
ABB MEASUREMENT & ANALYTICS

AquaMaster4 electromagnetic flowmeter

For water distribution network and revenue metering applications



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Measurement made easy

Optimum management of water distribution network – naturally!

AquaMaster4 – a perfect fit for:

- **Water supply in district/zonal metering area**
- **Revenue metering**
- **Leak monitoring in district/zonal metering area**
- **Survey and flow investigation**

Potable water distribution network

Application needs and challenges

The purpose of a water distribution network is to supply the users with water demanded and to supply this water with adequate pressure under various loading conditions. A municipal water supply system is subjected to a number of different loading conditions:



Peak daily demands, varying throughout a day



Critical load when pipes leak or burst



Fire extinguishing demands at different nodes

A combination of growing water scarcity exacerbated by:



Growing population



Rapid urbanization and increase of per capita demand



Impact of global warming

One of the ways utilities can increase their operational efficiency is by knowing accurately the load on the network

Continuous flow measurement is paramount to enable effective construction and calibration of network model. The flow data into and out of each zone provides utilities detailed understanding of per capita demand and over time information of growth of demand and also leakage. To achieve all this, the right choice of flowmeter technology and the sizing of it are very important as the meter needs to cope with – peak daily flows, seasonal demand and night flows into a DMA (District Metered Area) or into sub-divisions of a DMA. In addition to these, accuracy is another important requirement to enable precise revenue billing and to gather total leakage data.

Advantages of electromagnetic flow technology

Due to its technical and economic advantages electromagnetic flowmeters have become the standard flow measurement technology within the water industry.

The original brains behind the world's 1st

Research and development is a vital source of ABB's technology leadership. It builds on the foundation of many innovations and continues to develop breakthrough technologies needed to meet future challenges.

1988

World's 1st – battery powered electromagnetic flowmeter for District Metered Area (DMA)

1995

World's 1st – insertion electromagnetic flowmeter

1996

World's 1st – insitu electromagnetic flowmeter verification system

2000

World's 1st – 0 x diameter upstream and 0 x diameter sensor technology

2004

World's 1st – integrated GSM communication technology in flowmeter

2006

World's 1st – self-verifying electromagnetic flowmeter

2011

World's 1st – renewable energy powered electromagnetic flowmeter

2014

World's 1st – Water Industry Telemetry Standards (WITS) integrated powered electromagnetic flowmeter

2017

World's 1st – electromagnetic flowmeter with NFC (Near Field Communication) interface

AquaMaster4...

Innovative, evolutionary, inspirational



Invest smartly through 'single box' District Metered Areas (DMA)

Measurement of flow and pressure parameters are critical to optimize your water distribution network. The inbuilt logger functionality provides total flexibility – enabling data to be interrogated, in precise detail, during a period of interest, at even higher time resolution.

Achieve even more (flow, pressure and logger) with less capital expenditure



Increase confidence in your revenue billing

Accuracy of flow measurement is key for revenue billing. AquaMaster4 offers the widest flow range (up to R1000), highest accuracy (up to $\pm 0.2\%$ of reading ± 0.5 mm/s) and long term stability.

Deliver accurate bills for true consumption, not estimates



Have confidence in our flow meters from the wet calibration

ABB's flow calibration facilities are certified by national independent accredited bodies/laboratories, which are linked by the 'International Laboratory Accreditation Cooperation' (ILAC).

Have complete confidence in the accuracy of our flow meters





Receive early warnings for leaks or bursts – minimizing Non-Revenue Water (NRW)

Accurate flow and pressure measurement are essential for understanding non-revenue water in your network. AquaMaster4 with its unique reduced bore sensor enables water utilities to accurately measure flow and pressure at very low flow rates during night. This capability enables water utilities to separate leaks from consumption.

Manage leaks and pressure in your distribution network – reduce waste and prioritise OPEX strategically



Class leading ‘fit and flow’ set-up with unique ABB Velox mobile app

AquaMaster4 is the first transmitter to feature a contactless interface using industry standard Near Field Communication (NFC). The dedicated ABB Velox App, available for use with Android & Windows mobile devices, enables configuration changes to be easily made. Simply configure offline and utilize NFC to update the AquaMaster4 configuration. The data logger contents can also be downloaded in CSV format for offline interrogation.

Delivers increased productivity and simplifies sensor/transmitter configuration



Achieve lowest total cost of ownership (TOTEX) over complete product lifecycle

A combination of up to 10 years of battery life, readily available off-the-shelf batteries, no need for special cables and dedicated mobile phone applications (ABB Velox) to increase staff productivity make the AquaMaster4 deliver the lowest TOTEX over complete product lifecycle.

Achieve a higher return from the investments you make with us

Designed to perform, built to last

Harness the power of electromagnetic flowmeters

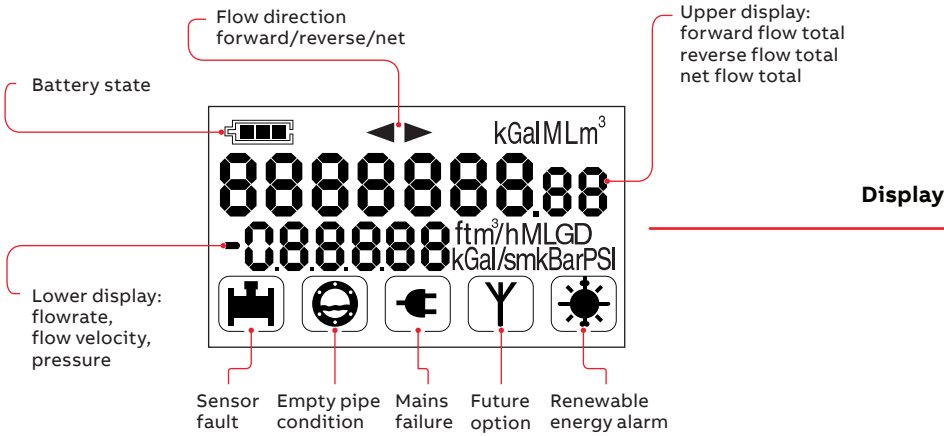
Wall-mount contactless couple (optional)

Allows users to communicate easily using a mobile phone/tablet when the transmitter is located in inaccessible places (for example, a pit).



Clear and comprehensive display

8 mm (0.31 in.) high displays for totals (exceeds ISO 4064 requirements).



Fit and flow

No need to match sensor and transmitter, sensor stores all calibration factors, site settings and serial numbers.

In built data logger (optional)

Optional multi-speed, flowrate and pressure internal logger runs at high speed allowing user to request logged data at any interval (typically set to one minute, but can be as fast as 15 seconds). This gives the user total flexibility to download logged data, and investigate, in precise detail, flow and pressure activity during a period of interest at even higher time resolution.











IP68 connectors

IP68 rated as standard, the transmitter can be fully-submerged up to 2 meters.

Multiple power options

Configurable features

Interactive phone / tablet app – simple and easy

 Internal batteries (up to 10 years life)	 Solar	 Wind	 AC mains	 In-built logger	 Pressure measurement	 Verification	 Secured and easy	 Contactless	 Chart and retrieve data	 Offline configuration	 Easy firmware update
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Advantages for water utilities:

\$↗ Widest flow range, highest accuracy and long-term stable calibration, resulting in highest confidence in performance and revenue billing

\$↗ Offline configuration and save as template stops repetition resulting in increase in staff's productivity

\$↘ No need for special cables resulting in lower cost of ownership

\$↗ Interactive app allows easy download of logger file and sharing via email resulting in an increase in staff's productivity

\$↘ Increased battery life resulting in lower cost of ownership



Protective cover (optional) with wire to the contactless coupler

The removable cover protects the transmitter display from accidental impact damage.

Contactless communication

AquaMaster4 is the first instrument to feature a contactless interface using industry standard Near Field Communication (NFC). A free App (ABB Velox) is available for use with Android and Windows smart phones and tablets. This supports simple configuration changes to made on your touch screen color phone/ tablet. Just touch to upload, then configure offline and touch again to update the AquaMaster4

Renewable power options

Solar and wind power utilizes a simple DC (6 to 22 V) connection from sources as small as a 5 W solar panel/wind generator.

Anti-tamper seal

Security is paramount. To prevent unauthorized access all passwords can be changed. An optional read only/tamper seal switch is located inside the transmitter, so when set and the tamper seals are in place, either none or restricted changes can be made to the transmitter's configuration meeting MID MI-001 regulations. Volume totalizer and tariff values backed-up in the sensor for total security.


Battery enclosure

Readily-available, locally sourced, industry standard D-cell lithium batteries (2 off) provide to 10 years battery life. Each battery can be replaced without loss of logger contents enabling smooth switchover.



NFC tag for backup

For integral mount, all calibration settings are stored for easy access during in-field service. In remote mount the settings are stored in the sensor.



Communications options

	Modbus	Sensus protocol
Pulse output		

Measurement performance

	
Accuracy up to ±0.2% ±0.5 mm/s	Range [R] up to R1000

Environmental conditions

	
IP68 to 2 m	-20 to 60 °C

Easy and intuitive interface to AquaMaster4

What used to take minutes now takes seconds

In practice, many water utilities like many organizations overlook the potential cost savings through increase in productivity of their work force. The level of technologies can make a massive difference in creating a productive and effective workforce.

Velox (Latin word meaning swift) smart phone/tablet app, enables water utilities to increase the productivity (do more in less time) of their work force whilst reducing human errors.



Available on Google play store and Microsoft store



Secure

NFC communications are protected by NIST approved strong encryption to avoid eavesdropping or tampering. 'Use Pin' function allow users to lock/unlock the ABB Velox app with their personalized pin. 'Master password' allows users to set a unique password for all their flowmeters.



View and share

The ABB Velox app allow users to view and share the process values, configuration file and the diagnostics in an easy and intuitive way.



Chart and retrieve data

The ABB Velox app allow users to view the log file on their smart phone/tablet and download it as CSV file.



Contactless

A contactless interface using industry standard Near Field Communication (NFC), allows users to interact with the transmitter without having to connect any cable to the laptop.



Configure online/offline

Users can easily configure or change configuration of the product using the ABB Velox app. This can be done whilst they are away from the site and can be saved it as a template.



Easy and intuitive

The ABB Velox app is easy and intuitive to use, allowing water utilities to deal with de-skilling issues and engage younger generations with instruments.

Easy display of all parameters by ID

The ABB Velox app's process values tab, shows in an easy and intuitive way values for flow measurement, volume totaliser, pressure measurement and digital outputs.

Easy display of flow measurement

The ABB Velox app records the latest flow and velocity readings from the transmitter.

Easy display of volume totalizers

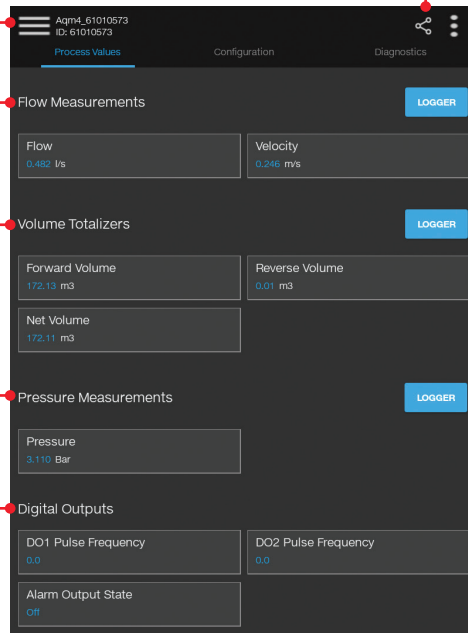
The ABB Velox app records the latest forward volume, reverse volume and net volume from the transmitter.

Easy display of pressure measurements

The ABB Velox app records the latest pressure from the transmitter.

Easy display of digital outputs

The ABB Velox app shows clearly the digital output values.

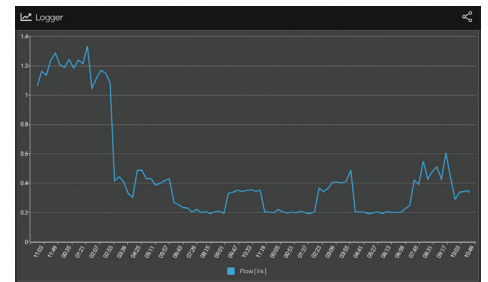


Easy sharing of process values

The ABB Velox app allows users to easily share the process values as text file via one of the methods shown.

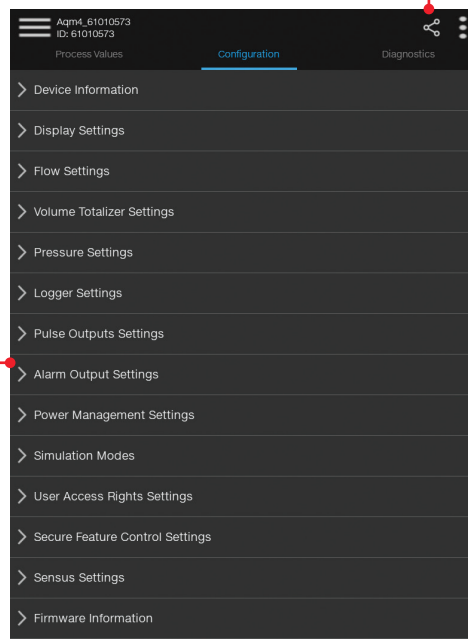
Easy access to view and download logger file

If the transmitter was ordered with in-built logger, the ABB Velox app shows the logger icon.



Easy way to save configuration templates

The ABB Velox app allows users to save configuration templates. A technician can then go to site and just flash the transmitter with the settings in that template.

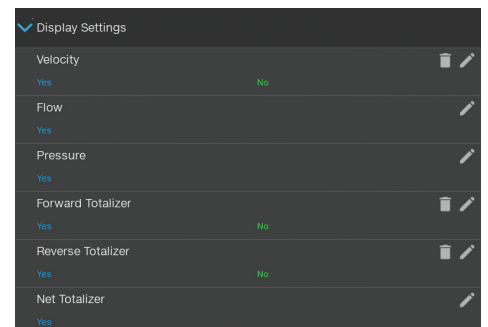


Easy sharing of configuration file

The ABB Velox app allows users to easily share the Configuration file as text file via one of the methods shown.

Easy and intuitive configuration menu

The Configuration tab in the ABB Velox app allows users to intuitively go through the easy set up menu and make changes. Changes made are clearly highlighted as shown below.



Flanged sensor DN40 to 2400 (1.5 to 95 in.)

Designed to perform in all environments

Range of flange options

- ISO 7005, DIN, EN 1092-1 PN10 / PN16 / PN25 / PN40
- ANSI / ASME B16.5 / 16.47 series B
- Class 150 / Class 300
- AWWA C207 Class B / D / E
- AS 4087 PN16
- AS2129 Table E
- JIS 7.5K / 10K / 5K

IP68, NEMA 6P

All sensor types are, as standard, inherently submersible thus ensuring suitability for installation in chambers and metering pits that are prone to flooding.

Sensor memory

The sensor stores all calibration factors, site settings and serial numbers enabling users to 'fit-and-flow'.

Drinking water approvals

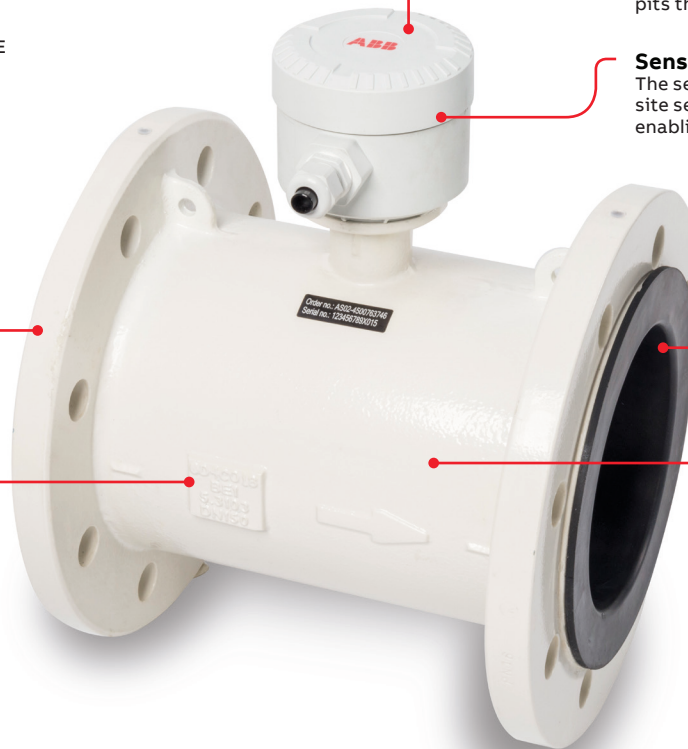
NSF | WRAS | AS/NZS 4020 | DVGW | ACS

EN ISO 12944 C4 grade

Comparable corrosion resistance zinc-based primed with $\approx 70 \mu\text{m}$ (optional $300 \mu\text{m}$) thick paint coat provides long lasting corrosion resistance even in arduous applications.

Upstream and downstream pipe length

Reduced bore DN40 to 600 requires 0D upstream and downstream full bore DN40 to 2400 requires 5D upstream and 2D downstream.



Probe 300 to 1000 mm (12 to 40 in.)

Designed to survey and investigate flow profile

IP68, NEMA 6P

All sensor types are, as standard, inherently submersible thus ensuring suitability for installation in chambers and metering pits that are prone to flooding.

Sensor memory

The sensor stores all calibration factors, site settings and serial numbers enabling users to 'fit-and-flow'.

Mounting

Integrated and remote form.

Material selected to last

The sensor body material enables it to be used in rugged applications.

Hot tap capability

The sensor construction enables installation with no interruptions to water supply.

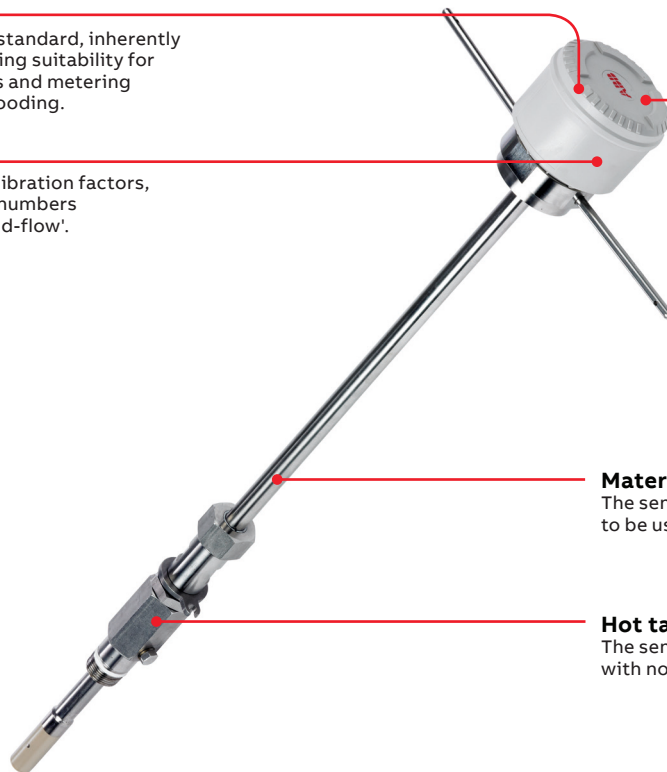


ABB flow laboratory

Certified by external accredited laboratories



Calibration rig NIST traceable and certificated by ISO, UKAS AND SIMT

ABB's flow calibration facilities are certified by various national independent accredited bodies/laboratories. These are all linked by the 'International Laboratory Accreditation Cooperation' (ILAC7), ensuring that, irrespective of where in the world a meter is calibrated, provided that it is calibrated at a nationally accredited laboratory, the calibration is within the published uncertainty for that laboratory.

Flowmeters in ABB's facilities can be calibrated by one of the following methods:

- gravimetric (using weigh scales)
- volumetric (using the meter prover)
- comparison (using reference meters)

Additionally, ABB's laboratories are checked against each other and against external accredited laboratories using transfer standard meters.

Gravimetric

In this method, the flowmeter is calibrated in a pipeline, with water being pumped through it from a sump. A diverter valve situated downstream directs the flow from the meter either back to the sump or to a tank of sufficient capacity attached to a highly accurate weighing system.

This method enables the volume of water collected to be ascertained. When coupled with the collection time, this value gives the average flowrate from the meter during the calibration run. By comparing this with the average flowrate indication from the flowmeter, the error can be measured.

Volumetric

There are two main methods of volumetric calibration:

Fixed volume volumetric tank method

This method works in a similar way to the gravimetric method, except that the flow from the meter is diverted into a tank of known volumetric capacity. This eliminates the need for a weighing system or to calculate the volume of water from its weight.

Fixed volume ball meter prover

In this method, the diverter valve directs the flow from the meter into a meter prover. The prover is a precisely manufactured section of pipe containing a sphere that is three percent larger in diameter than the pipe. Two detector switches are situated in the pipe at a fixed distance apart. The volume of water that is contained in the pipe between the switches is known as the calibrated volume.

During the calibration process, the sphere passes through the flow stream. As it passes the first switch, monitoring of the flowmeter output and the water temperature and pressure.

When the sphere passes the second switch, the monitoring is stopped. At this point, the volume measured by the flowmeter is recorded. The whole cycle is then repeated, this time with the prover flow direction reversed.

The data from both calibration runs enables the total volume of water passed through the prover to be calculated and compared with the volume of water measured by the meter, with any difference being the error.

Comparison

In this method, the flowmeter under calibration is installed in a pipeline in series with a reference, or master, flowmeter with a known calibration. Once the flow of water through both meters is stable, a timer is started and the outputs of both meters are simultaneously monitored. After a set period, the timer is stopped. Using the data from the calibration run enables the average flowrate of the meter under test to be compared with the master meter, with the difference being the error.

Advantages of ABB's calibration rig

All flowmeters have a random uncertainty or noise in their indication. Random uncertainties are often more significant at the lower end of a meter's flow range and can lead to additional errors during calibration. ABB ensures random uncertainties are minimized by adapting calibration times to suit the meter being calibrated.

All of ABB calibration facilities are continuously pumped enabling a flowmeter to be calibrated at a steady flowrate (for example, over 300 or 600 seconds; or longer if required), to reduce a meter's random uncertainty errors during calibration.

ABB has one of the largest continuously pumped calibration facilities in the world, capable of pumping 2.5 m³/s, enabling larger meters to be calibrated at high flowrates.

ABB's high turndown flowmeters (those with a high R number), can be calibrated over an extended flow range, guaranteeing accurate flowmeter performance over its full operating range.

Designed to suit your needs

Services to maximize asset value

Commissioning

Make sure you start quick and easy

Maximizing productivity, profitability and reliability



Verification | Maintenance

Tools and services that make life simpler

Minimize downtime and meet network demands



Calibration

Guaranteed measurement accuracy for metering

Maximizing profitability and quality assurance



Spares, upgrades and electronics replacements

Keep your flow meter operational for longer

Maximizing total asset value and minimizing downtime



Learning in the modern era

Equipping your people with the skills to manage assets effectively

Efficient network management



Measurement care

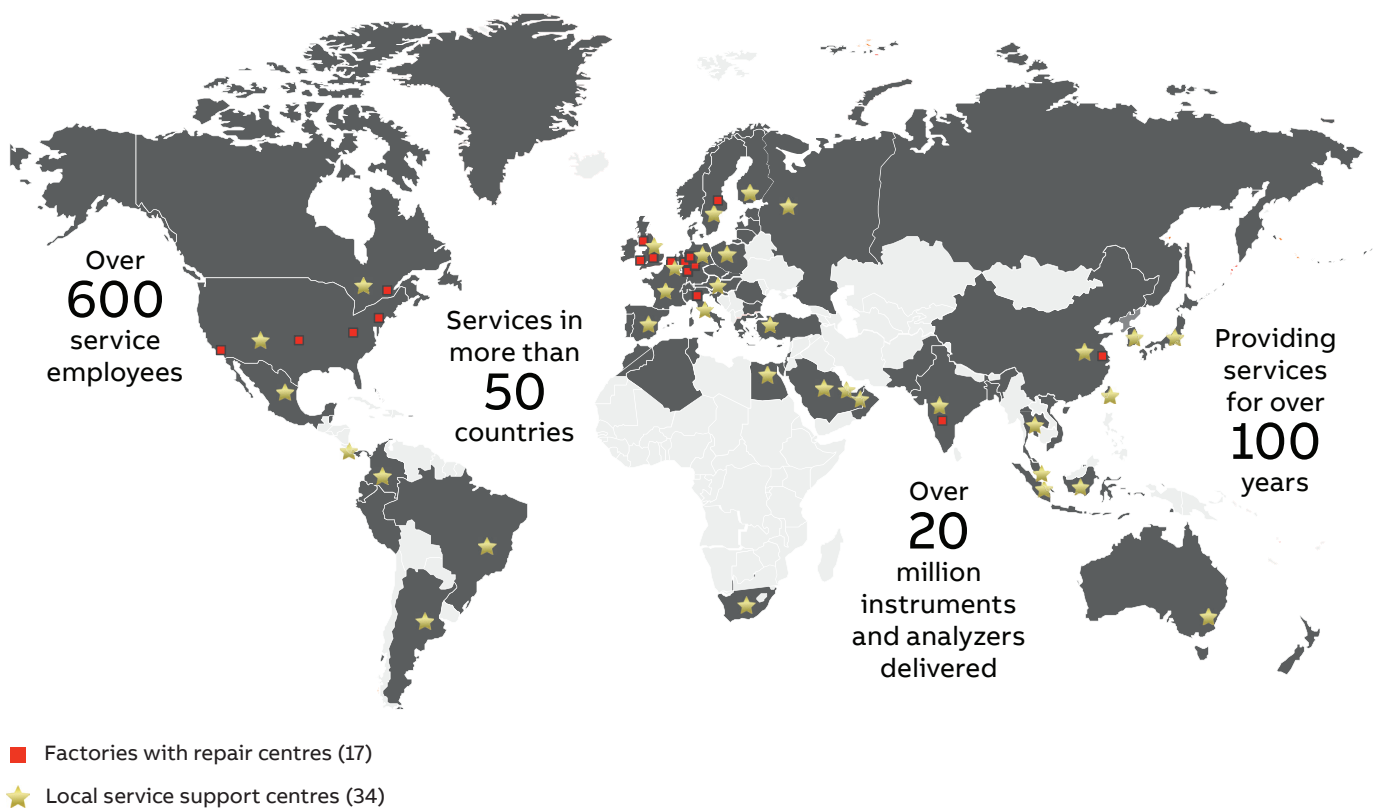
Taking care of your assets so you can take care of your business

Services tailored to your needs



Rest assured you're in safe hands

Your service partner



Providing local support to water utilities dealing with the pressures of urbanization and sustainability

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