

FnIO M – Series :
M3901

M3901(3Phase AC Measurement, Lx-Ly 500Vac, 1A)

Date: 2018.06.19

Specification Preliminary

Table of Contents

Table of Contents.....	2
History.....	3
1.Environment Specification.....	4
2.M3901 (3Phase AC Measurement, Lx-Ly 500Vac, 1A).....	5
2.1.M3901 Specification.....	5
2.2.M3901 Wiring Diagram.....	6
2.3.M3901 LED Indicator.....	7
2.3.1.LED Indicator.....	7
2.3.2.Channel Status LED.....	7
2.4.Mapping Data into the Image Table.....	8
2.5.Parameter Data.....	14

History

REV.	PAGES	REMARKS	DATE	Editor
1.00		Preliminary	Jun 19, 2018	BS HA

Specification Preliminary

1. Environment Specification

Environmental specification	
Operation Temperature	-20°C to 60°C
Non-Operating Temperature	-40°C ~ 85°C
Relative Humidity	5% ~ 90% Non-condensing
Operating Altitude	2,000m
Mounting	DIN Rail
General specification	
Shock Operating	IEC 60068-2-27
Vibration Resistance	Sine Vibration (Based on IEC 60068-2-6) - 5 ~ 25Hz : ±1.6mm - 25 ~ 300Hz : 4g - Sweep Rate : 1 Oct/min, 20 Sweeps Random Vibration (Based on IEC 60068-2-64) - 10 ~ 40 Hz : 0.0125 g ² /Hz - 40 ~ 100 Hz : 0.0125 → 0.002 g ² /Hz - 100 ~ 500 Hz : 0.002 g ² /Hz - 500 ~ 2000 Hz : 0.002 → 1.3 x 10 ⁻⁴ g ² /Hz - Test time : 1hrs for each test
EMC Resistance Burst/ESD	EN 61000-6-2 : 2005 EN 61000-6-4/A11 : 2011
Installation Pos. / Protect. Class	Variable/IP20
Product Certifications	CE, UL TBD

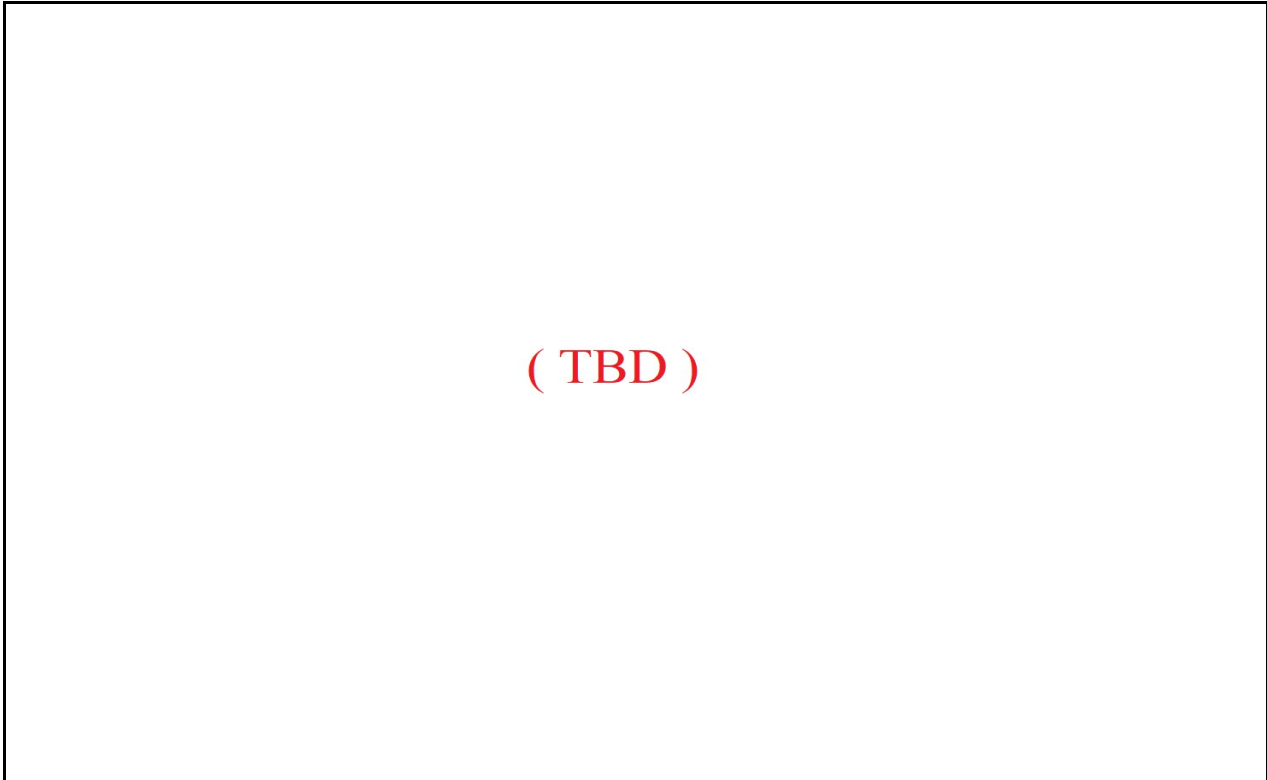
Specification Preliminary

2. M3901 (3Phase AC Measurement, Lx-Ly 500Vac, 1A)

2.1. M3901 Specification

Items	Specification
Input Specification	
Number of Channel	3Ch Voltage Input, 3Ch Current Input via CT
Indicators	1 Green Status LEDs 3 LEDs : VL1, VL2, VL3 Over Voltage or Under Voltage 3 LEDs : IL1, IL2, IL3 Over Current or Under Current
Input Voltage Range	$V_{LN} = 288VAC$, $V_{LL} = 500VAC$
Input resistance voltage path	1200K Ω
Measuring Current	1A(MAX)
Input resistance current path	60m Ω
Resolution	24bits
Input Frequency range	45Hz~65Hz
Measured values	Angle, Voltage, Current, Power, Energy, Frequency, Power Factors
Measuring error	Voltage = 0.5% Current = 0.5% Frequency = $\pm 0.01Hz$ Phase angle = $\pm 0.3^\circ$
Data Update Time	TBD
General Specification	
Power Dissipation	Max. TBD mA @ 5Vdc
Isolation	I/O to Logic : Photocoupler Isolation Field Power : Non-Isolation
Field Power	Supply Voltage : 24Vdc nominal Voltage Range : 15~32Vdc Power dissipation: 0mA @32Vdc
Wiring	I/O Cable Max. 2.0mm ² (AWG#14)
Weight	72g
Module Size	12mm x 110mm x 75mm
How swap	Possible
Environment Condition	Refer to 'Environment Specification'

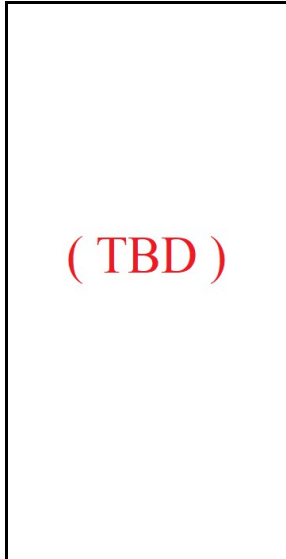
2.2. M3901 Wiring Diagram



Pin No.	Signal Description
0	Input Channel 0
1	Input Channel 1
2	Input Channel 2
3	Input Channel 3
4	Input Channel 4
5	Input Channel 5
6	Input Channel 6
7	Input Channel 7
8	Input Channel 8
9	Input Channel 9
10	Input Channel 10
11	Input Channel 11
12	Input Channel 12
13	Input Channel 13
14	Input Channel 14
15	Input Channel 15
16	Input Channel Common(AGND)
17	Input Channel Common(AGND)

2.3. M3901 LED Indicator

2.3.1. LED Indicator



LED No.	LED Function / Description	LED Color
0	INPUT Channel 0	Green
1	INPUT Channel 1	Green
2	INPUT Channel 2	Green
3	INPUT Channel 3	Green
4	INPUT Channel 4	Green
5	INPUT Channel 5	Green
6	INPUT Channel 6	Green
7	INPUT Channel 7	Green

2.3.2. Channel Status LED

Status	LED	To indicate
Error Status	Repeat Green and Off	Error Occurred
Input Status	Off	Over/Under Voltage or Over Current
	Green	Nomal Operation

2.4. Mapping Data into the Image Table

byte	Output data	Input data
0	Control byte 0	Status byte 0
1	Control byte 1	Status byte 1
2	Control byte 2	Status byte 2
3	Control byte 3	Status byte 3
4		Error Byte 0
5		Error Byte 1
6		Error Byte 2
7		Reserved
8		Process value1
9		
10		
11		Process value2
12		
13		
14		Process value3
15		
16		
17		Process value4
18		
19		
20		Process value4
21		
22		
23		

● **Output Image Value**

Control byte X							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
RES		Measure Select			CON_ID		
Measure Select		0 = Voltage 1 = Current 2 = Power 3 = PF 4 = Phase Angel 5 = Frequency 6 = Energy 7 = reserved					
RES		Resetting all of the min/max/energy values *Only have control byte 0 other is reserved					
CON_ID		CON_ID					

Specification Preliminary

CON_ID	Measured Value	Data Type	Scaling
Measure Select = Voltage			
00	RMS Voltage L1-N	uint32	0.01V
01	RMS Voltage L2-N	uint32	0.01V
02	RMS Voltage L3-N	uint32	0.01V
03	Max. RMS Voltage L1-N	uint32	0.01V
04	Max. RMS Voltage L2-N	uint32	0.01V
05	Max. RMS Voltage L3-N	uint32	0.01V
06	Min. RMS Voltage L1-N	uint32	0.01V
07	Min. RMS Voltage L2-N	uint32	0.01V
08	Min. RMS Voltage L3-N	uint32	0.01V
09	Peak value voltage L1-N	uint32	0.01V
0A	Peak value voltage L2-N	uint32	0.01V
0B	Peak value voltage L3-N	uint32	0.01V
0C	reserved		
0D			
0E			
0F			
CON_ID	Measured Value	Data Type	Scaling
Measure Select = Current			
00	RMS Current L1-N	uint32	0.001A
01	RMS Current L2-N	uint32	0.001A
02	RMS Current L3-N	uint32	0.001A
03	Max. RMS Current L1-N	uint32	0.001A
04	Max. RMS Current L2-N	uint32	0.001A
05	Max. RMS Current L3-N	uint32	0.001A
06	Min. RMS Current L1-N	uint32	0.001A
07	Min. RMS Current L2-N	uint32	0.001A
08	Min. RMS Current L3-N	uint32	0.001A
09	Peak value Current L1-N	uint32	0.001A
0A	Peak value Current L2-N	uint32	0.001A
0B	Peak value Current L3-N	uint32	0.001A
0C	reserved		
0D			
0E			
0F			
CON_ID	Measured Value	Data Type	Scaling
Measure Select = Power			
00	Apparent power L1	uint32	0.01VA
01	Apparent power L2	uint32	0.01VA
02	Apparent power L3	uint32	0.01VA
03	Active power L1	int32	0.01W
04	Active power L2	int32	0.01W
05	Active power L3	int32	0.01W
06	Max. active power L1	int32	0.01W
07	Max. active power L2	int32	0.01W
08	Max. active power L3	int32	0.01W
09	Min. active power L1	int32	0.01W
0A	Min. active power L2	int32	0.01W
0B	Min. active power L3	int32	0.01W
0C	Reactive power L1	int32	0.01VAR
0D	Reactive power L2	int32	0.01VAR
0E	Reactive power L3	int32	0.01VAR

Specification Preliminary

CON_ID	Measured Value	Data Type	Scaling
Measure Select = Energy			
00	Apparent energy L1	uint32	Set the Parameter
01	Apparent energy L2	uint32	
02	Apparent energy L3	uint32	
03	Total Apparent Energy	uint32	
04	Active energy L1	int32	
05	Active energy L2	int32	
06	Active energy L3	int32	
07	Total Active Energy	int32	
08	Reactive Energy L1	int32	
09	Reactive Energy L2	int32	
0A	Reactive Energy L3	int32	
0B	Total Reactive Energy	int32	
0C	reserved		
0D			
0E			
0F			
CON_ID	Measured Value	Data Type	Scaling
Measure Select = Power Factor			
00	cos phi L1	int32	0.01
01	cos phi L2	int32	0.01
02	cos phi L3	int32	0.01
03	reserved		
04			
05			
06			
07			
08			
09			
0A			
0B			
0C			
0D			
0E			
0F			
CON_ID	Measured Value	Data Type	Scaling
Measure Select = Frequency			
00	Supply network frequency L1	uint32	0.01Hz
01	Supply network frequency L2	uint32	0.01Hz
02	Supply network frequency L3	uint32	0.01Hz
03	Max. Supply network frequency L1	uint32	0.01Hz
04	Max. Supply network frequency L2	uint32	0.01Hz
05	Max. Supply network frequency L3	uint32	0.01Hz
06	Min. Supply network frequency L1	uint32	0.01Hz
07	Min. Supply network frequency L2	uint32	0.01Hz
08	Min. Supply network frequency L3	uint32	0.01Hz
09	reserved		
0A			
0B			
0C			
0D			
0E			

Specification Preliminary

CON_ID	Measured Value	Data Type	Scaling
Measure Select = Phase angle			
00	Phase angle phi L1	uint32	0.01 °
01	Phase angle phi L2	uint32	0.01 °
02	Phase angle phi L3	uint32	0.01 °
03	reserved		
04			
05			
06			
07			
08			
09			
0A			
0B			
0C			
0D			
0E			
0F			

Specification Preliminary

● **Input Image Value**

Error byte 0							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
ERR_VL2	VL2_Error code			ERR_VL1	VL1_Error code		
ERR_VL1		Phase x Voltage Input ERROR 0 = OK 1 = Error occurred					
Status byte X							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
RES	Measure Select			CON_ID			
Measure Select		0 = Voltage 1 = Current 2 = Power 3 = PF 4 = Error code 5 = Phase Angle 6 = Phase x Voltage Input ERROR 7 = Frequency 8 = Energy 9 = Error occurred 10 = Reserved					
RES		Phase x Current Input ERROR *Only have status byte 0 other is reserved					
CON_ID		0 = OK 1 = Error occurred					
Error byte 1							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
ERR_IL3	IL3_Error code			ERR_IL2	IL2_Error code		
ERR_IL2		Phase x Current Input ERROR 0 = OK 1 = Error occurred					
ERR_IL3		Phase x Current Input ERROR 0 = OK 1 = Error occurred					
Error code		0 = No Error 1 = Over Input 2 = Under Input					
Error byte 2							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Specification Preliminary

Process value 0-0 Byte							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Proc0[7 : 0]							
Proc0[7 : 0]		Process value 0 of Status Byte 0					
Process value 0-1 Byte							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Proc0[15 : 8]							
Proc0[15 : 8]		Process value 0 of Status Byte 0					
Process value 0-2 Byte							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Proc0[23 : 16]							
Proc0[23 : 16]		Process value 0 of Status Byte 0					
Process value 0-3 Byte							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Proc0[31 : 24]							
Proc0[31 : 24]		Process value 0 of Status Byte 0					
Process value 1-0 Byte							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Proc1[7 : 0]							
Proc1[7 : 0]		Process value 1 of Status Byte 1					
Process value 1-1 Byte							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Proc1[15 : 8]							
Proc1[15 : 8]		Process value 1 of Status Byte 1					
Process value 1-2 Byte							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Proc1[23 : 16]							
Proc1[23 : 16]		Process value 1 of Status Byte 1					
Process value 1-3 Byte							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Proc1[31 : 24]							
Proc1[32 : 24]		Process value 1 of Status Byte 1					
Process value 2-0 Byte							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Proc2[7 : 0]							
Proc2[7 : 0]		Process value 2 of Status Byte 2					
Process value 2-1 Byte							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Proc2[15 : 8]							
Proc2[15 : 8]		Process value 2 of Status Byte 2					
Process value 2-2 Byte							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Proc2[23 : 16]							
Proc2[23 : 16]		Process value 2 of Status Byte 2					
Process value 2-3 Byte							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Proc2[31 : 24]							
Proc2[31 : 24]		Process value 2 of Status Byte 2					
Process value 3-0 Byte							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Proc3[7 : 0]							
Proc3[7 : 0]		Process value 3 of Status Byte 3					
Process value 3-1 Byte							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Proc3[15 : 8]							
Proc3[15 : 8]		Process value 3 of Status Byte 3					
Process value 3-2 Byte							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Proc3[23 : 16]							
Proc3[23 : 16]		Process value 3 of Status Byte 3					
Process value 3-3 Byte							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Proc3[31 : 24]							
Proc3[31 : 24]		Process value 3 of Status Byte 3					

2.5. Parameter Data

- **Valid Parameter length : 5 Bytes**
- **Parameter Data**

	Bit#7	Bit#6	Bit#5	Bit#4	Bit#3	Bit#2	Bit#1	Bit#0
Byte#0	CT sensor 1 : x							
	Value for the current transformer ratio divisor							
	Bit#7	Bit#6	Bit#5	Bit#4	Bit#3	Bit#2	Bit#1	Bit#0
Byte#1	Frequency	Scaling for energy values			CT sensor 1 : x			
	0 = 45~55Hz	0 = 1m Wh/VARh/VAh			Value for the current transformer ratio divisor			
	1 = 55~65Hz	1 = 0.01 Wh/VARh/VAh						
		2 = 0.1 Wh/VARh/VAh						
		3 = 1 Wh/VARh/VAh						
		4 = 0.01k Wh/VARh/VAh						
		5 = 0.1k Wh/VARh/VAh						
		6 = 1k Wh/VARh/VAh						
	7 = reserved							
	Bit#7	Bit#6	Bit#5	Bit#4	Bit#3	Bit#2	Bit#1	Bit#0
Byte#2	Overvoltage threshold Lx (value) Resolution 0.2V							
	Overvoltage threshold = 250V+value*0.2V. (MAX 300V)							
	Bit#7	Bit#6	Bit#5	Bit#4	Bit#3	Bit#2	Bit#1	Bit#0
Byte#3	Undervoltage threshold Lx (value) Resolution 0.5V							
	Undervoltage threshold = 0V+value*0.5V. (MAX 125V)							
	Bit#7	Bit#6	Bit#5	Bit#4	Bit#3	Bit#2	Bit#1	Bit#0
Byte#4	Overcurrent threshold Lx (value) Resolution 2mA							
	Overcurrent threshold = 0.8A+value*0.002A. (MAX 1.3A)							