



### Description

The Bitronics M664 (with display) and M665 (without display) are panel meters with Fast Frequency Response (FFR) algorithms and low pass filtering designed for applications with inverters such as Bulk/Battery Electric Storage Systems (BESS). FFR meters help to meet system requirements such as those stated by ERCOT where overall response to frequency changes must be made within 15 cycles after the frequency in the grid reaches a threshold trigger.

#### **Key Features**

#### **Fast Frequency Response**

- Provides 0.01Hz accuracy for frequency on a 0.5Hz step change within 2 cycles, and 0.001Hz accuracy within 10 cycles
- 0.001Hz accuracy is achieved over 80% of the time within 2 cycles for a 0.3Hz step change

#### Communications

- Ethernet service port provides access to web server in the meter for viewing and configuration with standard web browser
- Direct import of IEC 61850 CID files generated by off-the-shelf system configurator tools (SCTs)
- Fully configurable unbuffered or buffered report generation for communication to other equipment
- Ethernet protocols: IEC 61850, DNP3, Modbus, and EtherNet/IP (only one Ethernet connection supported)
- Optional 100 Mbps fiber Ethernet port with LC connector supporting IEC 61850, DNP3, Modbus, and EtherNet/IP (only one Ethernet connection supported)
- Serial DNP3 or Modbus available via configurable RS-232/ RS-485 serial port
- Option for standard secondary "optimal resolution" or primary units makes communications with SCADA/RTU more flexible

#### **Measurements & Recording**

- Full basic measurement set with demand and harmonic values
- 0.2% revenue accuracy
- 0.001Hz accuracy
- Updates every cycle (16 or 20ms)
- Option to monitor power supply voltage
- Transformer and line loss compensation
- Optional trend recording
- Optional KYZ pulse outputs for energy consumption monitoring and meter verification

#### **Low Pass Filtering**

Low pass filter prevents the aliasing effects of harmonics normally associated with inverters in photovoltaics and battery storage applications.





### **Technical Data**

Specifications	
Dimensions	M664: 4.5"W x 4.5"H x 6.5"D / M665: 5.25"W x 4.5"H x 6.5"D
Weight	1.8 lbs
Power Supply	Universal 48-250V dc/55-240V ac nominal
Compliance	IEC 61850 Edition 1 and Edition 2
Current Inputs	1A or 5A nominal to maximum of 2A or 10A (2x overload) Optional 5A nominal to 20A (4x overload) Optional 1A or 5A nominal external split-core CT
Voltage Inputs	120V ac nominal, 45-65Hz
Outputs	Optional KYZ outputs (4 with common return)
Communications Ports	Standard RJ45 10BaseT/100BaseTX port for service port functions and IEC 61850, DNP3, Modbus, and EtherNet/IP Optional LC 100Base FX fiber Ethernet port with IEC 61850, DNP3, Modbus, and EtherNet/IP Optional configurable DNP3 and Modbus port, RS-232/RS-485, 9600bps to 115.2kbps
Environmental	Operating temperature -40° to 70°C; storage temperature -40° to 85°C Humidity 0-95% non-condensing Surge withstand to ANSI/IEEE C37.90.1: 2002 UL/CSA Recognized, File Number E164178, CE Marked
Available Measurements	Amps A, B, C, Residual Demand/Max. Amps A, B, C, Residual Volts AN, BN, CN, NG, AB, BC, CA Fundamental Frequency 3-Phase Avg. L-N Volts 3-Phase Avg. L-V Volts Watts A, B, C, Total VARs A, B, C, Total VARs A, B, C, Total Uncompensated Watts, Total Uncompensated Watts, Total Uncompensated VARs, Total Power Factor A, B, C, Total Watt-Hrs Normal Watt-Hrs Normal Watt-Hrs Reverse Watt-Hrs Reverse Watt-Hrs Lag VAR-Hrs Lag VAR-Hrs Lag VAR-Hrs Lag VAR-Hrs Lag Fund. Amps A, B, C, Residual Fund. Volts AN, BN, CN, AB, BC, CA Phase Angle Volts AN, BN, CN, AB, BC, CA K-factor Amps A, B, C, Residual TDD Amps A, B, C, Residual TDD Denominator A, B, C THD Volts AN, BN, CN, AB, BC, CA Demand/Max. Fund. Amps A, B, C, Residual Average/Max./Min. VARs A, B, C, Total Average/Max./Min. VAS A, B, C, Total Displacement Power Factor A, B, C, Total





### **Feature Options**

	M664	M665
Display	Yes	No
Trend Recording	Optional	Optional
Power Supply	48-250V dc/69-240V ac	48-250 V dc/69-240V ac
Power Supply Monitoring	Optional	Optional
Signal Input Range	120V ac, 0-1A or 0-5A	120V ac, 0-1A or 0-5A
20A Input Range	Optional	Optional
Split Core CTs	Optional 1A or 5A	Optional 1A or 5A
Serial Port RS-232/RS-485, DNP3, and Modbus	Optional	Optional
Fiber Ethernet LC Connector 100BaseFX	Optional	Optional
KYZ Pulse Output	Optional	Optional
Ethernet RJ45 10BaseT/100BaseTX	Service Port	Service Port
Ethernet RJ45 10BaseT/100BaseTX DNP3 and Modbus	Optional	Optional
Ethernet RJ45 10BaseT/100BaseTX IEC 61850, DNP3, and Modbus	Optional	Optional
Ethernet RJ45 10BaseT/100BaseTX EtherNet/IP, DNP3, and Modbus	Optional	Optional

## **Application Diagram**

Typical frequency response following a generator trip







# **Ordering Information**

	Base Model	Power Supply	Input Signal Range	Communication Port	Ethernet Port	Description
M664				-		Advanced SCADA meter with display, low pass filter and fast frequency response
	М3	-	-	-	-	Multifunction, Advanced, 3 Line Alphanumeric Display
	Т3	-	-	-	-	Multifunction, Advanced, Trend Recording, 3 Line Alphanumeric Display
		U	-	-	-	Universal, 48-250V dc/69-240V ac - only available with option M3 and option 5 in Input Signal Range
		D	-	-	-	24V dc (8-40 dc range), with monitoring ( <b>N/A with C, A, T options in Input Signal Range</b> )
		Р	-	-	-	Universal, 48-250V dc/69-240V ac, with monitoring
			1	-	-	120V ac, 0-1 Amps
			5	-	-	120V ac, 0-5 Amps
			А	-	-	120V ac, 0-1 Amp Split-Core CTs (3)
			С	-	-	120V ac, 0-5 Amp Split-Core CTs (3)
			Т	-	-	120V ac, 0-20 Amps
				0	-	None (N/A with option C, A, T options in Input Signal Range)
				1	-	Serial DNP3 and Modbus, RS-232/RS-485 (configurable)
				5	-	Fiber Ethernet, LC connector, 100BaseFX, protocols enabled ( <b>N/A with C, A, T options in Input Signal Range</b> )
				7	-	KYZ Pulse Output, 4 (with common return)
					0	Ethernet 10BaseT/100BaseTX, service port only
					1	Ethernet 10BaseT/100BaseTX, IEC 61850, DNP3, and Modbus
					3	Ethernet 10BaseT/100BaseTX, DNP3, and Modbus
					4	Ethernet 10BaseT/100BaseTX, EtherNet/IP, DNP3, and Modbus



### **Ordering Information**

	Base Model	Power Supply	Input Signal Range	Communication Port	Ethernet Port	Description
M665				-		Advanced SCADA meter, low pass filter and fast frequency response
	M3	-	-	-	-	Multifunction, Advanced
	Т3	-	-	-	-	Multifunction, Advanced, Trend Recording
		U	-	-	-	Universal, 48-250V dc/69-240V ac - <b>only available with option</b> M3 and option 5 in Input Signal Range
		D	-	-	-	24V dc (8-40 dc range), with monitoring (N/A with C, A, T options in Position 8)
		Р	-	-	-	Universal, 48-250V dc/69-240V ac, with monitoring
			1	-	-	120V ac, 0-1 Amps
			5	-	-	120V ac, 0-5 Amps
			А	-	-	120V ac, 0-1 Amp Split-Core CTs (3)
			С	-	-	120V ac, 0-5 Amp Split-Core CTs (3)
			Т	-	-	120V ac, 0-20 Amps
				0	-	None (N/A with option C, A, T options in Position 8)
				1	-	Serial DNP3 and Modbus, RS-232/RS-485 (configurable)
				5	-	Fiber Ethernet, LC connector, 100BaseFX, protocols enabled ( <b>N/A with C, A, T options</b> )
				7	-	KYZ Pulse Output, 4 (with common return)
					0	Ethernet 10BaseT/100BaseTX, service port only
					1	Ethernet 10BaseT/100BaseTX, IEC 61850, DNP3, and Modbus
					3	Ethernet 10BaseT/100BaseTX, DNP3, and Modbus
					4	Ethernet 10BaseT/100BaseTX, EtherNet/IP, DNP3, and Modbus





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