4.9.4.3.	Not available in easYgen. Monitoring is based on true RMS measurement instead of Symmetric components
4.9.3.9 Zero sequence overvoltage protection [59N]	The zero sequence component of the fundamental voltage overvoltage protection might be configured to operate the interface protection and to change to the narrow frequency band according to 4.9.4.3.	Not available in easYgen. Monitoring is based on true RMS measurement instead of Symmetric components

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