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Atlas Copco
Enhanced Mini Macs
Troubleshooting Guide

1: Basic System Layout

The *mini*MACS PC consists of three parts, the WinQCM-E Interface, the Station Controller and a MMS Interface.

WinQCM-E is the tool used to configure the servos, including the tightening programs used.
The Station Controller is responsible for the coordination of the individual servos in order to make them act as one unit. The station controller mainly handles start and stop of a cycle including reject management as well as communication with the Automation PC (APC)

The MMS interface is used by other, remote, applications in order to access cycle data from the *mini*MACS PC. The MMS interface is implemented as a separate application, which is interfaced to the WinQCM-E using a socket.

The following "Sequence of operations" are showing a couple of process situations with and without Reject Management active.

All examples are showing the I/O communication for one spindle in a multiple.

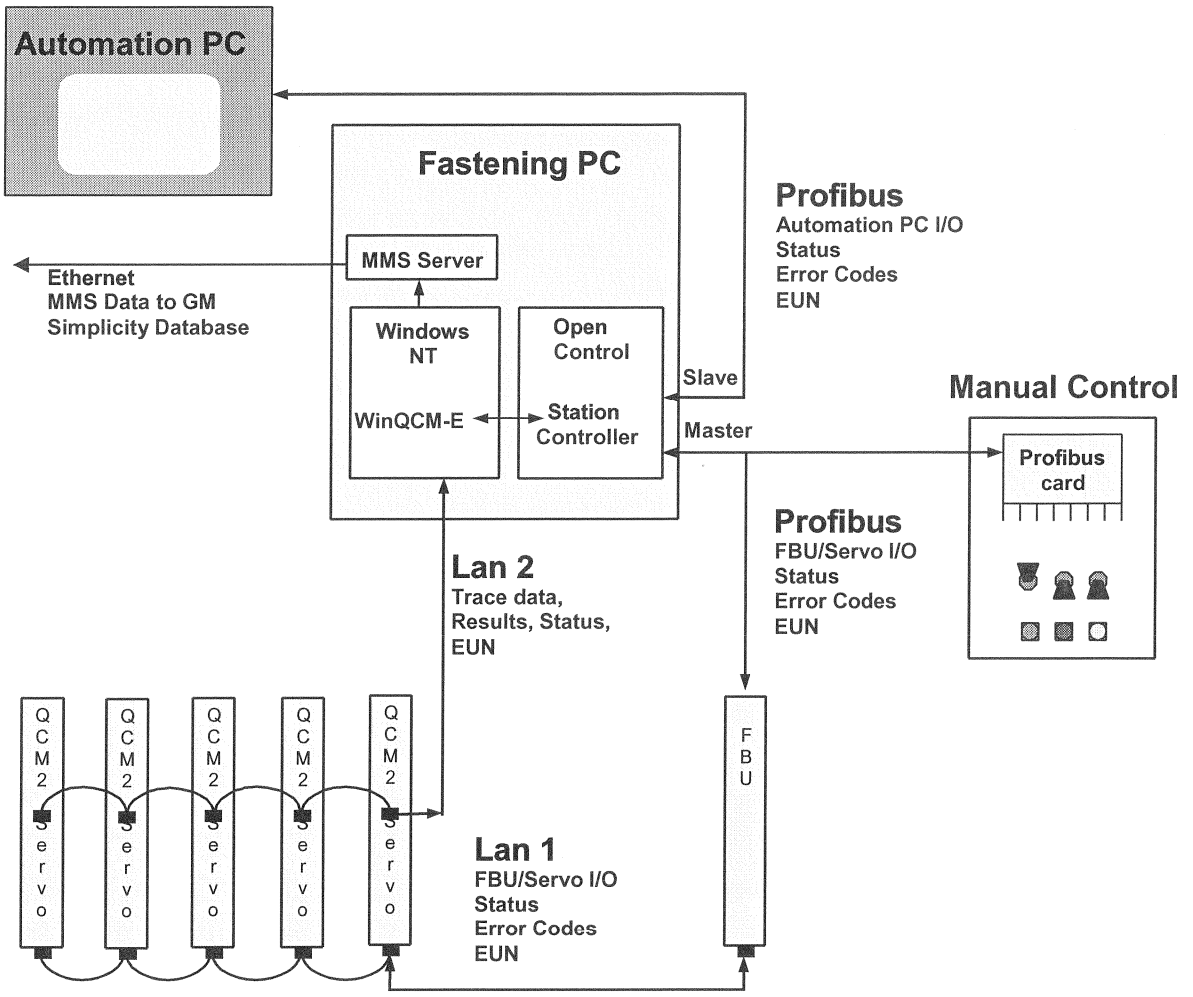
All charts are starting with the External (APC) conditions, such as "Engine in Station" and "Slide in Position"

Before Start, or at the same time, the following need to be set:
- EUN
- Select Parameter Set

Check the following conditions:
- Controller OK
- Parameter Set Echo

If start conditions above are OK, give:
- Start
- At start, the OK/NOK is still active from last cycle (normally OK is high)
- Running comes on to confirm that the system is in operation, and at that moment, the OK/NOK output goes low.
- In processes where Reject Management is used, the Parameter Set Echo bits will change status during a process. (Short interrupt in the Parameter Set Echo)
- As soon as all spindles are OK, the green Station OK turn ON.
- If one or more spindles are NOK, the station will be NOK

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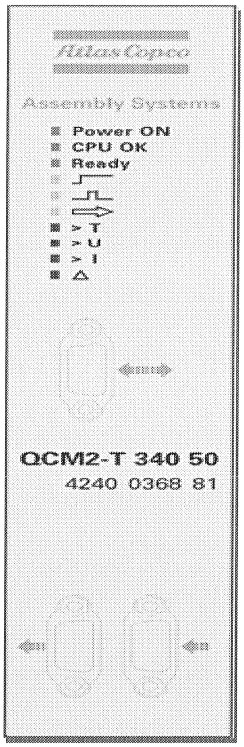


Sequence of Operation OK Cycle (Spindle without RM)

Type of I/O	I/O	Function	Time	Comments
APC		Station Ready (engine in station)		
APC		Slide position		
FPC-Sp	O	Controller OK/Ready		
FPC-Sp	I	Bypass Spindle		
FPC-Sp	O	Spindle Bypassed		
FPC-Sta	I	EUN		
FPC-Sta	I	Select Parameters		
FPC-Sta	O	Parameter Echo		
FPC-Sta	I	Start		
FPC-Sta	O	Running		
FPC-Sp	O	Cycle NOK		
FPC-Sp	O	Torque NOK		
FPC-Sp	O	Angle NOK		
FPC-Sta	I	Stop		
FPC-Sta		Station OK		
FPC-Sta		Station NOK		
FPC-Sta		RM back off started		
FPC-Sta		RM re-tightening started		
FPC-Sta		Station Diagnostic Bit 0		
FPC-Sta		Station Diagnostic Bit 1		
FPC-Sta		Station Diagnostic Bit 2		
FPC-Sta		Reset		
			Cycle End	

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Modules in Enhanced Mini MACS System: SERVO



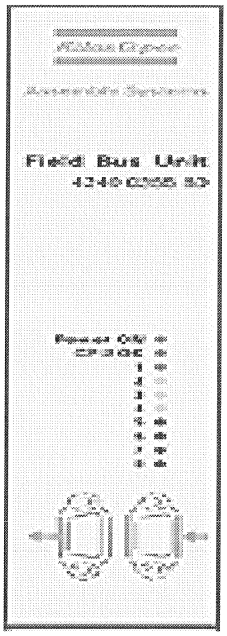
The QMC2 servo unit performs the actual tightening. During the execution of a tightening cycle they records tightening information, i.e. torque and angle data. This data is stored in internal memory and can be retrieved by the WinQCM-E application over the Lan2 bus.

LED	Signal Name	Color	Description
1	Ready	Green	Servo drive is ready to accept a start signal.
2	Running	Yellow	Servo drive is running a tightening set.
3	Selected	Yellow	Servo drive is selected for communication.
4	Current Limit	Yellow	Current limit exceeded in the servo drive unit.
5	Over temperature	Red	Over temperature in the motor or in the servo drive unit.
6	Resolver Fault	Red	A Resolver fault is detected.
7	Over current	Red	A short circuit is detected in the motor or the motor cables.
8	Other Faults	Red	A fault is detected, other then the three listed above.

On the QCM2-T (servo) the Error LED's also indicate transducer fault as: LED 6+7+8 = Calibration error, LED 5+6+7 = Zero offset error

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Field Bus Unit:FBU



The Field Bus Unit, or FBU, receives control data from the Station Controller over the Profibus interface. The FBU processes the control data and sends it to the servo drive units over the Lan1 bus. The status of the drive units is sent back the same way to the Station Controller. This communication chain is essential for the operation of the tightening system.

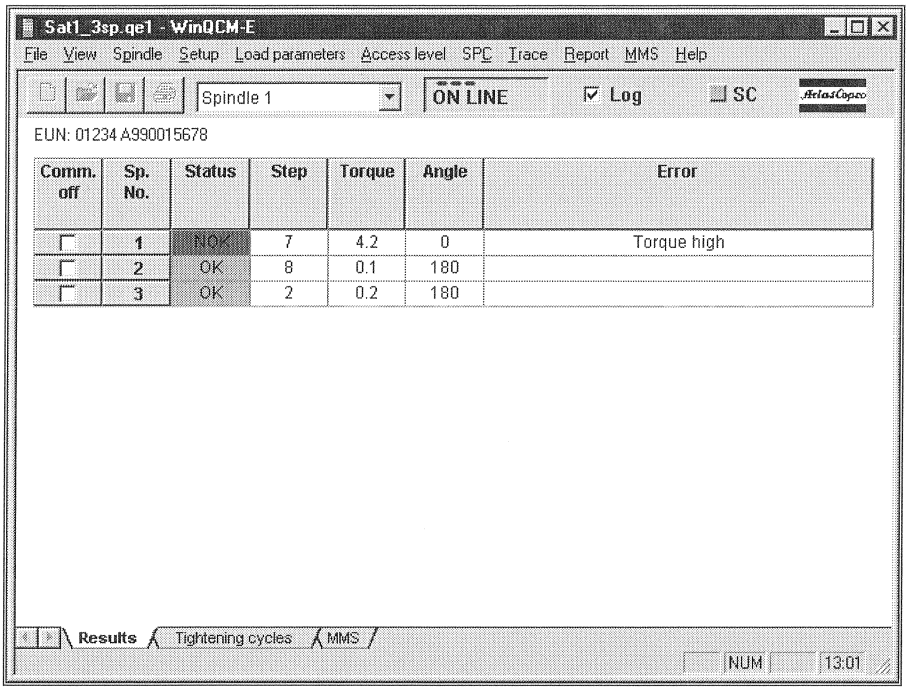
Led	FBU
Power On	
CPU OK	
1	
2	
3	
4	
5	Lan 1 Error FBU to Servo
6	Profibus ErrorComputer to FBU
7	
8	

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Fastening Errors:

The Results Window

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.



The results (step, 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.

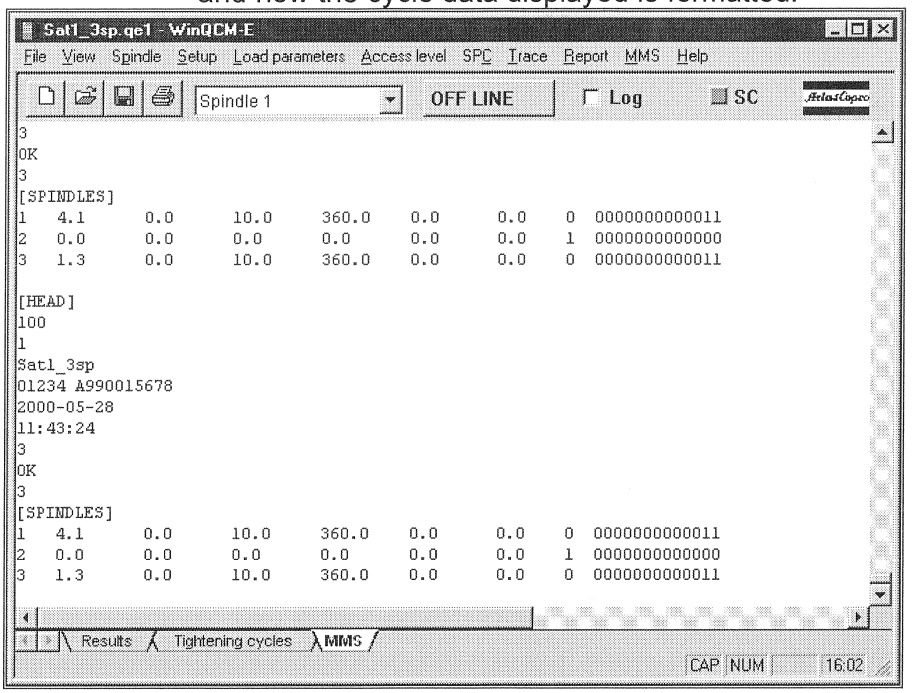
Table of Errors:

Error	Description
Timeout	Timeout exceeded
Minangle	Min angle not reached
Maxangle	Max angle exceeded
Mintorque	Min torque not reached
Maxtorque	Max torque exceeded
Mstop	Machine stopped
Calibration error	Torque measurement out of calibration (checked when starting a set)
Offset error	Torque measurement offset too big (checked when starting a set)
Overflow error	Too many Angle Pluses to Fast

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The MMS Window

Using the MMS window you can study the current status of the MMS queue. The MMS queue contains the result of the last cycles executed. The length of the queue is default 100 cycles but is configurable. See **Error! Reference source not found.** for a description of the MMS queue and how the cycle data displayed is formatted.



Possible Errors

<TimeOutExceeded>	::= 1 | 0	(1 indicates that the event occurred)
<MinAngleNotReached>	::= 1 | 0	(1 indicates that the event occurred)
<MaxAngleExceeded>	::= 1 | 0	(1 indicates that the event occurred)
<MinTorqueNotReached>	::= 1 | 0	(1 indicates that the event occurred)
<MaxTorqueExceeded>	::= 1 | 0	(1 indicates that the event occurred)
<MStopActivated>	::= 1 | 0	(1 indicates that the event occurred)
<SpindleError>	::= 1 | 0	(1 indicates that the event occurred)
<CalibrationError>	::= 1 | 0	(1 indicates that the event occurred)
<OffsetError>	::= 1 | 0	(1 indicates that the event occurred)
<OverFlowError>	::= 1 | 0	(1 indicates that the event occurred)
<DCBusLow>	::= 1 | 0	(1 indicates that the event occurred)
<FinalTorqueOK>	::= 1 | 0	(1 indicates that the event occurred)
<FinalAngleOk>	::= 1 | 0	(1 indicates that the event occurred)

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Problem	Possible Cause	Solution
Current Limit LED on Servo	Motor drew to much current for proper operation	Blink is normal function Wrong tool size installed. If angle step final torque required to reach target to great, rerun parts. Incorrect spindle setup.
Over Temperature LED on Servo	Motor to hot Servo to hot	Multiple hit on same part. Speed to slow causing motor to run under load to long. Bad motor, replace Bad Servo, replace Bad cable , replace
Resolver Fault LED on Servo	Servo connection to Resolver failed	Check connections at Servo and at Motor, if connections OK, replace servo, then motor if fault still present. Ground pigtail on cable connection poor.
Over Current LED on Servo	Motor drawing to much current	To much DynaTorque time. Bad Motor, replace. Bad Servo, replace Damaged cable, replace Incorrect motor installed. Incorrect motor selected in setup. Cross Thread causing motor to run to long.
Other Faults LED on Servo	Fault other that the above	Check other faults
LED #5 on FBU	FBU lost connection to Servo modules	Check connections across front of Servo modules, Verify 24vdc on last servo,

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LED #6 on FBU	FBU lost connection to Fastening Computer	Check Profi Buss connection at FBU and at Fastening PC, Verify that Open Controls is running on FPC.

Time Out	Spindle failed to reach target in allowed time in Step	Broken or missing Socket replace. Damaged spindle spring, socket not following, replace. Missing fastener Poor programming, to slow to get job done. Timers in Program set to close Target no achievable , check motor capability.

Min Angle	Spindle did not reach minimum amount of angle in Step	If Torque step Angle is not controlled, low angle result of Part. Shallow hole. Pre tightened part Missing gasket. Cross thread Rework part Verify Angle count from tool, Incorrect spindle installed or selected in setup

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Max Angle	Spindle rotated to far in Step	If Torque step Angle is not controlled, High angle result of Part. Cross thread fastener. Incorrect Bolt Debris in hole Oil or lube on threads Extra Gasket. Parts misaligned. Verify Angle count from tool, Incorrect spindle installed or selected in setup

Min Torque	Spindle failed to reach the minimum amount of torque in Step	If Angle step Torque is not controlled, Low torque result of Part. Torque restriction set to tight , current limiting torque output of tool. Incorrect motor installed. Incorrect Spindle in setup. Part yielding therefore torque not climbing. Bad motor, replace Bad servo , replace

Max Torque	Spindle exceeded Maximum Torque in Step	If Angle step Torque is not controlled, Low torque result of Part.

M Stop	Spindle stopped by Fastening Computer	E stop hit. Stop sent from automation. Spindle stopped due to reject on different spindle.

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Calibration Error	Transducer Calibration check failed at start of cycle	Loose cable connections, check at servo and tool. Ground pigtail on cable poor connection. Damaged transducer on tool, replace. Bad servo, replace
Offset Error	Transducer Offset check failed at start of cycle	Damaged transducer, replace. Loose cable Tool started on part.
Overflow Error	Transducer Signal lost	Loose cable. Bad servo, replace. Bad transducer, replace.
DC Bus Low	Bus voltage to Servo modules below minimum	E stop hit. 340vdc to servos lost, check fuses. Bad QMM powersupply in servo, replace Master servo. Bad servo, replace

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