

# ZIV e-NET Flex Family



# Complete and Reliable Solutions for Digital Transmission and Distribution Substations



Modular, Flexible & Cybersecure Protection IEDs designed to meet the most demanding requirements in each Application Field

HV Lines | Transformers | Busbars and Breakers | Feeders | Motors Bay Control Applications | Grid Automation

## **General Characteristics**

- ✓ Powerful programable logic.
- ✓ 2000 event log. Up to 100 oscillography seconds.
- ✓ Alphanumeric or graphic display.
- $\checkmark$  Up to 20 analog channels, 160 DI, 80 DO, and 22 LEDs.
- ✓ Bonding, RSTP, PRP and HSR Redundancy.
- ✓ IEC 61850 Ed. 2, DNP3, Modbus RTU and PROCOME protocols.
- ✓ Native process bus. Analog input cards operate as Merging Units for the CPU. Synchronized samples at 4800 Hz (as per IEC 61869-9).
- ✓ Cybersecurity in accordance with IEC 62351, IEC 62443 and IEEE 1686-2013 standards. RBAC, secure keys, physical and logical port disabling, cybersecurity event log, securing of management protocols (PROCOME, HTTPS, SFTP, SSH), remote authentication (LDAP, RADIUS) and digital firmware securitization.
- ✓ Time synchronization by IRIG-B, SNTP and PTP (Ordinary Clock / Transparent Clock).

Making the Smart Grid Real



## **Applications**

## **Busbar Protection - DBF**

The communication between the bay units and the central unit is based on IEC 61869-9 SV and IEC 61850-8-1 GOOSE. The bay units are synchronized by PTP IEC 61850-9-3. The **DBF** can be applied to any substation configuration, with up to 4 busbars, including two transfer busbars, with up to 4 ties, with simple and double CT and with up to 24 bays. The bay units, not only operate as SV publishers and GOOSE publishers / subscribers but they can also be used as Protection and Control IEDs, as they can run the protection functions of a feeder relay. This makes this solution very cost-effective for MV busbar differential protection.

#### Line Differential Protection · DLF

The **DLF** model includes all the protection, control and measurement functions for a power line with or without Series Compensation, Single Breaker, and Single or Three Pole Tripping. The fast Differential Unit, complemented by the External Fault Detector and the Capacitive Current Compensation unit, protects lines with up to 3 terminals, even with a transformer in the protection zone, providing excellent reliability even in the most adverse conditions.

**DLF** IEDs combine the Differential protection units with Distance metering elements (and complementary units such as Close-onto-Fault, Dead-Line, Remote Breaker Open, VT Fuse Failure, Power Swing and Load Encroachment detectors), Over / Undervoltage and Over / Underfrequency protection, Recloser, Synchronism Supervision, Control and Metering functions.

## Automatic Voltage Regulator · RTF

Parallel transformer regulation by master-slave, circulating current and negative reactance methods. Also includes line voltage drop compensation.

## Feeder Protection · IRF

The **IRF** is applicable in any substation scheme. The protection functions are suitable for any neutral configuration, solid-grounded, resistor-grounded, Petersen coil compensated, and isolated.

The powerful programmable logic features selectable execution times according to the required priority (2 ms, 10 ms and 20 ms). Includes many digital and analog operators, which allows the creation of complex protection and control functions.

#### **Transformer Protection · IDF**

Suitable for phase-shifting transformers, Scott or Leblanc transformers, can be applied as a differential protection for reactances, SVCs, generators and motors.

A fast differential unit, complemented by advanced blocking and harmonic restraint logics and an external fault detector, provides great reliability in all types of conditions.

#### **Distance Protection · ZLF**

The **ZLF** includes all the protection, control and measurement functions for a power line, with or without series compensation and single pole or three pole tripping.

Eight distance zones with Mho or quadrilateral characteristic, complemented with load encroachment and power swing, fuse failure, close onto fault, and saturation detectors provide great security and dependability even in the most adverse conditions.

The distance and overcurrent units can operate according to the following schemes: DTT, PUTT, POTT, DCUB and DCB. Weak infeed logic and current inversion blocking are also included.

## **Substation Automation**









Designed for up to **24 bays** and **4 busbars**, with ethernet **HSR** or **PRP** redundant communication between the central and bay units, based on process bus **IEC 61869-9 SV**, **IEC 61850-8-1 GOOSE** and **PTP IEC 61850-9-3** 

The **DBF** includes 4 main differential units, with percentage restraint and double slope. The differential unit has typical subcycle tripping times.

**DBF** device can be applied to any substation configuration, with up to 4 busbars, including two transfer busbars, with up to 4 ties, with simple and double CT and with up to 24 bays.

The communication between the bay units and the central unit is based on IEC 61869-9 SV and IEC 61850-8-1 GOOSE. The bay units are synchronized by PTP IEC 61850-9-3. The master clock can be the own central unit or an external device.

Redundant communication based on HSR or PRP can be used. These features allows **DBF** to be applied to both digital and conventional substations



## **Features**

## **External Fault Detector**

This detector is based on the ratio between instantaneous differential and restraint currents and on two directional comparison units. It allows blocking the differential unit when external faults with severe CT saturation occur, providing a great security.

## **Alarm Unit**

This unit allows detecting open CTs, allowing the main differential unit to be blocked.

## **Supervision Unit**

This unit takes into account all the bays in the substation, avoiding false trips of the main differential units due to erroneous status in the secondary contacts of the busbar isolators.

## **Dynamic Zone**

The dynamic zone logic provides better security and dependability for faults located between the CT and the breaker if the last one was opened.

The logic removes the bay current in the differential unit calculation accelerating trips when the CT is on the bus side and blocking the trip when the CT is on the line side.

## **Cost-Effective Solution**

The bay units, not only operate as SV publishers and GOOSE publishers / subscribers but they can also be used as Protection and Control IEDs, as they can run the protection functions of a feeder relay. This makes this solution very cost-effective for MV busbar differential protection.



**HSR redundancy between** 

central and bay units

# CENTRAL UNIT PRP NETWORK PTP SWITCHES

PRP network between central and bay units

## **Protection Units**

ANSI	Function	Uns.
50/51	Phase Overcurrent	3/3
50N/51N	Neutral Overcurrent (calculated IN)	3/3
50G/51G	Ground Overcurrent (measured IG)	3/3
50Q/51Q	Negative Sequence Overcurrent	3/3
50Ns/51Ns	Sensible Neutral Overcurrent	1/1
51Ns EPTR_C	Sensible Neutral O/C with EPTR_C	1
51Ni/c	Isolated / Compensated Neutral O/C	1
50V/51V	Voltage Dependent Overcurrent	1/1
67	Phase Directional	1
67N	Neutral Directional	1
67G	Ground Directional	1
67Ns	Sensible Neutral Directional	1
67P	Positive-Sequence Directional	1
67Ni / c	Isolated / Compensated Neutral Directional	1
67Q	Negative Sequence Directional	1
85	Teleprotection schemes	1
50FD	Fault Detector	1
	Phase Selector	1
49HS	Hot Spot Thermal Unit	0
50OL	Overload Instantaneous	0
510L	Time-Delayed Overload	0
	Differential Trip O/C Supervision	1
	Breaker Failure Trip O/C Supervision	1
	Remote Trip	1







## Line Differential Protection with Distance Backup. Both units are suitable for lines of any Voltage Level, Overhead or Under Ground, Multiterminal, and Single or Parallel Circuits

The **DLF** includes all the protection, control and measurement functions for a power line with or without **Series Compensation**, **Single Breaker**, and **Single** or **Three Pole Tripping**.

The fast **Differential Unit**, complemented by the **External Fault Detector** and the **Capacitive Current Compensation** unit, protects lines with **up to 3 terminals**, even with a transformer in the protection zone, providing excellent reliability even in the most adverse conditions. Breaker and a Half or Double Busbar (with CT group on the line) configuration capability added in **DLF-B**.

DLF IEDs combine the Differential protection units with Distance metering elements (and complementary units such as Close-onto-Fault, Dead-Line, Remote Breaker Open, VT Fuse Failure, Power Swing and Load Encroachment detectors), Over / Undervoltage and Over / Underfrequency protection, Recloser, Synchronism Supervision, Control and Metering functions.



## **Features**

## **Phase Differential Unit**

Configurable with 3 three-phase current inputs, to protect up to 3-terminal lines.

## Neutral, Negative Sequence and Positive Sequence Differential Units

Increases sensitivity during internal faults with low current contribution, such as very resistive faults, which may not be detected by the differential phase unit.

#### **External Fault Detector**

Blocks the differential unit against external faults with very high CT saturation, providing exceptional security.

#### **Capacitive Current Compensation**

The differential unit maintains good sensitivity in cables and very long overhead lines.

#### **Transformer-Line Protection Zone**

#### **Multi-End Fault Locator**

#### 8 Distance Zones

Reversible distance zones with Mho or quadrilateral characteristic. Independent characteristic selection for ground and phase-to-phase faults.

#### **Communication between IEDs**

- 2 ports: Communication without redundancy with up to 2 remote ends or with redundancy with one remote end.
- Selectable speed: from 1..12 x 64 kbit/s (C37.94) and 2 Mbit/s.
- Multimode or single mode FO interfaces (optional SFPs).
- Communication with SDH multiplexers via C37.94 or via ZIV model F2MUX optical-electric converter that integrates G703 output interfaces.
- Up to 16 digital signals can be exchanged between terminals to implement teleprotection schemes.

#### **TWO FRONT USB PORTS**



FOR LINE DIFFERENTIAL PROTECTION

## **Protection Units**

ANSI	Function	DI F-A	DI F-B
87PH	Phase Differential unit with Bestraint	1	1
87PH/50	Phase Differential unit without Bestraint	1	1
87N	Neutral Differential unit with Bestraint	1	1
87POS	Positive Sequence Differential with Bestraint	1	1
87NEG	Negative Sequence Differential with Restraint	1	1
87/50ED	Fault Detector	1	1
27ED	Fault Detector in Weak Infeed conditions	1	1
271 D 97P	External Fault Detector	1	1
6/REE	Restricted Earth Faults	1	0
50OE	Close onto Fault Detector	1	1
50/51	Phase O/C	3/3	4/4
50N/51N	Neutral O/C (calculated IN)	3/3	4/4
500/510	Negative Sequence O/C	2/2	4/4
50Q/51Q	Ground O/C	2/2	4/4
500/510	Ground O/C	3/3	4/4
500/510	Voltage Dependent O/C	3/3	4/4
071	Phase Directional	1	1
6/N	Neutral Directional	1	1
6/G	Ground Directional	1	1
6/P	Positive-Sequence Directional	1	1
6/Q	Negative Sequence Directional	1	1
	Harmonics Blocking	1	1
49W	Line Thermal Image	1	1
26	Hot Spot Thermal Image	1	0
500L/510L	Overload Instantaneous / Time units	1/1	0
27	Phase Undervoltage	3	4
59	Phase Overvoltage	3	4
59N	Neutral Overvoltage	3	4
47	Negative Sequence Overvoltage	1	0
64	Ground Overvoltage	3	4
81M	Overfrequency	4	2
81m	Underfrequency	4	2
81D	Rate of Change of the Frequency	4	2
	Load Shedding	1	0
59V/Hz	Overexcitation	4	0
25	Synchrocheck	2	4
50BF	Breaker Failure	1	1*
	Cold Load	1	1
21N/21P	Ground / Phase Distance Zones (8 / 8 zones)		
50SUP	Phase Overcurrent for Distance Supervision	1	1
	Load Encroachment	1	1
85-21	Teleprotection Schemes for Distance Units	1	1
85-67	Teleprotection Schemes for Overcurrent Units	1	1
	Open Phase Detector	1	1
	Remote Open Breaker Detector	1	1
60FF	Fuse Failure Detector	1	1
60VT	VT Supervision	1	1
68/78	Power Swing Detector	1	1
60CT	CT Supervision	1	1
3	Coil Supervision	Un to 1	2 coils
0	Breaker Supervision	1	1*
	Phase Selector	1	- 1
	Onen Pole Detector	- 1	1 0
0	Polo Disportanov		2
2	Pole Discolution	4	∠
	Deau-Line Detector	1	1
70		1	1
79		1	2
	I rip logic and Command	1	1
	Fault Locator & Multi Far-End Fault locator	1/1	1/1

(\*) Only for single breaker.







## Protection for two or three Winding Transformer or Autotransformer, of any voltage level, with Single or Double Circuit Breaker

Suitable for Phase-Shifting Transformers, Scott or Leblanc transformers.

Can be applied as a **Differential Protection** for reactances, SVCs, generators and motors.

A fast **Differential Unit**, complemented by advanced **Blocking** and **Harmonic Restraint Logics** and an **External Fault Detector**, provides great reliability in all types of conditions.



## **Characteristics**

## **Differential Units**

Includes one unit with percentage restraint and harmonic restraint/blocking, and another unrestrained. The latter allows to accelerate tripping of internal faults with high fault currents that cause CT saturation. Both differential units have up to four three-phase current inputs, allowing protection of windings transformers in breaker-and-a-half or ring-bus schemes.

### Harmonic Restraint / Blocking

The harmonic restraint and blocking units avoid trips under transformer inrush and overexcitation conditions. The wide variety of cross-blocking logics provide great security during transformer energization with low second harmonic percentage, common in new power transformer designs. Additionally, the dynamic harmonic blocking / restraint logic allows accelerating internal fault trips with CT saturation. Thanks to this last logic and the use of fast outputs, the differential unit trips in subcycle times.

#### **External Fault Detector**

Blocks the differential unit against external faults with very high CT saturation, providing exceptional security.

#### **Restricted Earth Faults**

The restricted earth faults unit detects ground faults in one of the windings of the machine, located very close to the neutral point. In addition to the neutral differential unit, the restricted earth faults unit includes a directional comparison unit that increases its security against external faults with CT saturation. The IED has low and high impedance Restricted Earth Faults units.

## **Backup Units**

The **IDF** has up to nine overcurrent units of each type (phase, neutral, negative sequence, ground). Each of them can be configured as a directional unit.



## **Protection Units**

ANSI	Function	Uns.
87	Restrained Differential Unit	1
87/50	Unrestrained Differential Unit	1
87FD	Fault Detector	1
50FD	Fault Detector (sequence magnitudes)	1
87P	External Fault Detector	1
50	Instantaneous Phase Overcurrent	9
51	Time-delayed Phase Overcurrent	9
50N	Instantaneous Neutral Overcurrent	9
51N	Time-delayed Neutral Overcurrent	9
50G	Instantaneous Ground Overcurrent	6//12
51G	Time-delayed Ground Overcurrent	6//12
50Q	Instantaneous Negative Sequence Overcurrent	9
51Q	Time-delayed Negative Sequence Overcurrent	9
50V	Instantaneous Voltage Dependent Overcurrent	1
51V	Time-delayed Voltage Dependent Overcurrent	1
67	Phase Directional	1
67N	Neutral Directional	3
67P	Positive-Sequence Directional	1
67Q	Negative Sequence Directional	1
	Harmonic Blocking	3
	Phase Selector	1
27	Phase Undervoltage	3
59	Phase Overvoltage	3
59N	Neutral Overvoltage	3
47	Negative Sequence Overvoltage	1
49	Thermal Image (configurable with RMS or TRUE RMS)	3
49HS	Hot Spot Thermmal Image	1
50OL	Instantaneous Overload unit	1
510L	Time-delayed Overload unit	1
81M	Overfrequency	4
81m	Underfrequency	4
81D	Rate of Change of the Frequency	4
	Load Shedding	1
50BF	Breaker Failure Protection	3
59V/Hz	Overexcitation	4
87N	Restricted Earth Faults Unit	3
60VT	Fuse Failure Detector	1
60VT	VT Supervision	1
60CT	CT Supervision	3
3	Coil Supervision (Depending on the Hardware Selection)	
	Breaker Supervision	3
2	Trip Logic and Command	3
	Open Pole Detector	3
	Saturation Detector (for all current channels)	1
	Cold Load	1
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**IRF-A** High Impedance Protection (ZIV e-NET flex family)



# Protection for **Distribution Feeders**, **Transformers** and **Busbars**

The **IRF** is applicable in any **substation scheme**. The protection functions are suitable **for any neutral configuration**, solid-grounded, resistor-grounded, Petersen coil compensated and isolated.

The powerful **programmable logic** features **selectable execution times** according to the required priority (2 ms, 10 ms and 20 ms). Includes many digital and analog operators, which allows the creation of complex protection and control functions.



## **Outstanding features**

# High Impedance Busbar, CT Supervision and Restricted Earth Fault.

In systems where busbar differential and transient earth faults protection are applied with the aid of external wiring, High Impedance units are used for the detection of phase and earth faults by applying the principles of overcurrent units. In addition, and alarm unit for CT failure is provided, which can be used to block the trip of the unit.

#### **Transient Earth Fault**

At Medium Voltage Distribution level, transient faults are very common in high impedance systems with high capacitance in feeders, as isolated, compensated, resistive, inductive, or combined neutral system, where earth fault current is so low that faults self-extinguishing a few milliseconds and reappearing again when voltage reaches its maximum value. Transient and sensitive transient earth fault protection units (TEFP and STEFP) work with the instantaneous neutral voltage and current samples of the

## **Protection Units**

ANSI	Function	Uns.
50	Instantaneous Phase Overcurrent	4***
51	Time-delayed Phase Overcurrent (Inverse/Fixed)	4***
50N	Instantaneous Neutral Overcurrent	4***
51N	Time-delayed Neutral Overcurrent (Inverse/Fixed)	4***
50G	Instantaneous Ground Overcurrent (*)	4***
51G	Time-delayed Ground Overcurrent (Inverse/Fixed)	4***
50Q	Instantaneous Negative Sequence Overcurrent (I2)	4***
51Q	Time-delayed Negative Sequence Overcurrent	4***
50Ns	Instantaneous Sensitive Ground Overcurrent	1
51Ns	Time-delayed Sensitive Ground Overcurrent	1
51Ns EPTR_C	Time-delayed Sensitive Ground O/C with EPTR_C	1
51Ni/c	Ungrounded/Compensated Neutral Overcurrent	1
50V	Instantaneous Voltage Dependent Overcurrent	1
51V	Time-delayed Voltage Dependent Overcurrent	1
67	Phase Directional	1
67N	Neutral Directional	1
67G	Ground Directional	1
67Ns	Sensitive Neutral Directional	1
67P	Positive-Sequence Directional	1
67Q	Negative Sequence Directional	1
67Ni/c	Isolated / Compensated Neutral Directional	1
85	Overcurrent Teleprotection Schemes	1
	High Impedance Restricted Earth Fault Unit	1
	High Impedance Differential Busbar Unit	1
	High Impedance Differential Alarm Unit	1
50BF	Breaker Failure Unit with Retrip Function	1
87N	Restricted Earth Faults Unit	1
67TEFP	Transient Earth Faults Protection	2
	Saturation Detector	1
	Harmonics Blocking	1
37	Time-Delayed Phase Undercurrent	1
46	Open Phase Unit	1
49	Thermal Image Unit	1
27	Phase Undervoltage	4***
27SPH	Single-Phase Undervoltage (Vsyn)	2
59	Phase Overvoltage	4***
59SPH	Single-Phase Overvoltage (Vsyn)	2
59N	Neutral Overvoltage	4***
64	Ground Overvoltage	4***
47	Negative Sequence Overvoltage	1

(\*) Depending on the Hardware Selection.

 Models with digit X9=3.
Dependign on FW digits X27+X28. Model with FW digits X27+X28 under 13 feature 3 units, models with FW digits X27+X28 equal or greater than 13 feature 4 units. first half cycle of the fault signal, with a sampling rate of 4800 Hz which, in combination with an adjustable directional characteristic is able to detect transient earth faults.

#### **Restricted Earth Fault**

The REF unit detects transformer winding faults located very close to the neutral point. In addition to the neutral differential unit, the Restricted Earth Fault Unit includes a directional comparison unit that increases security against external faults with CT saturation. The IED has low and high impedance Restricted Earth Faults unit.

#### **Saturation Detector**

CT saturation detection is based on the current derivative. The detector modifies the overcurrent units operating principle when activated. Overcurrent units use instantaneous voltage besides RMS voltage, allowing for less strict CT requirements.

ANSI	Function	Uns.
81M	Overfrequency	4
81m	Underfrequency	4
81D	Rate of Change of the Frequency	4
	Load Shedding	1
59V/Hz	Overexcitation	4
78	Out-of-Step	1
32P/Q	Directional Power (active / reactive)	2
79	Recloser	1
50FD	Fault Detector	1
60FF	Fuse Failure Detector	1
	Phase Selector	1
25	Synchronism Check Unit	2
	Cold-Load Unit	1
60VT	VT Supervision	1
60CT	CT Supervision	1
60CTI2	CT Supervision by Negative Sequence Current	1
60CTINDIF	CT Supervision by Neutral Differential Current	1
3	Coil Supervision	*
	Breaker Supervision	1
21FL	Fault Locator	1
	Transducer Voltage Supervision	1**
2	Pole Discrepancy	1
	Open Pole Detector	1
	Dead Line Detector	1
	Trip Logic	1
	Calendar	1





**New Extended HMI** 







# AVR – Automatic voltage regulation for up to 5 power transformers in parallel.

Parallel transformer regulation by **master-slave**, **circulating current** and **negative reactance** methods. It also includes line **voltage drop compensation**.

## **Key Features**

- Voltage Regulation. Maintains the transformer output voltage at the setpoint value, calculating the difference between the measured voltage and the setpoint voltage and comparing it with a threshold level to decide whether to send commands to the tap changer. The first tap change command has a time delay based on an inverse curve or a fixed time. Subsequent commands always have a fixed time delay.
- Line Voltage Drop Compensation. A compensation based on the measured current and the voltage drop between the transformer and the load, that provides stable voltage under load. The compensation can be calculated by two methods: LDC-Z or LDC-R & X.
- **Tap Indication and Monitoring**. The active tap can be read by digital inputs (directly or in BCD code), by an analog current transducer or by a Resistor Chain. Tap monitoring permits to generate alarms corresponding to irregular or extreme tap positions and to failures after tap change commands.



## **Voltage Regulation**

Maintains the transformer output voltage at the setpoint value, calculating the difference between the measured voltage and the setpoint voltage and comparing it with a threshold level to decide whether to send commands to the tap changer.

The first tap change command has a time delay based on an inverse curve or a fixed time. Subsequent commands always have a fixed time delay.

## Line Voltage Drop Compensation

A compensation based on the measured current and the voltage drop between the transformer and the load, that provides stable voltage under load.

The compensation can be calculated by two methods: LDC-Z or LDC-R & X.

## **Parallel Transformers Regulation**

Parallel transformer regulation can be achieved by the following methods:

- · Master / slave
- Circulating current
- Negative reactance

The first two methods in the list allow voltage regulation for up to 5 parallel transformers using GOOSE messaging (IEC 61850 ed 1 and 2).

## **Tap Indication and Monitoring**

The active tap can be read by digital inputs (directly or in BCD code), by an analog current transducer or by a Resistor Chain.

Tap monitoring permits to generate alarms corresponding to irregular or extreme tap positions and to failures after tap change commands.

## **Protección / Control Units**

ANSI	Function	Uns.
90	Voltage Regulator.	1
	LDC (LDC-Z, LDC R-X).	1
	Under Voltage Block with Temporization.	1
	Maximum Switching Current Block.	1
	Voltage Out of Range Block with Temporization and Reset.	1
	Power Reversal Detection.	1
	Tap Changer Monitoring.	1
59	Phase Overvoltage.	1
81m	Underfrequency.	1
60VT	VT Supervision.	1









## Subcycle Distance Protection suitable for lines of any voltage level with any configuration: Overhead or Underground, Single or Parallel circuits

The **ZLF** includes all the protection, control and measurement functions for a power line, with or without **series compensation** and **single pole** or **three pole** tripping.

**Eight distance zones** with **Mho** or **quadrilateral** characteristic, complemented with **load encroachment** and **power swing**, **fuse failure**, **close onto fault**, and **saturation detectors** provide great security and dependability even in the most adverse conditions.

The distance and overcurrent units can operate according to the following schemes: **DTT**, **PUTT**, **POTT**, **DCUB** and **DCB**. Weak infeed logic and current inversion blocking are also included.



## **Characteristics**

## **Subcycle Operation**

Distance algorithms based on half-cycle windows combined with robust solid-state trip outputs permit sub-cycle trip times for faults located within 75% of the zone.

#### **Mutual Coupling Compensation**

In parallel circuits is compensated by measuring the neutral current of the parallel line.

#### **Communication between IEDs**

- Up to 4 ports: Communication without redundancy with up to 4 remote ends or with redundancy with up to 2 remote ends.
- Selectable speed: from 1 x 64 kbit/s up to 2 Mbit/s.
- Multimode or single mode FO interfaces (optional SFPs).
- Communication with SDH multiplexers via C37.94 or via ZIV model F2MUX optical-electric converter that integrates G703 and V35 output interfaces.
- Up to 16 digital signals can be exchanged between terminals to implement teleprotection schemes.



Distance zones with quadrilateral characteristic and load limiters



## **Protection Units**

ANSI	Function	Uns.
21N	Ground Distance Zones (8 zones)	
21P	Phase Distance Zones (8 zones)	
50SUP	Phase Overcurrent for Distance Supervision	1
50FD	Fault Detector (sequence magnitudes)	1
	Load Encroachment	1
68/78	Power Swing Blocking / Out of Step Tripping	1
500F	Close-Onto-a-Fault Detector	1
	Remote Open Breaker Detector	1
50/51	Phase Overcurrent	3/3
50N/51N	Neutral Overcurrent (calculated IN)	3/3
50G/51G	Ground Overcurrent (measured IG)	3/3
50Q/51Q	Negative Sequence Overcurrent	3/3
67	Phase Directional	1
67N	Neutral Directional	1
67G	Ground Directional	1
67P	Positive-Sequence Directional	1
67Q	Negative Sequence Directional	1
	Harmonic Blocking	1
	Phase Selector	1
27	Phase Undervoltage	3
59	Phase Overvoltage	3
59N	Neutral Overvoltage	3
64	Ground Overvoltage	3
47	Negative Sequence Overvoltage	1
49	Thermal Image	1
40 81M	Overfrequency	4
81m		4
81D	Bate of Change of the Frequency	4
010	Load Shedding	1
46	Onen Phase	1
50BE	Breaker Failure Protection	1
	Distance Protection Schemes	1
	Overcurrent Protection Schemes	1
25	Synchrocheck	1
_0 60VT	Fuse Failure Detector	1
60VT	VT Supervision	1
60CT	CT Supervision	1
79	Becloser	1
15	Fault Locator	1
3	Coil Supervision (Depending on the Hardware	1
5	Selection)	
	Breaker Supervision	1
2	Pole Discrepancy	1
	Trip Logic and Command	1
	Open Pole Detector	1
	Dead Line Detector	1
	Saturation Detector (for all current channels)	1
	Calendar	

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