

TS*plus* Lift Position Unit

Model HP2

Installation and Maintenance

Publication Number: 8981 500 272 3/01

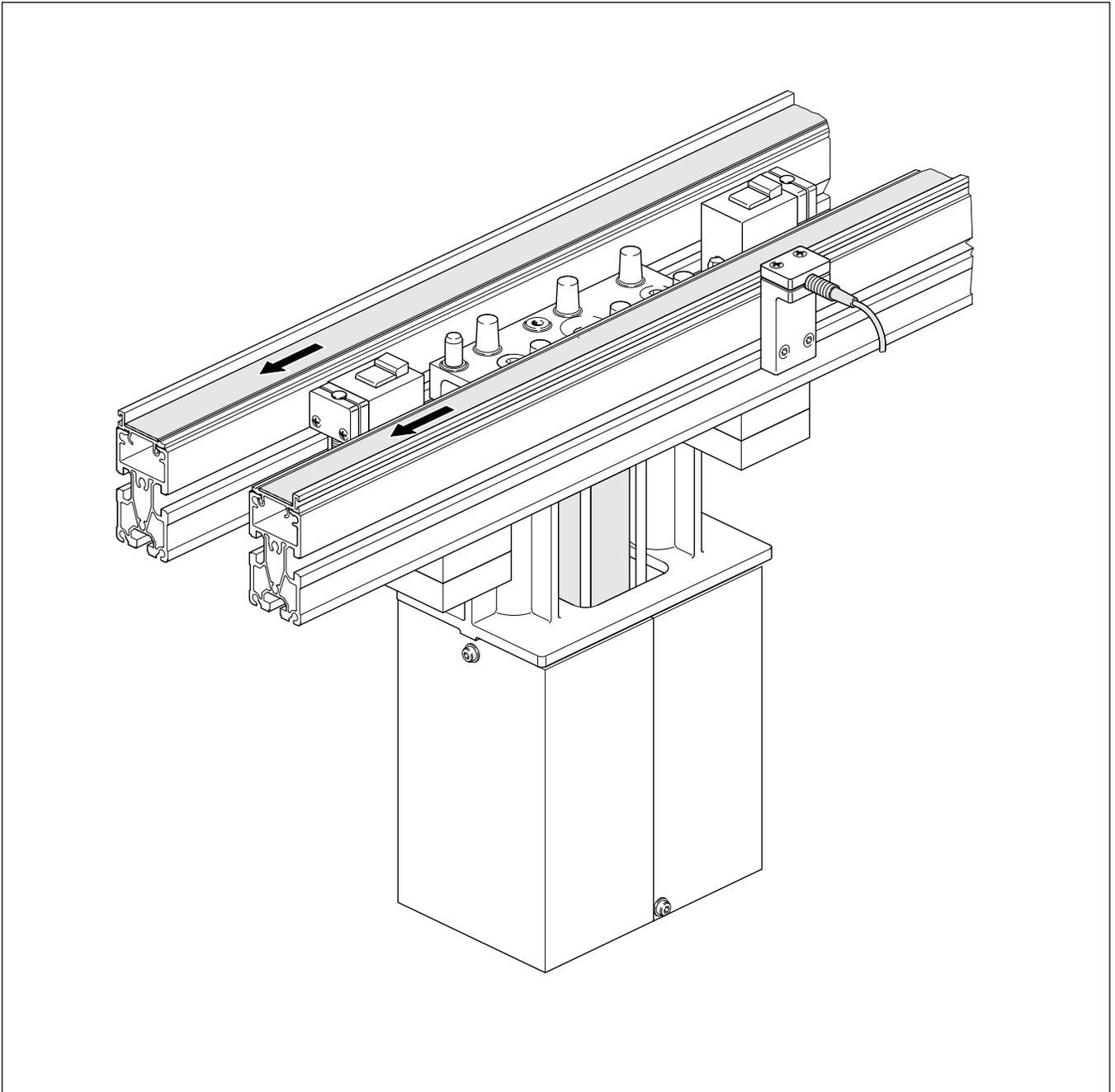


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IMPORTANT SAFETY INFORMATION

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 maintainers of this equipment.

IMPORTANT SAFETY INFORMATION

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 *TSplus* 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 manual 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 *TSplus* 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.
- *TSplus* pneumatic components are designed to operate in a range of 4-6 Bar (58-87psi). It is the user's 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.
- *TSplus* drives, returns and conveyor sections are designed to transport Bosch WT2S workpiece pallets. Proper usage is defined as the transport 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, pull the worker into the equipment and cause 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, pull the worker into the equipment and cause serious, or in extreme cases, life threatening injury.

SAVE THESE INSTRUCTIONS!

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 interlink manual and automatic work stations freely, making *TSplus* suitable for virtually any assembly task. The HP2 Lift Position Unit (LPU) module allows you to precisely lift and position pallets for automated assembly operations.

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 HP2 Lift Position Unit.

Technical Data

Provides the most important technical specifications.

Design and Detailed Description

Supplies an overview of the components that make up the HP2. This section will familiarize you with the module's individual components.

Assembly

Lists step-by-step instructions for installing the HP2.

Initial Start-up

Describes the final procedures for getting the HP2 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 primary components that make up the HP2 Lift Position Unit.

Other *TSplus* 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
- Transverse Conveyors
- Lift-Transfer Units

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.

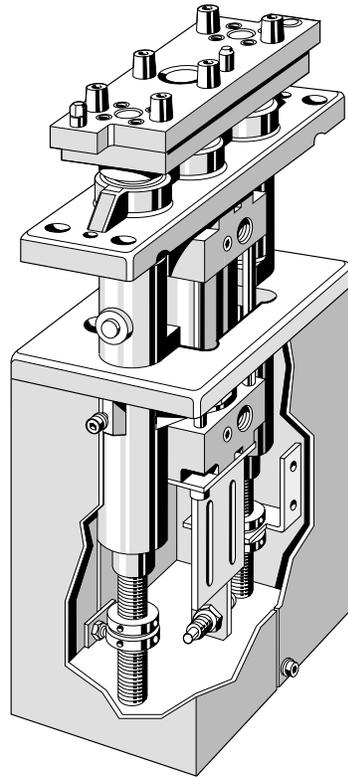


Fig. 1

Application and Function

The HP2 Lift-Position Units are used for precision positioning of workpiece pallets at automated workstations. Positioning pins on the HP2 engage locator bushings in the support plate of the pallet to lift it up off the conveyor. The resulting positional accuracy is ± 0.05 mm in the X and Y axes. The air cylinder generates 247 lbs. of upward force (1100 N) at 58 PSI (4 bar). A stop gate is required to stop the pallet before the lift-position unit can be actuated.

The HP2 lifts and lowers pallets with a double-acting pneumatic cylinder. There are four lift ranges available and, within each range, the lift is infinitely adjustable. The upper and lower position of the HP2 are sensed by proximity switches, not included. The lift-position unit used is determined by the workpiece pallet's length and width.

The HP2 can be mounted to either the bottom of the conveyor line, or the top of a machine base plate in an automated assembly station. It is available with either a positioning plate, or a lift plate (for mounting a custom positioning plate).

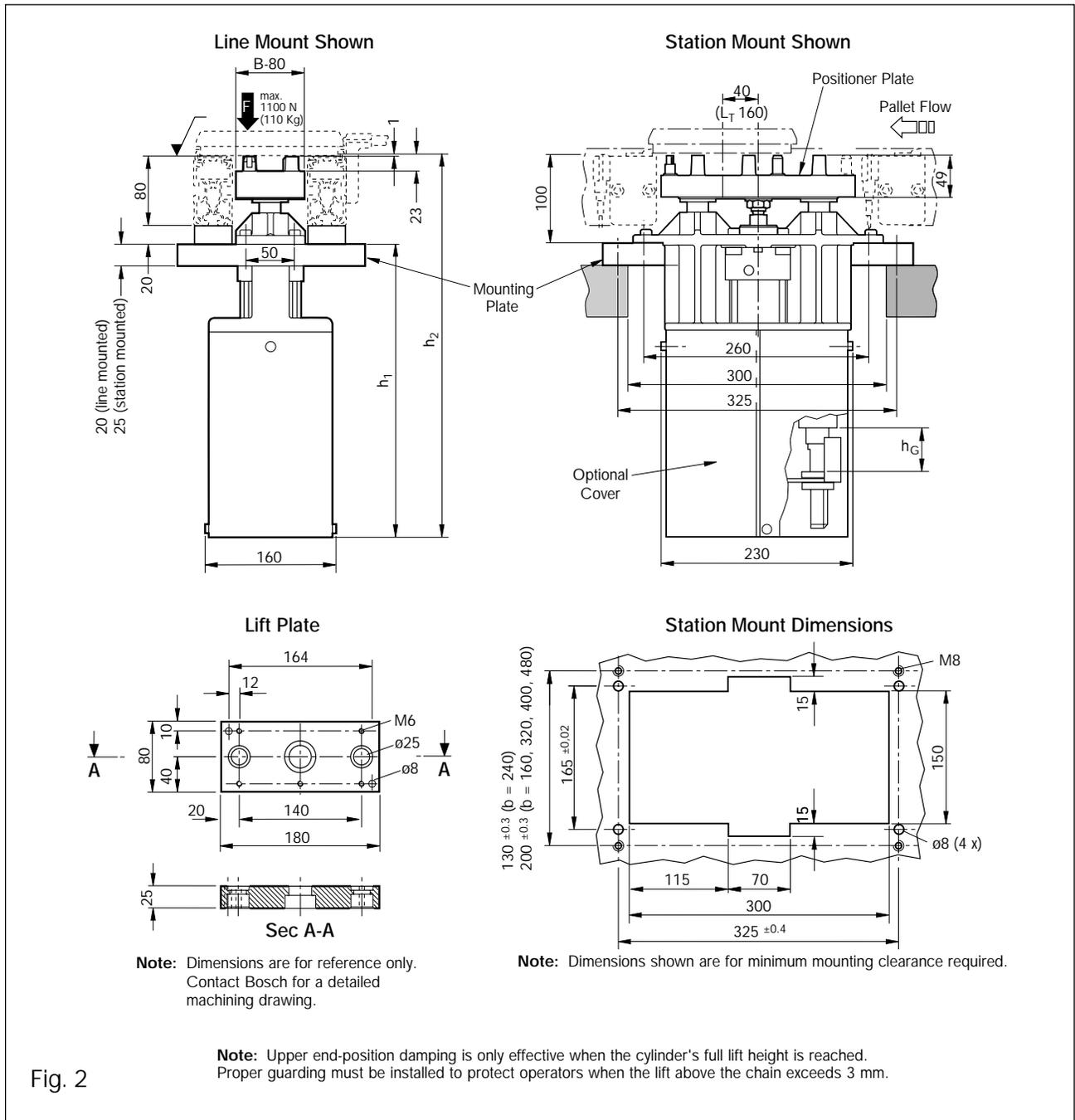


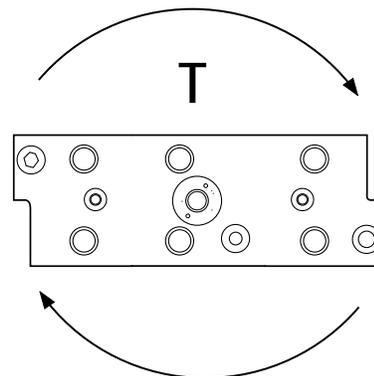
Fig. 2

Technical Data

Functional dimensions for the HP2 Lift Position Unit are shown in Fig. 2 above. Technical data tables are shown on page 8.

Technical Data for HP2

Load Capacity	=	110 kg (total pallet load + vert. force)
Positioning Accuracy	=	±0.05 mm both x and y axis
Permitted torque (T)	=	100 Nm
Air pressure	=	4-8 bar
Stroke (h_c) (see Fig. 2)	=	0 mm to 80 mm
		81 mm to 125 mm
		126 mm to 175 mm
Stroke Length Adjustment	=	80 mm
		176 mm to 225 mm
Cylinder diameter	=	63 mm
Air fittings	=	8 mm (5/16") push-lock

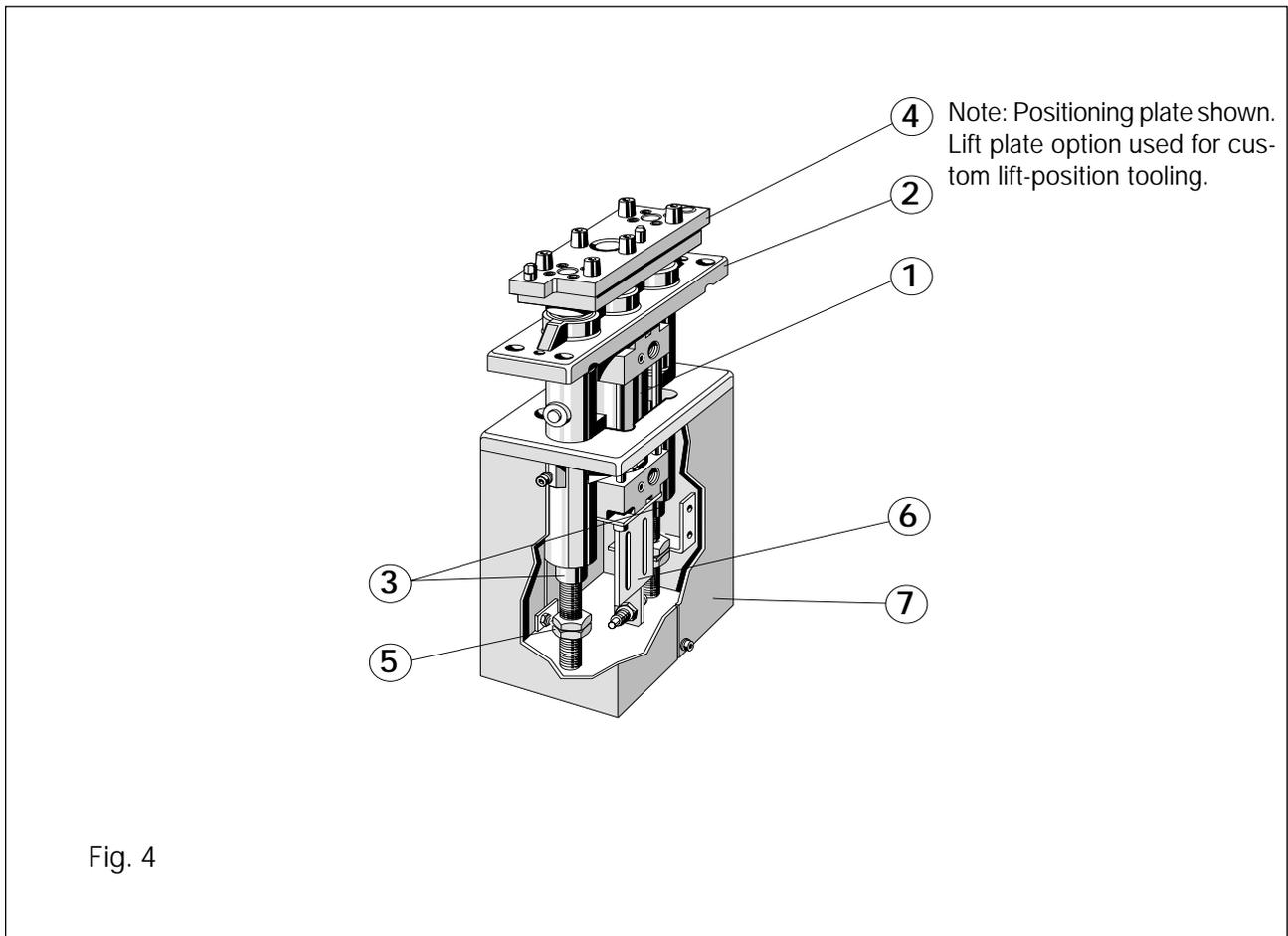


Note: Permissible torque (T) about the center of lift cylinder rod.

Size Ranges for HP2

	Pallet Length, B_Q							
	160	240	320	400	480	640	800	
Pallet Width, B_L	160	•	•	•	•	•	N/A	N/A
	240	•	•	•	•	•	N/A	N/A
	320	•	•	•	•	•	N/A	N/A
	400	N/A	N/A	•	•	•	•	•
	480	N/A	N/A	•	•	•	•	•

Fig. 3



Design and Detailed Description

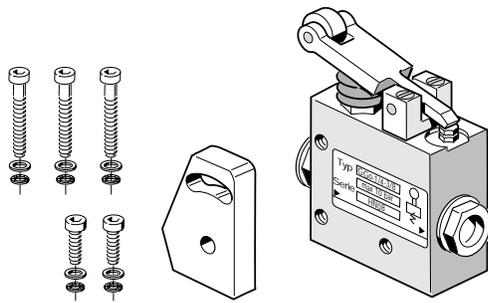
The HP2 Lift-Position Unit is delivered completely assembled Fig. 4.

The Lift Position Unit consists of the following main components:

- 1 Lift Cylinder
- 2 Main Housing
- 3 Guide Shafts
- 4 Positioning Plate (or lift plate)
- 5 Lock Nut (2)
- 6 Proximity Switch Mounting Bracket
- 7 Cover (optional)

The HP2 lifts and lowers pallets with a double-acting pneumatic cylinder (1). There are four lift ranges available and, within each range, the lift is infinitely adjustable. The positioning plate (4) has diamond and round locating pins that position the workpiece pallet by engaging the pallet's locator bushings. The main housing (2) has pressed-in bushings, which guide the two guide shafts (3). Two lock nuts (5) on the end of each guide shaft fix the lift stroke and act as hard stops. The proximity switch mounting bracket (6) is mounted on the bottom of the cylinder and also has slots for mounting the variable flow control valve for the damping

Accessories



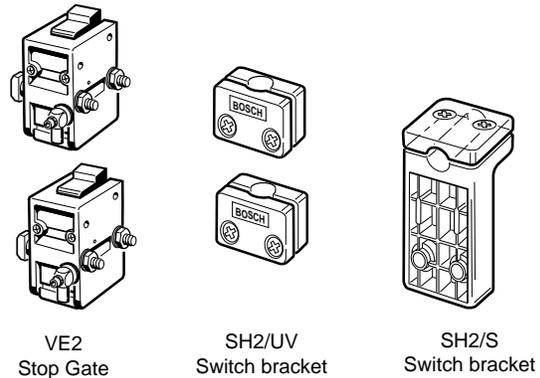
Damping Kit

kit.

Protective Cover

The protective cover (see Fig. 4) is available in four sizes, based on the lift above the belt: 0 - 59mm, 69 - 104mm, 105 - 154mm and 155 - 204mm.

Fig. 5



Traffic Control Kit

Conversion Kits

These kits make it possible to convert the lift-position unit from station to line mount, and vice-versa. The station-mount to line-mount LPU conversion kits include the necessary hardware and should be selected for the appropriate line width. The line-mount to station-mount conversion kit will work with any size LPU.

Note:

Refer to section 12 of the *TSplus* catalog for ordering information and part numbers of the accessories listed above.

Assembly

The line mounted lift-position unit, like virtually all Bosch conveyor modules, is connected to the transfer system using the T-slot principle (Fig. 6). For T-bolts, insert the T-bolt into the 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 ft-lbs).

Assembly tip: T-bolts also have a mark on the end of the threaded shaft that will be perpendicular to the T-slot when the bolt is in its locked position.

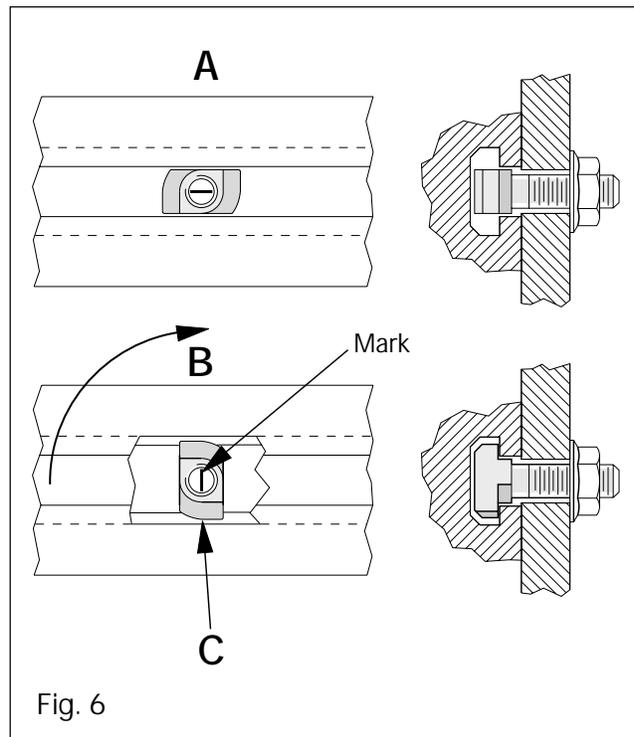
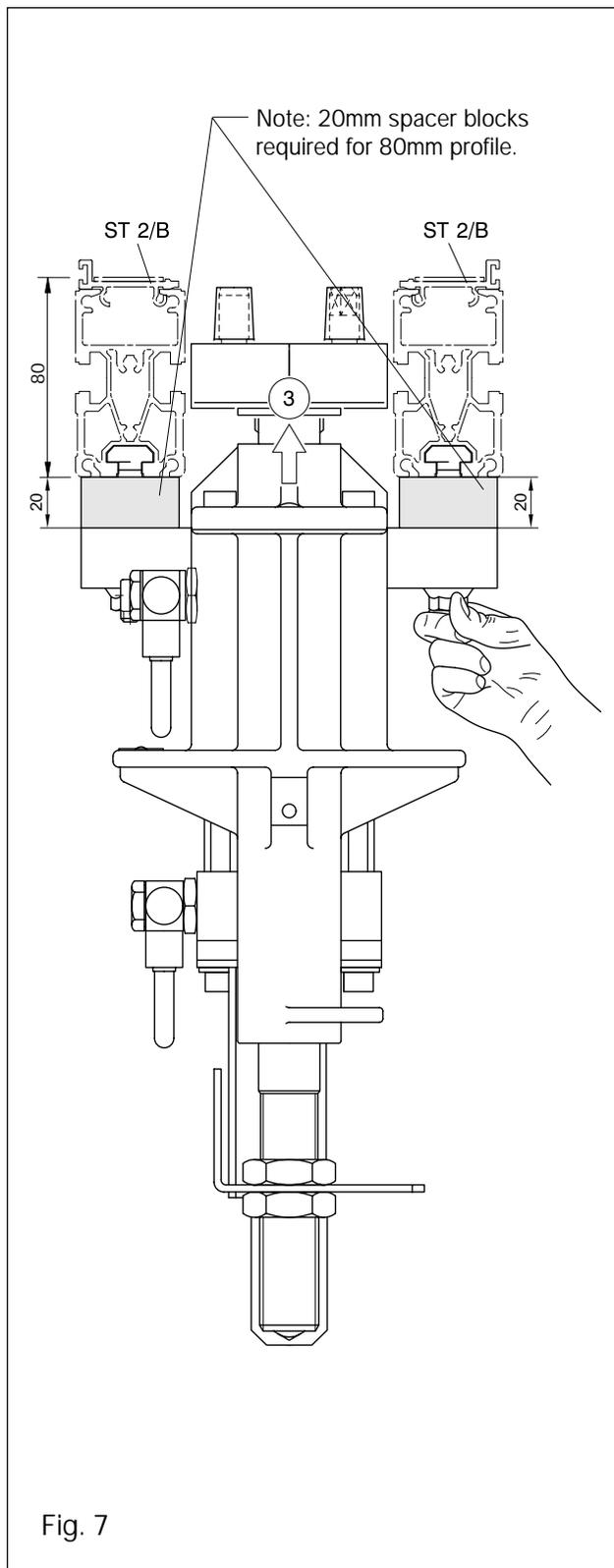


Fig. 6

Installing a Line Mounted Lift-Position Unit

Fig. 7 - 80mm Conveyor Section Profile

1. Mark the location on the conveyor line where the LPU is to be installed.
2. Ensure that the the 20mm spacer blocks are between mounting plate and conveyor profile.
3. Loosen the 54mm T-bolts and make sure they are in line with the T-slot.
4. Raise the LPU and support it from below until it has been properly fastened to the line.
5. Hand tighten the flange nuts, making sure that the mark on the T-bolt end is perpendicular to the T-slot (see Fig. 6).
6. Position the LPU exactly and torque the flange nuts to 25Nm.



Installing a Line Mounted Lift-Position Unit

Fig. 8 - 100mm Conveyor Section Profile

1. Mark the location on the conveyor line where the LPU is to be installed.
2. Remove and discard the 20mm spacer blocks and replace the 54mm T-bolts with the 34mm T-bolts.
3. Loosen the 34mm T-bolts and make sure they are in line with the T-slot.
4. Raise the LPU and support it from below until it has been properly fastened to the line.
5. Hand tighten the flange nuts, making sure that the mark on the T-bolt end is perpendicular to the T-slot (see Fig. 6).
6. Position the LPU exactly and torque the flange nuts to 25Nm.

Note: The 20mm spacer plates are not required for 100mm profile, and must be removed.

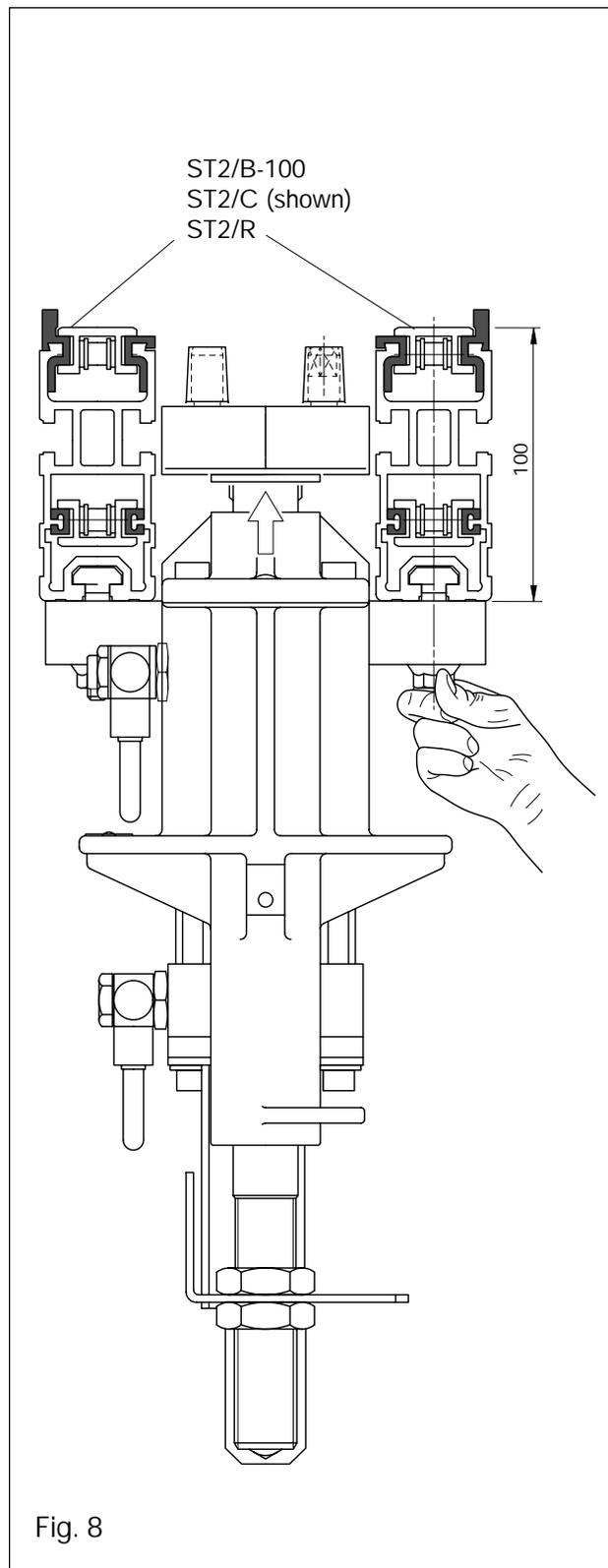


Fig. 8

Installing a Station Mounted Lift-Position Unit

Fig. 9

1. The cut out and mounting holes in the station base plate must match the dimensions shown in Fig. 9.
2. Install four 8mm dowel pins to locate the HP2 mounting plates.
3. Lower the LPU in from above the line.
4. Tighten four M8 SHCS to secure the LPU
5. Install the proximity switches and protective cover (if required).

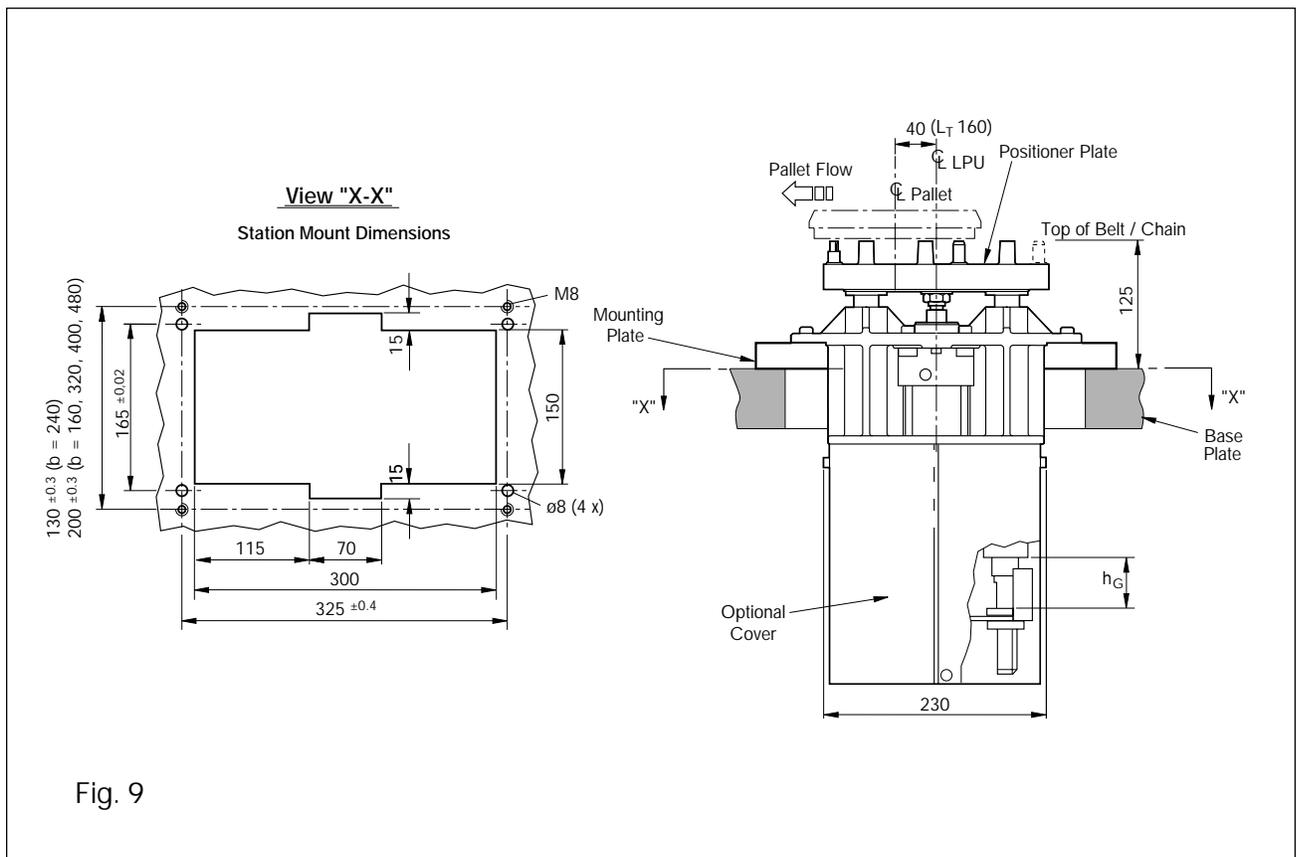


Fig. 9

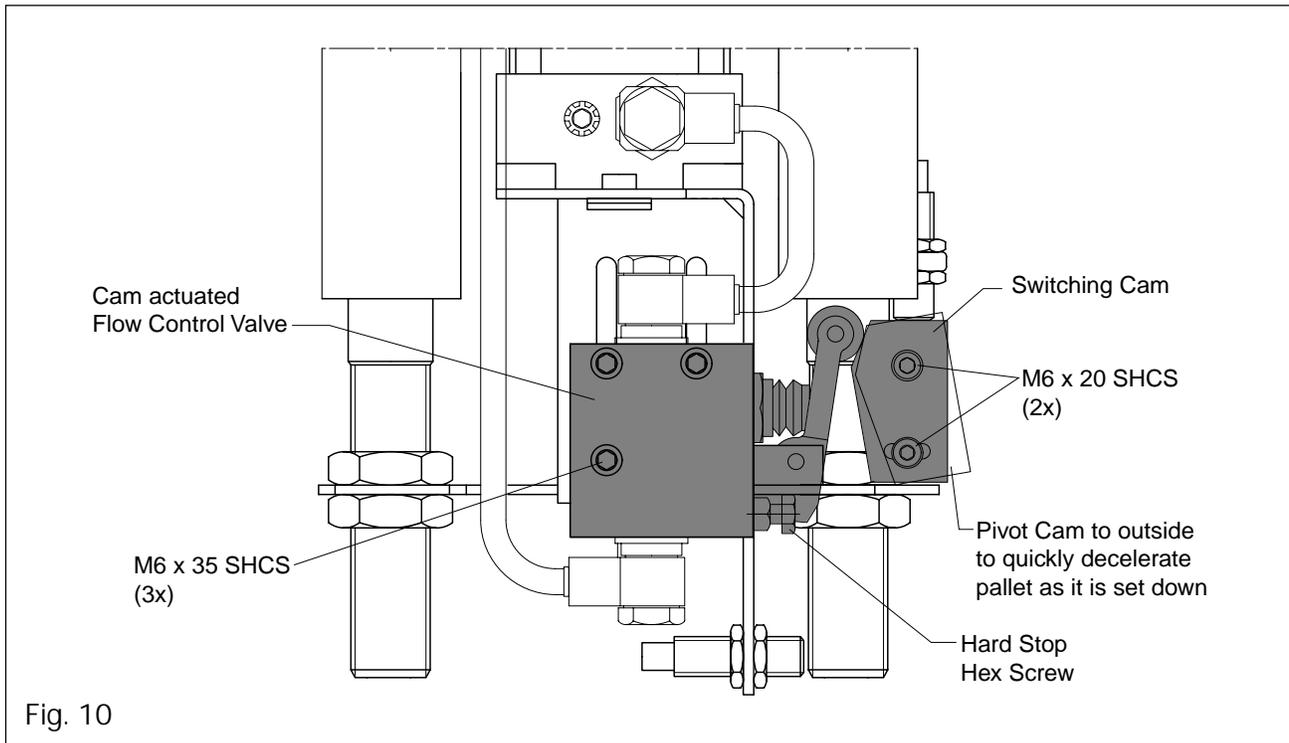


Fig. 10

Installing the Lift-Position Damping Kit

This optional damping kit reduces the air flow to the lift cylinder at the point where the pallet reaches the transport height. For short cycle times, when the HP2 needs to operate quickly, this kit provides a means to lower the pallet faster and still place it gently back on the conveyor.

Attach the switching cam, short profile up, to the mounting bracket using (2) M6 x 20 SHCS, lock washers and hex nuts provided. Next, attach the flow control valve to the two vertical slots in the proximity sensor mounting bracket, as shown in Fig. 10, using (3) M6 x 35 SHCS, lock washers, plain washers and hex nuts.

Now adjust the elevation of the flow control valve, such that the high point on the cam engages the roller as the pallet is being set down on the conveying media. This will be the point at which the air flow is most restricted, slowing down the cylinder travel speed.

A hex screw acts as the hard stop for roller travel. As the hex screw is adjusted out, the cylinder travel speed will be decreased.

Finally, adjust the angle of the cam by loosening the bottom SHCS and retightening at the desired angle. The greater the cam angle, the more quickly the pallet will be decelerated as it is set down.

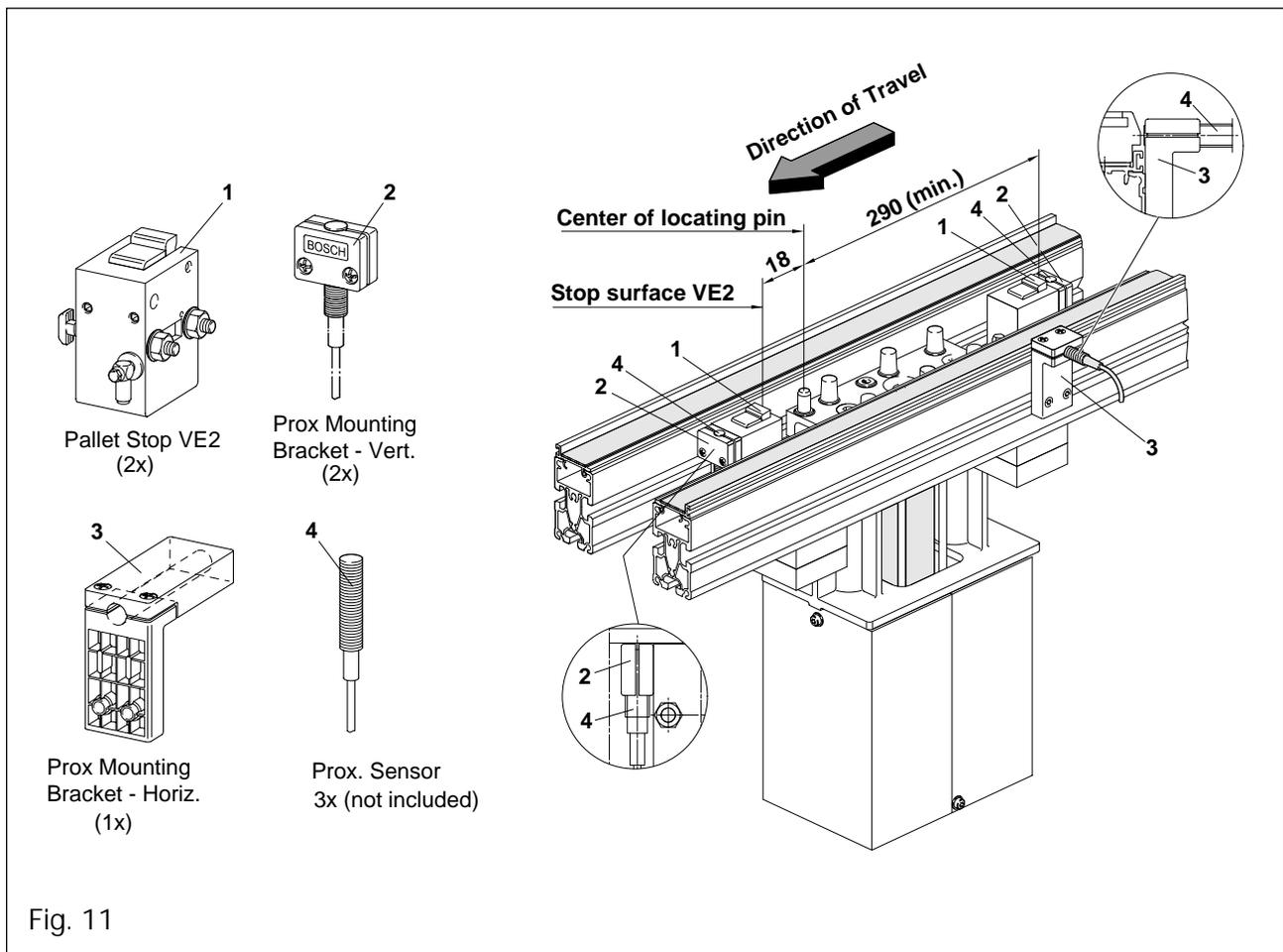


Fig. 11

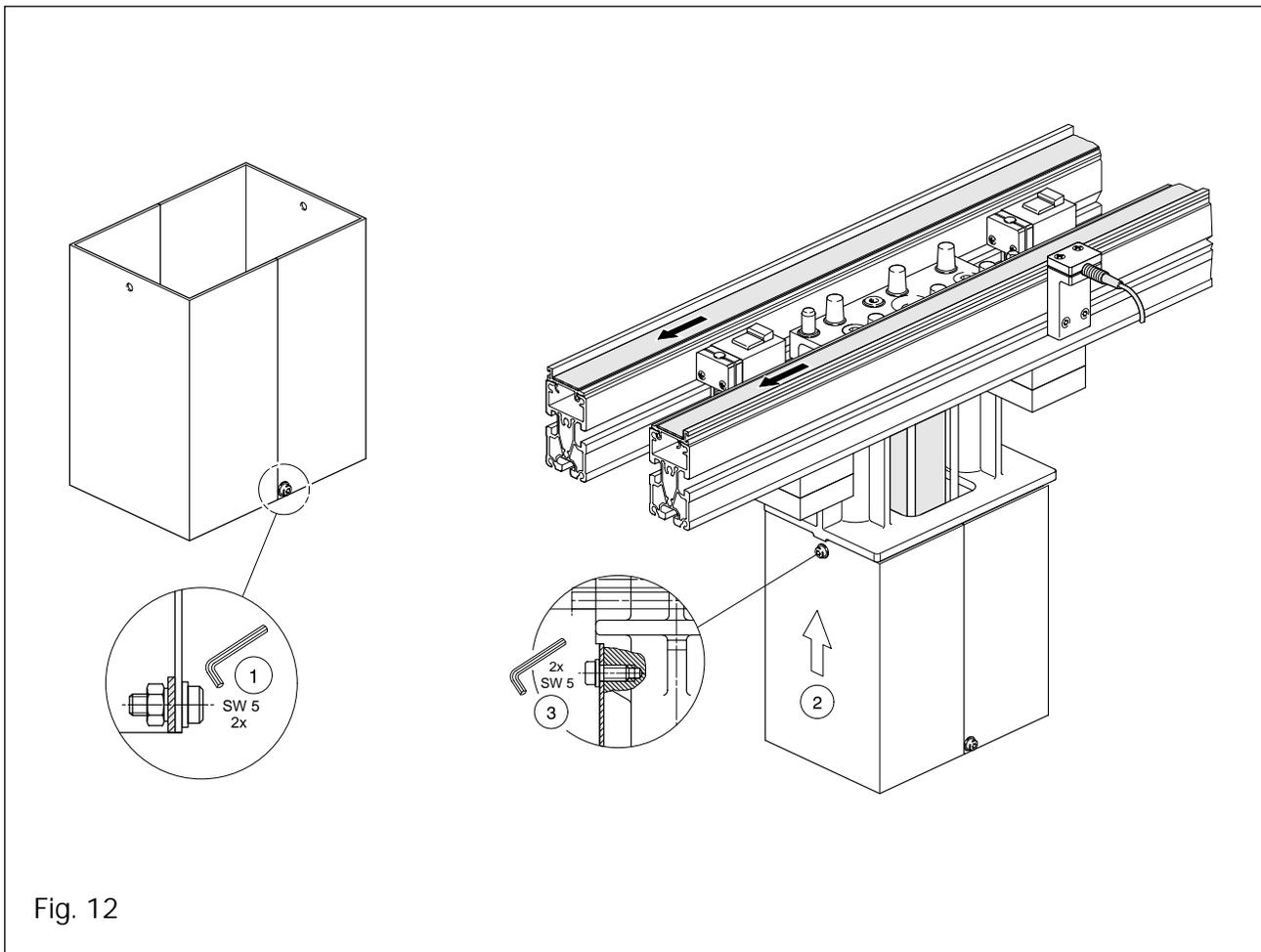
Traffic Control Kit

The optional traffic control kit includes pallet stops and proximity sensor brackets. A pre-stop and pallet stop are required for every lift position unit, to singulate the pallets coming into the station.

Bolt one VE2 stop (1) 18mm from the center of the locating pin on the front side of the LPU, as shown in Fig. 11. Bolt the second pallet stop at least 290mm from the center of the same locating pin, as shown in Fig. 11.

Now attach the proximity switch mounting brackets (2) to the front of each pallet stop. This will provide sensing, via the proximity sensor (4) (not included), to re-extend the VE2 stop dog after the pallet has been released.

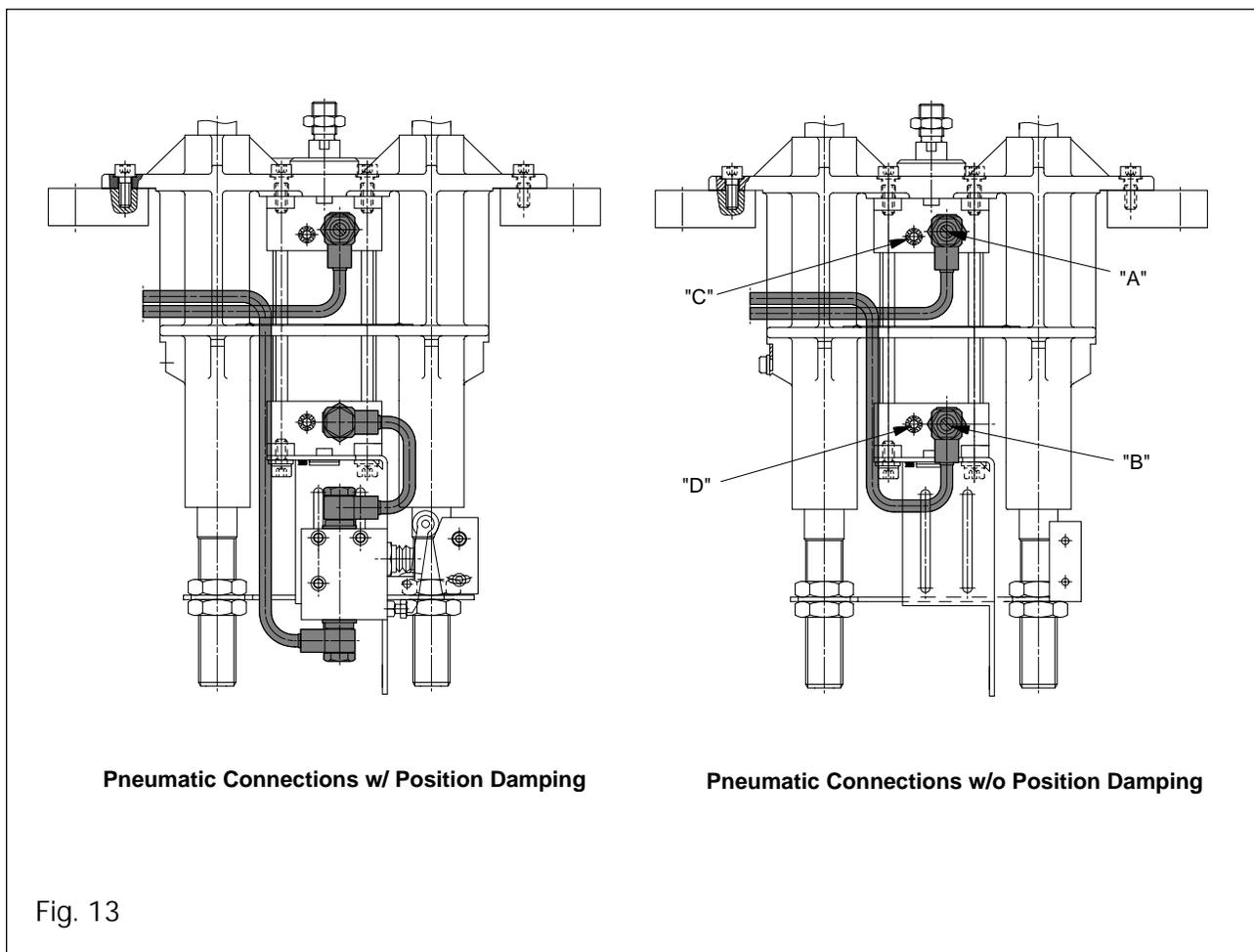
Attach the horizontal proximity sensor mounting bracket (3) to the side of the conveyor profile, and position the sensor to pick up the steel prox exciter in side of the pallet frame. The sensor should be activated when the pallet is in position over the LPU.



Protective Housing

Install the protective housing as shown in Fig. 12, using a 5mm allen wrench. Housing must be installed after installation and debug.

⚠ WARNING! Do not operate the lift position unit with the protective cover removed.



Compressed Air Connections

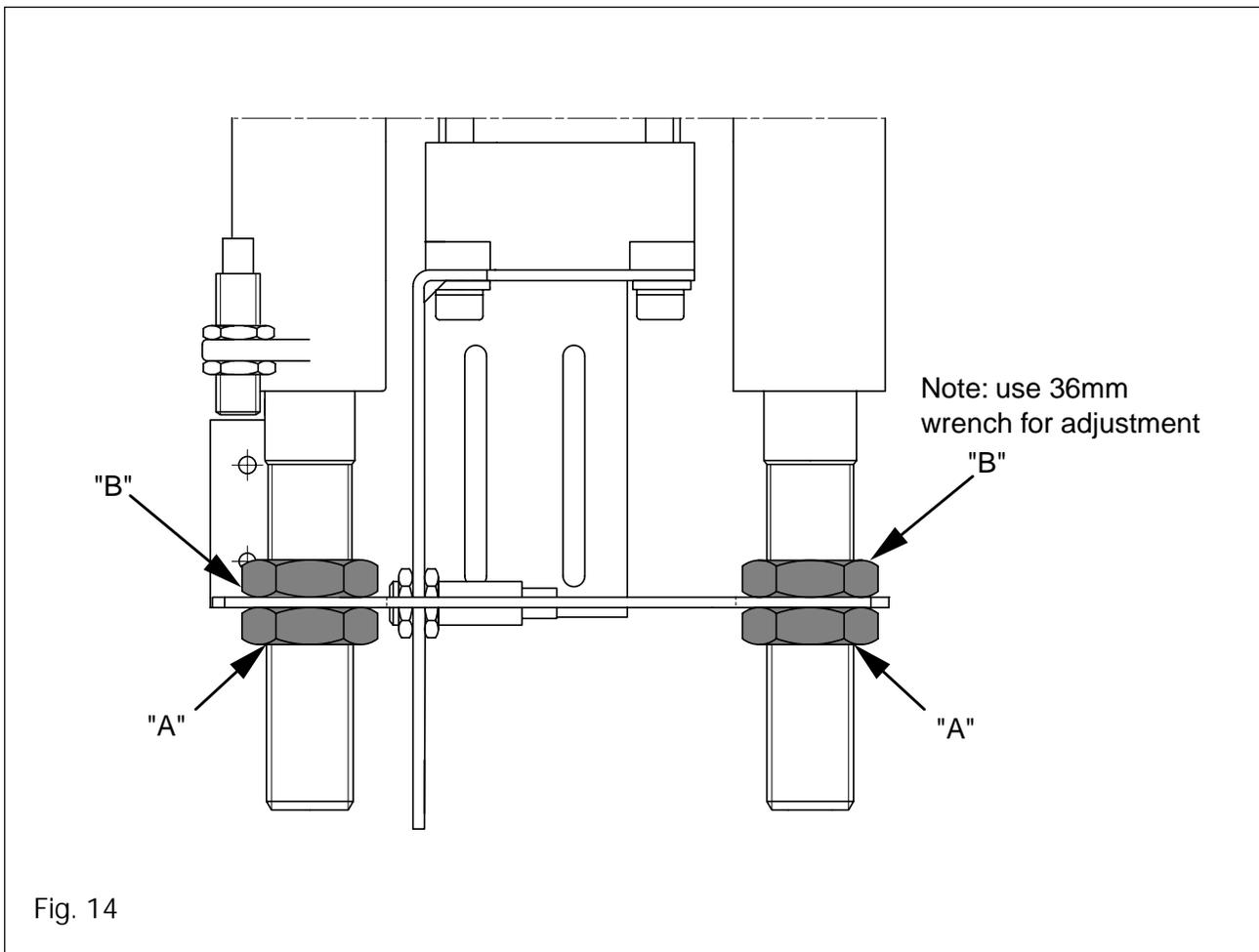
Shop air at 4-6 bar (60-90psi) is required to operate the HP2. The compressed air supply may be lubricated or unlubricated, filtered air.

All pneumatic tubing is 8mm dia. The connections are to be made as shown in Fig. 13, depending on whether or not position damping is required.

Flow controls should be adjusted as required to control cylinder speed. Turn flow control "A" cw to slow lift speed in the up direction. Turn "A" ccw and "B" cw to speed up cylinder travel.

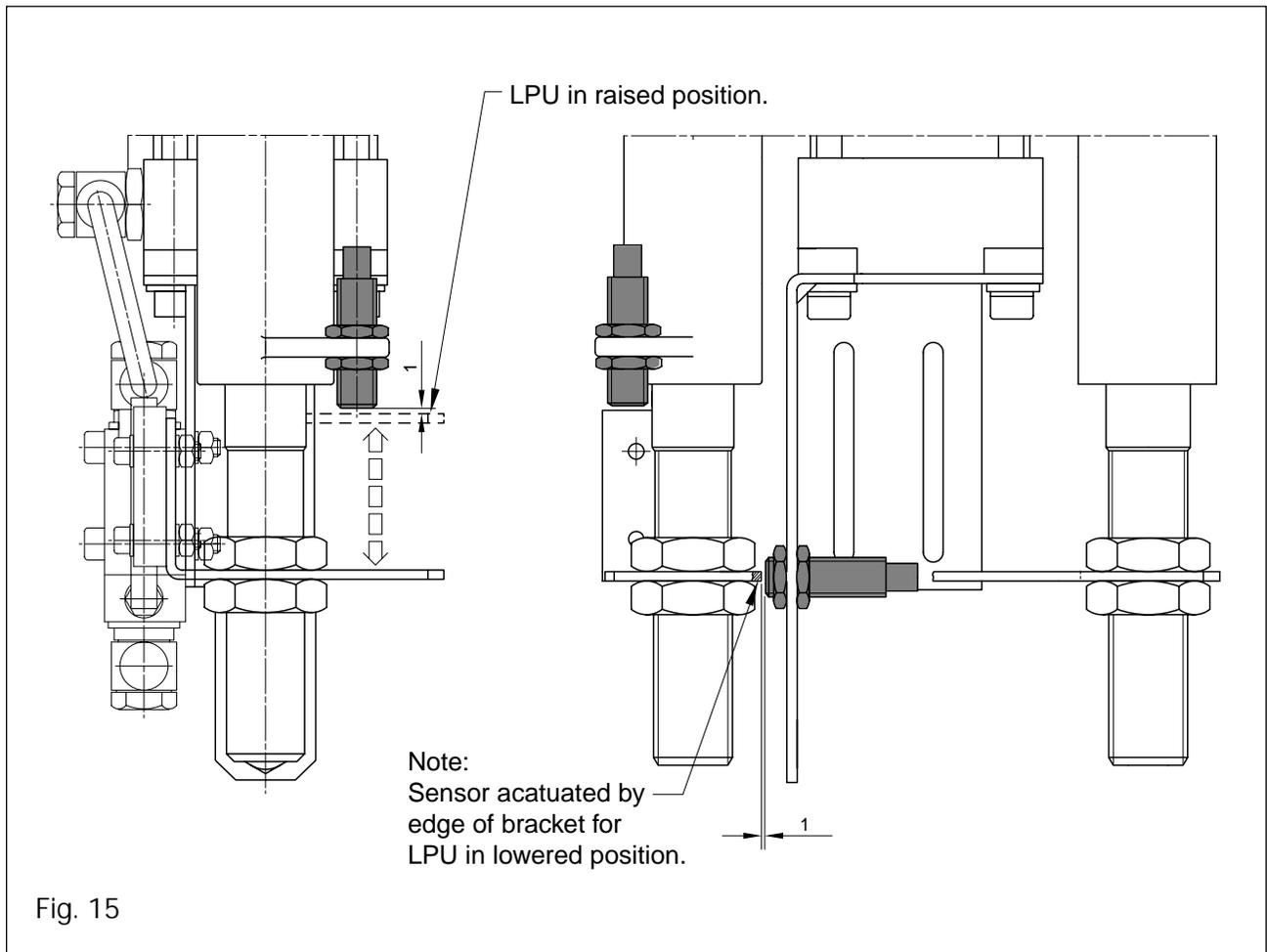
To adjust cylinder end cushions, turn SHCS "C" or "D" cw for less cushioning, ccw for more cushioning.

See page 21 for pneumatic diagram.



Stroke Adjustment

Loosen the lower lock nuts (A). Set the approximate height of the upper adjusting nuts (B). Carefully raise the unit and set the final adjustment of the upper adjusting nuts. Make sure the positioner plate is level. Finally, raise the lower locking nuts and tighten securely.



Proximity Sensor Adjustment

Install two 12mm barrel proximity sensors (not included with lift-position unit) to sense the raised and lowered positions, as shown above. Carefully raise the HP2 when adjusting the sensing range.

Set the sensing distance to approximately 1mm (.04") as shown in Fig. 15.

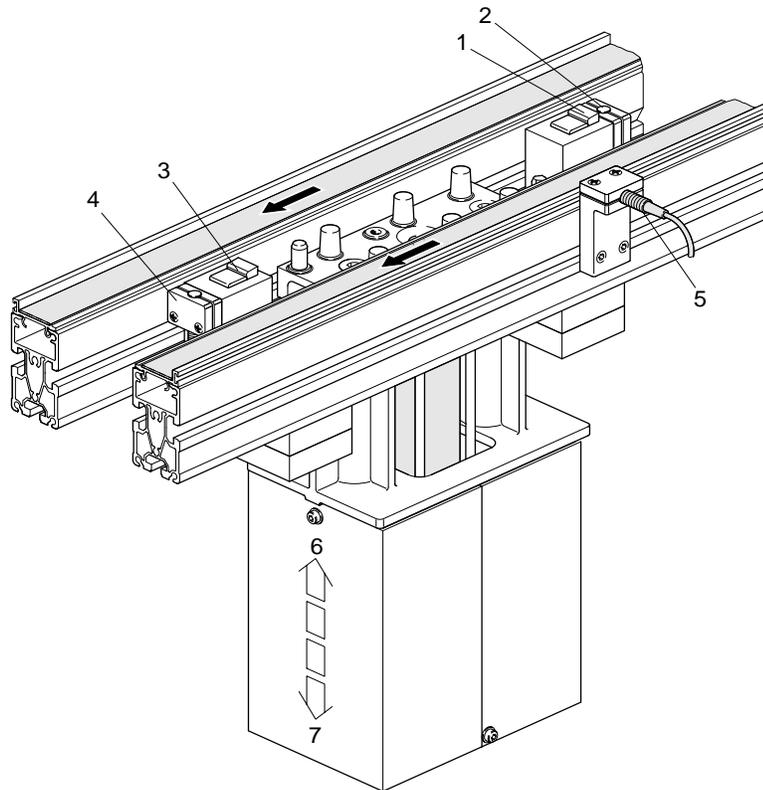


Fig. 16

Sequence of Operations

Initially, both stop gates, 1 & 3 are raised, with a pallet at stop 1. The proximity sensor 2 detects that a pallet is present at the pre-stop. After receiving a signal from either a push button or proximity sensor 5 clear, stop 1 lowers and releases the pallet.

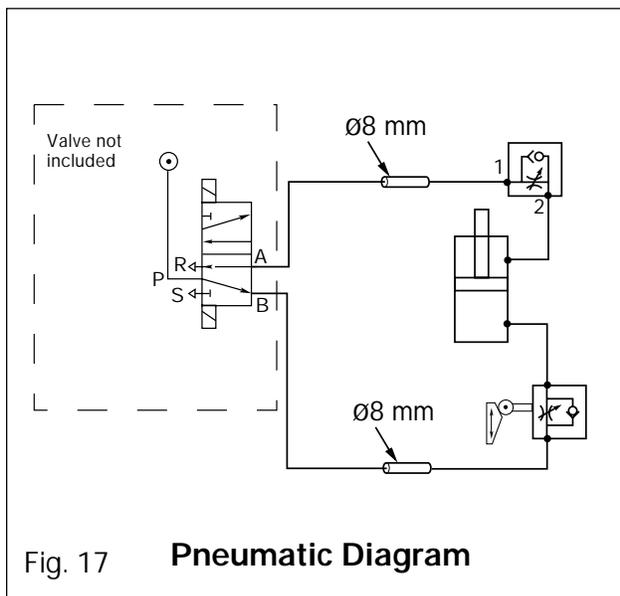
The pallet stops at stop 3 - over the lift position unit. When proximity sensor 5 is actuated, the LPU extends and lifts the pallet into the raised position.

Sensor 6 is actuated "LPU raised".

After a signal has been received "Operation complete", the LPU lowers the pallet back to the conveyor.

Sensor 7 is actuated "LPU lowered".

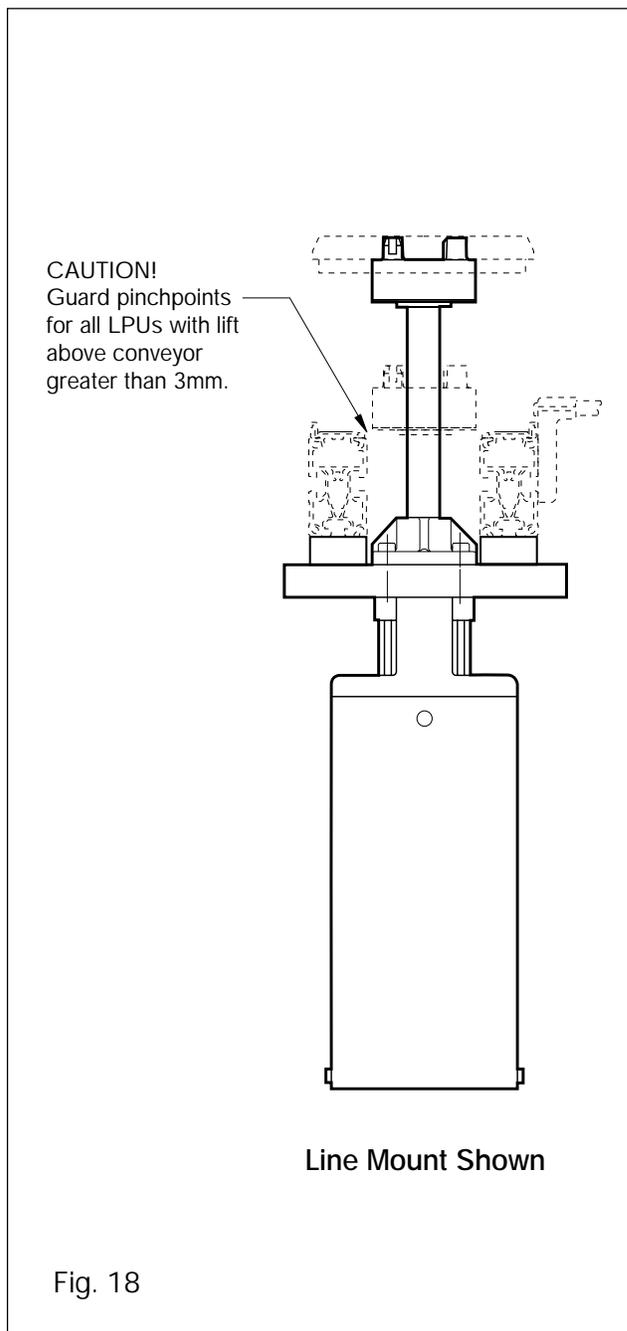
Stop gate 3 lowers and releases the pallet. Sensor 4 is actuated as the pallet passes over, and stop gate 3 raises again.



Operating Instructions

⚠ CAUTION! Lift position units with stroke ranges more than 3mm above the top of the conveying media must be properly guarded (Fig. 18). All pinch points must be guarded in compliance with OSHA standards.

Before operating the lift position unit, make sure that all pneumatic connections have been properly made. Flow controls must be installed and adjusted to regulate the LPU speed (Fig. 17).



Operation

The TS*plus* conveyor 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.
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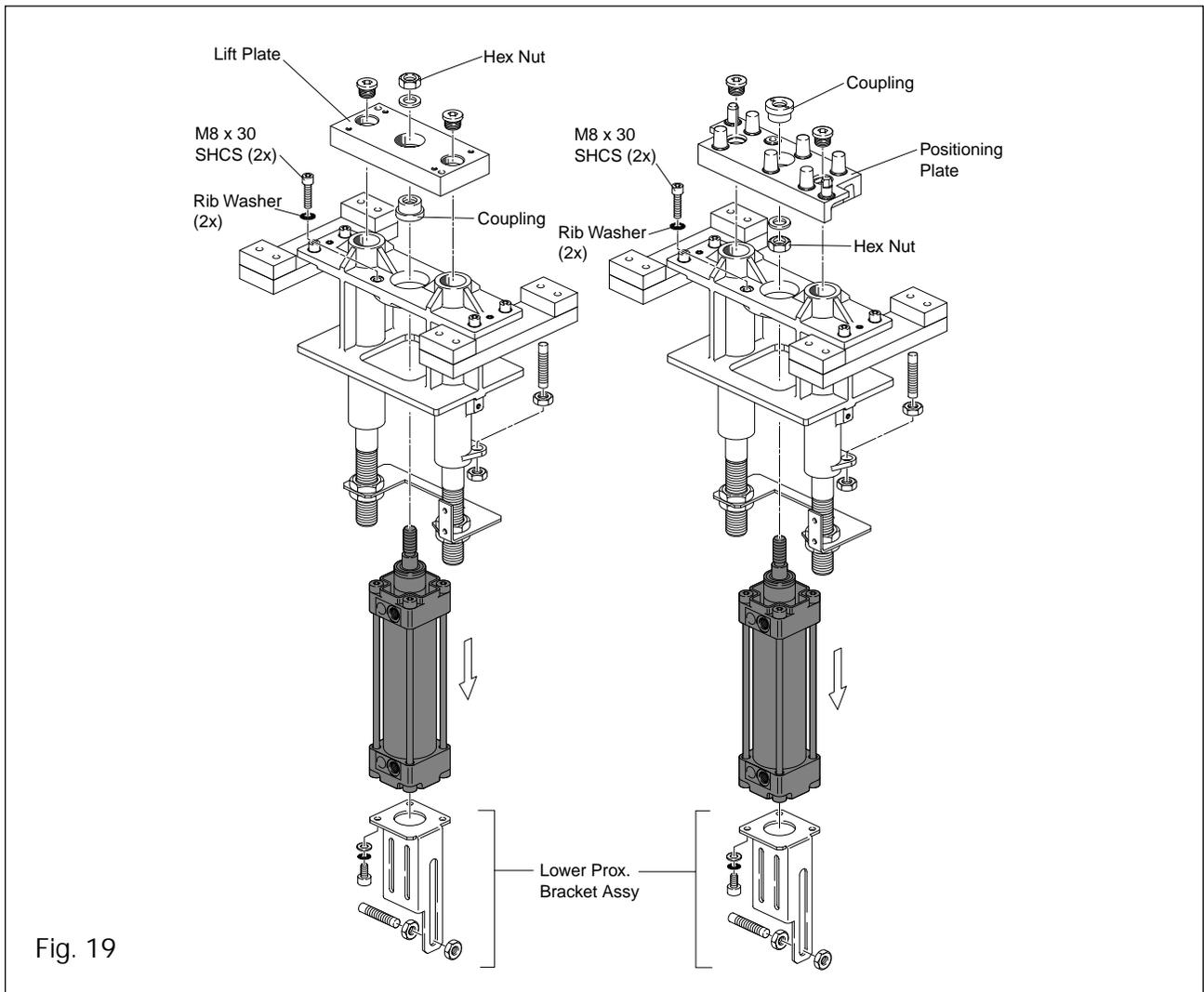


Fig. 19

Repair

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

Replacing the Pneumatic Cylinder (Fig. 18)

1. Remove the protective housing (not shown)
2. Disconnect 8mm pneumatic lines and remove flow controls.

3. Unscrew and remove the lower prox. bracket assy (see Fig. 17).
4. Unscrew the coupling or hex nut connecting the cylinder rod to the lift plate (shown on left) or positioning plate (shown on right).
5. Support the cylinder, unscrew the two M8 x 30 SHCS and remove the cylinder.
6. Install the new cylinder - installation is the reverse of steps 1-5.

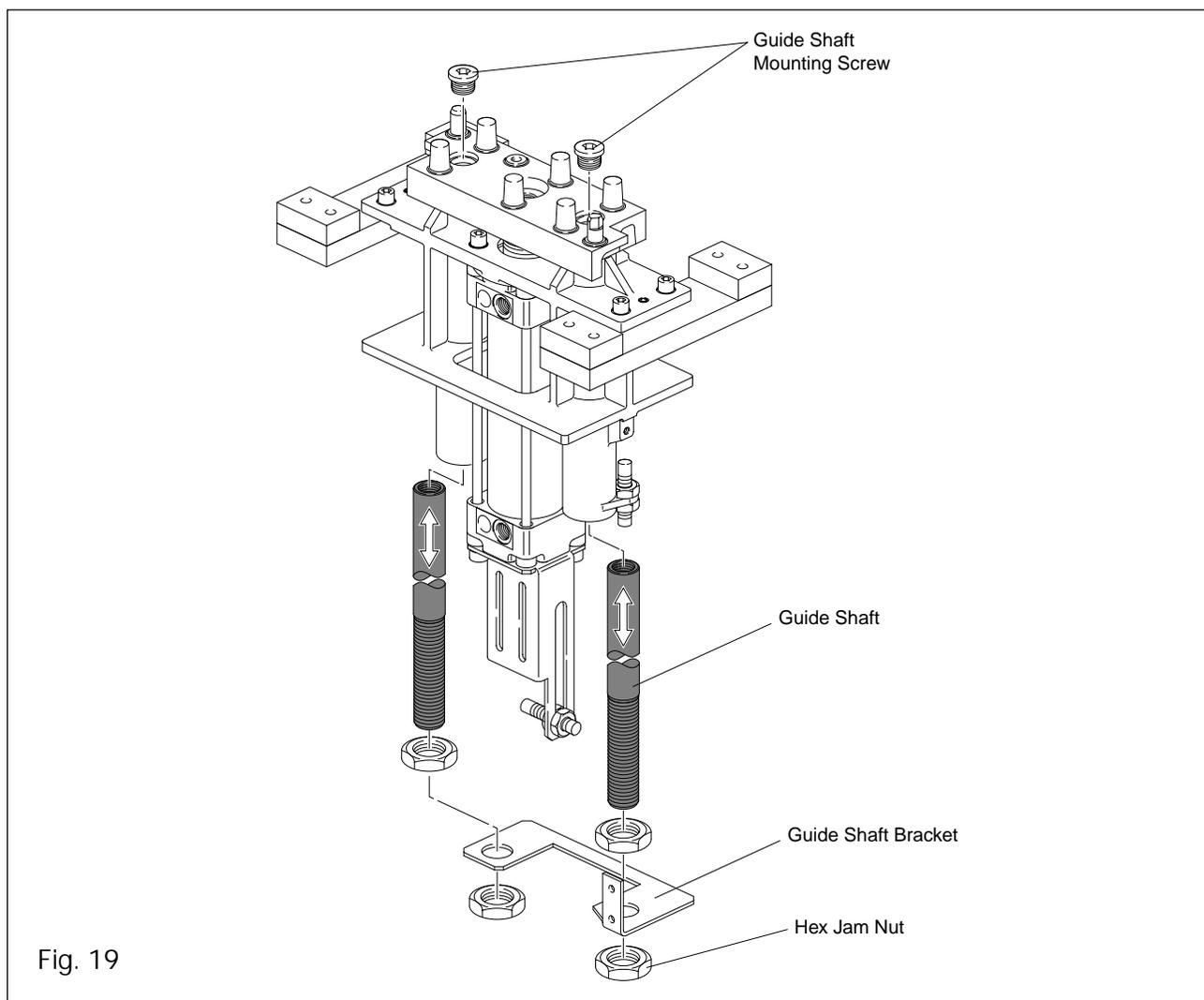


Fig. 19

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

Replacing the Guide Shafts (Fig. 19)

1. Remove the protective housing (not shown).
2. Unscrew the hex jam nuts and remove guide shaft bracket.
3. Unscrew the guide shaft mounting screws.
4. Carefully slide the guide shafts out from underneath the HP2.

5. Next, slide the new guide shafts back into the bushings. Check to be sure that the guide shafts are properly aligned, to prevent binding with the guide bushings.

6. Fasten the guide shaft mounting screws to the new guide shafts.

7. Reattach the guide shaft bracket.

8. Readjust the HP2 (see pg. 18).

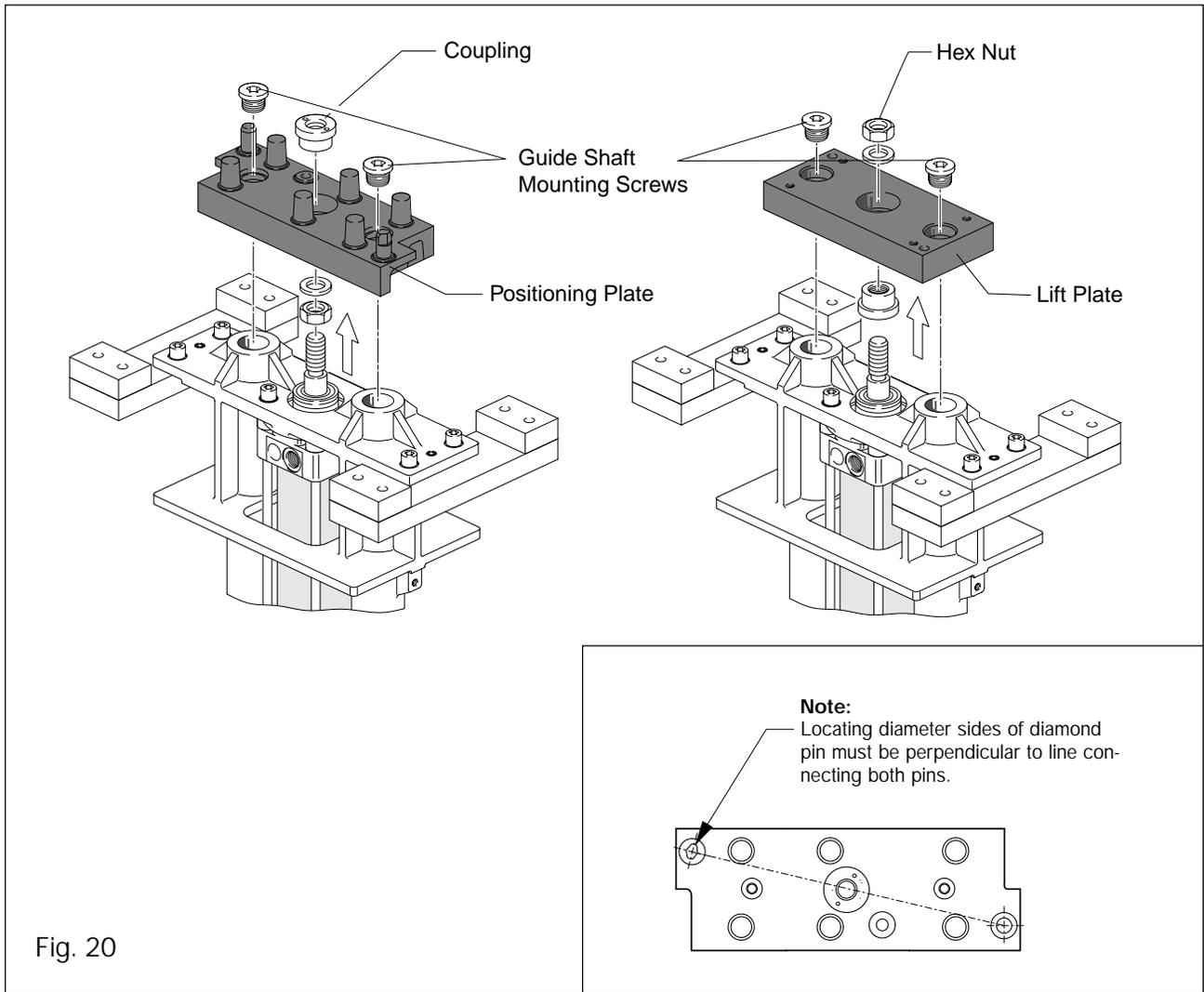


Fig. 20

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

4. If only diamond and round locating pins are to be replaced on the positioning plate, the diamond pin must be oriented as shown in the inset above.

Replacing the positioning plate, lift plate (Fig. 20)

1. Unscrew the two guide shaft mounting screws
2. Unscrew the coupling or hex nut from the cylinder rod.
3. Replace the the positioning plate or lift plate and retighten all fasteners.

Module Warranty

BOSCH AUTOMATION PRODUCTS 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

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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 T*S*plus Spare Parts List or 8981 500 170 T*S*2 and T*S*2/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.

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