

**Annexure 17: Supporting related to  
Controlling System devise**

# CSD100

## Point-on-Wave Controller

CSD100 is an advanced **Controlled Switching Device for high voltage AC circuit-breakers**. The ability to mitigate switching transients is becoming a key issue for today's grids as the generated stresses lead to power quality problems and accelerated aging. CSD100 provides utilities a cost-effective, streamlined solution to protect utility assets and improve system reliability by minimizing risks and operation costs.

### Challenges

In a grid decarbonization and decentralization context, the introduction of intermittent renewable power sources can generate:

- Grid instability
- Daily load variation, requiring reactive power compensation
- Need to transmit large blocks of energy since power sources are often distant from main consumption centers

Challenges with digitization of the grid include:

- Moving toward digital substations
- Acquiring and communicating data from the primary equipment
- Managing and operating substations with large amounts of data

### Solution

- GE's CSD100 controller used with GE's advanced circuit-breakers form a cost effective solution to improve the power quality and network stability
- CSD100 delivers optimized management of circuit-breaker switching to dramatically limit stress on grid equipment - extending asset life
- CSD100's design simplifies substation integration
- Combined data acquisition and digital communication capabilities to play an important role in asset performance management (APM).

### Advantages

GE is a world leading OEM with expert knowledge of the constraints linked to primary high voltage equipment and the electrical grid. Using this expertise, GE's CSD100 has been developed to be the ideal, high performance point-on-wave controller.



## Safe Connectivity of Intermittent Generation

- Voltage dip reduction
- Transformer stress limitation

## Safe Switching of Reactive Power Compensation

Drastic stress reduction on equipment for compensation:

- Capacitors Bank
- Shunt Reactor

## Increased Reliability of Overhead Lines (OHL)

- Safe closing and auto-reclosing
- Optimization of overhead lines designs
- Optimization of insulation levels
- Reduction of surge arrester stress

## Advanced Communications

- IEC 61850
- IEC 61850-9-2LE/IEC 61869 (upcoming)
- DNP3 (upcoming)
- Easy integration to digital substation
- User-friendly Web-HMI



## Safe Intermittent Connection to HV Grids

Managing the connection to the grid, the CSD100 combined with a properly configured-circuit breaker significantly reduces grid disturbance and allows the independent power producers to simplify their switching procedures:

- Strong limitation of voltage dip at grid connection
- Containment of inrush current at power transformer energization
- Power transformer increased lifetime



## Optimized Overhead Lines

Generation hubs are often distant from main consumption centers. Large amounts of power are transferred through very long lines. Overvoltage phenomena are generated by switching operations and amplified by the distance. The conventional answer, consisting of adding a pre-insertion resistor to the circuit-breaker, can be effectively replaced by the CSD100.

Advantages include:

- Safe auto-reclosing operations
- Reduction of required insulation level
- Compact overhead lines design

For more information please contact  
GE  
Grid Solutions

### Worldwide Contact Center

Web: [www.GEGridSolutions.com/contact](http://www.GEGridSolutions.com/contact)  
Phone: +44 (0) 1785 250 070



## Safe Switching in Reactive Power Compensation

Capacitor banks and shunt reactors help to stabilize the grid and improve the power factor. Acting as reactive power generators, their switching needs to be controlled precisely to a limit associated electrical transients:

- Significant stress reduction on capacitor banks
- Significant stress reduction on shunt reactors



## Asset Performance Management

With extensive data acquisition and storage capabilities, the CSD100 allows for extensive monitoring and optimized switching to protect equipment. Together, with its digital communication abilities, the CSD100 plays a key role in your Asset Performance Management (APM).

## GEGridSolutions.com

IEC is a registered trademark of Commission Electrotechnique Internationale. IEEE is a registered trademark of the Institute of Electrical Electronics Engineers, Inc. Modbus is a registered trademark of Schneider Automation.

GE, the GE monogram logo are trademarks of General Electric Company.

GE reserves the right to make changes to specifications of products described at any time without notice and without obligation to notify any person of such changes.

CSD100\_Overview-Flyer-EN-2020-02-Grid-AIS-1681. © Copyright 2020, General Electric Company. All Rights Reserved.



Imagination at work

## 1.3 Influences on Desired Closing and Opening Instants

The desired closing and opening instants depend on the load type. This chapter describes the most important influences.

### 1.3.1 Capacitive and Inductive Loads

The influences of the load type on the desired closing and opening instants are described using the closing operation as an example.

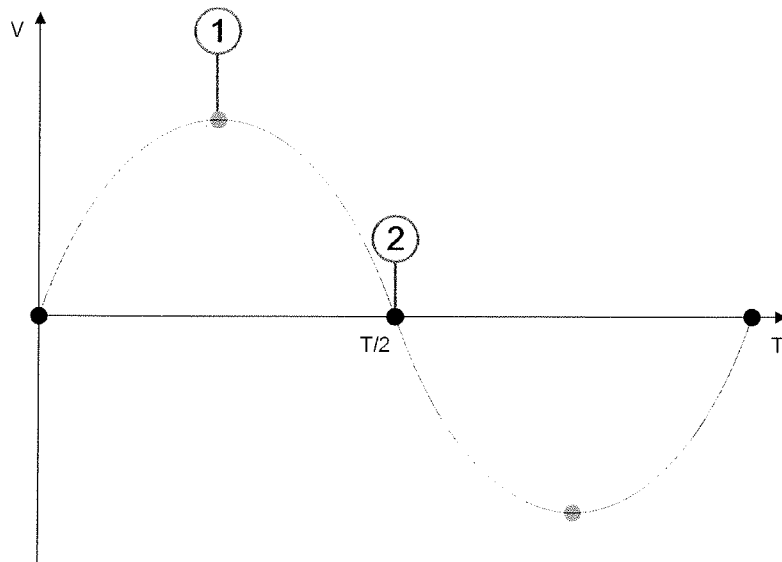


Figure 1-2 Desired Closing Instant in a System with a Grounded Neutral Point

1	Inductive load
2	Capacitive load
V	Voltage across open circuit-break pole
T	Network period

#### Inductive Load

A reactance coil (inductive load) creates a high resistance. When this reactance coil is energized, large differences of the current in the energizing instant would lead to a strong current increase and would therefore cause high overvoltages. It is therefore best to energize near the current zero crossing, that is, near the maximum voltage.

#### Capacitive Load

A discharged capacitor (capacitive load) has a low resistance. If this discharged capacitor is energized, strong transient balancing processes such as overvoltages and inrush currents occur when the capacitor is connected near the maximum voltage. To obtain the lowest potential difference upon energizing, the closing operation must occur near the voltage zero crossing.

### 1.3.2 System Grounding

Another influence on selecting the desired closing and opening instants is whether the system is grounded or isolated. This chapter describes this influence using the energizing of a capacitor bank as an example.

## 1.1 Introduction

The **Point-on-wave switching** function in SIPROTEC 5 is used to reduce increased electrodynamic and dielectric loads which are caused by non-optimal switching of circuit breakers in the network. In extreme cases, these loads reduce the reliability and life of the equipment installed in the network or lead to unnecessary opening operations by the protection device. To avoid effects such as overvoltages and inrush currents, this function can control the closing and opening instants of circuit breakers.

The following figure shows an example of closing for a capacitive load.

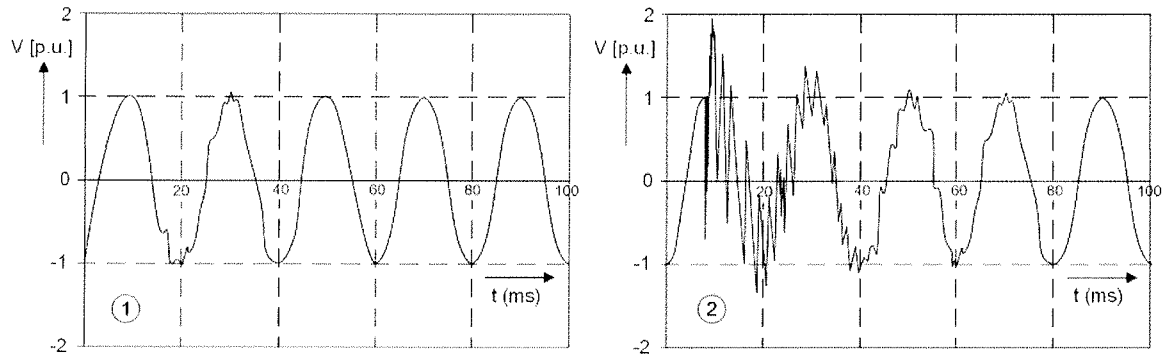


Figure 1-1 Example of a Closing for a Capacitive Load

- (1) Optimized closing instant
- (2) Non-optimized closing instant

Table 1-1 Avoided Effects in Different Load Types

Load Type	Switching Operation	Avoided Effect
Inductive load: Transformer, reactance coil	Opening	Restriking, overvoltage
	Closing	Inrush current, overvoltage
Capacitive load: Capacitor bank, transmission line	Opening	Restriking, overvoltage
	Closing	Overvoltage, inrush current

The **Point-on-wave switching** function is always started via a control command, either from the device-internal control function or from an external control function. Protection functions generally directly trip the circuit breaker and have no interaction with the **Point-on-wave switching** function.



# 1085 GE T&D India Limited

(formerly ALSTOM T&D India Limited)  
L31102DL1957PLC193993

142, Salamangalam Village,  
Vandalur Walajabad Road  
Padappai 601301  
Kanchipuram District

T +91 44 67126525  
F +91 44 67126949  
[www.ge.com/in/ge-td-india-limited](http://www.ge.com/in/ge-td-india-limited)

**To:-** M/s. JSW

**Offer Ref.:** 2022-12-009 dated 26.12.2022

**From:** K S Venkateswaran

**Subject:** Offer for supply of CSD

We thank you for the above-mentioned enquiry. Please find enclosed our offer consisting of the following:

- A. Special Terms & Conditions.
- B. Schedule of prices.
- C. Catalogue

Regards,



K S Venkateswaran  
Sales & Proposals

Encl: As above.

**A. SPECIAL TERMS & CONDITIONS****1.0 PRICES :**

The price includes necessary packing and forwarding.

**2.0 PRICE BASIS :**

Prices are Firm.

**3.0 DELIVERY :**

Ex-works delivery shall be completed within 8.5 months from the date of receipt of PO.

**4.0 VALIDITY :**

30 days from the date of this offer.

**5.0 TERMS OF PAYMENT :**

20% advance against PO and balance payment against proforma invoice before dispatch of materials.

**6.0 TAXES AND DUTIES :**

The present rate of GST is 18%. GST shall be charged extra. TCS @0.1% shall be charged extra.

However taxes and duties prevailing at the time of dispatch shall apply.

**7.0 FREIGHT CHARGES :**

Included.

**8.0 SUPERVISION of CSD Commissioning :**

Included

**9.0 GUARANTEE :**

The equipment is guaranteed for 18 months from the date of Ex-Works despatch or 12 months from the date of commissioning, whichever is earlier.

**10.0 LIMITATION OF LIABILITIES:**

Notwithstanding anything to the contrary in the contract documents, Supplier shall not in any circumstances under any legal theory, whether based on contract, warranty, tort (including negligence), strict liability, indemnity, professional liability or otherwise, be liable to indemnify the loss of use, loss of production, loss of profits, loss of contracts, loss of data, cost of capital, replacement power, claims of



Purchaser's customers, or any other financial or economic loss or any special, incidental, punitive, indirect or consequential loss or damage whatsoever whether suffered by Purchaser or by any third party and in no case the aggregate liability under the contract shall exceed the price of the contract.

#### **11.0 INSPECTION:**

Routine tests shall be performed on CB as per approved MQP. Charges towards making the offered equipments ready at our works for witnessing of routine tests as per sampling plan are included in the quoted prices. However, all costs towards travel, boarding, lodging and other incidental expenses of the inspector (s) shall be borne by the purchaser. Necessary assistance in booking of hotel room and local transportation can be provided by us on request.

DI/BI of inspected items shall be issued within 2 weeks from the date of inspection. In the event of delays in issuance of DI/BI, inventory holding/carrying charges shall be debited to purchaser's account

#### **12.0 FORCE MAJEURE:**

The delivery quoted by us is subject to the following force majeure conditions:

- 1) Natural phenomena, such as weather conditions, floods, droughts, earthquake, Pandemic and epidemics.
- 2) Act of Government Authority, domestic or foreign, such as war, declared or undeclared quarantines, embargoes, licensing control or production or distribution restrictions.
- 3) Accidents and disruption on account of fires, explosions, sabotages etc.
- 4) Transportation delay due to force majeure or accidents.
- 5) Strikes, slowdown, lockouts and power cut at our works or at our vendor's works.
- 6) Any other circumstances beyond our control.

Since all such conditions are beyond our control, we will not be able to accept any liability on account of delay in manufacturing or delivery.

- *The impacts of Coronavirus cannot be reasonably determined at this time. This proposal does not account for any potential adverse impacts of Coronavirus on GE's performance of obligations. In the event of any delays and adverse impacts, GE reserves the right for an equitable adjustment of the schedule and prices herein to offset the effects of Coronavirus delays."*

#### **13.0 DISPUTES & ARBITRATION:**

Any dispute or claim arising out of or relating to this Contract or the breach, termination or invalidity thereof which could not be amicably settled shall be finally settled by Arbitration in accordance with the Rules of Arbitration of Indian arbitration and conciliation act 1996. Arbitration shall be conducted by three arbitrators one each to be nominated by the purchaser and the supplier and the third to be named by the President of the Institution of Engineers of India who would conduct the arbitration as President of the Arbitration committee.

- a) The place of arbitration shall be New Delhi, India
- b) The language of arbitration shall be the English Language.
- c) The contract agreement shall be governed by and construed in accordance with the laws of the Country of India.

**14.0 SUSPENSION RIGHTS OF SUPPLIER:**

If the Purchaser has failed to pay any sum due under the Contract within the specified period, or failed to approve any invoice or supporting documents, or commits a substantial breach of the Contract, then the Supplier may suspend the performance of all or any of its obligations under the Contract, or reduce the rate of progress.

The Time for Completion shall be extended and any and all additional costs or expenses incurred by the Supplier as a result of such suspension or reduction shall be paid by the Purchaser in addition to the Contract Price, except in the case of Suspension order or reduction by reason of the Supplier's default or breach of the Contract.

**15.0 QUANTITY VARIATIONS:**

Quantity variations limited to  $\pm 10\%$  shall be intimated before the date of receipt of drawing approval or manufacturing clearance, whichever is earlier. Rates and deliveries of additional quantities shall be mutually discussed & agreed upon before issuance of PO amendments.

**16.0 SUSPENSION BY PURCHASER:**

Supplier shall be entitled to payments & delivery extension in case of suspension of works by the Purchaser.

**17.0 DESPATCH ADDRESS:**

The offered material would be dispatched from our works which is situated at,

**GE T&D INDIA LIMITED  
142, SALAMANGALAM VILLAGE,  
PADAPPAI  
KANCHEEPURAM DISTRICT  
TAMIL NADU - 601 301.**