VIP 40/45
VIP 400/410

PM100573

VIP 40/45

PM100576

VIP 400/410

Schneider Electric functional units including a circuit breaker core unit can be equipped for self powered protection with:
• a VIP 40, 45, 400 or 410 protection relays, integrated in an optimised functional block to form a protection system dedicated to the application
• Simple protection, easy to implement
• High sensitivity sensors to provide the highest level of reliability and sensitivity from 0.2 A to 20 In.

		Transformer protection		General use protection	
		VIP 40	**VIP 45**	**VIP 400**	**VIP 410**
Protection functions					
Phase overcurrent (ANSI 50-51)		■	■	■	■
Earth fault phase (ANSI 51N)	Standard (sum of current method)		■	■	■
	High sensitivity (earth fault CTs)				■
Thermal overload (ANSI 49)				■	■
Cold load pick-up					■
Measurement functions					
Phase current		■	■	■	■
Earth current			■	■	■
Phase peak demand current		■	■	■	■
Load history	Cumulative time			■	■
Control and monitoring functions					
Trip indication	Local (with origin of the fault)	■	■	■	■
	Remote (one contact) (3)	■	■	■	■
	3 output relays				■
Trip circuit supervision (ANSI 74TC)		■	■	■	■
Time-tagged events	Local on display (5 last trips)			■	■
	Remote, via communication				■
External tripping input					■
Overcurrent and breaking profile	Number of phase and earth trips			■	■
Serial communication port	Modbus RS485				■
Power supply					
Type of supply	Self-powered or auxiliary	self	self	self	dual (1)
	Minimum load current to activate the VIP	4A	4A	7A (2)	-

(1) The protection is self-powered. Auxiliary power is used only for communication and high sensitivity earth fault protection.
(2) 14A with 630A CBs.
(3) standard on Premset cubicle

VIP self-powered integrated protection relay

Optimised performance for transformer, incomer, feeder and bus riser protection
• Complete engineered and pre-tested protection system: dedicated CT and low power actuator (Mitop)
• Savings on space and cabling time
• Optimised for circuit breaker to work together in an optimum manner:
• Simple protection, easy to implement
• Perfectly adapted to dedicated applications

VIP 40/45: designed for transformer protection
• MV/LV transformer protection up to 200A
• Dedicated protection curve to protect against overloads, short-circuits and earth faults with straight-forward settings
• Designed up to 200 A circuit breakers to replace fuse-switch solutions

VIP 400/410: designed for buildings and MV/LV substation utilities
• Substation protection (incomers, feeders, bus risers) using 200/630A circuit breaker
• MV/LV transformer protection instead of VIP 40/45 if more functions are required
• DT (Definite Time) and IDMT (Inverse Definite Minimum Time) standardized tripping curves
• Switchgear diagnostics
• Multi-language display
• Metering functions

VIP 410: ready for Smart grids

VIP 410 includes a dual supply (self-powered plus auxiliary) for communication with:
• Remote communication with DMS and RTUs
• Remote Alarming
• Time stamped events recorded
• Measurement of current, load history, over-current and breaking profile

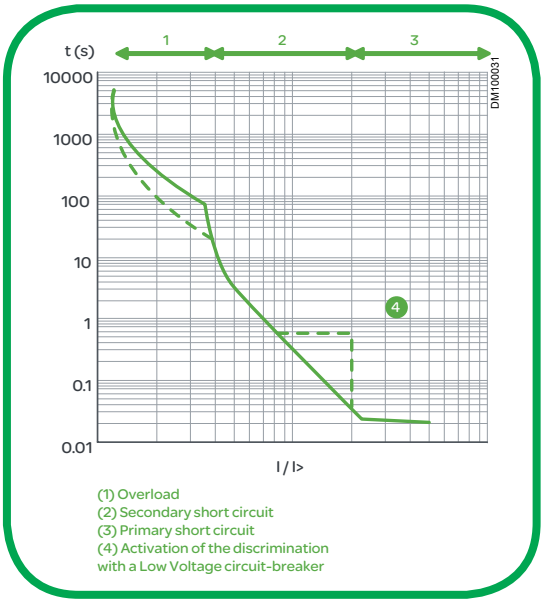
VIP 410 is dedicated for intelligent MV loops with automation:
• Remote configuration
• Setting groups selectable according to the configuration of the MV loop
• Remote asset management
• Plug and play system with Easergy RTUs (R200) to integrate all the protocols (IEC60870-104, DNP3, IEC61850), and remote WEB pages.

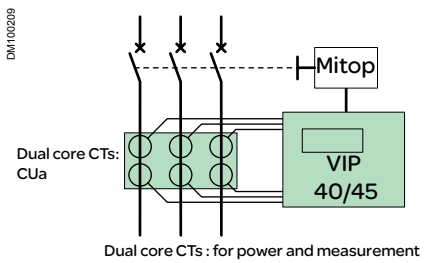
Schneider Electric

VIP 40/45
Protection relay

Schneider Electric recommends circuit breakers for transformer protection instead of fuses. They offer the following advantages:
- Easy to set
- Better discrimination with other MV and LV protection devices
- Improved protection performance for inrush currents, overloads, low magnitude phase faults and earth faults
- Greater harsh climate withstand
- Reduced maintenance and spare parts
- Availability of additional functions such as measurement, diagnostics and remote monitoring.

And with the recent development of low cost circuit breakers and self-powered relays, life time costs are now equivalent to those of traditional MV switch fuse solutions.





Application

- Entry level MV/LV transformer protection
- Dependent-time phase overcurrent tripping curve dedicated to MV/LV transformer protection
- Definite-time earth fault protection
- Phase current and peak demand current measurement

Main features

Self-powered operation
- Energised by the CTs: no auxiliary power needed

Complete pre-tested protection system
- Functional block ready to be integrated

Designed to protect transformers
- Designed up to 200 A circuit breakers to replace fuse-switch solutions
- Setting is as simple as fuse selection
- Maximum setting possibilities consistent with circuit breaker characteristics

Phase overcurrent protection
- Tripping curve optimised for MV/LV transformer protection
- Protection against overloads and secondary and primary short-circuits
- Only one setting (I>)
- Discrimination with LV circuit breakers or LV fuses
- Compliant with TFL (Time Fuse Link) operating criteria

Earth fault protection
- Definite-time tripping curve
- Settings: Io> (phase current sum method) and to>.
- Second harmonic restraint element

Measurement
- Load current on each phase
- Peak demand current

Front panel and settings
- Current measurements displayed on a 4 digit LCD
- Settings with 3 dials (I>, Io>, to>) protected by a lead-sealable cover
- Trip indication powered by dedicated integrated battery with reset by push-button or automatically

Other features
- Complete pre-tested solution that eliminates complicated CT selection
- Complies with MV protection relay standard IEC 60255
- No PC or specific tool required for setting or commissioning
- Maximum setting possibilities consistent with circuit breaker features
- Self-powered by dual core CTs: CUa
- Environment: -40°C / +70°C

Primary injection test
- A primary injection circuit may be permanently installed (option) through the CTs, inside the cubicle, to test the physical integrity of the complete protection system including the CTs
- The test is carried out without disconnecting the CTs and the VIP40/45 displays the injected current during testing
- If required, a temporary VIP40/45 test mode can be activated to test the tripping of the circuit breaker by pressing a test pushbutton

Test with the Pocket Battery module
- This accessory can be connected on the VIP40/45 front plate to energise the relay to carry out a quick test even when the relay is not powered. This test allows testing the circuit breaker.

References

VIP40 100A	phase overcurrent protection	REL 59910
VIP45 100A	phase and earth fault protection	REL 59912
VIP40 200A	phase overcurrent protection	REL 59911
VIP45 200A	phase and earth fault protection	REL 59913

Standards	
safety	IEC 61010
EMC emission	IEC 60255-25
EMC immunity	IEC 60255-22
climatic	IEC 60068-2
mechanical	IEC 60255-21
functional	IEC 60255-151

Characteristics

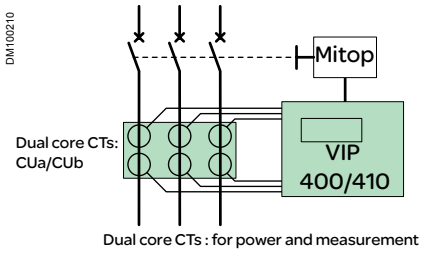
Phase Over Current protection (ANSI 50-51)		
I>	Setting range	5A…100A 5A…200A
	Accuracy	5%
T>	Tripping curve	- dependent time - dedicated to the MV/LV transformer protection - transformer secondary selection: fuse or CB
	Accuracy	8%
Earth Fault protection (ANSI-51N)		
Io>	Range	5A…100A 5A…200A
	Accuracy	2%
To>	DT curves	100ms…1s
	Accuracy	5%
Inrush current delay		on / off
Start up time		
Activation current		Minimum load current: • 4A (3 phases) • 6A (single phase)
Activation time without load, according to the fault current (1)	12A	< 80ms
	16A	< 30ms
	240A	< 20ms
	1kA	< 15ms
Measurement		
Phase current	Accuracy	2% typical
Peak current	Accuracy	2% typical
CTs		
Phase CTs type		CUa = Dual Core 200A with embedded measurement shunt
CTs input	Continuous	1,3 In
	Short time	25kA / 1s (primary side)
Characteristics		
CB Tripping		mitop eco,
Frequency		50Hz & 60Hz
Temperature		-40°C +70°C
Terminals	CTs	prefabricated (includes measurement and power supply)
	Mitop	prefabricated
Trip signaling		
Mechanical	Enclosure	front plate IP54, rear part IP30
	Mounting	in a cut out
	Dimensions	front plate (cut out) = 161 mm x 129 mm depth inside cubicle = 22 mm
Control & monitoring function		
Trip indication		• Local with a LED • Remote with one contact (located on Mitop actuator)
Trip circuit supervision (ANSI 74TC)		

(1) If the load current is above the activation current, there is no additional start up time delay and VIP40,45 will operate according to its normal time settings

VIP 400/410
Protection relay

• VIP 400 is a self-powered relay energised by the CTs; it does not require an auxiliary power supply to operate

• VIP410 is a dual powered relay offering self-powered functions and additional functions powered by an AC or DC auxiliary supply.

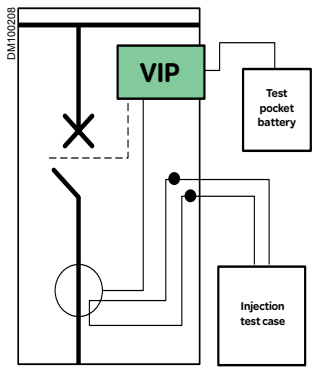


Dual core CTs : for power and measurement

Easy to use

Front panel keypad and display
• used to set the protections and the operating parameters.
• displays the network currents and the fault messages.
• the settings are protected by a password and by a sealable cover.
• the setting does not require a PC.
• the LCD is backlit if the VIP410 auxiliary power is present.
• 4 fault indicators: OC, EF, thermal, external
• 3 status led: watch dog, aux power supply, communication

Time tagged events records
Each time VIP400, 410 trips the CB, it records the origin of the event, the tripping currents, the date and the time. These data can be read on the front panel or by communication. It provides the operator with an help to analyze a fault on the network.



Tests of protection system and circuit breaker

Applications

• MV distribution substation incomer, feeder and bus riser protection relay
• MV/LV transformer protection

VIP 410: ready for Smart grids

VIP 410 includes a dual supply for communication with
• Remote communication with DMS and RTUs
• Remote alarming
• Time stamped events recorded
• Measurement of current, load history, over-current and breaking profile

VIP 410 is dedicated for intelligent MV loops with automation:
• Remote configuration
• Setting groups selectable according to the configuration of the MV loop
• Remote asset management
• Plug and play system with Easergy RTUs (R200) to integrate all the protocols (IEC60870-104, DNP3, IEC61850), and remote WEB pages.

Main features

VIP400: Self-powered protection relay
This version is energised by the current transformers (CTs).
It does not require an auxiliary power supply to operate.
• Overcurrent and earth fault protections
• Thermal overload protection
• Current measurement functions

VIP410: Dual powered protection relay
• Offers the same self-powered functions as the VIP 400
• In addition, the VIP410 has an AC or DC auxiliary supply to power certain additional functions that cannot be self-powered:
• sensitive earth fault protection convenient to all earthing systems
• external tripping input
• cold load pick-up
• 2 setting groups selectable by communication
• communication (Modbus RS485 port)
• signalling relays
• If the auxiliary power fails during an MV short-circuit, the protection functions are maintained operational

Other features
• Designed for circuit breakers 200A and 630A from Schneider Electric
• Complete pre-tested solution that eliminates complicated CT selection
• Complies with MV protection relay standard IEC 60255
• No PC or specific tool required for setting or commissioning
• Self-powered by dual core CTs: CUa/CUb
• Environment: -40°C / +70°C

Primary injection test
A primary injection circuit may be permanently installed (option) through the CTs, inside the cubicle, to test the physical integrity of the complete protection system including the CTs
• The test is carried out without disconnecting the CTs and the VIP relay displays the injected current during testing
• If required, a temporary VIP test mode can be activated to test the tripping of the circuit breaker by pressing a test pushbutton.

Test with the Pocket Battery module
• This accessory can be connected on the VIP relay front plate to energise the relay to carry out a quick test even though the relay is not powered. This test allows testing the circuit breaker.

References

VIP400		self powered relay	-	REL 59915
VIP410	A	dual powered relay	24...125 VDC & 100...120 VAC	REL 59916
	E	dual powered relay	110...250 VDC & 100...240 VAC	REL 59917

Standards	
Safety	IEC 61010
EMC emission	IEC 60255-25
EMC immunity	IEC 60255-22
Aux. power supply	IEC 60255-11
Climatic	IEC 60068-2
Mechanical	IEC 60255-21
Functional	IEC 60255-151

Characteristics

Phase overcurent protection (ANSI 50-51)			
I> and I>>	DT curve	0,05...20 In	
	IDMT curves	0,05...2 In	
	Accuracy	5%	
T> and T>>	Tripping curves	OFF, DT IEC: SIT/A, VIT/B, LTI/B, EIT/C IEEE: MI, VI, EI, other: RI	
	DT curves	0,05...300s	
	IEC, RI curves	TMS: 0,02...2 / step =0,01	
	IEE curves	TD: 0,5..15 / step = 0,1	
	Accuracy	DT 2% IDMT 5% according to IEC 60255-3	
I>>>	DT curve	0,1...20 In	
T>>>	Curves	OFF, DT, INST	
	DT curve	0,05...300s	
	Instantaneous	typical = 25ms, max = 40ms condition: VIP400, 410 is pre energized before the fault	
Earth Fault Protection (ANSI 50N-51N)			
Io>	DT curve	sum	0,025...10 In
		EF CT	1...24A and 10A...240A (VIP 410 only)
	IDMT curves	sum	0,025 ...In
		EF CT	0,2A...2,4A and 2A...24A (VIP 410 only)
To>	Curves	OFF, DT IEC: SIT/A, VIT/B, LTI/B, EIT/C IEEE: MI, VI, EI, other: RI	
	DT curves	0,05...300s	
	IEC, RI	TMS: 0,02...2 / step =0,01	
	IEEE curves	TD: 0,5..15 / step = 0,1	
Io>>	DT curve	sum	0,1...10 In
		EF CT	1A...24A and 10A...240A (VIP 410 only)
To>>	Tripping curve	OFF, DT	
	DT curve	0,05...300s	
Thermal protection (ANSI 59)			
Activity		ON / OFF	
Tripping set point		0,05 In...1 In	
Time constant		1mn...120 mn	
Cold load pickup			
Phase overcurrent	Action on set point	OFF, 150%, 200%, 300%, 400%, 500%, blocking	
	Time delay	1s...240mn	
Earth fault	Action on set point	OFF, 150%, 200%, 300%, 400%, 500%, blocking	
	Time delay	1s...60mn	

Start up current and time		
Activation current		Minimum load current for 200A CBs : 7A (3 phases), 14A (single phase) Minimum load current for 630A CBs : 14A (3 phases), 28A (single phase)
Activation time without load, according to the fault current (1)	0,06 In	< 140ms
	0,12 In	< 75ms
	1,2 In	< 40ms
	5 In	< 30ms
	10 In	< 20ms
Measurement		
Phase and earth current	Accuracy	1% typical
Peak current	Accuracy	1% typical
LCD activation		10A
Load history	Cumulative time	The cumulative time (hours) is displayed in 3 levels: For 200A CBs: <100A, <200A, > 200A For 630A CBs: <300A, <600A, > 600A
CTs		
Phase CTs type	200 A	CUa = Dual Core 200A with embedded measurement shunt
	630 A	CUb = Dual Core 630A with embedded measurement shunt
Earth fault CTs type (2)		ratio = 470:1 CSH 120, CSH200, GO110, CSHU = embedded EF CT 470/1
Thermal withstand - CTs input	Continuous	1,3 In
	Short time	25kA / 2s (primary side)
Input / output		
Ext tripping input	x 1 - ext contact	dry contact
CB Tripping		mitop eco
Auxiliary supply (2)	VIP410 A	24...125VDC, 100...120VAC +/-20%
	VIP410 E	110...250VDC , 100...240VAC +/-20%
Signaling relays (2)	x 3	250DC+20%, 240AC+20% AC: 5A/240V pf = 0,3 DC: 5A/24V, 1/48V, 0,1A/220V, L/R=40ms
Characteristics		
Frequency		50Hz & 60Hz
Temperature		-40°C +70°C
Battery	Type	1/2 AA LI 3,6V
	Life duration	10 years
Terminals	CTs	prefabricated (includes measurement and power supply)
	Earth Fault	screw type
	Mitop	prefabricated
	I/O, aux power	screw type
	Communication	RJ45 - Modbus
Mechanical	Enclosure	front plate IP54, rear part IP30
	Mounting	in a cut out
	Dimensions	front plate (cut out) = 161 mm x 129 mm depth inside cubicle = 98 mm
	Weight	800 g
Control & monitoring function		
Languages & display	English UK, english US, spanish, french, chinese, italian, german, turk, portugues,	
Trip indication	• Local with a LED • Remote with one contact (located on Mitop actuator) • 3 output relays : 01 = phase fault (I>, I>>, I>>>), 02=earth fault (To>, Io>>) , 03= termal overload alarm	
Events	Time-tagged events: • Local on display (5 last trips) • Remote, via communication	
External trip input	To connect an external relays (pressure, temperature…)	
Overcurent & breaking profile	The number of trips is displayed in a 4 levels: • for 200A CBs : <200A, <2kA, <8kA, >8kA • for 630A CBs : <630A, <10kA, <20kA, >20kA	
Serial communication port	Modbus – file description IEC61850	
Trip circuit supervision (ANSI 74TC)		

(1) If the load current is above the activation current, there is no additional start up time delay and VIP400 will operate according to its normal time settings. VIP410 is not subject to additional start up time because of its auxiliary power supply.
(2) VIP410 only

Sensors and connections

PE50032

CSH 120/200

PM100619

CSHU

PM100616

CUa CUb

The VIP series is an integrated protection system:
• Dedicated sensors located under the core unit provide protection and measurement outputs
• Optional additional earth fault sensors are available
• Actuators are low power tripping coils (Mitop).

High sensitivity sensors

VIP integrated protection system
The VIP integrated protection system is composed of sensors, a processing unit and an actuator, designed together to provide the highest level of reliability and sensitivity from 0,2A to 20 In for VIP 400/410 and 5A to 20 In for VIP 40/45

Sensors
The sensors are made up of one block of phase CTs with rated insulation voltages of 0.72 kV / 3 kV - 1mn, providing both measurement and power outputs.

• The measurement sensor is based on Low Power Current Transformer (LPCT) technology, ensuring excellent accuracy :
- 5P30 for protection
- class 1 for measurement.

• The power supply sensor ensures calibrated self-powering of the relay even for currents of just a few Amperes:
• e.g. 7A is sufficient for operation of the VIP400 with a 200A Circuit Breaker, up to its saturation level
• e.g. 4A is for operation of the VIP40 up to its saturation level

• The protection sensors are located under the core unit, the earth fault sensors around the bushings or on the cables. The connection between all these elements, sensors and relay, is prefabricated and protected against external aggression, providing a higher level of reliability.

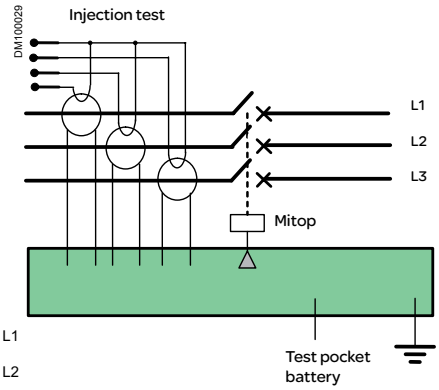
Actuators
• The actuator is a dedicated low power tripping coil (Mitop) specifically designed to operate with the sensors and the processing unit with a minimum energy.

• The integrity of the Mitop circuit is continuously supervised (Trip Circuit Supervision function).

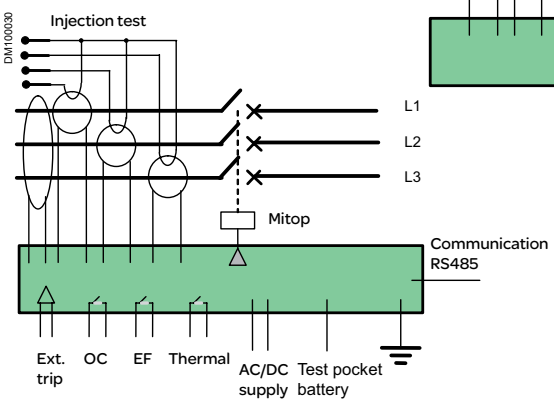
Connection

Connection diagrams

VIP 40/45 and VIP 400



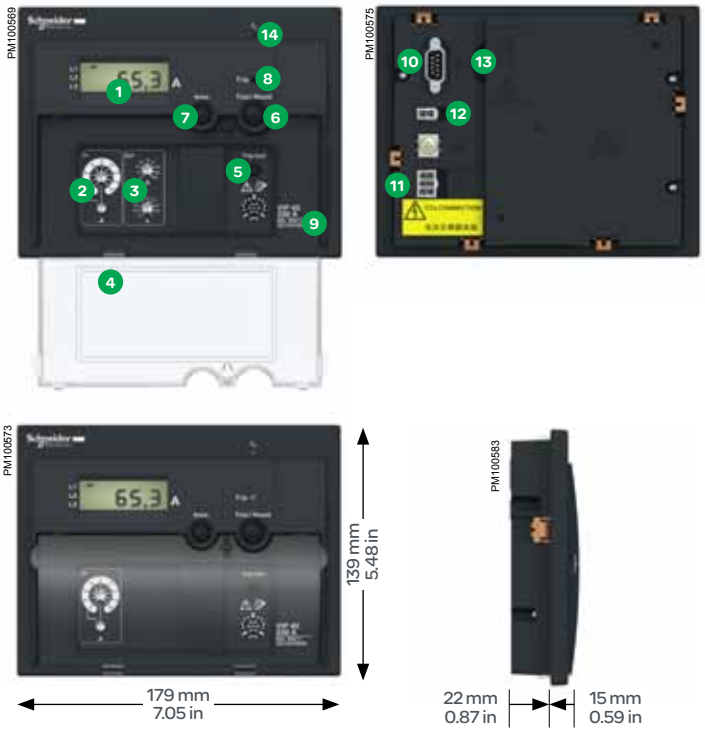
VIP 410



Connection VIP 40/45

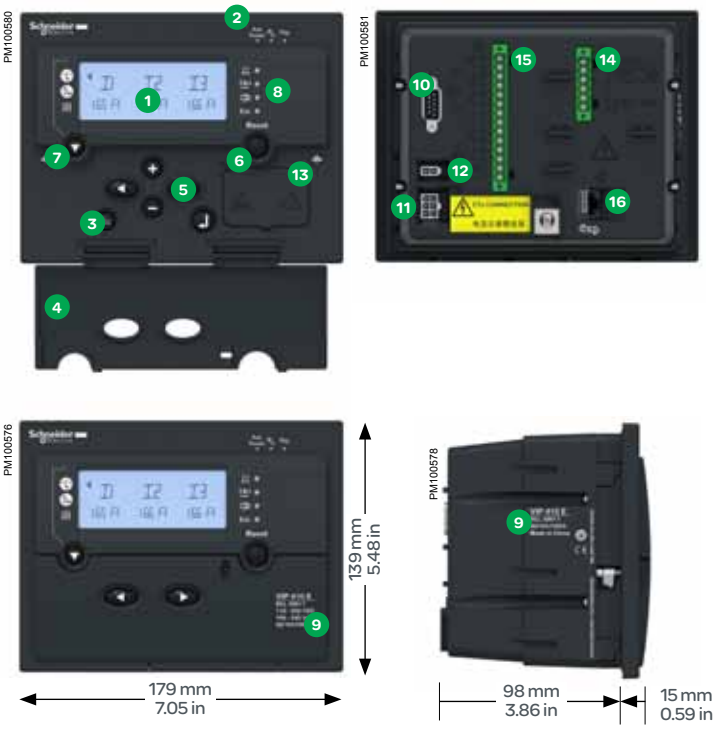
1	4 digits LCD display	• permanent display of the 3 phase currents in A • automatic scrolling display
2	Phase protection	• I> setting
3	Earth fault	• Io> and To> setting (1)
4	Sealing cover	• protects the settings and the trip test key
5	Trip test key	• to test the circuit breaker and the protection relay
6	Test/reset key	• to acknowledge the fault indication
7	Imax key	• to display the peak demand current • 3 phases automatic scrolling display
8	Trip indicator	• flashing red light powered by the embedded battery
9	Product reference	• commercial reference, logistic reference, production date code
10, 11	CTs connection	• measurement sensors connection • power supply sensors connection
12	Mitop connection	
13	Battery	• used to energize the trip indicator
14	VIP failure indicator	• watchdog checking system

(1) Only on VIP 45



Connection VIP 400/410

1	LCD display	• graphic display
2	Status LED	• auxiliairy power (VIP410) • failure indicator (watchdog) • COM (VIP410)
3	Setting keys	• confirm entry key, abort entry key, setting keys
4	sealing cover	- protects the settings and parameters
5	Selection keys	- to navigate in the menus
6	Reset key	- to acknowledge the fault indication
7	Menu key	• to select menus • to start VIP from the embedded battery in order to enter settings
8	Fault indicators	• flashing red light powered by the embedded battery
9	Product reference	• commercial reference, logistic reference, production date code
10, 11	CTs connection	• measurement sensors connection • power supply sensors connection
12	mitop connection	
13	battery	• used to energize the trip indicator • to set protections and parameters during commissionning without any external supply
14	Connector (VIP410)	• zero sequence sensor connection • external tripping input connection
15	Connector (VIP410)	• auxiliary power supply connection • signaling output (x3) connection
16	Communication connector (VIP410)	• RS485 modbus connection



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Design: Schneider Electric Industries SAS
Photos: Schneider Electric Industries SAS
Publishing: Altavia Connexion - Made in France