Relion® 630 series

Transformer protection and control RET630
Flexibility for demanding utility and industrial power distribution systems

Power and productivity
for a better world™

ABB

Protection and control with voltage regulation for two-winding power transformers

RET630 is a comprehensive transformer management relay for protection, control, measurement and supervision of power transformers, including step-up transformers, and power generator-transformer units in utility and industrial power distribution systems. RET630 is also ideal for transformer bay control.

Application

RET630 has been designed to be the main protection and offer full protection for two-winding power transformers. There are two pre-defined configurations, intended to match the most typical transformer protection and control requirements. One is for two-winding HV/MV transformer applications not requiring restricted earth-fault protection, and the other for such applications requiring it. The pre-defined configurations can be used as such or easily tailored to application-specific requirements with freely selectable functions.

RET630 can be used in either single or double-busbar applications with one or two breakers and numerous switching devices. It also supports a substantial number of both manually and motor-operated disconnectors and earthing switches. Consequently, RET630 can be used to control various types of switchgears.

Hot spot and aging rate monitoring is introduced, which allows calculating the hot spot temperature of the transformer winding and the momentary aging rate. As a result, the impact of thermal stress on the lifetime of the transformer can be determined.

RET630 also features an integrated voltage regulator. The voltage regulator allows automatic and manual voltage regulation of power transformers with a motor-driven on-load tap changer.

An optional RTD/mA module offers eight analog RTD or mA measuring inputs and four mA outputs. The RTD and mA inputs can be used for measuring the oil temperature at the bottom and top of the transformer tank and the ambient temperature, thus extending the functionality of the thermal overload protection and preventing premature aging of the transformer windings. The RTD and mA inputs can also be used for tracking the position of the on-load tap changer. The four mA outputs can be used for transferring freely selectable measured or calculated analog values to devices provided with mA inputs.

The pre-configurations can be tailored to meet the application requirements using the IEC 61850-compliant protection and control IED manager PCM600.

Human-machine Interface (HMI)

As a member of the Relion® product family, RET630 shares the same Human Machine Interface (HMI) look and feel as the other Relion protection and control relays and IEDs. The same look and feel includes the location of a push button with a certain function and the menu structure.

The 630 series relays are equipped with a large graphical display which can show customizable single-line diagrams (SLD) with position indication for the circuit breaker, disconnectors and the earthing switch. Also measured values can be displayed. The SLDs can be flexibly adjusted to meet user requirements using PCM600.

The 630 series HMI is distinguished by fifteen three-color LEDs and five configurable push buttons, which can be used as control buttons for various tasks such as blocking, adjusting setting groups or triggering the disturbance recorder. The five push buttons can also be conveniently used as menu shortcuts. Another distinguishing feature is the detached HMI, as an option to the integrated HMI, which is highly beneficial from a wiring perspective due to the large number of IOs the 630 series relays are equipped with.
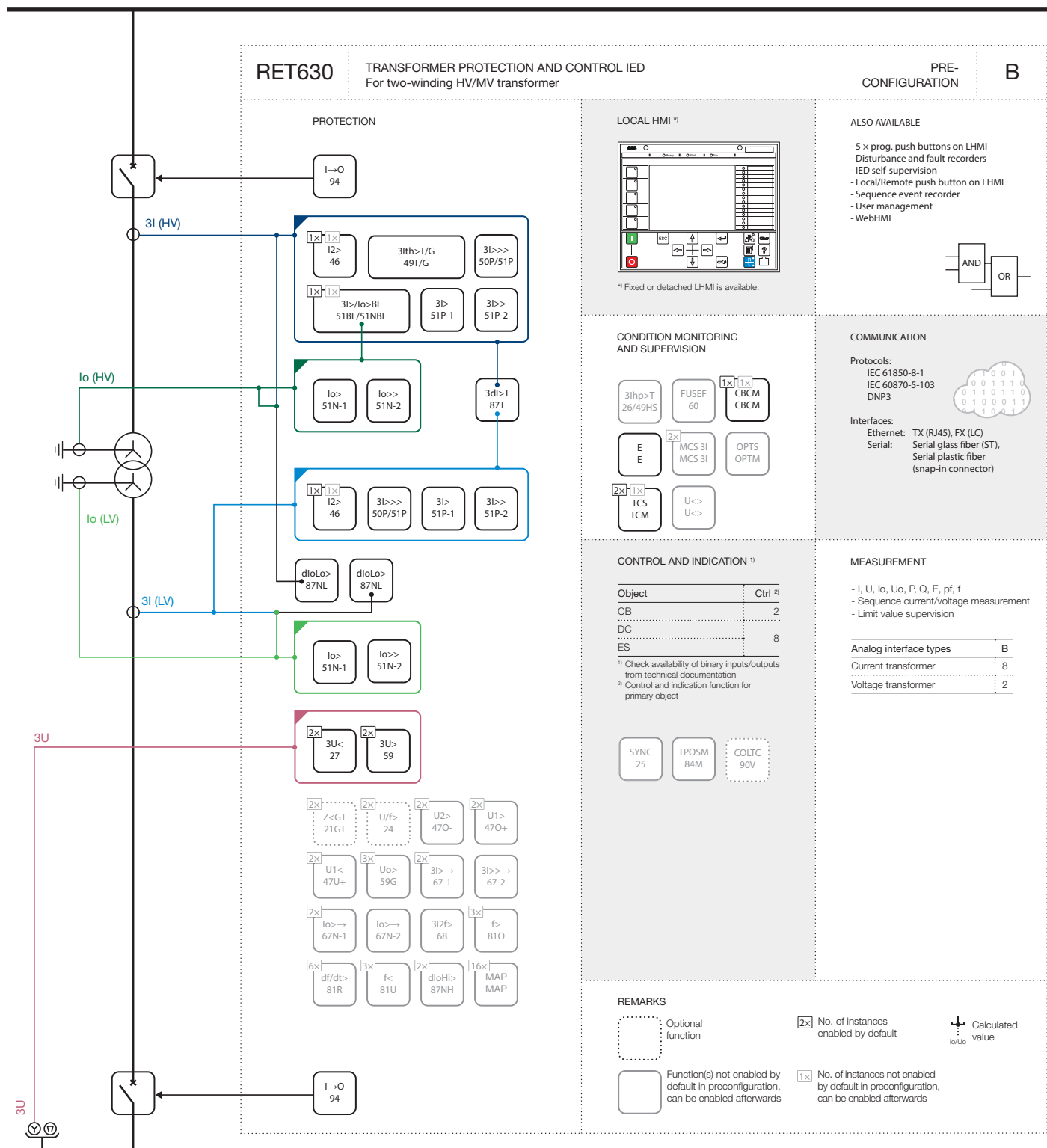
Standardized communication

RET630 fully supports the IEC 61850 standard for communication in substations. The transformer management relay also supports the DNP3 (TCP/IP) and 60870-5-103 communication protocols, and is able to use two communication protocols simultaneously. The supported communication protocols, including IEC 61850, offer seamless connectivity to various station automation and SCADA systems.

The implementation of the IEC 61850 standard in RET630 covers both vertical and horizontal communication, including GOOSE messaging according to IEC 61850-8-1 with both binary and analog signals. Analog GOOSE messaging enables fast transfer of analog measured values over the station bus. This facilitating, for example, sharing of RTD input values such as surrounding temperature with other relays. GOOSE messaging is also an alternative to traditional hardwiring signaling for exchanging interlocking information between the relays. For time-critical applications, RET630 supports synchronization over Ethernet using SNTP or over a separate bus using IRIG-B.

630 series

RET630 is a member of ABB's Relion product family and part of its 630 protection and control series. The 630 series relays are characterized by functional scalability and flexible configurability, and have been designed to unleash the full potential of the IEC 61850 standard for communication and

RET630 — TRANSFORMER PROTECTION AND CONTROL IED
For two-winding HV/MV transformer — PRE-CONFIGURATION B

PROTECTION

3I (HV)

Io (HV)

Io (LV)

3I (LV)

3U

3U

I→O 94

| 1× / 1× I2> 46 | 3Ith>T/G 49T/G | 3I>>> 50P/51P |
| 3I>/Io>BF 51BF/51NBF | 3I> 51P-1 | 3I>> 51P-2 |

| Io> 51N-1 | Io>> 51N-2 | 3dI>T 87T |

| 1× / 1× I2> 46 | 3I>>> 50P/51P | 3I> 51P-1 | 3I>> 51P-2 |

| dIoLo> 87NL | dIoLo> 87NL |

| Io> 51N-1 | Io>> 51N-2 |

| 2× 3U< 27 | 2× 3U> 59 |

2× Z<GT 21GT	2× U/f> 24	2× U2> 47O-	2× U1> 47O+
2× U1< 47U+	3× Uo> 59G	2× 3I>→ 67-1	3I>>→ 67-2
2× Io>→ 67N-1	Io>→ 67N-2	3I2f> 68	3× f> 81O
6× df/dt> 81R	3× f< 81U	2× dIoHi> 87NH	16× MAP MAP

I→O 94

LOCAL HMI *)

*) Fixed or detached LHMI is available.

ALSO AVAILABLE

- 5 × prog. push buttons on LHMI
- Disturbance and fault recorders
- IED self-supervision
- Local/Remote push button on LHMI
- Sequence event recorder
- User management
- WebHMI

CONDITION MONITORING AND SUPERVISION

3Ihp>T 26/49HS	FUSEF 60	1× / 1× CBCM CBCM
E E	2× MCS 3I MCS 3I	OPTS OPTM
2× / 1× TCS TCM	U<> U<>	

COMMUNICATION

Protocols:
  IEC 61850-8-1
  IEC 60870-5-103
  DNP3

Interfaces:
  Ethernet: TX (RJ45), FX (LC)
  Serial: Serial glass fiber (ST),
            Serial plastic fiber
            (snap-in connector)

CONTROL AND INDICATION [1]

Object	Ctrl [2]
CB	2
DC	
ES	8

[1] Check availability of binary inputs/outputs from technical documentation
[2] Control and indication function for primary object

| SYNC 25 | TPOSM 84M | COLTC 90V |

MEASUREMENT

- I, U, Io, Uo, P, Q, E, pf, f
- Sequence current/voltage measurement
- Limit value supervision

Analog interface types	B
Current transformer	8
Voltage transformer	2

REMARKS

Optional function

2× No. of instances enabled by default

Io/Uo Calculated value

Function(s) not enabled by default in preconfiguration, can be enabled afterwards

1× No. of instances not enabled by default in preconfiguration, can be enabled afterwards

Functional overview of pre-configuration B.

interoperability of substation automation devices. In addition to RET630, the 630 series includes the following relays:

- REF630 Feeder protection and control
- REM630 Motor protection and control
- REG630 Generator protection and control

RET630 transformer protection and control pre-configurations

Pre-configurations

Description	Pre-configuration
Pre-configuration A for two-winding HV/LV transformer	A
Pre-configuration B for two-winding HV/LV transformer including stabilized restriced earth-fault protection	B
Number of instances available	n

Supported functions with codes and symbols

Functionality	IEC 61850	IEC 60617	ANSI	A	B	n
Protection						
Three-phase non-directional overcurrent, low stage (LV side)	PHLPTOC	3I>	51P-1	1	1	2
Three-phase non-directional overcurrent, low stage (HV side)	PHLPTOC	3I>	51P-1	1	1	
Three-phase non-directional overcurrent, high stage, (LV side)	PHHPTOC	3I>>	51P-2	1	1	2
Three-phase non-directional overcurrent, high stage, (HV side)	PHHPTOC	3I>>	51P-2	1	1	
Three-phase non-directional overcurrent, instantaneous stage (LV side)	PHIPTOC	3I>>>	50P/51P	1	1	2
Three-phase non-directional overcurrent, instantaneous stage (HV side)	PHIPTOC	3I>>>	50P/51P	1	1	
Three-phase directional overcurrent, low stage	DPHLPDOC	3I> →	67-1	-	-	2
Three-phase directional overcurrent, high stage	DPHHPDOC	3I>> →	67-2	-	-	1
Non-directional earth-fault, low stage (LV side)	EFLPTOC	I0>	51N-1	-	1	2
Non-directional earth-fault, low stage (HV side)	EFLPTOC	I0>	51N-1	1	1	
Non-directional earth-fault, high stage (LV side)	EFHPTOC	I0>>	51N-2	-	1	2
Non-directional earth-fault, high stage (HVside)	EFHPTOC	I0>>	51N-2	1	1	
Directional earth-fault, low stage	DEFLPDEF	I0> →	67N-1	-	-	2
Directional earth-fault, high stage	DEFHPDEF	I0>> →	67N-2	-	-	1
Stabilized restricted earth-fault, (LV side)	LREFPNDF	dI0Lo>	87NL	-	1	2
Stabilized restricted earth-fault, (HV side)	LREFPNDF	dI0Lo>	87NL	-	1	
High-impedance based restricted earth-fault	HREFPDIF	dI0Hi>	87NH	-	-	2
Negative-sequence overcurrent, (LV side)	NSPTOC	I2>	46	1	1	4
Negative-sequence overcurrent, (HV side)	NSPTOC	I2>	46	1	1	
Three-phase current inrush detection	INRPHAR	3I2f>	68	-	-	1
Three-phase thermal overload for transformers	T2PTTR	3Ith>T	49T	1	1	1
Three-phase overvoltage, (LV side)	PHPTOV	3U>	59	2	2	2
Three-phase undervoltage, (LV side)	PHPTUV	3U<	27	2	2	2
Positive-sequence overvoltage	PSPTOV	U1>	47O+	-	-	2
Positive-sequence undervoltage	PSPTUV	U1<	47U+	-	-	2
Negative-sequence overvoltage	NSPTOV	U2>	47O-	-	-	2
Overexcitation	OEPVPH	U/f>	24	-	-	2
Three-phase underimpedance	UZPDIS	Z< GT	21GT	-	-	2
Residual overvoltage	ROVPTOV	U0>	59G	-	-	3
Frequency gradient	DAPFRC	df/dt>	81R	-	-	6
Overfrequency	DAPTOF	f>	81O	-	-	3
Underfrequency	DAPTUF	f<	81U	-	-	3
Transformer differential protection for 2-winding transformers	TR2PTDF	3dI>T	87T	1	1	1
Circuit breaker failure (HV side)	CCBRBRF	3I>/I0>BF	51BF/51NBF	1	1	2
Tripping logic, (LV side)	TRPPTRC	I → O	94	1	1	2
Tripping logic, (HV side)	TRPPTRC	I → O	94	1	1	
Multipurpose analog protection	MAPGAPC	MAP	MAP	-	-	16

Supported functions with codes and symbols

Functionality	IEC 61850	IEC 60617	ANSI	A	B	n
Control						
Bay control	QCCBAY	CBAY	CBAY	1	1	1
Interlocking interface	SCILO	3	3	4	4	10
Circuit breaker/disconnector control	GNRLCSWI	I ↔ O CB/DC	I ↔ O CB/DC	4	4	10
Circuit breaker	DAXCBR	I ↔ O CB	I ↔ O CB	1	1	2
Disconnector	DAXSWI	I ↔ O DC	I ↔ O DC	2	2	8
Local remote switch interface	LOCREM	R/L	R/L	-	-	1
Tap changer control with voltage regulator	OLATCC	COLTC	90V	-	-	1
Synchrocheck	SYNCRSYN	SYNC	25	-	-	1
Generic process I/O						
Single point control (8 signals)	SPC8GGIO	-	-	-	-	5
Double point indication	DPGGIO	-	-	-	-	15
Single point indication	SPGGIO	-	-	-	-	64
Generic measured value	MVGGIO	-	-	-	-	15
Logic Rotating Switch for function selection and LHMI presentation	SLGGIO	-	-	-	-	10
Selector mini switch	VSGGIO	-	-	-	-	10
Pulse counter for energy metering	PCGGIO	-	-	-	-	4
Event counter	CNTGGIO	-	-	-	-	1
Supervision and monitoring						
Runtime counter for machines and devices	MDSOPT	OPTS	OPTM	-	-	1
Circuit breaker condition monitoring (HV side)	SSCBR	CBCM	CBCM	1	1	2
Fuse failure supervision	SEQRFUF	FUSEF	60	1	-	1
Current circuit supervision, (LV side)	CCRDIF	MCS 3I	MCS 3I	-	-	2
Current circuit supervision, (HV side)	CCRDIF	MCS 3I	MCS 3I	-	-	
Trip-circuit supervision	TCSSCBR	TCS	TCM	2	2	3
Tap position indication	TPOSSLTC	TPOSM	84M	-	-	1
Hot spot and insulation aging rate	HSARSPTR	3lhp>T	26/49HS	-	-	1
Energy monitoring	EPDMMTR	E	E	1	1	1
Station battery supervision	SPVNZBAT	U<>	U<>	-	-	1
Measured value limit supervision	MVEXP	-	-	-	-	40
Measurement						
Three-phase current, (LV side)	CMMXU	3I	3I	1	1	2
Three-phase current, (HV side)	CMMXU	3I	3I	1	1	
Three-phase voltage, (phase-to-phase)	VPPMMXU	3Upp	3Vpp	1	1	2
Three-phase voltage, (phase-to-earth)	VPHMMXU	3Upe	3Vpe	1	1	2
Residual current measurement	RESCMMXU	I0	I0	2	2	2
Residual voltage measurement	RESVMMXU	U0	Vn	-	-	1
Sequence current measurement	CSMSQI	I1, I2	I1, I2	-	-	1
Sequence voltage measurement	VSMSQI	U1, U2	V1, V2	-	-	1
Power monitoring with P, Q, S, power factor, frequency	PWRMMXU	PQf	PQf	1	1	1
Disturbance recorder function						
Analog channels 1-10 (samples)	A1RADR	ACH1	ACH1	1	1	1
Analog channel 11-20 (samples)	A2RADR	ACH2	ACH2	1	1	1
Analog channel 21-30 (calc val)	A3RADR	ACH3	ACH3	-	-	1
Analog channel 31-40 (calc val)	A4RADR	ACH4	ACH4	-	-	1
Binary channels 1-16	B1RBDR	BCH1	BCH1	1	1	1
Binary channels 17 -32	B2RBDR	BCH2	BCH2	1	1	1
Binary channels 33 -48	B3RBDR	BCH3	BCH3	1	1	1
Binary channels 49 -64	B4RBDR	BCH4	BCH4	1	1	1
Station communication (GOOSE)						
Binary receive	GOOSEBINRCV	-	-	-	-	10
Double point receive	GOOSEDPRCV	-	-	-	-	32
Interlock receive	GOOSEINTLKRCV	-	-	-	-	59
Integer receive	GOOSEINTRCV	-	-	-	-	32
Measured value receive	GOOSEMVRCV	-	-	-	-	60
Single point receive	GOOSESPRCV	-	-	-	-	64

Contact us

**For more information see RET630 Product Guide
or contact us:**

**ABB Oy Medium Voltage Products,
Distribution Automation**
P.O. Box 699
FI-65101 VAASA, Finland
Phone: +358 10 22 11
Fax: +358 10 22 41094

www.abb.com/substationautomation

Power and productivity
for a better world™

ABB