01 ALMEMO® Measuring Instruments

ALMEMO[®] measuring instruments, overview

	Measurie	Expansions	Display	Graphics A:	Data I.c.	Integrated	Interface / ont	Precision -	Measuring	Measurie (mops) max	Multi-point	Portable .	Deskton	Fitted device	Catalog page
Compact measuring instrument ALMEMO [®] 2450-1L	1		~					С	2.5	35		~			19
Basic measuring instrument ALMEMO [®] 2490-1A ALMEMO [®] 2490-2A	1 2		✓ ✓				✓ ✓	B B	10 10	65 65		* *			20 20
Professional measuring instrume ALMEMO [®] 470 V7 wireless	nt	10		✓	~	~	✓						~		38
ALMEMO [®] 202-S V7 ALMEMO [®] 204 V7	2 4			✓ ✓	√ √	~	✓ ✓		1000 1000		opt. opt.	✓ ✓			32 32
ALMEMO [®] 2470-1S/-SCRH ALMEMO [®] 2470-2S ALMEMO [®] 2470-2	1 2 2	1	*		* *	*	A ✓	10 A A	65 10 10	65 65	1	*			23 24 24
ALMEMO [®] 2590-2A ALMEMO [®] 2590-4AS	2 4			✓ ✓	✓ ✓	~	✓ ✓	A A	10 10	65 65		✓ ✓			25 25
Precision measuring instrument ALMEMO [®] 2690-8A	5			✓	~	~	•	AA	100	66	opt.	~			28
ALMEMO [®] 2890-9	9			✓	1	✓	✓	AA	100	66	opt.	✓			30
ALMEMO® 710 V7	10			✓	 ✓ 	✓	√	AA	2000	66	opt.	✓			35
ALMEMO® 8590-9 ALMEMO® 8690-9A ALMEMO® 809 V7	9 9 9				✓ ✓ ✓	opt. opt.	* * *	AA AA AA	100 100 2000	66 66 66	opt. opt. opt.		* * *		63 63 47
ALMEMO [®] 5690-1M09 ALMEMO [®] 5690-2M09	9 9	opt. opt.		✓	✓ ✓	opt.	✓ ✓	AA AA	100 100	66 66	opt. opt.		✓ ✓		51 53
ALMEMO [®] 5690-1CPU ALMEMO [®] 5690-2CPU		opt. opt.		✓	✓✓	✓✓	✓✓	AA AA	100 100	66 66	opt. opt.		✓ ✓		57 59
ALMEMO [®] 500 CPU V7	20	opt.		✓	1	✓	✓	AA	4000	66	opt.		✓	✓	43
ALMEMO® 4390-2	1		✓		✓	✓	✓	AA	100	66				✓	67
Basic device (transmitter) ALMEMO [®] 2490-1R02U ALMEMO [®] 2490-2R02U	1 2		* *				√ √	B B	10 10	65 65				* *	65 65
Reference measuring instrument ALMEMO® 1020-2 X6 ALMEMO® 1030-2 X6 ALMEMO® 1033-2 X6	2 2 2			* * *	* *		* * *	AS AS AS	1.25 1.25 2.5	4 1 2	* * *	* * *			68 70 72
ALMEMO [®] 1036-2 X6 ALMEMO [®] 8036-9 X6	2 9			~	✓ ✓		✓ ✓	AS AS	1.25 1.25	7 7	✓ ✓	~	~		74 76

ALMEMO[®] Measuring Instruments

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.







ALMEMO[®] Measuring Instruments

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 $< 5 \mu V$
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 measu- ring instruments	Precision measu	ring instruments	
Precision class	С	В	Α	A	Α	
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 Option 400 mops*	/ 100 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	\pm 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 mea- sured 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 $^{\circ}\mathrm{C}$ Storage temperature: -20 to +60 $^{\circ}\mathrm{C}$

for power supply NA11/NA12

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

ALMEMO® Measuring Instruments

Measuring ranges

Sensor type	Туре	Meas	uring nge	Units	Resolution	n Linearization accuracy	Connector programming
Resistance temperature det	ectors:						
Pt100 / Pt1000 -1 4-wire	FP Axxx	-200.0 to	+850.0	°C	0.1 K	± 0.05 K ± 0.05 % of measured value	e 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
Pt100 -3 4-wire	FP Axxx	-8.000 to	+65.000	°C	0.001 K	±0.002 K	ZA 9030 FS7
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
T11							
Nice Ni (K)	ET 4	200.0 to	1270.0	°C	0 1 V	10.05 K $10.05 g/$ of measured value	7 A 0020 ES
NICI-NI (K)	F I AXXX	-200.0 to	+13/0.0	۰ <u>ر</u>	0.1 K	± 0.05 K ± 0.05 % of measured value	2 ZA 9020 FS
$\frac{1}{10000000000000000000000000000000000$		-200.0 to	+1300.0	°C	0.1 K	± 0.05 K ± 0.05 % of measured value	2A 9021 FSN
Fe-CuNI (L)		-200.0 to	+900.0	۰ <u>ر</u>	0.1 K	± 0.05 K ± 0.05 % of measured value	2A 9021 FSL
Fe-CuNi (J)		-200.0 to	+1000.0	°C	0.1 K	± 0.05 K ± 0.05 % of measured value	2A 9021 FSJ
Cu-CuNi(U)		-200.0 to	+600.0	۰ <u>ر</u>	0.1 K	± 0.05 K ± 0.05 % of measured value	2A 9000 FSU
Cu-Cuini(I)		-200.0 to	+400.0	°C	0.1 K	± 0.05 K ± 0.05 % of measured value	2 ZA 9021 FS1
P(Rn10-P(S))		0.0 to	+1700.0	۰ <u>ر</u>	0.1 K	±0.3 K	LA 9000 FSS
P(Rn13-P(K))		0.0 10	+1/00.0	°C	0.1 K	±0.3 K	ZA 9000 FSR
PtRh30-PtRh6 (B)		+400.0 to	+1800.0	۰ <u>ر</u>	0.1 K	±0.3 K	ZA 9000 FSB
Aufe-Cr		-2/0.0 to	+60.0	٩C	0.1 K	±0.1 K	LA 9000 FSA
Electrical and digital signal	ls:						
Millivolts DC		-10.0 to	+55.0	mV	1 µV	-	ZA 9000 FS0
Millivolts 1 DC		-26.0 to	+26.0	mV	1 µV	- 2	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	- 2	ZA 9602 FS
For measuring bridges Sup	ply 5 V (Example)) -26.0 to	+26.0	mV	1 µV	- 2	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	- 2	ZA 9903 AB5
Ampere AC (11 Hz to 250)	Hz) (Example)	0 to	+10.00	А	0.01 A		ZA 9904 AB2
Volts DC (sampling rate 1 l	kHz) (Example)	0 to	+400	V	1 V	- 2	ZA 9900 AB5
Ampere DC (sampling rate	e 1 kHz) (Example) 0 to	+10.00	А	0.01 A		ZA 9901 AB4
Milliamperes DC		-32.0 to	+32.0	*	mA	1 μA 2	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 sensor	rs:						
Rel. humidity	FH A646	5.0 to	98.0	%Н	0,1 %	—	
Rel. humidity with TC	FH A646-R	5.0 to	98.0	%Н	0,1 %	$\pm 0,5 \%$	
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	e
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	%Н	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	e
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).

ALMEMO[®] Measuring Instruments

Sensor type	Туре	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	$\pm 0.1 \text{ m/s}$	
Dynamic pressure sensor	FD A602-S6	1.8 to	90.0	m/s	0.1 m/s	$\pm 0.1 \text{ m/s}$	
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	pН	0.01 pH	_	ZA 9610 AKY4W
Redox probe	FY96RX-Ex	0.0 to	2600.0	mV	0.1 mV	-	ZA 9610 AKY5W
Optical radiation (Examp	les)						
Lux measuring probe	FLA613-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 ² s	0.1 µmol/m ² s	-	
Other connectable sensors	/ transducers (Exa	mples)					
Heat flow plates	FOAxxx	-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 mł	oar	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 measu	ring point					_	
Summation over measurin	ig 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 temperatu	re (WBGT) (0.1 TI	O + 0.7 TW	+0.2 TG)		-	
Measured value							
Cold junction temperature					°C		
Number of averaged value	es						
Volume flow		0 to	65000	m³/h	1 m ³ /h		