

OPERATING INSTRUCTIONS

TCS-6-LC TORCH CLEANING STATIONS

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Description of Product

1

The TCS-6-LC Torch Cleaning Station is designed for automatic spatter cleaning from the interior of the gas nozzles of MIG/MAG torches within a robot cell.

The torch cleaning station is referred to in this manual as the TCS-6-LC.

The frame is cast of aluminum with an integral cylindrical housing which accommodates the unit's stroke and also a manifold block for the pneumatic valves.

The reamer, which is designed to match the gas nozzle and torch geometry, is driven by the pneumatic motor and moves up and down in the guide slots in the direction of the axis of rotation. For the cleaning operation, the torch is clamped at the cylindrical part of the gas nozzle in a precisely-programmed position by means of the clamp. The three-point support ensures that no reaction forces are transmitted to the robot. The V-block has to be

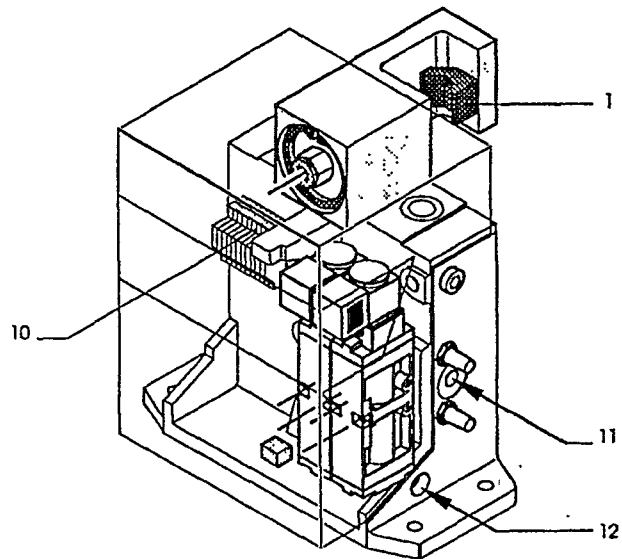
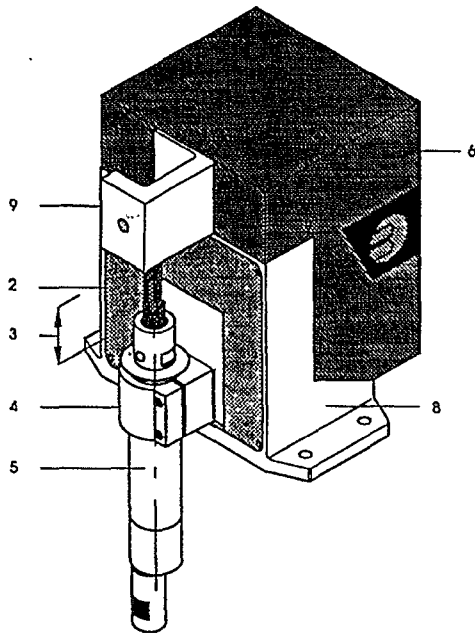
matched to the external diameter of the gas nozzle and can be exchanged for all sizes from 15mm to 30mm diameter.

The complete functional sequence can be controlled from the robot. For this, the robot must have one input and two outputs. The inputs and outputs are described on page 20, and page 21 shows a proposed program flow chart for robot programming.

All fittings, valves, clamp block, initiators, etc., are protected by a cover against outside influences.

The interior of the gas nozzle must be blown out during cleaning; refer to Accessories on page 17.

To obtain the optimum cleaning performance, the interior of the gas nozzle should be sprayed with BINZEL Anti-spatter Fluid after cleaning; refer to Accessories on page 17.



1. V-block*
2. Reamer*
3. Reamer lift (50 mm)
4. Guide slots
5. Pneumatic motor
6. Cover
8. Frame
9. Clamp
10. Functional board

Fig.: 1.1 TCS-6-LC, General arrangement

* The geometry of the gas nozzle and torch must be established for these components.

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Technical Data

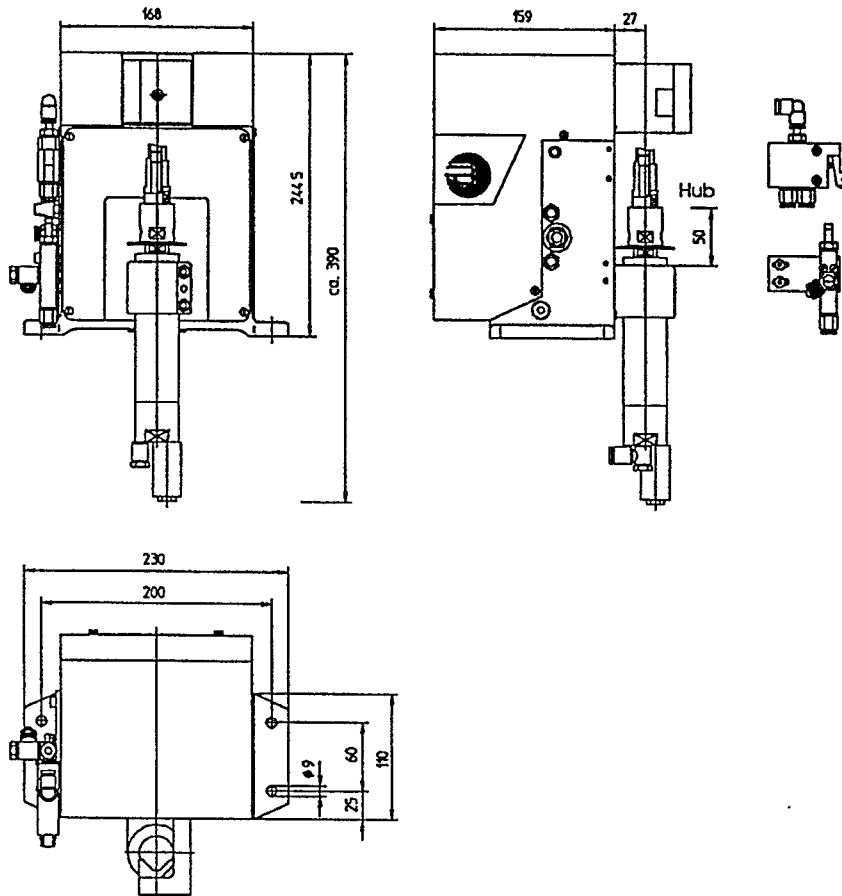


Figure 2.1 Dimensions

2.1 General data

Type
 Dimensions
 Weight
 Ambient temperature
 Protection to DIN 40050

2.2 Pneumatic equipment

Air connection
 Internal diameter
 Nominal pressure
 Operating pressure
 Nominal flow
 Nominal rotational speed
 of pneumatic motor

2.3 Electrical equipment

a) 5/2 way valves

Rated voltage
 Power consumption
 Relative operating time

b) Inductive proximity switch, normally-open contact, (pnp)

Operating voltage
 Permitted residual ripple
 Continuous current
 Current consumption
 Voltage drop

TCS-6-LC (Ident. No. 831.0300)
 Refer to Fig. 2.1
 Approx. 10 kg
 +5° to +50°C
 IP 21

G 1/4"
 Min. 8mm
 6 bar
 5 to 8 bar
 500 l/min
 300 r.p.m.

24 VDC
 4.5 W (EACU)
 Continuous duty

10 to 30 VDC
 $V_{pp} < 10\%$
 Max. 200 MA
 Approx. 4 MA (24 V)
 Approx 1.2V (200 MA)

1. The TCS-6-LC is constructed to the latest specifications and is safe to operate, provided:
 - a) It is correctly installed and maintained by qualified personnel
 - b) The Accident Prevention Regulations as well as the safety specifications of the relevant country* are observed
2. Installation, commissioning and maintenance shall be performed only by authorized personnel and all safety precautions in these Operating Instructions shall be observed.
3. This product shall be integrated into a higher safety system by plant engineering, if the installation site is within a secured area which has to be entered for assembly or maintenance work.
In this case it shall also be ensured that the complete plant is shut down and remains locked out against all inadvertent operation, e.g. due to control malfunction.
4. The TCS-6-LC is to be used only for torch cleaning within the parameters of its technical specifications.
5. The specified operating pressure shall not be exceeded.
6. When used independently, the TCS-6-LC may only be operated with the cover closed.
7. Keep hands clear of the area of the clamp and reamer operating space.
8. When making adjustments, shut off the air supply so that the equipment is unpressurized.
9. Additional fittings which were not offered as accessories may only be fitted with the approval of the manufacturer.
10. If it is intended to use the TCS-6-LC in an environment with corrosive or aggressive vapors or liquids, please check with the manufacturer for specific safety instructions.
11. When shutting down a system, make sure that the robot welding torch is not in the process of being cleaned by the TCS-6-LC; i.e. the nozzle is not clamped in the TCS-6-LC.

* In Germany, for example, these are the Guidelines of the Industrial Employers Liability Insurance Associations, VDI Guidelines, etc.

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4.1 Preparation

Before starting installation work in the area of the robot, ensure, for your personal safety, that all protective measures are taken while you are in the area of the robot.

Remove the TCS-6-LC from the packing case and fit silencer (13) and compressed air hose (14); refer to fig 4.1.

Extended scope of delivery: V-block and reamer.

The sizes of these components depend on the geometry of the torch and gas nozzle and should be ordered accordingly; refer to Installation of Fittings, Section 4.5.

Because the TCS-6-LC is to be installed in the operating area of the robot, the user must determine the most satisfactory installation point with the shortest approach paths.

4.2 Mounting

The TCS-6-LC can be mounted, with certain limitations, into any position and direction, but a

completely trouble-free operation can only be guaranteed when installed as shown in Fig 4.1 or 4.4

Secure the TCS-6-LC to a vibration-free base, or to the optional mounting stand, using four bolts (8mm diameter), refer to Fig 4.4

Exercise care when connecting the pneumatic or electrical supply!

Make sure that the air supply and electrical power to the TCS-6-LC are disconnected and remain so until the installation is complete!

4.3 Pneumatic connection

(Fig 8.1 Pneumatic circuit, page 19)

The TCS-6-LC operates on filtered and oiled compressed air which is supplied via a maintenance unit, refer to accessories (page 17), to the integral manifold.

The necessary 6mm (internal diameter) supply line is not supplied.

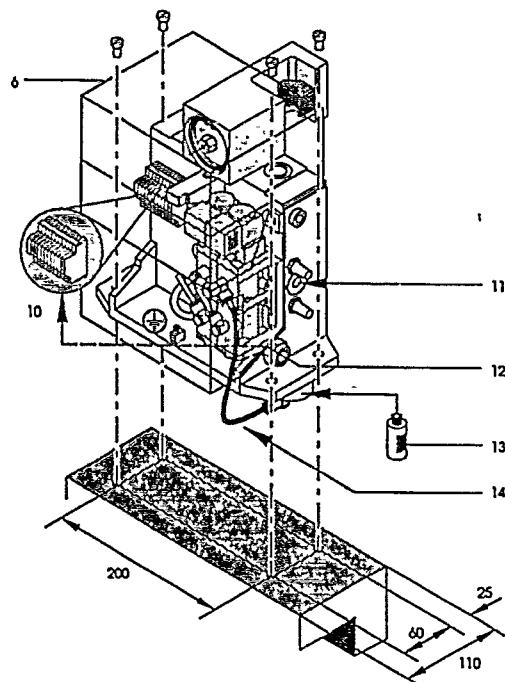


Fig.:4.1 Installation, pneumatic connection

- 6. Cover
- 10. Terminal block
- 11. Pneumatic connection
- 12. Electrical connection
- 13. Silencer
- 14. Compressed air hose

4.4 Electrical connections

(Refer to terminal layout, page 20)

Remove the side attaching screws and then remove cover (6). The terminal block (10) is now accessible (Fig 4.1).

Route connecting cable through screwed joint PG9 to terminal block (10) (Fig 1).

Recommended connecting cable: 6 x 0.5mm

External diameter: 6 x 9mm

1. Connect earth to XPE-1 (refer to Fig 4.1).
2. Connect 24 V.D.C. operating voltage to X1.6 and X1.5 (refer to wiring details on page 20).
3. Connect input control signal for "lift" to X1.8 (refer to terminal layout on page 20).
4. Connect the input control signal for "Clamp/Motor" to X1.7 (refer to terminal layout on page 20).
5. Connect output control signal for: "Lift down" to X1.9 (refer to terminal layout on page 20).

4.5 Installation or replacement fittings

Warning!

- Disconnect or switch off the air supply and operating voltage
- Refit cover (6) after completion of work

All installed fittings should have the same diameter markings as the external diameter marking of the gas nozzle to be cleaned.

4.5.1 V-Block (Fig 4.2)

Fit the V-block in the clamp using one M5 x 20 cheese-head screw, ensuring that it cannot twist.

4.5.2 Reamer (Fig 4.2)

When changing the reamer, use a wrench of the correct size.

Reamer mounting SW 27

Reamer SW 17

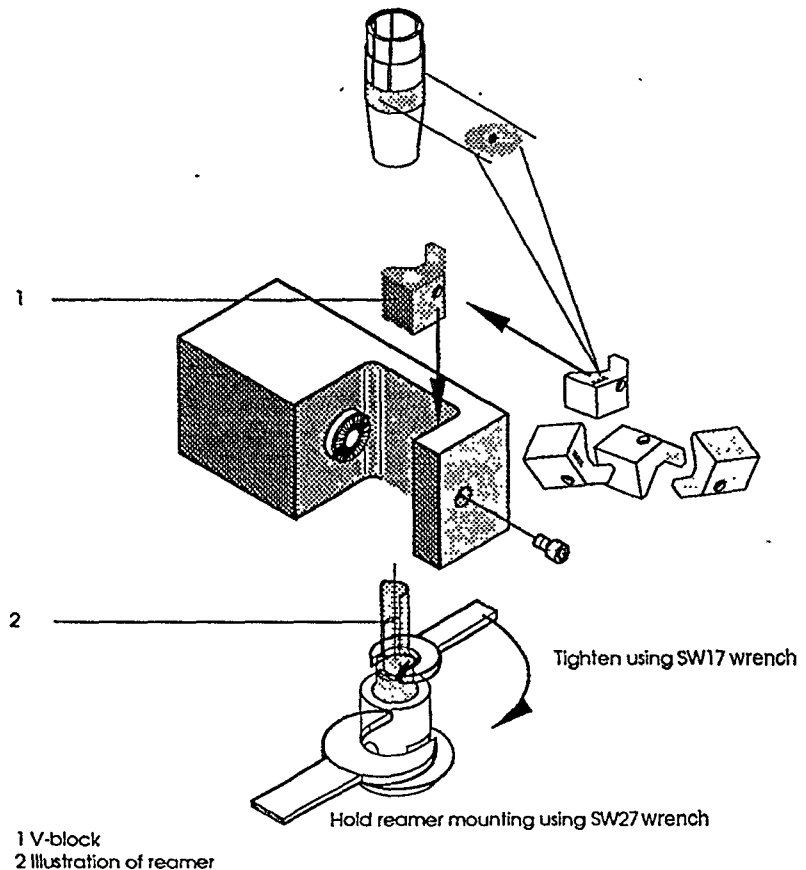


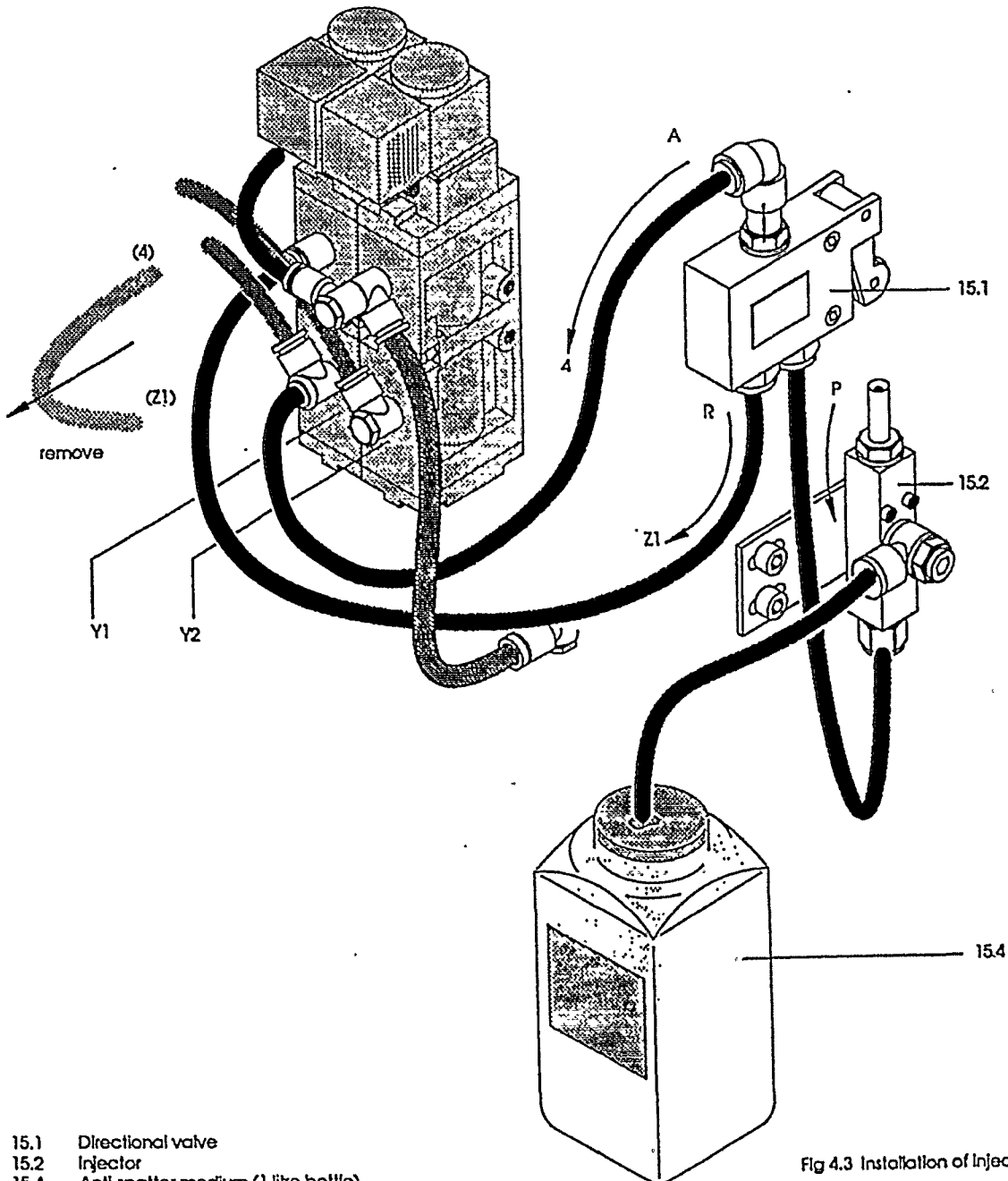
Fig.: 4.2 Fittings

The following items are available as options; refer also to Accessories on page 17.

4.6 Injector (optional)

The TCS-6-LC is designed for subsequent fitting of the anti-spatter injector unit. M4 threaded holes are provided for this purpose in the side of the frame, to which the directional valve (15.1) and the injector (15.2) are secured by two cheese-head bolts (refer to Fig 4.4).

Connect the hoses as shown in Fig 4.3, or in the pneumatic circuit diagram (Fig 8.2 on page 18). The suction hose to the injector (15.2) passes through the cap of the anti-spatter bottle (15.4), which must be suitably drilled out.



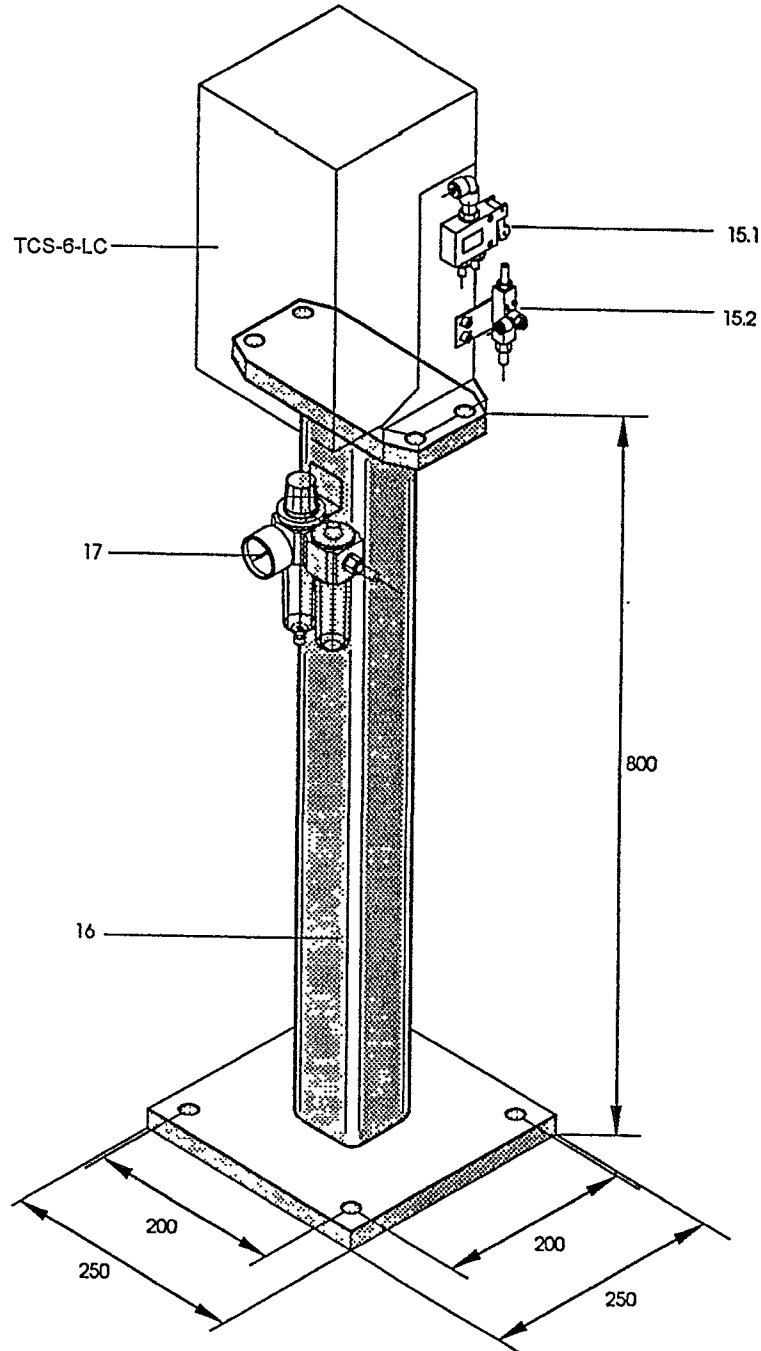
- 15.1 Directional valve
- 15.2 Injector
- 15.4 Anti-spatter medium (1 litre bottle)

Fig 4.3 Installation of Injector unit

4.7 Stand (optional) Fig 4.4

4.8 Maintenance unit (optional) Fig 4.4

The illustration shows the complete arrangement of all available options together with the TCS-6-LC.



- 15 Injector unit
- 15.1 Directional valve
- 15.2 Injector
- 15.3 Bottle holder
- 16 Stand
- 17 Maintenance unit

Fig 4.4 Optional equipment for TCS-6-LC

Commissioning

5

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5.1 programming robot to move to clamp position (Refer to Fig 8.4, suggested program sequence, page 21)

Precise programming is necessary to ensure that when the gas nozzle is clamped no reaction forces are transmitted via the torch to the axes of the robot, which could lead to malfunction or shutdown of axes. The following movement points are to be stored in the robot program.

1. Move robot to waiting position A (refer to Fig 5.1)
2. Check the operational readiness of the TCS-6-LC.
3. With the "stroke at bottom" = 1, enter the torch in to the clamp B.
4. Clamp position C, refer to Fig 5.2

The cylindrical part of the gas nozzle rests evenly and without strain on the V-block; the axis of the torch and reamer are now coaxial with respect to each other.

The same positioning is necessary when setting up the pneumatic motor.

5.2 Setting up the pneumatic motor

To avoid the risk of accident, ensure that no electrical power or air pressure is applied to the TCS-6-LC during set up.

– It is absolutely essential for efficient cleaning that both the internal diameter and the insertion depth of the torch nozzle are correct.

– The guide slots must always be be at the lowest position during all settings.

– Refit the cover after all adjustments.

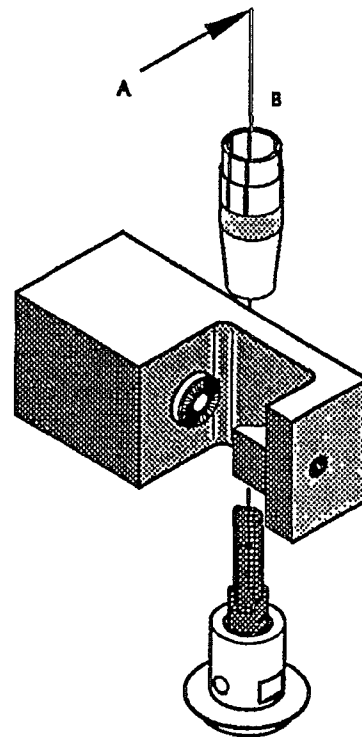


Fig 5.1 In clamp device

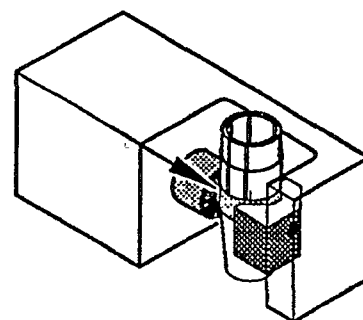


Fig 5.2 Clamp position

Adjustment (Fig 5.3)

- a) Slacken screws (1) to release pneumatic motor in clamp.
- b) Pull pneumatic motor (2) back into its mounting.
- c) Use a suitable Adjusting gauge (3) on the reamer. (The adjusting gauge is to measure the inside diameter of the gas nozzle (i.d.) and the diameter of the reamer)

Adjusting gauge

831.0036 is suitable up to i.d. 15.5mm

831.0163 is suitable up to i.d. 16mm to 18mm

- d) Move the torch with the gas nozzle, as described in section 5.1, to clamp position C.
- e) Using **hand 1**, hold the guide slots in the lower position (lift down)
- f) Using **hand 2**, push pneumatic motor (2) with adjusting gauge (3) on top against the gas nozzle.
- g) Clamp the pneumatic motor in position using screws (1)
- h) Move the torch from the clamp and remove the adjusting gauge from the reamer.

Check the settings with the air supply still switched off by moving the reamer in the guide slots (reamer lift) by hand. When doing so it must be possible to insert the reamer to its full depth in the gas nozzle without a collision (cleaning position).

5.3 The program start and operating sequence are triggered by a superior control system (refer to suggested program sequence on page 21).

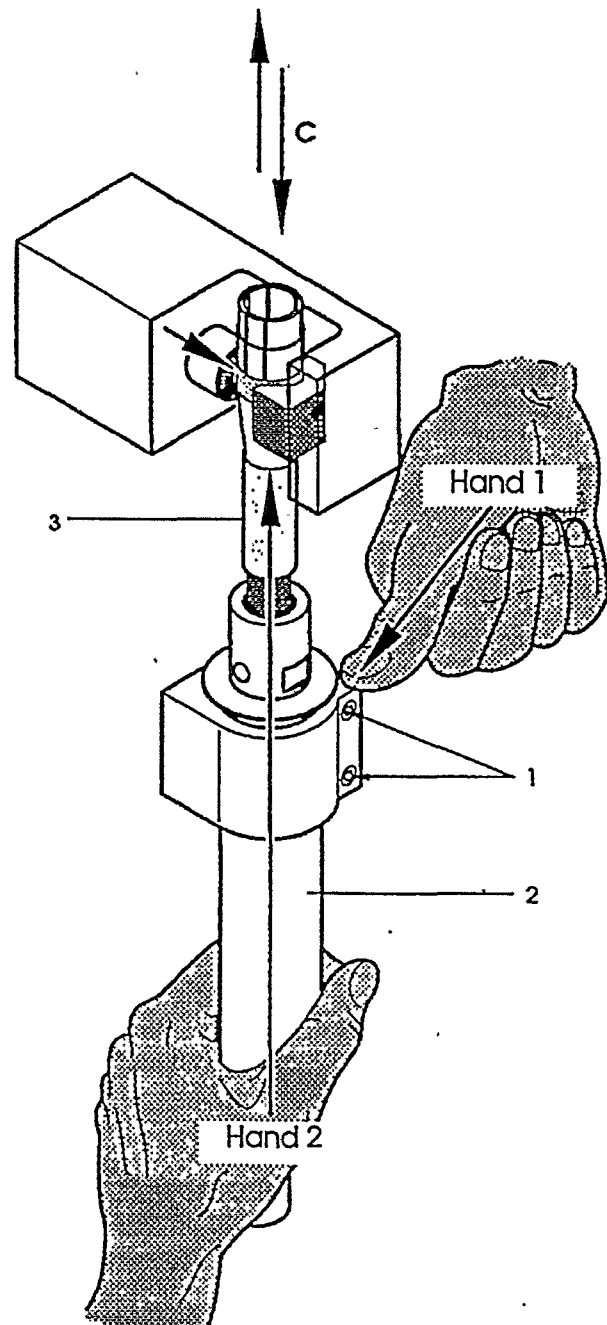


Fig 5.3 Adjustment of pneumatic motor

5.4 Functional run with the optional injector unit

For injection after the cleaning operation, the torch with gas nozzle (1) is moved from clamp position C to over the injector (2).

In this position, the gas jet (1) actuates the roller lever (3) which changes over directional valve (4). The compressed air is now no longer applied to the lift cylinder but instead to injector (2); refer to Fig 8.2, Pneumatic circuit program, page 19.

When the control signal "stroke" is again set to 1, the injector operation takes place:

The air through injector (2) generates a vacuum in suction hose (5) which draws the anti-spatter medium from storage bottle (6) and mixes it with the air which is passing through.

Refer to Program sequence 8.4 on page 21 for a suggested program.

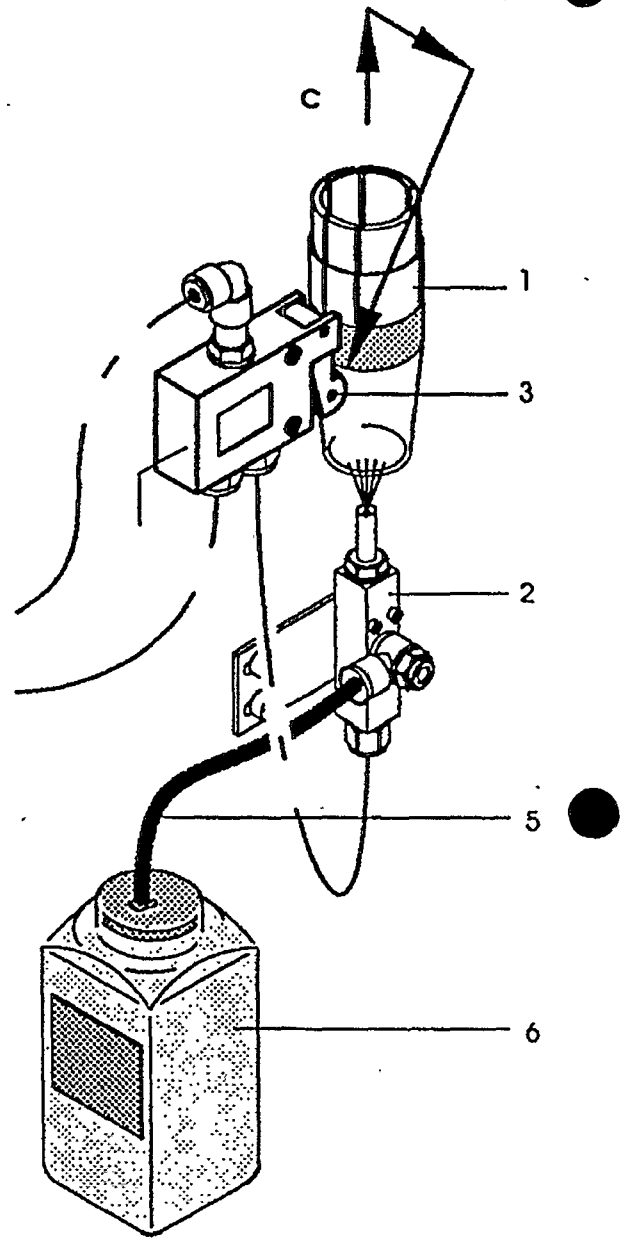


Fig 5.4 Injector unit, operation

The TCS-6-LC is a largely maintenance-free peripheral unit in robot welding cells. Nevertheless, it is in your interest to clean and inspect the mechanically stressed parts at regular intervals for additional spatter removal and wear and tear.

In particular, the channels in the reamer mounting should be kept free of loose spatter so that they can be blown free without restriction during cleaning.

Weekly: A thorough cleaning is needed on a weekly basis. In extreme working conditions, this may even be necessary daily.

Monthly: Check the oil level in the maintenance unit and ensure the unit is working correctly.

The TCS-6-LC may only be operated with filters and oiled compressed air, which is to be supplied via a suitable maintenance unit; refer to Accessories section.

Caution!

The TCS-6-LC must be shut down during maintenance work.

If the installation site is within an accessible secured area, it shall also be ensured that the system is shut down and inadvertent operation, e.g. due to control malfunction, is prevented, and that the system remains shut down.

The following are absolutely essential for the operation of the TCS-6-LC:

V-Block (Fig 7.1)

This can be supplied for normal gas nozzles of 15 to 30mm estimated diameter. Other sizes available on request.

This precise central position of the clamp relative to the axis of the reamer is only achieved if the diameter for which the V-block is designed is the same as that of the gas nozzle.

Note the diameter designation stamped on the block.

Reamer (Fig 7.2)

Gas nozzle and torch geometry up to maximum insertion depths of 50mm determine the dimensions of the reamer.

Can be supplied for all standard WH and Robo torch types from NW 13 to 18 mm.

Other sizes on request.

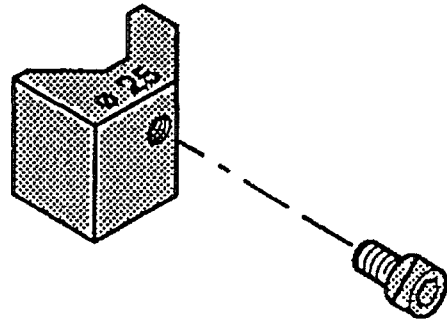


Fig 7.1 V-block (e.g. 25 mm dia)

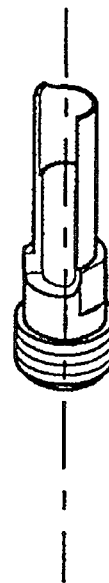


Fig 7.2

Important!

Blowing out and injecting the interior of the gas jet using original BINZEL anti-spatter agent to avoid build-up of spatter is just as important as torch cleaning using the TCS-6-LC.

Options

1. Injector unit

For injecting the gas nozzle from the front (after cleaning). This consists of the following:

- 1.1 Directional valve
- 1.2 Injector
- 1.4 BINZEL anti-spatter agent (not illustrated)

Ident No.: 832.0051

2. Stand

This offers the user a simple and cheap space-saving method of installing the TCS-6-LC using options 2 and 3.

3. Maintenance unit

We recommend the mounting kit (hose and fitting) and the stand 2 be used together for direct connection to the TCS-6-LC.

Not illustrated

4. Blow out and injector unit (24V)

A combined unit which is inserted from the back through the hose set for blowing out and injecting the interior of the gas nozzle.

4.1 Solenoid valve (24V)

For blowing out the interior of the gas nozzle from the rear through the hose set (during the cleaning process).

Ident No.: 832.0005

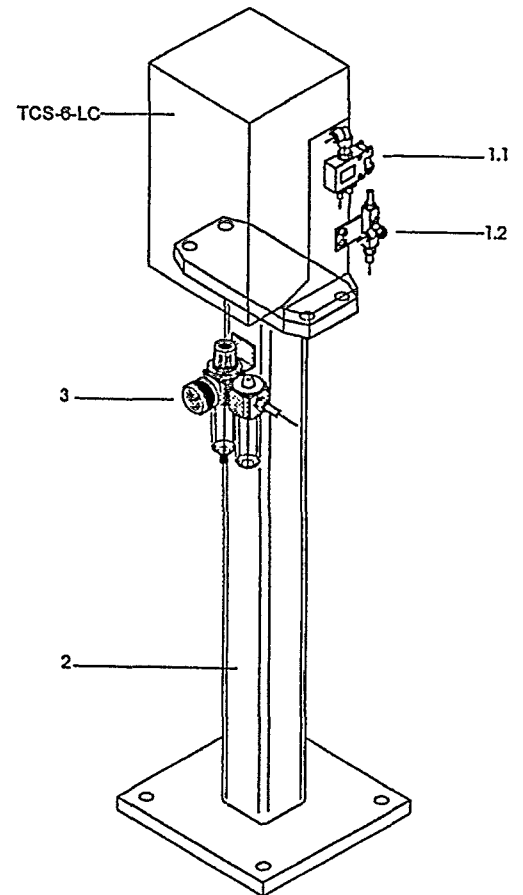
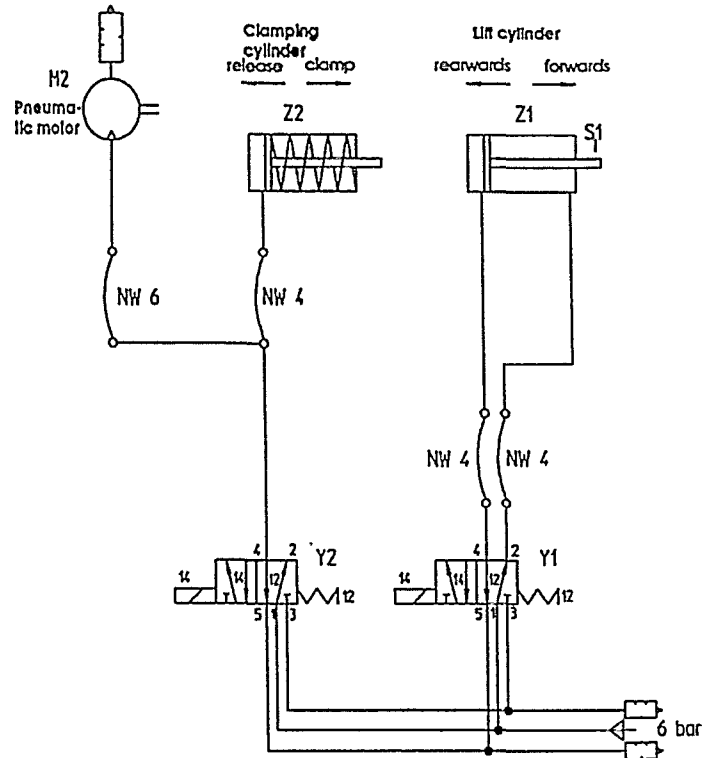


Fig 7.3 Options

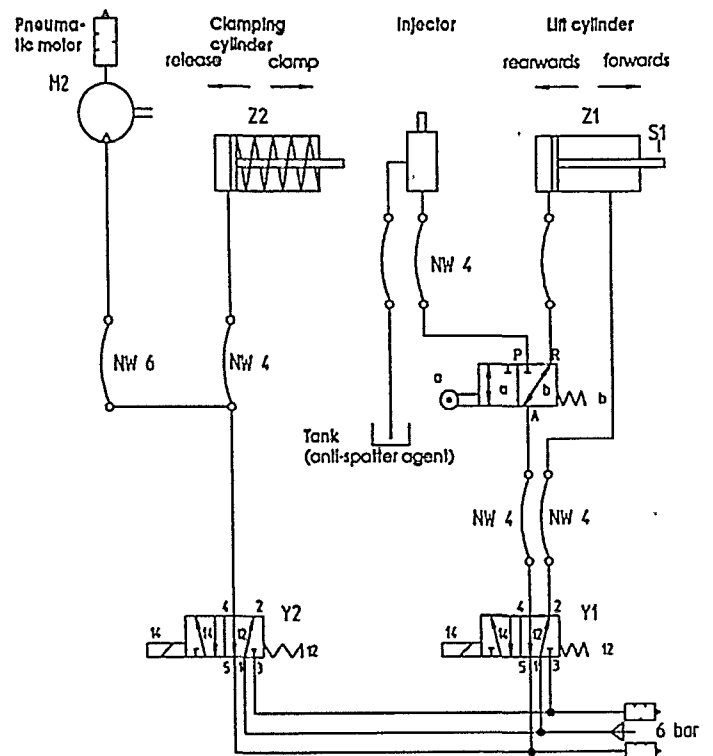
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Appendix

8.1 Pneumatic circuit diagram



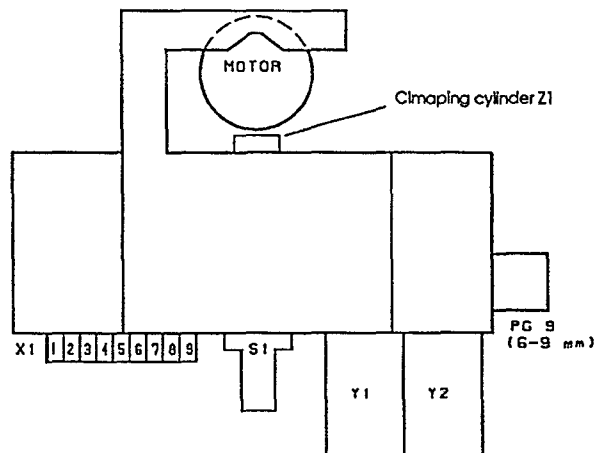
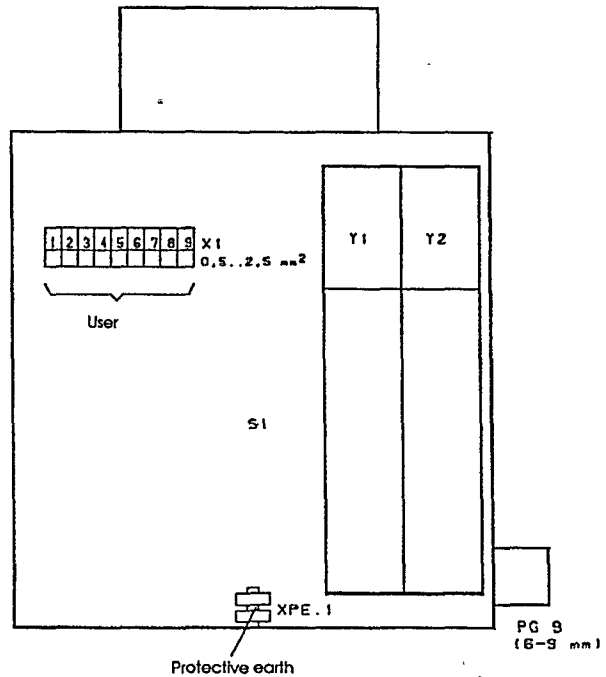
8.2 Pneumatic circuit diagram with "injector unit" option



Appendix

8.3 Arrangement of equipment and terminals

PE	↓	X1.1
PE	↓	X1.2
GND	↑	X1.3
GND	↑	X1.4
GND	↑	X1.5
+24 V DC		X1.6
Y2 Clamping/motor		X1.7
Y1 Lift ("spray")		X1.8
S1 "Lift downwards"		X1.9



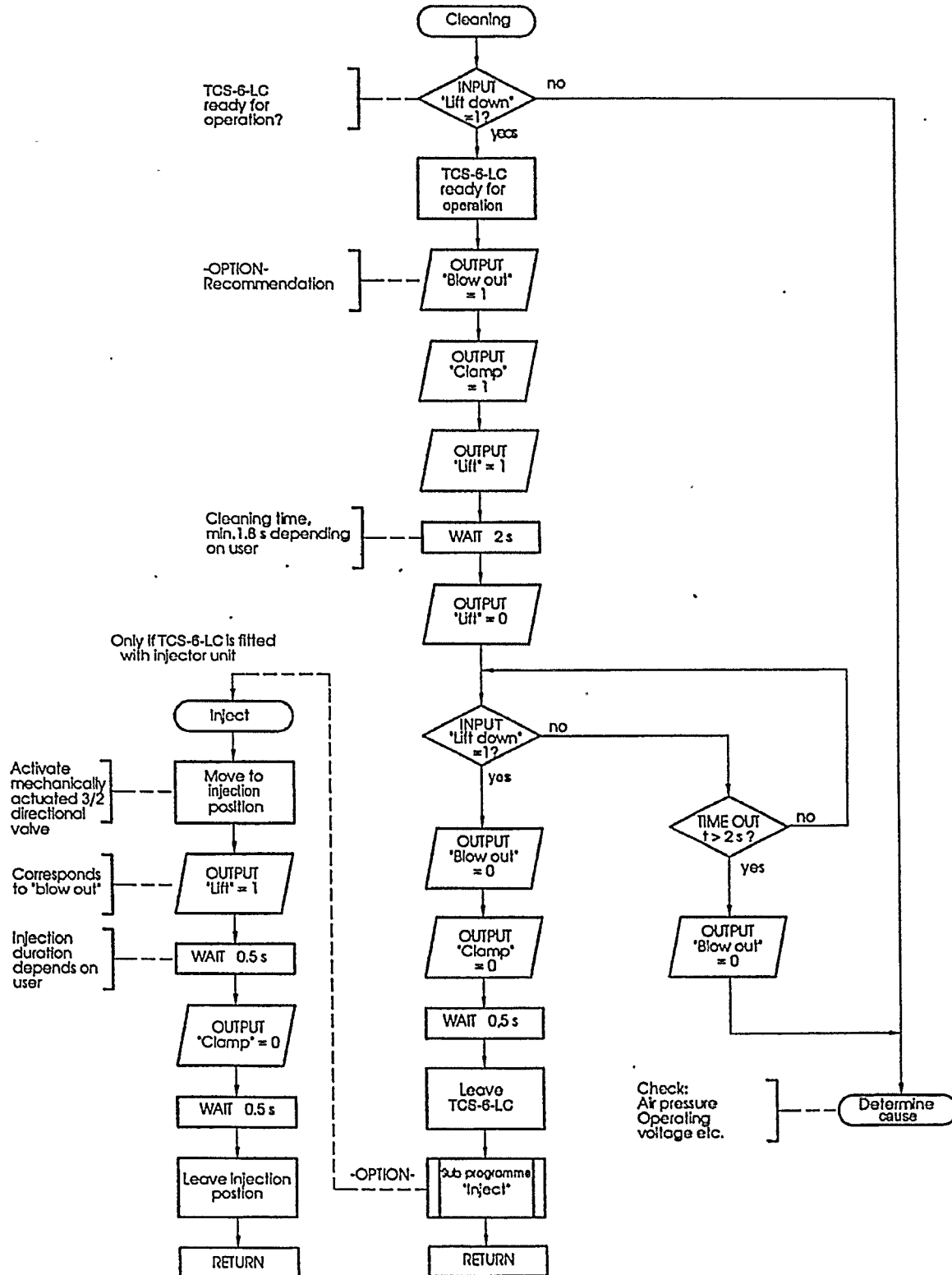
S1 Inductive proximity switch
 signal 1 "lift down" → TCS-6-LC ready for operation

Y1 directional valve
 signal =1 "lift" upwards movement
 signal =0 "lift" downwards movement

Y2 directional valve
 signal =1 "clamp/motor" on
 signal =0 "clamp/motor" off

Appendix

8.4 Suggested program sequence



Note: Deviations may be necessary depending on the program language.