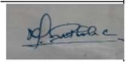
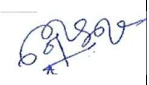
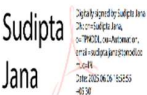


TECHNICAL SPECIFICATION

Compact FPI (Communicable Type) for Overhead Lines

For TP Odisha DISCOM

TPCODL/TPNODL/TPWODL/TPSODL

	Prepared By (EIC-CEG TPCODL)	Reviewed By (TPCODL)	Reviewed By (TPWODL)	Reviewed By (TPNODL)	Reviewed By (TPSODL)	Approved By (HEAD- ENGG.)	Released by (CHIEF- ENGG.)
Engineering/ STS/ Operation/C able & Switchgear	N. Garnaik 05.06.25	M. Sathish Kumar 17.06.2025	Jyoti Mohanty 18.06.2025	T.K. Behera. 06.06.2025	J. Sahoo 12.06.2025	Niranjan Khuntia 18.06.2025	Pourush Garg 20.06.2025
				 Tapati Kumar Behera IE Code-1171914 Superintending Engineer - PE & COS TP Northern Odisha Distribution Ltd.			
Automation		G. S. Behera 13.06.2025	S. Dash 12.06.2025	S. Jena 06.06.2025	Biswajit Dey 12.06.2025		
			 Sukhandi Dash.	Sudipta Jana  Digitally signed by Sudipta Jana DN: cn=Sudipta Jana, o=TPCODL, ou=Odisha, email=sudiptajana@tpcodl.com, c=India Date: 2025.06.25 15:55:45Z			

Central Engineering Services		Specification Name: Technical Specification for Compact FPI (Communicable Type) for Overhead Lines
------------------------------	--	--

CONTENTS

- 1 Scope**
- 2 Applicable Standards**
- 3 Climatic Conditions Of The Installation**
- 4 General Technical Requirements**
- 5 General Constructions**
- 6 Name Plate And Marking**
- 7 Tests**
- 8 Type Test Certificates**
- 9 Pre-Dispatch Inspection**
- 10 Inspection After Receipt At Stores**
- 11 Guarantee**
- 12 Packing And Transport**
- 13 Tender Sample**
- 14 Training**
- 15 Quality Control**
- 16 Testing Facilities**
- 17 Manufacturing Activities**
- 18 Spares, Accessories & Tools**
- 19 Drawings, Documents**
- 20 Guaranteed Technical Particulars**
- 21 Schedule Of Deviations**

ANNEXURES- 1

ANNEXURES- 2

ANNEXURES- 3

Central Engineering Services		Specification Name: Technical Specification for Compact FPI (Communicable Type) for Overhead Lines
------------------------------	--	--

1.0 SCOPE

This specification covers the technical requirements of design, manufacture, testing at manufacturer's works, packing, forwarding, supply and unloading, supply at stores, commissioning assist at the time of each installation of Communicable type Compact FPI Unit for Overhead Lines with all accessories and necessary Supervision & training for trouble free & efficient performance.

It is not the intent to specify completely herein all the details of tech design and construction of material. However, the material shall conform in all respects to high standards of engineering, design and workmanship and shall be capable of performing in continuous commercial operation in manner acceptable to the TPCODL/TPNODL/TPSODL/TPWODL, who will interpret the meanings of drawings and specification and shall have the power to reject any work or material which, in his judgment is not in accordance therewith. The offered material shall be complete with all components necessary for their effective and trouble free operation. Such components shall be deemed to be within the scope of Bidder's supply irrespective of whether those are specifically brought out in this specification and/or the commercial order or not. All necessary mounting fixture is in scope of supplier.

2.0 APPLICABLE STANDARDS

The equipment covered by this specification shall unless otherwise stated, be designed, manufactured and tested in accordance with latest editions of the following Standards /IEC and shall conform to the regulations of local statutory authorities.

IEC 60068-2-2	Electronic Equipment & Product Standards – For Dry Heat
IEC 60068-2-30	Electronic Equipment & Product Standards – Damp heat cyclic Test
IEC 60950	Information Technology equipment - Safety
IEC 61000-2	Electromagnetic compatibility for low-frequency conducted disturbances and signaling in public low power supply systems
IEC 61000-4	EMC - Testing & Measurement
IEC 61000-6	EMC- Immunity for Residential, Commercial and light industrial environments.
IEC 61010	Standard for safety requirements for electrical equipment for measurement, control, and laboratory use
IS 11353/1985	Guide for Uniform System of Marking and Identification of Conductors and Apparatus Terminals
IS 1248/2003	Indicating instruments.
EN 60-950	Product Safety testing standard for "Information Technology Equipment" (known as ITE)
IEEE 495-2007	Guide for testing faulted circuit indicators
IEC 60529	Degree of Protection.
IEC 60060-1	High-voltage test techniques – Part 1: General definitions and test requirements
IEC 60068-2-52	Salt mist, cyclic (sodium chloride solution)
IEEE STD 495	IEEE Guide for Testing Faulted Circuit Indicators
IEC 60870-5	Communication protocol.

Note- In case of any conflict on any technical particular in the specification, the stricter requirement mentioned in the relevant standard shall be valid.

Central Engineering Services		Specification Name: Technical Specification for Compact FPI (Communicable Type) for Overhead Lines
------------------------------	--	--

3.0 CLIMATIC CONDITIONS AT THE INSTALLATION

1	Maximum ambient temperature	50 deg C
2	Max. Daily average ambient temperature	35 deg C
3	Min Ambient Temperature	0 deg C
4	Maximum Humidity	100%
5	Average Annual Rainfall	150cm
6	Average No. of rainy days per annum	120
7	Altitude above MSL not exceeding	1000m
8	Wind Pressure	300 Km/hr
9	Earthquakes of an intensity in horizontal direction	equivalent to seismic acceleration of 0.3g
10	Earthquakes of an intensity in vertical direction	equivalent to seismic acceleration of 0.15g (g being acceleration due to gravity)

TPCODL/TPNODL/TPSODL/TPWODL service area has heavy saline conditions along the coast and High cyclonic Intensity winds with speed up-to 300 Kmph. The atmosphere is generally laden with mild acid and dust in suspension during the dry months and is subjected to fog in cold months.

4.0 GENERAL TECHNICAL REQUIREMENTS

Sr. No	Parameter Description	Requirement	As offered by Bidder
1	Offered Model no. or type of FPI for Overhead lines along with Make	Bidder to submit followings, a. Make b. Model no./Type c. Country of origin	
2	Application	Product shall be suitable for application on overhead lines of different size conductors and ABC	
3	Power	Self- powered for normal functioning without external auxiliary power for FPI	
4	Supply voltage Suitability	Suitable for 7 KV to 33 KV overhead conductors	
5	Nominal Current Range	0-600 A	
6	Power Frequency	50Hz	
7	Ingress Protection of enclosure	IP67 or better	
8	Short - circuit withstand	25kA for 3 seconds	
9	Suitable diameter of jaw	Suitable for Conductor- Dog, Wolf, Panther, Goat, Zebra	
10	Conformal coating	The relay PCB should have conformal coating	

Central Engineering Services		Specification Name: Technical Specification for Compact FPI (Communicable Type) for Overhead Lines
------------------------------	--	--

	Fault Detection Parameters		
11	Current setting Trigger value	100 A to 800 A steps of 100 A and Manually or Automatic Mode- Can be set on site remotely	
12	Current measurement accuracy	For 100A to 600A - <0.5% For low current loads - <±0.25A	
13	Transient faults detection feature	This feature can be made On or Off, Manually and Remotely as per application site need.	
14	Minimum fault current impulse filter time	60 to 300ms (To filter inrush current)	
15	Beacon Flash Indication Duration (user settable)	30 min to 720 min in steps of 30 min - Manual and Remote Settable	
16	Inrush transient restraint	2 sec	
	Reset (Permanent Fault)		
17	Auto-reset on restoration on supply	Should auto-reset after 30 seconds delay and within one min of supply restoration.	
18	Pre-set Timer Reset	30 min to 360 min in steps of 30 min - Manual and Remote Settable	
19	Manual Reset (Local and Remote both)	Manual and Remote Resettable	
	Fault indication		
20	Fault Indications	Bright Red flash light (LEDs) for permanent faults, Preferably Green LED for transient fault with different blinking rate Preferably Yellow LED for low battery indication Bidder to submit the offered equipment details of features for indication of above faults categories.	
21	Light Power	40 Lumens	
22	Visibility Angle	360 Degree and 300 mtr	
23	Flash Period for permanent faults	1 flash every 3 sec and/or Red flashing LED	
24	Flash Period for transient faults	2 flash every 12 sec and/ or Green flashing LED	
25	Standard total flash duration	Min. 1000 Hrs under permanent fault operation	
26	Battery low indication	The FPI should have low battery indication Local and remote alert (Bidder to submit details of provision)	
27	Internal Battery of FPI	Lithium Ion rechargeable battery (Shall recharge from line current)	
28	Life of the Battery (In operating condition)	More than 10 years	
29	Shelf Life of battery	More than 15 years	
30	FPI Battery capacity	Minimum 4 hours of battery backup. Bidder to mentioned details of voltage and Ah rating	

Central Engineering Services		Specification Name: Technical Specification for Compact FPI (Communicable Type) for Overhead Lines
------------------------------	--	--

31	Operation Temperature	-5 deg. C to +70 deg. C or better	
32	Storage Temperature	-5deg. C to +70 deg. C or better	
33	Suitability for Wind Resistance	For wind pressure 200kg/sqm up to an elevation of 10 mts	
34	Weight of FPI unit	Bidder to submit details of offered product	
35	Size of FPI unit (Dimensions)	Bidder to submit details of offered product	
36	Fixing on line conductor	Should be Easy to fix with hot stick	
37	FPI power up current	FPI should be power up with Minimum 5A line current & battery power shall be used only after fault	
38	Inbuilt Radio range	100 meter (A short-range radio interface shall be embedded in this Fault Passage Indicator/ so that to allow it communicate with the 2G/3G/4G/ 4G LTE, etc. communication interface) Provision of fall back 3G/2G to maintain uninterrupted network.	
39	SMS Alert	SMS alarm forwarding facility available for at least 5 different numbers.	
40	Communication protocol with server	The FPI unit should provide data to SCADA.	
41	Line Loading data	FPI should transmit real time line loading (phase wise), fault data to ADMS through FPI.	
42	Data Transmission rate	Data Transmission rate over Ethernet should be 10/100Mbps	
43	Multi master reporting	FPI should report at- least 8 master with single CASDU	
44	FPI Data downloading at site	Data downloading from FPI to Laptop should be possible from the application. LAPTOP software to be provided free of cost & should be compatible with windows 10 and latest edition	
45	Installation supervision	The bidder shall provide installation supervision	
46	SCADA integration of data.	The scope shall include the data integration up to SCADA.	

5.0 GENERAL CONSTRUCTION

- 5.0.1 The Overhead Fault Passage Indicator shall locate the passage of faults on overhead lines. The FPI shall indicate transient faults, sub-transient faults and permanent faults on the O/H lines. The transient fault detection feature should have disable feature with manual as well as remote settable.
- 5.0.2 FPI should detect the fault during trail charge. (Switch on to fault (SOTF) feature in FPI).
- 5.0.3 The Overhead Fault Passage Indicator shall operate on passing over of the absolute threshold current (user settable).
- 5.0.4 Current peaks, caused by switching on power equipment like transformers etc. can reach the operating point of FPI and may lead to a wrong evaluation, to avoid this, the incoming impulse must be filtered internally.

Central Engineering Services		Specification Name: Technical Specification for Compact FPI (Communicable Type) for Overhead Lines
------------------------------	--	--

- 5.0.5 The filtration shall be such that the fault will only be indicated by FPI, if the current impulse lasted longer than the pre adjusted minimum impulse duration.
- 5.0.6 This duration should be internal set as 60ms minimum or/and can be adjustable in range of 60 to 300ms based on equipment in network application.
- 5.0.7 The faults are indicated by all FPI indicators placed on line between the source input side and up to the location of the fault. Such that the fault location shall be between the last flashing FPI and the next non- flashing FPI which is in standby mode.
- 5.0.8 SPD to be provided.
- 5.0.9 FPI configuration option should be through wireless device like dongle with supporting software and remote, should not through hardware like USB Cable.
- 5.0.10 Protection setting and troubleshooting from web browser (OEM configuration tool can be avoided), as the program can be accessible from any user specific system or laptop.
- 5.0.11 Considering the lightning prone geography, need to consider SPD for FPI.
- 5.0.12 Hard rebooting of FPI through SMS shall be included in specification as a standard feature.
- 5.0.13 Cyber security needs to be ensure.
- 5.0.14 The FPI should report to 8 masters with one single CASDU.
- 5.0.15 The Fault passage Indicator (FPI) shall be designed to manage the risks associated with it such that there shall not be any safety hazard to the employees in normal service and during inspection and maintenance.
- 5.0.16 The Fault passage Indicator (FPI) shall be totally safe against inadvertent touch (by human/animal) of any of its constituent live parts.
- 5.0.17 The Fault passage Indicator (FPI) shall be cooled by natural air flow.
- 5.0.18 All cable requirements should be considered.
- 5.0.19 All the components of fault detection system shall be antirust, corrosion resistant and UV resistant hence suitable for long time outdoor exposure ensuring long life.

OPERATION PRINCIPLE

- Three sensors constantly sample and record currents and voltages information (waveforms)
- Once an outage or other abnormality occurs, the waveforms are sent from the two secondary sensors to the gateway-sensor which analyzes the 3-phase waveform and detects & classified the fault.
- The information is then sent to the application and which after additional analysis, displays the result and sends selected information to SCADA.

5.1 TRIP CURRENT AND FAULT TYPES

- 5.1.1 Trip current for the FPIs shall be settable at site.
- 5.1.2 FPIs shall constantly monitor, measure the line current and evaluate the same. In case current exceeds a pre-set value, a fault has to be indicated. Alternatively, there shall also be an "Automatic Mode", in which the FPIs will get adapted to the service current.
- 5.1.3 The FPI shall detect and indicate phase to phase & phase to earth faults. In addition to this, the FPI shall also detect and differentiate between transient, temporary and permanent faults.
- 5.1.4 In addition to these the FPI should be able to detect High impedance fault and broken conductor fault.
- 5.1.5 The FPI should capture 3 Phase waveforms and measure zero sequence current to detect current imbalance.
- 5.1.6 The FPI shall be equipped to filter out the inrush current due to transformer magnetizing currents thus avoiding the possible false indication of faults.
- 5.1.7 In case of faults, the Fault Passage Indicator which are detecting the variation of the electromagnetic field due to fault current (Indicator installed between the circuit breaker and fault point) shall provide a fault indication, while Fault Passage Indicators downstream the fault or on non-faulty branches shall not provide any indication.
- 5.1.8 The Fault Passage Indicator shall be selective in action as indicated below

Central Engineering Services		Specification Name: Technical Specification for Compact FPI (Communicable Type) for Overhead Lines
------------------------------	--	--

- a. It shall not respond to any sudden variation (increases/decrease) in load current.
- b. It shall not respond to an over current not due to a fault.
- c. It shall not respond to high magnetizing inrush currents, created upon line energizing.

5.2 LED/INDICATION

- 5.2.1 The FPI shall indicate faults by means of bright red LED for permanent faults so that the indication is clearly visible during night times and by means of a red luminous flag, so as to be clearly visible in the bright sunlight during day times.
- 5.2.2 Alternately it is preferred that FPI shall have different color light (LEDs) for permanent faults, transient fault and low battery indication.
- 5.2.3 Bidders to mention the options provided for various faults and indication purposes.

5.3 RESET

- 5.3.1 Once the fault is cleared, the FPI shall reset itself upon the power return.
- 5.3.2 It shall also have a facility of resetting with settable time duration and manual reset.
- 5.3.3 If FPI is busy in flashing on transient fault and if the permanent fault occurs, the FPI shall automatically change the priority and shall start flashing differently to show the permanent fault; thus helping maintenance crew to review the priorities.
- 5.3.4 The Fault indication shall remain until:
 - a. a time-out, configurable to at least 4 possible values between 2 and 16 hours, has expired,
 - b. the medium voltage is back,
 - c. the Fault Passage Indicator is reset manually
 - d. **Whatever condition comes first.**
- 5.3.5 The Fault indication reset shall consist in:
 - a. stopping the local light indication flashing
 - b. sending an alarm to the GSM/GPRS interface which shall itself forward this alarm to the SCADA Control Centre according to its configuration.

5.4 BATTERY

- 5.4.1 The FPIs shall be powered by inductive pickup from the 11kV conductor with a minimum operating current of 5A. During faults, when the system is down, FPIs shall be powered by lithium-Ion battery.
- 5.4.2 The battery shall have a minimum life of 10 years & a shelf life of minimum 15 years.
- 5.4.3 Low battery alarm indication shall be provided on local as well as SCADA control station.
- 5.4.4 Battery health monitoring feature must be included and should be accessible remotely by OEM application and SCADA, along with it a SMS communication of the battery life should be sent every 15 days.

5.6 REMOTE CONTROL UNIT FEATURES

- 5.6.1 The FPI shall be supplied along with suitable Remote Control Unit, having a LCD display, common for all the Overhead Fault Passage Indicator. The supplier shall supply one number of Remote Control Unit free of charge along with every 9 numbers of FPIs.
- 5.6.2 The FPI shall be equipped with remote Test and Reset features, so that the functionalities including status of battery and flag can be tested without removing the FPI from the line. The Remote Control Unit shall capable of performing the following operations:
 - I. Perform Test / Reset operations by standing below the FPIs.
 - II. View settings of various parameters of the FPI like trip current, response time, reset time, temporary fault indication status, transient fault indication status, auto-reclosure support status etc.
 - III. Set various parameters of the FPI like trip current, response time, reset time, temporary fault indication status, transient fault indication status, auto-reclosure support status etc.
 - IV. Perform battery check, battery health check and flag check.

Central Engineering Services		Specification Name: Technical Specification for Compact FPI (Communicable Type) for Overhead Lines
------------------------------	--	--

- V. View real-time value of the current flowing through the 11kV line on which a particular FPI is installed. This current shall be indicated in terms of Amps (A).
- VI. Operating range for the Remote Control Unit shall be minimum 30m radius.

5.6.3 The settings for the FPI shall be settable at site, without dismounting the FPI from the line. Following parameters shall be settable at time.

- Trip Current
- Response Time
- Reset Time
- Turn On / Off indication for Transient Faults
- Turn On / Off auto-reclosure support function

5.7 GSM/GPRS COMMUNICATION INTERFACE

Data Transmission Rate	10/100Mbps.
Communication	Controller must have at least one TCP/IP Ethernet port to for communication with master station over IEC-60870-5-104 & MQTT. No external protocol converter will be accepted.
Master station communication protocol	Support IEC -60870-5-104/MQTT for communicating with master station. Preferably support FTP protocol to transfer disturbance recorder to remote server. Simultaneously communication facility to field engineer for faster local restoration
DATA Reporting	Device should support periodic data reporting configurable from 2 second to 1 hr interval and spontaneous data as well. Digital data should have higher priority than analog data. The dead band for reporting analog data by exception shall be initially set to 1 % (in 1%) of full scale value.
Multi-Master reporting	8 master with single CASDU
CPU Processing Speed	32 bit ARM Core CPU operating @ minimum 450 MHz
RAM	64 MB
Controller	Must have External DI contact (to capture ON/OFF Status.) DO will use for control & DI will be for status. DI/DO card should have sufficient ratings to take care of operations without CMR.
Cyber Security	User level authentication, Disabling the DNS, Disabling/enabling/configurable TCP/UDP port,
Minimum Event Storage Capacity	
Measurement Event	10000
System Event	1000
Alarm Event	1000
Normal Event	5000

Detailed hardware requirement and architecture will be decided at the time of detailed engineering phase prior to implementation.

5.8 MEASUREMENTS

5.8.1 Event time-stamping, any change of state of information shall generate a time-stamped event stored in the GSM/GPRS interface memory.

Central Engineering Services		Specification Name: Technical Specification for Compact FPI (Communicable Type) for Overhead Lines
------------------------------	--	--

5.8.2 The event storage capacity shall be at least 1000 events.

5.8.3 Short-range radio- Short range radio shall use license-free radio frequency. It shall be designed so that to allow a maximum distance between GSM/GPRS interface and the Fault Passage Indicators equal to 100m or more.

5.9 COMMUNICATION WITH THE CONTROL CENTRE

5.9.1 Communication between the GSM/GPRS interface and the control center shall be through GSM/GPRS network, dual-band 900 MHz – 1800 MHz, and using any standard protocol.

5.9.2 It shall allow communication in 2 ways:

- i) At any time, based on configured periodic calls or on operator action, the GSM/4G/ GPRS interface shall be ready to receive a call from the control center.
- ii) Whenever a monitored information declared as alarming in the GSM/4G/GPRS interface configuration changes status, the GSM/4G/GPRS interface shall make a call to the control center and send it an alarm.

5.9.3 Each monitored information (fault current detection, voltage absence/presence, digital inputs etc...) shall be configurable as "alarming" when changing state, individually and independently of others.

5.10 CONFIGURATION AND MAINTENANCE

FPI configuration and diagnostic shall be performed through OEM Application.

6.0 NAME PLATE & MARKING: -

The Relay shall be provided with durable and legible nameplate sticker containing all parameters. The box of Relay shall be provided with legible name plate sticker on box with minimum following information:

Manufacturer name & address

Model No.

PO number & date

Property of TPCODL/TPNODL/TPSODL/TPWODL

The FPI shall be provided with durable and legible nameplate sticker containing all technical parameters.

Manufacturer's Name/Logo

Manufacturing month & year Type/Model

The other material shall have details of PO and Property of TPCODL/TPNODL/TPSODL/TPWODL mention on the box or equipment as per suitability.

7.0 TESTS

All the Routine and acceptance tests shall be carried out in accordance with the relevant IS/IEC standards. All acceptance tests shall be witnessed by the purchaser/his authorized representative. All the components within the relay enclosure shall have to be tested for Routine/acceptance and Type tests as per the relevant standards. All Type tests as per latest IS / IEC shall have been carried out on relay as a whole as per relevant IS/IEC. Following tests shall be necessarily conducted on the equipment and its components.

Note- In case of any conflict on any technical particular in the specification, the stricter requirement mentioned in the relevant standard shall be valid.

7.1 TYPE TESTS

A) For FPI line unit:

Central Engineering Services		Specification Name: Technical Specification for Compact FPI (Communicable Type) for Overhead Lines
------------------------------	--	--

Sr. no.	Test	Standard
2	Impulse Test	IEC60060-1
3	Power Frequency Magnetic Field Immunity	IEC 61000-4-8
4	Dry Heat Test	IEC 60068-2-2
5	Damp Heat Cyclic Test (With moisture at Upper temp 550C)	IEC 60068-2-30
6	EFT (Electrical Fast Transient) Immunity	IEC 61000-4-4
7	Surge Immunity Test	IEC 61000-4-5
8	Ingress Protection	IEC 60529
9	Salt mist, cyclic (sodium chloride solution) test	IEC 60068-2-52
10	Short Circuit Withstand test	IEEE 495 and IEC 62271-1

7.2 ROUTINE TESTS

Following routine tests are to be done on 100% of the lot quantity

1. Visual Inspection.
2. Electric strength or AC voltage test
3. Dimensional & Visual Checks
4. Functional Test

7.3 ACCEPTANCE TESTS

A. FPI: Following test shall be conducted at factory acceptance of in presence of our inspectors.

Sr. No.	Test	Method	Requirement
1	Insulation Resistance Test	IEC 60950-1	Withstand & value >100MOhm
2	Electric Strength (2kV)	IEC 60950-1,	Withstand without any damage/flash.
3	Visual Checks	As per specs and approved documents.	Should meet requirements
4	Functional Test	As per approved documents and specification requirements	Should meet requirements

8.0 TYPE TEST CERTIFICATE

The Bidder shall furnish the type test certificates of the relay of same model as offered in bid for the tests as mentioned above as per the corresponding standards. All the tests shall be conducted at CPRI/ERDA or any other International Laboratory as per the relevant standards of IS and IEC. Type tests shall have been conducted in certified Test laboratories during the period not exceeding 5

Central Engineering Services		Specification Name: Technical Specification for Compact FPI (Communicable Type) for Overhead Lines
------------------------------	--	--

years from the date of opening the bid. In the event of any discrepancy in the test reports, i.e. any test report not acceptable or any/all type tests (including additional type tests, if any) not carried out, same shall be carried out without any cost implication to TPCODL/TPNODL/TPSODL/TPWODL.

Bids without all type test reports shall stand disqualified.

9.0 PRE-DISPATCH INSPECTION

Equipment shall be subject to inspection by a duly authorized representative of the TPCODL/TPNODL/TPSODL/TPWODL. Inspection may be made at any stage of manufacture at the option of the purchaser and the equipment if found unsatisfactory as to workmanship or material is liable to rejection. Supplier shall grant free access to the places of manufacture to TPCODL/TPNODL/TPSODL/TPWODL's representatives at all times when the work is in progress. Inspection by the TPCODL/TPNODL/TPSODL/TPWODL or its authorized representatives shall not relieve the supplier of his obligation of furnishing equipment in accordance with the specifications. Material shall be dispatched after specific MDCC (Material Dispatch Clearance Certificate) is issued by TPCODL/TPNODL/TPSODL/TPWODL. Following documents shall be sent along with material

- a) Routine Test reports
 - b) MDCC issued by TPCODL/TPNODL/TPSODL/TPWODL
 - c) Invoice in duplicate
 - d) Packing list
 - e) Drawings
 - f) Delivery Challan
 - g) Installation and maintenance Manual soft copy
- Other Documents (as applicable)

10.0 INSPECTION AFTER RECEIPT AT STORE

The material received at TPCODL/TPNODL/TPSODL/TPWODL Store will be inspected for acceptance and shall be liable for rejection if found different from the reports of the pre-dispatch inspection.

If any deviation or anomaly observed at this stage same need to be rectified by bidder at bidders own cost at earliest.

During P2P bidder shall complete all the signal tests with SCADA as per approved IO list.

11.0 GUARANTEE

1. Bidder shall stand guarantee towards design, materials, workmanship & quality of process / manufacturing of items under this contract for due and intended performance of the same, as an integrated product delivered under this contract. In the event any defect is found by the Purchaser up to a period of at least 60 months from the date of commissioning or 66 months from the date of last supplies made under the contract whichever is earlier, Bidder shall be liable to undertake to replace/rectify such defects at its own costs, within mutually agreed time frame, and to the entire satisfaction of the Purchaser, failing which the Purchaser will be at liberty to get it replaced/rectified at Bidder's risks and costs and recover all such expenses plus the Purchaser's own charges (@ 20% of expenses incurred), from the Bidder or from the "Security cum Performance Deposit" as the case may be.
2. Warranty should be comprehensive at site warranty, it shall be clearly mentioned like what covered under warranty, considering the large geography OEM refuses to support.

12.0 Warranty, Maintenance, Upgrades, Patch Management & Database Modification Requirements

This Section specifies the requirements for Warranty, hardware and software maintenance for the System, Warranty maintenance and support, system upgrades, patch management etc.

Bidder to note the environmental condition of locations, the proposed system is being planned to be installed and operational.

Bidder shall provide facilities for carrying out online and offline maintenance of the components supplied as a part of the system. In general, this should include adequate testing equipment, tools, safety devices and other accessories. Bidder shall provide the details in their bid.

- a. Bidder should provide Maintenance strategy of the product (Own & Sub-Vendor) being offered so as to schedule appropriate timeline for maintenance.
- ***Maintenance Performance Requirement***

Purchaser envisaged that all offered equipment shall not require routine or planned maintenance. Therefore, no fans

Central Engineering Services		Specification Name: Technical Specification for Compact FPI (Communicable Type) for Overhead Lines
------------------------------	--	--

or moving parts shall be used in any of the system to avoid any need for maintenance. To ensure this, all the supplied equipment should be constructed to resist the entry of Dust, Water etc. A single technician shall be able to remove and replace for repair purposes, without special tools and test equipment, all equipment involved in the offered system. Restoration of equipment to full operational use shall be possible within 15 minutes (nominally) of repairs being completed. It should not be necessary to dismantle (remove multiple pieces of) the system in order to replace a module.

- *Service Life*

Purchaser prefers that the equipment shall be capable of complying with this standard, including performing its intended purpose, for a minimum of 10 years from the date of commissioning.

The supplier shall indicate the following:

- The date at which the product was released for sale.
- The anticipated date at which the product will be withdrawn from sale, but support will continue to be provided for Spares and Services.
- The anticipated date that product support will be withdrawn, i.e., spares and technical support will no longer be available.

- *Interchangeability*

All the parts/modules shall be interchangeable individually (e.g., DCUs/FPIs/modules shall be interchangeable individually). This is applicable for all the parts/module including Modems, Battery Chargers, battery supplied by the bidder under this contract.

Any such change or replacement shall not reduce the capability of the equipment to conform to the requirements of this specification.

- *Definitions*

The responsibility for maintenance of hardware and software will vary depending on the time during the Contract. So that the times for changes in responsibility can be determined, the following definitions shall be used:

Delivery – Delivery of any item shall be interpreted as receipt of the item at Purchaser's facility.

Commissioning – Commissioning of any item shall be interpreted as receipt of the item at Purchaser's facility, installation on-site, successful completion of the site tests, and correction of all variances from the tests.

- *Deliverable Hardware and Software Version*

The delivered Hardware and Software shall be the latest version being delivered by the manufacturer of the Hardware & Software six months prior to its delivery to Purchaser's facility. During delivery of the system, all the FRTU of a Bidder across the Tata Power DISCOMs network shall be upgraded to the latest version.

All hardware and software shall be of compatible versions. That is, the Bidder shall be responsible to ensure that all delivered hardware and software versions will inter-operate successfully. If it becomes necessary to upgrade some hardware or software to meet this requirement, the cost and time shall be borne by the Bidder. If it is necessary to revert to a previous version of any hardware or software to overcome incompatibilities among the hardware or software, the Bidder shall bear the cost and time of the "downgrade" and shall present a plan to correct the problems with the newer release. Such corrections shall also be at the Bidder's sole expense.

- *Warranty support*

- Maintenance services** for the supplied Hardware, System and application Software up-gradation, Patch Management services including sub-vendor products during the Standard warranty period of 5 Years from the date of system handover after SAT, resolution of all punch point of SAT and trouble-free operation of the entire system for a period of one month.
- Bidder shall provide Software up-gradation (if any), Patch Management services including sub- vendor products for next 5 years over and above as mentioned in item a.

SLA will be prepared and adhered by Bidder, Sub-Vendor's of bidder for extending the Hardware, Software and

Central Engineering Services		Specification Name: Technical Specification for Compact FPI (Communicable Type) for Overhead Lines
------------------------------	--	---

Service support to Purchaser for the period mentioned above. To mitigate major failure like Complete system failure, FRTU system instability, loss or failure of any major subsystem or system component such as to cause a significant adverse impact to system availability, performance, or operational capability. Some of the salient points as example are documented below:

- a. Bidder shall report to site within 48 hours of receipt of reporting of the failure occurrence
- b. Bidder shall provide replacement of the faulty equipment within 7 days after confirmation of the fact that the equipment can't be repaired at site. Failure to this clause may have some penalty reference on Bidder.
- c. Bidder will mandatorily provide detailed analysis report of the faulty equipment within 30 days from the date of the site visit.
- d. Any spare Equipment replacement, testing and its commissioning to be done by bidder, with no cost implications to Purchaser. Any tools, equipment, Software or Hardware required for testing of the System (e.g., IEDs/FRTU/Communication Equipment) will be the responsibility of the Bidder, this includes all system supplied by bidder under this contract.
- e. Any up gradation in application software and hardware will be informed to Purchaser and necessary up gradation to be carried out by Bidder with no cost implications to Purchaser.

Bidder to note that Tri-Party agreement will be prepared for Bidder, Sub-Vendor to have protection against quitting of executing bidder and its alliances during commissioning, warranty and post warranty period as specified in this document.

- ***Hardware Maintenance***

The project schedule shall include an allowance for hardware maintenance prior to the availability test. The Bidder will not be granted any relief for project delays caused by maintenance problems prior to the availability test.

- ***Pre-Delivery Maintenance***

The Bidder shall have the responsibility for maintenance of all hardware prior to delivery to Purchaser's site. This maintenance may be performed by a maintenance contract with Original Equipment Manufacturers (OEMs) or other parties or by the Bidder staff using spare parts from the Bidder's stores or other sources.

- ***Maintenance During Commissioning***

The Bidder shall have the responsibility for maintenance of all hardware after delivery and prior to commencement of the Warranty. This maintenance may be performed by a maintenance contract with OEMs or other parties or by Bidder staff using spare parts from the Bidder's stores or other sources.

Failed equipment shall be replaced or repaired, and spares inventories (if any) replenished to their delivered level throughout the period of commissioning. Any spare parts found to be defective during initial delivery inspection or during this period shall be replaced within one week after notification. There shall be no charges to Purchaser for these replacement parts, including delivery charges. All spare parts replaced under maintenance shall be new parts unless otherwise accepted by Purchaser.

- ***Maintenance Under Warranty***

Maintenance during the warranty shall be in conformance with the terms of the warranty sections of this RFP.

During the warranty period, Purchaser's hardware maintenance responsibilities will include the following:

- a. Provision of trained staff, responsible for call-out when problems occur
- b. Providing local assistance to the Purchaser during problem resolutions

The Bidder's hardware maintenance responsibilities shall include the following:

- a. Providing maintenance of all equipment, including spare parts
- b. Providing materials and instruction for appropriate engineering changes for equipment
- c. Provision of technical guidance towards the resolution of all hardware problems for equipment.

Central Engineering Services		Specification Name: Technical Specification for Compact FPI (Communicable Type) for Overhead Lines
------------------------------	--	--

When needed, the Bidder shall respond to requests for technical support within Two Hours, 24 hours a day, seven days a week.

Failed equipment shall be replaced or repaired, and spares inventories replenished to their delivered level throughout this period. Any spare parts found to be defective during initial delivery inspection or during the Warranty period shall be replaced within one week after notification. There shall be no charges to Purchaser for these replacement parts, including delivery charges. All spare parts replaced under maintenance shall be new parts unless otherwise accepted by Purchaser.

The Bidder's technical support staff shall work with Purchaser's technical staff to establish a strategy to efficiently resolve each identified problem. If at any time, Purchaser believes that the Bidder's technical support is not effectively resolving a problem, Purchaser may request that the Bidder's system expert or staff from the equipment's manufacturer be dispatched to Purchaser's facility. The Bidder's technical team shall be at Purchaser's facility within 48 hours of that request to provide hands-on support towards the problem resolution. Purchaser will not be responsible for any expenses connected to the technical support, including travel expenses.

The Resolution time for different complaints shall be as per the below matrix:

Category	Definition	Maximum Resolution Time
Severity 1 Urgent	Complete system failure, severe system instability, loss or failure of any major subsystem or system component such as to cause a significant adverse impact to system availability, performance, or operational capability	0-24 hrs.
Severity 2 Serious	Degradation of services or critical functions such as to negatively impact system operation. Failure of any redundant system component such that the normal redundancy is lost Non-availability of Manpower at site during working hours	0-48 hrs.
Severity 3 Minor	Any other system defect, failure, or unexpected operation Request for information, technical configuration assistance "how to" guidance, and enhancement requests.	0-72 hrs.

Failure by the Bidder to comply with the above-mentioned timelines, shall attract a penalty as per contractual LD clauses

- **Hardware Minimum Support Period**

The Bidder shall guarantee the availability of spare parts and hardware maintenance support services for all System equipment for a minimum period of 10 years. Subsequent to this minimum support period, the Bidder shall provide to Purchaser a minimum of two year's advance notice of their intent to terminate such services.

- **Upgrades, Patch Management & Modifications**

- Bidder shall continuously keep the Purchaser informed of all Software and Hardware upgrades as & when these are released.
- Bidder shall supply upgrades and patches of all installed software (both own and third party) for a period of ten years from the date of system acceptance without commercial implication.
- Bidder shall rectify all design defects and software bugs at no extra cost for a period of 10 years from the date of system acceptance.
- Bidder shall support the system totally for ten (10) years, even if no upgrades are implemented.
- Bidder shall provide lifetime support (10 years) for the system. To meet this requirement, Bidder shall refer with OEMs on the product's life cycle management and obsolescence. Bidder shall attach the product life cycle matrix for hardware and software offered under this RFP.
- The system referred to above includes Bidder's own as well as third party components.

- **Database modification during Warranty Period**

All database modification major or minor is in the scope of the bidder, after the system handover and during the warranty period. The Scope covers FRTU configuration and necessary changes for control center communication. It

Central Engineering Services		Specification Name: Technical Specification for Compact FPI (Communicable Type) for Overhead Lines
------------------------------	--	--

is bidder's responsibility to provide resources as and when required by the purchaser for these changes and testing of the same as per the project and planned activity schedule. One of the examples of Configuration changes/modification are as mentioned below:

- a. Addition of Tags
- b. Addition/ Deletion of System/IEDs/Devices/SCADA enabled equipment/sensors

13.0 PACKING

Bidder shall ensure that all equipment covered by this specification shall be prepared for rail/road transport (local equipment) and be packed in such a manner as to protect it from damage in transit. The packing should be in such manner that during storage of relay and its components should not be damaged. **No single use plastic to be used in packing material. Packing should be done with environment friendly recyclable materials.**

14.0 TENDER SAMPLE

Bidders to submit one sample of FPI at TPCODL/TPNODL/TPSODL/TPWODL for verification of all desired features.

For communicable FPI- Bidders to provide all required equipment and demo of one communicable FPI unit data communication and integration testing and only successful bidder shall be qualified for further processing.

Commissioning of one unit of FPI in case of new vendor to be done.

If the Model is already supplied then tender sample is not required.

15.0 TRAINING

The bidder shall arrange to provide the operating training at TPCODL/TPNODL/TPSODL/TPWODL offices as and when required for better installation and usage of the product.

Video Manuals for configuration and troubleshooting of FPI, help in understanding the things in better way and skill enhancement.

16.0 QUALITY CONTROL

The bidder shall submit with the offer, assurance plan indicating the various stages of inspection, the tests and checks which will be carried out on the material of construction, components during manufacture and after finishing, bought out items and fully assembled component and equipment including drives. As part of the plan, a schedule for stage and final inspection within the parameters of the delivery schedule shall be furnished. The Purchaser's or its nominated representative engineer shall have free access to the manufacturer/sub-supplier's works to carry out inspections.

To ensure proper functioning of relay the bidder shall provide onsite training of TPCODL/TPNODL/TPSODL/TPWODL teams as and when required. To ensure quality of installations bidder shall provide supervision support during impartation.

17.0 TESTING FACILITIES

Bidder shall have adequate in-house testing facilities for carrying out all routine tests, acceptance tests and special test as per this document and accordance to relevant International / Indian standards as mentioned.

18.0 MANUFACTURING ACTIVITIES

The successful bidder will have to submit (after placement of RC) technical compliance document and drawing of cable as per RC line items for getting approval before mass manufacturing.

Manufacturing mass quantity to start only after getting CAT-A approved drawings or as per intimation from TPCODL/TPNODL/TPSODL/TPWODL.

19.0 SPARES & ACCESSORIES

Bidder shall provide a list of recommended spares/tools with quantity and unit prices for 5 years of operation after commissioning. TP DISCOMs may order all or any of the spare parts listed at the time of contract award and the spare parts so ordered shall be supplied as part of the definite works.

Central Engineering Services		Specification Name: Technical Specification for Compact FPI (Communicable Type) for Overhead Lines
------------------------------	--	---

TP DISCOMs may order additional spares at any time during the contract period at the rates stated in the Contract Document. Bidder shall ensure availability of recommended spares for 15 years from the date of commissioning.

Minimum 10% buffer stock should be maintained by the BA to avoid the shortage of spare part.

The communication cable for accessing controller from laptop to be provided by bidder as spare item.

Remote 1 No. required for 9 Nos of FPI

Hot-Stick 1 No. required for 20 Nos of FPI

RATE OF SPARE NEED TO BE DISCUSSED

20.0 DRAWINGS & DOCUMENTS

Following drawings and documents shall be prepared based on TPCODL/TPNODL/TPSODL/TPWODL specifications and statutory requirements and shall be submitted with the bid:

- Completely filled in Technical compliance document for all clauses
- Any deviation sheet or No deviation
- General description of the equipment and all components including brochures.
- Experience List
- All set of Type test certificates & detailed reports

Drawings / documents to be submitted for approval after the award of the contract are as under:

- Completely filled in Technical compliance document for all clauses
- General Arrangement drawing
- Type test reports if any pending.

All the documents & drawings shall be in English language.

After the receipt of the order, the successful bidder will be required to furnish all detailed drawings of components for TPCODL/TPNODL/TPSODL/TPWODL approval.

Instruction Manuals: Bidder shall furnish softcopies and one hard copy manuals of Relay (In English language) covering erection and maintenance instructions and all relevant information and drawings pertaining to relay.

20.0 GENERAL TECHNICAL PARTICULARS

Bidder to submit compliance to all above clauses and sub-clauses and shall furnish all desired details as technical compliance document.

21.0 SCHEDULE OF DEVIATIONS

(TO BE ENCLOSED WITH TECHNICAL BID)

All deviations from this specification shall be set out by the Bidders, clause by Clause in this schedule. Unless specifically mentioned in this Schedule, the tender shall be deemed to confirm the purchaser's specifications:

Sl. No.	Clause No.	Details of deviation with justifications
---------	------------	--

Central Engineering Services		Specification Name: Technical Specification for Compact FPI (Communicable Type) for Overhead Lines

We confirm that there are no deviations apart from those detailed above.

Seal of the Company:

Designation

Signature

Annexure-1 - Inspection & Quality Test Plan

Sr. No.	Test	Method	Requirement
1	Insulation Resistance Test	IEC 60950-1, IEC 60255-27	Withstand & value >100MOhm
2	Electric Strength (2kV)	IEC 60950-1, IEC 60255-27	Withstand without any damage/flash.
3	Visual Checks	As per specs and approved documents.	Should meet requirements
4	Functional Test	As per approved documents and specification requirements	Should meet requirements

Central Engineering Services		Specification Name: Technical Specification for Compact FPI (Communicable Type) for Overhead Lines
------------------------------	--	---

Annexture-3 – I/O List for FPI

S.N.	Alarm Description as on SCADA	SPI(Bit 0)	SPI(Bit 1)	Datatype	Type of info	Type of signal
1	1st Line Fault Current A Phase			36	Floating	ANALOGS
2	1st Line Fault Current B Phase			36	Floating	ANALOGS
3	1st Line Fault Current C Phase			36	Floating	ANALOGS
4	2nd Line Fault Current A Phase			36	Floating	ANALOGS
5	2nd Line Fault Current B Phase			36	Floating	ANALOGS
6	2nd Line Fault Current C Phase			36	Floating	ANALOGS
7	3rd Line Fault Current A Phase			36	Floating	ANALOGS
8	3rd Line Fault Current B Phase			36	Floating	ANALOGS
9	3rd Line Fault Current C Phase			36	Floating	ANALOGS
10	1st Line R Phase Current			36	Floating	ANALOGS
11	1st Line Y Phase Current			36	Floating	ANALOGS
12	1st Line B Phase Current			36	Floating	ANALOGS
13	2nd Line R Phase Current			36	Floating	ANALOGS
14	2nd Line Y Phase Current			36	Floating	ANALOGS
15	2nd Line B Phase Current			36	Floating	ANALOGS
16	3rd Line R Phase Current			36	Floating	ANALOGS
17	3rd Line Y Phase Current			36	Floating	ANALOGS
18	3rd Line B Phase Current			36	Floating	ANALOGS
19	1st Line A Phase Electric Field			36	Floating	ANALOGS
20	1st Line B Phase Electric Field			36	Floating	ANALOGS
21	1st Line C Phase Electric Field			36	Floating	ANALOGS
22	2nd Line A Phase Electric Field			36	Floating	ANALOGS
23	2nd Line B Phase Electric Field			36	Floating	ANALOGS
24	2nd Line C Phase Electric Field			36	Floating	ANALOGS
25	3rd Line A Phase Electric Field			36	Floating	ANALOGS
26	3rd Line B Phase Electric Field			36	Floating	ANALOGS
27	3rd Line C Phase Electric Field			36	Floating	ANALOGS
28	1st Line A PH Indicator battery volt Va			36	Floating	ANALOGS
29	1st Line B PH Indicator battery volt Vb			36	Floating	ANALOGS
30	1st Line C PH Indicator battery volt Vc			36	Floating	ANALOGS
31	2nd Line A PH Indicator battery volt Va			36	Floating	ANALOGS
32	2nd Line B PH Indicator battery volt Vb			36	Floating	ANALOGS
33	2nd Line C PH Indicator battery volt Vc			36	Floating	ANALOGS
34	3rd Line A PH Indicator battery volt Va			36	Floating	ANALOGS

Central Engineering Services		Specification Name: Technical Specification for Compact FPI (Communicable Type) for Overhead Lines
------------------------------	--	--

35	3rd Line B PH Indicator battery volt Vb			36	Floating	ANALOGS
36	3rd Line C PH Indicator battery volt Vc			36	Floating	ANALOGS
37	1st Line A PH line temp Ta			36	Floating	ANALOGS
38	1st Line B PH line temp Tb			36	Floating	ANALOGS
39	1st Line C PH line temp Tc			36	Floating	ANALOGS
40	2nd Line A PH line temp Ta			36	Floating	ANALOGS
41	2nd Line B PH line temp Tb			36	Floating	ANALOGS
42	2nd Line C PH line temp Tc			36	Floating	ANALOGS
43	3rd Line A PH line temp Ta			36	Floating	ANALOGS
44	3rd Line B PH line temp Tb			36	Floating	ANALOGS
45	3rd Line C PH line temp Tc			36	Floating	ANALOGS
46	DCU battery voltage			36	Floating	ANALOGS
47	Charging Battery Volt			36	Floating	ANALOGS
48	DCU Status	Normal	Low	30	SPI	DIGITAL INPUT
49	DCU low battery alarm	Normal	Low	30	SPI	DIGITAL INPUT
50	1st Line A ph Indicator Comm Status	Normal	Fail	30	SPI	DIGITAL INPUT
51	1st Line A Ph Transient Short Circuit Fault	Normal	Operated	30	SPI	DIGITAL INPUT
52	1st Line A ph Permanent short circuit fault	Normal	Operated	30	SPI	DIGITAL INPUT
53	1st Line A ph Earth fault	Normal	Operated	30	SPI	DIGITAL INPUT
54	1st Line A ph Line Temp Overheat	Normal	Operated	30	SPI	DIGITAL INPUT
55	1st Line A ph Current Overloaded	Normal	Operated	30	SPI	DIGITAL INPUT
56	1st Line A ph Low Battery Alarm	Normal	Operated	30	SPI	DIGITAL INPUT
57	1st Line A ph Voltage Presence	Dead	Live	30	SPI	DIGITAL INPUT
58	1st Line A Ph Indicator Flag	Normal	Operated	30	SPI	DIGITAL INPUT
59	2nd Line A ph Indicator Comm Status	Normal	Fail	30	SPI	DIGITAL INPUT
60	2nd Line A Ph Transient Short Circuit Fault	Normal	Operated	30	SPI	DIGITAL INPUT
61	2nd Line A ph Permanent short circuit fault	Normal	Operated	30	SPI	DIGITAL INPUT
62	2nd Line A ph Earth fault	Normal	Operated	30	SPI	DIGITAL INPUT
63	2nd Line A ph Line Temp Overheat	Normal	Operated	30	SPI	DIGITAL INPUT
64	2nd Line A ph Current Overloaded	Normal	Operated	30	SPI	DIGITAL INPUT

Central Engineering Services		Specification Name: Technical Specification for Compact FPI (Communicable Type) for Overhead Lines
------------------------------	--	--

65	2nd Line A ph Low Battery Alarm	Normal	Operated	30	SPI	DIGITAL INPUT
66	2nd Line A ph Voltage Presence	Dead	Live	30	SPI	DIGITAL INPUT
67	2nd Line A Ph Indicator Flag	Normal	Operated	30	SPI	DIGITAL INPUT
68	3rd Line A ph Indicator Comm Status	Normal	Fail	30	SPI	DIGITAL INPUT
69	3rd Line A Ph Transient Short Circuit Fault	Normal	Operated	30	SPI	DIGITAL INPUT
70	3rd Line A ph Permanent short circuit fault	Normal	Operated	30	SPI	DIGITAL INPUT
71	3rd Line A ph Earth fault	Normal	Operated	30	SPI	DIGITAL INPUT
72	3rd Line A ph Line Temp Overheat	Normal	Operated	30	SPI	DIGITAL INPUT
73	3rd Line A ph Current Overloaded	Normal	Operated	30	SPI	DIGITAL INPUT
74	3rd Line A ph Low Battery Alarm	Normal	Operated	30	SPI	DIGITAL INPUT
75	3rd Line A ph Voltage Presence	Dead	Live	30	SPI	DIGITAL INPUT
76	3rd Line A Ph Indicator Flag	Normal	Operated	30	SPI	DIGITAL INPUT
77	1st Line B ph Indicator comm status	Normal	Fail	30	SPI	DIGITAL INPUT
78	1st Line B ph transient short circuit fault	Normal	Operated	30	SPI	DIGITAL INPUT
79	1st Line B ph Permanent short circuit fault	Normal	Operated	30	SPI	DIGITAL INPUT
80	1st Line B ph Earth fault	Normal	Operated	30	SPI	DIGITAL INPUT
81	1st Line B ph Line Temp Overheat	Normal	Operated	30	SPI	DIGITAL INPUT
82	1st Line B ph Current Overloaded	Normal	Operated	30	SPI	DIGITAL INPUT
83	1st Line B ph Low Battery Alarm	Normal	Operated	30	SPI	DIGITAL INPUT
84	1st Line B ph Voltage Presence	Dead	Live	30	SPI	DIGITAL INPUT
85	1st Line B Ph Indicator Flag	Normal	Operated	30	SPI	DIGITAL INPUT
86	2nd Line B ph Indicator comm status	Normal	Fail	30	SPI	DIGITAL INPUT
87	2nd Line B ph transient short circuit fault	Normal	Operated	30	SPI	DIGITAL INPUT
88	2nd Line B ph Permanent short circuit fault	Normal	Operated	30	SPI	DIGITAL INPUT
89	2nd Line B ph Earth fault	Normal	Operated	30	SPI	DIGITAL INPUT

Central Engineering Services		Specification Name: Technical Specification for Compact FPI (Communicable Type) for Overhead Lines
------------------------------	--	--

90	2nd Line B ph Line Temp Overheat	Normal	Operated	30	SPI	DIGITAL INPUT
91	2nd Line B ph Current Overloaded	Normal	Operated	30	SPI	DIGITAL INPUT
92	2nd Line B ph Low Battery Alarm	Normal	Operated	30	SPI	DIGITAL INPUT
93	2nd Line B ph Voltage Presence	Dead	Live	30	SPI	DIGITAL INPUT
94	2nd Line B Ph Indicator Flag	Normal	Operated	30	SPI	DIGITAL INPUT
95	3rd Line B ph Indicator comm status	Normal	Fail	30	SPI	DIGITAL INPUT
96	3rd Line B ph transient short circuit fault	Normal	Operated	30	SPI	DIGITAL INPUT
97	3rd Line B ph Permanent short circuit fault	Normal	Operated	30	SPI	DIGITAL INPUT
98	3rd Line B ph Earth fault	Normal	Operated	30	SPI	DIGITAL INPUT
99	3rd Line B ph Line Temp Overheat	Normal	Operated	30	SPI	DIGITAL INPUT
100	3rd Line B ph Current Overloaded	Normal	Operated	30	SPI	DIGITAL INPUT
101	3rd Line B ph Low Battery Alarm	Normal	Operated	30	SPI	DIGITAL INPUT
102	3rd Line B ph Voltage Presence	Dead	Live	30	SPI	DIGITAL INPUT
103	3rd Line B Ph Indicator Flag	Normal	Operated	30	SPI	DIGITAL INPUT
104	1st Line C ph Indicator comm status	Normal	Fail	30	SPI	DIGITAL INPUT
105	1st Line C ph transient short circuit fault	Normal	Operated	30	SPI	DIGITAL INPUT
106	1st Line C ph Permanent short circuit fault	Normal	Operated	30	SPI	DIGITAL INPUT
107	1st Line C ph Earth fault	Normal	Operated	30	SPI	DIGITAL INPUT
108	1st Line C ph Line Temp Overheat	Normal	Operated	30	SPI	DIGITAL INPUT
109	1st Line C ph Current Overloaded	Normal	Operated	30	SPI	DIGITAL INPUT
110	1st Line C ph Low Battery Alarm	Normal	Operated	30	SPI	DIGITAL INPUT
111	1st Line C ph Voltage Presence	Dead	Live	30	SPI	DIGITAL INPUT
112	1st Line C Ph Indicator Flag	Normal	Operated	30	SPI	DIGITAL INPUT
113	2nd Line C ph Indicator comm status	Normal	Fail	30	SPI	DIGITAL INPUT
114	2nd Line C ph transient short circuit fault	Normal	Operated	30	SPI	DIGITAL INPUT

Central Engineering Services		Specification Name: Technical Specification for Compact FPI (Communicable Type) for Overhead Lines
------------------------------	--	--

115	2nd Line C ph Permanent short circuit fault	Normal	Operated	30	SPI	DIGITAL INPUT
116	2nd Line C ph Earth fault	Normal	Operated	30	SPI	DIGITAL INPUT
117	2nd Line C ph Line Temp Overheat	Normal	Operated	30	SPI	DIGITAL INPUT
118	2nd Line C ph Current Overloaded	Normal	Operated	30	SPI	DIGITAL INPUT
119	2nd Line C ph Low Battery Alarm	Normal	Operated	30	SPI	DIGITAL INPUT
120	2nd Line C ph Voltage Presence	Dead	Live	30	SPI	DIGITAL INPUT
121	2nd Line C Ph Indicator Flag	Normal	Operated	30	SPI	DIGITAL INPUT
122	3rd Line C ph Indicator comm status	Normal	Fail	30	SPI	DIGITAL INPUT
123	3rd Line C ph transient short circuit fault	Normal	Operated	30	SPI	DIGITAL INPUT
124	3rd Line C ph Permanent short circuit fault	Normal	Operated	30	SPI	DIGITAL INPUT
125	3rd Line C ph Earth fault	Normal	Operated	30	SPI	DIGITAL INPUT
126	3rd Line C ph Line Temp Overheat	Normal	Operated	30	SPI	DIGITAL INPUT
127	3rd Line C ph Current Overloaded	Normal	Operated	30	SPI	DIGITAL INPUT
128	3rd Line C ph Low Battery Alarm	Normal	Operated	30	SPI	DIGITAL INPUT
129	3rd Line C ph Voltage Presence	Dead	Live	30	SPI	DIGITAL INPUT
130	3rd Line C Ph Indicator Flag	Normal	Operated	30	SPI	DIGITAL INPUT
131	Door Status	Close	Open	30	SPI	DIGITAL INPUT
132	FPI Group Reset	Operated	Normal	45	SPC	DIGITAL OUTPUT
133	1st Line A Phase FPI Reset	Operated	Normal	45	SPC	DIGITAL OUTPUT
134	1st Line B Phase FPI Reset	Operated	Normal	45	SPC	DIGITAL OUTPUT
135	1st Line C Phase FPI Reset	Operated	Normal	45	SPC	DIGITAL OUTPUT
136	2nd Line A Phase FPI Reset	Operated	Normal	45	SPC	DIGITAL OUTPUT
137	2nd Line B Phase FPI Reset	Operated	Normal	45	SPC	DIGITAL OUTPUT
138	2nd Line C Phase FPI Reset	Operated	Normal	45	SPC	DIGITAL OUTPUT
139	3rd Line A Phase FPI Reset	Operated	Normal	45	SPC	DIGITAL OUTPUT

Central Engineering Services		Specification Name: Technical Specification for Compact FPI (Communicable Type) for Overhead Lines
------------------------------	--	--

140	3rd Line B Phase FPI Reset	Operated	Normal	45	SPC	DIGITAL OUTPUT
141	3rd Line C Phase FPI Reset	Operated	Normal	45	SPC	DIGITAL OUTPUT

Sample Pictures

