Fmc - Fuel Mass Calculation

1 [Fuel Mass Calculation] Fuel Mass Calculation

1.1 [Overview]

Figure 1: [Fmc Function Overview]

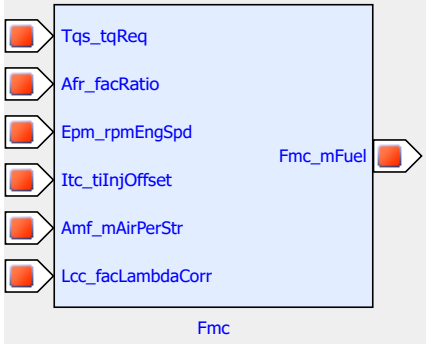
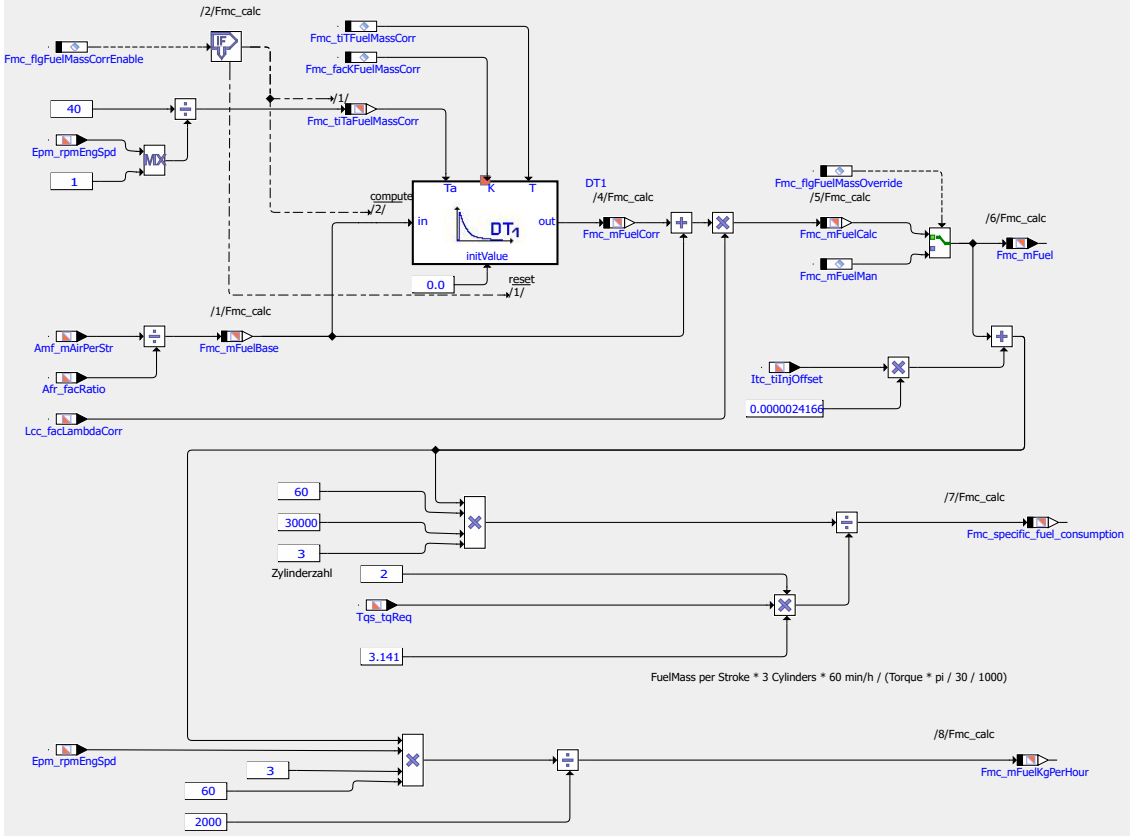


Figure 2: [FuelMass.Main]



1.2 [Einspritzmenge]

Im Modul Einspritzmenge (FuelMass) wird die zur Verbrennung benötigte Kraftstoffmasse Fmc_mFuel berechnet. Dazu wird zunächst der Quotient aus der Luftmasse im Zylinder Amf_mAirPerStr und dem Luft-Kraftstoff-Verhältnis Afr_facRatio gebildet und mit dem Korrekturwert Lcc_facLambdaCorr aus der Lambdaregelung multipliziert.

Da bei Saugrohreinspritzung im Gegensatz zur Direkteinspritzung zusätzlich verschiedene ungewünschte Effekte auftreten, wieWandfilm, Verzugszeit, usw., wird zur Verbesserung der Dynamik bei Lastwechseln eine zusätzliche Korrektur Fmc_mFuelCorr der Einspritzmenge durchgeführt. Dazu wird ein Differenzierer mit anschließendem Abklingverhalten verwendet. Je größer die Änderung der Einspritzmenge ist, desto stärker reagiert das DT1-Glied. Dadurch wird beispielsweise erreicht, dass bei einer Erhöhung der Luftmasse, was eine Erhöhung der Kraftstoffmenge zur Folge hat, zusätzlich Kraftstoff eingespritzt wird, der die Wandfilmeffekte im Saugrohr ausgleicht. Über die folgenden Einspritzungen wird diese Menge reduziert, um wieder den gewünschten λ-Wert zu erreichen.

Die Auswertung der Funktion Fmc_calc erfolgt im Synchron-Raster, wodurch die Abtastzeit des DT1-Glieds drehzahlabhängig ist. Dabei erfolgt pro Zylinder eine Auswertung jede zweite Umdrehung, also insgesamt drei Auswertungen über 720°KW. Die Bildung des Maximums von Drehzahl und Eins dient einzig der Sicherheit. Es wird eine Division durch Null vermieden, wobei bei einer Drehzahl von Null nie ein Synchron-Interrupt ausgelöst wird und damit nie eine Auswertung der Funktion erfolgt. Gleichung 5.10 zeigt die Berechnung der Abtastzeit des DT1-Glieds.

Die Berechnung der einzuspritzenden Kraftstoffmasse ergibt sich damit, wie in Gleichung 5.9 beschrieben. Durch das Flag Fmc_flgFuelMassOverride kann die Einspritzmenge manuell mit Fmc_mFuelMan überschrieben werden, bevor sie als Nachricht weitergereicht wird.

Figure 3: [fmc_jpg_1]

$$m_K = (\frac{m_L}{f_{L-K}} + m_{Korr}) \times f_{\lambda-Korr}$$

m_K	Krafstoffmasse
m_L	Luftmasse
f_{L-K}	Luft-Kraftstoff-Verhältnis
m_{Korr}	dynamische Korrektur durch DT1-Glied
$f_{\lambda-Korr}$	Korrektur durch λ-Regelung

Figure 4: [fmc_jpg_2]

$$T_a = \underbrace{\frac{2}{3}}_{\substack{\text{3 Absaugungen} \\ \text{pro 2 Umdrehungen}}} \times \frac{1}{U} \times 60 \; \frac{sek}{min}$$

$$T_a = \frac{40}{n} \; \frac{sek}{min}$$

T_a	Abtastzeit in Sekunden
n	Drehzahl in $\frac{1}{min}$

2 [C-Code Source]

2.1 [Code Listing]

```
/* BEGIN: ASCET REGION "Generation Information" */
/*****************************************************************************
 * BEGIN: Generation Information
 *---------------------------------------------------------------------------
 * Component:.............Module
 * Name:..................."FuelMass"
 * Implementation:........."Impl"
 * Dataset:..............."Data"
 * Specification:.........Block Diagram
 * Version:...............<empty String>
 * Library Path:..........."smartm160\Project_SmartM160\Function_Modules"
 *---------------------------------------------------------------------------
 * Project Name:..........."FlexECU_M160"
 * Project Library Path:....."smartm160\Project_SmartM160\"
 *---------------------------------------------------------------------------
 * Generation Date:.......03.12.2014
 * Generation Time:.......13:41:34
 *---------------------------------------------------------------------------
 * ASCET Version:.........V6.1.4 RB-DGS 2.3
 * ASCET-MD Version:......V6.1.4
 * ASCET-RP Version:......V6.1.4
 * ASCET-SE Version:......V6.1.4.28.19 CID[610]
 *---------------------------------------------------------------------------
 * END: Generation Information
 *****************************************************************************/
/* END: ASCET REGION "Generation Information" */

/* BEGIN: ASCET REGION "Project Options" */
/*****************************************************************************
 * BEGIN: Project Options "Build"/"Code"
 *---------------------------------------------------------------------------
 *    Build
 *---------------------------------------------------------------------------
 * Code Generator:.......Object Based Controller Implementation
 * Compiler:.............Microsoft Visual C++ 2008
 * Operating System:.....GENERIC_OSEK
 * Target:...............ANSI-C
 *---------------------------------------------------------------------------
```

```
 *    Code
 *---------------------------------------------------------------------------
 * Add Comment with Generation Information for each Component [true]: true
 * Add Comment with Implementation Information for each Assignment Statement [true]: true
 * Add Comment with Specification Source for each Statement [true]:..true
 * Add parenthesis for readability [false]:.........................false
 * Casting [MISRA]:.................................................MISRA
 * Force Parenthesis for Binary Logical Operators [false]:..........false
 * Generate Define Directives for Enum Values [false]:..............false
 * Prefix for Component Names [<empty String>]:.....................<empty String>
 * Protected against division by zero [true]:.......................true
 * Protected Division against Signed Overflow [true]:...............true
 * Protected Vector Indices [true]:.................................true
 *---------------------------------------------------------------------------
 *    Code.Compiler
 *---------------------------------------------------------------------------
 * Division truncation direction [Zero (T-division)]:...............Zero (T-division)
 * Inline directive [__inline]:.....................................__inline
 * Integer Bit Size [32]:...........................................32
 * Private directive [static]:......................................static
 * Public directive [<empty String>]:...............................<empty String>
 *---------------------------------------------------------------------------
 *    Code.FixedPoint
 *---------------------------------------------------------------------------
 * Allow Double bit Size for Division Numerators [true]:.............true
 * Allow Limit Service for Assignment Limitation [true]:.............true
 * Arithmetic Service Set [<None>]:.................................<None>
 * Generate Limiters (may be changed locally) [true]:................true
 * Generate Round Operation on float to integer Assignment [true]:...true
 * Maximum bit Length (float) [64]:.................................64
 * Maximum bit Length (int) [32]:...................................32
 * Result on Division by Zero [numerator]:..........................numerator
 * Temp Vars always 32 bit (integer) [false]:.......................false
 * Use power of 2 approximations of literals [false]:...............false
 * Use SHIFT Operation on Signed Values instead of DIV Operation [true]: true
 * Use SHIFT Operation on Signed Values instead of MUL Operation [true]: true
 *---------------------------------------------------------------------------
 *    Code.Optimizations
 *---------------------------------------------------------------------------
 * Auto-inline private methods (Smaller code-size - may be changed locally) [false]: false
 * Generate well-formed switch [false]:.............................false
 * Hierarchical Code-Generation (may be changed locally) [false]:....false
 * Initialise history variable with zero [false]:...................false
 * Optimize Direct Access Methods (Multiple Levels) [false]:........false
 * Optimize Direct Access Methods (One Level) [false]:..............false
 * Optimize Static Actions (Restricted Modelling) [false]:..........false
 * Outline Generated Methods (may be changed locally) [false]:.......false
 *---------------------------------------------------------------------------
 *    Code.Production
 *---------------------------------------------------------------------------
 * Add Implementation Definitions [true]:...........................true
 * Generate Access Macros for [(variables, messages)]:..............(variables, messages)
 * Generate Access Methods for dT (Alternative: use OS dT directly) [true]: true
 * Generate Data Structures [USELOCAL]:.............................USELOCAL
 * Generate Map File [true]:........................................true
 * Generate OS Configuration [true]:................................true
 *---------------------------------------------------------------------------
 *    Station.Build
 *---------------------------------------------------------------------------
 * Use Customized Data Type Names [false]:..........................false
 *---------------------------------------------------------------------------
 * END: Project Options "Build"/"Code"
 ***************************************************************************/
/* END: ASCET REGION "Project Options" */
/* BEGIN: ASCET REGION "ASCET-SE AddOn Options" */
/***************************************************************************
 * BEGIN: ASCET-SE AddOn Options
 * -------------------------------------------------------------------------
 *     Code
 * -------------------------------------------------------------------------
 * checkMemSectionVolatility [true]:................................false
 * checkMultipleSend [false]:.......................................false
 * distribVarMemClass ["DISTRRAM"]:.................................."RAM"
 * genAlwaysInitValues [false]:.....................................true
 * genLogicElementsAs [PACKED_BITFIELD]:............................PACKED_BITFIELD
 * genObjList [false]:..............................................false
 * implInfoComments [true]:.........................................true
 * initTaskMemClass ["ASD_INIT_TASK_MEM"]:..........................."ASD_INIT_TASK_MEM"
 * isrMemClass ["ASD_ISR_MEM"]:......................................"ASD_ISR_MEM"
 * mainMemClass ["ASD_EXT_CODE_MEM"]:..............................."ASD_EXT_CODE_MEM"
 * optimizeUnusedCode [true]:.......................................true
 * paramAsSysConst [false]:.........................................false
 * pragmaMemClassAtDecl [false]:....................................false
 * pragmaMemClassEnabled [true]:....................................false
 * referenceMemClass ["REFRAM"]:....................................."RAM"
```

```
 * shortNames [false]:.....................................................false
 * taskMemClass ["ASD_TASK_MEM"]:......................................"ASD_TASK_MEM"
 * virtualParameterMemClass ["VIRT_PARAM"]:............................."VIRT_PARAM"
 * ---------------------------------------------------------------------------
 *     Code.Appearance
 * ---------------------------------------------------------------------------
 * braceLineFeed [true]:...................................................true
 * genDate [<undef>]:.....................................................<undef>
 * genTime [<undef>]:.....................................................<undef>
 * generateSignatureDecorationComments [true]:.............................true
 * lineFeedPosition [LEFT]:................................................LEFT
 * maxIdentLength [0]:.....................................................40
 * maxRightLength [60]:....................................................60
 * minLeftLength [8]:......................................................8
 * preventIndentStructInit [true]:.........................................true
 * ---------------------------------------------------------------------------
 *     OS
 * ---------------------------------------------------------------------------
 * Os-Config-C_gen_declaration_alarms [false]:.............................false
 * Os-Config-C_gen_declaration_appmodes [false]:...........................false
 * Os-Config-C_gen_dt_calc [false]:........................................true
 * Os-Config-C_gen_initCOM [false]:........................................false
 * Os-Config-C_gen_inittask [false]:.......................................true
 * Os-Config-C_gen_main [false]:...........................................false
 * Os-Config-C_gen_process_container [false]:..............................true
 * Os-Config-C_gen_startuphook [false]:....................................false
 * asd_exclusive_area ["ASD_EXCLUSIVE_AREA"]:..........................."ASCET_exclusive_area"
 * messageDoInit [false]:..................................................false
 * messageExternalMessageCopies [false]:...................................false
 * messageGenOSEKDeclarations [true]:......................................false
 * messageIgnoreUsageInInitTask [false]:...................................false
 * messageOverloadInitValues [<undef>]:....................................<undef>
 * messageUsageVariant [OPT_COPY]:.....................................NON_OPT_COPY
 * modularMessageUse [false]:..............................................false
 * osAppModePattern ["%name%"]:........................................."appmode_%name%"
 * osStartupFunction [<undef>]:...........................................<undef>
 * ---------------------------------------------------------------------------
 *     OS.OIL
 * ---------------------------------------------------------------------------
 * OIL-COOP-RESOURCE-name ["ASD_Cooperative_Res"]:....................."ASD_Cooperative_Res"
 * OIL-outputFile ["temp.oil"]:........................................."temp.oil"
 * ---------------------------------------------------------------------------
 *     SERAP
 * ---------------------------------------------------------------------------
 * SERAPRefPageMemoryClass ["SERAP_REF"]:..............................."SERAP_REF"
 * SERAPWorkPageMemoryClass ["SERAP_WORK"]:............................."SERAP_WORK"
 * serap [false]:..........................................................false
 * serapEmbedded [true]:...................................................true
 * ---------------------------------------------------------------------------
 *     Virtual Address Tables
 * ---------------------------------------------------------------------------
 * addressTable [true]:....................................................false
 * addressTableMemoryClass ["VATROM"]:................................."VATROM"
 * ---------------------------------------------------------------------------
 * END: ASCET-SE AddOn Options
 ******************************************************************************/

/* END: ASCET REGION "ASCET-SE AddOn Options" */
/* BEGIN: ASCET REGION "Module Data Definitions" */

/******************************************************************************
 * DEFINITION OF COMPONENT VARIABLE OMITTED
 * ---------------------------------------------------------------------------
 * memory class:..............................'ROM'
 * model name:................................'Fmc'
 * reason:....................................no local elements
 * ---------------------------------------------------------------------------*/

/* END: ASCET REGION "Module Data Definitions" */

/* BEGIN: ASCET REGION "Exported Data Definitions" */

/******************************************************************************
 * BEGIN: DEFINITION OF VARIABLE 'Fmc_facKFuelMassCorr'
 * ---------------------------------------------------------------------------*/
const real32 Fmc_facKFuelMassCorr = 0.001F;
   /* min=0.001, max=+oo, ident, limit=yes */
/* ---------------------------------------------------------------------------
 * END: DEFINITION OF VARIABLE 'Fmc_facKFuelMassCorr'
 ******************************************************************************/


/******************************************************************************
 * BEGIN: DEFINITION OF VARIABLE 'Fmc_flgFuelMassCorrEnable'
 * ---------------------------------------------------------------------------*/
```

```
const uint8 Fmc_flgFuelMassCorrEnable = false;
   /* min=0, max=1, Identity, limit=yes */
/* ----------------------------------------------------------------------------
 * END: DEFINITION OF VARIABLE 'Fmc_flgFuelMassCorrEnable'
 ****************************************************************************/


/****************************************************************************
 * BEGIN: DEFINITION OF VARIABLE 'Fmc_flgFuelMassOverride'
 * --------------------------------------------------------------------------*/
const uint8 Fmc_flgFuelMassOverride = false;
   /* min=0, max=1, Identity, limit=yes */
/* ----------------------------------------------------------------------------
 * END: DEFINITION OF VARIABLE 'Fmc_flgFuelMassOverride'
 ****************************************************************************/


/****************************************************************************
 * BEGIN: DEFINITION OF VARIABLE 'Fmc_mFuelBase'
 * --------------------------------------------------------------------------*/
uint16 Fmc_mFuelBase = 0;
   /* min=0.0, max=9.99984741210938e-1, fac_65536, limit=yes */
/* ----------------------------------------------------------------------------
 * END: DEFINITION OF VARIABLE 'Fmc_mFuelBase'
 ****************************************************************************/


/****************************************************************************
 * BEGIN: DEFINITION OF VARIABLE 'Fmc_mFuelCalc'
 * --------------------------------------------------------------------------*/
uint16 Fmc_mFuelCalc = 0;
   /* min=0.0, max=9.99984741210938e-1, fac_65536, limit=yes */
/* ----------------------------------------------------------------------------
 * END: DEFINITION OF VARIABLE 'Fmc_mFuelCalc'
 ****************************************************************************/


/****************************************************************************
 * BEGIN: DEFINITION OF VARIABLE 'Fmc_mFuelCorr'
 * --------------------------------------------------------------------------*/
sint16 Fmc_mFuelCorr = 0;
   /* min=-0.5, max=4.99984741210938e-1, fac_65536, limit=yes */
/* ----------------------------------------------------------------------------
 * END: DEFINITION OF VARIABLE 'Fmc_mFuelCorr'
 ****************************************************************************/


/****************************************************************************
 * BEGIN: DEFINITION OF VARIABLE 'Fmc_mFuelKgPerHour'
 * --------------------------------------------------------------------------*/
uint16 Fmc_mFuelKgPerHour = 0;
   /* min=0.0, max=31.99951171875, fac_2048, limit=yes */
/* ----------------------------------------------------------------------------
 * END: DEFINITION OF VARIABLE 'Fmc_mFuelKgPerHour'
 ****************************************************************************/


/****************************************************************************
 * BEGIN: DEFINITION OF VARIABLE 'Fmc_mFuelMan'
 * --------------------------------------------------------------------------*/
const uint16 Fmc_mFuelMan = 0;
   /* min=0.0, max=9.99984741210938e-1, fac_65536, limit=yes */
/* ----------------------------------------------------------------------------
 * END: DEFINITION OF VARIABLE 'Fmc_mFuelMan'
 ****************************************************************************/


/****************************************************************************
 * BEGIN: DEFINITION OF VARIABLE 'Fmc_specific_fuel_consumption'
 * --------------------------------------------------------------------------*/
uint16 Fmc_specific_fuel_consumption = 0;
   /* min=0.0, max=1023.984375, fac_64, limit=yes */
/* ----------------------------------------------------------------------------
 * END: DEFINITION OF VARIABLE 'Fmc_specific_fuel_consumption'
 ****************************************************************************/


/****************************************************************************
 * BEGIN: DEFINITION OF VARIABLE 'Fmc_tiTFuelMassCorr'
 * --------------------------------------------------------------------------*/
const real32 Fmc_tiTFuelMassCorr = 1.0F;
   /* min=0.001, max=+oo, ident, limit=yes */
/* ----------------------------------------------------------------------------
 * END: DEFINITION OF VARIABLE 'Fmc_tiTFuelMassCorr'
 ****************************************************************************/
```

```
/*****************************************************************************
 * BEGIN: DEFINITION OF VARIABLE 'Fmc_tiTaFuelMassCorr'
 * ---------------------------------------------------------------------------*/
real64 Fmc_tiTaFuelMassCorr = 0.001;
   /* min=0.001, max=+oo, ident, limit=yes */
/* ---------------------------------------------------------------------------
 * END: DEFINITION OF VARIABLE 'Fmc_tiTaFuelMassCorr'
 *****************************************************************************/

/* END: ASCET REGION "Exported Data Definitions" */

/*****************************************************************************
 * BEGIN: DEFINITION OF MESSAGES
 * ---------------------------------------------------------------------------
 * Total size is [bytes]:.....................2
 * ---------------------------------------------------------------------------*/
/* messages of memory class:.............................................'RAM' */
/* messages of size [bytes]:.............................................2 */
/* modelled as 'Fmc_mFuel' */
uint16 Fmc_mFuel;
/* ---------------------------------------------------------------------------
 * END: DEFINITION OF MESSAGES
 *****************************************************************************/

#define _DT1 DT1_Fmc
#define _DT1_REF_ (&(DT1_Fmc))
#define _Fmc_facKFuelMassCorr Fmc_facKFuelMassCorr
#define _Fmc_flgFuelMassCorrEnable Fmc_flgFuelMassCorrEnable
#define _Fmc_flgFuelMassOverride Fmc_flgFuelMassOverride
#define _Fmc_mFuelBase Fmc_mFuelBase
#define _Fmc_mFuelCalc Fmc_mFuelCalc
#define _Fmc_mFuelCorr Fmc_mFuelCorr
#define _Fmc_mFuelKgPerHour Fmc_mFuelKgPerHour
#define _Fmc_mFuelMan Fmc_mFuelMan
#define _Fmc_specific_fuel_consumption Fmc_specific_fuel_consumption
#define _Fmc_tiTaFuelMassCorr Fmc_tiTaFuelMassCorr
#define _Fmc_tiTFuelMassCorr Fmc_tiTFuelMassCorr

/* BEGIN: ASCET REGION "Component Functions" */
/*****************************************************************************
 * BEGIN: FUNCTIONS OF COMPONENT
 *****************************************************************************/

/* BEGIN: ASCET REGION "Process Definition 'Fmc_calc'" */
/*****************************************************************************
 * BEGIN: DEFINITION OF PROCESS 'FUELMASS_IMPL_Fmc_calc'
 * ---------------------------------------------------------------------------
 * model name:..................................'Fmc_calc'
 * memory class:................................'CODE'
 * ---------------------------------------------------------------------------*/
//#if defined(COMPILE_UNUSED_CODE) || defined(COMPILE_UNUSED__FUELMASS_IMPL_Fmc_calc)
/* messages used by this process */

/* public Fmc_calc []  */

void FUELMASS_IMPL_Fmc_calc (void)
{
   /* temp. variables */
   real64 _t1real64;
   sint32 _t1sint32;
   uint16 _t1uint16;
   uint32 _t1uint32;
   sint32 _t2sint32;
   sint16 _t1sint16;

   /* define local message copies */
   uint16 Afr_facRatio__FUELMASS_IMPL_Fmc_calc;
   uint16 Amf_mAirPerStr__FUELMASS_IMPL_Fmc_calc;
   sint16 Epm_rpmEngSpd__FUELMASS_IMPL_Fmc_calc;
   uint16 Fmc_mFuel__FUELMASS_IMPL_Fmc_calc;
   sint16 Itc_tiInjOffset__FUELMASS_IMPL_Fmc_calc;
   uint16 Lcc_facLambdaCorr__FUELMASS_IMPL_Fmc_calc;
   sint16 Tqs_tqReq__FUELMASS_IMPL_Fmc_calc;
   /* receive messages implicitly */
   {
      DisableAllInterrupts();
      Afr_facRatio__FUELMASS_IMPL_Fmc_calc = Afr_facRatio;
      Amf_mAirPerStr__FUELMASS_IMPL_Fmc_calc = Amf_mAirPerStr;
      Epm_rpmEngSpd__FUELMASS_IMPL_Fmc_calc = Epm_rpmEngSpd;
      Fmc_mFuel__FUELMASS_IMPL_Fmc_calc = Fmc_mFuel;
      Itc_tiInjOffset__FUELMASS_IMPL_Fmc_calc = Itc_tiInjOffset;
      Lcc_facLambdaCorr__FUELMASS_IMPL_Fmc_calc = Lcc_facLambdaCorr;
      Tqs_tqReq__FUELMASS_IMPL_Fmc_calc = Tqs_tqReq;
```

```
      EnableAllInterrupts();
   }
   /* Fmc_calc: sequence call #1  */
   /* assignment to Fmc_mFuelBase: min=0, max=65535, hex=65536phys+0, limit=(maxBitLength: true, assign: true),
 zero incl.=true  */
   _Fmc_mFuelBase
      = (uint16)(((uint32)Amf_mAirPerStr__FUELMASS_IMPL_Fmc_calc << 11) / Afr_facRatio__FUELMASS_IMPL_Fmc_calc);
   /* Fmc_calc: sequence call #2  */
   if (_Fmc_flgFuelMassCorrEnable)
   {
      /* If-block: sequence call #2/Then #1  */
      _t1real64
         = (((real64)Epm_rpmEngSpd__FUELMASS_IMPL_Fmc_calc == 0.0) ? 80.0 : 80.0 /
(real64)Epm_rpmEngSpd__FUELMASS_IMPL_Fmc_calc);
      /* assignment to Fmc_tiTaFuelMassCorr: min=0, max=+oo, hex=phys, limit=n.a., zero incl.=true  */
      _Fmc_tiTaFuelMassCorr = ((_t1real64 <= 40.0) ? _t1real64 : 40.0);
      /* If-block: sequence call #2/Then #2  */
      DT1_IMPL_compute((real64)_Fmc_mFuelBase * 1.52587890625e-5, (real64)_Fmc_facKFuelMassCorr,
(real64)_Fmc_tiTFuelMassCorr, _Fmc_tiTaFuelMassCorr);
   }
   else
   {
      /* If-block: sequence call #2/Else #1  */
      DT1_IMPL_reset(0.0);
   } /* end if */
   /* Fmc_calc: sequence call #4  */
   _t1real64 = DT1_IMPL_out() * 65536.0;
   _t1real64 = ((_t1real64 < 0.0) ? _t1real64 - 0.5 : _t1real64 + 0.5);
   /* assignment to Fmc_mFuelCorr: min=-32768, max=32767, hex=65536phys+0, limit=(maxBitLength: true, assign:
true), zero incl.=true  */
   _Fmc_mFuelCorr
      = ((_t1real64 >= -32768.0) ? ((_t1real64 <= 32767.0) ? (sint16)_t1real64 : 32767) : -32768);
   /* Fmc_calc: sequence call #5  */
   _t1sint32
      = (_Fmc_mFuelCorr + (sint32)_Fmc_mFuelBase) * (sint32)Lcc_facLambdaCorr__FUELMASS_IMPL_Fmc_calc;
   _t1sint32
      = ((_t1sint32 >= 0) ? (((uint32)_t1sint32 <= 134215680U) ? _t1sint32 >> 11 : 65535) : 0);
   /* assignment to Fmc_mFuelCalc: min=0, max=65535, hex=65536phys+0, limit=(maxBitLength: true, assign: true),
 zero incl.=true  */
   _Fmc_mFuelCalc = (uint16)_t1sint32;
   /* Fmc_calc: sequence call #6  */
   /* assignment to Fmc_mFuel: min=0, max=65535, hex=65536phys+0, limit=(maxBitLength: true, assign: true), zero
 incl.=true  */
   Fmc_mFuel__FUELMASS_IMPL_Fmc_calc
      = ((_Fmc_flgFuelMassOverride) ? _Fmc_mFuelMan : _Fmc_mFuelCalc);
   /* Fmc_calc: sequence call #7  */
   _t1sint32 = (sint32)Tqs_tqReq__FUELMASS_IMPL_Fmc_calc * 3141 / 16000;
   _t1uint16
      = ((_Fmc_flgFuelMassOverride) ? _Fmc_mFuelMan : _Fmc_mFuelCalc);
   _t1uint32 = (uint32)_t1uint16 * 63281U / 3U;
   _t2sint32
      = (sint32)_t1uint32 + ((sint32)Itc_tiInjOffset__FUELMASS_IMPL_Fmc_calc * 6681 >> 1);
   _t2sint32 = ((_t1sint32 == 0) ? _t2sint32 : _t2sint32 / _t1sint32);
   _t1sint32
      = ((_t2sint32 >= 0) ? ((_t2sint32 <= 65535) ? _t2sint32 : 65535) : 0);
   /* assignment to Fmc_specific_fuel_consumption: min=0, max=65535, hex=64phys+0, limit=(maxBitLength: true,
 assign: true), zero incl.=true  */
   _Fmc_specific_fuel_consumption = (uint16)_t1sint32;
   /* Fmc_calc: sequence call #8  */
   _t1uint16
      = (((_Fmc_flgFuelMassOverride) ? _Fmc_mFuelMan : _Fmc_mFuelCalc)) >> 1;
   _t1sint16
      = (sint16)(Itc_tiInjOffset__FUELMASS_IMPL_Fmc_calc * 193328L / 9765625L) << 2;
   _t2sint32
      = ((sint32)_t1uint16 + _t1sint16) * Epm_rpmEngSpd__FUELMASS_IMPL_Fmc_calc;
   _t1sint32
      = ((_t2sint32 >= 0) ? (((uint32)_t2sint32 <= 23301333U) ? _t2sint32 * 9 / 3200 : 65535) : 0);
   /* assignment to Fmc_mFuelKgPerHour: min=0, max=65535, hex=2048phys+0, limit=(maxBitLength: true, assign:
 true), zero incl.=true  */
   _Fmc_mFuelKgPerHour = (uint16)_t1sint32;
   /* send messages implicitly */
   {
      Fmc_mFuel = Fmc_mFuel__FUELMASS_IMPL_Fmc_calc;
   }
}
/* ----------------------------------------------------------------------------
 * END: DEFINITION OF PROCESS 'FUELMASS_IMPL_Fmc_calc'
 ****************************************************************************/
#endif
/* END: ASCET REGION "Process Definition 'Fmc_calc'" */


/* ****************************************************************************
 * END: FUNCTIONS OF COMPONENT
 ****************************************************************************/
```

```
/* END: ASCET REGION "Component Functions" */
```