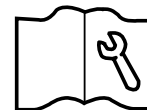


TSplus Belt Conveyor



Basic Equipment Manual

Installation and Maintenance Guide

Publication Number: 8981 500 251 4/02

Drive module, return module, leg sets,
conveyor sections, cross links, connection links,
foundation brackets, floor anchors, belt

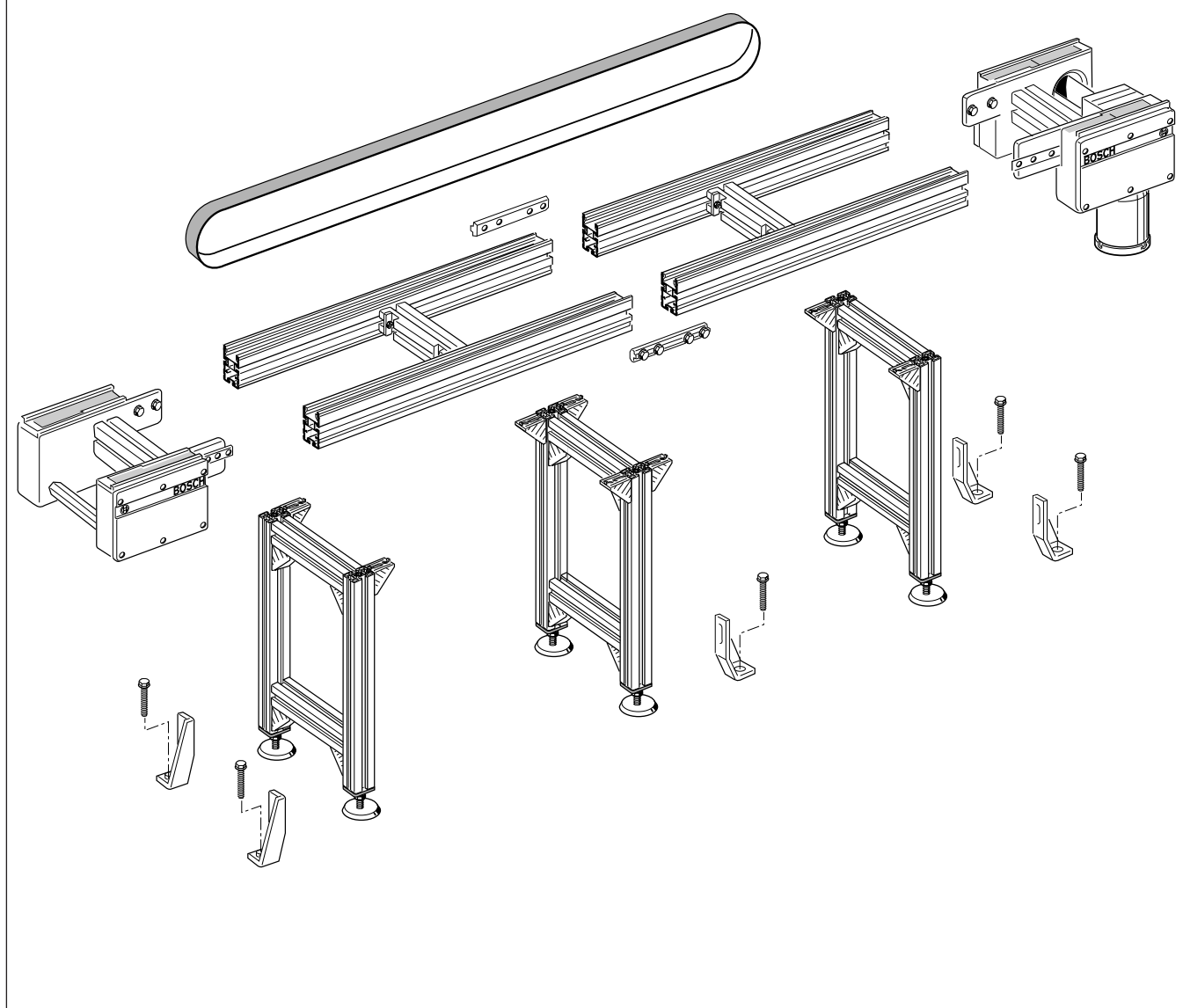


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Introduction

Like all Bosch flexible assembly systems, *TSplus* is constructed solely from standardized modules that are precisely matched to each other. One important benefit of this modular design is that you can freely interlink manual and automatic work stations, making *TSplus* suitable for virtually any assembly task. Another is that you can easily expand a *TSplus* installation: Use *TSplus* alone as a closed system, or as a sub-installation in a higher-order materials-handling, manufacturing or assembly system.

About this manual

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

Application and Function

Gives general information about the *TSplus* conveyor.

Design and Detailed Description

Supplies an overview of the modules that make up the basic *TSplus* conveyor. This section will familiarize you with the conveyor's individual components.

Assembly

Lists step-by-step instructions for setting up the conveyor.

Initial Start-up

Describes the final procedures for getting the conveyor up and running.

Maintenance

Provides information on preventive maintenance.

Repair

Gives step-by-step procedures for replacing any parts subjected to wear.

This manual describes the basic equipment for a *TSplus* belt conveyor:

- Drive
- Return
- Belt sections
- Leg sets
- Cross links
- Foundation brackets
- Belt

Modules for pallet control are also required and vary according to the configuration of the system. These modules are described in separate manuals and include the following:

- Cushioned and Standard Stop Gates, Rockers
- Proximity Switch Mounting Kits
- Accumulation Control Kits
- Code Programmers, Memory Blocks, Code Readers
- Transverse Conveyors
- Lift-Transverse Units
- Lift-Position Units
- Lift-Rotate Units
- Curve Modules

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

Application and Function

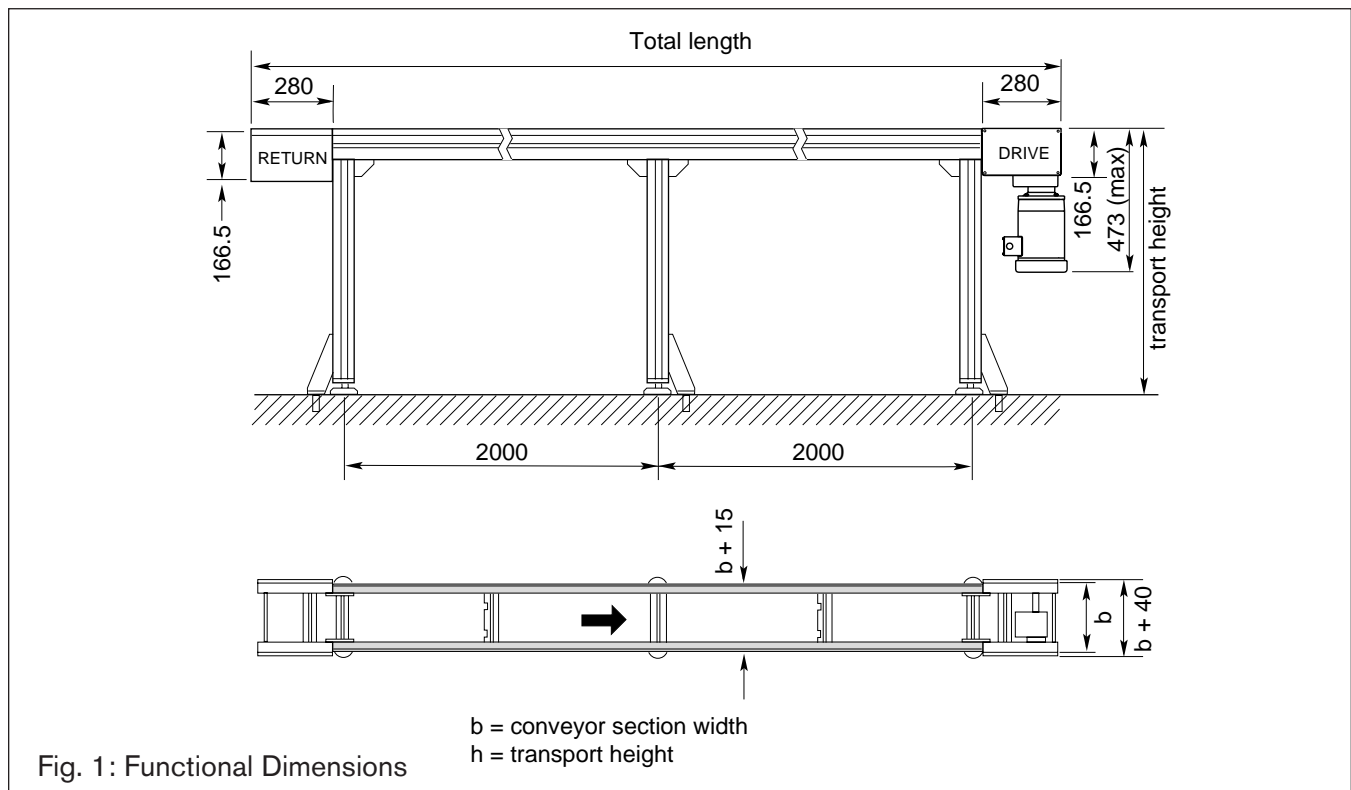
The belt version of the Bosch *TSplus* conveyor uses dual strands of belt as its transport medium. The low coefficient of friction with the workpiece pallets allows pallets to be stopped on the conveyor while the belt continues to move beneath them. It is thus possible to queue workpiece pallets as work processes are performed either manually or automatically.

The double belt (open center) conveyor design provides access to the fixtured workpiece from all sides. The belts themselves are tracked along the belt-guide profiles and are driven at constant speed by means of drive wheels.

The system is designed for a maximum total payload of 250 kg per drive.

Technical Data

Functional dimensions for the *TSplus* conveyor are shown in Figure 1 below.



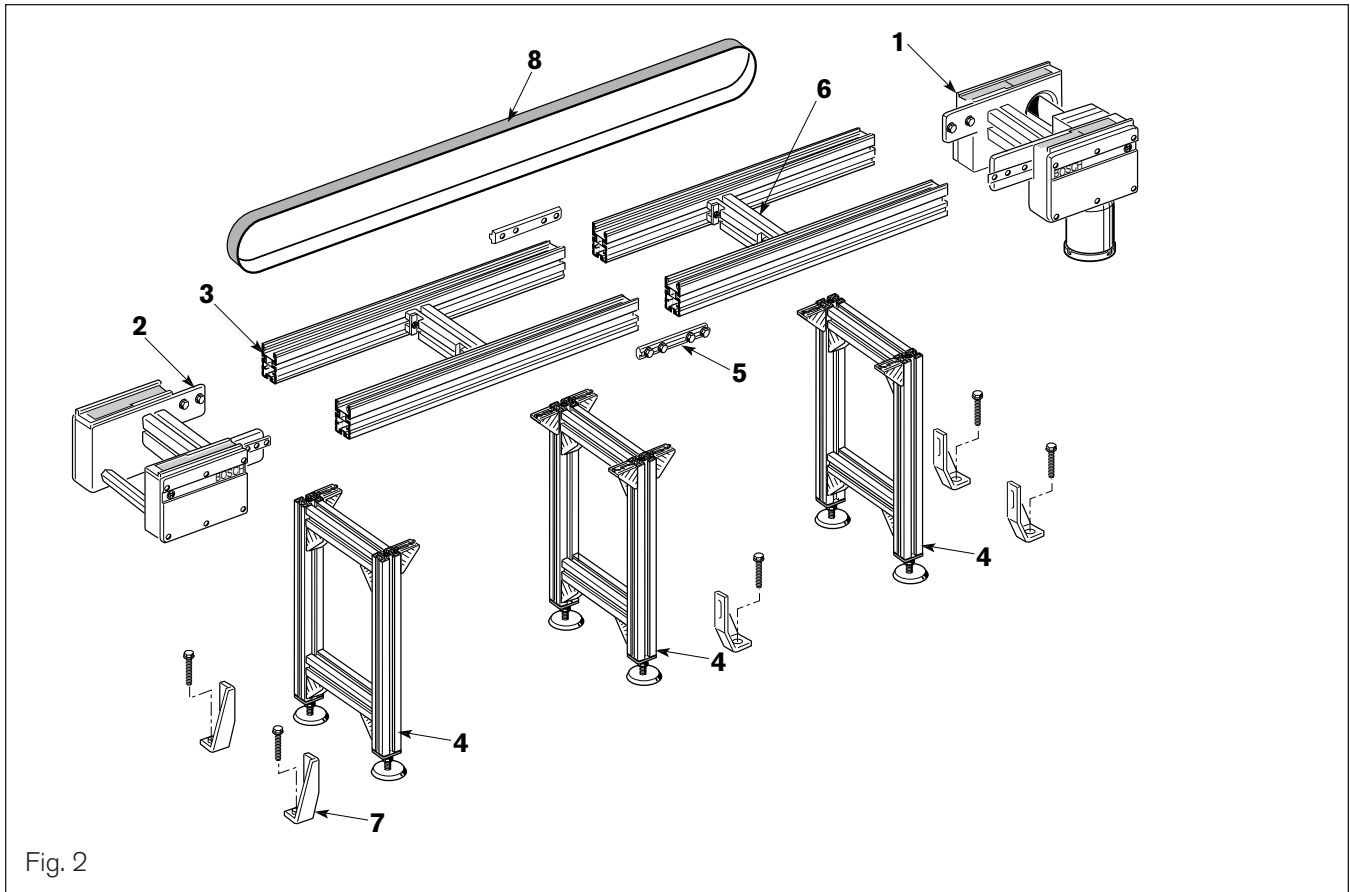


Fig. 2

Design and Detailed Description

Basic Equipment

The *TSpplus* basic configuration consists of the following modules (Figure 2):

- 1 Drive module (AS2B)
- 2 Return module (UM2B)
- 3 Conveyor belt sections, complete with belt guide profiles (ST2)
- 4 Leg set (SZ2)
- 5 Connection links
- 6 Cross links
- 7 Foundation brackets and floor anchors
- 8 Belt

NOTE: The customer assumes responsibility for the control equipment and must provide an EMERGENCY-OFF switch in the *TSpplus* conveyor.

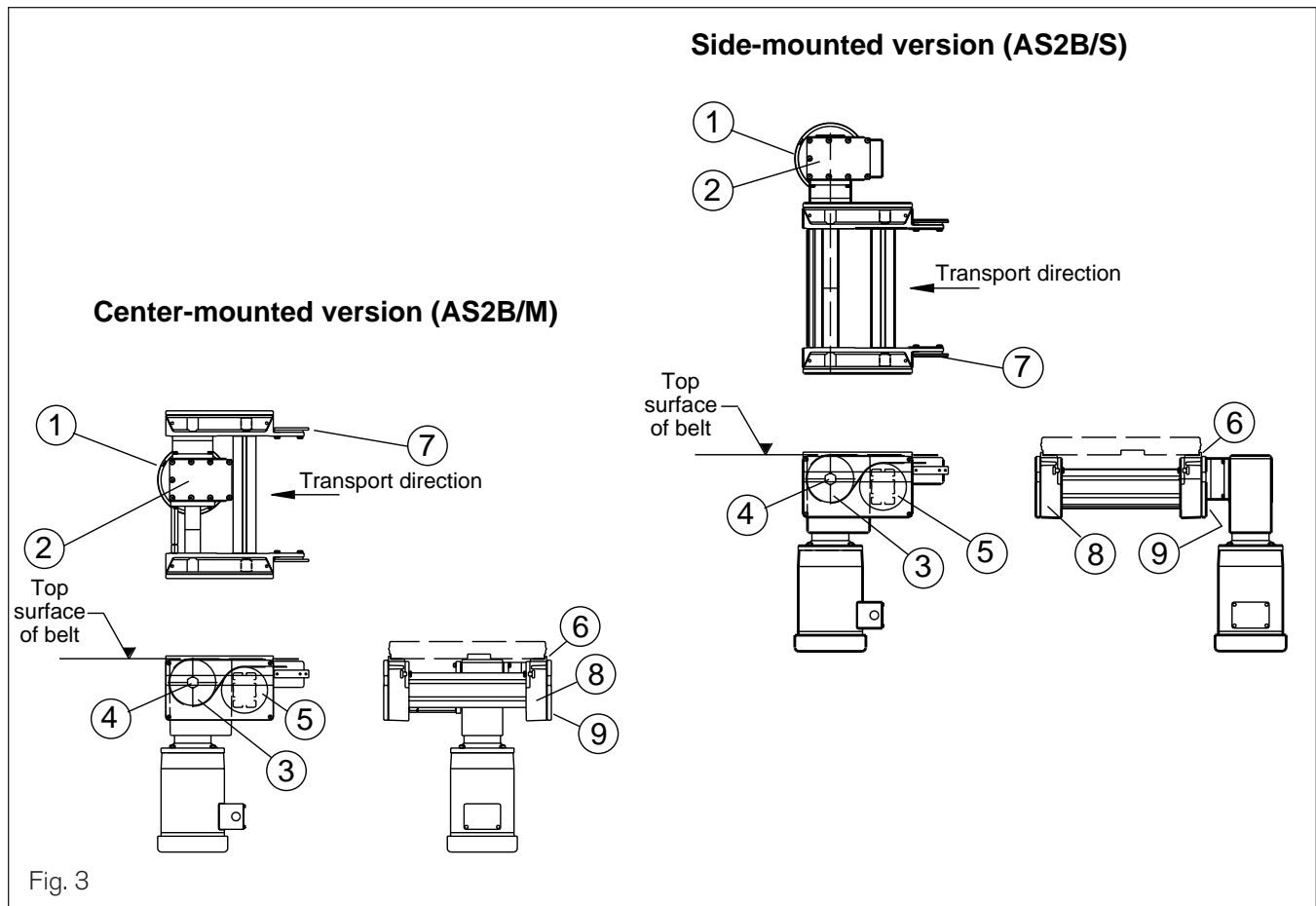
Drive Module AS2B

The *TSplus* Drive Module (Fig. 3) is delivered completely assembled and consists of the following main components:

- 1 Motor
- 2 Gearbox
- 3 Drive Wheel
- 4 Drive Shaft
- 5 Idler Wheel
- 6 Guide Profile
- 7 Parallel Key
- 8 Side Housing
- 9 Cover

In the *TSplus* drive module, the motor (1) and gearbox (2) turn the drive shaft (4), rotating the drive wheels (3) on both sides of the drive module. The drive wheels pull the belt the length of the conveyor, along the guide profile (6) and into the drive module, where it is routed around the idler wheel (5) back up into the belt return opening in the belt section profile.

The drive module mounts to the belt section profile by means of a parallel key (7), which is bolted to the side housing (8). The cover (9) ensures safety during conveyor operation, and also protects against premature wear that may otherwise result from dirt and other contaminants.



Return Module UM 2B

The *TSplus* return module (Fig. 4) is delivered ready to be mounted to the conveyor. It is constructed from the following components:

- 1 Idler Wheels
- 2 Guide Profile
- 3 Side Housing
- 4 Parallel Key
- 5 Cover

The *TSplus* return module conducts the belt arriving in the inside of the belt section profile back up to transport level. The idler wheels (1) route the belt through the return module, conducting the belt onto the transport level guide profile (2).

The return module mounts to the T-slot in the conveyor belt section by means of the parallel key (4) which is bolted to the side housing (3). The cover (5) ensures safety during conveyor operation, and also protects against premature wear that may otherwise result from dirt and other contaminants.

⚠ WARNING! DO NOT operate the conveyor with the guards removed! Serious injury may result if the conveyor is operated without guards!

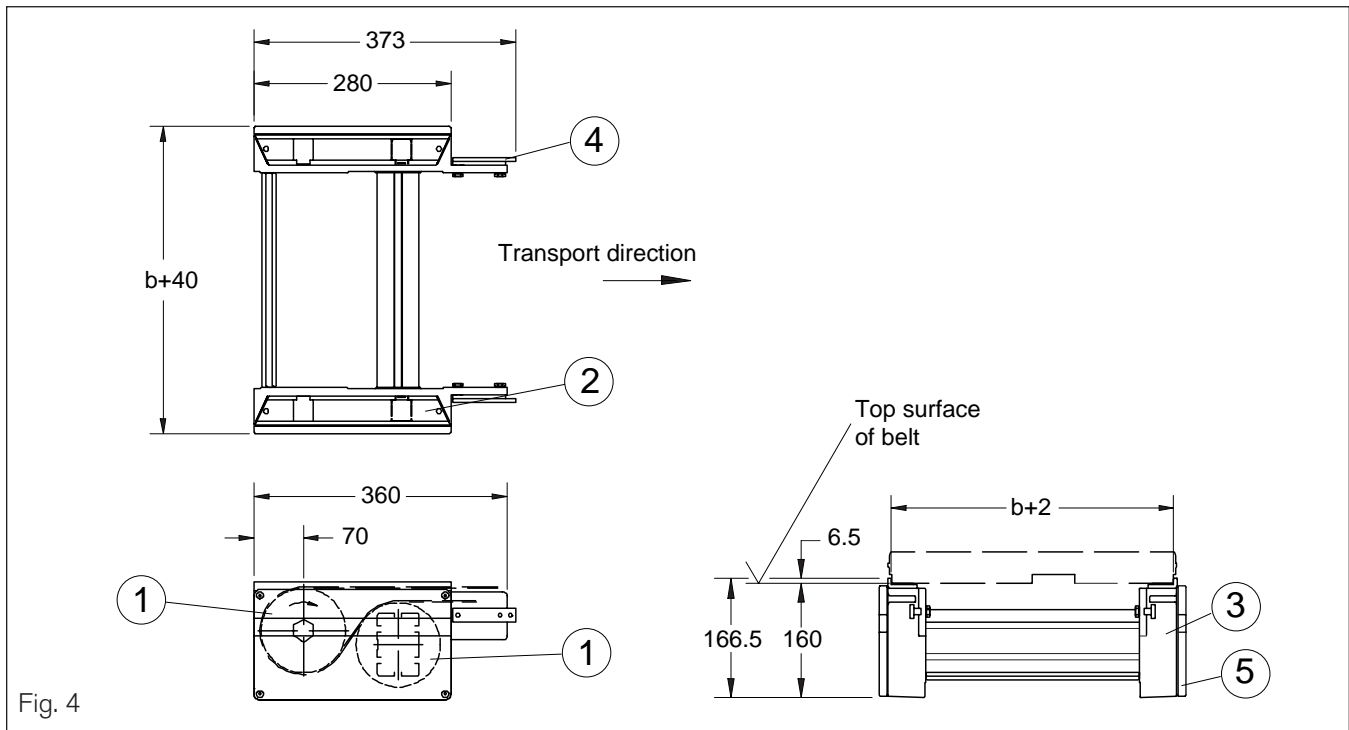
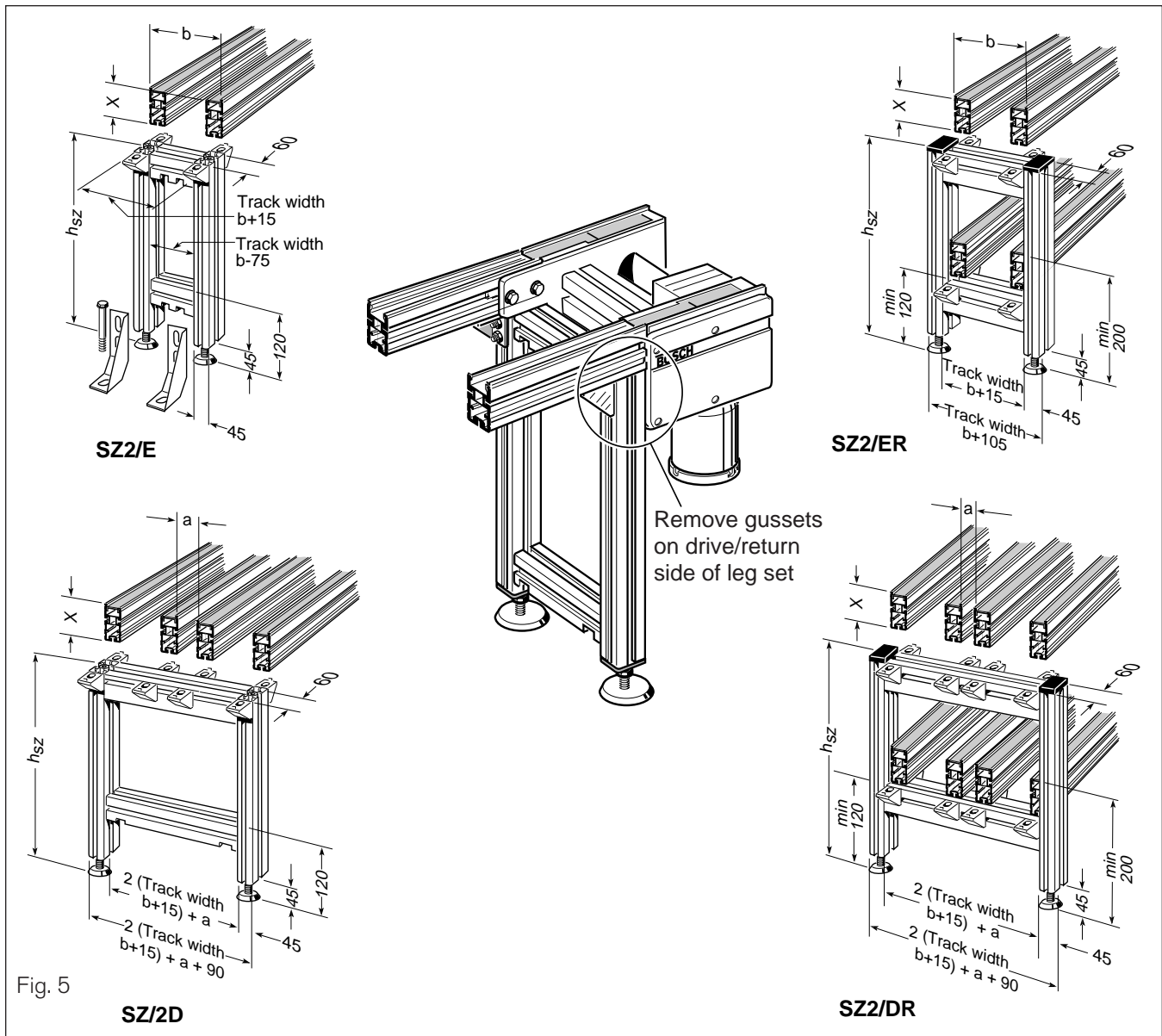


Fig. 4

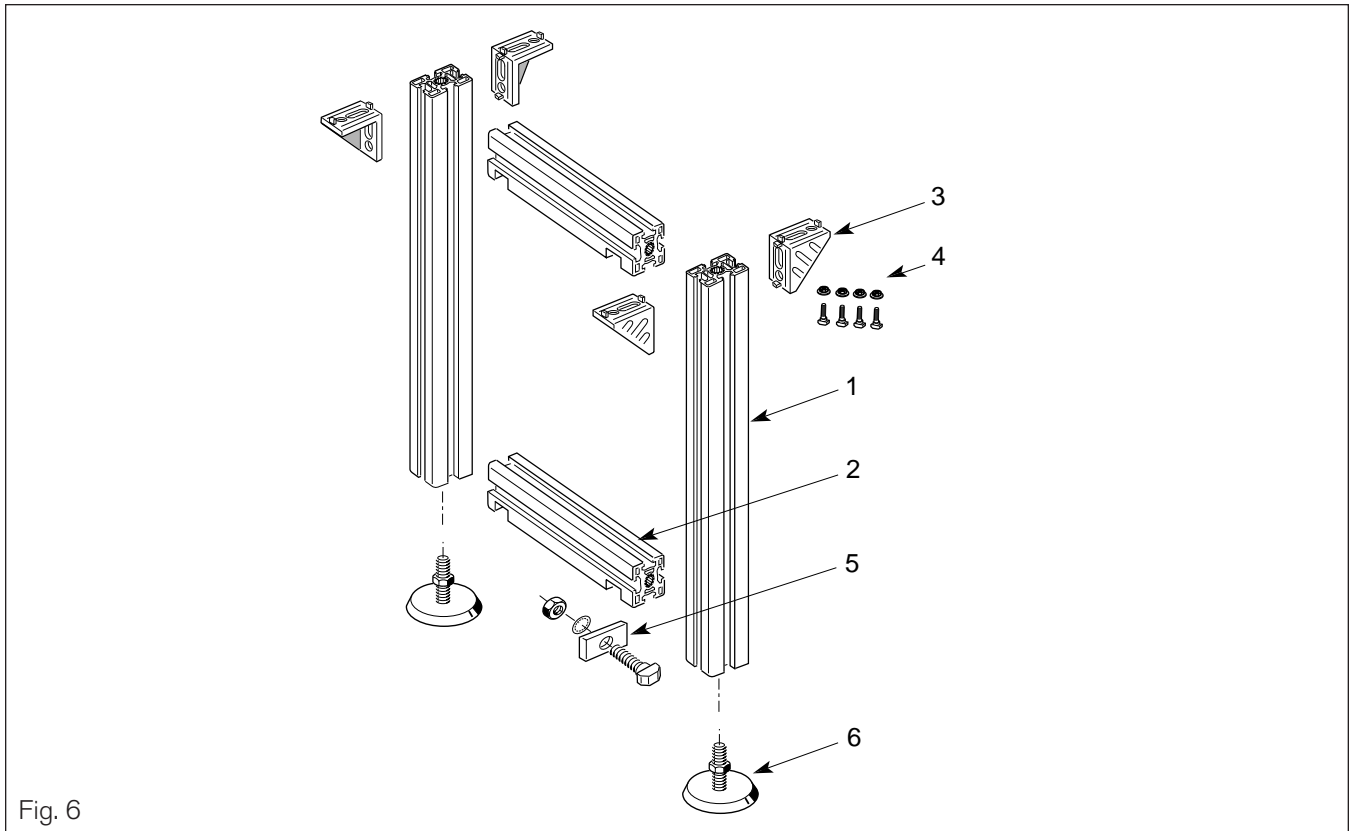


Leg Sets (Fig. 5)

The leg sets are the functional supports of the conveyor system. They ensure the correct line spacing, support the applied loads, and accommodate uneven floors through the use of leveling feet.

Leg sets are available in various configurations, four of which are shown in Fig. 5. Consult the *TSplus* catalog for available sizes and height ranges. The height specified for the leg set is from the floor to the top of the conveying media. The actual leg height (h_{SZ}) will be 80 mm or 100 mm shorter, depending on the type of conveyor sections being used.

Leg sets are installed adjacent to drives and returns, and at intervals of no more than 2 meters along the length of the conveyor. For leg sets adjacent to the drive and return unit, the gussets should be removed from one side of the leg so that the vertical leg post can be installed immediately adjacent to the drive or return, as shown in Fig. 5.



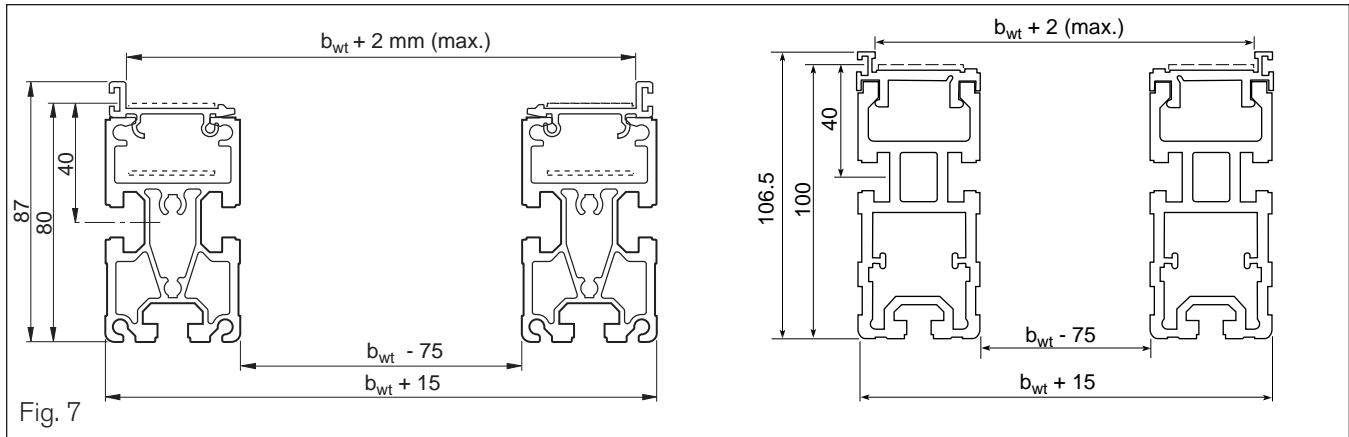
Generally, the leg sets are delivered pre-assembled and ready for attachment to the conveyor section. If the conveyor support system is broken down into its component parts, however, it consists of (see Fig. 6):

- 1 Strut profiles (2)
- 2 Cross links (2)
- 3 Aluminum gussets
- 4 T-bolts and flange nuts
- 5 Cross connector kit (4)
- 6 Leveling feet (2)

Foundation brackets and foundation anchor kits are ordered separately as needed.

The anodized aluminum **vertical posts** (1 in Fig. 6) form the upright supports of the *TSplus* conveyor leg set and have 10 mm T-slots for T-bolts, T-nuts, and other T-slot fasteners. The **cross links** (2) connect the leg set vertical posts to each other and are made of 45 x 60 strut profile. Each cross link has two milled slots for the **cross connector kit** (5). **Leveling feet** (6) screw into the vertical posts and permit continuously variable adjustment of the leg set height. **Aluminum gussets** (3) fasten the leg sets to the conveyor by means of T-bolts and flange nuts (4).

NOTE: Some leg sets will use gussets in place of cross connectors to attach the cross links. In this case, the cross links will not have milled slots, and the gussets attach to the vertical posts and cross links using T-bolts and flange nuts.



TSplus Belt Conveyor Section (ST 2)

The belt conveyor section acts as the bearing surface for the belt, and functions to guide the workpiece pallets from station to station. The conveyor section also functions as a frame to which other modules and components are mounted, such as stop gates, proximity switches, leg sets, and connection elements.

The TSplus belt sections used with the belt transport medium can be ordered in lengths from 200 mm to 6000 mm. Each belt section consists essentially of two parts (Fig. 8), delivered in matched pairs:

- 1 Aluminum conveyor profile
- 2 Belt guide profile

The TSplus conveyor profiles (Fig. 9) are anodized aluminum alloy and have 10 mm T-slots (A) for inserting M8 T-bolts and other fasteners. Dimensions are shown in Fig. 7.

The plastic belt guide profiles are delivered already attached to the conveyor profile. The guide profiles serve as wear strips and protect the belt.

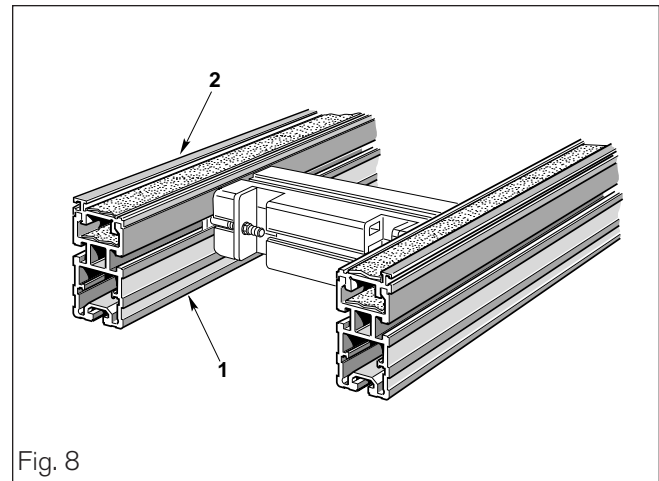


Fig. 8

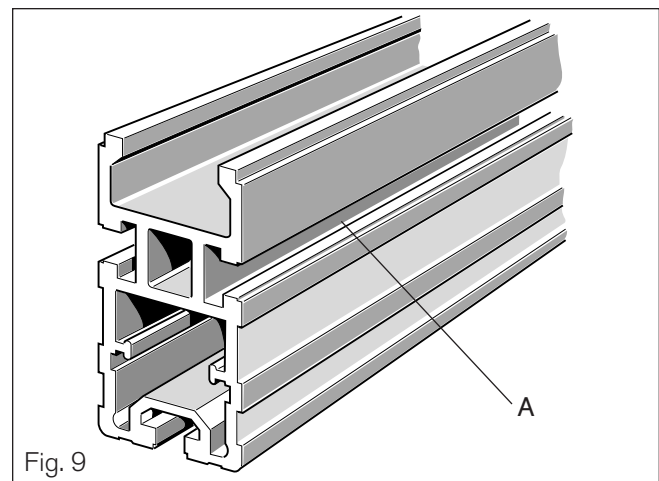
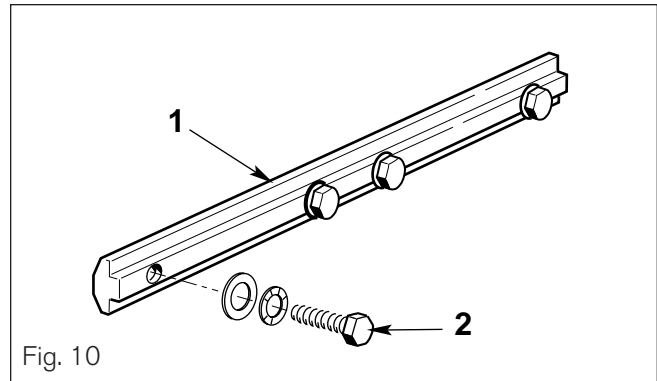


Fig. 9

Connection Links (Fig. 10)

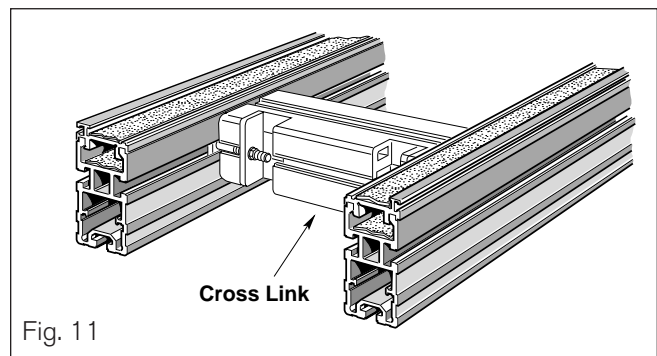
The conveyor section is extended with the help of connection links, two of which are needed for each conveyor-section joint. The connection link consists of the following parts (Fig. 10):

- 1 Connection link with four M8 threaded holes
- 2 M8 hex bolts with lockwashers and backing washers (Qty. 4)



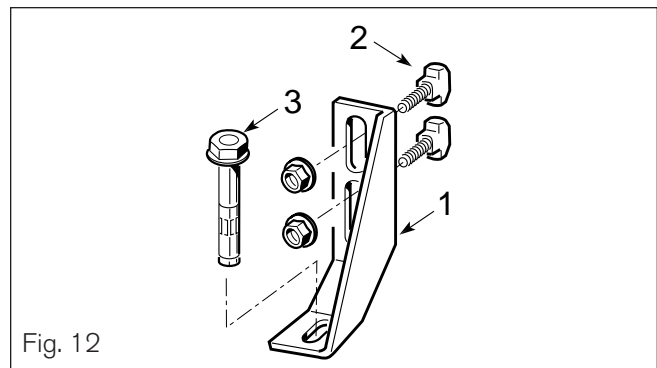
Cross Links (Fig. 11)

The cross links made of 45 x 60 strut profile provide extra structural support and ensure that the *TSplus* conveyor section has a uniform guiding width. Cross links must be fastened to the conveyor section profiles at a maximum of 2-meter intervals along the conveyor. Cross link length depends on the width of the workpiece pallet or line width.



Foundation Bracket/Anchor Kit (Fig. 12)

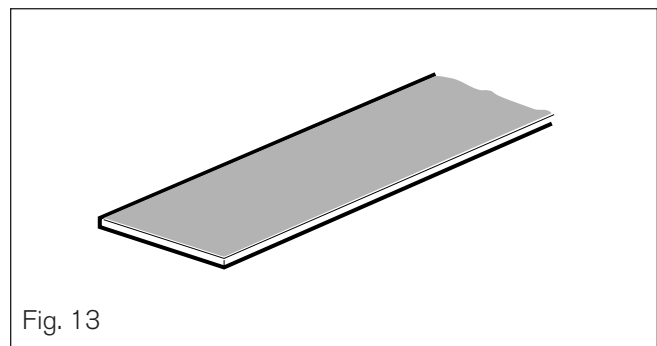
The leg sets are secured to the floor with the foundation bracket kit (1 and 2) and the anchor bolt (3). The foundation bracket (1) is fastened to the leg set with two T-bolt mounting kits. The foundation bracket itself is fastened to the floor with the foundation anchor, which is suitable for concrete floors.



Belt (Fig. 13)

The belt functions to convey the workpiece pallet from station to station.

The wear-resistant *TSplus* belt (Fig. 13) has a low-friction conveying surface. The lack of significant friction allows pallets to be stopped anywhere along the conveyor for processing or assembling operations while the conveyor belt continues to move.



Assembly

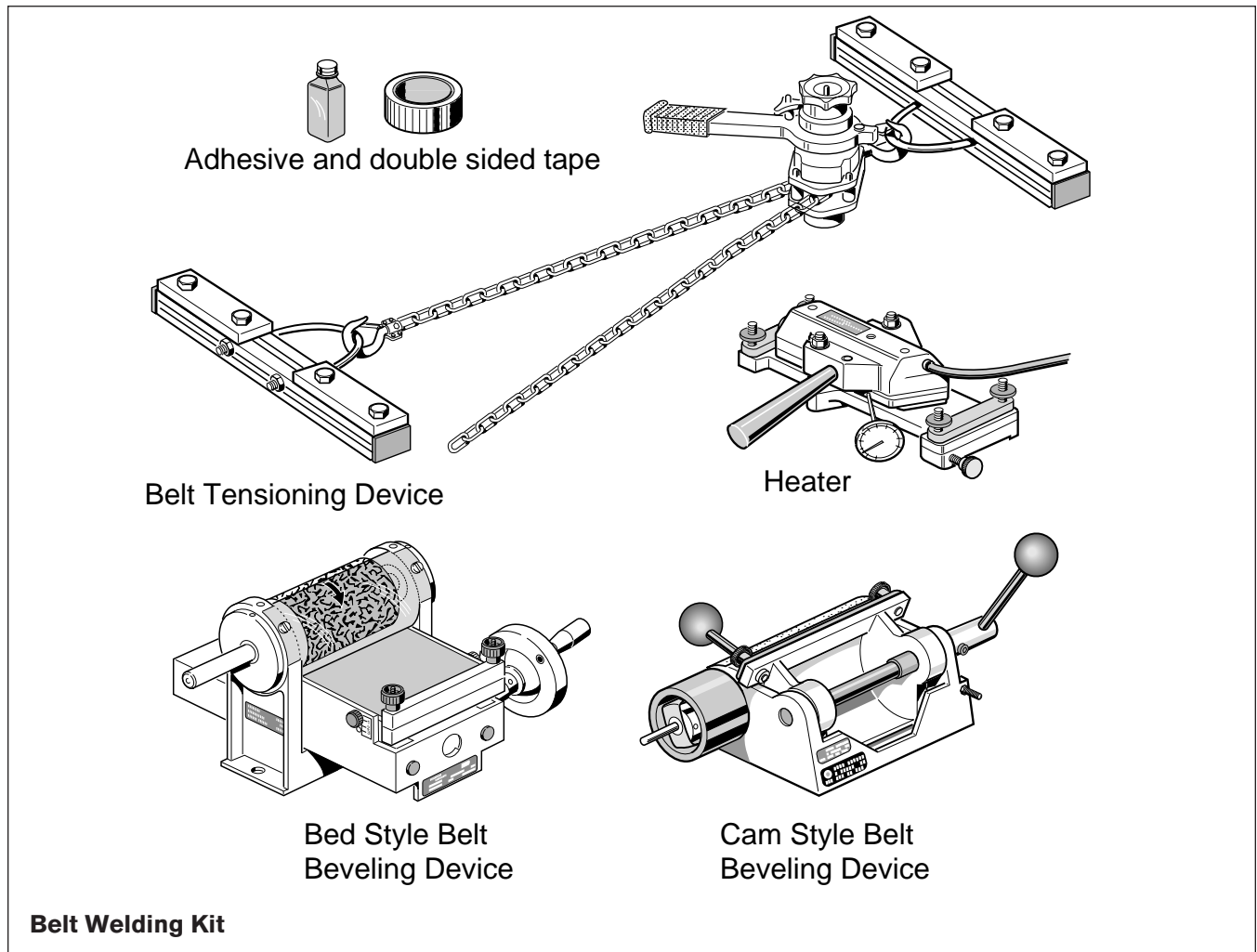
NOTE: The following assembly instructions describe the installation of a basic, single-level *TSplus* belt conveyor system. The assembly of other configurations is essentially the same.

Recommended Tools

The following tools are recommended for assembling the basic system:

- 1 metric hex wrench set (preferably torque wrenches)
- 1 Metric hex key set
- 1 pair spring-washer pliers A2

- 1 caliper gauge
- 1 90° square
- 1 soft-faced hammer
- 1 spirit level (2 - 3 ft.)
- 1 alignment cord
- 1 belt welding kit (available from Bosch)



Leg Set Assembly

Leg sets are shipped pre-assembled from the factory. The following instructions are included for adjustment and reference purposes.

NOTE: Careful pre-assembly of the leg set will save time during leveling and alignment. It is particularly important to make sure that the leveling feet are all screwed in to the same depth.

Pre-assemble the vertical posts

- 1 Set the M16 (A/F 24) hex nut to 45 mm (Fig. 14).
- 2 Grease the first 50 mm of the threaded shaft so that screw-in and subsequent adjustment are easier.
- 3 Screw the leveling foot in by hand until the hex nut touches the end of the strut profile.

NOTE: Do not tighten the hex nut completely until the entire conveyor has been set up and aligned.

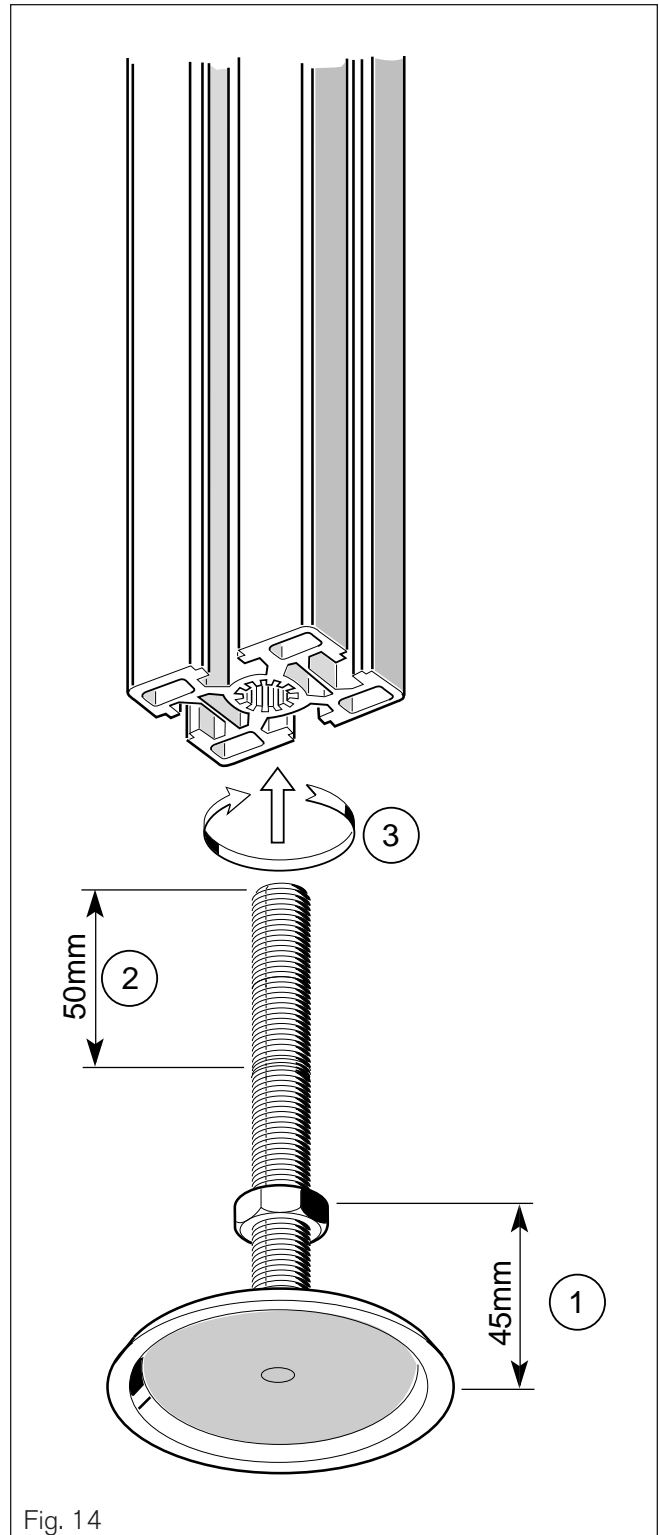
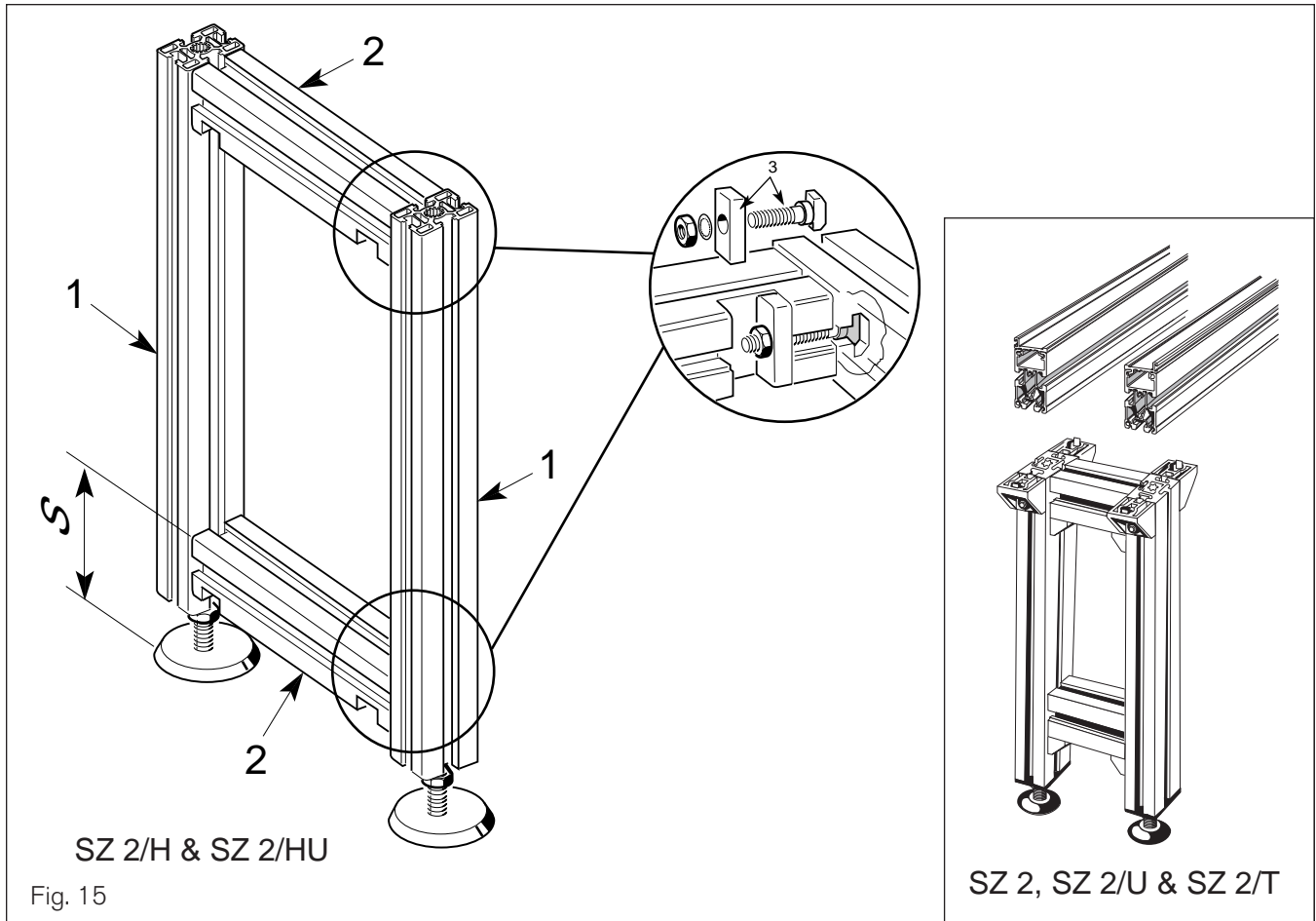


Fig. 14



Assemble the leg sets (Fig. 15)

NOTE: Some leg sets will use gussets in place of cross connectors to attach the cross links. In this case, the cross links will not have milled slots, and the gussets attach to the vertical posts and cross links using T-bolts and flange nuts.

- 1 Use cross links (2) to join the pre-assembled vertical posts (1). Position the cross links so that the milled slots are on the underside of the cross links, as shown.

NOTE: If assembling the leg sets on a table or other horizontal work surface, place shims (approx. 7.5 mm thick) beneath the cross links so that the cross link T-slots line up with the vertical post T-slots.

- 2 Align the cross link T-slots with the T-slots on the vertical posts and fasten the cross links to the vertical posts using the cross connector kits (3).

The upper cross link must be flush with the top ends of the strut profiles; the lower cross link must be mounted at a specific distance (**S** in Fig. 15) from the lower ends (See Fig. 5 on page 8).

⚠ CAUTION: Overtightening the screws may cause damage to the aluminum profiles. To avoid damage, tighten all threaded fasteners to 18 lb-ft. (25 Nm) using a torque wrench.

- 3 Check for corner squareness with a 90° square and then firmly tighten all screws and bolts.

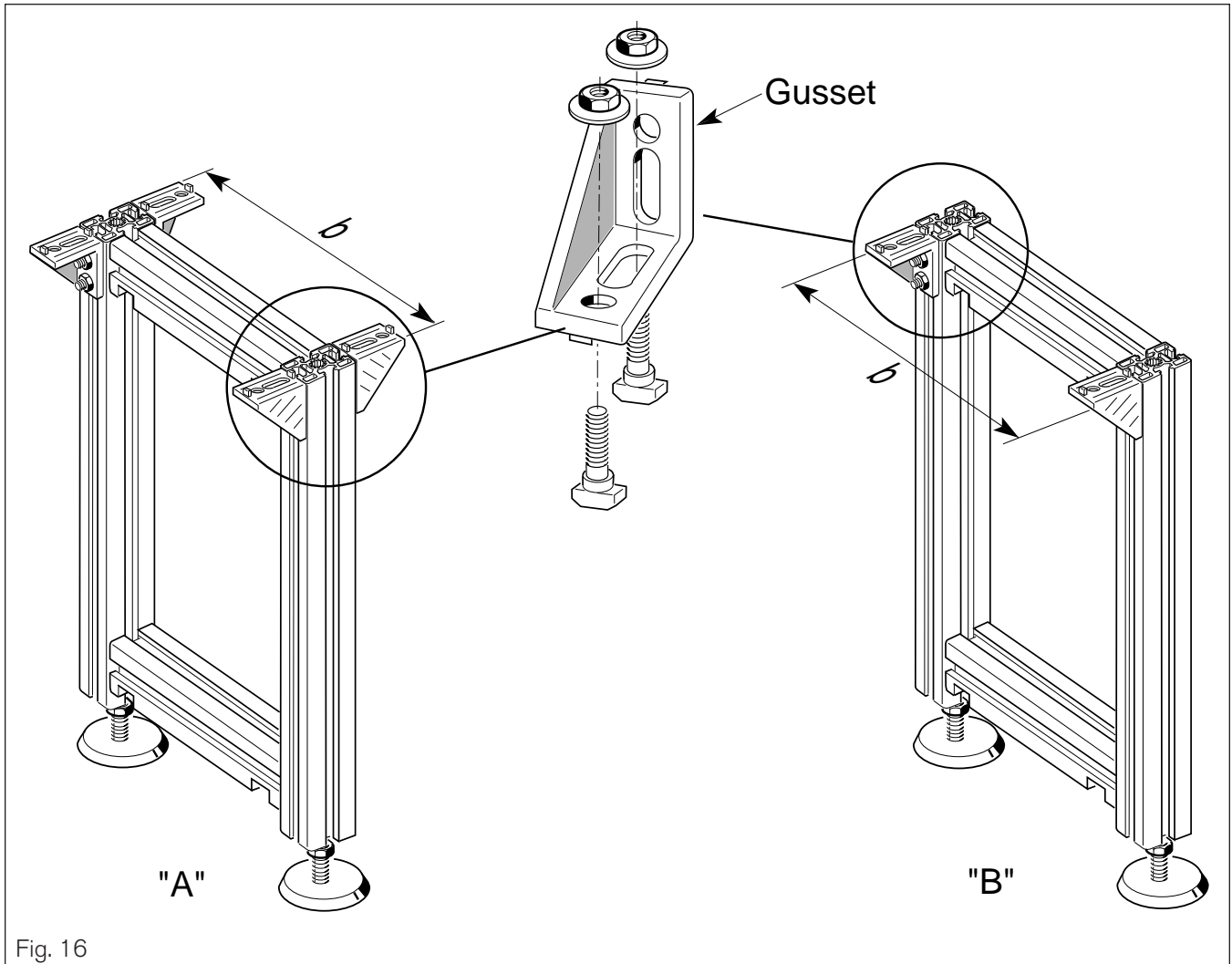


Fig. 16

Attach the gussets (Fig. 16)

Mount the gussets so that they are flush with the top end face of the leg sets, using a 13 mm hex wrench.

- Use 4 gussets for each intermediate leg set (A).
- Use 2 gussets (on one side only) for leg sets to be used at the drive or return end of the conveyor (B).

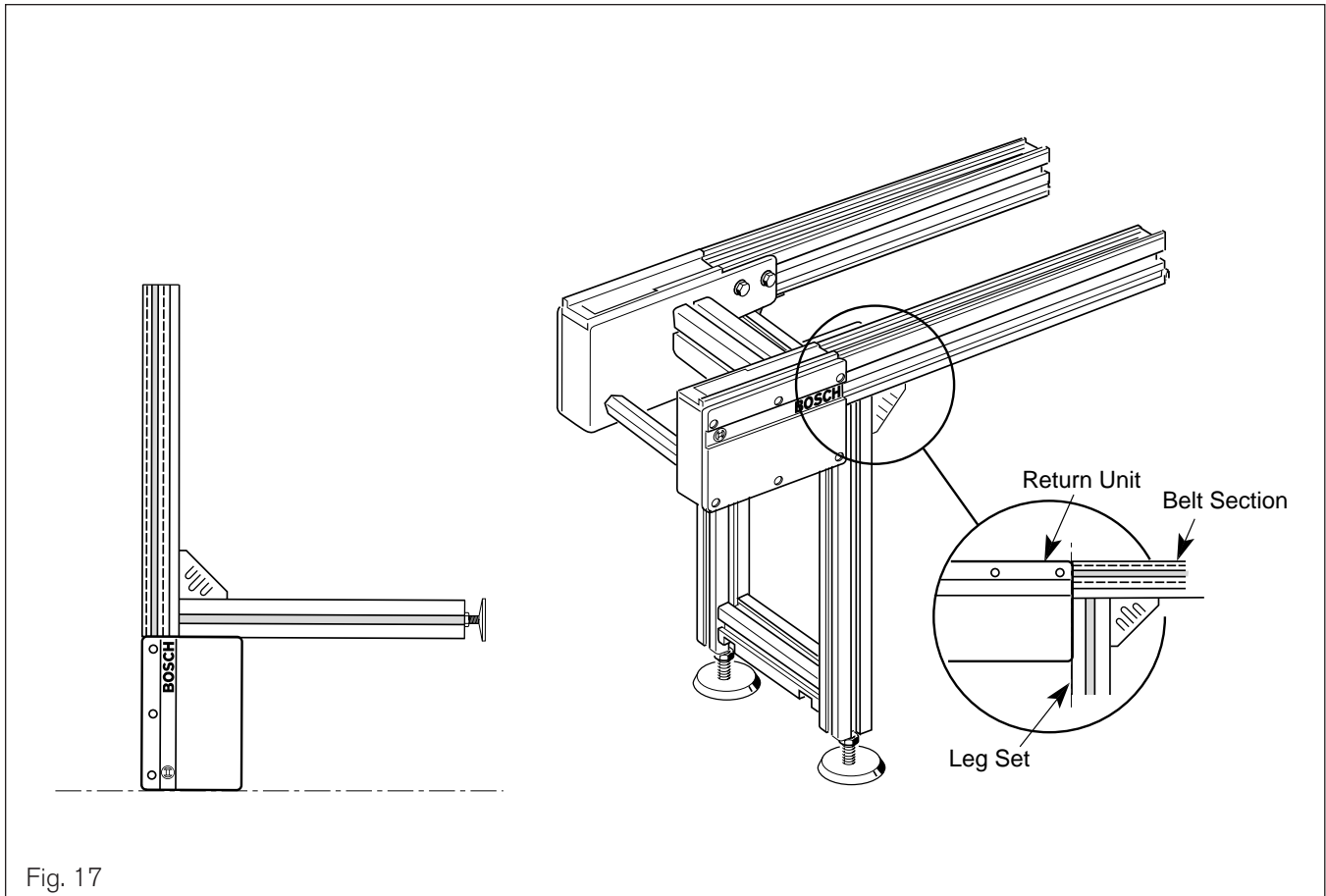


Fig. 17

Start assembly from the return end of the conveyor (Fig. 17 and 18)

NOTE: The leveling feet can be screwed in 30 mm, or out 60 mm. Therefore, it is imperative to identify the high point in the floor and make sure you will have enough adjustment remaining to level the conveyor. A transit is recommended to establish a conveyor height and make the process easier.

- 1 Set the return unit on the floor with the parallel keys pointing straight up. Loosen the four bolts holding the parallel key on the return.
- 2 Carefully slide the first conveyor rail onto the parallel key until it rests squarely against the return's side housing. Verify that the guide profile lines up correctly with the guides on the return unit.

Tighten the bolts on the parallel key to 18 lb-ft (25 Nm). Repeat for the second conveyor rail. Make sure both rails are tight and square against the return's side housings.

- 3 Remove the gussets from one side of the leg set and place the vertical posts directly adjacent to the return's side housings. Fasten the gussets to the conveyor section with T-bolts, tightening the flange nuts to 18 lb-ft (25 Nm).

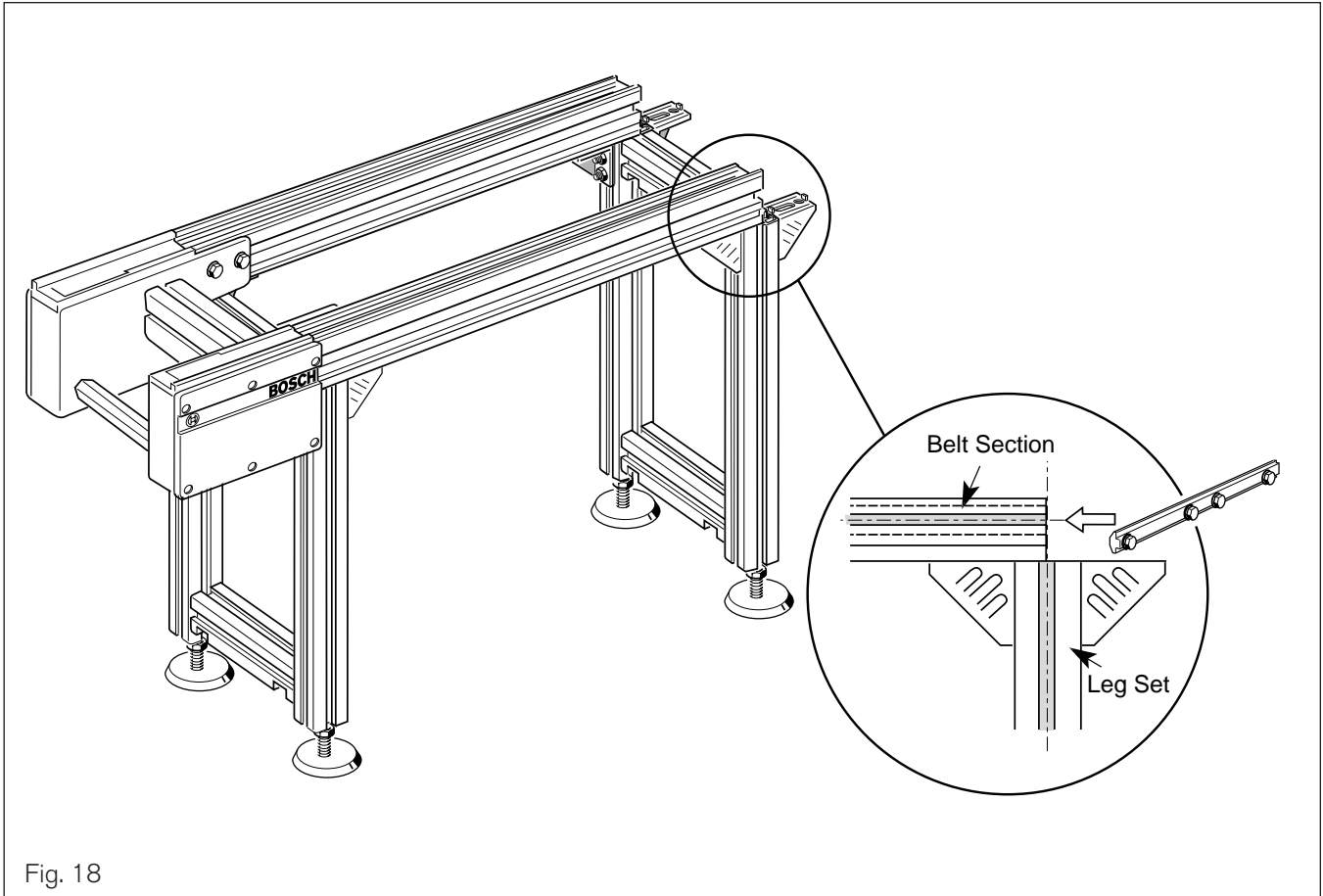


Fig. 18

4 Set the conveyor assembly upright on the leg set and place the free ends of the conveyor section onto the next leg set. The conveyor section ends should be centered on the vertical post of the leg set.

5 Slide a connection link into the T-slot of each conveyor section. One connection link is required per side, but they may be installed in either the inner or outer T-slots.

Use the transit and/or a spirit level to ensure that the assembly is at the correct height and level end-to-end and side-to-side.

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

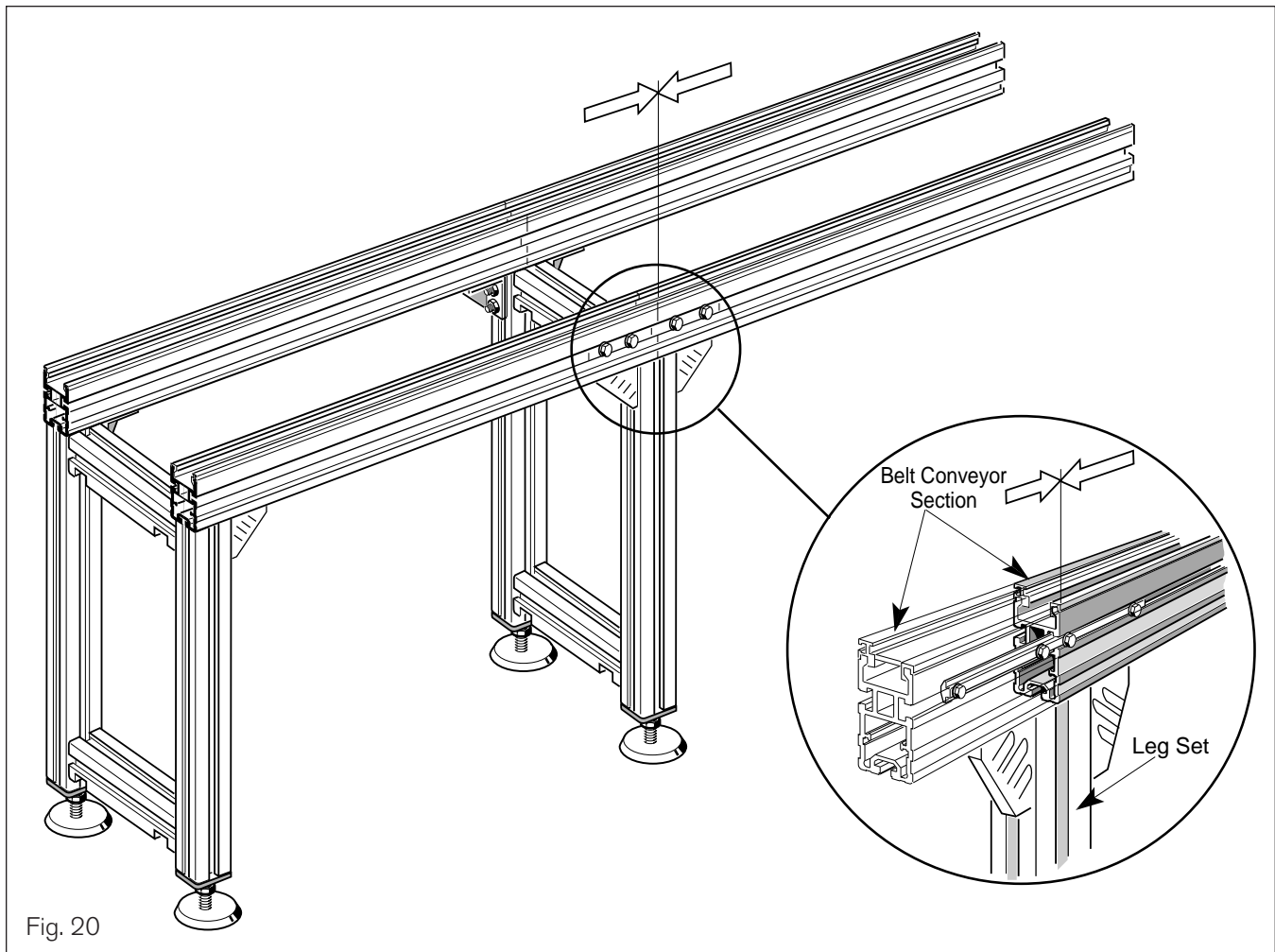


Fig. 20

Extend the conveyor (Fig. 20)

- 1 Set the next conveyor section onto the leg set and support the other end with an additional leg set.

Slide the connection link into place so it spans the joint evenly.

- 2 Use the transit to raise the new section to the proper height and verify that the line is level end-to-end and side-to-side.

- 3 Tighten the flange nuts on the gussets and the bolts on the connection links to 18 lb-ft (25 Nm).

- 4 Repeat this process for each conveyor section.

- 5 The last leg set will be flush with the end of the conveyor section, with no gussets on the outer side, a mirror image of the leg set at the return unit end.

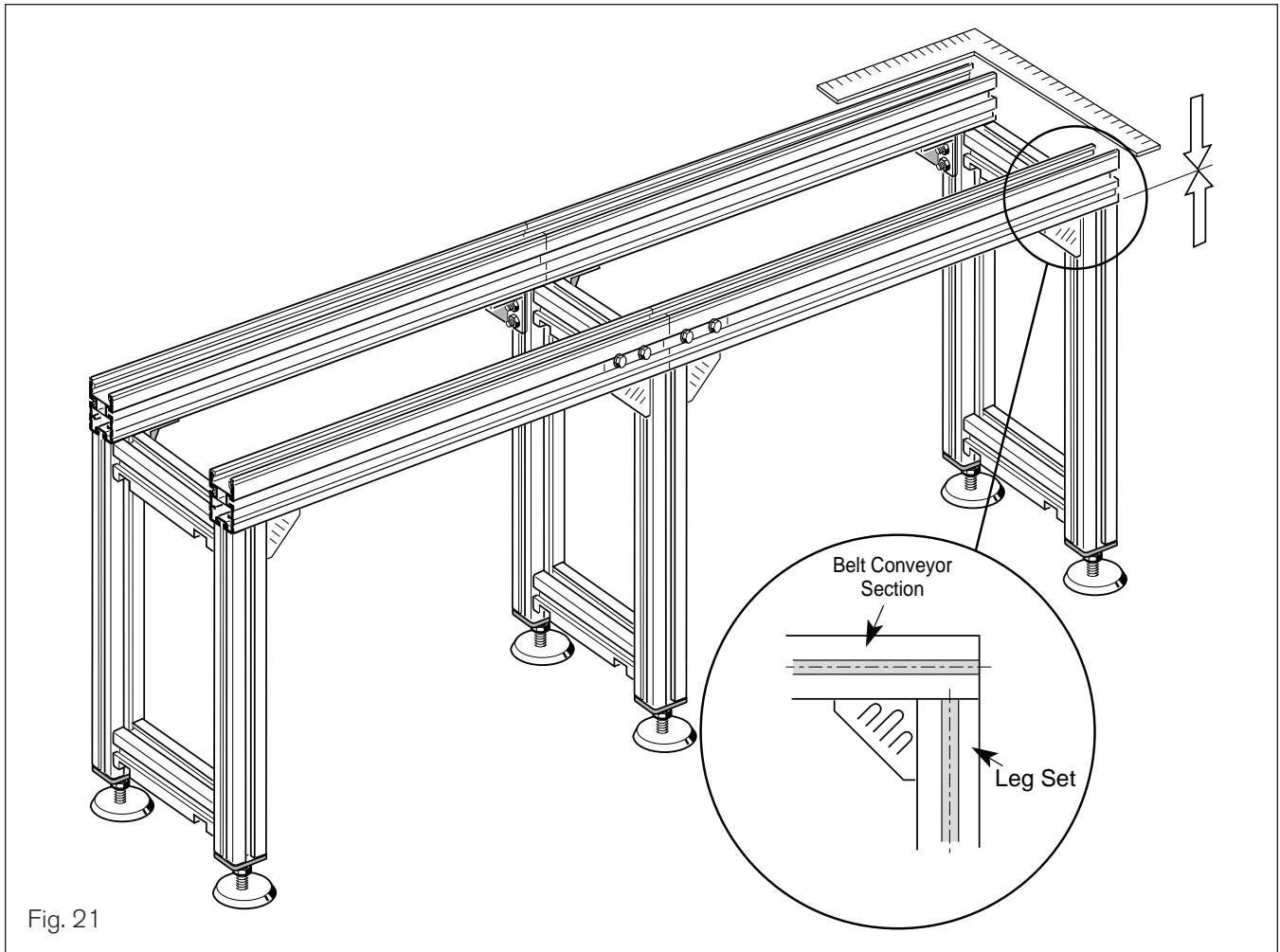


Fig. 21

Attach the drive module (Fig. 21)

- 1 Loosen the four bolts holding the parallel key on the drive unit. Carefully slide the drive unit into the ends of the conveyor section until the rails rest squarely against the side housings of the drive unit. Tighten the four parallel key bolts to 18 lb-ft (25 Nm).
- 2 Verify that the assembly is straight and level from end to end and side to side. Use a string line along the outside of the leg sets to verify that the conveyor assembly is straight.

IMPORTANT! Failure to ensure straightness will result in premature wear and belt failure.

Installation Tip: Install a T-bolt from the discarded leg set gussets on the drive and return leg. Run a string between the T-bolts immediately adjacent to the flange nuts and pull it tight. Use a scale to make sure the gap between the string and leg posts is identical for all legs. See page 21.

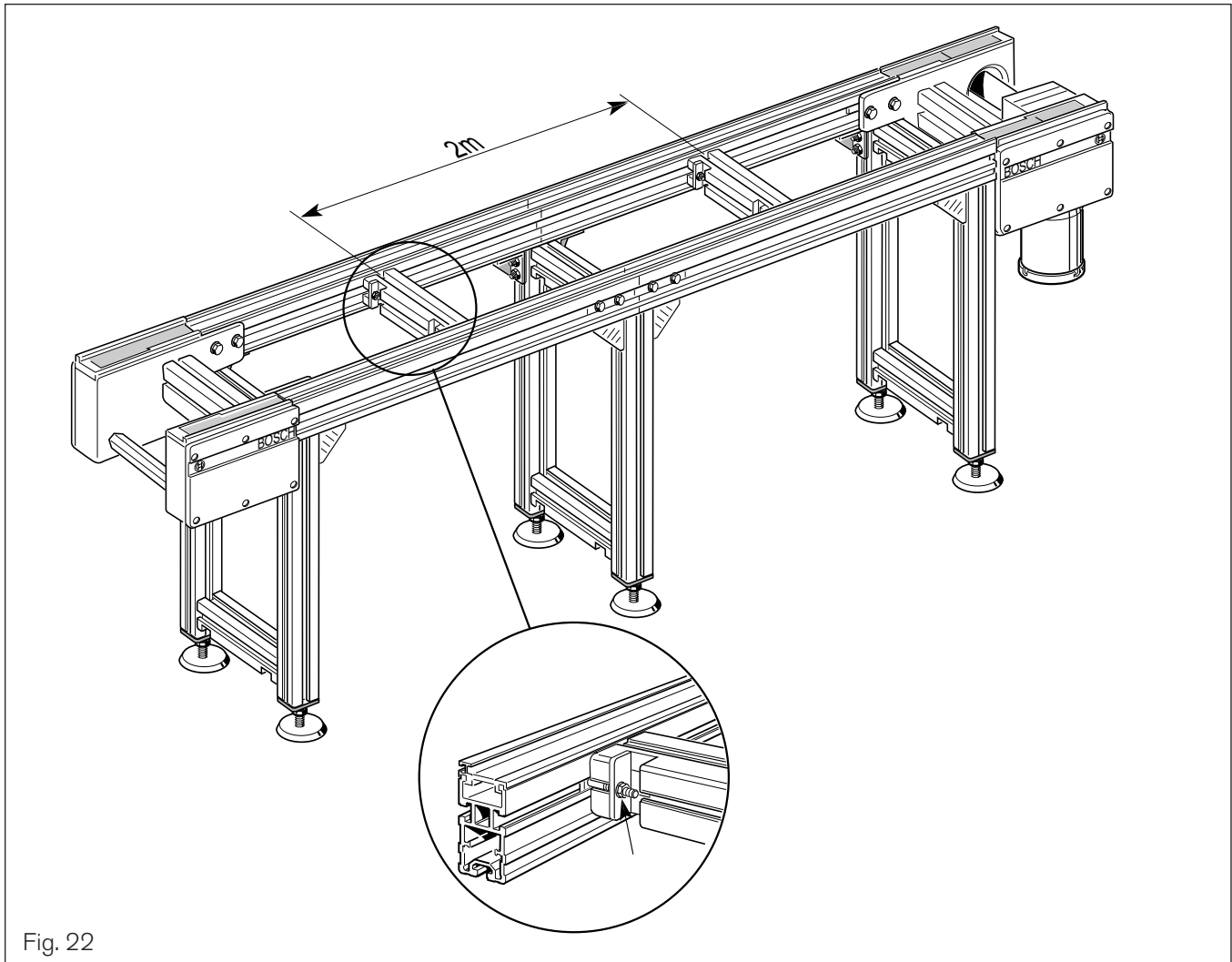


Fig. 22

Fit the cross links (Fig. 22)

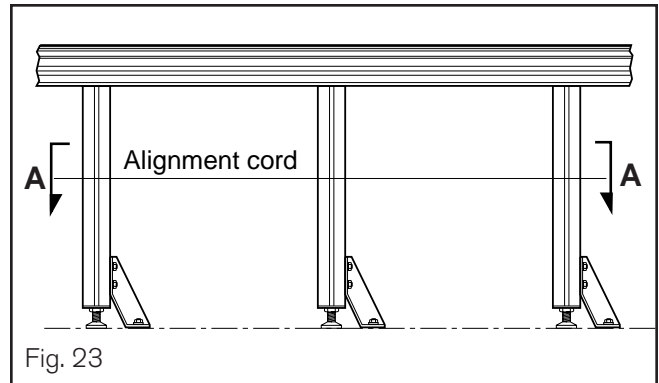
To ensure proper spacing where there are no leg sets, fit cross links at 2 meter intervals along the conveyor section. Do not fit cross links where leg sets are already present.

NOTE: Always re-check the crosswise alignment after making adjustments to the leveling feet for lengthwise alignment, and vice versa.

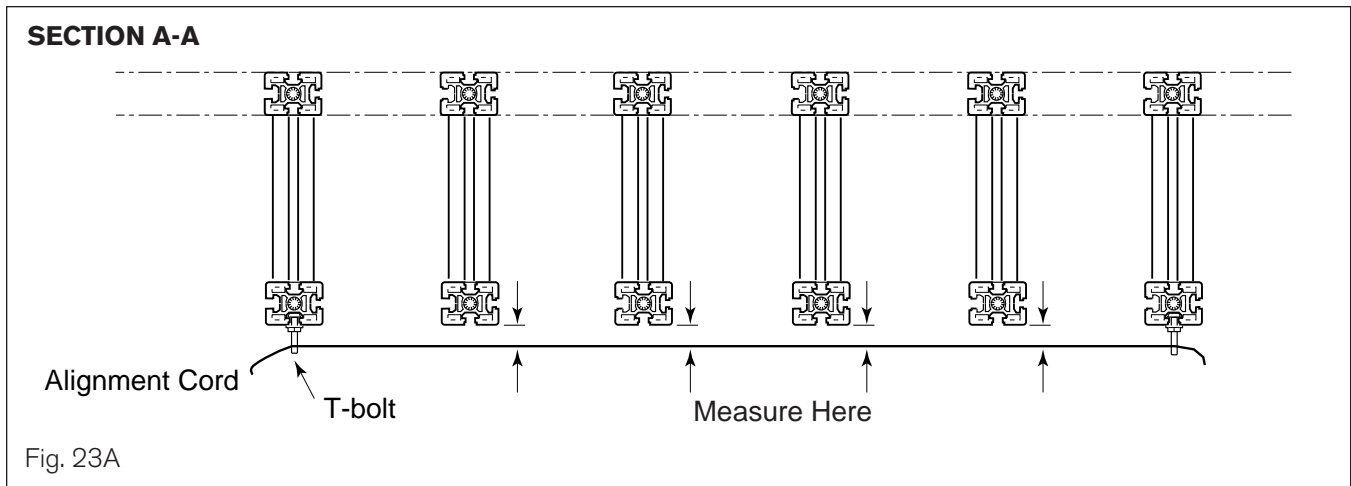
Straightness (Fig. 23)

Check to see whether the leg sets supporting the straight sections of the conveyor are exactly in line.

- 1 First check visually for straightness; then attach a T-bolt to the leg sets at each end of the conveyor's straight sections and run an alignment cord from end to end, as shown in Figs. 23 and 23A.
- 2 Make sure that the cord is taut and that the space between the cord and each leg set is identical. If the leg sets are not exactly in line, push them into place. Repeat the procedure for all of the conveyor's contiguous straight sections.



IMPORTANT! Failure to ensure straightness will result in premature wear and belt failure.



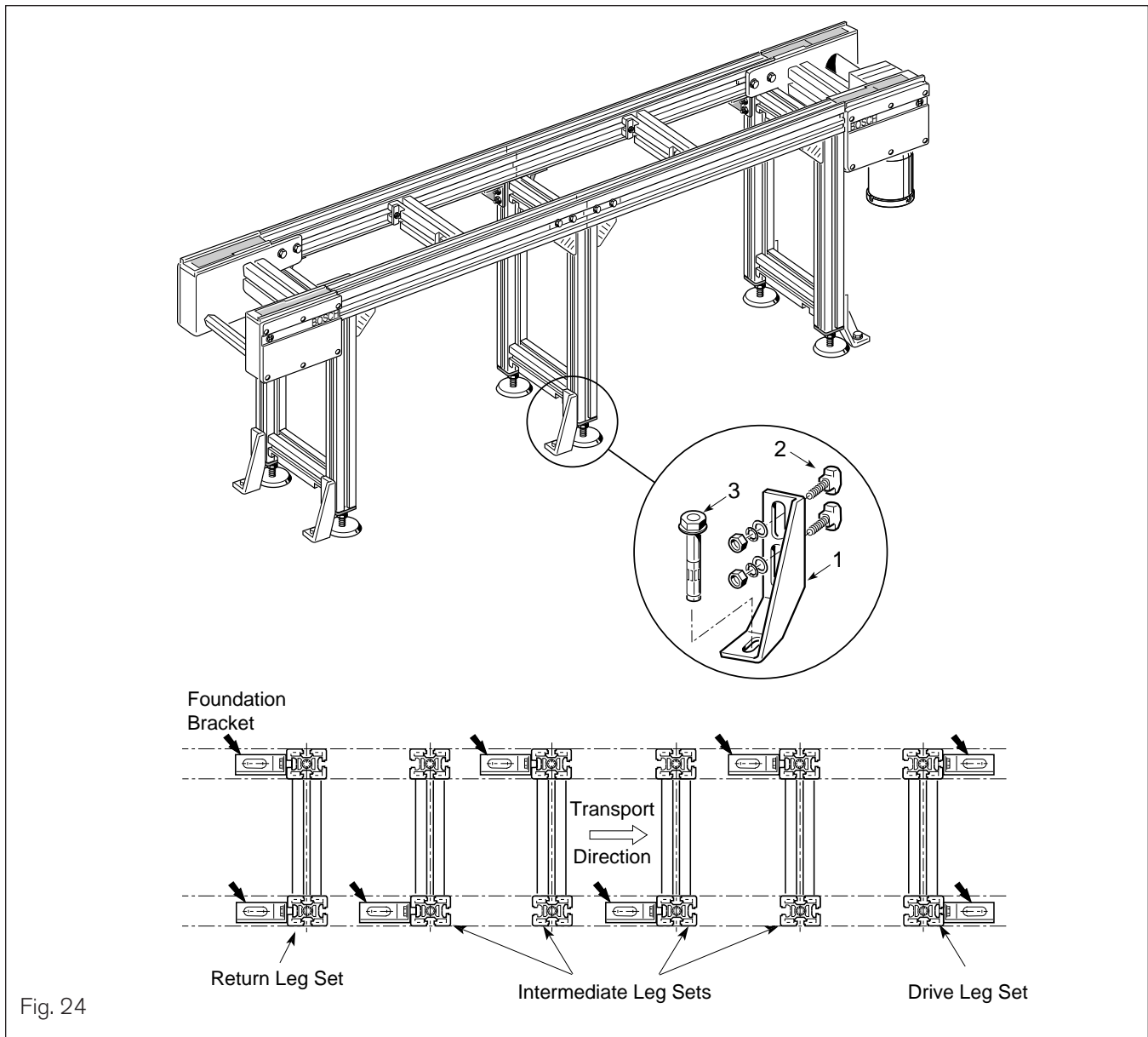


Fig. 24

Fasten the conveyor to the floor (Fig. 24)

- 1 Attach the foundation brackets to the leg sets according to the pattern shown in Fig. 24: On both sides of each drive and return leg set; then on alternate sides at each leg set along the length of the conveyor.
- 2 Mount the foundation brackets (1) to the leg sets with T-bolts (2). Bore a 5/16" dia. hole for each bracket into the floor. Finally, insert and tighten the floor anchors (3).

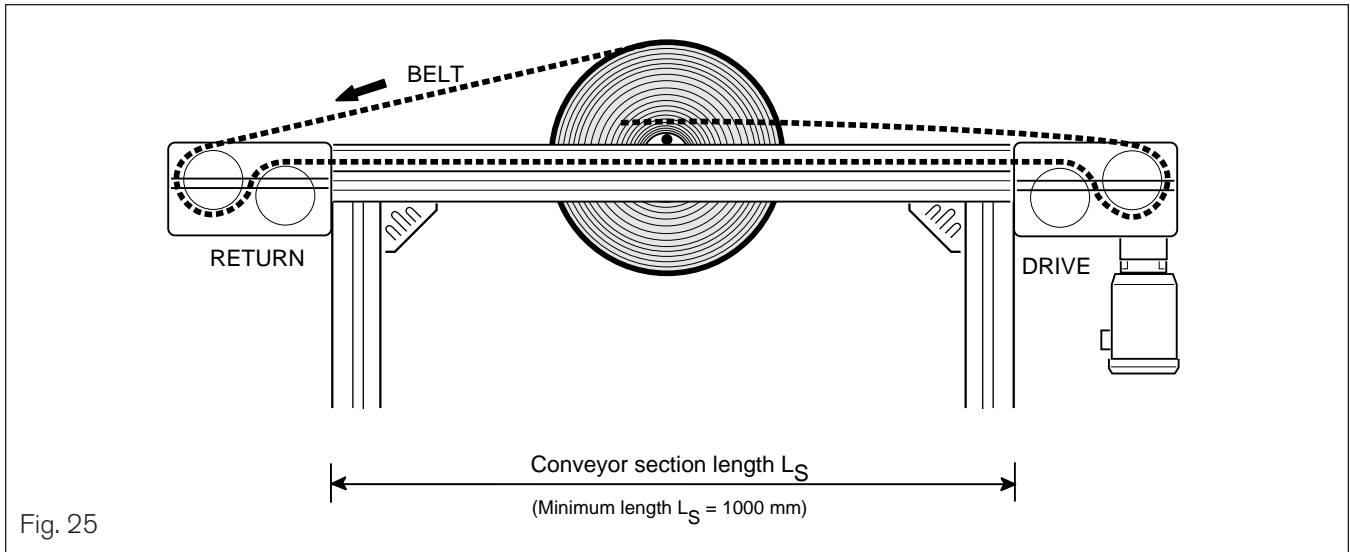


Fig. 25

Fitting the belt (Figs. 25 and 26)

Fitting the belt requires 4 steps:

- 1) Feeding the belt along the conveyor
- 2) Beveling the two ends of the belt
- 3) Tensioning the belt
- 4) Welding the belt

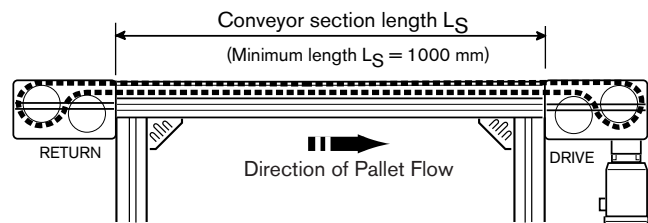
Before the belt is fitted, the conveyor must be leveled and then secured to the floor every 2 meters at the leg sets using the foundation brackets and the foundation anchor kits.

NOTE: The belt is delivered on a roll in the approximate length required for your system, with a maximum length per roll of 100 meters (approximately 325 feet). Make sure to follow the instructions exactly for cutting and welding the belt. See Fig. 25 and Table 1 to calculate the exact length of belt required.

To calculate the length of belt needed, please refer to the formulas below. Two belts are required for a conveyor section.

	2 x conveyor section length (in mm)	Belt needed for AS 2 and UM 2 (in mm)	Factor for pre-tensioning	Belt needed for overlap at weld (in mm)
Belt length for conveyor sections ≤ 2.5 meters in length (1 side)	=	$[2 \times L_S + 1320 \text{ mm}]$	$\times 0.990]$	+ 60 mm
Belt length for conveyor sections > 2.5 ≤ 4 meters in length (1 side)	=	$[2 \times L_S + 1320 \text{ mm}]$	$\times 0.980]$	+ 60 mm
Belt length for conveyor sections > 4 meters in length (1 side)	=	$[2 \times L_S + 1320 \text{ mm}]$	$\times 0.975]$	+ 60 mm

Table 1



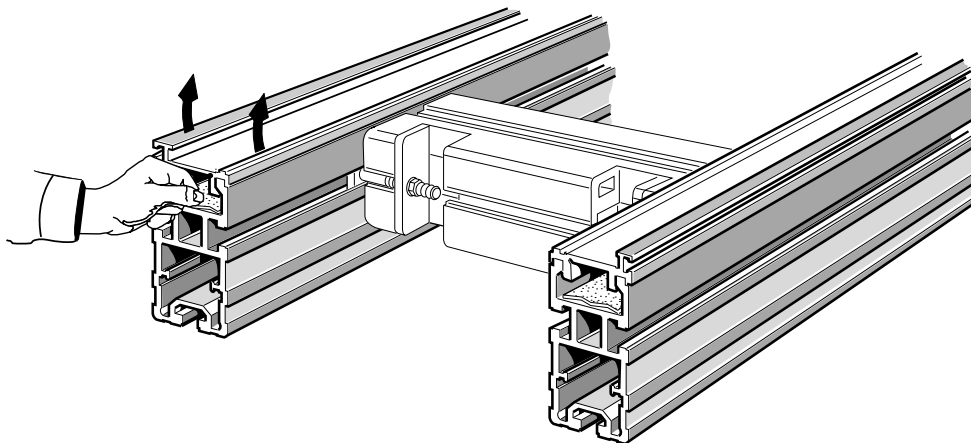


Fig. 26

Feeding the belt (Fig. 25, see page 23):

- 1 Remove the guards from both the drive and return modules.
- 2 Check the motor rotation.

Supply power to the motor to make sure that the belt will be pulled in the proper direction after it has been fitted. The drive wheel must rotate in the direction indicated so that the transport belt travels toward the drive module.

CAUTION: When you have confirmed proper motor rotation, immediately lock out power before proceeding!

- 3 Suspend the precut roll of belt between the two belt section profiles with a steel rod so that the end of the belt extends toward the return (Fig. 25).
- 4 Feed the belt into the return and guide it around the outer return roller, then back up around the inner return roller, as shown.

- 5 Begin feeding the belt into the belt profile's return level and push it through to the drive module.

NOTE: If the belt jams inside the profile, lift off the guide profile at the location of the jam and feed the belt the rest of the way by hand (Fig. 26).

- 6 At the drive module, feed the belt between the two wheels, around the drive wheel, then back up to transport level (Fig. 25). Pull the belt along the conveyor to the roll of belt suspended between the belt sections.

NOTE: It is strongly recommended that you cut each belt to length before installing it on the conveyor.

Joining the belt (Fig. 27)

Welding the ends of the belt to form a continuous loop will require the following equipment.

- 1 A belt beveling device
 - A) Bed style (for use, see below)
 - B) Cam style (for use, see page 28)
- 2 A belt tensioner unit
- 3 A heating press
- 4 Accessories
(adhesive, double-sided adhesive tape)

Beveling the belt with a bed style belt beveling device (Figs. 28–35)

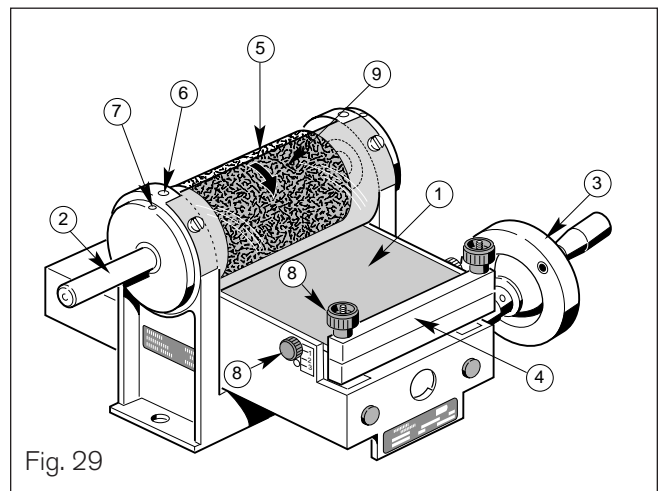
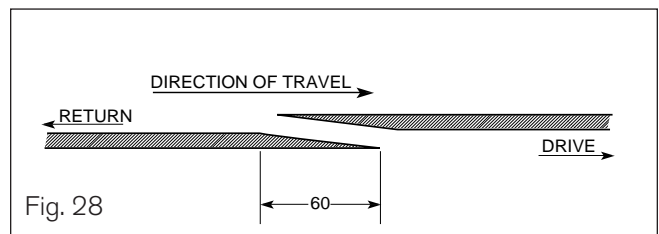
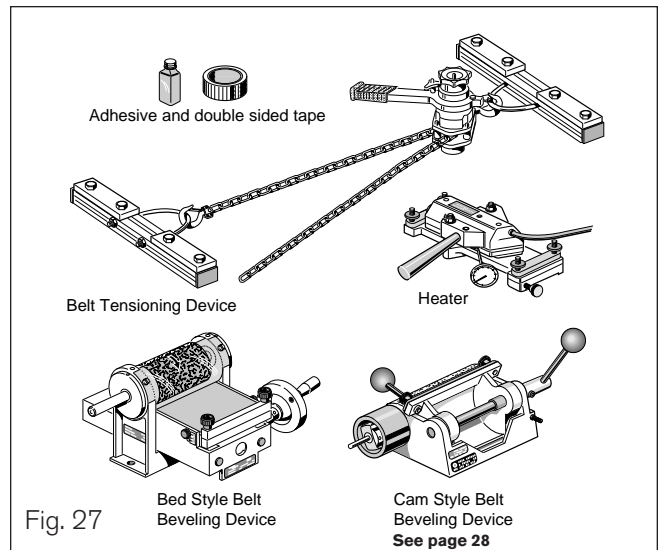
The belt ends must mate up as shown in Fig. 28 so that the joint is smooth when the two ends are glued together. This can be done by grinding the belt ends.

The bed style belt beveling device shown in Fig. 29 is available from Bosch. This easy to use grinder is driven by a drill motor running at 700 to 1000 r.p.m. and allows both belts in a double belt conveyor system to be beveled simultaneously in one continuous single pass.

The individual components of the bed style belt grinder are as follows (Fig. 29):

- 1 Adjustable pitch grinding plate
- 2 Drive shaft
- 3 Belt feed wheel
- 4 Belt clamp
- 5 Abrasive drum
- 6 Threaded pins
- 7 Radial hole
- 8 Knurled screws
- 9 Grinding guard
- 10 Grinding drum adhesive* (not shown)

***IMPORTANT!** This tube of adhesive is used to replace the abrasive strip on the grinding drum. **DO NOT** use it as transport belt adhesive. Use the bottle of adhesive included with the belt heater and accessories (Fig. 27), when welding belts.



Zero point check (Fig. 30)

NOTE: If the zero point setting of the abrasive drum is set properly, the front edge of the grinding plate just touches the drum as the plate passes under it. This adjustment should only be necessary the first time you use the equipment.

Turn the belt feed wheel (1) while at the same time turning the abrasive drum (2) by hand. Allow the grinding plate (3) to pass under the drum (Fig. 30). If evenly spread scratch marks appear on the front edge of the grinding plate the zero point setting is correct. If the drum does not contact the grinding plate evenly proceed to the zero point adjustment.

Zero point adjustment (Fig. 30)

- 1 Loosen the left, right or both threaded pins (4) with an allen wrench.
- 2 Place the allen wrench in the radial hole of the eccentric socket (5) and adjust the abrasive drum up or down by rotating the eccentric socket until the drum evenly contacts the grinding plate from side to side.
- 3 Tighten the threaded pins. Although no further adjustment should be necessary, periodically check the zero point adjustment.

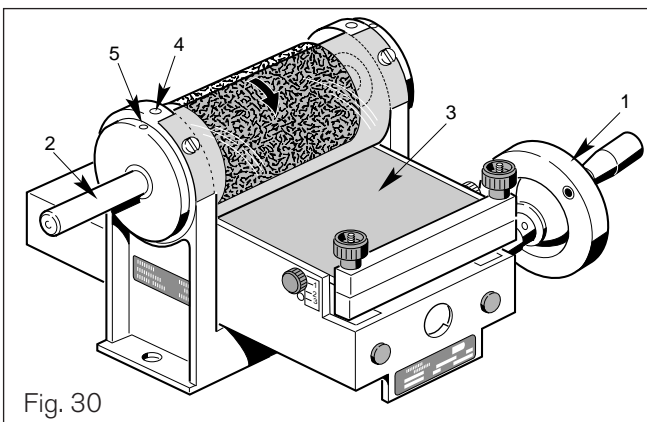


Fig. 30

NOTE: Mount the belt beveling device to a board or plate that spans the width of the conveyor to facilitate ease of use.

Setting up for beveling (Fig. 31)

- 1 Turn the belt feed wheel to position the front edge of the grinding plate (1) behind the abrasive drum as shown in Fig. 31.

IMPORTANT: Make sure the grinding plate is clean before attaching the double sided adhesive tape. If necessary, use mineral spirits to clean the surface.

- 2 Fasten two strips of double sided adhesive tape (2) to the grinding plate.
- 3 Position the knurled screws (3) in the first hole (inset Fig. 31), to achieve the proper bevel when grinding *TSplus* transport belts.

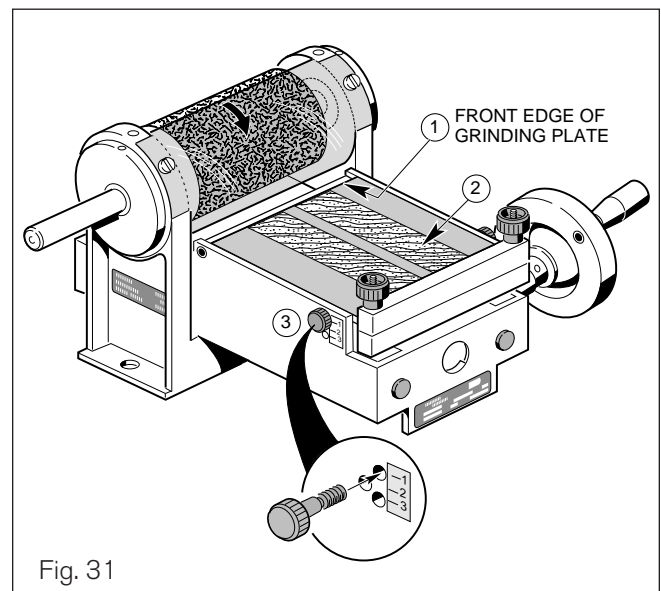
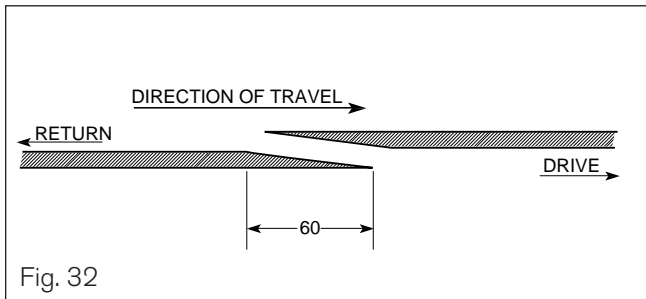


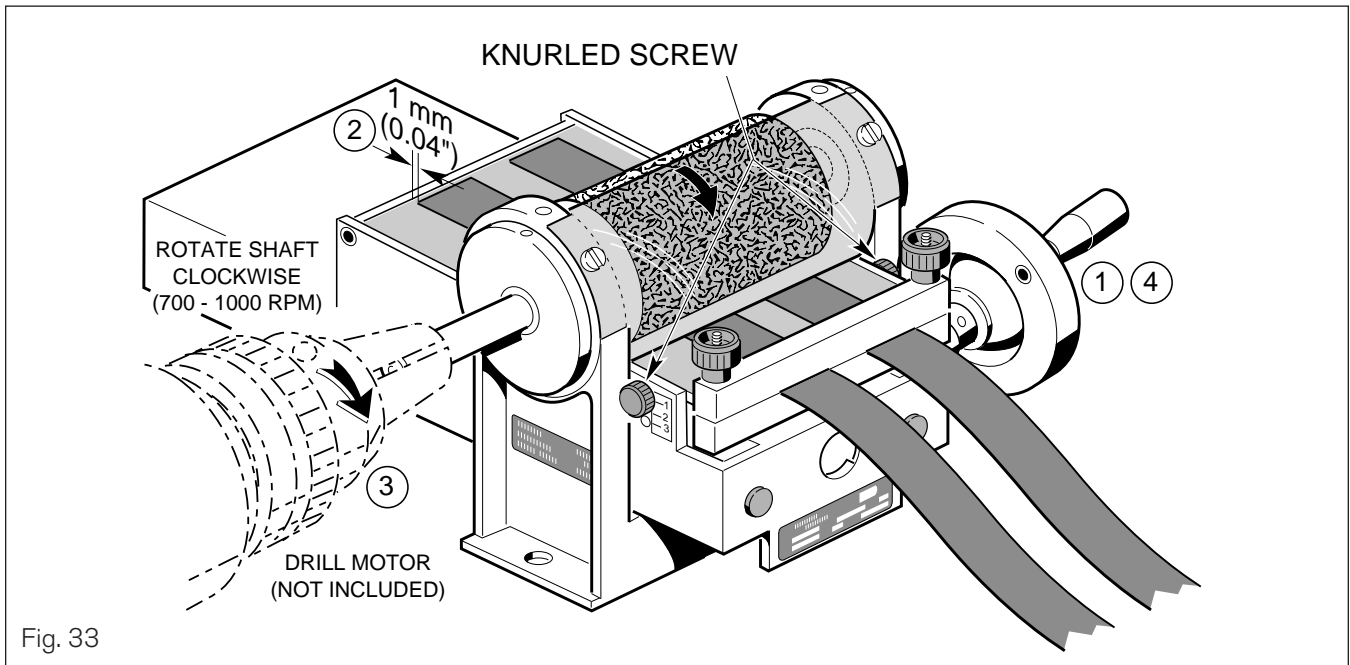
Fig. 31

Beveling the belt (Figs. 32 and 33)

IMPORTANT: Make sure that you grind the underside of the belt coming from the drive and the top side of the belt coming from the return, as in Fig. 32. This ensures smooth pallet transfer over the belt joint. Protect the ground area on both ends of the belt from contamination by oil, dust, moisture and fingerprints.



- 1 Turn the belt feed wheel and advance the grinding plate until the knurled screws touch the frame.
- 2 Fasten both ends of the belt you are beveling to the tape on the grinding plate. Position the belts approximately 1 mm (0.04") behind the ground edge of the plate and fasten them in place with the belt clamp.
- 3 Attach a drill chuck to the drive shaft of the abrasive drum and run the drill at 700 to 1000 r.p.m. Be sure to rotate the drum in the direction shown in Fig. 33.
- 4 Slowly turn the belt feed wheel, moving the ends of the belts into the rotating abrasive drum to complete the grinding process. Check the ends of the belts to be sure they are properly feathered (Fig. 34, page 28). If they are not, move the belt forward a little and repeat the grinding process.



5 Remove the belts from the grinding unit and grind the ends of the belts coming from the drive module the same way.

Be sure to turn the ends of the belts over before attaching them to the grinding unit. The belts on the drive module side must have the bevel on the underside (see Fig. 35).

NOTE: Make sure that the belt edge is properly feathered to ensure a suitable belt thickness after welding. (Fig. 34).

Beveling the belt with a cam style belt beveling device (Figs. 35 - 37)

Now bevel the belt by grinding the ends. The ends must mate up as shown in Fig. 35 so that the joint is smooth when the two ends are glued together.

IMPORTANT: Make sure that you grind the underside of the belt coming from the drive and the top side of the belt coming from the return, as in Fig. 35. This ensures smooth pallet transfer over the belt joint.

The cam style belt beveling device is driven by a standard drill and consists of (Fig. 36):

- | | |
|----------------------|-------------------|
| 1 Grinding cam | 4 Eccentric lever |
| 2 Coupling | 5 Clip |
| 3 Grinding cam lever | 6 Abrasive roller |

Both belts in the conveyor can be beveled simultaneously, as shown. Mount the belt beveling device to a board or plate that spans the width of the conveyor. Grind the belt gradually, in at least three stages, for proper beveling. Removing too much belt material at once can clog the abrasive roller.

NOTE: Make sure the grinding cam is clean before mounting the belt. If necessary, use mineral spirits to clean the cam before grinding.

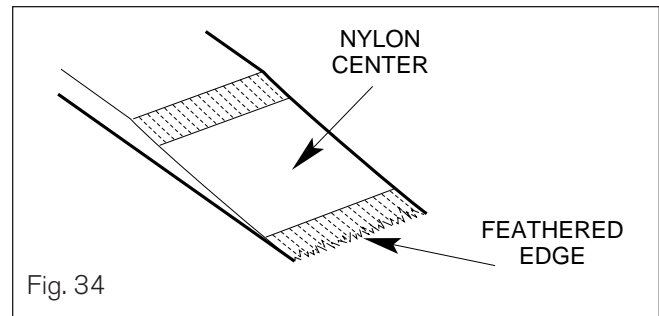


Fig. 34

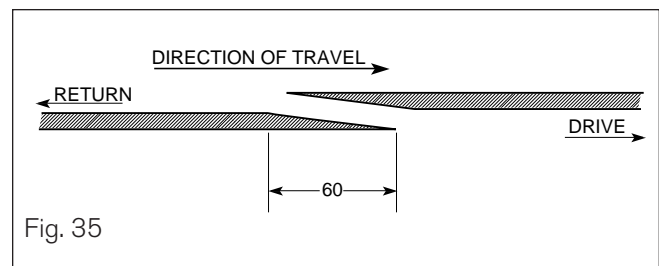


Fig. 35

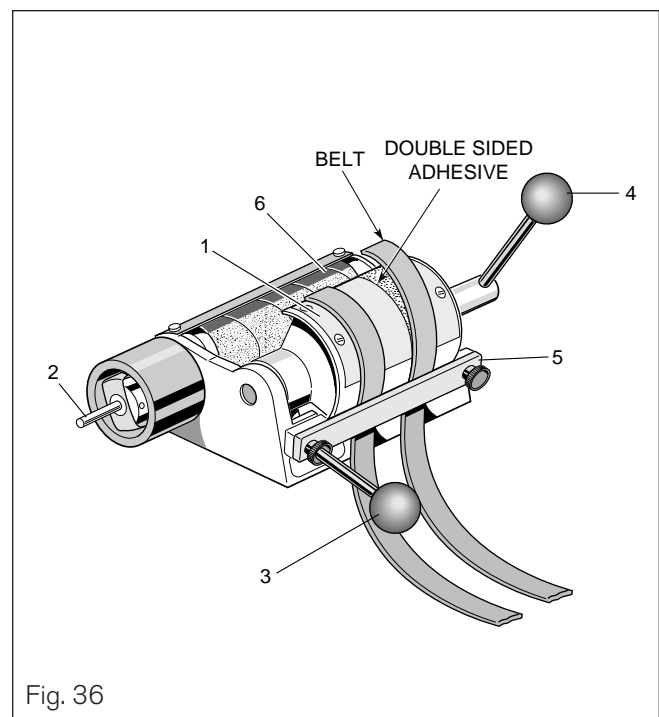


Fig. 36

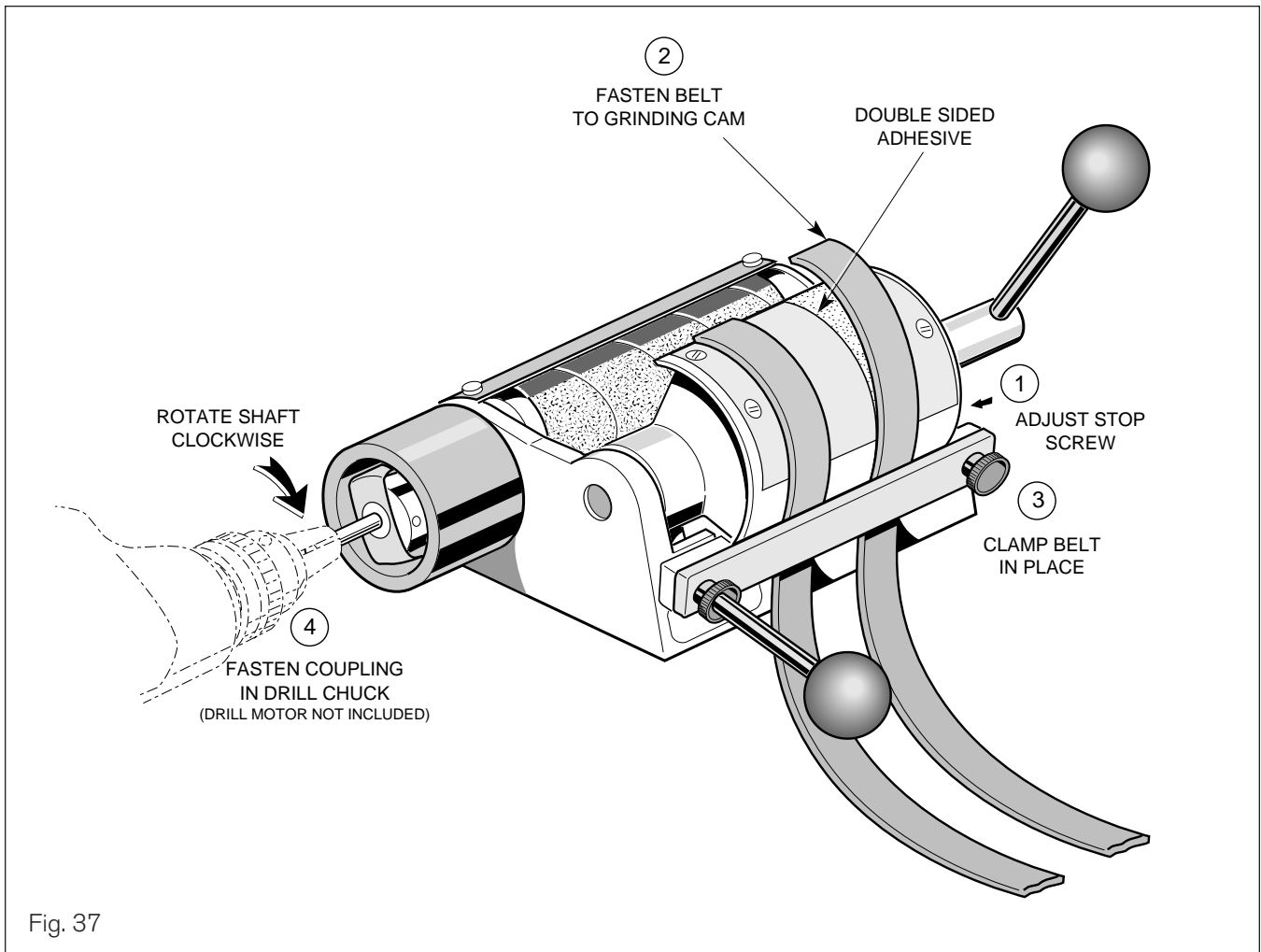


Fig. 37

Setting up for beveling (Fig. 37):

- 1 Using double-sided adhesive tape, fasten the end of the belt on the return unit side to the grinding cam (1) so that it is flush with the edge.
- 2 Clamp it tight with the clip.
- 3 Fasten the coupling in the drill chuck and run the drill at between 1000 and 1200 rpm.

- 4 Set the stop screw to limit the movement of the eccentric lever to the material thickness of the belt.

If the stop screw is set properly, the front edge of the grinding cam should just touch the grinding roller with the eccentric lever in its forward position. This should only be necessary the first time you use the equipment.

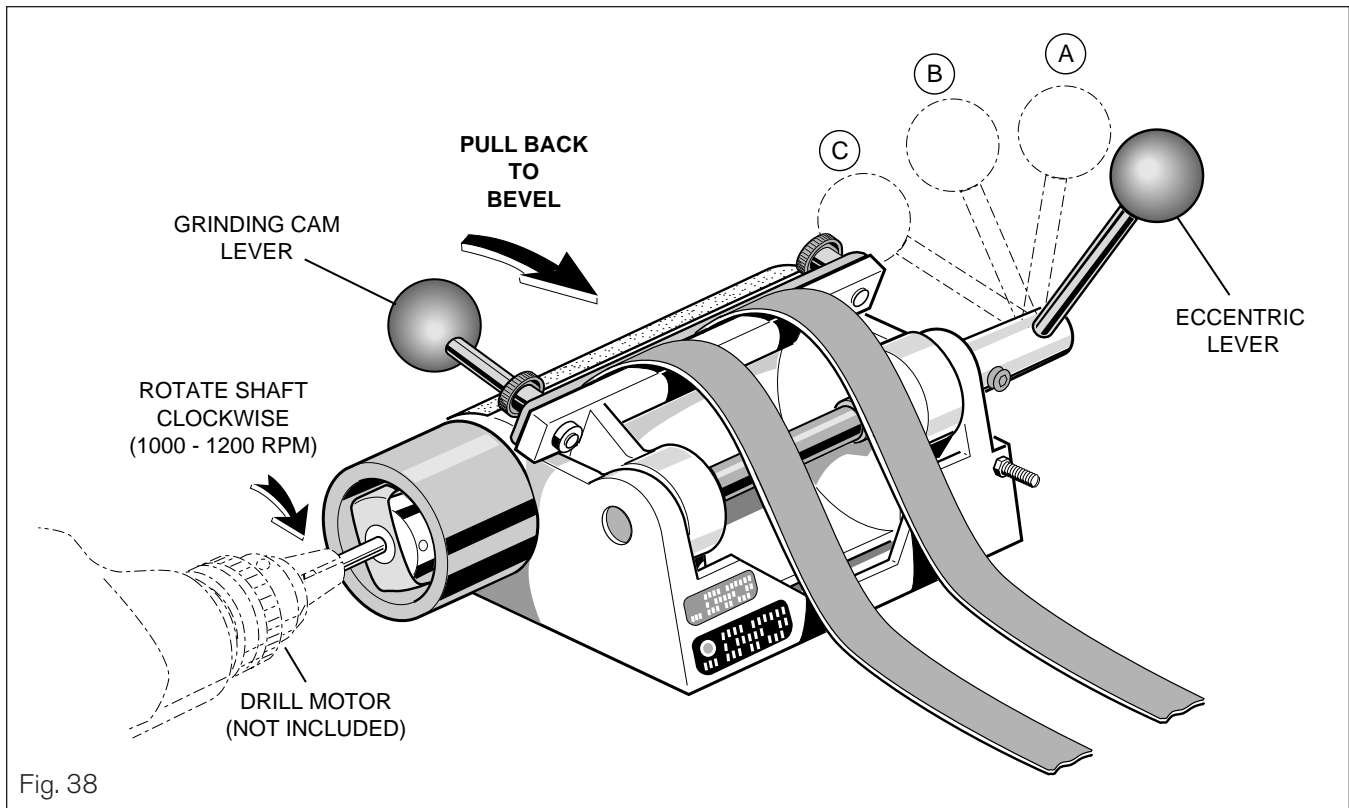


Fig. 38

Beveling Procedure:

NOTE: Always grind from the full material thickness of the belt toward the belt end. In other words, grind only while pulling the grinding cam lever in the direction shown in Fig. 38.

- 1 With the **eccentric lever** in starting position, push the **grinding cam lever** all the way forward. It is best to bevel the belt in three steps.
- 2 For the first of the three grinding steps, move the **eccentric lever** to the first 1/3 of its travel and hold in position (A).
- 3 Using a slow, uniform motion, make the first grind by moving the **grinding cam lever** back toward the housing base, as shown.
- 4 Return the **eccentric lever** to its starting position.
- 5 Again, push the **grinding cam lever** all the way forward.
- 6 Set the **eccentric lever** to 2/3 of the total feed path (position B) and repeat the beveling operation by pulling the **grinding cam lever** back toward the housing base.
- 7 Perform the 3rd and last beveling step: Pull the **eccentric lever** back, push the **grinding cam lever** forward, push the **eccentric lever** all the way forward (position C), then make the final grind by pulling the **grinding cam lever** slowly back.

For this final step, you may want to move the grinding cam lever back and forth a few times to smooth out the grind.

Tension the belt (Fig. 39 and 40)

⚠ WARNING: DO NOT perform tensioning operations until you have bolted the conveyor to the shop floor and verified that the foundation brackets and fastening hardware on all conveyor components are secure. Failure to bolt the conveyor to the shop floor may result in serious personal injury!

When you have successfully beveled all 4 belt ends (two per belt section), draw the two ends of each belt together for joining. This will tension the belt.

Tensioning equipment: (Fig. 39)

- 1 Belt clamps (2)
- 2 Chain with snap hook
- 3 Ratchet device with snap hook

⚠ CAUTION: Follow the tensioning and belt welding instructions exactly, and clear the area of any and all unnecessary personnel. Improper tensioning and gluing will cause the belt to separate prematurely and may result in serious personal injury.

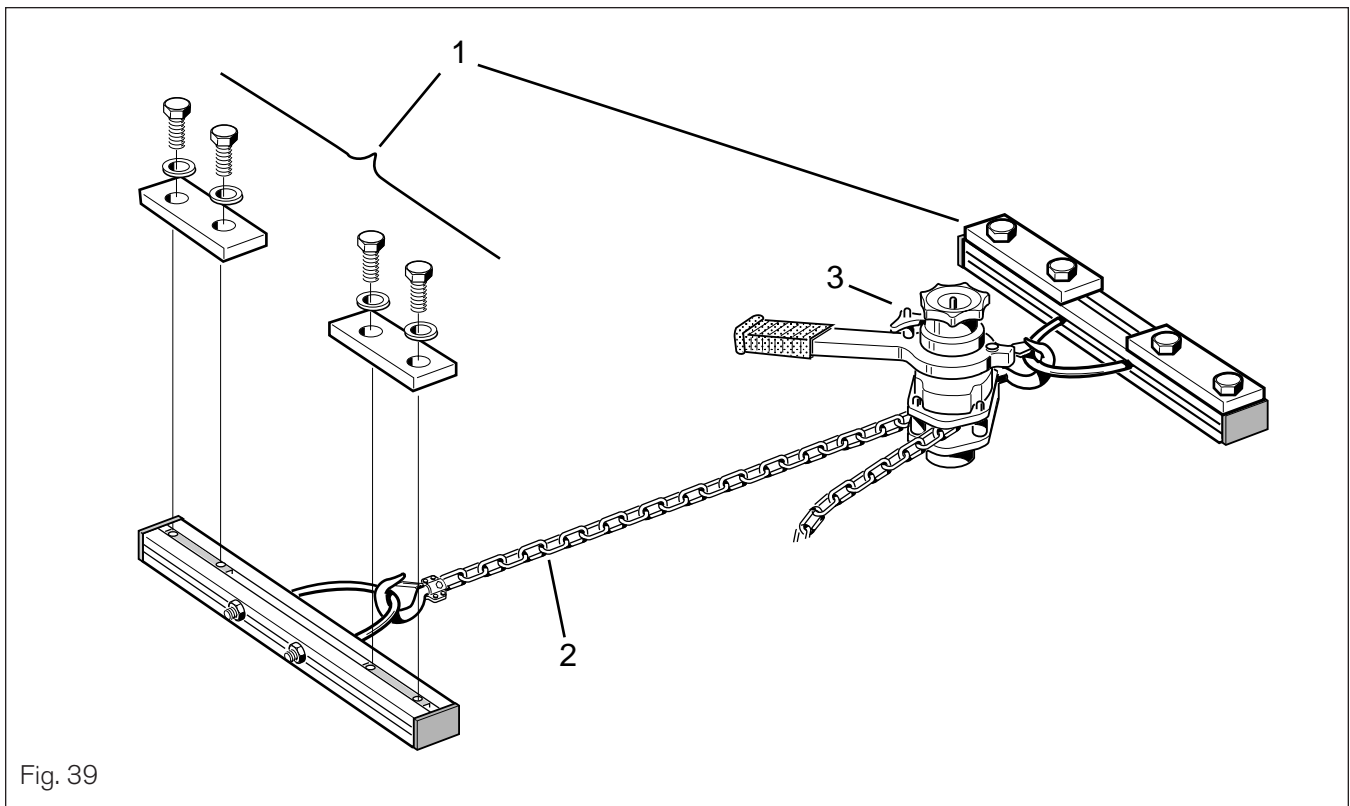


Fig. 39

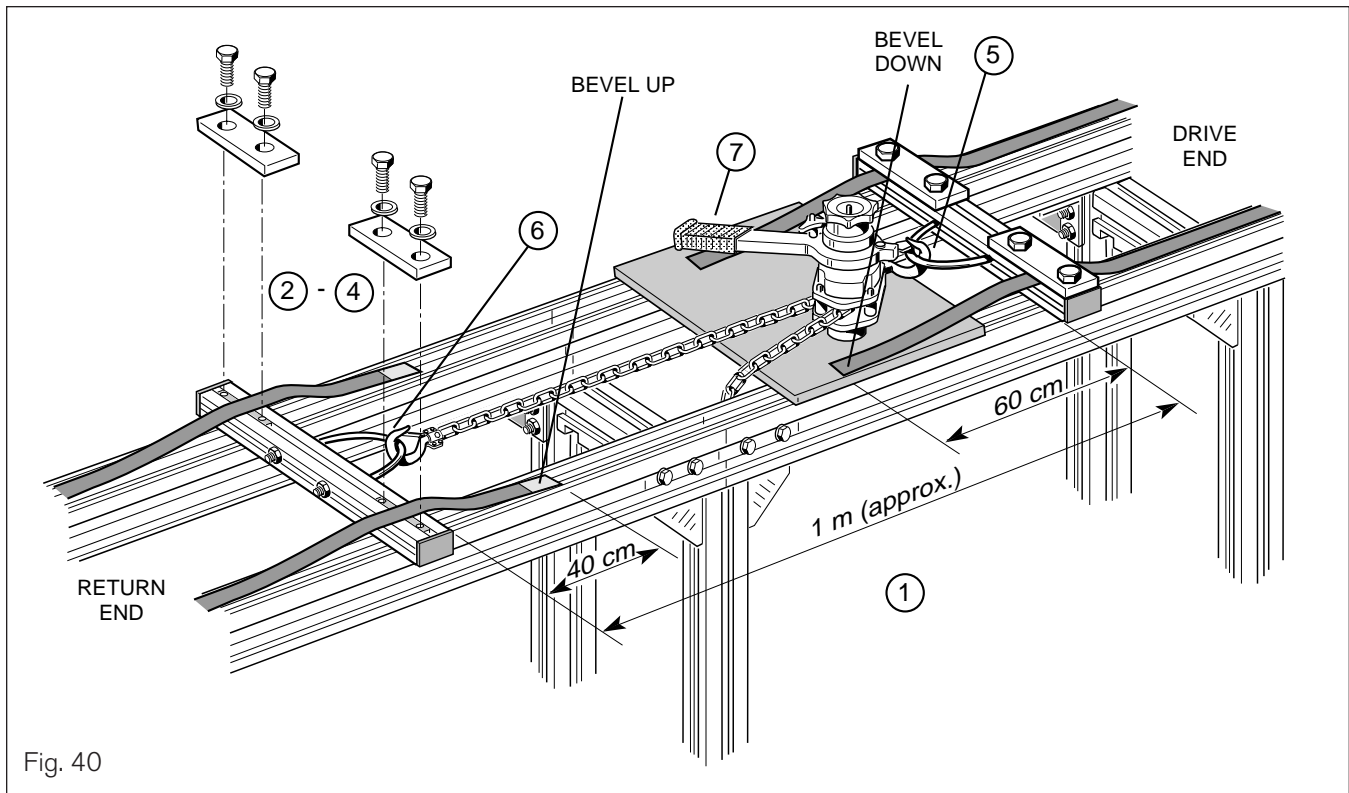


Fig. 40

Before beginning, make sure that the belts are centered on the reversing wheels of the drive and return unit. This will help prevent them from slipping off.

Procedure:

- 1 Place the belt clamps about one meter apart on the center of the conveyor section, with the metal rings facing toward each other as shown in Fig. 40.

NOTE: In order to avoid damaging the belt guide profiles, place a nonmetallic plate of some type between them and the ratchet device.

- 2 Unscrew the M8 hex bolts using a 13 mm wrench. Take off the clamp plates.

- 3 Place the ends of the belt on the aluminum strut profiles in the clamps, as illustrated. Make sure that they are parallel.

For longer conveyors, place a piece of abrasive cloth or sandpaper face down on the belt to help hold it in place. The belt ends should protrude by about 60 cm (24") from one belt clamp and by about 40 cm (16") from the other.

- 4 Replace and tighten down each clamp plate with the two M8 hex bolts and flat washers you removed earlier.

NOTE: Tighten the M8 hex bolts at the same time to a uniform tightening torque (max. 42 Nm). Ensure that the belt clamps are perpendicular to the conveyor and centered with the belts clamped in place immediately above the conveyor sections.

- 5 Attach the ratchet snaphook to the ring on the clamp with the longer piece of belt.
- 6 Attach the chain snaphook to the ring on the other clamp.
- 7 Crank the ratchet handle until the beveled belt ends overlap (see Fig. 41 at right) and are ready to be placed in the heating press for gluing.

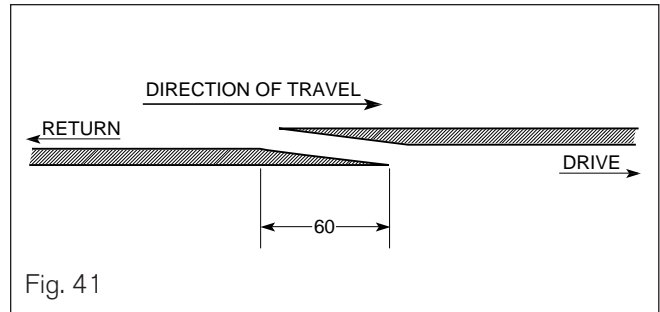


Fig. 41

Welding the belt

NOTE: The following belt welding procedure applies to the Bosch belt and adhesive supplied with your conveyor. The glued joint will hold permanently only if the belt is used together with the specified adhesive, and only when the following instructions are complied with exactly.

Due to its superior wear characteristics, antistatic belt is supplied with every Bosch conveyor. The glue supplied is manufactured specifically for this belt. The bond between the two beveled belt ends is formed in the heating press, which consists of (Fig. 42):

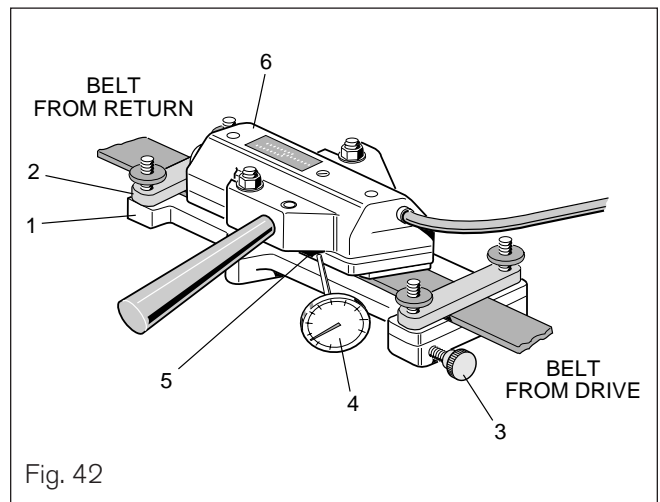


Fig. 42

- 1 Base
- 2 Clamping element
- 3 Thumb screw
- 4 Thermometer
- 5 Insert set consisting of:
Rubber plate, plastic film (qty. 2), steel plate
- 6 Heating element

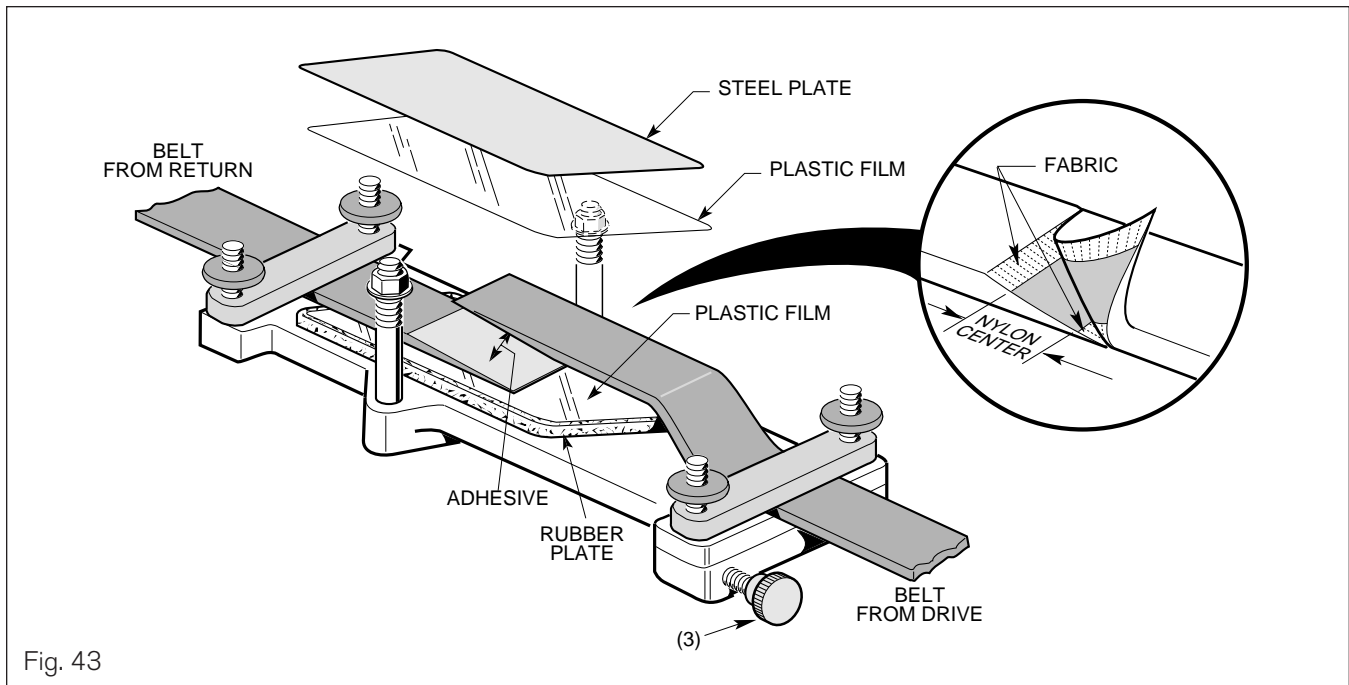


Fig. 43

Gluing operation (Fig. 43):

1 A properly beveled belt will have a ragged edge. This feathering is necessary to ensure correct belt thickness after welding. Make sure that no loose pieces of fabric are left on the beveled belt surfaces! Long or curled pieces of nylon should be trimmed off.

NOTE: DO NOT touch the ground end of the belt or use plant air to blow particles from the belt ends. Do not use solvent based cleaners on the belt. All of the above will result in contamination of the belt.

2 Position the heating press on the conveyor so that the thumb screw (3) on the heating press base points toward the drive.

3 Remove the heating element and pre-heat it to 120° C (248° F).

4 Take 1 piece of plastic film from the insert set and place it on the rubber plate in the base of the heating press.

5 Insert the end of the belt from the return and clamp it in place. Make sure to position it so that the entire surface of the weld will be covered by the heating element.

6 Insert the drive end of the belt as shown and clamp it tight with the clamping element.

IMPORTANT: When joining the belt, match up the two belt ends so that they are perfectly aligned (Fig. 43). The belt will not bond to the unground belt fabric; therefore, ensure that the two ground areas line up perfectly.

7 Loosen the thumb screw (3) and take off the clamping element, with the belt end still attached.

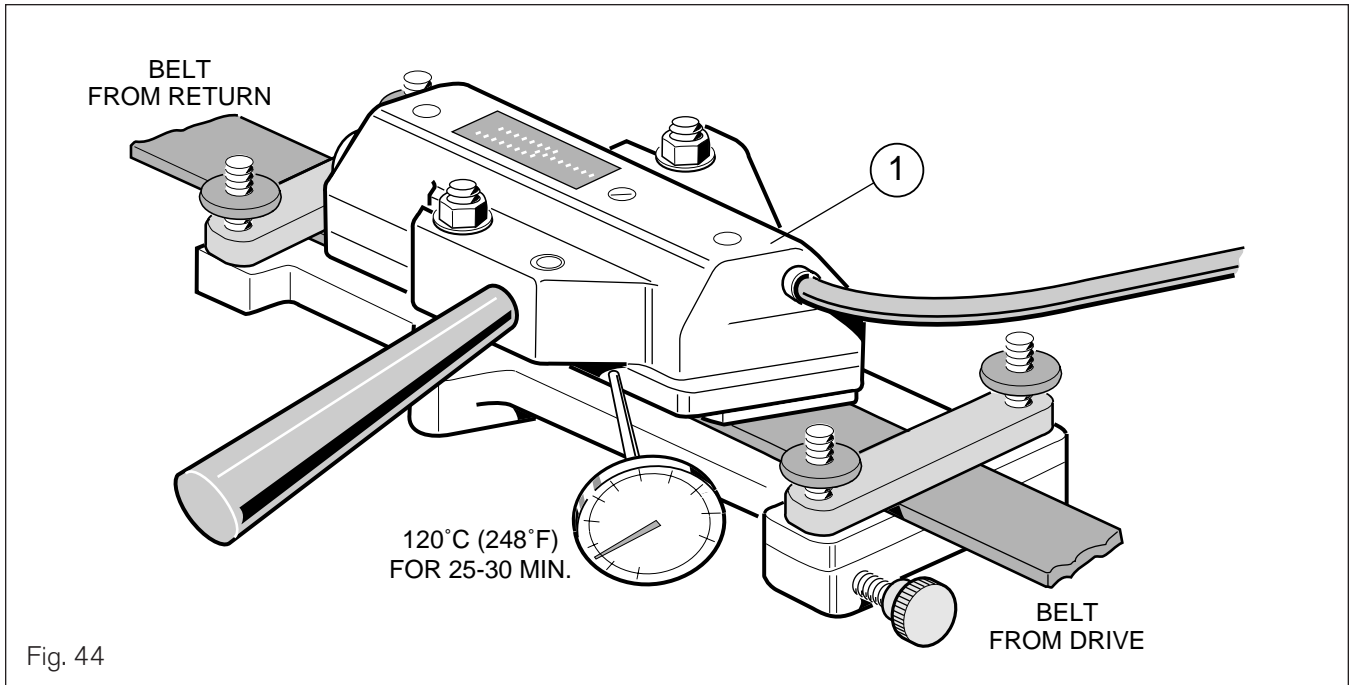


Fig. 44

Applying the heating press (Fig. 44):

8 Apply a very thin uniform coating of belt adhesive to the ground surfaces of each belt end.

NOTE: DO NOT expose treated ends to air for more than 2 minutes, or the weld will not hold permanently. The ends should be tacky immediately before they are pressed together. If the adhesive has dried, reapply it following the procedure in step 8.

9 Replace the clamping element so that the two ends of the belt are pressed against each other and are flush with each other. Lock in place with the thumb screw.

10 Place the remainder of the insert set on the weld in the following order: plastic film first; steel plate second.

1 Place the pre-heated heating element in position and tighten the nuts alternately and uniformly. The belt must have heavy pressure immediately applied to the area to be welded. The integral thermostat ensures automatic temperature control.

IMPORTANT: It is critical to make sure that the heater has pre-heated to the proper temperature (120°C [248°F]). Belts will hold permanently only if welded at this temperature for the proper length of time (25 - 30 minutes).

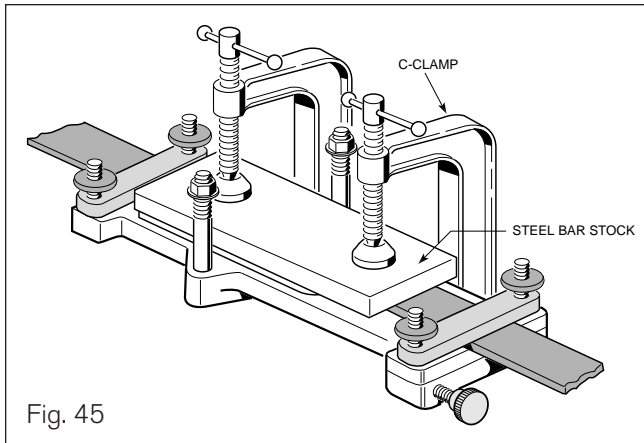


Fig. 45

Curing the belt weld (Fig. 45)

NOTE: Use one of the following two approved procedures to cure newly welded belts. Use procedure 2 to shorten the cooling process, but do not attempt any other method. Other methods may result in cracks in the weld, subsequently making the belt unusable.

- 1 Procedure 1: After 25-30 minutes, switch off the unit (unplug it) and let it cool to room temperature. Once it has cooled, open the heating press and remove the belt. Sand the edges lightly if necessary to remove glue residue.
- 2 Procedure 2: After 25-30 minutes, switch off the unit (unplug it) and immediately remove the heating element and clamp a piece of steel bar stock in its place for 30 minutes (Fig. 45). After 30 minutes remove the clamps and sand the edges lightly if necessary to remove glue residue.

The gluing procedure is now finished and the ratchet may be reversed to remove the tension on the chain. Remove the clamp blocks and carefully slide the bars from beneath the belts.

- 3 Re-attach the drive and return unit side covers.

Initial Start-up

Before starting up the conveyor for the first time, recheck all mounting hardware for tightness.

IMPORTANT: The customer assumes responsibility for the control system, and must provide an EMERGENCY-OFF SWITCH in the TSplus conveyor.

Connect the motor wiring (Fig. 46 below & Fig. 46A, page 37)

The motor and gearbox are delivered already mounted in the conveyor drive module. Replacement procedures for both the motor and gearbox are shown in the "Repair" section of the manual.

Make the motor electrical connections according to the connection schematic shown in Fig. 46 or Fig. 46A. An additional copy is attached to the motor nameplate.

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

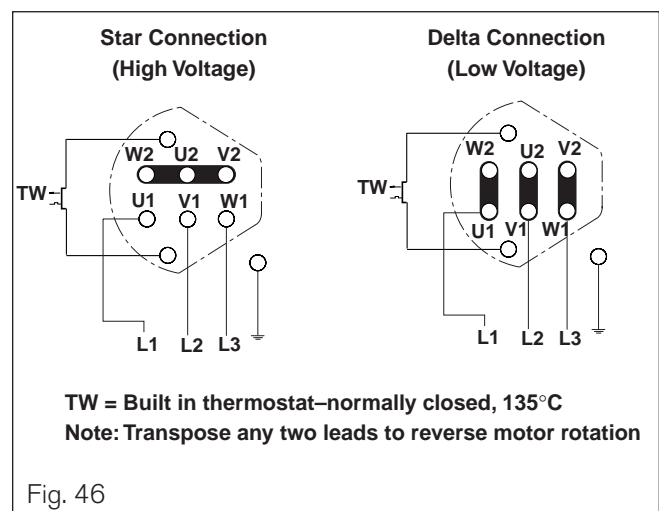


Fig. 46

Maintenance

⚠ CAUTION: LOCK OUT all power supplies 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 To ensure proper cooling, keep the motor surface, intake opening, fan shroud, and cooling fins clear of dirt and debris.
- 2 Wipe the conveyor clean of any excess grease, dirt or any foreign substances every month, and at the same time check the conveyor unit and belt for wear. Replace any parts showing signs of excess wear (see section titled “Repair.”)
- 3 Finally, check all fastening elements for tightness, and re-tighten to 18 lb-ft (25 Nm), if necessary.

Repair

⚠ CAUTION: LOCK OUT all power supplies before beginning maintenance work of any type.

Replacing the guide profiles (Fig. 47)

All guide profiles should be checked for wear regularly and replaced, if needed.

- 1 Gently pry up the edge of the guide profile with a screwdriver.
- 2 Then, snap off the old guide profiles by hand.
- 3 Finally, attach the new guide profile.

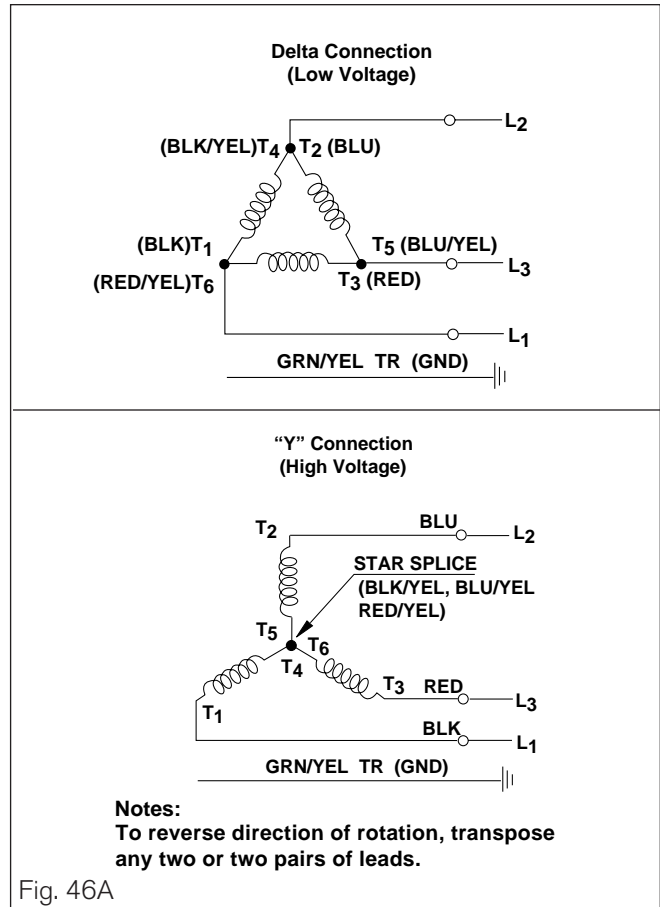


Fig. 46A

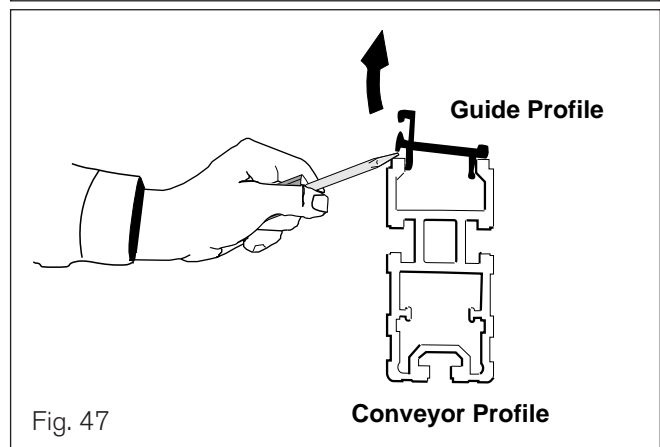


Fig. 47

Align the upstream end of the guide profile (the end nearest the return) flush with the end of the corresponding conveyor belt section and use a soft faced hammer to *gently* tap the guide profile into place.

Relaxing the belt tension

It is necessary to relax the tension on the belt before performing certain maintenance procedures, including the replacement of major drive or return components.

⚠ WARNING! The conveyor **MUST** be bolted to the floor before using the tensioning equipment. The bolts in the foundation brackets and the fastening hardware on all conveyor components **MUST** be tight. Clear the area of any unnecessary personnel.

Equipment needed to remove the belt include:
 Belt tensioner clamp
 Two large C-clamps
 Two metal blocks, approx. 1.5x4x2 in. (3.5x10x5cm)

To relax the tension on the belt (Figs. 48 and 49)

⚠ CAUTION: LOCK OUT all power supplies before beginning maintenance work of any type.

The procedure outlined below describes how to relax the belt tension on the drive module end, for example for gearbox or idler wheel bearing replacement. The same procedure applies for the return end, as well.

- 1 Remove and save the screws and side covers on the drive module.
- 2 Remove the belt guide profiles from the first section of aluminum extrusion where the drive module is attached. Remove the guide by lifting the belt and unsnapping the guide from the extrusion.

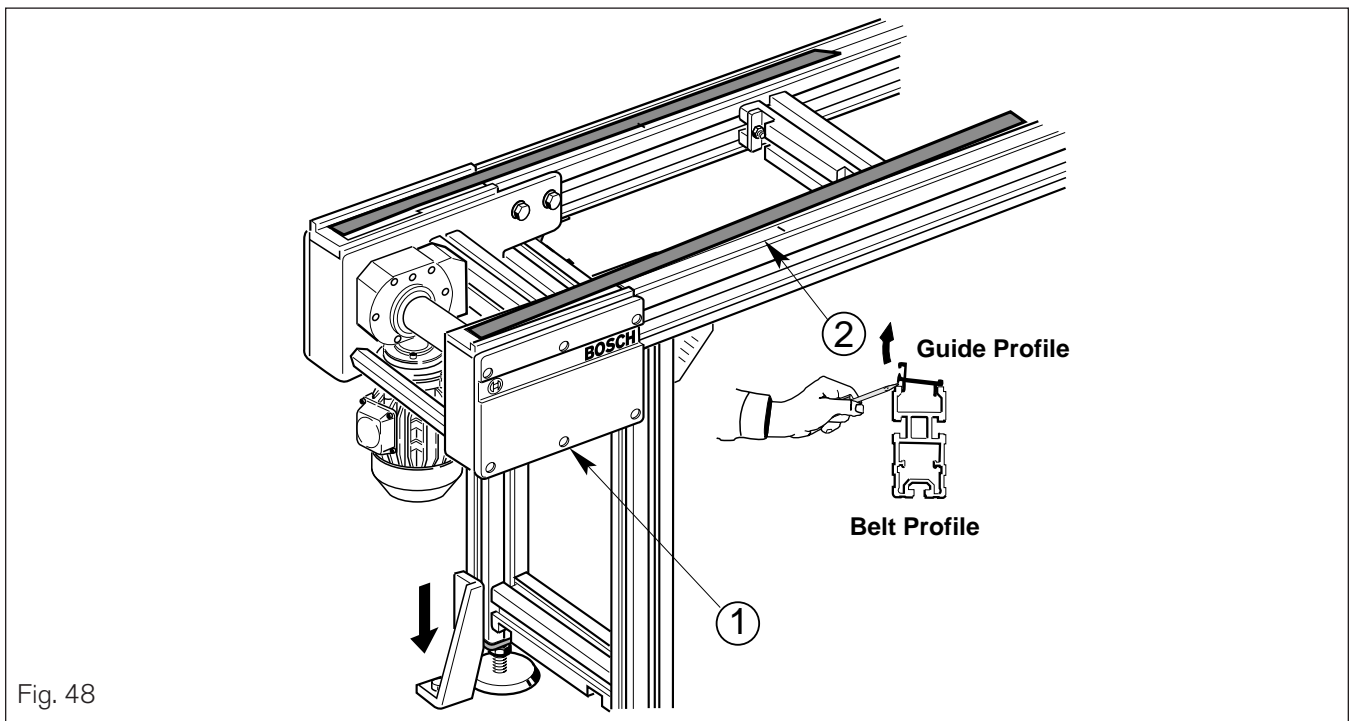


Fig. 48

3 Position metal blocks that fit into the return channel on top of the belt approximately one meter from the end. Clamp them **FIRMLY** in place as shown using large C-clamps (Fig. 49 inset).

⚠ WARNING! The conveyor **MUST** be bolted to the floor before using the tensioning equipment. The bolts in the foundation brackets and the fastening hardware on all conveyor components **MUST** be tight. Clear the area of any unnecessary personnel.

4 Attach the belt clamp and ratchet assembly to the transport level belt.

5 Fasten the ratchet snap hook around the leg set cross link of the conveyor as shown in Fig. 49.

6 Crank the ratchet handle **ONLY** until there is sufficient slack in the belt to relax the tension around the drive wheels.

7 To retension the belt once all maintenance work is complete, reverse the order of the procedures, always using the ratchet in reverse to remove the tension on the chain. **NEVER** release the chain tension suddenly! Serious injury and property damage could result.

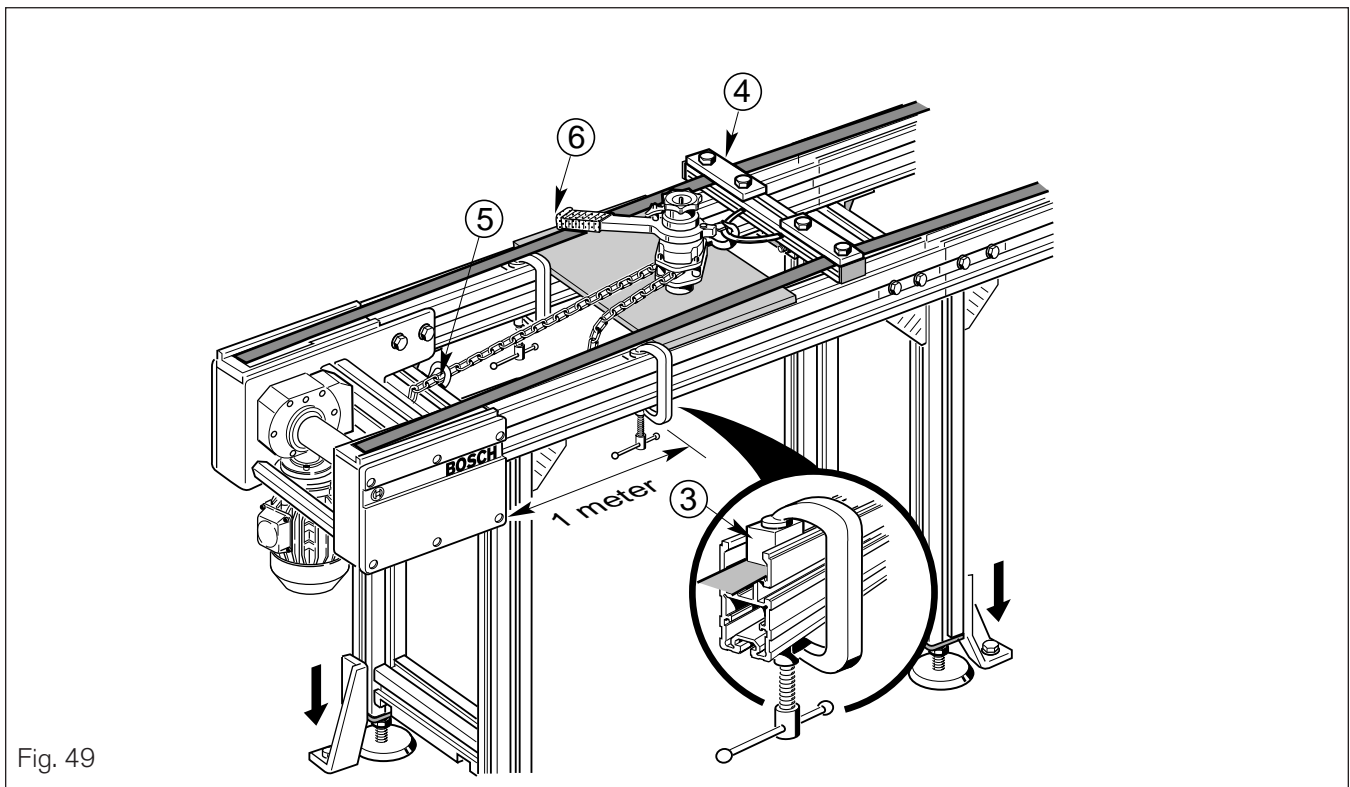


Fig. 49

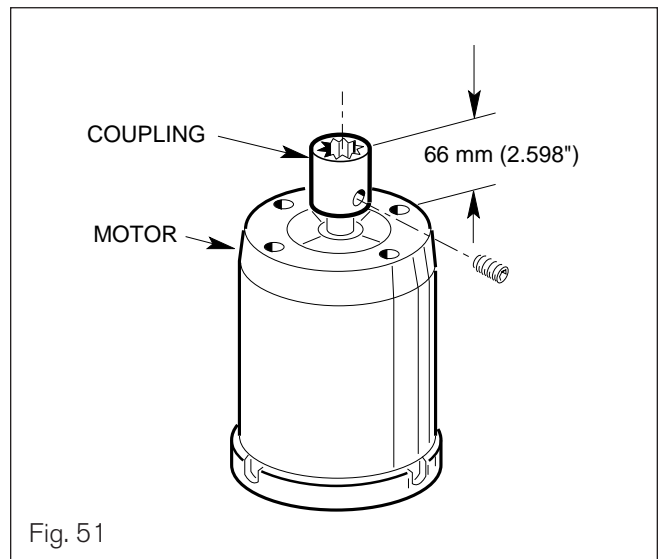
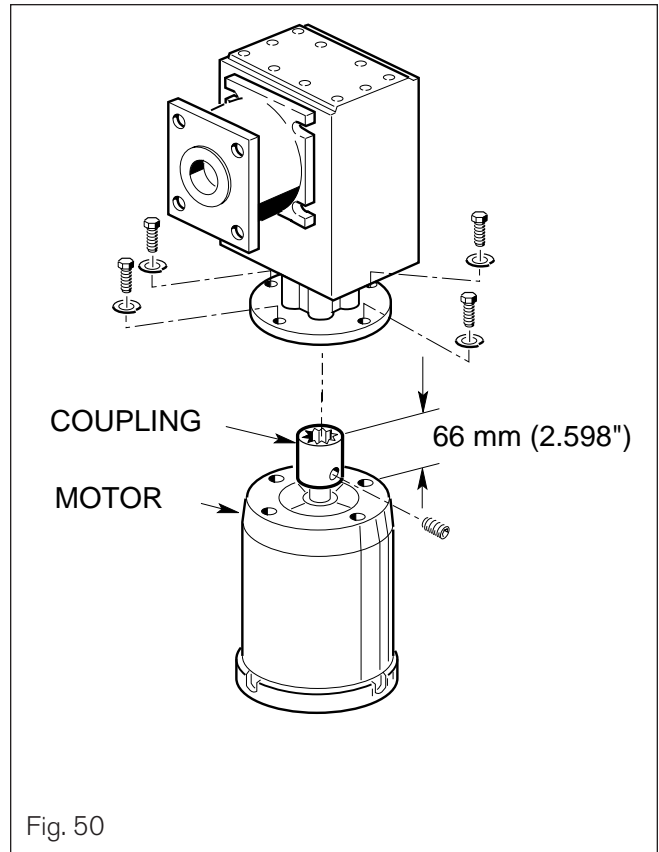
Heavy Duty Drives

(for standard duty drives, see page 43)

Replacing the motor (Fig. 50 and 51)

⚠ CAUTION: LOCK OUT all power supplies before beginning maintenance work of any type.

- 1 LOCK OUT POWER SUPPLY and disconnect electrical wiring to the motor.
- 2 Loosen the four hex screws connecting the motor to the mounting flange. Lower the motor from the gearbox.
- 3 Transfer the coupling to the new motor by loosening the set screw and sliding it off the motor shaft. Install the coupling on the new motor shaft according to the dimension in Fig. 51.
- 4 Apply a liberal amount of coupling grease to the coupling and gearbox input shaft. Use only Klüber Microlube 261.
- 5 Lift the motor into the gearbox mounting flange, carefully aligning the coupling and the gearbox input shaft. Do not force it; the two units should slide smoothly together.
- 6 Rotate the motor to obtain the proper j-box orientation, and secure it to the mounting flange with four hex bolts. For Nema motors, the bolts should be 3/8-16 x 1" and for IEC motors, the bolts should be DIN933 M6 x 25.
- 7 Reconnect the electrical wiring.
- 8 Apply power and carefully check for proper motor rotation. Use caution; reverse operation of the conveyor may cause severe damage.



**Replacing the gearbox—Center Mounted
(Fig. 52)**

⚠ CAUTION: LOCK OUT all power supplies before beginning maintenance work of any type.

- 1 Remove the motor as described on page 40.
- 2 Remove tension from the belt (see procedure on pages 38 and 39).
- 3 Remove the side covers (1) from both sides of the drive module.
- 4 On the side opposite the gearbox, remove the cap screw holding the hexagon spacer (3) between the two side housings. Slide the spacer (4) out of the way and unscrew the hexagon spacer shaft (5) from the side of the gearbox.
- 5 On the side with the gearbox, remove the snap ring (6) from the hexagon drive shaft. Push the hex shaft (7) through the sprocket and gearbox until the first cover tube section can be removed.
- 6 Support the gearbox while removing the three hex bolts (8) securing the gearbox to the mounting flange. Remove the gearbox.
- 7 To remove the motor mounting flange, remove the four cap screws (9) that secure it to the gearbox.
- 8 Install the new gearbox by reversing the disassembly procedure described above.

NOTE: Bosch gearboxes are factory filled with a specific volume and type of lubricant. **DO NOT** drain, fill, or “top off” the lubricant. Incorrect fluid level will cause leakage and gearbox damage.

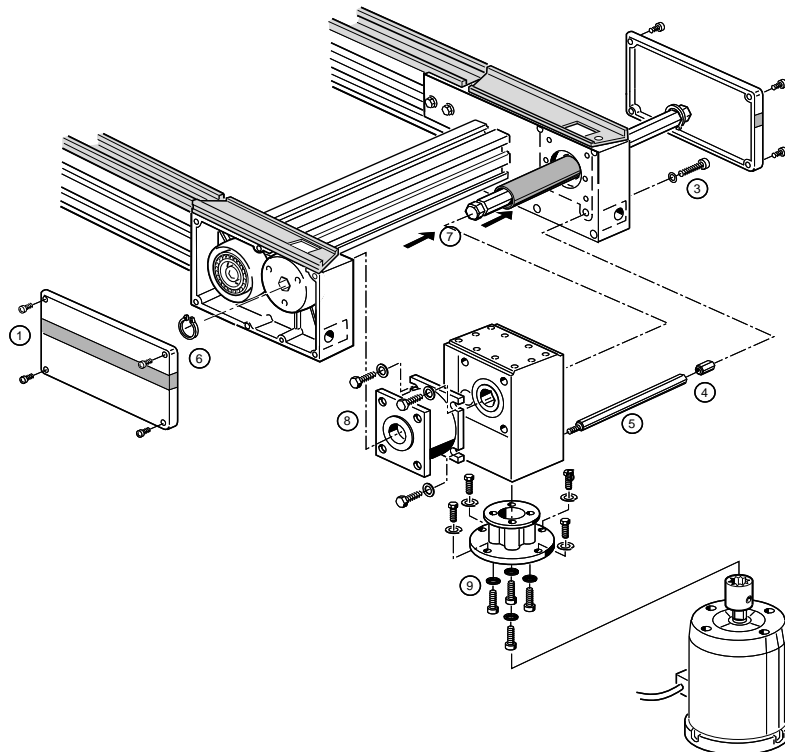


Fig. 52

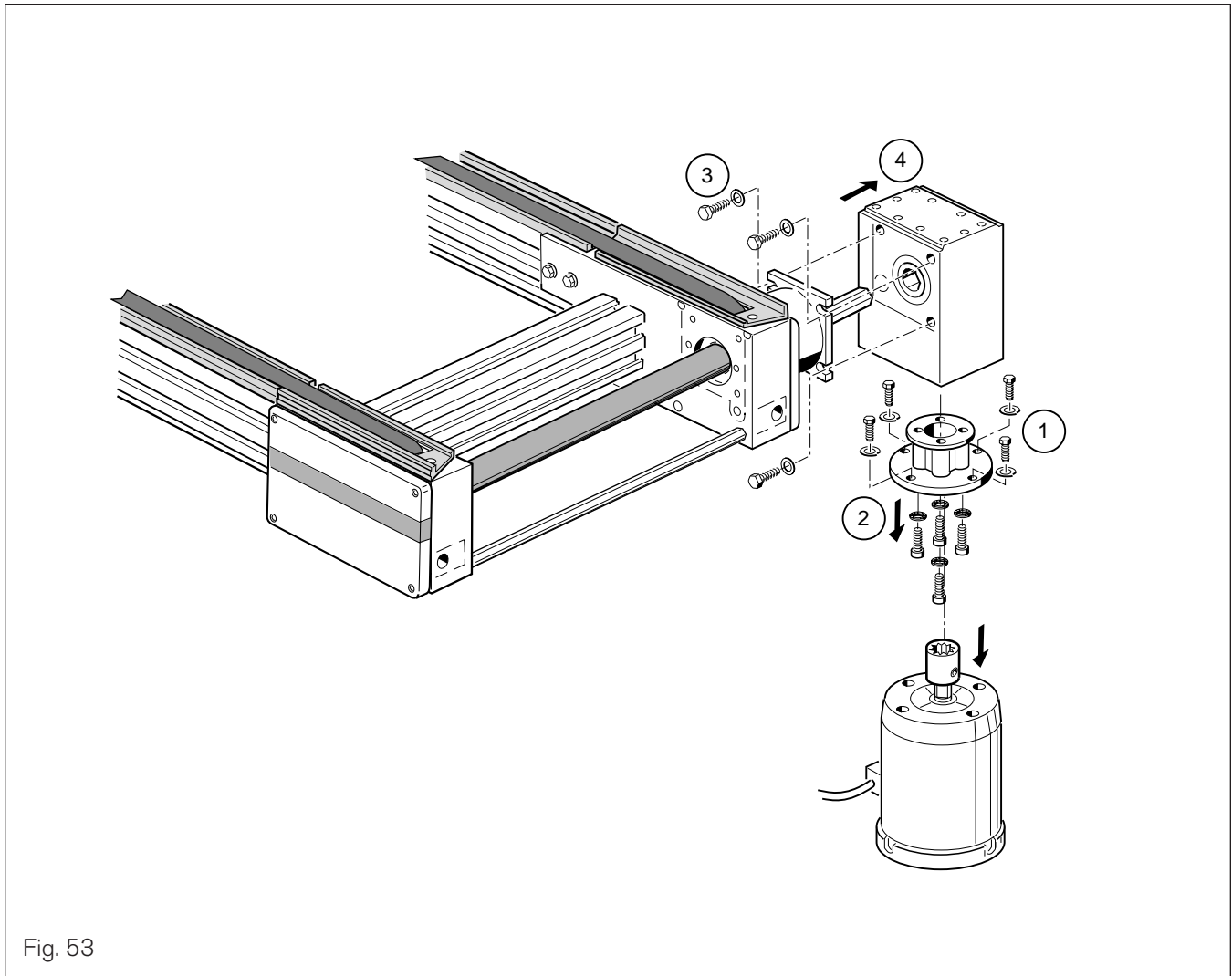


Fig. 53

Replacing the gearbox—Side Mounted (Fig. 53)

⚠ CAUTION: LOCK OUT all power supplies before beginning maintenance work of any type.

- 1 Remove the motor as described on page 40.
- 2 Support the gearbox while removing the three hex bolts securing the gearbox to the mounting flange. Remove the gearbox.
- 3 To remove the motor mounting flange, remove the four cap screws that secure it to the gearbox.
- 4 Install the new gearbox by reversing the disassembly procedure described above.

NOTE: Bosch gearboxes are factory filled with a specific volume and type of lubricant. **DO NOT** drain, fill, or “top off” the lubricant. Incorrect fluid level will cause leakage and gearbox damage.

Standard Duty Drives

Replacing the motor (Fig. 54)

⚠ CAUTION: LOCK OUT all power supplies before beginning maintenance work of any type.

- 1 LOCK OUT POWER SUPPLY and disconnect electrical wiring to the motor.
- 2 Loosen the four screws connecting the motor to the gearbox; then, remove the motor by lowering it.
- 3 Attach the new motor (the key on the motor shaft will help you align the motor properly) and tighten the hex screws.
- 4 Re-connect the electrical wiring.
- 5 Check for proper rotation of the new motor.

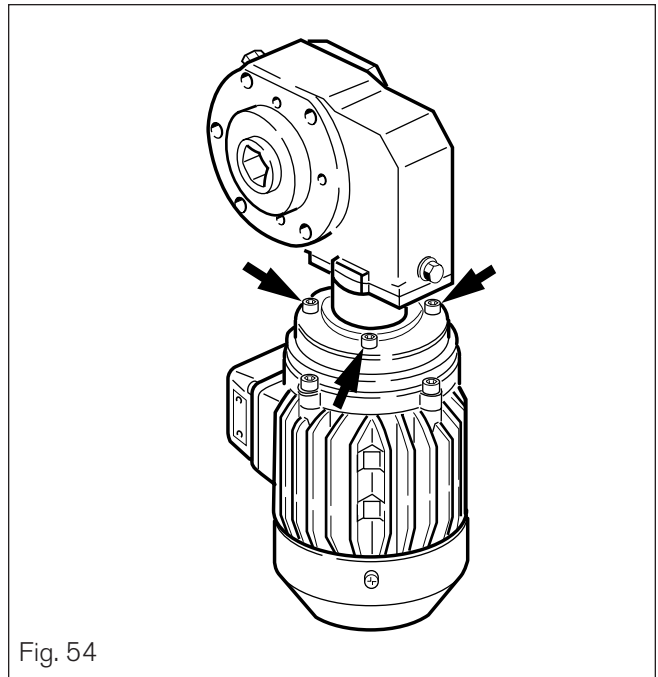
Replacing the center-mounted gearbox: standard duty drives (see Fig. 55 on page 44)

⚠ CAUTION: LOCK OUT all power supplies before beginning maintenance work of any type.

For 160 mm wide drives:

- 1 Remove both side covers from the drive module.
- 2 Remove the tension from the belt (see pages 38 and 39).
- 3 Remove the snap ring from the hexagonal drive shaft. Push the shaft through the drive to remove.
- 4 Gently pry up the guide profile and slide the drive wheel out of the drive housing to gain access to the gearbox mounting screws.
- 5 Support the gearbox while removing the two attachment screws.
- 6 Remove the gearbox from the drive module.
- 7 Replace the gearbox by reversing the above procedure. Remember to apply anti-seize lubricant to the motor shaft before assembling it to the gearbox.

Fig. 54



For 240 mm and larger drives, please see instructions on page 44.

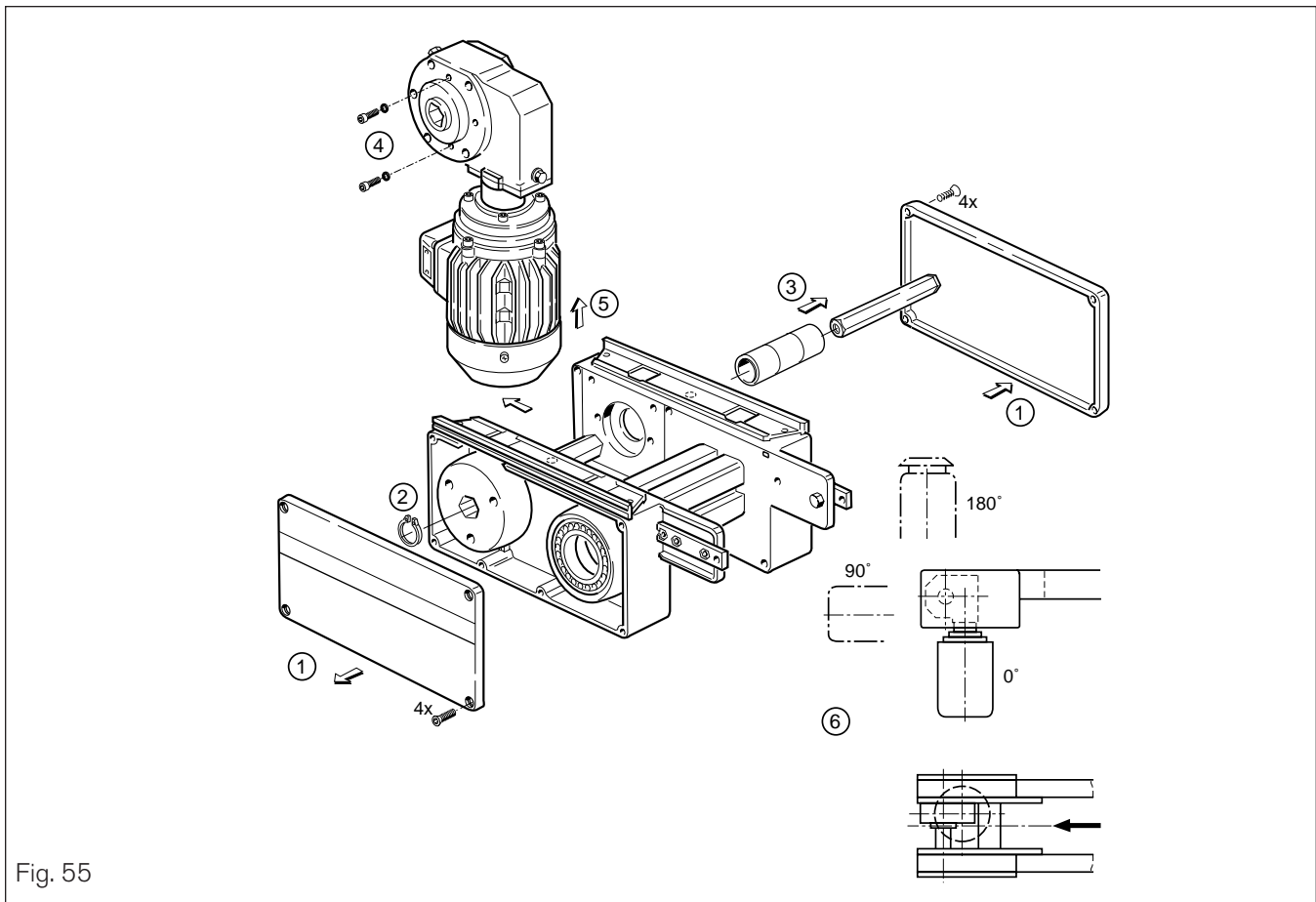


Fig. 55

Replacing the center-mounted gearbox: standard duty drives (Fig. 55)

240 mm and larger drives:

- 1 Remove both side covers from the drive module.
- 2 Remove the snap ring from the hexagonal drive shaft. Push the shaft through the drive to remove.
- 3 Support the gearbox while removing the two attachment screws securing the gearbox mounting flange to the drive housing.
- 4 Remove the gearbox/mounting flange from the drive module.
- 5 Replace the gearbox by reversing the above procedure. Remember to apply anti-seize lubricant to the motor shaft before assembling it to the gearbox.

NOTE: The motor/gearbox can be rotated into the positions shown above (0°, 90°, or 180°) prior to reassembly. Verify that the motor will not interfere with pallet movement before changing the motor/gearbox position!

Changing the motor mounting position

The drive module is delivered in one of two standard versions:

- 1 **AS2/M:** Center mounted motor, flange-mounted on right, motor position 0°.
- 2 **AS2/S:** Side-mounted motor, mounted on right, motor position 270°.

The motor mounting position can be changed at any time. Side mounted motors may be changed from outside left to outside right with no additional parts. To change from center to side-mount (and vice versa), however, you will need several additional parts, available from BOSCH.

Changing from outside right to outside left (Figs. 56 & 57):

Removing the motor from the outside right (Fig. 56)

- 1 Detach the gearbox mounting flange from the outside right by removing the four screws.
- 2 Remove the side cover from the left-hand side of the drive (the non-motor side), as shown.
- 3 Take off the snap ring from the end of the shaft (again on the non-motor side).
- 4 Push the drive shaft all the way through the drive, as illustrated.
- 5 Unscrew the small side cover. You will attach it later to the opposite side of the drive.

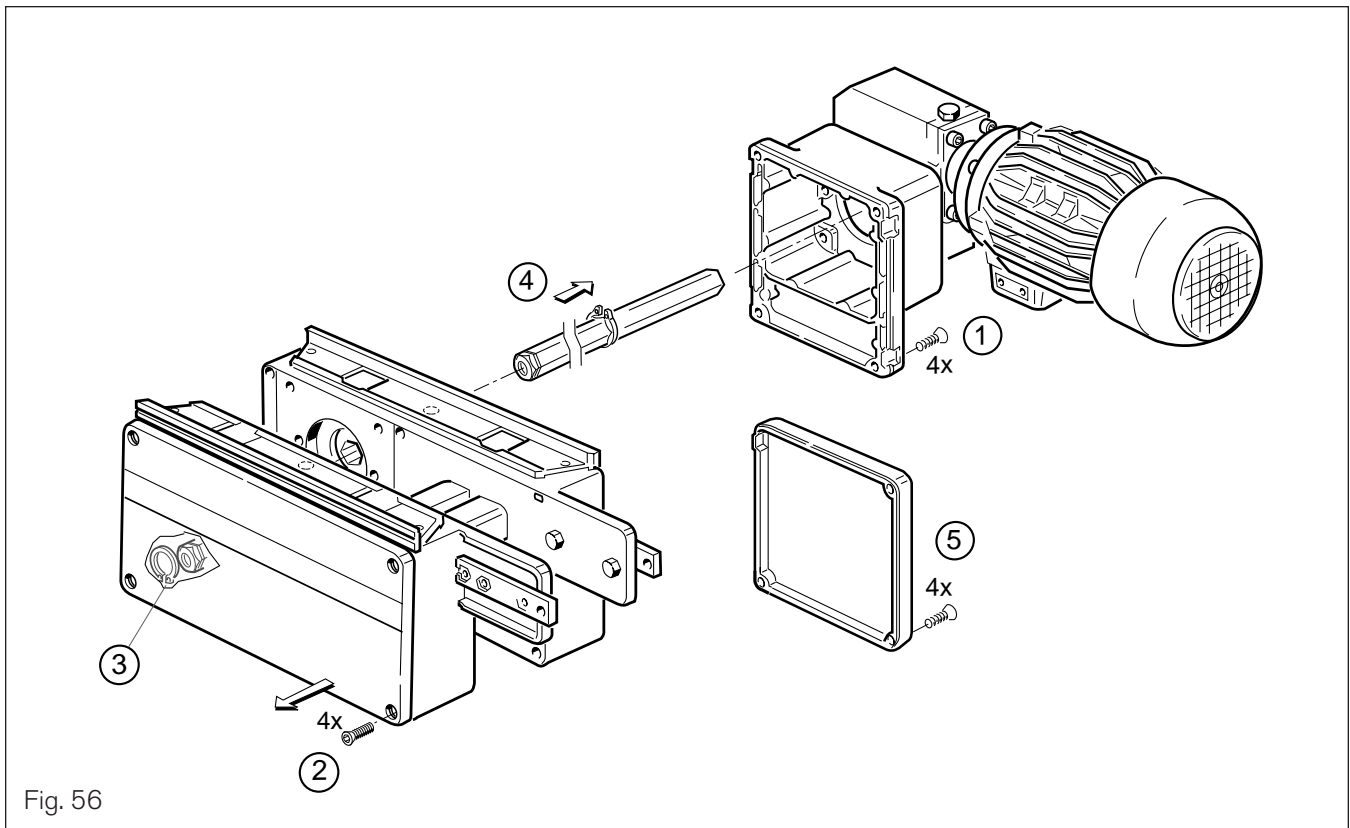


Fig. 56

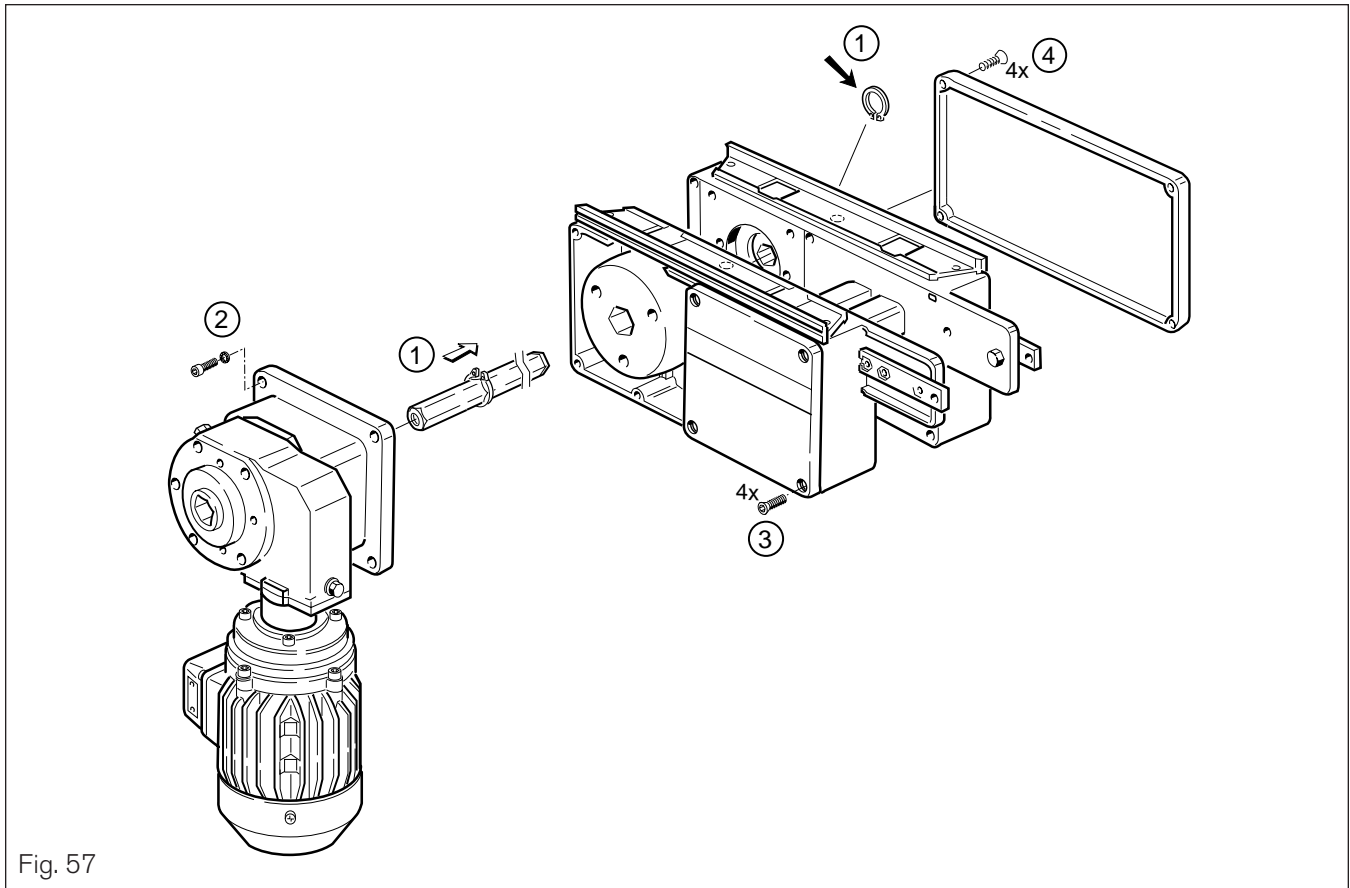


Fig. 57

Attaching the motor to the outside left (Fig. 57)

- 1 Reverse the orientation of the drive shaft as shown and insert it into the drive on the opposite side. **Make sure to re-attach the snap ring at the far end of the shaft.**

Remove the gearbox from the mounting flange by removing the two cap screws. Reverse the mounting flange so the gearbox/motor will be in the proper orientation when installed. Secure the gearbox to the flange with the two cap screws.

- 2 Now mount the gearbox on the outside left (when facing the drive from upstream), using the four screws to mount the flange to the side casting.

- 3 & 4 Attach the side covers to the drive module side casting in their new locations, as illustrated.

NOTE: Apply anti-seize lubricant to the hex shaft at all contact points.

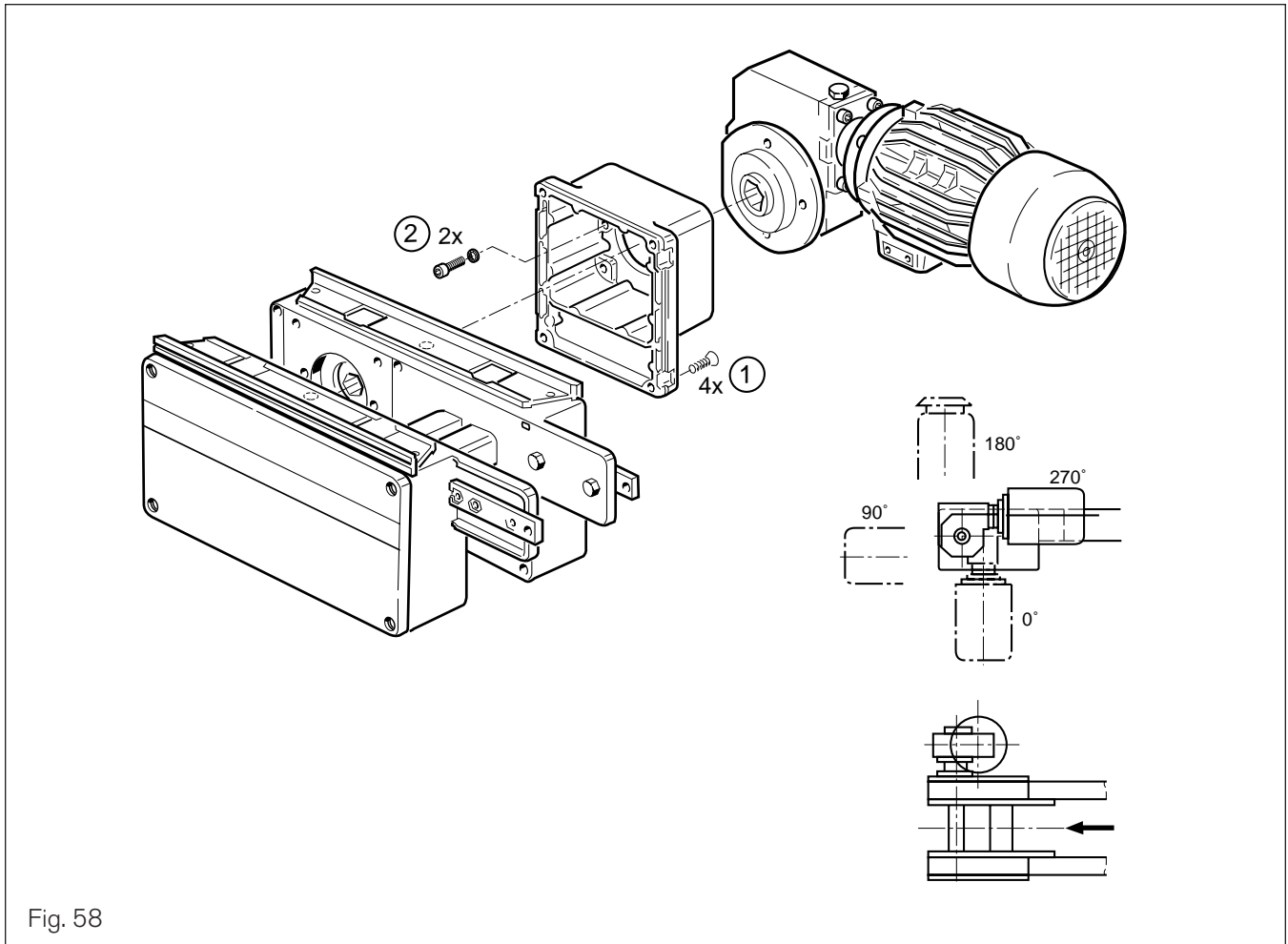


Fig. 58

**Replacing or rotating the gearbox:
Side-mounted (Fig. 58)**

- 1 Remove the four screws from the gearbox mounting flange on the side of the drive unit.
- 2 Remove the two screws attaching the gearbox to the mounting flange. Access to the screws is on the inside of the flange.
- 3 Replace or rotate the gearbox, as desired; then re-attach it to the drive using the reverse procedure.

If you wish to replace just the gearbox, it can now be unscrewed easily from the motor. Remember to apply anti-seize lubricant to the motor shaft before attaching the new gearbox.

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