

User's manual



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NOTE: For other languages (ES, FR, IT, RUS, DE), please contact your local BAHCO distributor or BAHCO directly.

SAFETY



IMPORTANT: DO NOT OPERATE THE TOOL BEFORE READING THESE INSTRUCTIONS. FAILURE TO DO SO MAY RESULT IN PERSONAL INJURY OR DAMAGE TO THE TOOL.

This tool is intended for use with threaded fasteners. Any other use is not recommended.

These tools require a reaction bar. See section on torque reaction.



There is a risk of crushing between the reaction bar and work piece.

Keep hands away from reaction bar.

Keep hands away from tool output.



WARNING: Risk of flying particles.

Over torquing can cause breakage. An out of calibration torque wrench can cause part or tool breakage. Broken hand tools, sockets or accessories can cause injury.

Wear safety goggles, user and bystanders.



Be sure all components, including all adaptors, extensions, drivers and sockets are rated to match or exceed the torque being applied.

Observe all equipment, system and manufacturer's warnings, cautions and procedures when using this tool.

Use the correct size socket for the fastener.

Do not use sockets showing wear or cracks.

Replace fasteners with rounded corners.



WARNING: Electrical Shock Hazard.

Electrical shock can cause injury. Tool is not insulated.

Do not use on live electrical circuits.

INTRODUCTION

A hand torque multiplier is a precision tool that will multiply the input torque by the specified ratio.

A hand torque multiplier a planetary gear system. The outer case of the multiplier, known as the annulus, will rotate in the opposite direction to the input torque unless a reaction arm is fitted to the annulus. Without the reaction arm no torque is applied through the square drive. See section on torque reaction (Page 5) for more details.

Multipliers with a high ratio gearbox (25:1 or more) require a certain amount of windup (backlash) to be taken up before any useful tightening work is applied to the nut. In this instance an Anti Wind-Up Ratchet (AWUR) is fitted to retain all of the wind up forces. See section on AWUR (Page 10 – 11) for more details.

OPERATING INSTRUCTIONS

To operate the multiplier you will need the following:-

- ▶ Bahco or other quality impact sockets.
- ▶ Reaction Arm.
- ▶ Bahco or other quality torque wrench.

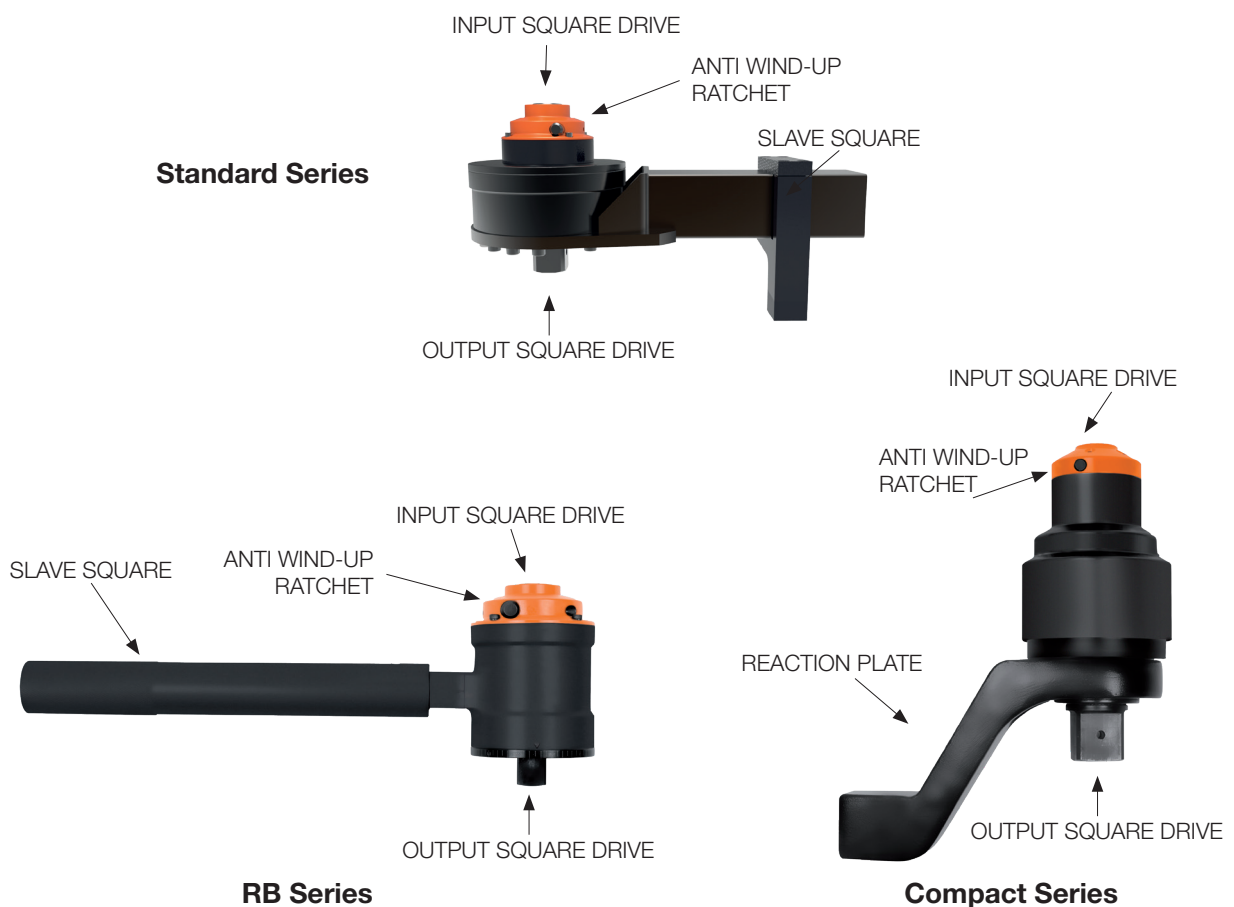


FIGURE 1

Torque Reaction

When the multiplier is in operation, the Reaction Plate rotates in the opposite direction to the Output Square Drive and must be allowed to rest squarely against a solid object or surface adjacent to the bolt to be tightened (see Figure 2).

Where the standard reaction plate is not suitable, it may be possible to adapt it. Refer to your Bahco distributor for advice.

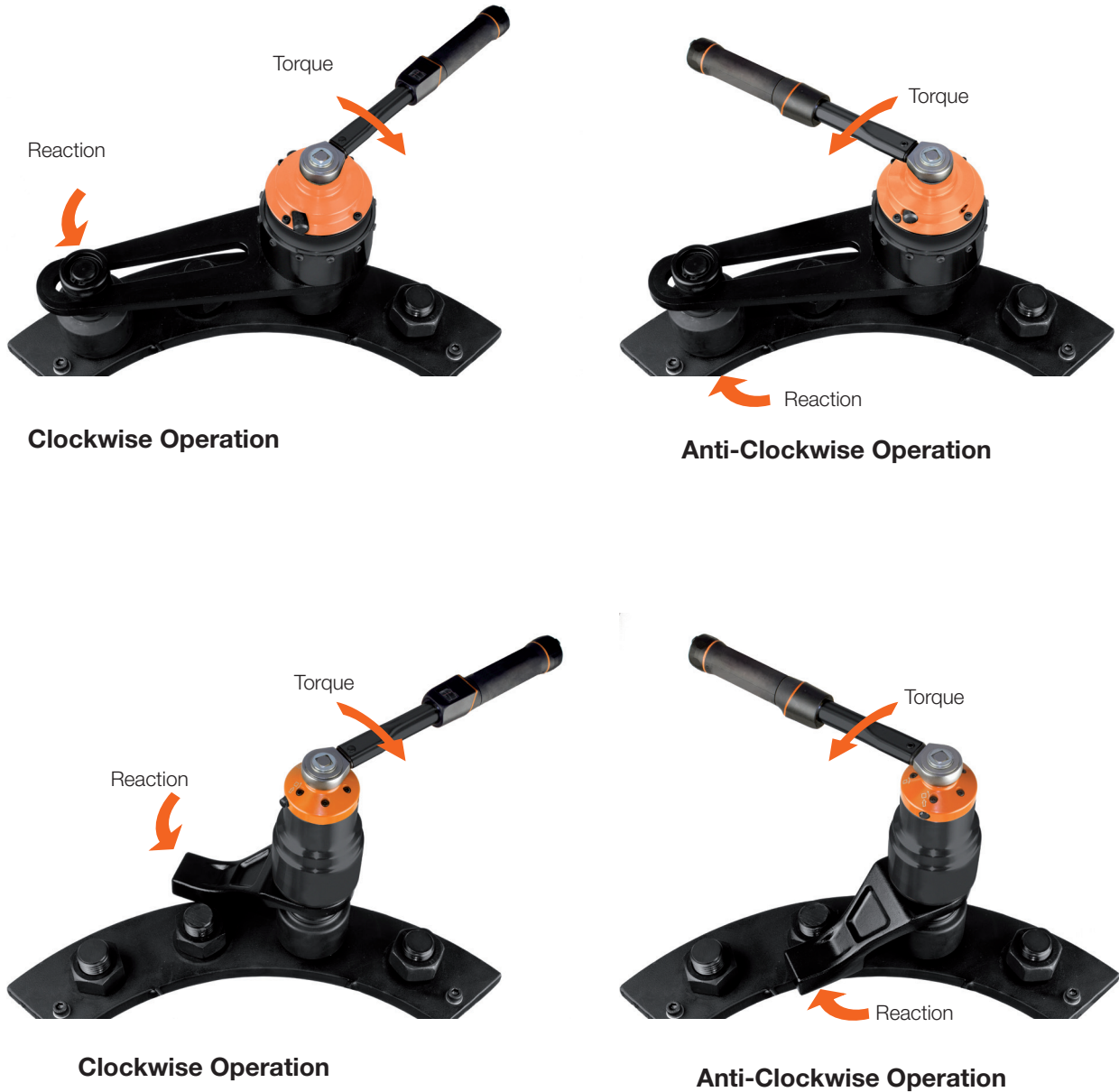


FIGURE 2

IMPORTANT: CARE MUST BE TAKEN TO ENSURE THAT THE REACTION PLATE IS ONLY USED WITHIN THE LIMITATIONS SHOWN IN FIGURES 3, 4, 5.

For special applications or where extra deep sockets must be used the standard arm may be extended but only within the limitations shown in Figures 3, 4, 5.



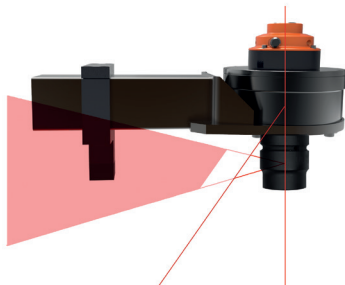
WARNING: FAILURE TO OBSERVE THE LIMITATIONS SHOWN IN FIGURES 3, 4, 5 AND 6 WHEN MODIFYING STANDARD REACTION PLATES OR MAKING SPECIALS MAY RESULT IN PREMATURE WEAR OR DAMAGE TO THE MULTIPLIER OUTPUT DRIVE.

Standard square drive extensions **MUST NOT** be used as these will cause serious damage to the wrench output drive.

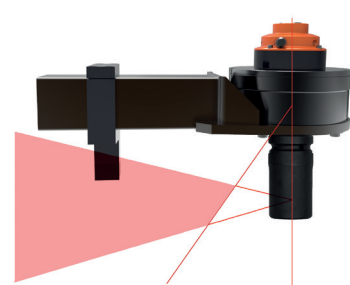
It is essential the reaction bar rests squarely against a solid object or surface adjacent to the fastener to be tightened, with reaction taken at the end of the reaction bar.

The supplied reaction bar has been designed to give an ideal reaction point when used with a standard length socket. If an extra long socket is used it may move the reaction bar outside the safe reaction window, as shown in figures 3, 4, 5. The standard reaction bar may need to be extended to ensure it remains wholly within the shaded area.

Standard Length Socket



Extra Length Socket



Torque Reaction should be taken in the shaded areas only

FIGURE 3 – Standard Series Safe Reaction Window

Standard length Socket

Extra length Socket

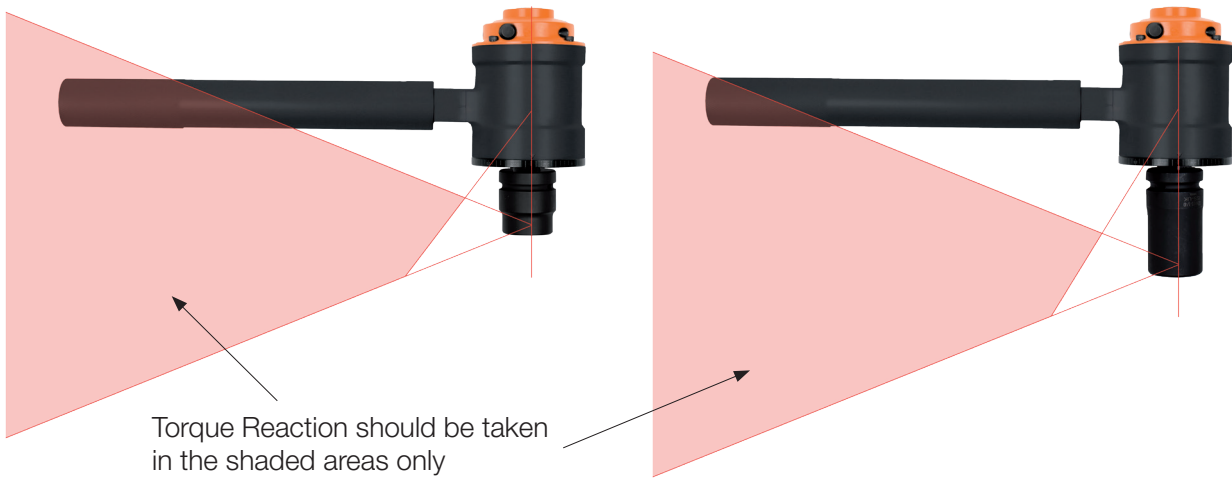


FIGURE 4 – RB Series Safe Reaction Window

Standard length Socket

Extra length Socket

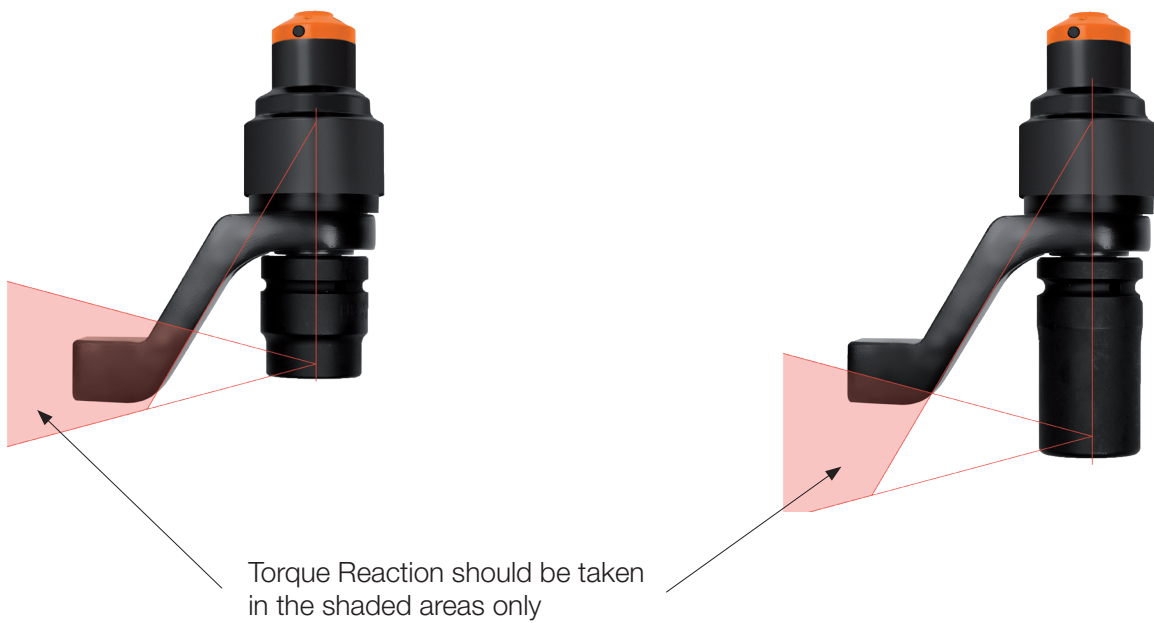


FIGURE 5 – Compact Series Safe Reaction Window

Setting Torque for Bolt Tightening (Non-Calibrated)

1. Establish the correct torque figure for the bolt from manufacturer's instructions.

NOTE: Many factors have an effect on the torque/induced load relationship and care should be taken to consider factors such as surface finish and amount/type of lubrication. In critical applications, the relationship between torque and induced load should be determined by experimentation with the actual components and lubrication used.

2. Divide the required torque by the 'Multiplication factor' of the multiplier (See Specifications section, page 13). This gives the input torque.

Example: A 9505-1700 has a 'Multiplication ratio of 5:1, so for an input torque of 1 N·m there is an output torque of 5 N·m, with a +/- 4% tolerance.

To reach the 9505-1700 maximum output torque of 1,700 N·m the below calculation is made:

$$\frac{1,700 \text{ (Required Torque)}}{5 \text{ (Multiplication Factor)}} = 340 \text{ N·m (Input Torque)}$$

3. Select a suitable torque wrench for the input torque. The wrench should be of high quality and regularly calibrated.

Setting Torque for Bolt Tightening (Calibrated)

This section only applies to multipliers that are supplied with a Certificate of Calibration (see Figure 7). The following part numbers come with a Certificate of Calibration 89222CR-1000, 9527CR-2000, 9525CR-4000 and 96255CR-7000.

1. Establish the correct torque figure for the bolt from manufacturer's instructions.

NOTE: Many factors have an effect on the torque/induced load relationship and care should be taken to consider factors such as surface finish and amount/type of lubrication. In critical applications, the relationship between torque and induced load should be determined by experimentation with the actual components and lubrication used.

2. Divide the required torque by the 'Multiplication factor' of the multiplier as stated on the Calibration Certificate included with the multiplier. This gives the input torque.

NOTE: Calibrated multipliers come with a unique Calibration Certificate which highlights the multipliers unique 'Multiplication Ratio. These multipliers will have a slight variation in the gearbox ratio, so for more accurate results the ratio on the Calibration Certificate will need to be used.

Bahco multipliers are engineered such that each gear stage has a specific velocity ratio. For example; a 25:1 gearbox has 2 stages each with a velocity ratio of 5.45:1, giving an overall velocity ratio of 29.75:1. Taking the gearbox efficiency into account the multiplication factor will give a ratio of around 25:1.

Torque output calculations are therefore a matter of simple arithmetic with little risk of incorrect bolt loading due to conversion errors. Other manufacturer's multipliers often require graphs or formulae to calculate the input torque to achieve a particular output.

Target Output		Applied Input Torque Readings				Measured Output Torque Readings			
		1	2	3	4	1	2	3	4
400.0		16.6	16.5	16.5	16.6	405.0	387.0	384.0	387.0
2400.0		95.90	95.90	98.10	96.90	2314.0	2356.0	2421.0	2390.0
4000.0		160.10	160.10	160.30	160.20	3927.0	3935.0	3943.0	3906.0

Calculated Average Multiplication Ratio: 24.21:1

Tool calibrated in accordance with Norbar test procedure GBA036.

Input Transducer Serial Number: 83191 Cert No.: 178171
 Output Transducer Serial Number: 62427 Cert No.: 182713 & 182714

FIGURE 7 – Certificate of Calibration

Supplied with Compact Series (see above for applicable models).

Example: The 9525CR-4000 Certificate of Calibration in Figure 7 displays a multiplication ratio of 24.21:1, meaning that for every 1 N·m of input, 24.21 N·m are output, with a +/- 4% tolerance.

To reach the 9525CR-4000 maximum output torque of 4,000 N·m, the below calculation is made:

$$\frac{4,000 \text{ (Required Torque)}}{24.21 \text{ (Multiplication Factor)}} = 165 \text{ N·m (Input Torque)}$$

3. Select a suitable torque wrench for the input torque. The wrench should be of high quality and regularly calibrated.

A 74WR-200+9525-400 kit has a combined accuracy of +/- 6.5%. This is taken from a combination of the +/- 3% Torque Wrench tolerance and the working variation of the multiplier's gearbox.

NOTE: The accuracy of +/- 6.5% is only valid provided the multiplication ratio on the Calibration Certificate is used and reaction is taken within the parameters demonstrated in Figure 5.

Setting Torque for Bolt Loosening

1. To ensure that the multiplier is not overloaded, it is desirable to use a torque wrench even for bolt loosening.
2. Divide the multiplier maximum output by the 'Multiplication factor'. This gives the maximum input torque.
3. Select a suitable torque wrench for the input torque.

NOTE: Some torque wrenches will not be active ('click') when used in the anti-clockwise direction.

Operating the Multiplier

1. Fit the multiplier with the correct size of power drive or impact quality socket to suit the bolt to be tightened.
2. Fit the multiplier to the bolt with the reaction plate adjacent to the reaction point. See Figure 2.
3. Fit the torque wrench to the multiplier, set as in 'Setting Torque for Bolt Tightening'.
4. Operate the torque wrench in the normal manner until it 'clicks'. Smooth and even use of the torque wrench will give more accurate results.

ANTI WIND-UP RATCHET

Purpose of the Anti Wind-Up Ratchet (AWUR)

Most multipliers with ratios of 25:1 and over are fitted with an anti wind-up ratchet. The multiplier can be thought of as a spring which must be fully wound before any tightening/untightening work can be applied to the bolt.

The AWUR ensures that the 'spring' stays wound and that any further torque input to the multiplier is applied directly to the bolt.

Familiarise yourself with the tool by initially applying low torques and removing wind-up.

There are two different types of AWUR that your multiplier may be equipped with as demonstrated below in Figure 8. The AWUR shown on the left side of the page requires a hexagon key to lock in to the neutral position. The AWUR on the right side of the page will automatically lock into the neutral position without the need for a hexagon key.

Operation of the Anti Wind-Up Ratchet

Please Read Carefully

1. Position the 'ratchet direction selector' for the appropriate direction of operation:



Clockwise Operation / Bolt Tightening



Neutral Position:

Centralise the 'ratchet direction selector'. Depending on model type this may need locking into position using a hexagon key. Check that the input square rotates freely in both directions before operation.



Anti-Clockwise Operation / Bolt Loosening



FIGURE 8

Test direction of rotation and ensure that the ratchet operates freely.



Or CW = Clockwise



Or CCW = Anti-Clockwise



Or N = Neutral



WARNING: DO NOT USE TOOL IF RATCHET DOES NOT OPERATE FREELY.

2. To apply torque, follow the instructions given earlier for setting and operating of the multiplier. Set the direction of operation for the Anti Wind-Up ratchet as shown in Figure 8.
3. **To remove the multiplier**, carefully load the gearbox until the 'ratchet direction selector' can be moved towards the neutral position. Allow the wrench to rotate slowly anti-clockwise until the multiplier becomes free.

3.1 Load the torque wrench.



FIGURE 9

3.2 With the wrench still loaded, move the 'ratchet direction selector' to anti-clockwise:



FIGURE 10

3.3 Allow the torque wrench to rotate slowly until the multiplier becomes free.



FIGURE 11

If wind-up cannot be released with one sweep of the wrench, re-engage the ratchet by pushing the 'ratchet direction selector' back to the clockwise position. Reposition the wrench and follow procedure 3 until the wind-up is fully released.

4. The tool may now be removed from the fastener.
5. Familiarise yourself with this tool by initially applying low torques and removing wind-up.

We recommend that the Anti Wind up assembly input gear and ratchet teeth are inspected annually by your Bahco approved distributor for wear or damage.

MAINTENANCE

Output Square Drive

The only user maintenance required on multipliers is the replacement of drive squares, should they become damaged. To avoid internal damage (especially due to torque overload), the output drive square / shaft have been designed to shear first. This saves major internal damage and allows easy square removal.

In some instances the square drive will not be removable without disassembling the gearbox. In these cases the multiplier should be returned to Bahco or a Bahco approved agent for repair.

However, in many cases the square drive can be replaced without disassembling the gearbox.

In these cases remove the bolt holding the drive square in position (bolt will be either M4 or M5).

Then remove the broken / damaged drive square.

Fit the new drive square.

Fit the new bolt and tighten (4.7 N·m for M4 bolts and 9 N·m for M5 bolts)



FIGURE 12



Any other maintenance or repairs should be carried out by Bahco or a Bahco approved agent and should form part of a service. Service intervals will depend on the type of usage of the tools and the environment in which they are being used.

Cleaning



Keep the tool in a clean condition to aid safety. Do not use abrasives or solvent based cleaners.

SPECIFICATIONS



RB Series

Part Number	Maximum Torque Output		Ratio	 Input Square	 Output Square
	N·m	lbf·ft		In	in
95155B-3000	3000	2200	15.5:1	1/2"	1"
9526B-4500	4500	3300	26:1	1/2"	1"

Compact Series

Part Number	Maximum Torque Output		Ratio	 Input Square	 Output Square
	N·m	lbf·ft		In	in
89222CR-1000A	1000	740	22.2:1	1/2"	3/4"
9527CR-2000	2000	1450	27:1	1/2"	1"
9525CR-4000	4000	2950	25:1	1/2"	1"
96255CR-7000	7000	5100	25.5:1	1/2"	1.1/2"

Standard Series

Part Number	Maximum Torque Output		Ratio	 Input Square	 Output Square
	N·m	lbf·ft		In	in
9505-1700	1700	1250	5:1	3/4"	1"
9525-1700	1700	1250	25:1	1/2"	1"
9505-3400	3400	2500	5:1	3/4"	1"
9525-3400	3400	2500	25:1	1/2"	1"
9605-6000	6000	4425	5:1	3/4"	1.1/2"
9625-6000	6000	4425	25:1	1/2"	1.1/2"
9625-9500	9500	7000	25:1	3/4"	1.1/2"

NOTE: Some of the ratios in the above table are a rough guide only, for more accurate results please refer to the multiplication ratio on your Certificate of Calibration provided with your multiplier (see page 8).

TROUBLE SHOOTING

The following is only a guide, for more complex faults please contact your local Bahco agent or Bahco directly.

Problem	Likely Solutions
Drive square sheared	See maintenance section.
Input drive rotates but output will not	Serious damage to internal gears, return to Bahco or agent for repair (Check AWUR change lever is not in neutral position).
Input drive will not rotate	Check AWUR change lever is in the correct position.

SNAEurope

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