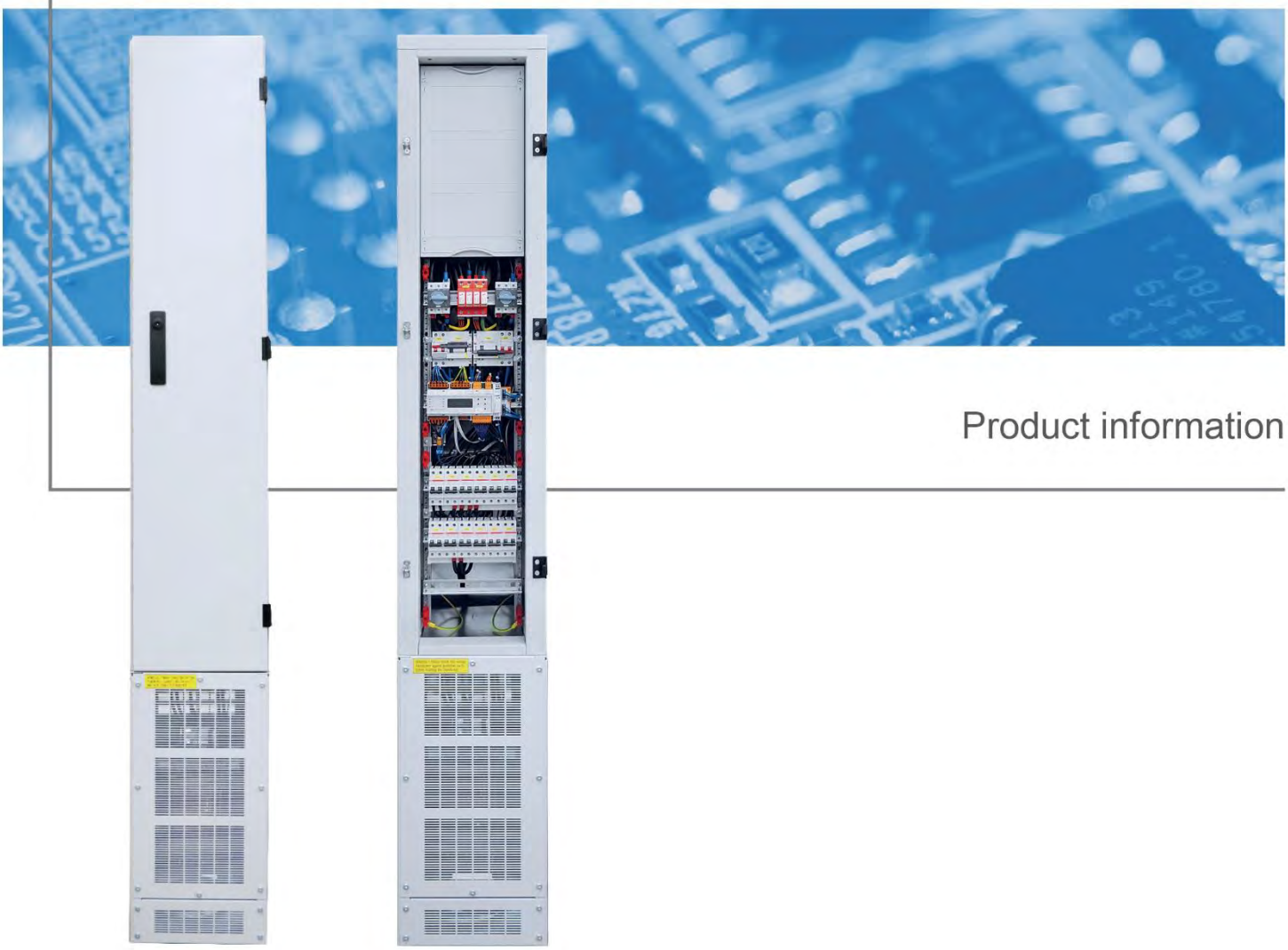
IPS-ICU Serie 710 modular

Insulated power system for operating rooms and intensive care units

Optionally with Insulation fault detection system IFS



Product information

Version 1.1, Revision 01-2020

ESA ELEKTROSCHALTANLAGEN GRIMMA GmbH

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Device:	IPS-ICU Serie 710 modular
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Change history

Version	Date	Change notice
1.0	20.09.2019	Initial creation of the document
1.1	13.01.2020	Correction of system dimension

Brand verification

Table of contents

1 Purpose of use

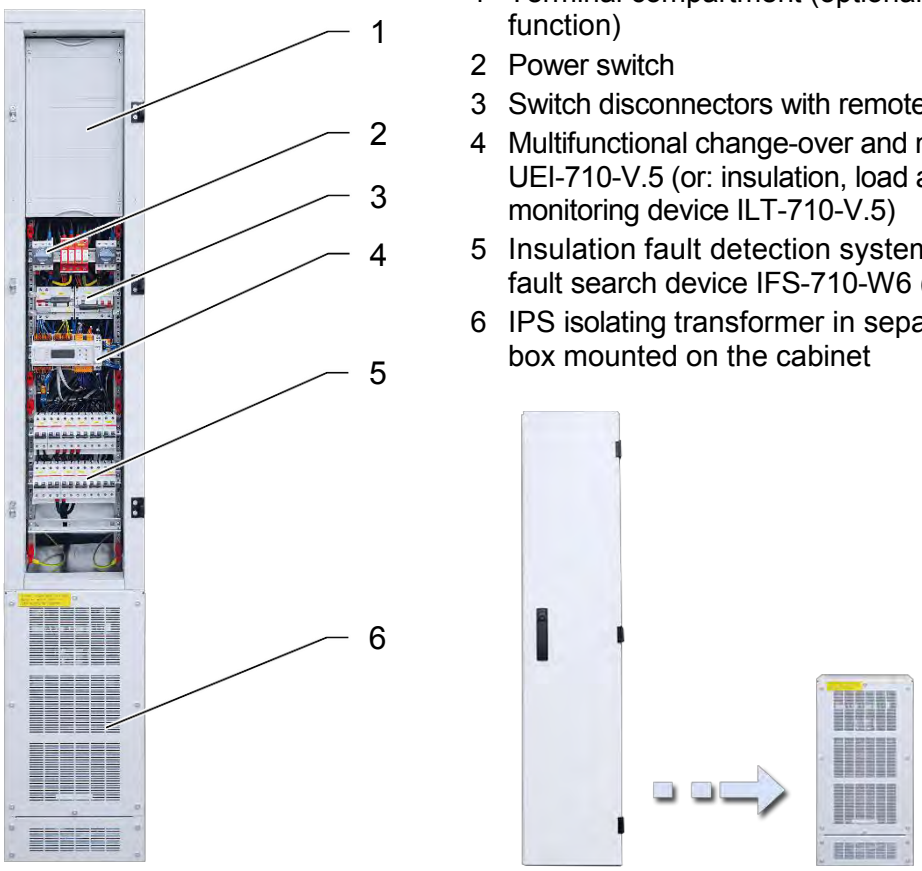
The insulated power system for operating rooms and intensive care units IPS-ICU is used for the supply of medical locations of group 2.

The IPS isolating transformer is installed in a separate transformer box. The transformer box can be mounted on the distribution cabinet (standing cabinet) or set up separately from the distribution cabinet (wall cabinet).

In the wall cabinet version, short-circuit-proof cables must be used to connect the transformer box which is mounted remotely from the distribution cabinet, e. g. type NSGAFÖU 1.8/3 kV according to DIN VDE 0250-602.

2 Assembly diagram

2.1 System view



1 Terminal compartment (optionally with bypass function)
2 Power switch
3 Switch disconnectors with remote operator
4 Multifunctional change-over and monitoring device UEI-710-V.5 (or: insulation, load and temperature monitoring device ILT-710-V.5)
5 Insulation fault detection system with insulation fault search device IFS-710-W6 (optional)
6 IPS isolating transformer in separate transformer box mounted on the cabinet

Abb. 1: Left: open IPS distribution cabinet as standing cabinet with mounted transformer box (equipment variable, field cover not depicted)
Right: closed IPS distribution cabinet as wall cabinet (extern transformer box)

2.2 System dimension

The dimensions of the IPS distribution cabinet vary depending on the scope and structure of the system.

Dimension of the IPS distribution cabinet (without transformer box)

Name of the IPS distribution cabinet	Number of fields	Cabinet width	Cabinet depth
Single IPS/S-IPS	1	300 mm	350 mm
Double IPS/D-IPS	2	600 mm	350 mm
Triple IPS/T-IPS	3	800 mm	350 mm

Tab. 1: Design variants of the IPS distribution cabinet

The IPS distribution cabinet is available in four heights as standard. The number of outputs depends on the dimensions of the IPS distribution cabinet and the version with bypass switch or bypass terminal.

Cabinet height	Design	Number of output circuits		
		S-IPS	D-IPS	T-IPS
1250 mm	with bypass switch	6	12	18
	with bypass terminal	12	24	36
1400 mm	with bypass switch	12	24	36
	with bypass terminal	18	36	54

Tab. 2: Number of outputs in the IPS distribution cabinet

Transformer box dimension

Design of the IPS distribution cabinet	Width	Height	Depth
Single IPS/S-IPS	300 mm	600 mm	350 mm
Double IPS/D-IPS	600 mm	600 mm	350 mm
Triple IPS/T-IPS	800 mm	600 mm	350 mm

Tab. 3: Transformer box dimension

In the standing cabinet version, the transformer box is mounted on the IPS distribution cabinet. In the wall cabinet version, the transformer box can be mounted remotely from the IPS distribution cabinet.

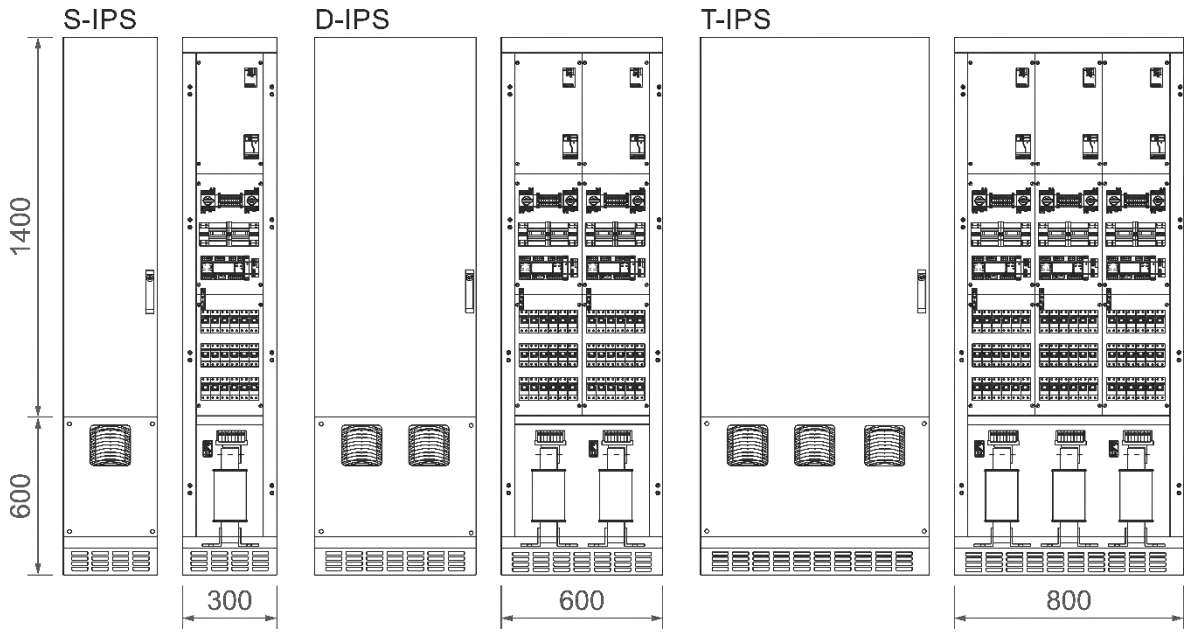


Abb. 2: Example for IPS distribution cabinet as standing cabinet (system dimensions in mm)

3 Functions

3.1 General functions

In all medical locations where operations or intensive care are performed, an initial fault (e.g. insulation fault, short contact through body contact or accidental earth), or fault in the general power supply must not interrupt the power supply and cause medical devices and modules to fail. The system used therefor consists of:

- IPS isolating transformer,
- load and temperature monitoring of IPS isolating transformer,
- insulation monitoring of IPS and
- insulation fault detection system (optional).

When the distribution cabinet is powered by a reliable redundant power supply, the system also consists of:

- change-over module with voltage monitoring and
- control voltage supply and change-over.

The system distribution supplies power to these areas (user group 2).

DIN VDE 0100-710 and IEC 60364-7-710 as well as nationally valid standards stipulates that the IPS must be powered through two independent lines in the low-voltage distribution board or from the main distribution board of the building:

- preferred feeder = line 1 and
- second feeder (feeder being in reserve) = line 2.

In accordance with IEC 60364-7-710, power distributions in group 2 medical locations (including the IPS isolating transformer and any required cable and line connectors) must be situated in the same storey and fire compartment as the devices receiving power in the group 2 medical location. They can also be situated in rooms directly above or below which belong to the same fire compartment or to their own directly adjacent fire compartment.

Change-over time of less than 0.5 s is observed (class 0.5).

3.2 Components

The following chapters contain an overview of the components of the IPS distribution cabinet. Further information can be found in the device- and system-specific operating manuals.

3.2.1 Change-over and/or monitoring module UEI-710/ÜEI-710

Change-over and/or monitoring modules type UEI-710 consists of:

- Change-over module,
- Insulation monitoring,
- Circuit breakers,
- Bypass switch or bypass terminal (optional) and
- Insulation fault detection system for single-circuit fault detection (optional).

3.2.2 Multifunctional change-over and monitoring device UEI-710-V.5 (optional)

The multifunctional change-over and monitoring device UEI-710-V.5 provides insulation fault monitoring for the IPS, load current and temperature monitoring for the IPS isolating transformer, control voltage supply and change-overs as well as voltage monitoring and change-over control. The insulation monitoring, load current monitoring and change-over control can be tested on site using the UEI-710-V.5.

All states of the UEI-710-V.5 (operating and fault messages) can be transmitted via the communication interface (CAN bus) to any suitable operating and annunciator terminals such as the BMTI 5 or annunciator and control panel where they can be displayed. These devices can also be used to initiate a test function (ISO test).

3.2.3 Insulation, load current and temperature monitoring device ILT-710-V.5 or ILT-710-V.4

The insulation, load current and temperature monitoring device ILT-710-V.5/ILT-710-V.4 provides insulation fault monitoring for the IPS, load current and temperature monitoring for the IPS isolating transformer. The insulation monitoring and load current monitoring can be tested on site using the ILT-710-V.5/ILT-710-V.4.

All states of the ILT-710-V.5/ILT-710-V.4 (operating and fault messages) can be transmitted via the communication interface (CAN bus) to any suitable operating and annunciator terminals such as the BMTI 5 or annunciator and control panel where they can be displayed. These devices can also be used to initiate a test function (ISO test).

3.2.4 Switch disconnectors with remote operators

Two mutual (electrical) latched switch disconnectors with remote operators are used as switchgear in change-over and monitoring module type UEI-710.

Upstream switch disconnectors (optional)

It is possible to switch off line 1 and/or line 2 manually via the upstream switch disconnectors (Q01 and Q02 ahead of the switch disconnectors with remote operators). This option can be used to test the functionality of voltage monitoring, change-over regulation, monitoring and change-over of control voltages and while performing repair and maintenance work.

In conjunction with the isolating terminals, these upstream switch disconnectors are used to implement the bypass function.

Bypass function via MP-UEI-710-XX/2/bypass switch (optional)

Using the isolating terminals and jumpers, line 1 or 2 can be connected to line 3 for servicing. This bypasses all monitoring and change-over functionality.

3.2.5 IPS isolating transformer in separate transformer box

The IPS isolating transformer is mounted in a separate transformer box either on the distribution board or remotely from the distribution board

Single-phase IPS isolating transformers are used exclusively. These are permanently monitored by the UEI-710-V.5 or ILT-710-V.5/ILT-710-V.4 for overloading and excessive temperatures. The IPS isolating transformer is supplied via line 3. It creates an electrically isolated power supply.

In particular, the descriptions given in section 710.512.1.101 of DIN VDE 0100-710 (VDE 0100 Part 710, Transformers for IPS) apply to the selected device and its capacity.

3.2.6 Insulation fault detection device IFS-710-W6 (optional)

Together with UEI-710-V.5 or ILT-710-V.5/ILT-710-V.4 and the integrated test signal generator, the insulation fault detection device IFS-710-W6 serves as a functional module for detecting insulation faults in the IPS.

The main functions of the IFS-710-W6 are:

- test current detection with integrated current transformers (six measuring channels),
- parallel data capture and processing (no multiplexing),
- internal self-monitoring of device,
- communication via CAN bus and
- configuration with UEI-710-V.5.

A maximum of 16 devices (96 channels) can be used together with the UEI-710-V.5 or ILT-710-V.5/ILT-710-V.4.

3.3 Change-over control

In general, statutory requirements and generally accepted engineering practice – including standards on high voltage systems used in hospitals and other medical locations – apply to the set-up and operation of electrical systems. Furthermore, the local regulations also have to be complied. This includes basic safety instructions and regulations as well as accident prevention guidelines.

The connecting lines to the power distribution of the IPS-ICU have to comply with the minimum cross-sections given in DIN VDE 0100 Part 430. A properly dimensioned back-up fuse will protect the IPS isolating transformer and maintain the required functionality of the downstream overcurrent protection devices for the IPS-ICU.

3.4 Control voltage supply with integrated change-over for control voltage

The voltages in both independent sources of power (line 1 and line 2) are constantly monitored by the UEI-710-V.5. The control voltage for change-over devices is supplied from line 2 in normal operation. If the voltage on line 2 falls below the configured limit value, the UEI-710-V.5 changes the control voltage over to line 1 and provides power to the control circuit from this line.

3.5 Insulation, load current and temperature monitoring

The momentary insulation resistance of the IPS (AC 230 V) is continuously displayed on the ILT device (UEI-710-V.5, ILT-710-V.5 or ILT-710-V.4). If the insulation resistance of the IPS falls below the response value set on the ILT device, this is displayed on the ILT

device as a text message and with the LED Isolation (insulation) resp. LED Status. This makes it possible to detect gradual deterioration to the insulation.

The load current is monitored in single-phase IPS isolating transformers using a special external current transformer of type ILT-W that is directly connected to the ILT device. The connections of the transformer are monitored continuously. The momentary load value is displayed as a percent or absolute value on the display. If the load current exceed the response value set on the ILT device, this is displayed on the ILT device as a text message and with the LED Laststrom (load current) resp. LED Status.

The temperature is monitored using the PTC thermistors or break contacts integrated in the transformer winding. Multiple PTC thermistors/break contacts can be connected in series to the ILT device. If the temperature of the IPS isolating transformer exceeds the limit value (120 °C), the resistance will increase in the sensor or the contacts will open. This change in resistance is captured and evaluated by the ILT device.

Respective messages are distribute via the communication interfaces (depending on device: fault signal relay, CAN bus, digital outputs and Modbus).

3.6 Insulation fault detection system (optional)

The insulation resistance in the IPS is permanently determined and monitored by the devices UEI-710-V.5, ILT-710-V.5 or ILT-710-V.4. If the insulation resistance falls below a specified value, the fault detection process is started by the test signal generator integrated in the device.

This feeds a test signal into the IPS. The insulation fault detection devices (e. g. IFS-710-W6) detect the test signal by their integrated current transformers (one in each outgoing circuit). The ILT device evaluates the fault detection data and transfers the evaluation via CAN bus.

Corresponding messages are shown on the ILT device and peripheral display devices. The messages contain detailed information about the faulty circuit and are saved for future evaluations.

4 External peripheral devices (accessories)

CAN bus can be used to connect various external peripheral devices to the changeover and/or monitoring module. External peripheral devices serve as a monitoring and display unit in the system.

External peripheral equipment are, for example, the operating and annunciator terminals BMTI 1, BMTI 2 and BMTI 5/BMTI 5s of ESA-Grimma.

Building services control system (BSCS):

Operating, warning and fault messages can be transmitted to the BSCS. This is ensured among other things by the CAN bus with protocol converters (e. g. Modbus), digital I/O devices (MPM series) that can be connected to CAN bus or potential-free (signal) contacts on ESA devices.

5 Pin assignment, displaying and operating elements

Connection diagrams and pin assignments as well as descriptions of the displaying and operating elements of the devices integrated in the IPS (UEI-710-V.5, ILT-710-V.5 or ILT-710-V.4 and optionally IFS-710-W6) are given in the operating manuals included with these devices and must be observed.

6 Declaration of conformity/Manufacturer certificate

Product name:	IPS distribution cabinet
Type:	IPS-ICU series 710
SIL 2 comparability:	The IPS distribution cabinet IPS-ICU series 710 achieves SIL 2 (IEC 61508).

CE

The used devices have the CE mark and fulfil the low-voltage directive 2014/35/EU and the EMC directive 2014/30/EU (observed standards see chapter 0 on page 13).

The complete drafts of the declaration of conformity can be requested from ESA Elektroschaltanlagen Grimma GmbH.

7 Technical Data

Technical data of the devices integrated in the IPS are given in the product information and operating manuals included with these devices and must be observed.

Operating data	
Rated operational current	depending on type of change-over and/or monitoring module UEI-710/ÜEI-710
Rated voltage	AC 230 V, 50 … 60 Hz
Control voltage	AC 230 V, 50 … 60 Hz
Maximum series fuse	depending on IPS isolating transformer
Overvoltage category	III
IPS isolating transformer	
Maximum isolating transformer capacity	8 kVA (in Germany) 10 kVA (not approved in Germany according to DIN VDE 0100-710)
Installation	in separate transformer box (mounted on the distribution cabinet or remotely from the distribution cabinet)
Dimension transformer box in mm (B x H x T)	see Tab. 3 on page 6
Voltage monitoring with change-over control (UEI-710)	
Voltage monitoring (line 1, 2 and 3) monitored System	1/N AC 0 …290 V, 50 … 60 Hz
Adjustment range, undervoltage	AC 150 … 230 V
Adjustment range, overvoltage	AC 230 … 260 V
Switching times (UEI-710)	
Switching delay time t_{vh}	0 … 20 s (parameterisable)
Reverse switching delay time t_{vr}	0 … 20 s (parameterisable)
No-load switching time (pause time) t_{nu}	0 … 20 s (parameterisable)
Insulation monitoring 230 V (UEI-710/ÜEI-710, ILT-710-V.5, ILT-710-V.4)	
Monitored system	AC 120 … 265 V, 50 … 60 Hz
Response value	parameterisable 50 … 250 kΩ
Hysteresis	fix 25 %

Load current monitoring with ILT-W transformer (UEI-710/ÜEI-710, ILT-710-V.5, ILT-710-V.4)	
Response value	parameterisable 5 … 50 A
Hysteresis	fix 4 %
Temperature monitoring (UEI-710-V.5, ILT-710-V.5, ILT-710-V.4)	
Using NC contacts or PTC thermistor	120 °C
Communications interface/protocol (UEI-710-V.5, ILT-710-V.5, ILT-710-V.4)	
Interface	CAN 2.0 (ISO 11898)
Protocol	ESA-CAN
Electromagnetic compatibility (EMC)	
Immunity according to EMC generic standards – Immunity for industrial environments	EN 61000-6-2:2006-03
Emissions according to	61000-6-3:2011-09
Emissions according to	EN 55011/CISPR11
Integrated test signal generator and insulation fault detection system (IFS-710-W6), optional	
Measuring channels	maximum 96 channels
Test signal	limited to max. 1 mA
Displays and messages (UEI-710-V.5)	
Message outputs	1 exchanger (potential-free)
Displays	operating and fault messages
Installation conditions	
IP code according to EN 60259	IP41 IP44 as special type
Safety class	I (grounded)
Flammability class	UL94V-0
Weight	depending on type
System dimensions	see Tab. 1 and Tab. 2 on page 6
Coating colour	RAL 7035 (light grey) RAL special colours
Environmental conditions	
Ambient temperature (operation)	-5 … +45 °C
Storage temperature	-25 … +70 °C

Degree of pollution	3
Climate class according to IEC 721	3K5, without condensation and icing
Standards	
The IPS distribution cabinet fulfils the requirements as stipulated in	DIN VDE 0100-710 (VDE 0100 Part 710):2012-10 ÖVE/ÖNORM E 8007 Edition: 2007-12-01 IEC 60364-7-710:2012-10 GOST 12.2.007.0-75 GOST-R 51321.1-2007 DIN EN 61557-9:2009-11 DIN EN 61557-1:2007-12 DIN EN 61557-8:2013-08 DIN EN 60947-6-1:2014-09 DIN VDE 0100-557 (VDE 0100-557):2014-10
Order data (art. no.)	
IPS-ICU series 710 modular	art. no. on request*

* The article numbers vary depending on the scope and structure of the IPS distribution cabinet.

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