Protective releases
Thermal-magnetic overcurrent release
Time-current curves, S3

Isomax
MCCBs
5

S3, R15

S3, R20-R30

S3, R35-R50

S3, R50-R100

15

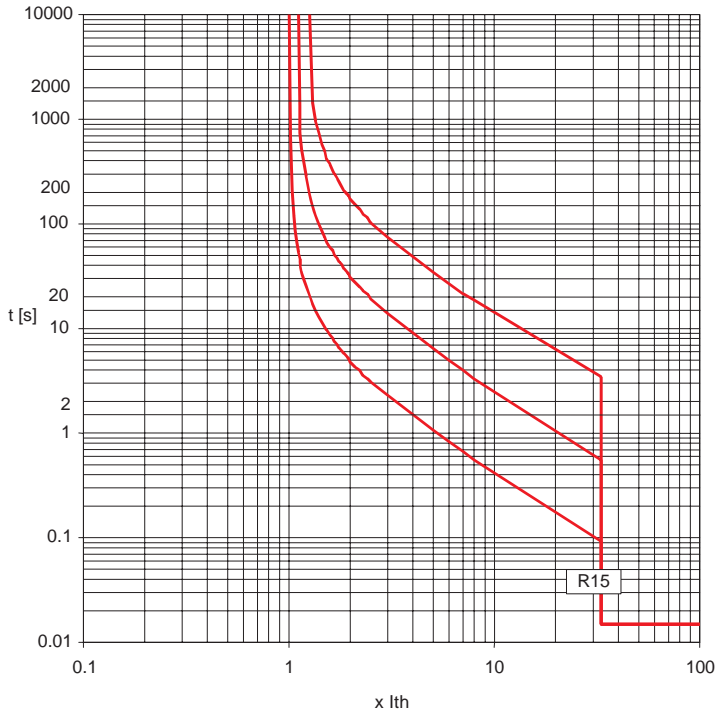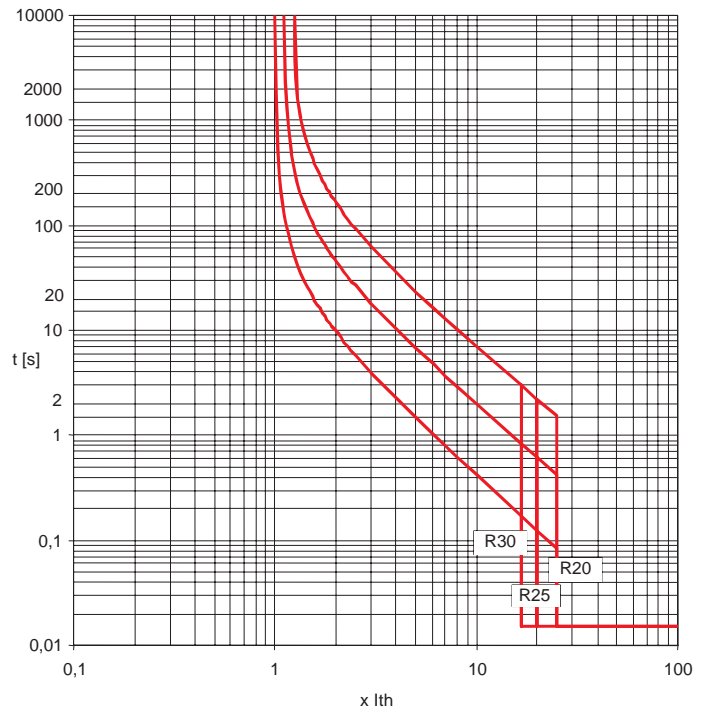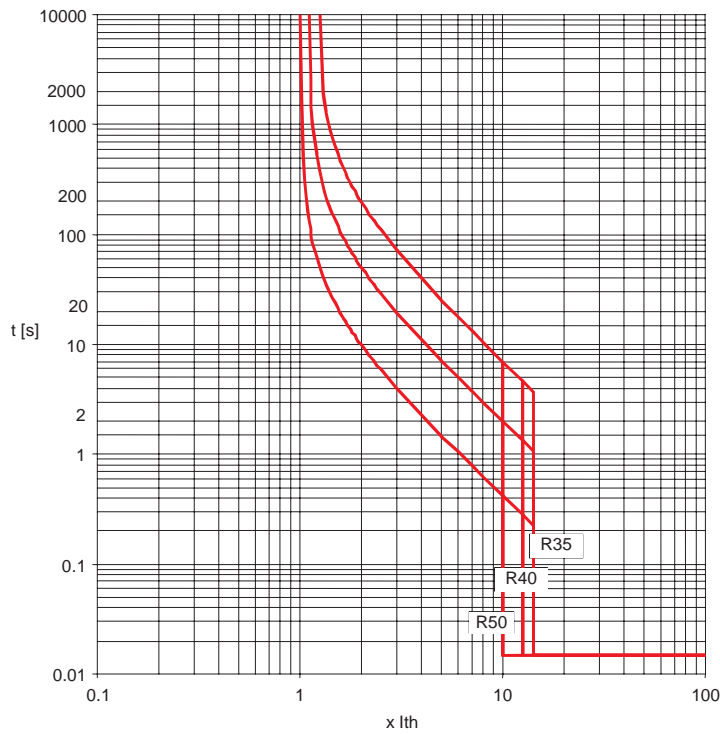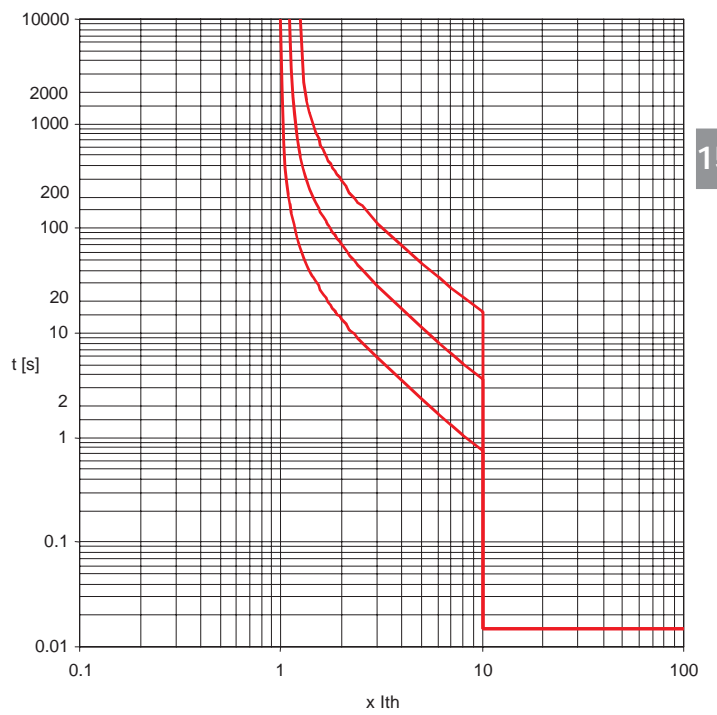① Direct current may shift tripping characteristic. Consult ABB.

Protective releases
Thermal-magnetic overcurrent release
Time-current curves, S3

S3, R125-R225 – 10X Im
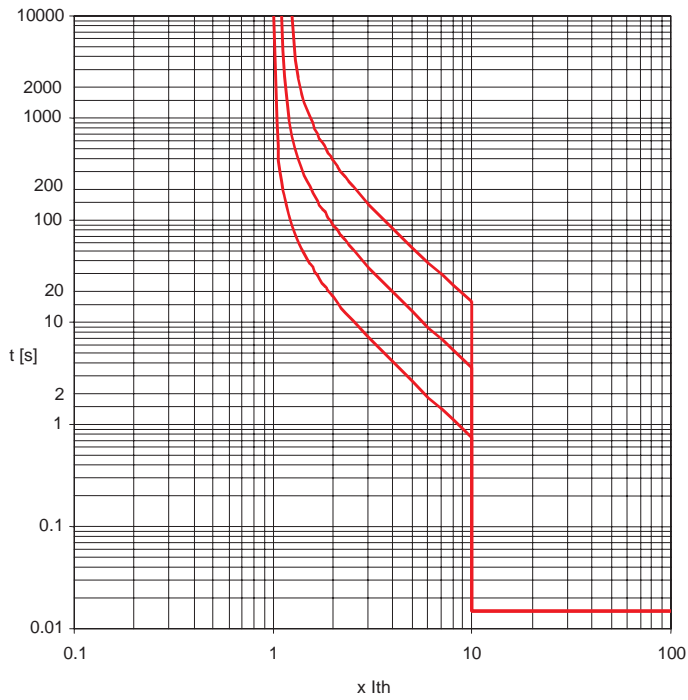
S3, R150-R225 – 3X Im
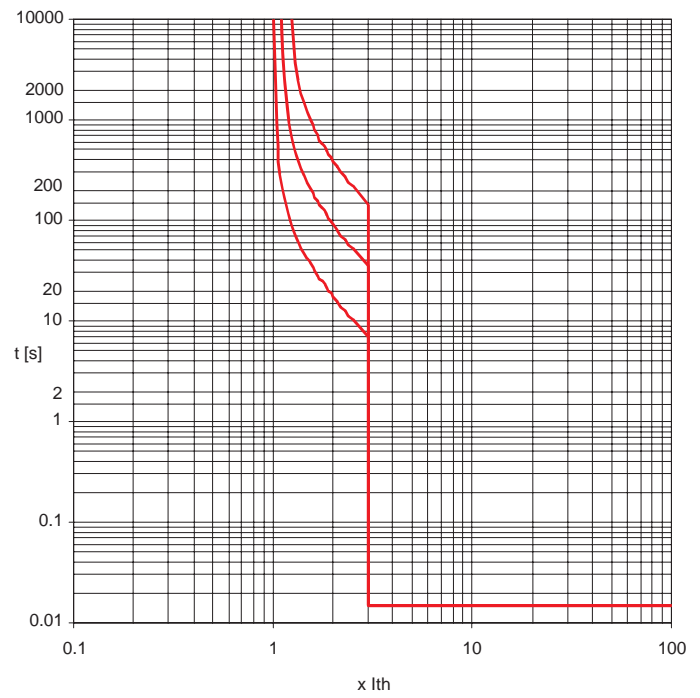
Trip curves for distribution
Circuit breakers w/thermomagnetic trip units
Isomax S5 & S6

Isomax MCCBs 5

S5 400 TMD

In = 300 - 400 A
I_3 = 2.5 In

Consult factory

S5 400 TMD

In = 300 - 400 A
I_3 = 5 ÷ 10 In

Consult factory

Trip curves for distribution
Circuit breakers w/thermomagnetic trip units
Isomax S6

S6 600 TMD

In = 800 A
$I_3 = 5 \div 10 \text{ In}$
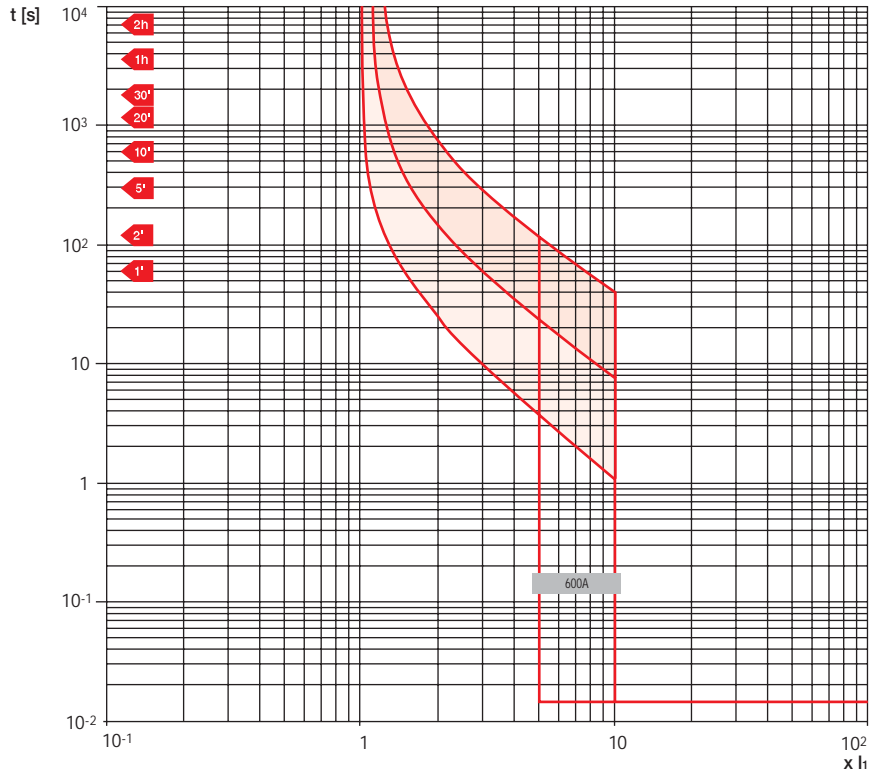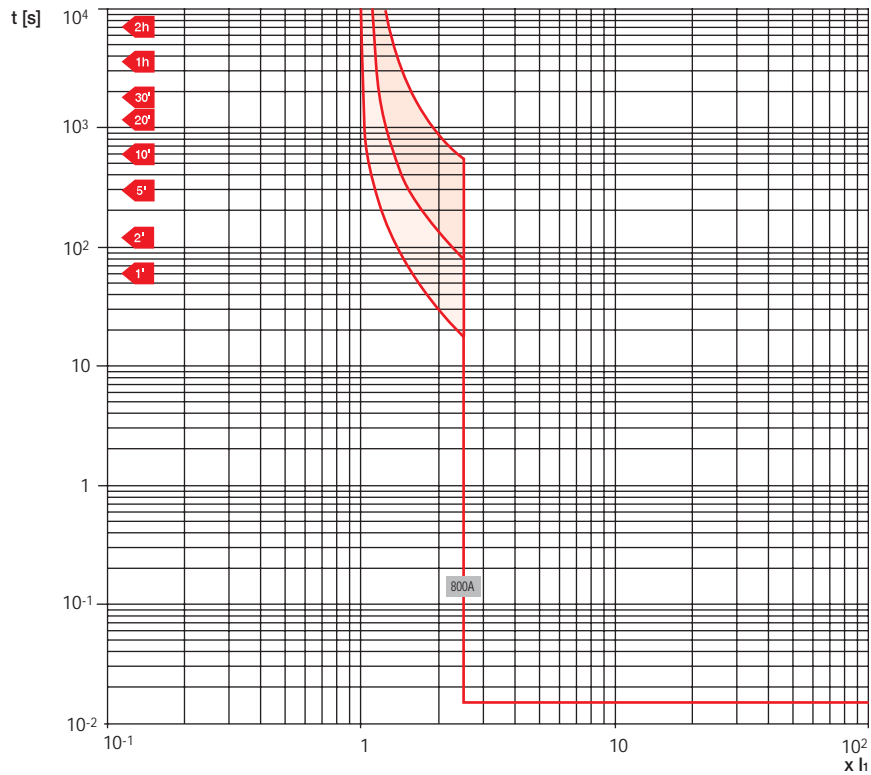
t [s]

2h
1h
30'
20'
10'
5'
2'
1'

600A

x I_1

S6 800 TMD

In = 800 A
$I_3 = 2.5 \text{ In}$

15

t [s]

2h
1h
30'
20'
10'
5'
2'
1'

800A

x I_1

Trip curves for distribution
Circuit breakers w/thermomagnetic trip units
Isomax S6

Isomax
MCCBs
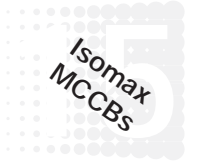
S6 800 TMD

In = 800 A
$I_3 = 5 \div 10$ In

t [s]

2h	
1h	
30'	
20'	
10'	
5'	
2'	
1'	

10^4

10^3

10^2

10

1

10^{-1}

10^{-2}

800A

10^{-1} 1   10 10^2

x I₁
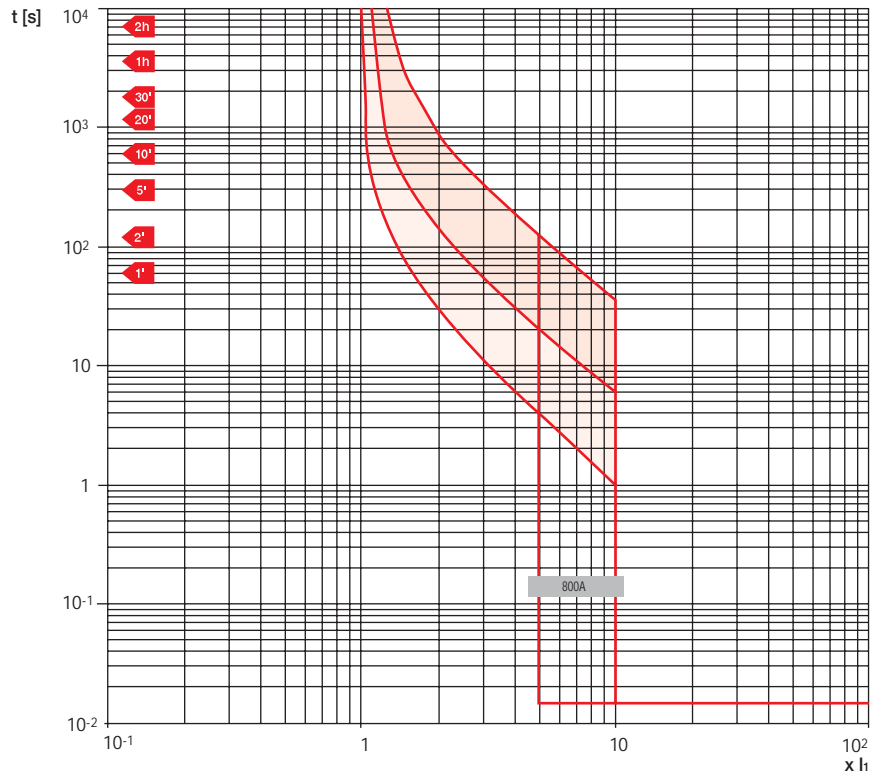
Microprocessor based overcurrent relays for alternating current for S4, S5, S6 and S7 circuit-breakers

The microprocessor based overcurrent relays (actual RMS) for Isomax S circuit-breakers offer a wide range of current and trip time settings.

They are available in two versions:

PR211/P with overcurrent protection «L» and instant short circuit protection «I». Available with functions «L», «I», or «L+I». L function includes adjustable long-time pick-up and long-time delay.

PR212/P with overcurrent protection «L», selective short circuit protection «S», instant short circuit protection «I» and ground fault protection «G». Available with functions «L+S+I» or «L+S+I+G». Functions «S», «I» and «G» can be excluded manually by means of the trip current threshold selector (OFF position). In its most complete configuration, i.e. with functions «L+S+I+G», the PR212/P relay can be combined, on request, with the following units:

PR212/D — dialog unit

Essential for two-way communication with electrical plant management systems. When the unit is present, it is possible to choose between the manually set parameters (LOC), and the parameters set by the electrical plant control system (REM) by means of the appropriate selector. The dialog unit must be supplied with an auxiliary voltage of 24 V d.c.

The following information is made available through the dialog unit on the field bus:

- protection parameters
- current values of phases, neutral and ground
- circuit-breaker state
- number of operations of circuit-breaker
- interrupted currents
- state of the overcurrent relay with indication of:
  - normal operation
  - pre-alarm (0.9 x I1)
  - overcurrent function «L»
  - trip function «S»
  - trip function «I»
  - trip function «G».

It is possible to provide and/or modify the protection parameters and the circuit-breaker opening/closing controls. In the event of a serial communication error, the overcurrent relay operates in accordance with the last parameters set and in any event always in accordance with the manually programmed setting. The same occurs in the event of a dialog unit fault, and in the absence of auxiliary supply.

The dialog unit is external for circuit breakers S4 and S5 and is located inside the relay box for circuit breakers S6 and S7.

The external dialog unit is connected by means of a cable for supply and communication with the PR212/P protection relay.

The standard version of the dialog interface has the following specifications:

- hardware: EIA RS485 serial transmission line
- communication protocol: ABB Modbus
- transmission speed: 150 – 19200 baud (bit/s).

PR212/K — signalling unit

Can be connected directly to the PR212/P protection relay and provides contacts for the protection unit trip and alarm signals: pre-alarm, overcurrent function «L», trip functions «S», «I» and «G», trip by relay and internal communication error with PR212/P.

PR212/T — actuator unit

Can be installed only if the dialog unit is present, and by means of suitable relays, controls the opening and closing of the circuit-breaker. In order that opening and closing can be actuated, the circuit-breaker must be equipped with a motor operator (direct-acting for S4 and S5; stored energy type for S6 and S7).

Note

The K and T units are always external.

Other important features of the microprocessor based relays are as follows:

- protection of neutral with programmable automatic adjustment, executed by the manufacturer, to 50% (standard) or 100% (on request) of the current value selected for the phases. The optional version has no code in this catalog;
- reliable operation also when one phase only is live;
- individual and simultaneous adjustment on the three phases and neutral;
- no need for auxiliary supply;
- trip specifications not affected by the ambient temperature;
- consistency of specifications and reliability including in contaminated environments;
- signalling of tripped relay (available for all versions) by means of voltage-free contact for 24 V d.c. or a.c. circuits maximum 3 W.

Circuit-breaker rated current change according to ambient temperature. The tripping characteristics of Isomax S4 – S8 with electronic trip units are unaffected by ambient temperatures from -25°C to +70°C.

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Protective releases
Microprocessor based overcurrent relays, PR211
for S4, S5, S6 & S7 breakers
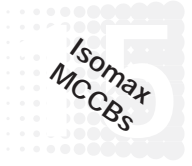
Protective functions and set values

Protection against	Trip	Symbol	Set values (manual adjustment in steps)
Overload	Long delay	L	I1 = 0.4-0.5-0.6-0.7-0.8-0.9-0.95-1 x In t1 = 4 curves A,B,C,D
Short-circuit	Instantaneous adjustment	I	I3 = 1.5-2-4-6-8-10-12 x In

PR211
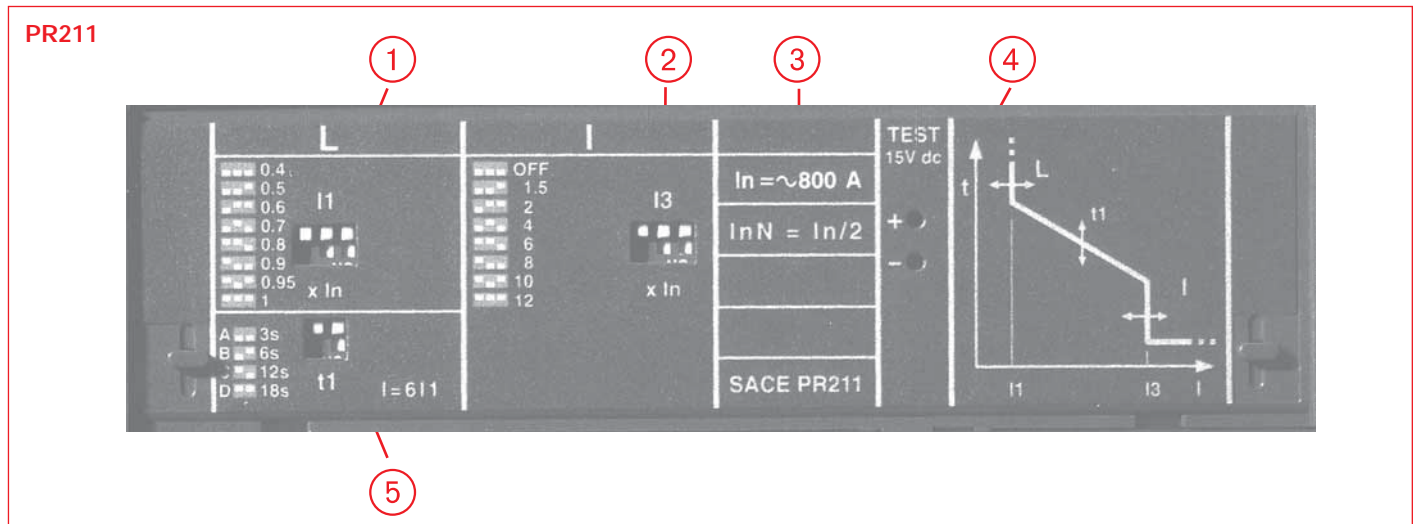
Key

1 Dip-switch for function L setting (I1)
2 Dip-switch for function I setting (I3)
3 Rated current of current transformers
4 15 V d.c. input for release functioning check
5 Function L trip time setting dip switch (T1)

15

Rated and setting currents

Circuit-breaker		Current transformer	Functions	
	Iu-A	In-A	L (I1) A (0.4 – 1 x In)	I (I3) A (1.5 – 12 x In)
S4	250	100	40 – 100	150 – 1200
		250	100 – 250	375 – 3000
S5	400	300	120 – 300	450 – 3600
		400	160 – 400	600 – 4800
S6	600/800	600	240 – 600	900 – 7200
		800	320 – 800	1200 – 9600
S7	1200	1000	400 – 1000	1000 – 12,000
		1200	480 – 1200	1800 – 14,400

Protective releases
Microprocessor based overcurrent relays, PR211
Time-current curves, S4 – S7

Function L - I
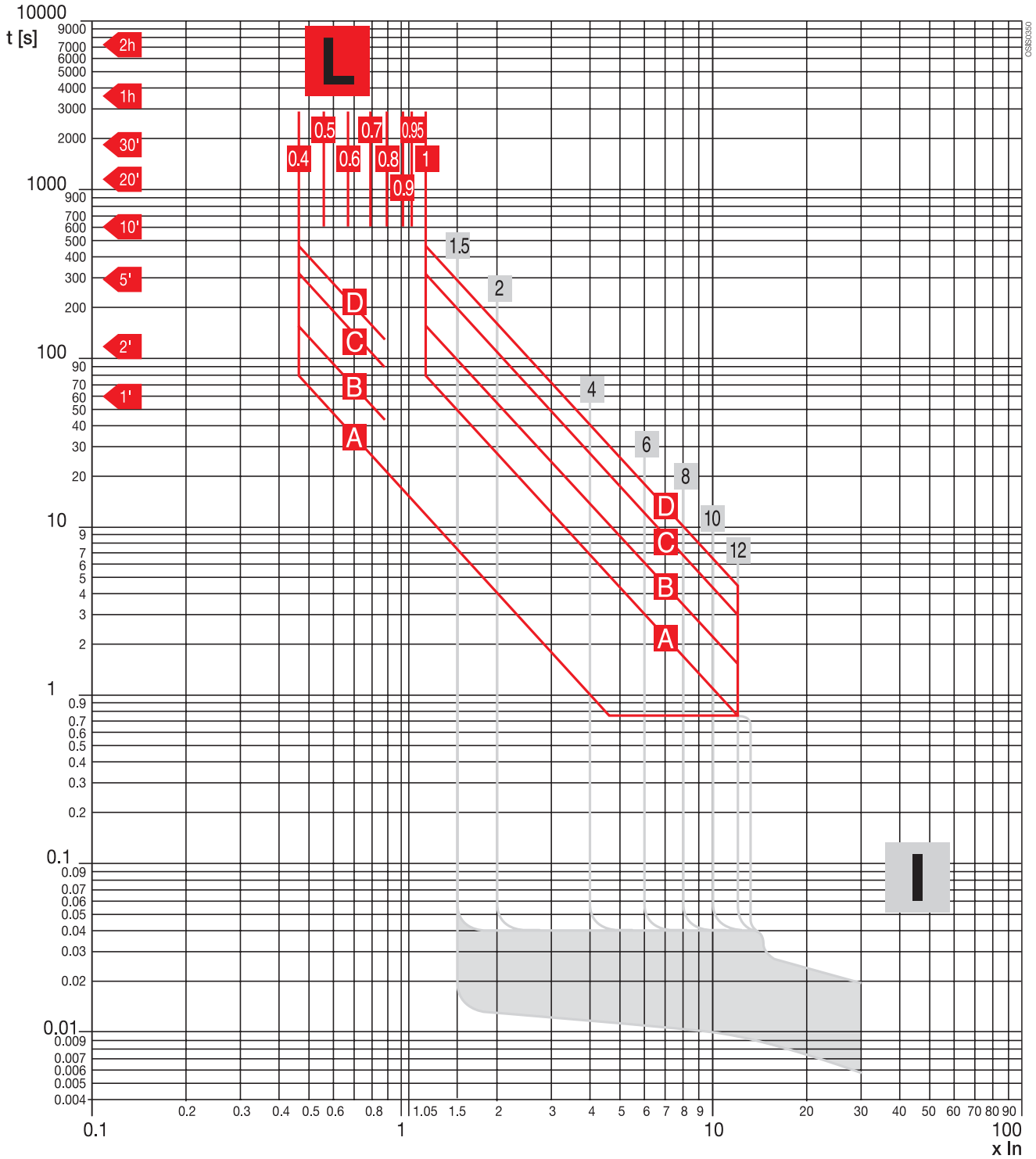
Key

In = Rated current of current transformers
t = Tripping time

Protective releases
Microprocessor based overcurrent relays, PR212
Protection functions and set values, S4 – S8

Isomax
MCCBs 5

Protection functions and set values

Protection against	Overload	Short-circuit	Short circuit	Earth fault
Trip	Long delay	Inverse or definite short delay	Instantaneous adjustable	Inverse short delay
Symbol	L	S	I	G ①
Set values (manual adjustment in steps)	I1 = 0.4-0.5-0.55-0.6-0.65-0.7-0.75 0.8-0.85-0.875-0.9-0.925-0.95-0.975-1 x In t1 = 4 curves A – D	I2 = 1-2-3-4-6-8-10 OFF x In t2 = 4 curves A – D	I3 = 1.5-2-4-6-8-10-12	I4 = 0.2-0.3-0.4-0.7-0.8-0.9-1 t4 = 4 curves A – D
Set values (electronic adjustment)	I1 = 0.4 - 1 x In t1 = 3 - 18s	I2 = 1 … 10 OFF x In t2 = 0.05 – 0.5	I3 = 1.5-12 OFF x In	I4 = 0.2 – 1 OFF x In t4 = 0.1 – 0.8s

PR212
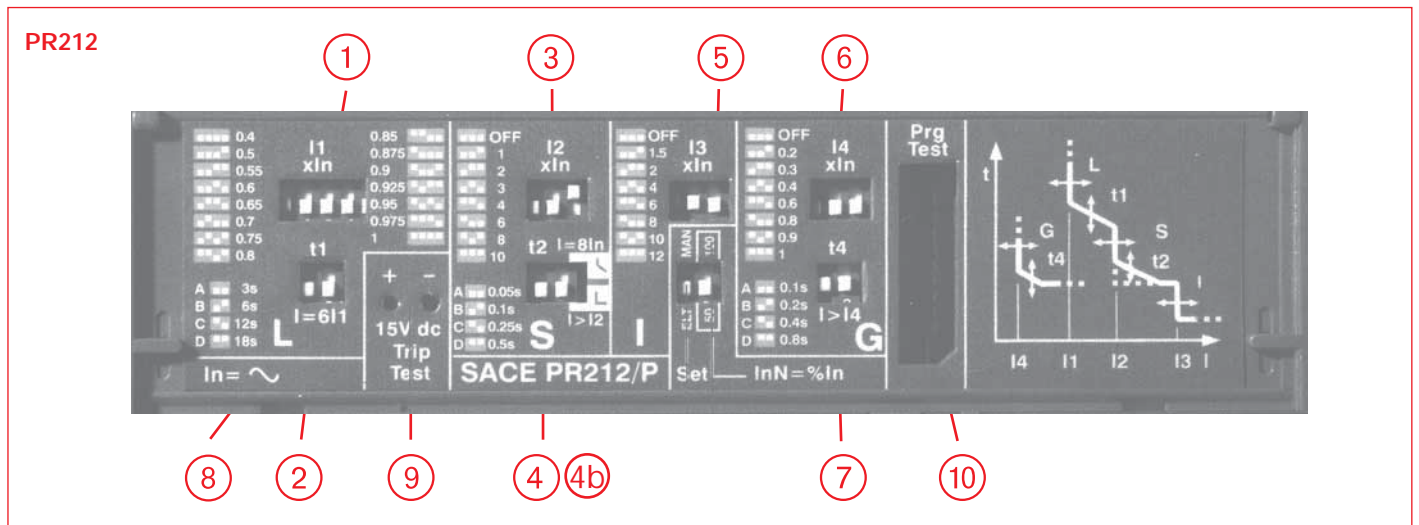
Key

1   Function L setting dip-switch (I1)
2   Function L trip time setting dip-switch (t1)
3   Function S setting dip-switch (I2)
4   Function S trip time setting dip-switch (t2)
4b Fixed/variable trip time selection dip-switch
5   Function I setting dip-switch (I3)
6   Function G setting dip-switch (I4)
7   Function G trip time setting dip-switch (t4)
8   Rated current of current transformers
9   15 V d.c. input for release functioning check
10 Socket for connecting SACE PR010/T test unit

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① S8 it = 0.2 - 0.4

Protective releases
Rated and setting currents, PR212
S4 – S8

Rated and setting currents

Circuit breaker		Current transformer	Functions			
Iu		In-A	L(I1) A (0.4 – 1.0 x In)	S (I1) A (1 – 10 x In)	I (I3) A (1.5 – 12 x In)	G (I4) A (0.2 – 1 x In) / S8 (0.2 – 0.4)
S4	250	100	40 – 100	100 – .1000	150 – 1200	20 – 100
		250	100 – 250	250 – .2500	375 – 3000	50 – 250
S5	400	300	120 – 300	300 – .3000	450 – 3600	60 – 300
		400	160 – 400	400 – .4000	600 – 4800	80 – 400
S6	600	600	240 – 600	600 – .6000	900 – 7200	120 – 600
	800	800	320 – 800	800 – .8000	1200 – 9600	160 – 800
S7	1200	1000	400 – 1000	1000 – .10,000	1500 – 12,000	200 – 1000
		1200	480 – 1200	1200 – .12,000	1800 – 14,400	240 – 1200
		1600	640 – 1600	1600 – .16,000	2400 – 19,200	320 – 640
S8	1600 – 2500	2000	800 – 2000	2000 – .20,000	3000 – 24,000	400 – 800
		2500	1000 – 2500	2500 – .25,000	3750 – 30,000	500 – 1000

Key

Iu	=	Rated uninterrupted current of circuit-breaker
In	=	Rated current of current transformers
I1	=	Current setting value for relay overload protection
I2	=	Current setting value for relay short-circuit selective protection
I3	=	Current setting value for relay instantaneous short-circuit protection
I4	=	Current setting value for earth fault protection

Protective releases
Microprocessor based overcurrent relays, PR212
Time-current curves, S4 – S8

Isomax
MCCBs 5

Function L - S - I

Key

In	=	Rated current of current transformers
t	=	Tripping time

Protective releases
Microprocessor based overcurrent relays, PR212
Time-current curves, S4 – S8

Function L - S - I

Key

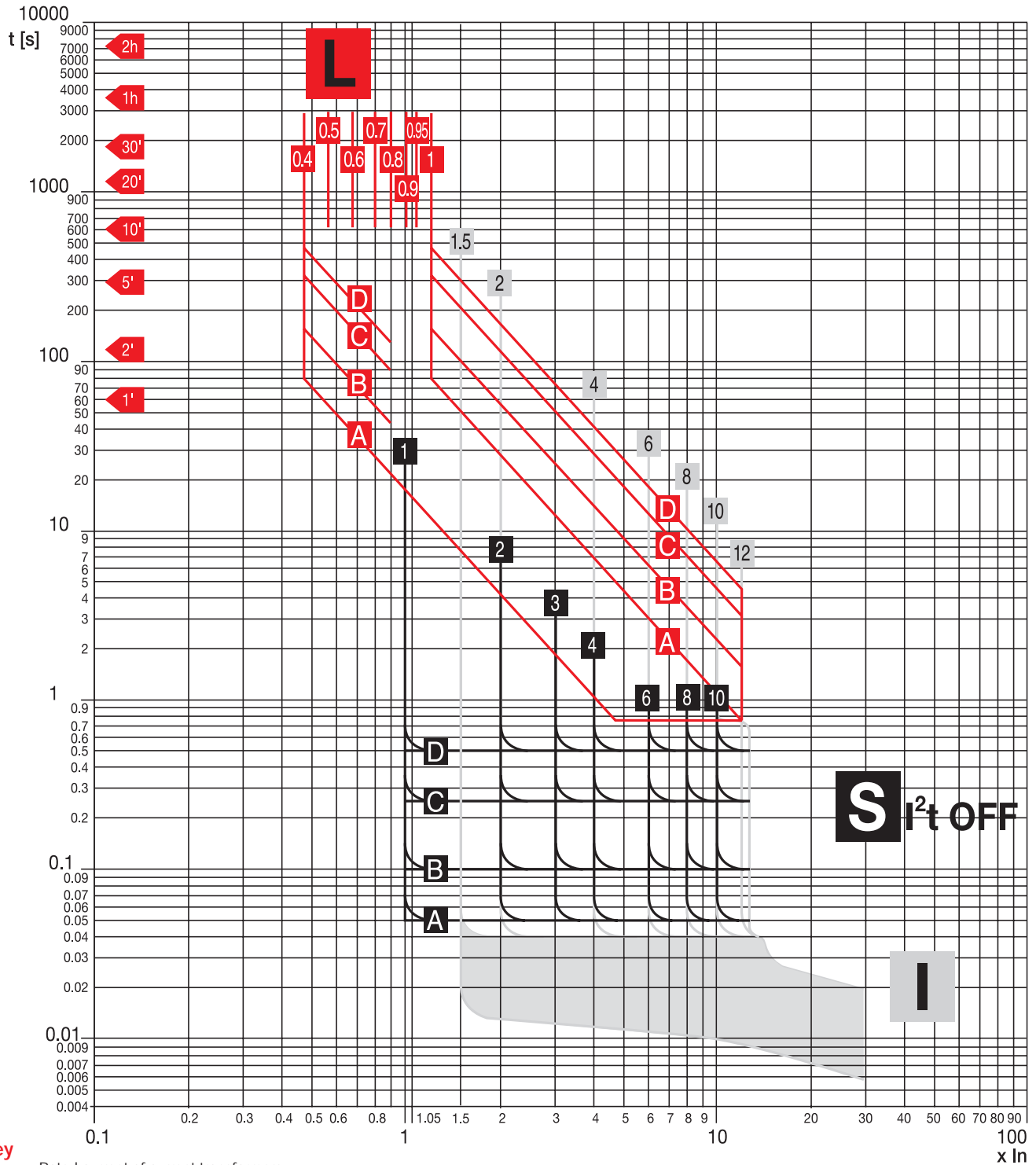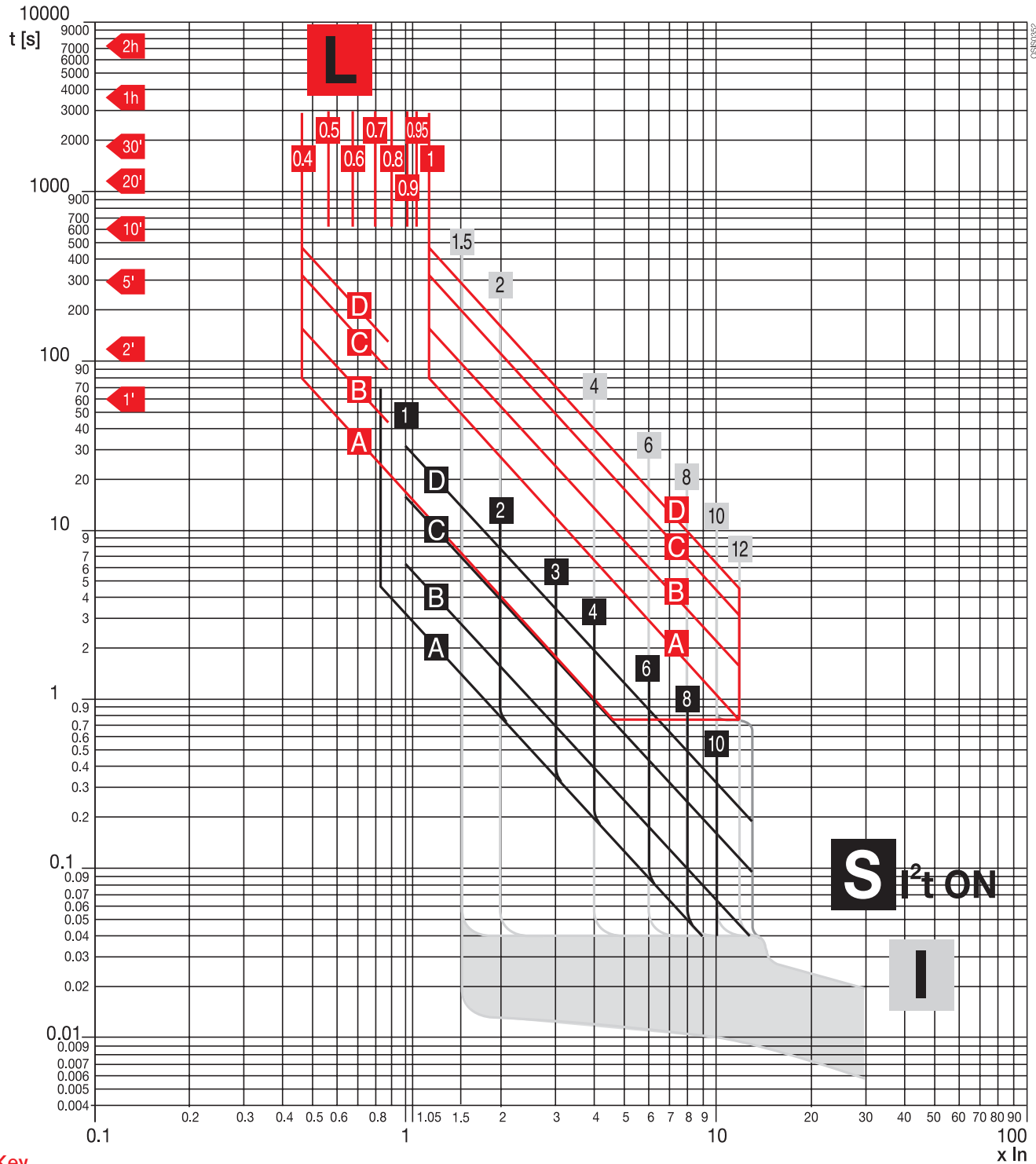In = Rated current of current transformers
t = Tripping time

Protective releases
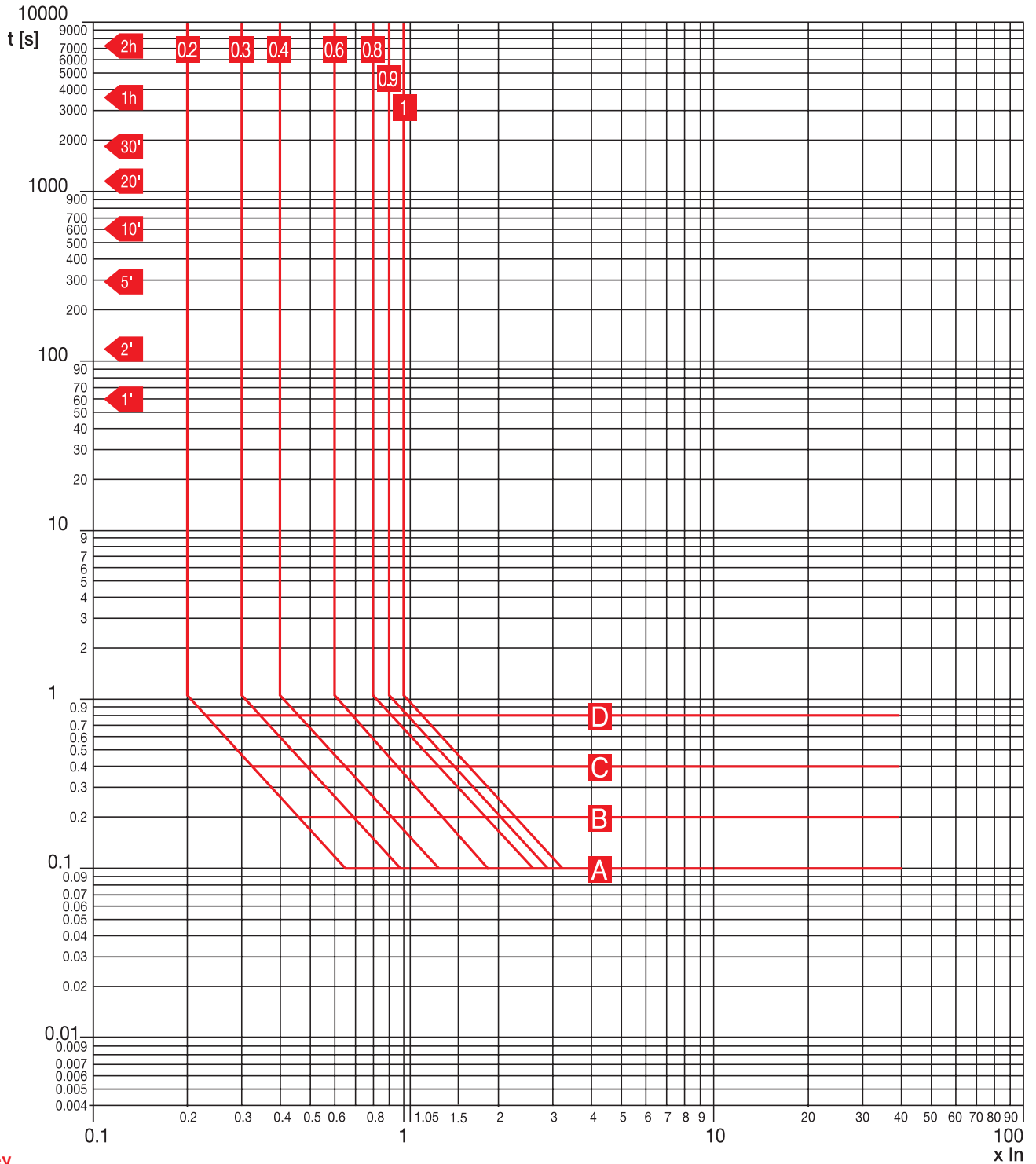## Microprocessor based overcurrent relays, PR212
Time-current curves, S4 – S8

Isomax
MCCBs
5

Function G①

Key
In = Rated current of current transformers
t = Tripping time

① S8 maximum setting is 0.4 per NEC guidelines.

Motor horsepower ratings
Magnetic trip
1/2HP @ 575V to 100HP @ 575V

Horsepower per NEC 430-50 — Approximate trip setting % of MFLA — Magnetic trip

208V	230V	460V	575V	Motor full Load amps	Isomax Type	MCP Rating	1.5X %	2X %	4X %	6X %	8X %	10X %	12X %
			1/2	0.9	S3	3	—	—	1300	2000	2700	3400	4000
		1/2		1.1	S3	3	—	—	1100	1600	2200	3700	3300
			3/4	1.3	S3	3	—	—	900	1400	1800	2300	2800
		3/4		1.6	S3	3	—	—	800	1100	1500	1900	2300
			1	1.7	S3	3	—	—	700	1100	1400	1800	2100
		1		2.1	S3	5	—	—	1000	1400	1900	2400	2900
	1/2			2.2	S3	5	—	—	900	1400	1800	2300	2700
1/2			1 1/2	2.4	S3	5	—	—	800	1300	1700	2100	2500
			2	2.7	S3	5	—	—	700	1100	1500	1900	2200
		1 1/2		3	S3	5	—	—	700	1000	1300	1700	2000
	3/4			3.2	S3	5	—	—	600	900	1300	1600	1900
		2		3.4	S3	5	—	—	600	900	1200	1500	1800
3/4				3.5	S3	10	—	—	1100	1700	2300	2900	3400
			3	3.9	S3	10	—	—	1000	1500	2100	2600	3100
	1			4.2	S3	10	—	—	1000	1400	1900	2400	2900
1				4.6	S3	10	—	—	900	1300	1700	2200	2600
		3		4.8	S3	10	—	—	800	1300	1700	2100	2500
	1 1/2			6	S3	10	—	—	700	1000	1300	1700	2000
			5	6.1	S3	10	—	—	700	1000	1300	1600	2000
1 1/2				6.6	S3	10	—	—	600	900	1200	1500	1800
	2			6.8	S3	10	—	—	600	900	1200	1500	1800
2				7.5	S3	25	—	—	1300	2000	2700	3300	4000
		5		7.6	S3	25	—	—	1300	2000	2600	3300	3900
			7 1/2	9	S3	25	—	—	1100	1700	2200	2800	3300
	3			9.6	S3	25	—	—	1000	1600	2100	2600	3100
3				10.6	S3	25	—	—	900	1400	1900	2400	2800
		7 1/2	10	11	S3	25	—	—	900	1400	1800	2300	2700
		10		14	S3	25	—	—	700	1000	1400	1800	2100
	5			15.2	S3	25	—	—	700	1000	1300	1600	2000
5				16.7	S3	25	—	—	600	900	1200	1500	1800
			15	17	S3	25	—	—	600	900	1200	1500	1800
		15		21	S3	50	—	—	1000	1400	1900	2400	2800
	7 1/2		20	22	S3	50	—	—	900	1400	1800	2300	2700
7 1/2				24.2	S3	50	—	—	800	1200	1700	2100	2500
		20	25	27	S3	50	—	—	700	1100	1500	1900	2200
	10			28	S3	50	—	—	700	1100	1400	1800	2100
10				30.8	S3	50	—	—	600	1000	1300	1600	1900
			30	32	S3	50	—	—	600	900	1300	1600	1900
		25		34	S3	50	—	—	600	900	1200	1500	1800
		30		40	S3	100	—	—	1000	1500	2000	2500	3000
			40	41	S3	100	—	—	1000	1500	2000	2400	2900
	15			42	S3	100	—	—	1000	1400	1900	2400	2900
15				46.2	S3	100	—	—	900	1300	1700	2200	2600
		40	50	52	S3	100	—	—	800	1200	1500	1200	2300
	20			54	S3	100	—	—	700	1100	1500	1900	2200
20				59.4	S3	100	—	—	700	1000	1300	1700	2000
			60	62	S3	100	—	—	600	100	1300	1600	1900
		50		65	S3	100	—	—	600	900	1200	1500	1800
	25			68	S3	100	—	—	600	900	1200	1500	1800
25				74.8	S3	150	—	—	800	1200	1600	2000	—
		60	75	77	S3	150	—	—	800	1200	1600	1900	—
	30			80	S3	150	—	—	800	1100	1500	1900	—
30				88	S3	150	—	—	700	1000	1400	1700	—
		75		96	S3	150	—	—	600	900	1300	1600	—
			100	99	S3	150	—	—	600	900	1200	1500	—

Motor horsepower ratings
Electronic trip
40HP @ 230V to 500HP @ 460V

208V	230V	460V	575V	Motor full Load amps	Isomax Type	MCP Rating	1.5X	2X	4X	6X	8X	10X	12X
Horsepower per NEC 430-50					Electronic trip		%	%	%	%	%	%	%
	40			104	S4	250	350	500	1000	1400	1900	2400	2900
40				114	S4	250	350	450	900	1300	1800	2200	2600
		100		124	S4	250	300	400	800	1200	1600	2000	2400
			125	125	S4	250	300	400	800	1200	1600	2000	2400
	50			130	S4	250	300	400	800	1200	1500	1900	2300
50				143	S4	250	250	350	700	1000	1400	1700	2100
			150	144	S4	250	250	350	700	1000	1400	1700	2100
	60			154	S4	250	250	300	600	1000	1300	1600	1900
		125		156	S4	250	250	300	600	1000	1300	1600	1900
60				169	S4	250	200	300	600	900	1200	1500	1800
		150		180	S5	400	350	450	900	1300	1800	2200	2700
	75			192	S5	400	300	400	800	1300	1700	2100	2500
75				211	S5	400	300	400	800	1100	1500	1900	2300
		200		240	S5	400	250	350	700	1000	1300	1700	2000
			250	242	S5	400	250	350	700	1000	1300	1700	2000
	100			248	S5	400	250	300	600	1000	1300	1600	1900
100				273	S6	600	350	450	900	1300	1800	2200	2600
			300	289	S6	600	300	400	800	1200	1700	2100	2500
		250		302	S6	600	300	400	800	1200	1600	2000	2400
	125			312	S6	600	300	400	800	1200	1500	1900	2300
			350	336	S6	600	250	350	700	1100	1400	1800	2100
125				343	S6	600	250	350	700	1100	1400	1700	2100
	150			360	S6	600	250	350	700	1000	1300	1700	2000
		300		361	S6	600	250	350	700	1000	1300	1700	2000
			400	362	S6	600	250	300	600	900	1300	1600	1900
150				396	S6	600	250	300	600	900	1200	1500	1800
			450	412	S6	800	300	400	800	1200	1600	1900	2300
		350		414	S6	800	300	400	800	1200	1600	1900	2300
			500	472	S6	800	250	350	700	1000	1400	1700	2000
		400		477	S6	800	250	350	700	1000	1300	1700	2000
	200			480	S6	800	250	350	700	1000	1300	1700	2000
		450		515	S6	800	250	300	600	900	1200	1600	1900
200				528	S6	800	250	300	600	900	1200	1500	1800
		500		590	S7	1000	250	350	700	1000	1400	1700	2000

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