GMP232/x
Grid measurement and protection module

<table>
<thead>
<tr>
<th>Item</th>
<th>Item no.</th>
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<tbody>
<tr>
<td>1 A</td>
<td>GMP232/1 00025962-00</td>
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<tr>
<td></td>
<td>GMP232/1 CC 00025966-00</td>
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<tr>
<td>5 A</td>
<td>GMP232/3 00025964-00</td>
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<td></td>
<td>GMP232/3 CC 00025968-00</td>
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<td>690 V</td>
<td>GMP232/2 00025961-00</td>
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<td>GMP232/2 CC 00025965-00</td>
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<tr>
<td>5 A</td>
<td>GMP232/4 00025963-00</td>
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<td>GMP232/4 CC On request</td>
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</tbody>
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General
Range of application: Grid measurement, monitoring and fault recording in 3-phase systems
System environment: Bachmann M1 control system (controller integrated module)
Dimensions: W x H x D = 110 x 119 x 65 mm
Weight: 535 g

Updating
Sampling interval: Grid frequency dependent approx. 100 µs (10 kHz)
Measurement interval: RMS and powers: continuous: < 1 ms, synced to cycle: T/6 (3.3 ms @ 50 Hz 3P)
Samples: Block access via application program (adjustable 100 to 1600 µs sampling)

Voltage and current measurement
Voltage inputs: 3 (L1, L2, L3, N)
Model variants: /1, /2, /3, /4:
Rated voltage Y / ∆ [VRMS]: 70 V / 120 V, 400 V / 690 V
Voltage measurement range Y / ∆ [VRMS]: 2 to 196 V / 3.6 to 340 V, 10 to 677 V / 17.3 to 1173 V
Short term overload U ∆ [VRMS]: 1035 V, 1385 V
Accuracy voltage*: ≤ 0.1 % U_Rated
Input impedance: > 2 MΩ
Current inputs: 3
Model variants: /1, /2, /3, /4:
Rated current of transformer [ARMS]: 1 A, 5 A
Current measurement range: 0.002 to 4 A, 0.01 to 15 A
Short term overload I [ARMS]: 100 A
Burden: 10 mVA, 250 mVA
Accuracy current*: ≤ 0.1 % I_Rated

Frequency measurement
Measurement range: 50 Hz range: 10 to 65 Hz, 60 Hz range: 10 to 75 Hz
Measurement interval: T/12 (1.667 ms @ 50 Hz)
Accuracy frequency*: < ±1 mHz
Special functions: Optional suppression of dynamic events, optional configurable averaging
Rate of change of frequency df/dt: Yes (regression line through a configurable number of frequency measurements)
Reference range df/dt: ±10 Hz/s

Power measurement/Energy metering
Quantities: P, Q, S, λ, cosφ (per phase and total); cosφ1
Calculation methods: RMS values and powers acc. DIN 40110-2 (True RMS up to 3 kHz)
RMS values and powers acc. DIN 40110 (Fundamental RMS)
RMS values and powers acc. IEC 61400-21 (Symmetrical components)
Accuracy power*: ≤ 0.2 % S_Rated
Energy metering: 2 separate 4-Q-Counters for TrueRMS and fundamental power; resolution: 1 Ws

Power quality
Harmonic analysis: Yes, up to 50. harmonic per phase for U and I
Calculation method: IEC 61000-4-7
Measurement interval: 200 ms @ 50 Hz (10 cycles at 50 Hz, 12 cycles at 60 Hz)
Characteristic quantities: THD (related to fundamental), THDn, TDD (related to nominals)

Other measurements
Angles: Phase shift angles (PHI_UxIx), voltage system angles (PHI_UxUy), angles of voltage phasors to frequency constant reference system
Asymmetry U, I: Yes (ratio negative sequence/positive sequence for voltage and current phasors)
Phase sequence: Yes (voltage and current system)
Relay outputs

Amount

Rated Voltage $[\text{V}_{\text{RMS}}]$

Output current (ohmic load)

Protection functions

| Time independent over current (ANSI 50TD) | 3-Level | $I > I_{>>}$, $I_{>>>}$ |
| Time independent directional over current (ANSI 67) | 2-Level | $I_{rg} > I_{rg}^{>>}$ |
| Unbalanced load / asymmetry current (ANSI 46) | 2-Level | $\text{Asym}_1 > \text{Asym}_1^{>>}$ |
| Time independent over/under voltage (ANSI 27/59) | 3-Level | $U <, U <, U <, U <, U <, U >>, U >>>$ |
| Time dependent over/under voltage (VFRT) | 4 limit curves / 10 points | $U(t) >, U(t) >$ |
| Asymmetry voltage (ANSI 47) | 2-Level | $\text{Asym}_U >, \text{Asym}_U^{>>}$ |
| Under / over frequency (ANSI 81 U/O) | 3-Level | $f <, f <, f <, f <, f >, f >, f >>>$ |
| Time dependent under / over frequency (FFRT) | 2 limit curves / 10 points | $f(t) <, f(t) <$ |
| Rate of change of frequency (ANSI 81 R) | 1-Level | $|df/dt|>$ |
| Vector shift (ANSI 78) | 1-Level | $\Delta \phi_{U} >, \Delta \phi_{U}^{>>}$ |
| Maximum power (ANSI 32) | 2-Level | $P >, P >$ |
| Reverse power (ANSI 32R) | 2-Level | $P_{R} >, P_{R}^{>>}$ |
| Under voltage / reactive power (Q(U)) | 2-Level | $Q(U) >, Q(U) >$ |
| Harmonics individual U (PQM) | 1-Level | $U_n >$ |
| Harmonics individual I (PQM) | 1-Level | $I_n >$ |
| Harmonics total distortion U (PQM) | 1-Level | $\text{THD}_U >, \text{THD}_U^{>>}$ |
| Harmonics total distortion I (PQM) | 1-Level | $\text{THD}_I >, \text{THD}_I^{>>}$ |

Application specific tripping / manual relay operation

Yes

Protection functions general

Input values

Configurable (fundamental, fundamental positive sequence, TrueRMS)

Tripping delay

0 to 600,000 (10 min) adjustable for time independent protection functions

Start blocking

Via application program on M1 CPU e.g. dependent on operating condition

Trip blocking

Configurable with criteria such as 1) Under/over voltage, 2) Under/over frequency,
3) Maximum negative sequence system

Relay reset

Configurable time delayed auto reset or manually via application program

Special functions

Time synchronisation

IEEE 1588 Precision Time Protocol, SNTP via CPU

Reference system

Integrated frequency constant reference system, calculation of the angle to the measured positive, negative and zero sequence system

Event recording

2048 entries remain on module (start, trip)

Real time data recording

24 channels configurable, trigger from protective tripping, 100 to 1600 µs sampling (6 to 96 s)

Grid statistics

Maximum/minimum of several grid quantities with time stamp, reseetable

Data aggregation

3 aggregation units available: 1+2 for 24 configurable channels, 2-staged, 3: harmonics; automatic calculation of mean, minimum, maximum for configurable intervals from 0.2 s/3 s to 15 min

Simulation

Generation of elementary values to test protection or behaviour of subsequent calculation functions

Self monitoring

Integrated self testing and run time measurement, watch dog function

Electrical safety

Product standard / application standard

IEC/EN 61131-2 / IEC/EN 60664-1

Degree of pollution

2

Over voltage category

III

Rated surge voltage

6 kV

Protection class

2

Degree of protection acc. IEC 60529

IP20

Environmental conditions

<table>
<thead>
<tr>
<th>Standard</th>
<th>ColdClimate (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating temperature</td>
<td>-30 to +60 °C (+70 °C on request)</td>
</tr>
<tr>
<td>Rel. humidity operation</td>
<td>5 to 95 % no condensation, 5 to 95 % with temporary condensation</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>-40 to +85 °C</td>
</tr>
<tr>
<td>Rel. humidity storage</td>
<td>5 to 95 % with temporary condensation</td>
</tr>
<tr>
<td>Altitude</td>
<td>2,000 m (up to 4,500 m with voltage and temperature derating)</td>
</tr>
</tbody>
</table>

Power supply

| Backplane | +5 V | ≤ 295 mA, +15 V | ≤ 21 mA, +15 V | ≤ 18 mA |
|---|---|---|---|
| External on module front | +24 V | ≤ 76 mA |

Certificates

General

CE, UL/cUL, CCC

Generator grid connection

BDEW:2008, FGW TR3 (Rev.23), FGW TR8 (Rev.6), ENA ER G59/3:2015, IEEE Std. C37.90-2005

Maritim

GL, DNV, LR, ABS, BV

System requirements

Hardware

M1 system with CPU (except ME203), Backplane SK1 not required

Software

Minimum: M-Base 4.0 (specification above requires M-Base 4.10, Firmware 1.02R, Driver 1.02R or higher

* Accuracy rating at 25 °C and reference conditions