

IMED

Medical Power Supplies
— and Accessories —





NORATEL

When performance matters.

NORATEL – one of Europe's biggest manufacturers of transformers

In 1925 Noratel started the production of radios, transmitters and receivers as "Norsk Radio Telefon og Telegraf A/S". Nowadays Noratel belongs with 2400 employees in 13 countries and yearly revenues of approx. 100 million Euros to the leading manufacturers of transformers.

Since 10 years now, Noratel Germany AG, founded in 2001, supplies a very special market:

Power supplies and accessories for the medical market.

In the meantime, besides the standard range of 20 different IMED models between 150 and 2000 VA output power, also especially matched earth leakage guards of the ELG-series and versatile usable network isolators of the MLI-series are available.

Furthermore, Noratel Germany AG established as professional provider of customized solutions and is the only supplier with such an extensive product line-up.

IMED Medical Power Supplies and Accessories

The recent medical technology with its increasing number of electric devices, combined to a system, necessitates turning one's special attention to its power supply conforming to the law.

Both the manufacturer of such a system and the system operator are responsible for meeting the statutory provisions.

All IMED products have especially been designed for the use in the medical technology. They are indispensable tools to meet the safety requirements of the medical devices directive and the corresponding device and system standards (EN 60601-1 and other applicable standards).

Protect your patients and employees and meet the strict legal requirements by using a medical power supply out of our NORATEL IMED portfolio.

A medical isolating transformer offers the perfect solution to protect patients and operating personnel.



Important tools to meet the safety requirements

The currently valid EU medical product directive (93/42/EEC with amendment 2007/47/EC) imperatively determines that medical devices and systems have to be designed in a way that patients, operating personnel or other persons may not suffer while being in contact with those.

This generates strict requirements for the safety of the power supply of electrical medical devices and systems. Especially medical electrical systems for life support and monitoring life functions require very high reliability and quality of their power supplies.

Increased safety requirements are valid in hospitals, surgeries, dental surgeries and in other areas, where patients or operators can come into contact with electrical devices.

- ward areas
- patient rooms
- treatment rooms
- laboratories
- consulting rooms
- waiting rooms, in which the patient has contact to electrical devices

The use of medical isolating transformers for the power supply of electrical devices and systems, used in medical protected zones, offers a well-priced possibility to follow the EU medical product directive and to ensure the electrical safety for the power supply in a medical environment.

Our development and production are controlled through a quality management system according to [DIN EN ISO 9001](#) supervised by Intertek. Regarding the medical technology according to [DIN EN ISO 13485](#) we are inspected by MDC. Additionally we keep an environmental management system according to [DIN EN ISO 14001](#). We run an in-house test laboratory being able to meet all requirements of the medical safety standards relevant for our products.



Therefore, our declarations of conformity are valid and binding to the full extent without a further conformity test through an approved inspection authority.



IMED_e series (euro series)
IMED_i series (international serie)
 Medical Isolating Transformers



IMED_e 1000

IMED_e
IMED_i

This series of medical isolating transformers is offered in two different versions. The IMED_e series was designed especially for the use within Europe. Therefore, it is working with a fix input and output voltage of 230 V~. The IMED_i series can be used in areas with 115 V~ and 230 V~ system voltage. Its voltage levels, which can be adjusted separately on the primary and secondary side, allow additional voltage adjustments.

For both series, a built-in inrush current limiter on semi-conductor technique (NTC) avoids an unwanted blow of the input fuses of the device or of an automatic circuit breaker of the building's sub-distribution through the inrush current.

All devices are equipped with a potential equalization bolt (POAG according to DIN 42801) for the connection to a special medical potential equalization existing in the room of application.

The protective earth conductor of the input socket is additionally conductively connected with the corresponding contacts of the output sockets. With this measure, the devices are equipped with a base potential equalization. Hereby, it is also possible to operate the devices in such medical rooms, in which no additional special potential equalization aside from the intact protective earth conductor of the wall socket is installed.

The transformers of the IMED series are designed for continuous operation. Self resetting temperature switches avoid damage through temperature rise in the device in a reliable way.

IMED_i

The devices of the IMED_i series additionally have the NRTL approval which allows the use in the US American and Canadian market. The model IMED_i 300WR is designed for an extended input voltage range of 100-130 V~/220-240 V~.

IMED_e



IMED_i



Technical data IMED_e series

Type	IMED _e 150	IMED _e 300	IMED _e 600	IMED _e 1000	IMED _e 2000
Art.-No.	9-059-000006	9-059-000003	9-059-000007	9-059-000005	9-059-000004
Max. power output	150 VA	300 VA	600 VA	1000 VA	2000 VA
Power input	170 VA	330 VA	630 VA	1040 VA	2050 VA
Output sockets	2 x IEC 320	4 x IEC 320	6 x IEC 320	9 x IEC 320	
Housing protection class	IP 20				
Weight (without packing) kg	approx. 3,0	approx. 4,5	approx. 9,0	approx. 14,0	approx. 21,0
Dimensions (L x W x H) mm	194 x 148 x 77	194 x 148 x 92	270 x 188 x 92	305 x 218 x 110	312 x 285 x 110
Input and output voltage	primary 230 V~, secondary 230 V~, 50/60 Hz				
Device leakage current (primary)	< 100 µA				< 350 µA
Output leakage current (secondary)	< 50 µA	< 70 µA	< 100 µA		
Inrush current limiter	thermal semiconductor				
Short circuit protection	micro fuse primary				
Excess temperature protection	self resetting temperature switch				
Housing design	sheet steel housing, powder-coated, light-grey RAL 7035				
Mains cable primary	included in delivery				
Mounting possibility	floor, table or wall mounting				floor or table mounting (no wall mounting)
Conformity	EN 60601-1, EN 60601-1-1, EN 60601-1-2, EN 61558-1, EN 61558-2-4				
Classification acc. to MPA	Important accessory for the safe operation of medical electrical systems, product of class I acc. to appendix VII, directive 93/42/EEC with addendum 2007/47/EC				



Technical data IMED_i series

Type	IMED _i 300	IMED _i 300 WR	IMED _i 1000
Art.-No.	9-059-000001	9-059-130075	9-059-000002
Max. power output	300 VA	300 VA	1000 VA
Power input	330 VA	330 VA	1040 VA
Output sockets	4 x IEC 320		9 x IEC 320
Housing protection class	IP 20		
Weight (without packing) kg	approx. 4,5	approx. 4,5	approx. 14,0
Dimensions (L x W x H) mm	194 x 148 x 92	194 x 148 x 92	305 x 218 x 110
Input and output voltage	primary 115 V~ or 230 V~, secondary 115 V~ or 230 V~, 50/60 Hz		
Device leakage current (primary)	< 100 µA		
Output leakage current (secondary)	< 70 µA	< 100 µA	
Inrush current limiter	thermal semiconductor		
Short circuit protection	micro fuse primary		
Excess temperature protection	self resetting temperature switch		
Housing design	sheet steel housing, powder-coated, light-grey RAL 7035		
Mains cable primary	included in delivery		
Mounting possibility	floor, table or wall mounting		
Conformity	EN 60601-1, EN 60601-1-1, EN 60601-1-2, EN 61558-1, EN 61558-2-4, UL 60601-1, CAN / CSA 22.2 No. 601.1 / NRTL approval		
Classification acc. to MPA	Important accessory for the safe operation of medical electrical systems, product of class I acc. to appendix VII, directive 93/42/EEC with addendum 2007/47/EC		

IMED_e series 3rd Edition (euro series)
IMED_i series 3rd Edition (international series)

The New Medical Isolating Transformers



IMED_e 1500 3rd

IMED_e 3rd
IMED_i 3rd

The medical isolating transformers IMED 3rd Edition have been designed for the power supply of high reliable medical electrical systems (ME systems). These are ME systems which may not fail at all even in the case of major interferences of the supply voltage. The power supply of such ME systems has to be immune especially against half-wave failures. Without special arrangements, these may lead to high over-currents in the isolating transformer. As a consequence of this

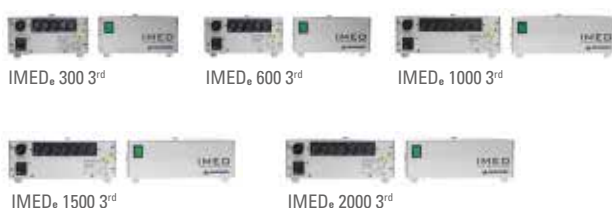
the input fuse of the device or the circuit breaker of the building's sub-distribution may fail.

Corresponding to the supply voltage zones in Europe and the rest of the world we also have designed the isolating transformers of the IMED 3rd Edition as an Euro series for 230 V~ operating voltage and as an International series with separately operable voltage selector switches on the primary and secondary side for the operation with 115 V~ and 230 V~.

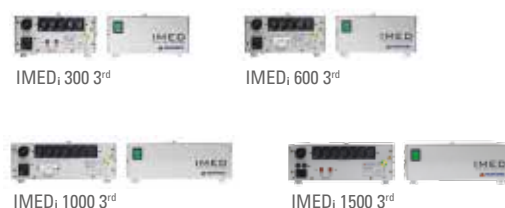
Characteristics of the IMED 3rd Edition Isolating Transformers:

- Electronic inrush current control. No increased inrush current pulse occurs when switching on the device
- Fast recognition of half-wave failure with an interruption of supply time of less than 50 milliseconds. A blow of the input fuse due to the half-wave failure is avoided in any case
- Fast recognition of the drop out of several cycles of the supply alternating voltage. After such a drop out, the isolating transformer will be switched on again in a controlled way without a current pulse
- Alarm indication of excess temperature situations of the transformer and of the undercut of the leakage resistance in the output circuit through the external, optionally available, earth leakage guard with temperature control ELG_T, which is connected via a separate interface and therefore does not occupy one of the output sockets
- Additional safety shutdown through a self resetting temperature switch in the case of dangerous overheating
- Optionally available mechanic retaining kit for the input and output plug
- Can be combined with an uninterruptible power supply (online or offline UPS) at the input of the isolating transformer

IMED_e 3rd



IMED_i 3rd





Technical data IMED_e series 3rd Edition

Type	IMED _e 300 3 rd	IMED _e 600 3 rd	IMED _e 1000 3 rd	IMED _e 1500 3 rd	IMED _e 2000 3 rd
Art.-No.	9-059-000056	9-059-000057	9-059-000058	9-059-000059	9-059-000060
Max. power output	300 VA	600 VA	1000 VA	1500 VA	2000 VA
Power input	330 VA	630 VA	1040 VA	1540 VA	2050 VA
Output sockets	5 x IEC 320		7 x IEC 320		
Housing protection class	IP 20				
Weight (without packing) kg	approx. 6,6	approx. 9,0	approx. 13,2	approx. 18,2	approx. 21,5
Dimensions (L x W x H) mm	275 x 219 x 109		344 x 285 x 109		
Input and output voltage	primary 230 V~, secondary 230 V~, 50/60 Hz				
Device leakage current (primary)	< 100 µA			< 250 µA	
Output leakage current (secondary)	< 70 µA		< 100 µA		
Inrush current limiter	electronic at nominal current value				
Short circuit protection	micro fuse primary				
Excess temperature protection	self resetting temperature switch				
Housing design	sheet steel housing, powder-coated, light-grey RAL 7035				
Mains cable primary	included in delivery				
Mounting possibility	floor, table or wall mounting with optional accessory				
Conformity	EN 60601-1 (3 rd Edition), EN 60601-1-2, EN 61558-1, EN 61558-2-4				
Classification acc. to MPA	Important accessory for the safe operation of medical electrical systems, product of class I acc. to appendix VII, directive 93/42/EEC with addendum 2007/47/EC				



Technical data IMED_i- series 3rd Edition

Type	IMED _i 300 3 rd	IMED _i 600 3 rd	IMED _i 1000 3 rd	IMED _i 1500 3 rd
Art.-No.	9-059-000050	9-059-000051	9-059-000052	9-059-000053
Max. power output	300 VA	600 VA	1000 VA	1500 VA
Power input	330 VA	630 VA	1040 VA	1540 VA
Output sockets	5 x IEC 320		7 x IEC 320	
Housing protection class	IP 20			
Weight (without packing) kg	approx. 6,7	approx. 9,1	approx. 13,2	approx. 18,3
Dimensions (L x W x H) mm	275 x 219 x 109		344 x 285 x 109	
Input and output voltage	primary 115 V~ or 230 V~, secondary 115 V~ or 230 V~, 50/60 Hz			
Device leakage current (primary)	< 100 µA			< 250 µA
Output leakage current (secondary)	< 70 µA		< 100 µA	
Inrush current limiter	electronic at nominal current value			
Short circuit protection	micro fuse primary			
Excess temperature protection	self resetting temperature switch			
Housing design	sheet steel housing, powder-coated, light-grey RAL 7035			
Mains cable primary	included in delivery			
Mounting possibility	floor, table or wall mounting with optional accessory			
Conformity	EN 60601-1 (3 rd Edition), EN 60601-1-2, EN 61558-1, EN 61558-2-4, UL 60601-1, CAN / CSA 22.2 No. 601.1 / NRTL approval			
Classification acc. to MPA	Important accessory for the safe operation of medical electric systems, product of class I acc. to appendix VII, directive 93/42/EEC with addendum 2007/47/EC			

MLI-1000 (Gigabit-Ethernet 1000 MBit/s)

Medical LAN-Isolator



Conformity approved by certification body "SLG Prüf- und Zertifizierungs GmbH"

MLI The medical LAN Isolator MLI 1000 is the solution for a serious problem in cable supported IT networks and network segments within medical safety areas. It is the missing link in the chain of necessary insulating measures when using modern data networks in medical areas.

All IT devices (devices of the information technology such as computers, printers, network servers etc.), that are interconnected by Ethernet cable, show a direct electrical connection with all other IT devices within the network structure. This connection is established by the shielding of the network cable.

For a safe operation of IT devices within the medical safety area, it is, additionally to the usage of medical IMED isolating transformers, necessary, to isolate the fast Ethernet or gigabit Ethernet network connections galvanically from the other network by the use of a Medical LAN Isolator MLI 1000. This is particularly required if the IT devices within a medical electrical system are additionally connected to medical electrical devices.

The MLI Isolators are totally transparent concerning the data transfer and do not need software or driver installation. They provide an insulating barrier with 4000V isolation strength between the network outside the medical safety area and the Ethernet network segment inside the medical electrical system. Thus, dangerous error or leakage currents out of the exterior IT network are kept away from patients and operators.

This connection is often ignored when evaluating the electrical safety of a medical electrical system with contact to the local IT net (LAN). However, the risk potential has to be rated as quite high. Hence, the insulation of the LAN connections is compulsory to keep the medical safety standards EN60601-1 (2. and 3. Edition – medical electrical devices and systems).

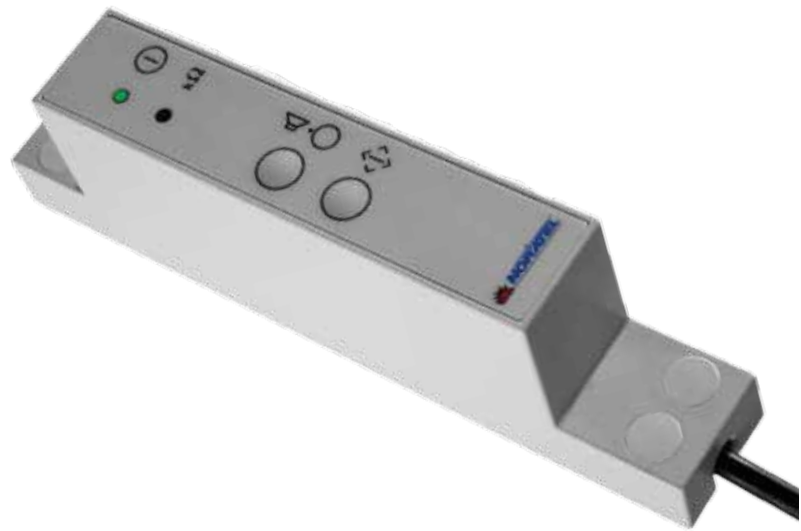
The Medical LAN Isolator MLI-1000 is delivered with a 50 cm patch cable that enables a simple loop-in into the LAN connection.

Technical data MLI-1000

Type	MLI-1000
Art.-No.	9-059-190180
Data speed	10 / 100 / 1000 MBit/s
Insulation strength	4 kV~
Max. cable length	60 m
Connections	2 x RJ 45 connectors
Dimensions (LxWxH) mm	90 x 51 x 25
Conformity	EN 60601-1:2006, EN 60601-1-2, medical products directive 93/42/EEC with addendum 2007/47/EC

ELG
ELG_s
ELG_T

Earth Leakage Guard



The earth leakage guards of the ELG-series control the dielectric resistance between the medical supply circuit and the earth potential.

The typically arranged protective measures against insulation fault on the building power supply (such as ground fault circuit breaker) may not principally identify possible insulation defects on the output side due to the galvanic insulation through the IMED isolating transformer. This leads to a potential danger for the patients or the operating personnel.

The earth leakage guards of the ELG-series close this security gap reliably by clearly warning against insulation faults. For this, the leakage resistance is controlled for the undercut of a limit value. If this case occurs, the ELG warns optically as well as acoustically.

Following types of Earth Leakage Guards are available:

This model is designed for the transformers of the IMED_e series.

ELG It is connected directly to one of the IEC output sockets.
This device can only be used at 230 V~.

ELG_s This model is identical to the ELG but has an expanded input voltage range of 115 V~ until 230 V~ and so can be used not only for the IMED_e but also for the IMED_i series.

ELG_T The earth leakage guard ELG_T was exclusively designed for the use with the medical isolating transformers of the IMED_e 3rd Edition and IMED_i 3rd series.

Besides the insulation control, known from ELG and ELG_s models, this series also provides a temperature control of the transformer in use.

In the case of an overload of the isolating transformer, the operator get's an optical-acoustical alarm and so can prevent a system failure by cutting of dispensable consumer loads.

The ELG_T is equipped with a special interface plug for the connection and so can only be combined with devices of the IMED_e 3rd and IMED_i 3rd series.

Technical data ELG / ELG_s / ELG_T

Type	ELG	ELG _s	ELG _T
Art.-No.	9-059-000010	9-059-000063	9-059-000062
Operating voltage	230 V ~ 50/60 Hz	115-230 V ~ 50/60 Hz	
Functions	insulation fault		insulation fault, excess temperature
Display	Operation (LED green), insulation fault (LED yellow)		Operation (LED green), insulation fault (LED yellow), excess temperature (LED yellow)
Connections	IEC 320 connector		interface connector
Protection class	Class 1 / IP 40		
Dimensions (LxWxH) mm	192 x 32 x 56		
Conformity	EN 60601-1 / EN 60601-1-4 / EN 60601-1-8 / EN 60601-1-2 / EN 61557-8 / EN 61010-1 / Low voltage directive 2006/95/EG	EN 60601-1 / EN 60601-1-8 / EN 60601-1-2 / EN 61557-8 / EN 61010-1 / Low voltage directive 2006/95/EG	

Examples for customer specific designs

Besides a large number of standard devices we also design and produce special customized devices acc. to customer requirements. In the following we are introducing some models more detailed:

IMED_e 580



This device is a combination of medical isolating transformer and low-voltage power supply.

The device provides both a safety isolated AC output voltage of 230 V with a load of 350 VA and two galvanically isolated DC-voltages 5 V DC and 12 V DC with a current rating up to 10 A each.

The unit is equipped with an electronic inrush current limiter with fast half-wave failure recognition. With this, short-termed supply voltage dips or interrupts cannot lead to a drop-out of the input fuse, which essentially improves the continuous operation reliability.

The IMED_e 580 meets the regulations for medical class I devices and is intended for the supply of medical electrical systems which simultaneously need 230 VAC and 5 VDC or 12 VDC.

The two DC-output voltages are generated by two AC/DC converters powered by two galvanically isolated low AC-voltages, which are created by two additional secondary windings of the medical isolating transformer. Both DC voltages are galvanically isolated from the AC-output as well as isolated against each other.

In total 12 outputs with 12 V DC and 6 outputs with 5 V DC are available. They are organized in three groups each, whereas each is equipped with a separate output fuse. With this, an individual drop-out of a fuse does not lead to a complete drop-out of the related DC-voltage level. The DC components are connected via differently coded connectors.

Technical data IMED_e 580

Type	IMED _e 580
Art.-No.	9-059-130145
Input voltage	230 V AC, max. 580 VA
Output voltage isolating transformer	230 V AC, max. 350 VA
Output DC-voltage 1	5 V DC, max. 10 A, $\pm 5\%$
Output DC-voltage 2	12 V DC, max. 10 A, $\pm 5\%$
Output current per DC-group	max. 4 A
Total output leakage current	< 100 μ A
Conformity	EN 60601-1 (3. Edition) / EN 60601-1-2 / EN 61558-1 / EN 61558-2-4

PDU 1750



This device is a central power supply for a so-called Large Monitor Subsystem. It is situated in a 19"-rack and supplies its components, such as A/D converter, splitter, video transmission modules etc., with electric current. Additionally up to two 8-mega-pixel big screen monitors can be operated.

All outputs are relay controlled and partially switched time-delayed. In the output circuit of the isolating transformer also a soft-start module for the controlled switch-on of the subsequent switch-mode power supplies is used.

Technical data PDU 1750

Type	PDU 1750
Art.-No.	9-059-130147
Input voltage	100-120 V / 220-240 V 50/60 Hz
Output voltage	175-240 V / 550 VA
Bypass output voltage	100-120 V / 220-240 V / 1200 VA
Ambient temperature	$t_a = 50 \text{ }^\circ\text{C/B}$
Dimensions	19" 3 RU, 400 mm
Approvals	IEC 60601-1 / UL 60601-1 / EN 60601-1 / EN 60601-1-2

IMED_e 150 VA

Due to illness, more and more people are forced to spend several hours per week in a dialysis centre.

To be able to work with a notebook during that time it is necessary to operate it via a medical isolating transformer, as otherwise the safety regulations, that are valid for medically used rooms, are not met.

The isolating transformer will be fixed to the trolley via a mounting clamp. Afterwards the patient can plug in his notebook and work with it. Due to the simple installation a fast change to another dialysis station is possible.



Technical data IMED_e 150 VA

Type	IMED _e 150 VA
Art.-No.	9-059-130102
Input voltage	230 V AC 50/60 Hz
Output voltage	230 V 150 VA
Protection class	IP 21
Conformity	EN 60601-1 / EN 60601-1-2 / EN 61558-1 / EN 61558-2-4

The IMED program – an overview

Medical power supply at the highest stage

Series	IMED _e	IMED _i	IMED _e 3 rd	IMED _i 3 rd
	Medical isolating transformers for Europe (230 V-)	Medical isolating transformers for international use (115/230 V-)	Most modern medical isolating transformers with electronic and optional accessories for the use in Europe (230 V-)	Most modern medical isolating transformers with electronic and optional accessories for international use (115/230 V-)
Available types	IMED_e 150 , 150 VA Art.-No. 9-059-000006 IMED_e 300 , 300 VA Art.-No. 9-059-000003 IMED_e 600 , 600 VA Art.-No. 9-059-000007 IMED_e 1000 , 1000 VA Art.-No. 9-059-000005 IMED_e 2000 , 2000 VA Art.-No. 9-059-000004	IMED_i 300 , 300 VA Art.-No. 9-059-000001 IMED_i 300 WR , 300 VA Art.-No. 9-059-130075 IMED_i 1000 , 1000 VA Art.-No. 9-059-000002	IMED_e 300 3rd , 300 VA Art.-No. 9-059-000056 IMED_e 600 3rd , 600 VA Art.-No. 9-059-000057 IMED_e 1000 3rd , 1000 VA Art.-No. 9-059-000058 IMED_e 1500 3rd , 1500 VA Art.-No. 9-059-000059 IMED_e 2000 3rd , 2000 VA Art.-No. 9-059-000060	IMED_i 300 3rd , 300 VA Art.-No. 9-059-000050 IMED_i 600 3rd , 600 VA Art.-No. 9-059-000051 IMED_i 1000 3rd , 1000 VA Art.-No. 9-059-000052 IMED_i 1500 3rd , 1500 VA Art.-No. 9-059-000053

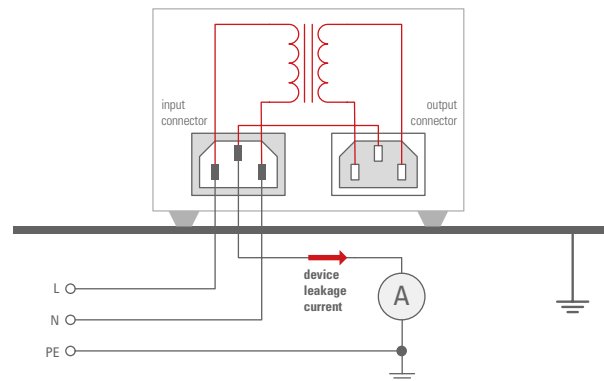
Accessories	for IMED _e	for IMED _i	for IMED _e 3 rd	for IMED _i 3 rd
MLI-1000 Art.-No. 9-059-190180	✓	✓	✓	✓
ELG Art.-No. 9-059-000010	✓	✗	✗	✗
ELG_s Art.-No. 9-059-000063	✓	✓	✗	✗
ELG_T Art.-No. 9-059-000062	✗	✗	✓	✓
Mounting brackets for wall mounting Art.-No. 9-059-000073	✗	✗	IMED _e 300 3 rd IMED _e 600 3 rd	IMED _i 300 3 rd IMED _i 600 3 rd
Mounting brackets for wall mounting Art.-No. 9-059-000074	✗	✗	IMED _e 1000 3 rd IMED _e 1500 3 rd IMED _e 2000 3 rd	IMED _i 1000 3 rd IMED _i 1500 3 rd
Retaining kit primary Art.-No. 9-059-000070	✗	✗	✓	✓
Retaining kit secondary Art.-No. 9-059-000071	✗	✗	IMED _e 300 3 rd IMED _e 600 3 rd	IMED _i 300 3 rd IMED _i 600 3 rd
Retaining kit secondary Art.-No. 9-059-000072	✗	✗	IMED _e 1000 3 rd IMED _e 1500 3 rd IMED _e 2000 3 rd	IMED _i 1000 3 rd IMED _i 1500 3 rd
IEC long heat device extension 1,5m angular plug to coupling, straight Art.-No. 1-530-290322	✗	✗	✓	✓

Term Definitions

Device Leakage Current

Measuring method of the device leakage current as indicated in the technical data of the medical isolating transformers.

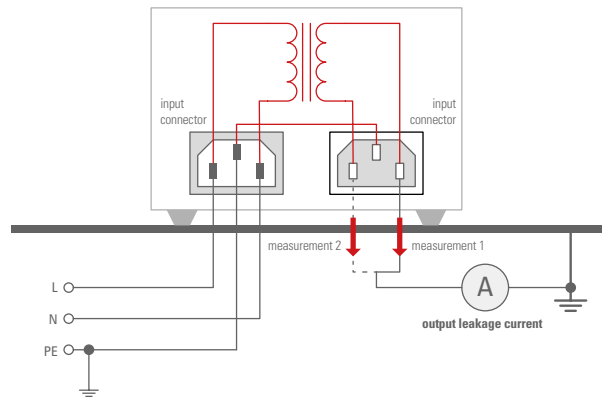
For measuring this, no load is connected to the output of the isolating transformer.



Output Leakage-Current

Measuring method of the output leakage current (secondary) as indicated in the technical data of medical isolating transformers.

The higher one of both measuring values is shown. For measuring this, no load is connected to the output of the isolating transformer.



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