

MiCOM P432 and P439

Distance Protection and Control Units



P439 in case 40TE



P432 or P439 in case 84TE

The MiCOM P432 and P439 are cost effective one-box solutions for integrated numerical distance protection and control.

The broad spectrum of protection functions enables the user to cover a wide range of applications in the area of selective short-circuit protection, ground fault protection and overload protection. They can be applied in all kind of medium-, high- and extra-high-voltage systems. In addition, numerous control functions are available. Thanks to the provision of four setting groups, the devices are readily adapted to varying conditions in system operation.

The control functions are designed for the control of up to six (P439) or ten (P432) electrically operated switchgear units equipped with electrical check-back signaling located in the bay of medium- or high-voltage substations. For the selection of the bay type the devices are provided with over 250 predefined bay types and allow download of customized bay type.

The intuitive user interface and the various communication interfaces allow easy control and monitoring of the switchgear units, simple and comprehensive setting as well as access to readings of extensive recordings. Numerous integrated communication protocols provide interfacing to almost any kind of substation control or SCADA system. Furthermore the integrated InterMiCOM protection interface provides direct end-to-end communication between two protection devices.

The standard 19" modular case of the P432 and P439 with a user-selected number of plug-in modules provide a flexible solution for easy integration of the devices into the substation.

The devices are available for flush mounting as well as wall-surface mounting.



Customer Benefits

- Protection and Control in one box
- Huge number of predefined bay types
- 1A/5A software setting
- Two communication interfaces (for SCADA and RTU)
- Numerous switchable communication protocols (for SCADA interface)

APPLICATION

Distance protection and control units MiCOM P432 and P439 provide a wide range of protection and control functions. The integrated functions reflect the different requirements in system protection and control. The preferred applications are as follows:

- P439: MV systems with 3pole tripping only; less complex bays
- P437: HV and EHV systems with 1pole or 3pole tripping; more complex bays.

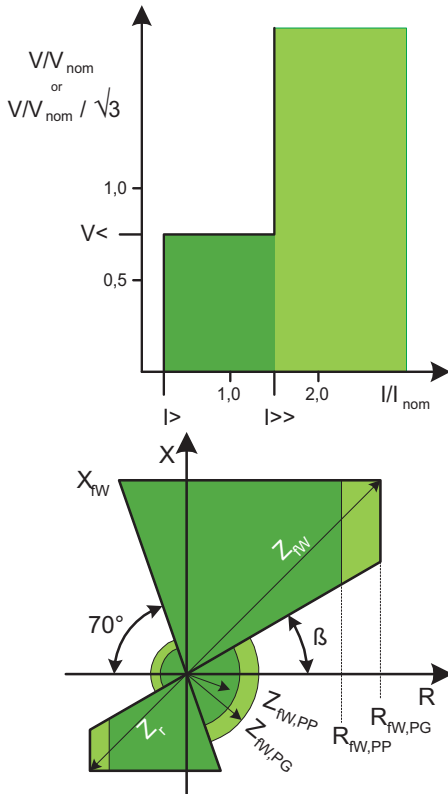
Further options are provided for various protection and control requirements for example increasing the number of switchgear units from 3 to 10 for control and monitoring and selection of automatic synchronism check.

GLOBAL FUNCTIONS

The following global functions are available in the devices:

- Parameter subset selection (4 alternative setting groups)
- Metering
- Operating data recording
- Overload recording incl. overload data acquisition
- Ground fault recording incl. ground fault data acquisition
- Fault recording of all CT/VT inputs and binary events incl. fault measurands (e.g. fault location).

Functions overview		P439	P432
21	DIST Distance Protection (No. of measuring systems)	• (1)	• (3)
	Mutual compensation	-	option
85-21	PSIG Protective signaling (channel aided scheme logic)	•	•
50/27	SOTF Switch on to fault protection	•	•
68	PSB Power swing blocking and out-of-step tripping	•	•
MCMON	Measuring-circuit monitoring (CT/VT supervision)	•	•
BUOC	Backup overcurrent-time protection	•	•
50/51 P,Q,N	DTOC Definite-time overcurrent protection	•	•
51/67 P,Q,N	IDMT Directional Inverse-time overcurrent protection	•	•
67N	GFSC Ground fault (short-circuit) protection (Br.: Directional earth fault protection, DEF)	-	•
85-67N	GSCSG Ground fault (short-circuit) protection signaling (Br.: DEF scheme logic)	-	•
32	P<> Directional power protection	•	-
49	THERM Thermal overload protection	•	•
27/59 P,Q,N	V<> Over-/undervoltage protection	•	•
81 O/U	f<> Over-/underfrequency protection	•	•
	TGFD Transient ground fault direction determination	option	-
	GFDSS Ground fault direct. determ. using steady-state values	•	-
	GFTRP Ground fault tripping	•	-
	GFSIG Ground fault protection signaling	•	-
25	ASC Automatic synchronism check	option	option
79	ARC Auto-reclosing control	3p	1/3p
	LIMIT Limit value monitoring	•	•
	LOGIC Programmable logic	•	•
	DEV Control and monitoring of switchgear units	3 or 6 (option)	3, 6, 10 (option)
	CMD_1 Single-pole commands	•	•
	SIG_1 Single-pole signals	•	•
	ILOCK Bay interlock	•	•
	COUNT Binary counter	•	•
	COMMx 2 comm. interfaces, protection comm. interface InterMiCOM	option	option
	IRIGB IRIG-B input	option	option
	INP/OUTP Binary inputs / output relays (maximum number)	40 / 38	40 / 26
	MEASI/ Analog I/O MEASO (2x 20 mA outputs, 20 mA input, RTD inputs)	option	option



Fault Detection Characteristics

MAIN FUNCTIONS

Main functions are autonomous function groups and can be individually configured or disabled to suit a particular application. Function groups that are not required and have been disabled by the user are masked completely (except for the configuration parameter) and functional support is withdrawn from such groups.

This concept permits an extensive scope of functions and universal application of the device in a single design version, while at the same time providing for a clear and straight-forward setting procedure and adaptation to the protection and control task under consideration.

DISTANCE PROTECTION

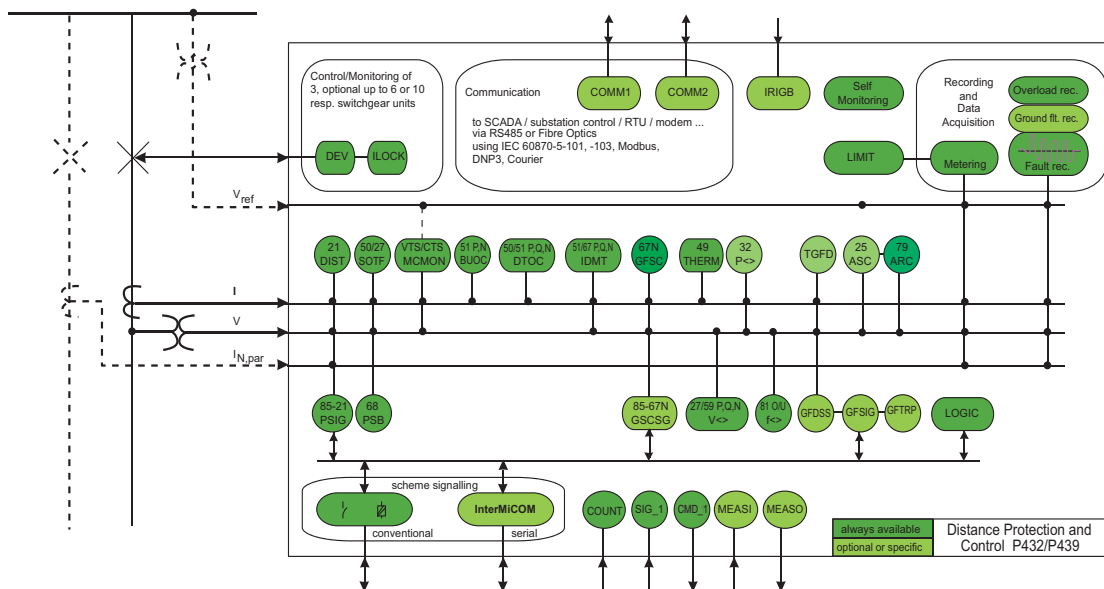
The devices are equipped with elaborate fault detection elements that can be adapted to the individual application. They provide reliable fault detection and fault type determination even under difficult system conditions.

The following criteria are continuously monitored:

- Overcurrent ($I >>$)
- Undervoltage ($V <$)
- Underimpedance with load blinding ($Z <$)
- Ground fault detection adaptable to system grounding.

Functional overview

All fault detection measurement elements operate simultaneously.



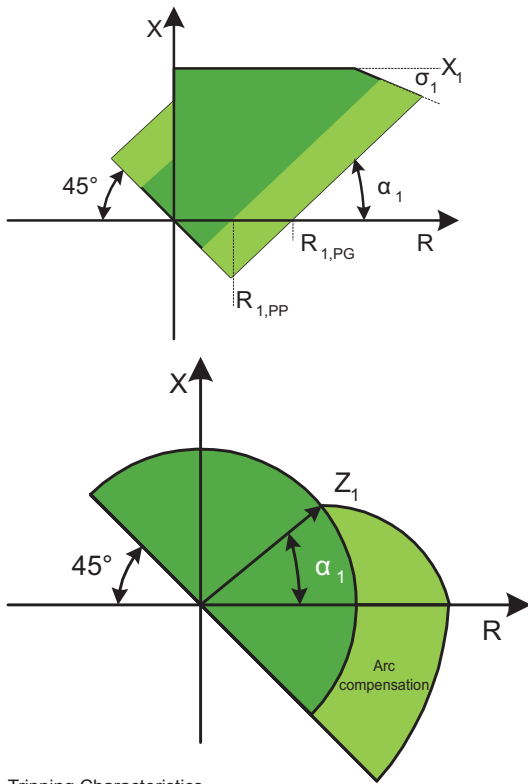
(Description of ANSI code nos. see Functions Overview)

MiCOM P432 and P439 provide a wide range of protection and control functions needs.

Inrush stabilization and fuse failure monitoring (VT circuit supervision) are integrated.

A well proven voltage memory eliminates all problems with directional determination in case of small fault voltage, CVT transients or in series compensated lines applications.

Six distance zones can be set in total. Each zone can be set as forward, backward or non-directional to suit requirements. Zone 1 extension is provided and controlled by integrated functions such as auto-reclosing control or protective signaling or by an external signal. Special zone 4 is provided, to allow auto-reclosing only on the overhead-line section in cable/line systems or to compensate the bundle conductor effect. P432 could optionally be equipped with an additional CT input to measure the residual current of a parallel line to provide mutual coupling compensation.



OVERCURRENT PROTECTION

various multi-stage, partly directional OC elements, with instantaneous or timed operation are provided for complementary protection schemes.

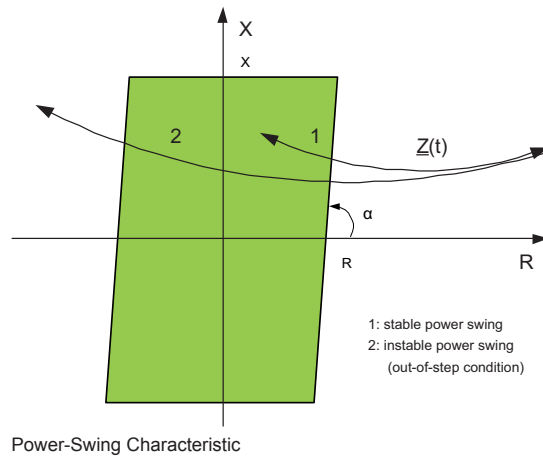
SWITCH ON TO FAULT PROTECTION

Closing of a circuit breaker might inadvertently lead to a short-circuit fault due to a maintenance ground clamp not yet removed, for example. 'Switch on to fault protection' provides an undelayed protective tripping during a settable time after a manual close command has been issued.

POWER SWING BLOCKING / OUT-OF-STEP TRIPPING

Power swings between generators due to severe load variations or system faults may cause measured impedances to enter distance zones. To avoid incorrect tripping, the devices measure the rated change of power to implement blocking for the duration of the swing. In case of short-circuits during a power swing, the blocking is disabled immediately to allow distance elements to operate.

Alternatively an out-of-step tripping feature can be activated which operates either on fast power change or upon detection of instable swings.



MiCOM P432 and P439 for rapid and selective fault clearance in your power system.

GROUND-FAULT PROTECTION

For the determination of the ground-fault direction in isolated or Peterson-coil compensated power systems two proven methods are provided with P439:

- wattmetric method (analysis of steady-state signals), with signaling scheme and trip logic;
- transient method (optional).

A highly sensitive zero-sequence power directional protection is integrated as back-up protection in P432 for high-impedance ground short-circuits in lowimpedance grounded systems. In order to achieve high-speed tripping, the device is equipped with a supplementary ground fault (short-circuit) protection signaling logic providing both, a release (permissive) and blocking scheme.

This scheme logic can be set up in parallel and independently from the distance scheme logic.

PROTECTION INTERFACE INTERMICOM

optional InterMiCOM allows high performance permissive and blocking type unit protection to be configured, plus transfer of any digital status information between line ends. Intertripping is supported too, with channel health monitoring and cyclic redundancy checks (CRC) on the received data for maximum message security.

InterMiCOM provides eight end-to-end signal bits, assignable to any function within a MiCOM relay's programmable logic.

Default failsafe states can be set in case of channel outage.

PROTECTIVE SIGNALING

The distance reach is usually set to values below 100 % line length so as to avoid overlapping with adjacent substations. Teleprotection scheme logic extends the reach of protection to 100 % by a logic operation on the signals received from the remote substation.

Protective signaling can be operated using one of the standard schemes:

- Direct Transfer Trip (DTT)
- Permissive Underreaching Transfer Trip (PUTT)
- Zone Extension
- Permissive Overreaching Transfer Trip (POTT)
- Blocking Scheme (incl. DC loop)
- Reverse Interlocking (busbar protection)

With P432 phase-selective signal transmission is possible.

Where required, additional features as weak infeed trip and echo logic, transient blocking and deblocking can be activated.

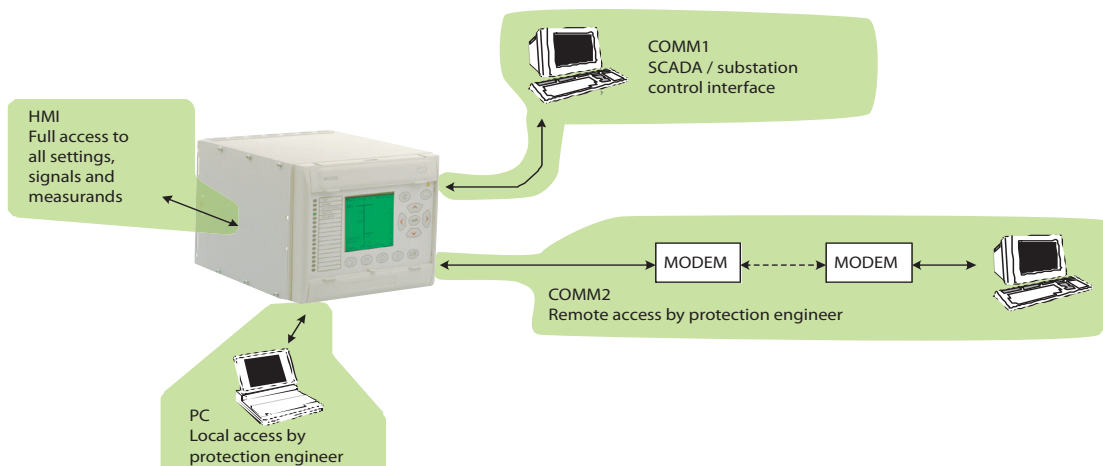
INFORMATION INTERFACES

information exchange is done via the local control panel, the PC interface and two optional communication interfaces.

One of the communication interfaces conforms to IEC 60870-5-103, IEC 60870-5-101, DNP 3.0, Modbus and Courier (IEC 61850 in preparation) and is intended for integration with substation control systems.

The 2nd communication interface conforms to IEC 60870-5-103 and is intended for central settings or remote access.

Clock synchronization can be achieved using one of the protocols or using the IRIG-B signal input.



Information Interfaces

CONTROL FUNCTIONS

The control functions are designed for the control of up to six or 10 resp. electrically operated switchgear units equipped with electrical check-back signaling located in the bay of a medium-voltage substation or a non-complex high-voltage station.

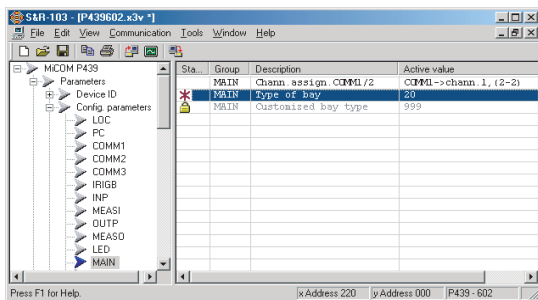
External auxiliary devices are largely obviated through the integration of binary inputs and power outputs that are independent of auxiliary voltages, by the direct connection option for current and voltage transformers and by the comprehensive interlocking capability.

For the selection of the bay type the devices are provided with over 250 predefined bay types. These include the assignment of binary inputs and outputs for the switchgear unit control and monitoring and the interlocking logic.

Additionally, a customized bay type can be created with bay type configurator BTC and downloaded into the devices.

The devices issue switching command outputs with the integration of switching readiness and permissibility tests; subsequently the devices monitor the intermediate position times of the switchgear units. If a switchgear malfunction is detected, this fact will be indicated (e.g. by an appropriately configured LED indicator).

The acquisition of further binary inputs is in the form of single-pole operating signals; they are processed in accordance with their significance for the substation (circuit breaker readiness, for example). In addition to the switching command output, a triggering of binary outputs by single-pole commands is possible.

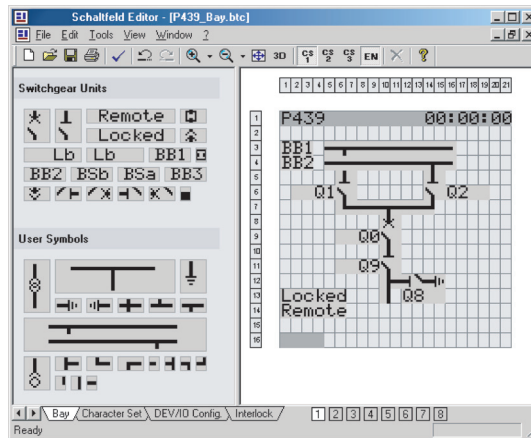


Selection of bay type

Proven control, advanced communication, complete local control, comfortable data handling.

BINARY COUNTER

for the acquisition of a binary count, a binary input may be configured. In the event of loss of operating voltage, the count is stored. Upon the following startup of the unit, counting is continued with the stored value as initial value.



Bay type creation with BTC

CONTROL AND DISPLAY

From the Local Control Panel all data required for operation of the protection and control unit are entered, the data important for system management are read out and the local control of switchgear units is executed.

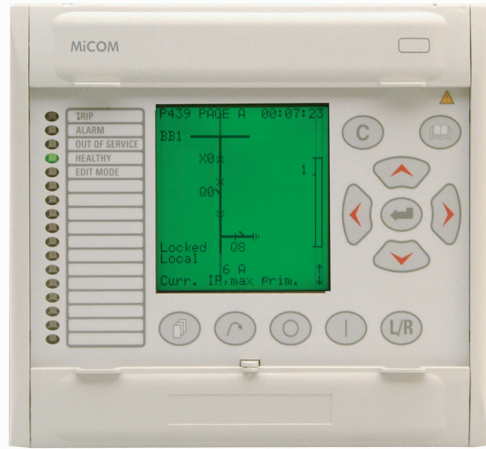
With the help of the Display Panels, the user is able to carry out a quick and up-to-date check of the state of the bay.

On the Bay Panel the selected bay is displayed as a single-pole equivalent network (single line diagram) with the updated switchgear states. Moreover, ancillary information are displayed.

Up to 28 status signals are displayed on the Signal Panels which are activated automatically upon status changes. Moreover, presentation modes for the display of status data and status change information can be selected.

Selected measured values are displayed on the Measured Value Panels. The type of measured values shown (such as measured operating data or measured fault values) will depend on the prevailing conditions in the substation.

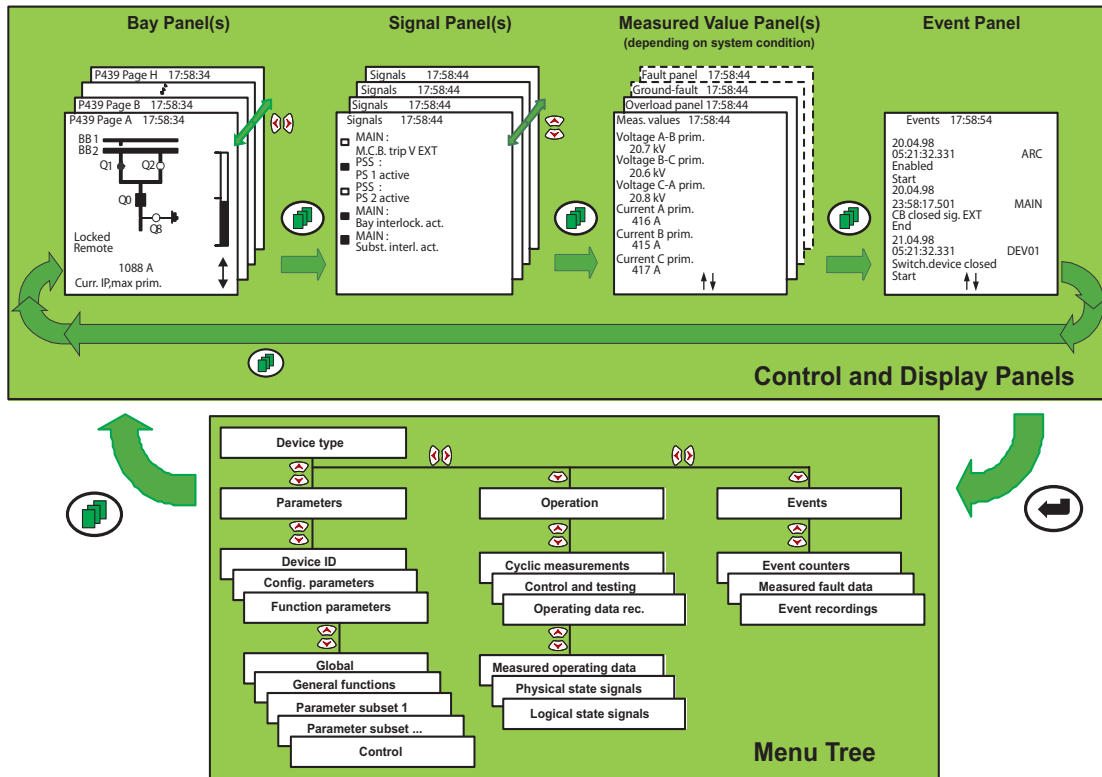
The Event Panel displays the most recent events with time-tagging such as the opening of a switchgear unit.



Local Control Panel Bay

Device track record

- PD 932: first one-box solution for integrated numerical distance protection and control launched in 1998, about 1000 devices installed.
- MiCOM P439: Transformation of PD 932 into MiCOM range with extended functionality, more than 500 devices installed since 2001.
- MiCOM P432: Combination of MiCOM P439 control with MiCOM P437 ehv distance protection, launched in 2003.



Control and Display Panels

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