Project: MSS54

Module: DIAGNOSIS LLS

DETECTION OF BLOCKED ACTUATORS

	Department	Date	name	Filename
editor				ED_LLS.DOC

1 Self-diagnosis: Idle speed control - control

1.1 Error detection:

The detection is carried out separately for the normally closed and normally closed windings of the ZWD-idle speed controller:

Open Load
short circuit to ground
Short circuit to Ubat
overtemperature of the driver

Error detection is performed every 100ms under the condition:
B_START or B_ML
and Ub > K_ED_UBMIN
carried out.

1.2 Error filtering:

K_ED_LLS_O_SIN	break winding - threshold for error entry
K_ES_LLS_O_SOUT	break winding - threshold for error output
K_ED_LLS_O_IN_INC	break winding - counter increment when error entry
K_ED_LLS_O_IN_DECR	break winding - counter decrement when error entry
K_ED_LLS_O_OUT_INC	break winding - counter increment when error is output
K_ED_LLS_O_OUT_DECR	Opener winding - counter decrement when error is output
K_ED_LLS_S_SIN	Normally open winding - threshold for error entry
K_ES_LLS_S_SOUT	Normally open winding - threshold for error output
K_ED_LLS_S_IN_INC	Normally open winding - counter increment b. error entry
K_ED_LLS_S_IN_DECR	Normally open winding - counter decrement b. error entry
K_ED_LLS_S_OUT_INC	Normally open winding - counter increment b. error output
K_ED_LLS_S_OUT_DECR	Normally open winding - counter decrement on error output.

1.3 Alternative measures:

Due to the five possible states of the normally closed and normally closed windings, the following matrix for the replacement measures results.

ZWDO\ZWDS	no mistake	Open Load	KS n. Masse	KS n. Ubat	overtemperature
no mistake	control	ZWD from	ZWDO max	ZWD from	ZWD from
Open Load	ZWD from	ZWD from	ZWDO max	ZWD from	ZWD from
KS n. Masse	ZWDS max	ZWDS max	ZWD from	ZWD from	ZWD from
KS n. Ubat	ZWD from	ZWD from	ZWD from	ZWD from	ZWD from
Overtemperature	ZWD off	ZWD from	ZWD from	ZWD from	ZWD from

Control: both windings are controlled with the calculated duty cycle

ZWD from: Both windings are de-energized - the ZWD gives the

emergency running cross-section free

ZWDO max: The normally closed winding is controlled with the maximum duty cycle K_LLS_TV_MAX, the normally open winding with the inverse value.

ZWDS max: The breaker winding is operated with the minimum duty cycle K_LLS_TV_MIN, the normally open winding with the inverse value controlled.

All replacement measures are taken immediately when the error occurs and remain effective only as long as the error is currently present.

In order to enable error recovery even when the ZWD is switched off, the idle speed controller is controlled with the duty cycle K_LLS_TV_NOTLAUF every K_LLS_ED_TFH seconds and the driver diagnosis for the two windings is evaluated again.

1.4 additional measures:

Locking the idle control
Blocking the LLR demand adaptation
blocking the lambda control

1.5 Location of the error:

Error number: ZWD Opener:		11
	ZWD closer:	10
PIN number:	ZWD opener:	29
	ZWD closer:	2

1.6 Type of error:

no mistake	0x00
Short circuit to Ubat:	0x01
Short circuit to ground:	0x02
Interruption:	0x04
Overtemperature:	0x08

stored environmental variables:

2 Self-diagnosis: Idle speed control - mechanics

2.1 Error detection:

The errors are detected

Idle speed control is stuck open or throttle valves do not close correctly
Idle speed control is stuck
leakage air

Error detection is performed with each LLR state transition from idle control to start-up control.

Idle speed control sticks open when
at least one adaptation value at minimum stop
and the I-controller of the LLR to minimum stop

Idle speed adjuster jams when
at least one adaptation value at maximum stop
and the I-controller of the LLR to maximum stop

Engine gets air leakage when
at least one adaptation value at minimum stop
and the I-controller is in the TL minimum limit

2.2 Error reporting:

as soon as all adaptation values of the LLR demand adaptation are within the defined limits.

2.3 Error filtering:

Error filtering already takes place indirectly through demand adaptation.

K_ED_LLR_SIN	threshold for error entry
K_ES_LLR_SOUT	threshold for error output
K_ED_LLR_IN_INC	Counter increment when error entry occurs
K_ED_LLR_IN_DECR	Counter decrement on error entry
K_ED_LLR_OUT_INC	Counter increment for error output
K_ED_LLR_OUT_DECR	Counter decrement for error output

Replacement measures:
no

additional measures:
no

Error location:
Error number: 23
PIN number: 136

2.4 Type of error:

no error:	0x00
Actuator stuck open:	0x01
Actuator stuck closed:	0x02
Engine gets air leakage:	0x04

stored environmental variables:

3 Self-diagnosis: detection of blocked actuators

3.1 Operating conditions of the idle control diagnosis

This function is enabled if B_LLDIA_ERLAUBT is set.
This is the case if

- no error in the EGAS system B_SK_EGAS_FEHLER = 0
- error-free speed detection
- stationary vehicle v = 0
- the engine is in a defined state B_LL, no B_KATH_AKTIV, no B_TEV_FEHLER, no B_EV_FEHLER, no B_TZ_FEHLER, tmot in the permissible window. no B_VAN_FEHLER, no B_ZWD_FEHLER, no B_HFM_FEHLER, no B_DIAG.

3.2 Functional description

This function monitors the behavior of the idle speed controller integrator lfr.mdi in interaction with the engine speed. If the speed difference is greater than K_LFROBD_DNO and the integrator is greater than the threshold K_LFROBD_DMO, the underspeed error BIT_MNLLR is set after the debounce time K_LFROBD_MN_FILTER.

If the speed difference is smaller than K_LFROBD_DNU and the integrator is smaller than K_LFR_OBD_DMU, the overspeed error BIT_MXLLR is set after the debounce time K_LFROBD_MX_FILTER.

If the throttle valve is too wide open, the engine may perform a permanent sawing with SA and WE. This prevents the LL integrator from reaching a stop. To detect this condition, the diagnosis monitors the number of positive edges of B_SA during a diagnosis phase (bit B_LLRDIA continuously set). If this number of SA is greater than the threshold K_LFROBD_DASA, the error BIT_MXLLR is set.

If the diagnostics have run and no error was detected, the LLR is reported as error-free.

3.3 Idle control diagnosis data

Description of the variables:

Name	Description Status	Type Resolution	
lfrobd_st	variable Counter	ub -	
lfrobd_mn_cnt	until error entry LLS closed.	uw 1 ms	
lfrobd_mx_cnt	Counter until error entry LLS-open Counter	uw 1 ms	
lfrobd_sa_cnt	SA phases Status byte	uw -	
lfrobd_ed	Diagnostics	ub -	

Description of the application data:

name	type	Dim. x-axis		
K_LFROBD_MN_FILTER	K	1	Waiting time until error entry LLS closed	--
K_LFROBD_MX_FILTER	K	1	Waiting time until error entry LLS open Max.	--
K_LFROBD_DMO	K	1	integrator deviation underspeed Max. integrator	--
K_LFROBD_DMU	K	1	deviation overspeed Max. speed deviation	--
K_LFROBD_DNO	K	1	underspeed Max. speed deviation underspeed	--
K_LFROBD_DNU	K	1	Filling threshold for LLR diagnosis Number of	--
K_LFROBD_RF	K	1	SA/WE phases for error detection	--
K_LFROBD_DASA	K	1		--