

## Ratings, Characteristics, and Functions

| Item                   |                                 | Power rating                    | 30 W                                                                                                                                                                                | 60 W                                     |                                          |
|------------------------|---------------------------------|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|------------------------------------------|
|                        |                                 | Rated output voltage            | 5 V                                                                                                                                                                                 | 12 V                                     | 24 V                                     |
|                        |                                 | Indication monitor              | None                                                                                                                                                                                | None                                     | None                                     |
| Efficiency *           |                                 | 115 VAC input                   | 78% typ.                                                                                                                                                                            | 85% typ.                                 | 85% typ.                                 |
|                        |                                 | 230 VAC input                   | 77% typ.                                                                                                                                                                            | 86% typ.                                 | 86% typ.                                 |
| Input conditions       | Voltage range *                 |                                 | Single-phase, 85 to 264 VAC, 90 to 350 VDC, 265 to 300 VAC (1 second)                                                                                                               |                                          |                                          |
|                        | Frequency *                     |                                 | 50/60 Hz (47 to 450 Hz)                                                                                                                                                             |                                          |                                          |
|                        | Input current *                 | 115 VAC input                   | 0.53 A typ.                                                                                                                                                                         | 0.99 A typ.                              | 1.1 A typ.                               |
|                        |                                 | 230 VAC input                   | 0.32 A typ.                                                                                                                                                                         | 0.61 A typ.                              | 0.67 A typ.                              |
|                        | Power factor                    |                                 | ---                                                                                                                                                                                 |                                          |                                          |
|                        | Leakage current *               | 115 VAC input                   | 0.5 mA max.                                                                                                                                                                         |                                          |                                          |
|                        |                                 | 230 VAC input                   | 1 mA max.                                                                                                                                                                           |                                          |                                          |
|                        | Inrush current *                | 115 VAC input                   | 16 A typ.                                                                                                                                                                           |                                          |                                          |
|                        |                                 | 230 VAC input                   | 32 A typ.                                                                                                                                                                           |                                          |                                          |
| Output characteristics | Rated output current            |                                 | 5 A                                                                                                                                                                                 | 4.5 A                                    | 2.5 A                                    |
|                        | Rated output power              |                                 | 25 W                                                                                                                                                                                | 54 W                                     | 60 W                                     |
|                        | Maximum boost current           |                                 | 6 A                                                                                                                                                                                 | 5.4 A                                    | 3 A                                      |
|                        | Voltage adjustment range *      |                                 | 4.5 to 5.8V (with V. ADJ)                                                                                                                                                           | 10.8 to 14 V (with V. ADJ)               | 21.6 to 28 V (with V. ADJ)               |
|                        | Ripple noise voltage *          | 100 to 240 VAC input            | 130 mVp-p max.<br>at 20 MHz of bandwidth                                                                                                                                            | 120 mVp-p max.<br>at 20 MHz of bandwidth | 110 mVp-p max.<br>at 20 MHz of bandwidth |
|                        | Input variation influence *     |                                 | 0.5% max.                                                                                                                                                                           |                                          |                                          |
|                        | Load variation influence *      |                                 | 1.5% max.                                                                                                                                                                           |                                          |                                          |
|                        | Temperature variation influence | 100 to 240 VAC input            | 0.05%/°C max.                                                                                                                                                                       |                                          |                                          |
|                        |                                 |                                 |                                                                                                                                                                                     |                                          |                                          |
|                        | Start up time *                 | 115 VAC input                   | 1000 ms max.                                                                                                                                                                        | 1000 ms max.                             | 1000 ms max.                             |
|                        |                                 | 230 VAC input                   | 1000 ms max.                                                                                                                                                                        | 1000 ms max.                             | 1000 ms max.                             |
|                        | Hold time *                     | 115 VAC input                   | 45 ms typ.                                                                                                                                                                          | 20 ms typ.                               | 20 ms typ.                               |
|                        |                                 | 230 VAC input                   | 240 ms typ.                                                                                                                                                                         | 120 ms typ.                              | 110 ms typ.                              |
| Additional functions   | Overload protection             |                                 | Yes, automatic reset, intermittent operation type, Refer to <i>Overload Protection</i> on page 8 for details.                                                                       |                                          |                                          |
|                        | Overvoltage protection          |                                 | Yes, 130% or higher of rated output voltage, power shut off (shut off the input voltage and turn on the input again), Refer to <i>Overvoltage Protection</i> on page 8 for details. |                                          |                                          |
|                        | Series operation                |                                 | Yes (For up to two Power Supplies; external diodes required.)                                                                                                                       |                                          |                                          |
|                        | Parallel operation              |                                 | Yes (For up to two Power Supplies), Refer to <i>Parallel Operation</i> on page 22 for details.                                                                                      |                                          |                                          |
|                        | Output indicator                |                                 | Yes (LED: Green)                                                                                                                                                                    |                                          |                                          |
|                        | Alarm indicator                 |                                 | Yes (LED: Red)                                                                                                                                                                      |                                          |                                          |
|                        | Indication monitor              | Measurement and display details | Refer to <i>Communication and Indication Items</i> on page 7 for details.                                                                                                           |                                          |                                          |
|                        |                                 | Main display                    | None                                                                                                                                                                                |                                          |                                          |
|                        | Ethernet communication          | Measurement and display details | Refer to <i>Communication and Indication Items</i> on page 7 for details.                                                                                                           |                                          |                                          |
|                        |                                 | Communication protocol          | EtherNet/IP, Modbus TCP                                                                                                                                                             |                                          |                                          |
|                        |                                 | Physical layer                  | 100BASE-TX                                                                                                                                                                          |                                          |                                          |
|                        |                                 | Communication specifications    | Refer to <i>Communication Specifications</i> on page 8 for details.                                                                                                                 |                                          |                                          |
| Insulation             | Withstand voltage               |                                 | 3.0 kVAC for 1 min. (between all input terminals and output terminals, all EtherNet/IP ports), current cutoff 20 mA                                                                 |                                          |                                          |
|                        |                                 |                                 | 2.0 kVAC for 1 min. (between all input terminals and PE terminals), current cutoff 20 mA                                                                                            |                                          |                                          |
|                        |                                 |                                 | 1.0 kVAC for 1 min. (between all output terminals and PE terminals), current cutoff 30 mA                                                                                           |                                          |                                          |
|                        |                                 |                                 | 0.5 kVAC for 1 min. (between all output terminals and all EtherNet/IP ports), current cutoff 30 mA                                                                                  |                                          |                                          |
|                        | Insulation resistance           |                                 | 100 MΩ min. (between all output terminals and all input terminals/PE terminals) at 500 VDC                                                                                          |                                          |                                          |
|                        |                                 |                                 | 100 MΩ min. (between all EtherNet/IP ports and all input terminals) at 500 VDC                                                                                                      |                                          |                                          |
| Environment            | Ambient operating temperature * |                                 | -40 to 70°C (Derating is required according to the temperature. Refer to <i>Engineering Data</i> ) (with no condensation or icing)                                                  |                                          |                                          |
|                        | Storage temperature             |                                 | -40 to 85°C (with no condensation or icing)                                                                                                                                         |                                          |                                          |
|                        | Ambient operating humidity      |                                 | 95% max. (Storage humidity: 95% max.)                                                                                                                                               |                                          |                                          |
|                        | Vibration resistance            |                                 | 10 to 55 Hz, maximum 5 G, 0.42 mm half amplitude for 2 h each in X, Y, and Z directions                                                                                             |                                          |                                          |
|                        | Shock resistance                |                                 | 150 m/s <sup>2</sup> , 3 times each in ±X, ±Y, ±Z directions                                                                                                                        |                                          |                                          |
| Reliability            | MTBF *                          |                                 | 160,000 hrs typ.                                                                                                                                                                    |                                          |                                          |
|                        | Life expectancy *               |                                 | 10 years min.                                                                                                                                                                       |                                          |                                          |
| Construction           | Weight                          |                                 | 250 g max.                                                                                                                                                                          | 250 g max.                               | 250 g max.                               |
|                        | Cooling fan                     |                                 | No                                                                                                                                                                                  |                                          |                                          |
|                        | Degree of protection            |                                 | IP20 by EN/IEC 60529                                                                                                                                                                |                                          |                                          |

\* Refer to *Definitions of the Terms Under Ratings, Characteristics, and Functions* on page 6.

| Item                                                                           |                                 | Power rating                                                        | 90 W                                                                                                                                                                                                                                      |                  | 120 W                                 |                  |
|--------------------------------------------------------------------------------|---------------------------------|---------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|---------------------------------------|------------------|
|                                                                                |                                 | Rated output voltage                                                | 24 V                                                                                                                                                                                                                                      |                  | 24 V                                  |                  |
|                                                                                |                                 | Indication monitor                                                  | Included                                                                                                                                                                                                                                  | None             | Included                              | None             |
| Efficiency *                                                                   |                                 | 115 VAC input                                                       | 86% typ.                                                                                                                                                                                                                                  | 87% typ.         | 90% typ.                              | 90% typ.         |
|                                                                                |                                 | 230 VAC input                                                       | 87% typ.                                                                                                                                                                                                                                  | 88% typ.         | 92% typ.                              | 92% typ.         |
| Input conditions                                                               | Voltage range *                 |                                                                     | Single-phase, 85 to 264 VAC, 90 to 350 VDC, 265 to 300 VAC (1 second)                                                                                                                                                                     |                  |                                       |                  |
|                                                                                | Frequency *                     |                                                                     | 50/60 Hz (47 to 450 Hz)                                                                                                                                                                                                                   |                  | 50/60 Hz (47 to 63 Hz)                |                  |
|                                                                                | Input current *                 | 115 VAC input                                                       | 1.7 A typ.                                                                                                                                                                                                                                | 1.7 A typ.       | 1.2 A typ.                            | 1.2 A typ.       |
|                                                                                |                                 | 230 VAC input                                                       | 1.0 A typ.                                                                                                                                                                                                                                | 1.0 A typ.       | 0.63 A typ.                           | 0.63 A typ.      |
|                                                                                | Power factor                    |                                                                     | ---                                                                                                                                                                                                                                       |                  | 0.9 min.                              |                  |
|                                                                                | Leakage current *               | 115 VAC input                                                       | 0.5 mA max.                                                                                                                                                                                                                               |                  |                                       |                  |
|                                                                                |                                 | 230 VAC input                                                       | 1 mA max.                                                                                                                                                                                                                                 |                  |                                       |                  |
|                                                                                | Inrush current *                | 115 VAC input                                                       | 16 A typ.                                                                                                                                                                                                                                 |                  |                                       |                  |
| 230 VAC input                                                                  |                                 | 32 A typ.                                                           |                                                                                                                                                                                                                                           |                  |                                       |                  |
| Output characteristics                                                         | Rated output current            |                                                                     | 3.75 A                                                                                                                                                                                                                                    |                  | 5 A                                   |                  |
|                                                                                | Rated output power              |                                                                     | 90 W                                                                                                                                                                                                                                      |                  | 120 W                                 |                  |
|                                                                                | Maximum boost current           |                                                                     | ---                                                                                                                                                                                                                                       |                  | 6 A                                   |                  |
|                                                                                | Voltage adjustment range *      |                                                                     | 23.0 to 24.1 V                                                                                                                                                                                                                            |                  | 21.6 to 28 V (with V. ADJ)            |                  |
|                                                                                | Ripple noise voltage *          | 100 to 240 VAC input                                                | 300 mVp-p max. at 20 MHz of bandwidth                                                                                                                                                                                                     |                  | 150 mVp-p max. at 20 MHz of bandwidth |                  |
|                                                                                | Input variation influence *     |                                                                     | 0.5% max.                                                                                                                                                                                                                                 |                  |                                       |                  |
|                                                                                | Load variation influence *      |                                                                     | 1.5% max.                                                                                                                                                                                                                                 |                  |                                       |                  |
|                                                                                | Temperature variation influence | 100 to 240 VAC input                                                | 0.05%/°C max.                                                                                                                                                                                                                             |                  |                                       |                  |
|                                                                                |                                 |                                                                     |                                                                                                                                                                                                                                           |                  |                                       |                  |
|                                                                                | Start up time *                 | 115 VAC input                                                       | 1000 ms max.                                                                                                                                                                                                                              |                  | 1000 ms max.                          |                  |
|                                                                                |                                 | 230 VAC input                                                       | 1000 ms max.                                                                                                                                                                                                                              |                  | 1000 ms max.                          |                  |
|                                                                                | Hold time *                     | 115 VAC input                                                       | 25 ms typ.                                                                                                                                                                                                                                |                  | 35 ms typ.                            |                  |
| 230 VAC input                                                                  |                                 | 130 ms typ.                                                         |                                                                                                                                                                                                                                           | 35 ms typ.       |                                       |                  |
| Additional functions                                                           | Overload protection             |                                                                     | Yes, automatic reset, intermittent operation type, Refer to <i>Overload Protection</i> on page 8 for details.                                                                                                                             |                  |                                       |                  |
|                                                                                | Overvoltage protection          |                                                                     | Yes, 110% or higher of rated output voltage (90 W), 130% or higher of rated output voltage (120 W), power shut off (shut off the input voltage and turn on the input again, Refer to <i>Overvoltage Protection</i> on page 8 for details. |                  |                                       |                  |
|                                                                                | Series operation                |                                                                     | Yes (For up to two Power Supplies, external diodes are required.)                                                                                                                                                                         |                  |                                       |                  |
|                                                                                | Parallel operation              |                                                                     | Yes (For up to two Power Supplies), Refer to <i>Parallel Operation</i> on page 22 for details.                                                                                                                                            |                  |                                       |                  |
|                                                                                | Output indicator                |                                                                     | Yes (LED: Green)                                                                                                                                                                                                                          |                  |                                       |                  |
|                                                                                | Alarm indicator                 |                                                                     | Yes (LED: Red)                                                                                                                                                                                                                            |                  |                                       |                  |
|                                                                                | Indication monitor              | Measurement and display details                                     | Refer to <i>Communication and Indication Items</i> on page 7 for details.                                                                                                                                                                 |                  |                                       |                  |
|                                                                                |                                 | Main display                                                        | 7-segment LED (White)                                                                                                                                                                                                                     | None             | 7-segment LED (White)                 | None             |
|                                                                                | Ethernet communication          | Measurement and display details                                     | Refer to <i>Communication and Indication Items</i> on page 7 for details.                                                                                                                                                                 |                  |                                       |                  |
|                                                                                |                                 | Communication protocol                                              | EtherNet/IP, Modbus TCP                                                                                                                                                                                                                   |                  |                                       |                  |
| Physical layer                                                                 |                                 | 100BASE-TX                                                          |                                                                                                                                                                                                                                           |                  |                                       |                  |
| Communication specifications                                                   |                                 | Refer to <i>Communication Specifications</i> on page 8 for details. |                                                                                                                                                                                                                                           |                  |                                       |                  |
| Insulation                                                                     | Withstand voltage               |                                                                     | 3.0 kVAC for 1 min. (between all input terminals and output terminals, all EtherNet/IP ports), current cutoff 20 mA                                                                                                                       |                  |                                       |                  |
|                                                                                |                                 |                                                                     | 2.0 kVAC for 1 min. (between all input terminals and PE terminals), current cutoff 20 mA                                                                                                                                                  |                  |                                       |                  |
|                                                                                |                                 |                                                                     | 1.0 kVAC for 1 min. (between all output terminals and PE terminals), current cutoff 30 mA                                                                                                                                                 |                  |                                       |                  |
|                                                                                |                                 |                                                                     | 0.5 kVAC for 1 min. (between all output terminals and all EtherNet/IP ports), current cutoff 30 mA                                                                                                                                        |                  |                                       |                  |
|                                                                                | Insulation resistance           |                                                                     | 100 MΩ min. (between all output terminals and all input terminals/PE terminals) at 500 VDC                                                                                                                                                |                  |                                       |                  |
| 100 MΩ min. (between all EtherNet/IP ports and all input terminals) at 500 VDC |                                 |                                                                     |                                                                                                                                                                                                                                           |                  |                                       |                  |
| Environment                                                                    | Ambient operating temperature * |                                                                     | -40 to 70°C (Derating is required according to the temperature. Refer to <i>Engineering Data</i> ) (with no condensation or icing)                                                                                                        |                  |                                       |                  |
|                                                                                | Storage temperature             |                                                                     | -40 to 85°C (with no condensation or icing)                                                                                                                                                                                               |                  |                                       |                  |
|                                                                                | Ambient operating humidity      |                                                                     | 95% max. (Storage humidity: 95% max.)                                                                                                                                                                                                     |                  |                                       |                  |
|                                                                                | Vibration resistance            |                                                                     | 10 to 55 Hz, maximum 5 G, 0.42 mm half amplitude for 2 h each in X, Y, and Z directions                                                                                                                                                   |                  |                                       |                  |
|                                                                                | Shock resistance                |                                                                     | 150 m/s², 3 times each in ±X, ±Y, ±Z directions                                                                                                                                                                                           |                  |                                       |                  |
| Reliability                                                                    | MTBF *                          |                                                                     | 110,000 hrs typ.                                                                                                                                                                                                                          | 150,000 hrs typ. | 110,000 hrs typ.                      | 140,000 hrs typ. |
|                                                                                | Life expectancy *               |                                                                     | 10 years min.                                                                                                                                                                                                                             |                  |                                       |                  |
| Construction                                                                   | Weight                          |                                                                     | 350 g max.                                                                                                                                                                                                                                |                  | 400 g max.                            |                  |
|                                                                                | Cooling fan                     |                                                                     | No                                                                                                                                                                                                                                        |                  |                                       |                  |
|                                                                                | Degree of protection            |                                                                     | IP20 by EN/IEC 60529                                                                                                                                                                                                                      |                  |                                       |                  |

\* Refer to *Definitions of the Terms Under Ratings, Characteristics, and Functions* on page 6.