ACCURACY CLASS 0.5S | AS/IEC 62053-22 COMPLIANT | ANSI C12.20 CLASS 0.2% | IP50 ENCLOSURE

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BFM-II DFR

Multi-Feeder Power Monitor & Digital Fault Recorder

The BFM-II DFR is a multi-feeder power monitor and digital fault recorder built for utility distribution substations. A single device monitors six, eight or up to twelve three-phase feeders on a common bus voltage. It connects to the existing CTs and PTs alongside legacy electromechanical protection relays, so it adds measurement and automation data without interfering with the protection scheme.

A modular design supports clip-on current sensors, plug-in digital and analogue I/O, relay outputs and an optional cellular modem. RS-485, Ethernet and USB ports are standard, with Modbus, DNP 3.0 and BACnet support. An integrated graphical touch screen, 256 MB of onboard memory and a universal AC/DC auxiliary supply complete the package.

Six-feeder configuration shown

BFM-II-DFR-ACDC-6F
Six three-phase feeders on a common bus voltage

BFM-II-DFR-ACDC-8F
Eight three-phase feeders on a common bus voltage

BFM-II-DFR-ACDC-12F
Twelve three-phase feeders on a common bus voltage

Main Features

- Monitors six, eight or up to twelve three-phase feeders in a single device
- True RMS volts, amps, active, reactive and apparent power, power factor, frequency and THD
- Per-phase and total measurement for most parameters
- Power quality monitoring of voltage and current harmonics
- Digital fault recording with pre-fault and post-fault waveform capture
- Class 0.5S accuracy to AS/IEC 62053-22 and 0.2% to ANSI C12.20
- 256 MB of onboard memory for event, waveform and data logs
- Standard RS-485, Ethernet and USB ports, with an optional cellular modem
- Modbus RTU/ASCII, DNP 3.0 and BACnet protocol support
- Integrated graphical touch screen, with an optional remote display
- DIN rail or enclosure installation
- Universal auxiliary supply, 50 to 290 VAC or 40 to 290 VDC

Feature Capabilities

Digital Fault Recording

- Pre-fault and post-fault waveform capture on recorded events
- Event records and captured waveforms viewed through **Power Analysis Software (PAS)**
- Waveform export to COMTRADE format for third-party fault analysis tools
- 256 MB of onboard memory for long-term event and waveform storage

Multi-Feeder Power Monitoring

- Six, eight or up to twelve three-phase feeders on a common bus voltage
- True RMS volts, amps, active, reactive and apparent power, power factor and frequency
- Per-phase as well as total measurement for most parameters
- Hundreds of parameters measured on each load through advanced digital signal processing

Power Quality Monitoring

- Voltage and current harmonic measurement
- Total harmonic distortion on voltage and current
- Detailed harmonic capture with direction, viewed in PAS

Energy Measurement & Accuracy

- Class 0.5S energy accuracy to AS/IEC 62053-22
- ANSI C12.20-2010, Class 100 and Class 400, accuracy 0.2%
- Three-phase and per-phase energy measurement on every monitored feeder
- Accuracy held across an operational ambient range of –25 °C to +60 °C

Retrofit Without an Outage

- Clip-on current sensors fit onto existing 5 A secondary circuits
- Non-intrusive to the protection relays, with no change to the protection scheme
- Ultra low burden, up to 20 x 5 A (100 A) maximum
- CS1S split-core sensor with a 16 mm (0.63 in) opening and a 2.5 m cable
- Sensors can be located up to 274 m (900 ft) from the meter
- An entire substation can be updated in a single day

Display Options

- Integrated 3.5 inch touch-panel LCD graphic TFT display at 320 x 240
- View each circuit one at a time, with a programmable screen saver
- Optional RGM-180 remote display with a 5.7 inch touch colour screen
- Remote display connects over Ethernet or serial

Feature Capabilities (continued)

Communications

- COM1: optically isolated RS-485 up to 115,200 bps, Modbus RTU/ASCII and DNP 3.0
- Ethernet: transformer-isolated 10/100Base-T with Modbus TCP (502), DNP3/TCP (20000) and BACnet
- Up to five simultaneous Ethernet connections, with SNTP time synchronisation
- Isolated USB 1.1 port for local connection over Modbus RTU
- Optional cellular modem with a second RS-422/485 communications port

Plug-In I/O Modules

MAXIMUM 2 MODULES PER DEVICE

- 18 optically isolated digital inputs, dry contact or 24, 48, 125 and 250 VDC variants
- Nine SPST Form A relay outputs rated 5 A at 250 VAC or 5 A at 30 VDC
- Four optically isolated analogue inputs with 0.5% FS accuracy
- Current input modules in six-channel and eighteen-channel versions

Data Recording & Timekeeping

- 256 Mbytes of standard onboard memory
- Real-time clock accurate to better than 5 seconds per month at 25 °C
- Event, trend and waveform logs retrieved over any communications port

Software Support

- **Power Analysis Software (PAS)** configures the device and monitors real-time data, and is bundled with every SATEC device at no charge
- **Expertpower™** is SATEC's browser-based energy management, billing and power quality platform, with no client software to install
- The **eXpertConnect™ App** gives mobile access to energy, demand and cost data drawn from Expertpower

Installation

- DIN rail or enclosure installation
- Universal auxiliary power supply for AC or DC operation
- Removable plug-in connectors throughout for straightforward commissioning
- Installation requires no outage on the monitored circuits

Specifications

ENVIRONMENTAL CONDITIONS

Operating temperature	–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% RH, non-condensing
Altitude	≤ 2000 m

CONSTRUCTION

Width	278 mm (18 channels) to 554 mm (54 channels)
Height	128 mm
Depth	72.5 mm
Weight	1.6 kg (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

Configuration	Three-phase supply, 1, 2 or 3-phase operation, 3 x 120/208 to 277/480 VAC
Input range	50 to 290 VAC / 40 to 290 VDC, 50/60 Hz
Max. power	10 W
Burden at 277 V	< 17 VA
Withstand insulation	4 kV AC at 1 min
Wire size	Up to 10 AWG (up to 6 mm²)
Terminal pitch	10 mm, 4 pins plus signal ground stud

AC VOLTAGE INPUTS (V1, V2, V3, VN)

Measuring range	3 x 120/208 to 277/480 VAC
Input impedance	10 MΩ
Burden at 277 V	≈ 0.08 VA
Burden at 120 V	≈ 0.02 VA
Galvanic isolation	4 kV AC at 1 min
Connector type	Removable, 4 terminals
Wire size	Up to 10 AWG (up to 6 mm²)
Terminal pitch	10 mm

AC CURRENT INPUTS I1–I36 — STANDARD HACS

Input	Via SATEC HACS, 100 A to 3000 A
Operating range	Maximum continuous 120% of I max, 120 A for HACS 100 A
Nominal measured current	50 A RMS (HACS 100 A)
Burden	< 0.15 VA
Overload withstand	100 A RMS continuous
Connector type	Removable, 6 terminals for 3 current inputs
Wire size	10 AWG (2.5 to 6 mm²)
Terminal pitch	5 mm

AC CURRENT INPUTS I1–I36 — OPTIONAL RS5

Input	Via SATEC HACS CS05S
Operating range	Maximum continuous 20 A primary current
Nominal measured current	5 A RMS primary current
Burden	< 0.15 VA
Overload withstand	12 A RMS continuous
Connector type	Removable, 6 terminals for 3 current inputs
Wire size	10 AWG (2.5 to 6 mm²)
Terminal pitch	5 mm

Specifications (continued)

PLUG-IN DIGITAL INPUTS — 18 DI

Type	Optically isolated, dry contact sensing (voltage-free)
Internal power supply	5 VDC
Sensitivity	Open at input resistance > 16 kΩ, closed at < 10 kΩ
Scan time	½ cycle
Withstand insulation	4 kV AC at 1 min
Wire size	12 AWG (up to 2.5 mm²)
Terminal pitch	3.81 mm

PLUG-IN ANALOGUE INPUTS — 4 AI

Ranges (on order)	±1 mA (100% overload), 0 to 20 mA, 4 to 20 mA, 0 to 1 mA (100% overload)
Accuracy	0.5% FS
Scan time	2 cycles
Withstand insulation	4 kV AC at 1 min
Wire size	28 to 16 AWG (0.1 to 1.5 mm²), 600 V isolation
Terminal pitch	3.81 mm

RELAY OUTPUTS

Type	9 relays, SPST Form A
Contact rating	5 A at 250 VAC, 5 A at 30 VDC
Update time	1 cycle
Recommended wire size	18 AWG (1 mm²), 600 V isolation
Terminal pitch	3.81 mm

CURRENT SENSORS

CS1S split-core	100 A, 16 mm (0.63 in) inner diameter, 2.5 m cable
Rating	Up to 20 x 5 A (100 A) maximum

REAL-TIME CLOCK & MEMORY

Clock accuracy	Better than 5 s/month at 25 °C
Onboard memory	256 Mbytes standard

DISPLAY MODULES

GDM (option)	3.5 inch touch-panel LCD graphic TFT, 320 x 240, serial TTL RS-232 non-isolated
GDM operating temp.	–20 °C to +70 °C
RGM-180 (option)	5.7 inch touch colour remote display, Ethernet or serial interface, programmable screen saver

COM1 — RS-485 (STANDARD, MCM)

Port	Serial EIA RS-485, optically isolated
Withstand insulation	4 kV AC at 1 min
Baud rate	Up to 115,200 bps
Protocols	Modbus RTU/ASCII, DNP 3.0
Connector type	Removable, 3 terminals
Wire size	Up to 12 AWG (up to 2.5 mm²)
Terminal pitch	5 mm

COM3 — DISPLAY PORT (STANDARD, MCM)

Port	Serial TTL RS-232, non-isolated, for the GDM
Baud rate	Up to 460,800 bps
Protocols	Modbus RTU

USB PORT (STANDARD, MCM)

Port	Isolated USB 1.1
Withstand insulation	4 kV AC at 1 min
Connector type	A male, standard USB cable, max. length 2 m
Protocols	Modbus RTU

ETHERNET PORT (STANDARD, MCM)

Port	Transformer-isolated 10/100Base-T
Withstand insulation	4 kV AC at 1 min
Connector type	RJ45 modular
Protocols	Modbus TCP (502), DNP3/TCP (20000), BACnet
Simultaneous connections	5 sockets
Time synchronisation	SNTP

CELLULAR MODEM (OPTIONAL MODULE)

Technology	Cellular modem, technology selected on order
Withstand insulation	4 kV AC at 1 min
Connector type	SMA
Protocols	Modbus TCP (502), DNP 3.0/TCP (20000)

Standards Compliance

Accuracy

- Complies with AS/IEC 62053-22, Class 0.5S
- Meets ANSI C12.20-2010, Class 100 and Class 400, accuracy 0.2%

Electromagnetic Compatibility

- Complies with AS/IEC 62052-11, AS/IEC 62053-22, ANSI C12.1 and ANSI C12.20
- IEC 61000-4-2: electrostatic discharge, air and contact
- IEC 61000-4-3: electromagnetic RF fields, 10 V/m at 80 MHz to 1000 MHz
- IEC 61000-4-4: fast transient burst, 4 kV on current and voltage circuits, 2 kV on auxiliary circuits
- IEC 61000-4-5: surge, 6 kV on current and voltage circuits, 1 kV on auxiliary circuits
- IEC 61000-4-6: conducted radio frequency, 10 V at 0.15 MHz to 80 MHz
- IEC 61000-4-8: power frequency magnetic field
- IEC 61000-4-12: damped oscillatory waves, 2.5 kV common mode and 1 kV differential mode
- CISPR 22, Class B

Surge & Transient Withstand

- ANSI C12.1 clause 4.7.3.3.1: 100 kHz ring wave surge, 6 kV at 0.5 kA, per IEEE C62.41.2-2002
- ANSI C12.1 clause 4.7.3.3.2: line surge 1.2/50 µs and 8/20 µs, 6 kV at 3 kA, per IEEE C62.41.2-2002
- ANSI C12.1 clause 4.7.3.11: surge withstand capability 2.5 kV, per IEEE C37.90.1

Insulation

- AS/IEC 62052-11: insulation impulse 12 kV/50Ω at 1.2/50 µs
- AS/IEC 62053-22: AC voltage tests related to ground, 4 kV AC at 1 min for power and signal ports above 40 V
- Alternatively per UL 61010-1 and UL 916 for basic and double insulation, Installation Category III

Safety

- Meets UL 916

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 per IEC 68-2-3, below 95% non-condensing at +40 °C
- Transport and storage temperature range: –40 °C to +85 °C
- IEC 60529: IP50

Vibration & Shock

- AS/IEC 62052-11, referencing IEC 60068-2-6: vibration 10 Hz to 150 Hz, transition frequency 60 Hz, constant movement amplitude 0.075 mm below 60 Hz, constant acceleration 9.8 m/s² (1 g) above 60 Hz
- AS/IEC 62052-11, referencing IEC 60068-2-27: shock, half sine pulse, peak acceleration 30 gn (300 m/s²)
- Transport vibration and shock: longitudinal 2.0 g, vertical 1.2 g, transversal 1.2 g

Ordering Information

MODEL – POWER SUPPLY – FEEDER COUNT – FREQUENCY – CURRENT SENSOR – MODULE

BFM-II DFR MULTI-FEEDER MONITOR	
6-Feeder Monitor. Monitors six three-phase feeders on a common bus voltage via clip-on current sensors for 5 A secondary circuits	**BFM-II-DFR-ACDC-6F**
8-Feeder Monitor. Monitors eight three-phase feeders on a common bus voltage via clip-on current sensors for 5 A secondary circuits	**BFM-II-DFR-ACDC-8F**
12-Feeder Monitor. Monitors twelve three-phase feeders on a common bus voltage via clip-on current sensors for 5 A secondary circuits	**BFM-II-DFR-ACDC-12F**
FREQUENCY	
50 Hz	**50HZ**
60 Hz	**60HZ**
CURRENT SENSORS	
100 A split-core current sensor. Inner diameter 16 mm (0.63 in), cable length 2.5 m	**CS1S**
DIGITAL INPUT AND OUTPUT MODULES — ORDERED SEPARATELY	
18 Digital Input Module, dry contact	**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-channel Relay Output Module. Maximum 2 modules per device	**RLY9-BFM II**
ANALOGUE INPUT MODULES — ORDERED SEPARATELY	
4AI Module, ±1 mA. Four optically isolated analogue inputs	**AI1-BFM II**
4AI Module, 0 to 20 mA. Four optically isolated analogue inputs	**AI2-BFM II**
4AI Module, 0 to 1 mA. Four optically isolated analogue inputs	**AI3-BFM II**
4AI Module, 4 to 20 mA. Four optically isolated analogue inputs	**AI4-BFM II**

Ordering Information (continued)

CURRENT INPUT MODULES — UP TO 2 PER INSTRUMENT	
CIM 6, six-channel current input module	**C6H**
CIM 18, eighteen-channel current input module	**C18H**
CIM 6 for measuring with 5 A secondary	**C6-RS5**
CIM 18 for measuring with 5 A secondary	**C18-RS5**
COMMUNICATION MODULES	
None	**0**
4G modem plus a second RS-422/485 communications port	**T4G-BFM-II**

PLACE AN ORDER

To place an order or request a quotation for the BFM-II DFR, contact the SATEC Australia sales team, or scan the QR code.

PHONE **+61 2 4774 2959**
EMAIL **sales@satec-global.com.au**
ONLINE **satec-global.com.au/contact**

DOCUMENT REVISION HISTORY

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