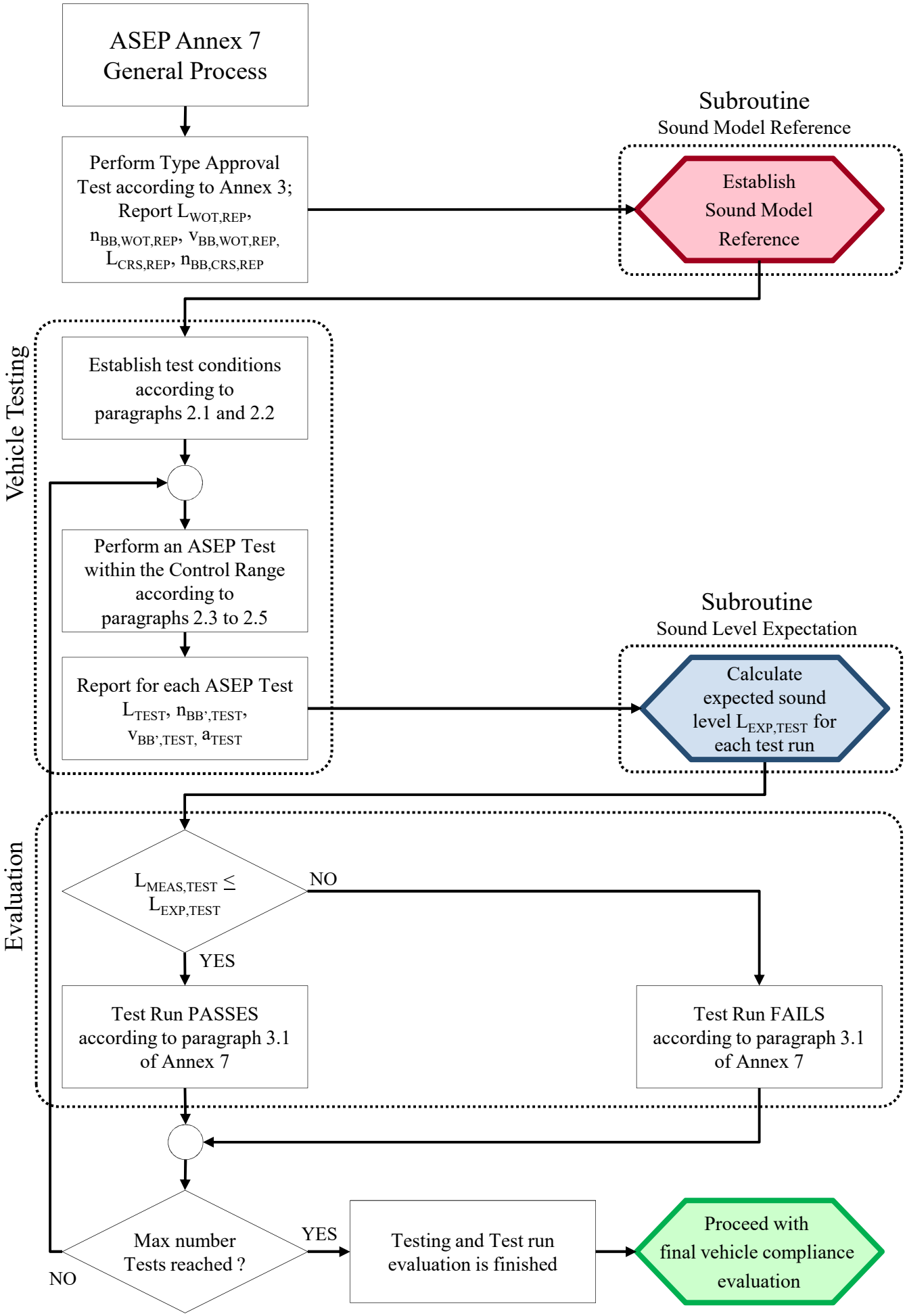
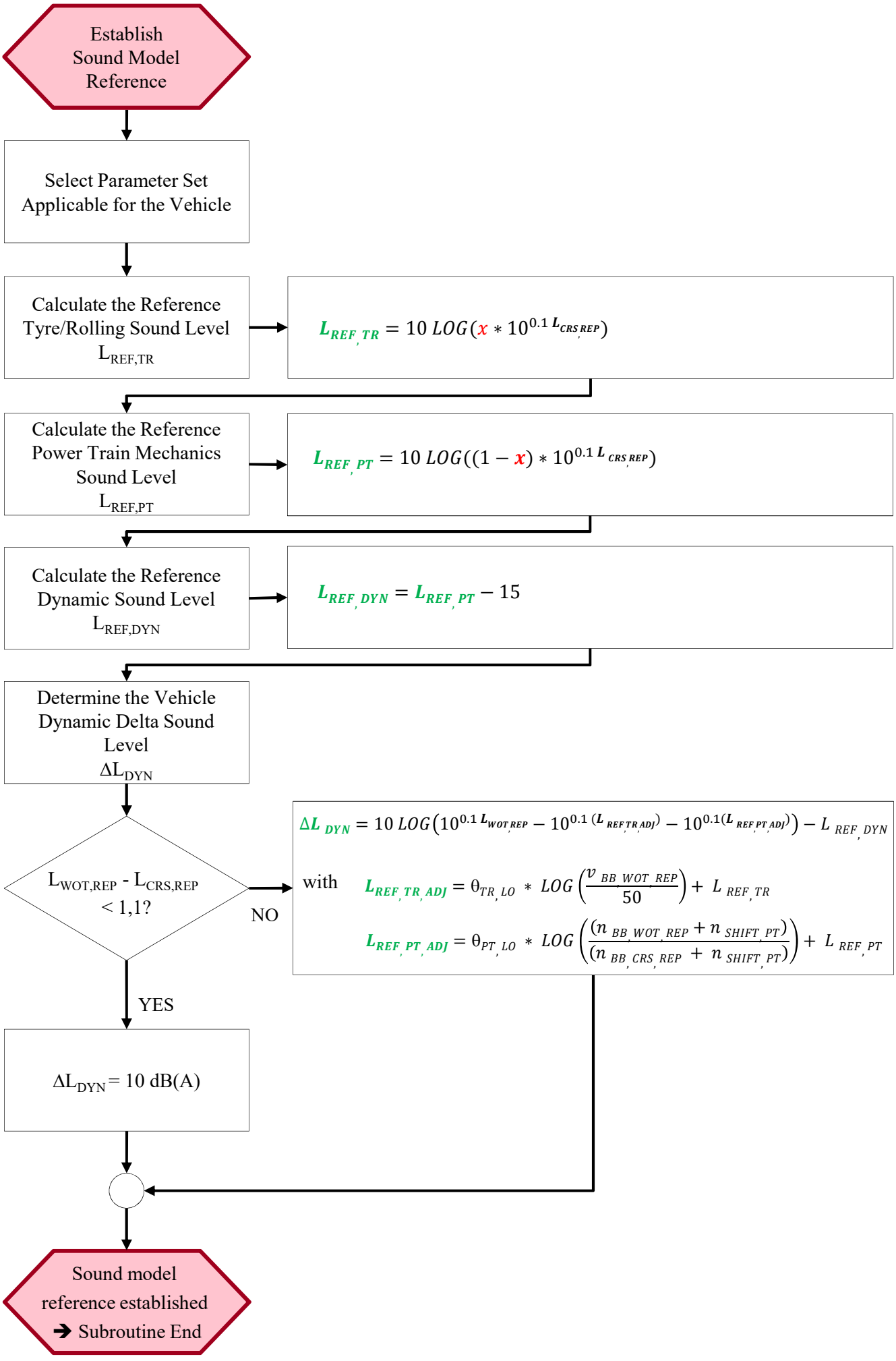
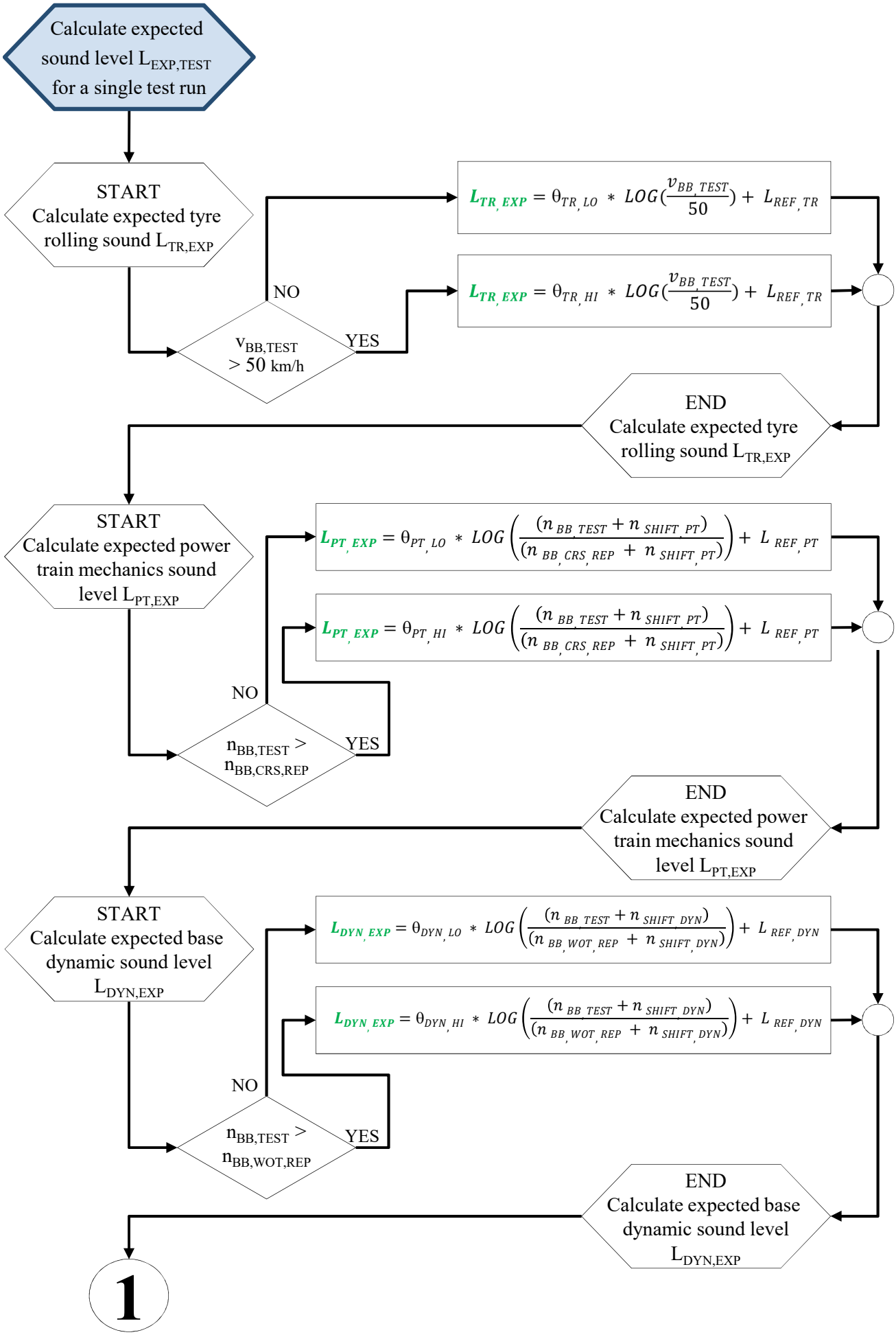
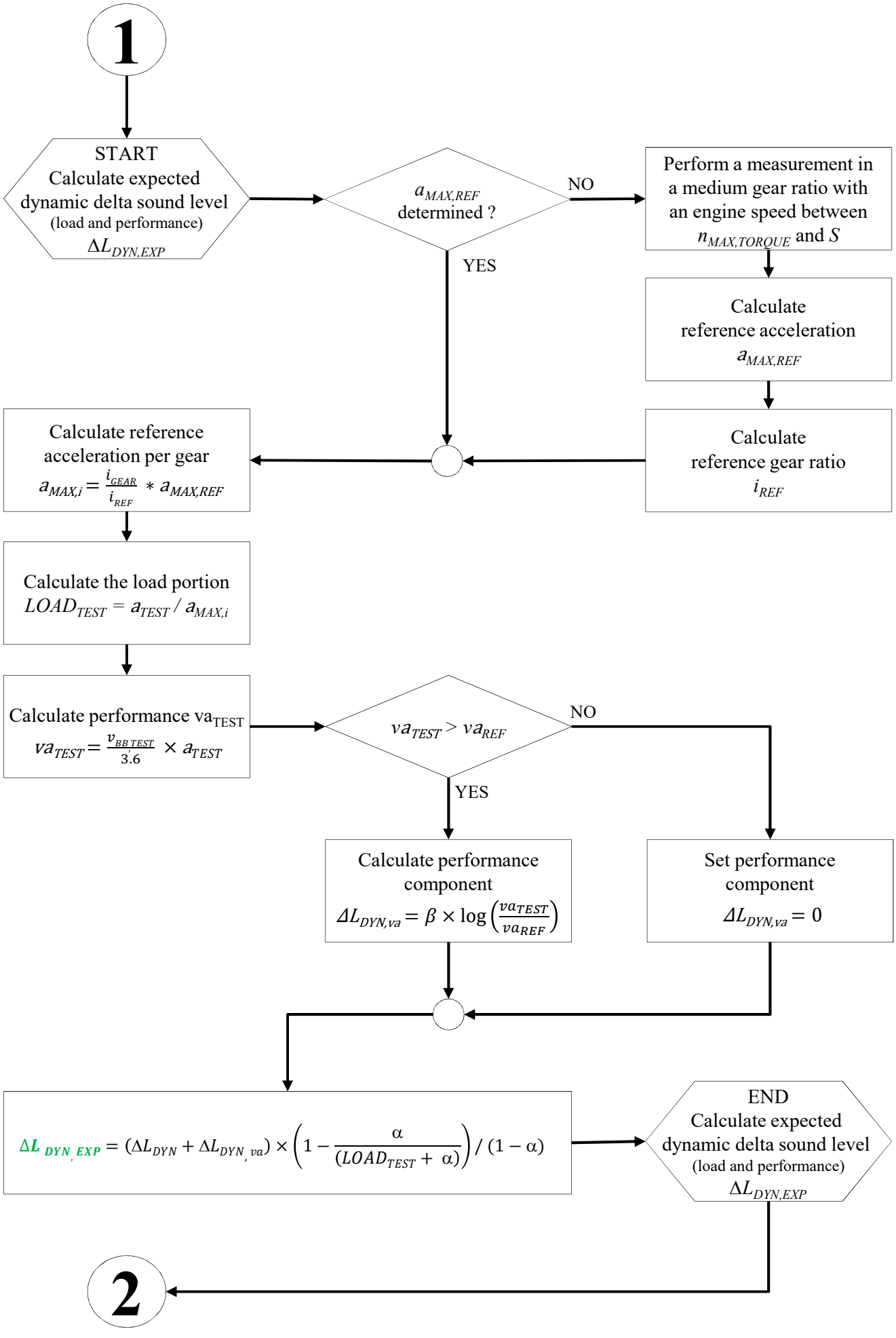
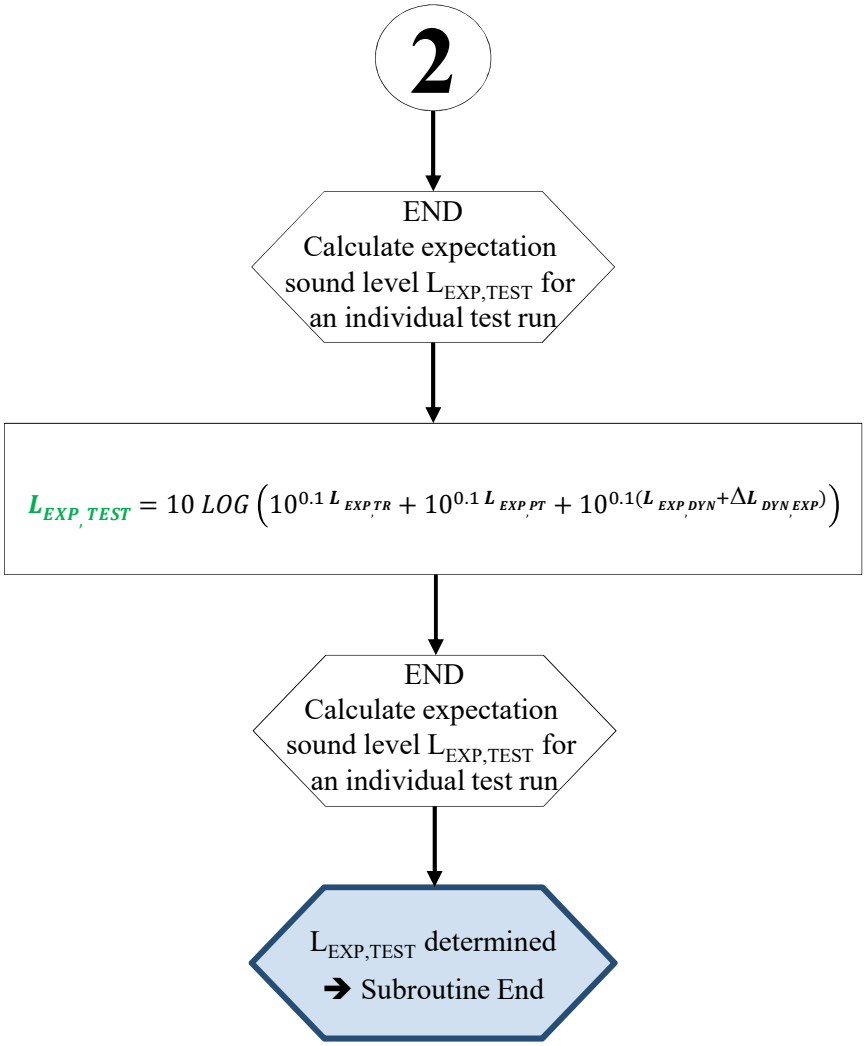
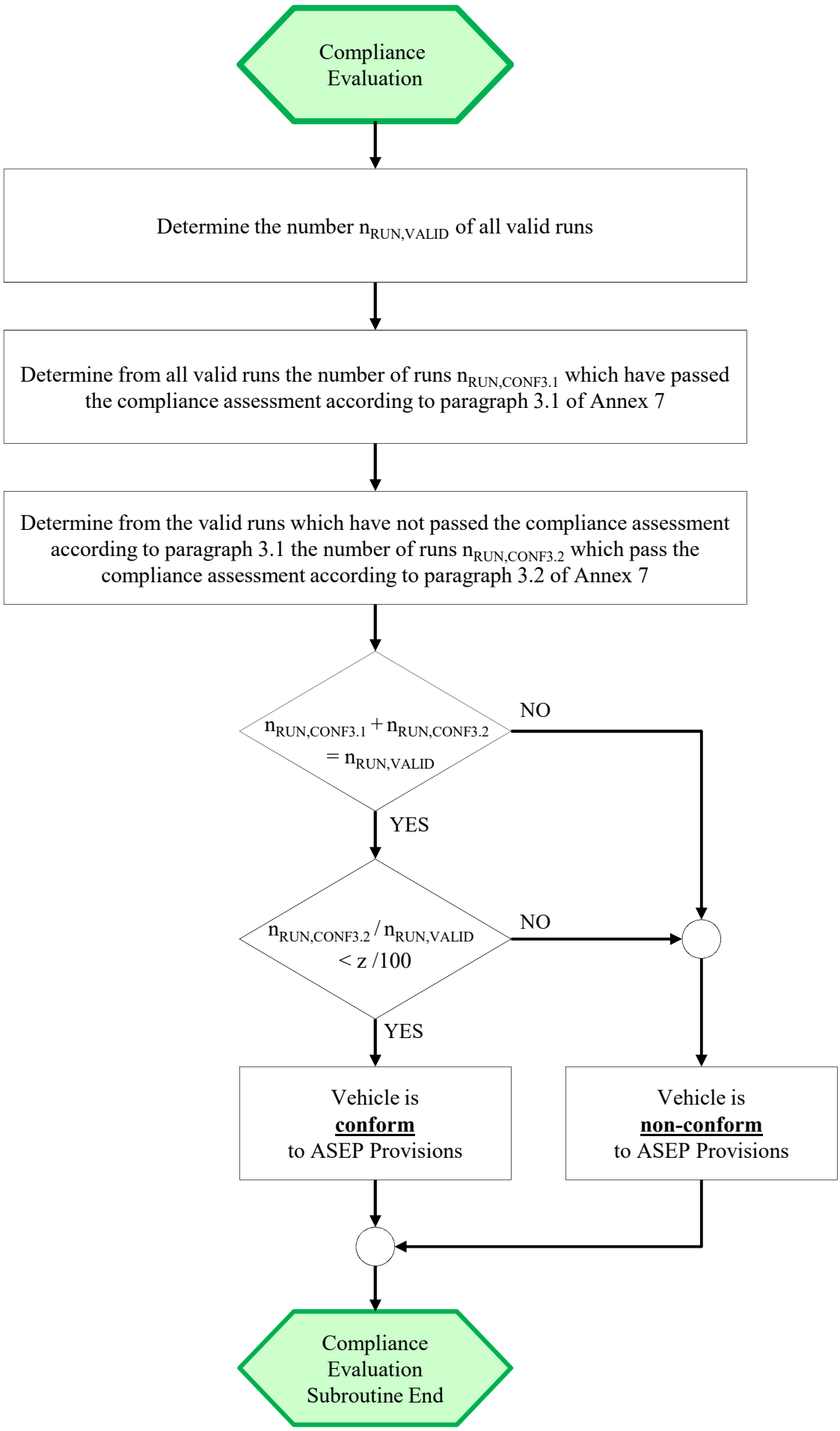

ASEP Annex 7
General Process
Perform Type Approval Test according to Annex 3; Report $L_{WOT,REP}$, $n_{BB,WOT,REP}$, $v_{BB,WOT,REP}$, $L_{CRS,REP}$, $n_{BB,CRS,REP}$
Subroutine
Sound Model Reference
Establish Sound Model Reference
Vehicle Testing
Establish test conditions according to paragraphs 2.1 and 2.2
Perform an ASEP Test within the Control Range according to paragraphs 2.3 to 2.5
Report for each ASEP Test L_{TEST}, $n_{BB',TEST}$, $v_{BB',TEST}$, a_{TEST}
Subroutine
Sound Level Expectation
Calculate expected sound level $L_{EXP,TEST}$ for each test run
Evaluation
$L_{MEAS,TEST} \leq L_{EXP,TEST}$
NO
YES
Test Run PASSES according to paragraph 3.1 of Annex 7
Test Run FAILS according to paragraph 3.1 of Annex 7
Max number Tests reached ?
YES
NO
Testing and Test run evaluation is finished
Proceed with final vehicle compliance evaluation


Establish Sound Model Reference
Select Parameter Set Applicable for the Vehicle
Calculate the Reference Tyre/Rolling Sound Level $L_{REF,TR}$
$L_{REF,TR} = 10\,LOG(x * 10^{0.1\,L_{CRS,REP}})$
Calculate the Reference Power Train Mechanics Sound Level $L_{REF,PT}$
$L_{REF,PT} = 10\,LOG((1-x) * 10^{0.1\,L_{CRS,REP}})$
Calculate the Reference Dynamic Sound Level $L_{REF,DYN}$
$L_{REF,DYN} = L_{REF,PT} - 15$
Determine the Vehicle Dynamic Delta Sound Level ΔL_{DYN}
$L_{WOT,REP}$ - $L_{CRS,REP}$ < 1,1?
NO
$\Delta L_{DYN} = 10\,LOG\left(10^{0.1\,L_{WOT,REP}} - 10^{0.1\,(L_{REF,TR,ADJ})} - 10^{0.1(L_{REF,PT,ADJ})}\right) - L_{REF,DYN}$
with $L_{REF,TR,ADJ} = \theta_{TR,LO} * LOG\left(\frac{v_{BB,WOT,REP}}{50}\right) + L_{REF,TR}$
$L_{REF,PT,ADJ} = \theta_{PT,LO} * LOG\left(\frac{(n_{BB,WOT,REP} + n_{SHIFT,PT})}{(n_{BB,CRS,REP} + n_{SHIFT,PT})}\right) + L_{REF,PT}$
YES
ΔL_{DYN} = 10 dB(A)
Sound model reference established
➔ Subroutine End


Calculate expected sound level $L_{EXP,TEST}$ for a single test run
START
Calculate expected tyre rolling sound $L_{TR,EXP}$
$v_{BB,TEST}$ > 50 km/h
NO
YES
$L_{TR,EXP} = \theta_{TR,LO} * LOG(\frac{v_{BB,TEST}}{50}) + L_{REF,TR}$
$L_{TR,EXP} = \theta_{TR,HI} * LOG(\frac{v_{BB,TEST}}{50}) + L_{REF,TR}$
END
Calculate expected tyre rolling sound $L_{TR,EXP}$
START
Calculate expected power train mechanics sound level $L_{PT,EXP}$
$n_{BB,TEST}$ > $n_{BB,CRS,REP}$
NO
YES
$L_{PT,EXP} = \theta_{PT,LO} * LOG\left(\frac{(n_{BB,TEST} + n_{SHIFT,PT})}{(n_{BB,CRS,REP} + n_{SHIFT,PT})}\right) + L_{REF,PT}$
$L_{PT,EXP} = \theta_{PT,HI} * LOG\left(\frac{(n_{BB,TEST} + n_{SHIFT,PT})}{(n_{BB,CRS,REP} + n_{SHIFT,PT})}\right) + L_{REF,PT}$
END
Calculate expected power train mechanics sound level $L_{PT,EXP}$
START
Calculate expected base dynamic sound level $L_{DYN,EXP}$
$n_{BB,TEST}$ > $n_{BB,WOT,REP}$
NO
YES
$L_{DYN,EXP} = \theta_{DYN,LO} * LOG\left(\frac{(n_{BB,TEST} + n_{SHIFT,DYN})}{(n_{BB,WOT,REP} + n_{SHIFT,DYN})}\right) + L_{REF,DYN}$
$L_{DYN,EXP} = \theta_{DYN,HI} * LOG\left(\frac{(n_{BB,TEST} + n_{SHIFT,DYN})}{(n_{BB,WOT,REP} + n_{SHIFT,DYN})}\right) + L_{REF,DYN}$
END
Calculate expected base dynamic sound level $L_{DYN,EXP}$
1


1
START
Calculate expected dynamic delta sound level (load and performance)
$\Delta L_{DYN,EXP}$
$a_{MAX,REF}$ determined ?
NO
YES
Perform a measurement in a medium gear ratio with an engine speed between $n_{MAX,TORQUE}$ and S
Calculate reference acceleration
$a_{MAX,REF}$
Calculate reference gear ratio
i_{REF}
Calculate reference acceleration per gear
$a_{MAX,i} = \frac{i_{GEAR}}{i_{REF}} * a_{MAX,REF}$
Calculate the load portion
$LOAD_{TEST} = a_{TEST} / a_{MAX,i}$
Calculate performance va_{TEST}
$va_{TEST} = \frac{v_{BB\,TEST}}{3.6} \times a_{TEST}$
$va_{TEST} > va_{REF}$
NO
YES
Calculate performance component
$\Delta L_{DYN,va} = \beta \times \log\left(\frac{va_{TEST}}{va_{REF}}\right)$
Set performance component
$\Delta L_{DYN,va} = 0$
$\Delta L_{DYN,EXP} = (\Delta L_{DYN} + \Delta L_{DYN,va}) \times \left(1 - \frac{\alpha}{(LOAD_{TEST} + \alpha)}\right) / (1 - \alpha)$
END
Calculate expected dynamic delta sound level (load and performance)
$\Delta L_{DYN,EXP}$
2


2
END
Calculate expectation sound level $L_{EXP,TEST}$ for an individual test run
$L_{EXP,TEST} = 10\ LOG\left(10^{0.1\,L_{EXP,TR}} + 10^{0.1\,L_{EXP,PT}} + 10^{0.1(L_{EXP,DYN}+\Delta L_{DYN,EXP})}\right)$
END
Calculate expectation sound level $L_{EXP,TEST}$ for an individual test run
$L_{EXP,TEST}$ determined
➔ Subroutine End


Compliance Evaluation
Determine the number $n_{RUN,VALID}$ of all valid runs
Determine from all valid runs the number of runs $n_{RUN,CONF3.1}$ which have passed the compliance assessment according to paragraph 3.1 of Annex 7
Determine from the valid runs which have not passed the compliance assessment according to paragraph 3.1 the number of runs $n_{RUN,CONF3.2}$ which pass the compliance assessment according to paragraph 3.2 of Annex 7
$n_{RUN,CONF3.1} + n_{RUN,CONF3.2} = n_{RUN,VALID}$
NO
YES
$n_{RUN,CONF3.2} / n_{RUN,VALID} < z/100$
NO
YES
Vehicle is **conform** to ASEP Provisions
Vehicle is **non-conform** to ASEP Provisions
Compliance Evaluation Subroutine End

Parameter Table

				M1		
Model Part	Parameter	Symbol	Unit	ICE	PEV	PMR < 25
TYRE	Reference Vehicle Speed	v_{REF}	km/h	50	50	40
	Tyre Rolling Sound Energy Fraction of Annex 3 Cruise Test $L_{CRS,REP}$	x	%	90	98	50
	T/R Sound Slope ≤ 50 km/h	$\theta_{TR,LO}$	---	20	20	20
	T/R Sound Slope > 50 km/h	$\theta_{TR,HI}$	---	40	40	40
MECHANIC NO LOAD	P/T Sound Slope ≤ $n_{BB,CRS,REP}$	$\theta_{PT,LO}$	---	60	60	60
	P/T Sound Slope > $n_{BB,CRS,REP}$	$\theta_{PT,HI}$	---	150	150	150
	Form Factor for the logarithm function of the meachanic sound model	$n_{SHIFT,PT}$	rpm	5000	5000	5000
DYNAMIC LOAD	Dynamic Sound Slope ≤ $n_{BB,WOT,REP}$	$\theta_{DYN,LO}$	---	60	60	60
	Dynamic Sound Slope > $n_{BB,WOT,REP}$	$\theta_{DYN,HI}$	---	110	110	110
	Form Factor for the logarithm function of the dynamic sound model	$n_{SHIFT,DYN}$	rpm	5000	5000	5000
DYNAMIC VxA	Reference Performance	va_{REF}	m^2/s^3	28	28	28
	Dynamic $v_x a$ Factor β	β	---	8	8	8
	Partial Load Form Factor α	α	---	0,111	0,111	0,111
GENERAL	Base Margin	m	dB(A)	2	2	2