



Smart
connections.

Data sheet

INVEOR M

INVEOR – "Smart connections." on five levels

1 The INVEOR

- IP65 protection class
- Integrated soft PLC
- Pre-fitted cable glands
- Fan-free design up to 7.5 kW
- Robust and vibration-resistant housing concept
- STO functional safety

3 Operation and observation

- Potentiometer
- M12 RS485 service interface
- Integrated foil keypad
- MMI handheld controller
- MMI cover option
- Touch operating terminal
- PC software: KOSTAL INVERTERpc
www.kostal-industrie-elektrik.com/KOSTAL_INVERTERpc

2 Communication



4 Motor adaptations

- Robust and vibration-resistant adapter concept
- Motor adapter concept compatible with all commercially available motors

5 Control process

- IE1, IE2, IE3, IE4: for asynchronous motors and synchronous motors

Overview of INVEOR M sizes



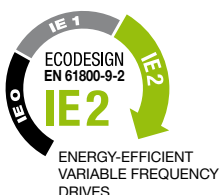
a

A

B

C

D



230 V devices, technical data for INVEOR M

| Size | α | | | | A | | | | |
|---|--|------|----------------|------|------------------------------------|------|------|-----|---|
| Recommended motor rating ¹⁾ [kW] | 0.25 | 0.37 | 0.55 | 0.75 | 0.37 | 0.55 | 0.75 | 1.1 | 1.5 |
| Supply voltage | 1 x 100 V AC -15 %...230 V AC +10 % 140 V DC -15 %...320 V DC +10 % ⁴⁾ | | | | | | | | |
| Grid frequency | 50/60 Hz ± 6% | | | | | | | | |
| Network configurations | TN / TT / IT (option) | | | | TN / TT | | | | |
| Line current [A] | 4.5 | 4.5 | 5.8 | 7.3 | 4.5 | 5.6 | 6.9 | 9.2 | 13.2 |
| Rated current output eff. [IN at 8 kHz] | 1.4 | 2.2 | 2.7 | 3.3 | 2.3 | 3.2 | 3.9 | 5.2 | 7 |
| Min. brake resistance [Ω] | - | | | | 50 | | | | |
| Overload for 60 sec. | 150 % | | | | | | | | 125 % |
| Switching frequency | 4 kHz, 8 kHz, 16 kHz, (factory setting 8 kHz) | | | | | | | | |
| Output frequency | 0 Hz – 400 Hz | | | | | | | | |
| Mains cycles of operation / restart | Every 2 min. | | | | | | | | |
| DIN EN 61800-5 touch current | < 10 mA ²⁾ | | | | | | | | |
| Protective function | Overvoltage and undervoltage, I ² t restriction, short-circuit, ground leak, motor and variable frequency drive temperature, stall prevention, blocking detection, PID dry run protection | | | | | | | | |
| Software functions | Process control (PID controller), fixed frequencies, data record changeover, flying restart, motor current limit | | | | | | | | |
| Soft PLC | IEC61131-3, FBD, ST, AWL | | | | | | | | |
| Housing | Plastic adapter plate / aluminium die-cast casing | | | | Two-part aluminium die-cast casing | | | | |
| Dimensions [L x W x H] mm | 187 x 126 x 70 | | 187 x 126 x 80 | | 233 x 153 x 120 | | | | |
| Weight including adapter plate | 1.5 kg | | | | 3.9 kg | | | | |
| Protection class [IPxy] | IP 65 | | | | | | | | |
| Cooling | Passive cooling | | | | | | | | Active "internal" cooling |
| Ambient temperature | -10 °C (non-condensing) to +40 °C (50 °C with derating) | | | | | | | | up to 35 °C/ 40°C ⁵⁾ |
| Storage temperature | -25 °C...+85 °C | | | | | | | | |
| Altitude of the installation location | Up to 1000 m above sea level / over 1000 m with reduced performance (1 % per 100 m) / above 2000 m see operating manual | | | | | | | | |
| Relative air humidity | ≤ 96 %, condensation not permitted. | | | | | | | | |
| Vibration resistance (DIN EN 60068-2-6) | 50 m/s ² , 60...160 Hz ³⁾ | | | | | | | | 10 m/s ² ; 5...200 Hz ³⁾ |
| Shock resistance (DIN EN 60068-2-27) | 300 m/s ² , 11ms, 3 layers | | | | | | | | 100 m/s ² |
| EMC (DIN-EN-61800-3) | C2 | | | | C1 | | | | |
| Certificates and conformity |    | | | | | | | | |

| Size | α | | A | | |
|---------------------------------|--|--|-------------------------------------|---|---------------------------------------|
| Application circuit board model | Standard | | Basic 0.37-1.1 kW | Standard 0.37-1.1 kW | Basic 1.5 kW |
| I/O interfaces | 2 DI / 1 DO / 1 AI / - AO / 1 relay | | 2 DI / 1 DO / 1 AI / - AO / - relay | 4 DI / 2 DO / 2 AI / 1 AO / 2 relays | 2 DI / 1 DO / 1 AI / - AO relay |
| Potentiometer on device | Accessories | | Option | Option | Option |
| Foil keypad | Option | | Option | Option | - |
| MMI option | - | | Option | Option | - |
| Internal power supply | 24 V DC, 100 mA / 10 V DC, 30 mA / short-circuit proof | | | | 24 V DC, 100 mA / short-circuit proof |
| External feed-in 24 V DC | - | | - | 24 V DC +/-15 % | - |
| Fieldbus integrated | Modbus RTU | | | | |
| Fieldbus option | CANopen | | - | CANopen / PROFIBUS / PROFINET / EtherCAT / Sercos III | - |

Technical data for 230 V devices INVEOR M (subject to technical changes)

¹⁾ Recommended motor rating (4-pole asynch. motor) is given based on the 230 V AC supply voltage.




²⁾ With 1LA7 asynchronous motor, motor-mounted

³⁾ Installation- and application-related resonant frequencies can damage the devices.

⁴⁾ In compliance with the overvoltage category

⁵⁾ For 40 m³/h / 60 m³/h cooling air flow

400 V devices, technical data for INVEOR M

| Sizes | A | | | | B | | | C | | D | | | |
|--|--|------|------|------|--|------|------|-----------------|------|---|------|----------------------------|-------|
| Recommended motor rating ¹⁾ [kW] | 0.55 | 0.75 | 1.1 | 1.5 | 2.2 | 3.0 | 4.0 | 5.5 | 7.5 | 11.0 | 15.0 | 18.5 | 22.0 |
| Supply voltage | 3 x 200 V AC -10 %...480 V AC +10 % 280 V DC -10 %...680 V DC +10 % ⁴⁾ | | | | | | | | | | | | |
| Grid frequency | 50/60 Hz ± 6 % | | | | | | | | | | | | |
| Network configurations | TN / TT | | | | | | | | | | | | |
| Line current [A] | 1.4 | 1.9 | 2.6 | 3.3 | 4.6 | 6.2 | 7.9 | 10.8 | 14.8 | 23.2 | 28.2 | 33.2 | 39.8 |
| Rated current output eff. [IN at 8 kHz] | 1.7 | 2.3 | 3.1 | 4.0 | 5.6 | 7.5 | 9.5 | 13.0 | 17.8 | 28.0 | 34.0 | 40.0 | 48.0 |
| Min. brake resistance [Ω] | 100 | | | | 50 | | | 50 | | 30 | | | |
| Overload for 60 sec. in % | 150 | | | | | | | | | | | | 130 |
| Switching frequency | 4 kHz, 8 kHz, 16 kHz, (factory setting 8 kHz) | | | | | | | | | 4 kHz - 16 kHz (factory setting 4 kHz) | | | |
| Output frequency | 0 Hz – 400 Hz | | | | | | | | | | | | |
| Nominal output apparent power [kVA] | 1.06 | 1.43 | 1.93 | 2.49 | 3.49 | 4.68 | 5.92 | 8.11 | 11.1 | 17.46 | 21.2 | 24.94 | 29.93 |
| Mains cycles of operation / restart | Unlimited ⁵⁾ | | | | | | | | | 2 min. | | | |
| DIN EN 61800-5 touch current | < 3.5 mA ²⁾ | | | | | | | | | | | | |
| Protective function | Overvoltage and undervoltage, I ² t restriction, short-circuit, ground leak, motor and variable frequency drive temperature, stall prevention, blocking detection, PID dry run protection | | | | | | | | | | | | |
| Software functions | Process control (PID controller), fixed frequencies, data record changeover, flying restart, motor current limit | | | | | | | | | | | | |
| Soft PLC | IEC61131-3, FBD, ST, AWL | | | | | | | | | | | | |
| Housing | Two-part aluminium die-cast casing | | | | | | | | | | | | |
| Dimensions [L x W x H] mm | 233 x 153 x 120 | | | | 270 x 189 x 140 | | | 307 x 223 x 181 | | 414 x 294 x 232 | | | |
| Weight including adapter plate | 3.9 kg | | | | 5.0 kg | | | 8.7 kg | | 21.0 kg | | | |
| Protection class | IP 65 | | | | | | | | | IP 55 | | | |
| Cooling | Passive cooling | | | | | | | | | Active cooling | | | |
| Ambient temperature | -40 °C (non condensing) to +50 °C (without derating) | | | | | | | | | -40 up to +50 °C (8kHz) | | -40 up to +50 °C (4kHz) | |
| Storage temperature | -40 °C...+85 °C | | | | | | | | | | | | |
| Altitude of the installation location | Up to 1000 m above sea level / over 1000 m with reduced performance (1 % per 100 m) / above 2000 m see operating manual | | | | | | | | | | | | |
| Relative air humidity | ≤ 96 %, condensation not permitted. | | | | | | | | | | | | |
| Vibration resistance (DIN EN 60068-2-6) standard variant | 50 m/s ² ; 60...160 Hz ³⁾ | | | | | | | | | 30 m/s ² 60...160 Hz ³⁾ | | | |
| Vibration resistance (DIN EN 60068-2-6) HD variant | - | | | | 50 m/s ² 60...160Hz ³⁾ ; Noise: 10-1000 Hz ³⁾ | | | | | | | | |
| Shock resistance (DIN EN 60068-2-27) standard variant & HD variant | 300 m/s ² , 11ms, 3 layers | | | | | | | | | | | | |
| EMC (DIN-EN-61800-3) | C2 | | | | | | | | | | | | |
| Energy efficiency class (EN 61800-9-2) | IE2 | | | | | | | | | | | | |
| Certificates and conformity |    | | | | | | | | | | | | |

| Size | A, B, C | | A, B, C, D | |
|---------------------------------|--|--|---|--|
| Application circuit board model | Basic | | Standard | Functional safety |
| I/O interfaces | 2 DI / 1 DO / 1 AI / - AO / - relay | | 4 DI / 2 DO / 2 AI / 1 AO / 2 relays | 4 DI / 2 DO / 2 AI / 1 AO / - relay / 2 STO channels |
| Potentiometer on device | Option | | Option | Option |
| Foil keypad | Option | | Option | Option |
| MMI option | Option | | Option | Option |
| Internal power supply | 24 V DC, 100 mA / 10 V DC, 30 mA / short-circuit proof | | | |
| External feed-in 24 V DC | - | | 24 V DC +/-15 % | 24 V DC +/-15 % |
| Fieldbus integrated | Modbus RTU | | | |
| Fieldbus option | - | | CANopen / PROFIBUS / PROFINET / EtherCAT / Sercos III | |

Technical data for 400 V devices INVEOR M (subject to technical changes)

¹⁾ Recommended motor rating (4-pole asynch. motor) is given based on the 400 V AC supply voltage.

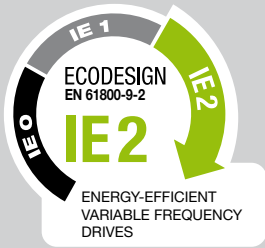
²⁾ With 1LA7 asynchronous motor, motor-mounted

³⁾ Installation- and application-related resonant frequencies can damage the devices.

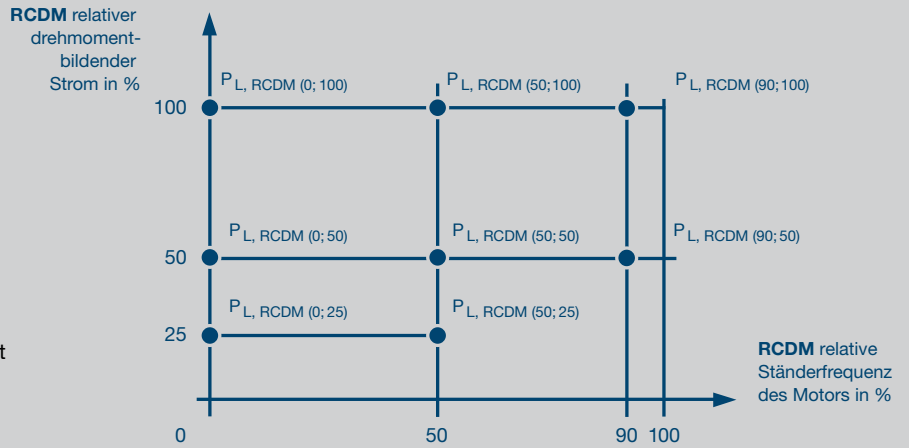
⁴⁾ In compliance with the overvoltage category

⁵⁾ < 3 s may result in power failure/intermediate circuit undervoltage faults

Variable frequency drive losses in accordance with EN 61800-9-2



INVEOR variable frequency drives meet the most stringent of energy efficiency requirements.



| Device | Supply voltage [V] | Nominal current [A] | Measurement (90; 100) | Measurement (50; 100) | Measurement (10; 100) | Measurement (90; 50) | Measurement (50; 50) | Measurement (10; 50) | Measurement (50; 25) | Measurement (10; 25) | Standby Losses [W] | IE class |
|----------------|--------------------|---------------------|---|-----------------------|-----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|--------------------|----------|
| | | | Relative losses [%] ^{1) 2) 3)} | | | | | | | | | |
| Size A 0.55 kW | 400 | 1.7 | 20 | 19 | 21 | 19 | 17 | 18 | 16 | 18 | 5 | IE2 |
| | | | 1.9 | 1.8 | 2 | 1.8 | 1.6 | 1.7 | 1.5 | 1.7 | | |
| Size A 0.75 kW | 400 | 2.3 | 26 | 25 | 26 | 19 | 19 | 21 | 19 | 20 | 5 | IE2 |
| | | | 1.8 | 1.8 | 1.8 | 1.3 | 1.3 | 1.4 | 1.3 | 1.4 | | |
| Size A 1.1 kW | 400 | 3.1 | 33 | 33 | 32 | 24 | 26 | 25 | 19 | 21 | 5 | IE2 |
| | | | 1.7 | 1.7 | 1.6 | 1.3 | 1.4 | 1.3 | 1 | 1.1 | | |
| Size A 1.5 kW | 400 | 4.0 | 45 | 38 | 41 | 29 | 31 | 30 | 32 | 26 | 5 | IE2 |
| | | | 1.8 | 1.5 | 1.6 | 1.2 | 1.2 | 1.2 | 1.3 | 1 | | |
| Size B 2.2 kW | 400 | 5.6 | 58 | 55 | 56 | 42 | 40 | 42 | 32 | 37 | 5 | IE2 |
| | | | 1.7 | 1.6 | 1.6 | 1.2 | 1.1 | 1.2 | 0.9 | 1 | | |
| Size B 3.0 kW | 400 | 7.5 | 81 | 87 | 71 | 54 | 53 | 52 | 43 | 46 | 5 | IE2 |
| | | | 1.7 | 1.9 | 1.5 | 1.2 | 1.1 | 1.1 | 0.9 | 1 | | |
| Size B 4.0 kW | 400 | 9.5 | 103 | 96 | 94 | 67 | 62 | 64 | 53 | 53 | 5 | IE2 |
| | | | 1.7 | 1.6 | 1.6 | 1.1 | 1 | 1.1 | 0.9 | 0.9 | | |
| Size C 5.5 kW | 400 | 13.0 | 153 | 125 | 123 | 77 | 73 | 73 | 53 | 58 | 5 | IE2 |
| | | | 1.9 | 1.5 | 1.5 | 0.9 | 0.9 | 0.9 | 0.7 | 0.7 | | |
| Size C 7.5 kW | 400 | 17.8 | 233 | 187 | 171 | 104 | 95 | 95 | 74 | 81 | 5 | IE2 |
| | | | 2.1 | 1.7 | 1.5 | 0.9 | 0.9 | 0.9 | 0.7 | 0.7 | | |
| Size D 11.0 kW | 400 | 28.0 | 268 | 234 | 242 | 152 | 140 | 150 | 107 | 116 | 13 | IE2 |
| | | | 1.5 | 1.3 | 1.4 | 0.9 | 0.8 | 0.9 | 0.6 | 0.7 | | |
| Size D 15.0 kW | 400 | 34.0 | 339 | 293 | 297 | 185 | 165 | 174 | 123 | 133 | 13 | IE2 |
| | | | 1.6 | 1.4 | 1.4 | 0.9 | 0.8 | 0.8 | 0.6 | 0.6 | | |
| Size D 18.5 kW | 400 | 40.0 | 407 | 347 | 347 | 212 | 189 | 200 | 135 | 147 | 13 | IE2 |
| | | | 1.6 | 1.4 | 1.4 | 0.9 | 0.8 | 0.8 | 0.5 | 0.6 | | |
| Size D 22.0 kW | 400 | 48.0 | 526 | 448 | 448 | 262 | 237 | 248 | 172 | 183 | 13 | IE2 |
| | | | 1.8 | 1.5 | 1.5 | 0.9 | 0.8 | 0.8 | 0.6 | 0.6 | | |

¹⁾ Loss values were determined at 4 kHz switching frequency
²⁾ Loss values include 10% supplement in accordance with EN 50598 standard
³⁾ Relative losses in relation to the device's rated apparent power

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