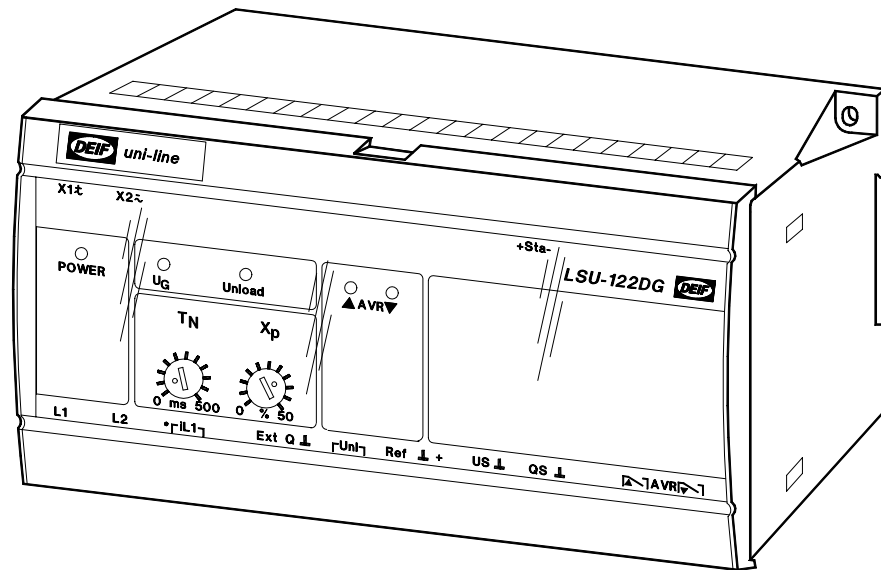# var load sharing unit type LSU-122DG
uni-line
4189340131F (UK)

- *For control of diesel and gas generators*

- *Built-in reactive power transducer*

- *Control of AVR*

- *LED indication of status*

- *LED indication for activated control*

- *35 mm DIN rail or base mounting*

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DEIF A/S

1. Description

This var load sharing unit type LSU-122DG forms part of a complete DEIF series (the *uni-line*) of relays for protection and control of generators.

The LSU-122DG is applied for sharing of the reactive load of a generator plant between a number of generators. One unit is applied for each generator.
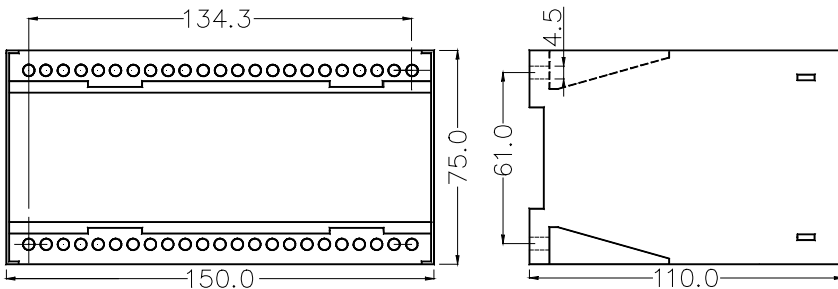
2. Label

The unit is provided with a label with the following data:
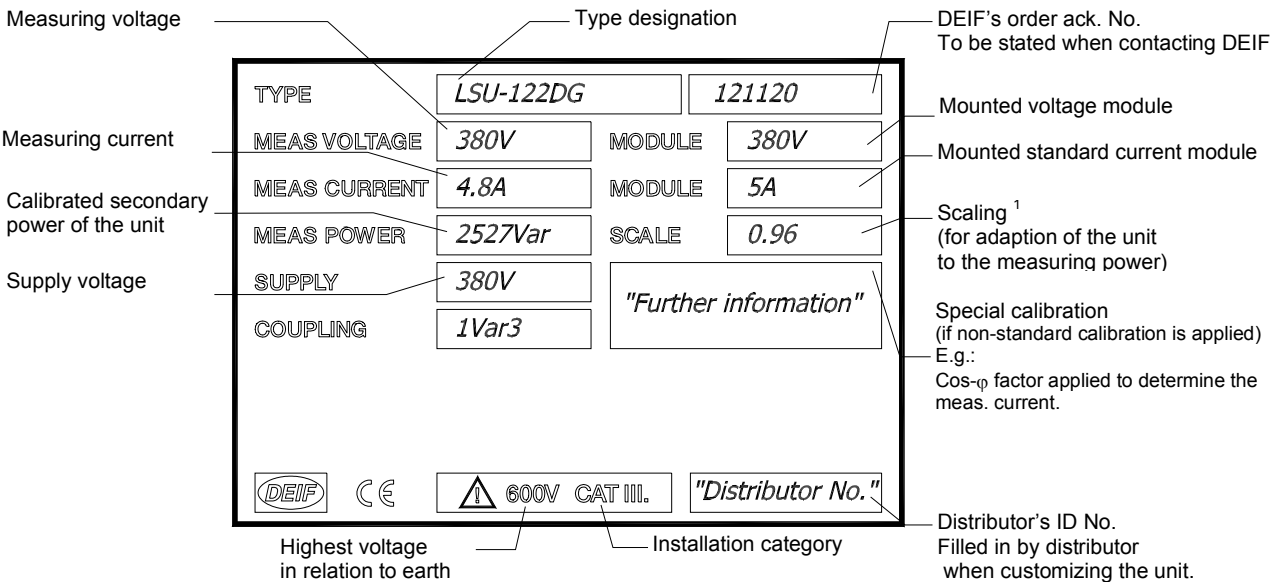
Note 1: Calculation of reactive measuring power:

voltage module x current module x scale x √3 x cos-φ = reactive measuring power
" √3" is replaced by "1" for coupling 1Var

3. Mounting instructions

The LSU-122DG 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
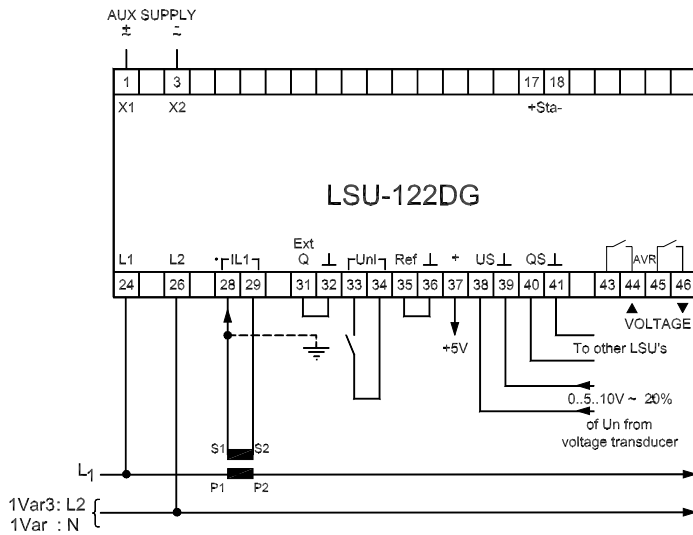
A 2A fuse may protect all voltage inputs.

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 (1Var3)	L1 to term. No. 24	L2 to term. No. 26
Between phase and neutral (1Var)	L1 (P) to term. No. 24	Neutral to term. No. 26

Terminal No.	Description/action
31 and 32 ("Ext.q")	Short-circuit these, if the internal reactive power transducer is applied
31 and 32	Connect external reactive 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 (cos-φ is changed to "1" - unloading).
35 ("Ref.")	Reference input If not applied: connect to term. No. 36 ("$\perp$").
37 ("+5V")	Reference output
36 ("$\perp$")	Common earth terminal for above reference input/output
38 "(US) and 39 ("$\perp$")	Shared line for voltage regulation of the generator system. Normally connected to the external voltage transducer.Calibration: see technical specifications.
40 "(QS) and 41 ("$\perp$")	Paralleling line for reactive power regulation of the generator system
43+44 Relay contacts "AVR"	Relay signals for increase of the excitation (voltage).
45 + 46 Relay contacts "AVR"	Relay signals for decrease of the excitation (voltage).
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 with a "transient suppressor".

All terminals marked "$\perp$" 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

Normal var sharing
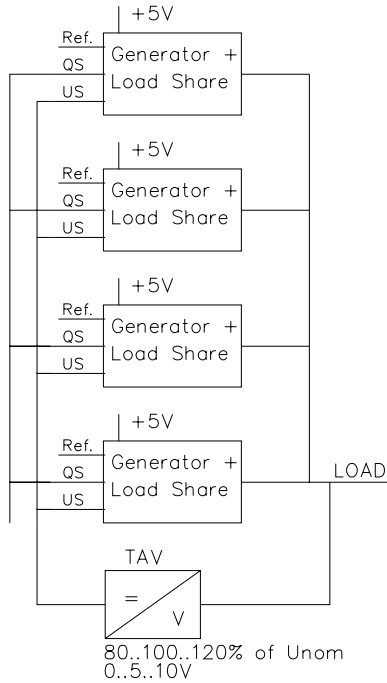
Master/Slave Mode
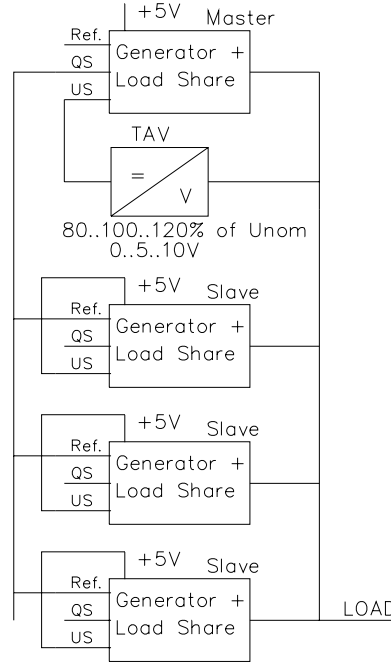
Fixed load to busbar — No frequency control

Fixed var to GRID (10 .. 100%) — No voltage control

1 generator for fixed var — 3 for var sharing

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

6. Start up instructions

6.1 Setting and indication

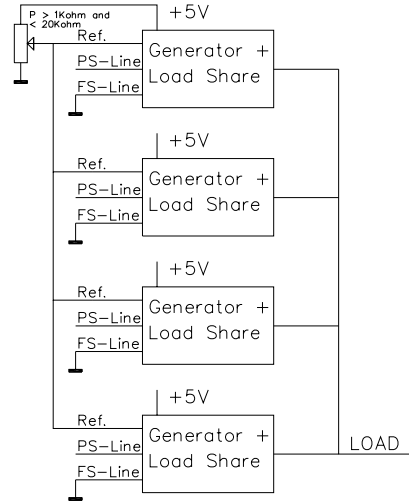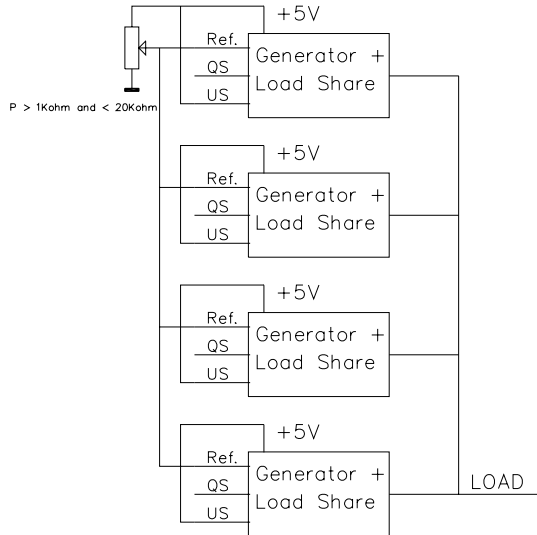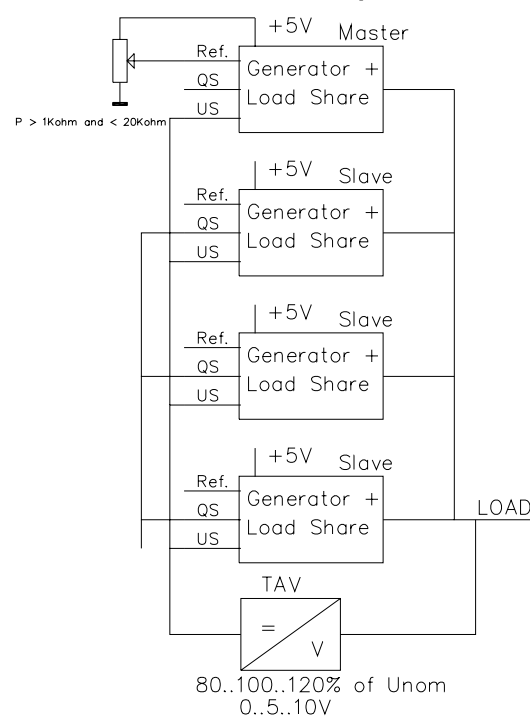| Setting of		Range
T_n	Control pulse length	25…500 ms
X_p	Proportional band	0…$\pm$50% of Q_n. 0…$\pm$10% of U_n.

LEDs		Lit	Switched off
U_G	Generator voltage	(Green) present	Failure
Unload	Unloading of this generator	(Green) generator unloaded	Normal load
AVR ▲	Increase voltage (reactive power)	(Yellow) relay activated	Relay not activated
AVR ▼	Decrease voltage (reactive power)		

Voltage regulation: is determined by the external transducer.
Normal calibration: 80…100…120% of U_n,
corresponding to an output of 0…5…10V DC
(5V representing the nominal voltage).

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.

X_p: determines the span within which the pulse ratio changes proportionally to the voltage/reactive power deviation from the required values.

Recommended starting point: 10%.

T_N determines the duration of the control pulse. A short T_N is applied for very swiftly reacting AVR's, a long T_N for slowly reacting AVR's.

Recommended starting point: 0.1 s.

If the voltage/reactive power 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 $\pm$2%), until the control loop becomes unstable again

- and select a suitable X_p value between these values (e.g. $\pm$5%).

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…<u>45…65</u>…70Hz

Inputs:

unload:	Potential-free relay contact. Open: 5V. Closed: 5mA
reference input:	0…5V (0…100% reactive power). Input resistance: $\geq$2MΩ
power measurement:	4…20mA DC from external reactive power transducer
voltage measurement:	0…5…10V corresponding to 80…100…120% of U_n from external voltage transducer

Contact outputs:

voltage control:	2 make contacts
contact ratings:	250V-8A-2000A (AC), 24V-8A-200W (DC)
contact voltage:	Max. 250V (AC). Max 150V (DC)

Analogue outputs:

QS-line:	1 parallel, analog line (-5…0…5V) 5V = 100% reactive power 0V = 0% reactive power
reference output:	Reference voltage: 5.0V $\pm$2%. Load: max. 5mA (R $\geq$ 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