synaptec
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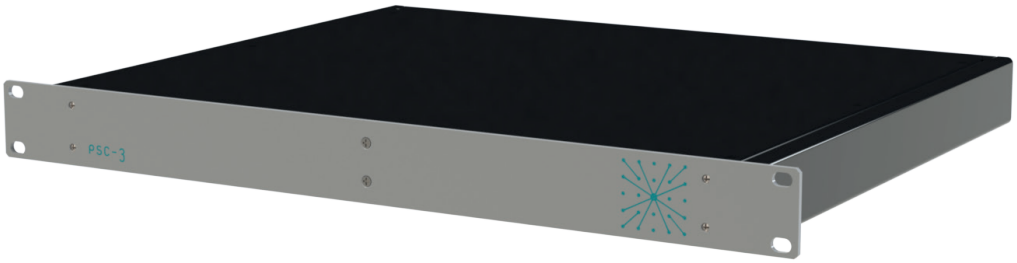
Installation manual

Passive Secondary Converter Three-Phase (PSC-3)



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Contents

1. Introduction

1.1 Chapter overview

This chapter provides some general information about the technical manual and an introduction to the device(s) described in this manual.

This chapter contains the following sections:

- Chapter overview
- Foreword

1.2 Foreword

This technical manual provides a functional and technical description of Synaptec's three-phase Passive Secondary Converter (PSC-3), as well as a comprehensive set of instructions for installation and use of the device. The level at which this manual is written assumes that you are already familiar with power systems instrumentation and have experience in this discipline. The description of principles and theory is limited to that which is necessary to understand the device.

The technical content presented in this document is based on an actual case or as-designed parameters, and therefore should not be relied upon for any specific application and does not constitute a performance guarantee for any projects. Actual results are dependent on variable conditions. Accordingly, Synaptec does not make representations, warranties, or assurances as to the accuracy, currency or completeness of the content contained herein. If requested, we will provide specific technical data or specifications with respect to any customer's particular applications. Our company is constantly involved in engineering and development. For that reason, we reserve the right to modify, at any time, the technology and product specifications contained herein.

We would therefore be very pleased to hear from you if you discover any errors or opportunities for improvement. Our policy is to provide the information necessary to help you safely specify, engineer, install, commission, maintain and eventually dispose of this product. We consider that this manual provides the necessary information, but if you consider that more details are needed, please contact us.

All feedback should be sent to us via info@synapt.ec.

1.2.1 Target audience

This manual is aimed towards all professionals charged with installing, commissioning, maintaining, troubleshooting or operating any of the products within the specified product range. This includes installation and commissioning personnel as well as engineers who will be responsible for operating the product.

The level at which this manual is written assumes that installation and commissioning engineers have knowledge of handling electronic equipment and fibre optics.

1.2.2 Nomenclature

Due to the technical nature of this manual, many special terms, abbreviations and acronyms are used throughout. Some of these terms are well-known industry-specific terms, while others may be special product-specific terms used by Synaptec. The first instance of any acronym or term used in a particular chapter is explained. In addition, a glossary is included in Section 1.2.3.

British English is used throughout this manual.

1.2.3 Glossary

For the purposes of this document, the following definitions apply:

- CT – Current Transformer
- VT – Voltage Transformer
- PSC – Passive Secondary Converter
- PSC-3 – Passive Secondary Converter - Three-Phase
- PSC-3-C – Passive Secondary Converter – Three-Phase - Current
- PSC-3-V – Passive Secondary Converter – Three-Phase – Voltage

2. Product scope

2.1 Chapter overview

This chapter provides information on the product and its use.

This chapter contains the following sections:

- Product overview
- Features and functions
- Compliance
- Functional overview

2.2 Product overview

The PSC retrofits Synaptec's passive photonic sensing technology to the secondary circuits of existing CTs or VTs to deliver reliable, centralised power system instrumentation. The PSC-3 is a three-phase measurement device.

The PSC, in combination with Synaptec's unique optical sensing architecture, allows standard instrument transformers in the substation to be digitised without the requirement for multiple powered Merging Units and digital telecoms. The PSC may be configured as an IEC 60044- or IEC 61869-compliant protection class device.

Synaptec's photonic sensing technology allows the PSC-3 to be completely optically isolated; no electronics, batteries , data communications, power supplies or time synchronisation is required at the measurement location. Secondary connections to existing CTs or VTs are made via standard screw terminal connections to the rear panel.

Each PSC-3 is installed in combination with Synaptec's Distributed Electrical Sensing (DES) Interrogator measurement device. Up to 10 PSC-3 units may be installed in series on a single optical fibre, connected to the Interrogator at a single end (typically in a substation environment). The PSC-3 may also be interoperated with Synaptec's other electrical and mechanical sensors (PSC-1, HV-PCT, PST, PTT, OHLS) to provide comprehensive local and remote infrastructure monitoring, protection, and metering. The distance from the Interrogator to the final electrical sensor in the chain may be as much as 60 km (subject to system topology, and with larger distances possible on request).

2.3 Features and functions

The PSC-3 is shown in Figure 2.1, with numbered items described in Table 2.1.

Table 2.1: Key components of the PSC-3, with reference to the numbering in Figure 2.1.

Item	Designation	Description	Qty
1	Mounting holes	Through-holes with standard 19" rack-mount spacing (1U height)	1
2	Fibre connection port	SC/APC fibre connection 'Optical IN' connects to the upstream fibre (Interrogator or preceding sensors) 'Optical OUT' connects to the downstream fibre (the following sensors more distant from the Interrogator)	2
3	Terminal block	6-pole terminal block, labelled 01...06 for connection of instrument transformer secondaries	1
4	Earth bonding point	For earthing of the PSC-3 chassis	1

Figure 2.1: PSC-3 design. Numbered items are identified in Table 2.1.

The standard form factor of the PSC-3 is 1U 19" rack-mount, but other options may be considered based on the use case.

2.4 Optical fibre routing

The PSC is designed to be monitored by Synaptec's DES Interrogator, utilising existing or new single-mode fibre to make series or parallel connection to each sensor in the fibre network. Each PSC-3 is typically connected into the optical fibre network via SC/APC terminated patch cables or single-mode fibre splices, depending on system architecture. Final fibre routing shall be agreed with the customer at the design stage of each project.

3. Installation

3.1 Chapter overview

This chapter describes the process of installation of the PSC-3.

This chapter contains the following sections:

- Tools
- Preparing for installation
- Mechanical mounting
- Fibre optic connection

3.2 Tools

For the purposes of installation, it is presumed that the installer has access to the following tools:

- Philips-head screwdriver
- M6 bolts and appropriate hex key or screwdriver
- 7mm spanner/wrench
- Fusion splicer (optional)
- Fibre connector cleaner

3.3 Preparing for installation

It should be ensured that a suitable mounting location is available for the PSC-3 in a 19" rack with access to existing instrument transformer secondary wiring and fibre optic connections. In advance of the installation, the installation location should be cleared of mess and debris.

It is at the customer or their installer's discretion whether an electrical outage should be arranged for installation of this equipment since this depends on the complete scope of work and the electrical safety protocols under which the work will be taking place.

3.4 Mechanical mounting

3.4.1 Mounting the enclosure

The standard rack-mountable device should be mounted via the front panel flanges using standard rack-mount tools. It is recommended that a suitable shelf or additional rack support is employed to support the weight of the device, or that it is installed directly above other Synaptec equipment, subject to the installation guidelines for that equipment.

No ventilation is present in the PSC-3 chassis, and so it is suitable for installation directly above or below other rack-mountable devices without an air gap, subject to the installation guidelines for those devices.

After mounting and before the equipment is energised, the enclosure should be earthed to a local common equipment earthing point by connection to the earth bonding point on the housing. The earthing wire should be terminated in a suitable ring lug for connection to the M4 earthing point.

3.4.2 Secondary circuit connections

The PSC-3 will be delivered in one of two formats: a PSC-3-C for current, or a PSC-3-V for voltage. For both device formats, secondary connections from the existing instrument transformer are made via M4 screw terminals on the rear panel, as indicated in Figure 2.1. Secondary wiring should be terminated in a suitable ring lug for connection to the screw terminal.

Table 3.1: Terminal block wiring order. S1 and S2 refer to the connections to the secondary wiring for each phase, determined by the polarity of the CT. The convention is to connect these such that energy flows from S1 to S2.

Terminal label	Secondary wiring connection	
	PSC-3-V	PSC-3-C
01	Phase A	Phase A S1
02	Neutral	Phase A S2
03	Phase B	Phase B S1
04	Neutral	Phase B S2
05	Phase C	Phase C S1
06	Neutral	Phase C S2

Table 3.1 indicates the connection order for each phase with reference to the terminal numbering on the rear panel. This format should be used for both PSC-3-C and PSC-3-V, unless otherwise agreed with the customer.

3.5 Fibre optic connection

Unless otherwise agreed with the customer or deemed necessary for optimum optical efficiency during system design, the PSC-3 is supplied with standard SC/APC fibre ports for connection into the sensor network. A simplex, single-mode SC/APC fibre optic patch cable should be used to connect the PSC-3 to the preceding device in the sensor network (or the Interrogator if the PSC-3 in question is the first in the network) and to the following device, providing uninterrupted line-of-sight through the fibre to the other sensors in the network and the Interrogator.

Should fibre optic splices be required, these should be performed by trained individuals using a suitable fusion splicer. For optimal operation, it is recommended that splice loss not exceed 0.05 dB.

For technical support, please call +44 (0)141 488 3664
or email support@synapt.ec
Synaptec Ltd, 204 George Street, Glasgow, G1 1XW, United Kingdom
T: +44 (0)141 448 3664 | info@synapt.ec | synapt.ec