TECHNICAL BRIEF

Enphase Energy System with FlexPhase planning guide

Applicable regions: Australia, New Zealand

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1. Overview

This guide contains information for site surveyors and design engineers to analyze a site and plan the design and installation of the Enphase Energy System with FlexPhase in Australia and New Zealand. It is not for installation and operation. This document supplements the information in the data sheets, quick install guides (QIGs), and product manuals. The diagrams and information demonstrate system configurations and installations. However, they may not include all additional local standards and regulations applicable to a site.

2. Enphase Energy System overview

All Enphase Energy Systems fall into one of the following groups depending on the energy sources used in a system.

1. Solar-only grid-tied backup-ready system (on-grid).
2. Solar + Battery for grid-agnostic operation (on-grid and backup).
3. Solar + Battery for grid-tied operation (on-grid only).

An IQ System Controller is required for grid-forming systems to provide backup. For grid-tied applications, the Enphase Communications Kit 2 device needs to be used along with the IQ Gateway and IQ Relay.

The following table lists the three use cases supported by Enphase Energy System with IQ Battery 5P with FlexPhase:

Table 1: Enphase Energy System use cases

Energy sources at the site	Description
Solar-only grid-tied backup ready	This configuration is ideal for homeowners who want to go solar and optimize their electricity bill savings. By producing and consuming the electricity generated from their solar plant, homeowners reduce their dependence on the grid and go green. The IQ System Controller installed will allow the system to be battery-ready in the future (with backup).
Solar + Battery grid-agnostic operation (on-grid and backup)	Pairing IQ Microinverters with IQ Batteries and the IQ System Controller, this configuration combines solar and storage to help maximize financial benefits, increase self-consumption, and also provide power backup to the home in the event of a grid outage. Apart from providing power backup, this system configuration saves money by supplying power to home loads, storing energy generated for later use, load shifting with time-of-use (ToU) tariffs, or exporting excess energy back to the grid when permitted.
Battery upgrade (installed on existing PV site)	If a home has an existing Enphase solar PV system, adding IQ Batteries can help maximize financial benefits by storing excess solar power and using this stored energy to power the home once the sun sets.

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3. Product overview

- IQ Series Microinverters and accessories: IQ Series Microinverters pack more power into less space than other rooftop solar systems and make rooftop solar more productive, reliable, smart, and safe.
- IQ Battery 5P: This is an all-in-one single-phase AC-coupled IQ Battery system. It has a total usable energy capacity of 5 kWh with a continuous power rating of 3.84 kW single-phase output.
- IQ Battery 5P with FlexPhase: This is the new FlexPhase version of the IQ Battery 5P, which can be configured as a single-phase or as a three-phase battery depending on site requirements. This also has the same 5 kWh battery capacity, and up to 3.84 kW single-phase or three-phase output. The power and current rating of the battery can be configured between 1.65 kW to 3.84 kW when used in single-phase, and between 1.84 kW and 3.84 kW when used in three-phase. Below, Tables 4 and 5 provide details of the power level selection and model names.
- IQ System Controller 3 INT: The IQ System Controller 3 INT connects the home to the public electricity grid, the IQ Battery 5P storage system, and IQ7 or IQ8 Series Microinverter circuits. It provides automatic transfer switch (ATS) functionality by automatically detecting and transitioning the home energy system from grid power to backup power in the event of a power cut. It consolidates interconnection equipment, IQ Gateway Metered, and IQ Relay functionalities into a single enclosure and streamlines grid-independent capabilities of PV and storage installations by providing a consistent, pre-wired solution, including CTs.
- Enphase Communications Kit 2: This kit enables the IQ Gateway Metered to communicate with the IQ Batteries using wired control (CTRL) communication. It is connected via USB to the IQ Gateway.

4. Product generation and interoperability

Table 2: Product interoperability

Product	S Series	IQ7 Series	IQ8 Series	IQ Battery 5P	IQ Battery 5P with FlexPhase	IQ System Controller 3 INT (for backup)	Communications Kit 2 (for grid-tied)
S Series Microinverters	—	Yes	No[1]	Yes	Yes	Yes	Yes
IQ7 Series Microinverters	Yes	—	Yes	Yes	Yes	Yes	Yes
IQ8 Series Microinverters	No[1]	Yes	—	Yes	Yes	Yes	Yes
IQ Battery 5P	Yes	Yes	Yes	—	Yes	Yes	Yes
IQ Battery 5P with FlexPhase	Yes	Yes	Yes	Yes	—	Yes	Yes
IQ System Controller 3 INT (for backup)	Yes	Yes	Yes	Yes	Yes	—	N/A

[1] The S Series Microinverters are not supported with IQ8 Series Microinverters on the common IQ Gateway. The existing S Series Microinverters can still be on the IQ Gateway, while installing the new IQ8 Series Microinverter on a separate IQ Gateway Metered separately with a suitable PLC line filter.

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Product	S Series	IQ7 Series	IQ8 Series	IQ Battery 5P	IQ Battery 5P with FlexPhase	IQ System Controller 3 INT (for backup)	Communications Kit 2 (for grid-tied)
Communications Kit 2 (for grid-tied)	Yes	Yes	Yes	Yes	Yes	N/A	—

Table 3: Supported and unsupported configurations of the Enphase Energy System with IQ Batteries

Configurations	Products	Compatibility support
Grid-agnostic (on-grid and backup)	S Series + IQ7 Series + IQ System Controller + IQ Battery 5P	Yes, supported for on-grid/grid-tied and backup operation with PV and energy storage
Grid-agnostic (on-grid and backup)	IQ7 Series + IQ8 Series + IQ System Controller + IQ Battery 5P	Yes, supported. The IQ7 Series and IQ8 Series can be connected to the IQ System Controller along with the IQ Battery
Grid-tied (on-grid only)	IQ7 Series + IQ8 Series + IQ Gateway + Communications Kit 2 + IQ Battery 5P	Yes, supported for on-grid/grid-tied operation with PV and energy storage
Grid-agnostic (on-grid and backup)	IQ7 Series + IQ8 Series + IQ System Controller	Yes, supported for on-grid/grid-tied operation with PV only and battery ready
Grid-agnostic (on-grid and backup)	S Series + IQ7 Series + IQ System Controller + IQ Battery 5P with FlexPhase	Yes, supported for on-grid/grid-tied and backup operation with PV and energy storage
Grid-tied (on-grid only)	IQ7 Series + IQ8 Series + IQ Gateway + Communications Kit 2 + IQ Battery 5P with FlexPhase	Yes, supported for on-grid/grid-tied operation with PV and energy storage
Grid-agnostic (on-grid and backup)	IQ7 Series + IQ8 Series + IQ System Controller + IQ Battery 5P with FlexPhase	Yes, supported. The IQ7 Series and the IQ8 Series can be connected to the IQ System Controller along with the IQ Battery
Grid-agnostic (on-grid and backup)	S Series + IQ8 Series + IQ System Controller + IQ Battery 5P	Not supported. The S Series and the IQ8 Series cannot be connected to the IQ System Controller along with the IQ Battery. The S Series can be on a separate IQ Gateway for regular grid-tied operation
Grid-agnostic (on-grid and backup)	S Series + IQ8 Series + IQ System Controller + IQ Battery 5P with FlexPhase	Not supported. The S Series and the IQ8 Series cannot be connected to the IQ System Controller along with the IQ Battery. The S Series can be on a

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Configurations	Products	Compatibility support
		separate IQ Gateway for regular grid-tied operation
Grid-tied (on-grid only)	S Series/IQ7 Series/IQ8 Series + IQ Gateway + Communications Kit 2 + IQ Battery 5P + IQ Battery 5P with FlexPhase	Yes, supported. The mix of IQ Battery 5P and IQ Battery 5P with FlexPhase batteries is supported for grid-tied operation
Grid-agnostic (on-grid and backup)	S Series/IQ7 Series/IQ8 Series + IQ System Controller + IQ Battery 5P + IQ Battery 5P with FlexPhase	Yes, supported. The mix of IQ Battery 5P and IQ Battery 5P with FlexPhase batteries is supported for backup operation

NOTE: The older product, the Enphase AC Battery, is not supported with the new IQ Battery 5P or the IQ Battery 5P with FlexPhase in grid-tied or in backup operation.

NOTE: String inverters are supported in Solar Plus Battery grid-agnostic configuration with the IQ Battery 5P or the IQ Battery 5P with FlexPhase. The string inverter needs to be connected via suitably rated external contactor and configured in the Enphase Installer App to operate normally in on-grid mode and between a specific battery SoC range during off-grid operation.

NOTE: M Series Microinverters not supported in Solar Plus Battery grid-agnostic configuration. In case there are M Series Microinverters at site, it needs to be connected via external contactors to the I/O board of IQ System Controller and configured to be shed/turned off during off-grid operation. Refer to Tech-brief for shedding PV circuits connected to IQ System Controller

5. Design an Enphase Energy System

5.1 System modes

The Enphase Energy System supports the following system modes of operation:

- Self-Consumption: The PV system and battery are optimized to enable maximum self-consumption of energy produced by the PV system. The battery's capacity caters to home loads to minimize energy import from the grid.
- Savings: This profile is for the economic use case wherein the battery discharges when the rates are at the peak and charges using PV before peak tariff periods.
- Full backup: This profile is for providing the single-phase backup power from PV and battery system in the event of a grid outage, the battery would charge from PV and/or from the grid to reserve 100% of the backup capacity. The battery will only discharge in the event of a grid outage. For this mode, the IQ System Controller is a must-have.

5.2 System considerations

Each IQ Battery 5P unit must be connected to the IQ System Controller in a single-phase or three-phase system installation to provide backup power to the home. When designing the

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Enphase Energy System, follow local regulations for system sizing and imbalances with PV and Battery capacities on each phase.

Read each product's quick install guides (QIG) for detailed information about installing the IQ Microinverter and the IQ Battery system at the Enphase documentation center.

5.2.1 Supported grid supply types

This section covers the type of grid supplies supported with the Enphase Energy System and focuses on the way a grid-agnostic system (backup with IQ System Controller) can be installed and wired for those grid supplies.

1. **Single phase 230 V L-N 50 Hz**: The 3-wire grid supply (L1-N-PE) can be wired to the IQ System Controller grid input, and the PV can be wired on the respective PV L1-N lugs on the IQ System Controller. The IQ Battery 5P or the IQ Battery 5P with FlexPhase configured as single-phase can be wired to the battery L1-N lugs on the IQ System Controller. Both types of batteries, IQ Battery 5P and IQ Battery 5P with FlexPhase, can be supported together at the site, wired on the common battery L1-N of the IQ System Controller. Refer to the system wiring SLDs in section 5.4
2. **Three-phase 400 V L-L/230 V L-N 50 Hz**: The 5-wire grid supply (L1-L2-L3-N-PE) can be wired to the IQ System Controller grid input, and the PV can be wired on the respective PV L1, L2, L3, and N lugs on the IQ System Controller. The IQ Battery 5P with FlexPhase, configured as three-phase, can be wired to the Battery L1, L2, L3, and N lugs on the IQ System Controller. The single-phase IQ Battery 5P can also be wired to the L1-N lugs of the IQ System Controller at the same site. Refer to the system wiring SLDs in section 5.4, and system sizing guidelines in section 5.3.1 for expected system functionality in case of a mixed battery system (IQ Battery 5P and IQ Battery 5P with FlexPhase together at a 3-phase site)
3. **Two-phase 230 V L-N 50 Hz**: The 4-wire grid supply (L1-L2-N-PE) can be wired to the IQ System Controller grid input, and the PV can be wired on the respective PV L1, L2, and N lugs on the IQ System Controller. Please bridge/connect the L2 and L3 lugs of the grid input in the IQ System Controller for smooth operation of the system. The IQ Battery 5P with FlexPhase can be configured as single-phase and wired to the battery L1 and N lugs on the IQ System Controller only. The single-phase IQ Battery 5P can also be wired to the L1-N lugs of the IQ System Controller at the same site. Refer to the system wiring SLDs in section 5.4, and system sizing guidelines in section 5.3 for expected system functionality.

5.2.2 Configuring the IQ Battery 5P with FlexPhase

1. The IQ Battery 5P with FlexPhase can be configured as a single-phase battery or as a three-phase battery, depending on site requirements. The jumper on the terminal block of the battery can be used when wired as single phase, and needs to be removed to wire the battery as a three-phase device. Refer to the IQ Battery 5P with FlexPhase quick install guide for more details on jumper connection/disconnection.
2. The power nameplate rating of the IQ Battery 5P with FlexPhase can be chosen at the time of commissioning the battery from the available options given in Tables 4 and 5 below. By default, the power rating is 3.84 kW for single-phase as well as three-phase. The model names corresponding to the chosen power rating need to be selected on the additional label provided with the IQ Battery 5P with FlexPhase and pasted on the main label. Refer to the QIG for more details.
3. The maximum conductor size compatible with IQ Battery 5P with FlexPhase is 10 mm^2 (without ferrule) in single-phase and three-phase configurations. Follow all local standards and regulations while selecting the AC circuit breakers and the conductors.

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Table 4: IQ Battery 5P with FlexPhase model names, power ratings, and sizing limits for single phase

Model name	Power kW	Current (A)	Maximum number of units in a daisy chain 'X'	Recommended 1-pole breaker rating for a single unit (A)	Max 1-pole breaker rating for 'X' units daisy chained (A)	Recommended number of units per single-phase IQ Relay (For grid-tied application only)
IQBATTERY-5P-3P-INT-1.65-1P	1.65	7.17	4	10	40	2
IQBATTERY-5P-3P-INT-2.50-1P	2.50	10.87	3	16	40	1
IQBATTERY-5P-3P-INT-3.00-1P	3.00	13.04	2	16	40	1
IQBATTERY-5P-3P-INT-3.68-1P	3.68	16	2	20	40	1
IQBATTERY-5P-3P-INT-3.84-1P	3.84	16.7	2	20	40	1

Table 5: IQ Battery 5P with FlexPhase model names, power ratings, and sizing limits for three-phase

Model name	Power kW	Per phase current (A)	Maximum number of units in a daisy chain 'X'	Recommended 3-pole breaker rating for a single unit (A)	Max 3-pole breaker rating for a 'X' units daisy chained(A)	Recommended number of units per three-phase IQ Relay (For grid-tied application only)
IQBATTERY-5P-3P-INT-1.84-3P	1.84	2.67	10	6	32	8
IQBATTERY-5P-3P-INT-2.50-3P	2.50	3.62	7	6	32	6
IQBATTERY-5P-3P-INT-3.00-3P	3.00	4.35	6	6	32	5
IQBATTERY-5P-3P-INT-3.68-3P	3.68	5.33	5	10	40	4

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Model name	Power kW	Per phase current (A)	Maximum number of units in a daisy chain 'X'	Recommended 3-pole breaker rating for a single unit (A)	Max 3-pole breaker rating for a 'X' units daisy chained(A)	Recommended number of units per three-phase IQ Relay (For grid-tied application only)
IQBATTERY-5P-3P-INT-3.84-3P	3.84	5.56	5	10	40	4

5.2.3 Site installation types

1. For all new grid-tied backup-ready installations with IQ Microinverters, installers are suggested to procure the IQ System Controller and connect the IQ Microinverter to designated PV terminals via the IQ Cables. Separate IQ Gateway, CTs, and IQ Relay are not required as these products are integrated inside the IQ System Controller itself. IQ Batteries can be added to the designated battery terminals in the future to provide backup to the house.
2. For all new grid-agnostic system (on-grid and backup) installations, installers are required to procure the IQ Microinverters, IQ Battery, and the IQ System Controller and connect as per the wiring diagrams shown in the section below.
3. For retrofitting an IQ Battery to an existing IQ Microinverter PV-only system for backup, installers are required to remove the existing IQ Gateway, IQ Relay, Production CT, and Consumption CTs from the site. The IQ Microinverter can be directly connected to the designated terminals in the IQ System Controller via the IQ Cables for all three phases; similarly, the IQ Battery can be connected to the battery terminals in the IQ System Controller to provide backup to loads connected on respective phases.
4. For adding a new Enphase Energy System with IQ Microinverter, IQ Battery and IQ System Controller at an existing site where an IQ Microinverter PV-only system is installed, having separate standalone IQ Gateway of its own, the installer needs to connect a suitable PLC filter with the older standalone IQ Gateway to avoid cross-talk with the new IQ Gateway integrated in the IQ System Controller.
5. In the grid-agnostic system with IQ System Controller, for monitoring the consumption of all home loads (backup and non-backup both) and for best system performance to support during on-grid operation, it is recommended to wire all the home loads through the designated backup and non-backup loads terminals in the IQ System Controller, as the Consumption CTs are pre-wired in the unit.
6. The production breaker (MCB) shall be sized according to the PV and battery system installed at the site to accommodate all the downstream breakers.
7. Any system with an IQ Battery installed must have Wi-Fi or Ethernet-based internet connectivity. Without an internet connection, Enphase will not be able to provide timely support, which can invalidate the warranty. The cell modem integrated within the IQ System Controller is to provide a backup internet connection in case the primary internet (Wi-Fi or Ethernet) is not available.
8. In order to correctly do the neutral wiring in the grid-agnostic system with IQ System Controller, refer to - IQ System Controller neutral wiring tech brief

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5.3 System sizing guidelines

When sizing the PV and battery system for on-grid and backup operation, the following considerations on the limits to be followed.

1. The Enphase Energy System with FlexPhase can provide backup to all three-phase loads, as well as single-phase loads connected to the designated L1, L2, and L3 backup load terminal in the IQ System Controller when using the IQ Battery 5P.
2. The total backup loads that can be supported with the Enphase Energy System are 64 A. Installers should not connect loads more than 64 A to the backup terminal; excess loads need to be connected on the non-backup terminals, which would lose power in case of a grid outage.
3. When running grid-tied or on-grid operation, the total PV and battery system can support all the backup and non-backup loads connected on the designated terminals in the IQ System Controller.
4. For higher energy strorage capacity installation more than 20kWh up to 50kWh at a site, refer to the tech brief on Space-optimized layouts for IQ Battery 5P to understand how IQ Batteries can be installed.
5. For the Enphase Energy System of IQ Battery and IQ System Controller with S Series/IQ7 Microinverter, the ratio of PV power (in kW) to battery power (in kW) should not cross 1.5. When IQ8 Series Microinverters are used in the system, this limit will be 2.

For a system having a mix of IQ Battery 5P and IQ Battery 5P with FlexPhase and a three-phase grid supply, for the battery power mentioned above, consider the power only from the IQ Battery 5P with FlexPhase.

The table mentions the various limits of PV capacity that can be connected with the number of IQ Batteries (IQ Battery 5P or IQ Battery 5P with FlexPhase). In case there is excess PV capacity installed at the site exceeds the limit, then the additional PV strings need to be connected via a suitably rated external contactor and configured in the Enphase Installer App to be shed during off-grid operation.

With this method, the excess PV microinverter string (grid-connected) will function normally in on-grid mode and will be disconnected when the IQ System Controller 3 INT transitions into backup mode. Refer to the tech brief on How to wire excess PV to shed during off-grid operation.

Table 6: System sizing with IQ7/S Series Microinverters and IQ Batteries

Battery count	Total energy capacity (kWh)	Total battery power[2] (kW)	Max supported PV with IQ7/S Series Microinverters (kW)	Maximum daytime backup power capability (kW)	Maximum night-time backup power capability (kW)
1	5	3.84	5.76	9.6	3.84
2	10	7.68	11.52	19.2	7.68
3	15	11.52	17.28	28.8	11.52
4	20	15.36	23.04	38.4	15.36

[2] For a three-phase system with IQ Battery 5P and IQ Battery 5P with FlexPhase together, consider the power of IQ Battery 5P with FlexPhase batteries only.

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Battery count	Total energy capacity (kWh)	Total battery power[2] (kW)	Max supported PV with IQ7/S Series Microinverters (kW)	Maximum daytime backup power capability (kW)	Maximum night-time backup power capability (kW)
5	25	19.2	28.8	48	19.2
6	30	23.04	34.56	57.6	23.04
7	35	26.88	40.32	67.2	26.88
8	40	30.72	46.08	76.8	30.72
9	45	34.56	51.84	86.4	34.56
10	50	38.4	57.6	96	38.4

Table 7: System sizing with IQ8 Microinverters and IQ Batteries

Battery count	Total energy capacity (kWh)	Total battery power[3] (kW)	Max supported PV with IQ8 Microinverters (kW)	Maximum daytime backup power capability (kW)	Maximum night-time backup power capability (kW)
1	5	3.84	7.68	11.52	3.84
2	10	7.68	15.36	23.04	7.68
3	15	11.52	23.04	34.56	11.52
4	20	15.36	30.72	46.08	15.36
5	25	19.2	38.4	57.6	19.2
6	30	23.04	46.08	69.12	23.04
7	35	26.88	53.76	80.64	26.88
8	40	30.72	61.44	92.16	30.72
9	45	34.56	69.12	103.68	34.56
10	50	38.4	76.8	115.2	38.4

5.3.1 System sizing for mixed battery sites

In case of a mixed battery system at a grid-agnostic site, i.e., having IQ Battery 5P and IQ Battery 5P with FlexPhase together at the site (backup with IQ System Controller 3 INT), the following system sizing and wiring considerations have to be taken into account.

[2] For a three-phase system with IQ Battery 5P and IQ Battery 5P with FlexPhase together, consider the power of IQ Battery 5P with FlexPhase batteries only.
[3] For a three-phase system with IQ Battery 5P and IQ Battery 5P with FlexPhase together, consider the power of IQ Battery 5P with FlexPhase batteries only.

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1. The IQ Battery 5P with FlexPhase can now be installed at sites that have IQ Battery 5P. The following points should be considered in planning such a system for a single-phase site.
   - IQ Battery 5P with FlexPhase can be added as a single-phase battery to an existing single-phase site having IQ Battery 5P. The power derating of the IQ Battery 5P with FlexPhase offers extended backup time capability without changing site architecture, and total battery power (kW) can be within the allowed interconnection limit.
   - IQ Battery 5P with FlexPhase can be added as single phase battery on L1, to an existing three-phase site having IQ Battery 5P on L1 phase. This can be useful for customers who need more backup capacity on the L1 phase; the derating feature of the IQ Battery 5P with FlexPhase will be useful in this case as well.
   - The IQ Battery 5P and IQ Battery 5P with FlexPhase can share a common circuit breaker in this case, when appropriately rated as per the current ratings.
2. At a three-phase site, where IQ Battery 5P is wired on L1 offering single-phase backup, adding IQ Battery 5P with FlexPhase as a three-phase battery will enable three-phase backup at the site. The considerations in such a case are:
   - Only FlexPhase batteries form the three-phase microgrid, and the IQ Battery 5P provides only extended backup time on L1 with more energy capacity, but does NOT add to the backup power possible on L1 phase.
   - If there is more than one IQ Battery 5P on the L1 phase, the recommended way is NOT to distribute and rewire those units on other phases and leave the units wired on L1-N only.
   - Recommended to have the IQ Battery 5P on a 1-pole breaker, and the IQ Battery 5P with FlexPhase on a separate 3-pole circuit breaker, both suitably rated as per the current rating of the batteries.
   - For sizing backup loads on each phase, only the power available from the total IQ Battery 5P with FlexPhase batteries should be considered (1.28kW per FlexPhase per phase). Examples of supported and unsupported system given in the table below.
   - Consider only the IQ Battery 5P with FlexPhase power one each phase to calculate the PV power (kW) to Battery power (kW) ratio, and meet the requirements in Table 5a and 5b in the System sizing requirements section above.

Table 8: Unsupported system sizing

Phase	On L1 phase (kW)	On L2 phase (kW)	On L3 phase (kW)
2 × IQ Battery 5P on L1	7.68	0	0
1 × IQ Battery 5P with FlexPhase on L1, L2, L3	1.28	1.28	1.28
Total load demand in backup	2.0	1.0	1.0
Reasoning	The load demand on L1 is more than what the IQ Battery 5P with FlexPhase can support in backup, hence the microgrid will be unstable.		

Table 9: Supported System sizing

Phase	On L1 phase (kW)	On L2 phase (kW)	On L3 phase (kW)
2 × IQ Battery 5P on L1	7.68	0	0
2 × IQ Battery 5P with FlexPhase on L1, L2, L3	2.56	2.56	2.56
Total load demand in backup	2.0	1.0	1.0

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Phase	On L1 phase (kW)	On L2 phase (kW)	On L3 phase (kW)
Reasoning	The load demand is within the power limit of what the IQ Battery 5P with FlexPhase can support, microgrid can be supported.		

In case of a mixed battery system at a grid-tied site, i.e., having IQ Battery 5P and IQ Battery 5P with FlexPhase together at the site (with IQ Gateway and Communications Kit 2), there is no such restriction on system sizing.

5.3.2 System sizing for two-phase sites

1. For two phase grid supplies mentioned in section 5.2.1 above, the Enphase Energy System can provide single-phase backup only on L1-N phase, with IQ Battery 5P or IQ Battery 5P with FlexPhase connected on L1-N phase only. The PV can produce on L1 and L2 phases when grid-connected, but during off-grid, PV and battery connected only on L1-N phase will give single-phase backup to the site.
2. Please ensure the grid input wiring to the IQ System Controller is done by connecting the L1, L2, N, and E from the grid to the marked grid terminals, and the L2 and L3 terminals are bridged/shorted for smooth system operation.

5.4 System wiring diagrams

As a reference for electrical symbols, refer to the following legend to comprehend the system diagrams better. The following sample Enphase Energy System diagrams help you design your PV and storage systems.

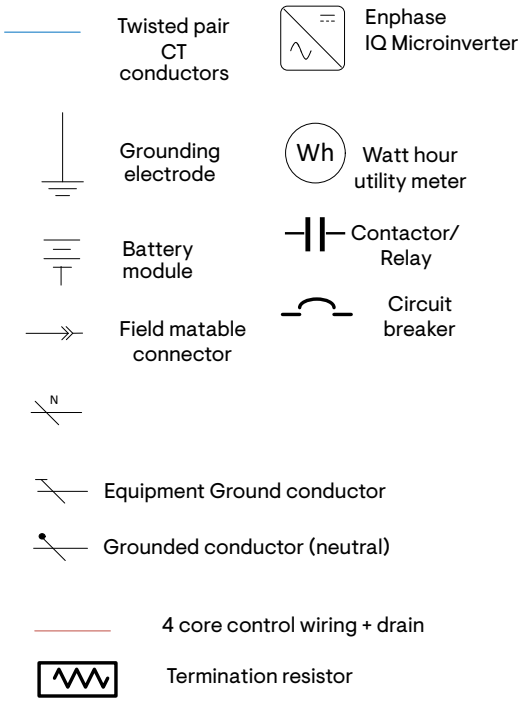


Figure 1: Legends

The following sample Enphase Energy System diagrams will help you design your PV and storage systems.

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5.4.1 Solar PV-only backup-ready

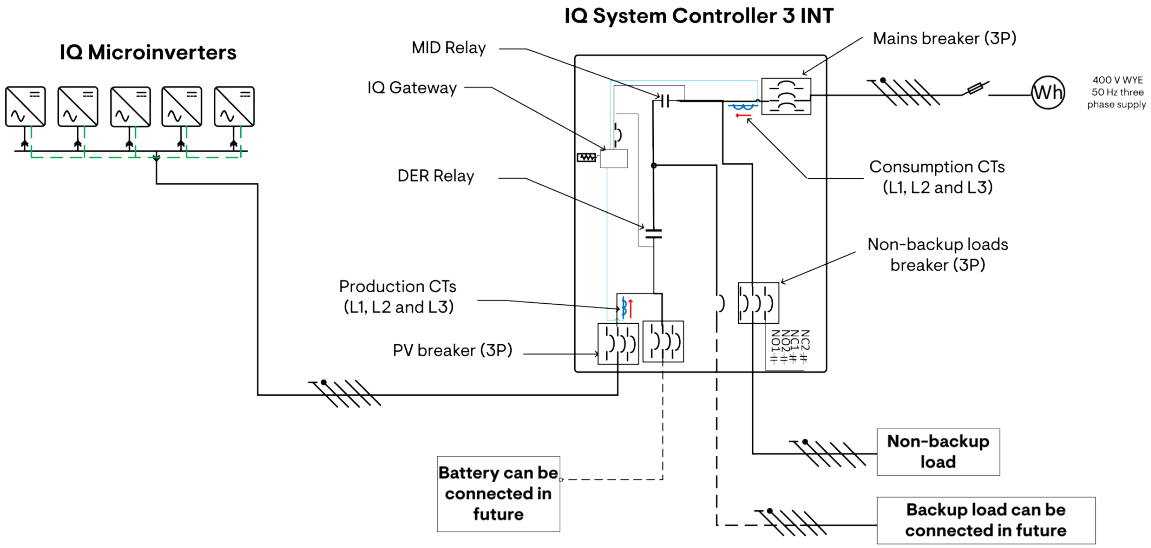


Figure 2: Three-phase S/IQ7/IQ8 Series PV-only backup-ready system diagram

5.4.2 Solar PV + Battery grid-tied system: Three-phase S/IQ7/IQ8 Series Microinverter and IQ Battery 5P with FlexPhase as a three-phase

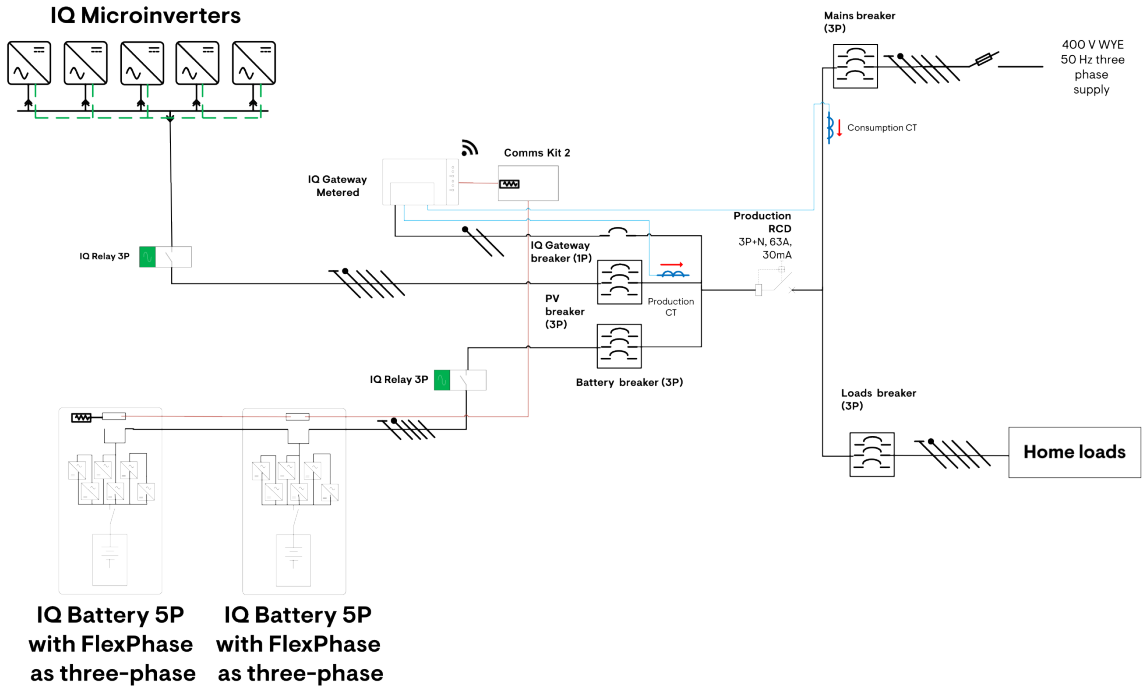


Figure 3: Three-phase S/IQ7/IQ8 Series and IQ Battery 5P with FlexPhase grid-tied system

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5.4.3 Solar PV + Battery grid-tied system: Single-phase S/IQ7/IQ8 Series Microinverter and IQ Battery 5P with FlexPhase as single-phase and IQ Battery 5P (optional)

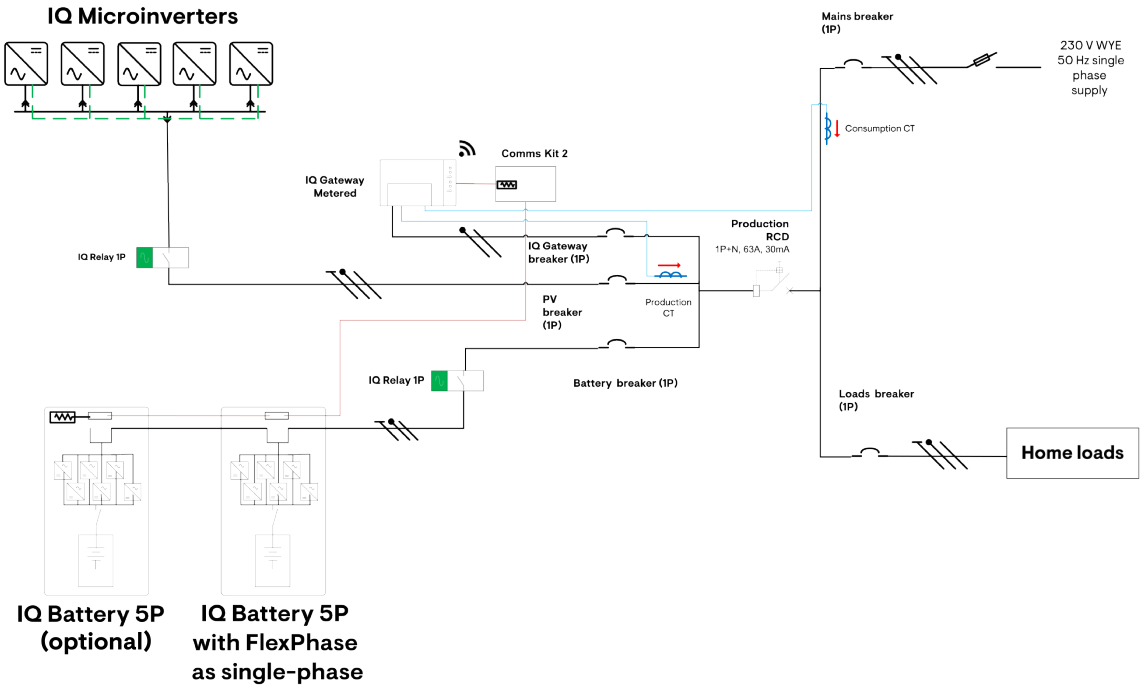


Figure 4: Single-phase S/IQ7/IQ8 Series and IQ Battery 5P with FlexPhase grid-tied system

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5.4.4 Solar PV + Battery whole home backup: Single-phase S/IQ7/IQ8 Series Microinverter and IQ Battery 5P with FlexPhase as single-phase and IQ Battery 5P (optional)

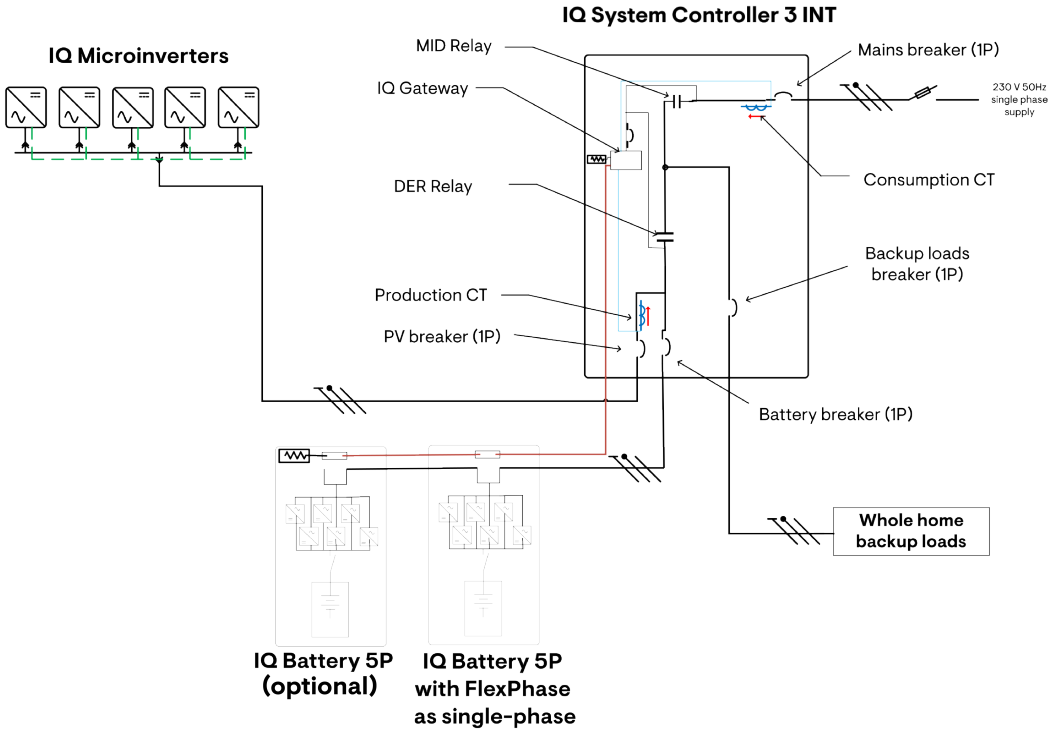


Figure 5: Single-phase IQ7/IQ8 Series Microinverter and IQ Battery 5P system diagram for whole home backup

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5.4.5 Solar PV + Batteries in partial home backup: Single-phase IQ7/IQ8 Series Microinverter and IQ Battery 5P with FlexPhase as single-phase and IQ Battery 5P (optional)

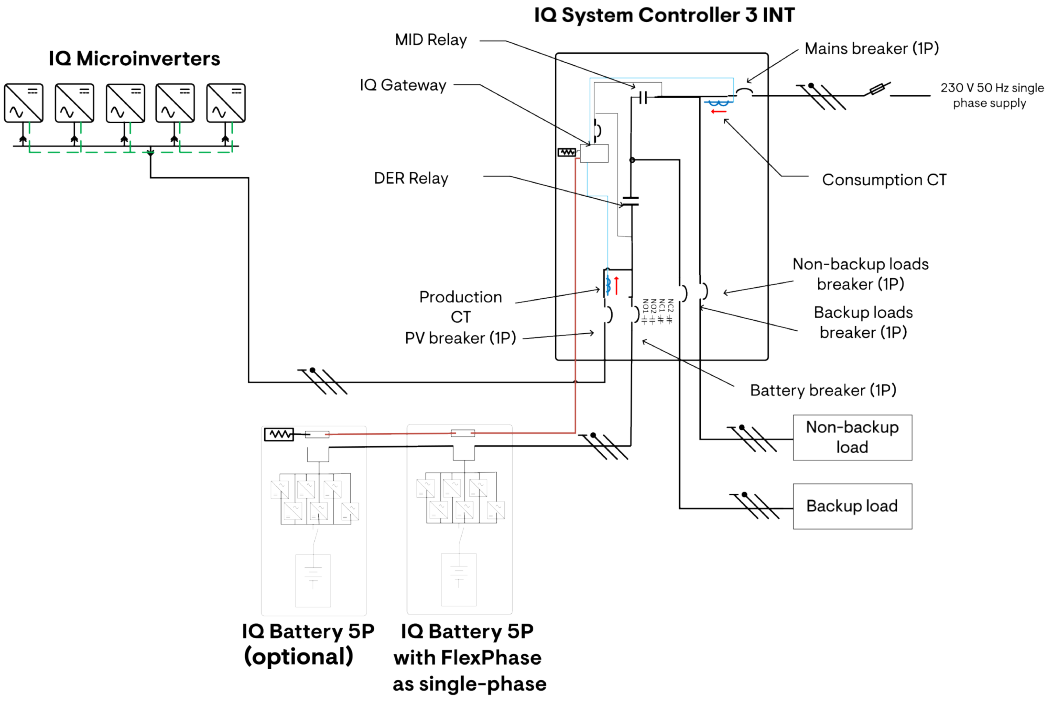


Figure 6: Single-phase IQ7/IQ8 Series PV and IQ Battery 5P system diagram in partial home backup

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5.4.6 Solar PV + Battery grid-agnostic system: Three-phase IQ7/IQ8 Series Microinverter and IQ Battery 5P with FlexPhase as three-phase

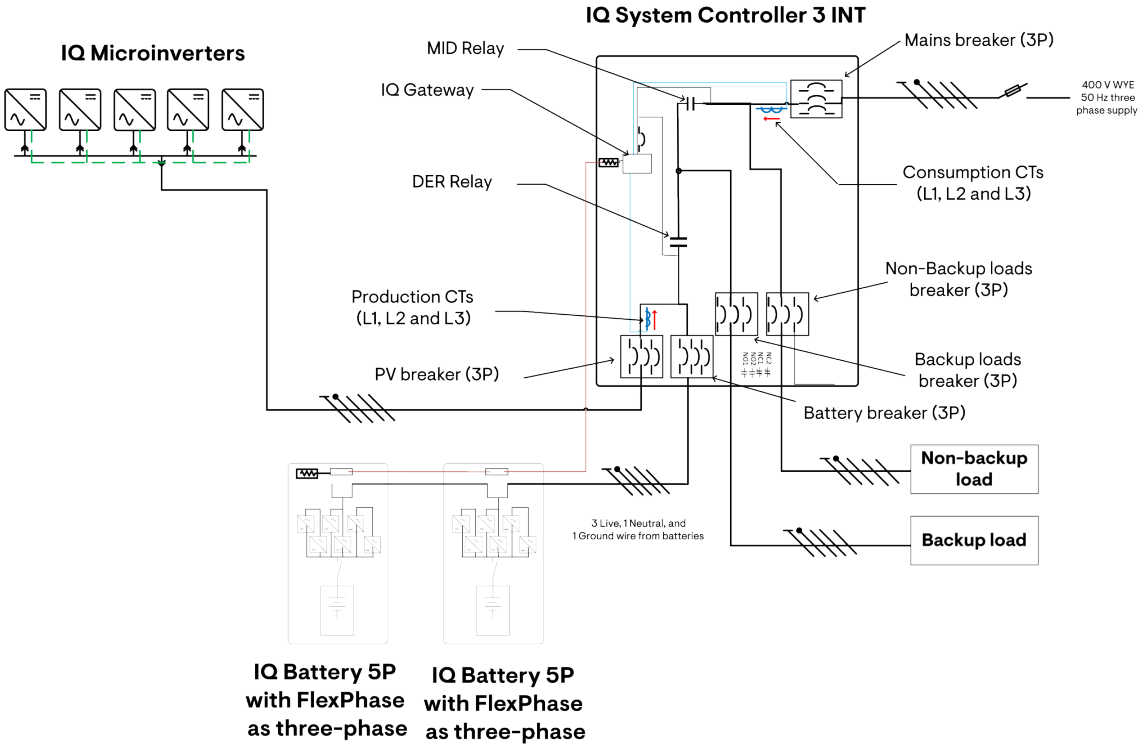


Figure 7: Three-phase IQ7/IQ8 Series PV and IQ Battery 5P system diagram for a three-phase supply

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5.4.7 Solar PV + Battery grid-agnostic system: Three-phase IQ7/IQ8 Series Microinverter with IQ Battery 5P single-phase and IQ Battery 5P with FlexPhase as three-phase

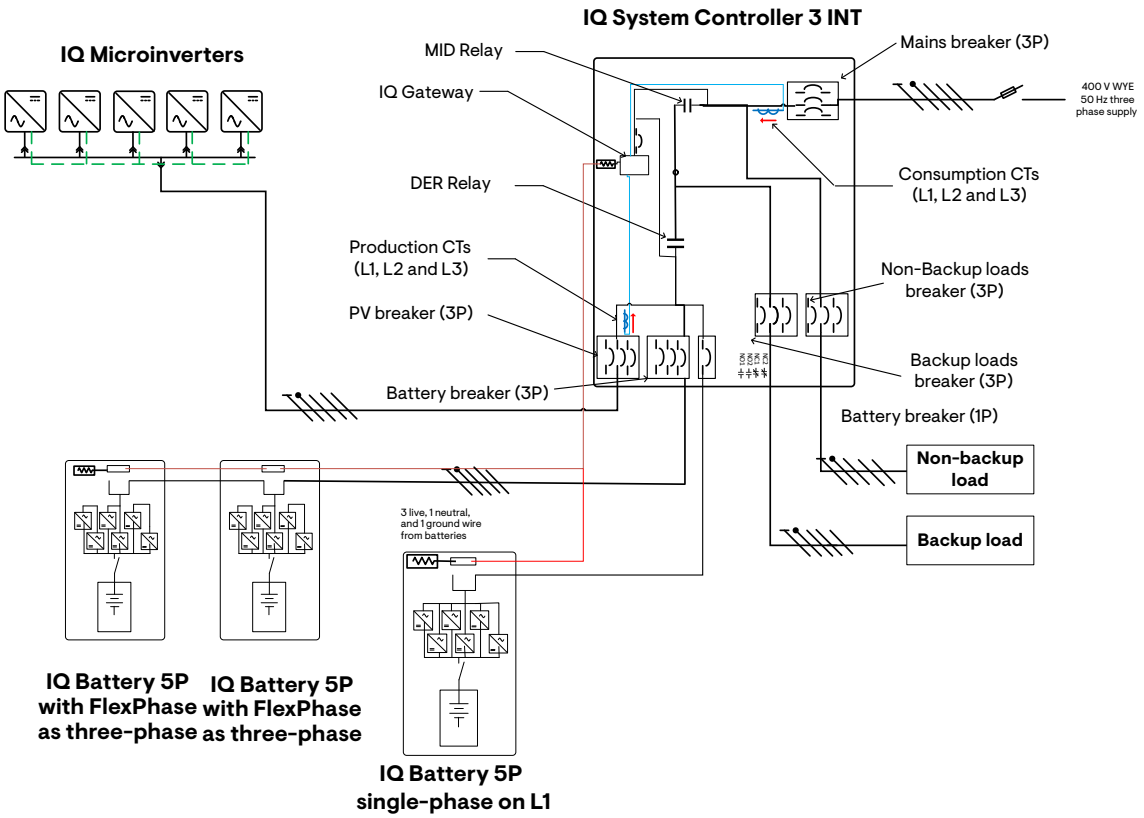


Figure 8: Three-phase IQ7/IQ8 Series Microinverters with IQ Battery 5P single-phase and IQ Battery 5P with FlexPhase system diagram for a three-phase supply

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5.4.8 Solar PV + Battery grid-agnostic system: Two-phase IQ7/IQ8 Series Microinverter and IQ Battery 5P with FlexPhase as single-phase and IQ Battery 5P (optional)

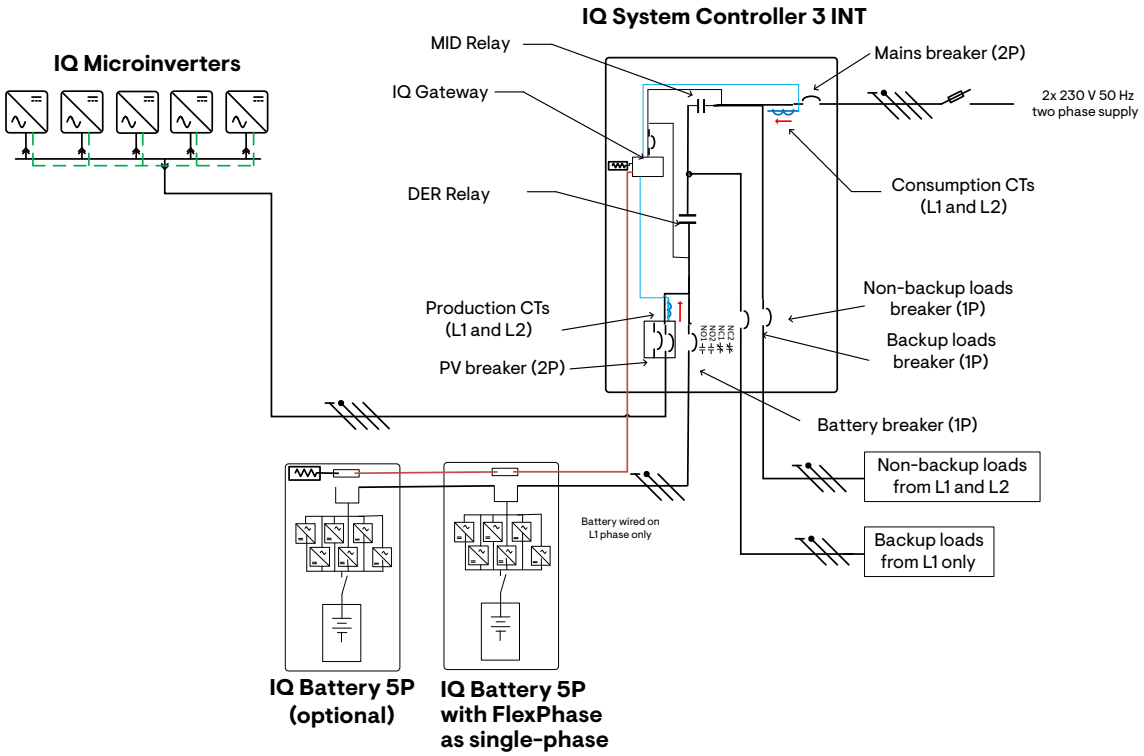


Figure 9: Two-phase IQ7/IQ8 Series Microinverters with IQ Battery 5P and IQ Battery 5P with FlexPhase system diagram for a two-phase supply

6. Control wiring

An Enphase Energy System communicates over a wired communications interface and needs control wiring between the IQ System Controller (for grid-agnostic sites) or the Communications Kit 2 (for grid-tied sites) and the IQ Battery 5P via a control communication cable. This control communication cable needs to be procured by the installer from the distributor or local market of the length as needed at the site, with a maximum limit of 100 m.

The following table lists the make and specification of the supported control communication cable for the Enphase system. The use of non-approved cables can result in issues with system performance.

Table 10: Enphase Energy tested control communication cables compatible with IQ Battery 5P

Country	Manufacturer	Model	Control header terminal	CTRL signal	Electra wire designation	LAPP wire designation
India	1. Electra 2. LAPP	1. EAS7302PHV 2. LAPP 1270802	Screw terminal 1	CTRL low	Twisted pair - 1 - Black/Blue	Twisted pair 1 - Black
			Screw terminal 2	CTRL high	Twisted pair - 1 - White	Twisted pair - 1 - White

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Country	Manufacturer	Model	Control header terminal	CTRL signal	Electra wire designation	LAPP wire designation
			Screw terminal 3	CTRL ground	Twisted pair - 2 - Black/Blue	Twisted pair - 2 - Black
			Screw terminal 4	N/A	Twisted pair - 2 - White	Twisted pair - 2 - White

The following figure shows the guidance for correctly stripping the control (CTRL) cable.

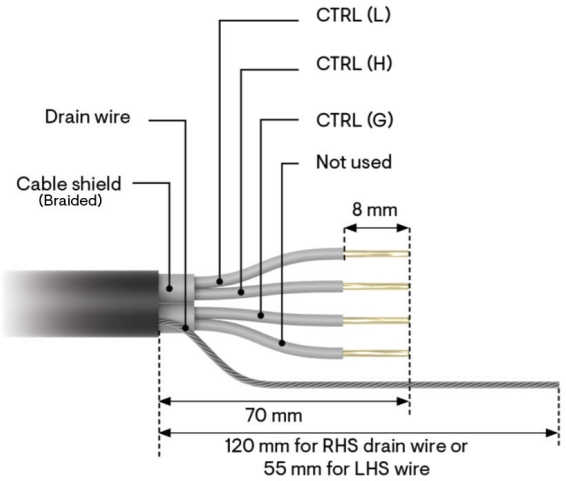


Figure 10: Control cable wire stripping illustration

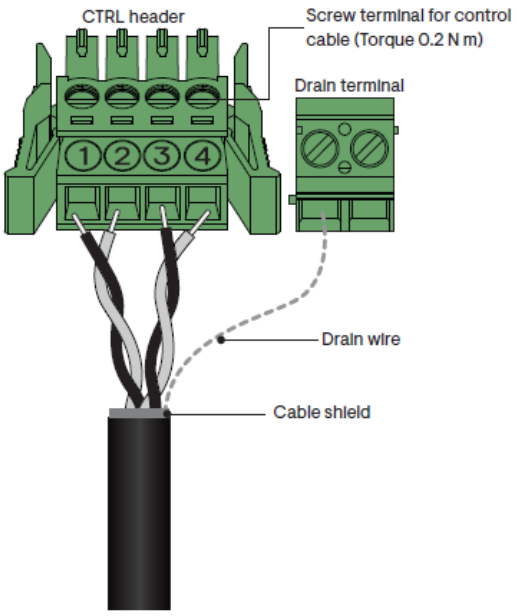


Figure 11: Control cable wire landing illustration

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6.1 Control wiring guidance for installing IQ Battery 5P with IQ System Controller 3 INT or the Communications Kit 2 INT

Refer to the following wiring scenarios to understand the position of the header with termination resistor, wiring order, and drain wire termination location.

NOTE: Control wiring will be the same for the IQ Battery 5P or the IQ Battery 5P with FlexPhase. For this section, IQ Battery 5P represents both types of batteries.

NOTE: To ensure optimal system performance, the total length of the control wiring across the system must not exceed 100 m.

NOTE: Follow the guidelines to avoid failures during system commissioning:

- Each component at the extreme end of the control network should have one header with a termination resistor installed.
- The drain wire should be terminated only at one end of each control wiring section or length. Figures 10 and 12 show two runs of the control cable, one for each IQ Battery 5P, and show drain wires connected only at one end for each cable run.
- It is recommended that the drain wire be terminated at the component from which the section's control wiring is initiated.

The following are the wiring sequences of the IQ Battery 5P with the IQ System Controller 3 INT:

6.1.1 Sequence 1: IQ Battery 5P – IQ System Controller 3 INT

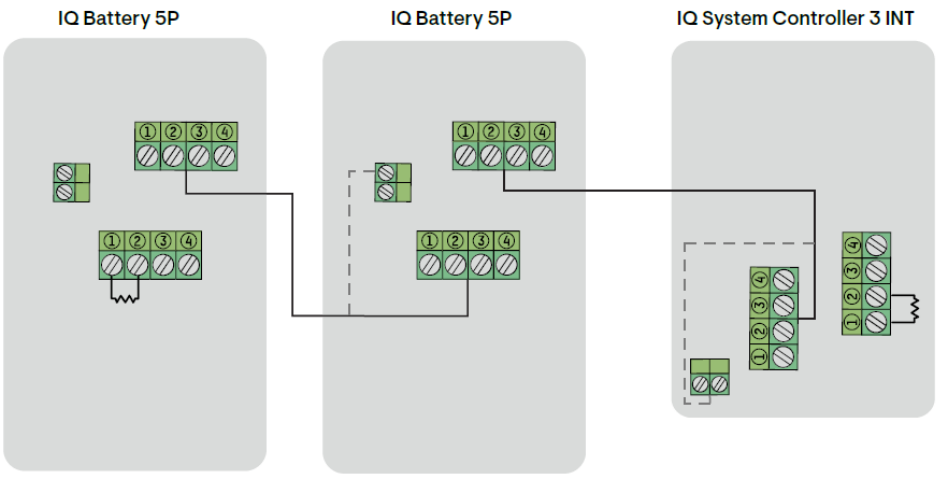


Figure 12: Control cable wire sequence 1 with the IQ System Controller 3 INT

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6.1.2 Sequence 2: IQ Battery 5P – IQ System Controller 3 INT -IQ Battery 5P

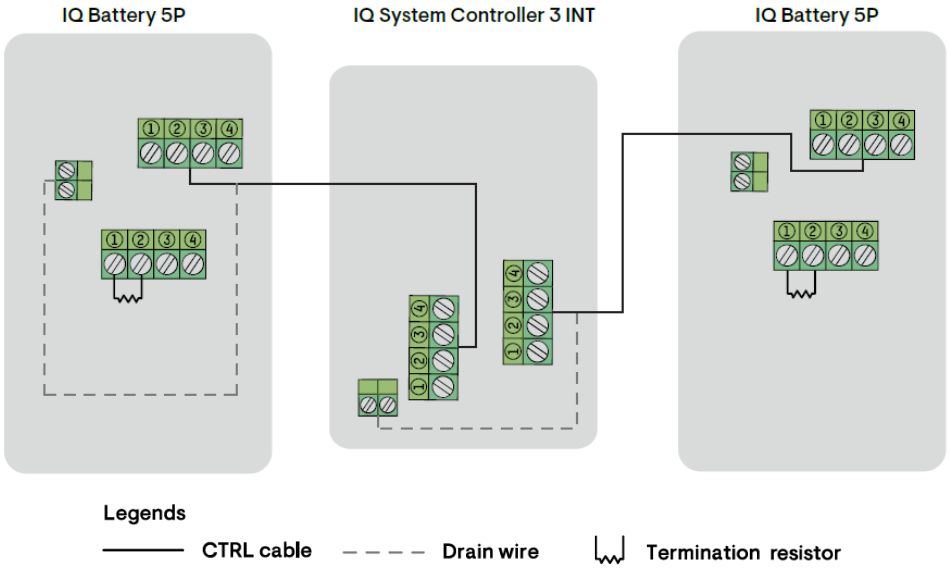


Figure 13: Control cable wire sequence 2 with IQ System Controller 3 INT

6.1.3 Sequence 1: IQ Battery 5P – Communications Kit 2 INT

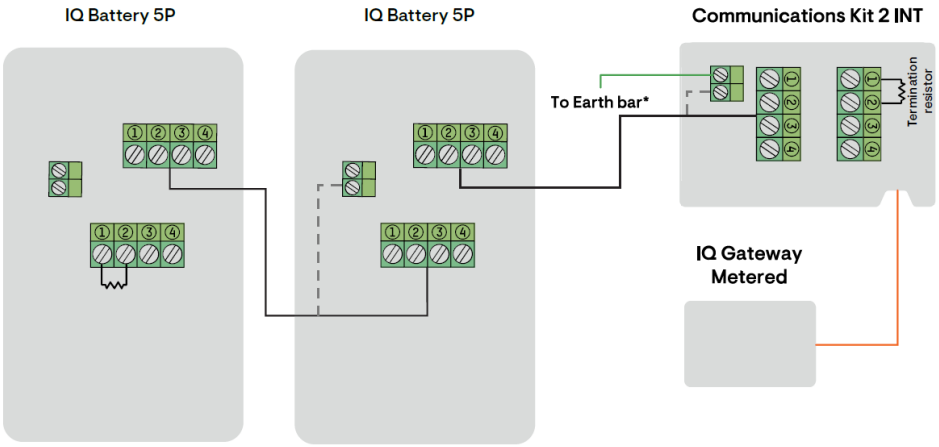


Figure 14: Control cable wire sequence 1 with Communications Kit 2 INT

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6.1.4 Sequence 2: IQ Battery 5P – Communications Kit 2 INT-IQ Battery 5P

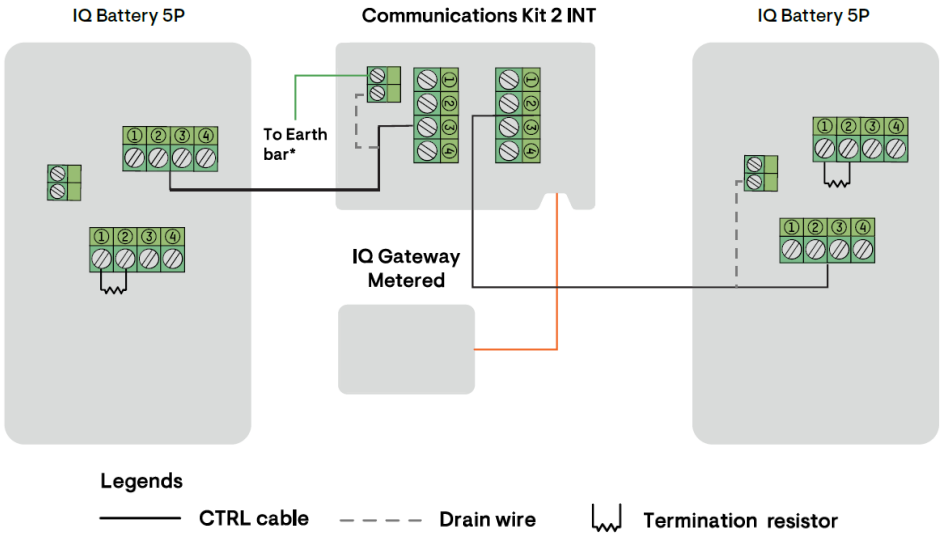


Figure 15: Control cable wire sequence 2 with Communications Kit 2 INT

Table 11: Termination resistor position guidance

Control wiring sequence	Termination resistor location
Sequence 1: IQ Battery 5P(s) – IQ System Controller 3 INT/Communications Kit 2 INT	Resistor 1: First IQ Battery 5P in the control bus Resistor 2: IQ System Controller 3 INT/ Communications Kit 2 INT
Sequence 2: IQ Battery 5P – IQ System Controller 3 INT/Communications Kit 2 INT - IQ Battery 5P	Resistors 1 and 2: The two IQ Battery 5P units at each end of the control bus

7. Appendix

The following table lists the order code for the Enphase components needed to complete a PV and battery installation. To ensure you select the appropriate components for your installation, refer to the IQ7/IQ8 Microinverter, IQ Battery 5P, and the IQ System Controller quick install guide and data sheet at the Enphase documentation center.

Table 12: Enphase components

Product type	Product	SKU
Enphase microinverters	IQ7 Microinverter	IQ7-60-2-INT IQ7A-72-M-INT IQ7PLUS-72-M-INT IQ7X-96-2-INT IQ7A-72-M-ACM-INT

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Product type	Product	SKU
	IQ8 Microinverter	IQ8AC-72-M-INT IQ8HC-72-M-INT IQ8X-80-M-INT IQ8HC-72-ACM-INT IQ8P-72-2-INT
Microinverter accessory	IQ Cable	Single-phase: Q-25-17-240 Three-phase: Q-25-17-3P-160 2.5 mm^2 IQ Cable for 60/96 cell, 1.7 m landscape module pitch
		Single-phase: Q-25-20-200 Three-phase: Q-25-20-3P-160 2.5 mm^2 IQ Cable for 72 cell, 2.0 m landscape module pitch
		Single-phase: Q-25-10-240 Three-phase: Q-25-10-3P-200 2.5 mm^2 IQ Cable for 60/72/96 cell, 1.0 m portrait module pitch
	IQ Terminator	Single-phase: Q-TERM-R-10 Three-phase: Q-TERM-3P-10
	IQ Sealing Cap	Q-SEAL-10
	IQ Field Wireable Connectors (female)	Q-CONN-R-10F
	IQ Field Wireable Connectors (male)	Q-CONN-R-10M
	Raw IQ Cable (metres)	Single-phase: Q-25-RAW-300 Three-phase: Q-25-RAW-3P-300
	IQ Cable Clips	ET-CLIP-100
	IQ Disconnect Tool	Q-DISC-10
	IQ Relay 1P	Q-RELAY-1P-INT
	IQ Relay 3P	Q-RELAY-3P-INT
Gateway	IQ Gateway Metered	ENV-S-WM-230
Current transformers	Consumption CT	CT-100-SPLIT

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Product type	Product	SKU
		CT-100-SPLIT-ROW CT-400-SPLIT-INT
Battery	IQ Battery 5P	IQBATTERY-5P-1P-ROW
	IQ Battery 5P FlexPhase	IQBATTERY-5P-3P-INT
Battery accessory	Handles for IQ Battery 5P (LH and RH)	IQBATTERY-HNDL-5
	Pedestal ground mount for the IQ Battery 5P	B05-PM-0550-O
System controller	IQ System Controller 3 INT	SC100G-M230ROW
Communications Kit	Communications Kit 2	COMMS-KIT-INT-02
Cellular modem	Mobile Connect CELLMODEM-07	CELLMODEM-07-INT-05
Line filter	Radius power line filter (three-phase)	LCF-250-PC

8. Revision history

Revision	Date	Description
TEB-00314-2.0	April 2026	Editorial updates.
TEB-00314-1.0	July 2025	Initial release.

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