



**APPLIED MEASUREMENTS LTD.**

**Transducer Specialists...**

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## Operating Instructions

Torque Sensor

**DRBK / DRBK-n**

**DRBK-A**



English

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**Inhalt**

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**Important instructions:**

The torque transducers of the DRBK-A series can be used as machine elements (e.g. test bench). In the case of mass-critical applications, the installation position of the drive and measurement side must be taken into account.

Please note that the transducers are not designed with the safety factors (2...20) customary in machine designs in favor of high measurement sensitivity.

Pay particular attention to the specified overload factors.

Where people and property could be injured in the event of breakage, the user must take appropriate safety measures (e.g. covers, overload protection) (observe the relevant accident prevention regulations!).

The torque transducer is not approved for use in hazardous areas.

If the transducer is opened or dismantled within the warranty period, the warranty claim becomes void.

The transducer may only be opened by qualified personnel.

## **1. Introduction**

Torque transducers measure torques in Nm.

## **2. Field of application and application instructions**

The torque transducers measure both right-hand and left-hand loads. With a right-hand load, the signal direction is positive. The nameplate provides information about the final value of the measuring range.

The torque transducers measure dynamic moments just as precisely as static torques. Here, the low masses and the high torsional rigidity are of particular advantage.

Note the signal rise of the transducer specified in the data sheet.

The torque transducers are maintenance-free due to their non-contact measurement signal transmission. Your electrical measurement signals can be transmitted to remote measurement stations and displayed, registered, processed and used for control and regulation tasks.

As a precision measuring device, the torque transducers require careful handling during transport and assembly, since impacts or falls can damage the transducer. Torque peaks in excess of the permissible overload can lead to the destruction of the torsion shaft. Where such peaks cannot be ruled out with certainty, they must be intercepted.

The limits for the permissible mechanical, thermal and electrical stresses are listed in the data sheet. It is imperative that they are complied with. Please take this into account when planning the measuring arrangement, during installation and finally during operation.

### **3. Structure and mode of operation**

#### **3.1 Torque Shaft**

The torsion shaft is made of hardened steel. The torque-proportional torsion of the torsion shaft within its elastic range is evaluated with strain gauges (DMS) applied to it. The strain gauges are arranged in a Wheatstone bridge circuit. The non-positive connection takes place via suitable couplings on the cylindrical shaft ends.

Optionally, the torsion shaft of the DRBK can be equipped with a speed measurement (see data sheet).

#### **3.2 Case**

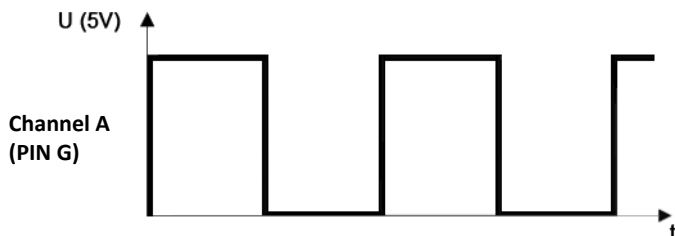
The torque transducer housings are made of high-strength aluminum and the surface is hard-anodized for protection. The torsion shaft is mounted twice in the housing via deep groove ball bearings. The transducer is mechanically fastened via threaded holes on the bottom of the housing. An evaluation electronics for torque and speed is mounted on the housing.

#### **3.3 Measurement**

The torsion shaft and thus the DMS are elastically deformed by the torsional force. The strain gages change their ohmic resistance in proportion to their change in length. The downstream electronics transmit the measurement signal optically frequency-modulated to the external electronics.

The conversion in the external electronics into the two output signals voltage/current takes place in proportion to the change in frequency. These are available for further evaluation.

A square-wave signal with 60 pulses/revolution is available at the speed output



### **3.4 Disturbances and their compensation**

Avoid bending, axial and radial forces. When you have problems with this, use ETH clutches.

To connect the transducer to a measurement unit you need a shielded cable.

The transducers are EMC-tested and are complying with

EN 55011:1998 + A1:1999 + A2:2002

EN 61326-1:2006-05 and

EN 61000-6-2:2005.

## **4. Conditions on location**

### **4.1 Ambient temperature**

For best results, the device must be operated within the nominal temperature range. The best operating conditions are constant and, if necessary, slowly changing temperatures. The specified temperature errors apply if the temperature does not change faster than 5K/h. One-sided thermal radiation or cooling should be avoided and appropriate technical preventive measures taken, if necessary.

### **4.2 Moisture and dust**

The torque transducers comply with protection type rating IP40 as per DIN 40050.

**Note: There should be no moisture inside the transducer connector**

### **4.3 Chemical effects**

The torque transducers are not protected against chemical effects. They must not be used in caustic or corrosive environments.

### **4.4 Deposits**

Dirt, dust or other foreign substances should not accumulate so that they can enter the bearing or the connectors.



## 5. Mechanical installation

### 5.1 Precautions when assembling

- Handle transducer carefully.
- **Important note:**  
**When installing the couplings, do not overload the transducer, not even temporarily.**  
**It is strongly recommended to remove the transducer before mounting connect electrically and the torque signal with too monitor in order not to exceed the measuring range!**
- Misalignments in the axial and radial directions must be avoided. The axis offset should be max. 50% of the permissible values of the coupling used (axial, angular and lateral misalignment) be. Please refer to the data sheet for your coupling for this data.
- A good electrical connection of the housing to grounded parts must be observed.

### 5.2 General assembly guidelines

The drive and transducer sides should not be swapped, otherwise measurements (readings) will be invalidated during accelerations, for example.

**When reading the device label, the drive side is on the right and the transducer side on the left of the transducer. There is a small cavity in the cover on the measurement side.**

Flexural, axial and radial forces are disturbances that cause incorrect measurements.

Be careful with the thermal expansion of the assembly.

## **6. Structure of the measurement chain**

In order to be able to measure with the transducer, a complete measurement chain must be set up.

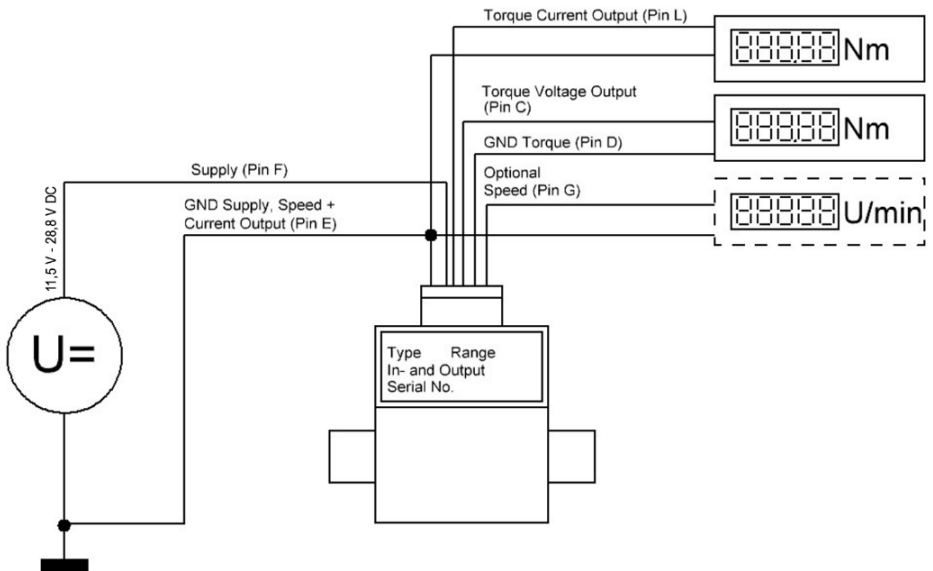
This consists of:

- torque transducer
- connection cable  
We recommend using our ETH cables.  
They are optimized in design and shielding.
- Supply and evaluation device (e.g. PLC)

A supply unit is necessary to supply the transducer with the necessary operating voltage. The transducer includes the complete measuring amplifier, so that no additional amplifier is necessary. The measuring signal can be further processed directly (e.g. PC) or displayed and evaluated with supply and evaluation devices.

## 7. Connection

Connection of a torque transducer with a 12-pin connector



### **7.1 Hints for connection**

Electric and magnetic fields cause interference with the measuring signal. This interference is mainly caused by power cords, relays or motors installed nearby. Besides these, interference can be caused by multiple grounding of the measurement chain on more than one point.

Pay attention to the following:

- Use only shielded cables with low capacitance (like our measuring cables).
- Connect supply voltage correctly (no reverse polarity protection).
- Measuring cables shouldn't be nearby high voltage or control cables.
- Magnetic radiation from transformers, motors or relays must be avoided.
- Don't ground transducer and display unit multiple.
- Connect all devices of the measurement chain to the same ground.

### **7.2 Connector**

The transducer is equipped with a 12 pin fitted connector type Binder.

### **7.3 Pinout of the connector**

The pinout of the connector is showed on the next page.

### **7.4 Extension of cable**

Extension cables must be shielded and low-capacitance. We recommend using the cables we offer that meet these requirements.

In the case of cable extensions, care must be taken to ensure a perfect connection and good insulation. It is important to ensure that the cable cross-section is large enough to ensure sufficient supply voltage at the transducer. Recalibration is not necessary when the cable is extended.

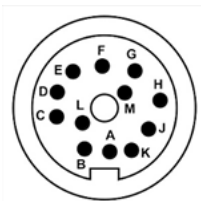
If the cable has to bridge a longer distance, we recommend using the current output.

### 8. Pinout

- Standard measuring cable AK12.4
- Robot cable AK12.5

Connector: 12 pin

Pin	Standard cable AK12.4 Colour	Robot cable AK12.5 Colour	Pinout DRBK
A	Green	Black	message ready
B	Red / Blue	Red	NC
C	Yellow	Brown	moment voltage output
D	White	White	moment voltage mass
E	Grey	Yellow	supply + speed + current ground
F	Pink	Purple	supply +11...28V
G	Grey / Pink	Green	speed output
H	Purple	Pink	memory chip
J	Black	Grey	NC
K	Red	Grey/Pink	NC
L	Brown	Blue/Red	moment current output
M	Blue	Blue	NC



*(Connection on the transducer seen from the front)*

## 9. Output

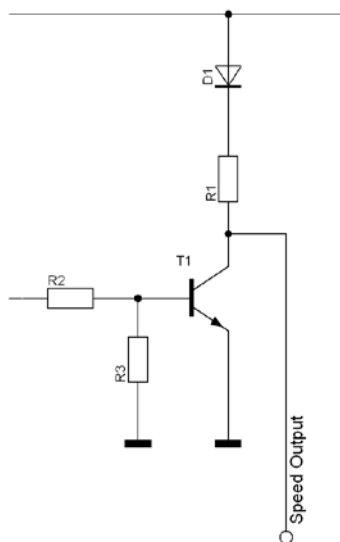
The transducer's output is a proportional voltage of 0 -  $\pm 5V$  and a current of 10 -  $\pm 8mA$ .

With clockwise torque the output is positive; with counter clockwise torque the output voltage is negative.

The outputs for rotation speed and angle measurement have an open collector stage, with an internal 10 K $\Omega$  pull up resistor in series with a diode. See schematic below.

With this circuit you can measure speed of more than 15,000 RPM and with a cable of up to 33 ft.

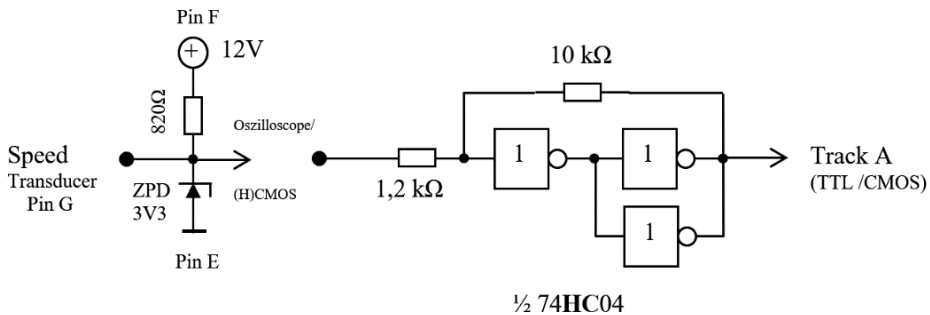
The signal level of the circuit on the left hand side is suitable for opto couplers, frequency counters, oscilloscopes and for (H)CMOS logic. If you need standard TTL levels you can add the circuit on the right hand side.



The 'ready' signal is activated as soon as the supply voltage is within the permitted voltage range and the overvoltage protection has not been activated.

The voltage level on the 'ready' output is equal to the applied supply voltage.

The output can be loaded with max. 100mA.



## 10. Functions of the display (at DRBK-A)

The displayed torque is always shown in 4 digits. For example, with a nominal torque of 200 Nm, a value is displayed as „199.2Nm“. The torque is updated every 100ms.

The speed is represented as an integer. The valid range is between 0 and 32000 RPM.

The update occurs every second.

In standard the display is in track mode (LED off).

To change the measuring mode, press the „PEAK / TRACK“ button. If the peak mode is active, the LED below the display lights up. The peak mode shows the respectively applied peak torque in right-hand load. It is only available for values greater than 5% of the full scale value in right-hand load. The current torque is displayed for values that are smaller or with left-hand load.

With the „TARE“ key, the zero point can be reset in track mode. However, this function is only available if the torque is less than 5% of the end value of the measuring range.

In the peak mode, the „TARE“ key has the function of deleting the displayed peak value.



## **10. Recalibration**

Regardless of usage, the sensor must be calibrated after the period specified by ETH - every 2 years by default (see certificate and sticker sensor).

We also carry out a complete check (e.g. wearing parts).

To ensure that the calibration can be carried out quickly, we recommend making an appointment before returning the device.

## **11. Disposal**

The transducer can be returned to us free of charge for disposal, complete with the measuring cable. As soon as this is packed by you, send a message to [sales@eth-messtechnik.de](mailto:sales@eth-messtechnik.de), we will then commission our parcel service to collect it.

Unfortunately, we cannot accept parcels sent to us without prior notice.



## 13. Datasheet

Torque Transducer

# DRBK + DRBK-A

Torque ranges from 0,5 to 1000 Nm



### Features

- Low-Cost Torque transducer
- Current output and voltage output
- Very short
- Measurement accuracy:  $\leq 0.5\%$  of full scale
- Contactless transfer of measurement signal
- Proven strain gage technology
- Integrated signal amplifier
- Single power supply
- wide range of applications
- Optional speed measurement

The Series DRBK torque transducers are suitable for lab and industrial applications because of their small size and multiple mounting options.

As supply voltage and output signal are transmitted without contact, the device can operate continuously with low wear and no maintenance.

These transducers are also available with speed measurement for a host of applications.

### Extra Features DRBK-A

- Simultaneous speed/torque indication
- 4-segment display with sign
- Peak mode (clockwise only)
- Indication area on LCD display 30 x 11 mm
- Speed indication updated 1x sample/second
- Torque updated 1,000 samples/second

Series DRBK-A torque transducers are custom made for applications where an extra analyzer should not be used or is not needed.

Production monitoring data can be clearly displayed at very small cost!

### 13.1 Technical specifications

Supply voltage:	11,5 to 28,8 V DC
Current consumption:	DRBK approx. 200 mA / DRBK-A approx. 250 mA
Rise time 10-90 %:	1 ms
Limit frequency -3 dB:	1 kHz
Voltage output:	0 to $\pm 5$ V
Internal resistance:	100 $\Omega$
Current output:	10 $\pm$ 8 mA    Burden max 500 $\Omega$
Ripple:	< 100 mVss
Nonlinearity:	< 0,3 %
Hysteresis:	< 0,3 %
Deviation at zero point:	$\leq \pm 100$ mV / $\pm 200$ $\mu$ A
Max. measurement error	0,5 % (FS / of full scale)
Operating temperature:	0 - 60 °C
Compensated temperature range:	5 - 45 °C
Temperature error	
Zero point:	0,05 % / K
Sensitivity:	0,02 % / K
Mechanical overload:	100 %
Internal protection:	IP40
Connection:	12pin- connector

#### EMV Immunity for interference (DIN EN 61326-1 / EN 61000-6) \*1

Enclosure		
HF line interference	Severity	Criterion
150 kHz - 80 MHz (AM)	3 V	A
(ESD) Electrostatic discharge	Air 8 kV	A
	Contact 4 kV	A
Enclosure		
Electromagnetic Field		
80 MHz - 1000 MHz (AM)	10 V/m	A
80 MHz - 2700 MHz (AM)	10 V/m	A
Leads - Connection Cable		
Burst (fast transients)	2 kV	A
Surge voltage (Surge)	1 kV	B
Interference Emission (EN 61326-1 / EN 55011)		
Disturbance Voltage (Electromagnetic Disturbances)	-	Class B (150 kHz - 30 MHz)
Radiated Emission (Electromagnetic Disruption axis)	-	Class B (30 MHz - 1000 MHz)

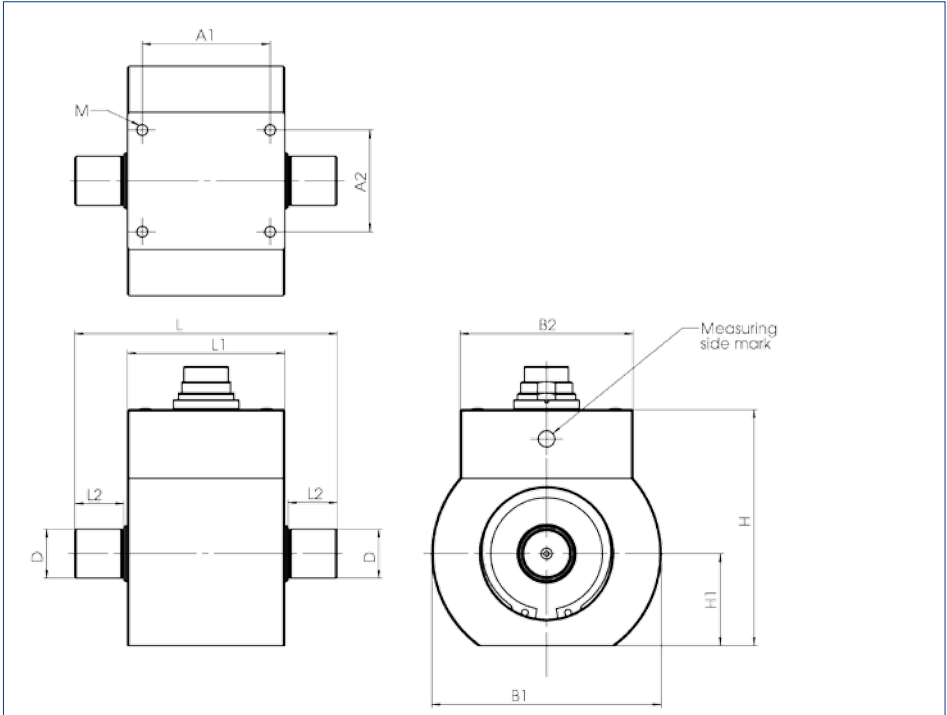
Speed Option (n) only DRBK *2	
max. rev.:	up to 10 000 min <sup>-1</sup> *3
Output:	Open-Collector
Internal pull up:	4,7 k $\Omega$ (5 V level)
External pull up:	24 V max / 20 mA
Pulses/rev.:	60

\*1 Severity / Criterion: industrial environment;  
Cable length  $\leq$  30m.  
Application not outside buildings.

\*2 standard on DRBK-A

\*3 by proper external connections til speed max.

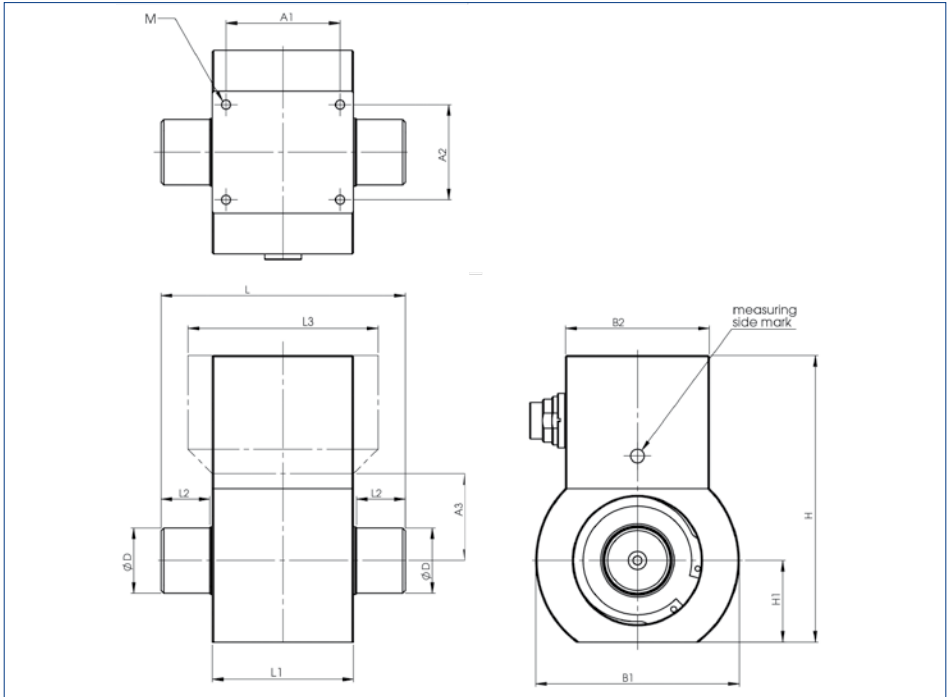
### 13.2 Mechanical dimensions DRBK



### 13.3 Sizes DRBK

Type:	0	I	II	III
Torque Ranges: (Nm)	0,5   1   2	5   10   20	50   100   200	500   1000
Dimensions:				
L (mm)	66	80	90	120
∅ B1 (mm)	45	70	75	105
B2 (mm)	45	53	53	76
H (mm)	56	72	77,5	97,5
H1 ± 0,05 (mm)	18	28	30	40
∅ D g6 (mm)	6	15	24	40
L1 (mm)	42	48	52	65
L2 (mm)	10	15	18	26
A1 (mm)	33	39	42	50
A2 (mm)	20	31	35	55
M	M3 x 5 deep	M4 x 6 deep	M4 x 6 deep	M5 x 10 deep
	General tolerances DIN 2768 - m			
Weight approx.: (g)	230	550	850	2450
Speed max.: (1/min)	20000	18000	16000	9000

### 13.4 Mechanical dimensions DRBK-A



### 13.5 Sizes DRBK-A

Sizes	0	I	II	III
Torque Ranges: (Nm)	0,5   1   2	5   10   20	50   100   200	500   1000
Dimensions:				
L (mm)	66	80	90	120
Ø B1 (mm)	45	70	75	105
B2 (mm)	54	53	53	76
H (mm)	90	100	106	122
H1 ± 0,05 (mm)	18	28	30	40
Ø D g6 (mm)	6	15	24	40
L1 (mm)	42	48	52	65
L2 (mm)	10	15	18	26
L3 (mm)	51	48	52	65
A1 (mm)	33	39	42	50
A2 (mm)	20	31	35	55
A3 (mm)	22	-	-	-
M	M3 x 5 deep	M4 x 6 deep	M4 x 6 deep	M5 x 10 deep
	General tolerances DIN 2768 - m			
Weight approx.: (g)	310	610	910	2530
Speed max. (min <sup>-1</sup> )	20000	18000	16000	9000

### 13.6 Mechanical values and load limits DRBK + DRBK-A

Sizes	Torsion Shaft-Type	Measuring range (Nm)	spring constant C (Nm/rad)	Mass Moment J (g•cm <sup>2</sup> )			Permitted Axial load (N) *	Permitted Radial load (N) *
				Total	Drive side	Measuring side		
0	DRBK-0.5	0,5	144	14,9	14,3	0,6	190	30
	DRBK-1	1	144	14,9	14,3	0,6	190	30
	DRBK-2	2	287	14,9	14,3	0,6	190	60
I	DRBK-5	5	1100	100	82	18	930	25
	DRBK-10	10	2700	100	82	18	930	45
	DRBK-20	20	5400	101	82	19	930	90
II	DRBK-50	50	20 x 10 <sup>3</sup>	339	233	106	1580	210
	DRBK-100	100	36 x 10 <sup>3</sup>	347	237	110	1580	420
	DRBK-200	200	52 x 10 <sup>3</sup>	364	246	118	1580	845
III	DRBK-500	500	290 x 10 <sup>3</sup>	3265	1794	1471	3920	1420
	DRBK-1000	1000	420 x 10 <sup>3</sup>	3434	1878	1556	3920	2875

\*The values for axial and radial load refer to the non-fixed housing

#### Features

- The outputs are short-circuit proof
- Signal output for „transducer ready“ 100 mA, level = power supply

#### Available Accessories

Cables, Analyzers, Couplings

#### Compatible Couplings

for Size 0 KB2/20-38-6-x

for Size I KB4K/20-39-15-x

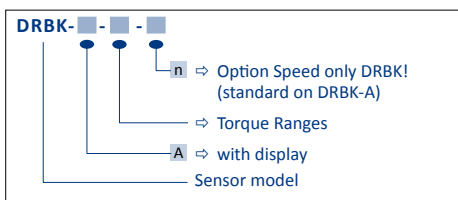
for Size II KB4K/200-60-24-x

for Size III KB4K/1000-84-40-x

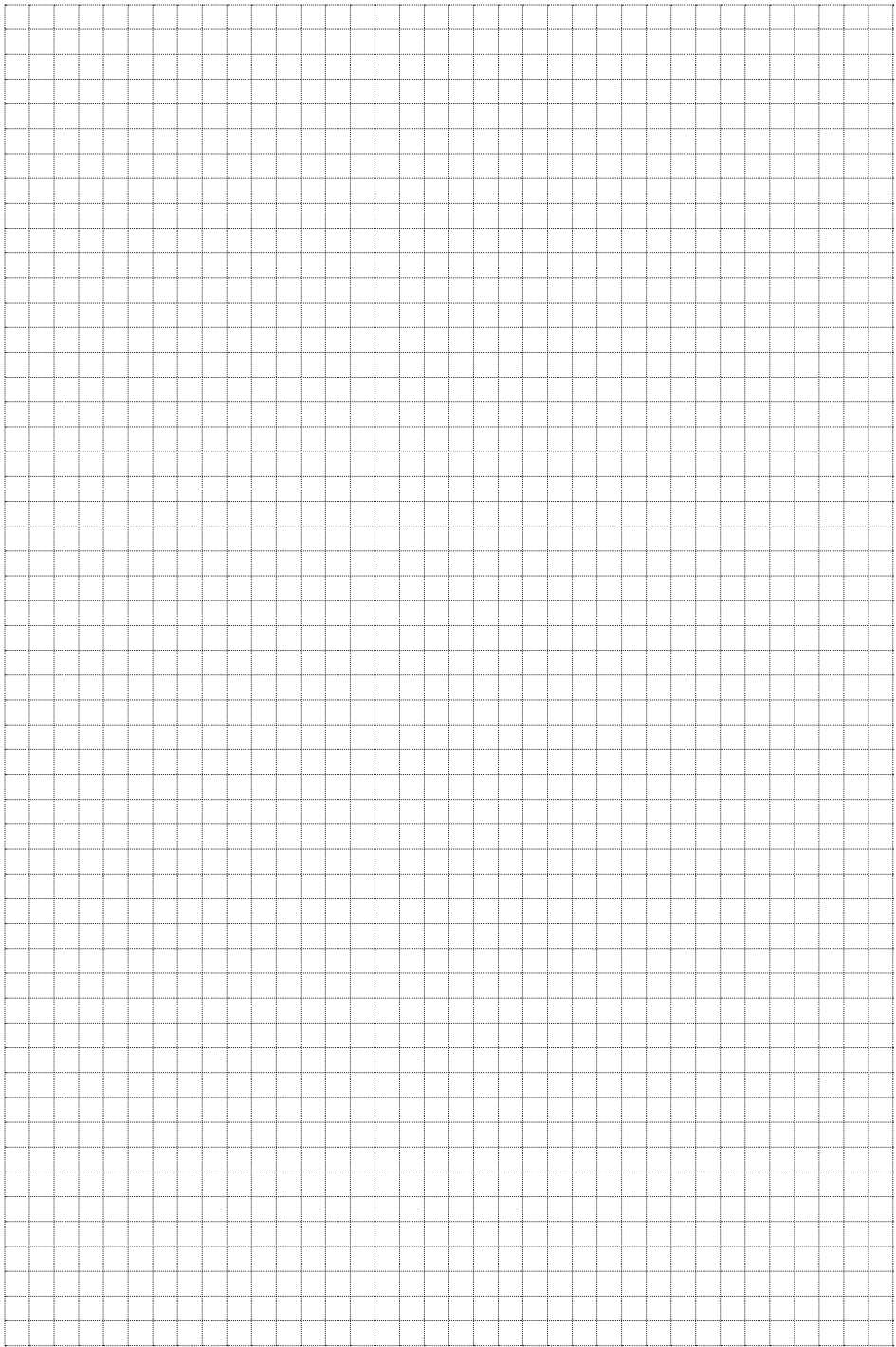
#### Ordering Code Coupling

Model/Size - Lenght - ØD1 - ØD2

#### Ordering Example









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