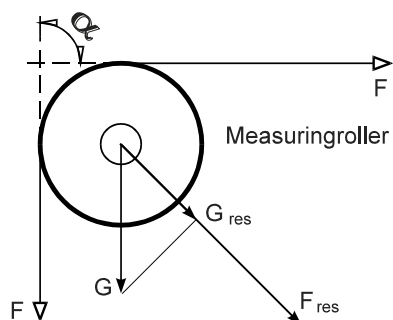
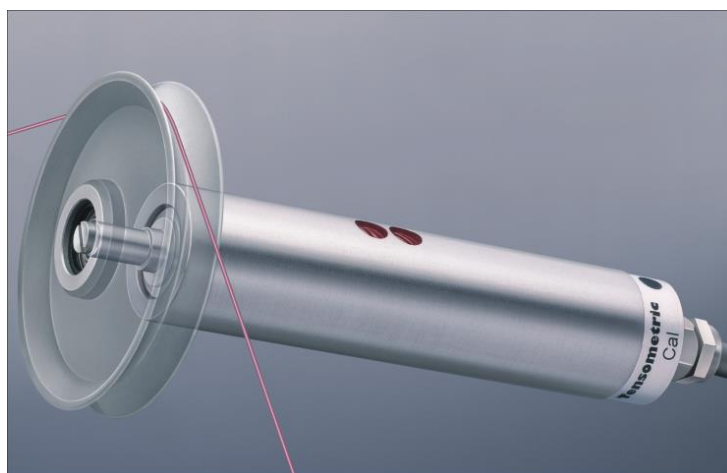


Radial Force Sensor Series M 1392 and M 1391



- α = angle of contact
- F = tension of the material to be measured
- F_{res} = resulting force which is measured
- G = weight of the measuring-roller
- G_{res} = part of the -measuring roller weight- in sphere-direction of the sensor



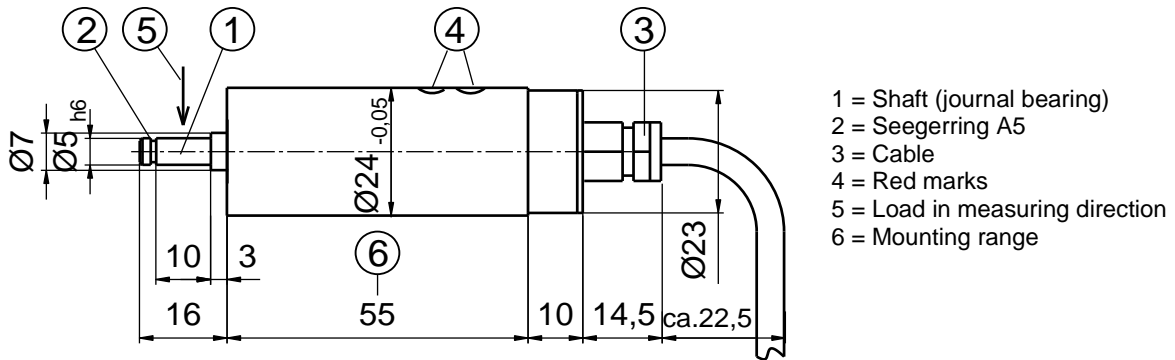
Radial Force Sensors series M 1392 and M 1391 are precise and reliable measuring systems, as well high overload-protected as high in long-time-stability.

For measuring tensile forces on running material, fit a ball-bearing mounted roller on the journal-bearing. This measuring-roller has to be mounted in a position, that the material which is measured, will deviated in a defined angle. Here angle of contacts, of the material which is measured - around the measuring roller -, between 3° and 180° are possible. The resulting radial forces, due to the deviation, are measured by the sensor. The radial force is proportional to the tensile force, in the material which is measured. Corresponding to this radial-force, the nominal load of the sensor is to select.

<i>Application</i>	Tensile-force-measurement on : optical-fibres, wires, cables, ropes, tapes, etc.		
<i>Characteristics</i>	Pulleys- or guide-rollers, are mounted on the shaft and used for tensile force measurement. Consequently no additional rollers are in the material run. Realization the measured data is lever-arm-independent, even with a wider or bigger measuring-roller.		
Amplifier	Amplifier is built-in - supplies an analogue output signal of 0 - 10 V. Option: system without amplifier: series M 1191 and M 1192		
<i>Nominal loads</i>	Series M 1392 (M 1192)	smallest nominal load 2 N	highest 30 N
	Series M 1391 (M 1191)	smallest nominal load 20 N	highest 300 N
	Series M 1391 C (M 1191 C)	smallest nominal load 200 N	highest 5000 N
<i>Measuring range</i>	By changing the angle of contact - around the measuring roller - the measuring range is variable. P.e: having an angle of contact of 3° , a measuring range of 0 to 20 times the nom.load is obtained. P.e: having an angle of contact of 180° , a measuring range of 0 to 50% the nom.load is obtained.		
<i>Measuring roller</i>	will <u>not</u> delivered as standard accessory		
<i>Overload protection</i>	standard > 10 times the nominal load. Safe protection against unexpected operation conditions. No damage of the sensor due to a blockade by means of tearing material.		
<i>Protection</i>	IP 50 to IP 64. Hereby the measuring system is certainly protected.		
<i>Measuring principle</i>	The - on the shaft - radial acting force, causes a proportional, minimal deformation of a complex formed bending-beam. The built-in strain-gage full-bridge transforms this deformation into a proportional electric outputsignal.		
<i>Journal-bearing (shaft)</i>	1. Standard : for mounting a pulley equipped with ball-bearings / 2. Tailor-made. Fixing the roller either by means of a screw or a Seegerring		
<i>Accessories available</i>	Connection-cable, amplifier with or without indicating tensile forces, rollers, clamping devices		

Technical data *Radial Force Sensor Series M 1192 KA*

Dimensions Radial Force Sensor Series M 1192 KA



Type M 1192 KA is a radial-force sensor without amplifier.
For transformation the low measuring-voltage into a norm-signal, it needs an external amplifier.

Therefor Tensometric amplifier are suited: KMV 10, MV 10 (without display)
SA DMS 610, SA DMS 310 (with display)

Nominal loads **2 N, 3 N, 4 N, 5 N, 6 N, 10 N, 20 N, 30 N** others upon request
Overload protection **> 10 times the nominal load**

Protection IP 50

Journal-bearing (shaft) standard Ø 5 mm, fixing the measuring roller by means of a Seegerring
other shafts or roller-fixing upon request

Material (tube) housing: stainless steel shaft : aluminium alloy

Electrical connection M 1192 5-pol. connector
M 1192 KA shielded, fixed cable - standard length 3 m
upon request: 5 m. Shield is connected to the housing.

Mounting Mounting into a hole Ø 24 mm, locking by means of screw-pressure on the tube
Mounting into a chucking tool Ø 24 mm.
Mounting by using Tensometric clamping device Z 1190 or Z 1391

Series :
Type M 1192 Realization the measured data via strain-gages, electrical connection via 5-pol. connector
Type M 1192 KA Realization the measured data via strain-gages, electrical connection via 3 m connection cable
Type M 1392 with built-in amplifier. Technical data please see separate data sheet

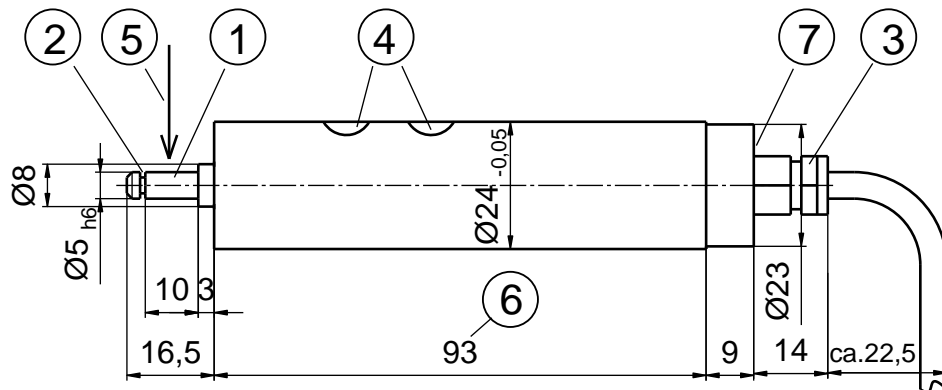
Measuring principle	strain-gage, full-bridge	Resistance input	350 Ohm
Measuring range	1 % up to min. 115%	Resistance output	350 Ohm
Charact. value	1,5 mV / V	Error in measurement	< ± 03 %
Charact. value tolerance	< ± 0,2 %	max. error in line.	< ± 0,2 %
Charact. range of temp.	+ 5°C ...+ 60° C	Reference-voltage	10 V
Coef. of temperature	< ± 0,02% / °C	Max. service- voltage	10 V

Volume of delivery: M 1192 Sensor without measuring roller, 5-pol. connector
Instruction manual with calculation tabular
M 1192 KA Sensor without measuring roller, fixed cable 3 m long
Instruction manual with calculation tabular

Accessories available Connection cable, amplifier with or without display
measuring roller, clamping device Z 1190 or Z 1391

Technical data **Radial Force Sensor M 1392**

Dimensions Radial Force Sensor Series M 1392



- 1 = Shaft (Journal bearing)
- 2 = Seegerring A5
- 3 = Cable
- 4 = Red Marks
- 5 = Load in measuring direction
- 6 = Mounting range
- 7 = Potentiometer for adjusting ZERO + CAL

Type M 1392 is with built-in amplifier.

It supplies an outputsignal of 0 to +10V, corresponding to 0-100% the nominal load.

To adjust the electrical zero and the gain (calibration), the corresponding potentiometer (7) are accessible from outside.

By ordering this type - the desired service-voltage must be indicated.

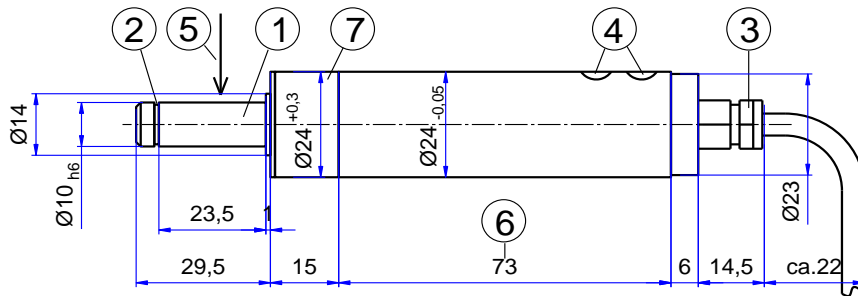
Service-voltage and output-signal are galvanic separate. (not with $\pm 15 V$!)

Connection-cable is fixed, 3 m long. Shield of the connection cable is connected to the housing.

<i>Application</i>	Tensile force measurement on thin + flexible material		
Nominal loads	1 N, 2 N, 3 N, 4 N, 5 N, 6 N, 10 N, 20 N, 30 N	others upon request	
Overload protection	> 10 times the nominal load		
<i>Protection</i>	IP 50		
<i>Journal-bearing (shaft)</i>	standard $\varnothing 5$ mm, fixing the measuring roller by means of a Seegerring other shafts or roller-fixing upon request		
<i>Material</i>	(tube) housing : stainless steel	shaft : aluminium alloy	
<i>Electrical connection</i>	shielded, fixed cable - standard length 3 m upon request: 5 m Shield is not connected to the housing.		
<i>Mounting</i>	Mounting into a hole $\varnothing 24$ mm, locking by means of screw-pressure on the tube Mounting into a chucking tool $\varnothing 24$ mm. Mounting by using Tensometric clamping device Z 1190 or Z 1391		
<i>Measuring principle</i>	strain-gage, full-bridge	<i>Service voltage</i>	5 V $\pm 10\%$ < 90 mA
<i>Measuring range</i>	1 % up to min. 120 %		12 V $\pm 10\%$ < 70 mA
<i>Charact. range of temp.</i>	+5°C ...+60° C		24 V $\pm 10\%$ < 25 mA
<i>Coef. of temperature</i>		<i>Option</i>	$\pm 15 V \pm 10\%$ +20/ -5 mA
- of the zero	< 0,025% / °C	<i>Adjusting range zero</i>	$\pm 20\%$ of the nom. load
- of the measuring range	< 0,02 % / °C	<i>Adjusting range gain</i>	$\pm 20\%$ of the nom. load
<i>Error in measurement</i>	< $\pm 0,3$ %	<i>Output signal</i>	0 ... ± 10 V
max. error in line.	< $\pm 0,2$ %	<i>Output current max.</i>	2 mA
<i>Volume of delivery</i>	Sensor without measuring roller, fixed connection cable Instruction manual with calculation tabular		
<i>Accessories available</i>	Connection cable, amplifier with or without display measuring roller, clamping device Z 1191 or Z 1391		

Technical data Radial Force Sensor M 1191 KA

Dimensions Radial Force Sensor Series M 1191 KA



- 1 = Shaft (Journal-bearing)
- 2 = Seegerring A 10
- 3 = Cable
- 4 = Red mark
- 5 = Load in measuring direction
- 6 = Mounting range
- 7 = Sealing

Type M 1191 KA is a radial force sensor without amplifier.
For transformation the low measuring-voltage into a norm-signal, it needs an external amplifier.

Therefore Tensometric amplifier are suited : KMV 10, MV 10 (without display)
 SA DMS 610, SA DMS 310 (with display)

Application Tensile force measurement on material which is flexible

Nominal loads 20 N, 30 N, 40 N, 50 N, 60 N, 100 N, 200 N, 300 N others upon request
Overload-protection > 10 times the nominal load

Protection **IP 52 Option IP 64**
Independent of the nominal load of the sensor, sealing for IP 52 and IP 64 can cause an additional error of 0,2 N. To obtain the highest possible accuracy, customer can remove sealing IP 52 by themselves, without problem. In this manner protection reduces to IP 50.

Journal-bearing (shaft) standard Ø 10 mm, fixing the measuring roller by means of a Seegerring
other shafts or roller-fixing upon request

Material (tube) housing and shaft: stainless steel Sealing material: Silicon, SL 601

Electrical connection M 1191 5-pol. connector
M 1191 KA shielded, fixed cable - standard length 3 m. upon request: 5 m.
Shield is not connected to the housing.

Mounting Mounting into a hole Ø 24 mm, locking by means of screw-pressure on the tube
Mounting by using Tensometric clamping device Z 1391

Measuring principle	strain-gage, full-bridge	<i>max. error in line.</i>	< ± 0,2 %
Measuring range	1 % up to 120%	<i>Coef. of temp.</i>	< ± 0,02% /°C
Error in measurement	< ± 0,3%	<i>Resistance input</i>	350 Ohm
Charact. value	1,5 mV / V	<i>Resistance output</i>	350 Ohm
Charact. value tolerance	< ± 0,2 %	<i>Reference-voltage</i>	10 V
Charact. range of temp.	+ 5°C ...+ 60°C	<i>Max. service voltage</i>	10 V

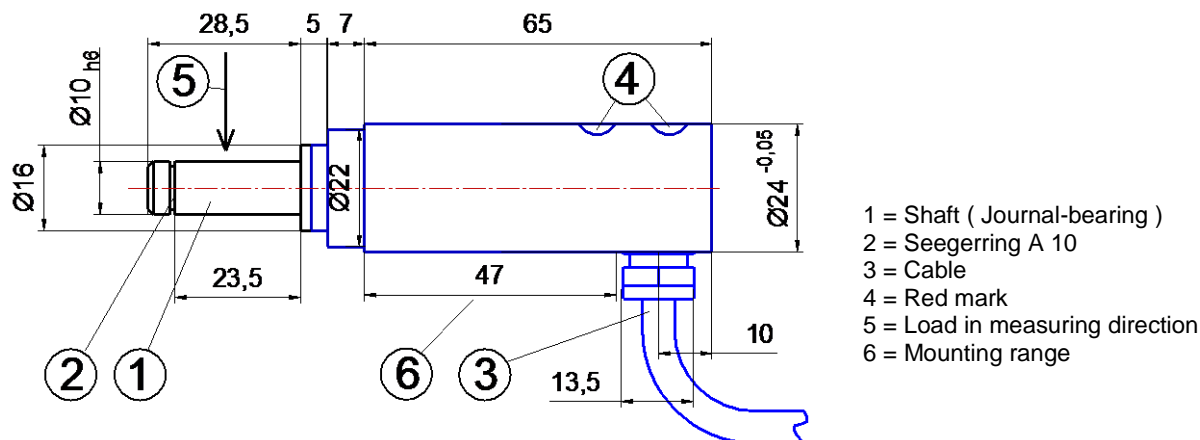
Series :
Type M 1191 Realization the measured data via strain-gages, electrical connection via 5-pol. connector
Type M 1191 KA Realization the measured data via strain-gages, electrical connection via 3 m connection cable
with built-in amplifier. Technical data please see separate data sheet
Type M 1391

Volume of delivery M 1191 Sensor without measuring roller, 5-pol. connector
Instruction manual with calculation tabular
M 1191 KA Sensor without measuring roller, fixed cable 3 m long
Instruction manual with calculation tabular

Accessories available Connection cable, amplifier with or without display
measuring roller, clamping device Z 1391

Technical data **Radial Force Sensor M 1191 KAS**

Dimensions Radial Force Sensor Series M 1191 KAS



Type M 1191 KAS is a radial force sensor without amplifier.
For transformation the low measuring-voltage into a norm-signal, it needs an external amplifier.

Therefor Tensometric amplifier are suited: KMV 10, MV 10 (without display)
SA DMS 610, SA DMS 310 (with display)

Application Tensile force measurement on material which is flexible

Nominal loads **20N, 30 N, 40 N, 50 N, 60 N, 100 N, 200 N, 300 N** others upon request
Overload-protection **> 10 times the nominal load**

Protection IP 50 Option IP 52 or IP64
Independent of the nominal load of the sensor, sealing for IP 52 or IP64 can cause an additional error of 0,2 N.

Journal-bearing (shaft) standard Ø 10 mm, fixing the measuring roller by means of a Seegerring
other shafts or roller-fixing upon request

Material (tube) housing and shaft: stainless steel
Protection IP 52 or IP64: Sealing material: Silicon, SL 601

Electrical connection shielded, fixed cable - standard length 3 m. Shield is connected to the housing.

Mounting Mounting into a hole Ø 24 mm, locking by means of screw-pressure on the tube
Mounting by using Tensometric clamping device Z 1391

Measuring principle	strain- gage, full-bridge	max. error in line.	< ± 0,2 %
Measuring range	1 % up to 115%	Coef. of temp.	< ± 0,02% /°C
Error in measurement	< ± 0,3%	Resistance input	350 Ohm
Charact. value	1,5 mV / V	Resistance output	350 Ohm
Charact. value tolerance	< ± 0,2 %	Reference-voltage	10 V
Charact. range of temp.	+ 5°C ...+ 60°C	Max. service voltage	10 V

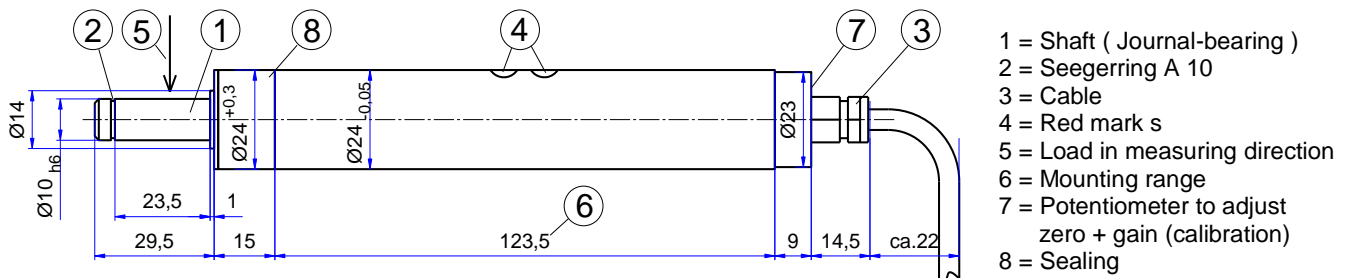
Series :
Type M 1191 KAS Realization the measured data via strain-gages, electrical connection via 3 m connection cable

Volume of delivery Sensor without measuring roller, fixed cable 3 m long, Instruction manual with calculation tabular

Accessories available Connection cable, amplifier with or without display
measuring roller, clamping device Z 1391

Technical data **Radial Force Sensor M 1391**

Dimensions Radial Force Sensor Series M 1391



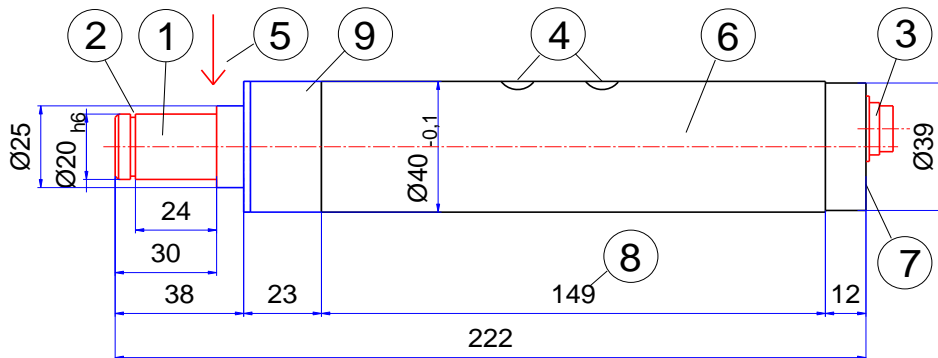
Type M 1391 is with built-in amplifier.
 It supplies an outputsignal of 0 to +10V, corresponding to 0-100% the nominal load.
 To adjust the electrical zero and the gain (calibration), the corresponding potentiometer (7) are accessible from outside.

By ordering this type - the desired service-voltage must be indicated.
Service-voltage and output-signal are galvanic separate. (not with $\pm 15 V !$)
 Connection-cable is fixed, 3 m long. Shield of the connection cable is connected to the housing.

<i>Application</i>	Tensile force measurement on material which is flexible		
<i>Nominal loads</i>	20 N, 30 N, 40 N, 50 N, 60 N, 100 N, 200 N or 300 N others upon request		
<i>Overload-protection</i>	> 10 times the nominal load		
<i>Protection</i>	IP 52 at the shaft-side / IP 50 at the cableside (Option IP 64 upon request) Independent of the nominal load of the sensor, sealing for IP 52 and IP 64 can cause an additional error of 0,2 N. To obtain the highest possible accuracy, customer can remove sealing IP 52 by themselves, without problem. In this manner protection reduces to IP 50.		
<i>Journal-bearing (shaft)</i>	standard $\varnothing 10$ mm, fixing the measuring roller by means of a Seegerring other shafts or roller-fixing upon request		
<i>Material</i>	(tube) housing and shaft : stainless steel Sealing material: Silicon, SL 601		
<i>Electrical connection</i>	shielded, fixed cable - standard length 3 m, upon request: 5 m. Shield is connected to the housing.		
<i>Mounting</i>	Mounting into a hole $\varnothing 24$ mm, locking by means of screw-pressure on the tube Mounting by using Tensometric clamping device Z 1391		
<i>Measuring principle</i>	strain-gage, full-bridge	<i>Service voltage</i>	5 V $\pm 10\%$ < 90 mA
<i>Measuring range</i>	1 % up to min. 115 %		12 V $\pm 10\%$ < 70 mA
<i>Charact. range of temp.</i>	+5°C ...+60° C		24 V $\pm 10\%$ < 25 mA
<i>Coef. of temperature</i>		<i>Option</i>	$\pm 15 V \pm 10\%$ +20/ -5 mA
- of the zero	< 0,025% / °C	<i>Adjusting range zero</i>	$\pm 20\%$ of the nom. load
- of the measuring range	< 0,02 % / °C	<i>Adjusting range gain</i>	$\pm 20\%$ of the nom. load
<i>Error in measurement</i>	< $\pm 0,3$ %	<i>Output signal</i>	0 ... ± 10 V
<i>max. error in line.</i>	< $\pm 0,2$ %	<i>Output current max.</i>	2 mA
<i>Volume of delivery</i>	Sensor without measuring roller, fixed connection cable Instruction manual with calculation tabular		
<i>Accessories available</i>	Connection cable, amplifier with or without display measuring roller, clamping device Z 1191 or Z 1391		

Technical data **Radial Force Sensor M 1391 - C**

Dimensions Radial Force Sensor Series M 1391 - C



- 1 = Shaft (Journal-bearing)
- 2 = Seegerring A 20
- 3 = Male-connector
- 4 = Red marks
- 5 = Loading in meas. direction
- 6 = Housing
- 7 = Potentiometer to adjust the zero + gain
- 8 = Mounting range
- 9 = Sealing

Type M 1391 C is with built-in amplifier.
 It supplies an outputsignal of 0 to +10V, corresponding to 0-100% the nominal load.
 To adjust the electrical zero and the gain (calibration), the corresponding potentiometer (7) are accessible from outside.

By ordering this type - the desired service-voltage must be indicated.
Service-voltage and output-signal are galvanic separate.

<i>Application</i>	For tensile force measurement on material which has high forces		
<i>Nominal loads</i>	from 200 N up to 5000 N, in steps of 100 N		
<i>Overload protection</i>	4 to 20 times, depending on the nominal load		
<i>Protection</i>	IP 50 Option IP 64		
<i>Shaft</i>	Standard shaft Ø 20 mm length and diameter can be adjusted custom-made		
<i>Material</i>	Housing and shaft : stainless steel, Sealing : SIMRIT / basis NBR		
<i>Electrical connection</i>	5 - pol. connector		
<i>Mounting</i>	fixing in machines by using clamping devices which embrace the cylindrical body or Tensometric devices Z 40 A / Z 40 B		

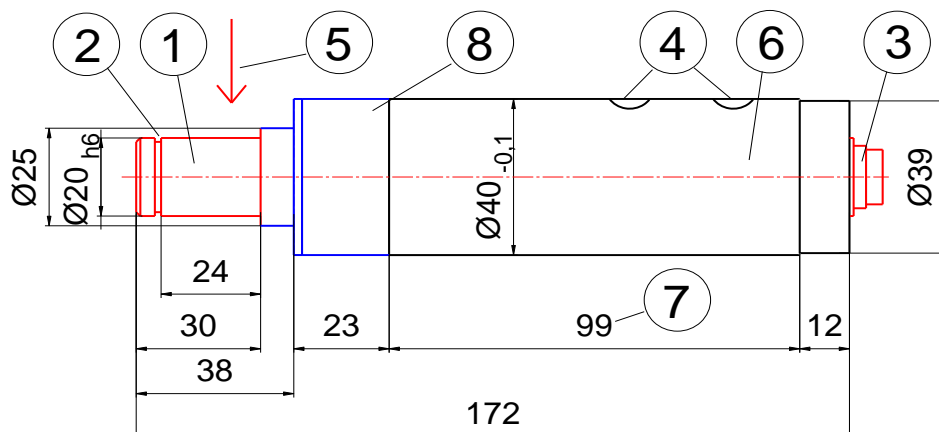
<i>Measuring principle</i>	strain-gage, full-bridge	<i>Service voltage</i>	5 V ± 10%	< 90 mA
<i>Measuring range</i>	1 % to > 120 %		12 V ± 10%	< 70 mA
<i>Charact. range of temp.</i>	+5°C ...+60° C		24 V ± 10%	< 25 mA
<i>Coef. of temperature</i>		<i>Adjusting range</i>	±20% of the nom.load	
- of the zero	< 0,025% / °C	<i>Adjusting range gain</i>	±20% of the nom.load	
- of the measuring range	< 0,02 % / °C	<i>Output signal</i>	0 ... ± 10 V	
<i>Error in measurement</i>	< ± 0,3 %	<i>Output current</i>	2 mA	
<i>max. error in line.</i>	< ± 0,2 %	<i>Option : output current</i>	4 - 20 mA	

Volume of delivery Sensor without measuring roller, with standard shaft, 5-pol. connector
 Instruction manual with calculation tabular

Accessories available Connection cable, amplifier with or without display
 measuring roller, clamping device Z 40-A or Z 40 B

Technical data **Radial Force Sensor M 1191 - C**

Dimensions Radial Force Sensor M 1191 C



- 1 = Shaft (journal bearing)
- 2 = Seegerring A 20
- 3 = Connector
- 4 = Red Marks
- 5 = Load in meas. direction
- 6 = Housing
- 7 = Mounting range
- 8 = Sealing

Type M 1191 - C is a radial-force sensor without amplifier.
 For transformation the low measuring-voltage into a norm-signal, it needs an external amplifier.

Therefor Tensometric amplifier are suited: KMV 10, MV 10 (without display)
SA DMS 610, SA DMS 310 (with display)

<i>Application</i>	For tensile force measurement on material which has high forces		
Nominal loads	from 200 N up to 5000 N, in steps of 100 N		
<i>Overload protection</i>	4 to 20 times, depending on the nominal load		
<i>Protection</i>	IP 50 Option IP 64		
<i>Shaft</i>	Standard shaft Ø 20 mm length and diameter can be adjusted custom-made		
<i>Material</i>	Housing and shaft : stainless steel, Sealing : SIMRIT / basis NBR		
<i>Electrical connection</i>	5 - pol. connector		
<i>Mounting</i>	fixing in machines by using clamping devices which embrace the cylindrical body, or Tensometric devices Z 40 A / Z 40 B		
<i>Measuring principle</i>	strain- gage, full-bridge	<i>max. error in line.</i>	< ± 0,2 %
<i>Measuring range</i>	1 % up to 120%	<i>Coef. of temp.</i>	< ± 0,015% /°C
<i>Error in measurement</i>	< ± 0,3%	<i>Resistance input</i>	350 Ohm
<i>Charact. value</i>	1,5 mV / V	<i>Resistance output</i>	350 Ohm
<i>Charact. value tolerance</i>	< ± 0,2 %	<i>Reference-voltage</i>	10 V
<i>Charact. range of temp.</i>	+ 5°C ...+ 60°C	<i>Max. service voltage</i>	10 V
<i>Volume of delivery</i>	Sensor without measuring roller, with standard shaft, 5-pol. connector Instruction manual with calculation tabular		
<i>Accessories available</i>	Connection cable, amplifier with or without display measuring roller, clamping device Z 40 A or Z 40 B		