BRS TwinCAT Description

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1 Introduction

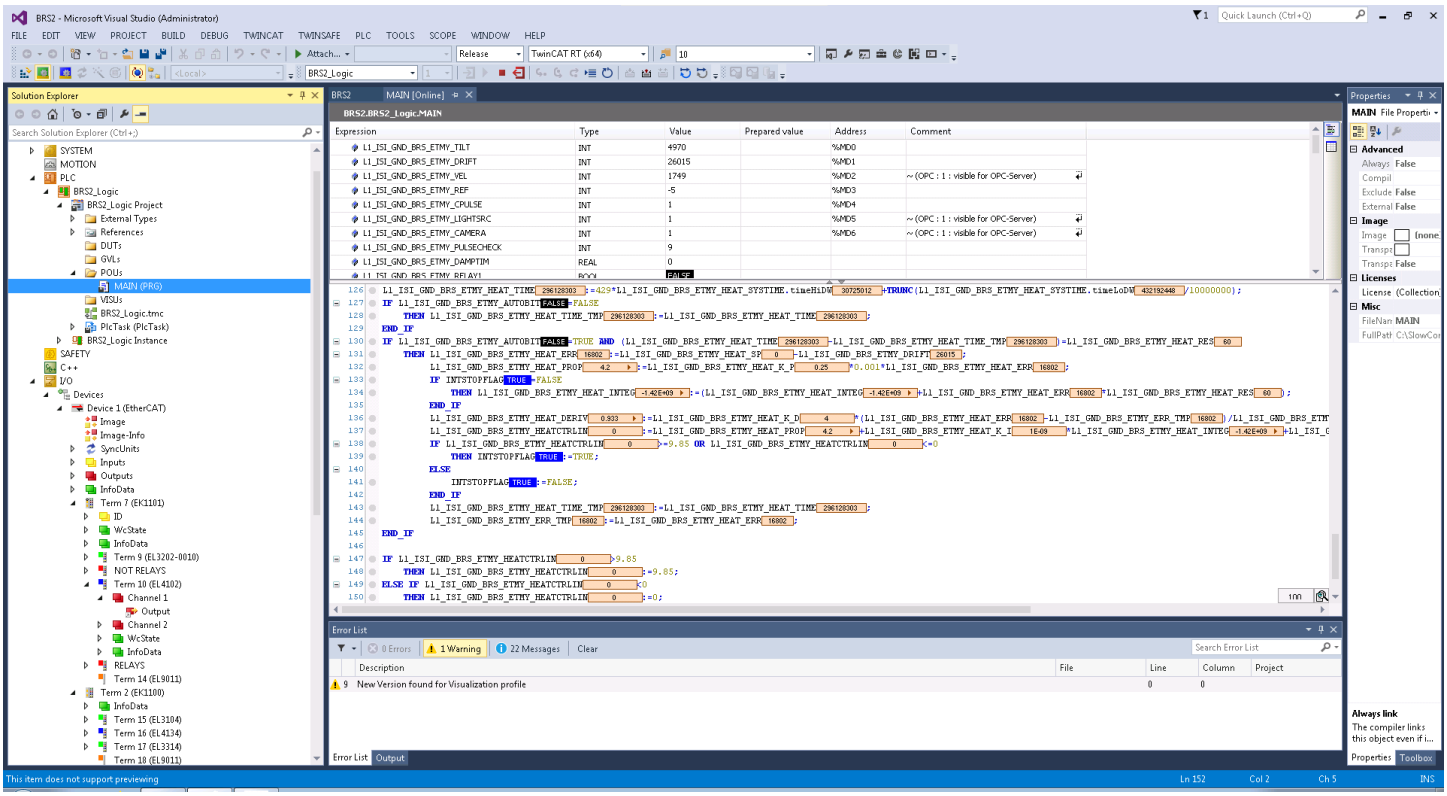
https://github.com/mpross/BRS-Control

2 Installation

3 Overview

4 Hardware

5 User Interface



6 PLC Variables

```
VAR
        L1_ISI_GND_BRS_ETMY_TILT AT %MD0: INT;
        L1_ISI_GND_BRS_ETMY_DRIFT AT %MD1: INT;
        L1_ISI_GND_BRS_ETMY_VEL AT %MD2: INT;(*~ (OPC : 1 : visible for OPC-Server)
                                                (OPC_PROP[0005]
                                                    :1:
                                                    read-only)
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                                                                    (OPC_PROP[0101]
                                                                        :Sqrt(Velocity):
                                                                        DESC)
                                                                    (OPC_PROP[0103]
                                                                        :-500: LOPR)
                                                                    (OPC_PROP[0102]
                                                                        :+500: HOPR)
                                                                    *)
    L1_ISI_GND_BRS_ETMY_REF AT %MD3: INT;
    L1_ISI_GND_BRS_ETMY_CPULSE AT %MD4: INT;
    L1_ISI_GND_BRS_ETMY_LIGHTSRC AT %MD5: INT;(*~ (OPC : 1 : visible for OPC-Server)
                                                                    (OPC_PROP[0005]
                                                                        :1:
                                                                        read-only)
                                                                    (OPC_PROP[0101]
                                                                        :Light
                                                                        Source
                                                                        Status:
                                                                        DESC)
                                                                    *)
    L1_ISI_GND_BRS_ETMY_CAMERA AT %MD6: INT;(*~ (OPC : 1 : visible for OPC-Server)
                                                                    (OPC_PROP[0005]
                                                                        :1:
                                                                        read-only)
                                                                    (OPC_PROP[0101]
                                                                        :Camera
                                                                        Status:
                                                                        DESC)
                                                                    *)

    L1_ISI_GND_BRS_ETMY_PULSECHECK: INT:=0;
    L1_ISI_GND_BRS_ETMY_DAMPTIM: REAL;
    L1_ISI_GND_BRS_ETMY_RELAY1: BOOL;
    L1_ISI_GND_BRS_ETMY_RELAY2: BOOL;
    L1_ISI_GND_BRS_ETMY_DRIFTBIT: BOOL;(*~ (OPC : 1 : visible for OPC-Server)
                                                                    (OPC_PROP[0005]
                                                                        :1:
                                                                        read-only)
                                                                    (OPC_PROP[0101]
                                                                        :Drift
                                                                        Status:
                                                                        DESC)
                                                                    (OPC_PROP[0106]
                                                                        :GOOD: ONAM)
                                                                    (OPC_PROP[0107]
                                                                        :BAD: ZNAM)
                                                                    *)
    L1_ISI_GND_BRS_ETMY_MODBIT: BOOL;(*~ (OPC : 1 : visible for OPC-Server)
                                                                    (OPC_PROP[0005]
                                                                        :1:
                                                                        read-only)
                                                                    (OPC_PROP[0101]
                                                                        :ISI
                                                                        Modules
                                                                        Status:
                                                                        DESC)
                                                                    (OPC_PROP[0106]
                                                                        :GOOD: ONAM)
                                                                    (OPC_PROP[0107]
                                                                        :BAD: ZNAM)
                                                                    *)
    L1_ISI_GND_BRS_ETMY_BOXBIT: BOOL;(*~ (OPC : 1 : visible for OPC-Server)
                                                                    (OPC_PROP[0005]
                                                                        :1:
                                                                        read-only)
```

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                                                                    (OPC_PROP[0101]
                                                                        :BRS Box
                                                                        Status:
                                                                        DESC)
                                                                    (OPC_PROP[0106]
                                                                        :GOOD: ONAM)
                                                                    (OPC_PROP[0107]
                                                                        :BAD: ZNAM)
                                                                    *)
    L1_ISI_GND_BRS_ETMY_CAPDRIVE: INT;

    L1_ISI_GND_BRS_ETMY_TEMPL AT %IW0: INT;(*~ (OPC : 1 : visible for OPC-Server)
                                                                    (OPC_PROP[0005]
                                                                        :1:
                                                                        read-only)
                                                                    (OPC_PROP[0101]
                                                                        :Tempurature
                                                                        Left: DESC)
                                                                    (OPC_PROP[0100]
                                                                        :1/100 C:
                                                                        EGU)
                                                                    *)
    L1_ISI_GND_BRS_ETMY_TEMPR AT %IW1: INT;(*~ (OPC : 1 : visible for OPC-Server)
                                                                    (OPC_PROP[0005]
                                                                        :1:
                                                                        read-only)
                                                                    (OPC_PROP[0101]
                                                                        :Tempurature
                                                                        Right: DESC)
                                                                    (OPC_PROP[0100]
                                                                        :1/100 C:
                                                                        EGU)
                                                                    *)
    L1_ISI_GND_BRS_ETMY_BOXIN AT %IW2: BOOL;
    L1_ISI_GND_BRS_ETMY_MOD1IN AT %IW3: BOOL;
    L1_ISI_GND_BRS_ETMY_MOD2IN AT %IW4: BOOL;
    L1_ISI_GND_BRS_ETMY_USER: BOOL:=TRUE;(*~ (OPC : 1 : visible for OPC-Server)
                                                                        (OPC_PROP[0005
                                                                            :3:
                                                                            read/write)
                                                                        (OPC_PROP[0101
                                                                            :User
                                                                            Damping
                                                                            Control:
                                                                            DESC)
                                                                        (OPC_PROP[0106
                                                                            :On:
                                                                            ONAM)
                                                                        (OPC_PROP[0107
                                                                            :Off:
                                                                            ZNAM)
                                                                        *)
    L1_ISI_GND_BRS_ETMY_LOWTHRESHOLD: INT:=800;(*~ (OPC : 1 : visible for OPC-Server)
                                                                    (OPC_PROP[0005]
                                                                        :3:
                                                                        read/write)
                                                                    (OPC_PROP[0101]
                                                                        :Lower
                                                                        Damping
                                                                        Threshold:
                                                                        DESC)*)
    L1_ISI_GND_BRS_ETMY_HIGHTHRESHOLD: INT:=2000;(*~ (OPC : 1 : visible for OPC-Server)
                                                                    (OPC_PROP[0005]
                                                                        :3:
                                                                        read/write)
```

```
                                                                    (OPC_PROP[0101]
                                                                        :Upper
                                                                        Damping
                                                                        Threshold:
                                                                        DESC)*)
L1_ISI_GND_BRS_ETMY_DAMPTIMEOUT: REAL:=62500;(*~ (OPC : 1 : visible for OPC-Server)
                                                                    (OPC_PROP[0005]
                                                                        :3:
                                                                        read/write)
                                                                    (OPC_PROP[0101]
                                                                        :Damping
                                                                        Timeout:
                                                                        DESC)*)

L1_ISI_GND_BRS_ETMY_CAPOUTL AT %QW0: INT;
L1_ISI_GND_BRS_ETMY_CAPOUTR AT %QW1: INT;
L1_ISI_GND_BRS_ETMY_AMPBIT AT %QW3: BOOL;(*~ (OPC : 1 : visible for OPC-Server)
                                                                        (OPC_PROP[0005
                                                                            :1:
                                                                            read-only)
                                                                        (OPC_PROP[0101
                                                                            :Amplitude
                                                                            Status:
                                                                            DESC)
                                                                        (OPC_PROP[0106
                                                                            :GOOD:
                                                                            ONAM)
                                                                        (OPC_PROP[0107
                                                                            :BAD:
                                                                            ZNAM)
                                                                        *)
L1_ISI_GND_BRS_ETMY_TILTOUT AT %QW4: INT;
L1_ISI_GND_BRS_ETMY_DRIFTOUT AT %QW5: INT;
L1_ISI_GND_BRS_ETMY_REFOUT AT %QW6: INT;
L1_ISI_GND_BRS_ETMY_DAMPBIT AT %QW7: BOOL;(*~ (OPC : 1 : visible for OPC-Server)
                                                                        (OPC_PROP[0005
                                                                            :1:
                                                                            read-only)
                                                                        (OPC_PROP[0101
                                                                            :Damping
                                                                            Status:
                                                                            DESC)
                                                                        (OPC_PROP[0106
                                                                            :Damping:
                                                                            ONAM)
                                                                        (OPC_PROP[0107
                                                                            :Not
                                                                            Damping:
                                                                            ZNAM)
                                                                        *)

L1_ISI_GND_BRS_ETMY_CBIT AT %QW8: BOOL; (*~ (OPC : 1 : visible for OPC-Server)
                                                                        (OPC_PROP[0005
                                                                            :1:
                                                                            read-only)
                                                                        (OPC_PROP[0101
                                                                            :C#
                                                                            Running
                                                                            Status:
                                                                            DESC)
                                                                        (OPC_PROP[0106
                                                                            :GOOD:
                                                                            ONAM)
                                                                        (OPC_PROP[0107
                                                                            :BAD:
```

```
                                                                    ZNAM)
                                                                *)

        L1_ISI_GND_BRS_ETMY_RELAYL AT %QW9: BOOL;
        L1_ISI_GND_BRS_ETMY_RELAYR AT %QW10: BOOL;
        L1_ISI_GND_BRS_ETMY_NOTRELAYL AT %QW11: BOOL;
        L1_ISI_GND_BRS_ETMY_NOTRELAYR AT %QW12: BOOL;
        L1_ISI_GND_BRS_ETMY_STATUSOUT AT %QW13: INT;

END_VAR
```

7 PLC Loop

```
(*User master switch for damping*)
IF L1_ISI_GND_BRS_ETMY_USER=TRUE
THEN
        (*If damper is on. 3276 = 1V output*)
        IF L1_ISI_GND_BRS_ETMY_DAMPBIT=TRUE
        THEN
                (*If under lower threshold the damping timer turns on.*)
                IF ABS(L1_ISI_GND_BRS_ETMY_VEL)<L1_ISI_GND_BRS_ETMY_LOWTHRESHOLD
                        (*Checks to see if damping timer is off and start Timer.*)
                        THEN IF L1_ISI_GND_BRS_ETMY_DAMPTIM <=0
                                THEN L1_ISI_GND_BRS_ETMY_DAMPTIM:=1;
                                        L1_ISI_GND_BRS_ETMY_CAPDRIVE:=L1_ISI_GND_BRS_ETMY_VEL;
                                (*Damping timeout check*)
                                ELSE IF
                                    L1_ISI_GND_BRS_ETMY_DAMPTIM<L1_ISI_GND_BRS_ETMY_DAMPTIMEOUT
                                        THEN
                                        L1_ISI_GND_BRS_ETMY_CAPDRIVE:=L1_ISI_GND_BRS_ETMY_VEL;
                                        L1_ISI_GND_BRS_ETMY_DAMPTIM:=L1_ISI_GND_BRS_ETMY_DAMPTIM+1;
                                        (*Damper timeout reset*)
                                        ELSE
                                                L1_ISI_GND_BRS_ETMY_DAMPBIT:=FALSE;
                                                L1_ISI_GND_BRS_ETMY_CAPDRIVE:=0;
                                                L1_ISI_GND_BRS_ETMY_DAMPTIM:=0;
                                                L1_ISI_GND_BRS_ETMY_RELAY1:=FALSE;
                                                L1_ISI_GND_BRS_ETMY_RELAY2:=FALSE;
                                        END_IF
                                END_IF
                        (*If above lower threshold continue damping*)
                        ELSE
                                L1_ISI_GND_BRS_ETMY_RELAY2:=FALSE;
                                L1_ISI_GND_BRS_ETMY_CAPOUTL:=L1_ISI_GND_BRS_ETMY_CAPDRIVE;
                                L1_ISI_GND_BRS_ETMY_CAPOUTR:=0;
                                L1_ISI_GND_BRS_ETMY_DAMPTIM:=0;
                                L1_ISI_GND_BRS_ETMY_CAPDRIVE:=L1_ISI_GND_BRS_ETMY_VEL;
                        END_IF
                        (*If capdrive is positive send to left capacitor, if negative send to
                            right capacitor*)
                        IF L1_ISI_GND_BRS_ETMY_CAPDRIVE >= 0
                        THEN L1_ISI_GND_BRS_ETMY_RELAY1:=TRUE;
                        ELSE L1_ISI_GND_BRS_ETMY_RELAY2:=TRUE;
                                L1_ISI_GND_BRS_ETMY_RELAY1:=FALSE;
                                L1_ISI_GND_BRS_ETMY_CAPOUTR:=-L1_ISI_GND_BRS_ETMY_CAPDRIVE;
                                L1_ISI_GND_BRS_ETMY_CAPOUTL:=0;
                        END_IF
        (*If damper is off*)
        ELSE
                (*Upper threshold check.*)
                IF ABS(L1_ISI_GND_BRS_ETMY_VEL)>L1_ISI_GND_BRS_ETMY_HIGHTHRESHOLD
                (*Sets damper on.*)
                THEN L1_ISI_GND_BRS_ETMY_DAMPBIT:=TRUE;
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                (*If below upper threshold turn off damping*)
                ELSE
                        L1_ISI_GND_BRS_ETMY_RELAY1:=TRUE;
                        L1_ISI_GND_BRS_ETMY_RELAY2:=TRUE;
                        IF L1_ISI_GND_BRS_ETMY_VEL=0
                                THEN L1_ISI_GND_BRS_ETMY_CAPDRIVE:=0;
                                ELSE
                                        L1_ISI_GND_BRS_ETMY_CAPDRIVE:=
                                            (L1_ISI_GND_BRS_ETMY_VEL/ABS(L1_ISI_GND_BRS_ETMY_VEL))*(L1_
                                        L1_ISI_GND_BRS_ETMY_CAPOUTL:=L1_ISI_GND_BRS_ETMY_CAPDRIVE+1600
                                        L1_ISI_GND_BRS_ETMY_CAPOUTR:=-L1_ISI_GND_BRS_ETMY_CAPDRIVE+160
                        END_IF
                END_IF
        END_IF
(*User control check.*)
ELSE L1_ISI_GND_BRS_ETMY_RELAY1:=FALSE;
        L1_ISI_GND_BRS_ETMY_RELAY2:=FALSE;
        L1_ISI_GND_BRS_ETMY_CAPDRIVE:=0;
        L1_ISI_GND_BRS_ETMY_CAPOUTL:=0;
        L1_ISI_GND_BRS_ETMY_CAPOUTR:=0;
        L1_ISI_GND_BRS_ETMY_DAMPBIT:=FALSE;

END_IF
(*Nonlinear amplitude check. Sets amplitude status bit.*)
IF ABS(L1_ISI_GND_BRS_ETMY_TILT)>10000
        THEN L1_ISI_GND_BRS_ETMY_AMPBIT:=FALSE;
ELSE L1_ISI_GND_BRS_ETMY_AMPBIT:=TRUE;
END_IF
(*Drift amplitude check.*)
IF ABS(L1_ISI_GND_BRS_ETMY_DRIFT)>=32000
        THEN L1_ISI_GND_BRS_ETMY_DRIFTBit:=FALSE;
ELSE L1_ISI_GND_BRS_ETMY_DRIFTBit:=TRUE;
END_IF
(*C# code pulse check. Sets C# code status bit.*)
IF L1_ISI_GND_BRS_ETMY_PULSECHECK>=20
        THEN L1_ISI_GND_BRS_ETMY_PULSECHECK:=0;
        IF L1_ISI_GND_BRS_ETMY_CPULSE=1
                THEN L1_ISI_GND_BRS_ETMY_CBIT:=TRUE;
                L1_ISI_GND_BRS_ETMY_CPULSE:=0;
        ELSE L1_ISI_GND_BRS_ETMY_CBIT:=FALSE;
        END_IF
END_IF
IF (L1_ISI_GND_BRS_ETMY_CBIT=FALSE) OR (L1_ISI_GND_BRS_ETMY_DRIFTBIT=FALSE) OR
    (L1_ISI_GND_BRS_ETMY_LIGHTSRC=0) OR (L1_ISI_GND_BRS_ETMY_CAMERA=0) OR
    (L1_ISI_GND_BRS_ETMY_MODBIT=FALSE) OR (L1_ISI_GND_BRS_ETMY_BOXBIT=FALSE)
        THEN(*Turns damping off if C# code isn't running.*)
                L1_ISI_GND_BRS_ETMY_CAPDRIVE:=0;
                L1_ISI_GND_BRS_ETMY_RELAY1:=FALSE;
                L1_ISI_GND_BRS_ETMY_RELAY2:=FALSE;
                L1_ISI_GND_BRS_ETMY_DAMPBIT:=FALSE;
END_IF
(*Beckhoff status inversion*)
L1_ISI_GND_BRS_ETMY_BOXBIT:=NOT L1_ISI_GND_BRS_ETMY_BOXIN;
L1_ISI_GND_BRS_ETMY_MODBIT:= NOT L1_ISI_GND_BRS_ETMY_MOD1IN OR NOT L1_ISI_GND_BRS_ETMY_MOD2IN;
(*Overview status out construction. If any error flags are raised set status to 0V, else if
    damping set to 2 V, else set to 5V*)
IF (L1_ISI_GND_BRS_ETMY_CBIT=FALSE) OR (L1_ISI_GND_BRS_ETMY_AMPBIT=FALSE) OR
    (L1_ISI_GND_BRS_ETMY_DRIFTBIT=FALSE) OR (L1_ISI_GND_BRS_ETMY_LIGHTSRC=0) OR
    (L1_ISI_GND_BRS_ETMY_CAMERA=0) OR (L1_ISI_GND_BRS_ETMY_MODBIT=FALSE) OR
    (L1_ISI_GND_BRS_ETMY_BOXBIT=FALSE)
        THEN
                L1_ISI_GND_BRS_ETMY_STATUSOUT:=0;
ELSE IF L1_ISI_GND_BRS_ETMY_DAMPBIT=TRUE
        THEN L1_ISI_GND_BRS_ETMY_STATUSOUT:=2*3276;
        ELSE
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                L1_ISI_GND_BRS_ETMY_STATUSOUT:=5*3276;
        END_IF
END_IF
L1_ISI_GND_BRS_ETMY_PULSECHECK:=L1_ISI_GND_BRS_ETMY_PULSECHECK+1;
(*Relay states set so the capacitors are either passed the damping signal or grounded.*)
L1_ISI_GND_BRS_ETMY_RELAYL:= L1_ISI_GND_BRS_ETMY_RELAY1;
L1_ISI_GND_BRS_ETMY_RELAYR:= L1_ISI_GND_BRS_ETMY_RELAY2;
L1_ISI_GND_BRS_ETMY_NOTRELAYL:= NOT L1_ISI_GND_BRS_ETMY_RELAY1;
L1_ISI_GND_BRS_ETMY_NOTRELAYR:= NOT L1_ISI_GND_BRS_ETMY_RELAY2;
L1_ISI_GND_BRS_ETMY_TILTOUT:=L1_ISI_GND_BRS_ETMY_TILT;
L1_ISI_GND_BRS_ETMY_DRIFTOUT:=L1_ISI_GND_BRS_ETMY_DRIFT;
L1_ISI_GND_BRS_ETMY_REFOUT:=L1_ISI_GND_BRS_ETMY_REF;
```

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8 Signal Processing

9 Troubleshooting

- 1.