MiCOM Protection

20, 30 and 40 Series Relays
Key Features

The MiCOM range of relays offers varying levels of functionality and hardware options to best suit the protection requirements, and allows the customer to choose the most cost effective solution for their application.

The 20, 30 and 40 series hardware platforms are the building blocks of the MiCOM protection relay range providing the capability for a wide variety of protection, control, measurement, monitoring and communication functions.

The versatile hardware allows for application in many installations and a common relay management software (MiCOM S1) makes for easy configuration and application.

A standard and simple user interface across the range makes this ideal in any environment, from the more complex bay level control and mimic to the more simple LCD display and interrogation facility.

Numerous integrated communication protocols allow easy interfacing to most substation control or SCADA systems. The majority of MiCOM 30 and 40 series relays can be supplied with ethernet, to allo a full IEC 61850 solution for the substation.

THE MICOM RANGE OFFERS COMPREHENSIVE PROTECTION SOLUTIONS AT ALL POWER SYSTEM LEVELS SUCH AS :

> Generation
> Integrated Generator Protection

> Transmission and Distribution
> Distance Protection
> Line Differential
> Transformer Management
> Busbar Protection
> Stand Alone Breaker Fail Protection
> Directional/Non-Directional Overcurrent
> Feeder Management and One Box Solutions
> Loadshedding
> Voltage & Frequency Protection

> Industrial
> Motor Management
> Interconnection Protection

> Railway
> Feeder Management
> Transformer Management
> Distance Protection

Customer benefits

- One single configuration software - MiCOM S1
- 1A/5A dual rated inputs
- Scalable hardware
- Flexible mounting options
- Standardized user interfaces
- Wide range of communication protocols

AREVA T&D

AREVA

KEY FEATURES

The MiCOM range of relays fulfils the requirements at all voltage levels from LV to EHV for Industrial, Distribution and Transmission Systems.

COMMON FEATURES

- 1A/5A dual rated CT's
- Event and Disturbance Recording
- Various casing and mounting options
- Relays have rear RS 485 port with choice of protocols and front RS 232 for local setting
- A number of auxiliary supply and digital input voltage options

> 20 Series Relays (Px2x)

It will fulfil the basic requirements of industrial, transmission and distribution systems providing simplicity and ease of application in a wide range of installations.

- Scalable solutions where type and quantity of protection features is model dependent
- Simple 'AND' logic equations available on most models
- Compact hardware options for easy installation
- Common functions throughout the range

> 30 Series Relays (Px3x)

Designed to meet the rigorous requirements of MV, HV and EHV systems with particular focus on feeder and transformer protection and control.

- Protection with Bay level control options to facilitate feeder management
- Input/Output quantity selectable based on requirements
- A number of Rear Port hardware options available with a wide range of Protocols selectable via software
- Protection functions available for unearthed/petersen coil earthed systems
- Surface and flush mounted as well as compact case option available in the range
- Full Programmable Scheme Logic

> 40 Series Relays (Px4x)

It will fulfil the protection requirements for a wide market of MV, HV, EHV and industrial systems and offers a wide range of protection functions.

- Full Programmable Scheme logic available with Graphic Configuration Tool for easy setting
- Scalable Input / Output hardware depending on requirements
- Operating voltage selectable via Software for Opto inputs
- Hardware accessories available for easy mounting in racks or panels.

APPLICATIONS

> Px2x Series

The integrated functions reflect the different requirements in system protection. The preferred applications are as follows:

- P12x: Universal Overcurrent protection for main or back-up protection on MV and HV systems
- P22x: Motor Protection Series for LV and MV systems
- P52x: Line Differential protection for MV and HV systems with multiple communication options
- P821 : Dedicated Breaker Failure Protection suitable for EHV, HV and MV systems
- P92x: Voltage and frequency protection suitable for generators, motors and feeders

> Px3x Series

30 Series protection devices provide a wide range of protection and control functions meeting stringent market segments. The range is especially suitable for petersen coil earthing requirements.

The preferred applications are:

- P13x: Feeder management relays suitable for railway, MV and HV systems with various types of earthing practices
- P43x: Distance protection for MV, HV and EHV systems and rail catenary requirements
- P63x: Differential protection for transformers, generators and motors (including railway transformers).

> Px4x Series

40 Series protection devices provide a wide range of protection and control functions and meets the requirements of a wide market segment.

The preferred applications are:

- P14x: Feeder management relay suitable for MV and HV systems
- P24x: Rotating Machine Management relay for application on a wide range of synchronous and induction machines
- P34x: Generator protection for small to sophisticated generator systems and interconnection protection
- P44x: Full scheme Distance protection relays for MV, HV and EHV systems.
- P54x: Line Differential protection relays for HV/EHV systems with multiple communication options as well phase comparison protection for use with PLC.
- P74x: Numerical Busbar protection suitable for application on MV, HV and EHV busbars
- P94x: Frequency protection for load shedding, load restoration and generator abnormal detection

CONTROL

> Programmable scheme logic

Simple logic equations as well as block logic is available in a number of 20 series relays, see figure 1. Powerful graphical logic available in the 30 and 40 series relays allows the user to customize the protection and control functions of the relay. It is also used to program the functionality of the opto-isolated inputs, relay outputs, LED and user alarms.

The Programmable Scheme Logic can be used to implement additional supervision features, such as trip circuit supervision or implement complex logic such as frequency restoration schemes. Schemes have been developed capable of supervising the trip coil and circuit with the circuit breaker open or closed.

The Px40 gate logic includes OR, AND, NOT and majority gate functions, with the ability to invert the inputs and outputs, and provide feedback. A number of general purpose logic timers are also available as well as those timers used to condition the relay contacts. The system is optimized (event driven) to ensure that the protection out-puts are not delayed by the PSL operation.
The Programmable Scheme Logic is configured using the graphical MiCOM S1 PC software, as shown in Figure 2 The Px30 logic can be created using Boolean Equations or a graphical interface as shown in figure 3.
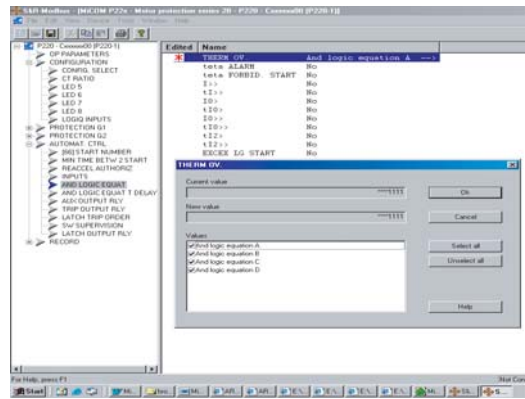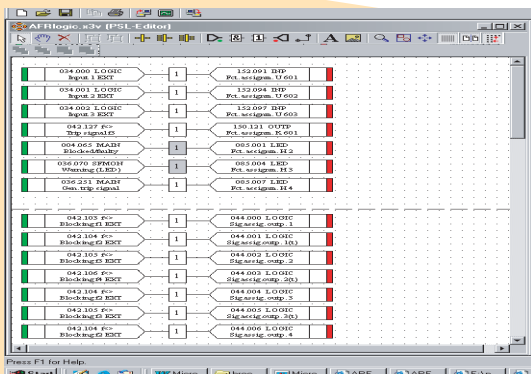
Figure 1 | Simple 'AND' logic for Px20

> Independent Protection Settings Groups

Up to two setting groups are supported in the 20 Series whereas the 30 and 40 series can offer up to four independent setting groups. These can be activated locally, remotely or via a dedicated input and are used to allow for different system operating conditions and where adaptive relaying is applied.

> Measurement & Post Fault Analysis

The MiCOM Range of relays are capable of measuring and storing a wide range of system quantities such as Current, Voltage, Frequency, Power etc. depending on the relay functionality.
All event, fault and disturbance records are time tagged to a resolution of 1ms using the internal real time clock and are stored in non-volatile memory. A supervised lithium battery ensures that the real time clock and records are maintained during auxiliary supply interruptions.

Where relays are communicating to a SCADA system, the protocols' telegrams can be used for external time synchronization or alternatively an optional IRIG-B port is available for accurate time synchronization on all Px30 and Px40 MiCOM relays.
Some relays can also use an opto input to synchronize the relay's clock.

Figure 2 | Programmable logic for Px40

Figure 3

Programmable logic for Px30

> Power System Measurement

A comprehensive set of measurement values including instantaneous and derived values are available on the relays.
These measured values can be displayed on the front LCD display or transferred locally or remotely as per the user requirements.

POST FAULT ANALYSIS

> Event records

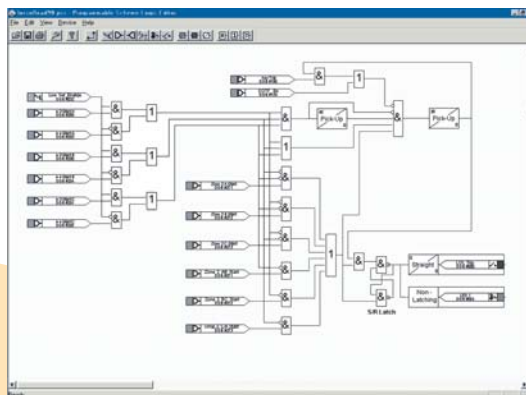These are generated for status changes to logic inputs and outputs, modifications to one or more setting parameters and alarm signals.
All events are time-tagged and stored in chronological order in a cyclic memory where the oldest record is overwritten once the relay's maximum event count is exceeded. These are readily available for viewing on the LCD, or extraction via the communication ports.
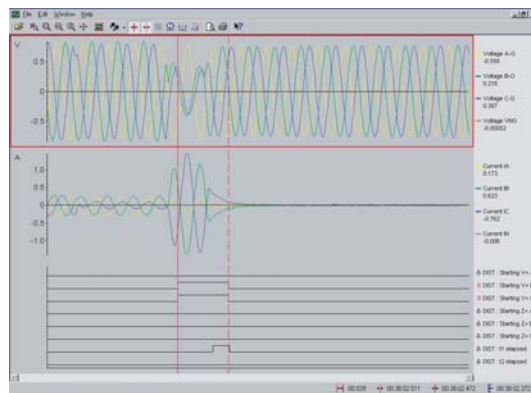
Figure 4 | Oscillography analysis using MiCOM S1 Software for Optimum results

> Fault records

At least 5 records are supported on all relays and for every fault, the following information is captured in the relay records

- A fault number
- The date and time
- The active setting group
- The function that issued the trip
- The magnitude of the current/voltage that gave rise to the trip command

> Disturbance records

The internal disturbance recorder will record the sampled values of all analog input variables such as phase currents and voltages etc. where applicable during a fault. Oscillographic analysis can be performed using MICOM S1 which will provide the means to quickly analyse analog and digital signals on the same time-scale for convenience. Disturbance records can be extracted from the relay via the communication ports and saved in the COMTRADE format.

RELAY COMMUNICATIONS

As standard, a front communication port is available for local access to the relay. An auxiliary rear communication port is available as an option on relays providing an engineering port for easy access to settings, records and measurements for protection engineers. A main rear communications port is also available for interface to a SCADA system. A number of protocols are available as an option for this purpose.
(See cortec code for each relay)

Figure 5 | A typical substation control system
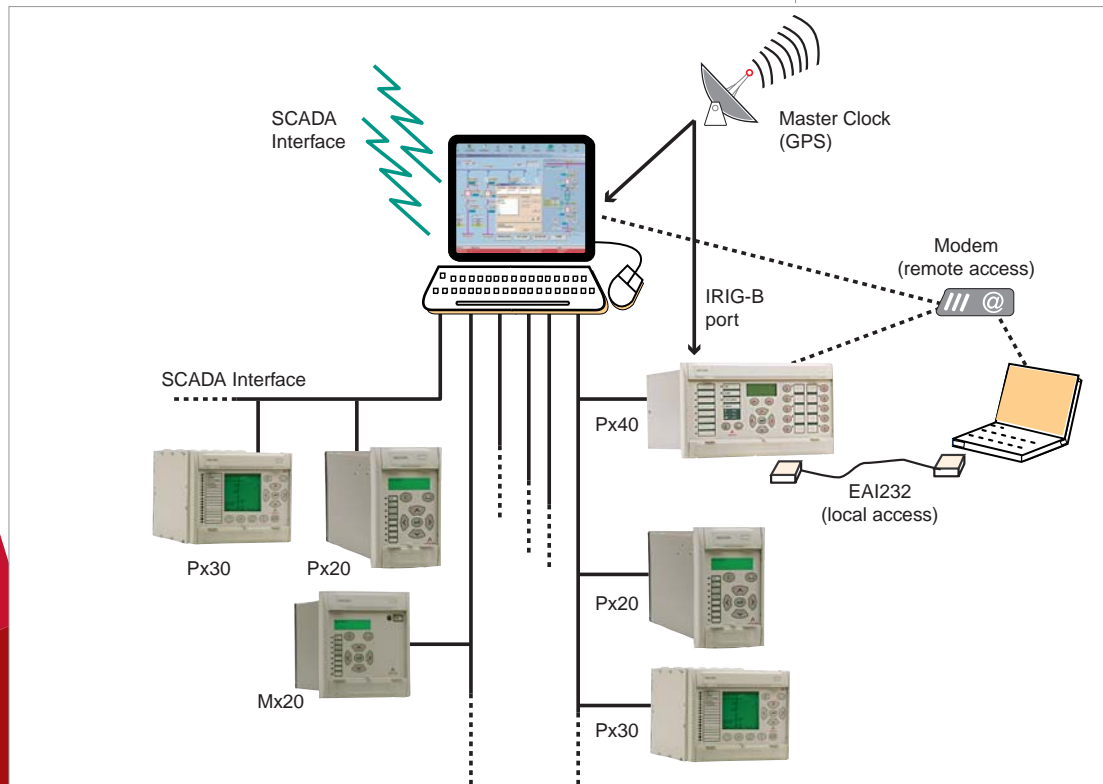
> Local Communication

The front EIA(RS)232 communication port has been designed for use with the MiCOM S1 software and is primarily for configuring the relay settings and programmable scheme logic. It is also used to locally extract event, fault and disturbance record information and can be used as a commissioning tool by viewing all relay measurements simultaneously. In Px20 / Px30 the front EIA(RS)232 is also used to upgrade relay software. In Px40 a separate front parallel port is used for this.

> Rear Communication

The rear communication port is based upon EIA(RS)485 voltage levels and is designed for permanent multidrop connection to network control and data acquisition systems. An optional fiber optic communications port is also supported on the 30 and 40 platforms.

In general, the following protocols are available at ordering or via setting selection on the relays.

- Courier/K-Bus
- Modbus
- IEC 60870-5-103
- DNP3.0

The following protocol is only available on Px30 / Px40 relay models with an Ethernet port currently.

- IEC61850

Fig 5 illustrates the flexibility with which the MICOM range of relays can be integrated into a SCADA system as well as provide engineering data for remote access by utility engineers.

USER INTERFACES

The user interface and menu text are available in English, French, German and Spanish as standard.
Other languages such as for example Russian and Italian are supported on some relays depending on market requirements.
The ability to customize the menu text and alarm descriptions are also supported on Px30 and Px40.

Figure 7 | Compact case user interface

The front panel user interfaces, as shown in Figures 6, 7 & 8 comprise:

(1) A back-lit liquid crystal display (20, 30, 40 series)
Graphic LCD display (30 series only)
(2) Four fixed function LEDs (20, 40 series)
Five fixed function LEDs (30 series)
(3) Up to Four user programmable LEDs (20 series)
Up to Eight user programmable LEDs (40 series)
Twelve user programmable LEDs (30 series)
(4) Menu navigation and data entry keys.
(5) "READ" and "CLEAR" keys for viewing and reset of alarms
(6) An upper cover identifying the product name, which may be raised to view full product model number, serial number and rating information.
(7) A lower cover concealing the front EIA(RS)232 port, download/monitor port and battery compartment. Cover not available on compact case.
(8) Facility for fitting a security seal
(9) Bay control keys up to 6 bays control (30 series)
(10) Programmable Function keys (compact case)

Figure 6 | Px40 series user interface

User Language options that provide true global convenience

Figure 8 | Px30 series user interface with bay control
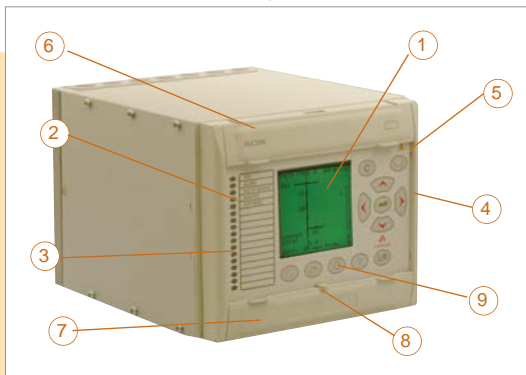
SELF MONITORING

Comprehensive Self monitoring procedures within the device ensure that internal hardware and software errors are detected thus ensuring a high degree of reliability. Automatic tests are performed during start-up and a cyclic self monitoring tests are performed during operation. Any deviations are stored in non-volatile memory and the result of the fault diagnosis determines whether a blocking of the device will occur or whether an alarm is only issued.

MECHANICAL DESCRIPTION

> Cases

The MiCOM series relays are housed in a specially designed case providing a high density of functionality within the product. Communication ports and model/serial number information is concealed by upper and lower covers.

Physical protection of the front panel user interface and prevention of casual access is provided by an optional transparent front cover, which can be fitted or omitted according to choice, since the front panel has been designed to IP52 protection against dust and water The cases are suitable for either rack or panel mounting as shown in Fig.9.
An option for surface mounting is also supported on the 30 series range and a compact case option is available on a few 20 and 30 series relays for installations with space limitations.

Taking into account the differing case widths -relays can be combined with or without the use of standard blanking plates to form a complete 19" mounting. This saves space and allows for a neat installation.

> Wiring

External connections are made via ring type terminal on all MiCOM relay except on the compact case. These take pin type terminals along with the 30 series relays as an option.
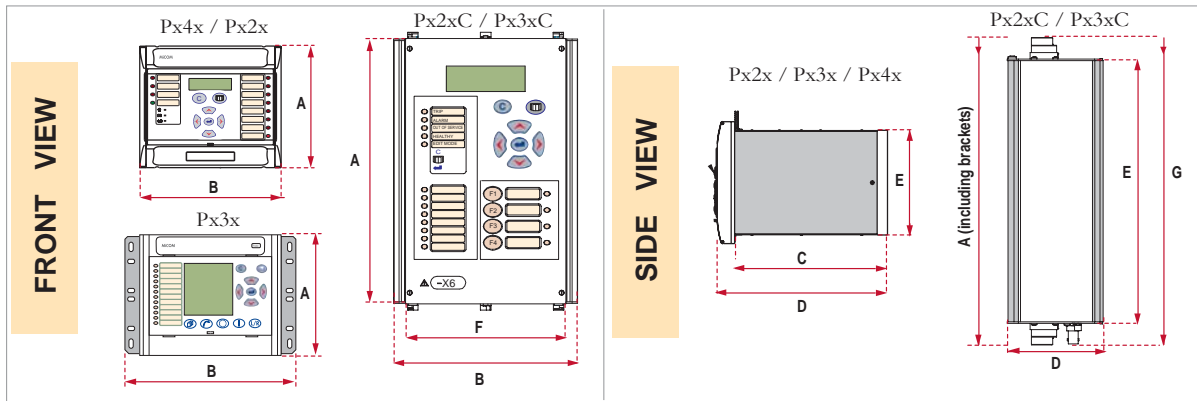
Figure 9 | Typical case dimensions

Typical case dimensions Table		A	B	C	D	E	F	G
Px20	20TE	177	103	240 (inc. wiring)	270 (inc. wiring)	157.5		
Px20	30TE	177	155	139,8 223	166,4 249,6	155.2 156		
Px30	40TE	184.5	213.4	227.9	253.6	177.5		
Px30	40TE rack	184.5	260.2	227.9	253.6	177.5		
Px30	84TE	184.5	434.8	227.9	253.6	177.5		
Px30	84TE rack	184.5	481.6	227.9	253.6	177.5		
Px30	40TE surface	184.5	260.2		257.1	177.5		
Px30	84TE surface	184.5	481.6		257.1	177.5		
Px40	40TE	177	206	240 (inc. wiring)	270 (inc. wiring)	157.5 max		
Px40	60TE	177	309.6	240 (inc. wiring)	270 (inc. wiring)	157.5 max		
Px40	80TE	177	413.2	240 (inc. wiring)	270 (inc. wiring)	157.5 max		
Px40	80TE rack	177	483	240 (inc. wiring)	270 (inc. wiring)	157.5 max		
Px20C/ Px30C	compact	294.4	175.6		88.5	253	162.5	294.4
Px20C/ Px30C	Compact incl. brack.	310	175.6		88.5	253	162.5	294.4

Note: Maximum sizes for guidance only, for specific product information please check the relevant product documentation. (All dimensions in mm)

TECHNICAL DATA

> Power supplies

A wide range of power supply options are available at the ordering stage.

	Nominal Voltage Vnom.	Operate Range (V)	
		DC	AC
Px20	24- 60 DC	19.2-72	-
	48-150 DC	38.4-180	-
	130-250 DC	104-300 DC	-
	100- 250 AC	-	80-275
	125-250 DC	1 00-300 DC	-
	100- 250 AC	-	80-275 AC
Px30	24 DC	19-29	-
	48-250 DC	38-300	100-230
Px40	24-48 DC	19-65	-
	48-125 DC	37-150	24-110
	110-250	87-300	80-265

> Digital Inputs

A wide range of opto input voltages are supported throughout the range

	Auxiliary Voltage	Digital Operating range (V)
Px20	24-60 DC	15.2-60 DC
	48-150 DC	25.6-180 DC
	130-250 DC/ 100-250 AC	38.4-300 DC/38.4-275 AC
	125-250 DC/ 100-250 AC	84-174 DC
	48-150 DC	25.6-180 (AC immune)
	130-250 DC	38.4-300 (AC immune)
Px30	**Thresholds**	
	Standard Variant	
	> 18 (Uaux. 24-250V DC)	
	Further Options	
	> 73V (67% of Uaux. 110V DC)	
	> 90V (60-70% of Uaux. 125/150V DC)	
	> 146V (67% of Uaux. 220V DC)	
	> 155V (60-70% of Uaux. 220/250V DC)	
Px40	**Vmin/Vmax thresholds**	
	24/27, 30/34, 48/54, 110/125 and 220/250 (software selectable)	

General Series Data	Px20	Px20C	Px30	Px30C	Px40
Frequency 50/60Hz	X	X	X	X	X
Dual rated 1A/5A	X	X	X	X	X
CT thermal ratings continuous: 4 Inom for 10s: 30 Inom for 1s: 100 Inom	X	X	X	X	X
Opto Inputs	max 8	max 7	max. 34	max 2	max. 24
Output Contacts	max 9.	max 8	max 46	max 8	max. 46
Carry: continuous	5A	5A	5A	5A	10A
Make and carry	30A for 3s	30A for 3s	30A for 0.5s	30A for 0.5s	30A for 3s
LED Indication (freely programmable)	8 (4)	8 (4)	17 (12)	17 (12)	12 (8)
Function Keys / Hot Keys	No	4	No	4	10 functions/2 hotkeys (available on some models)
Settings Groups	2	2	4	4	4 (2)
Fault Records	5	5	8	8	5
Event Records	75	75	200	100	250-512
Disturbance Records	5 (15s max)	8 (24s max)	8 (16.4 s max)	8 (16.4 s max)	75 s max.
Programmable logic	Simple 'AND' logic (available on some models)	Simple 'AND' logic	Fully programmable	Fully programmable	Fully programmable
IRIG B	No	No	Option	Option	Option
LCD Display	Alphanumeric	Alphanumeric	Alphanumeric / Graphical (some models only)	Alphanumeric	Alphanumeric
Front Port (RS 232)	Yes(most models)	Yes	Yes	Yes	Yes
Rear Port	Yes	Yes	Yes, 2nd rear port option	Yes, 2nd rear port option	Yes, 2nd rear port option
Courier	EIA(RS)485 (available on some models)	No	EIA(RS)485 or fiber	EIA(RS)485 or fiber	K-Bus/ EIA(RS) 485 or fiber (some models only)
Modbus	EIA(RS)485 (available on some models)	EIA(RS)485/Glass fiber	EIA(RS)485 or fiber	EIA(RS)485 or fiber	EIA(RS) 485 or fiber (some models only)
IEC 60870-5-103	EIA(RS)485	EIA(RS)485/Glass fiber	EIA(RS)485 or fiber	EIA(RS)485 or fiber	EIA(RS) 485 or fiber (some models only)
IEC 60870-5-101	No	No	EIA(RS)485 or fiber	EIA(RS)485 or fiber	No
DNP3.0	EIA(RS)485 (available on some models)	No	EIA(RS)485 or fiber	EIA(RS)485 or fiber	EIA(RS) 485 or fiber (some models only)
IEC 61850	No	No	Available on some models	No	Available on some models
One Box Bay Control with Mimic	No	No	Yes (available on some models)	No	No
Terminals	Ring	Pin	Pin or Ring Type	Pin	Ring

MiCOM Series Data

OVERCURRENT AND FEEDER MANAGEMENT RELAYS

Device		P120	P121	P122	P122C	P123	P124 Self Power	P124 Dual Power	P125	P126	P127	P130C	P132	P138 Rail	P139	P141	P142	P143	P144	P145
CT Inputs		1	4	4	4	4	4	4	1	4	4	4	4	2	4	5	5	5	5	5
VT inputs		-	-	-	-	-	-	-	1	1	3	3	4/5	1	4/5	3	3	3/4	4[2]	3/4
Opto Inputs (max)1		2	2	3	7	5	-	5	4	7	7	2	40	16	40	8	16	32	16	32
Output Contacts (max)1		5	5	7	8	9	2	7	7	9	9	8	32	24	32	7	15	30	15	32
Output for Striker Triggering		-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-
Magnetic Flags		-	-	-	-	-	X	X	-	-	-	-	-	-	-	-	-	-	-	-
RTDs (max. option)		-	-	-	-	-	-	-	-	-	-	-	9	1	9	-	-	-	-	-
Analogue I/O (max. option)		-	-	-	-	-	-	-	-	-	-	-	1/2	1/2	1/2	-	-	-	-	-
Function Keys/Hotkeys		-	-	-	X	-	-	-	-	-	-	X	X	-	X	X	X	X	X	X
Bay Control & Monitoring		-	-	-	-	-	-	-	-	-	-	-	X	-	X	-	-	-	-	-
- with Mimic		-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-
Interlocking Logic		-	-	-	-	-	-	-	-	-	-	-	X	-	X	X	X	X	X	X
Protection																				
1 Phase or Earth overcurrent	50/51P/N	X	-	-	-	-	-	-	X	-	-	-	-	-	X	-	-	-	-	-
3 Phase overcurrent	50/51P	-	X	X	X	X	X	X	-	X	X	X	X	-	X	X	X	X	X	X
Ground fault	50/51N	-	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Phase directional	67P	-	-	-	-	-	-	-		X	X	X	X	-	X	X	X	X	X	X
Ground Fault directional	67N	-	-	-	-	-	-	-	X	X	X	X	X	X	X	X	X	X	X	X
Sensitive directional earthfault	67N	-	-	-	-	-	-	-	X	X	X	-	-	-	-	X	X	X	X	X
Transient Ground Fault directional	67N	-	-	-	-	-	-	-	-	-	-	-	X	-	X	-	-	-	-	-
Wattmetric earthfault	67W	-	-	-	-	-	-	-	X	X	X	X	X	-	X	X	X	X	X	X
Neutral admittance	YN	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	X	X	X	X
Restricted earthfault	64	X	X	X	-	X	-	-	X	X	X	-	-	-	-	X	X	X	X	X
Voltage controlled overcurrent	51V	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	X	X	X	X
Negative sequence overcurrent	46	-	-	X	X	X	-	X	-	X	X	X	X	-	X	X	X	X	X	X
Thermal overload	49	-	-	X	X	X	X	X	-	X	X	X	X	X	X	X	X	X	X	X
Undercurrent	37	-	-	X	X	X	-	-	X	X	X	X	X	-	X	X	X	X	X	X
Over/Under voltage	27/59	-	-	-	-	-	-	-	-	-	X	X	X	X	X	X	X	X	X	X
Residual over voltage	59N	-	-	-	-	-	-	-	X	X	X	X	X	-	X	X	X	X	X	X
Negative sequence overvoltage	47	-	-	-	-	-	-	-	-	-	-	-	X	X	-	X	X	X	X	X
Over/Under frequency	81O/U	-	-	-	-	-	-	-	-	-	-	-	X	X	X	X	X	X	X	X
Rate of change of frequency	87R	-	-	-	-	-	-	-	-	-	-	-	X	X	-	X	X	X	X	X
Incomplete sequence relay	48	-	-	-	-	-	-	-	-	-	-	-	X	X	X	-	-	-	-	-
Master sequence device	34	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-
Lock-out	86	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Directional Power	32	-	-	-	-	-	-	-	-	-	-	-	X	X	X	-	-	-	-	-
Circuit breaker failure	50BF	-	-	X	X	X	-	X	-	X	X	X	X	X	X	X	X	X	X	X
Motor	49LR	-	-	-	-	-	-	-	-	-	-	-	X	X	X	-	-	-	-	-
Startup Monitoring	66	-	-	-	-	-	-	-	-	-	-	-	X	X	X	-	-	-	-	-
Autoreclose	79	-	-	-	-	X	-	X	-	X	X	X	X	-	X	-	-	X	X	X
Check synchronising	25	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	X	-	X
Broken conductor	46BC	-	-	X	X	X	-	X	-	X	X	-	-	-	-	X	X	X	X	X
Voltage/Current transformer supervision	VTS/CTS	-	-	-	-	-	-	-	-	-	-	-	X	X	-	X	X	X	X	X
Cold load pick-up		-	-	X	X	X	-	X	-	X	X	X	X	-	X	X	X	X	X	X
Inrush blocking		-	-	-	-	-	-	-	-	-	-	-	X	X	X	-	-	-	-	-
Switch on to fault	SOTF	-	-	-	-	X	-	-	-	-	-	X	X	X	-	X	X	X	X	X
Circuit breaker monitoring		-	-	X	X	X	-	X	-	X	X	-	-	-	-	X	X	X	X	X
Trip Circuit Supervision	TCS	-	-	X	X	X	-	X	-	X	X	-	X	-	X	X	X	X	X	X
Limit value monitoring		-	-	-	-	-	-	-	-	-	-	-	-	X	X	-	-	-	-	-
Protective Signalling	85	-	-	-	-	-	-	-	-	-	-	-	X	X	X	-	-	-	-	-
InterMicom		-	-	-	-	-	-	-	-	-	-	-	X	X	X	-	-	-	-	-

1. Please note that some relays may have a limit on max. I/O when used as a combination.
2. 3V0 measured input and allows vee connected VTs.

MOTOR AND GENERATOR MANAGEMENT RELAYS

	Device	P220	P225	P226C	P241	P242	P243	P341	P342	P343	P344
CT Inputs		4	4	4	4	4	7	4	5	8	8
VT inputs		-	1	1	3	3	3	4	4	4	5
Opto Inputs (max)[1]		5	6	7	8	16	16	16	24	32	32
Output Contacts (max)[1]		6	6	8	7	16	16	15	24	32	32
RTDs/thermistors (option)		6/0 or 4/2	10/3	-	10/0	10/0	10/0	-	10/0	10/0	10/0
Analogue I/O (option)		0/1	0/2	-	4/4	4/4	4/4	4/4	4/4	4/4	4/4
Function Keys/Hotkeys		-	-	X	-	-	-	X	X	X	X
Interlocking Logic		-	-	-	X	X	X	X	X	X	X
Protection											
Motor Protection											
- Short circuit	50/51	X	X	X	X	X	X				
- Motor Differential	87M	-	-	-	-	-	X	-	-	-	-
- Locked Rotor	50S/51LR/51S	X	X	X	X	X	X	-	-	-	-
- Reverse Power	32R	-	-	-	X	X	X	-	-	-	-
- Reacceleration	27LV	X	X	X	-	-	-	-	-	-	-
- Startup Monitoring/Excessive long start	66/48/51	X	X	X	X	X	X	-	-	-	-
- Negative sequence overvoltage	47	-	-	-	X	X	X	-	-	-	-
- Out of Step	55	-	-	-	X	X	X	-	-	-	-
- Loss of load	37	X	X	X	X	X	X	-	-	-	-
- Undercurrent	37P/37N	X	X	X	X	X	X	-	-	-	-
- Unbalance/Lock-out	30/46/86	X	X	X	X	X	X	-	-	-	-
- Speed switch inputs	14	X	X	X	X	X	X				
Generator Protection											
- Generator Differential	87G	-	-	-	-	-	-	-	-	X	X
- Interturn/split phase	50DT	-	-	-	-	-	-	-	-	X	X
- Underimpedance	21	-	-	-	-	-	-	-	X	X	X
- Pole Slipping	78	-	-	-	-	-	-	-	-	X	X
- Directional Power	32L/O/R	-	-	-	-	-	-	X	X	X	X
- Loss of Field	40	-	-	-	-	-	-	-	X	X	X
- Restricted earthfault	64	-	-	-	-	-	-	X	X	X	X
- 100% Stator earth fault (3rd harmonic)	27TN	-	-	-	-	-	-	-	-	X	X
- Overfluxing	24	-	-	-	-	-	-	-	X	X	X
- Unintentional energisation at standstill	50/27	-	-	-	-	-	-	-	X	X	X
- Voltage dependent O/C	51V	-	-	-	-	-	-	-	X	X	X
Ancillary Functions											
Phase overcurrent	50/51P	X	X	X	X	X	X	X	X	X	X
Phase directional	67P	-	-	-	-	-	-	X	X	X	X
Ground fault	50N/51N	X	X	X	X	X	X	X	X	X	X
Ground Fault directional	67N	-	-	-	-	-	-	X	-	-	-
Sensitive directional earthfault	67N	-	-	-	X	X	X	-	X	X	X
Wattmetric earthfault	64N/32N	-	-	-	X	X	X	X	X	X	X
Negative sequence overcurrent	460C	-	X	X	X	X	X	-	X	X	X
Negative sequence thermal	46T	-	-	-	-	-	-	-	X	X	X
Thermal overload	38/49	X	X	X	X	X	X	X	X	X	X
Under/Over voltage	27/59	-	X	X	X	X	X	X	X	X	X
Residual over voltage	59N	-	-	-	X	X	X	X	X	X	X
Negative sequence overvoltage	47	-	-	-	-	-	-	X	X	X	X
Under frequency	81U	-	-	-	X	X	X	X	X	X	X
Over frequency	81O	-	-	-	-	-	-	X	X	X	X
Turbine abnormal frequency	81AB	-	-	-	-	-	-	-	X	X	X
Voltage vector shift	dVθ	-	-	-	-	-	-	X	-	-	-
Rate of change of frequency	81R	-	-	-	-	-	-	X	-	-	-
Circuit breaker failure	50BF	-	X	X	X	X	X	X	X	X	X
Circuit breaker monitoring		X	X	X	X	X	X	X	X	X	X
Trip Circuit Supervision	TCS	X	X	X	X	X	X	X	X	X	X

1. Please note that some relays may have a limit on max. I/O when used as a combination.

Device		P430C	P432	P433	P435	P436 Rail	P437	P438 Rail	P439	P441	P442	P443	P444	P445
CT Inputs		4	4/5	4	4	2	4/5	3	4	4	4	4	4	4
VT inputs		4	4/5	4	4/5	1	4/5	2	4/5	4	4	4	4	4
Opto Inputs(max)[1]		2	46	16	28	28	28	28	34	8	16	24	24	24
Output Contacts(max)[1]		8	32	30	46	46	46	46	20	14	21	32	46	32
RTDs (option)		-	1	1	1	1	1	1	1	-	-	-	-	-
Analogue I/O (option)		-	1/2	1/2	1/2	1/2	1/2	1/2	1/2	-	-	-	-	-
Function Keys/Hotkeys)		X	-	-	-	-	-	-	-	X	X	X	X	X
Bay Control & Monitoring with Mimic		-	X	-	-	-	-	-	X	-	-	-	-	-
Interlocking Logic		X	X	-	-	-	-	-	X	X	X	X	X	X
Protection														
Distance Protection														
- Distance	21/21N	X	X	X	X	X	X	X	X	X	X	X	X	X
- Autoreclose	79	3 pole	X	-	X	-	-	-	-	X	X	-	-	-	X
		1/3 pole	-	X	-	X	-	X	-	-	-	X	X	X	-
- Power Swing Blocking	78	X	X	X	X	-	X	-	-	X	X	X	X	-
- Out of step tripping	68	-	X	X	X	-	X	-	-	-	-	-	-	-
- Check synchronising	25	-	X		X	-	X	-	X	X	X	X	X	X
- Directional Power	32	X	X	X	X	-	-	-	X	-	-	-	-	-
- Switch on-to fault	50/27	X	X	X	X	X	X	X	X	X	X	X	X	X
- Mutual Compensation		-	X	-	-	-	X	-	-	X	X	X	X	-
- **Rail Catenary Protection**	HZ	-	-	-	-	16 2/3	-	25/50/60	-	-	-	-	-	-
- Defrost Protection		-	-	-	-	-	-	X	-	-	-	-	-	-
- Train startups	di/dt,dv/dt,dΦ/dt	-	-	-	-	X	-	X	-	-	-	-	-	-
Ancillary Functions														
Phase overcurrent	50/51P	X	X	X	X	X	X	X	X	X	X	X	X	X
Phase directional	67P	X	X	X	X	-	X	X	X	X	X	X	X	X
Delta directional comparison	$\Delta I/\Delta V$	-	-	-	-	-	-	-	-	-	-	X	-	-
Ground fault	50/51N	X	X	X	X	-	X	-	X	X	X	X	X	X
Ground Fault directional	67N	X	X	X	X	-	X	-	X	X	X	X	X	X
Transient Ground Fault directional	67N	-	X	X	X	-	-	-	X	-	-	-	-	-
Sensitive directional earthfault	67N	-	-	-	-	-	-	-	X	-	-	-	-	-
Wattmetric earthfault	64N/32N	-	-	-	-	-	-	-	-	X	X	-	X	-
Negative sequence overcurrent	46	X	X	X	X	-	X	-	X	X	X	X	X	X
Directional negative sequence	46/67	X	X	X	X	-	X	-	X	X	X	X	X	X
Thermal overload	49	X	X	X	X	X	X	X	X	X	X	X	-	X
Under/Over voltage	27/59	X	X	X	X	X	X	X	X	X	X	X	X	X
Residual over voltage	59N	X	X	X	X	-	X	-	X	-	-	X	-	X
Over/Under frequency	81U	X	X	X	X	-	X	-	X	-	-	-	-	-
Rate of change of frequency	81R	X	X	X	X	-	X	-	X	-	-	-	-	-
Circuit breaker failure	50BF	X	X	X	X	X	X	X	X	X	X	X	X	X
Broken Conductor	46BC	-	-	X	X	-	X	-	X	X	X	X	X	X
Stub Bus Protection	50ST	X	X	X	X	X	X	-	X	X	X	X	X	X
Voltage/Current transformer supervision	VTS/CTS	X	X	X	X	X	X	X	X	X	X	X	X	X
Capacitive voltage transformer supervision	CVTS	-	-	-	-	-	-	-	-	X	X	-	X	-
Channel Aided Scheme Logic	85	X	X	X	X	-	X	-	X	X	X	X	X	X
Trip Circuit Supervision	TCS	X	X	X	X	X	X	X	X	X	X	X	X	X
InterMicom		X	-	X	X	-	X	-	X	-	X	X	X	X

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LINE DIFFERENTIAL, TRANSFORMER AND BUSBAR PROTECTION RELAYS

	Device	P521	P541	P542	P543	P544	P545	P546	P547	P630C	P631	P632	P633	P634	P741	P742	P743
CT Inputs		4	4	4	5	9	5	9	4	6	6	8	12	15	4	4	4
VT inputs		-	-	-	4	3	4	3	-	-	-	1	1	1	-	-	-
Opto Inputs(max) [1]		5	8	16	16	16	24	24	8	2	4	34	40	34	8	16	24
Output Contacts(max) [1]		8	7	14	14	14	32	32	8	8	14	22	30	22	8	8	21
Analogue I/O(option)		-	-	-	-	-	-	-	-	-	-	1/2	1/2	1/2	-	-	-
RTDs (option)		-	-	-	-	-	-	-	-	-	-	1	1	1	-	-	-
Function Keys/Hotkeys		-	X	X	X	X	X	X	X	X	-	-	-	-	-	-	-
Interlocking Logic		-	X	X	X	X	X	X	X	X	-	-	-	-	-	-	-
Protection																	
Line Differential	87P	X	X	X	X	X	X	X	-	-	-	-	-	-	-	-	-
- 2 terminal		X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
- 2/3 terminal		-	X	X	X	X	X	X	-	-	-	-	-	-	-	-	-
- FO signalling		X	X	X	X	X	X	X	-	-	-	-	-	-	-	-	-
- Metallic signalling		X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
- SDH/Sonet networks		-	-	-	X	X	X	X	-	-	-	-	-	-	-	-	-
- In-Zone transformer		X	X	X	X	-	X	-	-	-	-	-	-	-	-	-	-
- 2[nd]harmonic restraint		X	X	X	X	-	X	-	-	-	-	-	-	-	-	-	-
- Vector Compensation		X	X	X	X	-	X	-	-	-	-	-	-	-	-	-	-
- Transient Bias (CT saturation)		X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
- 2 breaker configuration		-	-	-	-	X	-	X	-	-	-	-	-	-	-	-	-
- Direct/Permissive Intertripping		X	X	X	X	X	X	X	-	-	-	-	-	-	-	-	-
Phase Comparison	87PC	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-
- PLC signalling		-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-
Transformer Differential	87P	-	-	-	-	-	-	-	-	X	X	X	X	X	-	-	-
- windings		-	-	-	-	-	-	-	-	2	2	2	3	4	-	-	-
- Restricted earth fault	87G/ 64	-	-	-	-	-	-	-	-	-	-	2	3	3	-	-	-
- overfluxing/5th harmonic		-	-	-	-	-	-	-	-	X	X	X	X	X	-	-	-
- overexcitation	24	-	-	-	-	-	-	-	-	-	-	X	X	X	-	-	-
- 2nd harmonic restraint		-	-	-	-	-	-	-	-	X	X	X	X	X	-	-	-
Busbar Protection	87BB	-	-	-	-	-	-	-	-	-	-	-	-	-	X	X	X
- Central unit - up to 28 feeders		-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-
- Peripheral units - 8 zones		-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	X
- Phase segregated differential - 8 zones	87P	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-
- Sensitive earth fault differential - 6 zones	87N	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-
- Check Zone – 8 zones	87CZ	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-
- CT supervision	CTS	-	-	-	-	-	-	-	-	-	-	-	-	-	X	X	X
- CT Saturation Detection		-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	X
- Fibre optic signalling		-	-	-	-	-	-	-	-	-	-	-	-	-	X	X	X
Ancillary Functions																	
Phase overcurrent	50/51P	X	X	X	X	X	X	X	X	X	X	X	X	X	-	X	X
Phase directional	67P	-	-	-	X	X	X	X	-	-	-	-	-	-	-	-	-
Ground fault	50/51N	X	X	X	X	X	X	X	X	X	X	X	X	X	-	X	X
Ground Fault directional	67N	-	-	-	X	X	X	X	-	-	-	-	-	-	-	-	-
CT supervision	CTS	-	-	-	X	X	X	X	-	-	X	X	X	X	X	X	X
Sensitive directional earthfault	67N	-	-	-	X	X	X	X	-	-	-	-	-	-	-	-	-
Wattmetric earth fault	64W	-	-	-	X	X	X	X	-	-	-	-	-	-	-	-	-
Distance Protection	21	-	-	-	X	X	X	X	-	-	-	-	-	-	-	-	-
Power Swing Blocking	78	-	-	-	X	X	X	X	-	-	-	-	-	-	-	-	-
Check Sync	25	-	-	-	X	-	X	-	-	-	-	-	-	-	-	-	-
Negative sequence overcurrent	46	X	-	-	X	X	X	X	X	X	X	X	X	X	-	-	-
Thermal overload	49	X	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-
Loss of load/Undercurrent	37	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Under/Over frequency	81U/O	-	-	-	-	-	-	-	-	-	-	X	X	X	-	-	-
Circuit breaker failure	50BF	X	X	X	X	X	X	X	X	-	-	-	-	-	X	X	X
Autoreclose	79	-	-	3 pole	1/3 pole	-	1/3 pole	-	-	-	-	-	-	-	-	-	-
Over/Under voltage	27/59	-	-	-	X	X	X	X	-	-	-	X	X	X	-	-	-
Trip Circuit Supervision	TCS	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

1. Please note that some relays may have a limit on max. I/O when used as a combination.

VOLTAGE, FREQUENCY AND ANCILLARY PROTECTION RELAYS

	Device	P821	P842	P846	P921	P922	P923	P941	P943
CT Inputs		4	-	6	-	-	-	-	-
VT inputs		-	4	3	4	4	4	3	3
Opto Inputs(max)		5	48	16	2	5	5	16	32
Output Contacts(max)		9	32	24	4	8	8	15	30
Protection									
Breaker Failure Protection	50BF	X	-	-	-	-	-	-	-
- 2 Stage		X	-	-	-	-	-	-	-
- Pole Discrepancy		X	-	-	-	-	-	-	-
- Dead Zone Function		X	-	-	-	-	-	-	-
Autoreclose	79	-	X	-	-	-	-	-	-
- Mesh Corner/Single Switch		-	X	-	-	-	-	-	-
- Check Sync	25	-	X	-	-	-	-	-	-
- Ferroresonance Suppression		-	X	-	-	-	-	-	-
Open Line Detector	DLO	-	-	X	-	-	-	-	-
- High Speed Breaker Fail	50BF	-	-	X	-	-	-	-	-
- Fast Hybrid Output contacts		-	-	X	-	-	-	-	-
- 3 pole tripping		-	-	X	-	-	-	-	-
Voltage and Frequency Protection									
- Undervoltage	27	-	-	-	X	X	X	X	X
- Overvoltage	59	-	-	-	X	X	X	X	X
- Residual Overvoltage	59N	-	-	-	X	X	X	-	-
- Phase Sequence Voltage	47/27D	-	-	-	-	X	X	-	-
- Under/Over frequency	81U/O	-	-	-	-	X	X	X	X
- Rate of change of Frequency(df/dt+t)	81R	-	-	-	-	-	X	X	X
- Frequency supervised Rate of change of Frequency (f+df/dt)	81RF	-	-	-	-	-	yes by logic	X	X
- Frequency supervised average Rate of change of Frequency (f+Δf/ Δt)	81RAV	-	-	-	-	-	-	X	X
- Generator Abnormal Frequency	81AB	-	-	-	-	-	-	X	X
- Load Restoration logic		-	-	-	-	-	-	X	X
Trip Circuit Supervision	TCS	X	X	X	-	X	X	X	X

ADDITIONAL INFORMATION RESOURCE

For further information on the MiCOM series of relays may be obtained from www.areva-td.com

AREVA Track Record - MiCOM Series Relays

>> **P12x MiCOM series** introduced in 1990. Worldwide application, with over 83 000 units delivered

>> **P13x MiCOM series** introduced in 2001. Worldwide application, with over 3200 units delivered

>> **P14x MiCOM series** introduced in 1999. Worldwide application, with over 11 000 units delivered

>> **P22x MiCOM series** introduced in 1999 Worldwide application, with over 7 000 units delivered

>> **P24x MiCOM series** introduced in 1999 Worldwide application, with over 1 500 units delivered

>> **P34x MiCOM series** introduced in 1999. Worldwide application, with over 2 300 units delivered

>> **P43x MiCOM series** introduced in 2001 Worldwide application, with over 4 600 units delivered

>> **P44x MiCOM series** introduced in 1999. Worldwide application, with over 6 000 units delivered

>> **P52x MiCOM series** introduced in 2003 Worldwide application, with over 500 units delivered

>> **P54x MiCOM series** introduced in 1999 Worldwide application, with over 3 500 units delivered

>> **P63x MiCOM series** introduced in 2001 Worldwide application, with over 4 500 units delivered

>> **P74x MiCOM series** introduced in 2002 Worldwide application, with over 250 units delivered

>> **P92x MiCOM series** introduced in 2000 Worldwide application, with over 9 000 units delivered

>> **P94x MiCOM series** introduced in 1999 Worldwide application, with over 750 units delivered

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