# Table of Contents

# C. Control and Signal Modules

# VH10—Discrete Signal Module

## 1. Product Overview

The discrete control/signal modules are required to provide a means for the customer to communicate with and control the Tool Changer.

M12, 4-socket, D-coded connectors are provided for passing through Ethernet signals between VH10 master and tool modules to support Tool Changer and customer-specified I/O.

On the master module (6) separate M12 male, 5-Pin connectors are provided to support and interface with a supplied PROFINET I/O block. These connections support Tool Changer Lock, Unlock and RTL (Ready-To-Lock) Tool-ID and power proximity sensor inputs as well as Tool Changer valve Latch and Unlatch output and Tool-ID.

An interface is also provided on the master module for support of an integrated solenoid valve (DC Voltage). The integrated valve can is supplied as part of the valve adapter block, 9121-Jxx-M. Refer to the valve adapter block manual for more information (9620-20-C-Air and Valve Adapters).

When the Tool Changer is coupled, the master and tool modules communicate across their interface using a spring loaded pin block. A flexible boot surrounds the pin block to seal the connection from moisture and liquid while coupled.

The VH10 modules are designed with special features to afford the user the opportunity to operate the Tool Changer in the safest manner possible. In addition to providing the standard Locked, Unlocked, and Ready-to-Lock sensor inputs the VH10 modules are outfitted with patented Tool Stand Interlock (TSI) technology. The TSI feature consists primarily of a physical break in the unlock solenoid valve circuit. The TSI circuit is made available to the customer via an M12 female, 4-socket connector on the tool module. Using this connector, a mechanical switch, and trip dog can be integrated by the customer to allow the unlock solenoid valve circuit to be completed only when the tool is in the Tool Stand (see Figs. 1.1 and 1.2). A momentary action single-pole, double-throw switch is suggested.

In order to allow the Tool Changer to uncouple when a tool is not present, a relay circuit in parallel with the TSI circuit is utilized. This relay circuit is located in the master module and is triggered by the RTL sensor. If the RTL sensor is low, indicating no tool presence, then the relay circuit is closed, thus allowing the unlock solenoid valve circuit to be completed. If the RTL sensor is high, indicating tool presence, then the relay circuit is open and the TSI circuit on the tool-side must be closed in order to complete the unlock solenoid valve circuit.

Monitoring of the relay circuit is achieved through the RTLV input. Refer to Table 3.1 for suggested fault monitoring conditions.

Refer to Section 7 for module specifications and Section 8 for drawings and specific connector details.

**Figure 1.1—VH10 Modules**

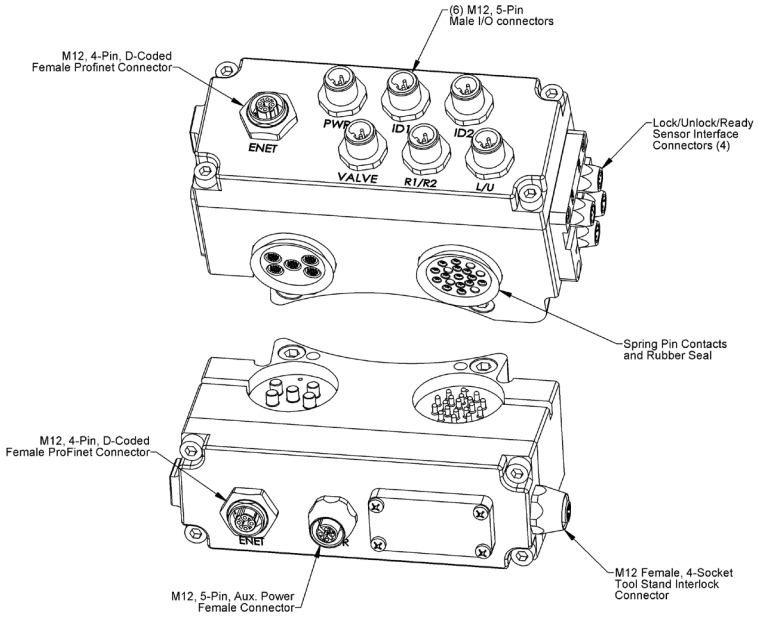
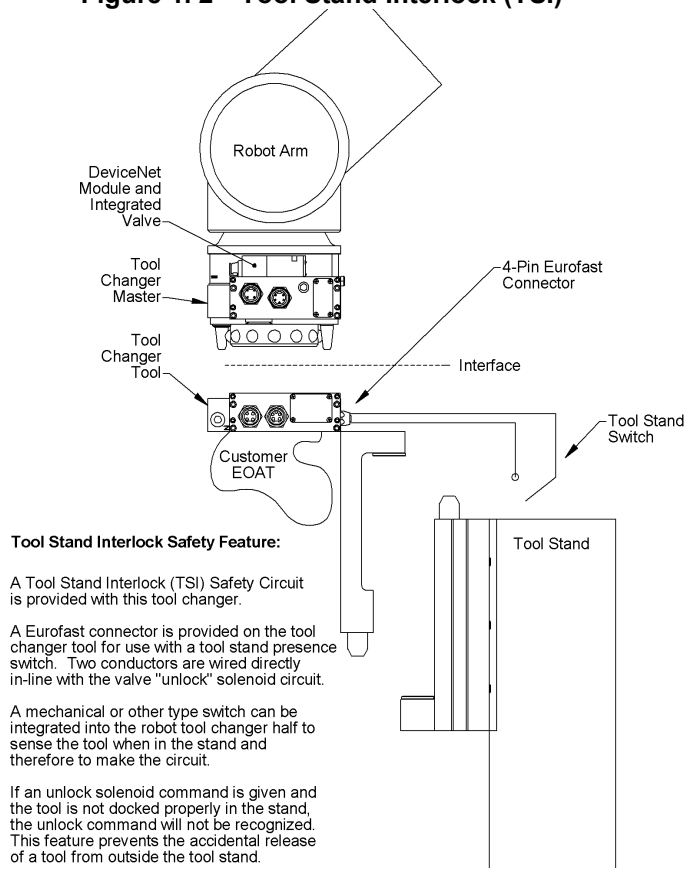



**Figure 1. 2—Tool Stand Interlock (TSI)**




**CAUTION:** The Tool Changer is equipped with Tool Stand Interlock (TSI). Special procedures are required to unlock the Tool Changer.

# 2. Installation

The control/signal modules are typically installed by ATI prior to shipment. The steps below outline the field installation or removal as required.

For wiring information refer to the drawings in Section 8.

**WARNING:** Do not perform maintenance or repair on Tool Changer or modules unless the tool is safely supported or docked in the tool stand and all energized circuits (e.g. electrical, air, water, etc.) have been turned off. Injury or equipment damage can occur with tool not docked and energized circuits on. Dock the tool safely in the tool stand and turn off all energized circuits before performing maintenance or repair on Tool Changer or

## 2.1 Installing

1. It may be necessary to clean the mounting surface on the Tool Changer prior to installing the module in order to remove any debris that may be present.
2. Using the ledge feature as a guide place the module into the appropriate location on the Tool Changer body. Align the module with the Tool Changer using the dowels in the bottom of the ledge feature. Apply Loctite 242 to the supplied M6 SHCS fasteners and tighten to 110 in-lbs.
3. Typically, proximity sensor and valve cables need to be connected to the Master side control module. These connections can be made after attaching the module to the Tool Changer body. Customer connections up to the module can also be made after the module is installed. Ensure that the connectors are cleaned prior to being secured as appropriate.

## 2.2 Removal

1. Prior to removing the module use a marker pen to scribe a line or indication between the Tool Changer and module body as a reminder where the module is to be re-installed.
2. Depending upon the service or repair being done, customer connections up to the module may or may not need to be disconnected. Also, proximity sensor and valve cables may or may not need to be disconnected.
3. Remove the socket head cap screws and lift the module from the Tool Changer.

# 3. Operation

M12, 4-socket connectors are provided on the control/signal master and tool modules for customer interface to downstream I/O. The M12 connector wiring is compatible with that of an off-the-shelf PROFINET I/O block that is integrated into the overall Tool Changer package.

Integrated connections Locked, Unlocked and Ready-to-Lock proximity sensor input connections are provided for confirmation of Tool Changer and locking mechanism positions.

(3) Separate M12, 5-Pin connectors on the master module support an interface to Tool Changer Locked, Unlocked and RTL proximity sensor inputs as well as Latch and Unlatch valve outputs. Cables are provided in the overall Tool Changer package to connect these signals to the supplied PROFINET I/O block. This interface allows for confirmation and control of the Tool Changer and locking mechanism position. Please refer to drawings in Section 8 for details.

Refer to the specific Tool Changer manual for details on the operation of the Tool Changer and recommended procedure for coupling.

When the Tool Changer is coupled, the discrete module tool can be communicated with, downstream I/O can be read and attached end-effectors can be used.

## 3.1 Operation Flow Chart

Refer to the flow chart in Figure 3.1 for a logical description of Tool Changer operation, lock/unlock procedures and diagnostic checks.

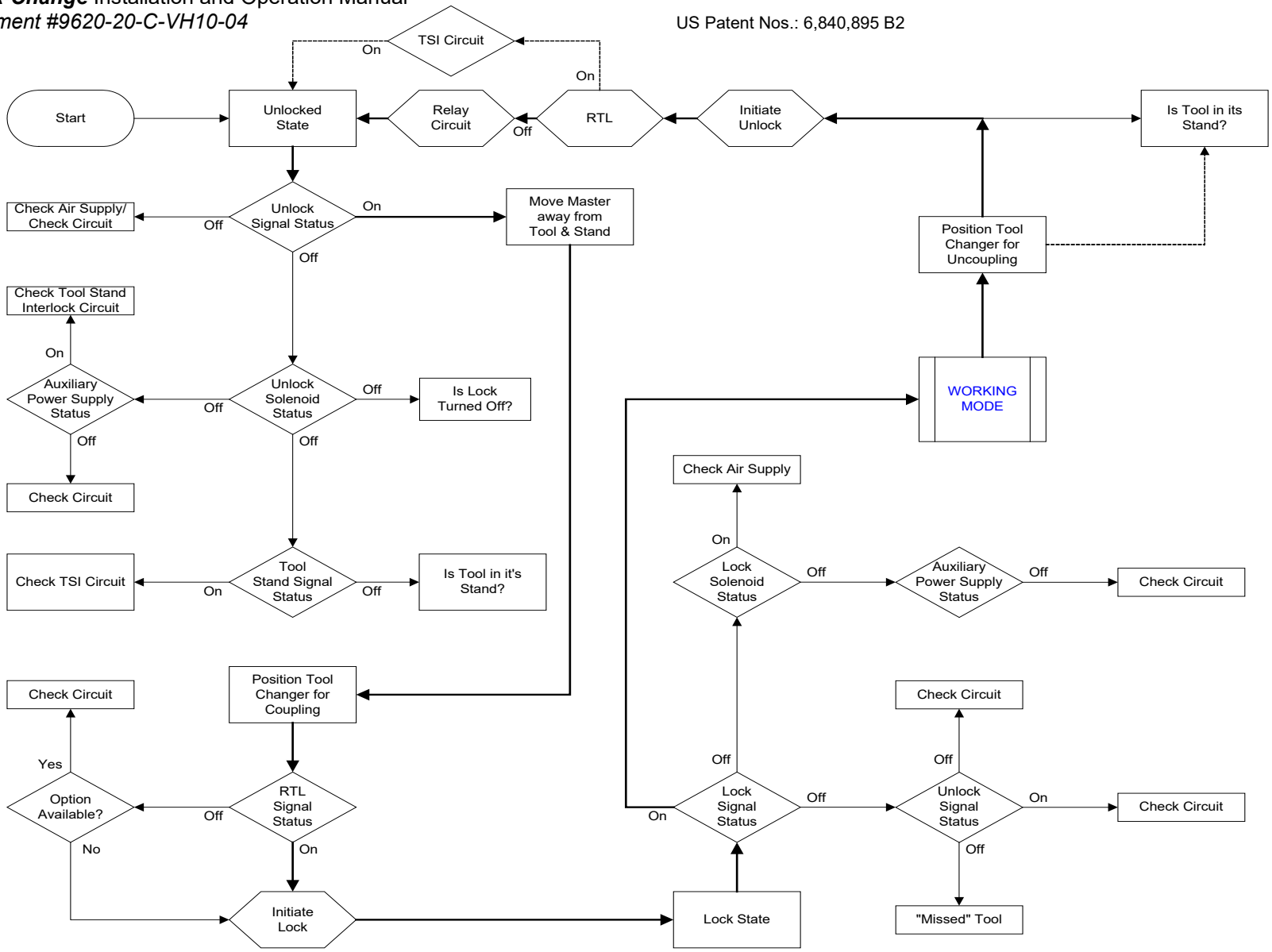



**Figure 3.1—Logical Operation and Diagnostics**

# 4. Maintenance

Once installed the operation of the control modules is generally trouble free. The modules are not designed to be field serviced as all point-to-point wiring connections are soldered. Component replacement is limited to the V-Ring seal on the Master.

> **WARNING:** Do not perform maintenance or repair on Tool Changer or modules unless the tool is safely supported or docked in the tool stand and all energized circuits (e.g. electrical, air, water, etc.) have been turned off. Injury or equipment damage can occur with tool not docked and energized circuits on. Dock the tool safely in the tool stand and turn off all energized circuits before performing maintenance or repair on Tool Changer or modules.

If the Tool Changer is being used in dirty environments (e.g., welding or deburring applications), care should be taken to limit the exposure of the Tool Changer. Idle Tool assemblies should be covered to prevent debris from settling on the mating surface. Also, the Master assembly should be exposed for only a short period of time during Tool change and down time.

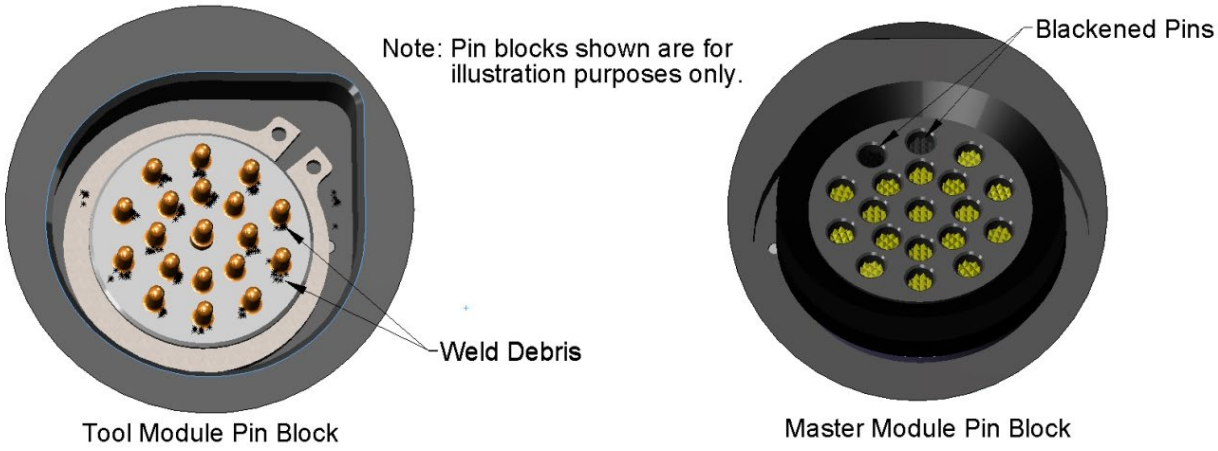
Under normal conditions, no special maintenance is necessary, however it is recommended that periodic inspections be performed to assure long-lasting performance and to assure that unexpected damage has not occurred. Perform the following visual inspection monthly:

- Inspect mounting fasteners to verify they are tight and if loose, then tighten to the proper torque.
- Cable connections should be inspected during maintenance periods to ensure they are secure. Loose connections should be cleaned and re-tightened as appropriate. Inspect cable sheathing for damage, repair or replace damaged cabling. Loose connections or damaged cabling are not expected and may indicate improper routing and/or strain relieving.
- Inspect the Master and Tool pin blocks for any pin damage, debris or darkened pins. Refer to *Section 4.1—Pin Block Inspection and cleaning.*
- Inspect V-Ring seals for wear, abrasion, and cuts. If worn or damaged, replace. Refer to *Section 4.2—Seal Replacement.*

## 4.1 Pin Block Inspection and cleaning

1. Inspect the Master and Tool pin blocks for any debris or darkened pins.

**Figure 4.1—Inspect Master and Tool Pin Blocks**

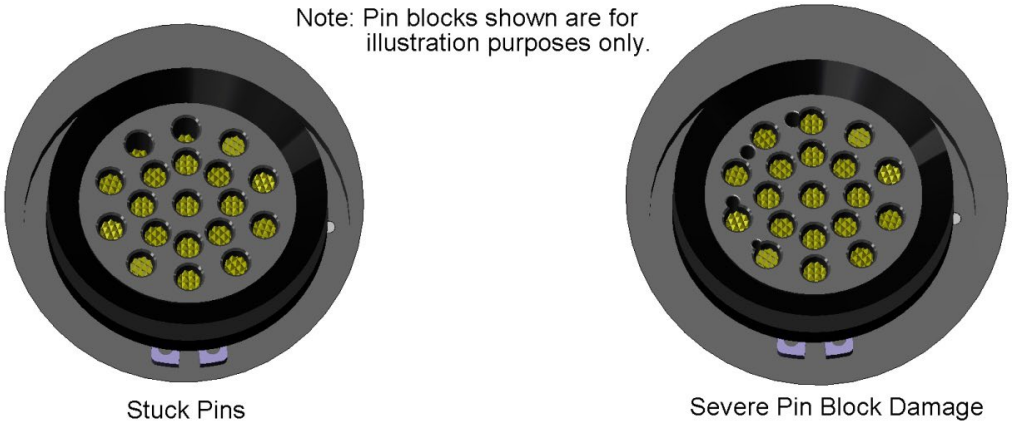



2. If debris or darkened pins exist, remove debris using a vacuum, and clean using a nylon brush (ATI part number 3690-0000064-60).

**NOTICE:** Do not use an abrasive media, cleaners, or solvents to clean the contact pins. Using abrasive media, cleaners, or solvents will cause erosion to the contact surface. Clean contact surfaces with a vacuum or non-abrasive media such as a nylon brush (ATI part number 3690-0000064-60).

3. Inspect the Master and Tool pin blocks for stuck pins or severe pin block damage.

**Figure 4.2—Stuck Pin and Pin Block Damage**



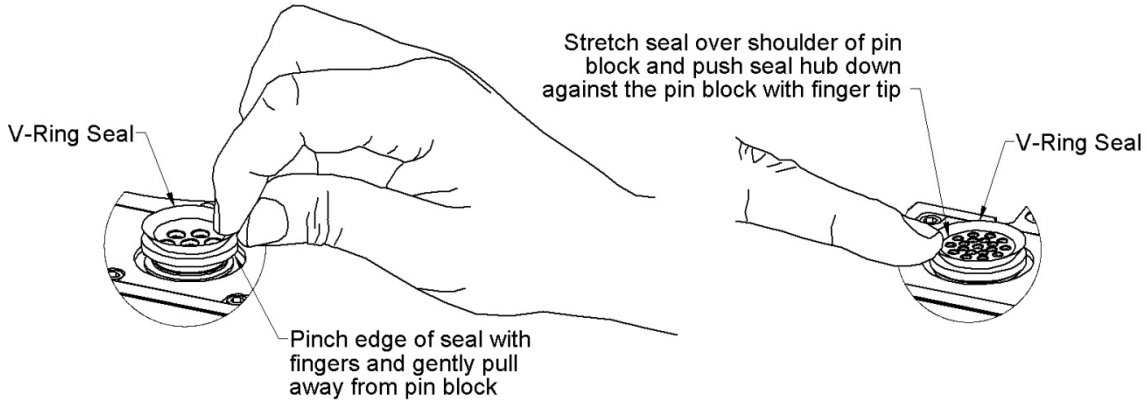

4. If stuck pins or severe pin block damage exists, contact ATI for possible pin replacement procedures or module replacement.

## 4.2 Seal Replacement

Replace the V-Ring seal:

1. To remove the existing seal, pinch edge of seal with fingers and gently pull the seal away from the pin block on the Master.
2. Pull the seal off the pin block.
3. To install a new seal, stretch the new seal over the shoulder of the pin block.
4. Push the seal's hub down against the pin block using finger tip.

**Figure 4.3—V-Ring seal Replacement**




# 5. Troubleshooting

| Symptom | Possible Cause / Correction |
|---|---|
| Unit will not lock or unlock | Verify that ball bearings are moving freely. Clean and lubricate as needed.<br>Check air supply.<br>Check that exhaust port is properly vented (check muffler).<br>Check valve for proper operation.<br>Verify that discrete signals are mapped and are communicating properly.<br>Verify that the Master and Tool are within the specified No-Touch zone when attempting to lock.<br>Check TSI circuit for proper operation. |
| Sensors not operating properly | Verify that cables are connected correctly.<br>Verify that the sensors are set correctly.<br>Ensure that the Tool Plate is securely held to the Master Plate, that nothing is trapped between their surfaces, and that there is no air trapped in the Unlock (U) air port.<br>Replace cables and/or sensors. |
| Loss of Communication | Check/Replace signal cabling up- and down-stream of Tool Changer modules.<br>Inspect module contact pins for debris/wear/damage.<br>Check product up- and downstream of Tool Changer for failure. This failure can “appear” to be caused by the Tool Changer or affect Tool Changer performance. |

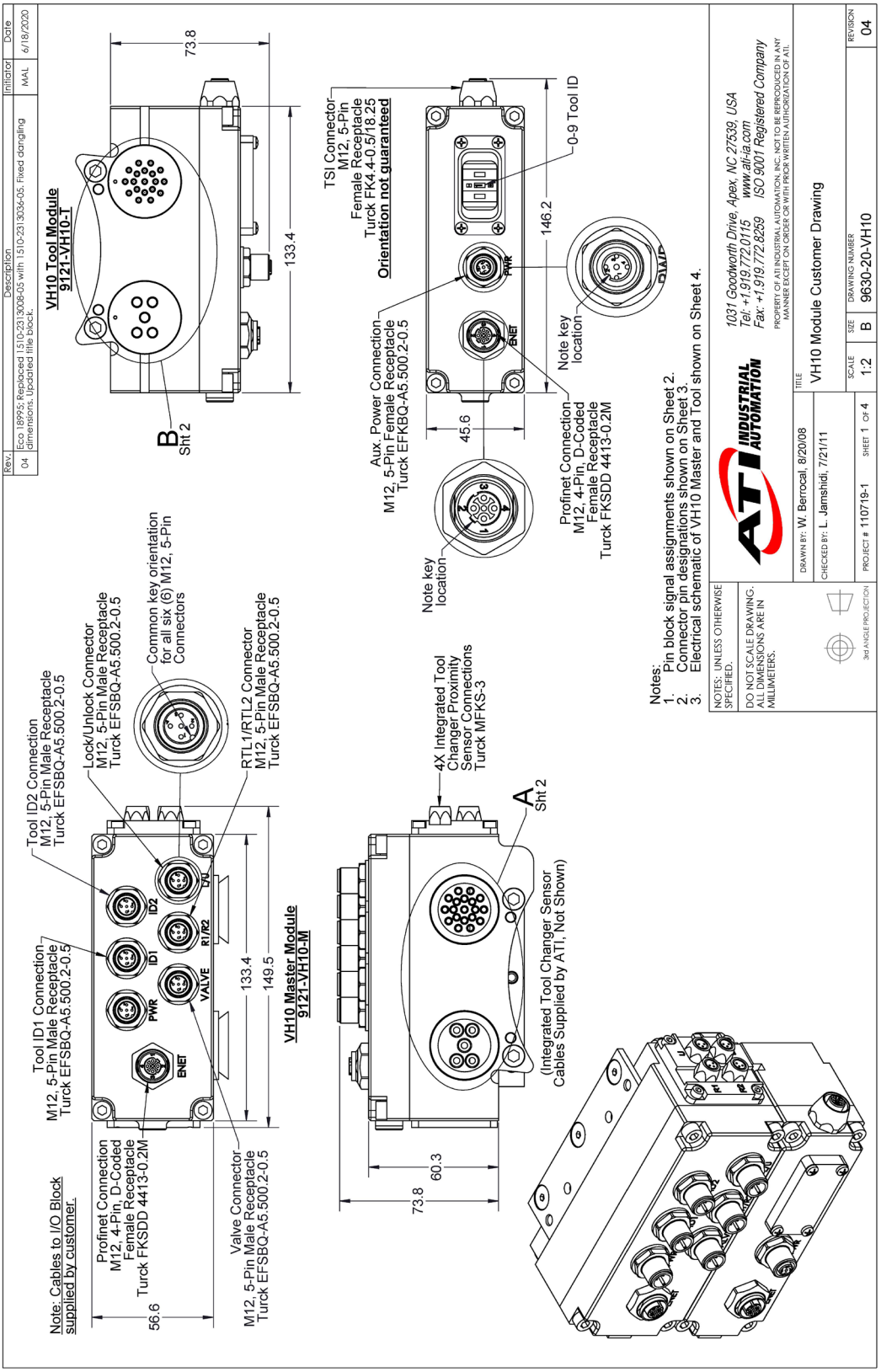
# 6. Recommended Spare Parts

See Drawings in Section 8.

# 7. Specifications

| | | |
|---|---|---|
| **VH10-M** | | Discrete Module Supporting Integrated Solenoid Valve (DC Voltage), Tool Changer I/O and PROFINET I/O Block. Mates with VH10 Tool. |
| | | |
| Connector(s) | FKSDD 4413<br><br>(3) @ FS 4.5–0.5/18.25 | M12, 4-socket,female Tool Changer Connection compatible with PROFINET I/O Block.<br>M12 Male, 5-Pin Discrete I/O Point Connection(s). |
| | | |
| Weight | 1.72 lbs (0.78 kg) | Master side |
| | | |
| Pass-Through Signals | 19 @ 5A, 250V | Fold-plated, spring-loaded and no-touch contact pins. |
| | | |
| **VH10-T** | | Discrete Module with 19-pin block Supporting PROFINET I/O Block and TSI on Tool. Mates with VH10-M. |
| | | |
| Connector(s) | CKF 17–17<br><br>FK 4.4–0.5/18.25 | M23 Female, 17-Socket Tool Changer Connection compatible with PROFINET I/O Block.<br>M12 Female, 4-Socket TSI Connection. |
| | | |
| Weight | 1.42 lbs (0.64 kg) | Tool side |
| | | |
| Pass-Through Signals | 19 @ 5A, 250V | Gold-plated contacts w/ first mate ground pin. |
| | | |
| **Jxx-M** | | Valve Adapter |
| | 250mA @ 24VDC | Integrated single solenoid valve, e.g. 9121-JC2-M.<br>(MAC 48 Series, 48B-AUA-000-GEUA-1GB MOD4507)<br>Valve power and control supplied through PROFINET I/O Block and M12, 5-Pin “Valve” Connector. |
| | | |
| **PROFINET I/O Block** | | See drawings in Section 8. Alternate I/O blocks available from Turck (FLDP-IOM124-0001) and Siemens (Simatic-ET200R). |
| | | |

# 8. Drawings


VH10 Tool Module
9121-VH10-T
VH10 Master Module
9121-VH10-M
Tool ID2 Connection
M12, 5-Pin Male Receptacle
Turck EFSBQ-A5.500.2-0.5
Tool ID1 Connection
M12, 5-Pin Male Receptacle
Turck EFSBQ-A5.500.2-0.5
Lock/Unlock Connector
M12, 5-Pin Male Receptacle
Turck EFSBQ-A5.500.2-0.5
Common key orientation
for all six (6) M12, 5-Pin
Connectors
RTL1/RTL2 Connector
M12, 5-Pin Male Receptacle
Turck EFSBQ-A5.500.2-0.5
Profinet Connection
M12, 4-Pin, D-Coded
Female Receptacle
Turck FKSDD 4413-0.2M
Valve Connector
M12, 5-Pin Male Receptacle
Turck EFSBQ-A5.500.2-0.5
Note: Cables to I/O Block
supplied by customer.
56.6
133.4
149.5
4X Integrated Tool
Changer Proximity
Sensor Connections
Turck MFKS-3
(Integrated Tool Changer Sensor
Cables Supplied by ATI, Not Shown)
60.3
73.8
TSI Connector
M12, 5-Pin
Female Receptacle
Turck FK4.4-0.5/18.25
Orientation not guaranteed
Aux. Power Connection
M12, 5-Pin Female Receptacle
Turck EFKBQ-A5.500.2-0.5
Note key
location
45.6
146.2
0-9 Tool ID
Profinet Connection
M12, 4-Pin, D-Coded
Female Receptacle
Turck FKSDD 4413-0.2M
Notes:
1. Pin block signal assignments shown on Sheet 2.
2. Connector pin designations shown on Sheet 3.
3. Electrical schematic of VH10 Master and Tool shown on Sheet 4.
NOTES: UNLESS OTHERWISE SPECIFIED.
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3rd ANGLE PROJECTION
PROJECT # 110719-1
SHEET 1 OF 4
TITLE
VH10 Module Customer Drawing
SCALE 1:2
SIZE B
DRAWING NUMBER 9630-20-VH10
REVISION 04
Rev. 04
Description
Eco 18995; Replaced 1510-2313008-05 with 1510-2313036-05. Fixed dangling dimensions. Updated title block.
Initiator MAL
Date 6/18/2020

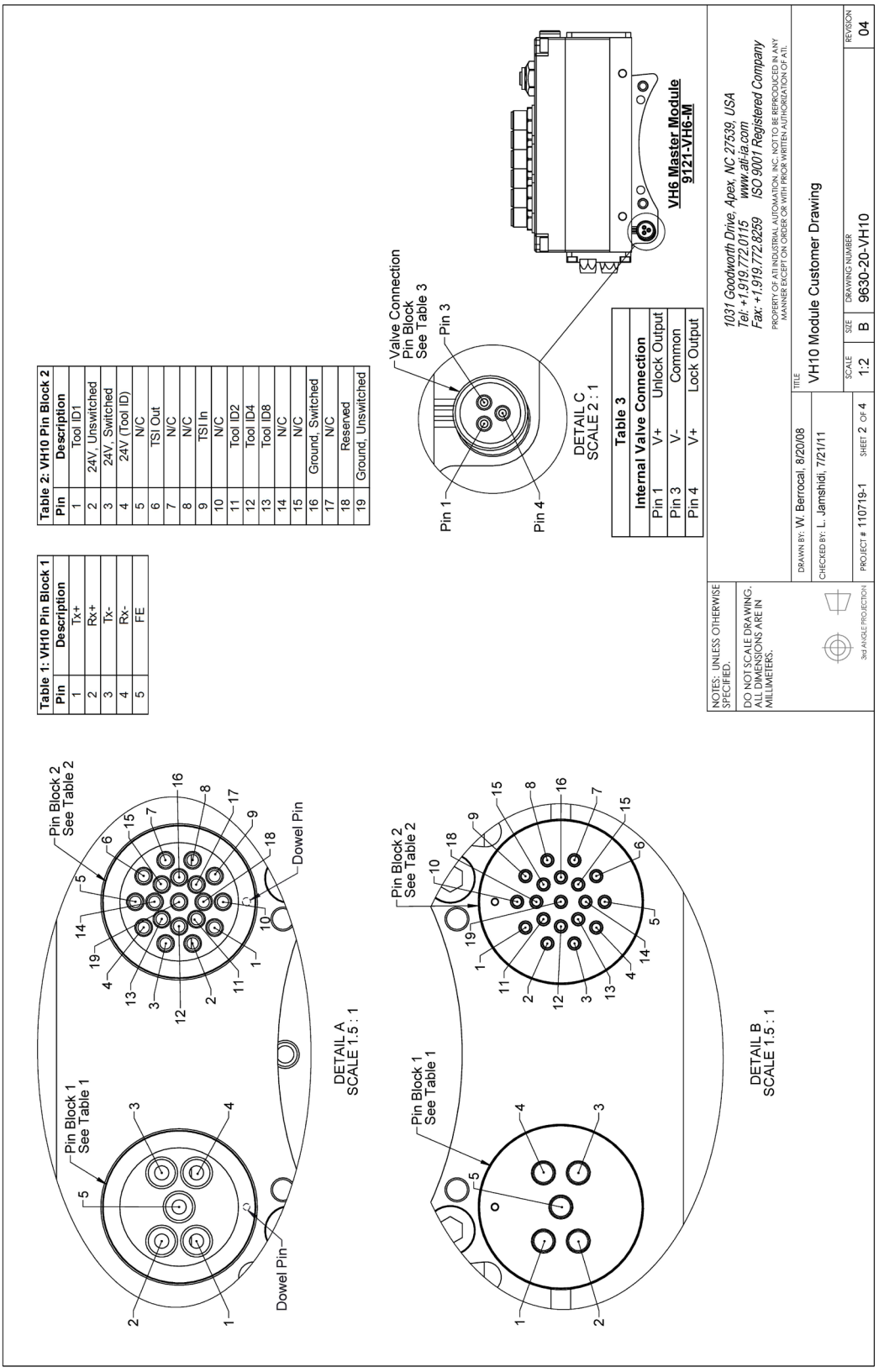
Table 1: VH10 Pin Block 1
Pin | Description
1 | Tx+
2 | Rx+
3 | Tx-
4 | Rx-
5 | FE
Table 2: VH10 Pin Block 2
Pin | Description
1 | Tool ID1
2 | 24V, Unswitched
3 | 24V, Switched
4 | 24V (Tool ID)
5 | N/C
6 | TSI Out
7 | N/C
8 | N/C
9 | TSI In
10 | N/C
11 | Tool ID2
12 | Tool ID4
13 | Tool ID8
14 | N/C
15 | N/C
16 | Ground, Switched
17 | N/C
18 | Reserved
19 | Ground, Unswitched
Table 3
Internal Valve Connection
Pin 1 V+ Unlock Output
Pin 3 V- Common
Pin 4 V+ Lock Output
Valve Connection
Pin Block
See Table 3
Pin 3
Pin 1
Pin 4
DETAIL C
SCALE 2 : 1
VH6 Master Module
9121-VH6-M
Pin Block 2
See Table 2
Dowel Pin
Pin Block 1
See Table 1
DETAIL A
SCALE 1.5 : 1
DETAIL B
SCALE 1.5 : 1
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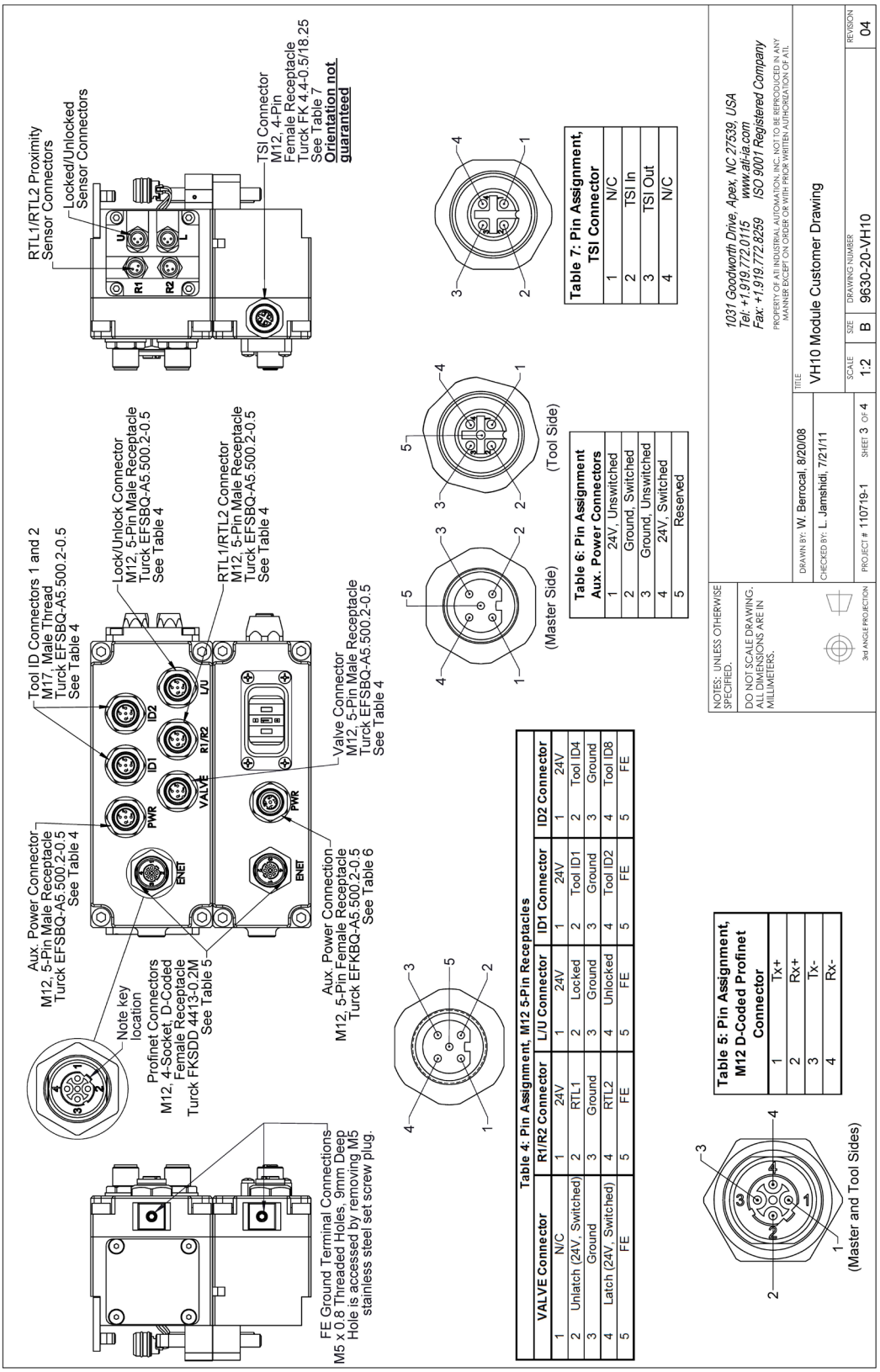
SHEET 2 OF 4
TITLE
VH10 Module Customer Drawing
SCALE 1:2
SIZE B
DRAWING NUMBER 9630-20-VH10
REVISION 04


RTL1/RTL2 Proximity Sensor Connectors
Locked/Unlocked Sensor Connectors
TSI Connector M12, 4-Pin Female Receptacle Turck FK 4.4-0.5/18.25 See Table 7 Orientation not guaranteed
Tool ID Connectors 1 and 2 M17, Male Thread Turck EFSBQ-A5.500.2-0.5 See Table 4
Lock/Unlock Connector M12, 5-Pin Male Receptacle Turck EFSBQ-A5.500.2-0.5 See Table 4
RTL1/RTL2 Connector M12, 5-Pin Male Receptacle Turck EFSBQ-A5.500.2-0.5 See Table 4
Valve Connector M12, 5-Pin Male Receptacle Turck EFSBQ-A5.500.2-0.5 See Table 4
Aux. Power Connector M12, 5-Pin Male Receptacle Turck EFSBQ-A5.500.2-0.5 See Table 4
Note key location
Profinet Connectors M12, 4-Socket, D-Coded Female Receptacle Turck FKSDD 4413-0.2M See Table 5
Aux. Power Connection M12, 5-Pin Female Receptacle Turck EFKBQ-A5.500.2-0.5 See Table 6
FE Ground Terminal Connections M5 x 0.8 Threaded Holes, 9mm Deep Hole is accessed by removing M5 stainless steel set screw plug.
(Master Side)
(Tool Side)
(Master and Tool Sides)
Table 4: Pin Assignment, M12 5-Pin Receptacles
VALVE Connector
1 N/C
2 Unlatch (24V, Switched)
3 Ground
4 Latch (24V, Switched)
5 FE
R1/R2 Connector
1 24V
2 RTL1
3 Ground
4 RTL2
5 FE
L/U Connector
1 24V
2 Locked
3 Ground
4 Unlocked
5 FE
ID1 Connector
1 24V
2 Tool ID1
3 Ground
4 Tool ID2
5 FE
ID2 Connector
1 24V
2 Tool ID4
3 Ground
4 Tool ID8
5 FE
Table 5: Pin Assignment, M12 D-Coded Profinet Connector
1 Tx+
2 Rx+
3 Tx-
4 Rx-
Table 6: Pin Assignment Aux. Power Connectors
1 24V, Unswitched
2 Ground, Switched
3 Ground, Unswitched
4 24V, Switched
5 Reserved
Table 7: Pin Assignment, TSI Connector
1 N/C
2 TSI In
3 TSI Out
4 N/C
NOTES: UNLESS OTHERWISE SPECIFIED.
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PROJECT # 110719-1
SHEET 3 OF 4
TITLE
VH10 Module Customer Drawing
SCALE 1:2
SIZE B
DRAWING NUMBER 9630-20-VH10
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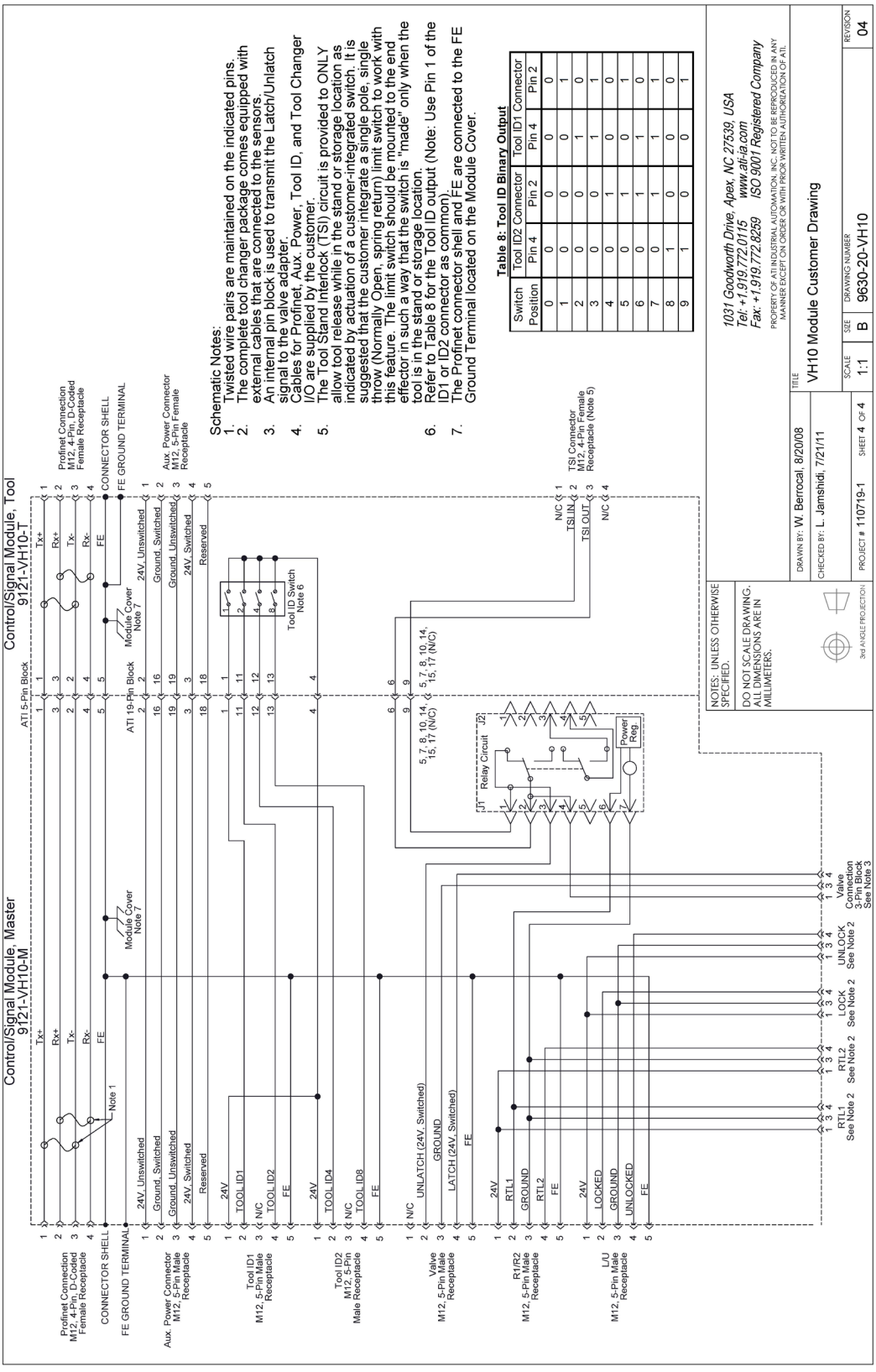
Control/Signal Module, Master
9121-VH10-M
Control/Signal Module, Tool
9121-VH10-T
ATI 5-Pin Block
ATI 19-Pin Block
Tx+
Rx+
Tx-
Rx-
FE
Note 1
Module Cover
Note 7
24V, Unswitched
Ground, Switched
Ground, Unswitched
24V, Switched
Reserved
24V
TOOL ID1
N/C
TOOL ID2
TOOL ID4
TOOL ID8
Tool ID Switch
Note 6
UNLATCH (24V, Switched)
GROUND
LATCH (24V, Switched)
RTL1
RTL2
LOCKED
UNLOCKED
J1 Relay Circuit J2
Power Reg
5, 7, 8, 10, 14, 15, 17 (N/C)
N/C
TSI IN
TSI OUT
CONNECTOR SHELL
FE GROUND TERMINAL
Profinet Connection
M12, 4-Pin, D-Coded
Female Receptacle
Aux. Power Connector
M12, 5-Pin Female
Receptacle
Tool ID1
M12, 5-Pin Male
Receptacle
Tool ID2
M12, 5-Pin
Male Receptacle
Valve
M12, 5-Pin Male
Receptacle
R1/R2
M12, 5-Pin Male
Receptacle
LocU
M12, 5-Pin Male
Receptacle
TSI Connector
M12, 4-Pin, Female
Receptacle (Note 5)
RTL1
See Note 2
RTL2
See Note 2
LOCK
See Note 2
UNLOCK
See Note 2
Valve
Connection
3-Pin Block
See Note 3
Schematic Notes:
1. Twisted wire pairs are maintained on the indicated pins.
2. The complete tool changer package comes equipped with external cables that are connected to the sensors.
3. An internal pin block is used to transmit the Latch/Unlatch signal to the valve adapter.
4. Cables for Profinet, Aux. Power, Tool ID, and Tool Changer I/O are supplied by the customer.
5. The Tool Stand Interlock (TSI) circuit is provided to ONLY allow tool release while in the stand or storage location as indicated by actuation of a customer-integrated switch. It is suggested that the customer integrate a single pole, single throw (Normally Open, spring return) limit switch to work with this feature. The limit switch should be mounted to the end effector in such a way that the switch is "made" only when the tool is in the stand or storage location.
6. Refer to Table 8 for the Tool ID output (Note: Use Pin 1 of the ID1 or ID2 connector as common).
7. The Profinet connector shell and FE are connected to the FE Ground Terminal located on the Module Cover.
Table 8: Tool ID Binary Output
Switch Position
Tool ID2 Connector
Tool ID1 Connector
Pin 4
Pin 2
Pin 4
Pin 2
0 0 0 0 0
1 0 0 0 1
2 0 0 1 0
3 0 0 1 1
4 0 1 0 0
5 0 1 0 1
6 0 1 1 0
7 0 1 1 1
8 1 0 0 0
9 1 0 0 1
NOTES: UNLESS OTHERWISE SPECIFIED.
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3rd ANGLE PROJECTION
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PROJECT # 110719-1
SHEET 4 OF 4
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VH10 Module Customer Drawing
SCALE 1:1
SIZE B
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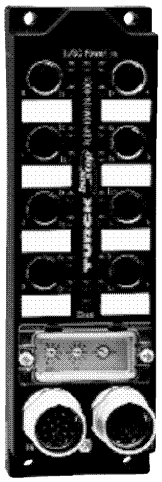


The FLDP-IOM124-0001 *busstop*® station provides a direct connection to PROFIBUS-DP. Up to twelve 2-/3-wire pnp sensors and up to four actuators with an output current of 2 A each may be connected to the station.

The inputs feature common short-circuit monitoring. The signal status of the inputs/outputs is indicated by green LEDs. The ON-LINE/OFF-LINE status of the station is signalled by a green/red LED.

The robust station is epoxy-encapsulated and equipped throughout with metal connectors.

Connection to PROFIBUS-DP is accomplished with 17-pole round connectors. The station supports transmission rates of up to 12 Mbps and adjusts automatically to the communication rate determined by the master station. The address of the station is set via two rotary switches located under a protective cover. It can be set from 0 to 99.

Power is also fed via a 17-pole connector. A green Power LED indicates that the station is powered, while a red Power LED indicates that the load voltage is missing. If the load voltage falls below the minimum value of 18 VDC, the Power LED turns red.

The robot module can be connected to the earth potential via the external earthing screw. The earth (PE) is capacitively coupled with the shield of the bus cable.

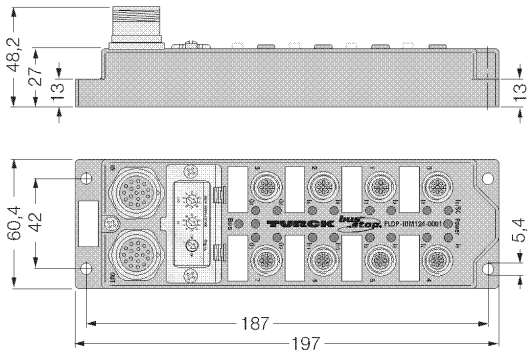
The GDS file can be downloaded from the internet under **www.turck.com.**

## FLDP-IOM124-0001

- Robust PROFIBUS-DP station
- 6 x 2 inputs and 2 x 2 outputs

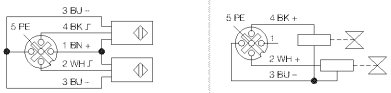
**Applications**
- For robot applications
- For connection of twelve 2/3 pnp wire sensors or mechanical contacts
- For connection of four actuators, 2 A max. each

**Special features**
- Common short-circuit monitoring of pnp inputs
- Glass fibre reinforced plastic housings with encapsulated electronics and nickel-plated brass connectors meet protection degree IP67
- Transmission rate up to 12 Mbps
- Intelligent bus terminator



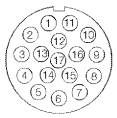

**Wiring diagram**

| Inputs | Outputs | Operating/load voltage |
|---|---|---|
| 3-wire pnp sensors | DC actuator | male connector **(IN)** / female connector **(OUT)** |



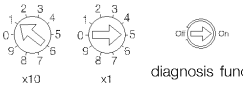






for pin configuration see page 2

# Input/output module FLDP-IOM124-0001
# 6 x 2 inputs/2 x 2 outputs, 24 VDC

| | |
|---|---|
| **Type** | FLDP-IOM124-0001 |
| Ident-no. | 6825347 |
| **Operating/load voltage** | 18...30 VDC |
| Internal current consumption | < 200 mA (from operating voltage) |
| **Adjustments** | |
| Address | 0...99 (decimal) via 2 rotary switches located under protective cover |
| diagnosis function „$U_L$" | disabling of the diagnosis function via $U_L$ |
| In this example address 15 is set |   diagnosis function „$U_L$" |
| **Input circuits** | (12) pnp 3-wire sensors/2-wire sensors |
| Input voltage | 18...30 VDC (from operating voltage) |
| Input current | total input current ≤ 500 mA, short-circuit protection |
| Switching threshold OFF / ON | 2 mA / 4 mA |
| Input time delay | 2.5 ms |
| Switching frequency | < 250 Hz |
| Isolation | to bus |
| **Output circuits** | (4) DC actuators |
| Output voltage | 18...30 VDC (from load voltage) |
| Output current | 2 A per output, short-circuit protection |
| Switching frequency | < 250 Hz |
| Isolation | to bus |
| **LED indications** | |
| Bus | green/red: normal operation/no communication |
| Voltage supply | green/red: normal operat./load voltage missing |
| I/O status | (12) green: input ON / (4) green: output ON |
| Common short-circuit indication (LED SC) | red: short-circuit at one input |
| **Connection** | |
| Operating and load voltage | 17-pole round connector |
| Bus line | 17-pole round connector |
| Inputs/outputs | M12 x 1 connector |
| **Bus terminator** | automatic activation of the internal bus terminator if pin 15 and pin 16 of 17-pole female connector are not shorted |

**Pin configuration**

| 17-pole round connector | | | |
|---|---|---|---|
| **IN** | | **OUT** | |
| 1 | | 1 | 0 V, $U_B$ |
| 2 | | 2 | 0 V, $U_L$ |
| 3 | | 3 | +24 V, $U_L$ |
| 4 | | 4 | +24 V, $U_B$ |
| 5 | | 5 | PE |
| 6 | | 6 | B-line |
| 7 | | 7 | |
| 8 | | 8 | |
| 9 | | 9 | |
| 10 | | 10 | |
| 11 | | 11 | A-line |
| 12 | | 12 | |
| 13 | | 13 | |
| 14 | | 14 | |
| 15 | | 15 | reserved |
| 16 | | 16 | reserved |
| 17 | | 17 | |

**I/O data mapping**

Abbreviations:
C0P4 = connector 0, pin 4,
C1P2 = connector 1, pin 2
0 = off, 1 = on
SC = common short-circuit indication of inputs, I > 500 mA
$U_L$ = load voltage, $U_L$ < 18 VDC
$U_B$ = operating voltage $U_B$ < 18 VD

| | Bit | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|---|---|---|---|
| **Input** | **Byte 0** | C4P2 | C4P4 | C2P2 | C2P4 | C1P2 | C1P4 | C0P2 | C0P4 |
| **Input** | **Byte 1** | – | – | – | – | C6P2 | C6P4 | C5P2 | C5P4 |
| **Output** | **Byte 0** | – | – | – | – | C7P2 | C7P4 | C3P2 | C3P4 |
| **Diagnose** | **Byte 0** | – | – | – | – | – | $U_B$ | $U_L$ | SC |

| | |
|---|---|
| **Housing** | 197 x 60 x 27 mm (h x w x d) |
| Material | PA6-GF30; nickel-plated brass connectors |
| Mounting | via 4 through-holes, Ø 5.3 mm |
| Protection degree (IEC 60529/EN 60529) | IP67 (NEMA 1, 3, 4, 12, 13) |
| Shock and vibration test | according to EN 60068-2-6/2-27 |
| Temperature range | 0 °C up to +55 °C (32 °F up to +131 °F) |

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