



SP PRO KACO Managed AC Coupling

INTRODUCTION

The SP PRO KACO Managed AC Coupling provides a method of linking the KACO Powador xx00 and Powador xx02 series grid tie inverters to the SP PRO via the AC Load supply so that regardless of whether the grid or a generator is connected, the SP PRO can manage and control the KACO grid tie inverters.

Each SP PRO can manage a maximum of five KACO grid tie inverters by commanding each grid tie inverter to output the right amount of power that is needed to simultaneously supply the load, export any excess and maintain the battery bank at any particular point in time. This is done via a communications link which also serves to retrieve all the operational data for display and logging by the SP PRO.

This document details the additional steps needed to install the managed system. The SP PRO and KACO inverters can be installed as per their individual installation instructions with the additional allowance of a communications cable linking all of the inverters.

Note: *This document needs to be read in conjunction with the SP PRO Instruction Manual and the KACO xx02 Series or KACO xx00 Series Instruction Manual.*

ADDITIONAL INFORMATION

Selectronic web site – <http://www.selectronic.com.au> or contact the Selectronic Sales Team.

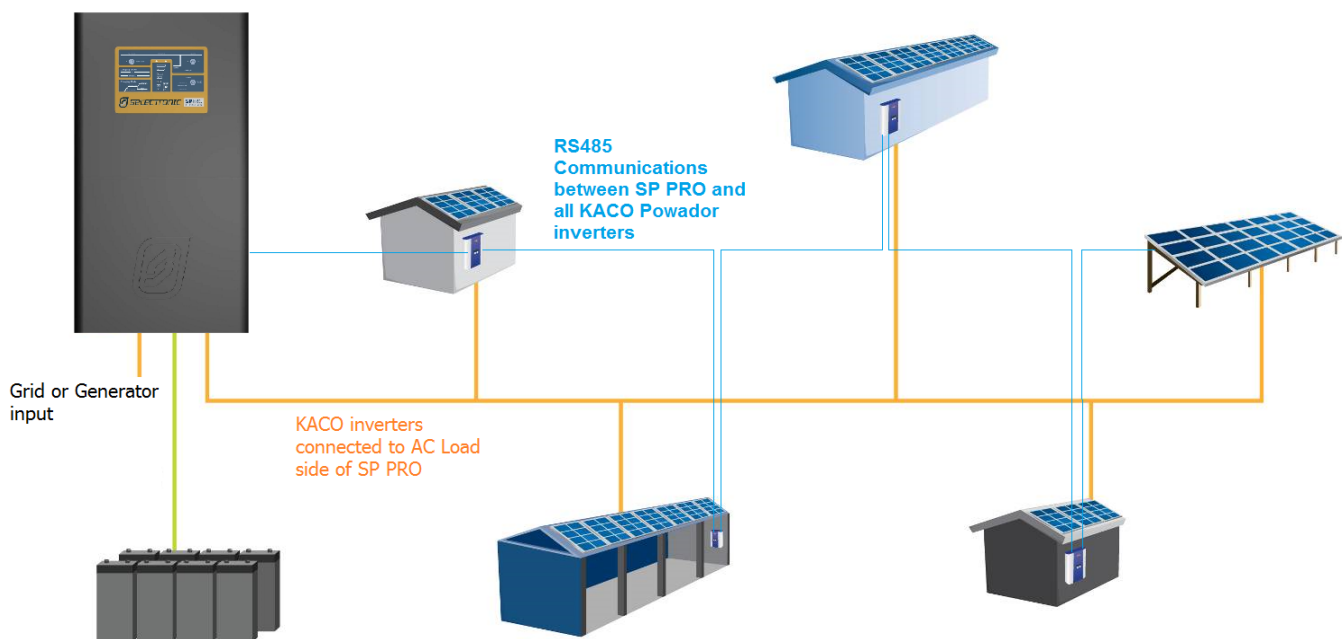
SP PRO KACO Managed AC Coupling Installation Notes



OVERVIEW

The diagram below shows a managed AC coupled system with five KACO inverters.

NOTE: The RS485 Communications links between the SP PRO and KACO Powador inverters can be either wired link (using CAT 5 cable) or a wireless link (Using the Optional Selectronic wireless RS485 link, stock code 005075 – see Installation note IN0029 under the Support tab at the Selectronic web site <http://www.selectronic.com.au> for more details)



SYSTEM REQUIREMENTS

To successfully install a SP PRO KACO managed system, there are particular system requirements that need to be met.

- This installation document is applicable to SP PRO series II inverters only (revision 20 or greater). To install an AC coupled system using a series I SP PRO inverter an additional AC coupling adaptor (stock code 004665) is required.
- Combined maximum AC output of all the connected KACO inverters must not exceed twice the continuous SP PRO output power rating.
- Battery bank must be sized to suit the SP PRO model and the combined maximum AC Output power of the KACO inverters.
- SP PRO and KACO inverters must have appropriate firmware version installed.
- Maximum of 5 KACO inverters per SP PRO.

SP PRO KACO Managed AC Coupling Installation Notes



SP PRO MODEL AND MINIMUM BATTERY CAPACITY FOR SOLAR HYBRID SYSTEMS

For a Solar Hybrid (grid connected) system, the minimum battery capacity that must be connected to the SP PRO inverter varies depending on SP PRO model only. The following table defines the minimum battery capacity for each SP PRO model.

When the system is islanded (e.g. during a grid outage) the SP PRO will limit the output of the AC coupled solar based on the actual installed battery size (see table 3 in Appendix I)

Minimum Battery Capacity for Solar Hybrid Systems (@C10) ^{1,2}							
Combined max. ABB AC Output	SP PRO Model						
	SPMC240	SPMC241	SPMC481	SPMC482	SPMC1201	SPLC1200	SPLC1202
1 kW	180 Ah	180 Ah	180 Ah	180 Ah	100 Ah	250 Ah	250 Ah
2 kW	180 Ah	180 Ah	180 Ah	180 Ah	100 Ah	250 Ah	250 Ah
3 kW	180 Ah	180 Ah	180 Ah	180 Ah	100 Ah	250 Ah	250 Ah
4 kW	180 Ah	180 Ah	180 Ah	180 Ah	100 Ah	250 Ah	250 Ah
5 kW	180 Ah	180 Ah	180 Ah	180 Ah	100 Ah	250 Ah	250 Ah
6 kW	180 Ah	180 Ah	180 Ah	180 Ah	100 Ah	250 Ah	250 Ah
7 kW	Not valid	180 Ah	180 Ah	180 Ah	100 Ah	250 Ah	250 Ah
8 kW	Not valid	180 Ah	180 Ah	180 Ah	100 Ah	250 Ah	250 Ah
9 kW	Not valid	180 Ah	180 Ah	180 Ah	100 Ah	250 Ah	250 Ah
10 kW	Not valid	Not valid	180 Ah	180 Ah	100 Ah	250 Ah	250 Ah
11 kW	Not valid	Not valid	Not valid	180 Ah	100 Ah	250 Ah	250 Ah
12 kW	Not valid	Not valid	Not valid	180 Ah	100 Ah	250 Ah	250 Ah
13 kW	Not valid	Not valid	Not valid	180 Ah	100 Ah	250 Ah	250 Ah
14 kW	Not valid	Not valid	Not valid	180 Ah	100 Ah	250 Ah	250 Ah
15 kW	Not valid	Not valid	Not valid	180 Ah	100 Ah	250 Ah	250 Ah
16 kW	Not valid	Not valid	Not valid	Not valid	Not valid	250 Ah	250 Ah
17 kW	Not valid	Not valid	Not valid	Not valid	Not valid	250 Ah	250 Ah
18 kW	Not valid	Not valid	Not valid	Not valid	Not valid	250 Ah	250 Ah
19 kW	Not valid	Not valid	Not valid	Not valid	Not valid	250 Ah	250 Ah
20 kW	Not valid	Not valid	Not valid	Not valid	Not valid	250 Ah	250 Ah
25 kW	Not valid	Not valid	Not valid	Not valid	Not valid	250 Ah	250 Ah
30 kW	Not valid	Not valid	Not valid	Not valid	Not valid	250 Ah	250 Ah
35 kW	Not valid	Not valid	Not valid	Not valid	Not valid	Not valid	250 Ah

Table 1: Solar Hybrid: Minimum Battery capacity for each SP PRO model and AC solar

Notes:

1. Battery capacity is C10 rating.
2. Round battery capacity up as appropriate to available battery sizes.

Ensure that the system meets these minimum battery capacity requirements. Any battery combinations larger than the minimum are suitable.

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SP PRO MODEL AND MINIMUM BATTERY CAPACITY FOR OFF GRID SYSTEM

The minimum battery capacity that must be connected to the SP PRO inverter varies depending on SP PRO model, an overriding minimum battery capacity and the combined maximum KACO AC Output. The following table defines the minimum battery capacity for each SP PRO model.

Minimum Battery Capacity (@C10) ^{1,2}							
Combined max. KACO AC Output	SP PRO Model						
	SPMC240	SPMC241	SPMC481	SPMC482	SPMC1201	SPLC1200	SPLC1202
1 kW	180 Ah	180 Ah	180 Ah	180 Ah	100 Ah	250 Ah	250 Ah
2 kW	180 Ah	180 Ah	180 Ah	180 Ah	100 Ah	250 Ah	250 Ah
3 kW	240 Ah	240 Ah	180 Ah	180 Ah	100 Ah	250 Ah	250 Ah
4 kW	320 Ah	320 Ah	180 Ah	180 Ah	100 Ah	250 Ah	250 Ah
5 kW	400 Ah	400 Ah	200 Ah	200 Ah	100 Ah	250 Ah	250 Ah
6 kW	480 Ah	480 Ah	240 Ah	240 Ah	100 Ah	250 Ah	250 Ah
7 kW	Not valid	560 Ah	280 Ah	280 Ah	112 Ah	250 Ah	250 Ah
8 kW	Not valid	640 Ah	320 Ah	320 Ah	128 Ah	250 Ah	250 Ah
9 kW	Not valid	720 Ah	360 Ah	360 Ah	144 Ah	250 Ah	250 Ah
10 kW	Not valid	Not valid	400 Ah	400 Ah	160 Ah	250 Ah	250 Ah
11 kW	Not valid	Not valid	Not valid	440 Ah	176 Ah	250 Ah	250 Ah
12 kW	Not valid	Not valid	Not valid	480 Ah	192 Ah	250 Ah	250 Ah
13 kW	Not valid	Not valid	Not valid	520 Ah	208 Ah	250 Ah	250 Ah
14 kW	Not valid	Not valid	Not valid	560 Ah	224 Ah	250 Ah	250 Ah
15 kW	Not valid	Not valid	Not valid	600 Ah	240 Ah	250 Ah	250 Ah
16 kW	Not valid	Not valid	Not valid	Not valid	Not valid	256 Ah	256 Ah
17 kW	Not valid	Not valid	Not valid	Not valid	Not valid	272 Ah	272 Ah
18 kW	Not valid	Not valid	Not valid	Not valid	Not valid	288 Ah	288 Ah
19 kW	Not valid	Not valid	Not valid	Not valid	Not valid	304 Ah	304 Ah
20 kW	Not valid	Not valid	Not valid	Not valid	Not valid	320 Ah	320 Ah
25 kW	Not valid	Not valid	Not valid	Not valid	Not valid	400 Ah	400 Ah
30 kW	Not valid	Not valid	Not valid	Not valid	Not valid	500 Ah	500 Ah
35 kW	Not valid	Not valid	Not valid	Not valid	Not valid	Not valid	600 Ah

Table 2: Off Grid: Minimum battery capacity for each SP PRO model and AC solar

Notes:

1. Battery capacity is C10 rating.
2. Round battery capacity up as appropriate to available battery sizes.

Ensure that the system meets these minimum battery capacity requirements. Any battery combinations larger than the minimum are suitable.

SP PRO KACO Managed AC Coupling Installation Notes



SP PRO AND KACO FIRMWARE REQUIREMENTS

1. The SP PRO units' revision should be 20 or later (series II). Earlier unit revisions (series I) need an additional AC coupling adaptor (stock code 004665).
2. SP PRO Software Version 8.00 or later is required. To check software revision run SP LINK, connect to the SP PRO and go to Data View – Technical Data – “SP PRO Revision” and “Software Version”



ACN 063 863 785

SGSE/090398

CB:FI-11386

Serial No: **114713**
GQNJSBX

Revision: **20**

1 2 3 4 5 6 7 8

Packed weight: **45 kg**

Model No:

SPMC241

Stock Code: **004724**

Packaging Label indicating Revision: 20

Site Information	Configuration Settings	QuickView	Data View
Now	Today	DC History	AC History
Technical Data			Exp
Inverter			
SP PRO Model	SPMC482-AU	Power Module 1 Serial Number	115764
SP PRO Ratings	48V DC, 7.5kW, 240V AC	Power Module 1 Revision	3
SP PRO Serial Number	118096	Power Module 1 Mod Status	
SP PRO Revision	21	Power Module 2 Serial Number	115754
SP PRO Mod Status		Power Module 2 Revision	3
Software Version	8.0	Power Module 2 Mod Status	
Control PCA Serial Number	117299	SP PRO Total Run Time	4259.7h
Control PCA Revision	20	Grid Connect SW Version	2.00
Control PCA Mod Status			

- Older revisions of firmware must be updated to firmware revision 8.00 or later.
- Do **NOT** change any configuration settings until firmware is updated.

Note: Selectronic web site – <http://www.selectronic.com.au> for latest SP PRO firmware and Tech Note 34 SP PRO Firmware Update Procedure.

SP PRO KACO Managed AC Coupling Installation Notes



KACO POWADOR xx00 SERIES

KACO Powador xx00 Series inverters must be manufactured from April 2013 onwards to contain the compatible firmware. The label on compatible inverters is marked with 02/2013 or greater. This means the second quarter 2013. KACO inverters prior to April 2013 do not have compatible firmware installed and cannot be updated.

KACO new energy GmbH Carl-Zeiss-Str. 1 74172 Neckarsulm MADE IN GERMANY	Typ / Type	Powador 3200 – AU – IL
	Seriennummer / serial no.	3.2X01336164
	Artikelnummer / part no.	70201096
Max. Eingangsleistung / inputpower DC	3200 W	
Max. Eingangsstrom / inputcurrent DC / Isc PV	8,6 A / 8,6 A	
Max. Eingangsspannung / inputvoltage DC	800 V	
Min. Eingangsspannung / inputvoltage DC	350 V	
MPP – Spannungsbereich / MPP voltage range DC	350 V – 600 V	
Umgebungstemperatur / ambient temperature	–20 °C ... +60 °C	
Schutzklasse Schutzart / protection class protection	1 / IP54	
Cos phi	0,8 ind – 0,8 cap	
Nennspannung / rated outputvoltage AC	220 V / 230 V	
Frequenz / rated frequency	60 / 50 Hz	
Nennleistung / rated outputpower AC	2600 W	
Nennstrom / rated output current AC	11,3 A	
Netzüberwachung / grid monitoring	VDE V 0126 – 1 – 1 + A1 / country specific	
Jahr / year	02 / 2013	
galvanisch nicht getrennt / galvanic isolation		
Dep. on country settings all specific requirements are met, details see manual.		

KACO POWADOR xx02 SERIES

KACO Powador xx02 Series inverters must be manufactured during 2011 or later to contain the compatible firmware. KACO inverters prior to 2011 do not have compatible firmware installed and cannot be updated.



SP PRO KACO Managed AC Coupling Installation Notes



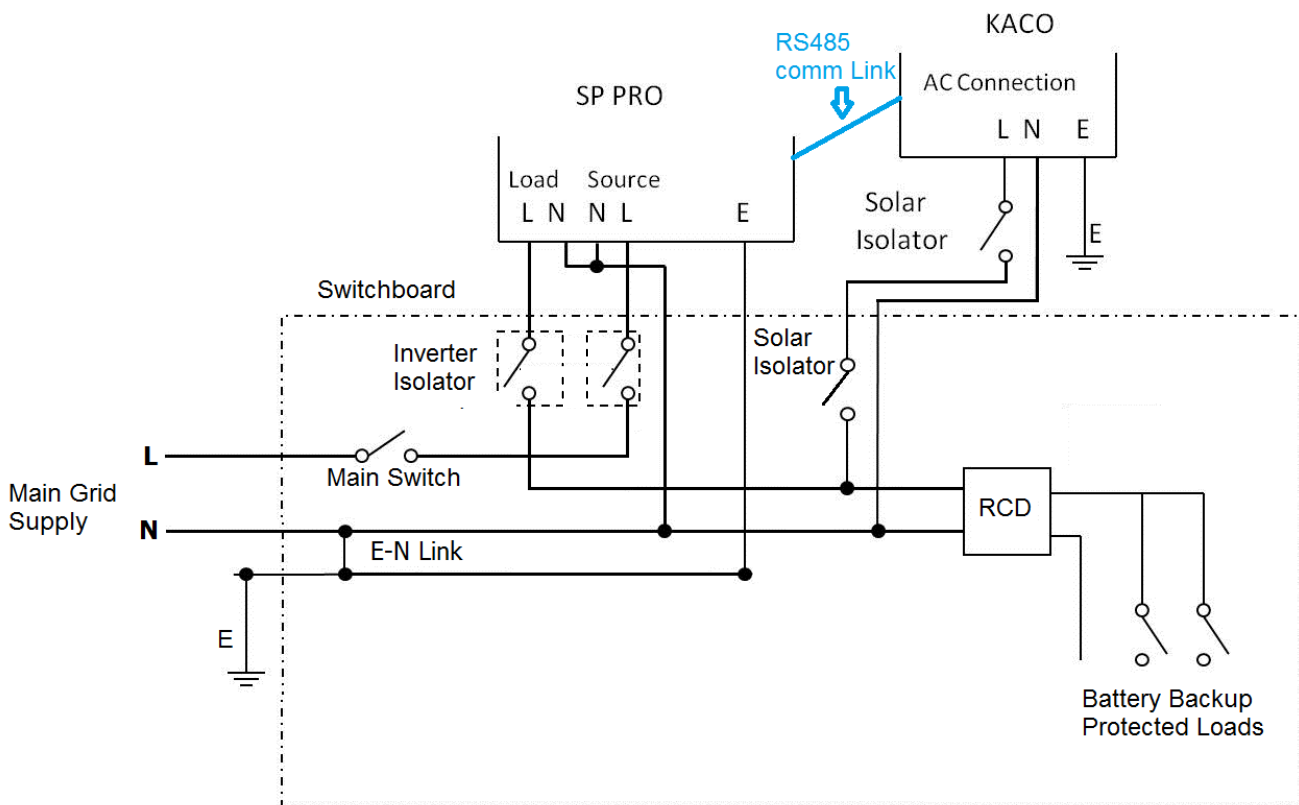
INSTALLATION

The SP PRO and KACO inverters should be installed as per their respective installation instructions. Particular instructions directly related to Managed AC Coupling are listed below.

It is good practice to number each KACO inverter from 1 up to 5 so that each inverter can be easily referenced within SP LINK. In a three phase AC coupled system label each KACO inverter L1-1 to L1-5 for the KACO inverters connected to SP PRO L1, L2-1 to L2-5 for those connected to L2 and so on. This number 1 to 5 is used for the Communications Link addressing. See Configuration section.

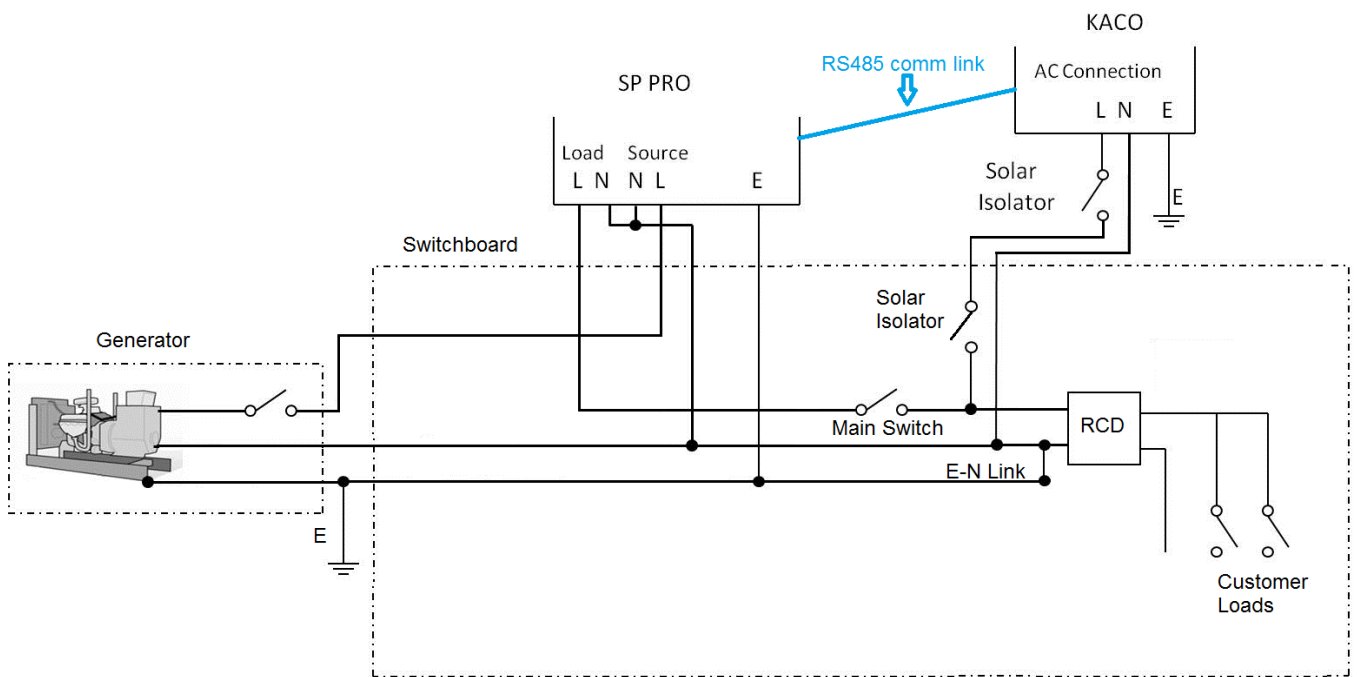
KACO AC WIRING

The KACO AC output wiring must be connected to the AC Load terminals of the SP PRO in accordance with local wiring rules for correct operation.



KACO AC Wiring guide for Grid connected installation

SP PRO KACO Managed AC Coupling Installation Notes



KACO AC Wiring guide for Off Grid connected installation

Note: The system will NOT function correctly if the KACO inverters are installed on the AC Source side of the SP PRO.

SP PRO KACO Managed AC Coupling Installation Notes

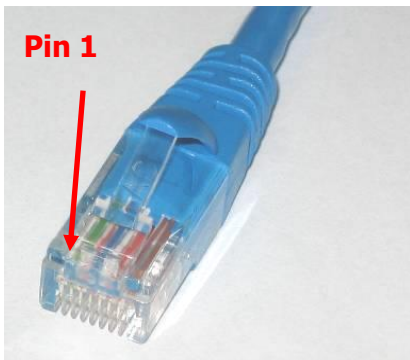


COMMUNICATIONS LINK (RS485)

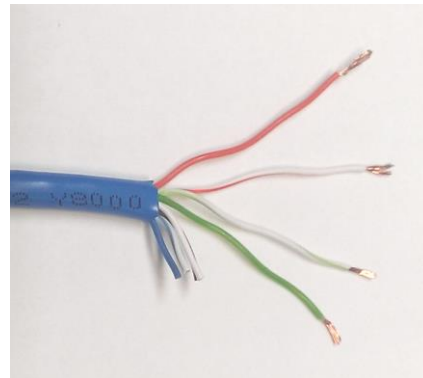
The communications link always starts at the SP PRO, then connects to all the KACO inverters in a daisy chain arrangement and finishes at the last KACO inverter. There is no need to connect the KACO inverters in any particular order.

Using the supplied 'CAT5' network cable, **cut off one of the RJ45 connectors**, expose and crimp the wires using supplied wire crimps or alternatively use a longer cable as required (not supplied) as outlined in the table below.

PLEASE NOTE: The wire colours in the table below may vary between different CAT5 cables. To ensure correct connections please check that the "RS485 RJ45 Adaptor pin #" corresponds to the "KACO RS485 Connector" connection by buzzing out the lead before connecting it to the KACO or the SP PRO inverter.



RS485 RJ45 Adaptor Pin 1 designation



Cut off one RJ45 Connector

RS485 RJ45 Adaptor pin #	Signal	Typical Wire Colour (May vary with different CAT5 leads)	KACO xx00 Series RS485 Connector	KACO xx02 Series RS485 Connector
1	GND	Green/White	-	GND
2	GND	Green	-	
3	RS485 - B	Orange/White	B	B
4	GND	Blue	-	-
5	GND	Blue/White	-	-
6	RS485 - A	Orange	A	A
7	GND	Brown/White	-	-
8	GND	Brown	-	-

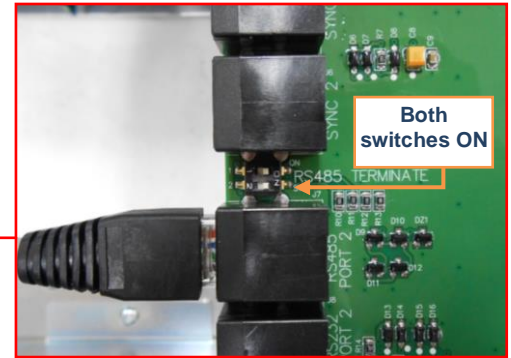
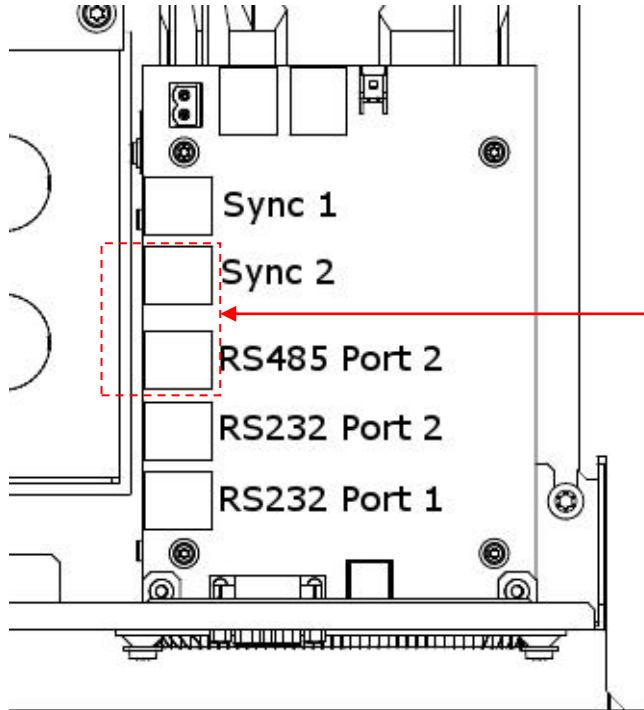
RS485 adaptor to KACO connections and wire colours

Note: Only the wires connected to Pins 1, 2, 3, and 6 (on the RJ45) are used.

SP PRO KACO Managed AC Coupling Installation Notes



Connect the RJ45 connector to the SP PRO **RS485 Port 2** connection and the crimped wires to the **RS485** port on the KACO inverter.



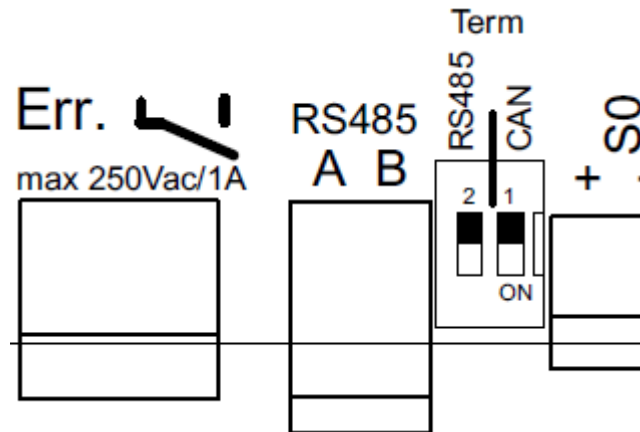
RJ45 connector to SP PRO
RS485 Port 2 and make sure
SW 1 and SW2 ON
(Terminator ON)

SP PRO Connections (inside unit) – RS485 Port 2 RJ45 connector

SP PRO KACO Managed AC Coupling Installation Notes



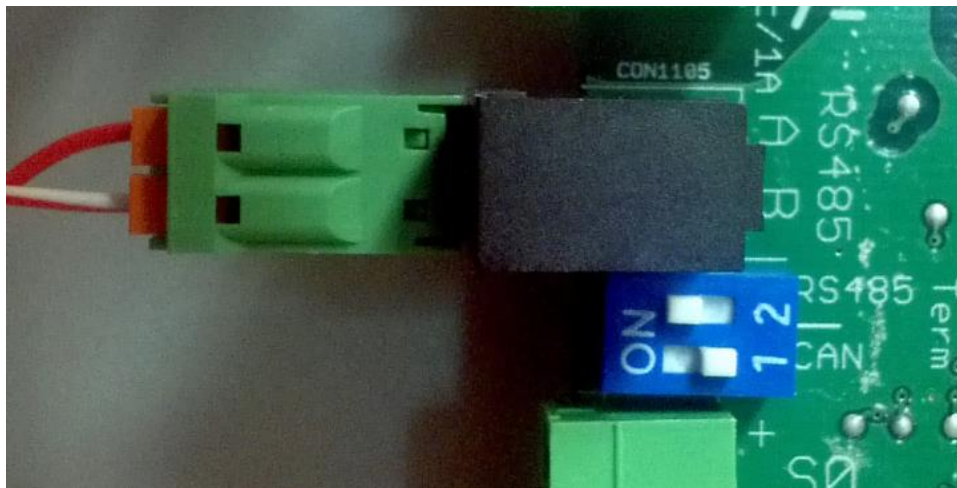
KACO POWADOR XX00 SERIES RS485 CONNECTIONS



KACO xx00 Series RS485 Connections (inside unit) – double plug in socket.

On the KACO inverter there are two parallel connection sockets allowing “looping through” of the wiring to additional inverters. Either connection point is suitable. Green mating plugs are provided with each KACO unit – included with mounting hardware plastic bag.

When looped to another KACO, the termination switch position 2 should be set to “OFF” (away from ON). For the last KACO inverter on the Communications Link (RS485) (or when only one KACO inverter is used), the termination switch position 2 must be set to “ON”



Last KACO on Communications Link (RS485), or when only 1 KACO is used:
SW 2 ON (Terminator ON)

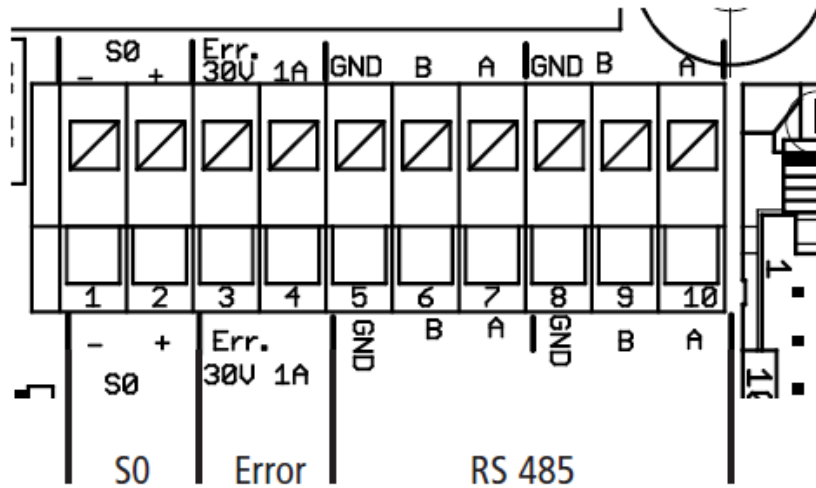
Notes:

1. Green mating connector show is provided in plastic bag with mounting hardware
2. Wire colours may vary with different CAT5 cables.
3. Switch position 1 is always set to OFF
4. The Ground wire (GND) from the SP PRO RS485 communication link is not connected.

SP PRO KACO Managed AC Coupling Installation Notes



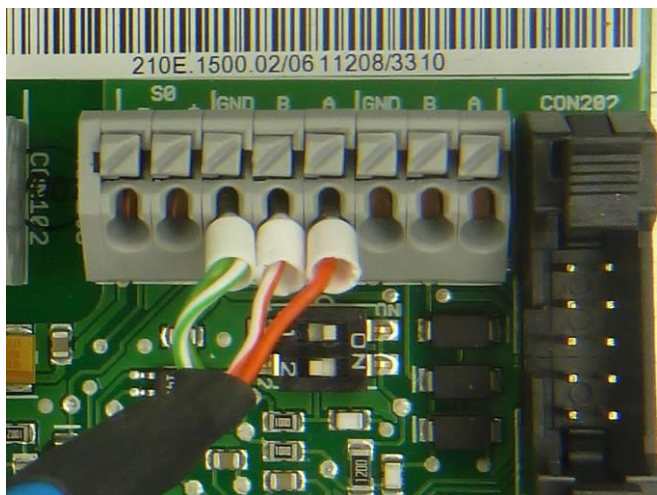
KACO POWADOR XX02 SERIES



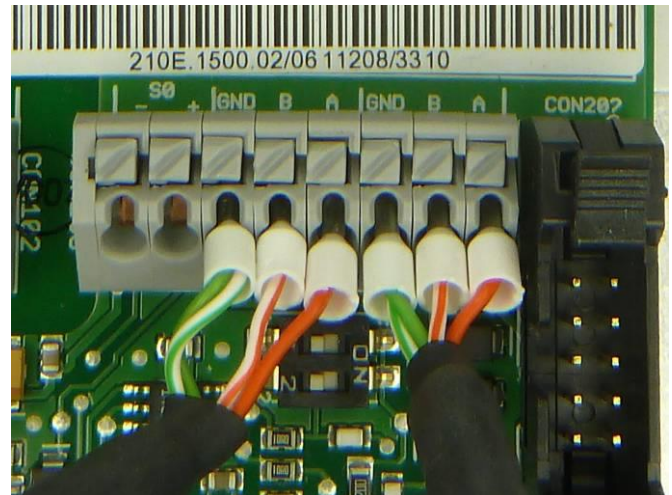
KACO xx02 Series RS485 Connections (inside unit) – spring loaded terminals

On the KACO inverter there are two parallel sets of connections allowing “looping through” of the wiring to additional inverters. Either connection point is suitable.

When looped to another KACO, the termination switch position 1 should be set to “OFF” (away from ON). For the last KACO inverter on the Communications Link (RS485) (or when only one KACO inverter is used), the termination switch position 1 must be set to “ON”



Last KACO on Communications Link (RS485), or when only 1 KACO is used:
SW 1 ON (Terminator ON)



KACO loop-through:
SW 1 OFF (Terminator OFF)

Notes:

1. Wire colours may vary with different CAT5 cables.
2. Switch position 2 is always set to OFF

SP PRO KACO Managed AC Coupling Installation Notes



CONFIGURATION – ADDITIONAL SETTINGS

It is recommended that the Site Configuration wizard (in SP LINK 7.7 and above) be used to configure the SP PRO settings. Using the wizard will ensure all the SP PRO settings are compatible with the manage AC coupled system.

The settings detailed below will be set when the Site Configuration Wizard is used to configure the SP PRO. Only the additional settings required to enable KACO Managed AC Coupling are shown. The remainder of systems settings will be set by the Site Configuration Wizard.

The SP PRO **must** be configured **before** any of the KACO inverters are energised. The AC coupled failsafe system in the SP PRO is only enabled when the correct KACO configuration has been programmed into the SP PRO.

The KACO inverters must be set to RS485 and appropriately addressed to ensure correct communications (see "KACO Port Configuration" section).

SETTINGS THAT ARE SET BY SITE CONFIGURATION WIZARD

In SP LINK – CONFIGURATION SETTINGS – SYSTEM the follow settings will be set.

- **Enable KACO Link, KACO Com Port** is set to **RS485**.
- **Number of KACO inverters connected** is set to the number of KACO inverters installed in the system.

Managed AC Coupled Solar

String Inverter Powador	Fallback Power Disabled
Number of Devices [1 - 5] 1	Islanding Power Limit [0.1 - 50 kW] 12.5 kW
Grid Export Limit Monitor Over Export Trip Time [0 - 1000 s] 20	Over Export Trip Limit [0 - 50 kW] 50.00 kW

SP LINK - Configuration Settings – System tab

Note: Port 2 Communication settings will not be available once KACO Com port has been enabled. This is normal operation.

In the example used above, only one KACO inverter is connected to the SP PRO.

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PROGRAMMING FALLBACK POWER INTO THE SP PRO INVERTER

This section details the process for programming the SP PRO inverter in the system to enable “fallback power” mode. Fall back power Mode is required when using a batteryless SP PRO configuration or when a wireless RS485 link is installed. It is highly recommended for ALL other managed AC coupled systems.

Fall back power mode is a failsafe function that causes the output power of a KACO powador inverter to drop to zero if there is a failure in the RS485 communications link with the SP PRO. As soon as the RS485 communications link is restored the system will function again normally.

Details for setting the KACO inverters to “fallback power” mode are provided in the next section.

WARNING: It is important that both the SP PRO and ALL the connected KACO inverters are set to “fallback Power” mode to ensure correct system operation.

Multiple Phase Settings Multiple Phase Disabled	Communication Port 1 Baud Rate* 9600	Managed AC Coupled Solar String Inverter Powador	Fallback Power* Enabled
Multiple Charging Enable Multiple Chargers Disabled	Port 1 DTR/DCD Enabled	Number of Devices [1 - 5] 1	Islanding Power Limit [0.1 - 50 kW] 12.5 kW
Generic AC Coupling Generic AC Coupling Disabled	Port 2 Baud Rate 9600	Grid Export Limit Monitor Over Export Trip Time [0 - 1000 s] 20	
Frequency Ramp Limit [0.1 - 5.2 Hz] 5.2	Port 2 DTR/DCD Enabled	Over Export Trip Limit [0 - 50 kW] 50.00 kW	
	Power Up Output Mode Power Up Output Mode Idle		

1. Check that the firmware revision of the SP PRO is 8.0 or greater.
2. Check that the firmware version on ALL connected KACO inverters is greater than or equal to the following (see next section for details on checking the KACO):
 - a. ARM: V5.34
 - b. DSP: V5.32
3. In SP LINK, click on the “Configuration Settings” tab then “System” tab. Set the “Fallback Power” setting to “Enable”.
4. When the configuration is complete, Save Site to file (File / Site information / save).
5. Once the site has been saved then connect to the SP PRO using the Connect button or the Connection Menu. Once connected the configuration is sent to the SP PRO using the “Configure SP PRO” button in the “Configuration Settings” tab.

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KACO PORT CONFIGURATION

The settings listed below are all that is required.

The serial port on the KACO inverter must be set to RS485 and each inverter set to an inverter address from 1 through to 5 as appropriate.

1. Isolate the DC solar from the KACO inverter(s) (via the appropriate DC circuit breaker).
2. Disconnect the RS485 connection from the SP PRO. The KACO parameter settings cannot be accessed when the communications link is active between the SP PRO and the KACO(s).
3. Ensuring that the SP PRO AC Load supply is present at the KACO inverter, switch on the AC supply to the KACO inverter.
4. Wake up the KACO inverter by pressing and holding the **Night Switch** for 10 seconds.



5. Once the display is active on the KACO, enter parameter settings mode. To enter settings mode, hold down both keys **1** and **2** for approximately one second.



Use key **1** to scroll through the various menu items. The menu is continuous. When the end is reached, the display automatically returns to the first item.

Use the **2** key to change the parameter that is shown. The values here are also continuous, i.e. after you reach the maximum value, they return to the minimum value.

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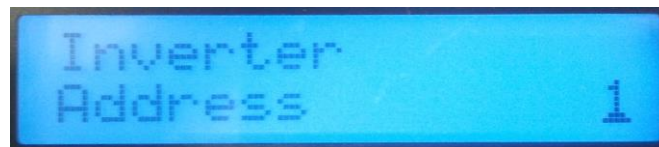
6. Scroll to **Interface** setting and ensure that it is set to **RS485**.

NOTE: The latest firmware in the Powador 00 series does not have the interface setting. In this case the only interface is RS485 so no setting is required.



7. Scroll to **Inverter Address** setting.
 - a. If only one KACO is installed then the address must be set to 1.
 - b. If more than one KACO is installed then the addresses must be allocated sequentially starting from 1 (i.e. first KACO = 1, second KACO = 2, third KACO = 3 etc). It is best practice if the address number matches the labelled KACO number.

Note: It is forbidden to skip any address numbers in the sequence when using multiple KACO inverters.



8. Save parameters, simultaneously press both keys **1** and **2**.
9. If there are multiple KACO inverters installed, repeat for all others.
10. Reconnect the RS485 connection to the SP PRO.

Note: See Menu Level 2 within KACO Operating Instructions.

PROGRAMMING FALLBACK POWER INTO THE KACO POWADOR INVERTERS

This section details the process for programming the KACO inverters in the system to enable "fallback power" mode. Details for setting the SP PRO to "fallback power" mode are provided in the previous section.

WARNING: *It is important that both the SP PRO and ALL the connected KACO inverters are set to "fallback Power" mode to ensure correct system operation.*

To set "fallback power" mode in the KACO inverters follow the instructions below.

1. Isolate the DC solar from the KACO inverter(s) (via the appropriate DC circuit breaker).
2. Disconnect the RS485 connection from the SP PRO. The KACO parameter settings cannot be accessed when the communications link is active between the SP PRO and the KACO(s).

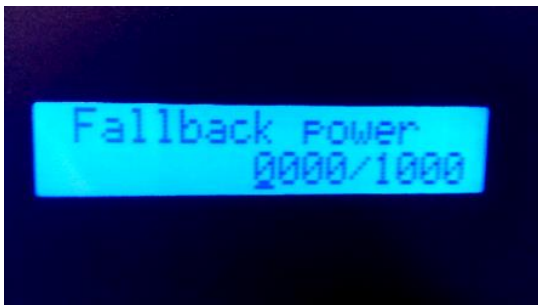
SP PRO KACO Managed AC Coupling Installation Notes



3. Ensuring that the SP PRO AC Load supply is present at the KACO inverter, switch on the AC supply to the KACO inverter.
4. Wake up the KACO inverter by pressing and holding the Night Switch for 10 seconds.



5. Once the display is active on the KACO, enter parameter settings mode (level 2 menu) by pressing keys 1 and 2 together. The firmware version will be displayed. Check that the firmware version is greater than or equal to the following:
 - ARM: V5.34
 - DSP: V5.32
6. Press keys 1 and 2 together to return to main menu (level 1). Hold down key 2 for 20 seconds to get to the level 3 menu. "Select Country" is displayed
7. Keep pressing key 1 until "Config. fallback power" is displayed. Press key 2 to select "yes". Press key 1 and the "Fallback Power" screen is displayed.
8. Press key 2 to change fallback power to 0000/1000. Press key 1 until "Timeout" setting appears. Adjust the setting to 000005 s using key 2 to change digit and key 1 to move to next digit.



9. Press keys 1 and 2 together to save settings and return to main menu
10. Carry out the System Commissioning testing in the following section (Page 18).

SP PRO KACO Managed AC Coupling Installation Notes



SYSTEM COMMISSIONING – ADDITIONAL TESTS

In addition to the normal system testing that would be performed, the following additional tests must be performed as detailed below.

The commissioning sequence should verify the SP PRO and its operation without any of the KACO inverters in operation and then once the steps below are performed, the KACO inverters can be brought into service.

COMMUNICATIONS LINK (RS485) VERIFICATION

The correct operation of the KACO Managed AC Coupling relies on the Communications Link. It is vital that the communications link (RS485) connection has been setup correctly before operating the AC coupled system.

1. Check that all the RS485 connections have been connected correctly.
2. Wake the KACO(s) up by pressing and holding the **Night Switch** for 10 seconds (if they are not already awake). In the case of multiple KACOs this must be done for each inverter.
3. In the Data View => Technical Data tab there should be live data for all the connected KACO inverters. As a minimum there should be a reading for the AC volts, Device Address and the KACO model number displayed.
 - a. If the KACO data is all zeros then check the RS485 wiring and connections. Take careful note that A connects to A, B to B between all KACO inverters and the RS485 Adaptor.

AC Solar #1 (6002)
RS485 Device Address: 1
AC Energy Today
0.0 kWh
AC Power
0.17 kW
AC Volts
242.1 V
AC Current
0.6 A
DC Power
0.17 kW
DC Volts
200.0 V
DC Current
0.8 A
Temperature
20 °C
AC Power Peak Today
3.90 kW

For SP PRO Firmware version 8.00 or greater the Communication link may be further tested using the AC Solar Link Test found in SP LINK under the Service Settings tab.

1. Wake up the KACO inverters (as per step 2 above)
2. In the Service Settings tab click the "Reset Counters" button
3. Wait 2 minutes and check that the error count remains at zero for all the connected KACO inverters. (An error count of 3 or less per minute is acceptable but in this case it is good practice to check the wiring and that the termination resistors are set correctly in the SP PRO and KACO.

AC Solar Link Test	
Errors or non-responses from grid-tie inverters can indicate quality of link.	
Counting while grid tie inverter is off is normal.	
Link #1	0
Link #2	0
Link #3	
Link #4	
Link #5	
<input type="button" value="Reset Counters"/>	

Once the Communications link has been verified for each KACO inverter, the DC feeds to each KACO inverter can be switch on and full system testing and verification can be performed.

SP PRO KACO Managed AC Coupling Installation Notes



FALLBACK MODE VERIFICATION

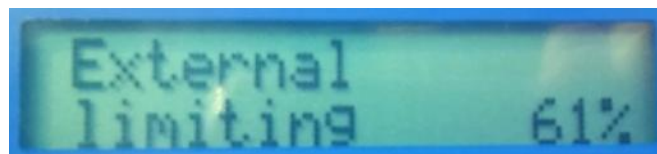
If Fallback mode has been set in the SP PRO Inverter and the KACO inverter(s) then its operation can easily be tested with the following process:

1. Run the system so that each of the KACO inverters is producing power. This can be verified by reading the power on front display on each of the KACO inverters.
2. Unplug the RS485 connected from the SP PRO inverter.
3. After 5 seconds check that power produced by each of the KACO inverters has dropped to zero. This can be verified by reading the power on front display on each of the KACO inverters.
4. Plug the RS485 connector back into the SP PRO inverter. The KACO inverters should start producing power again after a few seconds up to a few minutes.

OPERATION

The SP PRO will operate normally, exporting and charging as set and required. The KACO inverters will behave slightly differently than in straight grid tie operation if Fallback Power mode is NOT set.

If Fall Back Power mode is NOT set, the KACO display may show – External Limiting – with a percentage listed afterwards.



The external limiting message indicates that the SP PRO is controlling the KACO unit to maintain correct power to the loads, appropriate battery charge and solar burst limiting.

The Percentage Power may be displaying less than 100% even though no power limiting is required. This is because the SP PRO intelligently uses predictive algorithms to determine the optimum value based on the available solar input to the grid inverter at that time.

Also, the KACO inverters display will be locked and no other screens will be able to be selected.



Appendix I : Islanding power limit vs battery capacity

Islanded power limit (kW)

Battery Capacity Ah (C10)	SP PRO Model						
	SPMC240	SPMC241	SPMC481	SPMC482	SPMC1201	SPLC1200	SPLC1202
100	Not valid	Not valid	Not valid	Not valid	6.3kW	Not valid	Not valid
180	2.3kW	2.3kW	4.5kW	4.5kW	11.3kW	Not valid	Not valid
250	3.1kW	3.1kW	6.3kW	6.3kW	15.0kW	15.6kW	15.6kW
300	3.8kW	3.8kW	7.5kW	7.5kW	15.0kW	18.8kW	18.8kW
400	5.0kW	5.0kW	10.0kW	10.0kW	15.0kW	25.0kW	25.0kW
500	6.0kW	6.3kW	10.0kW	12.5kW	15.0kW	30.0kW	31.3kW
600	6.0kW	7.5kW	10.0kW	15.0kW	15.0kW	30.0kW	35.0kW
700	6.0kW	8.8kW	10.0kW	15.0kW	15.0kW	30.0kW	35.0kW
800+	6.0kW	9.0kW	10.0kW	15.0kW	15.0kW	30.0kW	35.0kW

Table 3: Limit to AC couple solar during islanding vs battery capacity