



Product Documentation

ENSPD [Electromagnetic waves – Noise Smart Protector Device]

GD-2000(Multifunction grounding leakage current shielding device)

Jun, 2020



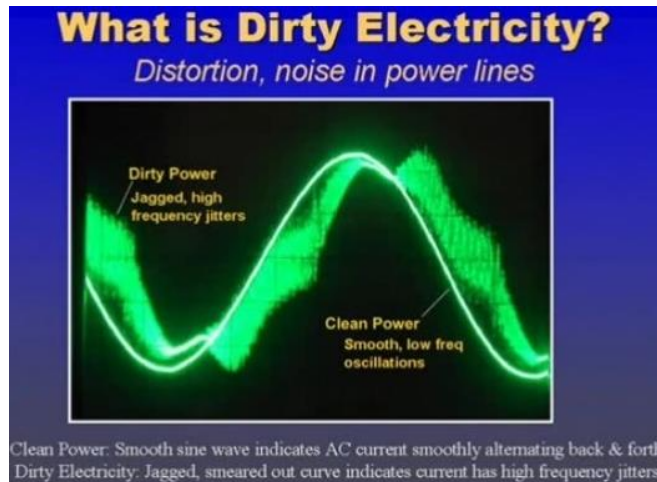
01. Product Development Backgrounds

■ Increase in damages caused by electromagnetic waves and noise with electrical goods, communication repeater and use of frequency etc.

- Electromagnetic waves are generated by alternating current electricity and devices. They create a field that stretches one or two meters around the wires and devices like invisible fog (EMF- Electromagnetic field).
- All electronic products with an oscillation circuit of 9kHz or higher generate electromagnetic waves.
- Need to be improved due to the increased defective rate of products with electromagnetic waves and noise

■ Dirty electricity, which is still unfamiliar in Korea, is the cause of electromagnetic waves.

Korea use sine wave of 60Hz 220v. The thing which is attached to the periphery of the wave as shown in the figure below is harmonics (Harmonics) and is the main cause that generates electromagnetic waves transmitted through air and wires.

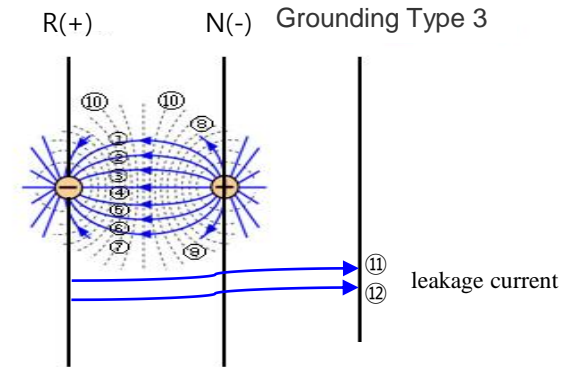
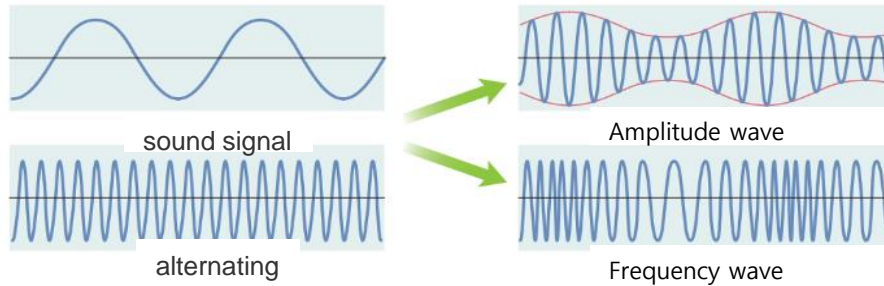


- It should be careful where using solar power. This is because solar power emits severe amount of harmonics through power conversion while supplying A / C through inverter.

02. Product Introduction

Principle of the Technology

- Waveform improvement point by **apparent power (voltage, current) abnormal state detection and frequency compensation control device**



Principle of ECSPD

1. ECSPD compensates frequency with **“apparent power (voltage, current) abnormal state detection and frequency compensation control device”** that utilizes a wavelength band based on the equipotential phenomenon between phases.

This converts the frequency to a sine wave shape and a constant amplitude without external interference.

Through this process, the electric power lines are arranged electronically so that there is no potential difference.

In other words, it is a principle to prevent leakage current from flowing through “zero potential”.

As a result, it is a principle to help prevent electric shock accidents by shielding, absorbing and reducing leakage current.

Therefore, it is possible to prevent electric shock by shielding and reducing leakage current and shielding lightning surge without external interference through apparent power (voltage, current) abnormal state detection and frequency compensation control device.

Therefore, it is not related to short circuit and overload.

01. Product Development Backgrounds

■ Increase in damages caused by electromagnetic waves and noise with incases in use of electrical products, telegraphic repeater, frequency

- ☞ Semiconductor field : malfunctions with unknown causes, burning (damage by a fire) on products, damage by high frequency caused by noise.
- ☞ Communication field : internet speed degradation, losing internet connection problem, malfunction in IT field, I/O card, LAN card, IC chip damages.
- ☞ Hospital field : reduce malfunctions with unknown causes, prevention of burning on products, prevention of damage by high frequency caused by noise.
- ☞ Human body field : feel fatigue when suing PC/ electrical products. Fever, headache and dizziness can be caused.
- ☞ IT equipment : unknown error occurrence in IT equipment and precision instruments, repeated failure in electronic products, computer paralysis, data loss.
- ☞ Internet field : unstable speed of wired internet and Wi-Fi, frequent freeze of IPTV and TV mosaic occurrence.
- ☞ In the past, mobile phones and microwave ovens were most common thing that came to the mind when thinking about the damages caused by electromagnetic waves. However, as the modernization era has brought many devices into homes, the damage range of electromagnetic waves has widened. The product is prepared by anticipating increased damage caused by electromagnetic waves with mobile phones, microwave ovens, air purifiers, humidifier, refrigerator, washing machine, dishwasher, trailer, etc.

- ❖ **The electromagnetic waves of high frequency band is measurable by Spectrum Analyzer (dB), however,**
- ❖ **AC 60HZ extremely low frequency electric fields (V/m), magnetic field (mG) tests are not measurable by tester.**

01. Product Development Backgrounds

■ Increase in electric shock accidents, damages caused by noise and surge



- Deterioration of existing electrical facilities.
- Increase in short circuit accident increase in electrical fire accident.



- Widespread use of electrical machine.
- Increase in electric shock accident.
- Human body malfunction due to the electromagnetic waves etc.



- Increase in electric shock accident by streetlight pole.
- Accident by careless use of electrical machines.
- Increase in children electric shock accident.



- Increased electric shock damage to vinyl house.
- Electric shock occurs.



- Increase in damages caused by surge.
- Damage by fire to electronic products.
- Occurrence of human casualties.

ENSPD

Including prevention of electric shock accident.

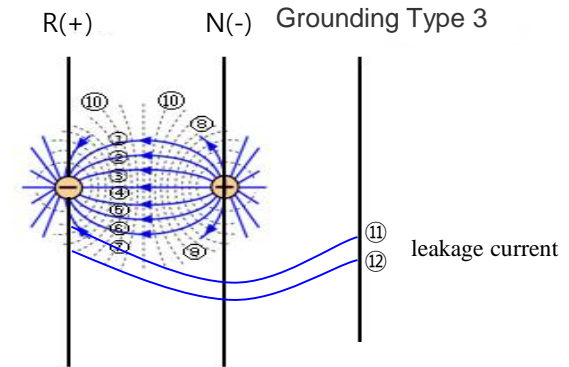
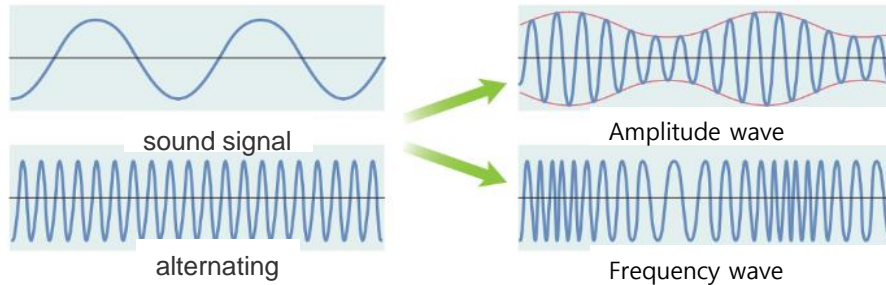
**Technology using
“apparent power
(voltage, current)
abnormal state
detection” and
“frequency
compensation control
device”**

ENSPD[Electromagnetic waves-Noise Smart Protector Device]

02. Product Introduction

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Principle of ECSPD

1. ECSPD compensates frequency with **“apparent power (voltage, current) abnormal state detection and frequency compensation control device”** that utilizes a wavelength band based on the equipotential phenomenon between phases.

This converts the frequency to a sine wave shape and a constant amplitude without external interference.

Through this process, the electric power lines are arranged electronically so that there is no potential difference.

In other words, it is a principle to prevent leakage current from flowing through “zero potential”.

As a result, it is a principle to help prevent electric shock by shielding and reducing leakage current, reducing electromagnetic waves- noise.

Therefore, it is possible to prevent electric shock by shielding and reducing leakage current and reducing electromagnetic waves-noise without external interference through apparent power (voltage, current) abnormal state detection and frequency compensation control device.

Therefore, it is not related to short circuit and overload.

02. Product Introduction

Product Composition

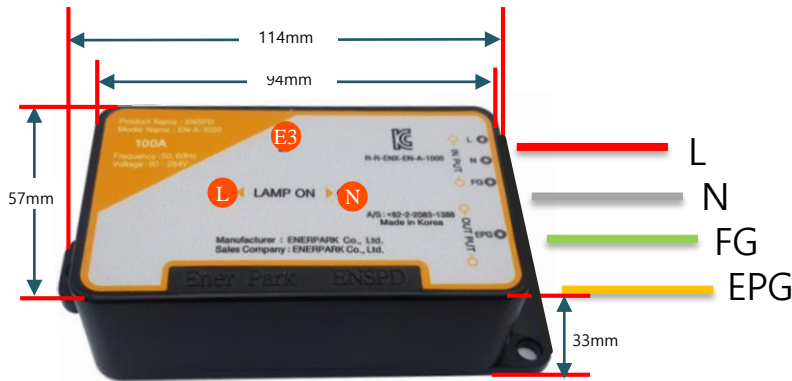


Basic Specifications of ENSPD Technology & Customizing

Range of voltage/Current	Customizing
-voltage : AC110V / AC220V / AC380V / other voltage / DC voltage -current : applicable to the required level depending on the customized structure	various sizes available according to the surrounding structure

02. Product Introduction

■ Functions of Product - ENSPD



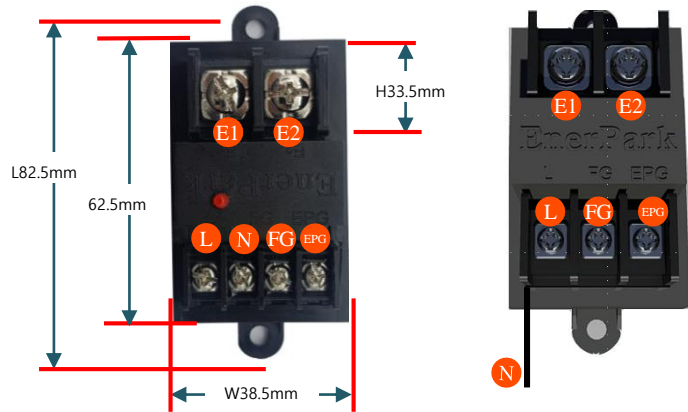
Name	AC ENSPD (For single phase)
Model No.	• EN-A-1000
Band	• 1KHz ~ 1GHz reduction effect(Noise, electromagnetic waves)
Rated current	<ul style="list-style-type: none"> • 30A (AC 30A or less) : Leakage current shielding, absorption and reduction amount: 10mA • 100A (AC 100A or less) : Leakage current shielding, absorption and reduction amount: 30mA
Voltage	• 90V ~ 264V.
Frequency	• Does not matter whether 50HZ or 60HZ (110V / 220V compatible)
Range	<ul style="list-style-type: none"> • Installation distance : within about 10~50cm in terminal power supply part • Install the ENSPD by attaching it directly to the terminal load (motor, equipment).(the closer the distance is, the better it is)
Main function	<ul style="list-style-type: none"> • Shielding and reducing electromagnetic waves- noise • With shielding and reducing leakage current, prevent electric shock • Shielding switching surge (Surge Protector Device)
Additional function	• Shielding switching surge.(3.5KA)
Precaution	<ul style="list-style-type: none"> • Check and make sure the polarity matches before installation. (Electroscope, Multimeter) • Select and install suitable products depending on the purpose of installation and the installation location.

Ground terminal	Function
L / N	(+) / (-)
FG(E3)	• Shielding and reducing leakage current.
EPG(Load case)	

02. Product Introduction

Function of Product – Multifunction grounding leakage current shielding device

GD-2000 maintains the grounding state normally before electricity is supplied. And in conjunction with ECSPD, ENSPD, it transforms the signal in the form of constant voltage and sinusoidal voltage and frequency. In this manner, the terminal block capture leakage current and shields grounding current.



Product Name: Multifunction grounding leakage current shielding device

Model name.	<ul style="list-style-type: none"> GD-2000
Role / Reason	<ul style="list-style-type: none"> Grounding leakage current shielding. Grounding divider role. Designed to enable connect FG-E1 and EPG-E2 to utilize 100% of ENSPD functions.

Precaution

- E1 : Connect E1 and load ground wire.
- E2 : Connect E2 and load.

➔ If there are lots of load ground wire, additional ground dividers may be installed to connect the load ground wires.

(Change the existing load ground connection to the new ground terminal)

※ E1 and E2 can be connected according to the ground wire capacity.

Thickness of ground wire

- Thickness of ground wire = capacity of circuit breaker (rated current) × 0.0496
- ex) capacity of circuit breaker 50A is $50 \times 0.0496 = 2.48$ (i.e. 4SQ), capacity of circuit breaker 100 A is $100 \times 0.0496 = 4.96$ (i.e. 6 SQ) capacity of circuit breaker 250A is $250 \times 0.0496 = 12.4$ (i.e. 16SQ).
- Use an ground wire that is one size larger than that calculated for safety considerations.
- Proper thickness of ground wire shall be selected considering the function and protection level of the installation site.
- Comply with the Electrical Facilities Technical Standards and the Consumer's Electrical Installation Guide

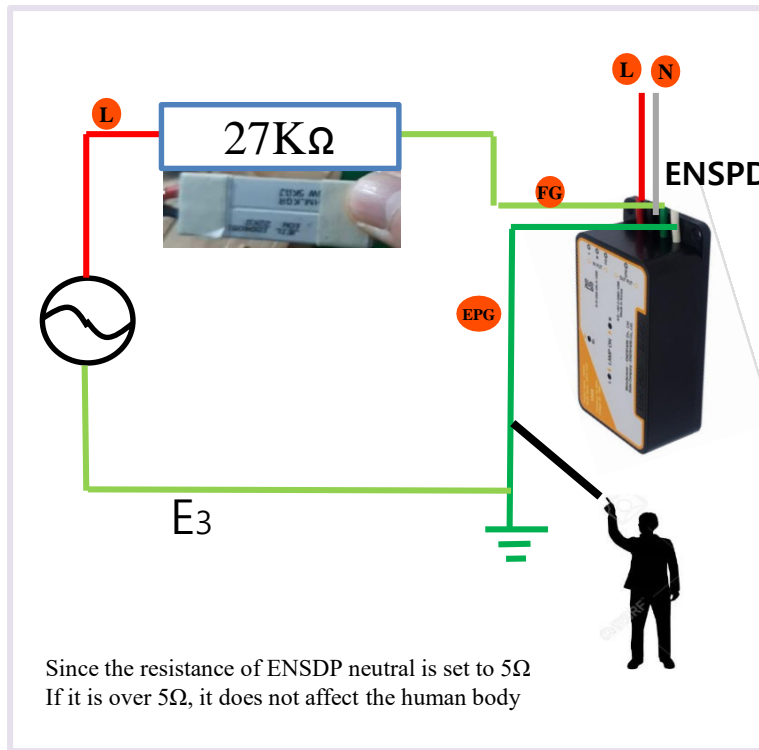
How to connect GD-2000(Sub grounding and ENSPD)

GD	SUB E3	GD	ECSPD
E2	Output connection	EPG	EPG connection
		FG	FG connection
E1	Input connection	N	N connection
		L	L connection

02. Product Introduction

Electric shock accident prevention experiment

- Connecting a resistance (27K Ω) to the equivalent circuit produces a leakage current of 8 mA.
- Connecting the ENSPD to this circuit reduces the leakage current of 8 mA to 0.83 mA..



Before installing ENSPD
(7.92mA)



After installing ENSPD
(0.83mA)



Before installing ENSPD
(22.9mA)



After installing ENSPD
(2mA)

03. Installation Effects

❖ **Noise, electromagnetic waves band : 1KHz ~ 1GHz reduction effect**

❖ **Consist internal circuit including just switching surge SPD. (3.5KA)**

→(Order the **OPTION** separately for external surge)

❖ **Installation Effects (AC 60HZ extremely low frequency electric fields (V/m), magnetic field (mG) tests are not measurable)**

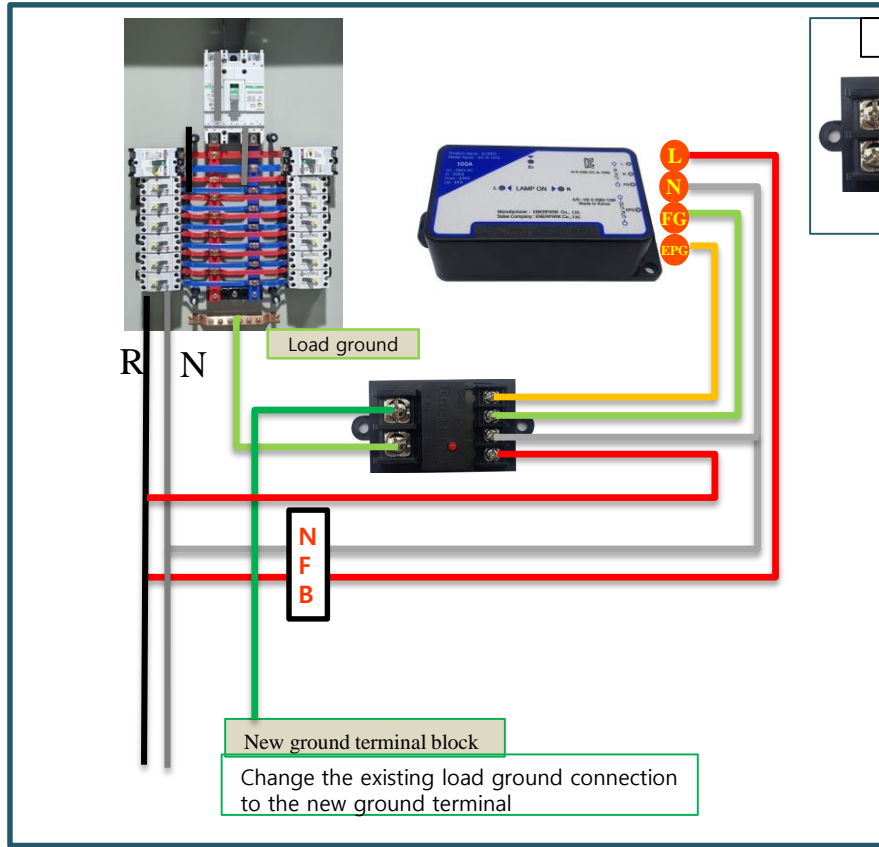
- ☞ electricity field : reduce malfunctions with unknown causes, prevention of burning (damage by a fire) on products, prevention of damage by high frequency caused by noise
- ☞ semiconductor field: reduce malfunctions with unknown causes, prevention of burning on products, prevention of damage by high frequency caused by noise
- ☞ communication field : internet speed improvement, elimination of internet connection lost phenomenon, elimination of malfunction in IT field, suppression of conductive electromagnetic wave by electromagnetic wave
- ☞ hospital field : reduce malfunctions with unknown causes, prevention of burning on products, prevention of damage by high frequency caused by noise
- ☞ human body field : prevention of electromagnetic wave damage by blocking radioactive electromagnetic waves, suppressing fever, headache, dizziness and skin trouble etc.

❖ **The electromagnetic waves of high frequency band is measurable by Spectrum Analyzer (dB), however,**

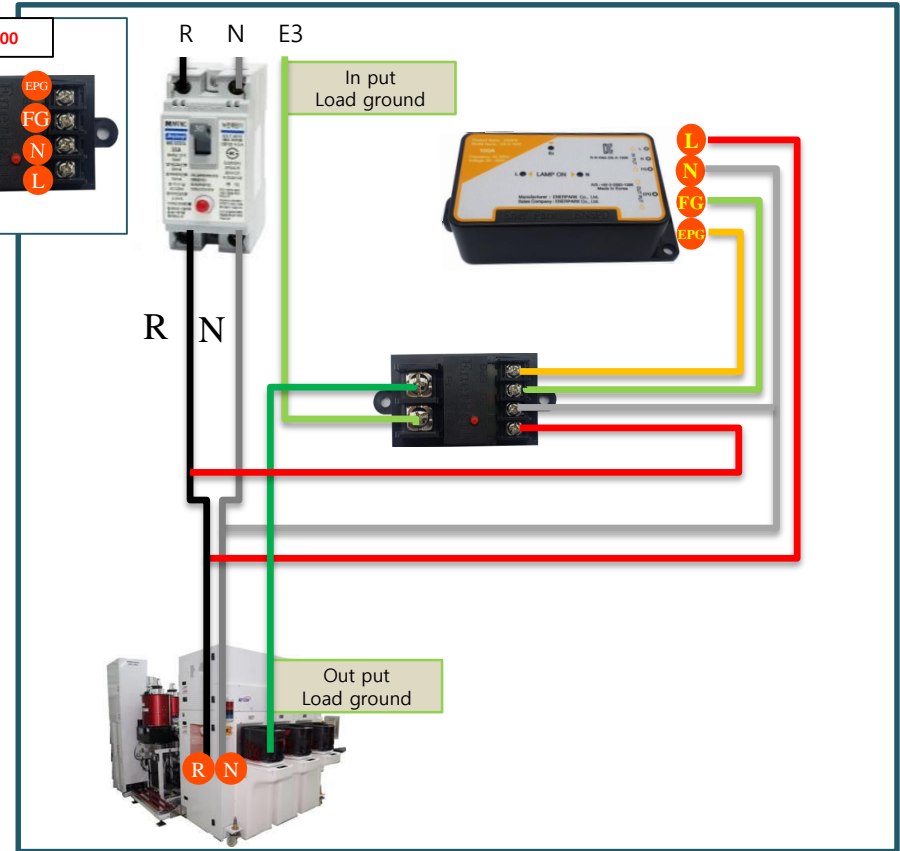
❖ **AC 60HZ extremely low frequency electric fields (V/m), magnetic field (mG) tests are not measurable by tester.**

04. Installation Method - In case there is an ground (For shielding electromagnetic waves- noise)

❖ Distribution board (1 phase 2-wire system)-ECSPD



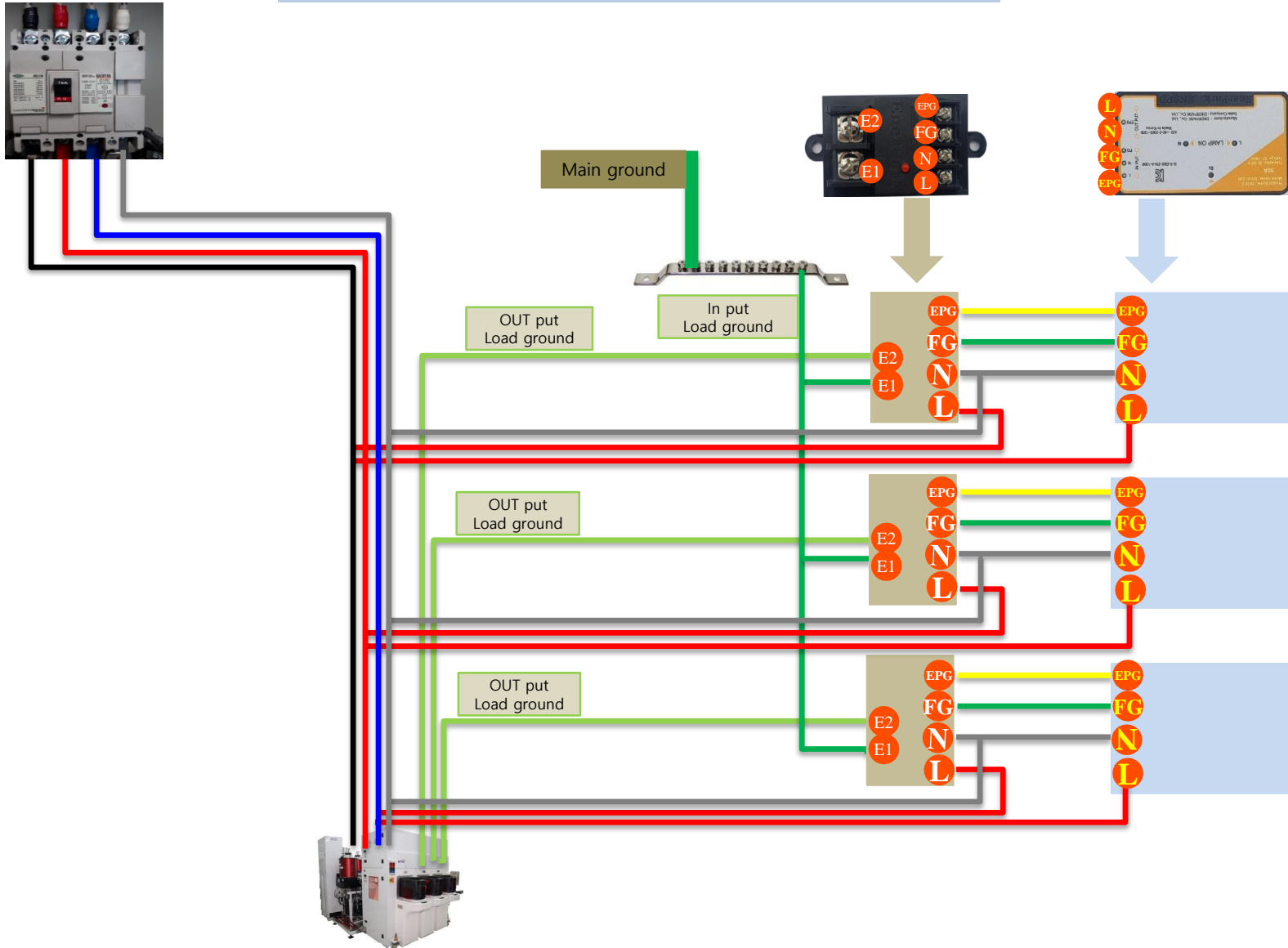
❖ Load (1 phase 2-wire system)



04. Installation Method - In case there is an ground (For shielding electromagnetic waves- noise)

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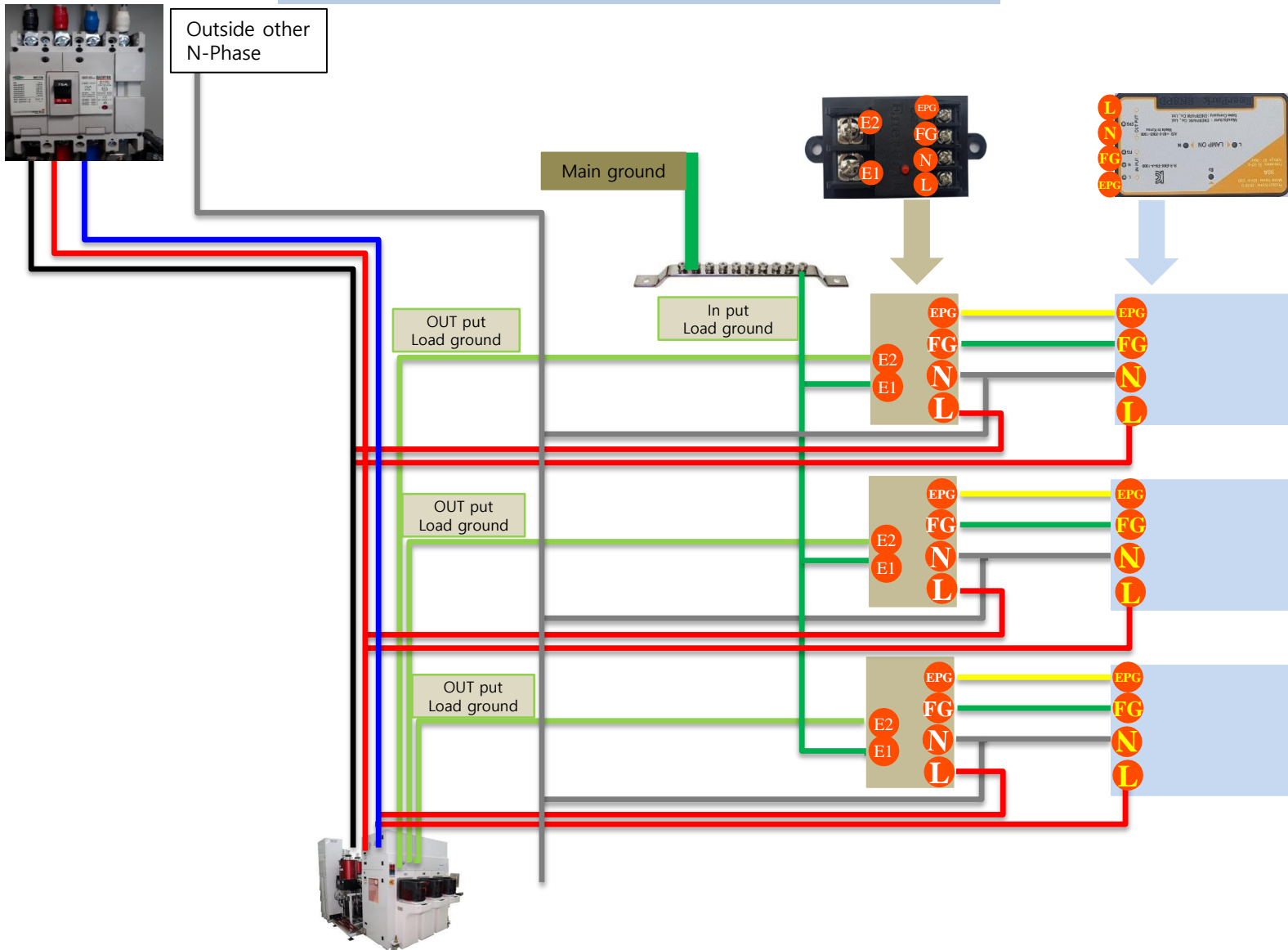
❖ Load (3-phase 4-wire system) - use condition of 220V in 380V line



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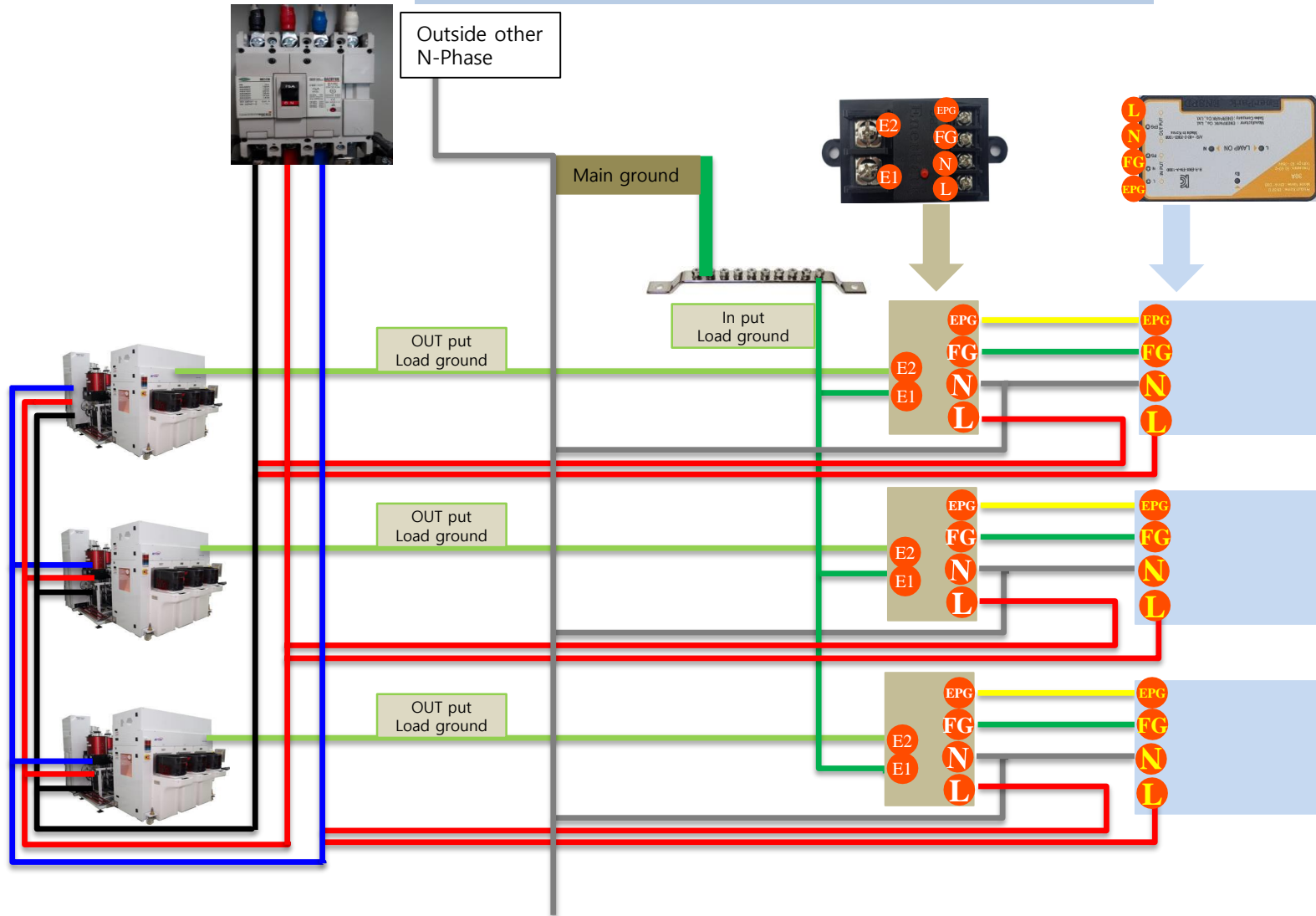
❖ Load (3-phase 3-wire system) - use condition of 220V in 380V line



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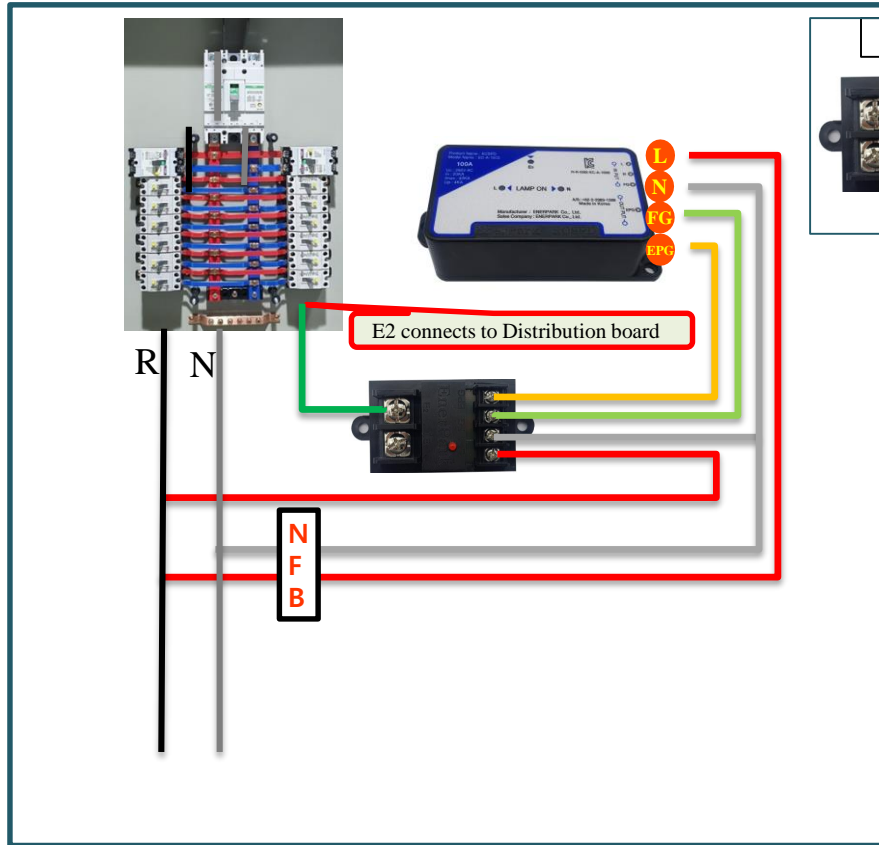
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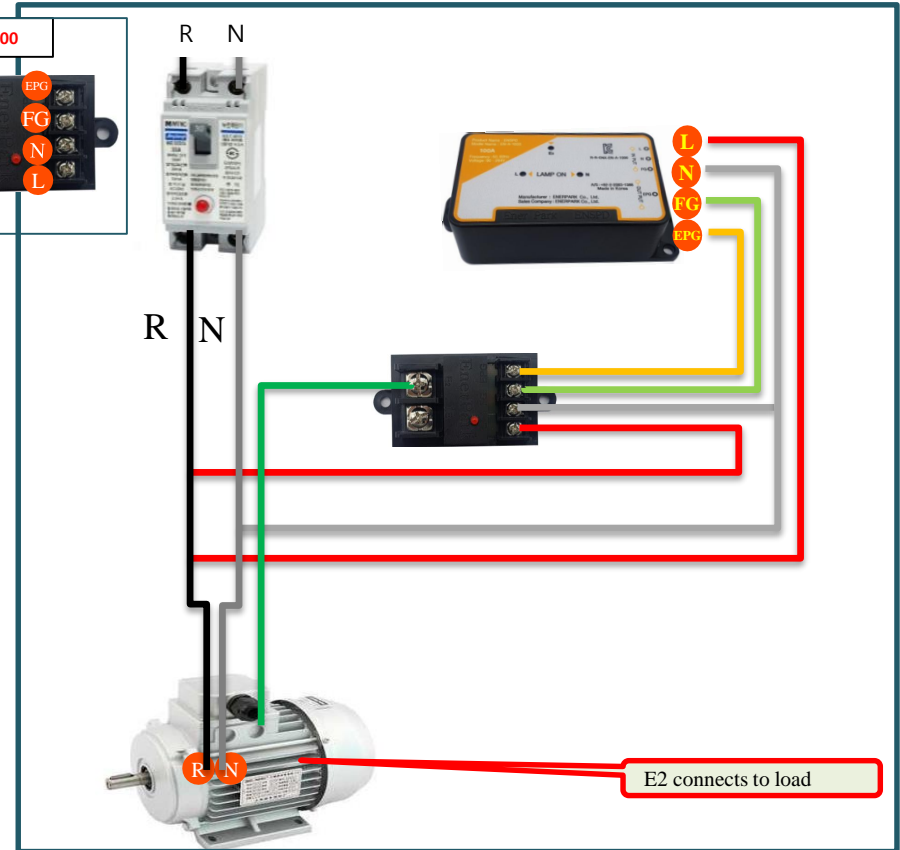


05. Installation Method - in case there is no ground (For shielding leakage current)

❖ Distribution board (1 phase 2-wire system)



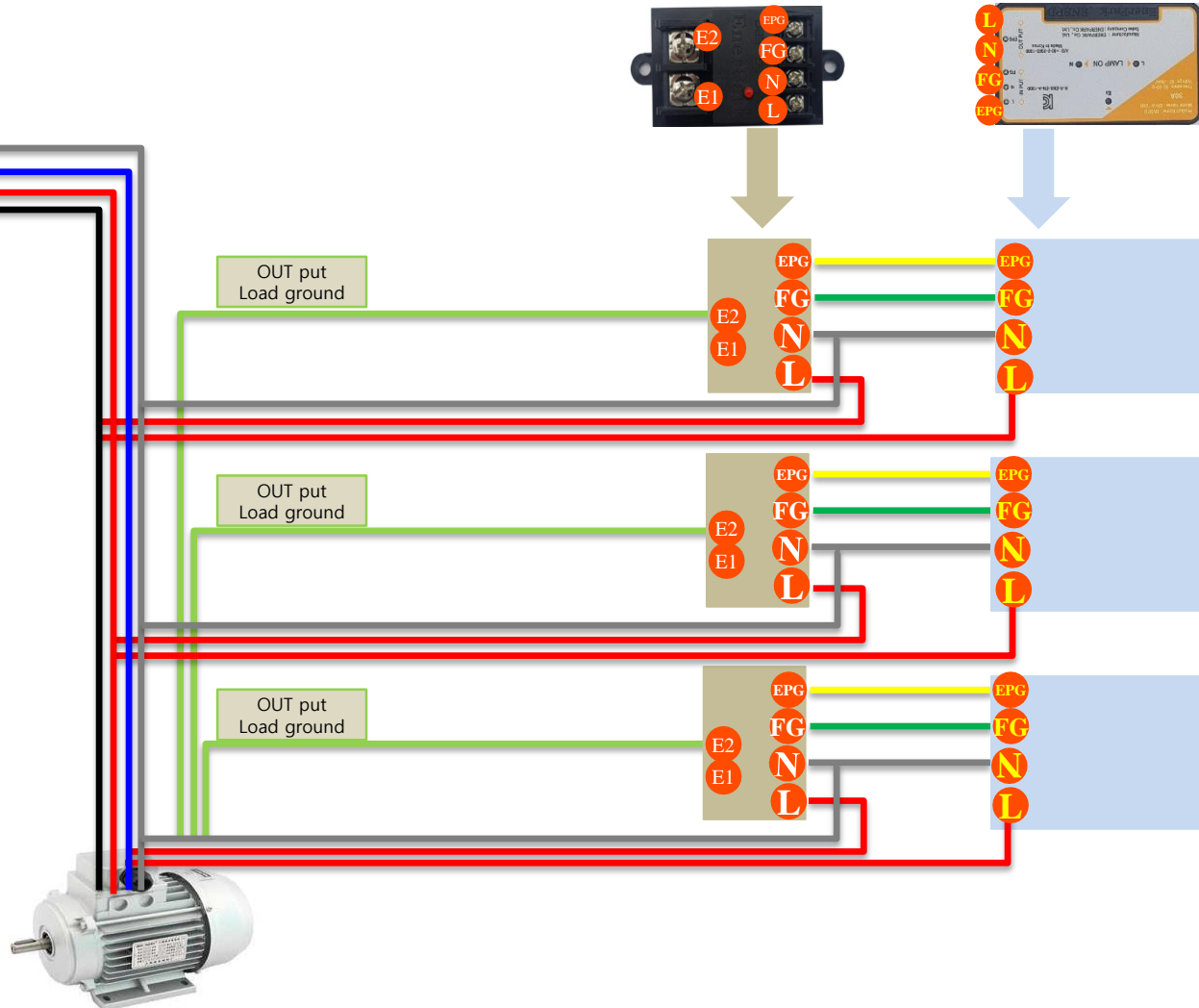
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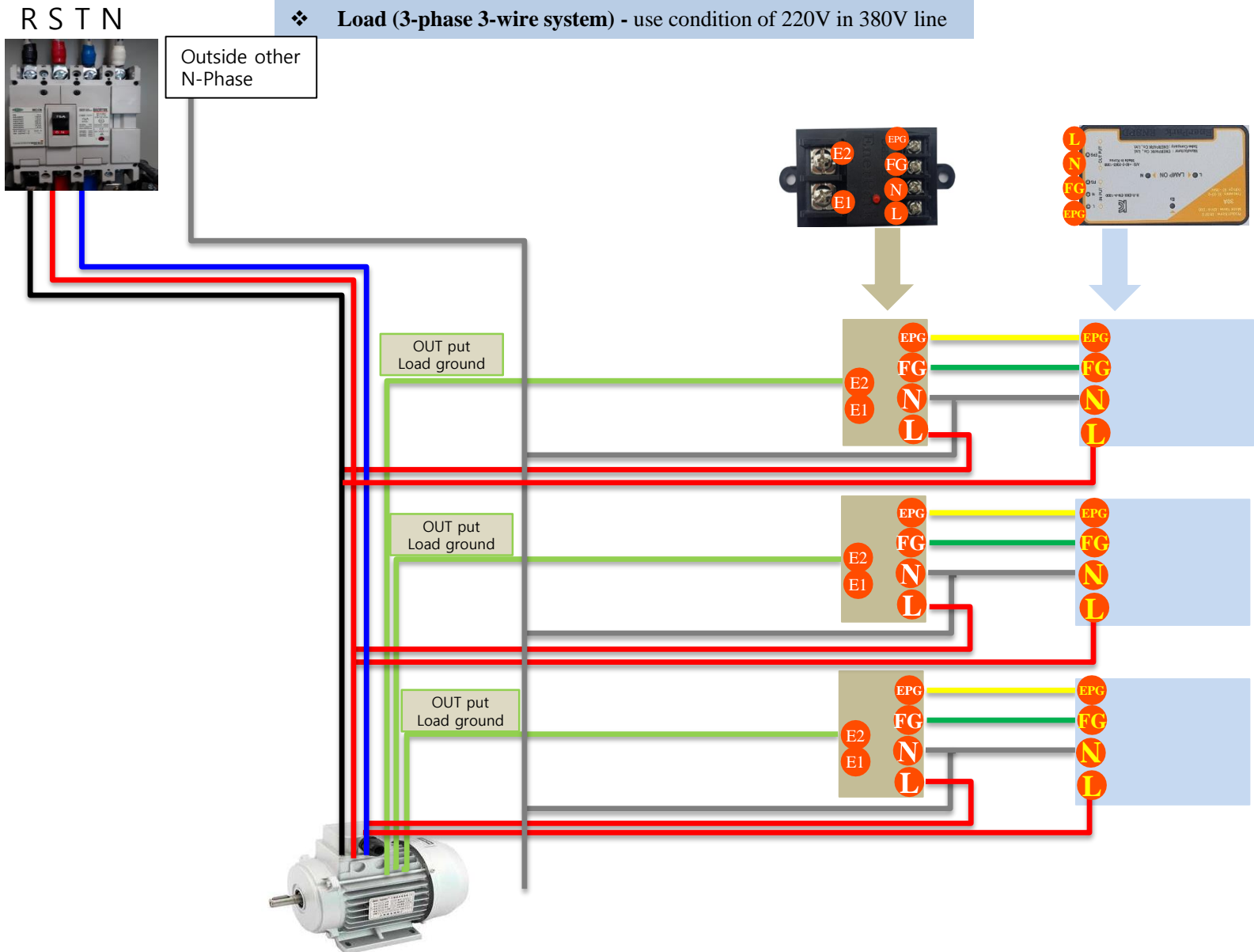
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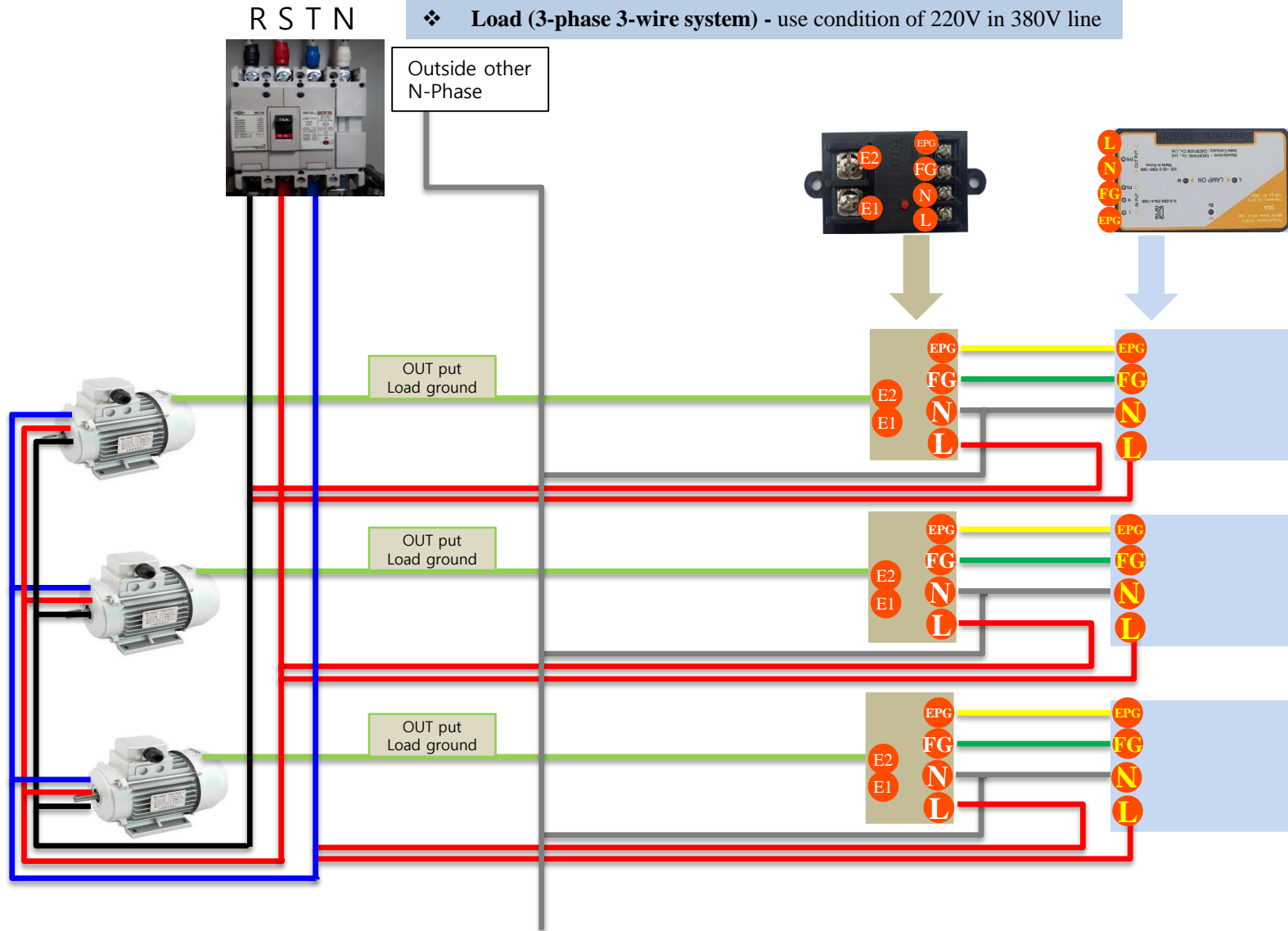


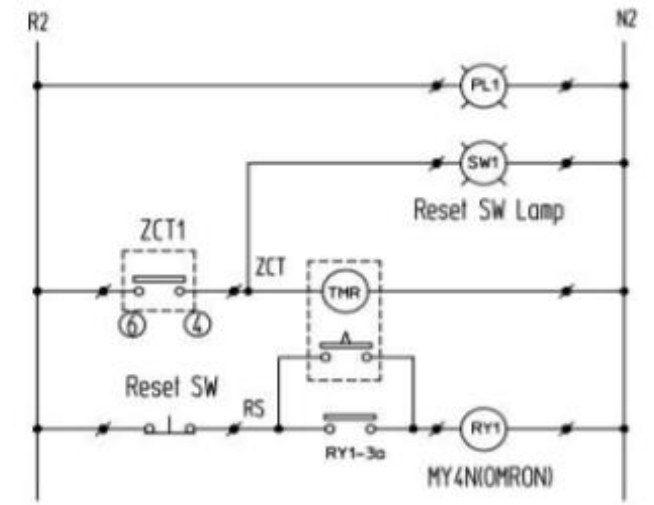
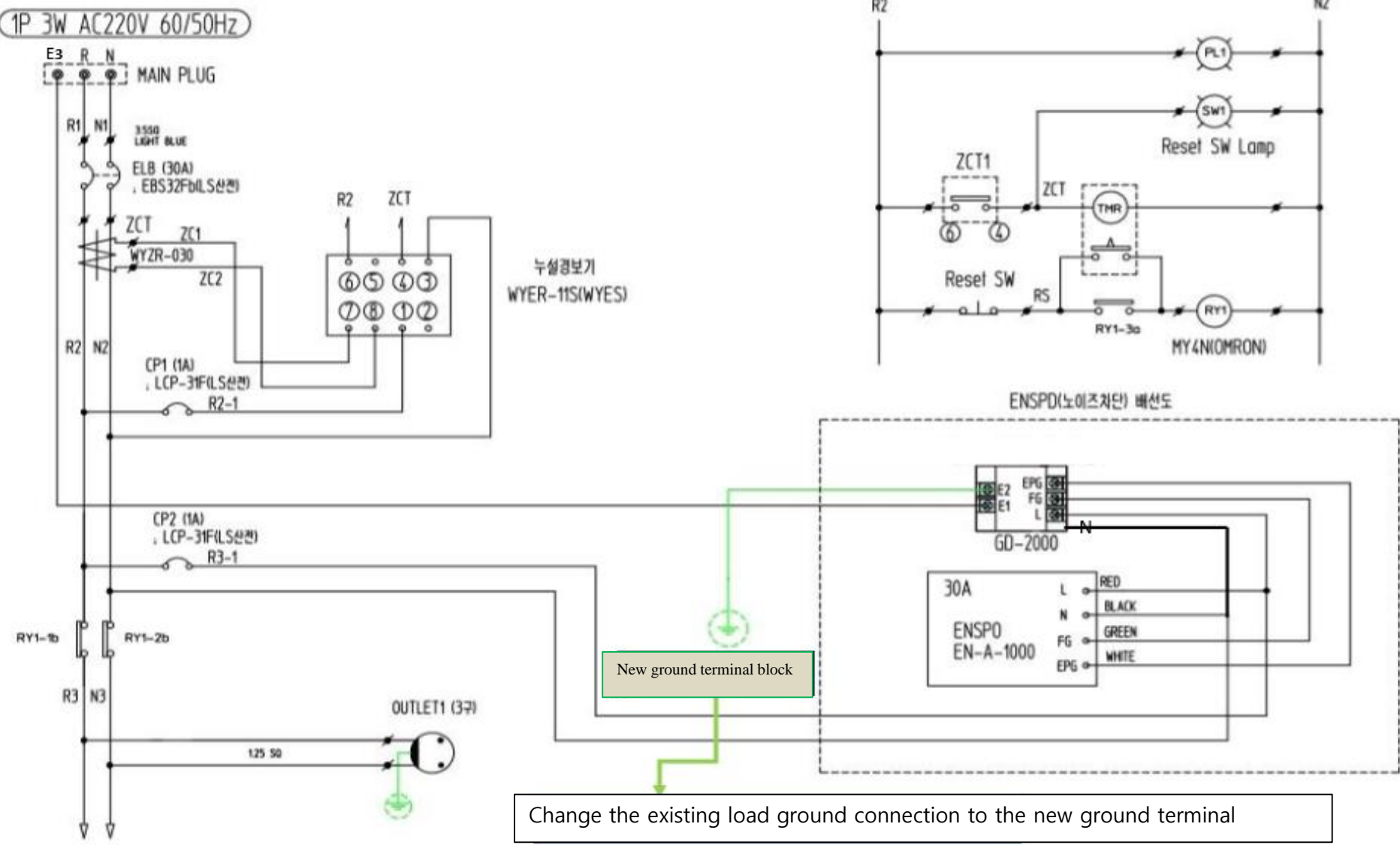
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05. Installation Method - in case there is no ground (For shielding leakage current)







ENERPARK CO., LTD.

B-1110, Sk Technopark, 60, Haan-ro
Gwangmyeong-si, Gyeonggi-do, Republic of Korea
Tel : 02-2083-1388, Fax : 02-2083-1389
E-mail : design66@naver.com

THANK YOU!

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