

Industrial Electronics



TRUMMETER®



Hilger u. Kern

## Measuring tension...

# TRUMMETER

## Precision instrument for measuring belt tension

A belt drive achieves its maximum life span when it is configured specifically for the application, the belt is perfectly tensioned and the pulleys are precisely aligned.

The TRUMMETER is an electronic measuring instrument that consists of a measuring probe and a microprocessor and is used for measuring the belt tension and checking the strand force of a belt drive.

The measurement result is displayed in Hertz, Newtons or Pounds Force. This result can be compared with the set-point of the belt tension.

Drive-belt suppliers list this set-point value in Hertz or Newtons. It depends on the characteristics of the drive system. Alternatively, it can be also calculated according to the formula:

$$F = \frac{540 \times P \times 1.3}{z \times v} + k \times v^2 \quad [ \text{Newton} ]$$

P = Engine power kW

z = Number of belts

v = Belt speed =  $D \times n / 19100$

D = Effective diameter of the small disc in mm

n = Number of revolutions of the small disc (rpm)

$k \times v^2$  = Centrifugal force (relevant for number of revolutions > 800 rpm)

k = Belt weight in kg/m according to table (for one belt)

## Measuring the belt tension [Hz]

The belt frequency can be measured only when the drive has been shut down and is stationary.

Whilst still fitted, the taut drive belt must be tapped in order to make it oscillate at its natural frequency.

This static natural frequency is then measured by the probe with the aid of pulsed light. Care must be taken to ensure the light is reflected sufficiently by the belt.

The measured values are displayed in Hertz [Hz].

It's not necessary to enter the belt masses and lengths.

## Measuring the strand force [N], [lbf]

To calculate the strand force, values for the frequency, the belt mass, and the belt length are entered into the microcomputer of the TRUMMETER. The strand force is calculated by the computer and compared with the specified value defined when the drive was designed.

The microcomputer calculates the strand force using the formula:

$$F = 4 \times m \times L^2 \times f^2 \text{ or } f = \sqrt{\frac{F}{4 \times m \times L^2}}$$

F = strand force in N

m = linear belt mass in kg/m  
(compare table „Belt masses“)

L = length of the free belt strand in m

f = natural frequency of the free belt  
measured in Hz

## Measuring procedure

1. Switch on the TRUMMETER.
2. Tap the drive belt so that it begins to oscillate at its natural frequency.
3. Hold the measurement probe approximately at the centre of the free strand length at a distance of between 3 and 20 mm above the drive belt.
4. Successful measurement is acknowledged by an acoustic signal and the indication “Measurement” appears on the display.
5. The measured value is displayed in Hz.

## Switching value display mode

The measured values can also be displayed in Newtons or in Pounds Force. Please refer to the section entitled “Menu structure”.

## Note

The measurement position is always at the longest part of the belt drive between 2 pulleys.



## Mounting

After mounting, the belt length will extend within 1 hour. This is why it makes sense to adjust the strand force with 30 % more and to repeat the measurement after 1 hour. In addition to the calculated strand force, consider the limit of the radial load of the bearings.

Pulley radial load  $F = 2 \times$  strand force of the belt.

## Note

Measurement deviations of up to +/- 10 % over several measurements taken on the same drive belt are not normally caused by a measurement error or fault in the unit. In most cases, measurement deviations are due to the mechanical tolerances of the drive systems.

## Troubleshooting

**If despite careful preparations no measurement results are displayed, this may be due to one of the following reasons:**

1. The drive belt is oscillating below the minimum measurement limit of 10 Hz.  
→ Tighten the belt or, if the strand length is very long and open, support the belt in order to shorten the strand length. Enter the new belt length before repeating measurement.
2. The unit cannot be switched On.  
→ The battery must be exchanged when the display shows "Low Bat".
3. The unit will automatically switch itself OFF after pauses longer than 8 minutes.

**Attention!** Newton or Pounds Force calculations have a **square factor** higher error result

$$(F = 4 \times m \times L^2 \times f^2)!$$

## CE Confirmation and WEEE:

The belt tensionmeter TRUMMETER is made by Hilger u. Kern GmbH in Germany. We confirm that it is designed and manufactured in accordance with the EMC directive 2004/108/EG.

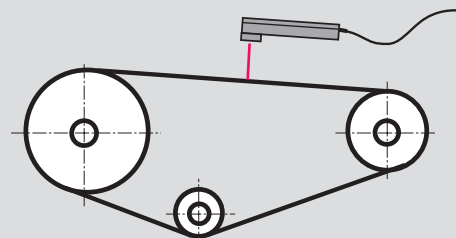
Hilger u. Kern is registered with no. DE 91093691 following the EC – directive of 27.1.2003 on waste electrical and electronic equipment (WEEE).

**Either no or low measuring values are displayed despite the drive belt being correctly tensioned.**

It may be the case that the light from the measuring probe has not been reflected sufficiently.

- To improve reflection, affix a piece of light-coloured adhesive tape to the belt or slightly moisten the belt at the measuring point.

The distance between the drive belt and the measuring probe should be between 3 and 20 mm. See sketch for positioning.



## Belt masses

To measure the belt mass precisely, we recommend that you weigh the drive belt and then recalculate this weight based on a belt length of 1 metre. See weight button. The set point value can be taken from the list below. If your belt type is not listed you may weigh the belt and calculate the weight per meter.

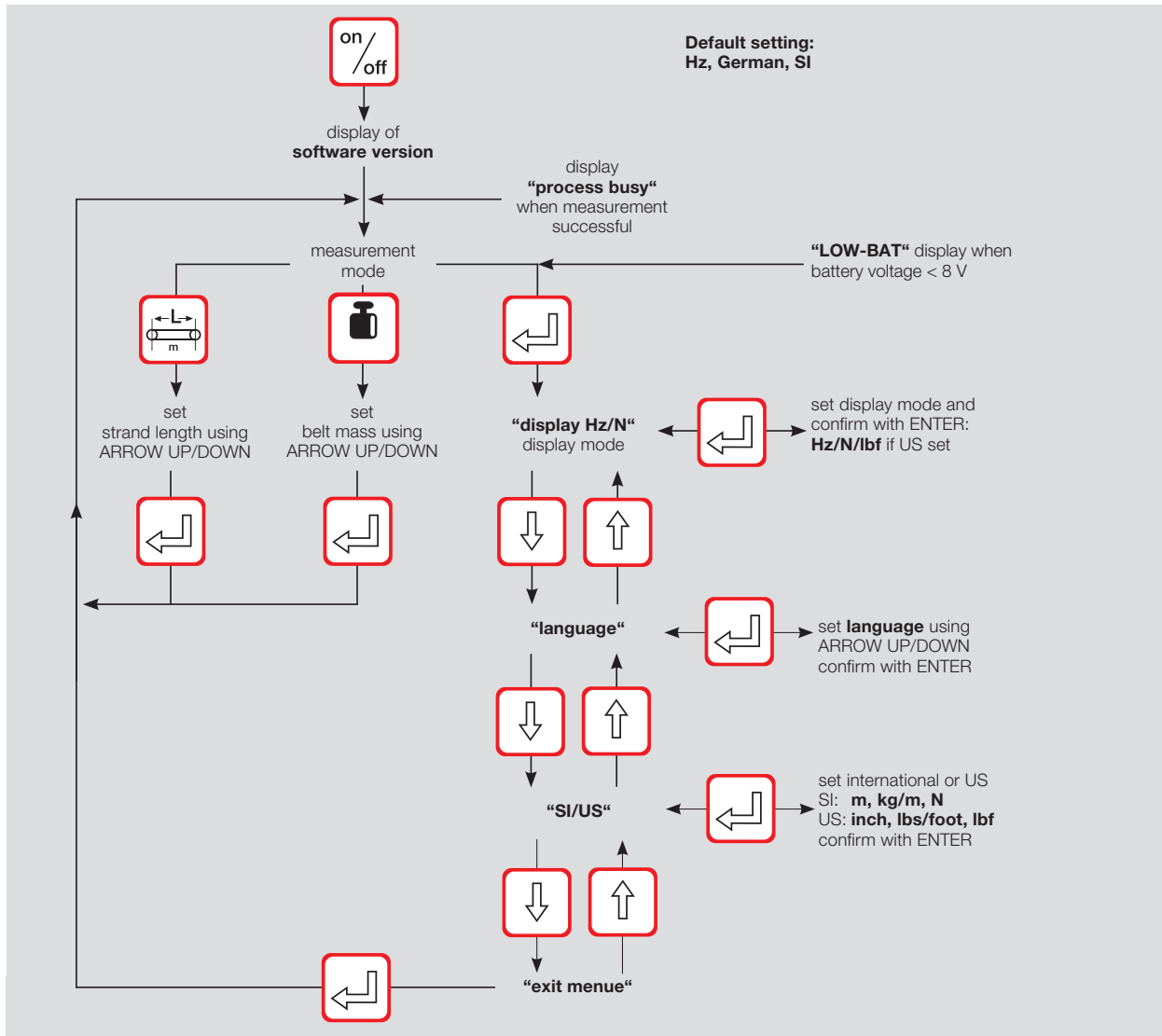
<b>Ribbed V-belts</b>	PJ = 0.082 PM = 1.100	PL = 0.320	kg/m per 10 ribs
<b>V-belts</b>	SPZ = 0.074 SPB = 0.195	SPA = 0.123 SPC = 0.377	kg/m per belt
	10 = 0.064 17 = 0.196 22 = 0.324 32 = 0.668	13 = 0.109 20 = 0.266 25 = 0.420 40 = 0.958	kg/m per belt
<b>Power belts</b>	SPZ = 0.120 SPB = 0.261	SPA = 0.166 SPC = 0.555	kg/m per rib
	3V/9J = 0.120 8V/25J = 0.693	5V/15J = 0.252	kg/m per rib
<b>Polyurethane timing belts</b>	T 2.5 = 0.015 T 10 = 0.048	T 5 = 0.024 T 20 = 0.084	kg/m per 10 mm width
	AT 3 = 0.023 AT 10 = 0.063	AT 5 = 0.034 AT 20 = 0.106	kg/m per 10 mm width

## Technical data

<b>Measuring range</b>	10 up to 800 Hz
<b>Digital sampling error</b>	< 1 %
<b>Indication error</b>	+/- 1 Hz
<b>Total error</b>	< 5 %
<b>Nominal temp.</b>	+20 °C
<b>Operating temp.</b>	+10 °C ... +50 °C
<b>Shipping temp.</b>	-5 °C ... +50 °C
<b>Casing</b>	Plastic (ABS)
<b>Dimensions, unit</b>	80 x 126 x 37 mm
<b>Dimensions, case</b>	226 x 178 x 50 mm
<b>Display</b>	2-line LCD, 16 char./line
<b>Languages</b>	10
<b>Input range:</b>	
– free strand length	up to 9.99 m
– belt mass	up to 9.999 kg/m
<b>Power supply</b>	9-V battery



# Menu structure

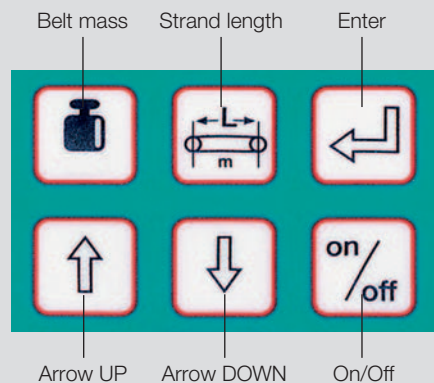


## Display

Displays measured and calculated values in

- German
- Portugese
- English
- Swedish
- Italian
- Norwegian
- French
- Danish
- Spanish
- Finnish

## Buttons on the membrane keyboard



## Measuring probe

Measures the natural frequency of the taut, free belt with the aid of pulsed light

## Scope of delivery

The TRUMMETER is supplied in a strong plastic case. Included in the scope of delivery are 2 measuring probes and a 9-V battery.

## Product advantages

- Exact measurement of the belt tensioning force
- Exact calculation of the strand force
- Necessary for recording in accordance with DIN EN ISO 9001ff
- Operator prompts and measured value displays in 10 languages
- Simple and safe operation
- Compact and handy to use

**...with precision**



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of metering and mixing systems in the world for plural component

polymers and single component media such as greases, oils and pastes.

For more than 30 years the group has developed systems and

components to suit your individual needs.

Hilger u. Kern GmbH in Mannheim, with its Drive Engineering, Metering

Systems, Industrial Electronics, Vibration Technology and Spray Technology

divisions, is one of the leading manufacturers of high-quality and innovative

technical capital goods in Germany.