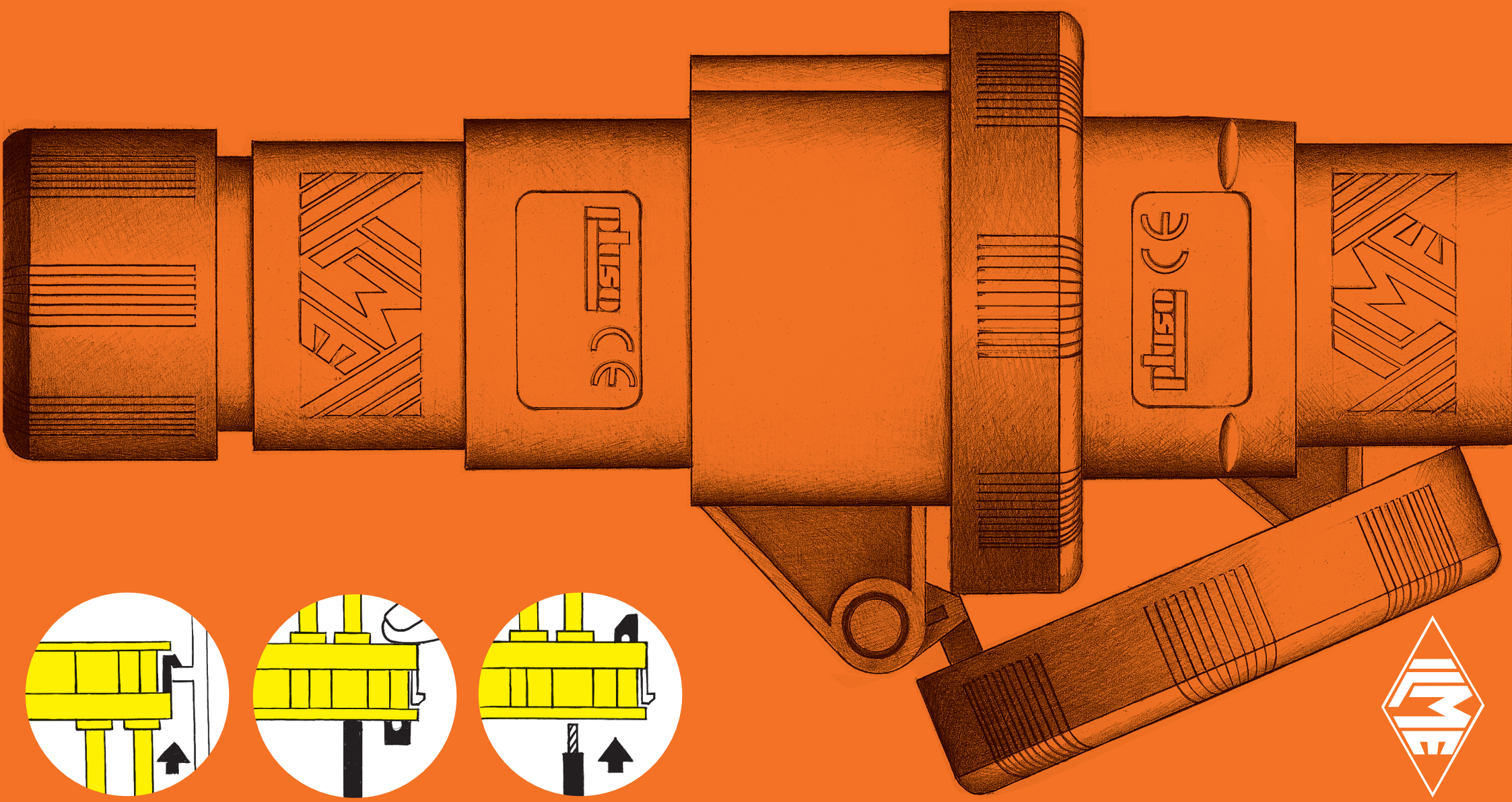
ENGLISH

PES 16A
Industrial sockets and plugs



The Company and the Product

INDUSTRIA LOMBARDA MATERIALE ELETTRICO SpA has been operating **in Milan since 1938**, in particular in the electrotechnical sector for the manufacturing of equipment for industrial installations.
ILME reflects the traditional **entrepreneurial spirit of Lombardy**, and has enjoyed continuous expansion for over half a century.
The company has carved an important role for itself in the main world markets, also operating directly in the countries that have assumed world leadership in the field of automation, including Germany and Japan.
In the **electrical connection** sector with applications in industrial automation, characterised by top performance and utmost **reliability** needs, ILME is today the acknowledged partner of many leading companies worldwide.
The company's fundamental values are:
Product innovation, original solutions, excellent **price-quality ratio**, a customer-oriented sense of **service**, ethical behaviour and an environmentally-friendly approach.

To promote the continuing improvement of its **qualitative results**, ILME has always encouraged its collaborators to work with utmost **responsibility and participation**.
The company focuses on a series of benefits to the user, including research into the most suitable materials, high quality and safe cabling, a rapid turnaround and readily available services.

CE marking

As from January 1st 1997, in order to launch electrical products on the European market the manufacturer must ensure these bear the relevant CE marking, in line with the Low Voltage Directive 73/23/EEC* (implemented in Italy as law 18-10-1977 no. 791) and its modification 93/68/EEC* (implemented in Italy as L. D. 25-11-1996 no. 626/96, published in the supplement to the Gazzetta Ufficiale of 14-12-1996). Said marking must be placed on the product - or, if this is not possible, on the packaging, the instructions for use or the warranty certificate - and acts as a declaration by the manufacturer that the product complies with all relevant EU directives.

ILME products bear the CE marking on the product or packaging.

Almost all ILME products fall under the Low Voltage Directive.
All SELV socket-outlets with safety transformer, which are fitted with a magnetic transformer, also fall within the field of application of the electromagnetic compatibility directive 89/336/EEC (implemented in Italy as D.L. 4-12-1992 no. 476 amended by the above mentioned directive 93/68/EEC), which they conform to, without the need of testing. A declaration of compliance is required before applying the CE marking.
This document, to which the market is not directly entitled, must be made available to the control authorities (in Italy the Ministry for Industry, Commerce and Handicraft) at all times.
In it, the manufacturer declares the technical safety standard(s) followed to manufacture the product.
These standards must be, in decreasing order of preference:

- A European standard (EN prefix)
- A European harmonisation document (HD prefix)
- An international IEC standard
- A national standard
- In the absence of reference standards, the manufacturer's internal specifications, guaranteeing compliance with the directive's basic safety requirements.

Compliance with harmonised technical standards (i.e. ratified by the CENELEC) constitutes presumed conformity to the directive's basic safety requirements.
The CE marking of ILME products results from said products' declaration of conformity to harmonised standards or international IEC standards.
Through the CE marking, ILME declares full compliance, not merely with the directive's basic safety requirements, but also with those international or national EU standards on which voluntary safety certification markings are based (e.g. IMQ and VDE).
In this way, ILME intends to award the CE marking the value of self-certification in terms of safety, given the loss in legal value of voluntary certifications issued by third parties, ratified by directive 93/68/EEC*.
Notwithstanding the above, practically all ILME products still bear voluntary conformity markings and are in accordance with the RoHS European Directive.

This EC declaration of conformity becomes null and void when the assembly of products includes one or more components not manufactured by us and without EC approval.

*** Note:**
New legal reference for the Low Voltage Directive is 2006/95/EC which is the consolidated edition of Directive 73/23/EEC + Directive 93/68/EEC.

The information contained in this catalogue is not binding and may be changed without prior notice.

Certification ISO 9001: 2008
Design, manufacture and distribution of industrial electrical equipment (IAF 19, 29a)
Certificate No. 50 100 11133

NEW

PES

SQUICH® connection

A TIMESAVER

New PES series plugs and socket-outlets with SQUICH® connection

A timesaver

The evolution of the ILME plugs and socket-outlets is the result of over forty years of experience acquired by ILME SpA.

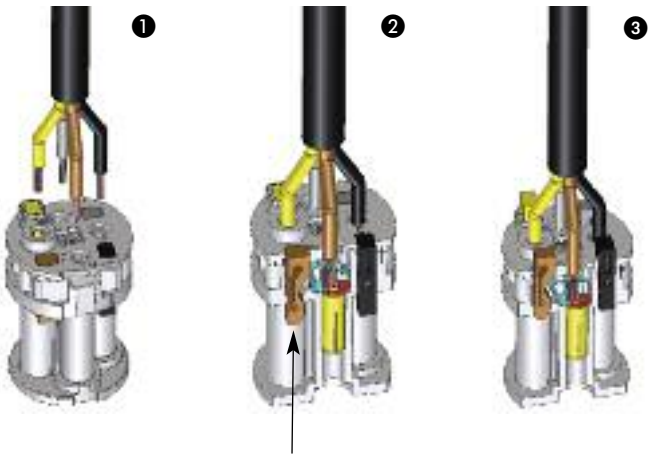
Safety, fast connection and **ease** of use are the main features of the new PES series, thanks to the innovative technical features introduced, **allows wiring times to be reduced by 50% as compared to conventional models.**

It is in fact sufficient to press the actuator button (pin) to close the spring device of the corresponding terminal, which is supplied open to customers.
This enables the establishment of a spring connection between the conductor and the corresponding electric contact.

The connection can simply be made at the press of a button, without the need for specific tools.

Operators can also check that connections have been performed correctly: after initially pressing the button, both the spring and actuator button position themselves automatically in the correct slot, thus locking the conductor in place.
The terminal cannot be left in half-open position because the mechanism is independent from the operator.
Furthermore, the terminal can be reopened without the use of tools, by pressing the opposite end of the corresponding actuator button.

Connection



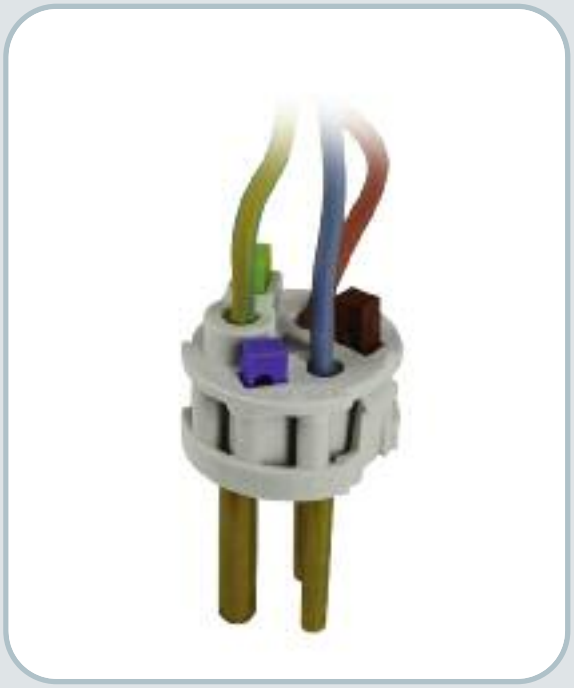
Connection terminals can be used for:
- unprepared flexible conductors (12 mm stripping), 1 mm^2 ÷ 2,5 mm^2;
- prepared flexible conductors (with crimped bush terminal), 1 mm^2 ÷ 2,5 mm^2.

New PES series plugs and socket-outlets with SQUICH® connection

A timesaver

Actuator buttons are supplied in lifted position and with an open terminal. They are **colour-coded in brown/black/grey/blue/yellow-green to allow operators to quickly identify the functions of the terminals associated to the corresponding contacts**:
- Brown/Black/Grey = Phase contacts
- Blue = Neutral contact (when present)
- Yellow/Green = PE earth contact.

The following markings are also present:
L1, L2, L3 N, ⏚.



Actuator buttons are arranged in appropriate slots that are situated **opposite to after those where the conductors** are inserted into the terminals to facilitate access to terminals.
Thanks to this exclusive solution, it is sufficient to check the position of the **actuator buttons** to easily identify the terminals that are still open.
All terminals are supplied open, ready for the insertion of the conductors.

This type of connection offers the following advantages:
- no special wire preparation **(other than stripping)**;
- optimum contact surface between the conductor and terminal;
- no need for cabling tools;
- optimum fastening and greater resistance to strong vibrations;
- possibility of using both rigid and flexible conductors, prepared and unprepared;
- significantly reduced insert preparation times.

New PES series plugs and socket-outlets with SQUICH® connection

A timesaver

To further simplify assembly, even the procedure for the insertion of the pre-wired insert is very fast and user-friendly:
- position the earthing contact in the required hour reference.

(earthing contact positioned at 4h)

(earthing contact positioned at 6h)

(earthing contact positioned at 9h)

Note:
the above applies to socket-outlets. Plugs are situated in a mirrored position as compared to socket-outlets.

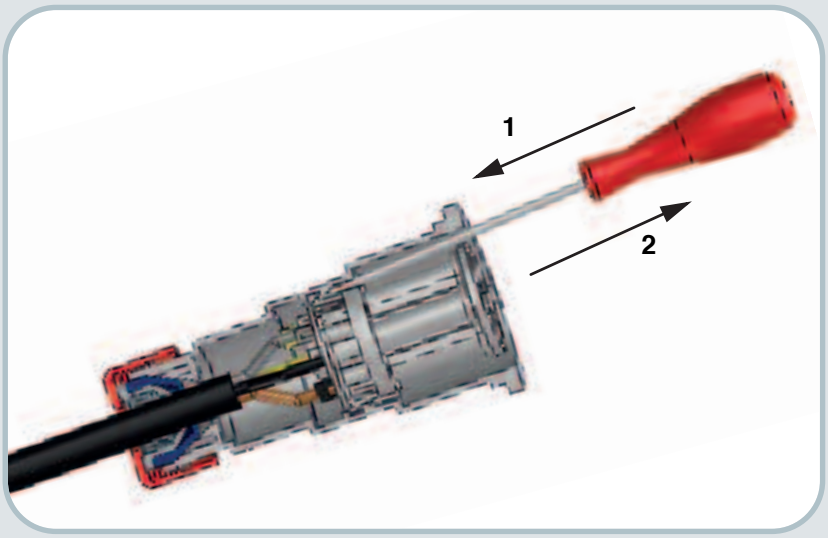
- Fully push the insert into the enclosure.

CLICK!

New PES series plugs and socket-outlets with SQUICH® connection

A timesaver

To release the plug or socket insert from its seating, simply **fully push in and then remove a 4 mm or 5 mm flat screwdriver in each of the slots** located along the outer perimeter of the insert in succession (two or three depending on the polarity and size of the socket or plug insert).



CLICK!

This system generates single-block, robust insert protection enclosures.
The configuration consisting in a single component offers greater resistance to shocks, falls and mechanical stresses.

New PES series plugs and socket-outlets with SQUICH® connection

A timesaver

The main features of the enclosures are:

- **New cable gland** with “locking ring” and a robust and reliable “pliers-like” **cable clamp**: both items can be tightened manually without tools and do not require further screws to be fixed in place. **Both products adapt to all permitted cable dimensions** and avoid the need of cutting or stripping grommets. **This significantly reduces wiring times.**

The new cable gland is suitable for cables with a diameter ranging from 7 to 16 mm (2P+⏚ and 3P+⏚ models) and from 8 to 24 mm (3P+N+⏚ models).

- The “standard” colour of the socket-outlet/plug body is light grey (RAL 7035) for all models. The colour that typically represents the voltage level, which is an optional requirement indicated in standards IEC 60309-1 and IEC 60309-2 but particularly appreciated by users, has now been used for the new cable gland and the locking ring of IP66/IP67 models or for the cover of the socket-outlets.

- **Certified** in accordance with the recently approved variant 1 of **European standards IEC 60309-1 and IEC 60309-2**, these products enable a “versatile” **IP66/IP67** degree of protection for industrial plugs and socket-outlets, in accordance with IEC 60529.

1) Cable gland with locking ring;
2) Pliers-like cable clamp;
3) Sealing gasket;
4) Single-block protection enclosure;
5) SQUICH® male insert.

Available versions:
- Rated current: 16 A
- Rated voltage *: 110 V, 230 V, 400 V
- Frequency: 50 ÷ 60 Hz
- No. of poles: 2P+⏚, 3P+⏚ and 3P+N+⏚;
- Degree of protection in accordance with IEC 60529: IP44, IP66/IP67.

The new PES series plugs and socket-outlets further integrate the renewed PE series with screw connectors, thus offering customers one of the widest range of products for industrial electrical applications.

The new PES series also offer the possibility of using fittings for PE 25 FG threaded tubes (for 2P+⏚ and 3P+⏚ models) and PE 32 FG threaded tubes (for 3P+N+⏚ models). Refer to page 10 for further details.

* For information on voltage ranges, see the corresponding pages in the catalogue and the table on page 11.

General characteristics

The range of products covers a wide number of different installation requirements.
Plugs and socket-outlets are suitable for mobile installations.
These construction features enable ILME plugs and socket-outlets to be used in the most demanding applications:

- Mechanical industry
- Shipbuilding industry
- Chemical and petrochemical industry
- Services sector
- Building industry
- Agricultural and livestock breeding sector

The following parameters must be considered when selecting the correct type of industrial plugs and socket-outlets:

- rated current of the device to supply with the plug and socket-outlet coupling;
- the rated voltage of the power supply and the type of distribution (single phase or three-phase, with or without neutral conductor) to determine the number of poles and hour position;
- the location of installation to determine the required degree of protection (IP44 or IP66/IP67) and the voltage (in some areas the installation standards require very low safety voltage).

Electrical features

Rated frequency:
From 50 to 60 Hz

Rated operating voltage:
- Low voltage socket-outlets (and plugs) for effective voltage values of 110V, 230V and 400V*

Polarity:
Models are designed with:
- 3, 4 and 5 poles (low voltage: 2P+⏚, 3P+⏚, 3P+N+⏚)

Rated current:
With 16 A values (low voltage)

Rated insulation voltage:
- **690V** for low voltage plugs and socket-outlets
Minimum surface insulation distance: 10 mm (IEC 60309-1)
Minimum air insulation distance: 8 mm (for rated operating voltages above 500V)

Hour position:
4h, 6h, 9h

Breaking capacity:
1.25 times greater than the rated current value (test performed at a voltage of 1.1 times the operating voltage)

Mechanical features

- Mechanical resistance
Tested in accordance with the requirements of Article 24 of standard IEC 60309-1

- Resistance to chemical agents
Contact ILME SpA

- Degree of protection
IP44 and IP66/IP67, in accordance with IEC 60529
(see information on page 13)

- Glow-wire resistance
In compliance with IEC 60695 -2 -11: 650 °C for enclosures, 850 °C for inserts

- Temperatures
Ambient: -25 °C ÷ +40 °C; limit of materials: -40 °C ÷ +90 °C

- Self-extinguishing properties
UL 94 classification:
94HB for enclosures
94V-2 for type and inserts

Materials

- Enclosures and inserts in self-extinguishing insulating thermoplastic material
- Anti-aging elastomer gaskets
- Brass pins
- Self-centring brass holes
- Terminals with spring connection and actuator button
- Terminal spring in stainless steel

* For information on voltage ranges, see the corresponding pages in the catalogue and the table on page 11.

PES/PESW...SV plugs, low voltage from over 100V up to 415V

- Compliant with IEC 60309-1 and -2
- Enclosure, insert and locking ring in insulating, thermoplastic, self-extinguishing material
- PES...SV types (IP44), entry with cable gland colour coded according to the operating voltage, RAL 7035 grey enclosure
- PESW...SV types (IP66/IP67), entry with cable gland colour coded according to the operating voltage, RAL 7035 grey enclosure, locking ring with gasket colour coded according to operating voltage
- Terminals with retained screws
- IP44 and IP66/IP67 degrees of protection (IEC 60529)

16A
IP44 degree of protection

16A
IP66/IP67 degrees of protection

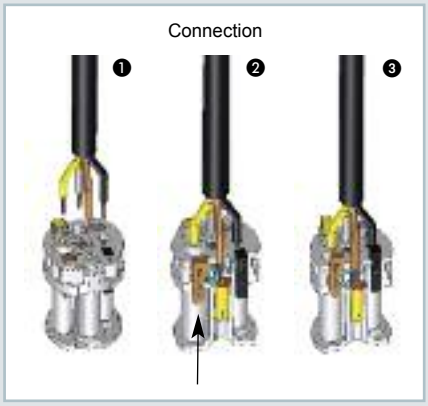
Number of poles	Frequency Hz	Voltage V	Earthing contact position h	Part No.	Colour	Part No.	Colour
2P+⏚	50 and 60	100 ÷ 130	4	**PES 1643 SV**		**PESW 1643 SV**	
	50 and 60	200 ÷ 250	6	**PES 1663 SV**		**PESW 1663 SV**	
	50 and 60	380 ÷ 415	9	**PES 1693 SV**		**PESW 1693 SV**	
3P+⏚	50 and 60	100 ÷ 130	4	**PES 1644 SV**		**PESW 1644 SV**	
	50 and 60	200 ÷ 250	9	**PES 1694 SV**		**PESW 1694 SV**	
	50 and 60	380 ÷ 415	6	**PES 1664 SV**		**PESW 1664 SV**	
3P+N+⏚	50 and 60	57/100 ÷ 75/130	4	**PES 1645 SV**		**PESW 1645 SV**	
	50 and 60	120/208 ÷ 144/250	9	**PES 1695 SV**		**PESW 1695 SV**	
	50 and 60	200/346 ÷ 240/415	6	**PES 1665 SV**		**PESW 1665 SV**	

Accessories for IP66/IP67 plugs (optional)

Loose protective cover

Size	Polarity	Part No.
16A	2P+⏚	**PEW 163 CS**
16A	3P+⏚	**PEW 164 CS**
16A	3P+N+⏚	**PEW 165 CS**

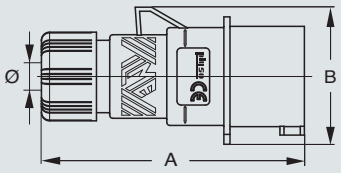
Connection



dimensions shown are not binding
and may be changed without notice

dimensions in mm

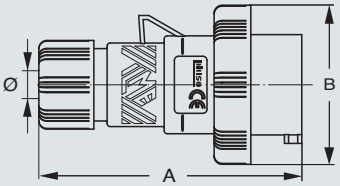
PES...SV



PES...SV		A	B	ø min	ø max
16A	2P+⏚	129	59,5	7	16
	3P+⏚	129	67	7	16
	3P+N+⏚	129	75	8	24

dimensions in mm

PESW...SV



PESW...SV		A	B	ø min	ø max
16A	2P+⏚	129	70	7	16
	3P+⏚	129	77	7	16
	3P+N+⏚	129	86	8	24

PES/PESW...PV couplers, low voltage from over 100V up to 415V

- Compliant with IEC 60309-1 and -2
- Enclosure, insert and spring lid in insulating, thermoplastic, self-extinguishing material
- PES...PV types (IP44), RAL 7035 grey enclosure, spring lid colour coded according to the operating voltage, entry with cable gland
- PESW...PV types (IP66/IP67), RAL 7035 grey enclosure, spring lid with locking ring and gasket colour coded according to the operating voltage, entry with cable gland
- Terminals with retained screws
- IP44 and IP66/IP67 degrees of protection (IEC 60529)

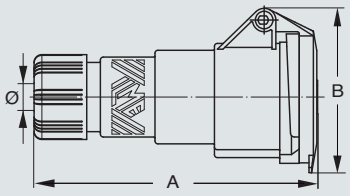
16A
IP44 degree of protection

16A
IP66/IP67 degree of protection

Number of poles	Frequency Hz	Voltage V	Earthing contact position h	Part No.	Colour	Part No.	Colour
2P+⏚	50 and 60 50 and 60 50 and 60	100 ÷ 130 200 ÷ 250 380 ÷ 415	4 6 9	**PES 1643 PV** **PES 1663 PV** **PES 1693 PV**		**PESW 1643 PV** **PESW 1663 PV** **PESW 1693 PV**	
3P+⏚	50 and 60 50 and 60 50 and 60	100 ÷ 130 200 ÷ 250 380 ÷ 415	4 9 6	**PES 1644 PV** **PES 1694 PV** **PES 1664 PV**		**PESW 1644 PV** **PESW 1694 PV** **PESW 1664 PV**	
3P+N+⏚	50 and 60 50 and 60 50 and 60	57/100 ÷ 75/130 120/208 ÷ 144/250 200/346 ÷ 240/415	4 9 6	**PES 1645 PV** **PES 1695 PV** **PES 1665 PV**		**PESW 1645 PV** **PESW 1695 PV** **PESW 1665 PV**	

dimensions in mm

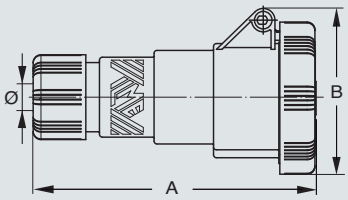
PES...PV



PES...PV		A	B	ø min	ø max
16A	2P+⏚	146	74,5	7	16
	3P+⏚	146	84,5	7	16
	3P+N+⏚	146	92,5	8	24

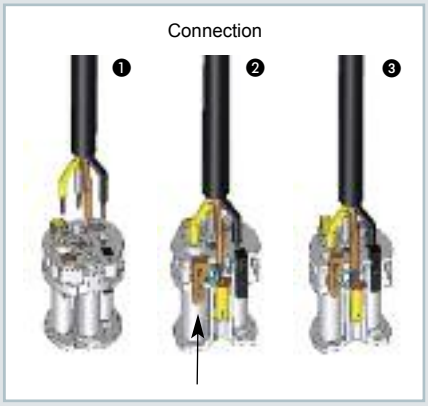
dimensions in mm

PESW...PV



PESW...PV		A	B	ø min	ø max
16A	2P+⏚	145	77	7	16
	3P+⏚	145	85	7	16
	3P+N+⏚	145	93	8	24

Connection



dimensions shown are not binding
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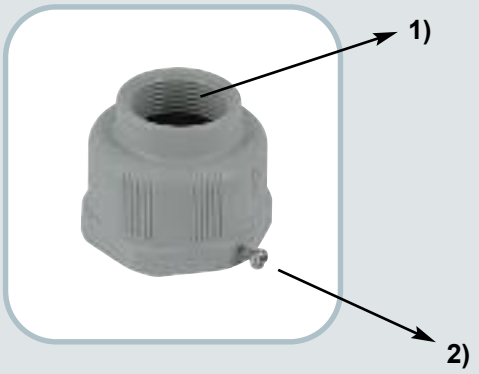
threaded adaptor for loose inserts and plugs



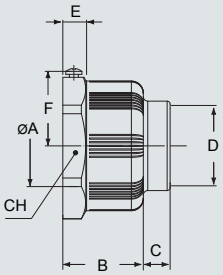
description	Part no.	entry M
- for PES/PESW...SV/PV 16A models, 2 poles+⏚ and 3 poles+⏚	**PE 25 FG**	25
- for PES/PESW...SV/PV 16A models, 3 poles+N+⏚ and 32A all models	**PE 32 FG**	32

Advantages

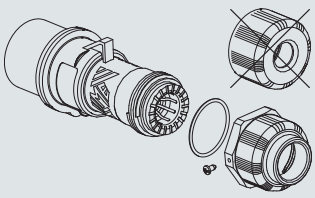
1) threading for fittings and cable glands
2) screw designed for two purposes:
– to fix insert to anchor wire
– to fix the adaptor in place for heavy duty applications

dimensions in mm

PE...FG



		øA	B	C	D	E	F	CH
PE 25 FG	16A 2/3P+⏚	49	27,5	9	M25 x 1,5	8	27	44
PE 32 FG	16A 3P+N+⏚ 32A	56	27,5	9	M32 x 1,5	8	29,5	52



Cable anchoring ring supplied as standard

PE 25 FG M25 x 1,5
16A 2P+T, 3P+T

PE 32 FG M32 x 1,5
16A 3P+N+T
32A 2P+T, 3P+T, 3P+N+T

Replacement sequence:

- Remove the cable anchoring ring from the housing, keeping the sealing gasket and the clamp in place.
- Install the sheath retainer with the sheath and cable (not supplied) on the cable anchoring ring with the threaded exit hole, after verifying that its protection degree is compatible with the one marked on the housing: position the gasket supplied in the seat on the bottom of the cable anchoring ring.
- Insert the cable in the housing and connect it.
- Insert the cable anchoring ring with the threaded exit hole in the threaded seat of the housing and tighten it to create a mechanical seal between the cable anchoring ring and the gasket.
- Tighten the spring screw and/or suspension supplied.

WARNING: Do not remove or alter in any way the sealing gasket or cable anchoring clamp, because these items are essential for the safety of the insert/plug.

dimensions shown are not binding
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EN 60309-1 and EN 60309-2 standards

In 1990, **CENELEC** (European Electrotechnical Standards Committee) introduced the provisions of the international publications IEC 60309-1 and IEC 60309-2 into the two corresponding European standards EN 60309-1 and EN 60309-2 (classification CEI 23-12/1 and 23-12/2). **IEC** *(International Electrotechnical Commission)*, the worldwide organisation for electrotechnical standardisation, had adopted these publications basing them almost entirely on the EEC 17 Publication of 1958, now withdrawn, issued by the now dissolved organisation **CEEel**. This is why still today this system of industrial sockets and plugs is traditionally called by many "EEC". The European standards EN 60309-1 and -2 were then compulsorily adopted as national standards by all the CENELEC member states (which as from May 1st 2004, with the expansion of the EU, include Austria, Belgium, Cyprus, Denmark, Estonia, Finland, France, Germany, Greece, Ireland, Iceland, Iceland, Italy, Latvia, Lithuania, Luxembourg, Malta, Norway, Holland, Poland, Portugal, United Kingdom, Czech Republic, Slovakia, Slovenia, Spain, Sweden, Switzerland and Hungary). All conflicting national standards have at the same time been abolished.
Today, therefore, the manufacture of plugs and socket-outlets for industrial use has been harmonised throughout Europe. Before its termination, CEEel's members also included Bulgaria, Israel, former Yugoslavia (today Bosnia, Croatia, Macedonia, Serbia with Montenegro, Slovenia) and the former Soviet Union (today the Russian Federation).
In virtue of the correspondence with the IEC publications, this industrial plugs and socket-outlets system is widely known and appreciated in leading non-European countries such as Argentina, Australia, Brazil, Canada, China, Korea, Egypt, Japan, India, South Africa, Turkey and the USA. In Italy the above harmonisation is regulated by standards EN 60309-1 and EN 60309-2. In 1999 the fourth editions of the IEC publications were adopted as EN by the CENELEC and published in Italy in 2000. In 2005, IEC published the Amendment 1 for both standards (EN corresponding publications are dated 2007).
The technical notes below and the products illustrated in the present booklet refer to series 1 versions, used in Europe on the basis of said European Standards and in countries of European technical-cultural origin (e.g.: most of Latin America, Australia, South Africa). A series 2 also exists, which differs for its rated current, voltage and frequency values and for its polarity and pole marking, adapting to North American installation standards and those of countries that have adopted this system (e.g. Mexico, Japan).

The provisions of standards

Each model of plug and socket is unique and has a specific use. Each model has safety devices that make it impossible to insert a plug into a socket made for a different capacity, voltage, frequency and number of poles.

In the "low voltage" versions, the safety system is based on two references:
- a guiding groove on the socket that corresponds to a nib on the plug;
- an earthing contact of increased capacity with respect to the other contacts, and located in different hour positions according to the voltages used.

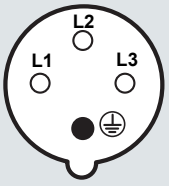
The 63A and 125A plugs have a pilot contact for operating an electric interlock.

Hour position (h)

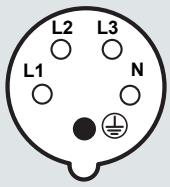
This position is determined by looking at the front of the socket and placing the major guiding groove at the 6 o' clock position and noting the hour position of the earthing contact. Following are examples of three different polarities with the earth contact at the 6 o' clock position.

Socket - front view

major key



major key



major key

Low voltage over 50V up to 1000V

Number of poles	Frequency Hz	Rated operating voltage V	Hour position (h) earthing contact (1) 16A e 32A	63A e 125A	Colour	
2P+⏚	50 e 60	100 ÷ 130	4	4		yellow
		200 ÷ 250	6	6		blue
	50 e 60	380 ÷ 415	9	9		red
		480 ÷ 500	7	7		black
		supply from ins. transformer	12	12	(5)	
	100 ÷ 300	> 50	10	10		(4)
	> 300 ÷ 500	> 50	2	2		(4)
	direct current	> 50 ÷ 250 (6)	3	3	(5)	
		> 250	8	8	(5)	
3P+⏚	50 e 60	supply from ins. transformer	12	12	(5)	
		100 ÷ 130	4	4		yellow
		200 ÷ 250	9	9		blue
		380 ÷ 415	6	6		red
	60	440 ÷ 460 (2)	11	11		red
	50 e 60	480 ÷ 500	7	7		black
		600 ÷ 690	5	5		black
	50 60	380 440 (3)	3	3		red
	50 e 60	1000	--	8		black
	100 ÷ 300	> 50	10	10		(4)
	> 300 ÷ 500	> 50	2	2		(4)
3P+N+⏚	50 e 60	57/100 ÷ 75/130	4	4		yellow
		120/208 ÷ 144/250	9	9		blue
		200/346 ÷ 240/415	6	6		red
		277/480 ÷ 288/500	7	7		black
		347/600 ÷ 400/690	5	5		black
	60	250/440 ÷ 265/460 (2)	11	11		red
	50 60	220/380 250/440 (3)	3	3		red
	50 e 60	supply from ins. transformer	12	12	(5)	
	100 ÷ 300	> 50	10	10		(4)
	> 300 ÷ 500	> 50	2	2		(4)
all types	all rated operating voltages and/or frequencies not covered by other configurations. Moreover, this hour position can be used in special applications where a distinction from the other normalized positions is necessary.		1	1		(5)

(1) The positions indicated with dashes "--" are not standardised.
(2) Mainly for marine installations.
(3) Only for refrigerated containers (standardised by ISO).
(4) If necessary, green colour may be used together with the colour of the operating voltage for frequencies of over 60 Hz up to 500 Hz inclusive.
(5) Colour according to voltage.
(6) This configuration must have an earth contact as it works with voltages exceeding the ELV (d.c.) upper limits according to IEC 60364-4-41.

Size of connectable conductors according to IEC 60309-1

Conductor cross-sections in mm^2 usable in socket-outlets and plugs

rated operating voltage	rated current	fixed plugs* (rigid or semi rigid conductors)		plugs and couplers (rigid or semi fixed plugs rigid conductors)	
		min	max	min	max
over 50V up to 690V	16A	1,5	4	1	2,5
	32A	2,5	10	2,5	6
	63A	6	25	6	16
	125A	25	70	16	50
up to 50V	16A	4	10	4	10
	32A	4	10	4	10

For pilot contacts (63A ad 125A socket-outlets and plugs), refer to the conductors which can be used in the 16A socket-outlets and plugs with a rated voltage of over 50V.

* It is also possible to connect flexible conductors to fixed sockets and plugs. The equivalent section of the flexible conductor is generally one size smaller than the rigid or the semi rigid conductor. Please refer to IEC 60309-1 and -2 standards.

Use of multipolar cables according to IEC 60309-1

Min. and max. diameters of cables which clamped in couplers and plugs

rated operating voltage	rated current	approximate external cable ø in mm (cables type HO5 RR-F and HO7 RN-F)	
		min	max
over 50V up to 690V	16A	8,1	15,3
	32A	11,5	21,3
	63A	17,3	31,3
	125A	26,0	48,8
up to 50V	16A	13,5	22,8
	32A	13,5	22,8

Degrees of pollution

The pollution degrees define the environmental conditions.
To go into more detail, standard IEC 60664-1 clarifies that pollution is defined as any contribution of foreign matter, whether a solid, liquid or gaseous (ionised gas), that may negatively affect the dielectric strength of the surface resistivity of the insulating material.
Four degrees of pollution are defined and are described by conventional numbers based on the quantity of polluting agent or on the frequency with which the phenomenon occurs that reduces the dielectric strength and/or the surface resistivity.

pollution degree 1:
no pollution or only dry non-conductive pollution.
The pollution has no influence.

pollution degree 2:
only non-conductive pollution except that occasionally a temporary conductivity caused by condensation is to be expected.

pollution degree 3:
conductive pollution occurs or dry non conductive pollution occurs which becomes conductive due to condensation which is to be expected [7].

The **pollution degree 3** refers to an industrial or similar environment.
The **pollution degree 2** refers to a household or similar environment.

The third edition and the forthcoming fourth edition of standard IEC 60309-1 specifies that the normal use environment for the industrial plugs and socket-outlets complying with this standard has a pollution degree 3 according to standard IEC 60664-1.

IP degree of protection and the IEC 60529 standard

The minimum IP degree of protection is regulated by the CEI 64-8 installation standards (inclusion of the harmonisation documents of the CENELEC HD384 series and the IEC 60364 publication) which, in part 7, cover a number of special environments: construction and demolition sites, structures designed for agricultural or livestock breeding use, restricted conductor areas, caravans and caravan sites, environments with a greater risk in case of fire, public performance and entertainment areas, pools and, in the future, fountains and marinas and harbour areas. The standard is applicable to enclosures for electric materials with a rated power no greater than 72.5 kW. All the equipment must be installed according to the rule of art and must comply with any manufacturer's assembly instructions. When components of different degrees of protection are assembled, the resulting board or distribution system will assume the lowest degree of protection of the mounted components.

This has been assessed and applies:
- socket-outlets, when a plug of the same degree of protection is inserted or when the cover is closed (with counternuts tightened for IP67).
- plugs (with counternuts tightened for IP67).
- for cases, when all the covers are adequately closed.

The range of ILME products presented in this catalogue offers the following range of protection:

IP44: protection against the *penetration of solid foreign objects* with a diameter equal to or greater than 1 mm for protection against the intrusion of dangerous parts with an access calibre of Ø 1 mm (1st digit), and protected against the *dangerous effects of water spray* from all directions (2nd digit).
IP55: Protection against the *penetration of harmful quantities of powder* and against *access to dangerous parts* with an access calibre of Ø 1 mm (1stdigit) and protected against the *dangerous effects of water jets* with a nozzle from all directions (2nd digit).
IP66: total protection against *dust* and access to *dangerous parts* with an accessibility calibre of Ø 1 mm (1st digit), and protected against *powerful water jets* such as sea waves (2nd digit).
IP67: Total protection against *powder* and against *access to dangerous parts* with an access calibre of Ø 1 mm (1st digit) and protected against *the effects of temporary immersion* (30') in water at a maximum depth of 1 meter (2nd digit).

The socket-outlets with IP55 degree of protection and those with double degree of protection IP66/IP67 [8] have a bayonet jointed lid, traditionally defined as "water-tight" and require plugs with IP67 degree of protection (with counternut and gasket) to preserve the degree of protection marked on the apparatus.

1st characteristic numeral
Personal protection against contact with hazardous parts

IP	External solid foreign bodies	Protection
0		none
1		against solid foreign objects with Ø greater or equal to 50 mm (e.g. hand)
2		against solid foreign objects with Ø greater or equal to 12 mm (e.g. finger)
3		against solid foreign objects with Ø greater or equal to 2.5 mm (e.g. tools and wires)
4		against solid foreign objects with Ø greater or equal to 1 mm (e.g. fine tools and wires)
5		dust-protected
6		dust-tight

2nd characteristic numeral
Protection of materials against harmful penetration of water

IP	Tests	Protection
0		none
1		against vertical drops of water
2		against drops of water at an angle of 15°
3		against drops of water at an angle of 60°
4		against water sprayed from all directions
5		against jets of water from all directions
6		against powerful jets of water (such as sea waves)
7		against the effect of temporary immersion in water at a depth of 1 metre
8		against the effects of continuous immersion in water

[7] Pollution degree 4 was eliminated in the new standard edition as clearly illogical: conditions of persistent conductivity caused for example by conductive dust, rain or snow are definitely to be avoided throughout the project, and no isolating distance is capable of withstanding them.

[8] The **IP66/IP67** degree of protection has been introduced in the amendment 1 of standards IEC 60309-1 and IEC 60309-2. It is already accounted for in the IP degree of protection standard IEC 60529 as a "versatile" form of protection, covering the fact that the temporary immersion resistance test (protection IPX7) does not automatically comply with the two lower degrees of protection IPX6 and IPX5, tested with the respective jet tests. If the end user requires the equipment to resist both against temporary immersions and pressurized water jets, declaredly IP66/IP67 devices with double marking must be selected.

Notes

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