DATAFLEX®

Torque measuring shaft type 140/…

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

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1 Technical data

DATAFLEX® torque measuring shaft

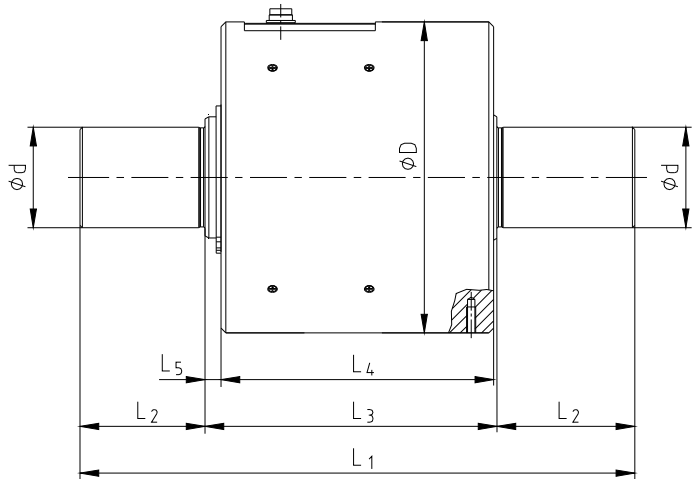


Illustration 1: DATAFLEX® torque measuring shaft

Table 1: Dimensions

DATAFLEX® type	Dimensions [mm]						
	d	D	L_1	L_2	L_3	L_4	L_5
140/20000 140/50000	140	280	486	140	206	191	13

Table 2: Technical data

Coupling size DATAFLEX®	140/20000	140/50000
Electrical data		
Nominal torque T_{KN} [Nm]	-20000 ... +20000 Nm	-50000 ... +50000 Nm
Band width of torque signal [kHz] (-3dB)	16	
Error in linearity incl. hysteresis [%] 1)	< ±0,5	
Influence of temperature [%/10K]	0,5	
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 2)		
Number of impulses / revolution	60	
Amplitude [V]	24/5V	
DC speed output [V]	0 - 10	
Scale of direct voltage output	16 settings via micro switch	
Inaccuracy of DC output [%] 3)	± 0,2	
Direction signal [V]	to be omitted	
Mechanical data		
Static load limit $T_{Kmax.}$ 1) [%]	150	
Breaking load $T_{K\ break}$ 1) [%]	300	
Max. bending torque [Nm]	2750	5500
Max. radial force [N]	8000	16000
Max. axial force [kN]	100	160
Weight [kg]	73,9	76,5
Torsion spring stiffness C_T [Nm/rad]	3935000	6750000
Torsion angle with T_{KN} [degrees]	0,30	0,42
Mass moment of inertia [kgmm^2]	170000	175000
Max. speed [rpm]	2000	

1) Referring to rated torque T_{KN}
2) With connection housing DF2
3) Referring to measuring range value

2 Advice

2.1 General advice

Please read through these assembly/operating instructions carefully before you start up the measuring shaft.
Please pay special attention to the safety instructions!
The mounting instructions are part of your product. Please keep them carefully and close to the measuring shaft.
The copyright for these mounting instructions remains with **KTR** Kupplungstechnik GmbH.

2.2 Safety and advice symbols

	**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.**

2.3 General hazard warnings

D A N G E R !
With the assembly, operation and maintenance of the measuring shaft it is important to secure the entire drive train against accidental switch-on. Please read through and observe the following safety instructions.

- All operations with and on the measuring shaft must be performed based on the idea of “Safety First”.
- Secure the measuring shaft and the disengaged drive before the operations are performed.
- Secure the drive system against accidental switch-on, 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 accidental contact. Use an appropriate cover or shield.

2.4 Intended use

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

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

The measuring shaft can only be used in accordance with the technical data (see table 1 to 3). Unauthorized alterations to the measuring shaft are not allowed. We will not assume liability for any damage that may arise. In the interest of further development we reserve the right for technical modifications.
The **DATAFLEX® torque measuring shaft** described corresponds to the technical status at the time of printing these assembly instructions.

3 Storage

The **DATAFLEX®** can be stored at a dry and covered place for 6 - 9 months.

C A U T I O N !
Humid storage rooms are not suitable.
Please make sure that condensation is not generated. The best relative air humidity is less than 65%.

4 Assembly

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.

4.1 Components of DATAFLEX® Torque Measuring Shaft

Components of DATAFLEX® torque measuring shaft

Component	Quantity	Designation
1	1	DATAFLEX® torque measuring shaft

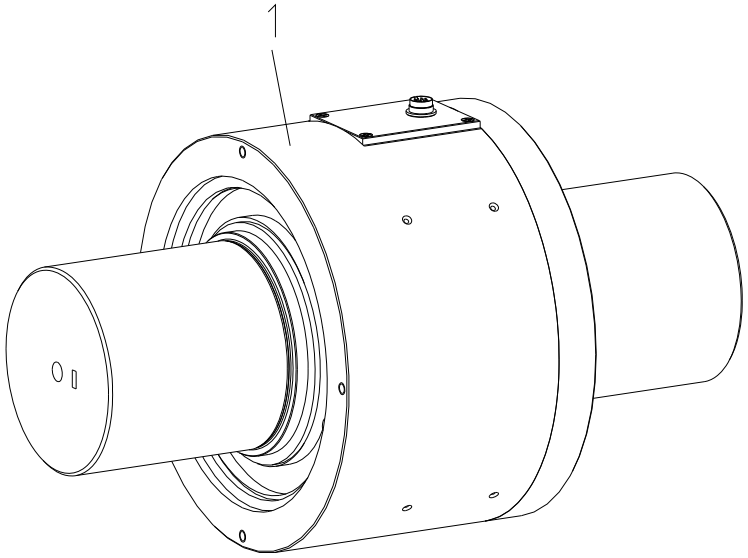


Illustration 2: DATAFLEX® 140 - torque measuring shaft

4.2 Advice for assembly of the DATAFLEX® torque measuring shaft

- **Fix the housing**

C A U T I O N !
The housing must be protected from rotation. For this purpose there is a thread size M4 at the bottom side. Please make absolutely sure to avoid a rigid fixing of the housing!

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

4 Assembly

4.2 Advice for assembly of the DATAFLEX® torque measuring shaft

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

- **Maintenance**
  The DATAFLEX® measuring shaft is maintenance-free. Lubrication or cleaning is not necessary.

- **Calibration**
  The unit is supplied with a calibration sheet. We recommend to inspect the calibration every six months.

4.3 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 DF2 available as accessories or manually by a 12-pole coupling (type Binder series 432) (pin configuration see table 3). 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 switched on when all of the connections have been properly connected. After it has been switched 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 3: 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 Ω)
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	

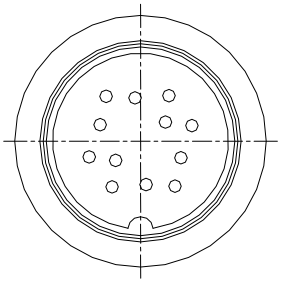


Illustration 3: plug connection DATAFLEX®

4 Assembly

4.3 Technical description

3. Connection housing DF2

The connection housing DF2 has 12 screwed connections for power supply, display equipment and switches.
The torque signal is displayed as proportional direct voltage 0 … 10 V and as current of 4 … 20 mA.
For speed output a square wave signal and a scalable voltage signal is available (for pin configuration see table 4).
The switch T1 serves for programming and can be bridged externally from GND via the terminal 12 (T1).

Table 4: Pin assignment of the connection housing DF2

No.	Designation	Function	Characteristic
		Input voltage	
10	24V	Supply voltage +	24 V DC ± 4 V / 100 mA
11	GND	Supply voltage -	
		Torque output	
4	M-U	Output voltage +	0 V ... 10 V (R_A = 1 kΩ)
5	GND	Ground torque output	
6	M-I	Output current	4 mA … 20 mA
		Speed output pulse signal	
7	N1	Speed output channel 1	HTL (24V, 60 pulses /rev.) TTL (5V, 60 pulses /rev.)
8	GND	Ground for pulse speed output	
9	N2	Without function	
		Speed output DC-voltage	
1	R/L	Without function	
2	GND	Ground for DC speed output	
3	N-U	Speed output DC-voltage	0 V ... 10 V (scalable)
		Other connections / operating device	
12	T1	Push button T1	External connection T1
13	L1, L2	Signal LED's	
14	T1, T2	Push button T1, T2	Push button for programming
15	TP	Switch low pass filter	On/off switch low-pass
16	-	Connection measuring shaft	1:1 Connection Cable
17	-	Switch for speed scaling	see table 8

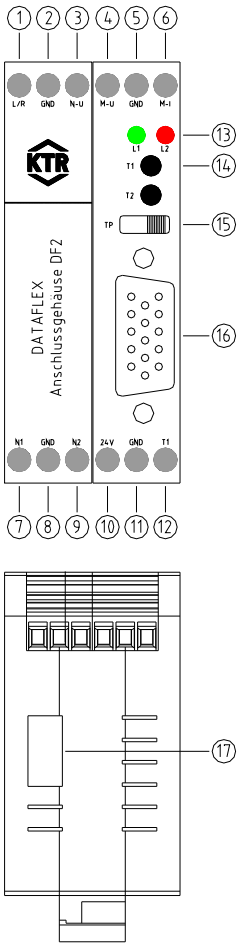


Illustration 4:
connection housing DF2

4. Description of connections

a) Supply voltage 24V

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

b) Torque output U, I

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

4 Assembly

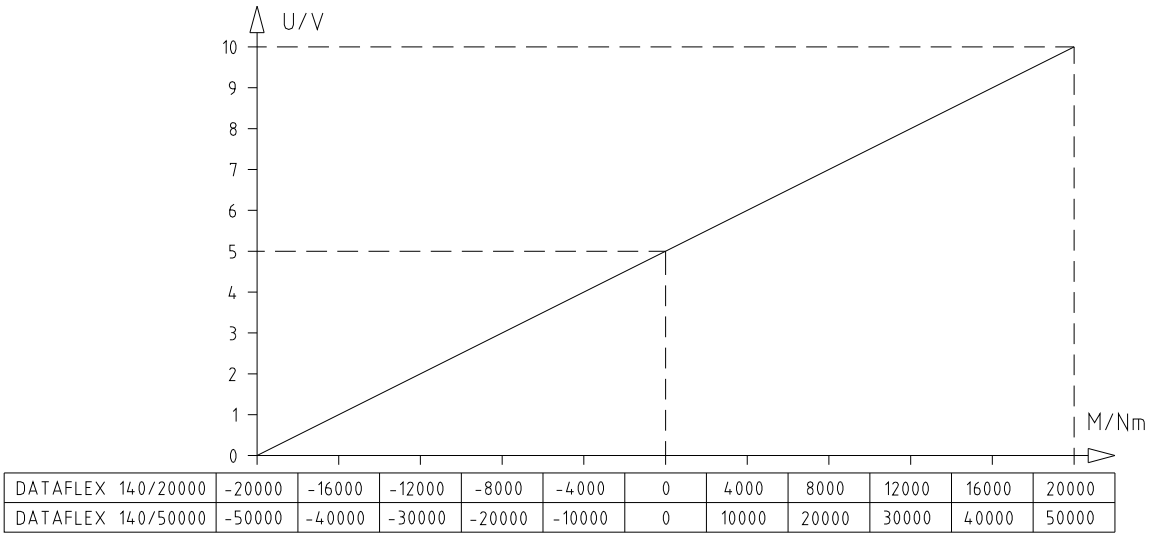
4.3 Technical description

Table 5: Relation between torque - output values

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

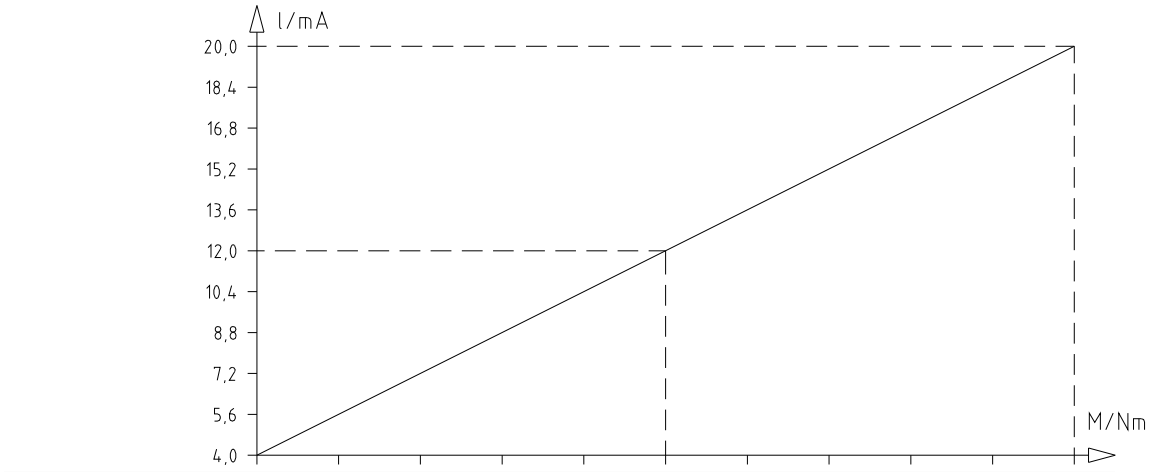
The characteristic curves of the output are shown in illustration 5.1 and 5.2.

The characteristic curves of the output values (see illustration 5.1 and 5.2)



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

Illustration 5.1: voltage to torque relationship



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

Illustration 5.2: current to torque relationship

4 Assembly

4.3 Technical description

- **Low pass filter (No. 15)**

If the connection housing DF2 is used, the signal of the voltage output can be filtered.

Table 6: Low pass switch (No. 15)

Button adjustment TP	Left	Right
	Low-Pass on	Low-Pass off

The limit frequency of the filter can be changed by varying the DIP switches (see illustration 6) inside the connection housing:

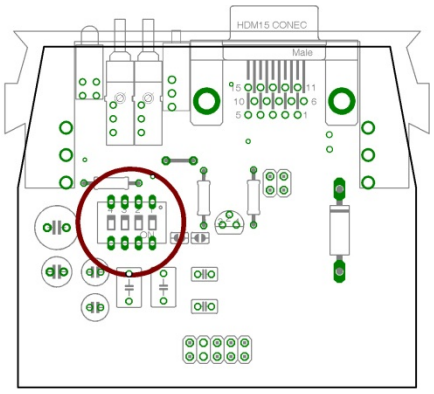


Illustration 6: position of DIP switch

Table 7: Adjustment of the requested filter frequency

Limit frequency [Hz]	Switch 1	Switch 2	Switch 3	Switch 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 pre-set.

c) Output speed N1 (No. 7)

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

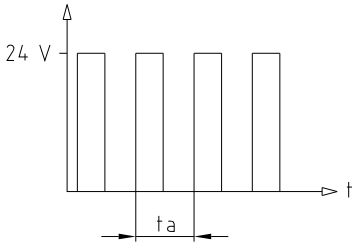


Illustration 7

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

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

4 Assembly

4.3 Technical description

Output circuit (connection N1)

The speed output N1 has short-circuit proof push-pull outputs providing a square-wave voltage with an amplitude of 24V and a maximum switching current of 30 mA. The output terminals must not be charged with an external voltage (see illustration 8).

The output voltage of speed lines can be varied by modifying the jumper position in the connection housing to 5V level (see illustration 9).

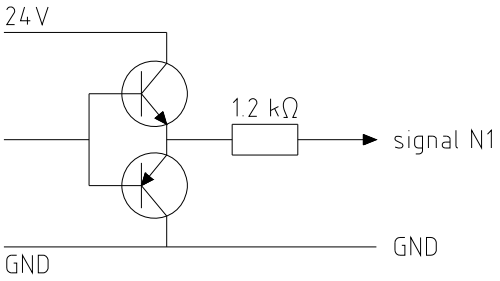


Illustration 8: output circuit of speed outputs

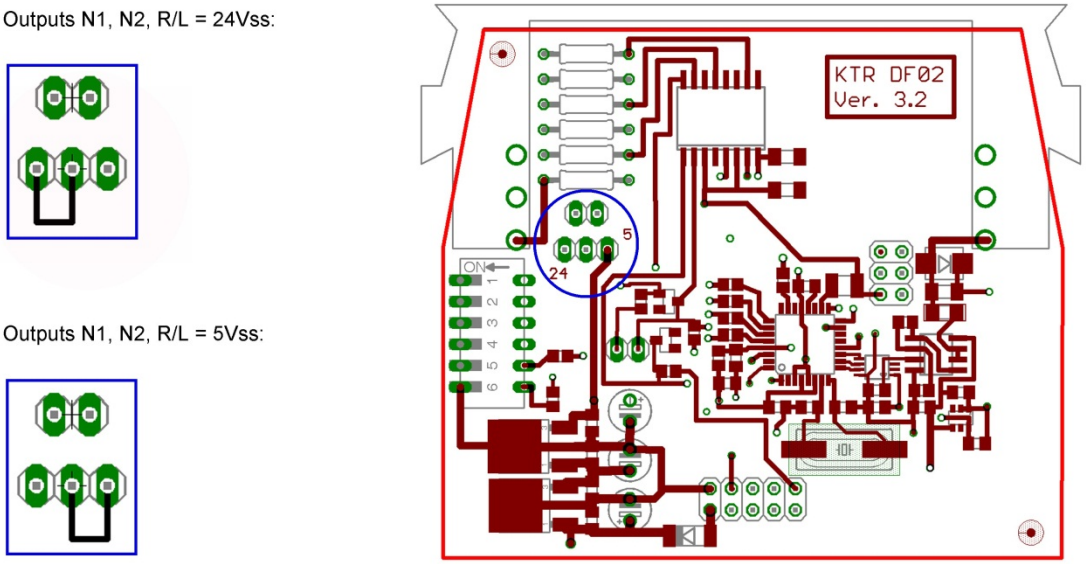


Illustration 9: modification of voltage level for the speed signal

d) Outputs N-U

The KTR connection housing DF02 contains an integrated f/U converter. It converts the pulses of the encoder to a linear DC-voltage output (terminal N-U).
On the bottom side of the connection housing DF02 there is a sixfold multiple switch allowing to adapt the scaling of the speed signal to the type of measuring shaft and the speed range (see illustration 4 and 10).

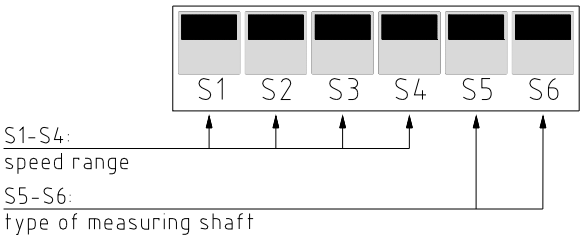


Illustration 10: switch positions

4 Assembly

4.3 Technical description

Scaling of the speed direct voltage output

Table 8: Switch position S1-S4 and the corresponding scale of the speed output N-U

Max. speed	Scaling	S1	S2	S3	S4
10	1 U/min / V	0	0	0	0
20	2 U/min / V	0	0	0	1
40	4 U/min / V	0	0	1	0
60	6 U/min / V	0	0	1	1
80	8 U/min / V	0	1	0	0
100	10 U/min / V	0	1	0	1
200	20 U/min / V	0	1	1	0
400	40 U/min / V	0	1	1	1
600	60 U/min / V	1	0	0	0
800	80 U/min / V	1	0	0	1
1000	100 U/min / V	1	0	1	0
2000	200 U/min / V	1	0	1	1
4000	400 U/min / V	1	1	0	0
6000	600 U/min / V	1	1	0	1
8000	800 U/min / V	1	1	1	0
10000	1000 U/min / V	1	1	1	1

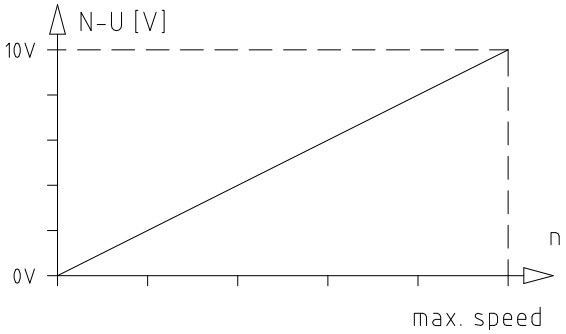


Illustration 11

Table 9: Selection of DATAFLEX® series

DATAFLEX® type	S5	S6
DATAFLEX® 22, 42, 85, 140	0	0
DATAFLEX® 16	1	1
DATAFLEX® 32	0	1

e) 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 DF2 accessory the connections for the LED output and the calibration input are wired as shown in illustration 12 (see table 3).

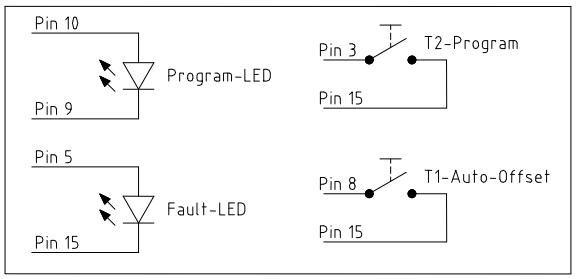


Illustration 12

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.

LED 2 (Error) / Error Signal

The perfect operation of the measuring system is permanently supervised.
An electronic defect is shown by an error signal. If an error is permanently shown, the measuring system is damaged and must be returned to KTR.

4 Assembly

4.3 Technical description

Table 10:

Condition	LED 2
Normal Operation	OFF
Error	ON

Automatic Offset Correction

If an incorrect value is indicated if no torque is applied (≠ 5,0 V), an automatic offset alignment can be effected by pressing the button T1-Auto-Offset for 2 seconds.
For this purpose 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 program - LED and the normal measuring operation is continued automatically.
For an easy connection in control systems the Auto-Offset-Connection is accessible in the connection housing DF2 (No. 12).

5. Calibration (Manual adjustment of amplification and offset.)

☞ **A T T E N T I O N !**
The measurement shaft is delivered in calibrated state.
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 incline of the curves shown in illustration 5.1 and 5.2. 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 illustration 13).

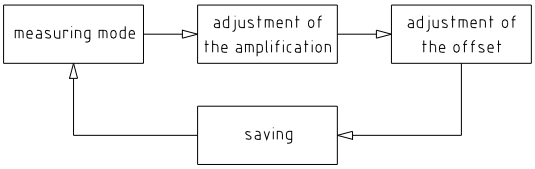


Illustration 13: flow of the manual setting

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 possible now.
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 illustration 14.1).
4. If the difference of the displayed measurement values of the loading and unloading corresponds with the outside determined torque difference, 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 start now.
6. As described under point 3 the keys can be pressed quickly to set all of the values (see illustration 14.2). If no torque is applied 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 be in its normal operating mode again.

4 Assembly

4.3 Technical description

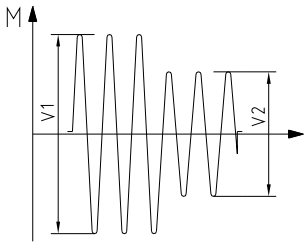


Illustration 14.1

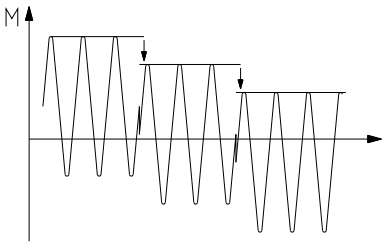


Illustration 14.2

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 switched off for a short time and then switched on again. 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.**

4.11 Services, customer service addresses

If requested we are pleased to perform the calibration of your torque measuring shaft and other services.

Contact addresses of the KTR partners for spare parts and orders can be obtained from the KTR homepage at www.ktr.com.

A T T E N T I O N !
KTR does not assume any liability or warranty for the use of spare parts and accessories which are not provided by KTR and for the damages which may incur as a result.

5 EC certificate of conformity

EC Certificate of Conformity

The manufacturer - KTR Kupplungstechnik GmbH, D-48432 Rheine - states that the

torque measuring shaft DATAFLEX®

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

2004/108/EG council directive of 15 December 2004 on the approximation of the laws of the Member States relating to electromagnetic compatibility and repealing directive 89/336/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,	29.05.2013	i. V.	i. A.
City	Date	Reinhard Wibbeling Engineering Manager	Jürgen Kösters Product Manager