

Programmable Tap position transducer Rishducer TP-25K

Data Sheet

Transducer for measuring
Tap position Resistance



Tap position transducer **RISH Ducer** TP-25K in housing S17

Application

Tap position transducer **RISH Ducer** TP-25K converts resistance to proportional analogue output signal. The analogue output signal is either an impressed current or superimposed voltage which is processed by other devices for purposes of displaying, recording and / or regulating a constant.

Input measuring range is programmable. It is programmed with the aid of PC and corresponding software. Other parameters relating to the analogue output, transmission mode, operating sense and the open-circuit supervision can also be programmed.

The transmitter fulfils all the important requirements and regulation concerning electromagnetic compatibility EMC and Safety (IEC 1010 resp. EN 61010). It was developed and is manufactured and tested in strict accordance with the quality assurance standard ISO9001.

Features / Benefits

- Input tap resistance and measuring range programmed using PC / Simplifies project planning and engineering (the final measuring range can be determined during commissioning). Short delivery times and low stocking levels.
- Analogue output signal also programmed on the PC (impressed current or superimposed voltage for all ranges between – 20 and + 20 mA DC resp. – 12 and + 15 V DC) / Universally applicable. Short delivery times and low stocking levels.
- Electric insulation between measured variable, analogue output signal and power supply / Safe isolation acc. to EN 61010
- Wide power supply tolerance / Only two operating voltage ranges between 20 and a maximum of 264 V DC/AC.
- Provision for either snapping the programmable Transducer **RISH Ducer** TP-25K onto top-hat rails
or securing it with screws to a wall or panel
- Housing only 17.5 mm wide (size S17 housing) / Low space

Principal of operation (Fig 1)

A constant reference current facilitates the measurement of resistance. Depending on the type of connection, either one or more of the terminals 1,2, 6, and the common ground terminal 11 are used.

The constant reference current which is needed to convert a variation of resistance to a voltage signal is available at terminal 6. The internal current source (2) automatically sets the reference current to either 12 or 76 μ A to suit the measuring range. The corresponding signal is applied to terminal 1 and is used for resistance measurement.

An extremely important component of the input stage is the EMC filter which protects the transmitter from interference or even destruction due to induced electromagnetic waves.

From the input stage, the measured variable and auxiliary signal (the open-circuit sensor supervision) go to the multiplexer (4), which controlled by the micro-controller (6) applies them cyclically to the A/D converter (5).

The A/D converter operates according to the dual slope principle with an integration time of 20 ms at 50 Hz and a conversion time of approximately 38 ms per cycle. The internal resolution is 12 Bit regardless of measuring range.

The micro-controller relates the measured variable to the auxiliary signal and to the data which were loaded in the micro-controller's FLASH via the programming connector (7) when the transmitter was configured. These settings determine the type of connections, the measuring range, and the operating sense (output signal directly or inversely proportional to the measured variable). The measured signal is then filtered again, but this time digitally to achieve the maximum possible immunity to interference. Finally the value of the measured variable for the output signal is computed.

Depending on the measured variable and the input circuit, it can take 0.4 to 1.1 seconds before a valid signal arrives at the optocoupler (8). The different processing times result from the fact that, for example, a resistance measurement with a four-wire connection and open-circuit sensor supervision requires more measuring cycles than the straight forward measurement of with two wire connection.

The main purpose of the opto-coupler is to provide electrical insulation between input and output. On the output side of the optocoupler, the D/A converter (9) transforms the digital signal back to an analogue signal which is then amplified in the output stage (10) and split into two non-electrically isolated output channels. A powerful heavy-duty output is available at A1 and a less powerful output for a field display unit at A2. By a combination of programming and setting the 8 DIP switches in the output stage, the signals at A1 and A2 can be configured to be either a DC current or DC voltage (but both must be either one or the other). The signal A1 is available at terminals 9 and 4 and A2 at terminals 8 and 3.

If the micro-controller (6) detects an open-circuit measurement sensor, it firstly sets the two output signals A1 and A2 to a constant value. The latter can be programmed to adopt a preset value between –10 and 110% or to maintain the value it had at the instant the open-circuit was detected. In this state, the micro-controller also switches on the red LED (11) and causes the green LED (12) to flash. Via the opto-coupler (8), it also excites the relay driver (13) which depending on configuration switches the relay (14) to its energised or de-energised state. The output contact is available at terminals 13, 14 and 15. It is used by safety circuits. In addition to being able to program the relay to be either energised or de-energised, it can also be set to "relay disabled". In this case, an open-circuit sensor is only signalled by the output signal being held constant, the red LED being switched on and the green LED flashing. The relay can also be configured to monitor the measured variable in relation to a programmable limit.

The normal state of the transmitter is signalled when the green LED (12) is continuously lit. As explained above, it flashes should the measurement sensor become open-circuit. It also flashes, however, if the measured variable falls 10% below the start of the measuring range or rises 10% above its maximum value and during the first five seconds after the transmitter is switched on.

The push-button S1 is for automatically calibrating the leads of a two-wire resistance circuit. This is done by temporarily shorting the resistance sensor and pressing the button for at least three seconds. The lead resistance is then automatically measured and taken into account when evaluating the measure variable.

The power supply H is connected to terminals 5 and 10 on the input block (15). The polarity is of no consequence, because the input voltage is chopped on the primary side of the power block (16) before being applied to a full-wave rectifier. Apart from the terminals, the input block (15) also contains an EMC filter which suppresses any electromagnetic interference superimposed on the power supply. The transformer block (17) provides the electrical insulation between the power supply and the other circuits and also derives two secondary voltages. One of these (5 V) is rectified and stabilised in (18) and then supplies the electronic circuits on the input side of the transmitter. The other AC from block (17) (–16 V / + 18 V) is rectified in (19) and used to supply the relay driver and the other components on the output side of the transmitter.

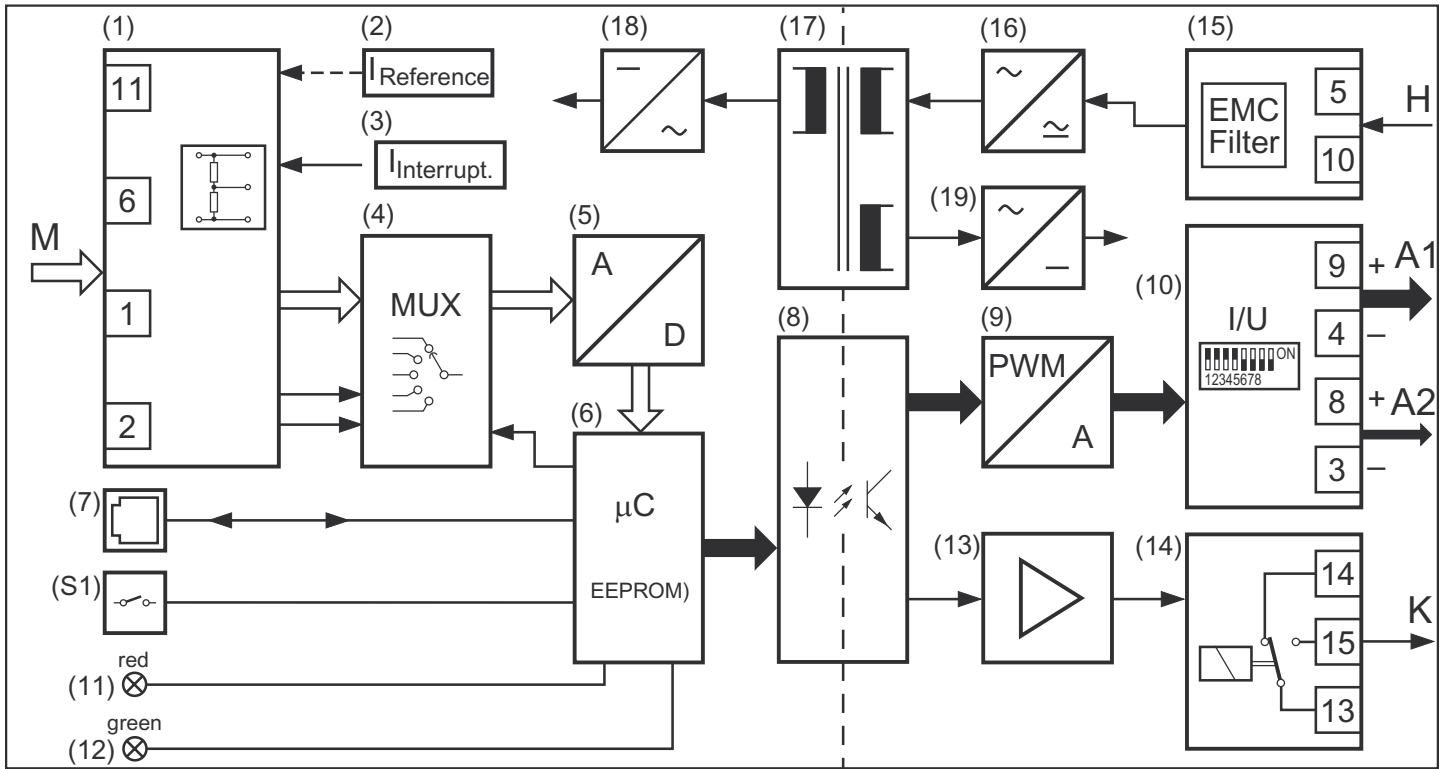


Fig 1. Block diagram of *RISH Ducer TP - 25K*.

Programming (Figs. 2 and 3)

A PC with RS 232 C interface (Windows 98 / XP), the Programming cable PRKAB 600 and the configuration software (configuration software for Tap position transducer Rishducer TP - 25K) are required to program the transmitter. (Details of the programming cable and the software are to be found in the separate Data sheet: PRKAB 600)

The connections between "PC . PRKAB 600 .RishDucer TP - 25K" can be seen from Fig. 2. The power supply must be applied to RishDucer TP - 25K before it can be programmed.

The "configuration software for Tap position transducer and Rishducer TP - 25K" is supplied on a CD. The programming cable PRKAB 600 adjusts the signal level and provides the electrical insulation between the PC and Of the programmable details listed in section "Features / Benefits" one parameter – the output signal – has to be determined by PC programming as well as mechanical setting on the transmitter unit,

... the output signal range by PC

... the type of output (current or voltage signal) has to be set by DIP switch (see Fig. 3).

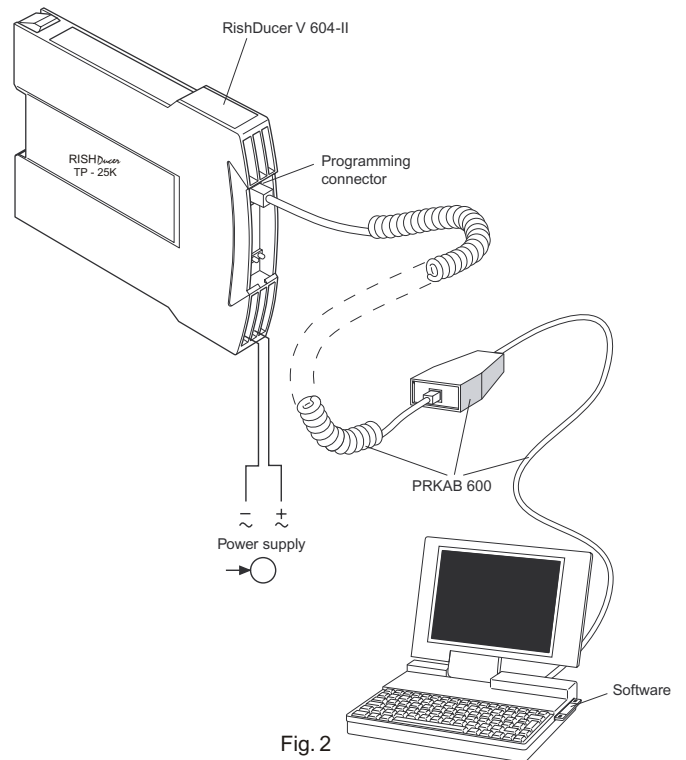


Fig. 2

The eight pole DIP switch is located on the PCB in the RishDucer TP - 25K.



DIP switches	Type of output signal
ON  12345678	load-independent current
ON  12345678	load-independent voltage

Fig. 3

Technical Data

Measuring Input

Measured variable M

Table 1: Measuring ranges

Measured variables	Measuring ranges		
	Limits	Min. span	Max. span
Variation of resistance of remote sensors / potentiometers			
low resistance range	0...3700 Ω ¹	75 Ω	3700 Ω
high resistance range	0...25000 Ω ¹	500 Ω	25000 Ω

¹ Permissible value of the ratio "full-scale value/span = 100".

Tap Resistance, potentiometer measurement

Measuring range: See Table 1

Resistance sensor types: Type WF
Type WF DIN
Potentiometer.

Measuring current : = 0.076 mA for measuring range 0...3700Ω.
or
= 0.012 mA for measuring range 0...25000Ω.

Kinds of input : Resistance sensor WF current measured at pick-up, wiring connection diagram No. 4
Resistance sensor WF DIN current measured at pick-up, wiring connection diagram No. 5
Resistance sensor for two, three or four-wire connection, wiring connection diagram No. 1,2,3

Input resistance : Ri > 10 M Ω

Lead resistance  : ≤ 30Ω. per lead

Output Signal

Output signals A1 and A2

The output signals available at A1 and A2 can be configured for either an impressed DC current I_A or a superimposed DC voltage U_A by appropriately setting DIP switches. The desired range is programmed using a PC. A1 and A2 are not DC isolated and exhibit the same value.

Standard ranges for I_A : 0...20 mA or 4...20 mA

Non-standard ranges : Limits -22 to + 22 mA
Min. span 5 mA
Max. span 40 mA

Open-circuit voltage : Neg. -13.2...-18 V, pos. 16.5...21 V

Burden voltage I_{A1} : + 15 V, resp. -12 V

External resistance I_{A1} : $R_{\text{ext max.}} [\text{k}\Omega] = \frac{15 \text{ V}}{I_{\text{AN}} [\text{mA}]}$

resp. = $\frac{-12 \text{ V}}{I_{\text{AN}} [\text{mA}]}$

I_{AN} = full-scale output current

Burden voltage I_{A2} : < 0.3 V

External resistance I_{A2} : $R_{\text{ext max.}} [\text{k}\Omega] = \frac{0,3 \text{ V}}{I_{\text{AN}} [\text{mA}]}$

Residual ripple: < 1% p.p., DC ... 10 kHz
< 1.5% p.p. for an output span < 10 mA

Standard ranges for U_A : 0...5, 1...5, 0...10 or 2...10 V

Non-standard ranges: Limits -12 to + 15 V
Min. span 4 V
Max. span 27 V

Open-circuit voltage: ≤ 40 mA

Load capacity U_{A1} / U_{A2} : 20 mA

External resistance

U_{A1} / U_{A2} : $R_{\text{ext}} [\text{k}\Omega] \geq \frac{U_A [\text{V}]}{20 \text{ mA}}$

Residual ripple: < 1% p.p., DC ... 10 kHz
< 1.5% p.p. for an output span < 8 V

Fixed settings for the output signals A1 and A2

After switching on: A1 and A2 are at a fixed value for 5 s after switching on (default).
Setting range -10 to 110%² programmable, e.g. between 2.4 and 21.6 mA (for a scale of 4 to 20 mA).

Green LED ON flashes for the 5 s

When input variable out of limits: A1 and A2 are at either a lower or an upper fixed value when input variable..


... falls more than 10% below the minimum value of the permissible range

... exceeds the maximum value of the permissible range by more than 10%.


Lower fixed value = -10%², e.g. -2 mA (for a scale of 0 to 20 mA).

Upper fixed value = 110%², e.g. 22 mA (for a scale of 0 to 20 mA).

The green LED ON flashes

Open-circuit sensor: A1 and A2 are at a fixed value when an open-circuit sensor is detected (see Section "Sensor and open-circuit lead supervision ").

The fixed value of A1 and A2 is configured to either maintain their values at the instant the open-circuit occurs or adopt a preset value between -10 and 110%², e.g. between 1.2 and 10.8 V (for a scale of 2 to 10 V).

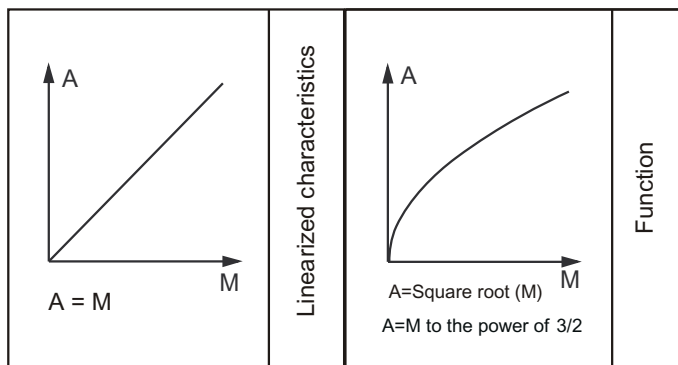
The green LED ON flashes and the red LED  lights continuously

²In relation to analogue output span A1 resp. A2

Output characteristic

Characteristic: Programmable

Table 2 : Available characteristics (acc. to measured variable)



Operating sense: Programmable output signal directly or inversely proportional to measured variable

Setting time (IEC 770): 1sec approx.

Power supply H

DC, AC power pack (DC and 45...400 Hz)

Table 3: Nominal voltage and tolerance

Nominal voltage U_{HN}	Tolerance	Instrument version
24... 60 V DC / AC	DC -15...+ 33% AC \pm 15%	Standard
85...230 V ¹ DC / AC		

Power consumption: \leq 1.4 W resp. \leq 2.7 VA

Open-circuit sensor circuit supervision input circuits are supervised.

Pick-up/reset level: 1 to 15 k Ω acc. to kind of measurement and range

Signalling modes

Output signals

A1 and A2:

Programmable fixed values. The fixed value of A1 and A2 is configured to either maintain their values at the instant the open-circuit occurs or adopt a preset value between -10 and 110%² e.g. between 1.2 and 10.8 V (for a scale of 2 to 10 V)

Front plate signals:

The green LED ON flashes and the red LED lights continuously

Output contact K:

Relay 1 potentially-free changeover contact (see Table 4)
Operating sense programmable
The relay can be either energised or de-energised in the case of a disturbance.
Set to "Relay inactive" if not required!

Supervising a limit GW (Γ)

This Section only applies to transmitters which are not configured to use the output contact K in conjunction with the open-circuit sensor supervision (see Section "Open-circuit sensor circuit super-vision ").

...in this mode relay is set to "Relay disabled"

Limit:

Programmable

- Disabled
- Lower limit value of the measured variable (see Fig. 4, left)
- Upper limit value of the measured variable (see Fig. 4, left)

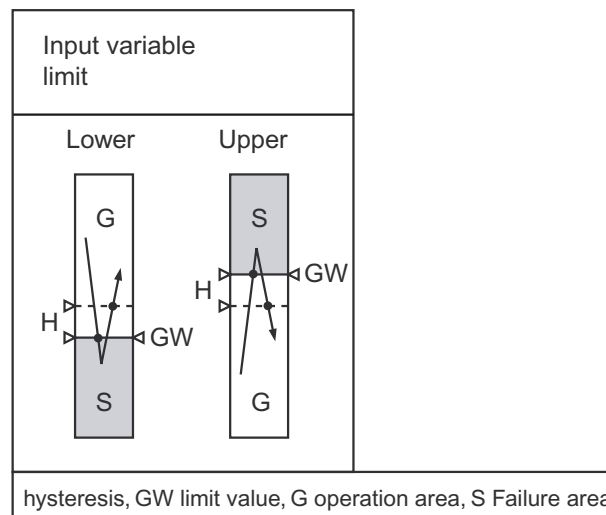


Fig. 4. Switching function according to limit monitored.

Trip point setting using PC for GW:

Programmable

- between -10 and 110% ¹ (of the measured variable)

Reset ratio:

Programmable

- between 0.5 and 100%¹ (of the measured variable)

Operating and resetting delays:

Programmable

- between 1 to 60 s

Operating sense:

Programmable

- Relay energized, LED on
- Relay energized, LED off
- Relay de-energized, LED on
- Relay de-energized, LED off (once limit reached)

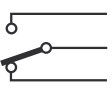
Relay status signal:

GW by red LED (Γ)

¹An external supply fuse must be provided for DC supply voltages > 125 V.

²In relation to analogue output span . A1 resp. A2

Table 4: Contact arrangement and data

Symbol	Material	Contact rating
	Gold flashed silver alloy	AC: $\leq 2 \text{ A} / 250 \text{ V}$ (500 VA) DC: $\leq 1 \text{ A} / 0.1 \dots 250 \text{ V}$ (30 W)

Programming connector

Interface:	RS 232 C
FCC-68 socket:	6/6 pin
Signal level:	0 / 3 V
Power consumption:	Approx. 50 mW

Accuracy data (acc. to DIN/IEC 770)

Basic accuracy:	Max. error $\leq \pm 0.2\%$ Including linearity and repeatability errors.
Additional error (additive):	$< \pm 0.3\%$ for linearised characteristic $< \pm 0.3\%$ for measuring ranges $< 100\Omega$. $< \pm 0.3\%$ for a high ratio between full-scale value and measuring range $>$ factor 10, $< \pm 0.3\%$ for current output $< 10 \text{ mA}$ span $< \pm 0.3\%$ for voltage output $< 8 \text{ V}$ span $< 2 \cdot$ (basic and additional error) for two-wire resistance measurement $< \pm 0.1\%$ for ranges other than standard ranges. $< \pm 0.1\%$ for bipolar output.

Reference conditions:

Ambient temperature	23 °C, $\pm 2 \text{ K}$
Power supply	24 V DC $\pm 10\%$ and 230 V AC $\pm 10\%$
Output burden	Current : $0.5 \cdot R_{\text{ext}}$ max. Voltage : $2 \cdot R_{\text{ext}}$ min.

Influencing factors:

Temperature Burden	$< \pm 0.1 \dots 0.15\%$ per 10 K $< \pm 0.1\%$ for current output $< 0.2\%$ for voltage output, providing $R_{\text{ext}} > 2 \cdot R_{\text{ext}}$ min.
Long-time drift	$< \pm 0.3\%$ / 12 months
Switch-on drift	$< \pm 0.5\%$
Common and transverse mode influence	$< \pm 0.2\%$
+ or – output connected to ground:	$< \pm 0.2\%$

Installation data

Housing :	Housing type S17 Refer to Section "Dimensional drawings" for dimensions
Material of housing :	Lexan 940 (polycarbonate). Flammability Class V-0 acc. to UL 94, self-extinguishing, non-dripping, free of halogen
Mounting :	For snapping onto top-hat rail (35 x 15 mm or 35 x 7.5 mm) acc. to EN 50 022or directly onto a wall or panel using the pull-out screw hole brackets
Mounting position :	Any
Terminals :	DIN/VDE 0609 Screw terminals with wire guards for light PVC wiring and max. 2 x 0.75 mm ² or 1 x 2.5 mm ²
Permissible vibrations :	2 g acc. to EN 60 068-2-6 10 ... 150 ... 10 Hz 10 cycles
Shock :	3 x 50g 3 shocks each in 6 directions acc. to EN 60 068-2-27
Weight :	Approx. 0.25 kg
Electrical insulation :	All circuits (measuring input/measuring outputs/power supply/output contact) are electrically insulated. Programming connector and measuring input are connected. The PC is electrically insulated by the programming cable PRKAB 600.
Standards	
Electromagnetic compatibility :	The standards DIN EN 50 081-2 and DIN EN 50 082-2 are observed
Intrinsically safe :	Acc. to DIN EN 50 020: 1996-04
Protection (acc. to IEC 529 resp. EN 60 529) :	Housing IP 40 Terminals IP 20
Electrical design :	Acc. to IEC 1010 resp. EN 61 010
Operating voltages :	Measuring input $< 40 \text{ V}$ Programming connector, measuring outputs $< 25 \text{ V}$ Output contact, power supply $< 250 \text{ V}$
Rated insulation voltages :	Measuring input, programming connector, measuring outputs, output contact, power supply $< 250 \text{ V}$
Pollution degree :	2
Installation category II :	Measuring input, programming connector, measuring outputs, output contact
Installation category III :	Power supply

- Test voltages :
- Measuring input and programming connector to :
- Measuring outputs 2.3 kV, 50 Hz, 1 min.
 - Power supply 3.7 kV 50 Hz, 1 min.
 - Output contact 2.3 kV, 50 Hz, 1 min.
- Measuring outputs to:
- Power supply 3.7 kV, 50 Hz, 1 min.
 - Output contact 2.3 kV, 50 Hz, 1 min.
- Serial interface for the PC to:
- everything else 4 kV, 50 Hz, 1 min. (PRKAB 600)

Ambient conditions

- Commissioning temperature : – 10 to + 55 °C
- Operating temperature : – 25 to + 55 °C
- Storage temperature : – 40 to + 70 °C
- Relative humidity annual mean: ≤ 75% standard climatic rating
 ≤ 95% enhanced climatic rating

Basic configuration

The transmitter Rish Ducer TP - 25K is also available already programmed with a basic configuration which is especially recommended in cases where the programming data is not known at the time of ordering

Rish Ducer TP - 25K supplied as standard versions are programmed for basic configuration (see “Table 5: Standard versions”).

- Basic configuration:
- Measuring input 0...25000Ω
 - connection type : 2-wire
 - Lead resistance : 0Ω
 - Measuring output 0...20 mA linear, fixed value 0% during 5 s after switching on
 - Open- circuit supervision inactive
 - Mains ripple suppression 50Hz
 - Limit functions inactive.

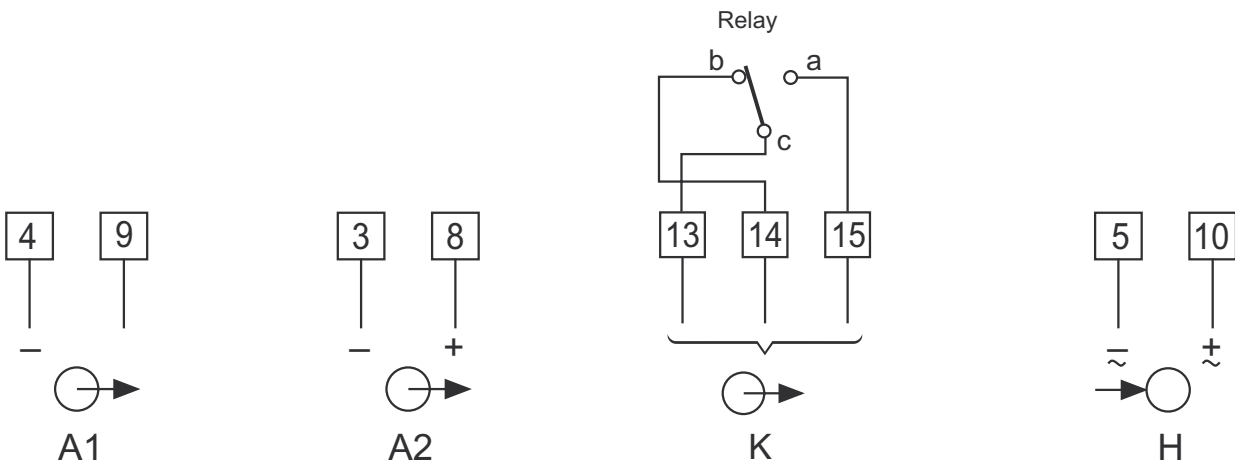
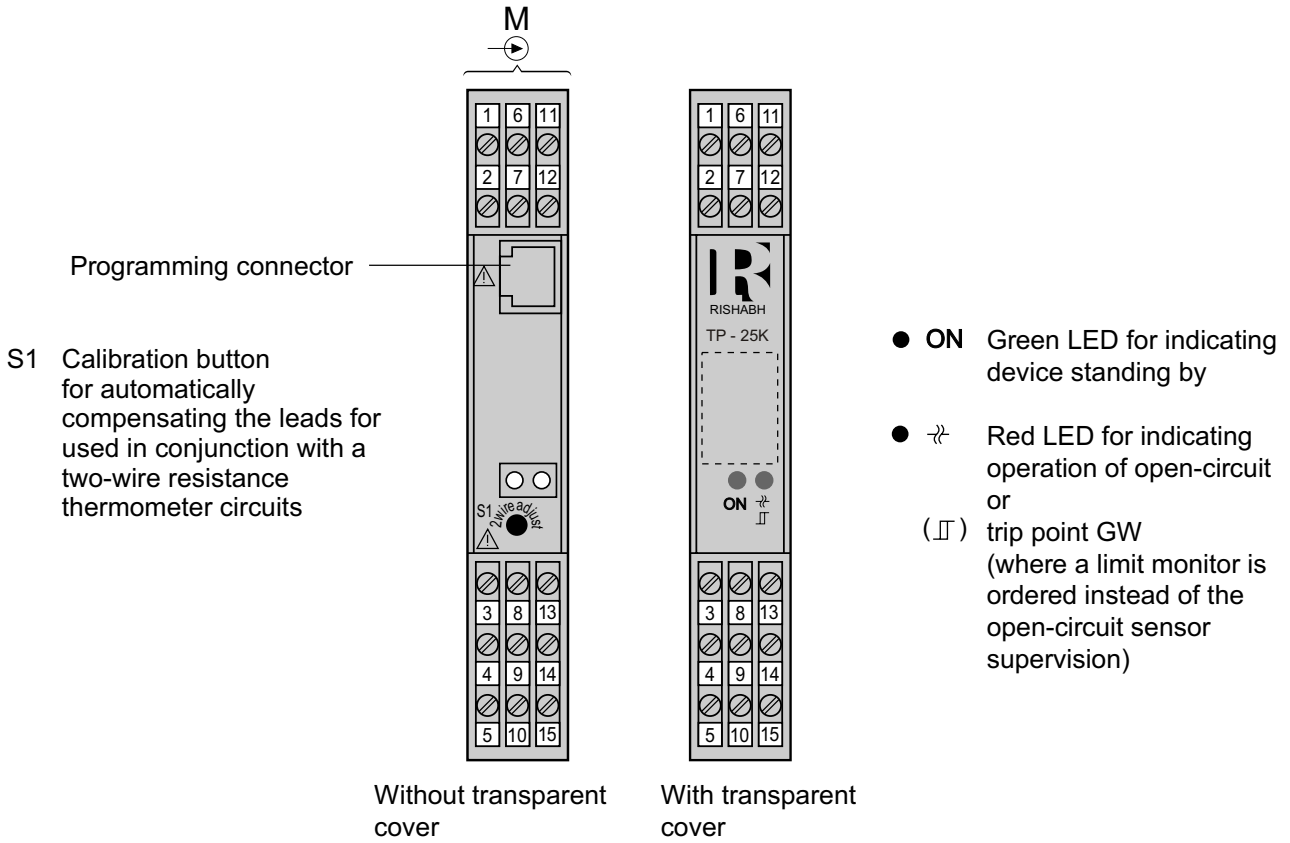
Table 5: Standard versions (Ordering Information)

The following 4 transmitter versions are already programmed for basic configuration and are available as standard versions. It is only necessary to quote the Order No.:

Power supply	Order Code	Product code
24... 60 V DC / AC	TP - 25K-312	P3150091RIS
85...230 V DC / AC	TP - 25K322	P3150092RIS

Electrical connections

Front



Energised: a – c
De-energised: b – c

- M = Measured variable / measuring input,
Terminal allocation acc. to the measuring mode and application see "Table 1: Measuring input"
- A1 = Output signal / measuring output
- A2 = 2nd output (field indicator)
- K = Output contact for open-circuit sensor supervision or for monitoring a limit GW
- H = Power supply

Table 6: Connection Diagram

Measurement	Measuring range limits	Measuring span	No.	Wiring diagram Terminal arrangement
Resistance Measurement two-wire connection	0... 3700 Ω / 0...25000 Ω	75... 3700Ω / 500...25000Ω	1	
Resistance Measurement three-wire connection	0... 3700 Ω / 0...25000 Ω	75... 3700Ω 500...25000Ω	2	
Resistance Measurement four-wire connection	0... 3700 Ω / 0...25000 Ω	75... 3700Ω 500...25000Ω	3	
Resistance Transmitter WF	0... 3700 Ω / 0...25000 Ω	75... 3700Ω 500...25000Ω	4	
Resistance Transmitter WF DIN	0... 3700 Ω / 0...25000 Ω	75... 3700Ω 500...25000Ω	5	

Dimensional Drawings

All Dimensions are in mm

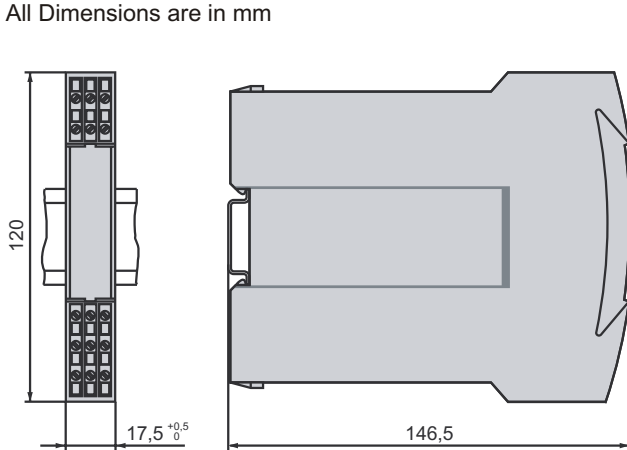


Fig. 5. Rish Ducer TP - 25K in housing S17 clipped onto a top-hat rail (35 × 15 mm or 35 × 7.5 mm, acc. to EN 50 022).

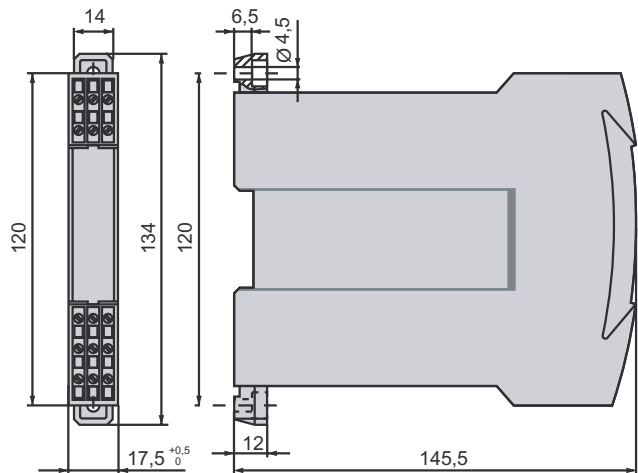


Fig. 6. Rish Ducer TP - 25K in housing S17 with the screw hole brackets pulled out for wall mounting.

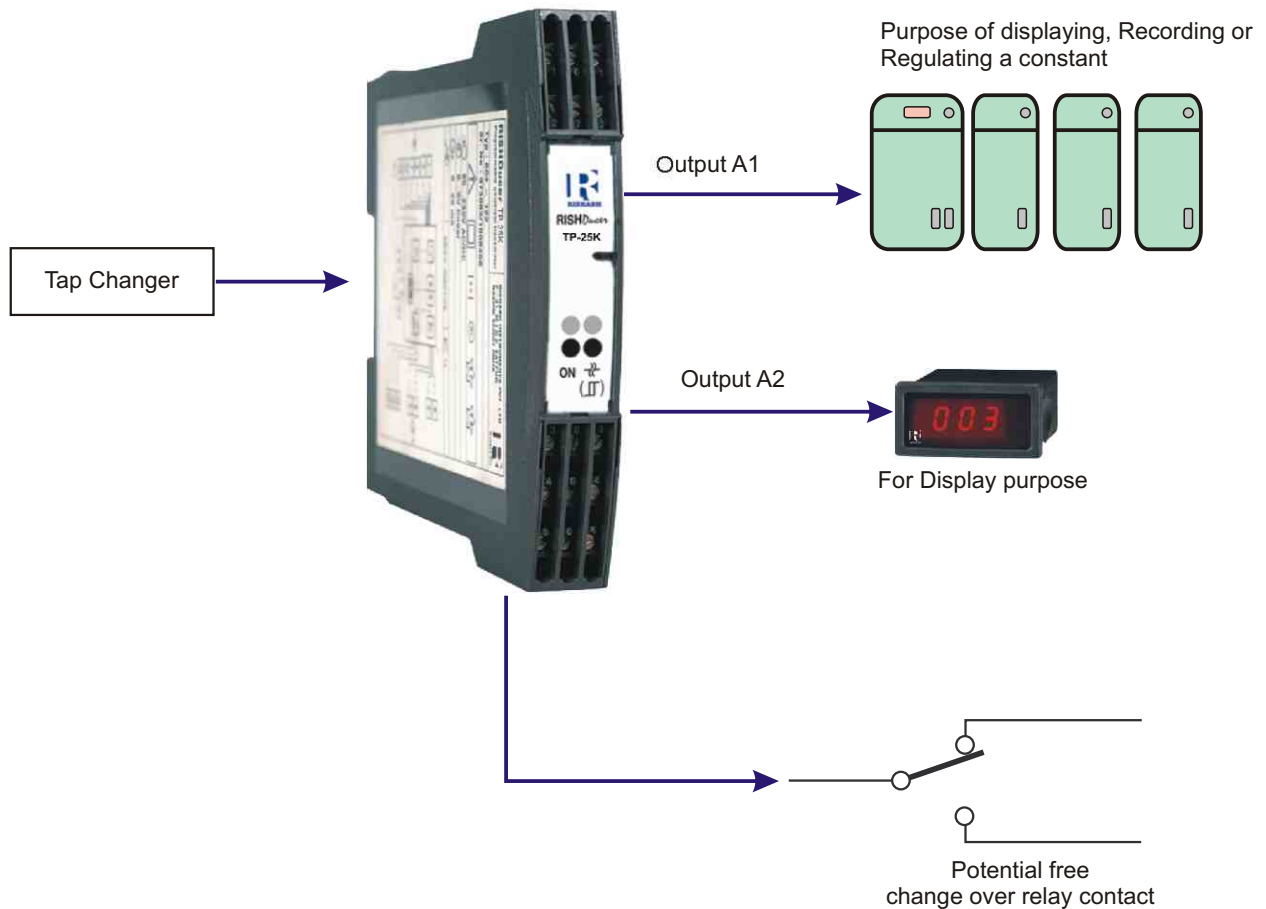
Table 7: Accessories and spare parts

Description	Product code
Programming cable PRKAB 600	P3150090RIS
Ancillary cable for RishDucer TP - 25K	-
Configuration Software for RishDucer TP - 25K Windows 98 and XP	-
Pull-out handle (for removing device from its housing)	-
Front label (behind transparent cover)	-
Inscription label (green, for recording programmed settings)	-
Operating Instructions TP - 25K	-

Standard accessories

- 1 Operating Instructions : English
- 2 Inscription labels (green, for recording programmed settings)
- 2 Pull-out handle (for removing device from its housing)
- 1 Front labels (behind transparent cover)

Application Block Diagram



RISHABH
INSTRUMENTS
Measure, Control & Record with a Difference

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