Electric Controlled Pneumatic Torque Transducerized UAMC & UASMC Tools

Instruction Manual

Ver. 3.0

URYU SEISAKU, LTD.

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1. Overview of UAMC & UASMC Systems

1.1 Overview

The industrial fastening system is expected to be flexible in the multi-jobs as well as to provide the highly reliable fastening on a single job more than before in order to meet a variety of requests. URYU SEISAKU LTD. (hereunder called URYU) has come to develop the high-performance UEC-4800(SD) controller that is hooked up to the UAMC and UASMC tools with the built-in auto-relief developed for further accuracy. UEC-4800(SD) controls the increasing dynamic torque in a fastening process and judges a fastening status based on its pre-determined comparator. It provides you with the torque readings on its display. It can detect the fastening errors including initial torque spike, overly long cycle time, and missing fasteners. Plus, its inherent self-diagnosis can check the ZERO/CAL error and circuit. You may interface easily with the controller via the touch panel for UEC-4800TP(SD), the LCD screen for UEC-4800(SD), and PC setup software.

1.2 Features of UAMC

Auto-Relief Mechanism

When you fasten bolt with oil-pulse tool, the inner pressure of pulse unit increases in each pulse. The inner pressure is proportionate to fastening torque, so the ideal shape of fastening is to increase the number of blows as much as possible at the starting point of fastening and to make the inner pressure higher at the completion point of fastening to reach the target torque.

Inhibited Torque Spike

As auto-relief is fully opened when the bolt has seated, torque spike is inhibited.

Speed-up of Fastening

As auto-relief is fully opened other than pulsing, resistance pulse which is 180-degree opposite direction from pulsing is getting smaller as well as oil-flow resistance when pulsing/other than pulsing. Because of this, the number of blows is getting larger during the same time.

Improvement of Torque Accuracy

By reaching the stability range earlier, the range which has small variations can be used, and thus, the torque accuracy will be stable.

Improvement of Durability

As resistance pulse and oil-flow resistance is getting smaller, the heat generation of pulse unit can be inhibited. As a result, the oil degradation becomes slow, and the durability will be improved. As surge pressure generated when seating is absorbed by auto relief, rapid oil pressure to sealing part of anvil can be reduced and the durability (oil leaking etc.) can be improved.

Easy to adjust

As Relief position is automatically optimized, default setting for tool becomes easier and you will be free from relief adjustment when you exchange a tool.

Conventional Relief Valve Available

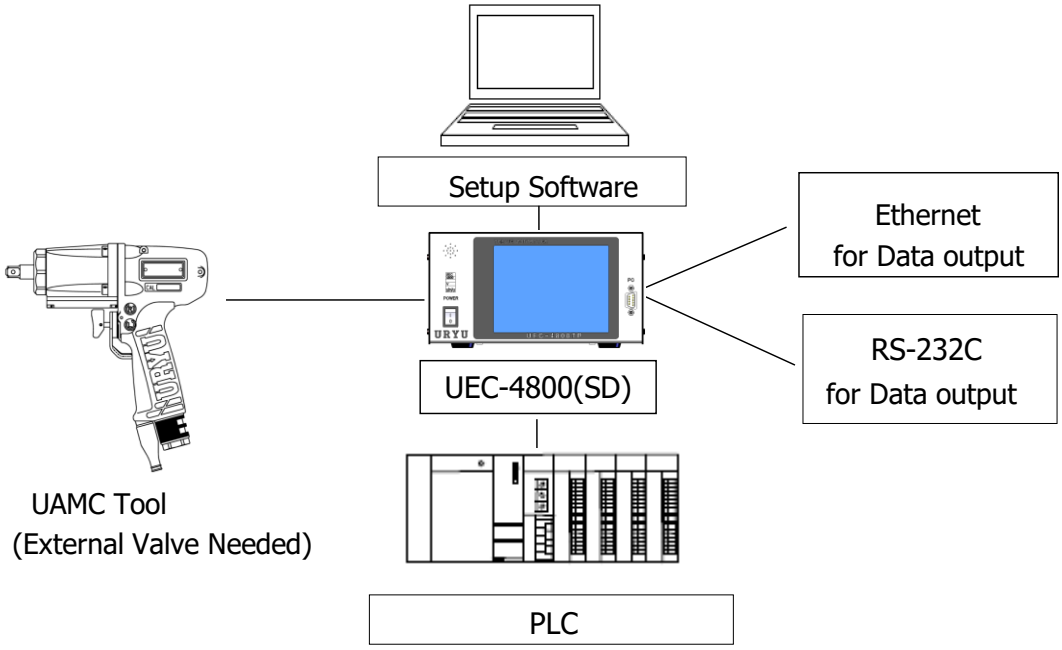
Also, in addition to auto relief, conventional relief valve, which controls the maximum oil pressure generated has been installed, allows you to achieve more optimal fastening.

Triple-Chamber Motor

For the key models of UA40MC, UA50MC, and UA60MC, we have adopted Triple-Chamber Motor (Medium Speed & High Output Power) that achieves lowering the rotation speed maintaining the output equal with existing Dual-Chamber Motor to control the torque spike by the inertia generated along with the rotation speed of the motor.

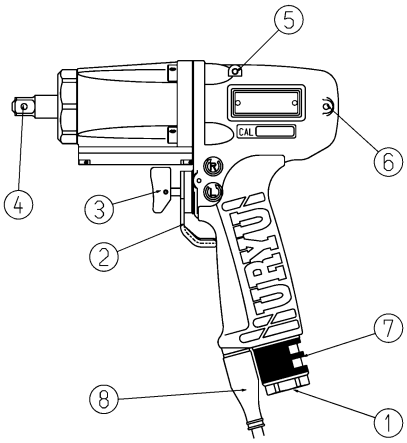
1.3 Overview of System

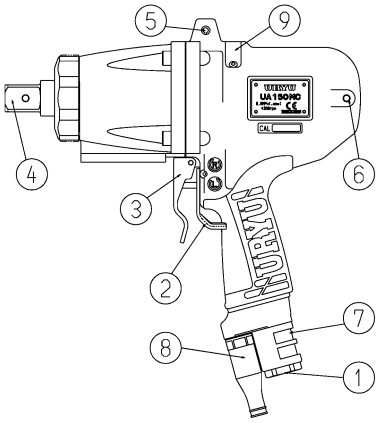
This system is composed of UAMC and UEC-4800(SD). The PC setup software comes standard with UEC-4800. Plus, it has the Ethernet capability.



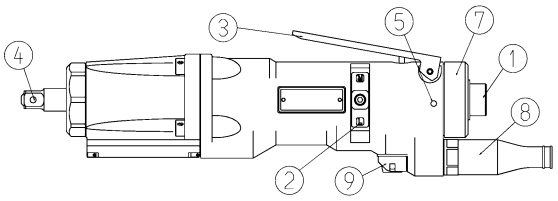
2. Hardware Features

○Pistol Type





○Straight Type



① Air Inlet Bushing : Port for Air Hose

② Reverse Lever : Running Rotation Change (R for CW, L for CCW)

③ Valve Lever : Trigger
(Pistol Type only: 2-step speed (slow / high))

④ Sensor Spindle : Fix a socket using pin and O-ring for Square Drive Type only

⑤ ⑥Suspension Ring : Hang the tool to the device including balancer

⑦ Exhaust Stack : Air exhaust
(Directional air exhaust available with Pistol Type)

⑧ Joint Cable : Cable to connect the tool and controller. The wires for power and sensor are included in this cable.

⑨ LED Indicator : Green for OK and Red for NOK
For pistol type, LED indicator is available with UA150MC only.

3. Specifications

Note that the below torque values are for guidance purpose only. Please choose the best tool as per the actual application. Note that "D" that comes with model number as suffix has a quick-change driver anvil.

	Model Number	Nominal Bolt Capacity	Torque Range (N·m) Air Pressure (MPa)			Free Speed (rpm) Air Pressure (MPa)		
			0.4	0.5	0.6	0.4	0.5	0.6
Pistol Type	UA40DMC	M6	3.5 - 7.5	4.5 - 9.5	5.0 - 12	3000	3300	3600
	UA40MC		4.0 - 9.0	5.0 - 11	7.0 - 13			
	UA50DMC	M6 - M8	7.0 - 15	8.0 - 18	9.0 - 23	3800	4100	4200
	UA50MC		8.0 - 18	9.0 - 20	11 - 25			
	UA60MC	M8	14 - 26	16 - 30	18 - 38	4700	4900	5000
	UA70MC	M8 - M10	20 - 35	25 - 40	30 - 50	5000	5300	5700
	UA80MC	M10 - M12	30 - 45	35 - 50	40 - 60	5300	5600	6000
	UA90MC	M10 - M12	30 - 55	35 - 65	40 - 80	5300	5600	6000
	UA100MC	M12	40 - 70	45 - 75	50 - 90	4600	4900	5200
	UA130MC	M14	65 - 95	70 - 130	85 - 150	3800	4000	4500
	UA150MC	M16	120 - 180	140 - 200	150 - 220	4000	4100	4300
Straight Type	UA40SDMC	M6	3.5 - 7.5	4.5 - 9.5	5.0 - 12	3000	3300	3600
	UA40SMC		4.0 - 9.0	5.0 - 11	7.0 - 13			
	UA50SDMC	M6 - M8	7.0 - 15	8.0 - 18	9.0 - 23	4500	4700	5000
	UA50SMC		8.0 - 18	9.0 - 20	11 - 25			
	UA60SDMC	M8	12 - 24	14 - 27	16 - 34	4000	4200	4400
	UA60SMC		14 - 26	16 - 30	18 - 38			
	UA70SMC	M8 - M10	20 - 35	25 - 40	30 - 50	5000	5300	5700

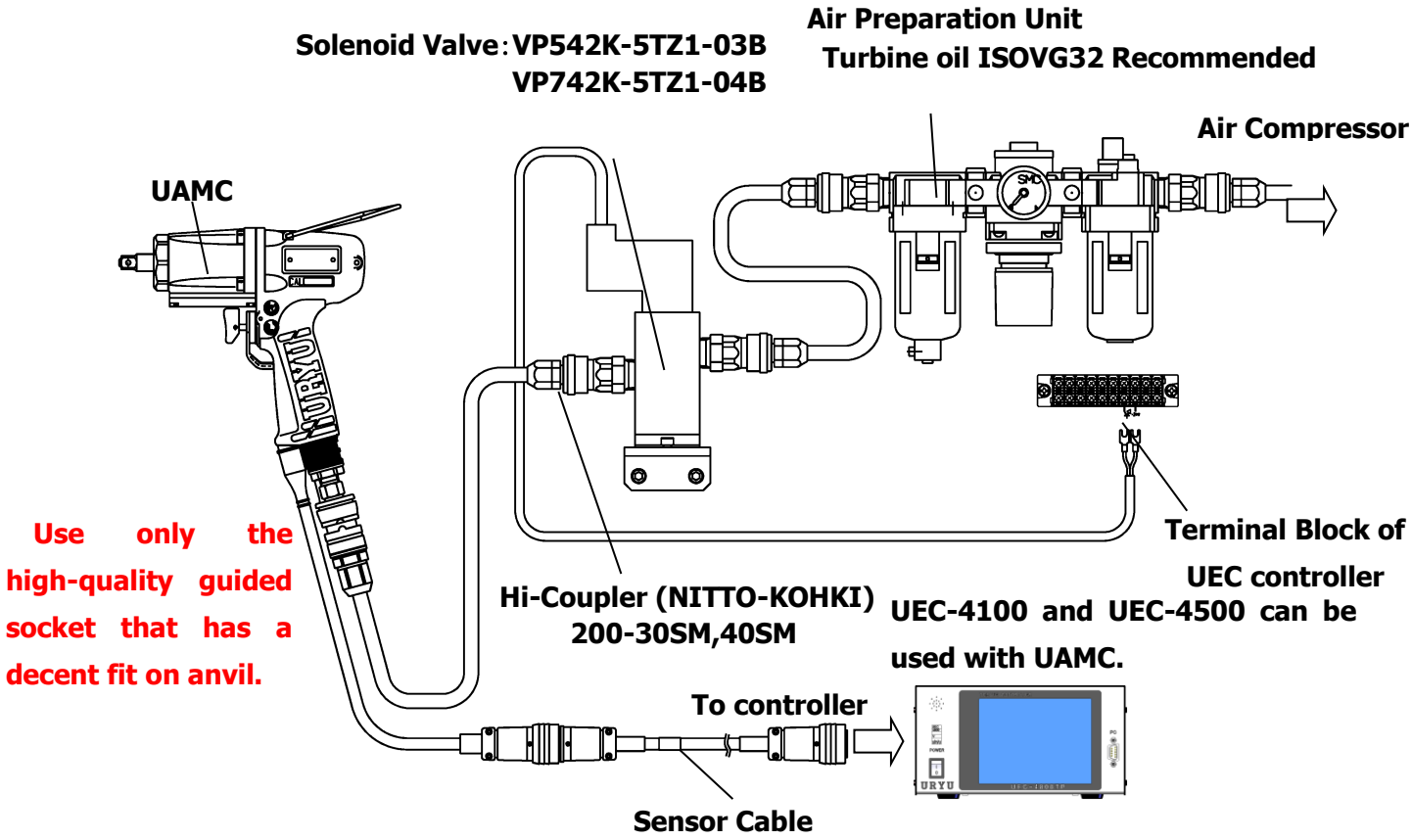
	Model Number	Sq. Drive or Hex. Size (mm)	Overall Length (mm) Note 1	Weight (kg) Note 1	Air Consumption under load (m3 /min)	Air Inlet Size	Hose ID (mm)	Sensor CAL Value	Noise Level (dB(A))	Vibration Total Value (3-axes) ($m/s^{2)}$
Pistol Type	UA40DMC	6.35Hex	170	1.10	0.20	NPT 1/4"	6.5	200	78	< 2.5
	UA40MC	9.5sq								
	UA50DMC	6.35Hex			0.25			400		
	UA50MC	9.5sq								
	UA60MC		175	1.14	0.40		8.0		80	
	UA70MC		187	1.24	0.45			600		
	UA80MC		195	1.55	0.48					
	UA90MC	12.7sq	203	1.70	0.53			800	82	
	UA100MC		215	2.05	0.55			1200		
	UA130MC		233	2.80	0.73		11	1500		
	UA150MC	19sq	251	4.0	0.7			3000	83	2.7
Straight Type	UA40SDMC	6.35Hex	246	1.22	0.2	NPT 1/4"	6.5	200	78	2.7
	UA40SMC	9.5sq								< 2.5
	UA50SDMC	6.35Hex		1.23	0.25			400		3.1
	UA50SMC	9.5sq								2.7
	UA60SDMC	6.35Hex	252	1.30	0.40		8		80	3.5
	UA60SMC	9.5sq								3.1
	UA70SMC		265	1.39	0.45			600		3.3

Note 1: Neither socket nor bit is fitted to the tool

Note 2: Noise level as per ISO15744

Note 3: Vibration total value as per ISO28927-2

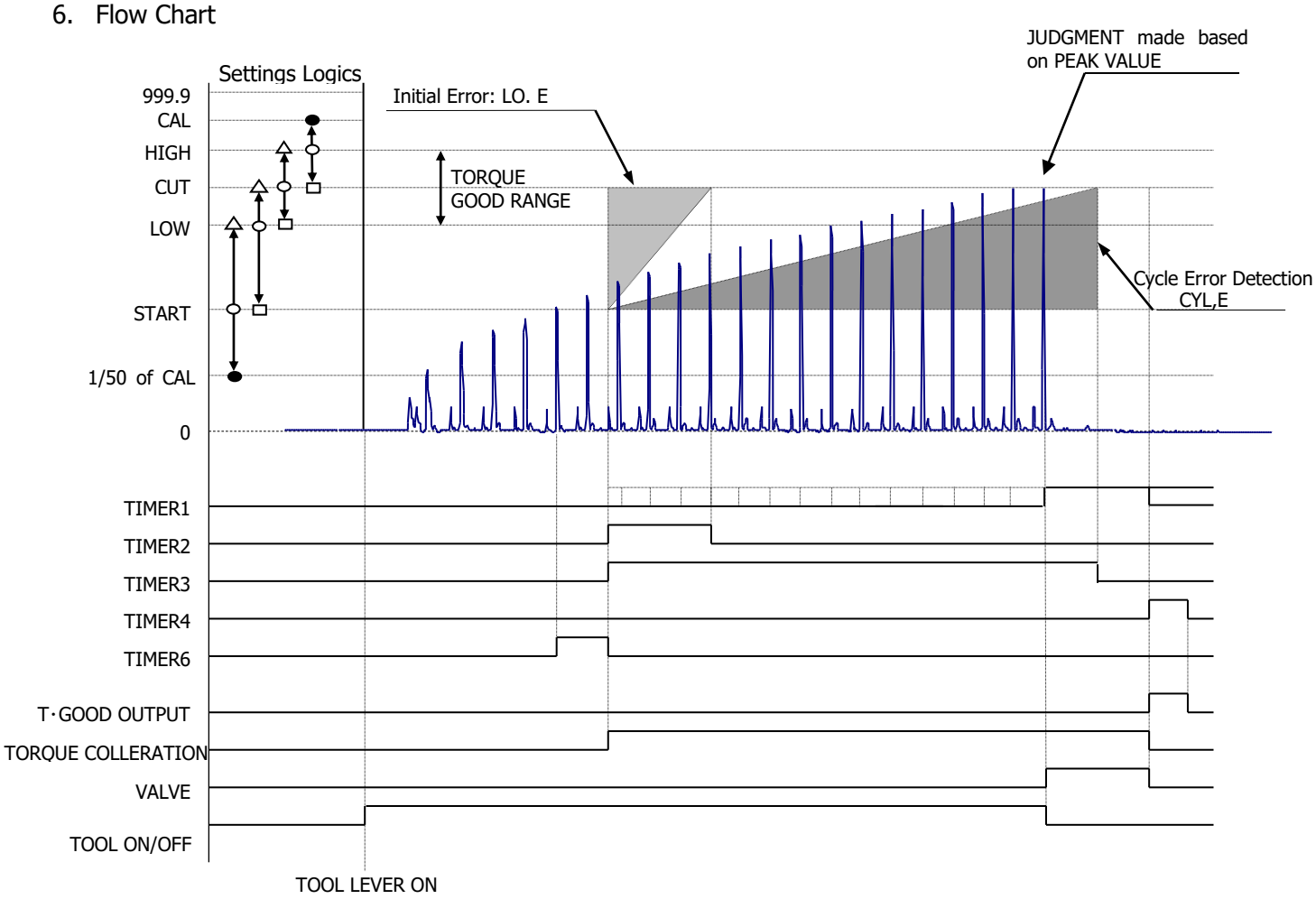
4. System Layout



5. How-to-use

1. Pull the trigger to run the tool. Make the best use of the trigger that provides you with a speed change control from slow to full rotation, when you run the pistol type of UAMC.
2. The tool gets loaded after the fastener is seated. As the dynamic torque starts increasing, the built-in torque sensor starts sending the torque signal to the controller.
3. The torque signal exceeds the preset START level set into the controller. Then, the controller's control function and judgment get activated and the controller starts measuring the dynamic torque.
4. The dynamic torque keeps increasing and it reaches the preset CUT level. Then, the controller sends the external valve of UAMC the signal to stop operation. The tool shuts off upon receipt of the signal.
5. The controller holds the peak torque value measured and displays it on its DPM as torque.

6. Flow Chart



SETTING: ○: Values shown in the left、□: 1 added values shown in ○. ●: Same value as the one shown in ○, △: 1 deducted values shown in ○

Basic Settings

- HIGH: TORQUE HIGH Limit
- CUT: TORQUE CUT Value
- LOW: TORQUE LOW Limit
- START: Judgment Wake-up Point
- CAL: CAL Value of Transducer

Timer Settings

- TIMER 1: Judgment Delay Timer
- TIMER 2: Initial Torque Spike Detection Timer
- TIMER 3: Cycle Error Detection Timer
- TIMER 4: Torque Good Output Timer
- TIMER 6: Torque Measuring Delay Timer

- VALVE: Time Between START and Valve Cut Signal

Note: Timer 1 gets started after the 1st pulse exceeds the preset START level. When the 2nd pulse does not exceed before the time 1 elapses, a judgment is made against the first pulse.

7. Tool Setup

Make the controller settings. See further info from the manual of controller.
○Basic Settings
・Input the CAL value on tool.
・START value: 20 - 30 % of CAL value
・The next formula should be adhered to: High Torque> CUT torque > Low Torque
○MODE Settings
Make it 3 to operate the pneumatic torque transducerized UAMC.

①

Is the residual torque close to the target torque?
NO → Re-adjust the CUT value so that the residual torque can be close to the target torque.

YES

※1 Pulse number > 5? (Check on the torque wave.)
NO → Check the followings in this order.
1. Proper size of air hose used.
2. Decrease the air pressure within capacity.
☆Adjust Relief Valve.
3. Select the one-size smaller tool.

YES

※2 Tightening Time < 1.5 seconds?
NO → Check the followings in this order.
1. Proper size of air hose used.
2. Increase the air pressure within capacity.
☆Adjust Relief Valve.
3. Select the one-size larger tool.

YES

Keep pulsing after UAMC reaches CUT Torque?
YES → Place Solenoid Valve as close to UAMC as possible (within 5 meters recommended). Use a coupler with great capacity to minimize the negative influence over the accuracy.

NO

CUT Torque = Residual Torque?
NO → Use this formula to calculate the new proof-ratio (PR) value, based on several simulations.

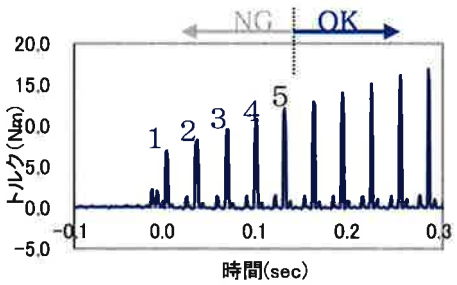
$$\text{New PR value} = \frac{\text{Audit Value}}{\text{Controller Value}} \times \text{old PR value}$$

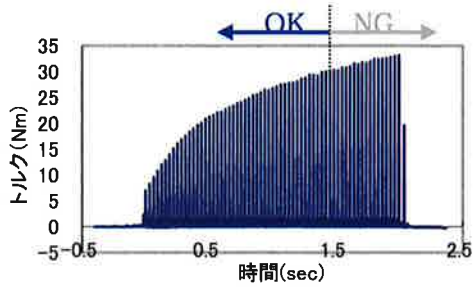
YES

Is the accuracy acceptable?
NG → ・Verify that application and socket should be good for UAMC. → ①

OK → You are ready to run the tool.

※ 1. Pulse number > 5? Check on the torque wave. ※ 2. Does the controller read 1.5 seconds or less?





☆ Note that the built-in Auto Relief helps you tighten a fastener accurately. If you happen to find UAMC achieving accuracy, the adjustment of Relief Valve is likely to help you out.

8. Special Technique

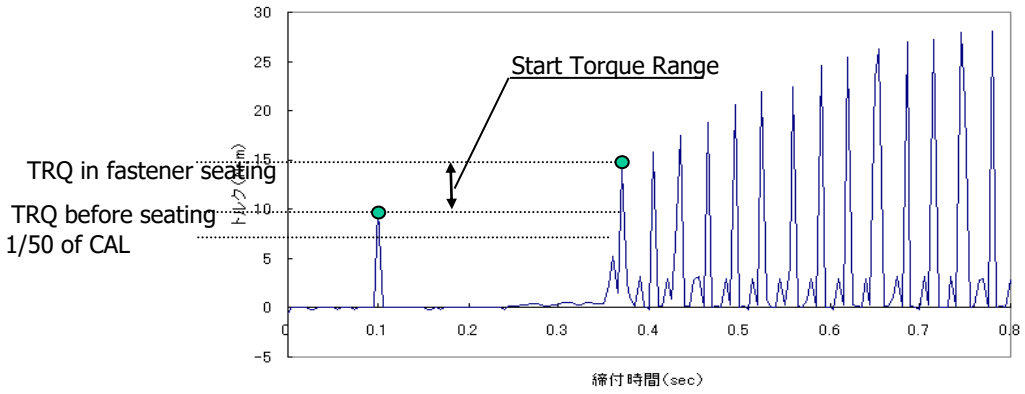
You may have difficulty finding a best tightening strategy for your applications. The improper controller settings will lead to the poor durability and accuracy of UAMC. UAMC provides you with the solutions to the various working conditions, as shown below.

8.1 Tool Selection

Refer to the specifications in page 4. The tool performance is likely affected by the application. Adjust the tool before putting it in a line to verify that it meets the specifications.

8.2 Start Torque Adjustment

You may see spike in torque when a fastener is seated. The UEC setup software will help you make sure that the torque spike will reach the start torque. If that is the case, fine-adjust the start torque so that the controller will not be influenced by torque spike.

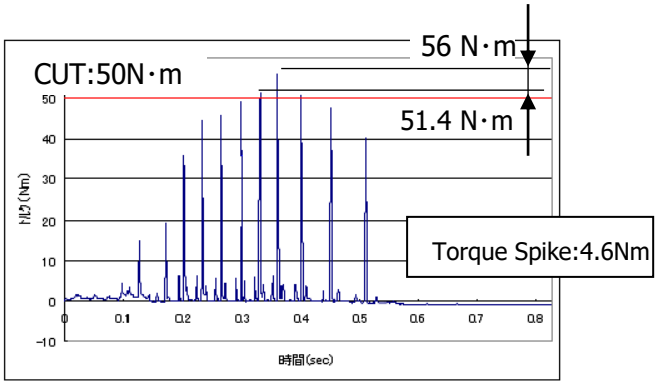


8.3. Initial Torque & Torque High Errors

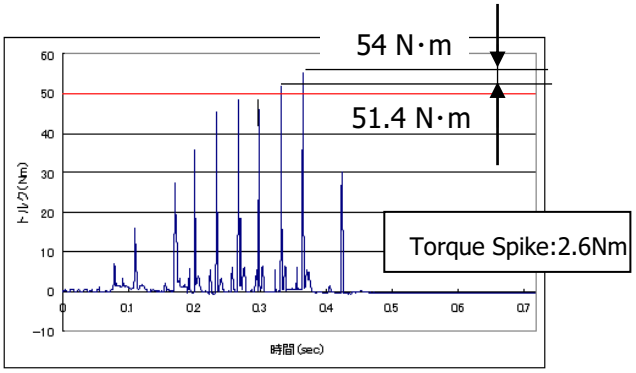
The residual pressure treatment and / or lower air pressure will help you tighten a fastener with good accuracy if you acknowledge dynamic torque / controller value is larger than cut / target torque greatly.

8.3.1 Residual Pressure Treatment

The residual air pressure may cause the tools with external valve like UAMC to keep pulsing after the external valve is closed. The usage of coupler with great capacity helps cancel the influence over the torque accuracy to a great extent. Refer to the "4. System Layout" on page 5.



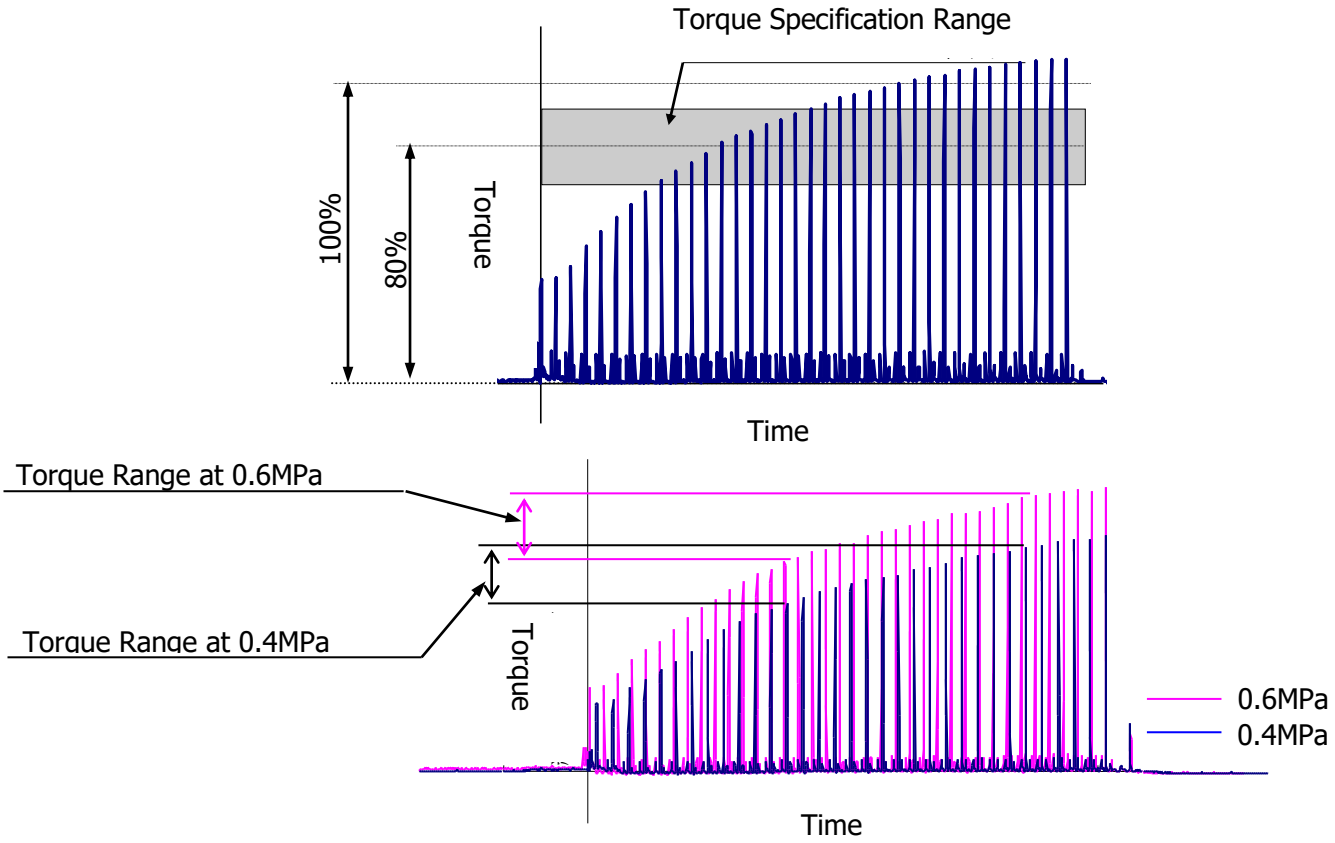
◎ Before Treatment



◎ After Treatment

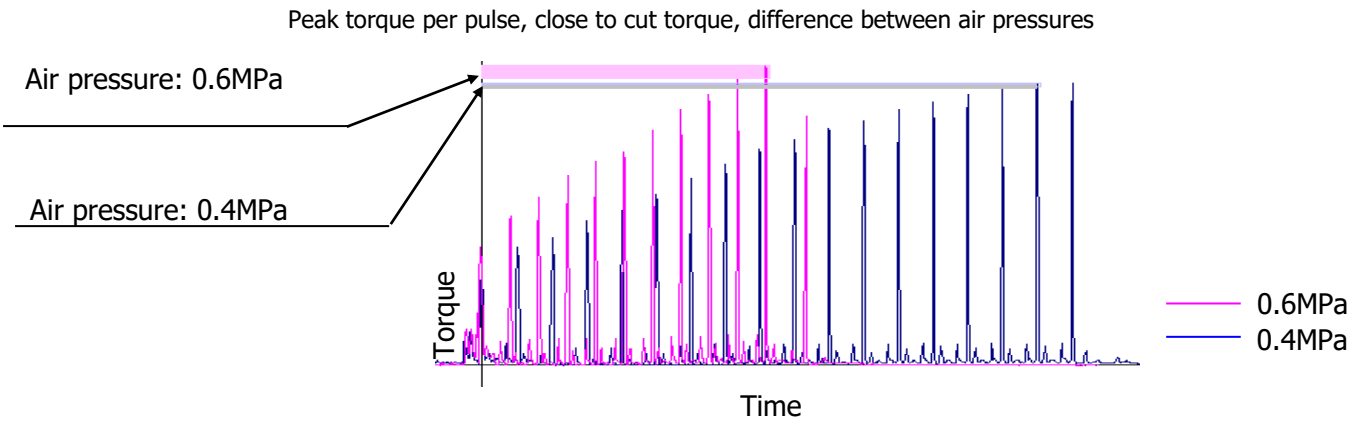
8.3.2. Air Pressure Adjustment

The air pressure level applied to tool will determine the maximum torque output level. As shown in the below graph, there is a liner increase in the torque output at each air pressure level and the torque wave will be flat as time passes. If you adjust the air pressure and achieve the target torque at which the torque curve starts getting flat (about 80% of the rated torque), you will have less torque spikes and better torque accuracy.



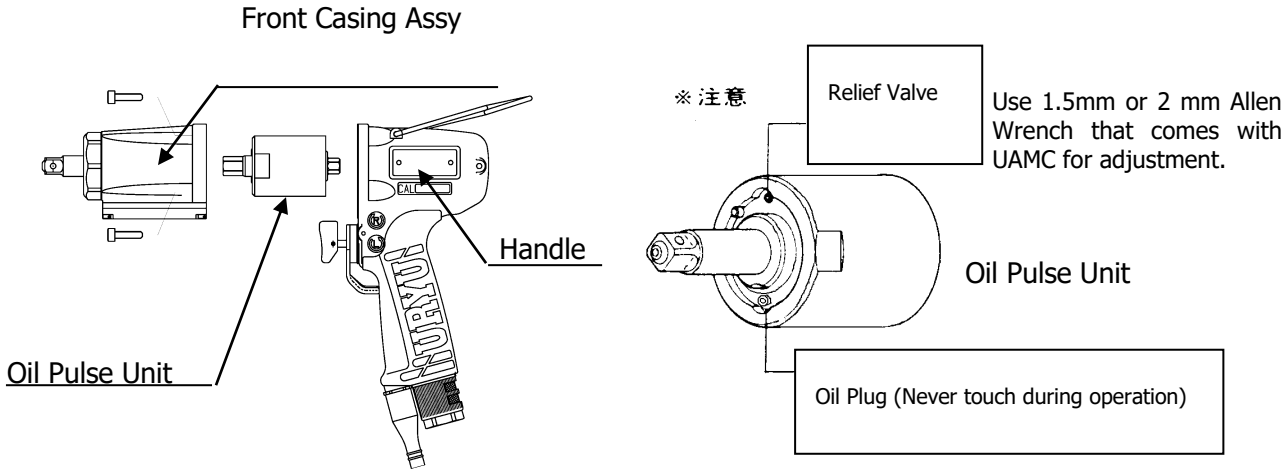
Note that the recommended torque range of UAMC is 0.4 – 0.6 MPa. Please adjust the air pressure to UAMC during the recommended torque range.

If there is a sharp increase in dynamic torque per pulse close to cut torque, you will see overtorquing / torque high error frequently. The decent adjustment of air pressure will allow dynamic torque to make a liner increase per pulse, which will lead to the better accuracy.



8.4 Relief Valve Adjustment

The Auto Relief Valve of UAMC helps you achieve the good and accurate tightening. If you happen to find some difficult applications even with Auto Relief Valve features, the adjustment of Relief Valve will be most likely to help you tighten a fastener with accuracy. Make sure to power off the UEC controller before adjustment of Relief Valve. As shown below, loose out 4 Allen Head Bolts and detach the Front Casing from the Handle with the Anvil down. Note: Be most careful to detach the Front Casing from the Handle since the cable runs from Handle to Front Casing. Otherwise, the connector and / or cable is broken.



Enlarged Pictures of Connector between Handle and Front Casing

Remove the Oil Pulse Unit from the Handle and adjust the Relief Valve Spindle with the Allen Wrench. Turn it in a CW direction to increase torque and in a CCW direction to decrease. Note that you will be unable to increase torque since the Relief Valve is set at / close MAX. Turn it CCW first when you start adjustment. If you turn it to the end, slightly turn it back CCW for the optimal torque output. Never turn it CW too hard.

8.5 Correlating the Controller Value to Master Transducer Value

It is not always the case that the torque measured by master transducer is identical to the one shown on the UEC-4800 display. Use the following formula to calculate the new proof-ratio value and input it into the controller.

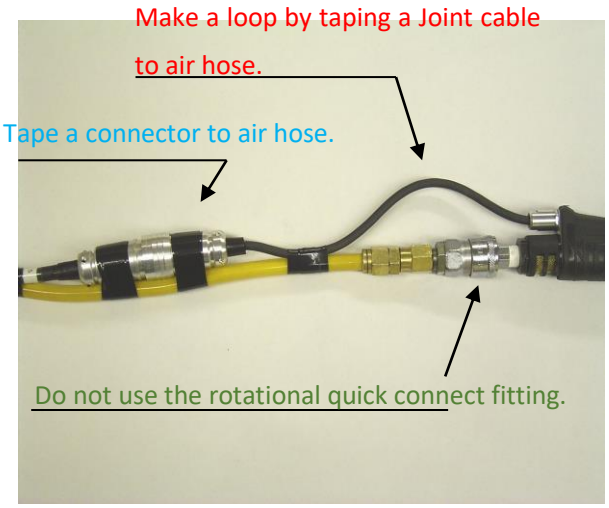
$$New\ \ Proof\text{-}ratio\ \ Value = \frac{AverageAuditValue}{AverageDisplayValue} \times Old\ \ Proof\text{-}ratio\ \ Value$$

8.6 Connector Clamping

When you connect the hose and cable to tool, do not apply any stress to the sensor cable or may cause broken wire. Be sure to follow the instruction below before use.

1) Mount the sensor cable on the air hose, as shown right so that any stress goes to air hose.

2) Do not use swivel fitting. The anti-rotational quick connect fitting, as shown below, to prevent air hose and cable from twisting comes standard with the UAMC tool.



9. Maintenance

9.1 Consideration for Usage

1. Put a few drops of lubrication oil in tool once a day. Mobile turbine oil # 32 is recommended.
2. Place the regulator in the air line system and keep the air pressure level at 0.4 – 0.6 MPa for better accuracy.
3. Use only the air hose with inside diameter specified Uryu.
4. Never either drop or give an impact to the tool. There is an amplifier board at the bottom of Front Casing with MC tools. Be careful to handle the tools when you put a tool in tool holder during operation.
5. The controller is likely to be affected by an electrical interference from servo motor or electric valve that is close to it. It is recommended that any anti-noise protection device including surge killer be equipped to the peripheral devices. Also, ground the controller using the FG terminal on the back panel for anti-noise protection.
6. The oil pulse tool may slip prior to operation under 5 degrees Celsius. Fix the anvil on vice and run the tool for some 10 seconds to warm it up.
7. The magnet-strictive sensor is built into the MC tool. Never place any magnet near the MC tool to avoid any magnetic field effect. Otherwise, the tool may malfunction.

9.2 Before Operation

Switch on the controller to start the inherent self-diagnosis. If it has been switched on, switch it off and switch it on again. After it is switched on, it starts the inherent self-diagnosis.

9.3 Preventative Maintenance

1. The regular preventative maintenance is highly recommended to avoid tightening error due to insufficient motor power and overly long cycle time.

2. Guideline for Maintenance Due Time

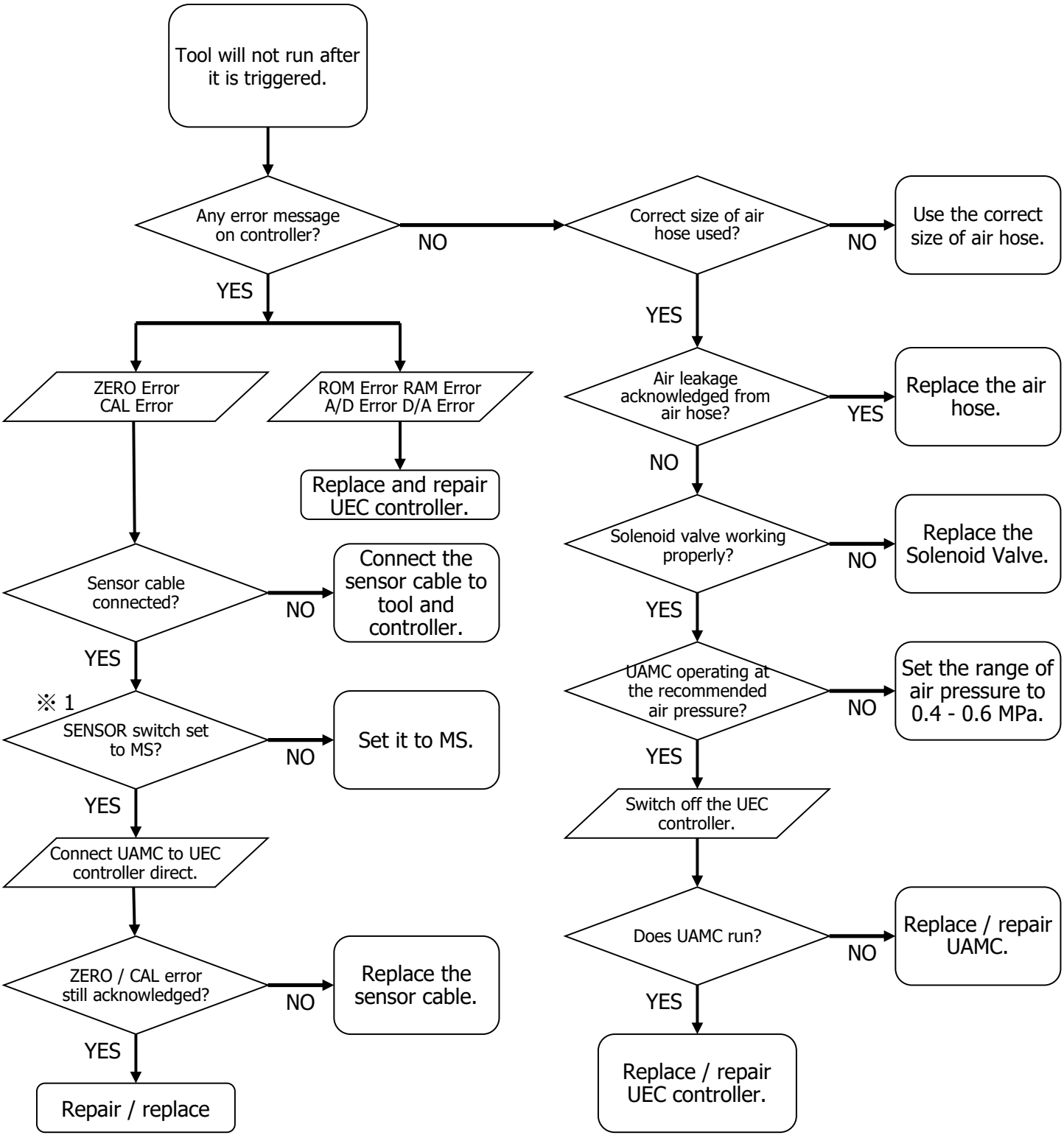
	Duration or Cycle Numbers	Check Points	Works
Oil Pulse Unit	Every three months or 100,000 cycles	Oil Quality and Amount	Oil Change / Re-filling
	Every six months or 200,000 cycles	Worn Parts including O-Ring, Spring, and Support Ring	Parts Change
Motor Unit	Every one year or 500,000 cycles	Worn Parts including Blade, Cylinder, Cylinder Plates, and Ball Bearings	Parts Change
Torque Sensor / Transducer	Every one year or 500,000 cycles	ZERO point / Hysteresis	User Unserviceable

10. Troubleshooting

Refer to the following chart when you experience any problem with the system.

10. 1 Tool will not operate after it is triggered.

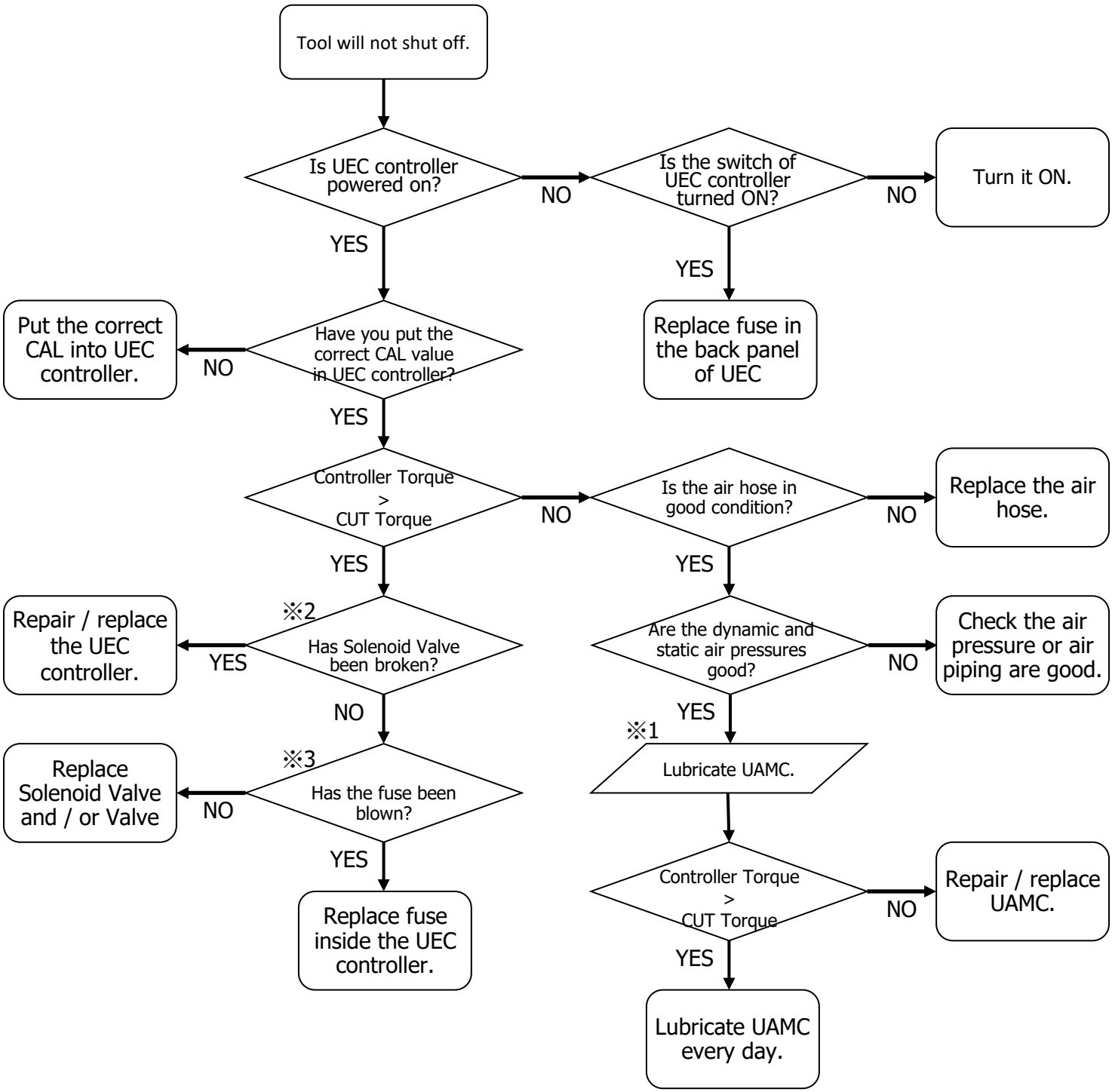
○Be sure to switch off UEC controller first. Then, be careful to attach / detach it to / from UAMC and mount the wires on the terminal block at the safe place.
○Refer to the manual of UEC controller when you operate it.



※1. The sensor switch is located on the back panel of UEC controller.

10. 2 Tool will not shut off after it is triggered.

Note that UAMC will behave differently, e.g. lengthened fastening time and more pulses, since the various changes like broken socket cause torque not to be transmitted to the applications correctly. The below chart will help you find if UAMC is broken. If you find that UAMC needs more time / pulses than it did originally, we request you to check that, together with UAMC, there is no change in application and accessories including socket.



※1 Supply light turbine oil properly through air inlet or line lubricant and run the tool.
Note that oil mist will come out of exhaust stack.
※2 Make sure that Solenoid Valve works with the INPUT/OUTPUT CHECK function.
※3 Check that the 24V fuse on the main PC board is ok. Make sure to power off the UEC controller before checking and replace the fuse as per the manual.

10.3 Error Message of UEC controller

Error	Countermeasure
ZERO error	・Be sure to set the select switch, [M.S] or [S.G], in UEC rear panel (refer to 4.2 Rear Panel 5)  ・Replace a tool and sensor cable. ・Get the sensor values to agree with the torque sensor connected. ・Check if the tool is running during the checking is being made.
CAL error	
Buffer Full error	・Check the communicating cable. ・Set the setting of WAVEFORM MEMORY FUNCTION SELECT to 4.
Valve Disconnection Error	・Check the wiring to the solenoid valve or replace the wiring/solenoid valve with new one. ・Do the countermeasure on the "Blown DC24V Fuse on the PC board error" below. ・Do not allocate #16.
Setting error	・Check and correct the mode settings parameters to see they are logically correct like the formula START<CUT.
Initial/Cycle error	・Check any possible double-fitting and/or cross thread fastener. ・Check the alignment of workpiece and bolt. ・Check start torque and cut torque values. ・Check the timers for initial torque spike/cycle incomplete error. *1 ・Check the pulse low/high limits. *1
Pulse number LOW/HIGH	
Fastening suspension error	・Check the tool performance and air pressure applied to tool. ・Check the judgement delay timer is long enough. ・Be sure not to release the trigger before the tool reaches the CUT level.
Start torque error	・Check the alignment of workpiece and bolt. ・Check the tool performance and air pressure applied to tool. ・Check the start torque and start torque error detect timer is correctly set.
Cycle over time error	・Check the tool performance and air pressure applied to the tool. ・Check the setting value of cycle over error detect timer is correctly set.
Warning count/pulse number error	・Recondition the tool like oil change and set the count/pulse number for the next maintenance due time.
Repair count/pulse number error	・Repair or replace a tool, and clear the repair count / pulse number.
Warning memory error	・Download and store the data in the UEC-4800 memory, and then clear the memorized data. ・Review the setting value of MEMORY DATA CONTENTS if this function is not needed.
ROM/RAM error	・Replace the UEC-4800.
A/D error	・Replace the tool or the UEC-4800.
Filter Error	・Replace the controller with new one or send the unit to Uryu for repair.
Sum check error	・If UEC works in order again by switching on or pressing RES, memory can be overwritten by noise. Set all the setting values again as the previous setting values are initialized when UEC is recovered by switching on or pressing RES.
Blown DC24V Fuse on the PC board	・Check the wiring and replace the fuse (model: MH10(1) code number: 909-814-0 maker: Daitoh tushinki). Make sure to switch off and disconnect the power cable from AC power receptacle when replacing the fuse.
Disconnection Error	・Check if the connector of sensor cable is firmly connected and locked.

	・Replace the tool/cable with new one.
Reverse CUT Error	・Replace the tool/cable with new one. ・Check if the polarity switch on the main board is correct. Refer to 8.1 Torque Polarity.

*1: Decide the values referring to the fastening time from start torque to cut level, blow numbers and angle for good tightening.