

Protection and control REX640

All-in-one protection for advanced power generation and distribution applications



REX640 is a powerful and freely configurable all-in-one protection and control relay for advanced power generation and distribution applications. Complete application coverage combined with fully modular and scalable hardware and software ensures maximum flexibility and optimal cost-effectiveness throughout the relay life cycle.

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01 Protection and control REX640

Addressing aging infrastructure by future-proofing the grid

- Easy customization and adaptation to changing protection requirements with modular and scalable hardware and software
- Continuous access to the latest hardware and software developments
- Condition monitoring and supervision for optimized component maintenance and return on investment
- Convenient retrofit alternative to ensure the power protection system meets today's requirements –and is adaptable to future requirements too

Supporting the digitalization of substations

- Designed to support the increasing digitalization of substations – with IEC 61850 9-2-based process bus for future integration with centralized protection
- Standardized IEC 61850-compliant communication for smooth interoperability between substation automation devices – a cost-effective and ecological choice
- Optimal cyber security to safeguard critical infrastructure – including compliance with the EU cyber resilience act effective in 2027
- Cost-effective fault management with self-healing ring and only one multifunctional protection relay per ring-main unit (RMU)

Optimizing asset management

- Less to learn and less spare devices to store with one relay covering multiple application areas
- Adaptable to changing requirements for the lifetime of the relay through easy adding or replacing of modules or application packages
- Optimal situational awareness and usability with application-driven local HMI/switchgear HMI (LHMI)/SHMI)
- Extensive life cycle services – long-term global partner with longtime experience, close to you in your language
- Easy access to up-to-date information via the e-business platform ABB Relays-Online

Complying with evolving regulations

- Interconnection protection package for a better way of connecting to renewables
- Compliance with the latest grid codes to ensure renewables remain connected during disturbances
- Extensive protection and fault location functionality to ensure compliance with the regulation of electricity utilities to minimize costly downtime
- Reduced environmental impact with sustainable design, production, operation, maintenance and end-of-life management

Function description	IEC 60617	ANSI	IEC 61850	Instances	Application package
Protection					
Distance protection	Z<	21P,21N	DSTPDIS	1	APP3
Local acceleration logic	LAL	21LAL	DSTPLAL	1	APP3
Scheme communication logic	CL	85 21SCHLGC	DSOCPSCH	1	APP3
Phase segregated scheme communication logic	CLSP	85 21SCHLGCSP	SPDSOCPSCH	1	APP3
Current reversal and weak-end infeed logic	CLCRW	85 21CREV,WEI	CRWPSCH	1	APP3
Phase segregated current reversal and weak-end infeed logic	CLCRWSP	85 21CREV,WEISP	SPCRWPSCH	1	APP3
Communication logic for residual overcurrent	CLN	85 67G/N SCHLGC	RESCPSCH	1	APP3
Current reversal and weak-end infeed logic for residual overcurrent	CLCRWN	85 67G/N CREV,WEI	RCRWPSCH	1	APP3
Power swing detection	Zpsb	68	DSTRPSB	1	APP3
Line differential protection with inzone power transformer	3Id/I>	87L	LNPLDF	1	APP4
Binary signal transfer	BST	BST	BSTGAPC	4	APP3, APP4
Switch-onto-fault protection	CVPSOF	SOTF	CVPSOF	2	Base
Three-phase non-directional overcurrent protection, low stage	3I>	51P-1	PHLPTOC	5	Base
Three-phase non-directional overcurrent protection, high stage	3I>>	51P-2	PHHPTOC	5	Base
Three-phase non-directional overcurrent protection, instantaneous stage	3I>>>	50P	PHIPTOC	5	Base
Three-phase non-directional overcurrent protection, instantaneous only stage	3I>>>>	50P	PHIPIOC	5	Base
Three-phase non-directional long time overcurrent protection	3I>	51LT	PHLTPTOC	2	Base
Three-phase directional overcurrent protection, low stage	3I>->	67P/51P-1	DPHLPDOC	5	Base
Three-phase directional overcurrent protection, high stage	3I>>->	67P/51P-2	DPHHPDOC	5	Base
Non-directional earth-fault protection, low stage	Io>	51G/51N-1	EFLPTOC	5	Base
Non-directional earth-fault protection, high stage	Io>>	51N-2	EFHPTOC	5	Base
Non-directional earth-fault protection, instantaneous stage	Io>>>	50G/50N	EFIPTOC	5	Base
Non-directional earth-fault protection, instantaneous only stage	Io>>>>	50G/50N	EFIPIOC	5	Base
Directional earth-fault protection, low stage	Io>->	67G/N-1 51G/N-1	DEFLPDEF	5	Base
Directional earth-fault protection, high stage	Io>>->	67G/N-1 51G/N-2	DEFHPDEF	5	Base
Three-phase power directional element	I1->	67P-TC	DPSRDIR	4	APP6, APP10
Neutral power directional element	I2->, Io->	67N-TC	DNZSRDIR	2	APP1
Admittance-based earth-fault protection	Yo>>->	21YN	EFPADM	3	APP1
Multifrequency admittance-based earth-fault protection	Io>->Y	67NYH	MFADPSDE	3	APP1
Wattmetric-based earth-fault protection	Po>>->	32N	WPWDE	3	APP1
Transient/intermittent earth-fault protection	Io>->IEF	67NTEF/NIEF	INTRPTEF	2	APP1
Harmonics-based earth-fault protection	Io>HA	51NH	HAEFPTOC	1	APP1
Touch voltage based earth-fault current protection	IF>/UT>	46SNQ/59N	IFPTOC	3	APP1
Negative-sequence overcurrent protection	I2>M	46M	NSPTOC	3	Base
Phase discontinuity protection	I2/I1>	46PD	PDNSPTOC	1	Base
Residual overvoltage protection	Uo>	59G/59N	ROVPTOV	4	Base
Three-phase undervoltage protection	3U<	27	PHPTUV	5	Base
Three-phase overvoltage variation protection	3Urms>	59.S1	PHVPTOV	2	APP6
Three-phase overvoltage protection	3U>	59	PHPTOV	4	Base
Positive-sequence overvoltage protection	U1>	59PS	PSPTOV	4	Base
Positive-sequence undervoltage protection	U1<	27PS	PSPTUV	4	Base
Negative-sequence overvoltage protection	U2>	47,59NS	NSPTOV	4	Base
Frequency protection	f>/f<,df/dt	81	FRPFRQ	12	Base
Three-phase voltage-dependent overcurrent protection	3I(U)>	51V	PHPVOC	5	Base
Overexcitation protection	U/f>	24	OEPVPH	2	APP8, ADD1

Function description	IEC 60617	ANSI	IEC 61850	Instances	Application package
Three-phase thermal protection for feeders, cables and distribution transformers	3Ith>F	49F	T1PTTR	2	Base
Three-phase thermal overload protection, two time constants	3Ith>T/G/C	49T/G/C	T2PTTR	1	APP8, ADD1
Three-phase overload protection for shunt capacitor banks	3I> 3I<	51,37,86C	COLPTOC	3	APP5
Current unbalance protection for shunt capacitor banks	dI>C	60N	CUBPTOC	3	APP5
Three-phase current unbalance protection for shunt capacitor banks	3dI>C	60P	HCUBPTOC	2	APP5
Shunt capacitor bank switching resonance protection, current based	TD>	55ITHD	SRCPTOC	1	APP5
Compensated neutral unbalance voltage protection	CNU>	59NU	CNUPTOV	2	APP5
Phase voltage differential protection for shunt capacitor banks	3dU>	87V	CPHPTDV	1	APP5
Directional negative-sequence overcurrent protection	I2>->	67Q	DNSPDOG	2	Base
Low-voltage ride-through protection	U<RT	27RT	LVRTPTUV	3	APP6
Voltage vector shift protection	VS	78VS	VVSPPAM	3	APP6
Directional reactive power undervoltage protection	Q>->,3U<	32Q,27	DQPPTUV	2	APP6
Reverse power/directional overpower protection	P>/Q>	32R/32O	DOPPDPR	3	APP6, APP7, APP8
Underpower protection	P<	32U	DUPPDPR	3	APP8, ADD1
Three-phase underimpedance protection	Z<G	21G	UZPDIS	3	APP8, ADD1
Directional negative sequence impedance protection	Z2->	Z2Q	DNZPDIS	3	Base
Three-phase underexcitation protection	X<	40	UEXPDIS	2	ADD1
Third harmonic-based stator earth-fault protection	dUo>/Uo3H	64TN	H3EFPSEF	1	ADD1
Rotor earth-fault protection (injection method)	Io>R	64R	MREFPTOC	2	ADD1
Generator shaft current leakage protection	I>,GS	38, 51	GSLPTOC	1	ADD1
Thermal overload protection for rotors	3Ith>R	49R	RPTTR	1	APP7
High-impedance or flux-balance based differential protection	3dIHi>M	87HIM	MHZPDIF	1	APP7
Out-of-step protection with double blinders	OOS	78PS	OOSRPSB	1	APP3, ADD1
Negative-sequence overcurrent protection for machines	I2>M	46M	MNSPTOC	2	APP7
Loss of phase (undercurrent)	3I<	37	PHPTUC	3	Base
Loss of load supervision	3I<	37	LOFLPTUC	1	APP7
Motor load jam protection	Ist>	50TDJAM	JAMPTOC	2	APP7
Motor start-up supervision	Is2t n<	49,66,48,50TDLR	STTPMSU	1	APP7
Motor start counter	n<	66	MSCPMRI	1	APP7
Phase reversal protection	I2>>	46R	PREVPTOC	1	APP7
Thermal overload protection for motors	3Ith>M	49M	MPTTR	1	APP7
Stabilized and instantaneous differential protection for machines	3dI>M/G	87M/87G	MPDIF	1	APP7
Underpower factor protection	PF<	55U	MPUPF	2	APP6, ADD1
Stabilized and instantaneous differential protection for two- or three-winding transformers	3dI>3W	87T3	TR3PTDF	1	ADD2
Stabilized and instantaneous differential protection for two-winding transformers	3dI>T	87T	TR2PTDF	1	APP8
Numerical stabilized low-impedance restricted earth-fault protection	dIoLo>	87NLI	LREFPNDF	3	Base
High-impedance based restricted earth-fault protection	dIoHi>	87NHI	HREFPDIF	3	Base
High-impedance differential protection for phase A	dHi_A>	87_A	HIAPDIF	3	APP7, APP8, APP9
High-impedance differential protection for phase B	dHi_B>	87_B	HIBPDIF	3	APP7, APP8, APP9
High-impedance differential protection for phase C	dHi_C>	87_C	HICPDIF	3	APP7, APP8, APP9
Circuit breaker failure protection	3I>/Io>BF	50BF	CCBRBRF	4	Base
Circuit breaker failure protection - single phase breakers	3I>/Io>BFSP	50BFSP	SPCCBRBRF	1	Base
Circuit breaker pole discrepancy protection	CBPD	52PD	CBPDSC	1	Base
Three-phase inrush detector	3I2f>	68HB	INRPHAR	4	Base
Residual current inrush detector	Io2f>	68HBG/N	RINRPHAR	4	Base
Master trip	Master Trip	94/86	TRPPTRC	6	Base
Master trip - single phase	Master trip SP	94/86SP	SPTRPPTRC	2	Base

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Arc protection	ARC	AFD	ARCSARC	4	Base
High-impedance fault detection	HIF	HIZ	PHIZ	1	APP1
Fault locator	FLOC	FLOC	SCEFRFLO	1	APP2
Load-shedding and restoration	UFLS/R	81LSH	LSHDPFRQ	10	Base
Multipurpose protection	MAP	MAP	MAPGAPC	24	Base
Accidental energization protection	U<,I>	50/27	GAEPVOC	1	ADD1
Load blinder	LB	21LB	LBRDOB	1	Base
Cable end protection	dIo>	87N	CEPNDF	2	Base
Cold load pickup	CLP	62CLD	CLPGAPC	4	Base
Current disturbance detector	I>>>CDD	50DD	CDDPTOC	2	Base

Control

Circuit-breaker control	I<-> O CB	52	CBXCBR	4	Base
Circuit-breaker control	I<-> O CB	52	CBXCBR	2	APP51, APP52, APP53
Circuit-breaker control - single phase circuit breakers	I<-> O CBSP	52SP	SCBXCBR	1	Base
Three-state disconnecter control	I<->O P3S	29DS/GS	P3SXSXI	6	Base
Disconnecter control	I<-> O DCC	29DS	DCXSXI	8	Base
Earthing switch control	I<-> O ESC	29GS	ESXSXI	3	Base
Three-state disconnecter position indication	I<->O P3SS	29DS/GS	P3SSXSXI	6	Base
Disconnecter position indication	I<-> O DC	29DS	DCSXSXI	8	Base
Earthing switch position indication	I<-> O ES	29GS	ESSXSXI	3	Base
Emergency start-up	ESTART	EST,62	ESMGAPC	1	APP7
Autoreclosing	O-> I	79	DARREC	2	Base
Autoreclosing - single phase	O-> I SP	79SP	SPARREC	1	Base
Autosynchronizer for generator breaker	AUTOSYNCG	25AUTOSYNCG	ASGCSYN	1	APP11
Autosynchronizer for network breaker	AUTOSYNC	25AUTOSYNGBT/T	ASNSCSYN	3	APP12
Autosynchronizer co-ordinator	AUTOSYNC	25AUTOSYNC	ASCGAPC	1	Base
Synchronism and energizing check	SYNC	25	SECRSYN	4	Base
Tap changer control with voltage regulator	COLTC	90V	OL5ATCC	1	APP10
Tap changer position indication and manual control	TPOSM	84T	TPOSYLTC	1	APP8, APP10
Transformer data combiner	OLGAPC	OLGAPC	OLGAPC	5	APP10
Petersen coil controller	ANCR	90	PASANCR	1	APP13
High speed bus transfer	I<->O BT	HSBT	HSABTC	1	APP51
High speed bus transfer	I<->O BT	HSBT	HSABTC	2	APP52
High speed bus transfer	I<->O BT	HSBT	HSABTC	3	APP53

Condition Monitoring and Supervision

Circuit-breaker condition monitoring	CBCM	52CM	SSCBBR	4	Base
Circuit-breaker condition monitoring - single phase circuit breakers	CBCMSP	52CMSP	SPSCBBR	1	Base
Motor controlled earthing switch and disconnecter supervision	ESDCCM	29CM	ESDCSSXI	11	Base
Hot-spot and insulation ageing rate monitoring for transformers	3Ihp>T	26/49HS	HSARSPTR	1	APP8
Cable Fault Detection	CFD	CFD	RCFD	3	Base
Trip circuit supervision	TCS	TCM	TCSSCBBR	11	Base
Current circuit supervision	MCS 3I	CCM	CCSPVC	5	Base
Current circuit supervision for transformers	MCS 3I, I2	CCM 3I, I2	CTSRCTF	1	APP8
Current transformer supervision for high-impedance protection scheme for phase A	MCS I_A	CCM_A	HZCCASPVC	3	APP9
Current transformer supervision for high-impedance protection scheme for phase B	MCS I_B	CCM_B	HZCCBSPVC	3	APP9
Current transformer supervision for high-impedance protection scheme for phase C	MCS I_C	CCM_C	HZCCCSPVC	3	APP9
Fuse failure supervision	FUSEF	VCM, 60	SEQSPVC	7	Base
Fuse failure voltage difference supervision	FUSEFVD	VCM, 60	FFVDSPPVC	2	Base
Protection communication supervision	PCS	PCS	PCSITPC	2	APP3, APP4
Runtime counter for machines and devices	OPTS	OPTM	MDSOPT	2	Base

Function description	IEC 60617	ANSI	IEC 61850	Instances	Application package
Three-phase remanent undervoltage supervision	3U<R	27R	MSVPR	3	Base
Diesel Generator Monitoring	P><, U/f ><	32/40G	DGMGAPC	1	APP14
Measurement					
Three-phase current measurement	3I	IA, IB, IC	CMMXU	8	Base
Sequence current measurement	I1, I2, I0	I1, I2, I0	CSMSQI	8	Base
Residual current measurement	Io	IG	RESCMMXU	8	Base
Three-phase voltage measurement	3U	VA, VB, VC	VMMXU	8	Base
Single-phase voltage measurement	U_A	V_A	VAMMXU	4	Base
Phase voltage measurement	3UL	VL	VPHMMXU	2	Base
Residual voltage measurement	Uo	VG/VN	RESVMMXU	8	Base
Sequence voltage measurement	U1, U2, U0	V1, V2, V0	VSMSQI	8	Base
Three-phase power and energy measurement	P, E	P, E	PEMMXU	4	Base
Load profile recorder	LOADPROF	LOADPROF	LDPRLRC	1	Base
Frequency measurement	f	f	FMMXU	5	Base
Power Quality					
Current total demand, harmonic distortion, DC component (TDD, THD, DC) and individual harmonics	PQM3IH	PQM ITHD, IDC	CHMHAI	4	Base
Voltage total harmonic distortion, DC component (THD, DC) and individual harmonics	PQM3VH	PQM VTHD, VDC	VHMHAI	4	Base
Voltage variation	PQMU	PQMV SWE, SAG, INT	PHQVVR	4	Base
Voltage unbalance	PQUUB	PQMV UB	VSQVUB	4	Base
Traditional LED indication					
LED indication control	LEDPTRAC	LEDPTRAC	LEDPTRAC	1	Base
Individual virtual LED control	LED	LED	LED	66	Base
Logging functions					
Disturbance recorder (common functionality)	DR	RDRE	RDRE	1	Base
Disturbance recorder, analog channels 1...12	A1RADR	A1RADR	A1RADR	1	Base
Disturbance recorder, analog channels 13...24	A2RADR	A2RADR	A2RADR	1	Base
Disturbance recorder, binary channels 1...32	B1RBDR	B1RBDR	B1RBDR	1	Base
Disturbance recorder, binary channels 33...64	B2RBDR	B2RBDR	B2RBDR	1	Base
Fault recorder	FAULTREC	FR	FLTRFRC	1	Base
Communication					
IEC 61850-1 MMS	MMS	MMS	MMSLPRT	1	Base
IEC 61850-1 GOOSE	GSE	GSE	GSELPRT	1	Base
IEC 60870-5-103 protocol	I3C	I3C	I3CLPRT	2	Base
IEC 60870-5-104 protocol	I5C	I5C	I5CLPRT	5	Base
DNP3 protocol	DNP 3.0	DNP 3.0	DNPLPRT	5	Base
Modbus protocol (slave)	MBS	MBS	MBSLPRT	5	Base
Modbus protocol (master)	MBM	MBM	MBMLPRT	1	Base
Received Modbus binary value	MMV	MMV	MMVGAPC	2	Base
Received Modbus 32-bit integer value	MMVI4	MMVI4	MMVI4GAPC	5	Base
Received Modbus measured value	MMVF4	MMVF4	MMVF4GAPC	10	Base
IEC 61850 Edition 2.1 and Edition 1					
IEC 61869-9/IEC 61850-9-2 LE (receive up to four streams and send one stream)					
Redundancy protocols PRP/HSR/RSTP					
Time synchronization for non-redundant and redundant protocols: SNTP, IRIG-B, PTP IEEE 1588 (redundant only)					
Ethernet communication with dual IP address					

Cyber security

Integrity and authenticity of relay software

Role-based account management including password hardening

Relay communication hardening with detection and shielding for Denial of Service attacks

Security event logging supporting Central Activity Logging (CAL) via Syslog

Secure communication with WebHMI and relay configuration tool

Central Account Management with Windows AD

Centralized security certificate management with public key infrastructure

Secure communication (IEC 61850 MMS, DNP3 and IEC 60870-5-104)

Virtual Local Area Networks

Hardware**Amount****Standard**

Current inputs	5-14
Voltage inputs	3-10
Current sensors (according to IEC 61869)	0/3/6/12
Voltage sensors (according to IEC 61869)	0/3/6/12
Binary inputs/Binary outputs	9-96/10-42
RTD/mA inputs	0-20/0-12
Communication ports RJ45/LC/SFP LC/RS-485/ST	0-3/0-3/1/0-1/0-1

Narrow

Current inputs	5-7
Voltage inputs	3-5
Current sensors (according to IEC 61869)	0/3/6
Current inputs (according to IEC 61869)	0/3/6
Binary inputs/Binary outputs	9-48/10-26
RTD/mA inputs	0-10/0-6
Communication ports RJ45/LC/RS-485/ST	0-3/0-3/1/0-1/0-1
