Communication interfaces between subunits of heatmeters

A) General

I) Scope

This standard describes communication interfaces between subunits of heatmeter systems. Examples for such subunits are:

1.) Remote displays
2.) Tariff units
3.) Volume- or mass measuring subunits
4.) Digital temperature sensors
5.) Adapters for special communication systems

Not covered are simple interfaces for incremental pulse output or pulse input where each pulse corresponds to a predefined metric volume- or energy increment. Such interfaces are treated in a separate section of this standard.

II) Strategy

The hardware and software interfaces between subunits should use the same standards as for general (external) communication whenever possible. Especially the M-Bus interfaces and protocols should be used whenever possible. The following standards describe therefore only hardware or software communication interfaces for special requirements.

B) Physical layer

I) General Requirements

Communication with a subunit must never deteriorate the metering function, the accuracy or timely requirements for the meter or bus-communication functions.

Communication with interfaces for local readout or the display function might be temporarily impaired if a readout or display is not delayed by more than 1 sec under all circumstances.
All interfaces between subunits must meet all requirements for heat meters especially all EMC-type requirements.

II) Unidirectional interfaces

Often only unidirectional communication between a meter and its subunits is required. In this case only the transmitting unit (meter or subunit) determines the time point of data transmission. The receiving unit must always be ready for data reception independent of its internal mode and operation status.

III) Standard interface physical layer

The M-Bus interface should be used for communication except if the subunit or the meter does not have sufficient power available for the voltages (>24V) and currents (up to 23mA) required for communication via this interface. This interface can guarantuee all EMC-type requirements and can often supply the additional current required for the communication between subunits and meters.

IV) Other physical layers

1.) Unidirectional open collector output interface

This physical interface is electrically similar to the pulse output Class D (open collector, short pulses). It can be used together with an input interface similar to a pulse input interface Class C. A closed (low impedance) state signals a „zero“.
The timing requirements must fulfill the byte timing requirements of the ISO/IEC7480 for the baudrate used.
The maximum cable length for this interface is <3m.

2.) Optical interface

This physical interface emits infrared light in the wavelength range of 870-960nm with an intensity of >0.1mW/sr for a „zero“ and with an intensity <10uW/sr when the data bit is off. Note that these requirements are also met by the output side of an optical interface according to EN61107 (1996). The corresponding input interface must detect the active state („zero“) for intensities >50uW/cm² and the passive state („one“) for intensities < 20uW/cm². The mechanical construction for such an optical interface must also be standardized in the future.

V) Bit codings

1.) Direct bit coding

For a „zero“-bit the active state is transmitted for the full bit time. For a „one“-bit the passive state is transmitted for the full bit time.

2.) Power saving bit coding

Especially (but not only) for optically isolated subunits IrDA-type coded data bits may be used. Here a „zero“ is coded as an active (low impedance, light on) pulse with a duration beween 1.6usek and 3/16 of a bit time. For the rest of the bit time a passive state is used. A „one“ is coded as a continous passive state for the full bit time.

C) Unidirectional link- and application layer

I) Standard byte structure

All communication between subunits must use asynchronous (start-stop)-communication with either 300Baud or 2400 Baud. The byte structure is 1 start bit, 8 data bits, 1 even parity bit and 1 stop bit. For the byte and telegram timing requirements see ISO/IEC7480.

II) Partially structured multibyte telegrams

Especially for intelligent volume interfaces or heat meters a multibyte telegram containing incremental information can be used. Such an incremental telegram starts with a leading $78 signalling a non-M-Bus-type telegram. This is followed by a length byte and and then by a DIF/VIF-structured information telegram of 2-255 bytes. The telegram ends with a checksum byte as used in the standard link layer. No further link layer overhead and no fixed data header is used. The time interval between such data packages must be >=330 bit times. It is recommended that the volume interface can also output either automatically or on request a fully structured telegram containing fixed data (e.g.header) or integral data (e.g. accumulators).

III) Fully structured multibyte telegrams

These telegram follow completely the EN1434 part 3 M-Bus protocol for either SND_UD or for RSP_UD-telegrams, depending on the direction: RSP_UD telegrams are used for communication from the meter to the subunits and SND_UD are used for the other direction. Note that both these telegram types start with a leading $68 and are therefore distinguishable from partially structured multibyte telegrams (starting with $78). The time interval between such data packages must be >330 bit times.

D) Bidirectional link- and application layer

All bidirectional communication uses the same link- and application layer as the M-Bus protocol of the EN1434 part 3.