

Performance Number: DM9667

Change Level: 03

SALES MODEL:	C18	COMBUSTION:	DIRECT INJECTION
BRAND:	CAT	ENGINE SPEED (RPM):	1,800
MACHINE SALES MODEL:		HERTZ:	60
ENGINE POWER (BHP):	499	ASPIRATION:	TA
GEN POWER W/O FAN (EKW):	340.0	AFTERCOOLER TYPE:	SWAC
COMPRESSION RATIO:	16.5	AFTERCOOLER CIRCUIT TYPE:	JW+OC, AC
RATING LEVEL:	PRIME	AFTERCOOLER TEMP (F):	126
PUMP QUANTITY:	1	JACKET WATER TEMP (F):	192.2
FUEL TYPE:	DIESEL	TURBO CONFIGURATION:	SINGLE
MANIFOLD TYPE:	WATER COOLED	TURBO QUANTITY:	1
GOVERNOR TYPE:	ELEC	TURBOCHARGER MODEL:	S410W021-1.26
CAMSHAFT TYPE:	STANDARD	CERTIFICATION YEAR:	2009
IGNITION TYPE:	CI	PISTON SPD @ RATED ENG SPD (FT/MIN):	2,161.4
INJECTOR TYPE:	EUI		
REF EXH STACK DIAMETER (IN):	8		
MAX OPERATING ALTITUDE (FT):	984		

INDUSTRY	SubIndustry	APPLICATION
MARINE	INLAND WATERWAY	MARINE AUXILIARY
MARINE	PLEASURE CRAFT	MARINE AUXILIARY
MARINE	FERRY	MARINE AUXILIARY
MARINE	TUG & SALVAGE	MARINE AUXILIARY
MARINE	FISHING	MARINE AUXILIARY
MARINE	DREDGE	MARINE AUXILIARY
MARINE	OFFSHORE	MARINE AUXILIARY
MARINE	GOVERNMENT	MARINE AUXILIARY

General Performance Data

GENSET POWER WITHOUT FAN	PERCENT LOAD	ENGINE POWER	BRAKE MEAN EFF PRES (BMEP)	BRAKE SPEC FUEL CONSUMPTN (BSFC)	ISO BRAKE SPEC FUEL CONSUMPTN (BSFC)	VOL FUEL CONSUMPTN (VFC)	ISO VOL FUEL CONSUMPTN (VFC)
EKW	%	BHP	PSI	LB/BHP-HR	LB/BHP-HR	GAL/HR	GAL/HR
374.0	110	549	218	0.355	0.348	27.5	26.9
340.0	100	499	198	0.357	0.350	25.1	24.6

306.0	90	449	179	0.367	0.360	23.2	22.8
272.0	80	399	159	0.377	0.370	21.2	20.8
255.0	75	374	149	0.378	0.371	19.9	19.5
238.0	70	349	139	0.378	0.370	18.6	18.2
204.0	60	299	119	0.375	0.368	15.8	15.5
170.0	50	249	99	0.375	0.368	13.2	13.0
136.0	40	200	79	0.385	0.377	10.8	10.6
102.0	30	150	60	0.408	0.400	8.6	8.4
85.0	25	125	50	0.430	0.422	7.6	7.4
68.0	20	99.8	40	0.468	0.460	6.6	6.5
34.0	10	49.9	20	0.681	0.668	4.8	4.7

GENSET POWER WITHOUT FAN	PERCENT LOAD	ENGINE POWER	INLET MFLD PRES	INLET MFLD TEMP	EXH MFLD TEMP	EXH MFLD PRES	ENGINE OUTLET TEMP	COMPRESSOR OUTLET PRES	COMPRESSOR OUTLET TEMP
EKW	%	BHP	IN-HG	DEG F	DEG F	IN-HG	DEG F	IN-HG	DEG F
374.0	110	549	50.2	133.6	1,019.6	53.8	726.7	54	350.1
340.0	100	499	47.6	133.3	976.8	50.4	698.9	51	334.7
306.0	90	449	45.7	132.4	950.6	48.0	683.4	49	324.7
272.0	80	399	42.2	131.4	915.6	44.6	664.6	45	308.0
255.0	75	374	39.2	130.9	887.9	41.7	649.6	42	294.0
238.0	70	349	36.2	130.4	859.0	38.6	633.5	39	280.1
204.0	60	299	30.4	129.3	797.6	31.8	598.6	33	252.5
170.0	50	249	24.7	128.2	731.6	25.8	560.9	27	225.2
136.0	40	200	19.0	127.1	663.8	20.9	521.4	21	198.0
102.0	30	150	13.5	125.9	596.3	16.8	479.5	15	171.1
85.0	25	125	11.2	125.5	563.6	15.1	457.8	13	159.8
68.0	20	99.8	9.6	125.4	531.8	13.8	435.6	11	151.0
34.0	10	49.9	7.1	125.3	469.5	12.1	389.6	8	137.2

GENSET POWER WITHOUT FAN	PERCENT LOAD	ENGINE POWER	WET INLET AIR VOL FLOW RATE	ENGINE OUTLET WET EXH GAS VOL FLOW RATE	WET INLET AIR MASS FLOW RATE	WET EXH GAS MASS FLOW RATE	WET EXH VOL FLOW RATE (32 DEG F AND 29.98 IN HG)	DRY EXH VOL FLOW RATE (32 DEG F AND 29.98 IN HG)
EKW	%	BHP	CFM	CFM	LB/HR	LB/HR	FT3/MIN	FT3/MIN
374.0	110	549	1,249.3	2,868.9	5,455.0	5,649.8	1,189.0	1,091.8
340.0	100	499	1,212.9	2,710.5	5,287.6	5,465.7	1,150.3	1,060.4
306.0	90	449	1,189.8	2,614.3	5,180.6	5,345.3	1,124.5	1,040.4

272.0	80	399	1,140.2	2,479.2	4,953.9	5,103.3	1,084.2	1,006.6
255.0	75	374	1,096.1	2,362.8	4,753.4	4,893.0	1,047.3	973.9
238.0	70	349	1,051.9	2,233.1	4,553.7	4,683.8	1,004.3	935.4
204.0	60	299	963.6	1,950.0	4,157.0	4,268.6	906.0	846.5
170.0	50	249	875.3	1,682.5	3,763.9	3,857.8	810.6	760.0
136.0	40	200	786.9	1,445.4	3,374.2	3,451.3	724.4	681.9
102.0	30	150	698.5	1,224.8	2,988.1	3,049.3	641.2	606.4
85.0	25	125	661.8	1,131.2	2,828.4	2,882.1	606.2	574.9
68.0	20	99.8	634.3	1,054.6	2,708.9	2,755.7	579.2	551.0
34.0	10	49.9	592.3	931.6	2,527.3	2,561.4	539.3	516.9

Heat Rejection Data

GENSET POWER WITHOUT FAN	PERCENT LOAD	ENGINE POWER	REJECTION TO JACKET WATER	REJECTION TO ATMOSPHERE	REJECTION TO EXH	EXHAUST RECOVERY TO 350F	FROM OIL COOLER	FROM AFTERCOOLER	WORK ENERGY	LOW HEAT VALUE ENERGY	HIGH HEAT VALUE ENERGY
EKW	%	BHP	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN
374.0	110	549	15,455	1,455	19,171	8,909	3,175	4,515	23,270	59,619	63,509
340.0	100	499	14,589	1,271	17,478	7,952	2,901	3,853	21,155	54,458	58,011
306.0	90	449	13,998	1,171	16,355	7,409	2,685	3,444	19,039	50,411	53,700
272.0	80	399	13,275	1,079	15,008	6,655	2,451	2,975	16,924	46,024	49,027
255.0	75	374	12,765	1,014	14,002	6,064	2,304	2,619	15,866	43,248	46,070
238.0	70	349	12,240	945	12,918	5,483	2,149	2,242	14,808	40,338	42,970
204.0	60	299	11,146	804	10,641	4,363	1,828	1,485	12,693	34,323	36,562
170.0	50	249	9,992	671	8,577	3,330	1,526	904	10,578	28,659	30,529
136.0	40	200	8,818	550	6,829	2,409	1,252	514	8,462	23,502	25,036
102.0	30	150	7,663	437	5,292	1,600	995	248	6,347	18,672	19,891
85.0	25	125	7,111	386	4,639	1,255	875	157	5,289	16,425	17,496
68.0	20	99.8	6,576	340	4,079	950	762	92	4,231	14,312	15,246
34.0	10	49.9	5,543	257	3,177	406	554	46	2,116	10,403	11,082

Emissions Data

DIESEL

RATED SPEED NOMINAL DATA: 1800 RPM

GENSET POWER WITHOUT FAN	EKW	374.0	340.0	255.0	170.0	85.0	34.0
ENGINE POWER	BHP	549	499	374	249	125	49.9
PERCENT LOAD	%	110	100	75	50	25	10

TOTAL NOX (AS NO2)		G/HR	2,636	2,217	1,317	1,097	876	456
TOTAL CO		G/HR	180	156	120	129	132	183
TOTAL HC		G/HR	19	21	24	20	20	24
TOTAL CO2		KG/HR	279	255	202	134	76	49
PART MATTER		G/HR	23.1	21.4	27.3	27.6	20.1	34.6
TOTAL NOX (AS NO2)	(CORR 5% O2)	MG/NM3	2,174.4	1,997.9	1,550.8	1,791.9	2,000.0	1,170.4
TOTAL CO	(CORR 5% O2)	MG/NM3	147.5	140.3	150.2	221.7	302.9	464.4
TOTAL HC	(CORR 5% O2)	MG/NM3	13.6	16.0	24.0	28.8	38.8	53.0
PART MATTER	(CORR 5% O2)	MG/NM3	16.0	16.1	28.4	38.7	42.0	80.2
TOTAL NOX (AS NO2)	(CORR 5% O2)	PPM	1,059	973	755	873	974	570
TOTAL CO	(CORR 5% O2)	PPM	118	112	120	177	242	372
TOTAL HC	(CORR 5% O2)	PPM	25	30	45	54	72	99
TOTAL NOX (AS NO2)		G/HP-HR	4.83	4.47	3.54	4.41	7.04	9.16
TOTAL CO		G/HP-HR	0.33	0.31	0.32	0.52	1.06	3.68
TOTAL HC		G/HP-HR	0.04	0.04	0.07	0.08	0.16	0.49
PART MATTER		G/HP-HR	0.04	0.04	0.07	0.11	0.16	0.69
TOTAL NOX (AS NO2)		LB/HR	5.81	4.89	2.90	2.42	1.93	1.00
TOTAL CO		LB/HR	0.40	0.34	0.27	0.28	0.29	0.40
TOTAL HC		LB/HR	0.04	0.05	0.05	0.04	0.04	0.05
TOTAL CO2		LB/HR	615	562	446	294	168	108
PART MATTER		LB/HR	0.05	0.05	0.06	0.06	0.04	0.08
OXYGEN IN EXH		%	10.3	10.9	12.3	13.4	13.7	13.7
DRY SMOKE OPACITY		%	1.3	1.4	1.8	2.2	2.0	3.9
BOSCH SMOKE NUMBER			0.58	0.59	0.82	0.97	0.88	1.58

RATED SPEED POTENTIAL SITE VARIATION: 1800 RPM

GENSET POWER WITHOUT FAN	EKW	374.0	340.0	255.0	170.0	85.0	34.0	
ENGINE POWER	BHP	549	499	374	249	125	49.9	
PERCENT LOAD	%	110	100	75	50	25	10	
TOTAL NOX (AS NO2)		G/HR	2,847	2,394	1,422	1,184	946	492
TOTAL CO		G/HR	337	292	225	240	247	343
TOTAL HC		G/HR	36	39	46	38	37	46
PART MATTER		G/HR	45.0	41.7	53.2	53.8	39.3	67.4
TOTAL NOX (AS NO2)	(CORR 5% O2)	MG/NM3	2,348.3	2,157.7	1,674.8	1,935.3	2,160.0	1,264.0
TOTAL CO	(CORR 5% O2)	MG/NM3	275.9	262.3	280.9	414.6	566.5	868.5

TOTAL HC	(CORR 5% O2)	MG/NM3	25.7	30.2	45.4	54.5	73.3	100.2
PART MATTER	(CORR 5% O2)	MG/NM3	31.1	31.3	55.4	75.4	81.9	156.3
TOTAL NOX (AS NO2)	(CORR 5% O2)	PPM	1,144	1,051	816	943	1,052	616
TOTAL CO	(CORR 5% O2)	PPM	221	210	225	332	453	695
TOTAL HC	(CORR 5% O2)	PPM	48	56	85	102	137	187
TOTAL NOX (AS NO2)		G/HP-HR	5.22	4.83	3.82	4.77	7.60	9.89
TOTAL CO		G/HP-HR	0.62	0.59	0.60	0.97	1.99	6.89
TOTAL HC		G/HP-HR	0.07	0.08	0.12	0.15	0.30	0.92
PART MATTER		G/HP-HR	0.08	0.08	0.14	0.22	0.32	1.36
TOTAL NOX (AS NO2)		LB/HR	6.28	5.28	3.13	2.61	2.08	1.09
TOTAL CO		LB/HR	0.74	0.64	0.50	0.53	0.54	0.76
TOTAL HC		LB/HR	0.08	0.09	0.10	0.08	0.08	0.10
PART MATTER		LB/HR	0.10	0.09	0.12	0.12	0.09	0.15

Regulatory Information

CCNR STAGE II	2006 - ----
<p>GASEOUS EMISSION DATA MEASUREMENTS ARE CONSISTENT WITH THOSE DESCRIBED IN CHAPTER 8A OF RHINE VESSEL INSPECTION REGULATION (RVIR) AND ISO 8178 FOR MEASURING HC, CO, PM, AND NOX. GASEOUS EMISSIONS VALUES ARE WEIGHTED CYCLE AVERAGES AND ARE IN COMPLIANCE WITH THE MARINE REGULATIONS.</p>	

EPA TIER 2	2007 - 2013			
<p>GASEOUS EMISSIONS DATA MEASUREMENTS PROVIDED TO THE EPA ARE CONSISTENT WITH THOSE DESCRIBED IN EPA 40 CFR PART 94.103 AND ISO 8178 FOR MEASURING HC, CO, PM, AND NOX. THIS ENGINE CONFORMS TO US EPA MARINE COMMERCIAL COMPRESSION-IGNITION EMISSION REGULATIONS. THE "MAX LIMITS" SHOWN BELOW ARE WEIGHTED CYCLE AVERAGES AND ARE IN COMPLIANCE WITH THE MARINE REGULATIONS.</p>				
Locality	Agency	Regulation	Tier/Stage	Max Limits - G/BKW - HR
U.S. (INCL CALIF)	EPA	MARINE COMMERCIAL	TIER 2	CO: 5.0 NOx + HC: 7.2 PM: 0.20

IMO II	2011 - ----
<p>GASEOUS EMISSIONS DATA MEASUREMENTS ARE CONSISTENT WITH THOSE DESCRIBED IN REGULATION 13 OF REVISED ANNEX VI OF MARPOL 73/78 AND ISO 8178 FOR MEASURING HC, CO, PM, AND NOX. THIS ENGINE CONFORMS TO INTERNATIONAL MARINE ORGANIZATION'S (IMO) MARINE COMPRESSION-IGNITION EMISSION REGULATIONS.</p>	

Altitude Derate Data

STANDARD

ALTITUDE CORRECTED POWER CAPABILITY (BHP)

AMBIENT OPERATING TEMP (F)	30	40	50	60	70	80	90	100	110	120	130	140	NORMAL
ALTITUDE (FT)													
0	499	499	499	499	499	499	499	497	488	479	471	463	499
1,000	499	499	499	499	499	496	487	478	470	462	454	446	499
2,000	499	499	499	496	486	477	469	460	452	444	437	430	485
3,000	499	496	487	477	468	459	451	443	435	428	421	414	470
4,000	487	477	468	459	450	442	434	426	419	412	405	398	455
5,000	469	459	450	442	433	425	417	410	403	396	389	383	441
6,000	450	441	433	424	416	409	401	394	387	381	374	368	427
7,000	433	424	416	408	400	393	386	379	372	366	360	354	413
8,000	416	408	400	392	385	377	371	364	358	351	345	340	400
9,000	399	391	384	376	369	362	356	350	343	337	332	326	386
10,000	383	376	368	361	355	348	342	336	330	324	318	313	374
11,000	368	361	354	347	340	334	328	322	316	311	306	300	361
12,000	353	346	339	333	326	320	314	309	303	298	293	288	349
13,000	338	332	325	319	313	307	302	296	291	286	281	276	337
14,000	324	318	312	306	300	294	289	284	279	274	269	265	325
15,000	311	305	299	293	287	282	277	272	267	263	258	254	314

Cross Reference

Test Spec	Setting	Engine Arrangement	Engineering Model	Engineering Model Version	Start Effective Serial Number	End Effective Serial Number
NAP	NAP	2906539	GS388	-	GBM00001	
0K9812	PP5941	3284534	GS388	-	GPS00001	
0K9813	PP5942	3284536	NAP	NAP	GPS00001	
0K9812	PP5941	3284538	GS388	-	GPS00001	
0K9813	PP5942	3284540	GS388	-	GPS00001	

Performance Parameter Reference

<p>Parameters Reference: DM9600 - 15</p> <p>PERFORMANCE DEFINITIONS</p> <p>PERFORMANCE DEFINITIONS DM9600</p> <p>APPLICATION: Engine performance tolerance values below are representative of a typical production engine tested in a calibrated dynamometer test cell at SAE J1995 standard reference conditions. Caterpillar maintains ISO9001:2000 certified quality management systems for engine test Facilities to assure accurate calibration of test equipment. Engine test data is corrected in accordance with SAE J1995. Additional reference material SAE J1228, J1349, ISO 8665, 3046-1:2002E, 3046-3:1989, 1585, 2534, 2288, and 9249 may apply in part or are similar to SAE J1995. Special engine rating request (SERR) test data shall be noted.</p> <p>PERFORMANCE PARAMETER TOLERANCE FACTORS: Power +/- 3% Torque +/- 3% Exhaust stack temperature +/- 8% Inlet airflow +/- 5% Intake manifold pressure-gage +/- 10% Exhaust flow +/- 6% Specific fuel consumption +/- 3% Specific fuel consumption (C7-C18) +/- 4% Fuel rate +/- 5% Specific DEF consumption +/- 3% DEF rate +/- 5% Heat rejection +/- 5% Heat rejection exhaust only +/- 10% Heat rejection CEM only +/- 10% Heat Rejection values based on using treated water.</p> <p>Torque is included for truck and industrial applications, do not use for Gen Set or steady state applications.</p> <p>On C7 - C18 engines, at speeds of 1100 RPM and under these values are provided for reference only, and may not meet the tolerance listed.</p> <p>On 3500 and C175 engines, at speeds below Peak Torque these values are provided for reference only, and may not meet the tolerance listed.</p> <p>These values do not apply to C280/3600. For these models, see the tolerances listed below.</p>

C280/3600 HEAT REJECTION TOLERANCE FACTORS: Heat rejection +/- 10% Heat rejection to Atmosphere +/- 50% Heat rejection to Lube Oil +/- 20% Heat rejection to Aftercooler +/- 5%

TEST CELL TRANSDUCER TOLERANCE FACTORS: Torque +/- 0.5% Speed +/- 0.2% Fuel flow +/- 1.0% Temperature +/- 2.0 C degrees Intake manifold pressure +/- 0.1 kPa
OBSERVED ENGINE PERFORMANCE IS CORRECTED TO SAE J1995 REFERENCE AIR AND FUEL CONDITIONS.

REFERENCE ATMOSPHERIC INLET AIR FOR 3500 ENGINES AND SMALLER SAE J1228 AUG2002 for marine engines, and J1995 JAN2014 for other engines, reference atmospheric pressure is 100 KPA (29.61 in hg), and standard temperature is 25deg C (77 deg F) at 30% relative humidity at the stated aftercooler water temp, or inlet manifold temp.
FOR 3600 ENGINES Engine rating obtained and presented in accordance with ISO 3046/1 and SAE J1995 JANJAN2014 reference atmospheric pressure is 100 KPA (29.61 in hg), and standard temperature is 25deg C (77 deg F) at 30% relative humidity and 150M altitude at the stated aftercooler water temperature.

MEASUREMENT LOCATION FOR INLET AIR TEMPERATURE Location for air temperature measurement air cleaner inlet at stabilized operating conditions.

REFERENCE EXHAUST STACK DIAMETER The Reference Exhaust Stack Diameter published with this dataset is only used for the calculation of Smoke Opacity values displayed in this dataset. This value does not necessarily represent the actual stack diameter of the engine due to the variety of exhaust stack adapter options available. Consult the price list, engine order or general dimension drawings for the actual stack diameter size ordered or options available.

REFERENCE FUEL DIESEL Reference fuel is #2 distillate diesel with a 35API gravity; A lower heating value is 42,780 KJ/KG (18,390 BTU/LB) when used at 15 deg C (59 deg F), where the density is 850 G/Liter (7.0936 Lbs/Gal).

GAS Reference natural gas fuel has a lower heating value of 33.74 KJ/L (905 BTU/CU Ft). Low BTU ratings are based on 18.64 KJ/L (500 BTU/CU FT) lower heating value gas. Propane ratings are based on 87.56 KJ/L (2350 BTU/CU Ft) lower heating value gas.

ENGINE POWER (NET) IS THE CORRECTED FLYWHEEL POWER (GROSS) LESS EXTERNAL AUXILIARY LOAD Engine corrected gross output includes the power required to drive standard equipment; lube oil, scavenge lube oil, fuel transfer, common rail fuel, separate circuit aftercooler and jacket water pumps. Engine net power available for the external (flywheel) load is calculated by subtracting the sum of auxiliary load from the corrected gross flywheel out put power. Typical auxiliary loads are radiator cooling fans, hydraulic pumps, air compressors and battery charging alternators. For Tier 4 ratings additional Parasitic losses would also include Intake, and Exhaust Restrictions.

ALTITUDE CAPABILITY Altitude capability is the maximum altitude above sea level at standard temperature and standard pressure at which the engine could develop full rated output power on the current performance data set.

Standard temperature values versus altitude could be seen on TM2001.

When viewing the altitude capability chart the ambient temperature is the inlet air temp at the compressor inlet.

Engines with ADEM MEUI and HEUI fuel systems operating at conditions above the defined altitude capability derate for atmospheric pressure and temperature conditions outside the values defined, see TM2001.

Mechanical governor controlled unit injector engines require a setting change for operation at conditions above the altitude defined on the engine performance sheet. See your Caterpillar technical representative for non standard ratings.

REGULATIONS AND PRODUCT COMPLIANCE TMI Emissions information is presented at 'nominal' and 'Potential Site Variation' values for standard ratings. No tolerances are applied to the emissions data. These values are subject to change at any time. The controlling federal and local emission requirements need to be verified by your Caterpillar technical representative. Customer's may have special emission site requirements that need to be verified by the Caterpillar Product Group engineer.

EMISSION CYCLE LIMITS: Cycle emissions Max Limits apply to cycle-weighted averages only. Emissions at individual load points may exceed the cycle-weighted limit.

WET & DRY EXHAUST/EMISSIONS DESCRIPTION: Wet - Total exhaust flow or concentration of total exhaust flow Dry - Total exhaust flow minus water vapor or concentration of exhaust flow with water vapor excluded

EMISSIONS DEFINITIONS: Emissions : DM1176

EMISSION CYCLE DEFINITIONS

1. For constant-speed marine engines for ship main propulsion, including,diesel-electric drive, test cycle E2 shall be applied, for controllable-pitch propeller sets test cycle E2 shall be applied.
2. For propeller-law-operated main and propeller-law-operated auxiliary engines the test cycle E3 shall be applied.
3. For constant-speed auxiliary engines test cycle D2 shall be applied.
4. For variable-speed, variable-load auxiliary engines, not included above, test cycle C1 shall be applied.

HEAT REJECTION DEFINITIONS: Diesel Circuit Type and HHV Balance : DM9500

HIGH DISPLACEMENT (HD) DEFINITIONS: 3500: EM1500

RATING DEFINITIONS: Agriculture : TM6008

Fire Pump : TM6009

Generator Set : TM6035

Generator (Gas) : TM6041

Industrial Diesel : TM6010

Industrial (Gas) : TM6040

Irrigation : TM5749

Locomotive : TM6037

Marine Auxiliary : TM6036

Marine Prop (Except 3600) : TM5747

Marine Prop (3600 only) : TM5748

MSHA : TM6042

Oil Field (Petroleum) : TM6011

Off-Highway Truck : TM6039

On-Highway Truck : TM6038

SOUND DEFINITIONS: Sound Power : DM8702

Sound Pressure : TM7080

Date Released : 03/12/24