

|  |
| --- |
| Assets Planning and Delivery Group  Engineering |

DESIGN STANDARD DS 26-21

Type Specifications – Electrical

Type Specification for Current Transformers and Sensors

|  |
| --- |
|  |
|  |
| version 1  revision 4 |
| FEBRUARY 2023 |

**FOREWORD**

The intent of Design Standards is to specify requirements that assure effective design and delivery of fit for purpose Water Corporation infrastructure assets for best whole-of-life value with least risk to Corporation service standards and safety. Design standards are also intended to promote uniformity of approach by asset designers, drafters and constructors to the design, construction, commissioning, and delivery of water infrastructure and to the compatibility of new infrastructure with existing like infrastructure.

Design Standards draw on the asset design, management and field operational experience gained and documented by the Corporation and by the water industry generally over time. They are intended for application by Corporation staff, designers, constructors and land developers to the planning, design, construction, and commissioning of Corporation infrastructure including water services provided by land developers for takeover by the Corporation.

Nothing in this Design Standard diminishes the responsibility of designers and constructors for applying the requirements of the Western Australia's Work Health and Safety (General) Regulations 2022 to the delivery of Corporation assets. Information on these statutory requirements may be viewed at the following web site location:

[Overview of Western Australia’s Work Health and Safety (General) Regulations 2022 (dmirs.wa.gov.au)](https://www.dmirs.wa.gov.au/sites/default/files/atoms/files/overview_general_regulations.pdf)

Enquiries relating to the technical content of a Design Standard should be directed to the Principal Engineer, Electrical (Power) Section, Infrastructure Design Branch. Future Design Standard changes, if any, will be issued to registered Design Standard users as and when published.

**Head of Engineering**

*This document is prepared without the assumption of a duty of care by the Water Corporation. The document is not intended to be nor should it be relied on as a substitute for professional engineering design expertise or any other professional advice.*

*It is the responsibility of the user to ensure they are using the current version of this document.*

© Copyright – Water Corporation: This standard and software is copyright. With the exception of use permitted by the Copyright Act 1968, no part may be reproduced without the written permission of the Water Corporation.

DISCLAIMER

This Standard is intended solely for application to the acquisition of water infrastructure in Operating Areas in Western Australia where the Water Corporation has been licensed to provide water services subject to the terms and conditions of its Operating License.

This Standard is provided for use only by a suitably qualified professional design engineer who shall apply the skill, knowledge and experience necessary to understand the risks involved and undertake all infrastructure design and installation specification preparation work.

Any interpretation of anything in this Standard that deviates from the requirements specified in the project design drawings and construction specifications shall be resolved by reference to and determination by the design engineer.

The Corporation accepts no liability for any loss or damage that arises from anything in the Standard including loss or damage that may arise due to the errors and omissions of any person.

**REVISION STATUS**

The revision status of this standard is shown section by section below. It is important to note that the latest revisions including additions, deletions and changes to this version of the standard.

| **REVISION STATUS** | | | | | |
| --- | --- | --- | --- | --- | --- |
| **VER./**  **REV.** | **DATE** | **PAGES REVISED** | **REVISION DESCRIPTION**  **(Section, Clause, Sub-Clause)** | **RVWD.** | **APRV.** |
| **0/4** | **01.09.03** | **All** | **New section** | **NHJ** | **AAK** |
| **1/0** | **27.02.04** | **All** | **Sections split** | **NHJ** | **AAK** |
| **1/1** | **23.05.05** | **All** | **Paragraphs renumbered** | **NHJ** | **AAK** |
| **1/ 2** | **30.06.06** | **6** | **2.1,2.7,2.8 revised** | **NHJ** | **AAK** |
| **1/3** | **02.06.09** | **5** | **2.7 revised** | **NHJ** | **AAK** |
| **1/4** | **27.02.23** | **6,7** | **2.1,2.8 revised** | **SWG** | **EDG** |

DESIGN STANDARD DS 26-21

Type Specifications – Electrical

Type Specification for Current Transformers and Sensors

**CONTENTS**

*Section Page*

[1 GENERAL 6](#_Toc128637962)

[2 CURRENT TRANSFORMERS 6](#_Toc128637963)

[2.1 Standards 6](#_Toc128637964)

[2.2 Primary Current Rating 6](#_Toc128637965)

[2.3 Short Time Current Rating 6](#_Toc128637966)

[2.4 Rated Operating Voltage 6](#_Toc128637967)

[2.5 Rated Insulation Level 6](#_Toc128637968)

[2.6 Rated Secondary Current 6](#_Toc128637969)

[2.7 Accuracy Class 6](#_Toc128637970)

[2.8 Accuracy Limit Factor 7](#_Toc128637971)

[2.9 Burden 7](#_Toc128637972)

[2.10 Rated Secondary Reference Voltage 7](#_Toc128637973)

[3 ROGOWSKI COIL CURRENT SENSORS 7](#_Toc128637974)

[3.1 Primary Current Rating 7](#_Toc128637975)

[3.2 Short Time Current Rating 7](#_Toc128637976)

[3.3 Rated Operating Voltage 7](#_Toc128637977)

[3.4 Rated Insulation Level 8](#_Toc128637978)

[3.5 Rated Secondary Current 8](#_Toc128637979)

[3.6 Accuracy Class 8](#_Toc128637980)

[3.7 Accuracy Limit Factor 8](#_Toc128637981)

[3.8 Burden 8](#_Toc128637982)

# GENERAL

This Specification covers the performance requirements for current transformers and current sensors to be provided as part of High or Low Voltage Switchboards.

# CURRENT TRANSFORMERS

## Standards

Current transformers shall be in accordance with AS 61869.2 (Instrument transformers - Additional requirements for current transformers) or with IEC 61869-2 (Instrument transformers - Part 2: Additional requirements for current transformers) and shall be designated in full in accordance with one or other of these standards.

## Primary Current Rating

In any particular circuit, the primary current rating of associated current transformers shall be the next largest available current rating greater than the circuit continuous maximum demand current and shall not be greater than twice the continuous maximum demand current.

## Short Time Current Rating

Current transformers shall have a short time current rating not less than the short time current rating specified for the whole of the associated switchboard with the exception that current transformers installed on the load side of current limiting fuses need only have a short time current rating providing an allowable let through I2t greater than the total I2t of the associated current limiting fuse.

## Rated Operating Voltage

Current transformers shall have a rated operating voltage not less than the rated operating voltage specified for the whole of the associated switchboard.

## Rated Insulation Level

Current transformers shall have a rated insulation level not less than the rated insulation level specified for the whole of the associated switchboard.

## Rated Secondary Current

Metering current transformers shall have a secondary current rating of 5 Amp.

Protection current transformers shall have the secondary current ratings shown on the Principal’s drawings.

If such ratings are not shown on the Principal’s drawings, protection current transformers shall have a secondary current rating of either 1 Amp or 5 Amp.

## Accuracy Class

Metering current transformers used in association with power or energy transducers shall be accuracy class 0.5 (i.e. rated current error of 0.5% and phase error of 0.9 crad). Otherwise metering current transformers shall be accuracy class 1.0 (i.e. rated current error of 1.0% phase error of 1.8 crad).

Generally, protection current transformers shall be of accuracy class 5P (i.e. rated composite error of not more than 5% at the Accuracy Current Limit).

However, protection current transformers to be used in balanced protection applications shall be of a higher accuracy class if such is shown on the Principal’s drawings.

## Accuracy Limit Factor

As specified in AS 61869.2, metering transformers shall maintain their rated accuracy at currents up to 120% of full load current rating for times limited by their rated continuous thermal current (which is normally the full load rated current).

Protection current transformers shall have a rated accuracy limit factor of not less than 10.

## Burden

Current transformers shall have a rated burden VA in accordance with the following:

Qr = (Qd + Qw + Qt)

where:

Qr = CT rated burden VA at rated secondary current

Qd  = Rated burden VA at the CT rated secondary current of the switchboard mounted instruments, relays, trip coils and other devices to be operated by the CT

Qw = Burden VA of the CT secondary circuit switchboard wiring at the CT rated secondary current (to be determined by calculation for the particular switchboard).

Qt = Burden VA of external test instruments

= 2.0 VA for 5A secondaries

= 1.0 VA for 1A secondaries

## Rated Secondary Reference Voltage

The rated secondary reference voltage (expressed in Volts) for a protection current transformer shall be determined as follows:

Vsr = Qr\*F/Is

where,

Qr  = CT rated burden VA at rated secondary current, Amps

F = CT rated accuracy limit factor

Is = CT rated secondary current, Amps

# ROGOWSKI COIL CURRENT SENSORS

## Primary Current Rating

In any particular circuit, the maximum operating range of associated Rogowski coil current sensors shall not be more than five times the circuit continuous maximum demand current.

## Short Time Current Rating

Rogowski coil current sensors have a short time current rating not less than the short time current rating specified for the whole of the associated switchboard with the exception that Rogowski coil current sensors installed on the load side of current limiting fuses need only have a short time current rating providing an allowable let through I2t greater than the total I2t of the associated current limiting fuse.

## Rated Operating Voltage

Rogowski coil current sensors shall have a rated operating voltage not less than the rated operating voltage specified for the whole of the associated switchboard.

## Rated Insulation Level

Rogowski coil current sensors shall have a rated insulation level not less than the rated insulation level specified for the whole of the associated switchboard.

## Rated Secondary Current

Rogowski coil current sensors shall have a secondary current rating of 1 Amp at the maximum operating current.

## Accuracy Class

Rogowski coil current sensors shall have a rated composite error of not more than 5% over the complete operating range.

## Accuracy Limit Factor

Rogowski coil current sensors shall have a rated accuracy limit factor of not less than 10 times the maximum operating current.

## Burden

Rogowski coil current sensors shall have a rated burden VIA in accordance with the following:

Qr = (Qd + Qw + Qt)

where:

Qr = Sensor rated burden VA at the sensor rated secondary current

Qd = Rated burden VA at the sensor rated secondary current of the switchboard mounted relays, trip coils and other devices to be operated by the sensor (to be determined by calculation for the particular switchboard)

Qw = Burden VA of the sensor secondary circuit switchboard wiring at the sensor rated secondary current.

Qt = Burden VA of external test instruments

= 1.0 VA for 1A secondaries

END OF DOCUMENT