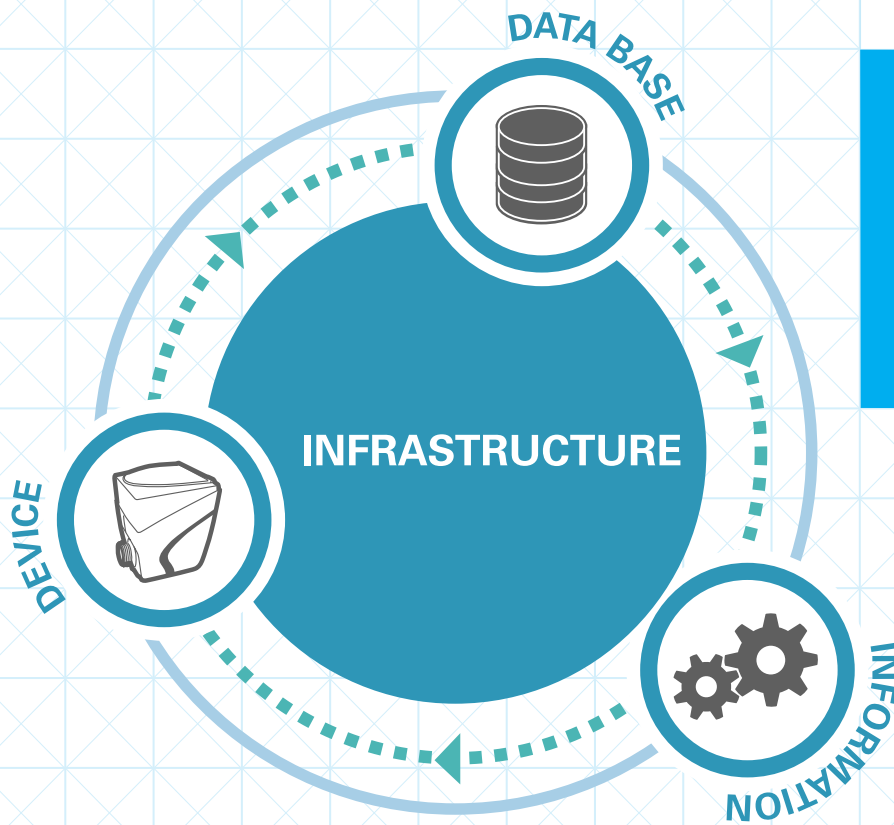



The SensusRF radio system acts as an interface, getting the required information from the endpoint and providing it for database processing for further analysis and converting data into information.



## SensusRF

### SensusRF Infrastructure

SensusRF is the optimized license free radio for battery driven endpoints and repeaters. Scalable for mobile and remote reading without exchange of components, it is available in 433 MHz and 868 MHz. OMS compatible 

### SensusRF offers two communication modes:

#### Unidirectional - BUP\*

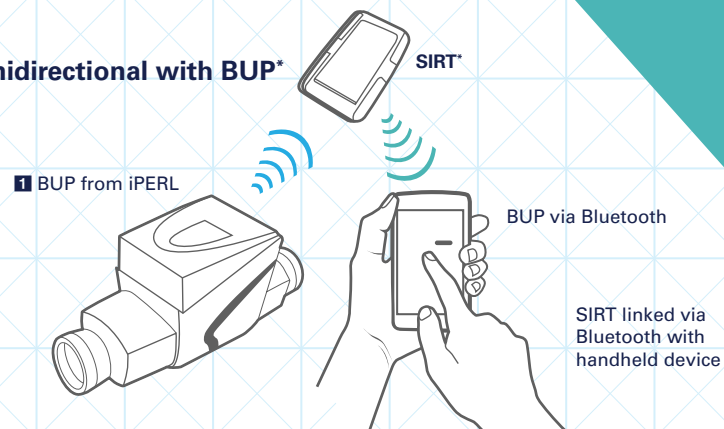
- Fast Readout
- Easy to use
- Reliable battery lifetime of the device
- Simple "sniffing" for devices in a certain range
- Short and robust telegram (BUP\*) with endpoint ID, total consumption, alarm flags
- Auto routing capability in radio network

#### Bidirectional - LAT\*

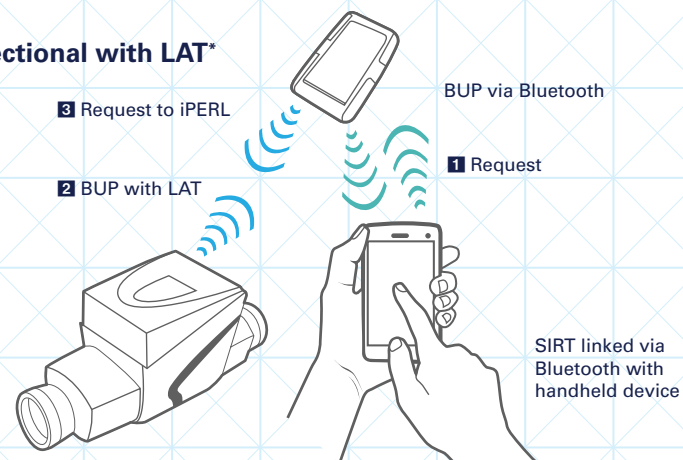
- Extended data protocol
- Retrieve data on request
- Remote configuration (alarms, alarm resetting etc.)
- Download of data logger values

**SIRT\*** Sensus Interface Radio Tool  
**BUP\*** Bubble Up Meter Reading Packet Format  
**LAT\*** Listen After Talk

### Unidirectional with BUP\*



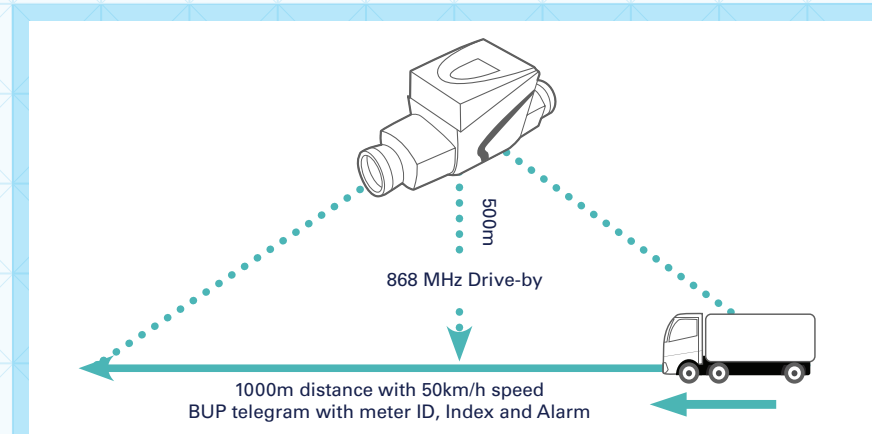
### Bidirectional with LAT\*





### Mobile read - Walk- / Drive-by

- Unidirectional telegrams
- Bidirectional communication
- Spontaneous reception without route
- Configuration of the endpoint



Note: all distances for direct line-of-sight

### SIRT (Sensus Interface Radio Tool)

SIRT is a radio modem for SensusRF radio connection to a handheld via Bluetooth and using SensusREAD software with the following features:

- Installation and readout of devices
- Reception of frequently transmitted radio messages from Sensus RF radio endpoints.
- Request additional information from the radio endpoints
- Change configuration of radio endpoints (alarm, level settings... )

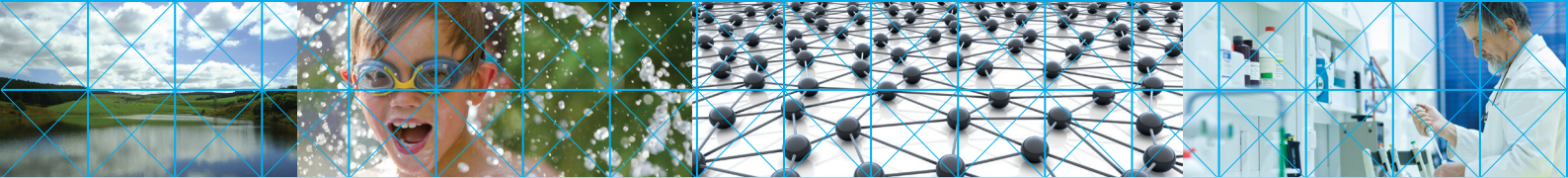
SIRT provides 2 internal antennas and forwards radio messages from the strongest one received (diversity function). Technical features:

- IP 53 (water spray protected)
- Power supply via USB from mains or PC
- External antenna available for drive-by applications
- Software library available to integrate SIRT into existing systems

### Mobile Reading Software

SensusREAD is a Sensus software for automatic readout of metering devices through a mobile handheld. The user can choose between a guided (route) or service readout.

- Export of readout data / Import of other MDM database
- Readout via radio by single address or broadcast
- Supports also other technologies like Sensus((S))cout
- Repeaters can be implemented to expand the radio range in each direction



## iPERL infrastructure

All iPERL and future Sensus endpoints have SensusRF integrated technology covering the advantages of both uni- and bidirectional system architecture as described before.

- Reliable battery lifetime determination
- Automatic endpoint detection via handheld computer or PC
- Short and robust information set and on demand longer radio telegram with additional information
- Remote programming
- Applicable for walk-by, drive-by and fixed radio network infrastructure without any configuration or exchange of components

**iPERL provides information every 15 seconds in a short telegram (BUP):**

Fab. No.	24871973
Meter reading	3683
Alarm information*	00000000
Reception level (RSSI)**	95%
Time stamp**	05.01.2011

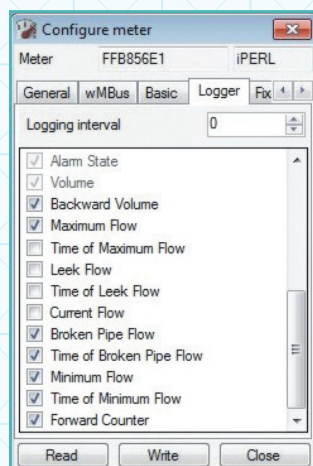
\* possible alarms are: tampering with magnet, low battery, broken pipe, leakages, backward flow, empty pipe

\*\* added by the receiving device

## Endpoint dependent protocol - here iPERL

Using SensusRF, parameters and additional information can be retrieved from iPERL on request - see table below:

Meter type	OMS status	Leak start
Fab. No.	OMS interval	Leak end
Meter reading	Alarm activation	Magnet tamper start
Alarm information	Leakage detection	Magnet tamper end
Reception level (RSSI)	Broken pipe detection	Empty pipe start
Time stamp	Remaining battery	Empty pipe end
BUP interval	Max. flow rate	Backflow start
LAT interval	Time since max. flow	Backflow end
Current flow rate	Min. flow rate	Broken pipe start
Backward volume	Time since min. flow	Broken pipe end
Units	Time since low battery detected	Fixed date reading

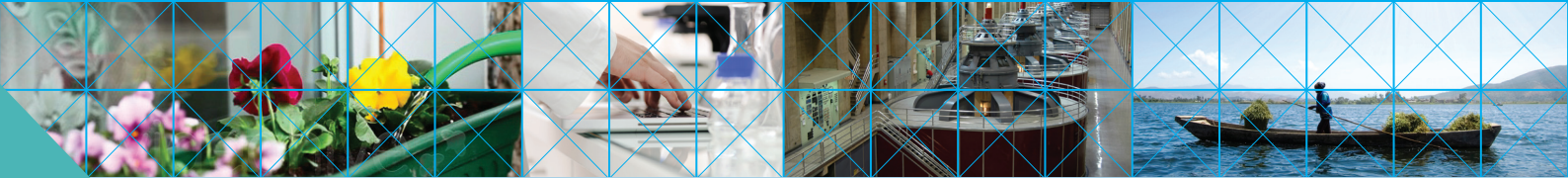


Data logger and fixed date reading are special telegrams requested by command.

The integrated data-logger can provide from 2 up to 13 parameters with up to 2880 steps within the rotating memory - see table:

The time interval can be selected from 1 minute up to 1 day.





## Fixed Radio Network

- Auto configuration wizard (gateway sniffing for endpoints and repeaters)
- Integrating repeaters (up to 7 hops in a chain)
- Self-healing network (using alternative routes)
- Meter reading transparent and local
- Fast track alarms
- DMA snap shot (snap shot of a water network for evaluation)
- Using TCP/IP technology for the WAN communication
- High level of data security (encryption end-to-end)
- Enables cloud technologies, FTP and other remote database applications

## Network devices - Sensus Repeater & Gateways

Gateways can use repeaters to extend the radio range of a network.

- Scheduled reading of programmed meters
- Transparent mode
- Remote reading and network maintenance
- Auto routing of a network (repeater and endpoints)
- Auto maintenance in case of endpoints missed
- GPRS and Ethernet connection
- IP65 (wet/humid environment, outdoor usage)
- Mains power supply, solar panel, .....
- Up to 7 repeaters

## iPERL Fixed radio network - Remote Access & Monitoring

