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LIST OF SYMBOLS AND ABBREVIATIONS

\$	-	US dollar
%	-	Percentage
% vol.	-	Percent volume
°C	-	Degree centigrade
A.C	-	Alternate current
AGTDC	-	After gas exchange top dead centre
ATDC	-	After top dead center
ATR	-	Autothermal reforming
BHP	-	Brake horse power
BMEP	-	Brake mean effective pressure
BP	-	Brake power
BSEC	-	Brake specific energy consumption
BSFC	-	Brake specific fuel consumption
BSN	-	Bosch smoke number
BTDC	-	Before top dead centre
BTE	-	Brake thermal efficiency
CA	-	Crank angle
CAD	-	Crank angle degree
сс	-	Cubic centimetre
CFD	-	Computational fluid dynamics
CH ₄	-	Methane
CI	-	Compression ignition
CID	-	Cubic inch displacement
cm/s	-	Centimetre per second
cm ² /s	-	Square centimetre per second
CNG	-	Compressed natural gas

CO	-	Carbon monoxide
CO_2	-	Carbon dioxide
COG	-	Coke oven gas
cSt	-	Centistokes
CUTE	-	Clean Urban Transport for Europe
CWF	-	Cooling water flow rate
DC	-	Direct current
DI	-	Direct injection
DISI	-	Direct injection spark ignition
DOE	-	Department of energy
$dQ/d\theta$	-	Apparent rate of heat release
EC	-	European commission
ECOEHG	-	Electronic control unit of OEH gas
ECU	-	Electronic control unit
EGR	-	Exhaust gas recirculation
EGT	-	Exhaust gas temperature
EPA	-	Environmental protection agency
FCV	-	Fuel cell vehicle
FT	-	Fuel temperature
FTP	-	Federal test procedure
g/kWh	-	Gram per kilowatt hour
g/L	-	Gram per litre
GaN	-	Gallium nitride
GHG	-	Greenhouse gas
GSOI	-	Gas start-of-injection
H/C	-	Hydrogen to carbon ratio
H_2	-	Hydrogen
H ₂ KO	-	Potassium hydrate
H_2O	-	Water
HC	-	Hydro carbon

HCCI	-	Homogeneous charge compression ignition
HCNG	-	Mixture of compressed natural gas and hydrogen
HECU	-	Hydroxy electronic control unit
HFI	-	Hydrogen fuel injection
HRG	-	Hydrogen rich gas
HRR	-	Heat release rate
HSU	-	Hatridge smoke unit
Hz	-	Hertz
I.D.I	-	Indirect injection
IAT	-	Inlet air temperature
IC	-	Internal combustion
ICE	-	Internal combustion engine
IHP	-	Indicated horse power
IMEP	-	Indicated mean effective pressure
IP	-	Indicated pressure
IS	-	Iodine sulphur
ISFC	-	Indicated specific fuel consumption
ISFC	-	Indicated specific fuel consumption
J/CAD	-	Joules per crank angle degree
Κ	-	Kelvin
kg	-	Kilogram
Kg/m ³	-	Kilogram per cubic metre
km	-	Kilometre
KOH(aq)	-	Aqueous solution of potassium hydroxide
kW	-	Kilowatt
LCG	-	Low calorific gases
LCV	-	Lower calorific value
Li	-	Lithium
LPG	-	Liquefied petroleum gas
lpm	-	Litres per minute

MCFC	-	Molten carbonate fuel cell
MFC	-	Mass flow controller
MJ	-	Megajoule
MJ/kg	-	Megajoule per kilogram
MJ/kWh	-	Megajoules per kilowatt hour
MLSS	-	Mixed liquor solids suspension
mJ	-	Millijoule
mm	-	Millimetre
MNRE	-	Ministry of New and Renewable Energy
MPa	-	Megapascal
mV/bar	-	Millivolt per bar
MW	-	Megawatt
N_2	-	Nitrogen
NaCl	-	Sodium chloride
NaCl(aq)	-	Aqueous solution of Sodium chloride
NaHCO ₃	-	Sodium bicarbonate
NaOH(aq)	-	Aqueous solution of sodium hydroxide
NDIR	-	Non dispersive infra red
NHERMP	-	National Hydrogen Energy Road Map
NIMEP	-	Net indicated mean effective pressure
NO _X	-	Oxides of nitrogen
0	-	Atomic oxygen
O ₂	-	Oxygen
OEH	-	Oxygen enriched hydrogen
°F	-	Degree Fahrenheit
OH	-	Hydroxyl
PAFC	-	Phosphoric acid fuel cell
PEC	-	Photo-electrochemical
PEM	-	Proton exchange membrane
PID	-	Proportional-integral-derivative

PM	-	Particulate matter
POX	-	Partial oxidation
ppm	-	Parts per million
PV	-	Photovoltaic
PWM	-	Pulse width modulator
Q_{app}	-	Apparent heat release rate
$Q_{\rm w}$	-	Quantity of heat transferred to cylinder wall
rpm	-	Revolution per minute
rps	-	Revolution per second
S.I	-	Spark ignition
Sb	-	Antimony
SFC	-	Specific fuel consumption
SHP	-	Shaft horse power
SMD	-	Sauter mean diameter
SMR	-	Steam methane reforming
SOFC	-	Solid oxide fuel cell
SOI	-	Start of injection
THC	-	Total hydrocarbon
UBHC	-	Unburned hydrocarbon
ULSD	-	Ultra-low-sulfur diesel
V	-	Voltage
wt%	-	Weight percent
Zn	-	Zinc
ZnO	-	Zinc oxide
λ	-	Air fuel ratio
γ	-	Specific heat ratio