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T2X Dispense System

Installation Manual

Save These Instructions

T2X

Ingersoll Rand

INDEX

1 General Information

This manual will give both operators and maintenance personnel indispensable information to operate the units. We therefore strongly recommend a thorough study of this manual.
In order to make easy use of this manual it must be easily accessible to the people working with the equipment.

1.1 The T2X systems provides

- Highly Efficient Production with T2X
  Either as a stationary independent unit or robot mounted the T2X can be totally integrated with any production unit and a wide diverse range of robot applications. When robot mounted, via an automatic tool changer flexibility is increased. The doser will be refilled through a docking station and not along the robot arm. Productivity and operation are greatly enhanced by enabling hose-less operation.

- Accurate dosing
  Accurate dosing is performed with the newly developed T2X electrical servo driven piston. The closed loop of the servo together with the PC gives precise control of the spindle inside the doser. Accuracy and efficiency of the dosing is furthermore enhanced with the integrated PC control, thus synchronising robot movement and servo control. The flow is fully proportional towards the tool speed of the robot (TCP related flow).

- User-friendliness and total control
  One of the outstanding T2X features is its user-friendliness. Through the intuitive and interactive PC based user-interface. The operator only requires basic training to control the doser. Simple menus allow the operator to obtain detailed information when needed without losing an overview of the system. The quality and efficiency historical process data are stored in an open format. This enables the customer to make any type of quality control and process analysis.

1.2 Safety

WARNING

- **Read and understand all instructions.** Failure to follow all instructions listed below, may result in electric shock, fire and/or serious personal injury.
- **Read and understand all instructions and all safety warnings supplied with all accessories, optional components and integrated hardware before installing and operating this product.** A Dispense System will often contain other components, accessories and robots whose hazards are not covered by this manual.
- **It is your responsibility to make this safety information available to others that will operate this product.** Failure to follow standards and regulations can cause personal injury.
- **All persons working with this equipment must have read the Safety Information Manual first.**

1.3 Technical support

If needed, **Ingersoll Rand**'s technical service support is available for the benefit of the customer, and is contacted by telephone, e-mail or fax.

1.4 Replacing spare parts

WARNING

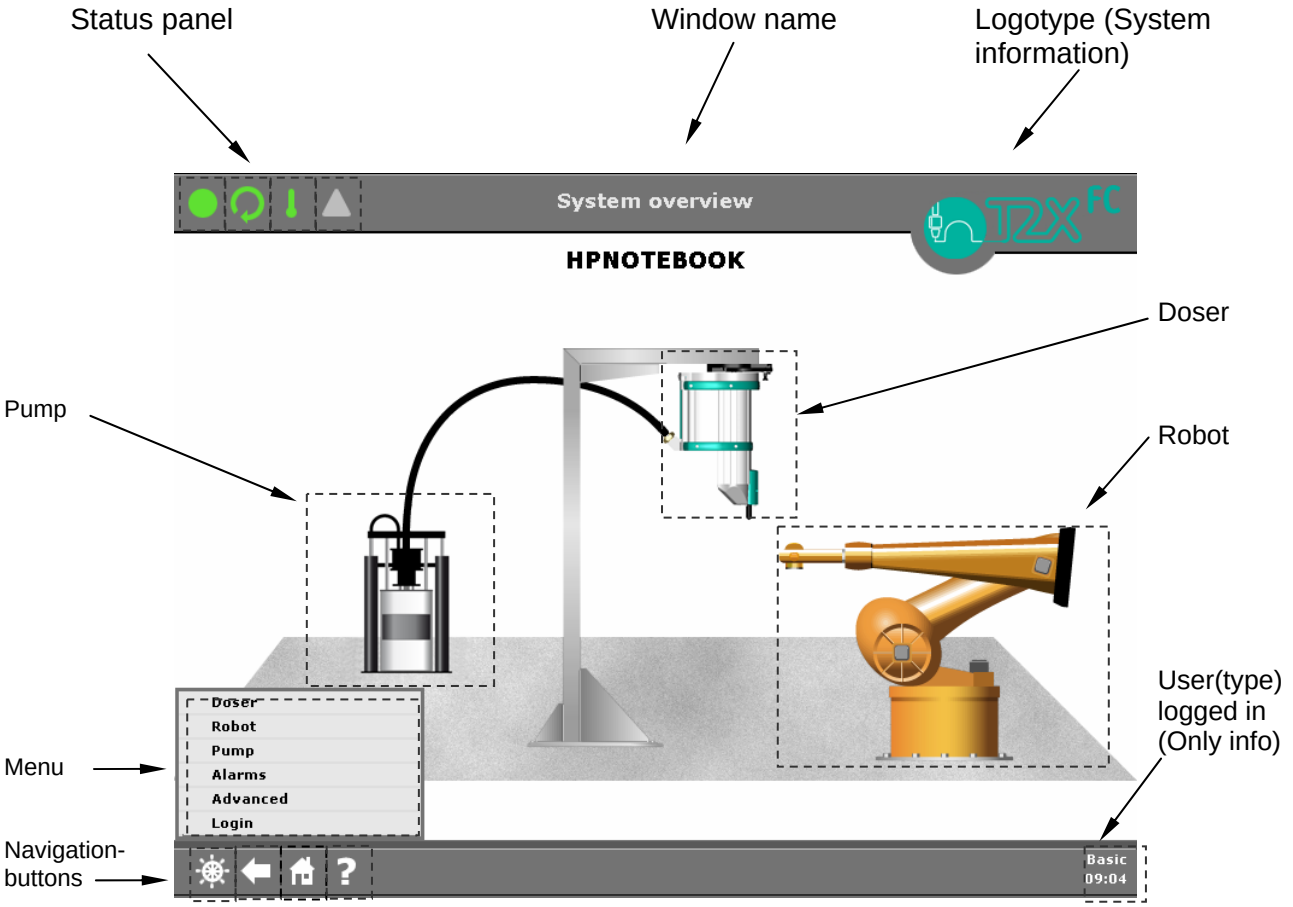
- **Installation and service must be performed only by qualified personnel.** Service or maintenance performed by unqualified personnel could result in a risk of injury. Consult your nearest **Ingersoll Rand** Authorized Servicenter.
- **When servicing this product, use only genuine Ingersoll Rand replacement parts and follow all Maintenance Instructions.** Use of unauthorized parts or failure to follow Maintenance Instructions may create a risk of electric shock or injury.

NOTICE

- **Installing and removing parts must be performed according to the Manuals.**
- **Use only Ingersoll Rand parts to ensure the longest life.**

2 System overview

The window “System overview” is the first to appear. From this window it is possible to bring forth – click on – functions available in the system.



The window “System overview”

2.1 Purpose and survey

The function of the T2X system is based on using the movement (speed) of the doser as an additional axis of the robot. This enables the dispensing of various flow rates proportionally to the tool centre speed of the robot. It is designed for highly viscous and tempered adhesives and sealing materials.

The stationary equipment above consists of a pump unit with an electric hose for the heating of the material, a doser and a control system. *For robot mounted systems a docking station will be added*. A temperature conditioning system can be added to the system.

The doser could be configured as a stationary mounted (S) (pedestal) with a direct hose connection, or as a robot-mounted (R) – with docking station. Dosers built for robot mounting are installed without direct hose connection along the robot arm. The hose is connected to a docking station where filling occurs. This allows very high flexibility and increased range of motion for the robot.

The equipment is designed and manufactured with the stability, accuracy and precision for handling high pressures and for a defined performance. This equipment is utilized in the automotive industry, by the dosing of highly viscous sealing and adhesive material etc.
Prior to each delivery the equipment is tested and thoroughly inspected. According to the requirements of the site where the installation will be performed.

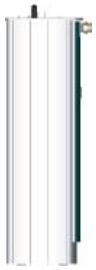
3 Parts included

3.1 Supplied by Ingersoll Rand:

Doser: (Sxxx or Rxxx):

The spindle equipped and electrical servo-driven doser is the central component of the T2X equipment, either as a stationary doser (e.g. the Sxxx) to be installed on a doser pedestal, or as a robot-mounted doser (e.g. the Rxxx). By using the principle of constriction, the doser is capable of handling highly viscous pastes and adhesives with ease. All dosers have a manual tool changer for fast tool changing and integrated electrical boxes for fast interconnecting of the wiring.

Docking station: (DS):



The docking station is used for robot mounted (Rxxx) dosers only. Using a docking station allows a hose-less robot mounting of the doser. If the robot uses a tool changer (ATC), the doser can be left in the docking station.

Main power and control box (AE1):

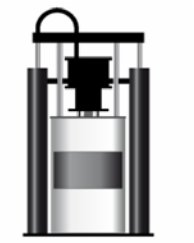
This unit receives the incoming power supply of 400VAC/ 25A and distributes all power supply 230VAC, 24VDC and safety interlocked 24VDC. The AE1 is directly connected to the pump and the docking-station. This box includes the safety relays for emergency, safety stop and serves as a distribution unit within the T2X system.

This unit also contains the servo pack and handles the signal-exchange between the robot and the T2X system. It is the core of the system, from which the system is operated and monitored.

Media panel

The Media Panel controls the air and lubrication systems for the T2X.

Material pump, material hose



The material pump is a plunger pump unit for 20 or 200 litre barrels.
All material hoses are steel-mantled PTFE hoses, which can maintain high dynamical pressures and have extra long lifetime. The material hoses are as standard 4.0 meters long, and connect to either the doser (Sxxx) or the docking station (Rxxx).

Cables, air and lubrication hoses etc.

3.2 Not supplied by Ingersoll Rand

- Installation

All work needed for installing and connecting the T2X system must be done by the integrator accordingly.

- Robot

Neither the robot nor robot specific parts such as: SBCU (device for TCP-check) robot tools, automatic tool changer or parts directly belonging to it. Programming of robot is to be provided by the integrator.

- Cable tray, ducts and hose support

The line builder, who installs all parts of the included cable package, must supply the cable trays or ducts needed for the complete T2X system. If cable duct covers are needed these must also be provided by the integrator. It is also the integrators responsibility to provide support for the material hose in order to guaranty flexibility under all conditions.

3.3 Parts not directly described in this manual

WARNING

- **Read product labels and Material Safety Data Sheets (MSDS) and follow all manufacturer's warnings and directions for handling dispensed materials.** Improper use or handling of dispensed materials may create a risk of fire or personal injury.
- **Only use materials that are compatible with the dispense system.** Failure to do so could cause serious injury.
- **This product is intended for viscous material. Do not dispense flammable or volatile material. Only dispense materials approved by Ingersoll Rand.** Failure to do so could cause serious injury.
- **All excess dispensed material must be disposed of according to the manufacture's directions and local, state, and federal laws.** Improper disposal may cause personal injury or endanger the environment.

- Robot arm and robot controller

Ingersoll Rand does not supply the robot arm or its controller.

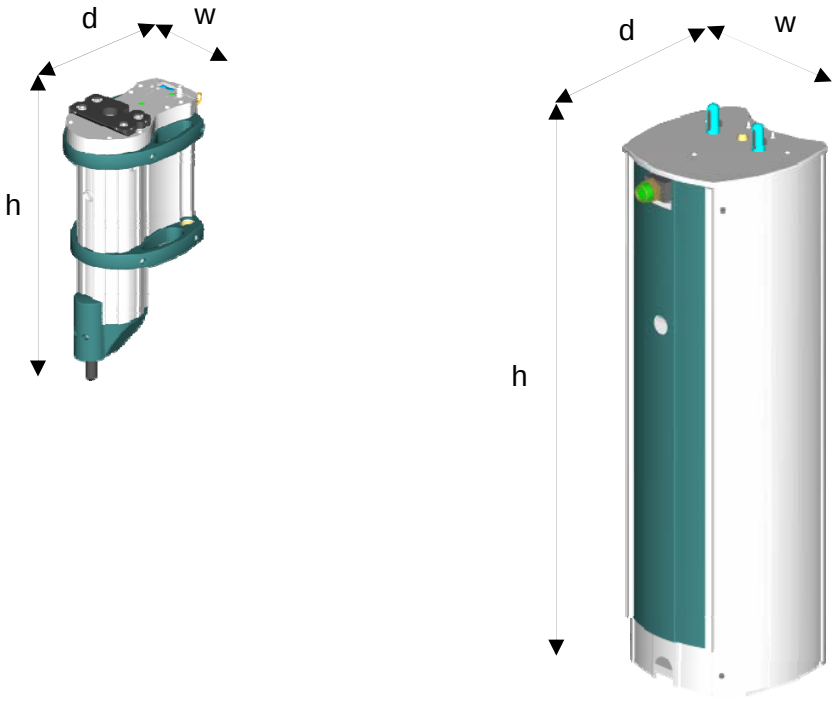
- Materials

The numerous materials available for use with the T2X, such as adhesives, sealants or lubricants are not supplied by **Ingersoll Rand** and will not be specifically described in this manual. For information about the materials, see material manufacturer specs (Material safety data information).

4 Packaging and handling

4.1 General information – transport/handling

Component	Height, width and depth [mm]	Weight [kg]
Heated pump, 200 litres	1020x610x1790 (2555)	250
Doser S80	550x210x275	23
Doser R80	550x210x275	23
Doser R250	722x210x275	25
Doser S250	722x210x275	25
Docking station DS	1040x310x320	60
Main power and pump box [AE1]	760x600x380	50
Media panel	590x215x750	11



Doser and docking station

4.2 Unwrapping

Inspect all units for any kind of transport damage. Non-standard configuration components may be sent separately. All removal of the packaging is within the responsibility of the line builder.

4.3 Assembly

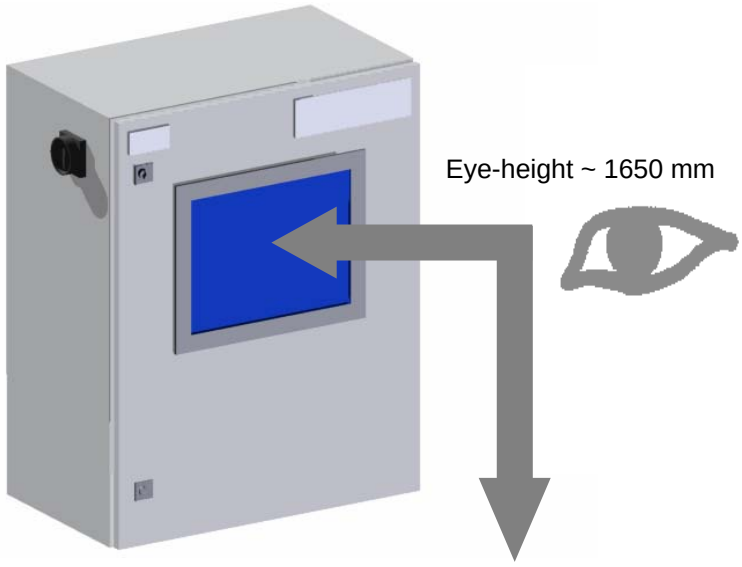
After being unwrapped, place the units according to the agreed and conduct a thorough inspection. Make certain that each unit is what was ordered and inspect the mounting areas, floor, support etc. are free from damages and will meet with the demands/loads of the equipment.
Parts of the equipment, covered by anticorrosive agent, shall be cleaned and carefully dried before start-up.

5 Installation Layout of equipment

There are a few restrictions in the placement of the equipment due to intended use of equipment. Carefully look at the different layouts to identify the best placing of each unit. **Ingersoll Rand** will upon request provide 3D-models for simulation. All cables between cabinets are to be specified by the customer in lengths of 2.5-20 meters in step of 2.5 m (except for material hose that is 4 m).

- Main power, Control box (AE1)

Connections:
The AE1 need 3p x 400 VAC + N +PE 25A, directly to the main disconnect (If voltage other than 3x400VAC or no “N”, a transformer is needed.)
Notes:
Place the box so that the monitor can be operated from outside the cell, making it possible to operate the system without entering the cell. Place the AE1 so that on the left side mounted main breaker and door are easily accessible. For best function, place the monitor at eye-height (~1650mm.).



Control box AE1

- Material pump

Connections:
The pump is connected to the AE1 main power, the pump box and the media panel.
The material hoses are as standard in one length, 4 m, and will be connected to the docking station on robot-mounted systems, or to the doser on stationary systems.

Notes:
The pump must be placed so that the material barrel is easy to change. We recommend a two-metre radius of clear space in front of the pump.

- Media panel

Connections:
The media panel’s air inlet is connected to the external air supply, the pump and the doser pedestal (Sxxx) or the docking station and the robot (Rxxx). The lubrication systems are connected to the docking station (Rxxx), the doser (Rxxx on board lubrication) or on the doser pedestal (Sxxx). The media panel is also electrically connected to the AE1.

Notes:
The media panel should be placed in close proximity to the material pump.

- Doser pedestal

Connections:
The doser pedestal is to be connected to the box AE1 (main power/pump box) and the media panel.

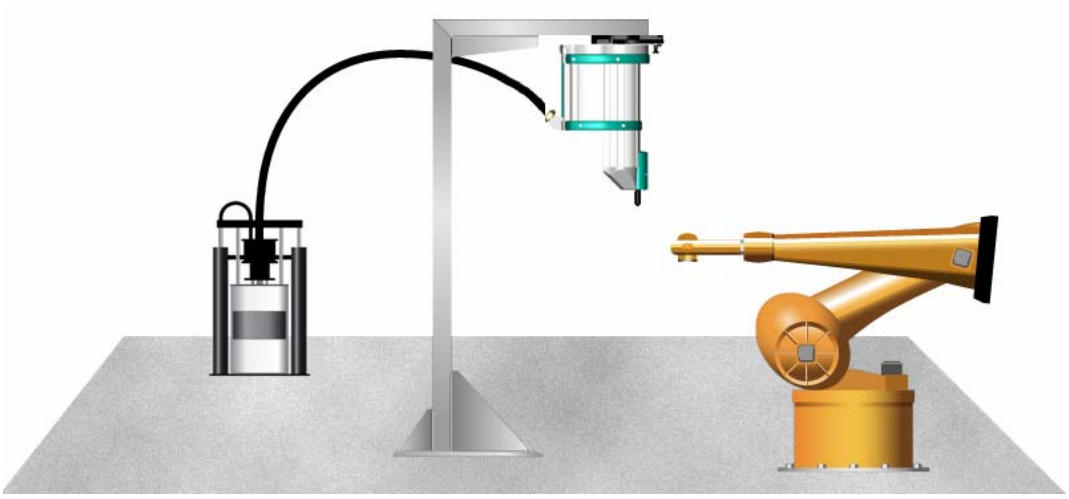
Notes:
When placing the doser pedestal it is important to consider its position in relation to the doser and the robot.

- Docking station

Connections:
The docking station is connected to the material pump, the AE1 and the media panel.

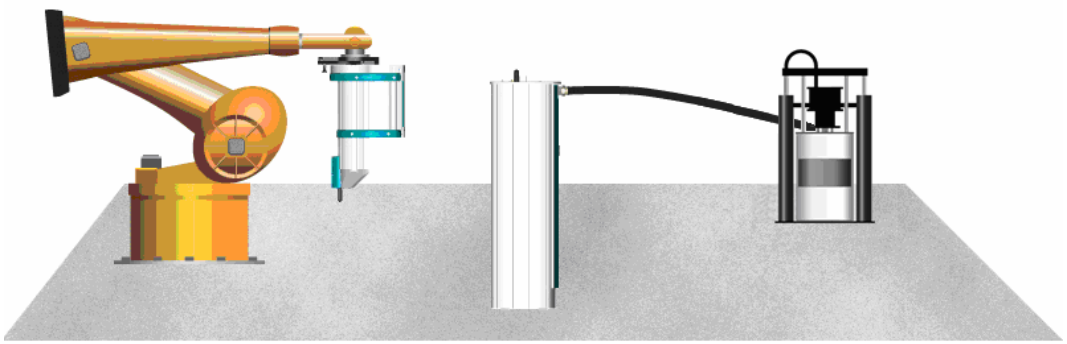
Notes:
It is very important to know that the length of the hose to the pump is limited to 4 m. Contact **Ingersoll Rand** concerning any other lengths. The docking station must be placed inside a clearly defined area, and within reach of the robot. Careful consideration should be given to the placement of the docking station to reduce the robots cycle time.

Sample layout of stationary system (S80):



Iso view

Sample layout of robot mounted system (R80 & R250):



Iso view

6 Mechanical installation

WARNING

- **Locate operator controls in an area where the operator is not endangered, has easy ingress and egress and can readily access all emergency shutdown controls.** Considering operator safety in system layout can eliminate many operator risks.
- **Ensure an accessible emergency shut off valve has been installed in the air supply line, and make others aware of its location.** In the event of an accident, this shut off may minimize personal injury.
- **Install the dispense system including the control cabinet and dispense head to a stable structure capable of safely supporting their weight. Improper installation can result in personal injury.**
- **Be sure all hoses & fittings are the correct size & are tightly secured.** Loose hoses may leak or disconnect and whip and cause injury.
- **Avoid any rubbing or extreme twisting of hoses to prevent fatigue wear. Do not use damaged, frayed or deteriorated air hoses and fittings.** Worn or damaged hoses may burst or leak resulting in personal injury.
- **Always turn off the air and material supply & depressurize the entire system before installing, removing or adjusting any accessory on this product, or before performing any maintenance on this product or any accessory.** Failure to follow these instructions can result in personal injury.

6.1 Doser

WARNING

- **When a dozer is removed from its mounting, it is unstable.** Ensure that precautions have been taken to handle its weight and to securely hold it.

All dosers are equipped with a manual mechanical tool changer as the connection to robot or pedestal for fast exchange of doser. The mechanical tool changer has an ISO-160 flange as an interface.

Notes:
Since the doser is the most critical part of the system, please handle with care.

Two different type dosers can be used:

Stationary (S80, S250)

- One air and two lubrication hoses need to be connected to the doser.
  Note. The air hose to doser **must** come from media panel (7 bar – 100 psi regulated air).
- One signal and one power cable need to be connected to the doser.

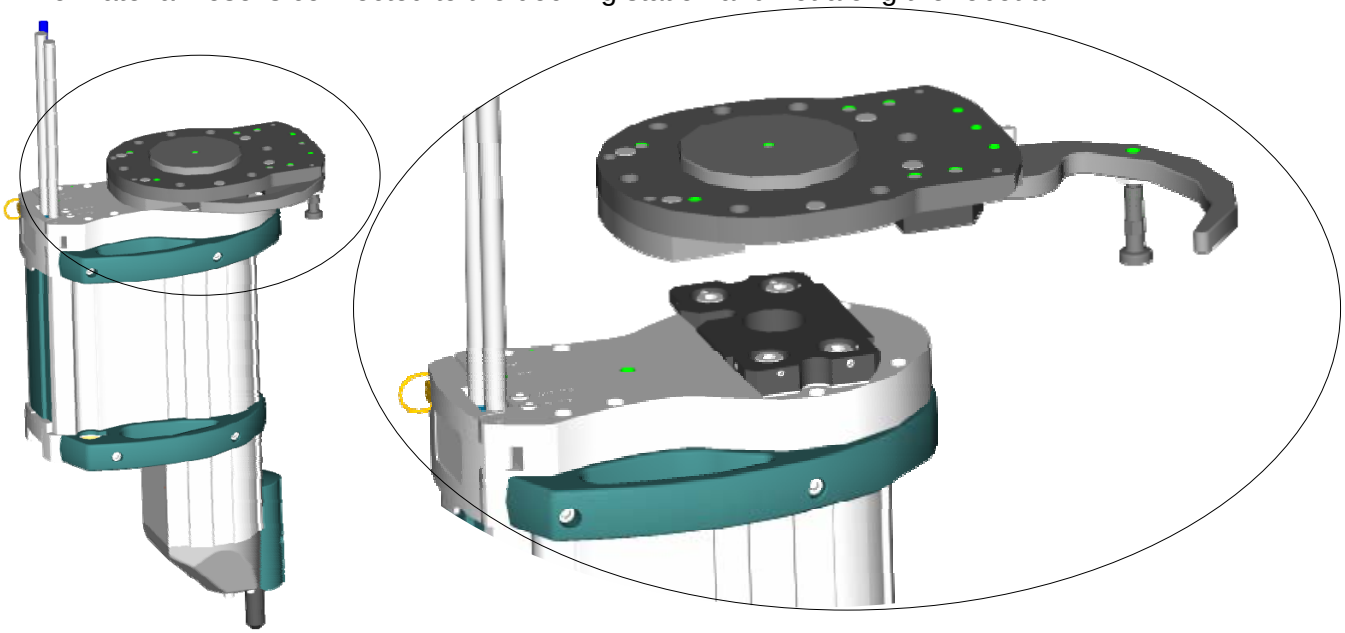
Robot mounted (R80, R250)

- One air hose and one signal and one power cable need to be mounted inside or on the robot arm.

Notes:
The air hose to doser ***originates*** from the media panel (7 bar – 100 psi regulated air).

- Lubrication systems dock the “lubricant” via automatic oil couplings in the docking station or via two lubrication hoses that are connected to the doser (On Board Lubrication).

Notes:
The material hose is connected to the docking station and not along the robot arm.



Mechanical tool changer interface.

6.2 Doser-pillar (S80, S250)

On stationary systems, the doser pedestal holds the doser. It must be stable enough to hold a doser and keep it steady even when a heavy vehicle (forklift) passes nearby. A mechanical tool changer is always included with the doser. It has an ISO-160 flange as an interface between the pedestal and the female part of the tool changer. A hose bracket can be used to support the material hose. **Ingersoll Rand** offers options for pedestals and they can be quoted and purchased with your system.

Sample - Doser stand for a stationary doser.

6.3 Controller Stand

The stand is constructed so that the electrical box AE1 is at eye level (user friendly). It is important to construct the rack for AE1 in such a way that the display is located for a standing operator (~1650 mm from floor).

Ingersoll Rand supplies this frame with each controller.

Sample - Stand for controller.

6.4 Media panel / air supply / lubrication

Place the media panel next to the pump.
Connect the external air supply to the media panel.
Connect the air supply to the pump.
Connect lubrication system to the docking station (Rxxx) or to the doser on the pedestal (Sxxx).

Media panel with main air unit and lubrication system

Connect the plants air supply hose to the left end of the conditioning unit. Under the pressure sensor, the regulated (7 bar) (100 psi) pressure shall be connected to the doser. At the right end a pressure regulator (set to 2-3 bar) (30-45 psi) feeds the pump, via the pump valve. The main air hose minimum size is ½ inch.

6.5 Material pump

Connect the 4m heated material hose to the material pump outlet.
Connect the air supplies to the media panel:
½ inch pneumatic hose to the pump air motor, adjust pressure to approximately 3 bar (45 psi).
8 mm pneumatic hose to the control box, pressure is adjusted on media panel to 7 bar (100 psi).
The *oil cup* must be filled so that the oil is at least 1 cm below the rim.
Note*: See pump documentation for further information of recommended oil.*

6.6 Installation of docking station and docking stand (R80, R250)

WARNING

- **Pinch and entrapment hazards exist in the proximity of any robot operation.** Ensure that no one is in the proximity or travel path of a robot during operation.

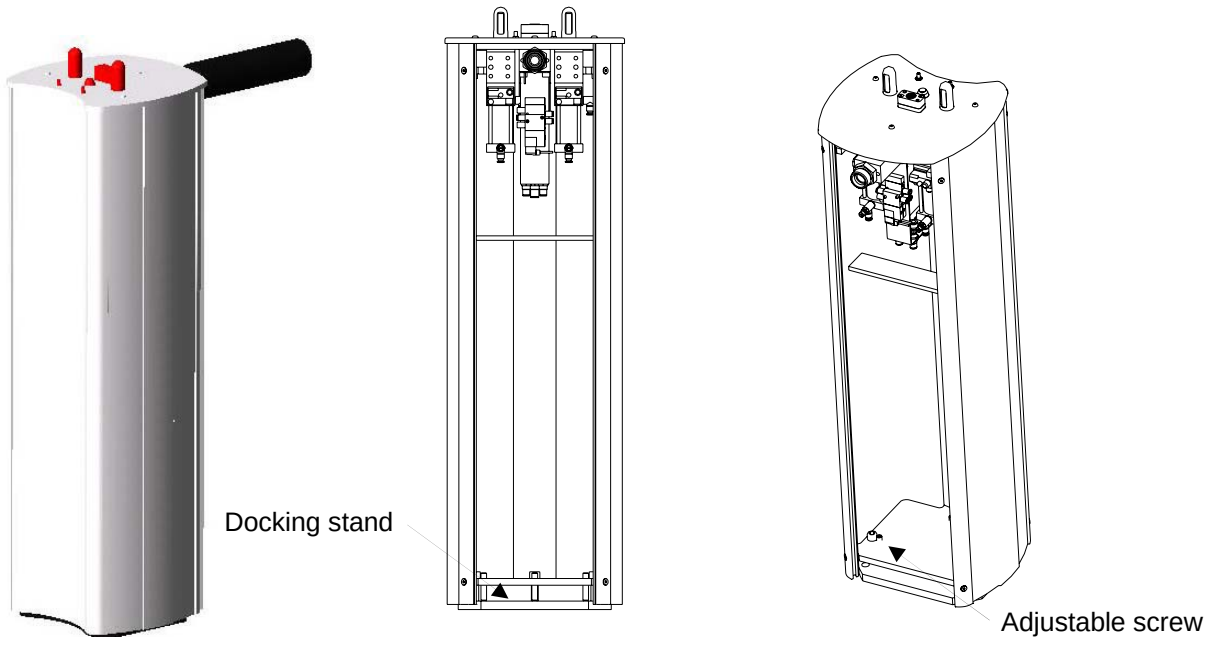
On robot mounted systems a docking station is needed. It consists of two parts: a docking unit (with clamp and male docking valve) and a docking stand.

6.6.1 The docking stand

The docking stand is the plate on which the docking station is positioned. The docking stand must be screwed to the site floor.

6.6.2 Positioning and levelling

When installing, three adjustable screws are used on the docking stand, along with a bubble level on the upper side to adjust the docking station to a perfect upright position.



Docking station

6.6.3 The docking station

Generally use the documentation drawings and the component list for the specified unit. In the description below, the figures refer to the corresponding figures on the drawing.

6.6.3.1 Mounting the docking unit

Drawings/Component lists:

- DS-ATC complete T2X-16-500-IR
- DS complete T2X-16-501-IR

NOTICE

- **This operation requires, the following special tools and preparations: Mounting paste**

a) Place the docking station inside the defined area, within reach of the robot. Screw the docking stand to the site floor.

b) Use the three adjustable screws (2) on the docking stand, along with a bubble level on the upper side to adjust the docking station to a perfect upright position. Secure the docking station to the correct position with the lock screws.

c) Connect the air hose and lubrication hoses. Connect electric connection (7 on T2X-16-502-IR).

d) Mount docking unit (1) by screwing the 4 hexagonal nuts and washers (16 and 17). They can be turned 180° and placed back at the same location.

e) Connect the material hose to the coupling (20 on T2X-16-502/503-IR).

f) Take off the cover plate (9) by removing the 3 hexagonal screws (14).

Note: Pneumatic system: The clamp is normally open when the doser is away from the docking station. (Upper position – inside the guiding pins.)

6.6.3.2 Pneumatic clamps

Drawings/ Component lists:

• DS-ATC Docking unit		T2X-16-502-IR
• Automatic Tool Changer	DS Docking station	T2X-16-500-IR
	DS-ATC Docking unit	T2X-16-502-IR
• Automatic Tool Changer	DS Docking station	T2X-16-501-IR
	DS Docking unit	T2X-16-503-IR

Also see the Repair Handbook (45532694), docking station

6.6.3.3 Male docking valve complete

- Drawings/Component lists: T2X-16-500/-501-IR
  T2X-16-502/-503-IR
  T2X-16-510-IR

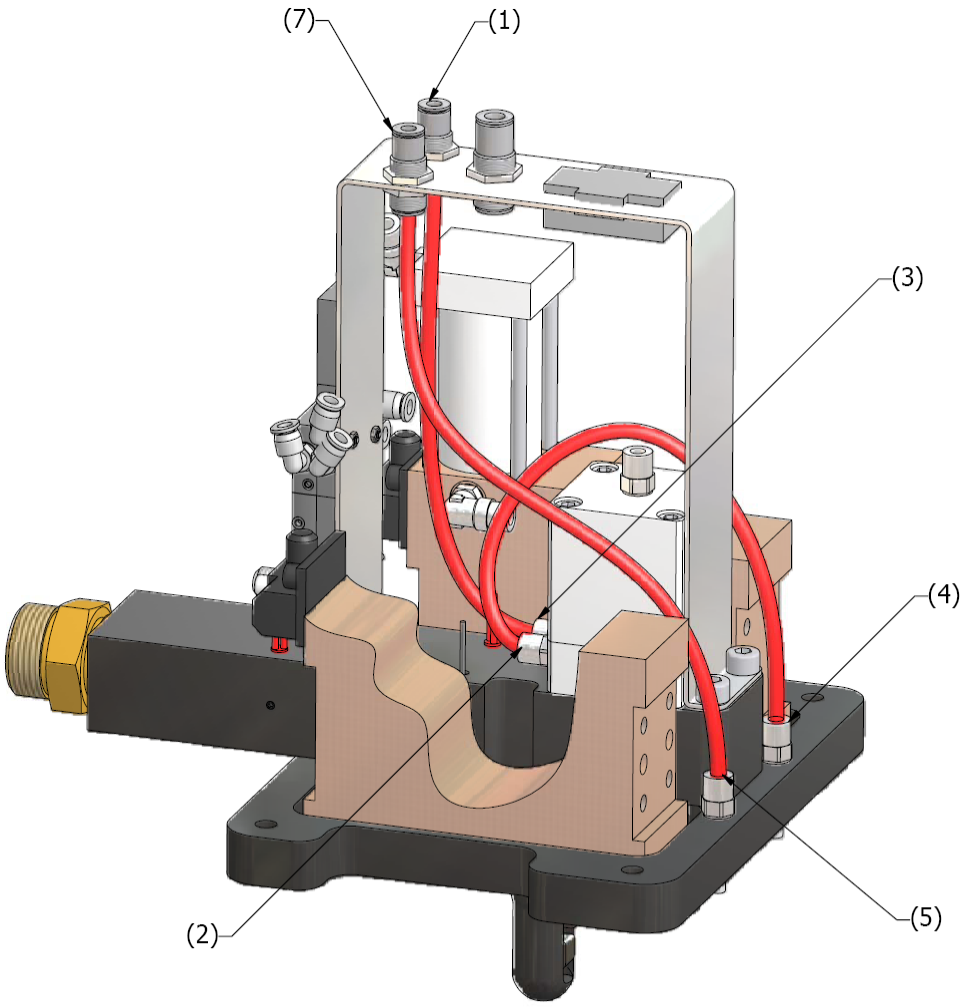
Also see the Repair handbook (45532694), docking station

6.7 Hydraulics of the Docking Station (extract from maintenance manual)

Drawing/Component list:

- DS ATC T2X-16-500-IR
- DS T2X-16-501-IR
- Docking Unit ATC T2X-16-502-IR
- Docking Unit T2X-16-503-IR

For doser hydraulics and pneumatics, see chapter 6.8.

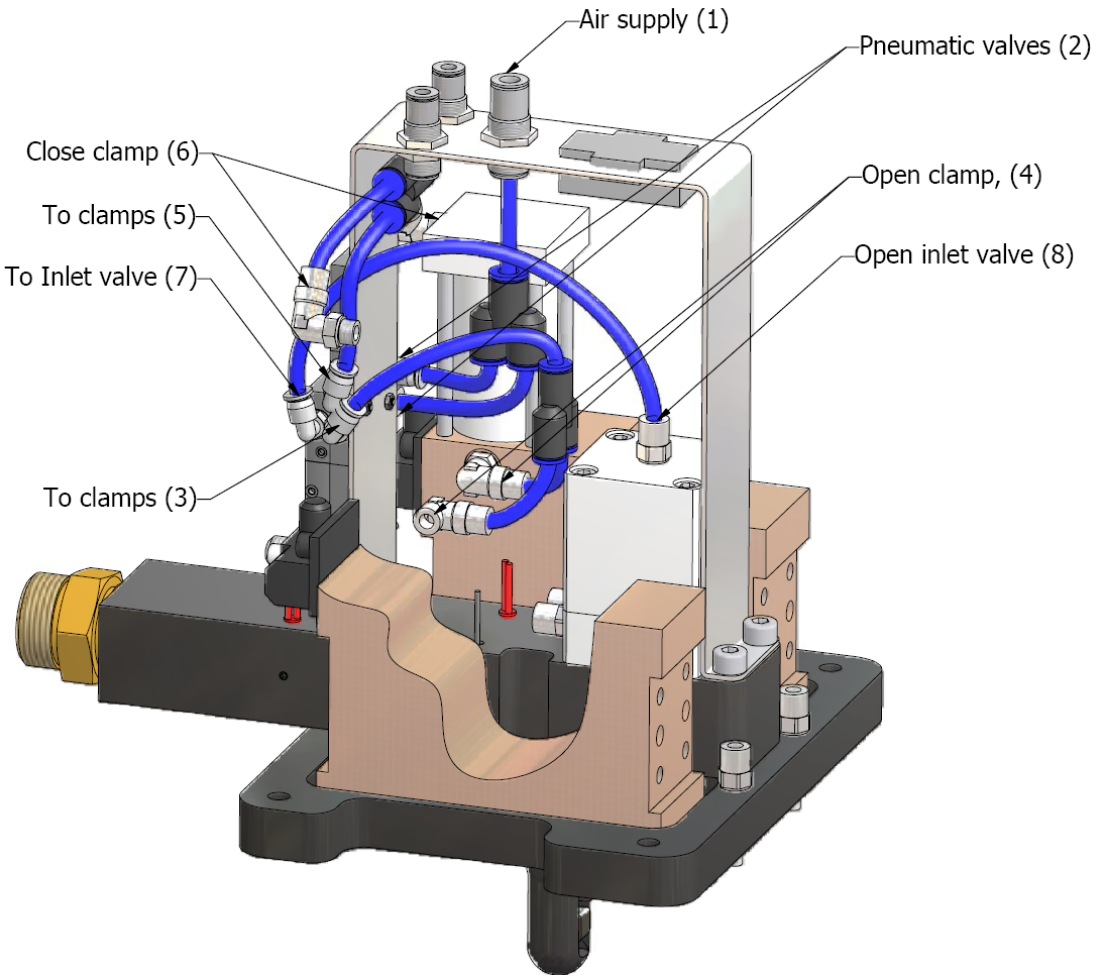


	From		To
(1)	Inlet hydraulics	(2)	Incoming inlet valve
(3)	Outgoing inlet valve	(4)	Incoming docking unit
(5)	Inside doser	(6)	Incoming docking unit
(7)	Outlet hydraulics		

6.8 Pneumatics of the Docking Station (extract from maintenance manual)

Drawing/Component list:

- DS ATC T2X-16-500-IR
- DS T2X-16-501-IR
- Docking Unit ATC T2X-16-502-IR
- Docking Unit T2X-16-503-IR



Also see pneumatic scheme T2X-07-xxx-IR

	From		To
(1)	Inlet pneumatics	(2)	Pneumatic valves, connection 1
(3)	Pneumatic valve, connection 2	(4)	Open clamp
(5)	Pneumatic valve, connection 2	(6)	Close clamp
(7)	Pneumatic valve, connection 4	(8)	Open inlet valve

7 Electrical Installation

WARNING

- **If an emergency electric power shut off is installed, ensure it is accessible and make others aware of its location.** In the event of an accident, this shut off may minimize personal injury.
- **Always use specified supply voltage.** Incorrect voltage can cause electrical shock, fire, abnormal operation and may result in personal injury.
- **Grounded products must be plugged into an outlet properly installed and grounded in accordance with all codes and ordinances. Never remove the grounding prong or modify the plug in any way. Do not use any adapter plugs. Check with a qualified electrician if you are in doubt as to whether the outlet is properly grounded.** If this product should electrically malfunction or break down, grounding provides a low resistance path to carry electricity away from the user.
- **All components of the Dispense System must be grounded. Use hoses incorporating a static wire or use groundable piping.** Static electricity may build up in the dispense system during normal operation if not grounded. Sparks from static discharge can ignite flammable material and vapors.

There will be some variations on different systems. The most important components are described below. For specific information see electrical documentation.
All connectors are marked with fixed labels.

7.1 Power Supply

The equipment connects single-phase loads to a local neutral point. If a neutral point cannot be supplied from the plant, a power transformer (D/Y+N) is used to create the neutral point.

All types of T2X equipment are installed with prefabricated wiring, fitted with plugs, where only the lengths vary (2.5-20 m). This means that the system is easy to install and the boxes are easy to replace.

Power supply: 3 x 400 VAC + N +PE 25A, directly to the main switch (If voltage other than 3x400VAC or no “N”, transformer is needed.)

See also the Electrical documentation.

7.2 Cable routing

This is a general overview of the cable routing for the different T2X systems. See Electrical documentation for detailed information. The units which are to be connected are:

- T2X control box (AE1)
- Robot controller
  Connected to the control box (AE1).
- Material pump
  Connected to the control box (AE1).

- Doser
  For the communication between the doser and the control box, two cables are installed from the control box to either connectors on the robot foot (R80, R250), or the connectors on the doser (S80).
  The line builder or the robot manufacturer is responsible for providing and installing the cables along the robot arm. The recommended types to use are shielded twisted pair cables. These cables eliminate noise from the encoder feedback to our control box and supply power to the doser. At the top of the cables (at the robot wrist), solder the connectors supplied by **Ingersoll Rand** (see Electrical documentation).

- Media panel
  Connected to the control box (AE1).

7.3 Bus interface

7.3.1 Field bus

A field bus handles the communication between the T2X system and the robot controller. A robot slave can be connected on the T2X field bus.

7.3.2 Gateway communication

The T2X system is also able to communicate with other buses through a special converter module (Gateway), which is a common way of doing this communication. Currently the following buses are available:

- Interbus
- Profibus
- Can
- DeviceNet
- Ethernet
- RS485/RS232 (fixed special protocol)

7.3.3 Voltage-feeding

The field bus card in the robot can be voltage-fed externally by our control box AE1. The advantage gained is that our system will continue to run if the robot control is shut down. Otherwise (without external voltage-feeding) shutting down the robot control will mean that the temperature of the doser decreases, causing a delay of heating when the system is restarted. Check type with **Ingersoll Rand**.

7.4 Safety circuit connection

The equipment has no 'own' built-in safety devices. But the units are, however, interlocked in a way that emergency shutdown is achieved.

7.4.1 Emergency shutdown

Emergency shutdown makes the equipment powerless and pneumatically exhausted. The emergency shutdown is connected to the control system from the robot control system. See electrical documentation.

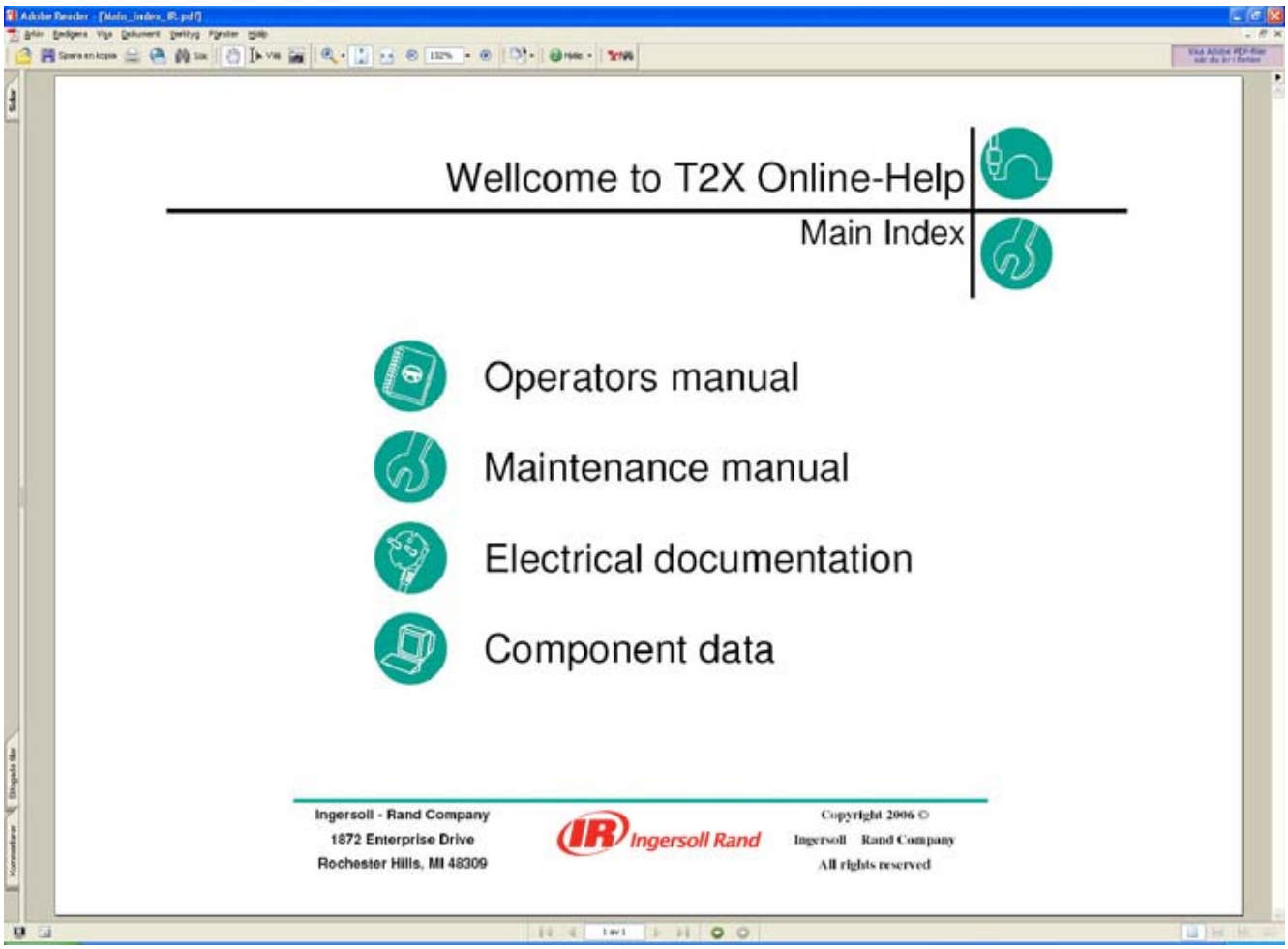
8 Test procedure before power-on

Before the first power-on, the customer should go through the following checklist:

DONE	*Check that:*
❑	all cabinets are mounted on walls or stands securely.
❑	the doser is securely mounted to a pillar or robot arm.
❑	the docking station is securely mounted to the floor.
❑	the media panel is mounted on a wall or on a stand.
❑	the material pump is correctly placed regarding the length of the hose.
❑	the material pump is firmly mounted and the hose properly supported.
❑	the air supply is connected to the media panel.
❑	the air is connected to the doser from the **Ingersoll Rand** media panel.
❑	the air is connected to the pump and the docking station.
❑	the cleaning/greasing system is correctly mounted.
❑	the power supply is connected to AE1.
❑	all peripheral cables not delivered by **Ingersoll Rand** are made according to the proper specifications and thoroughly tested.
❑	all cables are properly installed and undamaged.

9 On-line Documentation

Complete documentation on-line is provided as an option for T2X.
The on-line documentation provides the same information as provided in paper format. Manuals, drawings, part lists etc. can be shown on the screen.



Example of contents of the on-line documentation

Click the manual you wish to view. In the contents of every manual, the headings are linked directly to the corresponding section in the document

10 Technical specifications

Control system	Industrial PC with Windows XP Pro and real-time extension Field bus master card in PC 12” VGA TFT monitor Software developed in-house with Borland Delphi and Microsoft Visual Studio Robot can be connected with any type of field bus, or discrete I/O.					
Doser – Type	Servo driven plunger dosers with integrated material gun and pressure sensor TCP–related flow control using external set values					
Doser – Volume	Standard sizes are 80 and 250 ccm					
Doser – Data	Volume [ccm]	Max pressure [bar]	Max. temp. [ºC]	Flow [ccm/s]	Servo [W]	Weight [kg]
	80	250 (3625 psi)	140	0 - 20	400	23
	250	250 (3625 psi)	140	0 - 20	750	25
Repeatability	99.84 % (figure from the VOLVO functional package test 01 with 80 ccm doser)					
Standard pump	200 litres heated plunger pump 65:1, pneumatic drive, for industrial use					
Material transport	High pressure hose, heated where needed, standard length 4 m					
Power supply	3 x 400 VAC + N +PE 25A, directly to the main switch (If voltage other than 3x400VAC or no “N”, transformer is needed.)					
External connection	Safety cable and field-bus cable to the robot control					
Air supply	To the media panel using ½ inch-coupling, 7-12 bar (102-175 psi)					
Air consumption	About 180 litres per minute when 3 bar supplied to the pump and filling of 250ccm doser performed					

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