Technical delivery conditions

Components of the setting and monitoring system

for points

DBS 918 121

Content

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Responsibility for technical content: DB Netz AG I.NPF 111 (W)

Business responsibility: DB Netz AG, I.NPF 1

1.

Issue	Revision date	Comments	Page
02	13/12/2016	• Bending of bars: use of radial bending machines • Corrosion protection: RAL 1002 for primer coat • Annex 5.1: Bearing tolerance relationship of the fork opening surface to the drilled fork hole modified • Annex 5.2: Dimension a1 added	6 7

Foreword

This DB Standard has been prepared by DB Netz AG, I.NPF 111(W) – Permanent Way Technology in collaboration with the manufacturing plants and quality assurance (FS.EI 21). It represents the interests of Deutsche Bahn AG.

Scope of application

The DBS regulates the demands on the manufacturers of components of the point setting and monitoring system to ensure delivery compliant with quality standards. It refers to the constructions listed below:

- Bearing iron for securing the point machine, cranked lever, point detector, roller guide and point signal including the fixing components
- Cranked lever
- Operating rods
- Cranked lever connecting rods
- Cranked lever connecting rods
- Detector rods
- Locking rods
- Coupling rods
- Tongue connecting rods
- Mechanical locks and detectors
- Point locks (e.g. dead bolt locks, HV 73, HVE)
- Derailers
- Pedestal bars
- Covers
- Points
- Mechanical points machines
- Point and derailer signals
- Plastic parts (e.g. bushes, rollers, insulation parts)

1 Normative references

This DB standard contains stipulations from other publications in the form of dated or undated references. These normative references are quoted in the respective positions in the text and the names of the publications are stated thereafter. In the case of dated references, subsequent amendments or revisions to these publications only belong to this standard if they have been incorporated by means of amendment or revision. In the case of undated references, the latest version of the referenced publication applies (including amendments).

DIN 50979	Metallic coatings – Galvanic zinc and zinc alloy coatings on iron materials with additional Cr(VI)-free treatment
DIN EN 3834	Quality requirements for the fusion welding of metallic materials
DIN EN 10025-2	Hot-rolled products of structural steels – Part 2: Technical delivery conditions for non-alloy structural steels

DIN EN 10058	Hot rolled flat steel bars for general purposes - Dimensions and tolerances on shape and dimensions
DIN EN 10060	Hot rolled round steel bars - Dimensions and tolerances on shape and dimensions
DIN EN 10130	Cold rolled low carbon steel flat products for cold forming - Technical delivery conditions
DIN EN 10131	Cold rolled uncoated and zinc or zinc-nickel electrolytically coated low carbon and high yield strength steel flat products for cold forming - Tolerances on dimensions and shape
DIN EN 10204	Metallic products - Types of inspection documents
DIN EN 10210	Hot finished structural hollow sections of non-alloy and fine grain steels
DIN EN 10243-1/2	Steel die forgings - Tolerances on dimensions
DIN EN 10278	Dimensions and tolerances of bright steel products
DIN EN 13920	Welding - General tolerances for welded constructions - Dimensions for lengths and angles; shape and position
DIN EN ISO 1461	Hot dip galvanized coatings on fabricated iron and steel articles
DIN ISO 2768-1	General tolerances; Tolerances for linear and angular dimensions without individual tolerance indications
DIN ISO 2768-2	General tolerances; Tolerances for shape and position dimensions without individual tolerance indications
DIN EN ISO 9606-1	Qualification testing of welders - Fusion welding - Part 1: Steels
TL/TP-KOR steel structures	Technical delivery conditions and technical test specifications for coating materials for the corrosion protection of steel structures
Ril 120.0381V13	List of products subject to quality inspection

2 Basis for ordering

The current DB Netz AG drawings shall take precedence for the manufacture of the mechanical components of the point setting system. The drawings are to be requested from I.NPS 333 Berlin. The list of DB standard drawings is updated quarterly and can be viewed at www.dbportal.db.de/ Technische Mitteilungen Fahrweg/ Oberbautechnik/Verzeichnis für Regelzeichnungen.

3 Qualification and quality assurance

The components of the point setting and monitoring system are safety-relevant and are subject to Quality Inspection Level II. For the production of the bearing and transmission parts, the Ril 120.0381V13 "List of products subject to quality inspection" applies. This also regulates the qualification of the suppliers, including subcontractors.
Prior to the first delivery to DB AG, the manufacturer's capability to manufacture a product as specified in the contract shall be verified. This shall take the form of a "manufacturer-related product qualification".

4 Requirements regarding materials to be used

4.1 Semi-finished steel products

Semi-finished steel products must be procured with factory certifications 3.1 according to EN 10204. If necessary, the certificates are to be submitted to the Quality Assurance (FEI 2) or the Technology (I.NPF 111) department. This applies to:

- Steel flat bars S235JR according to DIN EN 10025-2 and DIN EN 10058 for all bearings
- Round steel bars S355J2+N according to DIN EN 10025-2 and DIN EN 10060 for all setting, crank lever connecting, detector, trestle, dead bolt, coupling and tongue connecting rods
- Tube 42.4 x 4 S235JRH or S355J2H according to DIN EN 10210, galvanised according to DIN EN 10220 for all crank lever connecting rods
- Fine-grade sheet steel DIN EN 10130/10131
- Forged steel S355J2 DIN EN 10025 for all crank levers and fork heads
- Round steel S355J2 (+AR or +M) according to DIN 10060 or S355J2C according to DIN EN 10278 for all bolts

4.2 Plastics

The material properties must comply with the following requirements:

- Plastic bushings made of PAS-LGX: Data sheet PAS-LGX, Annex 1
- Plastic rollers PA: Data sheet PA, Annex 2
- Insulating parts PA: Data sheet PA, Annex 2
- Covers made of GRP: Data sheet GRP, Annex 3

4.3 Forged parts

Fork heads, cranked levers and bearing blocks are forged parts. The tolerances according to DIN EN 10243-1/2, Forging Grade "F" shall apply. Forged parts are identified with the manufacturer's mark and the year of forging. Forged parts shall be deburred and must be free from notches.

4.4 Requirements for welding

Setting, detector, trestle, pedestal, crank lever and locking rods are manufactured from forged forks and round steel by means of flash butt welding. The welding process is only to be performed by machines with continuous quality monitoring (monitoring/recording of the welding parameters).
Flash butt welds are to be deburred and free from notches. The parts are to be durably identified by a manufacturer's mark on one fork head.
For other welded joints the welding quality requirements according to DIN EN 3834 shall apply.
The welds must be performed by welders tested in accordance with DIN EN ISO 9606-1.

5 Bending of bars

Bars made of round material (Ø 26 mm; Ø 30 mm and Ø 36 mm) are to be pre-heated to 850°C before bending. Bends > 90° are to be normalised.
When using an automatically guided radial bending machine, the pre-heating is not necessary. Every delivery batch of round material is to be checked and documented for freedom from cracks with a 90° bending. The specimens are to be kept for at least six months.
If no bending radius is specified on the drawing, it must be at least 30 mm + material radius.

6 Tolerances

Unless separate tolerance measurements are marked on the standard drawings, the general tolerance DIN IS0 2768 -c for machined individual parts or DIN EN 13920-CG for welded assemblies is to be applied. In addition, the following shape and positional tolerances shall apply:

- for the mounting surfaces of the bearings: Annex 4
- for the cutouts of the fork heads for all rods: Annex 5.1
- for the alignment of the drilled hole of the fork heads to the receiving slot: Annex 5.2
  Alternatively, a mounting test using a test intrusion piece and matching bolts is permissible here.
  - The following requirements apply to the test piece:
    - Penetration height *h1* = fork cutout *h* (nominal dimension) – 1 mm
    - Penetration depth *a1* = nominal depth *a* – tolerance value (acc. to DIN ISO 10243-1, forging quality F)
    - Test specimen width *b1* = fork width *b* + 20 mm (projection on both sides at least 10 mm)
    - The bore diameter of the test specimen corresponds to that of the fork head or the internal diameter of the mounted bushing.
  - The bolt is to be designed, relative to the nominal diameter with the fit *h9*, with a bearing projection of 10 mm

- Alignment of the detector rod eye Annex 5.3
  Using the test equipment described, in the case of offset detector rods, the alignment of the eye is to be checked for a maximum deviation of < l/150 from the alignment of the detector rod at the bore of the fork head. The welded bolt is to be designed, relative to the nominal diameter with the fit *h9*, with a bearing projection of 10 mm.

7 Threads

External threads of adjustable-length detector rods and coupling rods are to be created by rolling.

8 Corrosion protection:

- All bearings and mounting or bearing plates are to be provided with certified coating materials according to TL/TP-KOR Steel Structures. Alternatively, the corrosion protection coating can be replaced by hot-dip galvanising (DIN EN ISO 1461 min. 45 µm). Bituminous paints only remain permissible for deliveries relating to existing master agreements.
- Protective ducts and channels are to be hot-dip galvanised in accordance with DIN EN ISO 1461. In accordance with DIN EN ISO 1461, the coating thickness is to be at least 45 µm, and an average of 55 µm.
- Detector rods and coupling rods shall be galvanised (according to DIN 50979, min. thickness 12 µm, thick-film passivated, sealed). Alternatively, the application of CDP coating or zinc dust paint is permissible.
- Cranked lever, coating application:
    - Priming:
        - Zinc dust paint, film thickness 80 µm,
        - Alternatively: 2C epoxy resin paint, film thickness 80 µm
    - Top coat: alkyd resin paint, film thickness 80 µm, RAL 601 crystal fayalit green
- Point and derailer signals, coating application:
    - Priming:
        - Zinc dust paint, film thickness 80 µm
        - Alternative: CDP coating
    - Top coat: alkyd resin paint, film thickness 80 µm, RAL 9005 jet black

  The primer colour must contrast clearly with the base material and with the top coat in order to clearly indicate that each paint achieves the minimum film thickness.

9 Identification of parts

All parts or modules are to be identified with the part number specified on the standard drawing and the material number. The design of the labelling can be selected by the manufacturer. It shall be executed in a suitable manner that ensures the labelling remains recognisable after storage for at least three years in the signal depot and after shipment to the place of installation (e.g. weather-resistant adhesive labels).

10 Dispatch

As a rule, the parts shall be delivered as mounted assemblies. All bolts, threads and bearings receive basic lubrication during assembly at the manufacturing plant. A suitable form of deliver shall be selected that rules out any damage (e.g. to threads) and bending.

Annex 1 Data sheet for plastics - PAS-LGX

Moulding compound with designation according to ISO 9988 POM-K:

Polyoxymethylene with approx. 13% glass fibre + PE-UHMW, dyed olive green

Requirements and test schedule for the moulding (finished part):

Type of test	Specification, test guideline	Requirement	Qualification test (QT)	First article inspection (FAI)[1)]	In-house production control (IPC)
Colour, tone	Drawing, retention sample	compliant	X	X	X
Surface	Drawing, retention sample	compliant	X	X	X
Dimensions	Drawing	compliant	X	X	X
Functional dimensions	Drawing or specified in QM plan	compliant	X	X	X
Weight	Drawing	compliant	X	X	X
Cavities	Retention sample	compliant	X	X	X
Density	DIN EN ISO 1183-1	1.48 g/cm³	X	X	X
Glass content	DIN EN ISO 1172	13 ± 3%	X	X	X
Thermogram of DSC analysis	ISO 11357-3	165 – 175 °C	X	X	X
Tensile modulus of elasticity	DIN EN ISO 527-1 and 2	3600 MPa	X	X	-
Ball indentation hardness	DIN EN ISO 2039-1	160 Mpa	X	X	-
Impact strength	EN ISO 179-1/1eU at 23°C/50% rh	35 kJ/m²	X	X	-
Moisture content	Test procedure, see 4.4	0.15 – 0.3%	X	X	X
Notch impact strength	EN ISO 179-1/1eU at 23°C/50% rh	5 kJ/m²	X	X	-
Specific volume resistivity	DIN IEC 60093	>=10^{14} Ωcm	X	-	-

1) If the FAI equals QT, the QT plan shall apply

Miscellaneous:
In the IPC, and in additional quality tests performed by DB AG, the values determined must be at the level of the property values from the qualification tests or FAI

Only plastic bushings made of PA-LGX by Faigle have been permitted by DB AG to date.

Annex 2 Data sheet for plastics - PA

Moulding material with designation according to ISO 1874: PA66+PA6-HI, MHR, 14-020N

Mechanical properties

		Standard	Unit	Status	
Tensile modulus of elasticity	1 mm/min	ISO 527	MPa	dry cond.	2450 800
Tensile stress	50 mm/min	ISO 527	MPa	dry cond.	65 35
Elongation	50 mm/min	ISO 527	%	dry cond.	4 20
Tensile stress at break	50 mm/min	ISO 527	MPa	dry cond.	40
Elongation at rupture	50 mm/min	ISO 527	%	dry cond.	25 >50
Impact strength	Charpy, 23°C	ISO 179/2-1eU	kJ/mm²	dry cond.	no break no break
Impact strength	Charpy, -30°C	ISO 179/2-1eU	kJ/mm²	dry cond.	no break no break
Charpy impact strength	Charpy, 23°C	ISO 179/2-1eU	kJ/mm²	dry cond.	12 47
Charpy impact strength	Charpy, -30°C	ISO 179/2-1eU	kJ/mm²	dry cond.	11 8
Ball indentation hardness		ISO 2039-1	MPa	dry cond.	125 45

Thermal properties

		Standard	Unit	Status	
Melting temperature	DSC	ISO 11357	°C	dry	260
Dimensional stability HDT/A	1.80 MPa	ISO 75	°C	dry	55
Dimensional stability HDT/B	0.45 MPa	ISO 75	°C	dry	160
Linear thermal expansion, longitudinal	23-55°C	ISO 11359	10^{-4}/K	dry	1.2
Linear thermal expansion, transverse	23-55°C	ISO 11359	10^{-4}/K	dry	1.5
Max. service temperature	continuous	ISO 2578	°C	dry	80-100
Max. service temperature	transitory	ISO 2578	°C	dry	180

Electrical properties

		Standard	Unit	Status	
Dielectric strength		IEC 60243-1	kV/mm	dry cond.	31 27
Comparative leakage path formation	CTI	IEC 60112	-	cond.	600
Volume resistivity		IEC 60093	Ω . m	dry cond.	10^{12} 10^{10}
Spec. surface resistance		IEC 60093	Ω	cond.	10^{11}

General properties

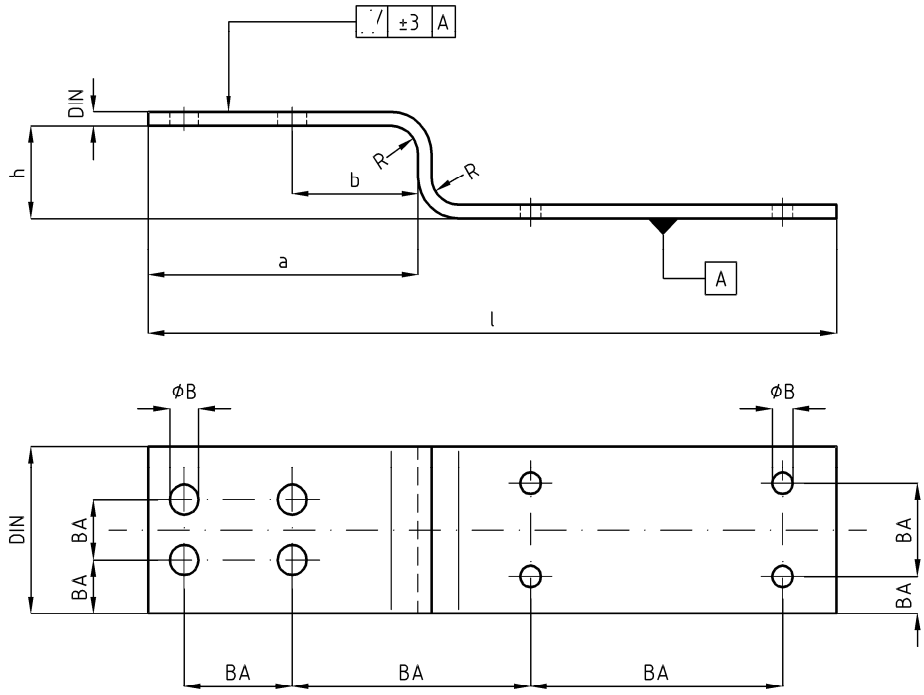
		Standard	Unit	Status	
Density		ISO 1183	g/cm^3	dry	1.13
Flammability (UL94)	0.8 mm	ISO 1210	Stage	-	HB
Water absorption	23°C/saturated	ISO 62	%	-	8.5
Moisture absorption	23°C/50% rel.hum.	ISO 62	%	-	2.5
Linear mould shrinkage	long.	ISO 294	%	dry	1.25
Linear mould shrinkage	long.	ISO 294	%	dry	1.25
Max. service temperature	transverse	ISO 294	%	dry	1.35

Annex 3 Data sheet for plastics - GRP

General properties

	Standard	Unit	
Bending strength	DIN 53452	N/mm^2	> 130
Impact strength	DIN 53453	kJ/mm^2	> 40
Charpy impact strength	DIN 53453	kJ/mm^2	> 35
Dimensional stability at elevated temperature (acc. to Martens)	DIN 53462	°C	150
Resistance to glow heat	VDE 0304 T3	BH 2 Burning distance	Stage ≤ 10 mm
Water absorption	DIN 53472	mg	<80
Surface resistance	VDE 0303 T3	Ω	$> 10^{14}$
Tracking resistance	VDE 0303 T1 + T10	Ω	CTI 500

Annex 4 Tolerance measurements on bent bearing iron



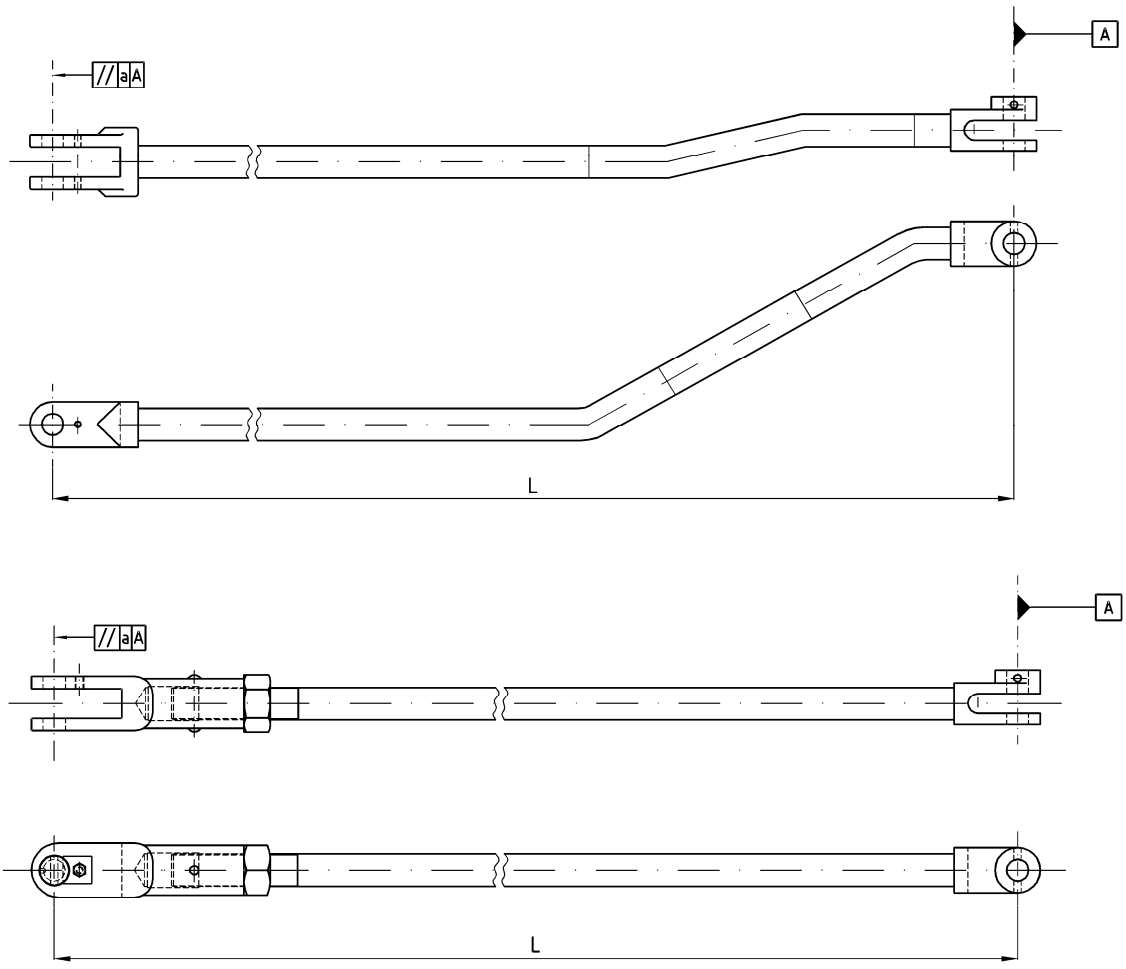
Nominal dimension range		Tolerance	
		+	-
l	< 1000	15	5
	> 1000	20	10
h	< 200	8	5
	> 200	10	5
a		10	5
b		2	2

Hole spacings		
Nominal dimension range	Tolerance	
	+	-
< 100	0,8	0,8
100 - 200	1	1
200 - 400	1,5	1,5
> 400	2	2

	Tolerance	
	+	-
Hole diameter	1	0,5

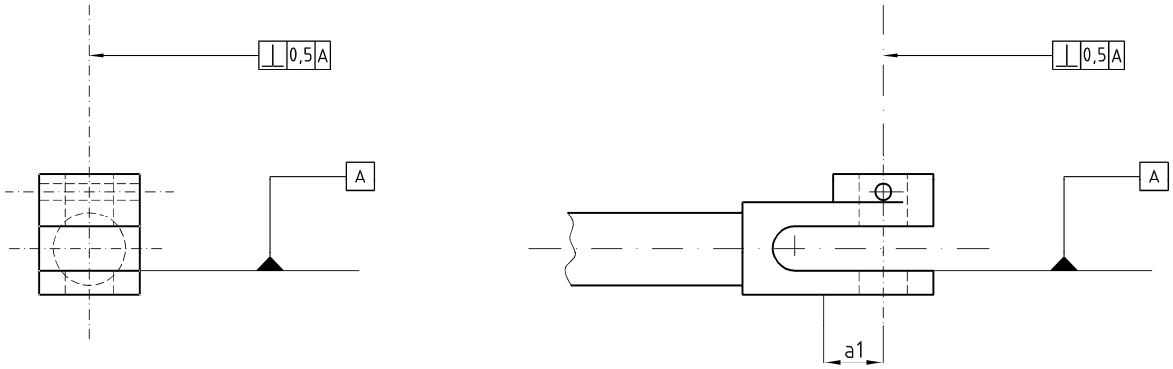
Annex 5

5.1 Tolerances of parallelism of the fork cutouts

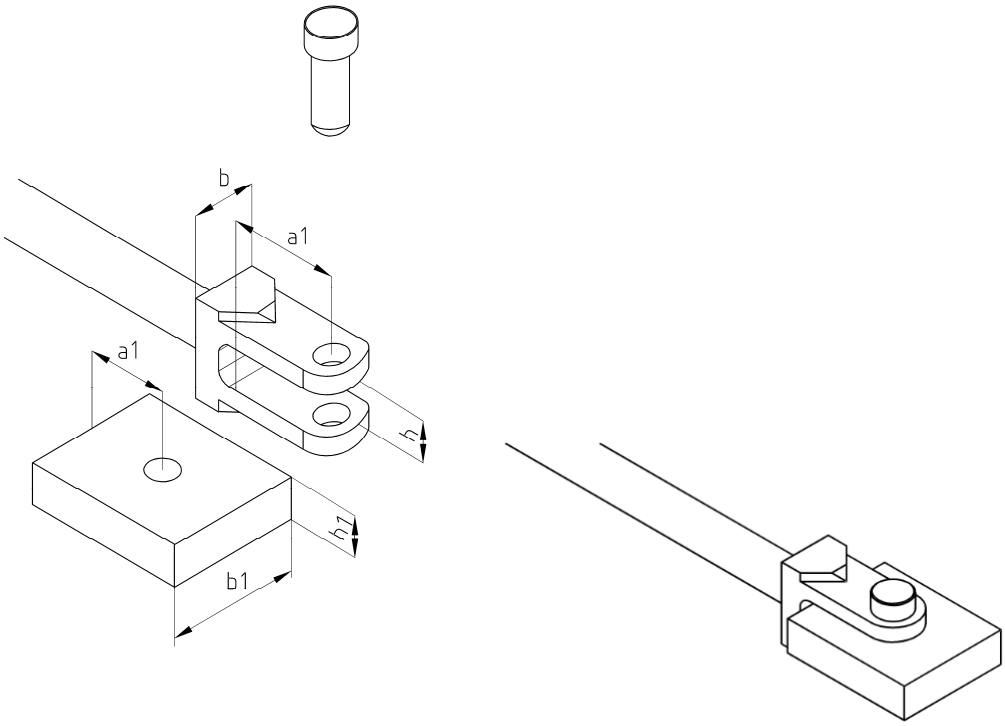


L ≤ 2000	a=1
L 2000 – 4000	a=1,5
L > 4000	a=2

5.2 Alignment of the drilled hole to the receiving slot of the forked head



Alternative: Mounting test with test specimen according to Section 6:



5.3 Alignment of the detector rod eye

Offset from hole centre < l/150