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GE Power Management

Digital Microprocessor-based
Non-directional Overcurrent Relays

MIC series 1000

Instructions
GEK 98840C

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1. DESCRIPTION

Type MIC relays are digital, microprocessor-based, non-directional overcurrent relays that protect against phase to phase and phase to ground faults.

The MIC performs the following functions:

- Inverse overcurrent, including four characteristic curves, and four values of definite time protection, as well as instantaneous overcurrent protection with programmable delay; all in the same relay.
- Phase and ground current measurement.
- Phase and ground current recorder and the operating time of the last trip.

MODEL LIST

Protection	**Functions**	**Basic Models**
Phase	**Ground**	**Common Measuring Units for the Phases**
-	1x50/51N	MIC5000
3X50/51	-	MIC7000
3X50/51	1X50/51N	MIC8000
2X50/51	1X50/51	MIC9000

MIC5000 models are single phase relays with one measuring unit for phase or ground, and one instantaneous unit.

MIC7000 models are three phase relays with one measuring unit common to the three phases, and one instantaneous unit.

These instructions do not purport to cover all details or variations in equipment nor to provide for every possible contingency to be met in connection with installation operation or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to General Electric (USA) Power Management, S.A.

MIC8000 models are three phase relays with one measuring unit common to the three phases, and an additional unit for phase to ground faults. An additional two instantaneous units are provided, one common for the three phases and another for ground.

CURRENT RANGES

Nominal Current (In)	Inverse Time Unit (Is)	Instantaneous Unit
5 Amp	1.5 - 13.125 Amp 0.5 - 4.375 Amp	1 to 31 x Is
1 Amp	0.3 - 2.615 Amp 0.1 - 0.875 Amp	

The pick up value for the instantaneous unit can be adjusted between 1 to 31 times the value selected for the inverse time unit.

The instantaneous unit can be disabled by adjusting the setting to zero times the inverse value.

The basic relay has two output relays which can be selected to indicate either if a trip has been produced by the instantaneous unit or the inverse unit, or by phases or ground; based on the position of a selector switch at the front of the relay. An alarm is also available.

The information required to completely define a model are indicated in the following figures.

MODEL SELECTION (Phase or Ground Relays)

MIC	*	0	*	*	N	0	1	1	*	00	*	DESCRIPTION
	5											1 phase (or ground)
	7											3 phase
			1									In = 1 A
			5									In = 5 A
				0								Range = 0.1 - 0.875 x In
				1								Range = 0.2 - 1.75 x In
				2								Range = 0.3 - 2.625 x In
									F			Aux. Voltage: 24 - 48 Vac-dc
									G			Aux. Voltage: 48 - 125 Vac-dc
									H			Aux. Voltage: 110 - 250 Vdc 110 - 220 Vac
											C	Individual Drawout Type Housing
											S	Drawout Type mounted in System
											∅	Non-Drawout Housing

Example: Overcurrent microprocessor-based relay, three-phase, rated current In = 5 A., range 0.3-2.625 x In, auxiliary voltage 48-125 Vdc/ac. Model: **MIC 7052 N 011 G 00**

MODEL SELECTION (Phase and Ground Relays)

MIC	*	0	*	*	N	0	1	1	*	00	*	DESCRIPTION
	8											3 phase + ground
	9											2 phase + ground
			2									Phase Range: 0.3 - 2.625 Amp
			5									Phase Range: 1.5 - 13.125 Amp
				0								Grnd Range = 0.1 - 0.875 Amp
				3								Grnd Range = 0.5 - 4.375 Amp
									F			Aux. Voltage: 24 - 48 Vac-dc
									G			Aux. Voltage: 48 - 125 Vac-dc
									H			Aux. Voltage: 110 - 250 Vdc 110 - 220 Vac
											C	Individual Drawout Type Housing
											S	Drawout Type mounted in System
											∅	Non-Drawout Housing

Example: Overcurrent microprocessor-based relay, three-phase and ground, phase range 1.5-13.125 Amp, ground range 0.5-4.375 Amp, auxiliary voltage 48-125 Vdc/ac.
Model: **MIC 8053 N 011 G 00**

2. APPLICATION

MIC relays are applied on ac circuits (lines, machines, transformers, etc.), and provide both rapid protection against short circuits and effective overload protection. Model selection for a given application should be performed in such a manner as to provide proper selectivity and to isolate only that part of the system which has produced the fault.

Negligible overtravel (less than 50 ms for the inverse time unit, less than 10 ms for the instantaneous unit), and a high drop out to pick up ration (>95%), along with the instantaneous unit adjustment tap, allow optimal coordination and reclosing without compromising selectivity.

The MIC offers the possibility of selecting 8 families of operating curves, 4 dependent time, and 4 independent time.

The **Inverse time** characteristic is generally used in applications where the magnitude of the fault current depends on the system generating capacity at the moment of the fault. Figures 1 and 2 represent inverse time characteristics BS 142 and ANSI respectively.

The **Very Inverse time** characteristic is generally used in applications where the magnitude of the fault current depends fundamentally on the system impedance between the point of generation and the relay location. System generating characteristics have little to no influence. Figure 3 represents the Very Inverse characteristic.

The **Extremely Inverse** characteristic is principally used in applications where high values of current are produced at the moment a circuit is energized after having been out of service for a certain time. A typical application is on distribution circuits since the Extremely Inverse characteristic is the one which most closely approximates fuse curves used on those circuits. Figure 4 represents the Extremely Inverse characteristic.

In addition, four definite time characteristics are available: 2,4,6, and 8 seconds.

The **instantaneous unit** can be programmed with a time delay. The operating time of the instantaneous unit when the time delay is zero is shown in Figure 5.

3. CHARACTERISTICS

3.1 General Characteristics

- Accurate and reliable with low power consumption.
- Semi-Flush mounting.
- LED Indicators for: pick-up, phase trip, ground trip, and in-service.
- 7 digit displays of high resolution and clarity.
- Sealed plastic case, shock resistant and flame resistant, which allows indicator reset from outside the case.
- High anti-seismic waveform response.
- Solid state components of high reliability.
- Microprocessor based system.

3.2 Technical Specifications

Nominal frequency:	*50/60 Hz*
Nominal current:	*1 or 5 amps*
Auxiliary power supply:	*24-48 Vdc/ac* *48-125 Vdc/ac.* *110-250 Vdc,110-220 Vac.*
Burden:	*Less than 1.5 watts at all voltages*
Temperature:	
Operating:	*-10ºC to +55ºC*
Storage:	*-40ºC to +65ºC*
Overcurrent Ratings:	
Continuous:	*2 x In*
Three Second:	*50 x In*
One Second:	*100 x In*
Relative Humidity:	*Up to 95% without condensing*

Accuracy:
Operating Value: *5%*
Operating Time: *5% or 0.025 seconds, whichever is greater*

Current and operating class E Error Index, per BS 142: Class E-5

Repeatability:
Operating Value: *1%*
Operating Time: *2% or 0.025 seconds, whichever is greater*

Output and Trip Contacts

Closing: *3000 watts resistive for two seconds with a maximum of 30 amps and 300 volts DC.*

Interrupting: *50 watts resistive with a maximum of 2 amps and 300 volts DC.*

Continuous: *5 amps, with 300 volts DC maximum.*

Frequency operating range: *47 - 63 Hz.*

Type Tests and Standards

Insulation Withstand: *2 kV, 50/60 Hz for one minute, per IEC 255-5.*

Impulse: *5 kV peak 1.2/50 microseconds, 0.5 J, per IEC 255-4.*

Interference: *2.5 kV longitudinal, 1 kV transversal, Class III, per IEC 255-4.*

Electrostatic Discharge: *Per IEC 801-2, Class III.*

Radio Frequency Interference: *Per IEC 801-3, Class III.*

Fast Transients: *Per IEC 801-4, Class III.*

NOTE: Interference Suppression Ground Connection

The MIC relay contains high frequency interference protection consisting of a series of capacitors connected between the different input terminals and terminal B1.

Terminal B1 of the relay should be connected to ground so these interference suppression circuits can perform their protective function. This connection should be as short as possible to assure maximum protection. Braided #12 AWG conductors (2.5 mm) are recommended.

The purpose of this connection is to prevent the high frequency disturbances from affecting the electronic circuits of system operation. With this terminal connected, the protection capacitors are connected from the terminal to the case. Therefore one needs to take special care upon applying high voltage between these terminals and the case.

The suppression capacitors used in this relay are capable of withstanding voltages up to 3 kV. However, during high voltage tests, even higher overvoltages can be generated, and the capacitors should not be subjected to these types of tests. Therefore, the ground conductor should be disconnected from terminal B1 during these tests. In addition, the auxiliary voltage circuits wired to terminals A1 and A2 should be disconnected.

3.3. Ranges and Settings

The following indicates the ranges of standard models. Special models can be supplied with other ranges, upon demand.

Time Overcurrent Unit (TOC) (independent ranges for phase and ground units):

0.1 – 0.875 x In, or
0.3 – 2.625 x In in 32 steps of 0.025 x In

Time Delay (TOC) (independent for phase and ground):

Depends on the curve selected. Four Inverse Time curves are available (see figures 1,2,3, and 4) and four definite time (maximum time 2,4,6,8 seconds), all in the same relay.

Instantaneous Unit Pick-Up (independent for phase and ground units):

1 –31 times the tap setting
Setting of zero disables the instantaneous unit

Instantaneous Unit Time Delay (independent for phase and ground):

0 to 3.1 seconds in 100 millisecond steps

Phase Operating Curves:

BS 142 Inverse, ANSI Inverse, Very Inverse, and Extremely Inverse.
Four families of definite time characteristics, with maximum values of 2, 4, 6, and 8 seconds.
Between each family of curves, a determined curve can be selected between 0.05 and 1.0 in steps of 0.05.

Ground Operating Curves:

BS 142 Inverse, ANSI Inverse, Very Inverse, and Extremely Inverse.
Four families of definite time characteristics, with maximum values of 2, 4, 6, and 8 seconds.
Between each family of curves, a determined curve can be selected between 0.05 and 1.0 in steps of 0.05.

All values are adjusted with dipswitches located at the front of the relay.

4. OPERATING PRINCIPLES

4.1. Inputs

The secondary current from the current transformers of the protected circuit is input to the relay and immediately reduced through internal current transformers. The secondaries of the relay's internal current transformers are connected across input resistors, yielding a voltage proportional to the relay input current.

This voltage is rectified and filtered before input to the multiplexor and analog to digital converter, which are internal to the microprocessor where the measurements are performed.

4.2. Measurement

A timer internal to the microprocessor generates an interruption every millisecond on 50 Hz system and every 0.833 milliseconds at 60 Hz, such that there are 20 interruptions per cycle.

Phase and ground measurements are made in each of these interruptions. These measurements are grouped, separately for phase and ground, in two groups of ten, and the average of the maximum value of these groups is taken.

This average is converted at times tap, which is the value with which the relay works. This value is read each 5 milliseconds.

To improve precision in obtaining the times tap value, two consecutive measurements are carried out. The first is made with a determined voltage reference of the internal converter and, depending on the value obtained, the reference is changed, and the second measurement is obtained - which is the one used. This approach takes better advantage of the dynamic range of the analog to digital converter and therefore better precision.

MIC measurements have an autoadjustment system to avoid false measurements as a result of changes in the reference voltages for the converter. This is accomplished through an external reference voltage which is compared to the measured value.

4.3. Inverse Time Unit

The times tap measurement obtained is compared, independently for phases and neutral, with a value that corresponds to one times a tap set be the user and if the measurement exceeds the fixed setting, a pick-up LED lights on the front of the relay.

The minimum current necessary to cause the Inverse Time measuring elements to operate is never less than the set value (Is), nor greater than ten percent of the set value.

1.0 Is < 1 min < 1.1 Is

The drop out to pick up ratio is not less than 95%, based on the actual operating value.

The MIC incorporates four inverse time curves (BS 142 Inverse, ANSI Inverse, Very Inverse, and Extremely Inverse) and four definite times (maximum time of 2, 4, 6, and 8 seconds).

Within each family, the curves are defined by a coefficient (time index) from 1 (upper curve) to 0.05 (lower curve).

4.4. Instantaneous Unit

The times tap measurement obtained is compared, independently for phase and ground, with a user set value, and if the user set value is exceeded, a pick up LED is lit on the front of the relay and a user programmable timer is initiated. When the timer expires, the relay trips and a trip LED (phase or ground) is lit on the front of the relay.

The trip level is user adjustable independently for phase and neutral. Likewise, the timer can be programmed, independently for phase and neutral, between 0.0 and 3.1 seconds, in 100 millisecond steps.

The instantaneous unit can be disabled by setting the trip value to zero.

4.5. Changing Settings

Settings can be changed by dip switches on the front of the relay. Once the desired changes are made, the relay has to be initialized so it accepts the changes. Initialization is accomplished by depressing the reset button for three seconds until the in-service LED goes out.

At any time when a dip switch is changed, the in-service LED begins to flicker at a frequency of twice per second. If the settings are returned to their previous positions, or if the relay is initialized, the in-service LED will cease to flicker. This avoids the settings from being inadvertently changed without initializing the relay, implying that the relay would be set to respond to values different than those shown by the dip switch positions. If the relay remains in this state for three minutes, it will accept the new settings and self initialize.

NOTE: *The above paragraph does not apply to the time delay pick up setting adjustment switches (setting I>), whose setting change is immediate.*

4.6. Display and Reset

MIC type relays are provided with a reset push-button on the front and a seven segment display.

Upon energizing the relay a value appears on the display which indicates the relay state. In order to differentiate this from the rest of the information, it appears with the two points illuminated. The values displayed indicate:

00	Equipment in Service.
01	Internal settings are different from the external settings.
80	Fatal flaw.

Depressing the reset button for less than two seconds advances a sequence of data.

This sequence is:

F0	Actual state of the equipment.
F1	Phase current.
F2	Ground current.
F3	Phase current for the last trip.
F4	Ground current at the last trip.
F5	Operating time for the last trip.

Last trip data (F3, F4, and F5) is retained provided auxiliary power is maintained.

With two displays, only 99 seconds can be reached for the operating time of the last trip. From then, it begins again from zero with both decimal points lit to indicate 100 units. If the time exceeds 199 seconds, the display stays lit with the figure 99 and both decimal points lit.

By pushing the reset button for less than 2 seconds, the next function appears on the display. If, for example, the phase current is showing on the display and the button is pushed, F2 appears, which indicates the next function, and the moment the button is released, the display will show the value of this function, which is the ground current in times tap setting.

If the button is held for more than three seconds, the in service LED goes out and the relay initializes itself. The display shows the state function.

It is only possible to initialize the relay if it has not picked up. If it has picked up, or has tripped and the fault persists, and the button is held for more than three seconds, the display will show the actual function when the button is released. In this case, initialization is not allowed.

If the reset button is not pushed for more than two minutes, phase current appears on the display.

4.7. Self Test and Error Routines

When the MIC detects a grave failure of one of its components, it immediately gives a fatal error order and disables the trip outputs. In this case the relay program gets stuck in do loop from which it cannot exit until power is removed and the relay reenergized. Locally, the In Service LED goes out and the state of the relay is indicated by a 80 on the display, flickering at a frequency of once per second. If the relay is equipped with an alarm, the alarm relay picks up, indicating the error.

The first thing the MIC does when powered is perform a complete check of the EPROM. If any error is detected, a fatal error output is given.

Once in operation, partial EPROM checks are made during the time the relay is free form its protection functions. If any one of these checks gives an error signal, it goes to fatal error output.

The MIC incorporates a WATCHDOG monitoring system for the program.

Measurements are continuously compared with a reference voltage so they can be automatically adjusted in the event of a voltage drop in the internal microprocessor converter.

5. CONSTRUCTION

5.1. Case

The MIC case is made of sheet metal, with outline dimensions as shown in Figure 7.

The front cover is plastic and is set on the relay case by pressing against a rubber gasket which is located around the perimeter of the relay, producing a hermetic seal impervious to dust.

5.2. External and Internal Connections

External connections are made to the two terminal blocks mounted on the back of the relay. Each terminal block contains 12 ring type screw terminals of 4 mm diameter for non-drawout models and 3 mm for drawout models.

All current inputs are made to the same base plate, to a terminal block located on the lower part of the relay. This block has the current carrying capacity required to carry the current of the transformer secondaries. Internal input current conductors are larger in diameter than the rest of the internal connections. They are designed to have the shortest length possible to minimize the resistive burden on the current transformers. The connections are made through pressure type terminals. Input current cables are bundled together and separated from the other cable bundles in order to minimize magnetic coupling effects of the input current conductors on the internal conductors carrying weaker signals.

5.3. Identification

The complete model of the relay is indicated on the characteristic plate. Figure 6 represents the front plate of the MIC.

Terminal blocks are identified by a letter located on the lower plate, just above the left border of each block, as viewed from the rear of the relay. There are two terminal blocks on each case and each has a unique code (from A to B) to avoid confusion when making external connections.

On each terminal block, connection screws (1 to 12) are marked by engraved numbers.

5.4. External Signals

The MIC has four Light Emitting Diodes (LED's) on the front of the relay in order to indicate the following situations:

In Service. A green LED indicates that the relay is in operation.
Pick Up. A red LED indicates that one of the protection units has picked up.
Phase Trip. A red LED indicates that one of the phase units has produced a trip.
Ground Trip. A red LED indicates that the ground unit has produced a trip.

6. ACCEPTANCE, HANDLING & STORAGE

Relays are supplied to the client in a special packaging material which is designed to protect the relay during normal conditions of transport.

Immediately upon receipt of the relay, The customer should inspect the relay to determine if there is any sign of damage suffered before or during transport. If it is obvious that the relay has been damaged due to mistreatment, the customer should immediately advise the shipper in writing, with copy to the factory.

Unpacking the relay requires that normal precaution is taken not to lose the screws supplied in the box.

If the relay is not intended for immediate use, it is best to store it in the original packing, in a dry, dust free environment.

It is important to verify that the nameplate inscription characteristics conform to those on the purchase order.

7. ACCEPTANCE TESTS

Visual inspection and acceptance testing, as described below, are recommended immediately upon receipt of the relay in order to assure that the relay has not suffered damage in transit and that the factory calibration has not been altered.

These tests can be performed as installation or acceptance tests, per the user's normal criteria. Because most users have different procedures for installation and acceptance testing, this section indicates all test that can be performed with the relays.

7.1. Visual Inspection

Verify that the model number indicated on the front nameplate corresponds to the information included in the order. Unpack the relay and verify that no parts are broken and that the relay has not suffered damage or deterioration during transit.

7.2. Electrical Tests

7.2.1. Inverse Time Unit

7.2.1.1. Pick up Tab Calibration Verification

- Set the switch on the front of the relay so the output relays correspond to phase or ground.
- Connect the relay as indicated in Figure 8. In order to apply current to the relay, use a supply of 127 or 220 volts, 50 Hz, with a variable resistor in series, or a power supply.
- Set the relay at whichever tap desired and disable the instantaneous unit by setting the instantaneous to zero.

Apply current to the relay and verify that the pick up LED on the front of the relay lights between 100 and 110 percent of the tap setting and that the trip relay closes thereafter.

With the output relay closed, reduce the current applied, verifying that a t a value between 95 and 105 percent of the tap, the relay resets and the pick up LED turns off.

7.2.1.2. Verification of Operating Time

With the relay connected as indicated in the previous paragraph, set the inverse time unit to the minimum tap and set the corresponding curve to 0.5.

Successively apply currents of 2, 5, and 10 times tap at a minimum, verifying that the operating times are within the margins indicated in tables 1, 2, 3, and 4.

TABLE 1. BS 142 Inverse Characteristic

Times Tap	Current Input (A) Example I ≥ 1A	Operating Times for Curve (IT = 0.5) in Seconds
2 5 10	2 5 10	4.38 - 5.62 1.96 - 2.27 1.42 - 1.55

TABLE 2. ANSI INVERSE Characteristic

Times Tap	Current Input (A) Example I ≥ 1A	Operating Times for Curve (IT = 0.5) in Seconds
2 5 10	2 5 10	3.93 - 5.06 1.85 - 2.15 1.33 - 1.47

TABLE 3. VERY INVERSE Characteristic

Times Tap	Current Input (A) Example I ≥ 1A	Operating Times for Curve (IT = 0.5) in Seconds
2 5 10	2 5 10	7.43 - 9.56 1.38 - 1.61 0.77 - 0.85

TABLE 4. EXTREMELY INVERSE Characteristic

Times Tap	Current Input (A) Example I ≥ 1A	Operating Times for Curve (IT = 0.5) in Seconds
2	2	7.63 - 9.76
5	5	1.01 - 1.15
10	10	Approx. 0.31

For the Definite Time Characteristics, based on any current input, the time should be half of the maximum value.

Set the relay at the minimum tap and verify that with an input current of five times tap, the operating time is between the margins shown in tables 5 and 6.

TABLE 5

Curve	Time in Seconds			
	BS Inverse	ANSI Inv.	Very Inverse	Extremely Inv.
I. TIME = 1	4.10 - 4.52	3.80 - 4.20	2.85 - 3.15	2.05 - 2.25
I. TIME = 0.7	2.85 - 3.15	2.66 - 2.94	2.00 - 2.20	1.42 - 1.56
I. TIME = 0.3	1.26 - 1.38	1.19 - 1.31	0.88 - 0.96	0.65 - 0.71
I. TIME = 0.1	Appx. 0.44	Appx. 0.41	Appx. 0.31	Appx. 0.25

TABLE 6. Definite Time

Curve	Time in Seconds			
	Tmax. = 2 sec	Tmax. = 4 sec	Tmax. = 6 sec	Tmax. = 8 sec
I. TIME = 1	1.98 - 2.02	3.98 - 4.03	5.98 - 6.04	7.98 - 2.25
I. TIME = 0.7	1.38 - 1.42	2.78 - 2.83	4.18 - 4.23	5.58 - 5.64
I. TIME = 0.3	0.58 - 0.62	1.18 - 1.23	1.78 - 1.83	2.38 - 2.42
I. TIME = 0.1	Appx. 0.2	Appx. 0.4	0.58 - 0.64	0.79 - 0.82

7.2.2. Instantaneous Unit

7.2.2.1. Verification of Pick-up

- Set the switch on the front of the relay to ON so the output relays correspond to phase or neutral.
- Connect the relay as indicated in Figure 8. Use a supply voltage with a variable resistor in series, or use a power supply.
- Set the relay at the minimum tap. The instantaneous will set itself to one times the value set for the inverse time unit. Set the instantaneous time delay to zero seconds.

Apply current to the relay and verify that the PICK UP LED lights and the output trip relay closes when the current is between 95 and 105% of the tap setting.

With the trip output contact closed, lower the applied current verifying that the trip relay resets and that the PICK UP LED turns off at a current value equal to or greater than 95% of the pick up value.

7.2.2.2. Verification of Operating Time

With the relay connected as indicated in the previous paragraph, apply a current of 5 times the tap setting, verifying that the operating time is less than 0.025 seconds.

Set the time delay of the instantaneous unit and verify that it is never less than the set time nor greater than the set time plus 50 milliseconds.

8. INSTALLATION

8.1. Introduction

The relay should be installed in a clean, dry place, free from dust and vibration, and should be well lit to facilitate tests and inspections.

The relay should be mounted on a vertical surface. Figure 7 is a plan view.

External connection schemes are reflected in Figure 9.

8.2. Ground Connection for Overvoltage Suppression

Relay tap B1 should be connected to ground so the distortion suppression circuits can function correctly. This connection should be made with wire of a cross section of 2.5 millimeters and as short as possible to assure maximum protection (preferably 25 cm or less).

8.3. Tests

Since most users utilize different installation test procedures, the section ACCEPTANCE TESTS includes all the necessary tests which can be performed as installation tests according to the users' criteria. The following indicates tests that are considered necessary as a minimum:

Inverse Time Unit Tests

Set the relay at the pick up tap setting desired with the five switches located on the front of the relay and marked with symbol I>. The pick up tap is the sum of the switches in the ON position plus the value indicated above these switches. Apply current to the relay and verify that it operates between 1 and 1.1 times the setting value. The ACCEPTANCE TESTS section includes a detailed description of pick up current testing of the inverse time unit.

Set the relay at the desired time curve according to the table at the front of the relay. Set the time dial with the switches on the front of the relay marked with T.dial. Curves can be selected from the lower curve (0.05, with all switches in the OFF position) to the higher curve (1, with all switches in the ON position). Verify the operating time by applying a current of 5 times the pick up value of the tap setting. The ACCEPTANCE TESTS section includes detailed test information for operating time testing of the inverse time unit.

Instantaneous Unit Tests

Set the relay instantaneous unit to the desired value with the five switches marked with the symbol I>> ()XI> (in such a way that the sum of the switches in the ON position is equal to number times nominal current that should trip the instantaneous unit) and refer to the ACCEPTANCE TESTS section for the tests to verify pick up and operating times. The instantaneous time delay is set with the switches on the front of the relay marked I>> T(), where the time delay is the sum, in seconds, of the switches in the ON position.

All the tests described in the section INSTALLATION should be performed at the time the relay is installed.

If for any reason the ACCEPTANCE TESTS have not yet been performed, they should be performed at the time the relay is installed.

8.4. Tabs settings.

In this section we will explain how to adjust the different settings (pick-up, curves, instantaneous, etc) of a MIC relay.

MIC relays have 3 (MIC 5000 and 7000) or 6 (MIC 8000 y 9000) groups of 8 switches which can be configured in two positions (OFF with the switch on the left, ON with the switch on the right). These switches are distributed in columns with 3 groups of switches each.

At a functional level, we can consider each column to be divided in the following groups:

- Pick-up current setting: 5 first switches of the first group.
- Curve type setting: switches 6 to 8 of the first group.
- Time dial: 5 first switches of the second group.
- Instantaneous pick-up setting: switches 6 to 8 of the second group and 1 & 2 of the third group.
- Instantaneous operation time delay setting: positions 3 to 7 of the third group of switches.

As an example, let's imagine we want to adjust a relay with the following settings (for phase, for ground we would follow the same procedure):

- Pick-up current = 2.25 A.
- Very inverse curve.
- Time dial = 0.5
- Instantaneous pick-up current = 6.75 A.
- Instantaneous time delay = 0.3 s.

in a MIC 8053 N011 _00 relay.

1. Pick-up current setting.

The pick-up current is obtained using the following formula:

$$I > = [\ 30 + (\quad)\ ] * In/100$$

In our example, we would obtain the following switch disposal:

2.25 = [30 + ( )] * 5/100

( ) = 15

OFF	ON	
- - -		**120**
- - -		**60**
- - -		**30**
	- - -	**15**
- - -		**7.5**

2. Type of curve and time dial setting.

The type of curve is adjusted using the corresponding switches, as indicated on the front characteristics plate.

The time dial setting is obtained according to the following formula:

D.T. =(( ) + 5) / 100

In our example, we would obtain the following switch disposal:

0.5 = [( ) + 5] / 100

( ) = 45

OFF	ON	
- - -		**40**
	- - -	**20**
	- - -	**20**
- - -		**10**
	- - -	**5**

3. Instantaneous pick-up setting.

The instantaneous pick-up setting is obtained from the following formula:

I >> = () * I>

In our example, we would obtain the following switch disposal:

6.75 = ( ) * 2.25

( ) = 3

OFF	ON	
- - -		**16**
- - -		**8**
- - -		**4**
	- - -	**2**
	- - -	**1**

4. Instantaneous operation time delay setting.

Finally, we will adjust the instantaneous timing to the desired delay

In this case T= 0.3 s.

OFF	ON	
- - -		**1.6**
- - -		**0.8**
- - -		**0.4**
	- - -	**0.2**
	- - -	**0.1**

9. PERIODIC MAINTENANCE & TESTING

Since the important role of protective relays in the operation of the installation they are applied to protect, a program of periodic testing is recommended. Since the interval between periodic tests varies between different types of relays and installations, and based on the experience of the user with periodic tests, it is recommended that the points described in the INSTALLATION section be verified at intervals ranging form one to two years.

10. OUTPUT CONTACT CONFIGURATION

The MIC relay has two output contacts which can be configured, which allow the user to distinguish between phase and ground and between time delay and instantaneous by means of a switch marked on the dial as ø/N 50/51.

In the OFF position marked on the dial ø/N, time delay trips, as well as phases and ground, are output through contacts A3-A8, and the phase and neutral instantaneous through contact A3-A6.

In the ON position marked on the dial 50/51, both time delay and instantaneous phase trips are output through contact A3-A6, and both time delay and instantaneous ground are output through contact A3-A8. Trip alarms operate in the same manner as the trip contacts.

FIGURES

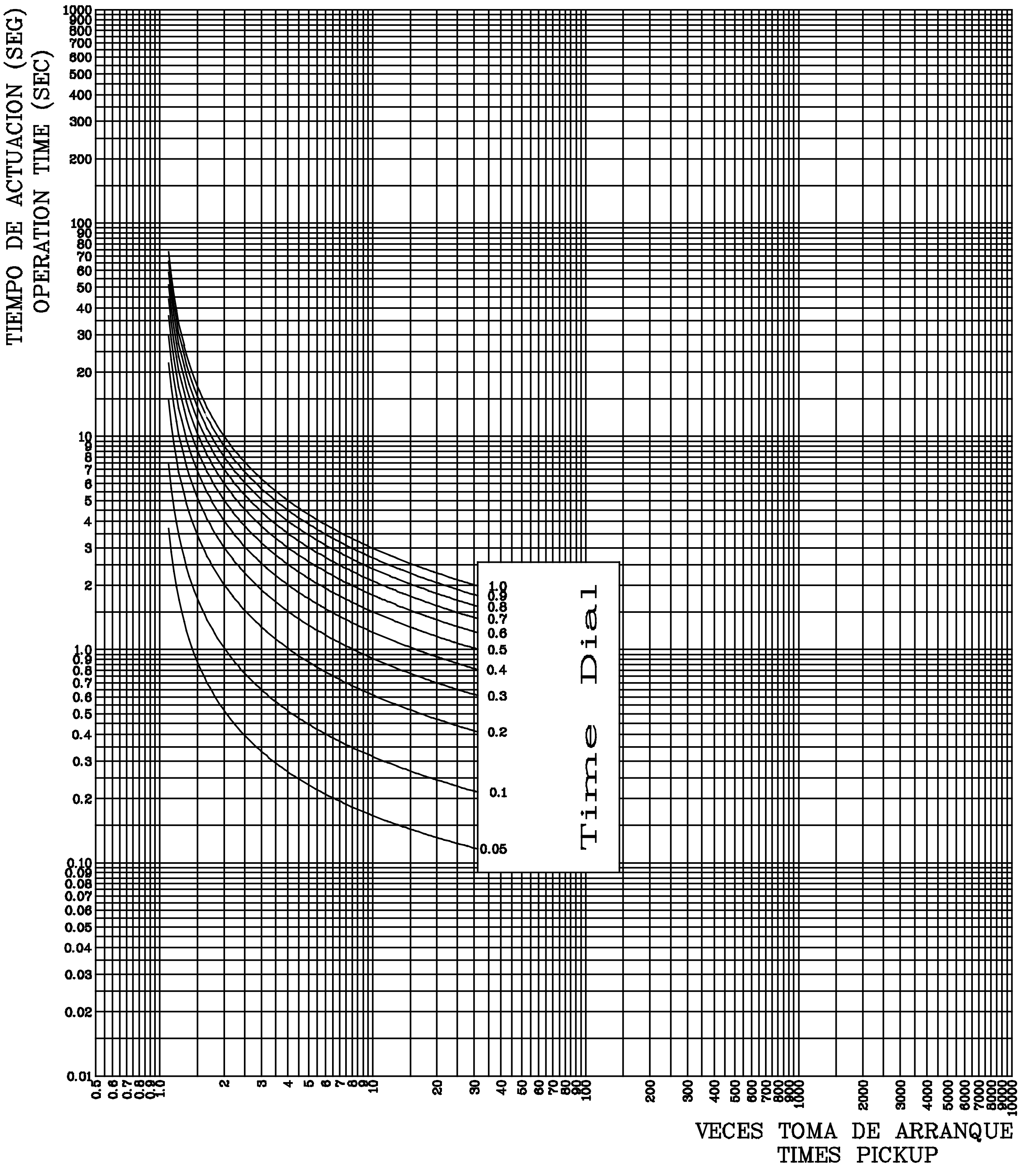


Figure 1. *Inverse BS142 operating characteristic curve (301A7410F1)*

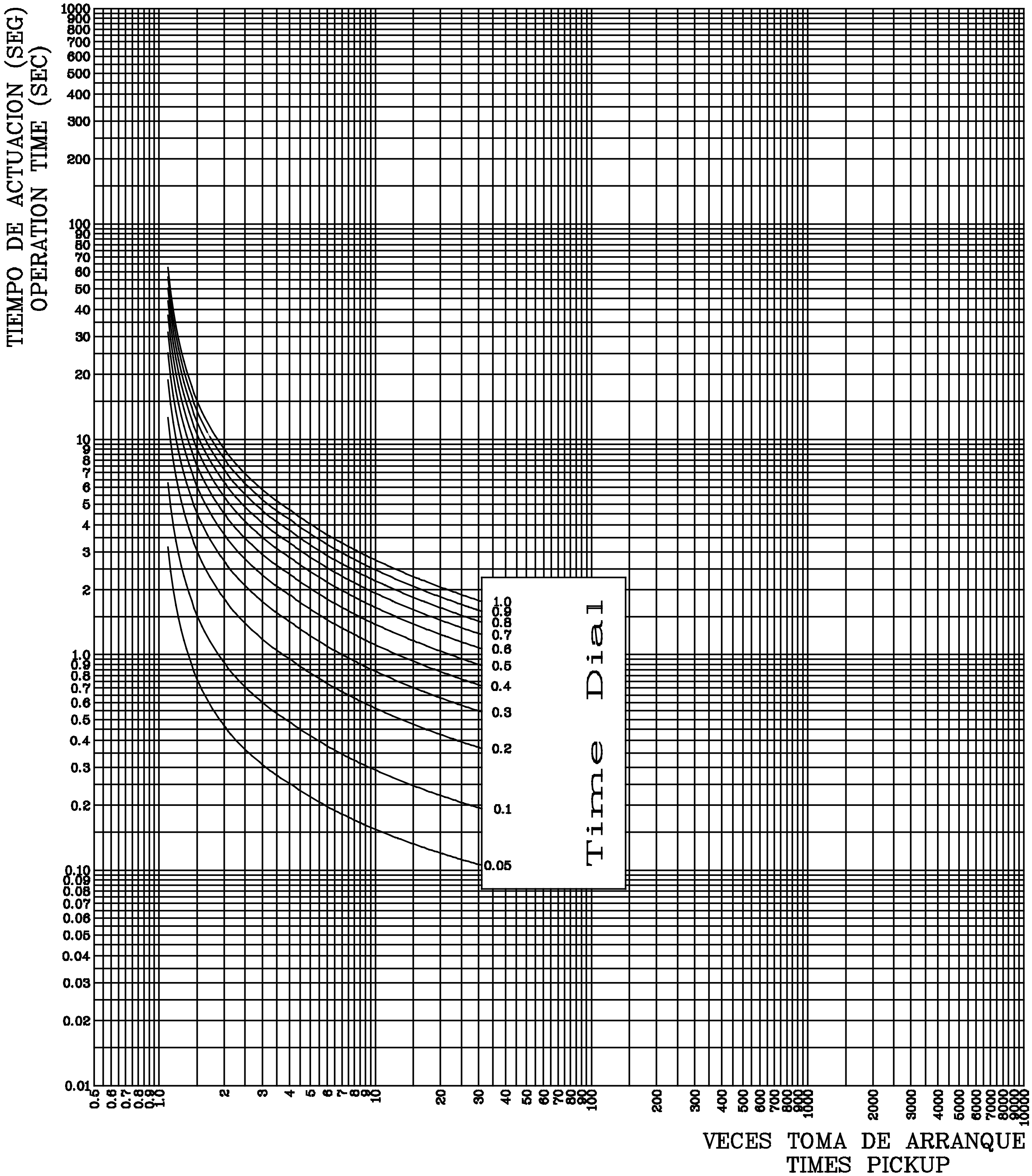


Figure 2. *ANSI INVERSE time characteristic curve (301A7410F2)*

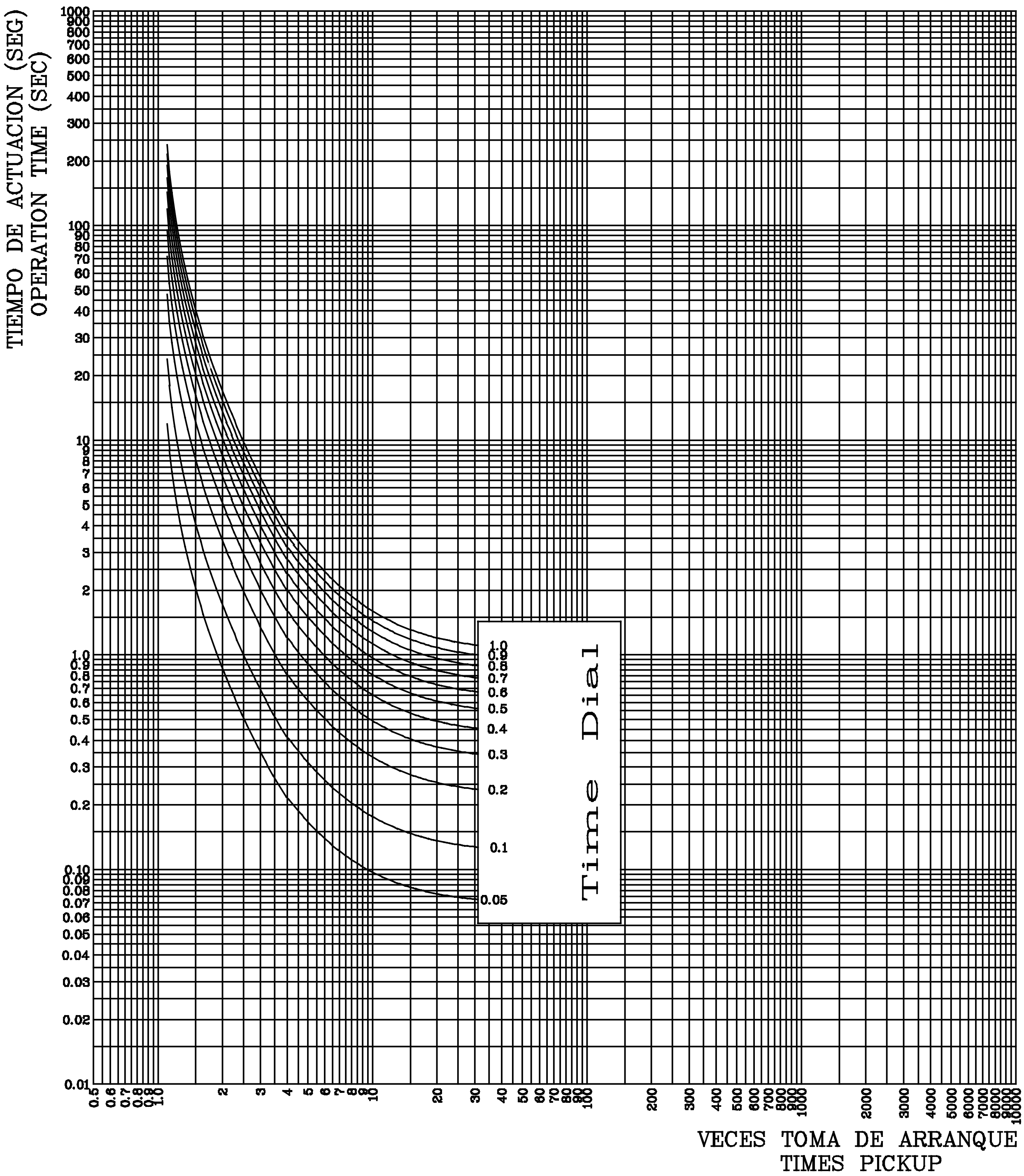


Figure 3. *VERY INVERSE time characteristic curve (301A7410F4)*

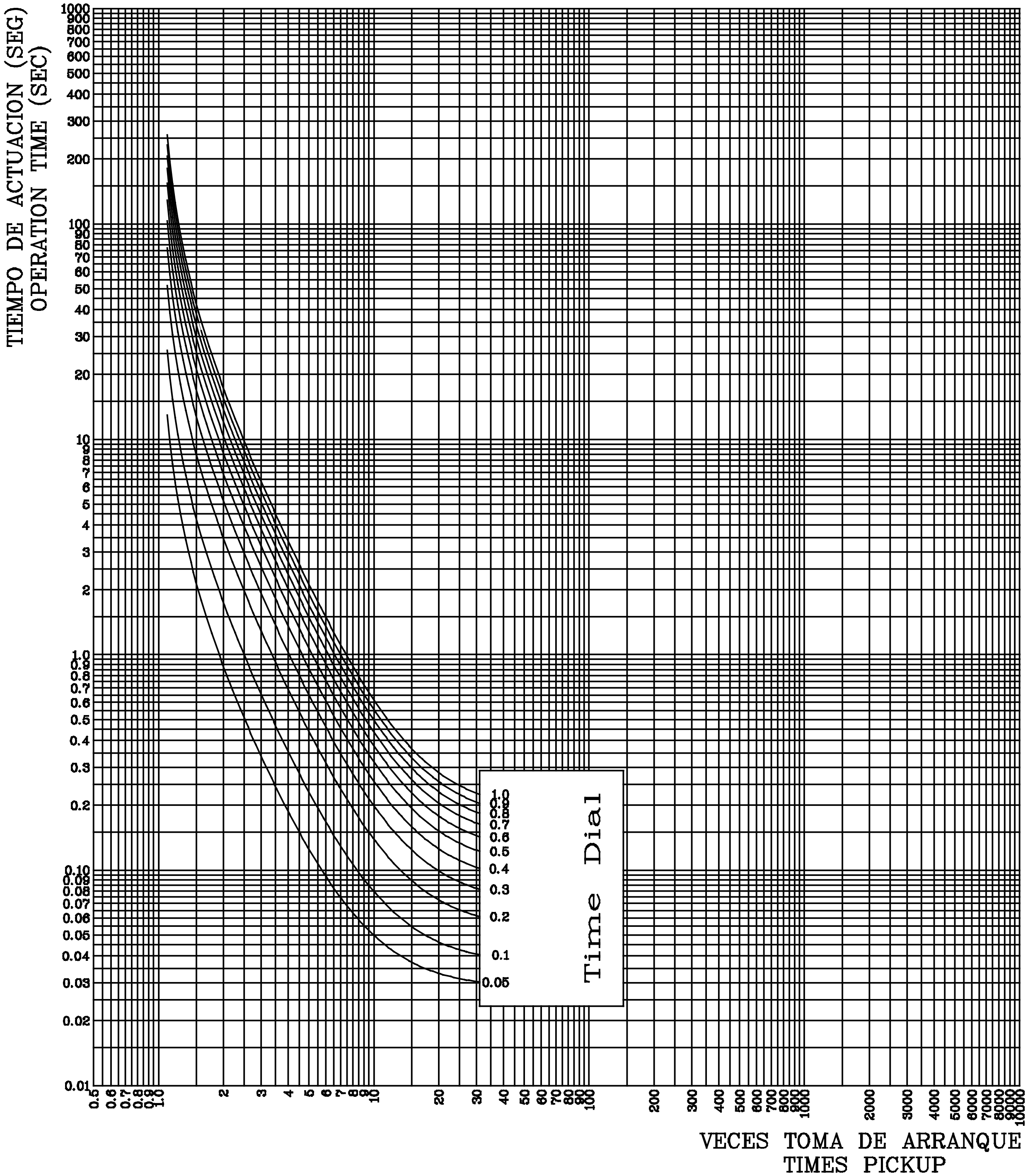


Figure 4. *EXTREMELY INVERSE time characteristic curve (301A7410F3)*

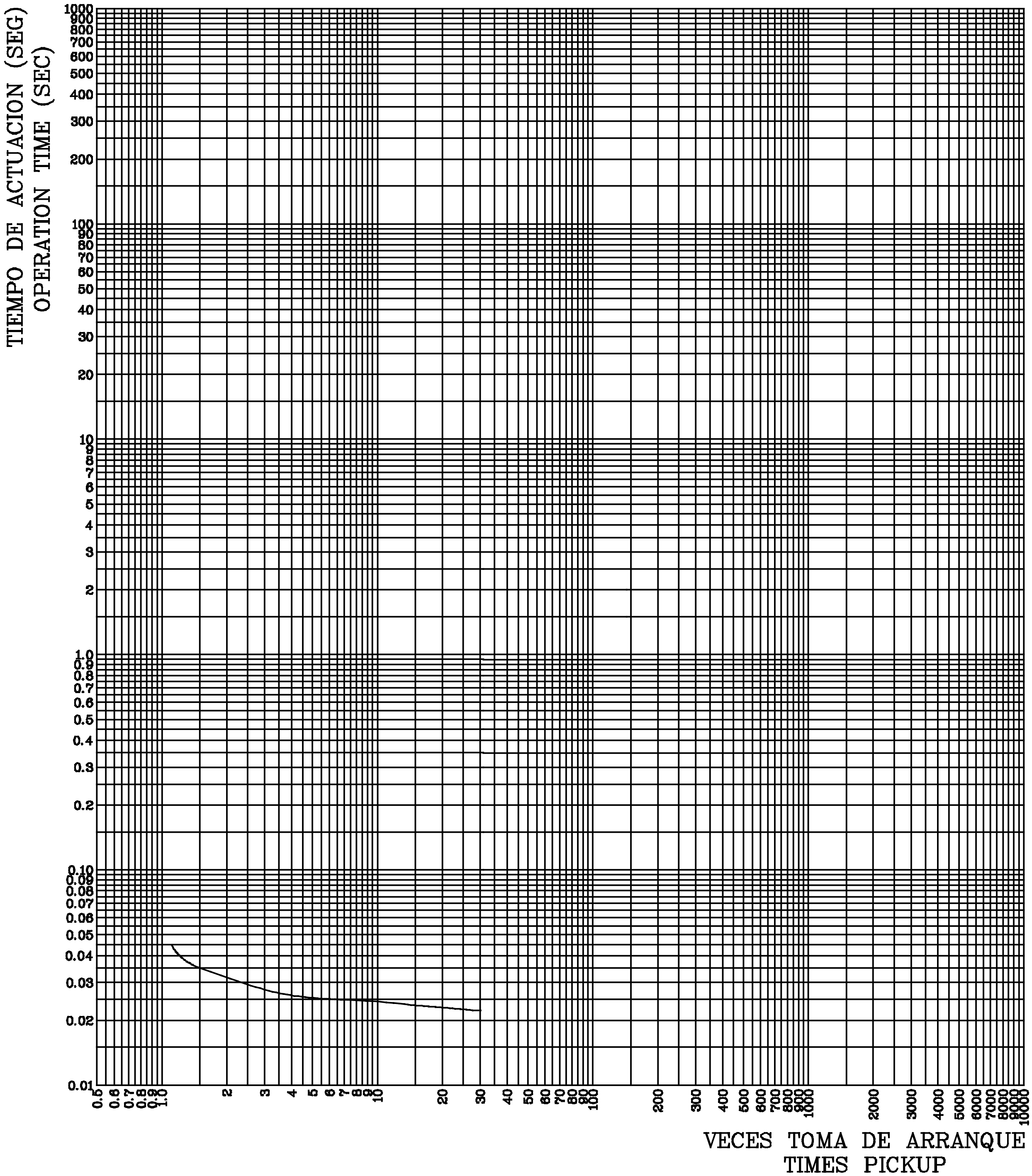


Figure 5. *Instantaneous unit characteristic curve including output relays (301A7410F5)*

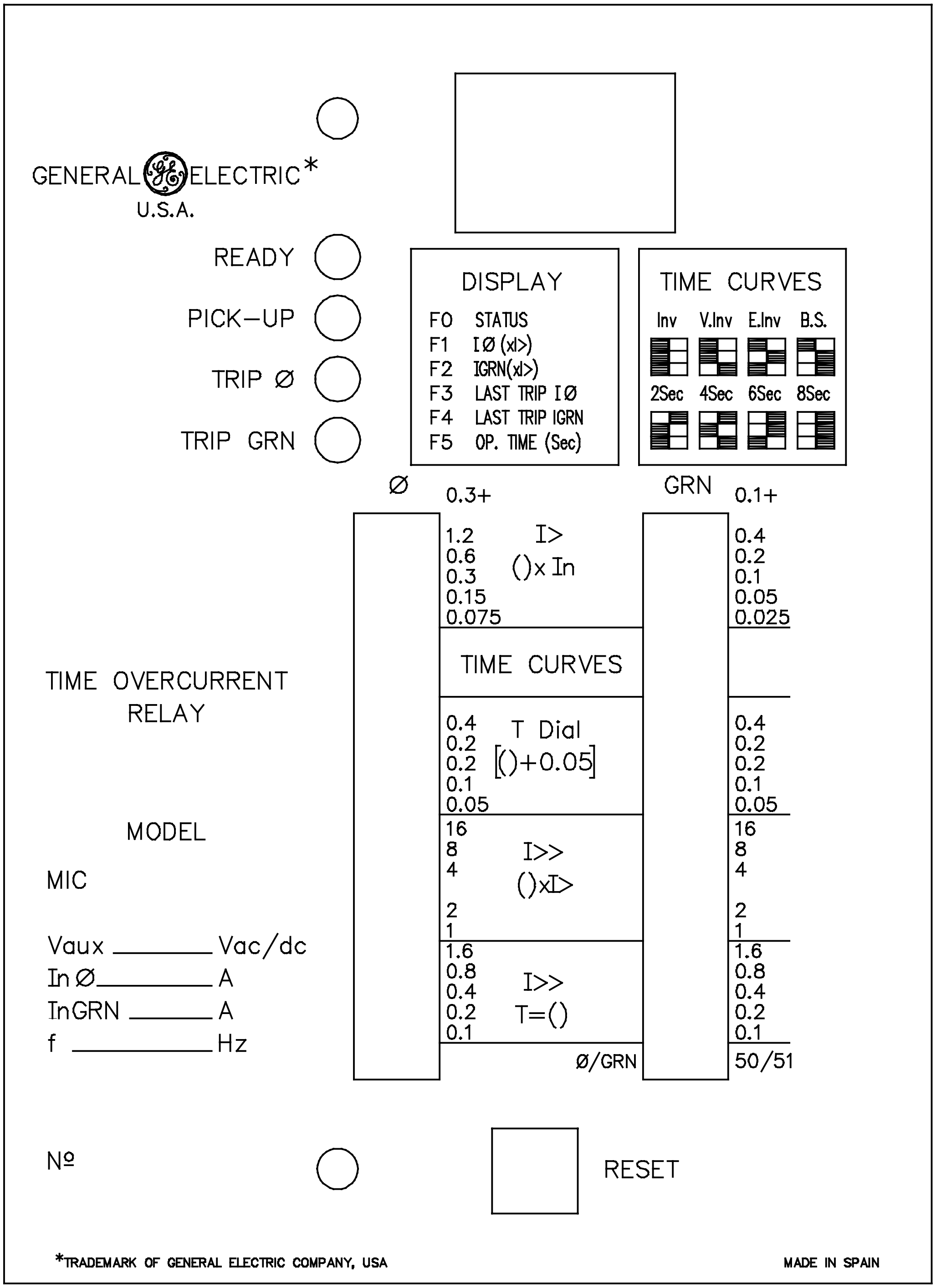


Figure 6. *Front plate characteristic of the MIC 8000/9000 (226B7400F1)*

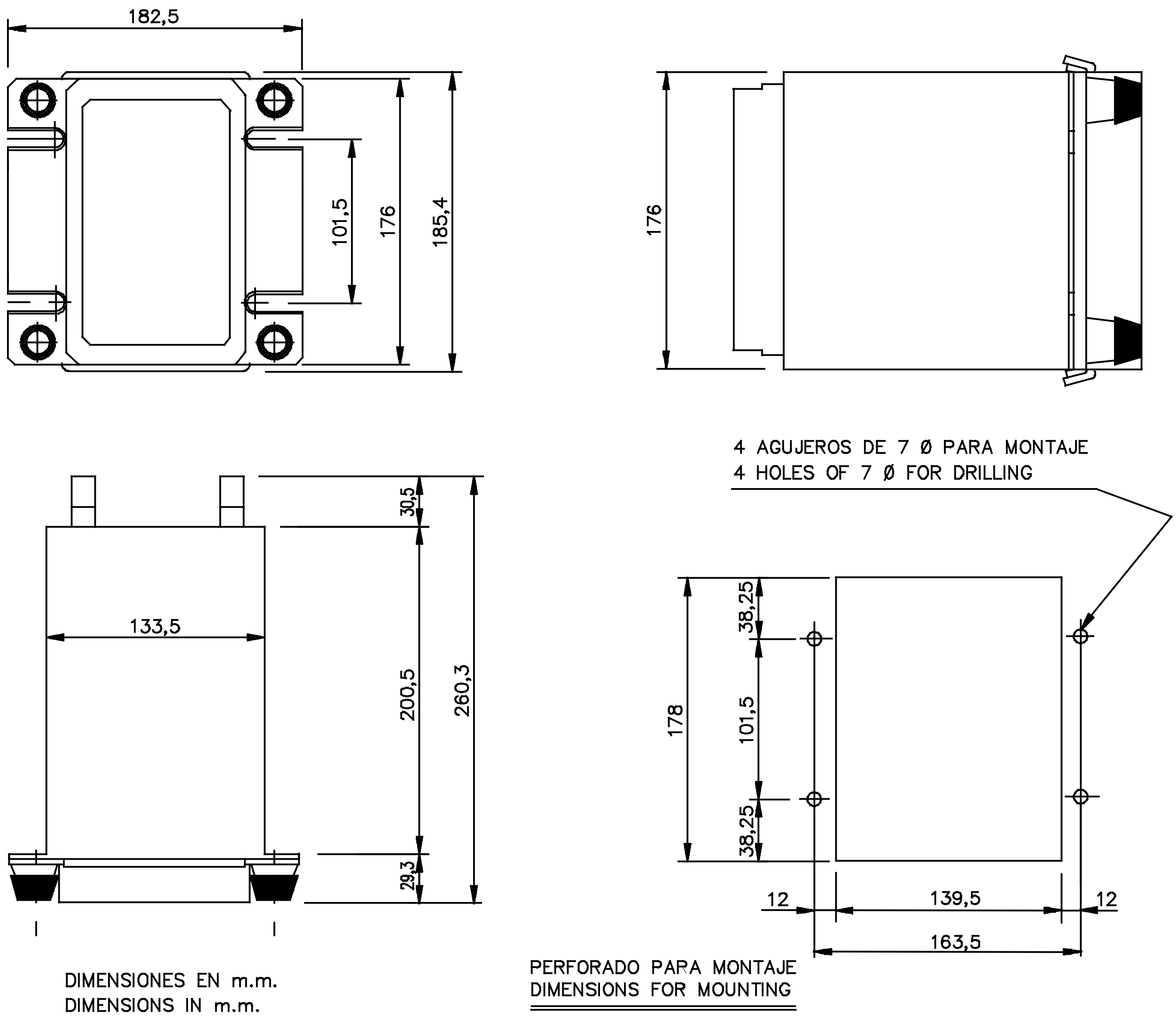


Figure 7a. *Dimensions and mounting of the MIC (non-drawout type)*
226B6086F4

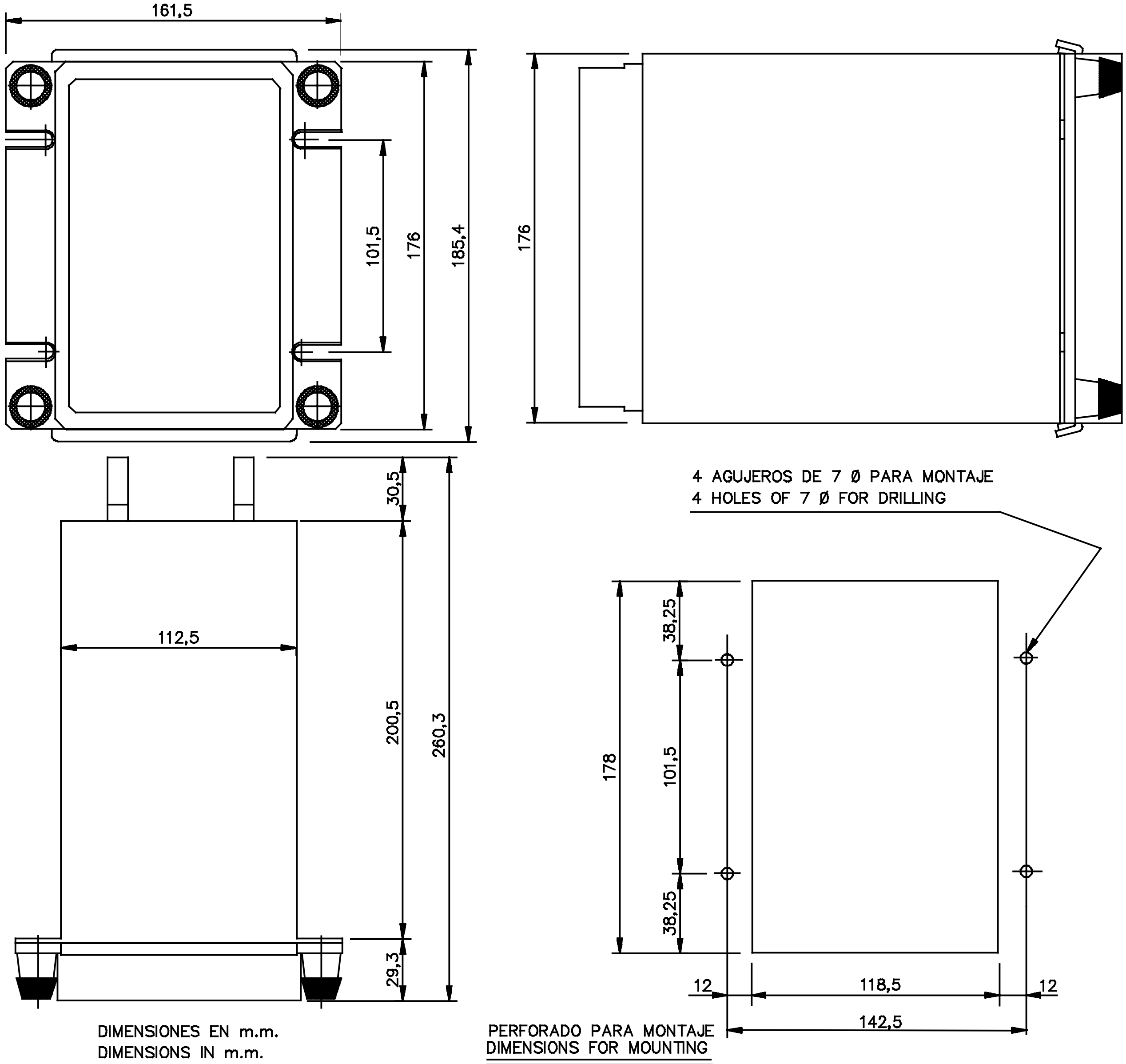
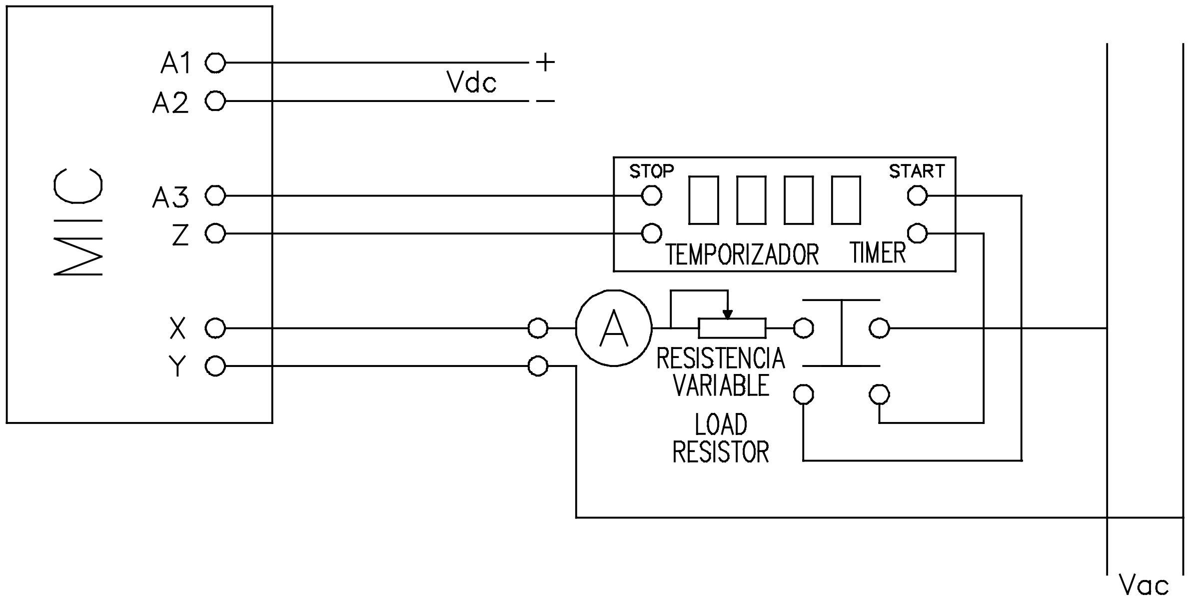


Figure 7b. *Dimensions and mounting of the MIC (drawout type) 226B6086F2*



	X	Y	Z	
A	B2	B3	A6	MIC NO EXTRAIBLE MIC NON DRAWOUT MODEL
B	B4	B5	A6	
C	B6	B7	A6	
GRN	B8	B9	A8	
A	B3	B4	A6	MIC EXTRAIBLE MIC DRAWOUT MODEL
B	B5	B6	A6	
C	B7	B8	A6	
GRN	B9	B10	A8	

Figure 8. *Testing scheme (301A7411F1)*

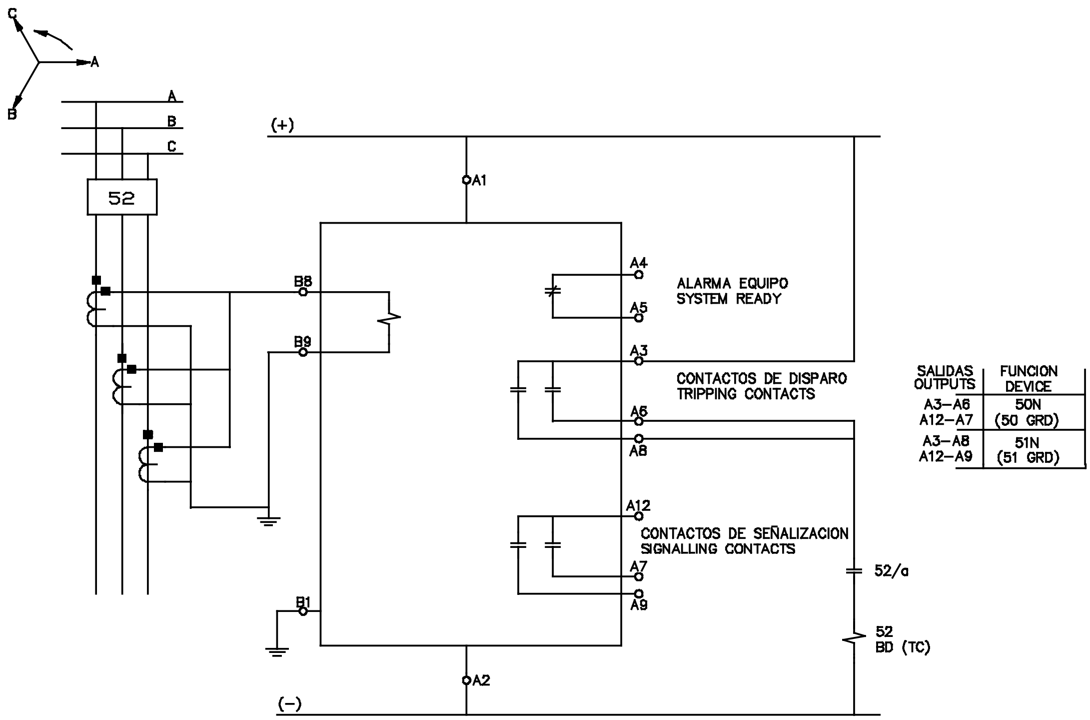


Figure 9a. *External connections of the MIC 5000 (non drawout type) 226B7322F1*

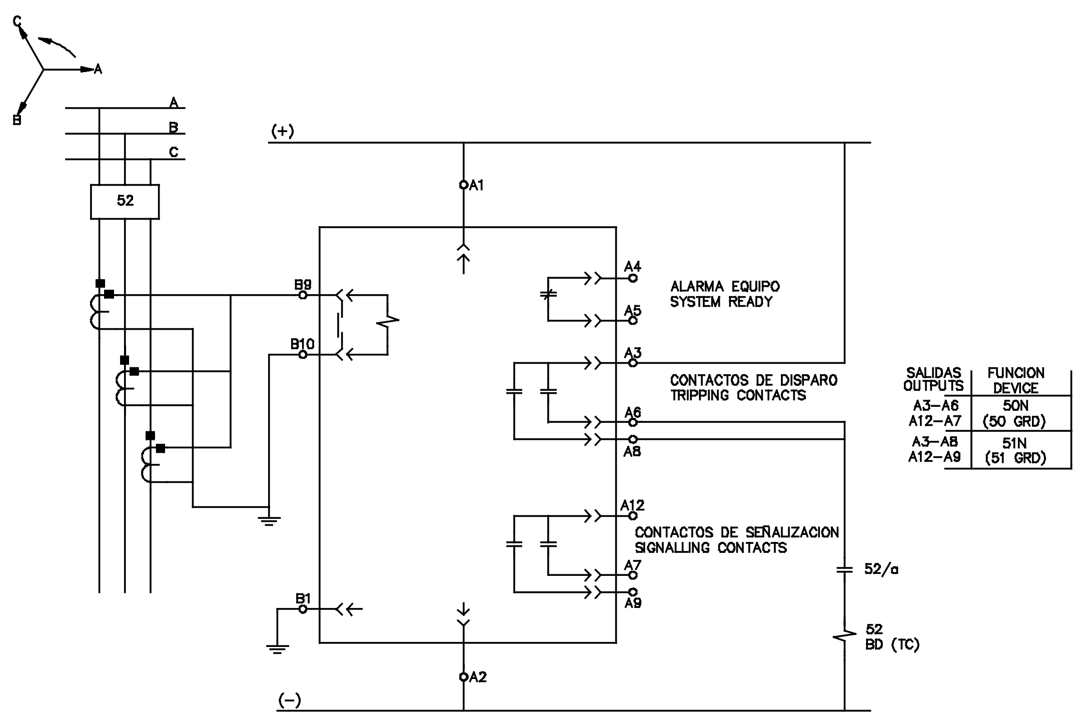
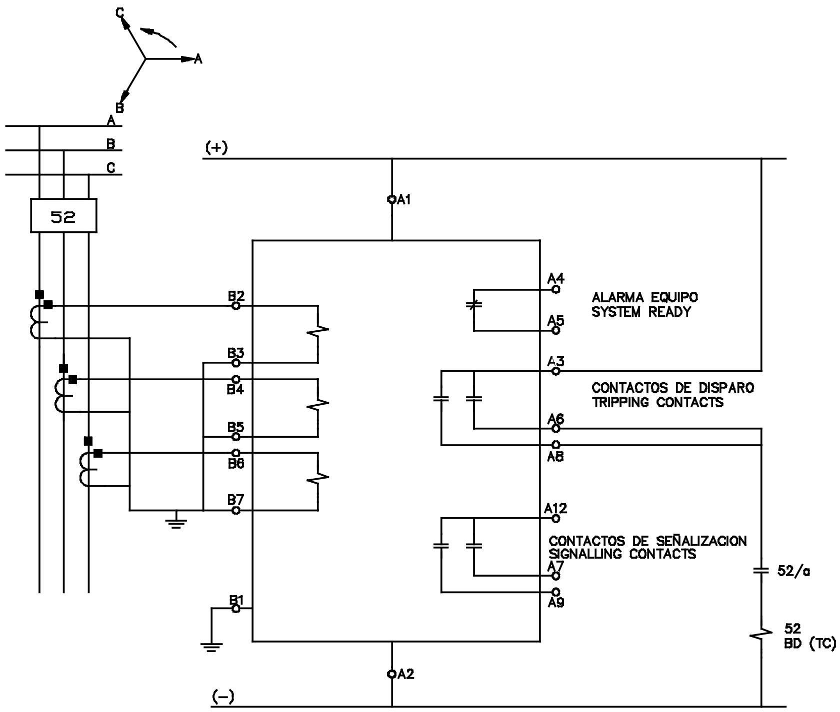
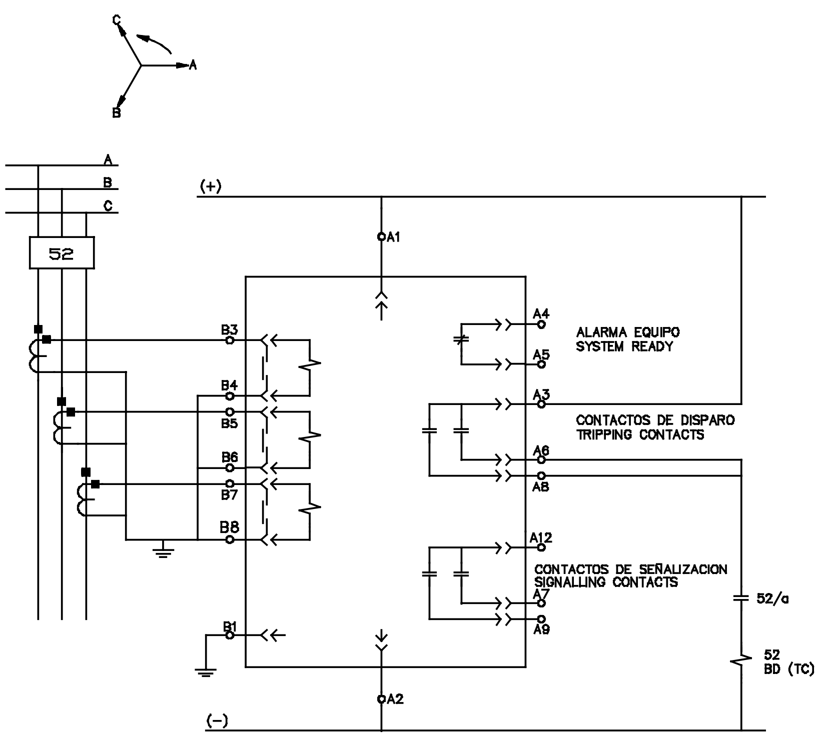


Figure 9b. *External connections of the MIC 5000 (drawout type) 226B7322F3*



SALIDAS OUTPUTS	FUNCIONES DEVICES
A3–A6 A12–A7	50F 50ø
A3–A8 A12–A9	51F 51ø

Figure 10a. *External connections of the MIC 7000 (non drawout type) 226B7215F1*



SALIDAS OUTPUTS	FUNCIONES DEVICES
A3–A6 A12–A7	50F 50ø
A3–A8 A12–A9	51F 51ø

Figure 10b. *External connections of the MIC 7000 (drawout type) 226B7215F3*

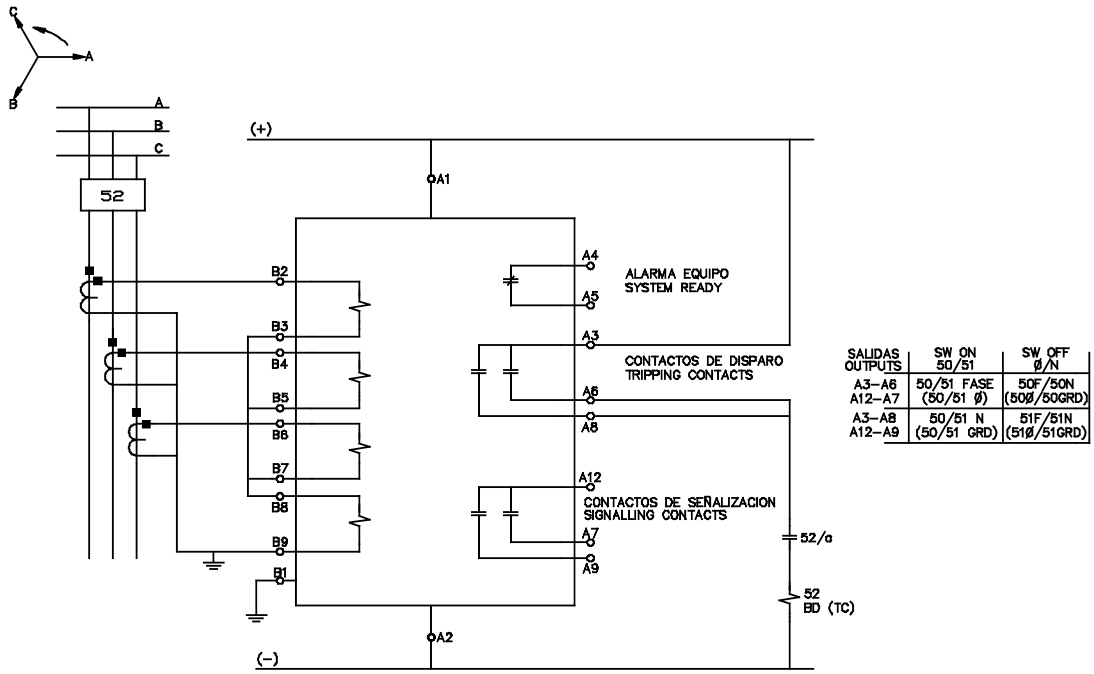


Figure 11a. *External connections of the MIC 8000 (non drawout type) 226B7214F1*

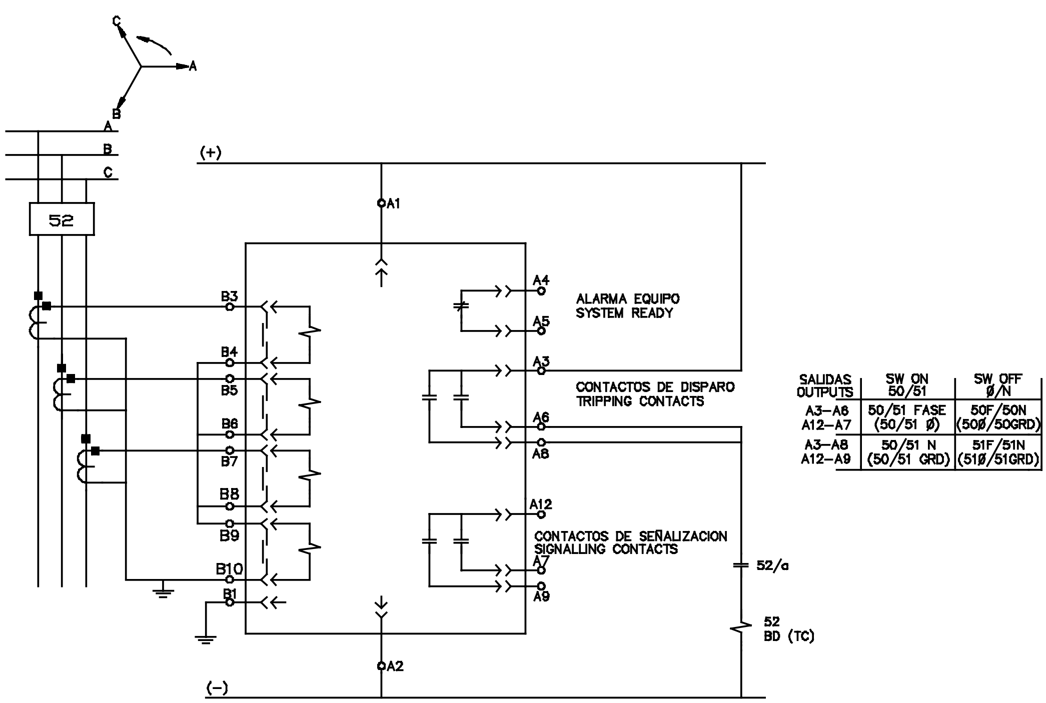


Figure 11b. *External connections of the MIC 8000 (drawout type) 226B7214F3*

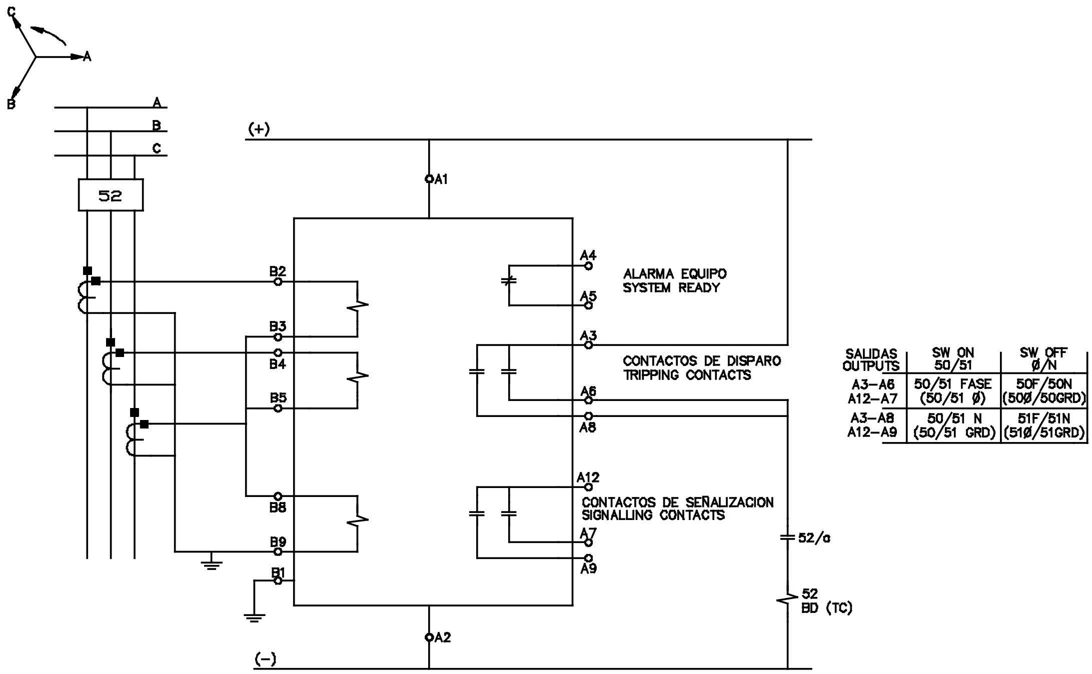


Figure 12a. *External connections of the MIC 9000 (non drawout type) 226B7246F1*

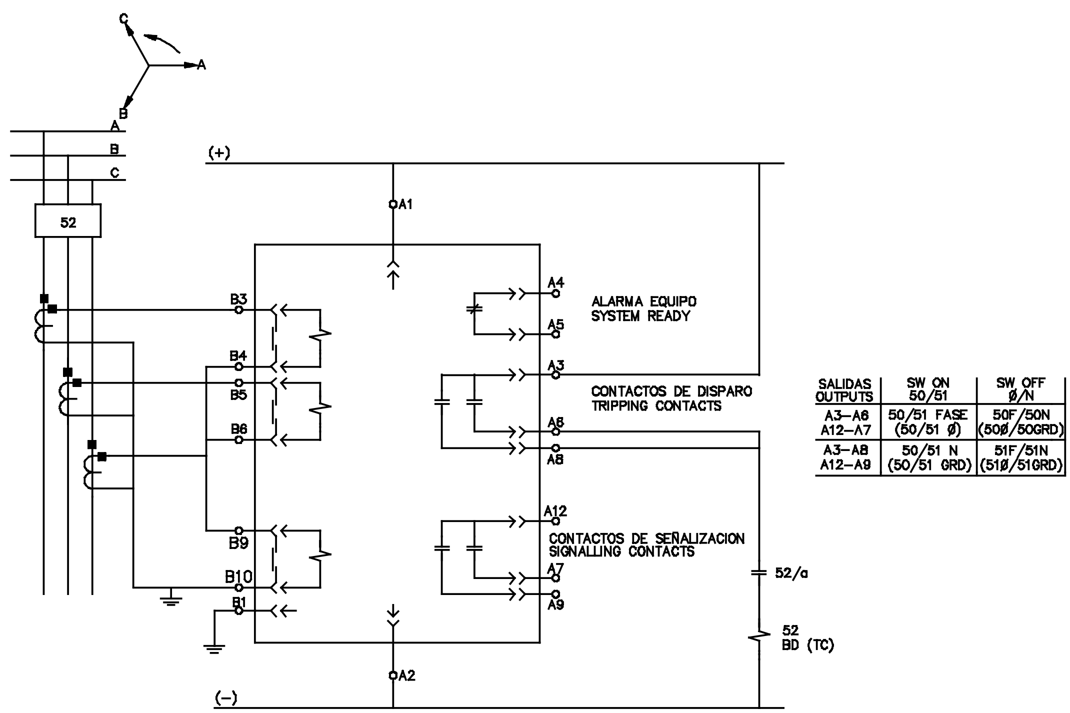


Figure 12b. *External connections of the MIC 9000 (drawout type) 226B7246F*