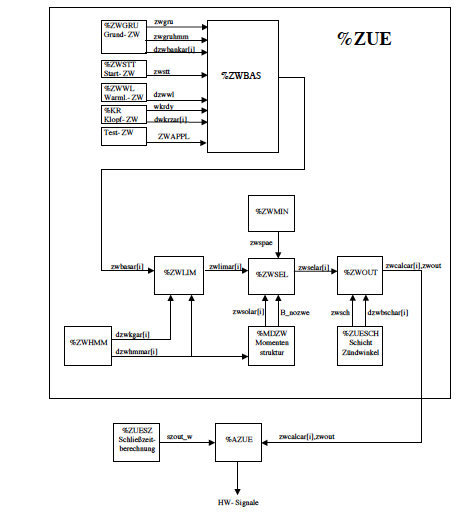
**FU ZUE 318.20.3 Basic Function - Ignition**

Overview ignition:



zue-overview

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Source-X | Source-Y | Type | Name |
| DZWOLA | LAMSBG\_W |  | KL | Lambda dependence of the optimum ignition angle with respect to lambda 1 |
| DZWOLAL | LAMSBG\_W |  | KL | Lambda dependency of the opti. Angle at lambda 1 with LBK in function |
| KFDZWKG | NMOT\_W | LAMSBG\_W | KF | Angle correction by shifting the knock limit |
| SNM08\_\_UB | NMOT |  | SV (REF) | Location distribution Speed, 8 Sst. |
| STM08\_\_UB | TMOT |  | SV (REF) | Location distribution Motor temperature, 8 Sst. |
| SUB08ZUUB | UB |  | SV (REF) | Substitution distribution for closing time |
| WPHN | NMOT |  | KL | phase response |
| ZWAPPL |  |  | FW | Application Interface Zonal Angle Adjustment |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| System constant | |  | | Type | | Description | | |
| SY\_BDE | |  | | SYS (REF) | | system constant gasoline direct injection | | |
| SY\_HKS | |  | | SYS (REF) | | System Constant BDE Mode Homogeneous Knock Protection (HKS) | | |
| SY\_HMM | |  | | SYS (REF) | | System constant HMM operation available | | |
| SY\_HSP | |  | | SYS (REF) | | System Constant BDE Mode Homogeneous Split (HSP) | | |
| SY\_LS | |  | | SYS (REF) | | System constant lambda split | | |
| SY\_OVLLIM | |  | | SYS (REF) | | Maximum number of sync latches within a load interval | | |
| SY\_REDMX | |  | | SYS (REF) | | System constant maximum reduction level | | |
| SY\_SCHICHT | |  | | SYS (REF) | | System constant BDE system with shift operation (= 1: with shift, = 0: only homogeneous) | | |
| SY\_WMAX | |  | | SYS (REF) | | System constant for the highest possible open angle | | |
| SY\_WMIN | |  | | SYS (REF) | | earliest outputable angle of field | | |
| SY\_ZYLOFFH | |  | | SYS (REF) | | Offset Cylinder counter for calculation ti, wesbh for homogeneous injection | | |
| SY\_ZYLZA | |  | | SYS (REF) | | Cylinder number | | |
| SY\_ZZBANK | |  | | SYS (REF) | | System Constant Cylinder Assignment Bank1 u. B.2, 0 B.1, 1 for B.2, as a binary number | | |
|  | |  | |  | |  | | |
| Variable | Source | | Referenced by | | Type | | Description |  | |
| B\_HKS | BDEMUM | | AWEA, BBKR, BDEMKO, BDEMUS, ESAUSG, ... | | ON | | condition Operating mode homogeneous knock protection |  | |
| B\_HMM | BDEMUM | | BBAGR, BBKR, BDEMEN, BDEMUE, BGAGRA, ... | | ON | | Condition Homogenous-lean mode |  | |
| B\_HOM | BDEMUM | | ATR, BAKH, BBAGR, BBKR, BDEMKO, ... | | ON | | condition Homogenous mode |  | |
| B\_HSP | BDEMUM | | AWEA, BDEMEN, BDEMKO, BDEMUS, ESAUSG, ... | | ON | | condition Homogeneous split mode |  | |
| B\_KHLS |  | | KOLASPH ATM, BAKH, DMDSTP, KTMHK, LAKH, ... | | ONE | | condition Katheizen with Lamda-split |  | |
| B\_LLREIN |  | | LLRBB BGNLLKH, LLRBB, LLRNS, LLRRM, MDGEN, ... | | ON | | condition LLR Ready after start |  | |
| B\_NOZWE | MDZW | | DLGHMM, MDIST, ZUE, ZWSEL | | ON | | condition no angle engagement of the torque structure |  | |
| B\_SA | MDRED | | AMSV, ARMD, ATM, BBAGR, BBBO, | | ON | | condition push-off |  | |
| B\_ZWKRA | ZUE ZWOUT | |  | | OFF | | Condition: Apex angle of the KR is output |  | |
| B\_ZWSCH | BDEMUM BDEMUS, MDBAS, MDFAW, MDKOG, MDRED, ... | |  | | ON | | condition Operating mode with shift coverage angle active |  | |
| DWKRZ | KRREG | | ZUE, ZWBAS | | ON | | cylinder. ZW slew adjustment incl. Dyn |  | |
| DZWBANKAR | ZUE | | ZUE, ZWBAS | | DOK | | Array ZW offset for two banking systems |  | |
| DZWBSCHAR | ZUE | | ZUE, ZWOUT | | DOK | | Array selective offset angle offset for 2 bank systems in shifts |  | |
| DZWHMM | ZUE | |  | | DOK | | ZW- correction in homogeneous lean operation |  | |
| DZWHMMAR | ZUE | | MDZW, ZUE, ZWLIM | | OFF | | Array lambdaabh. Offset of the optimal ZW in homogeneous lean operation at BDE |  | |
| DZWKGAR | ZUE | | ZUE, ZWLIM | | DOK | | array lambdaabh. Displacement of the knock limit in homogeneous lean operation |  | |
| DZWOAG | MDBAS ZUE, ZWGRU, ZWMIN | |  | | A | | exhaust gas flow rate dep. Angle correction of the optimal ZW |  | |
| DZWWL | ZWWL ZUE, ZWBAS | |  | | A | | delta tilt angle from warm-up |  | |
| FLB\_W | LBKFGS BGAGRSOL, BGPIRG, BGPRGS, KOLASPH, LAMBTS, ... | |  | | A | | factor of charge movement |  | |
| LAMSBG\_W | LAMKO | |  | | ATM, BDEMEN, BGLAMOD, BGLASO, BGMSNOVK, ... | | A lambda roll limit (word) |  | |
| NMOT\_W | BGNMOT AEVABU, AGRUE, ALE, AMSV, ARMD, ... | |  | | ON | | engine speed |  | |
| REDIST | BGEVAB EVABUE, MDIST, MDRED, MSF, ZUE, ... | |  | | An | | actual reduction stage |  | |
| SZOUT\_W | ZUE | | HT2KTIGNI, KT\_ZUEN, ZUESZ | | OFF | | closing time output |  | |
| WKRDYV | KRDY | | BBKR, ZUE, ZWBAS | | A | | Zb angle adjustment for KR dynamics |  | |
| WPHG | ZUE | | ZUE | | LOK | | Fence angle DG phase correction |  | |
| ZWBAS | ZUE | | MDBAS, MSF, ZUE | | FROM | | Basic Ignition Angle |  | |
| ZWBASAR | ZUE | | ZUE, ZWLIM, ZWOUT, ZWSEL | | LOK | | Basic Ignition Angle Array |  | |
| ZWCALCAR | ZUE | | ZUE, ZUESZ | | OUT | | Zebra angle output array |  | |
| ZWGRU | ZUE | | LAMBTS, ZUE, ZWBAS | | From | | base angle |  | |
| ZWIST | ZUE | | AWEA, DFFT, MDIST, MSF, TKMWL, ... | | OFF | | actual angle |  | |
| ZWKRAFLD | ZUE | | BBKR, KRREG, ZUE | | DOK | | Bit pattern of the zyl.ind. discarded B\_zwkra |  | |
| ZWLIMAR | ZUE | | ZUE, ZWOUT, ZWSEL | | DOK | | array for the earliest possible zebra angle zwlim |  | |
| ZWOUT | ZUE | | UFZWC, ZUE | | from | | Zebra angle output |  | |
| ZWOUTCPL | ZUE | | UFZWC, ZUE | | OFF | | One's complement of the Z-Angle for functional monitoring |  | |
| ZWSCH | ZUE | | ZUE, ZWOUT | | DOK | | Zundungswinkel in shift operation |  | |
| ZWSELAR | ZUE ZUE, ZWOUT | | OFF | | Array for ZOOM selected for spring and late limit | |  |  | |
| ZWSOLAR | MDZW | | MDZW, ZUE, ZWSEL | | ON | | Array Target span angle from moment intervention |  | |
| ZWSPAE | ZUE | | ZUE, ZWSEL | | DOK | | Best Zebra Angle |  | |
| ZWSTT | ZUE | | STADAP, ZUE, ZWBAS, ZWMIN | | DOK | | ignition angle in start |  | |
| ZZYLH | SYNTIZW ESAUSG, GK, KT\_ES, MDZW, RKTI, | |  | | ON | | cylinder counter for homogeneous injection |  | |
| ZZYLZUE | SYNTIZW | | HT2KTIGNI, MDZW, SYNTIZW, ZUE, ZUESCH, ... | | ON | | SW cylinder counter for calculation of ignition |  | |

**FB ZUE 318.20.3 Function description**

This overview function describes the complete scope of the ignition for the operating modes used so far. If individual Operating modes are not provided, the corresponding software part can be hidden by system constants. So far used for this were:

- SY\_BDE

- SY\_HMM

- SY\_LAY

- SY\_LS

- SY\_HSP

- SY\_HKS

The use of the individual operating modes is described in detail in the individual functions. For example, for one Intake manifold injection system without Y exhaust system and pure homogeneous operation all system constants are set to 0, so that some functions completely eliminated.

**Zwbas module:**

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The ignition angle zwgru from the Grundzbebebebrechnung is the angle dzwwl the warm-up and the cylinder-individual Angle dwkrz [i] and wkrdy of the knock control corrects and forms the base bias angle zwbasar [i] for the current cylinder zzylzue. If SY\_ZZBANK> 0, then a cylinder-selective delta angle dzwbank [i] is calculated for the second intake manifold system.

In the starting case (! B\_llrein or! B\_stend), the start angle zwstt is used.

In stationary mode, the corresponding base tooth angle for the current cylinder is zzylzue in zwbasar [zzylzue] and for the following cylinders up to zwbasar [zzylzue + SY\_OVLLIM]. SY\_OVLLIM returns the maximum possible overlap the closing times.

During the transition between homogeneous and homogeneous-lean, in the% ZWGRU, parallel to SY\_ZYLOFFH Syncros, next to zwgru also zwgruhmm, the Zundungswinkel for homogeneous lean operation, made available.

During a mode changeover between hom and hmm, the toggle bits B\_homhmm or B\_hmmhom are set. Dependent from the rising edge of these toggle bits, the parameters for the crossover loop for ZW calculation are calculated.

It is in zwbasar [zzyluzue, ..., zzylzue + SY\_ZYLOFFH -1] the Z Zundwinkel the old mode and in

zwbasar [zzylzue + SY\_ZYLOFFH, ..., zzylzue + SY\_OVLLIM] enter the angle of attack for the new operating mode.

In the homogeneous and homogeneous knock protection mode, the current basic key angle zwbas is obtained, as the input quantity for the moment structure, from zwbas = zwbasar [zzylzue], whereas for the homogeneous lean operation zwbas = zwbasar [zzylh] (zzylh is the

Cylinder in which the injection offset in zzylzue is ignited (zzylh = zzylzue + SY\_ZYLOFFH).

Two interfaces are provided for the application. The fixed value ZWAPPL allows a ZW adjustment via application tools.

The code word CWMDAPP (bit 0) deactivates the intervention of the torque functions so that the applied one Zebra angle zwbasar [zzylzue] can be driven directly.

**Zwhmm module:**

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In homogeneous-lean operation (B\_hmm = true), the lambda dependence with the additive angle corrections dzwolhmm and dzwkghmm becomes lambda-dependent of the ignition angle and the displacement of the knock limit with lambda cylinder-selectively taken into account.

To do this, dzwolhmm in dzwhmmar [zzylh] and dzwkghmm in dzwkgar [zzylh] are entered cylinder-selectively. The addressing takes place with the cylinder counter zzylh, which leads the cylinder counter zzylzue ahead of SY\_ZYLOFFH, thus taking into account that the injection SY\_ZYLOFFH synchros before the ignition.

With the factor flb\_w, which represents the position of the LBK, is between the curves DZWOLA (LBK = open) and DZWOLAL (LBK = closed) interpolated to calculate dzwolhmm.

**Zwlim module:**

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The function% ZWLIM has the task of registering the earliest possible ignition angle cylinder-selectively in the ignition angle array zwlimar [i].

For cylinders in front of the cylinder with zzylnm the ignition angle of the old operating mode is entered. The sequence of entry takes place in the same way as in% ZWSEL and is therefore included in% ZWSEL6.10ff. Dependencies of operating mode, Station operation or mode switching are also taken into account.

In Homogeneous or Homogeneous Chatter Protection Mode, the Zth Angle of the 1st cylinder is the Zth Angle from the ith element of Zwbasar [i].

In the homogeneous-lean mode, the ignition angle of the i-th cylinder is the ignition angle of the i-th element of zwbasar [i] + dzwhmmar [i] + dzwkgar [i].

**Zwsel module:**

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When operating mode changeover is detected, the cylinder number is determined for the first combustion in the new mode. This is calculated from zzylzue + SY\_ZYLOFFH. In the Syncros transition phase, the updated, mode-dependent dep. Pass value of the respective cylinder.

**Apex angle for homogeneous operation (HOM):**

% MDZW gives as its output the ignition angle zwsolar [0], which, if B\_nozwe is false, is at the earliest possible ignition angle zwlimar [i] is bounded after early or at the ignition angle zwspae after late. The thus determined Z¨undwinkel is in zwselar [zzylzue ... zzylzue + SY\_OVLLIM].

When the transition to HMM has been detected, the HOM setpoint angle is entered by means of [zzylzue .... zzylzue + SY\_ZYLOFFH -1]. From zwselar [zzylnm] is the zwlimar [zzylnm] registered.

**Apex angle for Homogeneous Knock Protection Mode (HKS):**

If condition B\_hks = true is satisfied, the ZW zwkfzwhks for the operating mode HKS comes from the% ZWGRU and is used as the ignition angle in zwselar [zzylzue ... zzylzue + SY\_OVLLIM] written. The same applies as in homogeneous operation.

**Apex angle for homogeneous lean operation (HMM):**

In homogeneous-lean operation (B\_hmm = true), zwlimar [zzylzue] is the earliest possible ZW for HMM operation. In approved Angle-angle intervention is considered cylinder-selectively between [zzylzue] from% MDZW if B\_hmmv = TRUE; otherwise will

zwlimar [zzylzue + SY\_ZYLOFFH] written after zwselar [zzylzue + SY\_ZYLOFFH].

When the transition to HOM is detected, the HOM setpoint angle is entered by means of [zzylnm .... zzylnm + SY\_OVLLIM -1]. The remaining HMM angles in zwselar [zzylzue .... zzylnm] remain.

**Yaw angle for fuel cut-off**:

With active overrun fuel cutoff (B\_sa = true), the next possible ignition angle zwspae is written in zwselar [zzylzue] by the moment dismantle.

**Zwout module:**

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The function zwout has the task, when switching the operating mode from or after shift, the ignition angle cylinder selectively in new operating mode from the cylinder number zzylnm (cylinder number in the new mode) in the zwaltarray array zwcalcar [].

For cylinders in front of the cylinder with zzylnm, the ignition angle from the old operating mode is entered.

In shift mode (operating mode layer (SCH), homogeneous layer (HOS) and layered catalysts (SKH)), cylinder-selective in zwcalcar [i] written. If SY\_ZZBANK> 0 (systems with two intake manifolds) dzwbschar [i] is added to zwsch.

In Homogenous (HOM), Homogeneous (HMM), Homogeneous (HKS) and Homogeneous Split (HSP) modes, the i.th cylinder is used in the i.te element of zwcalcar [i] the angle of the zth of the ith element of zwselar [i] is written. In these modes is the knocking control over B\_zwkra + zwkrafld signals when the break is reached zwlimar / zwbasar.

The ignition angles from zwcalcar [i] can be phase corrected to compensate for runtimes in the encoder system via wphg, and are then output from the% AZUE (ME (D) 7) or% HT2KTIGNI (ME (D) 9).

To ensure the ignition angle as the input parameter of the function monitoring, the one-complement of zwout is formed and stored in zwoutcpl.

**Zuesz module:**

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This function determines the closing time in the simplest case. from Ubatt and Tmot. These simple ZUESZ function variants are designed to be very resource-saving and sufficient for conservative ignition systems.

If high demands are placed on the candle life and / or ignition coils are driven at the saturation limit,

There are also more expensive ZUESZ variants, in which, depending on different motor influencing factors (for example, R1), an energy reduction is planned (see platform list).

**APP ZUE 318.20.3 Application Notes**