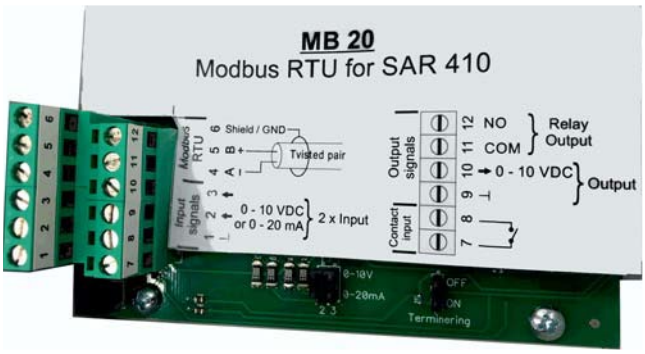
# MB 20

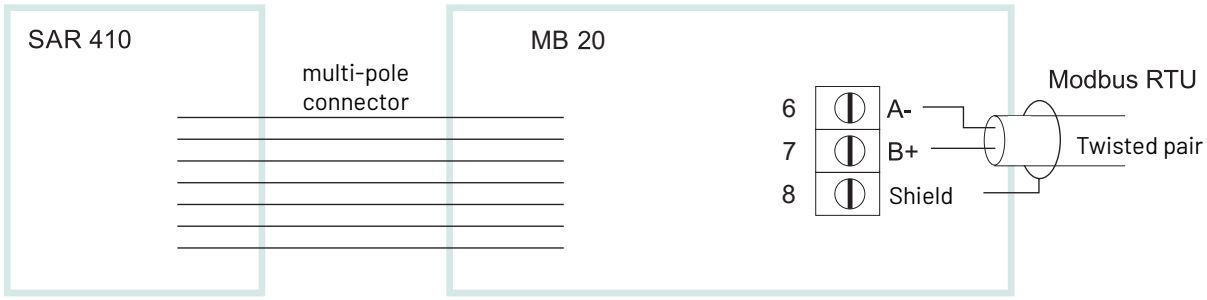
## *MODBUS RTU INTERFACE UNIT FOR SAR 410*

MB 20 is an interface card for connecting the SAR 410 pressure regulator to the Modbus RTU bus. Readable and programmable data are SAR of the room controller as well as the FHR of the fume cupboard controls and to these the values of the connected control dampers.




# TECHNICAL INFORMATION

| | |
|---|---|
| Operating voltage | 24 VAC via SAR 410 |
| Power consumption | 2 VA |
| Ambient temperature | 0 to 50°C |
| Encapsulation | SAR 410 inside, IP 65 |
| Traffic speed | 9600, 19200, 38400, 57600 |
| Device addresses | 1-247 |
| Data bits | 8 |
| Stop bits | 1 or 2 (2 stop bits if parity is not set) |
| Parity | None/Even/Odd |




## DESCRIPTION OF FUNCTIONS

MB 20 is an interface unit for the SAR 410 room controller and devices connected to the room bus for the Modbus RTU bus.

## CONFIGURING THE SETTINGS

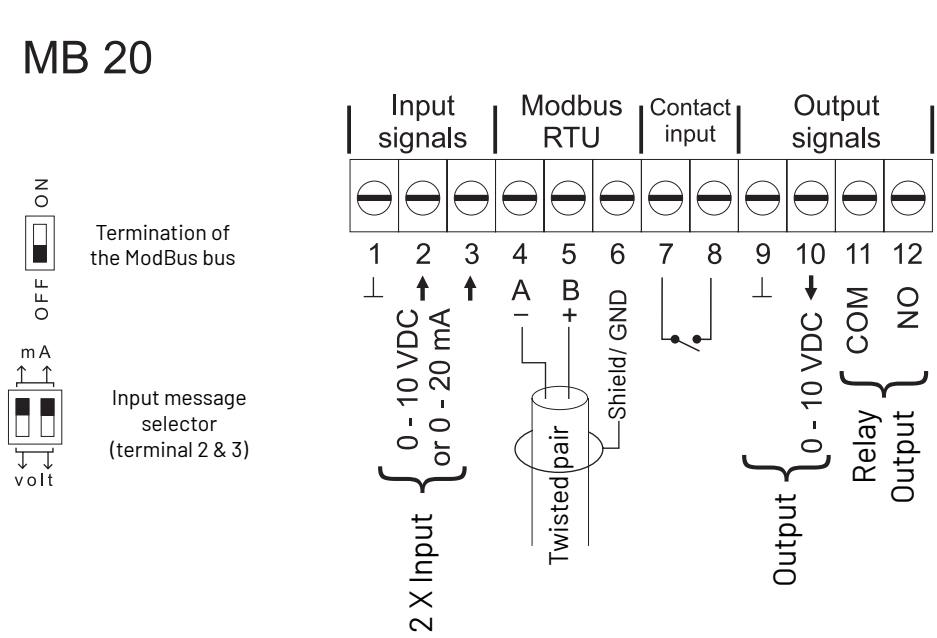
Settings for traffic speed, device address and parity are set with a separate SAR 410 programming device.

End termination of the ModBus bus and selection of input messages is done with jumpers on the circuit board.

Analog messages to terminals 2 and 3 are used, for example, to read the position of analog control dampers.

This device's information security must be ensured in the connected ModBus network.

## CIRCUIT DIAGRAM



# MODBUS REGISTER

## *Modbus communication*

**Interface:** RTU, RS-485
**Baud rates:** 9600, 19200, 38400, 57600
**Data bits:** 8bits
**Stop bits:** 1 or 2 (2 stop bits with no parity)
**Parity:** None, Even, Odd

Slave address, baud rate and parity are changed in LabVent SAR Id 15

## *Modbus function codes*

| Code | Description |
|---|---|
| 03 | Read Holding Registers |
| 06 | Write Single Holding Register |

## *Modbus function codes*

| Code | Description |
|---|---|
| 01 | Illegal Function (for example if you try and write to a read-only register) |
| 02 | Illegal Address (if you try and read/write to an unmapped register) |
| 06 | Slave Device Busy (if you request external (FHR, ACU) registers too often) |

## *Modbus register mapping*

SAR is mapped to holding registers 40001 - 40199.
FHR gets mapped to 40200 upto 42999 depending on the number of FHRs in the system.
ACU gets mapped to 43000 upto 44999 depending on the number of ACUs in the system.

| Product | Reg Start | Reg End | Product | Reg Start | Reg End | Product | Reg Start | Reg End |
|---|---|---|---|---|---|---|---|---|
| SAR | 40001 | 40199 | FHR 22 | 42300 | 42399 | ACU 1 | 43000 | 43099 |
| FHR 1 | 40200 | 40299 | FHR 23 | 42400 | 42499 | ACU 2 | 43100 | 43199 |
| FHR 2 | 40300 | 40399 | FHR 24 | 42500 | 42599 | ACU 3 | 43200 | 43299 |
| FHR 3 | 40400 | 40499 | FHR 25 | 42600 | 42699 | ACU 4 | 43300 | 43399 |
| FHR 4 | 40500 | 40599 | FHR 26 | 42700 | 42799 | ACU 5 | 43400 | 43499 |
| FHR 5 | 40600 | 40699 | FHR 27 | 42800 | 42899 | ACU 6 | 43500 | 43599 |
| FHR 6 | 40700 | 40799 | FHR 28 | 42900 | 42999 | ACU 7 | 43600 | 43699 |
| FHR 7 | 40800 | 40899 | | | | ACU 8 | 43700 | 43799 |
| FHR 8 | 40900 | 40999 | | | | ACU 9 | 43800 | 43899 |
| FHR 9 | 41000 | 41099 | | | | ACU 10 | 43900 | 43999 |
| FHR 10 | 41100 | 41199 | | | | ACU 11 | 44000 | 44099 |
| FHR 11 | 41200 | 41299 | | | | ACU 12 | 44100 | 44199 |
| FHR 12 | 41300 | 41399 | | | | ACU 13 | 44200 | 44299 |
| FHR 13 | 41400 | 41499 | | | | ACU 14 | 44300 | 44399 |
| FHR 14 | 41500 | 41599 | | | | ACU 15 | 44400 | 44499 |
| FHR 15 | 41600 | 41699 | | | | ACU 16 | 44500 | 44599 |
| FHR 16 | 41700 | 41799 | | | | ACU 17 | 44600 | 44699 |
| FHR 17 | 41800 | 41899 | | | | ACU 18 | 44700 | 44799 |
| FHR 18 | 41900 | 41999 | | | | ACU 19 | 44800 | 44899 |
| FHR 19 | 42000 | 42099 | | | | ACU 20 | 44900 | 44999 |
| FHR 20 | 42100 | 42199 | | | | | | |
| FHR 21 | 42200 | 42299 | | | | | | |

# Modbus register / SAR Holding registers 40001-40164

| SAR | HEADER | REG | DESCRIPTION | CMD | FORMAT | UNIT | FORMAT NOTE | MIN | MAX | DEF |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Serial number | 1 | Serial number | 03 | u16 | | | 0 | 32000 | 500 |
| 2 | Program version | 2 | Program version | 03 | u16 | | Ex: 123 = 1.23 | 0 | 65535 | 100 |
| 3 | Analog input 1 (Air volume) | 4 | Range | 03, 06 | u16 | l/s or m3/h | Unit is set in SAR register 67 | 0 | 4000 | 0 |
| | | 5 | Current value | 03 | u16 | % | | 0 | 100 | |
| 4 | Analog input 2 (Air volume) | 7 | Range | 03, 06 | u16 | l/s or m3/h | Unit is set in SAR register 67 | 0 | 4000 | 0 |
| | | 8 | Current value | 03 | u16 | % | | 0 | 100 | |
| 5 | Analog input 3 (Air volume or room pressure) | 10 | Range | 03, 06 | u16 | l/s or m3/h | Unit is set in SAR register 67 | 0 | 4000 | 0 |
| | | 11 | Current value | 03 | u16 | % | | 0 | 100 | |
| | | 13 | Setpoint | 03, 06 | s16 | Pa | Min and max depends on sensor type setting | -80 | 80 | 0 |
| | | 15 | Alarm level low | 03, 06 | s16 | Pa | Min and max depends on sensor type setting | -100 | 100 | -10 |
| | | 16 | Alarm level high | 03, 06 | s16 | Pa | Min and max depends on sensor type setting | -100 | 100 | 10 |
| | | 17 | Alarm delay | 03, 06 | u16 | seconds | | 10 | 240 | 20 |
| 6 | Analog input 4 (air volume or room temperature) | 19 | Range | 03, 06 | u16 | l/s or m3/h | Unit is set in SAR register 67 | 0 | 4000 | 0 |
| | | 20 | Current value | 03 | u16 | % | | 0 | 100 | |
| | | 21 | Setpoint | 03, 06 | u16 | Celsius | | 15 | 30 | 24 |
| | | 22 | Max control output | 03, 06 | u16 | l/s or m3/h | Unit is set in SAR register 67 | 0 | 8000 | 0 |
| | | 23 | Overtemperature | 03, 06 | u16 | Celsius * 10 | Celcius with 1 decimal point<br>Ex 10 = 1.0<br>Ex 29 = 2.9 | 10 | 50 | 30 |
| 7 | Analog input 5 (Air volume or zone pressure) | 25 | Range | 03, 06 | u16 | l/s or m3/h | Unit is set in SAR register 67 | 0 | 4000 | 0 |
| | | 26 | Current value | 03 | u16 | % | | 0 | 100 | |
| | | 27 | Setpoint | 03, 06 | u16 | Pa | | 100 | 400 | 200 |
| | | 28 | Manual control | 03, 06 | u16 | % | | 0 | 100 | 50 |
| | | 29 | Alarm level | 03, 06 | u16 | Pa | | 50 | 400 | 150 |
| | | 30 | Alarm delay | 03, 06 | u16 | seconds | | 10 | 240 | 20 |
| 8 | Constant air or door switch | 34 | Constant air 1 vol. | 03, 06 | u16 | l/s or m3/h | Unit is set in SAR register 67 | 0 | 1000 | 0 |
| | | 35 | Constant air 2 vol. | 03, 06 | u16 | l/s or m3/h | Unit is set in SAR register 67 | 0 | 1000 | 0 |
| | | 36 | Constant air 3 vol. | 03, 06 | u16 | l/s or m3/h | Unit is set in SAR register 67 | 0 | 1000 | 0 |
| 9 | Extra constant air | 37 | Extra exhaust | 03, 06 | u16 | l/s or m3/h | Unit is set in SAR register 67 | 0 | 8000 | 0 |
| | | 38 | Extra inlet | 03, 06 | u16 | l/s or m3/h | Unit is set in SAR register 67 | 0 | 8000 | 0 |
| 10 | Min. exhaustfrom room | 39 | Min. exhaust | 03, 06 | u16 | l/s or m3/h | Unit is set in SAR register 67 | 0 | 8000 | 0 |
| | | 40 | Min. external exhaust | 03, 06 | u16 | l/s or m3/h | Unit is set in SAR register 67 | 0 | 8000 | 0 |
| 11 | Max. Exhaustfrom | 42 | Max. exhaust | 03, 06 | u16 | l/s or m3/h | Unit is set in SAR register 67 | 0 | 32000 | 0 |
| 15 | Expansion module | 53 | Modbus address | 03, 06 | u16 | 1-247 | | 1 | 247 | 1 |
| 16 | Air balance | 56 | Adjust low | 03, 06 | s16 | % | | -100 | 100 | 0 |
| | | 57 | Adjust high | 03, 06 | u16 | % | | 50 | 200 | 100 |
| | | 58 | Air balance | 03, 06 | s16 | l/s or m3/h | Unit is set in SAR register 67 | -3000 | 3000 | 0 |
| 17 | Total exhaust | 61 | Total exhaust | 03 | u16 | l/s or m3/h | Unitis setin SAR register 67 | | | |
| 18 | Total inlet | 62 | Total inlet | 03 | u16 | l/s or m3/h | Unitis setin SAR register 67 | | | |
| 19 | Zone pressure | 63 | Zone pressure | 03 | u16 | Pa | | | | |
| 20 | Zone damper ang. | 64 | Zone damper ang. | 03 | u16 | deg | | | | |
| 21 | Room pressure | 65 | Room pressure | 03 | u16 | Pa | | | | |
| 22 | Temperature | 66 | Temperature | 03 | u16 | Celsius | | | | |
| | | 67 | Global unit | 03, 06 | u16 | 0-1 | 0 = m3/h<br>1 = l/s | 0 | 1 | 0 |
| | Total nodes | 68 | Connected nodes | 03 | u16 | | Total number of nodes (FHR, ACU) | | | |
| | | - | - | - | - | - | - | - | - | - |
| | MB20 Inputs / Outputs | 70 | Analog input 1 | 03 | u16 | % | Terminal block 2 on MB20 | 0 | 100 | |
| | | 71 | Analog input 2 | 03 | u16 | % | Terminal block 3 on MB20 | 0 | 100 | |
| | | 72 | Analog output 1 | 03, 06 | u16 | % | Terminal block 10 on MB20 | 0 | 100 | 0 |
| | | 73 | Digital input 1 | 03 | u16 | open,closed | Terminal block 7 & 8 on MB20 | 0 | 1 | 0 |
| | | 74 | Digital output 1 | 03, 06 | u16 | % | Terminal block 11 & 12 on MB20 | 0 | 1 | 0 |

# Modbus register / FHR Holding registers 4xx00-4xx50 (xx=02...29)

| FHR | HEADER | REG | DESCRIPTION | CMD | FORMAT | UNIT | FORMAT NOTE | MIN | MAX | DEF |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 0 | Connection status | 03 | u16 | 0-1 | 0 = OFFLINE<br>1 = ONLINE | 0 | 1 | 0 |
| 1 | Serial number | 1 | Serial number | 03 | u16 | | | | | |
| 2 | Program version | 2 | Program version | 03 | u16 | | Ex: 123 = 1.23 | | | |
| 3 | Setpoint | 3 | NORMAL | 03, 06 | u16 | cm/s | | 30 | 150 | 50 |
| | | 4 | ECONOMY | 03, 06 | u16 | cm/s | | 20 | 100 | 30 |
| 4 | Anemometer (HPS 50) | 5 | Count | 03, 06 | u16 | | | 1 | 2 | 1 |
| | | 6 | Not for airvolume | 03, 06 | u16 | 0-1 | | 0 | 1 | 0 |
| | | 7 | Mode | 03, 06 | u16 | 0-3 | 0 = Normal<br>1 = Normal Slow<br>2 = Analog<br>3 = Analog Slow | 0 | 3 | 0 |
| 5 | Alarm | 8 | Alarm level | 03, 06 | u16 | % | Alarm level LED/Buzzer | 20 | 90 | 80 |
| | | 9 | Delay LED | 03, 06 | u16 | s | | 10 | 60 | 20 |
| | | 10 | Delay buzzer | 03, 06 | u16 | s | | 10 | 60 | 20 |
| | | 11 | Buzzer reset | 03, 06 | u16 | minutes<br>OFF | 0 = OFF | 0 | 60 | 0 |
| 7 | ECONOMY sensor | 19 | Count | 03, 06 | u16 | | Economy sensor, PD 30, IR 50, IR 60 | 0 | 2 | 1 |
| | | 22 | Onset delay | 03, 06 | u16 | seconds | | 5 | 240 | 20 |
| | | 23 | Alarm sash high | 03, 06 | u16 | cm or OFF | 0 = OFF | 0 \| 10 | 50 | 0 |
| 10 | Air limits | 29 | Min. air limit | 03, 06 | u16 | (l/s or $m^3$/h)<br>OFF | 0 = OFF<br>Unit setin SAR register 67 | 0 \| 100 | 1000 | 0 |
| | | 30 | Max. air limit | 03, 06 | u16 | (l/s or $m^3$/h)<br>OFF | 0 = OFF<br>Unit setin SAR register 67 | 0 \| 200 | 4000 | 0 |
| | | 31 | Max. air limit buzzer | 03, 06 | u16 | 0-1 | 0 = Not used<br>1 = Used | 0 | 1 | 0 |
| | | 32 | Max. sash opening | 03, 06 | u16 | cm<br>OFF | 0 = OFF | 0 \| 10 | 100 | 0 |
| | | 33 | Min. damper angle | 03, 06 | u16 | deg | | 0 | 90 | 0 |
| | | 34 | Max. damper angle | 03, 06 | u16 | deg | | 0 | 90 | 90 |
| 13 | Sash pot. adjust | 41 | Sash pot. 1 adjust | 03, 06 | s16 | cm | Signed integer | -10 | 10 | 0 |
| | | 42 | Sash pot. 2 adjust | 03, 06 | s16 | cm | Signed integer | -10 | 10 | 0 |
| 14 | Damper relation | 43 | FHD relation | 03, 06 | u16 | % | FHD1 - FHD2 relation | 50 | 200 | 100 |
| 15 | Air flow adjust | 44 | Adjust low | 03, 06 | u16 | % | | 50 | 200 | 100 |
| | | 45 | Adjust high | 03, 06 | u16 | % | | 50 | 200 | 100 |
| 16 | Damper 1 | 46 | Damper 1 angle | 03 | u16 | deg | | | | |
| 17 | Damper 2 | 47 | Damper 1 angle | 03 | u16 | deg | | | | |
| 18 | Air volume | 48 | Air volume | 03 | u16 | l/s or m3/h | Unit setin SAR register 67 | | | |
| 19 | Sash 1 | 49 | Sash 1 height | 03 | u16 | cm | | | | |
| 20 | Sash 2 | 50 | Sash 2 height | 03 | u16 | cm | | | | |

# Modbus register / ACU Holding registers 4xx00-4xx11 (xx=30...49)

| ACU.X | HEADER | REG | DESCRIPTION | CMD | FORMAT | UNIT | FORMAT NOTE | MIN | MAX | DEF |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 0 | Connection status | 03 | u16 | 0-1 | 0 = OFFLINE<br>1 = ONLINE | 0 | 1 | 0 |
| 1 | Serial number | 1 | Serial number | 03 | u16 | | | 0 | 32000 | 500 |
| 2 | Program version | 2 | Program version | 03 | u16 | | Ex: 123 = 1.23 | 0 | 65535 | 100 |
| 4 | Group | 5 | Controller mode | 03, 06 | u16 | 0-3 | 0 = Normal<br>1 = Normal Slow<br>2 = Analog<br>3 = Analog Slow | 0 | 3 | 0 |
| 5 | Alarm | 6 | Alarm level | 03, 06 | u16 | % | | 20 | 90 | 80 |
| | | 7 | Alarm delay | 03, 06 | u16 | s | | 10 | 60 | 20 |
| 6 | Damper angle | 8 | Damper angle | 03 | u16 | deg | | | | |
| 7 | Air volume | 9 | Air volume | 03 | u16 | l/s or m3/h | Unitis setin SAR register 67 | | | |
| 8 | Air velocity | 10 | Air velocity | 03 | u16 | cm/s | | | | |
| 9 | Setpoint | 11 | Setpoint | 03 | u16 | cm/s | | | | |

We reserve the right to limit the write rights of the registry. Registers related to the start-up procedure are not presented here.