



Input voltage ranges up to 168 V DC  
1 or 2 isolated outputs 3.3...48 V DC  
3 kV AC I/O electric strength test voltage



- Extremely slim case (4TE wide), fully enclosed
- Extremely low inrush current, hot swappable
- Operating ambient temperature range -40...71°C with convection cooling

## Selection chart

| Output 1                      |                            |                            | Output 2                      |                            |                            | Type                          | Type                          | Options |
|-------------------------------|----------------------------|----------------------------|-------------------------------|----------------------------|----------------------------|-------------------------------|-------------------------------|---------|
| $U_{o \text{ nom}}$<br>[V DC] | $I_{o \text{ nom}}$<br>[A] | $I_{o \text{ max}}$<br>[A] | $U_{o \text{ nom}}$<br>[V DC] | $I_{o \text{ nom}}$<br>[A] | $I_{o \text{ max}}$<br>[A] | Input Voltage<br>16...36 V DC | Input Voltage<br>38...75 V DC |         |
| 5.1                           | 16                         | 16                         | -                             | -                          | -                          | 24Q1001-2R                    | 48Q1001-2R                    | P       |
| 12                            | 8                          | 8                          | -                             | -                          | -                          | 24Q2320-2R                    | 48Q2320-2R                    | P       |
| 15                            | 6.6                        | 6.6                        | -                             | -                          | -                          | 24Q2540-2R                    | 48Q2540-2R                    | P       |
| 24                            | 4                          | 4                          | -                             | -                          | -                          | 24Q2320-2R                    | 48Q2320-2R                    | P       |
| 24                            | 4.4                        | 4.4                        | -                             | -                          | -                          | 24Q2660-2R                    | 48Q2660-2R                    | P       |
| 30                            | 3.3                        | 3.3                        | -                             | -                          | -                          | 24Q2540-2R                    | 48Q2540-2R                    | P       |
| 48                            | 2.2                        | 2.2                        | -                             | -                          | -                          | 24Q2660-2R                    | 48Q2660-2R                    | P       |
| 5.1                           | 7.5                        | 7.5                        | 5.1                           | 7.5                        | 7.5                        | 24Q2001-2R                    | 48Q2001-2R                    | P       |
| 12                            | 4                          | 4                          | 12                            | 4                          | 4                          | 24Q2320-2R                    | 48Q2320-2R                    | P       |
| 15                            | 3.3                        | 3.3                        | 15                            | 3.3                        | 3.3                        | 24Q2540-2R                    | 48Q2540-2R                    | P       |
| 24                            | 2.2                        | 2.2                        | 24                            | 2.2                        | 2.2                        | 24Q2660-2R                    | 48Q2660-2R                    | P       |

| Output 1                      |                            |                            | Output 2                      |                            |                            | Type                            | Type                            | Type                          | Options |
|-------------------------------|----------------------------|----------------------------|-------------------------------|----------------------------|----------------------------|---------------------------------|---------------------------------|-------------------------------|---------|
| $U_{o \text{ nom}}$<br>[V DC] | $I_{o \text{ nom}}$<br>[A] | $I_{o \text{ max}}$<br>[A] | $U_{o \text{ nom}}$<br>[V DC] | $I_{o \text{ nom}}$<br>[A] | $I_{o \text{ max}}$<br>[A] | Input Voltage<br>14.4...36 V DC | Input Voltage<br>21.6...54 V DC | Input Voltage<br>35...75 V DC |         |
| 3.3                           | 18                         | 22                         | -                             | -                          | -                          | BQ 1101-7                       | GQ 1101-7                       | CQ 1101-7                     | -9      |
| 5.1                           | 16                         | 20                         | -                             | -                          | -                          | BQ 1001-7R                      | GQ 1001-7R                      | CQ 1001-7R                    | -9, P   |
| 12                            | 8                          | 10                         | -                             | -                          | -                          | BQ 2320-7R                      | GQ 2320-7R                      | CQ 2320-7R                    | -9, P   |
| 15                            | 6.6                        | 8                          | -                             | -                          | -                          | BQ 2540-7R                      | GQ 2540-7R                      | CQ 2540-7R                    | -9, P   |
| 24                            | 4.4                        | 5.5                        | -                             | -                          | -                          | BQ 2660-7R                      | GQ 2660-7R                      | CQ 2660-7R                    | -9, P   |
| 24                            | 4                          | 5                          | -                             | -                          | -                          | BQ 2320-7R                      | GQ 2320-7R                      | CQ 2320-7R                    | -9, P   |
| 30                            | 3.3                        | 4                          | -                             | -                          | -                          | BQ 2540-7R                      | GQ 2540-7R                      | CQ 2540-7R                    | -9, P   |
| 48                            | 2.2                        | 2.75                       | -                             | -                          | -                          | BQ 2660-7R                      | GQ 2660-7R                      | CQ 2660-7R                    | -9, P   |
| 5.1                           | 7.5                        | 9.5                        | 5.1                           | 7.5                        | 9.5                        | BQ 2001-7R                      | GQ 2001-7R                      | CQ 2001-7R                    | -9, P   |
| 12                            | 4                          | 5                          | 12                            | 4                          | 5                          | BQ 2320-7R                      | GQ 2320-7R                      | CQ 2320-7R                    | -9, P   |
| 15                            | 3.3                        | 4                          | 15                            | 3.3                        | 4                          | BQ 2540-7R                      | GQ 2540-7R                      | CQ 2540-7R                    | -9, P   |
| 24                            | 2.2                        | 2.75                       | 24                            | 2.2                        | 2.75                       | BQ 2660-7R                      | GQ 2660-7R                      | CQ 2660-7R                    | -9, P   |

| Output 1               |                     |                     | Output 2               |                     |                     | Type                           | Type                           | Options |
|------------------------|---------------------|---------------------|------------------------|---------------------|---------------------|--------------------------------|--------------------------------|---------|
| $U_{o\ nom}$<br>[V DC] | $I_{o\ nom}$<br>[A] | $I_{o\ max}$<br>[A] | $U_{o\ nom}$<br>[V DC] | $I_{o\ nom}$<br>[A] | $I_{o\ max}$<br>[A] | Input Voltage<br>43...108 V DC | Input Voltage<br>65...168 V DC |         |
| 3.3                    | 18                  | 22                  | -                      | -                   | -                   | DQ 1101-7                      | EQ 1101-7                      | -9      |
| 5.1                    | 16                  | 20                  | -                      | -                   | -                   | DQ 1001-7R                     | EQ 1001-7R                     | -9, P   |
| 12                     | 8                   | 10                  | -                      | -                   | -                   | DQ 2320-7R                     | EQ 2320-7R                     | -9, P   |
| 15                     | 6.6                 | 8                   | -                      | -                   | -                   | DQ 2540-7R                     | EQ 2540-7R                     | -9, P   |
| 24                     | 4                   | 5.5                 | -                      | -                   | -                   | DQ 2660-7R                     | EQ 2660-7R                     | -9, P   |
| 24                     | 4                   | 5                   | -                      | -                   | -                   | DQ 2320-7R                     | EQ 2320-7R                     | -9, P   |
| 30                     | 3.3                 | 4                   | -                      | -                   | -                   | DQ 2540-7R                     | EQ 2540-7R                     | -9, P   |
| 48                     | 2.2                 | 2.75                | -                      | -                   | -                   | DQ 2660-7R                     | EQ 2660-7R                     | -9, P   |
| 5.1                    | 7.5                 | 9.5                 | 5.1                    | 7.5                 | 9.5                 | DQ 2001-7R                     | EQ 2001-7R                     | -9, P   |
| 12                     | 4.4                 | 5                   | 12                     | 4.4                 | 5                   | DQ 2320-7R                     | EQ 2320-7R                     | -9, P   |
| 15                     | 3.3                 | 4                   | 15                     | 3.3                 | 4                   | DQ 2540-7R                     | EQ 2540-7R                     | -9, P   |
| 24                     | 2.2                 | 2.75                | 24                     | 2.2                 | 2.75                | DQ 2660-7R                     | EQ 2660-7R                     | -9, P   |

## Input

|                |                            |
|----------------|----------------------------|
| Input voltage  | refer to selection chart   |
| Inrush current | ETS 300 132-2<br>typ. 40 A |

## Output

|                                         |                                                                     |                                             |
|-----------------------------------------|---------------------------------------------------------------------|---------------------------------------------|
| Efficiency                              | $U_{i\ nom}, I_{o\ nom}$                                            | up to 88%                                   |
| Output voltage setting accuracy         | $U_{i\ nom}, I_{o\ nom}$                                            | $\pm 0.6\% U_{o\ nom}$                      |
| Worst case output voltage 1             | $U_{i\ min}...U_{i\ max}, 0...I_{o1\ max}, T_{C\ min}...T_{C\ max}$ | $\pm 1.8\% U_{o\ nom}$                      |
| Minimum output current 1, 2             | in parallel configuration not required                              | 0 A                                         |
| Minimum output current 1, 2             | in individual or series configuration                               | 10% $I_{o1,2\ nom}$                         |
| Load regulation output 2                | $I_{o1,2\ min}...I_{o1,2\ max}$                                     | typ. $100\ m\Omega \cdot (I_{o1} - I_{o2})$ |
| Output voltage switching noise          | IEC/EN 61204, total, peak-peak                                      | typ. $0.3\% U_{o\ nom}$                     |
| Common current limit. $I_{o1} + I_{o2}$ | rectangular U/I characteristic                                      | typ. 130% $(I_{o1\ max} + I_{o2\ max})$     |
| Operation of units in parallel          | by connecting the current sharing pins T                            |                                             |

## Protection

|                            |                                           |                        |
|----------------------------|-------------------------------------------|------------------------|
| Input reverse polarity     | built-in fuse                             |                        |
| Input undervoltage lockout |                                           | typ. 90% $U_{i\ min}$  |
| Input overvoltage lockout  |                                           | typ. 110% $U_{i\ max}$ |
| Input transient protection | varistor                                  |                        |
| Output                     | no-load, overload and short-circuit proof |                        |
| Output overvoltage         | second control loop                       | typ. 125% $U_{o\ nom}$ |
| Overtemperature            | switch-off with auto restart (-7 units)   | $T_C$ typ. 100°C       |

## Control

|                             |                                                    |                           |
|-----------------------------|----------------------------------------------------|---------------------------|
| Output voltage adjustment   | with feature R                                     | 60/80...110% $U_{o\ nom}$ |
| Inhibit on input side       | TTL input, output(s) disabled if left open circuit |                           |
| Status indication           | LEDs: In OK (-7 units), Out OK (all)               |                           |
| Output good signal (Out OK) | isolated open collector signal                     |                           |

**Safety**

|                                |                                      |           |
|--------------------------------|--------------------------------------|-----------|
| Approvals                      | EN 60950, UL 1950, CSA C22.2 No. 950 |           |
| Class of equipment             |                                      | class I   |
| Protection degree              |                                      | IP 20/30  |
| Electric strength test voltage | I/case, O/case, Out OK/case          | 1.5 kV AC |
|                                | I/O, Out OK/I, Out OK/O              | 3 kV AC   |
|                                | O/O                                  | 300 V DC  |

**EMC**

|                                |                                                    |             |
|--------------------------------|----------------------------------------------------|-------------|
| Electrostatic discharge        | IEC/EN 61000-4-2, level 4 (8/15 kV)                | criterion B |
| Electromagnetic field          | IEC/EN 61000-4-3, level 3 (10 V/m)                 | criterion A |
| Electr. fast transients/bursts | IEC/EN 61000-4-4, output/input, level 3/4 (2/4 kV) | criterion B |
| Surge                          | IEC/EN 61000-4-5, input, level 2/3 (1/2 kV)        | criterion B |
| Conducted disturbances         | IEC/EN 61000-4-6, level 2/3 (3/10 V)               | criterion A |
| Electromagnetic emissions      | CISPR 22/EN 55022, 24/48/BQ/CQ/GQ, conducted       | class B     |

**Environmental –2 units**

|                                  |                                                          |                 |
|----------------------------------|----------------------------------------------------------|-----------------|
| Operating ambient temperature    | $U_{i\text{ nom}}, I_{o\text{ nom}}$ , convection cooled | -10...50°C      |
| Operating case temperature $T_C$ | $U_{i\text{ nom}}, I_{o\text{ nom}}$                     | -10...80°C      |
| Storage temperature              | non operational                                          | -25...100°C     |
| Damp heat                        | IEC/EN 60068-2-3, 93%, 40°C                              | 21 days         |
| Vibration, sinusoidal            | IEC/EN 60068-2-6, 10...60/60...2000 Hz                   | 0.15 mm/2 $g_n$ |
| Shock                            | IEC/EN 60068-2-27, 6 ms                                  | 15 $g_n$        |
| Bump                             | IEC/EN 60068-2-29, 6 ms                                  | 10 $g_n$        |
| MTBF                             | MIL-HDBK-217F, $G_B$ , 40°C, 24/48Q1000                  | 588'000 h       |

**Environmental –7 units**

|                                  |                                                          |                 |
|----------------------------------|----------------------------------------------------------|-----------------|
| Operating ambient temperature    | $U_{i\text{ nom}}, I_{o\text{ nom}}$ , convection cooled | -25...71°C      |
|                                  | $U_{i\text{ nom}}, I_{o\text{ max}}$ , convection cooled | -25...50°C      |
| Operating case temperature $T_C$ | $U_{i\text{ nom}}, I_{o\text{ nom}}$                     | -25...95°C      |
|                                  | $U_{i\text{ nom}}, I_{o\text{ max}}$                     | -25...85°C      |
| Storage temperature              | non operational                                          | -40...100°C     |
| Damp heat                        | IEC/EN 60068-2-3, 93%, 40°C                              | 56 days         |
| Vibration, sinusoidal            | IEC/EN 60068-2-6, 10...60/60...2000 Hz                   | 0.35 mm/5 $g_n$ |
| Shock                            | IEC/EN 60068-2-27, 11 ms                                 | 50 $g_n$        |
| Bump                             | IEC/EN 60068-2-29, 11 ms                                 | 25 $g_n$        |
| Random vibration                 | IEC/EN 60068-2-64, 20...500 Hz                           | 4.9 $g_n$ rms   |
| MTBF                             | MIL-HDBK-217F, notice 2, $G_B$ , 40°C, BQ 2000           | 853'000 h       |

**Options**

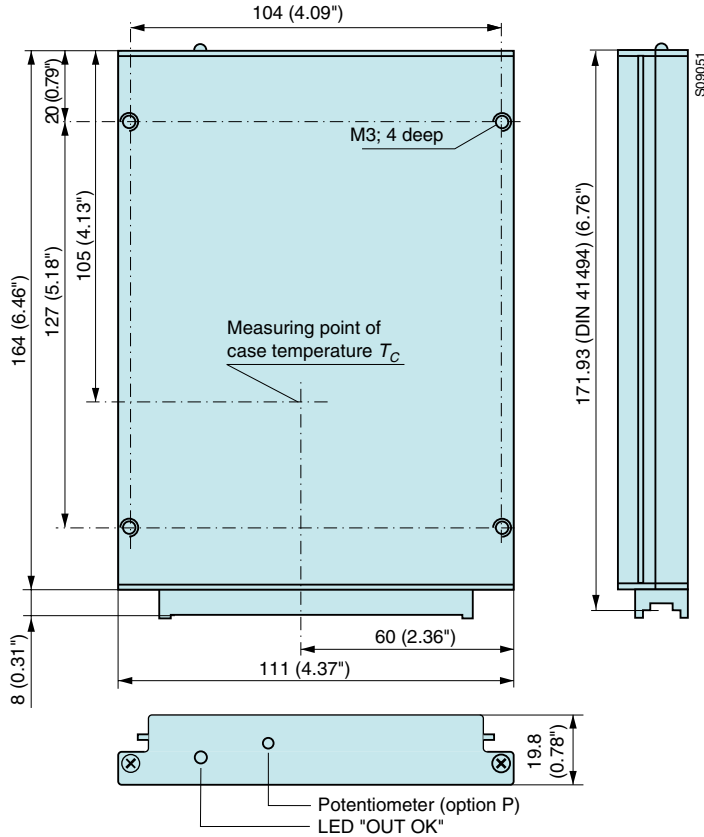
|                            |                                                             |    |
|----------------------------|-------------------------------------------------------------|----|
| Extended temperature range | -40...71°C, ambient, operating, for -7 units                | -9 |
| Output voltage adjustment  | ±10% $U_{o\text{ nom}}$ , excludes feature R and vice versa | P  |

**Accessories**

|                                                                                 |
|---------------------------------------------------------------------------------|
| Front panels for 19" rack mounting in 3U or 6U configuration (Schroff/Intermas) |
| Mating H15 connectors with screw, solder, fast-on or press-fit terminals        |
| Connector retention facilities and code key system for connector coding         |
| Additional external input or output filters                                     |
| Mechanical mounting supports for chassis, DIN-rail and PCB mounting             |

## Mechanical data

Tolerances  $\pm 0.3$  mm (0.012") unless otherwise indicated.



## Pin allocation

| Pin | Electrical determination       | Q 1000  | Q 2000  |
|-----|--------------------------------|---------|---------|
| 4   | Output voltage (positive)      | Vo1+    | Vo1+    |
| 6   | Output voltage (positive)      | Vo1+    | Vo2+    |
| 8   | Output voltage (negative)      | Vo1-    | Vo1-    |
| 10  | Output voltage (negative)      | Vo1-    | Vo2-    |
| 12  | Sense line (positive)          | S+      | S+      |
| 14  | Sense line (negative)          | S-      | S-      |
| 16  | Output voltage control input   | R       | R       |
| 18  | Current sharing control input  | T       | T       |
| 20  | Do not connect (internal Gnd.) | -       | -       |
| 22  | Output good signal (positive)  | Out OK+ | Out OK+ |
| 24  | Output good signal (negative)  | Out OK- | Out OK- |
| 26  | Protective earth               | ⊕       | ⊕       |
| 28  | Inhibit control input          | i       | i       |
| 30  | Input voltage (positive)       | Vi+     | Vi+     |
| 32  | Input voltage (negative)       | Vi-     | Vi-     |