CABLE GLANDS
for explosive atmospheres

Jacob

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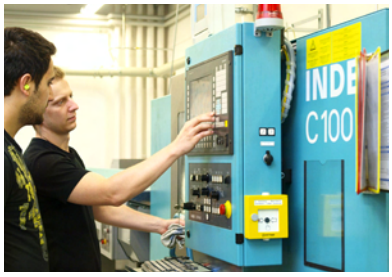
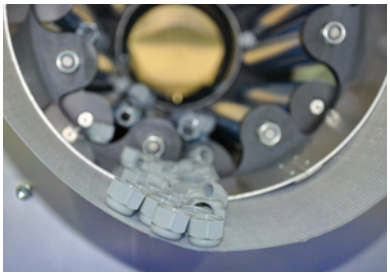
Jacob - your specialist for cable glands and measuring technology



The basis of our success story was founded in 1922:
Wilhelm Jacob begins in the West of Stuttgart with the production of brass turning parts for the electric industrie on Fasson automatic turning machines. At this time he already presents his company at the Leipzig exhibition and established contacts for the business abroad.

Continuous growth and the expansion of the production programms require continuous removals. Over Fellbach and Waiblingen the way finally ends in Kernen-Rommelshausen. At this location we combine the consolidated buisness of the company - and we have enough space for future extensions.



Today we produce on modern injection moulding machines and with CNC-multi-spindle-turning machines. Our 200 employees develop, manufacture and distribute cable glands in brass, stainless-steel and plastic. An additional focus of our company: For more than 25 years we produce measuring technology. We provide standard-product lines as well as costomized solutions for specific applications.

Our products are being used worldwide - by now we deliver in 70 countries. Whether in the electro industry, for panel building, machine building or at the electro wholesaler:
As your competent partner we offer extensive customer service and support. Our complete production is "Made in Germany" and guarantees highest quality!

We know, that flexibility and velocity is important for the satisfaction of our customers. Our new logistic and production centre enables us to deliver the goods in time. That is our understanding of best possible service.

Until now the descendants of the company´s founder take influence. For us, tradition and continuity do not exclude each other.
We feel obligated to our customers.

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Cable glands

As one of the leading manufacturers of cable glands we offer a wide range of products and accessories. With a large variety of cable glands we offer a solution for almost all customer requirements.

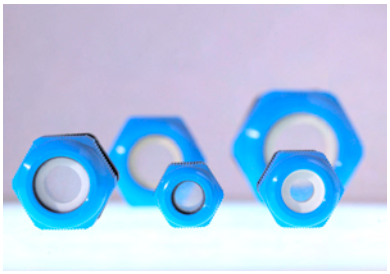
Our production technology at Jacob with modern injection moulding machines and CNC-multiple spindle turning machines is state-of-the-art. The electroplating facility for our brass items is compliant with the strictest environmental standards. The moulds for the plastic production are mostly developed and
produced in our in-house tool shop.

Jacob cable glands are available in brass, stainless steel and various plastic materials. All main product series have approvals according to EN 50262 and UL 514B.

For technical documentation and details please see our main catalogues:

Metric cable glands
Cable glands with Pg-, NPT- and pipe thread
Cable glands for explosive atmospheres

Or check our website www.jacob-gmbh.de for further information.



Explosion protection

BASIC INFORMATION AND TERMINOLOGY

Directive 94/9/EG

Requirements for explosion protection in Europe have recently been redefined in directive 94/4/EC. The directive specifies the requirements for safety and health in potentially explosive atmospheres. The directive is also referred to as "ATEX 95". ATEX is an acronym formed from the French term "Atmosphrère Explosible" ("explosive atmosphere") and was used by the authors of the directive as a working title for the project (formerly also ATEX 100a). Since 1 July 2003, only products in accordance to this directive may be sold for use in potentially explosive atmospheres.
The manufacturer must possess

- an EC-Type Examination Certificate and
- a QA Certificate for his explosion-proof product.

Both documents are issued by an officially nominated certification body after the relevant tests have been passed.

The manufacturer will be issued with an **EC-Type Examination Certificate** provided that his product passes the technical tests and fulfils all safety requirements. After a successful QA audit, the manufacturer will receive a QA certificate for his quality assurance system from a nominated body. This document certifies that he has fulfilled the requirements of the ATEX directive in the production of equipment and protective systems intended for use in potentially explosive atmospheres.
The **EC declaration of conformity** is a declaration by the manufacturer indicating that his product conforms to the applicable directives of the European Union, as identified by the letters CE.

The CE symbol is an administrative mark and not a mark of quality.

STANDARDS AND TYPES OF PROTECTION

Standard	Titel and types of protection	Code
relevant for Ex-cable glands and Ex-accessories		
EN 60079-0	Explosive atmospheres - Part 0: Equipment - General requirements	
EN 60079-1	Explosive atmospheres - Part 1: Equipment protection by flameproof enclosures "d"	Ex d
EN 60079-7	Explosive atmospheres - Part 7: Equipment protection by increased safety "e"	Ex e
EN 61241-0	Electrical apparatus for use in the presence of combustible dust - Part 0: General requirements	
EN 61241-1	Electrical apparatus for use in the presence of combustible dust - Part 1: Protection by enclosures "tD"	

EQUIPMENT GROUPS, CATEGORIES AND ZONES

Equipment group	**I** Mining	
Category	**M1**	**M2**
Level of safety	very high	high

Equipment group	**II** other potentially explosive areas					
Category	**1**		**2**		**3**	
Atmosphere	Gas **G**	Dust **D**	Gas **G**	Dust **D**	Gas **G**	Dust **D**
Zone	0	20	1	21	2	22
potentially explosive atmopshere is existent	continuously or for long periods or frequently		incidental		infrequent and for short period	
Level of safety	very high		high		normal	

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Explosion-proof cable glands

DEFINITION, APPLICATION, MARKING

Definition

Cable glands and Ex-cable glands for use in potentially explosive atmospheres are defined in EN 60079-0

Cable gland is a device permitting the introduction of one or more electric and / or fibre optics cables into an electrical apparatus so as to maintain the relevant type of protection

Ex-cable gland is a cable gland tested separately from the apparatus enclosure but certified as an apparatus and which is fitted to the apparatus enclosure during installation.

Applications for Jacob explosions-proof cable glands

Our explosion-proof cable glands and accessories illustrated on the following catalogue pages have been approved and can be used for the introduction of cables and leads in potentially explosive atmospheres of

Equipment group	II
categories	2 und 3
with gas explosion protection	G
and dust explosion protection	D
in zones	1, 2, 21, 22
in types of protection	Ex e und Ex i

Marking

Electrical equipment for use in potentially explosive atmospheres must be marked permanently at an easily visible location.

Example: Marking of our PERFECT Ex-cable gland made of brass

on the single item: II 2 G Ex e II 2 D Ex tD A21 M**x1,5 DMT 99 E016

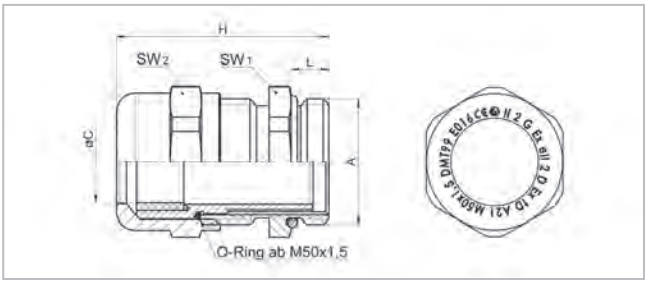
on the packaging: 0158 II 2 G Ex e II 2 D Ex tD A21 IP68 M**x1,5 DMT 99 ATEX E016

EXPLANATION OF MARKTINGS:

	Jacob trade name
CE	CE-Marking
0158	Code of the notified body, DMT
Ex	Spezific marking for explosion protection
II	Symbol of the equipment group
2	Code for the category
G	Gas explosion protection
Ex	Symbol Ex, which indicates that the electrical appartus corresponds to one or more of the types of protection
e	Symbol for type of protection "Increased safety"
II	Symbol of the equipment group
2	Code for the category
D	Dust explosion protection
Ex	Symbol Ex, which indicates that the electrical appartus corresponds to one or more of the types of protection
tD	Symbol for type of protection "Protection by enclosures"
A	Method of determining dust ingress is according to IEC 60529 - IP Code
21	Code for the dust zone
IP68	Protection grade
M**x1,5	Size of connecting thread
DMT	Notified body
99	Year of the testing
ATEX	Conformity with directive 94/9/EG
E016	Certification number of the notified body

PERFECT Ex-cable gland 50.6xx M/EX

Configuration	
Dome nut	Brass CuZn39Pb3, nickel-plated
Dust cap	Polyethylene PE-LD
Lamellar insert	Polyamide PA6 V-2
Sealing ring	Polychloroprene-Nitrile rubber CR/NBR
Gland body	Brass CuZn39Pb3, nickel-plated
O-ring	Nitrile rubber NBR
Connecting thread	metric, as per EN 60423
Properties	
	integrated anchorage, wide sealing and clamping range, easy-to-install
Equipment group	II
Category / Zone	2G and 2D / 1, 2, 21, 22
Type of protection	Ex e - increased safety Ex tD A21 - Protection by enclosures
Cable installation	fixed
Temperature range	-20°C / +80°C
Protection grade	IP68 - 5bar
Test standard	EN 60079-0 / EN 60079-7 EN 61241-0 / EN 61241-1
EC-Type certificate	DMT 99 ATEX E016



Characteristics

Connecting thread standard length

A	ØC mm	L mm	SW1 mm	SW2 mm	H mm	Piece	Part No.	
M12x1,5	3 - 6	5	14	14	25	100	50.612 M/EX	
M12x1,5	3 - 6,5	5	14	14	24	100	50.612 M1/EX	
M16x1,5	5 - 9	5	17	17	29	100	50.616 M/EX	
M20x1,5	9 - 13	6	22	22	33	100	50.620 M/EX	
M20x1,5	6 - 12	6	22	22	31	100	50.620 M1/EX	
M25x1,5	11 - 16	7	27	27	36,5	50	50.625 M/EX	
M32x1,5	14 - 21	8	34	34	38	25	50.632 M/EX	
M40x1,5	19 - 27	8	43	43	41	10	50.640 M/EX	
M50x1,5	24 - 35	9	55	55	47,5	5	50.650 M/EX	
M63x1,5	32 - 42	10	65	65	54,5	5	50.663 M/EX	
M63x1,5	38 - 48	10	65	65	54,5	5	50.663 M1/EX	

Connecting thread long

A	ØC mm	L mm	SW1 mm	SW2 mm	H mm	Piece	Part No.	
M12x1,5	3 - 6	10	14	14	30	100	50.612 M/L/EX	
M16x1,5	5 - 9	10	17	17	34	100	50.616 M/L/EX	
M20x1,5	9 - 13	10	22	22	37	100	50.620 M/L/EX	
M25x1,5	11 - 16	11	27	27	40,5	50	50.625 M/L/EX	
M32x1,5	14 - 21	13	34	34	43	25	50.632 M/L/EX	
M40x1,5	19 - 27	13	43	43	46	10	50.640 M/L/EX	
M50x1,5	24 - 35	14	55	55	52,5	5	50.650 M/L/EX	
M63x1,5	32 - 42	14	65	65	58,5	5	50.663 M/L/EX	
M63x1,5	38 - 48	14	65	65	58,5	5	50.663 M1/L/EX	

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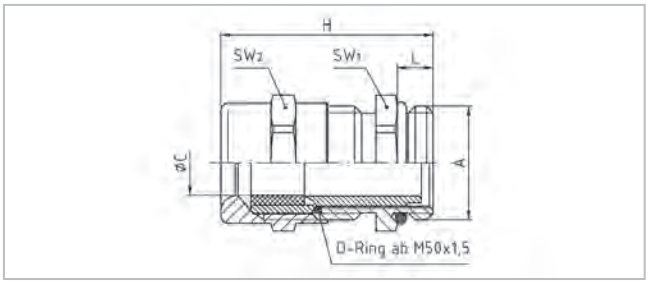
PERFECT Ex-cable gland 50.7xx M/EX

Configuration	
Dome nut	Brass CuZn39Pb3, nickel-plated
Dust cap	Polyethylene PE-LD
Lamellar insert	Polyamide PA6 V-2
Sealing ring	Polychloroprene-Nitrile rubber CR/NBR
Gland body	Brass CuZn39Pb3, nickel-plated
O-ring	Nitrile rubber NBR
Connecting thread	metric, as per EN 60423
Properties	
	integrated anchorage, wide sealing and clamping range, easy-to-install
Equipment group	II
Category / Zone	2G and 2D / 1, 2, 21, 22
Type of protection	Ex e - increased safety Ex tD A21 - Protection by enclosures
Cable installation	flexible
Temperature range	-20°C / +80°C
Protection grade	IP68 - 5bar
Test standard	EN 60079-0 / EN 60079-7 EN 61241-0 / EN 61241-1
EC-Type certificate	DMT 99 ATEX E016



Characteristics

Connecting thread standard length

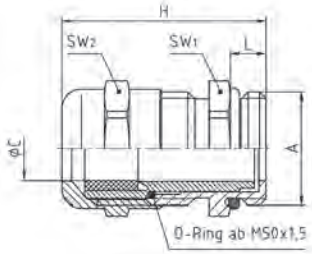
A	ØC mm	L mm	SW1 mm	SW2 mm	H mm	Piece	Part No.	
M12x1,5	3 - 6	5	14	14	26,5	100	50.712 M/EX	
M16x1,5	5 - 9	5	17	17	30	100	50.716 M/EX	
M20x1,5	9 - 13	6	22	22	36	100	50.720 M/EX	
M25x1,5	11 - 16	7	27	27	39,5	50	50.725 M/EX	
M32x1,5	14 - 21	8	34	34	41	25	50.732 M/EX	
M40x1,5	19 - 27	8	43	43	45,5	10	50.740 M/EX	
M50x1,5	24 - 35	9	55	55	50,5	5	50.750 M/EX	
M63x1,5	32 - 42	10	65	65	55	5	50.763 M/EX	
M63x1,5	38 - 48	10	65	65	55	5	50.763 M1/EX	

Connecting thread long

A	ØC mm	L mm	SW1 mm	SW2 mm	H mm	Piece	Part No.	
M12x1,5	3 - 6	10	14	14	31,5	100	50.712 M/L/EX	
M16x1,5	5 - 9	10	17	17	35	100	50.716 M/L/EX	
M20x1,5	9 - 13	10	22	22	40	100	50.720 M/L/EX	
M25x1,5	11 - 16	11	27	27	44	50	50.725 M/L/EX	
M32x1,5	14 - 21	13	34	34	46	25	50.732 M/L/EX	
M40x1,5	19 - 27	13	43	43	50,5	10	50.740 M/L/EX	
M50x1,5	24 - 35	14	55	55	55,5	5	50.750 M/L/EX	
M63x1,5	32 - 42	14	65	65	59	5	50.763 M/L/EX	
M63x1,5	38 - 48	14	65	65	59	5	50.763 M1/L/EX	

PERFECT EMC-Ex-cable gland — 50.6xx M/EMV/EX

Configuration	
Dome nut	Brass CuZn39Pb3, nickel-plated
Dust cap	Polyethylene PE-LD
Lamellar insert	Polyamide PA6 V-2
Sealing ring	Polychloroprene-Nitrile rubber CR/NBR
Gland body	Brass CuZn39Pb3, nickel-plated
O-ring	Nitrile rubber NBR
Connecting thread	metric, as per EN 60423
Properties	
	for cables with shielding, integrated anchorage, wide sealing and clamping range
Equipment group	II
Category / Zone	2G and 2D / 1, 2, 21, 22
Type of protection	Ex e - increased safety Ex tD A21 - Protection by enclosures
Cable installation	fixed
Temperature range	-20°C / +80°C
Protection grade	IP68 - 5bar
Test standard	EN 60079-0 / EN 60079-7 EN 61241-0 / EN 61241-1
EC-Type certificate	DMT 99 ATEX E016



EMV / EMC

Characteristics

Connecting thread standard length

A	ØC mm	L mm	SW1 mm	SW2 mm	H mm	Piece	Part No.
M12x1,5	3 - 6	5	14	14	25	100	50.612 M/EMV/EX
M12x1,5	3 - 6,5	5	14	14	24	100	50.612 M1/EMV/EX
M16x1,5	5 - 9	5	17	17	29	100	50.616 M/EMV/EX
M20x1,5	9 - 13	6	22	22	33	100	50.620 M/EMV/EX
M20x1,5	6 - 12	6	22	22	31	100	50.620 M1/EMV/EX
M25x1,5	11 - 16	7	27	27	36,5	50	50.625 M/EMV/EX
M32x1,5	14 - 21	8	34	34	38	25	50.632 M/EMV/EX
M40x1,5	19 - 27	8	43	43	41	10	50.640 M/EMV/EX
M50x1,5	24 - 35	9	55	55	47,5	5	50.650 M/EMV/EX
M63x1,5	32 - 42	10	65	65	54,5	5	50.663 M/EMV/EX
M63x1,5	38 - 48	10	65	65	54,5	5	50.663 M1/EMV/EX

Connecting thread long

A	ØC mm	L mm	SW1 mm	SW2 mm	H mm	Piece	Part No.
M12x1,5	3 - 6	10	14	14	30	100	50.612 M/EMVLEX
M16x1,5	5 - 9	10	17	17	34	100	50.616 M/EMVLEX
M20x1,5	9 - 13	10	22	22	37	50	50.620 M/EMVLEX
M25x1,5	11 - 16	11	27	27	40,5	50	50.625 M/EMVLEX
M32x1,5	14 - 21	13	34	34	43	25	50.632 M/EMVLEX
M40x1,5	19 - 27	13	43	43	46	10	50.640 M/EMVLEX
M50x1,5	24 - 35	14	55	55	52,5	5	50.650 M/EMVLEX
M63x1,5	32 - 42	14	65	65	58,5	5	50.663 M/EMVLEX
M63x1,5	38 - 48	14	65	65	58,5	5	50.663 M1/EMVLEX

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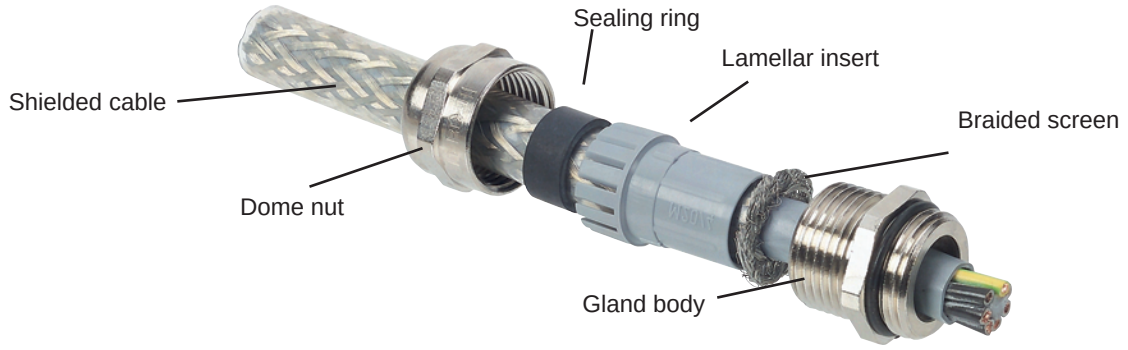
PERFECT EMC-Ex-cable gland

BASIC INFORMATION

One of the important quality characteristics of electrical and electronic products is their electromagnetic compatibility (EMC). To ensure trouble-free operation of electrical appliances, systems and plants, the basic EMC requirements must be met, i.e. electrical devices must be protected from interference and must not themselves interfere with other appliances and equipment. Cable glands play an important part in safeguarding EMC requirements where cables and leads enter into a shielded system. They have to ensure a permanent connection with very low ohmic or inductive resistance between the cable shield and the housing potential.

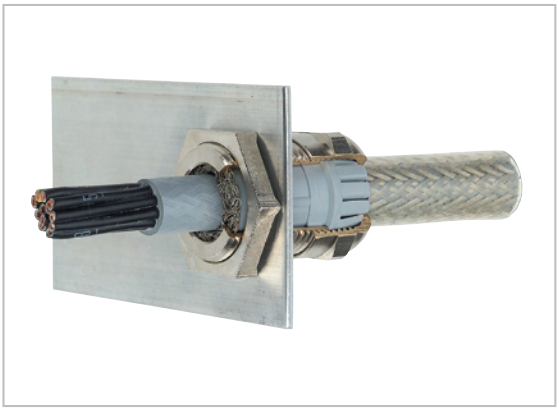
Our easy-to-assemble **PERFECT EMC cable gland** ensures continuous contacting without gaps. The dome nut and the lamellar insert are simply pushed onto the lead. The exposed cable shield is folded around the lamellar insert, and the gland base is then pushed on. The screw-fitting of the dome nut ensures that the cable shield is pressed over a large surface between the torsion-protected lamellar insert and the gland base. The result is a very good metal contact area of the cable shield via the gland base to the housing, protected from external environmental influences.

The equipotential bonding and the vibration protection can be improved further by using our hexagonal locknut with cutting edges (see catalogue page 11).



ASSEMBLY INSTRUCTION

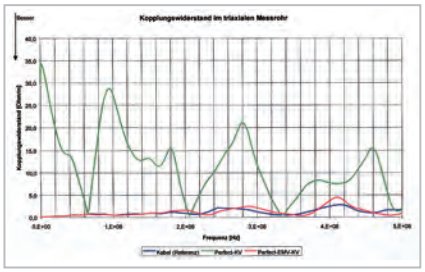
1. Cut off outer cable sheath and expose braided screen over a length of approx. 10 - 15 mm, depending on the cable diameter.
2. Push the dome nut and lamellar insert with sealing ring onto the cable.
3. Bend braided screen outwards at a right angle (90°)
4. Fold braided screen towards outer sheath, i.e. by annother 180°.
5. Push gland base up to braided screen and turn briefly around both sides of the cable axis.
6. Push lamellar insert with sealing ring into gland base and snap anti-rotation element into place.
7. Firmly screw on dome nut.



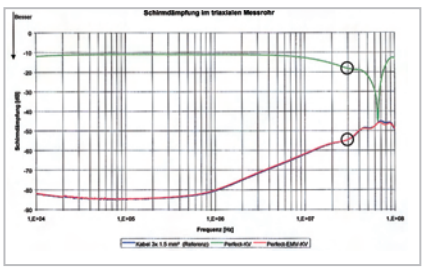
EMC TEST REPORT

Our PERFECT EMC cable glands have been tested and certified by the VDE according to the VG standard 95373 Part 40 for transfer impedance and shield attenuation. On request, we will be pleased to provide you with a copy of the complete test report.

Transfer impedance cable and cable glands
PERFECT EMC-cable gland and PERFECT cable gland

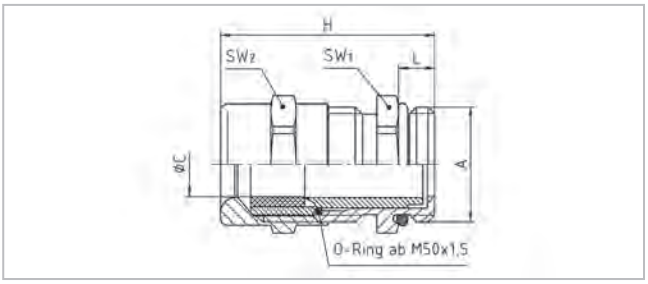


Shield attenuation
PERFECT EMC-cable gland, PERFECT cable gland and reference cable up to 30 MHz logarithmic frequency scaling.
The 30 MHz point ist marked



PERFECT EMC-Ex-cable gland — 50.7xx M/EMV/EX

Configuration	
Dome nut	Brass CuZn39Pb3, nickel-plated
Dust cap	Polyethylene PE-LD
Lamellar insert	Polyamide PA6 V-2
Sealing ring	Polychloroprene-Nitrile rubber CR/NBR
Gland body	Brass CuZn39Pb3, nickel-plated
O-ring	Nitrile rubber NBR
Connecting thread	metric, as per EN 60423
Properties	
	for cables with shielding, integrated anchorage, wide sealing and clamping range
Equipment group	II
Category / Zone	2G and 2D / 1, 2, 21, 22
Type of protection	Ex e - increased safety Ex tD A21 - Protection by enclosures
Cable installation	flexible
Temperature range	-20°C / +80°C
Protection grade	IP68 - 5bar
Test standard	EN 60079-0 / EN 60079-7 EN 61241-0 / EN 61241-1
EC-Type certificate	DMT 99 ATEX E016



Characteristics

Connecting thread standard length

A	ØC mm	L mm	SW1 mm	SW2 mm	H mm	Piece	Part No.	
M12x1,5	3 - 6	5	14	14	26,5	100	50.712 M/EMV/EX	
M16x1,5	5 - 9	5	17	17	30	100	50.716 M/EMV/EX	
M20x1,5	9 - 13	6	22	22	36	100	50.720 M/EMV/EX	
M25x1,5	11 - 16	7	27	27	39,5	50	50.725 M/EMV/EX	
M32x1,5	14 - 21	8	34	34	41	25	50.732 M/EMV/EX	
M40x1,5	19 - 27	8	43	43	45,5	10	50.740 M/EMV/EX	
M50x1,5	24 - 35	9	55	55	50,5	5	50.750 M/EMV/EX	
M63x1,5	32 - 42	10	65	65	55	5	50.763 M/EMV/EX	
M63x1,5	38 - 48	10	65	65	55	5	50.763 M1/EMV/EX	

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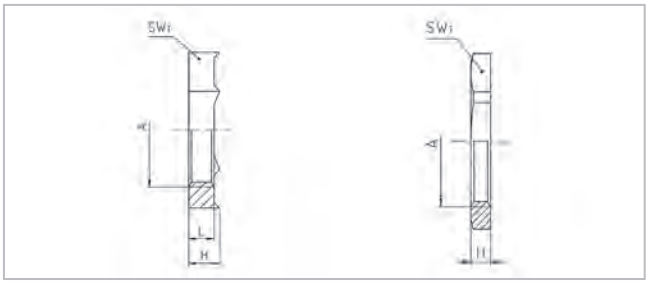
Hexagonal locknut 50.2xx Mzzz

Configuration	
Hexagonal locknut	Brass CuZn39Pb3, nickel-plated
Internal thread	metric, as per EN 60423
Properties	
Standard	for secure tightening of cable glands and accessories
with cutting edges	for secure tightening of EMC-cable glands, to cut through paint layers or powder coatings ensuring optimal contact for equipotential bonding, increased vibration resistance



Characteristics

Standard

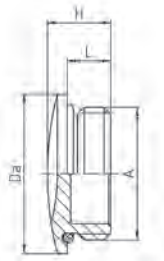
A		SW1 mm	H mm	Piece	Part No.	
M12x1,5		15	2,8	100	50.212 M	
M16x1,5		19	2,8	100	50.216 M	
M20x1,5		24	3	100	50.220 M	
M25x1,5		30	3,5	100	50.225 M	
M32x1,5		36	4	100	50.232 M	
M40x1,5		46	5	50	50.240 M	
M50x1,5		60	5	50	50.250 M	
M63x1,5		70	6	50	50.263 M	

with cutting edges

A	L mm	SW1 mm	H mm	Piece	Part No.	
M12x1,5	4,5	15	5,5	100	50.212 MPOT	
M16x1,5	4,5	19	5,5	100	50.216 MPOT	
M20x1,5	4,5	24	5,5	100	50.220 MPOT	
M25x1,5	4,5	30	5,5	100	50.225 MPOT	
M32x1,5	4,5	36	5,5	100	50.232 MPOT	
M40x1,5	5	46	6	50	50.240 MPOT	
M50x1,5	5	60	6	50	50.250 MPOT	
M63x1,5	6	70	7	50	50.263 MPOT	

Ex-screw plug 10.xx15 M/G/EX

Configuration	
Screw plug	Brass CuZn39Pb3, nickel-plated
O-ring	Nitrile rubber NBR
Connecting thread	metric, as per EN 60423
Properties	
	for secure sealing of unused threaded or clearance holes
Equipment group	II
Category / Zone	2G and 2D / 1, 2, 21, 22
Type of protection	Ex e - increased safety Ex tD A21 - Protection by enclosures
Protection grade	IP68
Temperature range	-30°C / +80°C
Test standard	EN 60079-0 / EN 60079-7 EN 61241-0 / EN 61241-1
EC-Type certificate	DMT 99 ATEX E016



Characteristics

A	L mm	H mm	Da mm	Piece	Part No.	
M12x1,5	5	8	16	100	10.1215 M/G/EX	
M16x1,5	6	9	20	100	10.1615 M/G/EX	
M20x1,5	6,5	9,5	24	100	10.2015 M/G/EX	
M25x1,5	7	11	28	100	10.2515 M/G/EX	
M32x1,5	8	12	35	50	10.3215 M/G/EX	
M40x1,5	8	12	45	50	10.4015 M/G/EX	
M50x1,5	9	15	55	25	10.5015 M/G/EX	
M63x1,5	10	16	68	10	10.6315 M/G/EX	

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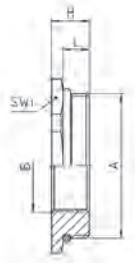
Ex-reduction MxxMxx/6/OM/EX

Configuration	
Reduction	Brass CuZn39Pb3, nickel-plated
O-ring	Nitrile rubber NBR
External thread	metric, as per EN 60423
Internal thread	metric, as per EN 60423
Properties	
	reduction of threaded or clearance holes to smaller thread sizes
Equipment group	II
Category / Zone	2G and 2D / 1, 2, 21, 22
Type of protection	Ex e - increased safety Ex tD A21 - Protection by enclosures
Protection grade	IP68
Temperature range	-30°C / +80°C
Test standard	EN 60079-0 / EN 60079-7 EN 61241-0 / EN 61241-1
EC-Type certificate	DMT 99 ATEX E016
Comment	the combination of more than one reduction to reduce the thread size is not acceptable



Characteristics

A	B	L mm	SW1 mm	H mm	Piece	Part No.	
M16x1,5	M12x1,5	5	17	8	100	M16M12/6/OM/EX	
M20x1,5	M12x1,5	6	22	9	100	M20M12/6/OM/EX	
M20x1,5	M16x1,5	6	22	9	100	M20M16/6/OM/EX	
M25x1,5	M16x1,5	7	27	10	100	M25M16/6/OM/EX	
M25x1,5	M20x1,5	7	27	10	100	M25M20/6/OM/EX	
M32x1,5	M20x1,5	8	34	11	50	M32M20/6/OM/EX	
M32x1,5	M25x1,5	8	34	11	50	M32M25/6/OM/EX	
M40x1,5	M25x1,5	8	43	12	25	M40M25/6/OM/EX	
M40x1,5	M32x1,5	8	43	12	25	M40M32/6/OM/EX	
M50x1,5	M32x1,5	9	55	13	10	M50M32/6/OM/EX	
M50x1,5	M40x1,5	9	55	13	10	M50M40/6/OM/EX	
M63x1,5	M50x1,5	10	65	14	10	M63M50/6/OM/EX	

Ex-enlarger MxxMxx/FR/EX

Configuration	
Enlarger	Brass CuZn39Pb3, nickel-plated
O-ring	Nitrile rubber NBR
External thread	metric, as per EN 60423
Internal thread	metric, as per EN 60423
Properties	
	enlarger for threaded or clearance holes to larger thread size
Equipment group	II
Category / Zone	2G and 2D / 1, 2, 21, 22
Type of protection	Ex e - increased safety Ex tD A21 - Protection by enclosures
Protection grade	IP68
Temperature range	-30°C / +80°C
Test standard	EN 60079-0 / EN 60079-7 EN 61241-0 / EN 61241-1
EC-Type certificate	DMT 99 ATEX E016
Comment	the combination of more than one enlarger to enlarge the thread size is not acceptable

Characteristics

A	B	L mm	SW1 mm	H mm	Piece	Part No.	
M12x1,5	M16x1,5	5	18	16	100	M12M16/FR/EX	
M16x1,5	M20x1,5	5	22	16,5	100	M16M20/FR/EX	
M20x1,5	M25x1,5	6	27	18,5	50	M20M25/FR/EX	
M25x1,5	M32x1,5	7	34	20,5	25	M25M32/FR/EX	
M32x1,5	M40x1,5	8	42	23,5	25	M32M40/FR/EX	
M40x1,5	M50x1,5	8	52	30	10	M40M50/FR/EX	
M50x1,5	M63x1,5	9	65	32,5	10	M50M63/FR/EX	

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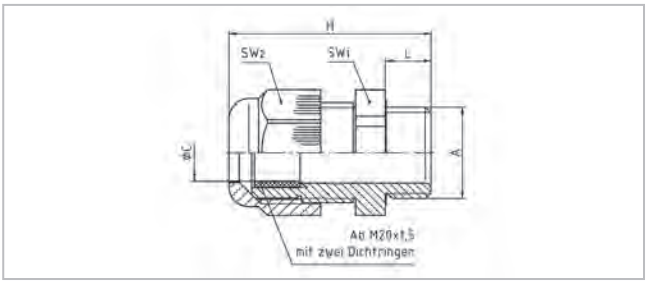
Notes

PERFECT Ex-cable gland — 50.6xx PAzz/EX

Configuration	
Dome nut	Polyamide PA6
Dust cap	Polyethylene PE-LD
Sealing ring / outer part	Polychloroprene-Nitrile rubber CR/NBR
Sealing ring / inner part	Evoprene TPE (from M20x1,5)
Gland body	Polyamide PA6
Connecting thread	metric, as per EN 60423
Properties	
	wide sealing and clamping range, integrated anchorage, easy-to-install
Equipment group	II
Category / Zone	2G and 2D / 1, 2, 21, 22
Type of protection	Ex e - increased safety Ex tD A21 - Protection by enclosures
Cable installation	fixed
Temperature range	-20°C / +70°C (M12 and M16) -30°C / +70°C (M20 to M63) Further information on page 23
Protection grade	IP66
Test standard	EN 60079-0 / EN 60079-7 EN 61241-0 / EN 61241-1
EC-Type certificate	PTB 99 ATEX 3101 X (M12 and M16) PTB 99 ATEX 3128 X (M20 to M63)
IECEx certificate	IECEx PTB 05.0004x



Characteristics

Connecting thread standard length

A	ØC mm	L mm	SW1 mm	SW2 mm	H mm	Piece	RAL 9005 jet black Part No..	RAL 5015 blue Part No.	
M12x1,5	4 - 7	8	15	15	31	100	50.612 PASW/EX	50.612 PABL/EX	
M16x1,5	5,5 - 10	8	20	20	35,5	100	50.616 PASW/EX	50.616 PABL/EX	
M20x1,5	5,5 - 13	8	24	24	37	100	50.620 PASW/EX	50.620 PABL/EX	
M25x1,5	8 - 17	8	29	29	43	50	50.625 PASW/EX	50.625 PABL/EX	
M32x1,5	12 - 21	10	36	36	50	25	50.632 PASW/EX	50.632 PABL/EX	
M40x1,5	17 - 28	10	46	46	51	10	50.640 PASW/EX	50.640 PABL/EX	
M50x1,5	22 - 35	12	55	55	61,5	5	50.650 PASW/EX	50.650 PABL/EX	
M63x1,5	27 - 48	12	68	68	65,5	5	50.663 PASW/EX	50.663 PABL/EX	

Connecting thread long

A	ØC mm	L mm	SW1 mm	SW2 mm	H mm	Piece	RAL 9005 jet black Part No..	RAL 5015 blue Part No.	
M12x1,5	4 - 7	12	15	15	35	100	50.612 PASWL/EX	50.612 PABL/L/EX	
M16x1,5	5,5 - 10	12	20	20	39,5	100	50.616 PASWL/EX	50.616 PABL/L/EX	
M20x1,5	5,5 - 13	13	24	24	42	100	50.620 PASWL/EX	50.620 PABL/L/EX	
M25x1,5	8 - 17	13	29	29	48	50	50.625 PASWL/EX	50.625 PABL/L/EX	
M32x1,5	12 - 21	15	36	36	55	25	50.632 PASWL/EX	50.632 PABL/L/EX	
M40x1,5	17 - 28	15	46	46	56	10	50.640 PASWL/EX	50.640 PABL/L/EX	
M50x1,5	22 - 35	16	55	55	65,5	5	50.650 PASWL/EX	50.650 PABL/L/EX	
M63x1,5	27 - 48	16	68	68	69,5	5	50.663 PASWL/EX	50.663 PABL/L/EX	

Blue dome nut = specific marking for type of protection Ex i - intrinsic safety

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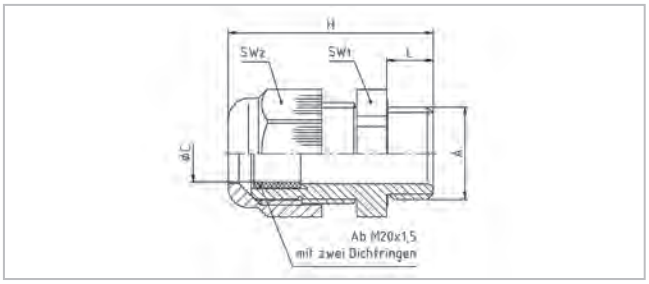
PERFECT Ex-cable gland — 50.6xx PAzzEXSI

Configuration	
Dome nut	Polyamide PA6
Dust cap	Polyethylene PE-LD
Sealing ring / outer part	Silicone VMQ
Sealing ring / inner part	Evoprene TPE (from M20x1,5)
Gland body	Polyamide PA6
Connecting thread	metric, as per EN 60423
Properties	
	wide sealing and clamping range, integrated anchorage, easy-to-install
Equipment group	II
Category / Zone	2G and 2D / 1, 2, 21, 22
Type of protection	Ex e - increased safety Ex tD A21 - Protection by enclosures
Cable installation	fixed
Temperature range	-20°C / +70°C (M12 and M16) -55°C / +70°C (M20 to M63) Further information on page 23
Protection grade	IP66
Test standard	EN 60079-0 / EN 60079-7 EN 61241-0 / EN 61241-1
EC-Type certificate	PTB 99 ATEX 3101 X (M12 and M16) PTB 99 ATEX 3128 X (M20 to M63)
IECEx certificate	IECEx PTB 05.0004x



Characteristics

Connecting thread standard length

A	ØC mm	L mm	SW1 mm	SW2 mm	H mm	Piece	RAL 9005 jet black Part No..	RAL 5015 blue Part No.	
M12x1,5	4 - 7	8	15	15	31	100	50.612 PASWEXSI	50.612 PABLEXSI	
M16x1,5	5,5 - 10	8	20	20	35,5	100	50.616 PASWEXSI	50.616 PABLEXSI	
M20x1,5	5,5 - 13	8	24	24	37	100	50.620 PASWEXSI	50.620 PABLEXSI	
M25x1,5	8 - 17	8	29	29	43	50	50.625 PASWEXSI	50.625 PABLEXSI	
M32x1,5	12 - 21	10	36	36	50	25	50.632 PASWEXSI	50.632 PABLEXSI	
M40x1,5	17 - 28	10	46	46	51	10	50.640 PASWEXSI	50.640 PABLEXSI	
M50x1,5	22 - 35	12	55	55	61,5	5	50.650 PASWEXSI	50.650 PABLEXSI	
M63x1,5	27 - 48	12	68	68	65,5	5	50.663 PASWEXSI	50.663 PABLEXSI	

Connecting thread long

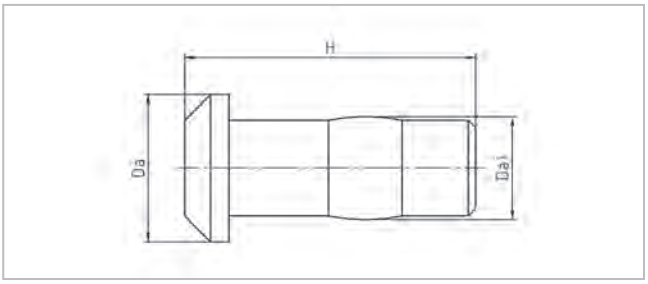
A	ØC mm	L mm	SW1 mm	SW2 mm	H mm	Piece	RAL 9005 jet black Part No..	RAL 5015 blue Part No.	
M12x1,5	4 - 7	12	15	15	35	100	50.612 PASWLEXSI	50.612 PABLLEXSI	
M16x1,5	5,5 - 10	12	20	20	39,5	100	50.616 PASWLEXSI	50.616 PABLLEXSI	
M20x1,5	5,5 - 13	13	24	24	42	100	50.620 PASWLEXSI	50.620 PABLLEXSI	
M25x1,5	8 - 17	13	29	29	48	50	50.625 PASWLEXSI	50.625 PABLLEXSI	
M32x1,5	12 - 21	15	36	36	55	25	50.632 PASWLEXSI	50.632 PABLLEXSI	
M40x1,5	17 - 28	15	46	46	56	10	50.640 PASWLEXSI	50.640 PABLLEXSI	
M50x1,5	22 - 35	16	55	55	65,5	5	50.650 PASWLEXSI	50.650 PABLLEXSI	
M63x1,5	27 - 48	16	68	68	69,5	5	50.663 PASWLEXSI	50.663 PABLLEXSI	

Blue dome nut = specific marking for type of protection Ex i - intrinsic safety

Ex-blanking plug

WJ-D xx-VPAEX

Configuration	
Blanking plug	Polyamide PA6, red
Properties	
	protective closure for uninstalled PERFECT Ex-cable glands, Application only with PERFECT Ex-cable glands of the series 50.6xx PAzz/EX and 50.6xx PAzzEXSI
Equipment group	II
Category / Zone	2G and 2D / 1, 2, 21, 22
Type of protection	Ex e - increased safety Ex tD A21 - Protection by enclosures
Protection grade	IP66
Temperature range	+20°C / +70°C (M12 and M16) -55°C / +70°C (M20 to M32) Further information on page 23
Test standard	EN 60079-0 / EN 60079-7 EN 61241-0 / EN 61241-1
EC-Type certificate	PTB 99 ATEX 3101 X (M12 and M16) PTB 99 ATEX 3128 X (M20 to M32)
IECEx certificate	IECEx PTB 05.0004x



Characteristics

Size xx	H mm	Da mm	Da1 mm	Piece	Part No.	
12	30,3	7	6	20	WJ-D 12-VPAEX	
16	33	8	7	20	WJ-D 16-VPAEX	
20	34,5	12	8,5	20	WJ-D 20-VPAEX	
25	36	16	11	20	WJ-D 25-VPAEX	
32	39,5	20	14	20	WJ-D 32-VPAEX	

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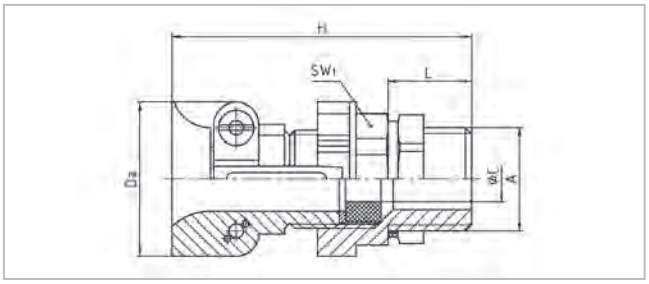
Trumpet-shaped Ex-cable gland 73xx B

Configuration	
Pressure screw	Polyamide PA
Strain relief clamp	Polyamide PA
Bolt / Nut	Stainless steel
Sealing ring	Nitrile rubber NBR, multiple perforation
Gland body	Polyamide PA
Hexagonal locknut	Polyamide PA6
Thread sealing ring	KLINGERsil
Connecting thread	metric, as per EN 60423
Properties	
	excellent anchorage, wide clamping range
Equipment group	II
Category / Zone	2G and 2D / 1, 2, 21, 22
Type of protection	Ex e - increased safety Ex tD A21 - Protection by enclosures
Cable installation	flexible
Temperature range	-40°C / +85°C
Protection grade	IP66
Test standard	EN 60079-0 / EN 60079-7 EN 61241-0 / EN 61241-1
EC-Type certificate	PTB 00 ATEX 3121
IECEx certificate	IECEx BKI 08.0007



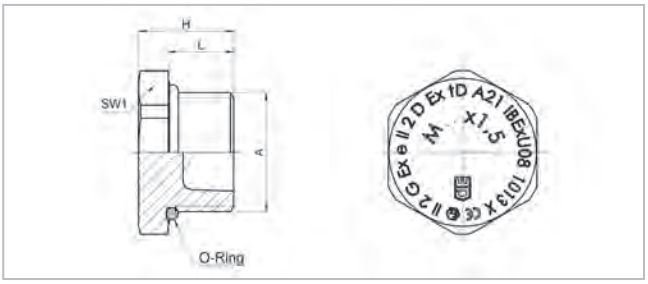
Characteristics

Connecting thread standard length

A	ØC mm	L mm	SW1 mm	H mm	Da mm	Piece	black Part No.	
M20x1,5	8 - 13	15	27	77	40	10	7320 B	
M25x1,5	11 - 16	15	32	80	43	10	7325 B	
M32x1,5	15 - 20	15	41	92	54	10	7332 B	
M40x1,5	19 - 27	15	50	98	64	10	7340 B	
M50x1,5	26 - 34	16	60	108	73	1	7350 B	
M63x1,5	35 - 46	16	75	119	89	1	7363 B	

Ex-screw plug V300-1xxx-zz

Configuration	
Screw plug	Polyamide PA6 GF30 V-0
O-ring	Choice from three materials possible: 01: Silicone rubber VMQ 02: Ethylene-Propylene rubber EPDM 03: Nitrile rubber NBR
Connecting thread	metric, as per EN 60423
Properties	
	for secure sealing of unused threaded or clearance holes
Equipment group	II
Category / Zone	2G and 2D / 1, 2, 21, 22
Type of protection	Ex e - increased safety Ex tD A21 - Protection by enclosures
Temperature range	01: -55°C/ +95°C 02 and 03: -40°C/ +95°C depending on the material of O-ring
Protection grade	IP66 / IP68 - 10 bar (6h) / IP69K
Test standard	EN 60079-0 / EN 60079-7 EN 61241-0 / EN 61241-1
EC-Type certificate	IBExU 08 ATEX 1013 X



Characteristics

A	L mm	SW1 mm	H mm	O-ring Material	Piece	RAL 9005 jet black Part No.	
M12x1,5	10	16	15	VMQ	100	V300-1012-01	
M16x1,5	10	21	21	VMQ	100	V300-1016-01	
M20x1,5	11	25	16	VMQ	100	V300-1020-01	
M25x1,5	11,5	30	17,5	VMQ	100	V300-1025-01	
M32x1,5	13	37	20	VMQ	50	V300-1032-01	
M40x1,5	13	46	20	VMQ	25	V300-1040-01	
M50x1,5	15	56	23	VMQ	25	V300-1050-01	
M63x1,5	15	69	23	VMQ	25	V300-1063-01	

A	L mm	SW1 mm	H mm	O-ring Material	Piece	RAL 9005 jet black Part No.	
M12x1,5	10	16	15	EPDM	100	V300-1012-02	
M16x1,5	10	21	15	EPDM	100	V300-1016-02	
M20x1,5	11	25	16	EPDM	100	V300-1020-02	
M25x1,5	11,5	30	17,5	EPDM	100	V300-1025-02	
M32x1,5	13	37	20	EPDM	50	V300-1032-02	
M40x1,5	13	46	20	EPDM	25	V300-1040-02	
M50x1,5	15	56	23	EPDM	25	V300-1050-02	
M63x1,5	15	69	23	EPDM	25	V300-1063-02	

A	L mm	SW1 mm	H mm	O-ring Material	Piece	RAL 9005 jet black Part No.	
M12x1,5	10	16	15	NBR	100	V300-1012-03	
M16x1,5	10	21	15	NBR	100	V300-1016-03	
M20x1,5	11	25	16	NBR	100	V300-1020-03	
M25x1,5	11	25	16	NBR	100	V300-1025-03	
M32x1,5	13	37	20	NBR	50	V300-1032-03	
M40x1,5	13	46	20	NBR	25	V300-1040-03	
M50x1,5	15	56	23	NBR	25	V300-1050-03	
M63x1,5	15	69	23	NBR	25	V300-1063-03	

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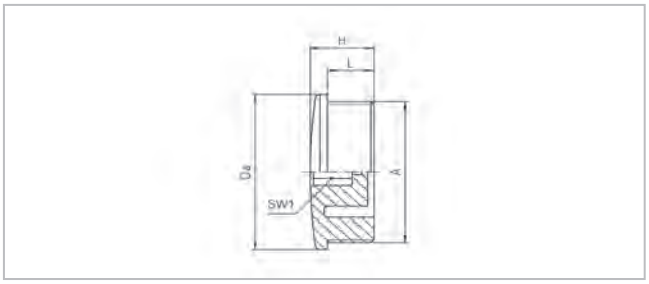
Ex-screw plug 10xx PASW/EX

Configuration	
Screw plug	Polyamide PA66
Connecting thread	metric, as per EN 60423
Properties	
	for secure sealing of unused threaded or clearance holes
Equipment group	II
Category / Zone	2G and 2D / 1, 2, 21, 22
Type of protection	Ex e - increased safety Ex tD A21 - Protection by enclosures
Temperature range	-55°C / +95°C
Protection grade	IP66
Test standard	EN 60079-0 / EN 60079-7 EN 61241-0 / EN 61241-1
EC-Type certificate	PTB 98 ATEX 3130
IECEx certificate	IECEx PTB 03.0000



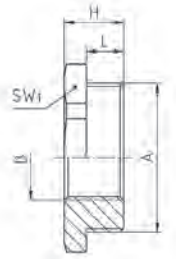
Characteristics

Assembly with key wrench

A	L mm	SW1 mm	H mm	Da mm	Piece	black Part No.	
M16x1,5	11	8	15	21	100	1016 PASW/EX	
M20x1,5	12	8	16	25	100	1020 PASW/EX	
M25x1,5	12	8	16	30	100	1025 PASW/EX	
M32x1,5	14	8	19,5	37	100	1032 PASW/EX	
M40x1,5	14	8	19,5	45	50	1040 PASW/EX	
M50x1,5	15	8	20,5	55	50	1050 PASW/EX	

Ex-reduction MxxMxx PA/SW/EX

Configuration	
Reduction	Polyamide PA6
External thread	metric, as per EN 60423
Internal thread	metric, as per EN 60423
Properties	
	reduction of threaded or clearance holes to smaller thread sizes
Equipment group	II
Category / Zone	2G and 2D / 1, 2, 21, 22
Type of protection	Ex e - increased safety Ex tD A21 - Protection by enclosures
Temperature range	-20°C / +70°C
Protection grade	IP66
Test standard	EN 60079-0 / EN 60079-7 EN 61241-0 / EN 61241-1
EC-Type certificate	PTB 99 ATEX 3128 X
Comment	the combination of more than one reduction to reduce the thread size is not acceptable



Characteristics

A	B	L mm	SW1 mm	H mm	Piece	RAL 9005 jet black Part No.	
M16x1,5	M12x1,5	8	24	12	100	M16M12 PA/SW/EX	
M20x1,5	M12x1,5	8	24	12	100	M20M12 PA/SW/EX	
M20x1,5	M16x1,5	8	24	12	100	M20M16 PA/SW/EX	
M25x1,5	M12x1,5	8	29	14	100	M25M12 PA/SW/EX	
M25x1,5	M16x1,5	8	29	14	100	M25M16 PA/SW/EX	
M25x1,5	M20x1,5	8	29	14	100	M25M20 PA/SW/EX	
M32x1,5	M20x1,5	10	36	16	50	M32M20 PA/SW/EX	
M32x1,5	M25x1,5	10	36	16	50	M32M25 PA/SW/EX	
M40x1,5	M25x1,5	10	46	16	25	M40M25 PA/SW/EX	
M40x1,5	M32x1,5	10	46	16	25	M40M32 PA/SW/EX	
M50x1,5	M32x1,5	12	55	18	25	M50M32 PA/SW/EX	
M50x1,5	M40x1,5	12	55	18	25	M50M40 PA/SW/EX	
M63x1,5	M40x1,5	12	68	18	25	M63M40 PA/SW/EX	
M63x1,5	M50x1,5	12	68	18	25	M63M50 PA/SW/EX	

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Charateristics and Properties - additional information

A	ØC	L	Temperature range	Impact resistance	Test torque connecting thread	Test torque dome nut for ØCmin.	Test torque dome nut for ØCmax.	Part No.	Part No.
	mm	mm	°C	J o. Nm	Nm	Nm	Nm		
Series 50.6xx PAzz/EX									
M12x1,5	4 - 7	8	-20 / +70	< 4	2,5	2,0	1,0	50.612 PASW/EX	50.612 PABL/EX
M16x1,5	5,5 - 10	8	-20 / +70	< 4	3,75	3,0	2,5	50.616 PASW/EX	50.616 PABL/EX
M20x1,5	5,5 - 13	8	-20 / +70	< 7	3,75	3,5	2,5	50.620 PASW/EX	50.620 PABL/EX
M20x1,5	5,5 - 13	8	-30 / +70	< 4	3,75	3,5	2,5	50.620 PASW/EX	50.620 PABL/EX
M25x1,5	8 - 17	8	-25 / +70	< 7	5,0	5,0	3,5	50.625 PASW/EX	50.625 PABL/EX
M25x1,5	8 - 17	8	-30 / +70	< 4	5,0	5,0	3,5	50.625 PASW/EX	50.625 PABL/EX
M32x1,5	12 - 21	10	-30 / +70	< 7	7,5	8,0	5,0	50.632 PASW/EX	50.632 PABL/EX
M40x1,5	17 - 28	10	-30 / +70	< 7	7,5	6,0	5,0	50.640 PASW/EX	50.640 PABL/EX
M50x1,5	22 - 25	12	-30 / +70	< 7	7,5	16,0	5,0	50.650 PASW/EX	50.650 PABL/EX
M63x1,5	27 - 48	12	-30 / +70	< 7	7,5	22,0	5,0	50.663 PASW/EX	50.663 PABL/EX
M12x1,5	4 - 7	12	-20 / +70	< 4	2,5	2,0	1,0	50.612 PASWL/EX	50.612 PABL/L/EX
M16x1,5	5,5 - 10	12	-20 / +70	< 4	3,75	3,0	2,5	50.616 PASWL/EX	50.616 PABL/L/EX
M20x1,5	5,5 - 13	13	-32 / +70	< 7	3,75	3,5	2,5	50.620 PASWL/EX	50.620 PABL/L/EX
M20x1,5	5,5 - 13	13	-30 / +70	< 4	3,75	3,5	2,5	50.620 PASWL/EX	50.620 PABL/L/EX
M25x1,5	8 - 17	13	-25 / +70	< 7	5,0	5,0	3,5	50.625 PASWL/EX	50.625 PABL/L/EX
M25x1,5	8 - 17	13	-30 / +70	< 4	5,0	5,0	3,5	50.625 PASWL/EX	50.625 PABL/L/EX
M32x1,5	12 - 21	15	-30 / +70	< 7	7,5	8,0	5,0	50.632 PASWL/EX	50.632 PABL/L/EX
M40x1,5	17 - 28	15	-30 / +70	< 7	7,5	6,0	5,0	50.640 PASWL/EX	50.640 PABL/L/EX
M50x1,5	22 - 25	16	-30 / +70	< 7	7,5	16,0	5,0	50.650 PASWL/EX	50.650 PABL/L/EX
M63x1,5	27 - 48	16	-30 / +70	< 7	7,5	22,0	5,0	50.663 PASWL/EX	50.663 PABL/L/EX
Series 50.6xx PAzz/EXSI									
M12x1,5	4 - 7	8	-20 / +70	< 4	2,5	2,0	1,0	50.612 PASWEXSI	50.612 PABLEXSI
M16x1,5	5,5 - 10	8	-20 / +70	< 4	3,75	3,0	2,5	50.616 PASWEXSI	50.616 PABLEXSI
M20x1,5	5,5 - 13	8	-40 / +70	< 7	3,75	3,5	2,5	50.620 PASWEXSI	50.620 PABLEXSI
M20x1,5	5,5 - 13	8	-55 / +70	< 4	3,75	3,5	2,5	50.620 PASWEXSI	50.620 PABLEXSI
M25x1,5	8 - 17	8	-25 / +70	< 7	5,0	5,0	3,5	50.625 PASWEXSI	50.625 PABLEXSI
M25x1,5	8 - 17	8	-55 / +70	< 4	5,0	5,0	3,5	50.625 PASWEXSI	50.625 PABLEXSI
M32x1,5	12 - 21	10	-55 / +70	< 7	7,5	8,0	5,0	50.632 PASWEXSI	50.632 PABLEXSI
M40x1,5	17 - 28	10	-55 / +70	< 7	7,5	6,0	5,0	50.640 PASWEXSI	50.640 PABLEXSI
M50x1,5	22 - 25	12	-55 / +70	< 7	7,5	16,0	5,0	50.650 PASWEXSI	50.650 PABLEXSI
M63x1,5	27 - 48	12	-55 / +70	< 7	7,5	22,0	5,0	50.663 PASWEXSI	50.663 PABLEXSI
M12x1,5	4 - 7	12	-20 / +70	< 4	2,5	2,0	1,0	50.612 PASWLEXSI	50.612 PABLLEXSI
M16x1,5	5,5 - 10	12	-20 / +70	< 4	3,75	3,0	2,5	50.616 PASWLEXSI	50.616 PABLLEXSI
M20x1,5	5,5 - 13	13	-40 / +70	< 7	3,75	3,5	2,5	50.620 PASWLEXSI	50.620 PABLLEXSI
M20x1,5	5,5 - 13	13	-55 / +70	< 4	3,75	3,5	2,5	50.620 PASWLEXSI	50.620 PABLLEXSI
M25x1,5	8 - 17	13	-25 / +70	< 7	5,0	5,0	3,5	50.625 PASWLEXSI	50.625 PABLLEXSI
M25x1,5	8 - 17	13	-55 / +70	< 4	5,0	5,0	3,5	50.625 PASWLEXSI	50.625 PABLLEXSI
M32x1,5	12 - 21	15	-55 / +70	< 7	7,5	8,0	5,0	50.632 PASWLEXSI	50.632 PABLLEXSI
M40x1,5	17 - 28	15	-55 / +70	< 7	7,5	6,0	5,0	50.640 PASWLEXSI	50.640 PABLLEXSI
M50x1,5	22 - 25	16	-55 / +70	< 7	7,5	16,0	5,0	50.650 PASWLEXSI	50.650 PABLLEXSI
M63x1,5	27 - 48	16	-55 / +70	< 7	7,5	22,0	5,0	50.663 PASWLEXSI	50.663 PABLLEXSI

A	Ø C	L	Temperature-range	Impact resistance	Test torque connecting thread	Test torque pressure screw	Test torque bolt (Anchorage)	Part No.
	mm	mm	°C	J o. Nm	Nm	Nm	Nm	
Series 73xx B								
M20x1,5	8 - 13	15	-40 / +85	< 7	3,5	3,0	1,5	7320 B
M25x1,5	11 - 16	15	-40 / +85	< 7	4,0	3,0	2,5	7325 B
M32x1,5	15 - 20	15	-40 / +85	< 7	7,5	6,0	4,0	7332 B
M40x1,5	19 - 27	16	-40 / +85	< 7	12,0	10,0	6,0	7340 B
M50x1,5	26 - 34	16	-40 / +85	< 7	35,0	30,0	10,0	7350 B
M63x1,5	35 - 46	16	-40 / +85	< 7	45,0	40,0	15,0	7363 B

Applications of Ex-cable glands

PERSUASION BY QUALITIY

Throughout the world our customers in the fields of

machine building and vehicle construction,
electro technical industries,
panel buidling and enclosures
as well as electro wholesalers standard

appreciate our well-engineered PERFECT technology and the variety of cable glands and accessories for standard as well as individual solutions.

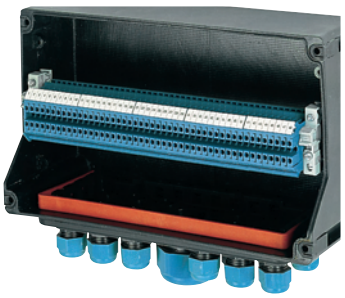
APPLICATION AREAS

We would like to thank those customers and business partners mentioned by name in the catalogue for their kind support and their straightforward assistance in providing product pictures.

CEAG Sicherheitstechnik GmbH
Ex - Emergency Light Fitting

MIAG Fahrzeugbau GmbH
Ex-Electric Pedestrian Reach Truck

CEAG Sicherheitstechnik GmbH
Ex i - Junction Box



Baumer Hübner GmbH
Ex-Incremental Encoder

CEAG Sicherheitstechnik GmbH
Ex e - Intermediate Motor Terminal Box

Ex i - Transmitter

VEM motors GmbH
Ex-Three-Asynchronous

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EC-Type Examination Certificate

On demand we will send you our EC-Type Examination Certificates as a pdf-file. You may also download the files from our website www.jacob@jacob-gmbh.de.

Material characteristics of metals and thermoplastics

Material	Unit	Brass	Stainless steel	Polyamide	Polyethylene
Material abbreviation		**CuZn39Pb3**	**XBCrNIS18-9**	**PA6**	**PE-LD**
Further names			1.4305		
for article series (examples)		PERFECT Ex-c.g. Ex-Screw plug Ex-Reduction Ex-Enlarge Hexagonal locknut		PERFECT Ex-c.g. Lamellar insert for PERFECT Ex-c.g. Ex-Screw plug Ex-Reduction	Dust cap
Basic characteristics					
Halogen-free		yes	yes	yes	n.i.
Phosophorus-free		yes	yes	yes	n.i.
Silicone-free		yes	yes	yes	n.i.
Physical characteristics					
Watertightness	g/cm³	8,45	7,9	1,10 - 1,15	0,94
Moisture absorption at +23°C	%	0	0	2,0 - 3,4	n.i.
Linear shrinkage	%	n.i.	n.i.	1,2 - 2,0	n.i.
Thermal characteristics					
Flammability to UL94		(not inflammable)	(not inflammable)	partly V-2	n.i.
UL test number		not UL-tested	not Ul-tested	partly E86034	not UL-tested
Plastic yield at low temperature	°C	> -60	> -60	n.i.	-50
min. sustained application temp. static	°C			-55 / -40	-50
dynamic	°C			-20	-50
max. sustained application temperature	°C			100	90
max. temporary application temperature	°C			140	n.i.
Plastic yield at high temperature (ISO 75) Method A	°C	n.i.	n.i.	65 - 85	60 - 65
(ISO 75) Method B	°C	n.i.	n.i.	160 - 185	100
Melting point	°C	895	ca. 1450	217 - 222	130
Heat conductivity	W/mK	117	n.i.	ca. 0,22	0,3 - 0,5
Mechanical characteristics					
Fluxural strength DIN 53482	N/mm²	n.i	n.i.	85 - 105	n.i.
Notched impact strength at +23°C (DIN 53453)	kJ/m²	n.i.	n.i.	2,5 - 6	no breakage
Ball indentation hardness	N/mm²	>110	130 - 180	180 - 135	59
Impact resistance (+23°C) (DIN 53453)	kJ/m²	n.i.	n.i.	n.i.	n.i.
Tensile strength (DIN 53453)	N/mm²	>360	500 - 700	ca. 80	28 - 35
Risk of thermal stress cracking (in humid state)		minimal	minimal	minimal	relatively high
Electrical characteristics					
Dielectric strength (DIN 53481)	kV/mm²	(electro conductive)	(electro conductive)	100 - 150	50
Surface resistance (DIN 53483)	Ohm			10^{12}	10^{14}
Resistance					
Weather		1 - 2	1 - 2	Generally resistant	2
UV		1 - 2	1 - 2	Generally resistant	Suitable for indoor use
Ozone		1 - 2	1 - 2	3	n.i.
Ozone 20 ppm in air		1 - 2	1 - 2	3	n.i.
Ozone 1 ppm in water		1 - 2	1 - 2	2	n.i.
Ageing		1 - 2	1 - 2	n.i.	n.i.
Acetone (2%)		2	1	2	2 - 3
Ethanol (40 Vol)		1	1	2	1
Ammonia (20% by weight)		2 / X	2 / n.i.	2	1
Benzole		1	1	2	X
Petrol Normal/Super fuel to DIN		1	1	2	X
Brake fluid (Hydraulan-BASF)		n.i.	1 - 2	2	2
Steam (Sterilization DIN 58946)		2 - 3	1 - 2	3 - X	X
Diesel fuel to DIN		2	1	2	2
Crude oil / fuel oil / mineral oil		2	1	2	2
Faeces		n.i.	1 - 2	2	1
Hydraulic oil (mineral oil based)		2	1 - 2	2	3
Potassium hydroxide solution		3	1 - 2	1 - 3	1
Kerosene		n.i.	n.i.	2	X
Carbon dioxide		3	1	1	1
Paints		1	1	2	Z.e.
Solvents		1	1	1 - 2	Z.e.
Stove enamelling (150°C)		1	1	n.i.	X
Glue		2	1	2	1
Air, atmospheric		1	1	1 - 2	up to 90°C
Air, containing oil vapour		2	1	1 - 2	up to 90°C
Seawater		3	2	1 - 2	1
Methanol		1	1	1 - 2	1
Sodium chloride (aqueous)		3	3	1 - 3	1
Oil (vegetable, etheric)		2	1 - 2	2 - 3	2 - 3
Petroleum		2	1	1 - 2	2 - 3
Phosphoric acid (50%)		X	2	X	1
Nitric acid (40%)		X	2	X	X
Hydrochloric acid (38%)		X	3	X	1
Sulphuric acid (30%)		X	X	X	1
Soap solution		2	2	1 - 2	1
Silicon oils and greases		2	2	1 - 2	1
Terpentine (oil)		n.i.	2	1 - 2	3
Drinking water		1	1	1	1
Detergent solution (heavy-duty) (20°C / 80°C)		n.i.	2	2 / 3	1

Key for resistance ratings:

1 = very good resistance
2 = good resistance
3 = mean/ conditional resistance
X = not resistant
n.i. = no information
Z.e. = determine precise composition

The values provided here are guideline values only, based on our current state of knowledge and cannot be used as the basis for any legally binding assurance of certain characteristics or concrete cases of application. To ascertain the concrete suitability of a particular product, a test of the finished part under the specific application conditions is necessary.

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Material characteristics of elastomers

Material	Unit	Polychloroprene-Nitrile rubber	Acrylonitrile-Butadiene-rubber	Methyl-Vinyl-Silicone-rubber	TPE Evoprene	Fiber elastomere mixture
Material abbreviation		**CR/NBR**	**NBR**	**VMQ**		
further names		Neoprene	Perbunan	Silicone-rubber		Centellen, KLINGERsil
for article series (example)		Sealing ring in PERFECT Ex-c.g.	O-Ringe on connecting thread from PERFECT Ex-c.g. Ex-screw plug Ex-Reduction Ex-Enlarger		Sealing ring on PERFECT Ex-c.g.	Connecting thread sealing ring
Basic characteristics						
Halogen-free		no	yes	n.i.	yes	n.i.
Phosphorus-free		n.i.	yes	n.i.	yes	n.i.
Silicone-free		n.i.	yes	no	yes	n.i.
Thermal properties						
UL test number		not UL-tested	not UL-tested	not UL-tested	not UL-tested	not UL-tested
Combustibility		extinguishes	n.i.	n.i.	n.i.	n.i.
Flame resistance		very good	n.i.	unstatisfactory	n.i.	n.i.
min. temporary application temperature	°C	-30	-35	-80	n.i.	n.i.
min. sustained application temperature	°C	-20	-30	-55	-30	-200
max. sustained application temperature	°C	100	80	175	140	200
max. temporary application termperature	°C	130	100	300	n.i.	350
Mechanical properties						
Hardness	Shore A	30 ... 90	70 ... 80	20 ... 80	61	n.i.
Tensile strength	N/mm²	7... 25	>= 10	4 ... 9	10,0	11
Notched impact strength		good	n.i.	unstatisfactory	n.i.	n.i.
Abrasion resistance		very good	n.i.	mediocre	n.i.	n.i.
Gas permeability (Diffusion)		mediocre permeable	n.i.	very good permeable	n.i.	impermeable
Electrical characteristics						
Dielectric strength		medicore	poor	very good	n.i.	n.i.
Resistance						
Weather		1 - 2	3	1	n.i.	2
UV		1 - 2	2	1	1 (in black)	2
Ozone		2	X	1	no crack	2
Ozone 20 ppm in air		n.i.	n.i.	n.i.	n.i.	n.i.
Ozone 1 ppm in water		n.i.	n.i.	n.i.	n.i.	n.i.
Ageing		1 - 2	1	1	n.i.	n.i.
Acetone		1	X	2	n.i.	2
Ethanol		1	1	2	2	2
Ammonia (non aqueous)		2 / n.i.	1 - 2 / n.i.	2 / n.i.	n.i.	2
Benzole		X	X	X	n.i.	2
Petrol Normal/ Super fuel to DIN		3 - X	2 - 3	X	n.i.	2
Break fluid		3	Z.e.	X	3	n.i.
Steam (Sterilisation DIN 58946)		X	up to 80°C	X	n.i.	up to 175°C
Diesel fuel to DIN		3	1	3	n.i.	2
Crude oil		3	1 - 2	3	n.i.	2
Faeces (fluid)		1	n.i.	1	n.i.	1
Fuel oil						
Hydraulic oil (mineral based)		3	1	2	n.i.	2
Potassium hydroxide solution		1	2	3	n.i.	n.i.
Kerosene		3 - X	2	3	n.i.	2
Carbon dioxide		1	1	1	n.i.	n.i.
Paints		Z.e.	Z.e.	Z.e.	n.i.	n.i.
Solvents		n.i.	n.i.	n.i.	n.i.	n.i.
Stove enamelling (150°C)		n.i.	n.i.	n.i.	n.i.	n.i.
Glue		1	1	1	n.i.	2
Air, atmospheric, oil-free		up to 90°C	up to 80°C	up to 230°C	n.i.	n.i.
Air, containing oil vapour		up to 90°C	up to 80°C	up to 150°C	n.i.	n.i.
Seawater		1	1	3	2	n.i.
Methanol		1	1 (up to 20°C)	2	3	2
Sodium chloride (aqueous)		1	1	1	n.i.	2
Oil (vegetable, etheric)		2	n.i.	2	n.i.	2
Petroleum		3	1	X	n.i.	n.i.
Phosphoric acid (50%)		1 - 2	X	1	n.i.	2
Nitrile acid (40%)		X	X	X	X	X
Hydrochloric acid (38%)		3	X	X	2 - 3	3
Sulphuric acid (30%)		2	3	3	2	3
Soap solution		1	1	2	n.i.	n.i.
Silicone oils and greases		1	1	1	n.i.	n.i.
Terpentine (oil)		X	3 (up to 60°C)	3	n.i.	2
Transformer oil (Pyranole)		X	1	3	n.i.	2
Drinking water		2 (up to 70°C)	1 (up to 100°C)	2	2	1
Detergent solution		2	1	2	n.i.	n.i.

Key for resistance ratings:

1 = very good resistance
2 = good resistance
3 = mean/ conditional resistance
X = not resistant
n.i. = no information
Z.e. = determine precise composition

The values provided here are guideline values only, based on our current state of knowledge and cannot be used as the basis for any legally binding assurance of certain characteristics or concrete cases of application. To ascertain the concrete suitability of a particular product, a test of the finished part under the specific application conditions is necessary.

Explanation of the material tables

The tables provide summarized non-binding guideline values. The information supplied is intended as an aid to working with the equipment and permits only an inital selection to be made. It refers to parts not subjected to load. The list of materials makes no claim to completeness, and was drawn up largely on the basis of documentaion provided by the raw material manufacturers. No legally binding assurance of certain characteristics or concrete case of application may be derived from the information provided. No warrenty is accepted for the workmanship of raw materials used in our products. To ascertain their suitability in concrete cases, a product test under specific application conditions and qualified advice by material engineers and designers is necessary.

The buyer/ user recognizes the special objectives of the Chemical Act with relevance for the used materials. The manufacturer furthermore wishes to expressly point out that the raw materials used in our products may be subject to Art. 16 of the Chemical Act on the basis of their chemical composition. Any liability, in particular in accordance with Arts. 823 ff of the German Civil Code is excluded.

Notes on the different levels of resistance:

1 Very good resistance: Material is unlikely to be destroyed by the chemical product in question.
2 Good resistance: Material may be expected to demonstrate good to fair serviceability. After exposure to the relevant chemical product, it may be destroyed in time.
3 Medium/ conditional resistance: Material is likely to demonstrate limited serviceability when coming into sporadic contact with the relevant chemical product. Continuous contact destroys the material.
X Not resistant: The material cannont be recommended for this application.

Free of silicone and PWIS

The usage of silicone and other paint-wetting impairment substances is being vastly in the production of our cable glands and accesorries. Nevertheless we are unable to provide the assurance of absolute silicone- and PWIS-free execution as a resiudal risk of diffusion or contamination from the environment caused by PWIS and silicone-like products cannot be ruled out.

Weather resistance

External exposure to weather is caused by a combination of chemical effects (oxygen, water, ozone, atmospheric pollution) with simultaneous exposure to heat and UV radiation. This interaction places a considerable strain on plastics. An unsuitable choice of materials can lead to destruction of products within a short period.

Sustained application temperature

Temperature resistance over years. Within this time, the physical properties of the material alter due to heat ageing to a degree considered reasonable for technical components in accordance with experience values.

Literature sources:

Technical data sheets - guideline values for materials
of different raw material manufacturers
Compendium of plastics, Franck, Vogel-Verlag
Plastic polymer materials, Krebs / Anvodet
Rubber-cautschouc-elastomers, Krebs

REMARKS, MODIFICATIONS AND WARRANTY

The above information and any written or verbal application engineering-related advice are provided to the best of our knowledge. However any such advice or information is totally non-binding and without commitment, also in respect of any third-party industrial property rights.

Our advisory service does not exonerate the recipient from itself reviewing the advice provided for its suitability in respect of the intended application and purpose.

Any claim based on work conditions and different application conditions outside our sphere of influence is excluded. Should our products be applied or processed and our advice utilized in products manufactured by you, this shall be deemed to take place beyond our control and accordingly outside our sphere of responsibility. Should our liability be called into question despite this disclaimer, however, any damages shall be limited to the value of goods supplied by us and utilized by you.

Our warranty relates to a consistent standard of quality in our products in accordance with our specifications and our General Terms and Conditions of Sale, Delivery and Payment. Any warranty of product function is conditional upon correct handling and treatment of the products, in particular upon correct observance of clamping ranges, cable diameters, tightening torques and protection ratings.

The suitability of the product for the purpose and application of the user in respect of application conditions, duration of use and load capacity must be reviewed and guaranteed by the user under the practical conditions in question, and must be in compliance with currently valid electrical installation and safety regulations.

Subject to error and to technical modifications.

The latest valid revision of the catalogue only is authoritative.

Jacob GmbH · Gottlieb-Daimler-Straße 11 · D-71394 Kernen · Fon +49(0)7151 4011-0 · Fax +49(0)7151 4011-49 · E-Mail: jacob@jacob-gmbh.de

Protection grades

DEGREES OF PROTECTION PROVIDED BY ENCLOSURES (IP-CODES) ACCORDING TO IEC 60529

Protections against solid foreign objects, marked first index

First Index	Protection grade	
	Short description	**Definition**
0	Non-protected	-
1	Protected against solid foreign objects of 50 mm diameter and greater	The object probe, sphere of 50 mm diameter, shall not fully penetrate *)
2	Protected against solid foreign objects of 12,5 mm diameter and greater	The object probe, sphere of 12,5 mm diameter, shall not fully penetrate *)
3	Protected against solid foreign objects of 2,5 mm diameter and greater	The object probe, sphere of 2,5 mm diameter, shall not penetrate at all *)
4	Protected against solid foreign objects of 1 mm diameter and greater	The object probe, sphere of 1mm diameter, shall not penetrate at all *)
5	Dust-protected	Ingress of dust is not totally prevented, but dust shall not penetrate in a quantity to interfere with statisfactory operation of apparatus or to impair safety
6	Dust-tight	No ingress of dust

*) Note: The full diameter of the object probe shall not pass through an opening of the enclosure

Protection against water, marked second index

Second index	Protection grade	
	Short description	**Definition**
0	Non-protected	-
1	Protected against falling water drops	Vertically falling drops shall have no harmful effects
2	Protected against falling water drops when enclosure tilted up to 15°	Vertically falling drops shall have no harmful effects when the enclosure is tilted at any angle up to 15° on either side of the vertical
3	Protected against spraying water	Water sprayed at an angle up to 60° on either side of the vertical shall have no harmful effects
4	Protected against splashing water	Water splashed against the enclosure from any direction shall have no harmful effects
5	Protected against water jet	Water projected in jets against the enclosure from any direction shall have no harmful effects
6	Protected against powered water jet	Water projected in powerful jets against the enclosure from any direction shall have no harmul effects
7	Protected against the effects of temporary immerson in water	Ingress of water in quantities causing harmul effects shall not be possible when enclosure is temporarily immersed in water under standardised conditions of pressure and time
8	Protected against the effects of continuous immersion in water	Ingress of water in quantities causing harmul effects shall not be possible when enclosure is continuously immersed in water under conditions which shall be agreed between manufacturer and user but which are more severe than for numeral 7

Example: Code **IP 6 8**

MEASURING TECHNOLOGY

Measuring equipment, controls and switches is our domain.

For 25 years Jacob has developed measuring equipment for special applications on the highest quality standards. Our strengths is our large product variety as well as the realization of customized solution. Over the years we have become a specialist for individual solutions, which is the benefit for your specific application.

With our wide product range consistent of level switches, analogue level sensors, suction lances, level electrodes, measuring units, magnetic switches, wireless technology and individual product development we will find a suitable solution for your application. Jacob is your partner for measuring technology and a specialist for all kinds of liquid measuring equipment.

No matter what the task may be, our customer service team is prepared. Our staff assists you from the stage of planning until the realization of a new product. With our quick support we take our customers one step ahead of their competition.

All our products are manufactured in our new logistic and production centre in Kernen. We apply the strictest quality standards and use first-class materials in order to produce long-living products with high durability. In addition we can guarantee an environmental friendly production process and the compliance with the European RoHS directive. Naturally we are certified according to DIN EN ISO 9001:2008.

Our product range at a glance:

- Level measuring equipment
- Magnetic switches
- Measuring units
- Suction lances
- Temperature sensors
- Wireless technology

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CUSTOMIZED SOLUTIONS

Haven't found what you are looking for?
Jacob offers not only a large range of standard products but also customized items for your specific application.

Starting from the earliest stage of product development we offer our support to make your ideas come true. Together with our customers we realize high quality products with unique design and highest functionality under economic conditions. We take our customers one step ahead of their competition.

Our range of customized solution includes:

- Metal and plastic parts according to drawing
- Non-standard materials in metal and plastics
- Individual thread lengths for metal parts
- Individual dimensions for metal parts

Customized component
for Lumberg Automation

HAWKE CABLE GLANDS
PARTNERSHIP WITH CONNECTIONS

The companies Jacob and HAWKE have been partnering successfully for more than 15 years in the field of explosion proof cable glands.

Together we aim for the highest quality standards and best customer service.

Our qualified staffs support you with project knowledge and long-term product experience to the benefit of our customers.

Exclusively in Germany and in cooperation with our sales partners in Switzerland and Austria Jacob offers you the following product range:

- Cable glands Ex e / Ex d according to BS, EN and IEC tested by BASEEFA
- Adapter, reductions and enlargers in various thread types and dimensions (NPT / Pg / metric / pipe thread etc.)
- EX- enclosures
- EX-connectors

General terms and conditions (status July 2005)

1. Scope of Validity

1.1 The terms and conditions hereinafter set out ("Conditions") apply in the latest version in force to all of our offers, sales and deliveries. The terms and conditions also apply to all of our future business transactions with purchaser.

1.2 Conflicting conditions of purchaser are not binding upon us. We hereby expressly object against any business conditions of purchaser. This also applies if purchaser objects in his purchase conditions the validity of our conditions and if we refrain from expressly rejecting once more. This also applies to all offers and orders.

1.3 Any conflicting conditions of purchaser are only binding upon us if we accept such conditions expressly in writing. Furthermore, our execution of purchaser`s order shall not be deemed an acceptance of such conflicting terms and conditions of purchaser.

2. Offer

2.1 Our offers shall not be binding.

2.2 Any information contained in quotations and offers or other documents as for instance illustrations, drawings, etc. are only provisional unless we and purchaser have expressly agreed that the information shall be binding. Any information given in such document as well as the German Industrial Standard "DIN" shall not be construed as an agreement as to the fitness of the goods for a specific purpose. We reserve the title and any copyright in respect of all aforementioned documentation and all other documents that are provided to purchaser. Any such documentation may not be disclosed to a third party without our express consent in writing.

2.3 Oral collateral agreement as well as agreements as to the fitness of the goods for a specific purpose and alterations made after the conclusion of the contract shall only be binding upon us after our written confirmation of these agreements or alterations.

Order and Scope of Delivery

3.1 If purchaser`s order shall be deemed to be an offer according to § German Civil Code, we have the right to accept the said offer within 4 weeks.

The text of our confirmation of order is decisive for the content of the contract made and the nature and content of order. Oral agreements are invalid unless confirmed in writing by us.

If no confirmation of order according to clause 3.2 of these conditions has been issued but we have provided an offer remaining open for a limeted period which has been accepted in good time by purchaser, then the scope of delivery shall be determined by our offer.

4. Prices, changes in price

4.1 Subject to any other agreement our prices are quoted ex point of sale plus value added tax at a rate as from the time in force and - subject to clause 4.2 of these conditions - plus all additional costs for packaging.

4.2 In case of small orders below € 100,- without value added tax we will change an additional fee (handling fee) amounting to € 25,-, unless a joint handling with other orders is possible subject to our resonable discretion. Delivery is ex works. Unless otherwise expressly agreed in these conditions, the INCOTERMS shall apply in their respecitive latest version in force.

4.3 All prices only apply in case of acceptance of complete packaging-units. In case of partial package quantity we are entitled to charge packaging costs amounting to € 7,50.

4.4. Price basis for our brass metall products is the quotation for MS 58 amounting to € 155.--. Should that quotation increase (c.f. daily press) we are - for each rise in quotation amounting to € 13.-- - entitled to charge an additional fee of 5% of the purchase price.

4.5 We reserve the right to reasonably change our prices, in the event that after conclusion of the contract increases or reductions in our manufacturing costs occur, especially as a result of an alteration of material cost or labour cost under collective agreements. We shall satisfactorily show such increase or reduction in costs at purchaser's request.

Conditions of payment

5.1 Unless otherwise agreed in writing all of our invoices are due and payable upon receipt by purchaser and have to be made in cash without any deduction.

5.2 Purchaser shall be in default of payment after having received our reminder. Such reminder is not required in case there is an agreed due date for payment determined according to the calendar or the parties have agreed on a payment within a certain period of time after an event specified in the contract has occurred. In any case purchaser is in default of payment 30 days after the receipt of the invoice, at the latest, if the receipt of the invoice cannot be determined, 30 days after receipt of the goods.

5.3 Should purchaser be in default of payment, we shall be entitled to claim default interest at a rate of 8 % above the respective basic interest rate mentioned in § 288 German Civil Code. Any of our rights to claim further damages caused by the default in payment remains unaffected.

5.4 We shall accept bills of exchange or cheques but always provided that where payment is made by means of bill of exchange or cheques or any other negotiable or not negotiable instrument, we shall not be deemed to have received payment until the bill of exchange or cheque or the other negotiable instrument or not negotiable instrument has been honoured notwithstanding that we may have negotiated such instrument and received value therefore. Purchaser shall bear any costs of any kind arising therewith, especially any banking-, discount- and collecting fees and taxes. Payments by bills of exchang eor cheques or any other negotiable or not negotiable instruments shall only be deemed to have been made after we are finally entitled to dispose of the amount paid. We are under no obligation to properly present, protest, notify or return the bill of exchange or cheque or any other negotiable or not negotiable instrument. Purchaser is obliged to effect payment of the outstanding debts or the balance of such outstanding debts without delay in case a bill of exchange or cheque or any other negotiable or not negotiable instrument has not been honoured in time. In no event shall dicount be given in case of payment by means of bill of exchange.

5.5 We can request that payment shall be made by an irrevocable confirmed letter or credit without charges for the account of the beneficiary which shall be opened through a German bank of our choice in our favour, allowing partial shipments, and one third (1/3) of which shall be immediately payable after the opening of the letter of credit upon first demand and the remaining two thirds (2/3) upon presentation of the documents.

5.6 Payments shall only be deemed to have been made after we are finally entitled to dispose of the amount paid.

6. Retention of Payment, Set-Off

6.1 Purchaser is only entitled to a right of retention of payment as such right arises under the same contract.

6.2 Any set-off of purchaser with his claims is not allowed except in so far as such claims of purchaser are undisputed or subject-matter of a final and conclusive judgment of a competent court.

7. Delivery

7.1 We cannot comply with an accurate number of items in case of custom-made products. We therefore reserve in any case the right of over- and under-deliveries not exceeding 10 %.

7.2 Partial deliveries are permissible.

7.3 Dates and periods of delivery are provisional and not binding upon us unless expressly and bindingly agreed in writing.

7.4 The delivery period commences upon the date of the confirmation of order and shall be deemed to be met if upon its expiry we have arranged for the delivery of the goods and after notification of purchaser that the goods are ready for dispatch.

7.5 The delivery period can only be observed if all documents to be supplied by purchaser, necessary permits and releases, especially concerning plans, are received in time and if agreed terms of payment and other obligations of purchaser are fullfilled. Unless these conditions are fullfilled in time, the delivery period shall be extended appropiately; this shall not apply where we are responsible for the delay.

7.6 The delivery period is subject to unforeseeable events that are beyond our control, especially in case of force majeure, business disruption, industrial disputes, especially strike and lockout, war, mobilisation, riots and problems with the material and energy supply. Should such events influence the performance of the contract in due time, the delivery period shall be extended adequately.

7.7 Modifications and additions requested by purchaser subsequent to the conclusion of the contract, which render delivery on the agreed date impossible, shall lead to a postponement of the delivery date corresponding to the period of time which is requested for making these modifications and additions.

7.8 We are entitled to refuse dispatch and delivery of goods until purchaser has paid all outstanding debts concerning previous deliveries. If, after the conclusion of the contract, we learn of adverse circumstances with respect to the creditworthiness of purchaser or if we have reasonable doubts as the solvency of purchaser, we are entitled to refuse the dispatch and delivery or to request an advance payment or a security before delivery. If purchaser does not effect any advance payment or does not provide a security within a reasonable period of time set by us, we are entitled to repudiate the contract.

8. Delay

8.1 If we are in delay of delivery, purchaser, provided that he is able to submit prima facie evidence for the existence of a damage caused by delay, is entitled to a compensation for each full week of delay amounting to 0,5 %, but in no case more than a total of 5 % of the price of the part of the delivery, which cannot purposively be used due to the delay of delivery.

8.2 Purchaser's claims for damages caused by delay of delivery as well as claims for damages in lieu of performance, exceeding the compensation specified in Clause 8.1 of these Conditions, shall be excluded in all cases of delayed delivery, even upon expiry of a time limit set for delivery. The above shall not apply in case of compulsory liability owing to intent, gross negligence, injury of life, body or health. Purchaser shall only be entitled to repudiate the contract according to the compulsory provisions as far as we are responsible for the delay of delivery. The aforementioned provisions shall not imply a change in the burden of proof to the detriment of purchaser.

8.3 Purchaser shall upon our request declare within an appropriate period of time whether he repudiates the contract due to the delay of delivery or whether he requests delivery.

8.4. If dispatch or shipment is delayed at purchaser's request by more than one month after notice of the readiness for dispatch, purchaser may be charged, for every month commenced, storage costs of 0,5 % of the price of the items of the deliveries, but in no case more than a total of 5 %. The parties to the contract may prove that higher or, as the case may be, lower storage costs have been incurred. However, we shall be entitled to set an appropriate time limit for the acceptance of the goods ; after fruitless expiry of such time limit, we shall be entitled to dispose otherwise of the goods or to deliver the goods to purchaser within an adequately extended delivery period.

9. Dispatch and Passing of Risk

9.1 Unless expressly otherwise agreed in writing, purchaser has to bear the costs of dispatch, transport and transport insurance. We select the way and type of dispatch at our own discretion.

9.1 Risk of accidental loss or deterioration of the goods shall pass to purchaser upom the moment in which the goods have left our premises. This also applies in case of deliveries free of all charges. We assume no liability for damage, breakage or loss of the goods during transport.

9.3 Purchaser has no right to reject delivery of the goods on the ground of minor discrepancies of the agreed quallity or minor interferences in the application.

10. Retention of Title

10.1 All delivered goods remain our property until all existing claims of whatever legal ground we have against purchaser at the moment of the conclusion of the contract are paid in full. Where payment is made by means of bill of exchange, cheque or other negotiable or not negotiable instrument, we shall not be deemed to have received payment to purpose of this provision until the bill of exchange, cheque or other negotiable or not negotiable instrument has been honoured notwithstanding that we may have negotiated it. The title of the goods as well as we are totally released from any contingent liability which we undertook in the interest of purchaser in particular such liabilities as aforesaid resulting from the negotiation of negotiable instruments. In case of current account the reservation of title shall be deemed as collateral for the balance of account in our favour and if a balance is struck and confirmed, this shall not effect the retention of title.

10.2 Purchaser may process and use for manufacturing the delivered goods in the course of his usual business. Purchaser will process and use for manufacturing the delivered goods for and on bahalf of us; no obligations for us shall arise from such processing or use in manufacturing. In case of manufacturing, assembly, amalgation or mixing of the delivered goods with other goods which we have not delivered, we shall acquire a co-ownership share of the new device in a ratio of the invoice value of the delivered goods to the value of the other manufactured goods at the moment of the manufacturing, assembly, amalgation or mixing. In the event that purchaser acquires sole ownership of the new device, purchaser now transfers in advance a co-ownership share of the new device to us corresponding the aforementioned ratio and commits itself to store such device free of charge for us.

10.3 In the event that purchaser sells the delivered goods or the new device in which we have acquired a co-ownership share according to Clause 10.2 of these Conditions solely or together with goods not owned by us, purchaser now hereby assigns in advance his claims arising from a further sale with all ancillary rights amounting to the value of the delivered goods. We hereby accept the assignement. In the event that we hold a co-ownership on the sold device, the aforementioned assignement applies to the claims corresponding the value of our co-ownership share. We hereby authorize purchaser, subject to

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General terms and conditions (status July 2005)

revocation, to collect the debt assigned to us. In case purchaser is put to default, purchaser shall disclose to us the full name and address of the deptors of the assigned claims. Purchaser is moreover obliged to notify the assignment to the debtors. In such case we are also entitled to notify the assignment to the respective debtors and to collect debts.

10.4 Should purchaser be in breach of contract, in particular be in default of payment or in violation of his obligation of due care of the delivered goods, we shall be entitled to retake and permanently retain possession of the delivered goods subsequent to our reminder and the fruitless expiry of a final time limit. In such case purchaser is obliged to deliver possession of the delivered goods. Neither the execution of our right to retake possession of the delivered goods nor any execution or distress levied upon the delivered goods by us shall be regarded as an implied repudiation of the contract unless we expressly declare such repudiation. Purchaser hereby irrevocably authorizes us or our duly authorized agents to enter purchaser's premises to execute our right to retake.

10.5 Purchaser may solely sell the delivered goods in the course of his usual and proper business and provided that the transfer of the claims assigned to us according to the aforement is effective and valid. Purchaser shall not be entitled to any further disposal or transaction regarding the delivered goods' pledge or transfer by way of security.

10.6 Should any execution or distress be levied upon the delivered goods, purchaser shall without delay notify us thereof - even if we are only co-owner of the delivered goods - and deliver us any documentation required in order to object against such execution or distress.

10.7 Purchaser must insure the delivered goods at his own expense against fire and theft. Purchaser hereby assigns to us any claims against the insurer with regard to the delivered goods and we hereby accept such assignment.

10.8 Purchaser who is resident in a foreign country shall do any act required by law or otherwise to make our retention of title and our rights under Clause 10 of these conditions valid and effective.

10.9 Should the value of the delivered goods be more than 150 % in excess of all sums due from the purchaser to us then we shall be obliged to release such goods and to transfer title in these goods to purchaser.

11. Defects as to Quality

We shall be liable for defects as to quality, any failure to comply with any particular agreement or guarantee as to the fitness of the goods for a specific purpose or the durability of the goods, for any over-delivery, under-delivery or aliud-delivery ("Defect") as follows:

11.1 All parts of services where a Defect becomes apparent within the limitation period shall, at our discretion, be repaired, replaced or redelivered free of charge irrespective of the hours of operation elapsed, provided that the reason for the Defect has already existed at the time when the risk passed.

11.2 Claims based on Defects are subject to a limitation period of 12 months. This provision shall not apply where longer periods are prescribed by law according to Sec. 438 para. 1 No 2 (buildings and things used for a building), Sect. 479 para. 1 (right of recourse), and Sec. 634a para. 1 No 2 (defects of a building) German Civil Code ("BGB"), as well as in cases of injury of life, body or health, or where we intentionally or grossly negigently fail to fulfil our obligation or fraudulently conceal a Defect. The legal provisions regarding suspension of expiration ("Ablaufshemmung"), suspension ("Hemmung") and recommencement of limitation periods remain unaffected.

11.3 Written notice of apparent Defects must be given without delay at the latest 14 days from the receipt of the goods. Written notice of hidden Defects must be given without delay, at the latest 14 days from the discovery of such Defects. Claims based on Defects shall be excluded, should purchaser fail to give written notice of such Defects within the aforementioned period of time.

11.4 In case of notification of a Defect, purchaser may withhold payments to a reasonable extent taking into account the Defect occured. Purchaser, however, may withhold payments only if the subject-matter of the notification of the Defect occured is justified beyond doubt. Unjustified notifications of Defect shall entitle us to have our expenses reimbursed by purchaser.

11.5 We shall first be given the opportunity to supplement our performance ("Nacherfüllung") within a reasonable period of time.

11.6 If supplementary performance is unsuccessful, purchaser shall be entitled to repudiate the contract or reduce the remuneration, irrespective of any claims for damages he may have according to Clause 14 of these Conditions.

11.7 There shall be no claims based on a Defect in cases of insignificant deviations from the agreed quality, of only minor impairment of usefulness, of usual wear and tear or damage arising after the transfer of risk from faulty or negligent handling, excessive strain, unsuitable equipment, defective workmanship, inappropriate foundation soil or from particular external influences not assumed under the contract, or from non-reproducible software errors. Claims based on defects attributable to improper modifications or repair work carried out by purchaser or third parties and the consequences thereof shall be likewise excluded.

11.8 Purchaser shall have no claim with respect to expenses incurred in the course of supplementary performance, including costs of travel and transport, labour, and material, to the extent that expenses are increased because the subject-matter of the deliveries was subsequently brought to another location than purchaser's branch office, unless doing so is conformity with the intended use of the deliveries.

11.9 Purchaser's right of recourse against us pursuant to Sec. 478 BGB is limited to cases where purchaser has not concluded an agreement with his customers exceeding the scope of the statutory provisions governing claims based on Defects. Moreover, Clause 11.8 of these Conditions shall apply mutatis mutandis to the scope of the right of recourse purchaser has against us pursuant to Sec. 478 para. 2 BGB.

11.10 Furthermore, the provisions of Clause 14 of these conditions (Other Claims for Damages) shall apply in respect of claims of damages. Any other claims of purchaser against us or our agents or any such claims exceeding the claims provided for in Clause 11 of these Conditions, based on a Defect, shall be excluded.

11.11 Any return shipment of the goods by purchaser is in any event subject to our written approval. In case of such approval, the Goods have to be returned to our business premises at Gottlieb-Daimler-Straße 11, 71394 Kernen. Redeliveries not owing to our default are as a matter of principle only accepted upon prior agreement. The handling expenses are calculated according to the time and effort for examination, diassembling and re-storage.

12. Industrial Property Rights and Copyright; Defects in Title

12.1 Unless otherwise agreed, we shall provide the deliveries free from third parties' industrial property rights and copyrights (hereinafter referred to as "IPR") with respect to the country of the place of destination. If a third party asserts a justified claim against purchaser based on an infringement on an IPR with respect to the deliveries made by us and then used in conformity with the contract, we shall be liable to purchaser within the time period stipulated in Clause 11.2 of these Conditions and according to the following Clauses 12.2 to 12.9 of these Conditions.

12.2 We shall choose whether to acquire, at our own expense, the right to use the IPR with respect to the deliveries concerned or whether to modify the deliveries such that they no longer infringe the IPR or replace them. If this is not reasonably possible for us, purchaser may repudiate the contract or reduce the remuneration pursuant to the applicable statutory provisions.

12.3 Our liability to pay damages shall be governed by Clause 14 of these Conditions.

12.4 Our above obligations shall only apply if purchaser immediately notifies us of any such claim asserted by the third party in writing, does not concede the existence of an infringement and leaves any protective measures and settlement negotiations to our discretion. If purchaser stops using the deliveries in order to reduce the damage or for other good reason, he shall be obliged to notify the third party that no acknowledgement of the alleged infringement may be inferred from the fact that the use has been discontinued

12.5 Claims of purchaser shall also be excluded if he is himself responsible for the infringement of an IPR.

12.6 Claims of purchaser shall also be excluded if the infringement of the IPR is caused by specifications made by purchaser or owing a type of use not foreseeable by us or the deliveries being modifid by purchaser or being used together with products not provided by us.

12.7 In addition, with respect to purchaser's claims pursuant to Clause 12.2 of these Conditions Clauses 11.4, 11.5 and 11.9 shall apply mutatis mutandis in the event of an infringement of an IPR.

12.8 Where other defects in title occur, Clause 11 of these Conditions shall apply mutatis mutandis.

12.9 Any other claims of purchaser against us or our agents or any such claims exceeding the claims provided for in Clause 12 of these Conditions, based on a defect in title, shall be excluded.

13. Impossibility of Performance; Adaption of Contract

13.1 To the extent that deliveries are impossible to be carried out, purchaser shall be entitled to claim damages, unless we are not responsible for the impossibility. Purchaser's claim for damages shall, however, be limited to an amount of 10 % of the value of the part of the deliveries which, due to the impossibility, cannot be put to the intended use. This limitation shall not apply in the case of compulsory liability based on intent, gross negligence or injury of life, body or health; this does not imply a chance in the burden of proof to the detriment of purchaser. Purchaser's right to repudiate the contract shall remain unaffected.

13.2 Where unforeseeable events within the meaning of Clause 7.6 of these Conditions substantially change the economic importance of the contents of the deliveries or considerably affect our business, the contract shall be adapted taking into account the principles of reasonableness and good faith. Where doing so is economically unreasonable, we shall have the right to repudiate the contract. If we intend to exercise our right to repudiate the contract, we shall notify purchaser thereof without undue delay after having realised the repercussions of the event; this shall also apply even where an extension of the delivery period has previously been agreed with purchaser.

14. Other Claims for Damages

14.1 Any claims for damages and reimbursement of expenses purchaser may have (hereinafter referred as "Claims for Damages"), based on whatever legal reason, including infringement of duties arising in connection with the contract or tort, shall be excluded.

14.2 The above shall not apply in case of mandatory liability, e.g. under the German Product Liability Act ("Produkthaftungsgesetz"), in case of intent, gross negligence, injury of life, body or health, or breach of a condition which goes to the roots of the contract ("wesentliche Vertragspflichten). However, Claims for Damages arising from a breach of a condition which goes to the roots of a condition which goes to the roots of the contract shall be limited to the foreseeable damage which is intrinsic to the contract, unless caused by intent or gross negligence or based on liability for injury of life, body or health. The above provision does not imply a change in the burden of proof to the detriment of purchaser.

14.3 To the extent that purchaser has a valid Claim for damages according to Clause 14 of these Conditions, he shall be time-barred upon expiration of the limitation period applicable to Defects pursuant to Clause 11.2 of these Conditions. In case of claims for damages under the German Product Liability Act, the statuory provisions governing limitation periods shall apply.

15. Measurement

We reserve our right to technically modify the products offered in our catalogue, especially to modify measurements and erroneous specifications.

16. Place of Performane and Venue

16.1 Place of performance for any actual or future claims under the business relationship with purchaser, especially claims for payment against purchaser or claims for delivery against us, is the place of our business seat, i.e. Kernen (Rems-Murr-Kreis).

16.2 If purchaser is a merchant, exclusive venue and jurisdiction for all disputes arising directly or indirectly out of the contract shall be the place of our business seat. However, we may also bring an action at purchaser's place of business or at any other statuory venue.

17. Applicable Law

These Conditions and the entire legal relations existing in connection with this contract between us and purchaser shall be governed by German substantive law, to the exclusion of the United Nations Convention on Contracts for the International Sale of Goods (CISG).

Symbols and dimensions

Description	Symbol
Size of connecting thread	A
Size of further threads	B
Clamping range of round cable	ØC
Clamping range of flat cable	□ C
Diameter	D
Outer diameter	Da
Other outer diameter	Da1
Inner diameter	Di
Total unit height	H
Other height	H1
Length of connecting thread	L
Other lenght	L1
Other lenght	L2
Width across flat on basic unit	SW1
Other width across flat	SW2
Connecting thread Standard length	
Connecting thread long	
Packing unit	

Dimension overview of metric thread according to EN 60423

ISO size	pitch mm	outer thread diameter Ø mm	core Ø diameter mm	clearance hole Jacob specification mm
12	1,5	12	10,5	12,2
16	1,5	16	14,5	16,2
20	1,5	20	18,5	20,2
25	1,5	25	23,5	25,2
32	1,5	32	30,5	32,2
40	1,5	40	38,5	40,2
50	1,5	50	48,5	50,2
63	1,5	63	61,5	63,2

Minimum assembly dimensions

A mm	SW1 mm	M1 Assembly dimension for inner threads	M2 Assembly dimension with hexagonal locknut mm
M12x1,5	14	16,5	
	15	17,0	17,0
	17	19,5	19,5
	18	20,5	
M16x1,5	17	19,5	
	18	20,5	
	19	22,0	22,0
	20	23,0	
	22	25,0	25,0
	24	27,5	
M20x1,5	22	25,0	
	24	27,5	27,5
	26	29,5	
	27	31,0	31,5
M25x1,5	27	31,0	
	29	33,0	
	30	34,0	34,0
	32	36,5	36,5
	33	37,5	
	34	38,5	
M32x1,5	34	38,5	
	36	40,0	40,0
	40	45,0	
	41	46,0	46,0
	42	46,5	
M40x1,5	43	47,0	
	46	51,0	51,0
	50	56,0	56,0
	52	58,0	
	53	59,5	
M50x1,5	55	61,0	
	57	63,5	
	60	67,0	67,0
	65	73,0	
M63x1,5	65	73,0	
	68	76,5	
	70	79,0	79,0
	75	84,5	84,5

Attention: Consider addition of dimension for tools individually.

Further information about our representatives abroad is available at

www.jacob-gmbh.de

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05/2011