

## Synchro-check Monitor PLL/D-100/120, PLL/D-173/240, PLL/D-380/480, PLL/D-277/500 DIN-rail mounted

### Introduction

This unit compares the voltage, frequency and phase angle of two supplies and operates a relay according to the synchronicity of the supplies. If the two supplies cease to match, the relay operates to provide a control output. The relay output can be used for alarm or control purposes.

The unit also provides a dead bus function. If the bus supply fails, the relay operates and the output can be used to switch in an emergency generator. LEDs indicate power on, relay and dead bus status.

Controls on the front panel set the trip points at which the relays and LEDs operate:


- Degree of synchronicity  $U_x$  (%Volts)
- Nominal voltage ( $U_n$ )
- Dead bus function on/off

The unit is powered from the generator supply.


These instructions contain important safety information. Please read them thoroughly before commissioning, operating or maintenance of the unit.

### Specification

Parameter	PLL/PLD	100/120	173/240	380/480	277/500
Rated Vg range $U_n$		57-69V	100-139V	220-277V	277-500V
Overload capacity	- continuous	87V	174V	346V	600V
	- 10s max.	104V	209V	416V	700V
Minimum supply Vg $U_{on}$		35V	60V	132V	166V
Burden on supply (Max)		2 VA / 1.6W	2.7 VA / 1.7W	4 VA / 2.2W	5 VA / 2.8W
Frequency range		45-65 Hz			
Deadbus on $U_{dbon}$		25% $U_{on}$			
Deadbus off $U_{dboff}$		50% $U_{on}$			
Sync Tolerance		10-30% Volts			
<b>Relay contacts:</b> for general switching		2 x changeover, volt-free			
Load capacity - a.c.		250V @ 8A, 2 kVA			
Load capacity - d.c.		30V 8A			
Insulation		4 kV/1 min			
Mech. endurance		30x10 <sup>6</sup> operations			
<b>Other Data:</b>					
Dimensions		90 x 105 x 64 mm			
Weight (100/208/380/277)		291 / 335 / 332 / 335 g			
Maximum conductor size		2 x 1.5 mm <sup>2</sup> or 1 x 2.5 mm <sup>2</sup>			
Operating temperature		-20 to +55 °C			
Storage temperature		-30 to +70 °C			
Over-voltage category		III			
Pollution degree		2			
Environmental protection		IP40 for front panel IP20 for terminals.			
Standards		EN 60255-6, EN 60255-27, EN 61000-6-2, EN 61000-6-4			

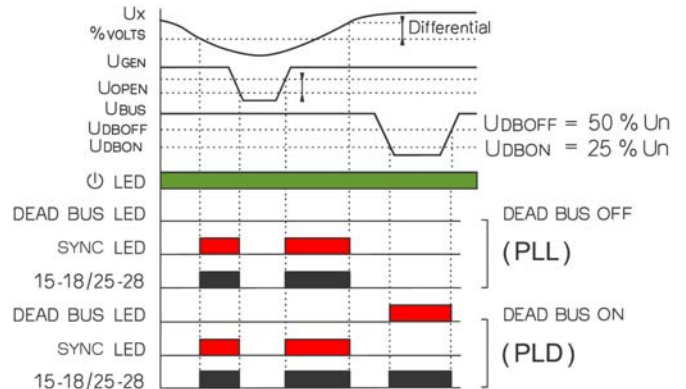
 Insulation Class: Ensure any external circuits connected to the relay are provided with double or reinforced insulation.

### Operation

The green  LED lights shows when the power supply is on.

While the two supplies match in voltage, frequency and phase to the degree set by the %Volts control, the **Sync** LED lights and the relay is energised.

If one supply varies such that they no longer match to that degree, the **Sync** LED goes off and the relay de-energises.



$$U_x = |U_{GEN} - U_{BUS}| \text{ (VOLTAGE, FREQUENCY + PHASE ANGLE)}$$

The differential trip levels help to prevent relay chatter as the monitored voltage level varies.

As the relays have changeover contacts, the relay outputs can be inverted by wiring to the alternative terminals 15-16 or 25-26.

If the generator voltage falls below the  $U_{on}$  level, the unit ceases to operate, the relay de-energises and the **Sync** LED goes off.

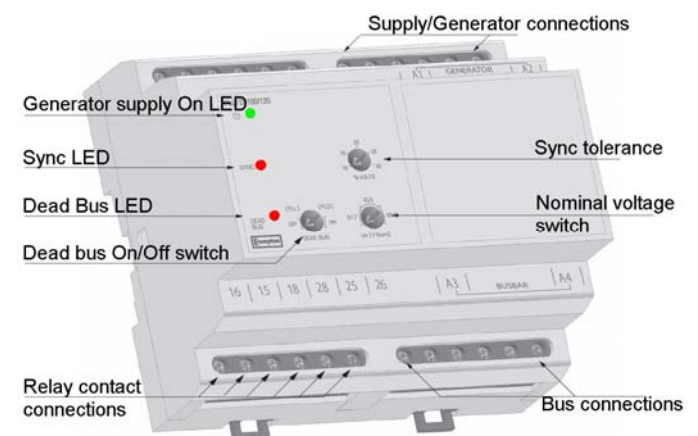
With Dead Bus On, if the bus voltage falls below the  $U_{dbon}$  level, the relay energises and the **Dead Bus** LED lights. The relay can be used to turn on an emergency supply in the event of bus supply failure. The relay will de-energise again and the LED will go off when the bus voltage rises above the  $U_{dboff}$  level.

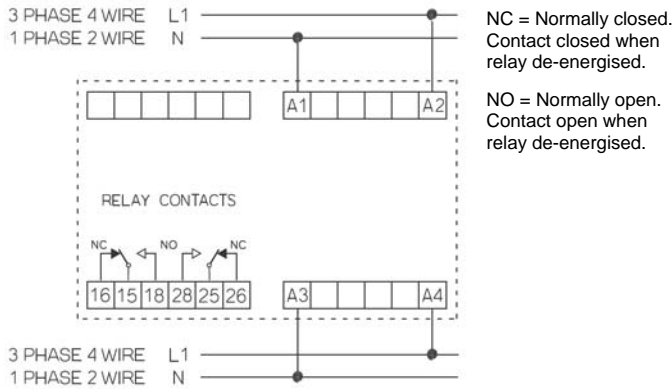
**Note; Red LED indicates fault condition, not relay status**

### Installation

The unit is intended for mounting on a standard DIN rail. Hook the unit onto the top of the rail and press the bottom of the unit until it locks in place. To remove the unit from the rail, lever down the black tabs at the bottom of the unit to release it from the rail.

The unit is intended for use in a reasonably stable ambient temperature within the range -20 to +55°C. Do not mount the unit where there is excessive vibration or in excessive direct sunlight.





- Avoid routing wiring to this unit alongside cables and products that are, or could be, a source of interference.
- To protect the product against incorrect operation or permanent damage, surge transients must be controlled. It is good EMC practice to suppress differential surges to 2kV or less at the source. The unit has been designed to automatically recover from typical transients, however in extreme circumstances it may be necessary to temporarily disconnect the auxiliary supply for a period of greater than 5 seconds to restore correct operation.
- Screened communication leads are recommended and may be required. These and other connecting leads may require the fitting of RF suppression components, such as ferrite absorbers, line filters etc., if RF fields cause problems.
- It is good practice to install sensitive electronic instruments that are performing critical functions in EMC enclosures that protect against electrical interference causing a disturbance in function.

## Warnings:



**Caution: Risk of Electric Shock**

- During normal operation, voltages hazardous to life may be present at some of the terminals of this unit. Installation and servicing should be performed only by qualified, properly trained personnel abiding by local regulations. Ensure all supplies are de-energised before attempting connection or other procedures.
- It is recommended adjustments be made with the supplies de-energised, but if this is not possible, then extreme caution should be exercised.
- Terminals should not be user accessible after installation and external installation provisions must be sufficient to prevent hazards under fault conditions.
- This unit is not intended to function as part of a system providing the sole means of fault protection - good engineering practice dictates that any critical function be protected by at least two independent and diverse means.
- The unit does not have internal fuses therefore external fuses must be used for protection and safety under fault conditions.
- If this equipment is used in a manner not specified by the manufacturer, protection provided by the equipment may be impaired.

## Safety

The unit was designed in accordance with BS EN 600255-6 and -27 – Permanently connected use, Normal condition. Insulation category III, pollution degree 2, basic insulation for rated voltage. Measurement Category III.

## EMC Installation Requirements

This unit has been designed to provide protection against EM (electromagnetic) interference in line, in accordance with BS EN 61000-6-2 and -6-4. Precautions necessary to provide proper operation of this and adjacent equipment will be installation dependent and so the following can only be general guidance:

## Wiring

All connections are made to screw clamp terminals. Terminals are suitable for copper wires only and will accept one stranded 0.05 - 2.5mm<sup>2</sup> (30 - 12 AWG) stranded or solid core cables. Terminal screws should be tightened to 0.5 Nm. Choice of cable should meet local regulations.

Instrument transformers used for connection to the meter must be of approved type, compliant with ANSI/IEEE C57.13 / IEC 60044-1 to provide isolation from measuring inputs.

*For UL approved installation*, use National Electrical Code (NEC) Class 1 wiring, rated at 300V / 60°C min rating.

## Fusing

A suitable switch or circuit breaker conforming to the relevant parts of IEC 60947-1 and IEC 60947-3 should be included in the building installation. It should be positioned so as to be easy to operate, in close proximity to the equipment, and clearly identified as the disconnecting device.

This unit must be fitted with an external fuse in voltage supply line. Line must be fused with a quick blow fuse 1A maximum. Choose fuse of a type and with a breaking capacity appropriate to the supply and in accordance with local regulations.

*For UL approved installations:*

UL listed branch circuit fuses, suitable for the installation voltage, shall be provided and installed in accordance with national installation code – 1A fast acting AC rated at the input.

## Maintenance

In normal use, little or no maintenance is needed. Where used, ensure any CT secondary circuits are short circuited prior to carrying out installation or maintenance of the unit. As appropriate for service conditions, isolate electrical power, inspect the unit and remove any dust or other foreign material present. Periodically check all connections for freedom from corrosion and screw tightness, particularly if vibration is present.

All of the above information, including drawings, illustrations and graphic designs, reflects our present understanding and is to the best of our knowledge and belief correct and reliable. Users, however, should independently evaluate the suitability of each product for the desired application. Under no circumstances does this constitute an assurance of any particular quality or performance. Such an assurance is only provided in the context of our product specifications or explicit contractual arrangements. Our liability for these products is set forth in our standard terms and conditions of sale.

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# Installation and Operating Instructions

Synchro-check Monitor PLL/D-100/120-UL,  
 PLL/D-173/240-UL, PLL/D-380/480-UL,  
 PLL/D-277/500-UL DIN-rail mounted

## Warnings



**Caution: Risk of Electric Shock and Danger**

- During normal operation, voltages hazardous to life may be present at some of the terminals of this unit. Installation and servicing should be performed only by qualified, properly trained personnel abiding by local regulations. Ensure all supplies are de-energised before attempting connection or other procedures.
- It is recommended adjustments be made with the supplies de-energised, but if this is not possible, then extreme caution should be exercised.
- Terminals should not be user accessible after installation and external installation provisions must be sufficient to prevent hazards under fault conditions.
- This unit is not intended to function as part of a system providing the sole means of fault protection - good engineering practice dictates that any critical function be protected by at least two independent and diverse means.
- The unit does not have internal fuses therefore external fuses must be used for protection and safety under fault conditions.
- If this equipment is used in a manner not specified by the manufacturer, protection provided by the equipment may be impaired.

## Safety

The unit was designed in accordance with BS EN 600255-6 and -27 – Permanently connected use, Normal condition. Insulation category III, pollution degree 2, basic insulation for rated voltage. Measurement Category III.

## EMC Installation Requirements

This unit has been designed to provide protection against EM (electromagnetic) interference in line, in accordance with BS EN 61000-6-2 and -6-4. Precautions necessary to provide proper operation of this and adjacent equipment will be installation dependent and so the following can only be general guidance:

- Avoid routing wiring to this unit alongside cables and products that are, or could be, a source of interference.
- To protect the product against incorrect operation or permanent damage, surge transients must be controlled. It is good EMC practice to suppress differential surges to 2kV or less at the source. The unit has been designed to automatically recover from typical transients, however in extreme circumstances it may be necessary to temporarily disconnect the auxiliary supply for a period of greater than 5 seconds to restore correct operation.
- Screened communication leads are recommended and may be required. These and other connecting leads may require the fitting of RF suppression components, such as ferrite absorbers, line filters etc., if RF fields cause problems.
- It is good practice to install sensitive electronic instruments that are performing critical functions in EMC enclosures that protect against electrical interference causing a disturbance in function.

## Wiring

All connections are made to screw clamp terminals. Terminals will accept 0.05 - 2.5mm<sup>2</sup> (30 - 12 AWG) stranded or solid core cables. Terminal screws should be tightened to 0.5 Nm (4.5 lb.in) Choice of cable should meet local regulations.

For UL approved installation, use National Electrical Code (NEC) Class 1 wiring. Use copper conductors only, rated 600V / 75°C minimum.

## Fusing

A suitable switch or circuit breaker conforming to the relevant parts of IEC 60947-1 and IEC 60947-3 should be included in the building installation. It should be positioned so as to be easy to operate, in close proximity to the equipment, and clearly identified as the disconnecting device.

This unit must be provided with an external fuse in voltage supply lines. Lines must be fused with a quick blow fuse 1A maximum. Choose fuse of a type and with a breaking capacity appropriate to the supply and in accordance with local regulations.

For UL approved installations:

UL listed branch circuit fuses, suitable for the installation voltage, shall be provided and installed in accordance with national installation code – 1A fast acting AC rated at the input.

## Maintenance

In normal use, little or no maintenance is needed. Where used, ensure any CT secondary circuits are short circuited prior to carrying out installation or maintenance of the unit. As appropriate for service conditions, isolate electrical power, inspect the unit and remove any dust or other foreign material present. Periodically check all connections for freedom from corrosion and screw tightness, particularly if vibration is present.

## Introduction

This unit compares the voltage, frequency and phase angle of two supplies and operates a relay according to the synchronicity of the supplies. If the two supplies cease to match, the relay operates to provide a control output. The relay output can be used for alarm or control purposes.

The unit also provides a dead bus function. If the bus supply fails, the relay operates and the output can be used to switch in an emergency generator. LEDs indicate power on, relay and dead bus status.

Controls on the front panel set the trip points at which the relays and LEDs operate:

- Degree of synchronicity U<sub>x</sub> (%Volts)
- Nominal voltage (U<sub>n</sub>)
- Dead bus function on/off


The unit is powered from the generator supply.

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## Specification

Parameter	PLL/PLD	100/120	173/240	380/480	277/500
Rated Vg range U <sub>n</sub>		57-69V	100-139V	220-277V	277-500V
Overload capacity					
- continuous		87V	174V	346V	600V
- 10s max.		104V	209V	416V	700V
Minimum supply Vg U <sub>on</sub>		35V	60V	132V	166V
Burden on supply (Max)		2 VA / 1.6W	2.7 VA / 1.7W	4 VA / 2.2W	5 VA / 2.8W
Frequency range		45-65 Hz			
Deadbus on U <sub>dbon</sub>		25% U <sub>on</sub>			
Deadbus off U <sub>dboff</sub>		50% U <sub>on</sub>			
Sync Tolerance		10-30% Volts			
Relay contacts: for general switching		2 x changeover, volt-free			
Load capacity - a.c.		250V @ 10A, B300 General purpose 70°C			
Load capacity - d.c. (Not UL rated)		30V 8A			
Insulation		3 kV/min between adjacent relays 4KV/min to measuring inputs			
Mech. endurance		30x10 <sup>6</sup> operations			
Other Data:					
Dimensions		90 x 105 x 64 mm			
Weight (100/208/380/277)		291 / 335 / 332 / 335 g			



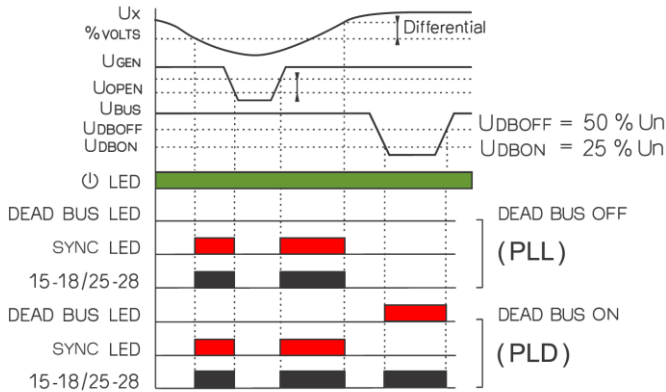
Maximum conductor size	2 x 1.5 mm <sup>2</sup> or 1 x 2.5 mm <sup>2</sup> (12AWG)
Surrounding air temperature rating	-20 to +55 °C
Storage temperature	-30 to +70 °C
Over-voltage category	III
Pollution degree	2
Environmental protection (Not evaluated by UL)	IP40 for front panel IP20 for terminals.
Standards	EN 60255-6, EN 60255-27, EN 61000-6-2, EN 61000-6-4, UL508, CSA C22.2
	Insulation Class: Ensure any external circuits connected to the relay are provided with double or reinforced insulation.

## Operation

The green  LED lights shows when the power supply is on.

While the two supplies match in voltage, frequency and phase to the degree set by the %Volts control, the **Sync** LED lights and the relay is energised.

If one supply varies such that they no longer match to that degree, the **Sync** LED goes off and the relay de-energises.



$$U_x = |U_{GEN} - U_{BUS}| \text{ (VOLTAGE, FREQUENCY + PHASE ANGLE)}$$

The differential trip levels help to prevent relay chatter as the monitored voltage level varies.

As the relays have changeover contacts, the relay outputs can be inverted by wiring to the alternative terminals 15-16 or 25-26.

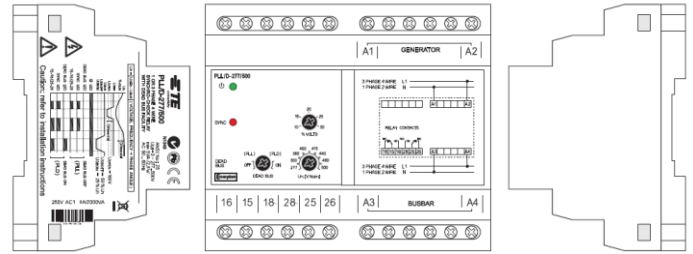
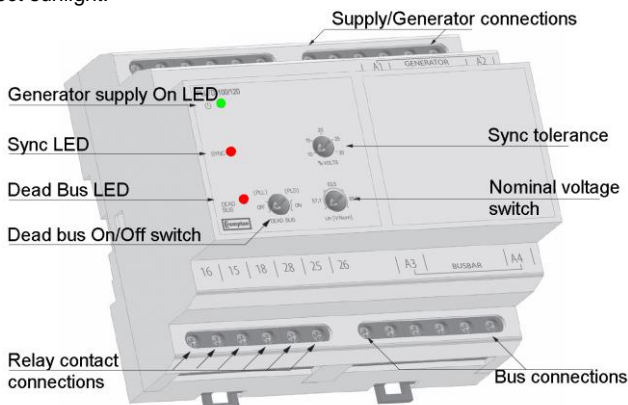
If the generator voltage falls below the Uon level, the unit ceases to operate, the relay de-energises and the **Sync** LED goes off.

With Dead Bus On, if the bus voltage falls below the Udbon level, the relay energises and the **Dead Bus** LED lights. The relay can be used to turn on an emergency supply in the event of bus supply failure. The relay will de-energise again and the LED will go off when the bus voltage rises above the Udboff level.

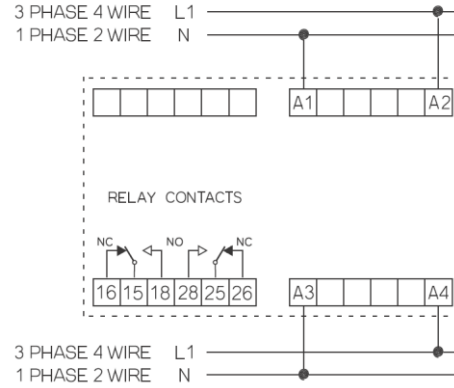
**Note: Red LED indicates the unit is synchronised.**

## Installation

The unit is intended for mounting on a standard DIN rail. Hook the unit onto the top of the rail and press the bottom of the unit until it locks in place. To remove the unit from the rail, lever down the black tabs at the bottom of the unit to release it from the rail. The unit is intended for use in a reasonably stable ambient temperature within the range -20 to +55°C. Do not mount the unit where there is excessive vibration or in excessive direct sunlight.



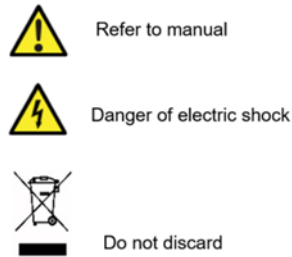
## Wiring Diagram



NC = Normally closed.  
Contact closed when relay de-energised.

NO = Normally open.  
Contact open when relay de-energised.

## Explanation of Symbols



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