



## HYDRAULIC PUNCH TOOL

Max. Capacity: 20 Tons (HP20)  
35 Tons (HP35)

**Definition:** A hydraulic punch tool is a tool powered by a hydraulic pump to punch profile holes in metal or similar materials.

Read and carefully follow these instructions before installation and use of this tool. Many problems with new equipment are caused by improper operation and installation.

**NOTE:** Inspect the tool upon arrival. The carrier, not the manufacturer, is responsible for any damage resulting from shipment.

## SAFETY DEFINITIONS

Safety symbols are used to identify any action or lack of action that can cause personal injury. Your reading and understanding of these safety symbols is very important.



**DANGER** - Danger is used only when your action or lack of action will cause serious human injury or death.



**WARNING** - Warning is used to describe any action or lack of action where a serious injury can occur.

**IMPORTANT** - Important is used when action or lack of action can cause equipment failure, either immediate or over a long period of time.

## SAFETY PRECAUTIONS

These instructions are intended for end-user application needs. If parts are ever needed for product repair, a detailed parts list or information on Power Team Authorized Hydraulic Service Center locations can be obtained by contacting your nearest Power Team facility. **Note: All Power Team parts are carefully tested and selected so it is very important to use only genuine Power Team replacement parts!** A list of all Power Team facilities is located at the end of this document.



**WARNING:** It is the operator's responsibility to read and understand the following safety statements,




- Only qualified operators should install, operate, adjust, maintain, clean, repair, or transport this machinery.
- These components are designed for general use in normal environments. These components are not specifically designed for lifting and moving people, agri-food machinery, certain types of mobile machinery or special work environments such as: explosive, flammable or corrosive. Only the user can decide the suitability of this machinery in these conditions or extreme environments. Power Team will supply information necessary to help make these decisions.



**WARNING**

- All WARNING statements must be carefully observed to help prevent personal injury.

## GENERAL

- ALWAYS read and carefully follow the operating instructions and safety precautions before assembling or using this punch. Most problems with new equipment are caused by incorrect operation or assembly.
- Read and carefully follow the operating instructions and safety precautions for the pump and hose(s) used with this punch.
- Punches can exert extremely high forces at moderate hydraulic pump pressures. If you have any questions concerning how much force is exerted at a given pressure, contact your nearest Power Team facility (see listing at the end of this document).
-  Always wear eye protection whenever operating hydraulic equipment.
-  Always wear hearing protection as required.
- Operation, repair, or maintenance of hydraulic equipment should be performed by a qualified person who understands the proper function of hydraulic equipment per applicable directives and standards.
- Hydraulic equipment must be assembled correctly and then checked for proper function before use. Use hydraulic components of the same hydraulic pressure ratings. An appropriate hydraulic pressure gauge is recommended to monitor pressure.
-  Never place your hands or other body parts near a hydraulic fluid leak. Never use your hands or other body parts to check for a possible leak. High pressure fluid can be injected under your skin causing serious injury and/or infection.
- High pressure fluid is present throughout a hydraulic system. Always use caution when operating, repairing, or maintaining this equipment. Before beginning any work on any hydraulic system component, stop the equipment, disconnect from its power source, and relieve all pressure in all parts of the system. Do not tamper with the internal hydraulic relief valve settings.

## SAFETY PRECAUTIONS CONTINUED -


### GENERAL (CONTINUED)

- Avoid exposing hydraulic equipment (especially hoses) to extreme high or low temperatures. Damage to equipment or failure may result and cause loss of control or personal injury.
- Do not drop any hydraulic system components. Damage to the equipment and/or injury may result.
- Avoid slipping or falling by cleaning up any oil spills.
- Avoid back injury by always lifting equipment carefully.
- It is strongly recommended to view the Power Team Hydraulic Safety video tape before using hydraulic equipment.

### SET-UP

- The owner/operator of this punch must see that it is installed and operated according to federal (OSHA), state, local, European (EU), and other safety standards where applicable.
- Shield the punch to minimize danger to others. Hydraulic pressure can cause materials to break, possibly resulting in personal injury due to flying objects, falling objects, shifting loads and other hazards.
- This punch is designed for punching holes in mild steel, aluminum, and similar non-hardened material. Guards, enclosures, monitors, interlocks, controls, restraints, and other devices must be used by the owner/operator when this punch is used for specific applications with hazards best known by the owner/operator. For information regarding other applications, contact your nearest Power Team facility (see listing at the end of this document).
- Additions of specific safety equipment, such as permanent enclosures, guards or shields, light curtains, etc., to the punch must be on separate, free-standing structures, or clamped to the punch frame without cutting, drilling, welding or otherwise modifying the punch structure or affecting it's function. Such modifications can cause equipment damage and/or personal injury.
- Modifications to the structure and function of this punch are not permitted, voids the warranty, may cause personal injury, and voids the Declaration of Incorporation.
- Any punch accessories, die sets, or special equipment used with the punch must have a maximum tonnage rating equal to or higher than the maximum tonnage rating of the punch, or breakage and possible injury can occur.
- The owner/operator of the punch must ensure that all safety-related decals are installed, maintained, and replaced if they become hard to read.
- Do not hook up punch (HP35) to a power pump with a double-acting valve.
- Always connect hoses at the punch (HP20) with solid connection fittings not couplers.

### HYDRAULIC HOSE

- Before operating this tool, tighten all hose connections using the proper tools. Do not overtighten the connections. Connections need only be tightened securely and leak-free. Overtightening may cause premature thread failure or high pressure fittings to split at pressures lower than their rated capacities.
-  Should a hydraulic hose ever burst, rupture, or need to be disconnected, immediately shut off the pump. Never attempt to grasp a leaking hose under pressure with your hands. The force of the escaping hydraulic fluid could cause serious injury.
- Do not subject the hose to potential hazard such as fire, extreme heat or cold, sharp surfaces, or heavy impact. Do not allow the hose to kink, twist, curl or bend so tightly that the oil flow within the hose is blocked or reduced. Periodically inspect the hose for signs of wear because any of these conditions can damage the hose and may result in personal injury.

## SAFETY PRECAUTIONS CONTINUED -

### HYDRAULIC HOSE (CONTINUED)

- Do not use the hose to move attached equipment. Stress may damage the hose and cause personal injury.
- Hose material and coupler seals must be compatible with the hydraulic fluid used. Hoses also must not come in contact with corrosive materials such as creosote-impregnated objects and some paints. Consult the manufacturer before painting a hose. Never paint the couplers. Hose deterioration due to corrosive materials may result in personal injury.
- Always connect hoses at the punch (HP20) with solid connection fittings not couplers.


### PUMP


- Do not exceed the hydraulic pressure rating noted on the pump nameplate or tamper with the internal high pressure relief valve. Creating pressure beyond rated capacities can result in personal injury.
- Before replenishing the fluid level, retract the system to prevent overfilling the pump reservoir or bladder. An overfill can cause personal injury due to excess reservoir or bladder pressure created when the cylinders are retracted.
- Always shut off the motor or engine and relieve pressure before breaking any connections in the system.
- The motor or engine is the major part of the weight of the pump. Always take this into consideration when lifting or moving the pump.
- A power pump with a double-acting valve is NOT to be used with HP35 punch.

### HYDRAULIC FLUIDS


- Properly dispose of all fluids, components, and assemblies at the end of their useful life.
- Use only Power Team hydraulic fluids in this punch and be sure the type of fluid is compatible with all hydraulic components.

### PUNCH TOOL

-  Approved safety glasses **MUST** be worn while operating punch.
- Do not exceed the maximum capacity of the punch.
- Do not hook up punch (HP35) to a power pump with a double-acting valve.
- Always match the punch and die correctly. Keep pump and die sets as clean as possible. Store in case after use. Never use cracked, chipped or worn punches and dies; replace them.

-  Hardened metal may fly apart when severed. Take the necessary precautions by using a protective blanket.

- These punches must either be bench-mounted or always supported before and after operation to prevent the punch from tipping over.

 **DANGER:** A double-acting cylinder or ram must have both hoses and all couplers securely connected to both ports. If one of the two ports is restricted or becomes disconnected, pressure will build and the cylinder, hose or coupler can burst, possibly causing serious injury or death.

## SET UP

Carefully plan your hydraulic system by selecting components that meet pressure range, load capacity, and set-up requirements. Any Power Team 10,000 PSI hydraulic pump may be used to power this punch, however, a low flow pump will provide the best and safest overall punch operation. The system operating pressure must not exceed the pressure rating of the lowest rated component in the system.

**NOTE:** • Do not use HP35 punch with a power pump with a double-acting valve.

- Use only Power Team hydraulic fluid in the punch and pump system and be sure the type of fluid is compatible with all hydraulic components.

If the punch tool is to remain in one location, it is recommended to mount the punch to a stable table or counter utilizing the mounting bracket located at the base of the main frame.

## PUNCH AND DIE INSTALLATION AND REMOVAL



**WARNING:** • Shut off and disconnect the pump from its power source before doing any maintenance, adjustment, or changes to the punch. Remove all pressure by cycling the valve after the pump is OFF.



- Keep fingers and hands out of the punch and stripper area if pump is connected to power source or pressure is present.
- Only one person should remove and install punch and die sets.

## HP35

### Installation of Punches and Dies:

**NOTE:** The punch and die must be a correctly matched set. Each punch and die are coded as a set with a color dot on the top surface of each piece.

#### Round

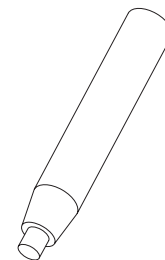
- Place the die into the main frame lower jaw with the larger opening facing downward. The color code dot on the surface of the die should be visible. Tighten the set screw.
- Position the punch into the locking collar with the long stem facing downward. Thread the locking collar into the main frame with fingers. Tighten with the locking collar tool.

#### Square, Oblong, or Rectangular

Square, oblong, and rectangular shape punches require special indexing of the punch and die to assure accurate mating of these parts.

- Position the die into the main frame lower jaw with the larger opening facing downward and the depression in the side of the die toward the set screw. The color code dot on the surface of the die should be visible. With the larger of the two hex key wrenches provided, tighten the set screw into the frame until it engages the depression of the die.
- Place the punch into the locking collar with the long stem facing downward. Place both locking collar and punch into main frame and turn punch until it's indexing pin slides into a mating hole in the piston.

**NOTE:** The piston has two holes 90° from each other so the oblong and rectangular punches can be positioned in either direction. Tighten the locking collar as tight as possible with fingers, then finish tightening with the locking collar tool.



Locking Collar Tool

Check for proper alignment of the punch and die by slowly advancing the the punch to the die. The punch should pass freely through the die. Minor adjustments of the die are possible by loosening the die, adjusting the position, and re-tightening the set screw.

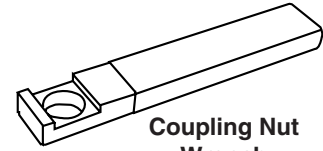
### Removal of Punches and Dies:

- Locate the locking collar tool provided with your hydraulic punch. Place the tool in one of the holes in the locking collar, then using the tool as a lever, rotate the locking collar counterclockwise as far as the tool can move. Move the tool to the next hole back clockwise to allow the tool to move the locking collar counterclockwise again. Keep moving the tool to loosen the locking collar enough to allow it to be removed by turning it out with your fingers. Remove the punch. Set the locking collar aside and proceed with removing the die.
- Using the larger of the two hex key wrenches provided with your hydraulic punch, loosen the set screw on the main frame lower jaw. Remove the die by simply pushing it out from the bottom of the main frame lower jaw.

## PUNCH AND DIE INSTALLATION AND REMOVAL CONTINUED -

### HP20

#252001 or #252002  
Coupling Nut  
Note: These have  
left-hand threads!



Coupling Nut  
Wrench  
(optional)

#### Installation of Punches and Dies:

**NOTE: The punch and die must be a correctly matched set.**

- Place the die into the main frame lower jaw with the larger opening facing downward and the depression in the side of the die toward the set screw. Tighten the set screw.
- Thread the stripper into the main frame upper jaw till it is flush with the jaw. Using the correct coupling nut to accommodate the punch (#252001 for use with sizes .125/.688; #252002 for use with .751/.813), place the coupling nut wrench around the punch and position over the die. Slowly and carefully advance the punch piston to the coupling nut. Thread the coupling nut (left-hand threads) to the piston and tighten with the coupling nut wrench (or wrench).
- Retract the punch and thread the stripper out of the frame to the position for the material thickness.

Check for proper alignment of the punch and die by slowly advancing the the punch to the die. The punch should pass freely through the die. Minor adjustments of the die are possible by loosening the punch, adjusting the position, and re-tightening the coupling nut.




#### Removal of Punches and Dies:

- With a hex key wrench, loosen the set screw on the main frame lower jaw. Remove the die by simply pushing it out from the bottom of the main frame lower jaw.
- Thread the stripper into the main frame upper jaw till it is flush with the jaw. Hold the hole of the coupling nut wrench over the die opening. Slowly and carefully advance the punch far enough to use the coupling nut wrench (or wrench) to loosen the coupling nut. Remove the punch.

## OPERATION



**WARNING:** To help prevent personal injury,

-  The punch operator and anyone within sight of the punch must wear protective eyewear that meets the requirements of OSHA, ANSI Z87.1-1968, or applicable EU standards.
-  It is the owner/operator's responsibility to use appropriate guarding to contain any pieces that might break or fly apart when applying force. For added protection, always wrap the workpiece in a protective blanket before applying force. Contact your nearest Power Team facility (see listing at the end of this document) for more information about protective blankets.
-  Keep hands out of the work area during a punching operation.  
Note: To limit punch speed to 10 mm/sec. or less, use a pump with a maximum of 90 cubic inches per minute flow with the HP20 or a maximum of 160 cubic inches per minute with the HP35.
- Workpieces must be well supported and aligned so that cylinder/ram force is straight, and parts being punched cannot slip out or break.
- Use caution when loading and unloading the punch.
- Special beveled dies may be required for structured steel flanges or other tapered surface punching. Consult your Power Team distributor or the factory.
- Adjustable strippers on some models must be adjusted to the material with the pump shut off and disconnected from the power source and with pressure relieved. Allow enough clearance for the material to move freely between the stripper and the lower die.
- Do not operate this punch if connected to a power pump with a double-acting valve.



**OPERATION CONTINUED -**

- When used as a portable punch, lift using the handles provided. Securely hold the unit before and after punching. Avoid being pinched or caught in the tool.
- A center punch indentation or mark can be used to help locate the punch on the material to be punched.
- When the punch is located correctly, activate the pump while keeping fingers and other body parts away from the punch and stripper area. The punch assembly must be completely supported before and after punching the hole. Stop the pump (model HP35) or shift the valve (model HP20) to retract the punch after punching the hole.
- Only one operator should locate, support, and actuate the punch assembly. Other persons should stay a safe distance away during punch operation.
- Check for loose, damaged, worn, and misaligned parts before each use.

**Operation of HP35 punches:**

1. Select material to be punched. A center punch indentation or mark should be made to indicate where the holes will be punched.
2. Position workpiece to be punched on the lower jaw of the punch tool.  
**NOTE:** • Scribes in the stripper will help to align cross hatch marks on the workpiece for centering of the punch.
3. Slowly advance the punch to the workpiece to clamp it in position.
4. Stand to one side of the punch and hold handle to stabilize tool. Advance hydraulic pressure to make punch, release pressure and retract, and remove workpiece. Discard slug.

**IMPORTANT: TO HELP PREVENT DAMAGE TO THE PISTON FROM METAL CHIPS, AVOID OPERATING THIS PUNCH IN AN UPSIDE DOWN POSITION.**

**Operation of HP20 punches:**

1. Select material to be punched. A center punch indentation or mark should be made to indicate where the holes will be punched.
2. Place the material on the die. Adjust the stripper to the material by threading it down to within 1/32" clearance.
3. Shift the valve on top of the punch to the PUNCH position. Start the pump motor.
4. Slowly advance the punch to the material and align the punch with the markings you indicated for the punch location. Stand to one side of the punch and hold handle to stabilize tool. Continue to advance punch until it makes the complete punch.
5. Shift valve to RETRACT position and allow punch to retract fully. Shut off pump motor and remove workpiece. Discard slug.

**Note:** If the punch is ever jammed, use a probe, punch, or other tool. Do not put fingers or hands in this area without shutting off the pump, disconnecting it from the power supply and completely relieving pressure.

**IMPORTANT:**

- On model HP35 punches, periodically check the locking collar and set screw to ensure that they remain tight.
- Remove slugs from the punch each time to help prevent damage to the mounting bracket.
- Replace any cracked, chipped, or worn punches and dies.
- Foot switches and hand switches are available on some models.

**PREVENTIVE MAINTENANCE**

Keep the outer surface of the punch and the die sets as free from dirt as possible. Protect the coupler(s) when not in use. Lubrication is not required, but may help extend punch and die life.

Note: Shaded areas reflect last revision(s) made to this form.

Sheet No. 4 of 5

Rev. 2 Date: 13 Dec. 1999

## SELECTING A PUNCH

The following information, is provided as a convenient general reference guide for metal punching operations.

### Hole Size vs. Material Thickness

Punching holes in metal is the fast, economical way to get precise hole size, smoothness and minimum burr. Compressive strength of the punch steel determines that the thickness of the metal being punched must not exceed the diameter of the punch. This relationship varies with the type of material. For example: the minimum hole diameter will be 1/4" in 1/4" mild steel, 1/4" in 3/16" stainless steel, and 1/4" in 5/16" aluminum.

### Maximum Rated Capacity

All punching tools have their maximum capacities for safe, dependable operation over a long life span. The hydraulic punches listed in this form have a "rated capacity" based on its design strength. Before selecting a tool, use the charts on sheet 5 of 5 to determine the specific tonnage required to punch the size and shape holes through the type and gauge metal considered.

## DETERMINING TONNAGES

### For Round Holes

To determine tonnages for hot rolled mild steel (typically used in bar size angle iron, channels, tees and zeeks) with a 50,000 PSI shear strength, read direct from chart #1 on next page.

**Example:** To punch a 3/8" diameter hole thru 3/8" thick mild steel, chart #1 shows 11.1 tons are required.

For ASTM A-36 steel (typically used for structural size wide flange, H and I beams, tees and zeeks) with a 60,000 PSI shear strength, read direct from chart #2 on next page.

**Example:** To punch a 1/4" round hole in 1/4" thick A-36 steel, chart #2 shows 5.9 tons of force is needed.

### For Irregular Shape Holes

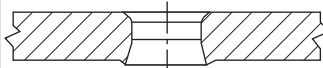
When punching irregular shaped holes (square, obround and etc.) multiply the length of metal to be cut by the multiplier given for a 1" length of cut in chart #3 on next page.

**Example:** The shear length (or total distance around a 1/2" square hole) is 2". To punch such a hole in 1/4" thick mild steel multiply 2" x 6.25 (from chart #3) = 12.5 tons. For stainless steel this would be 2" x 9.5 = 19 tons.

## DIE CLEARANCES

The relationship of the larger die hole size to the punch size is die clearance and is stated as a percentage of the thickness of the material being punched. The range of clearances varies from 10% for thin materials to 20% for thicker materials. For 3/4" material the total die clearance is .150". Clearance should always be specified when there is any reason for doubt (see illustrations at right). Effects of die clearance are more noticeable in thicker materials (such as 1/2") than in thinner materials (such as 3/16"). When ordering die sets, specify the type and thickness of material being punched (see chart #4 on next page).

### TOO MUCH CLEARANCE



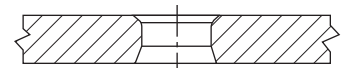
1. Extra roll-in at top of the hole.
2. Too much burr at bottom of the hole.

### TOO LITTLE CLEARANCE



1. More punching pressure needed. Can reduce tool life.
2. High stripping force causes part distortion and extra punch wear.

### CORRECT CLEARANCE



1. Straighter hole thru material.
2. Minimum distortion at top of hole.
3. Minimum burr at bottom of hole.



**CHART #1****Tons of Pressure Required to Punch Mild Steel**

Round Hole Dia.		1/8"	3/16"	1/4"	5/16"	3/8"	7/16"	1/2"	9/16"	5/8"	11/16"	3/4"	13/16"
Gauge	Inches												
20	.036	.4	.5	.7	.9	1.1	1.2	1.4	1.6	1.8	1.9	2.1	2.3
18	.048	.5	.7	.9	1.2	1.4	1.6	1.9	2.1	2.4	2.6	2.8	3.1
16	.062	.6	.9	1.2	1.5	1.8	2.1	2.3	2.6	2.9	3.2	3.5	3.8
14	.075	.7	1.1	1.5	1.8	2.2	2.6	2.9	3.3	3.7	4.0	4.4	4.8
12	.105	1.0	1.5	2.1	2.6	3.1	3.6	4.1	4.6	5.1	5.7	6.2	6.7
11	.120	1.2	1.8	2.4	2.9	3.5	4.1	4.7	5.1	5.9	6.2	7.1	7.6
10	.135	1.3	2.0	2.6	3.3	4.0	4.6	5.3	5.9	6.6	7.3	7.9	8.6
3/16"	.188	—	2.8	3.7	4.6	5.5	6.4	7.4	8.3	9.2	10.1	11.0	12.0
1/4"	.250	—	—	4.9	6.1	7.4	8.6	9.8	11.1	12.3	13.5	14.7	16.0
5/16"	.312	—	—	—	7.8	9.2	10.7	12.3	13.9	15.4	17.0	18.5	20.0
3/8"	.375	—	—	—	—	11.1	12.8	14.8	16.5	18.5	20.2	22.1	23.8
1/2"	.500	—	—	—	—	—	—	19.7	22.0	24.6	26.9	29.5	31.8

**CHART #2****Tons of Pressure Required to Punch ASTM-A36 Structural Steel**

Round Hole Dia.		1/8"	3/16"	1/4"	5/16"	3/8"	7/16"	1/2"	9/16"	5/8"	11/16"	3/4"	13/16"
Gauge	Inches												
12	.105	1.2	1.9	2.5	3.1	3.7	4.3	4.9	5.6	6.2	6.8	7.4	8.0
1/8" or 11	.120	1.4	2.1	2.8	3.5	4.2	4.9	5.7	6.4	7.1	7.8	8.5	9.2
10	.135	—	2.4	3.2	4.0	4.8	5.6	6.4	7.2	7.9	8.7	9.5	10.3
3/16"	.187	—	3.3	4.4	5.5	6.6	7.7	8.8	9.9	11.0	12.1	13.2	14.3
1/4"	.250	—	4.4	5.9	7.4	8.6	10.3	11.8	13.2	14.7	16.2	17.7	19.1
5/16"	.312	—	—	7.4	9.2	11.0	12.9	14.7	16.5	18.4	20.2	22.0	24.0
3/8"	.375	—	—	8.8	11.0	13.3	15.5	17.7	19.9	22.1	24.3	26.5	28.7
1/2"	.500	—	—	—	—	—	—	23.6	26.5	29.4	32.4	35.3	38.3

**CHART #3****Tons Pressure Required to Shear 1" Length**

Material Thickness	Mild Steel	Stainless Steel	Brass
3/16"	4.25	7.00	3.25
1/4"	6.25	9.50	4.50
5/16"	8.00	12.00	5.50
3/8"	9.50	14.25	6.25
7/16"	11.00	16.50	7.75
1/2"	12.50	18.75	8.75

**CHART #4****Clearance for Mild Steel**

Material Thickness	Approx. Decimal Thickness	Overall Clearance – Add to Punch Size
7 gauge	.1793	.021
3/16"	.1875	.023
1/4"	.250	.037
5/16"	.3125	.047
3/8"	.375	.057
1/2"	.500	.075

**NOTE:** Most grades of half hard aluminum use the same clearance as shown above. In many cases, your own experience may dictate that you call for clearances different than the above, especially when punching other materials such as stainless steel. Special clearances may be ordered for that purpose.

## POWER TEAM FACILITIES



**UNITED  
STATES**

CERTIFIED

*Hydraulic Technologies  
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Rockford, IL 61109-3699  
USA  
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***Cust. Service/Order Entry***

***Tel: 1-800-541-1418  
FAX: 1-800-288-7031***

***Technical Services***

***Tel: 1-800-477-8326  
FAX: 1-800-765-8326***



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FAX: 31 (45) 5678878  
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**FAR**

**EAST**

*7 Gul Circle  
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FAX: (65) 6265-6646  
E-mail:*

For more information, Internet address: <http://www.powerteam.com> (or) <http://www.hytec.com>