

Original Instruction Handbook for

UDP-A60LMC, A60MC, A80MC,

UDP-A600LMC, A700MC, A100MC and A120MC series

Electric Hydraulic Impulse Tools



Read all safety warnings, instructions, illustrations, and specifications provided with this power tool. Failure to follow all instructions listed below may result in electric shock, fire and/or serious injury.

Do not discard the safety and operating instructions. Give them to the operator. Save these instructions for future reference.



Edition 1-1

URYU

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Read through this instruction handbook and familiarise yourself with the system before installation, operation, maintenance, and inspection. Take note that two different signs; 'WARNING' and 'CAUTION' are used in this handbook according to degrees of seriousness and urgency.





- : The misuse of the product may cause the operators death or severe injury and the event shall be reported to all personnel immediately.
- : The misuse of the product may cause the operators moderate injury and physical damage to your equipment.

CAUTION signs may also cause any possible acute event.

You shall follow all requirements described in this handbook. Please retain this instruction handbook for future reference.

Intended Use: The tool is designed to tighten or loosen threaded fasteners.

- The tool is intended for professional use only.
- Avoid misuse and abuse of the tool. (e.g. Do not throw the tool on the floor, strike the housing in any way or use the tool as a hammer to knock material into place.)



- This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety.
- Do not modify the tool. Modifications can reduce the effectiveness of safety measures and increase the risks to the operator.
- · Stop using the tool if discomfort, tingling feeling or pain occurs.



Work Area Safety

- · Keep work area clean and well lit. Cluttered or dark areas invite accidents.
- Do not operate power tools in potentially explosive atmospheres, such as in the presence of flammable liquids, gases or dust. Power tools create sparks which may ignite the dust or fumes.
- · Keep children, bystanders and visitors away while operating the tool. Distraction can cause you to lose control.
- · Indoor use only.
- · Proceed with care in unfamiliar surroundings. Hidden hazards may exist.
- Always secure workpiece. Use clamps or other practical way to secure and support the workpiece to a stable
 platform. Holding the workpiece by hand or against your body is unstable and may lead to loss of control.
- Mount the system on incombustible component such as metal. There may be a fire risk.
- · Keep flammable materials away from the system. There may be a fire risk.
- · Mount the system on the place that can support its weight. Accidental drop may cause injury.
- · Avoid any foreign materials' intrusion. There may be an electric shock or fire risk.

Electrical Safety



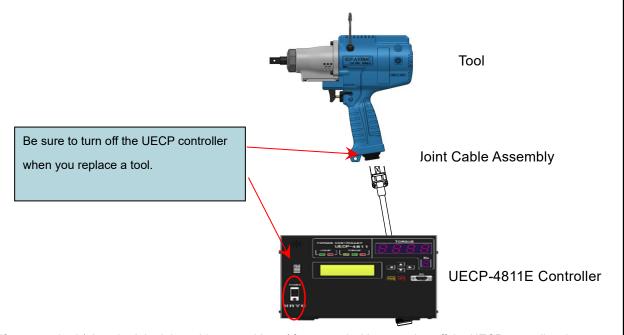
- Tool plugs must match the outlet. Never modify the plug in any way. Do not use any adapter plugs with earthed (grounded) tools. Unmodified plugs and matching outlets will reduce risk of electric shock.
- Avoid body contact with earthed or grounded surfaces, such as pipes, radiators, ranges and refrigerators. There is an increased risk of electric shock if your body is earthed or grounded.
- Do not expose the tool to rain or wet conditions. Water entering a power tool will increase the risk of electric shock.
- Do not abuse the cables. Never use the cables for carrying, pulling or unplugging the tool. Keep cable away from heat, oil, sharp edges or moving parts. Damaged or entangled cords increase the risk of electric shock.
- Do not handle the tool with wet hands. There may be an electric shock.
- When operating a power tool outdoors, use an extension cord suitable for outdoor use. Use of a cord suitable for outdoor use reduces the risk of electric shock.
- Do not crush, puncture, shorten external contracts or circuits, dispose of in fire or water.
- · Arrange the cables so that it may not be stepped, caught or stressed for damages.
- Do not use the tool if it is damaged by a drop or is with damaged cables.
- Make sure that the system is OFF before wiring. There may be an electric shock or fire risk.
- Place the molded case circuit breaker (MCCB). There may be a fire risk.
- · Install the UECP controller firmly before wiring. There may be an electric shock or fire risk.
- · Never touch the terminal block when the system is plugged in even when it is switched off.
- Avoid damage, mechanical stress and load to cables and never sandwich them forcibly to avoid an electric shock.
- Switch off the system when you do not run it.
- If operating a power tool in a damp location is unavoidable, use a residual current device (RCD) protected supply. Use of an RCD reduces the risk of electric shock.



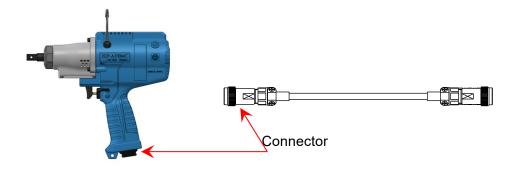
- Verify that the rated voltage of the system agrees with the connected AC power source to avoid personal injury and a
 possible fire.
- Wires shall be routed and fixed properly and securely to avoid personal injury and fire.



• Be sure to turn off the UECP controller before you attach / detach the joint cable assembly to / from tool.



• If you attached / detached the joint cable assembly to / from a tool without turning off the UECP controller, the connector will be damaged tool due to the deteriorated condenser built in a tool.



• If you continue to operate a tool with the connector damaged, the cable connector will deteriorate. Further usage will cause the cable and tool to become overheated and burnt.



Personal Safety



- Stay alert, watch what you are doing and use common sense when operating the tool. Do not use any tool while
 you are tired or under the influence of drugs, alcohol or medication. A moment of inattention while operating tools
 may result in serious personal injury. A moment of inattention while operating power tools may result in serious
 personal injury.
 - Use personal protective equipment. Always wear eye protection. Protective equipment such as dust mask, non-skid safety shoes, hard hat, or hearing protection used for appropriate conditions will reduce personal injuries.
- Prevent unintentional or inadvertent start. Ensure that the trigger is in the off-position before picking up or carrying the tool. Carrying the tool with your finger on the trigger or activating the tool that has the trigger on invites accidents.
- Do not overreach. Keep proper footing and balance at all times. This enables better control of the tool in unexpected situations.

Personal Safety



- Remove any adjusting wrench before turning the tool on. A wrench that is left attached to a rotating part of the tool may result in personal injury.
- Dress properly. Do not wear loose clothing, jewellery and neck ware. Keep your hair, clothing and gloves away from all moving parts. Loose clothes, jewellery or long hair can be caught in moving parts.
- Avoid awkward or off-balanced postures. Change the posture during extended tasks, which may help to avoid discomfort and fatigue. If the operator experiences symptoms such as persistent or recurring discomfort, pain, throbbing, aching, tingling, numbness, burning sensation or stiffness, the operator should tell the employer and consult a qualified health professional immediately.
- · Carry the tool only by the handle.
- · Never hold the drive socket or drive extension. Keep hands away from rotating drives.
- Ensure that the workpiece is securely fixed.
- Do not run the system excessively and/or more than necessary. Never touch the motor or the rotating part during operation or soon after the system is switched off. There may be an injury or burn risk.
- If devices are provided for the connection of dust extraction and collection facilities, ensure these are connected and properly used. Use of dust collection can reduce dust-related hazards.
- Keep handles and grasping dry, clean and free from oil and grease. Slippery handles and grasping surfaces do not allow for safe handling and control of the tool in unexpected situations.



• Unprotected exposure to high noise levels can cause permanent disabling, hearing loss and other problems such as tinnitus (ringing, buzzing, whistling or humming in the ears).

Risk assessment and implementation of appropriate controls for these hazards are essential.
 Use hearing protection in accordance with employer's instructions and as required by occupational health and safety regulations. Look after your hearing protection.

WARNING

- Exposure to vibration can cause disabling damage to the nerves and blood supply of the hands and arms. If you experience numbness, tingling, pain or whitening of the skin in your fingers or hands, stop using the tool, tell the employer and consult a physician immediately.
- Hold the tool with a light but safe grip taking account of the required hand reaction forces. The risk from vibration is generally greater when the grip force is higher.
- Wear warm clothing when working in cold conditions and keep your hands warm and dry.

Products Use and Care



- Do not force the tool. Use the correct tool for your application. The correct tool will do the job better and safer at the rate for which it is designed.
- Do not use the tool if the valve lever does not turn it on and off. Any tool that cannot be controlled with the valve lever is dangerous and must be repaired.
- Disconnect the plug from the power source before making any adjustments, changing accessories, or storing power tools. Such preventive safety measures reduce the risk of starting the power tool accidentally.
- Store idle power tools out of the reach of children and do not allow persons unfamiliar with the power tool or these instructions to operate the power tool. Power tools are dangerous in the hands of untrained users.
- Maintain power tools and accessories. Check for misalignment or binding of moving parts, breakage of parts and any other condition that may affect the power tool's operation. If damaged, have the power tool repaired before use. Many accidents are caused by poorly maintained power tools.
- Use the power tool, accessories and tool bits etc. in accordance with these instructions, taking into account the working conditions and the working conditions and the work to be performed. Use of the power tool for operations different from those intended could result in hazardous situations.
- ${\color{red} \bullet} \ \, \text{Hold the tool correctly: be ready to counteract normal or sudden movements have both hands available.}$
- Keep handles and grasping surfaces dry, clean and free from oil and grease. Slippery handles and grasping surfaces do not allow for safe handling and control of the tool in unexpected situations.
- Overwork applications can cause not only smoke or fire from the motor but also anvil breakage, resulting in injuries.
- · Unless otherwise required, do not make idle running at free speed.
- Keep cutting tools sharp and clean. Properly maintained cutting tools with sharp cutting edges are less likely to bind and are easier to control.

Products Use and Care



• Hold the power tool by insulated gripping surfaces, when performing an operation where the fastener may contact hidden wiring or its own cord. Fasteners contacting a "live" wire may make exposed metal parts of the power "live" and could give the operator an electric shock.

Service



• Have your power tool serviced by a qualified repair person using only identical replacement parts. This will ensure that the safety of the power tool is maintained.

Residual Risks



- Gloves can become entangled with the rotating drive, causing severed or broken fingers. Rotating drive sockets and drive extensions can easily entangle rubber coated or metal reinforced gloves.
- Additional residual risks may arise when using the tool which may not be included in the safety warnings. These risks can arise from misuse, prolonged use and so on. Even with the application of the relevant safety regulations and the implementation of safety devices, certain residual risks cannot be avoided. (e.g. injuries caused when changing any parts or accessories)

General Precautions

- Note that the drawings and pictures in this handbook may not show all the accessories needed for safety measure to explain the details. Be sure to put the regular accessories back to the system as specified in this handbook before operation.
- Never connect other tools than UDP tool to UECP controller.
- This system is not waterproof. Never expose the system to water or moisture. Otherwise the system will be short-circuited and there may be an electric shock or fire risk.
- Magnetostrictive sensor is built in the UDP-MC tool. Keep magnets away from UDP-MC tools to avoid any magnetic field effect. Otherwise, UDP-MC tool may malfunction.

Disclaimer

• The contents of this instruction handbook are subject to change without prior notice.



1. Overview & Features

1.1 Overview

Taking environmental issue into consideration, UDP-MC series adopt electricity as the drive source. UDP-MC tool has an electric motor driving a hydraulic impulse mechanism for tightening and loosening threaded fasteners. UDP-MC (with auto-relief function and DC brushless electric motor) provides you with ergonomic fastening solution (low noise, low vibration and low torque reaction) and high energy efficiency.

[Features]

- 1) UDP-MC provides you with flexible production line build and layout change as it is driven by the commercial electricity from power plant.
- 2) UDP-MC and UECP controller can be connected by one cable. It cuts down on a burden of operator. Also, the cable can be mounted to top port depending on the construction of production line.
- 3) The plastic housing contributes to its light-weight design and insulation properties.
- 4) Adopted DC brushless motor emits no noise and vibration generated from brushes and reduces running cost.
- 5) URYU genuine technology, Auto-Relief (PAT.) function, is adopted in the pulse mechanism, which realises high accuracy, high-efficiency and high durability.
- 6) UDP-MC stops its operation to minimise impacts from e.g. excessive operation and short circuit, to operator and workpiece.
- 7) The ventilation system equipped for cooling the tool enables you to do the tightening at quicker cycle time.
- 8) The free speed can be increased every 100 rpm. Also, the current value can be adjusted at 4 levels.
- 9) UDP-MC provides you with the 2-step tightening, which will help you minimise the hike in torque in bolt seating.

1.2 Products supplied

- Check the followings when you open the package.
- 1) Make sure that you receive the correct model that you ordered.
- 2) Make sure that no breakage is acknowledged with the supplied product.

Contact the URYU distributor that you have ordered if there is anything wrong.

Please refer to the instruction manual of UECP controller regarding the above check points.

1.3 Precautions for Correct Use

Misuse of the product will not enable you to run the system correctly and it may also break the tool itself. Be sure to run the system as per the below points.

- 1) Switch off the device when you do not run for a long time. There may be an injury risk and electric shock due to accidental start.
- 2) Install the UECP controller firmly before wiring. The improper installation may cause an injury in the event of earthquake.



3) Make sure that there is no loose connection or no damage to the system. There is a risk of injury as well as the deteriorated performance and/or possible breakage. We highly recommend that you send the system for PM purpose to avoid any unexpected malfunction and accident.

How to choose the correct tool UDP-A * *MC $\frac{(TL)}{l}$

No letters: Standard type (TL): Top Load Type

1.4 Installation

Familiarise yourself with the followings to install and fix the device firmly. Please refer to the instruction manual of UECP-controller for installation.

1.4.1 Place to install UDP-MC system

- 1) Install the UDP-MC system inside a building. Never expose it to rain or direct sunshine. It is not waterproof.
- 2) Never expose the system to corrosive and flammable gas, cutting oil, oil mist and metal chips.
- 3) Install the system with good ventilation. Neither of moisture nor dust is good.
- 4) Do not expose the system to vibration.

1.4.2 Workstation Requirements

Check Items	Requirements
Place	Indoor use only
Ambient Temperature	5° C- 40° C (no dew) *1
Ambient Humidity	Less than 80%RH (no dew)
Storage Temperature	0° C - 40° C (no dew / no frost) *2
A la i	No hazardous components such as corrosive and explosive gas, dust and other
Ambience	components which threaten the performance of motor are included.

^{*1:} Due to viscosity of hydraulic fluid, especially where the ambient temperature is low (about below 5 ° C), impulse action may not be generated at the beginning of use. Warm up the tool for approximately ten (10) seconds by fixing the anvil on a vice before use.

1.5 Power Supply

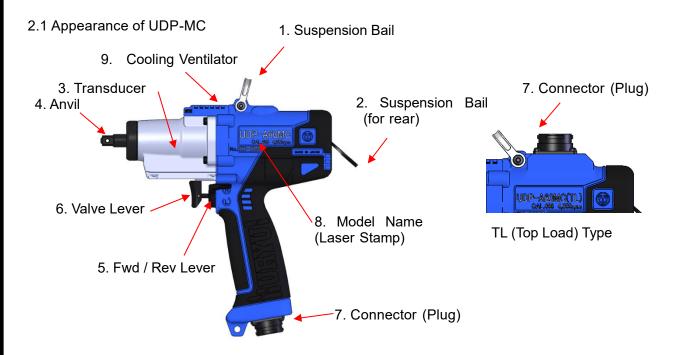
Refer to the below for power supply requirements.

Check Items	Contents
Power Supply	Single Phase AC100V/115V ※ from UECP-4811E
Power Socket	3 prongs AC inlet with earth terminal
Allowable Voltage Range	+/- 10% of each power supply
Power Frequency	50Hz or 60Hz

^{*2:} This is the temperature range for transport.



2. Parts' Descriptions and Functions



UDP-A60LMC, A60MC, A80MC, A600LMC, A700MC

You can suspend the tool with this suspension bail. You can also suspend the 1. Suspension Bail

tool for vertical fastening by connecting it to the bottom part of tool.

2. Suspension Bail (for ... You can suspend the tool for vertical fastening with this suspension

rear) bail.

3. Transducer Magnetostrictive type transducer for torque detection

4. Anvil Rotating part to fit socket depending upon purpose

5. Fwd / Rev Lever To change the direction of rotation

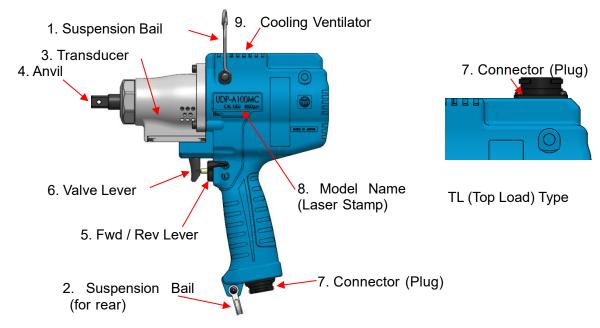
6. Valve Lever To operate (ON/OFF) the tool

7. Connector (Plug) To connect to controller by joint cable

8. Model Name (Laser ... Indication of model name

Stamp)

9. Cooling Ventilator To minimise rise in temperature of tool



UDP-A100MC, A120MC

1. Suspension Bail ... You can suspend the tool with this suspension bail. You can also change the

direction to suspend the tool by connecting it to the rear part of tool.

2. Suspension Bail (for ... You can suspend the tool for vertical fastening with this optional

rear) suspension bail.

3. Transducer ... Magnetostrictive type transducer for torque detection

4. Anvil ... Rotating part to fit socket depending upon purpose

5. Fwd / Rev Lever ... To change the direction of rotation

6. Valve Lever ... To operate (ON/OFF) the tool

7. Connector (Plug) ... To connect to controller by joint cable

8. Model Name (Laser ... Indication of model name

Stamp)

9. Cooling Ventilator ... To minimise rise in temperature of tool

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2.2 Technical Specifications

Item / Model Name		UDP-A60LMC	UDP-A60MC	UDP-A80MC		
Controller		UECP-4811E				
Nominal Bolt Capacity	mm	5~6	6~8	8~12		
Torque Range	N∙m	4~20	5∼25	25~55		
Free Speed *1	rpm		4,800 (Max Speed)			
CAL Value	_	250	400	600		
Anvil SQ. Size	mm	9.5Sq	9.5Sq	9.5Sq		
Overall Length	mm	214	214	242		
Weight	kg	1.53	1.53	1.78		
Sound Pressure Level (Lpa) *2	dB(A)	74	74	76		
Vibration Value (ahd)	m/sec²	< 2.5	< 2.5	< 2.5		
Vibration Uncertainty (K)	m/sec ²	0.6	0.6	0.63		
Torque Reaction	Nm	0.7	0.72	0.91		
Trigger Force N			8.0			
Rated Power Consumption*3	kw	0.49	0.49	0.6		

Item / Model Name		UDP-A600LMC	UDP-A700MC	UDP-A100MC	UDP-A120MC
Controller	UECP-4811E				
Nominal Bolt Capacity	mm	5~6	6~12	10~12	12~14
Torque Range	N∙m	4~20	10~50	45~100	55~120
Free Speed *1	rpm		4,800 (M	ax Speed)	
CAL Value	_	250	600	1200	1200
Anvil SQ. Size	mm	9.5Sq	9.5Sq	12.7Sq	12.7Sq
Overall Length	mm	214	242	248	248
Weight	kg	1.53	1.78	2.85	2.85
Sound Pressure Level(Lpa) *2	dB(A)	74	76	76	78
Vibration Value (ahd)	m/sec²	< 2.5	< 2.5	< 2.5	< 2.5
Vibration Uncertainty (K)	m/sec ²	0.6	0.63	0.62	0.64
Torque Reaction	Nm	0.72	0.91	2.3	2.4
Trigger Force N			8	3.0	
Rated Power Consumption*3	kw	0.49	0.6	0.66	0.72
∴ IEC 60745-1 and -2-2	∴ IEC 60745-1 and -2-2 are applied. Protection against electric shock is Class I.				Class I.



These declared sound and vibration values given in the above table were obtained by laboratory type testing in accordance with **EN 62841-1 for sound levels** and **ISO 28927-2 for vibration values** and are not adequate for use in risk assessments. Values measured in individual work places may be higher than the declared values. The actual exposure values and risk of harm experienced by an individual user are unique and depend upon the way the user works, the workpiece and the workstation design, as well as upon the exposure time and the physical condition of the user.

We, URYU SEISAKU, LTD., cannot be held liable for the consequences of using the declared values, instead of values reflecting the actual exposure, in an individual risk assessment in a work place situation over which we have no control.

- *1: Speed Adjustment Range: 1000r/min.-4800r/min., setting available per 100r/min.
- *2: The uncertainty in the sound levels is 3dB(A).
- *3: The maximum instantaneous power consumption.

 No load: approx. 0.06kW, Standby: approx. 0.02kW

List of Optional Items

Item	Description	Code	Remarks
	5m Joint Cable	910-807-0	Common Parts for
	10m Joint Cable	910-808-0	UDP-A60LMC,A60MC,
	15m Joint Cable	910-809-0	A80MC,A600LMC,
Cables	20m Joint Cable	910-810-0	A700MC,A100MC
	5m Joint Cable	910-567-0	
	10m Joint Cable	910-568-0	For UDP-A120MC
	15m Joint Cable	910-569-0	FOI ODF-A120IVIC
	20m Joint Cable	910-625-0	



3. Fastening

3.1 Fastening Control Function

UDP-MC can be controlled by the parameter setting on UECP controller. See the UECP controller instruction manual for details.

3.2 Motor Setting

Motor-mode setting in UECP controller is recommended to be set as [2] for UDP-A60LMC, A60MC and A80MC, and set as [4] for UDP-A600LMC, A700MC, A100MC and A120MC.

Also, the following parameters can be adjusted by the setting of controller.

Initial Speed Setting: Rotation speed setting from valve lever ON to START torque. See the phase 1

on the below timing chart. Its RPM ranges from 1,000 to 4,800, incremented by

100 rpm.

Initial Current Setting: Motor current setting from switch lever ON to START torque. See the phase 1 on

the below timing chart. 4-step-adjustment is available.

Speed Setting : Rotation speed setting from START torque to CUT torque. See the phase 2 on

the below timing chart. Its RPM ranges from 1,000 to 4,800, incremented by 100

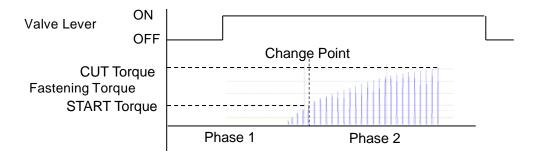
rpm.

Current Setting : Motor current setting from START torque to CUT torque. See the phase 2 on the

below timing chart. 4-step-adjustment is available.

Note that too low RPM will lead to the too low motor power. This will cause the tool not to shut off at the cut torque and/or to be serviced more frequently than it should be. You can refer to the Setting Manual in the last page to better understand how to set the speed and current settings.

Timing Chart



Reverse Speed Setting: Reverse rotation speed setting when the Lever is set to Rev. position. Its RPM ranges from 1,000 to 4,800, incremented by 100 rpm.

Note that the reverse current is not programmable.



Standard functions equipped in UDP-A600LMC, A700MC, A100MC and A120MC

Duty Ratio Setting: Power to run motor setting. Its power ranges from 10% to 100%, incremented by 10%. Note that this is available with UECP-4810E & UECP-4811E only. It is recommended that you should set this setting to 100% normally. This setting should be changed when you find it difficult to achieve CUT torque with the combination of RPM and current settings.

Double-hitting Error Detection available with UECP-4810E & UECP-4811E controller UECP-4810E & UECP-4811E will help you detect the double-hitting error when its error detection is activated under Motor-mode [4] and if motor rotation angle from triggering to START torque was lower than predetermined setting value. Please refer to the UECP-4810E & UECP-4811E instruction manual for further info.

External Start: UDP-MC tools start running with no triggering by allocating signal inputs of CW or CCW to UECP controller. Please refer to the UECP-4810E & UECP-4811E instruction manual for further info. (It is not possible to activate Double-hitting Error Detection when UDP-MC is controlled by External Start.)

3.3 Operation of Cooling Ventilator

The cooling ventilator operates when the switch lever is triggered. When the motor temperature exceeds 50° C, the cooling ventilator keeps rotating. When the motor temperature went down below 50° C, the ventilator stop rotating after a twenty-minute rotation.

3.4 Heat Protection

When the motor is overheated, red LED flashes in the cycle of 0.8 sec. on and 0.2 sec. off and the tool stops regardless of the setting on the controller. In this case, the tool will be able to restart if you push the reset button on the controller, but the heat protection will function immediately. Once the red LED flashes, do not use the tool for 30 minutes at least until the motor temperature decreases. Re-start after the temperature has reached the ambient temperature. Also, there is a possibility that the tool is overloaded when red LED flashes. Then, cross-check your tool model selection for the job or cycle time for the tool model.

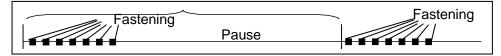


Guideline

UDP tools can perform with no heat protection triggered when total pulse numbers per minutes are within the allowable pulse numbers mentioned as below. Please avoid the consecutive tightening in short cycle and/or excessive workload to the tools as such operations lead to the damage to motor.

Model Number	Nominal Bolt Capacity	Torque Range	Allowable pulse numbers(pulse/min.)
UDP-A60LMC	5~6	4~20	103 (0.5 sec fastening time x 6 cycles)
UDP-A60MC	6~8	5~25	84 (0.5 sec fastening time x 7 cycles)
UDP-A80MC	8~12	25~55	84 (0.5 sec fastening time x 7 cycles)
UDP-A600LMC	5~6	4~20	103 (0.5 sec fastening time x 6 cycles)
UDP-A700MC	8~12	10~50	84 (0.5 sec fastening time x 7 cycles)
UDP-A100MC	10~12	45~100	120 (1.0 sec fastening time x 6 cycles)
UDP-A120MC	12~14	55~120	100 (1.0 sec fastening time x 5 cycles)

1 minute



NOTE: Number of allowable pulse numbers varies depending on working conditions.

3.5 Buzzer

The buzzer sounds one time per fastener for Torque OK. The buzzer keeps sounding when any kind of Error / NG is detected by controller.

The use of buzzer can be selected by the controller. (See the instruction manual for controller.)



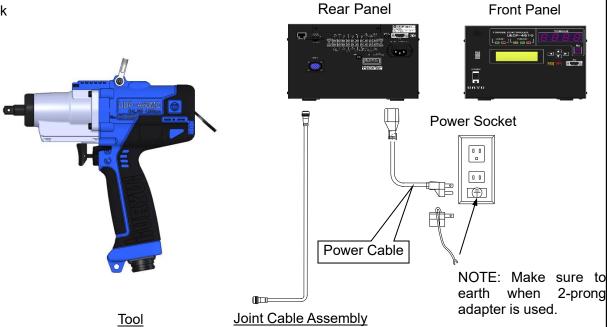
3.6 Display of LED Indicator

You can find the status of tool from the LED indicator on the rear top of tool.

Status of LED Indicator	Status of Tool	Remarks	
GREEN	Torque OK	Measured torque value is within the	
GREEN	Torque OK	setting value.	
AMBER	Torque LOW NOK	Measured torque value is less than	
AMDER	Torque LOW NOR	low limit setting value.	
RED	Torque HIGH NOK	Measured torque value is over upper	
1125	Torquo Tilori Ttori	limit setting value.	
AMBER Long Flushing	Pulse LOW NOK	Measured pulse number is less than	
(0.8 sec. on / 0.2 sec. off cycle)	- 4.00 LOW 11.01.	low limit setting value.	
AMBER Short Flushing	Pulse HIGH NOK	Measured pulse number is over upper	
(0.3 sec. on / 0.2 sec. off cycle)		limit setting value.	
RED Short Flushing	Cycle Error, Initial Error,	See the instruction manual of	
(0.3 sec. on / 0.2 sec. off cycle)	Incomplete Job Error, Cycle	controller for details.	
	Over Error		
	Controller under programming	See the instruction manual of	
	mode	controller for details. There is a	
RED and GREEN Flushing in	Communication Error including	possibility of disconnection or damage	
turn	ZERO/CAL & Self-Diagnostic	in case the operation does not return	
	Check	even if you push the reset button.	
	Double-hitting Error	Tool Retighten a bolt.	
	Ç		
		The self-protection of motor causes	
	Motor Overheat	the motor to stop operating due to the	
		high temperature inside the motor.	
RED Long Flushing		Too much current has been provided	
(0.8 sec. on / 0.2 sec. off cycle)		to motor due to the 6 seconds or	
RED Long Flushing		longer consecutive tightening. Or,	
(0.8 sec. on / 0.2 sec. off cycle)	Motor Protection	the anvil is overloaded (Rock	
, ,		Protection). There is a possibility of	
		breakage of motor in case the motor	
		protection functions again even if you	
		push the reset button.	

4. Layout

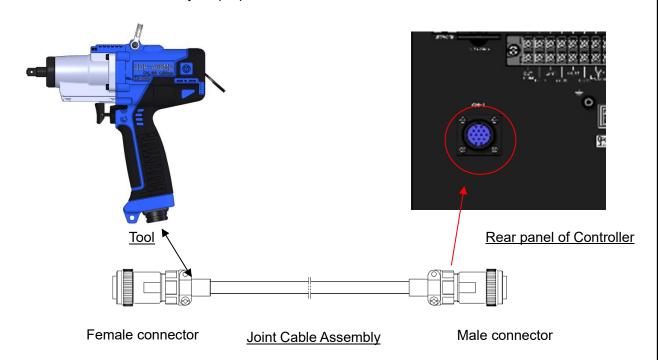
4.1 Outlook



Controller (UECP-4811E)

4.2 How to connect

Connect the connector in the bottom part of tool to the female connector of the joint cable assembly. Continue to connect the connector in the rear panel of the controller to the male connector of the joint cable assembly. Note that the threaded screw connectors are used for UDP system. Be sure to tighten the threaded screw connectors firmly for proper connection.

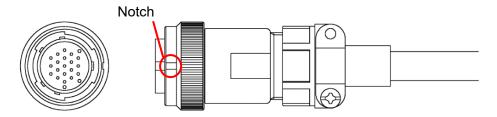


For connection of controller with external input/output terminal, see the instruction manual of controller.

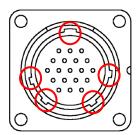


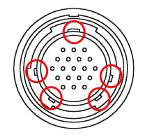
How to make a firm connection of the threaded screw connectors

1. Make sure that the connector of the joint cable assembly is unlocked. If the notch on the connector is located as shown in the below picture, the connector is unlocked.



2. Make sure to install the locator male keys in the corresponding female slots, as shown in the below picture. *The configuration of locator slots for UDP-A120MC differs from other UDP tools.

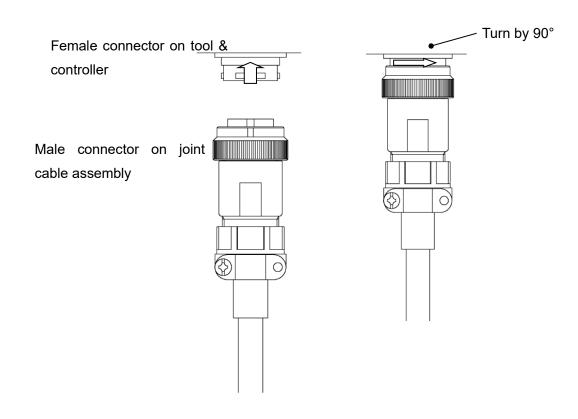




Female slots on tool connector

Locator male keys on joint cable assembly

3. Turn the screw in a right-hand direction by 90 degrees to lock up the connectors.





5. Operation

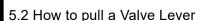
5.1 How to decide CW/CCW rotation

Set the Fwd / Rev lever to R for CW.

Set the Fwd / Rev lever to L for CCW.

Valve Lever

Fwd / Rev Lever



RPM increases in 3 steps as you pull the valve lever to the end for CW and CCW rotation.

Slow	Middle	High
About 500	About 1,000 rpm	The tool will run at the preset Initial Speed RPM or Speed RPM.
		Note that max. speed is 4,800 RPM. For programming of
rpm		controller, see the instruction manual of controller.

If you release your finger from the valve lever, the brake will work to stop the tool.

Cooling Ventilator

5.3 How to operate

Hold the handle and pull valve lever firmly until the tool automatically shuts off. If you release the trigger, the tool will not shut off at the preset cut torque.

For programming of controller, see the instruction manual of controller.

Caution: Do not cover the cooling ventilator during operation.

Insufficient ventilation may result in heat or smoke.

Keep pulling the valve lever till automatic shut-off.

Useful information to achieve the better accuracy

1. Working Condition

The various factors including torque coefficient, which is decided by bolt finish and application, grade, and length of fastener will have a great influence over torque, even if you tighten the fasteners with same diameter. The surface finish of application and the alignment of application will also have a great influence over torque. If a nut is not placed well to hold a bolt during operation, the torque will not be properly delivered.

2. Worn-out Socket

Use a guided impact sockets in good condition. Worn or ill-fitting sockets reduce power. Replace worn sockets to prevent vibration, loss in torque output, poor accuracy and damage to the output drive. Poor condition or hand sockets and accessories can shatter and become a projectile.

3. Valve Lever

Pull the valve lever to start operation. If you do not pull the valve lever properly, the tool may not shut off automatically.

4. Usage of Accessories Including Socket Adapter

If the tool fitted to universal joint and/or socket adapter, torque may not be delivered to fasteners properly.







Maintenance Instructions

- · Continuous satisfactory operation depends upon proper tool care and regular maintenance.
- · Have the tool serviced by a qualified repair person.
- Use URYU genuine parts for replacement. This will ensure that the safety and the optimum performance of the tool are maintained. Refer to the parts list supplied along with the tool and use correct jigs for proper service. Contact your local URYU distributor or URYU Japan.

Overhaul

• It is recommended that after every 100,000 fasteners or 3 months, whichever comes earlier, the fluid, Hyrando Jinen TX46 oil (see the right table) in the pulse unit should be changed and grease the bearing.

Hyrando Jinen TX46 Oil

Part No.	Quantity
998-735-0	20L

Do not substitute any other fluid. Failure to use Hyrando Jinen TX46 oil could damage the tool, increase maintenance and decrease performance.

- It is recommended that after every 200,000 fasteners or 6 months, the pulse unit should be inspected with care. Inspect hard parts for damages or wearing. Replace damaged parts, all sealing materials such as SU-ring, O-rings and supporter rings and consumable materials such as springs in the pulse unit each time you disassemble the pulse unit.
- More frequent overhaul may be needed when the tool is in heavy duty operation.
- Wipe the casing with a soft cloth. Do not use volatile liquid or a wet cloth as it would cause deterioration of its strength and discoloration.
- Ensure that any labels on the tool are kept in legible condition. Replace any damaged label.

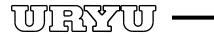
Disposal



- Separate collection of used tools and packaging allows materials to be recycled and used again. Re-use of recycled materials helps to prevent environmental pollution and reduces the demand for raw materials.
- The tool is made of steel, aluminium alloy, plastic and rubber. When disposing the tool, make sure not to cause pollution to human being and the environment. Follow your local laws and regulations relating to disposal.



• (In EU) The products are covered by the European Parliament and the Council directive, 2002/96/EC (27 January 2003) on waste electrical and electronic equipment (WEEE). The tools should be disposed of separately from normal household waste so that they can be recycled.



Troubleshooting

Symptom	Possible Reasons	Possible Solutions
UECP will not start.	Power-Cable is not connected. Controller fuse blown Controller breakage	Make sure the power cable is firmly plugged in. Replace the fuse.(Refer to the controller manual) Repair or replace UECP.
UECP will not start. The power-switch will return to "OFF" - position.	Tool breakage Controller breakage	Repair or replace. (Be sure not to use a tool and replace It. If UECP still does not start even after tool replacement, UECP may be out of order.
Tool will not start. (LED Indicator is not on.)	 Joint Cable is wrongly connected. Cable disconnection inside Cable Cable disconnection inside a tool Broken Valve Lever Controller breakage 	 Make sure the Joint cable is firmly connected. Replace the Joint Cable. Repair or replace a tool. Repair or replace UECP.
Tool will not start. (The RED and GREEN LED indicators flash in turn. UDP.E, UdP.4, UdP.5 and UdP.6 is shown in UECP controller.)	 Joint Cable is wrongly connected. Cable disconnection inside Cable Cable disconnection inside a tool Motor breakage Controller breakage 	 Make sure the Joint cable is firmly connected. Enable the setting of "Automatic Return" (when using UECP-4800) Hit the RESET button on UECP. Replace the Joint Cable. Repair or replace a tool. Repair or replace UECP.
Tool will not start. (The RED LED indicator flashes and UDP.E is shown in UECP controller.)	 The self-protection of motor causes the motor to stop operating due to the high temperature inside the motor. Abnormal lowering of driving voltage due to controller breakage. 	Reduce the workload to UDP system. Repair or replace UECP.
Tool will not start. ("Udn.E" is shown in UECP controller.)	 Torque sensor error due to wrong Connection or cable disconnection in Joint Cable. Cable disconnection inside a tool Torque sensor breakage Controller breakage 	 Make sure the Joint cable is firmly connected. Hit the RESET button on UECP. Replace the Joint Cable. Repair or replace a tool. Repair or replace UECP.
Tool will not start. (message other than above is shown in UECP controller.	·Error from controller	●Refer to the controller manual.
Tool will run in incorrect direction.	Fwd / Rev lever is set to incorrect direction.Broken Fwd / Rev lever	Set the Fwd / Rev Lever to the correct direction. Repair or replace a tool.
Operating noise in free running at "slow"(rpm) or "middle"(rpm) is louder than that of "high"(rpm).	•The noise is not abnormal, but is due to cogging-torque as a characteristic of magnetic force in Motor.	●Tool is available for use.
Abnormal noise and unstable speed in free running.	Motor breakage	●Repair or replace a tool.

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Symptom	Possible Reasons	Possible Solutions
Tool rotates in low speed (approx.1000rpm) even when fully pulled the Valve Lever.	 Socket is too heavy. Initial speed setting is set to 1,000(rpm). Motor settings are reset to default value due to instant disconnection of joint cable assembly and/ or connector. 	●Reduce the load on Anvil. ●Check the controller settings. ●Enable the setting of "Automatic Return" (when using UECP-4800) ●Replace the Joint Cable.
It takes longer to reach the CUT torque or tool will not reach the CUT torque.	 Worn or broken Socket Low setting values of current and / or rpm of controller Influence by the characteristics of work piece, bolt-seating-face, and /or tightening on soft joint. Maintenance period of the oil-pulse unit has come. Worn or broken Bearing in a Motor 	 Replace a Socket. Check the controller settings. (Refer to the setting manual in page) Review the "Proof-Ratio" setting. (Refer to the controller manual) Repair or replace a tool.
Cooling-ventilator will not work.	Motor breakageBroken cooling ventilator and / or wiring disconnection	●Repair or replace a tool.
Tool becomes hot.	Stop using a tool when heat protect function gets activated.	 Make sure the cooling ventilator runs correctly when triggering the valve lever. Choose one size up larger tool Reduce the workload to UDP system and / or reduce the cycle number.
Tool will not stop at the CUT torque.	• "Additional-pulse" is set in the controller.	Check the controller settings. (Refer to the controller manual.)
Torque display on UECP differs greatly from the break torque.	 Incorrect CAL value Influence by the characteristics of work piece, bolt-seating-face, worn and /or heavy socket, etc. 	Check the CAL value setting. Review Proof ratio so as to match UCC display with break torque. (Refer to the controller manual)
Bad tightening accuracy	 Pulse numbers are too low (less than 5 pulse numbers.) Worn or Socket breakage Too heavy Socket Influence by Inertia force at bolt seating 	Review the motor settings. (Refer to the setting manual in page) Replace a Socket. Review the Socket size.
Tool will not start. (CAL.E or 0.E. is shown in UECP controller.)	Sensor breakageCable disconnectionZero/Cal is checked during tightening.	Repair or replace. Be sure not to hit RES button during tightening. Refer to the controller manual.

Should the above steps fail to remedy a problem with the tool, immediately stop using the product and contact local URYU distributor or URYU Japan.

Find URYU distributor in your country at www.uryu.co.jp/english/network.html.



Starter Guide (Installation)

[Models]

Tool: UDP-A60LMC, A60MC, A80MC, A600LMC, A700MC, A100MC, A120MC

Controller: UECP-4800E,4810E START [Model Selection] Torque Tool Model Torque Tool Model 25~55[Nm] → UDP-A80MC 4~20[Nm] → UDP-A60LMC, A600LMC 45~100[Nm] → UDP-A100MC → UDP-A60MC 5~25[Nm] 10~50[Nm] → UDP-A700MC UDP-A60LMC, A600LMC = "250" = "400" UDP-A60MC = "600" UDP-A80MC, A700MC UDP-A100MC,A120MC [START Torque Input] UDP-A60LMC, A600LMC =2.5[Nm] UDP-A60MC = 4 [Nm] UDP-A80MC, A700MC = 6 [Nm] UDP-A100MC, A120MC = 12[Nm] [LOW Torque Input]
Input low limit torque value. ***Attention*** START ≤ LOW < CUT < HIGH The above is interlocked so that you cannot input values except the above. [CUT Torque Input] Input target torque value. (HIGH Torque Input)
Input high limit torque value. [Fasterner Quantity Input]
Input quantity of fasteners. [Motor Setting Input] **Speed change is the priority of adjustment. Input SPEED and CURRENT LEVEL. [Change CUT Torque Value] Increase CUT torque value. [Change CUT Torque **Select unput values from 'Setting Guideline', judging from 'Target Torque' and 'Tool Model' (Input the same values for both Initial Speed Value] Decrease CUT torque value. UT Torque - Breakaway Torque = Adjustm CUT Torque — Breakaway Torque = Adjus & Speed.) (CUT Torque - Break [Change Motor Setting] [Change Motor Setting] [Trial on Actual Application] Lower SPEED by 500rpm. *II it is the lowest spped at the current level, decrease the current level and set the speed at 4800rpm. Increase SPEED by 500rpm. *If it is the maximum speed at the Tighten the fastener on the actual "TORQUE LOW NG" "TORQUE HIGH NG" (No Error?) "PULSE HIGH NG" "PULSE LOW NG" Check Error (OK/NOK) displayed on UECP: Pulse Qty ≥ 21 pulses Pulse Qty ≤ 5 pulses Check Pulse Qty displayed on UECP. Pulse Qty = 6~20 Pulses Below LOW limit of test standard Reyond HIGH limit of test stand Check breakaway torque by manual torque wrench If breakaway torque does not reach LOW limit even with the maximum speed and the highest current level, please try UDP-A700MC on the application. Pass your test standard Beyond HIGH limit of test standard. Below LOW limit of test standard. Cp<1.33 (Confirmation) Collect breakaway torque data *1: If CP value does not pass the standard. Cp≥1.33 adjustment of Motor Duty Cycle may help to improve. **READY TO USE**



Setting Guideline (Combination of CURRENT & SPEED)

Numbers in the table= N ⋅ m

			Hard	Joint (Ger				Mediur		.60LMC asteners c		FIPG)	S	oft Joint (Deformabl	e Fastene	rs)
					Cur	rent				Cur	rent				Cu	rrent	
				1	2	3	4		1	2	3	4		1	2	3	4
			4800					4800			8~9		4800				9
			4500		0 - 0			4500			7		4500			-	8
			4000		8~9			4000					4000			5	7
		Ë	3500 3000		7			3500 3000			6 5		3500 3000			4	-
	M5	Speed[r.p.m.]	2600		- /			2600			3		2600			4	
		늋	2500		6			2500			4		2500				
		96	2100					2100					2100				
		$\overline{\Omega}$	2000		5			2000					2000				
			1700		4			1700			T Inc.	alid	1700			- In	valid
			1500			lnv	alid	1500			Inv	alid	1500				Vallu
			1300					1300					1300				
					Cur	rent				Cur	rent				Cu	rrent	
				1	2	3	4		1	2	3	4		1	2	3	4
			4800		12~15			4800				14~15	4800				13^
			4500		11			4500			10	13	4500			7	1
			4000		10			4000				12	4000				1
Ze		7	3500		9			3500		8			3500				1
Bolt Size	М6	E.	3000		8			3000			9	11	3000				
Solt I	IVIO	=======================================	2600					2600					2600				
ш		ě	2500		7			2500		7			2500				
		Speed[r.p.m.]	2100					2100					2100	ļ			
		-	2000					2000					2000	ļ			
			1700			Inv	/alid	1700			Inv	alid	1700	1		Inv	valid
			1500					1500					1500	1			Ė
			1300					1300					1300	1			
		_	_			rent		\			rent					rrent	1
			4000	1	2	3	4	4000	1	2	3	4	4000	1	2	3	4
		4800			17		4800				20	4800	1		-	+ ~	
			4500			16		4500				20	4500				2
			4000			15	00	4000				19	4000				1
		<u>-</u>	3500				20	3500				18	3500				1
	M8	Speed[r.p.m.]	3000				19 18	3000				17 15~16	3000				150
		늗	2600 2500				18	2600 2500				15~16	2600 2500				15^
		Φ											2100				
		g	2100					2100									
	l		2000	-				2000		-			2000	 	-		
			1700			_		1700									
			1700			Inv	alid	1700			Inv	alid	1700			Inv	valid
			1500			Inv	alid	1500			Inv	alid	1500			Inv	valid
						Inv	alid		UDP-	A60MC	Inv	alid				Inv	valid
			1500 1300	Joint (Ger	neral Faste		alid	1500 1300		A60MC asteners c			1500 1300	oft Joint (Deformabl		
			1500 1300		Cur	eners)		1500 1300	m Joint (F	asteners c Cur	oated with	FIPG)	1500 1300		Cu	e Fastene	rs)
			1500 1300 Hard	Joint (Ger	Cur 2	eners)	alid 4	1500 1300 Mediur		asteners c Cur 2	oated with		1500 1300 S	oft Joint (e Fastene	rs)
			1500 1300 Hard		Cur 2 13	eners)		1500 1300 Mediur 4800	m Joint (F	asteners c Cur 2 10	oated with	FIPG)	1500 1300 S 4800		Cu	e Fastene rrent 3	rs) 4
			1500 1300 Hard 4800 4500		Cur 2 13 12	eners)		1500 1300 Mediur 4800 4500	m Joint (F	asteners c Cur 2 10 9	oated with rent 3	FIPG)	1500 1300 S 4800 4500		Cu	e Fastene rrent 3 9 8	rs)
			1500 1300 Hard 4800 4500 4000		Cur 2 13 12 11	eners)		1500 1300 Mediur 4800 4500 4000	m Joint (F	asteners c Cur 2 10 9	oated with rent 3 15	FIPG)	1500 1300 S 4800 4500 4000		Cu	e Fastene rrent 3 9 8 7	rs)
		- F	1500 1300 Hard 4800 4500 4000 3500		Cur 2 13 12 11 10	eners)		1500 1300 Mediur 4800 4500 4000 3500	m Joint (F	2 10 9 8 7	0 ated with rent 3 15 14 13	FIPG)	1500 1300 S 4800 4500 4000 3500		Cu	e Fastene rrent 3 9 8	rs)
	M5	J.m.]	1500 1300 Hard 4800 4500 4000 3500 3000		Cur 2 13 12 11	eners)		1500 1300 Mediur 4800 4500 4000 3500 3000	m Joint (F	asteners c Cur 2 10 9	oated with rent 3 15	FIPG)	1500 1300 S 4800 4500 4000 3500 3000		Cu	e Fastene rrent 3 9 8 7	rs)
	M5	J[r.p.m.]	1500 1300 Hard 4800 4500 4000 3500 3000 2600		Cur 2 13 12 11 10 9	eners) rrent 3		1500 1300 Medium 4800 4500 4000 3500 3000 2600	m Joint (F	2 10 9 8 7	0ated with rent 3 15 14 13	FIPG)	1500 1300 S 4800 4500 4000 3500 3000 2600		Cu	e Fastene rrent 3 9 8 7	rs)
	M5	eed[r.p.m.]	1500 1300 Hard 4800 4500 4000 3500 3000 2600 2500		Cur 2 13 12 11 10	eners)		1500 1300 Mediur 4800 4500 4000 3500 3000 2600 2500	m Joint (F	2 10 9 8 7	0 ated with rent 3 15 14 13	FIPG)	1500 1300 1300 S 4800 4500 4000 3500 3000 2600 2500		Cu	e Fastene rrent 3 9 8 7	rs)
	M5	Speed[r.p.m.]	Hard 4800 4500 4000 3500 3000 2600 2500 2100		Cur 2 13 12 11 10 9 7~8	eners) rrent 3		1500 1300 Mediur 4800 4500 4000 3500 3500 2600 2500 2100	m Joint (F	2 10 9 8 7	0ated with rent 3 15 14 13	FIPG)	1500 1300 1300 \$ \$ \$4800 4500 4000 3500 3500 2600 2500 2100		Cu	e Fastene rrent 3 9 8 7	rs)
	M5	Speed[r.p.m.]	Hard 4800 4500 3500 3000 2600 2100 2000		Cur 2 13 12 11 10 9	eners) rrent 3		1500 1300 1300 Mediur 4800 4500 4000 3500 3000 2600 2100 2000	m Joint (F	2 10 9 8 7	0ated with rent 3 15 14 13	FIPG)	1500 1300 1300 8 4800 4500 4000 3500 3000 2600 2100 2000		Cu	e Fastene rrent 3 9 8 7	rs)
	M5	Speed[r.p.m.]	1500 1300 Hard 4800 4500 3500 3000 2600 2500 2100 2100 1700		Cur 2 13 12 11 10 9 7~8	eners) rent 3 15		1500 1300 Mediur 4800 4500 4500 3500 2600 2500 2100 2000 1700	m Joint (F	2 10 9 8 7	0 oated with rent 3 15 14 13 12 11	FIPG)	1500 1300 8 4800 4500 3500 2600 2500 2100 2000 1700		Cu	e Fastene rrent 3 9 8 7 5~6	rs) 1 1 1 1 1 10 10 10 10 10 10 10 10 10 1
	M5	Speed[r.p.m.]	1500 1300 Hard 4800 4500 4000 3500 2500 2500 2100 2000 1700 1500		Cur 2 13 12 11 10 9 7~8	eners) rent 3 15	4	1500 1300 Mediur 4800 4500 4000 3500 2600 2500 2100 2000 1700 1500	m Joint (F	2 10 9 8 7	0 oated with rent 3 15 14 13 12 11	FIPG)	1500 1300 1300 8 4800 4500 4000 3500 3500 2600 2500 2100 2000 1700 1500		Cu	e Fastene rrent 3 9 8 7 5~6	rs) 1 1 1 1 1 10 10 10 10 10 10 10 10 10 1
	M5	Speed[r.p.m.]	1500 1300 Hard 4800 4500 3500 3000 2600 2500 2100 2100 1700		Cur 2 13 12 11 10 9 7~8	ners) rent 3 15 14	4	1500 1300 Mediur 4800 4500 4500 3500 2600 2500 2100 2000 1700	m Joint (F	asteners c Cur 2 10 9 8 7 5~6	oated with rent 3 15 14 13 12	FIPG)	1500 1300 8 4800 4500 3500 2600 2500 2100 2000 1700		2 2	e Fastene rrent 3 9 8 7 5~6	rs) 1 1 1 1 1 10 10 10 10 10 10 10 10 10 1
	M5	Speed[r.p.m.]	1500 1300 Hard 4800 4500 4000 3500 2500 2500 2100 2000 1700 1500	1	Cur 2 13 12 11 10 9 7~8 5~6	rent 15 14 Inv	4 alid	1500 1300 Mediur 4800 4500 4000 3500 2600 2500 2100 2000 1700 1500	n Joint (F	2 10 9 8 7 5~6	0 atted with rent 3 15 14 13 12 11 1nv	FIPG) 4	1500 1300 1300 8 4800 4500 4000 3500 3500 2600 2500 2100 2000 1700 1500	1	Cul 2	e Fastene rrent 3 9 8 7 5~6	1 1 1 10 valid
	M5	Speed[r.p.m.]	1500 1300 Hard 4800 4500 4000 3500 2600 2500 2100 2000 1700 1500		Cur 2 13 12 11 10 9 7~8 5~6	ners) rent 3 15 14	4	1500 1300 Mediur 4800 4500 4000 3500 2600 2500 2100 2000 1700 1500	m Joint (F	2 10 9 8 7 5~6 Cur	oated with rent 3 15 14 13 12	FIPG)	1500 1300 8 8 4800 4500 4000 3500 3500 2600 2500 2100 2000 1700 1500 1300		2 2	e Fastene rrent 3 9 8 7 5~6	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
	M5	Speed[r.p.m.]	1500 1300 Hard 4800 4500 4000 3500 2600 2500 2100 2000 1700 1300	1	Cur 2 13 12 11 10 9 7~8 5~6 Cur 2 13	rent 15 14 Inv	4 alid	1500 1300 1300 Mediur 4800 4500 4000 3500 2600 2500 2100 2000 1700 1500 4800	n Joint (F	2 10 Cur 2 10	oated with rent 3 3 15 14 13 12 11 11 Invertent 3	FIPG) 4	1500 1300 8 4800 4500 4500 3500 3500 2600 2500 2100 2000 1700 1500 1300	1	Cul 2	e Fastene rrent 3 9 8 7 5~6	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
	M5	Speed[r.p.m.]	1500 1300 Hard 4800 4500 4000 3500 2600 2500 2100 2100 1700 1500 1300	1	Cur 2 13 12 11 10 9 7~8 5~6 Cur 2 13 12	rent 15 14 Inv	4 alid	1500 1300 Mediur 4800 4500 4000 3500 3500 2600 2500 2100 2100 1700 1500 1300 4800 4500	n Joint (F	2 10 9 Cur 2 10 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	0 atted with rent 3 15 14 13 12 11 11 11 11 11 11 11 11 11 11 11 11	FIPG) 4	1500 1300 8 4800 4500 4000 3500 2600 2500 2100 2100 1700 1500 1300 4800 4500	1	Cul 2	e Fastene rrent 3 9 8 7 5~6	rs) 4 11 11 10- 10- valid
	M5		1500 1300 Hard 4800 4500 4000 3500 2600 2500 2100 2000 1700 1500 1300	1	Cur 2 11 10 9 7~8 5~6 Cur 2 13 12 11 11 11 11 11 11 11 11 11 11 11 11	rent 15 14 Inv	4 alid	1500 1300 Mediur 4800 4500 4000 3500 2500 2500 2100 2000 1700 1500 1300 4800 4500 4000	n Joint (F	2 10 9 8 7 7 5~6 Cur 2 10 9 8 8 7 8 7 8 7 8 8 8 7 8 8 8 7 8 8 8 7 8	oated with rent 3 15 14 13 12 11 Inverent 3 15 14 11 11 11 11 11 11 11 11	FIPG) 4	1500 1300 8 4800 4500 4000 3500 2600 2500 2100 2000 1700 1500 1300 4800 4500 4000	1	Cul 2	e Fastene rrent 3 9 8 7 5~6	valid
	M5		1500 1300 Hard 4800 4500 4000 3500 2100 2100 2100 1700 1300	1	Cur 2 13 12 11 10 9 7~8 5~6 Cur 2 13 12 11 10 10	15 14 Inv.	4 alid	1500 1300 1300 4800 4500 4000 3500 2100 2100 2200 1700 1300 4800 4500 4500 4500 4500 4500 4500	n Joint (F	2 10 9 8 7 5~6 Cur 2 10 9 8 7 7 5 7 6 10 9 8 8 7 7 7 5 7 6 10 9 8 8 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	oated with rent 3 15 14 13 12 11 11 11 11 11 11 11 11 11 11 11 11	FIPG) 4	1500 1300 1300 8 4800 4500 3500 3500 2500 2100 2000 1700 1300 4800 4500 4500 4500 4500	1	Cul 2	e Fastene rrent 3 9 8 7 5~6	valid
	M5		1500 1300 1300 4800 4500 4000 3500 2500 2100 2000 1700 1500 4800 4500 4000 3500 3500 3000	1	Cur 2 11 10 9 7~8 5~6 Cur 2 13 12 11 11 11 11 11 11 11 11 11 11 11 11	rent 15 14 Inv	4 alid	1500 1300 1300 4800 4500 4000 3500 2600 2500 2100 2000 1700 1500 4800 4500 4000 3300 3000	n Joint (F	2 10 9 8 7 7 5~6 Cur 2 10 9 8 8 7 8 7 8 7 8 8 8 7 8 8 8 7 8 8 8 7 8	oated with rent 3 15 14 13 12 11 Inverent 3 15 14 11 11 11 11 11 11 11 11	FIPG) 4	1500 1300 1300 8 4800 4500 4000 3500 2500 2100 2000 1700 1500 4800 4500 4500 4500 3500 3500 3500 3500 35	1	Cul 2	e Fastene rrent 3 9 8 7 5~6	valid
ize			1500 1300 1300 Hard 4800 4500 4000 3500 2600 2500 2100 1700 1500 1300 4800 4500 4000 3500 3000 2600 2600	1	Cur 2 11 10 9 Cur 2 13 12 11 10 9 9	15	4 alid	1500 1300 4800 4500 4000 3500 3500 2600 2500 2100 2100 1700 1500 1300 4500 4500 4500 4500 4500 4500 4500 4	n Joint (F	2 10 9 8 7 5~6 Cur 2 10 9 8 7 7 5 7 6 10 9 8 8 7 7 7 5 7 6 10 9 8 8 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	oated with rent 3 15 14 13 12 11 Inverse of the state of the st	FIPG) 4	1500 1300 8 4800 4500 4000 3500 2500 2100 2100 1700 1500 1300 4500 4500 4000 3500 2500 2000 2000 2000 2000 2000 2	1	Cul 2	e Fastene rrent 3 9 8 7 5~6	valid
			1500 1300 1300 Hard 4800 4500 4000 3500 2600 2500 2100 1700 1500 1300 4800 4000 3500 3000 2600 2000 2000 2000 2000 2000 20	1	Cur 2 13 12 11 10 9 7~8 5~6 Cur 2 13 12 11 10 10	15 14 Inv.	4 alid	1500 1300 Mediur 4800 4500 4000 3500 2500 2100 2000 1700 1500 1300 4800 4500 4000 3500 3500 3500 3500 2500 2500 2500 2	n Joint (F	2 10 9 8 7 5~6 Cur 2 10 9 8 7 7 5 7 6 10 9 8 8 7 7 7 5 7 6 10 9 8 8 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	oated with rent 3 15 14 13 12 11 11 11 11 11 11 11 11 11 11 11 11	FIPG) 4	1500 1300 8 4800 4500 4000 3500 2600 2500 2100 1700 1500 1300 4800 4000 3500 3500 3500 3500 2600 2500	1	Cul 2	e Fastene rrent 3 9 8 7 5~6	valid
		Speed[r.p.m.] Speed[r.p.m.]	1500 1300 1300 Hard 4800 4500 4000 3500 2500 2100 2100 1700 1300 4800 4500 4900 3500 3500 2500 2500 2500 2500 2500 25	1	Cur 2 13 12 11 10 9 7~8 5~6 Cur 2 13 12 11 10 9 7~8	15	4 alid	1500 1300 1300 4800 4500 4000 3500 2600 2500 2100 2100 1300 4800 4500 4500 4500 3500 2500 2500 2500 2500 2500 2500 2	n Joint (F	2 10 9 8 7 5~6 Cur 2 10 9 8 7 7 5 7 6 10 9 8 8 7 7 7 5 7 6 10 9 8 8 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	oated with rent 3 15 14 13 12 11 Inverse of the state of the st	FIPG) 4	1500 1300 1300 8 4800 4500 4000 3500 2500 2100 2000 1700 1300 4800 4500 4500 4500 4500 2500 2500 2500 25	1	Cul 2	e Fastene rrent 3 9 8 7 5~6	valid
			1500 1300 1300 4800 4500 4000 3500 2500 2100 2000 1700 1500 4500 4000 3500 3000 2500 2500 2500 2500 2500 2	1	Cur 2 11 10 9 Cur 2 13 12 11 10 9 9	15 14 Inv.	alid 4	1500 1300 1300 4800 4500 4000 3500 2500 2100 2000 1700 1500 4500 4500 4500 4500 4500 4500 45	n Joint (F	2 10 9 8 7 5~6 Cur 2 10 9 8 7 7 5 7 6 10 9 8 8 7 7 7 5 7 6 10 9 8 8 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	oated with rent 3 15 14 13 12 11 15 14 13 12 11 15 14 13 12 11 11 11 11 11 11 11 11 11 11 11 11	FIPG) 4 valid	1500 1300 1300 8 4800 4500 3500 2500 2100 2000 1700 1500 4500 4500 4500 4500 4500 2500 2500 2	1	Cul 2	e Fastene rrent 3 9 8 7 5~6 Inversely 9 8 7 5~6	2 4 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
			1500 1300 1300 Hard 4800 4500 4000 3500 2600 2500 2100 1700 1500 4800 4500 4500 4500 4500 2600 2500 2100 2600 2500 2100 2100 2100 2100 2100 2100 21	1	Cur 2 13 12 11 10 9 7~8 5~6 Cur 2 13 12 11 10 9 7~8	15 14 Inv.	4 alid	1500 1300 4800 4500 4000 3500 3500 2600 2500 2100 1700 4800 4500 4000 3500 3500 3500 4000 2600 2500 2100 2600 2500 2100 2600 2600 2700 2700 2700 2700 2700 27	n Joint (F	2 10 9 8 7 5~6 Cur 2 10 9 8 7 7 5 7 6 10 9 8 8 7 7 7 5 7 6 10 9 8 8 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	oated with rent 3 15 14 13 12 11 Inverse of the state of the st	FIPG) 4 valid	1500 1300 8 4800 4500 4000 3500 2600 2500 2100 1700 1300 4800 4000 3500 3500 3000 4000 2600 2500 2500 2000 1700	1	Cul 2	e Fastene rrent 3 9 8 7 5~6 Inversely 9 8 7 5~6	rs)
			1500 1300 1300 Hard 4800 4500 4000 3500 2100 2100 2100 1500 1300 4800 4500 4500 4500 4500 2500 2500 2500 25	1	Cur 2 13 12 11 10 9 7~8 5~6 Cur 2 13 12 11 10 9 7~8	15 14 Inv.	alid 4	1500 1300 1300 Mediur 4800 4500 4000 3500 2100 22000 1700 4800 4500 4500 4500 4500 4500 4500 45	n Joint (F	2 10 9 8 7 5~6 Cur 2 10 9 8 7 7 5 7 6 10 9 8 8 7 7 7 5 7 6 10 9 8 8 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	oated with rent 3 15 14 13 12 11 15 14 13 12 11 15 14 13 12 11 11 11 11 11 11 11 11 11 11 11 11	FIPG) 4 valid	1500 1300 1300 1300 1300 4800 4500 3500 2500 2100 2000 1700 4800 4500 4500 3500 3500 3500 3500 3500 35	1	Cul 2	e Fastene rrent 3 9 8 7 5~6 Inversely 9 8 7 5~6	2 4 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
			1500 1300 1300 Hard 4800 4500 4000 3500 2600 2500 2100 1700 1500 4800 4500 4500 4500 4500 2600 2500 2100 2600 2500 2100 2100 2100 2100 2100 2100 21	1	Cur 2 13 12 11 10 9 7~8 5~6 Cur 2 13 12 11 10 9 7~8 5~6	15 14 Inv	alid 4	1500 1300 4800 4500 4000 3500 3500 2600 2500 2100 1700 4800 4500 4000 3500 3500 3500 4000 2600 2500 2100 2600 2500 2100 2600 2600 2700 2700 2700 2700 2700 27	n Joint (F	asteners c Cur 2 10 9 8 7 5 ~ 6 Cur 2 10 9 8 8 7 5 ~ 6	oated with rent 3 15 14 13 12 11 11 11 15 15 14 13 12 11 15 11 11 11 11 11 11 11 11 11 11 11	FIPG) 4 valid	1500 1300 8 4800 4500 4000 3500 2600 2500 2100 1700 1300 4800 4000 3500 3500 3000 4000 2600 2500 2500 2000 1700	1	Cul 2	e Fastene rrent 3 9 8 7 5 ~ 6	2 4 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
			1500 1300 1300 Hard 4800 4500 4000 3500 2100 2100 2100 1500 1300 4800 4500 4500 4500 4500 2500 2500 2500 25	1	Cur 2 11 10 9 7~8 Cur 2 13 12 11 10 9 7~8 5~6 Cur 2 13 12 11 10 9 9 7~8 5~6 Cur	15	alid 4	1500 1300 1300 Mediur 4800 4500 4000 3500 2100 22000 1700 4800 4500 4500 4500 4500 4500 4500 45	n Joint (F	2 10 9 8 7 5~6 Cur 2 10 9 8 8 7 5 6 Cur 2	oated with rent 3 15 14 13 12 11 Inverse 15 14 13 12 Inverse 15 14 13 12 Inverse 15 Inve	FIPG) 4 valid 4	1500 1300 1300 1300 1300 4800 4500 3500 2500 2100 2000 1700 4800 4500 4500 3500 3500 3500 3500 3500 35	1	Cul 2	e Fastene rrent 3 9 8 7 5~6 Inv rrent 3 9 Inv rrent	valid
			1500 1300 Hard 4800 4500 4000 3500 2600 2500 2100 1700 1500 4800 4500 4500 2000 1700 1500 1300	1	Cur 2 13 12 11 10 9 7~8 5~6 Cur 2 13 12 11 10 9 7~8 5~6	15	alid 4	1500 1300 Mediut 4800 4500 4000 3500 2600 2500 2100 1700 1500 4000 3500 3000 4000 2500 2100 2500 2100 2500 2100 2500 2100 2500 2100 2500 2100 2500 2100 2500 2100 2500 2100 2500 2100 2500 2100 2500 2100 2500 2100 2500 2100	n Joint (F	asteners c Cur 2 10 9 8 7 5 ~ 6 Cur 2 10 9 8 8 7 5 ~ 6	oated with rent 3 15 14 13 12 11 Inverent 3 15 14 11 Inverent 3 15 14 13 12 Inverent 3 15 17 Inverent 3 18 Inverent 3	FIPG) 4 valid	1500 1300 1300 8 4800 4500 4000 3500 2600 2500 2100 1700 1500 4800 4500 4000 3500 3500 3500 3500 3500 35	1	Cul 2	e Fastene rrent 3 9 8 7 5 ~ 6 Interpret 3 9 9 8 7 5 ~ 6	valid
			1500 1300 1300 4800 4500 4000 3500 2500 2100 2100 1700 1300 4800 3500 2500 2100 2100 2000 1700 1500 2000 2100 2000 1700 1300	1	Cur 2 11 10 9 7~8 Cur 2 13 12 11 10 9 7~8 5~6 Cur 2 13 12 11 10 9 9 7~8 5~6 Cur	15	alid 4	1500 1300 1300 Mediur 4800 4500 4000 3500 2600 2100 2100 2100 1500 4300 4500 4500 4500 1500 1300 2500 2500 2500 2500 2500 2500 2500 2	n Joint (F	2 10 9 8 7 5~6 Cur 2 10 9 8 8 7 5 6 Cur 2	oated with rent 3 15 14 13 12 11 11 11 11 11 11 11 11 11 11 11 11	FIPG) 4 valid 4	1500 1300 1300 1300 1300 4800 4500 3500 2500 2100 2000 1700 1500 4500 4500 4500 4500 2500 2500 2500 2	1	Cul 2	e Fastene rrent 3 9 8 7 5~6 Inverse Invers	rs) 11 11 11 10- 10- 11 11 11 10- 10- 10-
			1500 1300 1300 4800 4500 4000 3500 2600 2500 2100 1700 1500 4500 4000 3500 3000 2600 2500 2100 2000 1700 1500 1300 2600 2500 2500 2500 4000 4500 4500 4500 45	1	Cur 2 11 10 9 7~8 Cur 2 13 12 11 10 9 7~8 5~6 Cur 2 13 12 11 10 9 9 7~8 5~6 Cur	15	alid 4	1500 1300 1300 4800 4500 4000 3500 2500 2100 2000 1700 4500 4500 4000 3500 3500 3500 2000 1700 1500 2000 1700 1500 1500 2500 2500 4000 4000 4000 4000 4000 4	n Joint (F	2 10 9 8 7 5~6 Cur 2 10 9 8 8 7 5 6 Cur 2	oated with rent 3 15 14 13 12 11 11 15 14 13 12 11 11 11 11 11 11 11 11 11 11 11 11	FIPG) 4 valid 4 4	1500 1300 1300 1300 1300 4800 4500 2600 2500 2100 2000 1700 4500 4500 2600 2500 2500 2100 4500 2500 2500 2500 2500 2500 2500 4500 4	1	Cul 2	e Fastene rrent 3 9 8 7 5 ~ 6 Inv rrent 3 9 8 7 5 ~ 6	rs) 4 11 10- 10- 10- 11 11 10- 10- 10- 10- 10
		Speed[r.p.m.]	1500 1300 1300 Hard 4800 4500 4000 3500 2600 2200 1700 1500 1300 2600 2500 2100 2000 1700 1500 2600 2600 2600 2600 2600 2600 2600 2	1	Cur 2 11 10 9 7~8 Cur 2 13 12 11 10 9 7~8 5~6 Cur 2 13 12 11 10 9 9 7~8 5~6 Cur	15	alid 4	1500 1300 Medium 4800 4500 4000 3500 3500 2600 2500 2100 1700 1500 4800 2600 2500 2100 2000 1700 1500 1300 4800 4800 44800 44800 44800 44800 44800 44800 44800 44800 44800 44800	n Joint (F	2 10 9 8 7 5~6 Cur 2 10 9 8 8 7 5 6 Cur 2	oated with rent 3 15 14 13 12 11 Invariant Sample S	FIPG) 4 4 Alid 4 25	1500 1300 1300 8 4800 4500 4000 3500 3500 2600 2500 2100 1700 1500 4800 4000 2600 2500 2100 1700 1500 1300 2600 2500 2500 4800 2600 2600 2600 2600 2600 4600 4600 46	1	Cul 2	e Fastene rrent 3 9 8 7 7 5~6 Inverse 1 3 9 9 8 7 7 5~6 Inverse 2 19~20 17~18	rs) 11 11 10 10 11 11 11 10 10 10 10 10 10
Bolt Size	M6	Speed[r.p.m.]	1500 1300 1300 14800 1300 1500 1300 1500 1300 1500 1300 1500 1300 1500 1300 1500 1300 1500 1300 1500 1300 1500 1500 1300 1500 1500 1300 1500	1	Cur 2 11 10 9 7~8 Cur 2 13 12 11 10 9 7~8 5~6 Cur 2 13 12 11 10 9 9 7~8 5~6 Cur	15	alid 4	1500 1300 1300 Mediur 4800 4500 4000 3500 2600 22000 1700 1300 4800 4500 2500 2100 2000 1700 1300 4800 2500 2100 2000 1700 1300 4800 2500 2100 2000 1700 1500 1300	n Joint (F	2 10 9 8 7 5~6 Cur 2 10 9 8 8 7 5 6 Cur 2	oated with rent 3 15 14 13 12 11 11 11 11 11 11 11 11 11 11 11 11	FIPG) 4 4 Alid 4 25 24	4800 4500 2500 2100 2100 2100 2100 2100 2100 2	1	Cul 2	e Fastene rrent 3 9 8 7 5~6 Inversely 3 9 8 7 5~6 Inversely 3 9 8 7 5~6 Inversely 4 10 17~18 16	rs) 11 11 10 10 11 11 11 10 10 10 10 10 10
Bolt Size		Speed[r.p.m.]	1500 1300 1300 1400 1300 1400 1300 1500 1300 1500 1500 1300 1500 1500 1300 1500	1	Cur 2 11 10 9 7~8 Cur 2 13 12 11 10 9 7~8 5~6 Cur 2 13 12 11 10 9 9 7~8 5~6 Cur	15	alid 4	1500 1300 1300 Mediur 4800 4500 3500 2600 2500 2100 2100 1500 3500 3500 4500 4500 4500 4500 4500 4	n Joint (F	2 10 9 8 7 5~6 Cur 2 10 9 8 8 7 5 6 Cur 2	oated with rent 3 15 14 13 12 11 Invariant Sample S	FIPG) 4 4 Alid 4 25	1500 1300 1300 1300 1300 4800 4500 2600 2500 2100 2000 1700 1500 4500 2500 2500 2100 2000 1700 1300 2600 2500 2500 2500 2500 2500 2500 25	1	Cul 2	e Fastene rrent 3 9 8 7 7 5~6 Inverse 1 3 9 9 8 7 7 5~6 Inverse 2 19~20 17~18	rs) 11 11 10 10 11 11 11 10 10 10 10 10 10
Bolt Size	M6	Speed[r.p.m.]	1500 1300 Hard 4800 4500 4000 3500 2600 1700 1500 4500 4000 3500 3000 2600 2500 2100 4500 4500 4500 4500 4500 4500 4500 4	1	Cur 2 11 10 9 7~8 Cur 2 13 12 11 10 9 7~8 5~6 Cur 2 13 12 11 10 9 9 7~8 5~6 Cur	15	alid 4	1500 1300 1300 Mediur 4800 4500 4000 3500 2600 2700 1700 1500 4800 4500 4000 3500 2600 2700 1700 1500 1300 2600 2700 1700 1500 1700 1500 1700 1500 1700 1500 1700 1500 1700 1500 1300 2600 2500 2000 1700 1500 1300 2600 2600	n Joint (F	2 10 9 8 7 5~6 Cur 2 10 9 8 8 7 5 6 Cur 2	oated with rent 3 15 14 13 12 11 Inverse of the property of the propert	FIPG) 4 4 Alid 4 25 24	1500 1300 1300 1300 4800 4500 4000 3500 2500 2100 4500 4500 4000 3500 2500 2100 4500 2500 2500 2500 2500 2500 2500 25	1	Cul 2	e Fastene rrent 3 9 8 7 5~6 Inversely 3 9 8 7 5~6 Inversely 3 9 8 7 5~6 Inversely 4 10 17~18 16	rs) 11 11 10 10 11 11 11 10 10 10 10 10 10
Bolt Size	M6	Speed[r.p.m.]	1500 1300 1300 4800 4500 4000 3500 2600 2500 1700 1500 1300 4800 4500 4500 4500 2600 2500 2110 2500 1700 1500 1300	1	Cur 2 11 10 9 7~8 Cur 2 13 12 11 10 9 7~8 5~6 Cur 2 13 12 11 10 9 9 7~8 5~6 Cur	15	alid 4	1500 1300 Medium 4800 4500 4000 3500 2600 2500 1700 1500 4500 2000 1700 1500 1300 2600 2500 2100 2600 2500 2100 2600 2500 2100 2600 2500 3000 2500 2500 2500 2500 2500 25	n Joint (F	2 10 9 8 7 5~6 Cur 2 10 9 8 8 7 5 6 Cur 2	oated with rent 3 15 14 13 12 11 11 11 11 11 11 11 11 11 11 11 11	FIPG) 4 4 Alid 4 25 24	1500 1300 1300 8 4800 4500 4000 2500 2500 2100 2000 1700 1300 4800 4500 2500 2100 2500 2100 2500 2100 2500 2100 2500 25	1	Cul 2	e Fastene rrent 3 9 8 7 5~6 Inversely 3 9 8 7 5~6 Inversely 3 9 8 7 5~6 Inversely 4 10 17~18 16	rs) 2 11 11 11 10 10 11 11 11 11 10 10 10 10
Bolt Size	M6		1500 1300 1300 14800 1500 1300 1500 1300 1500 1300 1500 1300 1500 1300 1500 1300 1500 1300 1500 1300 1500 1300 1500 1500 1300 1500	1	Cur 2 11 10 9 7~8 Cur 2 13 12 11 10 9 7~8 5~6 Cur 2 13 12 11 10 9 9 7~8 5~6 Cur	15	alid 4	1500 1300 1300 1300 14800 4500 3500 2600 2100 2100 1500 1300 2500 2500 2100 2100 2500 3500 3500 3500 3500 3500 3500 35	n Joint (F	2 10 9 8 7 5~6 Cur 2 10 9 8 8 7 5 6 Cur 2	oated with rent 3 15 14 13 12 11 Inverse of the property of the propert	FIPG) 4 4 Alid 4 25 24	1500 1300 1300 1300 1300 4800 4500 2600 2500 2100 2100 2100 1500 1300 3500 3500 2100 2100 2100 2000 1700 2000 1700 2500 2500 2500 2500 2500 2500 2500 2	1	Cul 2	e Fastene rrent 3 9 8 7 5~6 Inversely 3 9 8 7 5~6 Inversely 3 9 8 7 5~6 Inversely 4 10 17~18 16	rs) 2 11 11 11 10 10 11 11 11 11 10 10 10 10
Bolt Size	M6	Speed[r.p.m.]	1500 1300 14800 2500	1	Cur 2 11 10 9 7~8 Cur 2 13 12 11 10 9 7~8 5~6 Cur 2 13 12 11 10 9 9 7~8 5~6 Cur	15	4 alid 4 25 24	1500 1300 1300 Mediur 4800 4500 4000 3500 2600 2500 1700 1500 4500 4500 4500 4500 4500 4500 45	n Joint (F	2 10 9 8 7 5~6 Cur 2 10 9 8 8 7 5 6 Cur 2	oated with rent 3 15 14 13 12 11 11 11 11 11 11 11 11 11 11 11 11	FIPG) 4 4 4 4 25 24 22~23	1500 1300 1300 1300 1300 4800 4500 2500 2100 2100 2100 4500 4500 4500 2500 2100 2500 2100 2500 2100 2500 25	1	Cul 2	e Fastene rrent 3 9 8 7 5 ~ 6 Inverted 3 9 8 7 5 ~ 6 Inverted 3 21 ~ 22 19 ~ 20 17 ~ 18 16 15	rs) 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
Bolt Size	M6	Speed[r.p.m.]	1500 1300 1300 14800 1500 1300 1500 1300 1500 1300 1500 1300 1500 1300 1500 1300 1500 1300 1500 1300 1500 1300 1500 1500 1300 1500	1	Cur 2 11 10 9 7~8 Cur 2 13 12 11 10 9 7~8 5~6 Cur 2 13 12 11 10 9 9 7~8 5~6 Cur	15	alid 4	1500 1300 1300 1300 14800 4500 3500 2600 2100 2100 1500 1300 2500 2500 2100 2100 2500 3500 3500 3500 3500 3500 3500 35	n Joint (F	2 10 9 8 7 5~6 Cur 2 10 9 8 8 7 5 6 Cur 2	oated with rent 3 15 14 13 12 11 11 11 11 11 11 11 11 11 11 11 11	FIPG) 4 4 Alid 4 25 24	1500 1300 1300 1300 1300 4800 4500 2600 2500 2100 2100 2100 1500 1300 3500 3500 2100 2100 2100 2000 1700 2000 1700 2500 2500 2500 2500 2500 2500 2500 2	1	Cul 2	e Fastene rrent 3 9 8 7 5 ~ 6 Inverted 3 9 8 7 5 ~ 6 Inverted 3 21 ~ 22 19 ~ 20 17 ~ 18 16 15	rs) 2 11 11 11 10 10 11 11 11 11 10 10 10 10



										N80MC							
			Hard	Joint (Ge	neral Faste			Mediur	n Joint (F		oated with	FIPG)	So	oft Joint (I			rs)
			_		1	rent					rrent					rrent	,
				1	2	3	4		1	2	3	4		1	2	3	4
			4800					4800					4800				
			4500		30			4500					4500				
			4000		29			4000					4000				
		-	3500		28			3500				29~30	3500				29~30
	M8	Speed[r.p.m.]	3000		27			3000				27~28	3000				27~28
	IVIO	兰	2600					2600				25~26	2600				25~26
		9	2500		26			2500					2500				
		gbe	2100					2100					2100				
		0,	2000		25			2000					2000				
			1700			Inv	alid	1700			Inv	alid	1700			L In	valid
			1500				and _	1500					1500				valiu
			1300					1300					1300				
			_		Cui	rent				Cu	rrent				Cu	rrent	
				1	2	3	4		1	2	3	4		1	2	3	4
			4800		40	51		4800			35		4800			32	
			4500		39	49~50	55	4500			34	49~55	4500			31	49~55
			4000		38	47~48	54	4000			33	44~48	4000			30	45~48
Ф		-	3500		36~37	45~46	53	3500			32	40~43	3500				41~44
Bolt Size	M10	Speed[r.p.m.]	3000		34~35	43~44	52	3000			30~31	36~39	3000				33~40
ä	IVITO	프	2600					2600					2600				
ш		9	2500		31~33	41~42		2500					2500				
		gbe	2100					2100					2100				
		0,	2000		30			2000					2000				
			1700			Inva	alid	1700			Inv	valid —	1700			In	valid —
			1500					1500				and	1500			L	vana
			1300					1300					1300				
			_		Cui	rent]\[Cu	rrent				Cu	rrent	
				1	2	3	4		1	2	3	4		1	2	3	4
			4800		51			4800			52		4800			52	
			4500		50			4500			51		4500			51	
			4000					4000			50		4000			50	
		-	3500					3500				55	3500				55
	M12	E.	3000			55		3000				54	3000				54
	17112	Speed[r.p.m.]	2600			54		2600				53	2600				53
		ed	2500			53		2500					2500				
		96	2100			52		2100					2100				
		,	2000					2000					2000				
			1700			Inva	lid	1700			Inv	/alid	1700			In	valid
			1500					1500					1500				
			1300					1300					1300				

			Hard	Joint (Ger				Mediur		600LMC asteners c		FIPG)	So	oft Joint (I		e Fastenei	's)
					Cur	rent	ı			Cur	rent				Cu	rrent	
				1	2	3	4		1	2	3	4		1	2	3	4
			4800 4500	-				4800 4500			8~9 7		4800 4500				9
			4000		8~9			4000			-		4000			5	7
			3500					3500			6		3500				
	ME	Speed[r.p.m.]	3000		7			3000			5		3000			4	6
	M5	[r.p	2600					2600					2600				
		960	2500		6			2500			4		2500				
		Sp	2100		_			2100					2100				
			2000 1700	-	5 4			2000 1700				L	2000 1700				Ь,
			1500	+	-4	Inv	alid	1500			In	valid	1500			In	valid
			1300					1300					1300				
					Cur	rent				Cur	rent				Cu	rrent	
				1	2	3	4		1	2	3	4		1	2	3	4
			4800		12~15			4800			40	14~15	4800			7	13~
			4500 4000	-	11 10			4500 4000			10	13 12	4500 4000			7	12 11
•			3500		9			3500		8		12	3500				10
Bolt Size		E.	3000		8			3000		- ŭ	9	11	3000				9
olt:	M6	Speed[r.p.m.]	2600					2600					2600				8
В		þee	2500		7			2500		7			2500				
		Spe	2100					2100					2100				
			2000				<u> </u>	2000				<u> </u>	2000				
			1700 1500	-		Inva	alid	1700 1500			In	valid	1700 1500			In	valid
			1300					1300					1300				
		/			Cur	rent				Cur	rent				Cu	rrent	
		`		1	2	3	4		1	2	3	4		1	2	3	4
			4800			17		4800					4800				
			4500			16		4500				20	4500			-	20
			4000			15	20	4000				19 18	4000 3500			 	19
		[.	3500 3000	-			19	3500 3000				18	3000				18 17
	M8	ā.	2600				18	2600				15~16	2600				15~
		Speed[r.p.m.]	2500					2500					2500				
		be	2100					2100					2100				
		0)	2000					2000					2000				
			1700			Inva	alid	1700			Inv	alid	1700			In	valid
			1500					1500					1500				
_			1300					1300	UDP-A	700MC			1300				
_			Hard	Joint (Ger	neral Faste	ners)		Mediur		asteners c	oated with	FIPG)	Sc	oft Joint (I	Deformabl	e Fastener	s)
					Cur	rent				Cur	rent				Cu	rrent	
				1	2	3	4		1	2	3	4		1	2	3	4
			4800 4500	-				4800 4500		12 11			4800 4500			11	13~
			4500	DUTY70				4500		- 11			4500			10	12
			4000	%				4000		10			4000				
				15													
			3500	DUTY70 %				3500			15		3500				
			3300	14				3300			13		3300				
		-		DUTY70													
	M6	p.n	3000	% 13				3000			14		3000				
		늏	2600	- 10				2600					2600				
		Speed[r.p.m.]		DUTY70													
		S	2500	% 11~12				2500			13		2500				
			2100	111-212				2100					2100				
				DUTY50													
			2000	%				2000					2000				
			1700	10		_		1700			_		1700				<u> </u>
			1700 1500			Inva	alid	1700 1500			Inv	/alid	1700 1500			In	valid
			1300	\vdash				1300					1300				
			,		Cur	rent		.555		Cur	rent	-			Cu	rrent	
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			4800		31	39		4800		21		00 15	4800				35~
			4500 4000	24 23	30 29	38 37		4500 4000		20 19	25	36~40 32~35	4500 4000			-	31~
ez Se			4000	23	29	36		3500		19	25	32~35 29~31	3500			<u> </u>	29~
Size			3500		20	- 50		5500		10	27	20 - 01					
Bolt Size			3500	DUTY90						17	23	26~28	3000				15~
Bolt Size			3500 3000	DUTY90 %	27	35	40	3000							1	1	-
Bolt Size		m.]	3000	DUTY90	27	35	40						2600				
Bolt Size	M8	r.p.m.]		DUTY90 % 19~21	27	35	40	3000 2600					2600				
Bolt Size	M8	ed[r.p.m.]	3000	DUTY90 % 19~21 DUTY70 %	27	35	40			16	22		2600 2500				
Bolt Size	M8	Speed[r.p.m.]	3000 2600 2500	DUTY90 % 19~21 DUTY70			40	2600 2500					2500				
Bolt Size	M8	Speed[r.p.m.]	3000 2600	DUTY90 % 19~21 DUTY70 % 16~18			40	2600									
Bolt Size	M8	Speed[r.p.m.]	3000 2600 2500	DUTY90 % 19~21 DUTY70 % 16~18			40	2600 2500					2500				
Bolt Size	M8	Speed[r.p.m.]	3000 2600 2500 2100 2000	DUTY90 % 19~21 DUTY70 % 16~18	26		40	2600 2500 2100 2000		16			2500 2100 2000				
Bolt Size	M8	Speed[r.p.m.]	3000 2600 2500 2100 2000	DUTY90 % 19~21 DUTY70 % 16~18	26	32~34		2600 2500 2100 2000 1700		16	22	alid	2500 2100 2000 1700			Inv	/alid
Bolt Size	M8	Speed[r.p.m.]	3000 2600 2500 2100 2000 1700 1500	DUTY90 % 19~21 DUTY70 % 16~18	26			2600 2500 2100 2000 1700 1500		16	22		2500 2100 2000 1700 1500			Inv	/alid
Bolt Size	M8	Speed[r.p.m.]	3000 2600 2500 2100 2000	DUTY90 % 19~21 DUTY70 % 16~18	26	32~34		2600 2500 2100 2000 1700		16	22		2500 2100 2000 1700		Cu		/alid _
Bolt Size	M8	Speed[r.p.m.]	3000 2600 2500 2100 2000 1700 1500	DUTY90 % 19~21 DUTY70 % 16~18	26 25	32~34		2600 2500 2100 2000 1700 1500	1	16 15	22 Inv		2500 2100 2000 1700 1500	1		rrent	valid -
Bolt Size	M8	Speed[r.p.m.]	3000 2600 2500 2100 2000 1700 1500 1300	DUTY90 % 19~21 DUTY70 % 16~18 DUTY50 % 15	26 25 Cur 2 40	32~34 Inva	alid	2600 2500 2100 2000 1700 1500 1300	1	16	22 Inv	alid 4	2500 2100 2000 1700 1500 1300	1	Cu 2	rrent 3 32	4
Bolt Size	M8	Speed[r.p.m.]	3000 2600 2500 2100 2000 1700 1500 1300 4800 4500	DUTY90 % 19~21 DUTY70 % 16~18 DUTY50 % 15	26 25 Cur 2 40 39	32~34 Inva	alid	2600 2500 2100 2000 1700 1500 1300 4800 4500	1	16 15	22 Inv	alid 4 49~50	2500 2100 2000 1700 1500 1300 4800 4500	1		3 32 31	49~
Bolt Size	М8	Speed[r.p.m.]	3000 2600 2500 2100 2000 1700 1500 1300 4800 4900 4000	DUTY90 % 19~21 DUTY70 % 16~18 DUTY50 % 15	26 25 Cur 2 40 39 38	32~34 Inva rent 3 49~50 47~48	alid	2600 2500 2100 2000 1700 1500 1300 4800 4500 4000	1	16 15	22 Inv	alid 4 49~50 44~48	2500 2100 2000 1700 1500 1300 4800 4500 4000	1		rrent 3 32	49~ 45~
Bolt Size	М8		3000 2600 2500 2100 2000 1700 1500 1300 4800 4500 4000 3500	DUTY90 % 19~21 DUTY70 % 16~18 DUTY50 % 15	26 25 Cur 2 40 39 38 36~37	32~34 Inva rent 3 49~50 47~48 45~46	alid	2600 2500 2100 2000 1700 1500 1300 4800 4500 4000 3500	1	16 15	22 Inv	4 49~50 44~48 40~43	2500 2100 2000 1700 1500 1300 4800 4500 4000 3500	1		3 32 31	4 49~ 45~ 41~
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Bolt Size			3000 2600 2500 2100 2000 1700 1500 1300 4800 4500 4000 3500 3000 2600 2500	DUTY90 % 19~21 DUTY70 % 16~18 DUTY50 % 15	26 25 Cur 2 40 39 38 36~37 34~35	32~34 Inva rent 3 49~50 47~48 45~46	alid	2600 2500 2100 2000 1700 1500 1300 4800 4500 4000 3500 3000 2600 2500	1	16 15	22 Inv	4 49~50 44~48 40~43	2500 2100 2000 1700 1500 1300 4800 4500 4000 3500 3000 2600 2500	1		3 32 31	49~ 45~ 41~
Bolt Size		Speed[r.p.m.]	3000 2600 2500 2100 2000 1700 1500 4800 4500 4000 3500 3000 2600 2500 2100	DUTY90 % 19~21 DUTY70 % 16~18 DUTY50 % 15	25 Cur 2 40 39 38 36~37 34~35 33 31~32	32~34 Inva rent 3 49~50 47~48 45~46 43~44	alid	2600 2500 2100 2000 1700 1500 1300 4800 4500 4000 3500 3500 2600 2500 2100	1	16 15	22 Inv	4 49~50 44~48 40~43	2500 2100 2000 1700 1500 1300 4500 4500 4000 3500 3500 2600 2500 2100	1		3 32 31	49~ 45~ 41~
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			Hard	Joint (Ger				Mediur		asteners c	oated with	FIPG)	Sc	oft Joint (I	Deformabl		ers)
						rent					rent					rent	
			4800	1	2	3	4 91~100	4800	1	2	3 51~52	4	4800	11	2	3	57~
	1		4500		57~60		91 100	4500			49~50	71~100 61~70	4500				54~
			4000		53~56	71~80	81~90	4000			48	58~60	4000				51~
		<u>-</u> -	3500		50~52			3500			47	55~57	3500				48~
	M12	Ë	3000		47~49	61~70		3000			46	53~54	3000				45~
	14112	불	2600					2600					2600				
		Speed[r.p.m.]	2500 2100		45~46			2500 2100			45		2500 2100				
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			1700			lan.	alid	1700			Inva	lial .	1700			Γ.	
			1500			linv	alid ——	1500			linva	ilia j	1500			Lin	valid
			1300					1300					1300				
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			4800	1	2	3	4	4800	1	2	3	4 91~100	4800	1	2	3	91~
			4500		81~83			4500			77~79	88~90	4500				86
			4000		78~80	88~90	91~100	4000			75~76	85~87	4000				81-
Φ		_	3500		76~77	85~87		3500			73~74	82~84	3500				75^
Siz	M14	Ë	3000		70~75	83~84		3000			70~72	80~81	3000				70~
Bolt Size	'*' '-	Speed[r.p.m.]	2600					2600					2600				
ш	1	990	2500					2500					2500				
	1	g	2100 2000					2100 2000					2100 2000				
	1		1700			Γ.	-11:4	1700			Γ.	-11:4	1700				
	1		1500			Inv	alid ——	1500			Inv	alid	1500			LIn	valid
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	1		4000	1	2	3	4	4000	1	2	3	4	4000	11	2	3	00-
	1		4800 4500					4800 4500				97~100 93~96	4800 4500		 		96~
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	Mac	Ē.	3000			93~96		3000					3000				L
	M16	<u>ار</u> ب	2600					2600					2600				
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		86				0			i				2100		1	1	
		Speed[r.p.m.]	2100					2100					2000				
		Spee	2000					2000			Γ.		2000 1700				L
		Spee	2000 1700			Inv	valid	2000 1700			Inv	/alid	1700			In	valid
		Spee	2000			Inv	valid	2000			Inv	/alid				In	valid
		Spee	2000 1700 1500 1300				valid	2000 1700 1500 1300		120MC			1700 1500 1300				
		Spee	2000 1700 1500 1300	Joint (Ger		ners)	valid	2000 1700 1500 1300		asteners c	oated with		1700 1500 1300	oft Joint ([Deformabl	e Fastene	
		Spee	2000 1700 1500 1300		Cur	ners)		2000 1700 1500 1300	m Joint (F	asteners c Cur	oated with	FIPG)	1700 1500 1300		Cui	e Fastene	ers)
		sees	2000 1700 1500 1300	Joint (Ger		ners)	valid 4 101~120	2000 1700 1500 1300 Mediur		asteners c	oated with		1700 1500 1300	oft Joint (I		e Fastene	ers)
		Spee	2000 1700 1500 1300 Hard 4800 4500		Cur	ners)	4 101~120	2000 1700 1500 1300 Mediur 4800 4500	m Joint (F	asteners c Cur	oated with	FIPG) 4 91~120 81~90	1700 1500 1300 Sc 4800 4500		Cui	e Fastene	66~ 61^
		Spee	2000 1700 1500 1300 Hard 4800 4500 4000		Cur	ners)	4	2000 1700 1500 1300 Mediur 4800 4500 4000	m Joint (F	asteners c Cur	oated with rrent 3 66~70 62~65	FIPG) 4 91~120 81~90 78~80	1700 1500 1300 Sc 4800 4500 4000		Cui	e Fastene	66~ 61^
			2000 1700 1500 1300 Hard 4800 4500 4000 3500		Cur 2	eners) rent 3 81~90	4 101~120	2000 1700 1500 1300 Mediur 4800 4500 4000 3500	m Joint (F	asteners c Cur	oated with rent 3 66~70 62~65 58~61	FIPG) 4 91~120 81~90 78~80 75~77	1700 1500 1300 Sc 4800 4500 4000 3500		Cui	e Fastene	66~ 61^
	M12		2000 1700 1500 1300 Hard 4800 4500 4000 3500 3000		Cur	ners)	4 101~120	2000 1700 1500 1300 Mediur 4800 4500 4000 3500 3000	m Joint (F	asteners c Cur	oated with rrent 3 66~70 62~65	FIPG) 4 91~120 81~90 78~80	1700 1500 1300 Sc 4800 4500 4000 3500 3000		Cui	e Fastene	66~ 61^
	M12		2000 1700 1500 1300 Hard 4800 4500 4000 3500 3000 2600		Cur 2 67~70	eners) rent 3 81~90	4 101~120	2000 1700 1500 1300 Mediur 4800 4500 4000 3500 3000 2600	m Joint (F	asteners c Cur	oated with rent 3 66~70 62~65 58~61	FIPG) 4 91~120 81~90 78~80 75~77	1700 1500 1300 1300 Sc 4800 4500 4000 3500 3000 2600		Cui	e Fastene	66~ 61^
	M12		2000 1700 1500 1300 Hard 4800 4500 4000 3500 3000		Cur 2	eners) rent 3 81~90	4 101~120	2000 1700 1500 1300 Mediur 4800 4500 4000 3500 3000	m Joint (F	asteners c Cur	oated with rent 3 66~70 62~65 58~61	FIPG) 4 91~120 81~90 78~80 75~77	1700 1500 1300 Sc 4800 4500 4000 3500 3000		Cui	e Fastene	66~ 61^
	M12	Speed[r.p.m.]	2000 1700 1500 1300 Hard 4800 4500 4000 3500 2600 2500		Cur 2 67~70	eners) rent 3 81~90	4 101~120	2000 1700 1500 1300 Mediur 4800 4500 4000 3500 3000 2600 2500 2100	m Joint (F	asteners c Cur	oated with rent 3 66~70 62~65 58~61	FIPG) 4 91~120 81~90 78~80 75~77	1700 1500 1300 1300 86 4800 4500 3500 3000 2600 2500 2100 2000		Cui	e Fastene	66~ 61^
	M12		2000 1700 1500 1300 Hard 4800 4500 4000 3500 2600 2500 2100 2000 1700		Cur 2 67~70 60~66	ners) rent 3 81~90 71~80	4 101~120	2000 1700 1500 1300 Mediur 4800 4500 4000 3500 2600 2500 2100 2000 1700	m Joint (F	asteners c Cur	oated with rent 3 66~70 62~65 58~61 55~57	FIPG) 4 91~120 81~90 78~80 75~77 71~74	1700 1500 1300 1300 Sc 4800 4500 3500 3000 2600 2500 2100 2000 1700		Cui	e Fastene rent 3	66~ 61~ 55~
	M12		2000 1700 1500 1300 Hard 4800 4500 4000 3500 2600 2500 2100 2000 1700 1500		Cur 2 67~70 60~66	ners) rent 3 81~90 71~80	4 101~120 91~100	2000 1700 1500 1300 Mediur 4800 4500 4000 3500 2600 2500 2100 2000 1700 1500	m Joint (F	asteners c Cur	oated with rent 3 66~70 62~65 58~61 55~57	FIPG) 4 91~120 81~90 78~80 75~77	1700 1500 1300 1300 \$c 4800 4500 4000 3500 3000 2500 2100 2000 1700 1500		Cui	e Fastene rent 3	66~ 61~ 55~
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Bolt Size		Speedfr.p.m.]	2000 1700 1500 1300 1300 4800 4500 2500 2100 2500 2100 1700 1500 1300 4500 4500 4500 4000 3500 3300 2600 2600 2600 2600	1	Cur 2 67~70 60~66 55~59 Cur 2 82~100 78~81	ners) rent 3 81~90 71~80 Inv rent 3 105~110	4 101~120 91~100 alid 4 111~120	2000 1700 1500 1300 Medium 4800 4500 3500 2500 2100 2000 1700 1300 4500 4500 4500 4500 4500 4500 4500 4	m Joint (F	asteners c Cur 2	oated with rent 3 66~70 62~65 58~61 55~57 Inv:	FIPG) 4 91~120 81~90 78~80 75~77 71~74 alid 4 111~120 86~110	1700 1500 1300 1300 4800 4500 4000 3500 2500 2100 2000 1700 1500 1300 4800 4500 4000 3500 3500 3500 3000 2500 2500 2500 2	1	Cul	e Fastene rent 3	66~ 61- 55~ 55~ 480~ 880~ 78°
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Bott Size		Speedfr.p.m.]	2000 1700 1500 1300 1300 4500 4500 2500 2500 2100 2000 1700 1500 2500 2500 2500 2500 2500 2500 25	1	Cur 2 67~70 60~66 55~59 Cur 2 82~100 78~81	ners) rent 3 81~90 71~80 71~80 105~110 101~104	4 101~120 91~100 alid 4 111~120	2000 1700 1500 1300 Medium 4800 4500 4500 2500 2100 2000 1700 3500 3000 2500 2500 2100 2000 2500 2100 2500 2100 2500 2100	m Joint (F	asteners c Cur 2	oated with rent 3 66~70 62~65 58~61 55~57 Inv. rent 3 78~81 73~77 70~72	FIPG) 4 91~120 81~90 78~80 75~77 71~74 alid 4 111~120 86~110	1700 1500 1300 1300 1300 4800 4500 4500 2500 2100 2000 1700 1500 4800 4500 4000 3500 3000 2500 2500 2100 2500 2500 2500 2500 2	1	Cul	e Fastene rent 3	66~ 61~ 55~ 86~ 74~ 70~
Bolt Size		Speedfr.p.m.]	2000 1700 1500 1300 Hard 4800 4500 2500 2100 2000 4500 4500 4500 4500 4500 4500 45	1	Cur 2 67~70 60~66 55~59 Cur 2 82~100 78~81 73~77 70~72	ners) rent 3 81~90 71~80 71~80 105~110 101~104	4 101~120 91~100 alid 4	2000 1700 1500 1300 4800 4500 2500 1300 2600 2500 4500 2500 2100 2500 2500 2500 2500 2500 2	m Joint (F	Cur 2	oated with rent 3 66~70 62~65 58~61 55~57 Inv. rent 3 78~81 73~77 70~72	FIPG) 4 91~120 81~90 78~80 75~77 71~74 alid 4 111~120 86~110 82~85	1700 1500 1300 1300 1300 1300 4800 4500 2600 2500 2100 2000 1700 4800 4000 3500 3000 2600 2500 2100 2000 1700	1	Cul 2	e Fastene rent 3	66~ 61- 55~ 86~ 78- 74- 70~
Bolt Size		Speedfr.p.m.]	2000 1700 1500 1300 1300 4500 4500 2500 2500 2100 2000 1700 1500 2500 2500 2500 2500 2500 2500 25	1	Cur 2 67~70 60~66 55~59 Cur 2 82~100 78~81 73~77 70~72	ners) rent 3 81~90 71~80 71~80 105~110 101~104	4 101~120 91~100 alid 4 111~120	2000 1700 1500 1300 Medium 4800 4500 4500 2500 2100 2000 1700 3500 3000 2500 2500 2100 2000 2500 2100 2500 2100 2500 2100	m Joint (F	Cur 2	oated with rent 3 66~70 62~65 58~61 55~57 Inv. 78~81 73~77 70~72	FIPG) 4 91~120 81~90 78~80 75~77 71~74 alid 4 111~120 86~110 82~85	1700 1500 1300 1300 1300 4800 4500 4500 2500 2100 2000 1700 1500 4800 4500 4000 3500 3000 2500 2500 2100 2500 2500 2500 2500 2	1	Cul 2	e Fastene rent 3	66~ 61~ 55~ 55~ 86~ 82~ 74~ 70~
Bolt Size		Speedfr.p.m.]	2000 1700 1500 1300 Hard 4800 4500 3500 3000 2600 2100 2000 1700 1300 2600 2500 2100 2000 1700 1500 2500 2100 2500 2100 2500 2100 2500 2100 2500 2100 2500 2100 2500 2100 2500 2100 2500 2100 2500 2100 2500 2100 2500 2100 2500 2100 2500 2100	1	Cur 2 67~70 60~66 55~59 Cur 2 82~100 78~81 73~77 70~72	ners) rent 3 81~90 71~80 71~80 105~110 101~104	4 101~120 91~100 alid 4	2000 1700 1500 1300 Medium 4800 4500 4500 2500 2100 2000 1700 4500 4500 4500 4500 4500 4500 4500 4	m Joint (F	Cur 2	oated with rent 3 66~70 62~65 58~61 55~57 Inv. rent 3 78~81 73~77 70~72	FIPG) 4 91~120 81~90 78~80 75~77 71~74 alid 4 111~120 86~110 82~85	1700 1500 1300 1300 1300 1300 4800 4500 2600 2500 2100 2000 1700 1500 3000 4800 4600 2500 2500 2100 2000 1700 1500 2500 2500 2500 2500 2500 2500 25	1	Cul 2	e Fastene rent 3	66~ 61-155-155-155-155-155-155-155-155-155-1
Bolt Size		Speedfr.p.m.]	2000 1700 1500 1300 1300 4500 4500 2500 2500 2100 2000 1700 1500 2500 2500 2500 2500 2500 2500 25	1	Cur 2 67~70 60~66 55~59 Cur 2 82~100 78~81 73~77 70~72	ners) rent 3 81~90 71~80 71~80 105~110 101~104	4 101~120 91~100 alid 4 111~120	2000 1700 1500 1300 Medium 4800 4500 4500 2500 2100 2000 1700 3500 3000 2500 2500 2100 2000 2500 2100 2500 2100 2500 2100	m Joint (F	Cur 2	oated with rent 3 66~70 62~65 58~61 55~57 Inv. 78~81 73~77 70~72	FIPG) 4 91~120 81~90 78~80 75~77 71~74 alid 4 111~120 86~110 82~85	1700 1500 1300 1300 1300 4800 4500 4500 2500 2100 2000 1700 1300 4800 4800 2500 2100 2000 1700 1300 2500 2100 2000 1700 2000 2000 2000 2000 20	1	Cul 2	e Fastene rent 3	66~ 61-155-155-155-155-155-155-155-155-155-1
Bolt Size		Speedfr.p.m.]	2000 1700 1500 1300 Hard 4800 4500 2500 2100 2100 1500 1300 4800 4500 4500 4500 4500 4500 4500 45	1	Cur 2 67~70 60~66 55~59 Cur 2 82~100 78~81 73~77 70~72 Cur 2	ners) rent 3 81~90 71~80 71~80 105~110 101~104 Inv rent 3 116~120	4 101~120 91~100 alid 4 1111~120	2000 1700 1500 1300 Mediur 4800 4500 2500 2100 2500 1500 1500 1500 1500 1	m Joint (F	Cur 2	oated with rent 3 66~70 62~65 58~61 55~57 Inv. 78~81 73~77 70~72	FIPG) 4 91~120 81~90 78~80 75~77 71~74 alid 4 111~120 86~110 82~85	1700 1500 1300 1300 4800 4500 4000 3500 3500 2600 2500 2100 1700 1500 4800 4000 2500 2500 2000 1700 1500 1300 2000 2000 2000 4000 2000 4000 2000 4	1	Cul 2	e Fastene rent 3	66~ 61-155-155-155-155-155-155-155-155-155-1
Bott Size		Speed[r.p.m.] Speed[r.p.m.]	2000 1700 1500 1300 Hard 4800 4500 3500 2500 2100 2000 1700 1500 2600 2500 2100 2000 1700 1500 2600 2600 2600 2600 2700 2600 2700 2600 2700 27	1	Cur 2 67~70 60~66 55~59 Cur 2 82~100 78~81 73~77 70~72 Cur 2	ners) rent 3 81~90 71~80 Inv rent 3 105~110 101~104 Inv rent 3	4 101~120 91~100 alid 4 1111~120	2000 1700 1500 1300 4800 4500 4000 2500 1700 1500 2100 2000 1700 1500 2500 2100 2500 2100 2500 2100 2500 2100 2500 25	m Joint (F	Cur 2	oated with rent 3 66~70 62~65 58~61 55~57 Inv. 78~81 73~77 70~72	FIPG) 4 91~120 81~90 78~80 75~77 71~74 alid 4 111~120 86~110 82~85	1700 1500 1300 1300 1300 1300 1300 1300 4800 4500 4000 3500 3000 2600 2500 2100 2000 1700 1500 2500 2100 2600 2500 2100 2600 2500 2100 2600 2500 2100 2600 2500 2100 2600 2500 2500 2100 2600 2500 2500 2500 2500 2500 2500 25	1	Cul 2	e Fastene rent 3	66~ 61-155-155-155-155-155-155-155-155-155-1
Bolt Size	M14	Speed[r.p.m.] Speed[r.p.m.]	2000 1700 1500 1300 Hard 4800 4500 3500 2600 2500 2100 2000 1700 1500 1300 2500 2500 2100 2000 1700 1500 1300 2500 2500 2500 2100 2000 2500 2500 2100 2000 2500 25	1	Cur 2 67~70 60~66 55~59 Cur 2 82~100 78~81 73~77 70~72 Cur 2	ners) rent 3 81~90 71~80 71~80 105~110 101~104 Inv rent 3 116~120	4 101~120 91~100 alid 4 1111~120	2000 1700 1500 1300 Medium 4800 4500 3500 2500 2100 2000 1700 1500 2500 2100 2000 1700 1500 2500 2100 2500 2100 2500 2100 2500 2100 2500 2100 2500 25	m Joint (F	Cur 2	oated with rent 3 66~70 62~65 58~61 55~57 Inv. 78~81 73~77 70~72	FIPG) 4 91~120 81~90 78~80 75~77 71~74 alid 4 111~120 86~110 82~85	1700 1500 1300 1300 1300 1300 1300 1300 14800 14800 1500 1300 1500 1300 1500 1300 1500 1300 1500 1300 1500 1300 1500 1300 1500 1300 1500 1300 1500 1300 1500 1300 1500 1300 1500 1300	1	Cul 2	e Fastene rent 3	66~ 61-155-155-155-155-155-155-155-155-155-1
Bolt Size		Speed[r.p.m.] Speed[r.p.m.]	2000 1700 1500 1300 Hard 4800 4500 3500 2600 2700 1500 1300 2000 1700 1500 1300 2000 1700 1500 1300 2000 1700 2000 1700 2000 1700 2000 2500 2400 2500 2400 2500 2500 25	1	Cur 2 67~70 60~66 55~59 Cur 2 82~100 78~81 73~77 70~72 Cur 2	ners) rent 3 81~90 71~80 71~80 105~110 101~104 111~115 116~120 111~115 106~110	4 101~120 91~100 alid 4 1111~120	2000 1700 1500 1300 Medium 4800 4500 3500 2600 2700 1700 1500 1300 2600 2500 2100 2000 1700 1500 1300 2500 2500 2500 2500 2500 2500 2500 2	m Joint (F	Cur 2	oated with rent 3 66~70 62~65 58~61 55~57 Inv. 78~81 73~77 70~72	FIPG) 4 91~120 81~90 78~80 75~77 71~74 alid 4 111~120 86~110 82~85	1700 1500 1300 1300 1300 1300 1300 1300 4800 2600 2500 2100 2000 1700 1500 3500 3000 2600 2500 2100 2000 1700 1300 1300 2600 2500 2100 2000 2500 2500 2600 2500 2600 2500 2600 26	1	Cul 2	e Fastene rent 3	4 66~ 61^ 55^ 100 100 100 100 100 100 100 100 100 10
Bolt Size	M14	Speed[r.p.m.] Speed[r.p.m.]	2000 1700 1500 1300 Hard 4800 4500 2500 2100 2500 1300 4800 4500 4500 4500 4500 4500 4500 45	1	Cur 2 67~70 60~66 55~59 Cur 2 82~100 78~81 73~77 70~72 Cur 2	ners) rent 3 81~90 71~80 Inv rent 3 105~110 101~104 Inv rent 3	4 101~120 91~100 alid 4 1111~120	2000 1700 1500 1300 Mediur 4800 4500 3500 2100 2500 1500 1500 1300 2500 2100 2500 2500 2100 2500 2500 25	m Joint (F	Cur 2	oated with rent 3 66~70 62~65 58~61 55~57 Inv. 78~81 73~77 70~72	FIPG) 4 91~120 81~90 78~80 75~77 71~74 alid 4 111~120 86~110 82~85	1700 1500 1300 1300 1300 1300 1300 4800 4500 2600 2500 1700 1500 1300 2600 2500 2100 2000 1700 1500 1300 2600 2500 2100 2000 2500 2100 2000 2500 25	1	Cul 2	e Fastene rent 3	66~ 61-155-155-155-155-155-155-155-155-155-1
Bolt Size	M14	Speedfr.p.m.]	2000 1700 1500 1300 Hard 4800 4500 2500 2100 2500 2100 2500 2100 2500 2100 2500 2100 2500 25	1	Cur 2 67~70 60~66 55~59 Cur 2 82~100 78~81 73~77 70~72 Cur 2	ners) rent 3 81~90 71~80 71~80 105~110 101~104 111~115 116~120 111~115 106~110	4 101~120 91~100 alid 4 1111~120	2000 1700 1500 1300 4800 4500 4500 4500 4500 2500 2100 2000 1700 1500 1300 2600 2500 2100 2500 2100 2500 2100 2500 2100 2500 2100 2500 2100 2500 2100 2500 25	m Joint (F	Cur 2	oated with rent 3 66~70 62~65 58~61 55~57 Inv. 78~81 73~77 70~72	FIPG) 4 91~120 81~90 78~80 75~77 71~74 alid 4 111~120 86~110 82~85	1700 1500 1300 1300 1300 1300 1300 1300 4800 2600 2500 2100 2000 1700 1500 1300 2600 2500 2100 2000 1700 1500 1300 2500 2100 2000 2500 2100 2000 2500 2100 2000 1700 1500 1300 2500 2500 2100 2500 2100 2500 2100 2500 2100 2500 2100 2500 2100 2500 2100 2500 25	1	Cul 2	e Fastene rent 3	4 66~ 61^ 55^ 100 100 100 100 100 100 100 100 100 10
Bolt Size	M14	Speed[r.p.m.] Speed[r.p.m.]	2000 1700 1500 1300 Hard 4800 4500 3500 2600 2100 2000 1700 1500 1300 4800 2500 2100 2000 1700 1500 1300 2500 2500 2100 2000 2500 2100 2000 2500 2100 2000 2500 2100 2000 2500 2100 2000 2500 2100 2000 2500 2100 2000 2500 2100 2000 2500 2100 2000 2500 2100 2000 2500 2100 2000 2500 2000 2500 2000 2500 2000 2500 2000 2500	1	Cur 2 67~70 60~66 55~59 Cur 2 82~100 78~81 73~77 70~72 Cur 2	Inversion (Inversion (4 101~120 91~100 alid 4 111~120	2000 1700 1500 1300 Medium 4800 4500 3500 3000 2500 1700 1500 2000 1700 1500 2500 2100 2500 2100 2500 2500 2100 2500 25	m Joint (F	Cur 2	oated with rent 3 66~70 62~65 558~61 55~57 Invierent 3 78~81 73~77 70~72 Invierent 3	FIPG) 4 91~120 81~90 78~80 75~77 71~74 alid 4 111~120 86~110 82~85	1700 1500 1300 1300 1300 1300 1300 1300 13	1	Cul 2	e Fastene rent 3	4 66~ 61^ 55^ 155^ 155^ 155^ 155^ 155^ 155^ 1
Bolt Size	M14	Speed[r.p.m.] Speed[r.p.m.]	2000 1700 1500 1300 Hard 4800 4500 2500 2100 2500 2100 2500 2100 2500 2100 2500 2100 2500 25	1	Cur 2 67~70 60~66 55~59 Cur 2 82~100 78~81 73~77 70~72 Cur 2	ners) rent 3 81~90 71~80 71~80 105~110 101~104 111~115 116~120 111~115 106~110	4 101~120 91~100 alid 4 111~120	2000 1700 1500 1300 4800 4500 4500 4500 4500 2500 2100 2000 1700 1500 1300 2600 2500 2100 2500 2100 2500 2100 2500 2100 2500 2100 2500 2100 2500 2100 2500 25	m Joint (F	Cur 2	oated with rent 3 66~70 62~65 558~61 55~57 Invierent 3 78~81 73~77 70~72 Invierent 3	FIPG) 4 91~120 81~90 78~80 75~77 71~74 alid 4 111~120 86~110 82~85	1700 1500 1300 1300 1300 1300 1300 1300 4800 2600 2500 2100 2000 1700 1500 1300 2600 2500 2100 2000 1700 1500 1300 2500 2100 2000 2500 2100 2000 2500 2100 2000 1700 1500 1300 2500 2500 2100 2500 2100 2500 2100 2500 2100 2500 2100 2500 2100 2500 2100 2500 25	1	Cul 2	e Fastene rent 3	



- Basis for Recommended Setting Value for CUT Torque Value

Setting value for CUT toque is decided by the following four (4) points.

