



# Innovative fire barrier solutions for the rail industry

For maximum safety



# Innovative and safe fire barrier solutions

When designing rail vehicles, the primary objective is to ensure the safety of people and equipment during day to day operation.

Fire protection has become an increasingly important focus area for rail manufacturers and operators. Fire safety requirements for rail applications have in the past been regulated by a diverse range of national standards. DIN 5510-2 (Germany), NF F 16 101/102 (France), NFPA 130 (USA), UNI CEI 11170-3 (Italy) and BS6853 (UK). With the introduction and ratification of EN 45545 a unification of fire safety standards is taking place in Europe.

As the leading manufacturer of high quality cable protection systems for the rail industry, PMA has supplied components meeting the material requirements of the national standards for many years, investing time and effort in testing and certification to allow components to be specified in all application areas. The products and materials PMA recommends for rolling stock applications are certified to the material requirements of the new European standard EN 45545-2.

EN 45545-3 describes the fire resistance requirements for fire barriers. PMA has developed innovative solutions allowing cables to be fed through a fire barrier without loss of integrity.

#### Your key benefits:

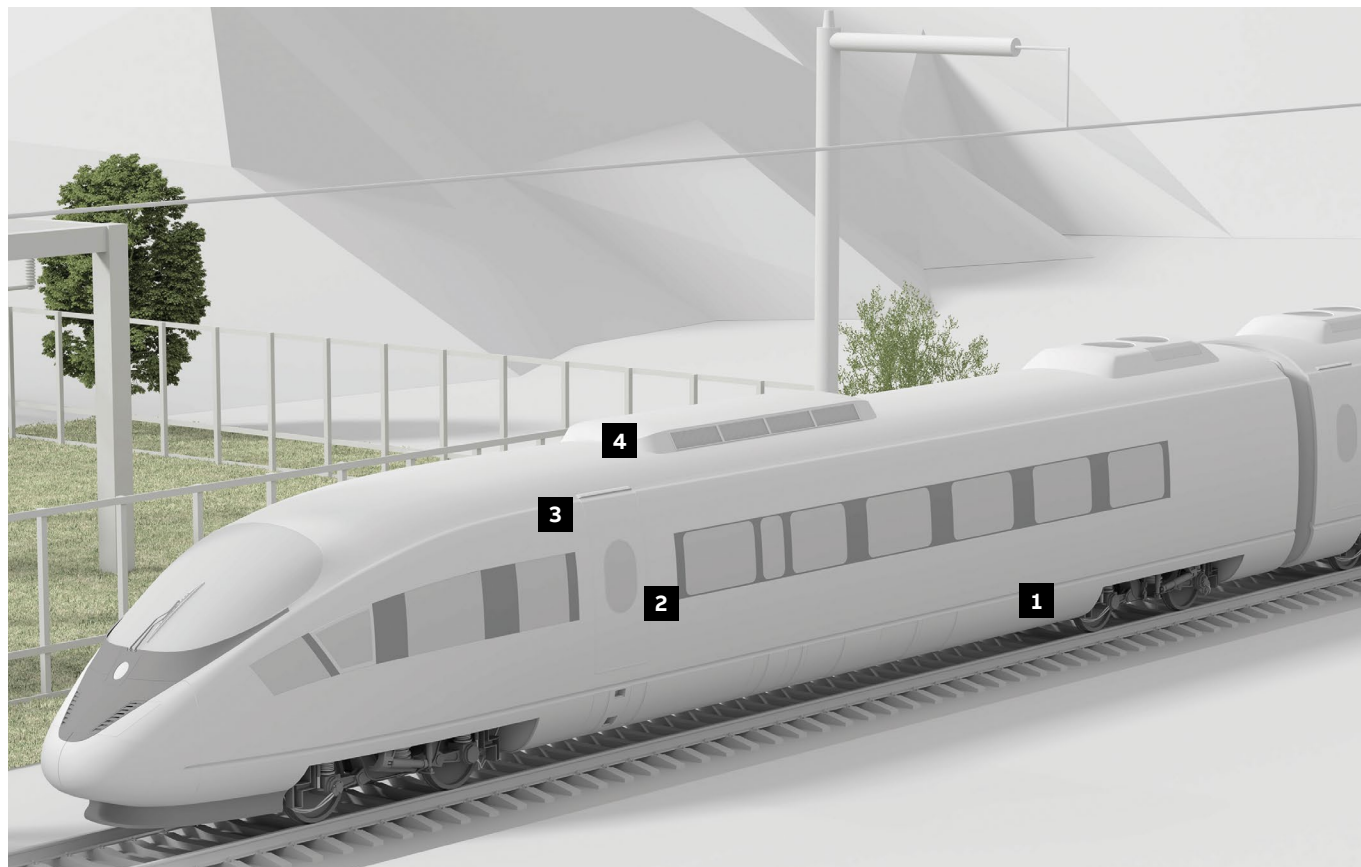
- Fire safety according EN 45545-3
- A complete fire barrier solution for higher protection
- Flexible system for all ranges of installation
- Easy to install



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## A flexible system

Use it anywhere on the train where cables are fed through a fire barrier



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**PMA Fire barrier solutions  
for installation situations  
with possible origin of fire:**

- |   |                 |   |                     |
|---|-----------------|---|---------------------|
| 1 | Underfloor area | 3 | Luggage compartment |
| 2 | Passenger area  | 4 | Technical cabinets  |





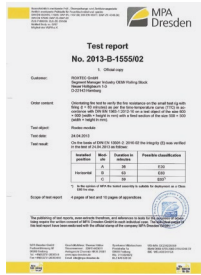
# Fire protection standard EN 45545

To ensure the safety of people and equipment in railway applications



With the introduction and ratification of EN 45545 a unification of fire safety standards is taking place in Europe.

EN 45545-1 contains basic definitions as well as general rules on how to classify rail vehicles. Train operating and train design categories are defined in order to assess fire risk. Hazard levels are defined based upon these classifications.



EN 45545-2 describes the material requirements for the different hazard levels (HL1, HL2 and HL3). Table R22 sets the flammability, smoke emission and toxicity requirements for internal applications. Table R23 does the same for external applications.

EN 45545-3 describes the fire resistance requirements for fire barriers. Unless designed with care, locations where cables within cable protection conduits are fed through fire barriers could represent potential weak points through which fire, heat or gas could penetrate.

EN 45545-3 sets E, I and W requirements for 10 different fire protection installation situations in acc. with the operating categories defined in EN 45545-1:

- E (integrity), with a performance rating of E15, E30 (in minutes)
- I (heat insulation)
- W (radiation)

E15 is sufficient for several of the 10 installation situations and operating categories. E30, the highest requirement is specified for fire barriers between luggage compartments and passenger areas or the driver's cab for train operating categories 3 and 4. In such situations the fire must be prevented from breaking through for at least 30 minutes.



## To fit all your requirements

Three flexible fire protection solutions, offering total planning and installation flexibility

As a leading global supplier of cable protection systems for use in rail applications, PMA has developed novel, innovative, EN 45545-3 compliant fire barrier solutions for combination with its proven cable protection systems.

A PMA metal adapter is now available with built in intumescent material which can be used in combination with the standard range of PMA cable protection products approved for use in the rail industry. The adapters allow cables to be ducted through a fire wall without compromising the integrity and function of the fire wall. In the event of a fire the intumescent material swells to up to 40 times its original volume, sealing all cavities around and between the cables, preventing the propagation of fire and transport of smoke and gas along the cable protection system.

Further solutions offer additional flexibility for other installation situations using elements from two other companies well established in the rail industry, Roxtec and Pflitsch.

PMA fittings using strain relief cable clamping elements have been available for many years. Special fire resistant clamping elements are now available which when integrated into a PMA fitting provide a secure and effective barrier against fire, smoke and gas for up to 15 minutes.

PMA has also developed an adapter including intumescent material which can be built into a Roxtec sealing system. Roxtec sealing modules are well known and proven in rail and ship building construction for decades. The specially designed PMA adapter fits perfectly into a Roxtec module providing a sealed system.

### PMA adapter solution



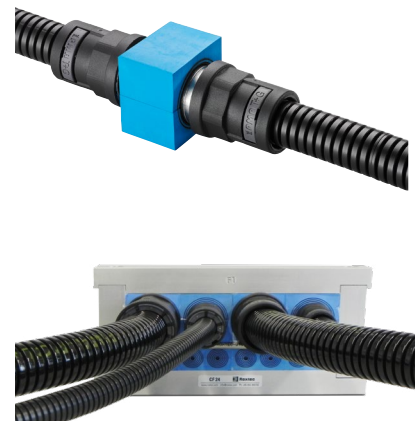
PMA adapter solution fitting provides a secure and effective barrier against fire, smoke and gas for up to 30 minutes.

### PMA Strain relief fitting



PMA Strain relief fittings with fire barrier function, provide a secure and effective barrier against fire, smoke and gas for up to 15 minutes.

### PMA solution with Roxtec



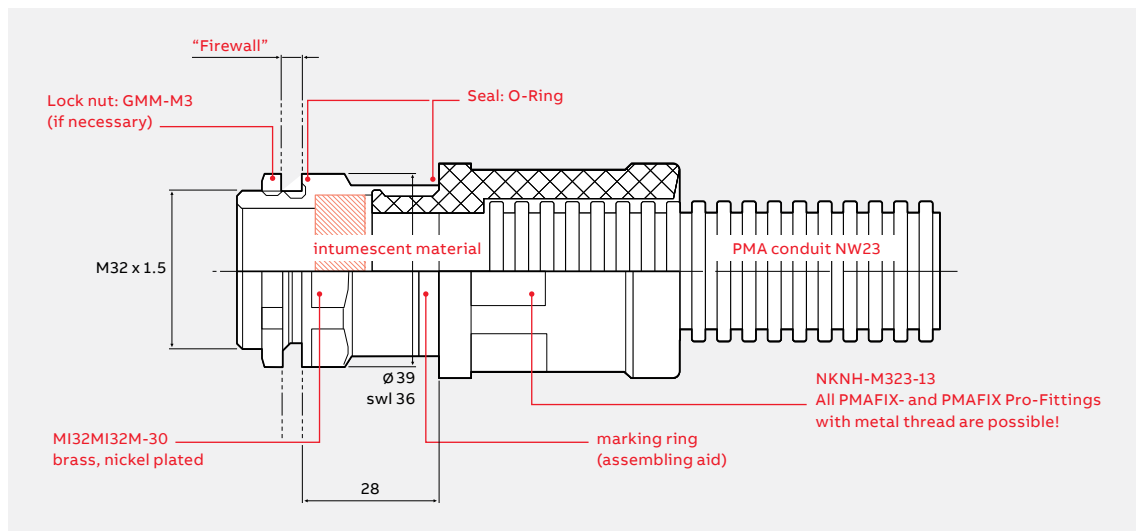
PMA solution for use in combination with Roxtec sealing modules for up to 60 minutes.

## PMA adapter solution

Fire safety in trains for up to 30 minutes according to EN 45545-3

The unique PMA fire barrier adapters allow termination of a cable protection system to a fire wall. The adapter uses intumescent material to seal all cavities in the event of a fire and can be attached directly to the fire wall. It ensures that cables and wires can be fed through the fire barrier while retaining an E30 rating and above according to EN 45545-3. These adapters are available in sizes M16 to M63 and can be adapted to any wall structure to ensure simple and safe assembly.

The intumescent material within the PMA solution blocks transport of fire heat and fumes up to 30 minutes in accordance to EN 45545-3.



The Intumescent material within the PMA adapter solution blocks transport of fire heat and fumes up to 30 minutes in accordance to EN 45545-3.



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## PMA adapter solution

### How the fire barrier works in a train

In the event of a fire, the intumescent material ensures that two areas remain separated from each other for at least 30 minutes (E30) in accordance with EN 45545-3. The intumescent material is fixed within the adapter to block the transport of fire, heat and fumes. The material is expanding to fill the cavities between the cables

within the adapter. Intumescent materials (typically sodium silicate or graphite) swell as a result of heat exposure to many times their original volume. The PMA adapters use this material very effectively to seal cavities preventing heat, fire and gases from passing through.

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#### Without fire barrier: Fire and fumes can spread

In case of fire: Without a fire barrier, fire heat and fumes can immediately spread between the compartments and escalate the situation.

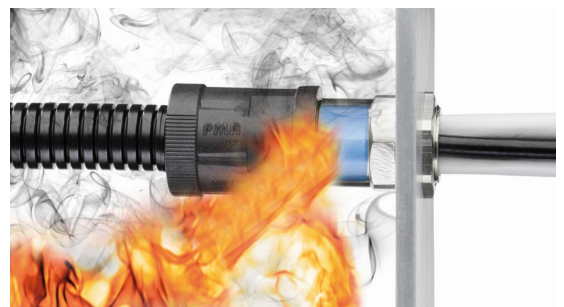
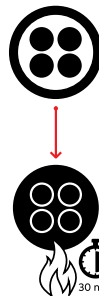


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#### With PMA fire barrier: More safety and better prevention

The intumescent material within the PMA adapters swell in case of fire exposure and blocks transport of fire heat and fumes between the compartments or cabins up to 30 minutes in accordance to EN 45545-3.

In the event of a fire the intumescent material swells up to 40 times its original volume, sealing all cavities around and between the cables, preventing the propagation of fire and transport of smoke and gas along the cable protection system. Giving valuable extra time to evacuate passengers and initiate the emergency plan.



## PMA single side solution

All combinations for fittings and conduits you need

For use on the carriage roof, couplings, intercar jumper connections and under the vehicle: XPCS and XPCSF Heavy-duty flexible conduits for dynamic outside applications with highest requirements to UV and weathering resistance. For use inside the carriage passenger zone (Electrical cabinets, etc): VAM and VAML Heavy-duty and medium-duty flexible conduits for high

fire and passenger safety requirements in interior applications such as passenger areas. The matrix below shows the combinations of PMA adapter, fitting and conduit which have been tested to EN 45545-3.



PMA Fire barrier adapter



PMAFlaX Pro IP68 + IP69K connectors



PMAFIX IP68 connectors

PMA Adapter	PMA Conduits			PMA Fittings			
PMA MA/B Adapter	Conduit Size	VAM & VAML Conduits	XPCS & XPCSF Conduits	Possible Fitting Geometries	PMAFIX Pro	PMAFIX IP68	PMAFIX IP68GT
M16MI16M-10/B	NW10	VAMT-10B or VAMLT-10B	XPCST-10BG or XPCSFT-10BO	Straight 90° Curved Elbow 45° Elbow Pflitsch strain relief Jacob strain relief	NKNH-M160-10 NKBH-M160-10 NKAH-M160-10 NKNZ-M160/Px NKNZ-M160S-10	NVNV-M160-10 NVWV-M160-10 NVNZ-M160S/Px NVNZ-M160S-10	NVNV-M160GT-10 NVWV-M160GT-10 NVNZ-M160GT/Px NVNZ-M160GT-10
M20MI20M-10/B	NW12	VAMT-12B or VAMLT-12B	XPCST-12BG or XPCSFT-12BO	Straight 90° Curved Elbow 45° Elbow Pflitsch strain relief Jacob strain relief	NKNH-M202-10 NKBH-M202-10 NKAH-M202-10 NKNZ-M202/Px NKNZ-M202S-10	NVNV-M202-10 NVWV-M202-10 NVNZ-M202S/Px NVNZ-M202S-10	NVNV-M202GT-10 NVWV-M202GT-10 NVNZ-M202GT/Px NVNZ-M202GT-10
M25MI25M-11/B	NW17	VAMG-17B or VAMLG-17B	XPCSG-17BG or XPCSFG-17BO	Straight 90° Curved Elbow 45° Elbow Pflitsch strain relief Jacob strain relief	NKNH-M257-11 NKBH-M257-11 NKAH-M257-11 NKNZ-M257/Px NKNZ-M257S-11	NVNV-M257-11 NVBV-M257-11 NVAV-M257-11 NVNZ-M257S/Px NVNZ-M257S-11	NVNV-M257GT-11 NVBV-M257GT-11 NVAV-M257GT-11 NVNZ-M257GT/Px NVNZ-M257GT-11
M32MI32M-13/B	NW23	VAMG-23B or VAMLG-23B	XPCSG-23BG or XPCSFG-23BO	Straight 90° Curved Elbow 45° Elbow Pflitsch strain relief Jacob strain relief	NKNH-M323-13 NKBH-M323-13 NKAH-M323-13 NKNZ-M323/Px NKNZ-M323S-13	NVNV-M323-13 NVBV-M323-13 NVAV-M323-13 NVNZ-M323S/Px NVNZ-M323S-13	NVNV-M323GT-13 NVBV-M323GT-13 NVAV-M323GT-13 NVNZ-M323GT/Px NVNZ-M323GT-13
M40MI40M-13/B	NW29	VAMG-29B or VAMLG-29B	XPCSG-29BG or XPCSFG-29BO	Straight 90° Curved Elbow 45° Elbow Pflitsch strain relief Jacob strain relief	NKNH-M409-13 NKBH-M409-13 NKAH-M409-13 NKNZ-M409/Px NKNZ-M409S-13	NVNV-M409-13 NVBV-M409-13 NVAV-M409-13 NVNZ-M409S/Px NVNZ-M409S-13	NVNV-M409GT-13 NVBV-M409GT-13 NVAV-M409GT-13 NVNZ-M409GT/Px NVNZ-M409GT-13
M50MI50M-14/B	NW36	VAMG-36B or VAMLG-36B	XPCSG-36BG or XPCSFG-36BO	Straight 90° Curved Elbow 45° Elbow Pflitsch strain relief Jacob strain relief	NKNH-M506-14 NKBH-M506-14 NKAH-M506-14 NKNZ-M506/Px NKNZ-M506S-14	NVNV-M506-14 NVBV-M506-14 NVAV-M506-14 NVNZ-M506S/Px NVNZ-M506S-14	NVNV-M506GT-14 NVBV-M506GT-14 NVAV-M506GT-14 NVNZ-M506GT/Px NVNZ-M506GT-14
M63MI63M-14/B	NW48	VAMG-48B or VAMLG-48B	XPCSG-48BG or XPCSFG-48BO	Straight 90° Curved Elbow 45° Elbow Pflitsch strain relief Jacob strain relief	NKNH-M638-14 NKBH-M638-14 NKAH-M638-14 NKNZ-M638/Px NKNZ-M638S-14	NVNV-M638-14 NVBV-M638-14 NVAV-M638-14 NVNZ-M638S/Px NVNZ-M638S-14	NVNV-M638GT-14 NVBV-M638GT-14 NVAV-M638GT-14 NVNZ-M638GT/Px NVNZ-M638GT-14





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“PMA has developed innovative solutions allowing cables to be fed through a fire barrier without loss of integrity in trains.”





# PMA Strain relief fittings

## Fire barrier function with clamping elements

Especially for jumper cables fused to connect carriage and locomotives in the rail industry, PMA offers a solution with the PMA strain relief fittings NVVZ and NKNZ which include a fire resistant cable gland, providing strain relief and prevents fire, heat and fums from breathing through in event of a fire.

Due to the fact a screwdriver is required for dismantling, it's impeding unauthorised or accidental opening space-saving dismantling of the fittings.

With an easy push-in assembly for maximum installation reliability, the components are easy to install and guarantee up to 15 minutes fire stop rating according to EN 45545-3 and offer an excellent conduit pull-out strength.

PMAFIX Pro NKNZ or PMAFIX NVZ fittings can be attached on either side of the adapter allowing connection with the EN 45545-2 approved XPCS, XPCSF, VAM, VAML conduits, to achieve an EN 45545-3 E15 rating in combination.



PMAFIX Pro	PMAFIX IP68	NW	Thread size
NKNZ-M120/B	NVNZ-M120S/B*	10	M12
NKNZ-M160/B	NVNZ-M160S/B*	10	M16
NKNZ-M202/B	NVNZ-M202S/B*	12	M20
NKNZ-M207/B	NVNZ-M207S/B*	17	M20
NKNZ-M257/B	NVNZ-M257S/B*	17	M25
NKNZ-M253/B	NVNZ-M253S/B*	23	M25
NKNZ-M323/B	NVNZ-M323S/B*	23	M32
NKNZ-M329/B	NVNZ-M329S/B*	29	M32
NKNZ-M409/B	NVNZ-M409S/B*	29	M40
NKNZ-M406/B	NVNZ-M406S/B*	36	M40
NKNZ-M506/B	NVNZ-M506S/B*	36	M50
NKNZ-M508/B	NVNZ-M508S/B*	48	M50
NKNZ-M638/B	NVNZ-M638S/B*	48	M63

All sizes available with sealing inserts for various cable sizes



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## PMA solution with Roxtec

### A complete wall transit feed through system for cables and wires

This solution of PMA fire barrier adapter is designed to be used in combination with Roxtec wall seating systems. The combined PMA and Roxtec components provide a complete wall transit feed through system for cables and wires within a cable protection system providing protection against all kinds of mechanical and environmental influences. The components are easy to install and guarantee beyond E30 fire stop rating according to EN 45545-3 for wall, roof and floor installations.

The Roxtec RM PPS sealing module is a customized solution produced to order. Combined with a PMA 30 mm or 60 mm fire barrier adapter it can easily be adapted to seal PMA conduits of various sizes in a wide range of applications achieving an E60 rating according to EN 45545-3. The intumescent material in the PMA fire barrier adapter expands upon exposure to

high temperatures sealing wall transits. The solution is easy to install and due to its compact size can reduce the weight of the complete solution.

The Roxtec round frame RS PPS/S is a sealing solution which can be used to seal wall penetrations. It is approved for use with PMA conduits in a wide range of structures such as walls and floors, achieving up to E60 rating according to EN 45545-3. In case of fire, it efficiently blocks smoke and flames from passing through the penetration.

PMA PMAFIX Pro or PMAFIX fittings can be attached on either side of the adapter allowing connection to PMA conduits. (XPCS, XPCSF, VAM, VAML). The components are easy to install and guarantee up to E30 fire stop rating according to EN 45545-3 for wall, roof and floor installations.

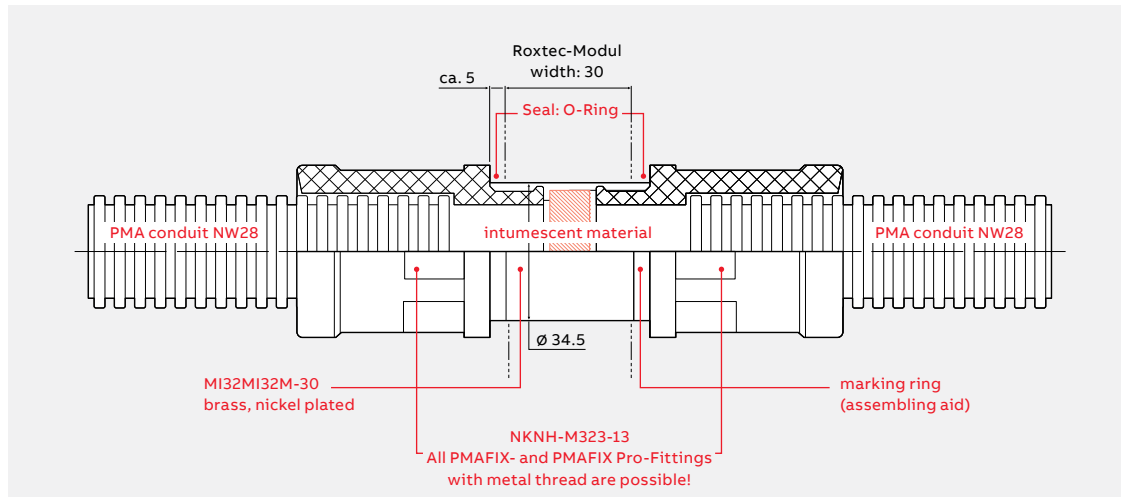
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The Roxtec RM PPS sealing module can easily be adapted to seal PMA conduits of various sizes in a wide range of applications achieving an E60 rating according to EN 45545-3.



# PMA fire barrier solution with wall transit

## 30 mm Roxtec compact Modules with PMA combinations



The first fire barrier solution consists of a 30mm PMA fire barrier adapter designed to be used in Roxtec compact modules installed in versions of Roxtec compact frames, achieving an E30 rating according to EN 45545-3.

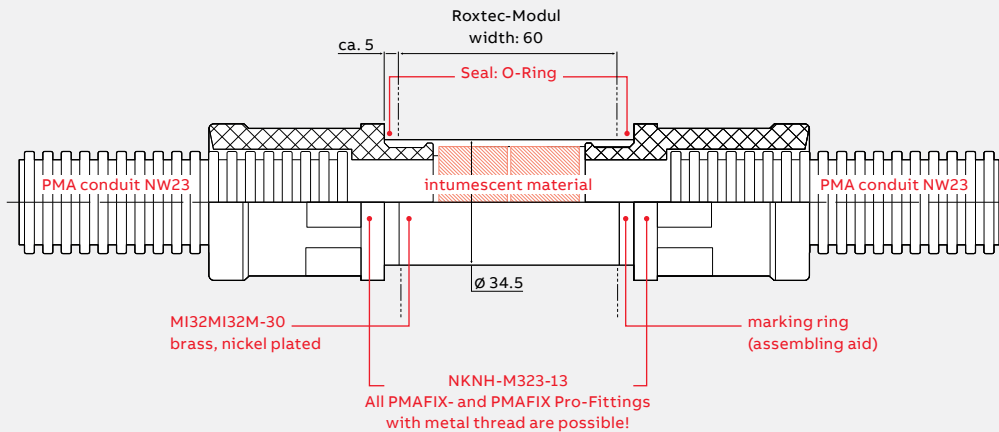
Roxtec Compact Modules 30 mm				Conduit sizes	PMA combinations				
CM 30 (Ø 10–25 mm)	CM 40 (Ø 21,5–34,5 mm)	CM 60 (Ø 28–54 mm)	CM 80 (Ø 48–71 mm)		Fitting and Conduit *				
					PMAFIX Pro	PMAFIX IP68	PMAFIX IP68GT	Conduit	Conduit
PMA Adapter / MixxMixxM-30	MI20MI20M-30 (Ø 22,5 mm)			NW 12	NKNH-M202-10	NVNV-M202-10	NVNV-M202GT-10	VAMT-12B	XPCST-12BG
					NKBH-M202-10	NVWV-M202-10	NVWV-M202GT-10	VAMLT-12B	XPCSFT-12BO
					NKAH-M202-10	NVNZ-M202S/Px	NVNZ-M202GT/Px		
					NKNZ-M202/Px	NVNZ-M202S-10	NVNZ-M202GT-10		
				NKNZ-M202S-10					
		MI25MI25M-30 (Ø 27,5 mm)		NW 17	NKNH-M257-11	NVNV-M257-11	NVNV-M257GT-11	VAMG-17B	XPCSG-17BG
					NKBH-M257-11	NVBV-M257-11	NVBV-M257GT-11	VAMLG-17B	XPCSFG-17BO
					NKAH-M257-11	NVAV-M257-11	NVAV-M257GT-11		
					NKNZ-M257/Px	NVNZ-M257S/Px	NVNZ-M257GT/Px		
				NKNZ-M257S-11	NVNZ-M257S-11	NVNZ-M257GT-11			
	MI32MI32M-30 (Ø 34,5 mm)			NW 23	NKNH-M323-13	NVNV-M323-13	NVNV-M323GT-13	VAMG-23B	XPCSG-23BG
					NKBH-M323-13	NVBV-M323-13	NVBV-M323GT-13	VAMLG-23B	XPCSFG23BO
					NKAH-M323-13	NVAV-M323-13	NVAV-M323GT-13		
					NKNZ-M323/Px	NVNZ-M323S/Px	NVNZ-M323GT/Px		
				NKNZ-M323S-13	NVNZ-M323S-13	NVNZ-M323GT-13			
		MI40MI40M-30 (Ø 42,5 mm)		NW 29	NKNH-M409-13	NVNV-M409-13	NVNV-M409GT-13	VAMG-29B	XPCSG-29BG
					NKBH-M409-13	NVBV-M409-13	NVBV-M409GT-13	VAMLG-29B	XPCSFG-29BO
					NKAH-M409-13	NVAV-M409-13	NVAV-M409GT-13		
					NKNZ-M409/Px	NVNZ-M409S/Px	NVNZ-M409GT/Px		
				NKNZ-M409S-13	NVNZ-M409S-13	NVNZ-M409GT-13			
		MI50MI50M-30 (Ø 53 mm)		NW 36	NKNH-M506-14	NVNV-M506-14	NVNV-M506GT-14	VAMG-36B	XPCSG-36BG
					NKBH-M506-14	NVBV-M506-14	NVBV-M506GT-14	VAMLG-36B	XPCSFG-36BO
					NKAH-M506-14	NVAV-M506-14	NVAV-M506GT-14		
					NKNZ-M506/Px	NVNZ-M506S/Px	NVNZ-M506GT/Px		
				NKNZ-M506S-14	NVNZ-M506S-14	NVNZ-M506GT-14			
			MI63MI63M-30 (Ø 66 mm)	NW 48	NKNH-M638-14	NVNV-M638-14	NVNV-M638GT-14	VAMG-48B	XPCSG-48BG
					NKBH-M638-14	NVBV-M638-14	NVBV-M638GT-14	VAMLG-48B	XPCSFG-48BO
					NKAH-M638-14	NVWV-M638-14	NVWV-M638GT-14		
					NKNZ-M638/Px	NVAV-M638-14	NVAV-M638GT-14		
				NKNZ-M638S-14	NVNZ-M638S/Px	NVNZ-M638GT/Px			
					NVNZ-M638S-14	NVNZ-M638GT-14			

\* Choose a PMA fitting and conduit depending on requirement



# PMA fire barrier solution with wall transit

## 60 mm Roxtec compact Modules with PMA combinations



The second fire barrier solution consists of a 60mm PMA fire barrier adapter designed to be used in Roxtec regular modules, installed in Roxtec S-, SF- and G frames or in customized frames, achieving an E60 rating according to EN 45545-3.

Roxtec Regular Modules 60 mm					Conduit sizes	PMA combinations						
RM 30 (Ø 10–25 mm)	RM 40 (Ø 21,5–34,5 mm)	RM 60 (Ø 28–54 mm)	RM 80 (Ø 48–71 mm)	RM 90 (Ø 48–71 mm)		Fitting and Conduit *						
						PMAFIX Pro	PMAFIX IP68	PMAFIX IP68GT	Conduit	Conduit		
MI20MI20M-60 (Ø 22,5 mm)					NW 12	NKNH-M202-10	NVNV-M202-10	NVNV-M202GT-10	VAMT-12B	XPCST-12BG		
						NKBH-M202-10	NVWV-M202-10	NVWV-M202GT-10	VAMLT-12B	XPCSFT-12BO		
						NKAH-M202-10	NVNZ-M202S/Px	NVNZ-M202GT/Px				
						NKNZ-M202/Px	NVNZ-M202S-10	NVNZ-M202GT-10				
		MI25MI25M-60 (Ø 27,5 mm)				NW 17	NKNH-M257-11	NVNV-M257-11	NVNV-M257GT-11	VAMG-17B	XPCSG-17BG	
							NKBH-M257-11	NVBV-M257-11	NVBV-M257GT-11	VAMLG-17B	XPCSFG-17BO	
							NKAH-M257-11	NVAV-M257-11	NVAV-M257GT-11			
							NKNZ-M257/Px	NVNZ-M257S/Px	NVNZ-M257GT/Px			
						NKNZ-M257S-11	NVNZ-M257S-11	NVNZ-M257GT-11				
PMA Adapter / MixxMixxM-60		MI32MI32M-60 (Ø 34,5 mm)				NW 23	NKNH-M323-13	NVNV-M323-13	NVNV-M323GT-13	VAMG-23B	XPCSG-23BG	
							NKBH-M323-13	NVBV-M323-13	NVBV-M323GT-13	VAMLG-23B	XPCSFG-23BO	
							NKAH-M323-13	NVAV-M323-13	NVAV-M323GT-13			
							NKNZ-M323/Px	NVNZ-M323S/Px	NVNZ-M323GT/Px			
						NKNZ-M323S-13	NVNZ-M323S-13	NVNZ-M323GT-13				
			MI40MI40M-60 (Ø 42,5 mm)				NW 29	NKNH-M409-13	NVNV-M409-13	NVNV-M409GT-13	VAMG-29B	XPCSG-29BG
								NKBH-M409-13	NVBV-M409-13	NVBV-M409GT-13	VAMLG-29B	XPCSFG-29BO
								NKAH-M409-13	NVAV-M409-13	NVAV-M409GT-13		
								NKNZ-M409/Px	NVNZ-M409S/Px	NVNZ-M409GT/Px		
							NKNZ-M409S-13	NVNZ-M409S-13	NVNZ-M409GT-13			
			MI50MI50M-60 (Ø 53 mm)				NW 36	NKNH-M506-14	NVNV-M506-14	NVNV-M506GT-14	VAMG-36B	XPCSG-36BG
								NKBH-M506-14	NVBV-M506-14	NVBV-M506GT-14	VAMLG-36B	XPCSFG-36BO
								NKAH-M506-14	NVAV-M506-14	NVAV-M506GT-14		
								NKNZ-M506/Px	NVNZ-M506S/Px	NVNZ-M506GT/Px		
							NKNZ-M506S-14	NVNZ-M506S-14	NVNZ-M506GT-14			
						</						

\* Choose a PMA fitting and conduit depending on requirement



Index

Products in alphabetical order

PMA Adapters	GID No.
M16MI16M-10/B	7TCA292000R5976
M20MI20M-10/B	7TCA292000R5977
M25MI25M-11/B	7TCA292000R5978
M32MI32M-13/B	7TCA292000R5979
M40MI40M-13/B	7TCA292000R5980
M50MI50M-14/B	7TCA292000R5981
M63MI63M-14/B	7TCA292000R5982

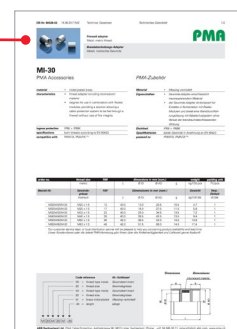
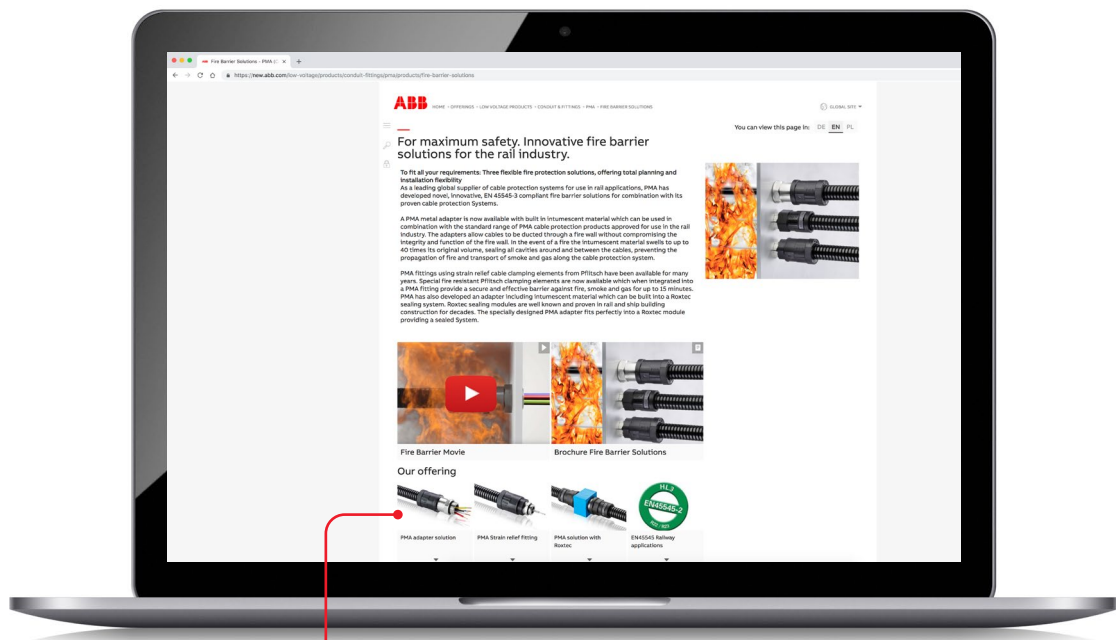
PMA Adapters for use with 30 mm Roxtec Modules		GID No.
MI20MI20M-30		7TCA292000R5998
MI25MI25M-30		7TCA292000R5999
MI32MI32M-30		7TCA292000R6000
MI40MI40M-30		7TCA292000R6001
MI50MI50M-30		7TCA292000R6002
MI63MI63M-30		7TCA292000R6003

PMA Adapters for use with 60 mm Roxtec Modules		GID No.
MI20MI20M-60		7TCA292000R6004
MI25MI25M-60		7TCA292000R6005
MI32MI32M-60		7TCA292000R6006
MI40MI40M-60		7TCA292000R6007
MI50MI50M-60		7TCA292000R6008
MI63MI63M-60		7TCA292000R6009



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- CAD files
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- Videos





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