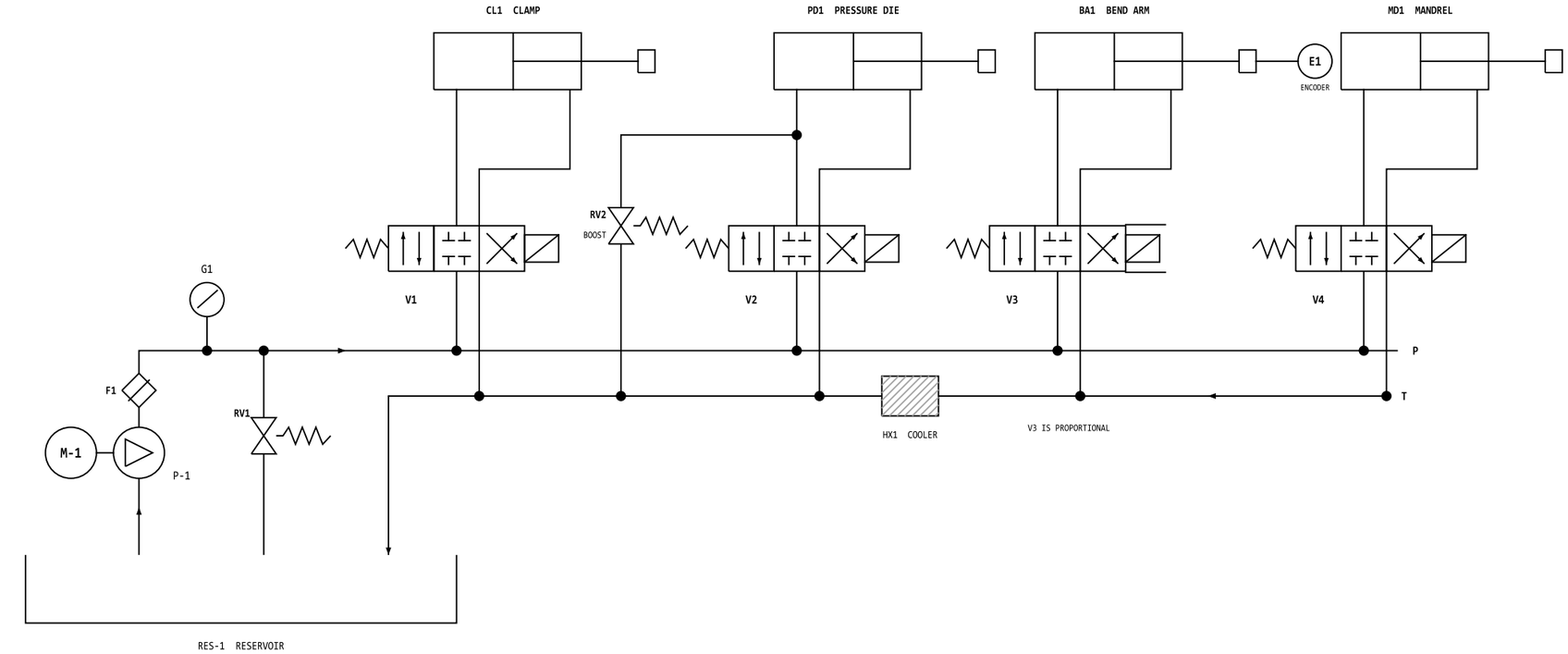
TUBE BENDING MACHINE - REFERENCE HYDRAULIC CIRCUIT

NOT TO SCALE - TAGS ONLY, NO PROCESS VALUES

HYDRAULIC CIRCUIT - ONE POWER UNIT, FOUR FUNCTIONS



THE CLAMP HOLDS THE TUBE WHILE THE ARM BENDS

RV2 SETS THE BOOST ON THE PRESSURE DIE

E1 TELLS THE CONTROLLER THE ANGLE OF THE ARM

NOTES

1. REFERENCE HYDRAULIC CIRCUIT OF A TUBE BENDING MACHINE, DRAWN IN THE STYLE OF THE GRAPHICAL SYMBOLS OF FLUID POWER. TAGS ONLY: NO FORCE, PRESSURE, FLOW, SIZE, TIME OR QUANTITY VALUE IS GIVEN.
2. P-1, DRIVEN BY M-1, TAKES FLUID FROM RES-1 THROUGH F1 TO THE P RAIL. RV1 LIMITS THE PRESSURE AND G1 SHOWS IT. THE T RAIL RETURNS THROUGH HX1 TO RES-1.
3. EACH FUNCTION HAS ITS OWN VALVE: V1 FOR THE CLAMP CL1, V2 FOR THE PRESSURE DIE PD1, V3 FOR THE BEND ARM BA1 AND V4 FOR THE MANDREL MD1. THE CENTRE POSITION HOLDS EACH CYLINDER WHERE IT IS.
4. RV2 ON THE LINE OF PD1 SETS THE BOOST: THE PRESSURE DIE FOLLOWS THE TUBE THROUGH THE BEND AND LIMITS THE THINNING OF THE OUTSIDE WALL.
5. V3 IS A PROPORTIONAL VALVE, SO THAT THE CONTROLLER CAN MOVE BA1 SMOOTHLY AND STOP IT AT THE ANGLE. E1 ON THE BEND ARM REPORTS THE ANGLE TO THE CONTROLLER.
6. LINES THAT CROSS ARE NOT CONNECTED. A DOT SHOWS A CONNECTION.
7. INTERLOCKED GUARDING AND AN EMERGENCY STOP CUT THE DRIVE, AND TRAPPED PRESSURE CAN BE RELEASED. CATALOGUE ITEMS ARE BOUGHT IN.
8. THE CARRIAGE AND ROTATION AXES, THE BEND HEAD IN PLAN AND THE DETAILS ARE ON SHEET 002.

LEGEND

- FLUID LINE
- CYLINDER
- RESERVOIR
- RELIEF VALVE
- PUMP
- MOTOR
- FILTER
- COOLER
- PRESSURE GAUGE
- ENCODER
- SPRING RETURN
- SOLENOID

WHAT EACH STEP DOES

STEP	WHAT HAPPENS
1 CLAMP	V1 CLOSES CL1 ON THE TUBE
2 PRESSURE DIE	V2 PUSHES PD1 IN; RV2 SETS THE BOOST
3 MANDREL	V4 MOVES MD1 TO ITS PLACE
4 BEND	V3 TURNS BA1; E1 READS THE ANGLE
5 RELEASE	V1, V2, V4 OPEN; V3 RETURNS THE ARM

REFERENCE CONFIGURATION - NOT FOR CONSTRUCTION

NEOMETRIX DEFENCE LIMITED

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TUBE BENDING MACHINE - REFERENCE CONFIGURATION

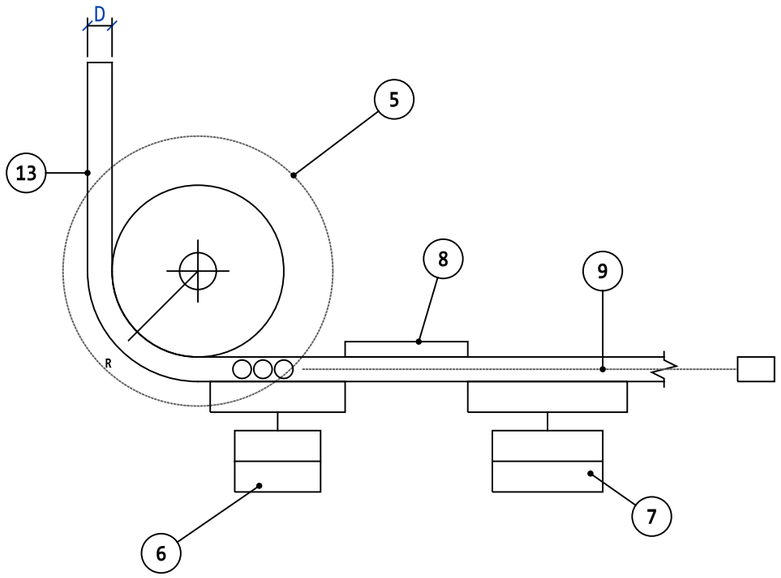
HYDRAULIC CIRCUIT

THE POWER UNIT AND THE FOUR FUNCTIONS OF THE BEND HEAD

DWG NO	SCALE @ A3	SHEET	REV
NMX-PBM-93-001	NTS	1 OF 2	A
DATE	**UNITS**	**DRAWN**	**STATUS**
04-11-2026	TAGS ONLY	NMX-DO	REFERENCE

PLAN - BEND HEAD

NOT TO SCALE

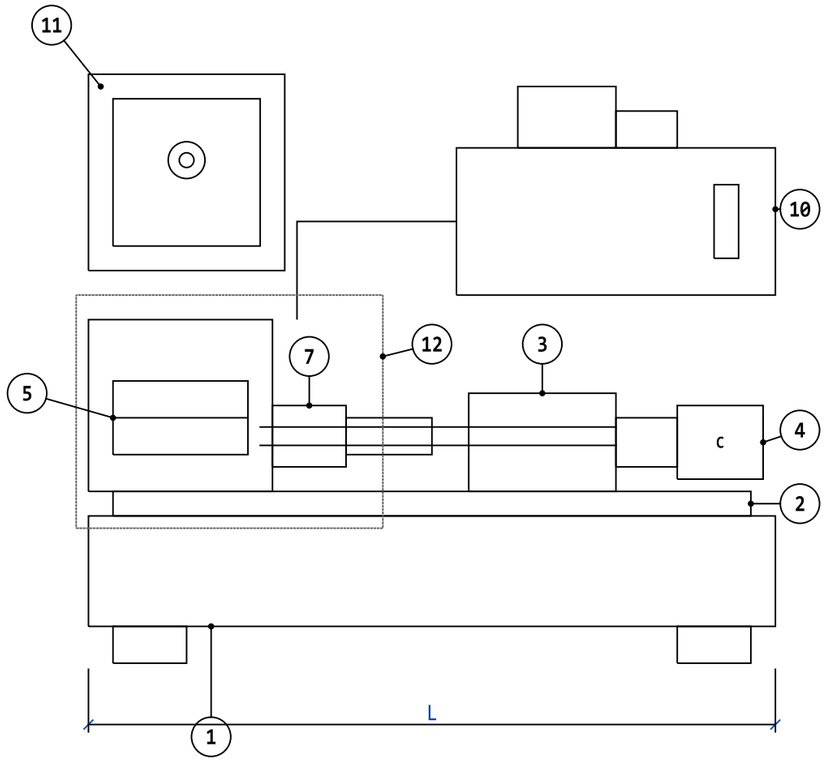


THE TUBE IS CLAMPED TO THE DIE AND DRAWN ROUND IT

THE PRESSURE DIE PUSHES IT IN; THE WIPER AND THE MANDREL HOLD THE WALL

ELEVATION - TUBE BENDING MACHINE

NOT TO SCALE



THE TUBE LIES ALONG THE RAIL, HELD BY THE CARRIAGE

NOTES

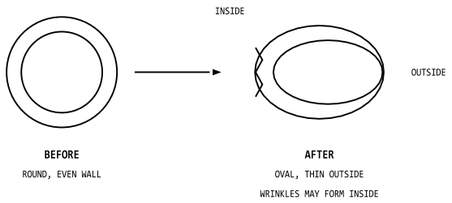
1. REFERENCE ARRANGEMENT OF A TUBE BENDING MACHINE AND OF ITS BEND HEAD. LETTERS ARE DIMENSIONS SET BY DESIGN: NO FORCE, PRESSURE, SIZE, RADIUS, ANGLE LIMIT, TIME OR QUANTITY VALUE IS GIVEN.
2. THE PLAN SHOWS THE BEND HEAD: THE TUBE LIES IN THE GROOVE OF THE BEND DIE, GRIPPED BY THE CLAMP DIE AND PUSHED IN BY THE PRESSURE DIE. THE WIPER DIE SUPPORTS THE INSIDE JUST BEHIND THE BEND AND THE MANDREL KEEPS THE TUBE ROUND. R IS THE CENTRELINE RADIUS AND D THE OUTSIDE DIAMETER.
3. THE ELEVATION SHOWS THE BED, THE RAIL, THE CARRIAGE THAT HOLDS THE TUBE AND THE ROTATION DRIVE THAT TURNS IT, THE BEND HEAD, THE POWER UNIT, THE CONTROL CABINET WITH ITS EMERGENCY STOP AND THE INTERLOCKED GUARD. L IS THE LENGTH OF THE BED.
4. DETAIL A: THE OUTSIDE OF A BEND IS STRETCHED, SO THAT ITS WALL THINS. THE INSIDE IS SQUEEZED, SO THAT IT MAY WRINKLE, AND THE ROUND SECTION TENDS TO BECOME AN OVAL. THE TOOLING HOLDS THE WALL.
5. DETAIL B: WHEN THE ARM LETS GO, THE ANGLE OPENS A LITTLE. THE MACHINE BENDS FURTHER THAN THE ANGLE IT WANTS BY AN AMOUNT LEARNED FROM TRIAL BENDS.
6. DETAIL C: EACH BEND IS A LENGTH L, A ROTATION R AND AN ANGLE A, RUN IN ORDER FROM THE BEND TABLE.
7. THE HYDRAULIC CIRCUIT IS ON SHEET 001. CATALOGUE ITEMS ARE BOUGHT IN.

ITEMS

ITEM	DESCRIPTION
1	BED AND FRAME
2	RAIL
3	CARRIAGE
4	ROTATION DRIVE
5	BEND DIE AND BEND ARM
6	CLAMP DIE AND CYLINDER
7	PRESSURE DIE AND CYLINDER
8	WIPER DIE
9	MANDREL AND ROD
10	HYDRAULIC POWER UNIT
11	CONTROL CABINET AND STOP
12	INTERLOCKED GUARD
13	TUBE

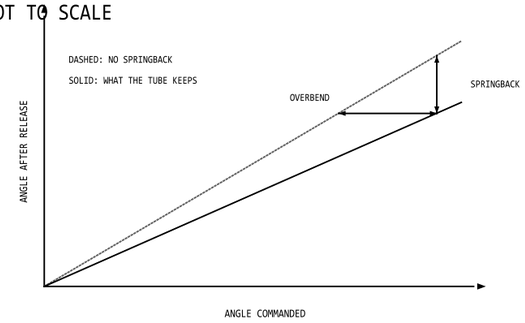
DETAIL A - SECTION AT THE BEND

NOT TO SCALE



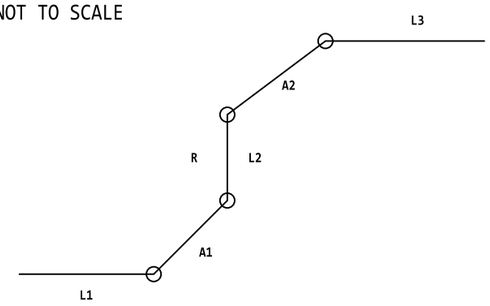
DETAIL B - SPRINGBACK

NOT TO SCALE



DETAIL C - THE BEND TABLE

NOT TO SCALE



L LENGTH TO FEED

R ROTATION TO THE NEXT PLANE

A ANGLE TO BEND

REFERENCE CONFIGURATION - NOT FOR CONSTRUCTION

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TUBE BENDING MACHINE - REFERENCE CONFIGURATION

GENERAL ARRANGEMENT AND DETAILS

BEND HEAD, MACHINE, SECTION, SPRINGBACK AND BEND TABLE

DWG NO	SCALE @ A3	SHEET	REV
NMX-PBM-93-002	NTS	2 OF 2	A
DATE	UNITS	DRAWN	STATUS
04-11-2026	TAGS ONLY	NMX-DO	REFERENCE