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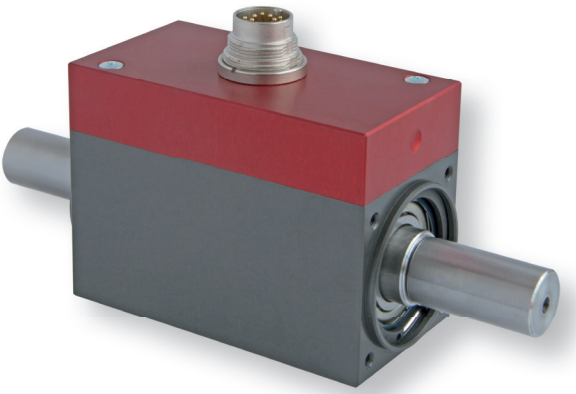
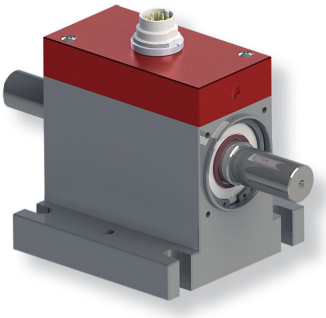
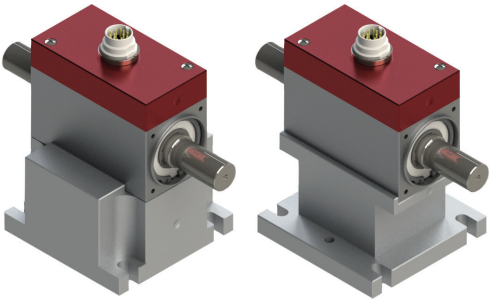
Operator manual

DRVL





Option „F“ with base



Accessory: Mounting adapter

English

This operator manual is not a quality agreement or durability guarantee as set out in Section 443 of the German Civil Code.

Specification changes, typing and printing errors reserved.

Content

Important instructions

The torque sensors of the DRVL 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 sensors are not designed with the usual safety factors (2...20) in machine designs in favor of high measurement sensitivity.

Pay particular attention to the specified overload factors.

Where people can be injured and property can be damaged 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 sensor is not approved for use in the ex area.

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

1. Introduction

The torque sensors of the DRVL series are suitable for torque, rotational speed and angle of rotation measurements. The measuring ranges extend from 0.02 Nm to 20,000 Nm.
The non-contact transmission of supply voltage and measurement signal enables low-wear and largely maintenance-free continuous operation.
Further technical specifications can be found in the data sheet at the end of these operating instructions.

2. Area of application and application notes

The torque sensors measure clockwise and counterclockwise loads.
The type plate provides information about the full scale value.

The torque sensors measure dynamic torques just as precisely as static torques. The low masses and high torsional rigidity are of particular advantage in this context. Note the signal increase of the sensor specified in the data sheet.

The torque sensors are largely maintenance-free due to their non-contact measurement signal transmission. Their electrical outputs can be transmitted to remote test benches, where they can be displayed, recorded, processed and used for control and regulation operations.

As a precision measuring device, the torque sensors require careful handling during transport and installation, since, for example, impacts or vibrations can damage the sensor. Torque peaks above the rated 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. Description and operation

3.1 Torsion shaft

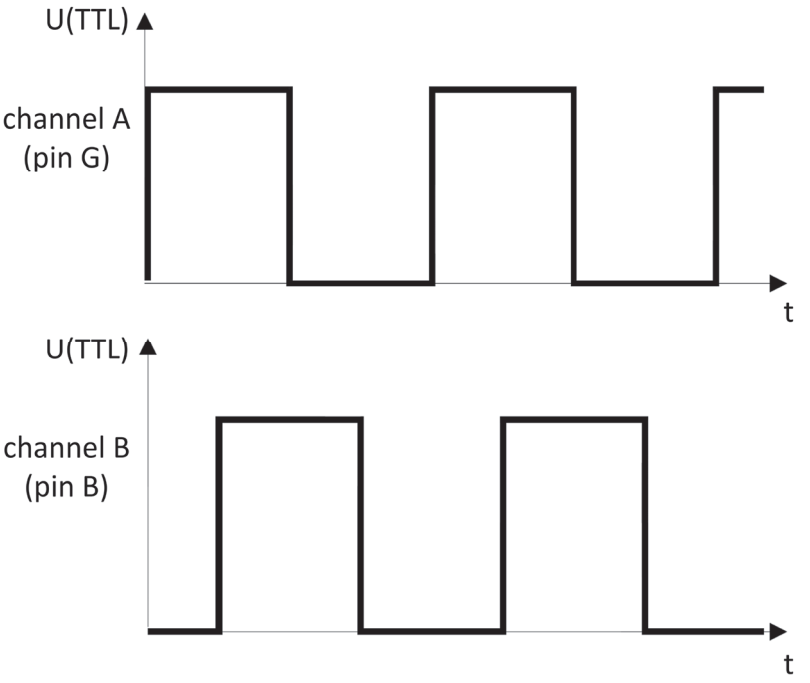
Depending on the full scale value, the torsion shaft is made of special aluminum or hardened steel. The twisting of the torsion shaft, which is proportional to the torque, is evaluated within its elastic range on its applied strain gauges.
The strain gauges are arranged in a Wheatstone bridge circuit.
The frictional connection takes place via cylindrical shafts with smooth shaft ends or optionally via a parallel key according to DIN 6885. The torsion shaft can optionally be equipped with a pulse disc for rpm or angle measurement (see data sheet).

3.2 Housing

The torque sensor housings are made of high-strength aluminum, the surface is hard-anodized for protection. The torsional shaft is supported in the housing between two deep groove ball bearings. The sensor can be mechanically mounted either from below, via flange attachment or with option „F“ on the base.

3.3 Measurement process

The torsional shaft, and thus the strain gauges, are elastically deformed by the torsional force. The strain gages change their ohmic resistance in proportion to their change in length. The subsequent electronics transmit the measurement signal contact-free and frequency-modulated to the external electronics in the housing.
In proportion to the change in frequency, the external electronics convert the first output into an analogue voltage and the second output into a frequency. Those are galvanically isolated and available for further evaluation.
The pulse disk on the torsional shaft is sampled with an encoder in the housing. With the speed option, a square-wave signal with 60 pulses per revolution is available for further evaluation. With the angle of rotation option, there are two square-wave signals shifted by 90°, each with 360 pulses per revolution.
The direction of rotation can be detected with the angle of rotation option, since channel A is 90° ahead of channel B when rotating clockwise rotation.



3.4 Disturbances and their compensation

Bending, axial and radial forces are disturbance variables and should therefore 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 sensors are tested for compliance with EN 55011:2011.
They were also tested for interference immunity according 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 at the place of use

4.1 Ambient temperature

To achieve optimal results, the nominal temperature range must be complied with. 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 radiant heat or cooling must be avoided and appropriate measures taken if necessary.

4.2 Moisture and dust

The torque sensors comply with protection class IP40 according to DIN 40050.

Note: Moisture must not penetrate the connector plug of the sensor!

4.3 Chemical influences

The torque sensors are not protected against chemical influences.
They cannot be used in aggressive environments.

4.4 Deposits

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

5. Mechanical installation

5.1 Precautions when assembling

- Handle the sensor carefully.
- **IMPORTANT!**
  When instaling the couplings, the sensor must not be overloaded, not even temporarily. It is strongly recommended to electrically connect the sensor before mounting and to monitor the torque signal in order not to exceed the measuring range!
- Misalignments in the axial and radial direction must be avoided.
- A good electrical connection of the housing to grounded parts must be ensured.

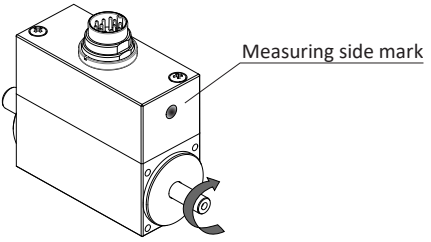
5.2 General assembly guidelines

The drive and measuring sides should not be interchanged, otherwise the measurement result will be falsified (e.g. during acceleration processes).
The measuring side is the lower-mass side and should therefore face the test object. The pulse disc is on the measuring side to avoid angle errors caused by the torsion path when measuring the angle of rotation.

When reading the type plate, the drive side is on the right and the measuring side is on the left of the sensor. The measuring side is also marked by a recess in the cover.

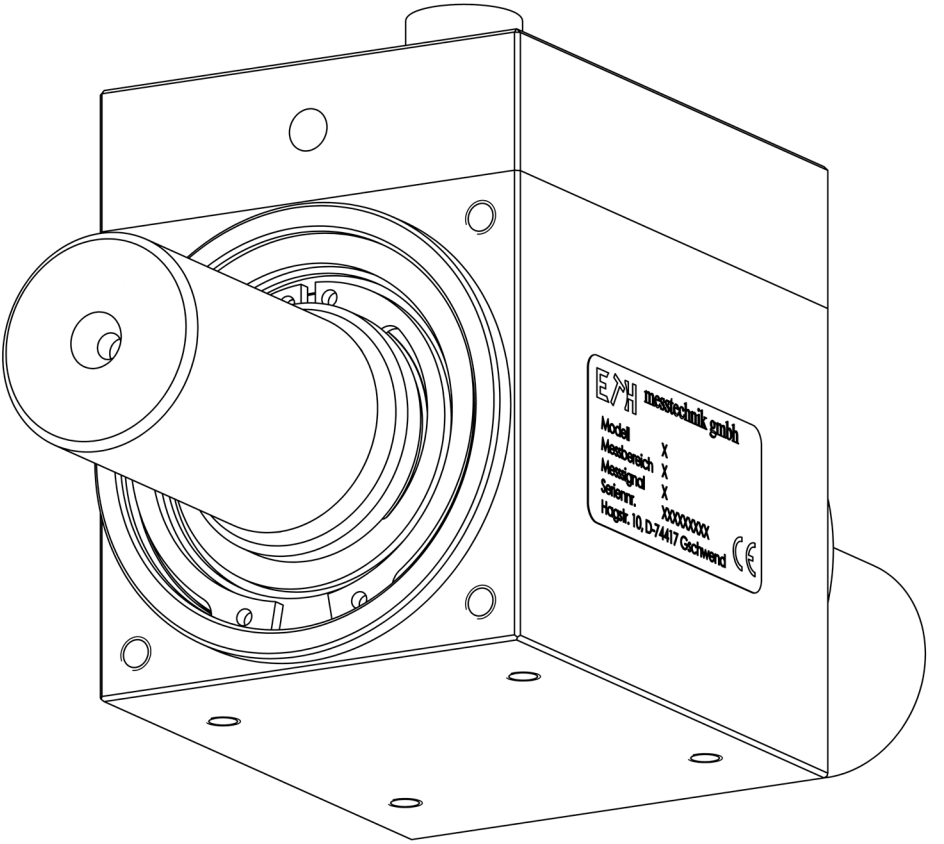
Bending, axial and radial forces are disturbance variables, i.e. causes of measurement errors.

Thermal expansion of the construction must be taken into account.



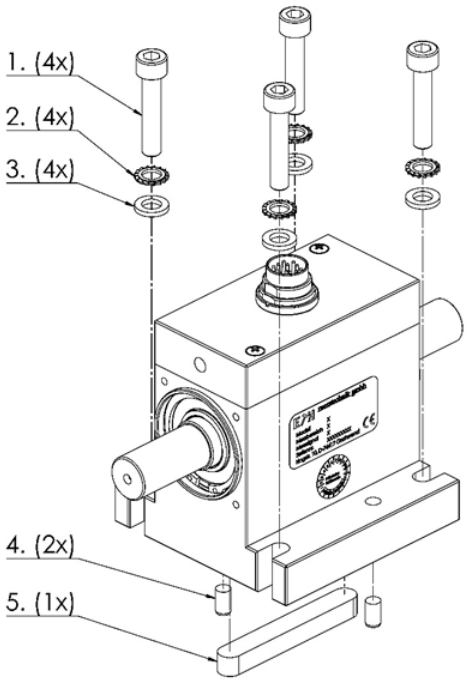
Load direction for a
positive torque reading

5.3 Standard housing
Recommended values for installation



Type	DRVL	DRVL-I	DRVL-Ib	DRVL-II	DRVL-III	DRVL-IV	DRVL-V	DRVL-VI
	Max. tightening torque when screwing to the bottom of the housing [Nm]							
Recommended values for installation with a friction coefficient of μ=0.12	0,6	1,0	1,0	1,0	2,6	8,6	21	40,8
	Min. screw-in depth into the housing base [mm]							
	4,0	4,0	5,0	5,0	7,0	10,0	13,0	16,0
	Max. tightening torque when screwing on the front sides [Nm]							
	0,6	1,0	1,0	1,0	2,6	8,6	--	--
	Min. screw-in depth on the front [mm]							
	4,0	4,0	5,0	5,0	7,0	10,0	--	--

5.4 Option „F“ with base
Additional parts and recommended values for installation



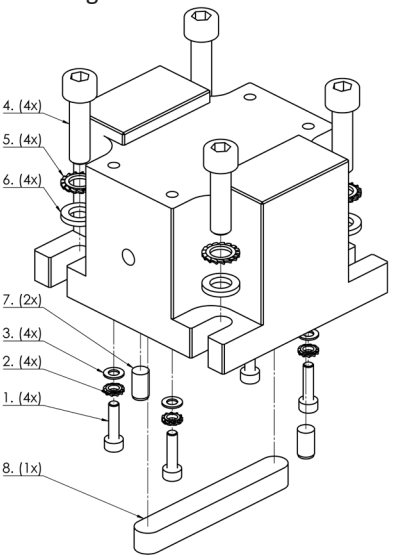
Type	DRVL-F	DRVL-I-F	DRVL-Ib-F	DRVL-II-F	DRVL-III-F	DRVL-IV-F	DRVL-V-F	DRVL-VI-F
Additional parts:								
1. Hexagon socket head cap screw (DIN912-8.8-Zn)	M5x25	M5x25	M6x30	M6x30	M8x35	M10x45	M12x55	M16x80
2. Fan washer (DIN6798-A-Zn)	5,3	5,3	6,4	6,4	8,4	10,5	13	17
3. Plain washer (DIN433-4.8-Zn)	5,3	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

(Straight pins and parallel keys are used for alignment and not for holding loads)

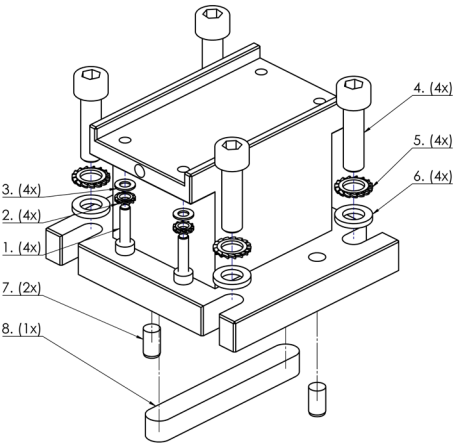
Recommended values for installation with a friction coefficient of μ=0.12	Max. tightening torque when screwing the base to steel [Nm]							
	5,8	5,8	9,9	9,9	24,1	47	82,3	201,9
	Max. tightening torque when screwing the base to aluminium [Nm]							
	5,0	5,0	8,6	8,6	21,0	40,8	71,4	175,1
	Max. tightening torque when screwing on the front sides [Nm]							
	0,6	1,0	1,0	1,0	2,6	8,6	--	--
	Min. installation depth of the straight pins in the sensor [mm]							
	4,0	4,0	5,0	5,0	6,0	8,0	10,0	12,0

5.5 Accessory: Mounting adapter
Additional parts and recommended values for installation

Design X



Design Y



Type	M-DRVL	M-DRVL-I	M-DRVL-Ib	M-DRVL-II	M-DRVL-III	M-DRVL-IV	M-DRVL-V	M-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. Hexagon socket head cap screw (DIN912-8.8-Zn)	M5x18	M5x20	M6x22	M6x22	M8x30	M10x40	M12x5ß	M16x60
5. Fan 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

(Straight pins and parallel keys are used for alignment and not for holding loads)

recommended values for installation with a friction coefficient of µ=0.12	Max. tightening torque when screwing the mounting adapter to steel [Nm]							
	5,8	5,8	9,9	9,9	24,1	47	82,3	201,9
	Max. tightening torque when screwing the mounting adapter to aluminum [Nm]							
	5,0	5,0	8,6	8,6	21,0	40,8	71,4	175,1
	Max. tightening torque when screwing the mounting adapter to the sensor housing [Nm]							
	0,6	1,0	1,0	1,0	2,6	8,6	21	40,8
	Min. installation depth of the straight pins in the sensor [mm]							
	4,0	4,0	5,0	5,0	6,0	8,0	10,0	12,0

6. Set-up of the measurement chain

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

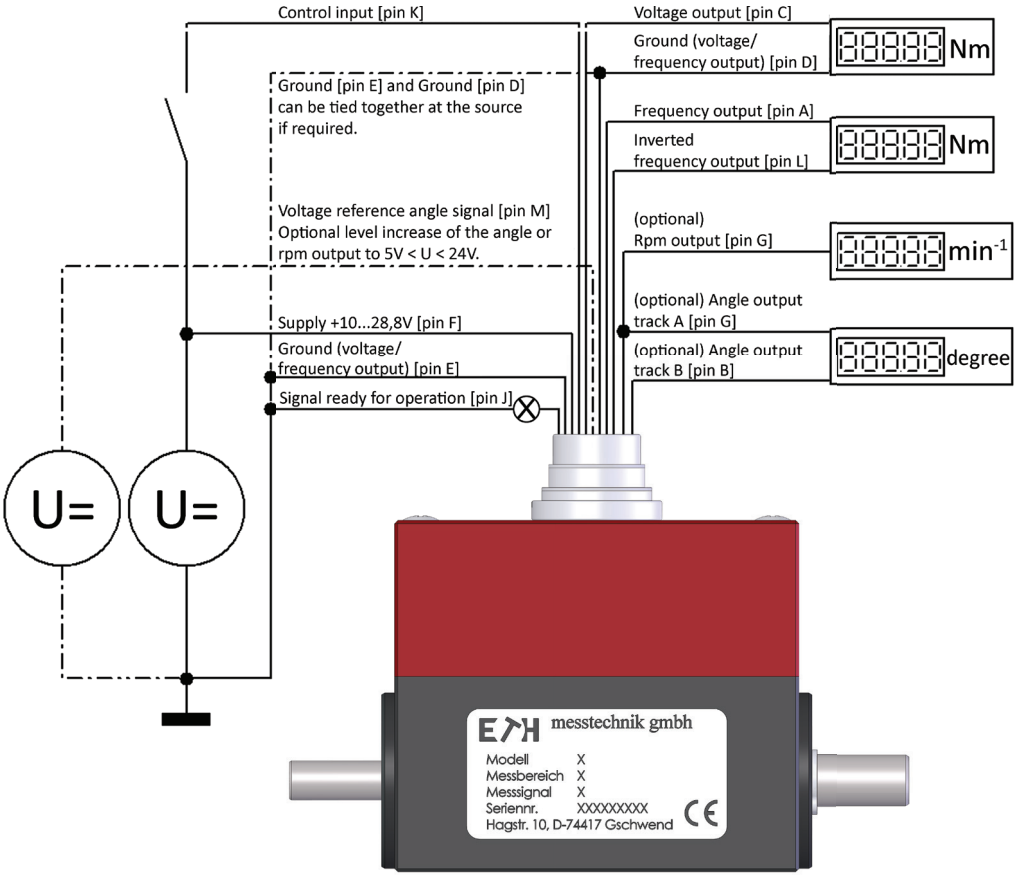
The measurement chain consists of:

- Torque sensor
- Connection cable
- Supply and evaluation unit

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

7. Electrical connection

The reference ground for the voltage and frequency output is pin D. The reference ground for the supply and the rpm and angle output is pin E.



7.1 Wiring instructions

Electrical and magnetic fields often cause interference voltages to be coupled into the measuring circuit. These disturbances are primarily caused by power lines running parallel to the measuring lines, but also by contactors or electric motors in the vicinity. In addition, interference voltages can be coupled in galvanically, in particular by grounding the measuring chain at several points, resulting in potential differences.

Please note the following instructions.

- Only use shielded and low-capacitance measuring cables.
- Connect the supply voltage correctly.
- Do not lay measuring cables parallel to power lines.
- Avoid stray fields from transformers, motors and contactors.
- Do not earth the sensor, evaluation and display device more than once. Connect all devices in the measurement chain to the same protective conductor.

7.2 Connectors

The sensors are equipped with a 12-pin Binder type 680 built-in connector.

7.3 Pin assignment for the connectors

The pin assignments of the connectors are on the following pages. The sensor internally generates a galvanically isolated measuring signal. The grounds must not be connected directly to the sensor, otherwise measurement errors will occur depending on the cable length to the supply and evaluation device. If required, these can be connected to the supply and evaluation device.

7.4 Control activation pin K

The “control activation” is used to test and adjust the measurement chain. The maximum signal swing is applied to the current output signal. Therefore, this function should only be used in an unloaded and tared condition. The drive level is 4.5V to supply voltage; the reference ground point is the supply ground.

7.5 Extension cables

Extension cables must be shielded and have low-capacitance. We recommend using the cables we offer, as they meet these requirements. In the case of cable extensions, ensure that the connection is flawless and that the insulation is adequate. It must be ensured that the cable cross-section is large enough to ensure sufficient supply voltage at the sensor. Recalibration is not necessary when the cable is extended.

7.6 Power supply

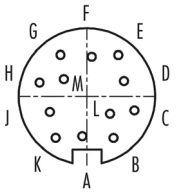
The torque sensor is equipped with a wide voltage input. Voltages from 10 V - 28.8 V are tolerated. With voltages above 28.8 V, the internal protective circuit becomes conductive and the electronics of the torque sensor can be damaged if the overvoltage lasts longer. We recommend installing a 250mA fuse (semi time-lag) in the supply line.

8. Pin assignment

8.1 Standard cable AK12.4

AK12.4 for active sensors
12-pin connector

Pin	Colour	Assignment DRVL
A	green	frequency output
B	red/ blue	angle output track B = 90 °
C	yellow	voltage output
D	white	ground (voltage/ frequency output)
E	grey	ground (supply, rpm/ angle output)
F	pink	supply +10… 28,8V
G	grey/ pink	rpm & angle output track A = 0°
H	purple	memory chip
J	black	message ready for operation
K	red	control input
L	brown	inverted frequency output
M	blue	voltage reference angle signal



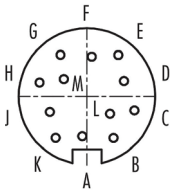
contact arrangement (plug-in side)

Pin D and pin E are internally electrically isolated.
If necessary, connect to the supply source (not to the sensor).

8.2 Robot cable AK12.5

AK12.5 for active sensors
12-pin connector

Pin	Colour	Assignment DRVL
A	black	frequency output
B	red	angle output track B = 90 °
C	brown	voltage output
D	white	ground (voltage/ frequency output)
E	yellow	ground (supply, rpm/ angle output)
F	purple	supply +10… 28,8V
G	green	rpm & angle output track A = 0°
H	pink	memory chip
J	grey	message ready-to-run
K	grey/ pink	control input
L	blue/ red	inverted frequency output
M	blue	voltage reference angle signal



contact arrangement (plug-in side)

Pin D and pin E are internally electrically isolated.
If necessary, connect to the supply source (not to the sensor).

External EMC circuit
A 100 nF / 50 V ceramic capacitor can be soldered between pins C and D at the evaluation on the evaluation side of line-related interference.

9. Measurement outputs

The sensor supplies a torque-proportional DC voltage of e.g. ±10 V. The output voltage is positive for clockwise load, and negative for counterclockwise load. In addition, the sensor outputs a differential frequency signal of 10 kHz ± 5 kHz. The torque sensor has a permitted zero point deviation of ±50 mV/ ±50 Hz. A taring option must be provided for precise measurements.

The outputs for rpm or angle are equipped with an active driver. Without an external voltage reference, the rpm, angle and ready-to-run outputs provide a TTL level.

The sensor has a ready-to-run signal (**pin J**). If the output delivers a HIGH level, the measurement electronics are basically working. If the level is LOW, there is an error.

If higher levels are required (e.g. for PLC inputs), a voltage reference can be specified via **pin M**. The voltage reference tolerates a voltage of 5V - 24V.

10. Maintenance and recalibration

Regardless of use, we recommend recalibration every 2 years (see certificate or inspection label) at ETH. Maintenance is also carried out.

11. Disposal

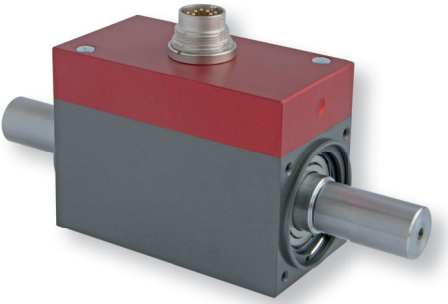
The sensor can be sent back to us free of charge for disposal, complete with measuring cable. As soon as you have packed it, send a message to sales@eth-messtechnik.de and we will commission our parcel service to pick it up. Unfortunately, we cannot accept parcels sent to us freight collect and without notification.

12. Datasheet

Torque sensor

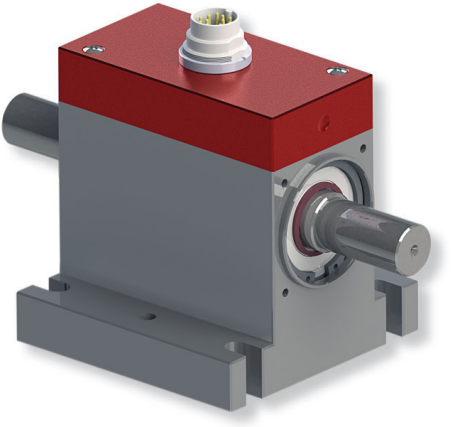
DRVL

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



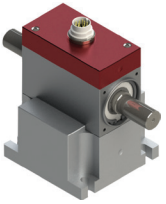
Option „F“ with base

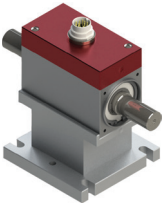
Alternative fastening option,
enables simplified attachment!
Easy to assemble!
Alignment in the longitudinal axis using a parallel key,
oriented and unmistakable installation
(for example after recalibration)
by means of parallel pins



Accessory mounting adapter

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





Features

- contactless signal transmission
- integral signal amplifier
- low moment of inertia
- rpm measurement (optional)
- angle of rotation measurement (optional)
- advanced electromagnetic compatibility (EMC)
- adjustable output level for rpm- and angle signal (5 - 24 V)
- larger rpm range for rpm- and angle measurements
- frequency output 10 kHz ± 5 kHz
- larger input voltage range (10 - 28,8 V)
- compact dimensions, universally applicable
- strain gauge technology
- option base
- accesory mounting adapter
- 0.05% linearity error option

Series DRVL torque sensors 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 largely maintenance-free.

These sensors are also available with optional rpm 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 parallel keys (see table).

A factory calibration certificate with 25% increments (left, right) is included in the scope of delivery.

12.1 Electrical 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:
Output signal:	0 ± 10 V	10 kHz ± 5 kHz
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 %)
Error for 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

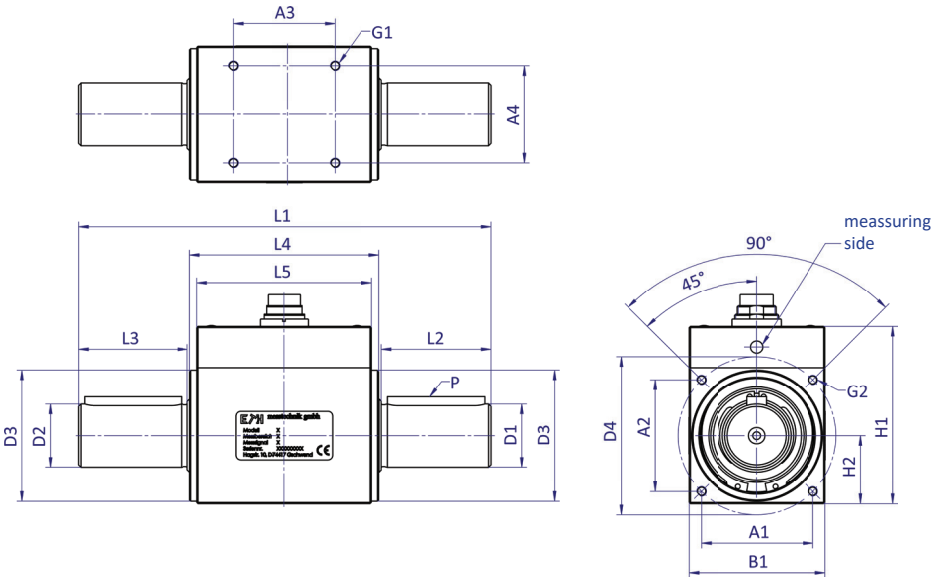
Basic standard	Testing accuracy	coupling	Result
EN61000-4-2:2009 Electrostatic discharge (ESD)	4 kV	direct	A
EN61000-4-2:2009 Electrostatic discharge (ESD)	4 kV	indirect	A
EN61000-4-3:2009 Electromagnetic fields	10 V/m	indirect	A
EN61000-4-4:2009 Bursts	2 kV	indirect	A
EN61000-4-5:2005 Surge voltages	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

	Rpm option (n)	**Angle option (w)**
Max rpm:	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

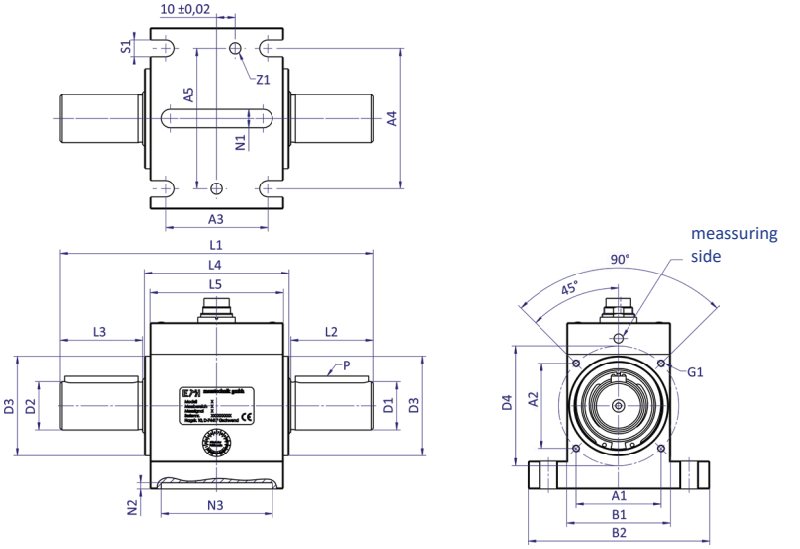
* The values are valid for ETH test cables ≤ 10 m, the maximum permissible rpm of the sensor must be observed.

12.2 Mechanical dimensions of the standard housing



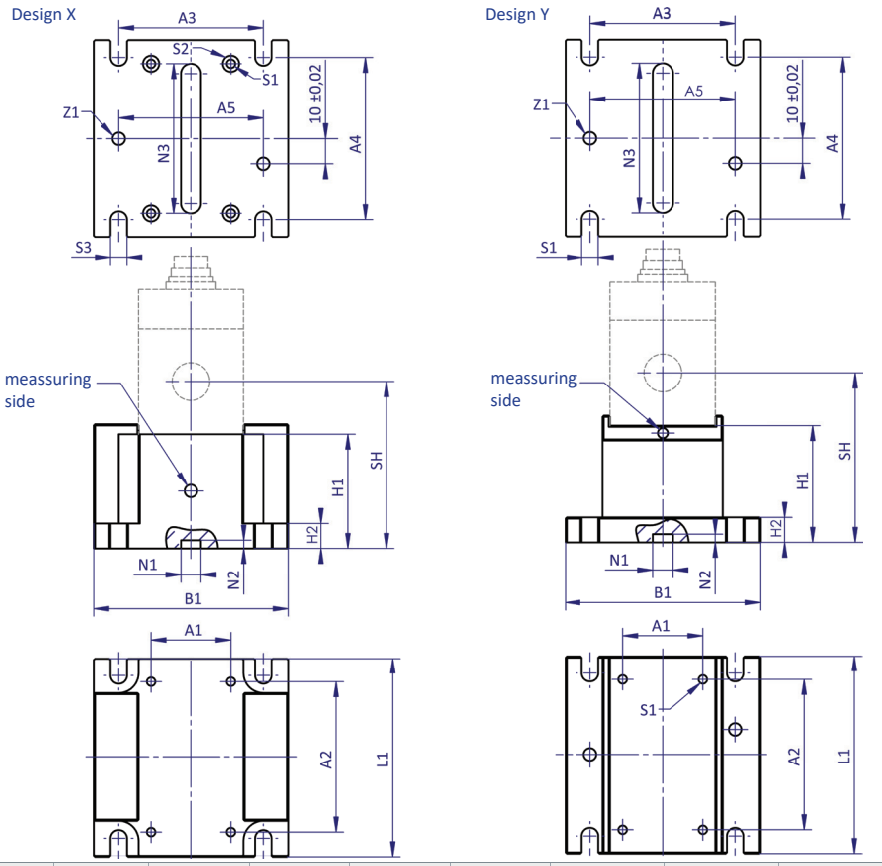
Type	DRVL	DRVL-I	DRVL-Ib	DRVL-II	DRVL-III	DRVL-IV	DRVL-V	DRVL-VI
Torque	0,02	0,05 2	1	5	50	500	2000	10.000
ranges:	0,05	0,1	2	10	100	1000	3000	15.000
(± 0 - ...)	0,10	0,2	5	20	150	1300	4000	20.000
[Nm]		0,5	10	30	200	1500	5000	
		1		50	300			
Dimensions: [mm]		(Other ranges upon request; General tolerances DIN 2768-m)						
L1	82	89 95	110	145	170	270	320	355
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	--	--
L5	63	62	68	79	72	84	95	121
B1	32	28	36	42	56	88	105	168
H1	47	54	58	58	73	104	121	185
H2 ± 0,05	14	14	18	21	28	44	52,5	84
D1 g6	3	8 8	10	15	26	45	70	110
D2 g6	3	5 6	10	15	26	45	70	110
D3 -0,1	15	27	32	38	54	80	--	--
D4 ± 0,1	(→ A1&A2)	32	38	46	65	98	--	--
A1 ± 0,1	24	(→ D4)	(→ D4)	(→ D4)	(→ D4)	(→ D4)	(→ D4)	--
A2 ± 0,1	22	(→ D4)	(→ D4)	(→ D4)	(→ D4)	(→ D4)	(→ D4)	--
A3	50	40	56	60	42	46	75	91
A4	24	22	24	32	40	70	85	138
G1	M2,5 x 5	M3 x 5	M3 x 6	M3 x 6	M4 x 8	M6 x 12	M8 x 16	M10x16
G2 both sides	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 aprox. [g]	200	170	340	600	1300	4500	11.500	33.000

12.3 Mechanical dimensions of option „F“ with base



Type	DRVL-F	DRVL-I-F	DRVL-Ib-F	DRVL-II-F	DRVL-III-F	DRVL-IV-F	DRVL-V-F	DRVL-VI-F
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: [mm]	(Other ranges upon request; General tolerances DIN 2768-m)							
L1	82	89 95	110	145	170	270	320	355
L2	7,5	11 14	18	30	45	85	110	115
L3	7,5	10 14	18	30	45	85	110	115
L4	63	62	68	79	72	84	95	121
L5	67	66	72	83	78	90	--	--
B1	56	60	78	78	98	158	208	298
B2	32	28	36	42	56	88	105	168
H1	78	85	85	82	90	172	228,5	316
H2 ± 0,05	45	45	45	45	45	112	160	215
H3	12	12	15	15	15	20	30	40
D1 g6	3	8 8	10	15	26	45	70	110
D2 g6	3	5 6	10	15	26	45	70	110
D3 -0,1	15	27	32	38	54	80	--	--
D4 ± 0,1	(→ A1&A2)	32	38	45	65	98	--	--
A1	24	(→ D4)	(→ D4)	(→ D4)	(→ D4)	(→ D4)	--	--
A2	22	(→ D4)	(→ D4)	(→ D4)	(→ D4)	(→ D4)	--	--
A3 ± 0,1	50	50	50	65	55	65	70	90
A4 ± 0,1	44	44	58	58	76	124	156	233
A5 ± 0,02	44	44	58	58	76	124	156	233
G1 both sides	M2,5 x 5	M3 x 6	M3 x 6	M3 x 6	M4 x 8	M6 x 12	--	--
S1	5,5	5,5	6,6	6,6	9	11	13	17
Z1 E8	4	4	5	5	6	8	10	12
N1 H8	6	6	8	8	10	10	10	10
N2 +0,2	2,8	2,8	3,3	3,3	3,3	3,3	3,3	3,3
N3 +0,3	50	50	60	60	60	60	80	100
P (DIN 6885) optional	--	--	2x A3x3x14	2x A5x5x25	2x A8x7x40	4x A14x9x80	4x A20x12x100	--
Weight approx.[g]	400	400	600	900	1600	6600	15.000	43.000

12.4 Mechanical dimensions of the mounting adapter



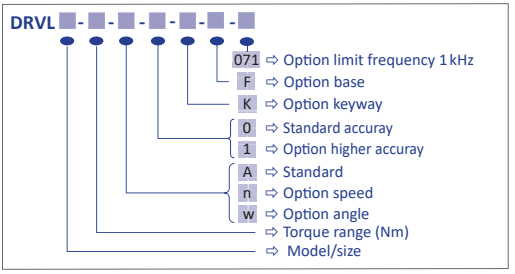
Type	M-DRVL		M-DRVL-I		M-DRVL-Ib		M-DRVL-II		M-DRVL-III		M-DRVL-IV		M-DRVL-V		M-DRVL-VI	
Design	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y
SH	23…55	≥56	25…60	≥61	29…65	≥66	32…67	≥68	41…84	≥85	67…119	≥120	93…154	≥155	152…211	≥212
Dimensions: [mm]																
L1	63		62		68		79		72		84		95		121	
B1	56		60		78		78		98		158		208		298	
H1	= SH - 14		= SH - 14		= SH - 18		= SH - 21		= SH - 28		= SH - 44		= SH – 52,5		= SH - 84	
H2	8		10		10		10		12		15		25		35	32
A1	24		22		24		32		40		70		85		138	
A2	50		40		56		60		42		46		75		91	
A3	44		44		58		58		76		124		156		233	
A4	50		50		50		65		55		65		70		90	
S1	2,9		3,4		3,4		3,4		4,5		6,6		9		11	
S2	6,5	--	6,5	--	6,5	--	6,5	--	8,5	--	11,5	--	15,5	--	18,5	--
S3	5,5		5,5		6,6		6,6		9		11		13		17	
Z1 E8	4		4		5		5		6		8		10		12	
N1 H8	6		6		8		8		10		10		10		10	
N2 +0,2	2,8		2,8		3,3		3,3		3,3		3,3		3,3		3,3	
N3 +0,3	50		50		60		60		60		60		80		100	
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 in mm] → Example: M-DRVL-II-SH65

12.5 Mechanical specifications

Type	Torque range (0 - ...) [Nm]	Max. rpm [min $^{-1}$]	Spring constant [Nm/rad]	Mass moment of inertia [g x cm²]			Max. axial load [N]	Max. radial load [N]
				Total	Drive side	Measuring side		
DRVL	0,02	20.000	8	7	7	0,1	35	30
	0,05	20.000	8	7	7	0,1	35	30
	0,10	20.000	8	7	7	0,1	35	30
DRVL-I	0,05	37.000	25	10	10	0,2	105	2
	0,1	37.000	40	10	10	0,2	140	3
	0,2	37.000	40	10	10	0,2	140	3
	0,5	37.000	80	10	10	0,3	160	4
	1	37.000	80	10	10	0,3	210	7
	2	37.000	213	10	10	0,4	210	13
DRVL-Ib	1	26.000	250	29	24	5,5	630	10
	2	26.000	250	29	24	5,5	630	10
	5	26.000	710	29	24	5,6	725	25
	10	26.000	1319	30	24	5,9	725	50
DRVL-II	5	19.000	955	98	65	32	1200	15
	10	19.000	2115	98	66	32	1300	30
	20	19.000	3955	99	66	32	1300	60
	30	19.000	5335	100	67	33	1300	100
	50	19.000	6700	103	68	34	1300	155
DRVL-III	50	13.500	17.000	774	428	346	1800	125
	100	13.500	30.000	782	432	350	1800	215
	150	13.500	44.000	796	439	357	1800	340
	200	13.500	54.000	809	446	364	1800	450
	300	13.500	66.000	837	459	377	1800	650
DRVL-IV	500	7900	259.000	9930	5290	4640	4150	650
	1000	7900	387.000	10.140	5395	4745	4150	1275
	1300	7900	429.000	10.280	5465	4815	4150	1650
	1500	7900	449.000	10.380	5515	4865	4150	1650
DRVL-V	2000	6300	1.430.000	62.905	32.560	30.345	4800	1950
	3000	6300	1.820.000	63.505	32.860	30.645	4800	2930
	4000	6300	2.090.000	64.225	33.220	31.005	4800	3880
	5000	6300	2.270.000	65.005	33.610	31.395	4800	4000
DRVL-VI	10.000	4000	8.200.000	434.720	221.570	213.150	11.800	8000
	15.000	4000	10.440.000	442.430	225.430	217.000	11.800	8000
	20.000	4000	11.800.000	450.880	229.650	221.230	11.800	8000

Ordering code



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