

GUIDELINE FOR SAFE OPERATION OF POWER OPERATED BOLLARDS

IMPRINT

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BVT/MZT GUIDELINE FOR SAFE OPERATION OF POWER OPERATED BOLLARDS

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Retractable power operated bollards fulfil functions that are comparable to those of barriers or gates. However, currently there are no specific regulations and standards that can be applied to bollards. In the following, the term „bollard“ is used for retractable power operated bollards just to make it simple. For the power operated bollards dealt with here, the Machinery Directive (2006/42/EC) must be strictly adhered to. However, it only makes general statements about the safety of machines.

This guideline provides support to operators, installers and experts of bollards for the safe operation of retractable power operated bollards as well as for inspection and determining the minimum level of safeguarding.

This guideline describes the requirements and test procedures with regard to the safe use of all types of bollards, which are intended for installation in access areas with pedestrian traffic and whose intended use mainly pertains to enabling the safe access of goods and vehicles that are driven or controlled by people into industrial and commercial facilities as well into residential complexes.

A distinction is made between:

- **Traffic bollards** as vehicle access control: These prevent vehicles from entering certain areas. It is not considered likely, that the bollards will be deliberately run over by vehicles. The manufacturer has to declare the maximum speed of a possible impact or the impact resistance and the breaking strength (which is not a stipulation of this guideline).
- **High security bollard:**
This guideline also applies to high security bollards if they are operated as traffic bollards.

In this guideline, high security bollards are bollards that have been tested for crash by an independent test institute in accordance with applicable standards and defined impact energies, for example, according to PAS 68, ASTM F2656 or IWA 14-1.

German Judgement establishing the principle of “public area”

According to the general legal opinion (court ruling by the Higher Regional Court, Hamm/Germany dated 04.03.2008, case no. 2 Ss 33/08) company premises or private areas are considered as public areas, if these areas are accessible to the general public, regardless of ownership rights.

Properties that are not secured against access by third parties are also considered as public area.

“Non-public area” means that only instructed persons or those accompanied by instructed persons can use as well as access these areas. This is, for example, the case with a fenced company premises, where it is ensured that only authorized persons have access.

Bollards can be differentiated according to their nature of drive or type.

2.1 Differentiation according to drive type

- Electromechanical bollards
- Pneumatic bollards
- Hydraulic bollards
- Semi-automatic bollards (for example, raising with a gas-filled piston)

2.2 Differentiation by bollard type

- Retractable bollards
- Fixed bollards
- Telescopic bollards
- Mobile bollards
- Removable bollards

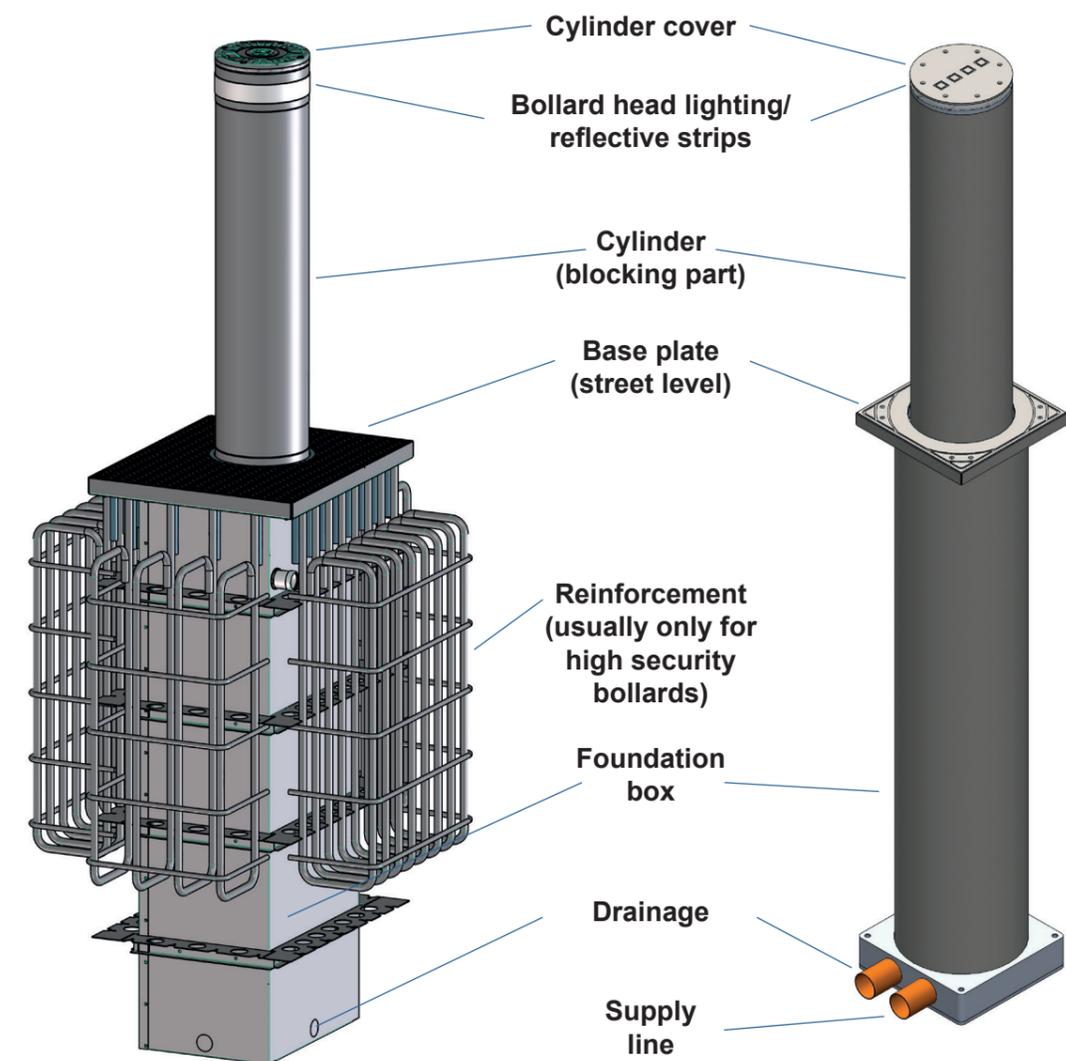
2.3 Alarm circuit closing (EFO function)

(Emergency Fast Operation) as an Option:

The EFO function is triggered by authorised and instructed persons and not automatically. Hereby, security (crime prevention) always takes precedence over safety (safe use). In connection with the EFO function, the operator must prepare an access protection concept with safety analysis, since all safety functions are switched off when the EFO function is used.

2.4 Components of bollards

Examples of variants



Bollards are not explicitly regulated by the Construction Products Regulation (EU) No. 305/2011.

The type of bollards and their specification must be selected taking into account the installation location and the operational requirements set out for the bollard.

The requirements for safety in use, level of automation, type of actuation, position of the bollard at the site, frequency of use, aspects of user-friendliness and scope & frequency of maintenance measures influence the design of bollards.

Such specifications can contain requirements for performance characteristics, which must be demonstrated through the standards specified in the following sections.

Bollards must be planned and designed in accordance with the requirements listed below (for example, single or multi lane traffic, separation) in order to ensure their safe operation under foreseen circumstances and expected operating conditions. In addition, safe installation, maintenance, repair and dismantling must be guaranteed and described in the corresponding technical documentation.

Corrosion protection should be specified by the manufacturer/supplier in accordance with EN ISO 12944.

Mechanical hazards such as crushing, shearing, retracting as well as lifting and knocking during the operation of bollards are to be avoided with every installed system and possibly, any accessories installed. If this is not possible, for example, due to the installation situation, further suitable safety measures may have to be taken.

According to the Machinery Directive, the manufacturer must carry out a risk assessment for power operated bollards, for example, for carrying out and documenting in accordance with EN ISO 12100. In addition, the EMC Directive, the RoHS Directive and, if applicable, the RED Directive must be taken into account.

In the following, the general potential hazard zones are considered. The risk assessment is carried out in accordance with the Machinery Directive.

4.1. Hazards in retracted cylinder position

4.1.1 Personal hazards

- Edges causing tripping
- Danger of slipping

4.1.2 Property damages

- Protruding parts of the bollard, for example, on a sloping terrain

4.1.3 Measures against personal hazards and property damages

- Sign board: "Warning, bollards ahead"

Example



HAZARDS AND SAFETY MEASURES

4.2. Hazards in raised cylinder position

4.2.1 Personal hazards

- Running against bollards
- Driving against bollards with prams, scooters, bicycles, e-scooters, vehicles for people with reduced mobility
- Driving against bollards with cars, trucks, motorcycles

4.2.2 Property damages

- Driving against bollards with cars, trucks, motorcycles

4.2.3 Measures against personal hazards and property damages

- Sign board: "Warning, bollards ahead"
- Reflective signal strips in accordance with ECE regulation (retroreflective markings)
- Additional fittings: for example, coloured markings
- Identification of separate lanes / bicycle lanes / pedestrian routes
- Selection of the bollard height

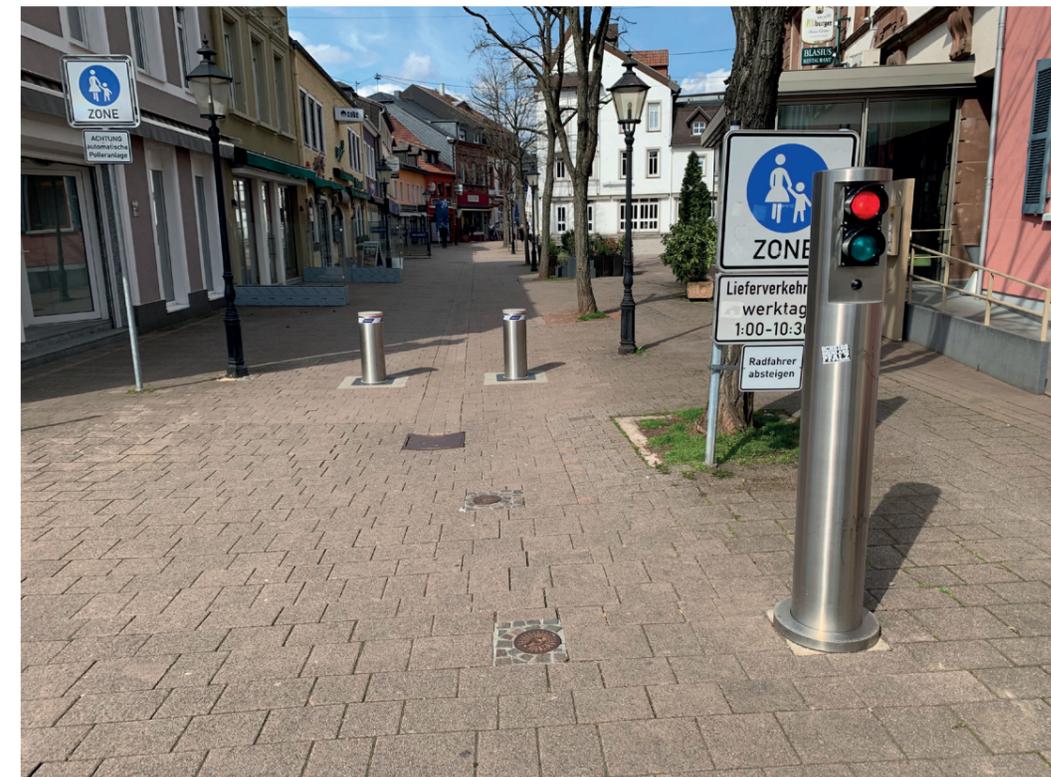
Example



4.3. Hazards during the movement of the cylinder

4.3.1 Personal hazards

- Stopping of people in the area of movement of the bollard – this can relate to individuals, people with prams, scooters, bicycles, e-scooters or vehicles for people with reduced mobility.
- Tripping over the moving bollard
- Driving with prams, scooters, bicycles, e-scooters, vehicles for people with reduced mobility against moving bollard



HAZARDS AND SAFETY MEASURES

4.3.2 Property damages

- Driving with cars, trucks or motorcycles against moving bollard

4.3.3 Measures against personal hazards and property damages

- Sign board: "Warning, bollards ahead"
- Identification of separate lanes
- Compliance with safe distances in accordance with the Machinery Directive
- Minimum distances between the bollards (for example, for people in wheelchairs)
- Retroreflective signal strips in accordance with ECE Regulation
- Traffic light system
- Acoustic signal
- Additional fittings: Coloured markings, Signal and safety lighting
- photo cells, scanners, light grids or similar
- Limit the raising speed and force of the bollard

Example



REVIEW OF THE SAFETY MEASURES, TEST PROCEDURES

6.1. Requirements and information for operation, testing and maintenance by experts

The manufacturer must supply suitable documentation such as installation and operating manuals, CE declarations (declaration of conformity) as well as an inspection booklet to ensure that bollards can be properly and safely installed, operated, maintained and dismantled in accordance with the requirements.

The manufacturer must specify in the maintenance manual,

- the maintenance intervals,
- the wearing parts of the system,
- the criteria for their replacement and
- the measures required for these.

Components such as, for example, those which may be subject to wear and tear or show fatigue signs, must be designed such that they can be replaced with little effort.

Shorter maintenance intervals may be necessary due to increased frequency of use and/ or specific environmental conditions.

Maintenance must be carried out by professionals.

The total number of operating cycles for which the bollard system is designed must be specified by the manufacturer and must take into account the intended service life, planned maintenance activities and the replacement of wearing and ageing parts.

The manufacturer must also specify the life cycles for which the bollard was designed.

The operation of bollards is subject to a duty of care in accordance with the local legal regulations.

Power operated bollards are to be assessed and marked in accordance with the Machinery Directive (this also applies to the safety-related components) – refer to Annex I, section 1.7.3 of the Machinery Directive.

An installation company becomes a manufacturer if it adds safety-relevant components to the system that have not been tested for compatibility and approved by the bollard manufacturer. The manufacturer must provide the installation company with the following documents:

- Installation and dismantling manuals
- Information about any tools and lifting gear required depending on the weight of the bollard

The manufacturer of the bollards has to provide an operating manual in accordance with Annex I, section 1.7.4 of the Machinery Directive to the enduser in his national language. National regulations must be taken into account. The operating manual must contain at least the following points (not an exhaustive list and to be updated with respect to product):

- Maintenance manual
- Notes on the regular inspection of bollards (what should be checked? Who is supposed to check?), Inspection report in Annex 9.1
- Inspection booklet

6.2 Regular safety checks and maintenance

Power operated bollards must be properly checked for their safe condition in accordance with the manufacturer's specifications before they are used for the first time, after significant changes and on a recurring basis. The recurring inspection should be carried out at least once a year.

The operator is responsible for carrying out the safety checks and maintenance activities. The results of the safety check are to be recorded, for example, in the BVT inspection protocol for bollards (Annex 9.1), and should be filed with the operator. The safety inspection of bollards may only be carried out by experts who can assess the functional efficiency of the safety devices and check it with suitable measuring technique. Furthermore, country-specific construction regulations are to be adhered to.

CONFORMITY ASSESSMENT/ CE DECLARATION

The conformity with the Machinery Directive 2006/42 / EC and the EMC Directive must be declared.

This declaration of conformity or the declaration for incorporation of partly completed machinery must be supplied in the customer's national language.

Bollards are covered by the Machinery Directive and must therefore also meet those safety related requirements that concern electrical power supply, in accordance with the Annex I to the Machinery Directive.

A machine supplied with electrical energy must be designed, built and equipped in such a way that all hazards of electrical nature are avoided or can be avoided.

If radio modules are used, the RED Directive must also be complied with. With regard to hazards of electrical nature, the obligations arising from the conformity assessment and when introducing in the market and/or commissioning of machines are however governed exclusively by the applicable Machinery Directive.

MARKING/CE LABEL

Bollards are to be marked in accordance with the Machinery Directive. The CE mark must be affixed to the bollard. The manufacturer or his authorised representative based in the EU is responsible for affixing the CE mark.

At least the following information must be recognizable, clearly legible and permanently affixed to each machine:

- Business name and full address of the manufacturer / authorised Designation of the machinery
- Designation of series or type and serial number, if any
- Year of construction, that is the year in which the manufacturing process is completed
- Rated voltage or rated voltage range in volts
- Symbols for the type of current, if the rated frequency is not specified
- Rated consumption in watts or rated current in amperes
- IP number (EN 60529 Degrees of Protection provided by Enclosures) for the degree of protection against ingress of water except IPX0

Relevance and completeness are to be aligned with the respective Directives!

9.1 Inspection protocol

Inspection protocol for power operated bollards

System data	Operating Company
Description: _____	Name: _____
Type: _____	Address: _____
Serial No.: _____	_____
Manufacturer: _____	Installation location: _____
Date of manufacture: _____	_____
Commissioning: _____	Serial/Identification number: _____
<input type="checkbox"/> Single bollard system <input type="checkbox"/> Multiple bollard system Number of bollards: _____	

n.C. = No complaints; C = Complaints; n.a. = not available, tick only if the component is not available

1. Mechanical	n.C. C n.v.	5. Function check	
1.1 Cylinder	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	5.1 Test run carried out?	yes / no
1.2 Guide	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	6. Marking	
1.3 Stop (top, bottom)	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	a) Rating plate availability	yes / no
1.4 Mechanical movement	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	b) CE marking availability	yes / no
1.5 Lines and hoses	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	c) Completeness, Legibility	n.C. C <input type="checkbox"/> <input type="checkbox"/>
1.6 Drainage	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	7. Bollard documentation/Inspection booklet	
2. Drive	n.C. C n.v.	availability	yes / no
2.1 General status	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	8. Number of operating cycles	_____
2.2 Force limit (according to manufacturer information)	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	9. Additional equipments checked	n.C. C
2.3 Leak-proof	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	1. _____	<input type="checkbox"/> <input type="checkbox"/>
2.4 Emergency actuation	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	2. _____	<input type="checkbox"/> <input type="checkbox"/>
2.5 Heating	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	3. _____	<input type="checkbox"/> <input type="checkbox"/>
3. Control	n.C. C n.v.	10. Findings of the inspection	
3.1 Operating elements	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	No defects found	<input type="checkbox"/>
3.2 Limit stop	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Following defects found	<input type="checkbox"/>
3.3 Control unit housing	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	1. _____	
3.4 All pole disconnection of power supply	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	2. _____	
3.5 Checking the electrical lines for insulation damages	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	3. _____	
4. Safety devices	n.C. C n.v.	(If necessary, use an additional sheet for further defects)	
4.1 Induction loop, light barrier, laser, radar or other presence detectors	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	The defect under no. The defect under no.	<input type="checkbox"/>
4.2 Emergency unlocking mechanism	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	is relevant to safety, poses danger to people and property and must be rectified immediately.	<input type="checkbox"/>
4.3 Reflective strips	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	It is urgently recommended to shut down the system until the defect has been rectified.	<input type="checkbox"/>
4.4 Optical warning devices	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>		
4.5 Acoustic warning devices	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>		

The inspection was carried out to the best of knowledge and belief. A liability for hidden defects, that cannot be identified while exercising the usual care, is excluded.

Inspecting company: _____

Name: _____

Address: _____

Place, Date

Next inspection date latest by: _____

Name and signature of the Inspector (Expert)

Received a carbon copy of the inspection report: _____

(Recommended: File another carbon copy of the inspection report directly near the bollard system.)

Date and signature for the operating company

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9.2 Sample declaration of conformity

Example: EC/EU Declaration of Conformity

(according to the Machinery Directive 2006/42/EC, Annex II, Part 1 A)

Manufacturer: Bollard manufacturer with complete address
 Authorised representative: Authorised representative of the above-mentioned manufacturer

The manufacturer above herewith declares under his sole responsibility, that the products named below

Type: For example, automatic bollard
 Model(s): Model name(s)
 Intended Use: For traffic control and/or as protective barrier

comply with the basic requirements and other relevant provisions of the EC/EU Directives listed below, for their intended use:

2006/42/EG (MD)	Machinery Directive 2006/42/EC
2014/30/EU (EC)	Electromagnetic Compatibility
2014/53/EU (RED)	EU Radio Equipment Directive (optional)
2015/863/EU (RoHS)	Restriction of Hazardous Substances Directive

Applicable standards and specifications:

Exemplary list of the applicable standards (not exhaustive):

EN 60204-1:2006 + A1:2011	Safety of Machinery – Electrical Equipment of Machines – Part 1: General requirements
EN ISO 12100:2010	Safety of Machinery – General principles for design – Risk assessment and risk reduction
EN 61000-6-2:2005	Electromagnetic compatibility (EMC) – Immunity standard for industrial environments

EN 61000-6-3:2007 + A1:2011
+ AC:2012

Electromagnetic Compatibility (EMC) –
Emission standard for residential, commercial
and light-industrial

ETSI EN XXX YYY*

Harmonised Standard for Radio interference
immunity (optional)

ETSI EN YYY ZZZ*

Harmonised Standard for Radio frequency
utilisation (optional)

EN IEC 63000:2018
EN 60529

Restriction of Hazardous Substances Directive
Degrees of protection provided by Enclosures

* Latest edition in each case

Any modifications made to the product without our approval will invalidate this declaration.

The management of the above-mentioned manufacturer is authorised to compile the required technical documentation.

Place, Date

Signature of the authorised representative

p.p. First name Last name

Function of the authorised representative

9.3 Table of minimum level of safeguarding for power operated bollards

Minimum level of safeguarding for the safety of power operated bollards
(based on Table 1 of EN 12453)

Type of actuation	Types of use			
	Trained users (public not likely to be present)	Trained users (public likely to be present)	Untrained users	EFO function in traffic area
	“Type 1”	“Type 2”	“Type 3”	“Type 4”
Hold-to-run control mode of operation	A	B	Not possible	A
Impulse activation in sight of the bollard	F* and H* and I*	F and H and I*, or L	F and H and I* and J and K, or L	Not possible
Impulse activation out of sight of the bollard	F* and H* and I* and J and K, or L	F and H and I* and J and K, or L	F and H and I* and J and K, or L	Not possible
Automatic mode	F* and H* and I* and J and K, or L	F and H and I* and J and K, or L	F and H and I* and J and K, or L	Not possible

* Depending on the risk assessment on site

Notes on the EFO function

Have the operator countersign the EFO function.

The operators have to be instructed.

A	Hold-to-run control mode of operation (dead man's control)
B	Hold-to-run control mode of operation with manual actuator equipped with a key switch or similar
F	Sign board, optical warning signal not integrated (for example, traffic light)
H	Integrated optical warning signal (pre flashing/during the movement)
I	Integrated acoustic warning signal (pre warning/during the movement)
J	Additional equipment for property protection (for example, induction loop, radar)
K	Limitation of forces (Internal and external safety devices)
L	Contactless personal safety device (for example, laser)



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