# MFM2160

## Multifunction Meter

**% Load Bar**  **Aux. Supply**  **RTC**  **MD**  **THD**

**Modbus** Over RS485

RoHS

## Features

The MFM2160 Multifunction Meter is a device used in electrical systems to measure and monitor various electrical parameters (voltage, current, power, frequency, Energy etc.) Meters are widely used across commercial and industrial sectors, providing critical data for energy management and system optimization. Its multi-line backlit LCD/LED display allows for the simultaneous display of Multiple parameters.

MFM2160 provides RS485 port supporting Modbus-RTU protocol for communication with THD, Individual Harmonics measurements, Maximum Demand, RTC, Min-Max readings. More than basic metering, it optionally provides Energy pulse output and Data logging features.

The MFM2160 can interface with Masibus mLogiView software, allowing users to Configure parameters such as system settings and data logging, and retrieve logged data through the software.

- Available in Accuracy Class 1.0/0.5s/0.2s
- True RMS measurement
- Field Programmable CT/PT Primary & Secondary
- Four Quadrant measurement with identification
- Isolated RS485 Modbus Communication (Modbus-RTU protocol)
- Available front Pulse LED for site calibration for selected type of energy.
- THD measurement for voltage and current, up to $31^{st}$ odd harmonics
- Current and power demand monitoring
- Display of minimum and maximum values
- 'OLD' register to store the previously cleared energy value
- Monitors Run hours & On hours.
- Auto Scaling from Kilo to Mega to Giga (LCD Display Only)
- Auto Scrolling feature for easy readability for all parameters
- Favourite page Store feature
- User programmable password protection for Setup mode
- User Assignable Modbus registers for ease of integration
- Energy Pulse Output - Optional for LCD Display only
- Data Logging - Optional for LCD Display only

## Applications

- Commercial and industrial sub-metering
- EMS & BMS applications
- Electrical installation remote monitoring.
- High, medium and low-voltage switchgear panels
- Panel instrumentation
- Power control Centre (PCC) panels
- Motor control Centre (MCC) panels
- LV distribution panels
- Control and relay panels
- Automation and monitoring systems

# TECHNICAL SPECIFICATIONS

| | |
|---|---|
| Type of Measurement | TRUE RMS |
| Sampling Rate | 82 Samples/Cycle |
| Connection Type | 3P4W / 3P3W / 1P2W (Site selectable) |

## Input

### Voltage Input

| | |
|---|---|
| Measuring Voltage Range | 20VL-N to 300VL-N ( 34VL-L to 520VL-L) |
| PT(VT) Primary | 100 V to 1000 KV AC (L-L) (Programmable) |
| Nominal Voltage range (Un) (PT/VT Secondary) | 57.5VL-N to 240VL-N (100VL-L to 415VL-L) |
| Burden | <0.2VA per phase |
| Over Voltage | 120% of Un Continuous |

### Current Input

| | |
|---|---|
| Measuring Current Range | 5mA to 6A |
| CT Ratings Primary | 1A/5A to 15000 A (Programmable) |
| Nominal Current range (In) (CT Secondary) | 1A or 5A |
| Burden | 1A: <0.1 VA per phase; 5A: <0.2VA per phase |
| Overload | 150% of In Continuous |
| Short-time Over Current | 20 x Imax for 1 sec., 10 x Imax for 3 sec., 7 x Imax for 10 sec. |
| Suppression Current | A minimum current detection threshold of 1 to 99 mA can be configured to ignore induced or insignificant current flowing in the circuit; 5 mA is the default |
| **Frequency** | 45 to 65Hz |

## Measurement Accuracy

| | Class 1.0 | Class 0.5s | Class 0.2s |
|---|---|---|---|
| Voltage | ±0.5% | | ±0.2% |
| Current | ±0.5% | | ±0.2% |
| Frequency | | ±0.05% | |
| Power Factor | ±0.01 | ± 0.005 | |
| Active Power | ±1.0% | ± 0.5% | ± 0.2% |
| Reactive Power | ±1.0% | ± 0.5% | |
| Apparent Power | ±1.0% | ± 0.5% | ± 0.2% |
| Active Energy | Class 1 As per IEC 62053-21 | Class 0.5s As per IEC 62053-22 | Class 0.2s As per IEC 62053-22 |
| Reactive Energy | Class 1 As per IEC 62053-24 | Class 0.5s As per IEC 62053-24 | Class 0.5s As per IEC 62053-24 |
| Apparent Energy | Class 1.0 | Class 0.5s | Class 0.2s |

## Display & Keys

| | |
|---|---|
| LCD Display | Large multi-line backlit LCD Display 3 lines of 5 digits − Height: 9.10 x Width: 5.33 mm last line of 7 digits − Height: 7.00 x Width: 3.97 mm Bar Graph for % Load for each phase Four-line alphanumeric LCD display with 7 digits for energy and 5 digits for instantaneous parameters |
| LED Display | LED Display : 3 line 4-digit Red LED Display with 0.56" [ 14.2mm] height, LED Display - 12 digit for energy & 4 digit for Instantaneous parameters |
| Keypad | 3 buttons for navigation to performing configuration setup & Operation |
| Protection Features | Password protected for set-up & clearing energy and Min. / Max. data |
| Green LED Indication | RS485 Communication Activity |
| Red LED ⎍ Indication | Energy Pulse |

## Auxiliary Power Supply

| | |
|---|---|
| Power Supply | Standard: 85-265VAC, 50/60Hz or 100-300VDC Optional: 20-60 VDC |
| Burden | < 3.5VA / <1.5W |

## Environmental

| | |
|---|---|
| Operating Temperature | -10°C to +60°C |
| Storage Temperature | -25°C to +70°C |
| Relative Humidity | Up to 95% non-condensing |
| IP degree of Protection | IP51 front side, IP30 meter body |
| Isolation | 4 kV RMS, 1 minute |
| Impulse withstand | 6 kV |
| Pollution Degree | 2 |

## Mechanical

| | |
|---|---|
| Mounting Type | Panel mount |
| Size | 100(W) x 100(H) x 55(D) mm |
| Panel Cut out | 92(W) x 92(H) mm |
| Material | ABS |
| Accessory | 2 Panel mount clamps |
| Weight | 0.4 kg (Approx.) |
| Terminal & Cable Size | Barrier type terminal  U-type / ring-type termination: maximum up to 4 mm² Cable |

## Output

### Modbus Communication

| | |
|---|---|
| Interface & Protocol | RS485 Port and Modbus RTU: 2 Wires, Half-duplex |
| Baud Rate | 2400, 4800, 9600, 19200, 38400 bps (Default 9600 bps) |
| Parity Bit | None, Odd, Even with 1 or 2 stop bit |
| Firmware Update | Firmware update through communication port |

### Energy Pulse Output - Optional for LCD Display only

| | |
|---|---|
| Type | Wh / VARh / VAh |
| Rating | 24VDC, 20mA |
| Pulse Rate | Programmable from 100 to 60000 pulses per Energy |
| Pulse Duration | 20 mSec ± 10% |
| Output Type | Open collector [External Excitation Required] |

## Demand Parameters

| | |
|---|---|
| Total Active Power | Rising, Maximum and Maximum Demand Time Stamp* |
| Total Reactive Power | Rising, Maximum and Maximum Demand Time Stamp* |
| Total Apparent Power | Rising, Maximum and Maximum Demand Time Stamp* |
| Average Current | Rising, Maximum and Maximum Demand Time Stamp* |
| Demand Intervals | Programmable from 1 to 60 minutes |
| Demand Calculation Method | Block & Sliding |

## Data Logging - Optional for LCD Display only

| | |
|---|---|
| Method | Periodic Time Based, Load Profile based |
| Time Interval | 1min, 5min,10min,15min, 30min, 45min, 60min, 8h,12h, 24h. |
| Parameters (Programmable up to 34 Parameters) | Voltage, Current, Power Factor, Frequency, Total Power & Energy (Active, Reactive, Apparent) with Time stamp |
| No. of Records | 524288 / ((No of Parameters + 2) * 8) |

## Electromagnetic compatibility (as per IEC 61326-1)

| | |
|---|---|
| Electrostatic Discharge | IEC 61000-4-2 |
| Immunity to Fast transient | IEC 61000-4-4 |
| Immunity to surge waves | IEC 61000-4-5 |
| Immunity to magnetic fields | IEC 61000-4-8 |
| Immunity to voltage dips and interruptions | IEC 61000-4-11 |
| Conducted emissions | CISPR 11 |
| Radiated emissions | CISPR 11 |



**Rear View**

# TECHNICAL SPECIFICATIONS

| Measured Parameters | | |
|---|:---:|:---:|
| **Measured Parameters** | **LED Display** | **LCD Display** |
| Phase-to-neutral voltage (L1, L2, L3) | √ | √ |
| Phase-to-phase voltage (L12, L23, L31) | √ | √ |
| Average voltage | √ | √ |
| Line current (L1, L2, L3) | √ | √ |
| Average current | √ | √ |
| Neutral current | √ | √ |
| System frequency | √ | √ |
| Power factor (L1, L2, L3) | √ | √ |
| Average power factor | √ | √ |
| Phase Angle (L1, L2, L3) | X | √ |
| V, A, PF, P phase-wise & Average/Total | X | √ |
| Active power (L1, L2, L3) | √ | √ |
| Total active power | √ | √ |
| Apparent power (L1, L2, L3) | √ | √ |
| Total apparent power | √ | √ |
| Reactive power (L1, L2, L3) | √ | √ |
| Total Reactive power | √ | √ |
| Average Current demand (A) | √ | √ |
| Total Power demand (KW, KVAR, KVA) | √ | √ |
| RPM [Pole (2-48) and slip (0.0 to 99.99%)] | √ | √ |
| On hours, Run hours, Power Interruption Count | √ | √ |
| THD Voltage (L1, L2, L3) | √ | √ |
| THD Current (L1, L2, L3) | √ | √ |
| Active Import Energy | √ | √ |
| Active Export Energy | √ | √ |
| Active Net Energy (Import – Export) | X | √ |
| Active Total Energy (Import + Export) | X | √ |
| Apparent Import Energy | √ | √ |
| Apparent Export Energy | √ | √ |
| Apparent Net Energy (Import – Export) | X | √ |
| Apparent Total Energy (Import + Export) | X | √ |
| Reactive Import Energy | √ | √ |
| Reactive Export Energy | √ | √ |
| Reactive Net Energy (Import – Export) | X | √ |
| Reactive Total Energy (Import + Export) | X | √ |
| Reactive Lag Energy | √ | √ |
| Reactive Lead Energy | √ | √ |
| Reactive Inductive Import Energy – Q1 | X | √ |
| Reactive Capacitive Import Energy – Q2 | X | √ |
| Reactive Inductive Export Energy – Q3 | X | √ |
| Reactive Capacitive Export Energy – Q4 | X | √ |
| Min. / Max. values (V, A, PF, Hz, KW, KVAR, KVA) | √ | √ |
| Percentage Voltage & Current Unbalance | √ | √ |
| Real time clock & date | X | √ |
| Energy Pulse output | X | √ |
| Data logging | X | √ |

**Note \*** : Demand Time stamp is not available in LED Display

## Ordering Code

| Model | | Accuracy | | Power Supply | | Data Logging | | Pulse Output | | Display | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| MFM2160 | X | | X | | X | | X | | X | | |
| | S | Class 1.0 | U1 | Aux. Powered 85-265VAC/ 100-300VDC | N | None | N | None | LCD | LCD Display |
| | 1 | Class 0.5s | U2 | Aux. Powered 20-60VDC | Y | Required# | Y | Required# | LED | LED Display |
| | 2 | Class 0.2s | | | | | | | | |

**Note** #: Data Logging & Pulse output options are not applicable in LED Display