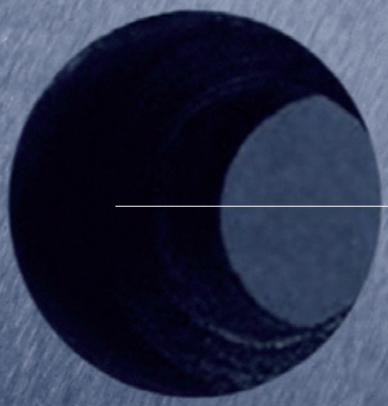
ZORROTZ

MACHINE TOOL SLIDE-WAYS



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01

At **Zorrotz Legazpi S.L.L.** we have been producing Machine Tool Slide-Ways for the past few decades.

All Machine Tool is equipped with sliding elements. A specific solution can be adopted with specific designing requirements, for each application.

In all applications, sliding guides are designed to drive with precision the rolling element, in order to guarantee a displacement, as smooth and precise as possible.

In those cases where the "Standard Linear Guides" are not able to satisfy the high requirements of precision and long durability, Special Slide-Ways, are used instead.

Our custom made Slide-Ways, are designed and manufactured in order to achieve better performances.

The Special Slide-Ways manufactured by **Zorrotz** Legazpi S.L.L., are the ideal solution for those application where long durability, high stability and a strong wear resistance are needed, when standard linear guides, equipped with rollers or bearing, are not sufficient to guarantee the desired quality.

The possibility of manufacturing Slide-Ways according to the customer`s drawing, offers to the engineering department a great flexibility at the time of customizing a product.

The materials and heath treatments used by **Zorrotz** in the production Slide-Ways, are selected according to the customer requirements: size, tolerances, final application; also taking in count cost saving requirements.

The Alloy Steel used as raw material by **Zorrotz**, is produced exclusively by the most important European Tool Steel producers.

The quality is guaranteed by industry standard certificates, available to customers upon request.

The experience accumulated by **Zorrotz** Legazpi S.L.L. performing heating treatments, guarantees the correct implementation of the process and a homogenous hardness all over the Slide-Way´s surfaces. Through hardening treatment is carried out exclusively in our facilities by experienced **Zorrotz** staff.

Apart from being able to provide a product of excellent quality, we are able to provide a first class customer service to users internationally, thanks to the network of agents available in different countries around the world.

For more information about our company, products and services visit our website at **www.zorrotz.com**

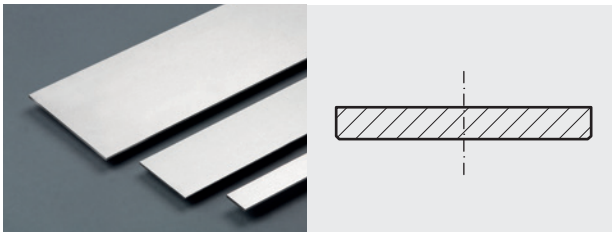
IN THE CURRENT CHAPTER, ONLY AS A DEMONSTRATIVE PURPOSE, WE ILLUSTRATE SOME COMMON EXAMPLES OF PROFILES AND SHAPES OF SLIDE-WAYS WE CAN PRODUCE. HOWEVER, THIS LIST OF EXAMPLE IS LIMITED IN COMPARISON WITH THE WIDE RANGE OF SLIDE-WAYS WE CAN MANUFACTURE AT ZORROTZ.

BEING ABLE TO MANUFACTURE PRODUCTS, UPON CUSTOMER´S DRAWING, WE ARE ABLE TO SATISFY THE MOST DIFFERENT REQUESTS.

IF AMONG THE FOLLOWING EXAMPLES YOU CANNOT FIND THE EXACT DESIGN OF THE SLIDE-WAY YOU ARE LOOKING FOR, WE INVITE YOU TO GET IN CONTACT WITH US OR ANY OF OUR AGENTS, WHO WILL BE PLEASED TO ASSIST YOU.

02.1

THIN FLAT SLIDE-WAY



These are Slide-Ways of thickness between 3 and 6 mm approximately.

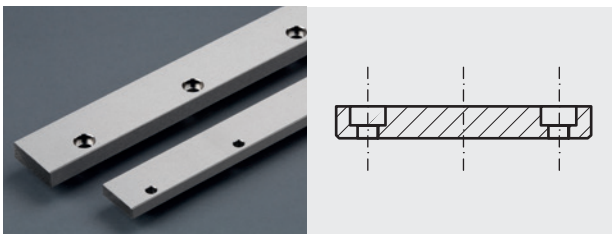
These products are generally used in order to cover pores on the casted iron machine-tool bed or revamping old machine-tool with worn out slides.

They are usually glued directly onto the machine-tool bed, and finally re-ground once they are in their final position.

Thin Flat Slide-Ways of the same purchase order, are manufactured and ground together, in order to guarantee they all have exactly the same thickness.

02.2

FLAT SLIDE-WAY WITH BORES



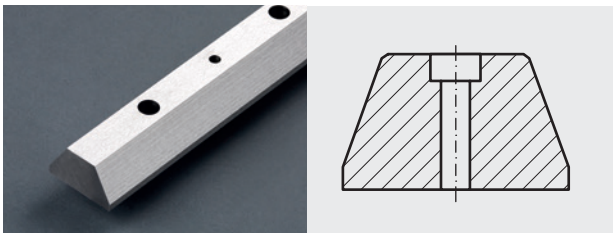
These Slide-Ways have the same function as Flat Thin Slide-Ways. The main difference between them is the technique used to secure the Slide-Ways to the machine tool bed, in this case using bolts.

Both, countersink or counterbore bores can be provided, depending on customer's needs.

Flat Slide-Ways with bores, of the same order are manufactured and ground together, in order to guarantee they have all exactly the same thickness.

02.3

PRISMATIC SLIDE-WAY



This type of Slide-Ways is generally used in applications where, apart from the sliding movement, a guide, who forces the carriage to an exact centred position, is required.

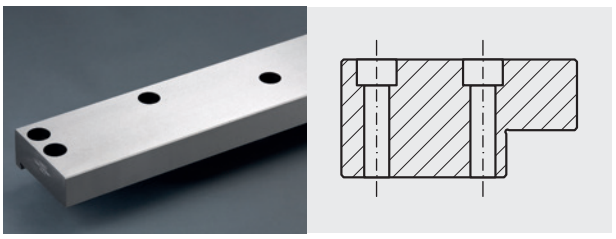
They are generally manufactured with bores that allow securing them to the machines with the help of bolts.

We can also manufacture Prismatic Ways in a shape of a circular segment. Used in conjunction with straight segments, they allow the creation of "Non-linear" path.

We guarantee that both, linear and circular segments match in size, in order to guarantee the smooth transition throughout the entire path.

02.4

SLIDE-WAY WITH MULTIPLE SLIDING SURFACES



This Slide-Way is the type that requires the highest manufacturing skills.

The sliding of the carriage, or the bearings, is performed ensuring its position on two or more surfaces, perpendicular to each other. Strict Paralelism, Flatness and Squareness tolerances are usually required on these products. Both skilful personnel and "Cutting Edge" equipment are employed in order to achieve the best results.

We are able to manufacture different profiles according to customer´s requirements.

DEPENDING ON THE TYPES OF THE SLIDE-WAYS, (FORMS, FINAL APPLICATIONS AND DIMENSIONS), WE CAN IDENTIFY A FEW CHARACTERISTICS WHICH DESCRIBES: TOLERANCES, PRECISION, SURFACE CONDITION, AND THEREBY THE QUALITY OF A SLIDE-WAY.

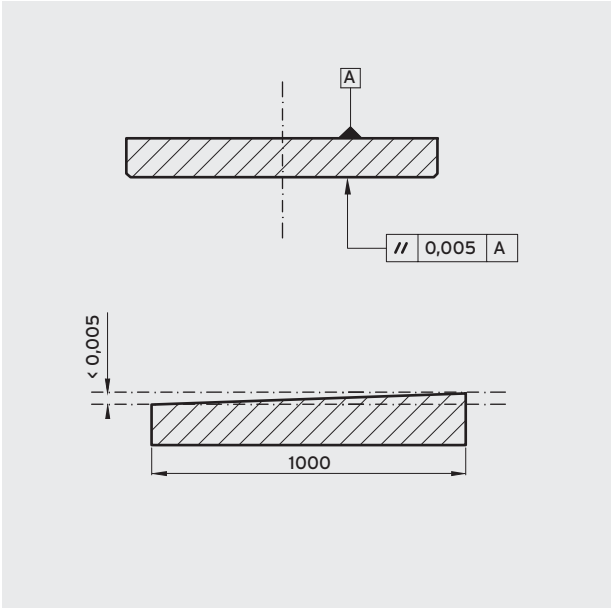
THE MAIN CHARACTERISTICS WHICH WE CAN IDENTIFY IN A SLIDE-WAY ARE:

PARALLELISM (03.1), PERPENDICULARITY (03.2), FLATNESS (03.3), ROUGHNESS (03.4).

THESE CHARACTERISTICS CAN BE MEASURED AND DEFINE THE MAXIMUM ALLOWED ERROR, ACCORDING TO INTERNATIONAL DESIGN STANDARDS.

03.1

PARALLELISM



By "Parallelism" we identify, the maximum error between two parallel flat surfaces. This characteristic is critical for the Slide-Way, due to the fact that any error of parallelism, is directly transferred to the machine´s X, Y, Z reference planes, having a direct impact on the quality and tolerances the machine can achieve.

How to measure

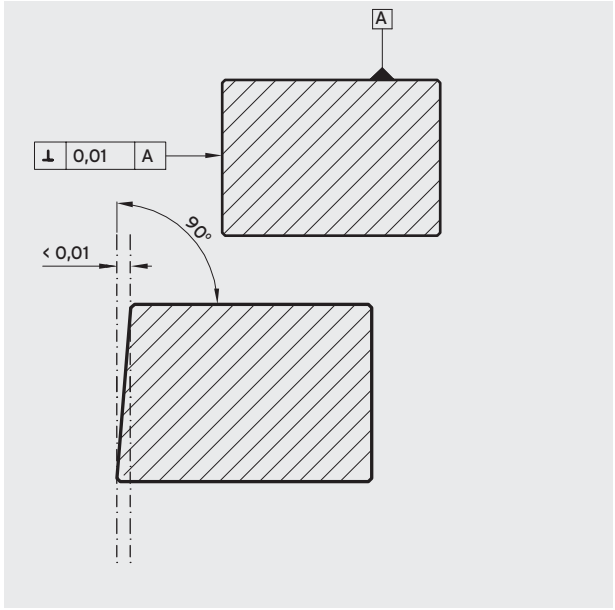
According to the following images, the value of the parallelism is the absolute value of the maximum acceptable difference between dimensions X and Y.

Usually we refer to a virtual ideal plane, or datum, "A", as the reference surface for the measurement.

It can be shown as an absolute value, over the overall length, or as a value of mm/Mt.

03.2

SQUARENESS



As the parallelism, the squareness is another important characteristic for Slide-Ways.

Any dimensional error in squareness, has a direct influences in the positioning of the headstock or the carrier, therefore in tolerances and quality the machine will eventually achieve.

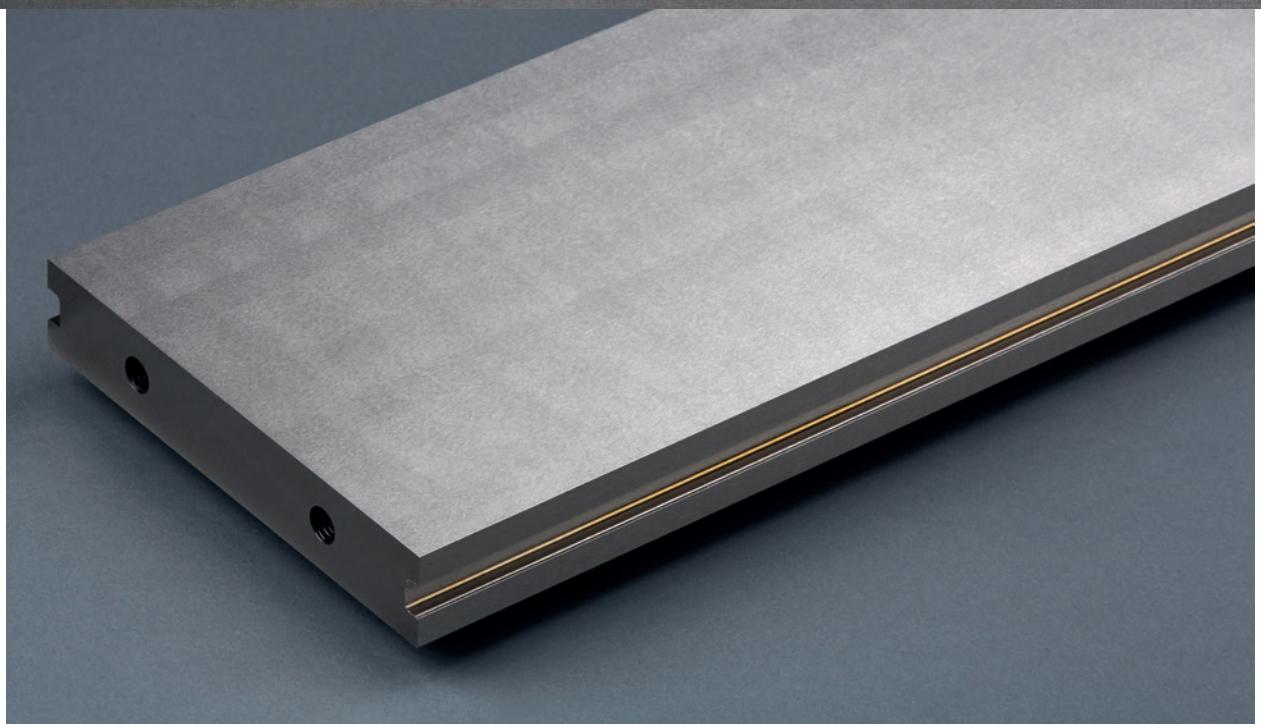
The squareness, defines the absolute value of the maximum error between two perpendicular surfaces.

Usually we refer to a virtual ideal plane, or datum, "A", as the reference surface for the measurement.

How to measure

Taking as a reference a Flat surface (Datum) "A", the value of squareness, is the maximum allowable error measured between the ideal plane, perpendicular to the reference surface, and the real piece.

It can be shown as an absolute value, over the overall length, or as a value of mm/Mts.

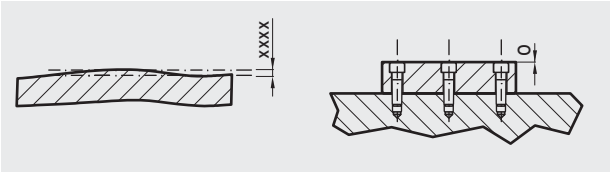


03.3

FLATNESS

The flatness defines the maximum allowable error between an "ideally flat surface" and the real surface we need to measure the flatness of. Flatness can be measured with the Slide-Way in two different positions:

- Free state
- Fastened to the machine tool bed



As shown in the pictures, depending on the measuring method (Free state or Fastened), the flatness of the same Slide-Way can change remarkably.

The flatness of the Slide-Way when "fastened", can be shown as:

SLIDE-WAY FLATNESS < = Bed flatness + Slide-Way Parallelism

The importance of the flatness in Slide-Ways and the method of the measurement, depends on the final use and the type of machine.

Generally, the flatness should be measured always after having fastened the Slide-Way on the machine-tool bed.

This mainly due to the fact that:

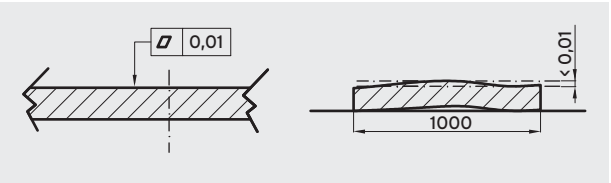
- The final flatness will depend mainly on the bed flatness.
- Achieving a restricted flatness of the Slide-Way in a "free state" has a strong impact on the production costs.

Generally, when the sum of the flatness errors, between the tool machine bed and the Slide-Ways, is higher than the required flatness, a final grinding of the whole assembly, might be necessary.

How to measure

As mentioned previously, before measuring the flatness of the Slide-Ways, it is important to define whether the measurement should be in a "free-state" or "fastened on the tool machine bed".

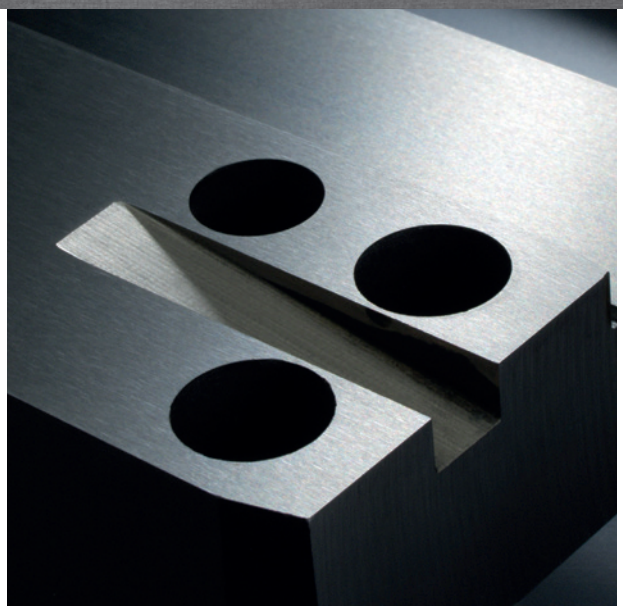
In all cases, the flatness of a surface will be the difference between its highest and lowest points.



All the **Zorrotz** Legazpi S.L.L. Slide-Ways are produced considering the flatness as measured once the piece is mounted and correctly fastened to the machine.*

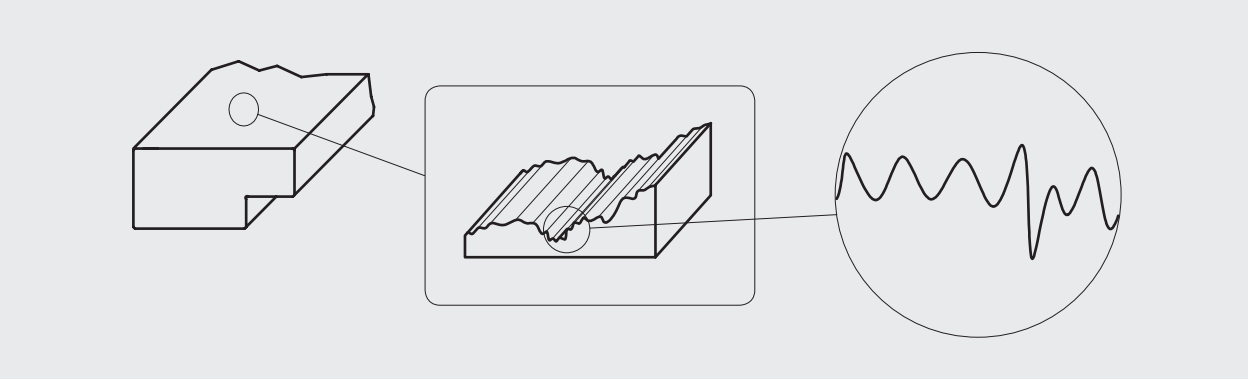
In this case, the flatness will always be equal to the maximum parallelism error.

* unless otherwise specified on the drawing



03.4

ROUGHNESS



The roughness is the property describing the state of any machined surface.

Any tool machining process, create furrows on the machined surface.

Depending on the tool type and speed used during the manufacturing process, the size of the resulting furrows changes.

The size and shape of these small irregularities, defines the surface roughness.

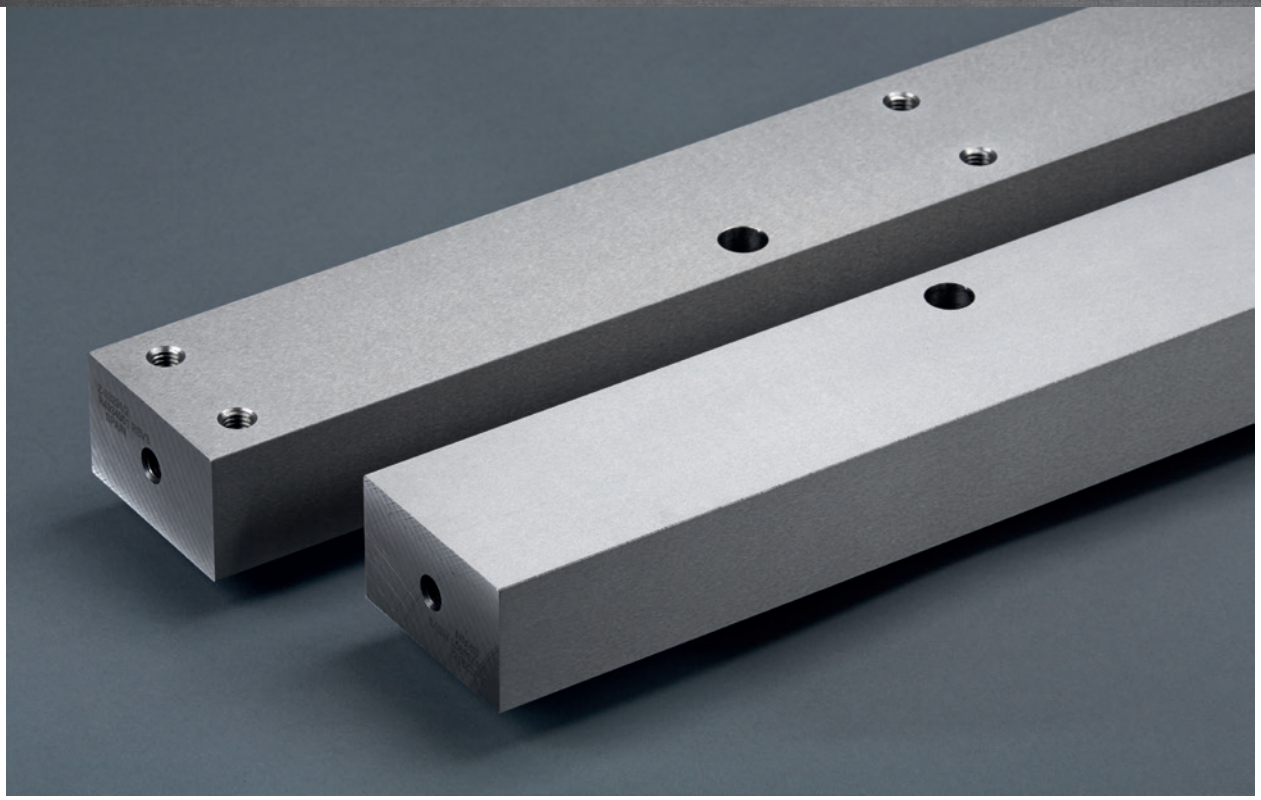
How to measure

The rougness of a surface is measured by a specific instrument called Profilometer, or Surface Roughness Tester.

The procedure of defining the roughness, consist in recording the profile of the surface and measuring the amplitude of its peaks.

Roughness can be defined according to various scales and units.

If not specified otherwise, the unit scale used by **Zorrotz** for the measurement of the roughness is "Ra".



THANKS TO THE FLEXIBILITY OF OUR PRODUCTION PROCESSES, WE ARE ABLE TO PRODUCE SLIDE-WAYS OF MULTIPLE PRECISIONS AND FINISHING.

IN THE FOLLOWING TABLE, YOU CAN FIND TWO DIFFERENT QUALITY STANDARDS (STANDARD AND FINE).

FOR BOTH STANDARDS, WE ALSO LIST THE TYPICAL DIMENSIONS FOR EACH ONE OF THE CHARACTERISTICS.

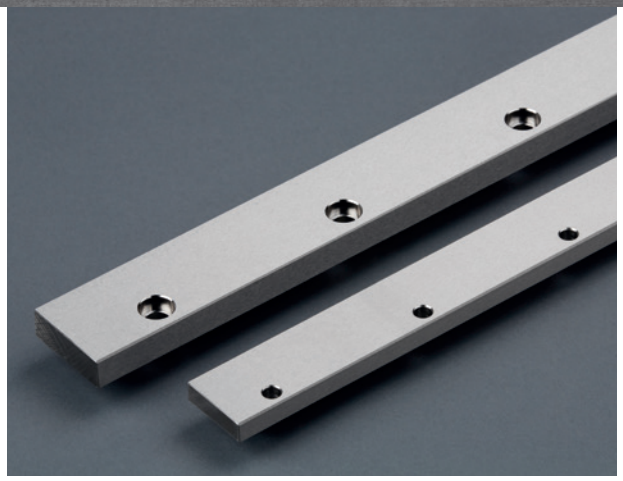
"STANDARD": Dimensional Tolerances which satisfy the majority of the guides produced for the Machine-Tool market.

"PRECISION": Fine dimensional tolerances, applicable to those products which require a higher precision.

	STANDARD	PRECISION
PARALLELISM	< 0,02	< 0,01
PERPENDICULARITY	< 0,05	< 0,005
FLATNESS*	< 0,15/Mt	< 0,005/300mm (0.015/Mt)
ROUGHNESS	Ra 0,8	Ra 0,2

*Flatness measured in "free state"

	STANDARD	PRECISION
THICKNESS	+/- 0,1	+/- 0,005
LENGTH	+/- 1	+/- 0,1



IN ORDER TO ASSEMBLE THE SLIDE-WAYS TO THE MACHINE, THE MAJORITY OF THEM REQUIRE HOLES, (COUNTERSINK, COUNTERBORE OR THREADED).

HOLES CAN BE MANUFACTURED ACCORDING TO ALL INTERNATIONAL STANDARDS FOR BOLTS AND SCREWS (I.E.: UNI 5931/DIN 912/ ISO 261/ISO 262 ECC.)

Unless a bevel is correctly indicated on the customer drawing, all holes will be finished breaking sharp edges.

The positioning of the holes, and the precision of the distance centre to centre between holes, can change depending on the manufacturing processes used.

The main factor which can influence the precision of the distance centre to centre is the contraction or distension of the steel, during the heating treatment.

During designing process, the engineers should keep in mind the following warnings:

1) Drilling parts after "Through Hardening", is a time-demanding and difficult operation and it requires special costly tools to be performed.
2) During "Through Hardening", the piece, either shrink or elongate. This makes difficult to control the distance between centres of two holes.
3) Since "Induction Hardening" is a surface treatment of approximately 3 mm depth, it is easier and faster to drill an induction hardened workpiece than a through hardened workpiece.

   As a consequence, it is also cheaper to achieve restricted tolerances on the dimensions involving distances between the centres of holes.
4) Nitriding is a heat treatment which does not deform the workpiece. Any drilling can be performed before the heating treatment, as the centre to centre holes distance will not change.

   Besides, being the nitride surfaces, extremely hard to machine, it is not advisable to drill them after the treatment is applied.

In the following table you will find a summary of the tolerances we can achieve in Slide-Ways, for each of the heating treatments mentioned above.

As we are continuously improving our processes and precisions, feel free to contact us in order to know all our possibilities.

	STANDARD	PRECISION
THROUGH HARDENING*	+/- 0,7 mm/mt	+/- 0,1mm/mt*
INDUCTION TEMPERING		+/- 0,1mm/mt
NITRIDING	+/- 0,5 mm/mt	+/- 0,5 mm/mt

*Any drilling performed after the "Through hardening" increases the cost of production.

06.1

TOOLS STEELS

Steel used in the production of Slide-Ways, is generally part of the family of "Tool Steels". This family of steels include only high alloyed steels. Their chemical composition is specifically thought, in order to allow for heating treatments to be applied, and enhance the steel properties.

All steel used by **Zorrotz**, is produced by the biggest European tool steel producers. Their quality is guaranteed by their quality management systems and internationally recognised certifications.

The Slide-Ways made by **Zorrotz** are done with selected steels in order to guarantee:

- Low friction resistance
- High wear resistance
- Long life of the Slide-Way
- Rolling elements resistance
- Surface hardness

Depending on each specific application, technical specifications and dimensional tolerances, we are able to provide different solutions, proposing the proper steel to be used and heating treatment to be applied.

We are able to satisfy the customer´s request, suggest alternative solutions, providing the required technical solution, at the most competitive level.

06.2

HARDNESS

The hardness is one of the most important characteristics of a Slide-Way. A higher hardness is generally synonymous of a good wear resistance and, in turn, longer durability over the time.

The usual heating treatments offered by **Zorrotz** are:

Through Hardening:
- The part is fully heated and tempered down to the "core" of the piece
- The Slide-Way will have the same hardness all over
- Allows achieving very high resistance to compression
- Non indicato per guide di grandi spessori
- Not indicated for Slide-Ways with strict tolerances on the distance "centre to centre" of holes

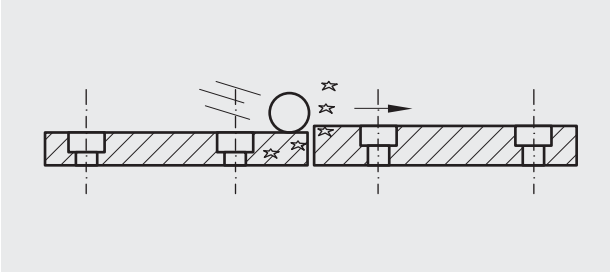
Induction tempering:
- Surface treatment
- The hardness on the piece reaches a maximum depth of 3 mm
- Economically advantageous for Slide-Ways of big thickness

Nitriding:
- Depth of hardness limited to 1 mm.
- Hardness can reach 1000 Vickers (Depending on the steel used).
- Dimensional stability is guaranteed during heating treatment.
- Not indicated for Slide-Ways with high thickness or where high compression resistance is needed.

In the following table we can find a summary of the most common steels used for the production of Slide-Ways, some of the heating treatments we can execute, maximum hardness achievable and finally, the maximum length we are capable of manufacturing in one piece.
If the solution you are looking for is not available on this list, please get in touch with us as we are always finding new solutions for our customers.

HEATING TREATMENT	DIN STANDARDS	WERKSTOFF STANDARD	HARDNESS	HARDNESS DEPTH	HARDNESS AT THE CORE	MAX LENGTH (mm)
THROUGH HARDENING	90MnCrV8	1.2842	Up To 58/60 HRC			3.8 Mt
	X155CrVMo121	1.2379	Up To 60/62 HRC			3.8 Mt
	X210CrV12	1.2080	Up To 60/62 HRC			3.8 Mt
TEMPERING INDUCTION	C60		Up To 60/62 HRC	Up To 3 mm		4 Mt
	C45		Up To 58/60 HRC	Up To 3 mm		4 Mt
	40CrMnMo7	1.2311	Up To 58/60 HRC	Up To 3 mm	100 Kg/mm2	4 Mt
	40CrMnMoS8.6	1.2312	Up To 58/60 HRC	Up To 3 mm	100 Kg/mm2	4 Mt
	90MnCrV8	1.2842	Up To 58/60 HRC	Up To 3 mm		4 Mt
NITRIDING	HARDOX 500 (UNI)	URSSA 500	Up To 1000 Vickers	0,1 mm → 1mm	500 Vickers	7 Mt
	HARDOX 400 (UNI)	URSSA 400	Up To 1000 Vickers	0,1 mm → 1mm	400 Vickers	7 Mt

THICKNESS



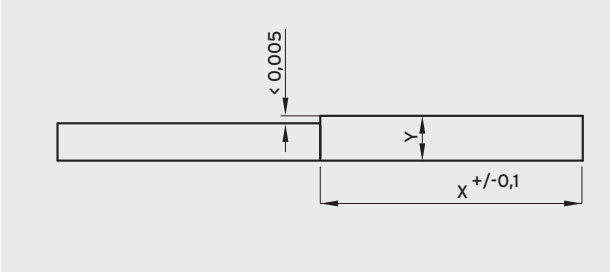
The line of union between two Slide-Ways, is a very critical area. Any difference, even if small, can affect the correct sliding or rolling of the moving elements.

Any error can lead to an early wear of the sliding element, and generate unexpected vibrations.

To limit any critical situation to a minimum, at **Zorrotz**, we are able to produce Slide-Ways perfectly joined between them.

In case the use requires perfectly joined Slide-Ways, it should be clearly indicated on the drawing with a note (i.e. "Grind all ways together", "All ways at the same exact thickness")

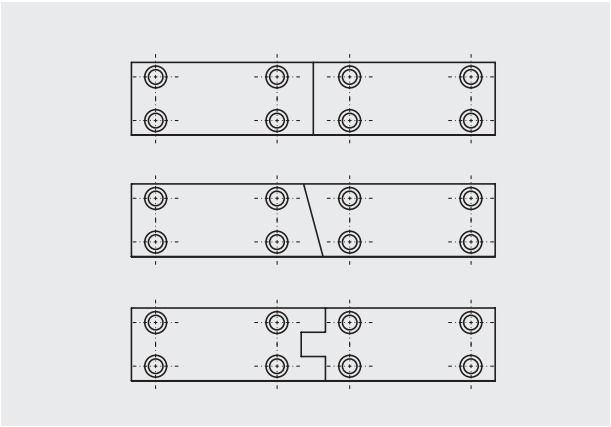
HEAD TO HEAD



When multiple pieces are assembled together, any small difference in the "length dimension" will accumulate.

For all Slide-Ways, that need to be assembled in sets of two or more, the length dimension should be quoted with restricted tolerance.

TYPE OF JOINTS



The joint between the Slide-Ways can be done in different forms according to their final application.

Below some examples:

	APPLICATION	ADVANTAGES	DISADVANTAGES
STRAIGHT	General	Standard manufacturing process	Possible skipping
TILTED	Special for tool machine high precision	Smooth and progressive transition of the rolling elements	Not standard manufacturing process
SQUARE	Special application	For special applications (assembling and alignment)	Complex execution

08

TRACEABILITY

All our products are produced according to the "highest workmanship standards". We execute production and project management processes, according to the specifications specified by our Quality Management

The data of all relevant production processes is recorded for future traceability.

All our Slide-Ways are identified and etched with the **Zorrotz** logo, and the internal "Manufacturing Order Identification Number".

This number allows us, to identify and trace back to the production data of the Slide-Way, even years after the manufacturing date.

09

CERTIFICATIONS

10.1

QUALITY SYSTEM

Zorrotz Legazpi is committed to the highest quality standards. Our internal Quality Management System covers all Management, Manufacturing and Quality Check processes.

The certification of our Quality Management System is made according to the ISO 9001 standard which guarantees its correct application. (Since 1999)

Certificado

Norma de aplicación ISO 14001:2004

N° registro certificado 3 00.12141

TÜV Rheinland Ibérica Inspection, Certification & Testing S.A. certifica:

Titular del certificado: ZORROTZ LEGAZPI, S.L.L.
Bº Olaberria, 7
E - 20230 LEGAZPI (GIPUZKOA)

Ámbito de aplicación: Producción de cuchillas industriales rectas y circulares, útiles de plegadora, reglas de deslizamiento.

Mediante auditoría realizada, según consta en el informe nº 12141 se verificó el cumplimento de los requisitos recogidos en la norma ISO 14001:2004.

La fecha límite para la auditoría de seguimiento es 11-12 (dd-mm).

Validez: Este certificado es válido desde 2013-01-30 hasta 2016-01-29.
Fecha de primera certificación 2013-01-30.

2013-02-06 TÜV Rheinland Ibérica Inspection, Certification & Testing S.A. Carrotxa, 10-12 – E-08820 El Prat de Llobregat

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10.2

ENVIRONMENT MANAGEMENT SYSTEM

The **Zorrotz´s** strong compromise with a clean environment and a correct waste management, has brought **Zorrotz** Legazpi S.L.L. to obtain the ISO 14001 certification (year 2002).

Certificado

Norma de aplicación ISO 9001:2008

N° registro certificado 0.04.12241

TÜV Rheinland Ibérica Inspection, Certification & Testing S.A. certifica:

Titular del certificado: ZORROTZ LEGAZPI, S.L.L.
Bº Olaberria, 7
E - 20230 LEGAZPI (GIPUZKOA)

Ámbito de aplicación: Producción de cuchillas industriales rectas y circulares, útiles de plegadora, reglas de deslizamiento.

Mediante auditoría realizada, según consta en el informe nº 12241 se verificó el cumplimento de los requisitos recogidos en la norma ISO 9001:2008.

La fecha límite para la auditoría de seguimiento es 11-12 (dd-mm).

Validez: Este certificado es válido desde 2013-01-30 hasta 2016-01-29.
Fecha de primera certificación 2013-01-30.

2013-02-06 TÜV Rheinland Ibérica Inspection, Certification & Testing S.A. Carrotxa, 10-12 – E-08820 El Prat de Llobregat

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CONTACT INFORMATION

Bº Olaberria, Nº 7
20230 LEGAZPI (Gipuzkoa) Spain

T. +34 943730950
F. +34 943730975

E: comercial@zorrotz.com

www.zorrotz.com

ZORROTZ

Bº Olaberria, Nº 7
20230 LEGAZPI (Gipuzkoa) Spain

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