Introduction

This SunSpec Alliance Interoperability Specification describes the data models and MODBUS register mappings for meter devices used in Renewable Energy systems. This document defines the floating point models for:

- Single Phase Meter
- Split Phase Meter
- Wye Connect Meter
- Delta Connect Meter

Meter Device Block

The following data elements are provided to describe meters.

- **C_SunSpec_DID –** A well-known value that uniquely identifies this block as a meter block. (4) for single phase meters and (5) for three phase meter types.
- **C_SunSpec_Length** – The length of the meter block in registers.
- **M_AC_xxxx**– Meter AC values.
- **M_Exported_xxxx**– Meter Exported Energy values
- **M_Imported_xxxx**– Meter Imported Energy values

Energy value

The energy value is represented by a 32 bit floating point value. Values for import and export are provided. Unsupported or invalid accumulators may return 0.0.

Power signs and Energy quadrants are per IEEE 1459-2000.

Meter Event Flag Values

The SunSpec Common Elements defines a C_Event value. The meter specific flags are defined here.

M_EVENT_Power_Failure	0x00000004	Loss of power or phase
M_EVENT_Under_Voltage	0x00000008	Voltage below threshold (Phase Loss)
M_EVENT_Low_PF	0x00000010	Power Factor below threshold (can indicate miss-associated voltage and current inputs in three phase systems)
M_EVENT_Over_Current	0x00000020	Current Input over threshold (out of measurement range)
M_EVENT_Over_Voltage	0x00000040	Voltage Input over threshold (out of measurement range)
M_EVENT_Missing_Sensor	0x00000080	Sensor not connected
M_EVENT_Reserved1	0x00000100	Reserved for future
M_EVENT_Reserved2	0x00000200	Reserved for future
M_EVENT_Reserved3	0x00000400	Reserved for future
M_EVENT_Reserved4	0x00000800	Reserved for future
M_EVENT_Reserved5	0x00001000	Reserved for future
M_EVENT_Reserved6	0x00002000	Reserved for future
M_EVENT_Reserved7	0x00004000	Reserved for future
M_EVENT_Reserved8	0x00008000	Reserved for future
M_EVENT_OEM1-15	0x7FFF000	Reserved for OEMs

MODBUS Register Mappings

Floating Point Meter Model - MODBUS Mapping

This map supports single, split, wye, and delta meter connections in a single map as proper subsets. The connection type is distinguished by the C_SunSpec_DID. Registers that are not applicable to a meter class shall return the unsupported value. (e.g. Single Phase meters will support only summary and phase A values).

Start	End	#	R/W	Name	Type	Units	Scale Factor	Contents	Description
Identification									
0001	0001	1	R	C_SunSpec_DID	uint16	N/A	0	211 212 213 or 214	Well-known value. Uniquely identifies this as a SunSpecModbus Map: Single Phase (AN or AB) Meter (201) Split Single Phase (ABN) Meter (202) Wye-Connect Three Phase (ABCN) Meter (203) Delta-Connect Three Phase (ABC) Meter(204)
0002	0002	1	R	C_SunSpec_Length	uint16	Registers	0	124	Length of meter model block
Current									
0003	0004	2	R	M_AC_Current_f	float32	Amps	1	Measured	**AC Current** (sum of active phases)
0005	0006	2	R	M_AC_Current_A_f	float32	Amps	1	Measured	Phase A AC Current
0007	0008	2	R	M_AC_Current_B_f	float32	Amps	1	Measured	Phase B AC Current
0009	0010	2	R	M_AC_Current_C_f	float32	Amps	1	Measured	Phase C AC Current
Voltage									
Line to Neutral Voltage									
0011	0012	2	R	M_AC_Voltage_LN_f	float32	Volts	1	Measured	**Line to Neutral AC Voltage** (average of active phases)
0013	0014	2	R	M_AC_Voltage_AN_f	float32	Volts	1	Measured	Phase A to Neutral AC Voltage
0015	0016	2	R	M_AC_Voltage_BN_f	float32	Volts	1	Measured	Phase B to Neutral AC Voltage
0017	0018	2	R	M_AC_Voltage_CN_f	float32	Volts	1	Measured	Phase C to Neutral AC Voltage
Line to Line Voltage									
0019	0020	2	R	M_AC_Voltage_LL_f	float32	Volts	1	Measured	**Line to Line AC Voltage** (average of active phases)
0021	0022	2	R	M_AC_Voltage_AB_f	float32	Volts	1	Measured	Phase A to Phase B AC Voltage
0023	0024	2	R	M_AC_Voltage_BC_f	float32	Volts	1	Measured	Phase B to Phase C AC Voltage

0025	0026	2		M_AC_Voltage_CA_f	float32	Volts	1	Measured	Phase C to Phase A AC Voltage
Frequency									
0027	0028	2	R	M_AC_Freq_f	float32	Herts	1	Measured	**AC Frequency**
Power									
Real Power									
0029	0030	2	R	M_AC_Power_f	float32	Watts	1	Measured	**Total Real Power**(sum of active phases)
0031	0032	2	R	M_AC_Power_A_f	float32	Watts	1	Measured	Phase A AC Real Power
0033	0034	2	R	M_AC_Power_B_f	float32	Watts	1	Measured	Phase B AC Real Power
0035	0036	2	R	M_AC_Power_C_f	float32	Watts	1	Measured	Phase C AC Real Power
Apparent Power									
0037	0038	2	R	M_AC_VA_f	float32	Volt-Amps	1	Measured	**Total AC Apparent Power**(sum of active phases)
0039	0040	2	R	M_AC_VA_A_f	float32	Volt-Amps	1	Measured	Phase A AC Apparent Power
0041	0042	2	R	M_AC_VA_B_f	float32	Volt-Amps	1	Measured	Phase B AC Apparent Power
0043	0044	2	R	M_AC_VA_C_f	float32	Volt-Amps	1	Measured	Phase C AC Apparent Power
Reactive Power									
0045	0046	2	R	M_AC_VAR_f	float32	VAR	1	Measured	**Total AC Reactive Power**(sum of active phases)
0047	0048	2	R	M_AC_VAR_A_f	float32	VAR	1	Measured	Phase A AC Reactive Power
0049	0050	2	R	M_AC_VAR_B_f	float32	VAR	1	Measured	Phase B AC Reactive Power
0051	0052	2	R	M_AC_VAR_C_f	float32	VAR	1	Measured	Phase C AC Reactive Power
Power Factor									
0053	0054	2	R	M_AC_PF_f	float32	%	1	Measured	**Average Power Factor**(average of active phases)
0055	0056	2	R	M_AC_PF_A_f	float32	%	1	Measured	Phase A Power Factor
0057	0058	2	R	M_AC_PF_B_f	float32	%	1	Measured	Phase B Power Factor
0059	0060	2	R	M_AC_PF_C_f	float32	%	1	Measured	Phase C Power Factor
Accumulated Energy									
Real Energy									
0061	0062	2	R	M_Exported_f	float32	Watt-hours	1	Measured	**Total Exported Real Energy**
0063	0064	2	R	M_Exported_A_f	float32	Watt-hours	1	Measured	Phase A Exported Real Energy
0065	0066	2	R	M_Exported_B_f	float32	Watt-hours	1	Measured	Phase B Exported Real Energy
0067	0068	2	R	M_Exported_C_f	float32	Watt-hours	1	Measured	Phase C Exported Real Energy
0069	0070	2	R	M_Imported_f	float32	Watt-hours	1	Measured	**Total Imported Real Energy**
0071	0072	2	R	M_Imported_A_f	float32	Watt-hours	1	Measured	Phase A Imported Real Energy
0073	0074	2	R	M_Imported_B_f	float32	Watt-hours	1	Measured	Phase B Imported Real Energy
0075	0076	2	R	M_Imported_C_f	float32	Watt-hours	1	Measured	Phase C Imported Real Energy

Apparent Energy									
0077	0078	2	R	M_Exported_VA_f	float32	VA-hours	1	Measured	**Total Exported Apparent Energy**
0079	0080	2	R	M_Exported_VA_A_f	float32	VA-hours	1	Measured	Phase A Exported Apparent Energy
0081	0082	2	R	M_Exported_VA_B_f	float32	VA-hours	1	Measured	Phase B Exported Apparent Energy
0083	0084	2	R	M_Exported_VA_C_f	float32	VA-hours	1	Measured	Phase C Exported Apparent Energy
0085	0086	2	R	M_Imported_VA_f	float32	VA-hours	1	Measured	**Total Imported Apparent Energy**
0087	0088	2	R	M_Imported_VA_A_f	float32	VA-hours	1	Measured	Phase A Imported Apparent Energy
0089	0090	2	R	M_Imported_VA_B_f	float32	VA-hours	1	Measured	Phase B Imported Apparent Energy
0091	0092	2	R	M_Imported_VA_C_f	float32	VA-hours	1	Measured	Phase C Imported Apparent Energy
Reactive Energy									
0093	0094	2	R	M_Import_VARh_Q1_f	float32	VAR-hours	1	Measured	**Quadrant 1: Total Imported Reactive Energy**
0095	0096	2	R	M_Import_VARh_Q1A_f	float32	VAR-hours	1	Measured	Phase A - Quadrant 1: Imported Reactive Energy
0097	0098	2	R	M_Import_VARh_Q1B_f	float32	VAR-hours	1	Measured	Phase B- Quadrant 1: Imported Reactive Energy
0099	0100	2	R	M_Import_VARh_Q1C_f	float32	VAR-hours	1	Measured	Phase C- Quadrant 1: Imported Reactive Energy
0101	0102	2	R	M_Import_VARh_Q2_f	float32	VAR-hours	1	Measured	**Quadrant 2: Total Imported Reactive Energy**
0103	0104	2	R	M_Import_VARh_Q2A_f	float32	VAR-hours	1	Measured	Phase A - Quadrant 2: Imported Reactive Energy
0105	0106	2	R	M_Import_VARh_Q2B_f	float32	VAR-hours	1	Measured	Phase B- Quadrant 2: Imported Reactive Energy
0107	0108	2	R	M_Import_VARh_Q2C_f	float32	VAR-hours	1	Measured	Phase C- Quadrant 2: Imported Reactive Energy
0109	0110	2	R	M_Export_VARh_Q3_f	float32	VAR-hours	1	Measured	**Quadrant 3: Total Exported Reactive Energy**
0111	0112	2	R	M_Export_VARh_Q3A_f	float32	VAR-hours	1	Measured	Phase A - Quadrant 3: Exported Reactive Energy
0113	0114	2	R	M_Export_VARh_Q3B_f	float32	VAR-hours	1	Measured	Phase B- Quadrant 3: Exported Reactive Energy
0115	0116	2	R	M_Export_VARh_Q3C_f	float32	VAR-hours	1	Measured	Phase C- Quadrant 3: Exported Reactive Energy
0117	0118	2	R	M_Export_VARh_Q4_f	float32	VAR-hours	1	Measured	**Quadrant 4: Total Exported Reactive Energy**
0119	0120	2	R	M_Export_VARh_Q4A_f	float32	VAR-hours	1	Measured	Phase A - Quadrant 4: Exported Reactive Energy
0121	0122	2	R	M_Export_VARh_Q4B_f	float32	VAR-hours	1	Measured	Phase B- Quadrant 4: Exported Reactive Energy
0123	0124	2	R	M_Export_VARh_Q4C_f	float32	VAR-hours	1	Measured	Phase C- Quadrant 4: Exported Reactive Energy
Events									
0125	0126	2	R	M_Events	uint32	Flags	0	M_EVENT_	See M_EVENT_ flags. 0 = no events.