

Meta Data Specification for the NIST Ballistics Toolmark Database

The meta data (data about the data) for the NIST ballistics toolmark database is organized into several linked categories:

- 1) Study: Meta data describing the properties and creator of a ballistics toolmark study, typically involving several firings from one or more firearms.
- 2) Creator: Information about the creator of a ballistic toolmark study or the creator of measurement data.
- 3) Firearm: Meta data describing a firearm used in a ballistic toolmark study.
- 4) Bullet: Meta data describing a bullet specimen collected in a ballistic toolmark study.
- 5) BulletMeasurement: Meta data describing measurement data of a bullet specimen.
- 6) CartridgeCase: Meta data describing a cartridge case specimen collected in a ballistic toolmark study.
- 7) CartridgeCaseMeasurement: Meta data describing measurement data of a cartridge case specimen.

In addition, each measurement data file contains meta data describing the date of the measurement, person and organization that performed the measurement, the measurement instrument, and the measurement parameters.

The data fields described below are not intended to provide a detailed description, but rather a practical set of major differentiation properties relevant to a research database.

Table 1: Study

This table contains data describing the properties of a ballistic toolmark study.

StudyID	: Primary key
	Unique identifier of the study.
	<ul style="list-style-type: none">• Generated by the database
StudyName	: String (VARCHAR (50))
	Name of the study. For example, the name of the principal investigator.
	<ul style="list-style-type: none">• User supplied (check whether supplied name is unique)• Mandatory field
Description	: Memo (VARCHAR (2000))
	Short description of the study.
	<ul style="list-style-type: none">• User supplied

LiteratureReference	: Memo (VARCHAR (2000)) Literature reference to a report or paper describing the study.
	<ul style="list-style-type: none"> • User supplied
CreatorID	: Foreign key (primary key of the Creator table) Unique identifier of the study creator, typically the principal investigator.
	<ul style="list-style-type: none"> • Assigned by the database based on mandatory Creator input
UserId	: Foreign key (primary key to the Users table) Unique identifier of the user who submitted the study data
	<ul style="list-style-type: none"> • Assigned by the database • Internal NIST use only
HasPersistence	: Boolean Whether the study contains persistence firings (at least two bullet or cartridge case specimens fired from the same firearm with many intermediate firings).
	<ul style="list-style-type: none"> • User supplied • Mandatory field • Search field
HasConsecutive	: Boolean Whether the study contains firings obtained from firearms with consecutively manufactured components (or in close proximity).
	<ul style="list-style-type: none"> • User supplied • Mandatory field • Search field
HasDifferentAmmo	: Boolean Whether the study contains different brands of ammunition fired from the same firearm.
	<ul style="list-style-type: none"> • User supplied • Mandatory field • Search field
ActiveStatus	: int Whether the study is deleted or in active status.
	<ul style="list-style-type: none"> • Set to 1 (active) for all supplied datasets. Administrator can change this field to 0 (deleted). If in future we need more status codes, this is more flexible than using Boolean.

IsVirtual : Boolean

Whether the study is a virtual study

- Set False for all supplied datasets. Administrator can change this field to True.

Table 2: Creator

This table contains data describing the creator of a ballistic toolmark study, typically the principal investigator, or the creator of a measurement data file.

CreatorID : Primary key

Unique identifier of the creator.

- Generated by the database.

StudyID : Foreign key

Unique identifier of the Study.

- Generated by the database

FirstName : String (VARCHAR (50))

First name of the creator.

- User supplied
- Mandatory field

LastName : String (VARCHAR (50))

Last name of the creator.

- User supplied
- Mandatory field

Organization : String (VARCHAR (50))

Name of the creator organization.

- User supplied
- Mandatory field

Phone : String (VARCHAR (50))

Phone number of the creator

- User suppliedInternal NIST use only

Email : String (VARCHAR (50))

Email address of the creator

- User supplied
- Internal NIST use only

Table 3: Firearm

This table contains data describing the properties of the firearm(s) used in a study. For a study involving one firearm with exchanged components, such as firing pins, each table entry describes one instance of the firearm used to generate a ballistic specimen.

FirearmID	: Primary key	<ul style="list-style-type: none"> • User supplied • Internal NIST use only <p>Unique identifier of the firearm instance.</p> <ul style="list-style-type: none"> • Generated by the database
FirearmName	: String (VARCHAR (50))	<p>Unique identifier of a firearm instance within a study. This is typically the identifier used by the team that conducted the ballistic toolmark study.</p> <ul style="list-style-type: none"> • User supplied (check whether the supplied name is unique within the study) • Mandatory field
StudyID	: Foreign key (primary key of the Study table).	<p>Unique identifier of the study in which the firearm was used.</p> <ul style="list-style-type: none"> • Assigned by the database
IsConsecutive	: Boolean	<p>Whether the firearm component relevant to the generated bullet or cartridge case specimens is part of a set of consecutively manufactured components (or in close proximity).</p> <ul style="list-style-type: none"> • User supplied • Mandatory field
Brand	: Enumeration	<ul style="list-style-type: none"> - Beretta - Bersa - Browning - Canik - Chiappa - Colt - CZ-USA - FN Herstal - Glock - Heckler & Koch - Hi-Point - Kahr Arms

- Kel-Tec
- Kimber
- Para Ordnance
- Remington
- Rossi
- Ruger
- Sig Sauer
- Smith & Wesson
- Springfield Armory
- Steyr Arms
- Stoeger
- Taurus
- Walther
- Other

Firearm brand.

- User supplied
- Mandatory field
- Search field

Model : String (VARCHAR (50))

Firearm model.

- User supplied
- Mandatory field

Caliber : Enumeration

- 22LR
- 25 Auto
- 32 Auto
- 9 mm
- 38/357
- 357 Sig
- 380 Auto
- 40/10 mm
- 44 Spl/Mag
- 45 Auto
- Other

Firearm caliber.

- User supplied
- Mandatory field when the user supplies cartridge case data
- Search field

FiringPinClass : Enumeration.

- Hemispherical
- Glock Type

- Circular
- Truncated Cone
- Rectangular
- Other
- Not Specified

Classification of the firing pin surface.

- User supplied
- Mandatory field when the user supplies cartridge case data
- Search field when the user is searching for cartridge case data

BreechFaceClass : Enumeration

- Arched
- Circular
- Cross Hatch
- Granular
- Smooth
- Striated
- Other
- Not Specified

Classification of the breech face surface texture.

- User supplied
- Mandatory field when the user supplies cartridge case data
- Search field when the user is searching for cartridge case data

OtherBreechFaceClass : String (Varchar (50))

- User supplied
- This is to store the description of Other BreechFaceClass that can be added to the list later

NumberOfLands : Enumeration

- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- ≥10
- Not specified

- User supplied
- Mandatory field when the user supplies bullet data
- Search field when the user is searching for bullet data

TwistDirection	: Enumeration
	<ul style="list-style-type: none"> - Left - Right - Not specified <p>Twist direction of the barrel rifling.</p> <ul style="list-style-type: none"> • User supplied • Mandatory field when the user supplies bullet data • Search field when the user is searching for bullet data
Comment	: Memo (VARCHAR (2000))
	<p>Comments about the firearm instance</p> <ul style="list-style-type: none"> • User supplied
ActiveStatus	: int
	<p>Whether the firearm is deleted or in active status.</p> <ul style="list-style-type: none"> • Set to 1 (active) for all supplied datasets. Administrator can change this field to 0 (deleted). If in future we need more status codes, this is more flexible than using Boolean.

Table 4: Bullet

This table contains data describing the properties of a bullet specimen obtained in a study.

BulletID	: Primary key
	<p>Unique identifier of a bullet specimen.</p> <ul style="list-style-type: none"> • Generated by database
SpecimenName	: String (VARCHAR (50))
	<p>Unique identifier of a bullet specimen within a study. This is typically the identifier used by the team that conducted the ballistic toolmark study.</p> <ul style="list-style-type: none"> • User supplied (check whether the supplied name is unique within the bullets of a study) • Mandatory field
FirearmID	: Foreign key (primary key of the Firearm table)
	<p>Unique identifier of the firearm used to generate the specimen.</p> <ul style="list-style-type: none"> • Assigned by the database
Brand	: Enumeration

- Aguila
- Bear
- CCI
- Federal
- Fiocchi
- FN
- Hornady
- Nosler
- PMC
- Remington
- Sellier & Bellot
- Speer
- Tulammo
- Weatherby
- Winchester
- Wolf
- Other

Brand name of the ammunition. These values are available for both Bullets and Cartridge Cases.

- User supplied
- Mandatory field
- Search field when the user searches for bullet data

NominalCaliber : Enumeration

Nominal caliber of the ammunition. These values are available for both Bullets and Cartridge Cases.

- 22LR
- 25 Auto
- 32 Auto
- 9 mm
- 38/357
- 357 Sig
- 380 Auto
- 40/10 mm
- 44 Spl/Mag
- 45 Auto
- Other

- User supplied
- Mandatory field
- Search field when the user searches for bullet data

CartridgeDesignation: String (VARCHAR (50))

Cartridge model designation used by the manufacturer.

- User supplied

Weight : Enumeration

- 30-50
- 51-100
- 101-150
- 151-200
- 201-250
- 251-300
- ≥ 301
- Not Specified (blank row)

Weight (grain) of the bullet.

- User supplied

SurfaceMaterial : Enumeration

- Copper
- Brass
- Steel
- Lead
- Polymer
- Other
- Not specified

Material composition of the bullet surface.

- User supplied

FiringSequence : Integer > 0 or null

- Not Specified

Field indicating the sequence number of the firing for a persistence study.

- User supplied

LotNumber : String (VARCHAR (50))

- Not Specified

Manufacturing lot number of the ammunition.

- User supplied

Comment : Memo (VARCHAR (2000))

Comments about the bullet specimen.

- User supplied

ActiveStatus : int

Whether the bullet is deleted or in active status.

- Set to 1 (active) for all supplied datasets. Administrator can change this field to 0 (deleted). If in future we need more status codes, this is more flexible than using Boolean.

Table 5: BulletMeasurement

This table contains data describing the properties of a bullet measurement.

BulletMeasurementID: Primary key

Unique identifier of a bullet measurement.

- Generated by database

BulletID : Foreign key (primary key of the Bullet table)

Unique identifier of the measured bullet specimen.

- Assigned by database

CreatorID : Foreign key (primary key of the Creator table)

Unique identifier of the creator of the measurement data.

- Assigned by database

IsNistMeasurement : Boolean

Whether the measurement data was obtained at NIST

- Set to False for all supplied datasets. Administrator can change this field to True.

FileName : String (VARCHAR (50))

Name of the measurement data file supplied by the user

- User supplied
- Mandatory field
- Must not be a duplicate within the study.

FilePointerName : String (VARCHAR (50))

Name of the measurement data file generated by the system to point to the actual file

- System generated
- Mandatory field
- Must not be a duplicate within the study.

MeasurementType : Enumeration

- Disc Scanning Confocal
- Laser Scanning Confocal
- Interferometry
- Focus Variation
- Photo Stereometric
- Micro Array Confocal
- Reflectance Microscopy
- Stylus
- Other

Type of measurement. These values are available for both Bullets and Cartridge Cases.

- User supplied
- Mandatory field
- Search field when the user searches for bullet measurement data

Measurand : Enumeration

- Photo Image
- 2D Profile
- 3D Topography

Classification of the measured quantity. These values are available for both Bullets and Cartridge Cases.

- User supplied
- Mandatory field
- Search field when the user searches for bullet measurement data

RegionOfInterest : Enumeration

- Land Engraved Area
- Groove Engraved Area
- Full or partial circumference

Measured specimen region.

- User supplied
- Mandatory field
- Search field when the user searches for bullet measurement data

LeaOrGeaNumber : Integer >0 or null

- Not specified or not applicable

Number of the measured land engraved area or groove engraved area.

- User supplied

InstrumentBrand	: String (VARCHAR (50))
	Brand name of the measurement instrument.
	<ul style="list-style-type: none"> • User supplied • Mandatory field
InstrumentModel	: String (VARCHAR (50))
	Model designation of the measurement instrument.
	<ul style="list-style-type: none"> • User supplied • Mandatory field
LateralResolution	: Real >0 up to 5 decimal places
	Nominal lateral distance between two neighboring measurement points or pixels in micrometers.
	<ul style="list-style-type: none"> • User supplied • Mandatory field
VerticalResolution	: Real > 0 up to 5 decimal places
	For 2D profile or 3D topography measurements, the resolution of the measurement data in the direction orthogonal to the measured surface, in micrometers.
	<ul style="list-style-type: none"> • User supplied
LightingDirection	: Enumeration
	<ul style="list-style-type: none"> - Ring Light - 3 O'Clock - 6 O'Clock - 9 O'Clock - 12 O'Clock - Other - Not specified or not applicable
	For photo images, the type of lighting used. These values are available for both Bullets and Cartridge Cases.
	<ul style="list-style-type: none"> • User supplied • Mandatory field when Measurand = Photo Image
ObjectiveMagnification	: Real > 0 up to 1 decimal place
	Magnification of the objective.
	<ul style="list-style-type: none"> • User supplied

ObjectiveNA	:	Real >0, 2 decimal places afterwards Numerical aperture of the objective. <ul style="list-style-type: none">• User supplied
Comment	:	Memo (VARCHAR (2000)) Comments about the measurement <ul style="list-style-type: none">• User supplied
ActiveStatus	:	int Whether the bullet measurement is deleted or in active status. <ul style="list-style-type: none">• Set to 1 (active) for all supplied datasets. Administrator can change this field to 0 (deleted). If in future we need more status codes, this is more flexible than using Boolean.

Table 6: CartridgeCase

This table contains data describing the properties of a cartridge case specimen obtained in a study.

CartridgeCaseID	:	Primary key Unique identifier of a cartridge case specimen. <ul style="list-style-type: none">• Generated by the database
SpecimenName	:	String (VARCHAR (50)) Unique identifier of a cartridge case specimen within a study. This is the identifier used by the team that conducted the ballistic toolmark study. <ul style="list-style-type: none">• User supplied (check whether the supplied name is unique within the cartridge cases of a study)• Mandatory field
FirearmID	:	Foreign key (primary key of the Firearm table) Unique identifier of the firearm used to generate the specimen. <ul style="list-style-type: none">• Assigned by the database
Brand	:	Enumeration <ul style="list-style-type: none">- Aguila- Bear- CCI- Federal- Fiocchi

- FN
- Hornady
- Nosler
- PMC
- Remington
- Sellier & Bellot
- Speer
- Tulammo
- Weatherby
- Winchester
- Wolf
- Other

Brand name of the ammunition. These values are available for both Bullets and Cartridge Cases.

- User supplied
- Mandatory field
- Search field when the user searches for cartridge case data

NominalCaliber : Enumeration

Nominal caliber of the ammunition. These values are available for both Bullets and Cartridge Cases.

- 22LR
- 25 Auto
- 32 Auto
- 9 mm
- 38/357
- 357 Sig
- 380 Auto
- 40/10 mm
- 44 Spl/Mag
- 45 Auto
- Other

- User supplied
- Mandatory field
- Search field when the user searches for cartridge case data

CartridgeDesignation : String (VARCHAR (50))

Cartridge model designation used by the manufacturer.

- User supplied

CaseMaterial : Enumeration

- Brass
- Aluminum
- Steel

- Nickel
- Other
- Not specified

Material composition of the cartridge case surface, excluding primer.

- User supplied

PrimerSurfaceMaterial : Enumeration

- Brass
- Nickel
- Copper
- Other
- Not Specified

Material composition of the primer surface.

- User supplied

FiringSequence : Integer > 0 or null
- Not specified

Field indicating the sequence number of the firing for a persistence study.

- User supplied

LotNumber : String (VARCHAR (50))

Manufacturing lot number of the ammunition.

- User supplied

Comment : Memo (VARCHAR (2000))

Comments about the cartridge case specimen.

- User supplied

ActiveStatus : int

Whether the cartridge case is deleted or in active status.

- Set to 1 (active) for all supplied datasets. Administrator can change this field to 0 (deleted). If in future we need more status codes, this is more flexible than using Boolean.

Table 7: CartridgeCaseMeasurement

This table contains data describing the properties of a cartridge case measurement.

CartridgeCaseMeasurementID : Primary key

Unique identifier of a cartridge case measurement.

- Generated by database

CartridgeCaseID : Foreign key (primary key of the cartridge case table)

Unique identifier of the measured cartridge case specimen.

- Assigned by database

CreatorID : Foreign key (primary key of the Creator table)

Unique identifier of the creator of the measurement data.

- Assigned by database

IsNistMeasurement : Boolean

Whether the measurement data was obtained at NIST

- Set to False for all supplied datasets. Administrator can change this field to True.
- Although not a search field, return with search result data.

FileName : String (VARCHAR (50))

Name of the measurement data file.

- User supplied
- Mandatory field
- Must not be a duplicate within the study.

MeasurementType : Enumeration

- Disc Scanning Confocal
- Laser Scanning Confocal
- Interferometry
- Focus Variation
- Photo Stereometric
- Micro Array Confocal
- Reflectance Microscopy
- Stylus
- Other

Type of measurement. These values are available for both Bullets and Cartridge Cases.

- User supplied

	<ul style="list-style-type: none"> • Mandatory field • Search field when the user searches for cartridge case measurement data
OtherMeasurementType	<p>: String (Varchar (50))</p> <ul style="list-style-type: none"> • User supplied • This is to store the description of Other MeasurementType that can be added to the list later
Measurand	<p>: Enumeration</p> <ul style="list-style-type: none"> - Photo Image - 2D Profile - 3D Topography <p>Classification of the measured quantity. These values are available for both Bullets and Cartridge Cases.</p> <ul style="list-style-type: none"> • User supplied • Mandatory field • Search field when the user searches for cartridge case measurement data
HasBreechFace	<p>: Boolean</p> <p>Whether the measured area includes the breechface impression.</p> <ul style="list-style-type: none"> • User supplied • Mandatory field • Search field when the user searches for cartridge case measurement data
HasFiringPin	<p>: Boolean</p> <p>Whether the measured area includes the firing pin impression.</p> <ul style="list-style-type: none"> • User supplied • Mandatory field • Search field when the user searches for cartridge case measurement data
HasEjectorMark	<p>: Boolean</p> <p>Whether the measured area includes the ejector mark.</p> <ul style="list-style-type: none"> • User supplied • Mandatory field • Search field when the user searches for cartridge case measurement data
HasApertureShear	<p>: Boolean</p> <p>Whether the measured area includes the firing pin aperture shear.</p> <ul style="list-style-type: none"> • User supplied • Mandatory field • Search field when the user searches for cartridge case measurement data

InstrumentBrand : String (VARCHAR (50))

Brand name of the measurement instrument.

- User supplied
- Mandatory field

InstrumentModel : String (VARCHAR (50))

Model designation of the measurement instrument.

- User supplied
- Mandatory field

LateralResolution : Real

Nominal lateral distance between two neighboring measurement points or pixels in micrometers.

- User supplied
- Mandatory field

VerticalResolution : Real

For 2D profile or 3D topography measurements, the resolution of the measurement data in the direction orthogonal to the measured surface, in micrometers.

- User supplied

LightingDirection : Enumeration

- Ring Light
- 3 O'Clock
- 6 O'Clock
- 9 O'Clock
- 12 O'Clock
- Other
- Not specified or not applicable

For photo images, the type of lighting used. These values are available for both Bullets and Cartridge Cases.

- User supplied
- Mandatory field when Measurand = Photo Image

ObjectiveMagnification : Real

Magnification of the objective.

- User supplied

- ObjectiveNA : Real
- Numerical aperture of the objective.
- User supplied
- Comment : Memo (VARCHAR (2000))
- Comments about the measurement
- User supplied
- ActiveStatus : int
- Whether the cartridge case measurement is deleted or in active status.
- Set to 1 (active) for all supplied datasets. Administrator can change this field to 0 (deleted). If in future we need more status codes, this is more flexible than using Boolean.