

MB-RTU-TCP-ABS

Modbus RTU <> TCP Converter

使用說明書 User Manual



韌體 Firmware v1.0.04-mbgw · UI 0.2.0-66

2026-10

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中文版

1. 產品概述

Modbus RTU <> TCP Converter 讓 SCADA / HMI 以 Modbus TCP 直接讀寫 RS485 / RS232 上的 Modbus RTU 或 ASCII 從站，不需改動現場設備。

- 方向：Modbus TCP 伺服器 → Modbus RTU / ASCII 主站。SCADA 連進本機的 TCP 埠，本機把請求送上序列匯流排，再把從站的回應送回去。
- 逐筆透傳：MBAP 的 Unit ID 就是序列端的從站位址，PDU 原封不動；不快取、不改寫功能碼。
- 兩個獨立通道：Port 1 (RS232) 與 Port 2 (RS485) 各自一個 TCP 埠、各自選 RTU 或 ASCII，每埠最多 16 條 TCP 同時連線。
- 純轉換器：不做 MQTT、不做點位輪詢，兩個序列埠完全屬於轉換功能。

多台 SCADA 經轉換器排隊、輪流使用兩條序列匯流排

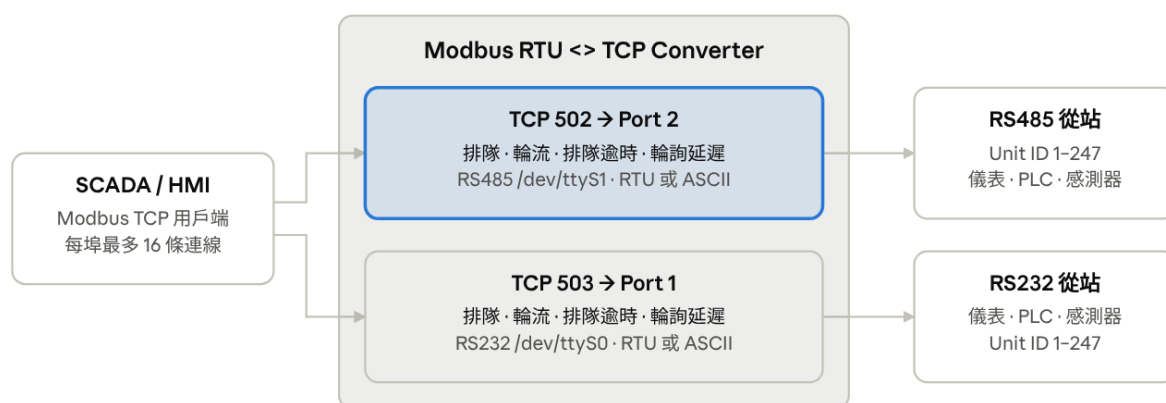


圖 1 系統架構：每個序列埠一次跑一筆交易，多條 TCP 連線的請求在轉換器內排隊、輪流送出

2. 產品規格

項目	規格
外觀尺寸 / 重量	110 × 90 × 26 mm (寬 × 深 × 高) / 150 ± 10 g
電源輸入	DC 9 ~ 24 V
處理器 / 記憶體	MediaTek MT7688 (580 MHz) / 128 MB DDR2 / 32 MB Flash
序列埠	Port 1 = RS232 (/dev/ttyS0) 、 Port 2 = RS485 (/dev/ttyS1)
序列協定	Modbus RTU 或 Modbus ASCII (每埠設定)
鮑率 / 格式	1200 – 115200 bps ; 資料位元 7 / 8 、同位元 N / E / O 、停止位元 1 / 2
從站位址	Unit ID 1 – 247 ; 0 = 廣播 (僅寫入)
Modbus TCP	每個序列埠一個 TCP 埠 (出廠 Port 2 = 502 、 Port 1 = 503)

項目	規格
TCP 同時連線數	每埠最多 16 條 (兩埠共 32 條) · 出廠 8
乙太網路	10/100 Mbps RJ45 ; 靜態 IP (出廠 192.168.0.150/24) 或 DHCP
Wi-Fi	802.11 b/g/n 2.4 GHz · AP 模式 (出廠關閉 · 維護用)
管理介面	HTTPS 網頁 (TCP 8443) · 繁體中文 / 英文
指示燈	SYS、PWR、RX、TX、LAN
看門狗	硬體看門狗 · 系統當住時自動重新開機
即時時鐘 RTC (選配)	Epson RX-8010 · 斷電保持時間
儲存溫度	-25 ~ 80 °C
保留埠	22、53、80、443、8443 不可作為 Modbus TCP 埠
實測效能	9600 bps、每筆讀 50 個暫存器、輪詢之間延遲 150 ms 時、每埠約每秒 2.3 筆

3. 登入

1. 電腦設在同一網段，瀏覽器開 <https://192.168.0.150:8443> (出廠 IP)。
2. 自簽憑證會出現安全警告，選擇繼續前往。
3. 輸入出廠帳號 admin、密碼 password1234。
4. 首次登入後請到「系統總覽」更改密碼 (至少 8 字元)。
5. 右上角可切換繁體中文 / English。

4. 網路設定

在「網路設定」頁設定靜態 IP 或 DHCP、遮罩、閘道、DNS，按「套用」。

網路變更確認式提交 (IETF RFC 6241 NETCONF §8.4 confirmed-commit 機制)

更改 IP 後，必須在新位址登入並確認，變更才算完成；靜態 IP 180 秒、DHCP 300 秒內沒有確認，就自動退回原本的網路設定。確認期間斷電重開也會退回。

打錯 IP 或遮罩不會讓設備從網路上消失，不必到現場按重置。此機制由網頁操作，設備不提供 NETCONF 協定埠。

4.1 確認步驟

1. 按「套用」後，頁面顯示新位址的連結 (帶一次性確認碼)。
2. 若新 IP 不在電腦目前的網段，頁面會先警告；請先調整電腦的 IP。
3. 開啟新位址連結，用帳號密碼登入。
4. 按「確認」，變更完成。
5. DHCP：先從 DHCP 伺服器或 T-7688 Scanner 查到新位址，再輸入到頁面產生連結。

5. 完成設定並限制存取

設定全部完成後，可以在「系統總覽」頁開啟「完成設定並限制存取」：網頁管理介面（80 / 443 / 8443）只在每次開機後 60 秒內可用，其餘時間關閉，減少現場設備被人從網路上改設定的機會。

限制的範圍

只關閉網頁管理介面。Modbus TCP 轉換（502 / 503）不受影響，照常運作。

60 秒從網頁服務實際就緒時開始計算，不會被開機過程吃掉。

5.1 開啟限制

1. 確認所有設定都已儲存並套用。
2. 在「系統總覽」頁把「完成設定並限制存取」開關打開。
3. 立即生效：這次開機的網頁管理介面也會在 60 秒後關閉，頁面會顯示提示。
4. 之後每次開機，網頁管理介面只開放 60 秒。

5.2 再次進入或解除限制

情況	做法
要再進入網頁修改設定	重新上電，開機後 60 秒內登入，先把限制開關關閉（60 秒一到網頁就會關閉），改完設定再重新開啟。
要解除限制	開機後 60 秒內登入，把「完成設定並限制存取」開關關閉；網頁管理介面恢復全時可用。
錯過 60 秒或不知道 IP	按住 Reset 鍵 30 秒：IP 恢復成出廠 192.168.0.150/24，同時解除限制。

6. 序列埠 / Modbus 設定

所有轉換設定都在「序列埠 / Modbus」一頁：Port 1、Port 2 分頁設序列端，Modbus TCP 分頁設各埠的 TCP 端，最後按「儲存」再按「套用設定」。

6.1 Port 1 / Port 2 分頁（序列端）

欄位	範圍	出廠	說明
協定	ascii / rtu	rtu	要與該匯流排上所有從站一致
鮑率	1200 – 115200	9600	同上
資料位元 / 同位元 / 停止位元	7-8 / N E O / 1-2	8 / N / 1	ASCII 設備常見 7E1
從站回應逾時 (ms)	50 – 10000	1000	送完請求後等多久；要大於最慢從站的回應時間
輪詢之間延遲 (ms)	0 – 1000	0 = 自動	兩筆交易之間匯流排最少空多久（見 6.3）
廣播後等待 (ms)	0 – 5000	100	廣播後給從站執行的時間
逾時重試次數	0 – 3	0	寫入指令重送可能重複寫入

6.2 Modbus TCP 分頁 (每個序列埠一張卡)

欄位	範圍	出廠	說明
啟用	勾選	Port 2 開、Port 1 關	關閉就不開該序列埠、不監聽
連接埠	1 – 65535	502 / 503	兩個啟用中的埠不可相同；不可用保留埠
最大連線數	1 – 16	8	滿線時關閉閒置最久的連線
閒置斷線 (ms)	0 – 3600000	300000	0 = 不因閒置斷線
請求排隊逾時 (ms)	0 – 60000	1000	排隊超過就回 0x0B、不送出；建議 ≤ SCADA 逾時；0 = 不限

6.3 輪詢之間延遲：自動模式

設 0 時由轉換器自動調整：曾經回應過的從站逾時或回錯誤框，延遲加倍 (最多 400 ms)；連續 40 筆順利後縮短 1/8。從沒回應過的 Unit ID 不會影響延遲，SCADA 輪詢不存在的位址也不會拖慢整條匯流排。

混接真實儀表與經 USB-RS485 的設備 (例如 PC 上的模擬器) 時，建議設 0 (自動) 或固定 150 ms 起試。

6.4 儲存與套用

1. 改完按「儲存」，狀態顯示已儲存；欄位超出範圍會在頁面上列出、不送出。
2. 按「套用設定」重啟轉換服務，已連線的 SCADA 會斷線重連一次；套用失敗自動退回上一版設定。
3. 還沒儲存就離開頁面，會詢問是否捨棄變更。

7. 讀懂執行階段狀態

「序列埠 / Modbus」頁下方的執行階段狀態每 3 秒更新。

卡片	意思	要注意的時候
運行中 · 監聽 TCP n	服務正常	「狀態未更新」表示服務可能停了
TCP 連線	目前連線數	長期等於最大連線數時會有連線被踢
請求 / 回應	累計數	兩者差距 = 轉換器自己回的例外
逾時 / 錯誤框	從站沒回 / 回應壞掉	錯誤框持續增加：查接線、鮑率、終端電阻
從站例外	從站回的例外 (如 02 非法位址)	檢查 SCADA 的位址與功能碼
排隊逾時丟棄	排隊太久被丟掉的請求	持續增加 = 輪詢太頻，減少輪詢或連線
目前輪詢延遲	兩筆交易之間的空檔	自動模式下長期靠近 400 ms：匯流排有問題
最近錯誤	最後一次錯誤與時間	看 Unit ID 找出是哪台從站

8. SCADA 端設定建議

- 連線：IP = 轉換器 IP，Port = 該序列埠的 TCP 埠 (出廠 502 / 503)。
- Unit ID：填從站的 Modbus 位址 (1–247)。

- **逾時**：建議 3000 ms 以上；多台 SCADA 共用一條匯流排時要更長。
- **輪詢量**：每埠每秒能跑的交易數 $\approx 1000 \div (\text{序列傳輸時間} + \text{從站回應時間} + \text{輪詢之間延遲} \cdot \text{單位 ms})$ ，所有 SCADA 加起來不要超過。

9. 疑難排解

現象	原因	處理
某台從站只有單獨輪詢才讀得到	請求緊接在另一台的回應之後，慢轉向設備收不到	輪詢之間延遲設 0 (自動) 或 150 ms 起試
SCADA 大量逾時，但請求 / 回應幾乎相等	轉換器有回，只是排隊後超過 SCADA 的逾時	減少連線或輪詢頻率，拉長 SCADA 逾時
排隊逾時丟棄持續增加	輪詢量超過匯流排容量	同上；或提高鮑率、一次讀較少暫存器
某 Unit ID 永遠 0x0B、錯誤框為 0	從站沒收到或沒回：ID、鮑率、協定、A/B 接線	檢查從站設定；有些儀表只回特定功能碼
錯誤框持續增加	訊號品質，或匯流排上有兩個主站	終端電阻、雙絞線、接地；確認只有本機是主站
收到 0x0A	Unit ID 0 讀取、248–255、或序列埠出錯	改用 1–247；序列埠出錯請查系統紀錄
SCADA 被斷線	連線數滿被踢、閒置斷線、或送了非 Modbus 封包	調高最大連線數或關掉沒用的連線
總覽某埠顯示「已停止」、 「Modbus TCP 服務未執行」	該埠在 Modbus TCP 分頁沒有勾選啟用，或本機還沒有有效授權	勾選啟用後按「套用設定」；授權檔在「系統總覽」頁上傳，上傳後服務自動重新啟動

10. 例外碼對照

例外碼	誰產生	意思
0x01 – 0x08 等	從站	從站自己的例外 (如 02 非法位址)，轉換器原樣回傳
0x0A	轉換器	Gateway Path Unavailable：Unit ID 0 讀取、Unit ID 248–255、序列埠 I/O 錯誤
0x0B	轉換器	Gateway Target Failed to Respond：從站逾時、CRC / LRC 錯、回應不符，或請求排隊逾時

11. 韌體版本

日期	版本	內容
2026-10-05	v1.0.04-mbgw	在網頁匯入授權後，Modbus TCP 服務自動重新啟動（之前要重新開機或按「套用設定」）；授權訊息與總覽的停止狀態改為「Modbus TCP 服務未執行」
2026-09-30	v1.0.03-mbgw	「完成設定並限制存取」的狀態文字跟著語言切換
2026-09-29	v1.0.02-mbgw	請求排隊逾時、自動輪詢延遲、狀態新增排隊逾時丟棄與目前輪詢延遲；名稱 Modbus RTU <> TCP Converter、新 logo
2026-09-29	v1.0.01-mbgw	序列端支援 Modbus ASCII
2026-09-29	v1.0.00-mbgw	第一版：Modbus TCP → RTU 轉換

English

1. Overview

The Modbus RTU <> TCP Converter lets SCADA / HMI systems read and write Modbus RTU or ASCII slaves on RS485 / RS232 over Modbus TCP, with no change to the field devices.

- **Direction:** Modbus TCP server → Modbus RTU / ASCII master. SCADA connects to the converter's TCP port; the converter puts each request on the serial bus and returns the slave's reply.
- **Transparent:** the MBAP Unit ID is the serial slave address and the PDU passes unchanged; nothing is cached or rewritten.
- **Two independent channels:** Port 1 (RS232) and Port 2 (RS485) each have their own TCP port and RTU or ASCII setting, with up to 16 concurrent TCP connections per port.
- **Converter only:** no MQTT and no point polling; both serial ports belong to the converter.

Many SCADA clients share each serial bus through the converter queue

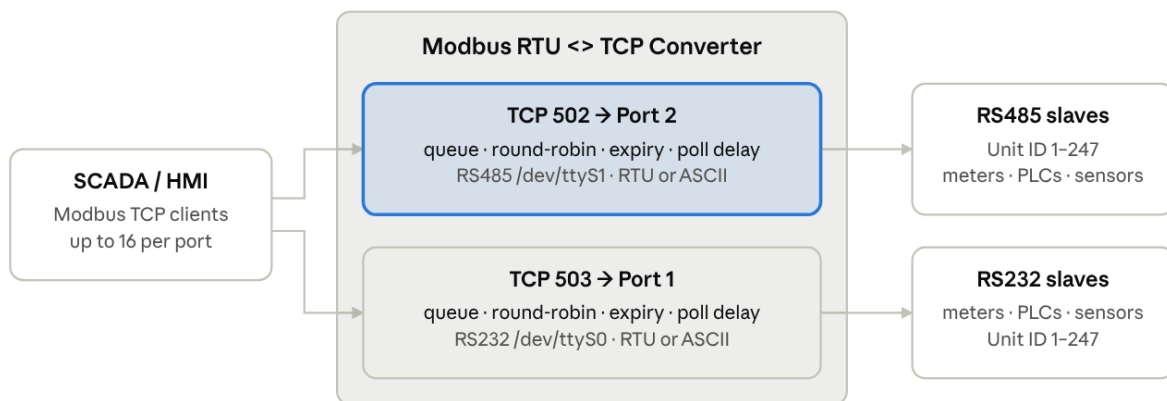


Figure 1 Architecture: each serial port runs one transaction at a time; requests from several TCP connections queue in the converter and are sent in turn

2. Specifications

Item	Specification
Dimensions / weight	110 × 90 × 26 mm (W × D × H) / 150 ± 10 g
Power input	DC 9 ~ 24 V
Processor / memory	MediaTek MT7688 (580 MHz) / 128 MB DDR2 / 32 MB flash
Serial ports	Port 1 = RS232 (/dev/ttyS0), Port 2 = RS485 (/dev/ttyS1)
Serial protocol	Modbus RTU or Modbus ASCII (per port)
Baud / format	1200 – 115200 bps; data bits 7 / 8, parity N / E / O, stop bits 1 / 2
Slave addresses	Unit ID 1 – 247; 0 = broadcast (writes only)
Modbus TCP	one TCP port per serial port (factory Port 2 = 502, Port 1 = 503)
Concurrent TCP connections	up to 16 per port (32 across both ports), factory 8
Ethernet	10/100 Mbps RJ45; static IP (factory 192.168.0.150/24) or DHCP
Wi-Fi	802.11 b/g/n 2.4 GHz, AP mode (off at the factory, for maintenance)
Management	HTTPS web UI (TCP 8443), Traditional Chinese / English
LEDs	SYS, PWR, RX, TX, LAN
Watchdog	hardware watchdog; the unit restarts itself if the system hangs
Real-time clock (optional)	Epson RX-8010, keeps time through power loss

Item	Specification
Storage temperature	-25 ~ 80 °C
Reserved ports	22, 53, 80, 443, 8443 cannot be used for Modbus TCP
Measured performance	about 2.3 transactions a second per port at 9600 bps reading 50 registers with a 150 ms delay between polls

3. Logging in

1. Put the PC on the same subnet and open <https://192.168.0.150:8443> (factory IP).
2. The self-signed certificate raises a browser warning; choose to continue.
3. Enter the factory account admin and password password1234.
4. After the first login, change the password on the System Overview page (8 characters or more).
5. Switch between 繁體中文 and English at the top right.

4. Network settings

On the Network page set static IP or DHCP, netmask, gateway and DNS, then press Apply.

Confirmed commit for network changes (IETF RFC 6241 NETCONF §8.4 confirmed-commit mechanism)

After an IP change, the change is complete only when someone logs in at the new address and confirms it; with no confirmation within 180 s (static IP) or 300 s (DHCP) the previous network settings come back automatically. A power cycle during the window rolls back too.

A mistyped IP or netmask cannot strand the unit off the network or send someone to site to press reset. The mechanism is operated from the web UI; the unit does not offer a NETCONF protocol port.

4.1 Confirming a change

1. After Apply, the page shows a link to the new address carrying a one-time confirmation token.
2. If the new IP is outside the PC's current subnet, the page warns first; change the PC's IP.
3. Open the link to the new address and log in.
4. Press Confirm; the change is complete.
5. DHCP: look up the new address on the DHCP server or with T-7688 Scanner first, then enter it on the page to build the link.

5. Finish setup and restrict access

When all settings are done, turn on Finish setup & restrict access on the System Overview page: the web management interface (80 / 443 / 8443) is then reachable only for 60 seconds after each boot and closed the rest of the time, which reduces the chance of someone changing a field unit over the network.

What the restriction covers

Only the web management interface closes. Modbus TCP conversion (502 / 503) is not affected and keeps running.

The 60 seconds start when the web service is actually ready, so the boot sequence does not eat into them.

5.1 Turning the restriction on

1. Make sure all settings are saved and applied.
2. On the System Overview page, turn on the Finish setup & restrict access switch.
3. It takes effect at once: the web management interface of the current boot also closes after 60 seconds, and the page says so.
4. From then on, every boot opens the web management interface for 60 seconds only.

5.2 Getting back in or lifting the restriction

Situation	What to do
Change settings again	Power-cycle the unit, log in within 60 seconds of boot and turn the restriction off first (the web interface closes when the 60 seconds are up), then turn it back on when the changes are done.
Lift the restriction	Log in within 60 seconds of boot and turn the Finish setup & restrict access switch off; the web interface stays available at all times again.
Missed the window or lost the IP	Hold the Reset button for 30 seconds: the IP returns to the factory 192.168.0.150/24 and the restriction is lifted at the same time.

6. Serial / Modbus settings

All converter settings live on the Serial / Modbus page: the Port 1 and Port 2 tabs set the serial side, the Modbus TCP tab sets each port's TCP side; then press Save and Apply.

6.1 Port 1 / Port 2 tabs (serial side)

Field	Range	Factory	Notes
Protocol	ascii / rtu	rtu	must match every slave on that bus
Baud	1200 – 115200	9600	as above
Data bits / parity / stop bits	7–8 / N E O / 1–2	8 / N / 1	ASCII devices are often 7E1
Slave response timeout (ms)	50 – 10000	1000	time to wait after sending; longer than the slowest slave's reply
Delay between polls (ms)	0 – 1000	0 = auto	minimum quiet gap between two transactions (see 6.3)
Wait after broadcast (ms)	0 – 5000	100	time for slaves to act on a broadcast
Retries on timeout	0 – 3	0	a retried write may be written twice

6.2 Modbus TCP tab (one card per serial port)

Field	Range	Factory	Notes
Enabled	tick box	Port 2 on, Port 1 off	off = serial port not opened, TCP port not listened on
Port	1 – 65535	502 / 503	two enabled ports cannot share a port; reserved ports not allowed
Max connections	1 – 16	8	when full, the connection idle longest is closed
Idle disconnect (ms)	0 – 3600000	300000	0 = never
Request queue timeout (ms)	0 – 60000	1000	older requests get 0x0B unsent; keep ≤ the SCADA timeout; 0 = no limit

6.3 Delay between polls: automatic mode

At 0 the converter adjusts the gap itself: when a slave that has answered before times out or sends a bad frame, the delay doubles (up to 400 ms); after 40 clean transactions it shrinks by an eighth. Unit IDs that never answered do not affect it, so SCADA polling a missing address does not slow the whole bus.

With real meters and devices behind USB-RS485 (such as a simulator on a PC) on one bus, use 0 (auto) or start from a fixed 150 ms.

6.4 Save and apply

1. Press Save; the state line shows Saved. Out-of-range fields are listed on the page and nothing is sent.
2. Press Apply to restart the converter service; connected SCADA clients reconnect once. A failed apply rolls back to the previous settings.
3. Leaving the page with unsaved changes asks whether to discard them.

7. Reading the runtime status

The runtime status at the bottom of the Serial / Modbus page refreshes every 3 seconds.

Card	Meaning	Watch for
Running · Listening on TCP n	service is up	"Status not updating" means the service may have stopped
TCP connections	current connections	constantly at the maximum means connections are being evicted
Requests / replies	running totals	the difference = exceptions the converter answered itself
Timeouts / bad frames	slave silent / reply corrupt	bad frames keep rising: check wiring, baud rate, termination
Slave exceptions	exceptions sent by slaves (e.g. 02 illegal address)	check the SCADA address and function code
Expired in queue	requests dropped for waiting too long	keeps rising = polling too fast; poll less or use fewer connections
Current poll delay	gap between transactions	near 400 ms for long in auto mode: the bus has a problem
Last error	last error and when	the Unit ID tells which slave

8. SCADA-side recommendations

- **Connection:** IP = the converter's IP, port = that serial port's TCP port (factory 502 / 503).
- **Unit ID:** the slave's Modbus address (1–247).
- **Timeout:** 3000 ms or more; longer when several SCADA clients share one bus.
- **Polling load:** transactions a second per port $\approx 1000 \div (\text{serial transfer time} + \text{slave reply time} + \text{delay between polls, in ms})$; all SCADA clients together should stay below it.

9. Troubleshooting

Symptom	Cause	Fix
A slave answers only when polled alone	the request follows another device's reply too closely and a slow-turnaround device misses it	set Delay between polls to 0 (auto) or start at 150 ms
SCADA shows many timeouts, yet requests and replies are almost equal	the converter answers, but after queuing longer than the SCADA timeout	fewer connections or slower polling; raise the SCADA timeout
Expired in queue keeps rising	polling exceeds bus capacity	as above; or a higher baud rate, or fewer registers per read
One Unit ID always gets 0x0B and bad frames stay at 0	the slave never heard or never answered: ID, baud, protocol, A/B wiring	check the slave; some meters answer only certain function codes
Bad frames keep rising	signal quality, or two masters on one bus	termination, twisted pair, grounding; make sure the converter is the only master
0x0A received	read to Unit ID 0, Unit ID 248–255, or a serial port error	use 1–247; for serial errors check the system log
SCADA gets disconnected	evicted when full, idle disconnect, or a non-Modbus packet	raise Max connections or close unused connections
The overview shows a port as Stopped, "Modbus TCP service not running"	the port is not enabled on the Modbus TCP tab, or the unit has no valid licence yet	tick Enabled and press Apply; upload the licence file on the System Overview page and the service restarts by itself

10. Exception codes

Code	Raised by	Meaning
0x01 – 0x08 etc.	slave	the slave's own exception (e.g. 02 illegal address), returned unchanged
0x0A	converter	Gateway Path Unavailable: read to Unit ID 0, Unit ID 248–255, serial I/O error
0x0B	converter	Gateway Target Failed to Respond: slave timeout, bad CRC / LRC, mismatched reply, or request expired in the queue

11. Firmware versions

Date	Version	Changes
2026-10-05	v1.0.04-mbgw	installing a licence from the web UI restarts the Modbus TCP service by itself (before, it took a reboot or Apply); licence messages and the overview's stopped note now read "Modbus TCP service not running"
2026-09-30	v1.0.03-mbgw	the Finish setup & restrict access status line follows a language switch
2026-09-29	v1.0.02-mbgw	request queue timeout, automatic delay between polls, status adds expired-in-queue and current poll delay; renamed Modbus RTU <> TCP Converter, new logo
2026-09-29	v1.0.01-mbgw	Modbus ASCII on the serial side
2026-09-29	v1.0.00-mbgw	first release: Modbus TCP → RTU conversion