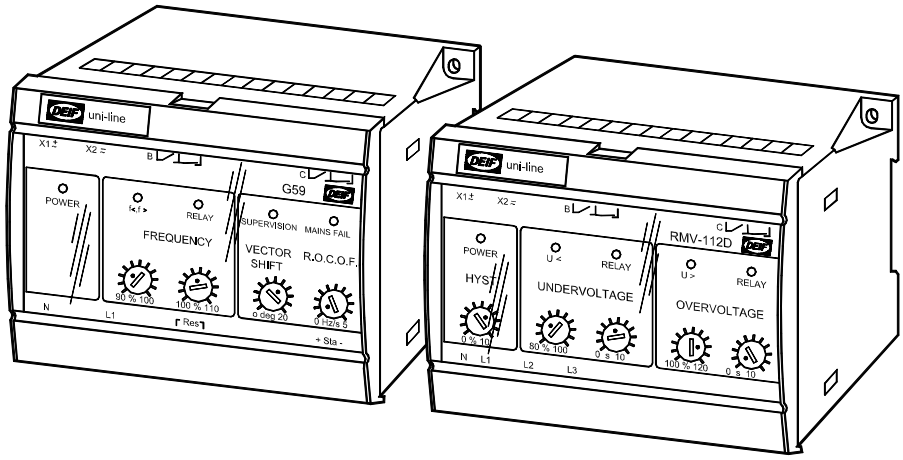
DEIF A/S

Installation and start up instructions

G59 Relay Package

uni-line

4189340236C (UK)



- *Detection of df/dt (rate of change of frequency R.O.C.O.F.)*
- *Detection of vector shift*
- *Detection of over- and underfrequency*
- *Detection of 3-phase over- and undervoltage*
- *Generator disconnection on mains failure*
- *Ensures no asynchronous reconnection*
- *LED indication of fault condition*
- *LED indication for activated relay*
- *35 mm DIN rail or base mounting*

CE

DEIF A/S
Frisenborgvej 33, DK-7800 Skive
Denmark

Tel: *(+45) 9614 9614*
Fax: *(+45) 9614 9615*
E-mail: *deif@deif.com*

General Description

The G59 package consists of the G59 and RMV-112D protection relays and forms part of a complete DEIF series (the uni-line) of relays for protection and control of generators.

The G59 package is applied to protect synchronous generators running in parallel with a high-voltage network (the mains) against damages caused by automatic reconnection to the network and against frequency and voltage fluctuations.

1. G59 Relay

1.1 Description

The G59 relay will detect a mains failure, provided that a disconnection at an arbitrary point of the network results in a swift change of the generator frequency (vector shift) and/or a changing frequency overtime, df/dt (R.O.C.O.F).

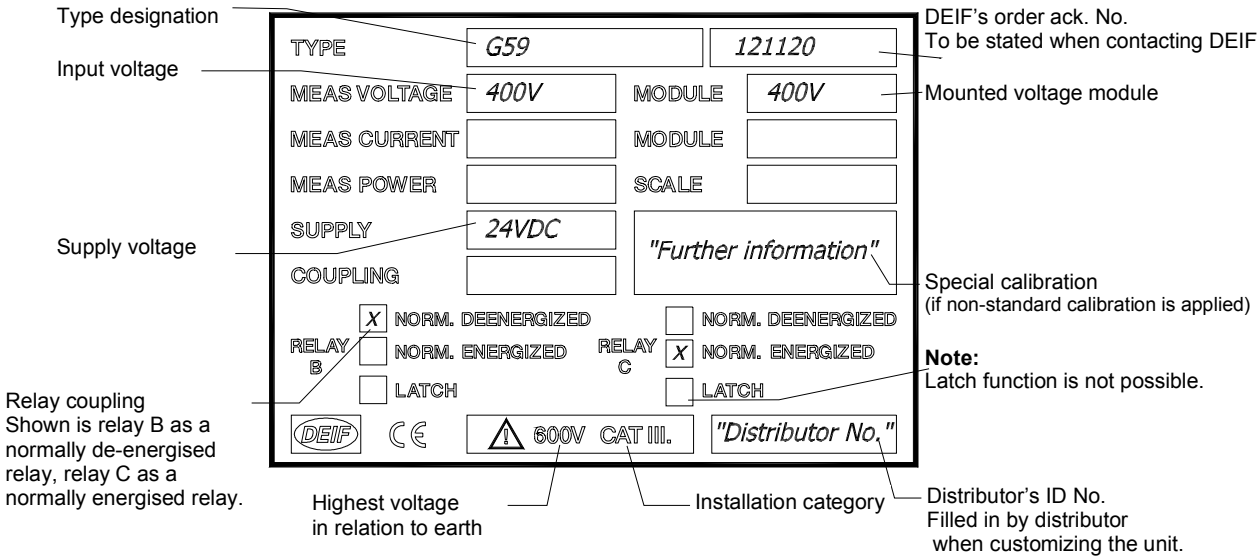
The G59 relay vector shift detects the sudden change of the load angle of the generator, arising the moment the external mains circuit breaker is opened momentarily on mains failure, thus disconnecting the generator. Basically a momentary 5% change of the load results in a 4.5 electr. degr. change of the load angle of the generator. If the vector shift potentiometer of the G59 relay is set to 4 electr. degr., the relay will thus open its mains circuit breaker, ensuring that the generator remains disconnected, until the mains has been restored, and the generator has been resynchronised.

The G59 relay df/dt detects a change of frequency over time. If the frequency keeps changing for four periods in a row, exceeding the set-point, the output is activated.

The G59 relay over-/underfrequency detects a frequency rising above the selected setpoint. When the limit is exceeded, the relay and LED is activated.

1.2 G59 Label

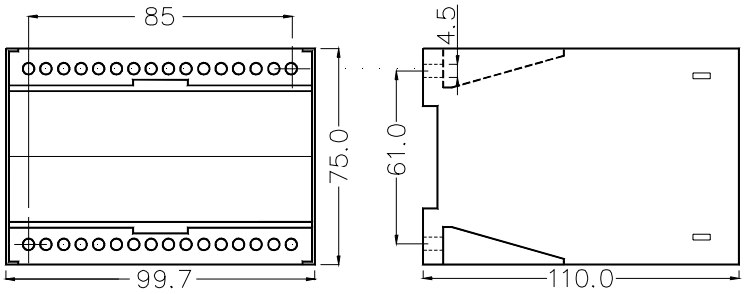
The relay is provided with a label with the following data:



Note: The relay is provided with a 200 ms power-up delay, ensuring correct function of the relay on connection of the auxiliary voltage.

Normally energised contacts (”NE”) are not activated (contact does not open/close) until 200 ms after connection of the auxiliary voltage.

1.3 Mounting instructions



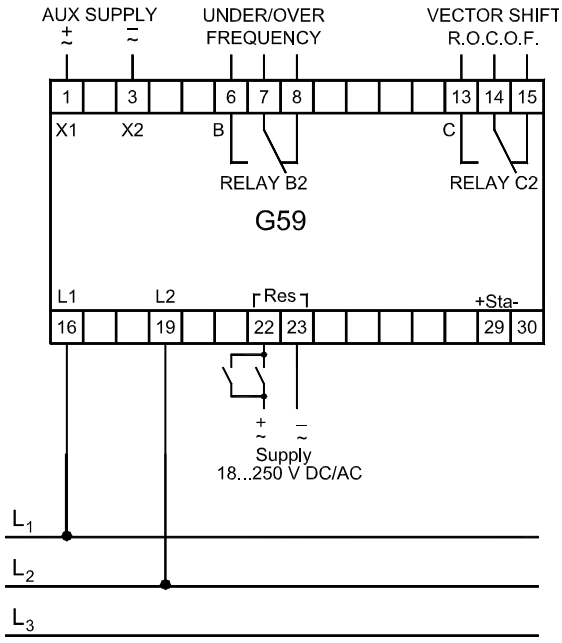
The G59 is designed for panel mounting, being mounted on a 35 mm DIN rail, or by means of two 4-mm screws.

Weight: Approx. 0.650 kg.

The design of the relay 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.

1.4 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.

The G59 may be connected between 2 phases or between 1 phase and neutral.

The G59 is to be configured so that the input of the relay corresponds to the connected voltage.

1.5 Start up instructions

1.5.1 Setting and indication

Setting of	LED/relay
Vector shift: (2…20 electr. degr.)	Red LED "MAINS FAIL" is lit during fault condition.
R.O.C.O.F.: 0…5 Hz/s	Red LED "MAINS FAIL" is lit during fault condition.
Overfrequency: (100…110% of f_n)	Yellow LED "f>, f<" is lit during fault condition.
Underfrequency (90…100% of f_n)	Yellow LED "f>, f<" is lit during fault condition.

The delay timer is started, when the contacts connected to the "RES" input open. It is fixed to 5 s; however, a longer delay is selected if unwanted disconnections occur immediately upon synchronisation of the generator to the mains.

During start up, the following setting procedure is recommended:

a. Generators operating as emergency generators (much of their power is used locally, and simulating change of generator load is possible):
   1. Remove connections to "RES"
   2. Adjust potentiometer marked vector shift / df/dt, so that an opening signal is transmitted to the mains circuit breaker at a load variation of 5…10%.

b. Generators of a co-generation plant, supplying all their power to the mains (change of generator load is only with difficulty simulated)
   1. Set potentiometer marked vector shift / df/dt to 5/1.5
   2. If necessary, adjust this on the basis of practical experience.

1.6 Technical specifications

Overload, voltages:	1.2 x U_n, continuously 2 x U_n for 10 s
Load:	2kΩ/V
Frequency range:	40…45…65…70Hz
"RESET" inputs:	Input voltage: 18…250V AC/DC for "activated" condition Input impedance: 100kΩ
Relay contacts:	2 change-over switches
Contact ratings:	250V-8A-2000A (AC), 24V-8A-200W (DC)
Contact voltage:	Max. 250V (AC). Max 150V (DC)
Response time:	<30 ms, vector shift <100 ms, R.O.C.O.F. and frequency
Galv. separation:	Between inputs and outputs: 3250V-50Hz-1 min.

Consumption: (Aux. supply) 4VA/3.5W

Status output: Open (fault): 10…30V DC
Closed (OK): max. 5mA

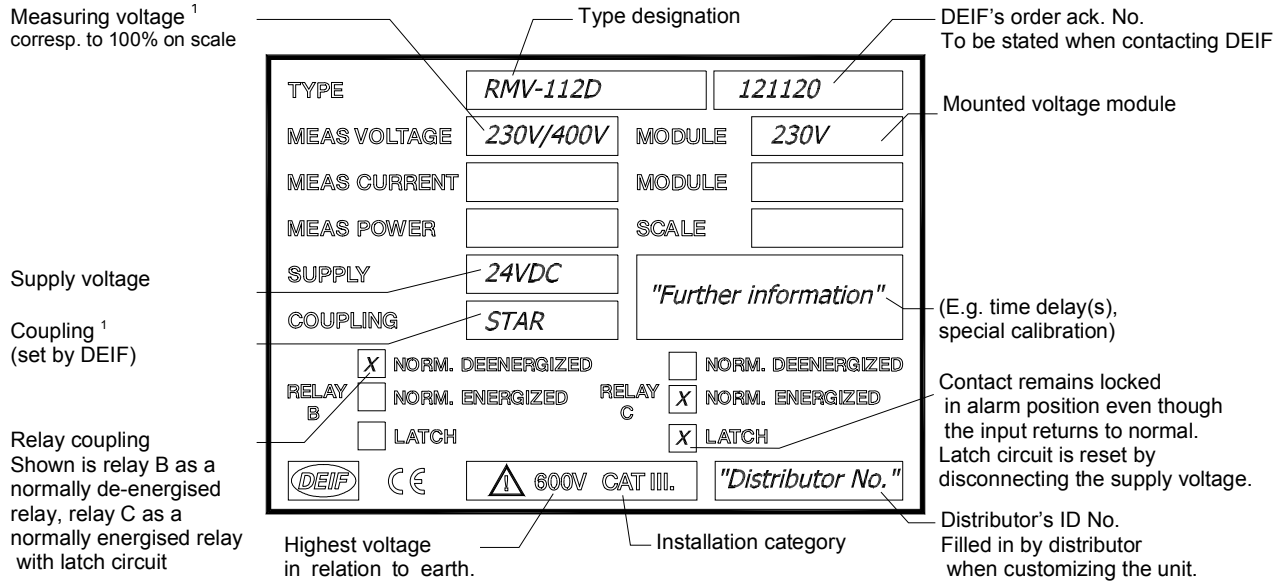
2. RMV-112D

2.1 Description

This combined undervoltage and overvoltage relay type RMV-112D forms part of a complete DEIF series (the *uni-line*) of relays for protection and control of generators.

2.2 Label

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

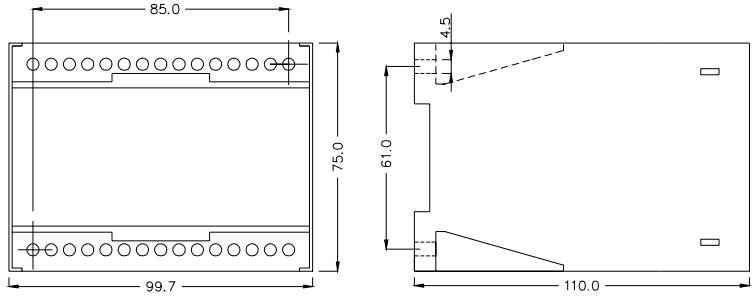


Note 1: Example of a label for an RMV-112D for delta coupling:

MEAS VOLTAGE	*400/230V*	MODULE	*400V*
COUPLING	*DELTA*		

Note : The relay is provided with a 200 ms power-up relay, ensuring correct function of the relay on connection of the auxiliary voltage. Normally energised contacts (”NE”) are not activated (contact does not open/close) until 200 ms after connection of the auxiliary voltage. Likewise, the relay is provided with a 200 ms power-down circuit, ensuring supervision and maintenance of any set point exceeding for 200 ms after disconnection of the auxiliary voltage.

2.3 Mounting instructions



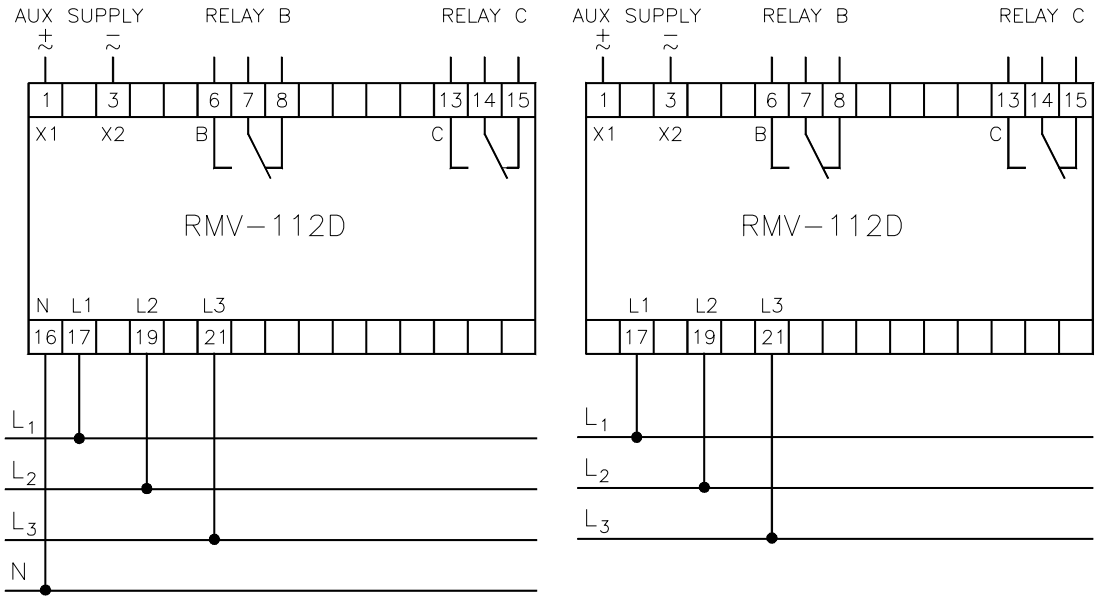
The RMV-112D is designed for panel mounting, being mounted on a 35 mm DIN rail, or by means of 2 off 4 mm screws.

Weight: ca. 0.650 kg

The design of the relay 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.

2.4 Connection diagram



Star coupling Delta coupling

Please note the difference between relays for delta coupling and for star coupling. The coupling is stated on the label.

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.

2.5 Start up instructions

2.5.1 Setting and indication

Setting of	LED/relay	
Undervoltage set point: (80…100%) of U_n	”U<”	Yellow LED is lit when the input voltage exceeds the set point, but the output contact has not yet been activated.
Overvoltage set point: (100…120%) of U_n	”U>”	Yellow LED is lit when the input voltage exceeds the set point, but the output contact has not yet been activated.
Time delay: 0…10 s	The contact is activated and the red LED is lit after the timer has expired.	
Hysteresis: (1…10%) of U_n	Relay contact is reset when fault voltage equals or is less than the preset hysteresis.	

The built-in relays of the RMV-112D are activated when the input voltage drops below or exceeds the set points preset on the front of the unit.

A suitable hysteresis is selected in relation to the preset set points, e.g. to ensure, that the relay contacts are not reset, until the input voltage is within its nominal range.

Example: Nominal voltage range: 95…105V
Undervoltage set point: 90% of U_n (90V)
Overvoltage set point: 110% of U_n (110V)
Hysteresis: 5% of U_n (5V)

The relay will now be activated at an undervoltage of 90V and at an overvoltage of 110V, and will be deactivated again when the input voltage is within the range 95…105V.

Note: Hysteresis setting is common to undervoltage and overvoltage contacts.

When setting the set points on the front of the RMV-112D an accuracy of ±10% of the scaling, corresponding to ±2% of U_n, may normally be obtained.

If a higher accuracy is required, the unit (the generator) connected to the relay must be regulated until the required set point value is reached.

When the input voltage drops below/exceeds the set point, the relevant yellow LED of the RMV-112D is lit.

2.6 Technical specifications

Frequency range: 40…45…65…70Hz

Max. input voltage: 1.2 x U_n, continuously,
2 x U_n for 10 s

Load: 2kΩ/V

Relay contacts: 1 changeover switch per relay

Contact ratings: 250V-8A-2000A (AC), 24V-8A-200W (DC)

Contact voltage: Max. 250V (AC). Max. 150V (DC).

Response time: <100 ms

Galv. separation: Between inputs and outputs: 3250V-50Hz-1 min.

Consumption: (Aux. supply) 3.5VA/2W