MSS54

tank ventilation

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1st GENERAL

The tank is vented via the tank vent valve, which is controlled by pulse width modulation.

The period of the valve is 105 msec, the resolution is 3.21 usec.
There is a **flushing phase** in which the AKF is flushed and there is **a learning or basic adaptation phase** in which the lambda adaptation is active and the TEV is closed.

1.1. SWITCH-ON CONDITIONS

The very first time you enter the rinsing phase is when
tmot > K_TE_TMOT and
Lambda controller active (B_LAx) or tl > KL_TE_N_TL and
Lambda controller factor la_f_reglerx > K_TE_LA_MIN.

1.2. RINSING PHASE

After the rinsing time has elapsed, you move from the rinsing phase to the basic adaptation phase.

te_t_spuel > K_TE_T_SPUEL_MIN + K_TE_T_SPULE

or

(B_HFM_FEHLER and tl < KL_TE_N_TL)

or

te_t_spuel > K_TE_SPUEL_MIN and teax_f > K_TEA_FMAX

In the rinsing phase there are 4 further states between which the system switches depending on the situation.

The opening and closing of the valve is done via the valve factor te_f_ventil, which is moved up and down via different ramps.

Important: In the case of a positive jump, the valve opening duration is filtered via a low-pass filter with the time constant K_TE_TVTE_TAU.

The valve starts at the minimum opening time of K_TE_TV_MIN and is immediately set to 0 below this time.

1.2.1 ADAPTATION

During the flushing phase, the lambda adaptation is switched off and the tank ventilation adaptation takes over its function and ensures that the lambda controller regulates by 1.0 again. The tank ventilation adaptation only runs when the lambda control is active.

The adaptation factor is regulated with the RAMP K_TEA_AB_SA if,
B_SA or

B_HFM_ERROR or
B_TE_DS2 or
B_SLP_DS2

The adaptation factor is regulated with the RAMP K_TEA_AB_TL_SCH if,
tl > KL_TE_N_TL

The adaptation factor is regulated with the RAMP K_TEA_AB_TLLA if,
tl < KL_TE_N_TL and !B_LA

The adaptation factor is regulated with the RAMP K_TEA_AB_LERN if,
you leave the rinsing phase.

The adaptation factor is calculated as follows:

teax_f = teax_f + (1.0 - la_f_reglerx) / K_TEA_TAU2

The adaptation factor is limited to K_TEA_FMIN and K_TEA_FMAX.

1.2.2 CONDITION: B_TE_NORM

This condition is the normal condition of the tank ventilation.

valve control:

In this state, the duty cycle for the valve control is calculated from the KF_TE_N_TL_TVTE or, in the case of B_LL, from the constant K_TE_TVTE_LL.

The valve is regulated up to this value via the factor te_f_ventil with the ramp K_TE_AUF.

This factor te_f_ventil is then increased using the RAMP K_TE_AUF1, but only until either the tank ventilation adaptation factor falls below the value K_TEA_FMIN1 or the factor te_f_ventil has reached the final value of K_TE_F_VENTIL_MAX.

Exit conditions:

From the state B_TE_NORM you exit into the state

a.) B_TE_SA during overrun cut-off B_SA

b.) B_TE_LIMIT if tmot < K_TE_TMOT
tl < KL_TE_N_TL and !B_LA
la_f_reglerx < K_TE_LA_MIN

1.2.3 STATE: B_TE_SA

This condition is assumed when the engine is switched on.

valve control:

In this state, the valve is immediately closed by setting the factor te_f_ventil to 0.

Exit conditions:

From the state B_TE_SA you exit into the state

a.) B_TE_NACH_SA if !B_SA

1.2.4 STATE: B_TE_NACH_SA

This condition is assumed after a phase of relapse.

valve control:

In this state, the duty cycle for the valve control is calculated from the KF_TE_N_TL_TVTE or, in the case of B_LL, from the constant K_TE_TVTE_LL.

The valve is regulated up to this value via the factor te_f_ventil with the ramp K_TE_AUF.

This factor te_f_ventil is then increased using the RAMP K_TE_AUF1, but only until either the tank ventilation adaptation factor falls below the value K_TEA_FMIN1 or the factor te_f_ventil has reached the final value of K_TE_F_VENTIL_MAX.

Exit conditions:

From the state B_TE_NACH_SA you exit into the state

a.) B_TE_LIMIT if
tl < KL_TE_N_TL and
(la_f_regelx < K_TE_LA_MIN or !B_LA)

b.) B_TE_SA during overrun cut-off (= B_SA)

1.2.5 STATE: B_TE_LIMIT

This state is the limit control, ie the AKF is so full that the lambda controller would fall below the limit value K_TE_LA_MIN.

valve control:

In this state, the valve is regulated via the factor te_f_ventil with the ramp K_TE_LIMIT.

Exit conditions:

From the state B_TE_LIMIT you exit into the state

a.) B_TE_NORM if
tmot > K_TE_TMOT and
(tl > KL_TE_N_TL or B_LA) and
la_f_reglerx > K_TE_LA_MIN

b.) B_TE_SA during overrun cut-off (= B_SA)

1.3. LEARNING OR BASIC ADAPTATION PHASE

After the flushing time has elapsed, the basic adaptation phase begins. The lambda adaptation is enabled again when the valve is completely closed and the general lambda adaptation conditions are valid (see lambda adaptation).

valve control:

In this state, the valve is regulated via the factor te_f_ventil with the ramp K_TE_ZU_LERN.

Exit conditions:

From the state B_TE_LERN you exit into the state

a.) B_TE_SPUEL if te_t_lern > K_TE_T_LERN

2nd VIRTUAL FORGETTING OF ADAPTATION AND VALVE OPENING DURATION

Every time the adaptation factor is to be forgotten, virtual
Forgetting factor tea_f_virtuell regulated via a slow ramp K_TEA_AB_VIRTUELL.

After the conditions for forgetting are no longer met, a starting value for the adaptation value is calculated as follows:

teax_f = 1.0 + (teax_f_start -1.0) * tea_f_virtual

where teax_f_start was the value before the forgetting phase.

After the conditions for forgetting are no longer met, a
Starting value calculated as follows:

te_f_ventil = te_f_ventil_start * tea_f_virtuell where te_f_ventil_start was the value before the forgetting phase.