ELECTRICAL RATINGS: (EV EXPORT / DISCHARGE MODE)

MODEL(S)	QUASAR 2
DC RATINGS:	INPUT
MAX. SYSTEM VOLTAGE VOC (V DC)	920
VOLTAGE OPERATING RANGE (VDC)	200-920
VOLTAGE START RAGE (VDC)	200-920
MAX. OPERATING CURRENT (A DC)	30
MAX. SHORT CIRCUIT CURRENT (A DC)	67.6
AC RATINGS:	OUTPUT
PHASE CONFIGURATION	SINGLE SPLIT PHASE (TN)
NUMBER OF PHASES	1
NOMINAL (LINE TO LINE) VOLTAGE (V AC)	240VAC
OPERATING VOLTAGE RANGE (V AC)	211-264
FREQUENCY (HZ)	60
OPERATING FREQUENCY RANGE OR SINGLE FREQUENCY (HZ)	58. 8 – 61.2
RATED CURRENT (A AC)	52
MAXIMUM AIR AMBIENT (°C)	+5 0°C
RATED OUTPUT POWER @ 25 °C, 432-920VDC VDC INPUT (KW)	12.48
RATED OUTPUT POWER @ 40°C, 432-920VDC VDC INPUT (KW)	12.48
RATED OUTPUT POWER @ 50°C, 388-920VDC VDC INPUT (KW)	11.2
MAX. OUTPUT (KW)	12.48
MAX OUTPUT (KVA)	12.48
MAX POWER FACTOR LEADING OR LAGGING	-0.898 - +0.898
VOLTAGE MEASUREMENT ACCURACY (VNOM)	1%
FREQUENCY MEASUREMENT ACCURACY (HZ)	0.010
ACTIVE POWER MEASUREMENT ACCURACY (SRATED)	5%
REACTIVE POWER MEASUREMENT ACCURACY (SRATED)	5%
TIME MEASUREMENT ACCURACY	1%
MAX. BRANCH CIRCUIT OVERCURRENT PROTECTION (A AC)	70
MAX. OUTPUT FAULT CURRENT (A AC) AND DURATION (MS)	89.2 / 3.0
OTHER RATINGS	
ENCLOSURE TYPE RATING(S)	3R
SHIPPING TEMPERATURE RANGE	-40 – 70 °C
OPERATING TEMPERATURE RANGE	-30 + 50 °C

All Power line surges applied to grid/utility terminals of the end-product.

INTERCONNECTION INTEGRITY TEST CATEGORIES:	
IEEE C62.42.2 Ring Wave Surge Category	B (6kV / 0.5kA)
IEEE C62.42.2 Combination Wave Surge Category	B (6kV / 3kA)
IEEE C37.90.1 RF Immunity – compliance	Yes

IEEE C37.90.2 Communication circuit - compliance	Yes

ELECTRICAL RATINGS: (EV CHARGE MODE)

MODEL(S)	QUASAR 2
AC RATINGS:	INPUT
PHASE CONFIGURATION	SINGLE SPLIT PHASE (TN)
NUMBER OF PHASES	1
NOMINAL (LINE TO LINE) VOLTAGE (V AC)	240VAC
OPERATING VOLTAGE RANGE (V AC)	211-264
LIMITS OF ACCURACY OF VOLTAGE MEASUREMENT	± 1%
FREQUENCY (HZ)	60
OPERATING FREQUENCY RANGE OR SINGLE FREQUENCY (HZ)	58. 8 – 61.2
RATED CURRENT (A AC)	52
MAX. INPUT POWER (KW)	12. 48
MAX. BRANCH CIRCUIT OVERCURRENT PROTECTION (A AC)	70
MAX. INPUT FAULT CURRENT (A AC) AND DURATION (MS)	24.8 / 1.0
/DC RATINGS:	OUTPUT
MAX. SYSTEM VOLTAGE VOC (V DC)	920
VOLTAGE OPERATING RANGE (VDC)	200-920
MAX. OPERATING CURRENT (A DC)	30
RATED OUTPUT POWER @ 25 °C (KW)	12.0
RATED OUTPUT POWER @ 40 °C (KW)	12.0
RATED OUTPUT POWER @ 50 °C (KW)	11.5
MAX. OUTPUT (KW)	12.0
MAXIMUM AIR AMBIENT (°C)	+50°C
MAX. OUTPUT FAULT CURRENT (A DC) AND DURATION (MS)	562.6 / 4.0
OTHER RATINGS	
ENCLOSURE TYPE RATING(S)	3R
SHIPPING TEMPERATURE RANGE	-40 – 70 °C
OPERATING TEMPERATURE RANGE	-30 + 50 °C

UL1741SA Using IEEE1547.1-2020 Grid Support Test Methods and UL1741SB:

UL1741 SA Test Name	SA Test Section	Comparable IEEE 1547.1-2020 and UL1741 SB Test Section	DER complies with SA and SB
Anti-Islanding Protection	SA8	5.10.2	
Low and High Voltage Ride-Through	SA9	5.4.4, 5.4.7	
Low and High Frequency Ride-Through	SA10	5.5.3, 5.5.4	
Normal Ramp Rates	SA11.2	NA[a]	

Soft-Start Ramp Rates	SA11.4	5.6	
Specified Power Factor	SA12	5.14.3	
Volt/Var Mode	SA13	5.14.4	
Frequency-Watt	SA14	5.15.2	
Volt-Watt	SA15	5.14.9	
Disable Permit Service	SA17	5.6	
Limit Active Power	SA18	5.13	
For the purpose of Grid Support Interactive evaluations, this table provides options to use tests from either the UL 1741 SA or IEEE 1547.1 2020 and UL1741SB.			
[a] IEEE 1547-2018 and IEEE 1547.1-2020 do not have a requirement for, or test equivalent to, the UL 1741 SA Normal Ramp Rate which is presently a local requirement per California Rule 21 and/or Hawaii 14H which both require compliance with the Normal Ramp Rate test of SA11.2. **Additional testing to SA11.2 Normal Ramp Rate has been conducted to demonstrate compliance on this DER.**			

Voltage regions equivalencies between UL1741SA and IEEE1547.1-2020/UL1741SB:

UL1741 SA Boundary	IEEE 1547.1-2020 Shall Trip
High Voltage 3 (HV3)	Not applicable
High Voltage 2 (HV2)	Over Voltage 2 (OV2)
High Voltage 1 (HV1)	Over Voltage 1 (OV1)
Low Voltage 1 (LV1)	Under Voltage 1 (UV1)
Low Voltage 2 (LV2)	Under Voltage 2 (UV2)
Low Voltage 3 (LV3)	Not applicable
Low Voltage 4 (LV1)	Not applicable

Frequency regions comparison between UL1741SA and IEEE1547.1-2020:

UL1741 SA Boundary	IEEE 1547.1-2020 Shall Trip
High Frequency 3 (HF3)	Not applicable
High Frequency 2 (HF2)	Over Frequency 2 (OF2)
High Frequency 1 (HF1)	Over Frequency 1 (OF1)
Low Frequency 1 (LF1)	Under Frequency 1 (UF1)
Low Frequency 2 (LF2)	Under Frequency 2 (UF2)
Low Frequency 3 (LF3)	Not applicable

UL 1741 SB & SA SUPPLEMENTAL RATINGS:

Model(s)		Quasar 2
Magnitude and Trip Times Category III - Utility interconnection voltage magnitude limits, and trip times:		
Nominal voltage		240Vac L-L
	Default Settings	Ranges of allowable Settings

Shall Trip function	Voltage (p.u. of nominal voltage)		Clearing time (s)		Voltage (p.u. of nominal voltage)		Clearing time (s)	
			Min		Max		Min	Max
OV2	1.20		0.16		1.20		0.16	0.16
OV1	1.10		13.0		1.10		1.20	1.00	13.0
UV1	0.88		21.0		0.00		0.88	21.0	50.0
UV2	0.50		2.00		0.00		0.50	2.00	21.0

SA9, Voltage Ride-Through Category III:				
Nominal voltage			240Vac L-L	
Operating Mode	Voltage Range (p.u.)		Minimum Ride-Through time(s)	Maximum Response time(s)
	Min	Max		
Cease to Energize	1.20	1.20	0.00	0.16
Momentary Cessation	1.10	1.20	12.0	0.083
Continuous Operation	0.88	1.10	Infinite	N/A
Mandatory Operation	0.70	0.88	20.0	N/A
Mandatory Operation	0.50	0.70	10.0	N/A
Momentary Cessation	0.00	0.50	1.00	0.083

Frequency and Trip Times Category III - Utility interconnection frequency magnitude limits, and trip times:						
Nominal Frequency			60Hz			
	Default Settings			Ranges of allowable Settings		
Shall Trip function	Frequency (Hz)	Clearing time (s)		Frequency (Hz)		Clearing time (s)
			Min	Max	Min	Max
OF2	62.0	0.16	61.8	66.0	0.16	1000.0
OF1	61.2	300.0	61.0	66.6	180.0	1000.0
UF1	58.5	300.0	50.0	59.0	180.0	1000.0
UF2	56.5	0.16	50.0	57.0	0.16	1000.0

UL 1741 SB & SA SUPPLEMENTAL RATINGS: CONT'D

SA10, Frequency Ride-Through Category III:			
Nominal Frequency		60Hz	
Operating Mode	Frequency Range (Hz)		Minimum Ride-Through time(s)
	Min	Max	
No Ride Through	62.0	62.0	N/A
Mandatory Operation	61.2	61.8	299.0
Continuous Operation	58.8	61.2	Infinite
Mandatory Operation	57.0	58.8	299.0

No Ride Through	57.0	57.0	N/A

SA14, Frequency-Droop Category III:			
Nominal Frequency		60Hz	
Parameter	Default Settings	Ranges of allowable Settings	
		Min	Max
db_{OF}, db_{UF} (Hz)	0.036	0.017	1.0
k_{OF}, k_{UF}	0.05	0.02	0.05
$T_{response}$ (small signal) (s)	5.0	0.20	10.0

SA11 Ramp Rate test ratings (RR)		
Minimum soft start ramp-up rate	0.10%	Var/SEC
Maximum soft start ramp-up rate	100.0%	Var/SEC

SA12 SPF Specified Power Factor		
Minimum Inductive (Underexcited) Power Factor (<0)	-0.898	Vars P.U
Minimum Capacitive (Overexcited) Power Factor (>0)	0.898	Vars P.U.

UL 1741 SB & SA SUPPLEMENTAL RATINGS: CONT'D

SA13, Volt/Var Mode (VV) extent of curve range settings				
Reactive Power Settings		Qmax Values - Maximums	Qmin Values - Minimums	Units
Reactive power production setting	Q_1	0.53	0.00	p.u
Reactive power absorption setting at the left edge of the deadband	Q_2	0.53	-1.00	p.u.
Reactive power absorption setting at the right edge of the deadband	Q_3	0.53	-1.00	p.u.
Reactive power absorption setting	Q_4	0.00	-1.00	p.u.
Voltage Settings		Maximum	Minimum	Units
The voltage at Q_1	V_1	0.94	0.82	p.u.
The voltage at Q_2	V_2	1.00	0.97	p.u.

The voltage at Q_3	V_3	1.03	1.00	p.u.
*The voltage at Q_4	V_4	1.18	1.04	p.u.

SA14, Frequency-Watt (FW) extent of curve range settings				
Curtailment function Settings		Over Frequency	Under Frequency	Units
Low end of the adjustment range	F_{start_min}	60.17	59.00	Hz
High end of the adjustment range	F_{start_max}	61.00	59.80	Hz
Minimum slope of frequency droop	HIGH_kof-min	0.00	0.20	f_{PU}/W_{PU} change
Maximum slope of frequency droop	HIGH_kof-max	0.05	1.00	f_{PU}/W_{PU} change

SA15, Volt-Watt (VW) extent of curve range settings			
Curtailment function Settings		Units	
Low end of the adjustment range (begin function)	V_{start_min}	1.05	PU (Vnom)
High end of the adjustment range (begin function)	V_{start_max}	1.09	PU (Vnom)
Low end of the adjustment range (end function)	V_{stop_min}	1.07	PU (Vnom)
High end of the adjustment range (end function)	V_{stop_max}	1.10	PU (Vnom)