

# Welding Force Test Transmitter

Type 9833C...

## Measuring of Electrode Force in Spot Welding Machines

The force transmitter is designed to measure the contact force generated between the electrodes during a spot welding operation.

- The welding process can be kept at a constant high quality by periodical testing of the electrode forces
- Optimization of welding tong life and servicing intervals
- The joining process can be regularly documented for audit purposes

### Description

It consists of a quartz force sensor with an integrated charge amplifier built into the housing. The sensor is positioned between the electrodes as the load, but no weld current, is applied. The sensor output then shows the shape of the loading curve produced, during the spot welding operation. This information can then be used to optimize the process.

The charge amplifier circuitry integrated in the sensor supplies an output signal of  $\pm 5$  V proportional to the force.

- Minimum electrode spacing of only 6,2 mm at Type 9833C1.../C2... (electrode shape Type F,  $\varnothing 13$  mm); at Type 9833C3... electrode spacing of 14,5 mm
- Calibrated sensor, no uniform sensitivity
- The charge amplifier is not calibrated. Its nominal output voltage is  $\pm 5$  V
- Non-ground insulated sensor construction
- Switched measuring ranges
  - Type 9833C1.../C2...  
Range I: 100 % FS, Range II: 20 % FS
  - Type 9833C3...  
Range I: 100 % FS, Range II: 40 % FS
- Transmitter is mounted on damping elements
- High repeatability accuracy. Tapered receptacle on the sensor optimizes the introduction of the electrode force



Type 9833C10



Type 9833C21



Type 9833C31

### Application

Periodic testing of the electrode closing force. The process is briefly interrupted for this purpose. The welding robot then carries out a servicing program which, in addition to other operations, also tests the electrode force. The tapered receptacle on the sensor assists optimum centering and the introduction of the electrode force to the measuring element.

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### Technical Data

Sensor	Type		9833C1...	9833C2...	9833C3...
Measuring range I	F <sub>z</sub>	kN	0 ... 5	0 ... 10	0 ... 25
Measuring range II	F <sub>z</sub>	kN	0 ... 1	0 ... 5	0 ... 10
Overload measuring range I	F <sub>z</sub>	kN	0 ... 12	0 ... 12	0 ... 30
Calibrated range I	F <sub>z</sub>	kN	0 ... 5	0 ... 10	0 ... 25
Calibrated range II	F <sub>z</sub>	kN	0 ... 1	0 ... 5	0 ... 10
Response threshold		N	≤0,01	≤0,01	≤0,01
Sensitivity, nominal,*					
Measuring range I	F <sub>z</sub>	mV/N	≈1	≈0,5	≈0,2
Measuring range II	F <sub>z</sub>	mV/N	≈5	≈1	≈0,5
Linearity	F <sub>z</sub>	%/FSO	≤±1	≤±1	≤±1,5
Operating temperature range		°C	0 ... 60	0 ... 60	0 ... 60
Temperature (min./max.)		°C	-10/70	-10/70	-10/70
Weight		g	280	280	280
Connector		5-pole pos.	M12	M12	M12
Degree of protection (with connected cable)		EN60529	IP67	IP67	IP67

### Electronics

Output voltage		VDC	±5	±5	±5
Output voltage offset		mV	<±15	<±15	<±15
Output current		mA	<±1	<±1	<±1
Output impedance		Ω	≈100	≈100	≈100
Noise impedance (ca. 0 ... 1 kHz)		mV <sub>pp</sub>	<2	<2	<2
Drift					
Measuring range I		mV/s	<±0,015	<±0,008	<±0,003
Measuring range II		mV/s	<±0,075	<±0,015	<±0,008
Reset-Operate transition					
Measuring range I		mV/s	<±0,6	<±0,3	<±0,12
Measuring range II		mV/s	<±3	<±0,6	<±0,3
Reset time		ms	ca. 1	ca. 5	ca. 10
Time constant			long	long	long
Supply voltage		VDC	11 ... 30	11 ... 30	11 ... 30
Supply current		mA	<8	<8	<8

### Control Signals

Reset	open or	VDC	0 ... 1	0 ... 1	0 ... 1
Operate		VDC	3 ... 30	3 ... 30	3 ... 30
Range measuring range I	open or	VDC	6 ... 30	6 ... 30	6 ... 30
Range measuring range II		VDC	0 ... 1	0 ... 1	0 ... 1
Shock resistance (1 ms)		g	200	200	200

\* measured with Type F electrodes ø16 mm, no uniform sensitivity.  
 The calibrated sensitivity is within the range of ±10 % of the nominal sensitivity.

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**Installation (Mounting Example)**

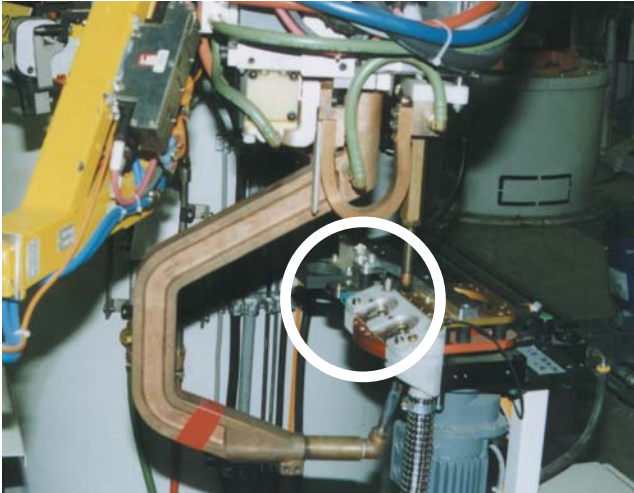


Fig. 1: Measure- and machining post for welding electrodes

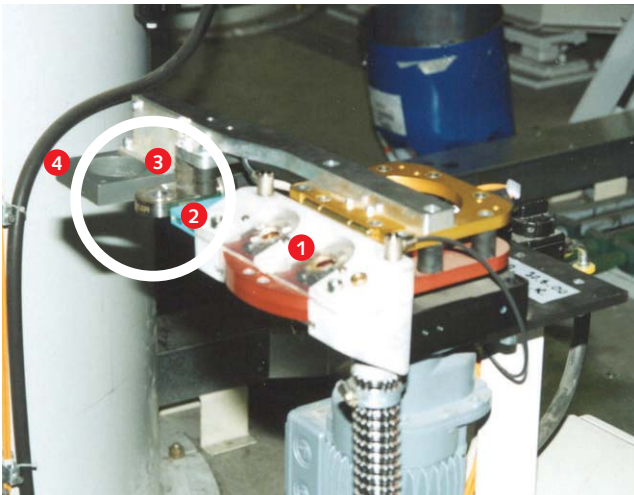


Fig. 2: Test transmitter installed in servicing station

- Example of a servicing station for robot welding tongs:
- 1 Cap milling cutter (for tapered shape and domed surface)
  - 2 Visual dimension check
  - 3 Testing the electrode closing force (Kistler)
  - 4 Measuring the welding current

**Dimensions**

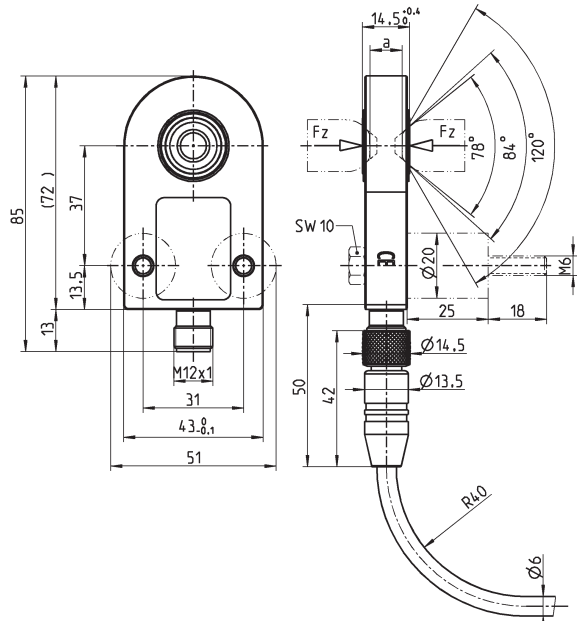


Fig. 3: Dimensions welding force test transmitter Type 9833C1.../C2...

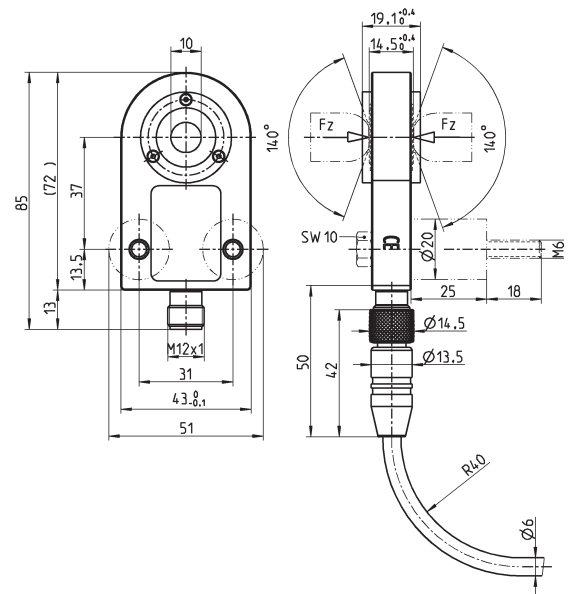
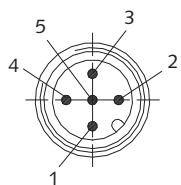


Fig. 4: Dimensions welding force test transmitter Type 9833C3...

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View A

- |   |                           |
|---|---------------------------|
| 1 | Exct +11 ... 30 VDC       |
| 2 | Operate                   |
| 3 | Exct/Signal GND           |
| 4 | Output                    |
| 5 | Range                     |
|   | Shield (also as Exct GND) |

**Colors of Connecting Cable Type 1785A...**

- brown
- white
- blue
- black
- gray

Fig. 5: Pin allocation welding force test transmitter Type 9833C...

### Electrode Shapes

The test sensor can be used for different electrodes in the diameter range of 13 ... 16 mm. The shape of the electrode defines the minimum electrode spacing (a) during the measuring cycle.

Electrode Shape (E-caps according to ISO 5821)	Electrodes outer $\varnothing$ d1	Electrodes outer $\varnothing$ d2	R1	Electrode spacing a between 2 identical electrode caps	
				Type 9833C1.../C2...	Type 9833C3...
	mm	mm	mm	mm	mm
	13	5	32	6,2	14,5
	16	6	40	7,3	14,5
	13	5	32	8,9	14,5
	16	6	40	9,4	14,5
	13	5	32	8,1	14,5
	16	6	40	9,3	14,5

### Optional Accessories

- Connecting cable  
5-lead PUR cable, connector M12x1,  
cable length 10 m, open cable end
- Monitor  
Mobile indicator for measurands T  
(subscript: instant) and F (subscript: Peak)
- Connecting cable  
Connection of transmitter Type 9833C...  
to Monitor Type 5825A1 or Type 5825A2,  
cable length 2 m

**Type/Art. No.**  
1785A10

5825A1

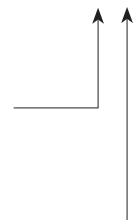
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### Ordering Key

Measuring range 5 kN	1
Measuring range 10 kN	2
Measuring range 25 kN	3

Transmitter without accessories	0
Transmitter with fitted damping elements	1

Type 9833C



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