UNIGYR®

Universal Process Unit PRU1...

Universal Process Units to regulate, control and supervise building services plants. Configurable user program cards that apply the function block technique. Interface with the plant process via separate I/O modules and the process bus. (P-bus)

Local display and operation via project-related printed and optically encoded operating cards.

Options and extensions using the cards are provided

- **to communicate via remote operation between several Universal Process Units and via «UNIGYR Insight» * using PROFIBUS (building bus) or a modem on the public telephone network**
- **for RMC (Single Room Management Control) applications; Universal Process Unit as a MONOGYR central unit,**
- **to connect bus-capable SIGMAGYR heating controllers to UNIGYR, with a common operating platform.**

Note

* «UNIGYR Insight» is a PC program package to communicate with one or several UNIGYR Process Units. The program transfers the Process Units' operation and display functions to the PC level and visualizes the plant process.

«UNIGYR Insight» facilitates remote operation and supervision of building services plants that are controlled and regulated by UNIGYR Process Units.

Use

Together with the I/O modules of the UNIGYR system, the PRU1... Universal Process Units are used to regulate, control and supervise building services plants with emphasis on HVAC applications.

Depending on the requirements and the plant size, the following choices are available:
- Process Unit in stand-alone mode
- Process Unit in a communication network
  - with other Process Units and/or
  - with «UNIGYR Insight»
  - via the public telephone network using a modem

Functions

The Universal Process Unit offers the following major functions:
- process functions
- operation and display
- communication with networked units

Separate user application program cards in the form of function blocks comprise the plant regulation, control and supervision functions.
The function blocks needed to meet specific plant requirements are interlinked in accordance with their actions and hierarchy as well as the way in which they are called up.
This «plant configuration» is performed using the «UNIGYR Design» PC program tool.

Cards with user programs, some of them combined, which apply to different plant sizes exist for:
- heating
- ventilating/air conditioning
- individual room temperature control

The scope of functions provided by these program cards is summarized in the respective data sheets (refer to «Equipment combinations»).

Function blocks that are programmed on cards are described in detail in the associated «Function manual» Z8281.

Type summary

Universal Process Unit for max. 32 load units	**PRU1.32**
Universal Process Unit for max. 64 load units	**PRU1.64**

Delivery

The Process Units do not contain program cards; Please place a separate order for the required type of card.
The card sets contain all additional terminal bases for communication and RMC applications (refer to «Equipment combinations»).
The Process Unit is delivered for flush panel mounting. For wall mounting inside a control panel, order the necessary baseplate as an additional item (refer to «Accessories»).

Accessories

Baseplate for control panel mounting (wall mounting)	**PRM1.1W**
Service operating cards (German)	**PUP3.9de**
Service operating cards (English)	**PUP3.9en**
Operating card holder*	**PUP1.2**
Blank operating card forms*	**PUP2.1**

* Used to produce the plant specific operating card set

Equipment combinations

Various cards are available for the PRU1... Process Units. A program card is always required; the communication cards represent extensions.

Card	Type reference	Data sheet
HVAC program cards	**PAA1...**	8261
RMC program cards	**PAA1...**	8261
Communication set (PROFIBUS)	**PAK1.1**...	8271
RMC bus set	**PAK1.0M...**	8277
H-bus set	**PAK1.0H55**	8276
PC cable	**PUW1.1**	8961

I/O modules	Unit	Type	Data sheet
	I/O-modules with basic functions for measuring, counting, signalling, switching, positioning	**PTM1...**	8111...8171
	I/O-compact units with several basic functions within one housing	**PTK1...**	818...
	Interface module to connect units with the L&G bus	**PTM5...**	866...

Technical design

Module supply

The electronic circuits of the I/O modules are supplied from the Process Unit with DC 24 V via the P-bus line (PU) and the system neutral (G0) of the I/O bar's AC 24 V system supply.
However, to relieve the Process Unit, some modules are supplied separately by the AC 24 V system supply.
Power consumption depends on the type of module and is expressed in load units.
The total of load units determines the type of Process Unit to be used.
A load table is available in data sheet 8102, «Basic Data of I/O Module System» under «Engineering notes».

Data traffic between Process Unit and I/O modules (process bus)

Data traffic between the I/O modules and the Universal Process Unit takes place via the process bus. The Process Unit sends data in the form of addressed telegrams, in digital form, to the I/O modules and calls up data from the modules in the plant in a similar manner.
All telegrams are transmitted serially within a cycle time of 0.5 seconds. Only raw values are transmitted, that is, plain numbers with no units, data type, and arrangement within the scale range.
Data traffic is controlled by the Process Unit which is the master for actively sending data to the slave I/O modules as well as fetching data from the slave I/O modules.

The process bus consists of three lines:
– the data line (PD) to transmit the signal telegrams
– the clock line (PC) to synchronize the signal telegrams
– the reference line (PU) to carry the reference voltage for the data and clock lines, and the I/O module power supply

Data sheet 8020 contains a detailed description of bus structure, signal levels, telegram structure and data transmission formats.

Signal processing in the Process Unit

The signals are processed by a microprocessor which is supported by a special integrated switching function that takes over the peripheral functions. This FEH (Front End Hardware) Controller provides the following functions:
– system time base
– watchdog (supervision of microprocessor)
– transmitting P-bus telegrams
– decoding optical codes on the operating card pages
– controlling write access to EEPROM (programmable memory)
– monitoring the buffer battery condition

The regulator function blocks of the Process Unit operate as DDC units.

Communication interfaces	For communication, the Universal Process Unit is equipped with two interfaces:

For communication, the Universal Process Unit is equipped with two interfaces:
- Communication interface for PROFIBUS (building bus):
  – for the data network with other locally installed Process Units
  – to connect to a PC using the «UNIGYR Insight» program package, either locally or remotely, via the telephone network using a modem

  This interface consists of a communication card, a communication submodule, and an additional rear-mounted terminal base. The communication cards are options and do not constitute part of the basic standard unit.

- Local PC interface:
  – to connect the «UNIGYR Design» configuration tool which is used for configuring the specific user program in the Process Unit
  – for commissioning and diagnosis with the help of the «UNIGYR Insight» program

  This interface (V.24/RS-232) is incorporated in the Process Unit as a standard feature. It is accessed via a connector in the unit's front using the PC cable.

System reliability

In the event the AC 24 V system supply fails (power failure), P-bus traffic is interrupted. The microprocessor carries out a "save routine", which performs a defined down sequencing of the system's functions within approximately 20 ms. The WATCHDOG then generates a RESET state so that, after power restoration (power on), a defined restart sequence is initiated.

The Universal Process Unit has data backup capability which maintains the following functions if there is a power failure:
– operating card page identification
– time of day
– watchdog operation
These functions are battery buffered through a card containing three batteries.
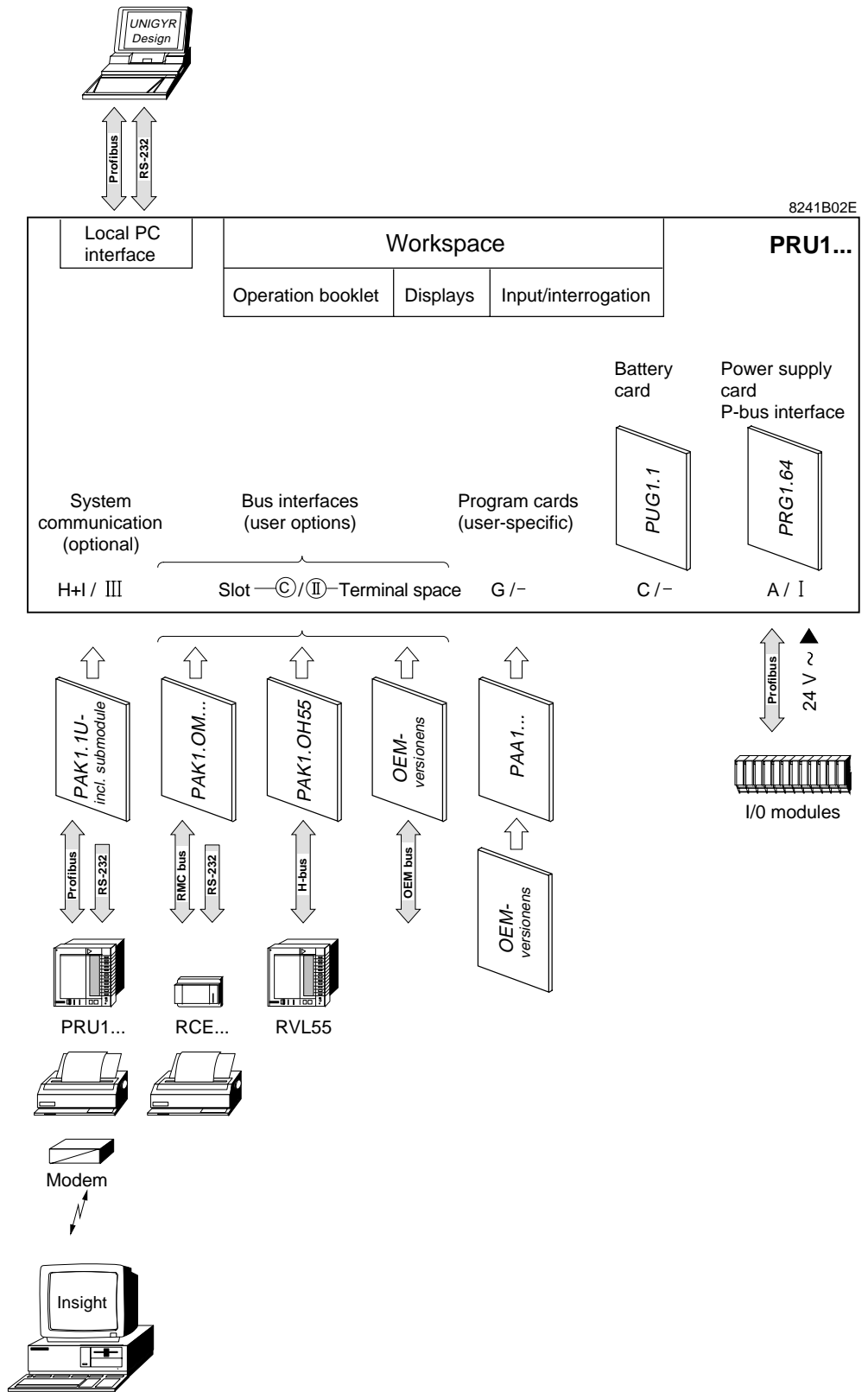
The way in which the I/O modules associated with the Universal Process Unit respond on system supply failure or P-bus telegram error is described in the respective individual data sheets under «Technical features».

Operating card page identification

The pages of the operating card are identified and read in the cassette through optically encoded black-and-white patterns.
These individual code patterns are printed on prepared operating cards using a printer or plotter. The finished booklet, when inserted in the cassette, is read with photo-reflex sensors. The code patterns on the top page or on a single page are read serially.
Page insertion is not required with a constant speed and the reading process can be interrupted for any length of time.

Universal process unit
with card and function
variants

UNIGYR
Design

Profibus | RS-232

8241B02E

Local PC interface	Workspace			PRU1...
	Operation booklet	Displays	Input/interrogation	

Battery card

Power supply card
P-bus interface

System communication (optional)	Bus interfaces (user options)	Program cards (user-specific)	PUG1.1	PRG1.64
H+I / Ⅲ	Slot —Ⓒ/Ⅱ—Terminal space	G /–	C /–	A / Ⅰ

PAK1.1U- incl. submodule

PAK1.OM...

PAK1.OH55

OEM- versionens

PAA1...

OEM- versionens

Profibus | RS-232

RMC bus | RS-232

H-bus

OEM bus

Profibus

24 V ~

PRU1...   RCE...   RVL55

I/0 modules

Modem

Insight

PRU1...   Universal Process Unit
PRG1.64   Power supply card (standard)
PUG1.1   Battery card (standard)
PAA1...   Program cards with plant-specific configurable function blocks,
                 OEM versions with customized function blocks
PAK1.1U...   Communication set (optional card)
PAK1.0M...   RMC bus set (optional card) for individual room controllers and switching devices
PAK1.0H55   H-bus set (optional card) for the connection of heating controllers,
                 OEM bus set for customized bus systems

Note:

Plug-in space: slot in the Process Unit
Terminal space: position of terminal block on the housing for the external connections
The cards with bus interfaces (RMS bus, H-bus, and OEM bus set) are
inserted in place of the battery card (plug-in space C).

Mechanical design

3D-Illustration
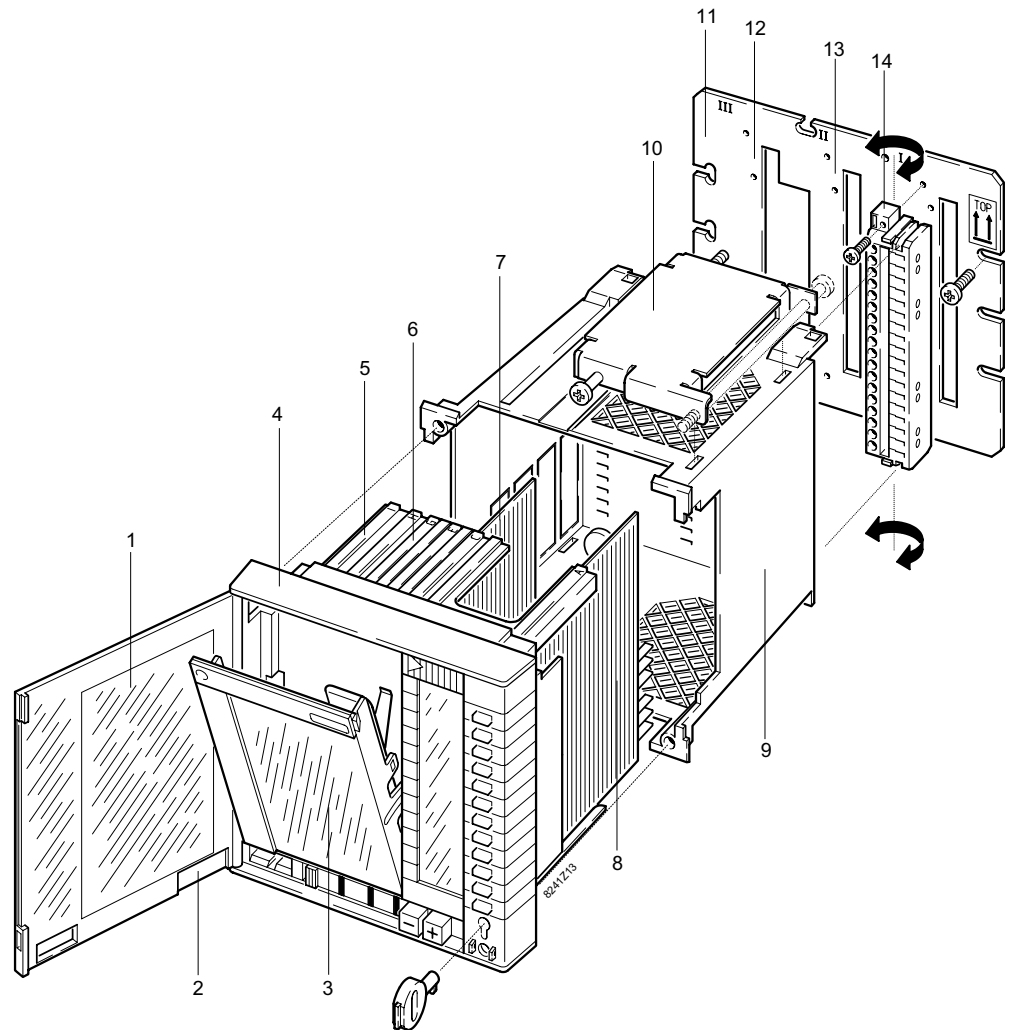
1	Transparent front cover with grooves to insert a cover card
2	Removable insert for tool connection with a closed cover
3	Swing-out cassette
4	Electronics unit
5	Plug-in location «I» for communication card set PAK1.U... (optional)
6	Plug-in location «G» for program card PAA1...
7	Battery card or optional bus card PAK 1... (with buffer battery), plug-in location «C»
8	Power supply card with P-bus connection PRG1.64, plug-in location «A»
9	Housing
10	Fixing brackets for housing, on top and bottom
11	Baseplate PRM1.1W for wall mounting (separate accessory)
12	Terminal base III for communication card (optional)
13	Terminal base II for bus card (optional)
14	Terminal base for power supply, terminal base I
	(Terminal bases are turned by 180° for panel mounting=delivered state)

Mounting

Two fixing brackets are supplied for flush panel mounting (requiring a standard 138 x 138 mm cut-out to DIN 43700). A baseplate for wall mounting inside the control panel must be ordered separately.

Housing

Plastic housing with a rear snap-on terminal base for wiring the system supply and process bus lines. There are spaces for two additional terminal bases which mate with the contacts of optional cards.
Mechanical coding of the various terminal bases and their related locations on the housing eliminate the possibility of false wiring.

Electronics unit and cards

The slide-in electronics unit consists of a front panel with operating and display elements as well as a transparent lockable plastic cover. This unit slides into the housing and is secured with two screws. Once in place, the unit can be sealed against unauthorized removal. On the back of the front panel, there is a main printed circuit board for up to five cards.

The power supply and battery card are supplied as standard, but the program card depends on the application and must be fitted at the latest prior to commissioning. The remaining locations are for optional cards or extensions (refer to «Equipment combinations»).

Operating and display elements

The unit's front panel contains all operating and display elements. The largest portion is taken up by the swing-out cassette into which the operating card (with optically encoded pages) is inserted. A large LCD window is located to the right of the cassette and, to the right of the LCD, there is a vertical column with 12 buttons that are arranged to functionally correspond with the lines of data in the operating card and LCD.

Front view
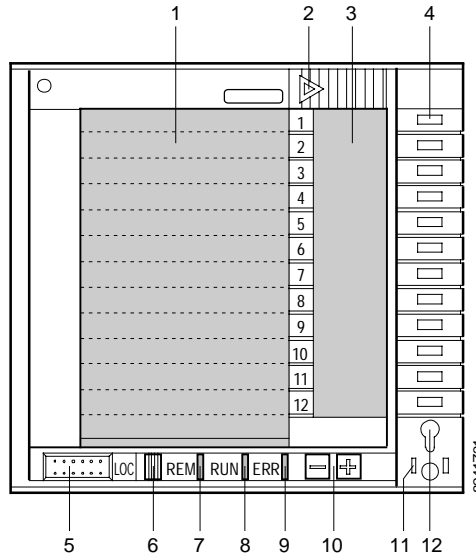
1	Cassette for operation cards
2	Push-button to open the cassette
3	12-line, 4-character LCD window
4	Operating buttons to call up and save parameters
5	Socket for PC connecting cable with PC-Tool interface V.24/V.28 and PROFIBUS interface
6	Changeover switch for local/remote operation (via PROFIBUS)
7	Indicator for data traffic via PROFIBUS
8	Operation indicator for Process Unit
9	Common fault indicator
10	+/- buttons for changing parameters and settings
11	Fixtures for sealing the Process Unit
12	Keyhole for opening the front cover

LOCAL/REMOTE switch

- LOCAL: Operation from an external Universal Process Unit or via a PC with the «UNIGYR Insight» program is locked, but access to an external PRU's data and its remote operation is still possible
- REMOTE: Operation with an external PRU or via the PC is enabled

The LOCAL/REMOTE switch only applies to access via PROFIBUS. The switch has no influence on the serial interface (SCI V.24/V.28) which uses the same front connector.

Indicator lights

- Orange REMOTE indicator for data communication:
  - flashes during data communication (receiving or sending) via the communication interface for PROFIBUS and PC tool
- Green RUN indicator for the plant program:
  - FLASH LIGHT: Plant program does not run (e.g. interpreter stopped, none or illegal plant configuration)
  - STEADY LIGHT: Plant program is active
- Red ERROR indicator for common fault status signal:
  - FLASH LIGHT: Fault in he plant or in the PRU
  - STEADY LIGHT: Fault acknowledged but not rectified, or other acknowledged faults are still present

Buttons (+/-)	• +/- buttons for value readjustments: After pressing one of the 12 vertical buttons, the related value that is to be changed flashes in the LCD window. Once the required +/- setting has been entered, the new value flashes until stored (confirmed) by pressing the same button again. If the value is not stored within three minutes, the former value is retained.
Note	With the exception of the LOCAL/REMOTE switch, all operating elements are accessible even if the front cover is closed. The small plastic insert on the front cover can be removed to enable access to the PC connector.
Operating card set (POP Cards)	The operating concept relies on the operating cards which apply specifically to the plant involved. Each booklet page is optically encoded which in turn links it to the user program. The operating card set contains a maximum of 16 double-sided printed operating cards, each of which is subdivided into 12 lines. Each line is arranged to correspond horizontally to a display in the LCD window and to a button. The operating cards slide into a swing-out cassette which has reserve space at the back for further cards or additional plant information. The front cover has grooves to accept one general operating card which activates the associated LCD when the cover is closed. Each operating card page contains the related information and intervention choices for one or several plant elements of the whole plant operating program. After inserting the bundled operating cards, the top card's optical encoding is read and called up in the user program. A software link to the function block relating to the operating card's listed plant section is made; then, each operating card line is allocated to its LCD window line and button. This way, all plant functions can be displayed and handled page by page. The operating cards are produced during and according to a project's planning. They are printed on blank perforated cards and, when finished, are clipped together to form an operating card set. There are separate service and diagnostic accessory cards for time, diagnostics, and I/O module service.
Operating card example	

Engineering notes

STOP

All documents and notes listed below contain engineering basics for the process unit as well as the system level. Please read these notes and documents before proceeding to the next section and pay special attention to the safety information:

- «Basic Data of I/O Module System», Document 8102
- «Process Bus» (P-Bus), Document 8022
- Refer to «Equipment combinations» in this data sheet to obtain information on technical data sheets relating to cards and peripheral devices that are used together with the process unit in a system- and plant-specific manner.

Proper use of the product

In a system, this unit must be used only for applications as described briefly on the title page (bold type) as well as in the chapter «Use». In addition, observe all conditions and limitations as specified in the chapters «Engineering notes» and «Technical data» in this data sheet.

All sections in this chapter that are marked with the warning symbol to the right contain safety requirements and limitations. Observe all the warnings to avoid injuries and damages.

Operating voltage AC 24 V

Operate the process unit, all connected I/O-modules as well as all other networked devices **using safety extra low voltage only** (SELV) in accordance with EN 60 950.

Transformer sizing

With a central supply, transformer demand must be sized for all units connected per plant. These units are the following:

- Process unit(s)
- I/O-modules that require a voltage of AC 24 V in addition to the bus power supply.
- Field devices with AC 24 V operating voltage, e.g. actuators, active sensors, transformers, etc.

Load units for I/O-modules

Process units with a P-bus connection supply the connected I/O-modules with a DC 23 V supply voltage via the P-bus. The load units for I/O-modules are contained in document 8102 «Basic I/O-Module System» and/or in the individual technical data sheets for the I/O-modules; refer to «Equipment combination». The maximum number of load units for the Process units is listed in the chapter «Technical data» in this data sheet.

Fitting notes

Observe the required depth when flush-mounting the unit in the control panel front or inside the control panel using the baseplate. Additionally, observe minimum clearances between adjacent Process Units (refer to «Dimensions»).

Each Universal Process Unit comes with mounting instructions.

Detailed instructions for mounting and wiring are listed in the «Mounting and Installation Manual» M8012.

Commissioning notes

Battery card

When commissioning the Process Unit, the battery card must be transferred from its storage position (E) to its normal operating position (C).
If the batteries are exhausted at the time the battery card is transferred, the respective error message will appear on the Process Unit until the charge status is reached, but this does not adversely affect the proper functioning of the unit.

Addressing the I/O modules	The Process Unit can address the I/O modules only if they have been addressed, that is, if the address plugs with the respective numbers have been fitted.

STOP Service card

Carefully read the following notes before using the service card.
Using the «I/O module» service card, the following checks and interventions can be performed via the unit's display and operating buttons:
- Process Unit test (error messages, setting and changing the time)
- Calling up values and statuses at the I/O modules' inputs and outputs
- Changing statuses and positioning values at the switching and positioning outputs of the I/O modules

Note

You can only use these service functions if the program card is inserted; however, the card does need not be configured.

On-site plant operation

You can operate the Process Unit on-site applying two types of operation:
- Direct operation at the operating panel using the plant-specific printed operating cards (not the service cards)
- Using the «UNIGYR Insight» PC program which must be connected via the tool plug at the front of the unit.

Maintenance notes

The life of the rechargeable batteries on the battery card is at least five years, and the battery condition is constantly monitored. Battery "low" will cause the common fault indicator to light (with the front cover closed), and the relative diagnostic service card page appears on the fault signal line. "Low" battery does not affect the proper functioning of the Process Unit as long as the equipment is under normal power supply. These batteries are soldered in position, which means that the whole card must be exchanged if the batteries fail.

Technical data

⚠ Power supply

Operating voltage	AC 24 V ± 20 %
Safety extra low voltage«SELV» in accordance with	EN 60 730
Transformer requirements in accordance with	EN 60 742
Frequency	50 Hz / 60 Hz
Power consumption	
PRU1.32	30 VA
PRU1.64	45 VA

Standby operation for power failure

Standby operation of system clock (Real Time Clock)	max. 48 hrs.
Buffer battery life	min. 5 years

P-Bus

Access cycle to I/O modules	0,5 s
Transmission rate	62,5 kBaud
Signal level (via tool adapter PRW1.0U28)	DC +23 V and 0 /-5 V
Permissible line length,	50 m
under special conditions and means	max. 200 m
Minimum cross sectional area	3 x 0,75 mm^2
Detailed information on the P-bus	Document 8022 «Process bus»

Tool-connector at the unit front

Tool interface	
Signal definition	V.24 under CCITT
Signal level	V.28 under CCITT
Supported signals	RXD and TXD
Transfer format	
Start bit	1
Data bit	8
Stop bit	1
Parity	none
Baud rate	2400 Baud
PROFIBUS	see document 8023 «PROFIBUS»

Insulation protection

Protection against electrical shock	III under EN 60 730

IP protection

Degree of housing protection	
Front panel mounting	IP40 under EN 60 529
Wall mounting	IP20 under EN 60 529

Ambient conditions	Transport	IEC 721-3-2
	Climatic conditions	Class 2K3
	Temperature range	-25 °C...+70 °C
	Humidity	<95 % r.F.
	Mechanical conditions	Class 2M2
	Operation	IEC 721-3-3
	Climatic conditions	Class 3K5
	Temperature range	-5 °C...+50 °C
	Humidity (Moisture condensation not permissible)	<95 % r.F.
CE-Conformity	In accordance with the directives set forth by the European Union	
	Electromagnetic compatibility	89/336/EEC
Product standards	Automatic electric control devices for domestic use and similar applications	EN 60 730
Electromagnetic compatibility (EMC)	Emissions	EN 50 081-1
	Immunity	EN 50 082-2
Terminal connectors	Terminals for wires of	min. 0,5 mm $\varnothing$ max. 2x1,5 mm^2 or 1x2,5 mm^2
Weight	Basic version only	1.27 kg
Dimensions	Refer to «Dimensions»	
Note	All technical data associated with program and communication cards is listed in the respective data sheets that are listed under «Equipment combinations».	

Connecting terminals

X0 Connector on the front for the PUW1.1 PC cable
(interface V.24/RS-232 and PROFIBUS)
XI Terminal block for power supply and P-bus interface (standard)
XII Terminal blocks for bus interfaces (optional RMC bus, H-bus, OEM bus set)
XIII Terminal block for system communication (optional communication set)

Operating voltage AC 24 V
G System potential
GO System neutral

P-bus (process bus)
PC Clock (synchronization line)
PD Data line
PU Reference voltage

RMC bus (MONOGYR bus)
W Bus signal
M9 Bus ground
RD Receive Data }
TD Transmit Data } RS-232 interface
SG Signal Ground }

H-bus (heating bus)
D Data bus
M Ground

PROFIBUS
UG Signal Ground
UGP Power Ground
UN Negative data line
UP Positive data line
UR Remote supply for PROFIBUS repeater
$\perp$ Shielding

Modem (V.24 interface)
Designations in compliance with CCITT:
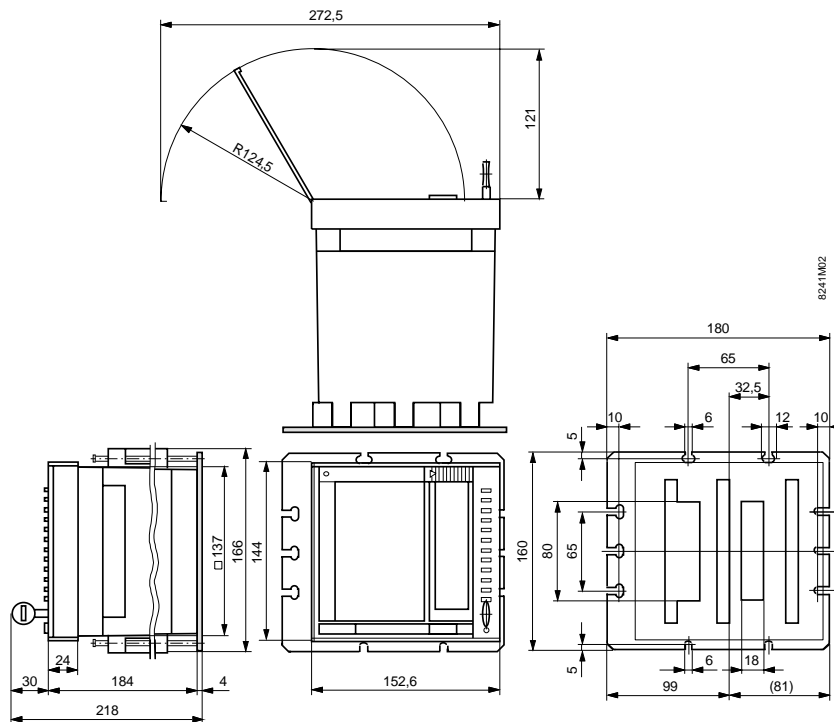|	
102	Signal ground
103	Transmit data
104	Receive data
105	Request to send
106	Clear to send
107	Data set ready
108	Connect data set to line
109	Receive carrier signal detect
140	Remote test loop/test mode on
141	Local test loop on
142	Test state

Dimensions

Flush panel mounting
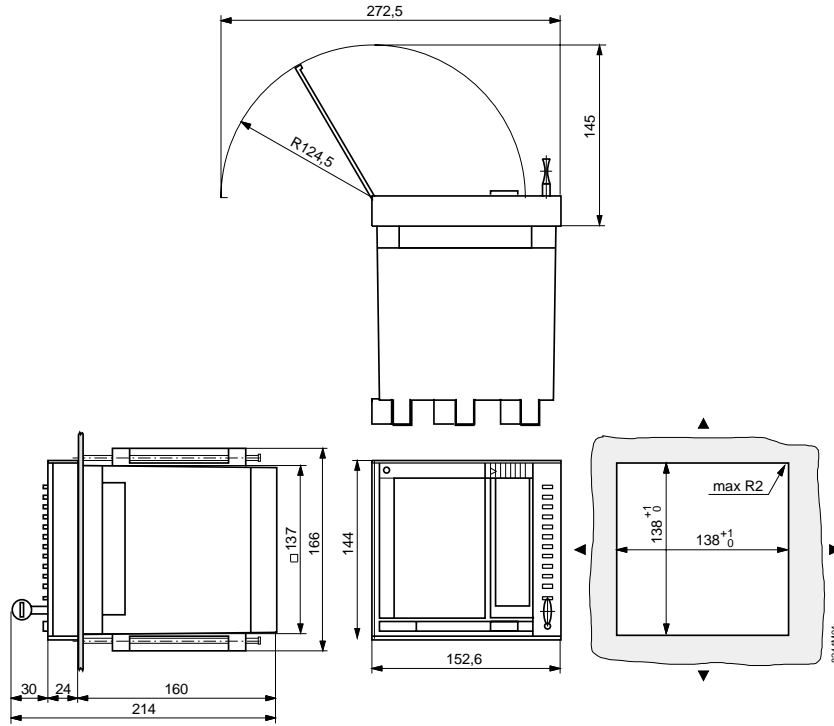
▼ Minimum clearance to the next cut-out is 40 mm (for additional Process Units)

Wall mounting