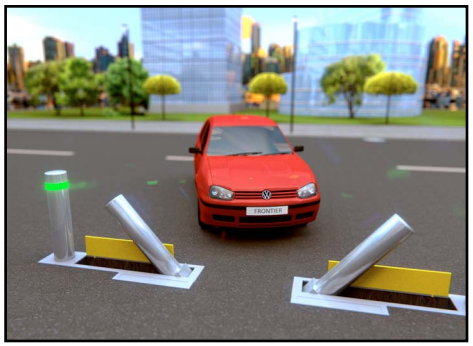

PLANET RANGE OF

TERRA BOLLARDS

Frontier Pitts manufacture a portfolio of PAS 68 bollards, each proven to stop the different energy ratings of the HVM (Hostile Vehicle Mitigation) specification.

MODEL Bollard diameter in mm		CLASS IWA 14-1 / PAS 68			EMBEDMENT			
		30 mph	40 mph	50 mph	Shallow Mount Technology	Ultra Shallow Embedment	Shallow Embedment	Standard Embedment
TERRA BOLLARD MK2 245mm	Automatic Rising			•				•
TERRA QUANTUM 219mm	Automatic Rising (side folding)	•				•		
	Shallow Static	•				•		
TERRA VENUS 219mm	Shallow Static	•				•		
	Static	•					•	
	Removable Static	•					•	
TERRA MARS 219-245mm	Shallow Mount Static	•	•		•			
	Static	•	•				•	
	Removable Static		•				•	
TERRA JUPITER 273mm	Static			•			•	
	Removable Static			•			•	
TERRA NEPTUNE 273mm	Shallow Mount Static (Standalone)		•		•			
	Static		•				•	
	Removable Static		•				•	
		48kph **US:** M30/K4	64kph **US:** M40/K8	80kph **US:** M50/K12	**< 250** millimetres	**< 300** millimetres	**< 500** millimetres	**< 900** millimetres

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* *All PAS68 testing performed with 7.5t vehicle*
New US rating: *ASTM F2656-07*
US rating: *K12 / K8 / K4 L3*

IMPACT TEST STANDARDS

Energy and Classification

INTERNATIONAL

IWA 14-1:2013

Vehicle security barriers - Part 1: Performance requirement, vehicle impact test method and performance rating.

IWA 14-1:2013 is the International Workshop Agreement which specifies the essential impact performance requirement for a vehicle security barrier (VSB) and a test method for rating its performance when subjected to a single impact by a test vehicle not driven by a human being.

BRITISH

BSi PAS 68 Impact Test Specifications for Vehicle Security Barriers

BSi PAS 68:2010 is the latest BSi's Publicly Available Specification for vehicle security barriers. It has become the UK's standard and the security industry's benchmark for HVM (Hostile Vehicle Mitigation) equipment, and is the specification against which perimeter security equipment is tested as part of the ongoing research to prevent VBIED (Vehicle Born Improvised Explosive Device) attacks. BSi PAS 69 complements this specification by providing guidance on the product installation.

EUROPEAN

CWA 16221: 2010 Vehicle security barriers. Performance requirements, test methods and guidance on application

The European CEN workshop agreement that combines the detail from BSI PAS 68 and PAS 69. It provides guidance on test methods for determining vehicle security barrier performance classification and also includes a series of informative annexes that advise on appropriate product selection, installation and use.

CEN Workshop Agreement (CWA) 16221 has been prepared to address the needs of organizations who wish to have assurance that vehicle security barriers (VSBs) will provide the level of impact resistance which is sought.

Vehicle Energies in kJ

Vehicle Speed (kph)	Vehicle Weight (kg)			
	1500	2500	3500	7500
16	15	25	35	74
32	59	99	138	296
48	133	222	311	667
64	237	395	553	1185
80	370	617	864	1852

Classification Codes

1 Type of Test V=vehicle	2 Product	3 Vehicle Weight	4 Vehicle Speed (kph)	5 Impact Angle	6 Vehicle Penetration	7 Debris
V	Terra Blocker	7500 N2	80	90	0	5.2

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PLANET RANGE OF BOLLARDS

BSi PAS 68 Bollards

Bollards are a common perimeter security solution in certain locations, particular public realm and crowded places, as they mitigate criminal or terrorist vehicle borne threats whilst allowing free pedestrian movement.

Frontier Pitts Planet range of BSi PAS 68 Bollards includes a large range of options including static, automatic and semi-automatic rising bollard models. All bollard models have been successfully impact tested stopping a 7.5t vehicle travelling at various speeds (please see table on page 1).

In line with the BSi PAS 69:2013, all bollards must be installed with a maximum distance of 1200mm between upright bollard faces.

The choice of bollard depends on the threat level and the individual site requirements (landscaping and standoff):-

Threat level : What is the locations terrorist threat level?

What speed could a vehicle borne threat reach within the locations surrounding landscaping?

Standoff : What is the maximum standoff distance from potential bollard position and building?

Access Point : Is an access point required within the HVM (Hostile Vehicle Mitigation) line of Static Bollards? Are Rising/Retractable Bollards required?

BOLLARD FINISH

Once the bollard model has been ascertained, there is a choice of finish:

Standard:
Painted
Finish

Optional:
Stainless Steel
Sleeves

STAINLESS STEEL SLEEVE OPTIONS

First, choose the stainless steel finish:

Satin-polished
stainless steel finish

Bead-blasted
stainless steel finish

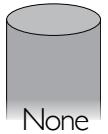
Secondly, choose the Bollard Topping

Flat

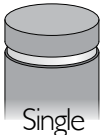
Mitre

Dome

Finally, choose the Bandings



None



Single

Double

Additional
Personalised Engraving

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RISING BOLLARD

IWA 14-1 High Security HVM Retractable Bollard

The Rising Terra Bollard has been successfully impact tested to the IWA 14-1 specification stopping 7.2t @ 50mph and is Stainless steel clad as standard.

BOLLARD DESIGN OPTIONS

Foundation Depth	**1515mm**
Lift Height	**100mm**
Diameter	**245mmø**
Finish	**Stainless Steel Sleeve**

TECHNICAL SPECIFICATIONS

Vehicle Test Weight (kg)	**7200**
Vehicle Class	**N2**
Vehicle Speed	**80**
Vehicle Angle	**90**
Vehicle Penetration	**-**
Dispersion	**-**

CLASSIFICATIONS

PAS 68 Rising Terra Bollards
7.2t @ 50mph (1852kJ)
Classification Codes:
V/7200[N2]/80/90:X.X/X.X
PAS 68 Tested Height above ground: **900mm**

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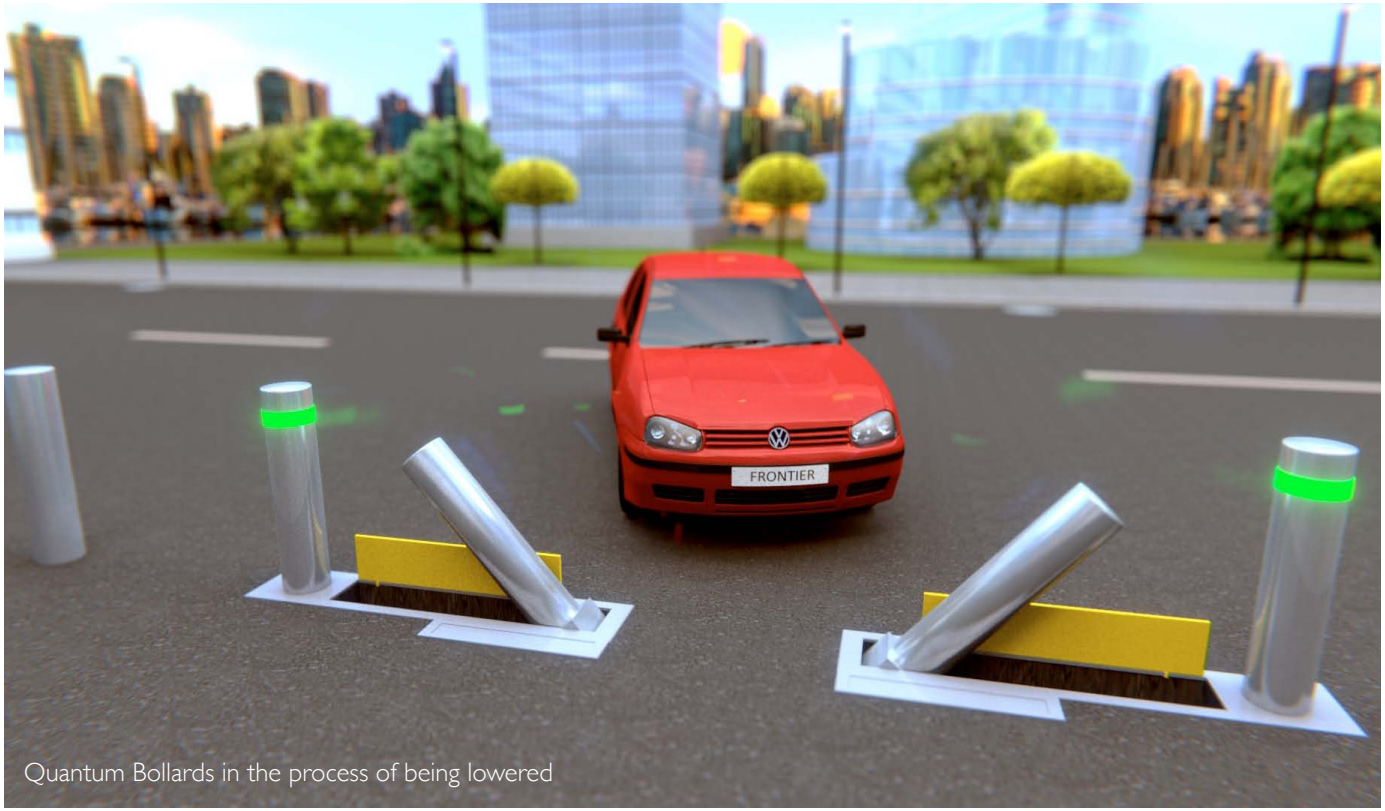
QUANTUM BOLLARD

PAS 68 Shallow Depth Automatic Side Folding Bollard

The Terra Quantum Bollard is a very unique automatic side folding bollard twinned with a static. The shallow depth bollard has been successfully impact tested stopping 7.5t @ 30mph.



Quantum Bollards in the process of being lowered

BOLLARD DESIGN OPTIONS

Foundation Depth	**300mm**
Height above ground	**925mm**
Diameter	**219mm**
Finish	**Painted Powder Coating**
Optional	**Stainless Steel Sleeve**
	Semi-automatic

TECHNICAL SPECIFICATIONS

Vehicle Test Weight (kg)	**7500**
Vehicle Class	**N2**
Vehicle Speed	**48**
Vehicle Angle	**90**
Vehicle Penetration	**0.0**
Dispersion	**1.5**

CLASSIFICATIONS

PAS 68 Terra Quantum Bollard
7.5t @ 30mph (667kJ)

Classification Codes:
V/7500[N2]/48/90:0.0/1.5

PAS 68 Tested Height above ground: **925mm**

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JUPITER STATIC BOLLARD

PAS 68 High Security HVM Static Bollard

The Terra Jupiter Bollard has been successfully impact tested stopping 7.5t @ 50mph and is available in a variety of sleeves including the satin-polished stainless steel finish pictured here.

BOLLARD DESIGN OPTIONS

Embedment	**500mm**
Height above ground	**1080mm**
Diameter	**273mm ø**
Finish	**Painted Powder Coating**
Optional	**Stainless Steel Sleeve Removable**

TECHNICAL SPECIFICATIONS

Vehicle Test Weight (kg)	**7500**
Vehicle Class	**N3**
Vehicle Speed	**80**
Vehicle Angle	**90**
Vehicle Penetration	**10.6**
Dispersion	**11.1**

CLASSIFICATIONS

PAS 68 Static Terra Jupiter Bollards
7.5t @ 50mph (1852kJ)

Classification Codes:
V/7500[N3]/80/90:10.5/11.1

PAS 68 Tested Height above ground: **1080mm**

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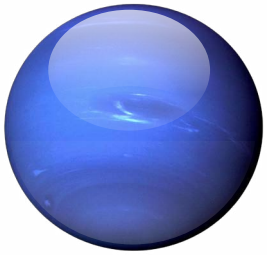

SINGLE SHALLOW DEPTH NEPTUNE STATIC BOLLARD

PAS 68 High Security HVM Static Bollard

The Shallow Depth Terra Neptune Bollard with an embedment depth of only 230mm has been successfully impact tested as a **single** bollard stopping 7.5t @ 40mph.

Neptune Crash Test

BOLLARD DESIGN OPTIONS

Embedment	**230mm**
Height above ground	**1000mm**
Diameter	**273mmø**
Finish	**Painted Powder Coating**
Optional	**Stainless Steel Sleeve**

TECHNICAL SPECIFICATIONS

Vehicle Test Weight (kg)	**7500**
Vehicle Class	**N2**
Vehicle Speed	**64**
Vehicle Angle	**90**
Vehicle Penetration	**0.0**
Dispersion	**0.0**

CLASSIFICATIONS

PAS 68 Static Terra Neptune Bollards
7.5t @ 40mph (1185kJ)

Classification Codes:
V/7500[N2]/64/90:0.0/0.0

PAS 68 Tested Height above ground: **1000mm**

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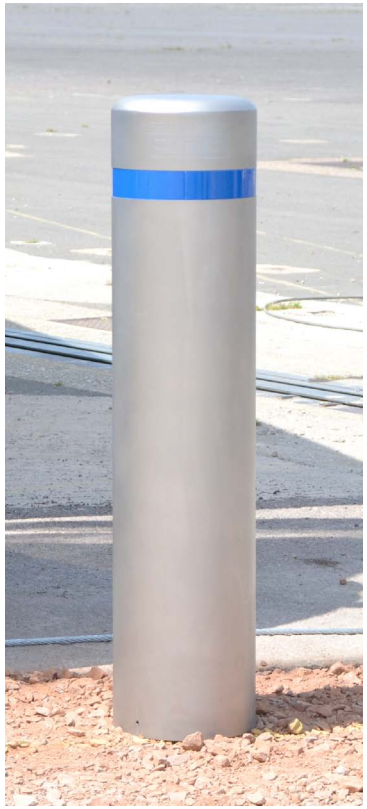
NEPTUNE STATIC BOLLARD

PAS 68 High Security HVM Static Bollard

The Terra Neptune Bollard has been successfully impact tested stopping 7.5t @ 40mph and is available as painted or with a variety of stainless steel sleeves.

Neptune Bollards behind a Terra Swing Gate



BOLLARD DESIGN OPTIONS

Embedment	**500mm**
Height above ground	**1000mm**
Diameter	**273mm ø**
Finish	**Painted Powder Coating**
Optional	**Stainless Steel Sleeve Removable**

TECHNICAL SPECIFICATIONS

Vehicle Test Weight (kg)	**7500**
Vehicle Class	**N2**
Vehicle Speed	**64**
Vehicle Angle	**90**
Vehicle Penetration	**3.3**
Dispersion	**0.0**

CLASSIFICATIONS

PAS 68 Static Terra Neptune Bollards
7.5t @ 40mph (1185kJ)

Classification Codes:
V/7500[N2]/64/90:3.3/0.0

PAS 68 Tested Height above ground: **1000mm**

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SHALLOW DEPTH MARS STATIC BOLLARD

PAS 68 High Security HVM Static Bollard

The Shallow Depth Terra Mars Bollard with an embedment depth of only 230mm has been successfully impact tested stopping 7.5t @ 30mph & 40mph.

BOLLARD DESIGN OPTIONS

Embedment	**230mm**
Height above ground	**1050mm**
Diameter	**245mmø**
Finish	**Painted Powder Coating**
Optional	**Stainless Steel Sleeve**

TECHNICAL SPECIFICATIONS

Vehicle Test Weight (kg)	**7500**
Vehicle Class	**N2**
Vehicle Speed	**48**
Vehicle Angle	**90**
Vehicle Penetration	**1.71**
Dispersion	**0.0**

CLASSIFICATIONS

PAS 68 Static Terra Mars Bollards
7.5t @ 30mph (667kJ)
V/7500[N2]/48/90:1.71/0.0
7500kg @ 40mph (1185kJ)
V/7500[N2]/64/90: 20.8/7.6
PAS 68 Tested Height above ground:**1050mm**

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MARS STATIC BOLLARD

PAS 68 High Security HVM Static Bollard

The Terra Mars Bollard has been successfully impact tested stopping 7.5t @ 40mph and is available as painted or with a variety of stainless steel sleeves.

BOLLARD DESIGN OPTIONS

Embedment	**500mm**
Height above ground	**1000mm**
Diameter	**219mm ø**
Finish	**Painted Powder Coating**
Optional	**Stainless Steel Sleeve Removable**

TECHNICAL SPECIFICATIONS

Vehicle Test Weight (kg)	**7500**
Vehicle Class	**N2**
Vehicle Speed	**64**
Vehicle Angle	**90**
Vehicle Penetration	**4.0**
Dispersion	**16.7**

CLASSIFICATIONS

PAS 68 Static Terra Mars Bollards
7.5t @ 40mph (1185kJ)

Classification Codes:
V/7500[N2]/64/90:4.0/16.7

PAS 68 Tested Height above ground: **1000mm**

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SHALLOW DEPTH VENUS STATIC BOLLARD

PAS 68 High Security HVM Static Bollard

The Shallow Depth Terra Venus Bollard with an embedment depth of only 300mm has been successfully impact tested stopping 7.5t @ 30mph.

BOLLARD DESIGN OPTIONS

Embedment	**300mm**
Height above ground	**1000mm**
Diameter	**219mm ø**
Finish	**Painted Powder Coating**
Optional	**Stainless Steel Sleeve**

TECHNICAL SPECIFICATIONS

Vehicle Test Weight (kg)	**7500**
Vehicle Class	**N2**
Vehicle Speed	**48**
Vehicle Angle	**90**
Vehicle Penetration	**3.3**
Dispersion	**0.0**

CLASSIFICATIONS

PAS 68 Static Terra Venus Bollards
7.5t @ 30mph (667kJ)

Classification Codes:
V/7500[N2]/48/90:3.3/0.0

PAS 68 Tested Height above ground: **1000mm**

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VENUS STATIC BOLLARD

PAS 68 High Security HVM Static Bollard

The Terra Venus Bollard has been successfully impact tested stopping 7.5t @ 30mph and is available in a variety of sleeves including the Bead Blasted Stainless Steel finish pictured here.

BOLLARD DESIGN OPTIONS

Embedment	**500mm**
Height above ground	**1000mm**
Diameter	**219mm ø**
Finish	**Painted Powder Coating**
Optional	**Stainless Steel Sleeve**
	Shallow & Removable

TECHNICAL SPECIFICATIONS

Vehicle Test Weight (kg)	**7500**
Vehicle Class	**N2**
Vehicle Speed	**48**
Vehicle Angle	**90**
Vehicle Penetration	**0.0**
Dispersion	**0.0**

CLASSIFICATIONS

PAS 68 Static Terra Venus Bollards
7.5t @ 30mph (667kJ)

Classification Codes:
V/7500[N2]/48/90:0.0/0.0

PAS 68 Tested Height above ground: **1000mm**

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STREETSCAPE

BSi PAS 68 in the urban environment

An illustration on the various ways PAS 68 Static Bollards can be integrated into the Streetscape.

PAS 68 Traffic light bollard

Corner of building protection

PAS 68 Terra planters and bollard

Building pillar protection

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