Multibit Screwdriver

GROUP ME A4

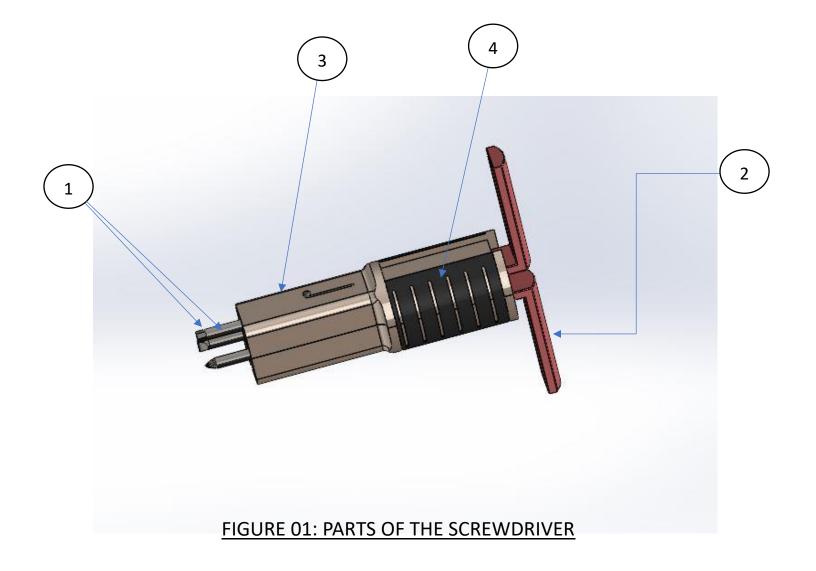
E/19/176

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- 1 SCREW BIT
- 2 FOLDABLE HANDLE
- 3 HANDLE
- 4 GRIP

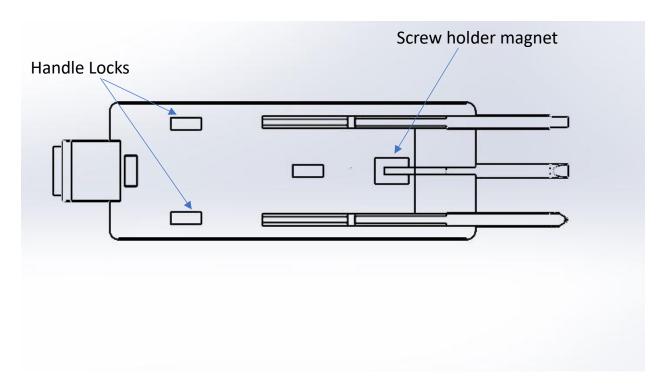


FIGURE 02: SECTIONAL VIEW OF THE DESIGN

TABLE 01: Modes of Failures

	Component	Type of Loading	Modes of failure
Shaft	Screw head	Compression Force	Compression
			Failure
		Shear force	Shear failure
	Shaft	Compression	Compression
			failure
		Torsion	Torsional failure
		Buckling	Buckling Failure
Foldable h	andle	Bending Force	Bending Failue
		Shear force	Shear failure
		Bending moment	Bending failure
Body		Torsion Force	Torsional Failure
Shaft hold	er	Compression	Compressive
			failure
		Compression Force	Crushing Failure

Data

Maximum load applied by an operator on the Body (F) = 80NLength of the foldable handle (L₁) = 6 cm

Assumption

- Body is assumed cylindrical.
- Frictional forces of the shaft are negligible.
- Cross section of the shaft is uniform.
- Weight of the screw driver is neglegibly small.

TABLE 02: Components, Selected materials, FOS

No	Component	Material	FOS
1	Body	acrylonitrile butadiene styrene	3
2	Screw	HIGH CARBON STEEL (AISI 1095)	3
3	Foldable Handle	acrylonitrile butadiene styrene	2
4	Magnet	Alnico	2
5	Pin(screw exiter)	AISI 1020 Plain carbon Steel	2
6	Grip	Thermo plastic Rubber	2
7	Screw exiter	AISI 1020 Plain carbon Steel	2

TABLE 03: Material Properties

	Yield/Compressiv	Bearing	Modulus of	Shear strength
Material	e/	strength	Elasticity	(MPa)
	Bending strength	(MPa)	(GPa)	
	(MPa)			
HIGH CARBON STEEL (AISI 1095)	1300	2600	200	750
Acrylonitrile butadiene styrene	50	100	2.3	28.85
Themo plastic Rubber	10	20	0.12	5.77
AISI 1020 Plain carbon Steel	400	800	190	230.8
Alnico	100	200	120	57.77

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Reference	Calculations	Pesult
	Considering the compression failure,	
	Tallowable = Tmaterial	
	F.O.5	
	= 1300 MPa	
	3	
	= 433.4 MPa	
	C. W. C. C. C. W. C.	
	For the compression failure,	OT DOM
	Tallowable > Traterio	
	423.4 × 106 > 80N × 4	
	433.4 × 106 > 80N × 4	
	ds2 > 80x4	
	433.4×106×7	
	ds > 0.5 mm	
	Considering the torshional failure of the screen	ew shatt.
	using maximum shear stress theory	
	dsmin = (32 ns (Tmax) 1/3	
	ds min = (32 1)3 (1 max)	
9 494 5	(1159	
	= 4.8 mm	
		ds = 6mm
	:. ds = 6 mm	03 2 81113
	Considering the AB Section, for buckling for	ilure.
	Considering the 118 section, to	
	Per > P (critical face)	
	TOEI > P	THE RESERVE
	L3 1	
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1 9 1 1	80 x 64	DESCRIPTION OF THE PERSON OF T
	L ₂ Z 1.5 m	
May a last		42=30mm
	L2 = 30 mm	

	No. Date	
Reference	Calculations	Result
	For BC Section, For allowable shear stress.	
	Tanowable = Tmaterial	
	5000 = 750 MPa	
	3	
	250 MPa	
	Using simple Torshional formula.	
	T T T-(14) 8=(a)	
	$\frac{T}{J} = \frac{7}{6}, J = \begin{pmatrix} a^4 \\ 6 \end{pmatrix}, P = \begin{pmatrix} a \\ 2 \end{pmatrix}$	
	AN MORE CON A SERVICE	
	48 × (a) = 7	
	$\frac{48 \times (a)}{\left(\frac{a^4}{6}\right)} = 7$	
	2.4 x 3 = 7	
	0.030 (2)	
	we know that Tailowable > T	
	250 Mpa > 2.4 ×3	
	a ³	
	a z z z z z z z z z z z z z z z z z z z	a=4mm
	leis get a = 4mm	4-4-1
	for La Value,	
and some	considering buckling failure of screw,	
	P P P 1 1 1 4 10	S 11
	Pcr > P = 1 a4	
	X E I > 180 N	
	L ₃ ²	
	12 x200 x 109 x 0.0044 > L32	
	12 x 80	6
	L3 (0.725m	
	lets get 43 = 26 mm	L3 = 26 mm
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Reference	Calculations	Result
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	I SON	
-	$= \frac{80N}{2\times6\text{ mm}^4}$	
		1
	= 6.66 MPa	1
	So screw will not fail under compression.	
	For other screws shear failure does not need to	
	be calculated. since when considering the shear	
	failure Projected area will be considered.	
	Since projected area is same for every sipu	
	il will not fail under shear stresses.	
	When considering the screw bits used srew bits	
	are	
	slotted 11 1) suit 51 10012 million	
	Cross Slot	
	Pozzidria Namo	
	Torx Torx	
	for failure under compression Cross slott has the	
	minimum Cross soction area.	
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	Figure 06: Screw head Area = 0.72 - 4x0.22	1 1 1 1
	The state of the s	
1 10	= 0.33 mm ²	1-1-4
	For compression force;	
	$T_1 = 90N$ 0.33 mm^2	
	= 242.42 MPa	
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	All the screw bits are in safe region.	A CONTRACTOR OF THE PARTY OF TH

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TABLE 04: Component Dimensions

Component	Dimension	Sign	Value (mm)
Body	Circular section Diameter	d	50
	square section length	a	40
	Circular section length	L_1	70
	Square section length	L_4	75
Foldable Handle	Length of foldable handle	L	60
	thickness of foldable handle	t	5
	Foldable handle pin diameter	D _n	4
	Foldable handle pin thickness	T _n	5
Grip	Grip thickness	t _g	1
	Outer Diameter	D_g,out	50
	Inner Diameter	$D_{g,inner}$	48
	Grip length	$L_g,\ length$	60
Pin	Pin Diameter	D_{pin}	4
	Pin shaft diameter	$D_{pin,shaft}$	2
	Pin head thicknes	P _{thickness}	2
	pin shaft length	P_{shaft} length	8
	fillet darius	F	0.5
Screw exiter	square sectionn length	a _{exiter}	4
	thickness	t _{exiter}	4
	length between columns	I _{col}	28.09
Screw	Screw circular diameter	ds	6
	square section length	a _s	4
	length of circular section	I _{Circular}	30
	length square section	I_{square}	26
	thickness of screw head	t _{head}	5
Magnet	Thickness of magnet	T_{magnet}	2
	Square section	a _{magnet}	2
	length of magnet	I _{magnet}	12

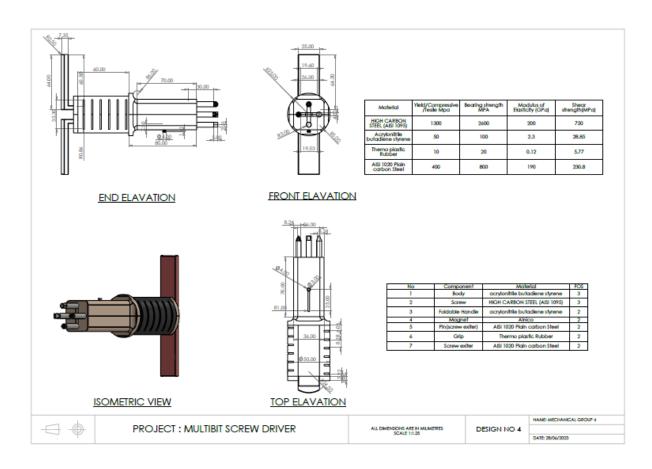


FIGURE 9 DRAWING OF THE SCREWBIT

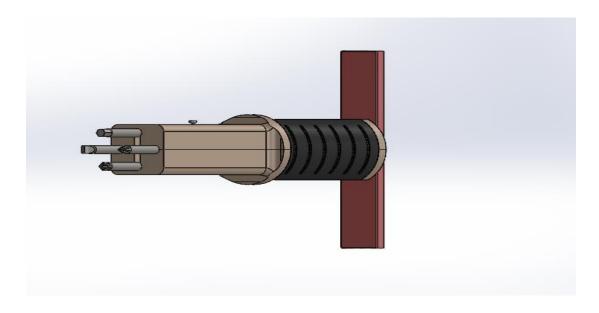


FIGURE 10 ISOMETRIC VIEW OF MULTIBIT SCREW DRIVER

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