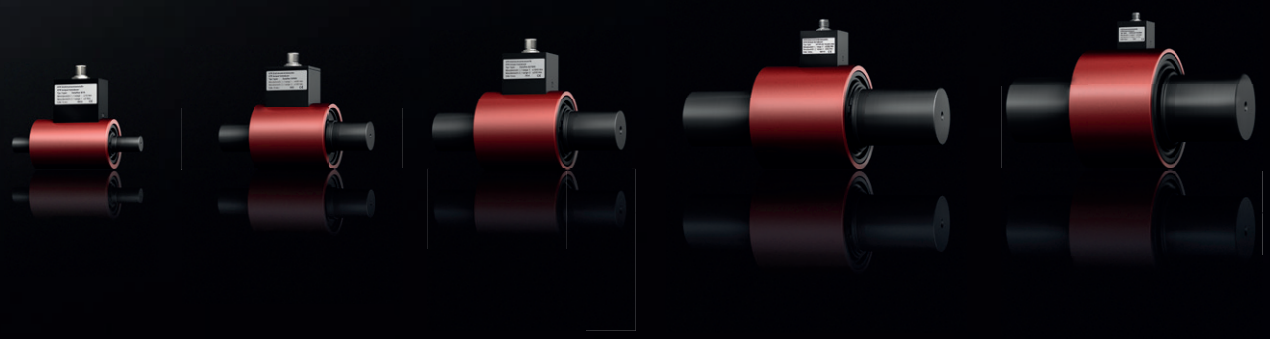
Torque measuring technology

DATAFLEX® 16 **DATAFLEX® 32** **DATAFLEX® 42** **DATAFLEX® 70** **DATAFLEX® 110**



Properties of torque measuring shafts

DATAFLEX® 16, 32, 42, 70, 110 – Dual-range measuring shaft providing for high precision with each revolution

The KTR torque sensors type DATAFLEX® 16 to DATAFLEX® 110 cover a torque range from 10 Nm to 20,000 Nm.
The torque is measured using the approved technology of wire strain gauges DMS while processing contactlessly with a revolution of 24 bits. Thus, the inaccuracy of torque measuring is reduced to less than 0.1 % of the measuring range. By integrating a high-resolution speed sensor the new series combines four measurements in one: Measuring the torque, speed, rotation angle and rotation direction is part of the standard equipment. A new feature is the option to switch the measuring range of each measuring shaft to one fifth of the rated torque. This option allows to measure smaller torques precisely without changing the design.

Customised solutions and special designs

Besides KTR precision measuring shafts KTR manufactures and calibrates customised measuring shafts for measuring ranges up to 500 kNm. In this context key parameters such as measuring range, size, length and coupling type can be adjusted to the specifications. The torque is measured contactlessly so that bearings are not required.

Apart from customised torque sensors KTR provides special solutions with couplings equipped with torque measuring technology so that the design does not have to be modified.

Couplings adjusted to any application

Matching with all series of DATAFLEX® we recommend to use the servo laminae coupling RADEX®-NC and the steel laminae coupling RADEX®-N. Together they form a compact solution which is easy to integrate while having a high stiffness. Basically it is also possible to use backlash-free, plug-in types of couplings such as ROTEX® GS or to fit an overload coupling.

Product finder of torque measuring shafts

Product	DATAFLEX® 16	DATAFLEX® 32	DATAFLEX® 42	DATAFLEX® 70	DATAFLEX® 110	customised
Maintenance-free	●	●	●	●	●	●
For rotating applications	●	●	●	●	●	●
Dual-range measuring shaft	●	●	●	●	●	–
Measuring range 1 T_{KN} [Nm]	10, 30, 50	100, 300, 500	1000	3000, 5000	10000, 20000	20000 - 500000
Measuring range 2 T_{KN2} [Nm]	2, 6, 10	20, 60, 100	200	600, 1000	2000, 4000	–
Inaccuracy (% of T_{KN}/T_{KN2})	< 0.1 / 0.2	< 0.1 / 0.2	< 0.1 / 0.2	< 0.1 / 0.2	< 0.1 / 0.2	< 0.2
Torque output	-10 … 10 V	-10 … 10 V	-10 … 10 V	-10 … 10 V	-10 … 10 V	-10 ... 10 V, 4 … 20 mA
Speed output						
Square-wave signal [pulses/rev.]	2 x 360	2 x 720	2 x 720	2 x 450	2 x 720	–
DC - direct voltage signal [0 ... 10V]	●	●	●	●	●	–
Direction signal	●	●	●	●	●	–
Maximum speed [rpm]	10,000	7,500	6,500	4,000	3,000	miscellaneous
Recommended coupling	RADEX®-NC 21, 26	RADEX®-NC 36 RADEX®-N 60	RADEX®-N 80	RADEX®-N 90, 115	as specified	as specified
Connection housing DF2	●	●	●	●	●	–

Connection housing DF2 - All inclusive

The connection housing DF2 can easily be combined with all DATAFLEX® torque measuring shafts disposing of a retainer for top hat rail assembly as well as terminal screws for an easy connection of external devices.
The following features save the purchase of expensive measuring amplifiers and converters:

- The torque output can be filtered over 5 steps so that short torque peaks in the display can be reduced.
- The pulsed outputs of the speed signals can be configured both for 5 V (TTL) and 24 V (HTL) controls. This makes the outputs compatible with data logging boards and SPS controls.
- In parallel with the pulse signal an integrated frequency voltage converter supplies a DC voltage from 0 – 10 V proportionally to the speed, the scaling of which can be individually adapted. This makes an expensive counter superfluous so that the signal can either be processed as a voltage or displayed.
- A direction signal indicates the rotational direction of the drive (with DATAFLEX® 16, 32, 42, 70 and 110).

DATAFLEX® 16/10, 16/30, 16/50
DUAL-RANGE TORQUE SENSOR

For torques up to 50 Nm

General properties					
DATAFLEX® type	Measuring range 1 T_{KN} [Nm]	Measuring range 2 T_{KN2} [Nm]	Supply voltage [V]	Current consumption [mA]	Operating temperature range [°C]
16/10	-10 ... +10	-2 ... +2			
16/30	-30 ... +30	-6 ... +6	24 ±4	<100	0 ... 55
16/50	-50 ... +50	-10 ... +10			

Technical data of torque signal					Technical data of speed signal				
DATAFLEX® type	Inaccuracy (% of T_{KN}/ T_{KN2}) [1), 2), 3)]	Output voltage [V]	Band width [kHz]	Influence of temperature [1)] [%/10 °C]	Resolution [pulses/rev.]	Number of channels	Square-wave signal [4)] [Vss]	Direct voltage signal [4)] [V]	Direction signal [4)] [V]
16/10									
16/30	<0.1 / 0.2	-10 ... 10	2	0.05	360	2, 90° offset	5 / 24	0 ... 10, scalable	5 / 24
16/50									

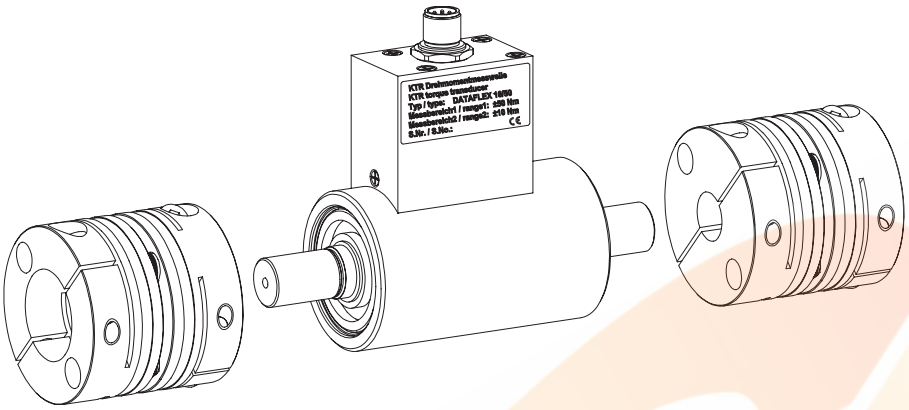
Mechanical data of torque measuring shaft										
DATAFLEX® type	Static load limit [1)] $T_{K\,max}$ [%]	Breaking load $T_{K\,break}$ [1)] [%]	Max. bending torque [Nm]	Max. radial force [N]	Max. axial force [kN]	Weight [kg]	Torsion spring stiffness C_T [Nm/rad]	Torsion angle with T_{KN} [°]	Mass moment of inertia [kgmm²]	Max. speed [5)] [rpm]
16/10			1.07	12	1.1		910	0.63		
16/30	150	300	3.2	37	2.3	0.7	2840	0.61	22.6	10000
16/50			5.3	61	3.1		4100	0.7		

Mechanical data of combination of DATAFLEX® 16 and RADEX®-NC							
DATAFLEX® type	Coupling			Mechanical data of combination			
	RADEX®-NC size	Clamping screw M		Mass moment of inertia [kgmm²]	Torsion spring stiffness C_T [Nm/rad]	Weight [kg]	Max. speed [5)] [rpm]
		M	T_A [Nm]				
16/10	21	M6	10	323	870	1.30	10000
16/30					2500		
16/50	26	M8	25	800	3600	1.80	

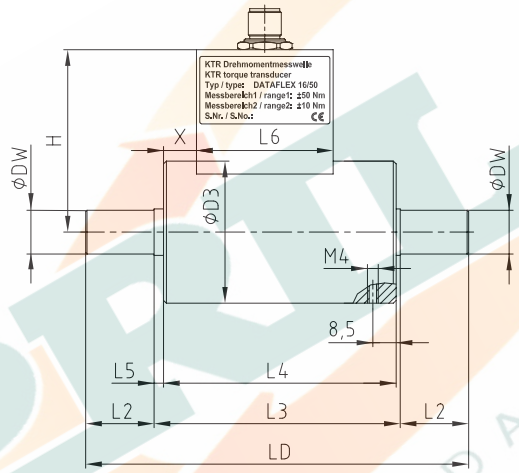
[1)] Referring to T_{KN}
[2)] Referring to T_{KN2}
[3)] Error in linearity incl. hysteresis
[4)] See page 367: with connection housing DF2
[5)] Using RADEX®-NC 3.5 hubs, with other couplings 7500 RPM.

Ordering example:	DATAFLEX® 16/30	DF2	2 m, 5 m and 10 m	RADEX®-NC 21 EK Ø16/20-Ø16/30
	Type of measuring shaft with measuring range	Connection housing (is required)	Connection cable	If any accessories are requested: coupling type, finish bores D/DW

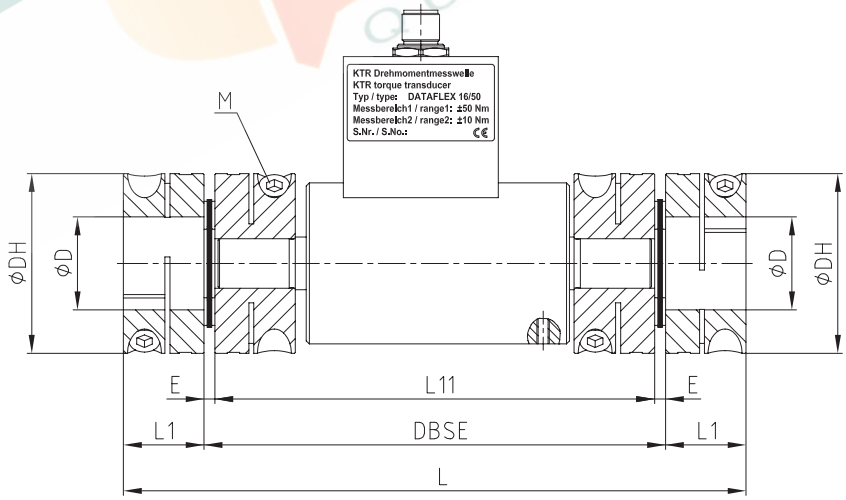
Components



DATAFLEX® 16



Combination of DATAFLEX® 16 with RADEX®-NC



Dimensions [mm] of torque measuring shaft and coupling combination with RADEX®-NC HT																	
DATAFLEX® type	DW	D3	LD	L2	L3	L4	L5	L6	H	X	RADEX®-NC size	DH	D_{max}	DBSE	L	L1	L11	E
16/10	16	52	140	25	90	85	3.5	50	67	12	21	58	30	149	201	26	142	3.5
16/30																		
16/50											26	69	38	166	232	33	156	5.0

DATAFLEX® 32/100, 32/300, 32/500
DUAL-RANGE TORQUE SENSOR

For torques up to 500 Nm

General properties					
DATAFLEX® type	Measuring range 1 T_{KN} [Nm]	Measuring range 2 T_{KN2} [Nm]	Supply voltage [V]	Current consumption [mA]	Operating temperature range [°C]
32/100	-100 ... +100	-20 ... +20	24 ±4	<100	0 ... 55
32/300	-300 ... +300	-60 ... +60			
32/500	-500 ... +500	-100 ... +100			

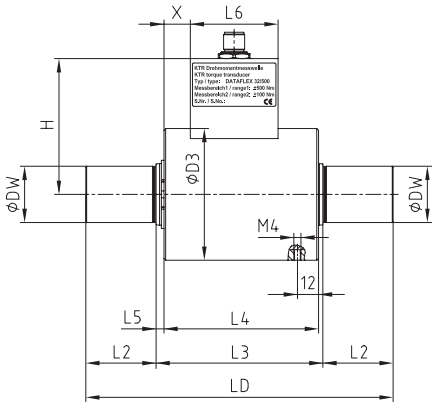
Technical data of torque signal					Technical data of speed signal				
DATAFLEX® type	Inaccuracy (% of T_{KN}/ T_{KN2}) [1), 2), 3)]	Output voltage [V]	Band width [kHz]	Influence of temperature [1)] [%/10 °C]	Resolution [pulses/rev.]	Number of channels	Square-wave signal [4)] [Vss]	Direct voltage signal [4)] [V]	Direction signal [4)] [V]
32/100	<0.1 / 0.2	-10 ... 10	2	0.05	720	2, 90° offset	5 / 24	0 ... 10, scalable	5 / 24
32/300									
32/500									

Mechanical data of torque measuring shaft										
DATAFLEX® type	Static load limit [1)] $T_{K\,max}$ [%]	Breaking load $T_{K\,break}$ [1)] [%]	Max. bending torque [Nm]	Max. radial force [N]	Max. axial force [kN]	Weight [kg]	Torsion spring stiffness C_T [Nm/rad]	Torsion angle with T_{KN} [°]	Mass moment of inertia [kgmm²]	Max. speed [5)] [rpm]
32/100	150	300	11	110	5.0	1.9	18000	0.32	219	7500
32/300			32	320	10.4		46000	0.37	221	
32/500			53	530	14.6		60000	0.48	224	

Mechanical data of combination of DATAFLEX® 32 and RADEX®-NC								
DATAFLEX® type	Coupling				Mechanical data of combination			
	RADEX®-NC/ RADEX®-N size	Setscrew/clamping screw			Mass moment of inertia [kgmm²]	Torsion spring stiffness C_T [Nm/rad]	Weight [kg]	Max. speed [5)] [rpm]
		G	T	T_A [Nm]				
32/100	RADEX®-NC 36	M10	–	49	1097	15800	3.80	7500
32/300	RADEX®-N 60	M8	20	10	17900	40000	11.65	6700
32/500						49000	11.70	

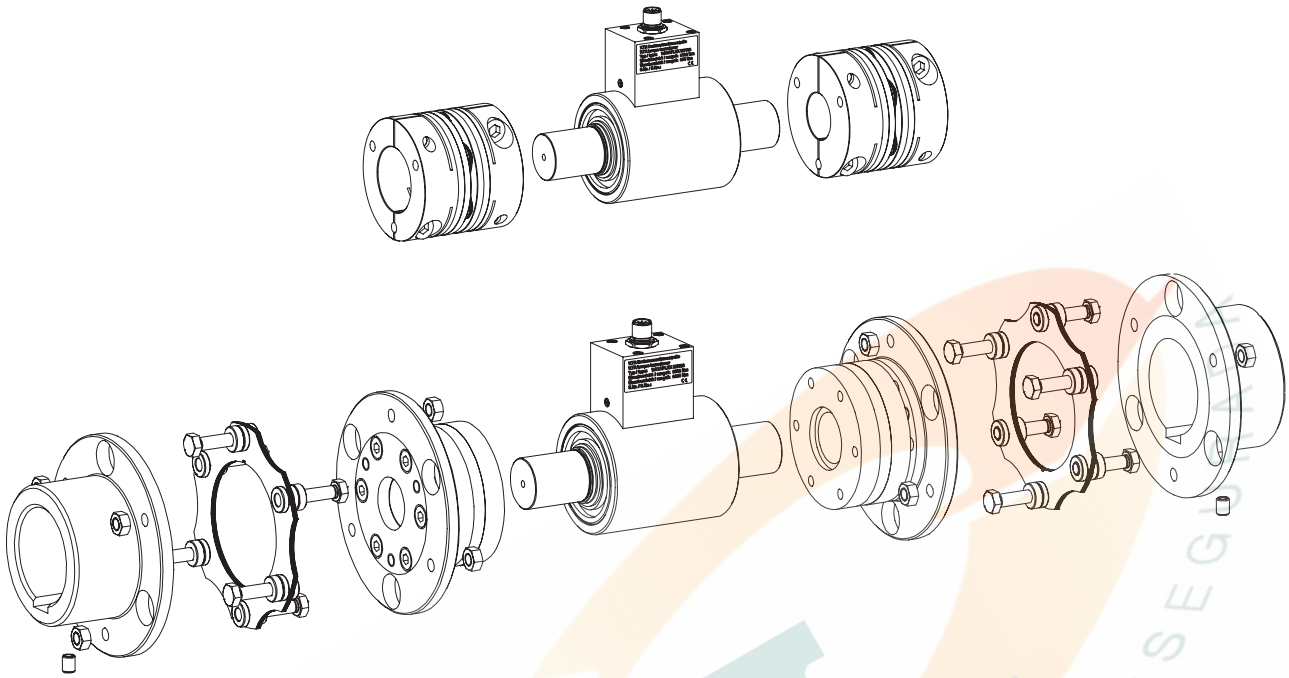
[1)] Referring to T_{KN}
[2)] Referring to T_{KN2}
[3)] Error in linearity incl. hysteresis
[4)] See page 367: with connection housing DF2
[5)] With high speeds use coupling hubs that are balanced

DATAFLEX® 32

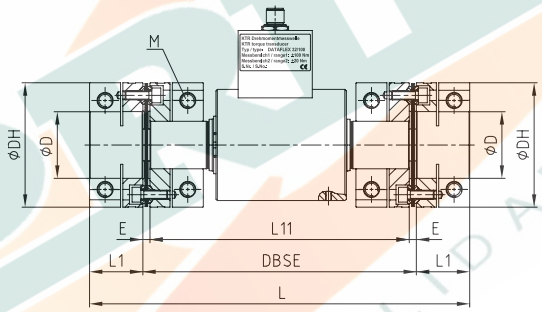


Ordering example:				
	DATAFLEX® 32/300	DF2	2 m, 5 m and 10 m	RADEX®-N 60 NN Ø32/50 keyway to DIN Ø32/60 keyway to DIN
	Type of measuring shaft with measuring range	Connection housing (is required)	Connection cable	If any accessories are requested: coupling type, finish bores D/DW

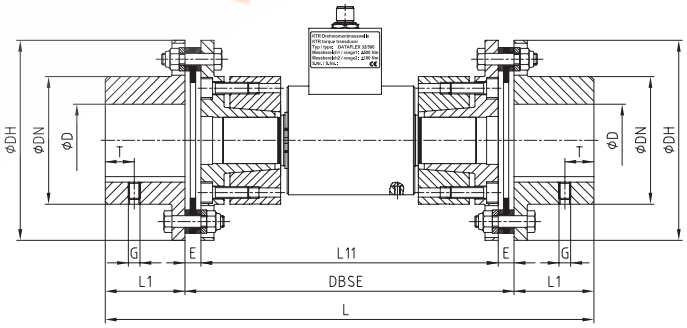
Components



Combination of DATAFLEX® 32 with RADEX®-NC



Combination of DATAFLEX® 32 with RADEX®-N



Dimensions [mm] of torque measuring shaft and coupling combination with RADEX®-NC size																		
DATAFLEX® type	DW	D3	LD	L2	L3	L4	L5	L6	H	X	RADEX®-NC size	DH	D_{max}	DBSE	L	L1	L11	E
32/100	32	75	175	40	95	88	4.5	50	77.3	15	36	84	45	184.6	256.6	36	175	4.8

Dimensions [mm] of torque measuring shaft and coupling combination with RADEX®-N size																			
DATAFLEX® type	DW	D3	LD	L2	L3	L4	L5	L6	H	X	RADEX®-N size	DH	DN	D_{max}	DBSE	L	L1	L11	E
32/300	32	75	175	40	95	88	4.5	50	77.3	15	60	138	88	60	227	337	55	205	11
32/500																			

DATAFLEX® 42/1000
DUAL-RANGE TORQUE SENSOR

For torques up to 1000 Nm

General properties					
DATAFLEX® type	Measuring range 1 T_{KN} [Nm]	Measuring range 2 T_{KN2} [Nm]	Supply voltage [V]	Current consumption [mA]	Operating temperature range [°C]
42/1000	-1000 ... +1000	-200 ... +200	24 ±4	<100	0 ... 55

Technical data of torque signal					Technical data of speed signal				
DATAFLEX® type	Inaccuracy (% of T_{KN}/ T_{KN2}) [1), 2), 3)]	Output voltage [V]	Band width [kHz]	Influence of temperature [1)] [%/10 °C]	Resolution [pulses/rev.]	Number of channels	Square-wave signal [4)] [Vss]	Direct voltage signal [4)] [V]	Direction signal [4)] [V]
42/1000	<0.1 / 0.2	-10 ... 10	2	0.05	720	2, 90° offset	5 / 24	0 ... 10, scalable	5 / 24

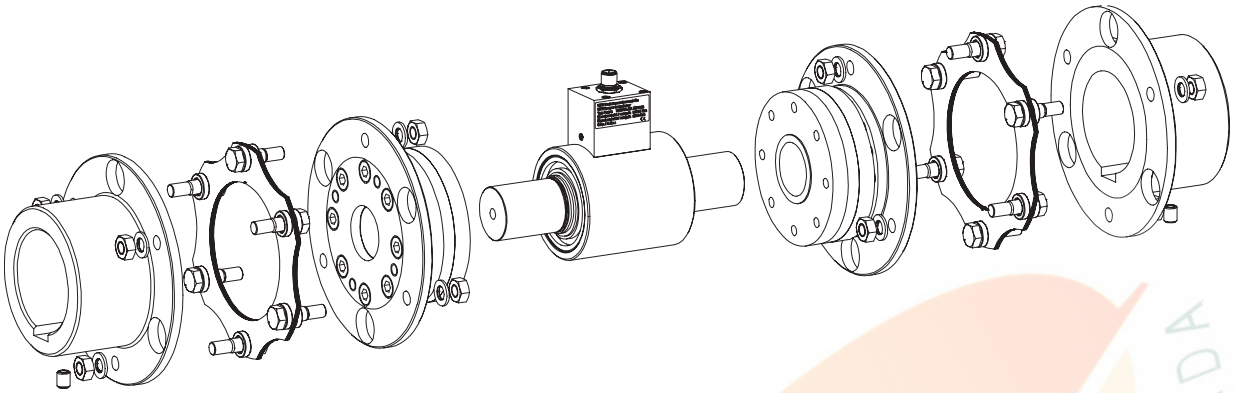
Mechanical data of torque measuring shaft										
DATAFLEX® type	Static load limit [1)] $T_{K\,max}$ [%]	Breaking load $T_{K\,break}$ [1)] [%]	Max. bending torque [Nm]	Max. radial force [N]	Max. axial force [kN]	Weight [kg]	Torsion spring stiffness C_T [Nm/rad]	Torsion angle with T_{KN} [°]	Mass moment of inertia [kgmm²]	Max. speed [5)] [rpm]
42/1000	150	300	107	780	24	3.43	132000	0.43	710	6500

Mechanical data of combination of DATAFLEX® 42 and RADEX®-N								
DATAFLEX® type	Coupling				Mechanical data of combination			
	RADEX®-N size	Setscrew			Mass moment of inertia [kgmm²]	Torsion spring stiffness C_T [Nm/rad]	Weight [kg]	Max. speed [5)] [rpm]
		G	T	T_A [Nm]				
42/1000	80	M10	20	17	61000	107000	23.1	5100

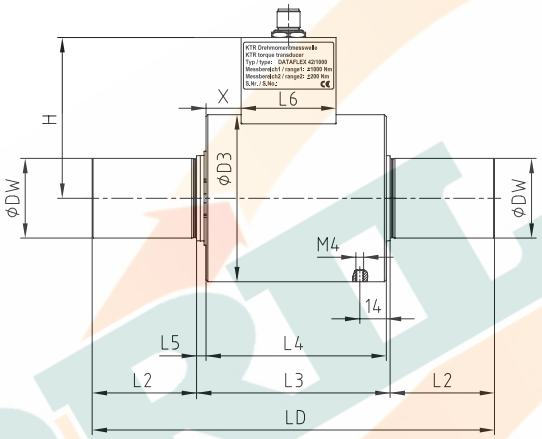
[1)] Referring to T_{KN}
[2)] Referring to T_{KN2}
[3)] Error in linearity incl. hysteresis
[4)] See page 367: with connection housing DF2
[5)] With high speeds use coupling hubs that are balanced

Ordering example:				
	DATAFLEX® 42/1000	DF2	2 m, 5 m and 10 m	RADEX®-N 80 NN Ø42/50 keyway to DIN Ø42/60 keyway to DIN
	Type of measuring shaft with measuring range	Connection housing (is required)	Connection cable	If any accessories are requested: coupling type, finish bores D/DW

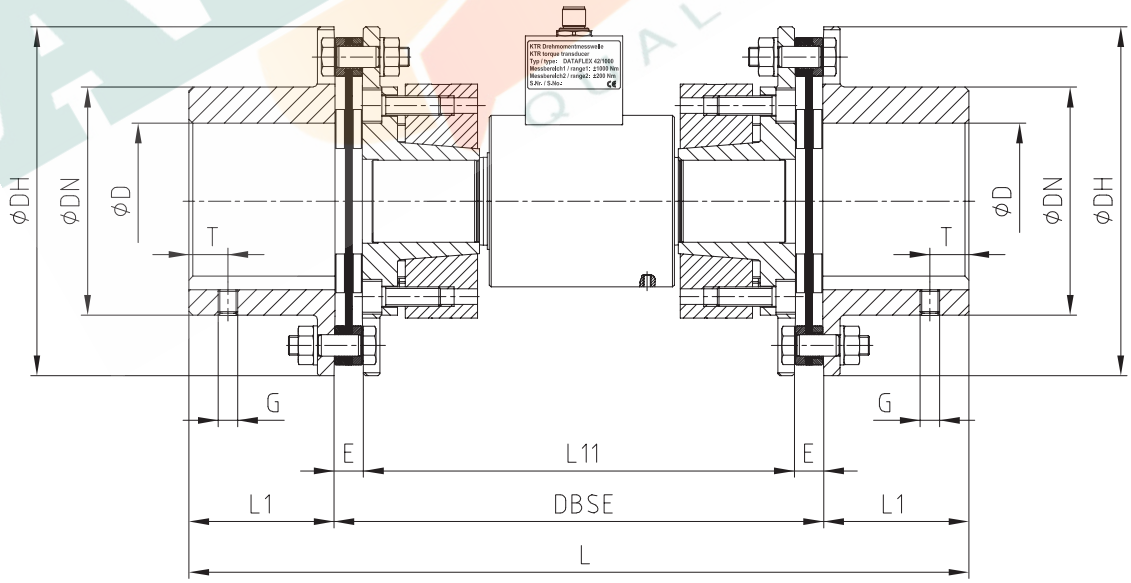
Components



DATAFLEX® 42



Combination of DATAFLEX® 42 with RADEX®-N



Dimensions [mm] of torque measuring shaft and coupling combination																			
DATAFLEX® type	DW	D3	LD	L2	L3	L4	L5	L6	H	X	RADEX®-N size	DH	DN	D_{max}	DBSE	L	L1	L11	E
42/1000	42	88	212	55	102	95	5	50	84.7	18.5	80	179	117	80	250	400	75	222	14

DATAFLEX® 70/3000, 70/5000
DUAL-RANGE TORQUE SENSOR

For torques up to 5000 Nm

General properties					
DATAFLEX® type	Measuring range 1 T_{KN} [Nm]	Measuring range 2 T_{KN2} [Nm]	Supply voltage [V]	Current consumption [mA]	Operating temperature range [°C]
70/3000	-3000 … +3000	-600 … +600	24 ±4	<100	0 … 55
70/5000	-5000 … +5000	-1000 … +1000			

Technical data of torque signal					Technical data of speed signal				
DATAFLEX® type	Inaccuracy (% of T_{KN}/ T_{KN2}) [1), 2), 3)]	Output voltage [V]	Band width [kHz]	Influence of temperature [1)] [%/10 °C]	Resolution [pulses/rev.]	Number of channels	Square-wave signal [4)] [Vss]	Direct voltage signal [4)] [V]	Direction signal [4)] [V]
70/3000	< 0.1 / 0.2	-10 … 10	2	0.05	450	2, 90° offset	5 / 24	0 … 10, scalable	5 / 24
70/5000									

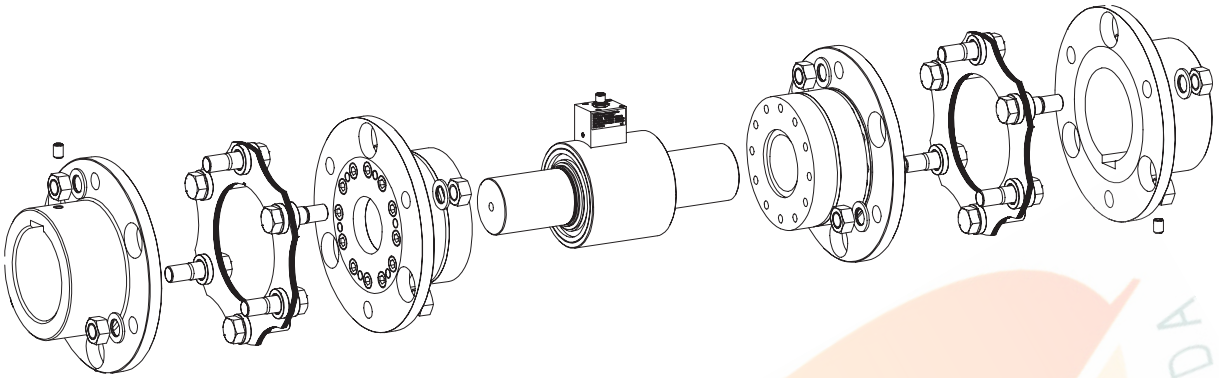
Mechanical data of torque measuring shaft										
DATAFLEX® type	Static load limit [1)] $T_{K\,max}$ [%]	Breaking load $T_{K\,break}$ [1)] [%]	Max. bending torque [Nm]	Max. radial force [N]	Max. axial force [kN]	Weight [kg]	Torsion spring stiffness C_T [Nm/rad]	Torsion angle with T_{KN} [°]	Mass moment of inertia [kgmm²]	Max. speed [5)] [rpm]
70/3000	150	300	320	1700	48	12.30	395000	0.44	7200	4000
70/5000			520	2800	66	12.45	500000	0.57	7300	

Mechanical data of combination of DATAFLEX® 70 and RADEX®-N								
DATAFLEX® type	Coupling				Mechanical data of combination			
	RADEX®-N size	Setscrew			Mass moment of inertia [kgmm²]	Torsion spring stiffness C_T [Nm/rad]	Weight [kg]	Max. speed [5)] [rpm]
		G	T	T_A [Nm]				
70/3000	90	M12	25	40	155200	283000	44.7	4000
70/5000	115		30		470000	389000	77.6	3400

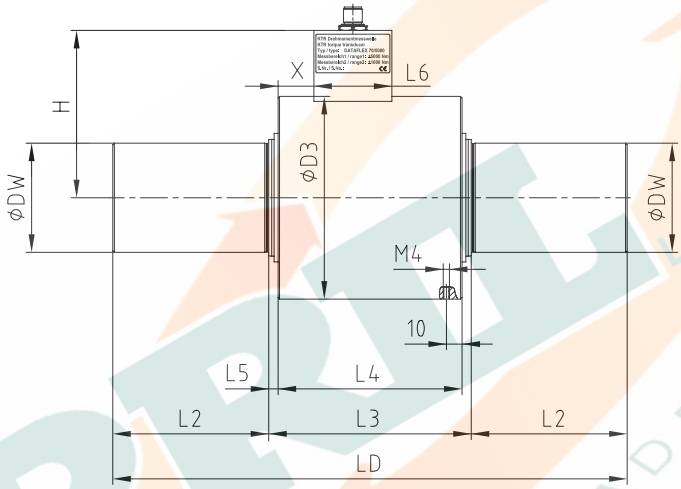
[1)] Referring to T_{KN}
[2)] Referring to T_{KN2}
[3)] Error in linearity incl. hysteresis
[4)] See page 367: with connection housing DF2
[5)] With high speeds use coupling hubs that are balanced

Ordering example:				
	DATAFLEX® 70/5000	DF2	2 m, 5 m and 10 m	RADEX®-N 115 NN Ø65/60 keyway to DIN Ø65/70 keyway to DIN
	Type of measuring shaft with measuring range	Connection housing (is required)	Connection cable	If any accessories are requested: coupling type, finish bores D/DW

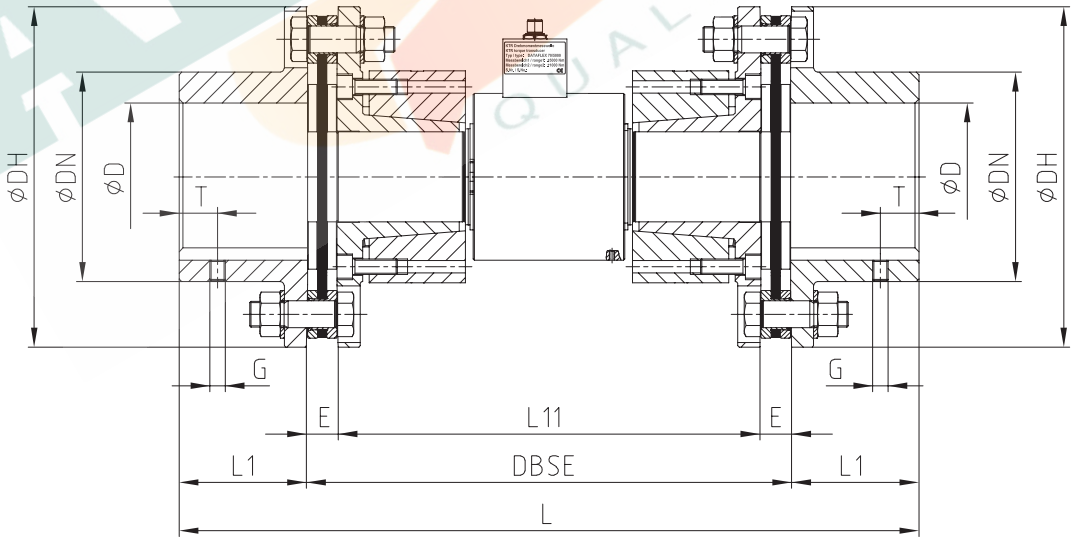
Components



DATAFLEX® 70



Combination of DATAFLEX® 70 with RADEX®-N

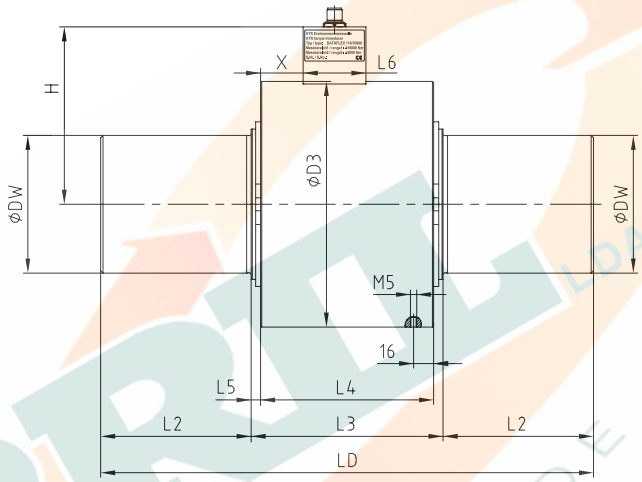


Dimensions [mm] of torque measuring shaft and coupling combination																			
DATAFLEX® type	DW	D3	LD	L2	L3	L4	L5	L6	H	X	RADEX®-N size	DH	DN	D_{max}	DBSE	L	L1	L11	E
70/3000	70	130	330	100	130	118	6	50	107.35	23	90	210	132	90	360	520	80	330	15
70/5000											115	265	163	115	376	576	100		23

DATAFLEX® 110/10000, 110/20000
DUAL-RANGE TORQUE SENSOR

For torques up to 20000 Nm

DATAFLEX® 110



General properties					
DATAFLEX® type	Measuring range 1 T_{KN} [Nm]	Measuring range 2 T_{KN2} [Nm]	Supply voltage [V]	Current consumption [mA]	Operating temperature range [°C]
110/10000	- 10000 ... + 10000	- 2000 ... + 2000	24 ±4	<100	0 ... 55
110/20000	- 20000 ... + 20000	- 4000 ... + 4000			

Technical data of torque signal					Technical data of speed signal				
DATAFLEX® type	Inaccuracy (% of T_{KN}/ T_{KN2}) [1), 2), 3)]	Output voltage [V]	Band width [kHz]	Influence of temperature [1)] [%/10 °C]	Resolution [pulses/rev.]	Number of channels	Square-wave signal [4)] [Vss]	Direct voltage signal [4)] [V]	Direction signal [4)] [V]
110/10000	< 0.1 / 0.2	-10 ... +10	2	0.05	720	2, 90° offset	5 / 24	0 ... 10, scalable	5 / 24
110/20000									

Mechanical data of torque measuring shaft										
DATAFLEX® type	Static load limit [1)] $T_{K\,max}$ [%]	Breaking load $T_{K\,break}$ [1)] [%]	Max. bending torque [Nm]	Max. radial force [N]	Max. axial force [kN]	Weight [kg]	Torsion spring stiffness C_T [Nm/rad]	Torsion angle with T_{KN} [°]	Mass moment of inertia [kgm²]	Max. speed [5)] [rpm]
110/10000	150	300	1033	4700	106	35.72	2270000	0.25	0.0562	3000
110/20000			2037	9300	166	36.20	3550000	0.32	0.0569	

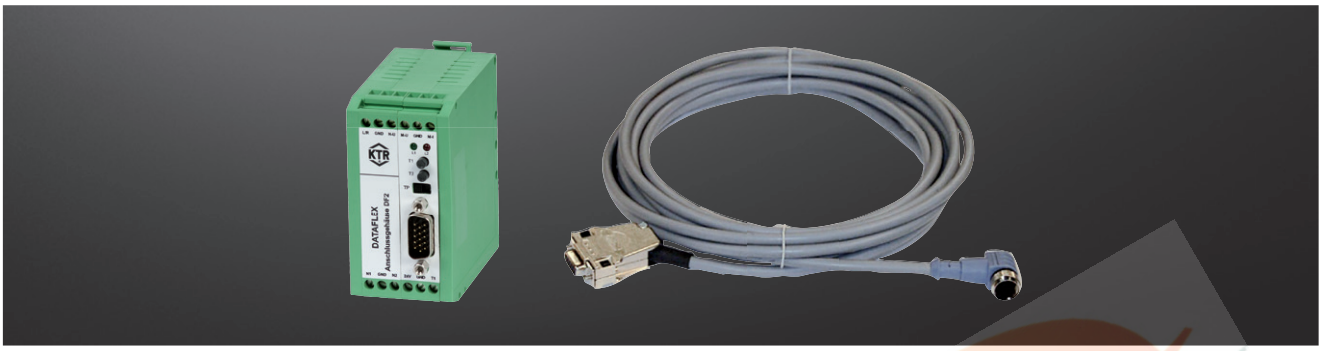
Dimensions [mm] of torque measuring shaft										
DATAFLEX® type	DW	D3	LD	L2	L3	L4	L5	L6	H	X
110/10000	110	196	393	120	153	138	7.5	50	141.4	34
110/20000										

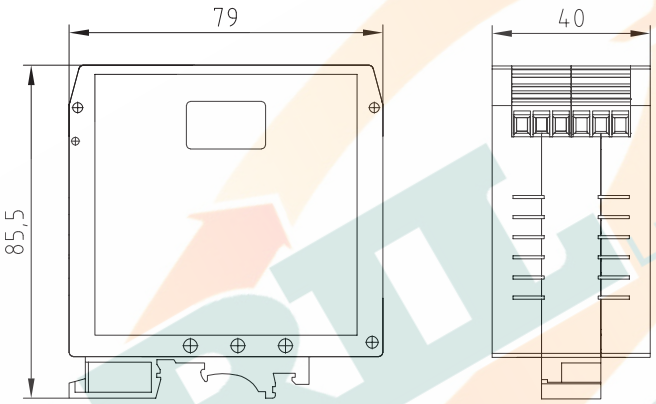
[1)] Referring to T_{KN}
[2)] Referring to T_{KN2}
[3)] Error in linearity incl. hysteresis
[4)] See page 367: with connection housing DF2
[5)] With high speeds use coupling hubs that are balanced

Ordering example:	DATAFLEX® 110/10000	DF2	2 m, 5 m and 10 m
	Type of measuring shaft with measuring range	Connection housing (is required)	Connection cable

DATAFLEX® CONNECTION ACCESSORIES OF TORQUE MEASURING SHAFTS

Connection housing DF2 and connection cable





Connection cable and connection housing DF2						
Description	Function	DATAFLEX® 16	DATAFLEX® 32	DATAFLEX® 42	DATAFLEX® 70	DATAFLEX® 110
Connections DF2						
Input of operating voltage						
24 V	Supply voltage +	24 V DC ± 4V / 100mA max.				
GND	Supply voltage -					
Torque output						
M-U	Voltage output +	-10 V ... 10V				
GND	Ground of torque output					
M-I	Current output	-	-	-	-	-
Speed output pulse signal						
N1	Pulsed output speed track 1	HTL, TTL (24 V, 5 V, 360 pulses/rev.)	HTL, TTL (24 V, 5 V, 720 pulses/rev.)	HTL, TTL (24 V, 5 V, 720 pulses/rev.)	HTL, TTL (24 V, 5 V, 450 pulses/rev.)	HTL, TTL (24 V, 5 V, 720 pulses/rev.)
GND	Ground of pulsed output					
N2	Pulsed output speed track 2	HTL, TTL (24 V, 5 V, 360 pulses/rev.)	HTL, TTL (24 V, 5 V, 720 pulses/rev.)	HTL, TTL (24 V, 5 V, 720 pulses/rev.)	HTL, TTL (24 V, 5 V, 450 pulses/rev.)	HTL, TTL (24 V, 5 V, 720 pulses/rev.)
Speed of direct voltage output						
R/L	Direction signal speed	HTL, TTL (24 V, 5 V, CW = 1)				
GND	Mass of direct voltage output speed					
N-U	Voltage output speed	0 V ... 10 V (scalable)				
Other connections / operating devices						
T1	Sensor T1 - connection	External push button connection T1				
L1, L2	Signal LEDs	Condition monitoring				
T1, T2	Sensor T1, T2	Sensor for programming				
TP	Switch low pass	Filter for torque signal to be set in four levels				
Connection cable						
Lengths of connection cable		2, 5, 10 m, other lengths on request				