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## Smart "Compact" range with display CD12 Smart Part number 88974042



- Highly visible blue LCD with 4 lines of 18 characters and configurable backlighting
- Allow the use of the entire library of specific functions blocs of the software workshop
- Extended temperature range (-20 °C → +70 °C)
- Analogue inputs 0-10 VDC, Potentiometer, NTC, LDR (0-20 mA/Pt100 with converters)
- Selective parameter setting : you can choose the parameters that can be adjusted on the front panel

### Part numbers

|          | Type       | Inputs                           | Outputs                               | Supply  |
|----------|------------|----------------------------------|---------------------------------------|---------|
| 88974042 | CD12 Smart | 8 digital (including 4 analogue) | 4 solid state 0.5 A (including 1 PWM) | 24 V DC |

### Specifications

#### General environment characteristics for CB, CD, XD, XB, XR and XE product types

|  |  |
|--|--|
| Certifications   | CE, UL, CSA, GL  |
| Conformity to standards (with the low voltage directive and EMC directive) | IEC/EN 61131-2 (Open equipment)<br>IEC/EN 61131-2 (Zone B)<br>IEC/EN 61000-6-2,<br>IEC/EN 61000-6-3 (*)<br>IEC/EN 61000-6-4<br>(*) Except configuration (88 970 1.1 or 88 970 1.2) + (88 970 250 or 88 970 270) + 88 970 241 class A (class B in a metal enclosure)  |
| Earthing   | Not included   |
| Protection rating  | In accordance with IEC/EN 60529 :<br>IP40 on front panel<br>IP20 on terminal block   |
| Overvoltage category   | 3 in accordance with IEC/EN 60664-1  |
| Pollution  | Degree : 2 in accordance with IEC/EN 61131-2   |
| Max operating Altitude   | Operation : 2000 m<br>Transport : 3048 m   |
| Mechanical resistance  | Immunity to vibrations IEC/EN 60068-2-6, test Fc<br>Immunity to shock IEC/EN 60068-2-27, test Ea   |
| Resistance to electrostatic discharge                                      | Immunity to ESD<br>IEC/EN 61000-4-2, level 3   |
| Resistance to HF interference  | Immunity to radiated electrostatic fields<br>IEC/EN 61000-4-3<br>Immunity to fast transients (burst immunity)<br>IEC/EN 61000-4-4, level 3<br>Immunity to shock waves<br>IEC/EN 61000-4-5<br>Radio frequency in common mode<br>IEC/EN 61000-4-6, level 3<br>Voltage dips and breaks (AC)<br>IEC/EN 61000-4-11<br>Immunity to damped oscillatory waves<br>IEC/EN 61000-4-12   |
| Conducted and radiated emissions   | Class B (*) in accordance with EN 55022, EN 55011 (CISPR22, CISPR11) group 1<br>(*) Except configuration (88 970 1.1 or 88 970 1.2) + (88 970 250 or 88 970 270) + 88 970 241 class A (class B in a metal enclosure)   |
| Operating temperature  | -20 → +70 °C<br>except CB and XB versions in VDC : -30 → +70 °C (+40 °C in a non-ventilated enclosure)<br>in accordance with IEC/EN 60068-2-1 and IEC/EN 60068-22  |
| Storage temperature  | -40 → +80 °C in accordance with IEC/EN 60068-2-1 and IEC/EN 60068-2-2  |
| Relative humidity  | 95 % max. (no condensation or dripping water) in accordance with IEC/EN 60068-2-30   |
| Mounting   | On symmetrical DIN rail, 35 x 7.5 mm and 35 x 15 mm, or on panel (2 x Ø 4 mm)  |
| Screw terminals connection capacity  | Flexible wire with ferrule =<br>1 conductor : 0.25 to 2.5 mm <sup>2</sup> (AWG 24...AWG 14)<br>2 conductors 0.25 to 0.75 mm <sup>2</sup> (AWG 24...AWG 18)<br>Semi-rigid wire =<br>1 conductor : 0.2 to 2.5 mm <sup>2</sup> (AWG 25...AWG 14)<br>Rigid wire =<br>1 conductor : 0.2 to 2.5 mm <sup>2</sup> (AWG 25...AWG 14)<br>2 conductors 0.2 to 1.5 mm <sup>2</sup> (AWG 25...AWG 16)<br>Tightening torque =<br>0.5 N.m (4.5 lb-in) (tighten using screwdriver diam. 3.5 mm)<br>Also valid for spring cage connectors (ref 88 970 313 and 88 970 317 for the RBT range) |

### General characteristics

|                       |  |
|-----------------------|--|
| Operating temperature | -20 → +70 °C   |
| Operating factor      | 100 % (6 A relays)<br>66 % (8 A relays)                                      |
| Storage temperature   | -40 → +80 °C   |
| LCD display           | Display with 4 lines of 18 characters, white characters on a blue background |

#### Processing characteristics of CB, CD, XD & XB product types

|  |  |
|--|--|
| LCD display                                | CD, XD : Display with 4 lines of 18 characters   |
| Programming method                         | Function blocks / SCF (Grafcet) or Ladder  |
| Program size                               | 8 Kb : 350 typical blocks, 64 macros maximum, 256 blocks maximum per macro<br>or<br>120 lines in Ladder                              |
| Program memory                             | Flash EEPROM   |
| Removable memory                           | EEPROM   |
| Data memory                                | 368 bit/200 words  |
| Back-up time in the event of power failure | Program and settings in the controller : 10 years<br>Program and settings in the plug-in memory : 10 years<br>Data memory : 10 years |
| Cycle time                                 | FBD : 6 → 90 ms (typically 20 ms)<br>Ladder : typically 20 ms  |
| Response time                              | Input acquisition time : 1 to 2 cycle times  |
| Clock data retention                       | 10 years (lithium battery) at 25 °C  |
| Clock drift                                | Drift < 12 min/year (at 25 °C)<br>6 s/month (at 25 °C with user-definable correction of drift)                                       |
| Timer block accuracy                       | 1 % ± 2 cycle times  |
| Start up time on power up                  | < 1,2 s  |

#### Characteristics of products with AC power supplied

##### Supply

|                                |   |  |
|--------------------------------|---|--|
| Nominal voltage                | 24 V AC   | 100 → 240 V AC   |
| Operating limits               | -15 % / +20 %<br>or 20.4 V AC → 28.8 V AC   | -15 % / +10 %<br>or 85 V AC → 264 V AC   |
| Supply frequency range         | 50/60 Hz (+4 % / -6 %)<br>or 47 → 53 Hz/57 → 63 Hz  | 50/60 Hz (+4 % / -6 %) or 47 → 53 Hz/57 → 63 Hz  |
| Immunity from micro power cuts | 10 ms (repetition 20 times)   | 10 ms (repetition 20 times)  |
| Max. absorbed power            | CB12-CD12-XD10-XB10 : 4 VA<br>CB20-CD20 : 6 VA<br>XD10-XB10 with extension : 7.5 VA<br>XD26-XB26 : 7.5 VA<br>XD26-XB26 with extension : 10 VA | CB12-CD12-XD10-XB10 : 7 VA<br>CB20-CD20 : 11 VA<br>XD10-XB10 with extension : 12 VA<br>XD26-XB26 : 12 VA<br>XD26-XB26 with extension : 17 VA |
| Isolation voltage              | 1780 V AC   | 1780 V AC  |

##### Inputs

|  |   |   |
|--|---|---|
| Input voltage                                  | 24 V AC (-15 % / +20 %)   | 100 → 240 V AC (-15 % / +10 %)  |
| Input current                                  | 4.4 mA @ 20.4 V AC<br>5.2 mA @ 24.0 V AC<br>6.3 mA @ 28.8 V AC                                  | 0.24 mA @ 85 V AC<br>0.75 mA @ 264 V AC   |
| Input impedance                                | 4.6 kΩ  | 350 kΩ  |
| Logic 1 voltage threshold                      | ≥ 14 V AC   | ≥ 79 V AC   |
| Making current at logic state 1                | > 2 mA  | > 0.17 mA   |
| Logic 0 voltage threshold                      | ≤ 5 V AC  | ≤ 20 V AC (≤ 28 V AC : XE10, XR06, XR10, XR14)  |
| Release current at logic state 0               | < 0.5 mA  | < 0.5 mA  |
| Response time with LADDER programming          | 50 ms<br>State 0 → 1 (50/60 Hz)   | 50 ms<br>State 0 → 1 (50/60 Hz)   |
| Response time with function blocks programming | Configurable in increments of 10 ms<br>50 ms min. up to 255 ms<br>State 0 → 1 (50/60 Hz)        | Configurable in increments of 10 ms<br>50 ms min. up to 255 ms<br>State 0 → 1 (50/60 Hz)        |
| Maximum counting frequency                     | In accordance with cycle time (Tc) and input response time (Tr) :<br>$1 / ((2 \times Tc) + Tr)$ | In accordance with cycle time (Tc) and input response time (Tr) :<br>$1 / ((2 \times Tc) + Tr)$ |
| Sensor type                                    | Contact or 3-wire PNP   | Contact or 3-wire PNP   |
| Input type                                     | Resistive   | Resistive   |
| Isolation between power supply and inputs      | None  | None  |
| Isolation between inputs                       | None  | None  |
| Protection against polarity inversions         | Yes   | Yes   |
| Status indicator                               | On LCD screen for CD and XD   | On LCD screen for CD and XD   |

#### Characteristics of relay outputs common to the entire range

|  |   |
|--|---|
| Max. breaking voltage                              | 5 → 30 V DC<br>24 → 250 V AC  |
| Breaking current                                   | CB-CD-XD10-XB10-XR06-XR10 : 8 A<br>XD26-XB26 : 8 x 8 A relays, 2 x 5 A relays<br>XE10 : 4 x 5 A relays<br>XR14 : 4 x 8 A relays, 2 x 5 A relays<br>RBT (Removable Terminal Blocks) versions : verify the maximum current according to the type of connection used |
| Electrical durability for 500 000 operating cycles | Utilization category DC-12 : 24 V, 1.5 A<br>Utilization category DC-13 : 24 V (L/R = 10 ms), 0.6 A<br>Utilization category AC-12 : 230 V, 1.5 A<br>Utilization category AC-15 : 230 V, 0.9 A  |
| Max. Output Common Current                         | 12 A for O8, O9, OA   |
| Minimum switching capacity                         | 10 mA (at minimum voltage of 12 V)  |
| Minimum load                                       | 12 V, 10 mA   |
| Maximum rate                                       | Off load : 10 Hz<br>At operating current : 0.1 Hz   |
| Mechanical life                                    | 10,000,000 (operations)   |

|                                 |  |
|---------------------------------|--|
| Voltage for withstanding shocks | In accordance with IEC/EN 60947-1 and IEC/EN 60664-1 : 4 kV                |
| Off-cycle response time         | Make 10 ms<br>Release 5 ms   |
| Built-in protections            | Against short-circuits : None<br>Against overvoltages and overloads : None |
| Status indicator                | On LCD screen for CD and XD  |

#### Characteristics of product with DC power supplied

| Supply                                 |   |  |
|--|---|--|
| Nominal voltage                        | 12 V DC   | 24 V DC  |
| Operating limits                       | -13 % / +20 %<br>or 10.4 V DC → 14.4 V DC (including ripple)  | -20 % / +25 %<br>or 19.2 V DC → 30 V DC (including ripple)   |
| Immunity from micro power cuts         | ≤ 1 ms (repetition 20 times)  | ≤ 1 ms (repetition 20 times)   |
| Max. absorbed power                    | CB12 with solid state outputs : 1.5 W<br>CD12 : 1.5 W<br>CD20 : 2.5 W<br>XD26-XB26 : 3 W<br>XD26-XB26 with extension : 5 W<br>XD26 with solid state outputs : 2.5 W | CB12-CD12-CD20 with solid state outputs - XD10-XB10 with solid state outputs : 3 W<br>XD10-XB10 with relay outputs : 4 W<br>XD26-XB26 with solid state outputs : 5 W<br>CB20-CD20 with relay outputs : 6 W<br>XD26 with relay outputs : 6 W<br>XD10-XB10 with extension : 8 W<br>XD26-XB26 with extension : 10 W |
| Protection against polarity inversions | Yes   | Yes  |

#### Digital inputs (I1 to IA and IH to IY)

|   |  |  |
|---|--|--|
| Input voltage                             | 12 V DC (-13 % / +20 %)  | 24 V DC (-20 % / +25 %)  |
| Input current                             | 3.9 mA @ 10.44 V DC<br>4.4 mA @ 12.0 V DC<br>5.3 mA @ 14.4 VDC   | 2.6 mA @ 19.2 V DC<br>3.2 mA @ 24 V DC<br>4.0 mA @ 30.0 VDC  |
| Input impedance                           | 2.7 kΩ   | 7.4 kΩ   |
| Logic 1 voltage threshold                 | ≥ 7 V DC   | ≥ 15 V DC  |
| Making current at logic state 1           | ≥ 2 mA   | ≥ 2.2 mA   |
| Logic 0 voltage threshold                 | ≤ 3 V DC   | ≤ 5 V DC   |
| Release current at logic state 0          | < 0.9 mA   | < 0.75 mA  |
| Response time                             | 1 → 2 cycle times + 6 ms   | 1 → 2 cycle times + 6 ms   |
| Maximum counting frequency                | Inputs I1 & I2 : FBD (up to 6 k Hz) & Ladder (1 k Hz)<br>Inputs I3 to IA & IH to IY : In accordance with cycle time (Tc) and input response time (Tr) : $1 / ((2 \times Tc) + Tr)$ | Inputs I1 & I2 : FBD (up to 6 k Hz) & Ladder (1 k Hz)<br>Inputs I3 to IA & IH to IY : In accordance with cycle time (Tc) and input response time (Tr) : $1 / ((2 \times Tc) + Tr)$ |
| Sensor type                               | Contact or 3-wire PNP  | Contact or 3-wire PNP  |
| Conforming to IEC/EN 61131-2              | Type 1   | Type 1   |
| Input type                                | Resistive  | Resistive  |
| Isolation between power supply and inputs | None   | None   |
| Isolation between inputs                  | None   | None   |
| Protection against polarity inversions    | Yes  | Yes  |
| Status indicator                          | On LCD screen for CD and XD  | On LCD screen for CD and XD  |

#### Analogue or digital inputs (IB to IG)

|                     |                  |                  |
|---------------------|------------------|------------------|
| CB12-CD12-XD10-XB10 | 4 inputs IB → IE | 4 inputs IB → IE |
| CB20-CD20-XB26-XD26 | 6 inputs IB → IG | 6 inputs IB → IG |

#### Inputs used as analogue input only in FBD

|   |   |   |
|---|---|---|
| Measurement range                                   | (0 → 10 V) or (0 → V power supply)                      | (0 → 10 V) or (0 → V power supply)                      |
| Input impedance                                     | 14 kΩ   | 12 kΩ   |
| Input voltage                                       | 14.4 V DC max.  | 30 V DC max.  |
| Value of LSB  | 14 mV   | 29 mV   |
| Input type  | Common mode   | Common mode   |
| Resolution  | 10 bit at max. input voltage                            | 10 bit at max. input voltage                            |
| Conversion time                                     | Controller cycle time                                   | Controller cycle time                                   |
| Accuracy at 25 °C                                   | ± 5 %   | ± 5 %   |
| Accuracy at 55 °C                                   | ± 6.2 %   | ± 6.2 %   |
| Repeat accuracy at 55 °C                            | ± 2 %   | ± 2 %   |
| Isolation between analogue channel and power supply | None  | None  |
| Cable length  | 10 m maximum, with shielded cable (sensor not isolated) | 10 m maximum, with shielded cable (sensor not isolated) |
| Protection against polarity inversions              | Yes   | Yes   |
| Potentiometer control                               | 2.2 kΩ/0.5 W (recommended)<br>10 kΩ max.                | 2.2 kΩ/0.5 W (recommended)<br>10 kΩ max.                |

#### Inputs used as digital inputs

|   |  |  |
|---|--|--|
| Input voltage                             | 12 V DC (-13 % / +20 %)  | 24 V DC (-20 % / +25 %)  |
| Input current                             | 0.7 mA @ 10.44 VDC<br>0.9 mA @ 12.0 VDC<br>1.0 mA @ 14.4VDC                                  | 1.6 mA @ 19.2 VDC<br>2.0 mA @ 24.0 V DC<br>2.5 mA @ 30.0 VDC                                 |
| Input impedance                           | 14 kΩ  | 12 kΩ  |
| Logic 1 voltage threshold                 | ≥ 7 V DC   | ≥ 15 VDC   |
| Making current at logic state 1           | ≥ 0.5 mA   | ≥ 1.2 mA   |
| Logic 0 voltage threshold                 | ≤ 3 V DC   | ≤ 5 V DC   |
| Release current at logic state 0          | ≤ 0.2 mA   | ≤ 0.5 mA   |
| Response time                             | 1 → 2 cycle times  | 1 → 2 cycle times  |
| Maximum counting frequency in FBD         | In accordance with cycle time (Tc) and input response time (Tr) : $1 / ((2 \times Tc) + Tr)$ | In accordance with cycle time (Tc) and input response time (Tr) : $1 / ((2 \times Tc) + Tr)$ |
| Sensor type                               | Contact or 3-wire PNP  | Contact or 3-wire PNP  |
| Conforming to IEC/EN 61131-2              | Type 1   | Type 1   |
| Input type                                | Resistive  | Resistive  |
| Isolation between power supply and inputs | None   | None   |
| Isolation between inputs                  | None   | None   |
| Protection against polarity inversions    | Yes  | Yes  |

|  |  |                             |
|--|--|-----------------------------|
| Status indicator   | On LCD screen for CD and XD  | On LCD screen for CD and XD |
| <b>Characteristics of relay outputs common to the entire range</b> |  |                             |
| Max. breaking voltage  | 5 →30 V DC<br>24 →250 V AC   |                             |
| Max. Output Common Current   | 12A (10A UL) for O8, O9, OA  |                             |
| Breaking current   | CB-CD-XD10-XB10-XR06-XR10 : 8 A<br>XD26-XB26 : 8 x 8 A relays, 2 x 5 A relays<br>XE10 : 4 x 5 A relays<br>XR14 : 4 x 8 A relays, 2 x 5 A relays  |                             |
| Electrical durability for 500 000 operating cycles                 | Utilization category DC-12 : 24 V, 1.5 A<br>Utilization category DC-13 : 24 V (L/R = 10 ms), 0.6 A<br>Utilization category AC-12 : 230 V, 1.5 A<br>Utilization category AC-15 : 230 V, 0.9 A |                             |
| Minimum switching capacity   | 10 mA (at minimum voltage of 12 V)   |                             |
| Minimum load   | 12 V, 10 mA  |                             |
| Maximum rate   | Off load : 10 Hz<br>At operating current : 0.1 Hz  |                             |
| Mechanical life  | 10,000,000 (operations)  |                             |
| Voltage for withstanding shocks                                    | In accordance with IEC/EN 60947-1 and IEC/EN 60664-1 : 4 kV  |                             |
| Off-cycle response time  | Make 10 ms<br>Release 5 ms   |                             |
| Built-in protections   | Against short-circuits : None<br>Against overvoltages and overloads : None   |                             |
| Status indicator   | On LCD screen for CD and XD  |                             |

**Digital / PWM solid state output**

|  |  |  |
|--|--|--|
| PWM solid state output*                          | CB12 : O4<br>XD26 : O4 →O7   | CD12-XD10-XB10 : O4<br>CD20-XD26-XB26 : O4 →O7   |
| * Only available with "FBD" programming language | * Only available with "FBD" programming language   |  |
| Breaking voltage                                 | 10.4 →30 V DC  | 19.2 →30 V DC  |
| Nominal voltage                                  | 12-24 VDC  | 24 V DC  |
| Nominal current                                  | 0.5 A  | 0.5 A  |
| Max. breaking current                            | 0,625 A  | 0,625 A  |
| Voltage drop                                     | ≤ 2 V for I = 0.5 A (at state 1)   | ≤ 2 V for I = 0.5 A (at state 1)   |
| Response time                                    | Make ≤ 1 ms<br>Release ≤ 1 ms  | Make ≤ 1 ms<br>Release ≤ 1 ms  |
| Operating frequency                              | 1 Maximum on inductive load  |  |
| Built-in protections                             | Against overloads and short-circuits : Yes<br>Against overvoltages (*) : Yes<br>Against inversions of power supply : Yes<br>(*) In the absence of a volt-free contact between the logic controller output and the load | Against overloads and short-circuits : Yes<br>Against overvoltages (*) : Yes<br>Against inversions of power supply : Yes<br>(*) In the absence of a volt-free contact between the logic controller output and the load |
| Min. load  | 1 mA   |  |
| Maximum incandescent load                        | 0,2 A / 12 V DC<br>0,1 A / 24 V DC   | 0,1 A / 24 V DC  |
| Galvanic isolation                               | No   |  |
| PWM frequency                                    | 14.11 Hz<br>56.45 Hz<br>112.90 Hz<br>225.80 Hz<br>451.59 Hz<br>1806.37 Hz  | 14.11 Hz<br>56.45 Hz<br>112.90 Hz<br>225.80 Hz<br>451.59 Hz<br>1806.37 Hz  |
| PWM cyclic ratio                                 | 0 →100 % (256 steps for CD, XD and 1024 steps for XA)  |  |
| Max. Breaking current PWM                        | 50 mA  |  |
| Max. cable length PWM                            | 20 m   |  |
| PWM accuracy at 120 Hz                           | < 5 % (20 % →80 %) load at 10 mA   |  |
| PWM accuracy at 500 Hz                           | < 10 % (20 % →80 %) load at 10 mA  |  |
| Status indicator                                 | On LCD screen for XD   | On LCD screen for CD and XD  |

**Accessories**

| Type    | Description  | Code     |
|---------|--|----------|
| M3 Soft | Multilingual programming software containing specific library functions (CD-ROM) | 88970111 |
| PA      | EEPROM memory cartridge  | 88970108 |
| PA      | 3 m serial link cable : PC →Millenium 3  | 88970102 |
| PA      | USB cable 3 m : PC →Millenium 3  | 88970109 |
| PA      | Millenium 3 interface →Bluetooth® (class A 10 m)                                 | 88970104 |

**Comments**\* to be marketed 1<sup>st</sup> quarter 2006**Dimensions (mm)****CD12 Smart**

