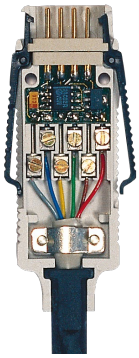
ALMEMO® measuring instruments, overview

	Measuring inputs	Expansions	Display	Graphics display	Data logger function	Integrated memory	Interface / outputs	Precision class	Measuring rate (mops) max.	Measuring ranges	Multi-point adjustment	Portable device	Desktop device	Fitted device	Catalog page
Compact measuring instrument															
ALMEMO® 2450-1L	1		✓					C	2.5	35		✓			19
Basic measuring instrument															
ALMEMO® 2490-1A	1		✓				✓	B	10	65		✓			20
ALMEMO® 2490-2A	2		✓				✓	B	10	65		✓			20
Professional measuring instrument															
ALMEMO® 470 V7 wireless		10		✓	✓	✓	✓						✓		41
ALMEMO® 202-S V7	2			✓	✓		✓		1000		opt.	✓			32
ALMEMO® 204 V7	4			✓	✓	✓	✓		1000		opt.	✓			32
ALMEMO® 2470-1S/-SCRH	1	✓			✓	✓	A	10	65		✓				23
ALMEMO® 2470-2S	2		✓		✓	✓	✓	A	10	65		✓			24
ALMEMO® 2470-2	2		✓				✓	A	10	65		✓			24
ALMEMO® 2590-2A	2			✓	✓		✓	A	10	65		✓			25
ALMEMO® 2590-4AS	4			✓	✓	✓	✓	A	10	65		✓			25
Precision measuring instrument															
ALMEMO® 104 V7	4			✓	✓	✓	✓	A	1000	66	opt.	✓			35
ALMEMO® 2690-8A	5			✓	✓	✓	✓	AA	100	66	opt.	✓			28
ALMEMO® 2890-9	9			✓	✓	✓	✓	AA	100	66	opt.	✓			30
ALMEMO® 710 V7	10			✓	✓	✓	✓	AA	2000	66	opt.	✓			38
ALMEMO® 8590-9	9				✓	opt.	✓	AA	100	66	opt.		✓		66
ALMEMO® 8690-9A	9				✓	opt.	✓	AA	100	66	opt.		✓		66
ALMEMO® 809 V7	9				✓	✓	✓	AA	2000	66	opt.		✓		50
ALMEMO® 5690-1M09	9	opt.			✓	opt.	✓	AA	100	66	opt.		✓		54
ALMEMO® 5690-2M09	9	opt.		✓	✓	✓	✓	AA	100	66	opt.		✓		56
ALMEMO® 5690-1CPU		opt.			✓	✓	✓	AA	100	66	opt.		✓		60
ALMEMO® 5690-2CPU		opt.		✓	✓	✓	✓	AA	100	66	opt.		✓		62
ALMEMO® 500 CPU V7	20	opt.		✓	✓	✓	✓	AA	4000	66	opt.		✓	✓	46
ALMEMO® 4390-2	1		✓		✓	✓	✓	AA	100	66				✓	70
Basic device (transmitter)															
ALMEMO® 2490-1R02U	1		✓				✓	B	10	65				✓	68
ALMEMO® 2490-2R02U	2		✓				✓	B	10	65				✓	68
Reference measuring instrument															
ALMEMO® 1020-2 X6	2			✓	✓		✓	AS	1.25	4	✓	✓			71
ALMEMO® 1030-2 X6	2			✓	✓		✓	AS	1.25	1	✓	✓			73
ALMEMO® 1033-2 X6	2			✓	✓		✓	AS	2.5	2	✓	✓			75
ALMEMO® 1036-2 X6	2			✓	✓		✓	AS	1.25	7	✓	✓			77
ALMEMO® 8036-9 X6	9				✓		✓	AS	1.25	7	✓		✓		79

Input connector

ALMEMO® input connector, also for existing sensors, see chapter ALMEMO® input connectors.

ALMEMO® standard plug



- The ALMEMO® measuring system makes it possible to process four channels per measuring input – depending on the sensor and the measuring instrument.
- The ALMEMO® plug incorporates 6 screw terminals - 2 for the sensor‘s power supply and 4 for its measuring signal.
- With Pt100 sensors using 4-conductor circuitry all 4 free connections will be required for the measuring signal. Only one sensor of this type can be connected therefore per measuring input.
- Electrical signals only require 2 connections for the measuring signal. One plug can thus acquire two different measuring signals over just one measuring channel.
- An atmospheric humidity sensor can for example usually be combined with a temperature sensor. The associated operands (e.g. dew point, mixture ratio, partial vapor pressure, enthalpy) are programmed in the plug as additional measuring channels.

ALMEMO® D6 plugs for digital sensors

- The digital ALMEMO® D6 sensor can be connected to any ALMEMO® measuring instrument without in any way affecting its measuring accuracy. The A/D converter incorporated in the ALMEMO® D6 sensor is exclusively responsible for the measuring accuracy of the whole system.
- The digital ALMEMO® D6 sensor is calibrated without involving the ALMEMO® measuring instrument (DAkkS / factory) and can be replaced or exchanged as and whenever necessary.
- The connecting cable for the digital ALMEMO® D6 sensor can be extended using pluggable extension cables quickly and easily and without any line losses (see chapter „General accessories“). These digital extension cables provide high transmission reliability; they have no effect on measuring accuracy.
- The configuration of the digital ALMEMO® D6 sensors (i.a. the selection of the measuring ranges) is effected by an ALMEMO® V7 measuring instrument, e.g. ALMEMO® 710 or ALMEMO® 202-S (refer to chapter ALMEMO® Universal Measuring Instruments), or directly on the PC by using the USB adapter cable ZA1919AKUV (refer to chapter Network technology).

New generation: **ALMEMO® V7** **ALMEMO® D7**

ALMEMO® V7 measuring instrument and ALMEMO® D7 plug for digital sensors

- With the ALMEMO® D7 plug technology, the measurement ranges of the sensors are completely independent of the measuring instrument. Each ALMEMO® D7 measurement plug features up to 10 display and function channels.
- The new ALMEMO® D7 measurement plug enables high measuring speeds or high measuring accuracy applicable for a vast variety of measuring tasks.
- The ALMEMO® D7 plug measures dynamic processes using the setting High Speed Measuring Operations at high sampling rate. The ALMEMO® V7 measuring instrument saves the measured values, and the WinControl measuring software displays them in graphical form. In case high resolution and stable values are needed (e.g. for accuracy transducers), the ALMEMO® D7 measurement plug measures with reduced sampling rate, if the setting High Resolution is selected.
- The digital ALMEMO® D7 measurement plug comes with an integrated A/D converter. The measuring rate is solely determined by the A/D converter. All D7 measurement plugs run in parallel on the ALMEMO® V7 measuring instrument with their own measuring rate. The minimal scanning cycle of the measuring instrument is determined by the measuring rates of the D7 measurement plugs and is virtually independent from the number of plugs.
- The overall accuracy of the measurement is independent from the ALMEMO® V7 display device / data logger and from the extension cable used. The complete measuring chain, consisting of sensor and connected ALMEMO® D7 measurement plug, is calibrated.
- The measured values can be complemented with a unit featuring up to 6 characters. To designate a sensor it is possible to program comments with up to 20 characters. The user can easily perform the configuration via the ALMEMO® V7 measuring instrument.

Important! ALMEMO® D7 measurement plugs can only be connected to ALMEMO® measuring instruments of the V7 generation, i.a. ALMEMO® 500, ALMEMO® 710, ALMEMO® 809, ALMEMO® 202-S.

General technical specifications

Inputs

Channel switching between input sockets for analog sensors	4-contact with photo-MOS relays Potential separation maximum 50 V Measuring modules with higher potential separation (see chapter „Input modules“) Offset voltage < 5 µV
Cold junction compensation (CJC)	Effective in range -30 to +100 °C, Accuracy ±0.2 K (±0.01 K / °C)
Nominal temperature	22 °C ±2 K
Sensor power supply	6 to 12 V depending on power supply
Self-calibration	Automatic zero-point correction, measuring current calibration
Monitoring functions	Automatic sensor recognition and sensor breakage detection

		Basic measuring instruments	Professional measuring instruments	Precision measuring instruments	
Precision class	**C**	**B**	**A**	**AA**	
ALMEMO® series	2450, 2420	24900	2470, 2790 2590A	4390	500, 710, 809, 2690A, 2890, 5690 8590, 8690
Measuring rates Measuring operations per second (mops)	2.5 mops	2.5 / 10 mops	2.5 / 10 mops	2.5 / 10 / 50 / 100 mops Option 400 mops* | Option 500 mops *	
Input range	0.26 to +2.6 V	-2 to +5 V	-1.9 to +2.9 V	meas. range 2.6 V: -3 to +3 V in all other meas. ranges -2.3 to +1.3 V	-1.9 to +2.9 V
Overload	-4 to +5 V	-2 to +5 V	-2 to +5 V	± 12 V	± 12 V
Input current	< 2 nA	< 10 nA	100 pA	Meas. range 2.6 V: 500 nA in all other meas. ranges 500 pA	100 pA
Measuring current		Pt100/1000: 0.3 mA	Pt100: 1 mA, Pt1000: 0.1 mA	Pt100: 1 mA, Pt1000: 0.1 mA	
System accuracy at 2.5 mops	0.1% of measured value ±4 digits	0.03% of measured value ±4 digits	0.03% of measured value ±3 digits	0.02 % of measured value ±2 digits	
Temperature drift	0.01 % / K (100 ppm)	0.005 % / K (50 ppm)	0.003 % / K (30 ppm)	0.003 % / K (30 ppm)	

*Measuring rate 400 mops (Option SA0000Q4)
*Measuring rate 500 mops (Option SA0000Q5):
It is also possible, in addition to the standard conversion rates, to set 400 or 500 mops (measuring operations per second). At the rate of 400 or 500 mops just one selected measuring channel can be saved. This can only be used with sensors with voltage or current ranges or with NTC sensors. Nor is it possible to change channels in the course of a measuring operation.
The resolution, accuracy, and sensitivity to disturbance caused by mains hum or electromagnetic interference are comparable with measuring operations performed at a rate of 50 mops. Care must be taken to ensure that the environment is free from interference and that the sensor lines are kept short. Data can only be output to a micro SD card: Accessories ZA1904SD, memory connector with micro SD. Data is saved in table format (separated by semi-colons) and with a time-stamp resolution of 0.0001 seconds. This format can be processed using the WinControl software (as of version 6.1.1.6).

Environmental conditions for ALMEMO® devices and ALMEMO® connectors

Humidity range: 10 to 90 % (non-condensing)

Temperature range:

for ALMEMO® devices without battery
Operating temperature: -10 to +50 °C
Storage temperature: -20 to +60 °C

for ALMEMO® devices with rechargeable NiMH battery
Operating temperature: -5 to +50 °C
Storage temperature: -20 to +60 °C

for ALMEMO® devices with rechargeable battery Li-Ion
Operating temperature: 0 to +45 °C
Storage temperature: -20 to +60 °C

for ALMEMO® connectors
Operating temperature: -10 to +50 °C
Storage temperature: -20 to +60 °C

for power supply NA11/NA12
Operating temperature:
NA11: 0 to +45 °C
NA12: 0 to +50 °C
Storage temperature: -40 to +70 °C

Measuring ranges

Sensor type	Type	Measuring range	Units	Resolution	Linearization accuracy	Connector programming
Resistance temperature detectors:						
Pt100 / Pt1000 -1 4-wire	FP Axxx	-200.0 to +850.0	°C	0.1 K	±0.05 K ±0.05 % of measured value	ZA 9030 FS1/4
Pt100 / Pt1000 -2 4-wire	FP Axxx	-200.00 to +400.00	°C	0.01 K	±0.05 K	ZA 9030 FS2 / 5
Ni100/1000 4-wire		-60.00 to +240.00	°C	0.1 K	±0.05 K	ZA 9030 FS3 / 6
NTC type N	FN Axxx	-50.00 to +100.00	°C	0.01 K	±0.05 K	ZA 9040 FS
Thermocouples						
NiCr-Ni (K)	FT Axxx	-200.0 to +1370.0	°C	0.1 K	±0.05 K ±0.05 % of measured value	ZA 9020 FS
NiCroSil-NiSil (N)		-200.0 to +1300.0	°C	0.1 K	±0.05 K ±0.05 % of measured value	ZA 9021 FSN
Fe-CuNi (L)		-200.0 to +900.0	°C	0.1 K	±0.05 K ±0.05 % of measured value	ZA 9021 FSL
Fe-CuNi (J)		-200.0 to +1000.0	°C	0.1 K	±0.05 K ±0.05 % of measured value	ZA 9021 FSJ
Cu-CuNi (U)		-200.0 to +600.0	°C	0.1 K	±0.05 K ±0.05 % of measured value	ZA 9000 FSU
Cu-CuNi (T)		-200.0 to +400.0	°C	0.1 K	±0.05 K ±0.05 % of measured value	ZA 9021 FST
PtRh10-Pt (S)		0.0 to +1760.0	°C	0.1 K	±0.3 K	ZA 9000 FSS
PtRh13-Pt (R)		0.0 to +1760.0	°C	0.1 K	±0.3 K	ZA 9000 FSR
PtRh30-PtRh6 (B)		+400.0 to +1800.0	°C	0.1 K	±0.3 K	ZA 9000 FSB
AuFe-Cr		-270.0 to +60.0	°C	0.1 K	±0.1 K	ZA 9000 FSA
Electrical and digital signals:						
Millivolts DC		-10.0 to +55.0	mV	1 µV	–	ZA 9000 FS0
Millivolts 1 DC		-26.0 to +26.0	mV	1 µV	–	ZA 9000 FS1
Millivolts 2 DC		-260.0 to +260.0	mV	0.01 mV	–	ZA 9000 FS2
Volts DC		-2.6 to +2.6	*	V	0.1 mV	ZA 9000 FS3
Volts DC		-26 to +26	V	1 mV	–	ZA 9602 FS
For measuring bridges Supply 5 V (Example)		-26.0 to +26.0	mV	1 µV	–	ZA9650 FS1V
For potentiometers Supply 2.5 V		-2.6 to +2.6	*	V	0.1 mV	ZA9025 FS3
Volt AC (50 Hz to 2 kHz) (Example)		0 to +26	V	0.1 V	–	ZA 9603 AK3
Volt AC (11 Hz to 250 Hz) (Example)		0 to +400	V	1 V	–	ZA 9903 AB5
Ampere AC (11 Hz to 250 Hz) (Example)		0 to +10.00	A	0.01 A	–	ZA 9904 AB2
Volts DC (sampling rate 1 kHz) (Example)		0 to +400	V	1 V	–	ZA 9900 AB5
Ampere DC (sampling rate 1 kHz) (Example)		0 to +10.00	A	0.01 A	–	ZA 9901 AB4
Milliamperes DC		-32.0 to +32.0	*	mA	1 µA	ZA 9601 FS1
Percent (4 / 20 mA DC)		0.0 to 100.0	%	0,01 %		ZA 9601 FS2
Ohms		0.00 to 500.00	*	Ω	0.01 Ω	ZA 9003 FS
Ohms		0.0 to 5000.0	*	Ω	0.1 Ω	ZA 9003 FS2
Frequency		0 to 15000	Hz	1 Hz	–	ZA 9909 AK1U
Pulses / measuring cycle		0 to 65000			–	ZA 9909 AK2U
Digital interface		0 to 65000			–	ZA 9919 AKxx
Digital input		0.00 to 100.00	%		–	ZA 9000 ES2
Capacitive humidity sensors:						
Rel. humidity	FH A646	5.0 to 98.0	%H	0,1 %	–	
Rel. humidity with TC	FH A646-R	5.0 to 98.0	%H	0,1 %	±0,5 %	
Dew-point temperature		-25.0 to +100.0	°C	0.1 K	±0.2 K	
Mixture ratio		0.0 to 500.0	g/kg	0.1 g/kg	±0.5 % of measured value	
Partial vapor pressure		0.0 to 1013.2	mbar	0.1 mbar	±0.1 mbar ±0.1 % of measured value	
Enthalpy		0.0 to 400.0	kJ/kg	0.1 kJ/kg	±0.5 % of measured value	
Psychrometer	FN A846				ZA 9846 AK	
Wet temperature		0.00 to +100.00	°C	0.01 K	±0.05 K	
Relative humidity		0.0 to +100.0	%H	0.1 %	±1,0 %H	
Dew-point temperature		-25.0 to +100.0	°C	0.1 K	±0.2 K	
Mixture ratio		0.0 to 500.0	g/kg	0.1 g/kg	±0.5 % of measured value	
Partial vapor pressure		0.0 to 1013.2	mbar	0.1 mbar	±0.1 mbar ±0.1 % of measured value	
Enthalpy		0.0 to 400.0	kJ/kg	0.1 kJ/kg	±0.5 % of measured value	

* Data may vary depending on device (see relevant device data sheet).

Sensor type	Type	Measuring range	Units	Resolution	Linearization accuracy	Connector programming
Flow sensors						
Rot. vane, snap-on head	FV AD15-Sx (e.g.)	0.50 to 40.00	m/s	0.01 m/s	–	
Rotating vane Macro	FV AD15-MA1	0.10 to 20.00	m/s	0.01 m/s		
Water turbine	FV AD15-WM1	0.00 to 5.00	m/s	0.01 m/s		
Dynamic pressure sensor	FD A602-S1K	0.5 to 40.0	m/s	0.1 m/s	± 0.1 m/s	
Dynamic pressure sensor	FD A602-S6	1.8 to 90.0	m/s	0.1 m/s	± 0.1 m/s	
Hot-wire anemometer	FV A935-TH4	0 to 2.000	m/s	0.001 m/s	–	
Hot-wire anemometer	FV A935-TH5	0 to 20.00	m/s	0.01 m/s	–	
Hot-wire anemometer	FV A605-TA1	0.01 to 1.000	m/s	0.001 m/s	–	
Hot-wire anemometer	FV A605-TA5	0.15 to 5.00	m/s	0.01 m/s	–	
Chemical probes						
Conductivity	FY A641-LF (e.g.)	0 to 20.000	mS	0.001 mS	±0.2 % of measured value	
O_2 dissolved saturation	FY A640-O2	0 to 260	%	1 %	–	
O_2 dissolved, concentr.	FY A640-O2	0.0 to 40.0	mg/l	0.1 mg/l	±0.2 mg/l	
O_2 in gases	FY 9600-O2	1 to 100	%	1 %	–	
O_3 in gases	FY 9600-O3	0 to 300	ppb	20 ppb	–	
CO probe	FY A600-CO (e.g.)	0 to 300	ppm	1 ppm	–	
CO_2 in gases	FY A600-CO2 (e.g.)	0.000 to 2.500	%	0,01 %	±0.2 % of measured value	
pH probe	FY96PH-Ex	0.0 to 14.00	pH	0.01 pH	–	ZA 9610 AKY4W
Redox probe	FY96RX-Ex	0.0 to 2600.0	mV	0.1 mV	–	ZA 9610 AKY5W
Optical radiation (Examples)						
Lux measuring probe	FL A613-VL	0 to 260000	lux	1 lux	–	
Lux measuring probe	FL A603-VL2	0.05 to 12500	lux	0.01 lux	–	
Lux measuring probe	FL A603-VL4	1 to 250000	lux	1 lux	–	
UV measuring probe	FL A613-UV	0 to 87.00	W/m^2	0.01 W/m^2	–	
UVA measuring probe	FL A603-UV24	0.0004 to 100	mW/cm^2	0.1 $\mu W/cm^2$	–	
Radiometric probe	FL A603-RW4	0.00004 to 10	mW/cm^2	0.01 $\mu W/cm^2$	–	
Photosynthesis probe	FL A603-PS5	0.0002 to 100	$mmol/m^2s$	0.1 $\mu mol/m^2s$	–	
Other connectable sensors / transducers (Examples)						
Heat flow plates	FQ Axxx	-260.0 to +260.0	mV	0.01 mV	–	ZA 9007 FS
Moisture content probe	FH A696-MF	0 to 50.0	%	0,1 %	–	
Differential pressure	FD A612-SR	0 to 1000	mbar	0.1 mbar	–	
Barometer	FD A612-SA	0.0 to 1050 mbar		0.1 mbar	–	
Pressure transducer FDA	FD A602-xx (e.g.)	0.00 to 10.00	bar	0.01 bar	–	
Force transducer	FK Axxx (e.g.)	0.0 to 50.00	kN	0.01 kN		
Displacement transducer	FW Axxx(e.g.)	0.0 to 150.00	mm	0.01 mm	–	
Tachometer	FU A919-2	8 to 30000	rpm	1 rpm		ZA 9909 AK4U
Function values						
Differential					–	
Maximum value					–	
Minimum value					–	
Average value over time					–	
Average value over measuring point					–	
Summation over measuring points		0 to 65000			–	
Total number of pulses	ZA 9909-AK2U	0 to 65000			–	
Pulses / print cycle	ZA 9909-AK2U	0 to 65000			–	
Alarm value		0.0 to 100.00	%		–	
Thermal coefficient	M (q) / M (ΔT)					
Wet-bulb globe temperature (WBGT) (0.1 TD + 0.7 TW +0.2 TG)					–	
Measured value						
Cold junction temperature				°C		
Number of averaged values						
Volume flow		0 to 65000	m^3/h	1 m^3/h		