

Single-Component Force Transmitter Type 9602AA...

with Integrated Electronics

Piezoelectric force transmitter for measuring and monitoring quasistatic and dynamic forces in industrial manufacturing processes.

- Sensor with integrated charge amplifier electronics
- Wide measuring range adjustable by remote control (cable connection) to ± 10 V FS
- Two switchable measuring ranges (1:5)
- Rugged, sealed case (IP67 and IP68), suitable for applications in harsh industrial environments.
- Low-impedance signal transmission; no high-insulation connecting cable necessary.

Description

The force to be measured is transferred through the cover and base of the seal-welded steel case onto the quartz sensor elements. These quartz elements produce an electrical charge proportional to the mechanical load.

The electronic circuitry integrated in the force transmitter processes the charge to produce an analog voltage signal of $0 \dots \pm 10$ V FS. The transmitter measuring range can be adjusted by remote control. In addition, the integrated electronics allow the range to be switched between 100 % FS and 10 % FS including during a measuring cycle.

The industrial design of the transmitter enables it to be used in dirty and damp environments. Low-impedance connecting cables simplify signal transmission to the machine control system.

Applications

Applications for the force transmitters include the following:

Production Engineering

- Force measurement in metal-cutting machine tools. Process monitoring of tool breakage, wear or collision.
- Measurement of forces on presses and forming machines.
- Optimization of joining methods. Quality control in presswork, joining of plates or in assembly operations.

General Force Measurement

- Force transmitter in combination with the RCM monitor Type 5825A1: mobile measuring system for checking process forces on site.



Technical Data

Measuring range (transmitter preloaded)		
Measuring range I	kN	0 ... 25
Measuring range II	kN	0 ... 5
Measuring range for ± 10 V output voltage adjustable within		
Measuring range I	kN	$\approx 2,5 \dots 25$
Measuring range II	kN	$\approx 0,5 \dots 5$
Overload, measuring range I	kN	30
Preloading force	kN	5
Sensitivity, nominal		
Measuring range I	mV/N	0,4 ... 4
Measuring range II	mV/N	2 ... 20
Adjustment error		
Measuring range I	%	± 5
Measuring range II	%	± 5
Measuring range, adjusted (delivery)		
Measuring range I	kN	$25 \pm 1,5$
Linearity, F_z	%/FSO	$\pm \approx 1$
Operating temperature range	$^{\circ}\text{C}$	0 ... 60
Temperature (min./max.)	$^{\circ}\text{C}$	-10/70
Shock resistance (1 ms)	g	200
Weight	g	30
Connector	8-pole pos.	M12
Degree of protection	EN60529	IP67/IP68
(with cable connected)		

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Electronics

Output voltage	V	±10
Output voltage offset	mV	<±15
Output current	mA	<±1
Output impedance	Ω	≈10
Noise voltage (ca. 0 ... 1 kHz)		
Measuring range I	mV _{pp}	<10
Measuring range II	mV _{pp}	<25
Drift		
Measuring range I	mV/s	<±0,055
Measuring range II	mV/s	<±0,275
Reset/Operate transition		
Measuring range I	mV	<±2,1
Measuring range II	mV	<±10,5
Reset time	ms	ca. 5
Time constant		long
Supply voltage	VDC	18 ... 30
Supply current	mA	<20
Frequency range (-3 dB)	kHz	0 ... 10

Control Signals

Choose measuring range			
Measuring range I	or open	VDC	2,4 ... 30
Measuring range II		VDC	0 ... 0,8
Delay time		ms	<2
Measure (Pin 3)			
active (Operate)		V	0 ... 0,8 (or GND)
inactive (Reset)		V	2,4 ... 30 (or open)
Delay time (Reset/Operate)		ms	<2
Measuring range adjustment (see page 5)			
Pin 4 R_/CS			
Pin 6 R_U/D			
Pin 7 R_/INC			
High level (default) (1)		V	2,4 ... 30
Low level (active) (0)		V	0 ... 0,8
Rise/fall time		μs	<500
Storage time		ms	>20
Cycle time		μs	>100

Block Schematic Diagram: Single-Component Force Transmitter Type 9602AA...

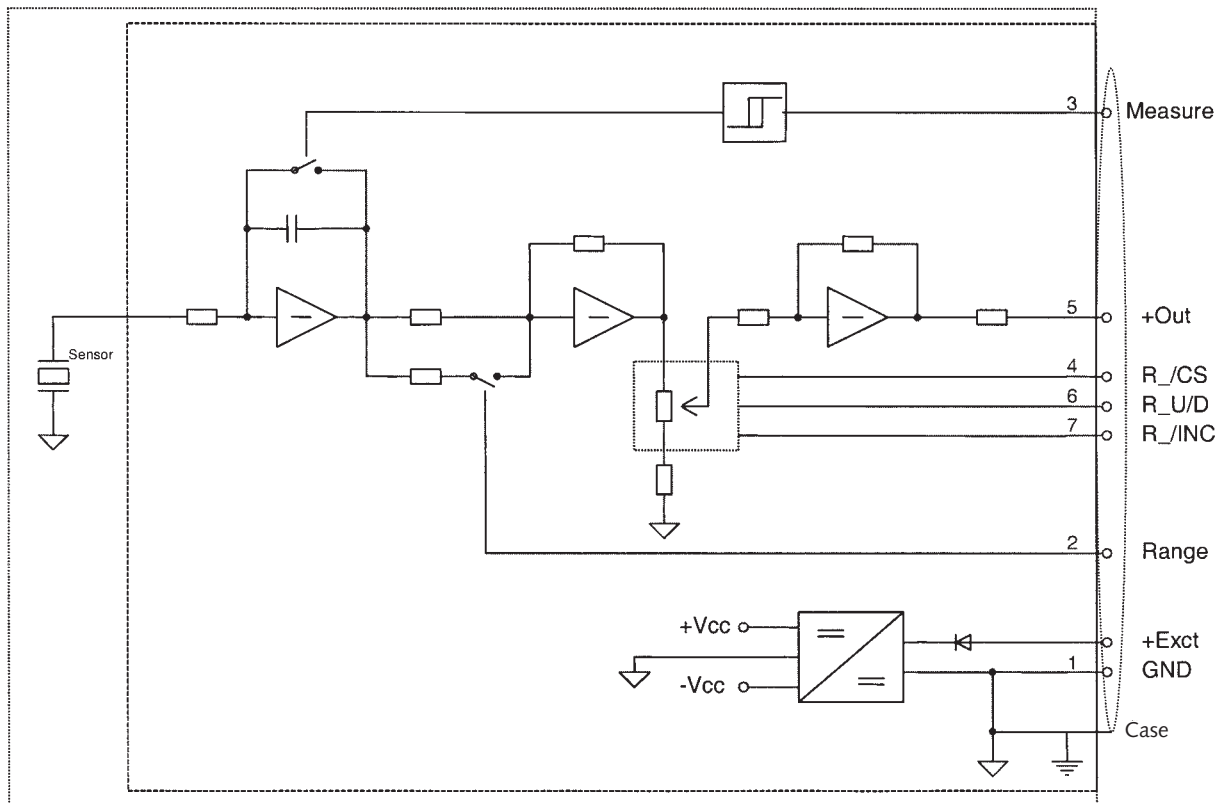


Fig. 1: Block schematic diagram: single-component force transmitter Type 9602AA...

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Dimensions

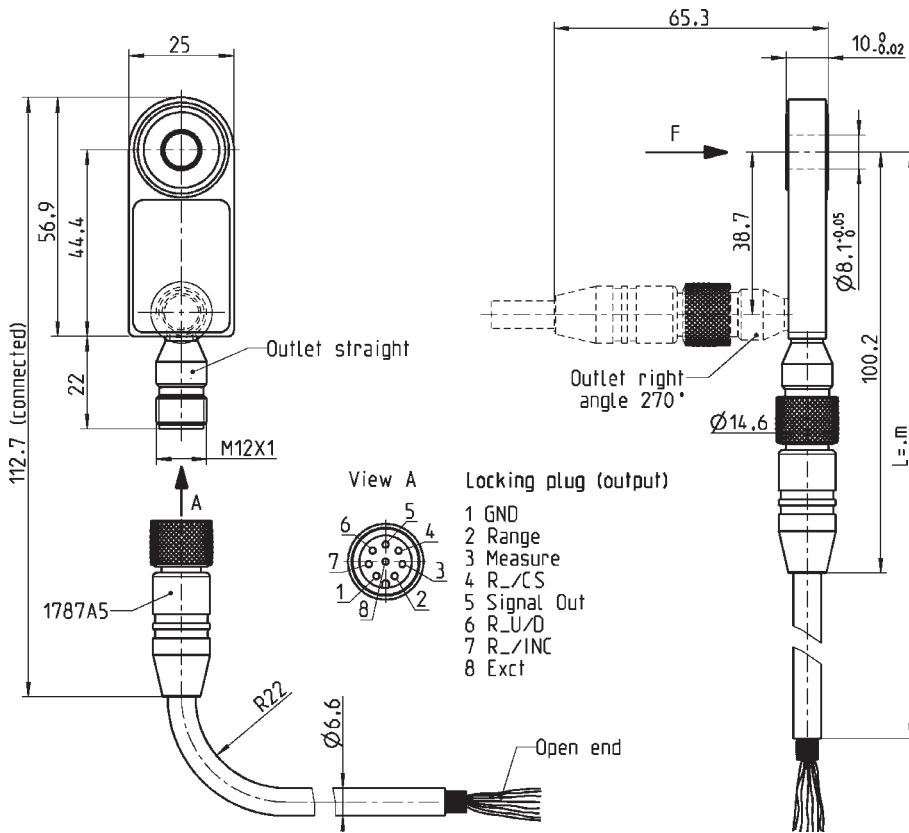


Fig. 2: Force transmitter Type 9602AA10, version with straight connector outlet

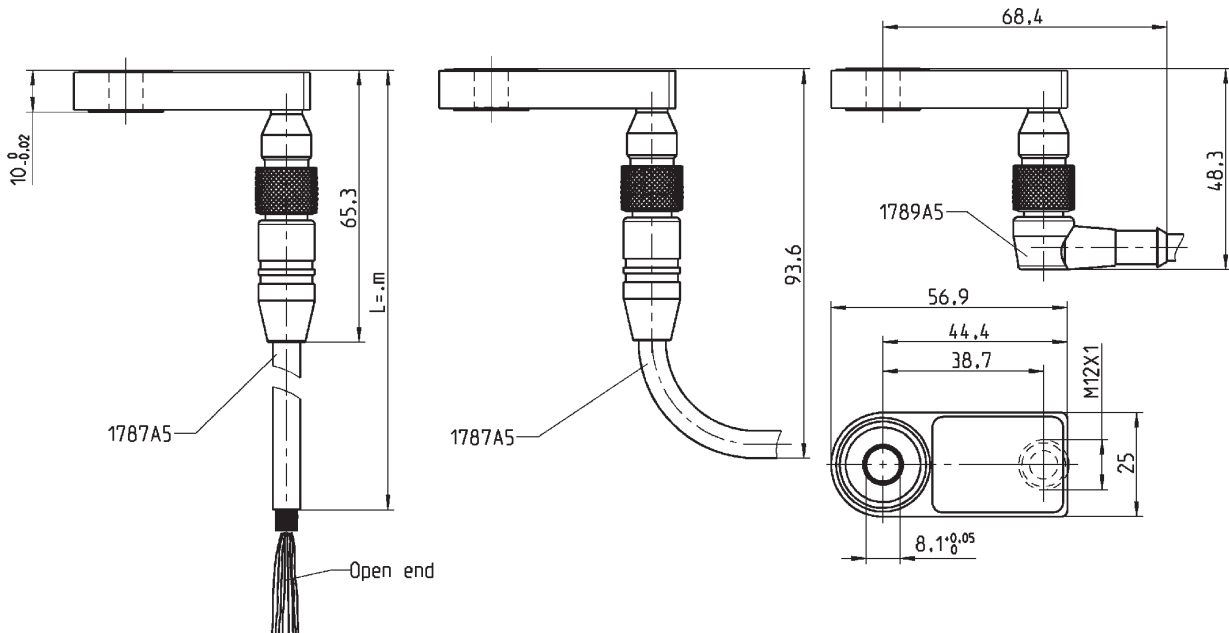


Fig. 3: Force transmitter Type 9602AA11, version with right-angled connector outlet

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Actuation – Measuring Principle

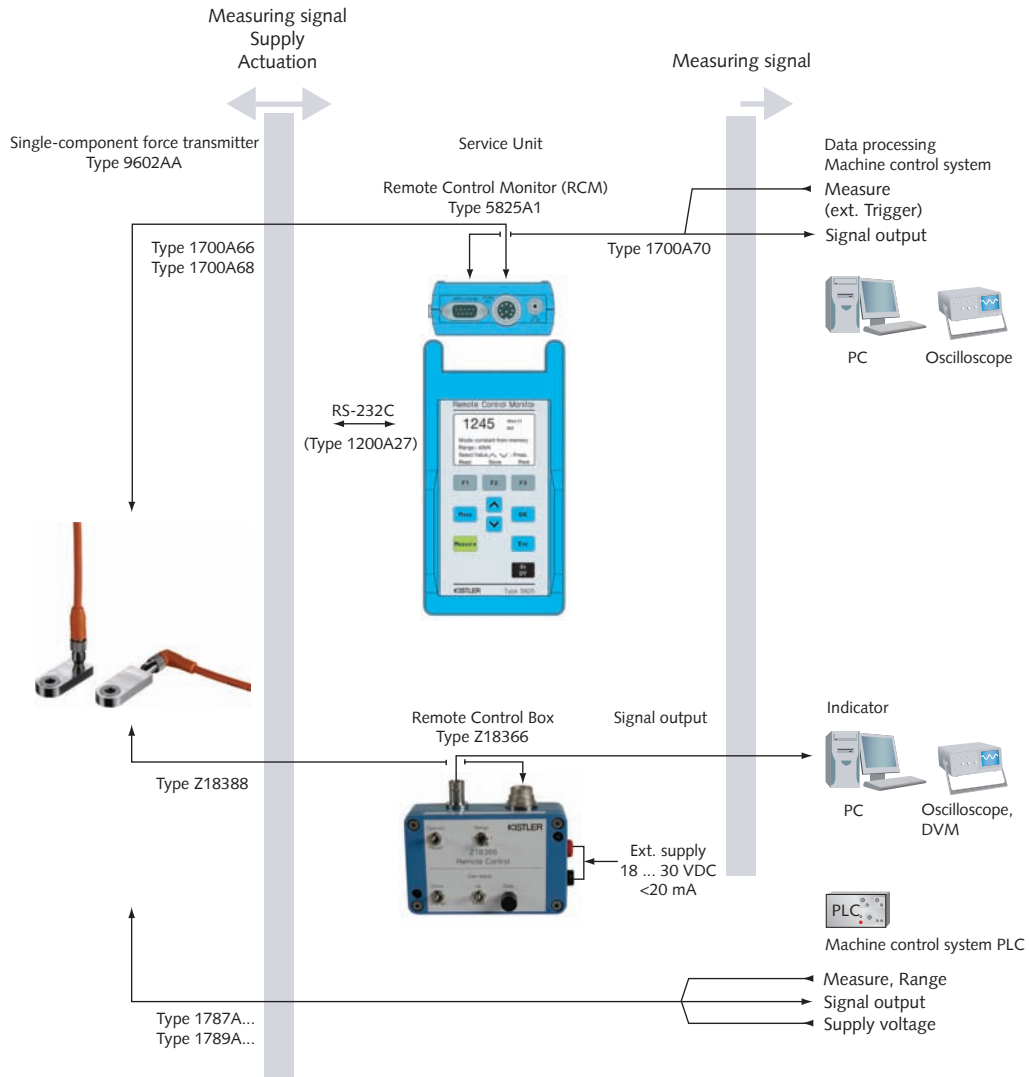


Fig. 4: Actuation – Measuring principle single component force transmitter Type 9602AA...

Output Connector Detail

Cables Types 1787A... and 1789A... are furnished with 8-pin LUMBERG connector.

Pin Allocation

View A



Wire Colors

1 GND	white
2 Range	brown
3 Measure	green
4 R_/CS	yellow
5 Signal Out	gray
6 R_U/D	pink
7 R_/INC	blue
8 Exct	red

Installation

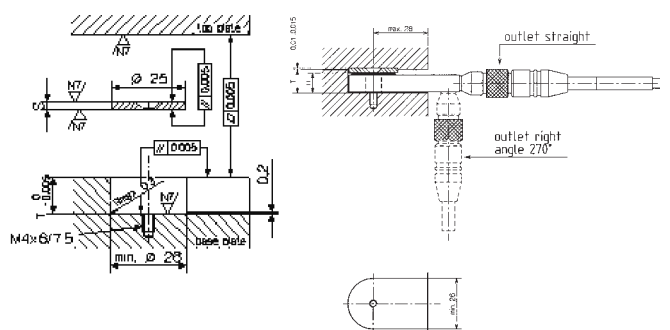


Fig. 5: Installation of single-component force transmitter Type 9602AA...

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Measuring Range Adjustment

The optimum measuring range of the transmitter can be set by actuating the integrated electronics. The adjustment is made with a service unit or directly by the machine control system PLC.

The entire range of measuring range I: 25 kN \approx 10 V and measuring range II: 5 kN \approx 10 V can be adjusted with an electronic potentiometer in a hundred steps (0 to 99) to a specific value or signal characteristic. The relationship between the number of steps (Step xx) and the associated measuring range (N) is illustrated below. When the transmitter is adjusted to a desired measuring range, the setting remains stored in the integrated charge amplifier electronics.

Relationship between Step Number (Step, Setting Level) and Measuring Range

Measuring range [N]		Step Number	
Range I	Range II	Step	Tolerance
25 000	5 000	1	+2/-1
22 500	4 500	2	\pm 2
20 000	4 000	3	\pm 2
17 500	3 500	5	\pm 2
15 000	3 000	8	\pm 2
12 500	2 500	11	\pm 3
10 000	2 000	14	\pm 4
7 500	1 500	23	\pm 5
5 000	1 000	40	\pm 8
2 500	500	88	\pm 11

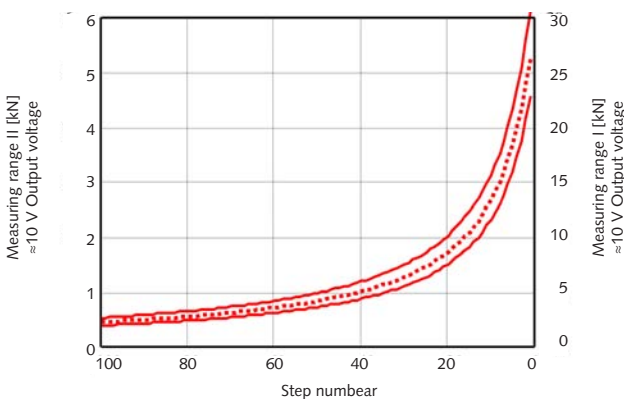


Fig. 6: Relationship between measuring range (kN) and step number for output signal \approx 10 V FS

The Preset Measuring Range (FSP)

The force transmitters of Type series 9602AA... are preset to a value of measuring range I: 25 kN \approx 10 V. Kistler makes this setting in the factory. The set measuring ranges can be checked by means of a calibration.

Setting any Measuring Range (FSA)

To change this setting, the corresponding signals must be actuated at pin positions 4, 6 and 7. The measuring range adjustment can be made in two ways:

1. Setting the Measuring Range with a Known Setting of the Electronic Potentiometer

The measuring range can be set or adjusted by adjusting the step position (raising or lowering). If the step number (Step) and thus the set measuring range is known, the newly set measuring range can be determined as a recommended value from the table on page 5 or Fig. 6.

Example

Previous value set:

Measuring range I = 25 kN \approx 10 V \approx Step 1 (+2/-1)

Correction by +7 steps

New value set:

Measuring range I = 15 kN \approx 10 V \approx Step 8

2. Setting the Measuring Range with an Unknown Setting of the Electronic Potentiometer

If you want to reset an accurate step position or measuring range (kN), the step number must first be set to "Step 0" (largest measuring range, transmitter at its most insensitive). The desired measuring range can now be set and then saved from the new basis (Step 0).

The storage process retains the set position of the electronic potentiometer. The step number or the set measuring range must be documented by the user, if so desired.

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Remote Control Box Type Z18366

Service unit for on-site transmitter adjustment

- Transmitter actuation (Reset-Operate, setting functions for measuring range adjustment, switching measuring ranges I and II)
- Analog output, measuring signal
- External power supply required (18 ... 30 V DC, 20 mA)



Fig. 7: Remote Control Box Type Z18366

Remote Control Monitor (RCM) Type 5825A1

Battery-operated service unit for on-site transmitter adjustment

- Transmitter actuation (supply, measuring mode, setting functions for measuring range adjustment, switching measuring ranges I and II)
- Display, indication of the set data and measuring data.
- RS-232C, record of the transmitter settings
- External trigger connection
- Analog outputs for trigger signal and measuring signal
- Power pack for external power supply



Fig. 8: Remote Control Monitor (RCM) Type 5825A1

Included Accessories

- None

Optional Accessories

- | | |
|------------------------------|------|
| • Preloading key | 9463 |
| • Preloading disk with screw | 9408 |
| • Preloading set | 9461 |

Connecting cable for transmitter actuation

8-pole for connection to monitor Type 5825A1:

- | | |
|---|---------|
| • Connecting cable, M12 8-pole connector, straight, l = 2 m | 1700A66 |
| • Connecting cable, M12 8-pole connector, right-angled, l = 2 m | 1700A68 |

Cable for connection to Remote Control Box Type Z18366:

- | | |
|---|--------|
| • Connecting cable, M12 8-pole connector, straight, l = 2 m | Z18388 |
|---|--------|

8-pole cable for connection to PLC:

- | | |
|--|---------|
| • Connecting cable, M12 8-pole connector, straight, open cable end, l = 5 m | 1787A5 |
| • Connecting cable, M12 8-pole connector, straight, open cable end, l = 20 m | 1787A20 |
| • Connecting cable, M12 8-pole connector, right-angled, open cable end, l = 5 m | 1789A5 |
| • Connecting cable, M12 8-pole connector, right-angled, open cable end, l = 20 m | 1789A20 |

Ordering Key

Force transmitter with straight connector outlet	10
Force transmitter with right-angled connector outlet	11

Type 9602AA



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