# SIEMENS

**9**<sup>760</sup>



9760p01

DESIGO™ INTEGRAL Migration

# Automation station, compact series

# PXC-NRUF

**In existing INTEGRAL plants, you can replace compact automation units NRUE/A, NRUF/A and NRUT/A with the PXC NRUF automation station.**
- **Same housing.**
- **Same periphery interface (plug compatible).**
- **Existing periphery can be assumed without a change.**
- **Use existing panel wiring.**

- **Compact, freely programmable automation station for HVAC and building services plants.**
- **Native BACnet automation station with communications**
  **– BACnet via LonTalk**
  **– BACnet PTP (point-to-point)**
  **– Modem.**
- **PPC processor allows for high performance and reliable operation**
- **Comprehensive management and system functions (alarm management, schedulers, trends, remote management, access protection, etc.)**
- **64 physical inputs / outputs**
- **Stand-alone application or for use with linked system or devices.**
- **Supports the following operating elements:**
  **– Room units QAX...**
  **– Local / networkable operator units**
  **– System or WEB operation via system network.**

## Functions

Automation stations provide the infrastructure for recording and processing system and application-specification functions and are freely programmable.
Comfortable management functions are integrated in addition to control functions, e.g.:

- Alarm management with alarm routing via the entire network. Standard, basis and expanded alarm management with checked secure transmission and automated transmission monitoring.
- Scheduler programs.
- Trend functions.
- Remote management function.
- Secured access to the entire network using individually defined user profiles and categories.

**Programming language**    The automation stations can be freely programmed (relying closely on CEN standard 1131) in D-MAP programming language. All function blocks, provided in libraries were graphically interconnected to plant operating programs.

**Communication**    The LONWORKS bus using internally standardized BACnet protocol is used for communications.
Both peer-to-peer communication to other automation stations as well as connection to operating units PXM... are supported.

## Type summary

| Device | Type | Data point mix | | | |
|--------|------|----|----|----|----|
| | | UI | DI | UO | DO |
| Automation station for 64 physical data points | PXC-NRUF | 16 | 24 | 8 | 16 |

| Accessories | Type designation |
|-------------|------------------|
| Connecting cable between operating unit PXM10 or PXM20 and the automation station. | PXA-C1 |
| Adapter for firmware download. | PXA-C2 |

## Equipment combinations

**Operation**

Various options exist to operating automation stations PXC-NRUF:
- **Room device QAX...** on the PPS2 interface. Up to a **maximum** of five room devices QAX... (without QAX5...) can be connected. Details on PPS2 communication are described in the DESIGO Technical principles manual (Section "I/O blocks", subsection "PPS2 addressing").
- **Local operator unit PXM10** *), is connected with cable PXA-C1.
- **Operator unit PXM20** *), is connecting with cable PXA-C1, for local operation or for decentralized operation of an entire plant connected within a BACnet / LonTalk network.

Note

*) Only one operator unit can be connected (PXM10 or PXM 20).

**Web operation**

The web controller PXG80-W allows for remote monitoring and operation of one or multiple DESIGO PX automation stations using a standard Internet browser.

The Web controller PXG80-WN also includes an Ethernet connection.

## Technical design

**Inputs**

**Universal inputs (UI 1 ... 16)** can be used for active sensor elements as well as potential-free contracts for signaling functions.

**Digital inputs (DI 1 … 8)** allow non-potential-free reporting functions.
They are **electrically isolated** from the system and from one another.

**Digital inputs (DI 9 … 16)** allow reporting functions **(potential-free)**.

**Digital inputs (DI 17 … 24)** allow reporting and counting functions **(potential-free)**.

**Outputs**

**Universal outputs (UO 1 … 8)** can, on the one hand, control modulating actuators, on the other hand, they can be programmed for binary switching functions via the program structure.

**Relay outputs (DO 1 … 16)** are designed for switching functions up to a maximum of AC/DC 42 V, 2 A.

**Power supply**

The device requires an external power supply AC/DC24V +/- 20%.
It must comply with SELV / PELV requirements!

The internal DC-DC converter supplies the internal processor system and inputs/outputs with controller voltage.

DC15V /200mA is also provided for active sensors (INTEGRAL periphery). This converter also establishes electrical isolation to the AC/DC24V power supply.

The device reset concept ensures defined conditions for field devices connected to the I/Os during power-up, power-down and undervoltage.

Overvoltage protection and startup protection protect the automation station against fluctuating power.

## Design

The compact construction allows you to install the automation station in narrow spaces and is particularly well suited for compact panels or for plants using integrated panels.



Metal housing.

Front cover, can be opened.
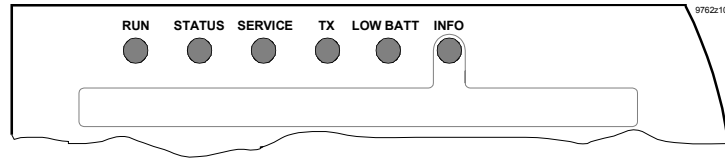
LED displays.

Plug-in terminal blocks.
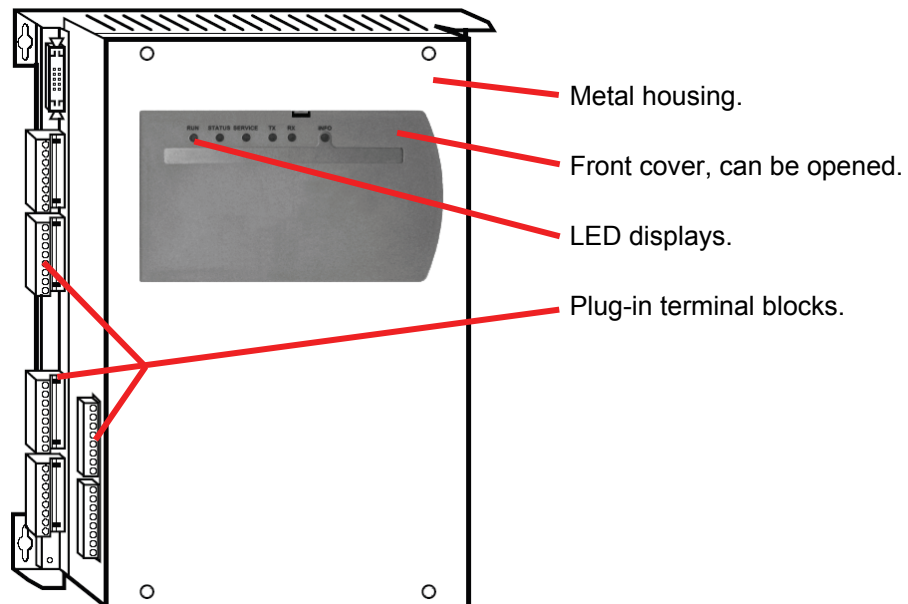
**Terminal blocks**

Terminal block can be plugged in to ease field device connection.
Existing INTEGRAL periphery can be plugged in at the same place as before.

Note     Older INTEGRAL systems, where the terminal blocks do not fit:
Use the terminal blocks delivered with the PXC-NRUF.

**LED displays**



| LED | Color | Activity | Function |
|---|---|---|---|
| RUN | Green | Continuously off | No supply present. |
| | | Continuously on | Supply present (LED controlled by SW). |
| STATUS | Red | Continuously off | Normal condition |
| | | Continuously on | Hardware error recognized during self test |
| | | | or automation station in a state of "coma". |
| | | Flashes quickly | There is no valid firmware present. |
| SERVICE | Red | Continuously off | LONWORKS node is configured. |
| | | Flashing | LONWORKS node is not configured. |
| | | Flashes in wink | Physical identification of the automation |
| | | command rhythm * | upon receipt of the wink command. |
| | | Continuously on | Neuron chip faulty or service button is |
| | | | pushed in. |
| TX | Yellow | Flashing | Data traffic on LONWORKS bus. |
| LOW BATT | Red | Continuously off | Batteries OK (LED controlled by SW). |
| | | Continuously on | Replace one or both batteries. |
| INFO | Red | | Freely programmable. |

* Wink command rhythm:
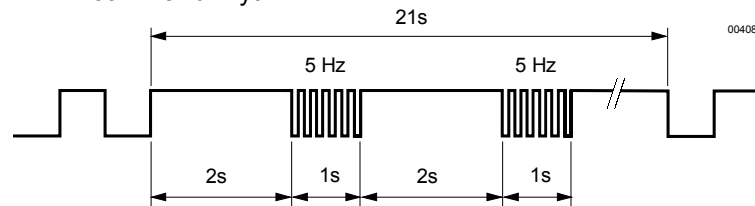


**Service button**    Identification of the automation station on the LONWORKS network:
refer to "commissioning".

## Disposal



The device is classified as waste electronic equipment in terms of the European Directive 2002/96/EC (WEEE) and should not be disposed of as unsorted municipal waste.
The relevant national legal rules are to be adhered to.
Regarding disposal, use the systems setup for collecting electronic waste.
Observe all local and applicable laws.

## Mounting notes

The device can be attached directly to any surface with four screws, e.g. on the panel's base plate.
Plug-in screw terminal blocks are provided to connect field devices, power and bus wiring. The other interfaces are connected using the quick plug-in connections.

Do not open the device. All service functions are accessible via the lid.

📖                         **The front cover may only be opened by instructed service staff!**

                          Comply with country-specific safety regulations and corresponding safety provi-
                          sions to prevent personal injury or damage to property.

**Download plant**        The DESIGO TOOLSET / XWORKS plus is used to download the plant operating
**operating programs**    program via the network (BACnet/LonTalk).
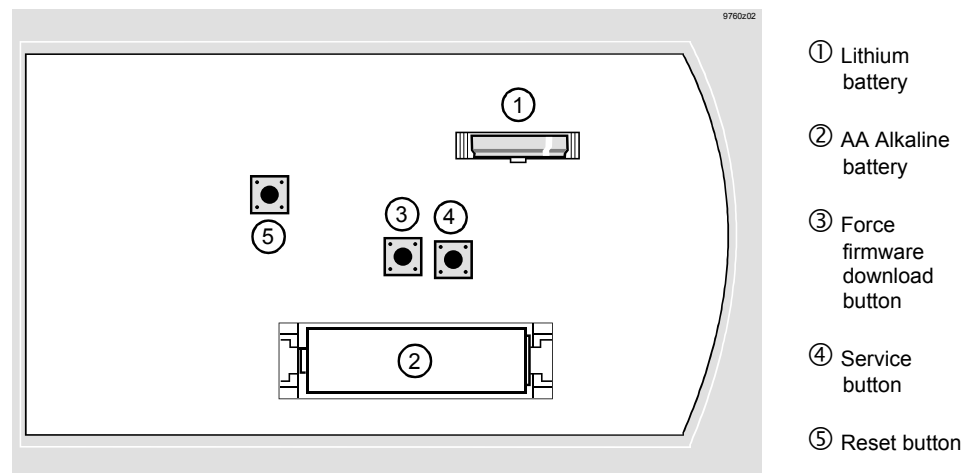
**Set parameters and**    Use DESIGO TOOLSET / XWORKS plus to set control parameters and
**configurations**        configuration data. You can also edit data visible in the network using the PXM20
                          operator unit.

**Wiring tests**          Field devices and wiring can be tested with the operating unit PXM20 as soon as
                          power is connected. There for loading the plant operating programs is not needed.

**Network connections**   The DESIGO TOOLSET / XWORKS plus configures network addresses. For
                          unique identification in the network (BACnet/LonTalk), press the **service button** or
                          send a wink command to the corresponding automation station (service LED
                          flashes).



① Lithium battery
② AA Alkaline battery
③ Force firmware download button
④ Service button
⑤ Reset button

**Firmware download**     The current D-MAP program is deleted from FLASH when the **Firmware**
                          **Download button** is pressed during restart (reset).
                          The automation station waits a moment for the signal to activate the FWLoaders
                          and then starts the automation station.

**Restart**               Press the **reset button** to force a restart.

**Battery effective life**

**Database information** is stored in **SDRAM** memory, that is supported by a battery (**alkaline type AA**). This avoids costly reloads of programs and databases following a longer power outage (up to ca. 1 month).
The unused effective life for alkaline batteries is at least four years.
The remaining life under load is just a few days following a "battery low" event.

The **real time clock** is supported by a **lithium battery** with an effective life of at least 10 years.

The LOW BATT LED is lit for insufficient load of one of the two batteries and the automation station automatically sends a system event and a device alarm.

**Replace battery**

Open the blue lid to replace the batteries. You can take out the batteries for as long as you want, when the unit is powered.

(STOP)  **Caution!**

**To prevent damage to the hardware from electrostatic discharge (ESD), use a grounded wristband to change batteries.**
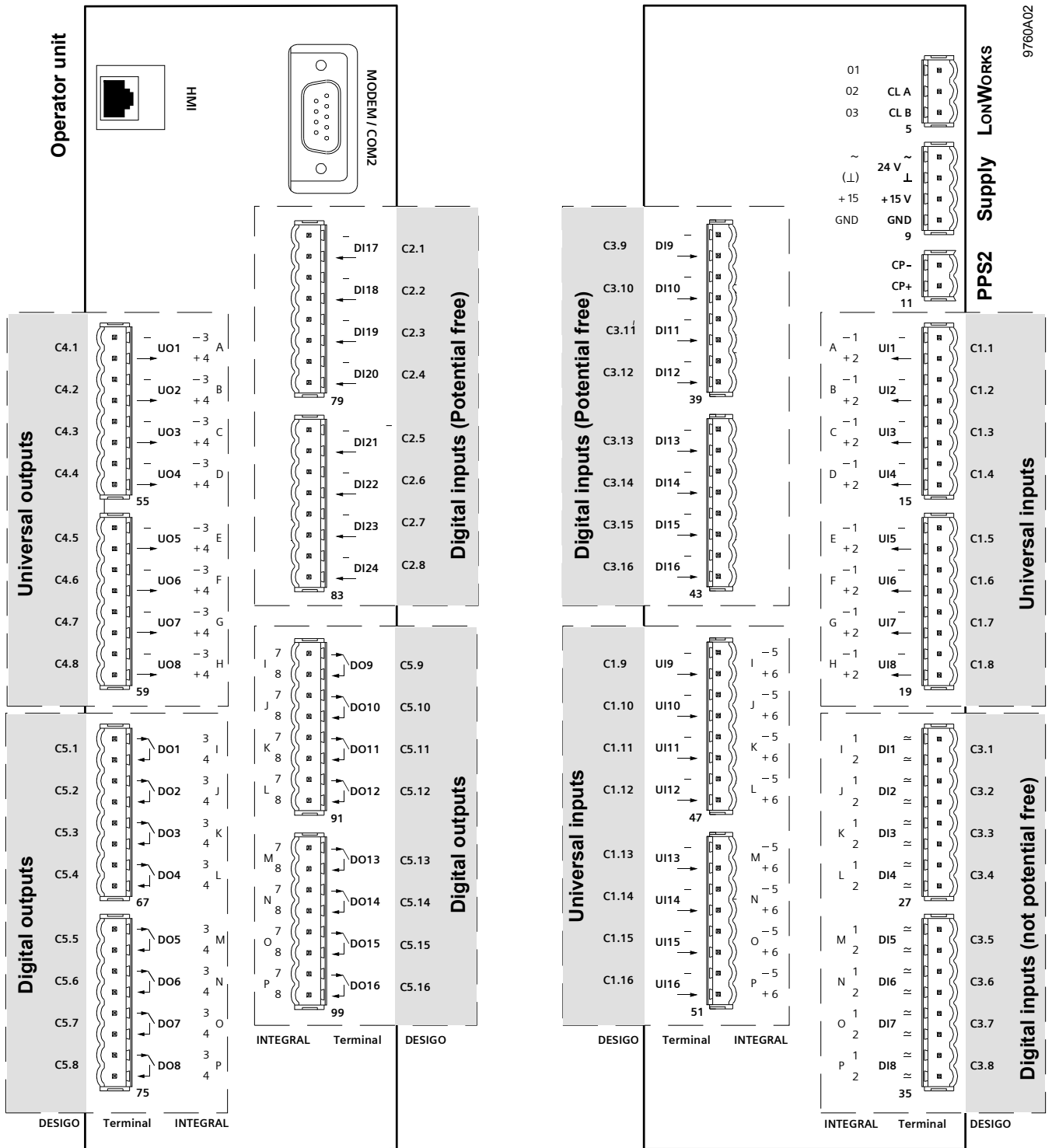
**Firmware upgrades**

Firmware and operating system are stored in non-volatile manner (on Flash ROM). It is easy to update the Flash ROM memory for the plant when new firmware versions become available.

**Technical data**

| General device data | Operating voltage | SELV / PELV AC/DC 24 V ± 20 %. |
|---|---|---|
| | Rated voltage | AC/DC 24 V |
| | Frequency | 0 / 50/60 Hz. |
| | Power consumption | max. 26 VA. |
| | Internal fuse | thermal, automated reset. |

| Functional data | Processor | Motorola PPC (MPC 885). |
|---|---|---|
| | Storage location FLASH | 16 MB. |
| | RAM | 64 MB. |
| | Data backup during power outage | |
| | Applications / Parameters (FLASH) | > 10 years. |
| | Runtime data | Unused: 4 years. |
| | (buffered by AA alkaline, | Typically 1 month in case of supply |
| | can be replaced on the plant) | failure (grid or AC 24 V) |
| | Realtime clock | 10 years. |
| | (buffered by Lithium battery, | |
| | can be replaced on the plant). | |
| | Precision category | 0.5. |
| | Sampling cycle | max. 1 second. |

| Universal inputs UI 1 ... 16 | Can be configured in software | |
|---|---|---|
| | A/D resolution (analog in) | 16 bit. |
| | Measured value inputs | |
| | Area | 0 ... 11.0 V. |
| | Input resistance | 100 kΩ against –. |
| | Sensor inputs | |
| | Temperature sensor | |
| | LG-Ni 1000, NI 1000, Pt 1000, T1 | Measuring range |
| | | – 50 ... 150 °C |
| | Sensor electricity (pulsed) | approx. 1.5 mA (peak). |
| | Resolution | 0.2 K. |
| | Meas. error at 25 °C (Ni 1000, Pt 1000) | max. 0.2 K (excluding wire + sensor). |
| | Measuring error at 25 °C (T1) | max. 1.0 K (excluding wire + sensor). |
| | Signal input | |
| | Contact voltage | DC 20 ... 25 V. |
| | Contact electricity (pulsed) | 7 mA (peak). |
| | Contact resistance | Max. 200 Ω (closed). |
| | Insulation resistance | Min. 50 kΩ (open). |

| Digital inputs DI 1 ... 8 Not potential free. | Electrically isolated | From system and from one another |
|---|---|---|
| | Area. | Low     < AC/DC 6V. |
| | | High     = AC/DC 15.. 42 V ± 10%. |
| | Interior resistance. | Ri = 4kΩ. |

| Digital inputs DI 9 ... 16 | Contact voltage. | DC 20 ... 25 V. |
|---|---|---|
| | Contact current (continuous). | 7 mA. |
| | Contact resistance. | Max. 200 Ω (closed). |
| | Insulation resistance. | Min. 50 kΩ (open). |

| Digital inputs DI 17 ... 24 with counting function | As DI 9 ... 16; additionally counting function: | |
| --- | --- | --- |
| | Counter frequency (symmetrical) | Max. 25 Hz. |
| | Min. closing/opening time incl. bouncing | 20 ms |
| | Max. bounce time | 10 ms |
| | Counter memory | 8 Bit (0...255 $\rightarrow$ max. cycle time 10 s at 25 Hz) |
| | *Counter inputs must be shielded, if they count faster than 1 Hz and are routed with analog inputs in the same trunking for more than 10 m.* | |

| Universal outputs UO 1 ... 8 | Can be configured in software | |
| --- | --- | --- |
| | D/A resolution (analog out) | 10 bit. |
| | Modulating | |
| | Output voltage range | 0 ... 11.0 V. |
| | Output current | Max. 1.5 mA source, max. 1.5 mA reduction. |
| | Digital | |
| | Output voltage | 0 / 10V |
| | Output current | 1.5 mA |

| ⚠ Relay outputs DO 1 ... 16 | Number of switching outputs | 16 (changeover contact) |
| --- | --- | --- |
| | External fuse protection for incoming cable | |
| | – Slow blow fusible link | Max. 10 A |
| | – Circuit breaker | Max. 13 A |
| | Circuit breaker tripping characteristic | Type B, C or D to EN 60898 |
| | Contact data | |
| | AC/DC switching voltage | max. AC 42 V / DC 42 V min. AC / DC 12 V |
| | AC current rating | Max. 4 A resistive, 3 A inductive Min. 4 mA at AC 42 V Min. 10 mA at AC 12 V |
| | Current on make (AC) | Max. 10 A (1 s) |
| | DC current rating | Max. 2 A resistive at DC 42 V Min. 10 mA resistive at DC 12V |
| | Response / dropout time | 7 ms / 3 ms typical |
| | Service life of contact for AC 42 V (guide values) | |
| | With 0.1 A resistive | $1 \times 10^7$ switching operations |
| | With 0.5 A resistive | $3 \times 10^6$ switching operations |
| | With 4.0 A resistive (N/O) | $2 \times 10^5$ switching operations |
| | Reduction factor with inductive load | 0.85 (cos phi = 0.6) |
| | Insulation resistance: Basic insulation between relay outputs and system electronics | AC 2500 V, to EN 60730-1 |

| Interface room units. | Interface type | PPS2. |
| --- | --- | --- |
| | Feed category | 4 |
| | Baud rate PPS2 | 4.8 kbps. |
| Interface LONWORKS bus. (screw terminal). | LONWORKS FTT transceiver | |
| | Network | TP/FT-10. |
| | Baud rate | 78 kbps. |
| | Protocol | BACnet. |
| Local communication (HMI, RJ45). | PXM10 (RS-232). | |
| | PXM20 (BACnet/LonTalk) | |
| | • *One operator unit PXM10 or PXM 20 can be connected per automation station.* | |
| | • *LONWORKS bus instead of the RS 485 bus used in INTEGRAL plants.* | |

| | | |
|---|---|---|
| Plug-in screw terminals | Power supply and signals | Solid or stranded wire 0.25...2.5 mm$^2$ or 2 x 1.5 mm$^2$. |
| | LonWorks bus | Solid or stranded wire 2 x 1.0 mm$^2$. |
| Simply cable lengths, and cable types | Universal inputs UI 1…16 | Max. 100m with A = 1 mm$^2$. |
| | Digital inputs DI 1…24 | Max. 100 m with diameter 0.6 mm. |
| | Universal outputs UO 1…8 | Max. 100m with A = 1.5 mm$^2$. |
| | Relay outputs DO 1…16 | Depends on load and local regulations. |
| | Interface room units PPS2 | Max. 125 m with A = 1.0 mm$^2$. |
| |    Cable type | 2-core, twisted pairs, unshielded. |
| |    Capacity | max. 56 nF/km. |
| | Interface cable LONWORKS bus | See installation guide PX, CA110396. |
| |    Cable type | ConCab or CAT5. |
| | Connecting cable PXM10 | Max. 3 m. |

| | | |
|---|---|---|
| Classification to EN 60730 | Automatic action | Type 1 |
| | Pollution degree | 2 |
| | Protection class | III |
| | | (Device also suitable for use in protection class II equipment) |
| Housing type. | Protection as per EN 60529 | IP 20. |

| | | |
|---|---|---|
| Ambient conditions | Operation | Class 3K5 as per IEC 60721. |
| |    Temperature | 0 ... 50 °C. |
| |    Humidity | 5..95 % r.h. (no condensation) |
| | Transportation | Class 2K3 per IEC 60721. |
| |    Temperature | – 25 ... 70 °C. |
| |    Humidity | 5 … 95 % r.h. (no condensation) |

| | | |
|---|---|---|
| Standards, guidelines and approvals | Product standard | |
| |    Automatic electrical controls devices for household and similar use | EN 60730-1. |
| |    Special requirements for energy controllers | EN 60730-2-9 |
| | Electromagnetic compatibility | |
| |    Immunity (industry) | EN 60730-1 |
| |    Emissions (domestic) | EN 60730-1 |
| | **CE** conformity | |
| |    Electromagnetic compatibility | 2004/108/EC |
| | C-Tick compliance per Australian EMC | Radio Communications Act 1992 |
| |    Framework Radio Emission Standard | AS/NZS CISPR11 |

| | | |
|---|---|---|
| Dimensions | Refer to dimensions | |
| Weight | *Excl. packaging* | *packaged.* |
| | 2.960 kg | 3.130 kg |

## Connection diagrams



**Operator unit**

HMI

MODEM / COM2

| | | LonWorks |
|---|---|---|
| 01 | | |
| 02 | CL A | |
| 03 | CL B | |
| | 5 | |

| | | Supply |
|---|---|---|
| ~ (⊥) | 24 V ~ ⊥ | |
| + 15 | + 15 V | |
| GND | GND | |
| | 9 | |

| | | PPS2 |
|---|---|---|
| CP– | | |
| CP+ | | |
| | 11 | |

**Universal outputs**

| C4.1 | UO1 | – 3 / + 4 | A |
| C4.2 | UO2 | – 3 / + 4 | B |
| C4.3 | UO3 | – 3 / + 4 | C |
| C4.4 | UO4 | – 3 / + 4 | D |
| | 55 | | |
| C4.5 | UO5 | – 3 / + 4 | E |
| C4.6 | UO6 | – 3 / + 4 | F |
| C4.7 | UO7 | – 3 / + 4 | G |
| C4.8 | UO8 | – 3 / + 4 | H |
| | 59 | | |

**Digital inputs (Potential free)**

| DI17 | C2.1 |
| DI18 | C2.2 |
| DI19 | C2.3 |
| DI20 | C2.4 |
| 79 | |
| DI21 | C2.5 |
| DI22 | C2.6 |
| DI23 | C2.7 |
| DI24 | C2.8 |
| 83 | |

**Digital inputs (Potential free)**

| C3.9 | DI9 |
| C3.10 | DI10 |
| C3.11 | DI11 |
| C3.12 | DI12 |
| | 39 |
| C3.13 | DI13 |
| C3.14 | DI14 |
| C3.15 | DI15 |
| C3.16 | DI16 |
| | 43 |

**Universal inputs**

| A | – 1 / + 2 | UI1 | C1.1 |
| B | – 1 / + 2 | UI2 | C1.2 |
| C | – 1 / + 2 | UI3 | C1.3 |
| D | – 1 / + 2 | UI4 | C1.4 |
| | 15 | | |
| E | – 1 / + 2 | UI5 | C1.5 |
| F | – 1 / + 2 | UI6 | C1.6 |
| G | – 1 / + 2 | UI7 | C1.7 |
| H | – 1 / + 2 | UI8 | C1.8 |
| | 19 | | |

**Digital outputs**

| C5.1 | DO1 | 3 / 4 | I |
| C5.2 | DO2 | 3 / 4 | J |
| C5.3 | DO3 | 3 / 4 | K |
| C5.4 | DO4 | 3 / 4 | L |
| | 67 | | |
| C5.5 | DO5 | 3 / 4 | M |
| C5.6 | DO6 | 3 / 4 | N |
| C5.7 | DO7 | 3 / 4 | O |
| C5.8 | DO8 | 3 / 4 | P |
| | 75 | | |

**Digital outputs**

| I 7 / 8 | DO9 | C5.9 |
| J 7 / 8 | DO10 | C5.10 |
| K 7 / 8 | DO11 | C5.11 |
| L 7 / 8 | DO12 | C5.12 |
| | 91 | |
| M 7 / 8 | DO13 | C5.13 |
| N 7 / 8 | DO14 | C5.14 |
| O 7 / 8 | DO15 | C5.15 |
| P 7 / 8 | DO16 | C5.16 |
| | 99 | |

**Universal inputs**

| C1.9 | UI9 | I – 5 / + 6 |
| C1.10 | UI10 | J – 5 / + 6 |
| C1.11 | UI11 | K – 5 / + 6 |
| C1.12 | UI12 | L – 5 / + 6 |
| | 47 | |
| C1.13 | UI13 | M – 5 / + 6 |
| C1.14 | UI14 | N – 5 / + 6 |
| C1.15 | UI15 | O – 5 / + 6 |
| C1.16 | UI16 | P – 5 / + 6 |
| | 51 | |

**Digital inputs (not potential free)**

| I 1 / 2 | DI1 | C3.1 |
| J 1 / 2 | DI2 | C3.2 |
| K 1 / 2 | DI3 | C3.3 |
| L 1 / 2 | DI4 | C3.4 |
| | 27 | |
| M 1 / 2 | DI5 | C3.5 |
| N 1 / 2 | DI6 | C3.6 |
| O 1 / 2 | DI7 | C3.7 |
| P 1 / 2 | DI8 | C3.8 |
| | 35 | |

DESIGO  Terminal  INTEGRAL

INTEGRAL  Terminal  DESIGO

DESIGO  Terminal  INTEGRAL

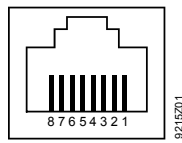INTEGRAL  Terminal  DESIGO

9760A02

**STOP** **Caution!**
- **Observe the technical data for the relay outputs.**
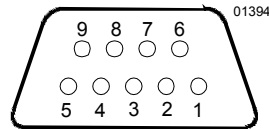- **Local installation regulations must be observed.**

**"HMI" socket (LONWORKS)**

| Pin | description. | Pin | description. |
|-----|-------------|-----|-------------|
| 1. | LONWORKS Data A (CLA). | 5. | Unoccupied. |
| 2. | LONWORKS Data B (CLB). | 6. | Connected to 8. |
| 3. | GND. | 7. | COM1 / TxD. |
| 4. | Plus 24V. | 8. | COM1 / RxD. |

87654321  9215Z01

**Interface Modem / COM2**

9 8 7 6
5 4 3 2 1  01394

| Pin | Abbr. | Description |
|-----|-------|-------------|
| 1 | DCD | data carrier detect |
| 2 | RXD | received data |
| 3 | TXD | transmit data |
| 4 | DTR | data terminal ready |
| 5 | GND | signal ground |
| 6 | DSR | data set ready |
| 7 | RTS | request to send |
| 8 | CTS | clear to send |
| 9 | NC | not connected |

## Connect field devices

| | | |
|---|---|---|
| (STOP) | **Note!** | This is a device using the 4-wire principle. System ground (G0) and measuring ground (– or GND) are electrically isolated.<br>For active field devices using **4-wire** technology, this connection is in the field device.<br>For active field devices using **3-wire** technology, the connection must be established separately:<br>– ① Either at the terminal on the field device.<br>– ② Or in existing plants, using only 3 wires: at the automation station between one of the terminals (–) and G0. |

### A) Field device supply of system transformer

**Compulsory specification for transformer**   Type   Safety isolating transformer AC 230 V/AC 24 V to EN 61 558
Fusing AC 24 V   **Max. 10A slow-blow** (Extra-low voltage fuse)
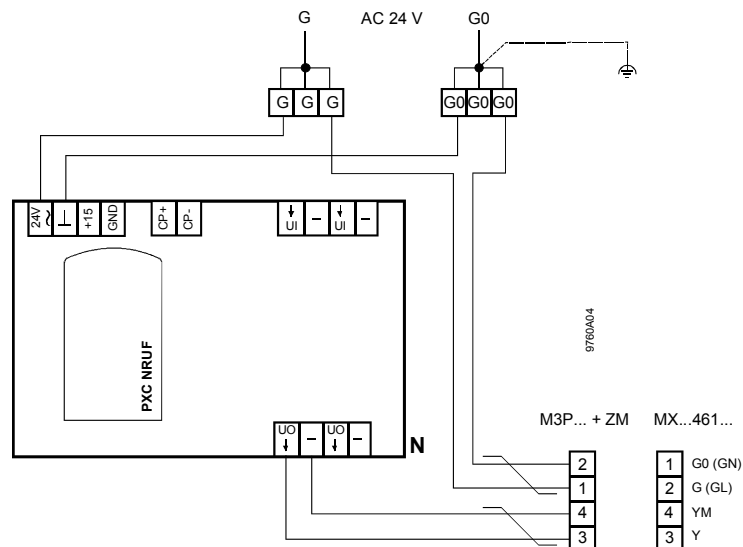**Max. 13 A circuit breaker**

**Counter inputs**   *Counter inputs must be shielded, if they count faster than 1 Hz and are laid with more than 10 meters using analog inputs in the same cable duct.*
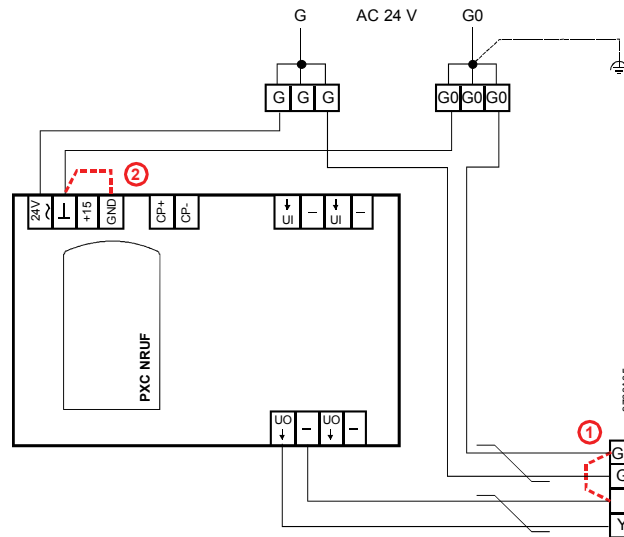
**Passive sensor**
(e.g. QAM... , Ni 1000)

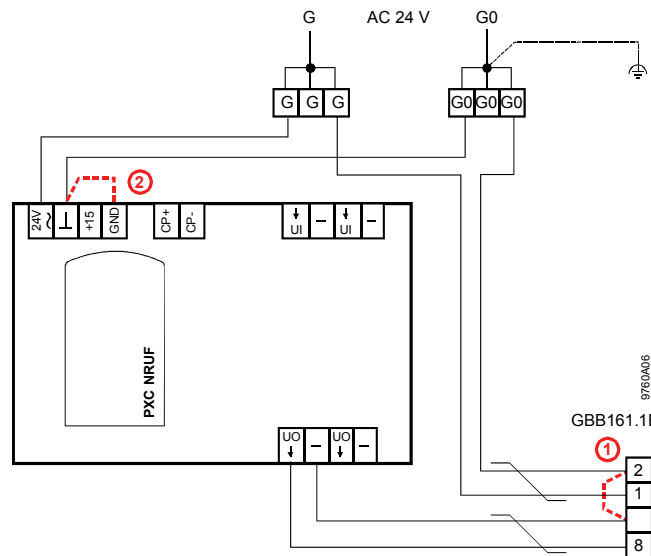**Active sensor**
(e.g. QFM... , humidity)
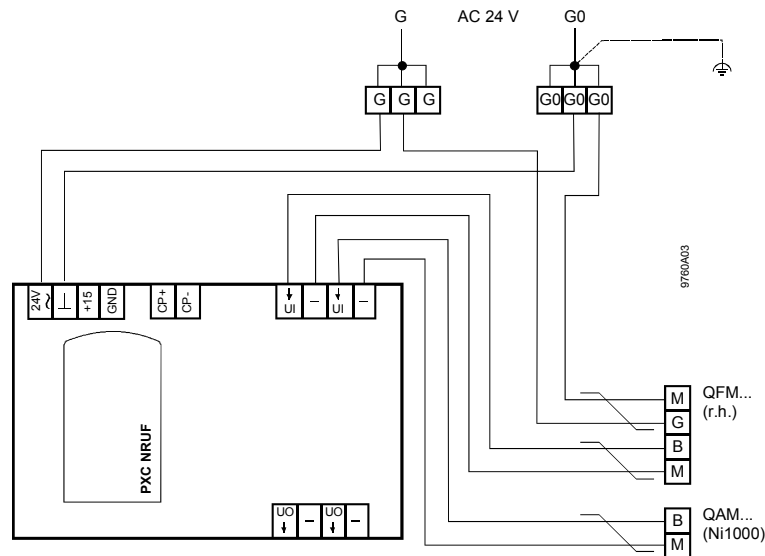


**Magnetic valve**s
(e.g. M3P... + ZM
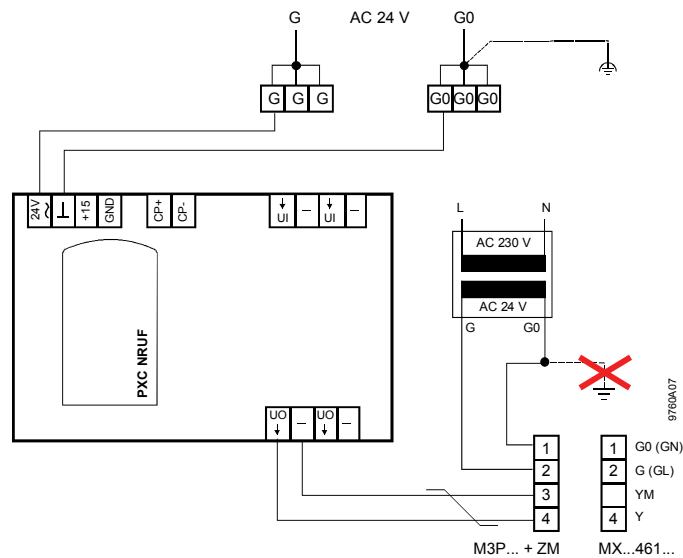or MX...461...).

**Motor valves**



**Damper actuators**
(e.g. GBB161.1E).



## B) Field device supply of separate transformers
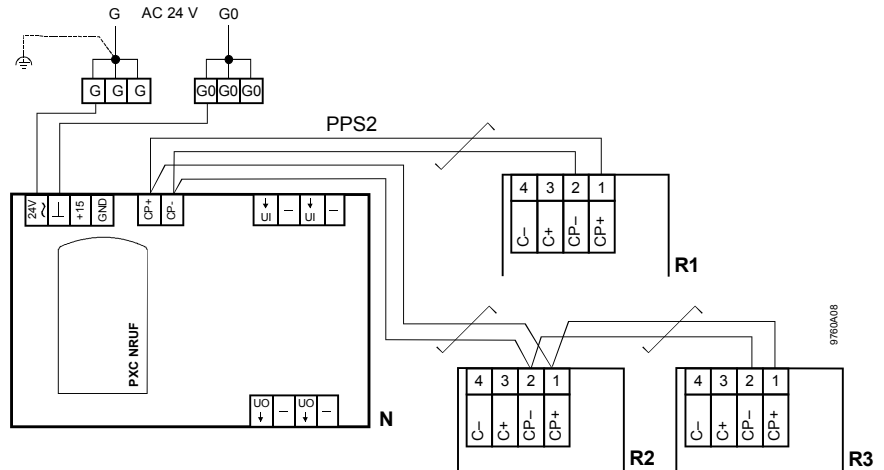
**Magnetic valve**s
(e.g. M3P... + ZM
or MX...461...).



**Note!**

**Do NOT ground separate transformer**

14 / 16

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CM2N9760en_04
16 Nov 2009

## C) Connect room units

N        Automation Station.

R...     Max. 5 room units
(parallel).

PPS2
- Twisted pair bus cable.
- Interchangeable polarity
- Wire length, refer to "Technical data".



Notes
- Room units are connected in parallel (maximal 5).
- Must be addressed using a jumper to distinguish (address plug on the circuit board). The address factory set to 1.

## Dimensions

All dimensions in mm

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Subject to change

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CM2N9760en_04
16 Nov 2009