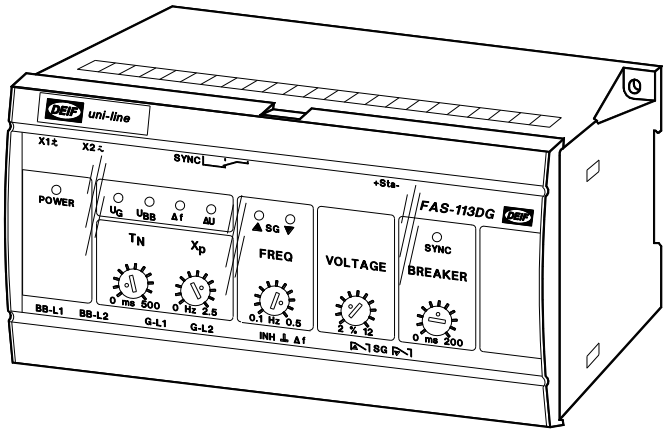
DEIF A/S

Installation and start up instructions

Synchroniser type FAS-113DG

uni-line

4189340126G (UK)



- *Synchronisation of generator to busbar*
- *Circuit breaker time compensation*
- *LED indication of status*
- *LED indication for activated frequency control*
- *LED indication for synchronising signal*
- *35 mm DIN rail or base mounting*

CE

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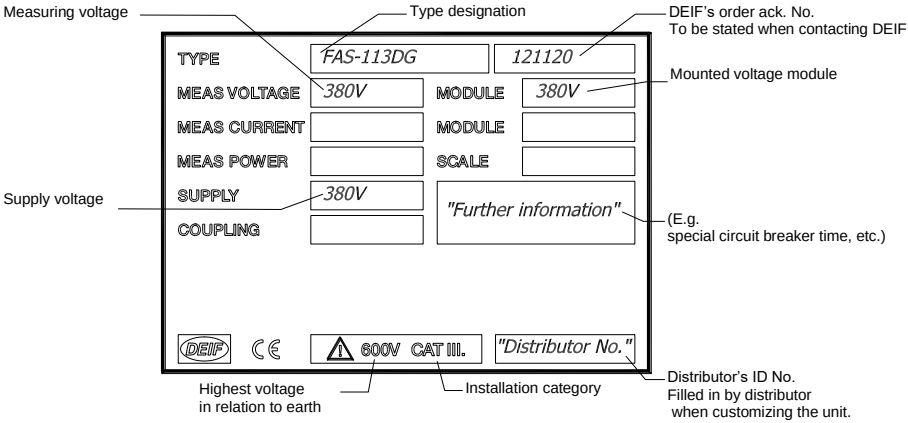
1. Description

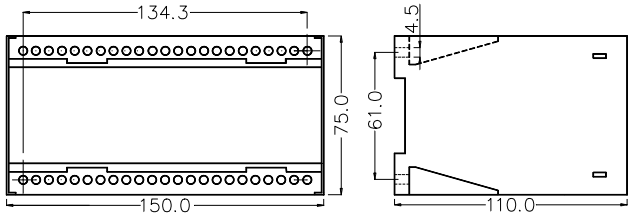
This synchroniser type FAS-113DG forms part of a complete DEIF series (the *uni-line*) of relays for protection and control of generators. The FAS-113DG synchroniser measures the busbar and generator voltages and frequencies and compares these, plus compares their phase angles. It controls the generator frequency, till it matches the busbar frequency. In order to determine phase accordance between the generator and the busbar, the synchroniser calculates a phase angle advance based on the circuit breaker closing time and the slip frequency. When the phase difference is within this "tolerance", the synchroniser transmits a closing signal for the generator circuit breaker – allowing time for this to close.

2. Label

The synchroniser is provided with a label with the following data:



3. Mounting instructions

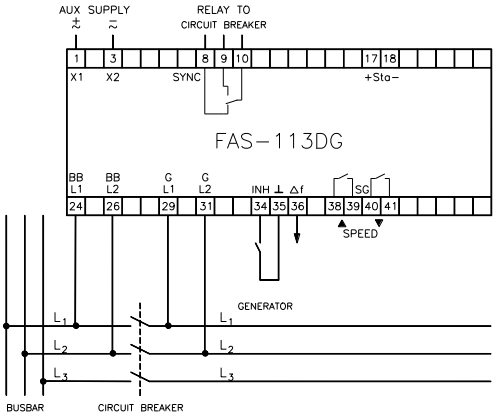


The FAS-113DG is designed for panel mounting, being mounted on a 35 mm DIN rail, or by means of two 4-mm screws.

Weight: Approx. 0.750 kg

The design of the synchroniser makes mounting of it close to other *uni-line* units possible, however make sure there are min. 50 mm between the top and 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 synchroniser is protected against ESD (electrostatic electricity), and further special protection against this during the mounting of the synchroniser is not necessary.

The FAS-113DG may be connected between 2 phases or between 1 phase and neutral. The FAS-113DG is to be configured so that the input of the synchroniser corresponds to the connected voltages.

The relay contacts marked “SG” (term. Nos. 38 + 39 and 40 + 41) provide relay signals for increase and decrease of the speed, respectively. The life of the built-in relays is considerably reduced when connected to inductive loads. Especially for DC controlled pilot motors, external auxiliary relays should therefore always be mounted. Mounting a “transient suppressor” across the coils of the auxiliary relays is likewise recommended. During start up activating the inhibit function (by short-circuiting term. Nos. 34 and 35) is recommended. This function disables the “SYNC” relay contact, to which the circuit breaker is connected (term. Nos. (8), 9 and 10).

When the FAS-113DG is applied for simultaneous synchronisation of all generators of a plant to the busbar, the FS line of the load sharing units type LSU… is connected to terminals Nos. 36 and 35.

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 (Sta)**
Supply voltage not connected or not acceptable	OFF	OFF
Supply voltage is accepted and the unit is running correctly	Constant green light	ON
Supply voltage is accepted but the unit is running 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 that is running wrongly.

5. Start up instructions

5.1 Setting and indication

Setting of		Range
T_N	Control pulse length	25…500 ms
X_p	Proportional band	0…±2.5Hz
f_{set}	Slip frequency	0.1…0.5Hz
ΔU_{max}	Acceptable voltage difference	±2…±12% of U_{BB}
T_{BC}	Breaker closure time	20…200 ms

LEDs		Light
U_G	Generator voltage*	Green, when value is within the acceptable range Switched off, if outside this range
U_{BB}	Busbar voltage*	
Δf	Frequency difference*	
ΔU	Voltage difference*	
SYNC	Synchronising	Yellow, when relay is activated
SG ▲	Increase speed (frequency)	
SG ▼	Decrease speed (frequency)	

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

Note: In addition to the status (4 conditions above) the FAS-113DG supervises the actual df/dt (ROCOF). If this is too great, no synchronisation pulses will be transmitted, and the Δf LED flashes. The allowable df/dt ratio depends on the f_{set} setting:
f_{set} 0.1Hz corresponds to a df/dt ratio of max. 2.5Hz/s.
f_{set} 0.5Hz corresponds to a df/dt ratio of max. 12.5Hz/s.

The T_N and X_p should be set during the start up. Correct setting of these is of major importance, to ensure a stable control of the generator.

T_N determines the duration of the control pulse. A short T_N is applied for very swiftly reacting speed governors, a long T_N for slowly reacting speed governors. *Recommended starting point: 0.2 s.*
If the frequency tends to oscillate around the f_{set} value:
- Reduce T_N (min. pulse: 25 ms), until stable control is obtained,
- then reduce X_p (e.g. to ±1Hz), until the control loop becomes unstable again – and select a suitable X_p value between these values (e.g. ±1.5Hz).

X_p: determines the span within which the pulse ratio changes proportionally to the frequency deviation from the f_{set} value. *Recommended starting point: 2.5Hz.*

f_{set} is set to the required slip frequency.
Set to 0.5Hz to ensure a swift synchronisation (emergency generators).
Set to 0.1Hz to ensure a very accurate synchronisation.
Recommended starting point: 0.5Hz.

Then reduce f_{set} (e.g. to 0.2Hz) until the synchronisation time becomes too long or the synchronisation conditions are no longer fulfilled (unstable control) – increase again, and select a suitable f_{set} value between these values (e.g. 0.3Hz).

ΔU_{max} determines the acceptable difference between busbar and generator voltages.
Set to ±2% when synchronising a powerful generator to a stable network.
Set to ±12% when synchronising a generator to unstable busbars.

T_{BC} is set to the circuit breaker closure time (indicated on the circuit breaker).
Correct setting is of major importance, as it affects the accuracy of the synchronisation.

6. Options

For description and activation of the options available for FAS-113DG, please see the data sheet of FAS-113DG and the Customisation Manual at www.deif.com.