synaptec
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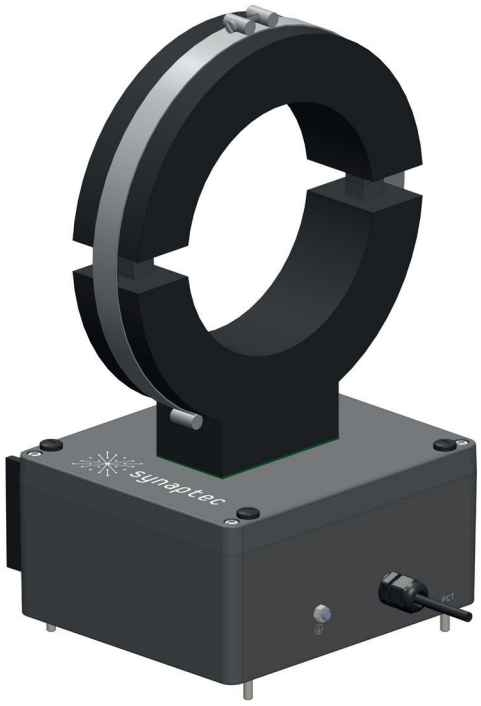
Installation manual

Low-Voltage Photonic Current Transducer (LV-PCT)



Document: TD-005 Rev.03

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 Low-Voltage Photonic Current Transducer (LV-PCT), 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 product.

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
- LV-PCT – Low-Voltage Photonic Current Transducer

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 LV-PCT combines an industry-standard iron core current transformer (CT) with Synaptec's passive photonic sensing technology to deliver reliable, remote power system instrumentation.

Using high-performance protection class CTs as primary converters, no non-standard or vulnerable installation processes are introduced, while Synaptec's photonic sensing technique permits measurement of the CT secondary without dedicated local merging units or data networks. The format of the primary converter—solid or split-core—may be determined by the customer based on the use case. The LV-PCT may be configured as an IEC 60044- or IEC 61869-compliant protection class device.

Synaptec's photonic technology allows the LV-PCT to be completely optically isolated: no electronics, batteries, data communications, power supplies or time synchronisation is required at the measurement location.

Each LV-PCT is installed in combination with Synaptec's Interrogator measurement device. Up to 30 single-phase LV-PCTs may be installed in series on a single optical fibre, connected to the Interrogator at a single end (typically in a substation environment). The distance from the Interrogator to the final LV-PCT in the chain may be as much as 60 km (with larger distances possible on request).

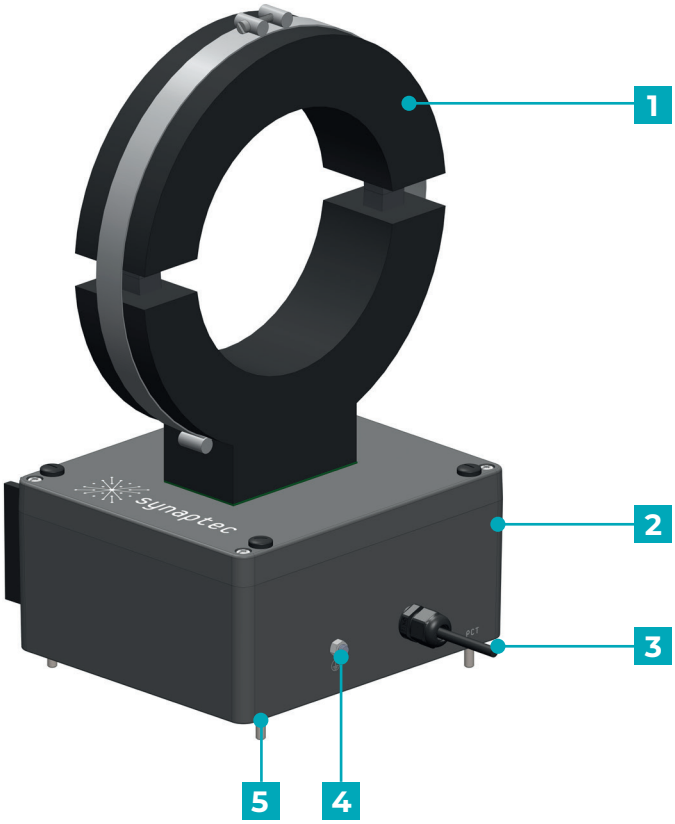
2.3 Features and functions

The LV-PCT is shown in Figure 2.1, with numbered items described in Table 2.1.

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

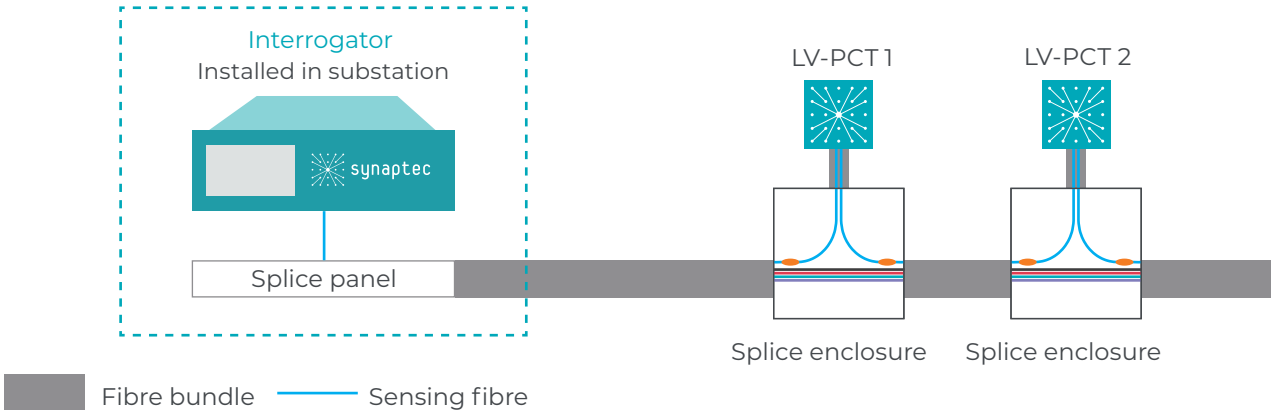
Item	Designation	Description	Qty
1	Current transformer	Industry standard iron-core CT. Split- and solid-core options available	1
2	Housing	Enclosure for secondary optical measurement device	1
3	Fibre optic cable	Duplex cable for connection of optical sensor into the wider sensor network	1
4	Earth bonding point	For earthing of the enclosure	1
5	Mounting screws	M6 mounting screws for installation of the device	4

Figure 2.1: LV-PCT design. Numbered items are identified in Table 2.1.



The CT element is typically customised for a given application, depending on the current to be measured, retrofit or new-build deployment, and any dimensional constraints at the installation location.

Figure 2.2: Example fibre routing between LV-PCT units and central DES Interrogator.



2.4 Optical fibre routing

The LV-PCT 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 LV-PCT in the fibre network. Each LV-PCT is typically connected into the optical fibre network via a local fibre splice enclosure. A general approach to fibre routing and connection is shown in Figure 2.2. Final fibre routing shall be agreed with the customer at the design stage of each project, but will follow this same general principle.

3. Installation

3.1 Chapter overview

This chapter describes the process of installation of the LV-PCT.

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:

- Flat-head screwdriver
- Adjustable spanner
- M6 bolts and appropriate hex key or screwdriver
- Fusion splicer

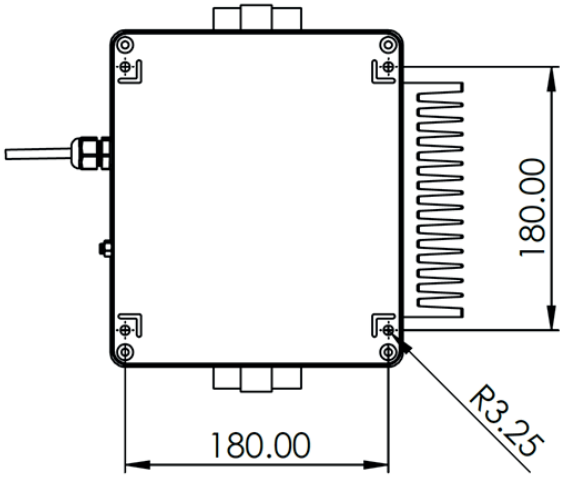
3.3 Preparing for installation

It should be ensured that a suitable mounting location is available for the LV-PCT for the CT element to be safely installed about the cable to be measured. The arrangement of mounting holes on the LV-PCT base is shown in Figure 3.1. It should be ensured that a suitable adaptor is produced for mounting of the LV-PCT at the desired location.

In advance of the installation, the installation location should be cleared of mess and debris. Any mounting adaptors required for interfacing with the device as shown in Figure 3.1 should be installed before the LV-PCT itself.

It is at the customer'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.

Figure 3.1: Arrangement of mounting holes on the LV-PCT base.



3.4 Mechanical mounting

3.4.1 Mounting the enclosure

The LV-PCT may be mounted on the designed adaptor using M6 bolts, per the diagram in Figure 3.2. M6 bolts of appropriate length for interface with any adaptor elements should be inserted into the enclosure mounting holes and secured to the mounting surface. The provided plugs should then be used to seal up the open mounting holes.

Figure 3.2: LV-PCT mounting arrangement.

After mounting and before the equipment is energised, the enclosure should be earthed to a local common earthing point by connection to the earth bonding point on the housing.

3.4.2 Installing the current transformer

The CT element is industry-standard, and so should be familiar to any qualified installer of CTs in the power sector. The LV-PCT may be supplied in solid- or split-core format depending on the customer preference.

For installation of solid-core devices, typically employed for new-build circuits, the cable to be monitored should be passed through the ring core before termination

For split-core devices, typically retrofitted to existing circuits, the core may be split at the midpoint and passed around the cable to be monitored. The securing ring should then be used to fix the two CT halves together.

The CT should be oriented such that current flows in the direction P1 to P2 as labelled on the CT exterior.

For outdoor installations of split-core LV-PCTs, a suitable putty is supplied for sealing the exposed sections of the iron core. In this case, manufacturer instructions for the putty are supplied separately.

3.5 Fibre optic connection

Unless otherwise agreed with the customer, the LV-PCT is supplied with 10 m of unterminated fibre optic cable for connection into the sensor network. The fibre cable typically contains 4 or 8 fibres. The fibres coloured red and yellow should be used to connect into the sensor network, and other fibres should be left unterminated. The red and yellow fibres should be spliced into the agreed optical fibre network at a local splice box location, providing uninterrupted line-of-sight through the fibre to the other sensors in the network and the Interrogator.

Fibre optic splices 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.