

COMMERCIAL TEST REPORT

TEST REPORT NO.: FIMTTC/MECH/22/2015

MONTH: DECEMBER, 2022

THIS TEST REPORT VALID UP TO: 14/12/2029



TRACTOR OPERATED REAPER BINDER (FRONT MOUNTED TYPE) “SUPER DELUXE – 229”



सत्यमेव जयते

TESTED AT



उत्तमा वृत्तिस्तु कृषिकर्मैव

FARM IMPLEMENTS & MACHINERY TESTING & TRAINING CENTRE
(AN ISO 9001:2015 CERTIFIED CENTRE)
CENTRAL WORKSHOP
SWAMI KESHWANAND
RAJASTHAN AGRICULTURAL UNIVERSITY
BIKANER – 334 006 (RAJASTHAN)

Telephone: 0151-2250437

Website : www.fimttcbkn.org

Tele fax No: 0151-2250576

E-Mail : fimttcbkn@gmail.com

(Approved by Ministry of Agriculture (DAC), GOI, New Delhi vide No. 8-1/2004-M4(I&P)(28) dated July 09, 2012)

FIMTTC/MECH/22/2015	TRACTOR OPERATED REAPER BINDER (FRONT MOUNTED TYPE) "SUPER DELUXE – 229"	COMMERCIAL TEST
---------------------	---	-----------------



Manufacturer : M/s Paul Agro Industries
Mansa – Bathinda Road
Village – Bhaini Bagha
Mansa – 151505 (Punjab)

Applicant : M/s Paul Agro Industries
Mansa – Bathinda Road
Village – Bhaini Bagha
Mansa – 151505 (Punjab)

Report No.: FIMTTC/MECH/22/2015

Month: DECEMBER

Year: 2022

THIS TEST REPORT VALID UP TO: 14/12/2029



सत्यमेव जयते



उत्तमा वृत्तिस्तु कृषिकर्मैव

TESTED AT

FARM IMPLEMENTS & MACHINERY TESTING & TRAINING CENTRE
(AN ISO 9001:2015 CERTIFIED CENTRE)
CENTRAL WORKSHOP
SWAMI KESHWANAND
RAJASTHAN AGRICULTURAL UNIVERSITY
BIKANER – 334 006 (RAJASTHAN)

Telephone : 0151-2250437

Website : www.fimttcbkn.org

Tele fax No : 0151-2250576

E-Mail : fimttcbkn@gmail.com

FIMTTC/MECH/22/2015	TRACTOR OPERATED REAPER BINDER (FRONT MOUNTED TYPE) "SUPER DELUXE – 229"	COMMERCIAL TEST
---------------------	---	-----------------



Type of test : Commercial

Test Code/Procedure : IS: 11467–1985–Test Code for Cereal Harvesting Machines.
: IS: 6025–1982–Specification for Knife sections for Harvesting Machines.
: IS: 4931–2004–Agricultural Tractors–Rear Mounted PTO.
: IS: 10378–1982–Specification for Knife Blade.
: IS: 6024–1983–Specification for guards of Harvesting Machines.

Period of test : October, 2022 to December, 2022

Test Report No. : FIMTTC/MECH/22/2015

Month/Year : **December, 2022**

- 1. This Commercial Test Report is valid for only this model of the implement for which it has been issued.**
- 2. The results reported in this report are observed values and no corrections have been applied for atmospheric and site conditions.**
- 3. The data given in the Test Report pertain to the particular machine submitted by the Applicant for test.**
- 4. The result presented in this report do not in any way attribute to the durability of the machine. The result should not be reproduced in part or full without the prior permission of the Agricultural Engineer, Farm Implements & Machinery Testing & Training Centre, SKRAU Bikaner.**

SELECTED CONVERSIONS

S. No.	Units	Conversion Factor
1.	Force	
	1 kgf	9.80665 N
		2.20462 lbf
2.	Power	
	1 hp	1.01387 metric hp (Ps)
		745.7 W
		735.5 W
3.	Pressure	
	1 Psi	6.895 kPa
	1 Kgf/cm ²	98.067 kPa = 735.56 mm of Hg
	1 bar	100 kPa = 10 N/cm ²
	1 mm of Hg	1.3332 m-bar

FIMTTC/MECH/22/2015	TRACTOR OPERATED REAPER BINDER (FRONT MOUNTED TYPE) "SUPER DELUXE – 229"	COMMERCIAL TEST
---------------------	---	-----------------



Type of test : Commercial

Name of Machine : Tractor Operated Reaper Binder

Make : TRUE PAUL

Model : SUPER DELUXE – 229

Type : Front Mounted Type

Serial Number : TPRB 1101

Manufactured by : **M/s Paul Agro Industries**
Mansa – Bathinda Road
Village – Bhaini Bagha
Mansa – 151505 (Punjab)

Test requested by : **M/s Paul Agro Industries**
(Applicant) Mansa – Bathinda Road
Village – Bhaini Bagha
Mansa – 151505 (Punjab)

Test conducted at : Farm Implement & Machinery Testing & Training Centre
Central Workshop, Swami Keshwanand Rajasthan
Agricultural University, **BIKANER-334006** (Rajasthan)

**Manufacturer's premises****Fabrication Workshop of Manufacturer****Testing in Lab of FIMTTC****Field Testing**

CONTENTS

S. No.	Contents	Page No.
1.	SCOPE OF TEST	1
2.	METHOD OF SELECTION	1
3.	TEST PROCEDURE	1
4.	SPECIFICATIONS	1
5.	LABORATORY TEST	12
6.	FIELD TEST	13
7.	EASE OF OPERATION, ADJUSTMENT AND SAFETY	14
8.	DEFECTS, ADJUSTMENTS, BREAKDOWNS AND REPAIRS	14
9.	COMMENTS AND RECOMMENDATION	14
10.	LITERATURE	15
11.	APPLICANT COMMENTS	16
	ANNEXURE I to VII	17-23

FIMTTC/MECH/22/2015	TRACTOR OPERATED REAPER BINDER (FRONT MOUNTED TYPE) "SUPER DELUXE – 229"	COMMERCIAL TEST
---------------------	---	-----------------



1. SCOPE OF TEST

The scope of test was to check and assess the following:-

1.1 Laboratory Test

- Checking of specifications.
- Hardness of soil engaging parts (knife blade).
- Wear analysis (on mass basis).

1.2 Field Test

- Rate of work.
- Quality of work.
- Ease of operation, maintenance and adjustments.
- Labour requirement.
- Defects, breakdowns & repairs.

2. METHOD OF SELECTION

The implement was selected randomly from the production / manufacturer location by the Testing Authority.

3. TEST PROCEDURES

- i) IS: 11467 – 1985 Test Code for Cereal Harvesting Machines.
- ii) IS: 6025 – 1982 Specification for Knife Section for Harvesting Machines.
- iii) IS: 4931 – 2004 Agricultural Tractors-Rear Mounted PTO.
- iv) IS: 10378 – 1982 Specification for Knife Blade.
- v) IS: 6024 – 1983 Specification for guards of Harvesting Machines.

4. SPECIFICATIONS

4.1 General

Name of the Machine	: Tractor Operated Reaper Binder
Name & address of the Manufacturer/applicant	: M/s Paul Agro Industries Mansa – Bathinda Road Village – Bhaini Bagha Mansa – 151505 (Punjab)
Make	: TRUE PAUL
Model	: SUPER DELUXE – 229
Type	: Front Mounted Type
Working width of machine, mm	: 2290
Year of manufacture	: 2022
Serial number	: TPRB 1101
Power source as recommended, hp	: 25 and above (apa)

FIMTTC/MECH/22/2015	TRACTOR OPERATED REAPER BINDER (FRONT MOUNTED TYPE) "SUPER DELUXE – 229"	COMMERCIAL TEST
---------------------	---	-----------------



4.2 Design suitability

Main crops	: Wheat/Paddy
Other crops	: Barley, Paddy, Mustard, Wheat, Sorghum, Guar, Soya bean and Millet.
Reaper evaluated for	: Wheat, Paddy.

4.3 Power unit

Type of prime-mover	: General purpose agricultural tractor
Power requirement (kW/hp)	: 25 and above (apa)

4.3.1 Details of prime-mover used*

Make	: Massey Ferguson 1035 DI
Model	: MF 1035 DI (39 hp)
Type of drive	: Through propeller shaft
Chassis No.	: S325 D50062
Engine No.	: 673169
Max. PTO Power, kw (Ps)	: 22.11
Rated Engine Speed For Field	: 1000-1200
Operation Recommended By applicant, rpm	

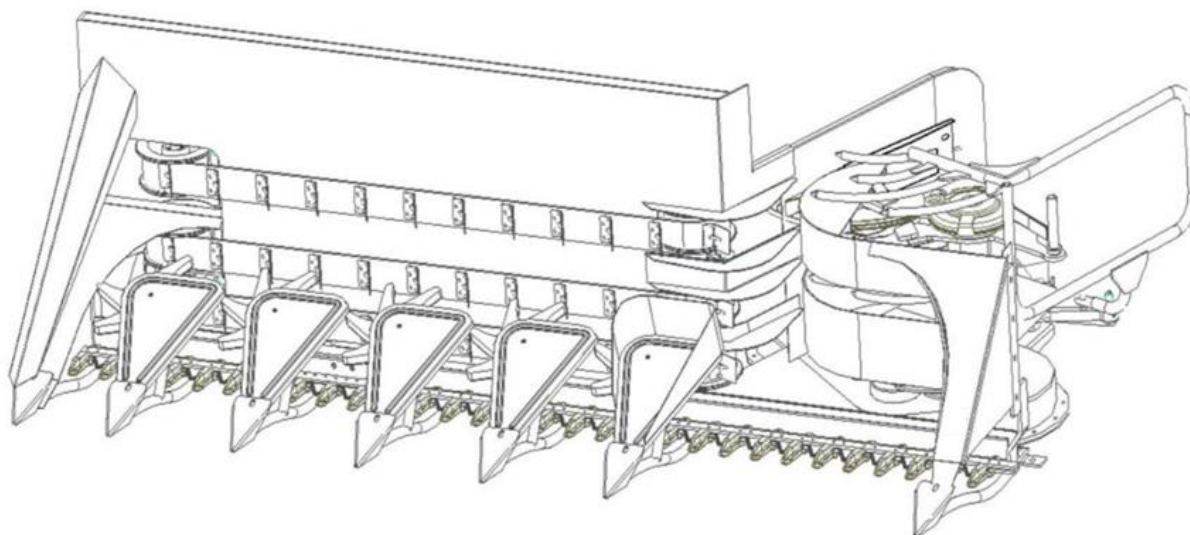


Fig. 01. Isometric View of Reaper Binder

4.4 Constructional details (refer fig. 01)

4.4.1 Frame: The base frame is fabricated by welding two angle iron of size 2360 x 65 x 65 x 6.25 mm and 2360 x 50 x 50 x 5.80 mm and one MS sheet of size 1600 x 665 x 2.40 mm in cross wise at its front. One angle of size 1250 x 65 x 65 x 5.83 mm is provided at rear as supporting members three point linkages and this angle is supported by the MS angle of size 410 x 40 x 40 x 5.13 mm.

4.4.2 Cutter Bar Assembly

Effective cutting bar width, mm	: 2200
Working width, mm	: 2290
Guard spacing, mm	: 80
Knife stroke, mm	: 75

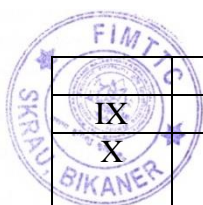
FIMTTC/MECH/22/2015	TRACTOR OPERATED REAPER BINDER (FRONT MOUNTED TYPE) "SUPER DELUXE – 229"	COMMERCIAL TEST
---------------------	---	-----------------



Stroke per minute	: 585 (at 1000 engine rpm) 690 (at 1200 engine rpm)
Arrangement and range of adjusting cutting height, mm	: By tractor hydraulic control lever, 70 to 410
Type of Ledger Plates	: Not provided as type of knife guard is B ₂ Type (as IS: 6024-1983) where the ledger plate is integrated part of knife guard.
Type of Knife Blade	: Serrated
Detail of the knife drive	: Cutter bar is driven by an eccentric push arm which receives the power from tractor PTO through a propeller shaft and gear box.
No. & type of bearing in gear box	: 04, Ball bearing
Type of dividers	: Shoe type
Arrangement for lifting lodged crop	: None
Knife drive safety arrangement	: None
4.4.2.1 Blades (refer fig. 02-A)	
Numbers	: 29
Material	: Shattered blade (V - Shape)
Trade mark	: Sharp
Size of blade, mm	: 78 x 75
Thickness, mm	: 3.43
Length of beveled edge, mm	: 60.85
Width of beveled edge, mm	: 9.50
No., size & spacing of the holes on each blade for fixing it to the flange, mm	: 02, 6.50 Φ, 51.55
Method of fixing of blades	: 29 blades riveted on a rectangular bar in same row.

4.4.2.2	Table 1 Dimensions of Knife Sections (Clause 5.1) (All the dimensions except α are in millimeter) (refer fig.2-A):				
S. No.	As per IS: 6025-1999				
	Designation	Dimension	Tolerance	As observed	Remarks
(1)	(2)	(3)	(4)	(5)	(6)
I	A	76.2	-0.2 -0.4	76.18	Conforms
II	B	50.5, (51.5) (52.5)	±0.1	51.56	Conforms
III	C	12.7 (11.85)	±0.1	11.93	Conforms
IV	D	5.5	±0.2-0	6.68	Does not conforms
V	E	9.5 (min.)	---	28.85	Conforms
VI	F	9 (min.)	---	9.95	Conforms
VII	G	0.8 (min.)	---	2.26	Conforms
VIII	H	11	±0.5	9.12	Does not

FIMTTC/MECH/22/2015	TRACTOR OPERATED REAPER BINDER (FRONT MOUNTED TYPE) "SUPER DELUXE – 229"	COMMERCIAL TEST
---------------------	---	-----------------



					conforms
IX	J	12.5 (min.)	---	12.98	Conforms
X	K	31.8 (30.6)	± 0.25	30.78	Conforms
XI	L	65	---	65.11	Conforms
XII	T	2.0 (min.)	---	2.24	Conforms
XIII	α	$< 19^\circ$	$\pm 0.1^\circ$	18°	Conforms

NOTE - The dimensions given in parentheses against **B**, **C** and **K** are non preferred dimensions.

Remark: - 02 out of 13 dimensions (15.38 %) are not conforming to relevant Indian Standard.

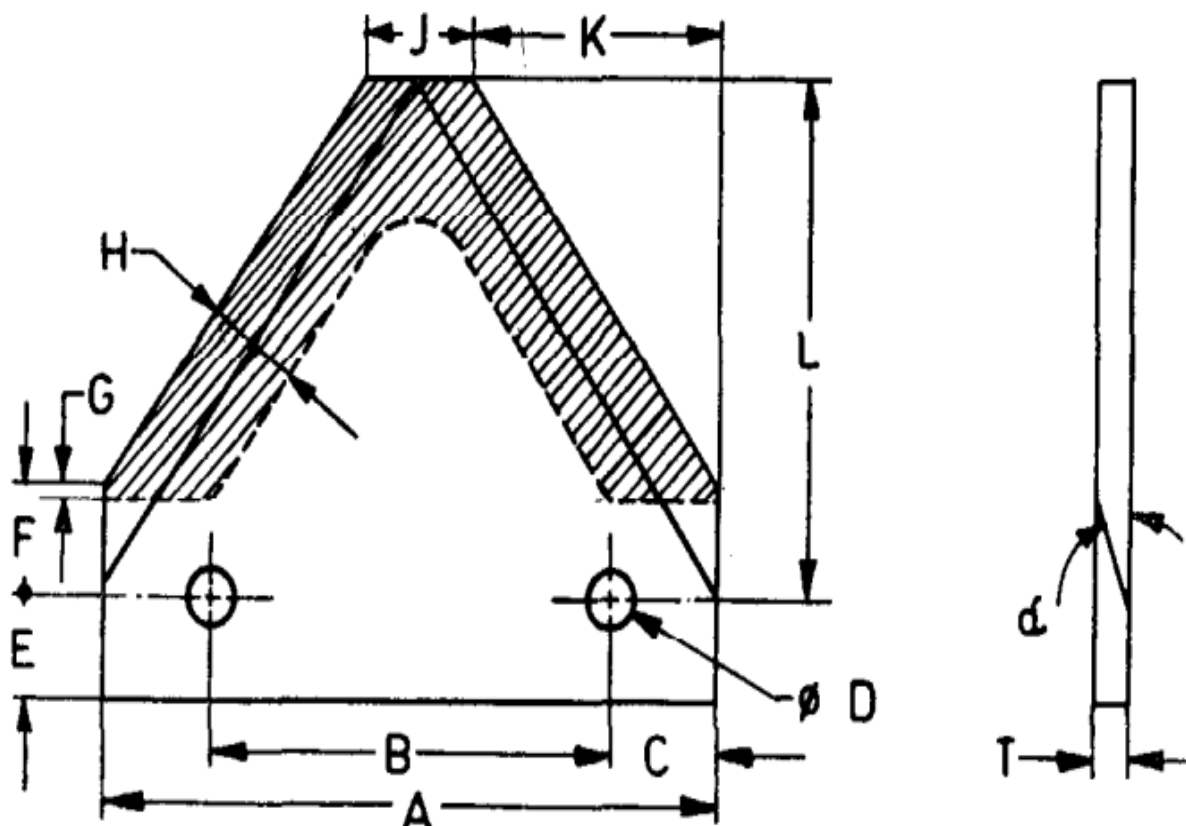


Fig. 02 – A - Dimensions of Knife Sections

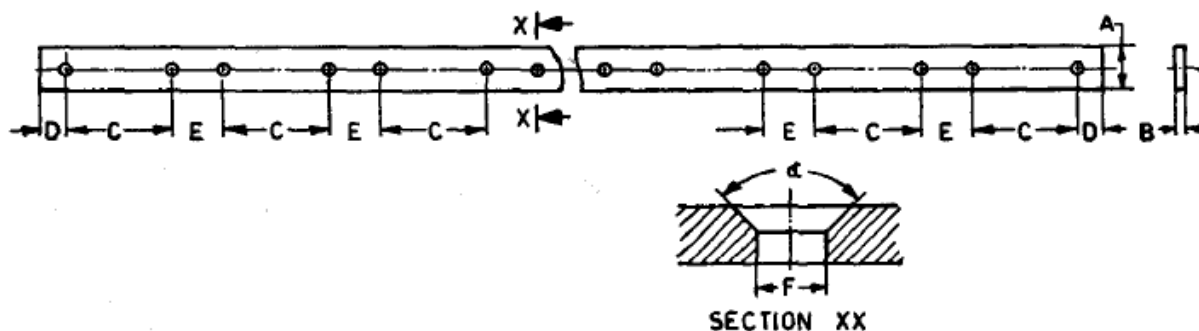


Fig. 02 – B - Dimensions of Knife Back

4.4.2.3 Dimensions of Knife Back (All dimensions except α are in mm) (refer fig. 02-B):					
S. No.	As per IS: 10378-1982			As observed	Remarks
	Designation	Dimension	Tolerance		
(1)	(2)	(3)	(4)	(5)	(6)
I	A	20 (min.)	----	21.93	Conform
II	B	4.5 (min.)	----	5.87	Conform
III	C	50.5, (51.5) (52.5)	$\pm 0.1-0$	51.56	Conform
IV	D	12 (min.)	----	12.82	Conform
V	E	25.4 (23.7)	± 0.1	24.48	Conform
VI	F	5.5	± 0.2 -0	6.53	Does not Conform
VII	α	75° or 90°	$\pm 0.1^\circ$	75	Conform
NOTE - The dimensions given in parentheses against <i>C</i> and <i>E</i> are non-preferred dimensions. Remark: - 01 out of 07 dimensions (14.28 %) are not conforming to relevant Indian Standard.					

4.4.3 Crop Conveyance

Type of crop conveyance	: Canvas conveyor with steel lug
Width of crop conveyor, mm	: A set of 03 canvas conveyor belts, each of 60 mm.
Type of drive	: All 03 belts move on individual pulleys mounted on common drive and driven shaft at both ends. At centre two rollers which are mounted on set of two bearings and support the belt drive. The drive shafts of the pulley receive the drive from the shaft extended from upper side of the gear box of reaper.
Linear speed, m/s	: 1.20
Method of tensioning	: By adjusting the position of the driven shaft which have three driven pulleys, are fixed through nuts and bolts welded with pulley shaft is supported.
Type of battens and their disposition	: 35 rectangular plate lugs are fixed on each belt, spacing of 120 mm at an inward inclination of 80°.
Arrangement for tilting of cutter bar platform	: Not provided
Height of cutter bar assembly	: 450
In transport position, mm	
Arrangement of locking cutter	: Provided through bolts and nuts.
Bar assembly in transport position	

FIMTTC/MECH/22/2015	TRACTOR OPERATED REAPER BINDER (FRONT MOUNTED TYPE) "SUPER DELUXE – 229"	COMMERCIAL TEST
---------------------	---	-----------------



	Type of suspension of the cutter bar assembly	: Three point linkage of tractor
4.5	Pick up and gathering devices	
	Type	: Star wheels and spring tine bars
	Type and number of tine bars	: 05 spring steel rods
	Diameter, mm	: 4.75
	Range of speed	: NA as no reel system is provided
	Arrangement for changing the speed	: NA
4.6	Side delivery and discharging devices	: Tine bars fixed on each star wheel through bolts and nuts.
4.7	Gathering devices	:
	Type	: Forks
	Number of fork	: 02 (Two)
	Number of fingers on each fork	: Seven finger on first fork and four finger on second fork respectively.
4.8	Knotting Unit	
	Method of crop binding	: With twine (Nylon string)
	Method of changing bundle size	: By spring tightening
4.9	Type of drive for various units	
	Gear box	: Tractor PTO transmits the drive to propeller shaft through belt and pulley. The other end of propeller shaft is connected to gear box, provided on reaper unit.
	Cutting bar	: Gear box through eccentric push arm
	Conveyor belt	: Gear box through V belt and pulley
	Star wheels	: Through lugs of conveyor belt
4.10	Power transmission	
4.10.1	Prime-mover to power input shaft	
	Mode of power transmission	: Through adjustment length propeller shaft having 06 splines on both tractor PTO and machine side respectively.
	Size of propeller shaft, mm	: 740 to 900 (Adjustable) x 35 x 35
	Mass of propeller shaft, kg	: 6.630
	Locking provision	: Not provided on tractor side and thresher side is movable

KEY WORDS (Refer Fig. 03 A, B)

- | | |
|--|--|
| 1. PTO | 10. PTO derive shaft, closed and extended length |
| 2. PIC | 11. Inner shaft |
| 3. PTO Yock bore | 12. Outer shaft |
| 4. PIC Yock bore | 13. Inner shaft Yock |
| 5. PTO Yock | 14. Outer shaft Yock |
| 6. PIC Yock | 15. PTO drive shaft guard |
| 7. Centred double universal joint gauard | 16. Double yoke |

8. Jurnal Cross – Assembly
9. Universal joint

17. Centred double universal joint
18. Center of articulation of centred double universal joint

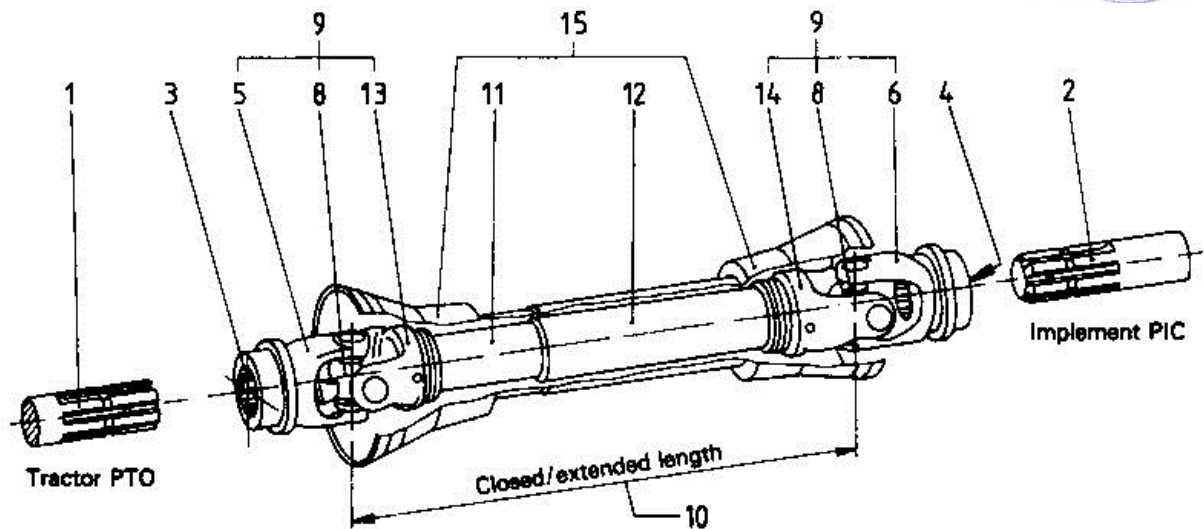


Fig. 03-A: - Designation of PTO derives shaft details

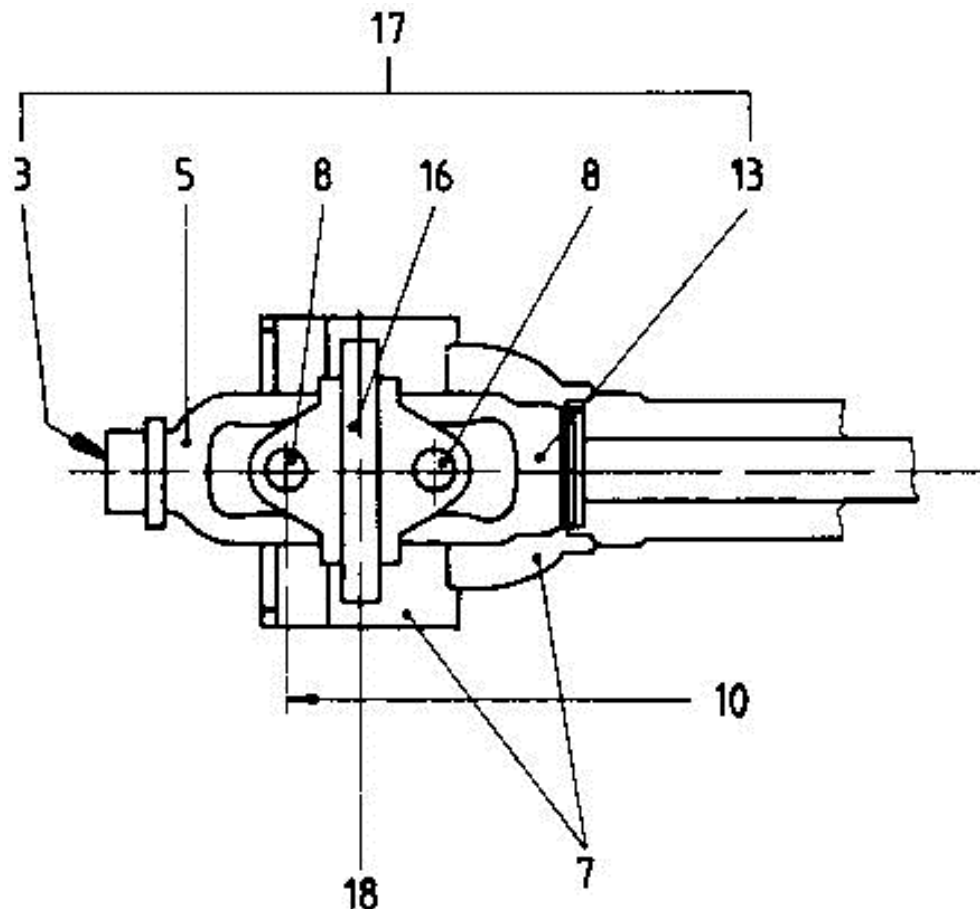


Fig. 03-B: - Designation of PTO derive shaft details

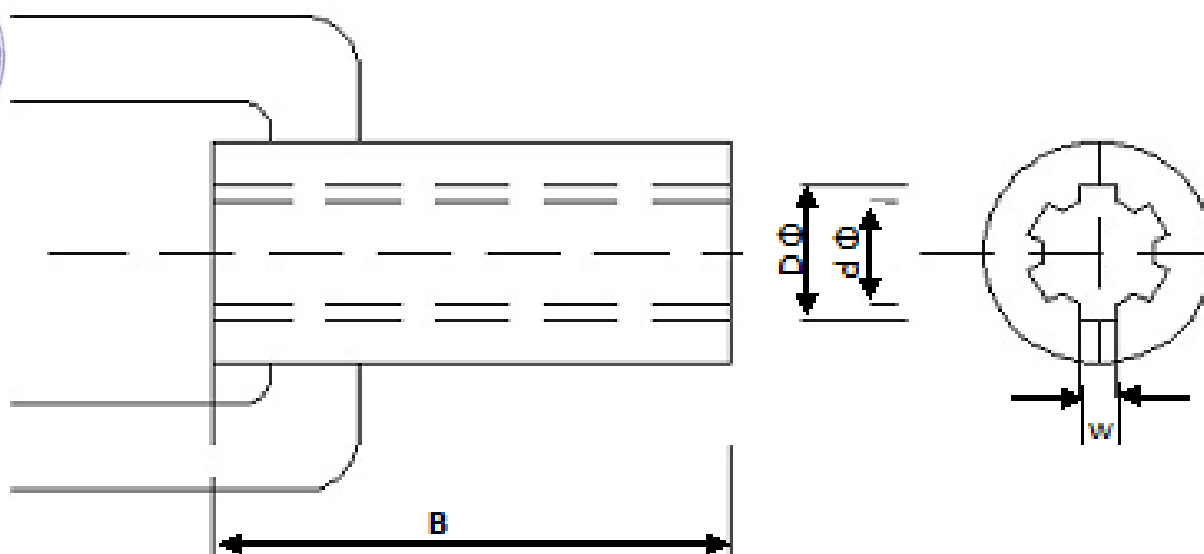


Fig. 04: Shaft Insert on Machine Side

4.10.2 Specifications of shaft insert on machine side (Ref. fig. 04)				
	Notation	Dimensions (mm)		Conformity to IS
		As per IS:4931-1995	As observed	
	DΦ	34.93+0.03	34.92	Conforms
	dΦ	29.7+0.1	30.56	Does not conforms
	w	8.69 + (0.02 to 0.05)	8.73	Conforms
	b	54 (min.)	57.88	Conforms
Remark: - 01 out of 04 dimensions (25 %) are not conforming to relevant Indian Standard.				
4.10.3 Specifications of shaft insert on tractor PTO shaft side (Ref. fig. 04)				
	Notation	Dimensions (mm)		Conformity to IS
		As per IS:4931-1995	As observed	
	Nominal speed	540+10	540	Conforms
	No. of splines	6	6	Conforms
	Direction of rotation	Clockwise	Clockwise	Conforms
	DΦ	34.93+0.03	34.92	Conforms
	dΦ	29.7+0.1	30.47	Does not conforms
	w	8.69 + (0.02 to 0.05)	8.73	Conforms
	b	54 (min.)	58.16	Conforms
Remark: - 01 out of 07 dimensions (14.28 %) are not conforming to relevant Indian Standard.				

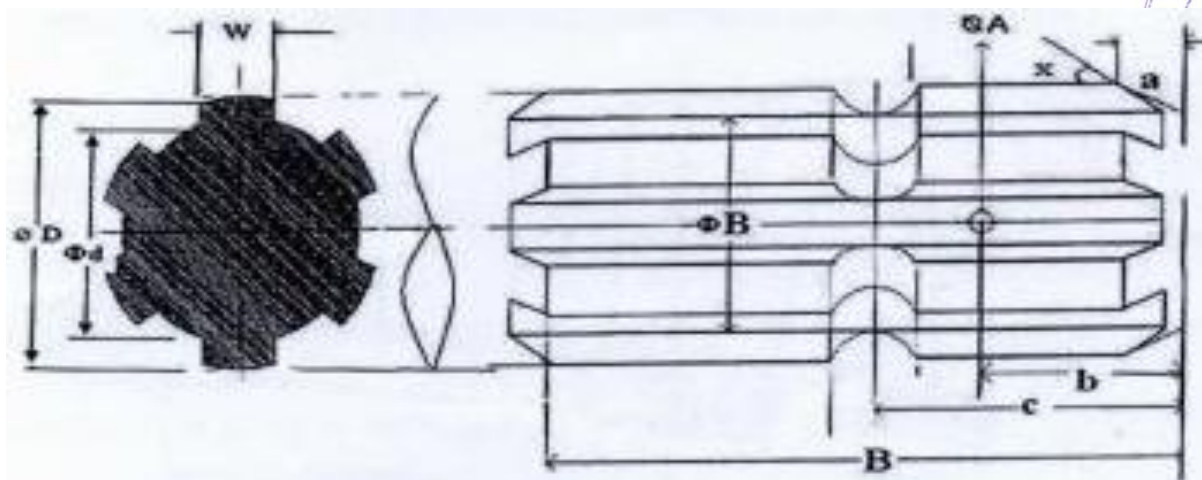


Fig. 05: Dimension of Implement Power Input Connection (PIC)

4.10.4 Specification of power input shaft (Refer fig. 05)			
Specifications	As per IS: 4931-1995	As measured (mm)	Remarks
Nominal speed, rpm	540 ± 10	540 ± 10	Conform
No. of splines	6	6	Conform
Direction of rotation	Clockwise	Clockwise	Conform
Dimensions, mm			
D Φ	34.79 ± 0.06	34.78	Conform
d Φ	$28.91 \pm 0.05/0.15$	28.85	Conform
B Φ	29.40 ± 0.1	29.43	Conform
A Φ (Optional)	8.3	Not applicable	-----
W	$8.69 + 0.09/-0.16$	8.76	Conform
a	7	Not applicable	-----
b (Optional)*	25 ± 0.5	Not applicable	-----
C	38	28.67	Does not conform
X	30°	30°	Conform
B	76 (min.)	68.24	Does not conform
* Recommended dimensions. It may be necessary to vary them in the case of specialized implements.			
Remark: - 02 out of 13 dimensions (15.38 %) are not conforming to relevant Indian Standard.			

FIMTTC/MECH/22/2015	TRACTOR OPERATED REAPER BINDER (FRONT MOUNTED TYPE) "SUPER DELUXE – 229"	COMMERCIAL TEST
---------------------	---	-----------------



4.10.5 Specifications of power input shaft to eccentric shaft

Method of driving : PTO driven with the help of propeller shaft and arrangement and location : located just back of the tractor and supported on crosses rails of chassis with the help of bolts and nuts. An output shaft is supported on LHS of gear box and on the chassis.

No. of grooves : Two
Dia. & size of drive pulley, : 150 Φ x 45 mm
Dia. & size of driven pulley, : 85 Φ x 45 mm
No. and of type and size of : 02, V-belts and B-31 belt
Speed reduction ratio : 1 : 1.76
Type : Spiral Bevel Gears and pinion, Multi-groove pulley and V-belt.
No. of teeth on drive gears : 10
No. of teeth on driven gears : 14
Length of splines, mm : 100
Speed of eccentric shaft : 780
Corresponding to engine speed of 1600 rpm, rpm
Gear ratio : 1 : 1.47
Oil capacity, l : 1 (SAE-140)
No. of grooves : One
No. of teeth on drive : 14 sprocket
No. of teeth on driven : 20 sprocket
No. and size of chain : 01, 1410 x 16.50 x 12.20 Φ
Speed of eccentric shaft : 545
Corresponding to engine speed of 1600 rpm, rpm
Provision for changing speed : Both pulleys can be interchanged for obtaining desired speed of cylinder from tractor PTO shaft of 540 rpm.
Provision for chain : By tightening idler sprocket is provided on the tensioning
Provision of safety guards : Complete safety guard is provided

4.10.6 Gear box to crop gathering conveying unit

Type : Chain sprockets and spur gear arrangement
No. of teeth on rotor shaft : 20 sprocket
No. of teeth on rotor shaft : 26 sprocket
No. and size of chain : 01, 1520 x 16.50 x 12.20 Φ

FIMTTC/MECH/22/2015	TRACTOR OPERATED REAPER BINDER (FRONT MOUNTED TYPE) "SUPER DELUXE – 229"	COMMERCIAL TEST
---------------------	---	-----------------



Speed reduction ratio : 1 : 1.3
 Dia. and number of teeth of spur gear on drive shaft : 95.75 Φ; 36
 Dia. and number of teeth of spur gear on driven shaft : 95.75 Φ; 36
 Dia. and number of teeth of spur gear on idler shaft : 95.75 Φ; 36
 Dia. and number of teeth of spur gear on idler shaft : 95.75 Φ; 36
 Dia. and number of teeth of spur gear on idler shaft : 95.75 Φ; 36
 Dia. and number of teeth of spur gear on driven / gathering device shaft : 170 Φ; 64
 Dia. and number of teeth of spur gear on idler shaft : 95.75 Φ; 36
 Dia. and number of teeth of spur gear on driven / conveying unit shaft : 170 Φ; 64
 Provision of safety guards : Complete safety guard is provided

4.11 Lubricants

S. No.	Particulars	As recommended by the manufacturer	As used during test	Oil change period
1.	Primary Gear box	SAE-140	Grease + SAE-140	200-250 h
2.	Chain sprocket	SAE-140	SAE-140	After 45-50 h
3.	Propeller Shaft	Grease	Multipurpose grease	After 45-50 h
4.	Rotor Hub	Grease	Multipurpose grease	After 08-10 h

4.12 Overall dimensions, mm

Length : 1285
 Width : 2470
 Height : 715
 Mass, kg : 300
 Colour of machine : Red

FIMTTC/MECH/22/2015	TRACTOR OPERATED REAPER BINDER (FRONT MOUNTED TYPE) "SUPER DELUXE – 229"	COMMERCIAL TEST
---------------------	---	-----------------



4.13 Marking/Labeling of implement

M/s Paul Agro Industries

Mansa – Bathinda Road

Village – Bhaini Bagha

Mansa – 151505 (Punjab)

Type : Front Mounted Type
Product : Reaper Binder
Make : TRUE PAUL
Model : SUPER DELUXE – 229
Serial number : TPRB 1101
Size, mm : 1285 x 2470 x 715 (L x W x H)
Weight, kg : 300
Year : 2022
Power (hp) : 25 and above

5. LABORATORY TEST

5.1 Hardness of knife blade and knife guard: The hardness of cutting blade was determined at hardened and remainder zone. The results of hardness test are as under:

S. No.	Zone of blade	Hardness (HRC)		Remarks
		As per IS: 6025-1999	As observed	
a.	Hardened Zone	48 to 58	51 to 54	Conform
b.	Remainder Zone	20 to 35	23 to 27	Conform

Remark: - The hardness of Hardened and Remainder zone of knife blade is conforming to IS: 6025-1999.

B	Component	Hardness (HRC)		Remarks
		As per IS: 6024-1999	As observed	
a.	Knife Guard	48 to 60	53 to 56	Conform

Remark: - The hardness of Knife Guard of knife blade is conforming to IS: 6025-1999.

5.2 Chemical composition: Chemical composition of critical component is given below:-

S. No.	Constituents / Elements	Composition		
		As per IS: 6024-1999	As observed	
			Blade	Knife Guard
1.	Carbon (C)	0.70-0.95	0.88	0.90
2.	Manganese (Mn)	0.3-0.5	0.448	0.38
3.	Phosphorus (P)	0.020	0.021	0.022
4.	Sulphur (S)	0.019	0.020	0.020
5.	Silicon (Si)	0.033	0.034	0.030

FIMTTC/MECH/22/2015	TRACTOR OPERATED REAPER BINDER (FRONT MOUNTED TYPE) "SUPER DELUXE – 229"	COMMERCIAL TEST
---------------------	---	-----------------



5.3 Adequacy of power of prime mover as used during test

The power of the prime mover as used during test was found adequate.

5.4 Wear analysis (on mass basis)

Wear of hatchet blades (on mass basis) was calculated after 28.50 hours in ensuing table:

Percentage wear of Reaper Binder blades on mass basis:-

S. No.	Initial mass of blade (gm) L to R	Mass of blade after 28.50 hours of operation (gm)	Wear of (%)	Wear on (%) hour basis
1.	68.30	65.15	4.612	0.162
2.	70.15	66.80	4.775	0.168
3.	67.90	64.65	4.786	0.168
4.	71.45	67.95	4.899	0.172
5.	70.85	67.60	4.587	0.161
6.	69.65	66.10	5.097	0.179
7.	70.40	67.25	4.474	0.157
8.	68.95	65.70	4.714	0.165
9.	71.10	67.90	4.501	0.158
10.	69.60	66.55	4.382	0.154

Remarks: - The average percentages of wear of Reaper Binder blades are 0.154% - 0.179%.

6. FIELD TEST

The reaper binder was operated in field for 28.50 hours for Wheat and Paddy harvesting to assess the performance of reaper binder with regard to quality of work, rate of work, fuel consumption. The working of reaper binder on field was observed satisfactory.

Table 1: Crop parameters for Wheat and Paddy

S. No.	Parameters	Range of parameters	
		Wheat	Paddy
1.	Plant height, cm	65 to 120	85 to 115
2.	Plant population (No. of tillers/m ²)	125 to 205	105 to 225
3.	Straw gain ratio	1.03 : 1 to 1.36 : 1	2.97 : 1 to 3.27 : 1
4.	Grain moisture %	12-15	14-20
5.	Straw moisture %	14-20	20-27

Table 2: Field performance observations

S. No.	Observation	Range of observations	
		Wheat	Paddy
1.	Speed of operation, kmph	2.63 to 2.78	2.27 to 2.43
2.	Width of cut, m	1.85 to 1.95	1.82 to 1.90
3.	Area covered, ha/h	0.24 to 0.25	0.23 to 0.24
4.	Fuel consumption		
	➤ l/h	2.275 to 2.657	2.237 to 2.327
	➤ l/ha	9.479 to 10.628	9.696 to 9.726
5.	Post harvest losses, kg/ha	8.15 to 12.45	12.15 to 14.05
6.	Crop conveyance losses, kg/ha	9.25 to 12.87	12.72 to 16.18
7.	Total machine losses, kg/ha	20.12 to 23.64	26.69 to 28.38

FIMTTC/MECH/22/2015	TRACTOR OPERATED REAPER BINDER (FRONT MOUNTED TYPE) "SUPER DELUXE – 229"	COMMERCIAL TEST
---------------------	---	-----------------



6.1 Rate of work and fuel consumption

- (i) During the tests the rate of work varied from 0.24 to 0.25 and 0.23 to 0.24 ha/h in Wheat and Paddy harvesting respectively.
- (ii) The fuel consumption varied from 2.275 to 2.657 and 2.237 to 2.327 l/h in Wheat and Paddy harvesting respectively.
- (iii) The fuel consumption per unit area harvested varied from 9.479 to 10.628 and 9.696 to 9.726 l/ha for Wheat and Paddy harvesting respectively.
- (iv) The overall performance of machine was found satisfactory.

6.2 Quality of work

- (i) During Wheat and Paddy harvesting post harvest losses varied from 8.15 to 12.45 kg/ha and 12.15 to 14.05 kg/ha respectively.
- (ii) Crop conveyance losses varied from 9.25 to 12.87 kg/ha and 12.72 to 16.18 kg/ha for Wheat and Paddy harvesting respectively.
- (iii) Total machine losses varied from 20.12 to 23.64 kg/ha and 26.69 to 28.38 kg/ha for Wheat and Paddy harvesting respectively.

6.3 Time required for daily maintenance

About 30 minutes are required for daily servicing and maintenance of reaper binder.

6.4 Labour requirement

One skilled operator was needed to operate the tractor with the implement.

7. EASE OF OPERATION, ADJUSTMENT AND SAFETY

Reaper Binder was found easy to operate and no problem observed in handling the reaper binder during the operation.

No safety provisions made in reaper binder. No provision of adjustment is made in reaper binder, however cutting height and cutter bar speed can be changed by the tractor.

8. DEFECTS, ADJUSTMENTS, BREAKDOWNS AND REPAIRS

No breakdown occurred during 28.50 hours of field test of the machine.

9. COMMENTS AND RECOMMENDATION

- The hardness of hardened and remainder zone of knife blade is conforming to IS: 6025-1999 requirement.
- The dimension of PTO drive shaft does not conform to IS: 4931-2004 up to 25% and 14.28%. This should be provided according to relevant Indian Standard.
- The dimension of PIC of implement does not conform to IS: 4931-2004 up to 15.38 %. This should be provided according to relevant Indian Standard.
- The dimension of Knife Sections does not conform to IS: 6025-1999 up to 15.38%. This should be provided according to relevant Indian Standard.
- The marking/labeling plate is provided with implement. All details of particulars are not provided. Hence, particulars like Serial No., month/year of manufacture, manufacture name and trade mark, size of implement & power requirement and recommended power should be stamped, engrossed or embossed on labeling plate a non-wearing part of the implement / machine.

FIMTTC/MECH/22/2015	TRACTOR OPERATED REAPER BINDER (FRONT MOUNTED TYPE) "SUPER DELUXE – 229"	COMMERCIAL TEST
---------------------	---	-----------------

- Maneuverability of tractor with Reaper Binder and quality of work were observed to be satisfactory.



10. LITERATURE

Operator's service manual with safety note warnings, Spare parts catalogue, accessories and attachments, maintenance instruction and instruction for storage, handling transport, installation, etc. is provided in English languages. It should be provided in Hindi and other regional languages for operator's use as per IS: 3600-1996.

TESTING AUTHORITY

(Vipin Laddha) Agricultural Engineer	 Agricultural Engineer Central Workshop S.K. Rajasthan Agriculture University BIKANER
(P.S. Shekhawat) Director of Research	 Director Research Directorate of Research SKRAU, Bikaner

The test report is prepared by
Er. Abhinav Yadav, SRF

FIMTTC/MECH/22/2015	TRACTOR OPERATED REAPER BINDER (FRONT MOUNTED TYPE) "SUPER DELUXE – 229"	COMMERCIAL TEST
---------------------	---	-----------------



11. APPLICANT'S COMMENTS

- Draft report was send to the manufacturer.
- The final report is released after receiving acceptance of the report by the manufacturer.

FIMTTC/MECH/22/2015	TRACTOR OPERATED REAPER BINDER (FRONT MOUNTED TYPE) "SUPER DELUXE – 229"	COMMERCIAL TEST
---------------------	---	-----------------



FIELD PERFORMANCE TEST RESULTS

S. No.	Observation	Range of observations	
		Wheat	Paddy
1.	Speed of operation, kmph	2.63 to 2.78	2.27 to 2.43
2.	Width of cut, m	1.85 to 1.95	1.82 to 1.90
3.	Area covered, ha/h	0.24 to 0.25	0.23 to 0.24
4.	Fuel consumption		
	➤ l/h	2.275 to 2.657	2.237 to 2.327
	➤ l/ha	9.479 to 10.628	9.696 to 9.726
5.	Post harvest losses, kg/ha	8.15 to 12.45	12.15 to 14.05
6.	Crop conveyance losses, kg/ha	9.25 to 12.87	12.72 to 16.18
7.	Total machine losses, kg/ha	20.12 to 23.64	26.69 to 28.38

FIMTTC/MECH/22/2015	TRACTOR OPERATED REAPER BINDER (FRONT MOUNTED TYPE) "SUPER DELUXE – 229"	COMMERCIAL TEST
---------------------	---	-----------------



ANNEXURE-II

BRIEF SPECIFICATIONS OF THE TRACTOR USED DURING FIELD TEST

1.	Name of the tractor (Make)	Massey Ferguson 1035 DI
2.	Model	MF 1035 DI (39 hp)
3.	Name of driver	Mr. Ratan Singh
4.	Engine no.	Engine and Chassis No. S325 D50062 and 673169
5.	Number of cylinders	3
6.	Power at standard PTO speed kW(Ps)	25.8
7.	Rated engine speed	2000
8.	No load engine speed during field test (rpm)	1700
9.	Drawbar power kW (Ps)	22.11
10.	Drawbar pull (kN):	
	Without ballast	11.4
	With ballast	17.9
11.	Number & size of tire:	
	Front	6.00-16, 6PR
	Rear	13.6-28, 12PR
12.	Standard track width (mm)	
	Front	1360
	Rear	1320
13.	Wheel base (mm)	1820
14.	Ballast Condition	Used in Unballasted Condition
15.	Total operational Mass (kg)	
	Front	635
	Rear	975
	Total	1610

FIMTTC/MECH/22/2015	TRACTOR OPERATED REAPER BINDER (FRONT MOUNTED TYPE) "SUPER DELUXE – 229"	COMMERCIAL TEST
---------------------	---	-----------------



OBSERVATION SHEET FOR FIELD TESTING (WHEAT HARVESTING)

Test No.	Crop variety	Height of plants (cm)	Length of Ear head (cm)	No. of grains per Ear head	Plant population (No. of tillers/m ²)	Straw grain ratio	Moisture (%)		Atmospheric condition		
							Grain	Straw	Ambient Temp. (°C)	R. H. (%)	Pressure (mm of mercury)
1	2	3	4	5	6	7	8	9	10	11	12
1.	Raj 3077	75-90	8-10	32-35	135-140	1:36: 1	12	20	28	18.5	735
2.	Raj 3077	80-95	8-9	30-40	125-130	1:03: 1	15	14	30.9	23.1	739
3.	Raj 3077	65-85	8-11	52-65	124-145	1:12: 1	12	18	28.7	24.5	732
4.	Raj 3077	110-120	10-12	43-54	112-135	1:25: 1	13	17	29.5	25.1	738

FIMTTC/MECH/22/2015	TRACTOR OPERATED REAPER BINDER (FRONT MOUNTED TYPE) "SUPER DELUXE – 229"	COMMERCIAL TEST
---------------------	---	-----------------



ANNEXURE-IV

OBSERVATION SHEET FOR FIELD TESTING (PADDY HARVESTING)

Test No.	Crop variety	Height of plants (cm)	Length of ear head (cm)	No. of grains per ear head	Plant population (No. of tillers/m ²)	Straw grain ratio	Moisture (%)		Atmospheric condition		
							Grain	Straw	Ambient Temp. (°C)	R. H. (%)	Pressure (mm of mercury)
1	2	3	4	5	6	7	8	9	10	11	12
1.	Pusa - 1121	95-115	18.2	82-93	165-225	3:35: 1	17	21	31	45	735
2.	Pusa - 1121	85-100	12.3	81-92	137-220	3:27: 1	14	27	30.5	46	738
3.	Pusa - 1121	90-100	14.5	79-88	105-150	3:17: 1	20	23	33.7	43	730
4.	Pusa - 1121	95-110	17.3	75-96	180-205	2:97: 1	19	20	27.2	42	739

FIMTTC/MECH/22/2015	TRACTOR OPERATED REAPER BINDER (FRONT MOUNTED TYPE) "SUPER DELUXE – 229"	COMMERCIAL TEST
---------------------	---	-----------------



DATA OF FIELD PERFORMANCE TESTS (WHEAT HARVESTING)

Test No	Duration of test (h)	Speed of operation (kmph)	Width of cut (m)	Area covered (ha/h)	Fuel consumption		Per harvest loss (kg/ha)	Post-harvest loss (kg/ha)	Crop conveyance loss (kg/ha)	Total losses (kg/ha)	Engine speed (rpm)	
					I/h	I/ha					No load	On load
1	2	3	4	5	6	7	8	9	10	11	12	13
1.	3.50	2.78	1.86	0.25	2.657	10.628	7.00	11.13	10.33	21.46	1200	1115
2.	4.00	2.76	1.85	0.25	2.638	10.553	13.00	8.15	12.87	21.02	1200	1100
3.	3.50	2.67	1.95	0.24	2.315	9.646	9.77	10.87	9.25	20.12	1200	1095
4.	4.00	2.63	1.91	0.24	2.275	9.479	11.00	12.45	11.19	23.64	1200	1125

FIMTTC/MECH/22/2015	TRACTOR OPERATED REAPER BINDER (FRONT MOUNTED TYPE) "SUPER DELUXE – 229"	COMMERCIAL TEST
---------------------	---	-----------------



DATA OF FIELD PERFORMANCE TESTS (PADDEY HARVESTING)

Test No	Duration of test (h)	Speed of operation (kmph)	Width of cut (m)	Area covered (ha/h)	Fuel consumption		Per harvest loss (kg/ha)	Post-harvest loss (kg/ha)	Crop conveyance loss (kg/ha)	Total losses (kg/ha)	Engine speed (rpm)	
					I/h	I/ha					No load	On load
1	2	3	4	5	6	7	8	9	10	11	12	13
1.	3.50	2.43	1.83	0.24	2.273	9.717	30.67	13.63	14.75	28.38	1200	1100
2.	3.00	2.32	1.82	0.23	2.327	9.726	25.67	12.15	16.18	28.33	1200	1110
3.	4.00	2.27	1.87	0.23	2.314	9.705	25.67	12.82	13.87	26.69	1200	1115
4.	3.00	2.39	1.90	0.24	2.237	9.696	17.33	14.05	12.72	26.77	1200	1105



ANNEXURE-VII

SYMBOL AND ABBREVIATIONS

SYMBOLS

I	Symbols Assigned to Basic SI Units		
S. No.	Physical Quantity	Name of SI Unit	Symbol
1.	Length	Meter	m
		Millimeter	mm
2.	Mass	Kilogram	kg
		Gram	gm
3.	Time	Tone	T
		Second	s

II	Symbols Assigned to Some Derived Units		
S. No.	Physical Quantity	Name of SI Unit	Symbol
1.	Area	Square centimeter	cm ²
		Square meter	m ²
2.	Speed/Velocity	Hectare	ha
		Meter per second	m/s
3.	Pressure	Kilometer per hour	kmph
		Newton per square millimeter	N/mm ²
4.	Time	Minute	min
		Hour	h
5.	Volume	Cubic centimeter	cm ³
		Milliliter	ml
		Liter	lit

ABBREVIATIONS

As per applicant	:	apa	Clause	:	CI
Degree	:	Deg	Figure	:	Fig
Indian Standard	:	IS	Kilowatt	:	kW
Number	:	No.	Not available	:	N.A.
Not Recorded	:	N.R.	Percent	:	%
Reference	:	Ref.	Revolution per minute	:	rpm
Implement	:	IMP	Thresher	:	THR
Machine	:	MECH	Sprayer	:	SPRY
Low gear Second	:	L-1	Replications	:	R
Tapered Roller Bearing	:	TRB	Ball Bearing	:	BB