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European Technical Assessment

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Trade name of the construction product

Designação comercial do produto de construção

FITECHNIC

Product family to which the construction product belongs

Família de produtos a que o produto de construção pertence

Point supported vertical glazing

Envidraçado vertical com fixações pontuais

Manufacturer

Fabricante

PENTAGONAL, Lda
Rua Virgílio Martinho
1600-821 Lisboa
Portugal
<https://pentagonal.com/>

Manufacturing plant(s)

Instalações de fabrico

Rua Virgílio Martinho
1600-821 Lisboa
Portugal

This European Technical Assessment contains

A presente Avaliação Técnica Europeia contém

26 pages, including 4 annexes which forms an integral part of this assessment

26 páginas, incluindo 4 anexos que faz parte desta avaliação

This European Technical Assessment is issued in accordance with Regulation (EU) No. 305/2011, on the basis of

A presente Avaliação Técnica Europeia é emitida ao abrigo do Regulamento (UE) n.º 305/2011, com base no

European Assessment Document (EAD)
No. EAD 090017-00-0404, edition October 2015
Documento de Avaliação Europeu (DAE) n.º EAD 090017-00-0404, edição de outubro de 2015

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1 Technical description of the product

FITECHNIC is a kit for point-supported vertical glazing. The kit includes glass panes, point fastener made of stainless steel and nylon parts to apply between glass and metal.

The point fasteners are of type 316 stainless steel (ASTM A276:2017), corresponding to type X5CrNiMo17-12-2, 1.4401 (EN 10088-3:2014), being shown in Annex 1. The parts to be interposed between the glass and the metal are made of nylon and are shown in Annex 2.

The flat glass panes of the system, with some of their characteristics, are as follows:

1. Thermally toughened safety glass, according to the standard (EN 12150-2:2004);
2. Heat strengthened glass, in accordance with the standard (EN 1863-2:2004) to be incorporated into laminated glass;
3. Heat soaked thermally toughened safety glass, according to the standard (EN 14179-2:2005);
4. Laminated safety glass, in accordance with the standard (EN 14449:2005), with glass panes of the type referred to in the previous paragraphs (1), (2) or (3)) and a polyvinyl butyral (PVB) interlayer film with, at least 0.76 mm thick, or SentryGlas® with 1.52 mm thick;
5. The base product of glass is soda lime silicate, according to the standard (EN 572-9:2004);
6. The edges of the glass have a polished finish (EN 12150-1:2000; EN 1863-1:2011);
7. Glass panes with the maximum size of 3000 mm × 6000 mm;
8. Rectangular and square glass panes with at least four point fasteners;
9. Glass panes thicknesses specified in Table 1;
10. The dimensional tolerances of the glass panes (width and height) are those specified in Table 2.

The glass panes have countersunk drilled holes or cylindrical drilled holes with the dimensions specified in Annex 1, depending on the stainless-steel bolts acting as point-fasteners. In the holes, the bolt and fixture plates are applied, with nylon spacers being interposed between the glass and the metal. The bolts and fixture plates are factory assembled. The fixture plates are tightened with a torque of 10 to 15 N.m. The articulated screw on site is fastened to a metallic substructure, using the parts indicated in Annex 3.

The thickness of the glass panes to be adopted on site results from the calculation and verification of the mechanical strength (see 2).

In laminated safety glass, pairs of glass panes of the same thickness are used. For glass panes with 8 and 10 mm, the PVB thickness must be at least 0.76 mm; while for glass panes with 12 mm, the PVB thickness must be at least 1.52 mm. The tolerances of the position of the drilled holes related to the corner of the plate shall be at most ± 3 mm. The hole mismatch and the plate mismatch at the edge shall be at most 2 mm.

TABLE 1
Kit glass panes thickness

Glass type	Dimensions (mm)		
Thermally toughened with HST	8	10	12
Security laminate	2 × 8	2 × 10	2 × 12

TABLE 2
Glass width and height tolerances

Width or height of glass (mm)	Tolerance (mm)
≤ 1000	± 1.5
≤ 2000	± 2.0
≤ 3000	± 2.5
≤ 4000	± 3.0
≤ 5000	± 4.0
≤ 6000	± 4.0

2 Specification of the intended use in accordance with the applicable European Assessment Document

Intended use

This product is intended for use in ventilated curtain walls façades or in internal space-enclosing vertical glazing. The glass is fixed to a support substructure, free of tension, and with a maximum inclination of 10° in relation to the vertical direction. This system is not intended to give rigidity to other components. This system is not qualified as a barrier against falling.

The performance characteristics indicated in section 3 are valid only if the point supported vertical glazing kit is used in accordance with the specifications and conditions indicated in this section.

The assessment and verification methods on which this European Technical Assessment is based lead to the assumption of a working life of the point-supported vertical glazing of at least 25 years, provided that the conditions laid down in "general assumptions" for the use/maintenance are met.

The indication given on the working life cannot be interpreted as a guarantee given by the producer, but are to be regarded only as a mean for choosing the right products in relation to the expected economically reasonable working life of the works.

General assumptions

For each work, it is necessary to develop a project that guaranties the mechanical resistance of the kit installed in the substructure, for the serviceability limit states (SLS) and for the ultimate limit state (ULS).

To ensure the mechanical strength of the glass and the kit, the tests specified in EAD 090017-00-0404 must be carried out, as well as an assessment with finite elements method that includes the reaction forces, combinations of stresses and deformations on the glass (central area and close to the point support) and on the metal parts of the point support. All effects relevant to the strength of the solutions must be considered and be adequately simulated in the calculation, namely: contact between glass, nylon and metal, length of the screw and the flexibility of the substructure. The point support are simulated with three-dimensional models, taking into account the material characteristics and the stresses in all contacts points between components, as well as the types of glass support, i.e. fixing point, movable bearing in horizontal direction, movable bearing in two directions (see Annex 1 and 4). In the model, the stresses due to friction between glass and nylon and between nylon and metal can be neglected.

For the serviceability limit states, neither the deflection of 1/100 of the distance between two consecutive supports, nor the deformation of 50 mm of the glass relative to the fixing points, may be exceeded.

The design must comply with the applicable national rules.

The substructure to which the FITECHNIC kit (includes glass and point support) is fixed must withstand the actions and combinations of actions foreseen in the project, taking into account the serviceability limit state and the ultimate limit state, and must satisfy the following requirements:

- i.** The dead load and the wind actions must be supported by the substructure, which must be verified by calculation.
- ii.** The effect of temperature on the kit and on the substructure must be considered and must be verified by calculation, for the applicable temperature differences, with a minimum variation in the range of ±30 °C. Sliding supports must be able to compensate the thermal expansion and manufacturing tolerances.
- iii.** The deformation of the substructure relatively to the serviceability limit state must be limited to 1/300 of the distance between supports.
- iv.** In the design of the substructure, the manufacturing tolerances of the various components of the kit must be considered, and the fixing of the glass panes must be ensured with a fixed support, movable bearing in horizontal direction and movable bearing in two directions, as indicated in the Annex 4. In the design of the substructure and in the fixing of the point support to it, in the sliding supports, solutions must be provided to ensure that the thermal expansion is allowed. The size of the joint between glass panes must be defined in such a way as to prevent contact between glass panes.

The technical manual of the system provides installation, maintenance, and periodic inspection instructions.

3 Performance of the product and references to the methods used for its assessment

Sampling, conditioning, testing and assessment for the intended use of this point supported vertical glazing kit, in accordance with the Essential Requirements, were carried out in accordance with EAD 090017-00-0404 *Point supported vertical glazing*. Table 3 presents the relevant performance of the kit declared by the manufacturer and the corresponding methods used in its assessment.

TABLE 3
Performance of the product and assessment methods

Basic Requirement	Essential characteristic	Assessment method	Expression of product performance (level, class, description)	
BWR 1 Mechanical strength and stability	Characteristic load bearing capacity and displacements Probability of NiS-induced (Nickel Sulphide) failure of tempered glass	1.5.1 of EAD 090017-00-0404	Characteristic bending strength of the different glass products Heat Soaking process Compound effect of laminated glass Adhesion behaviour	Performance not assessed
		1.5.2 of EAD 090017-00-0404	Characteristic of the point fastener	Stainless steel 1.4401, X5CrNiMo 17-12-2 (EN 10088) $R_{p0.2\%} \geq 200$ MPa, $R_m : 500$ a 700 MPa Brinell Hardness ≤ 215
		1.5.3 of EAD 090017-00-0404	Modulus of elasticity of materials between glass and metal	$E = 2450$ MPa
BWR 2 Fire safety	Reaction to fire	1.5.4 of EAD 090017-00-0404	Single glazing and point fasteners meet fire reaction class A1	A1
	Fire resistance	1.5.5 of EAD 090017-00-0404	Classification of laminated safety glass The classification depends on the substructure and therefore the class must be determined for each the individual case	Performance not assessed

4 Assessment and verification of constancy of performance (hereinafter AVCP) system applied, with reference to its legal base

According to Decision 2003/656/EC of the European Commission, of 17 September 2003, the system of assessment and verification of constancy of performance (see Annex V, amended by Delegated Regulation (EU) No. 568 /2014 of the European Commission, of 18 February 2014, and number 2 of article 65 of Regulation (EU) No. 305/2011) is shown in Table 4.

TABLE 4
System of assessment and verification of constancy of performance

Product	Intended use	Levels or classes	System
Vertical glazing with point fasteners	Buildings	–	1
	For uses subject to regulation on reaction to fire	–	1/3/4

5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable EAD

5.1 General

The ETA is issued on the basis of agreed data/information, deposited in LNEC, which identifies the product that has been assessed. It is the manufacturer's responsibility to make sure that all those who use the kit will be appropriately informed of the specific conditions laid down in this ETA, including its annexes.

Changes to the point supported vertical glazing kit or the components or their production process should be notified to LNEC before changes are introduced. LNEC will decide whether such changes affect the ETA and, if so, whether further assessment or alterations to the ETA shall be necessary.

5.2 Manufacturer tasks

Factory production control

The manufacturer shall exercise permanent internal control of production. All the elements, requirements and provisions adopted by the manufacturer shall be documented in a systematic manner in the form of written policies and procedures, including records of obtained results.

This production control system shall ensure that the product is in conformity with this ETA.

The manufacturer may only use components specified in the technical documentation of this ETA. The incoming raw materials are subjected to verifications by the manufacturer before acceptance.

For the components of the point supported vertical glazing kit, which the manufacturer does not manufacture by himself, he shall make sure that the factory production control carried out by the other manufacturers guarantees the components compliance with the ETA.

The factory production control shall be in accordance with the Control Plan ¹, which is part of the Technical Documentation of this ETA.

The control plan has been agreed between the manufacturer and the LNEC and is laid down in the context of the factory production control system operated by the manufacturer and deposited within LNEC. The results of factory production control shall be recorded and evaluated in accordance with the provisions of the control plan.

Other manufacturer tasks

The manufacturer shall, on the basis of a contract, involve a body (bodies) which is (are) notified for the tasks referred to in section 4 in the field of point supported vertical glazing kit in order to undertake the actions laid down in this clause. For this purpose, the control plan shall be handed over by the manufacturer to the notified body (bodies) involved.

For assessing the point supported vertical glazing kit and its components the results of the tests performed as part of the assessment for the ETA shall be used unless there are changes in the production line or plant. In such cases the necessary tests have to be agreed with LNEC.

The declaration of performance of the point supported vertical glazing kit to be drawn up by the manufacturer following the issue of this ETA shall include its reference number and issue date.

Changes to the point supported vertical glazing kit or its components or their production process should be notified to LNEC before the changes are introduced. LNEC will decide whether such changes affect the ETA and if so whether further assessment or alterations to the ETA shall be necessary.

5.3 Tasks for the notified body (bodies)

Notified bodies undertaking tasks under system 1 shall consider the European Technical Assessment issued for the kit as the assessment of the kit performance. Notified bodies shall therefore not undertake the tasks referred to in point 1.2 (b)(i) of Annex V of Regulation (EU) no 305/2011, unless there are changes in the manufacture or manufacturing plant. In such cases, the necessary assessment and verifications must be agreed between LNEC and the notified product certification body.

Within the scope of the initial inspection of factory and of factory production control, the notified body (bodies) shall ascertain that, in accordance with the Control Plan, the factory (in particular the personnel and the equipment) and the factory production control are suitable to ensure continuous and orderly manufacturing of the components according to the specifications mentioned in this ETA.

Within the scope of continuous surveillance, assessment and evaluation of factory production control, the notified body (bodies) shall visit the factory at least once a year for surveillance. It must be verified that the factory production control is maintained in suitable conditions.

¹ The Control Plan is a confidential part of this European Technical Assessment and is only handed over to the notified body or bodies involved in the procedure of assessment and verification of constancy of performance. See section 5.3.

These tasks shall be performed in accordance with the provisions laid down in the Control Plan.

The heat soak process must be evaluated by a notified body at least twice a year.

The notified body (bodies) shall retain the essential points of its (their) actions referred to above and state the results obtained and conclusions drawn in a written report.

Under systems 1 the notified certification body(ies) involved by the manufacturer shall issue respectively a certificate of constancy of performance of the kit and a certificate of conformity of the factory production control on the basis of the assessments and verifications carried out by that (those) body(ies).

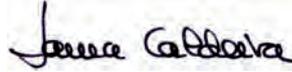
In cases where the provisions of the ETA and its control plan are no longer fulfilled, the notified certification body(ies) shall withdraw the certificate(s) issued and inform LNEC without delay.

Issued in Lisbon on 27-04-2023

By

Laboratório Nacional de Engenharia Civil (LNEC)

THE BOARD OF DIRECTORS

A handwritten signature in black ink, appearing to read 'Laura Caldeira', is written over a light grey rectangular background.

Laura Caldeira
President

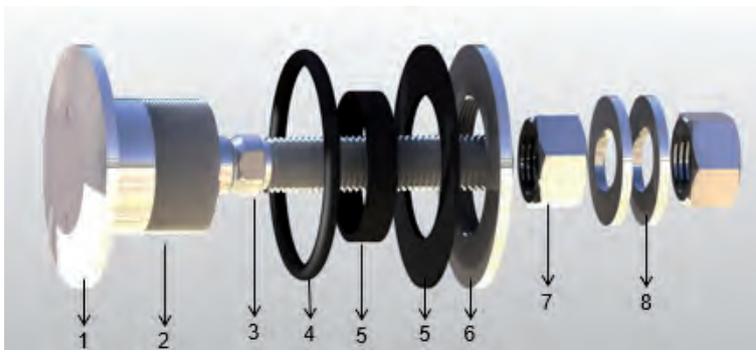
Annex 1 – Screw bolts, metal parts and drilled holes in the glass

Table 1 shows the references of the articulated point supports used in the kit.

TABLE 1
Articulated point supports of the kit

Point support with fixture front plate	Countersunk screw
RT 12-21 M14	RE 12-21 M14
RCT 10-21 M14	RCE 10-21 M14
RDT 28-36 M14	RD 28-36 M14

RT 12-21 M14: Articulated point support with fixture front plate



Components	N°
Fixture front plate and threaded body	1 and 2
Articulated screw M14	3
Nylon O-ring	4
Nylon spacer/washer	5
Threaded fixture back plate	6
Hex nut M14	7
Washer	8

Figure 1 – Articulated point support with fixture front plate RT 12-21 M14: constitution

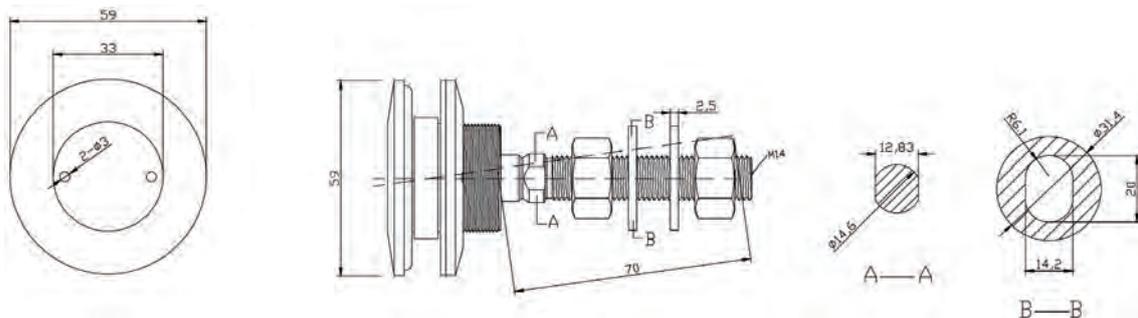


Figure 2 – Articulated point support with fixture front plate RT 12-21 M14: drawing

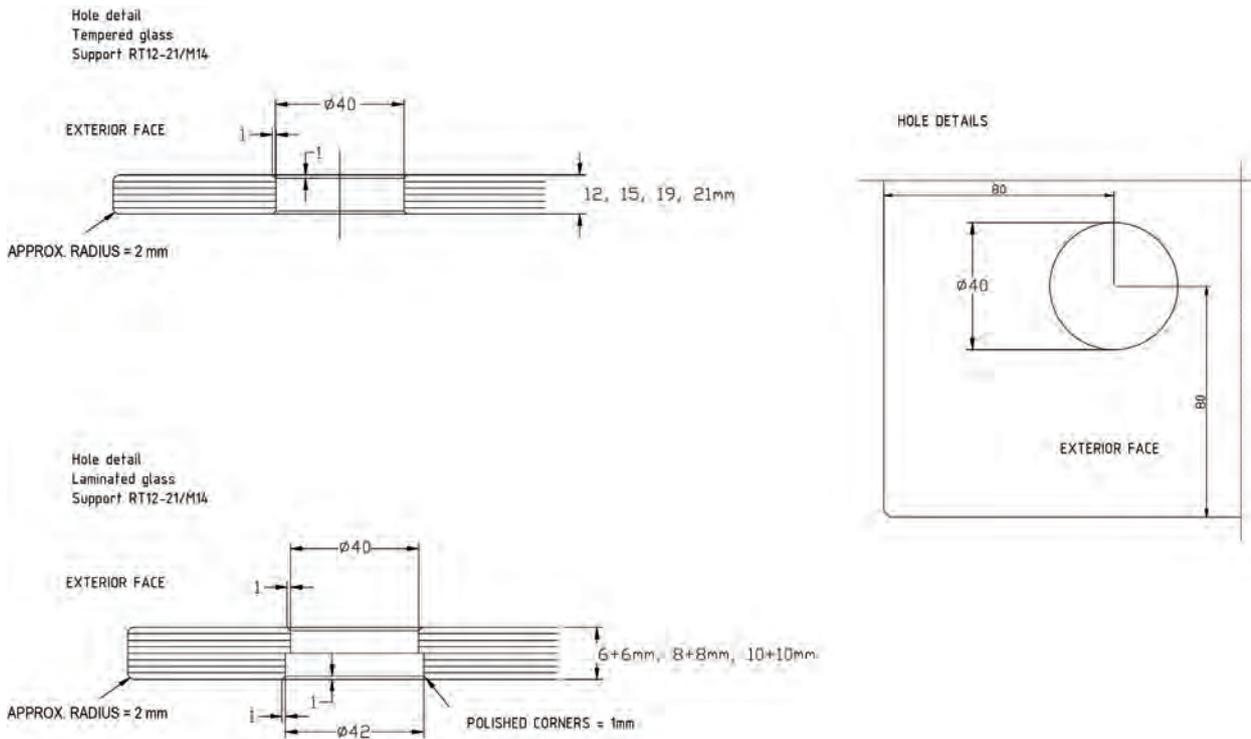


Figure 3 – Articulated point support with fixture front plate RT 12-21 M14: hole in the glass

RE 12-21 M14: Articulated point support with countersunk threaded body

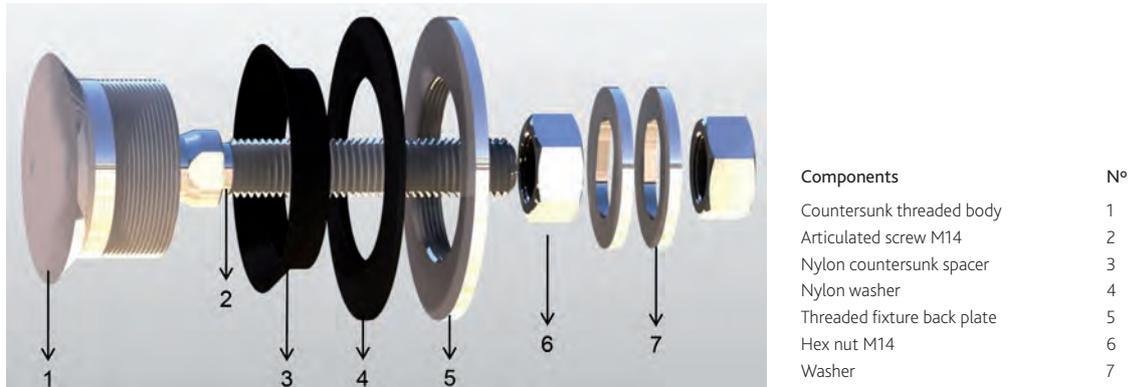


Figure 4 – Articulated point support with countersunk threaded body RE 12-21 M14: constitution

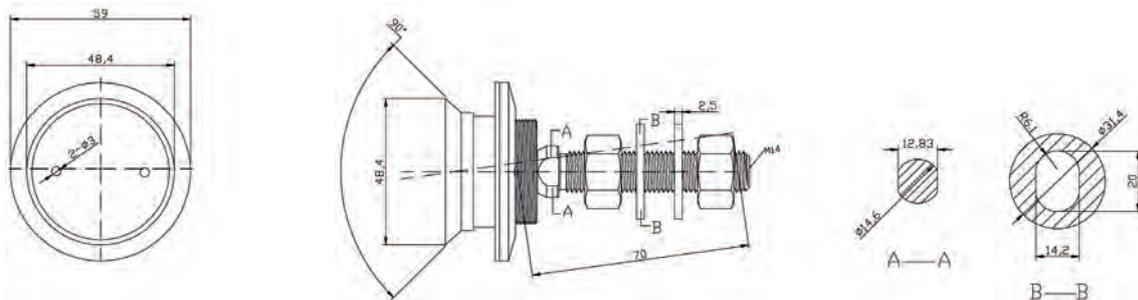


Figure 5 – Articulated point support with countersunk threaded body RE 12-21 M14: drawing

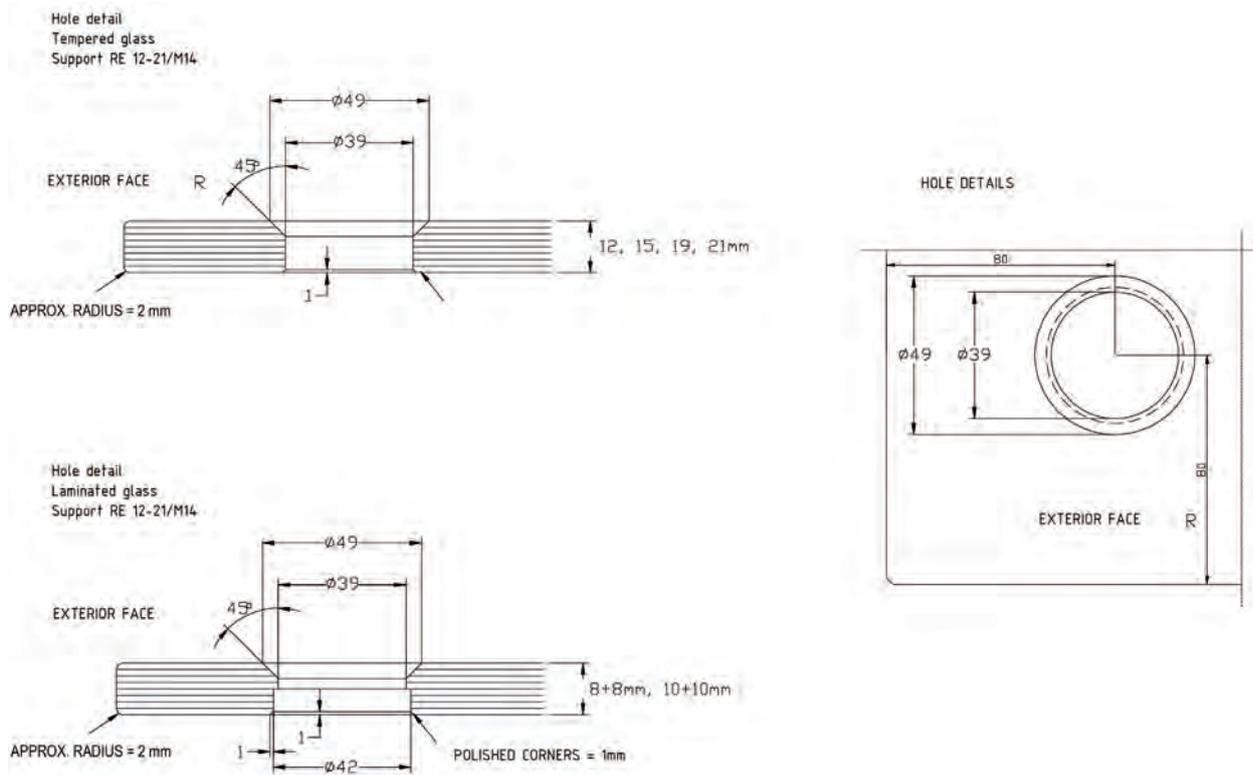


Figure 6 – Articulated point support with countersunk threaded body RE 12-21 M14: hole in the glass

RCT 10-21 M14: Articulated point support with fixture front plate

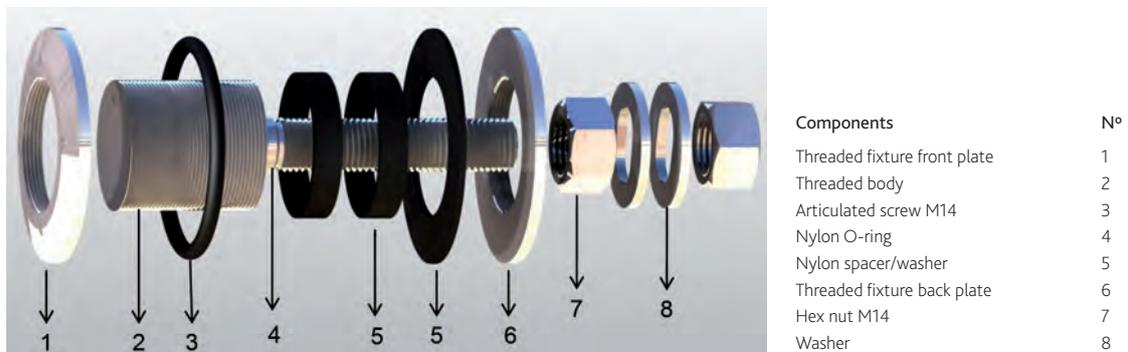


Figure 7 – Articulated point support with fixture front plate RCT 10-21 M14: constitution

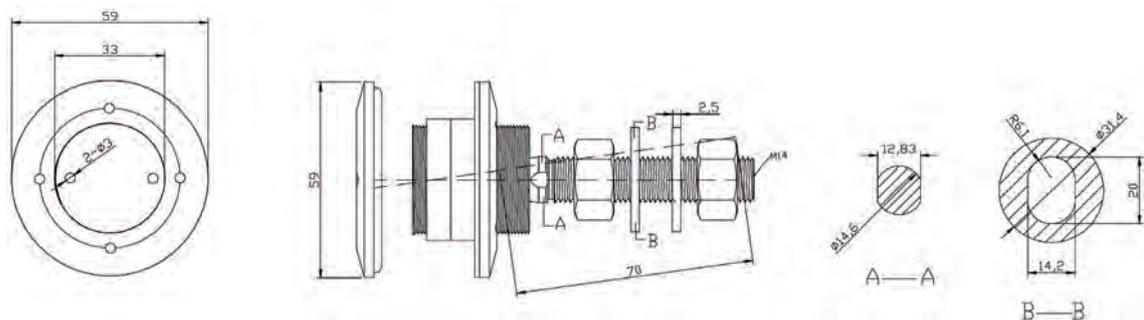


Figure 8 – Articulated point support with fixture front plate RCT 10-21 M14: drawing

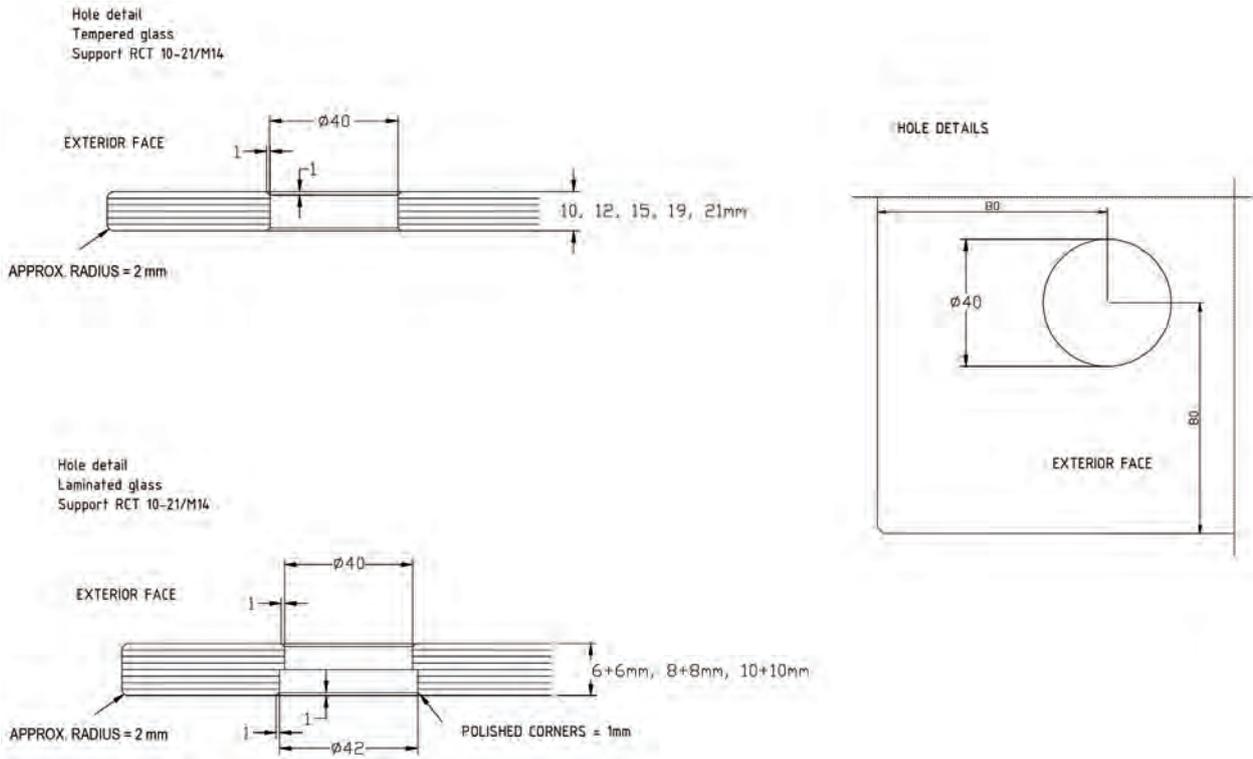
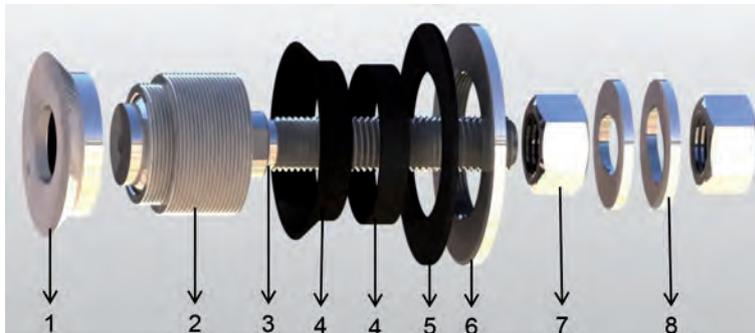


Figure 9 – Articulated point support with fixture front plate RCT 10-21 M14: hole in the glass

RCE 10-21 M14: Articulated point support with countersunk nut



Components	N°
Countersunk nut	1
Threaded body	2
Articulated screw M14	3
Nylon countersunk spacer	4
Nylon washer	5
Threaded fixture back plate	6
Hex nut M14	7
Washer	8

Figure 10 – Articulated point support with countersunk nut RCE 10-21 M14: constitution

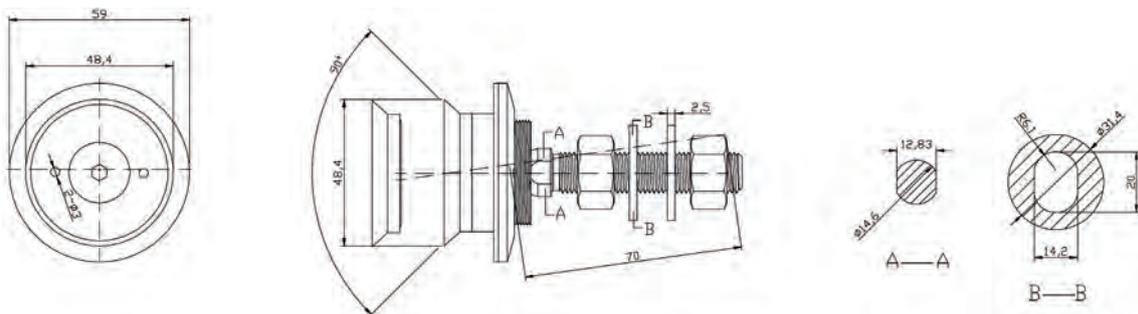


Figure 11 – Articulated point support with countersunk nut RCE 10-21 M14: drawing

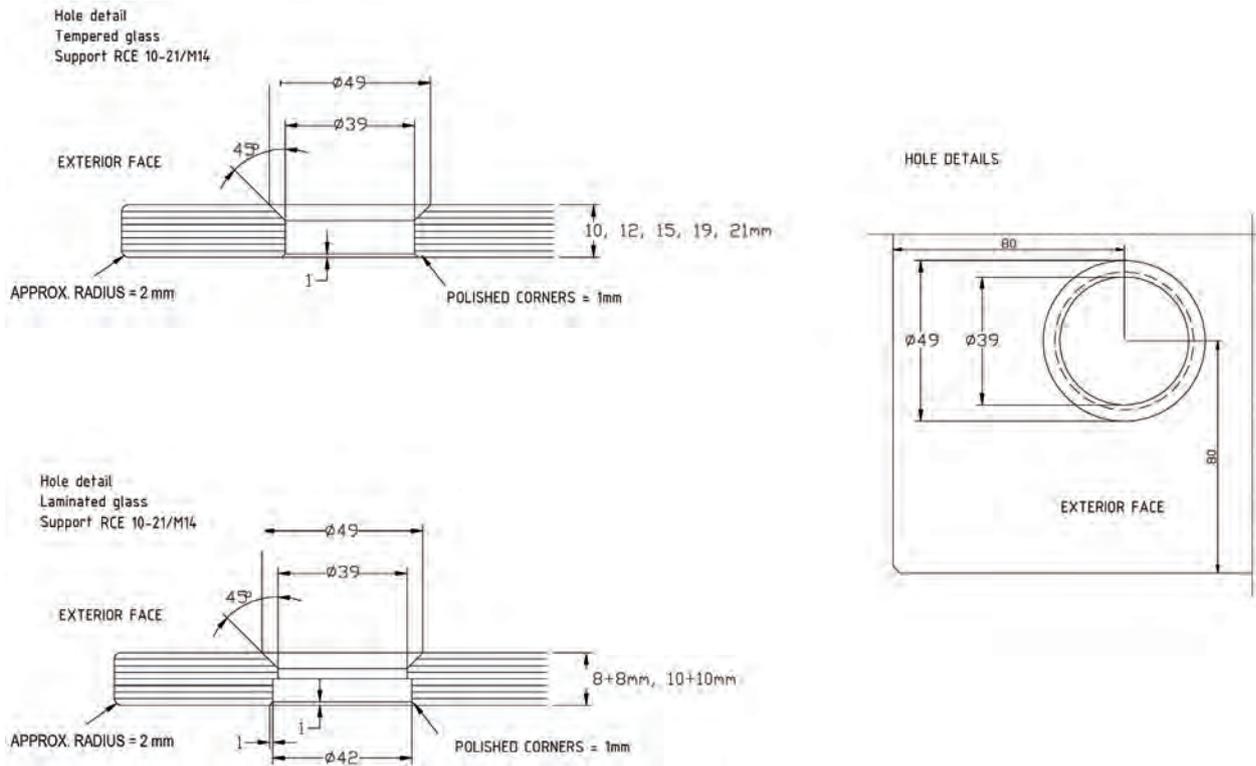
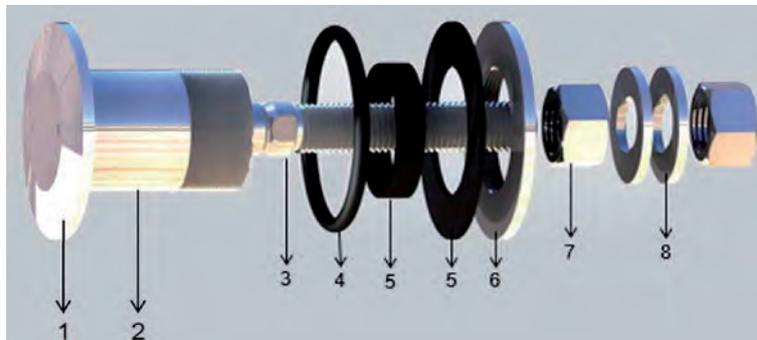


Figure 12 – Articulated point support with countersunk nut RCE 10-21 M14: hole in the glass

RDT 28-36 M14: Articulated point support with fixture front plate and threaded body



Components	N°
Fixture front plate and threaded body	1 and 2
Articulated screw M14	3
Nylon O-ring	4
Nylon spacer/washer	5
Threaded fixture back plate	6
Hex nut M14	7
Washer	8

Figure 13 – Articulated point support with fixture front plate and threaded body RDT 28-36 M14: constitution

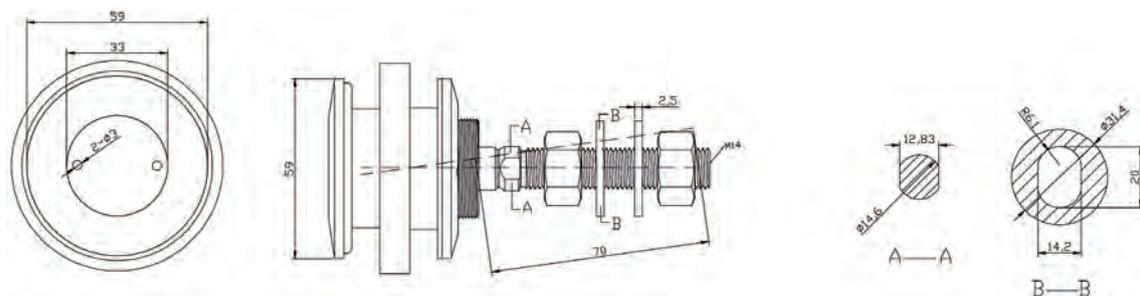
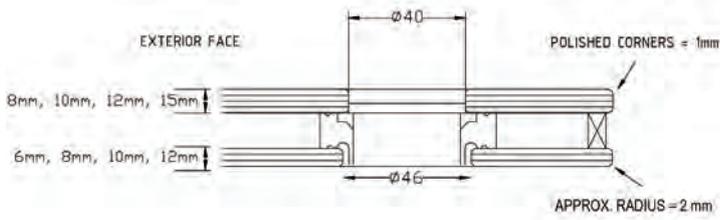
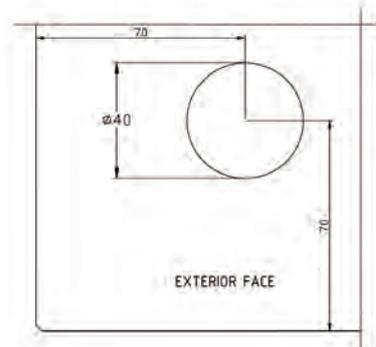


Figure 14 – Articulated point support with fixture front plate and threaded body RDT 28-36 M14: drawing

Hole detail
Tempered glass
Support RDT28-36/M14



HOLE DETAILS



Hole detail
Laminated glass
Support RD28-36/M14

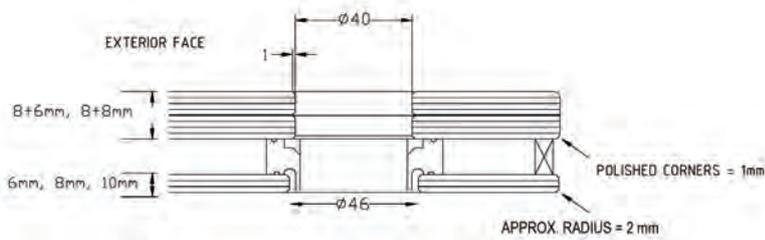
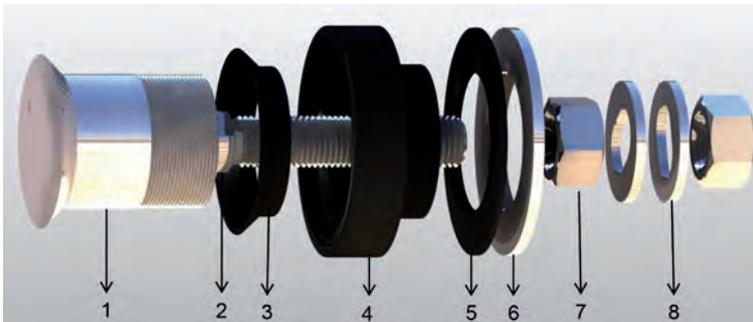


Figure 15 – Articulated point support with fixture front plate and threaded body RDT 28-36 M14: hole in the glass

RD 28-36 M14: Articulated point support with countersunk threaded body



Components	Nº
Countersunk threaded body	1
Articulated screw M14	2
Nylon countersunk spacer	3
Nylon spacer	4
Nylon washer	5
Threaded fixture back plate	6
Hex nut M14	7
Washer	8

Figure 16 – Articulated point support with countersunk threaded body RD 28-36 M14: constitution

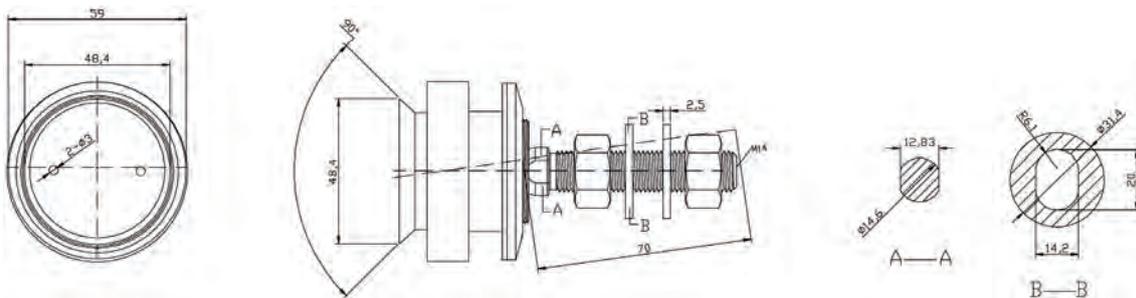


Figure 17 – Articulated point support with countersunk threaded body RD 28-36 M14: drawing

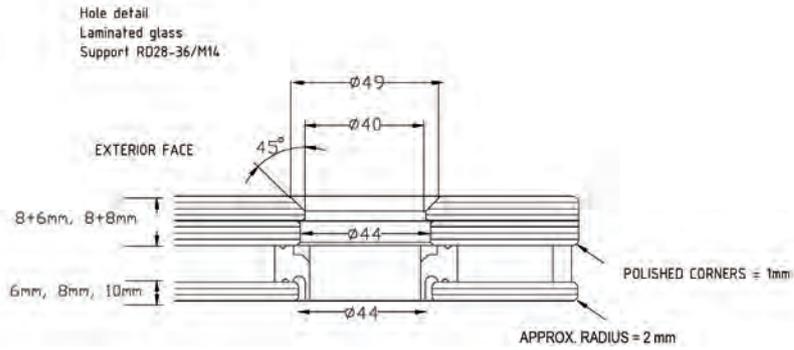
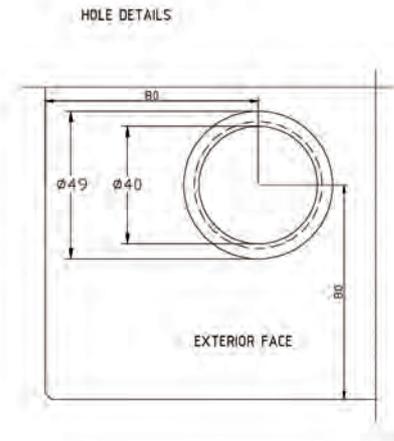
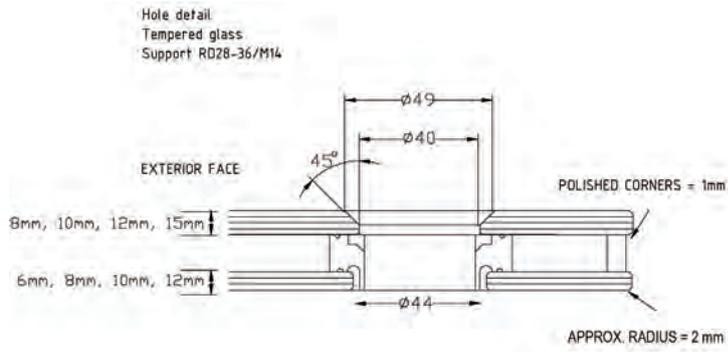
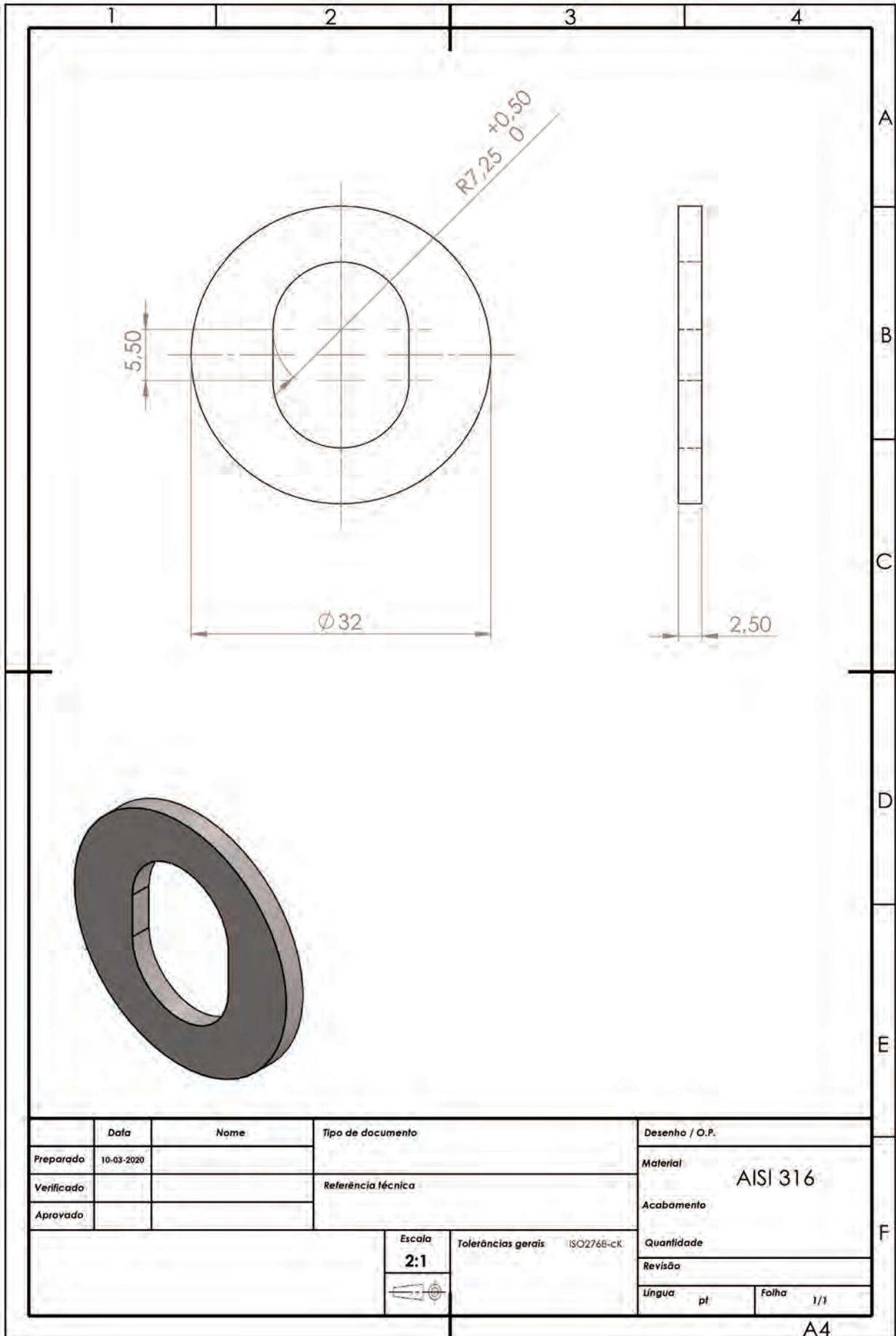
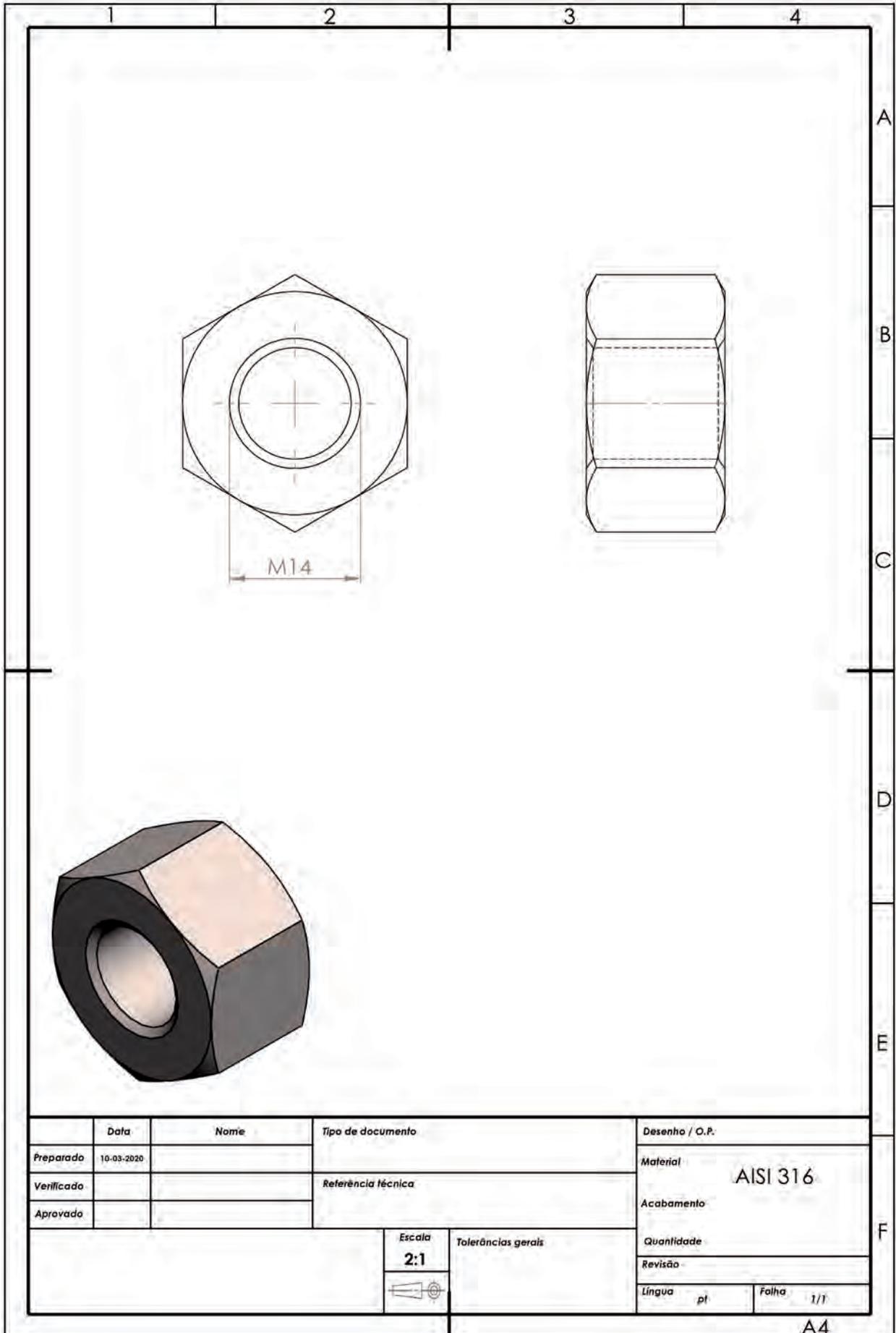


Figure 18 – Articulated point support with countersunk threaded body RD 28-36 M14: hole in the glass

Metal round washer



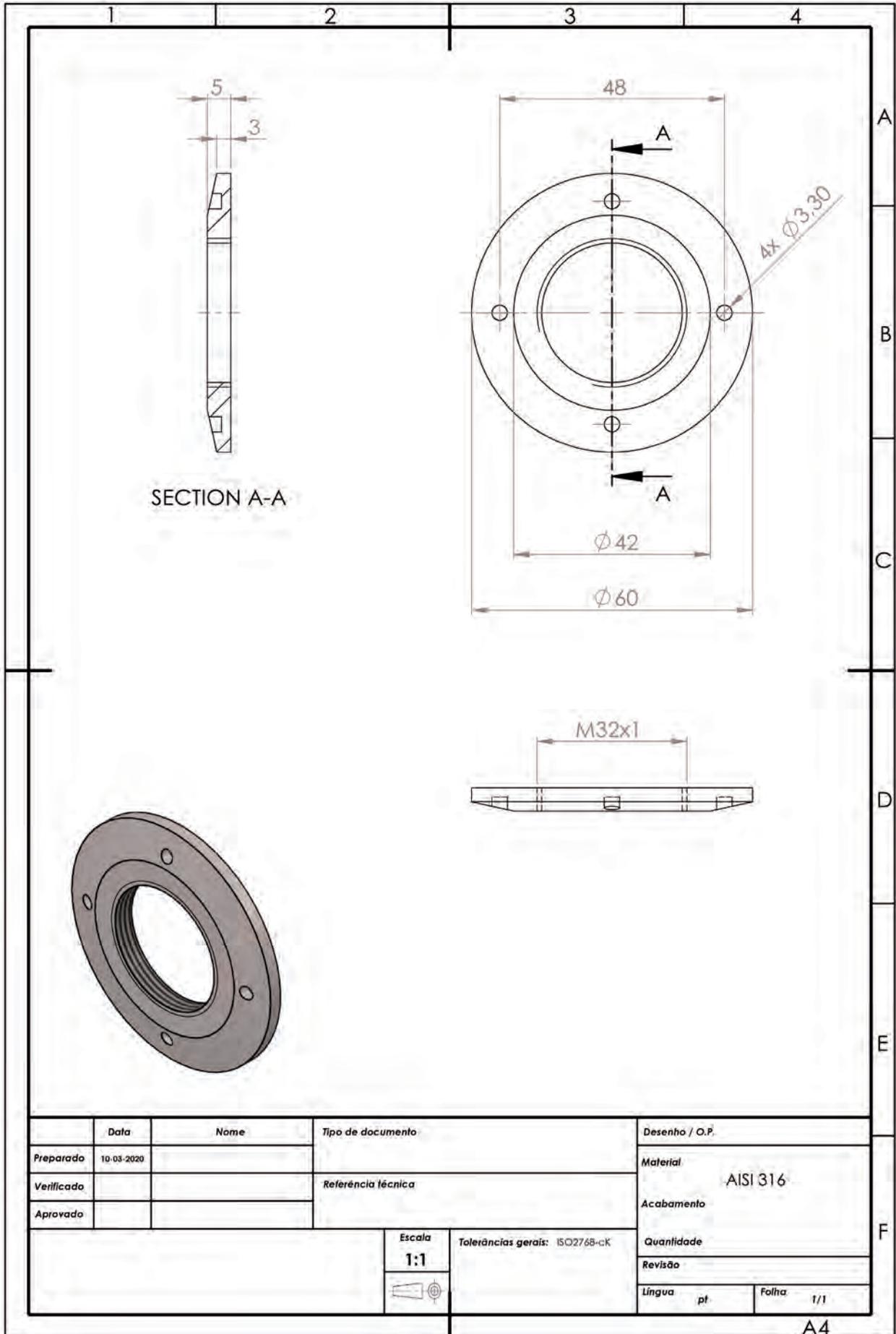
Hex nut M14



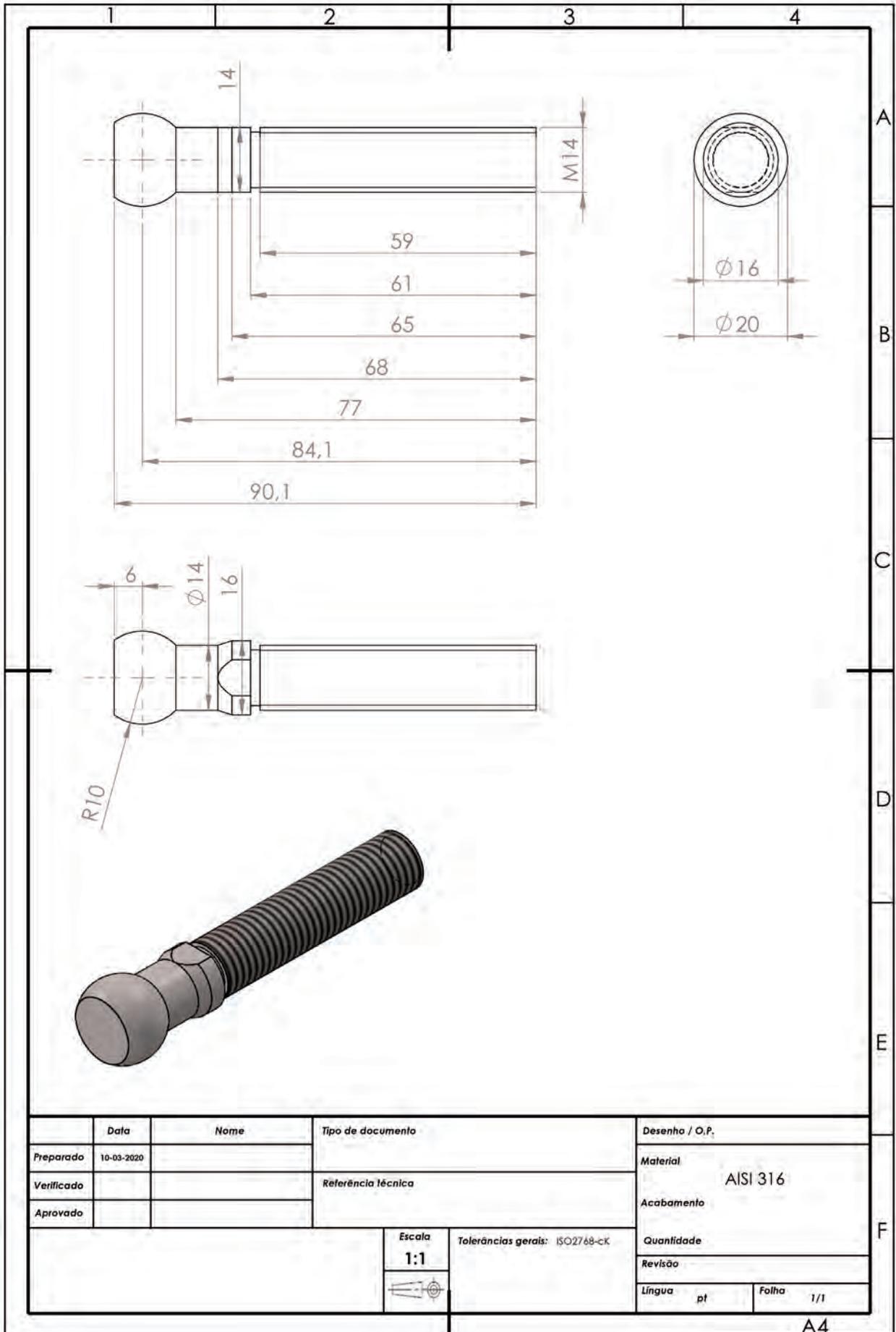
	Data	Nome	Tipo de documento	Desenho / O.P.	
Preparado	10-03-2020		Referência técnica	Material	AISI 316
Verificado				Acabamento	
Aprovado				Quantidade	
			Escala	Tolerâncias gerais	Revisão
			2:1		
					Língua pt
					Folha 1/1

A4

Threaded fixture front plate



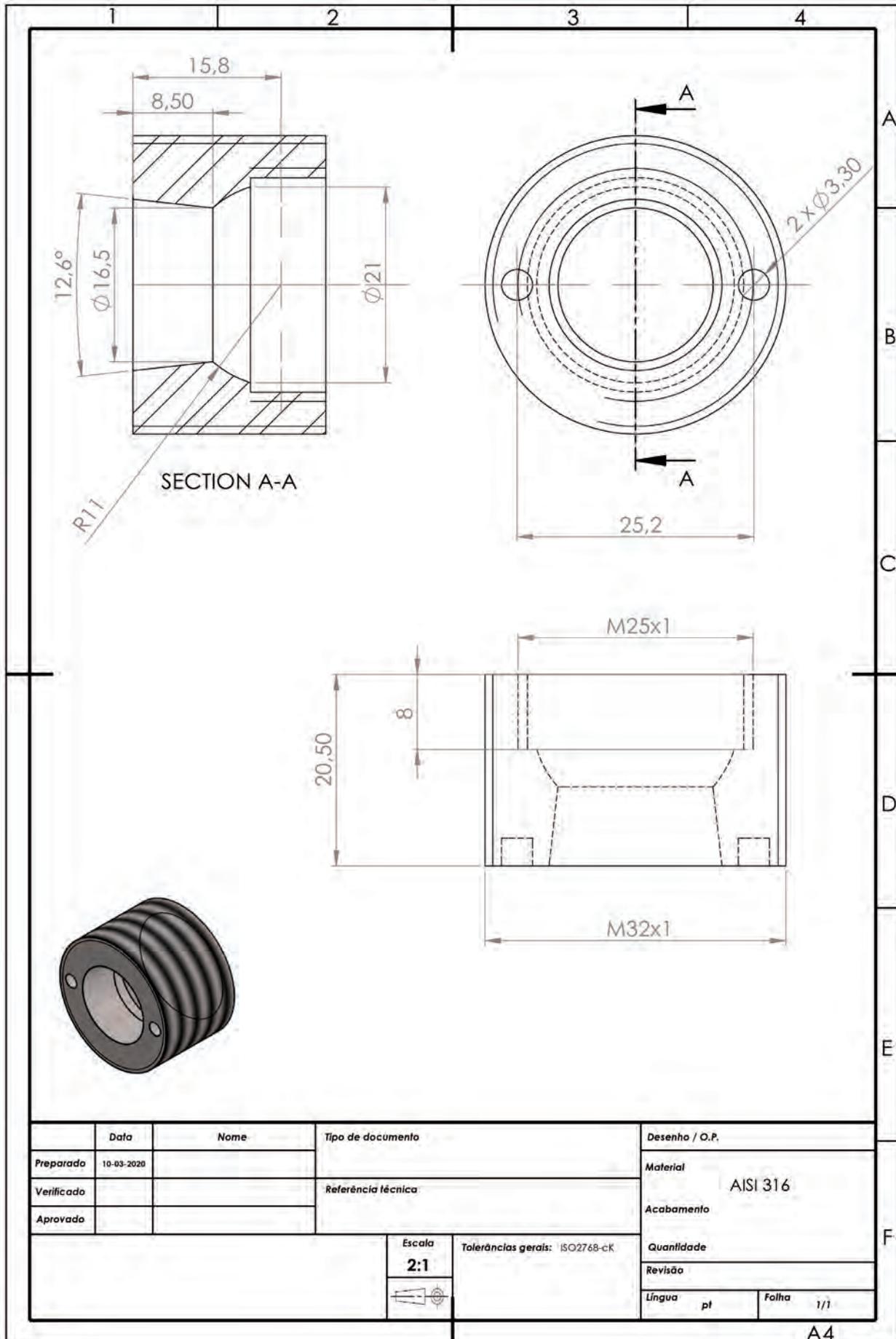
Articulated screw M14



	Data	Nome	Tipo de documento		Desenho / O.P.	
Preparado	10-03-2020				Material AISI 316	
Verificado			Referência técnica		Acabamento	
Aprovado					Quantidade	
			Escala 1:1	Tolerâncias gerais: ISO2768-cK	Revisão	
					Língua pt	Folha 1/1

A4

Body



	Data	Nome	Tipo de documento	Desenho / O.P.
Preparado	10-03-2020			Material
Verificado			Referência técnica	AISI 316
Aprovado				Acabamento
				Quantidade
				Revisão
				Língua pt
				Folha 1/1

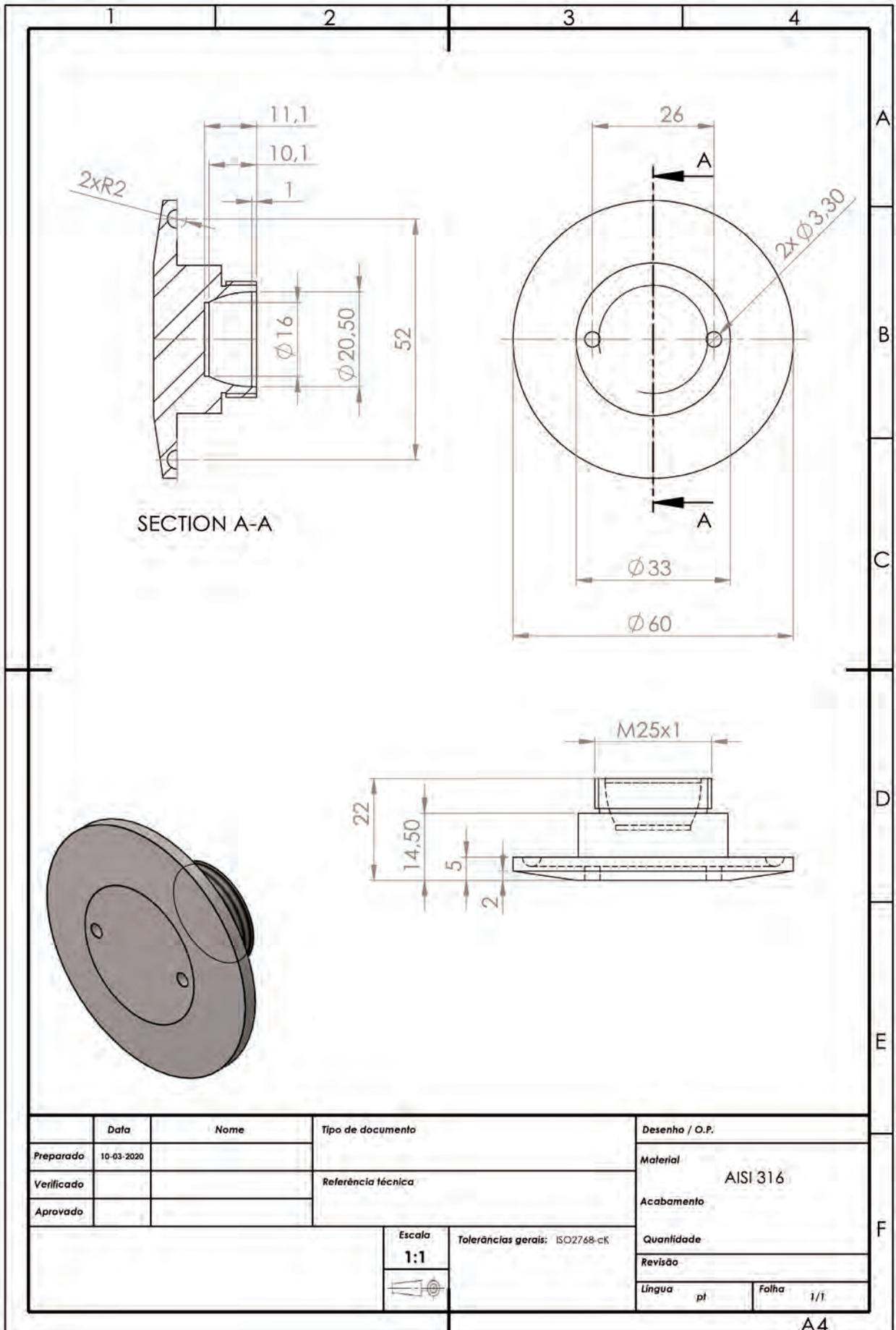
Escala
2:1

Tolerâncias gerais: ISO2768-cK

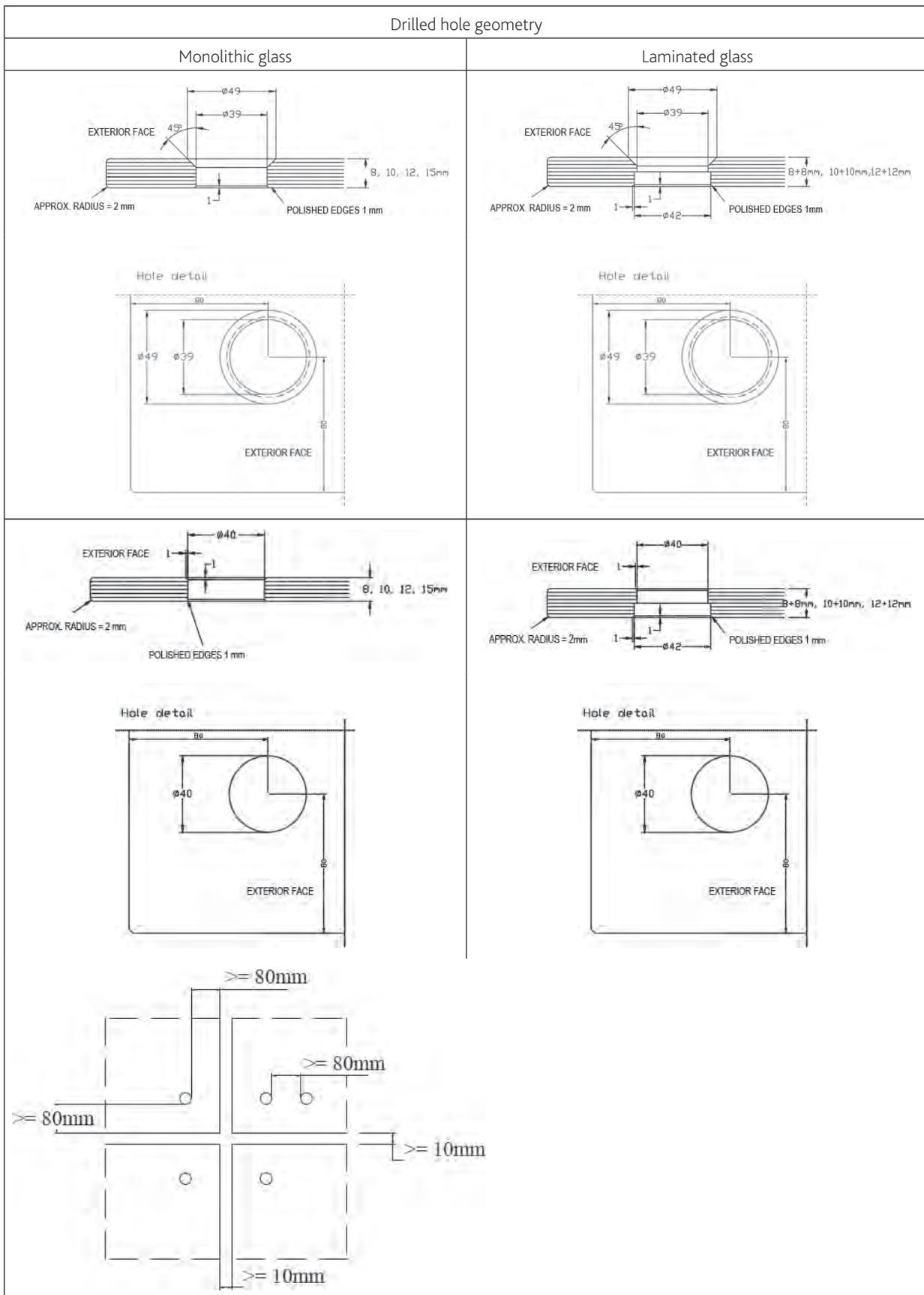


A4

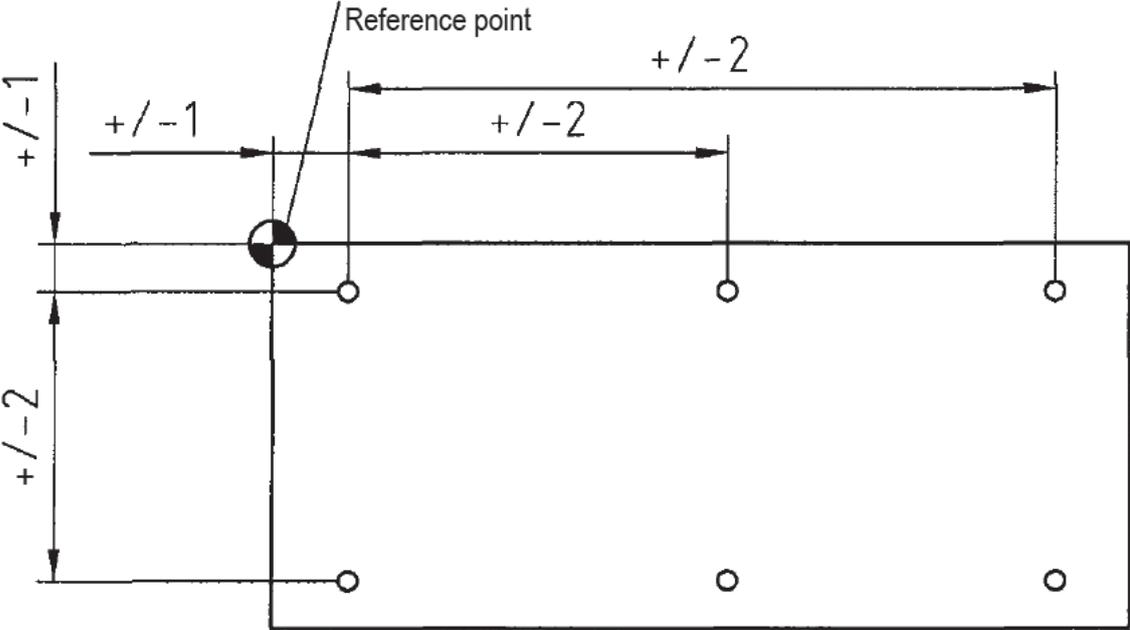
Body cover



Drilled holes in the glasses

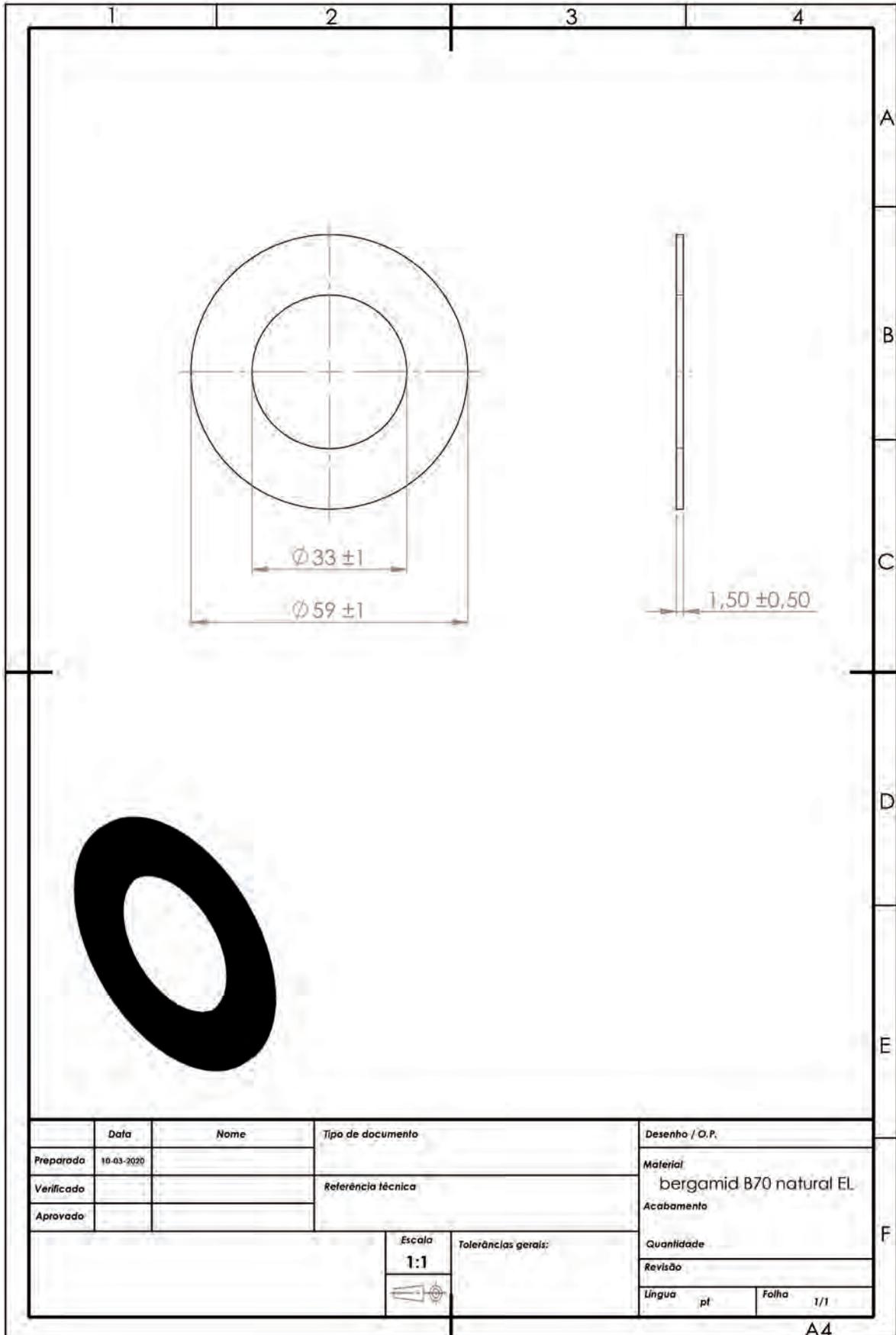


Between the "fixed" drilled hole in the glass and all other drilled holes, a horizontal and vertical tolerance of ± 2 mm is allowed.

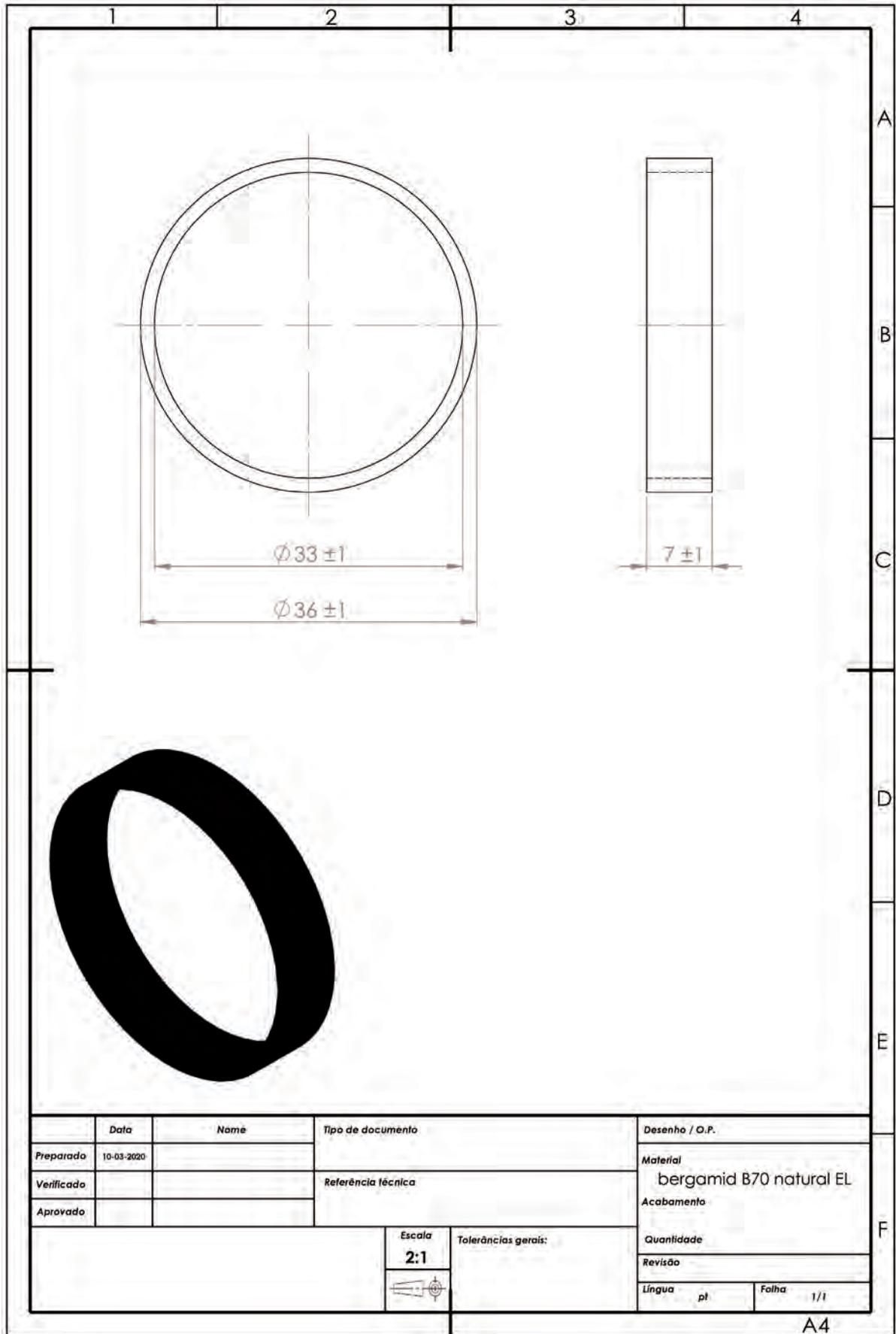


Annex 2 - Nylon parts between glass and metal

Nylon round washer



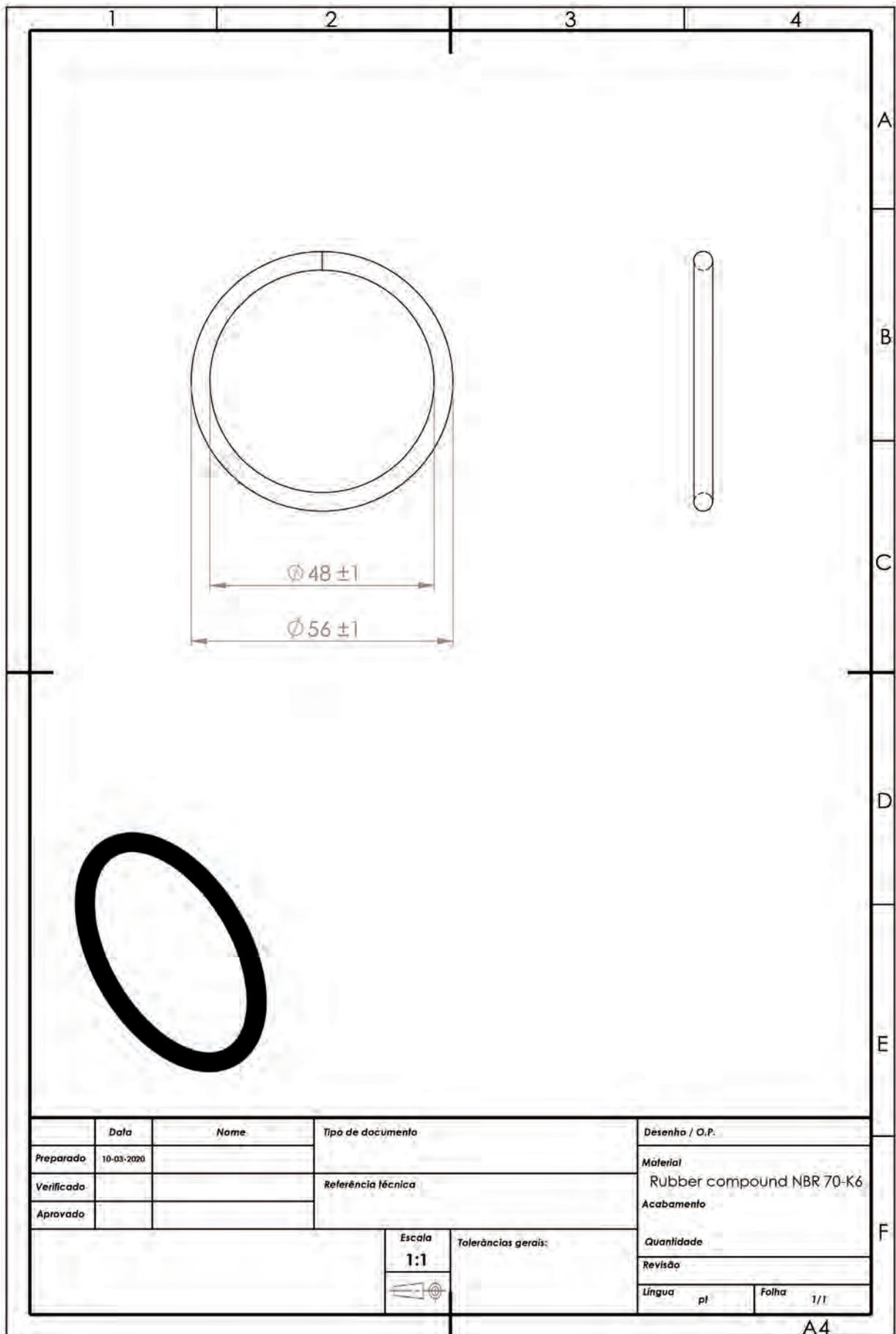
Nylon spacer



	<i>Data</i>	<i>Name</i>	<i>Tipo de documento</i>	<i>Desenho / O.P.</i>
<i>Preparado</i>	10-03-2020			<i>Material</i> bergamid B70 natural EL
<i>Verificado</i>			<i>Referência técnica</i>	<i>Acabamento</i>
<i>Aprovado</i>				<i>Quantidade</i>
			<i>Escala</i> 2:1	<i>Revisão</i>
			<i>Tolerâncias gerais:</i>	<i>Língua</i> pt
				<i>Folha</i> 1/1

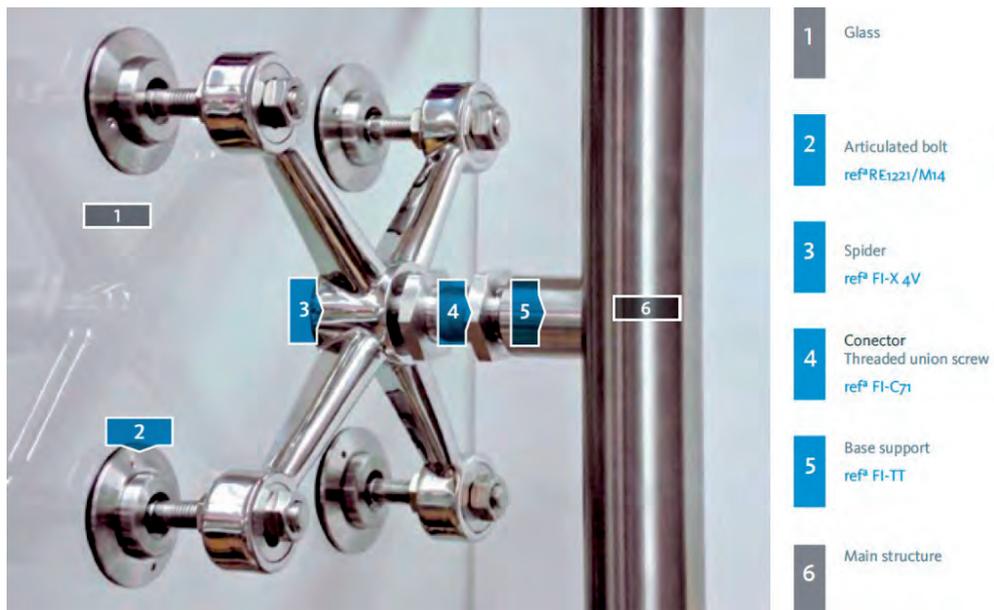
A4

Nylon O-ring



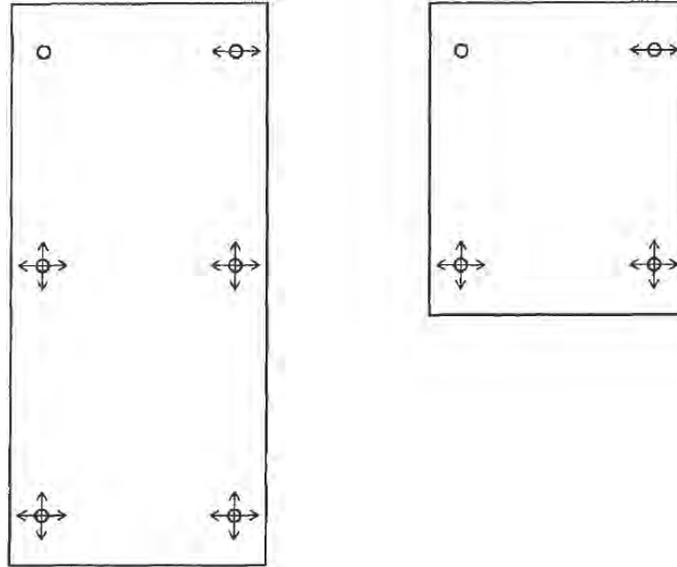
A4

Annex 3 - Fixing the articulated point support to the substructure



Annex 4 - Fixing the articulated point support to the substructure

Types of attachment of the articulated point support to the substructure to compensate for thermal expansion, for glazing fixed at six points and for glazing fixed at four points.



-  Fix point
-  Movable bearing in horizontal direction
-  Movable bearing in two directions

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