

1. Introduction

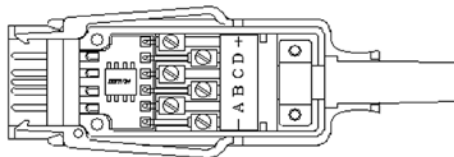
1.1 The ALMEMO® System

ALMEMO® measuring instruments represent an entirely new generation of measuring equipment. The intelligent ALMEMO® connectors are patented and have been especially designed for connecting the sensors and peripheral equipment. They include an EEPROM where sensor and device parameters are stored. Connected devices are automatically detected and the functions adapt correspondingly, giving the measuring instruments an unsurpassed flexibility and ease of operation.

All sensors, programmed ex works or by the user, can be exchanged without altering any settings. When connecting sensors to the measuring instrument the measuring range, gain, required power supply and reference junction compensation will be automatically transmitted to the measuring instrument. Furthermore, the measurement data corrections, scales, dimensions and even the sensor description will be transmitted to the instrument. Faulty measurements caused by wrong programming or confusion of sensors are totally impossible. Special sensors are not required. Nearly every sensor can be connected to the ALMEMO® connectors using the 6 terminals. Programmed connectors are available as accessories. However, all parameters can also be programmed manually via user interface or serial interface. A selective locking function has been integrated to protect against undesired alteration.

The interface electronics for analogue and digital interfaces is not integrated into the outputs of the measuring instruments but is located in the plugs of the connector cables. Consequently, there are no costs for outputs that are not used and, furthermore, it is possible to connect totally different interfaces to the same socket. The type and the parameters will be read out of an EEPROM located in the ALMEMO® connector and the instrument will be programmed accordingly. Analogue outputs and digital interfaces (RS232, RS485, fiber optics, Centronics etc.) can be changed with no programming required, even if they have different baud rates or transmission formats.

As a result, the ALMEMO® measuring instrument is, up to the timing of the process control, completely programmed by the intelligent ALMEMO® connector as soon as sensors and interface cables are connected. Furthermore, all parameters can be modified as the memory devices built into the connectors can be repeatedly overwritten..



ALMEMO® connector with EEPROM
and 6 terminals

Based on the intelligent ALMEMO® connectors all ALMEMO® measuring instruments have the same outstanding features:

- An incomparable range of transducers, sensors and signals that can all be connected to any measuring socket of any measuring instrument using the patented ALMEMO® connector system. No programming is required as all sensor data is stored in the connector plug allowing automatic configuration of the measuring instrument on connection.
- All instruments use the same measurement input circuit for more than 70 measuring ranges so that reproducible results can always be guaranteed.
- All sensors can be calibrated, scaled and allocated an unambiguous name using the sensor data memory. As a result, highest precision is achieved with a minimum of efforts and faulty measurements are totally eliminated.
- The change-over of measuring points is performed with electrical isolation using semiconductor relays that are totally free from wear. This allows for a continuous scanning of measuring points at a rate of 50 measurements/second even when in permanent service.
- Analogue or digital interfaces are integrated into the connecting plugs and connecting cables but not into the instruments. This allows the user to freely select analogue outputs, different interfaces (RS232, RS422, fiber optics, USB, ethernet, current loop, Centronics, radio), alarm signal generators or trigger inputs to requirements. There is only a purchase of what is required and can even be re-used with any other ALMEMO® device.
- All measuring instruments can be addressed via the interface and can be networked. A built-in distributor allows for a simple networking of up to 100 devices by means of network cables and via one single computer interface for data logging. RS422 drivers and distributors are available for larger distances between networked units. This system minimises the equipment required, cabling costs and EMC problems. It easily adjusts to any new task and can be extended as required.
- The software protocol and the command set is identical for all instruments. One terminal device is sufficient to programme all parameters or to scan all measuring data. Suitable data output formats are available for printer and for use with spreadsheets.
- The ALMEMO® instruments only differ from each other with regard to their enclosure (hand-held instruments, table instruments, 19" systems, switchboard instruments, transmitters etc.), the number of measuring inputs (1 to 100), the display, output and user interface controls, and the power supply.

1.2 The device generations

1.2.1 ALMEMO® Version 5

Since the first ALMEMO® hand-held instrument was introduced in 1993, the fascinating ALMEMO® system with its infinite possibilities for sensor connection, data processing and device networking was continuously improved. A wide range of all types of measuring instruments is now available. From 1-channel transmitters to data acquisition systems with more than 1,000 sensing points. With the launch in 1999 of device generation ALMEMO® Version 5 we successfully created one uniform firmware version for all our devices. Device functions were standardized and substantially extended; options could be configured as required. All parameters could also be accessed via interface commands.

- As a standard, all previous additional functions are available with each device
- As a standard, data loggers with 520kB memory for up to 100,000 measured values
- Data storage in external ALMEMO® EEPROM memory connectors (260kB)
- Memory configuration as linear or ring memory
- Selective data logger memory read-out with respect to time, number, alarm values
- A new LCD displays up to 19 channels with full resolution of the measured value
- All devices support 4 measuring channels/sensor (important for all humidity sensors)
- New possibilities due to programmable reference channels at arithmetic functions
- Integration of external devices via a serial interface
- Pt100 linearisations according to the new temperature scale ITS 90
- Support of the new chemical sensors with regard to conductivity, O₂ and CO₂
- Air pressure input or automatic compensation via pressure sensor
- Programming and monitoring of the individual sensor supply voltage
- Internal allocation of alarm relays to limit values, configurable relay function
- Programmable hysteresis when limit values are exceeded
- Changeable function of trigger cables (start/stop, manual, clear, press, reset)
- Scaling of the analogue output for each channel, external control via interface
- Continuous scanning of measuring points with a sampling rate up 2.5 to 50 measurements/second and output and data storage using a 0.01s time mark
- Limitation of data amount by a print cycle factor for each channel

- Faster data transmission with a baud rate of 57.6 kBd
- Solution for the 'year 2000 problem' with a four-digit indication of the year
- Free WINDOWS configuration software AMR-Control with terminal

Due to the large number of common features in ALMEMO® measuring instruments all sensors, connection options for existing own sensors, analogue and digital output modules and functions, with regard to the interface handling, are described in this ALMEMO® manual. Features and operating controls, which are specific for an individual device, are described in a separate device manual.

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1.2.2 The new generation 2002

The development of devices incorporating a graphics display (ALMEMO® 2590-9 and the 5990-2 system) has been another great leap forward in terms of functional range and user-friendliness.

- Illuminated graphics display
- Menu guidance via soft-keys
- User menus can be freely configured from a range of 50 measuring functions.
- Menus can be quickly and easily generated, loaded, and saved by means of the AMR-Control software.
- Each menu and all individual functions can be printed out.
- Selectable menu interface language - German / English / French
- Thumb-wheel (operated like a mouse) for quick and easy function selection and data input
- Continuous output of measured values for up to 20 measuring points
- Measured values can be displayed as line diagrams or bar charts.
- Measuring rate now up to 50 measuring operations per second
- Data can be saved for each different sensor configuration.
- Data can also be saved on smart media cards, up to 32 MB.
- High-speed search index for numbers and dates
- Double processor clock - for even quicker data transfer at 115.2 kbps
- Indication of remaining storage capacity when data is output
- All measured values can be saved - even with manual averaging.
- Programmable smoothing function
- Volume flow measurement - with channel diameter or cross-section
- Thanks to the new function channels for number of averaged values and volume flow, these parameters can be output and saved.
- Function channel for measured values allows multiple evaluation; function channel for cold junction temperature allows logging of ambient temperature without sensors.
- Date and time-of-day can be recorded for all maximum and minimum

values.

- Duration of measuring operation (extra function)
- Date and time-of-day can be output in MS-EXCEL-compatible table format.

1.2.3 V6: new device generation as of 2003

In 2003 we brought all our measuring instruments into line with absolute state-of-the-art technology - with powerful flash processors and high-resolution delta-sigma A/D converters. The first step was to make our lower-category devices available with vastly improved functions while retaining their very reasonable price. Our tried and tested ALMEMO® 2290-4 was phased out in favor of the new ALMEMO® 2390-5 with its three input sockets and more user-friendly handling. Compact universal transmitter 8390-1 supersedes the 8990-1; it is also available as display device 8390-2 with all the functions of the 2390-5.

- thermocouple characteristics as per ITS 90
- data logger with fail-safe EEPROM
- function channel for volume flow measurement - with factor, diameter, cross-section
- measured value menu for zero-setting, sensor adjustment, setpoint and units entry
- continuous / semi-continuous measured value scanning for continuous updating of all channels
- simplified averaging function, manual start / stop with averaging mode

New functions (except for ALMEMO® 2390-1, -3 and 8390-1, -2)

- Updating capability via the serial interface
- Support for special measuring ranges, special linearization, and multi-point calibration - all in new ALMEMO® connectors with larger EEPROMs (code E4)
- Option KL : User-defined special linearization and multi-point calibration

The introduction of our data loggers ALMEMO® 2690-8 und 2890-9 opens up a completely new dimension in user guidance.

- measuring menus, user menus, and programming menus as on the 2590-9
- another 30 help menus to assist with all slightly more sophisticated configurations
- a special help window to assist with many measuring and programming functions
- two-point scaling of transmitter signals
- straightforward sensor adjustment with brief, temporary unlocking
- pushbutton toggling between measuring menu and programming menu
- network measurement for determining volume flow - with maximum 12 points array
- calculation of available memory time based on cycle and measuring points

- indication of measuring duration after each start
- possibility of directly selecting any numbered measuring operation in the memory
- Unlimited memory capacity thanks to plug-in memory connectors with MMC card
Automatic generation of new files as soon as the connector configuration is modified. Ultra-quick data transfer to the PC using standard card reader
- brightness / duration of LED illumination, settable and adjustable
- modern, ergonomic, splash-protected housing with rubberized impact protection (2690-8 only)
- Option KL : Serial numbers management, calibration data management, device locking

1.2.4 New developments 2006 / 2007

In 2006, based on the tried and tested ALMEMO® 2890, our new ALMEMO® 8590-9 data acquisition modules appeared on the market; this series, with electrically isolated measuring circuitry, set new standards in terms of measuring quality and reliability. The new modular 5690-1 and 5690-2 systems also benefit from a streamlined power supply system and high-speed SPI bus networking. In 2007 we are launching a whole series of handy, inexpensive devices enclosed in a new compact housing. In conjunction with this series we have appreciably improved the addressing of output modules by means of relays, trigger inputs, and analog outputs.

Data acquisition modules and systems

- Electrically isolated measuring circuit operating at up to 100 mops
- Uniform and high-performance 12-volt sensor power supply for all modules
- Sleep mode for the whole system
- New modules for thermal connectors and direct clamp connectors
- All modules can be set individually to 10 / 20 / 30 / 40 channels.

Handy, compact devices

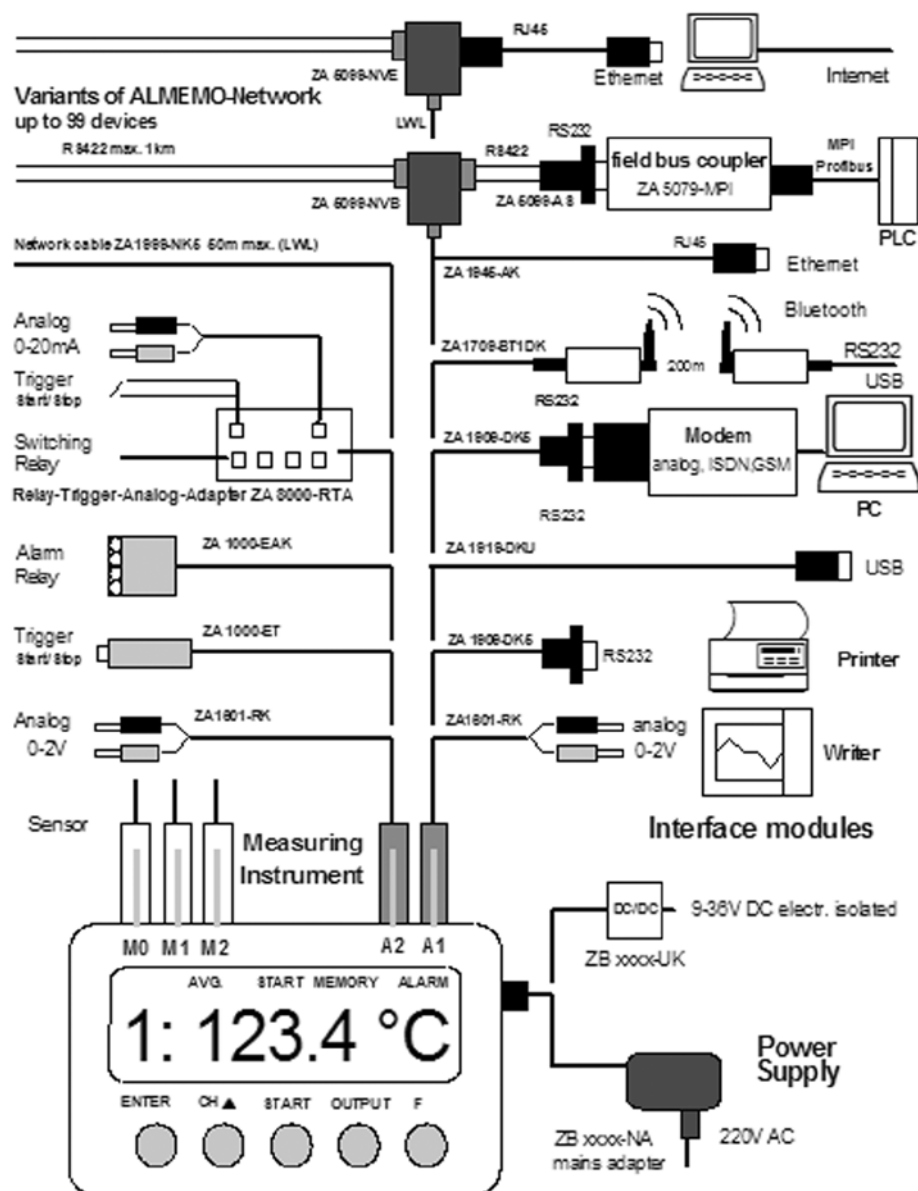
- High-performance power supply from three AA battery cells
- External power supply, 9 to 30 V
- All with keypad, maximum / minimum / hold functions, and relative measuring
- Memory sufficient for 100 measured values
- Generously dimensioned 2-row 7-segment display or illuminated graphics display
- Data logger with internal EEPROM or MMC memory connector
- Straightforward operation via the graphics interface with sensor menu and functions menu
- Standardized networked measuring with points calculation for determining volume flow

- Up to 4 sensor sockets
- Option with internal analog outputs, electrically isolated, RS485 interface

New functions

- New scanning modes for monitoring data loggers using our WinControl software
- Secure data transmission with CRC (cyclic redundancy check)
- Command macros executed via limit values and trigger signals
- All elements on output modules can be individually configured.
- Output modules with multiple analog outputs

1.3 ALMEMO® input / output modules via sockets A1 and A2



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