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## 1. INTRODUCTION

It is only possible to manufacture high-grade measurement instruments efficiently, if precise movements are available.

As part of its product line of systems, PREFAG also offers movements for 240° moving coil instruments. These movements have been developed to allow the efficient manufacture of reliable instruments for various applications.

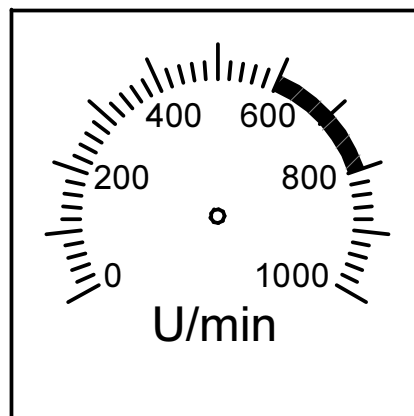
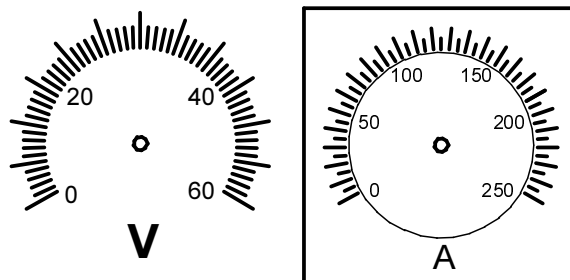
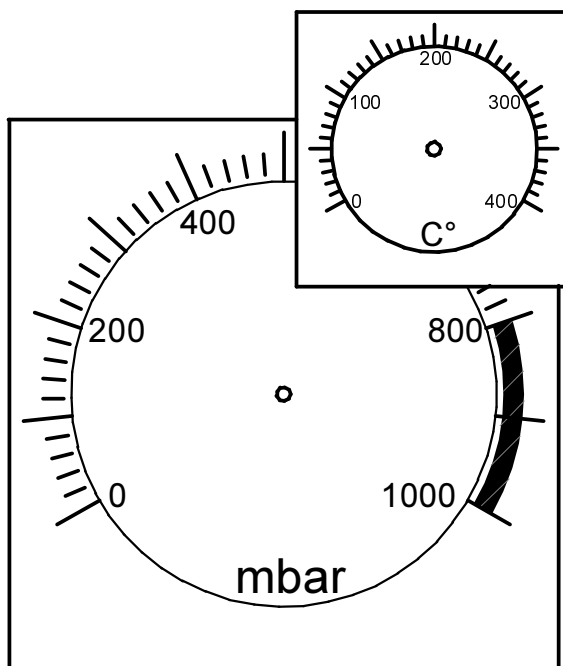
Our system allows our meter movements to meet a wide variety of demands, i.e. high sensitivity, higher accuracy class, high shock or vibration stress.

The dimensions of the 200 models of the KSI series are suitable for installation in standard DIN housings from 72 x 72 mm or 2"Ø round housings. At normal sensitivities, the torque is great enough for instruments up to DIN 144 x 144 mm or other housing dimensions with comparable pointer lengths.

It is easy to select the desired components for your meter movement by using the descriptions and dimension tables found below in chapter 10. Pivot points and coil formers etc. may be individually determined.

Smaller models for special applications with factory diameters starting from 23 mm are available for 1" and 1.5" round cases or for corresponding square dimensions. These are included in the KSI 100 series.

In this range we also offer our KSI 101 models for double instruments with a 180° each pointer range and only 12 mm distance between the two pointer centers. You will find more detailed specifications for these 100 models in a separate manual: KSI 100.



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## 2. APPLICATIONS

The models in the 200 line of the KSI series mentioned here are suitable not only for normal control panel applications, but also for critical applications with the following criteria:

- high frequency vibrations  
i.e. spinning machines
  
- strong shock exposure  
i.e. rail vehicles, heavy duty lorries
  
- extreme environmental conditions  
i.e. ship building, aircraft design
  
- as well as other difficult environmental conditions.

The basic principle of our modular system and the guaranteed availability of quality controlled components generally allow our customers to design their instruments even for the most critical applications without undue difficulties.

As a basis to help you make the correct selections for your instrument design, you will find a summary of mechanical and electrical specifications for a standard instrument in chapter 11. These specifications can and should be used only as a basis for the calculation and design of your individual movement.

The correct selection of pivot and bearing criteria is decisive in achieving the optimal implementation of electrical measurement instruments. PREFAG has suitable calculation methods at its disposal and has gained decades of world wide, systematic experience. We would be happy to develop suggestions for your particular applications.

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### **3. GENERAL CONCEPT**

By using PREFAG components that have long established reputations, the KSI 200 series could be designed following this principles:

- self-centering pivot holder system
- optimizable damping by means of various coil former material characteristic
- high sensitivity
- high precision
- 1% linearity
- play-free adjustment of the jewel bearings
- high degree of indifference to external magnetic fields.

#### 4. DESIGN

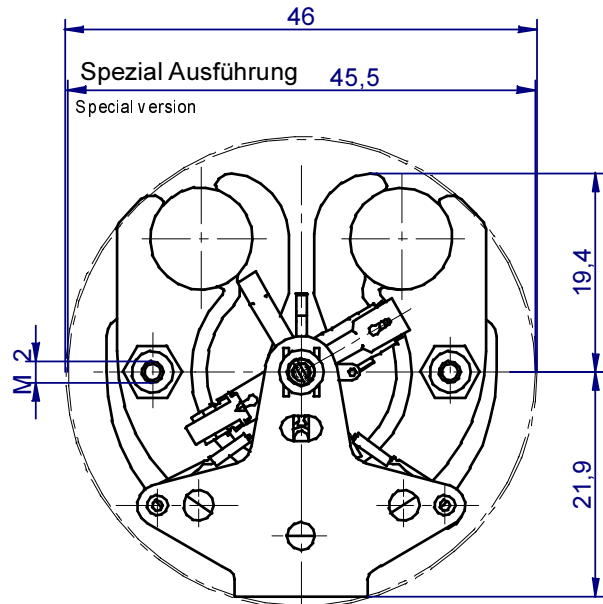
Great care was taken in the design of the KSI 200 modular series to ensure dependable components. For this reason, several functions were integrated into one single component wherever possible, thus reducing the total number of components. The core support has been designed as a precision stamped and pressed part that provides the basic frame for an axially aligned mounting of the moving element and for the minimally concentric placement of the magnet.

The coil former is mounted on a central spindle that goes all the way through. This mounting is done by a very dependable riveting process.

Centering the coil former on the spindle is done by the time-tested PREFAG system for self-centering and clamped pivot holders.

Furthermore, the design principle guarantees the smallest possible concentricity of the pole rings and the pivot point of the moving element. Superior linearity with an accuracy deviation of at most 1% is ensured. No calibration is necessary.

The design of the magnetic circuit guarantees effective shielding, so that external flux influence is kept extraordinarily low. The shape of the inner and outer pole rings ensures a firm fit of the magnets for any normal applications. If the instrument is subject to extreme conditions, we use Loctite glue nr. 493. Just one drop in the gap between the magnet and the inner pole ring and another drop between the magnet and the outer pole ring are sufficient to ensure a tight fit.



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#### **4. DESIGN (Cont.)**

For the KSI 264 models, the scale is attached by means of spacers.

An extra bridge is available which is screwed to the spacers and ensures a smaller distance between the scale attachment holes.

The KSI 266 models are available for designs with an extra-long balancing cross (extension greater than 11 mm). In this case, the customer provides the attachment points for the scale. Screws (SRN 10) are added.

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## 5. MATERIALS

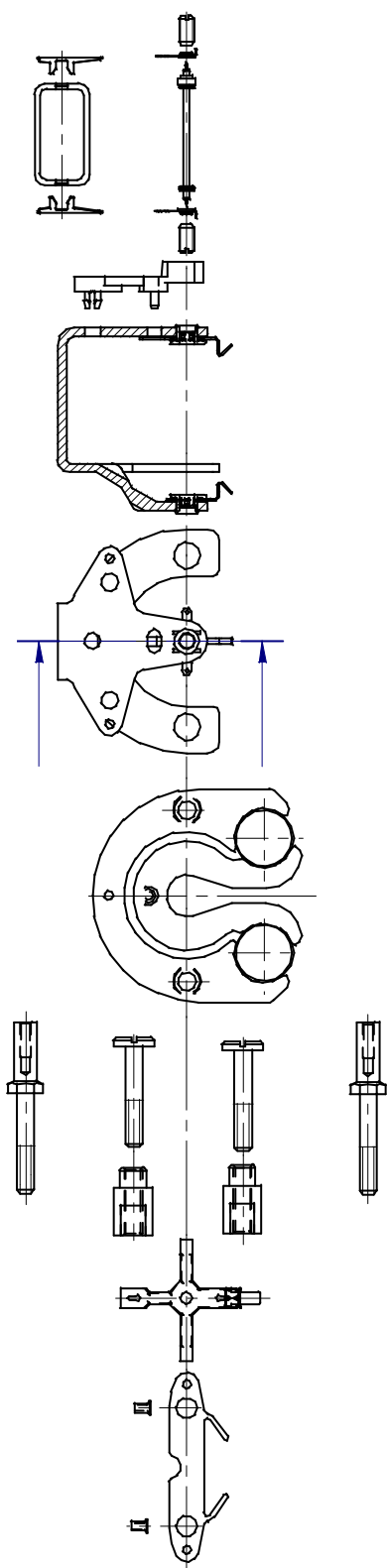
Our long years of experience in the field of measurement technology allow us to make an optimal choice of materials.

The materials have been most carefully selected for their particular uses and reinforce the technological lead of our instrument movements.

- Spindle: Aluminium
- Coil Former: Aluminium,(anodized)  
Various alloys
- Coil Former Support: Aluminium
- Zero-Adjustment Lever: PC  
Clip attachment
- Zero-Adjustment: Nickel-silver  
Assembled in the movement support  
with plastic-bushing
- Movement Support: Brass  
Integrated zero-adjustment
- Outside Pole-Ring: soft iron
- Inside Pole-Ring: soft iron
- Magnet: Alnico 450
- Spacer: Brass
- Pointercross: Nickel-silver
- Pointerstop: Aluminium, anodized  
or brass with ceramic-tube

**6.SURVEY OF COMPONENTS**

**6.1 KSI 264/266**



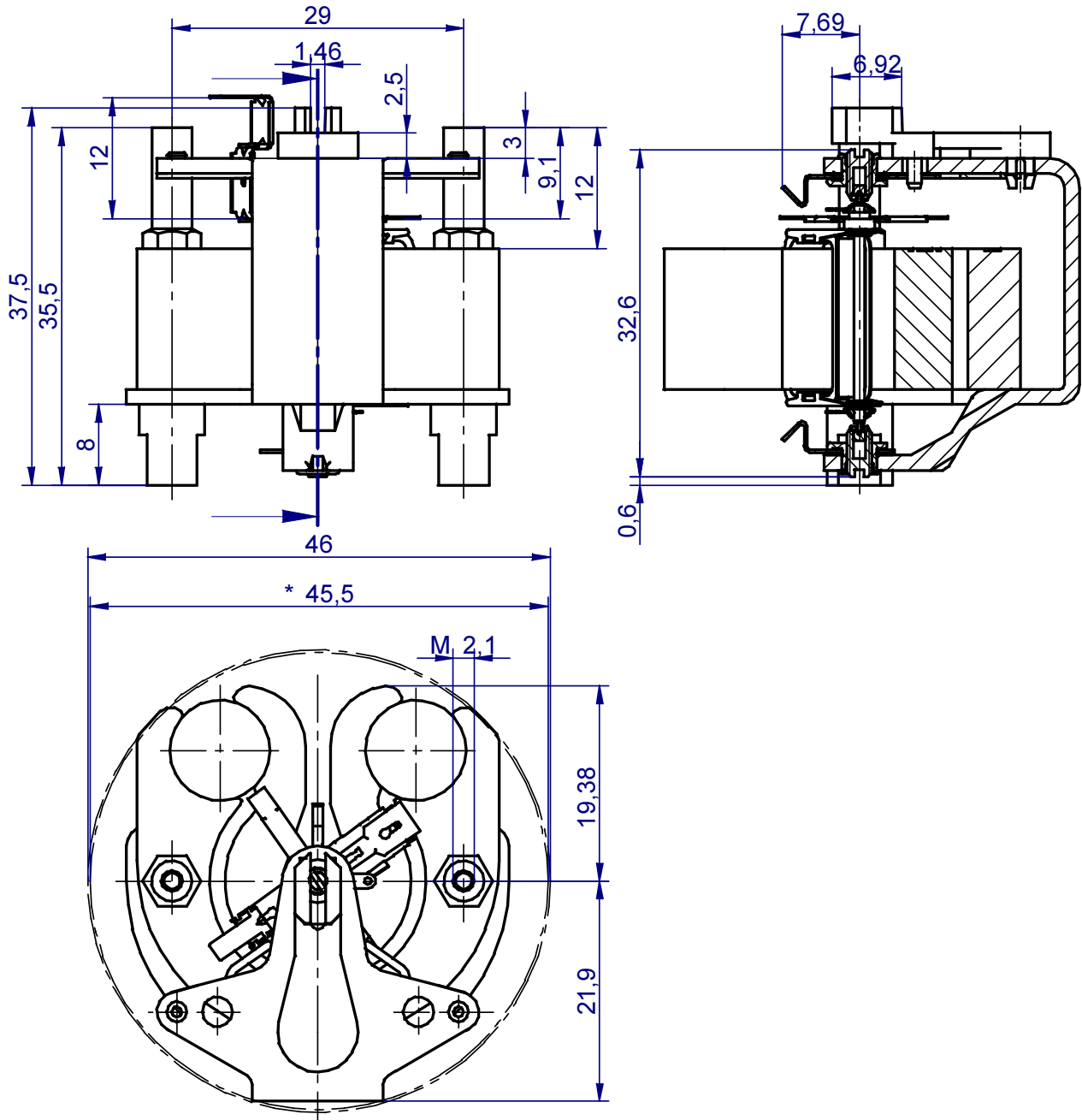
Bezeichnung designation		KSI 264	KSI 266
2	Körnerlager gefed. spring loaded jewel screw	M 2,5 x 0,35x5	
2	Spiralhalter, isoliert spring holder, insulated	IN 15	
1	Achse spindle	AN 1273 - 1284	
1	Rahmen coil former	RN 221	
2	Rahmenträger support	RTN 251	
1	Zwischenhebel zur Nullstellung lever for zero adjustment	ZHN 251	
1	Nullstellung zero adjustment	MTNM 2400	
1	Nullstellung zero adjustment		
1	Träger support		
1	Außenring outside pole-ring	ARN 250 <sup>1)</sup>	
1	Innenring inside pole-ring	IRN 250	
2	Magnet magnet	MGN 054	
2	Zylinderkopfschraube screw		SRN 10
2	Abstandsäule (Skala) column (scale)	ASN 1082	
2	Abstandsäule (Gehäuse) column (case)	ASN 1061	
1	Zeigerträger pointer cross	ZTN 6122 - 6522	
1	Zeigeranschlag pointer stop	ZAN 1240	
2	Niet rivet	NN 1240	

<sup>1)</sup> AR 264 Sonderausführung / special version

# KSI 200 MOVEMENT FOR 240° MOVING COIL INSTRUMENTS

## 7. DIMENSIONS

### 7.1 KSI 264/266



\* Sonderausführung  
\* Special version

## 8. TECHNICAL SPECIFICATIONS

- Air-gap induction (B <sub>L</sub> min.) *	175 mT
- Influence by iron plate	0,2 %
- 170x170x2mm	
- Pointer deflection	240° (250°)
- Linearity using MGN 054 magnets	± 1 %
- Operating temperature range **	-20°....+60°C
- Storage temperature range **	-30°....+80°C

\* With magnets MGN 054

\*\* The indications of the temperature ranges only refer to a failure of components exceeding of given temperature limits. Additional effects (for example measuring errors) are not considered.

## 9. DELIVERY DETAILS / SAMPLE ORDER

In order to avoid errors and mix-ups in defining particular systems and in ordering, we request that orders be set up according to the following sample. The following components from the data sheets in Chapter 10 are to be specified, corresponding to the particular instrument description:

- movement support	Pos. 1
- outside pole-ring	Pos. 3
- coil former	Pos. 5
- spindle	Pos. 7
- jewel bearing	Pos. 8

All the other components are dependent on the respective model and may be varied only after consulting our technical staff.

### Parts-List no.

### KSI 254 System

### for 240° Moving coil instrument

**This system is in general supplied as an completely assembled movement.**

Pos.	Qty	Description	PREFAG Standard	Part-no.
1	1	Support with zero adjustment	PN 1037	MTNM 2400
2	1	Inside Pole-ring	PN 1037	IRN 250
3	1	Outside pole-ring	PN 1037	ARN 250
4	2	Magnets	PN 1037	MGN 054
5	1	Coil former	PN 1037	RN 221.34
6	2	Support for coil former	PN 1037	RTN 251
7	1	Spindle	PN 1037	AN 1275
8	2	Jewel bearing	PN 1009	L 50428
9	2	Spring holder	PN 1020	IN 15
10	1	Lever	PN 1037	ZHN 251
11	2	Column (Scale)	PN 1037	ASN 1061
12	2	Column (Case)	PN 1037	ASN 1082
13	1	Pointer cross	PN 1070	ZTN 6122
14	1	Pointer stop	PN 1071	ZAN 1240

**10. TECHNICAL DESCRIPTIONS AND  
DATA SHEETS OF THE INDIVIDUAL  
COMPONENTS**

**10.1 Jewel Bearings**

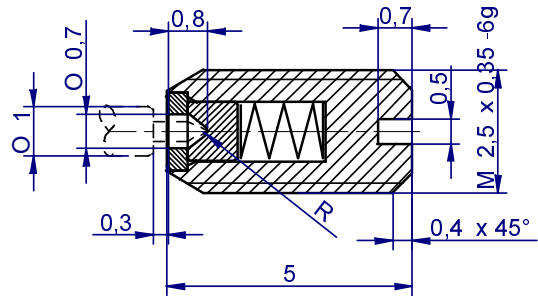
In our KSI 200 movement series, we supply our time-tested spring loaded jewel bearings M2.5x0.35x5 for both bearing positions. They are distinguished by the following superior characteristics:

- very high precision of jewels' return positioning
- minimal lateral play of jewels
- smooth jewel movement
- exactly maintained hair spring specifications
- excellent jewel bore surface
- high degree of cleanliness
- best, tested jewel quality according to PREFAG standards.

PREFAG jewel bearings are in use in the entire measurement instrument industry and related sectors. PREFAG jewel bearings have a world-wide reputation and guarantee a high degree of functional reliability.

We would be pleased to be of assistance in specifying suitable bearings and pivots in order to optimize your measurement instruments. For this, we need the following data:

- type of instrument (instrument application)
- range functional position of spindle (horizontal / vertical)
- pointer angle
- pointer length and weight
- desired sensitivity



Steinmaterial jewel material		R μm	F1 cN
Keramik ceramic	Saphir sapphire		
L 50 422	LN 422	40 - 70	10
L 50 693	LN 693		15
L 50 694	LN 694		20
L 50 424	LN 424	50 - 80	10
L 50 696	LN 696		15
L 50 697	LN 697		20
L 50 425	LN 425	60 - 100	10
L 50 426	LN 426		15 ←
L 50 700	LN 700		20
L 50 427	LN 427	80 - 120	10
L 50 428	LN 428		15 ←
L 50 818	LN 818		20
L 50 429	LN 429	100 - 150	15
L 50 308	LN 430		20

← Am häufigsten angewandte Teile  
most applied parts

### 10.1 Jewel Bearings (Cont.)

- required vibration tests
- required shock tests.

Please do not hesitate to consult our experienced technical staff to help you in the optimal design of your measurement instrument

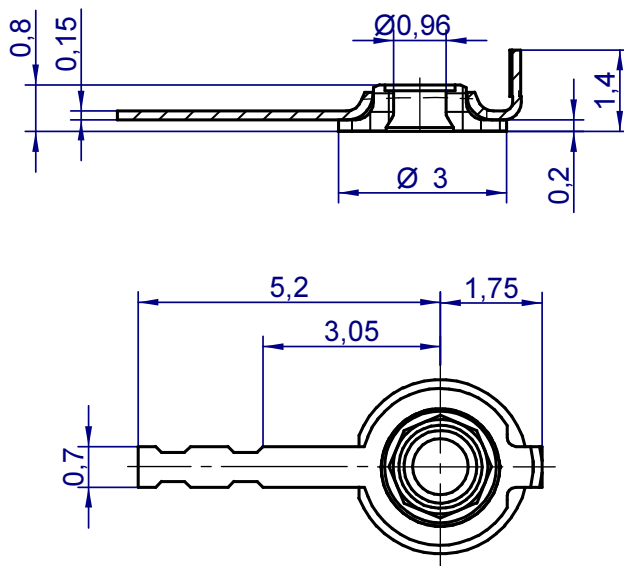
### 10.2 Spring Holders

Our spring holders have been completely redesigned and made to correspond to the DIN 43801 Bl. 1 standard usually used nowadays for the radius of the hair spring arm.

This has made an improvement of the soldered or welded joint possible. The choice of material (nickel-silver) also contributes to this improvement.

Both, upper and lower spring holder are insulated. The plastic part resists normal soldering temperatures. The insulation value is 19.3 kV/mm.

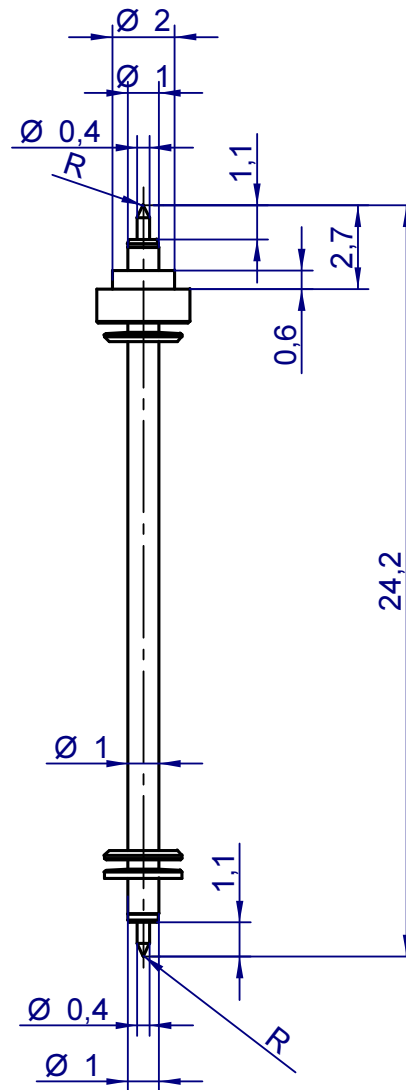
IN 15



### 10.3 Spindles

Our spindles are available according to our PREFAG standard for riveting assembly. They include our time-tested PREFAG bearing pivots. The pivot radii and the pivot material should be specified according to the table as follows for use in moving coil instruments in our KSI series.

Our spindles are manufactured according to the principle of inserted pivots. Special manufacturing processes guarantee exact straightness. All the attachment elements for the core supports, the spring holders and the pointer cross have been included in the lathing process.



Teile-Nr. part no.	R µm	Mat.
A 2025	9 - 11	HM
AN 1273	10 - 14	St
AN 1274	11 - 13	Inox
AN 1275 <b>r</b>	14 - 18	St
AN 1276	15 - 17	Inox
AN 1277	17 - 23	St
AN 1278	18 - 22	Inox
A 2014 <b>r</b>	18 - 22	HM
<b>r Am häufigsten angewandte Teile most most applied parts</b>		

### 10.4 Coil Former

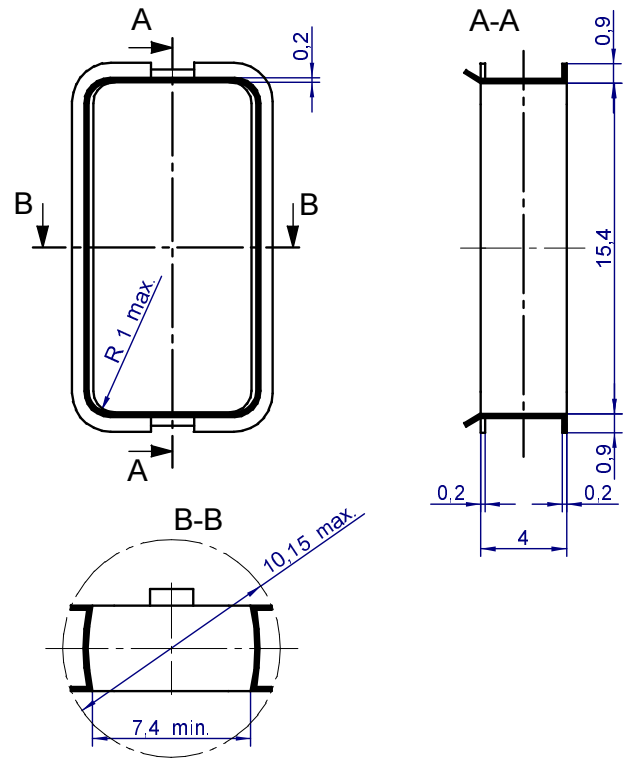
Our coil formers in the offer all the advantages of a carefully thought through production. Careful selection of materials, superior production methods and a dependable system of quality control ensure components of uniformly high quality.

Our special manufacturing methods produce components of high quality exactly according to drawings

- without jagged edges and corners
- with sharp inner edges so that the entire winding space can be used
- with lightly rounded edges to ensure coil winding with unharmed insulation.

Our coil formers are subjected to the same rigorous quality control that accompanies our entire manufacturing process.

Depending upon application, you may select your coil former from various aluminum alloys, or copper, to achieve optimal damping. This usually makes a complicated and expensive reduction of damping through such measures as holes in the coil former unnecessary.



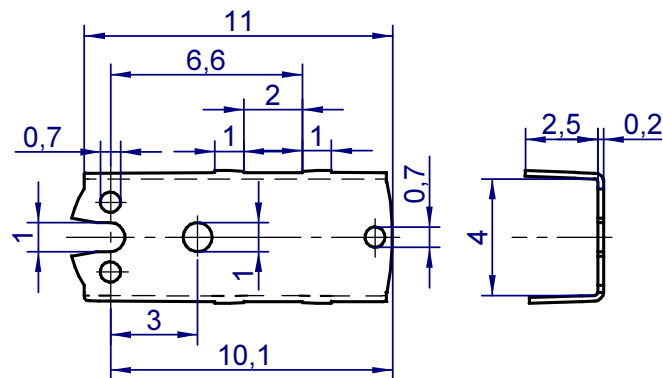
Teile-Nr. part no.	Material material	elektr.Leitfähigkeit conductivity	Farbe colour
RN 221.34	Al 34	34 S	Blau / blue
RN 221.26	Al 26	26 S	Gelb / yellow
RN 221.21	Al 21	21 S	Grün / green
RN 221.17	Al 17	17 S	Rot / red
RN 221.57	E-Cu	57 S	---

1 S = 1 / Ω

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### 10.5 Coil Former Support

The coil former supports have been developed especially for the KSI 200 movement series and ensure reliable and axially aligned mounting of the coil former onto the spindle.

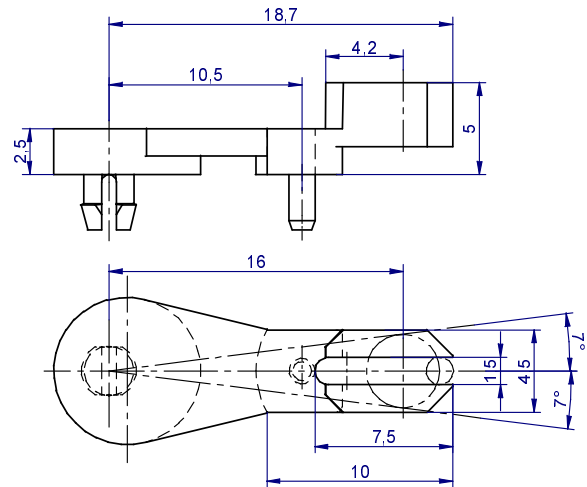


### 10.6 Zero-Adjustment Lever

The system can be equipped with a zero-adjustment intermediate lever for the pointer zero-adjustment. This lever fits into the zero-adjustment eccentric cam of the customer's apparatus.

The dimension 16mm and the radius  $R_{max. 2}$  influence the mutual adjustment angle  $7^\circ$  for the eccentric zero-adjustment.

ZHN 251



### 10.7 Zero-Adjustment

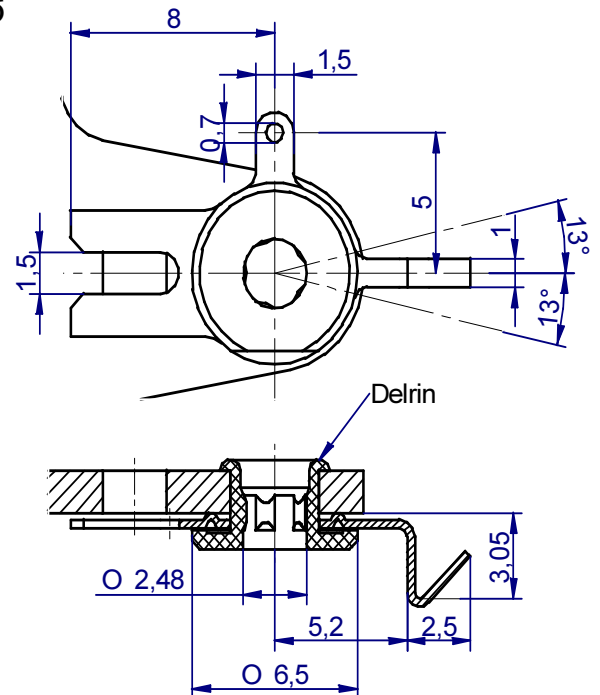
The upper zero-adjustment, NUN 6, has a zero-adjustment fork that the lower NUNJ 7 has not. The fork fits around the pin of the intermediate lever, thus allowing correction of the zero-adjustment after installation.

PREFAG zero-adjustments display a variety of advantageous characteristics:

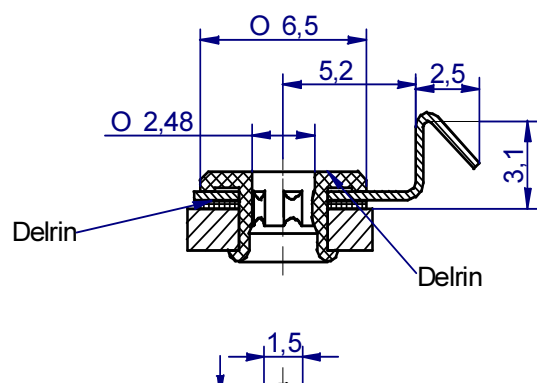
- no thread play during adjustment of the air gap between pivot and jewel screw
- self-locking thread, so that no counter-nut or laquer is required
- sure fit due to ultrasonic welding
- controlled torque.

The measurements are coordinated to the generally accepted dimensions of zero-adjustment eccentric cams and hair springs (chapter 10.14).

NUN 6



NUN 7

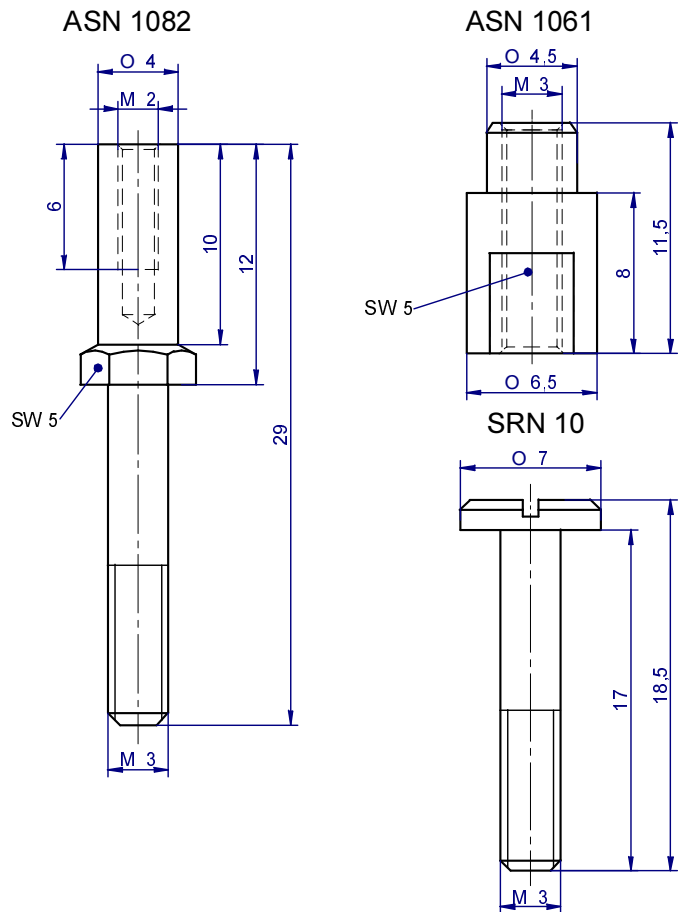


### 10.8 Spacers

The spacers ensure the exact screwing of the movement support to the magnetic circuit.

At the same time, they maintain the space between the movement and the case and between the movement and the scale.

For large pointercrosses with a balance arm length of > 11mm instead of the ASN 1082 scale column the SRN 10 screw is used ( type KSI 266, see chapter 6)



### 10.9 Movement Support

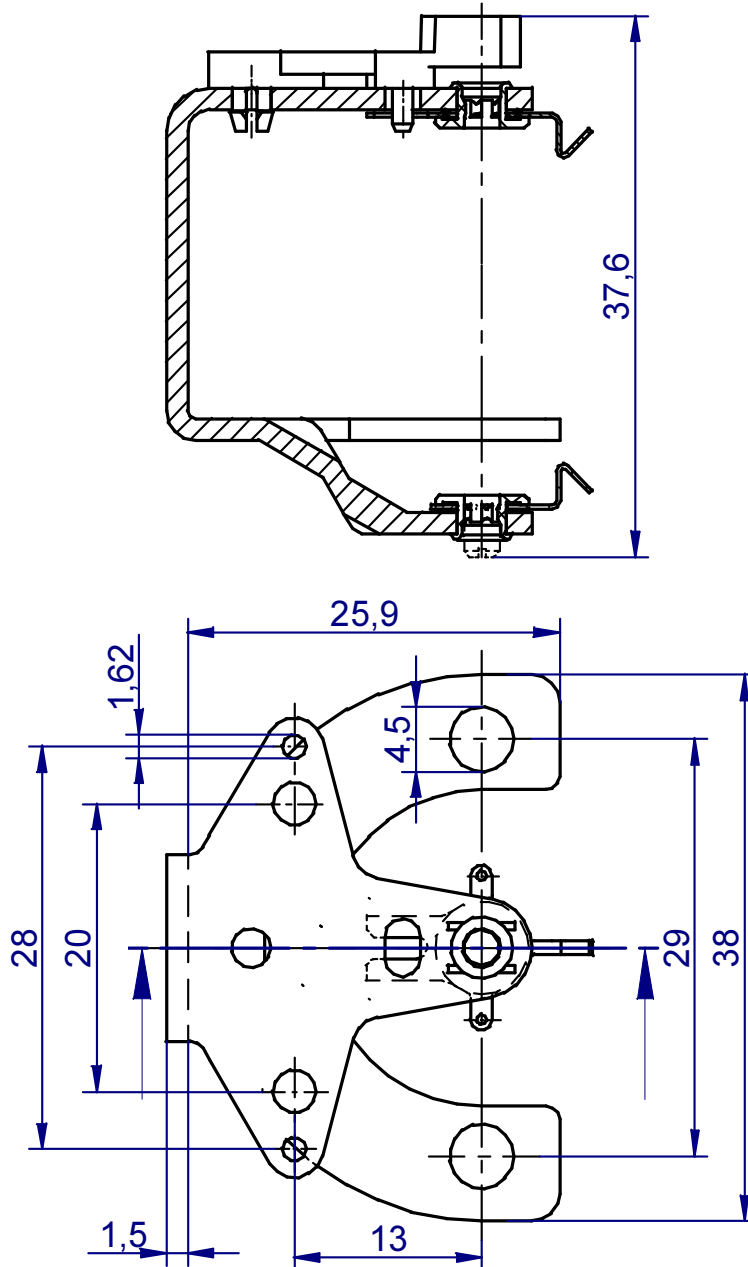
The movement supports include the time-tested PREFAG zero-adjustments (see chapter 10.7).

To ensure the necessary accuracy, the parts are manufactured as precision stamped and pressed parts.

A sure and aligned fit of the mounted zero-adjustments is obtained by ultrasonic welding done by automated equipment.

Our movement supports are corrosion-resistant and maintain their form even under extreme environmental influences such as temperature, humidity.

**10.9 Movement Support**  
(Cont.)



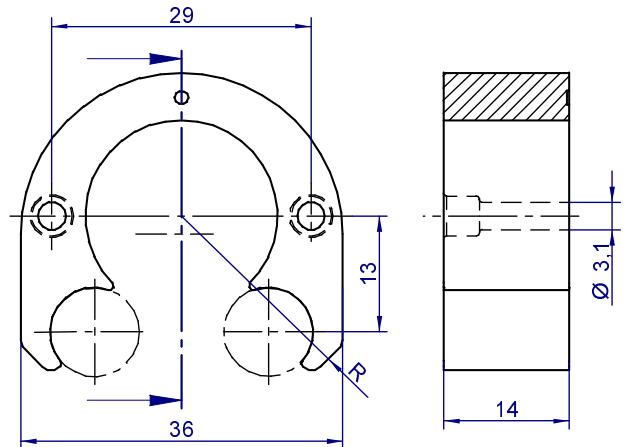
montiert mit NUN 6 + NUN 7 = MTNM 2400  
assembled with NUN 6+NUN 7 = MTNM2400

### 10.10 Outside Pole-Ring

The outside pole-rings of the magnet system are manufactured of soft iron in a powder metallurgical process with corrosion resistant surface. Carefully controlled steps during the manufacturing process and precise tools result in series parts within exceedingly narrow tolerances.

Two versions are available:

- for square cases that are 72 x 72 mm up to 96 x 96 mm ARN 250
- for 2 " dia.round cases under restricted space conditions ARN 264

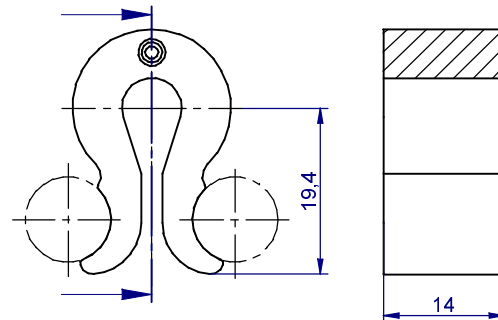


Teil Nr. /part no.	R mm
ARN 250	23
ARN 264	22,7

### 10.11 Inside Pole-Ring

The inside pole-rings of the magnet system are manufactured of soft iron in a powder metallurgical process with corrosion resistant surface. Carefully controlled steps during the manufacturing process and precise tools result in series parts within exceedingly narrow tolerances. One version is available:

- for square cases that are 72 x 72mm up to 96 x 96 mm and for 2 1/2" or 2"round cases IRN 250

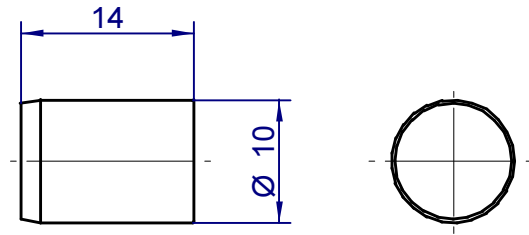


Teil Nr. /part no.	L mm
IRN 250	19,4

### 10.12 Magnet

In order to ensure measurement accuracy, stability and linearity, we use magnets made of Alnico 450.

Magnets with extremely small tolerances are needed to guarantee the advantages of easy and fast assembly and of excellent linearity without calibration.

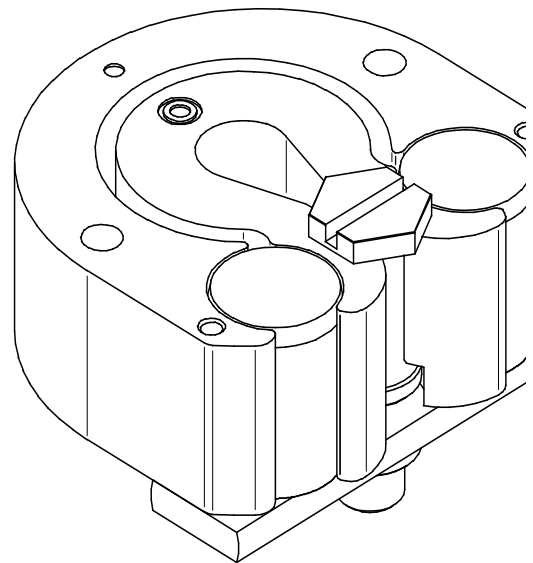


### 10.13 Magnetical shunt

For your calibration of the movements PREFAG can supply the movements assembled with a magnetical shunt system.

This magnetical shunt system is adjustable with a screw (see drawing).

The adjustable range is appr. 10 - 12 % F.S.D.(Laboratory values).



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## Hair Spring

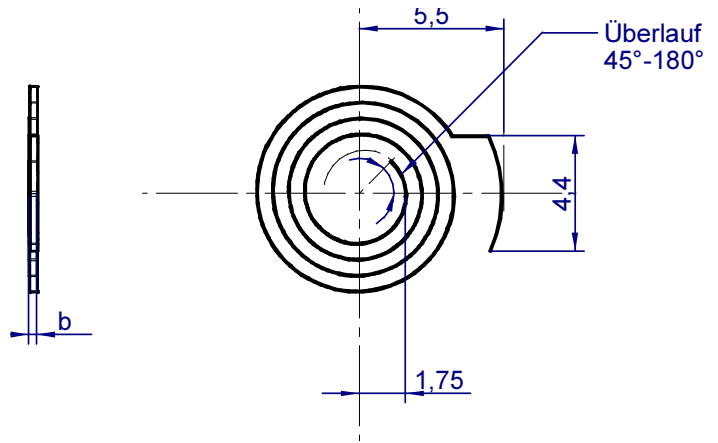
The hair springs in this series correspond to our movement design

As working range we have chosen springs with an angle of up to 250°.

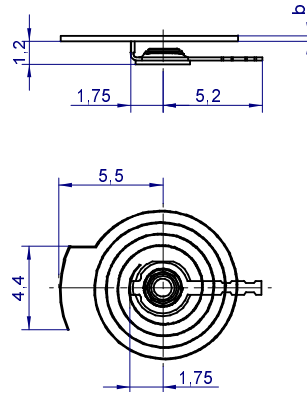
The used springs are with outer bend. With outer bend they are more complex but do provide better protection against interference of the hair spring with pointer cross, spring-holder and particularly the zero adjustment.

Our hair springs are welded to our insulated spring holders from our IN series by resistance welding. See chapter 10.2 in this manual.

For further information, we are always ready to assist you.



**10.14 Spring welded**



Spiralen geschweißt mit IN 15 spring welded with IN 15	Spirale spring	Drehmoment torque $\mu\text{Ncm} / 90^\circ$	Widerstand resistance Ohm +/- 20 %	Spiralbreite dimensions b mm +/- 10 %	Drehmoment-Abstufungen torque combinations		
					gesamt total	oben top	unten bottom
FNM 6915	FN 1416	60	2,10	0,24	120	60	60
FNM 6515	FN 1461	70	1,90	0,27	140	70	70
FNM 6615	FN 1462	80	1,80	0,26	160	80	80
FNM 7015	FN 1219	100	1,50	0,28	180	100	80
					200	100	100
FNM 6715	FN 1463	125	1,40	0,30	185	125	60
					195	125	70
					205	125	80
					225	125	100
					250	125	125
FNM 7115	FN 1220	160	1,20	0,31	220	160	60
					240	160	80
					260	160	100
					320	160	160
FNM 6815	FN 1464	200	1,15	0,33	280	200	80
					300	200	100
					325	200	125
					360	200	160
					400	200	200
FNM 7215	FN 1221	250	0,97	0,34	350	250	100
					375	250	125
					410	250	160
					450	250	200
					500	250	250
FNM 7315	FN 1222	400	0,86	0,41	525	400	125
					560	400	160
					600	400	200
					650	400	250
					800	400	400
FNM 7415	FN 1223	630	0,75	0,48	880	630	250
					1030	630	400
					1260	630	630



### 10.16 Pointer Cross

for KSI 200 240° deflection angle  
Tin balance  
Reinforced -

#### General Description

In the programm for pointer crosses PREFAG also offers a pointer cross for KSI 200 series.

On its critical points the pointer cross is reinforced by cramping, resulting in a higher mechanical stability.

By oriented riveting of the pointer cross to the moving element on the PREFAG mounting devices, precise and tight fit are ensured.

For a more flexible assembly of the movements there are on 3 positions key hole openings for balance weights to be hooked in. This way it is possible to attach the balance weights on the finished movements, when the corresponding pointer is known.

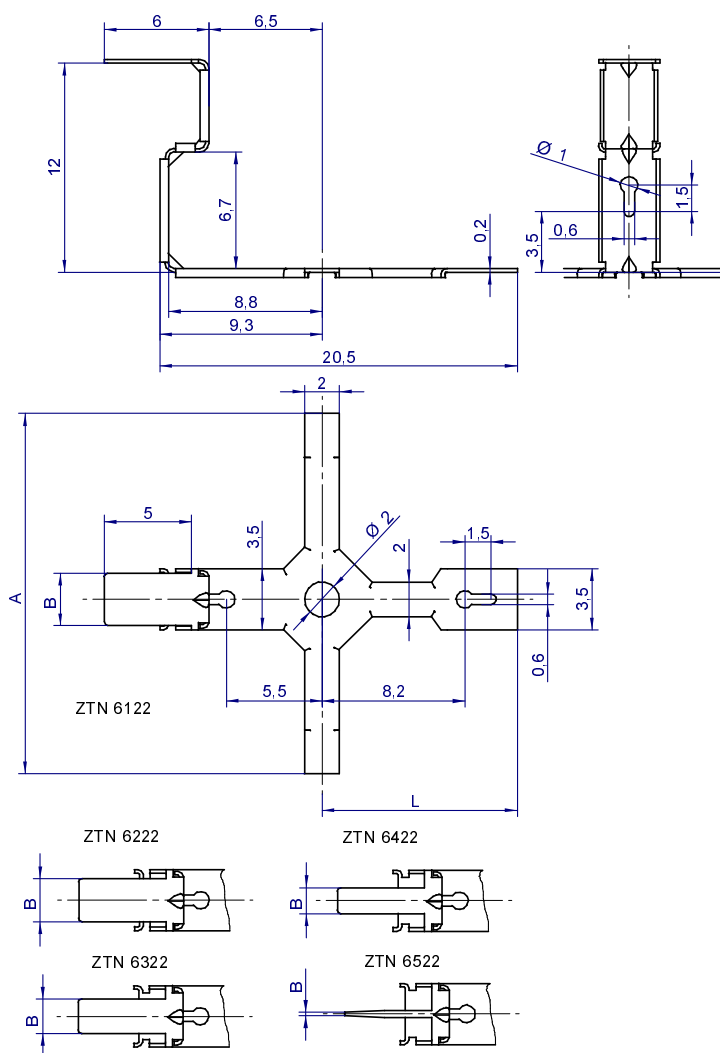
The weights are in different sizes available (chapter 10.17).

For the final fixing of the balance weights we recommend solder or adhesive.

These pointer crosses are available for DIN resp. shaft pointers as well as tupe pointers. The standard height is 12 mm. The manufacturing tool has been designed to allow certain flexibility in respect to height and pointer adapter configuration incurring only relatively low tooling cost.

Due to the mechanical stability we picked nickel silver as material for this pointer cross. The good solderability of this material helps the fine balancing which is still required.

If required special versions (e.g.wheel form), are available.



Teile-Nr. / part-no.	Meßwerk/ movement	Form/ form	Maße / dimensions		
			A mm	L mm	B mm
ZTN 6122	KSI 264, KSI 266	A	20	11,2	3
ZTN 6222		B			2,5
ZTN 6322		C			2
ZTN 6422		D			1,5
ZTN 6522		E			0,4

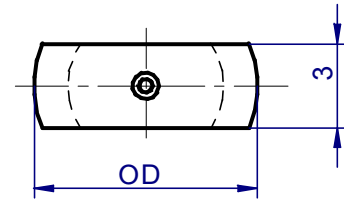
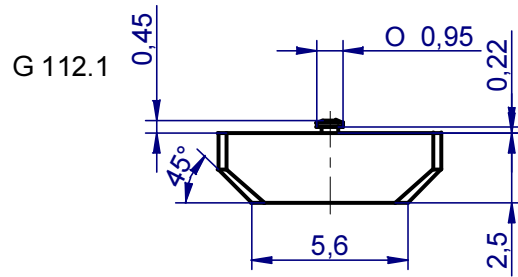
**10.17 Balance weight for  
pointer crosses ZTN 6122 - 6522**

**General description**

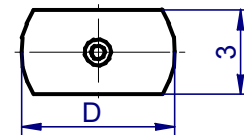
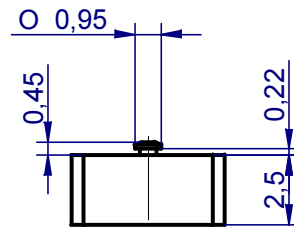
In parallel to the pointer cross program PREFAG offers for the pointer cross ZTN 6122 - 6522 (see chapter 10.16) hook-in balance weights to be assembled to the finished movements. For rationalisation in balancing there are on this new pointer cross on three positions key hole receivers for hook-in balance weights for the pre-balancing of the system. On the backside of pointer cross only G 115 is possible. The assembly of these weights is fairly simple. They are hooked into the pointer cross with a little fixing button and fixed with solder or adhesive. They are in various sizes (weights) available. For further details please see chapter 10.16 for pointer crosses. The material for these weights is iron-free brass.

For other executions please feel free to ask.

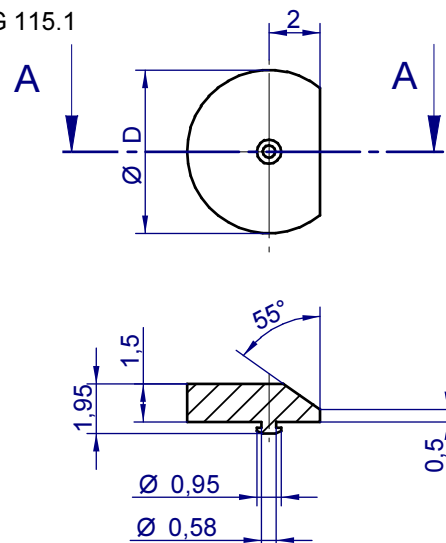
Teile-Nr. / part-no.	Maß D / dimensions D mm	Gewicht / weight mg
G 112.1	8	456
G 112.2	6,9	411
G 112.3	6,1	368
G 113.1	5,5	330
G 113.2	4,8	283
G 113.3	4,2	242
G 113.4	3,6	198
G 113.5	3,2	167
G 113.6	2,8	131
G 113.7	2,4	97
G 115.1	6,4	321
G 115.2	6	288
G 115.3	5,4	242
G 115.4	4,8	199
G 115.5	4,3	165
G 115.6	3,8	113
G 115.7	3,2	97



G113.1



G 115.1



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### **10.18 Pointer**

After verification of the corresponding specification, movements equipped with pointers and tin balanced can be supplied.

In order to maintain a higher flexibility and to simplify handling we prefer to procure these components ourselves.

### **10.19 Balance**

For industrial instruments tin balancing of movements has become standard procedure in Europe. Therefore also the movements of the KSI 200 series are designed for tin balancing.

Balancing with corresponding riveting weights is performed where required.

In case other methods of balancing are requested resp. required, detailed verification is necessary.

### **10.20 Scale**

In various cases movements with pointers and balanced are requested, however due to the design of the system, the pointer only can be fixed after the assembly of the scale. PREFAG therefore has meanwhile established together with selected capable partners the possibility to provide corresponding movements completely assembled with scales. Detailed verification of the specification is required prior to preparing the quotation.

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### **10.21 Calibration**

If required KSI 200 systems can be supplied with or without calibration. Calibration can be done via a weakening of the magnetic circuit. For the fine calibration PREFAG can also deliver movements equipped with a magnetical shunt (see chapter 10.13)

**11. GUIDELINES FOR THE ELECTRICAL  
AND MECHANICAL DESIGN**

It has been proven useful in selecting and putting together movements to have a set of various standard versions which serve as guidelines for the individual design of the customers' movements. For this reason the following data sheets have been set up for the PREFAG KSI 200 movements. All the technical data that could interest the engineer is shown. Using these data, it is easier to design a particular movement by extrapolation. Our technical staff is always available to assist you in selecting and combining for your movement.

**11.1 KSI 200 Design Criteria**

**11.1.1 Coil Data**

KSI 200		Ammeter		
Measurement range	mA/240°	0,1	1	20
Sensitivity	KOhm/Volt	10	1	0,2
no. of turns		3143	639	62
Cu-wire diameter	mm	0,02	0,05	0,15
Resistance	Ohm/ KOhm	8,6 K	281	4,53
Torque	µNcm/90°	320	650	1.260

$M_{90} = B_L * I * N * dh / 240^\circ$					
Drehmoment	Zeigerausschlag	Strom	Induktion	Faktor	Windungen
torque	pointer deflection	current	induction	factor	turns
M 90	240	I	Bl	dh	N
µNcm/90°	Grad / degrees	mA	170 mT	1,5102 cm²	Anzahl/ no.
Typische Formel für die Auslegung der Messwerke aus unseren Bausätzen KSI 200 ( KSI 400).					
Typical formula for the design of movements from our KSI 200 ( KSI 400) assembly kits.					

For the induction in the air gap  $B_L$  we recommend that you assume a value of  $B_L = 170 \text{ mT}$  (weakened approx 3%) for our magnets made of Alnico 450.

**11.1.1.2 Maximum number of turns, Coil former RN 221  
Average turn length 50.2mm**

Cu wire , diameter (mm)		number of turns max.	Resistance of max. turns (Ohm calculated/ 20°C)
Ø without insulation mm	Ø with insulation * mm		
0,020**	0,023	4690	12921
0,025**	0,029	2980	5254
0,030	0,036	1900	2326
0,032	0,038	16909	1819
0,036	0,043	1330	1131
0,040	0,047	1060	730
0,045	0,053	870	473
0,050	0,059	670	295
0,056	0,066	540	190
0,060	0,070	510	156
0,063	0,073	440	122
0,071	0,082	340	74,3
0,080	0,093	260	44,8
0,090**	0,104	200	27,2
0,100	0,115	180	19,84
0,106	0,121	145	14,22
0,112	0,128	140	12,30
0,118	0,135	130	10,29
0,125	0,142	100	7,05
0,132	0,150	98	6,20

\* Nominal values at DIN / IEC 317-0

\*\* Tested values / Other values were calculated

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## **12. TECHNICAL CHANGES**

This documentation and the products described in it are subject to change without notice.

Design studies, based on samples of PREFAG movements or PREFAG data sheets and drawings, should not be released for production, unless the customer has thoroughly checked by himself that he is using the latest up-dated versions of PREFAG documentation and components. Please see the cover sheet for the date of issue of this documentation.

The date of revision of the individual pages is given in the foot line.

## **13. PATENT RIGHTS**

Our components are protected either by patents or patents pending. We kindly request that none of our products be passed on to third parties, even in altered form.

## **14. GUARANTEE / CAPABILITY TESTS**

PREFAG offers years of experience regarding the mechanical and electrical lay-out of movements thus making the use of these movements possible under various environmental conditions. Suitable case design as well as the fitting of the movement in the case are also decisive factors ensuring that the instrument can fulfil its requirements.

The customer is therefore responsible for the type testing (capability tests) concerning the respective application. PREFAG only guarantees to deliver according to the agreed upon execution with the guarantee being limited to the value of the goods supplied.

The proposals of applications made by PREFAG are only examples.

They do not in any case represent a guarantee of characteristics according to the legislation.

**15. PROGRAM SURVEY OF METER  
MOVEMENTS**

Type of Movement	Angle range effective	Assembly kit series (Documentation)	Assembly kit
Moving iron movement	90°	DRI 400	DRI 407/402
Moving coil movement	250°	KSI 150	KSI 150 <sup>1)</sup>
Moving coil movement	240°	KSI 200	KSI 264-266
Moving coil movement	230°	KSI 100	KSI 100
Moving coil movement	170°	KSI 100	KSI 101
Moving coil movement	2x 170°	KSI 100	KSI 101 double
Moving coil movement	240°	KSI 100	KSI 103
Moving coil movement	240°	KSI 400	KSI 420/422
Moving coil movement	90°	KM 001 - 008	KM 001 to 008
Moving coil movement	90°	KM 400	KM 407/404/402
Moving coil movement	60°	SWI 60	SWI 60

<sup>1)</sup> = under preparation

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**APPENDAGE - A**

**Demagnetizing /calibration of magnetic field**

The polarity of the demagnetizing device (DC-field) must be as shown in drawing. The northpoles of the magnets point to the outer ring, the south poles to the inner ring.

The magnetic field should run as symmetrically as possible through the entire movement respectively magnetic system. We recommend to use a corresponding orientation fixture in the demagnetizer.

The magnets are thus being evenly demagnetized. Possible differences in the strength of the magnets are being compensated by the magnetic system itself.

Due to the unique design of the system recharging of the assembled movement will not result in the same airgap induction as on the newly supplied movement.

For recharching the movement to magnet saturation it will have to be returned for disassembly and remagnatization.

