TS plus Tandem Lift-Transfer Unit

Model EQ2/TR

Installation and Maintenance
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Tandem Lift-Transfer Unit

Bosch Automation
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IMPORTANT SAFETY INFORMATION

IMPORTANT: This operation and installation manual should be reviewed with all equipment operators as part of your operator training program.

SAFETY FIRST!

Important safety information is contained throughout this manual to alert you to potentially dangerous situations and help prevent accidental injury and property damage.

The safety warning symbol above has been included to warn you of hazards that can hurt or kill you and others, and/or cause serious damage to the equipment and other property.

In addition, the following safety alert words are used:

**DANGER!** Means that you or others will be seriously or fatally injured if instructions are not followed.

**WARNING!** Means that you or others may be seriously or fatally injured if instructions are not followed.

**CAUTION!** Means that you or others may be injured if instructions are not followed.

Material Hazards:

Some components, such as gearboxes, contain lubricants or other materials that can represent a potential health hazard if handled, stored, or disposed of improperly.

Please contact Bosch for copies of the Material Safety Data Sheets (MSDS) for the lubricating oil used in gearboxes and other potentially hazardous materials.

Review All Safety Information:

Please review the safety information included on page 4 and throughout this manual with all installers, operators, and maintenance personnel of this equipment.


**WARNING!**

Please read all assembly, and maintenance instructions carefully before beginning set-up of the components in this document.

Where appropriate, warning symbols have been included in this publication to alert you of potential or impending danger.

- Be sure to read and observe all safety warnings in this document as well as those attached to the individual modules. Failure to do so could result in potential risks to your health and safety as well as those around you.

- Covers and guards have been designed to eliminate pinch points and exposure to moving chains and gears. **DO NOT** operate the conveyor or any of the other components in the system with the guards removed. Serious injury may result!

- All set-up maintenance and repair work should be performed only by properly trained, qualified personnel. All operators must be properly trained in the use of this equipment.

- A qualified electrician must make all electrical connections when wiring the components installed in the TS plus system. Be sure to follow all local, state and federal regulations when installing electrical devices of any type. The customer assumes responsibility for the control system, and must provide an **EMERGENCY-OFF SWITCH** or switches for all workstation operators to meet all applicable industry and OSHA requirements. In general, emergency-off switches must be present at easily accessible locations for all operators of the installed TS plus conveyor system.

- All power supplies must be **LOCKED OUT** before beginning maintenance or repair work of any type on the conveyor system. Proper LOCK OUT procedures include the identification of the locked out power supply with a tag to prevent the accidental restoration of power.

- TS plus pneumatic components are designed to operate in a range of 4–6 Bar (58–87 psi). It is the users’ responsibility to install a filtered, regulated air supply to limit the pressure to that recommended by the manufacturer. Before beginning any maintenance or repair, bleed off the pressure lines to all components to prevent unexpected or accidental movement of a system component which could result in personal injury.

- TS plus drives, returns and conveyor sections and components are designed to transport Bosch WT2/S, WT2/A, WT2/A-H workpiece pallets. Proper usage is defined as the transport and positioning of parts and assemblies via the workpiece pallet and fixture during the assembly process. In no instances should the pallet payload, the downward force applied to the pallet, or the total load carrying capacity of the entire system be exceeded. Exceeding published specifications will result in premature wear or system failure and may cause damage to the motor, gearbox, roller chain, seals and other components.

- **CAUTION!** Do not operate or work near mechanical equipment when wearing loose clothing. Moving components such as roller chain, drive belts, drive shafts and pallets can snag long belts, scarves, ties and other loose fitting garments, and pull the worker into the equipment causing serious, or in extreme cases, life threatening injury.

- **CAUTION!** Operators having long hair must wear appropriate head protection (hair nets, hats, and hair caps) to minimize the risk associated with working near moving machinery. Hanging hair can get caught in moving components such as roller chain, drive belts, drive shafts and pallets, and pull the worker into the equipment causing serious, or in extreme cases, life threatening injury.
Introduction

Like all Bosch flexible assembly systems, TS plus is constructed solely from standardized modules that are precisely matched to each other. One important benefit of this modular design is that you can interlink manual and automatic work stations freely, making TS plus suitable for virtually any assembly task. The EQ 2/TR Tandem Lift Transfer Unit (LTU) module allows you to transfer pallets laterally off of the main conveyor line using one drive motor to power both LTUs.

About this manual

The manual is divided into the following sections to make it easier to use:

- **Design and Detailed Description** - Supplies an overview of the modules that make up the EQ 2/TR. This section will familiarize you with the modules individual components.

- **Application and Function** - Gives general information about the EQ 2/TR Tandem Lift Transfer Unit.

- **Technical Data** - Provides the most important technical specifications.

- **Assembly** - Lists step-by-step instruction for installing the EQ 2/TR

- **Initial Start-up** - Describes the final procedures for getting the EQ 2/TR up and running.

- **Maintenance** - Provides information on preventive maintenance.


This manual describes the primary components that make up the EQ 2/TR Lift Transfer Unit (refer to page 6 for a description of primary components and their functions).

Other TS plus modules are also available and vary according to the configuration of the system. These modules are described in separate manuals and include the following:

- Drives, Returns, and Conveyor Sections
- Cushioned and Standard Stop Gates, Rockers
- Proximity Switch Mounting Kits
- Accumulation Control Kits
- Lift-Position Units
- Lift-Rotate Units
- Curve Modules

Contact Bosch for information on these and any other modules for flexible assembly.

If this module was ordered as CE compliant, please contact our applications engineering department for a copy of the latest manufacturer’s CE declaration, if required for your records.
Application and Function

The EQ 2/TR Tandem Lift Transfer Unit is used to lift pallets from the transport surface of the main line and transfer them to a parallel line. It consists of a sending and receiving LTU (see Fig. 1) connected by non-powered track rollers. The sending LTU waits in “stand-by” mode below the transport surface level until a pallet passes over the LTU and is stopped by a stop gate triggering a proximity sensor that activates the LTU. The pneumatic cylinders in the LTU then energize, lifting the pallet above the transport surface of the main line. Toothed belts move the pallet perpendicularly off the main line, across the non-powered track rollers, and onto the waiting LTU. The waiting LTU then lowers the pallet back to the transport surface of the parallel line.

Technical Data

Functional dimensions for the EQ 2/TR Tandem Lift Transfer Unit are shown in Fig. 2.
$B_{wt} = \text{Workpiece Pallet Width}$
$L_{wt} = \text{Workpiece Pallet Length}$
$B_Q = \text{LTU Width}$
$B_L = \text{LTU Length}$

Direction of main transfer line flow

Direction of cross transfer line flow

Line gap “a” = 45 mm

Line gap “a” = 90 mm or 135 mm

Fig. 2
**Design and Detailed Description**

In the EQ 2/TR (Fig. 3 below), the Motor and Gearbox power the receiving LTU with a drive belt. The sending LTU is powered by means of the tandem drive kit which is connected to the drive shaft of the receiving LTU. Double acting pneumatic cylinders can lower the sending LTU below the transport surface to allow pallet pass through, or raise the pallet above the transport surface to start pallet transfer. In the upper or raised position the toothed transport belts on the LTU transfer a pallet across the track roller section onto the receiving LTU. Pneumatic cylinders on the receiving LTU lower the pallet to the transport surface of the parallel conveyor line. The protective guarding prevents accidental injury to the operator. Proximity switch mounting brackets along with proximity switches (ordered separately) can be used to detect raised/lowered status of the LTU. Quick connectors, flow controls and mufflers make it easy to plumb and control the operation for the EQ 2/TR Tandem Lift Transfer Units.

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**WARNING! DO NOT** operate the EQ 2/TR with the guards removed. Serious injury may result if the EQ 2/TR is operated without guards.

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**Tandem Lift Transfer Unit EQ 2/TR**

The EQ 2/TR Tandem Lift Transfer Unit is delivered partially assembled and consists of the main components shown below. Some of the components such as the tandem drive kit, guards and track rollers are individually packaged. Carefully check all packaging material before disposing of it.

1. Lift Transfer Unit
2. Lift Transfer Unit with drive belt
3. Motor and Gearbox Assembly
4. Protective guards
5. Flow Controls, Mufflers and Quick Connect Fitting (quantities may differ depending on size 1 or size 2).
6. Tandem Drive Kit
7. Track Rollers

---

Fig. 3
Fig. 4

**Size 1** $B_L = 160 \text{ mm}$

1. LTU With Toothed Drive Belt
2. Cover For LTU Without Driver Belt

**Size 1** $B_L \geq 240 \text{ mm}, 320 \text{ mm or } 400 \text{ mm}$

1. LTU With Toothed Drive Belt
2. LTU With Toothed Drive Belt

**Size 2** $B_L = 400 \text{ mm or } 480 \text{ mm}$

1. LTU With Toothed Drive Belt
2. LTU With Toothed Drive Belt

3. 45 mm Gap

4. Cover For LTU Without Driver Belt
5. Cover For LTU With Driver Belt

6. 90 mm and 135 mm Gap

7. 45 mm Gap

8. 90 mm and 135 mm Gap
Assembly

NOTE: Due to the stroke, all three positions can not be sensed. The assembly instructions that follow describe the installation of an EQ 2/TR Tandem Lift Transfer Unit into a standard TS plus conveyor line.

Recommended Tools

The following tools are recommended for assembling the EQ 2/TR:

1 metric hex wrench set (preferably torque wrenches)  
1 Metric allen wrench set
1 pair snap ring pliers
1 90° square
1 soft-faced hammer
1 spirit level (2-3 ft.)
1 steel strip, approximately 20 x 50 x 150 mm (l x w x h) to align LTU’s.
Using T-Bolts and T-Nuts

The EQ2/TR, like virtually all Bosch conveyor modules, is connected to the transfer system using the T-slot principle (Fig. 5). Insert the T-bolt into slot (A), and tighten down the hex nut. As it tightens, it will turn the T-bolt 90° in the slot (B), creating a friction lock (C). The same principle applies to T-nuts. The maximum allowable torque is 25 Nm (18.5 lb-ft).

**ASSEMBLY HINT:** T-Bolts also have a mark on the end of the threaded shaft that will be perpendicular to the T-slot when the T-Bolt is in its locked position.

Before you begin (Fig. 6)

To ensure proper operation and prevent premature wear, it is critical that the Lift Transfer Units be carefully aligned with each other. Take note of the location of leg sets, cross links, and other possible obstructions when selecting a location. Carefully mark the installation location before you begin and reconfirm proper alignment with a square after installation is complete. Improper alignment will result in premature wear.
Size 1 Installation: Pallet Width = 160mm to 400 mm

Install Lift Transfer Units for BL = 160mm (Fig. 7 and 9)

1. Loosen the T-Bolts in the base plate of both LTUs.

   **NOTE:** Use the spacer bar when mounting the LTU to 80 mm belt conveyor profiles. Remove it for 100 mm conveyor profiles.

2. Raise the Lift Transfer Unit with the toothed drive belt up to receiving position (Fig. 7) in the bottom of the conveyor profile, aligning the T-bolts in the bottom T-slots of the conveyor profile.

3. Tighten the flange nuts to 25 Nm (18 lb-ft).

Repeat steps 2 through 3 and install the sending Lift Transfer Unit (the one without the toothed drive belt), making sure that it is properly aligned with the receiving LTU as shown in Fig. 9. Refer to the “Assembly Hint” at the bottom of this page.

Install Lift Transfer Units for BL = 240 mm to 400 mm (Fig. 8 and 9)

**CAUTION:** Depending on the size of the Lift Transfer Unit, it may be very heavy. For larger sizes, the use of a lift, or other means of support is recommended during installation.

1. Loosen the T-Bolts in the mounting brackets of both LTUs.

   **NOTE:** The mounting brackets are attached to the LTU at the factory but must be removed for installation.

2. Remove the mounting brackets, saving the hardware, from both LTUs and using the T-bolts, loosely attach the brackets to the inner T-slots of the conveyor rails, as close to the final mounting position as possible. Do not fully tighten the T-bolts at this time.

3. Lower the Lift Transfer Unit with the toothed drive belt onto the mounting brackets at the receiving location (Fig. 8). Align the holes in the base plate of the LTU with the holes on the mounting brackets and fasten them in place with the hardware removed earlier. It may be necessary to adjust the mounting brackets to ensure proper alignment.

   **NOTE:** Do not completely tighten the mounting bracket flange nuts until both Lift Transfer Units and the track rollers have been properly aligned.

Repeat steps 2 through 3 and install the sending Lift Transfer Unit (the one without the toothed drive belt), making sure that it is properly aligned with the receiving LTU.

**ASSEMBLY HINT:** Apply air to the bottom of the lift cylinders to raise both units. This will make it much easier to check alignment using the side guides as shown in Fig. 9.
Size 2 Installation: Pallet Width = 480 mm

Install Lift Transfer Units for BL = 480 mm (Fig. 10 and 11)

1  Loosen the T-Bolts in the mounting brackets of both LTUs

**NOTE:** The mounting brackets are attached to the LTU at the factory but must be removed for installation.

2  Remove the mounting brackets, saving the hardware, from both LTUs and using the T-bolts, loosely attach the brackets to the inner T-slots of the conveyor rails, as close to the final mounting position as possible. Do not fully tighten the T-bolts at this time.

**IMPORTANT:** Install the Synchronizer bar on the Size 2 LTUs so that it is toward the center gap between the two main lines where the track rollers will be installed.

3  Lower the Lift Transfer Unit with the toothed drive belt onto the mounting brackets at the receiving location (Fig. 10). Align the holes in the base plate of the LTU with the holes on the mounting brackets and fasten them in place with the hardware removed earlier. It may be necessary to adjust the mounting brackets to ensure proper alignment.

Repeat steps 2 through 3 and install the sending Lift Transfer Unit (the one without the toothed drive belt), making sure that it is properly aligned with the receiving LTU.

**ASSEMBLY HINT:** Apply air to the bottom of the lift cylinder to raise both units. This will make it much easier to check alignment using the side guides as shown in Fig. 11.
Fig. 11
Install 90 and 135 mm Track Rollers (Fig. 12 and 13)

The 90 and 135 mm track roller sections are shipped partially assembled; however, assembly instructions are included here for your reference. 45 mm track rollers are shipped completely assembled (mounting instructions are shown on page 18).

For 90 and 135 mm line gaps, the track roller sections consist of the following parts (Fig. 12).

1. Aluminum roller profiles (x2).
2. Track roller elements 4 or 6 depending on length).
3. 45 x 45 gussets with mounting hardware and offset blocks (Q ty. 2-90 mm), (Q ty. 4-135 mm).

Assembly

1. Slide two rollers over the shafts on one roller element half. Clip the other half of the roller element in place onto the first. Be sure that the rollers turn freely (Fig. 13, inset).

   **NOTE:** Each roller element has two different halves. One half has a raised guide edge; the other half does not.

2. Clip the assembled roller elements into the aluminum roller profiles. The raised guide edge should always be on the same side for each profile (Fig. 13).

3. Use a flatblade screwdriver and remove all 4 centering tabs on the gussets as shown in the inset drawing (Fig. 14). Then insert an offset block, with the raised T-Slot guide positioned as shown, into each of the T-shaped holes in the gussets so that the T-Bolts will be offset in opposite directions. Be sure to position the raised T-slot guides as shown. This will allow the track roller section to be installed 10 mm above the main conveyor line height.
Install the Track Rollers (Fig. 15)

1. Align the guide edge of the track roller elements with the guide edge of the belt section on the adjacent Lift Transfer Units and fasten the track roller sections in place with the gussets prepared in Step 3. Be sure to install the gussets so that the transport surface of the track roller sections is 10 mm above the main conveyor (Inset Fig. 15).

2. Once the track rollers are in place, align the track rollers and both Lift Transfer Units. Tighten the flange nuts on the mounting brackets and gussets to 25 Nm (18 lb-ft).

**ASSEMBLY HINT:** Apply air to the bottom of the lift cylinder to raise both units. This will make it much easier to check alignment using the side guides as shown in Fig. 11.
Install 45 mm Track Rollers (Fig. 16 & 17)

For a line gap of 45 mm, special rollers are included, as opposed to the standard track rollers. These rollers come pre-assembled and attach to the conveyor rail T-slot.

1. Check the spacing “A” between the two conveyor sections. **It must be exactly 45 mm.**

2. Install each track roller by positioning them at an angle between the conveyor sections then turn them until the locking tab clicks into place in the T-slot.

3. Loosely install the T-nuts and socket head cap screws in the mounting flange of each track roller.

4. Refer to Fig. 17 and use a straight edge to carefully align the edge of the stop on both LTUs with the support roller on the track roller.

**ASSEMBLY HINT:** Apply air to the bottom of the lift cylinder to raise both units. This will make it much easier to check alignment using the side guides as shown in Fig. 17.

5. After the LTUs are aligned with the track rollers, tighten the mounting hardware to 10 Nm.
Checking and Adjusting Toothed Belt Tension (Fig. 18)

NOTE: Incorrect toothed belt tension can lead to premature belt failure! Always check toothed belt tension prior to initial operation!

Using a moderate amount of pressure, press upward on the belt for a deflection of approximately 10 mm (see inset #2).

To re-tension the toothed belt, loosen the 5 mm socket head cap screw on the return roller (see inset #1). Move tensioner pulley until the belt can be deflected, using a moderate amount of pressure, approximately 10 mm (see inset #2). Retighten the socket head cap screw. Recheck tension.

Fig. 18
Installing the Tandem Drive Kit (Fig. 19-22)

Power is transferred from one lift transfer unit to the other by means of a tandem drive kit.

The Tandem Drive Kit consists of the following components: (Fig. 19)

1. Toothed belt (1x)
2. Spacer bar with ball guides (1x)
3. Toothed belt drive pulleys (2x)
4. Hexagon shaft with collar (2x)
5. Snap rings (4x)
6. Support washers (2x)
7. M6 x 60 socket head cap screws with lock washers (2x)

The ball guides are pre-installed in the spacer bar at the correct location to ensure proper spacing.

To install the tandem drive kit:

**NOTE:** Fig. 19 shows the drive transfer kit parts in the general sequence in which they are installed. Refer to Steps 1 through 6 for detailed installation instructions.

Apply a light coating of white, lithium based grease to the ball guides before installation.

1. Slide a snap ring onto each hexagon shaft as shown in Fig. 20.

2. Slide a support washer onto the round end of each hexagon shaft and slide the round end through the ball guides on the spacer bar (Fig. 21). Thread the hexagon shafts into the drive shafts on the Lift Transfer Units.

3. Use one 17 mm wrench to hold the drive shafts of the Lift Transfer Units while tightening the hexagon shafts with a second 17 mm wrench.
4 Insert an M6x60 socket head cap screw with lock washer into each hexagon shaft (Fig. 22). Hold the hexagon shaft with a 17 mm wrench while tightening the cap screw with a 5 mm Allen wrench.

5 Loop the toothed belt over the toothed belt drive pulleys and slide the drive pulleys onto the hexagon shafts.

6 Secure the drive pulleys on the hexagon shafts with snap rings.
Install the Gearbox/Motor Assembly  
(Figs. 23 & 24)

The gearbox-motor assembly powers both Lift Transfer Units, one directly via a toothed belt, the other indirectly using the previously installed Tandem Drive kit. The gearbox/motor assembly attaches to the outside conveyor rails using the gearbox mounting bracket.

The gearbox-motor assembly is pre-assembled and consists of the following components (Fig. 23):

1. Gearbox mounting bracket w/fasteners
2. Gearbox
3. Motor
4. Drive Pulley
5. Idler Pulleys
6. Belt Cover Guard
Refer to Fig. 24 and use the T-bolts and flange nuts attached to the gearbox mounting bracket to loosely fasten the gearbox motor assembly to the side of the conveyor adjacent to the receiving LTU.

Remove the belt cover guard. Then route the toothed belt from the receiving LTU around the idler pulleys (see inset #1, Fig. 24). If necessary loosen the socket head cap screws on the mounting plate and pivot the mounting plate to install the toothed belt.

Tension the toothed belt. First loosen the socket head cap screws on the mounting plate then attach a spring scale to the lower notch of the mounting plate as shown. Apply a force of 200 N (44 lb-ft) to the spring scale and tighten the socket head cap screws to hold the mounting plate in position for the proper belt tension.

Carefully align the drive pulley on the motor/gear box with the toothed belt pulley on the Lift Transfer Unit. The belt should be perfectly square to the drive pulleys (see inset #2, Fig 24). Tighten the flange nuts on the gearbox mounting bracket to 25 Nm.

Tighten the mounting hardware on the guide plate.

**IMPORTANT:** Failure to properly align the pulleys and belt can lead to premature belt wear and possible bearing failure.

Press the belt cover guard into place and secure with the included screw.
**Proximity Switches (Fig. 25)**

Proximity switches are used to sense the location of the lift mechanism (raised, lowered, or centered).

Proximity switch mounting brackets are installed at the factory.

Install the proximity switch in the mounting bracket so that the sensing distance is approximately 2 mm (see inset).

Due to the stroke, all three positions can not be sensed, as three proximity switches will not fit into the bracket. It is recommended that the center “pallet stopping” position be sensed and the signal lost on the up and down stroke.

---

**Size 1 Proximity Switch Location**

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**Size 2 Proximity Switch Location**

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Fig. 25
Connect the Compressed Air Supply

**NOTE:** Use a 5/3 way open center position control valve (not included) to direct airflow to the module. A 2-way valve will not work because the center position is lost and the upward flow cannot be controlled.

The EQ 2/TR Tandem Lift Transfer Unit must be supplied with a filtered, regulated compressed air supply of 4-6 bar (58-87 psi). The customer must provide any necessary air preparation equipment.

All air connections should be made with 8 mm (5/16") pushlock type fittings. If a different air line size is used, the customer is responsible for installing the necessary fittings. Connect the fittings for the lift cylinders to the air supply manifold.

Pneumatic fittings, flow controls, mufflers and pushlock connectors are included to plumb the EQ 2/TR for “LIFT” or “LIFT AND LOWER” operation. Refer to the schematics on page 27 and Figures below and plumb the EQ 2/TR for your application.

**ASSEMBLY HINT:** In the following steps run 8mm airlines from a 5/3 way control valve to a tee fitting midway between each LTU (see the schematic). From the Tee fitting run an air line to the quick connect fittings on each lift transfer unit.

**SIZE 1 Units (BL = 160 to 400 mm)** These units have a single lift cylinder and the connections should be made directly to the cylinder as shown in Fig. 26. Carefully check the diagrams on the flow controls and make sure they are installed to correspond with the diagrams in the pneumatic schematics.

---

**Size 1 Units**

**B_L = 160 to 400 mm**

**LIFT ONLY**

- Muffler
- Straight Fitting
- "B"
- "A"
- Quick Connect Fitting

**LIFT AND LOWER**

- Quick Connect Fitting
- "C"
- "B"
- "A"
- Quick Connect Fitting

Fig. 26
**Connect the Compressed Air Supply (Continued)**

**SIZE 2 Units \(B_L = 400 \text{ to } 480 \text{ mm}\)** These units have two pneumatic lift cylinders and the units are pre-plumbed at the factory to the flow controls.

Refer to Fig. 27 and the pneumatic schematics to connect the 8 mm tubing from a control unit to the tandem LTUs for either lift only or lift and lower operation.

**Adjusting Flow Controls**

Flow controls A, B, and C can be adjusted to regulate the flow of air into and out of the LTUs. Adjustment may be required depending upon the pallet payload. Flow control adjustment is as follows.

**Flow Control A:** Controls flow of air from cylinder during lowering cycle. Increasing flow will cause the unit to lower at a faster rate. Adjust as required for payload.

**Flow Control B:** Controls flow of air into cylinder for lift cycle. Increasing flow will cause the LTU to lift at a faster rate. Adjust as required for payload.

**Flow Control C:** Controls the exhaust flow of air from cylinder as it is being lifted. Increasing air flow will cause the LTU to lift at a faster rate but also reduce end of stroke cushioning. Adjust as required for payload.
PNEUMATIC SCHEMATIC DIAGRAMS

Size 1 Units $B_L = 160$ To 400 mm
Lift Only

5/3 Way Open Center Position Valve Not Included

Size 1 Units $B_L = 160$ To 400 mm
Lift And Lower

5/3 Way Open Center Position Valve Not Included

Size 2 Units $B_L = 400$ To 480 mm
Lift Only

5/3 Way Open Center Position Valve Not Included

Size 2 Units $B_L = 400$ To 480 mm
Lift And Lower

5/3 Way Open Center Position Valve Not Included

Tee Fitting

Muffler

Tee Fitting
Connect the Motor Wiring

Make the motor electrical connections according to the connection schematic as shown (see Fig. 28). An additional copy is also attached to the motor nameplate.

**NOTE:** All electrical wiring must be connected by a qualified electrician.

For CE applications, refer to the next page for instructions on installing and connecting the terminal block. Before starting up the Lift Transfer Unit for the first time, recheck all mounting hardware for tightness.

**NOTE:** The customer assumes responsibility for the control system, and must provide an EMERGENCY-OFF SWITCH in the EQ 2/U2.

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![Connection Diagram](image-url)
For CE Applications

If a CE compliant module was ordered, an optional terminal block (Fig. 29) was included. Refer to the terminal box mounting instructions included with the terminal box. If a copy of the CE declaration is required for your records, please contact our applications engineering department for the most current version.

Terminal Block Assembly Instructions

1. Attach the terminal box to the motor according to the mounting instructions included with the terminal box. See Fig. 29.

2. Assemble the terminal block components to produce an assembly having the following order: support block, beige middle, blue middle block, orange block and beige end block. See Fig. 29.

3. Secure the terminal block assembly to the terminal box using two #4-40 screws in the position shown. Tighten in the range 3 to 5 lb-in.

4. For a "DELTA" connection, terminate the motor and line leads as follows:
   a. Insert the red-yellow motor lead, the black motor lead and a line lead into the blue middle block.
   b. Insert the black-yellow motor lead, the blue motor lead and a line lead into the orange middle block.
   c. Insert the blue-yellow motor lead, the red motor lead and a line lead into the beige end block near the motor lead exit.

5. For a “Y” connection, terminate the motor and line leads as follows:
   a. Insert the black-yellow, and blue-yellow and red-yellow motor leads into the beige middle block opposite the motor lead exit.
   b. Insert the black motor lead and a line lead into the blue middle block.
   c. Insert the blue motor lead and a line lead into the orange middle block.
   d. Insert the red motor lead and a line lead into the beige end block near the motor lead exit.
Operating Instructions

The EQ2/TR is part of the TS plus conveyor which is designed to transport Bosch WT2 workpiece pallets or WT2 workpiece pallet frames with integrated fixtures built into the pallet design. Since the conveyor is modular in design and part of a larger operating assembly system, it is the responsibility of the integrator or end user to provide a control system and operating procedures. For your safety, please observe the following guidelines when operating the conveyor:

⚠️ WARNING! ⚠️

- **Use a qualified technician who is familiar with the control system during the initial start-up.**
- **In case of control system failure, DO NOT attempt to catch or in any way prevent a pallet from falling from the end of the conveyor. Use the emergency stop switch to halt conveyor movement!**
- **KEEP HANDS CLEAR of moving conveyors and pallets. Pallet accumulation creates a crush hazard between pallets, stop gates, and guide rails. A crush and pinch hazard exists between Lift Position Units, Lift Transfer Units, and Lift Rotate Units. Assembly operations should be performed ONLY when the workpiece pallet has come to a complete stop.**
- **DO NOT perform pressing operations on a workpiece pallet without the use of a Lift Position Unit.**
- **DO NOT operate the conveyor or any other components in the system with the guards removed. It is the operator’s responsibility to make sure that all guards, covers, and other safety equipment is in place before the system is put into operation.**

⚠️ CAUTION! ⚠️

- **Do not operate or work near mechanical equipment when wearing loose clothing. Moving components such as roller chain, drive belts, drive shafts and pallets can snag long belts, scarves, ties and other loose fitting garments, pull the worker into the equipment and cause serious, or in extreme cases, life threatening injury.**
- **Operators having long hair must wear appropriate head protection (hair nets, hats, and hair caps) to minimize the risk associated with working near moving machinery. Hanging hair can get caught in moving components such as roller chain, drive belts, drive shafts and pallets, pull the worker into the equipment and cause serious, or in extreme cases, life threatening injury.**
**Stop Rail Orientation (Fig 30)**

As delivered LTU stop rails are positioned so a pallet will not stop on the LTU when it is in the centered or home position. If your application requires, either stop rail can be repositioned to stop a pallet entering the LTU prior to lift and transfer. When total pallet payload exceeds 30 kg or 12 m/min you must use a cushioned stop to halt pallet travel.

1. To change stop rail orientation, remove the socket head cap screws and turn the stop rail 180° and reattach it to the LTU.

**Installing Optional Cushioned Stop (Fig. 31)**

1. On side you are mounting the stop, position both stop blocks with the stop tab up.

2. Install stop bracket onto side of roller carrier as shown using the screws, lockwasher and hex nut included with cushioned stop.

3. Attach guard plate to bottom of stop bracket as shown.

4. Mount cushioned stop to stop bracket with mounting hardware shown.

5. Connect compressed air supply to inlet port.

**Cushioned Stop Pneumatic Diagram (Fig. 32)**

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**NOTE:** Cushioning action can be adjusted to compensate for pallet payloads. Turning screw clockwise toward + will increase cushioning.
Maintenance

**WARNING!** LOCK OUT all power supplies and release pressure from compressed air lines before beginning maintenance work of any type.

The gearbox and motor used in the TS plus conveyor are maintenance-free. The following cleaning and adjustment procedures, however, will help keep your conveyor in almost new condition if performed on a regular basis.

1. **Remove all dirt & grease.** Wipe the conveyor clean of any excess grease, dirt or any foreign substances every month, and at the same time check the conveyor unit for wear. Replace any parts showing signs of excess wear (see section titled “Repair.”)

2. **Re-tighten all fasteners.** Check all fastening elements for tightness, and re-tighten to 18 lb-ft (25 Nm), if necessary.

3. **Lubricate the toothed belts.** If the application permits, apply a thin coat of No. 10 machine oil to the toothed belts on a monthly basis to help prolong belt life.

4. **Check adjacent components.** Make sure that idler rollers turn freely, that all components are properly aligned and that there are no obstructions.

5. **Check the toothed belts and guides for wear.** The toothed belts and guides should be checked for excessive wear. If belts have stretched or worn to the point where they do not fit tightly to the pulleys, or show tears, cracks, or other visible damage, they should be replaced. If guides are worn or damaged, they should be replaced.

6. **Lubricate the spacerbar bearings (Fig. 33).** Grease the bearings on the tandem drive kit spacer bar as needed, using a white lithium-based grease.
Replacing the Belts (Fig. 34)

DANGER! LOCK OUT all power supplies before beginning maintenance work of any type.

The belts should be checked regularly for wear and damage. It is recommended that both belts on both units be replaced at the same time.

1 Remove the Tandem drive kit. Refer to page 20 and 21 and reverse steps 1 to 6, if necessary.

2 Loosen the socket head cap screws on the belt tensioner pulley (1) and slide the pulley back to release the belt tension.

3 Loosen the socket head cap screws (2) and remove the pallet guides (3).

4 Slide the old belt (4) off the return rollers and toothed drive wheel.

5 Slide the new belt over the return rollers and toothed drive wheel. The belt should be installed with the arrow-shaped weld pointing in the primary direction of transport directly adjacent to weld on the opposite belt.

6 Inspect the pallet guides for wear and replace, if necessary. Reinstall the pallet guides.

7 Push the tensioner pulley against the belt until the belt is tight (you should be able to push it in about 10 mm with your fingers), then tighten the socket head cap screws to lock the tensioner pulley. (Also see page 19 Fig. 18)

8 Reinstall the Tandem drive kit. Refer to the instruction on page 20 and 21 if necessary.

9 Check tension on belt (see page 19) and adjust if necessary.

Fig. 34
Replacing the Motor (Fig. 35)

**DANGER!** LOCK OUT all power supplies before beginning maintenance work of any type! Make sure there is no voltage present at the drive motor before proceeding.

1. Disconnect motor wiring.
2. Remove the four hex bolts holding the motor to the gearbox and lower the motor.
3. Apply anti-seize lubricant to the shaft of the new motor.
4. Carefully slide the new motor into place and secure with the bolts removed earlier.

Replacing the Gearbox

**DANGER!** LOCK OUT all power supplies before beginning maintenance work of any type! Make sure there is no voltage present at the drive motor before proceeding.

1. Disconnect motor wiring.
2. Remove the four hex bolts holding the motor to the gearbox and lower the motor.
3. Remove the drive belt mounting assembly (see page 23 if required). Save the drive belt mounting kit parts for installation on the new gearbox.
4. Remove the belt cover guard assembly, drive pulley assembly, spacer, and collar from the gearbox.
5. Reverse steps 1 to 6 above and install the components onto the new gearbox.
Protective Cover Assembly

Figure 36 shows the Protective Cover Assembly for the “powered” (receiving) lift transfer unit immediately adjacent to the motor/gearbox. Note the orientation of the assembly.

Cutout “A” is for the powered drive belt from the motor/gearbox, while cutout “B” is for the tandem drive belt kit connecting the two transfers. The components for the “non powered” (sending) LTU are similar except the side cover sheet (3) does not have cutout “A”.

**IMPORTANT:** the formed aluminum side cover (2b) and the cutout “B” must be adjacent to each other AND on the same end as the tandem transfer kit. Your installation will determine which end is correct, the view shown in Fig. 36 shows the tandem drive kit and the driven belt on the same end of the transfer.

**Scope of Delivery:**

1. Bottom aluminum cover sheet
2. End aluminum cover sheet, lower (with two tapped holes) (X2)
2a. End aluminum cover sheet, upper
2b. End aluminum cover sheet, upper
3. Side aluminum cover sheets, drive side (X2)
4. Side aluminum cover sheets, tandem side
5. Corner Bracket, LH (X2)
6. Corner Bracket, RH (X2)
7. M6 x 20 cap screw, lock washer, flat washer, M6 x 10 mm T-nut (X4)
8. Side corner rail profile (X2)
9. End corner rail profile (X2)
10. Flange screw (X4)
Step by Step Instructions for “Receiving” LTU Cover Assembly:

**INSTALLATION NOTE:** All of the corner rail profiles must be installed with the longer side on the bottom as shown. Make sure any protective film is removed from the aluminum sheets prior to assembly.

**ASSEMBLY HINT:** The four corner brackets hold the cover assembly firmly together, and the aluminum sheets fit snugly into them. To hold the corner rail profiles in place during assembly, slightly bend each aluminum sheet before sliding it into the corner rail profile.

1. Slide one end sheet (2) into the end corner rail profile (9).
2. Slide one LH and one RH corner bracket (5 and 6) onto the end sheet (2). Make sure they are oriented with the screw hole and locating nub as shown in (Fig. 37).
3. Repeat steps 1 and 2 for the other end.
4. Slide the bottom sheet (1) into the two side corner rail profiles (8).
5. Slide the two side cover sheets (3 and 4) into the side corner rail profiles (8).
6. Check for proper orientation of cutouts “A” and “B” based on the module this unit will guard.
7. Slide the two end assemblies, created in steps 1-3, onto either end of the bottom and side sheets.
8. Pre-assemble four M6 x 20 socket head cap screws, four ribbed lock washers, four flat washers and the four T-nuts into the holes on each corner bracket as shown in Fig. 37.
9. Install end sheet (2a), opposite from the end with cutout “B”, using two M6 x 12 flange head screws (10).
10. Install end sheet (2b), adjacent to the end with cutout “B”, using two M6x12 flange head screws (10).
11. Install the Protective Cover for the receiving LTU onto the bottom of the LTU by insetting the four T-nuts (7) into the bottom T-slots of the conveyor rails. Tighten the four socket head cap screws to 25 Nm (18 lb-ft).

Step by Step Instructions for “Sending” LTU Cover Assembly

1. The components for the “Sending” LTU protective cover are similar to the “Receiving” LTU except the side cover sheet (3) does not have the cutout “A”.
2. Assemble the “Sending” LTU cover following steps 1 through 11 on this page, but use the side cover sheet (3) that does not have a cutout “A”.
Module Warranty

B O S C H A U T O M A T I O N P R O D U C T S warrants to the original purchaser the modules manufactured by us to be free from defects in materials and workmanship under normal use and service. Our obligation under this warranty shall be limited to the repair or exchange of any part or parts which may thus prove defective under normal use and service within one (1) year from date of installation by the original purchaser. THIS WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES EXPRESSED OR IMPLIED, INCLUDING THE WARRANTY OF MERCHANTABILITY OR FITNESS FOR USE, AND WE NEITHER MAKE NOR AUTHORIZE ANY OTHER PERSON TO MAKE FOR US, ANY WARRANTY IN CONNECTION WITH THE SALE.

This warranty shall not apply to the modules or any part thereof that has been subject to accident, negligence, alteration, disassembly, abuse, or misuse after delivery by us. The term “Original Purchaser”, as used in this warranty, shall be deemed to mean the customer to whom the modules were originally sold.

Our obligation under this warranty is limited to the modules only, and excludes wear items, such as belts, etc., and we may not be responsible for system concept, design, engineering, or function beyond this.

For further information, contact:

BOSCH AUTOMATION PRODUCTS
816 East Third Street
Buchanan, MI 49107
Tel: 616-695-0151
Fax: 616-695-5363

Liability:

In no event can the manufacturer accept warranty claims or liability claims for damages resulting from improper use of the equipment or as a result of changes made to the equipment other than those specified in this instruction manual.

The manufacturer will accept no claims in which non-original spare parts have been used. For information on spare parts and replacement parts, refer to publication no. 8981 500 281 TS plus Spare Parts List or 8981 500 170 TS2 and TS2/C Spare Parts List.

Environmental Protection:

Always dispose of worn, damaged or obsolete parts in a responsible manner. Some components, such as gearboxes, contain lubricating oil which can pollute the environment. It is the user’s responsibility to dispose of all hazardous material within the components following all local, state and federal guidelines.

Please contact Bosch for copies of the Material Safety Data Sheets (MSDS) for the lubricating oil used in gearboxes.