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Micom p120 manual

1 MiCOM P120/P121/P122 & P123 Overcurrent Relays Version 6 Technical Guide P12x/EN T/E65 2 3 Technical Guide P12x/EN T/E65 Contents MiCOM P120/P121/P122 & P123 Page 1/2 MiCOM P120/P121/P122 & P123 OVERCURRENT RELAYS TECHNICAL GUIDE CONTENTS Safety instructions Introduction Handling, installation and case dimensions User guide Menu content tables Technical data and curve characteristics Application Guide Modbus Database Commissioning and maintenance guide Connection diagrams Commissioning test and setting records sheets Hardware/Software version history and compatibility P12x/EN S5A11 P12x/EN IT P12x/EN IN P12x/EN FT P12x/EN HI P12x/EN TD P12x/EN AP P12x/EN CM P12x/EN CO P12x/EN RS P12x/EN VC 4 P12x/EN T/E65 Page 2/2 Technical Guide Contents MiCOM P120/P121/P122 & P123 BLANK PAGE 5 Technical Guide SAFETY SECTION P12x/EN S5A11 SAFETY SECTION 6 7 Technical Guide SAFETY SECTION P12x/EN S5A11 Page 1/6 CONTENT 1. SAFETY INSTRUCTIONS 3 2. INSTALLATION, COMMISSIONING AND MAINTENANCE 4 3. OPERATING CONDITIONS OF THE MiCOM RELAY Replacement of the batteries Current transformer circuits Dielectric withstand test 4 4. REMOVAL AND DESTRUCTION OF THE MiCOM RELAY 5 5. TECHNICAL SPECIFICATIONS 5 8 P12x/EN S5A11 Page 2/6 Technical Guide SAFETY SECTION BLANK PAGE 9 Technical Guide SAFETY SECTION P12x/EN S5A11 Page 3/6 1. SAFETY INSTRUCTIONS For your safety, please read these instructions before doing any work on the MiCOM relay. Health and safety The safety instructions described in this document are intended to guarantee correct installation and use of the MiCOM relay and to avoid any damage. All persons directly or indirectly concerned with the use of these devices must be familiar with these safety instructions. The meaning of the symbols The meaning of the symbols which may be used on the equipment or in the product documentation is as indicated below!

Important: refer to the product documentation Important: risk of electrocution Protective/safety earth * Functional earth * NOTE: This symbol can also be used for a protective/safety earth on a terminal strip or in a subassembly, for example for the electrical power supply. NOTE: the term "earth" used in the product documentation is the direct equivalent of the term "exposed conductive parts" which is also used. 10 P12x/EN S5A11 Page 4/6 Technical Guide SAFETY SECTION 2. INSTALLATION, COMMISSIONING AND MAINTENANCE Connection of the MiCOM relay! The personnel in charge of the installation, commissioning and maintenance of a MiCOM relay must apply adequate procedures to guarantee safety when using the equipment. Before installation, commissioning or maintenance on the equipment, consult the relevant chapters in the technical documentation of the relay. The terminal blocks of the relays may have a dangerously high voltage during installation, commissioning or maintenance, if electrical isolation is not carried out. Access to the connectors at the rear of the relays can present risks of electrocution and thermal shock. Before you consider energisation, the MiCOM relay must be connected to earth via the terminal provided for this purpose. Unless otherwise indicated in the technical data chapter of the product documentation, the minimum size recommended for the earth wire is 2.5 mm 2. Before energising your MiCOM relay, please check the following points: Rated voltage and polarity of the auxiliary power supply Current value of the current transformer circuit and integrity of the connections Integrity of the earth connection 3. OPERATING CONDITIONS OF THE MiCOM RELAY The operation of the MiCOM relay must comply with the electrical and environmental requirements described in this document. 3.1 Replacement of the batteries! The internal batteries, if used, must be replaced by batteries corresponding to the type recommended. They must be installed with the correct polarity, to avoid any risk of damage to the equipment. 3.2 Current transformer circuits! Never open the auxiliary circuit of a live current transformer. The high voltage produced may cause serious physical injury and damage the insulation of the equipment. 3.3 Dielectric withstand test! Following an insulation test, the capacitors may still be charged with a potentially dangerous voltage. At the end of each part of the test, the voltage must be progressively brought down to zero to discharge the capacitors before disconnecting the test wiring. 11 Technical Guide SAFETY SECTION P12x/EN S5A11 Page 5/6 4. REMOVAL AND DESTRUCTION OF THE MiCOM RELAY! Removal: Destruction: The auxiliary power supply circuit of the relay can include capacitors for the power supply or for earthing. To avoid any risk of electrocution or thermal shock, it is appropriate to isolate the relay completely (the two direct current poles) from any power supply, then to discharge the capacitors in complete safety via the external terminals, before taking the device out of service. It is recommended that the relay should not be incinerated nor thrown into a river. MiCOM relays and their components should be disposed of and recycled strictly in compliance with regulations on safety and the environment. Before destruction, remove the batteries, taking the necessary precautions to avoid any risk of electrocution. 5. TECHNICAL SPECIFICATIONS Insulation level: IEC : 1990/A2: 1995 class I EN : 1993/A2: 1995 class I Environment: IEC : 1990/A2: 1995 pollution level 2 EN : 1993/A2: 1995 pollution level 2 This device must be connected to earth to guarantee the safety of the user. Conformity is established by reference to the generic safety standards. Product safety: 73/23/EEC Conformity with the European Commission directive relating to low voltages. CE EN : 1993/A2: 1995 EN 60905: 1992/A3: 1995 Conformity is established by reference to the generic safety standards. 12 P12x/EN S5A11 Page 6/6 Technical Guide SAFETY SECTION BLANK PAGE 13 Technical Guide P12x/EN IT/E65 MiCOM P120/P121/P122 & P123 Introduction 14 15 Technical Guide P12x/EN IT/E65 Introduction MiCOM P120/P121/P122 & P123 Page 1/6 CONTENTS 1. INTRODUCTION 3 2. HOW TO USE THIS MANUAL 3 3. INTRODUCTION TO THE MiCOM P120, P121, P122 & P123 RELAYS 4 4. MAIN FUNCTIONS 5 5. EQUIVALENCE TABLES 6 16 P12x/EN IT/E65 Page 2/6 Technical Guide Introduction MiCOM P120/P121/P122 & P123 BLANK PAGE 17 Technical Guide P12x/EN IT/E65 Introduction MiCOM P120/P121/P122 & P123 Page 3/6 1. INTRODUCTION The overcurrent relays of the MiCOM P120 range are ALSTOM universal overcurrent relays. The MiCOM P120, P121, P122 and P123 relays have been designed to control, protect and monitor industrial installations, public distribution networks and substations, and to be used as back-up protection for EHV and HV transmission networks. 2. HOW TO USE THIS MANUAL This manual provides a description of the MiCOM P120, P121, P122 and P123 functions and settings. It enables the user to become familiar with the application, installation, setting and commissioning of these relays. This manual has the following format : P12x/EN IT Introduction Contents of the manual and general introduction to the MiCOM P120 range of relays covered by the Guide. P12x/EN IN Handling, installation and case dimensions Precautions to be taken when handling electronic equipment. P12x/EN FT User Guide of MiCOM P120, P121, P122 and P123 relays A detailed description of the features of the MiCOM P120 range of relays. P12x/EN TD Technical data and curve characteristics Comprehensive details on nominal values, setting ranges, specifications and curves characteristics P12x/EN CM Commissioning and Maintenance Guide Guide to commissioning, problem solving and maintenance of MiCOM P120, P121, P122 and P123. P12x/EN CO P12x/EN RS P12x/EN VC P12x/EN CT Connection diagrams for MiCOM P120/P121 and P122/P123 Commissioning test records Hardware/Software version history Communication mapping data bases 18 P12x/EN IT/E65 Page 4/6 Technical Guide Introduction MiCOM P120/P121/P122 & P123 P120/P121/P122 & P123 RANGE OF RELAYS AND THE FORMER ALSTOM OR GEC-ALSTHOM RANGES 21 Technical Guide P12x/EN IN/E65 MiCOM P120/P121/P122 & P123 Handling, Installation and Case Dimensions 22 23 Technical Guide P12x/EN IN/E65 Handling, Installation MiCOM P120/P121/P122 & P123 Page 1/8 CONTENTS 1. GENERAL CONSIDERATIONS Receipt of relays Electrostatic discharge (ESD) 3 2. HANDLING OF ELECTRONIC EQUIPMENT 3 3. RELAY MOUNTING 4 4. UNPACKING 4 5. STORAGE 4 6. DIMENSIONS Connection of power terminals, and Signals terminals Communication port RS Earthing 6 7. CASE DIMENSIONS 7 24 P12x/EN IN/E65 Page 2/8 Technical Guide Handling, Installation MiCOM P120/P121/P122 & P123 BLANK PAGE 25 Technical Guide P12x/EN IN/E65 Handling, Installation MiCOM P120/P121/P122 & P123 Page 3/8 1. GENERAL CONSIDERATIONS 1.1 Receipt of relays Protective relays, although generally of robust construction, require careful treatment prior to installation on site. Upon receipt, relays should be examined immediately to ensure no damage has been sustained in transit. If damage has been sustained during transit a claim should be made to the transport contractor and ALSTOM should be promptly notified. Relays that are supplied unmounted and not intended for immediate installation should be returned to their protective polythene bags. 1.2 Electrostatic discharge (ESD) The relays use components that are sensitive to electrostatic discharges. The electronic circuits are well protected by the metal case and the internal module should not be withdrawn unnecessarily. When handling the module outside its case, care should be taken to avoid contact with components and electrical connections. If removed from the case for storage, the module should be placed in an electrically conducting antistatic bag. There are no setting adjustments within the module and it is advised that it is not removed unnecessarily. Although the printed circuit boards are plugged together, the connectors are a manufacturing aid and not intended for frequent dismantling; in fact considerable effort may be required to separate them. Touching the printed circuit board should be avoided, since complementary metal oxide semiconductors (CMOS) are used, which can be damaged by static electricity discharged from the body. 2. HANDLING OF ELECTRONIC EQUIPMENT A person's normal movements can easily generate electrostatic potentials of several thousand volts. Discharge of these voltages into semiconductor devices when handling electronic circuits can cause serious damage, which often may not be immediately apparent but the reliability of the circuit will have been reduced. The electronic circuits are completely safe from electrostatic discharge when housed in the case. Do not expose them to risk of damage by withdrawing modules unnecessarily. Each module incorporates the highest practicable protection for its semiconductor devices. However, if it becomes necessary to withdraw a module, the following precautions should be taken to preserve the high reliability and long life for which the equipment has been designed and manufactured. 1. Before removing a module, ensure that you are at the same electrostatic potential as the equipment by touching the case. 2. Handle the module by its frontplate, frame or edges of the printed circuit board. Avoid touching the electronic components, printed circuit track or connectors. 3. Do not pass the module to another person without first ensuring you are both at the same electrostatic potential. Shaking hands achieves equipotential. 4. Place the module on an antistatic surface, or on a conducting surface which is at the same potential as yourself. 5. Store or transport the module in a conductive bag. 26 P12x/EN IN/E65 Page 4/8 Technical Guide Handling, Installation MiCOM P120/P121/P122 & P123 If you are making measurements on the internal electronic circuitry of an equipment in service, it is preferable that you are earthed to the case with a conductive wrist strap. Wrist straps should have a resistance to ground between 500k 10M. If a wrist strap is not available you should maintain regular contact with the case to prevent a build-up of static. Instrumentation which may be used for making measurements should be earthed to the case whenever possible. More information on safe working procedures for all electronic equipment can be found in BS5783 and IEC 147-0F. It is strongly recommended that detailed investigations on electronic circuitry or modification work should be carried out in a special handling area such as described in the above-mentioned BS and IEC documents. 3. RELAY MOUNTING Relays are dispatched either individually or as part of a panel/rack assembly. If an MMLG test block is to be included it should be positioned at the right-hand side of the assembly (viewed from the front). Modules should remain protected by their metal case during assembly into a panel or rack. For individually mounted relays an outline diagram is supplied in section 6 of this chapter showing the panel cut-outs and hole centres. 4. UNPACKING Care must be taken when unpacking and installing the relays so that none of the parts is damaged or the settings altered. Relays must only be handled by skilled persons. The installation should be clean, dry and reasonably free from dust and excessive vibration. The site should be well lit to facilitate inspection. Relays that have been removed from their cases should not be left in situations where they are exposed to dust or damp. This particularly applies to installations which are being carried out at the same time as construction work. 5. STORAGE If relays are not to be installed immediately upon receipt they should be stored in a place free from dust and moisture in their original cartons. Where de-humidifier bags have been included in the packing they should be retained. The action of the dehumidifier crystals will be impaired if the bag has been exposed to ambient conditions and may be restored by gently heating the bag for about an hour, prior to replacing it in the carton. Dust which collects on a carton may, on subsequent unpacking, find its way into the relay; in damp conditions the carton and packing may become impregnated with moisture and the de-humidifier will lose its efficiency. Storage temperature : 25 C to +70 C. 27 Technical Guide P12x/EN IN/E65 Handling, Installation MiCOM P120/P121/P122 & P123 Page 5/8 6. DIMENSIONS 6.1 Connection of power terminals, and Signals terminals The individual equipment are delivered with sufficient M4 screws to connect the relay via annular terminals, with a maximum recommended of two annular terminals per contact. If necessary, ALSTOM can provide annular terminals to crimp. 5 references exist according to the section of the wire (see below). Each reference corresponds to a sachet of 100 terminals. Push-on connector 4.8 x 0.8 (wire size mm²) ALSTOM T&D EAI reference: ZB Push-on connector 4.8 x 0.8mm (wire size mm²) ALSTOM T&D EAI reference: ZB P0166ENa M4 90 Ring Tongue terminal (wire size mm²) ALSTOM T&D EAI reference, Stafford part number ZB M4 90 Ring Tongue terminal (wire size mm²) ALSTOM T&D EAI reference, Stafford part number ZB P0167ENa 28 P12x/EN IN/E65 Page 6/8 Technical Guide Handling, Installation MiCOM P120/P121/P122 & P123 To insure the insulation of the terminals and to respect the security and safety instructions, an insulated sleeve can be used. We recommend the following cable cross-sections: Auxiliary sources Vaux : 1.5 mm² Communication Port see paragraph 6.2 Other circuits 1.0 mm² Because of the limitations of the annular terminals, the maximum wire cross-section which can be used for the connector blocks (for current inputs and signals) is of 6mm² by using non-insulated annular terminals. When only pre-insulated terminals can be used, the maximum wire cross-section is reduced to 2, 63 mm² per annular terminal. If a more significant wire cross-section is necessary, two wires can be put in parallel, each one finished by a separate annular terminal. All the terminal blocks used for connections, except of the port RS485, must be able to withstand a nominal voltage of minimum 300V peak value. We recommend to protect the auxiliary source connection by using a fuse of type NIT or TIA with a breaking capacity of 16A. For security reasons, do never install fuses in current transformers circuits. The other circuits must be protected by fuses. 6.2 Communication port RS485 Connections to RS485 is made using annular terminals. It is recommended that a two core screened cable, is used with a maximum total length of 1000 m or a200nF total cable capacitance. Typical specification: Each core : Nominal conductor area : Screen : 16/0.2 mm² section copper conductor, PVC insulated. 0.5 mm² per core Overall braided, PVC sheathed Linear capacitance between conductor and earth : 100pF/m 6.3 Earthing Each equipment must be connected to a local earth terminal by the intermediary of a M4 earth terminals. We recommend a wire of minimal section of 2,5 mm², with annular terminals on the side of the equipment. Because of the limitations of the annular terminals, the possible maximum section is of 6mm² by wire. If a larger section is necessary, one can use cables connected in parallel, each one ending with an annular terminal separated on the side of the equipment. One can also use a metal bar. NOTE: To prevent any electrolytic risk between copper conductor or brass conductor and the back plate of the equipment, it is necessary to take precautions to isolate them one from the other. This can be done in several ways, for example by inserting between the conductor and the case a plated nickel or insulated ring washer or by using a tin terminals. 29 Technical Guide P12x/EN IN/E65 Handling, Installation MiCOM P120/P121/P122 & P123 Page 7/8 7. CASE DIMENSIONS MiCOM P120, P121, P122 and P123 relays are available in a 4U metal case for panel or flush mounting. Weight : 1.7 to 2.1 Kg External size : Height case 152 mm front panel 177 mm Width case 97 mm front panel 103 mm Depth case 226 mm front panel + case 252 mm All dimensions in mm Panel cut-out Flush mounting wiring details holes Ø holes Ø 4.4 (M4 screw) MiCOM P121 IA = A Trip Alarm Equip.fault Auxiliary supply C max. AUX. 1 AUX. 2 AUX. 3 AUX. 4 Flush mounting P0001ENa MiCOM P120, P121, P122 AND P123 RELAYS CASE DIMENSIONS NOTE : For flush mounting, use the screws supplied by Alstom with head diameter smaller than the hole of the front face, otherwise the active part will not be plugged properly (do not add washers). 30 P12x/EN IN/E65 Page 8/8 Technical Guide Handling, Installation MiCOM P120/P121/P122 & P123 BLANK PAGE 31 Technical Guide P12x/EN FT/E65 MiCOM P120/P121/P122/P123 Page 1/78 CONTENTS 1. DESCRIPTION OF THE MiCOM P120, P121, P122 AND P123 RELAYS 5 2. USER INTERFACE LCD display and keypad description LCD display Keypad ALARM keys Programming keypad LEDs The two areas under the top and bottom flaps The battery box 9 3. MENUS Default display Access to the menu Password Password protection Entering the password Changing the password ALARM display Electrical system ALARMS Relay Hardware or Software ALARMS Menu contents description OP.PARAMETERS Menu P122 and P123 additional OP.PARAMETERS Menu P122 and P123 additional OP.PARAMETERS Menu CONFIGURATION Menu DISPLAY sub-menu CT RATIO sub-menu LED 5 to 8 configuration sub-menu Group. Select sub-menu (P122 & P123 only) Alarms sub-menu (P122 & P123 only) Configuration inputs sub-menu (P122 & P123 only) Configuration Relays Maintenance sub-menu (P122 & P123 only) Configuration Phase Rotation sub-menu (P122 & P123 only) 28 34 P12x/EN FT/E65 Page 2/78 Technical Guide User Guide MiCOM P120/P121/P122/P123 MEASUREMENTS Menu P122 & P123 additional MEASUREMENTS Menu P122 additional MEASUREMENTS Menu COMMUNICATION Menu MODBUS COMMUNICATION Menu Courier COMMUNICATION Menu IEC COMMUNICATION Menu DNP3 COMMUNICATION Menu PROTECTION Menu [50/51] Phase OC sub-menu [50N/51N] EARTH OC sub-menu (P121 - P122 - P123 only) [46] NEGATIVE Phase SEQUENCE I2> sub-menu (P122 & P123 only) [37] UNDERCURRENT I< sub-menu (P122 & P123 only) [79] AUTORECLOSE sub-menu (P123 only) AUTOMAT. CTRL Menu Trip Commands sub-menu Latch of trip output relay by Function Sub-Menu (P121, P122 & P123 relays) Latch functions sub-menu (P120 relay) Blocking Logic sub-menu Logic Select sub-menus (P122 & P123 only) Outputs Relays sub-menu Latch of the auxiliary output relays (RL2 to RL8) Inputs sub-menu BROKEN CONDUCTOR sub-menu (P122 & P123 only) COLD LOAD PICK-UP sub-menu (P122 & P123 only) CIRCUIT BREAKER FAILURE sub-menu (P122 & P123 only) CIRCUIT BREAKER SUPERVISION sub-menu (P122 & P123 only) Comm. Order Sub-menu (P122 & P123 only) RECORDS Menu (P122 & P123 only) CB MONITORING sub-menu Fault Record sub-menu INSTANTANEOUS sub-menu DISTURBANCE RECORD sub-menu Time PEAK VALUE sub-menu ROLLING DEMAND sub-menu 75 35 Technical Guide P12x/EN FT/E65 User Guide MiCOM P120/P121/P122/P123 Page 3/78 4. WIRING Auxiliary supply Current measurement inputs Logic inputs Output relays Communication RS485 rear communication port RS232 front communication port (P122 & P123 only) 77 36 P12x/EN FT/E65 Page 4/78 Technical Guide User Guide MiCOM P120/P121/P122/P123 BLANK PAGE 37 Technical Guide P12x/EN FT/E65 User Guide MiCOM P120/P121/P122/P123 Page 5/78 1. DESCRIPTION OF THE MiCOM P120, P121, P122 AND P123 RELAYS MiCOM P120, P121, P122 and P123 are fully numerical relays to perform electrical protection and control functions. 3 phase and 1 earth current inputs are available for 1 and 5 Amps (4 inputs for 1 A and 4 inputs for 5 A) on MiCOM P121, P122 & P123 rear connectors. On the same MiCOM P121, P122 or P123 relay, combination is possible between 1 and 5 Amp current inputs (i.e. a mix of 1A for earth fault and 5A for phase connections). 2 current inputs (One for 1 A and one for 5 A) are available on the MiCOM P120 rear connectors. All output relays can be programmed to respond to any of the available control or protection functions. Logic inputs can also be allocated to the various control functions. The MiCOM relays are powered from either a DC or an AC auxiliary supply (3 ranges of auxiliary supply). Any short dips (< 50 ms) are filtered and regulated through the auxiliary supply. The front panel enables the user to navigate through the menu to access data, to change the settings, to read the measurements, etc. Eight LEDs on the front panel allows a clear and simple presentation of events. The various alarms detected are displayed on the back-lit LCD display. No password is required to read these alarm messages. The modification and clearing can only be carried out with a password, however. NOTE : From V3.B version it is not necessary to enter the password for clearing alarms. MiCOM 120, P121, P122 and P123 relays continuously measure the phase and earth currents (P120 makes a single measurement) and take into account the true RMS current value up to 10th harmonic (at 50 Hz). MiCOM P120, P121, P122 and P123 relays have their rear connectors, a standard RS485 port. Communication protocols can be chosen at the time of order, from MODBUS RTU, Courier, IEC or DNP3. Using the communication channel, all stored information (measurements, alarms, parameters) can be read, and settings can be modified. Consultation and modification of this data can be carried out on site with a normal PC and the appropriate ALSTOM software MiCOM S1. RS485 based communication allows MiCOM P120, P121, P122 and P123 relays to be directly linked to a digital control system (MiCOM S10 for example). All the available data is then placed at the disposal of the supervisor and can be processed either locally or remotely. The MiCOM P120 range of relays gives the user more flexibility to adapt the relays to the required applications. With regard to low installation costs, these relays offer an economic solution, providing integrated protection and control functions. 38 P12x/EN FT/E65 Page 6/78 Technical Guide User Guide MiCOM P120/P121/P122/P123 USER INTERFACE The MiCOM P120, P121, P122 and P123 relay front panel serves as an interface between the user and the protection relay. It enables the user to enter relay settings, display the measured values, alarms and display clearly the various actions carried out by MiCOM P120, P121, P122 and P123 relay. 2 tactile button keypad for reading and cleaning alarms and messages MiCOM P122BOOF111 N Cde 31705/ Ion Ua Vdc IA = A P122 2 x 16 alphanumeric backlit display Tripled alarm led Warning led Healthy led Trip Alarm Warning Healthy C Aux. 1 Leds programmables Batterie Aux. 2 Aux. 3 Aux. 4 defghi + abcd RS tactile button keypad for setting and consulting P0002ENa FIGURE 1 : MiCOM P120, P121, P122 AND P123 FRONT PANEL The front panel of the relay consists of three separate sections: 1. The LCD display and the keypad, 2. The LED's 3. The two zones under the upper and lower flaps. 2.1 LCD display and keypad description LCD display The front panel of the MiCOM P120, P121, P122 and P123 relays carries a liquid crystal display (LCD) on which data such as settings, measured values and alarms can be viewed. The data is accessed through a menu system. The liquid crystal display has two lines each with sixteen characters. A back-light is activated when any key is pressed and will remain lit for five minutes after the last key press. This allows the display to be read in most lighting conditions Keypad The keypad has seven keys divided into two groups : Two keys situated immediately under the screen (keys and). Five main keys situated at the middle of the front face are for programming ALARM keys The two keys and are dedicated for reading and acknowledging the alarms. So as to display successive alarms, press on key The alarms are presented in reverse order for their detection (the most recent first, the oldest last). So as to acknowledge the alarms, the user can either acknowledge each alarm using or go to the end of the ALARM menu and carry out a general acknowledgement. NOTE : the acknowledgement of the relay latched is described in the sub-menu contents description. 39 Technical Guide P12x/EN FT/E65 User Guide MiCOM P120/P121/P122/P123 Page 7/78 WARNING : TO ACKNOWLEDGE THE ALARMS, THE PASSWORD MUST BE ENABLE UP TO THE V3.A VERSION. FROM THE V3.B VERSION, THE ACKNOWLEDGE OF THE ALARMS IS WITHOUT PASSWORD Programming keypad 2.2 LEDs The five keys situated in the middle of the MiCOM front panel are dedicated to set the relay. The keys make it possible to move in the direction indicated to the various levels of the menus. The key validates a choice or value (modification of settings). The LED labels on the front panel are by default written in English, however the user has self-adhesive labels available with MiCOM relays in French on which it is possible to write using a ball point pen. The top four LEDs indicate to the status of the relay (Trip condition, alarm LED, equipment failure, auxiliary supply). The four lower LEDs can be freely programmed by the user to correspond to operation of the various thresholds (all models) and copy of the state of the logic inputs (P122 & P123 ONLY). Eight LEDs are located in the left portion of the front face (numbered from 1 to 8 starting from the top): LED 1 Colour : RED Label : Trip LED 1 indicates when a trip order has been issued by the relay to the cut-off element (circuit breaker, contactor). This LED recopies the trip order issued to the Trip logic output. Its normal state is unlit. It is illuminated as soon as a triggering order is issued. It goes out when the associated alarm is acknowledged either by front panel, or by remote command, or by digital input, or by a new fault (CONFIGURATION/Alarms menu). LED 2 Colour : ORANGE Label : ALARM LED 2 indicates that an alarm has been registered by MiCOM P120, P121, P122 and P123 relays. The alarms are either threshold crossings (instantaneous), or tripping orders (time delayed). As soon as an alarm is registered, the LED flashes. When all the stored alarms are read, the LED is illuminated continuously. When all the alarms are acknowledged, the LED goes out. NOTE : the alarms concerning the instantaneous can be selected self reset or No in the CONFIGURATION/Alarms Menu The alarm LED can be reset either by front panel, or by remote command, or by digital input, or by a new fault (CONFIGURATION/Alarms menu). LED 3 Colour : ORANGE Label : Warning LED 3 is dedicated to the internal alarms of MiCOM P120, P121, P122 and P123 relays. When a «non critical» internal alarm (typically communication Fault) is detected, the LED flashes continuously. When the fault is classed as «critical», the LED is illuminated continuously. The extinction of this LED is only possible by the disappearance of the cause that provoked it (repair of the module, disappearance of the Fault). 40 P12x/EN FT/E65 Page 8/78 Technical Guide User Guide MiCOM P120/P121/P122/P123 LED 4 Colour : GREEN Label : Healthy LED 4 indicates that MiCOM P120, P121, P122 and P123 relays is auxiliary powered in the nominal range. LED 5 to 8 Colour : RED Label : Aux.1 to 4. These LEDs can be programmed by the user on the basis of information on available thresholds (instantaneous and time-delayed) and state of the logic inputs (P122 & P123 only). The user selects the information he wishes to see associates with each LED from the menu element (Logic OR). Each LED illuminates when the associated information is valid. The extinction of each LED is linked to the acknowledgement of the associated alarms. 2.3 The two areas under the top and bottom flaps Under the upper flap, a label identifies the relay according to its model (ordering code) and series number. This information defines the product uniquely and specifically. In making all requests for information from ALSTOM T&D After Sales Department, please quote these two numbers. Information indicated in the lower portion of this label covers the auxiliary supply voltage and the nominal earth current value. Under the lower flap, a RS232 port is available in all MiCOM relays with different uses depending of the model : 1. For MiCOM P120 and P121, this RS232 port can be used to download a new application software version into the relay flash memories. 2. For MiCOM P122 and P123, this RS232 port can be used either to download a new application software version into the relay flash memories or to plug a laptop within the ALSTOM setting software MiCOM S1. The withdrawability of the MiCOM active part (chassis) from the case is effected by opening the two flaps, then with a 3mm screwdriver, turn the extractor situated under the upper flap, and pull using the two slots situated behind these flaps. 41 Technical Guide P12x/EN FT/E65 User Guide MiCOM P120/P121/P122/P123 Page 9/ The battery box To MiCOM RS 232 Battery box MiCOM E1 Input for external supply 12Vcc - 24Vcc P0005ENa FIGURE 2 : BATTERY BOX MiCOM E1 The battery box performs the two following functions: 1. Temporary powering of the relay in order to allow the user to view or modify data when the auxiliary power supply has failed. The battery used is a 6LR61 type (9V) which can power the relay up to 3 hours. When the battery is flat it is possible to power the battery box with an external dc supply. The dc voltage value must be comprised between 12Vdc and 24Vdc. 2. RS232 interface between the MiCOM relay and the PC equipped with the setting software MiCOM S1. 42 P12x/EN FT/E65 Page 10/78 Technical Guide User Guide MiCOM P120/P121/P122/P123 MENUS The menu of the MiCOM P120, P121, P122 and P123 relays is organised into main and sub menus. The content of these menus depends on the MiCOM model. 3.1 Default display By default, the current value (selected phase or earth) is continuously displayed. As soon as an alarm is generated by the MiCOM relay, that information is considered as priority and replaces the default value. The default display choice is made in the CONFIGURATION/Display menu. 3.2 Access to the menu Complete menu access is performed by manipulation of the keys. The general arrangement of the menus is shown in figure 2 for P120 and P121 and figure 3 for P122 and P123. Reading of parameters and measurements is possible without entering the password. Modification of the parameters requires entering the password. Should an error be made in entering a parameter, press to cancel. Except for reading and cancelling, the keys and are inactive. 3.3 Password NOTE : The letter P is displayed when the password is entered. If no key is pushed during 5 minutes, the password becomes inactive Password protection Password protection is applicable to the relay settings, especially to the selection of the various thresholds, time delays, communication parameters, allocation of inputs and outputs relays. The password consists of four alphabetical capital characters. When leaving the factory, the password is AAAA. The user can define his own combination of characters. Should the password be lost or forgotten, the modification of the stored parameters of the relay is prohibited. It is then necessary to contact the manufacturer or his agent by specifying the serial number of the relay so as to receive a stand-by password specific to the relay concerned. NOTE : The programming mode is showed with the letter "P" on the Low right of the display on each head menu. The letter P is present as long as the password is active (5 minutes if no key is pushed). As soon as the password has been entered, no setting change using the communication (RS485 or RS232) can be accepted Entering the password The input of the password is requested as soon as a modification of a parameter is made for any one of the menu or sub-menus. The user enters for each of the 4 characters/letters and validates the entire password with . After 5 seconds, the display returns to the point of the preceding menu. If no action is taken on the keypad for 5 minutes, the password is deactivated. A new request shall be associated with any subsequent parameter modification. 43 Technical Guide P12x/EN FT/E65 User Guide MiCOM P120/P121/P122/P123 Page 11/ Changing the password To change the active password, go to the OP.PARAMETERS menu and then to the point of the Password sub menu. Enter the old password and validate. Then press and enter the new password character per character and validate the new password using. The message NEW PASSWORD OK is displayed to indicate that the password has changed. 3.4 ALARM display Two alarm messages have been introduced in the relays since the firmware version V6. DEFAULT SETTINGS: Each time the relay is powered ON it will check its memory contents to determine whether the settings are set to the factory defaults. If the relay detects that the default settings are loaded an alarm is raised. A "HARDWARE " ALARM will appear on the LCD display. Pressing the button will cause DEFAULT SETTINGS message to be displayed. In addition, the ALARM LED (YELLOW) will light up the Watch Dog contact will be activated Only one parameter in the relay's menu needs to be changed to suppress these messages and to reset the watchdog. This alarm is only an indication to the user that the relay has its default settings applied. When the firmware version V6 is downloaded into the relay, this will load the default settings and the relay will, therefore, display this alarm. Changing one of the setting values will allow this alarm to be cleared. SETTING ERROR: Should the CPU fails to get correctly store data to the EEPROM during a setting change, a "HARDWARE " ALARM will appear on the LCD display followed by "SETTING ERROR" message (when pushing on the button). In addition, the ALARM LED (YELLOW) will light up the Watch Dog contact will be activated To reset this alarm it is necessary to power ON and OFF the relay. Following this, the last unsuccessful setting change will then need to be re-applied. If the alarm persists, i.e. the "SETTING ERROR" alarm is still displayed, please contact Alstom After Sales Services for advice and assistance. The management of alarms is directly displayed on the LCD. The display of alarm messages has priority over the default current value. As soon as an alarm is detected by the relay (threshold crossing for example), the message is displayed on the MiCOM LCD display and the Alarm LED (2nd LED) lights up. The alarm messages are classed as follows : Electrical power network alarm message Hardware or software fault message from the relay. 44 P12x/EN FT/E65 Page 12/78 Technical Guide User Guide MiCOM P120/P121/P122/P123 Page 12/78 BRKN COND. 1 AUX. 1 AUX. 2 broken conductor indication. I2/I1 element pick-up for longer than tbc. Tbc is settable in the AUTOMAT. CTRL/Broken cond. menu. t AUX1 time-out t AUX2 time-out CB FAILURE circuit breaker failure indication (the CB does not trip on tbf time-out) tbf is settable in the AUTOMAT. CTRL/CB Fail menu. I2> negative sequence current threshold pick-up (1 st stage) ti2> I2>> SPRING CHARGE FAIL T operating CB CB OPEN NB Sum AN TRIP CIRCUIT LATCH RELAY LATCH RELAY TRIP CB LOCASE FAILURE RECLOSER SUCCESS RECLOSER LOCKED negative sequence current threshold time-out (1 st stage) negative sequence current threshold pick-up (2 nd stage) negative sequence current threshold time-out (2 nd stage) Faulty circuit breaker indication by assignable logic input (settable in AUTOMAT. CTRL/Inputs menu). Operating (or tripping) time of the circuit breaker longer than the value set in the AUTOMAT. CTRL/CB Supervision menu. Number of circuit breaker operation higher than the value set in the AUTOMAT. CTRL/CB Supervision menu. Broken current measured higher than the value set in the AUTOMAT. CTRL/CB Supervision menu. Circuit breaker trip circuit failure for longer than the supervision timer t SUP settable in the AUTOMAT. CTRL/CB Supervision menu. A least one auxiliary relay is latched. The relay trip is latched. Circuit breaker closing time longer than the value set in the AUTOMAT. CTRL/CB Supervision menu. Successful reclose indication. Indicates that when the fault has been cleared upon circuit breaker reclosure, and has not re-appeared before expiry of the reclaim time. Recloser blocking indication. Generated by : - auxiliary power supply failure during dead time (definitive trip). - external breaker failure indication (ex. SF6 low). Indication provided via a logic input assigned to the CB FAILURE function in the AUTOMAT. CTRL/Inputs menu. 46 P12x/EN FT/E65 Page 14/78 Technical Guide User Guide MiCOM P120/P121/P122/P123 - external blocking indication, external blocking can be set by the user in the PROTECTION/ [79] AUTORECLOSE/EXT BLOCK menu. This blocking information is provided via a logic input assigned to the Block [79] function in the AUTOMAT. CTRL/Inputs menu. - definitive trip. - remote trip command during the reclaim time. - pick-up of I2> or thermal trip during dead time. - breaker failure (circuit breaker failure to trip on expiry of

tb). - breaker operating time (or tripping time) longer than the set time. CONFLICT RECLOS. Configuration conflict of the recloser function. This indication is generated by: - O/O Interlock not assigned to a logic input or assigned but not wired to the input. - no output relay assigned to the CB CLOSE function (AUTOMAT. CTRL/Output Relays menu). - trip contact latched. - no recloser cycle assigned to the protection functions (PROTECTION/ [79] Autoreclose menu). MAINTENANCE MODE The MiCOM relay is in maintenance mode Relay Hardware or Software ALARMS Any software or hardware fault of the MiCOM relay generates a "hard/software alarm". If several alarms are acquired they are all stored in their order of appearance. Display of the alarms is in reverse order (the most recent first and the oldest last). Each message is numbered and the total of messages is indicated below. The user can read all the alarm messages with the aid of, without entering the password. The acknowledgement of the relay alarm messages is IMPOSSIBLE. Only the disappearance of the cause resets the alarm. The management of the WARNING LED is directly linked to the status of the alarms stored in the memory. If the fault is major (the relay cannot perform protection functions), the WARNING LED is lit fixed. If the fault is minor (no influence on the protection and automation function e.g.communication failure), the WARNING LED is flashing. Possible Hardware or Software alarm messages : 47 Technical Guide P12x/EN FT/E65 User Guide MiCOM P120/P121/P122/P123 Page 15/78 Major fault The protection and automation functions are stopped. The RL0 watchdog relay is de-energised (35-36 contact closed). EEPROM ERROR CALIBR. : Calibration zone in fault CT ERROR : Analog channel in fault Minor fault The MiCOM relay is fully operational. The RL0 watchdog relay is energised (35-36 contact open, contact closed). RAM ERROR : RAM supplied by battery in fault. Battery fail : battery in fault (flat or not correctly in place) NOTE : The Battery backed RAM memory and Battery failure alarm messages can be configured displayed yes or no, in CONFIGURATION/Alarms menu. COMM.ERROR : Communication in fault CLOCK ERROR : Datation in fault 3.5 Menu contents description The menu of the MiCOM P122 & P123 relays is divided into 8 sections(6 for P120 and P121); OP PARAMETERS CONFIGURATION MEASUREMENTS COMMUNICATION PROTECTION G(1) PROTECTION G2 (P122 & P123 only) AUTOMAT. CTRL RECORDS (P122 & P123 only) To access these menus from the default display use. 48 P12x/EN FT/E65 Page 16/78 Technical Guide User Guide MiCOM P120/P121/P122/P123 To return to the default display from these menus or sub-menus press. DEFAULT DISPLAY IA=1245A OP PARAMETERS CONFIGURATION MEASUREMENTS COMMUNICATION PROTECTION AUTOMAT. CTRL P0003ENa FIGURE 3 : ORGANISATION OF MiCOM P120 AND P121 MAIN MENU NOTE : the menu content tables are supplied in P12x/EN HI document. 49 Technical Guide P12x/EN FT/E65 User Guide MiCOM P120/P121/P122/P123 Page 17/78 DEFAULT DISPLAY IA=1245A OP PARAMETERS CONFIGURATION MEASUREMENTS COMMUNICATION PROTECTION G1 PROTECTION G2 AUTOMAT. CTRL RECORDS P0004ENa FIGURE 4 : ORGANISATION OF MiCOM P122 AND P123 MAIN MENU NOTE : the menu content tables are supplied in P12x/EN HI document. 50 P12x/EN FT/E65 Page 18/78 Technical Guide User Guide MiCOM P120/P121/P122/P OP PARAMETERS Menu To gain access to the OP PARAMETERS menu from the default display, press. OP PARAMETERS Heading of the OP PARAMETERS menu To gain access to the menu content, press. Password * * * * Entry of the password to be able to modify the MiCOM relay settings and parameters. To enter the password, press Password AAAA Entry of the password is made letter by letter using to go up or down the alphabet. After each letter, press, to enter the following letter. At the end, press to validate the password. If the password is correct, the message «PASSWORD OK» is displayed on the screen. NOTE : The password is initially set in the factory to AAAA. WARNING : AS SOON AS THE PASSWORD HAS BEEN ENTERED, NO SETTING CHANGE USING THE COMMUNICATION (RS485 OR RS232) CAN BE ACCEPTED.

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