



Translation
ORIGINAL MANUAL

ATEMAG Control 4.0

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1 General

1.1 About the operation manual

1.1.1 Release

Status of the manual: 18.10.2022

Revision index: 02

1.1.2 Requirement

We require that the operator is trained in the safe operation of the chip unit and has read and understood this operating instruction.

1.1.3 Availability

Always keep the manual available to all persons who work with or on the chip unit.

1.2 Used description in this operating manual

1.2.1 Procedure of action

Procedures of action are marked as triangles in sequence of execution. The results of procedure are marked with a check mark. Example:

- ▶ Loosen cylindrical screw M5 (2).
- ✓ Arrestor bolt slides into the driving groove of the machine.

1.2.2 Illustration of safety indications




Safety indications are always marked with a signal word and sometimes additional marked with a danger specific symbol (see Chapter 1.2.3):

⚠ DANGER!
Direct danger! Ignoring this indication severe injuries or death is the consequence!
⚠ WARNING!
Possibly danger situations! Ignoring this indication result in severe injuries or death!
⚠ ATTENTION!
Possibly danger situation! Ignoring this indication cause medium or light injuries!
CAUTION!
Possibly danger situation! Ignoring this indication cause damage to property or pollution!

1.2.3 Applied symbols

The followed symbols are used in this manual:

Warning symbol

	Environmentally hazardous substance!
	Magnets can affect the function of pacemakers and implanted defibrillators!
	Corrosive substances!

Tab 1: Warning symbol

1.2.4 Indication

	Indication: Describes general information and recommendation.
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1.3 Guarantee and liability

Basically, the „General conditions of sale and delivery“ apply to ATEMAG.

1.3.1 Wireless functionality disclaimer

The chip unit is a wireless device that operates in the 2.4 GHz radio spectrum. The wireless functionality in the AC4.0 module is used to send and receive information to and from the module for configuration and offline data analysis. The wireless functionality should never be used in conjunction with security mechanisms. The wireless data link should not be used in safety control circuits or loops as this would exceed its intended purpose.

1.4 Information about manufacturer

Address	ATEMAG AggregateTechnologie und Manufaktur AG Mühlenmatten 2 D-77716 Hofstetten, Germany
Phone	+49 (0) 78 32/ 99 97 - 0
Fax	+49 (0) 78 32/ 99 97 - 12
E-Mail	info@atemag.de
Internet	www.atemag.de

Tab 2: Information about manufacturer

1.5 Product observation

Informing the manufacturer on accidents, potential hazards on the chip unit and obscurities in this manual.

1.6 Content of delivery

The content of delivery includes: chip unit, battery, possibly external temperature sensor, manual

2 General Safety Instruction

2.1 Appropriate Application

The chip unit must be used within the specific performance limits and in industrial environments. Following the manual and compliance with the maintenance and repair requirements are a prerequisite for the appropriate use of the chip unit. Any other use of the chip unit is not appropriate. The manufacturer is not liable for any damages resulting of inappropriate application.

2.2 Remaining risk

In normal operation there are no remaining risks. Against risks that may arise during maintenance and repair, is warned in the respective chapters.

2.3 Personnel requirements

Only authorized personnel are allowed to work on the chip unit! They must be familiar with the safety devices and instructions before they start work.

Authorized personnel are:

Operation	Qualification
Normal operation	Authorized personnel
Service	Trained personnel of the operator or manufacturer
Maintenance	Trained personnel of the manufacturer

Tab 3: Personnel requirements

3 Explanation of the chip unit

3.1 Main components of the chip unit

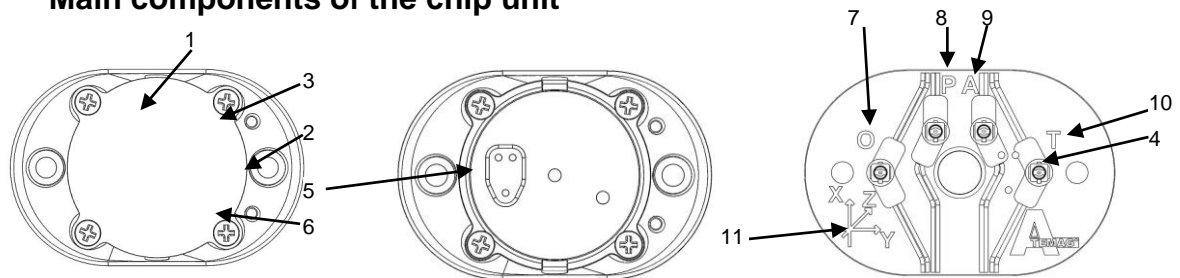


Fig 1. Main components and labeling of the chip unit

Pos.	Components/Control elements	Function
1	Battery cover	Cover of the battery compartment
2	Mounting screws	Attach the chip unit to the angle head
3	Reset button	Restart/reboot
4	External temperature sensor port	An external temperature sensor can be connected
5	Programming port	Special connection for programming the chip unit
6	LED display	Display Status chip unit

Tab 4: Main components of the chip unit

Pos.	Input	Function
7	O	1-Wire Sensor Network
8	P	Power for external Sensors. VBAT.
9	A	Accessory Sensor Input
10	T	External Digital Temperature Sensor
11	X, Y, Z	Directions of Acceleration Sensor

Tab 5: Labeling of the chip unit

4 Technical Data

Mechanical Data	
Dimensions (L x B x H)	45mmx30mmx15mm
Mounting	2xM3 screws
weight	<30g (with battery)
Temperature measurement	
Temperature Range	-40°C bis +85°C / -40°C bis +150°C (external temperature sensor)
Resolution/Accuracy	0,0625°C / ± 0,0625°C (over full range)
Repeatability	± 0,0625°C
Frequency	12 Samples/Minute
Rotation speed measurement	
Sensing Range Hz (rpm)	10Hz bis 1 kHz (600 to 60.000 rpm)
Excitation	magnetic
Accuracy	<10% up to 24.000 rpm
Vibration measurement	
Sensor Type	MEMS
Frequency Range	10Hz bis 1kHz
Detection Type	<ul style="list-style-type: none"> - RMS Velocity mm/s - FFT - Acceleration mm/s²
Wireless communication	
Type	BLE 5.0
Frequency	2.4 GHz
Bandwidth	50 Kbps
Range (nominal)	30m LOS (receiver dependent)
Material	
Housing	Aluminum alloy; Thermoplastic
Power	
Battery Type	3,6V lithium thionyl chloride
Lifetime	~2000 hrs of runtime; ~20000 hrs Standby
Optional Expansion	
Communication	1-Wire Bus Interface
Temperature	External temperature (up to 10)
Speed	External Speed Sensor
Power	24V AC/DC Input Module

Tab 6: Technical Data

5 Delivery, place of installation and storage

5.1 Delivery

5.1.1 Delivery status

The chip unit is fully assembled functionally tested and delivered ready for connection.

5.1.2 Scope of delivery

Scope of delivery you find in the contract documentation.

5.2 Requirements to the place of installation

5.2.1 Environmental conditions

Environmental temperature storage	-40 – +60 °C
Environmental temperature operation	-40 – +85°C
IP class	IP66

Tab 7: Environmental conditions

Tab 8:

6 Operation of the chip unit

The chip unit works almost completely without user interaction. Deploying a series of sensors, the module automatically records and stores data about the operation of the aggregate. Furthermore, the status of the module is transmitted wirelessly during operation so that each monitor (e.g. tablet or PC) can collect data and, in certain cases, respond.

6.1 Operating modes

The chip unit has a fixed number of operating modes in which it can operate and these modes determine the behaviour of a number of other functionalities. The following table lists the operating modes:

Operating modes	Description
Rest (sleep)	The chip unit consumes minimum power. No measurements take place. No transmission of status. Only the rotation of the aggregate can activate the chip unit from this state.
Idle	The chip unit is active and measures temperature and associated measurements. The chip unit transmits.
Working (Running)	The chip unit is active and makes temperature, speed and vibration measurements. The chip unit transmits.
Solution (Resolving)	As with "running", but determines if there was a speed change.

Tab 9: Operating modes of the chip unit

The chip unit automatically switches between the operating modes. The idle, running, and solution modes are all triggered by the activity of the aggregate. The sleep mode is activated when the unit has been inactive for more than 5 minutes.

6.2 LED display

The chip units contain a single red LED indicator light (1). The light is used to indicate certain conditions. The LED (1) is in the following position:

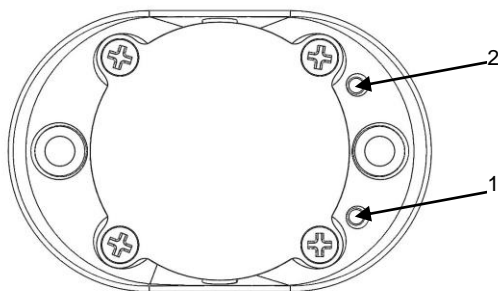


Fig 2. Position LED display

Possible LED displays:

Light pattern	Previous mode	Meaning
Single flash - 10ms	Sleep or idle	Rotation detected
Single flash - 200ms	No connection - idle	Connected established
Double flash - 200ms	Connected - Idle	Connection interrupted
Multiple flash	On Reset	More than 1 flash indicates an internal error. The number of flashes indicates which subsystem has failed.
Three flashes – 200ms	On Reset	Self check success.
Multiple flashes	On Reset	Flash count indicates which sub-system failed the Self-check.

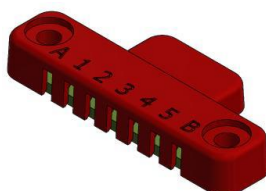
Tab 10: LED displays

Test function of the chip unit:

- ▶ Insert small object (e.g. straightened paper clip) into reset port (2).
 - ▶ A self-diagnostic process or reset after a system failure is performed.
 - ▶ Triple flash -> no internal error; multiple flash -> system error is present
- ✓ Function chip unit performed

6.3 1-Wire Bus

The C4.0 Module is equipped with a 1-Wire communication bus. The bus allows for a variety of sensors to be connected. The most common application is to use the 1-Wire bus to connect multiple temperature sensors. In order to connect multiple sensors a hub must be utilized like below. This version can allow up to 5 sensors to be connected. It must be noted that the additional of 1-Wire sensor may cause excessive power consumption and shorter battery life.



6.4 Battery replacement

The battery of the chip unit is specially designed for harsh environments. Only the following battery may be used in the chip unit, otherwise there is a risk of damaging the chip unit, the battery or both.

Tadiran TL-2450 / TLH-2450 3.6V button battery, wafer cell (primary lithium cell 3.6V)



Fig 3. Battery

An alarm is issued over the wireless connection if the battery is rated as low.

⚠ ATTENTION!



Danger due to corrosive substances!

- ▶ If the battery is damaged, caustic liquid may escape. Avoid contact.
- ▶ Contact may cause skin irritation, burns and caustic burns.
- ▶ If the fluid comes in contact with the eyes, seek medical attention immediately.
- ▶ Do not inhale any possibly resulting or released vapours.

⚠ WARNING!



Magnets can affect the function of pacemakers and implanted defibrillators!

- ▶ Always maintain the safety distance to the unit if you have a pacemaker or a ferromagnetic implant.



Consideration of duty according to the battery law (2006/66/EG) BattG:

Old batteries do not belong to domestic waste because they could cause damages of health and environment. You can return used batteries free of charge to your dealer and collection points. As end-user you are committed by law to bring back needed batteries to distributors and other collecting points!

RoHS

Obligation to comply with EU Directive (2011/65/EU):

The components that make up this product comply with the RoHS (Hazardous Substances in Electronic Equipment) Directive



Consideration of duty according to the law of electrical devices (2012/19/EU):

This symbol means that you must dispose of electrical devices separated from the general household waste when it reaches the end of its useful life. Take your unit to your local waste collection point or recycling centre. This applies to all countries of the European Union, and to other European countries with a separate waste collection system.

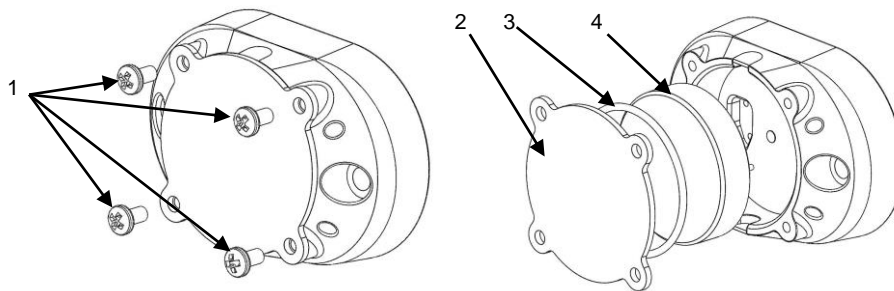



Fig 4. Battery replacement

- ▶ Unscrew Phillips screws (1) with No. 2 Phillips screwdriver.
- ▶ Remove Battery cover (2), O-ring (3) and battery (4).
- ▶ Replace the battery (4). Place the battery (4) in the specified compartment (note the battery contact arrangement) and push in until it snaps into place. **DO NOT** use excessive force!
- ▶ Mount O-ring (3) and battery cover (2). There must be no gap.
- ▶ Screw in Phillips screws (1) with No. 2 Phillips screwdriver.
- ✓ Battery is replaced.


7 Communication

The chip unit is a wireless data device. During operation, it sends certain status data (telemetry) and each monitoring device (a client) can record this data and respond accordingly. The transmission data contains status information such as temperature, vibration and current cycle time. In addition to 1-way transmission, 2-way connections between a client and the chip unit can be made to download data or configure the chip unit.

Communication

	1-way communication uses less power than 2-way communication (use only for a short time)
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The communication can take place between the chip unit and any Bluetooth 4.0 / 5.0 compatible client. Depending on the Bluetooth 4.0 / 5.0 client, special software is required to organise and exploit the information.

	This chip unit uses Bluetooth® Low Energy (Bluetooth® Smart) as a communication tool. The Bluetooth® wireless performance of the AC4.0 module is <8dBm. Use this device only in environments where Bluetooth® transmission is allowed. Bluetooth® is a trademark of Bluetooth SIG, Inc.
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Currently, the following software options are available for communication with a chip device:

Name	Platform	Scope
C4.0 Manager - PC	PC - Windows 10	Only OEM use. Not for distribution

Tab 11: Software overview

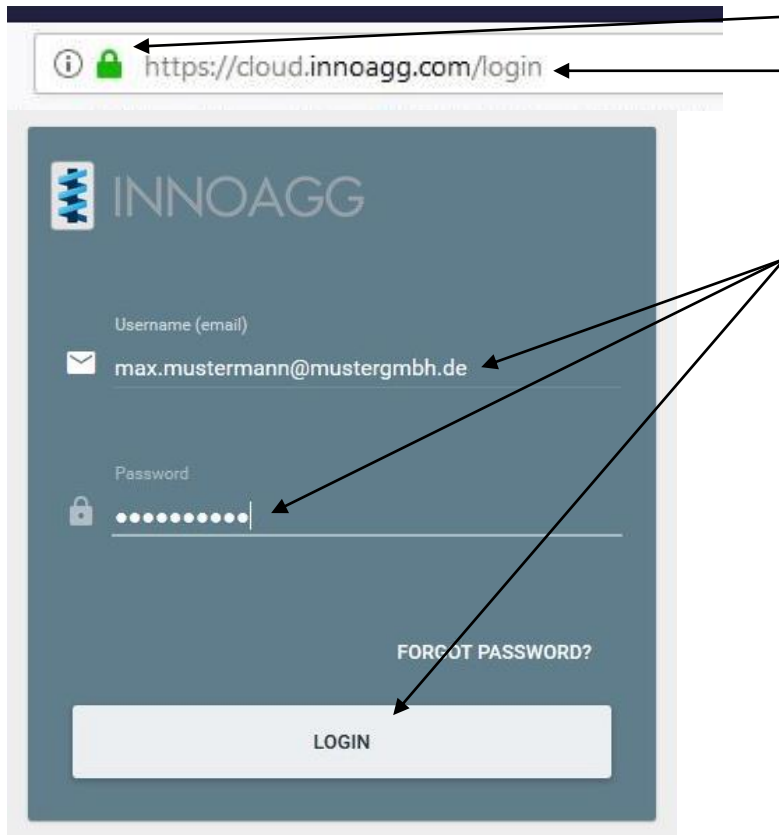
The range and performance of the wireless system depends on a number of factors, including client hardware, the physical environment, and the operation being performed. In general, the following areas can be considered as range:

Client-hardware	Transmission range	Connecting range
USB Collector	25m	10m

Tab 12: Übersicht Signalreichweite

7.1 Cloud functionality

7.1.1 Call up Cloud and log in



In the address bar of the browser, call up Cloud with this command and ensure a secure connection.

When logging in for the first time, a password must be assigned. For each login process, log in using the registered email address and password.

Fig 5. web address and login window

7.1.2 Call up aggregate

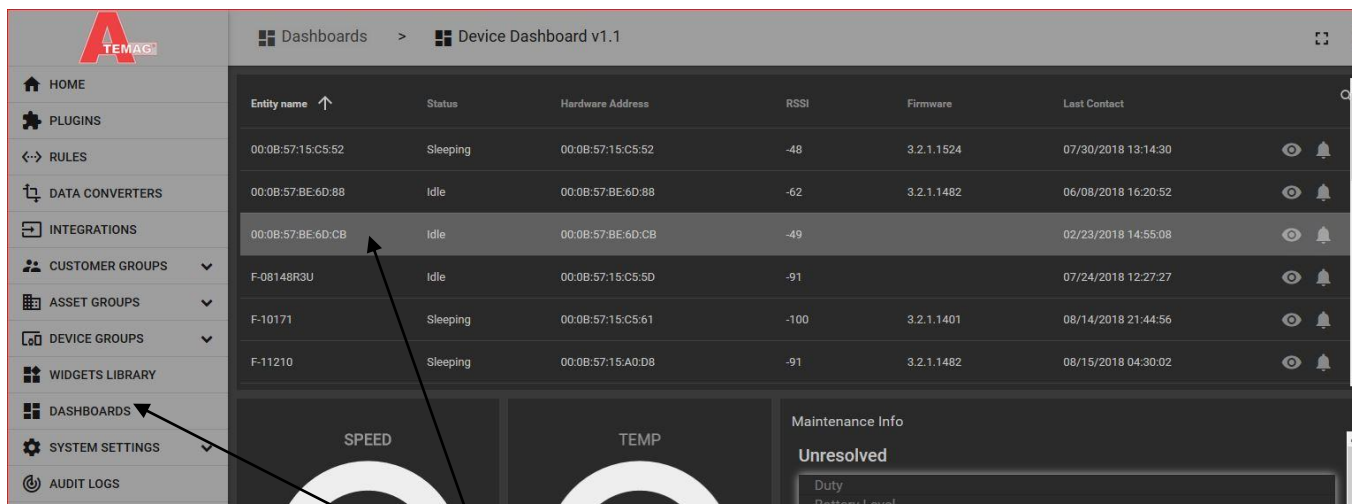


Fig 6. Aggregate display board

Call up dashboard and select aggregate from the list. The associated diagrams are displayed under the aggregate list. The illustration may differ depending on the degree of approval and the number of aggregates

7.1.3 Call up and download history and telemetry data

00:0B:57:15:C5:52	Sleeping	00:0B:57:15:C5:52	-48	3.2.1.1524	07/30/2018 13:14:30	
00:0B:57:BE:6D:88	Idle	00:0B:57:BE:6D:88	-62	3.2.1.1482	06/08/2018 16:20:52	
00:0B:57:BE:6D:CB	Idle	00:0B:57:BE:6D:CB	-49		02/23/2018 14:55:08	
F-08148R3U	Idle	00:0B:57:15:C5:5D	-91		07/24/2018 12:27:27	
F-10171	Sleeping	00:0B:57:15:C5:61	-100	3.2.1.1401	08/14/2018 21:44:56	

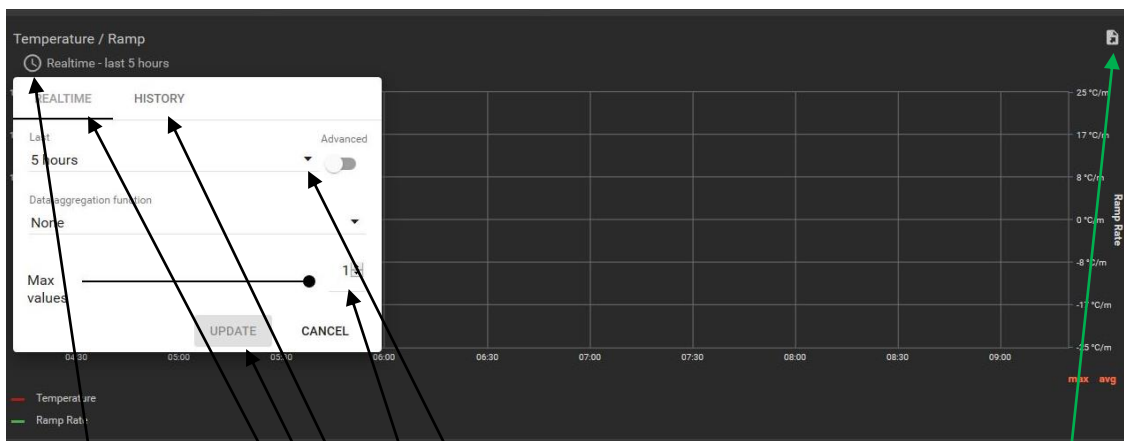


Fig 7. Call up history

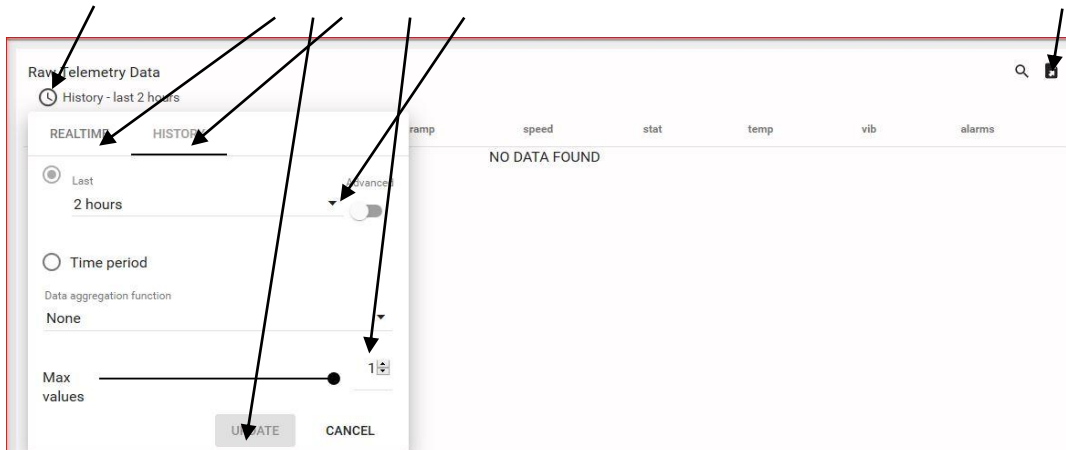


Fig 8. Call up telemetry data

- ▶ Prerequisite: the called up aggregate must have already completed working hours and data of an aggregate must have been transferred to the Cloud via a data collector.
- ▶ Select the desired aggregate.
- ▶ To come to the graphs, scroll down the dashboard.
- ▶ If the aggregate is marked, click on the "eye" symbol (1) close to the end of the line. Telemetry data is displayed.
- ▶ To select a display range, click on the clock (2) above the corresponding graph (temperature/temperature ramp, vibration/speed, cycle display) or in the telemetry data.
- ▶ Choose between real-time (up to 30 days) (3) or history (period more than 30 days ago) (4).
- ▶ Select period to be displayed on the graph (5).
- ▶ Select the number of values to be displayed (5). Caution: The longer the observation interval selected, the more display values must be set.
- ▶ Click Update button (7) to display data.
- ▶ Use the download button (8) to download the selected time window as an Excel file.
- ✓ History data/telemetry data downloaded.

8 Assembly and connection

CAUTION!

Damage to the chip unit!

Before installing, check the chip unit for shipping damage.

- ▶ Do not install a damaged chip unit!
- ▶ In case of a damaged chip unit, inform ATEMAG!

8.1 Retrofit aggregate

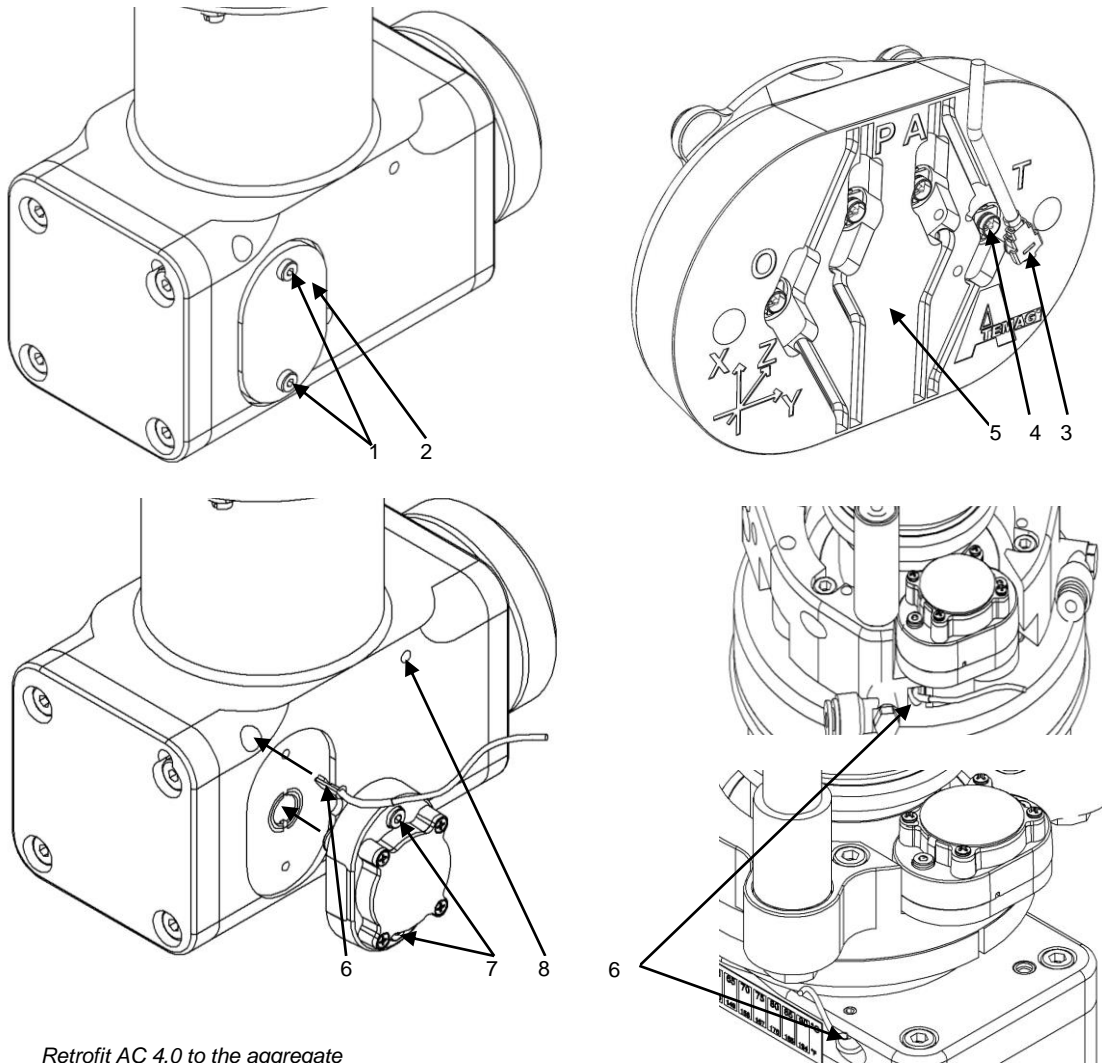


Fig 9. Retrofit AC 4.0 to the aggregate

- ▶ Unscrew cylinder head screws (1).
- ▶ Remove the metal cover (2).
- ▶ Clip the plug of the external temperature sensor (3) into the socket (4) of the chip unit (5).
- ▶ Insert cable into the specified contour.
- ▶ Mount the external temperature sensor (6) in the provided hole with thermal paste and seal with silicone.
- ▶ Secure the chip unit (5) to the intended position with cylinder head screws (7).
- ▶ Seal bearing surfaces and gaps with silicone.
- ▶ Secure the cable to the housing (8) with the supplied mounting material.
- ✓ The aggregate is retrofitted.


9 Dysfunction

The following troubleshooting elements are often found with the AC4.0 Manager.

Dysfunction	Possible cause	Possible operations
Connection to the chip unit with app not possible	Battery is empty - No LED indicators when moving	Remove battery and replace
	Out of range	Approach the chip unit
	Software/hardware problem	Restart (reset) the chip unit
LED flashes intermittently when connected to iOS app	There is a synchronisation problem with the connection	Reset the AC4.0 module (This problem exists in Version 2.3.1 and higher)
No LED display	Battery is empty - No LED indicators when moving	Remove battery and replace

Tab 13: Dysfunction

10 Disposal


CAUTION!	
	<p>Risk due to environmental pollutants! The battery chemicals are corrosive. The hazard to the environment depends on the materials used.</p> <ul style="list-style-type: none"> ▶ Clean contaminated components before disposal in principal! ▶ Clarify proper disposal with waste management and if applicable with competent authorities!

Tab 14: Disposal

11 Extract from the EC declaration of conformity

The ATEMAG Control 4.0 chip unit fulfills the requirements of the following EC directives:

- Directive 2006/42/EC (Machinery Directive)
- Safety: EN 60950-1:2006 + A 11:2009 + A 1:2010 + A 12:2011 + A2:2013
- Electromagnetic compatibility (Art. 3(1)(a)):
 - EN 301 489-1 v.1.9.2
 - EN 301 489-17:V2.2.1
 - EN 61000-4-3:2006
- Spectrum (Art. 3(2)):
 - EN 300 328 V1.9.1

	The detailed EC declaration of conformity is included in the scope of delivery.
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