BFM II

BRANCH FEEDER MONITOR

SATEC's BFM II is the second generation of Branch Feeder Monitor™, providing energy management for multi-point power solutions. Ideal for both new and retrofit projects, the BFM II automatically provides metering, demand and energy readings, logging and multi-tariff (TOU) data.

The BFM II monitors up to 18 three-phase circuits, 54 single-phase circuits, or any combination of single or three phase circuits. This flexibility makes the BFM II perfect for multi-tenant facilities such as residential projects, office buildings and shopping malls. Its modular design offers a selection of 18, 24, 30, 36, 42 or 54 channels to fit any requirement and to easily fit into existing panel boards or be flush mounted nearby, thus eliminating the need for expensive retrofit projects or for allocating extra space for the device.

The BFM II supports power quality monitoring to identify existing and potential operation problems, such as overloading or malfunctioning due to voltage or current harmonics, or voltage sags and swell.

The BFM II utilizes High Accuracy Current Sensors (HACS), which measure and report the current consumed by each of the branch circuits at the panel board. For billing purposes, single or multiple circuits can be defined for each customer. This flexibility allows for a simple reassignment of circuit groups without wiring changes, and enables easy changes when tenants move in and out. Main panel board or load center installation makes for a valuable saving of both time and money.

The BFM's user-defined and easily configured alarm system enables users to take predictive maintenance action in order to avoid unnecessary outages.

Highlights

- Multi-channel sub-metering – up to 54 single-phase, 18 two-phase or 18 three-phase meters in a single device. Any combination of single-, two-, and three-phase consumers can be chosen up to a total of 54 current inputs.
- Automatic totalization energy from different sub-consumers
- Modular design allows selection of 18, 24, 30, 36, 42 or 54 submeters

Features

- Includes high accuracy current transformers with Class 0.5S accuracy
- 3-phase/2-phase/single-phase meters (true RMS, volts, amps, power, power factor, neutral current)
- Ampere/Volt demand meter
- Time-of-Use, 8 energy/demand registers x 8 tariffs, 4 seasons x 4 types of days, 8 tariff changes per day, easy programmable tariff schedule
- Automatic 120–day daily profile for energy and maximum demand readings (total and tariff registers) separate for each submeter
- Power quality monitoring including voltage and current harmonics (up to the 25th), voltage sags, voltage swells and interruptions (future)
- Event recorder for logging internal diagnostic events and setpoint operations
- Data recorders; programmable periodical data logs separate for each submeter
- Embedded programmable controller (4 control setpoints, programmable thresholds and delays) separate for each submeter
- Detachable optional 3.5 inch 320×240 pixels touch screen display with backlight
- Internal clock, keeping the clock running over years without external power
- Standard RS-485, Ethernet and USB ports
- Optional cellular communication port plug-in module
- Optional 9/18 digital inputs plug-in module
- Modbus RTU, Modbus TCP and DNP3-DNP/TCP communication protocols
- Easy field upgrading device firmware

Technical Specifications

Environmental Conditions	
Operating temp.	-30°C to +70°C (-22°F to 158°F)
Storage temperature	-40°C to +85°C (-40°F to 185°F)
Humidity	0 to 95% non-condensing
Altitude	≤ 2000m

Construction	
OVERALL DIMENSIONS	
Width	278 mm/10.94" (18 channels) 554 mm/21.81" (54 channels)
Height	128 mm/5.04"
Depth	72.5 mm/2.85"
Weight	1.6kg (36 channels)
MATERIALS	
Enclosure & Panels	Polycarbonate
PCB	FR4 (UL94-V0)
Terminals	PBT (UL94-V0)
Plug-in connectors	Polyamide PA6.6 (UL94-V0)
Packaging case	Carton and Stratocell (Polyethylene Foam) Brackets
Labels	Polyester film (UL94-V0)

Power Supply	
Withstanding Insulation: 4kV AC @ 1min	
3 PHASE POWER SUPPLY (1, 2 OR 3 PHASE OPERATION) 3 X120/208 – 277/480 VAC	
Input range	70-561VAC 50/60 Hz
Max. Power	10W
Burden for 277V	< 17 VA
Wire Size	up to 10 AWG (up to 6 mm^2)
Terminal pitch	10 mm, 4 pins and Signal Ground stud

Input Ratings

AC VOLTAGE INPUTS: V1, V2, V3, VN	
Measuring range	3 x 120/208 – 277/480 VAC
Impedance Input	10MΩ
Burden for 277V	≈ 0.08 VA
Burden for 120V	≈ 0.02 VA
Galvanic Isolation, withstanding insulation	4kV AC @ 1min
Connector Type	Removable, 4 terminals
Wire Size	Up to 10 AWG (up to 6 mm2)
Terminal pitch	10 mm

AC CURRENT INPUTS	
Standard: I1 – I54 – HACS Input via SATEC HACS 100A to 3000A	
Operating range	Maximum continuous 120% I max, i.e 120A for HACS 100A
Nominal measured Current	50A RMS (HACS 100A)
Burden	< 0.15 VA
Overload Withstand	100A RMS continuous
Connector Type	Removable, 6 terminals for 3 current inputs
Wire Size	10 AWG (2.5 to 6 mm^2)
Terminal pitch	5 mm
Optional: I1 – I54 – RS5 Input via SATEC HACS CS05S	
Operating range	Maximum continuous: 10A (Primary current)
Nominal measured Current	5A RMS (Primary current)
Burden	< 0.15 VA
Overload Withstand	12A RMS continuous
Connector Type	Removable, 6 terminals for 3 current inputs
Wire Size	10 AWG (2.5 to 6 mm^2)
Terminal pitch	5 mm

Plug-In I/O Modules

18 DIGITAL INPUTS - 9/18 DI (UP TO 4 MODULES)	
Optically isolated input, dry contact sensing (voltage-free) Internal power supply 5 VDC	
Sensitivity	Open @ input resistance > 16kΩ, closed @ input resistance < 10kΩ
Scan time	½ cycle
Wire Size	12 AWG (up to 2.5 mm^2)
Terminal pitch	3.81 mm

Communication Ports

COM1 – STANDARD (MCM)	
Serial EIA RS-485 optically isolated port	
Withstanding Insulation	4kV AC @ 1 min
Connector Type	Removable, 3 terminals
Terminal pitch	5 mm
Wire Size	up to 12 AWG (up to 2.5 mm^2).
Baud Rate	up to 115,200 bps
Supported Protocols	MODBUS RTU/ASCII, DNP 3.0
COM3 – standard (MCM Display Communication port)	
Serial TTL RS-232 non-isolated port for the GDM	
Baud Rate	up to 460,800 bps
Supported Protocols	MODBUS RTU
USB Port – standard (MCM)	
Isolated USB 1.1 port	
Withstanding Insulation	4kV AC @ 1 min
Connector Type	A male, standard USB cable, max. Length 2 meters
Supported protocols	MODBUS RTU
ETHERNET PORT – STANDARD (MCM)	
Transformer-isolated	10/100Base-T port
Withstanding Insulation	4kV AC @ 1 min
Connector Type	RJ45 modular
Supported Protocols	MODBUS TCP (Port 502), DNP3/TCP (port 20000)
Number of simultaneous connections (sockets): 5	
SNTP – time synchronization	

Real-time Clock

Accuracy: better than 5 sec/month @ 25°C

Memory Log

Standard onboard memory: 256 Mbytes

Graphical Display Module – GDM (option)

3.5 Inch Touch-Panel LCD graphic TFT display

Resolution	320 x 240
Operating temperature	-20°C - +70 °C
Communication	Serial TTL RS-232 non-isolated port

Standards Specifications

EMC per IEC 62052-11, IEC 62053-22, ANSI C12.1 and ANSI C12.20

- IEC61000-4-2: Electrostatic discharge, 15/– air/contact
- IEC61000-4-3: Electromagnetic RF Fields, 10V/m @ 80MHz – 1000MHz
- IEC61000-4-4: Fast Transients burst, 4KV on current and voltage circuits and 2 KV for auxiliary circuits
- IEC61000-4-5: Surge 6KV on current and voltage circuits and 1 KV for auxiliary circuits
- IEC61000-4-6: Conducted Radio-frequency, 10V @ 0.15MHz – 80MHz
- IEC61000-4-8: Power Frequency Magnetic Field
- IEC61000-4-12: Damped oscillatory waves, 2.5kV CM and 1kV DM
- ANSI C12.1 – 4.7.3.3.1: 100kHz Ring Wave surge, 6kV @ 0.5kA (per IEEE C62.41.2-2002)
- ANSI C12.1 – 4.7.3.3.2: line surge, 1.2/50µs – 8/20µs, 6kV @ 3kA (per IEEE C62.41.2-2002)
- ANSI C12.1 – 4.7.3.11: SWC 2.5kV (per IEEE 37.90.1)
- CISPR 22 – class B

Insulation

- IEC 62052-11 (per NMI M6-1): Insulation impulse 12 kV/50Ω @ 1.2/50 µs

- IEC 62053-22: AC voltage tests related to ground, 4 kV AC @ 1mn, for power and signal ports (above 40V), or according to UL 61010-1/916 for basic and/or double insulation and Installation Category III

Safety

- UL 916
- NMI M6-1

Accuracy

- IEC/AZ 62053-22, class 0.5S
- ANSI C12.20-2010, Class 100, 400, accuracy 0.5%

Atmospheric Environment

- Accuracy Operational ambient temperature range: –25°C to +60 °C
- Operational ambient temperature range: –40°C to +70 °C
- Long-term damp heat withstand according to IEC 68-2-3 <95% (non-condensing), +40 °C
- Transport and storage temperature range: –40°C to +85 °C
- IEC 62052-11 (ref. IEC 60068-2-6): Vibration
  - Frequency range: 10Hz to 150Hz
  - Transition frequency: 60Hz
  - Constant movement amplitude 0.075mm, f < 60Hz
  - Constant acceleration 9.8 m/s^2 (1g), f > 60Hz
- IEC 62052-11(ref. IEC 60068-2-27): Shock
  - Half sine pulse
  - Peak acceleration: $30g_n$ (300 m/s^2)
  - Additional Transport vibration and shocks:
  - Longitudinal acceleration: 2.0 g
  - Vertical acceleration: 1.2 g
  - Transversal acceleration: 1.2 g
- IEC 60529: IP50

Measurement Specifications

Parameter	Full Scale @ Input Range	Accuracy			Range
		% Reading	% FS	Conditions	
Voltage	V_L = 120V V_L = 230V	0.3	0.05	100 to 300 V	0 to Vmax = 600 V
Line current	Instrument current transformer CTs I_L = 100A	0.5	0.05	1 to 100% FS	0 to HACS primary current Starting current: 0.1% FS
Active power	2 × Vmax × I_L/1000, kW	1	0.02	|PF| ≥ 0.5 [1]	-120.000 to 120.000 kW
Reactive power	2 × Vmax × I_L/1000, kvar	1	0.02	|PF| ≤ 0.9 [1]	-120.000 to 120.000 kvar
Apparent power	2 × Vmax × I_L/1000, kVA	1	0.02	|PF| ≥ 0.5 [1]	0 to 120.000 kVA
Power factor	1.0	-	1.0	|PF| ≥ 0.5, I ≥ 2% FSI	-0.999 to +1.000
Frequency		0.02	-	50 Hz: 39.00 to 65.00 Hz 60 Hz: 45.00 to 70.00 Hz	39 Hz up to 70 Hz
Active energy import[4]		Class 0.5S under conditions as per IEC/AZ 62053-22 Class 0.5 under conditions as per ANSI C12.20:2010			0 to 99,999,999.9 kWh
Reactive energy import/export		Class 1.0 under conditions as per IEC/AZ 62053-21:2003, |PF| ≤ 0.9			0 to 99,999,999.9 kvarh
Apparent energy		Class 1.0 under conditions as per IEC/AZ 62053-21:2003			0 to 99,999,999.9 kVAh

[1] @ 80% to 115% of voltage FS and 1% to 100% of current FS

FSV - voltage full scale

FSI - current full scale

Notes

1. Accuracy is expressed as ± (percentage of reading + percentage of full scale) ± 1 digit. This does not include inaccuracies introduced by the user's potential and current transformers. Accuracy calculated at 1-second average.
2. Specifications assume: voltage and current waveforms with THD ≤ 5% for kvar, kVA and PF; reference operating temperature: 20°C - 26°C.
3. Measurement error is typically less than the maximum error indicated here.
4. Accuracy of the device with HACS 100A (solid core type) complies with IEC 62053-22 class 0.5S standard

Order String

BFM II [ ] [ ] [ ]

OPTIONS	
Current (for standard 18 channels)	
100A to 3000A High Accuracy Current Sensors (HACS). Requires ordering of up to 18 HACS.	**HACS**
5A split core remote high accuracy current sensor (HACS). Requires ordering of up to 18 CS05S.	**RS5**
Calibration at Frequency	
50 Hz	**50HZ**
60 Hz	**60HZ**
Display Options	
Detachable Graphic Display Module	**G**
Blank Panel	**X**

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OPTIONAL MODULES (ordered separately)	
Current Input Module (CIM) - up to 2 CIM's per instrument (OK to mix HACS and RS5 version in single BFM II)	
6 current input module (CIM 6) - HACS version	**C6H-BFM II**
6 current input module (CIM 6) - RS5 version	**C6R-BFM II**
18 current input module (CIM 18) - HACS version	**C18H-BFM II**
18 current input module (CIM 18) - RS5 version	**C18R-BFM II**
Calibration at Frequency	
50 Hz	**50HZ**
60 Hz	**60HZ**

Communication Options	
2G/3G GSM Modem plus 2nd RS-422/485 communication port	**T3G-BFM II**
2G/3G CDMA Modem plus 2nd RS-422/485 communication port	**T3C-BFM II**
I/O Options	
9 digital inputs module	**DI9-BFM II**
18 digital inputs module	**DI18-BFM II**

Max. 4 modules per BFM II

Auxiliary Power Supply (Max. 1 module per BFM II)	
Auxiliary Power Supply AC/DC 90-290V AC / 90-290 VDC 90-290 V AC/DC @ -30°C to +70°C 40-290 V AC/DC @ -20°C to +60°C	**AUX-ACDC-BFM II**