MINSTER®
THE MINSTER MACHINE COMPANY

ORDER INFORMATION

MINSTER ORDER NO:	030352	**ORDER DATE:**	1-25-2005
PROPOSAL NO:		**REVISION DATE:**	
CUSTOMER ORDER NO:	23712	**REVISION LEVEL:**	1.00
SOLD BY:	PRESS MASTERS LLC (PMC)	**REG MGR:**	JBG
MKT SEGMENT:	MGH	**PROJECT MGR:**	JBG

MINSTER EQUIPMENT SERIAL NUMBERS:

PRESS	E2H-350-30352
FEED	18-51196
THREAD TABLE	13-81398
STRAIGHTENER	13-50783
REEL	13-70922

CUSTOMER INFORMATION

SOLD TO CUSTOMER:
00-010-4612
OMEGA MOTION, INC.
241 JAMIE WHITTEN BLVD.
SALTILLO, MS 38866

SHIP TO CUSTOMER:
00-010-4612
OMEGA MOTION, INC.
241 JAMIE WHITTEN BLVD.
SALTILLO, MS 38866

ULTIMATE DESTINATION: OMEGA MOTION, INC. / SALTILLO, MS / USA

NOTES

ACKNOWLEDGEMENT

TABLE OF CONTENTS

GENERAL SPECIFICATIONS

Control Specification	ANSI-B11.1 and NFPA-79
System Voltage	480 V, 3 Phase, 60 Hz
Paint Color	Birch White
Material Direction	Right to Left
Legend Plate Language	English
Service Manual Language	English
Service Manuals Provided	(2) Copies

GENERAL SPECIFICATIONS APPLY TO ALL
EQUIPMENT INCLUDED IN THIS ORDER

Customer Specifications

(Customer Provided Information)

DIE SPECIFICATIONS

Maximum R-L x F-B	No Information Available
Minimum R-L x F-B	No Information Available
Maximum Closed Height	No Information Available
Minimum Closed Height	No Information Available
Maximum Weight	No Information Available
Minimum Weight	No Information Available
Maximum Planned SPM	No Information Available
Minimum Planned SPM	No Information Available
Minimum Feedline Height over Bolster	No Information Available
Maximum Feedline Height over Bolster	No Information Available
Maximum Tons	No Information Available
Distance Off Bottom	No Information Available

MATERIAL SPECIFICATIONS

Maximum Width x Thickness	32.0 x 0.172 in (30,000 PSI yield)
Maximum Thickness x Width	No Information Available
Minimum Width x Thickness	No Information Available
Minimum Thickness x Width	No Information Available
MATERIAL TYPE	No Information Available

SURFACE FINISH	No Information Available

COIL

Maximum Coil Weight	No Information Available
Maximum Coil ID	No Information Available
Maximum Coil OD	No Information Available

PART TO BE MADE SPECIFICATIONS

Part Description	No Information Available
Maximum Progression x SPM	No Information Available
Material Thickness	No Information Available
Maximum SPM x Progression	No Information Available
Material Thickness	No Information Available

*Note: The proposed equipment may not meet this customer specification. Consult Minster for detailed information

Press and Feed
Integration Specifications

(See attached for individual equipment specification)

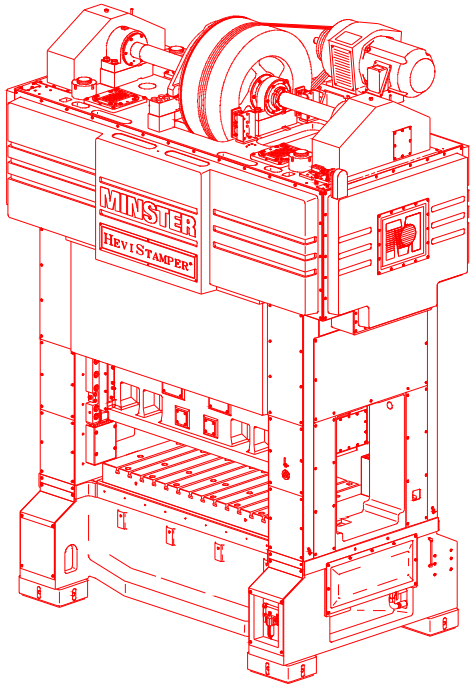
Press Floor to Top of Bolster	52.59 in
Press Pit Depth	None
Press Mount Height	No Information Available
Minimum Feed Line Height Over Bolster	5.41 in
Maximum Feed Line Height Over Bolster	17.41 in
Maximum Stock Width	32.0 in
Material Loop Pit Depth	No Information Available

Special Notes

1. Reference Press E2H-350-30271

2. Omega Motion will provide air & electric drops, oil & hydraulic fluid, and coil line connections.

E2H HeviStamper



NOTE: Above is for reference only and may not be representative of the equipment specified within.

E2H HeviStamper

Specifications (INCH)

Press Specifications

Model Number	E2H-350-86×47-SG
Force × Distance off Bottom	350 ton × 0.236 in,w/ ASM
Crankshaft Extension Location	None
Drive Arrangement	Single-Gear Twin-End
Drive Location	Twin Drive
Lube Unit Location	Rear Leg
Approximate Press Mass	140,000 lb
Scale and Display Units	Inch
Shop Air Pressure, Minimum	85 psi

Press Slide Specifications

Stroke Length	9.84 in
Speed Range	30 - 100 stroke/min
Quick Access Slide Range	2.95 in
Area of Slide, R-L × F-B	86.6 × 47.4 in
Slide Face Machining	Standard
Recommended Max Upper Die Mass	5500 lb

Press Bolster Specifications

Bolster Plate Material	Steel
*Special (4097)*Bolster Plate Thickness	9.09 in
Area of Bolster, R-L × F-B	86.6 × 47.4 in
Opening in Bolster, R-L × F-B	None
Bolster Plate Machining	Standard

Press Frame Specifications

Upright Passline Opening, F-B	33.5 in
Area of Bed, R-L × F-B	86.6 × 47.4 in
Opening in Bed, R-L × F-B	76.8 × 15.0 in
Bed Deflection at 50% of Die Area	0.0012 in/ft
*Special (4098)*Shutheight, Maximum (SDAU)	19.6 in., on Bolster
Shutheight Adjustment	6.89 in
Approx Clearance, Mount to Bottom of Bed	4.9 in
Approx. Distance Mount to Top of Bed	42.9 in
Approx. Floor Area, R-L × F-B	133 × 91.3 in

E2H HeviStamper

Specifications (INCH) continued

Press Control Specifications

Drive Motor Power, Speed	60 hp, 1500 - 1800 rpm
Hyd Pump Motor Power	10 hp
Lube Pump Motor Power	5 hp
Incoming Power Drop	Control Pedestal
Control Pedestal Location	Feed Side
Control Station Location	Pedestal Mounted
Run Station Location	Pedestal Mounted
Setup Station Location	Right Hand Upright
Limit Switch Type	Programmable
Control Operation Mode	Inch-Setup-Continuous
PMC Control Language	English
Press Mounted Stop Control PB	(2) Front and (2) Rear
Press Mounted Top Stop PB	(1) Front and (1) Rear

Features

Four Piece High Tensile Massive Cast Iron Frame component materials chosen to reduce overall press vibration level.

Die Lubricant Troughs cast integral with bed

Feed Pads on right and left side of bed for convenience when cabinet style feeding equipment is furnished.

Two Point Full Eccentric Crankshaft reduces the stamping load deflection.

Alternative Slide Motion Alternate Slide Motion feature provides the capability to reduce slide velocity during the working portion of the stroke while still maintaining the same strokes per minute. Reduced slide velocity can potentially improve stamping performance by improving draw speed, reducing punch impact force and associated vibration, reduced heat generation and lessen snap-thru shock. NOTE: Alternative Slide Motion is not available with the Adjustable Stroke feature on E2H type presses.

Additional Main Bearings included to reduce the eccentric shaft deflection from reverse load encountered in heavy blanking applications.

E2H HeviStamper

Features (continued)

Combination Hydraulic Flex Disc Clutch and Brake includes dual clutch valves. Provides quick starts and reduced stopping times for higher production speeds and is designed with thermal capacity for high clutch engagement rates. Replaceable segmented bolt on clutch and brake linings.

Dual Air Operated Flywheel Brakes with large surface area for long life, interlocked with stop circuit eliminates coasting resulting in quicker access to die area. Brake disc surface area allows units to be used for press slow down.

Pressurized Monitored Lubrication of all main and connection bearings have full film lubrication with pressurized oil supplied to each bearing within the crankshaft. The system is designed to stop the press in the event of improper oil pressure. A variable speed lube pump motor with pressure transducer feedback is used in a closed loop system configuration to maintain constant oil pressure through plant ambient and press temperature variations. The consistent oil film gives the ultimate dynamic bearing stiffness and longevity resulting in better bottom-dead-center repeatability and die life. Proper lubrication supply is ensured through a combination of pressure transducers and flow switches. Includes vacuum switch to monitor condition of filter.

Hydrostatic Gibs provide increase resistance to slide tipping and off-center loading. Pressurized oil forces the slide to stay centered. Becomes even more rigid as speeds increase. Eight bronze-lined gibs provide guiding F-B and L-R.

Four (4) Cylinder Counterbalance System in Crown lifts at each corner of the slide to eliminate tipping and/or twisting of the slide. The system statically balances the slide and upper die weight. It is not intended to provide a dynamic inertia balance.

Wrist Pins designed for 40% of press tonnage snap through.

Wrist Pin Bearings are fed with high-pressure oil to maintain full film lubrication and reduce servicing of critical components.

Hydraulic Motorized Shutheight Adjustment with Digital Readout

Hydraulic Slide Lockup eliminates clearances in slide adjustment parts to reduce the effects of snap-through forces and punch penetration, thus reducing vibration.

E2H HeviStamper

Features (continued)

Quick Lift Slide for quick die access. Facilitates die inspection and material threading. Ideal when shorter stroke applications are required.

Slide Face Machined with 1.0 in. general purpose T-slots F-B on 6.0 in. centers starting on center.

Bolster Plate Machined with 1.0 in. general purpose T-slots F-B on 6.0 in. centers starting on center.

Two (2) Die Safety Blocks Length is equal to the shutheight on the bolster with the stroke up and the adjustment at mid-range. Blocks are mounted on the pedestal.

Press Shock Mounts Set of (4) Vibro Dynamic elastomer style press mounts.

***Special* Link Black Max Die Space Guard** Light curtain package consists of four (4) light sources and four (4) receivers mounted on front and rear of press. System consists of vertical and horizontal light sources mounted on left front and right rear of press with vertical and horizontal receivers mounted on right front and left rear of press. Light beam located as defined by ANSI-B11.1 regulations, from outer edge of press bolster. If customer'' die assembly extends beyond the press bolster, it will be the customer'' responsibility to properly relocate the device to meet the application. Press operation will be interrupted in all modes if any light curtain beam is broken.

E2H HeviStamper

Features (continued)

Minster Production Management Press Control V8 includes the following features:

- Color Touch Screen
- Allen Bradley SLC 5/04 PLC
- 16-Pole Programmable Limit Switch
- Brake Monitor / Press Stopping Time Readout
- 75 Tool Storage Capacity with 7-Digit Numeric I.D. Codes
- System Prompts and Diagnostic Messages
- Lube Pump On/Off Indicator
- Motor Start/Stop Control
- Motor Speed Control
- Motor Speed and Load Display
- Slide Adjust Function Indicators
- Dual Clutch Valve Monitor
- Stock Lubricator Interface Output
- Auxiliary output interface for secondary control elements (2nd blowoff, lubricator, divertor tables, etc.)
- Blowoff Valve Interface Output
- Production Counters - Totalizers/Preset/Batch
- Maintenance Reminders - Activated by Predetermined Hours or Clutch Engagements, or Number of Parts Made.
- Press Lifetime Production Record - Hours/Cycles/Clutch Engagements
- Interface for Minster PMConnect Production Monitoring System
- Relay Based Primary Machine Control
- Servo Feed Interface for Minster Feed (provided if Minster Servo Feed is ordered with press)

Pedestal Control Enclosure is ergonomically designed to include illuminated indicators and operator/set-up buttons as well as to use minimal floor space. Also included is the press motor and clutch control circuit with a disconnect switch. The pedestal is wired with rigid standpipe and flexible overhead conduit to junction box on front of crown.

Control Station Includes:

- Clutch Selector Switch to select Control Operator Mode
- Power Off-On Locking Selector Switch
- Supervisory Control Lock Selector Switch (PMC only)
- Function Enable Illuminated Pushbutton (PMC only)

E2H HeviStamper

Features (continued)

Set-Up Station facilitates material threading and die set-up and includes:

- Slide Adjustment Control Buttons
- Two-Hand Inching Arrangement
- Stop Button

Run Station Includes:

- Two Guarded Run/Setup Cycle Buttons to operate press
- Arm Illuminated Pushbutton(s)
- Top Stop Button
- Stop Button
- Master Stop Button

Two (2) Die Safety Block Receptacles (less blocks) located on side of control pedestal.

Clutch and Motor Control Circuits including pushbuttons, operate on 110 VAC from control transformer.

Variable Frequency Press Drive System features the latest in press drive technology with Auto-Tune Setup, improved torque response, and high efficiency throughout the operating speed range.

Minster Production Management (4) Channel Load Monitor displays press load, allows for peak and reverse tonnage alarm settings and provides trend analysis to help protect the press and dies from potential overload conditions. System includes 'Monitor Parts Mode', which automatically compares each successive press cycle against a stored benchmark allowing for accurate 'real time' part quality and die protection strategies. Adjustable view window provides capability for monitoring specific process within tool such as peak forward load, snap through, or stripper plate impact. Load monitor system is dynamically calibrated through the full operating speed and tonnage range of the press and includes four strain gauge transducers located on press uprights.

Production Management 16-Point Die Protection Module – Standard with sixteen independent high speed inputs to detect event changes within 1 degree at speeds up to 1800 spm enabling quick die protection updates. The Die Protection Auto Tune feature allows for automatic adjustment of die protection sensors, which aids in the debug and set up of die protection programs. This feature is beneficial in eliminating nuisance faults due to sensor hysteresis, speed changes, etc.
Includes two press mounted interfaces for sensor connections consisting of six (6) five-way binding posts and two (2) Brad-Harrison type "Micro-Change" connectors.

E2H HeviStamper

Features (continued)

Minster Production Management Automatic Counterbalance Adjustment automatically set the counterbalance air pressure based upon the tool weight or PSI, reducing setup time and increasing press efficiency.

Minster Production Management Automatic Shutheight Adjustment includes automatic shutheight position, incremental position, with a choice of two (2) speeds.

Coil Line Interconnects by Customer Equipment interconnects between pieces of equipment, electrical, hydraulic, and pneumatic, are the responsibility of the user unless the Coil Line Interconnect option is purchased.

Two (2) Fluorescent Die Area Lights

One (1) Air Blowoff activated by a limit switch with On/Off control either in the PMC touchscreen (for PMC only) or a selector switch in the Control Station.

Machine Finish consists of quality Polane Paints for chemical resistance, long life, and highest quality appearance. All parts are primer under coated and castings are pre-coated with a smoothing agent providing the best possible paint adhering surface.

General Equipment Specifications This equipment is built to Minster's electrical, mechanical, hydraulic, and pneumatic standards.

DXF Package Minster will provide final press drawings in DXF format. The files will be provided on a standard CD that will be included with the equipment manuals at the time of shipment. The Minster Machine Company reserves the right to deny requests for any additional DXF drawings that are considered proprietary and/or confidential.

Standard One Piece Press Shipment Customer is responsible for reassembly of any minor miscellaneous parts removed from press.

E2H HeviStamper

Features (continued)

Die Clamping: Sliding Block Clamp Press is arranged for and includes six (6) 'Hilma' Sliding Block, single-acting, sliding-type hydraulic clamps with spring return to clamp dies to bolster. Each unit develops a maximum available clamping force of 5.2 tons (46.3 kN) at 3,500 PSI, (241 Bar) and has a maximum clamping stroke of 0.472" (12 mm). Clamping height for bolster clamps = 1.75".

Clamping system in slide consists of an additional six (6) 'Hilma' Sliding Block hydraulic clamps to clamp die to slide. Slide clamps have the same specifications as bolster clamps. Clamping height for slide clamps = 2.50".

The clamps in the bolster and slide can be removed when not in use (removal recommended to prevent damage to clamps).

Clamps to be used with standard 1" (25 mm) T-slots.

Hydraulic clamping package is controlled by an air/oil pump unit with five (5) circuits configured with three (3), two (2) way valves for operation of upper (slide) and lower (bolster) hydraulic die clamping mechanisms and lift rail mechanisms.

1st Circuit: Actuates bolster clamps.
2nd Circuit: Releases bolster clamps.
3rd Circuit: Actuates slide clamps.
4th Circuit: Releases slide clamps.
5th Circuit: Controls bolster lift rails.

Hydraulic pump and valve unit located in cavity opposite of feed.

Clamping system includes a remote control station located on the front left hand upright for activation and deactivation of clamping system and lift rails. Control and power unit interlocked with press stop control circuit, stopping press in event of loss of hydraulic pressure or electrical power in the system.

Hydraulic circuits for slide and bolster clamps are divided into two clamping zones. Clamps alternate zones so as every other clamp is on the same zone, with all zones having the same number of clamps. Each hydraulic zone includes a pilot operated hydraulic check valve located on the bolster or slide.

E2H HeviStamper

Features (continued)

Special **Die Clamping: Sliding Block Clamp** *(continued)*

Note: Processing galvanized stock or the use of die lubricants which contain sodium could possibly damage the clamps and void the clamp warranty.

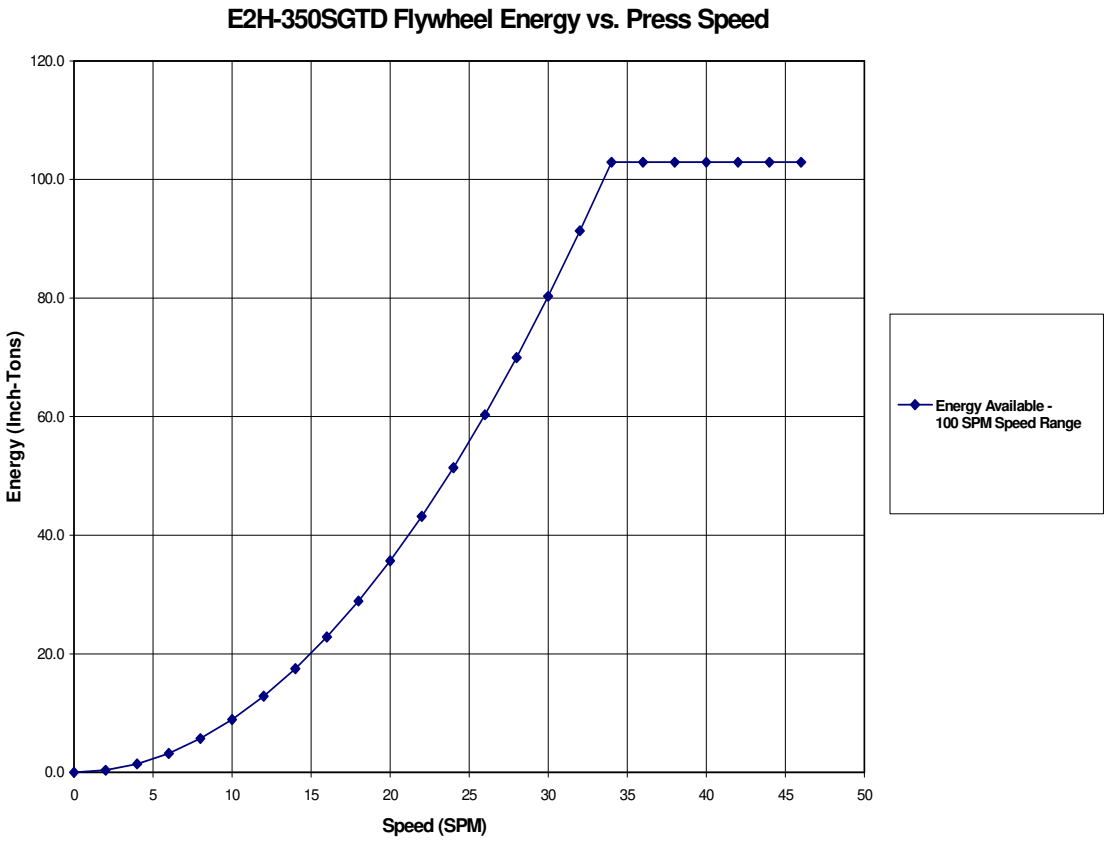
Weight of clamps equals 17.7 lbs. (8.03 kg) each.

Special **Two (2) SWT Roller-Type Rollblocks** *(#2415)* 46.6 in. (1184mm) in length with 15 rollers, fitted in machined U-slots. Rollers are spaced at 1.58 in. (40mm) intervals with every other roller removed. Total capacity is 10,500 lbs. (4763 kg) with all rollers in contact with die shoe and hydraulic pressure at 1,100 psi (76 Bar). Roll blocks are located 15.0 in each side of bolster centerline.

Special **Two (2) SWT Die Consoles** *(#3021)* 49.2 in. (1250mm) in length with 8,816 lbs. (4000 kg) total capacity. Units are a lift-off design and include a support leg with a roller assembly to aid in transporting the die console when removed from the press. Die consoles are mounted 15.0 in each side of press centerline.

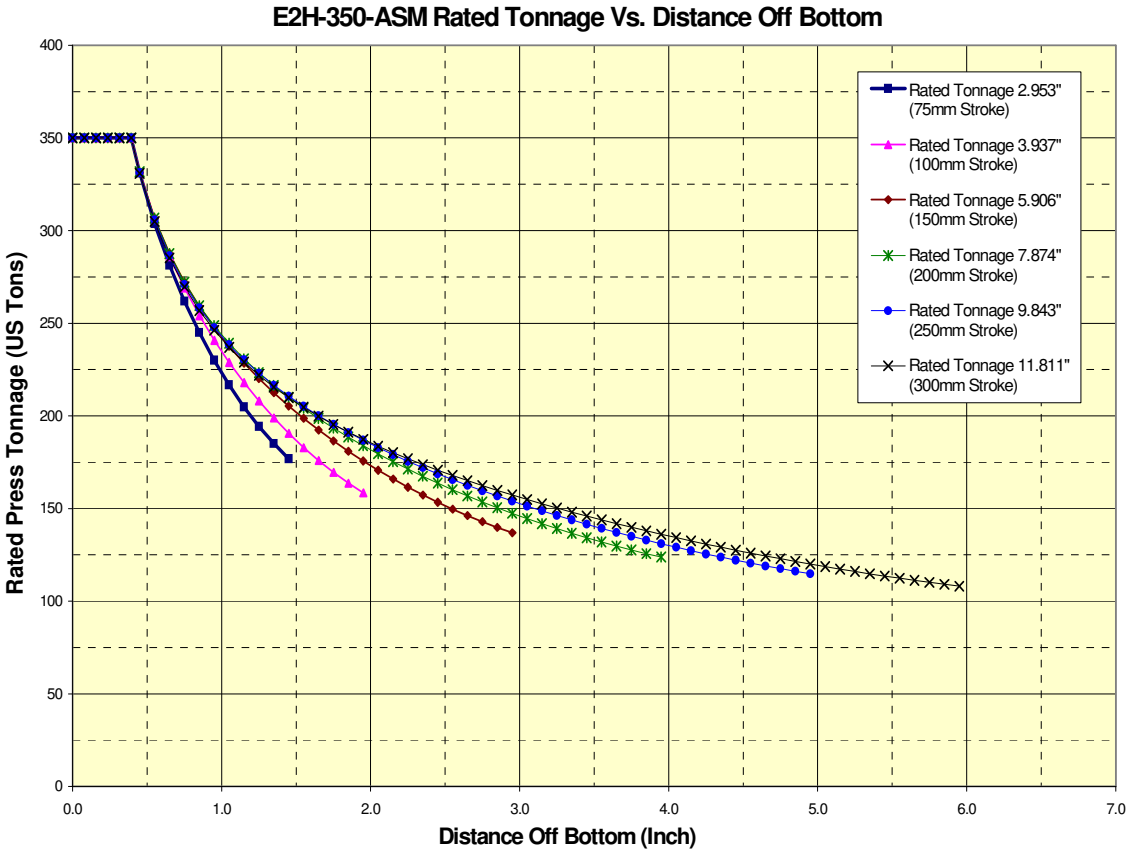
E2H HeviStamper

Features (continued)



E2H HeviStamper

Features (continued)



E2H HeviStamper

Features (continued)

Equipment Transportation and Set-Up Minster has the background and experience to move metal forming equipment and can provide efficient coordination of services to transport equipment and set-up in your facility. If you want to minimize your "hands-on" activities and ensure a seamless delivery and set-up process, Minster recommends you purchase this option.

Features:

- Minster assumes insurable risk for transportation of equipment.
- Includes transportation and set-up of all equipment in order.
- Includes one (1) lifting cycle and one movement of equipment and/or components from point of manufacture to destination point specified in order.
- Includes one (1) mobilization of rigging equipment and manpower to installation site.
- Includes re-assembly of press components, setting, alignment, leveling, and anchoring of equipment, in order.
- Includes work schedule Monday through Friday, eight (8) hours per day.

Unless stated otherwise, does not include set-up or handling of any equipment not included in order.

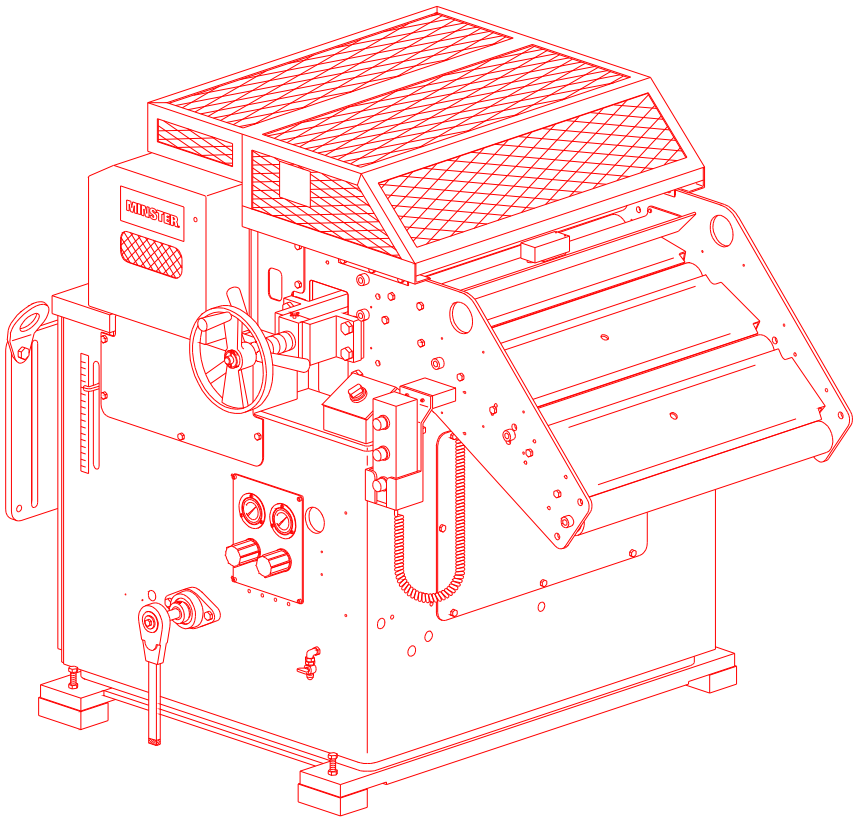
Work outside of agreed upon scope, delays to agreed upon shipment schedule(s) caused by customer, overtime and/or weekend hours, and delays beyond the control of The Minster Machine Company, may be subject to additional charges.

Customer/Facility Requirements:

- Requires Coil Line Interconnect feature for equipment in order.
- Requires free and clear access around machinery installation site.
- Requires adequate door sizes to allow machinery to enter building.
- Requires adequate floor structure to accommodate concentrated weights of components and equipment.
- Requires adequate ceiling height to accommodate height of lifting equipment.
- Requires equipment foundation(s) completed by others and ready at the time equipment ships from manufacture.
- Requires connection to facility utilities (air, electricity, etc.) to be performed by others.
- Assume insurable risk for equipment upon delivery to destination.

Please contact the Minster Machine Company Customer Service Department with any questions regarding features or customer/facility requirements. Phone: 419-628-6000.

Minster Electric Feed



NOTE: Above is for reference only and may not be representative of the equipment specified within.

Minster Electric Feed

Specifications (INCH)

Feed Specifications

Model Number	MEF6-32S
Feed Line Height	58.0 - 70.0 in over Floor
Feed Roll Diameter	6.37 in
Number of Rolls Driven	(2)
Minimum Stock Width	2.00 in
Maximum Stock Width	32.0 in
Minimum Stock Thickness	0.020 in
Maximum Stock Thickness	0.312 in
Maximum Stock Thickness at Max Width	0.151 in
Maximum Stock Width at Max Thickness	8.71 in
Maximum Stock Thickness x Width x Yield	See Capacity Chart
Roll Opening for Threading	0.470 in
Feed Repeatability Accuracy	+/- 0.002 in
Maximum Feed Length Preset	100 in
Maximum Roll Lift Rate	250 spm
Scale and Display Units	Inch
PMC Control Language	English
Approximate Feed Mass	6400 lb
Drive Reduction Ratio	Single 5/1
Feed Setup Station Location	Feed Hand-Held Pendant

Strip Capacity Table - MEF6-32/MSH30-32															
Stock Yield Strength															
Stock		40,000 psi 275 N/mm^2		50,000 psi 345 N/mm^2		60,000 psi 414 N/mm^2		70,000 psi 483 N/mm^2		80,000 psi 552 N/mm^2		90,000 psi 621 N/mm^2		100,000 psi 690 N/mm^2	
Thickness		Stock Width													
inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
0.031	**0.79**	32.00	**812**	32.00	**812**	32.00	**812**	32.00	**812**	32.00	**812**	32.00	**812**	32.00	**812**
0.062	**1.57**	32.00	**812**	32.00	**812**	32.00	**812**	32.00	**812**	32.00	**812**	32.00	**812**	32.00	**812**
0.094	**2.39**	32.00	**812**	32.00	**812**	32.00	**812**	32.00	**812**	26.19	**665**	21.87	**555**	18.57	**471**
0.125	**3.17**	32.00	**812**	32.00	**812**	25.63	**651**	20.63	**524**	17.02	**432**	14.31	**363**	12.23	**310**
0.156	**3.96**	30.25	**768**	22.72	**577**	17.85	**453**	14.47	**367**	12.02	**305**	10.17	**258**	8.73	**222**
0.188	**4.77**	21.80	**553**	16.50	**419**	13.06	**331**	10.65	**270**	8.89	**226**	7.56	**192**	6.52	**166**
0.219	**5.56**	16.60	**421**	12.64	**321**	10.05	**255**	8.24	**209**	6.91	**175**	5.90	**150**	5.11	**130**
0.250	**6.35**	13.07	**332**	10.00	**254**	7.99	**203**	6.57	**167**	5.53	**140**	4.74	**120**	4.11	**104**
0.281	**7.13**	10.56	**268**	8.11	**206**	6.50	**165**	5.37	**136**	4.53	**115**	3.89	**99**	3.39	**86**
0.312	**7.92**	8.71	**221**	6.71	**170**	5.40	**137**	4.47	**113**	3.78	**96**	3.26	**83**	2.84	**72**

Minster Electric Feed

Features (continued)

MEF6-32

Maximum Strokes per Minute at Given Feed Angle

Loop Weight	Feed Length		Feed Angle				
	inch	mm	90°	120°	150°	180°	210°
250 lbs (114 kg)	1	25	158	210	250	250	250
	2	51	121	162	202	242	250
	4	102	91	122	152	182	213
100% Feed Rate 2.18g	6	152	77	102	128	153	179
	8	203	68	90	113	135	158
	10	254	61	82	102	122	143
	12	305	57	75	94	113	132
	18	457	47	63	78	94	109
	24	610	41	55	69	82	96
	30	762	37	49	62	74	86
	36	914	34	45	57	68	79
Loop Weight	Feed Length		Feed Angle				
	inch	mm	90°	120°	150°	180°	210°
375 lbs (170 kg)	1	25	130	173	216	250	250
	2	51	98	131	163	196	228
	4	102	73	97	122	146	170
59% Feed Rate 1.29g	6	152	61	81	102	122	142
	8	203	54	71	89	107	125
	10	254	48	65	81	97	113
	12	305	45	59	74	89	104
	18	457	37	49	61	74	86
	24	610	32	43	54	64	75
	30	762	29	39	48	58	67
	36	914	27	35	44	53	62

Calculating Loop Weight

Loop Weight = SL x T x W x D

SL = Strip Length (inches) "Length of strip, feed roll to straightener exit work roll"

T = Strip Thickness (inches)

W = Strip Width (inches)

D = Material Density (lbs/inch^3) "Steel .283, Alum .095,

Minster Electric Feed

Features (continued)

Freestanding Feed Mounting Cabinet assures long life and consistent feed accuracy by reducing press induced vibration normally experienced with bracket feeds. The feed cabinet is constructed of heavy welded steel, stress relieved to provide maximum rigidity and maintain alignment critical to consistent, reliable feeding. A feed-to-press tie bar maintains spacing and feed alignment to the press.

Shock Isolation Mounts provide protection against press induced vibration. The transmission of vibration to the feed is minimized, which extends the life of feed components, thus reducing downtime due to component failure.

Chrome Blast #3 Roll Finish This roll finish is a textured hard chrome surface that is highly durable and provides superior gripping, reducing the chance for a misfeed. This roll finish is an excellent choice for most general stamping applications using hot rolled and cold rolled steels.

Low Inertia Belt Drive System improves production rates by the use of a custom aluminum drive pulley and high strength timing belt. All drive pulleys are mounted using keyless shaft-hub locking devices providing the advantage of a shrink fit, backlash free connection.

Upper Roll Drive, Precision Helical Anti-backlash Gear Set configured in a square gear pattern to maintain full tooth engagement during roll lift and varying material thickness. The zero backlash gear drive is essential in providing maximum material grip and the ultimate in accurate feed progressions.

Feed Passline Adjustment is accomplished through the use of a mechanical jack screw actuator, heavy duty steel guide post and anti-friction bushings for maintaining feed roll parallelism and perpendicularly. A fixed reversible ratchet allows quick and effortless height adjustment. A calibrated scale indicates the feed passline over the press bed for repeatable setup.

Pinch Roll Air Control Panel allows for easy adjustments of the roll lift and pinch pressure without the use of hard stops or wrenches. The Control Panel includes precision regulators for accurate adjustment, heavy duty liquid filled gauges and operating instructions on the panel for quick reference.

Minster Electric Feed

Features (continued)

High Efficiency Pneumatic Roll Lift Design provides high speed repeatable pilot release roll lift capabilities. Roll lift and dwell position are totally adjustable (with respect to press crankshaft position), through the press limit switch. A fail safe closure spring maintains pinch pressure to hold strip position when power is removed. Electrical control provides the ability to open the pinch roll for threading as well as turning off roll lift for single stroke thread up. All valves have "energized" indicator lights to ease trouble shooting.

Automatic Lubrication from Straightener Lubrication of the feed is interconnected with the Straightener Automatic Lubrication System providing an economical means of providing grease to the feed pinch roll gear train. Automatic Lubrication and Lubrication to the Feed options must be purchased on the Minster Straightener (see Straightener section). Replaces the standard manual lubrication zirks.

Cascading Entry Catenary Rolls provide incoming loop support and stability for smooth operation. The cascading multi-roller catenary provides full loop support preventing material set and providing loop stability. The catenary angle is adjustable by repositioning the rolls.

Hand Crank Adjustable Stock Guides The stock guides consist of harden double rollers which are adjusted by a hand wheel. The guides have independent adjustments for stock width and centerline offset and a calibrated scale is provided for quick repeatable setup. The hand wheel style guides are an enhancement improving the ease of adjustability.

End of Stock Detector Photo Electric Sensor detects the tail of the stock before it passes through the feed rolls and top stops the press. This feature prevents costly tail out miss feeds.

Digital Servo Feed Drive provides repeatable, highly accurate, high-speed feeding capabilities. A single, compact drive unit contains the system power supply, amplifier and intelligent control reducing the number of components resulting in a highly reliable unit with comprehensive diagnostic capabilities. The maintenance-free servo motor includes a cooling fan to take advantage of the motors peak performance. A motor holding brake maintains strip position when the drive power is removed.

Minster Electric Feed

Features (continued)

Production Management Control thru Press (PMC) combines the feed and press operator controls into one, centralized interface reducing control complexity and floor space. MINSTER's state-of-the-art PMC includes complete feed operation, full coil line diagnostics, and coil line tool storage capabilities at the press control. The feed parameters of feed length, feed rate, feed angle, and pilot release can be stored and retrieved through the PMC Tool Storage feature. Controls for thread-up are conveniently located to allow ease of operator movement during the die threading process. Remote free standing enclosure for the feed servo drive is located opposite the operator's side of the line.

Feed Mounted Controls include a Pinch Roll control switch and a Thread Table raise/lower switch when a Minster Thread Table is supplied.

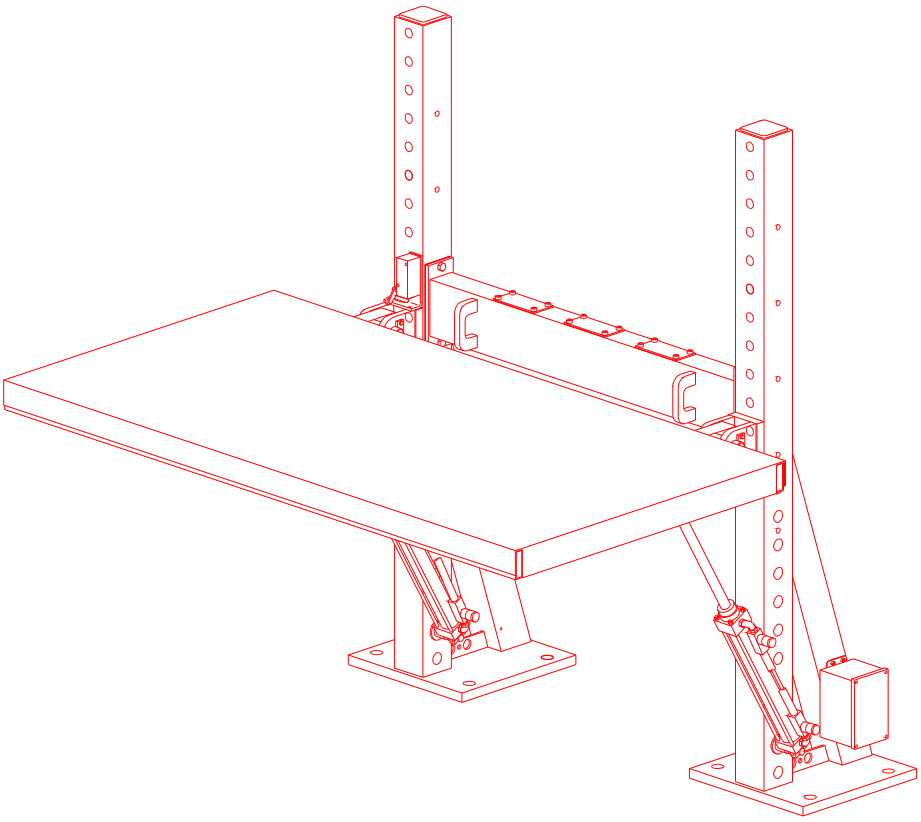
Machine Finish consists of quality Polane Paints for chemical resistance, long life, and highest quality appearance. All parts are primer under coated and castings are pre-coated with a smoothing agent providing the best possible paint adhering surface.

Machine Guarding is designed per Minster's interpretation of ANSI B11.18 and applicable European EN Safety Standards.

Coil Line Interconnects by Customer Equipment interconnects between pieces of equipment, electrical, hydraulic, and pneumatic, are the responsibility of the user unless the Coil Line Interconnect option is purchased.

DXF Package Minster will provide final drawings in DXF format. The files will be provided on a standard CD which will be included with the equipment manual at the time of shipment. The Minster Machine Company reserves the right to deny requests for any additional DXF drawings that are considered proprietary and confidential.

Minster Thread Table



NOTE: Above is for reference only and may not be representative of the equipment specified within.

Minster Thread Table

Specifications (INCH)

Thread Table Specifications

Model Number	MTT14-32S
Length of Table	168 in
Maximum Stock Width	32.0 in

Features

Heavy Duty Construction provides a highly reliable, maintenance free thread table design. The table top is constructed of solid sheet metal providing a smooth transition surface for the strip. The table is supported by two rigid, free standing, floor mounted frames.

Table Height Adjustments are provided for adjusting both the straightener and feed ends of table. This allows for optimization of the table height to the application. This adjustment is pre-set at the factory to the customer's specific line configuration and can be field set if it becomes necessary.

Hydraulic Cylinders provide a smooth lifting actuation for the table, raising it from the vertical rest position, to a horizontal threading position. All hydraulic lines are ran through the table framework for a clean appearance and bulkhead terminated at the straightener end of the table for ease of interconnection. The hydraulic power is supplied from the Minster Straightener hydraulic power unit.

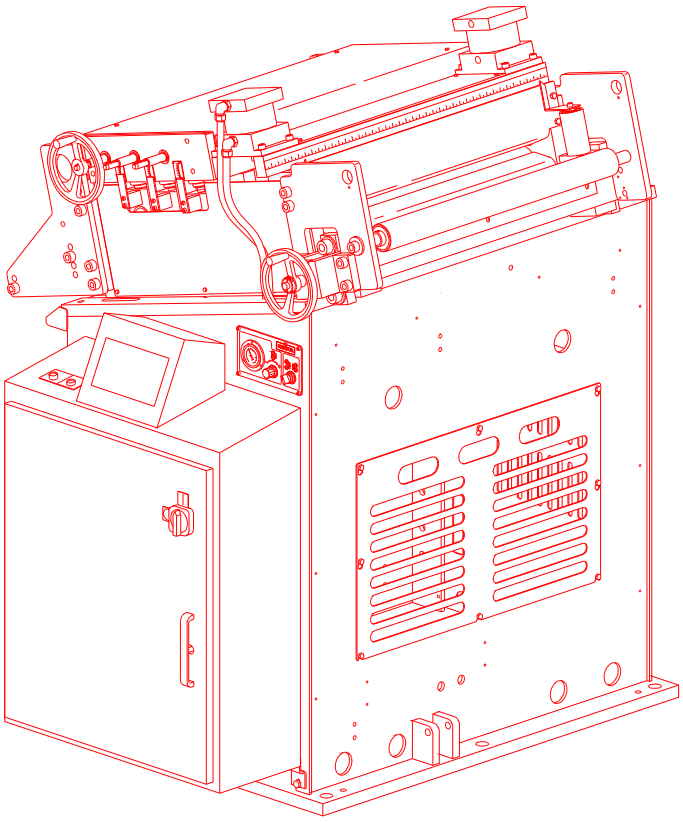
Thread Table Controls Integrated into the Minster Straightener provide an all-inclusive, operator friendly machine control system incorporating Minster's Production Management Control. The thread table operator's push buttons are located on the straightener operator interface, and the Thread Table logic control is handled through the straightener PLC.

Straightener Ultrasonic Loop Stand Mounting is integral to the thread table framework, providing a rigid mounting surface and internal wire routing for clean appearance. All thread table wiring is terminated to an electrical enclosure located at the straightener end of the table for ease of interconnection.

Machine Finish consists of quality Polane paints for chemical resistance, long life, and highest quality appearance. All parts are primer undercoated and casting pre-coated with a smoothing agent to provide the best possible paint adhering surface.

Machine Guarding is designed per Minster's interpretation of ANSI B11.18 safety standards and applicable European EN Safety Standards.

Minster Straightener



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Minster Straightener

Specifications (INCH)

Straightener Specifications

Model Number	MSH30-32-7
PMC Control Language	English
Maximum Stock Width	32.0 in
Minimum Stock Width	2.0 in
Minimum Stock Thickness	0.020 in
Maximum Stock Thickness	0.312 in
Maximum Stock Thickness at Max Width	0.151 in
Maximum Stock Width at Max Thickness	8.71 in
Max Stk Thickness x Width x Yield	See Capacity Chart
Line Speed	40 - 1200 in/min
Work Rolls Full Open	0.300 in
Work Rolls Full Close	- 0.300 in
Work Rolls Number Driven	6
Work Rolls Quantity	7
Work Rolls Diameter	3.00 in
Work Rolls Center Distance	4.50 in
Pinch Roll Diameter	5.06 in
Pinch Roll Opening	0.50 in
Pinch Roll Sets	1
Pinch Rolls Number Driven	2
Head Inclination	15 Degrees
Entry Pass Line Height	68.0 in
Exit Pass Line Height	56.0 in
Scale and Display Units	Inch
Pneumatic Supply Pressure	80 PSI
Approximate Straightener Mass	8000 lb
Approx. Overall Area, R-L × F-B	115 × 58.5 in
Approx. Floor Area, R-L × F-B	42.0 x 53.0 in

Minster Straightener

Features

Strip Capacity Table - MEF6-32/MSH30-32															
Stock Yield Strength															
Stock		40,000 psi 275 N/mm^2		50,000 psi 345 N/mm^2		60,000 psi 414 N/mm^2		70,000 psi 483 N/mm^2		80,000 psi 552 N/mm^2		90,000 psi 621 N/mm^2		100,000 psi 690 N/mm^2	
Thickness		Stock Width													
inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
0.031	**0.79**	32.00	**812**	32.00	**812**	32.00	**812**	32.00	**812**	32.00	**812**	32.00	**812**	32.00	**812**
0.062	**1.57**	32.00	**812**	32.00	**812**	32.00	**812**	32.00	**812**	32.00	**812**	32.00	**812**	32.00	**812**
0.094	**2.39**	32.00	**812**	32.00	**812**	32.00	**812**	32.00	**812**	26.19	**665**	21.87	**555**	18.57	**471**
0.125	**3.17**	32.00	**812**	32.00	**812**	25.63	**651**	20.63	**524**	17.02	**432**	14.31	**363**	12.23	**310**
0.156	**3.96**	30.25	**768**	22.72	**577**	17.85	**453**	14.47	**367**	12.02	**305**	10.17	**258**	8.73	**222**
0.188	**4.77**	21.80	**553**	16.50	**419**	13.06	**331**	10.65	**270**	8.89	**226**	7.56	**192**	6.52	**166**
0.219	**5.56**	16.60	**421**	12.64	**321**	10.05	**255**	8.24	**209**	6.91	**175**	5.90	**150**	5.11	**130**
0.250	**6.35**	13.07	**332**	10.00	**254**	7.99	**203**	6.57	**167**	5.53	**140**	4.74	**120**	4.11	**104**
0.281	**7.13**	10.56	**268**	8.11	**206**	6.50	**165**	5.37	**136**	4.53	**115**	3.89	**99**	3.39	**86**
0.312	**7.92**	8.71	**221**	6.71	**170**	5.40	**137**	4.47	**113**	3.78	**96**	3.26	**83**	2.84	**72**

Welded Structural Cabinet with Heavy Wall Construction provides a firm foundation for the straightener head, maintaining alignment and rigidity critical to the flattening process. The straightener base inclines the straightener head at an angle improving the pull off angle from the reel and the angle in which material is driven into the accumulation loop.

Heavy Duty Precision End Frames ground and machined to closely held tolerances provide the necessary positioning of the straightener rolls assure the ultimate in roll parallelism.

Seven (7), Close Centered Work Rolls offer two distinct advantages. Seven rolls, better deliver consistent, flat stock regardless of material characteristics that may change throughout a coil or from coil to coil. Close roll spacing improves the machine's ability to straighten a broader range of material thickness and yield strengths.

Driven Upper and Lower Work/Pinch Rolls improve material threading, strip tail purging and reduce slippage. These benefits all result in lighter work roll penetration settings, thus not over working the material or the straightener.

Powered Work Roll Adjustment Individual hydraulic motors adjusts the work rolls while the position of each is displayed at the operator's panel. From the operator's panel, the operator can raise or lower the work rolls via up/ down buttons or directly enter the work roll position. This enhances quick job changeover and improves the accuracy of the work roll settings.

Minster Straightener

Features (continued)

Sealed Heavy Duty Roller Bearings are used throughout the straightener head to achieve minimum roll spacing while maintaining high load capacities.

Solid Hardened and Ground Work/Pinch Rolls provide maximum resistance against deflection and excellent durability. All rolls are machined to exacting tolerances to assure true material tracking.

Spur Gear Drive Train delivers the power from the hydraulic drive motor to the work and pinch rolls providing high strength and a durable means of driving the straightener head.

Pinch Roll Air Actuation Entry Pinch Rolls provide a convenient and simple adjustment of the entry roll pinch pressure along with an open/close switch for strip threading. The control panel includes a heavy duty liquid filled gauge for repeatable setup.

Cascading Exit Cascade Rolls arrangement prevent induced coil set and provide loop support and stability for smooth high stroke rate operation. The catenary angle is adjustable by repositioning the rolls.

Hand Crank Adjustable Stock Guides The stock guides consist of hardened rollers coupled together with a dual direction lead screw. Adjustments are made via a hand wheel and the centering scale allowing easy, repeatable setups. The hand wheel style guides are an enhancement improving the ease of adjustability.

Proportional Hydraulic Straightener Drive provides precise variable speed control and full torque at low speeds allowing quick responses to changes in loop accumulation superior to other drive configurations. A proportional hydraulic valve controls a hydraulic motor coupled directly to the straightener gear train resulting in a simplistic and reliable drive configuration.

Integral Hydraulic Power Unit mounted within the straightener base provides an efficient power source for the straightener head as well as the optional auxiliary functions. The power unit includes a low level switch, dirty filter indicator switch and an over temperature sensor, providing full functionality diagnostics.

Ultrasonic Loop Control provides a precise non-contact speed control of the straightener maintaining the accumulation loop at the optimum height, eliminating the need for external adjustment devices.

Minster Straightener

Features (continued)

Straightener PMC Control mounted in the straightener control panel provides Minster's state-of-the-art Production Management Control System for operation of the Straightener, Thread Table, Reel, and Coil Car. This includes operation of the individual pieces of equipment, coil line diagnostics, coil line tool storage capabilities and full communication with the press and feed. The PMC Tool Storage Feature allows for one point of entry tool storage at the press, feed, or the straightener based on PMC equipment included in the line. The PLC Machine Control expands the functionality of the straightener allowing more sophisticated internal control logic resulting in a more user friendly and safe machine operation.

NOTE: Coil line tool storage and full feed line communications require Press Production Management Control and/ or Feed Production Management Control.

Speed Sync This feature automatically synchronizes the straightener line speed to the average line speed of the feed to obtain consistent material flow through the straightener. Consistent material flow reduces starting and stopping of the straightener which results in improved material flatness. Additional benefits include improved loop stability, reduced possibility of material slipping, marking, and strip damage due to pull off of reel.

Automatic synchronization is achieved via communication between the straightener and feed PMC controls. The line speed set for the straightener is displayed on the straightener PMC screen.

If the feed does not have a Minster PMC control, the Speed Sync feature will function through the straightener PMC control. The operator will have the ability to manually adjust the maximum speed and acceleration rate of the straightener to obtain the same benefits as automatic mode.

Straightener Mounted Control Cabinet includes the machine operator interface and the straightener electrical controls. This arrangement creates a simple design, saving floor space and interconnect wiring. The control panel includes a through-the-door fused disconnect.

Straightener End of Stock Detector senses the tail of the stock as it exits the straightener and automatically returns the straightener, reel and coil car back into manual. This feature increases production by allowing the operator to begin loading and prepping the next coil while the strip is finishing out through the press and feed.

Minster Straightener

Features (continued)

Machine Finish consists of quality Polane Paints for chemical resistance, long life, and highest quality appearance. All parts are primer under coated and castings are pre-coated with a smoothing agent providing the best possible paint adhering surface.

Machine Guarding is designed per Minster's interpretation of the ANSI B11.18 and applicable European Safety Standards.

Automatic Lubrication System Automatic centralized grease lubrication system provides grease to the straightener gear train. The system includes a grease reservoir, pump, low level indication, and the grease distribution circuit. This option insures an adequate grease supply to the critical straightener components.

Automatic Lubrication to the Feed Lubrication of the feed is interconnected with the Straightener Automatic Lubrication System providing an economical means of providing grease to the feed pinch roll gear train. Note: The Automatic Lubrication System option must be purchased on the Minster Straightener. Replaces the standard manual lubrication zirks.

Driven-Holddown Arm (5" Width), With End Flattener and Peeler Table The driven holddown arm mounts on top of the straightener head and is positioned by a hydraulic cylinder. A knurled wheel on the end of the arm is driven by a hydraulic motor and can be jogged forward or reverse as required to enhance threading operation. The peeler table hinges from entry end of straightener to peel and thread the lead end of strip from the coil to the straightener entry pinch rolls. The peeler table is hydraulically raised, lowered, extended, and retracted. An end flattener integral to the holddown arm works in conjunction with the peeler table to remove stock curvature, easing material threading.

This option is invaluable for retaining outer wrap of the coil during cutting of the coil bands and controlling the lead end of strip as it is threaded into the straightener. Note: The Holddown arm is 5" wide allowing a minimum of a 6" wide coil to be run. For applications requiring a 3" wide holddown arm or a polyurethane holddown wheel, please consult Minster Applications Department.

This option is recommended for stock over 1/16" thick or any situation where coil clock spring may be an issue.

Minster Straightener

Features (continued)

Coil Line Interconnects by Customer Equipment interconnects between pieces of equipment, electrical, hydraulic, and pneumatic, are the responsibility of the user unless the Coil Line Interconnect option is purchased.

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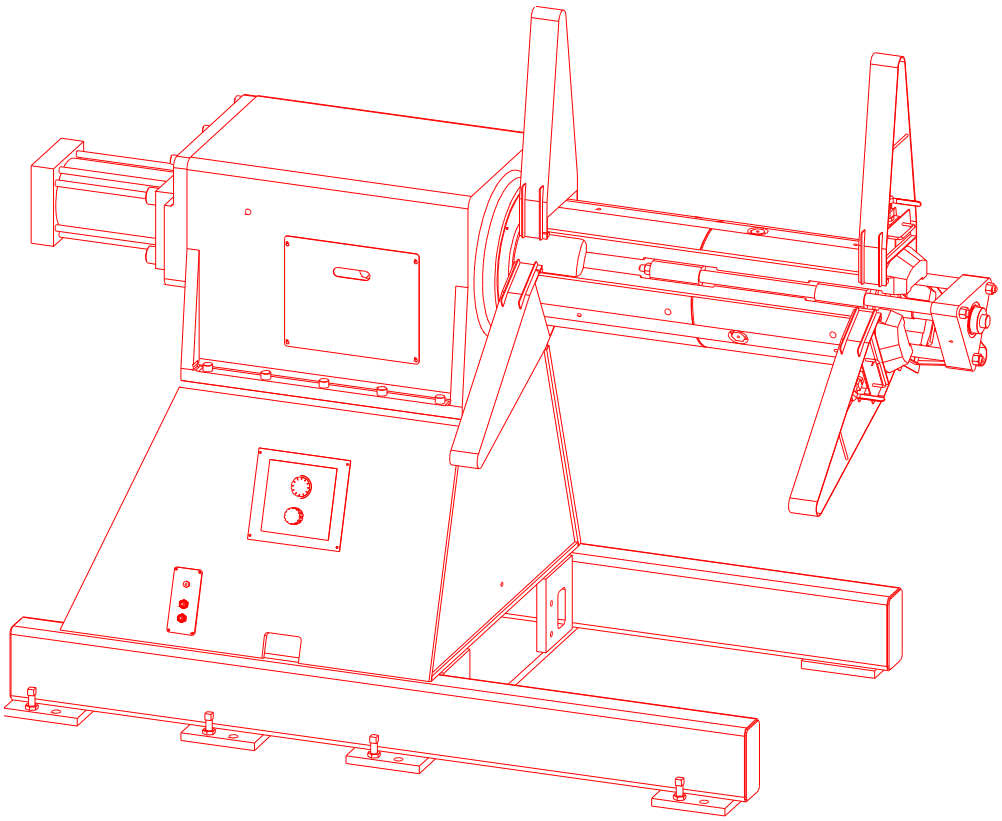
***Special* Customer-Supplied/Minster-Installed High Pressure Filter (#4519)** Customer to provide to Minster a High Pressure Filter and Minster will install in the pressure feed line to the proportion valve.

Minster Single Reel



NOTE: Above is for reference only and may not be representative of the equipment specified within.

Minster Single Reel

Specifications (INCH)

Reel Specifications

Model Number	MRH20-38S
Maximum Capacity per Mandrel	24,000 lb
Maximum Strip Width	38.0 in
Minimum Strip Width	2.0 in
Maximum Strip Thickness	0.38 in
Coil I.D. Range	20.0 - 24.0 in
Coil O.D. Maximum	72.0 in
Max Width at Full OD (by wt.)	27.3 in
Max OD at Full Width (by wt.)	62.3 in
Scale and Display Units	Inch
Coil Load Position	Towards Operator
Number of Coil Shoes	(3)
Approx. Floor Area, R-L × F-B	78.0 × 119 in
Center Mandrel to Floor	72.0 in
Approximate Reel Mass	9500 lb

Features

MRH20-38 Reel Strip Capacity Reel is capable of running all material that falls within the preceding Minster Straightener strip capacity specifications.

Heavy Duty Base construction with extended legs assures a solid anchoring footprint designed to withstand the abuse of coil loading. The mandrel bearing housing is a precision machine casting providing the foundation for the mandrel shaft, bearings and related innerworking mechanisms. All critical mechanisms are enclosed within the base for protection against damage and to provide a clean exterior look.

Three Wide Mandrel Segments provide six gripping points, doubling the support over conventional mandrel systems. This in turn minimizes coil egging and deformation of the inner coil wraps. The mandrel segments are heavy duty cast structural members providing the ultimate in strength and reliability.

Hydraulic Powered Mandrel Expansion with an ingenious design allows the expansion cylinder to be fixed. This eliminates the need for a costly, high-maintenance rotating cylinder.

Minster Single Reel

Features (continued)

Wedge-type Mandrel Expansion Mechanism is the strongest and most reliable in the industry. Heavy duty cast wedges with large bearing surfaces work in conjunction with the mandrel segments to provide a sliding wedge expansion design. Manual grease fittings on each wedge provide grease to the critical areas.

Powered Mandrel Jog gives the operator control of mandrel rotation, simplifying stock threading and increasing efficiency and operator safety. A hydraulic motor is coupled to the mandrel shaft via chain drive.

Power-off Mandrel Holding Brake is provided as a standard feature, locking the mandrel in position any time the control power is disabled. This provides added safety, eliminating the possibility of coil clock spring back-driving the mandrel inadvertently. This is accomplished by a spring-set brake designed into the powered mandrel jog mechanism.

Pneumatic Mandrel Drag Brake provides the pull-off back tension necessary for smooth decoiling, minimizing coil coast and jerk. An oversized pneumatically-actuated drum brake coupled directly to the mandrel shaft proves to be a highly reliable system superior to caliper or electromagnetic brake system. Drag brake tension is easily adjusted by a pneumatic control panel. The control panel includes a precision regulator, heavy duty liquid filled gage, and control valving. All components are in a single package flush mounted into the reel housing for ease of maintenance and a clean appearance.

Fixed Reel Base w/ Manual Keeper Arms is provided as a standard feature for coil wrap containment and guiding. Includes six (6) keeper arms per mandrel. The keepers are of a lightweight, yet heavy duty, design. The outboard keepers use a quick-release locking handle for the ease of operator use while the rear keepers incorporate a locking jack bolt for the added holding power needed to resist movement during coil loading.

Reel Controls Integrated into the Minster Straightener provides an all-inclusive, operator friendly machine control system incorporating Minster's Production Management Control. The reel operator's push buttons are located on the straightener operator interface, and the reel logic control is handled through the straightener PLC.

Machine Finish consist of quality Polane Paints for chemical resistance, long life, and highest quality appearance. All parts are primer under coated and castings are pre-coated with a smoothing agent providing the best possible paint adhering surface.

Minster Single Reel

Features (continued)

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Coil Line Awareness Barrier by Customer Coil Line Awareness Barrier is the customer's responsibility per the ANSI B11.18 Standard and all other applicable safety standards, unless the Coil Line Awareness Barrier option is purchased on the Minster Reel.