

BFM-II DFR

Multi-Feeder Power Monitor & Digital Fault Recorder for Utility Substations



SATEC BFM-II Series

Distribution substations constructed decades ago were equipped with electro mechanical protective relays for system protection. These relays have been in service for many years and regarded to be highly reliable with many years of operation remaining before they will need to be replaced. These devices however lack the functionality to provide performance and operational data essential to operate in a digital smart grid environment.

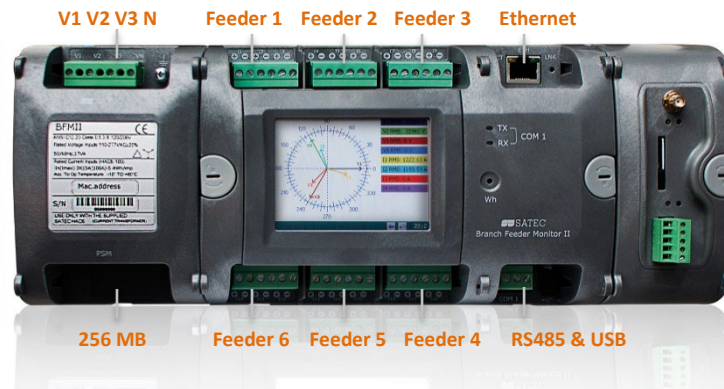
Utilizing a unique modular design the BFM-II Multi Feeder Monitor provides a cost effective alternative to enable utilities to update and upgrade their existing fleet of legacy substations directly contributing to an effective life extension strategy that delivers the required analog to digital transition with cutting edge automation technology. With the ability to facilitate installation that requires no outage, configurable feeder sizing and extensive I/O the advantages can be immediately realized.

Advanced Unique Features



- ➔ Monitor 6, 8 or up to 12 three phase feeders in a single device
- ➔ Three phase multi feeder power monitoring including V, I, W, VA, Var, PF, Freq, Thd and more
- ➔ Power Quality monitoring of Voltage and Current Harmonics
- ➔ Digital Fault Recording with pre / post fault waveform capture
- ➔ Accuracy compliance to ANSI C12.20 0.2% / IEC 62053-22
- ➔ Internal data storage
- ➔ Multiple communications ports: RS485, Ethernet, USB (wireless modem option)
- ➔ Communications protocols: DNP 3.0, Modbus, BACnet
- ➔ Integrated LCD graphical touch screen display (with available remote display option)
- ➔ DIN rail or enclosure installation
- ➔ Universal Aux Power Supply for AC/DC operation 50-290VAC or 40-290VDC

BFM II DFR Series Multi-Feeder Monitor

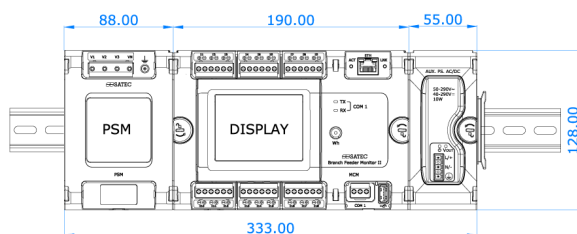


AUX PS
AC/DC Input
50-290 VAC
40-290 VDC

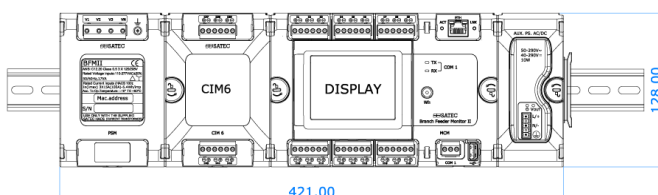
* Six feeder configuration shown

The BFM-II-DFR Series is a precise digital instrument for measuring multiple parameters of 3-phase electrical power systems. True RMS measurements via advanced digital signal processing ensure accurate data of hundreds of parameters on each load. Per phase as well as total measurements are provided for most parameters.

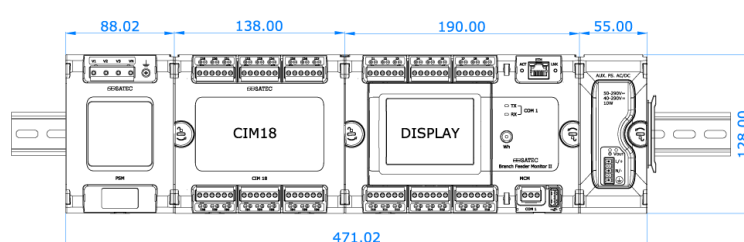
This device connects to the existing CT's and PT's to give total automation information, while co-existing with the existing electromechanical relays, and does not interfere with the protection scheme. The installation time is reduced dramatically where the entire substation can be updated in a single day. It extends the useful life of these relays by providing all the information that they cannot. The result is the most cost effective, fast means to automate and provide the full picture of operation never before provided by a single device:



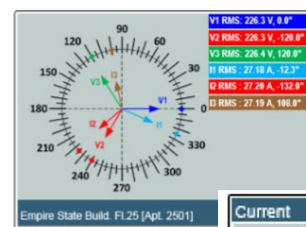
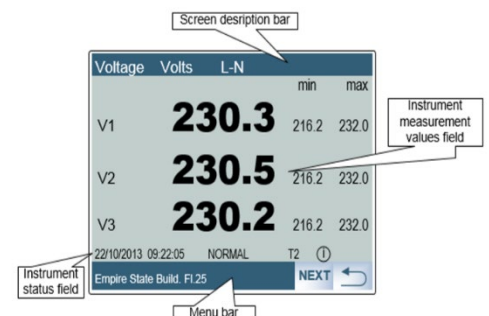
BFM-II-ACDC-6F



BFM-II-ACDC-8F



BFM-II-ACDC-12F



Current	Amps	min/max	Sign	Sign
I1	199.3	0.1 228.2	I10	199.3
I2	199.3	0.1 228.2	I11	199.3
I3	199.3	0.1 228.2	I12	199.3
I4	199.3	0.1 228.2	I13	199.3
I5	199.3	0.1 228.2	I14	199.3
I6	199.3	0.1 228.2	I15	199.3

Available Options

Clamp-On Installation

- Reduces Installation time
- Non – Intrusive to protection relays
- Up to 20x5A (100A) max
- Ultra low burden
- High degree of accuracy and reliability



CS1S (split)
100A Current Sensor
Opening 0.63"



Clip on existing 5A circuit
Can be located up to 900 feet from meter base

Remote Graphical Display

- 5.7" Touch Color Display
- View each circuit at a time
- Ethernet or serial interface
- Programmable screen saver



Remote Front Panel
Display
RGM-180 (optional)



Add-On Modules



18 DIGITAL INPUTS

- Optically isolated input, dry contact sensing (voltage-free)
- Internal power supply 5V DC
- Sensitivity:
Open @ input resistance >16kOhm, Closed @ input resistance <10kOhm
- Scan time: 1cycle
- Withstand insulation: 4kV AC @ 1min
- Wire: 28-16 AWG (0.1-1.5 mm²), 600V isolation
- Terminal pitch: 3.81mm

RELAY OUTPUTS

- 9 relays - SPST Form A
- Contact rating:
5A @ 250V AC, 5A @ 30V DC
- Update time: 1 cycle
- Recommended Wire Size:
18 AWG (1 mm²), 600V isolation
- Terminal pitch: 3.81 mm

4 ANALOG INPUTS

- Ranges (upon order):
 - ±1 mA (100% overload)
 - 0-20 mA
 - 4-20 mA
 - 0-1 mA (100% overload)
- Accuracy: 0.5% FS
- Scan time: 2 cycles
- Withstand Insulation: 4kV AC @ 1min
- Wire: 28-16 AWG (0.1-1.5 mm²), 600V isolation
- Terminal pitch: 3.81mm

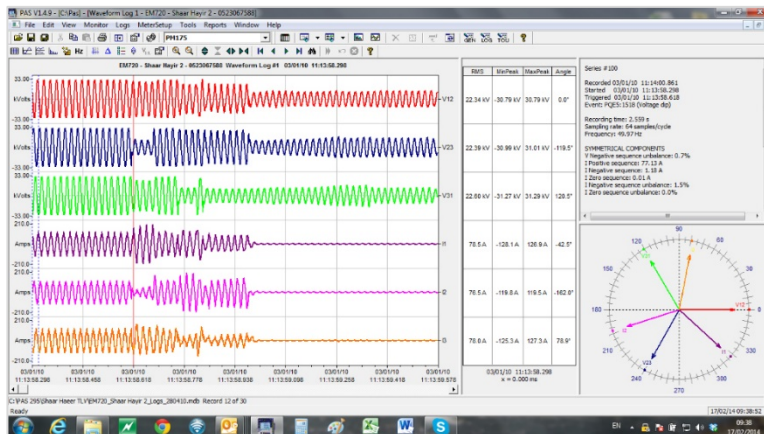
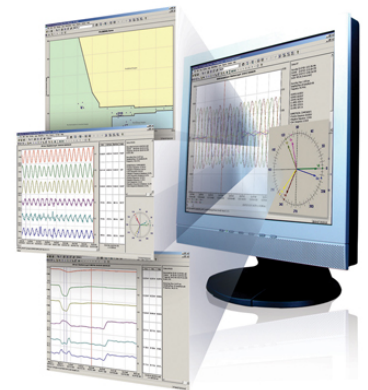
CELLULAR COMMUNICATION

- Cellular Modem
- Technologies (upon order):
 - GSM
 - CMA
- Withstand Insulation: 4kV AC @ 1min
- Connector type: SMA
- Supported Protocols: MODBUS TCP (Port 502), DNP 3.0/TCP (Port 20000)

NOTE: Max. 2 modules

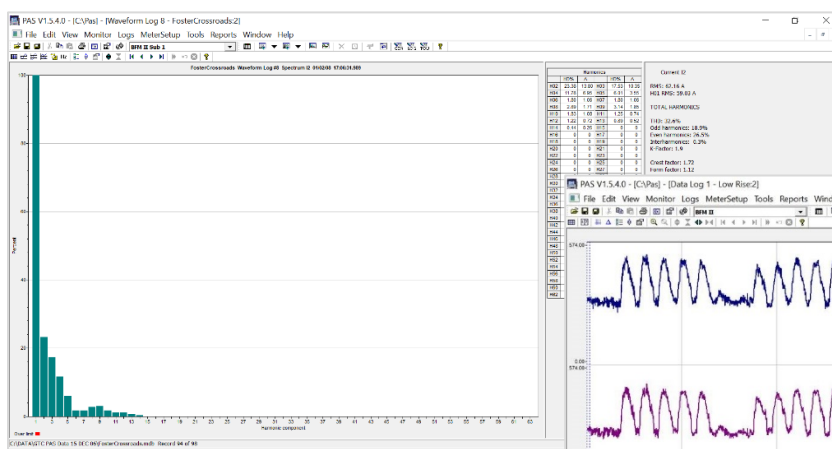
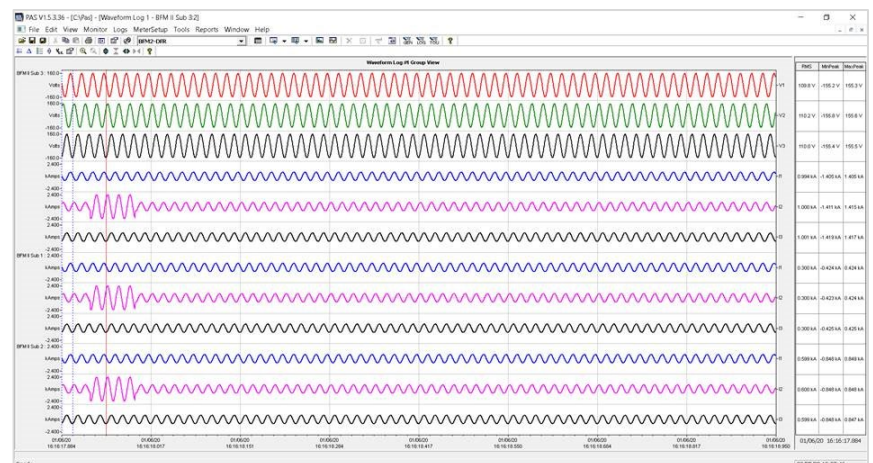
Power Analysis Software (PAS)

Designed to both configure and monitor real time data
and is bundled with all SATEC devices at no charge.



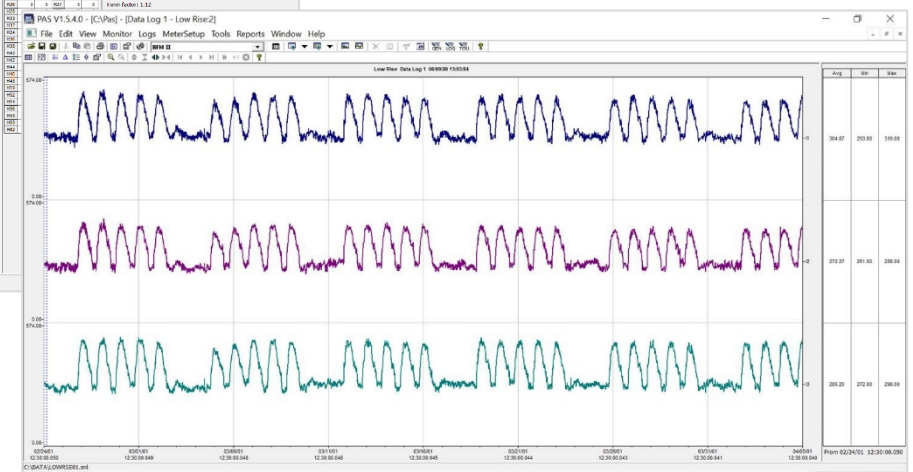
View event records and
waveform capture
Export to Comtrade format

Multi-Site view
of up to 12 circuits



Detailed harmonic capture
with direction

Log Trend screen



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

Withstand Insulation: 4kV AC @ 1min

3 PHASE POWER SUPPLY (1, 2 OR 3 PHASE OPERATION) 3 X120/208 – 277/480 VAC

Input range	50-290 VAC / 40-290 VDC 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, withstand insulation	4kV AC @ 1min
Connector Type	Removable, 4 terminals
Wire Size	Up to 10 AWG (up to 6 mm ²)
Terminal pitch	10 mm

AC CURRENT INPUTS

Standard: I1 – I36 – 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 – I36 – RS5 Input via SATEC HACS CS05S

Operating range	Maximum continuous: 20A (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 (UP TO 2 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	
Withstand 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

Withstand 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

Withstand Insulation 4kV AC @ 1 min

Connector Type RJ45 modular

Supported Protocols MODBUS TCP (Port 502), DNP3/TCP (port 20000), BACnet

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 0.2%

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, < 60Hz
 - Constant acceleration 9.8 m/s² (1g), f > 60Hz
- IEC 62052-11(ref. IEC 60068-2-27): Shock
 - Half sine pulse
 - Peak acceleration: 30gn (300 m/s²)
 - Additional Transport vibration and shocks:
 - Longitudinal acceleration: 2.0 g
 - Vertical acceleration: 1.2 g
 - Transversal acceleration: 1.2 g
- IEC 60529: IP50

Available Configurations

BFM-II FEEDER MONITOR	
6-Feeder Monitor	
Monitors six 3-Phase Feeders on a common bus voltage via clip-on current sensors for 5 amp secondary circuits *	BFM-II-DFR-ACDC-6F
8-Feeder Monitor	
Monitors eight 3-Phase Feeders on a common bus voltage via clip-on current sensors for 5 amp secondary circuits *	BFM-II-DFR-ACDC-8F
12-Feeder Monitor	
Monitors twelve 3-Phase Feeders on a common bus voltage via clip-on current sensors for 5 amp secondary circuits *	BFM-II-DFR-ACDC-12F
OPTIONS	
Frequency	
50 Hz	50HZ
60 Hz	60HZ
Current Sensors	
100A Split Core Current Sensor Inner diameter 0.63 in, cable length 2.5 meters	CS1S
OPTIONAL MODULES (ordered separately)	
DIGITAL INPUT/OUTPUT MODULES	
18 Digital Input Module – DRY	DI18-DRC-BFM II
18 Digital Input Module - 24 VDC	DI18-24V-BFM II
18 Digital Input Module - 48 VDC	DI18-48V-BFM II
18 Digital Input Module - 125 VDC	DI18-125V-BFM II
18 Digital Input Module - 250 VDC	DI18-250V-BFM II
9 CH Relay Output Module - (Max 2 modules per device)	RLY9-BFM II
ANALOG INPUT MODULES	
4AI Module ± 1 mA - 4 Optically Isolated Analog inputs	AI1-BFM II
4AI Module 0-20 mA - 4 Optically Isolated Analog inputs	AI2-BFM II
4AI Module 0-1 mA - 4 Optically Isolated Analog inputs	AI3-BFM II
4AI Module 4-20 mA - 4 Optically Isolated Analog inputs	AI4-BFM II
CIM Option (Up to 2 CIM's per Instrument)	
CIM 6 - 6 CH Current Input Module	C6H
CIM 18 - 18 CH Current Input Module	C18H
** OR FOR MEASURING WITH 5 Amp Secondary **	
IM Option (Up to 2 CIM's per Instrument) - RS5	
CIM 6 - 6 CH Current Input Module	C6-RS5
CIM 18 - 18 CH Current Input Module	C18-RS5
COMMUNICATION MODULES	
None	0
4G GSM Modem plus 2nd RS-422/485 communication port	T4G-BFM-II
4G CDMA Modem plus 2nd RS-422/485 communication port	T4C-BFM-II

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