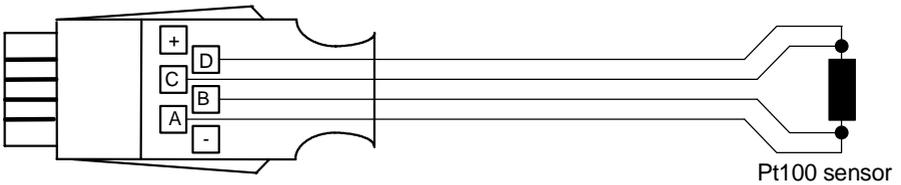


### 4.1.2 Connection of Resistor-based Sensors

Pre-programmed connectors ZA 9030-FS1,2,3 are available for existing Pt100 or Ni100 sensors. Resistances up to 500 Ohm are connected using the connector ZA 9003-FS in four-conductor circuit or in two-conductor circuit with bridges A-B and C-D. The connectors ZA9030-FS4,5,6 and ZA9003-FS2 (change-over to 1/10 measuring current with element flag) are available for Pt1000 or Ni1000 sensors and for the 5000 Ohm measuring range. (see 6.10.3)

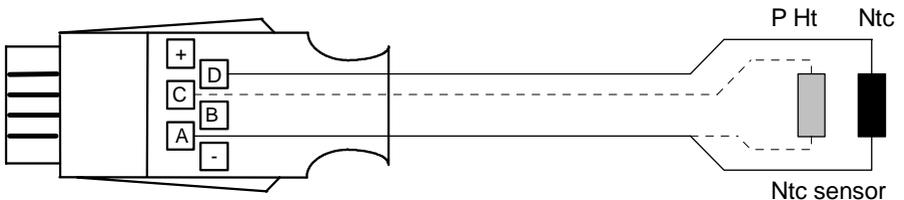
**Ranges:** Pt100-1, Pt100-2, Ni100, Ohm



### 4.1.3 Connection of Ntc Sensors

The Ntc sensors FN Axxx Typ N or corresponding Ntc's (10kW at 25°C) are connected to the connector ZA 9040-FS, as follows: When the measuring range 'humid temperature' or a multiplexer change-over (see 6.10.2) is used, a second sensor can be measured on the 2nd channel (connector for 2 Ntc sensors ZA 9040-FS2).

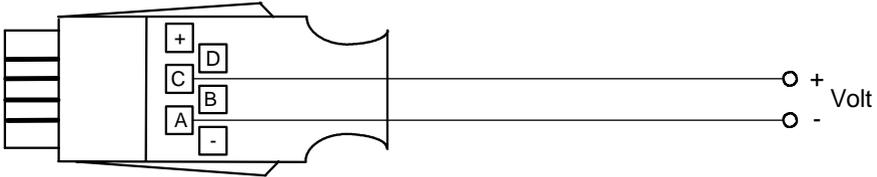
**Ranges:** Ntc, Wet Bulb Temperature P HT



### 4.1.4 Voltage Measurements

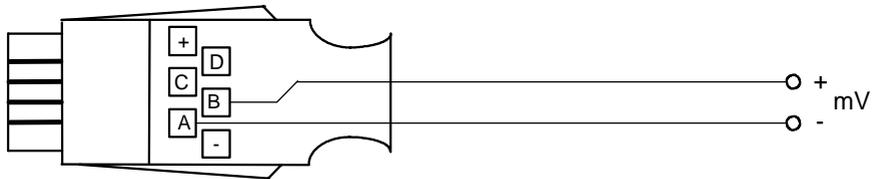
The standard connector ZA 9000-FS is used for voltage measurements in the range  $\pm 2.6V$ .

**Ranges:** 2.6V



ALMEMO® connectors ZA 9000-FS0 (55mV), -FS1 (26mV), -FS2 (260mV)

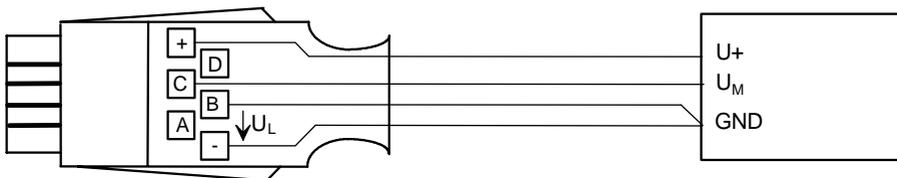
**Ranges:** 26mV, 55mV, 260mV



### 4.1.5 Differential Voltage Measurement for Sensors with Supply

To eliminate the voltage drop  $U_L$  on the ground wire a differential voltage measurement is advisable, particularly for sensors and transmitters (e.g. pressure sensors) that are supplied from the instrument. The connectors ZA 9000-FS0D, FS1D, FS2D or FS3D in 4-conductor circuit are used to connect the sensor and the output signal  $U_M$  is directly tapped through the differential input pins C and B. For signals with high common-mode portion (measuring bridges) the connector ZA 9650-FS must be used (see 4.2.5), in case of a higher supply voltage the ZA 960x-FSxV12 must be used (see 4.2.6).

**Applications:** Differential voltage 26 mV, 55 mV, 260 mV, 2.6 V



### 4.1.6 ALMEMO® Adapter Cable ZA 9000-AK

The ALMEMO® Universal Connector ZA 9000-FS is also available with connecting cable and free ends as an adapter cable ZA 9000-AK.

Sensor supply: All ALMEMO® connectors with screw terminals provide the option

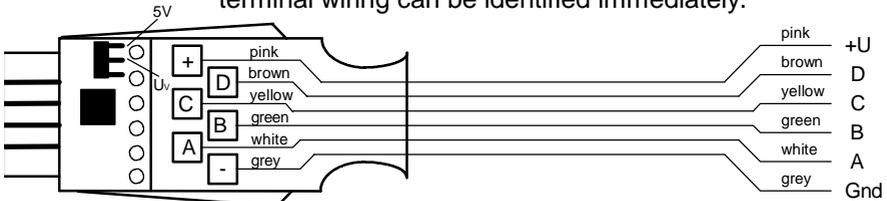
to set the voltage +U by means of two solder straps:

$U_v$  corresponds to the supply voltage of the device (factory setting),

5V is the regulated voltage of the ALMEMO® connector, power-handling capacity: max. 50mA

Connecting cable: 8-wire 8x0.09 mm<sup>2</sup> black, length 1.5 m

The wiring diagram and the colour coding of the wires is the same for all ALMEMO® sensors and cables, therefore, any terminal wiring can be identified immediately.

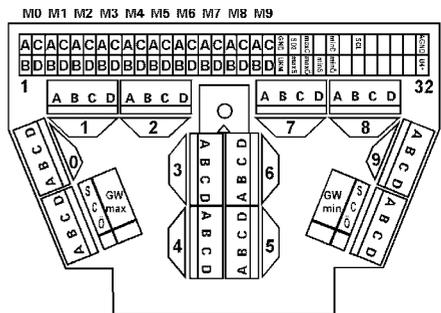


### 4.1.7 ALMEMO® 10-fold MU connector ZA5590MU

For ALMEMO® 5990 measuring systems there is (as an alternative to the plug-in boards for individual ALMEMO® plugs) the plug-in board ES5590G3 or ES5590MU with 10 inputs connected via a 64-pin socket strip. The sensors are connected via a 10-fold connector (ZA5590-MU) each with four screw terminals A, B, C, D - in the same way as individual ALMEMO® standard connectors ZA9000FS (see 4.1.1 to 4.1.4). Double sensors and sensors requiring a

power supply or an ALMEMO® connector with special interface circuitry (e.g. humidity sensors, rotating vanes, etc.) cannot be connected in this way. There are always only 10 channels available - irrespective of how the number of channels is configured. All sensors can be programmed individually but their programming data is all saved together in a common EEPROM located in the connector. Two limit value relays, operating separately for maximum and minimum, are already incorporated on the board / card; these relays can be contacted via the MU connector.

**Ranges:** NiCr-Ni, Fe-CuNi (L,J), Cu-CuNi (U,T), PtRh-Pt (S,R,B), AuFe-Cr, Pt100-1, Pt100-2, Ni100, Ohm, Ntc, 2,6V, 26 mV, 55 mV, 260 mV



## 4.2 Special Connectors

### 4.2.1 Thermo Connectors for Thermocouples

For the most popular NiCrNi or NiSiI thermocouples are available follow free from thermoelectric force ALMEMO® connectors.

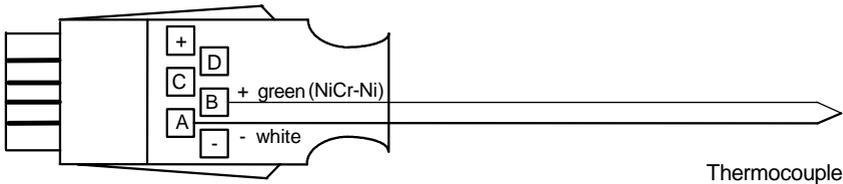
ZA 9020-FS for NiCr-Ni (K) und NiSiI (N)

ZA 9021-FSL for Fe-CuNi (L)

ZA 9021-FSJ for Fe-CuNi (J)

ZA 9021-FST for Cu-CuNi (T)

**Ranges:** NiCr-Ni (K), NiSiI (N), Fe-CuNi (L,J) Cu-CuNi (T)



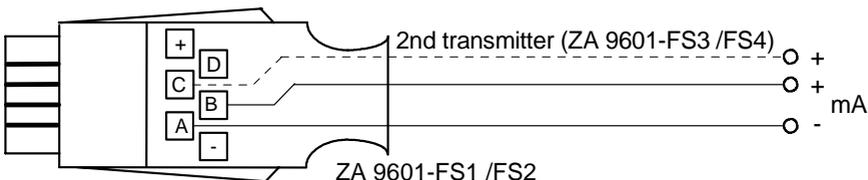
For especially exacting measuring operations, requiring a high level of precision, using several sensors, and performed under relatively unfavorable conditions (e.g. subject to thermal irradiation), the ALMEMO® ZA 9040-FSx connector is available, with its own integrated temperature sensor for cold junction compensation. This connector is suitable for all types of thermocouple but it needs two channels. Having "#J" programmed in the first two positions in the comments for the thermocouple ensures that the temperature sensor integrated in the connector is indeed used for cold junction compensation.

For temperature measurement with NiCr-Ni at high voltage potential the electrically isolated measuring module ZA9920AB is available; (see 4.2.8.3).

### 4.2.2 Shunt Connectors for Current Measurements

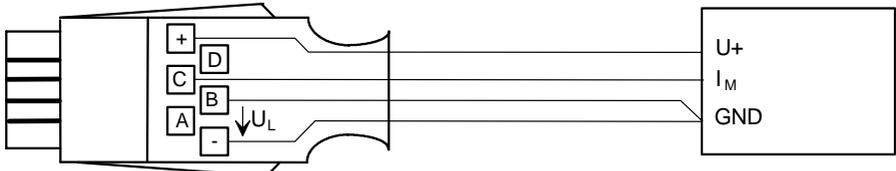
For current measurements in the range of  $\pm 32\text{mA}$  a connector ZA 9601-FS1 or in the range 0-100% (4-20mA) a connector ZA 9601-FS2 with an integrated shunt of 2 ohms is required, which has already been aligned in the factory. Alternatively, it is possible to use a standard connector with a 2W shunt 0.1% externally connected to the screw terminals A and B. If 2 current signals have a common ground it is possible to use one connector ZA 9601-FS3 or -FS4 to acquire both signals.

**Applications:** Milliamper, Percent (4-20mA)

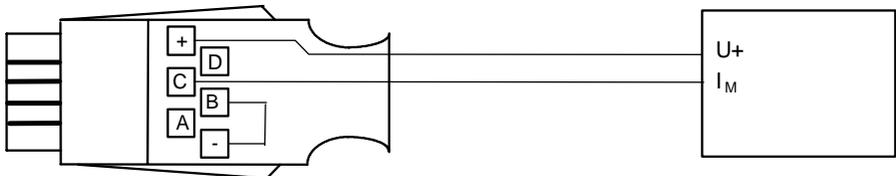


### Connectors for Sensors with Supply from the Device (7..9V):

If sensors with a current output are supplied from the device, the problem with a voltage drop on the ground wire is worse than with sensors with a voltage output (see 4.1.5). The problem can be solved in a similar way, but it requires a connector ZA9601-FS5 or FS6 with a shunt between C and B and a change of the multiplexer setting to C-B (see 6.10.2).



With this method it is also possible to connect 2-conductor transmitters (bridge between - and B).

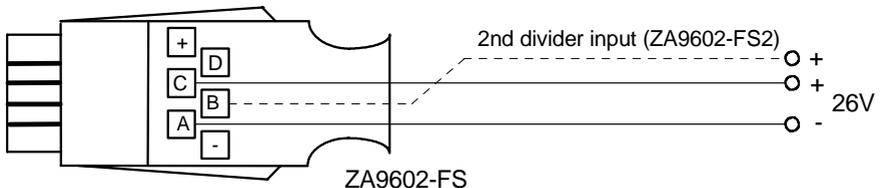


The connectors ZA960x-FSxV12 (see 4.2.6) are available for sensors that require a supply voltage of minimum 12V.

### 4.2.3 Voltage Divider Connectors for Voltage Measurements up to 26V DC

For a measurement of voltages up to  $\pm 26V$  the connector ZA 9602-FS/H with 100:1 divider is available. It is adjusted and programmed with the appropriate decimal point. For 2 signals that share a common ground connection there is also a connector with two voltage dividers available (ZA 9602-FS2/H).

Ranges: Voltage 2.6V

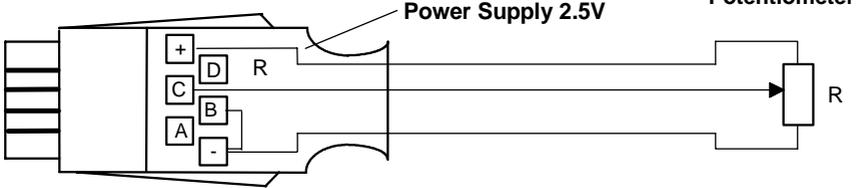


### 4.2.4 Evaluation of Potentiometer Pickoffs

Potentiometer pickoffs for measurements of lengths and angles of rotation can be analysed using the connector ZA 9025-FS3. The potentiometer must be connected to an internal power supply of 2.5V (max. 50ppm/K) and the sensing is measured within the measuring range 2.6 V.

**Ranges:** Voltage differential 2.6 V

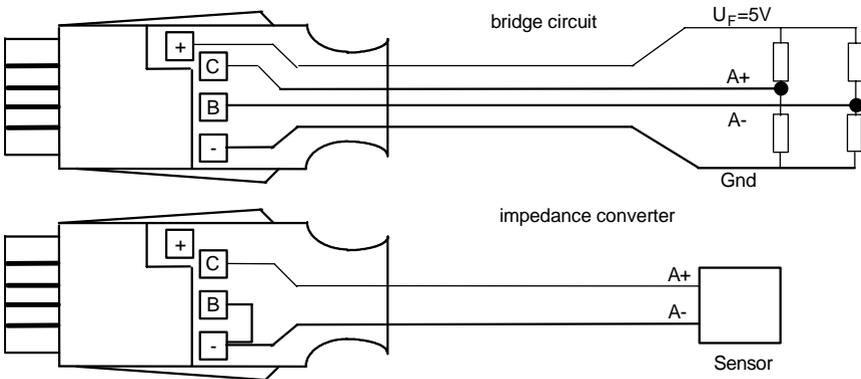
**Connector ZA 9025-FS3**



### 4.2.5 Connector for measuring bridges with Differential Amplifier and Stable 5V Supply

The connector ZA 9650-FSx is available for all sensors with bridge circuit (force transducers, wire strain gauges etc.) that require a stable power supply and that have a high common mode portion. Additionally, the connector can also be used for high impedance sensors that require an impedance converter. It contains a 5V voltage regulator and a differential amplifier with or without amplification. The alignment of zero point and gain can be stored in the EEPROM of the connector.

**Pin Configuration:**



Differential voltage connector ZA9650-FSx

**Technical Data:****Sensor supply:**

Voltage $U_F$ :	5V $\pm$ 0.05V
Temperature Coefficient:	<50ppm/°C
Output current:	max. 100mA

**Amplifier:**

Input voltage range (common mode):	-3.0V...+3.5V
Offset Voltage:	400 $\mu$ V (V=1), 225 $\mu$ V (G=10)
Offset voltage drift:	Max. 1 $\mu$ V/°C
Input current:	0.5 nA
Current consumption:	approx. 2mA

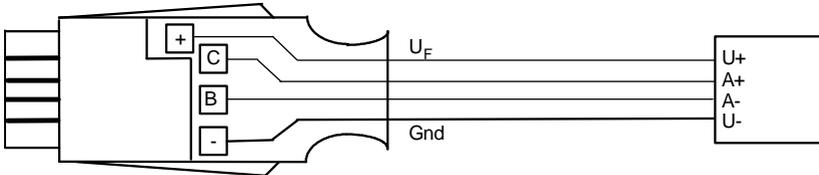
**Connector with Amplifier and 5V Supply:**

Differential voltage connector 55 mV:	ZA 9650FS0
Differential voltage connector 26 mV (G=10):	ZA 9650FS1V
Differential voltage connector 260 mV (G=10):	ZA 9650FS2V
Differential voltage connector 2.6V:	ZA 9650FS3

### 4.2.6 Connectors with 12V Supply

The connectors ZA960x-FSxV12 are available for sensors and transmitters that require a minimum voltage supply of 12V DC. They include a voltage converter that converts a lower battery voltage to 12V. 15 V voltage are available on request. The connector ZA 9602-FS3V12/H with 100:1 divider is available for signals up to 26V. The differential evaluation eliminates the line voltage drop.

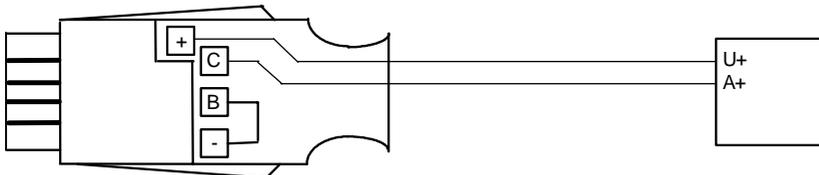
**Pin configuration:**



Differential current/voltage connector ZA960xFSxV12 with 12V supply

Sensor

The connector ZA 9601-FSxV12 with integrated 2 ohm shunt is available for 2-wire transmitters or sensors with a current output.



Differential current connector ZA9601FSxV12 with 12V supply

2-wire transmitter

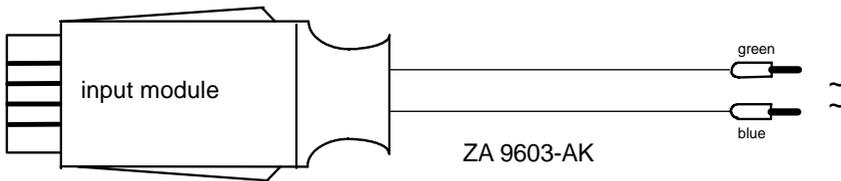
Device voltage $U_G$ :	7...12V
Sensor voltage supply $U_F$ :	$13.5V \pm 0.5V$
Output current:	100mA at $U_G=12V$
	50mA at $U_G=9V$
	20mA at $U_G=7V$

**Connectors with 12V Supply:**

Differential voltage connector 55mV:	ZA 9600FS0V12
Differential voltage connector 26mV:	ZA 9600FS1V12
Differential voltage connector 260mV:	ZA 9600FS2V12
Differential voltage connector 2.6V:	ZA 9600FS3V12
Differential voltage connector 26V:	ZA 9602FS3V12/H
Differential current connector 32mA:	ZA 9601FS5V12
Differential current connector %(4-20mA):	ZA 9601FS6V12

### 4.2.7 AC Modules for AC Signals

For a measurement of AC voltages the ALMEMO® adapter cable ZA 9603-AK is available where a true-rms converter is integrated. The converter is supplied via an integrated DC-DC converter that has been electrically isolated, therefore, several signals with different potentials in a maximum range of  $\pm 50\text{V}$  can be acquired. However, if a channel is selected an electrical connection from the measuring input to the ground connection of the measuring instrument also occurs. Therefore, voltages of more than  $50\text{V}$  must never, under any circumstances, be connected (danger to life!). As all signals are available in parallel it is possible to scan measuring points without problems. The use in Sleep mode is generally not provided for, due to the transient time.



**Ranges:** 260mV, Volt

#### Technical Data:

	Meas. range:	Resolution	Resistance
Typ ZA 9603-AK1:	260 mV <sub>eff</sub>	0.01 mV	Ri = 100 kΩ
Typ ZA 9603-AK2:	2.60 V <sub>eff</sub>	0.1 mV	Ri = 1 MΩ
Typ ZA 9603-AK3:	26.0 V <sub>eff</sub>	1 mV	Ri = 10 MΩ

Frequency range: 50 Hz up to 10 kHz

Accuracy:  $\pm 0.2\%$  of full scale value  $\pm 0.5\%$  of meas. value  
(40Hz to 2kHz sine)

Crest factor: 3 (add. error 0.7%)  
5 (add. error 2.5%)

Current consumption: approx. 5mA

## 4.2.8 Electrically Isolated Meas. Modules for AC/DC Signals and thermoelements

### Safety Instructions

If the measuring module is used in accordance with the intended use, the safety of the device and user can be guaranteed. However, in case of misuse the safety cannot be guaranteed. Therefore, please read through the following safety instructions thoroughly to avoid injuries of people or fire and damage at the measuring module or measuring instrument. If voltages over 50V are handled, the personnel must be instructed correspondingly with regard to the dangers and risks, especially when handling mains voltages.

- The measuring modules, depending on type, are suitable for measuring voltage, current, or thermocouples at potentials above 50 V. When operating the measuring module - and especially when connecting it, you must be extremely careful not to touch any parts carrying high voltage.
- With the meas. module for thermocouples, you must, before connecting the temp. sensor, disconnect the operating voltages for all devices involved.
- With the measuring modules for AC/DC signals, you must use the touch-proof test cable that is supplied or an equivalent.
- The measuring module for DC signals may only be used in conjunction with DC or DC voltage within the measuring range marked by a cross on the rating plate.
- Pay special attention to the fact that the **current** modules must always be connected in series with the consumer, i.e. in one feed line and not directly to the voltage.
- The measuring instrument and module must not be operated in a wet or humid environment.
- The plastic housing must be protected against open fires and hot surfaces (e.g. cooking surfaces).
- The meas. module must no longer be used when it is externally damaged or when it no longer functions even after it has been connected correctly.
- If the measuring module is not used in accordance with the intended use or if it has been operated incorrectly, we cannot accept any liabilities for damages.

### Safety Symbols:



**Warning:** Please take notice of all notes that are marked with this symbol to avoid injuries and danger to life or limb.



**Warning:** Danger due to the hazard of electric shock caused by touching a high-voltage connection.

### 4.2.8.1 Fast ALMEMO® Measuring Module

DC Voltage ZA 9900-AB

DC Current ZA 9901-AB



#### Introduction

The ALMEMO® measuring module ZA 9900/1-AB collects the momentary, maximum, minimum and average value of a DC voltage or DC current signal at a sampling frequency of 1kHz and transmits these four values to the ALMEMO® device every time a measuring point scan is triggered. The data transmission to the measuring instrument is digital. The connection within the module is electrically isolated with 4kV and is protected against overvoltages. As a result, the measuring module can be connected to any ALMEMO® measuring input, i.e. it is possible to connect several modules to one ALMEMO® device.

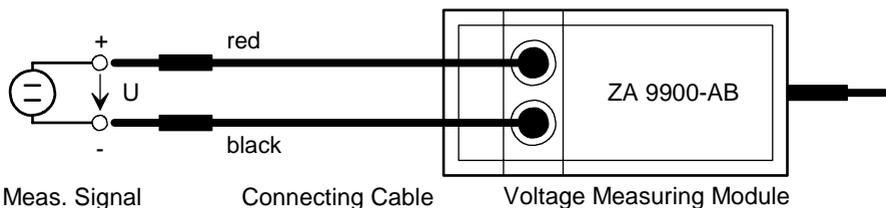
#### Connection of the Measuring Module



When connecting the measuring module, please note the measuring range that has been marked on the type plate.

#### Voltage Measurement with Module ZA 9900-ABx

For voltage measurements the input sockets of the measuring module must be directly connected to the connectors of the voltage source by using the supplied touchproof connecting cables.



Meas. Signal

Connecting Cable

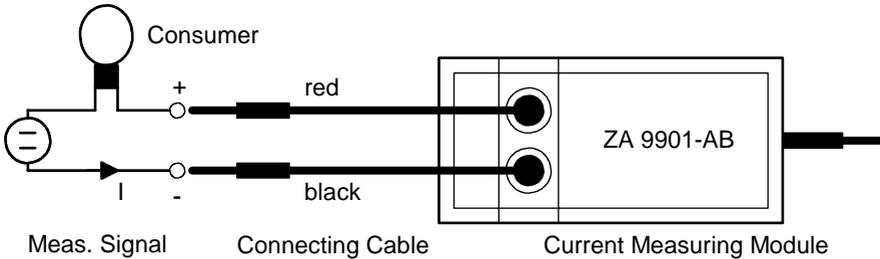
Voltage Measuring Module



**Warning!** In case of measuring voltages higher than 50V it is absolutely required that the cabling is performed when NO voltage is applied and that the voltage is only switched on afterwards. To avoid electric shocks do not touch any bare parts or connections during normal operation.

### Current Measurement with Module ZA 9901-ABx

For current measurements the input sockets of the measuring module must be directly wired into the connecting line of a consumer by using the supplied touchproof connecting cables.



**Warning!** In case of meas. voltages higher than 50V it is absolutely required that the cabling is performed when NO voltage is applied and that the voltage is only switched on afterwards. To avoid electric shocks do not touch any bare parts or connections during normal operation.



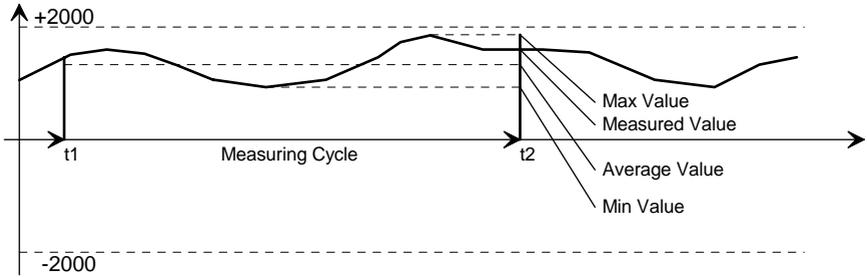
**Warning!** Do not directly connect the current meas. module to the voltage source when a consumer is not connected, as the module can be destroyed and the danger of overheating could develop. The current ranges can be overloaded for a short time but they are not protected by any fuses.

### Connection of the Measuring Module to an ALMEMO® Device

The ALMEMO® connector of the meas. module can be connected to any sensor socket Mxx of any ALMEMO® meas. instrument that provides the measuring range 'DIGI' (available since 05/98). Exception : The measuring module is not designed for operation with selector switch board ES5590MF. The power supply of the meas. module is provided through the ALMEMO® instrument and a DC/DC converter (insulation voltage min. 4kV/1sec). As a result, the power supply of the instrument is burdened by approximately 40mA, i.e. for long-term operation a mains supply unit is required. Isolated by an optocoupler the data is digitally transmitted to the instrument in 0.5 second intervals.

### Data Acquisition

The measuring signal is continuously scanned with 1kHz and the maximum, minimum and average value is determined. With each manual or cyclic measuring point scan the 4 channels of the ALMEMO® connector, the momentary measured value and the max, min and average values, since the previous measuring point scan, are provided as output and are afterwards deleted.



If the meas. channel Max, Min or Average is selected the corresponding value is acquired with the conversion rate (2.5 or 10 meas./s) and then deleted. If this is not desired, the 1st channel of the measuring module or another sensor must be selected.

If a series of more than 100 measured values are out of the measuring range, the displayed measured value will flash to indicate that measuring range has been exceeded.

### Programming of the ALMEMO® Connector:

Channel	Meas. Function	Range	Resolution	Locking
Chann. 1	Meas. Value	DIGI	1/2000 of m.r.	5.00
Chann. 2	Max. Value	DIGI	1/2000 of m.r.	5.00
Chann. 3	Min. Value	DIGI	1/2000 of m.r.	5.00
Chann. 4	Average Value	DIGI	1/20000 of m.r.	5.00



The alignment of the measuring range is stored within the slope (gain) correction. Before the locking is set below 4, it should be imperative for you to write down the alignment value so you can re-enter it if it has been deleted during programming or accidental handling.

### Technical Data:

Meas. Module	Meas. Range	Overload	Internal Resist.
ZA 9900-AB1 <sup>+</sup>	±200.0 mV	±40 V	50 kΩ
ZA 9900-AB2	±2.000 V	±400 V	800 kΩ
ZA 9900-AB3	±20.00 V	±500 V	1 MΩ
ZA 9900-AB4	±200.0 V	±500 V	1 MΩ
ZA 9900-AB5	±400. V	±1000 V	4 MΩ
ZA 9901-AB1	±20.00 mA	±0.1 A*	10 Ω
ZA 9901-AB2	±200.0 mA	±1 A*	1 Ω
ZA 9901-AB3	±2.000 A	±10 A*	0.1 Ω
ZA 9901-AB4	±10.00 A	±20 A*	0.01 Ω

+ Only for current measurement with external shunt.

\* The current ranges can be overloaded for a short time (1min) but are not fuse protected.

Accuracy:	0.1% of final value $\pm 2$ digits
Scanning rate:	1kHz
Resolution:	12bit, $\pm 2048$ digits
Meas. period/response time:	0.1s
Measuring cycle maximum:	14h
Electrical isolation:	1kV continuously, 4kV for 1s
Housing:	polystyrene, dimensions L100 x W54 x H31 mm
Sockets:	protected 4mm sockets
Operating voltage:	6 ... 14V through ALMEMO® instrument
Current consumption:	< 40mA (connector and module)

### Extent of the Delivery:

Measuring module including ALMEMO® connecting cable,  
2 test cables with protected banana plugs,  
operating instructions

## 4.2.8.2 True/Effective Value - Measuring Module

AC Voltage ZA 9903-AB

AC Current ZA 9904-AB



### Introduction

The ALMEMO® measuring modules ZA 9903-AB and ZA 9904-AB automatically and completely digitally acquire the true/effective value of an AC variable, i.e. the measuring signals with any course of a curve are digitised with 1kHz and the true effective value is calculated. The 2nd channel can be used to acquire the frequency. The data transmission to the meas. instrument is purely digital. The connection in the module is electrically isolated up to 4kV and overvoltage-protected. The meas. module can be connected to any ALMEMO® meas. input, i.e. it is possible to connect several modules to one ALMEMO® device.

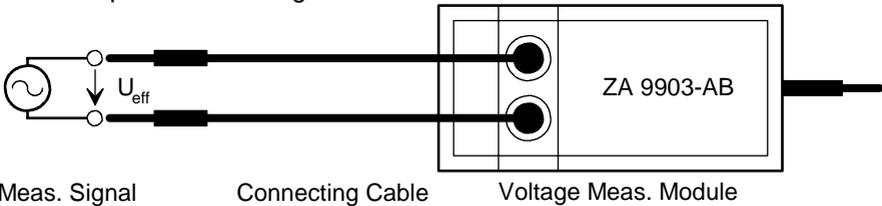
## Connection of the Measuring Module



When connecting the measuring module, please note the measuring range that has been marked on the type plate.

### Voltage Measurement with Module ZA 9903-ABx

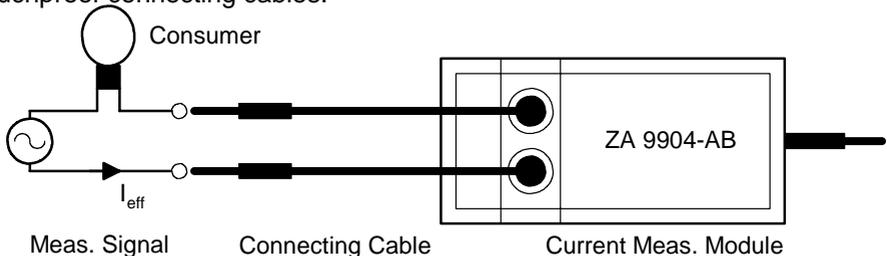
For voltage measurements the input sockets of the measuring module must be directly connected to the connectors of the voltage source by using the supplied touchproof connecting cables.



**Warning!** In case of measuring voltages higher than 50V it is absolutely required that the cabling is performed when NO voltage is applied and that the voltage is only switched on afterwards. To avoid electric shocks, do not touch any bare parts or connections during normal operation.

### Current Measurement with Module ZA 9904-ABx

For current measurements the input sockets of the measuring module must be directly wired into the connecting line of a consumer, by using the supplied touchproof connecting cables.



**Warning!** In case of meas. voltages higher than 50V it is absolutely required that the cabling is performed when NO voltage is applied and that the voltage is only switched on afterwards. To avoid electric shocks, do not touch any bare parts or connections during normal operation.



**Warning!** Do not directly connect the current meas. module to the voltage source when a consumer is not connected as the module can be destroyed and the danger of overheating could develop. The current ranges can be overloaded for a short time but they are not protected by any fuses.

### Connection of the Measuring Module to an ALMEMO® Device

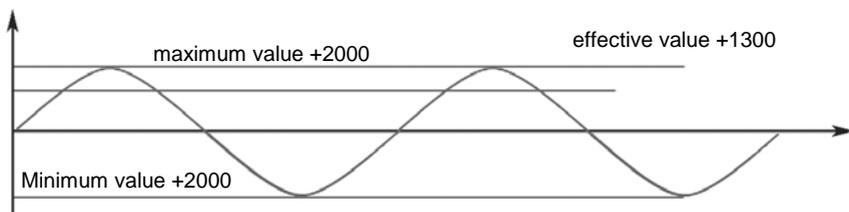
The ALMEMO® connector of the meas. module can be connected to any sensor socket Mxx of any ALMEMO® meas. instrument that provides the measuring range 'DIGI' (available since 05/98). Exception : The measuring module is not designed for operation with selector switch board ES5590MF. The power supply of the meas. module is provided through the ALMEMO® instrument and a DC/DC converter (insulation voltage min. 4kV/1sec). As a result, the power supply of the instrument is burdened by approximately 40mA, i.e. for long-term operation a mains supply unit is required. Isolated by an optocoupler the data is digitally transmitted to the instrument in 0.5 second intervals.

### True/Effective Measurement

The AC voltage signal is continuously scanned with 1kHz and the total effective value is calculated in 0.5s intervals from the DC voltage and the AC voltage constant voltage component and the alternating component.

$$V_{eff} = \sqrt{VAC^2 + VDC^2}$$

With a measuring range of 1300 digits for sinusoidal signals the total measuring range is ± 2000 digits.



If more than 10 out of the 500 measured values are not within the measuring range, the measured value will flash to indicate that the measuring range has been exceeded. For measuring the frequency the amplitude must be at least 10% of the final value.

### Programming of the ALMEMO® Connector:

Channel	Meas. Function	Range	Dim.	Resolution	Locking
chann. 1	AC effective val.	DIGI	V~	1/1300 of m.r.	5.00
chann. 2	frequency	DIGI	Hz	0.1Hz	5.00



The alignment of the measuring range is stored within the slope (gain) correction. Before the locking is set below 4, it should be imperative for you to write down the alignment value, so you can re-enter it, if it has been deleted during programming or accidental handling.

**Technical Data:**

Meas. Module	Meas. Range	Resolut.	Peak Value	Overload	Internal Resist.
<b>AC Voltage</b>	$U_{\text{eff}}$ sinus.		$U_{\text{SS}}$	$U_{\text{SS}}$	$R_i$
ZA 9903-AB1	130.0 mV <sub>eff</sub>	0.1 mV	$\pm 0.2$ V	$\pm 400$ V	0.5 M $\Omega$
ZA 9903-AB2	1.300 V <sub>eff</sub>	1 mV	$\pm 2$ V	$\pm 400$ V	0.8 M $\Omega$
ZA 9903-AB3	13.00 V <sub>eff</sub>	10 mV	$\pm 20$ V	$\pm 500$ V	1 M $\Omega$
ZA 9903-AB4	130.0 V <sub>eff</sub>	0.1 V	$\pm 200$ V	$\pm 500$ V	1 M $\Omega$
ZA 9903-AB5	400. V <sub>eff</sub>	1 V	$\pm 1000$ V	$\pm 1000$ V	4 M $\Omega$
<b>AC Current</b>	$i_{\text{eff}}$ sinus.		$I_{\text{SS}}$		
ZA 9904-AB1	1.000 A <sub>eff</sub>	1 mA	$\pm 2$ A	$\pm 10$ A*	0.10 $\Omega$
ZA 9904-AB2	10.00 A <sub>eff</sub>	10 mA	$\pm 20$ A	$\pm 20$ A*	0.01 $\Omega$

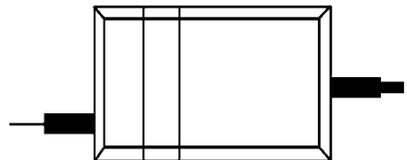
\* The current ranges can be overloaded for a short time (1min) but are not fuse protected.

	<b>TRMS</b>	<b>Frequency</b>
Accuracy:	0.1% of fin. val. $\pm 2$ digits	$\pm 0.1$ Hz
Sampling rate:	1kHz	-
Resolution:	12bit, $\pm 2048$ digits for $U_{\text{SS}}$	0.1Hz
Sensitivity:	-	10% of fin. value
Frequency range:	20.0 ... 250Hz	20.0 ... 250Hz
Meas. period/response time:	0.5s	0.5s
Electrical isolation:	1kV continuously, 4kV for 1s	
Housing:	polystyrene, dimensions L100 x W54 x H31 mm	
Sockets:	touchproof 4mm sockets	
Operating voltage:	6 ... 14V via ALMEMO <sup>®</sup> device	
Current consumption:	< 40mA (connector and module)	

### 4.2.8.3 Electrically isolated measuring modules for thermocouples NiCr-Ni (K), FeCuNi(J), Cu-CuNi(T)

#### Description :

To measure temperatures at high potential ALMEMO measuring modules ZA 9920-AB (type K) or ZA9921ABx (type J, T) can be used. These measuring modules are electrically isolated; they measure and record the temperature of a thermocouple and continuously transfer this measured value to the ALMEMO<sup>®</sup> device. Measurement data is sent to the measuring instrument in purely digital form. The measuring module can be connected to any ALMEMO<sup>®</sup> measurement input; i.e. several such measuring modules can be connected to one ALMEMO<sup>®</sup> device.

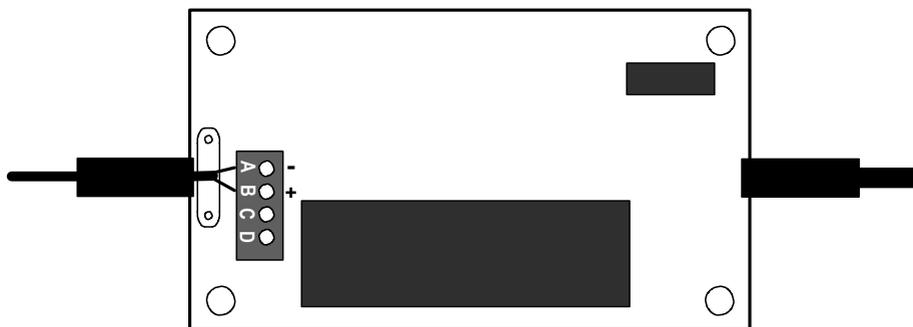


### Connecting the measuring module

To connect the thermocouple you must first open the housing. To open the housing you must (using a suitably pointed object, e.g. a knife) remove the feet (which cover the screws) and then loosen the four screws. You can then remove the lid. The thermocouple is led through the protective sleeve and (as on all ALMEMO® devices) is connected to terminals A and B. The plastic cable grip is to relieve strain.



**Important !** With potentials above 50 V it is absolutely vital that cabling work be performed with all equipment disconnected and at zero voltage and that the voltage only be (re)connected after this work has been completed. To avoid risk of electric shock, you must, during operation, be extremely careful not to touch any exposed parts or connections.



Having completed the cabling work, replace the lid, screw it back in position, and push the feet back on.

The ALMEMO® connector on the measuring module can be plugged into any sensor socket Mxx on any ALMEMO® measuring instrument designed for the 'DIGI' measuring range (i.e. models made since around May/1998). Exception : The measuring module is not designed for operation with selector switch board ES5590MF. The power for the measuring module is supplied by the ALMEMO® measuring instrument via a DC/DC converter (insulation voltage min. 4 kV / 1 second). The power supply to the measuring instrument is thus charged with approx . 40 mA; i.e. for prolonged operation a mains supply unit is necessary. Data is transferred to the measuring instrument at a measuring rate of 1.88 Hz optically insulated and in digital form.

### Programming the ALMEMO® connector :

1st channel : Measuring range DIGI, Locking mode 5

**Technical data :**

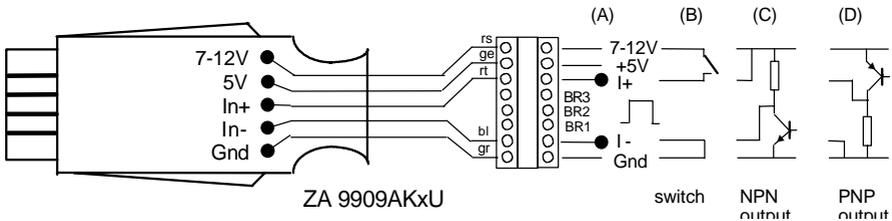
Measuring sensor :	Thermocouple
Measuring range :	ZA9920 AB: NiCrNi (K) -200.0...1370.0 °C ZA9921 ABJ: Fe-CuNi (J) -200.0...1000.0 °C ZA9921 ABT: Cu-CuNi (T) -200.0... 400.0 °C
Measuring rate :	1.88 Hz
Accuracy :	Accuracy linearisation, cold junction compensation, system accuracy see Section 2.1 / 2.3
Electrical isolation :	1 kV permanent, 4 kV for 1 second
Housing :	polystyrene, dim. (LxWxH) 100 x 54 x 31 mm
Sensor connection :	Screw terminals inside the housing
Connection cable :	1.5 meters, with ALMEMO® connector
Operating voltage :	6 ... 14 V via ALMEMO® device
Current consumption :	<40 mA (connector and module)

### 4.2.9 Frequency Meter Module for Frequency and Pulse Signals

The frequency meter module ZA 9909-AK for pulse counting has an own small microcontroller integrated in the sensor connector and is used for acquiring digital pulses and, on command, handing them over to the measuring instrument. This method also allows for detecting signals when the measuring channel is not selected, therefore, it is possible to connect several frequency meter modules to one instrument and acquire data via measuring point scans.

The new **universal version ZA 9909-AKU** of the module includes optocouplers in the input, which can either be triggered electrically isolated or directly by active voltage signals from 4 to 24V (A). To supply passive floating switch contacts (B) the device's supply voltage is also available at other ports. However, turbines or photoelectric pulse generators can also be supplied through the module (max. 50mA). Depending on the output driver the optocoupler must be wired correspondingly, (NPN:C) or (PNP:D). If the device voltage is not sufficient, the connector is also available with a voltage transformer to 12-13 volts (option V12).

**Applications:** Frequency, pulses



Depending on how the measuring range is programmed the frequency module can operate in the following different ways :

### ZA 9909-AK1U: Frequency Measurement

Measuring Range: Frequency 0 to 15000 Hz      Range: Freq

The frequency module counts the pulses per second and continuously provides this frequency value.



Resolution can be raised to 0.1 Hz by inserting a wire jumper between terminals BR1 and +5V.

Measuring range 0 to 3200.0 Hz; decimal point shift must be programmed !

### ZA 9909-AK2U: Pulse Measurement

Measuring range: Pulses 0 to 65000      Range: PULS

The pulse measurement is provided for signals with a low rate of repetitions, which must be acquired during a longer time period. The frequency module counts the pulses between two scans of measuring points (manual or cyclic) and provides the pulse count only at the measuring point scan, i.e. the value does not change during the cycle. If a measuring cycle of 1 minute is programmed, the pulse/minute count is displayed at each minute. By summing together over the print cycle using function channel S(P) it is also possible to define the pulse count over a longer period (e.g. 1 hour).



Bouncing contacts can be digitally suppressed by inserting wire jumpers between terminals BR1, BR2, and +5V, and then applying a time constant of 5 ms.

### ZA 9909-AK4U: Measurement of Rotational Speed

Measuring range: revolutions/minute 8 to 32000      Range: Freq

The speed module is a special variant of the frequency module (wire jumper from the BR2 terminal to the +5V terminal); it measures the period between two pulses and from this calculates the speed per minute.

### Technical Data of the Frequency Module:

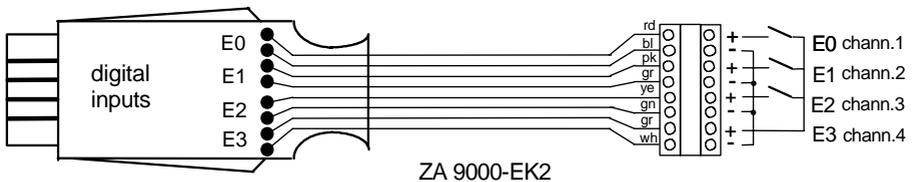
Frequency range:	0 to 15000 Hz (resolution 1 Hz), Gate time 4 x 0.5 s
	0 to 3200.0 Hz (0.1 Hz), Gate time 0.5 s + 1 edge
Speed range:	8 ... 32000rpm (resolution: 1rpm)
Max. pulse count:	65000
Pulse length:	> 50µs (5ms with bouncing contacts)
Input voltage range:	4 ... 40 V rectangular
Cable length:	1.5m
Sensor supply:	7..9V (with mains adapter 12V or Option V12), max. 50mA
Current consumption:	3mA
Temperature range:	-10 ... +60 °C

### 4.2.10 Adapter Cable for Digital Input Signals

3 digital inputs per measuring input (electrical signals of potential-free contacts) can be acquired and monitored by means of the adapter cable for digital inputs ZA 9000-ES2. Each input is programmed as a channel with the range 'Inp' and the status is displayed at each scan of measuring points in the print log with 0.00% or 100.00%. An alarm print can be provided by entering a limiting value, e.g. 50.00%.

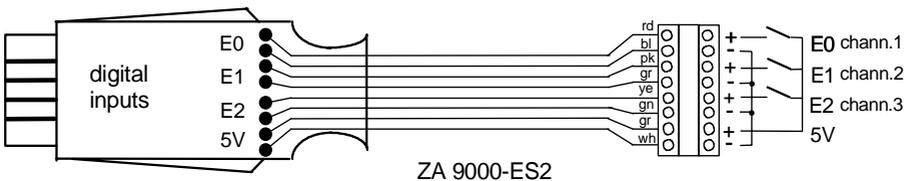


For determining the percentage ratio of the on/off mode over a cyclic period or over the whole measurement period, the relevant variable is easily available through the averaging (cyclic or continuous) function (see also 6.7.4). The highest resolution can be achieved with the continuous measuring point scan.



The digital inputs are optocouplers that switch from the LO state (0%) to the HI state (100%) when voltages in the range of approximately 4 to 30V DC are connected.

If **floating contacts** have to be monitored, the corresponding external voltages must be provided. The digital input cable ZA 9000-ES2 provides an auxiliary voltage of 5V for this purpose but, therefore, only has 3 digital inputs. The contacts must be wired to the 5V according to the wiring diagram so the optocouplers can be triggered by them.



### 4.2.11 Interface Connectors

The interface adapter cable ZA 9919-AKx allows for an integration of a maximum of four measured values from any third party device with serial interface (RS232, TTL or similar) into the data acquisition of the ALMEMO® device. Optocouplers are provided as insulation. The ALMEMO® connector contains its own microcontroller that must be programmed with the protocol of the third party device. Non-recurring software costs must be charged for this programming. It is also possible to use several of these adapters with one device.

**Application:** DIGI

**Technical Data:**

Display range: 65000 digits

Interface: asynchronous 7/8bit data, 1/2 stop bit, electrically isolated