

OEM Alpha direct Balance Switch and Balance Switch Modbus base stations

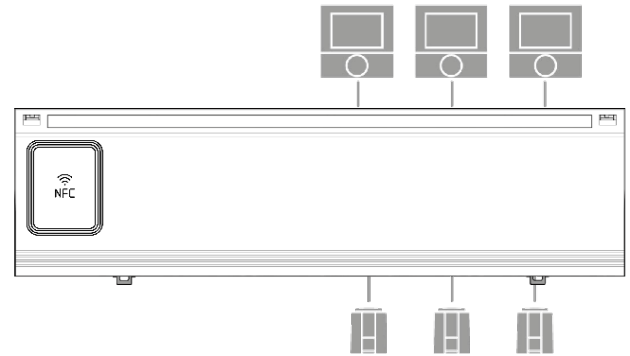
As intelligent, wired single room temperature control systems of the future, the OEM Alpha direct Balance Switch and Balance Switch Modbus base stations offer maximum comfort and high energy efficiency for panel heating systems in heating and cooling systems.

Parameters, settings and special functions can be changed or executed via the NFC app or Modbus interface*. The set parameters and settings can be read out via NFC or the Modbus interface*.

Data is transferred between the smartphone and base station via NFC and does not require an internet connection. No registration or account is required to use the system. Data is transmitted between the base station and the building management system via Modbus RTU. For a detailed description of the registers, see section 4.4 Modbus register structure.

The OEM Alpha direct Balance Switch and Balance Switch Modbus base stations automatically performs hydraulic balancing on water-based heating systems from the heating manifold onwards, without the need for additional equipment such as flow limiters. The performance of automated hydraulic balancing using this control system is considered to be at least equivalent to conventional hydraulic balancing and is certified by TÜV Rheinland.

By intelligently distributing the available flow rates over time, the OEM Alpha direct Balance Switch and Balance Switch Modbus base stations



ensure that the individual heating circuits are supplied according to their requirements. The time-delayed control of the thermal valve actuators ensures an even distribution of heat to all panel heating circuits, even if they are not optimally pre-set hydraulically. This operating principle is only used in slow-responding heating systems such as panel heating.

Furthermore, the OEM Alpha direct Balance Switch and Balance Switch Modbus base stations can also perform the cooling function by inverting the input signals from standard heating thermostats. Standard room thermostats can be connected, which is particularly advantageous when retrofitting. The system recognises the thermostat's requirements and automatically adjusts itself accordingly. This means that no special heating/cooling thermostats are required. The NC version of customary thermal valve actuators are used as final control elements.

*Alpha direct base station Balance Switch Modbus version only

1.1 Key features

- Version with 8 zones / thermostat
- Available in either 24 V or 230 V
- Connection for up to 12 valve drives (freely configurable assignment of valve actuators)
- Equipment for heating and/or cooling systems
- App functionality (→ Chapter 3)
- Automated hydraulic balancing, certified by TÜV Rheinland (→ Chapter 7)
- After a 30-minute commissioning phase, normal operation is maintained immediately, without any prior learning phases
- Automatically detects the controllers connected
- Simple, intuitive installation and operation, without flow and return sensor
- Status signalling via LEDs
- Pump control and boiler control
- Connection for temperature limiter or dew point sensor and setback temperature input
- Tried-and-tested cable routing and strain relief
- Screwless plug-in / clamp connection method
- Clearly arranged connection terminals
- High functional reliability
- Maintenance-free
- No initialisation or calibration necessary
- Cooling blocking can be defined per output
- Special functions (factory reset, ManualOpen, FirstOpen)
- OEM differentiation through appearance and function

1.2 Variants

In the basic version, the OEM Alpha direct Balance Switch and Balance Switch Modbus base stations are delivered as neutral devices without logo and in light grey, with transparent cover. The subsequent list shows the available versions.

Type	Version	Operating voltage	Zones	Equipment	Scope of supply
B 41903-08N2	Balance Switch	24 V	8	Switch, heating/cooling, pump and boiler control, status signaling	OEM Alpha direct Balance Switch in single package Instructions in 12 languages
B 21903-08N2		230 V			
BM 41903-08N2	Balance Switch Modbus	24 V	8	Switch, heating/cooling, pump and boiler control, status signaling, Modbus RTU control	OEM Alpha direct Balance Switch Modbus in single package Instructions in 12 languages
BM 21903-08N2		230 V			

1.3 Optional extensions or differentiations to the basic version**Differentiation possibilities**

Packaging	Packaging can be manufactured and printed individually according to requirements.
Imprint on casing	Laser marking of the company logo and the individual type designation and your device designation
Casing	Bottom part – color adaptation Housing cover – Completely overlapping housing cover, individual color, transparency and shape

Please contact us if you have further wishes.

Extension options

DIN rail	The scope of delivery is extended by a DIN rail for installation in the heating circuit distributor
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2 Technical data

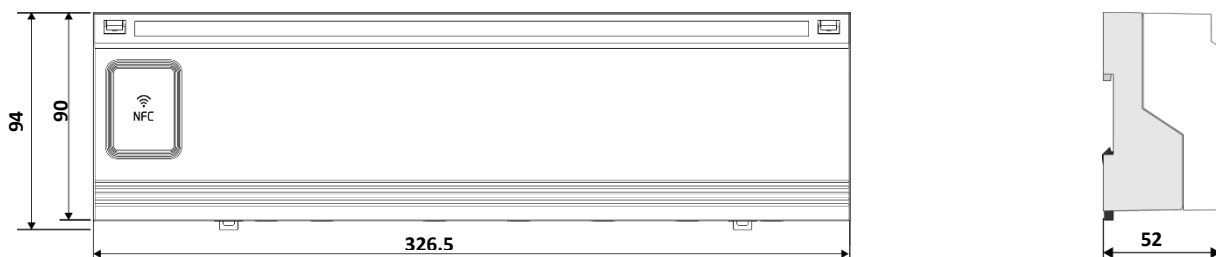
Type	B 41903-08N2 / BM 41903-08N2	B 21903-08N2 / BM 21903-08N2
Operating voltage	24 V / $\pm 20\%$ / 50 Hz	230 V $\pm 10\%$, 50 Hz
Power input (without pump/boiler)	Max. 50 VA	
Power consumption (idle)	<1 W	
Fuse	T2A	T4AH
Number of heating zones (HZ)	8	
Switching capacity per output/actuator	Max. 1 A	
Max. number of actuators	12 (freely assignable**)	
Switching current per actuator:	Max. 500 mA	
Pump connection	Closing contact (monopolar switching)	
Lead time/follow-up time	Parameterizable (default: 2 minutes)	
Switching power	2 A, 200 VA inductive	
Boiler connection	Closing contact (monopolar switching)	
Lead time/follow-up time	Parameterizable (default: 0 minutes)	
Switching power	2 A, 200 VA inductive	
Pump protection function	Parameterizable (default: 3 days / 5 min)	
Control direction normally closed (NC)/normally open (NO)	NC	
Ambient temperature	0 – 50 °C	
Storage/transport temperature	-20 °C – +70 °C	
Ambient humidity	5 to 80%, not condensing	
ERP class acc. to EU 811/2013	1=1 %	
Contamination degree	2	
Protection type	IP20	
Protection class	III	II
Function	Type 1 / Type 1.C	
Outer dimensions	90 x 326.5 x 52 mm	
Weight	465 g	600 g
Switching element design	TRIAC	
Overcharge protection	Current limitation via device fuse	
Setback input	Switchable via potential-free contact	
CO input	Switchable via potential-free contact	
Temperature limiter or dew point sensor	Switchable via potential-free normally closed contact	
Cover latch	Double latching of cover on casing, not to be opened without tools	
Valve protection function	Parameterizable (default: 16 days / 5 min)	
Connection terminals		
Line cross-section: massive	0.2 to 1.5 mm ²	
Conductor cross section fine-stranded	0.2...1.5 mm ²	
Conductor cross-section fine-stranded ADH	0.2...1 mm ²	
Conductor cross-section fine-stranded ADH insulated	0.2...0.75 mm ²	
Wire stripping length	8 to 9 mm	
Temperature for cone pressure test	550 °C	
Standards and regulations	EN 60730-1 / EN60730-2-9 / ElektroG resp. RoHS compliant	
Mains connection design	NYM connection terminals 3 x 1.5 mm ²	
Strain relief	Integrated	
Casing material	ABS	
Type of installation	Wall installation/DIN rail (TS35/35 x 7.5 mm)	
Casing color	RAL7035 (light grey)	
Color of cover	Transparent, polished in the area of the LEDs	

**Outputs not short-circuit proof

Display	
Heating zones LED	green (one LED per HZ)
Fuse LED	red
Power LED	green / red (two-coloured)
Pump LED	green
Boiler LED	green
Heating / cooling LED	blue
LED Modbus	flashing orange for Modbus activity

2.1 Dimensions

2.1.1 8 zone base station



All indications in mm

3 App functionality



The OEM Alpha direct Balance Switch and Balance Switch Modbus base stations are equipped with an NFC chip (NFC: Near Field Communication). The functions and parameters of the base stations can be configured via the NFC chip in conjunction with the **Balance NFC app**.

The **Balance NFC app** must be used to configure the base station (download using the QR code).

3.1 NFC operations

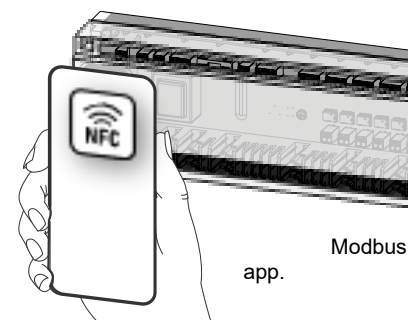
3.1.1 Requirements for the use of NFC:

- Knowledge of the existence and position of the NFC interface in the mobile device: the position of the NFC interface varies depending on the model.
- Activated **NFC** function, deactivated display lock

Remove protective covers before using NFC. Ensure a stable hold to avoid disconnections. The distance required to establish an NFC connection depends on the mobile device used.

Further information on the steps to follow for specific models can be found in the manufacturer's instructions.

Some functions require a re-initialisation of the OEM Alpha direct Balance Switch and Balance Switch base stations. The app is self-explanatory. It is recommended that you follow the instructions in the



3.2 App functions

Function	Description	Display
Configuration		
Name rooms	Select room designation for each heating zone from a list (e.g. storage room, hobby room, living room, kitchen), custom room names can be set	

Assign valve actuators	Free assignment of valve actuators to heating zones Cooling can be blocked individually for each actuator.	
Parameters and protection functions	Selection of parameters / protection functions for - boiler - pump - valves - Modbus Possible parameters / protection functions: - Turn-on delay - Follow-up time - Pump protection - Valve protection - Baud rate / parity / address	
Writing and reading		
Write		
Write configuration to device	Settings are written to the OEM Alpha direct Balance Switch and Balance Switch Modbus base stations	Ready to scan: Hold your smartphone close to the NFC tag Display: The configuration has been successfully transferred to the device. or Error message → Repeat the process: The mobile device was moved too early or needs to be aligned more precisely.
Save configuration as template	Settings read in are saved as a file in the memory of the mobile device. Possible use of the file: read in the configuration at a later time.	Please enter a file name under which the current configuration is to be saved.
Read		
Read configuration from device	Read out the settings of the OEM Alpha direct Balance Switch and Balance Switch Modbus base stations	Ready to scan: Hold your smartphone close to the NFC tag If the readout is successful, the configuration that has been read out is displayed in the app. or Error message → Repeat the process: The mobile device was moved too early or needs to be aligned more precisely.
Load template file	Requirement for use: Configuration saved on the mobile device as a template. Options for storing a file on the mobile device: – Save stored file using the command Save configuration as template	Load template file → Display of saved template files
Share		
Share current configuration as PDF	Creates a document (PDF) with the data of the current configuration. The document can be distributed by means of appropriate apps.	– Display of the file size and the apps available for distributing/saving the file.
Default values		
Reset configuration to default values (factory reset)	Option to reset the current configuration to default values.	Are you sure you want to load the default values and overwrite the current configuration?
Special functions		
FirstOpen	Sets the OEM Alpha direct Balance Switch and Balance Switch Modbus base stations to FirstOpen mode. All outputs are activated for 10 minutes.	Ready to scan: Hold your smartphone close to the NFC tag

		→ The FirstOpen function has been successfully activated. The power LED should flash alternately green and orange. In addition, the LEDs of all inputs should light up green. The system will switch back to normal operation in 10 minutes. or Error message → Repeat the process: The mobile device was moved too early or needs to be aligned more precisely.
ManualOpen	Opens selected valve actuators completely until the function is deactivated.	Ready to scan: Hold your smartphone close to the NFC tag → The ManualOpen function has been activated for the selected outputs. The power LED should flash alternately green and orange. The CO LED should also flash blue. or Error message → Repeat the process: The mobile device was moved too early or needs to be aligned more precisely.
Reset configuration to default values (base station factory reset)	Reset base station to default values. → The current configuration in the app remains unaffected.	Ready to scan: Hold your smartphone close to the NFC tag → The base station has been successfully reset to default values (factory reset). The power LED should flash red rapidly for five seconds while all other LEDs are switched off. or Error message → Repeat the process: The mobile device was moved too early or needs to be aligned more precisely.

Notes

All changes should only be made with the appropriate expertise. An incorrect setting can lead to the actuator malfunctioning, a control system fault and subsequent costs. The manufacturer accepts no responsibility for incorrect settings and their consequences.

Adoption of changes after restarting the OEM Alpha direct Balance Switch and Balance Switch Modbus base stations.

4 Presetting

The OEM Alpha direct Balance Switch and Balance Switch Modbus base stations can leave the factory with a customer-specific setting. The properties can be subsequently changed using the app; see the following section.

Function	Default	Optional
Assignment of actuators	– HZ 1: 1/2 – HZ 2: 3/4 – HZ 3: 5/6 – HZ 4: 7/8 – HZ 5: 9 – HZ 6: 10 – HZ 7: 11 – HZ 8: 12	– Freely parameterisable
Block cooling	– Deactivated for all valve actuators	– Can be activated for each individual valve actuator
Boiler / heat generator – Turn-on delay – Follow-up time	– 0 min – 0 min	– Freely selectable between 0 – 30 min (increment: 1 min) – Freely selectable between 0 – 20 min (increment: 1 min)
Pump – Turn-on delay – Follow-up time – Protection functions – Duration until the protection function is activated – Activation duration	– 2 min – 2 min – Activated – 3 days – 5 min	– Freely selectable between 0 – 10 min (increment: 1 min) – Freely selectable between 0 – 20 min (increment: 1 min) – Can be activated / deactivated – Freely selectable between 1 – 16 days – Freely selectable between 0 – 20 min (increment: 1 min)
Valves – Protection functions – Duration until the protection function is activated – Activation duration	– Activated – 16 days – 5 min	– Can be activated / deactivated – Freely selectable between 1 – 16 days – Freely selectable between 0 – 10 min (increment: 1 min)

5 Modbus

Note

If the OEM Alpha direct Balance Switch Modbus base station is the last device in the Modbus network, a terminating resistor must be installed on site.

5.1 Modbus addresses

Default address: 01

Change of address: - Via app

- From the master via register access

Adoption of changes after restarting the OEM Alpha direct Balance Switch Modbus base station.

5.2 Modbus setting

Default settings for OEM Alpha direct Balance Switch Modbus base station

Address:

1

Interface:

38400 baud

Parity None: 2 stop bits

Opt: Parity Even / Odd: 1 stop bit

Setting the address / interface via

- NFC
- Modbus

Once the address, baud rate and termination have been set, the OEM Alpha direct Balance Switch Modbus base station can be put into operation via Modbus.

5.3 Modbus register

The Modbus register functionality can be used to change settings and control the devices; customer-specific settings are available.

The OEM Alpha direct Balance Switch Modbus base station work with the following function codes (commands):

0x03 (R) Read Holding Register in single / multiple mode

0x10 (W) Write Registers in single / multiple mode

These function codes can be used to write or read individual registers or 255 registers in one command.

The Modbus protocol used is compliant with the guidelines from: <https://Modbus.org/specs.php>

5.4 Modbus register structure

Default values of a standard article, customer-specific settings on request.

Register	Address	Command	Description
1 – 7	0x0000 – 0x0007	R	Serial number (UID): The UID is a unique number that can be used to identify the device. (8 decimal values, 1 value per register)
8 – 15	0x0008 – 0x000F	R	Device type in plain text: ADBS230M, ADBS24M (8 characters, 1 character per register)
16	0x0010	R	Major software version as a decimal value
17	0x0011	R	Minor software version as a decimal value
18	0x0012	R	reserved
19	0x0013	R / W	Changeover: Control via Modbus Bit 0 = 0: Control changeover via external input Bit 0 = 1: Control changeover via Modbus Bit 1 = 0: Control changeover via Modbus inactive (Heating mode) Bit 1 = 1: Control changeover via Modbus active (Cooling mode) Bit 2 to bit 15: reserved
20 – 31	0x0014 – 0x001F	R / W	Assignment of an input (room) to an output (one register for each output, starting with 0x0014 for output 1) 0 = No room assigned 1 – 8 = Room number (default = 1, 1, 2, 2, 3, 3, 4, 4, 5, 6, 7, 8) Persistent storage possible via initialisation command
32 – 43	0x0020 – 0x002B	R	Info for PWM output status (one register per output, starting with 0x0020 for output 1) Unit: % Value range: 0 – 100 Resolution: 1 Without participation in load balancing: Actuator control = 100 No actuator control = 0 PWM accuracy: ±2% Query operating mode via register 0x002E
44	0x002C	W	Trigger commands: 0 = No command 1 = Factory reset 2 = Initialisation 3 = FirstOpen function 4 = ManualOpen function (with parameter, see register 0x002D) 5 = Normal mode 6 = Input simulation (see register 0x0034 ... 0x003B)
45	0x002D	R / W	Parameters for command in register 0x002C Use for command ManualOpen: Bit mask for outputs to be activated, e.g. 0x00F0
46	0x002E	R	Active mode 0 = Normal 1 = FirstOpen 2 = ManualOpen 3 = Input simulation
47	0x002F	R / W	Modbus address

			1 – 247 (default: 1) Persistent storage possible via initialisation command
48	0x0030	R / W	Baud rate 0 = 4800 1 = 9600 2 = 19200 3 = 38400 (default) Persistent storage possible via initialisation command
49	0x0031	R / W	Parity 0 = none* 1 = even (default) 2 = odd *automatically 2 stop bits Persistent storage possible via initialisation command
50	0x0032	R	Information on whether outputs participate in load balancing Bit 0: Output 1 Bit 1: Output 2 ... Bit 11: Output 12 Bit = 0 → Load balancing inactive Bit = 1 → Load balancing active
51	0x0033	R	Information on whether inputs participate in load balancing Bit 0: Input 1 Bit 1: Input 2 ... Bit 7: Input 8 Bit = 0 → Load balancing inactive Bit = 1 → Load balancing active
52 – 59	0x0034 – 0x003B	R / W	Simulated PWM for the inputs (one register for each input, starting with 0x0034 for input 1) Unit: % Value range: 0 – 100 Resolution: 1 Evaluation of the 8 registers in input simulation mode Default: pulse – pause ratio at the inputs No participation in load balancing when: – PWM = 0% – PWM = 100% When participating in load balancing, the input LED lights up if at least one heating zone assigned to the room is active. In cooling mode, the outputs are controlled according to the load balancing.
60	0x003C	R	reserved
61	0x003D	R	Heating / cooling mode 0 = Heating 1 = Cooling
62	0x003E	R	Pump status 0 = Pump off 1 = Pump on
63	0x003F	R	Boiler status 0 = Boiler off 1 = Boiler on
64	0x0040	R	Commissioning mode 0 = Commissioning inactive 1 = Commissioning active
65	0x0041	R	Dew point monitor / temperature limiter 0 = Condensation / excess temperature detected 1 = Monitoring of the dew point / temperature monitoring active
66	0x0042	R	Setback status 0 = Setback inactive 1 = Setback active
67	0x0043	R / W	Block cooling Flag for each output Bit 0: Output 1 Bit 1: Output 2 ... Bit 11: Output 12

			Persistent storage possible via initialisation command
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R: Read, W: Write

- Register consisting of 16 bits
- Data types:
 - Decimal
 - Bitmasks
 - Explicitly stated otherwise (e.g. device type in plain text)
- Changes to persistent parameters saved AFTER the initialisation command

6 Approvals and certificates

All Möhlenhoff products are extensively tested and certified by independent testing institutes.



The CE marking serves to certify that products placed on the market comply with the applicable guidelines of the EU.

Balance Switch



The products are certified by TÜV Rheinland.

Balance Switch Modbus



The products are certified by TÜV Rheinland for the automated hydraulic balancing procedure for water-based underfloor heating systems and are therefore considered equivalent to manual hydraulic balancing.

7 Technical notes on automated hydraulic balancing

7.1 Automated hydraulic balancing procedure

The method developed provides a temperature-based alternative to hydraulic balancing, utilising a simultaneity-based optimisation method without the need for individual balancing of the heat transfer units in accordance with DIN 94679-4. The aim of the process is to distribute the heat generator's available heat output efficiently amongst several active heating circuits, thereby ensuring that the connected rooms are supplied with heat in line with their requirements, without limiting instantaneous flow rates. Optimisation is not achieved by directly controlling the flow rate of individual heating circuits, but by coordinating the timing of the valve openings. This specifically reduces the simultaneous demand for heat and prevents individual rooms from being under-supplied, even when several rooms are requesting heat at the same time. The system is designed to control thermally actuated valves which regulate the flow in surface heating systems (e.g. underfloor heating). It is particularly suitable for systems with several individual zones and slow-responding heat transfer elements.

7.2 System requirements: Selecting suitable room thermostats

Automated hydraulic balancing only works in conjunction with room thermostats with a PWM output. With 2-point thermostats, the module does not become active.

Guidance on carrying out hydraulic balancing in accordance with Method B: It should be noted that the use of the OEM Alpha direct Balance Switch and Balance Switch Modbus base stations does not fully replace the hydraulic balancing procedure in accordance with Method B. The base stations can only influence those sections of the pipework network that are located downstream of the distribution manifold. Technical information on carrying out hydraulic balancing in accordance with Method B is available via the following link:
<https://faqdoc.info/systemauswahl/alpha-direct-bs/automatic-hydraulic-balancing-ad/>

When using third-party products in the OEM Alpha direct Balance Switch and Balance Switch Modbus systems, please note the following: Thermostats with cycle times of more than 30 minutes are unsuitable for use in the OEM Alpha direct Balance Switch and Balance Switch Modbus systems. When such thermostats are used, the base station passes the thermostat signal through to the valve drive on a 1:1 basis. The relevant heating zone is not included in the balancing process. Standard thermostats on the market use a cycle time of less than 30 minutes.

7.3 Instructions for commissioning

Each time the supply voltage is switched on, a 30-minute commissioning mode is carried out. During this period, the controller signals are passed through to the outputs on a one-to-one basis. The pump contact operates with a 2-minute turn-on delay and a follow-up time. During these 30 minutes, the input signals are analysed and used to calculate the hydraulic balancing, which begins after the commissioning mode. The control signals are continuously analysed during operation, and any changes in control behaviour are implemented.

7.4 Intended use

When using the device in conjunction with a heat pump: Follow the manufacturer's instructions for ensuring minimum volume flows! Additional hydraulic measures may need to be taken.