APPLIED MEASUREMENTS LTD.
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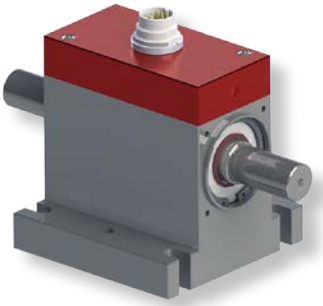
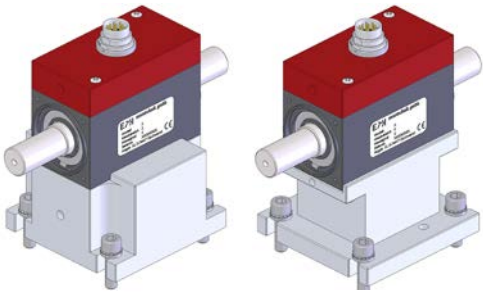
Operator manual

DRVL



Option „F“ Base/Foot



Accessories „Mounting Adapter“

English

Content

Important instructions:

The model DRVL torque transducer can be deployed as a component in a test bench, for example.
The installation position of the drive and transducer sides should be taken into account in applications where mass is critical.

Please note that in order to achieve greater sensitivity the transducer has not been designed with the safety factors 2 to 20 that are common in mechanical engineering.

Please pay special attention to the specified overload factors.

Where there is a risk of personal injury or damage to equipment due to mechanical failure leading to breakage, the user of the device must put in place adequate safety measures (e.g., covers and guards, and overload protections). All applicable accident prevention regulations must be followed.

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

Opening or disassembling the transducer during the warranty period will void the warranty.

1. Preliminaries

The torque transducers are made of different shaft materials to suit the loads.
Torque transducers measure torque in the unit Nm.
Please refer to the relevant data sheet for the current technical specifications.
www.eth-messtechnik.de

2. Applicability and instructions for use

The torque transducers measure clockwise and counterclockwise loads. In case of clockwise load, the output signal is positive.
The full-scale value is printed on the device label.

The torque transducers can measure both static and dynamic torques. The low masses and high torsional stiffness are particularly beneficial in this context. Please refer to the data sheet for the specified signal rise for the transducer.

The torque transducers need no maintenance as they are fitted with contactless outputs. Their electrical outputs can be transmitted to remote test benches, where they can be displayed, recorded, processed and used for control operations.

The torque transducers are precision devices and should be handled carefully when transported and when being installed to prevent them being damaged by shocks or if they fall to the ground. Torque peaks above the rated overload can severely damage the torsional shaft. These peaks must be intercepted and absorbed if they cannot be avoided.

The limits for the permissible mechanical, thermal and electrical stresses are detailed in the data sheet. They must be strictly observed. Please consider these limits when designing, installing and operating the measurement setup.

3. Description and functionality of the device

3.1 Torsional shaft

The torsional shaft is constructed with special aluminum or hardened carbon steel to suit the full-scale value.

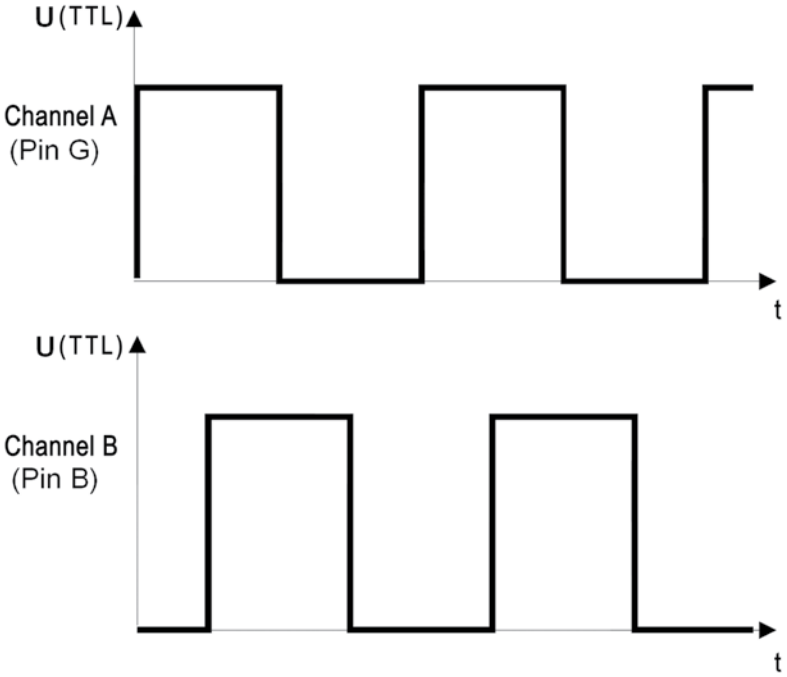
Strain gauges attached to the torsional shaft sense the shaft torsion, which is proportional to the torque and is within its elastic range. The strain gauges are arranged as a Wheatstone bridge circuit. The force is transmitted via cylindrical shaft extensions with smooth shaft extensions or a featherkey as per DIN 6885. A pulse disk for speed or rotation angle measurement can be fitted to the torsional shaft if needed. Please refer to the data sheet for more details.

3.2 Enclosure

The enclosure for the torque transducer is made of high-strength aluminum; the enclosure surface is hard-anodized to protect it. The torsional shaft is supported in the enclosure with two deep-grooved ball bearings. The transducer can either be base mounted or flange mounted. An electronics module for conditioning and analyzing the signal for torque, speed or angle of rotation is installed in the enclosure.

3.3 Principle of operation

The torsional shaft, and thus the strain gauges, are elastically deformed by the torsional force. The ohmic resistances of the strain gauges change proportional to their change in length. The electronics module is connected in series and it transfers the measurements by means of optical frequency modulation to the enclosure.
The signal is then converted by the external electronics unit to an analog voltage that is proportional to the change in frequency. Those signals and frequency output are available as an electrically isolated signal for further processing.
The pulse disk on the torsional shaft is sampled with an encoder in the enclosure. Two waveforms are available for analysis: (1) a square wave with 60 pulses/turn for the speed option, and (2) two square waves offset by 90° with 360 pulses/turn for the angle of rotation option.The direction of rotation can be detected with the angle of rotation option. Channel A leads channel B by 90° for clockwise rotation.



3.4 Disturbances and their compensation

Flexural, axial and radial forces are disturbances and, hence, should be avoided. We recommend the use of clamping hub couplings. They must be selected to suit the operating conditions.

Shielded cables should be used for the electrical connections. The electromagnetic compatibility (EMC)of the torque transducers are tested for compliance with EN 55011:2011.
The immunity of the torque transducers to noise is tested to the following standards:

- 61000-4-2:2009
- 61000-4-3:2009
- 61000-4-4:2009
- 61000-4-5:2009
- 61000-4-6:2009
- 61000-4-8:2009

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 to be taken when assembling the transducer

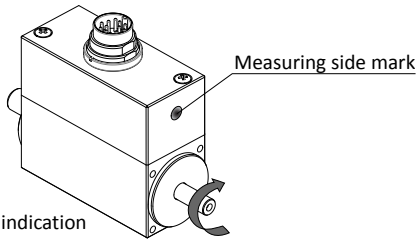
- Handle the transducer carefully.
- **IMPORTANT!**
  While assembling the couplings, don't overload the transducer, even temporarily. It is highly suggested to connect the transducer electri cally first and monitor the torque signal in order to prevent exceeding the torque range!
- Axial and radial misalignments must be avoided.
- Make sure the enclosure is correctly connected electrically to the grounded parts.

5.2 General assembly guidelines

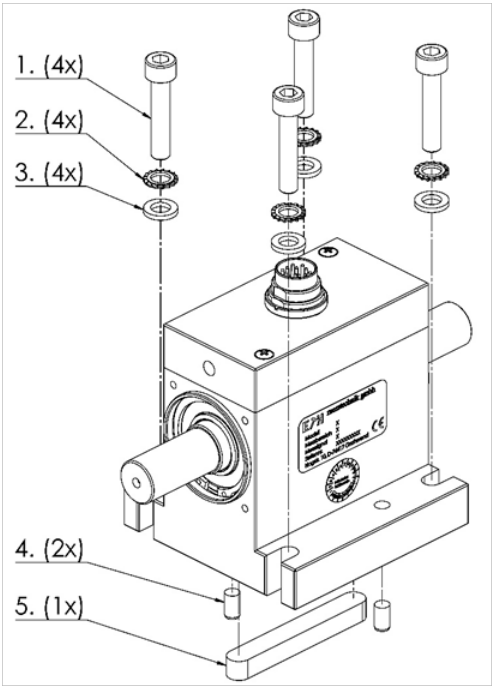
The drive and transducer sides should not be swapped, otherwise measurements (readings) will be invalidated during accelerations, for example.

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.



5.3 Option „F“ Foot/Base
Additional parts and suggested values for the installation



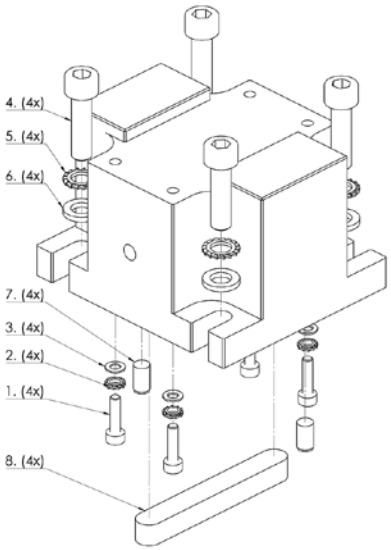
Model	DRVL-F	DRVL-I-F	DRVL-Ib-F	DRVL-II-F	DRVL-III-F	DRVL-IV-F	DRVL-V-F	DRVL-VI-F
Additional parts:								
1. Hexagon socket head cap screw (DIN912-8.8-Zn)	M5x25	M5x25	M6x30	M6x30	M8x35	M10x45	M12x55	M16x80
2. **Fan washer** (DIN6798 A-Zn)	5,3	5,3	6,4	6,4	8,4	10,5	13	17
3. Plain washer (DIN433-4.8-Zn)	5,3	5,3	6,4	6,4	8,4	10,5	13	17
4. Straight pin (DIN6325)	4m6x8	4m6x8	5m6x10	5m6x10	6m6x12	8m6x16	10m6x20	12m6x24
5. Parallel key (DIN6885 A)	6x6x50	6x6x50	8x7x60	8x7x60	10x8x60	10x8x60	10x8x80	10x8x100

Suggested Values to install with a friction value of μ=0.12	Maximum tightening torque of screws on steel (Nm)							
	5,8	5,8	9,9	9,9	24,1	47	82,3	201,9
	Maximum tightening torque of screws on aluminum (Nm)							
	5,0	5,0	8,6	8,6	21,0	40,8	71,4	175,1
	Maximum tightening torque of the screws on the flange (Nm)							
	0,6	1,0	1,0	1,0	2,6	8,6	--	--
	Minimum installation depth of the cylindrical pins in the sensor (mm)							
	4,0	4,0	5,0	5,0	6,0	8,0	10,0	12,0

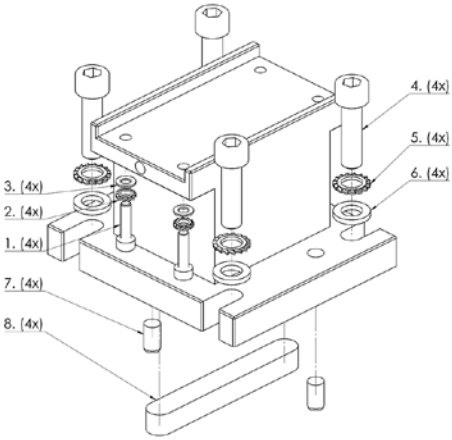
5.4 Accessories „Mounting Adapter“

Additional parts and recommended values for installation

Type X



Type Y



Model	DRVL	DRVL-I	DRVL-Ib	DRVL-II	DRVL-III	DRVL-IV	DRVL-V	DRVL-VI
Additional parts:								
1. Hexagon socket head cap screw (DIN912-8.8-Zn)	X= M2,5x10 Y= M2,5x12	M3x12	M3x12	M3x12	X= M4x14 Y= M4x16	X= M6x25 Y= M6x22	X= M8x45 Y= M8x30	X= M10x75 Y= M10x40
2. Fan washer (DIN6798 A-Zn)	2,7	3,2	3,2	3,2	4,3	6,4	8,4	10,5
3. Plain washer (DIN433-4.8-Zn)	2,7	3,2	3,2	3,2	4,3	6,4	8,4	10,5
4. Cap screws, hexagon socket (DIN912-8.8-Zn)	M5x18	M5x20	M6x22	M6x22	M8x30	M10x40	M12x5ß	M16x60
5. fan-type lock washer (DIN6798 A-Zn)	5,3	5,3	6,4	6,4	8,4	10,5	13	17
6. Plain washer (DIN433-4.8-Zn)	5,3	5,3	6,4	6,4	8,4	10,5	13	17
7. Straight pin (DIN6325)	4m6x8	4m6x8	5m6x10	5m6x10	6m6x12	8m6x16	10m6x20	12m6x24
8. Parallel key (DIN6885 A)	6x6x50	6x6x50	8x7x60	8x7x60	10x8x60	10x8x60	10x8x80	10x8x100

Suggested Values to install with a friction value of μ=0.12	Maximum tightening torque of screws on steel (Nm)							
	5,8	5,8	9,9	9,9	24,1	47	82,3	201,9
	Maximum tightening torque of screws on aluminum (Nm)							
	5,0	5,0	8,6	8,6	21,0	40,8	71,4	175,1
	Maximum tightening torque of the screws on the housing base (Nm)							
	0,6	1,0	1,0	1,0	2,6	8,6	21	40,8
	Maximum tightening torque of the screws on the mounting adapter (Nm)							
	0,6	1,0	1,0	1,0	2,6	8,6	--	--
	Minimum installation depth of the cylindrical pins in the sensor (mm)							
	4,0	4,0	5,0	5,0	6,0	8,0	10,0	12,0

6. The measurement-chain setup

A measurement chain is required for the transducer to take measurements.

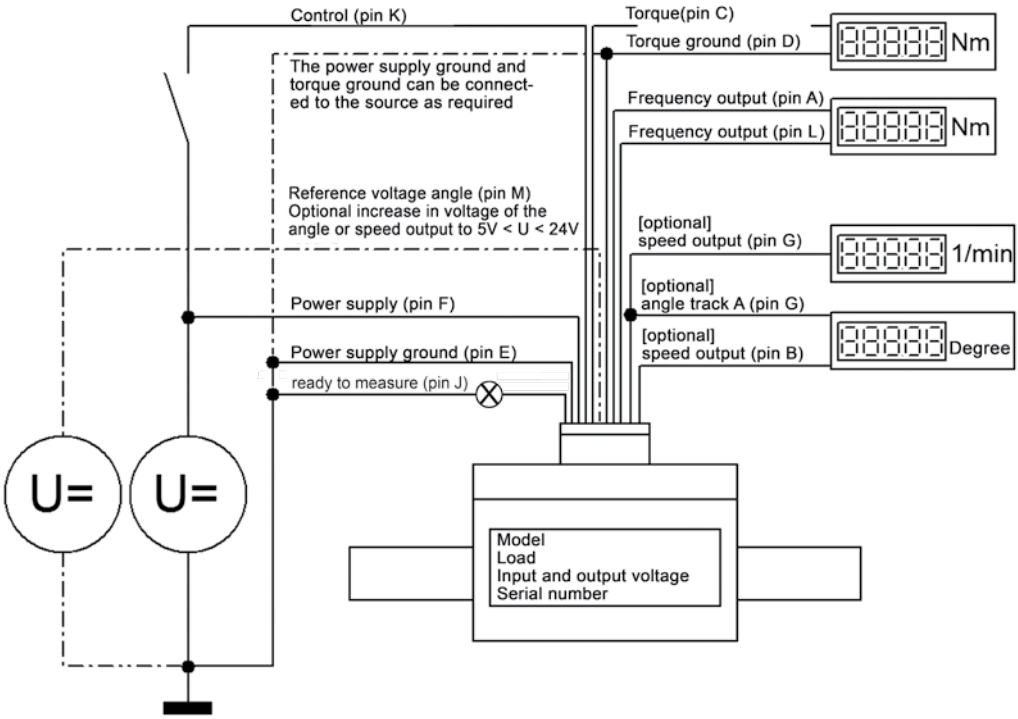
The measurement chain consists of:

- a torque transducer
- a connection cable
- a power supply and display unit

A power supply is required to supply the transducer with the necessary operating voltage. The transducer is fitted with a measurement amplifier (hence, no other amplifier is needed). The measurement data can be transmitted to a laptop, for example, or displayed and analyzed with power supply and display units.

7. Electrical connection

The electrical connection of a torque transducer with a 12-pin connector



7.1 Wiring instructions

Electrical and magnetic fields often disturb the measurement circuit. These disturbances typically emanate from power lines running parallel to the test cables, but they can also come from nearby contactors or electric motors. Interference or noise voltages can be injected into the circuit as well electrically, especially if the measurement chain is grounded at many points. This can give rise to potential differences.

Please note the following instructions.

- Use only shielded, and low-capacitance cables.
- Connect the supply voltage correctly
- Do not lay the device cable parallel to heavy-duty or control lines.
- Avoid leakage fields from transformers, motors and contactors.
- Do not ground the transducer, analyzer and indicating unit at multiple points.
  Connect all devices in the measurement chain to the same protective conductor.

7.2 Connectors

The transducers are fitted with a 12-pin integrated connector Binder model 680.

7.3 Pin assignment for the connectors

The pin assignments for the connectors are detailed on the following pages. The transducer outputs the measurements as an electrically isolated signal. The ground potentials should not be directly bridged at the transducer, as this could lead to incorrect measurements, depending on the length of the cable to the power supply and display unit. Instead, they can be bridged at the power supply and display unit, if necessary.

7.4 Control activation

The “control activation” is used to test the transducer. This emits its maximum signal of e.g. 10 V and 15 kHz (with right-hand load). The control level is 4.5 V up to the supply voltage; the reference ground point is the supply ground.
Attention: Note the tare!

7.5 Extension cables

Extension cables must be shielded and have low capacitance. We recommend you use our cable, as it meets these requirements. Pay particular attention to the connectors and ensure good insulation when using cable extensions. The cable cross-section should be sufficiently large to ensure adequate power reaches the transducer. There is no need to recalibrate the transducer when extending the cable.

7.6 The power supply

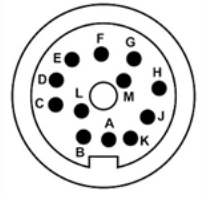
The torque transducer is fitted with a universal voltage input for the voltage range 10 V - 28.8 V. If the voltage goes above 28.8 V, the internal suppressor circuit is activated and the power supply is shorted.

8. Pin assignment

8.1 DRVL standard cable

AK12.4 for active sensors
12-pin connector

Pin	Colour	Occupancy DRVL
A	Green	Frequency output
B	Red / Blue	Angle exit track B = 90 °
C	Yellow	Moment exit
D	White	Moment mass
E	Grey	Supply + angle / speed ground
F	Pink	Supply + 9… 28V
G	Grey / Pink	Speed / angle output track A = 0 °
H	Purple	Memory chip
J	Black	Message ready for operation
K	Red	Control entrance
L	Brown	Inverted frequency output
M	Blue	Voltage reference angle signal



(Coupling socket seen from the front)

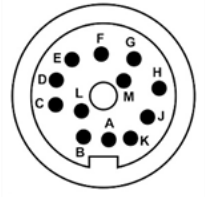
PIN D (torque ground) and PIN E (power supply ground) are electrically isolated internally, short at the power source if required (not at the transducer).

External EMC circuit
A 100 nF / 50 V ceramic capacitor can be soldered between pins C - D at the analyzer to suppress conductor-borne disturbances.

8.2 DRVL robot cable

AK12.5 for active sensors
12-pin connector

Pin	Colour	Occupancy DRVL
A	Black	Frequency output
B	Red	Angle exit track B = 90 °
C	Brown	Moment exit
D	White	Moment mass
E	Yellow	Supply + angle / speed ground
F	Purple	Supply + 9… 28V
G	Green	Speed / angle output track A = 0 °
H	Pink	Memory chip
J	Grey	Message ready for operation
K	Grey/Pink	Control entrance
L	Blue/Red	Inverted frequency output
M	Blue	Voltage reference angle signal



(Coupling socket seen from the front)

PIN D (torque ground) and PIN E (power supply ground) are electrically isolated internally, short at the power source if required (not at the transducer).

External EMC circuit
A 100 nF / 50 V ceramic capacitor can be soldered between pins C - D at the analyzer to suppress conductor-borne disturbances.

9. Measurement outputs

The transducer outputs a 0 – 10 V DC voltage that is proportional to the torque. The output voltage is positive for clockwise torque, and negative for counterclockwise torque. The transducer outputs a 10 kHz ± 5 kHz differential frequency signal (RS422), as well.
The torque sensor has a permitted zero point deviation of ± 50 mV / ± 50 Hz. A taring option must be provided for precise measurements.

Each of the speed and angle-of-rotation outputs has an active driver in the system. The speed, angle and ready outputs deliver a TTL signal in the absence of an external voltage reference.

The device also outputs a ready signal **(Pin J)**: logic HIGH means the device is ready, LOW means there is a fault in the device.

If a higher voltage output is needed, for PLC inputs, for example, a voltage reference can be set through **pin M**. The voltage reference tolerates a 5 V - 24 V voltage range.

10. Recalibration

We recommend, regardless of use, a recalibration (deadline see certificate) in the house of ETH.

11. Disposal

The transducer along with the measuring cable can be returned free of charge to us for disposal. As soon as you have packaged the transducer, send us an e-mail at sales@eth-messtechnik.de. We will then instruct our parcel service to pick it up.
We are sorry, but we cannot accept any goods sent to us unannounced and freight-collect.

12. Datasheet

Torque Transducer

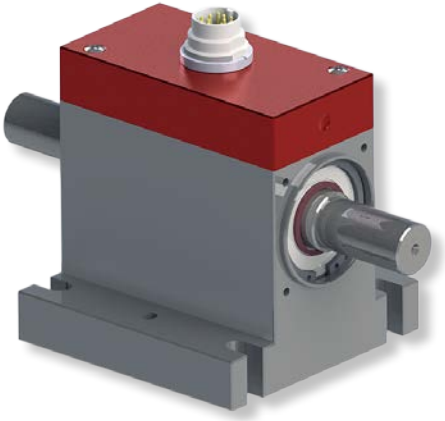
DRVL

27 torque ranges from ±0 - 0,02 Nm up to 20.000 Nm
precise measurement of torque, speed
and angle of rotation

Option base

Alternative fastening option,
enables simplified attachment!
Easy to assemble!

Alignment in the longitudinal axis using a keyway,
oriented and unmistakable installation
(for example after recalibration)
by means of parallel pins



Accessories mounting adapter

Precise peak height adjustment
to a desired level.
Hole pattern is the same as option with foot.

Features DRVL

- contactless signal transmission
- integral signal amplifier
- low moment of inertia
- speed/RPM measurement (optional)
- Angle of rotation measurement (optional)
- Advanced electromagnetic compatibility (EMC)
- adjustable output level for speed- and angle signal (5 - 24 V)
- larger speed range for speed- and angle measurements
- Frequency output 10 kHz ± 5 kHz (RS422)
- larger input voltage range (10 - 28,8 V)
- compact dimensions, universally applicable
- Strain gauge technology
- Option base
- Option mounting adapter
- 0.05% linearity error option

Series DRVL 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 optional speed and angular measurement for a host of applications. The integrated signal amplifier is powered with 10 - 28,8 V DC and outputs an electrically isolated analog signals of 0 ± 10 V and 10 kHz ± 5 kHz

The standard version has smooth shaft ends, several types are available with optional keyways (see table).

Standard delivery with factory calibration

12.1 Elektrical Specifications

Supply voltage:	10 - 28,8 V DC	
Power consumption:	at Ub 12 V approx. 180 mA (switching converter 2.2 W)	
Rise time 10-90 %:	2 ms (optional 400 µs)	
Limit frequency -3 dB:	200 Hz (optional 1 kHz)	
	Voltage output:	Output frequency:
Voltage output:	0 ± 10 V	10 kHz ± 5 kHz (RS422)
Resolution:	16 bit ≙ 0,38 mV	16 bit ≙ 0,19 mHz
Max. output range:	± 11 V	± 6,3 KHz
Internal resistance:	100 Ω	–
Ripple:	< 100 mVss	–
Nonlinearity/max. measurement error (of full scale)		
DRVL:	0,15 % (optional 0,1 %)	0,15 % (optional 0,1 %)
DRVL-I to DRVL-VI:	0,1 % (optional 0,05 %)	0,1 % (optional 0,05 %)
Hysteresis	0,1 %	0,1 %
Deviation at zero point:	≤ 50 mV	≤ 50 Hz
Operating temperature:	0 - 60 °C	
Compensated temperature range:	5 - 45 °C	
Temperature error		
Zero point:	0,02 % / K	
Sensitivity:	0,01 % / K	
Mechanical overload:	100 %	
Internal protection:	IP40	
Connection:	12pin-connector (circular connector series 680)	

Interference emission

Basic standard	Frequency range
EN55011 Limit class B	150 kHz - 6 GHz

Immunity to interference

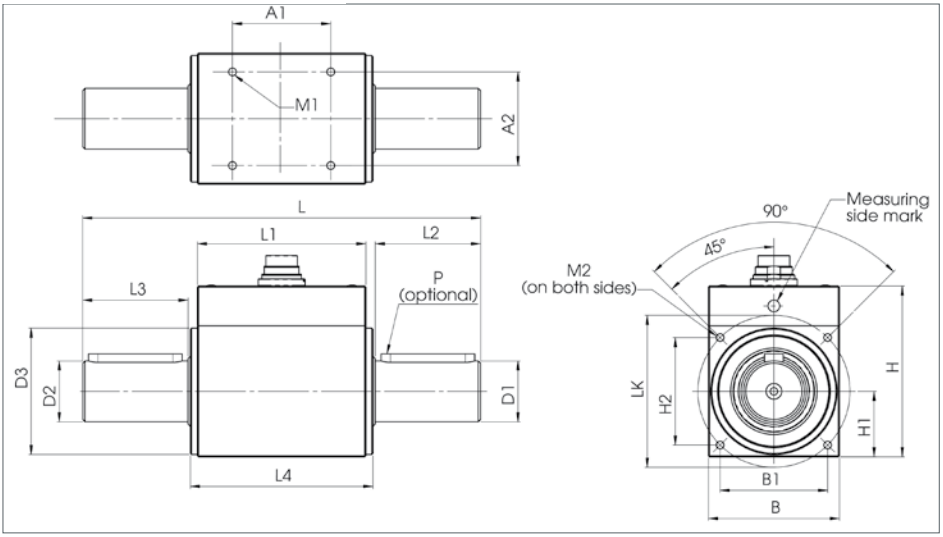
Basic standard	Testing accuracy	coupling	Result
EN61000-4-2:2009 Electrostatic discharge (ESD)	4 kV	direct	A
EN61000-4-2:2009 Electrostatic discharge (ESD)	4 kV	indirect	A
EN61000-4-3:2009 Electromagnetic fields	10 V/m	indirect	A
EN61000-4-4:2009 Bursts	2 kV	indirect	A
EN61000-4-5:2005 Surge voltages	1 kV	direct	B
EN61000-4-6:2009 Conductor-borne RF disturbances	10 V/m	indirect	A
EN61000-4-8:2005 Power frequency magnetic fields	30 A/m	indirect	A

A: Deviation of outputs during the test < 0.3 % of full scale
B: Deviation of outputs during the test > 0.3 % of full scale

	Speed option (n)	**Angle option (w)**
Max rev.:	37.000 min^{-1} * depending on size	20.000 min^{-1} *
Output:	TTL or over voltage on pin 5 V < U < 24 V	
Impedance:	22 Ω	22 Ω
I_{max}:	20 mA	20 mA
Pulses/rev.:	60	2 x 360
Resolution:	--	1°
Phase shift:	--	Channel A 90° at right spin of propulsion side

* The values are valid for ETH test cables ≤ 10 m, the maximum permissible speed of the sensor must be observed.

12.2 Mechanical Dimensions



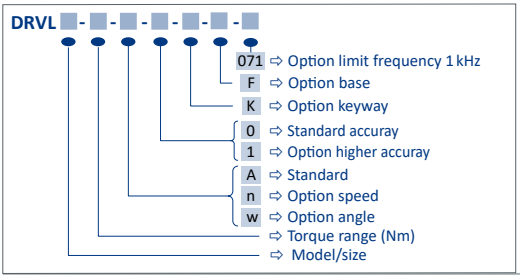
Model	DRVL	DRVL-I		DRVL-Ib	DRVL-II	DRVL-III	DRVL-IV	DRVL-V	DRVL-VI
Torque	0.02	0.05	2	1	5	50	500	2000	10.000
Ranges	0.05	0.1		2	10	100	1000	3000	15.000
(±0 - ... Nm)	0.1	0.2		5	20	150	1300	4000	20.000
		0.5		10	30	200	1500	5000	
		1			50	300			
Dimensions:					(other ranges upon request; General tolerances DIN 2768-m)				
L (mm)	82	89	95	110	145	170	270	320	355
B (mm)	32	28		36	42	56	88	105	168
B1 (mm)	24	(→ LK)		(→ LK)	(→ LK)	(→ LK)	(→ LK)	(→ LK)	--
H (mm)	47	54		58	58	73	104	121	185
H1 (mm)	14	14		18	21	28	44	52,5	84
H2 (mm)	22	(→ LK)		(→ LK)	(→ LK)	(→ LK)	(→ LK)	(→ LK)	--
Ø D1 g6 (mm)	3	8	8	10	15	26	45	70	110
Ø D2 g6 (mm)	3	5	6	10	15	26	45	70	110
Ø D3-0,1 (mm)	15	27		32	38	54	80	--	--
Ø LK ± 0,1 (mm)	(→ B1/H2)	32		38	46	65	98	--	--
L1	63	62		68	79	72	84	95	121
L2	7,5	11	14	18	30	45	85	110	115
L3	7,5	10	14	18	30	45	85	110	115
L4	67	66		72	83	78	90	--	--
A1	50	40		56	60	42	46	75	91
A2	24	22		24	32	40	70	85	138
M1	M2,5 x 5 deep	M3 x 5 deep		M3 x 6 deep	M3 x 6 deep	M4 x 8 deep	M6 x 12 deep	M8 x 16 deep	M10x16 deep
M2	M2,5 x 5 deep	M3 x 6 deep		M3 x 6 deep	M3 x 6 deep	M4 x 8 deep	M6 x 12 deep	--	--
P (DIN 6885) optional	--	--		2xA3x3x14	2xA5x5x25	2xA8x7x40	4xA14x9x80	4xA20x12x100	--
Weight (g)	200	170		340	600	1300	4500	11 500	33.000
n max (min^{-1})	20 000	37 000		26 000	19 000	13 500	7900	6300	4000

12.3 Technical Specifications

Model	Torque range (± 0 - ... Nm)	Spring constant C (Nm/rad)	Mass moment of inertia J (g•cm²)			Rated axial load (N)*	Rated radial load (N)*
			total	Drive side	Measuring side		
DRVL	0,02	8	7	7	0,1	35	30
	0,05	8	7	7	0,1	35	30
	0,10	8	7	7	0,1	35	30
DRVL-I	0,05	25	10	10	0,2	105	2
	0,1	40	10	10	0,2	140	3
	0,2	40	10	10	0,2	140	3
	0,5	80	10	10	0,3	160	4
	1	80	10	10	0,3	210	7
	2	213	10	10	0,4	210	13
DRVL-Ib	1	250	29	24	5,5	630	10
	2	250	29	24	5,5	630	10
	5	710	29	24	5,6	725	25
	10	1319	30	24	5,9	725	50
DRVL-II	5	955	98	65	32	1200	15
	10	2115	98	66	32	1300	30
	20	3955	99	66	32	1300	60
	30	5335	100	67	33	1300	100
	50	6700	103	68	34	1300	155
DRVL-III	50	17×10^3	774	428	346	1800	125
	100	30×10^3	782	432	350	1800	215
	150	44×10^3	796	439	357	1800	340
	200	54×10^3	809	446	364	1800	450
	300	66×10^3	837	459	377	1800	650
DRVL-IV	500	259×10^3	9930	5290	4640	4150	650
	1000	387×10^3	10.140	5395	4745	4150	1275
	1300	429×10^3	10.280	5465	4815	4150	1650
	1500	449×10^3	10.380	5515	4865	4150	1700
DRVL-V	2000	$1{,}43 \times 10^6$	63×10^3	32.560	30.345	4800	1950
	3000	$1{,}82 \times 10^6$	64×10^3	32.860	30.645	4800	2930
	4000	$2{,}09 \times 10^6$	64×10^3	33.220	31.005	4800	3880
	5000	$2{,}27 \times 10^6$	65×10^3	33.610	31.395	4800	4000
DRVL-VI	10.000	$8{,}20 \times 10^6$	434×10^3	221.570	213.150	11.800	8895
	15.000	$10{,}44 \times 10^6$	442×10^3	225.430	217.000	11.800	9830
	20.000	$11{,}80 \times 10^6$	450×10^3	229.650	221.230	11.800	9830

* The values for axial and radial load apply to the non-fixed case

Ordering code system



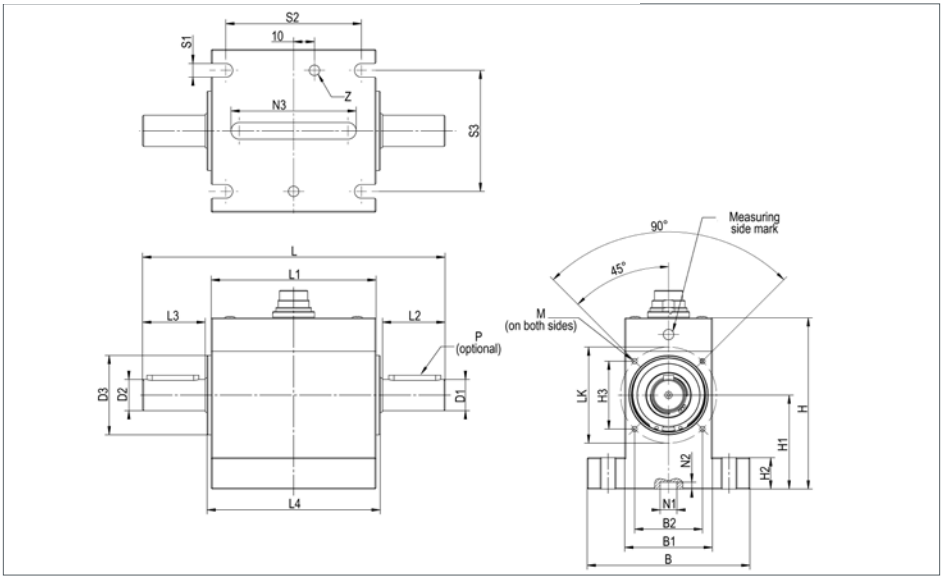
Available Accessories

Supply and display unit: GMV2
ValueMaster$_{base}$

Cables

Couplings

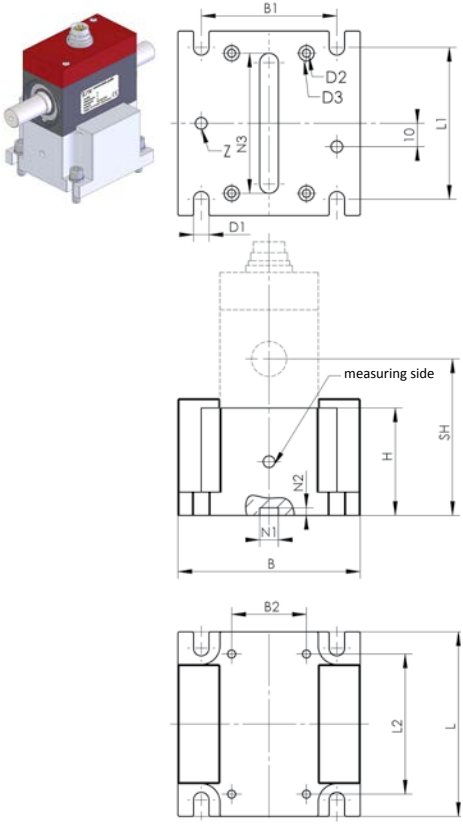
12.4 Mechanical Dimensions Option with Base



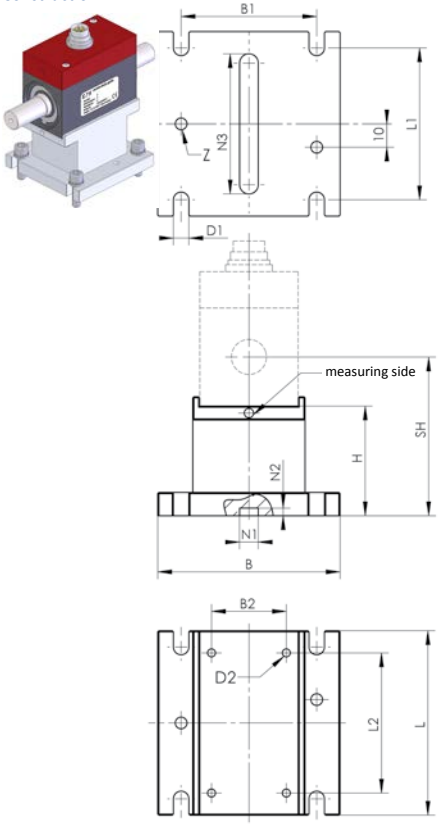
Model	DRVL	DRVL-I	DRVL-Ib	DRVL-II	DRVL-III	DRVL-IV	DRVL-V	DRVL-VI
Torque Ranges (± 0 - ... Nm)	0,02 0,05 0,10	0,05 2 0,1 0,2 0,5 1	1 2 5 10	5 10 20 30 50	50 100 150 200 300	500 1000 1300 1500	2000 3000 4000 5000	10.000 15.000 20.000
Dimensions:	(other ranges upon request; General tolerances DIN 2768-m)							
L (mm)	82	89 95	110	145	170	270	320	355
B (mm)	56	60	78	78	98	158	208	298
B1 (mm)	32	28	36	42	56	88	105	168
B2 (mm)	24	(→ LK)	(→ LK)	(→ LK)	(→ LK)	(→ LK)	--	--
H (mm)	78	85	85	82	90	172	228,5	316
H1 (mm)	45	45	45	45	45	112	160	215
H2 (mm)	12	12	15	15	15	20	30	40
Ø D1 g6 (mm)	3	8 8	10	15	26	45	70	110
Ø D2 g6 (mm)	3	5 6	10	15	26	45	70	110
Ø D3-0,1 (mm)	15	27	32	38	54	80	--	--
Ø LK ± 0,1 (mm)	(→ B2/H3)	32	38	45	65	98	--	--
L1	63	62	68	79	72	84	95	121
L2	7,5	11 14	18	30	45	85	110	115
L3	7,5	10 14	18	30	45	85	110	115
L4	67	66	72	83	78	90	--	--
N1H8 (mm)	6	6	8	8	10	10	10	10
N2 (mm)	2,8	2,8	3,3	3,3	3,3	3,3	3,3	3,3
N3 (mm)	50	50	60	60	60	60	80	100
S1	5,5	5,5	6,6	6,6	9	11	13	17
S2	50	50	50	65	55	65	70	90
S3	44	44	58	58	76	124	156	233
Ø Z E8	4	4	5	5	6	8	10	12
M	M2,5 x 5	M3 x 6	M3 x 6	M3 x 6	M4 x 8	M6 x 12	--	--
P (DIN 6885) optional	--	--	2x A3x3x14	2x A5x5x25	2x A8x7x40	4x A14x9x80	4x A20x12x100	--
Weight (g)	400	400	600	900	1600	6600	15.000	43.000
n max (min^{-1})	20.000	37.000	26.000	19.000	13.500	7900	6300	4000

12.5 Option Mounting Adapter

Construction X

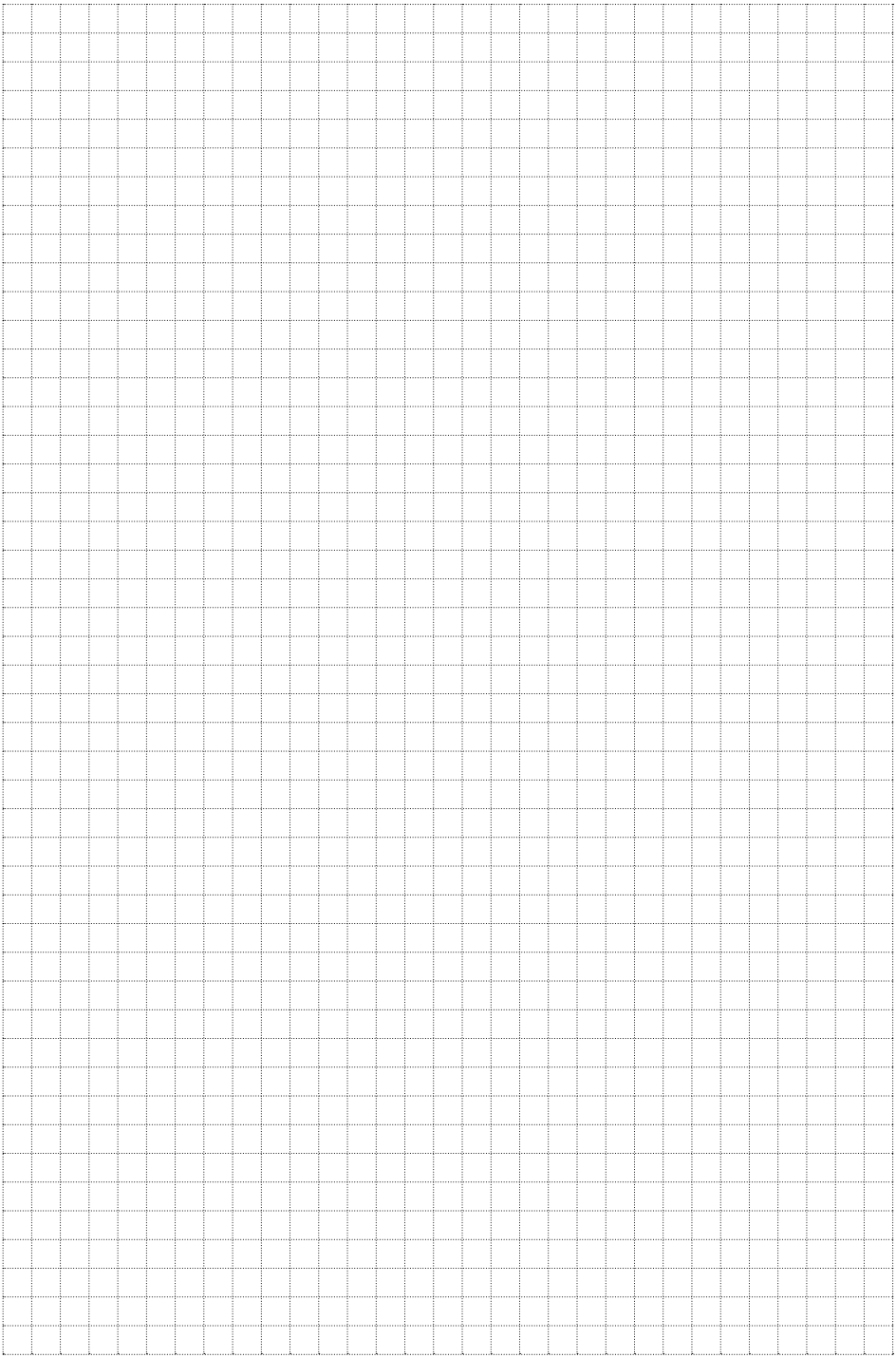


Construction Y



Type	DRVL		DRVL-I		DRVL-Ib		DRVL-II		DRVL-III		DRVL-IV		DRVL-V		DRVL-VI	
Construction	x	y	x	y	x	y	x	y	x	y	x	y	x	y	x	y
SH	23...55	≥56	25...60	≥61	29...65	≥66	32...67	≥68	41...84	≥85	67...119	≥120	93...154	≥155	152...211	≥212
Dimensions in mm																
L	63		62		68		79		72		84		95		121	
B	56		60		78		78		98		158		208		298	
H	= SH - 14		= SH - 14		= SH - 18		= SH - 21		= SH - 28		= SH - 44		= SH – 52,5		= SH - 84	
L1	50		50		50		65		55		65		70		90	
B1	44		44		58		58		76		124		156		233	
D1	5,5		5,5		6,6		6,6		9		11		13		17	
L2	50		40		56		60		42		46		75		91	
B2	24		22		24		32		40		70		85		138	
Ø D2	2,9		3,4		3,4		3,4		4,5		6,6		9		11	
Ø D3	6,5	--	6,5	--	6,5	--	6,5	--	8,5	--	11,5	--	15,5	--	18,5	--
N1 [H8]	6		6		8		8		10		10		10		10	
N2	2,8		2,8		3,3		3,3		3,3		3,3		3,3		3,3	
N3	50		50		60		60		60		60		80		100	
Ø Z E8	4		4		5		5		6		8		10		12	
Weight approx. (g)	80...330	≥230	110...380	≥220	150...430	≥350	180...660	≥420	230...850	≥500	740...2200	≥1300	1900...4100	≥2800	5700...9900	≥6800

Ordering Code: M-[Sensor-type]-SH[peak height] → Example: M-DRVL-II-SH65



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