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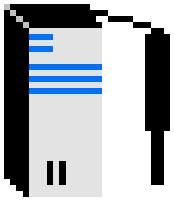
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1. Introduction

The “ATLAS COPCO QCM/S” is a smart servo for simple tightening -applications. Win QCM-81 is a Windows program for programming the servos.

Win QCM-81 can run on a PC:

- Running under Windows NT or Windows 95.
- 2 MB harddisc free.
- One or more free serial port(s).

The program can be in on-line or off-line mode. In on-line mode, parameters are sent to the servos when they are changed. In off-line a program can be modified without any servos connected.

The servos can be connected one by one or all at the same time.

The program can handle systems with maximum 40 spindles (maximum 15 per serial port).

This document describes the features of the WinQCM-81X software. For a functional description of the MiniMACS, see the MiniMACS manual.

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2. Function description.

When you start the program there is first a welcome page. In case of a new system, you will automatically come to the “System Set-up” window.

2.1 Menus

2.1.1 Main menu

The main menu has four windows, the result window, the tightening cycles window, the digital input window and the digital output window.

2.1.1.1 Results

If the program is in on-line mode and you switch to the result window results are continuously collected from all spindles in the system and viewed on the screen.

File View Spindle Set-up Load parameters Access level Help

Spindle 3 ONLINE ☐ Log

Results

Comm. Off	Sp. No.	Step	Status	Torque	Angle	Error
☐	1	3	OK	105.1 Nm	70 deg	
☐	2		Running			
☐	3	1	NOK	15.2 Nm	320 deg	Angle high, Torque low
☐	4		-	-	-	-

The results (Step no., status, torque values, angle values and error messages) are shown in one line for each spindle. If the status is OK the status box is green and if it’s NOK the status box is red and a text string explain type of fault. If the spindle is running the box is white and the status is RUNNING.

Lost serial communication is indicated with a question mark..

By clicking in the “Comm.Off” box, the selected spindle will be ignored in the serial communication (ex. a defect servo).

A click in the “Log” box will activate save data to a file.

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The presented torque and angle values are values from the step marked in the "Tightening cycles" table except if the results are from a NOK spindle, then the results will be from the NOK step.

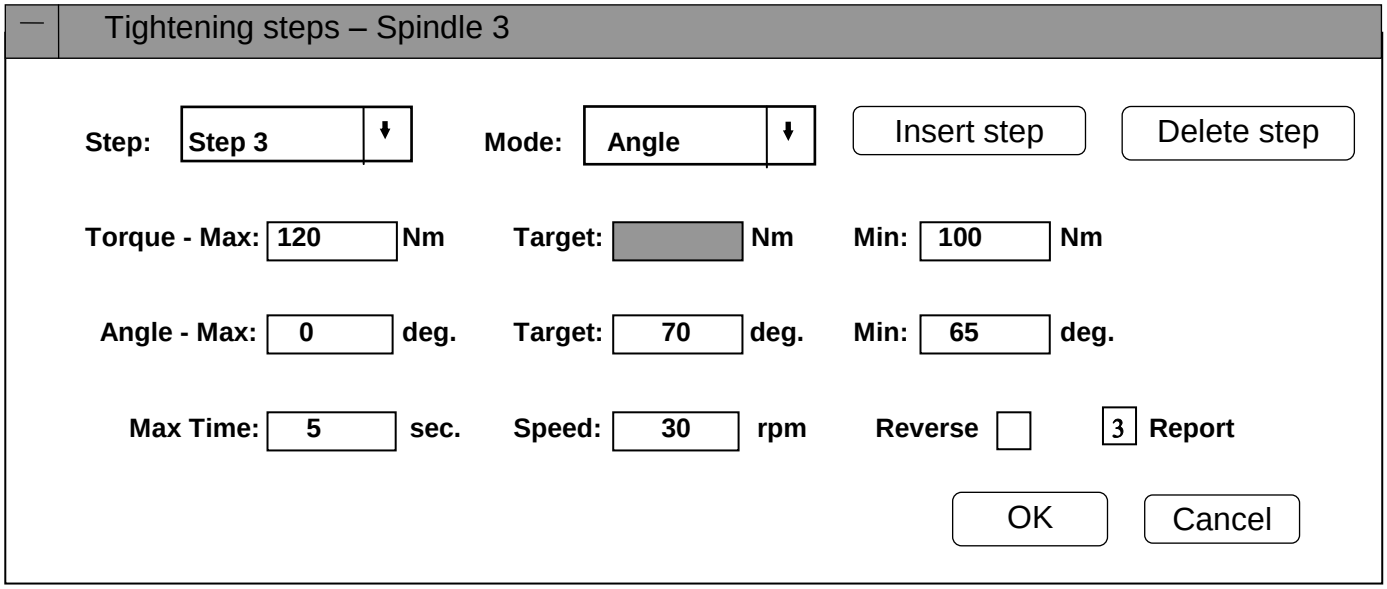
2.1.1.1 Tightening cycles

Tightening cycles

Step	Mode	(Nm) Torque Max	Target	Min	(Sec) Time	(deg) Angle Max	Target	Min	(rpm) Speed	Rev.
1	Torque	0	10.0	0	5	3000		0	100	
2	Torque	45.0	40.0	38.0	5	320		300	50	
R 3	Angle	120.0		100.0	5		70	65	30	No
4	Angle End	20.0		0	2		5	0	50	Yes
5	Angle	100.0		0	5		90	0	30	Yes
6	Angle End	100.0		0	5		3600	0	120	Yes
R 7	Delay End				0.0					
R 8	Delay End				0.0					
R 9	Delay End				0.0					
R 10	Delay End				0.0					
R 11	Delay End				0.0					
R 12	Delay End				0.0					
R 13	Delay End				0.0					
R 14	Delay End				0.0					
R 15	Delay End				0.0					
R 16	Delay End				0.0					

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You can edit the tightening program in the tightening cycles window. Select a step by clicking on it. If you double click on the step you will get a dialogue box for that step.



Mode can be selected from one of the following step types: Torque, Angle, Delay, Dynatork, Delay End, Angle End, Jog End or Torque End.

If the mode in a step is of an End type, there is a horizontal line under the step to indicate that this is the end of a tightening set.

Depending of the selected mode the editable parameters change according to:

Mode	Max torque	Target torque	Min torque	Time	Max angle	Target angle	Min angle	Speed	Reverse
Delay End	Yes	No	Yes	Yes	Yes	No	Yes	No	No
Torque End	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
Angle End	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Jog End	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Delay	Yes	No	Yes	Yes	Yes	No	Yes	No	No
Torque	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
Angle	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Dynatork	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes

“Yes” means that you can edit this parameter and “No” that you cannot use the parameter in the selected step type.

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Angles are programmed in degrees.

Max.time is programmed in seconds and time for Delay and Delay End steps can be programmed with one decimal.

Speed is programmed in rpm.
In all steps except Delay and Delay End one can select to run in reverse direction.

Torque is programmed in Nm/fl.lb and if Max torque is less than 400 Nm/fl.lb it can be programmed with one decimal.

The **Max. allowed torque** is programmed in the Spindle parameter menu, se below.

When **deleting** a step it is removed and the following steps will be moved up one row. The new step added as the last step will be an empty step.

When **inserting** a step the current step will be an empty step and following steps will be moved down one row.

Max. and Min. Torque and Angle limits can be programmed to 0 meaning that the parameter is not used.
Note: Torque limits are not stored as absolute values in the servo, but as a percentage of the target value. This means that if you store a limit in the servo and then read it back again, the actual value can differ slightly from the programmed one.

A click in the **"Report"** box means that the Torque and Angle result will be reported from this step. A "Report" step is indicated with a "R" before the step number in the "Tightening cycles" table.
Note: Only one step in a set can be marked for reporting.
If **no** step in a set is marked for reporting, there will be no report.
If a tightening was NOK, the reported data comes from the step that was NOK.

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2.1.1.3 Digital inputs

In the digital input window you can see the status of all digital inputs for all spindles. The digital input window can only be seen in Offline mode.
Example:

K7A: Sp.	16 Select 1	15 Select 2	14 Step mode	13 Step Sync.	12 Cycle stop	11 M. stop	10 Inhibit	9 Start	8 Select 4	7 Error	6 Cont. ON
1	0	0	0	0	0	1	0	0	0	0	1
2	0	0	0	0	0	1	0	0	0	0	1
3	0	0	0	0	0	1	0	0	0	0	1
4	-	-	-	-	-	-	-	-	-	-	-

2.1.1.4 Digital outputs

In the digital output window you can see the status of all digital outputs for all spindles. The digital input window can only be seen in Offline mode.
Example:

Spindle	Running/ Error bit 3 K7B:34	NOK K7B:33	OK K7B:32	Step sync. OUT K7B:31	Confirm 1/ Error bit 1 K7B:30	Confirm 2/ Error bit 2 K7B:29
1	0	0	1	0	0	0
2	1	0	0	1	0	0
3	0	1	0	0	0	0
4	-	-	-	-	-	-

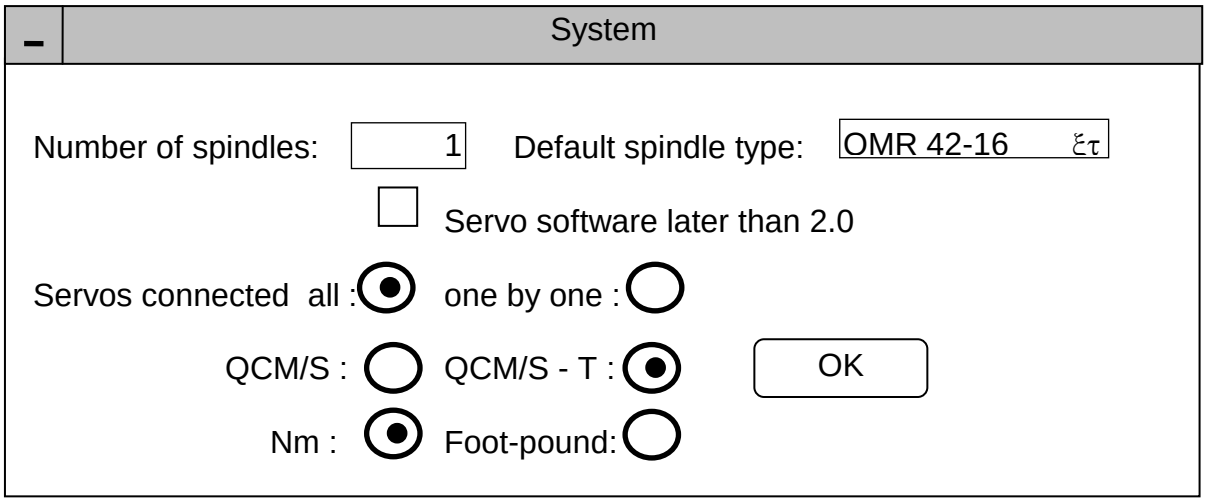
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2.1.2 File

File	View	Spindle	Set-up	Load parameters	Access level	Help
New Ctrl +N Open Ctrl +O Save Ctrl +S Save as..						
Print Ctrl +P Print preview Print set-up						
filename1 filename2 filename3 filename4						
Exit						

Under the menu file you will find the standard functions for file handling: New, Open, Save, Save as, Print and “open any of last four files”.

When you select New you get following dialogue box (to initiate the system):



Open a system file: the system must be in OFF LINE mode.

If you make a printout from the program you get a list of register parameters written to each spindle, one spindle per page.

Exit - to end the program (if current file is changed you get a question if you want to save the file).

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2.1.3 View

File | View | Spindle | Set-up | Load parameters | Access level | Help

- 4Toolbar
- 4Online button
- Status bar
- 4 Results
- Tightening cycles
- Digital input
- Digital output

The toolbar is working in the normal Windows way.

2.1.3 Spindle

File | View | Spindle | Set-up | Load parameters | Access level | Help

- Tightening steps
- Copy tightening steps
- Spindle parameters
- Torque reading
- Special
- Select current spindle

Tightening steps

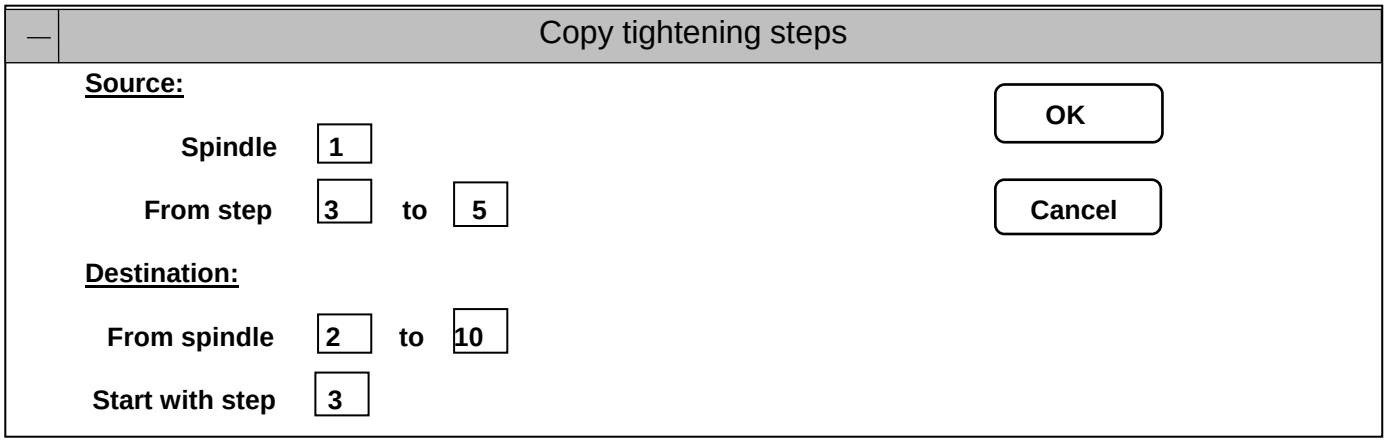
You will reach the same dialogue as when you in click on a tightening step in the main menu.

Copy tightening steps

Copy tightening steps from one spindle to other spindles. You select where you want to copy from - Source - and where you want to copy to - Destination.

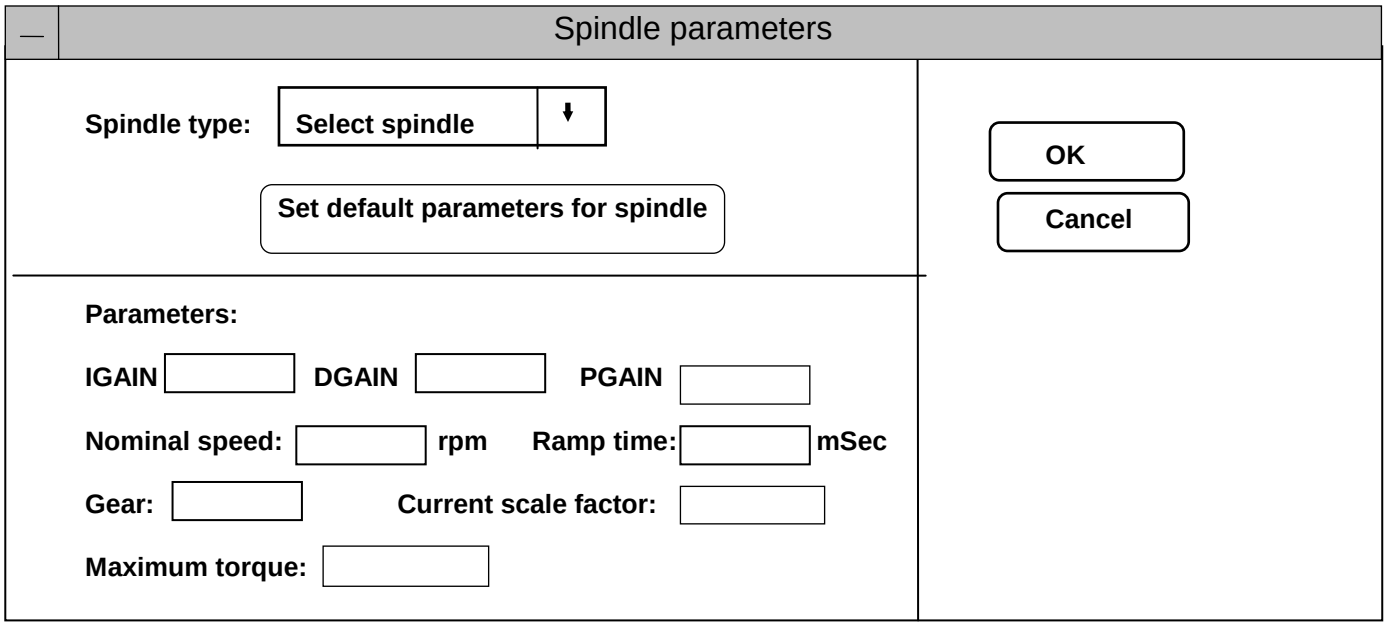
Note: Report flags are only copied if all 16 steps are copied.

In the example below you copy step 3, 4 and 5 from spindle 1 to spindle 2 - 10.



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Spindle parameters



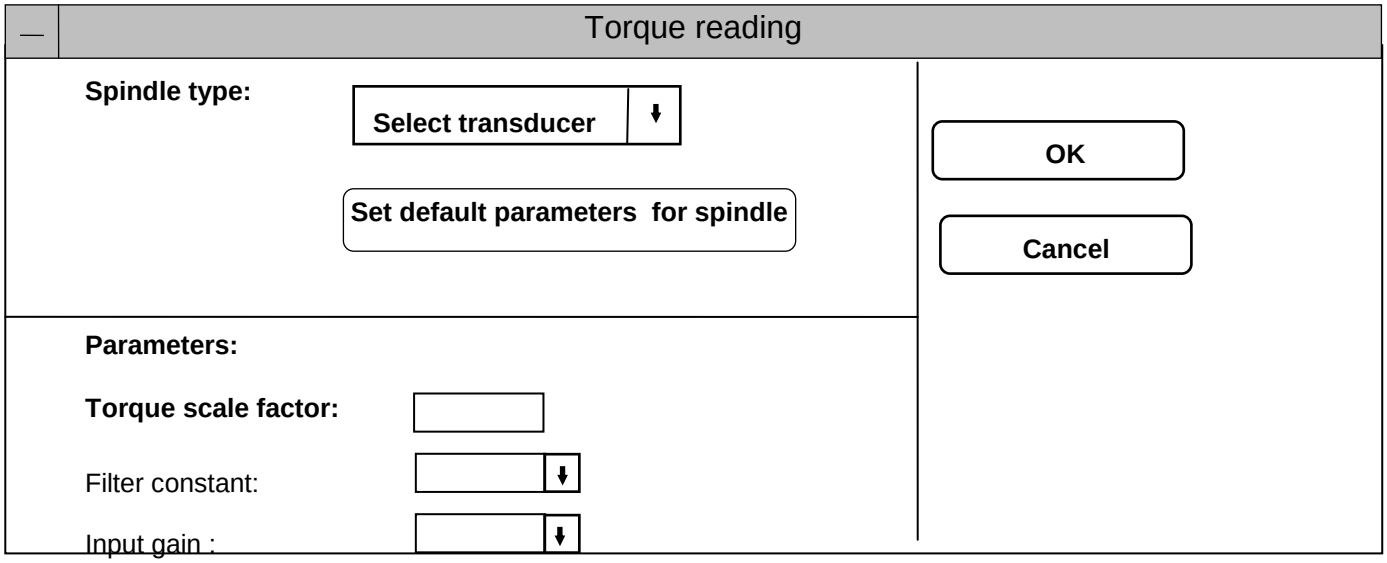
Select a spindle type and press the “Set default values for the spindle” button. Default parameters will then be automatically inserted.

With the Maximum torque parameter one select the range for the spindle. If the Maximum torque is above 400 Nm/Ftlb, torque values can not be programmed with decimal.
Note: The default value of “Maximum torque” is not stored in the servo meaning that if you read parameters from the servo, WinQCM will only get the information – Torque decimal or no Torque decimal. The exact torque value is lost and the shown value will be **<400** or **<4000** .

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Torque reading

Only valid if QCM/S -T servo is selected.



Select a torque transducer and press the “Set default values for the transducer” button. Default parameters will then be automatically inserted.

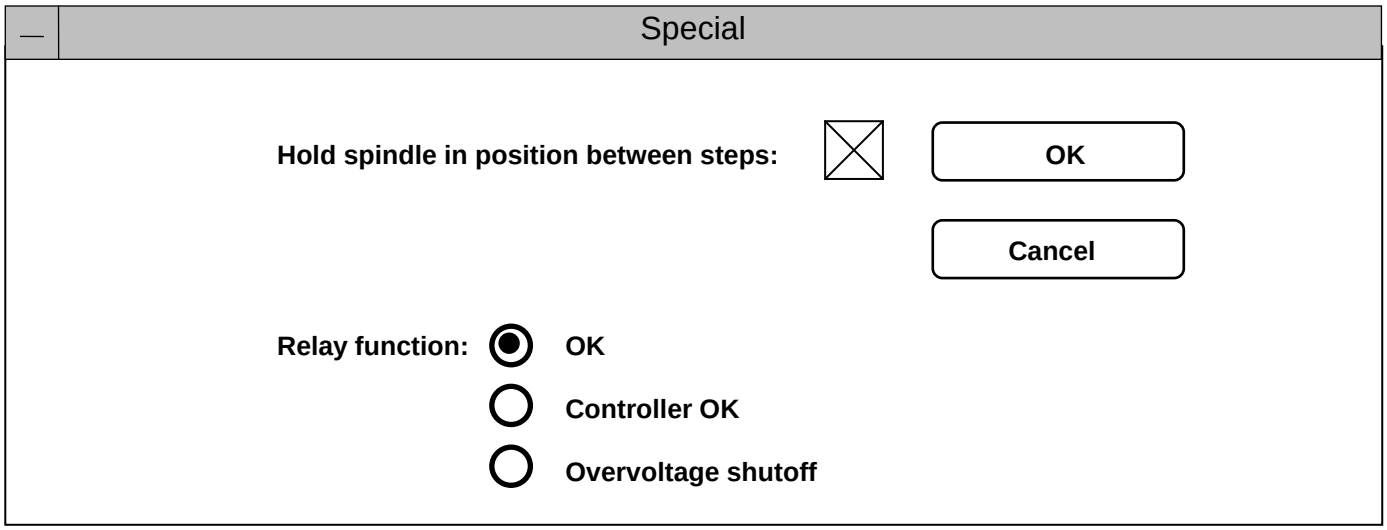
The “Torque scale factor”, the “Filter constant” and the “Input gain” can be edited manually if you e.g. have another type of torque transducer.

Filter constant can be 0,1,2 or 3 meaning that filter 0 is no filter and three is the hardest filter. Default is filter 1 and that means that if you have X Nm at sample ”n” and the torque increase with Y Nm till the sample ”n+1”, the stored peak torque value will be X+Y/2 at sample ”n+1”. Filter 2 means that the torque value increase with X+Y/4 and filter 3 means X=Y/8.

Input gain can be 1,2,4,8 or 16. Default gain is 4 meaning that you can use >100% of the transducer torque range. Gain 8 decrease the usable torque range (at gain 4) to the half but increase the resolution to the double.

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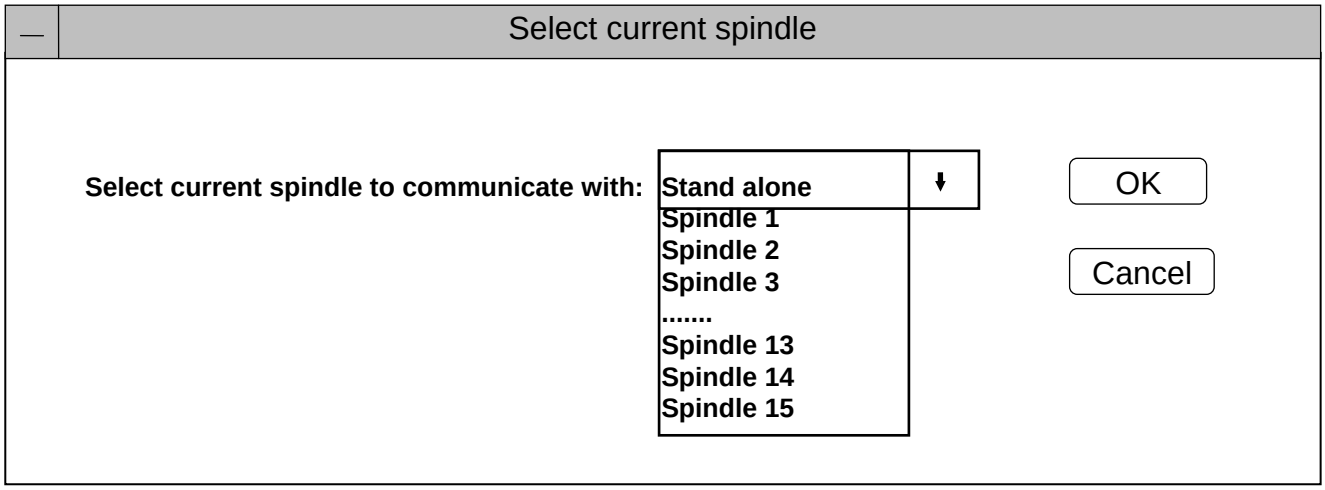
Special



Select current spindle

Select which spindle to communicate with. Available spindle to select from depends on what is programmed in Set-up - System (Max. 40).

Can also be done from the toolbar or by clicking on a spindle in the result menu.



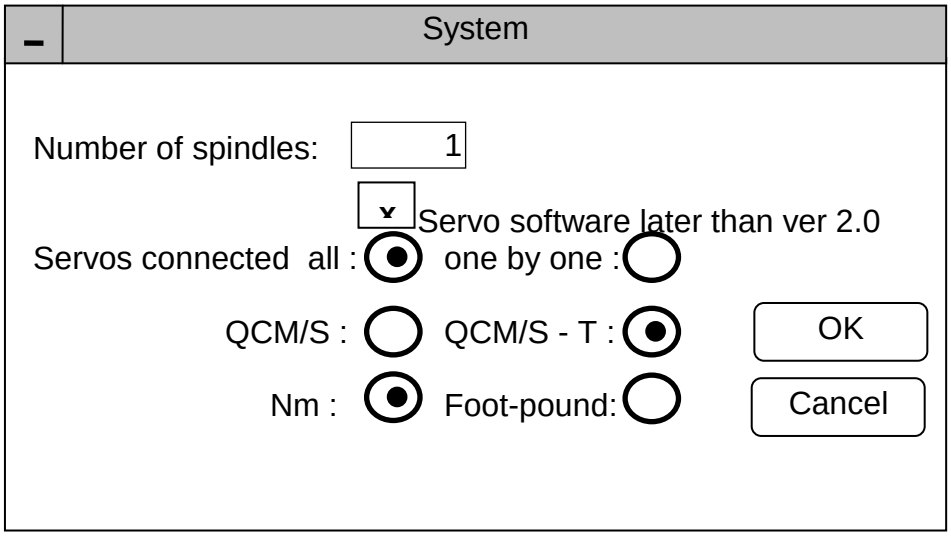
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2.1.4 Set-up

File	Set-up	.....

System
Change servo address
Communication
LPT1 Print report settings
File Log settings
On-line / Off-line
Log
Autostart

System



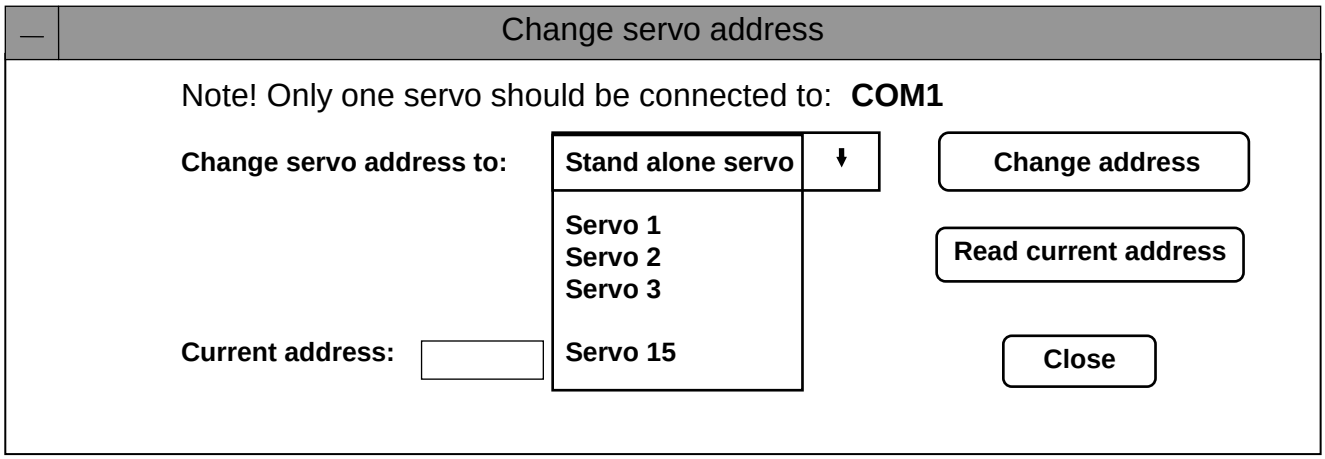
Servo software later than ver.2.0:
To able to use the “Extended reporting” as well as the reporting of step number in the results, you must have a servo software version later than 2.0 (4240 0351 20).

“Servos connected all”, **RECOMMENDED,** means that the servos have addresses from 1 and upwards and that all servos in the system are connected to the PC.

Servos connected “one by one” means that all servos have the address 0 (stand alone servo) and that only one servo is connected to the PC at a time.

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Change servo address

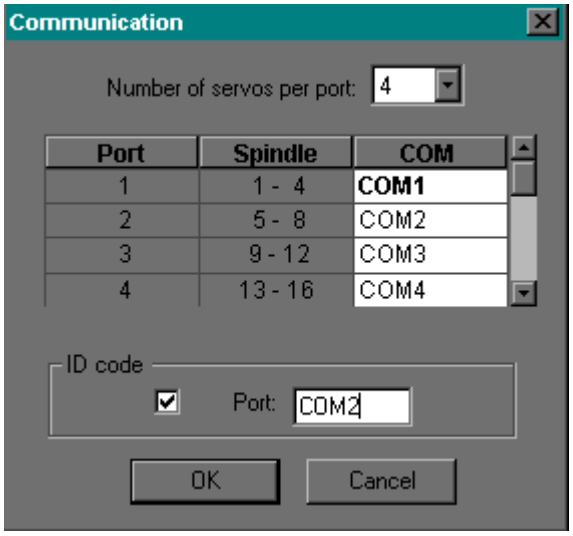


If all servos should be connected at the same time they must have different addresses. In this menu you can change the address for the connected servo. Note! Only one servo shall be connected at a time.

To be able to change the servo address the program must know the current address. If you don't know the current address use the "Read current address" button.

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Communication



In this window you specify the serial communication port for the communication with the servos.
Parity is always None, databits 8, stopbit 1 and baudrate 9600.
In order to speed up the communication between the servos and the PC, it is possible to use multiple COM-ports. It is possible to use one COM-port/servo and this means that theoretically you can use 40 COM-ports in a 40-spindle system(this require of course that you have a 40 COM-port board in your PC).
The maximum limit is 15 servos/COM-port.

In the example above, you have specified 4 servos/COM-port and as it is a 4 spindle system, all four servos shall be connected to COM1.

In the example is the “ID code” option selected with a click in the box and COM-port 2 is selected.
Parity is always None, databits 8, stopbit 1 and baudrate 9600 for an ID-device.

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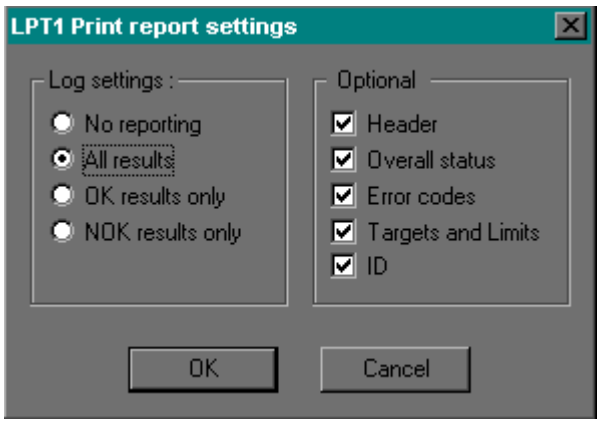
ID-device communication protocol:

- ACK/NAK protocol
- Character “NULL” (HEX 00) and “LF”(HEX 0A) always ignored
- Character “CR” (HEX 0D) add a “NULL” character at the end of the string and decide this as a complete ID-code

The WinQCM decoder can transmit the characters:
ACK (HEX 06)
NAK (HEX15)

Step	WinQCM		ID-Device
1.	NAK (one time each program start)	→	
2.		←	send ID-code string (max. 127 characters)
3.	ACK	→	
4.	back to step 2		

LPT1 Print report settings



Print report is, if selected, sent to over the parallel output port LPT1.

You can configure your printout by selecting the appropriate alternatives.

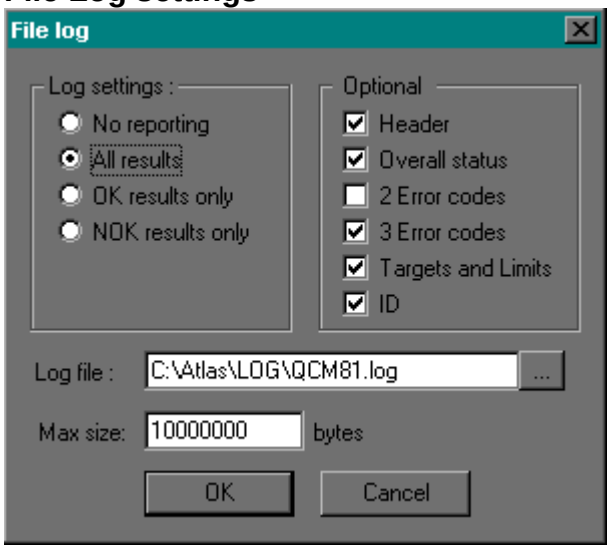
“Ok results only” means that all spindles must be OK.
“NOK results only” means that if one spindle is NOK, all spindles are reported.
The “Overall OK” is a “Station OK”:

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If one or more servos are inhibited, the “Communication Off” function must be used for these servos in the WinQCM-81 program.
If no step (of all 16 available) is marked with “R” (Report), no data will be reported to the LOG from this spindle.

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File Log settings



File log report is, if selected, sent to the defined file on your hard disc drive.
Note: It is not recommended to save data directly on a floppy drive as this slows down the reporting to much.

You can configure your file by selecting the appropriate alternatives.

In this window you can specify:
- which data you want to save
- the destination (file name and directory) where you want to save the tightening results.
- You can also specify the maximum size of the log file

“Ok results only” means that all spindles must be OK.
“NOK results only” means that if one spindle is NOK, all spindles are reported.

If one or more servos are inhibited, the “Communication Off” box in the “Results” window be must marked for these servos in the WinQCM-81 program.

If no step (of all 16 available) is marked with “R” (Report), no data will be reported to the LOG from this spindle.

The “Overall OK” is a “Station OK”:
You can only select one from the alternatives “2 Error codes” or “3 Error codes” and the reason for the alternatives is to save space in the report file .

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Online/Offline

Same function as the pushbutton in the main bar.
- If the program is in **Online**-mode, one push will set it into **Offline**-mode.
- If the program is in **Offline**-mode, one push will show a new window where you can select if you want to “Write all parameters” to the spindles or “Read all parameters” from the spindles.

Log

Same function as the pushbutton in the main bar.

Autostart



The “Autostart” feature can be used to have the running setup to automatically start up after a power down of the PC.

Procedure:
- Save the current setup to a file. Note that the WinQCM-81 shall be “ONLINE” and with “LOGON” (if you use the LOG-function) when you save the setup.
- Select “Autostart” and type the correct path to the saved file.
- Write a shortcut to WinQCM-81 in Windows AUTOSTART.

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2.1.5 Load parameters

File	Load parameters	
	Write all parameters to spindles Read all parameters from spindles Read and write registers	

Write all parameters to spindles

Write all programmable parameters to the servos. If the program is in off-line mode it will automatically be set in on-line mode after the operation

Read all parameters from spindles

Read all programmable parameters from the servos. If the program is in off-line mode it will automatically be set in on-line mode after the operation.

Read and write registers

This function is for skilled users who has full knowledge of the function of different registers.
Use when you want to read and write values direct in servo registers. Use only for special functions.

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2.1.6 Access level

File	Access level
	Login Logout User list

The program has 2 different access levels. The access level 3 is the highest with the right to modify everything. In the user list you can add new users with an access level.

In the user list you also select a default access level. This is the access level the program has when you start it. If you select access level 3 as default access level, the user doesn't need to login since the user automatically has the right to do everything.

The default user - Administrator, with the access level 3, has the password ATLASQCM.

2.3.5 Toolbar

Following functions are in the toolbar: **New, open, save, print, Select current servo, on-line/offline** and **Log.**

Select current servo is a pop-down menu with following selections: Servo 1, servo 2, ..., servo 40.

On-line/offline has the text on-line. In on-line the button looked pressed and above the text three dots shows up and disappear.
A parameter change in On-line mode is written directly to the spindle and it can be seen that the three dots change colour during (normally from blue to red) the transmission time.

New, Open and **Save** are standard windows symbols.

Log will activate the saving of data to a file.

2.3.6 Language

The program will be available in English and later in other languages.

2.3.7 Help menus

Not fully implemented.

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3. Parameters

R = register
E = EEPROM register

Reg	Name	Dialogue	Access level	Only QCM -T
R131	Relay function		3	
R135	Hold function		3	
E37	PGAIN	Set-up - spindle param.	3	
E38	IGAIN	Set-up - spindle param.	3	
E39	DGAIN	Set-up - spindle param.	3	
E47	Nom.speed (rpm)	Set-up - spindle param.	3	
E35	Ramp time (ms)	Set-up - spindle param.	3	
E48	Current scale factor	Set-up - spindle param.	3	
E49	Gear	Set-up - spindle param.	3	
R198	torque unit	Set-up - torque unit	3	Y
R199	Torque scale factor	Set-up - torque reading	2	Y
R200	Filter constant (0,1,2,3)	Set-up - torque reading	3	Y
R201	Input gain (1,2,4,8,16)	Set-up - torque reading	3	Y
R202	Torque/current decimal (0,1)	Set-up - automatically	3	
R150	Step 1 - Mode	Program - tight. steps	2	
R151	Step 1 - Target Torque	Program - tight. steps	2	
R152	Step 1 - Speed	Program - tight. steps	2	
R153	Step 1 - Target Angle	Program - tight. steps	2	
R154	Step 1 - Delay Time	Program - tight. steps	2	
R155	Step 1 - Max. Time	Program - tight. steps	2	
.....				
R192	Step 8 - Mode	Program - tight. steps	2	
R193	Step 8 - Target Torque	Program - tight. steps	2	
R194	Step 8 - Speed	Program - tight. steps	2	
R195	Step 8 - Target Angle	Program - tight. steps	2	
R196	Step 8 - Delay Time	Program - tight. steps	2	
R197	Step 8 - Max. Time	Program - tight. steps	2	
R204	Step 9 - Mode	Program - tight. steps	2	
R205	Step 9 - Target Torque	Program - tight. steps	2	
R206	Step 9 - Speed	Program - tight. steps	2	
R207	Step 9 - Target Angle	Program - tight. steps	2	
R208	Step 9 - Delay Time	Program - tight. steps	2	
R209	Step 9 - Max. Time	Program - tight. steps	2	

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.....				
R246	Step 16 - Mode	Program - tight. steps	2	
R247	Step 16 - Target Torque	Program - tight. steps	2	
R248	Step 16 - Speed	Program - tight. steps	2	
R249	Step 16 - Target Angle	Program - tight. steps	2	
R250	Step 16 - Delay Time	Program - tight. steps	2	
R251	Step 16 - Max. Time	Program - tight. steps	2	
R64	Step 1 - Max. Torque	Program - tight. steps	2	
.....	.....	.....	.....	
R79	Step 16 - Max. Torque	Program - tight. steps	2	
R80	Step 1 - Min. Torque	Program - tight. steps	2	
.....	.....	.....	.....	
R95	Step 16 - Min. Torque	Program - tight. steps	2	
R96	Step 1 - Max. Angle	Program - tight. steps	2	
.....	.....	.....	.....	
R111	Step 16 - Max. Angle	Program - tight. steps	2	
R112	Step 1 - Min. Angle	Program - tight. steps	2	
.....				
R127	Step 16 - Min. Angle	Program - tight. steps	2	
R46	Torque value	Results	1	
R48	Angle value	Results	1	
R50	Status (.....)	Results	1	

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The parameter registers are connected to the tightening set window as follows:

Step 1

Mode	Mode R150	Torque Max	Torque Target	Torque Min	Time	Angle Max	Angle Target	Angle Min	Speed
Delay End	0	R64		R80	R154	R96		R112	
Torque End	1	R64	R151	R80	R155	R96		R112	R152
Angle End	2	R64		R80	R155	R96	R153	R112	R152
Jog End	3	R64		R80	R155	R96		R112	R152
Delay	4	R64		R80	R154	R96		R112	
Torque	5	R64	R151	R80	R155	R96		R112	R152
Angle	6	R64		R80	R155	R96	R153	R112	R152
Dynatork	7	R64	R151	R80	R155	R96		R112	R152

Step 2

Mode	Mode R156	Torque Max	Torque Target	Torque Min	Time	Angle Max	Angle Target	Angle Min	Speed
Delay End	0	R65		R81	R160	R97		R113	
Torque End	1	R65	R157	R81	R161	R97		R113	R158
Angle End	2	R65		R81	R161	R97	R159	R113	R158
Jog End	3	R65		R81	R161	R97		R113	R158
Delay	4	R65		R81	R160	R97		R113	
Torque	5	R65	R157	R81	R161	R97		R113	R158
Angle	6	R65		R81	R161	R97	R159	R113	R158
Dynatork	7	R65	R157	R81	R161	R97		R113	R158

Step 3.....See table above.

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R135 Hold function 256 = Position hold function
0 = without position hold function

R131 Relay function. 0 = Overvoltage shutoff, 8 = OK, 32 = controller OK
R198 Torque unit. 1 = Nm, 2 = ft. lb
R200 Filter constant. can be set to 0,1,2 or 3. 0 means no filter
R201 Input gain . can be set to 1,2, 4, 8 or 16.
R202 Decimal 0 = no decimal; 1= one decimal
E35 Ramptime default 300 ms to 100% speed

Default values:

Spindle QMR	PGAIN E37	IGAIN E38	DGAIN E39	Nom. sp E47	C scale E48 *2	Gear E49 *1	Max torque
42-16	700	100	135	7000	2.5	1600	27
42-25	700	100	135	7000	2.5	2577	44
55-15	900	100	150	6400	8.0	1574	90
55-24	900	100	150	6400	8.0	2425	135
62-32	900	100	150	6400	8.0	3208	190
62-46	900	100	150	6400	8.0	4654	275
90-30	1000	50	220	5000	23.0	3033	560
90-47	1000	50	220	5000	23.0	4779	880

*1 For spindles where the motor has opposite rotation direction from the socket holder(u-gear or 2-wheel offset), the values shall be multiplied with -1.
*2 If 0 < Max torque < 400 the values shall be multiplied with 100.
If 400 < Max torque < 4000 the values shall be multiplied with 10.

R199 Torque scale

Torque transducer	20 Nm	50 Nm	100 Nm	200 Nm	1000 Nm
Default value	200	500	1000	2000	1000

R150 - R197, R204 - R251, R64 – R127 Step parameters

Mode	Delay End	Torque End	Angle End	Jog End	Delay	Torque	Angle	Dyna tork
Value	0	1	2	3	4	5	6	7

Torque If 0 < Max torque < 400 in dNm.
If 400 < Max torque < 4000 in Nm.
If Max torque > 4000 in 1/10 Nm.
Speed in rpm. Negative if reverse direction
Angle in degrees
Delay time in 1/10 sec.
Maxtime in sec.

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