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व्यावसायिक परीक्षण रिपोर्ट  
COMMERCIAL TEST REPORT (Initial)

संख्या / No. : T-1055/1580/2016  
माह / Month : December, 2016



**TAFE, MF 6028 TRACTOR**



सत्यमेव जयते

भारत सरकार

कृषि एवं किसान कल्याण मंत्रालय  
(कृषि, सहकारिता एवं किसान कल्याण विभाग)

GOVERNMENT OF INDIA

MINISTRY OF AGRICULTURE AND FARMERS WELFARE

(DEPARTMENT OF AGRICULTURE, CO-OPERATION AND FARMERS WELFARE)

केन्द्रीय कृषि मशीनरी प्रशिक्षण एवं परीक्षण संस्थान

ट्रैक्टर नगर, बुदनी (म.प्र.) ४६६ ४४५

**CENTRAL FARM MACHINERY TRAINING & TESTING INSTITUTE**

(An ISO : 9001 - 2008 Certified Institute)

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**Manufacturer** : **M/s. Tractors and Farm Equipment Limited, Post Box No. 3302, 35 Mahatma Gandhi Road, Nungambakkam, Chennai-600 034 (T.N.).**

Location of other manufacturing plants (apa) : **M/s. Tractors and Farm Equipment Limited, Kalladipatti Plant, 10/205, Kalladipatti (P.O.), Pin code - 624 201 Dindigul Disti., Tamilnadu**  
: **M/s. Tractors and Farm Equipment Limited, Doddaballapur Plant, Plot No. 1, Kiadb Industrial Estate Doddaballapur Bangalore - 561 203**

Test requested by (applicant) : **The manufacturer**  
Selected for test by : **Applicant**  
Place of running-in : **At applicant's works**

**Duration of said running-in (h):**  
- Engine : 12  
- Transmission : 16

**Method of Selection** : **The tractor was submitted directly by the applicant for test. Hence method of selection is not known.**

## 1. SPECIFICATIONS

### 1.1 Tractor:

Make : TAFE  
Model : MF 6028  
Variants, if any : Yes

Sl. No.	Variant Model*	Variant Features
i)	MF 6028 2WD	Same configuration with two wheel drive

**\*The variant model has not been tested at this institute yet.**

Brand name : None  
Type : Four wheeled, Four wheel driven (4WD), Unit construction, General purpose, Agricultural Tractor  
Year of manufacture : LF (i.e. November, 2015)  
Chassis number : MEA0935ELF3000048  
Country of Origin : India

### 1.2 Engine:

Make : Mitsubishi Heavy Industries – VST Diesel Engine Pvt. Ltd.  
Model : MVS3L2-JCT  
Type : Four stroke, water cooled, indirect injection, naturally aspirated, diesel engine.  
Serial number : MVS3L2 JCT A6616 G5  
**Engine speed (Manufacturer's recommended production setting), (rpm) :**  
- Maximum speed at no load : 2790 to 2870  
- Low idle speed : 925 to 1000  
- Speed at maximum torque : 1200 to 2200  
**Rated speed, (rpm):**  
- For PTO use : 2600±30  
- For drawbar use : 2600±30

## 16. SUMMARY OF OBSERVATIONS, COMMENTS & RECOMMENDATIONS

**16.1** Evaluative (mandatory) / Non-evaluation (Non-mandatory) parameters applicable for qualifying Minimum Performance criteria as per Clause-4 (Table-1) of IS: 12207-2014 for acceptance of the tractor for the purpose of subsidies/NABARD financing are summarized as under:

S. No.	Characteristic	Category (Evaluative / Non Evaluative)	Requirements as per IS: 12207-2014	Values declared by the applicant (D)/ Requirement (R)	As observed	Whether meets the requirements (Yes/No.)
1	2	3	4	5	6	7
<b>16.1.1</b>	<b>PTO Performance :</b>					
<b>a)</b>	Maximum power under 2 h test, (kW ) (Natural ambient condition)	Evaluative	Declared value to be achieved with a tolerance of: -5 / +10% for PTO power >26 kW. -7.5/+10% for PTO power ≤ 26 kW or-5 / +10% for Engine power >26 kW. -7.5/+10% for Engine power ≤ 26 kW	16.0 (D)	15.3	Yes
<b>b)</b>	Power at rated engine speed, (kW)	Non Evaluative	-do-	16.0 (D)	15.3	Yes
<b>c)</b>	Specific fuel consumption corresponding to maximum power, (g/kWh)	Non Evaluative	+ 5%	295 (D)	314	<b>No</b>
<b>d)</b>	Maximum equivalent crankshaft torque, (Nm)	Non Evaluative	± 8%	72 (D)	64.9	<b>No</b>
<b>e)</b>	Back-up torque, percent	Non Evaluative	10 percent, minimum	Minimum 10%	15.3	Yes
<b>f)</b>	<b>Maximum operating temperature (°C):</b>					
	1) Engine oil	Non Evaluative	The declared value should not exceed the max. value specified by the oil company and the observed value under high ambient condition should not exceed the declaration.	132 (D)	100	Yes
	2) Coolant	Evaluative	The declared value should not exceed the boiling temperature of coolant under the pressurized or otherwise and the observed value under high ambient condition should not exceed the declaration.	112 (D)	93	Yes
<b>g)</b>	Engine oil consumption, (g/kWh)	Evaluative	Not exceeding 1% of SFC at maximum power under High ambient conditions.	3.16	0.72	Yes
<b>h)</b>	Smoke level (per meter )	Evaluative	Maximum light absorption coefficient of 3.25 per metre or equivalent BOSCH No. 5.2 or 75 Hatridge value (As per CMVR)	5.2 BOSCH No	0.40	Yes

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1	2	3	4	5	6	7
<b>16.1.2</b>	<b>Drawbar performance :</b>					
<b>b)</b>	Maximum drawbar pull with unballast corresponding to 15 percent wheel slip, (kN)	Evaluative	Minimum 65% of static mass of tractor without ballast or with standard ballast as the case may be.	6.8 (D) 6.44 (R)	7.64	Yes
<b>c)</b>	Maximum drawbar power unballast, (kW).	Evaluative	Minimum 80 % of PTO power as referred in SI No. i) a) of PTO performance in case of tractors having total static mass > 1500 kg. Minimum 75 % of PTO power as referred in SI No. i) a) of PTO performance in case of light weight tractors having 1500 kg total static mass of tractor. Minimum 75 % of the engine power as referred in SI No. i) a) of engine performance in case of tractors which do not have a PTO shaft.	13.5 (D) 11.5 (R)	12.0	Yes
<b>d)</b>	Maximum transmission oil temperature (°C)	Non Evaluative	The declared value should not exceed the maximum value specified by oil company	132 (D)	86	Yes
<b>16.1.3</b>	<b>Power lift and hydraulic pump performance :</b>					
<b>a)</b>	Maximum lifting capacity throughout the range of lift, (kN):					
	1) At hitch points	Non Evaluative	To be declared by manufacturer [Tolerance of minus 10%]	11.0(D)	6.11	No
	2) With the standard frame	Evaluative	The lift capacity should at least be 24 kg/PTO kW. and it should be 21.5 kg/engine kW where the tractor is not provided with a PTO shaft and it should be 16 kg/engine hp where the tractor is not provided with a PTO shaft	8.0 (D) 3.6 (R)	4.77	Yes
<b>b)</b>	Maximum drop in the height of the point of application of the force after each 5 minutes interval for a total duration of 30 minute, (mm)	Non Evaluative	Observed value should not exceed 50 mm.	50 mm	09	Yes
<b>16.1.4</b>	<b>Brake performance at 25 kmph:</b>					
<b>a)</b>	Maximum stopping distance at a force, equal to or less than 600 N on brake pedal with unballast, (m):					
	1) Cold brake	Evaluative	10	10 (R)	2.75	Yes
	2) Hot brake	Evaluative	10	10 (R)	3.00	Yes
<b>b)</b>	Maximum force exerted on the brake pedal to achieve a deceleration of 2.5 m/s <sup>2</sup> (N).	Evaluative	600	600 (R)	130 to 143	Yes
<b>c)</b>	Whether parking brake is effective at a force of 600 N at foot pedal(s) or 400 N at hand lever.	Evaluative	Yes / No	Yes	281	Yes

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1	2	3	4	5	6	7
<b>16.1.5</b>	<b>Noise measurement :</b>					
<b>a)</b>	Maximum ambient noise emitted by the tractor dB(A)	Evaluative	As per CMVR	85 (R)	78	Yes
<b>b)</b>	Maximum noise at operator's ear level dB(A)	Evaluative	As per CMVR	96 (R)	89	Yes
<b>16.1.6</b>	<b>Amplitude of mechanical vibrations at :</b>					
	1) Left foot rest	Non Evaluative	100 microns (max)	100 (R)	120	<b>No</b>
	2) Right foot rest			100 (R)	130	<b>No</b>
	3) Seat (with driver seated)		-do-	100 (R)	60	Yes
	4) Steering wheel		-do-	100 (R)	90	Yes
<b>16.1.7</b>	<b>Haulage requirements :</b>					
<b>a)</b>	Gross mass of the trailers, (tonnes):					
	1) Two wheel	Non Evaluative	--	1.5 (D)	1.5	Yes
<b>b)</b>	Distance travelled / litre of fuel consumption, (km/l):					
	1) Two wheel	Non Evaluative	--	5.0 to 6.0 (D)	5.30 to 5.44	Yes
<b>c)</b>	Fuel consumption (ml/km/tonne):					
	1) Two wheel	Non Evaluative	--	100 to 140 (D)	123 to 126	Yes
<b>16.1.8</b>	<b>Wetland cultivation :</b>					
	Sealing for the following assemblies:	Evaluative	The identified assemblies should essentially meet the requirement of IS: 11082. No water ingress in the identified assembly given in column-2. If tractor does not meet the requirements of wetland cultivation, it may be recommended for dry land operation only.	There should be no ingress of water and/or mud (R)	No ingress of mud and / or water was observed	Yes
	1) Clutch assembly	-do-				
	2) Front axle housing	-do-				
	3) Engine oil	-do-				
	5) Transmission oil	-do-				
<b>16.1.9</b>	<b>Safety features :</b>					
<b>a)</b>	Guards against moving and hot parts	Evaluative	Belt drives, pulley, silencer, hydraulic pipes (As per IS 12239 (part 2))	Meets the requirement		Yes
<b>b)</b>	Lighting arrangement	Evaluative	As per CMVR	Meets the requirement		Yes
<b>c)</b>	Seating requirements (tractor having more than 1150 mm rear track width)	Non Evaluative	Should meet the requirements of IS 12343 (as amended from time to time)	Not applicable		--
<b>d)</b>	Technical requirements for PTO shaft	Non Evaluative	Should meet the requirements of IS 4931 (as amended from time to time)	<b>Does not meet the requirement</b>		<b>No</b>

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1	2	3	4	5	6	7
e)	Dimensions of three point linkage	Non Evaluative	Should meet the requirements of IS 4468 (part 1) (as amended from time to time)		Meets the requirement	Yes
f)	Specifications of linkage drawbar	Non Evaluative	Should meet the requirements of IS 12953 and IS 12362 (part 3) (as amended from time to time)		<b>Does not meet the requirement</b>	<b>No</b>
g)	Specifications of swinging drawbar	Non Evaluative			<b>Does not meet the requirement</b>	<b>No</b>
<b>16.1.10 Labelling of tractors (Provision of labelling plate):</b>						
	1) Make	Evaluative	Should conform to the requirements of CMVR	--	Tractors and Farm Equipment Limited, Chennai, India	Yes
	2) Model	Evaluative		--	MF 6028	Yes
	3) Year of manufacture	Evaluative		--	LF (i.e. November, 2015)	Yes
	4) Engine serial number	Evaluative		--	MVS3L2 JCT A6616 G5	Yes
	5) Chassis serial number	Evaluative		--	MEA0935ELF30000 48	Yes
	6) Declaration of PTO power, (kW)	Evaluative		--	16.0	Yes
<b>16.1.11 Discard limit for:</b>						
(a)	Cylinder bore diameter, (mm)	Evaluative	To be specified by the manufacturer and supported by printed literature	78.20	78.04	Yes
(b)	Clearance between piston & cylinder liner at skirt, (mm)	Non Evaluative		0.30	0.092 to 0.121	Yes
<b>(c) Ring end gap (mm):</b>						
	- Top comp. ring.	Evaluative	To be specified by the manufacturer and supported by printed literature	1.50	0.35	Yes
	- 2 <sup>nd</sup> comp. ring.			1.50	0.40 to 0.45	Yes
	- Oil ring.			2.0	0.30 to 0.35	Yes
<b>(d) Ring groove clearance (mm):</b>						
	- Top comp. ring.	Evaluative	-do-	-Tapered-		Yes
	- 2 <sup>nd</sup> comp. ring.		-do-	0.30	0.068 to 0.080	Yes
	- Oil ring.		-do-	0.20	0.040 to 0.045	Yes
<b>(e) Clearance of main bearings (mm):</b>						
	- Diametrical clearance	Evaluative	-do-	0.10	0.054 to 0.088	Yes
	- Crankshaft end float	Evaluative	-do-	0.50	0.15	Yes
<b>(f) Clearance of big end bearings, (mm):</b>						
	- Diametrical	Evaluative	-do-	0.15	0.041 to 0.089	Yes
	- Axial	Evaluative	-do-	0.50	0.25 to 0.30	Yes
(g)	Bearing number of front axle (king pin)	Non Evaluative	-do-	NA	Ball bearings are provided	NA
(h)	Bearing number of final drive bevel gear shaft (stub axle)	Non Evaluative	-do-	NA	Ball bearings are provided	NA

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<b>16.1.12 Literature (Submission to test agency)</b>						
<b>(a)</b>	Operator manual	Evaluative	Provided/Not Provided	As per relevant IS Code (IS 8132)	Provided	Yes
<b>(b)</b>	Parts Catalogue	Evaluative	Provided/Not Provided	As per relevant IS Code (IS 8132)	Provided	Yes
<b>(c)</b>	Workshop/ Service manual	Evaluative	Provided/Not Provided	As per relevant IS Code (IS 8132)	Provided	Yes

<b>16.1.13 CATEGORY OF BREAKDOWNS / DEFECTS :</b>					
S. No.	Characteristic	Category (Evaluative / Non Evaluative)	Requirements as per IS: 12207-2014	As observed	Whether meets the requirements (Yes/No.)
1.	Critical	Evaluative	No critical breakdown	None	Yes
2.	Major	Evaluative	Not more than two and neither of them should be repetitive in nature.	None	Yes
3.	Minor	Evaluative	Not more than five and frequency of each should not be more than two.	None	Yes
4.	Total breakdowns	Evaluative	In no case, the total number of breakdowns should exceed five, that is, (2 major + 3 minor) or 5 minor breakdowns.	None	Yes

<b>16.2 Optional requirements as per Clause-4 (Table-2) of IS:12207-2014:</b>				
S. No.	Characteristic	Requirements as per IS: 12207-2014	As observed	Whether meets the requirements (Yes/No.)
1	2	3	4	5
1.	Air cleaner oil pull over (%).	0.25% (maximum)	Dry type air cleaner is provided	NA
2.	Fitment of ROPS	With a provision for fitment of ROPS.	Provided	Yes
		If ROPS fitted it should meet the requirement of IS: 11821-1992.	ROPS not fitted	Not applicable
3.	Accessories	Trailer hitch, front tow hook, linkage drawbar may be provided.	Front tow hook, linkage drawbar, swinging drawbar	<b>No</b>

**16.3 Conformity with following IS:**

- i) Guide lines for declaration of power and specific fuel consumption and labeling of agricultural tractors (First revision) [IS 10273:1987 (Reaffirmed in March, 2009)] : **Conforms**
- ii) Agricultural tractors – Rear mounted power take-off - Types 1, 2 and 3(third revision)[IS: 4931-1995 (Reaffirmed in March, 2009)] : **Does not conform**
- iii) Agricultural wheeled tractors - Rear mounted three-point linkage: Part 1 Categories 1, 2, 3 & 4 (fourth revision) [IS 4468(Part-I):1997/ISO 730-1:1994 (Reaffirmed in March, 2009)] : **Conforms**
- iv) Drawbar for agricultural tractors – Link type [IS 12953:1990 (Reaffirmed in March, 2007)] : **Does not conform**
- v) Agricultural tractors - Operator's seat technical requirement [IS 12343 –1998 (First revision) (Reaffirmed in March, 2009)] : **Not applicable**

- vi) Guide for safety & comfort of operator of agricultural tractors: Part 1 General requirements (first revision) : [IS 12239 (PT-1) 1996/ISO 4254-1:1989 (Reaffirmed in (Reaffirmed in March, 2007))] : **Does not conform**
- vii) Tractors and machinery for agriculture and forestry, powered lawn and garden equipment – Symbols for operator controls and other displays [IS: 6283 (Part-1 & Part-2) –2006 & 2007 (Reaffirmed in March, 2009)]/ ISO 3767-2:1991] : **Does not conform**
- viii) Tractors and machinery for agriculture and forestry – Technical means for ensuring safety Part 2: Tractors (first revision) (IS 12239 (PT-2) 1999) (Reaffirmed in March, 2009)] : Conforms
- ix) Guide lines for location and operation of operator controls on agricultural tractors and machinery (first revision) (IS: 8133 – 1983) (Reaffirmed in March, 2009)] : Conforms
- x) Agricultural Tractor & Machinery Lighting device for travel on public roads (IS: 14683-1999) (Reaffirmed in March, 2009)] : Conforms

#### 16.4 Salient Observations:

##### 16.4.1 Laboratory tests:

##### 16.4.1.1 PTO Performance:

- i) The maximum PTO power was observed as **15.3 kW** against the declaration of **16.0 kW** which meets the requirement of IS: 12207-2014 with regard to tolerance limit.
- ii) The specific fuel consumption corresponding to maximum power was recorded as **314 g/kWh** against the declaration of **295 g/kWh**, which does not meet the requirement of IS: 12207-2014 with regard to tolerance limit. This should be looked into for necessary corrective action.
- iii) The maximum equivalent crankshaft torque was recorded as **64.9 N-m** against the declaration of **72 N-m**, which does not meet the requirement of IS: 12207-2014 with regard to tolerance limit. This should be looked into for necessary corrective action.
- iv) The backup torque was observed as **15.3 %**.

##### 16.4.1.2 Hydraulic performance:

- i) The lifting capacity at lower hitch point was recorded as **6.11 kN** against the declaration of **11.0 kN** which does not meet the requirement of IS: 12207-2014 with regard to tolerance limit. This should be looked into for necessary corrective action.
- ii) The moment about rear axle with standard frame was calculated as **6.5 kN-m**. Whereas, the moment about front axle was calculated as **4.9 kN-m**. The moment about rear axle is on higher side as compared to the moment about front axle. It is, therefore, recommended that the lifting capacity of the hydraulic system may be reduced suitably or additional ballast mass may be provided at front axle to avoid the front lifting of the tractor.
- iii) There should be provision of draft control mechanism to get even depth of operation to avoid overloading of the tractor during the field operation.



**16.4.1.3 Mechanical Vibration:**

The amplitude of mechanical vibration on various assemblies marked as (\*) in Chapter-8 of this test report is on higher side, especially at the left & right foot rest. This calls for dampening down of vibrations to improve the operational comfort and service life of components.

**16.4.1.4 Linkage Drawbar:**

Dimension FØ of linkage drawbar {Refer Fig. 1 (b)} does not meet to the requirement of IS 12953 – 1990 (Reaffirmed in 2000). This should be looked into for necessary corrective action.

**16.4.1.5 Swinging Drawbar:**

The dimensions “c” & “l” of swinging drawbar {Refer Fig. 1 (c)} does not meet the requirement as per IS: 12362 (Part 3)-1994. This should be looked into for necessary corrective action.

**16.4.1.6 Technical requirement for Power Take-off Shaft:**

Dimension “dØ” refer fig.: 2(a) parameter of PTO shaft does not meet the requirement of IS: 4931:1995. This should be looked into for necessary corrective action.

**16.4.2 Field performance test:****16.4.2.1 Wet land cultivation (Puddling operation):**

- i) The hunting of governor was observed during water proof test. During hunting 80 to 100 drop in engine rpm was recorded.
- ii) No ingress of mud/or water was noticed during puddling operation of the tractor and meets the requirements of IS:11082-1984 (Technical requirements of agricultural tractors for wetland operation). Therefore the tractor is found as suitable for wetland operation (Puddling).

**16.4.3 Components / Assembly Inspection**

The clearance between valve guide and valve stem of intake and exhaust valve was measured as 0.13 to 0.23 & 0.16 to 0.27 mm against discard limit of 0.10 & 0.15 mm respectively. The clearance crossed the discard limit only after 79.3 hours of operation and calls for improvement in the material / introduction of skirt quality control measures at production level.

**16.4 Maintenance / Service Problems:**

No noticeable maintenance or service problem was observed during the test.


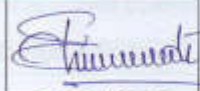

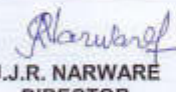
**16.5 Recommendation with regard to safety on tractor:**

The following requirements, inter alia, may be considered for incorporation on the tractor:

- i) Provision of spark arrester in the exhaust system.
- ii) Width of seat should be sufficient for proper seating and easy handling of tractor.
- iii) The driver seat should be recommended for the adjustment of driver's mass within 50 to 120 kg

Time frame for Testing & Evaluation as per Citizen Charter	Duration of Test	Whether the Test Report is released within the time frame given in Citizen Charter	Remarks
10 Months	05 Months (August, 2016 to December, 2016)	Yes	---

**TESTING AUTHORITY:**

		
<b>RAJNEESH PATEL</b> AGRICULTURAL ENGINEER	<b>C.V. CHIMOTE</b> TEST ENGINEER	<b>Y.K. RAO</b> SENIOR AGRICULTURAL ENGINEER
 <b>J.J.R. NARWARE</b> DIRECTOR		

Test report is compiled by: **Sh. Rajneesh Patel**, Agricultural Engineer.

**18. APPLICANT'S COMMENTS**

Para No.	Our Reference	Applicant's comments
18.1	1.21.1, 1.21.2 & 1.21.4	We shall study and initiate to incorporate in production.
18.2	16.3 - (ii), (iv), (vi) & (vii)	We shall study and initiate to incorporate in production.
18.3	16.4.1.1, 16.4.1.2, 16.4.1.3, 16.4.1.4, 16.4.1.6, 16.4.2.1 - i), 16.4.3 & 16.5	We shall study and initiate to incorporate in production.

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ANNEXURE- I

**BRIEF SPECIFICATION OF IMPLEMENTS USED DURING FIELD TEST**

S. No.	Particular	M.B. Plough	Rotavator
1	Make	Not available	Mahindra
2	Type	Mounted	Mounted
3	No. of Bottoms/Blades	Two	16 in 4 flanges
4	Type of Bottom/Blades	General purpose	Hatchet
5	Size of Bottoms/Blades (mm)	200	220 x 67.95 x 7.65
6	Spacing of bottoms/Flanges, (mm)	470	190
7	Lower hitch point span, (mm)	450	515
8	Mast height, (mm)	445	365
9	Overall Dimensions (mm):		
	Length	1375	745
	Width	580	1010
	Height	1100	790
10	Gross Mass, (Kg)	150	100

**ANNEXURE-II****TRACTOR RUN HOURS DURING TEST**

A.	LABORATORY AND TRACK TESTS:	HOURS
1.	Running-in	--
2.	PTO performance test	10.99
3.	Power lift and hydraulic pump performance test	2.85
4.	Drawbar performance test	12.25
5.	Turning ability	0.30
6.	Location of centre of gravity	Nil
7.	Operator's field of vision	Nil
8.	Brake test	0.75
9.	Noise measurement	1.17
10.	Mechanical vibration test	1.00
11.	Theoretical speed test	0.83
<b>B.</b>	<b>FIELD TEST:</b>	
1.	M.B. ploughing	10.75
2.	Rotavation	10.86
3.	Wetland cultivation (including water proof)	15.18
<b>C.</b>	<b>HAULAGE TEST:</b>	6.84
<b>D.</b>	Miscellaneous test and other run hours including idle run, transportation, trials and preparation for test	5.55
	<b>TOTAL:</b>	79.32