

Modulex3 Line



GRID

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Numerical Products Range

CODE	DESCRIPTION	NUMERICAL CODE
MX3AM30A	Three phase and earth fault overcurrent relay	51 - 51 - 50 - 51N - 51N - 50N
MX3AM0A	Earth fault overcurrent relay	51N - 51N - 50N
MX3AMD30A	Three phase overcurrent and sensitive directional earth fault relay	51 - 51 - 50 - 67N - 67N - 67N - 59N
MX3AMD0A	Sensitive directional earth fault relay	67N - 67N - 67N - 59N
MX3AMD016A	Multifunction directional protection for maximum two phase and earth current (CEI 0-16)	50, 51, 50N, 51N, 67, 67N
MX3AMD3A	Three phase directional overcurrent relay	67 - 67 - 67
MX3AMD20A	Two phase directional overcurrent and sensitive directional earth fault relay	67 - 67 - 67 - 67N - 67N - 67N - 59N
MX3AJ30A	Multifunction current relay: overcurrent, undercurrent, thermal replica overload, earth fault overcurrent	49 - 49 - 51 - 51 - 50 - 37 - 51N - 51N - 50N
MX3AJ30F	Extended frequency range (5-72 Hz) multifunction current relay	49 - 49 - 51 - 51 - 50 - 37 - 51N - 51N - 50N
MX3AJM30A	Motor protection & control	49 - 49 - 49 - 50 - 46 - 51R - 37 - 51N - 66
MX3VIC30A	Multifunction voltage relay	27 - 27 - 59 - 59 - 59N - 59N - 47 (U1<) - 47 (U2>) - 81< - 81< - 81< - 81< - 81> - 81> - 24 (U/f>)
MX3VIC30F	Extended frequency range (5-72 Hz) multifunction voltage relay	27 - 27 - 59 - 59 - 59N - 59N - 47 (U1<) - 47 (U2>) - 81< - 81< - 81< - 81< - 81> - 81> - 24 (U/f>)
MX3VIR016A	Multifunction protection for specific tension CEI 0-16	27 - 59 - 81< - 81> - 59N
MX3VIR30A	Multifunction voltage relay	27 - 27 - 59 - 59 - 59N - 59N - 81< - 81< - 81> - 81>
MX3DPG3A	Generator (and motor) biased differential protection	87G
MX3DPT3A	Two winding transformer biased differential protection	87T
MX3DVZ3A	High impedance HV & MV Busbar differential protection	87S or 3 * (51N - 51N - 27 - 59) or 50BF
MX3EG2A	Numeric Module for synchronization control	25
MX3EG2B	Numeric Module for synchronization control	25
MX3IPG1A	Integrated protection for Generator	49 - 49 - 51 - 51 - 50 (o 51V) - 51N - 51N - 50N - 21 - 21 - 46 - 46 - 27 - 59 - 40 - 40/78 - 32R - 32 - 32 - 37
MX3IPG2A	Integrated Protection for Generator	64R - 64R - 27c.c. - 27c.c. - 59c.c. - 59c.c.
MX3IPD1A	Integrated Protection & Control for MV distribution, sensitive directional earth fault version:	51 - 51 - 50 - 67N - 67N - 67N - 59N - 79
MX3IPD1B	Integrated Protection & Control for MV distribution	51 - 51 - 50 - 67N - 67N - 67N - 59N - 79
MX3IPD2A	Integrated Protection & Control for MV distribution	
MX3P3A	Integrated Protection (power based) & Control	27 - 27 - 59 - 59 - 59N - 59N - 81< - 81< - 81> - 81> - 32 - 32 - 32 - 37 - 37 - 37 - 32Q - 32Q - 37Q - 37Q - 55 - 55
MX3R1A	Automatic recloser	79
MX3MUX1A	Input/Output module: I/O, timers, logic functions	
MX3MUX1B	Input/Output module: I/O, timers, logic functions	
MX3IM1A	Measurement centre	
MX3EG1A	Automatic synchronizer (speed and voltage regulation, automatic paralleling)	90U - 90f - 25
MX3EG2B	Synchronization control	25

Complementary Products

CODE	DESCRIPTION	NUMERICAL CODE
IRMA2	Interface Program for local PC to Modulex3 or R3IPT connection	
REMI	Interface Program for remote PC to Modulex3 or R3IPT connection	
R3IPT	Integrated Protection & Control for two/three winding transformers in 19", 3U Rack	87T - 3 x (49 - 49) - 3 x (51 - 51 - 50) - 2 x (51N - 51N - 50N)

The Modulex3 Line

Modulex3 is a line of devices designed to protect, measure, monitor and control equipment in power generation, transmission and distribution.

Though maintaining the traditional reliability and solidity typical of conventional protections, this line of products allows several devices to be interlinked through a high-performance field-bus. Hence, the application of digital technology allows for the creation of a distributed-intelligence modular system aimed at supervising electrical systems.

The system thus made, consists of the following unit:

- protection, measuring, control and monitoring modules,
 - measurements module (I, V, P, Q, S, $\cos\phi$, f, Wh, VARh),
 - I/O module (14 digital inputs, 5 digital outputs),
- allows protection, measurement, monitoring and control functions to be integrated without losing any of the characteristics of functional autonomy, which results into a better flexibility and availability of the system.

Each component making up the **Modulex3** line is in fact provided with dedicated CPU, memory, power supply unit, measuring, monitoring and control sections, communication line and Human-Machine Interface.

This means it may operate in stand-alone mode, independently from the condition of any other module possibly connected.

The loss of a module does not involve the loss of all the provided functions. This is what would normally occur on a higher level of integration.

Besides improved system availability during operation, this feature also offers a better flexibility in design and the possibility of further expanding the system, along with the associated functions, at later stages.

Each module also features expanded self-monitoring functions with fault indications both local, on relay output and via field-bus.

Versions using Modbus communication protocol are also available.



The Protections

The Modulex3 line provides the user with a wide range of protections for electrical networks and equipment. The protection modules enable the monitored quantities to be measured and the maximum values to be stored.

All the modules are equipped with local HMI allowing the unit programming and providing for a safe and guided access to all present and stored data.

The protection modules also provide a fault recording function which enables the user to later analyze the monitored values in the event of an occurring fault.

These data are made available to the user both through the serial interface located on the front side of the module, and by the bus card, if provided.

In current relays, the module also provide for CB's pole wear monitoring, which enable the user to evaluate the service condition of the electrical parts for the purpose of any routine maintenance schedule to be drawn up. It is furthermore possible to realise the trip circuit supervision.

The modular character as well as the operating autonomy of each module allow conventional protection schemes to be set up. However, the use of the communication function makes it possible to also create logic selectivity schemes ("one-time" protection schemes), dramatically reducing the fault selection times.

The Measurements

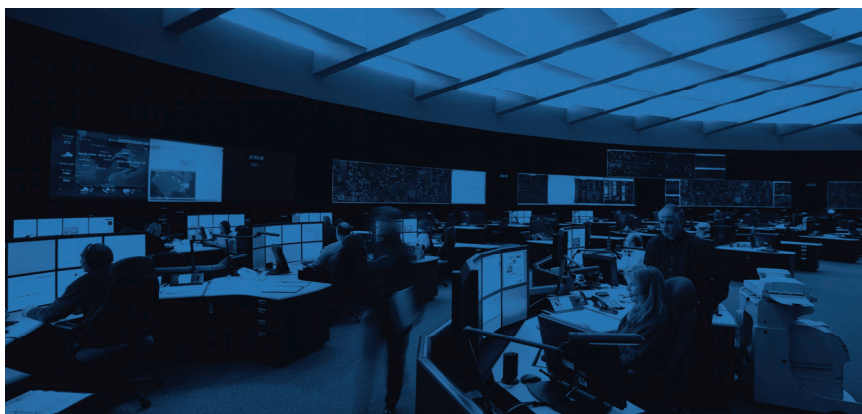
This new group of products incorporates a measuring module which enables the user to access the following information, calculated or monitored:

- three-phase and zero sequence current,
- three-phase voltage,
- active power,
- reactive power,
- apparent power,
- frequenc,
- $\cos\phi$ (power factor),
- bi-directional, active energy,
- bi-directional, reactive energy.

These values can be locally read through the HMI located on the module's front side or through a local Personal Computer connected; in presence of the Local Area Network, they can also be viewed from an eventually installed remote intelligent unit (SCADA or Supervisor).

With regard to input and output active and reactive power measurements, the module can also render these data available through pulse outputs.

The measurement module can also be used as slave of a separate protection to extend the measurement and recording ranges.



The use of a local or remote personal computer enables the user to make fault analysis by reading the disturbance recording stored by the measuring module.

By using the information, whether directly derived from any VT's and CT's possibly present within the plant or calculated by the

measuring module, the user is in a position to monitor any burden and power values possibly involved.

These data can then be stored, printed and/or used any time to evaluate the possible disconnection of non priority utilities or for network re-configuration.



Supervision & Control

In addition to the monitoring and control functions integrated in each protection module, the Modulex3 line also includes an I/O module which can almost be considered a small PLC unit, which manages.

More in detail, the following data are available:

- 14 Digital Inputs,
- 5 Relay Digital Outputs.

The module allows states and/or alarms to be monitored, drives to be actuated, logical functions to be set up (e.g.: breaker and disconnector interlock).

Human-Machine Interface (HMI)

The Modulex3 line allows the user to "dialogue" with each unit in three ways:

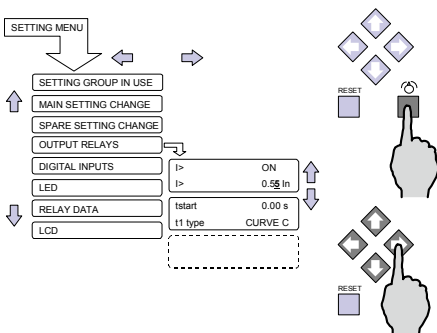
- Local HMI,
- Local engineering unit,
- Remote engineering unit.

Local HMI

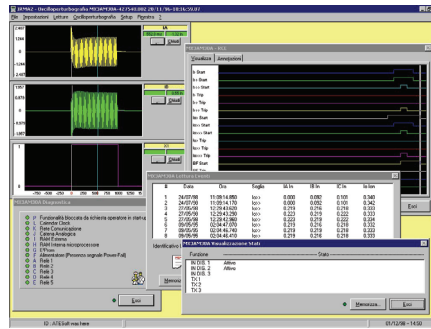
All handled data are made available to the user through the display unit and the keyboard which are mounted on each module. More in detail, the following data are available:

- measurements (when currents are measured also the effective value of circuit-breaker pole wear (by $\Sigma I^2 t$) is made available),
- configuration and setting parameters for current protections and automatic mechanisms,
- fault data.

Through this interface the unit can be programmed and tested and even used to send manual controls.



Dialog menu structure: edit mode



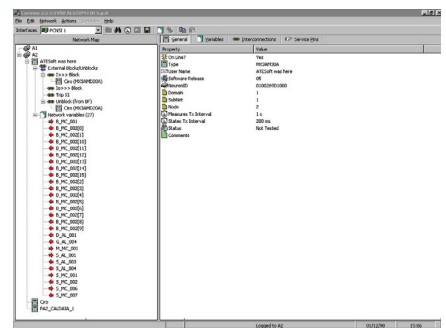
Configuration

All handled data are made available to the user on an engineering unit to be connected, by means of the RS232 serial interface. By means of the special software package supplied (IRMA2), the PC enables the user to access all present and stored data available in the unit (RCE), including disturbance recording data.

The use of a Personal Computer, besides allowing for filing records and locally changing settings, also makes it possible to edit all settings beforehand, with PC off-line, and load them at a later stage, when the PC is on-line with the modules.

The Supervision

The use of a real Supervision, Control and Data Acquisition system, known as SCADA, connected via fieldbus to the Modulex3 units, allows for a complete management of the power network. This ensemble performs the continuous monitoring of the network in terms of measurements, alarms and states and it performs also the network remote-control.



The information thus retrieved is made available to the user in the form of alarm, event lists, listings, measurement trends and charts of the monitored power systems. Moreover, the user can control any object among those displayed on the screen.

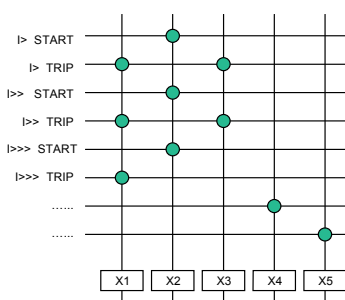
The retrieved information can be used to locate any operating failure showing up within the plant and to implement customised functions aimed at scheduling any routine maintenance work to be carried out on the systems.

The supervision system, available in the single and redundant versions, with or without front-end, allows for creating any Client/Server structure.

Therefore, the supervision system is the natural complement of the Modulex3 line for a global solution involving distributed intelligence, aimed at the protection, monitoring and control of power systems.

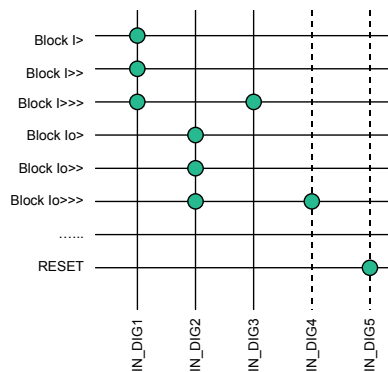
Main features of the Modulx3 line

- Monolithic withdrawable digital protection with automatic short-circuit of current inputs.
- Sealable front cover (to inhibit extraction the modules, parameter editing and testing activities).
- Power supply, two versions:
 - auxiliary power supply 64-300 Vd.c.-64-275 Va.c., digital input supply 64-264 Vd.c. (64-150 Vd.c. for MX3MUX1 module; higher values with external resistor),
 - or auxiliary power supply 19-100 Vd.c. - 17-72 Va.c., digital input supply 19-100 Vd.c. (19-70 Vd.c. for MX3MUX1 module; higher values with external resistor).



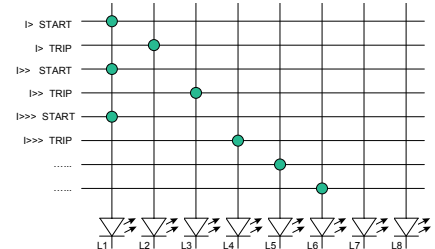
One or more functions can be associated to each output relay

- No. 6 output relays (1 for diagnostics, 5 are freely assignable) provided with gold-on-silver contacts, all suitable for control and signalling functions (In 5A, Un 250V, 10⁵ operations @ 0.3A, 110Vd.c., L/R=40ms):
 - output relays to be set as follows: normally de-energized or energised, self- or hand-reset, with adjustable min. pulse width.



Optoisolated inputs can be set to block, command and reset functions. Each input can be programmed as "active high" or "active low"

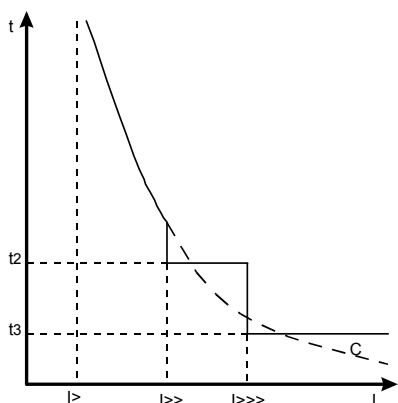
- No. 3 or 5 digital inputs (protection and measuring modules), No. 14 digital inputs (I/O modules MX3MUX type), which can be set to implement the following functions:
 - settings groups dynamic switch (protection modules only),
 - threshold block (logic selectivity schemes with double backup protection),
 - remote reset,
 - auxiliary timer control,
 - LED control,
 - output relay control.



One or more functions can be associated to each LED

- No. 12 LED's, 8 of which are freely assignable (starts, trips, self- or hand-reset settings).
- Protection functions: see dedicated Data sheets and catalogues.
- Two groups of settings or parameters (protection modules only): MAIN / SPARE.
- Threshold starting (alarm) outputs delayable by: 0-9.99 s.

- For overcurrent relays only:
 - First phase threshold and first ground fault threshold with dependent or independent time characteristic (A, B, C curves with extended ranges), with optional "trip suspension of dependent time operation" when the second or third threshold starts (to avoid troubling selectivity).



Trip suspension of dependent time operation when second or third threshold starts. This avoids any kind of interference between curves and characteristics of second and third thresholds.

- Breaker failure function, delay: 0.02-1.00 s.
- Complete self-diagnosis, both during start up and while running.
- Possibility of TEST (LED and display or each single output relay or for each output relays and therefore to the connected network section).
- RTC for date and time, which can be synchronised via field-bus; operation without auxiliary power supply guaranteed for at least 7 days; no maintenance needed (no battery inside the module).
- Settings handled via front keyboard and display, local PC or field-bus.
- Large front display (LCD, back-lighted, 2 lines of 16 characters each).
- Tree menu based Human Machine Interface, for an easy access to the reading and setting activities.
- Multilingual menu (selections: English, French, Italian, Spanish). Some relays are also available in a special Central Europe version (English, French, German, Russian, multilingual menu).
- Serial interface with local PC (via front plug, fiber optic connection), with PC and/or supervision system (via rear serial Modbus connection port), for:
 - settings uploading and downloading,
 - settings groups dynamic switch (protection modules only),
 - measurements,
 - reading and resetting of partial counters, max. measurements and $\Sigma I^2 t$,
 - fault recording,
 - event recording,
 - disturbance recording and fault-analysis,
 - synchronisation (via field-bus),
 - controls (via field-bus),
 - Diagnostics.
- PC interface programs for local connection (IRMA2) and for remote connection (REMI).

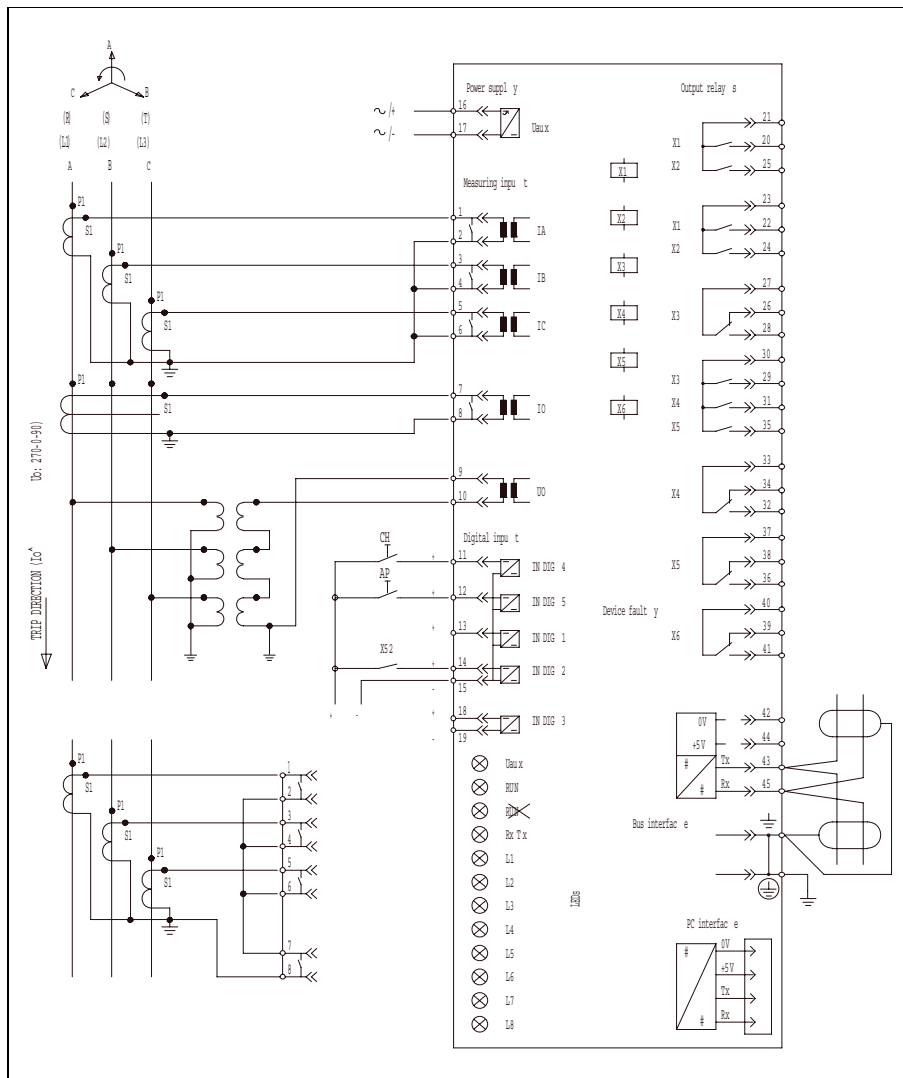
Standards

- The Modulex3 line complies with EU directives:

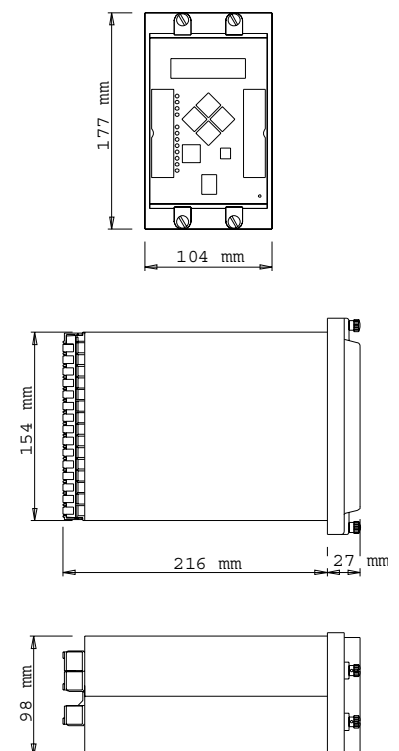
- LV 2006/95/CE
- EMC 2004/108/CE

- UNPEDE Norm (Spec) 13 "Automation and Control Apparatus for Generating Station and Sub-Station".

- ENEL R EMC02
- Norme CEI, CENELEC and IEC, standards for protection relays.



Example of block diagram and of insertions



Dimensions

ALSTOM TRACK RECORD MODULEX3 LINE

PRESENTATION OF LINE MX3AM IN 1995

PRESENTATION OF LINE MX3IPG FOR
GENERATORS IN 1992

PRESENTATION OF LINE MX3EG FOR
AUTOMATIC PARALLEL AND
SYNCHRONISM CHECK IN 2005

PRESENTATION OF LINE MX3DK5600,
DK5740 INTERFACE PROTECTION IN 2005

PRESENTATION OF LINE MX3CEI016,
NEW INTERFACE PROTOCOL IN 2009

LINE MX3 1995-2010, MORE THAN 30000
UNITS SOLD IN THE WORLD