DATAFLEX® is a maintenance free torque measurement shaft with integrated speed measurement.

General Hints

Read these instructions thoroughly before operating the measurement shaft.
Please pay special attention to the safety instructions!
The assembly instructions are a part of this product. Please store them carefully close to the measuring shaft.

Safety and Advise Hints

D A N G E R ! **Danger of injury to persons.**

C A U T I O N ! **Damages on the machine possible.**

A T T E N T I O N ! **Pointing to important items.**

General Hints to Danger

D A N G E R !
With the assembly, operation, and maintenance of the measuring shaft it is important that the entire drive train has been secured against unintentional engagement. Please read through and observe the following safety instructions.

- All work with and to the measuring shaft must be carried out with the idea of “Safety First”.
- Secure the measuring shaft and the disengaged drive before work is carried out.
- Secure the drive system against unintentional engagement, for example place warning signs at the switch or remove the fuse.
- Do not touch the measuring shaft when it is in operation.
- Protect the measuring shaft from unintentional contact. Use an appropriate cover or shield.

Proper Use

You may only assemble, operate and maintain the measurement shaft if you

- carefully read through the mounting instructions and understood them
- had technical training
- are authorized to do so by your company

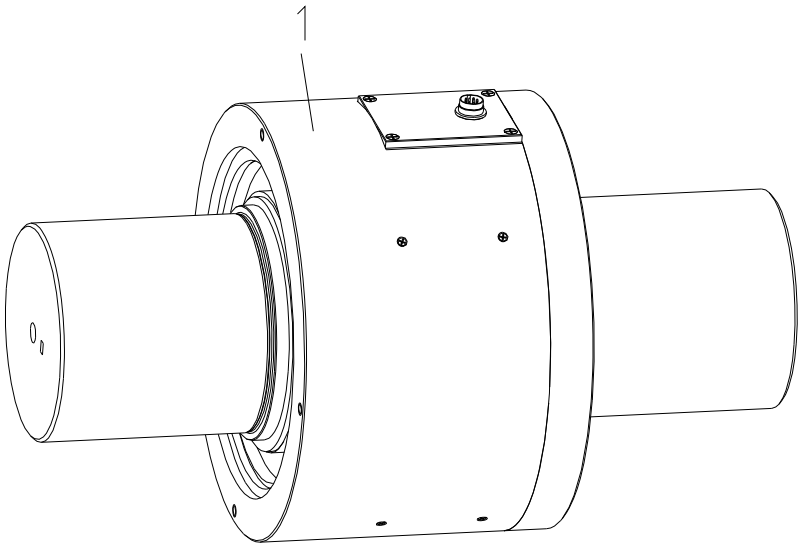
The coupling can only be used in accordance with the technical data (see sheet 8). Unauthorized alterations to the measuring shaft are not allowed. We do not take any responsibility for any resulting damage. In the interest of further technical development of the product we reserve the right for modifications.
The **DATAFLEX® torque measuring shaft** described corresponds to the technical status at the time of printing these assembly instructions.

Generally the measuring shaft is supplied in mounted condition. Before assembly the measuring shaft should be checked for completeness.
The position of the **DATAFLEX®** is variable. The measurement system can be mounted horizontally as well as vertically.

Mechanical Components – DATAFLEX® Torque Measuring Shaft

Components of DATAFLEX® torque measuring shaft

Component	Quantity	Designation
1	1	DATAFLEX® torque measuring shaft



picture 1: DATAFLEX® torque measuring shaft

Assembly Hints

- **Fix the Housing**

C A U T I O N !
The housing must be secured against rotation. For this purpose a thread is on the underside of the housing.

- **Insulation**
  All DATAFLEX®-measuring shafts of type 140 correspond to the Protection IP50 according to DIN EN 60529.

- **Maintenance**
  The DATAFLEX® measuring shaft measures torques without contact. We would recommend to check the calibration every six months.

C A U T I O N !
Opening the housing is not required and can lead to damage of the measurement shaft.

Technical Description

1. General Description

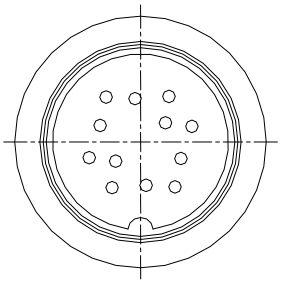
The overall measuring electronics is installed in the fixed housing so that additional devices for signal processing are not necessary. The measuring shaft can be wired either by the terminal housing DF1 available as accessories or manually by a 12-pole coupling (type Binder series 432) (pin configuration see table 1). The measuring system has three measuring terminals which the analogous terminal figures for torque and speed can be measured on. Two digital terminals show the current operating condition, while two digital inputs can be used for calibration.

☞ **A T T E N T I O N !**
The measuring shaft should initially be turned on when all of the connections have been properly connected. After it has been turned on for the first time the measuring shaft will take around 5 minutes until this warm up phase is finished and the measurement device will have its standard accuracy.

2. Pin assignment of the measuring shaft

Table 1: Pin assignment of the type Binder series 423 connection

Connection		Pin	Characteristic
Input Voltage			
Supply Voltage +	$24V_{IN}$	M	24 V DC ± 4 V / 100 mA
Supply Voltage -	GND	L	
Torque Output			
Output Voltage +	U_{OUT}	F	0 ... 10 V (R_A = 1 kΩ)
Output Voltage -	GND	E	
Output Current +	I_{OUT}	G	4 ... 20 mA ($R_A \leq 500\ \Omega$)
Output Current -	I_{OUT-}	L	
Speed Output			
Output Speed +	DRZ	H	24 V / 60 impulse/revolution
Output Speed -	GND	J	
LED-Output			
Program-LED	U_{LED1+}	D	5 V / 5 mA prepared for LED
	U_{LED1-}	C	
Fault Signal	U_{LED2+}	K	24 V / 5mA prepared for LED
	GND	L	
Calibration Input			
Auto-Offset	T1	A	activ on connection with GND (Pin L)
Program	T2	B	



picture 2: plug connection DATAFLEX®

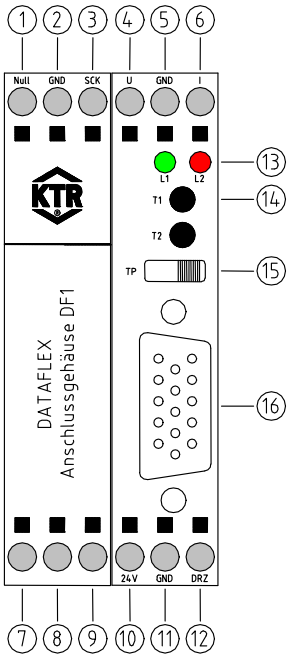
Technical Description

3. Connection housing DF1

The connection housing DF 1 has 12 screw clips where the connections of the measuring shaft can be connected (see table 2).

Table 2: Pin assignment of the connection housing DF1

No.	Designation	Function	Characteristic
		Input Voltage	
10	24V	Supply Voltage +	24 V DC ± 4 V / 100 mA
11	GND	Supply Voltage -	
		Torque Output	
4	U	Output Voltage +	0 ... 10 V (R_A = 1 kΩ)
5	GND	Ground Torque Output	
6	I	Output Current +	4 ... 20 mA ($R_A \leq$ 500 Ω)
		Speed Output	
12	DRZ	Speed Output +	24 V / 60 impulse/revolution
11	GND	Ground Speed Output	
		Digital Connections	
1	NULL	Auto-Offset - Input	Zero Offset Alignment
2	GND	Ground Digital Connections	
3	SCK	Output Error Signal	In case of error: 24V / 50 mA
		Operational Control / Indicators	
13	L1	Program - LED	State Indicator
	L2	Error LED	Error Indicator
14	T1	Button Auto Offset	Autom. Zero Alignment
	T2	Button for Programming	New Calibration
15	TP	Low-Pass Button	Filter on / off
16	-	Connection Measuring Shaft	Connecting Cable



picture 3: connection housing DF1

4. Analoguous outputs

a) Supply Voltage 24V

The supply voltage is 24V DC with a maximum current consumption of 100 mA.

b) Torque Output U, I

To control the torque there are a voltage and a current output available. Both outputs can be used at the same time.

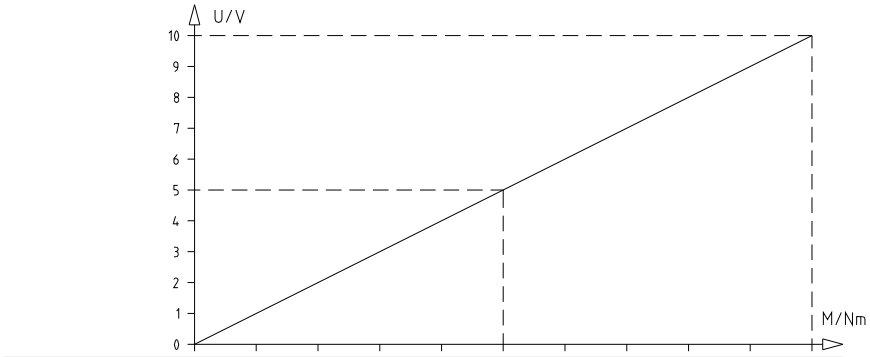
Table 3: Relationship between Torque - Output Values

DATAFLEX® size	ΔU / ΔM	ΔI / ΔM
140/20000	2,5 V / 10000 Nm	4 mA / 10000 Nm
140/30000	1,667 V / 10000 Nm	2,667 mA / 10000 Nm
140/50000	1 V / 10000 Nm	1,6 mA / 10000 Nm

The characteristic curves of the output are shown in pictures 4.1 and 4.2.

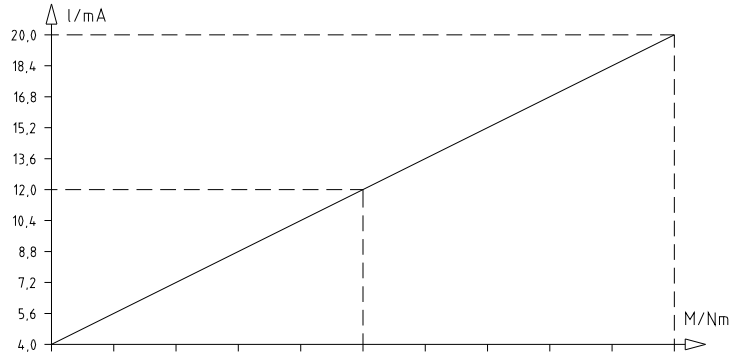
Technical Description

The characteristic curves of the output values (see pictures 4.1 and 4.2)



DATAFLEX 140/20000	-20000	-16000	-12000	-8000	-4000	0	4000	8000	12000	16000	20000
DATAFLEX 140/30000	-30000	-24000	-18000	-12000	-6000	0	6000	12000	18000	24000	30000
DATAFLEX 140/50000	-50000	-40000	-30000	-20000	-10000	0	10000	20000	30000	40000	50000

picture 4.1: voltage to torque relationship



DATAFLEX 140/20000	-20000	-16000	-12000	-8000	-4000	0	4000	8000	12000	16000	20000
DATAFLEX 140/30000	-30000	-24000	-18000	-12000	-6000	0	6000	12000	18000	24000	30000
DATAFLEX 140/50000	-50000	-40000	-30000	-20000	-10000	0	10000	20000	30000	40000	50000

picture 4.2: current to torque relationship

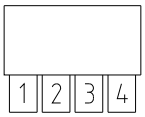
- **Filter voltage output**

If the connection housing DF1 is used, the signal of the voltage output can be filtered.

Table 4: Low-Pass Button

Button adjustment TP	left	right
	Low-Pass on	Low-Pass off

The limit frequency of the filter can be changed by variating the DIP switches (see picture 5) inside the connection housing:



picture 5: DIP switch (top view)

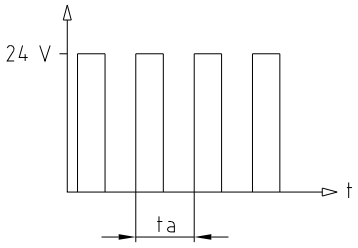
Table 5: Adjustment of the requested filter frequency

Limit frequency [Hz]	button 1	button 2	button 3	button 4
15000	**OFF**	**OFF**	**OFF**	**OFF**
1000	OFF	OFF	OFF	**ON**
100	OFF	OFF	**ON**	OFF
10	OFF	**ON**	OFF	OFF
1	**ON**	OFF	OFF	OFF

A filter frequency of 1000 Hz is preset.

c) Output Speed U_N

For determining the speed a square wave with a frequency of 60 impulses per revolution is available. The height of the square wave voltage is 24 Volts.



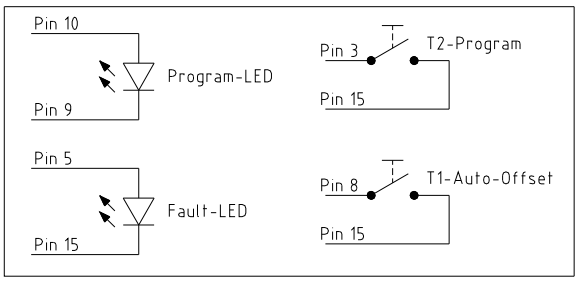
picture 6

speed (1/min) = 1 / ta(s)

speed (1/min) = f (1/s)

5. Digital Input and Output

The general parameters for calibration of the measuring shaft are stored electronically and can be changed by operating the external calibration input T1 and T2. As done in the connection box DF1 accessory the connections for the LED output and the calibration input are wired as shown in picture 7 (see Table 4).



picture 7

a) LED 1 (Program)

For calibration of the measuring shaft the factors for amplification and offset can be set in steps. According to the description of the procedure in chapter 4 (calibration) the PROGRAM-LED shows a change in the mode of operation.

b) LED 2 (Error) / Error Signal

The perfect function of the measuring system is permanently controlled.
An electronic defect is shown by a error signal. If an error is shown permanently, the measuring system is defect and must be returned to KTR.
For an easy connection in control systems the error signal is accessible in the connection housing DF1 (connection pin ERROR).

Table 6:

Condition	LED 2	Fault Signal
Normal Operation	OFF	0V
Error	ON	24V

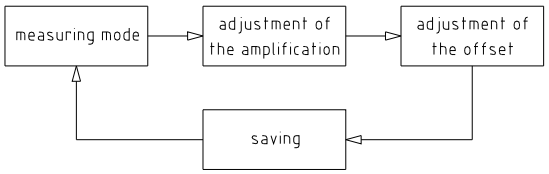
c) Automatic Offset - Correction

If in torqueless state an incorrect value is indicated (≠ 5,0 V), an automatic offset alignment can be effected by pressing the button T1-Auto-Offset for 2 seconds.
For this the torque is reduced to 0 and the button T1-AUTO-OFFSET must be pressed for 2 seconds. After successful alignment the saving of the new values is confirmed by 6-fold blinking of the programme - LED and the normal measuring operation is continued automatically.
For an easy connection in control systems the Auto-Offset-Connection is acessible in the connection housing DF1 (connection clip NULL).

6. (Manual adjustment of amplification and offset.)

A T T E N T I O N !
The measurement shaft is delivered calibrated.
We recommended checking the calibration every half year.

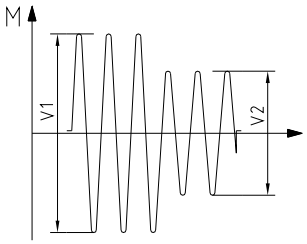
The amplification determines the correct relationship between the torque and the output voltage as well as the output current. It influences the steepness of the curves shown in picture 4.1 and 4.2. The displacement of the curves in vertical direction depends on the offset alignment.
Both parameters can be set and saved one after the other (see picture 8).



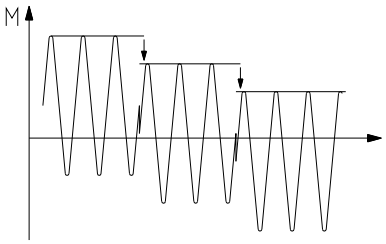
picture 8: flow of the manual setting

Instructions for a new calibration:

1. Press the T2-Program key for 2 seconds. The PROGRAM-LED will blink two times. An adjustment of the amplification factor is now possible.
2. The measurement shaft should now be alternately loaded and unloaded by a defined weight. The difference between the output values should be compared to the actual difference between the load and unload.
3. Through a quick press of the T1-AUTO-OFFSET key the amplification factor can be roughly varied. While a fine variation of the amplification factor can be made using a quick press of the T2-PROGRAM key. One after the other all of the types of amplification factors can be adjusted (see picture 9.1).
4. If the difference of the displayed measurement values of the loading and unloading corresponds with the outside determined torque difference, then the adjustment of the amplification is finished.
5. Press the T2-PROGRAM key for 2 seconds. The PROGRAM-LED will blink 4 times. The manual setting of the offset can now begin.
6. As described under point 3 the keys can be pressed quickly to set all of the values (see picture 9.2). When no torque is present the measurement shaft should be adjusted to an output voltage of 5,0 V or rather an output current of 12,0 mA.
7. When the offset adjustment is finished, pressing the T2-PROGRAM key for two seconds will save all of the new parameters. The PROGRAM-LED will blink one time. The measuring shaft will once again be in its normal operating mode.



picture 9.1

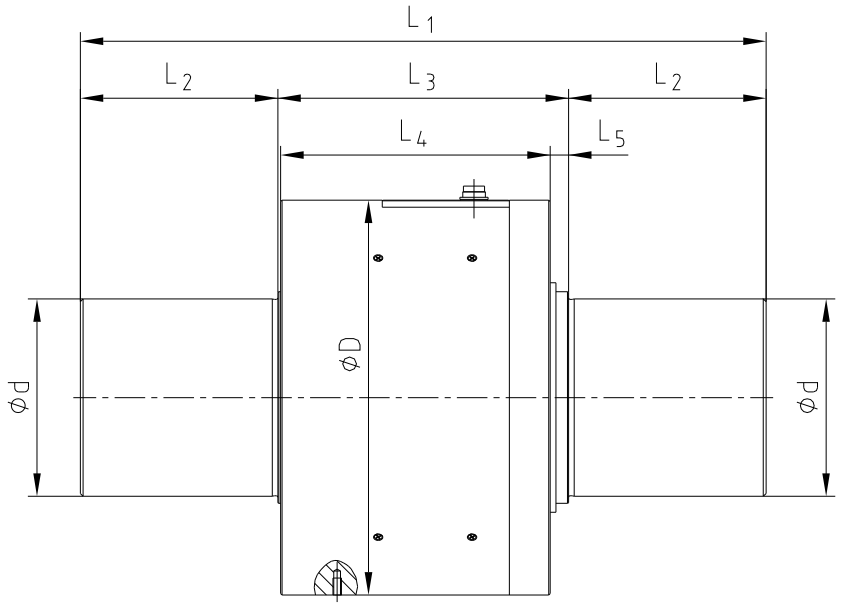


picture 9.2

C A U T I O N !
With saving all of the old data will be overwritten.

A T T E N T I O N !
- **The calibration can be interrupted if the measurement device is turned off for a short time and then turned back on. The previously saved parameters will then be reproduced.**
- **The safe measurement operation can be carried out after saving the new parameters (point 7) or after interrupting the power supply.**
- **After saving the new parameters (point 7) the parameters will stay the same even if the power supply is interrupted.**

DATAFLEX® Torque Measuring Shaft



picture 10

Table 7: dimension and technical data

coupling size DATAFLEX®	140/20000	140/30000	140/50000
Dimensions [mm]			
dimension d	140		
dimension D	280		
dimension L_1	486		
dimension L_2	140		
dimension L_3	206		
dimension L_4	191		
dimension L_5	13		
Electrical Data			
nominal torque T_{KN} [Nm]	-20000 ... +20000 Nm	-30000 ... +30000 Nm	-50000 ... +50000 Nm
limit frequency torque signal [kHz]	16		
measuring inaccuracy [%] 1)	± 0,5		
temperature influence [%/°K]	0,05		
nominal temperature range [°C]	0 ... 55		
supply voltage [V] DC	24 ± 4		
max. current consumption [mA]	100		
Torque Output			
output voltage torque [V]	0 ... 10		
output current torque [mA]	4 ... 20		
Speed Output			
number of impulses / revolution	60		
output signal [V]	24		
Mechanical Data			
static load limit $T_{Kmax.}$ 1) [%]	150		
breaking load $T_{K\ break}$ 1) [%]	300		
max. bending torque [Nm]	2750	3700	5500
max. radial force [N]	8000	11000	16000
max. axial force [kN]	100	123	160
weight [kg]	73,9	74,9	76,5
torsion spring stiffness C_T [Nm/rad]	3935000	5100000	6750000
torsion angle at T_{KN} [degrees]	0,30	0,34	0,42
mass moment of inertia [kgm²]	0,17	0,172	0,175
max. speed [1/min]	2000		

1) referred to T_{KN}

EC Certificate of Conformity

manufacturer - KTR Kupplungstechnik GmbH, D-48432 Rheine - herewith certifies that the

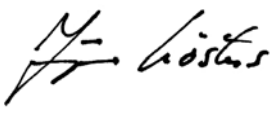
Torque measuring shaft DATAFLEX®

described in the present operating instructions is in accordance with the following standard:

89/336/EEC council directive of 3 May 1989 on the approximation of the laws of the member states relating to electromagnetic compatibility (89/336/EEC), changed by 91/263/EEC, 92/31/EEC and 93/68/EEC

Used standards:

DIN EN 61000-6-2:	immunity for industrial environments
DIN EN 61000-4-2:	electrostatic discharge immunity test (ESD)
DIN EN 61000-4-3:	radiated, radio-frequency, electromagnetic field immunity test
DIN EN 61000-4-4:	electrical fast transient/burst immunity test
DIN EN 61000-4-6:	immunity to conducted disturbances, induced by radio-frequency fields
DIN EN 61000-6-4:	emission for industrial environments
DIN EN 55011:	radio disturbance characteristics (intensity of radio interference area class B)



Rheine,	07.08.09	i. V.	i. A.
City	Date	Reinhard Wibbeling Engineering Manager	Jürgen Kösters Product Manager