



German retrofit provisions for HD-vehicle and NRMM engines

Anlage XXVII

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- **Anlage XXVII to National German Road Legislation (StVZO)**

- entered into force May 2007
(subsequently to Anlage XXVI for LDV)
- giving provisions to certify retrofit DPF systems for HDV and certain NRMM
- linked to environmental zones and road toll regulation

=> Vehicles with retrofitted DPF get better emissions-control sticker and are therefore allowed to enter corresponding environmental zones.



=> Vehicles with retrofitted DPF can make use of lower road toll pay scale.



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Content



- Based on the provisions given in the applicable European directives such as 2005/55/EC (2005/78/EC and 2006/51/EC) and 97/68/EC.
- Notified to Brussels (2006/0595/D) => available in EN, FR, SP, IT, etc.
- Defined PM limits in g/kWh which need to be met. Efficiency only used for system classification not for showing emission stage compliance.
=> Reason: Both, the environmental zone classification as well as the road toll scheme are linked to European limit values. Showing a certain grade of efficiency does not help to show compliance to a certain emission limit related to cost benefits and other incentives.
- Applicant has the freedom to create non-manufacturer related engine families with a single cylinder displacement of +/- 15% and the same engine aspiration system.
=> Reason: to reduce the number of engine tests and reduce costs

Engine families

Non-manufacturer related family



DAF	LF 45	LF 55	CF 65	CF 75	CF 85	XF
Zylinder	4	6	6	6	6	6
Vh:	0,975	0,983	0,983	1,530	2,100	2,100
Einspr.	CR	CR	PLD	PLD	PLD	PLD
Leistung	99-123	136-184	136-184	183-265	250-355	280-390

RVI	dCi 4	dCi 6	dCi 11	Dxi 11	Dxi 12
Zylinder	4	6	6	6	6
Vh:	1	1,030	1,830	1,8	1
Einspr.	CR	CR	CR	PD	PD
Leistung	110 - 130	158 - 195	229 - 303	250 - 350	324 - 353

Scania	DC16	DC12	DC11	DC9
Zylinder	8	6	6	5
Vh:	2	2	1,830	1,8
Einspr.	PD	PD	PD	PD
Leistung	368 - 456	250 - 345	250 - 280	169 - 228

VOLVO	D6B	D9B	D13A	D16C
Zylinder	6	6	6	6
Vh:	1	1,57	2,13	2,68
Einspr.		PD	PD	PD
Leistung	132 - 184	220 - 280	295 - 350	405 - 449

IVECO	F1A	F1C	C8	C10	C13
Zylinder	4	4	6	6	6
Vh:	0,575	0,7 - 0,75	1,300	1,700	2,150
Einspr.	CR	CR	PD	PD	PD
Leistung	-	-	200 - 260	294 - 316	350 - 400

MAN	D0834	D08366	D20	D28
Zylinder	4	6	6	6
Vh:	1,15	1,15	1,750	1,980
Einspr.	VP/CR	VP/CR	CR	CR
Leistung	110 - 132	162 - 206	228-287	228 - 338

DC	611	612	646	904 (6)	924 (6)	502	501	457
Zylinder	4	5	4	4 (6)	4 (6)	8	6	6
Vh:	0,54	0,54	0,54	1,070	1,2	1,98	1,98	2
Einspr.	CR	CR	CR	PLD	PLD	PLD	PLD	PLD
Leistung	60-95	115	80-110	-205	-240	235 - 335	370 - 425	260 - 315

VW	LT2 2,5	LT2 2,8	Crafter
Zylinder	5	4	5
Vh:	0,50	0,70	0,50
Einspr.	PLD	VP	CR
Leistung	82 - 96	116	85-120

Liter - 15%	Liter	Liter + 15%
0,54	0,63	0,72
0,935	1,1	1,265
1,19	1,4	1,61
1,7	2	2,3
	2,68	

Die Farben gruppieren die Zylinderhöbräume, die auf +/- 15% gleich sind.

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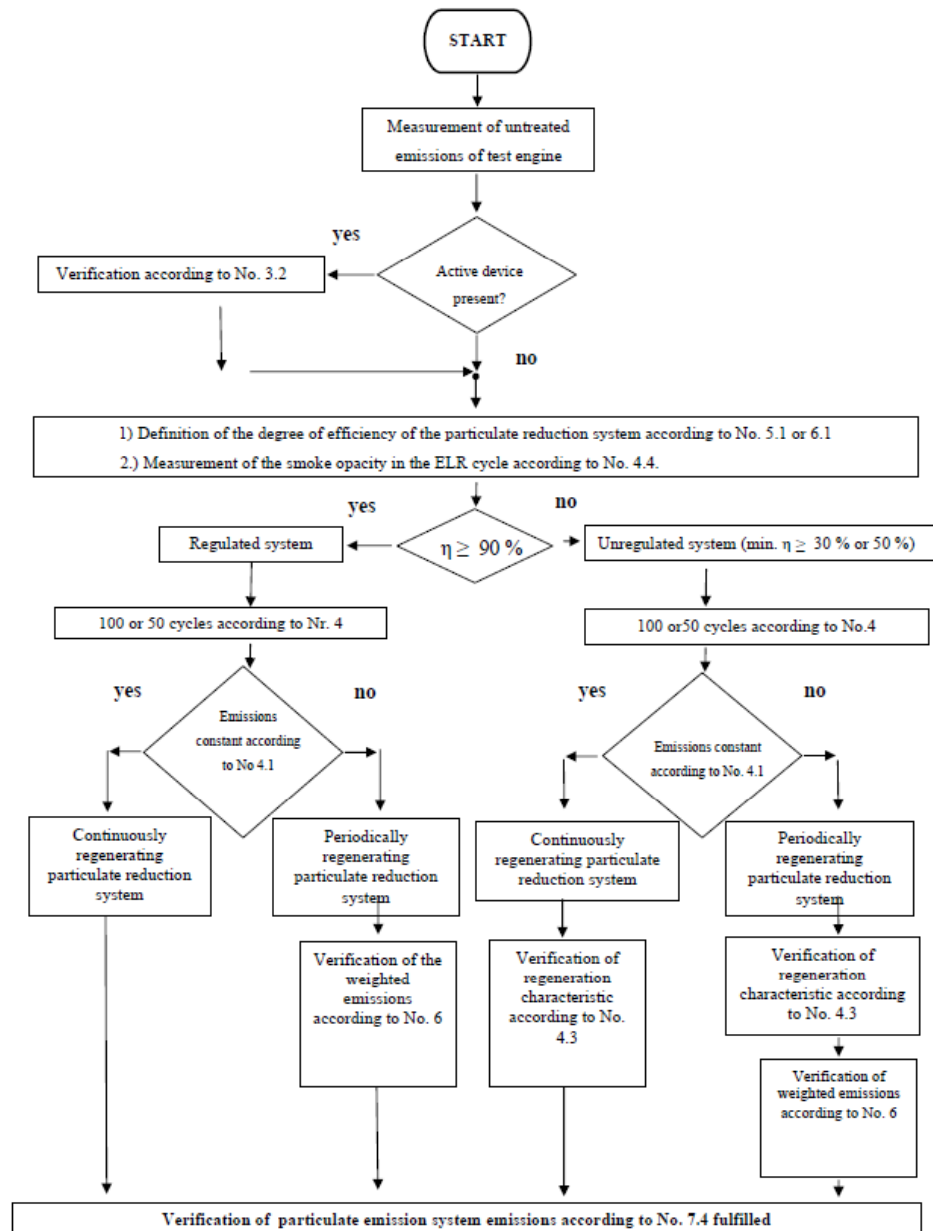
Content



- DPF family provisions applicable.
 - Technology neutral; e.g. non wall-flow systems can get approval as long as limit value, durability and regeneration requirements are met.
 - Applicable to active / passive systems.
 - If an additive is used, UBA need to confirm / allow its use.
 - The “better” the retrofit system, the “lesser” the approval testing.
 - Manufacturer / Applicant is responsible for durability.
 - Installation on vehicle only by notified garage / installation shop.
- => **Anlage XXVII** type approval scheme for retrofit DPF does not allow to show compliance to a whole emission stage (all regulated components) respectively to jump from a lower stage to a higher stage (e.g. from Euro III to Euro V) to full extent. The Euro stage demands further provisions to show compliance to, than meeting the emission limits only (e.g. OBD, ISC, Durability et cetera).

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Test Schedule



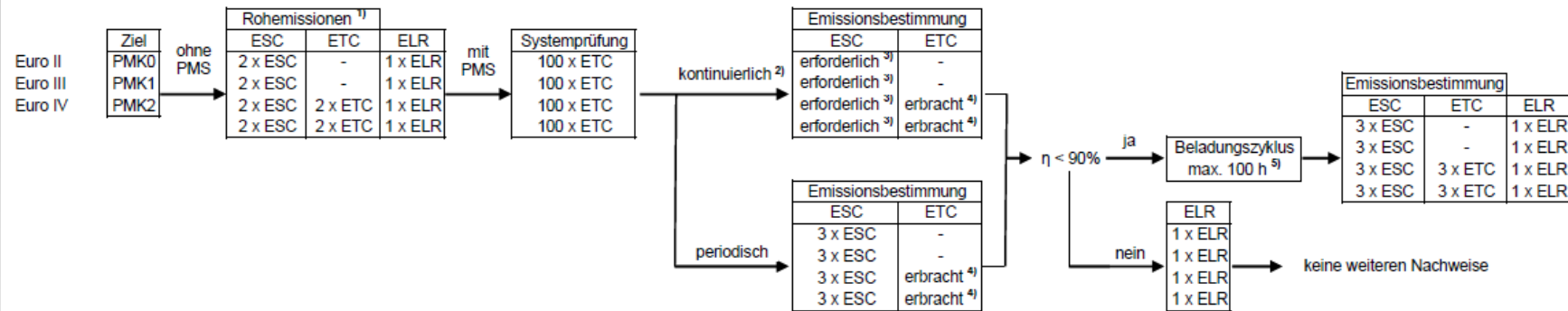
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Test Plan

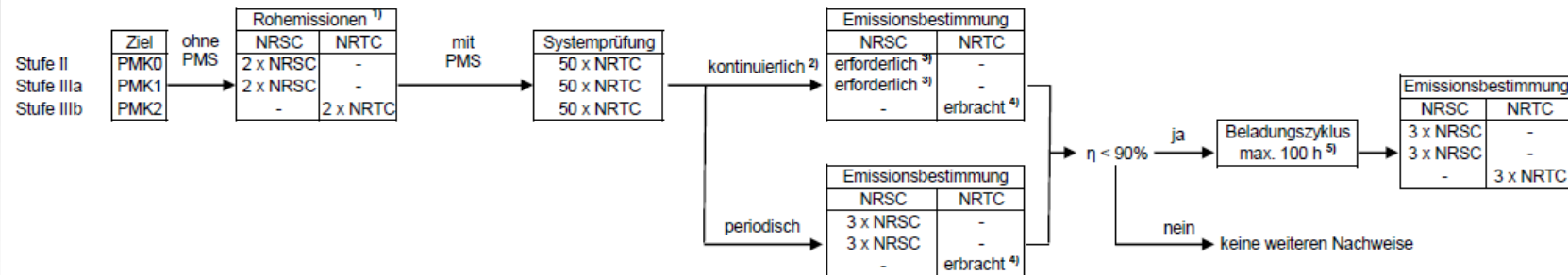


Ablaufplan der Test-Zyklen nach Anlage XXVII

Motoren nach 88/77/EG bzw. 2001/27/EG



Motoren nach 97/68/EG



- 1) = Vorgabe von zwei Messzyklen an den Stellen (5.1) und (6.1) zur Bestimmung von Ps
- 2) = Zum Nachweis der kontinuierlichen Regeneration können 25 ETCs/NRTCs aus der Systemprüfung herangezogen werden (4.1)
- 3) = keine Vorgaben zur Anzahl der Zyklen
- 4) = bereits über Systemprüfung abgedeckt
- 5) = min. 50h, wenn Abgasdruck = konstant oder max. 100h (4.3); oder grenzbeladenes System vom Hersteller

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Considerations



- +/- 15% family criteria proved to be too narrow
=> derogation provisions to be defined ?
- DPF compliance criteria may need to be adjusted for better in-service performance
=> minimum coating requirement for testing vs. in-service NO₂
(national German NO₂ monitoring for RF-DPF in preparation)
- Provisions for NRMM engines not fully satisfying.
=> e.g. power class related limit values not considered.
=> different engine applications / cycle depending on use.
- Additional provisions may be necessary for ECE approach.
=> e.g. NO₂ / durability run / in-use check / CoP
- First thoughts for NOx-retrofit existing
=> more stringent provisions / definitions necessary (similar to OEM)



**Thank you for
your kind attention!**