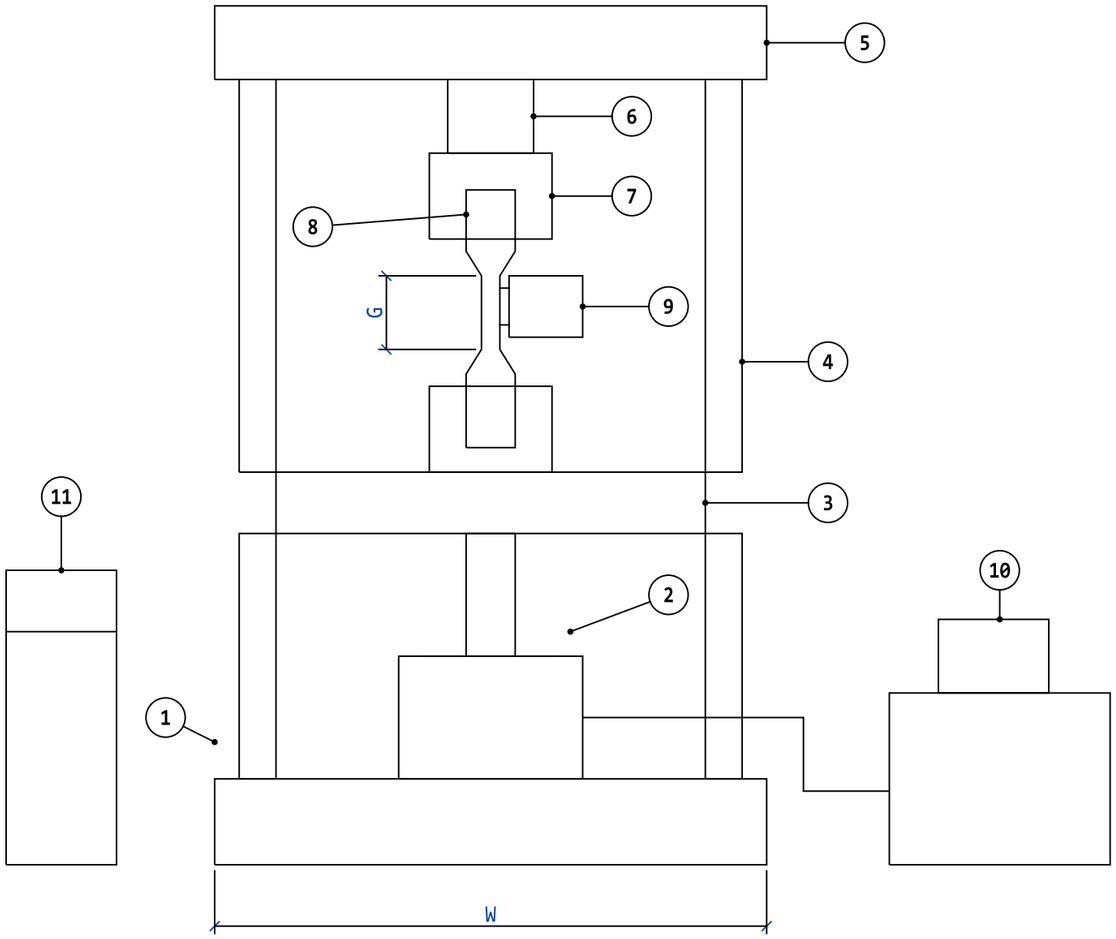
FRONT ELEVATION - HYDRAULIC LOAD FRAME

NOT TO SCALE



THE RAM MOVES THE LOWER CROSSHEAD; THE LOAD CELL READS THE FORCE

THE EXTENSOMETER IS CLIPPED ON THE SPECIMEN, SO THAT THE STRETCH IS ITS OWN

W IS THE WIDTH OF THE FRAME; G IS THE GAUGE LENGTH OF THE SPECIMEN

NOTES

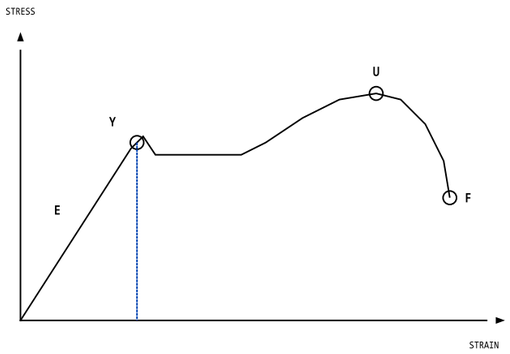
1. REFERENCE ARRANGEMENT OF A HYDRAULIC UNIVERSAL TESTING MACHINE. LETTERS ARE DIMENSIONS SET BY DESIGN: NO FORCE, RATE, SIZE, STRESS, STRAIN OR QUANTITY VALUE IS GIVEN.
2. THE FRONT ELEVATION SHOWS THE BASE, THE CYLINDER AND RAM, THE MOVING CROSSHEAD, TWO COLUMNS, THE FIXED CROSSHEAD, THE LOAD CELL, TWO GRIPS, A SPECIMEN WITH A CLIP-ON EXTENSOMETER, THE POWER UNIT AND THE CONTROLLER. W IS THE WIDTH OF THE FRAME AND G IS THE GAUGE LENGTH.
3. DETAIL A: AN ENGINEERING CURVE OF STRESS AGAINST STRAIN. E IS THE ELASTIC LINE, Y THE YIELD WITH ITS PLATEAU, U THE MAXIMUM AND F THE FRACTURE. THE RATE IS HELD ALONG THE WHOLE CURVE, AND AT THE YIELD TOO, WHERE THE LOAD STOPS RISING.
4. DETAIL B: ON ONE AXIS THE SPECIMEN IS ONLY STRETCHED. OFF THE AXIS BY E IT IS BENT AS WELL, AND THE RESULT READS WRONG. THE LOAD TRAIN IS ALIGNED AND CHECKED ON A TEST SPECIMEN.
5. DETAIL C: IN PLAN, THE FOUR COLUMNS, THE GRIPS AND THE SPECIMEN, WITH A SHIELD IN FRONT AND AT BOTH SIDES. THE OPERATOR STANDS BEHIND THE SHIELD, BECAUSE A SPECIMEN THAT BREAKS RELEASES ITS STORED ENERGY AT ONCE.
6. THE HYDRAULIC AND CONTROL CIRCUIT IS ON SHEET 002. CATALOGUE ITEMS ARE BOUGHT IN.

ITEMS

ITEM	DESCRIPTION
1	BASE
2	HYDRAULIC CYLINDER
3	MOVING CROSSHEAD
4	COLUMN
5	FIXED CROSSHEAD
6	LOAD CELL
7	GRIP
8	SPECIMEN
9	EXTENSOMETER
10	POWER UNIT
11	CONTROLLER

DETAIL A - THE CURVE AND THE RATE

NOT TO SCALE

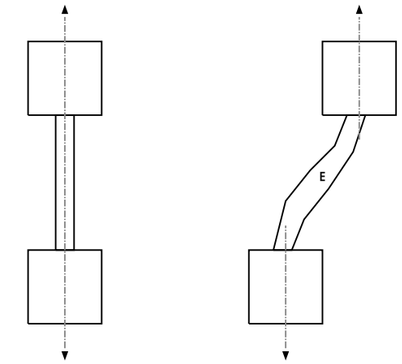


E ELASTIC LINE Y YIELD U MAXIMUM F FRACTURE

THE RATE IS HELD ALONG THE WHOLE CURVE, AND AT Y TOO

DETAIL B - ALIGNMENT

NOT TO SCALE

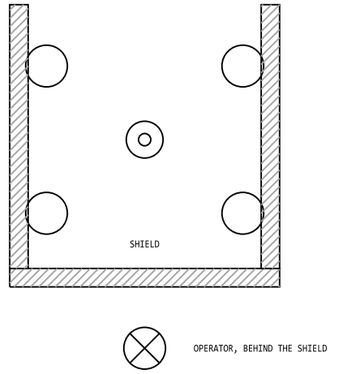


ON ONE AXIS: THE SPECIMEN IS ONLY STRETCHED

OFF THE AXIS BY E: THE SPECIMEN IS BENT

DETAIL C - THE SHIELD

NOT TO SCALE



A BREAK RELEASES STORED ENERGY AT ONCE

REFERENCE CONFIGURATION - NOT FOR CONSTRUCTION

NEOMETRIX DEFENCE LIMITED

ENGINEERED IN NOIDA - INDIA

UNIVERSAL TESTING MACHINE - REFERENCE CONFIGURATION

ARRANGEMENT AND DETAILS

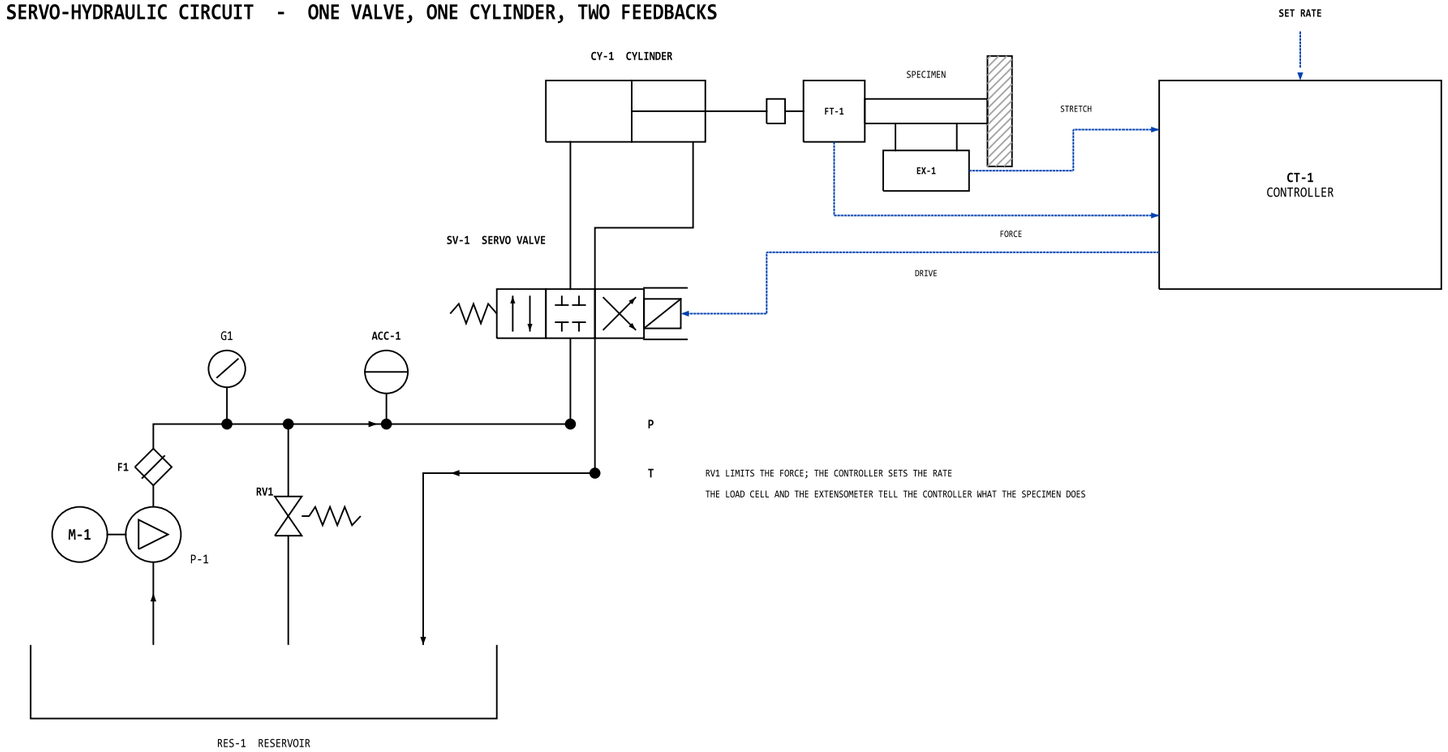
THE LOAD FRAME, THE CURVE, THE ALIGNMENT AND THE SHIELD

DWG NO	SCALE @ A3	SHEET	REV
NMX-UTM-101-001	NTS	1 OF 2	A
DATE	UNITS	DRAWN	STATUS
14-11-2026	TAGS ONLY	NMX-DO	REFERENCE

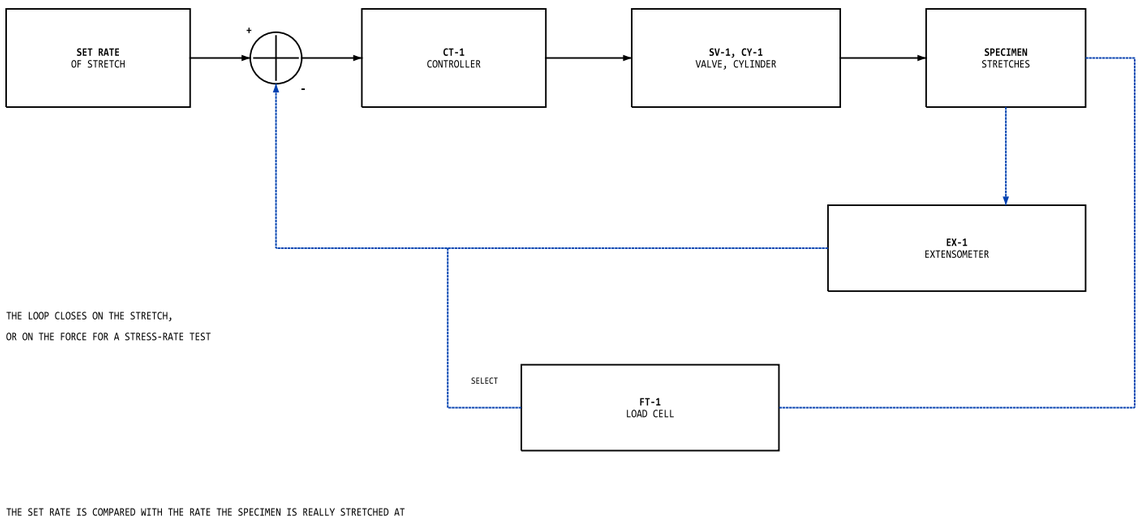
UNIVERSAL TESTING MACHINE - REFERENCE HYDRAULIC AND CONTROL CIRCUIT

NOT TO SCALE - TAGS ONLY, NO PROCESS VALUES

SERVO-HYDRAULIC CIRCUIT - ONE VALVE, ONE CYLINDER, TWO FEEDBACKS



THE CONTROL LOOP



WHAT EACH STEP DOES

STEP	WHAT HAPPENS
1 GRIP	THE SPECIMEN IS GRIPPED; FORCE AND STRETCH ARE ZEROED
2 LOAD	THE CONTROLLER HOLDS THE SET RATE FROM EX-1
3 YIELD	THE LOAD STOPS RISING; THE RATE IS STILL HELD
4 BREAK	THE SPECIMEN FAILS; CT-1 STOPS AND HOLDS
5 RECORD	THE CURVE IS SAVED WITH THE RATE THAT WAS SET

NOTES

1. REFERENCE SERVO-HYDRAULIC CIRCUIT AND CONTROL LOOP OF A UNIVERSAL TESTING MACHINE, DRAWN IN THE STYLE OF THE GRAPHICAL SYMBOLS OF FLUID POWER. TAGS ONLY: NO FORCE, RATE, PRESSURE, SIZE, TIME OR QUANTITY VALUE IS GIVEN. CY-1 IS DRAWN HORIZONTALLY FOR CLARITY.
2. P-1, DRIVEN BY M-1, TAKES OIL FROM RES-1 THROUGH F1 TO THE P RAIL. ACC-1 SMOOTHS THE SUPPLY. RV1 LIMITS THE PRESSURE, SO THAT AN OVERLOAD CANNOT BREAK THE FRAME, AND G1 SHOWS IT. THE T RAIL RETURNS TO RES-1.
3. SV-1 IS A FOUR-WAY THREE-POSITION VALVE WITH A PROPORTIONAL ACTUATOR. IT SENDS OIL TO THE CAP SIDE OR THE ROD SIDE OF CY-1, SO THAT THE CYLINDER MOVES SLOWLY AND STEADILY IN EITHER DIRECTION, AND HOLDS.
4. THE ROD OF CY-1 CARRIES THE LOAD CELL FT-1 AND THE SPECIMEN, WHICH IS HELD AT THE OTHER END. THE EXTENSOMETER EX-1 IS CLIPPED ON THE SPECIMEN. DASHED LINES ARE SIGNALS.
5. THE CONTROLLER CT-1 COMPARES THE SET RATE WITH THE RATE THE SPECIMEN IS REALLY STRETCHED AT, AS EX-1 SEES IT, AND DRIVES SV-1 TO CORRECT IT. AT THE YIELD THE LOAD STOPS RISING, AND THE LOOP KEEPS THE RATE ALL THE SAME.
6. THE LOOP CAN BE CLOSED ON THE FORCE FROM FT-1 INSTEAD, FOR A TEST SET BY A RATE OF STRESS.
7. LINES THAT CROSS ARE NOT CONNECTED. A DOT SHOWS A CONNECTION. THE ARRANGEMENT AND THE DETAILS ARE ON SHEET 001. CATALOGUE ITEMS ARE BOUGHT IN.

REFERENCE CONFIGURATION - NOT FOR CONSTRUCTION

NEOMETRIX DEFENCE LIMITED
ENGINEERED IN NOIDA - INDIA

UNIVERSAL TESTING MACHINE - REFERENCE CONFIGURATION

HYDRAULIC AND CONTROL CIRCUIT

THE SERVO-HYDRAULIC CIRCUIT, THE CONTROL LOOP AND THE STEPS

DWG NO	SCALE @ A3	SHEET	REV
NMX-UTM-101-002	NTS	2 OF 2	A
DATE	UNITS	DRAWN	STATUS
14-11-2026	TAGS ONLY	NMX-DO	REFERENCE