TENSOTECHNIQUE

M40 Torque Transducer

The M40 is a rotating torque transducer of a flange type.

The M40 transducers are used to measure static and dynamic torque at the wide measuring range ± 0.1 – ± 300 000 Nm and the high rotation speed up to 20 000 rpm.

The M40 torque transducers are designed without bearings and without slip-rings. They consist of two components: the rotor and the stator. The rotor comprises a measuring body applied with strain gauges and two mounting flanges. It is equipped with the electronic system for transmitting the SG excitation voltage and the measuring signal. The M40 torque transducers are equipped with the advanced digital telemetry system for contactless transmission of the measured torque data from the rotor to the stator. This digital coded signal has high interference immunity, provides high accuracy of measurements and can be transmitted over significant distances without distortion and loss of information.

The stator has divisible construction that provides easy mounting on a test bench.

M40 torque transducers are suitable to determine static as well dynamic rapidly changing torque in positive and negative polarity. The transducers have a built-in optoelectronic speed sensor.

The torque output signal can be digital (RS232, RS485 (Modbus RTU protocol), USB 2.0 interfaces), analogue (± 5 V, ± 10 V, 4 … 20 mA) and frequency (10 kHz ± 5 kHz, 60 kHz ± 30 kHz). The M40 can be easily connected to a PC. The Windows-based software for data acquisition and its processing is included in the scope of supply.

As there are no bearings and no slip-rings friction losses and heating will not occur. Due to their construction the M40 torque transducers are and maintenance-free.

Type-Survey

Type	Unit	Nominal torque	Max. speed, rpm
M40-0.1 … 2	Nm	0.1 0.2 0.5 1 2	20 000
M40-3 … 30		3 5 6 8 10 12 15 20 25 30	20 000
M40-50 … 150		50 60 80 100 150	16 000
M40-200 … 300		200 250 300	16 000
M40-400 … 1.2k		400 500 600 800 1 000 1 200	16 000
M40-1.5k … 2.5k	kNm	1.5 2 2.5	12 000
M40-3k … 6k		3 5 6	10 000
M40-8k … 15k		8 10 15	8 000
M40-20k … 30k		20 25 30	6 000
M40-40k … 60k		40 50 60	4 000
M40-80k … 100k		80 100	2 000
M40-120k … 150k		120 150	2 000
M40-200k … 300k		200 250 300	2 000

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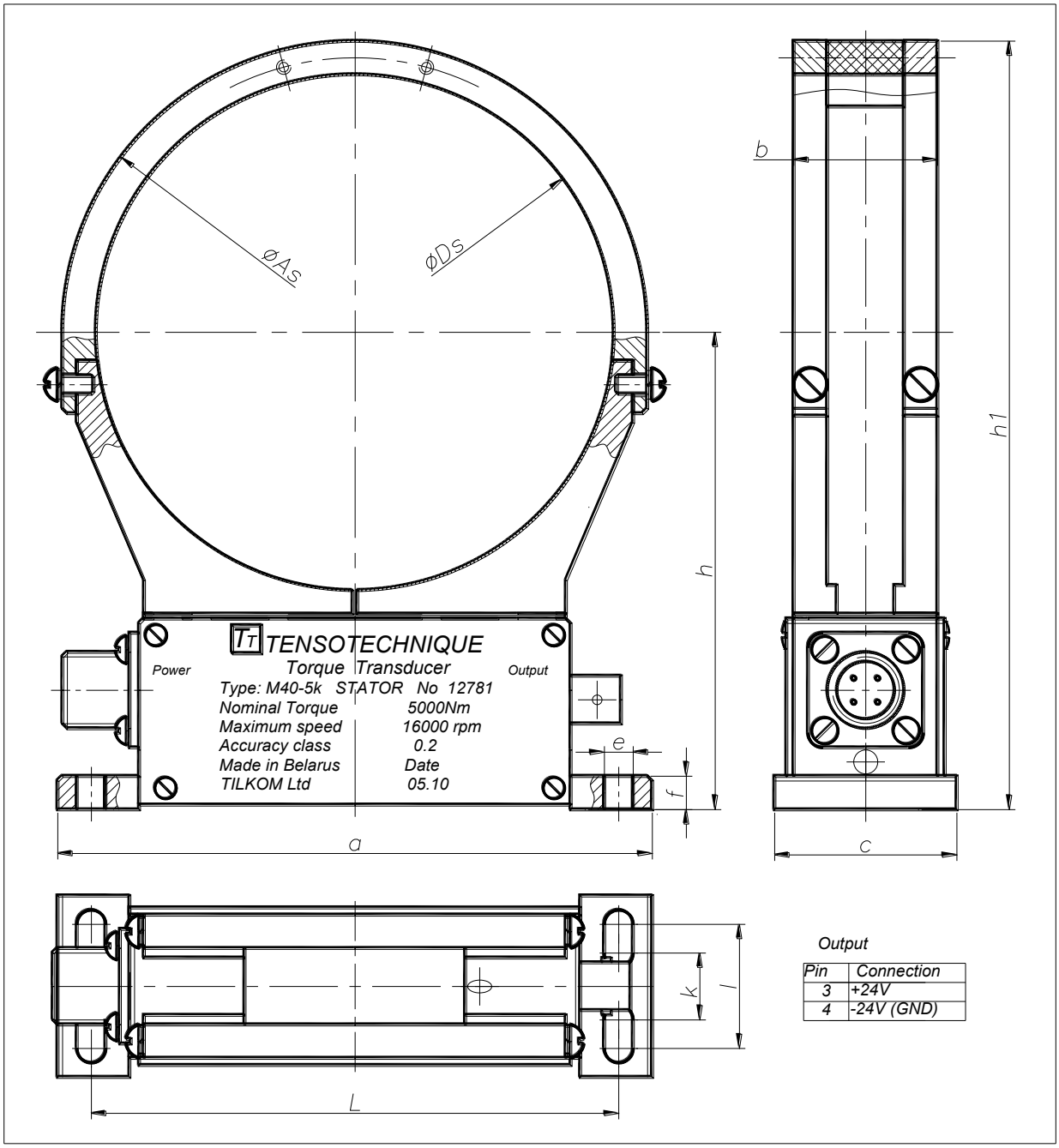
M40 Stator. Dimensions (in mm)



Output

Pin	Connection
3	+24V
4	-24V (GND)

Type	ØAs	ØDs	L	a	b	c	e	f	h	h1	k	l
M40-0.1 … 2	47	37	80±0.1	90	22	28	4.6	6	54	78	8	18
M40-3 … 30	57	47	80±0.1	90	26	30	4.6	6	60	88	10	20
M40-50 … 150	57	47	80±0.1	90	26	30	4.6	6	60	88	10	20
M40-200 … 300	62	52	80±0.1	90	26	30	4.6	6	62	93	10	20
M40-400 … 1.2k	82	70	110±0.1	124	28	40	6	7	80	121	16	28
M40-1.5k … 2.5k	92	80	110±0.1	124	28	40	6	7	85	131	16	28
M40-3k … 6k	120	106	110±0.1	124	30	40	6	7	100	160	16	28
M40-8k … 15k	142	128	110±0.2	124	32	40	6	7	110	181	16	28
M40-20k … 30k	162	146	138±0.2	154	50	53	7	8	123	204	20	38
M40-40k … 60k	196	180	138±0.2	154	50	53	7	8	140	238	20	38
M40-80k … 100k	214	198	138±0.2	154	50	53	7	8	148	256	20	38
M40-120k … 150k	232	216	138±0.2	154	50	53	7	8	158	274	20	38
M40-200k … 300k	244	260	138±0.2	154	50	53	7	8	172	302	20	38

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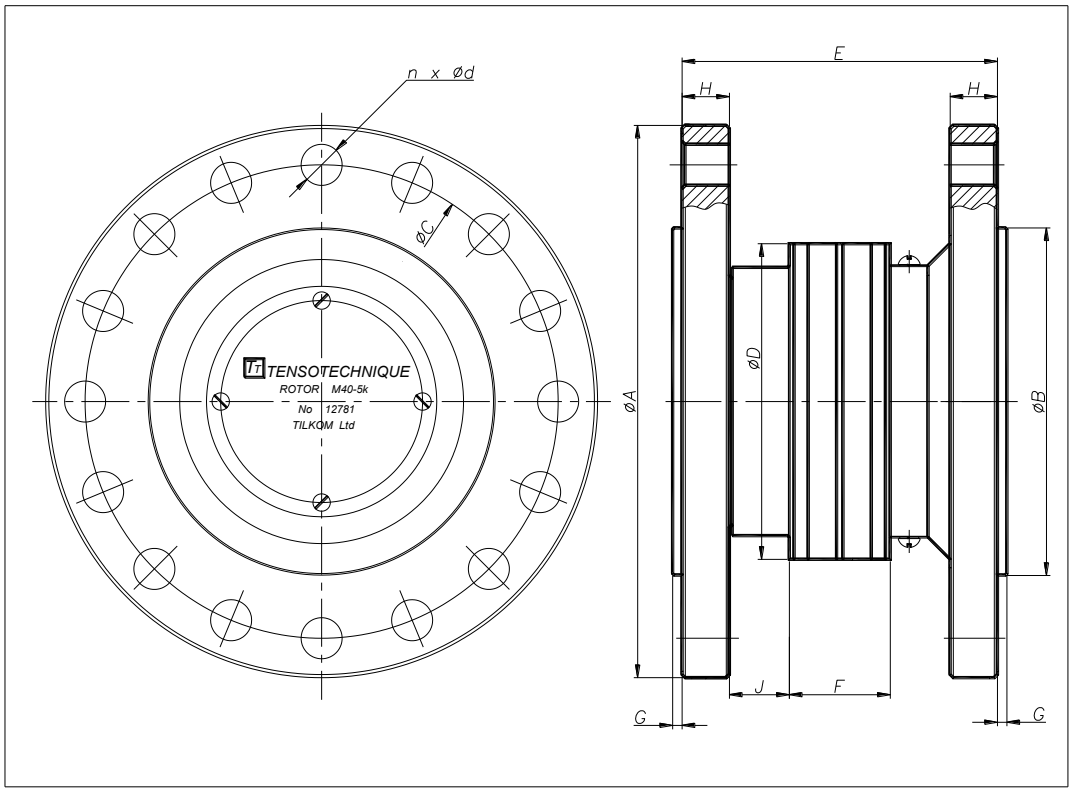
M40 Rotor. Dimensions in mm



Type	ØA	ØB	ØC	ØD	E	F	G	H	J	n	Ød
M40-0.1 … 2	45	30g6	38±0.1	32	54	22	$2.5^{+0.1}$	4	14	4	3.4H12
M40-3 … 30	60	40g6	50±0.1	40	60	26	$2.5^{+0.1}$	5.5	11.5	8	4.5H12
M40-50 … 150	78	50g6	66±0.1	40	64	26	$3^{+0.14}$	7	12	8	5.5H12
M40-200 … 300	90	60g6	76±0.1	45	68	26	$3^{+0.14}$	8	13	8	6.5H12
M40-400 … 1.2k	122	80g6	104±0.1	62	82	28	$3^{+0.14}$	12	14	12	8.5H12
M40-1.5k … 2.5k	142	90g6	120±0.12	72	90	28	$3^{+0.14}$	14	16	12	10.5H12
M40-3k … 6k	175	110g6	150±0.25	98	100	30	$3^{+0.14}$	16	18	16	13H12
M40-8k … 15k	200	130g6	170±0.25	120	120	32	$4^{+0.18}$	20	24	16	17H12
M40-20k … 30k	238	160g6	204±0.25	138	150	50	$4^{+0.18}$	22	28	16	19H12
M40-40k … 60k	304	210g6	260±0.25	170	170	50	$5^{+0.18}$	28	32	16	25H12
M40-80k … 100k	346	220g6	290±0.25	190	190	50	$6^{+0.22}$	32	38	16	32H12
M40-120k … 150k	450	320g6	395±0.3	208	234	50	$10^{+0.22}$	32	60	16	32H12
M40-200k … 300k	540	370g6	470±0.3	234	270	50	$10^{+0.22}$	40	70	18	37H12

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Technical data

Nominal torque M_N and max. speed see table «Type-Survey».

Accuracy class			0.2
Deviation of the actual output signal at the nominal torque from the nominal value (including hysteresis and nonlinearity)		%	± 0.2
Temperature effect per 10 °C on the zero signal, related to the nominal output value		%	± 0.1
Nominal supply voltage		V (DC)	12 … 30
Power consumption		W	< 5
Measurement frequency range		Hz	0 …1 000 (- 1.5 dB)
Amplitude ripple (0 … 500 Hz)		dB	≤ 0.1
Frequency output (T23 decoder)			
Frequency output signal with positive nominal torque		kHz	15 (90)
Frequency output signal with negative nominal torque		kHz	5 (30)
Frequency output signal at torque = zero		kHz	10 (60)
Load resistance		kΩ	≥ 2
Output voltage		V	5 ± 1(symmetrical meander)
Input-output galvanic isolation			+
Analogue output (T24 decoder)			
Nominal output signal with positive (right-hand) nominal torque		V	+ 5 (+ 10)
Nominal output signal with negative (left-hand) nominal torque		V	- 5 (- 10)
Output signal at torque = zero		V	0
Load resistance		kΩ	≥ 10
Analogue output (T24/4 … 20 mA decoder)			
Output current		mA	4 … 20
Output current at loading = zero		mA	12
Output current at nominal positive loading		mA	20
Output current at nominal negative loading		mA	4
Load resistance		kΩ	≥ 100
Digital output (T45 decoder)			
Interface			USB 2.0
Data transfer rate (Full-Speed)		Mbit/sec	12
Sample rate		kSample	5.0
Input-output galvanic isolation			+
Digital output (T37 decoder)			
Interface			Ethernet
Data transfer rate		Mbit/sec	10; 100
Sample rate		kSample	5.0
Input-output galvanic isolation			+
Digital output (T46 decoder)			
Interface			RS485
Protocol			MODBUS RTU
Data transfer rate		baud	2 400 - 115 200
Parity check			+
Sample rate		kSample	5.0
Input-output galvanic isolation			+
Digital output (T42 decoder)			
Interface			RS232
Data transfer rate		baud	2 400 - 115 200
Parity check			+
Sample rate		kSample	5.0
Input-output galvanic isolation			+
Rotation speed measuring system			
Accuracy (within 30… 20 000 rpm)		%	± 0.1
Pulses per revolution depending on a decoder	T23, T24		1
	T23/3, T24/3		60, 120, 360, 480, 720 (optionally)
Min. detected speed		rpm	30
Amplitude of output pulse voltage with analogue (frequency) output		V	5 ± 1

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Parameters of resistance to environment and mechanical exposures

Nominal temperature range	°C	+ 5 … + 50
Humidity	%	95 (+ 35 °C)
Atmospheric pressure	kPa	84 … 106.7 (630 … 800 mm Hg)
Storage temperature range	°C	- 10 … + 70
Storage humidity	%	95 (+ 30 °C)
Vibration resistance: Frequency range Duration Acceleration	 Hz h m/s^2	 10 … 55 1 40
Impact resistance: Number of impacts Duration Acceleration	 n ms m/s^2	 1 000 10 400
Degree of protection		IP40

Permissible load limits and mechanical values

Nominal torque M_N	Nm	0.1-0.2	0.5 - 1	1 - 2	3 - 5	10 - 30	50 - 100	200 - 300	400 - 1 200	1 500 – 2 500
Axial limit force on the rotor	kN	0.1	0.2	0.3	0.5	1.0	1.5	3	8	16
Lateral limit force on the rotor	N	2	3	5	10	40	120	220	1 000	2 000
Bending limit moment on the rotor	Nm	0.1	0.2	0.3	0.5	2	10	20	80	150
Torsional stiffness	kNm/ rad	0.02	0.12	0.20	0,50	3.50	31.0	51.0	480	710
Weight: rotor stator	kg	0.1 0.2	0.14 0.2	0.14 0.2	0.4 0.2	0.4 0.2	0.9 0.2	1.2 0.2	2.9 0.4	4.5 0.4

Nominal torque M_N	kNm	3 - 6	8 -15	20-30	40-60	80-100	120-150	200-300
Axial limit force on the rotor	kN	28	32	80	120	180	180	220
Lateral limit force on the rotor	kN	5	10	25	50	80	80	120
Bending limit moment on the rotor	kNm	0.6	0.6	1.2	2	4	4	6
Torsional stiffness	kNm/r ad	3 150	4 240	13 020	18 000	26 000	29 000	88 000
Weight: rotor stator	kg	7.8 0.5	12.8 1.0	21.0 1.1	37.1 1.2	55.0 1.4	66.5 1.4	175.0 1.4

Limit torque, related to M_N

Type	Unit	Nominal torque M_N	Limit torque related to M_N, %
M40-0.1 … 2	Nm	0.1 0.2 0.5 1 2	150
M40-3 … 30		3 5 6 8 10 12 15 20 25 30	
M40-50 … 150		50 60 80 100 150	
M40-200 … 300		200 250 300	
M40-400 … 1.2k		400 500 600 800 1 000 1 200	
M40-1.5k … 2.5k	kNm	1.5 2 2.5	
M40-3k … 6k		3 5 6	
M40-8 k… 15k		8 10 12 15	120
M40-20k … 30k		20 25 30	150 120
M40-40k … 60k		40 50 60	150 120
M40-80k … 100k		80 100	150
M40-120k … 150k		120 150	120
M40-200k … 300k		200 300	

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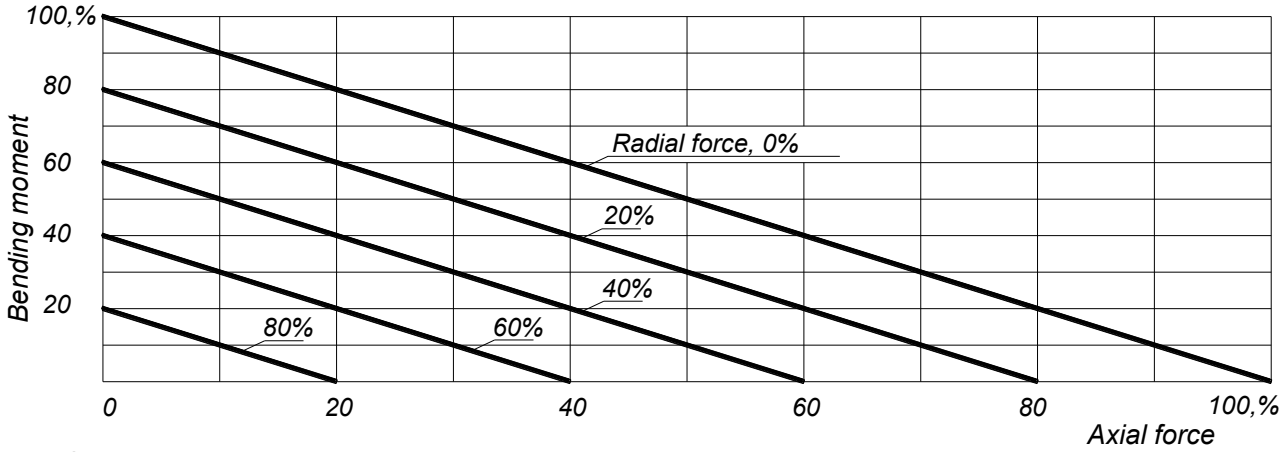
Axial force, radial force and bending moment have to be reduced according to graph 1, if they act together. To prevent from excessive stress due to misalignment and thermal influences the transducer should be fitted between flexible couplings. We offer such flexible torsionally rigid couplings MK series. Technical specification see in the data sheet entitled “MK Couplings”.



Graph 1

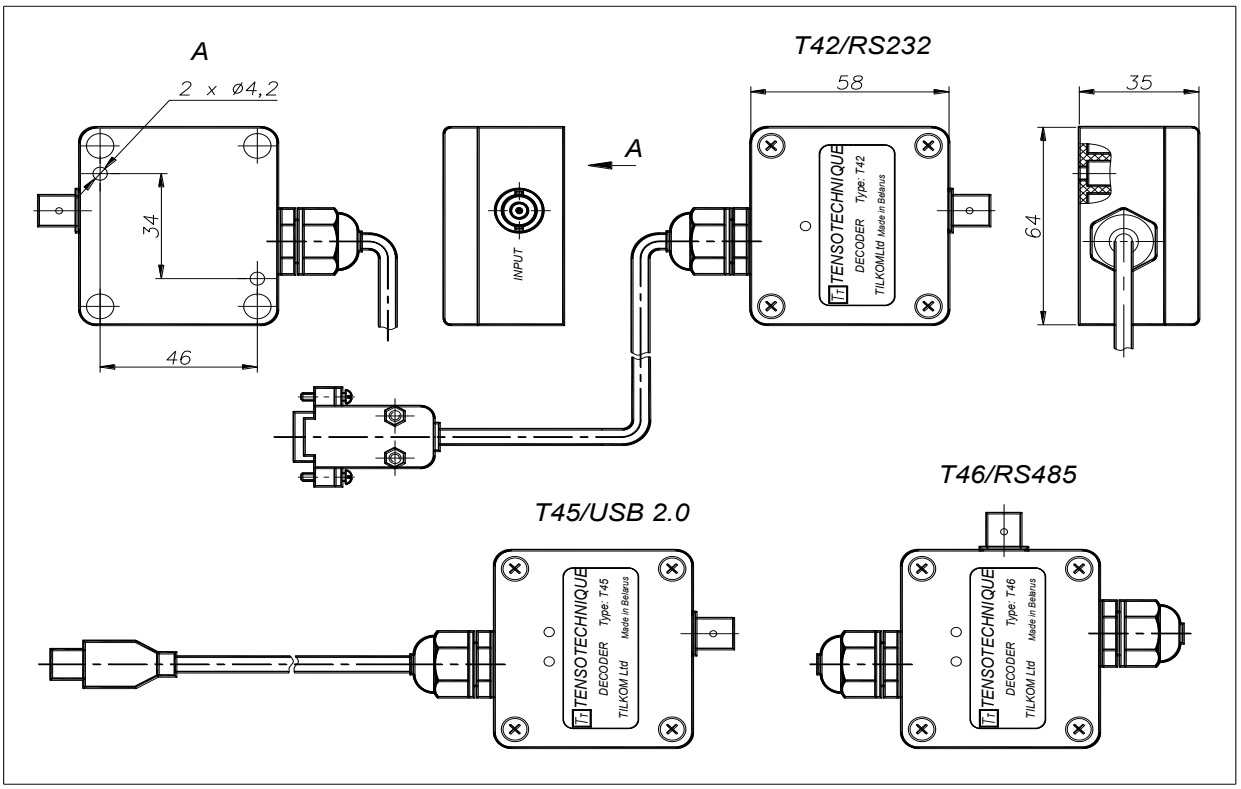
Scope of delivery

M40 torque transducer (rotor and stator)	1
Txx decoder	1
Output signal cable, 5 m long (optionally can be over in length)	1
Power supply connector (PC4 or 2PM14)	1
“Transducer” software for Windows XP, 7, 8, 10	1
Software user manual	1
Operating manual	1

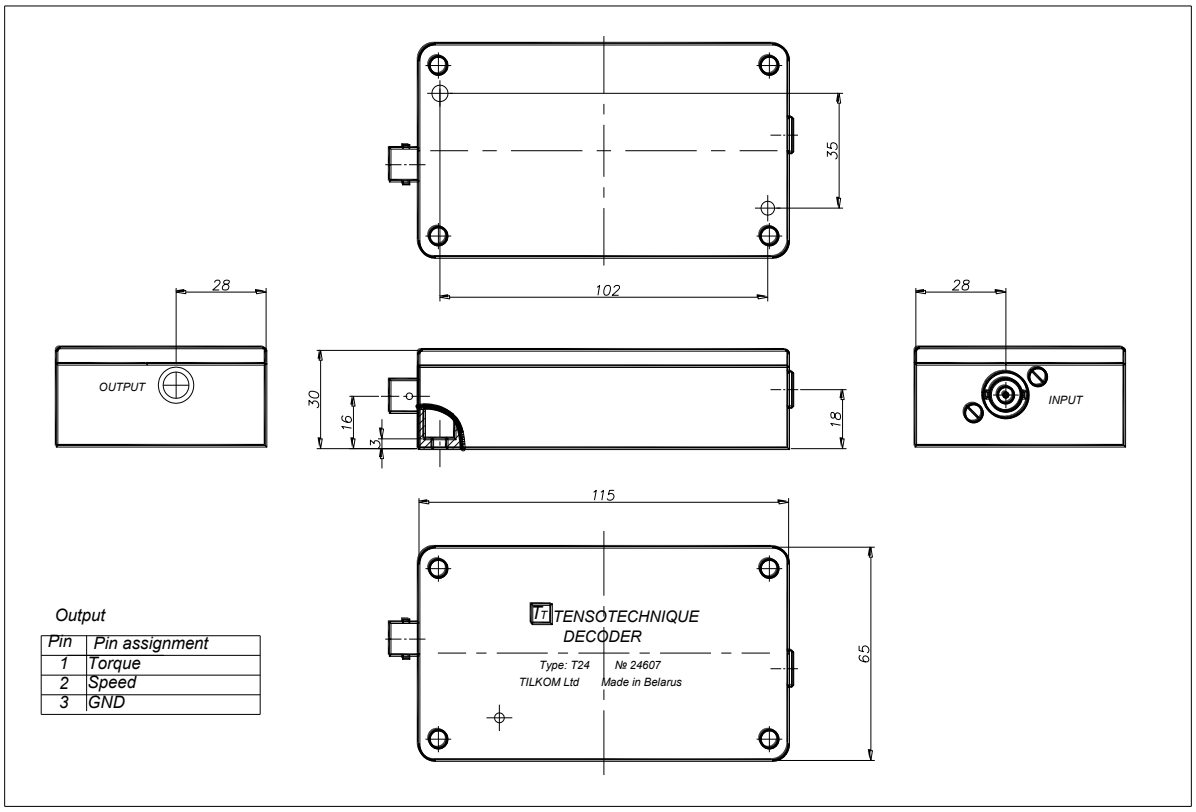
Accessories (to be ordered separately and optionally)

MK flexible torsionally rigid couplings	2
T40 display unit (displaying of torque, rotating speed, power)	1
T41 display unit (plastic case)	1
T50 display unit (oversize unit for long distances 50 – 70 m)	1
T24 analogue decoder (output (± 5 V; ± 10 V or 4 … 20 mA)	1
T23 frequency decoder (output 10 kHz ± 5 kHz or 60 kHz ± 30 kHz)	1
T45 digital decoder (output USB 2.0)	1
T42 digital decoder (output RS 232)	1
T46 digital decoder (output RS 485)	1
T37 digital decoder (output Ethernet)	1
AC/DC adapter 12 … 24 V	1

T42, 45, 46 digital decoders. Dimensions in mm



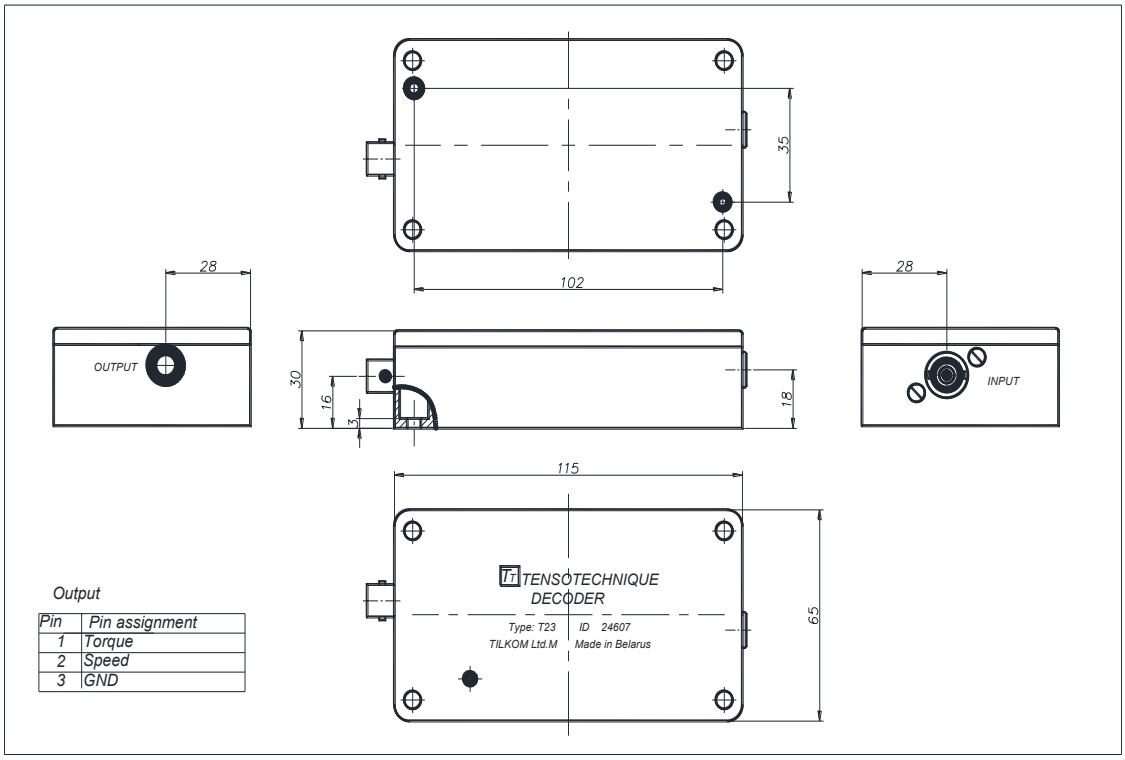
T24 analogue decoder. Dimensions in mm



Output

Pin	Pin assignment
1	Torque
2	Speed
3	GND

T23 frequency decoder. Dimensions in mm.



Output

Pin	Pin assignment
1	Torque
2	Speed
3	GND

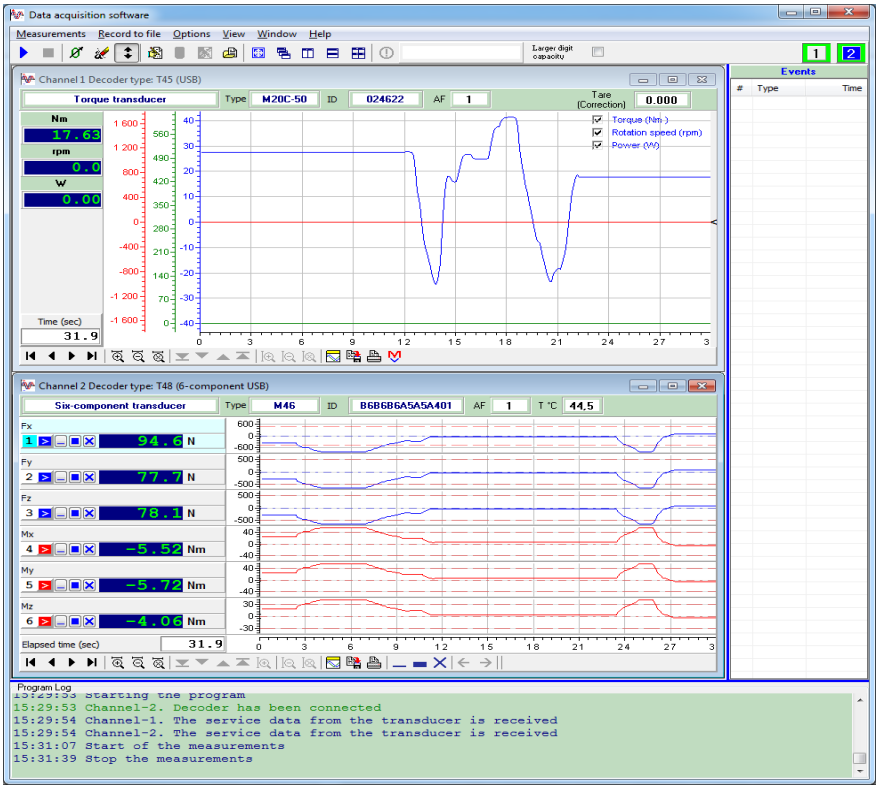
Software

The Windows-based software “Transducer” for M40 transducer enables the acquisition of measurement data and its storage in a file. The measurements can be visualized on-line with digital indicators and x/y displays. A text file is provided for storage so that the measurement data can be read and processed by other programs.

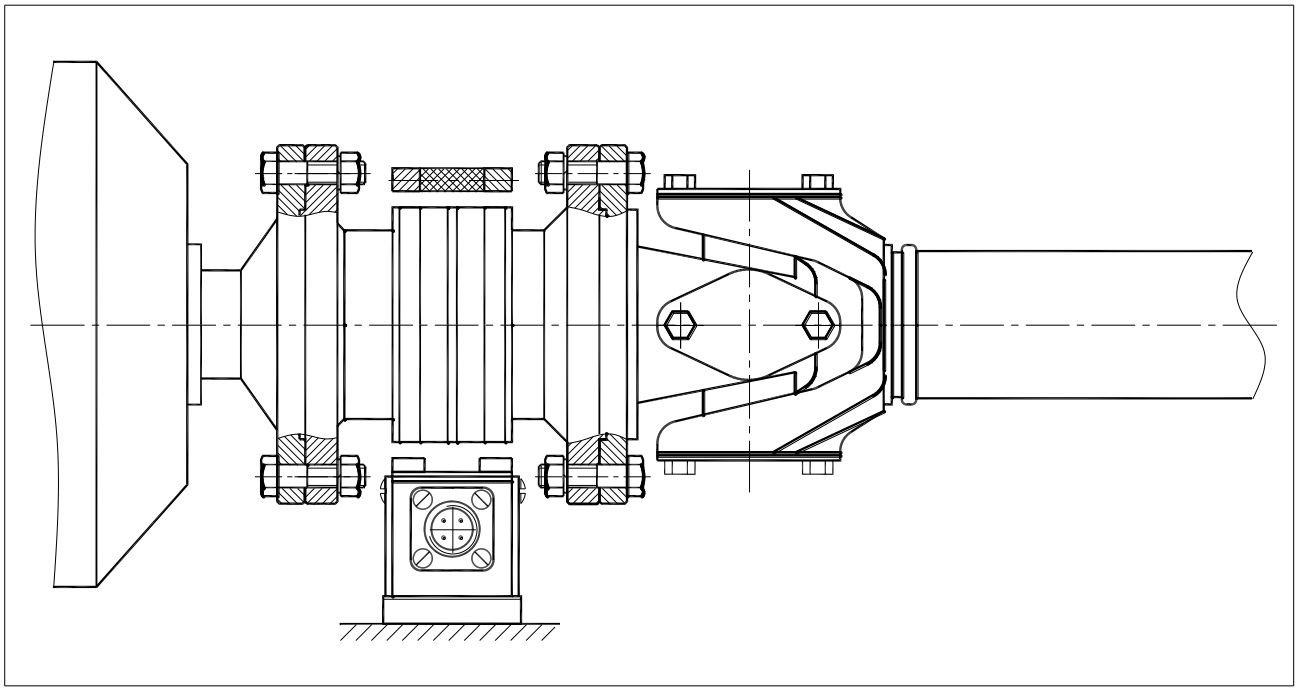
The software provides auto identification of type of transducer, serial number, measuring range.

Features: support up to 8 (eight) transducers simultaneously, mathematical computation of mechanical power, rotation speed and torque, measurement signal filter and signal averaging, zero shift adjustment, fast records, slow records, scaling of x-axis and y-axis, digital indicator of high resolution, real-time display of measured values, their storage and playback. The software has a function of recording data without averaging at the maximum speed of receiving data; this enables you to analyze the dynamic processes.

The “Transducer” main window

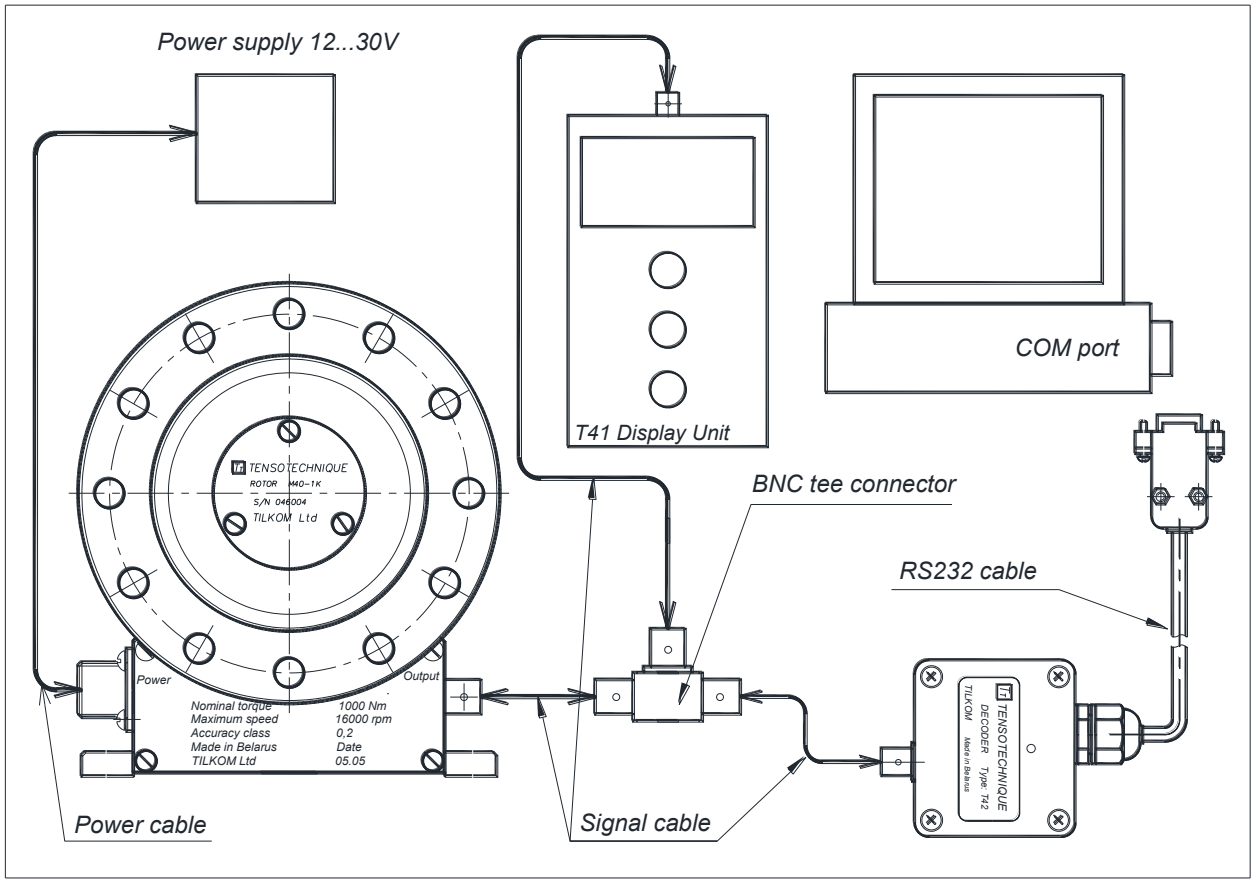


Installation example

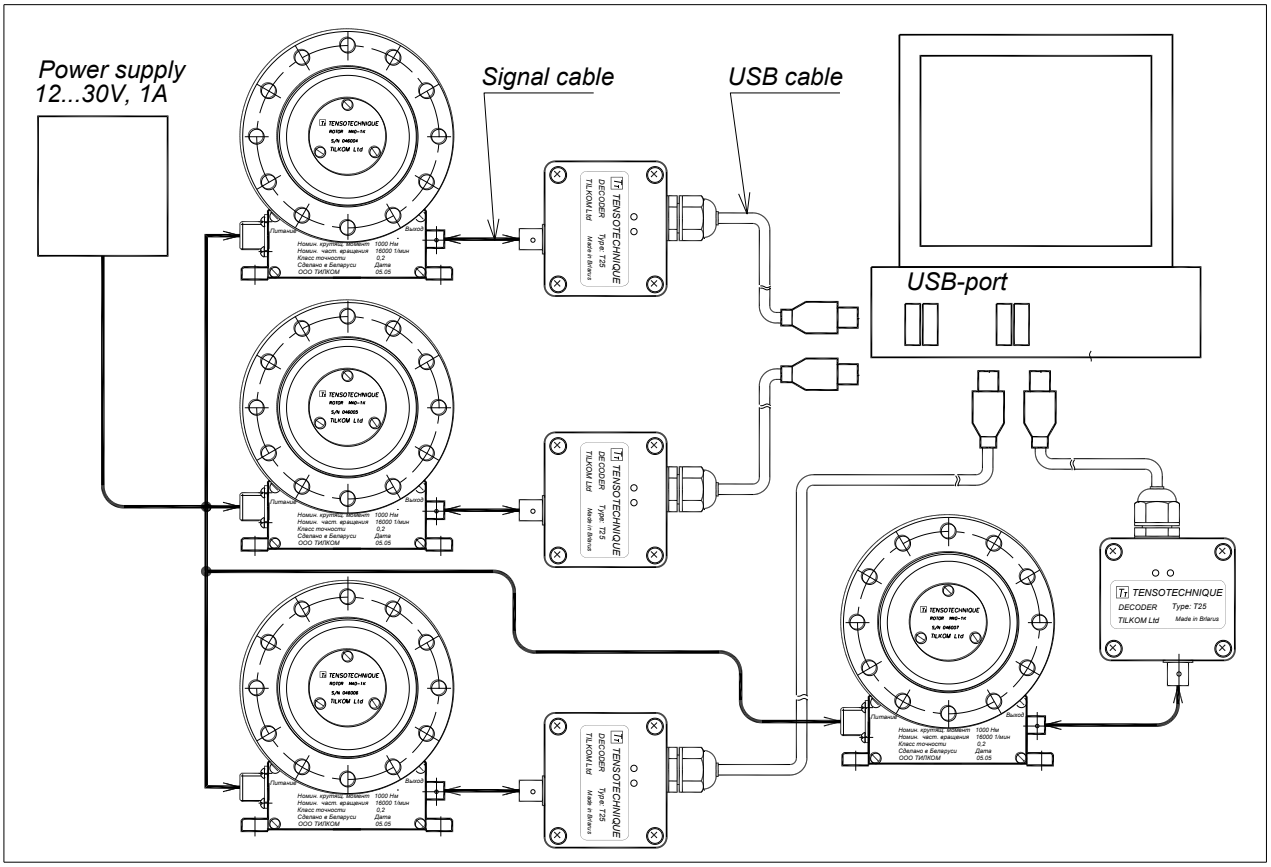


Electrical connections

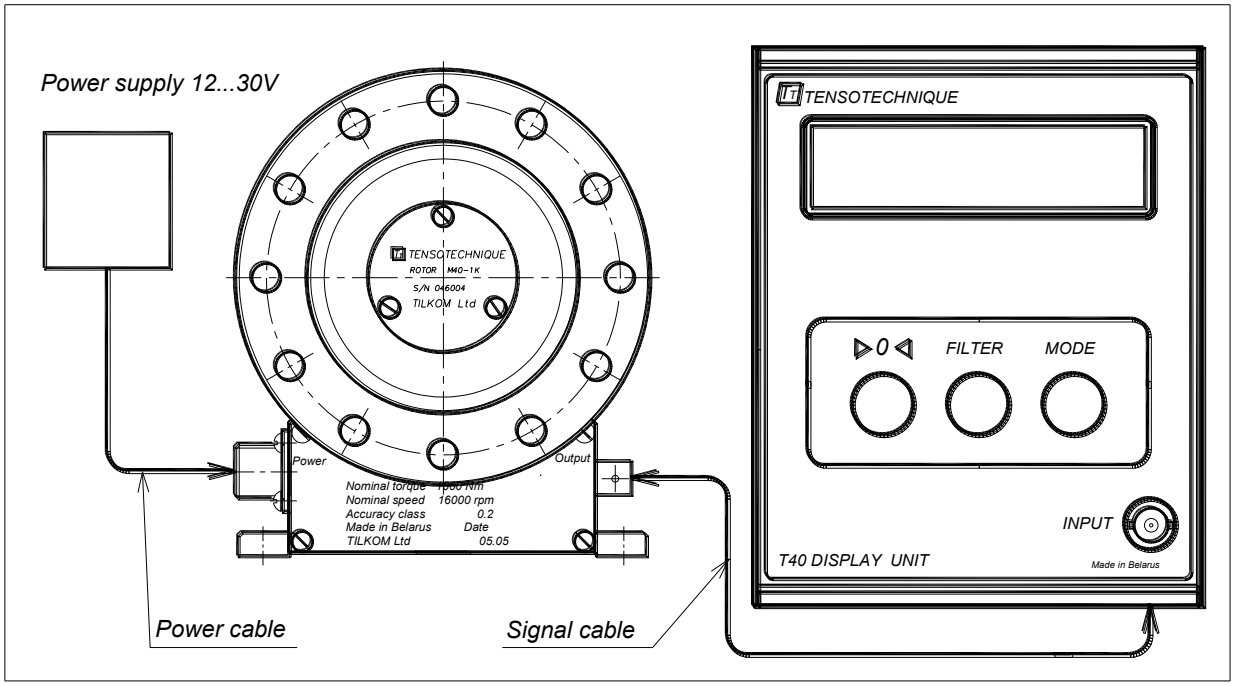
1. Simultaneous use of a PC and the T40 (T41) display unit



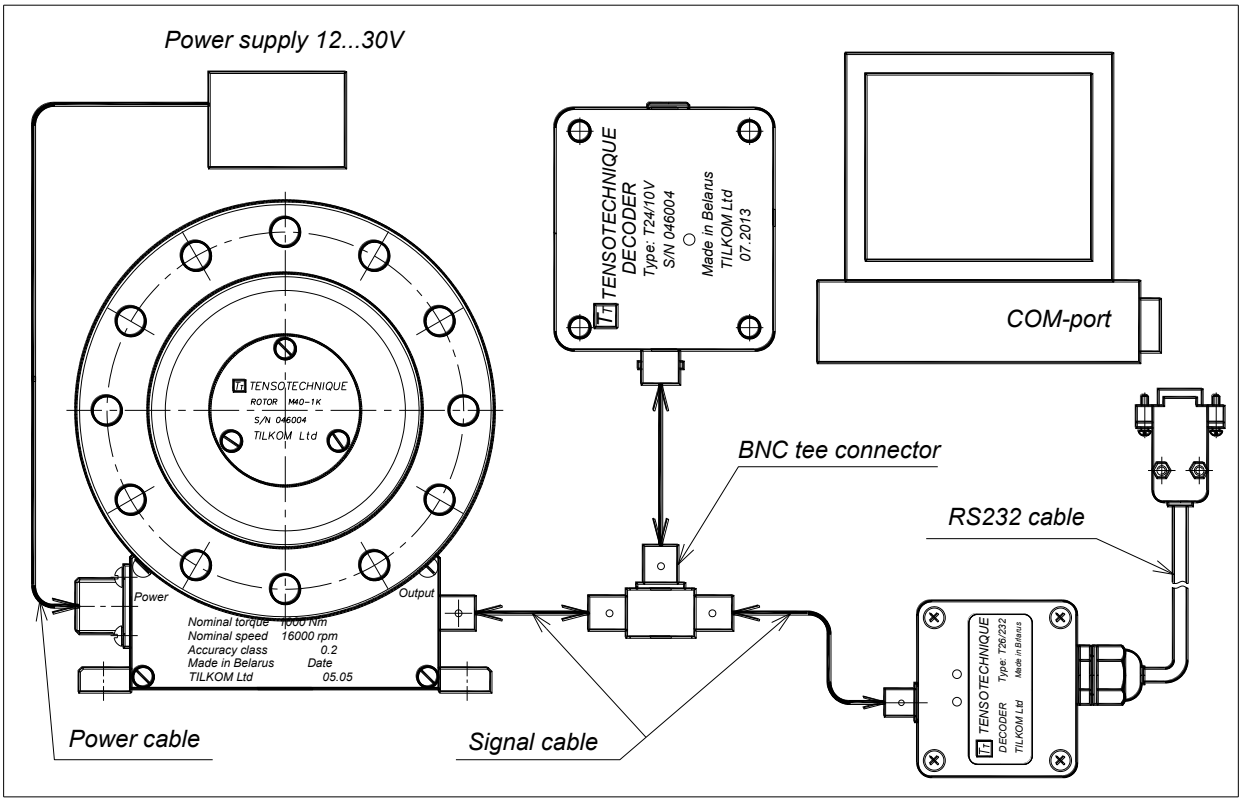
2. Connection to USB-ports



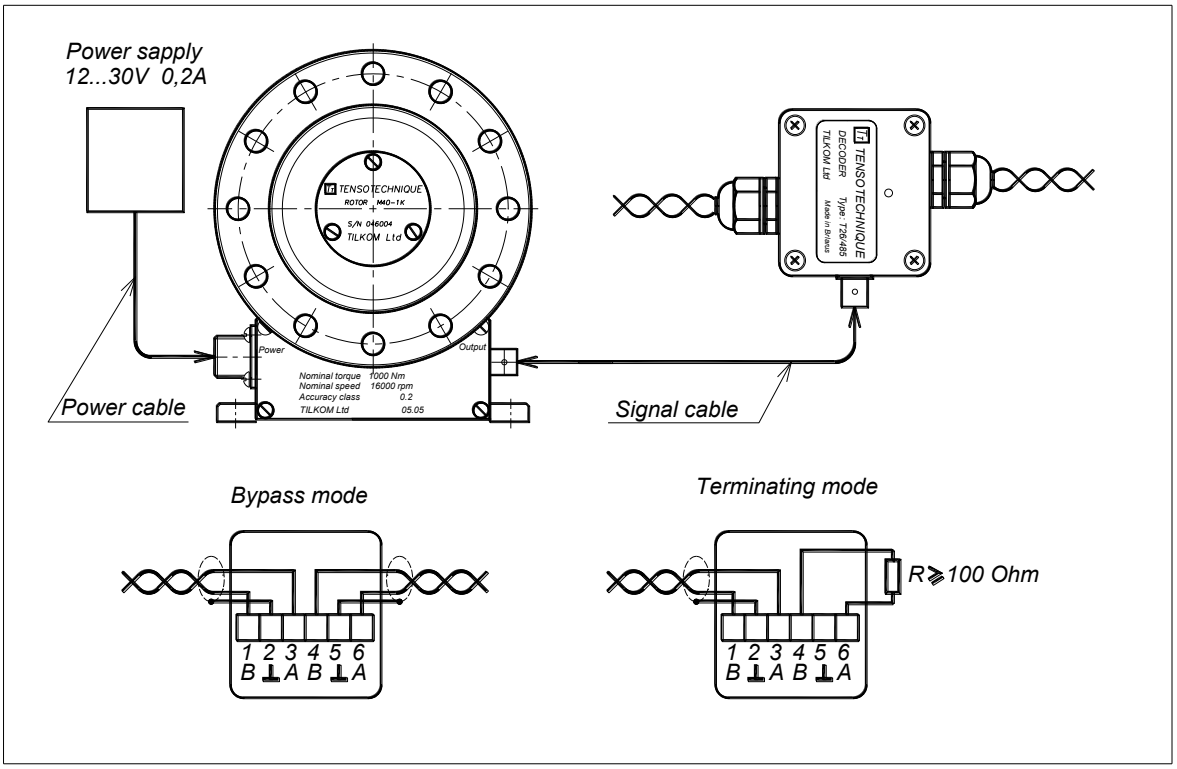
3. Connection to the T40 display unit



4. Connection to the T24 analogue decoder (± 5 V, ± 10 V or 4 … 20 mA)



5. Connection to the T46 (RS485) decoder



Modifications reserved.

We also produce customized torque transducers to meet your specific requirements.

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