

# ATV71QC25Y

variable speed drive ATV71Q - 250kW / 250HP  
- 500...690V - IP20



## Main

|                              |                                                                                                                                                                                      |
|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Range of product             | Altivar 71Q                                                                                                                                                                          |
| Product or component type    | Variable speed drive                                                                                                                                                                 |
| Device short name            | ATV71Q                                                                                                                                                                               |
| Product destination          | Asynchronous motors<br>Synchronous motors                                                                                                                                            |
| Product specific application | Complex, high-power machines                                                                                                                                                         |
| Assembly style               | With heat sink                                                                                                                                                                       |
| Variant                      | Reinforced version                                                                                                                                                                   |
| EMC filter                   | Integrated                                                                                                                                                                           |
| Network number of phases     | 3 phases                                                                                                                                                                             |
| [Us] rated supply voltage    | 500...690 V (- 15...10 %)                                                                                                                                                            |
| Supply voltage limits        | 425...759 V                                                                                                                                                                          |
| Supply frequency             | 50...60 Hz (- 5...5 %)                                                                                                                                                               |
| Network frequency limits     | 47.5...63 Hz                                                                                                                                                                         |
| Motor power kW               | 250 kW 3 phases for 690 V<br>200 kW 3 phases for 500 V                                                                                                                               |
| Motor power hp               | 250 hp 3 phases for 575 V                                                                                                                                                            |
| Motor cable length           | <= 400 m unshielded cable with motor choke<br><= 250 m shielded cable with motor choke<br><= 30 m unshielded cable without motor choke<br><= 15 m shielded cable without motor choke |
| Line current                 | 256 A for 690 V 3 phases / 250 kW<br>249 A for 600 V 3 phases / 300 hp<br>277 A for 500 V 3 phases / 200 kW                                                                          |

## Complementary

|                                  |                                                                                                                                                                                                                                                |
|----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Prospective line I <sub>sc</sub> | <= 35 kA for 3 phases                                                                                                                                                                                                                          |
| Continuous output current        | 290 A at 2.5 kHz, 690 V - 3 phases<br>290 A at 2.5 kHz, 575 V - 3 phases<br>312 A at 2.5 kHz, 500 V - 3 phases                                                                                                                                 |
| Maximum transient current        | 514.8 A for 2 s - 3 phases<br>468 A for 60 s - 3 phases                                                                                                                                                                                        |
| Speed drive output frequency     | 0.1...500 Hz                                                                                                                                                                                                                                   |
| Nominal switching frequency      | 2.5 kHz                                                                                                                                                                                                                                        |
| Switching frequency              | 2.5...4.9 kHz with derating factor<br>2...4.9 kHz adjustable                                                                                                                                                                                   |
| Speed range                      | 1...1000 asynchronous motor in closed-loop mode with encoder feedback<br>1...50 synchronous motor in open-loop mode, without speed feedback<br>1...100 asynchronous motor in open-loop mode, without speed feedback                            |
| Speed accuracy                   | +/- 10 % of nominal slip for 0.2 T <sub>n</sub> to T <sub>n</sub> torque variation, without speed feedback<br>+/- 0.01 % of nominal speed for 0.2 T <sub>n</sub> to T <sub>n</sub> torque variation, in closed-loop mode with encoder feedback |
| Torque accuracy                  | +/- 15 % in open-loop mode, without speed feedback<br>+/- 5 % in closed-loop mode with encoder feedback                                                                                                                                        |
| Transient overtorque             | 220 % of nominal motor torque, +/- 10 % for 2 s<br>170 % of nominal motor torque, +/- 10 % for 60 s                                                                                                                                            |
| Braking torque                   | < 150 % with braking or hoist resistor<br>30 % without braking resistor                                                                                                                                                                        |

|                                    |                                                                                                                                                                                                                                                                                                                                                     |
|------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Asynchronous motor control profile | Voltage/Frequency ratio, 2 points<br>Voltage/Frequency ratio, 5 points<br>Flux vector control without sensor, standard<br>Voltage/Frequency ratio - Energy Saving, quadratic U/f<br>Flux vector control without sensor, ENA (energy Adaptation) system<br>Flux vector control without sensor, 2 points<br>Flux vector control with sensor, standard |
| Synchronous motor control profile  | Vector control without sensor, standard<br>Vector control with sensor, standard                                                                                                                                                                                                                                                                     |
| Regulation loop                    | Adjustable PI regulator                                                                                                                                                                                                                                                                                                                             |
| Motor slip compensation            | Adjustable<br>Automatic whatever the load<br>Not available in voltage/frequency ratio (2 or 5 points)<br>Suppressable                                                                                                                                                                                                                               |
| Local signalling                   | 1 LED - red - drive voltage                                                                                                                                                                                                                                                                                                                         |
| Output voltage                     | $\leq$ power supply voltage                                                                                                                                                                                                                                                                                                                         |
| Isolation                          | Electrical between power and control                                                                                                                                                                                                                                                                                                                |
| Type of cable                      | UL 508 cable with a NEMA Type1 kit : 3 wire(s) - 40 °C, copper 75 °C / PVC<br>IEC cable with an IP21 or an IP31 kit : 3 wire(s) - 40 °C, copper 70 °C / PVC<br>IEC cable without mounting kit : 1 wire(s) - 45 °C, copper 70 °C / PVC<br>IEC cable without mounting kit : 1 wire(s) - 45 °C, copper 90 °C / XLPE/EPR                                |
| Electrical connection              | Terminal 4 x 185 mm <sup>2</sup> (PC/-, PA/+)<br>Terminal 4 x 185 mm <sup>2</sup> (L1/R, L2/S, L3/T, U/T1, V/T2, W/T3)<br>Terminal 2.5 mm <sup>2</sup> / AWG 14 (AI1-/AI1+, AI2, AO1, R1A, R1B, R1C, R2A, R2B, LI1...LI6, PWR)                                                                                                                      |
| Tightening torque                  | 0.6 N.m (AI1-/AI1+, AI2, AO1, R1A, R1B, R1C, R2A, R2B, LI1...LI6, PWR)<br>41 N.m, 360 lb.in (PC/-, PA/+)<br>41 N.m, 360 lb.in (L1/R, L2/S, L3/T, U/T1, V/T2, W/T3)                                                                                                                                                                                  |
| Supply                             | Internal supply : 24 V DC (21...27 V) - $\leq$ 200 mA with overload and short-circuit protection<br>Internal supply for reference potentiometer (1 to 10 kOhm) : 10.5 V DC, +/- 5 % - $\leq$ 10 mA with overload and short-circuit protection                                                                                                       |
| Analogue input number              | 2                                                                                                                                                                                                                                                                                                                                                   |
| Analogue input type                | Software-configurable current : (AI2) 0...20 mA - 242 Ohm - resolution: 11 bits<br>Bipolar differential voltage : (AI1-/AI1+) +/- 10 V DC - 24 V max - resolution: 11 bits + sign<br>Software-configurable voltage : (AI2) 0...10 V DC - 24 V max - 30000 Ohm - resolution: 11 bits                                                                 |
| Sampling duration                  | 2 ms +/- 0.5 ms (AI2) for analog output<br>2 ms +/- 0.5 ms (AI1-/AI1+) for analog output<br>2 ms +/- 0.5 ms (LI1...LI5) for discrete input<br>2 ms +/- 0.5 ms (LI6) if configured as logic input for discrete input                                                                                                                                 |
| Accuracy                           | +/- 1 % (AO1) for a temperature variation 60 °C<br>+/- 0.6 % (AI2) for a temperature variation 60 °C<br>+/- 0.6 % (AI1-/AI1+) for a temperature variation 60 °C                                                                                                                                                                                     |
| Linearity error                    | +/- 0.2 % (AO1)<br>+/- 0.15 % of maximum value (AI1-/AI1+, AI2)                                                                                                                                                                                                                                                                                     |
| Analogue output number             | 1                                                                                                                                                                                                                                                                                                                                                   |
| Analogue output type               | Software-configurable logic output : (AO1) 10 V - $\leq$ 20 mA<br>Software-configurable current : (AO1) 0...20 mA - 500 Ohm - resolution: 10 bits<br>Software-configurable voltage : (AO1) 0...10 V DC - 470 Ohm - resolution: 10 bits                                                                                                              |
| Discrete output number             | 2                                                                                                                                                                                                                                                                                                                                                   |
| Discrete output type               | Configurable relay logic : (R2A, R2B) NO - 100000 cycles<br>Configurable relay logic : (R1A, R1B, R1C) NO/NC - 100000 cycles                                                                                                                                                                                                                        |
| Response time                      | $\leq$ 100 ms in STO (Safe Torque Off)<br>2 ms +/- 0.5 ms (AO1)<br>7 ms +/- 0.5 ms (R2A, R2B)<br>7 ms +/- 0.5 ms (R1A, R1B, R1C)                                                                                                                                                                                                                    |
| Minimum switching current          | 3 mA at 24 V DC (configurable relay logic)                                                                                                                                                                                                                                                                                                          |
| Maximum switching current          | 2 A at 30 V DC on inductive load - cos phi = 0.4 - L/R = 7 ms (R1, R2)<br>2 A at 250 V AC on inductive load - cos phi = 0.4 - L/R = 7 ms (R1, R2)<br>5 A at 30 V DC on resistive load - cos phi = 1 - L/R = 0 ms (R1, R2)<br>5 A at 250 V AC on resistive load - cos phi = 1 - L/R = 0 ms (R1, R2)                                                  |
| Discrete input number              | 7                                                                                                                                                                                                                                                                                                                                                   |
| Discrete input type                | Safety input (PWR) 24 V DC - 1500 Ohm conforming to ISO 13849-1 level d<br>Switch-configurable PTC probe (LI6) - 0...6 probes - 1500 Ohm<br>Switch-configurable (LI6) 24 V DC, with level 1 PLC - 3500 Ohm<br>Programmable (LI1...LI5) 24 V DC, with level 1 PLC - 3500 Ohm                                                                         |

|                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Discrete input logic                | Positive logic (source) (PWR) , < 2 V (state 0), > 17 V (state 1)<br>Negative logic (sink) (LI1...LI5) , > 16 V (state 0), < 10 V (state 1)<br>Positive logic (source) (LI1...LI5) , < 5 V (state 0), > 11 V (state 1)<br>Negative logic (sink) (LI6) if configured as logic input, > 16 V (state 0), < 10 V (state 1)<br>Positive logic (source) (LI6) if configured as logic input, < 5 V (state 0), > 11 V (state 1)                                                                                                                           |
| Acceleration and deceleration ramps | Automatic adaptation of ramp if braking capacity exceeded, by using resistor<br>Linear adjustable separately from 0.01 to 9000 s<br>S, U or customized                                                                                                                                                                                                                                                                                                                                                                                            |
| Braking to standstill               | By DC injection                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Protection type                     | Power removal for motor<br>Motor phase break for motor<br>Thermal protection for motor<br>Against input phase loss for drive<br>Line supply overvoltage for drive<br>Line supply undervoltage for drive<br>Against exceeding limit speed for drive<br>Break on the control circuit for drive<br>Overvoltages on the DC bus for drive<br>Overcurrent between output phases and earth for drive<br>Input phase breaks for drive<br>Short-circuit between motor phases for drive<br>Thermal protection for drive<br>Overheating protection for drive |
| Dielectric strength                 | 5345 V DC between control and power terminals<br>3110 V DC between earth and power terminals                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Insulation resistance               | > 1 mOhm at 500 V DC for 1 minute to earth                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Frequency resolution                | 0.024/50 Hz for analog input<br>0.1 Hz for display unit                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Communication port protocol         | CANopen<br>Modbus                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Type of connector                   | 1 RJ45 for CANopen<br>1 RJ45 for Modbus on terminal<br>1 RJ45 for Modbus on front face                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Physical interface                  | 2-wire RS 485 for Modbus                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Transmission frame                  | RTU for Modbus                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Transmission rate                   | 20 kbps, 50 kbps, 125 kbps, 250 kbps, 500 kbps, 1 Mbps for CANopen<br>4800 bps, 9600 bps, 19200 bps, 38.4 Kbps for Modbus on terminal<br>9600 bps, 19200 bps for Modbus on front face                                                                                                                                                                                                                                                                                                                                                             |
| Data format                         | 8 bits, odd even or no configurable parity for Modbus on terminal<br>8 bits, 1 stop, even parity for Modbus on front face                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Type of polarization                | No impedance for Modbus                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Number of addresses                 | 1...127 addresses for CANopen<br>1...247 addresses for Modbus                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Method of access                    | Slave for CANopen                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Type of cooling                     | Water cooled                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Cooling fluid type                  | Water-glycol mixture<br>Clean water<br>Industrial water                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Operating temperature water         | 5...55 °C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Thermal losses                      | 4000 W 100 % of line current for area of liquid cooling (power part)<br>800 W 100 % of line current for area of air cooling (control part)                                                                                                                                                                                                                                                                                                                                                                                                        |
| Flow velocity                       | 24                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Pressure drop                       | <= 1 bar                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Volume of cooling water             | 0.4 l                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Operating position                  | Vertical +/- 10 degree                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Product weight                      | 140 kg                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

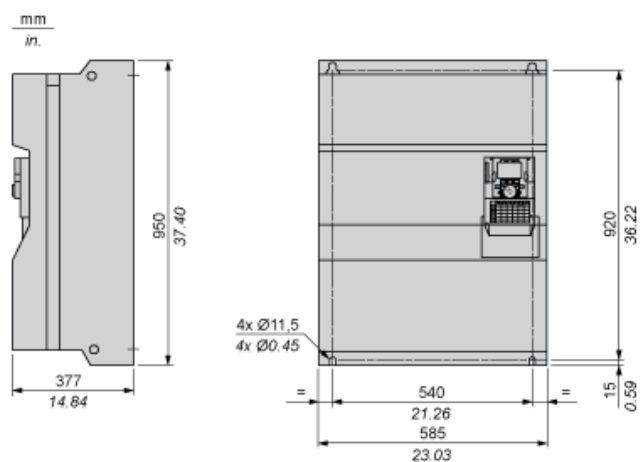
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| Option card | Overhead crane card<br>Controller inside programmable card<br>I/O extension card<br>Interface card for encoder<br>Communication card for CC-Link<br>Communication card for Interbus-S<br>Communication card for Profibus DP V1<br>Communication card for Profibus DP<br>Communication card for DeviceNet<br>Communication card for Ethernet/IP<br>Communication card for Modbus Plus<br>Communication card for Modbus/Uni-Telway<br>Communication card for Fipio<br>Communication card for Modbus TCP |
| Width       | 585 mm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Height      | 950 mm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Depth       | 377 mm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

## Environment

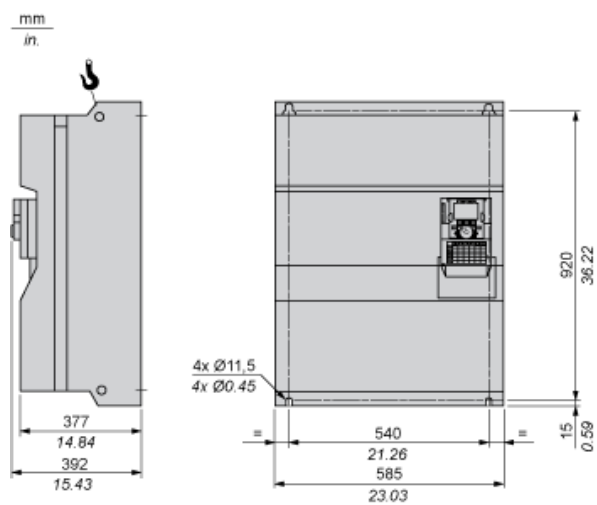
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| Ambient air temperature for operation | -10...50 °C without derating                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Ambient air temperature for storage   | -25...70 °C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Operating altitude                    | 1000...2260 m with current derating 1 % per 100 m<br><= 1000 m without derating                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Electromagnetic compatibility         | Voltage dips and interruptions immunity test conforming to IEC 61000-4-11<br>Conducted radio-frequency immunity test level 3 conforming to IEC 61000-4-6<br>1.2/50 µs - 8/20 µs surge immunity test level 3 conforming to IEC 61000-4-5<br>Electrical fast transient/burst immunity test level 4 conforming to IEC 61000-4-4<br>Radiated radio-frequency electromagnetic field immunity test level 3 conforming to IEC 61000-4-3<br>Electrostatic discharge immunity test level 3 conforming to IEC 61000-4-2 |
| Pollution degree                      | 3 conforming to UL 840<br>2 conforming to EN/IEC 61800-5-1                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| IP degree of protection               | IP54 on lower part conforming to EN/IEC 60529<br>IP54 on lower part conforming to EN/IEC 61800-5-1<br>IP30 on side parts conforming to EN/IEC 60529<br>IP30 on side parts conforming to EN/IEC 61800-5-1<br>IP30 on the front panel conforming to EN/IEC 60529<br>IP30 on the front panel conforming to EN/IEC 61800-5-1<br>IP41 on upper part conforming to EN/IEC 60529<br>IP41 on upper part conforming to EN/IEC 61800-5-1<br>IP00 conforming to EN/IEC 60529<br>IP00 conforming to EN/IEC 61800-5-1      |
| Vibration resistance                  | 0.6 gn (f = 10...200 Hz) conforming to EN/IEC 60068-2-6<br>1.5 mm peak to peak (f = 3...10 Hz) conforming to EN/IEC 60068-2-6                                                                                                                                                                                                                                                                                                                                                                                 |
| Shock resistance                      | 4 gn for 11 ms conforming to EN/IEC 60068-2-27                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Relative humidity                     | 5...95 % without dripping water conforming to IEC 60068-2-3<br>5...95 % without condensation conforming to IEC 60068-2-3                                                                                                                                                                                                                                                                                                                                                                                      |
| Noise level                           | 77 dB conforming to 86/188/EEC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Standards                             | EN 55011 class A group 2<br>EN 61800-3 environments 1 category C3<br>EN 61800-3 environments 2 category C3<br>EN/IEC 61800-3<br>EN/IEC 61800-5-1<br>IEC 60721-3-3 class 3C2<br>ISO 13849-1 level d<br>UL Type 1<br>IEC 61508 SIL2                                                                                                                                                                                                                                                                             |
| Product certifications                | CSA<br>C-Tick<br>GOST<br>NOM 117<br>UL                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Marking                               | CE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

## Dimensions

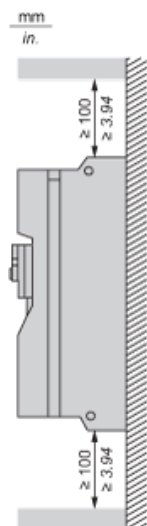
### Without or with 1 option card



### With 2 option cards

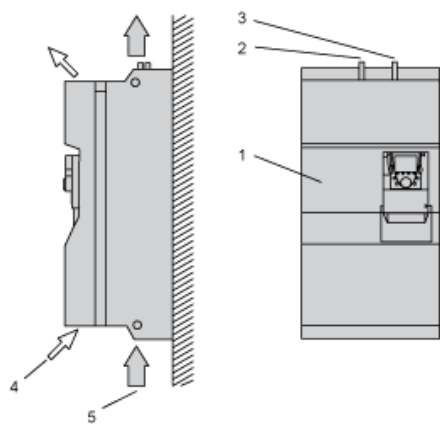


## Clearance



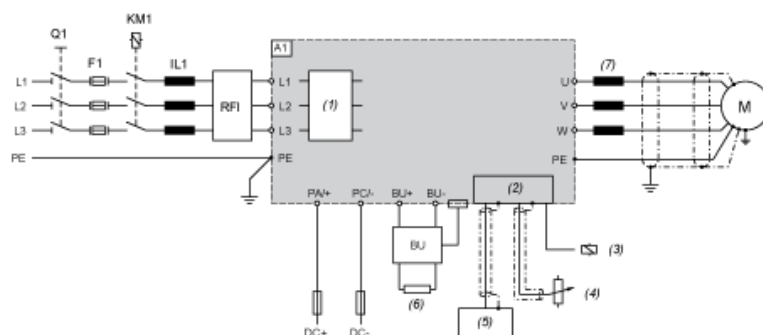
## Wall-Mounting

The drive is designed for installation on the wall, in an electrical room or into an enclosure. The device is built according to pollution degree 2. If the environment does not correspond to these conditions then the necessary transition of the pollution degree must be provided e.g. by means of an enclosure.



- (1) Drive
- (2) Cooling water inlet
- (3) Cooling water return
- (4) Cooling air for control part
- (5) Cooling air for power part (only capacitors)

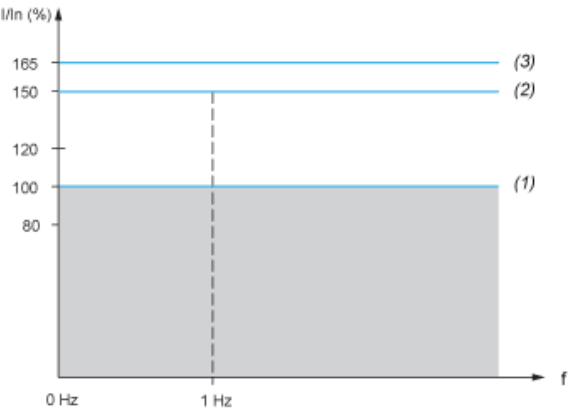
## Wiring Diagram



- A1 Drive
- BU Braking Unit
- F1 Fast-acting semi-conductor fuse
- IL1 Line choke
- KM1 Optional line contactor
- M Motor
- Q1 Switch
- RFI Optional radio frequency interference filter
- (1) Filter
- (2) Control
- (3) Relay control
- (4) Control potentiometer
- (5) PLC
- (6) External optional braking resistor
- (7) Optional motor choke

Continuous Current at Output Frequencies < 1 Hz

Due to the especially efficient liquid cooling of the drive the full overload capability is also available in the speed range of 0 Hz.



- (1) Continuous operation: 150% (165%) overload capability
- (2) Overload 150% for 60 s
- (3) Overload 165% for 2 s

Power Derating

|                       |                      |
|-----------------------|----------------------|
| 4 kHz pulse frequency | +5°K air temperature |
| 18%                   | 5%                   |