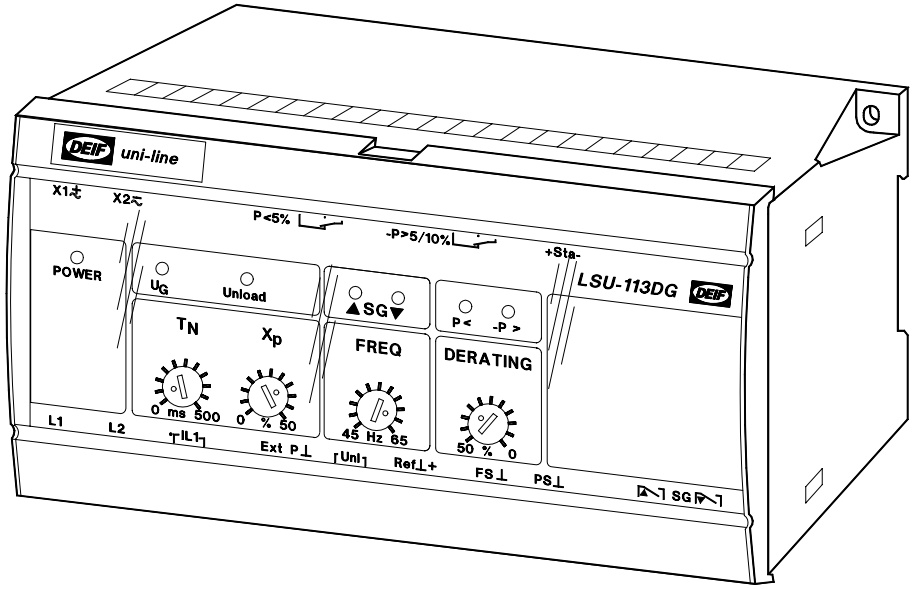
Installation and start up instructions

Load sharing unit type LSU-113DG

uni-line

4189340129G (UK)



- *With reverse power protection*
- *For control of diesel and gas generators*
- *Built-in power and frequency transducer*
- *Constant power or isochronous mode*
- *LED indication for status/activated control*
- *35 mm DIN rail or base mounting*

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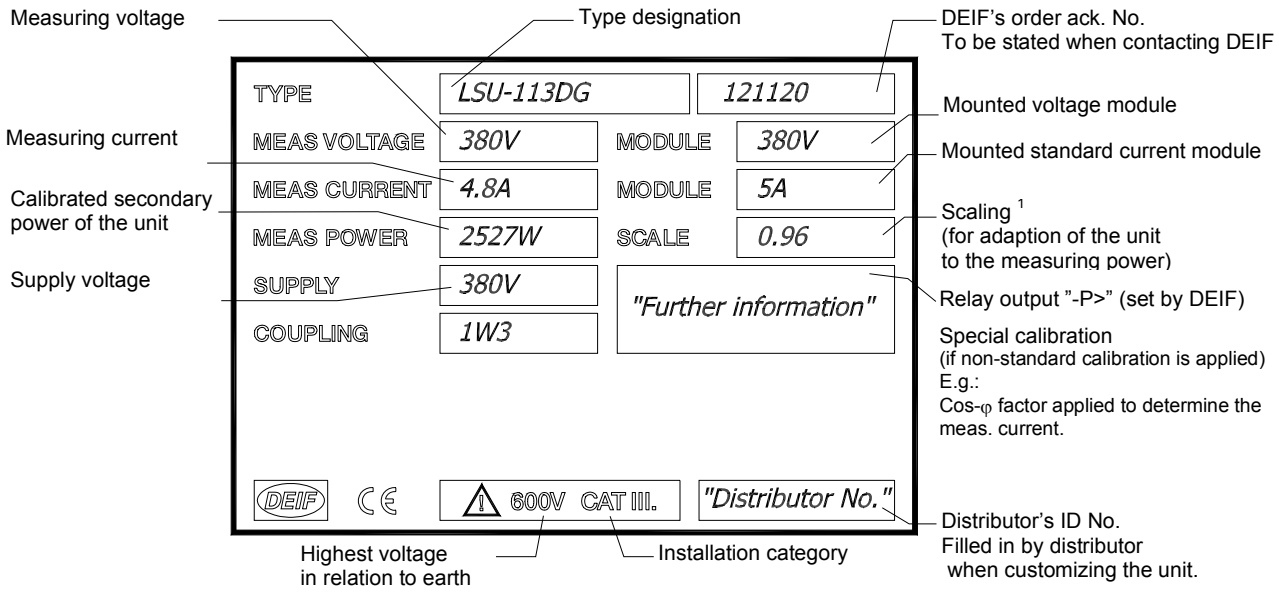
1. Description

This load sharing unit with reverse power protection type LSU-113DG forms part of a complete DEIF series (the *uni-line*) of relays for protection and control of generators.

The LSU-113DG is applied for sharing of the load of a generator plant between a number of generators and is provided with a reverse power tripping plus a “low power tripping”, activated in connection with the unloading of the generator. One unit is applied for each generator.

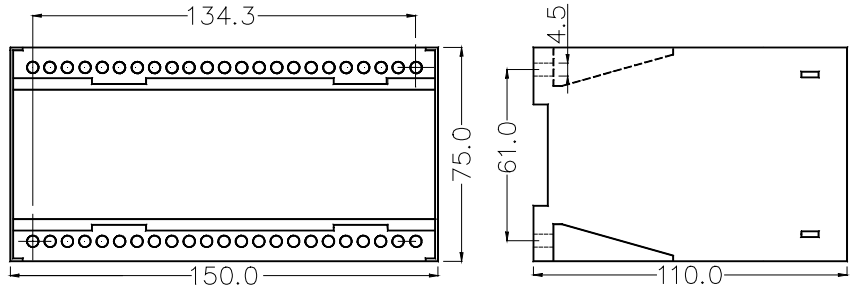
2. Label

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



Note 1: Calculation of measuring power:
voltage module x current module x scale x √3 x cos-φ = measuring power
” √3” is replaced by “1” for coupling 1W

3. Mounting instructions



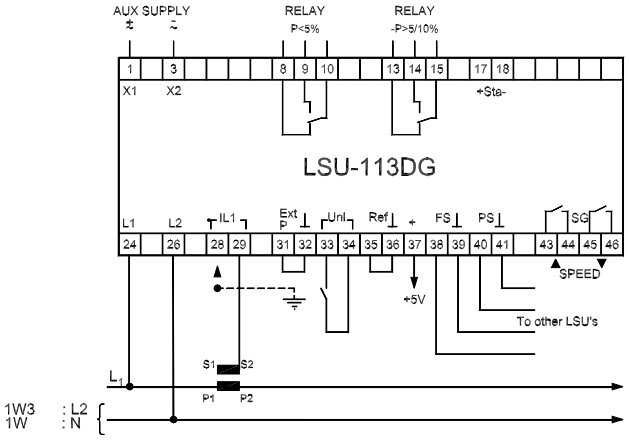
The LSU-113DG is designed for panel mounting, being mounted on a 35 mm DIN rail, or by means of two 4-mm screws.

Weight: approx. 0.75 kg

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

Connection type	Connect	
Standard (1W3)	L1 to term. No. 24	L2 to term. No. 26
Between phase and neutral (1W)	L1 (P) to term. No. 24	Neutral to term. No. 26

Terminal No.	Description/action
8, 9 and 10 ("P< 5%")	After unloading (short-circuit of term. Nos. 33+34 ("Unl")) an opening signal is transmitted to the generator circuit breaker, when the power has dropped to 5% or less of P_n.
13, 14 and 15 ("-P> 5/10%")	Relay output for reverse power protection. The –P> set point is set by DEIF to either 10% (delay: 5 s) or 5% (delay: 10 s).
31 and 32 ("Ext.p")	Short-circuit these, if internal power transducer is applied
31 and 32	Connect external power transducer, replacing the built-in one, to these (31 (+) and 32 (÷). The output of the external transducer must be 4…20mA DC.
33 and 34 ("Unl")	May be connected to a potential-free N/O relay contact. When this contact is activated, the power of the generator is reduced to zero (unloading).
35 ("Ref.")	Reference input. If not applied: connect to term. No. 36 ("⊥").
37 ("+5V")	Reference output
36 ("⊥")	Common earth terminal for above reference input/output
38 "(FS) and 39 ("⊥")	Paralleling line for frequency regulation of generator system
40 "(PS) and 41 ("⊥")	Paralleling line for power regulation of generator system
43+44 Relay contacts "SG"	Relay signals for increase of the speed.
45 + 46 Relay contacts "SG"	Relay signals for decrease of the speed.
Note: Relay contacts	These relays should always be connected via external auxiliary relays when a DC pilot motor is applied. The auxiliary relays should always be provided a "transient suppressor".

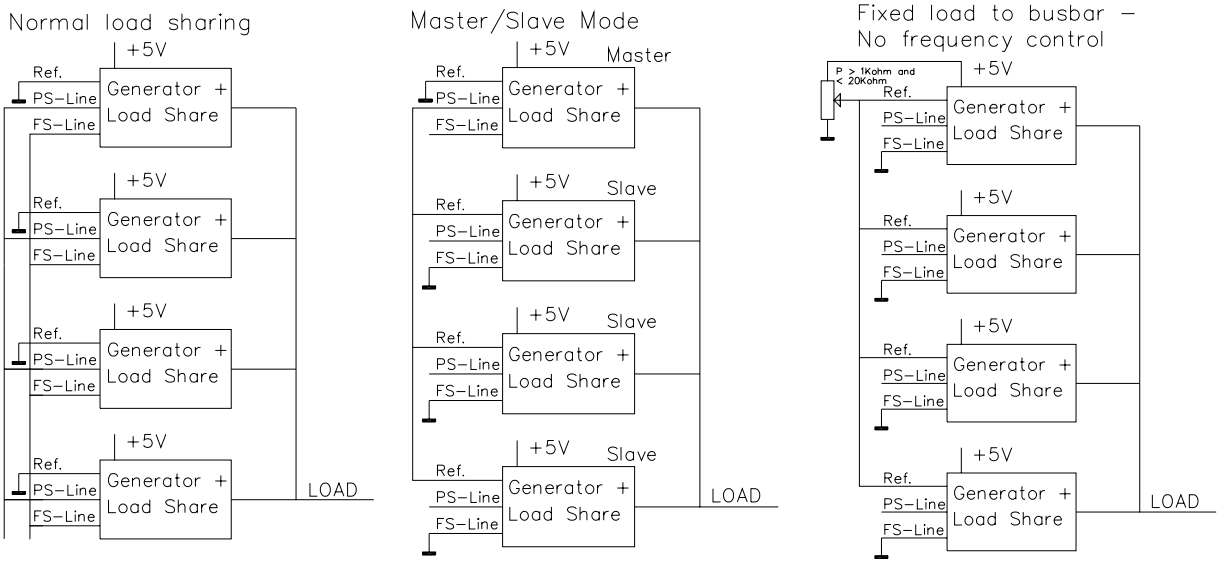
All terminals marked "⊥" are internally connected.

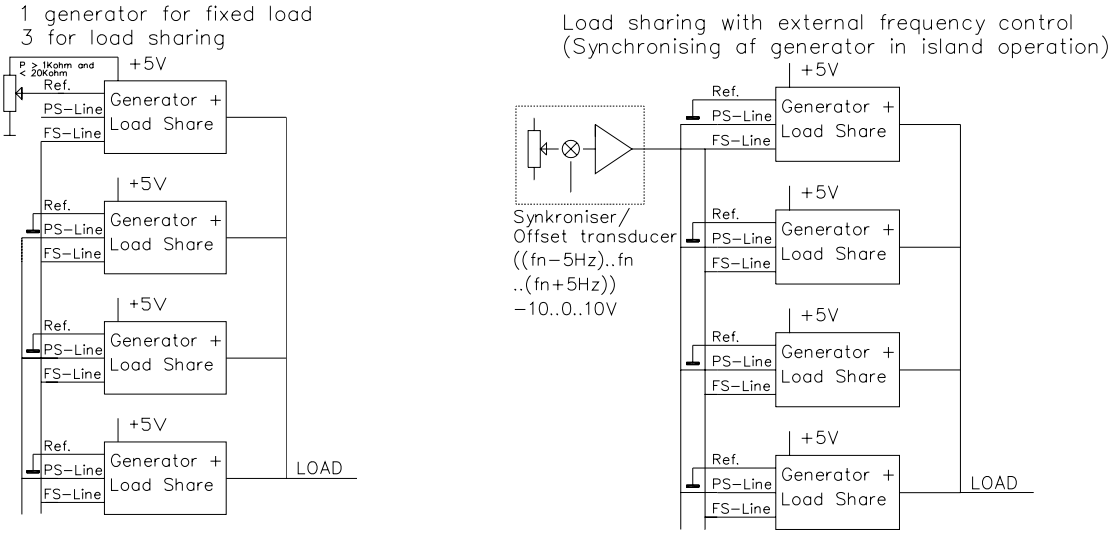
The unit is equipped with a self-monitoring function. The self-monitoring function supervises the microprocessor and hereby verifies if the programme is running correctly.

	Power LED	**Status output**
Supply voltage not connected or not acceptable.	OFF	OFF
Supply voltage is accepted and the unit is 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. Application examples





For further information: please see the ”*uni-line* application notes”

6. Start up instructions

6.1 Setting and indication

Setting of		Range
T_n	Control pulse length	25…500 ms
X_p	Proportional band	0…±50% of P_n. 0…±2.5Hz of set frequency
Frequency		45…65Hz
Derating		50…0% of P_n
Reverse power		-5% of P_n or –10% of P_n
Low power		5% of P_n

LEDs		Lit	Switched off
U_G	Generator voltage	(Green) present	Failure
-P> 5%/10%	Reverse power	(Yellow) fault	Normal. Associated relay deactivated
P< 5%	Low power	(Yellow)	
Unload	Unloading of this generator	(Green) generator unloaded	Normal load
SG ▲	Increase speed (power)	(Yellow) relay activated	Relay not activated
SG ▼	Decrease speed (power)		

"DERATING" Normally set to "0%", however, if the power of the applied prime mover does not correspond to the P_n of the generator, the "DERATING" potentiometer is set according to the actual power of the prime mover.

"FREQUENCY" Set to the nominal frequency (50Hz or 60Hz)

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 load sharing.

X_p: determines the span within which the pulse ratio changes proportionally to the frequency/power deviation from the required values.
Recommended starting point: 25%.

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/load sharing tends to oscillate around the required values:

- reduce T_N (min. pulse: 25 ms), until stable control is obtained
- then reduce X_p (e.g. to ±10%), until the control loop becomes unstable again

– and select a suitable X_p value between these values (e.g. ±15%).

7. Technical specifications

Overload, currents:	4 x I_n, continuously 20 x I_n for 10 s (max. 75A) 80 x I_n for 1 s (max. 300A)
Load:	Max. 0.5VA per phase at I_n
Overload, voltages:	1.2 x U_n, continuously 2 x U_n for 10 s
Load:	2kΩ/V
Frequency range:	40…45…65…70Hz
Inputs:	
unload:	Potential-free relay contact. Open: 5V. Closed: 5mA
reference input:	0…5V (0…100% power at cos-φ = 1). Input resistance: ≥2MΩ
power measurement:	4…20mA DC from external power transducer
frequency measurement:	-5…0…5V corr. to 0…±2.5Hz from external frequency transducer
Contact outputs:	
reverse/low power:	2 contacts. 1 change-over switch per relay
speed control:	2 make contacts
contact ratings:	250V-8A-2000A (AC), 24V-8A-200W (DC)
contact voltage:	Max. 250V (AC). Max 150V (DC)
Analogue outputs:	
PS-line, FS-line:	2 parallel, analog lines (-5…0…5V) 5V = 2.5Hz corresponding to 100% power 0V = 0Hz corresponding to 0% power
reference output:	Reference voltage: 5.0V ±2%. Load: max. 5mA (R ≥ 1kΩ)
Galvanic separation:	Between measuring voltage, measuring current, relay outputs, analog inputs/outputs and auxiliary voltage: 3250V-50Hz-1 min.
Consumption:	(Aux. supply) 3.5VA/2W
Status output:	Open: 10…30V DC Closed: max. 5mA