Conformance to standards:

符合标准

Additional services to benefit you

使您受益的附加服务

PMA products conform to worldwide standards and regulations. As a pioneer in the field of cable protection, we have always given high priority to our own testing facilities, and we have consciously introduced stringent in-house standards. This approach has enabled PMA to exercise a significant influence on the development of international standards. Standards committees with responsibility for cable systems regularly ask our company to provide advice or participate as an active member.

PMA 产品符合全球标准规则。作为电缆保护领域的先行者，**PMA** 一直优先发展自身的测试设备，并且有意识地引入了严格的内部测试标准。**PMA** 的这种措施对国际标准的发展起着非常重大的影响。负责电缆系统规则的标准委员会请求 **PMA** 提供建议或者以活跃成员的身份参与标准的制订。

High quality product from A-Z

高质量产品：A-Z

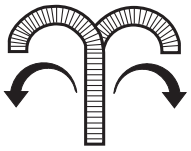
From basic items to high-tech products, all of our products meet the most stringent quality equirements. Some of the outstanding are:

- resistance to temperature, weathering, UV radiation, and chemical agents
- high system pull-out resistance
- excellent fire protection characteristics (flammability, smoke density, and toxicity)
- excellent system ingress protection up tol P66, IP68 and IP69
- extremely long service life
- conformance to the EN ISO 9001:2015 quality standard

PMA 所有产品，从基础产品到高科技产品，都满足最严格的质量要求。一些优异特性如下：

- 耐温耐候，抗紫外线辐射，耐化学性。
- 优秀的抗拉伸性
- 极佳的防火特性（燃烧性能，烟雾，毒性）
- 极佳的防护等级达到 IP66, IP68 和 IP69
- 极长的工作寿命
- 符合 EN ISO 9001:2015 质量标准

IEC EN61386
PMA DO 9.21-4425



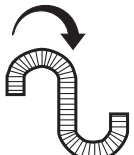
Resistance to Fatigue during Continuous Bending

Both standards describe tests designed to evaluate conduit resistance to fatigue when exposed to continuous cycles of repetitive bending.
The test procedure involves bending back and forth around a central pivotal point.
Although the test procedure is the same for both standards there are differences in the test parameters and the classification of results.
For a “pliable” classification according to IEC EN 61386-22 a conduit must withstand 3 cycles at the minimum declared operating temperature.
For a “flexible” classification according to IEC EN 61386-23 a conduit must withstand 5000 cycles at the minimum declared operating temperature.
PMA DO 9.21-4425 tests the conduit at 23°C and 50% r.h. but the test is not limited to a fixed number of cycles. It continues until the first signs of damage occur in order to find the actual performance limit.

循环交变弯曲抗疲劳性测试

这两项标准都描述了对于评估软管在循环交变弯曲中的抗疲劳性的测试。
测试过程包括围绕中心枢轴点前后弯曲。
尽管两种标准的测试程序相同，但测试参数和结果等级有所不同。
根据标准IEC EN 61386-22中“可折弯”的定义表明，软管必须在已声明的最低工作温度下经受住最少3次循环测试。
根据标准IEC EN 61386-23中“柔软性”的定义表明，软管必须在已声明的最低工作温度下承受5000次循环测试。
根据PMA DO 9.21-4425标准，软管在23°C/50%相对湿度环境下测试，软管测试不限固定的循环次数，直到软管破裂为止，以便找到实际的性能极限。

PMA DO 9.21-4420



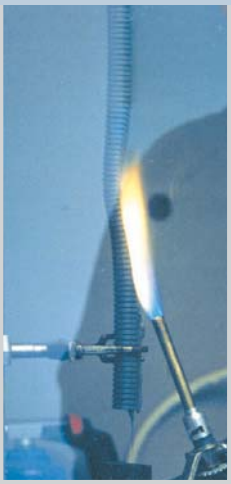
Resistance to Fatigue during Continuous Bending

This PMA internal standard describes a demanding test for conduit fatigue when exposed to continuous repetitive bending.
The conduit is fixed at the top of the apparatus, it passes over and under two pulley wheels. A weight is suspended at the bottom end simulating the weight of cables within the conduit. The pulley wheels move up and down continuously bending the conduit twice through 180° over its entire length.
The test is performed at 23°C and 50% r.h. and continues until the first signs of damage occur.

循环交变弯曲抗疲劳性测试

根据PMA标准描述，软管需经受苛刻的连续性重复的弯曲测试，以评估软管的抗疲劳性。
软管一端固定于设备顶部，另一端从两个滑轮上下依次穿过，并于底部悬挂一重物，模拟软管内电缆重量，此时软管弯曲幅度达到180°，并两次连续弯曲，滑轮开始沿整个软管长度连续上下移动。
测试在23°C/50%相对湿度环境下进行，并持续到出现第一个破裂为止。

IEC EN61386
PMA DO 9.21-4430



Flammability Tests

PMA DO 9.21-4430 evaluates flammability characteristics using a defined flame from a standard burner. The time before ignition, fire propagation behaviour and extinguishing time after removal of the heat source are all factors in evaluating the flammability of conduits for a Self-Extinguishing Classification.
IEC 61386 uses the EN 60695-2-10 Glow wire test procedure to evaluate the flame propagation behavior of conduits allocating the classifications. Non-flame propagating or flame propagating.

阻燃性能测试

PMA DO9.21-4430 使用标准燃烧器特定的火焰来评估阻燃性能。被燃着前的时间、火焰传播、移去火焰后的自熄时间等，都是评估软管自熄灭等级的因素
IEC 61386使用EN 60695-2-10灼热丝测试来评估软管的火焰传播行为的等级。非火焰传播或火焰传播。

IEC EN61386
PMA DO 9.21-4320

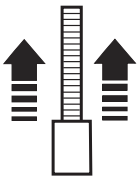
Compression Strength Test 抗压强度测试

Both standards describe a test designed to evaluate conduit resistance to compression forces. Excessive deformation of a conduit under compression could potentially cause damage to cables being protected within it.
The force required to compress the conduit between two square plates to a specific % of its original diameter is measured. Relaxation over time and recovery after removal of the force are evaluated.
The tests are performed at 23°C and 50% r.h.
IEC EN 61386 uses two 50mm x 50mm plates and allows 25% deformation.
PMA DO 9.21-4320 records results with 50mm x 50mm and 100mm x 100mm test plates and allows 20% deformation.

这两项标准都描述了评估软管抗压强度的测试。软管在压力状态下严重变形可能会对其内受保护的电缆造成损坏。
测试将软管放在两块四方形板之间进行挤压，压缩至其原始直径的特定百分比所需的力。评估移除压力后，随着时间舒张和复原状态。
测试在23°C/50％相对湿度的环境下进行。
IEC EN 61386标准，是使用两块50 mm x 50 mm的板测试，允许25%的变形。
PMA Do 9.21-4320 标准，记录使用50 mm x 50 mm和100 mm x 100 mm的板测试，但只允许20%的变形。

IEC EN61386
PMA DO 9.21-4610

System Pull-out Test 系统拉伸强度测试

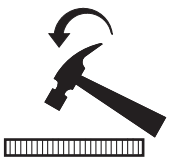


Both standards are designed to test the security of the conduit to fitting connection.
Two fittings with a piece of conduit between them are pulled apart with steadily increasing force. Extension of the conduit is recorded graphically against the force applied. The force required to pull the conduit out of the fitting is determined.
The tests are performed at 23°C and 50% r.h.

这两项标准是评估软管与管接头连接的安全性。
"两个管接头之间连接一段软管，随着力的不断增加而被拉开。以图形方式记录软管的拉伸情况。以确定将软管拉出管接头所需的力。"
测验在23°C/50%相对湿度环境下进行。

IEC EN61386
PMA DO 9.21-4330

Resistance to Impact Test 抗冲击测试



These standards describe tests to evaluate the resistance of conduits to high energy impacts.
They can be performed on conduits at various temperatures. Weights of different mass are dropped from an adjustable height directly onto a conduit sample which has been conditioned at the specified temperature. The energy of impact can be calculated as mass X gravity X height. The geometry of the object falling onto the conduit is regulated. No breaks, cracks or excessive permanent deformation should be visible after the test.

这些标准都描述了评估软管抗冲击强度的测试。它们需要在不同温度下在软管上进行。不同重量的砝码从可调的高度直接落在指定温度下调节的软管样品上。撞击能量可以计算为：重量X地心引力X高度。落在软管上的物体形状已规定。测试后不应出现断裂、裂纹或严重持久性变形。

PMA DO 9.21-4380

Flexibility at Low Temperature

低温下柔韧性

This standard describes a test procedure to evaluate the flexibility of conduits at low temperatures.

The conduit under test is placed in a climatic chamber at the lowest specified operating temperature for four hours.

It is then removed and immediately bent around a mandrel of diameter related to the outside diameter (OD) of the conduit.

Four classifications are achievable based upon the smallest achievable bending radius without damage.

本标准是评估在低温下的软管柔韧性测试。

将软管放置在特定最低工作温度下的控制箱内4个小时。

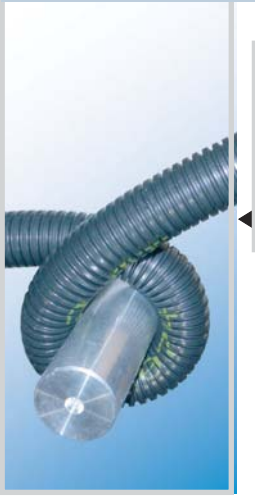
然后将其取出，并立即绕着直径约等于软管外径（OD）的芯棒弯曲。

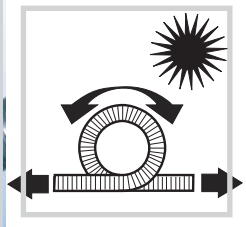
在基于在最小可达到的弯曲半径和无损伤的情况下，分四种等级评估。

PMA DO 9.21-4360

Thermal Ageing Test

高温老化测试





This standard describes a procedure designed to evaluate the thermal stability of a conduit and its resistance to thermal ageing.

The conduit is exposed to a temperature significantly above the maximum recommended continuous operating temperature for 168 hours, 160°C (PA6) or 150°C (PA12).

The flexibility at low temperature procedure DO 9.21-4380 is performed both before and after the thermal ageing procedure as an indicator of change to material characteristics.

本标准是评估软管高温稳定性及其耐高温老化性的测试。

将软管放置明显地高于其最高推荐的连续工作温度的控制箱内长达168小时，160°C（PA6）或150°C（PA12）

根据DO 9.21-4380标准，软管在高温老化过程的前和后通过在低温下柔韧性测试，以作为材料特性变化的指标。

PMA products offer complete protection!

PMA产品提供完全保护！

Ingress protection (IP) according to IEC EN60529

Ingress Protection (IP)

= A standard to classify product performance regarding ingress protection.

Different number = different protection!

For example, product classified as IP x8 are not automatically protected against jet water! Immersion tests for classifications IPx7 and IPx8 differ from the tests for protection against jet water for IPx9, IPx6, IPx5, or IPx4.

Therefore PMA cable protection systems are tested regarding different sealing requirements.

根据国际标准 IEC EN60529 IP防护等级

防止进入（**IP**）

= 划分产品防护等级的标准

不同的数字 = 不同的防护

比如：防护等级IPx8的产品并不能自动的代表对喷射的水提供防护。浸水 测试划分IPx7, IPx8等级，而喷水防护测试用来划分IPx9, IPx6, IPx5, IPx4等级。

因此：**PMA**电缆保护系统是根据不同的密封要求做相应测试的。

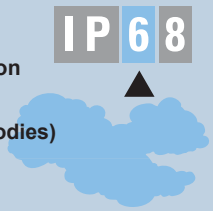
PMA products	**PMA 产品**	**PMAFIX Pro** IP68 / IP69	**PMAFIX** IP68 + WPS	**PMAFIX** IP68 / IP68GT	**PMAFIX** IP66	**SMART-LINE** IP66
IPx4	Splash water from all directions 各个方向飞溅的水	✔	✔	✔	✔	✔
IPx5	Jet water at any angle 任一角度喷射的水	✔	✔	✔	✔	✔
IPx6	Powerful jet water from any angle 任一角度强喷射的水	✔	✔	✔	✔	✔
IPx7	Submersion(1m, 30 min.) 浸没 （1米，30分）	✔	✔	✔		
IPx8	Submersion at time and / or pressure > IP x 7 浸没的时间和/或压力大于IP x 7	✔	✔	✔		
IPx9	High pressure and temperature (up to 80 bar) water from any angle 任一角度高达80巴的高压和高温喷水	✔	✔*	✔*	✔*	✔*

* IEC EN60529 can be fulfilled without WPS (Water impact protection ring). PMA recommends the use of WPS ring for trouble free practical applications.
* 没有WPS (抵抗水冲击的保护环）,也可符合IEC EN60529. 但PMA推荐使用WPS避免实际应用时出现问题。

Ingress protections IEC EN 60529

Dust 尘埃

Protection against contact and penetration of foreign objects
Degree of protection (contact / foreign bodies)
对接触和外来物质穿透的防护
防护等级代号（接触 / 外界物体）



0	No protection. 无防护。
1	Objects greater than 50mm Ø, accidental touch by hands. 防止人体（如手掌）因意外而接触到电器内部的零件，防止较大尺寸（直径大于50mm）的外物侵入。
2	Objects greater than 12.5mm accidental touch by fingers Ø. 防止人的手指接触到电器内部的零件，防止中等尺寸（直径大于12.5mm）的外物侵入。
3	Objects greater than 2.5mm Ø, e.g. tools/wires. 防止直径或厚度大于2.5mm的工具、电线及类似的小型外物侵入而接触到电器内部的零件。
4	Objects greater than 1mm Ø, e.g. tools/wires. 防止直径或厚度大于1.0mm的工具、电线及类似的小型外物侵入而接触到电器内部的零件。
5	Protected against dust - limited ingress (no harmful deposits). 防护灰尘。不可能完全阻止灰尘进入，但灰尘进入的数量不会影响设备的正常运行。
6	Totally protected against dust (dust-tight). 完全防止外物及灰尘侵入。

防护等级根据 IEC EN 60529

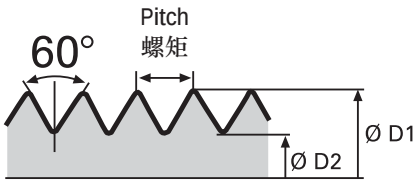
Water 水

Protection against fluids
Degree of protection (water)
防护液体
防护等级代号（水）

0	No protection. 无防护。
1	Protected against vertically falling drops of water. 防护水滴，垂直落下的水滴。
2	Protected against direct sprays of water 15° from vertical. 防护从垂直方向倾斜15度喷洒的水。
3	Protected against sprays of water to 60° from vertical. 防护从垂直方向倾斜60度喷洒的水。
4	Protected against water sprayed from all directions - limited ingress permitted. 防止各个方向飞溅或喷洒而来的水 - 有限度的水进入是允许的，但不会对设备造成损坏。
5	Protected against low pressure jets of water from all directions - limited ingress permitted. 防止持续至少3分钟的低压喷水 - 有限度的水进入是允许的，但不会对设备造成损坏。
6	Protected against strong pressure jets of water, heavy seas - limited ingress permitted. 防止大浪或防持续至少3分钟的高压喷水- 有限度的水进入是允许的，但不会对设备造成损坏。
7	Protection against the effects of immersion between 15cm - 1m，30 minutes. 防止浸水时水的进入， 在深达15厘米至1米的水中，30分钟的浸泡影响。
8	Protection against long periods of immersion under a quoted pressure, to be discussed between the manufacturer and the user. 防止在特定压力下较长时间沉没时水的进入，准确的条件由制造商和用户商讨。
9	Protection against high temperature (80°C) & extremely high pressure stream water jet. 防止极高喷射水压的高温 (80°C) 水的进入。

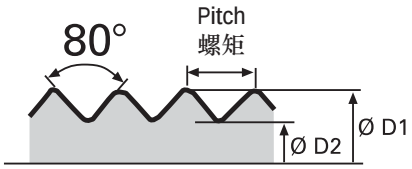
Thread dimensions 螺纹尺寸

IEC EN 60423 Metric fine thread 公制细螺纹



Metric	Pitch 螺矩 mm	Major Ø 主外径 D1 mm	Major Ø 辅外径 D2 mm	Hole 孔 -0 / + 0.3 mm
12	1.5	12	10.16	12.0
16	1.5	16	14.16	16.0
20	1.5	20	18.16	20.0
25	1.5	25	23.16	25.0
32	1.5	32	30.16	32.0
40	1.5	40	38.16	40.0
50	1.5	50	48.16	50.0
63	1.5	63	61.16	63.0

DIN 40430 PG thread PG 螺纹

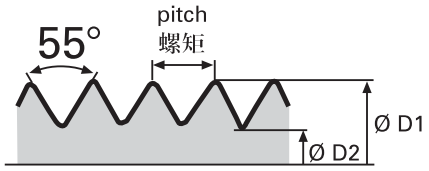


PG	Pitch 螺矩 mm	Major Ø 主外径 D1 mm	Major Ø 辅外径 D2 mm	Hole 孔 mm
07	1.270	12.5	11.28	12.7
09	1.411	15.2	13.86	15.4
11	1.411	18.6	17.26	18.8
13.5	1.411	20.4	19.06	20.7
16	1.411	22.5	21.16	22.8
21	1.588	28.3	26.78	28.6
29	1.588	37.0	35.48	37.4
36	1.588	47.0	45.48	47.5
48	1.588	59.3	57.78	59.8

Thread dimensions 螺纹尺寸

DIN 259 BI. 3
ISO 228/I

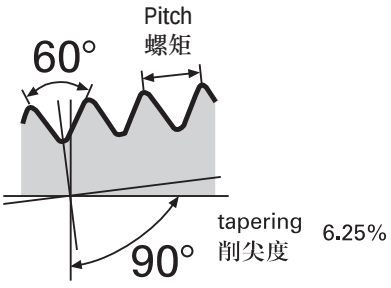
Gas pipe thread Gas 螺纹



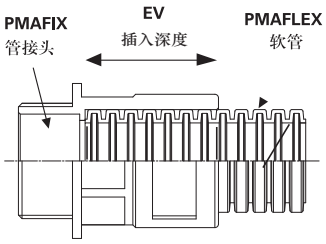
GAS	Pitch 螺矩 mm	Major Ø 主外径 D1 mm	Major Ø 辅外径 D2 mm	Hole 孔 mm
1/ 4"	1.337	13.157	11.445	13.4
3/ 8"	1.337	16.662	14.950	17.0
1/ 2"	1.814	20.955	18.631	21.3
3/ 4"	1.814	26.441	24.117	26.8
1 "	2.309	33.249	30.291	33.7
1 1/ 4"	2.309	41.910	38.952	42.4
1 1/ 2"	2.309	47.803	44.845	48.31
2 "	2.309	59.614	56.656	60.2

ANSI / ASME B1.20

American standard taper pipe thread 美国标准锥管螺纹

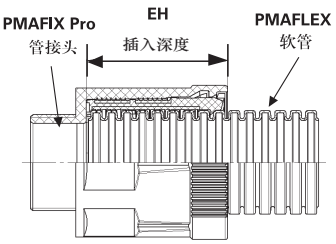


NPT	Pitch 螺矩 mm	Major Ø 主外径 D1 mm	Hole 孔 D2 mm
1/4"	1.411	13.716	13.9
3/8 "	1.411	17.145	17.4
1/2"	1.814	21.336	21.6
3/4"	1.814	26.670	26.9
1 "	2.209	33.401	33.7
1 1/4"	2.209	42.164	42.4
1 1/2 "	2.209	48.260	48.5
2 "	2.209	60.325	60.6



Insertion depth for PMA conduits into corresponding PMAFIX connectors

PMA 软管与对应的
PMAFIX 管接头在安装过程中的插入深度



Insertion depth for PMA conduits into corresponding PMAFIX Pro connectors

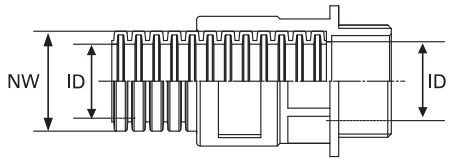
PMA 软管与对应的
PMAFIX Pro 管接头在安装过程中的插入深度

The dimensions given below have to be taken into account when calculating the length of conduit necessary between two connectors.
The insertion depth should be taken into account for each connector as mentioned below.

在两个管接头之间计算软管长度时，以下尺寸必须要计算在内。
在每个管接头内的插入深度要额外计算，请参照下表。

Nominal Width, conduit 软管标称内径	PMAFIX Insertion depth (EV nominal) PMAFIX 插入深度 (EV)	PMAFIX Pro Insertion depth (EH nominal) PMAFIX Pro 插入深度 (EH)
NW	mm	mm
07	22	-
10	24	28.5
12	27	34.0
17	35	39.0
23	37	41.5
29	37	47.0
36	51	51.5
48	51	57.5

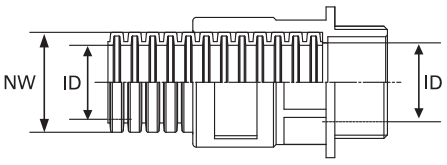
If wrongly installed, corresponding IP class may not be achieved.
如不正确安装，将不能达到指定的IP防水防尘等级。



Inside diameter of metric threads to inside diameter of conduits

公制螺纹内径与软管内径

Conduit 软管			Connector with metric thread 公制螺纹管接头		
Nominal width 标称内径 NW			Inside diameter mm (nom.) ID内径（毫米）		
Standard 标准	Metric 公制	Inside Ø nominal (mm) 正常内径（毫米）	Thread size 螺纹尺寸	Metal thread 金属螺纹	Polyamide thread 聚酰胺螺纹
07	10	6.2	M12	-	8.0
10	12	9.6	M12	5.7	8.0
10	12	9.6	M16	9.6	11.0
12	16	12.0	M16	9.7	11.0
10	12	9.6	M20	-	13.0
12	16	12.0	M20	13.5	13.0
17	20	16.2	M20	13.5	14.6
23	25	22.6	M20	-	15.0
17	20	16.2	M25	18.3	19.0
23	25	22.6	M25	18.4	19.0
23	25	22.6	M32	24.2	24.0
29	32	29.0	M32	25.4	26.0
29	32	29.0	M40	31.4	32.0
36	40	36.5	M40	32.6	32.0
36	40	36.5	M50	39.5	39.0
48	50	47.5	M50	41.5	42.0
48	50	47.5	M63	51.4	53.0



Inside diameter of PG threads to inside diameter of conduits

PG 螺纹内径与软管内径

Conduit 软管			Connector with PG thread PG 螺纹管接头		
Nominal width 标称内径 NW			Inside diameter mm (nom.) ID内径（毫米）		
Standard 标准	Metric 公制	Inside Ø nominal (mm) 正常内径（毫米）	Thread size 螺纹尺寸	Metal thread 金属螺纹	Polyamide thread 聚酰胺螺纹
07	10	6.2	PG07	-	8.0
10	12	9.6	PG09	9.5	10.0
12	16	12.0	PG11	12.5	13.0
-	-	-	PG13.5	14.5	14.5
17	20	16.2	PG16	16.5	17.5
23	25	22.6	PG21	22.0	22.5
29	32	29.0	PG29	30.0	30.5
36	40	36.5	PG36	40.0	37.5
-	-	-	PG42	-	46.0
48	50	47.5	PG48	49.5	50.0

Recommended torques for PMA Connectors　PMA管接头螺纹推荐扭矩

Tightening torques for PMA polyamide thread connectors to threaded holes or with lock nuts
适用于PMA聚酰胺螺纹管接头连接至螺纹孔或锁紧螺母的拧紧扭矩

Metric Polyamide thread size 公制，聚酰胺螺纹尺寸	Torque 扭矩 (Nm)	NPT Polyamide thread size NPT制，聚酰胺螺纹尺寸	Torque 扭矩 (Nm)
M12	1.5	NPT 1/2	4.0
M16	3.0	NPT 3/4	6.0
M20	4.0	NPT 1"	8.0
M25	6.0	NPT 1 1/4	9.0
M32	8.0	NPT 1 1/2	15.0
M40	9.0	NPT 2"	15.0
M50	10.0		
M63	10.0		

PG Polyamide thread size PG制，聚酰胺螺纹尺寸	Torque 扭矩 (Nm)
PG07	1.5
PG09	1.5
PG11	2.0
PG13,5	2.5
PG16	4.0
PG21	5.0
PG29	9.0
PG36	15.0
PG48	15.0

UNEF Polyamide thread size UNEF，聚酰胺螺纹尺寸	Torque 扭矩 (Nm)
1/2-28 UNEF	2.0
9/16-24 UNEF	3.0
5/8-24 UNEF	3.0
11/16-24 UNEF	3.0
3/4-20 UNEF	4.0
13/16-20 UNEF	4.0
7/8-20 UNEF	8.0
15/16-20 UNEF	8.0
1-20 UNEF	8.0
1 1/16-18 UNEF	10.0
1 3/16-18 UNEF	10.0
1 1/4-18 UNEF	10.0
1 5/16-18 UNEF	10.0
1 3/8-18 UNEF	10.0
1 7/16-18 UNEF	15.0
1 5/8-18 UNEF	15.0
1 3/4-18 UNS	15.0
2-18 UNS	15.0

Please note:
请注意:

These recommendations are guidelines. Please take into account the influence of the mating thread during assembly.
这些建议仅作为指导方针。 组装过程中请考虑与其适配螺纹的影响。

These values are based on measurements under standard climatic conditions (23°C / 50% relative humidity).
这些数据来源于标准环境下测量（23°C / 50% 相对湿度）。

Recommended torques for PMA Connectors　PMA管接头螺纹推荐扭矩

Tightening torques for PMA metal thread connectors to threaded holes or with lock nuts
适用于PMA金属螺纹管接头连接至螺纹孔或锁紧螺母的拧紧扭矩

Metric metal thread size 公制，金属螺纹尺寸	Torque 扭矩 (Nm)	NPT metal thread size NPT制，金属螺纹尺寸	Torque 扭矩 (Nm)
M12	4.0	NPT 1/2"	6.0
M16	4.0	NPT 3/4"	8.0
M20	6.0	NPT 1"	10.0
M25	8.0	NPT 1 1/4"	15.0
M32	10.0	NPT 1 1/2"	15.0
M40	15.0	NPT 2"	15.0
M50	15.0		
M63	15.0		

PG metal thread size PG制，金属螺纹尺寸	Torque 扭矩 (Nm)
PG07	3.5
PG09	4.0
PG11	6.0
PG13.5	6.0
PG16	7.0
PG21	8.0
PG29	10.0
PG36	15.0
PG48	15.0

UNEF metal thread size UNEF，金属螺纹尺寸	Torque 扭矩 (Nm)
1/2"-28 UNEF	4.0
9/16"-24 UNEF	5.0
5/8"-24 UNEF	5.0
11/16"-24 UNEF	5.0
3/4"-20 UNEF	6.0
13/16"-20 UNEF	6.0
7/8"-20 UNEF	10.0
15/16"-20 UNEF	10.0
1"-20 UNEF	10.0
1 1/16"-18 UNEF	10.0
1 3/16"-18 UNEF	10.0
1 1/4"-18 UNEF	10.0
1 5/16"-18 UNEF	10.0
1 3/8"-18 UNEF	10.0
1 7/16"-18 UNEF	15.0
1 5/8"-18 UNEF	15.0
1 3/4"-18 UNS	15.0
2"-18 UNS	15.0
2 1/4"-16 UN	15.0

Please note:
请注意:

These recommendations are guidelines. Please take into account the influence of the mating thread during assembly.
这些建议仅作为指导方针。组装过程中请考虑与其适配螺纹的影响。

These values are based on measurements under standard climatic conditions (23°C / 50% relative humidity).
这些数据来源于标准环境下测量（23°C / 50% 相对湿度）。

Recommended torques for PMA Connectors　PMA管接头螺纹推荐扭矩

Tightening torques for fixation screws for PMA conduit clamps, PMA conduit supports or PMA flange
PMA管夹、PMA软管固定夹或PMA法兰上的固定螺钉拧紧扭矩

Thread Size 螺纹尺寸	Torque 扭矩 (Nm)
M4	2.0
M5	3.0
M6	4.0
M8	10.0
M10	15.0

Maximum recommended torques for Pflitsch strain relief inserts (double nipple)
推荐适用于Pflitsch消除应力插入件（双重密封插入件）的最大扭矩

PFLITSCH®

The values quoted for Pflitsch strain relief inserts (double nipple) are absolute maximum values. These values should be adjusted for the type of cable and sealing insert in use.

应用在Pflitsch消除应力插入件（双重密封插入件）的值是绝对最大值。这些值应根据使用中的电缆和密封插入件的类型进行调整。

Thread size 螺纹尺寸	Metal 金属 NVNZ-MxxxS/Px, NVEZ-MxxxV/P NKNZ-Mxxx/Px, NKEZ-Mxxx/Px [IEC EN 62444] [Nm]	Thread size 螺纹尺寸	Metal 金属 NVNZ-PxxxS/Px [IEC EN 62444] [Nm]
M12	6.0	PG07	6.0
M16	8.0	PG09	8.0
M20	10.0	PG11	10.0
M25	10.0	PG13.5	10.0
M32	15.0	PG16	10.0
M40	20.0	PG21	15.0
M50	20.0	PG29	20.0
M63	20.0	PG36	30.0
		PG48	40.0

Manufacturer's data for tightening torques of UNI Dicht cable glands with metric & PG connecting thread for feedthroughs with internal threads and for through holes with locknuts.

生产商提供的数据适用于拧紧带公制或PG制螺纹的UNI Dicht电缆索头，在带内螺纹的穿孔和带锁紧螺母的通孔上所需的扭矩。

Please note:
请注意：

Table figures are general terms of reference. The torque depends on the cable used and the insert sealing; it should not, however, exceed the figures stated in the table.

表格中的数值是通用的参考值。 扭矩取决于使用的电缆和密封插入件; 但是，不应超出表中列出的数值。

Recommended torques for PMA Connectors　PMA管接头螺纹推荐扭矩

Recommended torques for Jacob strain relief inserts (gland body with insert)
推荐适用于Jacob消除应力插入件（带插入件的索头主体）的扭矩

Metric

Thread size 螺纹尺寸	Metal 金属 NVNZ-MxxxS-xx / NVEZ-MxxxV-xx NKNZ-MxxxS-xx / NKEZ-Mxxx-xx [Nm] Necessary to fulfill IEC EN 62444 必须满足IEC EN 62444标准	Thread size 螺纹尺寸	Polyamide 聚酰胺 S / BVNZ-MxxxS [Nm] Necessary to fulfill IEC EN 62444 必须满足IEC EN 62444标准
M12	3.5	M12	1.5
M16	3.5	M16	2.5
M20	3.5	M20	3.5
M25	6.7	M25	5.0
M32	12.0	M32	5.0
M40	13.5	M40	7.5
M50	16.0	M50	7.5
M63	16.0	M63	13.0

PG

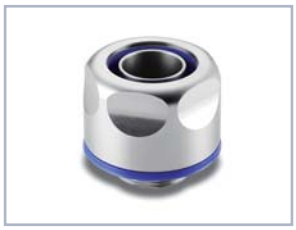
Thread size 螺纹尺寸	Metal 金属 NVNZ-PxxxS / NVEZ-PxxxV [Nm]	Thread size 螺纹尺寸	Polyamide 聚酰胺 S / BVNZ-PxxxS [Nm]
PG07	6.25	PG07	2.5
PG09	6.25	PG09	3.75
PG11	6.25	PG11	3.75
PG13.5	6.25	PG13.5	3.75
PG16	7.5	PG16	5.0
PG21	10.0	PG21	7.5
PG29	10.0	PG29	7.5
PG36	10.0	PG36	7.5
PG48	10.0	PG48	7.5

The manufacturer of the PERFECT strain relief insert recommends the use of the tightening torques quoted in VDE 0619 both for fixing cable glands to metal plates, threaded holes and for the compression of the strain relief part.

根据德国VDE 0619标准，PERFECT 消除应力插入件的生产商推荐使用的拧紧扭矩适用于固定电缆索头在金属板通孔，螺纹孔和消除应力部件的压缩组件。

Recommended torques for PMA Connectors　　PMA管接头螺纹推荐扭矩

Tightening torques for PMA purely metallic connectors and adapters (e.g. SCA, SWA, MAVI, MONK, JENQ, NSNV, NSBIV)
适用于PMA纯金属管接头和适配器的拧紧扭矩（如 SCA, SWA, MAVI, MONK, JENQ, NSNV, NSBIV系列）



Thread size 螺纹尺寸	Torque 扭矩 (Nm)	Thread size 螺纹尺寸	Torque 扭矩 (Nm)	Thread size 螺纹尺寸	Torque 扭矩 (Nm)
M16	10.0	NPT 1/2"	15.0	PG09	15.0
M20	20.0	NPT 3/4"	20.0	PG11	15.0
M25	30.0	NPT 1"	30.0	PG13.5	20.0
M32	35.0	NPT 1 1/4"	35.0	PG16	30.0
M40	35.0	NPT 1 1/2"	40.0	PG21	30.0
M50	40.0	NPT 2"	40.0	PG29	35.0
M63	40.0			PG36	40.0
				PG48	40.0

Tightening torques for PMA divisible lock nuts with PMA divisible connectors
适用于PMA可分螺母和可分管接头的拧紧扭矩

Thread size 螺纹尺寸	Torque 扭矩 (Nm)
M16	tighten by hand / 用手拧紧
M20	tighten by hand / 用手拧紧
M25	4.0
M32	6.0
M40	8.0
M50	10.0

Tightening torques for PMA divisible lock nuts with PMAFIX polyamide thread connectors
适用于PMA可分螺母和PMAFIX管接头的拧紧扭矩

Thread size 螺纹尺寸	Torque 扭矩 (Nm)
M16	tighten by hand / 用手拧紧
M20	3.0
M25	4.0
M32	6.0
M40	8.0
M50	10.0

Please note:
请注意:

These recommendations are guidelines. Please take into account the influence of the mating thread during assembly.
这些建议仅作为指导方针。 组装过程中请考虑与其适配螺纹的影响。
These values are based on measurements under standard climatic conditions (7 days, 23°C / 50% relative humidity).
这些数据来源于标准环境下测量 （7天，23°C / 50% 相对湿度）。

Reference list for O-rings to metal threads　　适配于金属螺纹的O型圈列表

Model of Connector 管接头型号	Thread size 螺纹尺寸	O-ring ID x d O型圈 内径 x 厚度	Order no. 订货号
1. NVNV-Mxxx-x. 2. NVAV-Mxxx-x.	M12 x 1.5	9 x 2.0	OR9.00 x 2.00
3. NVBV-Mxxx-x. 4. NVWV-Mxxx-x.	M16 x 1.5	13 x 2.0	OR13.00 x 2.00
5. NSBV-Mxxx-x. 6. NSWV-Mxxx-x.	M20 x 1.5	17 x 2.0	OR17.00 x 2.00
7. NSNV-Mxxx-x. 8. NKNH-Mxxx-x.	M25 x 1.5	22 x 2.0	OR22.00 x 2.00
9. NKAH-Mxxx-x. 10. NKBH-Mxxx-x.	M32 x 1.5	29 x 2.0	OR29.00 x 2.00
11. BVEMV-Mxxx-x. 12. BVEMV-MxxxSW-x.	M40 x 1.5	36 x 2.0	OR36.00 x 2.00
13. SCA-Mxx. 14. SCAK-Mxx-xx.	M50 x 1.5	47 x 2.0	OR47.00 x 2.00
15. SWA-Mxx-xx. 16. MAVI-Mxx / xx.	M63 x 1.5	60 x 2.0	OR60.00 x 2.00
17. MAVIK-Mxx / xx.			

Model of Connector 管接头型号	Thread size 螺纹尺寸	O-ring ID x d O型圈 内径 x 厚度	Order no. 订货号
1. NVNV-Pxxx.	PG 07	10 x 1.5	OR10.00 x 1.50
2. NVAV-Pxxx.	PG 09	13 x 1.5	OR13.00 x 1.50
3. NVBV-Pxxx.	PG 11	16 x 1.5	OR16.00 x 1.50
4. NVWV-Pxxx.	PG 13.5	18 x 1.5	OR18.00 x 1.50
5. NSBV-Pxxx-x.	PG 16	20 x 1.5	OR20.00 x 1.50
6. BVEMV-Pxxx.	PG 21	24 x 1.5	OR24.00 x 1.50
7. BVEMV-Pxxx-133.	PG 29	33 x 2.0	OR33.00 x 2.00
8. SCA-Pxx.	PG 36	42 x 2.0	OR42.00 x 2.00
9. SWA-Pxx.	PG 42	51 x 2.0	OR51.00 x 2.00
10. MAVI-Pxx / xx.	PG 48	54 x 2.5	OR54.00 x 2.50

Life Expectancy of PMA's sealings NVN3, O-rings (OR) and SVN4
PMA密封系列产品NVN3、OR和SVN4的使用寿命

PMA is recognized as worldwide market leader for high reliability polyamide cable protection systems for various applications in the rail industry. Our PMAFIX IP68 connectors have been used extensively for static, dynamic, internal and external applications, under carriages, on bogies and on the roof exposed to high levels of UV radiation and extreme weather conditions for up to 30 years now.

PMA一直被公认为全球市场领导者，具有高可靠性的聚酰胺电缆保护系统，适用于铁路行业的各种应用需求。我们的PMAFIX IP68管接头已经广泛应用于静态、动态、内部和外部，且在车厢、转向架和车顶暴露在高紫外线辐射和极端天气条件下其使用寿命已经长达30年。

The NVN3, OR and SVN4 sealing types are integral parts of the PMAFIX IP68 connectors series. The used high- performance materials are responsible for creating an efficient, long term seal. PMA has received no reports of insufficient product lifetime in installations where the recommended installation methods have been followed closely and the products have been operated within their specification. Although thin-walled sealing elements made of elastomeric materials are more sensitive than the more robust connectors and conduits, their expected lifetime can be up to 20 years. It is advised to plan a preventive maintenance check after 10 years installation.

NVN3密封帽、OR O型圈和SVN4扁平垫圈密封系列是PMAFIX IP68系列管接头中不可缺少的部分。其使用的高性能材料可有助于提供高效，长期的密封效果。在安装中，产品将严格遵循推荐的安装方法，并且产品已经在其规范内操作，目前为止PMA未收到关于在安装中产品减少寿命的报告。虽然由弹性材料制成的薄壁密封元件比更结实的管接头和软管更加敏感，但它们的预期寿命可长达20年。建议在安装10年后进行预防性维修检查。

Factors which may negatively affect the lifetime of NVN3, OR and SVN4 are as follows.

可能对NVN3、OR和SVN4使用寿命减少的因素有如下几方面

- Heat exposure. 暴露于高温
- Exposure to aggressive chemicals, please refer to PMA chemical resistance data.
  接触到腐蚀性化学品，请参考PMA耐化学腐蚀数据表
- Mechanical stress caused by movement of the conduit within the connector leading to wear. This should be avoided by preventing torsion forces in the application, possibly through use of the SWA swivel adapter.
  由于软管在管接头内扭动从而引起的机械应力导致磨损。可以通过使用SWA系列旋转适配器，从而避免在实际工作中产生的扭力。

Sealing elements for use with the threads of PMA connectors and adapters: O-rings, flat gaskets, thread sealing compound. 适用于PMA管接头和适配器的密封元件：O型圈、扁平垫圈、螺纹密封剂

Flat gaskets
扁平垫圈

In order to make the best choice of thread sealing element to use with a PMA connector or adapter in a specific application careful consideration must be made to all influencing factors and all components involved. It is not possible for PMA to make 100% clear cut recommendations about the correct sealing element to use for each connector and adapter because each application is different and PMA provides only part of the solution. Consideration of the mating parts is essential.

在特殊的应用中使用PMA管接头或适配器时，因每个应用环境不同，为了选择最佳的螺纹密封元件，必须仔细考虑到所有影响的因素及所涉及的组件，PMA不可能清楚地对每个管接头及适配器所适配的螺纹密封元件提供100%的建议，PMA仅提供部分的解决方案。要考虑到配对的部件，这是至关重要的。

Flat gaskets can provide a very effective seal between two flat surfaces. The total sealing area is the overlap between the connector flange, the mating surface and the gasket. Areas where one of these three elements are missing do not contribute to the sealing area. The system designer must ensure that the mating parts offer a large enough sealing area. If for example a connector does not sit in the middle of a through hole the sealing area will be reduced. Flat gaskets have the advantage that they can be effective even when the mating surface is slightly rough.

扁平垫圈可以在两个平面之间提供非常有效的密封。总密封面积为管接头法兰、配对表面及垫圈之间重叠的区域。缺少这三个元素任何一个，那就起不到相应的密封效果。系统设计者必须确保配对的部件提供足够大的密封面积，例如：一个管接头不位于通孔的中心，则密封区域将减少。扁平垫圈的优点在于，即使配对的表面稍微粗糙，它也能够提供有效的密封。

Flat gaskets 扁平垫圈

O-rings
O型圈

Successful use of an O-ring seal requires careful detail design of the mating threads. O-rings seal through elastic-plastic deformation of the cross-section of their material. The O-ring needs to be positioned precisely in a cavity which when the connector is fully installed has a volume 15-35% below the original volume of the O-ring. Many PMA metal thread connector have a recess at the end of the thread designed to position an O-ring. Due to the position of this recess it is unlikely the O-ring would be correctly compressed if the connectors is installed to a through hole and secured with a locknut. Metal parts and counterparts should be rounded and free from sharp edges.
The roughness of the mating surface should be checked to avoid O-ring damage during installation.
Twisting of the O-ring during installation should also be avoided.

有效使用O型密封件需要仔细设计配合相应的螺纹，O型圈通过其材料横截面的弹性塑性变形密封。O型圈需要精确地定位在空腔中，当管接头完全安装时，其体积比O型圈的原始体积低15-35%。许多PMA金属螺纹管接头在设计时，就将O型圈定位在螺纹端部的凹槽内。由于该凹槽的位置，当管接头安装至通孔并用锁紧螺母固定，则O型圈未必能正确地被压缩。金属部件和对应部件应用圆形的，并且没有锋利的边缘。应检查配对的表面的粗糙度，以避免安装过程中造成O型圈损坏同时应避免在安装过程中扭曲O型圈。

O-rings O型圈

Sealing elements for use with the threads of PMA connectors and adapters: O-rings, flat gaskets, thread sealing compound. 适用于PMA管接头和适配器的密封元件：O型圈、扁平垫圈、螺纹密封剂

Thread sealing compound
螺纹密封剂

If a high degree of sealing is required in applications where the use of an O-ring or flat gasket are not possible due to the geometry of the mating parts, good sealing performance can be achieved by applying a thread locking and sealing compound to the thread itself.
Twisting of the O-ring during installation should also be avoided
如果由于配对的部件为几何形状而无法使用O型圈或扁平垫圈，且应用中需要更高的密封性能要求时，则可以将螺纹锁固和密封剂应用于螺纹本身，从而获得良好的密封性能。

Seals supplied with PMA connectors and adapters for use on male threads
PMA管接头和适配器提供的密封元件适配于外螺纹

- When only one type of seal is supplied with a PMA connector or adapter then this seal corresponds to the PMA recommendation. The use of another seal type may be technically inappropriate or insecure due to constructive details.

当PMA的管接头或适配器只供应一款密封元件时，则此密封元件符合PMA的推荐。基于结构上的细节，若使用另一款密封元件时，可能在技术上不适合或不安全。

- When both an O-ring and a flat gasket are delivered with a PMA connector or adapter it is intended that the customer should choose which element is more appropriate for his application depending upon the application, method of attachment and the mating parts.

当PMA管接头或适配器供应时包括O型圈和扁平垫圈，客户应根据应用环境、安装方式和相关的配对的部件去选择更加适合其应用的密封元件。

- **An O-ring and a flat gasket should never be used together, they will impede each other from functioning correctly.**

O型圈和扁平垫圈不能同时使用，因它们会互相妨碍彼此的功效。

General recommendations
一般建议

As a general rule if a PMA connector or adapter is to be installed to a through hole in a casing of some kind and secured with a lock nut on the other side, then a flat gasket offers the best chances of creating an effective seal. The flat gasket can be compressed around the hole between the casing and the connector flange.
一般来说，如果将PMA管接头或适配器安装在某种外壳的通孔中，并在另一侧用一个锁紧螺母固定，那么扁平垫圈可提供最佳的密封效果。扁平垫圈可压缩在外壳与管接头法兰之间的孔周围。

If a PMA connector or adapter is to be installed to a threaded hole, then if the contours of the mating thread entry are designed appropriately an O-ring can function very well and may be the best choice.
如果将PMA管接头或适配器安装在螺纹孔中，若螺纹接头设计匹配螺纹入口的轮廓，则O型圈可以发挥有效的密封效果，并且可能是最好的选择。

If no suitable surfaces are available between which a flat gasket or O-ring could successfully be compressed then a thread sealing compound may be the only possible solution.
如果没有合适的表面让扁平垫圈或O型圈可以成功地被压缩，那么螺纹密封剂可能是唯一的解决方案。

Sealing elements for use with the threads of PMA connectors and adapters: O-rings, flat gaskets, thread sealing compound. 适用于PMA管接头和适配器的密封元件：O型圈、扁平垫圈、螺纹密封剂

The following PMA connectors and adapters are supplied with both an O-ring and a Flat Gasket:
以下的PMA管接头和适配器供货时包含O型圈和扁平垫圈：

Male metal thread connectors 公制金属螺纹管接头	(M)	NKNH-M, NKAH-M, NKBH-M N/MVNV-M, N/MVWV-M, N/MVBV-M, N/MVAV-M
Metal thread swivel connectors 金属螺纹旋转管接头	(M, PG)	NSNV-M/P, NSBV-M/P, NSWV-M
Metal thread adapters 金属螺纹适配器	(M, PG)	SWA-M/P, SCA-M/P, MAVI-M/P

For these articles the most suitable sealing element should be selected according to the application conditions
对于以上的产品，应根据应用条件选择最适合的密封元件

The following PMA adapters are supplied with an O-ring only
以下PMA适配器只提供O型圈

Metal thread adapters 金属螺纹适配器	(M)	SCAK-M, MAVIK-M

The following PMA connectors and adapters are supplied with a Flat Gasket only:
以下的PMA管接头和适配器只供应扁平垫圈：

Male, metal thread connectors 金属外螺纹管接头	(PG, NPT)	N/MVNV-P/N, N/MVWV-P, N/MVBV-P, N/MVAV-P
Male, metal swivel connectors 金属外螺纹，旋转管接头	(NPT)	NSNV-N, NSBV-N
Male, plastic thread connectors 塑料外螺纹管接头	(M) (M, PG, NPT)	B/SVNV-P/M/N, B/SVAV-P/M/N, B/SVWV-P/M/N

None of the articles above have a recess at the back of the thread to precisely define the position of an O-ring. They are supplied with a flat gasket only.
上面的任何一个产品都没有在螺纹的底端有一个凹槽来精确地定位O型环的位置。他们只提供扁平垫圈。

Sealing elements for use with the threads of PMA connectors and adapters: O-rings, flat gaskets, thread sealing compound. 适用于PMA管接头和适配器的密封元件：O型圈、扁平垫圈、螺纹密封剂

The following PMA strain relief connectors are delivered with an O-ring only. If the geometry of the mating parts does not allow correct compression of the O-ring a thread locking and sealing compound may be necessary to achieve a high level of sealing performance.

以下的PMA消除应力管接头只供应O型圈。 如果适配的部位为几何形状，O型圈不能被正确压缩，则可能需要应用螺纹锁定和密封剂，从而达到更高的密封性能。

The O-rings supplied with PMA strain relief connectors are pre-installed to the termination thread by Pflitsch .
PMA follows the recommendation of the cable gland manufacturer.

PMA消除应力管接头提供的O型圈，来自Pflitsch公司。O型圈是预先安装在螺纹底端上。
PMA遵循电缆索头制造商的建议。

Metric — **NVNZ-MxxxS / Px; NVNZ-MxxxS / Px - L (Pflitsch UNI Dicht 系列)**

Thread size 螺纹尺寸	ID mm	d mm	O-ring ID x d (mm) 内径 x 厚度(毫米)
M12 x 1.5	10.5	1.5	10.5 x 1.5
M16 x 1.5	13.0	1.5	13.0 x 1.5
M20 x 1.5	17.0	1.5	17.0 x 1.5
M25 x 1.5	22.0	1.5	22.0 x 1.5
M32 x 1.5	28.0	2.0	28.0 x 2.0
M40 x 1.5	38.0	2.0	38.0 x 2.0
M50 x 1.5	45.0	2.0	45.0 x 2.0
M63 x 1.5	58.0	2.0	58.0 x 2.0

PG — **NVNZ-PxxxS / Px (Pflitsch UNI Dicht 系列)**

Thread size 螺纹尺寸	ID mm	d mm	O-ring ID x d (mm) 内径 x 厚度(毫米)
Pg7	10.5	1.5	10.5 x 1.5
Pg9	12.0	1.5	12.0 x 1.5
Pg11	14.0	1.6	14.0 x 1.6
Pg13.5	17.0	1.5	17.0 x 1.5
Pg16	20.0	1.5	20.0 x 1.5
Pg21	26.0	1.5	26.0 x 1.5
Pg29	33.0	2.0	33.0 x 2.0
Pg36	42.0	2.0	42.0 x 2.0
Pg42	50.0	2.0	50.0 x 2.0
Pg48	55.0	2.0	55.0 x 2.0

Metric — **NVNZ-MxxxS / PBGx (Pflitsch blueglobe 系列)**

Thread size 螺纹尺寸	ID mm	d mm	O-ring ID x d (mm) 内径 x 厚度(毫米)
M12 x 1.5	11.0	1.5	11.0 x 1.5
M16 x 1.5	15.0	1.5	15.0 x 1.5
M20 x 1.5	19.0	1.5	19.0 x 1.5
M25 x 1.5	24.0	1.5	24.0 x 1.5
M32 x 1.5	30.0	1.5	30.0 x 1.5
M40 x 1.5	38.0	1.5	38.0 x 1.5
M50 x 1.5	48.0	2.0	48.0 x 2.0
M63 x 1.5	61.0	2.0	61.0 x 2.0

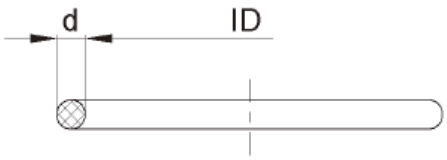
Sealing elements for use with the threads of PMA connectors and adapters: O-rings, flat gaskets, thread sealing compound. 适用于PMA管接头和适配器的密封元件：O型圈、扁平垫圈、螺纹密封剂

The following PMA strain relief connectors are delivered with an O-ring only. If the geometry of the mating parts does not allow correct compression of the O-ring a thread locking and sealing compound may be necessary to achieve a high level of sealing performance.

以下的PMA 消除应力管接头只供应O型圈。 如果适配的部位为几何形状，O型圈不能被正确压缩，则可能需要应用螺纹锁定和密封剂，从而达到更高的密封性能。

The O-rings supplied with PMA strain relief connectors are pre-installed to the termination thread by Jacob.
PMA follows the recommendation of the cable gland manufacturer.

PMA消除应力管接头提供的O型圈，来自Jacob公司。O型圈是预先安装在螺纹底端上。
PMA遵循电缆索头制造商的建议。



Metric **NVNZ-M (Jacob PERFECT 系列)**

Thread size 螺纹尺寸	ID mm	d mm	O-ring ID x d (mm) 内径 x 厚度(毫米)
M12 x 1.5	9	1.5	9.0 x 1.5
M16 x 1.5	13	1.5	13.0 x 1.5
M20 x 1.5	18	1.5	18.0 x 1.5
M25 x 1.5	21	2.0	21.0 x 2.0
M32 x 1.5	29	2.5	29.0 x 2.5
M40 x 1.5	37	2.0	37.0 x 2.0
M50 x 1.5	47	2.5	47.0 x 2.5
M63 x 1.5	60	3.0	60.0 x 3.0

PG **NVNZ-P (Jacob PERFECT 系列)**

Thread size 螺纹尺寸	ID mm	d mm	O-ring ID x d (mm) 内径 x 厚度(毫米)
Pg7	10.0	1.5	10.0 x 1.5
Pg9	13.0	2.0	13.0 x 2.0
Pg11	16.0	2.0	16.0 x 2.0
Pg13.5	18.0	2.0	18.0 x 2.0
Pg16	20.0	2.0	20.0 x 2.0
Pg21	24.0	2.0	24.0 x 2.0
Pg29	33.0	2.0	33.0 x 2.0
Pg36	42.0	2.5	42.0 x 2.5
Pg42	48.0	2.5	48.0 x 2.5
Pg48	54.0	3.0	54.0 x 3.0

Sealing elements for use with the threads of PMA connectors and adapters: O-rings, flat gaskets, thread sealing compound. 适用于PMA管接头和适配器的密封元件：O型圈、扁平垫圈、螺纹密封剂

NPT Threads
NPT 螺纹

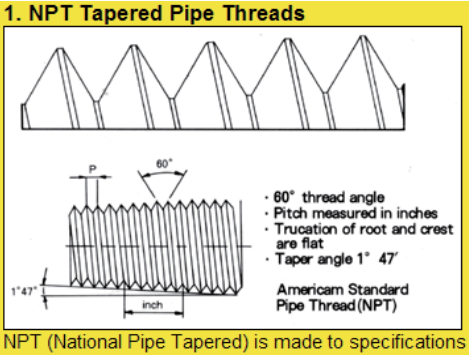
In North America NPT threads are widely used. To serve this market PMA offers a number of connector types with this type of threads. Both metal thread and polyamide thread types.

While Metric (IEC EN60423) and PG DIN40430 thread types are cylindrical in form with parallel sides, NPT threads are tapered in a conical form.

在北美NPT螺纹被广泛使用。 为了服务于这个市场，PMA提供了许多此系列螺纹的管接头，金属螺纹和聚酰胺螺纹两种类型。

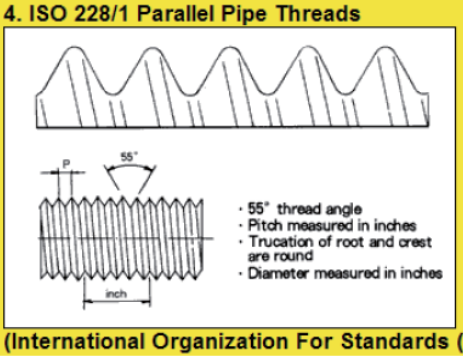
公制（IEC EN60423）和PG（DIN40430）螺纹类型为平行的圆柱形，但NPT螺纹呈锥形。

1. NPT Tapered Pipe Threads



NPT (National Pipe Tapered) is made to specifications outlined in ANSI B1.2.

4. ISO 228/1 Parallel Pipe Threads



(International Organization For Standards (ISO 228/1) Parallel (PF))

For parallel threads high tightening torques are only achieved when the end of the thread is reached. Usually two flanges meet and sealing element can be placed between them.

对于平行螺纹，只有在达到螺纹底端部时才能实现高拧紧扭矩。 通常是两个法兰连接，密封元件放置在它们之间。

For tapered or conical threads such as NPT types the torque increases as the mating threads are turned relative to one another. These types of thread are not ideally suited to flange sealing techniques. They were conceived as the name suggests (National Pipe Thread) for sealing of metal pipes without a flange.

对于诸如NPT系列的锥形或圆锥形螺纹，当匹配螺纹相对转动时，扭矩增大。这些系列的螺纹不适合法兰密封技术。 他们顾名思义认为（国家管螺纹）密封金属管连接时不需要法兰密封。

If a conical thread is used for flange sealing there is a danger that…

….either a very high tightening torque will be reached before the two flange surfaces meet,

….or the flange surfaces meet at a very low torque and the threads are still loose.

如果锥形螺纹用于法兰密封，则存在以下危险：

在两个法兰面连接之前，要么达到很高的拧紧力矩，

要么法兰表面以非常低的扭矩相交，螺纹仍然松动。

Sealing elements for use with the threads of PMA connectors and adapters: O-rings, flat gaskets, thread sealing compound. 适用于PMA管接头和适配器的密封元件：O型圈、扁平垫圈、螺纹密封剂

PMA female thread connectors and adapters:
PMA内螺纹管接头及适配器:

The following PMA connectors and adapters are supplied with an O-ring which sits in a recess at the back of the female thread:
以下PMA管接头和适配器提供O型圈，它位于内螺纹底端的凹槽中：

Female PA thread connectors / adapters 聚酰胺内螺纹管接头/适配器	(UNEF, M)	BKIHG-U, BVIVG-U, BVIVG-M, BVIDG-U
Female metal thread connectors / adapters 金属内螺纹管接头/适配器	(UNEF, M)	NVIVG-U, NVIVG-M, NSHV-U, NVIZG-U

For female thread connectors it is particularly important to consider the contours of the mating male thread. If the connector is installed to a male thread connector, the connector itself may have a sealing element. If the O-ring at the back of one of the connectors mentioned above is to be compressed correctly the contour at the end of the male thread must be appropriate and the thread length must be considered. If the connector thread is shorter than the PMA female thread the O-ring will not be reached.
对于内螺纹管接头，特别重要的是考虑配合外螺纹的轮廓。 如果管接头安装到外螺纹连接器上，连接器可能本身具有密封元件。 如果上述配件之一的O型圈正确被压缩，则外螺纹端部的轮廓必须匹配，并且必须考虑螺纹长度。 如果连接器螺纹短于PMA内螺纹，则O型圈不能被压缩。

It is often easier to find a connector which is compatible with the thread size of a circular connector than it is to find one which seals correctly.
找一个与圆形连接器螺纹尺寸相匹配的管接头比找到一个正确密封的管接头更容易。

The PMA series BKIHG-U, BVIVG-U, BVIDG-U were specifically designed for compatibility with MIL-DTL-5015H circular connectors.
The thread length ensures correct compression of the O-ring at the back of the PMA thread.
PMA系列BKIHG-U，BVIVG-U，BVIDG-U专为兼容 MIL-DTL-5015H 圆形连接器而设计。
螺纹长度可确保在PMA螺纹底端的O型圈受到压缩，达到密封效果。

BVIDA-U, BVIRA-U were designed for compatibility with AMP connectors of specific series.
BVIDA-U，BVIRA-U特别设计适合兼容AMP某一系列的连接器。

BVIDB-U, BVIRB-U and BVIRS-U were designed for compatibility with Souriau (formerly Burndy) and / or ITT Cannon connectors of specific series
BVIDB-U，BVIRB-U和BVIRS-U特别设计适合兼容某系列的苏里奥（原先的奔迪）和/或 ITT Cannon的连接器。

If the thread size and type of a PMA connector and a circular connector are compatible but a sealing element cannot be used for one reason or another. Then a thread sealing compound can be used to seal the junction between the two threads.
如果PMA管接头和圆形连接器的螺纹尺寸和类型是兼容的，但密封元件由于某种原因不能使用， 则可使用螺纹密封剂来密封两个螺纹之间的连接部分。

Adhesives and sealing agents for use with PMA cable protection system - connectors
粘合剂和密封剂与PMA电缆保护系统的管接头的使用

Based on tests performed in house with various materials at different temperatures and application experience gathered from customers we can recommend the following thread sealing agents and adhesives for good long term performance.
根据不同的材料在不同温度下进行的自家实验室的测试和从客户处收集所得的应用经验，我们推荐以下能提供良好的长期工作性能的螺纹密封剂和粘合剂。

All materials can be used on metal and plastic surfaces and threads (or combinations thereof) and with the exception of 3M 5200 which is only suitable for use up to 88°C, they all retain good adhesive characteristics up to 150°C.
所有材料可以在金属、塑料表面和螺纹使用（或它们的组合），除3M 5200 是仅适用于最高温度只能达88°C以外，其他都保持良好的粘合特性最高温度可达150°C。

Loctite 262

乐泰262

LOCTITE® 262 is designed for the permanent locking and sealing of threaded fasteners. The product cures when confined in the absence of air between close fitting metal surfaces and prevents loosening and leakage from shock and vibration. The thixotropic nature of LOCTITE® 262 reduces the migration of liquid product after application to the substrate.
Adhesive: Plastic-Plastic, Plastic-Metal, Metal-Metal
Sealing: Plastic-Plastic, Plastic-Metal, Metal-Metal

LOCTITE ® 262

是专为永久锁定螺纹紧固件的螺纹锁固剂。与空气隔绝的情况下，在两个紧密配合的金属面之间固化，避免螺纹紧固件的松动和渗漏，抗冲击、振动。LOCTITE ® 262 的触变性质能防止渗漏情况
粘合：塑料-塑料，塑料-金属，金属-金属
密封：塑料-塑料，塑料-金属，金属-金属

Loctite 542

乐泰542

LOCTITE® 542 is designed for the locking and sealing of metal pipes and fittings. The product cures when confined in the absence of air between close fitting metal surfaces and prevents loosening and leakage from shock and vibration. The thixotropic nature of LOCTITE® 542 reduces the migration of liquid product after application to the substrate.
Adhesive: Plastic-Metal, Metal-Metal
Sealing: Plastic-Metal, Metal-Metal

LOCTITE ® 542

是专为锁固和密封金属管材和管接头的螺纹锁固剂。与空气隔绝的情况下，在两个紧密配合的金属面之间固化，避免螺纹紧固件的松动和渗漏，抗冲击、振动。LOCTITE ® 542 的触变性质能防止渗漏情况
粘合：塑料-金属，金属-金属
密封：塑料-金属，金属-金属

3M DP490

A black thixotropic, gap filling, two component, epoxy adhesive with particularly good application characteristics. It is designed for use where toughness and high strength are required and shows special benefits in the construction of composite assemblies. The product has excellent heat and environmental resistance.
Adhesive: Plastic-Plastic, Plastic-Metal, Metal-Metal
Sealing: Plastic-Plastic, Plastic-Metal, Metal-Metal

3M DP490

是一款黑色触变，填缝的双组份环氧树脂胶粘合剂，具有良好的应用特性。
它用于要求高韧性和高强度，并可粘接多种材料。该产品具有良好的耐热和耐候性能
粘合：塑料-塑料，塑料-金属，金属-金属
密封：塑料-塑料，塑料-金属，金属-金属

Adhesives and sealing agents for use with PMA cable protection system - connectors
粘合剂和密封剂与PMA电缆保护系统的管接头的使用

3M 5200

Marine Adhesive/Sealant 5200 is a one-part polyurethane that chemically reacts with moisture to deliver strong, flexible bonds.
Designed for applications in which a very high ingress protection level must be achieved and maintained over long periods of time. It can easily be applied to PMA fittings prior to mounting of the conduit in order to completely seal and fix the joint. Designed for use in marine applications exposed to extreme weathering and salt water the products provide excellent long term sealing.
Adhesive: Metal-Metal
Sealing: Plastic-Plastic, Plastic-Metal, Metal-Metal

3M 5200

海洋粘合剂/密封剂5200是单一成分的聚亚胺脂，它通过和水分产生化学反应达到稳固的粘合作用。设计用于在很长一段时间的应用并达到非常高的防护等级。为了完全地密封和固定管接头，在软管安装前，应用此密封在管接头内。专为暴露在极端气候和海水环境的产品提供了良好的长期密封。
粘合：金属-金属
密封：塑料-塑料，塑料-金属，金属-金属

ELECOLIT 325

好乐325

A two component epoxy resin based adhesive free from solvents but with silver added to provide good electrical conductivity. It hardens well at room temperature has good gap filling properties and can be stored for 6 months at 25°C (9 months at 5°C)
This adhesive may be used in applications where an electrical connection between male and female threads is required particularly in combination with PMA XESX and ESD Conduit systems and in ATEX areas.

双组分环氧树脂粘合剂不含溶剂但加入银，以提供良好的导电性。在室温下固化具有良好的间隙填充性能，可在25°C下保存6个月（5°C下可保存9个月）。
该螺纹粘合剂特别应用在需要防爆的区域中，配合PMA的XESX和ESD软管和管接头之间外内螺纹的电气连接。

Loctite 262 and Loctite 542 have very good and quite similar performance characteristics, the major difference between them being that Loctite 542 is non-resistant to solvents. This may in certain applications be advantageous in others undesirable. A warning is given in their data sheets that stress cracking can occur when they are used with certain thermoplastics, this does not apply to the type of technical thermoplastics PMA uses such as polyamide.
乐泰262和乐泰542有很好的和相类似的性能特点，他们主要区别在于乐泰542是非耐溶剂的。这个在某些应用中是有利的，有些应用中则是不可取的。在它的技术参数中已经给出了警告，当它们用在某些热塑料上可能会发生应力开裂，这并不适用于PMA产品使用例如热塑性塑料的聚酰胺类型。

Which product is most suitable for your particular application depends upon a number of factors and your own preferences.
哪种产品最适合你的应用取决于一系列的因素和你自己的喜好。

Care should always be taken when using adhesives to ensure that surfaces are clean and prepared correctly before application.
Adhesive properties can be improved using surface cleaning agents and primers. Curing time can be reduced using activators.
使用粘合剂时，应始终采取正确的处理，确保使用前表面清洁。
用在清洗后的表面和底漆上，提高粘合性能，使用活化剂也可以有助于减少固化时间。

Please consult the appropriate manufacturer's data sheet or contact the nearest representative for technical support before using one of these adhesives to ensure the suitability for a particular application and for detailed application recommendations.
在使用这些粘合剂之前，请参阅制造商的数据表或联系最近的技术支持，以确保这个特定应有的适用性并得到详细的应用建议。

Applications engineering information 应用工程信息

Fill factor, relevant guidelines 填充率相关指导

The question of conduit capacity or fill factor arises in the use of cable protection systems. This describes the extent to which a conduit can or should be filled with cables and/or conductors based on the available cross-sectional area.

在电缆保护系统应用中，会出现软管填充容量的问题，即软管能充电缆或导线的程度。

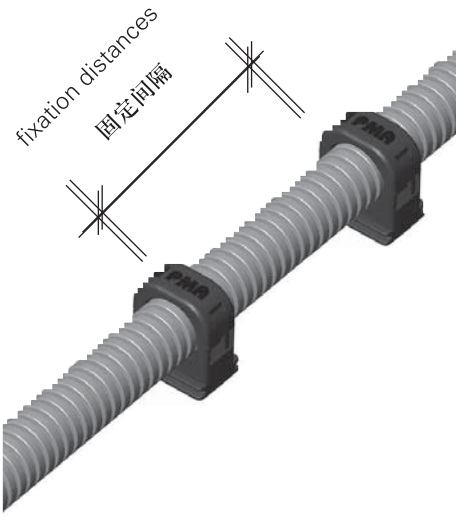
In all cases, **PMA** recommends that a conduit **capacity of 70%** not be exceeded. (Application-specific procedures and standards must also be considered.)

在所有情况，**PMA**建议软管容量不要超过70% （详细应用的情况和标准也必须加以考虑）。

This ensures that operation is not unnecessarily impaired by increased friction between the individual conductors in dynamically moving systems. In addition, subsequent installation of additional conductors and/or cables also possible if necessary.

这保证在动态运动系统中，各导线不断增强的摩擦力不会产生不必要的损坏，另外，如果需要的话，也可以再次安装增加的导线或电缆。

Wiring installation: Fixation 电缆安装：紧固



PMA recommends that cable protection systems be fastened with a spacing of **300 to 500** mm between supports. This spacing can be varied depending on the application and location. This recommendation applies for all available dimensions. For larger diameters, the increased load due to the cables and conductors in the conduit is accounted for by adherence to the support spacing. **PMA** supplies suitable system supports for various strength requirements and applications, European standard EN 50343:2003-5.15 “Railway applications - Rolling stock - Rules for installation of cabling” specifies the following spacing between supports for fastening conductors:

PMA 推荐需对电缆保护系统进行紧固，支架点要求有**300**到**500mm**的空间间隔。这个空间可以根据实际应用和安装位置进行调整，可用于各种外形尺寸。对于大口径软管，由于管内电缆和导线而增加的负载将影响支架点的空间间隔，**PMA**对于不同的强度要求和应用提供相应的支撑系统。

欧洲标准EN 50343:2003-5.15 “铁路应用 - 全部车辆 - 电缆安装规则” 确定如下紧固导线支架点间隔：

Horizontal wiring: 300mm
Vertical wiring: 500mm

水平线缆 300mm
垂直线缆 500mm

(Application specific guidelines and standards have to be additionally considered.)

“特别的应用指导和标准必须额外考虑”

Storage recommendation for polyamide products

Polyamide is widely and successfully used for products in the electrical and electronics industries. Thanks to its excellent mechanical and physical properties over a wide range of application temperatures and its very good weather resistance, polyamide can be used to make products for interior and external use that meet the most stringent of demands.

As a hygroscopic material, polyamide has the ability to absorb moisture in molecular form into the plastic matrix. As the moisture content goes up, product properties may change slightly, displaying increased toughness and lower rigidity for example.

The following table shows how the moisture content of polyamides comes into balance with the ambient air in a normal climate of 50% relative humidity and 23°C:

聚酰胺产品贮存建议

聚酰胺广泛及成功地应用于电气和电子行业。由于其在广泛的应用温度范围内，具有良好的耐候性，以及优异的机械和物理性能，因此聚酰胺可用于制造高技术要求的室内和室外产品。

聚酰胺作为一种吸湿材料，具有将分子形式的水分吸收到塑料基体中的能力。随着含水量的增加，产品性能可能略有变化，例如会体现出柔韧性增加和降低硬度。

下表显示了在50%相对湿度和23°C的一般气候下，聚酰胺的含水量如何与环境空气取得平衡：

Material 材质	In Air (23°C/50% r.h.) 空气中 (23°C/50% r.h.)
PA6	2 ... 3% by weight
PA12	0.8 ... 1.2% by weight

To maintain a balanced moisture content, PMA recommends storing products under the following conditions:
为了保持水分平衡，PMA建议在以下条件下储存产品：

Storage Temperature 储存温度	Processing Temperature 加工温度	Rel. Humidity 相对湿度
18°C ... 30°C	>18°C	>30%

At lower processing temperatures and in particular when subjected to unnatural drying, corrugated pipes display increased flexural rigidity.

In the very dry winter months the moisture balance may go down slightly as the material releases moisture to the environment (owing to lower rel. humidity).

Compared to natural outdoor conditions* at around 0°C (40 to 80% rh), the humidity in heated rooms may drop by half to below 20% rh if no humidification is present. (Even extremely dry regions such as the Sahara Desert record average humidity of 20% to 60% rh.)

If products from an outside environment are brought into a heated processing area, the change in climate may suddenly cause temporary demoisturization around the edges. After one or two days in the processing area a natural balance will be restored.

Most PMA products have been modified to make them immune to climate changes of this kind.

Observing this storage recommendation ensures optimum processability and material properties.

* Central European climate

在较低的加工温度下，尤其是在非自然干燥条件下，波纹管展示出增加的抗弯刚度。

在非常干燥的冬季，当材料向环境释放水分时（由于较低的相对湿度），水分平衡可能会略微下降。

与0°C（40%至80%rh）的自然室外条件*相比，如果不存在加湿，在加热室内的湿度可能会下降一半至低于20%rh。（即使是非常干燥的地区，如撒哈拉沙漠，记录的平均湿度为20%至60%rh。）

如果来自外部环境的产品被带到加热的加工区，气候的变化可能会突然在边缘周围造成暂时的水份失去，但在加工区域停留一两天后，将恢复平衡。

大多数PMA产品都经过了改良，以便适应相应的气候变化。

遵守此存储建议可确保最佳的加工性和材料性能。

* 中欧气候区

Chemical resistance 抗化学性能

Resistance against	防护	Chemical Formula 化学分子式	PA6 Polyamide 6 PA66 Polyamide 66	PA12 Polypropylene PA11 Polyamide 11	PP Polypropylene PE Polyethylene	TPU Thermoplastic Polyurethane elastomer	PFA Perfluoralkoxy-copolymer PVDF Polyethylene fluoride
Acetic acid (10%)	醋酸（10%）	$C_2H_4O_2$	●	●●	●●●	○	●●●
Acetone	丙酮	C_3H_6O	●●●	●●●	●●●	○	●●●
Ammonia (30%)	氨水（30%）	NH_3	●●●	●●●	●●●	○	●●●
Benzine	汽油	-	●●●	●●●	●●●	●	●●●
Brake fluid	制动液	-	●●●	●●●	●●●	○	●●●
Caustic soda	苛性钠	NaOH	●●●	●●●	●●●	●	●●●
Ethyl alcohol (40%)	乙醇（40%）	C_2H_6O	●●●	●●●	●●●	●	●●●
Glycol	烯糖	$C_2H_6O_2$	●●●	●●●	●●●	○	●●●
Hydochloric acid (10%)	盐酸（10%）	HCL	○	●	●●●	○	●●●
Methanol	甲醇	CH_4O	●●	●●●	●●●	●	●●●
Methyl ethyl ketone	丁酮	C_4H_8O	●●●	●●●	●●●	○	●●●
Nitric acid (10%)	硝酸（10%）	HNO_3	○	○	●●	○	●●●
Ozone	臭氧	O_3	●●	●●	●●	●	●●●
Paint thinner	涂料稀释剂	-	●●●	●●●	●	○	●●●
Perchlorethylene	全氯乙烯	C_2Cl_4	●●	●●	●●	○	●●●
Paraffin	石蜡	-	●●●	●●●	●	○	●●●
Phosphoric acid (10%)	磷酸（10%）	H_3PO_4	●	●●	●●●	○	●●●
Sea water	海水	-	●●●	●●●	●●●	●●	●●●
Soap solution	肥皂水	-	●●●	●●●	●●●	●●	●●●
Sodium chloride	氯化钠	NaCl	●●●	●●●	●●●	●●●	●●●
Sulphuric acid (10%)	硫酸（10%）	H_2SO_4	●	●●	●●●	○	●●●
Toluene	甲苯	C_7H_8	●●●	●●●	●	○	●●●
Trichlorethylene	三氯乙烯	C_2HCl_3	●	●●	○	○	●●●
Turpentine	松节油	-	●●●	●●●	○	○	●●●
Urine	稀释尿液	-	●●●	●●●	●●●	●●●	●●●
Resistance against Oils and Fats	**防护 油和脂**	-					
Cutting oils*	切削液	-	●●●	●●●	●●	●	●●●
Diesel oil	柴油	-	●●●	●●●	●●	●●	●●●
ASTM Oil Nr.3.	ASTM No.3 油	-	●●●	●●●	●●	●	●●●
Fuel oil	燃油	-	●●●	●●●	●●	●	●●●
Hydraulic oils*	液压油	-	●●●	●●●	●●	●	●●●
Mineral oils	矿物油	-	●●●	●●●	●●	●●●	●●●
Spark-erosion liquids	电火花腐蚀液		●●●	●●●	●●	●	●●●
Skydrol	特种液压工作油		●	●●	●●	○	●●●
Transformer oils*	变压器油		●●●	●●●	●●	●	●●●

* Synthetic additives can affect the oil resistance of plastics. Please contact PMA for further information

●●● Excellent resistance/suitable for permanent contact

●● Resistant/suitable for occasional contact

● Relatively resistant / suitable for short-term contact

○ Not recommended

* 合成添加剂会影响塑料的防油性能，请联系PMA咨询进一步信息。

●●● 有极好的抵抗力/适合永久接触。

●● 有良好的抵抗力/适用非经常接触。

● 有相当的抵抗力/适用短时间接触。

○ 不推荐。

Important:

The chemical resistance of plastic products is also dependant on factors such as temperature, amount of time exposed to chemicals (e.g.occasional contact or immersed) as well as the concentration of the specific chemicals.
The stated chemical resistances are valid for a temperature of 20°C. The chemical resistance table above serves only as a guide for the use of polyamide products in conjunction with the listed chemicals. Each specific application should be controlled for suitability by the end-user.
A more detailed table can be found on the PMA Homepage under www.pma.ch.

注意：

塑料产品的抗化学性能同样取决于其它因素，如：温度、暴露在化学物质中的时间（非经常接触或浸没等情况）、浓度等。

上述抗化学性能在20°C温度环境下有效。

上述抗化学性能表仅是对聚酰胺产品与所列化学物质的简要指南。为了正确使用，终端用户应要控制每个特定应用情况的适应性。

更多详细表格可查阅PMA网站www.pma.ch.

Important information

The specifications and instructions for our customers in this document reflect the product engineering level at the time of manufacturing. **PMA** accepts no liability for damages resulting from unprofessional installation or application or misuse for a purpose.
This disclaimer also includes damages to third parties. It is the customer's responsibility to check the delivered products and immediately notify **PMA** of detected faults. It is also the customer's responsibility to test the delivered product on its applicability for the intended purpose, **PMA** will accept liability or responsibility for their products if a product or a **PMA** system is combined or used together with third-party products, i.e. products from other companies than **PMA** .
Jurisdiction in all legal disputes concerning product liability have the courts of the canton of Zurich/Switzerland.
Swiss law applies.

To guarantee punctual deliveries please check availability of products before ordering.

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