T2t - Torque to throttle calculation

1 [Torque to throttle calculation] Torque to throttle calculation

1.1 [Overview]

Figure 1: [T2t Function Overview]

**Figure 2: [Torque2Throttle.Main]**
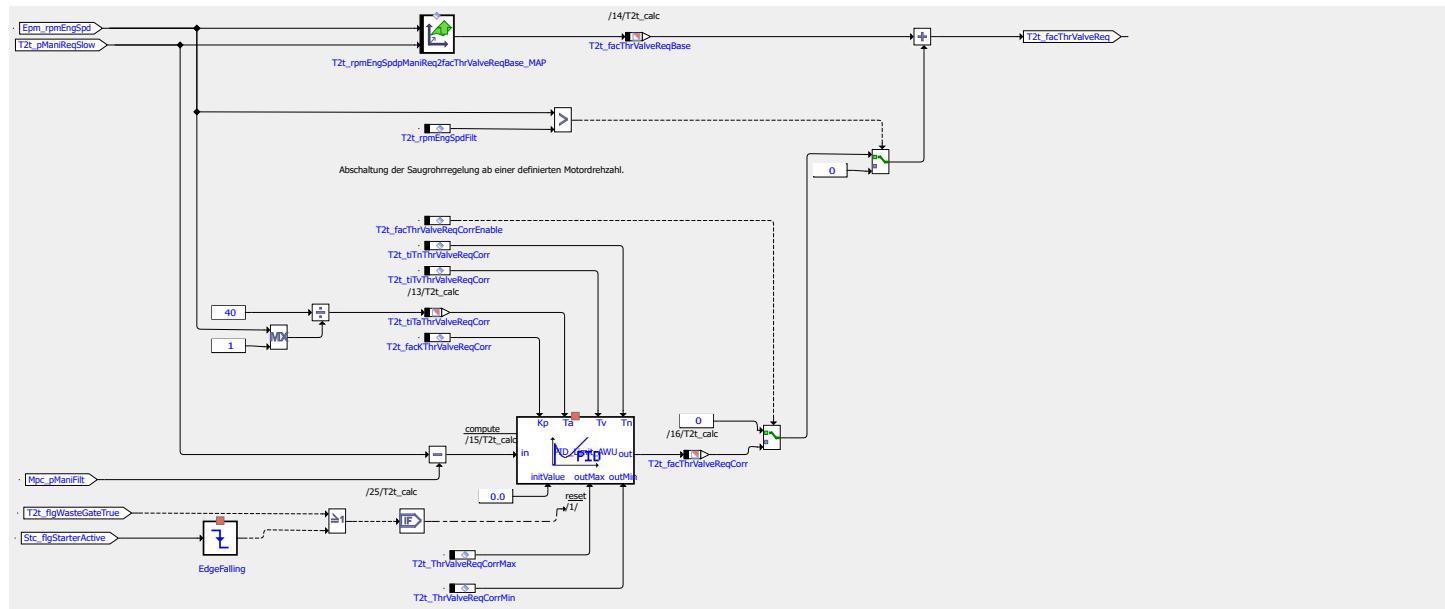
1.2 [Momentenumrechnung]

Das Modul Momentenumrechnung (Torque2Throttle) berechnet aus dem aktuellen Zustand des Motors und dem benötigten Moment die Drosselklappen- und Wastegateposition. Dazu wird aus der Drehzahl Epm_rpmEngSpd und gewünschten Moment Tqs_tqReq der Soll- Saugrohrdruck T2t_pManiReqMin dient über T2t_rpmEngSpdtqReq2pManiReqBase_MAP festge- legt und mit den Kehrwerten des Zündwinkelwirkungsgrad T2t_facSparkEff und des Lambdawirkungsgrad T2t_facLambdaEff multipliziert, wodurch Verluste ausgeglichen wer- den.Die untere Begrenzung des Saugrohrdruck-Basiswerts durch T2t_pManiReqMin dient der Sicherheit. Gründe dafür sind:
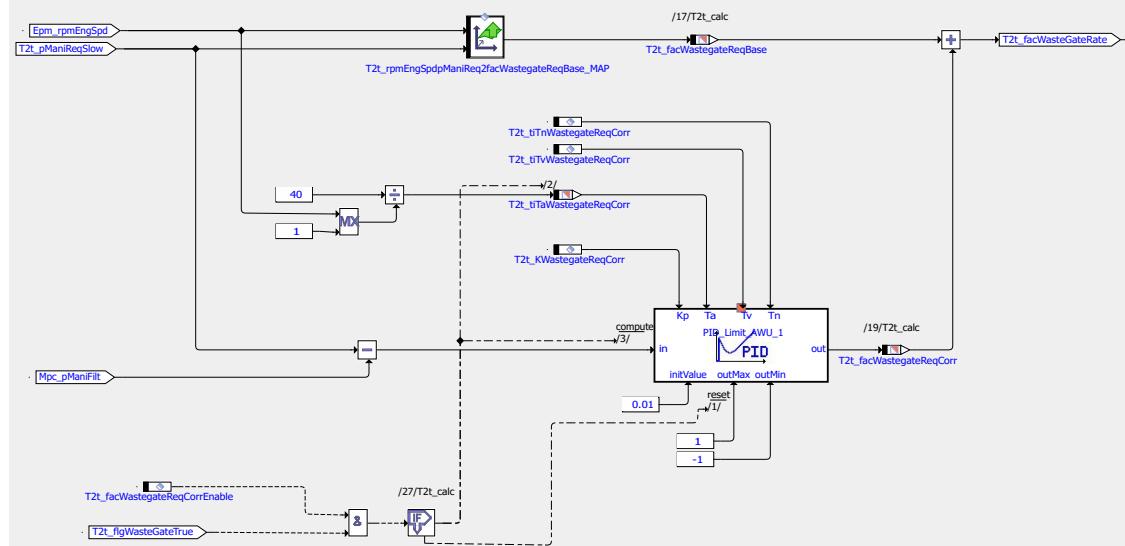
- Der Saugrohrdruck darf nicht zu tief fallen, damit keine Dichtungen eingesaugt werden
- Der Arbeitsbereich des Sensors hat eine Untergrenze von 20hPa
- Die Regler für Drosselklappen- und Wastegateposition dürfen keinen Sollwert vorge- gebenbekommen, der nicht erreichbar ist.

Figure 3: ThrottleValveControl [Torque2Throttle.Main.ThrottleValveControl]

Die Regelungen der Drosselklappe und des Wastegates erfolgen jeweils mit PI-Reglern. Zwischen beiden besteht eine große Abhängigkeit. Je weiter dasWastegate geöffnet ist, desto höher ist der Ladedruck und damit die Druckdifferenz vor und nach Drosselklappe, was zu einem anderen Luftmassenstrom führt. Umgekehrt kann bei niedrigen Saugrohrdrücken, also wenig Last, kein Ladedruck aufgebaut werden.

Figure 4: WastegateControl [Torque2Throttle.Main.WastegateControl]
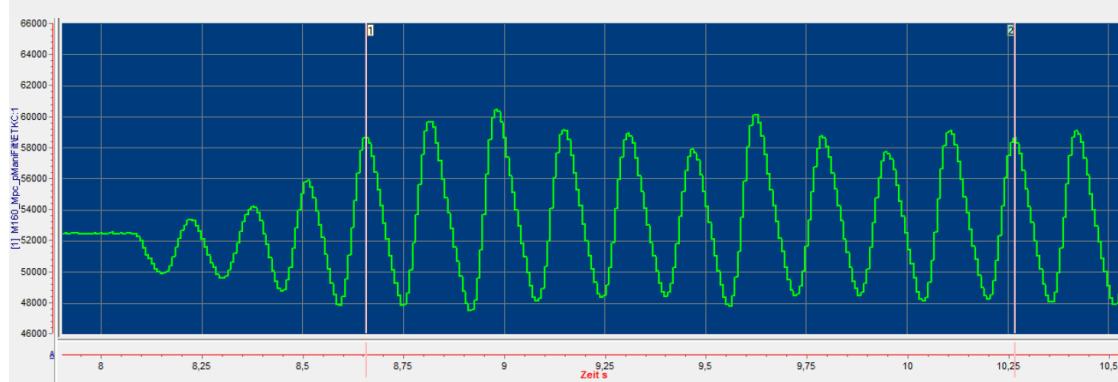
Da am Motor kein Ladedrucksensor verbaut ist, kann dieser nicht gemessen werden. Um die Steuerung einfach zu halten wird daher der Ladedruck unabhängig von der Drosselklappe geregelt. Bei einem Saugrohrdruck unter Umgebungsdruck wird eine reine Saugmotorsteuerung angenommen, d. h., ein Ladedruck von 0bar und bei Drücken über Umgebungsdruck eine reine Ladedruckregelung durchgeführt. Es wird angenommen, dass bei weit geöffneter Drosselklappe, was bei hohen Saugrohrdruckanforderungen der Fall ist, der Ladedruck gleich dem Saugrohrdruck ist. Erreicht wird das durch entsprechendes Parametrieren der Vorsteuerungen der Drosselklappen- und Wastegatepositionsvorgabe (T2t_facThrValveReq und T2t_facWasteGateRate).

Die Grundparametrierung der Kennlinien T2t_facSparkEff und des Lambdawirkungsgrad T2t_facLambdaEff und des Kennfelds T2t_rpmEngSpdtqReq2pManiReqBase_MAP sind eins zu eins aus einem vorhandenen BMW-8-Zylinder-Modell übernommen und müssen gegebenenfalls noch an den Smart-Motor angepasst werden.

Die Reglerauslegung für den Drosselklappensollwert erfolgt nach dem Verfahren der experimentellen Reglereinstellung nach Ziegler-Nichols. Der I-Anteil des Reglers kann durch setzen der Nachstellzeit auf einen großen Wert (z. B. T2t_tiTnThrValveReqCorr = 106) quasi ausgeschaltet werden.
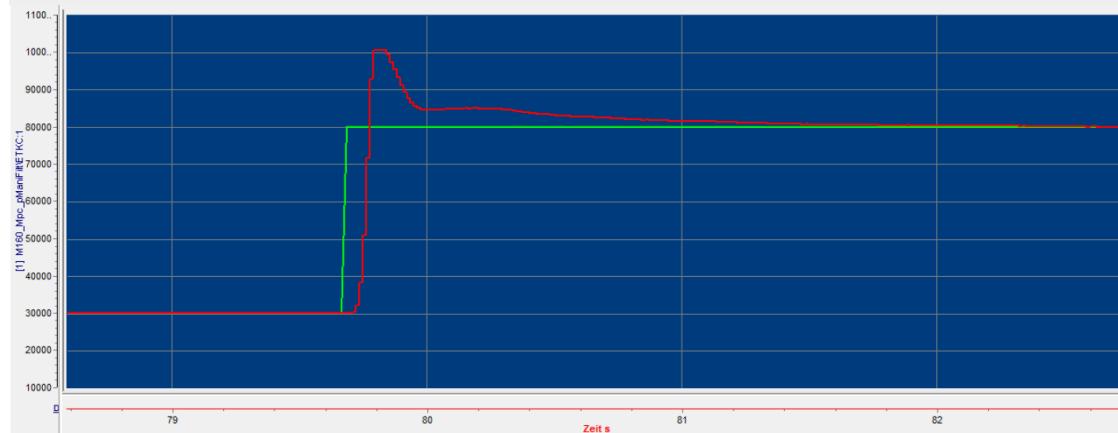
Zur Vereinfachung wird hierbei keine drehzahlabhängige Verstärkung verwendet, sondern der schlechteste Fall, der sich bei hohen Drehzahlen befindet. Die kritische Verstärkung liegt bei rund KPkrit = 3,5×10-5, woraus sich eine Reglerverstärkung Tqs_facKThrValveReqCorr = 0,4 × KPkrit = 1,4 × 10-5 ergibt. Die kritische Frequenz bzw. Periodendauer ergibt sich nach Abbildung 5.8 aus dem Mittelwert von 10 Schwingungen zu TKrit = 1,61⁄10 sek ≈ 0,16sek. Damit ist Tn = 0,8 × TKrit ≈ 0,13sek. Abbildung 5.11 zeigt die Sprungant- wort des geregelten Systems. In Anhang F wird die Grundparametrierung des Kennfelds T2t_rpmEngSpdpManiReq2facThrValveReqBase_MAP beschrieben. 180 Λ [16]

Figure 5: Kritische Frequenz der Saugrohrdruckreglerauslegung [t2t_png_1]

Durch das Flag T2t_pManiReqOverride kann die Saugrohrdruckanforderung manuell mit T2t_pManiReqMan überschrieben werden, bevor sie als Nachricht weitergereicht wird. Die Auswertung der Funktion T2t_calc erfolgt im Synchron-Raster. Die Berechnung der Abtastzeit der Regler erfolgt, wie in Gleichung 5.10 beschrieben.

Figure 6: Sprungantwort des Saugrohrdruckreglers [t2t_png_2]

Hint:

Die Auslegung erfolgt in der Simulation gegen LABCAR. Eventuell muss eine Anpassung am Motor durchgeführt werden. Bei der Auslegung des Saugrohrdruckreglers muss berücksichtigt werden, dass im Modul Drosselklappe (s. auch Abschnitt 5.5.1) eine Positionsregelung der Drosselklappe erfolgt. Es handelt sich um eine Regler-Kaskade, d. h., Änderungen am Regler für die Drosselklappenposition können Auswirkungen auf die Saugrohrdruckregelung haben. Zunächst wird der Motor nur als Saugmotor betrieben, d. h., das Wastegate ist immer voll geöffnet. Weiterhin findet nie ein Vollastbetrieb statt. Es stellt sich kein oder nur ein geringer Ladedruck ein, wodurch der Wastegateregler nie in Betrieb war und die Reglerparameter nicht eingestellt sind.

2 [C-Code Source]

2.1 [Code Listing]

```
/* BEGIN: ASCET REGION "Generation Information" */
/*************************************************************************
 * BEGIN: Generation Information
 *-----------------------------------------------------------------------
 * Component:...............Module
 * Name:....................."Torque2Throttle"
```

```
* 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" */

/****************************************************************************
 * BEGIN: DEFINITION OF SUBSTRUCT VARIABLE 'T2t_RAM'
 * ----------------------------------------------------------------------------
 * memory class:................................'RAM'
 * model name:..................................'T2t'
 * data set:....................................'TORQUE2THROTTLE_IMPL_Data'
 * ----------------------------------------------------------------------------*/
struct TORQUE2THROTTLE_IMPL_RAM_SUBSTRUCT T2t_RAM = {
    /* substruct: T2t_RAM.EdgeFalling (modeled as:'EdgeFalling.T2t') */
    {
        /* struct element:'T2t_RAM.EdgeFalling.buffer1' (modeled as:'buffer1.EdgeFalling.T2t') */
        false,
        /* struct element:'T2t_RAM.EdgeFalling.oldSignal1' (modeled as:'oldSignal1.EdgeFalling.T2t') */
        false
    },
    /* substruct: T2t_RAM.PID_Limit_AWU (modeled as:'PID_Limit_AWU.T2t') */
    {
        /* struct element:'T2t_RAM.PID_Limit_AWU.inOLD' (modeled as:'inOLD.PID_Limit_AWU.T2t') */
        0.0,
        /* struct element:'T2t_RAM.PID_Limit_AWU.memory1' (modeled as:'memory1.PID_Limit_AWU.T2t') */
        0.0,
        /* struct element:'T2t_RAM.PID_Limit_AWU.memory2' (modeled as:'memory2.PID_Limit_AWU.T2t') */
        0.0
    },
    /* substruct: T2t_RAM.PID_Limit_AWU_1 (modeled as:'PID_Limit_AWU_1.T2t') */
    {
        /* struct element:'T2t_RAM.PID_Limit_AWU_1.inOLD' (modeled as:'inOLD.PID_Limit_AWU_1.T2t') */
        0.0,
        /* struct element:'T2t_RAM.PID_Limit_AWU_1.memory1' (modeled as:'memory1.PID_Limit_AWU_1.T2t') */
        0.0,
        /* struct element:'T2t_RAM.PID_Limit_AWU_1.memory2' (modeled as:'memory2.PID_Limit_AWU_1.T2t') */
        0.0
    }
};
/* ----------------------------------------------------------------------------
 * END: DEFINITION OF SUBSTRUCT VARIABLE 'T2t_RAM'
 ****************************************************************************/

/****************************************************************************
 * BEGIN: DEFINITION OF COMPONENT VARIABLE 'T2t'
 * ----------------------------------------------------------------------------
 * memory class:................................'ROM'
 * model name:..................................'T2t'
 * data set:....................................'TORQUE2THROTTLE_IMPL_Data'
 * ----------------------------------------------------------------------------*/
const struct TORQUE2THROTTLE_IMPL T2t = {
    /* substruct: T2t.EdgeFalling (modeled as:'EdgeFalling.T2t') */
    {
        /* type descriptor pointer 'EDGEFALLING_IMPL_RAM' for memory class substruct for 'RAM' */
        &T2t_RAM.EdgeFalling
    },
    /* substruct: T2t.PID_Limit_AWU (modeled as:'PID_Limit_AWU.T2t') */
    {
        /* type descriptor pointer 'PID_LIMIT_AWU_IMPL_RAM' for memory class substruct for 'RAM' */
        &T2t_RAM.PID_Limit_AWU
    },
    /* substruct: T2t.PID_Limit_AWU_1 (modeled as:'PID_Limit_AWU_1.T2t') */
    {
        /* type descriptor pointer 'PID_LIMIT_AWU_IMPL_RAM' for memory class substruct for 'RAM' */
        &T2t_RAM.PID_Limit_AWU_1
    }
};
/* ----------------------------------------------------------------------------
 * END: DEFINITION OF COMPONENT VARIABLE 'T2t'
 ****************************************************************************/

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

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

/****************************************************************************
 * BEGIN: DEFINITION OF CHARACTERISTIC TABLE 'T2t_CatHeatTime2pManiRes'
 * ----------------------------------------------------------------------------*/
const struct CharTable1_uint16_4_uint16_TORQUE2THROTTLE_IMPL_TYPE T2t_CatHeatTime2pManiRes = {
        4,
        {
            0, 300, 1000, 2000
        },
```

```
        {
            15000, 30000, 30000, 0
        }
    };
    /* result: min=0.0, max=50000.0, ident, limit=no */
    /* x axis: min=0.0, max=100.0, fac_100 */
/* -----------------------------------------------------------------------
 * END: DEFINITION OF CHARACTERISTIC TABLE 'T2t_CatHeatTime2pManiRes'
 ***************************************************************************/


/***************************************************************************
 * BEGIN: DEFINITION OF VARIABLE 'T2t_KWastegateReqCorr'
 * ---------------------------------------------------------------------*/
const real64 T2t_KWastegateReqCorr = 0.000001;
    /* min=0.0, max=+oo, ident, limit=yes */
/* -----------------------------------------------------------------------
 * END: DEFINITION OF VARIABLE 'T2t_KWastegateReqCorr'
 ***************************************************************************/


/***************************************************************************
 * BEGIN: DEFINITION OF CHARACTERISTIC TABLE 'T2t_RpmEngSpd2pMaxWithoutWasteGate'
 * ---------------------------------------------------------------------*/
const struct CharTable1_sint16_11_uint16_TORQUE2THROTTLE_IMPL_TYPE T2t_RpmEngSpd2pMaxWithoutWasteGate = {
    11,
    {
        2000, 3000, 4000, 5000, 6000, 7000, 8000, 9000, 10000, 11000, 12000
    },
    {
        27500, 27500, 32500, 35000, 37500, 39250, 40000, 40000, 40000, 40000, 40000
    }
    };
    /* result: min=0.0, max=262140.0, fac_1div4, limit=no */
    /* x axis: min=-16384.0, max=16383.5, fac_2 */
/* -----------------------------------------------------------------------
 * END: DEFINITION OF CHARACTERISTIC TABLE 'T2t_RpmEngSpd2pMaxWithoutWasteGate'
 ***************************************************************************/


/***************************************************************************
 * BEGIN: DEFINITION OF VARIABLE 'T2t_ThrPosStart'
 * ---------------------------------------------------------------------*/
const uint8 T2t_ThrPosStart = 0;
    /* min=0.0, max=1.0, fac_128, limit=yes */
/* -----------------------------------------------------------------------
 * END: DEFINITION OF VARIABLE 'T2t_ThrPosStart'
 ***************************************************************************/


/***************************************************************************
 * BEGIN: DEFINITION OF VARIABLE 'T2t_ThrValve2WasteGateThreshold'
 * ---------------------------------------------------------------------*/
const uint8 T2t_ThrValve2WasteGateThreshold = 122;
    /* min=0.0, max=1.0, fac_128, limit=yes */
/* -----------------------------------------------------------------------
 * END: DEFINITION OF VARIABLE 'T2t_ThrValve2WasteGateThreshold'
 ***************************************************************************/


/***************************************************************************
 * BEGIN: DEFINITION OF VARIABLE 'T2t_ThrValveReqCorrMax'
 * ---------------------------------------------------------------------*/
const real64 T2t_ThrValveReqCorrMax = 1.0;
    /* min=-oo, max=+oo, ident, limit=yes */
/* -----------------------------------------------------------------------
 * END: DEFINITION OF VARIABLE 'T2t_ThrValveReqCorrMax'
 ***************************************************************************/


/***************************************************************************
 * BEGIN: DEFINITION OF VARIABLE 'T2t_ThrValveReqCorrMin'
 * ---------------------------------------------------------------------*/
const real64 T2t_ThrValveReqCorrMin = -1.0;
    /* min=-oo, max=+oo, ident, limit=yes */
/* -----------------------------------------------------------------------
 * END: DEFINITION OF VARIABLE 'T2t_ThrValveReqCorrMin'
 ***************************************************************************/


/***************************************************************************
 * BEGIN: DEFINITION OF CHARACTERISTIC TABLE 'T2t_degIgnAngleDiff2facSparkEff_CUR'
 * ---------------------------------------------------------------------*/
const struct CharTable1_sint8_67_uint16_TORQUE2THROTTLE_IMPL_TYPE T2t_degIgnAngleDiff2facSparkEff_CUR = {
    67,
```

```
        {
            -1, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20,
            21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40,
            41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60,
            61, 62, 63, 64, 65
        },
        {
            1024, 1024, 1024, 1024, 1024, 1019, 1019, 1014, 1014, 1009, 1009, 1004, 998,
            993, 988, 983, 978, 968, 963, 952, 942, 937, 927, 916, 901, 891, 876, 865, 850,
            835, 814, 799, 783, 763, 742, 722, 701, 676, 655, 630, 609, 584, 558, 527, 502,
            476, 445, 420, 394, 364, 338, 307, 282, 251, 225, 200, 174, 154, 128, 108, 87,
            72, 56, 46, 36, 31, 31
        }
    };
    /* result: min=0.0009765625, max=1.0, fac_1024, limit=no */
    /* x axis: min=-96.0, max=95.25, IGN_4div3 */
/* ----------------------------------------------------------------------------
 * END: DEFINITION OF CHARACTERISTIC TABLE 'T2t_degIgnAngleDiff2facSparkEff_CUR'
 *****************************************************************************/


/*****************************************************************************
 * BEGIN: DEFINITION OF VARIABLE 'T2t_facKThrValveReqCorr'
 * ----------------------------------------------------------------------------*/
const real64 T2t_facKThrValveReqCorr = 0.0000075;
    /* min=0.0, max=+oo, ident, limit=yes */
/* ----------------------------------------------------------------------------
 * END: DEFINITION OF VARIABLE 'T2t_facKThrValveReqCorr'
 *****************************************************************************/


/*****************************************************************************
 * BEGIN: DEFINITION OF CHARACTERISTIC TABLE 'T2t_facLambaReq2facLambdaEff_CUR'
 * ----------------------------------------------------------------------------*/
const struct CharTable1_uint16_18_uint16_TORQUE2THROTTLE_IMPL_TYPE T2t_facLambaReq2facLambdaEff_CUR = {
        18,
        {
            410, 614, 952, 1157, 1374, 1536, 1632, 1744, 1840, 1952, 2048, 2144, 2256, 2352,
            2464, 2576, 3072, 4076
        },
        {
            410, 410, 638, 834, 997, 1019, 1029, 1039, 1044, 1039, 1024, 1004, 973, 942,
            911, 870, 614, 69
        }
    };
    /* result: min=0.0009765625, max=2.0, fac_1024, limit=no */
    /* x axis: min=0.0, max=2.0, fac_2048 */
/* ----------------------------------------------------------------------------
 * END: DEFINITION OF CHARACTERISTIC TABLE 'T2t_facLambaReq2facLambdaEff_CUR'
 *****************************************************************************/


/*****************************************************************************
 * BEGIN: DEFINITION OF VARIABLE 'T2t_facLambdaEff'
 * ----------------------------------------------------------------------------*/
uint16 T2t_facLambdaEff = 1024;
    /* min=0.0009765625, max=2.0, fac_1024, limit=yes */
/* ----------------------------------------------------------------------------
 * END: DEFINITION OF VARIABLE 'T2t_facLambdaEff'
 *****************************************************************************/


/*****************************************************************************
 * BEGIN: DEFINITION OF VARIABLE 'T2t_facSparkEff'
 * ----------------------------------------------------------------------------*/
uint16 T2t_facSparkEff = 1024;
    /* min=0.0009765625, max=1.0, fac_1024, limit=yes */
/* ----------------------------------------------------------------------------
 * END: DEFINITION OF VARIABLE 'T2t_facSparkEff'
 *****************************************************************************/


/*****************************************************************************
 * BEGIN: DEFINITION OF VARIABLE 'T2t_facThrValveReqBase'
 * ----------------------------------------------------------------------------*/
sint16 T2t_facThrValveReqBase = 0;
    /* min=-0.12890625, max=1.0, fac_512, limit=yes */
/* ----------------------------------------------------------------------------
 * END: DEFINITION OF VARIABLE 'T2t_facThrValveReqBase'
 *****************************************************************************/


/*****************************************************************************
 * BEGIN: DEFINITION OF VARIABLE 'T2t_facThrValveReqCorr'
 * ----------------------------------------------------------------------------*/
```

```
sint16 T2t_facThrValveReqCorr = 0;
    /* min=-2.0, max=1.99993896484375, fac_16384, limit=yes */
/* ----------------------------------------------------------------------
 * END: DEFINITION OF VARIABLE 'T2t_facThrValveReqCorr'
 ***********************************************************************/


/***********************************************************************
 * BEGIN: DEFINITION OF VARIABLE 'T2t_facThrValveReqCorrEnable'
 * ------------------------------------------------------------------*/
const uint8 T2t_facThrValveReqCorrEnable = true;
    /* min=0, max=1, Identity, limit=yes */
/* ----------------------------------------------------------------------
 * END: DEFINITION OF VARIABLE 'T2t_facThrValveReqCorrEnable'
 ***********************************************************************/


/***********************************************************************
 * BEGIN: DEFINITION OF VARIABLE 'T2t_facWastegateReqBase'
 * ------------------------------------------------------------------*/
uint16 T2t_facWastegateReqBase = 0;
    /* min=0.0, max=1.0, fac_10000, limit=yes */
/* ----------------------------------------------------------------------
 * END: DEFINITION OF VARIABLE 'T2t_facWastegateReqBase'
 ***********************************************************************/


/***********************************************************************
 * BEGIN: DEFINITION OF VARIABLE 'T2t_facWastegateReqCorr'
 * ------------------------------------------------------------------*/
sint16 T2t_facWastegateReqCorr = 0;
    /* min=-1.0, max=1.0, fac_10000, limit=yes */
/* ----------------------------------------------------------------------
 * END: DEFINITION OF VARIABLE 'T2t_facWastegateReqCorr'
 ***********************************************************************/


/***********************************************************************
 * BEGIN: DEFINITION OF VARIABLE 'T2t_facWastegateReqCorrEnable'
 * ------------------------------------------------------------------*/
const uint8 T2t_facWastegateReqCorrEnable = true;
    /* min=0, max=1, Identity, limit=yes */
/* ----------------------------------------------------------------------
 * END: DEFINITION OF VARIABLE 'T2t_facWastegateReqCorrEnable'
 ***********************************************************************/


/***********************************************************************
 * BEGIN: DEFINITION OF VARIABLE 'T2t_flgWasteGateControllerTrue'
 * ------------------------------------------------------------------*/
uint8 T2t_flgWasteGateControllerTrue = false;
    /* min=0, max=1, Identity, limit=yes */
/* ----------------------------------------------------------------------
 * END: DEFINITION OF VARIABLE 'T2t_flgWasteGateControllerTrue'
 ***********************************************************************/


/***********************************************************************
 * BEGIN: DEFINITION OF VARIABLE 'T2t_pManiReq'
 * ------------------------------------------------------------------*/
uint16 T2t_pManiReq = 0;
    /* min=0.0, max=262140.0, fac_1div4, limit=yes */
/* ----------------------------------------------------------------------
 * END: DEFINITION OF VARIABLE 'T2t_pManiReq'
 ***********************************************************************/


/***********************************************************************
 * BEGIN: DEFINITION OF VARIABLE 'T2t_pManiReqCalc'
 * ------------------------------------------------------------------*/
uint16 T2t_pManiReqCalc = 0;
    /* min=0.0, max=262140.0, fac_1div4, limit=yes */
/* ----------------------------------------------------------------------
 * END: DEFINITION OF VARIABLE 'T2t_pManiReqCalc'
 ***********************************************************************/


/***********************************************************************
 * BEGIN: DEFINITION OF VARIABLE 'T2t_pManiReqMan'
 * ------------------------------------------------------------------*/
const uint16 T2t_pManiReqMan = 12500;
    /* min=0.0, max=262140.0, fac_1div4, limit=yes */
/* ----------------------------------------------------------------------
 * END: DEFINITION OF VARIABLE 'T2t_pManiReqMan'
 ***********************************************************************/
```

```
/**************************************************************************
 * BEGIN: DEFINITION OF VARIABLE 'T2t_pManiReqMin'
 * ----------------------------------------------------------------------*/
const uint16 T2t_pManiReqMin = 5250;
    /* min=0.0, max=262140.0, fac_1div4, limit=yes */
/* ----------------------------------------------------------------------
 * END: DEFINITION OF VARIABLE 'T2t_pManiReqMin'
 **************************************************************************/


/**************************************************************************
 * BEGIN: DEFINITION OF VARIABLE 'T2t_pManiReqOverride'
 * ----------------------------------------------------------------------*/
const uint8 T2t_pManiReqOverride = false;
    /* min=0, max=1, Identity, limit=yes */
/* ----------------------------------------------------------------------
 * END: DEFINITION OF VARIABLE 'T2t_pManiReqOverride'
 **************************************************************************/


/**************************************************************************
 * BEGIN: DEFINITION OF VARIABLE 'T2t_pManiReqSlow'
 * ----------------------------------------------------------------------*/
uint16 T2t_pManiReqSlow = 0;
    /* min=0.0, max=262140.0, fac_1div4, limit=yes */
/* ----------------------------------------------------------------------
 * END: DEFINITION OF VARIABLE 'T2t_pManiReqSlow'
 **************************************************************************/


/**************************************************************************
 * BEGIN: DEFINITION OF VARIABLE 'T2t_pManiRes'
 * ----------------------------------------------------------------------*/
const uint16 T2t_pManiRes = 6000;
    /* min=0.0, max=50000.0, ident, limit=yes */
/* ----------------------------------------------------------------------
 * END: DEFINITION OF VARIABLE 'T2t_pManiRes'
 **************************************************************************/


/**************************************************************************
 * BEGIN: DEFINITION OF VARIABLE 'T2t_rpmEngSpdFilt'
 * ----------------------------------------------------------------------*/
const sint16 T2t_rpmEngSpdFilt = 3000;
    /* min=0.0, max=16383.5, fac_2, limit=yes */
/* ----------------------------------------------------------------------
 * END: DEFINITION OF VARIABLE 'T2t_rpmEngSpdFilt'
 **************************************************************************/


/**************************************************************************
 * BEGIN: DEFINITION OF CHARACTERISTIC TABLE 'T2t_rpmEngSpdpManiReq2facThrValveReqBase_MAP'
 * ----------------------------------------------------------------------*/
const struct CharTable2_sint16_17_uint16_18_sint16_TORQUE2THROTTLE_IMPL_TYPE T2t_rpmEngSpdpManiReq2facThrValveRe
qBase_MAP = {
      17,
      18,
      {
        1500, 1600, 1700, 1800, 2000, 2500, 3000, 3500, 4000, 5000, 6000, 7000, 8000,
        9000, 10000, 11000, 12000
      },
      {
        5000, 7500, 10000, 12500, 15000, 16250, 17500, 18750, 20000, 21250, 22500,
        25000, 27500, 30000, 32500, 35000, 37500, 40000
      },
      {
        -59, -59, -32, -32, -19, -13, -7, 6, 18, 31, 43, 128, 209, 512, 512, 512, 512,
        512,
        -59, -59, -32, -32, -19, -13, -7, 6, 18, 31, 43, 128, 209, 512, 512, 512, 512,
        512,
        -59, -59, -32, -32, -19, -13, -7, 6, 18, 31, 43, 128, 209, 512, 512, 512, 512,
        512,
        -59, -59, -32, -32, -19, -13, -7, 6, 18, 31, 43, 128, 209, 512, 512, 512, 512,
        512,
        -59, -59, -32, -32, -19, -13, -7, 6, 18, 31, 43, 128, 209, 512, 512, 512, 512,
        512,
        -59, -59, -32, -32, -19, -13, -7, 6, 18, 31, 43, 128, 209, 512, 512, 512, 512,
        512,
        -49, -49, -38, -32, -19, -13, -7, 6, 18, 31, 43, 128, 209, 512, 512, 512, 512,
        512,
        -37, -37, -26, -20, -5, 0, 5, 18, 26, 38, 49, 92, 133, 230, 307, 512, 512, 512,
        -31, -31, -20, -14, 1, 9, 16, 26, 35, 45, 54, 77, 109, 184, 219, 512, 512, 512,
        -29, -24, -8, 6, 18, 23, 29, 37, 45, 53, 60, 77, 96, 128, 137, 512, 512, 512,
```

```
            -29, -19, -3, 14, 30, 38, 46, 52, 58, 64, 70, 77, 95, 123, 125, 512, 512, 512,
            -21, -14, -3, 17, 33, 42, 50, 55, 60, 65, 71, 82, 95, 118, 127, 184, 217, 512,
            -16, -9, 7, 29, 38, 49, 55, 60, 65, 70, 75, 87, 99, 113, 137, 179, 215, 512,
            -11, 1, 13, 37, 44, 51, 60, 65, 69, 74, 79, 92, 110, 113, 143, 174, 207, 512,
            -11, 1, 18, 42, 49, 56, 64, 69, 74, 79, 86, 97, 116, 128, 151, 169, 229, 512,
            -11, 1, 18, 42, 49, 56, 64, 69, 74, 79, 86, 97, 116, 128, 151, 169, 229, 512,
            -11, 1, 18, 42, 49, 56, 64, 69, 74, 79, 86, 97, 116, 128, 151, 169, 229, 512
        }
    };
    /* result: min=-0.12890625, max=1.0, fac_512, limit=no */
    /* x axis: min=-16384.0, max=16383.5, fac_2 */
    /* y axis: min=0.0, max=262140.0, fac_1div4 */
/* -----------------------------------------------------------------------
 * END: DEFINITION OF CHARACTERISTIC TABLE 'T2t_rpmEngSpdpManiReq2facThrValveReqBase_MAP'
 ***************************************************************************/


/***************************************************************************
 * BEGIN: DEFINITION OF CHARACTERISTIC TABLE 'T2t_rpmEngSpdpManiReq2facWastegateReqBase_MAP'
 * -----------------------------------------------------------------------*/
const struct CharTable2_sint16_17_uint16_18_uint16_TORQUE2THROTTLE_IMPL_TYPE T2t_rpmEngSpdpManiReq2facWastegateR
eqBase_MAP = {
        17,
        18,
        {
            1500, 1600, 1700, 1800, 2000, 2500, 3000, 3500, 4000, 5000, 6000, 7000, 8000,
            9000, 10000, 11000, 12000
        },
        {
            7500, 10000, 12500, 15000, 17500, 20000, 22500, 25000, 27500, 30000, 32500,
            35000, 37500, 40000, 42500, 45000, 47500, 50000
        },
        {
            0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
            0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
            0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
            0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
            0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
            0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
            0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
            0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
            0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
            0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
            0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1500, 3000, 3900, 4800, 4800, 4800, 4800,
            0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1500, 3000, 4700, 4700, 4700, 4700,
            0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1000, 2500, 4000, 4000, 4000, 4000,
            0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1000, 4000, 4000, 4000, 4000,
            0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1000, 3300, 3300, 3300, 3300,
            0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1000, 3000, 3000, 3000, 3000,
            0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 2000, 2000, 2000, 2000,
            0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1000, 1000, 1000, 1000
        }
    };
    /* result: min=0.0, max=1.0, fac_10000, limit=yes */
    /* x axis: min=-16384.0, max=16383.5, fac_2 */
    /* y axis: min=0.0, max=262140.0, fac_1div4 */
/* -----------------------------------------------------------------------
 * END: DEFINITION OF CHARACTERISTIC TABLE 'T2t_rpmEngSpdpManiReq2facWastegateReqBase_MAP'
 ***************************************************************************/


/***************************************************************************
 * BEGIN: DEFINITION OF CHARACTERISTIC TABLE 'T2t_rpmEngSpdtqReq2pManiReqBase_MAP'
 * -----------------------------------------------------------------------*/
const struct CharTable2_sint16_19_sint16_40_uint16_TORQUE2THROTTLE_IMPL_TYPE T2t_rpmEngSpdtqReq2pManiReqBase_MA
P = {
        19,
        40,
        {
            520, 800, 1080, 1520, 2000, 2500, 3000, 3500, 4000, 4500, 5000, 6000, 7000,
            8000, 9000, 10000, 11000, 12000, 13000
        },
        {
            0, 235, 905, 1667, 2048, 2415, 2782, 3091, 3434, 3691, 3944, 4293, 4482, 4917,
            5065, 5555, 5754, 5919, 6111, 6290, 6463, 6671, 7516, 7772, 8074, 8297, 8445,
            8672, 8841, 9028, 9237, 9629, 10022, 10559, 11173, 11567, 12148, 12729, 13310,
            13892
        },
        {
            5304, 5930, 7713, 9739, 10753, 11729, 12708, 13530, 14441, 15125, 15798, 16728,
            17230, 18388, 18782, 20085, 20614, 21055, 21564, 22042, 22503, 23054, 25304,
            25984, 26789, 27382, 27777, 28381, 28830, 29327, 29883, 30925, 31973, 33401,
            35035, 36084, 37630, 40372, 42847, 42847,
            5353, 5983, 7779, 9820, 10840, 11823, 12809, 13636, 14554, 15243, 15920, 16857,
            17363, 18528, 18926, 20238, 20770, 21214, 21727, 22208, 22672, 23228, 25494,
            26178, 26989, 27586, 27983, 28592, 29044, 29544, 30105, 31154, 32209, 33647,
```

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            35292, 36349, 37906, 40666, 43159, 43159,
            5402, 6037, 7845, 9900, 10927, 11917, 12910, 13743, 14667, 15361, 16043, 16986,
            17495, 18669, 19069, 20391, 20927, 21374, 21890, 22374, 22842, 23401, 25683,
            26372, 27189, 27789, 28190, 28803, 29258, 29762, 30326, 31383, 32445, 33894,
            35550, 36614, 38182, 40962, 43473, 43473,
            5479, 6121, 7948, 10026, 11064, 12065, 13068, 13911, 14844, 15546, 16235, 17189,
            17704, 18890, 19295, 20631, 21172, 21624, 22146, 22636, 23109, 23674, 25980,
            26677, 27503, 28110, 28515, 29135, 29594, 30104, 30674, 31742, 32816, 34280,
            35955, 37030, 38615, 41427, 43967, 43967,
            5563, 6212, 8061, 10163, 11214, 12226, 13241, 14094, 15038, 15748, 16446, 17411,
            17931, 19132, 19541, 20892, 21440, 21898, 22426, 22921, 23399, 23971, 26305,
            27010, 27845, 28459, 28869, 29496, 29961, 30477, 31053, 32134, 33221, 34702,
            36396, 37484, 39088, 41933, 44504, 44504,
            5650, 6308, 8179, 10306, 11369, 12394, 13422, 14284, 15240, 15958, 16664, 17641,
            18168, 19383, 19797, 21165, 21720, 22183, 22717, 23218, 23702, 24281, 26643,
            27356, 28202, 28823, 29238, 29873, 30343, 30865, 31449, 32543, 33642, 35142,
            36856, 37957, 39580, 42461, 45064, 45064,
            5738, 6403, 8296, 10449, 11525, 12562, 13602, 14475, 15442, 16169, 16883, 17872,
            18405, 19634, 20054, 21438, 21999, 22467, 23008, 23515, 24005, 24591, 26981,
            27703, 28558, 29187, 29607, 30249, 30725, 31253, 31844, 32951, 34064, 35581,
            37316, 38430, 40073, 42989, 45625, 45625,
            5825, 6498, 8414, 10592, 11681, 12730, 13782, 14665, 15644, 16379, 17102, 18102,
            18642, 19886, 20310, 21710, 22278, 22752, 23299, 23813, 24308, 24901, 27319,
            28049, 28915, 29551, 29976, 30626, 31107, 31642, 32240, 33360, 34485, 36020,
            37776, 38903, 40565, 43517, 46185, 46185,
            5912, 6593, 8532, 10735, 11837, 12898, 13962, 14856, 15846, 16590, 17321, 18333,
            18879, 20137, 20566, 21983, 22557, 23037, 23591, 24110, 24611, 25211, 27657,
            28396, 29271, 29915, 30345, 31002, 31490, 32030, 32635, 33768, 34907, 36460,
            38236, 39376, 41058, 44046, 46747, 46747,
            6000, 6689, 8649, 10878, 11992, 13066, 14142, 15046, 16048, 16800, 17540, 18564,
            19116, 20388, 20823, 22256, 22837, 23322, 23882, 24407, 24914, 25520, 27995,
            28743, 29628, 30279, 30714, 31379, 31872, 32419, 33030, 34176, 35328, 36899,
            38696, 39849, 41550, 44573, 47305, 47305,
            6087, 6784, 8767, 11021, 12148, 13234, 14323, 15237, 16250, 17011, 17759, 18794,
            19353, 20640, 21079, 22528, 23116, 23606, 24173, 24704, 25217, 25830, 28333,
            29089, 29985, 30643, 31083, 31755, 32254, 32807, 33426, 34585, 35750, 37339,
            39156, 40322, 42042, 45100, 47865, 47865,
            6262, 6975, 9002, 11307, 12460, 13570, 14683, 15618, 16654, 17432, 18197, 19255,
            19826, 21143, 21592, 23074, 23674, 24176, 24755, 25298, 25823, 26450, 29009,
            29782, 30698, 31372, 31821, 32508, 33018, 33584, 34216, 35402, 36593, 38218,
            40075, 41269, 43027, 46156, 48986, 48986,
            6437, 7165, 9238, 11593, 12771, 13906, 15044, 15999, 17058, 17853, 18635, 19716,
            20300, 21645, 22104, 23619, 24233, 24746, 25337, 25893, 26429, 27070, 29685,
            30475, 31411, 32100, 32559, 33262, 33783, 34361, 35007, 36219, 37436, 39096,
            40995, 42215, 44012, 47212, 50106, 50106,
            6612, 7356, 9473, 11879, 13082, 14242, 15404, 16380, 17461, 18274, 19073, 20178,
            20774, 22148, 22617, 24164, 24791, 25315, 25920, 26487, 27034, 27689, 30361,
            31168, 32124, 32828, 33297, 34015, 34547, 35137, 35798, 37035, 38279, 39975,
            41915, 43161, 44997, 48267, 51226, 51226,
            6787, 7547, 9708, 12165, 13394, 14578, 15764, 16761, 17865, 18695, 19511, 20639,
            21247, 22651, 23129, 24709, 25350, 25885, 26502, 27081, 27640, 28309, 31037,
            31861, 32838, 33556, 34035, 34768, 35311, 35914, 36589, 37852, 39122, 40854,
            42835, 44107, 45982, 49323, 52346, 52346,
            6962, 7737, 9943, 12451, 13705, 14913, 16125, 17142, 18269, 19116, 19948, 21100,
            21721, 23153, 23642, 25255, 25908, 26454, 27084, 27675, 28246, 28929, 31713,
            32554, 33551, 34284, 34773, 35521, 36076, 36691, 37379, 38669, 39965, 41733,
            43755, 45053, 46966, 50377, 53466, 53466,
            7137, 7928, 10179, 12738, 14017, 15249, 16485, 17523, 18673, 19537, 20386,
            21561, 22195, 23656, 24155, 25800, 26467, 27024, 27667, 28270, 28852, 29548,
            32389, 33247, 34264, 35012, 35511, 36274, 36840, 37468, 38170, 39486, 40808,
            42612, 44674, 45999, 47951, 51434, 54587, 54587,
            7312, 8119, 10414, 13024, 14328, 15585, 16846, 17904, 19077, 19958, 20824,
            22022, 22669, 24159, 24667, 26345, 27025, 27593, 28249, 28864, 29458, 30168,
            33065, 33940, 34977, 35740, 36249, 37027, 37604, 38245, 38961, 40303, 41651,
            43491, 45594, 46945, 48936, 52489, 55708, 55708,
            7487, 8309, 10649, 13310, 14640, 15921, 17206, 18285, 19481, 20379, 21262,
            22483, 23142, 24662, 25180, 26891, 27584, 28163, 28831, 29458, 30064, 30787,
            33741, 34634, 35690, 36468, 36987, 37780, 38369, 39021, 39752, 41120, 42495,
            44370, 46514, 47891, 49921, 53545, 56828, 56828
        }
    };
    /* result: min=0.0, max=262140.0, fac_1div4, limit=yes */
    /* x axis: min=-16384.0, max=16383.5, fac_2 */
    /* y axis: min=-256.0, max=255.9921875, fac_128 */
/* --------------------------------------------------------------------------
 * END: DEFINITION OF CHARACTERISTIC TABLE 'T2t_rpmEngSpdtqReq2pManiReqBase_MAP'
 **************************************************************************/


/****************************************************************************
 * BEGIN: DEFINITION OF VARIABLE 'T2t_tiTaThrValveReqCorr'
 * ----------------------------------------------------------------------*/
real64 T2t_tiTaThrValveReqCorr = 0.001;
    /* min=0.001, max=+oo, ident, limit=yes */
/* --------------------------------------------------------------------------
```

```
 * END: DEFINITION OF VARIABLE 'T2t_tiTaThrValveReqCorr'
 ***********************************************************************/


/***********************************************************************
 * BEGIN: DEFINITION OF VARIABLE 'T2t_tiTaWastegateReqCorr'
 * ---------------------------------------------------------------------*/
real64 T2t_tiTaWastegateReqCorr = 0.001;
    /* min=0.001, max=+oo, ident, limit=yes */
/* --------------------------------------------------------------------
 * END: DEFINITION OF VARIABLE 'T2t_tiTaWastegateReqCorr'
 ***********************************************************************/


/***********************************************************************
 * BEGIN: DEFINITION OF VARIABLE 'T2t_tiTnThrValveReqCorr'
 * ---------------------------------------------------------------------*/
const real64 T2t_tiTnThrValveReqCorr = 0.3;
    /* min=0.001, max=+oo, ident, limit=yes */
/* --------------------------------------------------------------------
 * END: DEFINITION OF VARIABLE 'T2t_tiTnThrValveReqCorr'
 ***********************************************************************/


/***********************************************************************
 * BEGIN: DEFINITION OF VARIABLE 'T2t_tiTnWastegateReqCorr'
 * ---------------------------------------------------------------------*/
const real64 T2t_tiTnWastegateReqCorr = 0.1;
    /* min=0.001, max=+oo, ident, limit=yes */
/* --------------------------------------------------------------------
 * END: DEFINITION OF VARIABLE 'T2t_tiTnWastegateReqCorr'
 ***********************************************************************/


/***********************************************************************
 * BEGIN: DEFINITION OF VARIABLE 'T2t_tiTvThrValveReqCorr'
 * ---------------------------------------------------------------------*/
const real64 T2t_tiTvThrValveReqCorr = 0.015;
    /* min=0.0, max=+oo, ident, limit=yes */
/* --------------------------------------------------------------------
 * END: DEFINITION OF VARIABLE 'T2t_tiTvThrValveReqCorr'
 ***********************************************************************/


/***********************************************************************
 * BEGIN: DEFINITION OF VARIABLE 'T2t_tiTvWastegateReqCorr'
 * ---------------------------------------------------------------------*/
const real64 T2t_tiTvWastegateReqCorr = 0.012;
    /* min=0.0, max=+oo, ident, limit=yes */
/* --------------------------------------------------------------------
 * END: DEFINITION OF VARIABLE 'T2t_tiTvWastegateReqCorr'
 ***********************************************************************/

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

/***********************************************************************
 * BEGIN: DEFINITION OF MESSAGES
 * --------------------------------------------------------------------
 * Total size is [bytes]:........................6
 * --------------------------------------------------------------------*/
/* messages of memory class:..........................................'RAM' */
/* messages of size [bytes]:...............................................2 */
/* modelled as 'T2t_facThrValveReq' */
sint16 T2t_facThrValveReq;
/* modelled as 'T2t_facWasteGateRate' */
uint16 T2t_facWasteGateRate;
/* modelled as 'T2t_pManiReqFast' */
uint16 T2t_pManiReqFast;
/* --------------------------------------------------------------------
 * END: DEFINITION OF MESSAGES
 ***********************************************************************/

#define _EdgeFalling T2t.EdgeFalling
#define _EdgeFalling_REF_ (&(T2t.EdgeFalling))
#define _PID_Limit_AWU T2t.PID_Limit_AWU
#define _PID_Limit_AWU_1 T2t.PID_Limit_AWU_1
#define _PID_Limit_AWU_1_REF_ (&(T2t.PID_Limit_AWU_1))
#define _PID_Limit_AWU_REF_ (&(T2t.PID_Limit_AWU))
#define _T2t_CatHeatTime2pManiRes T2t_CatHeatTime2pManiRes
#define _T2t_CatHeatTime2pManiRes_REF_ (&(T2t_CatHeatTime2pManiRes))
#define _T2t_degIgnAngleDiff2facSparkEff_CUR T2t_degIgnAngleDiff2facSparkEff_CUR
#define _T2t_degIgnAngleDiff2facSparkEff_CUR_REF_ (&(T2t_degIgnAngleDiff2facSparkEff_CUR))
#define _T2t_facKThrValveReqCorr T2t_facKThrValveReqCorr
#define _T2t_facLambaReq2facLambdaEff_CUR T2t_facLambaReq2facLambdaEff_CUR
#define _T2t_facLambaReq2facLambdaEff_CUR_REF_ (&(T2t_facLambaReq2facLambdaEff_CUR))
```

```
#define _T2t_facLambdaEff T2t_facLambdaEff
#define _T2t_facSparkEff T2t_facSparkEff
#define _T2t_facThrValveReqBase T2t_facThrValveReqBase
#define _T2t_facThrValveReqCorr T2t_facThrValveReqCorr
#define _T2t_facThrValveReqCorrEnable T2t_facThrValveReqCorrEnable
#define _T2t_facWastegateReqBase T2t_facWastegateReqBase
#define _T2t_facWastegateReqCorr T2t_facWastegateReqCorr
#define _T2t_facWastegateReqCorrEnable T2t_facWastegateReqCorrEnable
#define _T2t_flgWasteGateControllerTrue T2t_flgWasteGateControllerTrue
#define _T2t_KWastegateReqCorr T2t_KWastegateReqCorr
#define _T2t_pManiReq T2t_pManiReq
#define _T2t_pManiReqCalc T2t_pManiReqCalc
#define _T2t_pManiReqMan T2t_pManiReqMan
#define _T2t_pManiReqMin T2t_pManiReqMin
#define _T2t_pManiReqOverride T2t_pManiReqOverride
#define _T2t_pManiReqSlow T2t_pManiReqSlow
#define _T2t_pManiRes T2t_pManiRes
#define _T2t_RpmEngSpd2pMaxWithoutWasteGate T2t_RpmEngSpd2pMaxWithoutWasteGate
#define _T2t_RpmEngSpd2pMaxWithoutWasteGate_REF_ (&(T2t_RpmEngSpd2pMaxWithoutWasteGate))
#define _T2t_rpmEngSpdFilt T2t_rpmEngSpdFilt
#define _T2t_rpmEngSpdpManiReq2facThrValveReqBase_MAP T2t_rpmEngSpdpManiReq2facThrValveReqBase_MAP
#define _T2t_rpmEngSpdpManiReq2facThrValveReqBase_MAP_REF_ (&(T2t_rpmEngSpdpManiReq2facThrValveReqBase_MAP))
#define _T2t_rpmEngSpdpManiReq2facWastegateReqBase_MAP T2t_rpmEngSpdpManiReq2facWastegateReqBase_MAP
#define _T2t_rpmEngSpdpManiReq2facWastegateReqBase_MAP_REF_ (&(T2t_rpmEngSpdpManiReq2facWastegateReqBase_MAP))
#define _T2t_rpmEngSpdtqReq2pManiReqBase_MAP T2t_rpmEngSpdtqReq2pManiReqBase_MAP
#define _T2t_rpmEngSpdtqReq2pManiReqBase_MAP_REF_ (&(T2t_rpmEngSpdtqReq2pManiReqBase_MAP))
#define _T2t_ThrPosStart T2t_ThrPosStart
#define _T2t_ThrValve2WasteGateThreshold T2t_ThrValve2WasteGateThreshold
#define _T2t_ThrValveReqCorrMax T2t_ThrValveReqCorrMax
#define _T2t_ThrValveReqCorrMin T2t_ThrValveReqCorrMin
#define _T2t_tiTaThrValveReqCorr T2t_tiTaThrValveReqCorr
#define _T2t_tiTaWastegateReqCorr T2t_tiTaWastegateReqCorr
#define _T2t_tiTnThrValveReqCorr T2t_tiTnThrValveReqCorr
#define _T2t_tiTnWastegateReqCorr T2t_tiTnWastegateReqCorr
#define _T2t_tiTvThrValveReqCorr T2t_tiTvThrValveReqCorr
#define _T2t_tiTvWastegateReqCorr T2t_tiTvWastegateReqCorr

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

/* BEGIN: ASCET REGION "Process Definition 'T2t_calc'" */
/***************************************************************************
 * BEGIN: DEFINITION OF PROCESS 'TORQUE2THROTTLE_IMPL_T2t_calc'
 * ----------------------------------------------------------------------
 * model name:...................................'T2t_calc'
 * memory class:.................................'CODE'
 * ----------------------------------------------------------------------*/
//#if defined(COMPILE_UNUSED_CODE) || defined(COMPILE_UNUSED__TORQUE2THROTTLE_IMPL_T2t_calc)
/* messages used by this process */

/* public T2t_calc []  */

void TORQUE2THROTTLE_IMPL_T2t_calc (void)
{
    /* temp. variables */
    sint16 _t1sint16;
    uint32 _t1uint32;
    sint32 _t1sint32;
    uint16 _t1uint16;
    uint32 _t2uint32;
    sint16 _t2sint16;
    real64 _t1real64;

    /* define local message copies */
    uint16 Afr_facLambdaReq__TORQUE2THROTTLE_IMPL_T2t_calc;
    sint16 Epm_rpmEngSpd__TORQUE2THROTTLE_IMPL_T2t_calc;
    sint8 Iac_degIgn__TORQUE2THROTTLE_IMPL_T2t_calc;
    sint8 Iac_degMinAdvBestTq__TORQUE2THROTTLE_IMPL_T2t_calc;
    sint16 Isc_IdleSpdCtrlIPart__TORQUE2THROTTLE_IMPL_T2t_calc;
    sint16 Isc_IdleSpdCtrlPPart__TORQUE2THROTTLE_IMPL_T2t_calc;
    uint8 Isc_flgIdleSpdCtrlActive__TORQUE2THROTTLE_IMPL_T2t_calc;
    uint16 Mpc_pManiFilt__TORQUE2THROTTLE_IMPL_T2t_calc;
    uint16 Stc_CatalyserHeatingTime__TORQUE2THROTTLE_IMPL_T2t_calc;
    uint8 Stc_flgCatalyserHeating__TORQUE2THROTTLE_IMPL_T2t_calc;
    uint8 Stc_flgStarterActive__TORQUE2THROTTLE_IMPL_T2t_calc;
    sint16 T2t_facThrValveReq__TORQUE2THROTTLE_IMPL_T2t_calc;
    uint16 T2t_facWasteGateRate__TORQUE2THROTTLE_IMPL_T2t_calc;
    uint16 T2t_pManiReqFast__TORQUE2THROTTLE_IMPL_T2t_calc;
    sint16 Tqs_tqReq__TORQUE2THROTTLE_IMPL_T2t_calc;
    /* receive messages implicitly */
    {
        DisableAllInterrupts();
        Afr_facLambdaReq__TORQUE2THROTTLE_IMPL_T2t_calc = Afr_facLambdaReq;
```

```
        Epm_rpmEngSpd__TORQUE2THROTTLE_IMPL_T2t_calc = Epm_rpmEngSpd;
        Iac_degIgn__TORQUE2THROTTLE_IMPL_T2t_calc = Iac_degIgn;
        Iac_degMinAdvBestTq__TORQUE2THROTTLE_IMPL_T2t_calc = Iac_degMinAdvBestTq;
        Isc_IdleSpdCtrlIPart__TORQUE2THROTTLE_IMPL_T2t_calc = Isc_IdleSpdCtrlIPart;
        Isc_IdleSpdCtrlPPart__TORQUE2THROTTLE_IMPL_T2t_calc = Isc_IdleSpdCtrlPPart;
        Isc_flgIdleSpdCtrlActive__TORQUE2THROTTLE_IMPL_T2t_calc = Isc_flgIdleSpdCtrlActive;
        Mpc_pManiFilt__TORQUE2THROTTLE_IMPL_T2t_calc = Mpc_pManiFilt;
        Stc_CatalyserHeatingTime__TORQUE2THROTTLE_IMPL_T2t_calc = Stc_CatalyserHeatingTime;
        Stc_flgCatalyserHeating__TORQUE2THROTTLE_IMPL_T2t_calc = Stc_flgCatalyserHeating;
        Stc_flgStarterActive__TORQUE2THROTTLE_IMPL_T2t_calc = Stc_flgStarterActive;
        T2t_facThrValveReq__TORQUE2THROTTLE_IMPL_T2t_calc = T2t_facThrValveReq;
        T2t_facWasteGateRate__TORQUE2THROTTLE_IMPL_T2t_calc = T2t_facWasteGateRate;
        T2t_pManiReqFast__TORQUE2THROTTLE_IMPL_T2t_calc = T2t_pManiReqFast;
        Tqs_tqReq__TORQUE2THROTTLE_IMPL_T2t_calc = Tqs_tqReq;
        EnableAllInterrupts();
    }
    /* T2t_calc: sequence call #2  */
    _t1sint16
        = (sint16)Iac_degMinAdvBestTq__TORQUE2THROTTLE_IMPL_T2t_calc - Iac_degIgn__TORQUE2THROTTLE_IMPL_T2t_calc;
    /* assignment to T2t_facSparkEff: min=1, max=1024, hex=1024phys+0, limit=(maxBitLength: true, assign: true),
 zero incl.=true  */
    _T2t_facSparkEff
        = CharTable1_getAt_s8u16(_T2t_degIgnAngleDiff2facSparkEff_CUR_REF_,(sint8)(((_t1sint16 >= -128) ?
((_t1sint16 <= 127) ? _t1sint16 : 127) : -128)));
    /* T2t_calc: sequence call #3  */
    /* assignment to T2t_facLambdaEff: min=1, max=2048, hex=1024phys+0, limit=(maxBitLength: true, assign: true),
 zero incl.=true  */
    _T2t_facLambdaEff
        =
CharTable1_getAt_u16u16(_T2t_facLambaReq2facLambdaEff_CUR_REF_,Afr_facLambdaReq__TORQUE2THROTTLE_IMPL_T2t_calc);
    /* T2t_calc: sequence call #4  */
    _t1uint32 = (uint32)_T2t_facLambdaEff * _T2t_facSparkEff;
    _t1sint32
        = ((sint32)Tqs_tqReq__TORQUE2THROTTLE_IMPL_T2t_calc << 16) / (sint32)_t1uint32;
    _t1uint16
        =
CharTable2_getAt_s16s16u16(_T2t_rpmEngSpdtqReq2pManiReqBase_MAP_REF_,Epm_rpmEngSpd__TORQUE2THROTTLE_IMPL_T2t_calc,
((_t1sint32 >= -2048) ? ((_t1sint32 <= 2047) ? (sint16)_t1sint32 << 4 : 32767) : -32768));
    /* assignment to T2t_pManiReqCalc: min=0, max=65535, hex=1/4phys+0, limit=(maxBitLength: true, assign: true),
 zero incl.=true  */
    _T2t_pManiReqCalc
        = ((_T2t_pManiReqMin >= _t1uint16) ? _T2t_pManiReqMin : _t1uint16);
    /* T2t_calc: sequence call #5  */
    /* assignment to T2t_pManiReq: min=0, max=65535, hex=1/4phys+0, limit=(maxBitLength: true, assign: true),
 zero incl.=true  */
    _T2t_pManiReq
        = ((_T2t_pManiReqOverride) ? _T2t_pManiReqMan : _T2t_pManiReqCalc);
    /* T2t_calc: sequence call #6  */
    _t1sint32
        = (sint32)_T2t_pManiReq + ((sint32)Isc_IdleSpdCtrlPPart__TORQUE2THROTTLE_IMPL_T2t_calc +
Isc_IdleSpdCtrlIPart__TORQUE2THROTTLE_IMPL_T2t_calc >> 1);
    _t1sint32
        = ((_t1sint32 >= 0) ? ((_t1sint32 <= 65535) ? _t1sint32 : 65535) : 0);
    /* assignment to T2t_pManiReqFast: min=0, max=65535, hex=1/4phys+0, limit=(maxBitLength: true, assign: true),
 zero incl.=true  */
    T2t_pManiReqFast__TORQUE2THROTTLE_IMPL_T2t_calc = (uint16)_t1sint32;
    /* T2t_calc: sequence call #7  */
    _t1uint32 = (uint32)_T2t_pManiReq << 1;
    _t2uint32
        = ((Stc_flgCatalyserHeating__TORQUE2THROTTLE_IMPL_T2t_calc) ? (uint32)_T2t_pManiRes +
CharTable1_getAt_u16u16(_T2t_CatHeatTime2pManiRes_REF_,Stc_CatalyserHeatingTime__TORQUE2THROTTLE_IMPL_T2t_calc) :
(_t1uint16
        = ((Isc_flgIdleSpdCtrlActive__TORQUE2THROTTLE_IMPL_T2t_calc) ? _T2t_pManiRes : 0U) ,  _t1uint16));
    _t1sint32
        = ((sint32)_t1uint32 + Isc_IdleSpdCtrlIPart__TORQUE2THROTTLE_IMPL_T2t_calc << 1) + (sint32)_t2uint32;
    _t1sint32
        = ((_t1sint32 >= 0) ? (((uint32)_t1sint32 <= 262140U) ? _t1sint32 >> 2 : 65535) : 0);
    /* assignment to T2t_pManiReqSlow: min=0, max=65535, hex=1/4phys+0, limit=(maxBitLength: true, assign: true),
 zero incl.=true  */
    _T2t_pManiReqSlow = (uint16)_t1sint32;
    /* T2t_calc: sequence call #9  */
    _T2t_flgWasteGateControllerTrue
        = (_T2t_pManiReqSlow
        >
CharTable1_getAt_s16u16(_T2t_RpmEngSpd2pMaxWithoutWasteGate_REF_,Epm_rpmEngSpd__TORQUE2THROTTLE_IMPL_T2t_calc)
        || (_t1sint16 = _T2t_facThrValveReqBase << 5 ,  _t2sint16
        = ((Epm_rpmEngSpd__TORQUE2THROTTLE_IMPL_T2t_calc > _T2t_rpmEngSpdFilt) ? 0 :
((_T2t_facThrValveReqCorrEnable) ? _T2t_facThrValveReqCorr : 0)) ,  _t1uint16 = (uint16)
((uint16)_T2t_ThrValve2WasteGateThreshold << 7) ,  (sint32)_t1sint16 + _t2sint16 > (sint32)_t1uint16)) && !
Stc_flgStarterActive__TORQUE2THROTTLE_IMPL_T2t_calc;
    /* T2t_calc: sequence call #10  */
    if (_T2t_flgWasteGateControllerTrue)
    {
        /* If-block: sequence call #10/Then #1  */
        _t1sint16 = (sint16)_T2t_facWastegateReqBase + _T2t_facWastegateReqCorr;
```

```c
    /* assignment to T2t_facWasteGateRate: min=100, max=9900, hex=10000phys+0, limit=(maxBitLength: true,
assign: true), zero incl.=true  */
    T2t_facWasteGateRate__TORQUE2THROTTLE_IMPL_T2t_calc
        = ((_t1sint16 >= 100) ? (((uint16)_t1sint16 <= 9900U) ? (uint16)_t1sint16 : 9900U) : 100U);
  }
  else
  {
    /* If-block: sequence call #10/Else #1  */
    /* assignment to T2t_facWasteGateRate: min=100, max=9900, hex=10000phys+0, limit=(maxBitLength: true,
assign: true), zero incl.=true  */
    T2t_facWasteGateRate__TORQUE2THROTTLE_IMPL_T2t_calc = 100U;
  } /* end if */
  /* T2t_calc: sequence call #11  */
  _t1real64
      = (((real64)Epm_rpmEngSpd__TORQUE2THROTTLE_IMPL_T2t_calc == 0.0) ? 80.0 : 80.0 /
(real64)Epm_rpmEngSpd__TORQUE2THROTTLE_IMPL_T2t_calc);
  /* assignment to T2t_tiTaThrValveReqCorr: min=0, max=+oo, hex=phys, limit=n.a., zero incl.=true  */
  _T2t_tiTaThrValveReqCorr = ((_t1real64 <= 40.0) ? _t1real64 : 40.0);
  /* T2t_calc: sequence call #12  */
  /* assignment to T2t_facThrValveReqBase: min=-66, max=512, hex=512phys+0, limit=(maxBitLength: true, assign:
true), zero incl.=true  */
  _T2t_facThrValveReqBase
      =
CharTable2_getAt_s16u16s16(_T2t_rpmEngSpdpManiReq2facThrValveReqBase_MAP_REF_,Epm_rpmEngSpd__TORQUE2THROTTLE_IMPL_T2t
  /* T2t_calc: sequence call #13  */
  PID_LIMIT_AWU_IMPL_compute(_PID_Limit_AWU_REF_, ((real64)_T2t_pManiReqSlow -
(real64)Mpc_pManiFilt__TORQUE2THROTTLE_IMPL_T2t_calc) * 4.0, _T2t_facKThrValveReqCorr,
_T2t_tiTvThrValveReqCorr, _T2t_tiTnThrValveReqCorr, _T2t_tiTaThrValveReqCorr, _T2t_ThrValveReqCorrMax,
_T2t_ThrValveReqCorrMin);
  /* T2t_calc: sequence call #14  */
  _t1real64 = PID_LIMIT_AWU_IMPL_out(_PID_Limit_AWU_REF_) * 16384.0;
  _t1real64 = ((_t1real64 < 0.0) ? _t1real64 - 0.5 : _t1real64 + 0.5);
  /* assignment to T2t_facThrValveReqCorr: min=-32768, max=32767, hex=16384phys+0, limit=(maxBitLength: true,
assign: true), zero incl.=true  */
  _T2t_facThrValveReqCorr
      = ((_t1real64 >= -32768.0) ? ((_t1real64 <= 32767.0) ? (sint16)_t1real64 : 32767) : -32768);
  /* T2t_calc: sequence call #15  */
  /* assignment to T2t_facWastegateReqBase: min=0, max=10000, hex=10000phys+0, limit=(maxBitLength: true,
assign: true), zero incl.=true  */
  _T2t_facWastegateReqBase
      =
CharTable2_getAt_s16u16u16(_T2t_rpmEngSpdpManiReq2facWastegateReqBase_MAP_REF_,Epm_rpmEngSpd__TORQUE2THROTTLE_IMPL_T2
  /* T2t_calc: sequence call #17  */
  _t1real64 = PID_LIMIT_AWU_IMPL_out(_PID_Limit_AWU_1_REF_) * 10000.0;
  _t1real64 = ((_t1real64 < 0.0) ? _t1real64 - 0.5 : _t1real64 + 0.5);
  /* assignment to T2t_facWastegateReqCorr: min=-10000, max=10000, hex=10000phys+0, limit=(maxBitLength: true,
assign: true), zero incl.=true  */
  _T2t_facWastegateReqCorr
      = ((_t1real64 >= -10000.0) ? ((_t1real64 <= 10000.0) ? (sint16)_t1real64 : 10000) : -10000);
  /* T2t_calc: sequence call #23  */
  if (_T2t_flgWasteGateControllerTrue
      || EDGEFALLING_IMPL_compute(_EdgeFalling_REF_, Stc_flgStarterActive__TORQUE2THROTTLE_IMPL_T2t_calc))
  {
    /* If-block: sequence call #23/Then #1  */
    PID_LIMIT_AWU_IMPL_reset(_PID_Limit_AWU_REF_, 0.0);
  } /* end if */
  /* T2t_calc: sequence call #24  */
  _t2sint16
      = ((Stc_flgStarterActive__TORQUE2THROTTLE_IMPL_T2t_calc) ? (_t1uint16 = (uint16)((uint16)_T2t_ThrPosStart
<< 2) ,  (sint16)_t1uint16) : ((_T2t_flgWasteGateControllerTrue) ? 512 : _T2t_facThrValveReqBase +
(((Epm_rpmEngSpd__TORQUE2THROTTLE_IMPL_T2t_calc > _T2t_rpmEngSpdFilt) ? 0 : ((_T2t_facThrValveReqCorrEnable) ?
_T2t_facThrValveReqCorr >> 5 : 0)))));
  /* assignment to T2t_facThrValveReq: min=-66, max=512, hex=512phys+0, limit=(maxBitLength: true, assign:
true), zero incl.=true  */
  T2t_facThrValveReq__TORQUE2THROTTLE_IMPL_T2t_calc
      = ((_t2sint16 >= -66) ? ((_t2sint16 <= 512) ? _t2sint16 : 512) : -66);
  /* T2t_calc: sequence call #25  */
  if (_T2t_facWastegateReqCorrEnable && _T2t_flgWasteGateControllerTrue)
  {
    /* If-block: sequence call #25/Then #2  */
    _t1real64
        = (((real64)Epm_rpmEngSpd__TORQUE2THROTTLE_IMPL_T2t_calc == 0.0) ? 80.0 : 80.0 /
(real64)Epm_rpmEngSpd__TORQUE2THROTTLE_IMPL_T2t_calc);
    /* assignment to T2t_tiTaWastegateReqCorr: min=0, max=+oo, hex=phys, limit=n.a., zero incl.=true  */
    _T2t_tiTaWastegateReqCorr = ((_t1real64 <= 40.0) ? _t1real64 : 40.0);
    /* If-block: sequence call #25/Then #3  */
    PID_LIMIT_AWU_IMPL_compute(_PID_Limit_AWU_1_REF_, ((real64)_T2t_pManiReqSlow -
(real64)Mpc_pManiFilt__TORQUE2THROTTLE_IMPL_T2t_calc) * 4.0, _T2t_KWastegateReqCorr, _T2t_tiTvWastegateReqCorr,
_T2t_tiTnWastegateReqCorr, _T2t_tiTaWastegateReqCorr, 1.0, -1.0);
  }
  else
  {
    /* If-block: sequence call #25/Else #1  */
    PID_LIMIT_AWU_IMPL_reset(_PID_Limit_AWU_1_REF_, 0.01);
  } /* end if */
```

```
    /* send messages implicitly */
    {
        DisableAllInterrupts();
        T2t_facThrValveReq = T2t_facThrValveReq__TORQUE2THROTTLE_IMPL_T2t_calc;
        T2t_facWasteGateRate = T2t_facWasteGateRate__TORQUE2THROTTLE_IMPL_T2t_calc;
        T2t_pManiReqFast = T2t_pManiReqFast__TORQUE2THROTTLE_IMPL_T2t_calc;
        EnableAllInterrupts();
    }
}
/* -------------------------------------------------------------------------
 * END: DEFINITION OF PROCESS 'TORQUE2THROTTLE_IMPL_T2t_calc'
 ***************************************************************************/
#endif
/* END: ASCET REGION "Process Definition 'T2t_calc'" */


/* *************************************************************************
 * END: FUNCTIONS OF COMPONENT
 ***************************************************************************/
/* END: ASCET REGION "Component Functions" */
```