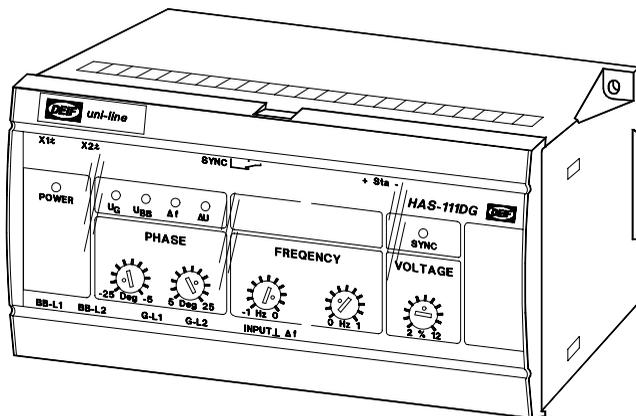


## Paralleling relay type HAS-111DG uni-line 4189340146G (UK)



- Synchronisation of generator to busbar
- Setting of phase angle difference
- Setting of frequency and voltage difference
- LED indication of status
- LED indication for synchronising signal
- 35 mm DIN rail or base mounting



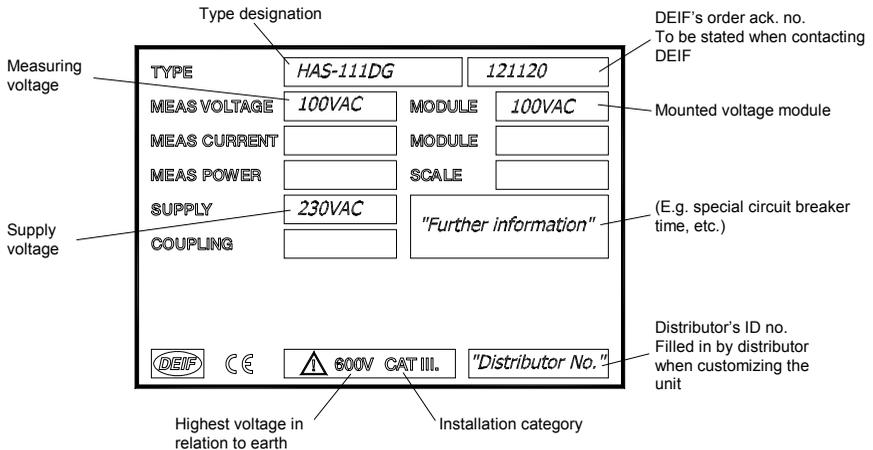
## 1. Description

This paralleling relay type HAS-111DG forms part of a complete DEIF series (the *uni-line*) of relays for protection and control of generators.

HAS-111DG paralleling relay is applied to check the synchronisation conditions or to synchronise a generator to the mains. The paralleling relay transmits a synchronisation pulse when the phase angle, frequency and voltage deviations are within the limits set.

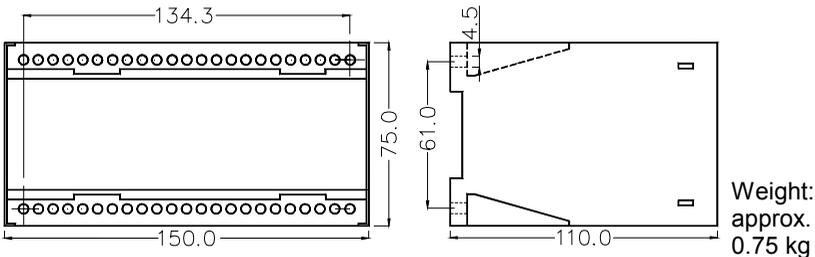
## 2. Label

The paralleling relay is provided with a label with the following data:



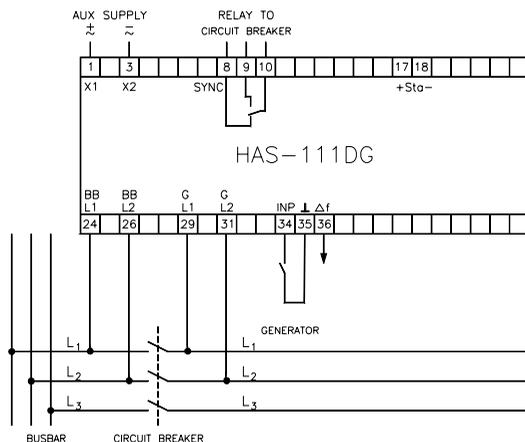
## 3. Mounting instructions

HAS-111DG is designed for panel mounting, and is to be mounted on a 35 mm DIN rail, or by means of two 4-mm screws.



The design of the paralleling relay makes it possible to mount it close to other *uni-line* units. However make sure there are min. 50 mm between the top and the bottom of this relay and other relays/units. The DIN rail must always be placed horizontally when several relays are mounted on the same rail.

## 4. Connection diagram



A 2A fuse may protect all voltage inputs.

The paralleling relay is protected against ESD (electrostatic electricity), and further special protection against this during the mounting of the unit is not necessary.

HAS-111DG may be connected between 2 phases or between 1 phase and neutral.

The paralleling relay is to be configured so that the input of HAS-111DG corresponds to the connected voltages.

The generator circuit breaker is connected to the synchronising relay to terminals Nos. 8, 9 and 10 (mrk. "SYNC"). During start up it is recommended to leave these terminals open.

When HAS-111DG is applied for simultaneous synchronisation of all generators of a plant to the busbar, the FS line of the load sharing units types LSU-112/113/114 DG is connected to terminals Nos. 36 and 35. A contact is connected to the digital input terminals Nos. 34 and 35. On activation of this input, HAS-111DG will control the generator frequency to a value lower than the busbar frequency. On deactivation of the input, it will control the frequency to a value higher than the busbar frequency.

The unit is equipped with a self-monitoring function. The self-monitoring function supervises the microprocessor and hereby verifies if the programme is running correctly.

	Power LED	Status output
Supply voltage not connected or not acceptable.	OFF	OFF
Supply voltage is accepted and the unit is working correctly.	Constant green light	ON
Supply voltage is accepted but the unit is working wrongly.	Flashing green light 2-3Hz	OFF

**GL applications only:** For applications approved by "Germanischer Lloyd" the status output must be connected to an alarm system. For applications with more than one *uni-line* product the status outputs of the units can be connected in series to the same alarm input. When the units are connected in series the flashing green power LED will indicate the unit which is defective.

## 5. Start up instructions

### 5.1 Setting and indication

Setting of	Range	
Acceptable phase angle difference	Negative: -25...-5° el.	Positive: 5...25° el.
Acceptable frequency difference	Negative: -1...0Hz	Positive: 0...1Hz
Acceptable voltage difference	±2...±12% of $U_n$	

LEDs	Light
$U_G$ Generator voltage*	Green, when value is within the acceptable range. Switched off, if outside this range.
$U_{BB}$ Busbar voltage*	
$\Delta f$ Frequency difference*	
$\Delta U$ Voltage difference*	
SYNC Synchronising	Yellow, when relay is activated.

\*) When all 4 LEDs are lit, the conditions for transmission of the synchronisation pulse are fulfilled.

"FREQUENCY" The FREQUENCY potentiometers determine the maximum frequency difference at the time of synchronisation. If the potentiometers are set symmetrically, synchronisation pulse will be emitted both at supersynchronous and undersynchronous slip frequency. If supersynchronous synchronisation is wanted, the potentiometer for -Hz is set to 0 and the potentiometer for +Hz (positive slip frequency) to the selected value. Information about the closing time of the applied circuit breaker is applied as starting point for the setting of the maximum slip frequency. If the circuit breaker has a closing time of 200msec, a maximum slip frequency of 0.2Hz is recommended as starting point. If the circuit breaker has a closing time of 50msec, a slip frequency of 0.8Hz can be applied as starting point. If the above settings lead to a "hard" synchronisation, the suggested settings are reduced. Note, the lower value selected for these potentiometers, the longer synchronisation time. If both are set to 0Hz, the generator will never be synchronized to the mains.

"PHASE" If both undersynchronous and supersynchronous synchronisation is selected, both PHASE potentiometers are typically set to the same value. The setting depends on the stability of the system and the size of the generator. It is recommended to start with a setting of  $\pm 10^\circ$ . If supersynchronous synchronisation is selected, the negative PHASE potentiometer is set to  $-15^\circ$  as starting point and the positive to  $5^\circ$ . If undersynchronous synchronisation is selected, the two PHASE potentiometers are set vice versa. If the synchronisation time is too long with the above settings, the PHASE potentiometers are set to a larger acceptance area. Vice versa, if the settings lead to a "hard" synchronisation, the acceptance area is reduced, or the

FREQUENCY potentiometers are set to a lower slip frequency. Note, the relay pulse to the circuit breaker is only emitted, if there is "room" for a 100msec relay pulse as a minimum in the selected PHASE window. To make "room" for the relay pulse the slip frequency is reduced, alternatively the PHASE window is increased.

For supersynchronous connection only, the following settings are typical:

"PHASE"            Negative:  $-15^{\circ}$             Positive:  $5^{\circ}$

"FREQUENCY"    Negative: 0Hz            Positive: 0.5Hz

"VOLTAGE"        Determines the acceptable difference between busbar and generator voltages.  
Set to:  
 $\pm 2\%$     when synchronising a powerful generator to a stable network.  
 $\pm 12\%$    when synchronising a generator to unstable busbars.  
 $\pm 5\%$     typical starting point.



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## 6. Technical specifications

Measuring voltage:	57.7-63.5-100-110-127-200-220-230-240-380-400-415-440-450-660-690V AC $\pm 20\%$ Load: 2k $\Omega$ /V
Frequency range:	40... <u>45</u> ... <u>65</u> ...70Hz
Digital input:	Potential-free contact. Open: 5V. Closed: 5mA
Synchronisation pulse output:	1 changeover switch
Frequency difference output:	1 analog output, -10...0...10V DC corr. to -5...0...5Hz
Contact ratings:	250V-8A-2000A (AC), 24V-8A-200W (DC)
Contact voltage:	Max. 250V (AC). Max. 150V (DC)
Galvanic separation:	Between inputs and outputs: 3250V-50Hz-1 min.
Consumption:	(Aux. supply) 3.5VA/2W
Status output:	Open: 10...30V DC Closed: Max. 5mA