MiCOM P532

Line Differential Protection and Control Device

P532 in 40 TE case fitted with a text HMI

P532 in 84 TE case fitted with a graphic HMI

Customer Benefits

- 1A/5A both supported in a single device
- Optional voltage transformers
- Freely configurable PCOMM interface
- Function keys (with text HMI)
- Optional control functions

The MiCOM P532 is an inexpensive line differential IED that features optional control functions for rapid and selective short-circuit and overload protection of cables and power lines.

The IED provides a rapid three-stage differential protection system using a tripping characteristic with multiple knee points. Amplitudes are matched by simply entering the nominal values of associated current transformers and the reference current on the power line. The nominal current defines the basic value of the differential protection calculation and may be freely adjusted.

In addition, the MiCOM P532 provides numerous supplementary functions. Apart from the dynamic adjustments there are four parameter subsets, which can adapt the device to different operating and power system management states.

The optional control functions make it possible to electrically control up to six switchgear units fitted to a bay panel in a medium or high voltage facility, and to monitor their contact positions.

The optional voltage-measuring inputs enhance the IED with directional backup protection and ground fault monitoring functionality.

The IED supports numerous communications protocols, which allow the device to be wired into substation control systems and telecontrol systems. The freely configurable PCOMM protection interface permits differential protection communication to be used as well as the transmission of up to three binary information telegrams between devices.

The modular design of the MiCOM P532 cases and the adaptable configuration, tailored to customer requirements, provides you with a flexible concept for easy integration of protection equipment in substations. The IED is designed for flush mounted installation into a cabinet, or surface-mounting to a control panel.

Schneider Electric

Application

The MiCOM P532 line differential IED features numerous protection functions.

There are two design versions available, depending on the specific requirements.

- MiCOM P532 including non-directional supplementary functions (not fitted with voltage transformers)
- MiCOM P532 including directional supplementary functions and ground fault monitoring (fitted with voltage transformers)

Furthermore, there are additional options for controlling switchgear units or the automatic synchronization check (ASC) function.

The IED may be applied using either a text or a graphic HMI.

Global functions

The IED is generally fitted with the following global functions:

- Parameter subset selection
- Operating data measurement, operating data recording
- Overload recording with overload data acquisition
- Fault recording with recording of all input measured values and fault data acquisition

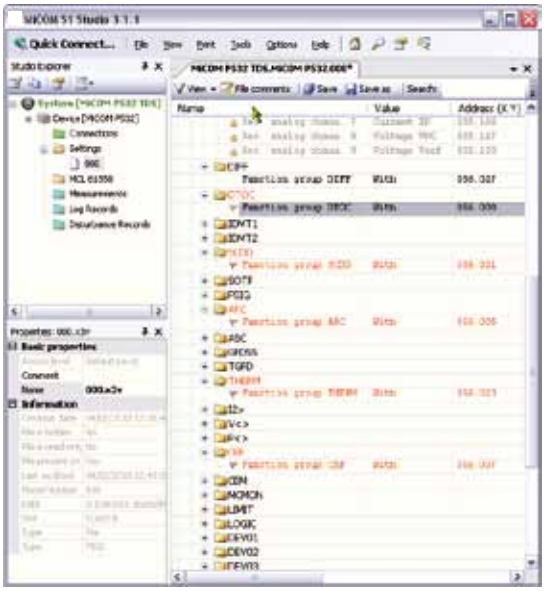
If the optional voltage transformers are fitted, the following additional functions become available:

- Ground fault recording with ground fault data acquisition

General functions

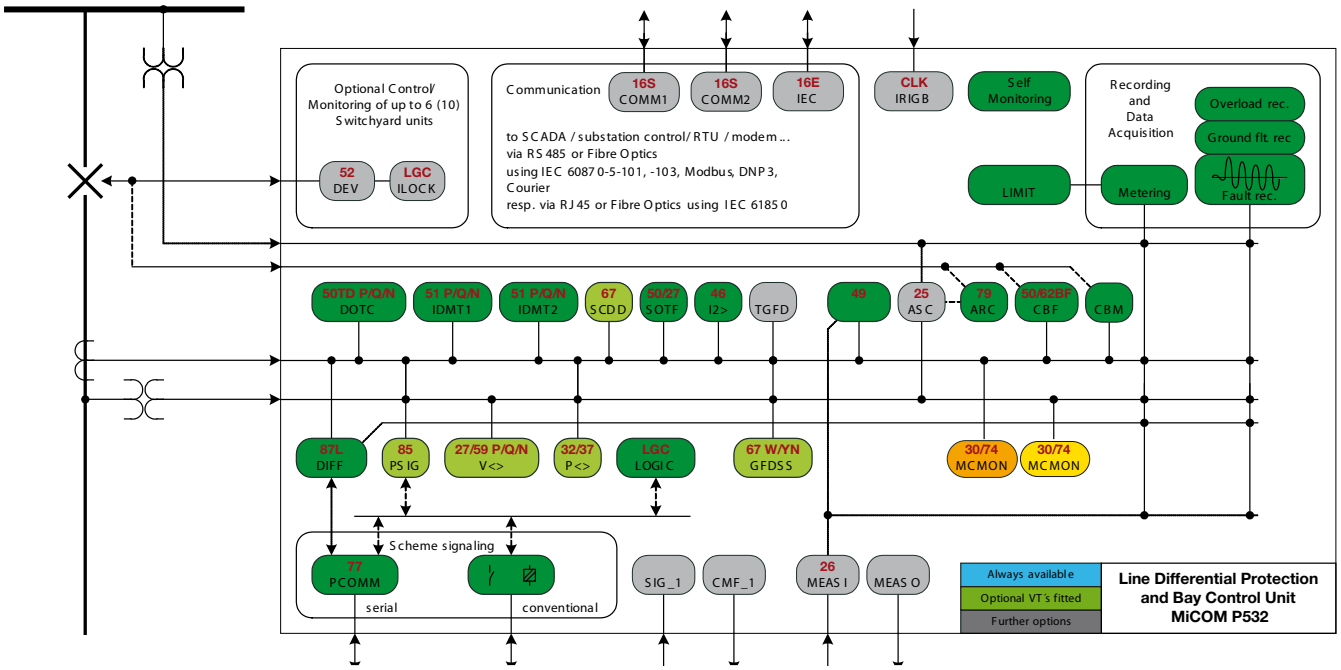
General functions are complete function groups, which may be individually configured or disabled depending on the application. Disabled functions are hidden from view to simplify the menu presentation.

This concept makes a wide range of functions and facilitates available. One IED model can then cover a wide range of applications. Despite this versatility, parameter settings are simple and clear and it is possible to adapt individual protection schemes.



Selecting functions with a mouse in the application program

Functional diagram



Functional overview

ANSI	IEC 61850	Function group	Function	VT´s not fitted	VT´s fitted
87L	PhsPDIF1	DIFF	Differential protection, phase selective Direct and permissive transfer tripping CT adjustment with settable reference current Settable stablization	● ● ●	● ● ●
77		PCOMM	Protection interface PCOMM Continuous plausibility and telegram monitoring Continuous synchronization monitoring Continuous propagation time monitoring	● ● ●	● ● ●
50TD P/Q/N	DtpPhs-/DtpEft-/ DtpNgsPTCOx	DTOC	Definite-time o/c protection, four stages, phase-selective Settable operating mode (DTOC / Backup DTOC) per stage	●	●
51P/Q/N	ItpPhs-/ItpEft-/ TtpNgsPTCOx	IDMT1/ IDMT2	Inverse-time o/c protection, single-stage, phase-selective Settable operating mode (IDMT/ Backup IDMT)	●	●
67	DtpPhs-/ DtpResRDIRx	SCDD	Short circuit direction detection		●
50/27	PSOF1	SOTF	Switch onto fault protection	●	●
85	PSCH1	PSIG	Protective signaling		●
79	RREC1	ARC	Auto-reclosure control (3-pole)	●	●
25	RSYN1	ASC	Automatic synchronism check		(●)
46	UbpNgsPTOCx	I2>	Unbalance protection	●	●
32/37	PdpAct-/ PdpRealPDyPx	P<>	Directional power protection		●
27/59 P/Q/N	VtpPhs-/VtpNgs-/ VtpPss-/VtpRefPTyVx	V<>	Over/Undervoltage protection		●
49	ThmPTTR1	THERM	Thermal overload protection Coolant temperature measuring (using MEASI)	● (●)	● (●)
67W/YN	PSDE1	GFDSS	Ground fault direction determination (wattmetric)		●
	PTEF1	TGFD	Transient ground fault direction determination		(●)
30/74	AlmGGIO1	MCMON	Measuring circuit monitoring Voltage measuring circuit monitoring	●	● ●
50/62BF	RBRFx	CBF	Circuit breaker failure protection	●	●
		CBM	Circuit breaker monitoring	●	●
		LIMIT	Limit value monitoring	●	●
LGC	PloGGIOx	LOGIK	Programmable logic		
26	RtdGGIO1 IdcGGIO1	MEASI/ MEASO	Analog inputs and outputs RTD input Measuring data input 20 mA, one settable input value Measuring data output 20 mA, two settable output values	(●) (●) (●) (●)	(●) (●) (●) (●)
	LLN0.SGCB	PSS	Parameter subset select	●	●
52 LGC	XCBRx, XCBIx	DEV CMD_1 SIG_1 ILOCK	Control and monitoring of up to 6 switchgear units Single-pole commands Single-pole signals Interlocking logic	(●) (●) (●) (●)	(●) (●) (●) (●)
16S CLK 16E		KOMMx IRIGB IEC	2 Communication interfaces serial, RS 422/485 or FO Time synchronisation IRIG-B Communication interface Ethernet	(●) (●) (●)	(●) (●) (●)

● = Standard; (●) = Option

The MiCOM P532 always provides the required functionality.

Differential protection

Depending on the primary CT current values, the MiCOM P532 line differential IED may be adapted to the line or cable reference current with suitable ranges. Amplitudes are matched by simply entering Iref for the line and Inom for each associated current transformer. The IED calculates the matching factors, which are checked to meet internally acceptable ranges. The tripping characteristic of the line differential protection has two knee points. Tripping characteristic evaluation is line selective. In case further stabilizing requirements are required, a line overlapping evaluation of restraining values may be selected. In such cases, the highest restraining current is used as a stabilizing criterion.

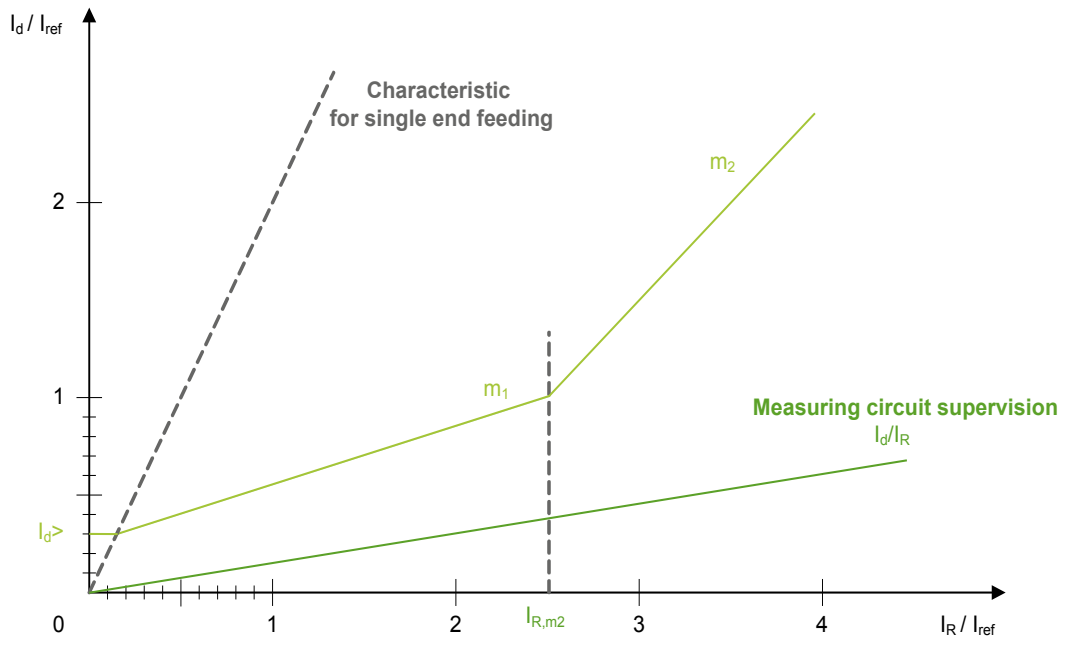
Differential currents may occur during normal operation because of different propagation times associated with the transmission of signals. A measurement circuit monitoring function Id/IR will signal faults detected within a settable monitoring time period.

Decisions made by the differential protection function are transmitted, via the PCOMM interface, to the other end where they result in a non-delayed transfer trip. Depending on the specific application, a permissive transfer trip may be configured instead of the non-¬delayed transfer trip. A transfer trip issued by other protection functions may also be generated.

Pcomm interface

Measured values required for differential protection are transmitted via the P532's serial PCOMM interface, which operates in full duplex mode (where data is transmitted and received simultaneously betweenstations).
The transmission rate can be selected as 19.2 kbps or 38.4 kps asynchronous. The PCOMM interface may either be installed with a twin fiber optic cable or with a cable including twin shielded twisted pairs of copper pilot wire (four wire connection).

The transmission time of the PCOMM interface must be stable and approximately equal in send and receive directions. The cyclic telegram transmission of the digital protection data permits continuous selfmonitoring of the complete PCOMM interface system, without the need of additional equipment. Up to three freely configurable binary signals may be transmitted. For the operation as a line protection device there are preset transfer and blocking signals.



Tripping characteristic of the line differential protection

Time-over current protection

For the time-overcurrent protection of line currents, residual currents and the negative-sequence current, the line differential protection device MiCOM P532 provides one definite-time and one inverse-time overcurrent protection function, each including numerous selectable characteristics.

Each stage may by choice be configured as a drop-back level for a faulty differential protection communication.

Short circuit direction determination

the optional short circuit direction determination function allows the directional operating mode of the time-overcurrent protection functions. In this mode the tripping direction (forward, backward or non-directional) may be individually configured for each stage.

Directional power protection

The directional power protection function is used to monitor the active and reactive power for their values to exceed or drop below set thresholds, or to change direction with any unbalanced loading of a power system.

Switch on to fault protection

Should a line branch be temporarily wired to ground then a corresponding circuit breaker could be mistakenly switched on to a short circuit. This function provides an undelayed trip during a settable delay time after a manual close command was issued.

Ground fault direction determination

These two methods to acquire measured data may be used to determine the transient ground fault direction with isolated neutral or resonant grounded power systems.

- Wattmetric method
  (evaluating constant measured data)
- Transient method
  (evaluating transient measured data)

The MiCOM P532 detects faults in cables and lines instantly and reliably.

Thermal over load protection

This function makes it possible to create thermal overload protection for lines. The maximum value of the three phase currents is used to track a first-order thermal image according to IEC 255-8. Tracking of the thermal replica may be based on relative or absolute temperature measurements.

Auto-reclosure control

The auto-reclosure control function operates with threepoles and offers the setting of parameters for reclosure cycles with a preceding high-speed reclosure (HSR) and multiple (max 9) time-delay reclosures (TDR).

Automatic synchronism check

This function, which comes as an optional feature with the MiCOM P532, may be applied together with the automatic or manual (re-) closure control and the close command. With parallel infeed power systems this function assures that only synchronism-checked closing is possible.

Protective signaling

Protective signaling may be used in conjunction with the short circuit direction determination function. A communication link between protection devices can be established through pilot wires or a channel on the PCOMM interface.

If protection devices are located on the feeder of radial systems then protective signaling may be controlled without the short circuit direction determination function.

Circuit breaker monitoring

The circuit breaker monitoring function offers the user various criteria to monitor the wear of CB contacts.

- Calculating the remaining number of switching operations with reference to the CB wear characteristic
- Number of mechanical switching operations made
- Accumulating disconnection current values (linear and squared)
- Accumulating current-time surface integrals of disconnections

A settable threshold is available for each criterion and should the value exceed or drop below this threshold then a respective signal is issued.

Control functions

The control functions featured by the MiCOM P532 have been designed to electrically control up to 6 (10) switchgear units and to monitor their contact position. Switchgear contact positions are acquired via binary signal inputs. Control signals to operate a switchgear unit are issued from output relays provided by an optional binary I/O module X (6I/6O).

The protection device offers full graphic control features when using the graphic display.

The number of external auxiliary devices required is largely minimized by the integration of binary signal inputs operating from any auxiliary voltage, and versatile relay output contacts, by the direct connection option for current and voltage transformers, and by the comprehensive interlocking capabilities.

For user selection the MiCOM P532 features more than 250 pre-defined bay panel types, which include the configuration of binary signal inputs and outputs to control external switchgear and the bay interlock. The setting of these bay panel types may be individually adapted.

In addition, a customized bay panel may be created by applying the bay editor from the PC Access Software MiCOM S1 Studio (module BTC) and downloaded to the MiCOM P532.

The MiCOM P532 will only issue switching commands after checking switching readiness and permissibility, and it will then monitor the propagation time of the switchgear units.

If the protection device detects that a switchgear unit has failed, it signals this information (e.g. by configuration to a LED indicator).

Single-pole operation signals can be acquired though binary signal inputs and they are processed according to their primary significance (e.g. CB readiness). Apart from issuing switching commands, binary outputs may also be triggered by single-pole commands.

Information interfaces

Information is exchanged through the local control panel, the PC interface or the two optional rear communication interfaces.

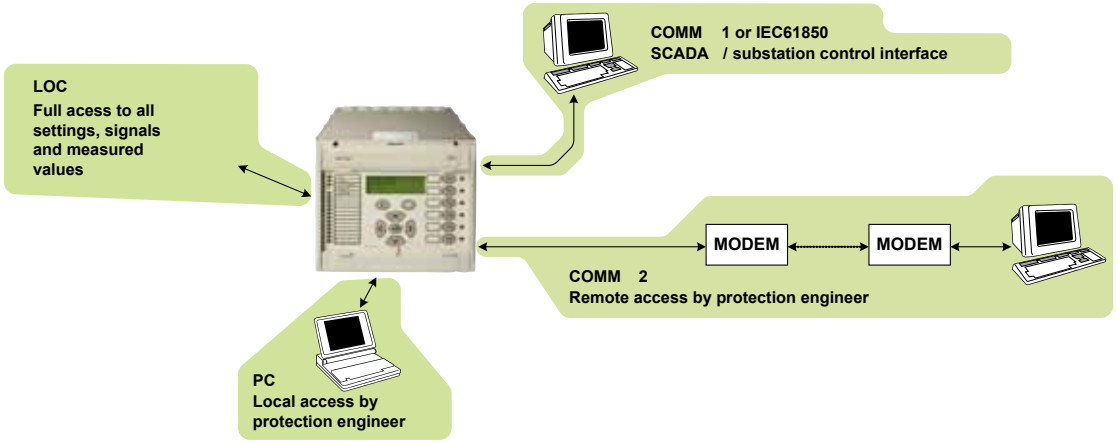
Using one of the two available communication interfaces (communication protocols per IEC 60870-5-103, IEC 60870-5-101, DNP 3.0, MODBUS or Courier) or the IEC 61850 Ethernet interface the digital protection devices can be wired either to the substation control system or a telecontrol system.

The second communication interface (IEC 60870-5-103) is provided for remote access.

External clock synchronization can be accomplished by using one of the protocols or the IRIG B input.

Function keys

When the text HMI is used the MiCOM P532 is fitted with six freely configurable function keys. Either a single function or a menu jump list may be assigned to each function key.



Information interfaces

Proven control functions, trendsetting communications, complete local control panel, only one setting file.

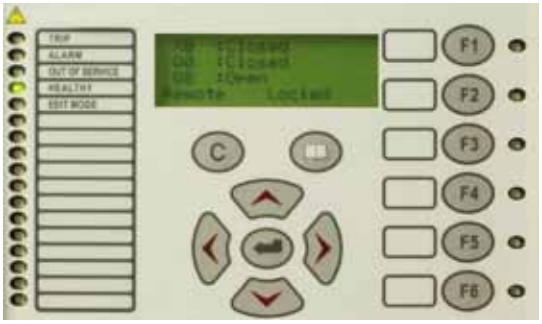
Control and display

The configuration of the text HMI permits the creation of measured value panels for the liquid-crystal-display (LCD), which will appear automatically, depending on the operating state of the power system.

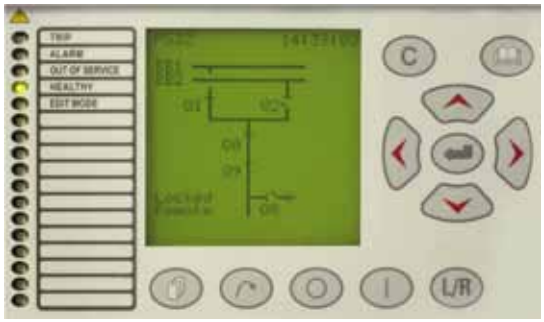
When the control functions are applied, pressing therespective function keys enables an additional bay panel. This displays the current states of the switchgear units on the local control panel.

The graphic HMI's display panels provide a rapid overview of the current sate of the bay.

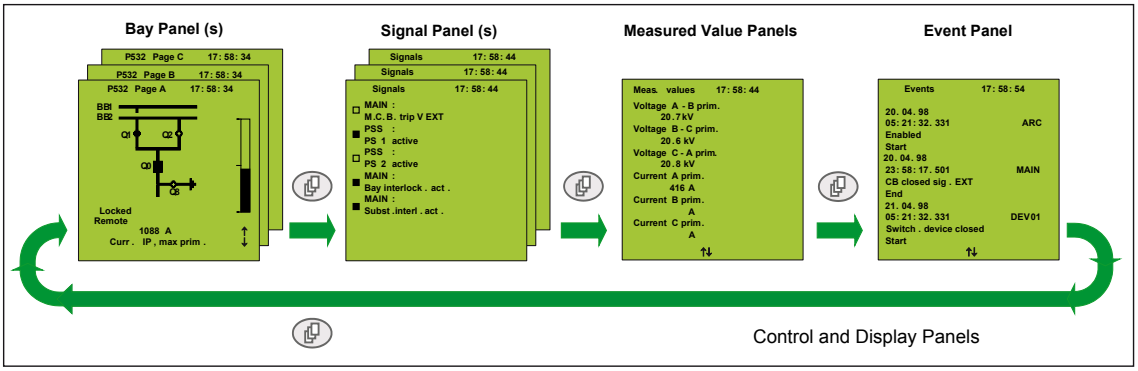
The selected bay is displayed on the bay panel as asingle-phase equivalent circuit diagram showing the current states of the switchgear. This panel is displayed after a system restart or after a permanent reset time period. Additional data such as the position of the local/remote switch, the operating state of the interlocking functions and, as an option, a measured value is displayed as clear text and as a bar chart.

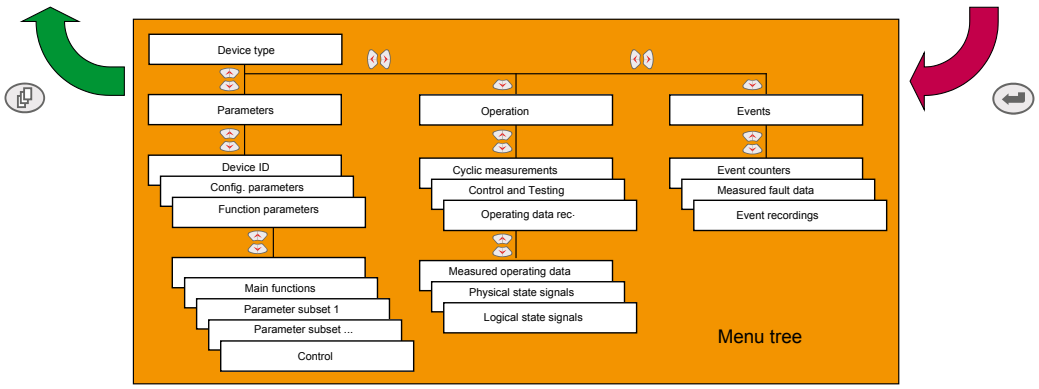


Local control panel with a text HMI



Local control panel with a graphic HMI





Display and control tree with graphic HMI

Device History

- PQ 741: First digital line differential protection device in a compact design. Over 4,000 devices world-wide in operation.
- MiCOM P530C: Digital line differential protection device in the MiCOM range of compact devices. Over 500 devices installed as of 2008.

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