



PROJECT: MSS54

MODULE: DIFFERENTIAL SUCTION SYSTEM

AUTHORIZATION

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version	Date	comment
1.0	20.09.2003	First version

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1 FUNCTIONAL DESCRIPTION

The DISA causes a switch between long (torque position, DISA on) and short (power position, DISA off) intake path.

In the switching DISA used in EVT, the switching point is determined by a lower speed limit $K_DISA_N_ON$, an upper speed limit $K_DISA_N_OFF$ and by the full load condition B_VL .

The DISA is in the on state if the full load condition is valid and the speed is in the range $K_DISA_N_ON < n < K_DISA_N_OFF$, otherwise the DISA is off.

The DISA is adjusted via an electric motor which is controlled by a PWM.

1.1 CONDITIONS OF THE DISA

The DISA has four different states:

disa_state	state
0	DISA from (service provision)
1	Adjust DISA from Off to On
2	DISA on (torque position)
3	Adjust DISA from On to Off

In the idle states 0 and 2, the DISA is controlled via a 20% PWM signal from the corresponding polarity to prevent the DISA from being adjusted automatically by vibrations.

During the switching processes (disa_state 1 and 3), a control dependent on a characteristic curve (KL_DISA_TV) takes place with a PWM signal between 100% and 20%.

1.2 INITIALIZATION

The initialization takes place in the function `disa_init`.

After initialization, the DISA is controlled with a 20% PWM signal in the off direction, `disa_state` is set to zero.

The DISA is then in the Off state.

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1.3 SWITCHING THE DISA

The DISA is switched in the function `disa_10ms`.

The DISA only switches over as long as the engine running condition (`B_ML`) is true.

1.3.1 TURN ON

After initialization, the DISA is in power state, ie `disa_state = 0`.

A switchover occurs when the following conditions are met:

- DISA in performance position: `disa_state = 0`
- Speed greater than `K_DISA_N_EIN`: `n > K_DISA_N_EIN`
- Speed less than `K_DISA_N_AUS`: `n < K_DISA_N_AUS`
- Engine at full load: `B_VL = 1`

If all four conditions are true, `disa_state = 1` is set.

As long as `disa_state = 1`, the function `disa_ein()` is called (10ms clock).

The function `disa_ein()` outputs the corresponding direction bit for the correct polarity and a PWM signal.

The PWM duty cycle is determined by the applicable characteristic curve `KL_DISA_TV`, the input variable of the characteristic curve is the counter variable `disa_cnt`.

`disa_cnt` is incremented with each call of `disa_ein()`, thus the characteristic curve is traversed.

First, a 100% duty cycle is output, which is then reduced to 20% to avoid jamming at the stop of the On position.

The last output duty cycle of 20% and the direction remain set until the next switching operation.

If `disa_cnt` exceeds the value `K_DISA_CNT_ENDE`, the switching process is complete, `disa_cnt` is set to 0, `disa_state` to 2, the DISA is now in torque position.

1.3.2 TURN OFF

The DISA is disabled when the following conditions are met:

- DISA in torque position: `disa_state = 2`
- one of the following three conditions:
 - o `n > K_DISA_N_AUS + K_DISA_HYST`
 - o `n < K_DISA_N_EIN + K_DISA_HYST`
 - o Condition full load `B_VL` is false

An applicable hysteresis `K_DISA_HYST` is added to the speed limits to avoid constant switching at the speed limits.

If the first and one of the following three conditions are true, `disa_state` is set to 3.

As long as `disa_state = 3`, the function `disa_au()` is called.

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The direction bit is set in the opposite direction, the duty cycle is again calculated from the characteristic curve KL_DISA_TV.

As soon as disa_cnt has exceeded the value K_DISA_CNT_ENDE and the characteristic curve has been passed, disa_cnt and disa_state are set to zero, ie the DISA is now in the power position and the switching process is complete.

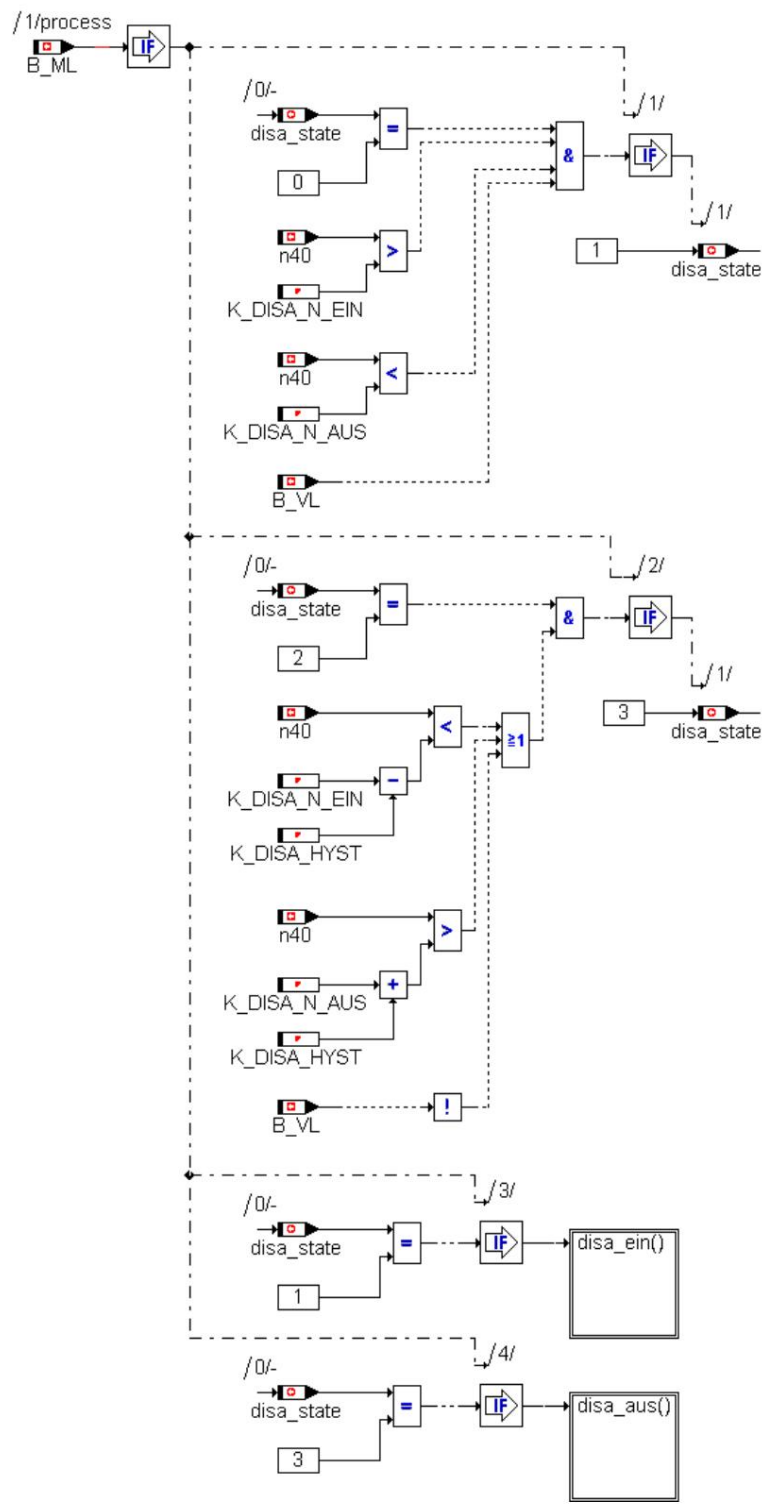
1.4 REVERSAL OF DIRECTION

The constant K_DISA_DIR can be used to reverse the switching direction of the DISA.

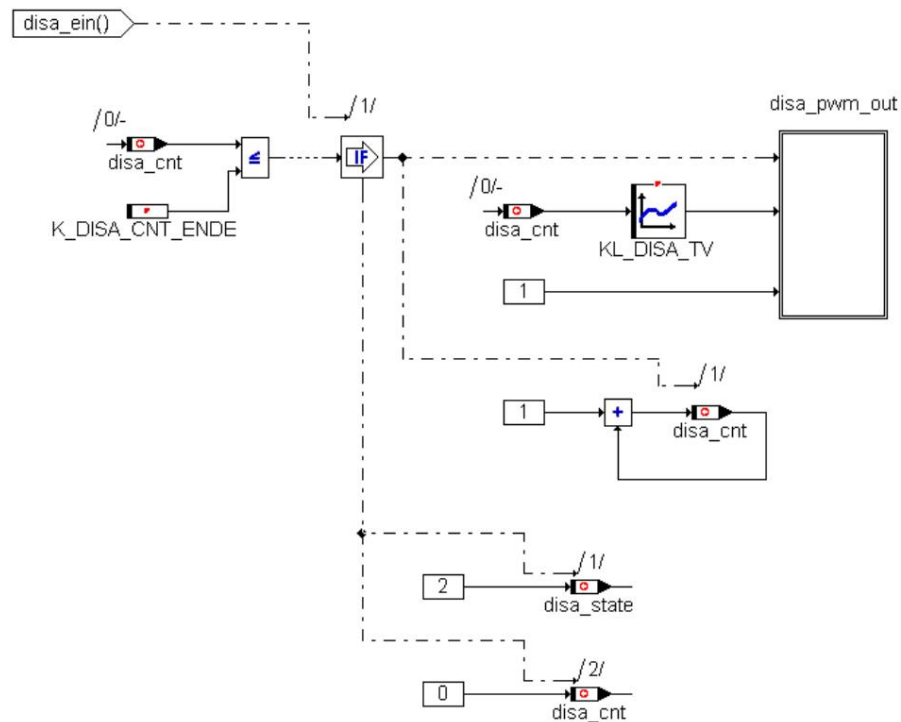
Since the direction bit of the hardware driver is only set during a switchover, a switchover must be triggered after changing the constant K_DISA_DIR in order to take effect.

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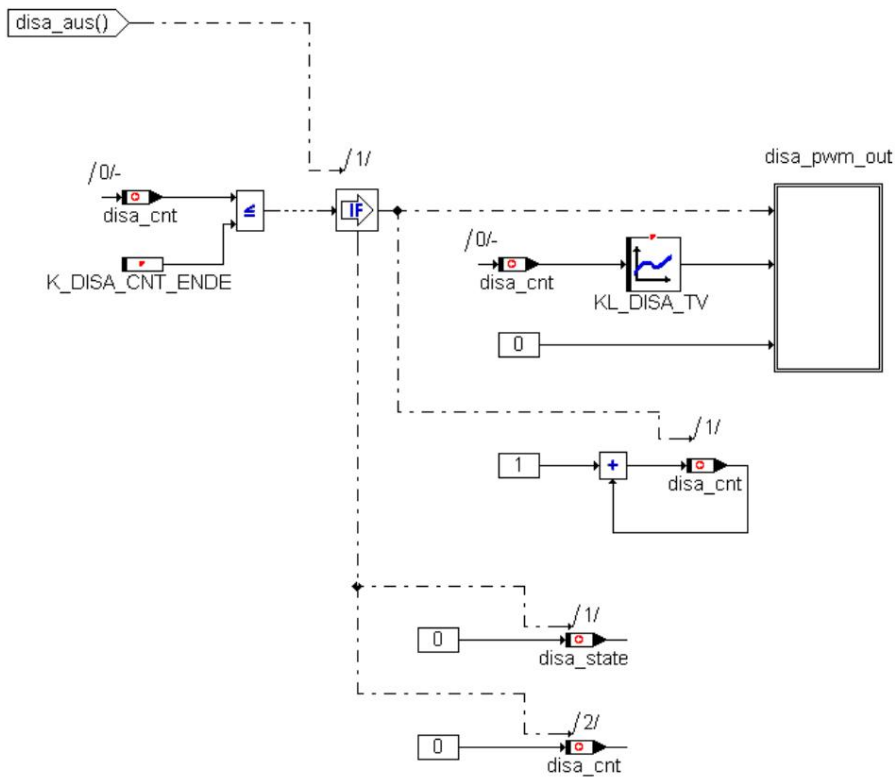
1.5 FUNCTIONAL CIRCUIT DIAGRAMS



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2 DATA FROM DISA

The function is calculated in the 10ms task.

Description of the variables:

disa_state	DISA operating state	ub

Description of the application data:

K_DISA_DIR	direction reversal DISA	ub
K_DISA_N_EIN	lower speed limit upper	ub
K_DISA_N_AUS	speed limit	ub
K_DISA_HYST	hysteresis value speed	ub
KL_DISA_TV	characteristic curve for duty cycle	ub / ub

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