

FINN-POWER PUNCH/SHEAR CENTRE TRS

TECHNICAL INFORMATION

TRS5 (series 10.1)
TRS6 (series 10.1)

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MULTI-TOOL

MULTI-TOOL[®] is a registered trademark of Finn-Power International, Inc.

1. Operation

1.1. General

The punch/shear centre is constructed for processing sheet material only. The processing is done by punching with a punch and die or by cutting with the right angle shear. In the process the workpiece is moved according to the CNC control commands. Punching is executed as a single stroke or a stroke sequence (nibbling, cutting). Tools for punching are located on the turret. The right angle shear is located beside the turret on a separate frame. The shear is equipped with two cutting blades forming a right angle. The right angle shear is used to cut off the workpieces from the sheet.

The machine must be operated and serviced in accordance with the manufacturer's instructions. The capacity data specified in the technical information section must not be exceeded. Neither the application, the construction or any part thereof must be changed nor any auxiliary equipment added without a written consent from the manufacturer.

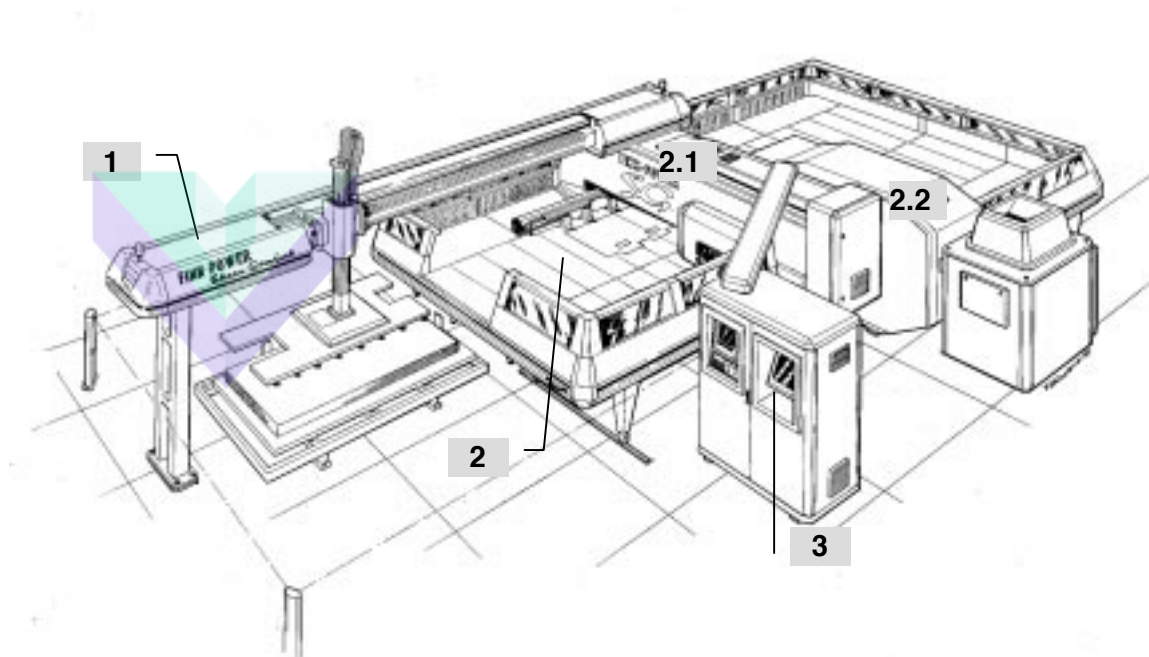


Fig. General layout of SG cell

1. Loading device LD
2. Punch/shear centre TRS
- 2.1 Turret punch press
- 2.2 Right angle shear
3. PowerLink MMC cell control

1.2. Operator

The operator of the TRS system must have sufficient training in the use of the machine and be fully acquainted with the instructions and data delivered with the machine.

NOTE! *The operator is always responsible for safe and proper operating of the machine.*

1.3. Operation stations and safety zones

1.3.1. Operation stations

The normal station for the operator during operation is at the control unit (operation station No. 1). If the operator wants to make any changes to the tool settings, the turret must be rotated with manual rotation buttons which are located at operation station No. 2 beside the turret.

1.3.2. Safety zones

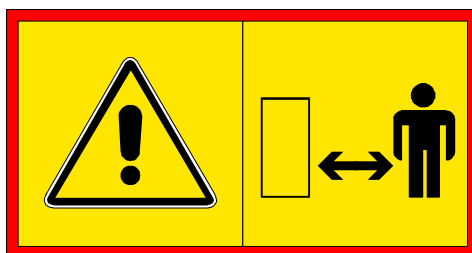
During automatic operation no one, including the operator, is allowed to stay within the safety zone. The operator is responsible for checking that neither anybody nor any foreign object comes within the safety zone when the machine is operated.

The parts cut on the right angle shear are conveyed to the safety zone behind the machine (safety zone No. 2). The safety zone has to be clearly marked by stripe painting the floor area or guarded by photoelectric safety beams or a barrier. A pallet, bin, or roller table must always be used to receive the parts from the conveyor.

Finn-Power turret punch presses are standard-equipped with electrical connection for the installation of safety devices (safety mats, photoelectric safety beams, light curtains, etc.) to the machine. Safety devices can be used to guard the safety zones of the machine. Within the European Community, the entrance to the safety zone No. 1 (loading side) has to be guarded by appropriate safety devices like photoelectric safety beam systems.

NOTE! *Do not store goods or products in the safety zone.*

NOTE! *The sheared parts from the right angle shear come on the conveyor to the protection area 2 behind the machine. Warning of the coming sheet parts is provided both by the warning sign illustrated below and by a separate signal lamp located on the side cover (or on the edge of the last conveyor). Make sure that there is a pallet, bin, or table receiving the parts. Guard the area by a barrier or photoelectric safety beam as necessary.*



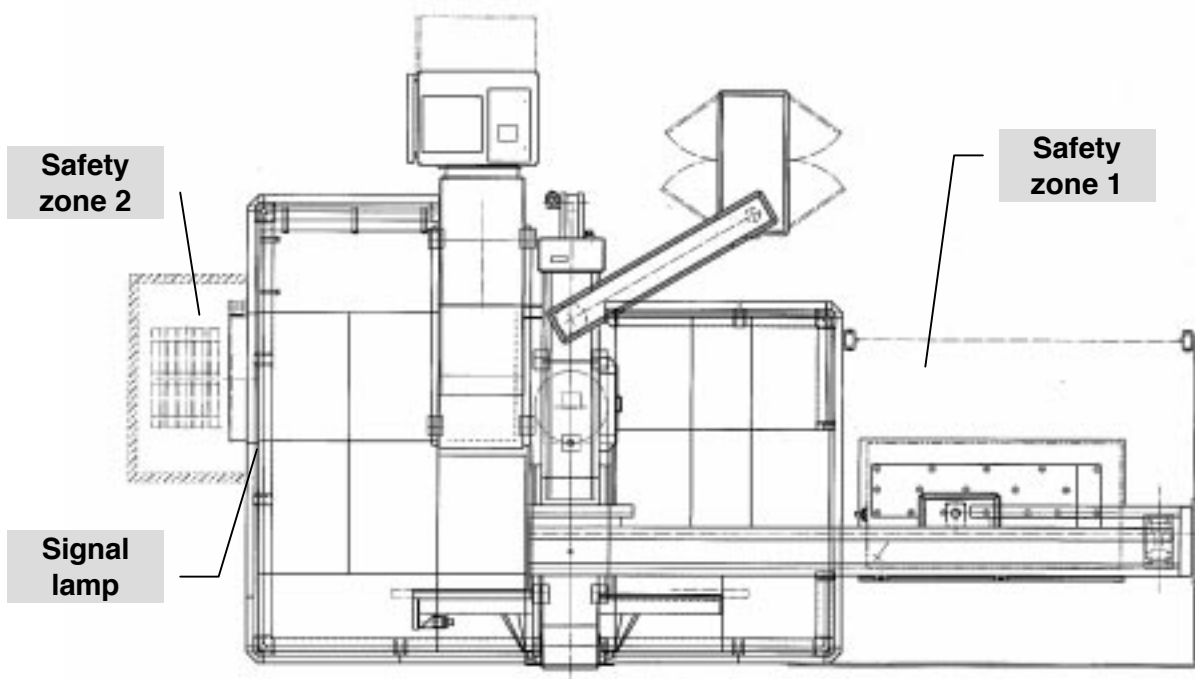


Fig. Safety zones of SG5/SG6, protected with photoelectric safety beams, and operation stations.

1.3.3. CE symbol

The CE approval requires that the machine is safe in operation. Consequently, we as manufacturer affix the CE symbol only on machines guarded by photoelectric safety beams.

1.3.4. Disturbance removal and maintenance

Extreme care must be taken in disturbance and maintenance situations. Although the machine has stopped in a disturbance situation, it may start again when the disturbance is removed. The main switch must be off, when you enter the safety zone to remove disturbances or to do maintenance.

NOTE! *The service personnel has to know how the machine functions and behaves during servicing.*

1.3.5. Noise

Sound pressure level may exceed 85 dB (A) at operation stations. Always use hearing protectors.

1.3.6. Risk analysis

Type of hazard	Hazardous point	Risk	Additional measure*
Mechanical hazard <ul style="list-style-type: none"> Squashing or crushing Cutting or cutting off Jab Spatter of liquids or gases at high pressure Bounding of parts 	<ul style="list-style-type: none"> Hydraulic punching unit Work chute Sheet clamps Mounting of tools Part separators Pressure pads Hydraulic punching unit Coordinate table and workpiece Hoses and pipes for hydraulics Pressure accumulator Workpiece 	<ul style="list-style-type: none"> Risk of injury Risk of injury Risk of injury Risk of injury Risk of injury Risk of injury Risk of injury Risk of injury Risk of injury Risk of injury Risk of injury 	<ul style="list-style-type: none"> - - - - - - - - - - -
Electrical hazard <ul style="list-style-type: none"> In case of electrical contact 	<ul style="list-style-type: none"> Directly: usually dead parts Indirectly: live parts in fault state 	<ul style="list-style-type: none"> Danger to life Danger to life 	
Hazard due to noise <ul style="list-style-type: none"> Hearing damage 	<ul style="list-style-type: none"> Punching / nibbling process 	<ul style="list-style-type: none"> Health hazard 	<ul style="list-style-type: none"> Use shear tools Use lower ram speed Use hearing protectors
Hazard due to substances <ul style="list-style-type: none"> Touching or inhaling of toxic liquids, gases, smokes, vapours, or dusts 	<ul style="list-style-type: none"> Tool lubrication Dusts, aerosols Cutting oils 	<ul style="list-style-type: none"> Health hazard Health hazard Health hazard 	<ul style="list-style-type: none"> Use lubricator sparingly Air the work place well Consider all instructions in operation manual
Hazard due to fault or malfunction <ul style="list-style-type: none"> Failure in energy supply 	<ul style="list-style-type: none"> Actuators Control voltage 	<ul style="list-style-type: none"> Risk of injury Risk of injury 	

*) Additional measure to be taken by Customer to reduce the risk existing in spite of the machine's safety devices.

1.4. Warranty

The supplier shall repair or replace any defect in the equipment which appears during the warranty period as a result of faulty materials or workmanship provided, when required by the supplier, that such part or parts be returned at the supplier's cost. The buyer shall immediately take appropriate steps to prevent any defect from becoming more serious and to enable the supplier to rectify the aforesaid defect.

Where the buyer wishes to avail himself of the warranty, he shall notify the supplier in writing without delay, during the warranty period or within thirty (30) days thereafter.

This is the only warranty applicable to the delivered equipment or any single device. Guarantee repairs are based solely on this warranty clause and performed on the conditions set in it. Guarantee repairs shall be carried out by an authorized Finn-Power service organisation.

The warranty period with respect to the equipment begins on the day of its approved commissioning and ends twelve (12) months later.

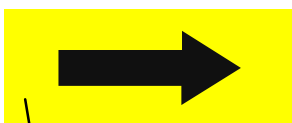
This warranty does not cover any defect due to:

- 1) materials or components or design provided by the buyer or on behalf of the buyer, his employees or third parties,
- 2) other than original spare parts supplied by the supplier, or
- 3) improper installation or alterations carried out without the supplier's consent in writing.

In particular, this warranty does not cover any defects that are caused by or connected with normal wear and tear or with any use, maintenance or service of the equipment or any part thereof which is not in conformity with the supplier's or any subcontractor's manuals or instructions.

2. Safety

2.1. Warnings and signs



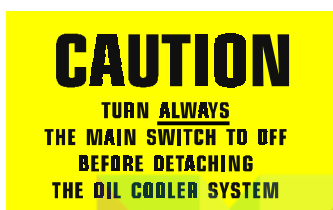
Electric motor's direction of rotation

Place: Hydraulic unit, protective housing for electric motors' fan



Oil level

Place: Hydraulic oil tank (beside oil level sight glass)



Turn the main switch to off before detaching the oil cooler system.

Place: Hydraulic unit, oil cooler

NOISE LEVEL MAY EXCEED 85 dB (A) USE HEARING PROTECTORS

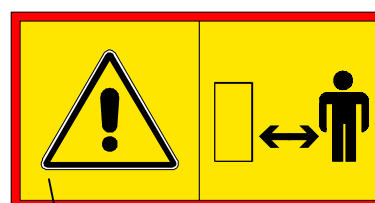


Sound pressure level may exceed 85 dB (A) at operation stations. Always use hearing protectors.



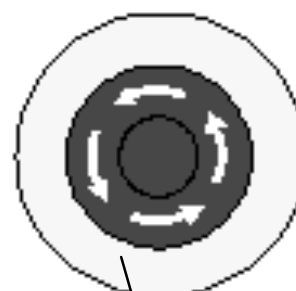
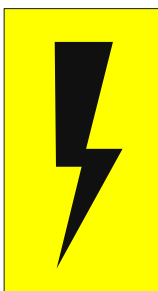
Fill the tank only through this connector.

Place: Hydraulic unit, tank cover.



WARNING: Moving machine part or work-piece. Keep away from the machine!

MAIN SWITCH



EMERGENCY STOP

NOTE!
INDEX TOOL HOLDERS AND MULTI TOOLS MUST BE GREASED REGULARLY ONCE A WEEK. LACK OF GREASE WILL CAUSE THE TOOL HOLDER TO STICK.

	<p>Greasing of lower index tool holder</p>		<p>Release lower index tool holder by pushing loading pin upwards. Grease, turn and repeat greasing at angles of 90, 180 and 270 degrees. Turn to zero angle after greasing.</p>
<p>Figure 1</p>		<p>Figure 2</p>	
	<p>Greasing of upper index tool holder. Grease, turn and repeat greasing at angles of 90, 180 and 270 degrees. Turn to zero angle after greasing.</p>		<p>Greasing of Multi-Tool</p>
<p>Figure 3</p>		<p>Figure 4</p>	

THE PICTURES ARE NOT IN NATURAL SIZE.

2.2. Safety devices

The FINN-POWER system is equipped with the following safety functions:

1. Punch force overload protection
2. Punch stripper function control
3. Programmed central locking and protection area control
4. Plate detection limits
5. Axes movement limits
6. Air pressure control
7. Overload protection of hydraulic unit's electrical motor
8. Overload protection of servo motors
9. Supply voltage control
10. CNC unit temperature control
11. Hydraulic oil temperature control
12. CNC Index Tool locking function control
13. Tool installation door limits
14. Emergency stop
15. Photoelectric safety beam systems for guarding the safety zone (obligatory option in the EC)
16. Clamp protection during shearing
17. Alert light (on side cover or last conveyor) warning of parts coming from right angle shear

In machines delivered to the European Community, entrance to the safety zone has to be guarded by appropriate safety devices, e.g. photoelectric safety beam systems.

3. Equipment

3.1. Shear Genius SG

FINN-POWER SG comprises a turret punch press, an integrated right angle shear, an automatic loading device, a cell control, and the software packages needed for programming. Using the SG system enables efficient punching and shearing of parts.

The SG is equipped with either Siemens Sinumerik 840D or Fanuc 16P CNC control.

3.2. Punch / Shear Centre TRS

Main parts

1. Frame
2. Turret
3. Coordinate table
4. Tables
5. Punching cylinder
6. Index mechanism
7. Clamps
8. Control unit
9. Tool change door
10. Hydraulic unit
11. CNC control panel and display screen
12. Right angle shear
13. Punching scrap conveyor
14. Shearing scrap conveyor
15. Display screen and keyboard of cell control

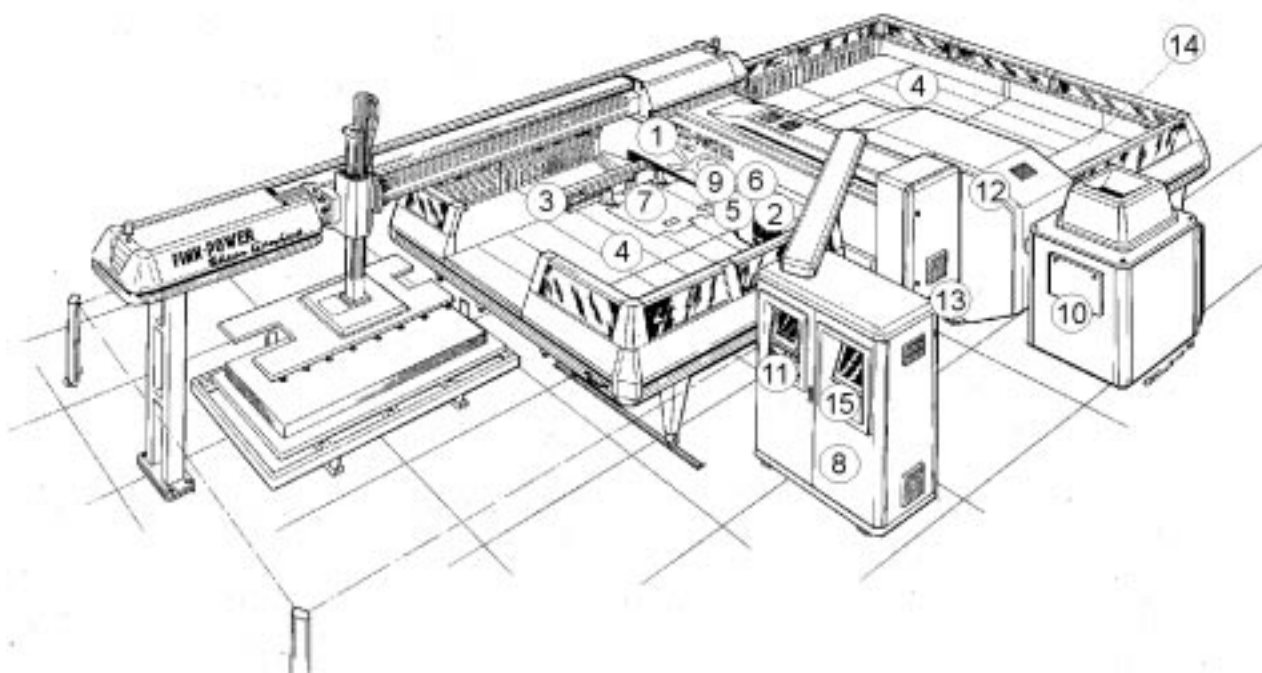


Fig. Main parts of Punch/Shear centre TRS

Frame. Closed O-construction provides optimum rigidity and the punching force does not cause angular deviation between punch and die.

Painting: 2-component polyurethane paint and epoxy/polyester powder paint
 Colours: blue RAL 5015
 grey Tikkurila TVT 854H (AKZO 160 A1)
 Gloss grade: 85 % epoxy/polyester powder paint
 90 % 2-component polyurethane paint

Turret. The tools are mounted on a 20-station turret. Separate tool holders are assembled to the turret plates. Included in a standard delivery:

- 16 pcs of fixed tool holders for tools (max. sheet thickness 8 mm)
- 2 pcs of index tool holders for tools (max. sheet thickness 8 mm)
- one MT24-8 Multi-Tool station (max. sheet thickness 4 mm, mild steel)
- one MT8-24 Multi-Tool station (max. sheet thickness 4 mm, mild steel)

Optionally more index-tool holders or Multi-Tool stations can be fixed into the turret to replace fixed stations.

Multi-Tools. The turret can be equipped with a Multi-Tool tool station to increase the number of tools. The Multi-Tool is mounted on the turret like a normal tool station. The desired punch is chosen by rotating the Z axis (C axis in Fanuc CNC). An MT24-8 station has 24 tool places with punch diameter of max. 8 mm. An MT8-24 has 8 tool places with punch diameter of max. 24 mm.

The tool cassette (punch + die) enables a quick tool change. Tool cassettes are also available as optional extra.

Right angle shear. The right angle shear shears off the punched parts from the blank sheet. It has two blades mounted at an angle of 90 degrees, and it is able to shear off max. 800 x 1270 mm (TRS5) or max. 800 x 1528 mm (TRS6) parts with one stroke. In X direction, longer cuts can be made using several half strokes, i.e. the Y blade does not cut. The final stroke is a full stroke shearing off the part also in Y direction.

The cut-off parts are removed on a belt conveyor from the machine. The right angle shear's conveyor has two standard positions, one for off-cut and the other for workpieces. An optional piece separation system can be joined to the right angle shear to sort and/or stack workpieces into pre-determined addresses.

Coordinate table. The coordinate table moves the workpiece in X and Y directions, being controlled by the CNC. Axis speed is freely programmable, and axis acceleration can be reduced by programming. The working area can be expanded in X direction with the automatic repositioning.

Sheet clamps. The workpiece is fastened to the X slide of the coordinate table by three (3) sheet clamps equipped with pneumatic central locking.

The patented automatic clamp setting (PCS) performs the transfer and locking of clamps into positions defined in the NC program. This can be made before running a new program (clamp setting) or during NC program run (clamp move). The CNC control measures the clamp positions and controls automatically that the clamps do not collide with the tool holder.

Work table. The workpiece moves on a brush or ball table. The work table is equipped with side covers to protect the operator.

Punching hydraulics. The upper and lower limits of the hydraulic punching cylinder are numerically adjustable. Due to the lower limit adjustment, shortening of punch is easily compensated. The programmable upper limit permits the optimum stroke length according to sheet thickness.

Hydraulic punching cylinder also provides automatic overload protection and punch speed programming for the tool. By reducing the speed of punch, the operator reduces the noise level and enables making very difficult shapes, too.

A separate hydraulic unit accommodates a hydraulic pump, a cooling unit, two filtration systems and a hydraulic tank.

As an option, the machine can be equipped with a forming system. With this system, the forming is made by lifting the die up. The forming dies are not at a higher level than standard tools in the turret, neither do they damage the lower surface of the sheet. This system allows for making higher forms to the parts to be produced.

Index system. The index system is used for rotating the index tool holders. With the CNC-controlled rotating, the index tool holder can be rotated to the angle defined by the NC program. The indexable tools allow punching and nibbling at a freely programmable angle. Indexable tools enable economical use of the punch press by permitting longer automatic periods and by reducing tool setups. Thanks to the index system, the amount of tools to be mounted on the turret can be decreased. The index system is also used for Multi-Tool tool change. The maximum amount of index, Multi-Tool and forming stations is 10.

Scrap conveyors. The scrap conveyors SC1 and SC1T remove the punching scrap from the punch press. SC1 removes the scrap behind the machine and SC1T on the turret side. Scrap conveyor RSC1 removes shearing scrap from the right angle shear behind the machine, while the RSC1T does the same to the turret side. When a scrap piece is removed with an RSC conveyor, the max. size of scrap is 400 mm x 400 mm.

CNC control. The servo drives and the main power switch are located in the control cabinet attached to the machine, while the separate control cabinet accommodates the CNC control, the cell control computer as well as any other control equipment.

NOTE! Fanuc 16P:

A connector for the RS-232 serial interface already exists on top of the control cabinet. Before the interface can be put into use, an optical data isolator (our order No. 078220) has to be connected to the connector. The isolator is placed in a plastic bag in the instruction manual folder delivered together with the machine.

4. Technical information

4.1. Punch/shear centre TRS5

Punching force	300 kN (Korea: 29.4 ton = 288 kN)
Number of turret stations	20 pcs
Number of tool stations with 2 Multi-Tools	30...66 pcs (optionally more)
Punch diameter, max.	89 mm
Material thickness, max. (punching)	8 mm
CNC Index Tool:	
- Number of index tool stations, max.	10 pcs (2 pcs included in delivery)
- Punch diameter, max.	89 mm
- Tool rotation, max.	58 r/min
Upward forming cylinder (option):	
Force	250 kN
Stroke	12 mm
Integrated right angle shear:	
- Material thickness, max. (shearing)	
aluminium	5 mm
steel Fe52 / Fe37	4 mm
stainless steel	3 mm
- Material thickness, min	0.5 mm
- Full stroke shear, X x Y, max.	800 mm x 1270 mm
- Blade clearance setting	manually by screws (optionally automatic)
Blank weight, max. ¹⁾	200 kg
Sheet clamps	pneumatic, 3 pcs
Sheet size, max. (X x Y)	2530 mm x 1270 mm
X-traverse	2584 mm (X-42...X2542)
Y-traverse	1317 mm (Y-25...Y1292)
Axis speed (X axis), max.	80 m/min
Axis speed (Y axis), max.	60 m/min
Traversing speed, max.	100 m/min
Hit speed, max. ²⁾	
1 mm between holes	1000 1/min
25 mm between holes	440 1/min
250 mm between holes	150 1/min
Punching accuracy according to LKP-7100 ³⁾	
Hole location deviation (X/Y axes), max.	0.1 mm
Hole-to-hole distance deviation (X/Y axes), max.	+/- 0.05 mm
Angular deviation (CNC Index Tool), max.	+/- 0.1 °
Positioning accuracy according to VDI/DGQ 3441 ⁴⁾	
Positional deviation P _a (X/Y axes)	0.08 mm (+/- 0.04 mm)
Positional scatter P _s (X/Y axes)	0.04 mm (+/- 0.02 mm)
Turret rotation	30 r/min
Tool change time	1...3 s
CNC control	Siemens Sinumerik 840D or Fanuc 16P
Program memory 16P	256 kB
840D	1000 kB
Machine weight	21.000 kg
Control unit weight	700 kg
Hydraulic unit drained weight	750 kg
Oil tank volume	330 l
Power supply	50 kVA
Power consumption, average ⁵⁾	30 kW
Compressed air consumption, average	30 NI/min
Compressed air pressure, min	6 bar
Oil cooler, cooling capacity max.	30 kW

4.2. Punch/shear centre TRS6

Punching force	300 kN (Korea: 29.4 ton = 288 kN)
Number of turret stations	20 pcs
Number of tool stations with 2 Multi-Tools	30...66 pcs (optionally more)
Punch diameter, max.	89 mm
Material thickness, max. (punching)	8 mm
CNC Index Tool:	
- Number of index tool stations, max.	10 pcs (2 pcs included in delivery)
- Punch diameter, max.	89 mm
- Tool rotation, max.	58 r/min
Upward forming cylinder (option):	
Force	250 kN
Stroke	12 mm
Integrated right angle shear:	
- Material thickness, max. (shearing)	
aluminium	5 mm
steel Fe52 / Fe37	4 mm
stainless steel	3 mm
- Material thickness, min	0.5 mm
- Full stroke shear, X x Y, max.	800 mm x 1528 mm
- Blade clearance setting	manually by screws (optionally automatic)
Blank weight, max. ¹⁾	200 kg
Sheet clamps	pneumatic, 3 pcs
Sheet size, max. (X x Y)	3061 mm x 1528 mm
X-traverse	2584 mm (X-42...X2542)
Y-traverse	1560 mm (Y-25...Y1535)
Axis speed (X axis), max.	80 m/min
Axis speed (Y axis), max.	60 m/min
Traversing speed, max.	100 m/min
Hit speed, max. ²⁾	
1 mm between holes	1000 1/min
25 mm between holes	440 1/min
250 mm between holes	150 1/min
Punching accuracy according to LKP-7100 ³⁾	
Hole location deviation (X/Y axes), max.	0.1 mm
Hole-to-hole distance deviation (X/Y axes), max.	+/- 0.05 mm
Angular deviation (CNC Index Tool), max.	+/- 0.1 °
Positioning accuracy according to VDI/DGQ 3441 ⁴⁾	
Positional deviation P _a (X/Y axes)	0.08 mm (+/- 0.04 mm)
Positional scatter P _s (X/Y axes)	0.04 mm (+/- 0.02 mm)
Turret rotation	30 r/min
Tool change time	1...3 s
CNC control	Siemens Sinumerik 840D or Fanuc 16P
Program memory 16P	256 kB
840D	1000 kB
Machine weight	22.000 kg
Control unit weight	700 kg
Hydraulic unit drained weight	750 kg
Oil tank volume	330 l
Power supply	50 kVA
Power consumption, average ⁵⁾	30 kW
Compressed air consumption, average	30 NI/min
Compressed air pressure, min	6 bar
Oil cooler, cooling capacity max.	30 kW

Notes

- 1) Maximum acceleration/deceleration rate of X and Y axes depends on sheet weight. Part accuracy depends on acceleration/deceleration rate and sheet size and weight.
- 2) Hit speed depends on the programmed stroke length, ram speed and acceleration/deceleration rate and speed of axis.
- 3) Punching accuracy is tested according to the Finn-Power standard LKP-7100 by punching holes in a 1 m x 1 m sheet with 100 % speeds and by measuring the location (X/Y) and angle (CNC Index Tool) of the punched holes.
- 4) Positioning accuracy is measured according to the VDI/DGQ 3441 standard, using a laser measurement system, from the X and Y slides of the coordinate table of the machine.
- 5) Average power consumption is based on production run of a typical nesting program with 1.5 mm x 1250 mm x 2500 mm sheet size. It can be used when calculating energy costs.

We reserve the right to change technical specifications without notice in advance.



4.3. FINN-POWER Jetcam SG Expert 3 programming software

Standard delivery of TRS includes programming software with MRP and nesting functions. Hardware (PC-computer) is not included in the delivery.

Finn-Power JETCAM SG Expert 3 is one of the most versatile programming systems on the market, including:

- Graphic user interface
- Job management database
- Component management database
- Material type library
- Tool library
- Automatic tool placement
- DXF interface for import and export purpose
- IGES interface for import
- Dimensioning
- Full set of powerful tooling commands
- Tool grouping
- Automatic nesting of one 'rectangular' component at two angles
- Interactive semiautomatic nesting facilities
- Automatic tonnage overload checking
- Automatic checking of clamp protection areas
- Automatic checking of machine over-travel
- Machine macro commands
- Automatic tool order and path optimisation
- Full punching and shearing simulation, including repositioning
- Manual punching and shearing reorganising possibility
- One postprocessor for NC program output
- Production time estimation
- Loading/unloading commands

The programming is carried out as follows:

- Part geometry of a single part is either input in DXF or IGES format, or the part is drawn in the CAD section of JETCAM.
- The geometry is read in, and the NC program of a single part is generated automatically with the auto-tooling function by using the tools in the tool library or with interactive tooling commands.
- Part program is stored.
- In multiplying, the placing of the parts to the blank sheet is optimised automatically by turning the part by 90 degrees.
- Different parts can be placed on the blank sheet by using interactive nesting.
- After the blank sheet is filled with parts, the NC program is prepared with the postprocessor. Optimisation of tool utilisation and tool path is also made at this stage. Complete punching and shearing simulation can be carried out on the screen.

- A JOB sheet with used tools, material, production time, clamp positions etc. is printed out. It is also possible to print out the nests where you can see working area, clamp protection area and workpiece/workpieces.

Fully automatic nesting of dissimilar components where each component is treated as a rectangle. The MRP section of JETCAM, material and order management, is used to input production data and to maintain material storage data.

The MRP section includes information on the available materials as well as sheet sizes. It can also be used as storage inventory when material deliveries are updated to the program.

Orders into auto-nesting

- The number of parts to be produced is input in the MRP file as basic information.
- The parts are divided into the ones to be produced, and into filler parts. Filler parts are only used to maximise the sheet utilisation.

Auto-nesting

The following basic selections are made:

- Sheet size; either one size only or all sheet sizes available in stock can be used.
- Distance between parts and also between part and sheet edge
- Minimum percentage of material utilisation

Auto-nesting optimises the sheet utilisation up to the given percentage by placing in the parts and, if required, also filler parts. The NC programs are generated automatically. From the auto-nesting information page, the operator can see the sheet size, program number, number of passes, material utilisation, produced parts as well as production time.

4.4. PowerLink MMC

The PowerLink MMC delivery comprises an industrial PC (incl. accessories) already installed in the machine as well as the hardware, operating systems and Windows compatible PowerLink software needed for data transfer. The main task of the PowerLink cell control is to seamlessly integrate the NC programming into the operation of the machine. Further, PowerLink provides an information system which allows the operator to open operation manuals or study alarm descriptions illustrated by images.

NC program management

- Management of directories and files in CNC memory and on hard disk
- Downloading and activating of NC programs
- Visual display and editing of NC programs' setting data

Alarms and time monitoring

- Description and acknowledgement of PLC and NC alarms
- Description of most alarms is illustrated by images
- Monitoring of CNC time on a daily basis

Operation manuals

- All user documentation for Finn-Power machines

Work queues

- Expanded automation cycles by combining NC programs into work queues
- Assessment of the machine's state of loading
- Easy-to-use work queue editor
- Automatic and manual sorting and stacking management (C1500 and STS3015)
- The system allows to execute work queues in a given order while new tasks are prepared

5. Tool holders

5.1. Tool system

The turret of the punch press comes with separate, interchangeable tool holders, which allows for making the turret layout to customer specification. The turret can accommodate tool holders of several manufacturers, and a damaged tool holder can be easily replaced. The turret plates are equipped with holes for tool holders; the holes are either 110 mm or 135 mm in diameter.

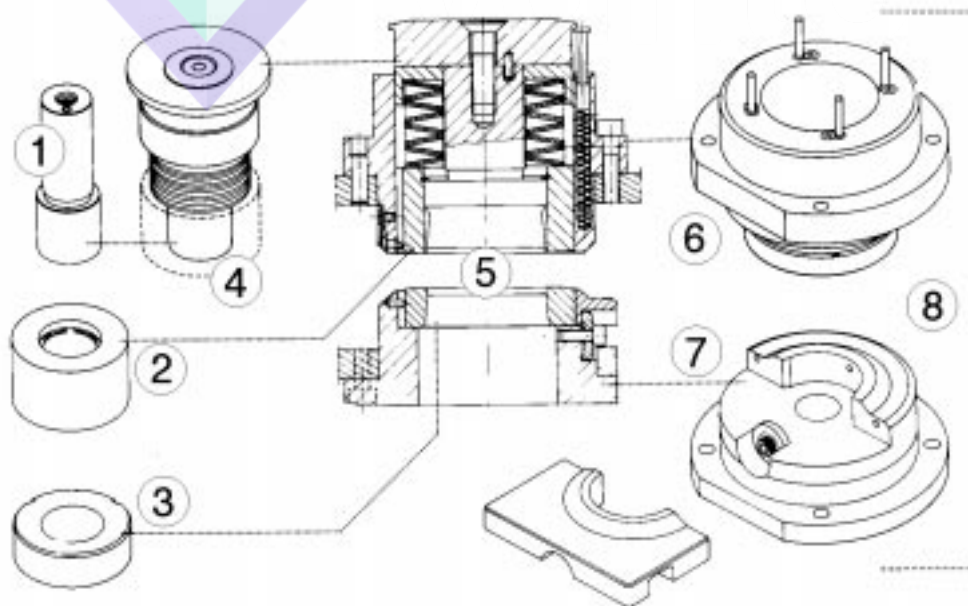
Tool holders are available for the following tools (main source in brackets):

AM=	Thick Turret	(Wilson Tool Int. Inc. USA / MATE Precision Tooling, USA)
SU=	Supra PAE/Nova Europe	(Supra SA, France / MATE Precision Tooling, USA)
NO=	Nova USA	(MATE Precision Tooling, USA)
TH=	Thin Turret	(Wilson Tool Int. Inc. USA)
FA=	Fabricating	(Wilson Tool Int. Inc. USA)

Parts of tool system

Punching tools of various manufacturers

Finn-Power tool holders for tools of various manufacturers



- 1 Punch
- 2 Stripper
- 3 Die
- 4 Guide assembly
- 5 Tool station
- 6 Upper tool holder
- 7 Lower tool holder (die holder)
- 8 Tool holders (pair)

MULTI-TOOL tool station

The turret can be equipped with MULTI-TOOL tool stations to increase the amount of tools in the turret.

- MT24-8 station accommodates 24 tools with max. 8 mm diameter
- MT8-24 station accommodates 8 tools with max. 24 mm diameter
- MT10-16 station accommodates 10 tools with max. 16 mm diameter
- MT6-A/135 station accommodates 6 Thick Turret (AM) tools with max. 12.7 mm diameter

Finn-Power MULTI-TOOL punches and dies used in MULTI-TOOL stations MT24-8, MT8-24 and MT10-16 are available from all of our tool suppliers. In the MT6-A/135 station, normal ½ IN (size A) Thick Turret tools are used. All MULTI-TOOL stations are mounted in a 135 mm turret hole.

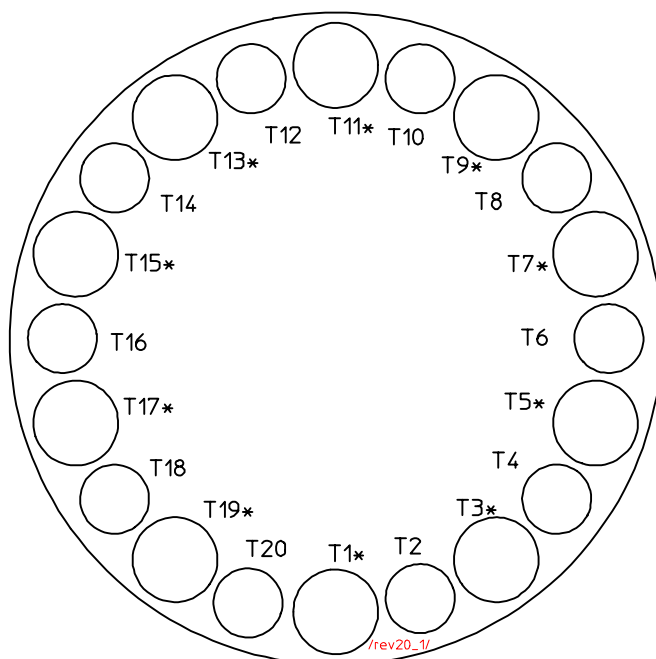
Forming stations (option)

The turret punch press can be furnished with an optional forming cylinder on the lower side and with a desired amount of forming stations. The forming stations are mounted in a 135 mm turret hole. By means of an adapter, also normal punching dies can be used in forming stations.

5.2. Turret

The punch press comes with a 20-station turret. The turret plates have holes for two tool holder sizes, with a diameter of 110 mm respective 135 mm, 10 pieces of each.

The figure below shows the positions of turret holes (135 mm holes are marked by an asterisk). You can use this figure for planning the turret layout by marking the tool holders in it.



5.3. Thick Turret tools (AM)

Tool holders for 110 mm holes

Fixed	Thick Turret tool	Max. punch diameter
A	A (0.5 IN)	12.7 mm (0.50 IN)
B	B (1.25 IN)	31.75 mm (1.25 IN)
C	C (2 IN)	50.8 mm (2.00 IN)

Tool holders for 135 mm holes

Fixed	CNC Index Tool	Forming station	Thick Turret tool	Max. punch diameter
B/135	Bi	Bf ^(*)	B (1.25 IN)	31.75 mm (1.25 IN)
C/135	Ci	Cf ^(*)	C (2 IN)	50.8 mm (2.00 IN)
D	Di	Df ^(*)	D (3.5 IN)	88.9 mm (3.50 IN)

^(*) Note! When a normal punching tool is used in a forming station, an adapter is necessary for mounting the die in the forming station. In Cf and Df stations, only round punching tools can be used together with an adapter; in Bf station also forming tools. In Df station, max. diameter of punching tool (scrap piece) is 75 mm (3 IN).

Forming station Df can be mounted only in turret stations No. 3, 7, 11, 15 and 19.

MULTI-TOOL stations (135 mm holes)

Type	Tools	Max. punch diameter
MT24-8	24 pcs	8 mm (0.314 IN)
MT8-24	8 pcs	24 mm (0.944 IN)
MT10-16	10 pcs	16 mm (0.630 IN)
MT6-A/135	6 pcs	12.7 mm (0.50 IN) Thick Turret tool)

5.4. Supra PAE / NOVA Europe tools (SU)

The dies of the Nova tools supplied in Europe are similar to the Supra PAE ones. Due to this, the guide assemblies and dies of Nova Europe tools fit in the same tool holders (holders 35...80) as Supra PAE tools. It is even possible to use Supra PAE and Nova Europe tools at the same time in a punch press. However, the punches, strippers and parts of guide assemblies are not interchangeable, i.e. only a Nova punch fits in a Nova guide assembly.

Supra PAE tool

Tool holders for 110 mm holes

Fixed	Supra tool	Max. punch diameter
35	PAE 35	35 mm (1.378 IN)
50	PAE 50	50 mm (1.968 IN)
65	PAE 65	65 mm (2.559 IN)

Tool holders for 135 mm holes

Fixed	CNC Index Tool	Forming station	Supra tool	Max. punch diameter
	35i	35f (**)	PAE 35	35 mm (1.378 IN)
	50i	50f (**)	PAE 50	50 mm (1.968 IN)
65/135	65i	65f (**)	PAE 65	65 mm (2.559 IN)
80	80i	80f (**)	PAE 80	80 mm (3.150 IN)*

*NOTE! In tool sizes 80 and 80i, the guide assembly is Supra PAE80 and the die is Thick Turret D. An adapter (order No. 69343) is available for Supra PAE80 die. NOTE! Supra PAE20 tool cannot be used!

Nova Europe tools*Tool holders for 110 mm holes*

Fixed	Nova Europe tool	Max. punch diameter
16	A	15.9 mm (0.625 IN)
35	B	25.4 mm (1.000 IN)
50	C	38.1 mm (1.500 IN)
65	E	65 mm (2.559 IN)

Tool holders for 135 mm holes

Fixed	CNC Index Tool	Forming station	Nova Europe tool	Max. punch diameter
	16i		A	15.9 mm (0.625 IN)
	35i	35f (**	B	25.4 mm (1.000 IN)
	50i	50f (**	C	38.1 mm (1.500 IN)
65/135	65i	65f (**	E	65 mm (2.559 IN)
80	80i	80f (**	G	88.9 mm (3.50 IN)*

*NOTE! In tool sizes 80 and 80i (Nova G), the guide assembly is Nova G and the die is Thick Turret D.

(** Note! When a normal punching tool is used in a forming station, an adapter is necessary for mounting the die in the station. Only round punching tools can be used. In 80f station, max. diameter of punching tool (scrap piece) is 75 mm (3 IN). 80f station can only be mounted in turret stations No. 3, 7, 11, 15 and 19.

MULTI-TOOL stations (135 mm holes)

Type	Tools	Max. punch diameter
MT24-8	24 pcs	8 mm (0.314 IN)
MT8-24	8 pcs	24 mm (0.944 IN)
MT10-16	10 pcs	16 mm (0.630 IN)

5.5. Nova USA tools (NO)

Nova USA tools employ different dies from SUPRA PAE/NOVA Europe tools.

Tool holders for 110 mm holes

Fixed	Nova USA tool	Max. punch diameter
A	A	15.9 mm (0.625 IN)
B	B	25.4 mm (1.000 IN)
C	C	38.1 mm (1.500 IN)
E	E	64 mm (2.520 IN)

Tool holders for 135 mm holes

Fixed	CNC Index Tool	Forming station	Nova USA tool	Max. punch diameter
	Bi		B	25.4 mm (1.000 IN)
C/135	Ci	Cf (*)	C	38.1 mm (1.500 IN)
E/135	Ei	Ef (*)	E	65 mm (2.559 IN)
G/135	Gi	Gf (*)	G	88.9 mm (3.50 IN)

(* Note! When a normal punching tool is used in a forming station, an adapter is necessary for mounting the die. In Nova USA dies, the guide pin is on the bottom side of the die, i.e. the adapter ring comes with angular positioning, and also forming dies can be used. In a Gf station, max. diameter of punching tool (scrap piece) is 75 mm (3 IN). A Gf station can be mounted in turret stations Nr. 3, 7, 11, 15, and 19 only.

MULTI-TOOL stations (135 mm holes)

Type	Tools	Max. punch diameter
MT24-8	24 pcs	8 mm (0.314 IN)
MT8-24	8 pcs	24 mm (0.944 IN)
MT10-16	10 pcs	16 mm (0.630 IN)

5.6. Thin Turret tools (TH)

Tool holders for 110 mm holes

Fixed	Thin Turret tool	Max. punch diameter
1.25	1.25 IN	31.75 mm (1.25 IN)
2	2 IN Wilson	50.8 mm (2.00 IN)

Tool holders for 135 mm holes

Fixed	CNC Index Tool	Forming station	Thin Turret tool	Max. punch diameter
1.25/135	1.25i	1.25f (*)	1.25 IN	31.75 mm (1.25 IN)
	2i		2 IN Wilson	50.8 mm (2.00 IN)
3.5	3.5i	3.5f (*)	3.5 IN	88.9 mm (3.50 IN)

(* Note! When a normal punching tool is used in a forming station, an adapter is necessary for mounting the die. Together with the adapter, only round punching tools can be used in 3.5f stations and also forming tools in 1.25f stations. In 3.5f stations, max. diameter of punching tool (scrap piece) is 75 mm (3 IN). Forming station 3.5f can be mounted in turret stations No. 3, 7, 11, 15 and 19 only.

MULTI-TOOL stations (135 mm holes)

Type	Tools	Max. punch diameter
MT24-8	24 pcs	8 mm (0.314 IN)
MT8-24	8 pcs	24 mm (0.944 IN)
MT10-16	10 pcs	16 mm (0.630 IN)

5.7. Fabricating tools (FA)

Tool holders for 110 mm holes

Fixed	Fabricating tool	Max. punch diameter
1.25	1.25 IN	31.75 mm (1.25 IN)
2	2 IN Wilson	50.8 mm (2.00 IN)

Tool holders for 135 mm holes

Fixed	CNC Index Tool	Forming station	Fabricating tool	Max. punch diameter
1.25/135	1.25i	1.25f (*)	1.25 IN	31.75 mm (1.25 IN)
	2i		2 IN Wilson	50.8 mm (2.00 IN)
ST3.5	ST3.5i	ST3.5f (*)	3.5 IN	88.9 mm (3.50 IN)

(* Note! When a normal punching tool is used in a forming station, an adapter is necessary for mounting the die. Together with the adapter, only round punching tools can be used in ST3.5f stations and also forming tools in 1.25f stations. In ST3.5f stations, max. diameter of punching tool (scrap piece) is 75 mm (3 IN). Forming station ST3.5f can be mounted in turret stations No. 3, 7, 11, 15 and 19 only.

MULTI-TOOL stations (135 mm holes)

Type	Tools	Max. punch diameter
MT24-8	24 pcs	8 mm (0.314 IN)
MT8-24	8 pcs	24 mm (0.944 IN)
MT10-16	10 pcs	16 mm (0.630 IN)

An example of turret layout with Thick Turret tools:

Tool holders

Fixed tool holders:

- B 5 pcs
- C 5 pcs
- D 1 pc

Index tool holders:

- Bi 2 pcs
- Ci 1 pc
- Di 2 pcs

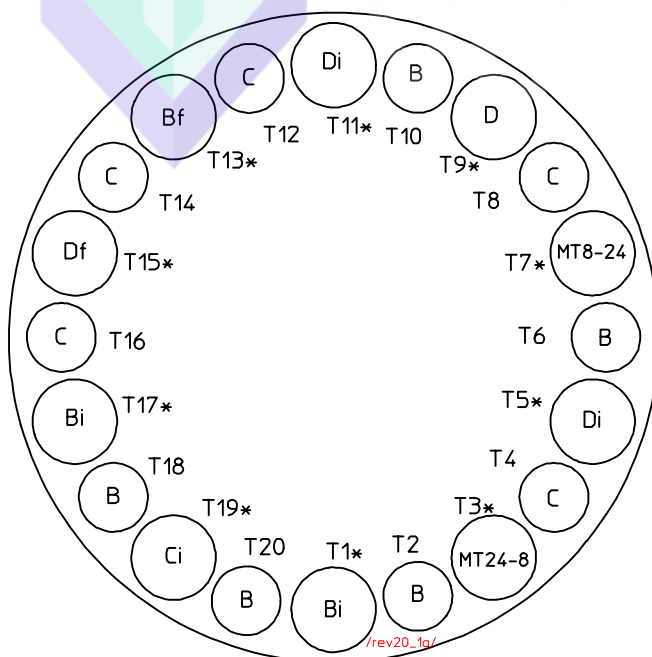
MULTI-TOOL:

- MT8-24 1 pc
- MT24-8 1 pc

Forming stations:

- Bf 1 pc
- Df 1 pc

The MT8-24 station accommodates 8 and MT24-8 24 tools, i.e. the turret in the example provides 50 tools in all.



6. Installation

6.1. General

The Finn-Power punching and shearing equipment is installed and commissioned under the supervision of the manufacturer's representative and according to his instructions.

The machine must not be used before the commissioning and initial service have been carried out.

The turret punch press is delivered without hydraulic oil.

Hydraulic oil recommendations:

The DIN 51524 types are HLP and HVLP, and the corresponding ISO 6743/4 types are HM and HV. The vegetable oil type is HETG (DIN 51524). For example the following oils can be used:

- AVIA
 - Avilub RSL 46
 - Avilub HVI 46
 - Avilub Hydraulic BIO32
- BP
 - Energol HLP 46
 - Bartran HV 46
- CASTROL
 - Hyspin AWS 46
 - Hyspin AWH 46
 - Biotec HVX
- ESSO
 - Nuto H 46
 - Univis N46
 - Hydraulic Oil PFL
- MOBIL
 - Mobil DTE 25
 - Mobil DTE 15
 - EAL 224 H
- SHELL
 - Tellus Oil 46
 - Tellus Oil T46
 - Naturelle HF-R32

Volume: 330 l

6.1.1. Filling up the oil tank

The hydraulic system of the equipment delivered by Finn-Power has been cleaned up with special care at the factory during the assembly stage. For the system's long life time and reliable functioning, it is **VITAL** that the achieved level of cleanliness be kept. Therefore, it is imperative to use the apparatuses and methods detailed in these instructions for transport and installation, for filling up and refilling the oil tank, and for clarifying the oil.

Procedure

During transport and storage, keep the hoses, pipes, and other connectors of the hydraulic system carefully closed. Ensure that the joints are clean before putting the parts together. Use appropriate clean and lint-free cloth for cleaning the joints.

- For filling the oil tank, always use a separate filling pump equipped with a filter with **at least 3 µm filtration efficiency**. It is recommended to replace the filling pump filter before filling the tank or replenishing large amounts of oil so that the by-pass of the filter is not activated.
- Always fill the oil tank through the bayonet coupling, see Fig. 1. Then the oil flows into the tank through the cooling system filter and, again, part of the impurities is filtered out of the oil.
- Connect a separate filtering unit beside the tank according to Fig. 2. Let the oil in the tank circulate through the separate filtering unit for at least one hour before starting the hydraulics.
- To replenish oil in the hydraulic system, follow the same steps or, exceptionally, use the pump of the cooling circulation.

NOTE! Never fill the tank without filtering the oil. The oil delivered by an oil company is nowhere near pure enough to be used in a servo hydraulic system.

Impure oil always speeds up wear and causes malfunctions and damages in the cylinder and valves.

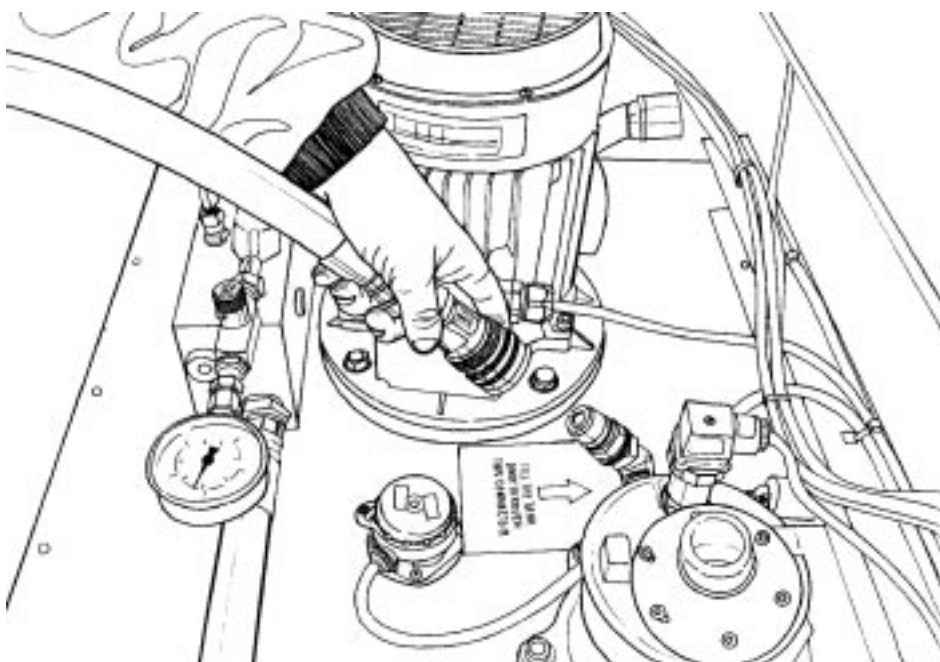


Fig. 1. Filling up the oil tank through the bayonet coupling.

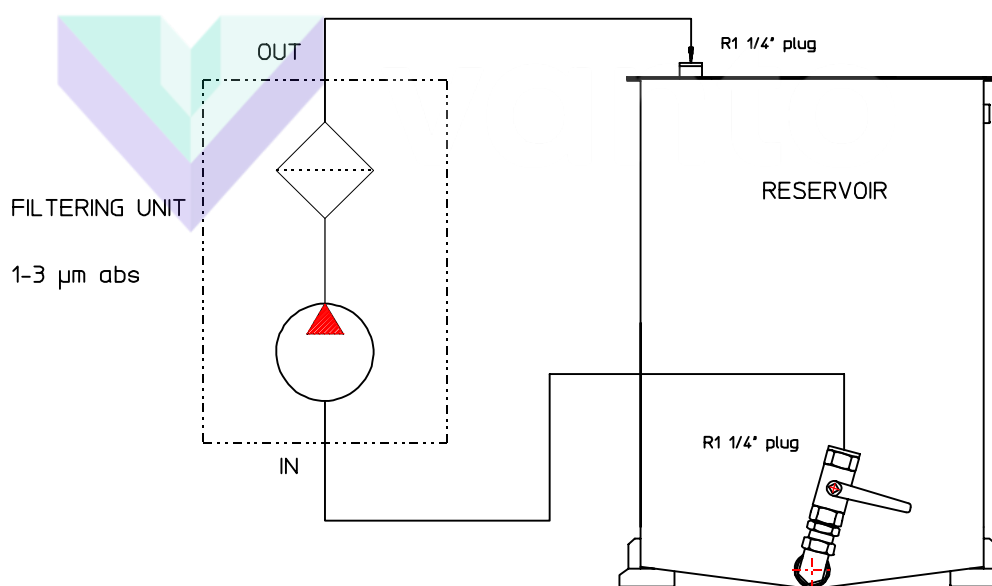


Fig. 2. Principal diagram of the separate filtering unit

6.2. Transportation and storing of the machine

6.2.1. Transportation

Follow the hoisting and handling instructions given in maintenance and packing instructions. The turret punch press is to be hoisted during installation and transportation by a crane from the hoisting points situated in the upper frame. There are two holes, 80mm in diameter, through the upper frame. A steel bar (of min. diameter 70 mm and min. length 1300 mm) can be pushed in through these holes for hoisting.

The weight of the punch press is either 10.000 kg (TRS5) or 11.000 kg (TRS6). The weight of the right angle shear is 11.000 kg.

6.2.2. Hoisting the control unit

The control unit is equipped with four (4) hoisting links on the top. The weight of the control unit is 700 kg.

6.2.3. Hoisting the hydraulic unit

The hydraulic unit is equipped with four (4) hoisting links at the top corners. The empty weight of the hydraulic unit is 750 kg, filled with oil 1.000 kg.



6.2.4. Hoisting points

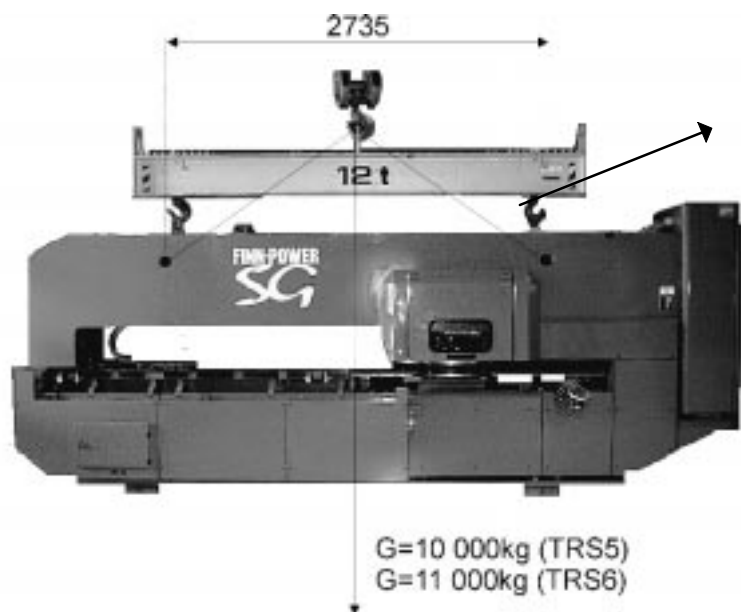


Fig. Hoisting points of turret punch press

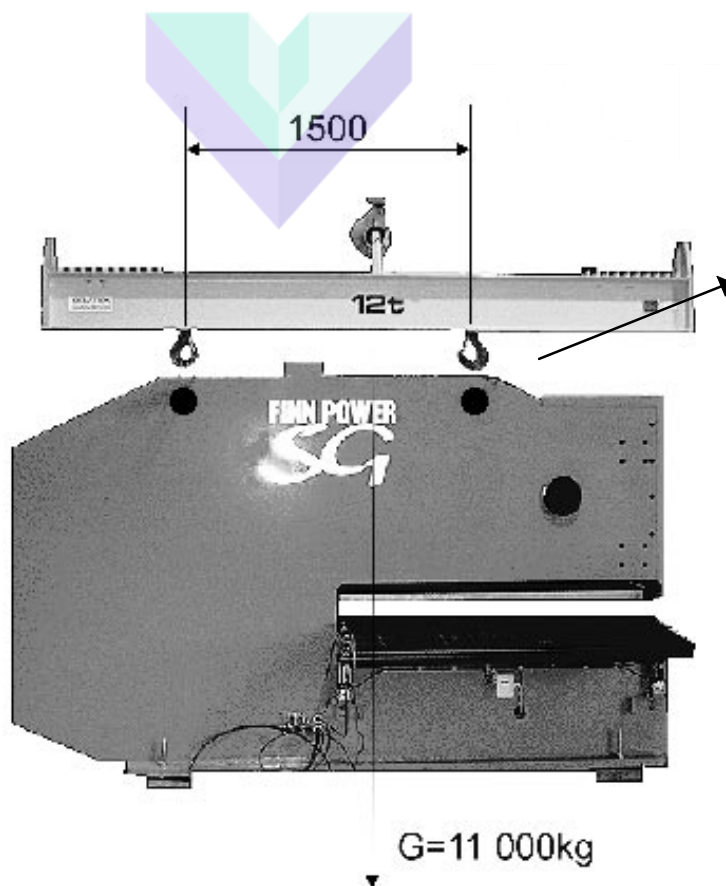


Fig. Hoisting points of right angle shear

6.2.5. Storing

The machines have been protected against rust for the time of transportation. For any longer-term storing, they require additional rust protection. The packed machines are to be stored sheltered from rain, preferably in dry indoor conditions.

6.3. Installation site

6.3.1. Operating conditions

Install the machine in a dry and dust-free space with stable temperature. There must not be any machines or equipment generating vibration nearby, or precautions must be taken to isolate the machine from outside vibration sources.

Temperature range allowed +15 °C...+30 °C (59 °F...86 °F) (with Siemens 840D)

Temperature range allowed +15 °C...+38 °C (59 °F...100 °F) (with Fanuc 16P)

Relative air humidity 20 %...75 %, temporarily max. 90 %

The accuracy specified in LKP-7100 standard is guaranteed in temperatures +17 °C...+23 °C (63 °F ... 73 °F).

On machines equipped with Siemens 840D control, an optional cooler is available for the servo cabinet. With this cooler, max. ambient temperature is +38 °C (100 °F). In machines equipped with Fanuc 16P control, this cooler is not needed.



6.3.2. Levelling of the machine

The machine stands on four feet. The machine is levelled by adjusting the height of the feet. Special measuring instruments are needed for levelling the machine. The levelling has to be done by authorised Finn-Power Service.

Requirements on floor (recommendation):

Floor description

Concrete slab

- Strength class of concrete C30/37, Eurocode 2
- minimum thickness 200 mm

Floor flatness

- Flatness of floor under the machine must be < 15 mm or in the area of the whole system < 30 mm.

Installation area

- No joints within the machine area

Density

- Surface of concrete has to be oilproof.

Floor loads:

Static loads

Static loads caused by the equipment (F_{st}) are marked in the installation / load diagram.

Prior to the installation, ensure the floor's load capacity within the area of the whole equipment. When required, a single foundation must be laid for the machine (see foundation drawing).

6.4. Electrical supply (E1)

6.4.1. Supply voltage

Supply voltage required by the machine:	3 x 400 V and PE
Supply voltage frequency:	50 Hz or 60 Hz
Supply voltage fluctuation:	max. +/- 7%

For use of a leakage current switch, see Chapter 6.4.4.

If the supply voltage at the Customer deviates from the voltage mentioned above, an auto-transformer is needed to convert the supply voltage into 400 VAC. With the auto-transformer (75 kVA, 50/60 Hz, 3~+PE) delivered with the equipment, the following voltages can be converted into 400 VAC:

200V, 208V, 220V, 230V, 380V, 415V, 440V and 460V.

6.4.2. Power supply

Cables and front fuses must be selected in accordance with the electrical safety regulations valid in the country concerned.

Sizes of cables cross-sections and fuses given in this document are based on EN and IEC regulations.

A machine **without auto-transformer** has to be equipped with a fast front fuse. The front fuse and cable size for PVC-insulated copper cable in mounting method E, when mounting one 3-phase cable, loaded with alternating current, in the cable rack in +40°C ambient temperature:

<i>Supply voltage</i>	<i>Supply cable</i>	<i>Front fuse</i>
3 x 400 V	4 x 35 mm ²	3 x 100 A

A machine **with auto-transformer** has to be equipped with fast front fuses according to the specification below. It describes the front fuse and cable sizes for PVC-insulated copper cable in mounting method E, when mounting one 3-phase cable, loaded with alternating current, in the cable rack in + 40°C (200V, +30°C) ambient temperature.

The machine can be protected by cables and front fuses of smaller size, given in parentheses below, but the protection will no longer be selective. However, we recommend a selective protection.

<i>Voltage</i>	<i>Supply cable</i>	<i>Front fuse</i>
200 V	4 x (95) 95 mm ²	(160 A) 200 A (+ 30 °C)
208 V	4 x (95) 95 mm ²	(160 A) 200 A (+ 30 °C)
220 V	4 x (95) 95 mm ²	(160 A) 200 A (+ 30 °C)
230 V	4 x (95) 95 mm ²	(160 A) 200 A (+ 30 °C)
380 V	4 x (35) 70 mm ²	(100 A) 125 A
415 V	4 x (25) 35 mm ²	(80 A) 100 A
440 V	4 x (25) 35 mm ²	(80 A) 100 A
460 V	4 x (25) 35 mm ²	(80 A) 100 A

Cable between auto-transformer and equipment: 4 x 35 mm².

The connectors for the power supply of the transformer are intended for connecting copper cables only.

6.4.3. Phase order

The phase order must be correct. If it is wrong, the motor of the hydraulic unit will rotate in the wrong direction and the hydraulic system will not work. Correct by interchanging any two phases at the main switch.

6.4.4. Use of a leakage current switch

We do not recommend to use a leakage current switch in the network before the power supply for the machine.

If the local law requires a leakage current switch, make sure

- to use an electronic leakage current switch so that only the phase conductors and the neutral (if any) are taken through the sum current transformer (toroid).
- that leakage current tripping limit is set at least at 500 mA.
- that a tripping delay of ~ 100 ms is set for leakage current tripping.

Lillbacka Corporation has tested e.g. the following leakage current circuit breakers that function correctly:

- Merlin-Gerin Vigirex RH 328A + toroid type IA
- Muuntosähkö VR-12 + toroid VMIK-100.

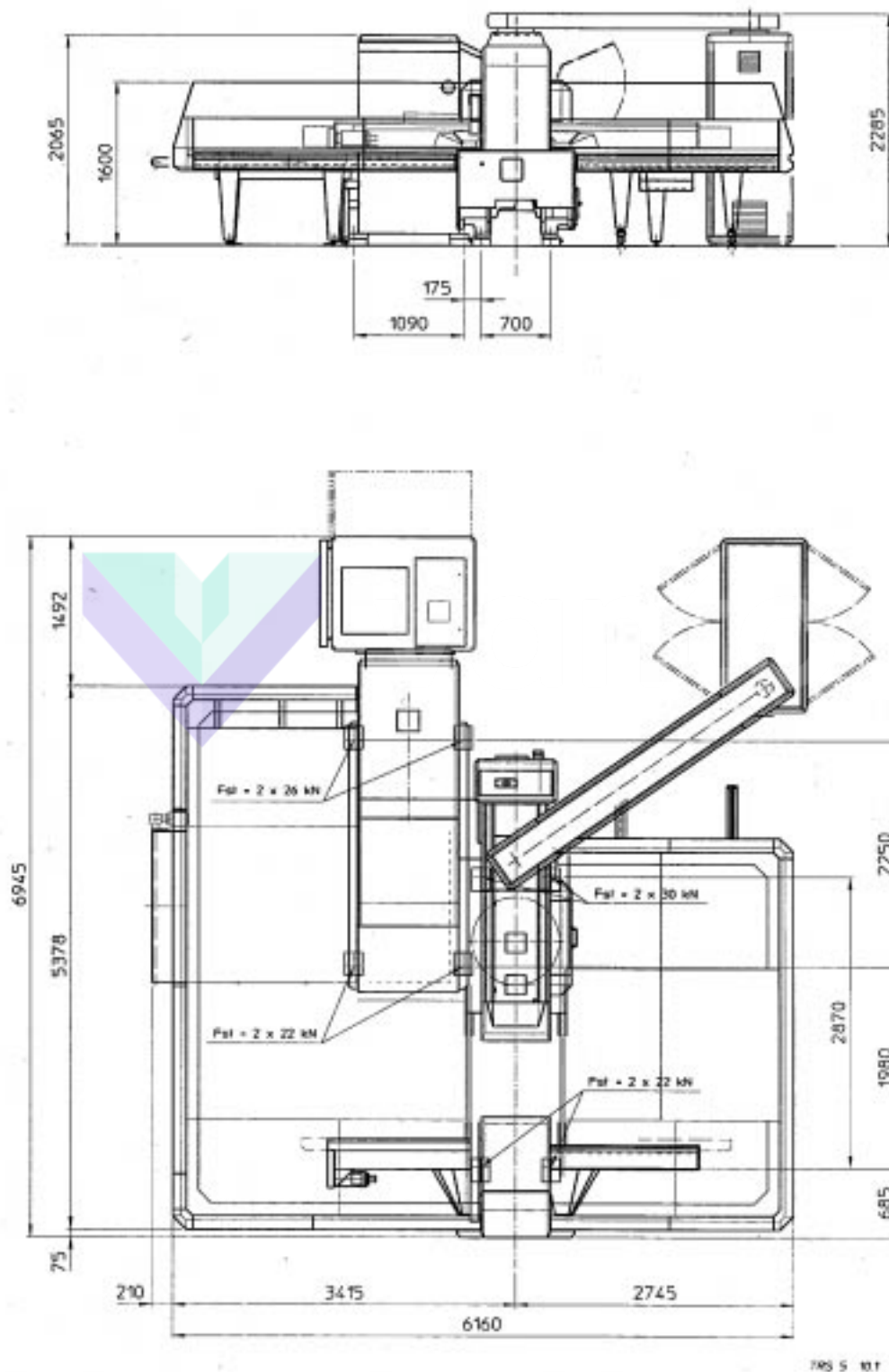
Do not use electromechanical leakage current switches, as they trigger false alarms.

6.5. Compressed air supply (P1)

Compressed air connections for all devices have been gathered together by a connection block, to which the external connection (P1) to the compressed air supply system is made. For further details, please refer to Operation Manual for Load/Unload Equipment.

7. Dimensional drawings

7.1. Dimension: TRS5



8. Foundation drawing

