EXTENSION TO NEYRIZ 66/20KVSUBSTATION

GUARANTEE TABLE FOR CONTROL AND PROTECTION

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Rev.	**Purpose of Issue**	**Date**	**Prepared**	**Check**	**Approved**	**Authorized**

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1 INTRODUCTION

1.1 Purpose

This document has been prepared to specify and establish the minimum technical requirements for the design, supply, installation, and commissioning of the Extension to Neyriz 66/20 kV Substation.

1.2 Definitions

Within the context of this document, the following definitions will be applicable:

Project: Extension to Neyriz 66/20 kV Substation

Client: Petro Kavian Sanat Pars Co.

Owner: Fars Regional Electric Co.

Consultants: Aria Niroo Jam Co.

EPC Contractor: Any firm who is responsible for providing any service and material with respect to detailed engineering, procurement, construction of all items and material in accordance with the contract between the CLIENT and him.

Vendor/Supplier: The company, which has been selected to supply the equipment and material and products technical documentation mainly, related to the production of the ordered supply.

The word "shall" indicate a requirement. The word "should" indicate a recommendation.

Contractor shall be responsible for vendor goods.

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2 DISTANCE PROTECTION (N.A)

ITEM	DESCRIPTION	UNIT	TECHNICAL PARTICULARS
1	Manufacturer / country		
2	Type designation		
3	applicable standard		
4	Type of scheme (non switch /switch)		
5	Number of measuring units		
6	Type of impedance measuring characteristic (Mho, reactance, etc.):		
i)	For Phase to ground faults:		
a)	Zone 1		
b)	Zone 2		
c)	Zone 3		
d)	Starting zone		
ii)	For phase to phase & phase to phase to ground faults:		
a)	Zone 1		
b)	Zone 2		
c)	Zone 3		
d)	Starting zone		
iii)	For 3 phase fault:		
a)	Zone 1		
b)	Zone 2		

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ITEM	DESCRIPTION	UNIT	TECHNICAL PARTICULARS
c)	Zone 3		
d)	Starting zone		
7	Range of impedance setting in secondary ohm for:		
a)	Zone 1	Ω	
b)	Zone 2	Ω	
c)	Zone 3	Ω	
d)	Starting zone	Ω	
8	Relay type (static, microprocessor based)		
9	In case of microprocessor based relay:		
9.1	Self-monitoring of AC input and internal measuring circuits possible	Yes/No	
9.2	Programming and selecting of impedance measuring characteristic possible	Yes/No	
9.3	Programmable indicator provided	Yes/No	
9.4	Sampling rate (No. of samples per cycle)	Khz	
9.5	Analog to digital measuring convertor resolution	Bit	
9.6	Type of central processing unit		
9.7	Time period of self-test operation	Sec	
9.8	Others capabilities		
9.9	Method of preventing interfering signals influence		
10	Frequency of AC input		
11	Accuracy for SIR < 30		

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ITEM	DESCRIPTION	UNIT	TECHNICAL PARTICULARS
12	Minimum operating current	% In	
13	Range of impedance settings if starting elements for:		
a)	Phase/earth fault	Ω	
b)	Phase/Phase faults	Ω	
14	Range of adjustment of compensation for primary circuit zero sequence impedance and mutual impedance:		
a)	For Zone 0		
b)	For Zone (1-2)		
15	Range of adjustment of phase angle of directional impedance zones degree		
16	Max. source impedance to Zone 1 setting impedance ratio at which the accuracy of relay maintained (Characteristic impedance ratio (C.I.R.)		
17	Range of adjustment of zone timing elements for:		
a)	Zone 2		
b)	Zone 3		
18	Method of ensuring correct discrimination for three phase close up faults, e.g.: “memory”		
19	Method for preventing mal-operation on C.V.T. transient		
20	Method for preventing mal-operation of phase to phase units under phase ground faults for Zs/Z1 ratio 0-2		
21	Method of preventing tripping during system power swing		

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ITEM	DESCRIPTION	UNIT	TECHNICAL PARTICULARS
22	Method of preventing operation on line de-energization		
23	Timing contour curves for range of S.I.R values up to the value for quoted in item 16 above		
24	Time delay between fault occurrence and energization of circuit breaker trip coil of combined impedance)/PLC scheme	m sec	
25	Maximum "safe" setting of zone 1 (% of feeder effective impedance)		
26	Maximum permissible resistance at point of fault for non-delayed discriminative operation of combined impedance/PLC scheme or permissible R/X Ratio	Ω	
27	Details of output circuit to operate C.B. trip coil:		
a)	type and number of contact	A	
b)	Continuously current rating	A/sec	
c)	Short time current rating		
d)	Break duty at D.C. control voltage L/R of trip coil circuit = 0.4	sec.A	
28	Maximum burden of voltage circuits, per phase at rated phase to neutral voltage:		
a)	Resistive	VA	
b)	Reactive	VA	
29	Current transformer requirements: State relevant requirements in accordance with the recommendation of latest edition of IEC 185		

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ITEM	DESCRIPTION	UNIT	TECHNICAL PARTICULARS
30	Capacitor voltage transformer requirements: State details of any special requirements not specified in IEC 186 or 186A e.g.: transient response of CVTs etc.		
31	Current coil suitable for	A	
32	Voltage coil suitable for (1 phase)	V	
33	Auxiliary supply voltage and its permissible variation?	V	
34	Burden:		
a)	Current coil	VA	
b)	Voltage coil	VA	
c)	D.C. circuits	W	
35	If built in fuse failure is provided, fill item 15.6		
36	If built in instantaneous directional overcurrent relay is provided		
37	Is auto reclose equipment built in?		
38	Specify all indicators on distance relay?		
39	Max electrical field for safe operation of relay	V/cm	
40	Max. magnetic field for safe operation of relay Gas		
41	State regarding special features provided in the relay		
42	Limiting short-circuit thermal with stand value		
43	Continuous overvoltage withstand value	KV	
44	Accessories (if essential to the relay performance) provided		

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ITEM	DESCRIPTION	UNIT	TECHNICAL PARTICULARS
45	Hand reset operation indicator with inscription provided?	Yes/No	
46	Interference test (1 MHz)	KV	
47	Dielectric test voltage	KV/sec	
48	Impulse withstand voltage (1.2/50 micro sec.)	KV	
49	Mounting position (flush, surface, etc....)		

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2.1 Longitudinal Differential Protection (N.A)

ITEM	DESCRIPTION	UNIT	TECHNICAL PARTICULARS
1	Manufacturer / country		
2	Type of relay		
3	Applicable standard		
4	Range of adjustment of percentage bias		
5	Range adjustment of effective sensitivity (percent of normal full load current of transformer circuit at rated voltage)		
6	Time delay between initiation of fault and energization of breaker trip coil at a current equal to three times minimum setting	ms	
7	Time delay between initiation of fault and energization of breaker trip coil at a current to ten times minimum setting	ms	
8	Method of preventing tripping during magnetizing inrush conditions		
9	Current transformer requirements: State relevant requirements of the current transformer; a) Accuracy class b) Accuracy limit factor or knee point voltage c) Maximum winding resistance d) Maximum exciting current or give sufficient information to enable these requirements to be determined.	Ω A	
10	Allowable relay saturation factor		

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ITEM	DESCRIPTION	UNIT	TECHNICAL PARTICULARS
11	Details of output circuit: a) Type and number of contact b) Continuously current rating c) Short time current rating		
12	Relay current rating		
13	Relay type static, or elec. mech.		
14	Mounting position (flush, surface, etc....)		
15	Auxiliary C.T. details: a) C.T. resistance b) C.T. ratio tap c) C.T. knee point voltage		
16	Maximum through fault current for which the relay system is stable		
17	Rated value of the auxiliary energizing quantity		
18	Frequency	Hz	
19	Hand reset operation indicator provided	Yes/No	
20	Limiting short circuit thermal withstand value	%In/sec	
21	Dielectric test voltage	kV/sec	
22	Fifth harmonic restrain feature provided		
23	Whether unrestrained very high speed operation provided	Yes/No	
24	Whether over flux feature provided with diff. Relay	Yes/No	

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2.2 Auto reclose Equipment (Valid For All Relays)

ITEM	DESCRIPTION	UNIT	TECHNICAL PARTICULARS
1	Manufacturer / country		
2	Type reference		
3	Applicable standard		
4	Range of dead time adjustments for various method of reclosing	Sec	
5	Range of reclaim time adjustments	Sec	
6	Auto-reclose cycling time:		
a)	Single phase A.R.	Sec	
b)	There phase A.R.	Sec	
7	Closing pulse time	Sec	
8	Method of blocking auto-recloser:		
a)	When circuit breaker is normally open		
b)	when closing onto a fault		
9	Settings of dead line charging interlock:		
a)	Permit reclose	V	
b)	Block reclose	V	
10	Relay type static or microprocessor based		
11	Number of auto reclosing shots		
12	Whether hand reset lock out feature on permanent trip required		
13	Single and three phase trip pulse time		

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ITEM	DESCRIPTION	UNIT	TECHNICAL PARTICULARS
14	Rated auxiliary voltage and its variation V DC+%		
15	Mounting position (flush, surface, etc....)		
16	Operation indicator	Yes/No	
17	Operation counter	Yes/No	
18	Whether feature for annunciation of C.B. maintenance after preset number of A/R scheme operation is required	Yes/No	
19	Method of reclosing: - Single phase (SPAR) - Three phase (TPAR) - Single or three phase (SPAR or TPAR) - Single and three phase (SPAR and TPAR)		
20	Whether provision is provided for blocking & initiating the A/R equipment from: i- Control / relay panel ii- Remote control		
21	Whether following features provided for safe closing: 1- Synchronizing check 2- Live line / dead bus 3- Live bus/dead line 4- Dead bus/dead line	 Yes/No Yes/No Yes/No Yes/No	
22	Whether complete A/R scheme logic is as per requirement of the specification	Yes/No	
23	Power consumption at rated D.C. aux. voltage	W	
24	Dielectric test voltage	KV/sec	

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2.3 Under Voltage protection (N.A)

ITEM	DESCRIPTION	UNIT	TECHNICAL PARTICULARS
1	Manufacturer / country		
2	Type reference		
3	Applicable standard		
4	Relay type, static or elec. mech.		
5	Relay rated voltage	V	
6	Relay burden	VA	
7	Frequency	Hz	
8	Voltage setting range	V	
9	Resetting ratio		
10	Resetting time	ms	
11	Time delay range	Sec	
12	Number of phases		
13	Hand reset operation indicator provided	Yes/No	
14	Short time rating (5 sec.)	%Vn	
15	Value of the limit of operating range of the voltage		
16	Auxiliary voltage details (If any)		
17	Contact data		
18	Data to permit identification of the coil		
19	Mounting position (flush, surface, etc.)		
20	Accessories (If essential to relay performance) provided		

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2.4 Over Voltage protection (N.A)

ITEM	DESCRIPTION	UNIT	TECHNICAL PARTICULARS
1	Manufacturer / country		
2	Type designation		
3	Applicable standard		
4	Rated value of voltage		
5	Value of the limit of operating range of the rated voltage		
6	Resetting ratio		
7	Resetting time	ms	
8	Time delay range		
9	Frequency	HZ	
10	Number of phases		
11	Limiting short time over voltage withstand value	%Vn/sec	
12	Auxiliary voltage details (if any)		
13	Contact data		
14	Data to permit identification of the coil(s)		
15	Burden of coil(s)	VA	
16	Mounting position (flush, surface, etc...)		
17	Accessories (if essential to relay performance) provided		
18	Hand reset type operation indicator required		

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2.6 Fuse failure Relay (Valid For All Relays)

ITEM	DESCRIPTION	UNIT	TECHNICAL PARTICULARS
1	Manufacturer / country		
2	Manufacturer type		
3	Applicable standard		
4	Rated voltage	V	
5	Rated frequency	HZ	
6	Rated current	A	
7	Rated value of auxiliary energizing quantity		
8	Is neutral current compensation provided	Yes/No	
9	Is features to monitor 3 phase P.T. fuse failure provided	Yes/No	
10	Operating time		
11	Resetting time	ms	
12	Setting range: a) Zero sequence current b) Zero sequence voltage	 A V	
13	Mounting position (flush, surface, etc....)		
14	Hand reset operating indicator provided	Yes/No	
15	Type of relay (2P.T. secondary or P.T. secondary +IO)		
16	Dielectric test voltage	KV/sec	
17	Contact data		

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2.7 Fault& Event Recorder (Valid For All Relays)

ITEM	DESCRIPTION	UNIT	TECHNICAL PARTICULARS
1	General:		
1.1	Manufacturer/Country		
1.2	Type designation		
1.3	Rating of input voltage for AC channel	V	
1.4	Rating of input current for AC channel	A	
1.5	Permissible continuous overvoltage	V	
1.6	Permissible continuous overcurrent	A	
1.7	Rating of Digital input voltage	V DC	
1.8	Power frequency insulation test for one minute	kV (rms)	
1.9	Impulse test (1.2/50 µS)	kV(Peak)	
1.10	High frequency test (1 MHZ)	kV	
1.11	Maximum input current (Maintain an accuracy)		
1.12	Accuracy		
1.13	Permissible ambient temperature for correct operation	°C	
1.14	Permissible ambient temperature for storage	°C	
1.15	Consumption per analog voltage channel	VA	
1.16	Consumption per analog current channel	VA	
1.17	Consumption of DC circuit - On operation - In normal case	 W W	
1.18	Type of mounting		

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ITEM	DESCRIPTION	UNIT	TECHNICAL PARTICULARS
2	Acquisition Station:		
2.1	Number of AC channel for each data acquisition	unit	
2.2	Number of D.C. channel for each data acquisition	unit	
2.3	Total number of A.C. channel		
2.4	Total number of D.C. channel		
2.5	Sampling rate for all channels	KHz	
2.6	Resolution of analog input (all channel)byte		
2.7	Total recording time.	sec	
2.8	Pre fault recording time	sec	
2.9	Storage capacity for buffer (event) memory (each channel)		
2.10	Event resolution time	ms	
2.11	Type of control processing unit (C.P.U.)		
2.12	Frequency of C.P.U.	MHz	
2.13	Type of input isolation from environment		
2.14	Level change binary input (0-1, 1-0)		
2.15	External trigging possible?	Yes/No	
2.16	Self-diagnostic indication provided.	Yes/No	
2.17	Time period of self-test	sec	
2.18	Data and time range		
2.19	Type and precision of clock.		
2.20	Remote transmission possible?	Yes/No	

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ITEM	DESCRIPTION	UNIT	TECHNICAL PARTICULARS
2.21	Setting of time, a data from acquisition unit possible.		
2.22	Other capability of acquisition station?		
2.23	Other Indication of acquisition station?		
3	Evaluation station:		
3.1	Manufacture's name and country of: a) Computer b) Display c) Printer		
3.2	Type designation of: a) Computer b) Display c) Printer		
3.3	Rated voltage of power supply (50 Hz)	V	
3.4	Capacity of hard disk mass storage	M.byte	
3.5	Capacity of floppy disk mass storage	M.byte	
3.6	Computer compatible to IBM	Yes/No	
3.7	Printer specification: a) Method of printing b) Printing mechanism c) Printing speed d) Type of paper		
4	Software:		
4.1	Operating system		
4.2	Menu driven system provided	Yes/No	
4.3	The dialogue language		

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ITEM	DESCRIPTION	UNIT	TECHNICAL PARTICULARS
4.4	Number of character for name of station		
4.5	Number of character for identification of channel		
4.6	Which of the following possibilities provided?		
	a) Magnification of the plot	Yes/No	
	b) Changing of scale	Yes/No	
	c) printing of single channel	Yes/No	
	d) Screen printing facility	Yes/No	
	e) Setting and control of acquisition of) Presentation	Yes/No	
	in colour	Yes/No	
	g)list of recorded event	Yes/No	

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3 INSTANTANEOUS DIRECTIONAL EARTH FAULT (N.A)

ITEM	DESCRIPTION	UNIT	TECHNICAL PARTICULARS
1	Manufacturer / country		
2	Type designation		
3	Applicable standard		
4	Frequency		
5	Rated zero sequence polarizing voltage (Vo)	V	
6	Rated zero sequence current (Io)	A	
7	Instantaneous D.E.F. element pick up time	ms	
8	Relay characteristic angle Degree		
9	Sensitivity of D.E.F. element		
10	D.E.F. element reset time on current reversal	ms	
11	Phase angle between Io and V_{ph} for D.E.F element operation	Degree	
12	Phase angle between Io and I_{ph} for D.E.F element operation	Degree	
13	Pick up level of the D.E.F. low set element	%	
14	Pick up level of the D.E.F high set element	%	
15	Pick up time of low set element ms	ms	
16	Pick-Up time of high set element	ms	
17	Drop off time of low set element	ms	
18	Drop off time of high set element	ms	
19	Is logic of the D.E.F. relaying as per specification	Yes/No	

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ITEM	DESCRIPTION	UNIT	TECHNICAL PARTICULARS
20	Rated value of auxiliary energizing voltage	V	
21	Value of limit of the operating range of the auxiliary energizing voltage		
22	Contact data		
23	Limiting short circuit thermal withstand value		
24	Dielectric test voltage	KV/sec	
25	Mounting position (flush, surface, etc...)		
26	hand reset operating indicator with inscription provided (if essential)	Yes/No	
27	Accessories (if essential to the relay performance) provided?		

3.1 Directional over current protection (N.A)

ITEM	DESCRIPTION	UNIT	TECHNICAL PARTICULARS
1	Manufacturer / country		
2	Type designation		
3	Applicable standard		
4	Frequency		
5	For directional unit: a) Rated polarizing voltage b) Rated zero-sequence current c) Max. torque phase angle degree d) Operation time	 V A Lag ms	

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ITEM	DESCRIPTION	UNIT	TECHNICAL PARTICULARS
6	Details of characteristic curves furnished for: - Normal inverse - Very inverse - Extremely inverse		
7	Current setting range		
8	Rated value of the auxiliary energizing voltage		
9	Value limit of the operating range of the auxiliary energizing	voltage	
10	Contact details		
11	Limiting short circuit thermal withstand value		
12	Dielectric test voltage	KV/sec	
13	Mounting position (flush, surface, etc....)		
14	Accessories (if essential to the relay performance) provided		
15	Hand reset operation indicator with inscription provided		

3.2 Inverse over Current and Earth Fault Protection (N.A)

ITEM	DESCRIPTION	UNIT	TECHNICAL PARTICULARS
1	Manufacturer / country		
2	Type of relay		
3	Range of current setting, percent of current rating	%	
4	Range of time setting at current equal to ten times current setting	Sec	
5	Time/current characteristic		

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ITEM	DESCRIPTION	UNIT	TECHNICAL PARTICULARS
6	Current at which relay fully resets, percent of current setting	%	
7	Impedance of CT current circuit: a) At current setting b) At ten times current setting	 Ω Ω	
8	Relay allowable saturation factor		
9	Details of output circuit to operate circuit breaker trip coils: a) Type and number of contact b) Continuously current rating c) Short time current rating	 A A/sec	
10	Relay current rating		
11	Relay type, static or elec. mech.		
12	Frequency		
13	Number of phases		
14	Rated value of current		
15	Hand reset operation indicator provided		
16	Mounting position (flush, surface, etc....)		
17	Dielectric test voltage	KV/sec	
18	Detail of high set unit: a) Rated current b) Range		
19	Limiting short circuit thermal withstand value	%In/sec	
20	Second harmonic blocking feature in case of transformer protection provided	Yes/No	

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3.3 Check Synchronizing Equipment (N.A)

ITEM	DESCRIPTION	UNIT	TECHNICAL PARTICULARS
1	Manufacturer /Country		
2	Type reference (designation)		
3	Applicable standard		
4	Maximum phase difference at which circuit breaker closure is permitted	Degree	
5	accuracy of phase difference in item 3 above	Degree	
6	Maximum slip frequency at which circuit breaker closure is permitted	Hz	
7	Setting of under voltage inhibit elements: a) Running voltage b) Incoming voltage	 V V	
8	Pick up/drop off ratio of under voltage inhibit elements		
9	Relay type, static or elec. mech.		
10	Type of mounting (flush, surface, etc...)		
11	Rated frequency	Hz	
12	Rated P.T. secondary voltage	V	
13	Operation time		
14	Dielectric test voltage	kV/sec	
15	Rated auxiliary D.C. voltage	V	
16	Rated burden		
17	Voltage monitoring relay is provided	Yes/No	

Extra sheet shall be repeated for synchro check relay for manual closure of C.B.

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3.4 Breaker Failure Protection (N.A)

ITEM	DESCRIPTION	UNIT	TECHNICAL PARTICULARS
1	Manufacturer / country		
2	Type designation		
3	Applicable standard		
4	Rated value of current	A	
5	Rated value of the setting range of characteristic quantity and the corresponding class of accuracy		
6	Drop out current as % of pick up current		
7	Pick up time	ms	
8	Resetting time	ms	
9	Frequency	Hz	
10	Burden	VA	
11	Timer details (rage etc.): a) Number of timer b) Auxiliary voltage c) Timing range	 V S	
12	Number of phases		
13	Limiting short time thermal withstand value		
14	Value of auxiliary DC and its permissible variation V DC		
15	DC consumption	W	
16	Contact data a) Number b) Continuous rating at 110 V DC		
17	Mounting position (flush, surface, etc...)		

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ITEM	DESCRIPTION	UNIT	TECHNICAL PARTICULARS
18	Accessories (if essential to relay performance) provided		
19	Hand reset operation indicator with inscription provided	Yes/No	
20	Burden		
21	Dielectric test voltage	kV/sec	

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4 TRANSFORMER DIFFERENTIAL PROTECTION (N.A)

ITEM	DESCRIPTION	UNIT	TECHNICAL PARTICULARS
1	Manufacturer / country		
2	Type of relay		
3	Applicable standard		
4	Range of adjustment of percentage bias		
5	Range adjustment of effective sensitivity (percent of normal full load current of transformer circuit at rated voltage)		
6	Time delay between initiation of fault and energization of breaker trip coil at a current equal to three times minimum setting	ms	
7	Time delay between initiation of fault and energization of breaker trip coil at a current to ten times minimum setting	ms	
8	Method of preventing tripping during magnetizing inrush conditions		
9	Current transformer requirements: State relevant requirements of the current transformer; a) Accuracy class b) Accuracy limit factor or knee point voltage c) Maximum winding resistance d) Maximum exciting current or give sufficient information to enable these requirements to be determined.	Ω A	
10	Allowable relay saturation factor		
11	Details of output circuit: a) Type and number of contact		

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ITEM	DESCRIPTION	UNIT	TECHNICAL PARTICULARS
	b) Continuously current rating c) Short time current rating		
12	Relay current rating		
13	Relay type static, or elec. mech.		
14	Mounting position (flush, surface, etc....)		
15	Auxiliary C.T. details: a) C.T. resistance b) C.T. ratio tap c) C.T. knee point voltage		
16	Maximum through fault current for which the relay system is stable		
17	Rated value of the auxiliary energizing quantity		
18	Frequency	Hz	
19	Hand reset operation indicator provided	Yes/No	
20	Limiting short circuit thermal withstand value	%In/sec	
21	Dielectric test voltage	KV/sec	
22	Fifth harmonic restrain feature provided		
23	Whether unrestrained very high speed operation provided	Yes/No	
24	Whether over flux feature provided with diff. Relay	Yes/No	

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5 RESTRICTED EARTH FAULT PROTECTION LV & HV (N.A)

ITEM	DESCRIPTION	UNIT	TECHNICAL PARTICULARS
1	Manufacturer / country		
2	Type of relay		
3	Applicable standard		
4	Effective sensitivity (percent of normal full load current of the transformer winding being protected or of the current rating of the earthing resistance where provided)		
5	Time delay between initiation of fault and energization of breaker trip coil at a current equal to three times minimum setting	ms	
6	Time delay between initiation of fault and energization of breaker trip coil at a current equal to ten times minimum setting	ms	
7	Method for testing proposed or predicated performance		
8	Current transformer requirements: State relevant requirements of the current transformer		
9	Relay allowable saturation factor		
10	Details of output circuit: a) Type and number of contact b) Continuously current rating c) Short time current rating		
11	Relay current rating		
12	Relay type static or elec. mech.		
13	Hand reset operation indicator provided	Yes/No	
14	Rated value of auxiliary energizing quantity		

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ITEM	DESCRIPTION	UNIT	TECHNICAL PARTICULARS
15	Value of the limit of the operating range(s) of auxiliary energizing quantity		
16	Mounting position (flush, surface, etc....)		
17	Dielectric test voltage	KV/sec	
18	Limiting short circuit thermal withstand value	A	
19	Value of external phase and earth fault current up to which the equipment is stable		
20	Current setting range		

5.1 Primary Inverse time over current protection with instantaneous unit (N.A)

ITEM	DESCRIPTION	UNIT	TECHNICAL PARTICULARS
1	Manufacturers name and country		
2	Type		
3	Current setting range in percent of current rating	%	
4	Transient over reach for instantaneous unit	%	
5	Time setting range	msec	
6	Operating time at current equal to 10 Is	msec	
7	Time/ current characteristic		
8	Current at which relay fully resets, percent of current setting	%	
9	Relay burden	VA	
10	Details of output circuit to operate circuit breaker trip coils:		
11	a) Type and number of contact		

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ITEM	DESCRIPTION	UNIT	TECHNICAL PARTICULARS
12	b) Continuously current rating	A	
13	c) Short time current rating	A/sec	
14	Number of phases		
15	Rated current		
16	Time accuracy class		
17	Mounting position (flush, surface, etc…)		
18	Dielectric test voltage	Kv/sec	
19	Drop off/pick up ratio for instantaneous element	%	
20	Limiting short circuit thermal withstand value	KA/sec	
21	Second harmonic blocking feature in case of transformer protection provided	Yes/No	

5.2 Power & Aux/Gr Transformers neutral earth fault protection with instantaneous unit (N.A)

ITEM	DESCRIPTION	UNIT	TECHNICAL PARTICULARS
1	Manufacturers name and country		
2	Type		
3	Current setting range and its accuracy class		
4	Rated current	A	
5	Transient over reach for instantaneous unit	%	
6	Time accuracy class		
7	Contact data		
8	Burden	V.A	

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ITEM	DESCRIPTION	UNIT	TECHNICAL PARTICULARS
9	Type of mounting		

6 SECONDARY DIRECTIONAL OVER-CURRENT PROTECTION (N.A)

ITEM	DESCRIPTION	UNIT	TECHNICAL PARTICULARS
1	Manufacturers name and country		
2	Type		
3	Applicable standard		
4	Rated zero sequence polarizing voltage (Vo)	V	
5	Rated zero sequence current (lo)	A	
6	Relay characteristic angle	Degree	
7	Sensitivity of directional element		
8	Directional element reset time on current reversal	msec	
9	Pick up level of the over current element	%	
10	Pick up level of the earth fault element	%	
11	Pick up time of over current element	msec	
12	Pick up time of earth fault element	msec	
13	Drop off time of over current element	msec	
14	Drop off time of earth fault element	msec	
15	Rated value of auxiliary energizing voltage	V	
16	Value of limit of the operating range of the auxiliary energizing voltage	V	
17	Contact data		
18	Limiting short circuit thermal withstand value	KA	

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ITEM	DESCRIPTION	UNIT	TECHNICAL PARTICULARS
19	Dielectric test voltage	kV/sec	
20	Mounting position (flush, surface, etc…)		
21	Hand reset operating indicator with inscription provided	Yes/No	

7 AUX/GR TRANSFORMERS NEUTRAL SENSITIVE EARTH FAULT PROTECTION (N.A)

ITEM	DESCRIPTION	UNIT	TECHNICAL PARTICULARS
1	Manufacturers name and country		
2	Type		
3	Current setting range and its accuracy class		
4	Transient over reach	%	
5	Contact data		
6	Burden	V.A	
7	Type of mounting		

8 AUXILIARY RELAY (SELF RESET) HIGH SPEED TYPE WITH FLAG FOR POWER TRANSFORMER MECHANICAL PROTECTION REPEATER (N.A)

ITEM	DESCRIPTION	UNIT	TECHNICAL PARTICULARS
1	Manufacturers name and country		
2	Type		
3	Contact data		

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ITEM	DESCRIPTION	UNIT	TECHNICAL PARTICULARS
4	Pick-up time	m sec	
5	Permissible voltage for pick-up	V	
6	Permissible voltage for drop-off	V	
7	Duty level as per appendix of IEC 60255-0-20		

9 BUS BARS PROTECTION (N.A)

ITEM	DESCRIPTION	UNIT	TECHNICAL PARTICULARS
1	Manufacturer / country		
2	Type reference		
3	Applicable standard		
4	Relay type, static or elec. mech. or other system of measuring basis (High imp., restrain current, directional comparison, etc....)		
5	Relay rated current	A	
6	Relay burden	VA	
7	Frequency	Hz	
8	Current setting range: - Phase / earth fault - Phase / phase fault	 A A	
9	Time between fault commencement and initiation of trip signal: - At 3 times fault setting - At 10 times fault setting	 ms ms	
10	Maximum permissible through fault current for which relay is stable	KA	

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ITEM	DESCRIPTION	UNIT	TECHNICAL PARTICULARS
11	Current transformer supervision relay provided	Yes/No	
12	Current transformer requirement: a) Formula for knee point voltage b) Max. of magnizaion current		
13	CT supervision relay details: a) Type and manufacturer b) Alarm pick up current c) Alarm pick up time d) Short circuit CT lead provided e) Blocking the tripping after a preset time provided	 Yes/No Yes/No	
14	Relay allowable saturation factor		
15	Hand reset operation indicator provided	Yes/No	
16	Mounting position (flush, surface, etc...)		
17	Rated value of auxiliary energizing quantity & its permissible variation	VDC	
18	Short time rating	KA/sec	
19	Fault setting with maximum number of current transformers connected - primary amperes		
20	Isolating auxiliary switches provided Yes/No	Yes/No	
21	Accessories (if essential to the relay performance) provided		
22	No. of tripping relays		
23	Interference test (Mhz)	kV	
24	Dielectric test voltage	kV(rms)	
25	Surge test (1.2/50 µs)	kV	

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ITEM	DESCRIPTION	UNIT	TECHNICAL PARTICULARS
26	Self-monitoring of its important circuit possible	Yes/No	
27	Automatic testing is possible	Yes/No	
28	DC consumption (main unit)	W	
29	Continuous rating of tripping contact	A	
30	Continuous rating of alarm contact	A	
31	Specify all indicators		
32	Other capabilities and advantages		

10 TRIP/CLOSE & LOCKOUT RELAY (VALID FOR ALL FEEDERS)

ITEM	DESCRIPTION	UNIT	TECHNICAL PARTICULARS
1	Manufacturer / country		
2	Type reference (designation)		
3	Applicable standard		
4	Operating time		
5	Burden	VA	
6	Rated voltage	V	
7	Target		
8	Number of contact		
9	Duty range in percent of rated voltage for pick up		
10	Permitted ambient temperature for indoor application		

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ITEM	DESCRIPTION	UNIT	TECHNICAL PARTICULARS
11	Contact details: a) Rated voltage b) Max. system voltage c) Current carrying capacity: - 200 mes /1sec - Continuously capacity d) Making and conducting capacity - 200 mes/1 sec e) Breaking capacity		
12	Pick up time: a) Make contact b) Break contact	NO NC	
13	Drop out time: a) Make contact b) Break contact		
14	Dielectric test voltage	kV/sec	
15	Type of mounting (flush, surface, etc...)		

11 LOCKOUT RELAY (VALID FOR ALL FEEDERS)

ITEM	DESCRIPTION	UNIT	TECHNICAL PARTICULARS
1	Manufacturer / country		
2	Type reference (designation)		
3	Applicable standard		
4	Operating time		
5	Burden	VA	
6	Rated voltage	V	

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ITEM	DESCRIPTION	UNIT	TECHNICAL PARTICULARS
7	Target		
8	Number of contact		
9	Duty range in percent of rated voltage for pick up		
10	Permitted ambient temperature for indoor application		
11	Contact details: a) Rated voltage b) Max. system voltage c) Current carrying capacity; - 200 mes /1sec - Continuously capacity d) Making and conducting capacity - 200 mes/1 sec e) Breaking capacity		
12	Pick up time: a) Make contact b) Break contact	NO NC	
13	Drop out time: a) Make contact b) Break contact		
14	Dielectric test voltage	kV/sec	
15	Type of mounting (flush, surface, etc...)		

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12 TRIP CIRCUIT SUPERVISION (VALID FOR ALL FEEDERS)

ITEM	DESCRIPTION	UNIT	TECHNICAL PARTICULARS
1	Manufacturer /country		
2	Type reference (designation)		
3	Applicable standard		
4	Time delay	S	
5	Auxiliary D.C. voltage details	V	
6	Contact data	A	
7	Circuit breaker trip coil current	A	
8	Mounting position (flush, surface, etc...)		
9	Circuit breaker trip circuit supervision of circuit breaker for circuit breaker close and trip position		
10	Number of phases		
11	Contact data		
12	Operation indicator of hand reset type provided		
13	Accessories (if essential to the relay performance) provided		
14	Dielectric test voltage	kV/sec	

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13 MV Outgoing, Bus Coupler and Capacitor Bank Protection Inverse Time Over Current Protection With Instantaneous Unit

ITEM	DESCRIPTION	UNIT	TECHNICAL PARTICULARS
1	Type		
2	Manufacturer		
3	Current setting range in multiples of rated current and accuracy class		
4	Current setting range in multiples of rated current for instantaneous unit		
5	Number of phases		
6	Burden	V.A	
7	Contact data		
8	Type of mounting		
9	Hand reset operation indicator	Yes/No	

13.1 Outgoing Sensitive earth fault Protection

ITEM	DESCRIPTION	UNIT	TECHNICAL PARTICULARS
1	Type		
2	Manufacturer		
3	Current setting range in multiples of rated current and its accuracy class		
4	Contact data		
5	Burden	V.A	
6	Type of mounting		

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ITEM	DESCRIPTION	UNIT	TECHNICAL PARTICULARS
7	Hand reset operation indicator	Yes/No	
8	Stage for alarm	Yes/No	
9	Stage for trip	Yes/No	

13.2 Capacitor Star-Point O/C Protection (N.A)

ITEM	DESCRIPTION	UNIT	TECHNICAL PARTICULARS
1	Type		
2	Manufacturer		
3	Current setting range in multiples of rated current and its accuracy class		
4	Contact data		
5	Burden	V.A	
6	Type of mounting		
7	Hand reset operation indicator	Yes/No	
8	Stage for alarm	Yes/No	
9	Stage for trip	Yes/No	

13.3 Over Voltage Protection (N.A)

ITEM	DESCRIPTION	UNIT	TECHNICAL PARTICULARS
1	Type		
2	Manufacturer		
3	Power consumption per phase of voltage circuit	VA	

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ITEM	DESCRIPTION	UNIT	TECHNICAL PARTICULARS
4	Rated value of the setting range of characteristic quantity and the corresponding class		
5	Resetting ratio	%	
6	Resetting time	msec	
7	Time delay range	Sec	
8	Number of phases		
9	Contact data		

13.4 Under Voltage Protection (N.A)

ITEM	DESCRIPTION	UNIT	TECHNICAL PARTICULARS
1	Type		
2	Manufacturer		
3	Power consumption per phase of voltage circuit	VA	
4	Rated value of the setting range of characteristic quantity and the corresponding class		
5	Resetting ratio	%	
6	Type		
7	Manufacturer		
8	Power consumption per phase of voltage circuit	VA	
9	Rated value of the setting range of characteristic quantity and the corresponding class		
10	Resetting time	msec	
11	Time delay range	Sec	
12	Number of phases		

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ITEM	DESCRIPTION	UNIT	TECHNICAL PARTICULARS
13	Contact data		
14	Hand reset operation indicator with inscription required	Yes/No	
15	Type of mounting		

14 METERS (VALID FOR ALL FEEDERS)

14.1 MWH & MVARH Meters

ITEM	DESCRIPTION	UNIT	TECHNICAL PARTICULARS
1	Manufacturer/country		
2	Type reference (designation)		
3	Applicable standard		
4	Accuracy		
5	Burden: - Current coil - Voltage coil	 VA VA	
6	Current coil suitable for	A	
7	Voltage coil suitable for	V	
8	Continuous rating of: - Current coil - Voltage coil	 %In %Vn	
9	Short time rating of: - Current coil - Voltage coil	 %In/sec %In/sec	
10	Type of mounting		

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ITEM	DESCRIPTION	UNIT	TECHNICAL PARTICULARS
11	Frequency	Hz	
12	Number of digits on the meter		
13	Whether test blocks provided		
14	Whether reverse running stop provided		

14.2 MW and MVAR Meters (N.A)

ITEM	DESCRIPTION	UNIT	TECHNICAL PARTICULARS
1	Manufacturer/country		
2	Type reference (designation)		
3	Applicable standard		
4	Accuracy		
5	Burden: - Current coil - Voltage coil	 VA VA	
6	Current coil suitable for	A	
7	Voltage coil suitable for	V	
8	Continuous ratig of: - Current coil - Voltage coil	 %In %Vn	
9	Short time rating of: - Current coil - Voltage coil	 %In/sec %In/sec	
10	Frequency	Hz	

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ITEM	DESCRIPTION	UNIT	TECHNICAL PARTICULARS
11	Dimension	mmxmm	
12	Type of mounting (flush, surface, etc...)		

14.3 Voltmeter (N.A)

ITEM	DESCRIPTION	UNIT	TECHNICAL PARTICULARS
1	Manufacturer/country		
2	Type reference (designation)		
3	Applicable standard		
4	Accuracy		
5	Burden	VA	
6	Current coil suitable for	V	
7	Continuous rating	%Vn	
8	Short time rating	%Vn/sec	
9	Frequency	Hz	
10	Dimension	mmxmm	
11	Type of mounting (flush, surface, etc...)		

14.4 Ammeters (N.A)

ITEM	DESCRIPTION	UNIT	TECHNICAL PARTICULARS
1	Manufacturer/country		
2	Type reference (designation)		

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ITEM	DESCRIPTION	UNIT	TECHNICAL PARTICULARS
3	Applicable standard		
4	Accuracy		
5	Burden	VA	
6	Current coil suitable for	V	
7	Continuous rating	%Vn	
8	Short time rating	%Vn/sec	
9	Frequency	Hz	
10	Dimension	mmxmm	
11	Type of mounting (flush, surface, etc...)		

14.5 Measurement Center

ITEM	DESCRIPTION	UNIT	TECHNICAL PARTICULARS
1	**Accuracy:**		
1.1	Type		
1.2	Manufacture		
1.3	Active and reactive energy		
1.4	Voltage	V	
1.5	Current	A	
1.6	Power	W	
1.7	Frequency	HZ	
2	**Voltage input**		

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ITEM	DESCRIPTION	UNIT	TECHNICAL PARTICULARS
2.1	Rated voltage(Vn)	V	
2.2	Optional rated voltage	V	
2.3	Voltage measuring range with separate auxiliary supply	V	
2.4	Self - Powered		
2.5	Burden with auxiliary supply	VA	
2.6	Burden self - powered	VA	
2.7	Rated frequency	HZ	
2.8	Frequency range		
2.9	Overload		
3	**Current input**		
3.1	Rated current (In)	A	
3.2	Maximum current (Imax)	A	
3.3	Burden	VA	
3.4	Overload		
4	**AC auxiliary supply**		
4.1	Auxiliary voltages (Vx)		
4.2	Optional auxiliary voltages		
4.3	Supply voltage range		
4.4	Burden		
4.5	Overload		
5	**Display**		

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ITEM	DESCRIPTION	UNIT	TECHNICAL PARTICULARS
5.1	LCD (No. of lines)		
5.2	Number of digits		
5.3	Height of digits		
5.4	Width of digits		
6	**Relay outputs**		
6.1	Relay Contact rating		
6.2	Maximum switching power		
6.3	Maximum number of pulses		
6.4	Pulse duration		
7	**Design**		
7.1	Degree of protection		
7.2	Weight		
8	**Ambient conditions**		
8.1	Temperature		
8.2	Rated range of operation		
8.3	Storage		
8.4	Humidity		

14.6 Automatic Voltage Regulator (N.A)

ITEM	DESCRIPTION	UNIT	TECHNICAL PARTICULARS
1	Type		

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ITEM	DESCRIPTION	UNIT	TECHNICAL PARTICULARS
2	Manufacture		
3	Voltage level		
4	Band width		
5	Does it equip with line drop compensator or Z compensation?		
6	Does it equip with load shedding?		
7	Does it equip with under voltage blocking feature?		
8	Does it equip with over voltage blocking feature?		
9	Does it equip with over current blocking feature?		
10	Rated current input?	A	
11	Rated voltage input?	V	
12	Is there any inputs for parallel control?		

14.7 Annunciators

ITEM	DESCRIPTION	UNIT	TECHNICAL PARTICULARS
1	Manufacturer/country		
2	Type reference (designation)		
3	Applicable standard		
4	Solid state or electro - mechanical		
5	Ambient temperature limitations: a) Max. b) Min.	 °C °C	

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ITEM	DESCRIPTION	UNIT	TECHNICAL PARTICULARS
6	Total power consumption per alarm point: a) Normal condition b) Flashing condition c)Steady condition	 W W W	
7	Is alarm divided to two sections: Urgent and non-urgent		
8	minimum momentary contact duration of an alarm point for annunciator to operate	ms	
9	Is it convertible to accept normally closed alarm contacts?		
10	Maximum transient voltage from alarm DC voltage which the equipment can withstand without damage or malfunction	V	
11	10% spare		
12	Number of window on each control panel		

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15 CONTROL PANEL ACCESSORIES

ITEM	DESCRIPTION	UNIT	TECHNICAL PARTICULARS
1	Discrepancy control switches: a) Manufacturer/country b) Applicable standard c) Type designation: - C.B. control switch D.S. control switch E.S. Control switch - D.S. /E. position indicator d) Rating of contacts: - Voltage - Make and carry continuously - Break e) Dimensions: - C.B. control switch - D.S. control switch E.S. Control switch - D.S. /E. position indicator	V A A mmxmm mmxmm mmxmm	
2	Selector switches: a) Manufacturer/country b) Applicable standard c) Type designation: - Voltmeter switch - Ammeter switch - A.R. on/off switch - Sub/Scada switch - Local/remote switch - Synchronizing key switch d) Rating of contacts: - Voltage - Make and carry continuously - Break	V A A	

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ITEM	DESCRIPTION	UNIT	TECHNICAL PARTICULARS
3	Push buttons: a) Manufacturer /country b) Applicable standard c)Type designation d)Whether shrouding provided to prevent inadvertent operation e) Number of No and NC contacts f) Rating of contact: - Voltage - Make and carry continuously	 V A	
4	Indicating lamps: a) Manufacturer /country b) Applicable standard c) Type designation d)Voltage and its permissible variation e) Wattage f) If series resistor is provided - Ohmic value - Power loss		

15.1 Relay and Control Panels

ITEM	DESCRIPTION	UNIT	TECHNICAL PARTICULARS
1	Manufacturer/country		
2	Circuit reference		
3	Type of construction (simple/etc)		
4	Type of sheet steel		
5	Thickness of sheet steel: a) Front b) Rear c) Side	 mm mm mm	
6	Painting thickness of panels	micron	

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ITEM	DESCRIPTION	UNIT	TECHNICAL PARTICULARS
7	Overall dimensions of each panel section		
8	Panel wiring: a) Material b) Size of conductors c) Voltage rating of wiring		
9	Terminal blocks: a) Manufacturer /country b) Type designation: - Voltage terminal - C.T. terminal - Other c) voltage grade d) current rating e) Whether 400/230 V terminal are segregated and fitted with plastic covers f) Percent of spare terminals g) Earthquake protection (coefficient of g)		

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