TENSOTECHNIQUE

# MA20 Reaction Torque Transducer

The MA20 torque transducers are used to measure static and dynamic torque in a non-turning mode. They are suitable for use in testing machines as reaction torque transducers or in calibration devices as reference torque transducers.

The MA20 transducers operate on the strain gauge principle. They are equipped with a built-in amplifier and analogue-digital converter. It is also particularly noted for its extremely low sensitivity to parasitic influences, such as bending moments and transverse and axial forces. They measure static and dynamic (rapidly changing) torque with positive and negative polarity.

The MA20 torque transducers can have different output signals: 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 MA20 can be connected to a PC to monitor the measurement process and to save the data. The appropriate software is in the scope of supply

## Type-Survey

| Type | Unit | Nominal Torque |
|---|---|---|
| MA20-0.1 … 2 | Nm | 0.1 0.2 0.5 1 2 |
| MA20-3 … 30 | | 3 5 6 8 10 12 15 20 25 30 |
| MA20-50 … 150 | | 50 60 80 100 150 |
| MA20-200 … 300 | | 200 250 300 |
| MA20-400 … 1.2k | | 400 500 600 800 1 000 1 200 |
| MA20-1.5 … 2.5k | kNm | 1.5 2 2.5 |
| MA20-3k … 6k | | 3 5 6 |
| MA20-8k … 15k | | 8 10 12 15 |
| MA20-20k … 30k | | 20 25 30 |
| MA20-40k … 60k | | 40 50 60 |
| MA80k … 120k | | 80 100 120 |
| MA150k … 300k | | 150 200 250 300 |



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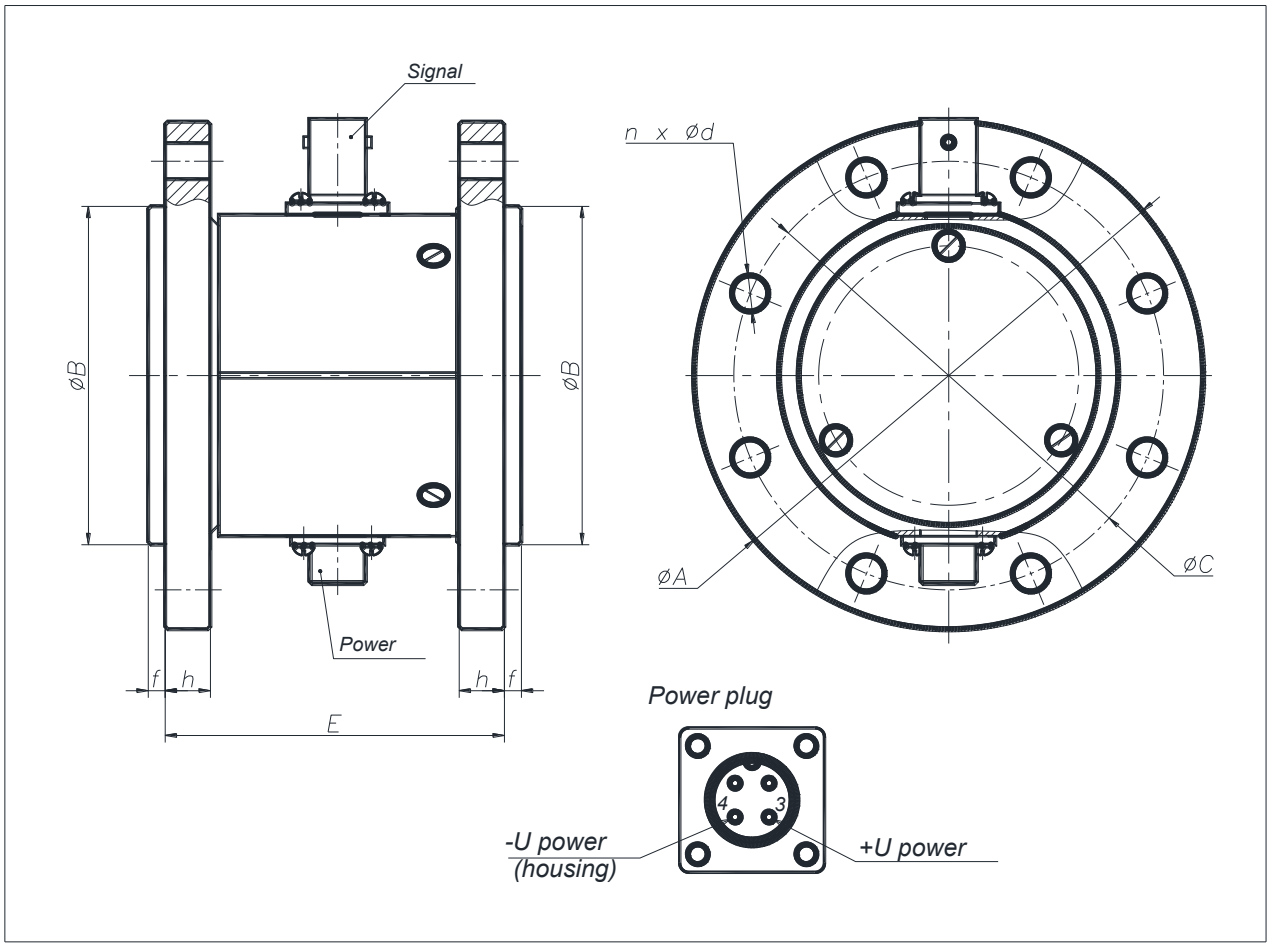
## Dimensions in mm




| Type | ØA | ØB | ØC | E | f | h | Ød | n |
|---|---|---|---|---|---|---|---|---|
| MA20-0.1…2 | 45 | 30g6 | 38±0.10 | 54 | $2.5^{+0.1}$ | 4.0 | 3.4H12 | 4 |
| MA20-3…30 | 60 | 40g6 | 50±0.10 | 50 | $2.5^{+0.1}$ | 5.5 | 4.5H12 | 8 |
| MA20-50…150 | 78 | 50g6 | 66±0.10 | 60 | $3^{+0.14}$ | 7.0 | 5.5H12 | 8 |
| MA20-200…300 | 90 | 60g6 | 76±0.10 | 64 | $3^{+0.14}$ | 8.0 | 6.5H12 | 8 |
| MA20-400…1.2k | 122 | 80g6 | 104±0.10 | 82 | $3^{+0.14}$ | 12.0 | 8.5H12 | 12 |
| MA20-1.5…2.5k | 142 | 90g6 | 120±0.12 | 90 | $3^{+0.14}$ | 15.0 | 10.5H12 | 12 |
| MA20-3k…6k | 175 | 110g6 | 150±0.25 | 100 | $3^{+0.14}$ | 16.0 | 13H12 | 16 |
| MA20-8k…15k | 200 | 130g6 | 170±0.25 | 120 | $4^{+0.18}$ | 20.0 | 17H12 | 16 |
| MA20-20k…30k | 238 | 160g6 | 204±0.25 | 150 | $4^{+0.18}$ | 22.0 | 19H12 | 16 |
| MA20-40k…60k | 304 | 210g6 | 260±0.25 | 170 | $5^{+0.18}$ | 28.0 | 25H12 | 16 |
| MA20-80k…120k | 380 | 250g6 | 320±0.25 | 192 | $6^{+0.22}$ | 32.0 | 31H12 | 16 |
| MA20-150k…300k | 520 | 360g6 | 450±0.25 | 224 | $10^{+0.22}$ | 39.0 | 38H12 | 16 |

# Technical data

**1. Nominal torque** see table «Type-Survey».

**2. Electrical and metrology parameters**

| | | |
|---|---|---|
| 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 | | + |



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### 3. Parameters of resistance to environment and mechanical exposures

| | | |
|---|---|---|
| Nominal temperature range | °C | 0 … + 60 |
| Relative humidity | % | ≤ 95 (+ 35 °C) |
| Air pressure | kPa | 84 …106.7<br>(630 … 800 mm Hg) |
| Storage temperature range | °C | - 10 …+ 70 |
| Storage humidity | % | 95 (+ 30 °C) |
| Vibration resistance:<br>Frequency range<br>Duration<br>Acceleration | <br>Hz<br>h<br>$m/s^2$ | <br>10 … 55<br>1<br>40 |
| Impact resistance:<br>Number of impacts<br>Duration<br>Acceleration | <br>n<br>ms<br>$m/s^2$ | <br>1 000<br>10<br>400 |
| Degree of protection | | IP40 |

### 4. 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 | kN | 0.1 | 0.2 | 0.3 | 0.5 | 1.0 | 1.5 | 3 | 8 | 16 |
| Lateral limit force | N | 2 | 3 | 5 | 10 | 40 | 120 | 220 | 1 000 | 2 000 |
| Bending limit moment | 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 | kg | 0.1 | 0.2 | 0.2 | 0.5 | 0.5 | 1.0 | 1.3 | 3.1 | 4.7 |

| Nominal torque $M_N$ | kNm | 3-6 | 8-15 | 20-30 | 40-60 | 80-100 | 120-150 | 200-300 |
|---|---|---|---|---|---|---|---|---|
| Axial limit force | kN | 28 | 32 | 80 | 120 | 180 | 180 | 220 |
| Lateral limit force | kN | 5 | 10 | 25 | 50 | 80 | 80 | 120 |
| Bending limit moment | kNm | 0.6 | 0.6 | 1.2 | 2 | 4 | 4 | 6 |
| Torsional stiffness | kNm/rad | 3 150 | 4 240 | 13 020 | 18 000 | 26 000 | 29 000 | 88 000 |
| Weight | kg | 8.0 | 13.0 | 22.0 | 38.1 | 57.0 | 68.0 | 180.0 |

### Limit torque, related to $M_N$

| Type | Unit | Nominal Torque | Limit torque related to $M_N$, % |
|---|---|---|---|
| MA20-0.1 … 2 | Nm | 0.1 0.2 0.5 1 2 | 150 |
| MA20-3 … 30 | | 3 5 6 8 10 12 15 20 25 30 | |
| MA20-50 … 150 | | 50 60 80 100 150 | |
| MA20-200 … 300 | | 200 250 300 | |
| MA20-400 … 1.2k | | 400 500 600 800 1 000 1 200 | |
| MA20-1.5 … 2.5k | kNm | 1.2 1.5 2 2.5 | |
| MA20-3k … 6k | | 3 5 6 | |
| MA20-8k … 15k | | 8 10 12<br>15 | 120 |
| MA20-20k … 30k | | 20 25<br>30 | 150<br>120 |
| MA20-40k … 60k | | 40 50<br>60 | 150<br>120 |
| MA80k … 100k | | 80 100 | 150 |
| MA120k … 150k | | 120 150 | 120 |
| MA200k … 300k | | 200 250 300 | |



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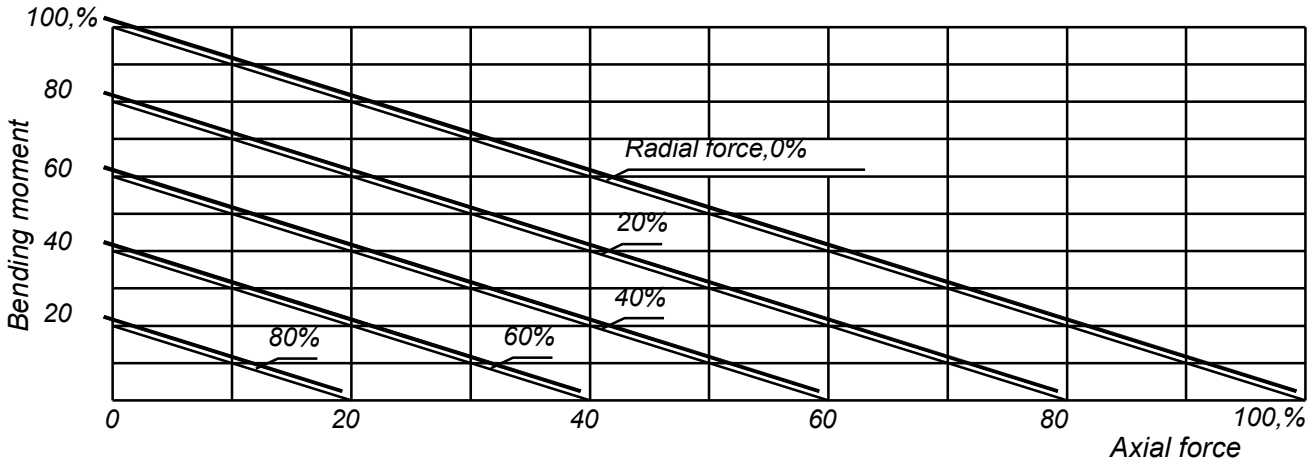
Axial force, radial force and bending moment have to be reduced according to graph below, if they act together.

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”.



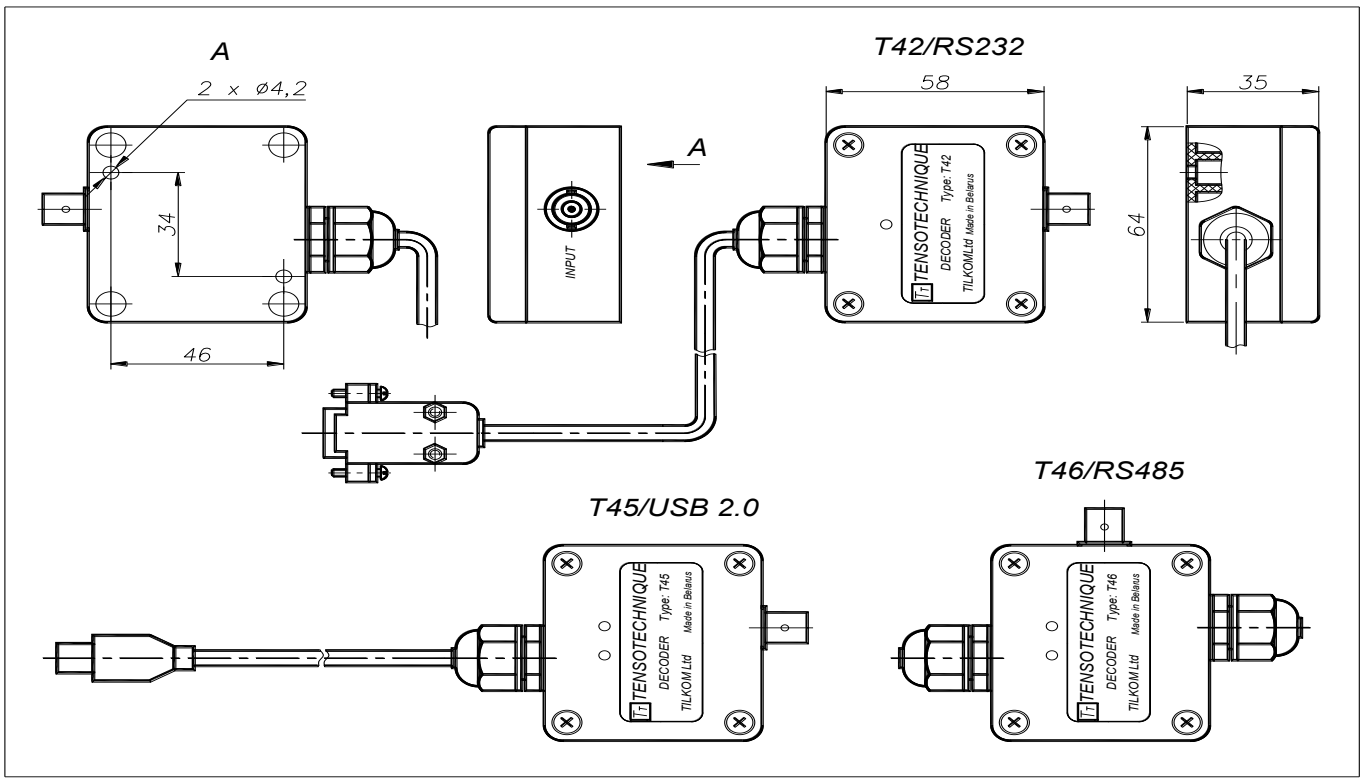

**Scope of delivery**

| | |
|---|---|
| MA20 torque transducer | 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 |

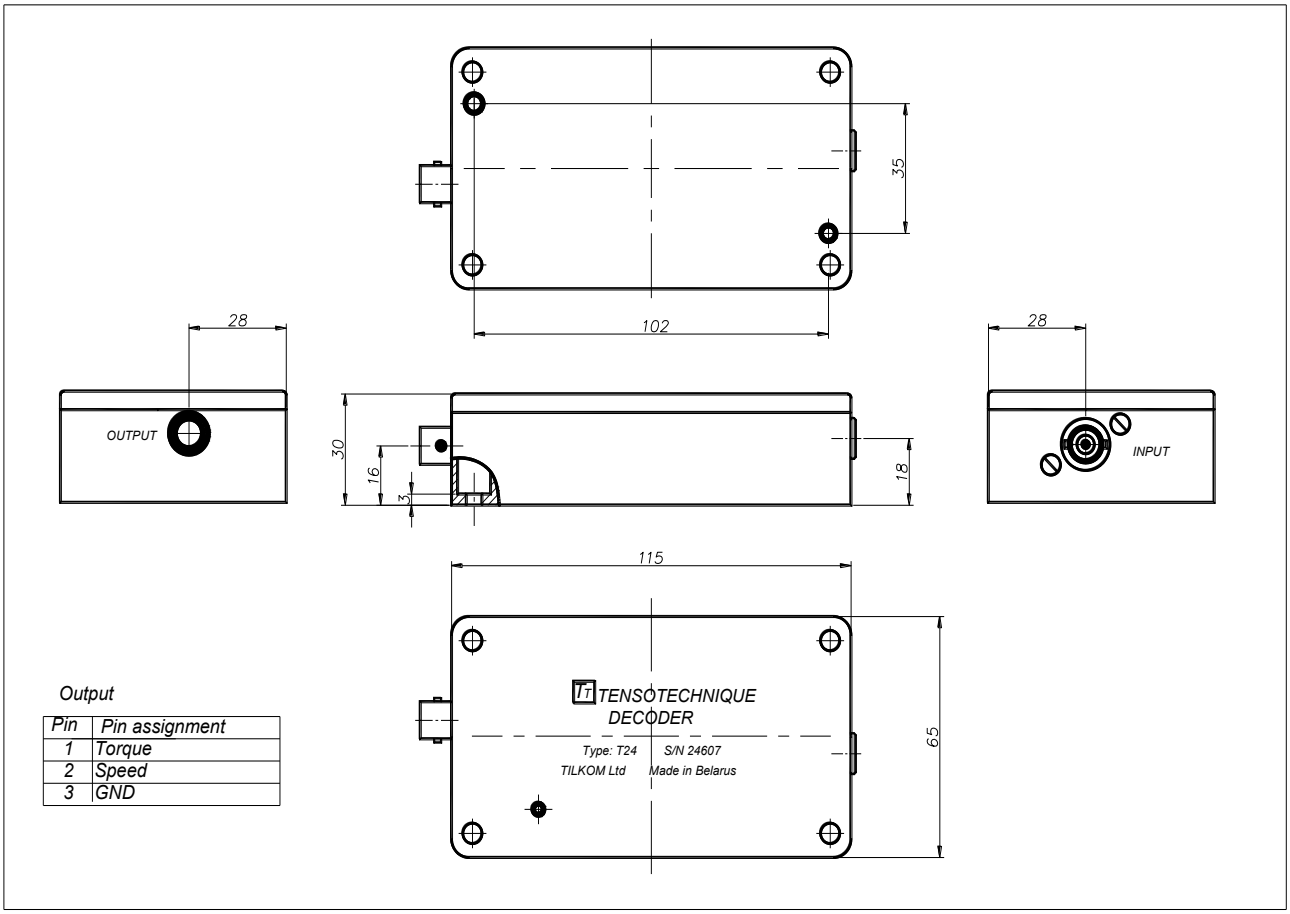
**Accessories** (to be ordered separately and optionally)

| | |
|---|---|
| MK flexible torsionally rigid couplings | 2 |
| T40 display unit | 1 |
| T41 display unit (plastic case) | 1 |
| T50 display unit | 1 |
| T24 analogue decoder (± 5 V, ± 10 V or 4… 20 mA) | 1 |
| T23 frequency decoder (10 ± 5 kHz or 60 ± 30 kHz) | 1 |
| T45 digital decoder (USB 2.0) | 1 |
| T42 digital decoder (RS232) | 1 |
| T46 digital decoder (RS485) | 1 |
| T37 digital decoder (Ethernet) | 1 |
| AC/DC adapter (12 … 30 V) | 1 |

## T42, T45, T46 digital decoder. Dimension in mm



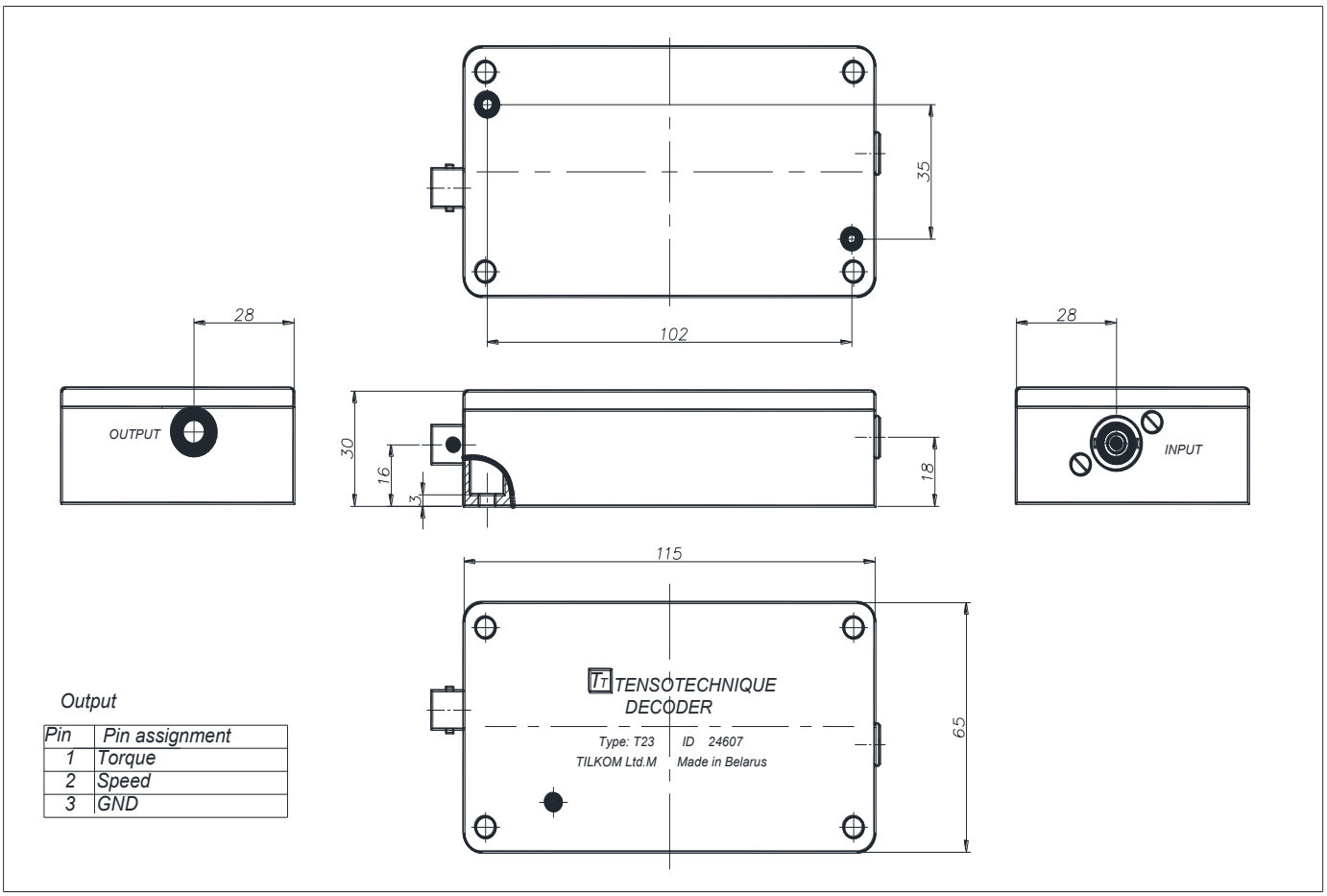

## T24 analogue decoder. Dimension in mm




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* |

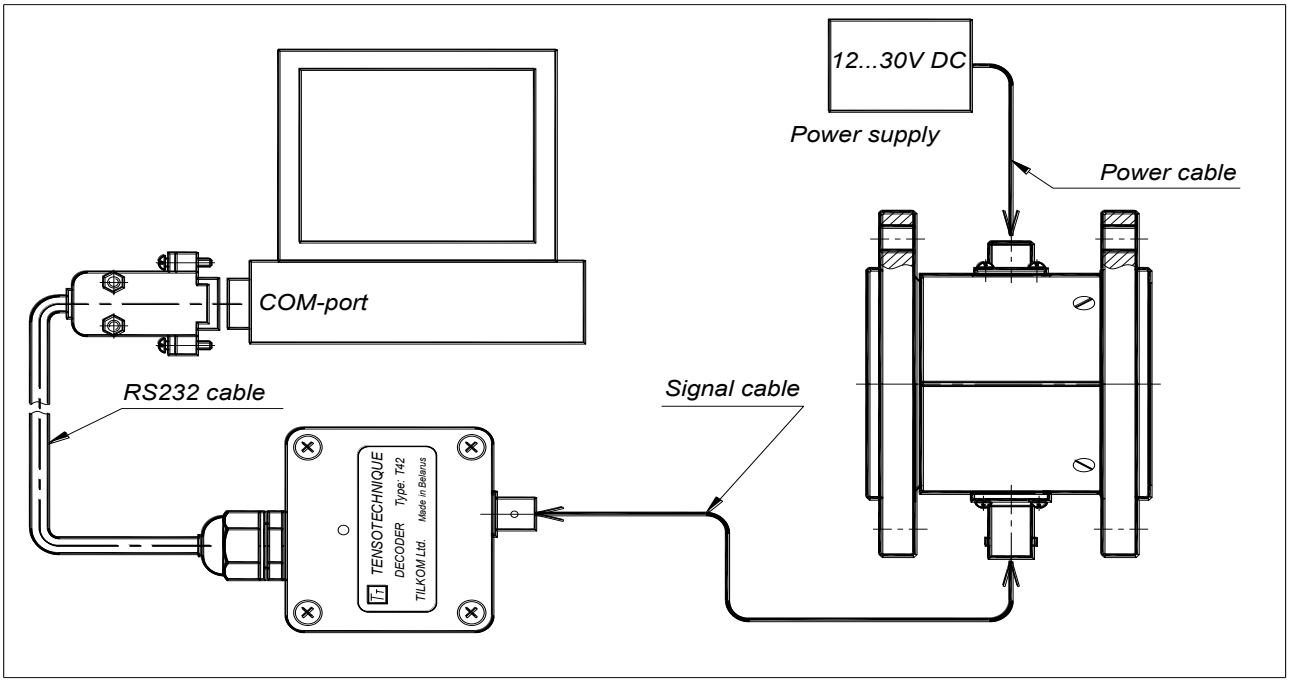
**Software**

The Microsoft® Windows-based software for MA20 torque 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.

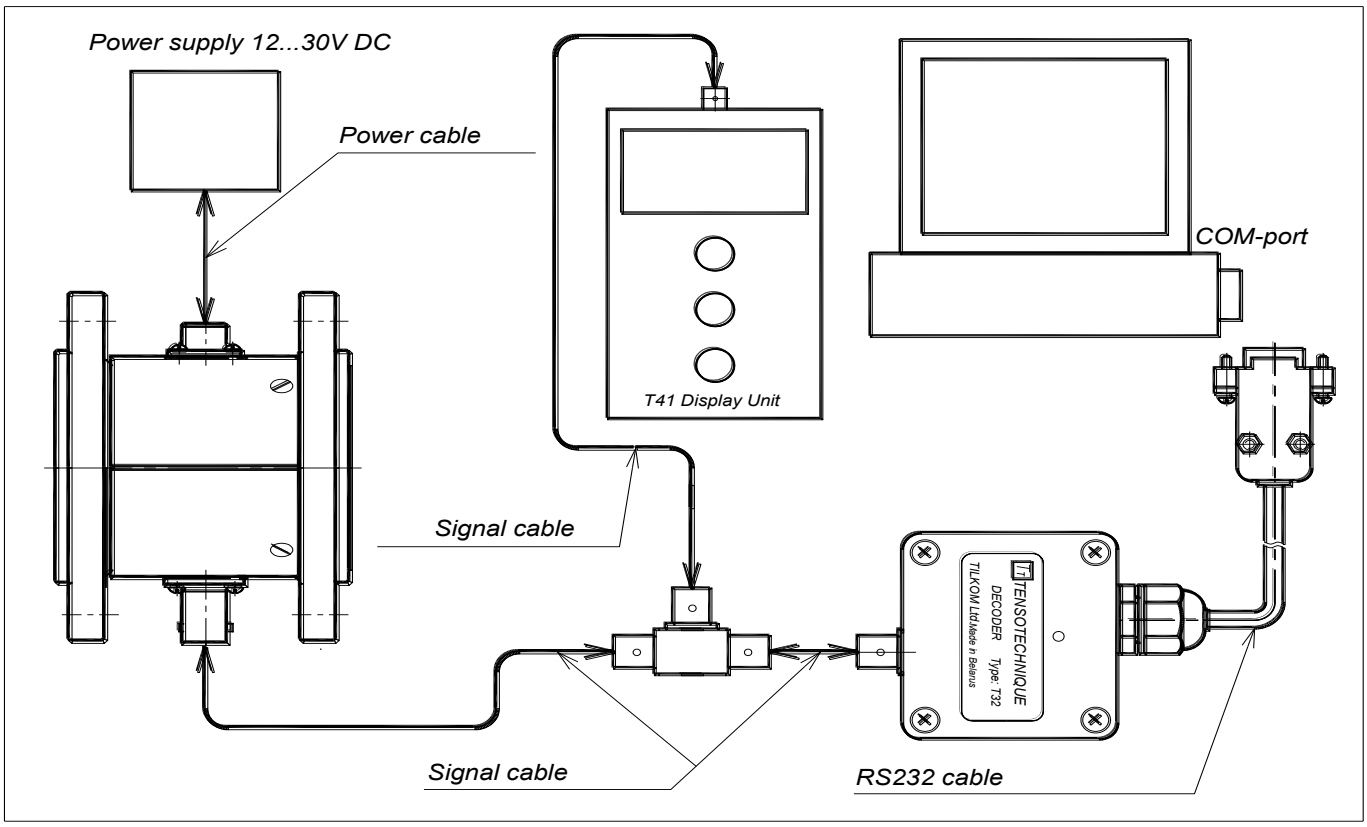
Features: support up to 4 (four) transducers simultaneously, mathematical computation of mechanical power, rotation speed and torque, measurement signal filter and signal averaging, zero shift adjustment, fast records, slow records, scaling of x-axis and y-axis, digital indicator of high resolution, 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.

# Electrical Connection

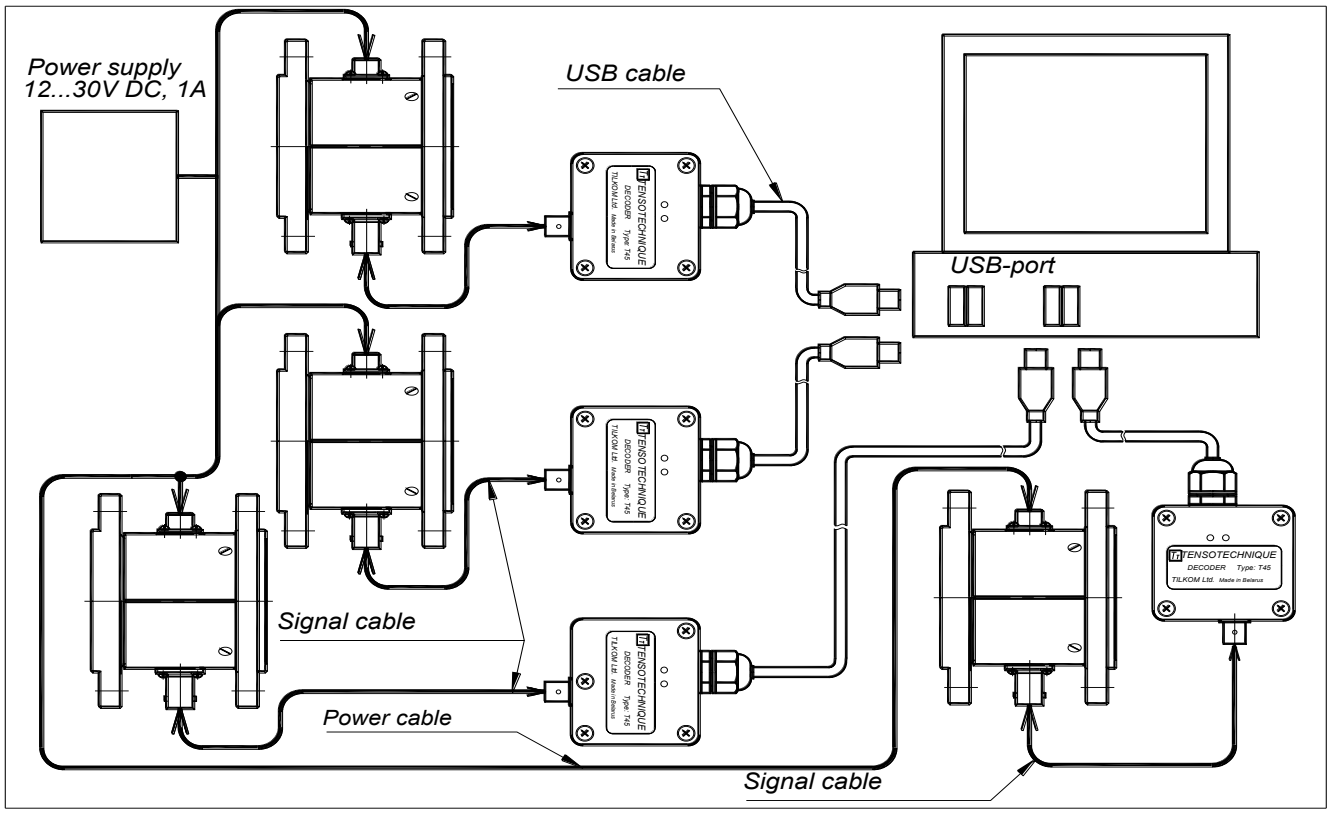
## 1. Connection to a PC via COM-port (T42 decoder)



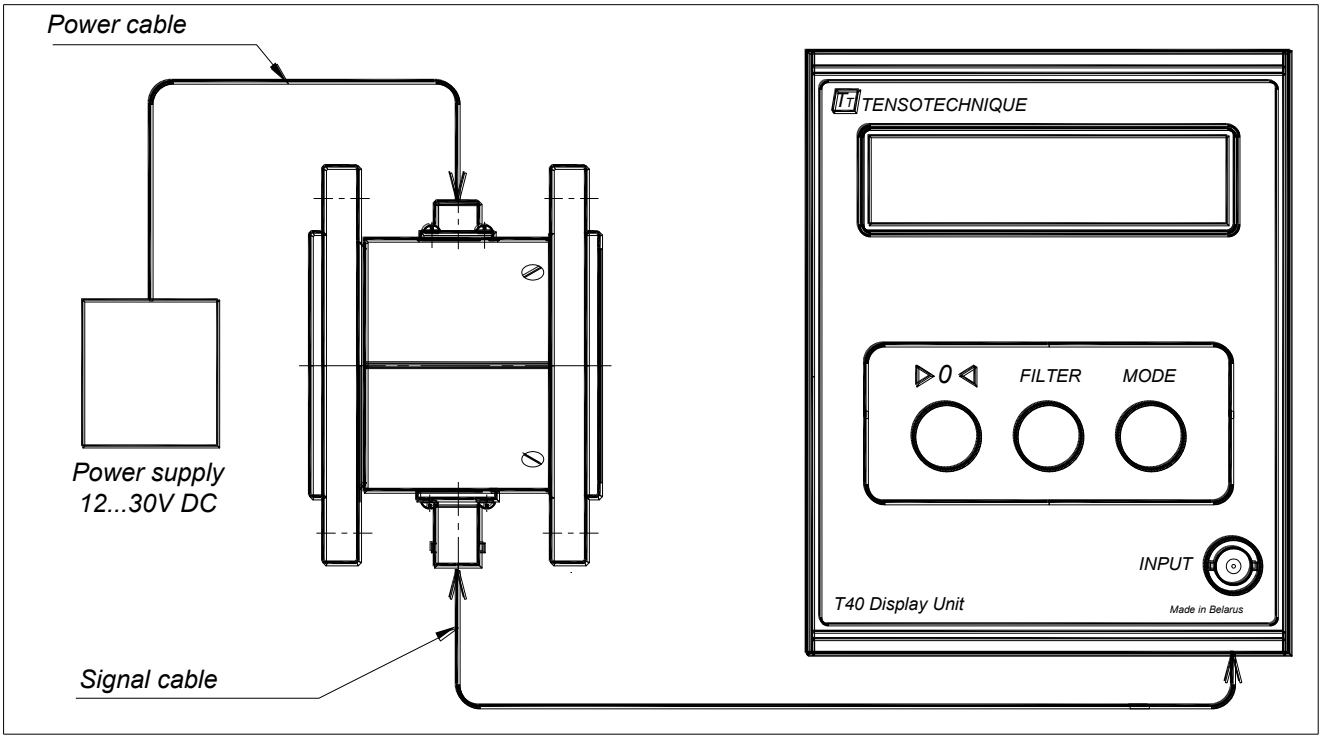

## 2. Simultaneous use of a PC and the T40 (T41) display unit



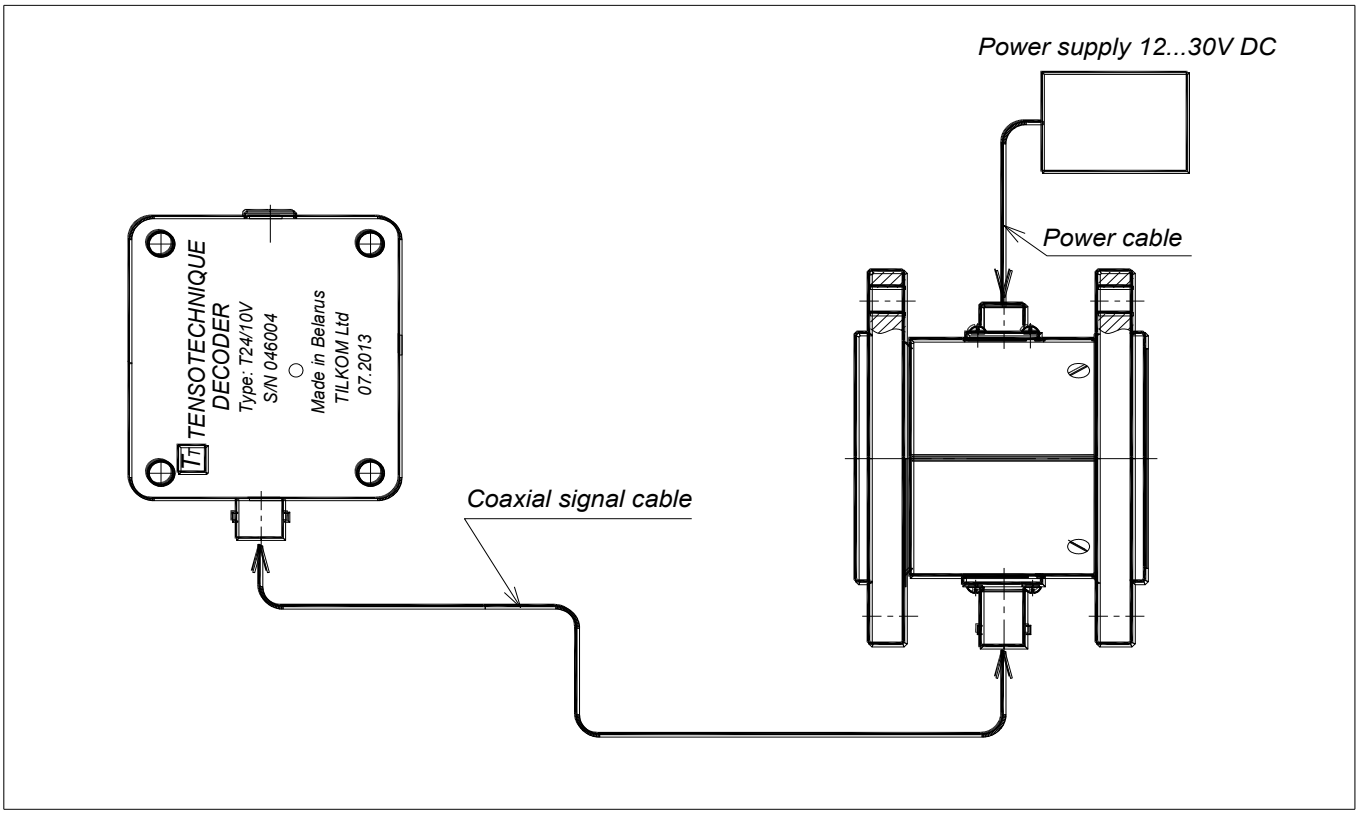
### 3. Connection to an USB-port (T45 decoder)




### 4. Connection to the T40 display unit



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




## 6. Connection to the T46 (RS485) decoder