Escuela Universitaria Politécnica - La Almunia
Centro adscrito
Universidad Zaragoza

ESCUELA UNIVERSITARIA POLITÉCNICA
DE LA ALMUNIA DE DOÑA GODINA (ZARAGOZA)

ANEXOS

Automatización de una planta industrial de generación de hidrógeno verde.

Industrial Green Hydrogen Generation Plant Automation.

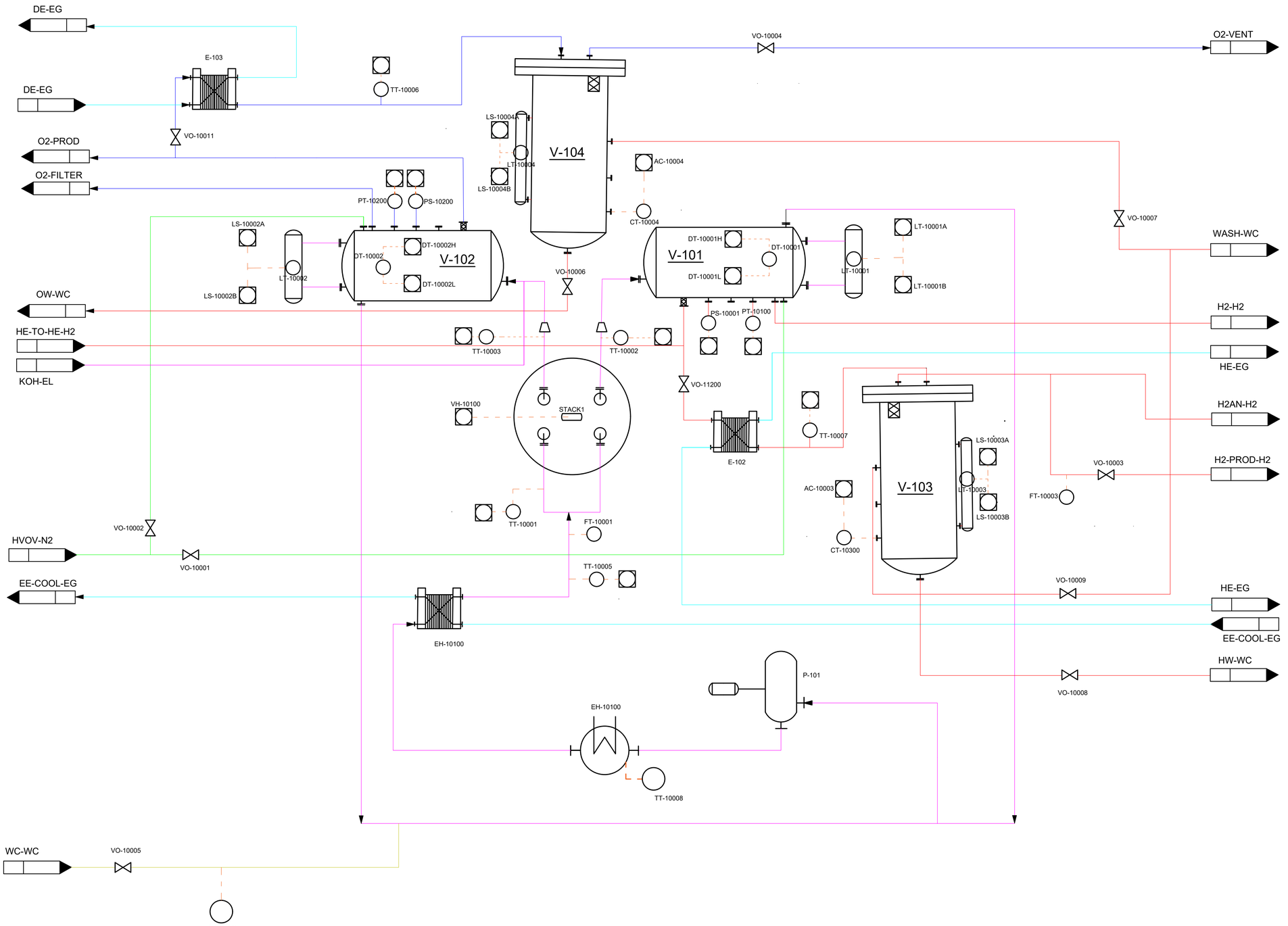
424.22.21

Autor: Eduardo Pérez González
Director: Alejandro Acero Oliete
Fecha: **JUNIO 2023**

ÍNDICE DE CONTENIDO

ANEXO1 (PLANOS)

Autor: Eduardo Pérez González
Nº TFG: 424 22 21



NOTAS GENERALES

N2-> NITROGENO GAS
H2-> HIDRÓGENO GAS
O2-> OXIGENO GAS
K OH-> ELECTROLITO LÍQUIDO
WC-> AGUA REFRIGERANTE
WD-> AGUA DESTILADA

ELEMENTOS

V-101-> SEPARADOR DE H2 Y KOH

V-102-> SEPARADOR DE O2 Y KOH

V-103-> TANQUE LAVADOR KOH Y H2

V-104-> TANQUE LAVADOR KOH Y O2

EH-101-> CALENTADOR ELECTRICO

E-101-> INTERCAMBIADOR DE CALOR KOH

E-102-> INTERCAMBIADOR DE CALOR H2

E-103-> INTERCAMBIADOR DE CALOR O2

	Fecha	Nombre	Firma:
Dibujado	06/2023	EDUARDO PÉREZ	
Comprobado	06/2023		

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Rev. A
Fecha: 06/2023

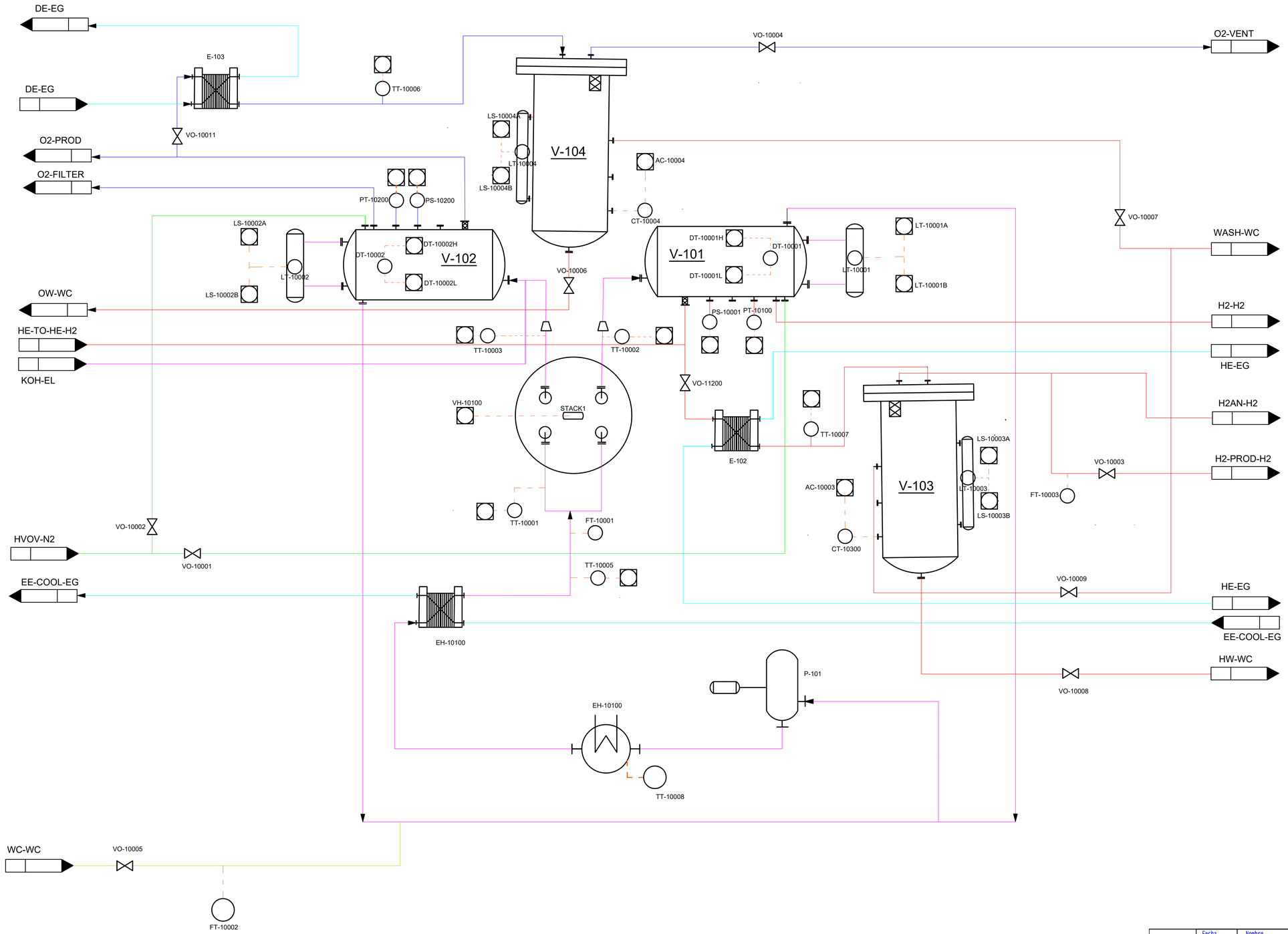
PLANTA HIDRÓGENO VERDE

Nº P: 424.22.21.000.00

ESCALA: N/A

STACK Y SEPARADORES

HOJA: 1/4



NOTAS GENERALES

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E-102-> INTERCAMBIADOR DE CALOR H2
E-103-> INTERCAMBIADOR DE CALOR O2

	Fecha	Nombre	Firma:
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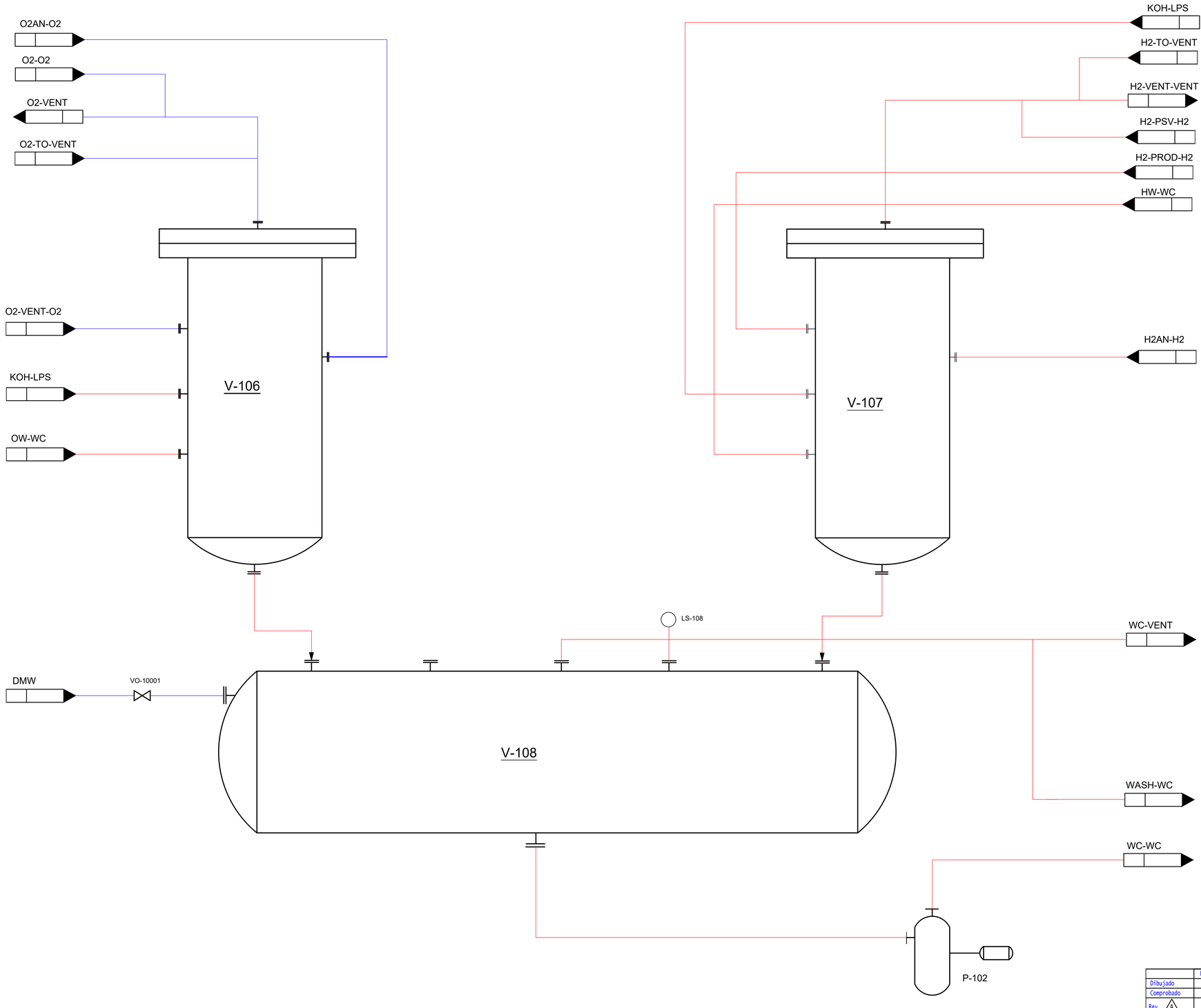
Rev: A Fecha: 06/2023	PLANTA HIDRÓGENO VERDE	Nº P: 424.22.21.000.00
ESCALA: N/A	STACK Y SEPARADORES	HOJA: 1/4



NOTAS GENERALES

N2-> NITROGENO GAS
H2-> HIDRÓGENO GAS
O2-> OXIGENO GAS
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ELEMENTOS

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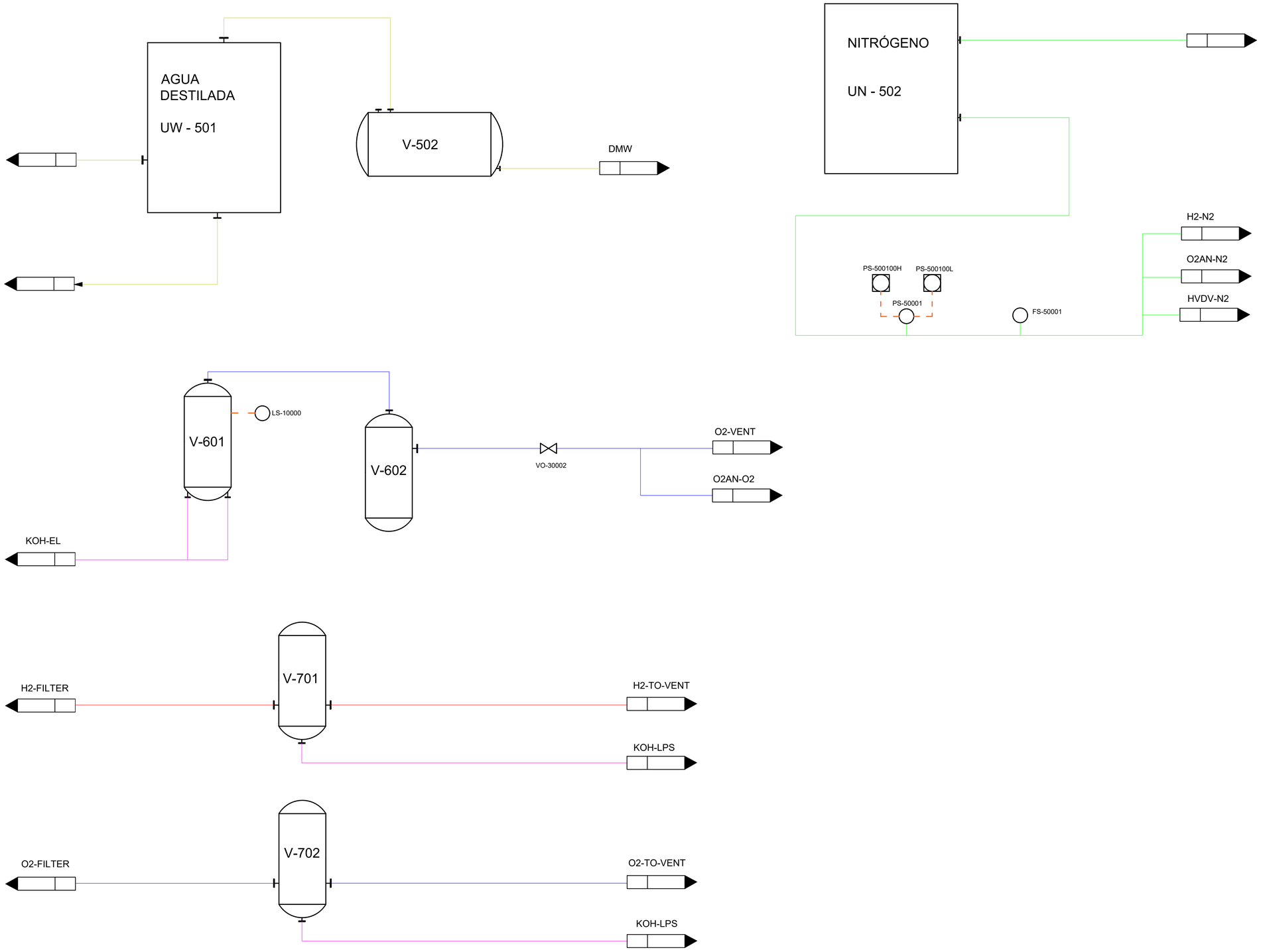
	Fecha	Nombre	Firma:	Escuela Universitaria Politécnica - La Almunia, Centro adscrito Universidad Zaragoza
Dibujado	06/2023	EDUARDO PÉREZ		
Comprobado	06/2023			
Rev. A Fecha: 06/2023	PLANTA HIDRÓGENO VERDE			Nº P: 424.22.21.100.02
ESCALA: N/A	SEPARADORES VENTEO			HOJA: 3/4



NOTAS GENERALES

N2-> NITROGENO GAS

H2-> HIDRÓGENO GAS

O2-> OXIGENO GAS

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V-103-> TANQUE LAVADOR KOH Y H2

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EH-101-> CALENTADOR ELECTRICO

E-101-> INTERCAMBIADOR DE CALOR KOH

E-102-> INTERCAMBIADOR DE CALOR H2

E-103-> INTERCAMBIADOR DE CALOR O2

	Fecha	Nombre	Firma:
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Rev. A
Fecha: 06/2023

PLANTA HIDRÓGENO VERDE

ESCALA: N/A

INERTIZADO Y BYPASS DE SEGURIDAD

Nº P: 424.22.21.100.03

HOJA: 4/4

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ANEXO 5 (PROGRAMACIÓN DEL AUTOMATISMO)

1.1. FC TRANSICTION STATES

```
IF "States".State_actual=0 THEN
    "E0_Apagado_DB"();
END_IF;
IF "States".State_actual = 1 THEN
    "E1_COLD_STAND_BY_DB"();
END_IF;
IF "States".State_actual=2 THEN
    "E2_INERTIZACION_DB"();
END_IF;
IF "States".State_actual = 3 THEN
    "E3_Calentamiento_DB"();
END_IF;
IF "States".State_actual=4 THEN
    "E4_RAMPA_DB"();
END_IF;
IF "States".State_actual=5 THEN
"E5_VENTEO_DB"();
END_IF;
IF "States".State_actual=6 THEN
    "E6_PRESURIZACION_DB"();
END_IF;
```

```
IF "States".State_actual = 7 THEN
   "E7_OPERACION_DB"();
END_IF;
IF "States".State_actual=8 THEN
   "E8_RAMPA_BAJADA_DB"();
END_IF;
IF "States".State_actual=9 THEN
   "E9_HOT_STAND_BY_DB"();
END_IF;
IF "States".State_actual=10 THEN
   "E10_RAMPA_SUB_2_DB"();
END_IF;
IF "States".State_actual=11 THEN
   "E11_DESPRESURIZACION_DB"();
END_IF;
IF "States".State_actual=12 THEN
   "States".State_emergency := TRUE;
   "E12_PARADA_EMERGENCIA_DB"();
ELSE
   "States".State_emergency := FALSE;
END_IF;
```

```
IF "States".State_actual = 0 AND "SCADA".Encendido THEN
    "States".State_actual := 1;
    "States".State_anterior := 0;
    "States".State_apagado := FALSE;
    "States".State_Cold_Stand_By := True;
    ; //PASA DE APAGADO A COLD STAND BY
END_IF;

IF "States".State_actual=1 AND "States".State_anterior=0 AND"SCADA".START
THEN
    "States".State_actual := 2;
    "States".State_anterior := 1;
    "States".State_Cold_Stand_By := FALSE;
    "States".State_inert := TRUE;
    "SCADA".Encendido:=FALSE;
END_IF;

IF "States".State_actual=1 AND "SCADA".Apagado=TRUE THEN
    "States".State_actual := 0;
    "States".State_anterior := 1;
    "States".State_apagado := TRUE;
    "States".State_Cold_Stand_By := FALSE;
    "SCADA".START:=FALSE;
    "SCADA".Encendido := FALSE;
    ;
END_IF;
```

```
IF "States".State_actual=2 AND  "Variables_importantes".ciclos_inert=11 THEN
    "States".State_actual := 3;
    "States".State_anterior := 2;
    "States".State_inert := FALSE;
    "States".State_calentamiento := TRUE;
    "Variables_importantes".ciclos_inert := 0;
    "Variables_importantes".ciclos_OK := false;
    "Variables_importantes".Contador_rampa := 0;
    "SCADA".Apagado := FALSE;
    "SCADA".START := FALSE;
    ;
END_IF;

IF "States".State_actual=3 AND "SCADA".Operacion=TRUE AND "States".Gen_cond_3_4=TRUE THEN
    "States".State_actual := 4;
    "States".State_anterior := 3;
    "States".State_calentamiento := FALSE;
    "States".State_rampa := TRUE;
    ;
END_IF;
```

```
    IF "States".State_actual=4 AND "States".State_anterior=3 AND
"STACK".V10001>13.15 THEN
        "States".State_actual := 5;
        "States".State_anterior := 4;
        "States".State_rampa := FALSE;
        "States".State_venteo := TRUE;
        "SCADA".Operacion:=FALSE;
        ;
    END_IF;

    IF "States".State_actual=5 AND "States".State_anterior=4 AND
"Variables_importantes".ciclos_venteo=10 AND "States".Gen_cond_5_6=TRUE THEN
        "States".State_actual := 6;
        "States".State_anterior := 5;
        "States".State_venteo := FALSE;
        "States".State_presurizacion := TRUE;

        ;
    END_IF;

    IF "States".State_actual=6 AND "States".Gen_cond_6_7=TRUE THEN
        "States".State_actual := 7;
        "States".State_anterior := 6;
        "States".State_presurizacion := FALSE;
        "States".State_operacion := TRUE;
    END_IF;
```

```
    IF "States".State_actual=7 AND "States".State_anterior=6 AND
"States".Gen_cond_7_8=TRUE AND "SCADA".Stand_BY=TRUE THEN
        "States".State_actual := 8;
        "States".State_anterior := 7;
        "States".State_operacion := FALSE;
        "States".State_rampa_bajada := TRUE;
        "SCADA".Stand_BY := FALSE;
        ;
    END_IF;

    IF "States".State_actual=8 AND "States".State_anterior=7 AND
"States".Gen_cond_8_9=TRUE THEN
        "States".State_actual := 9;
        "States".State_anterior := 8;
        "States".State_rampa_bajada := FALSE;
        "States".State_HOT_STAND_BY := TRUE;
        ;
    END_IF;

    IF "States".State_actual=9 AND "States".State_anterior=8 AND
"States".Gen_cond_9_10=TRUE AND "SCADA".RESTART=TRUE THEN
        "States".State_actual := 10;
        "States".State_anterior := 9;
        "States".State_rampa_subida_2 := TRUE;
         "States".State_HOT_STAND_BY := FALSE;
        "SCADA".RESTART := FALSE;
```

```
"SCADA".STOP := FALSE;
    "SCADA".RESTART := FALSE;
    ;
END_IF;

IF "States".State_actual=9 AND "States".State_anterior=8 AND "States".Gen_cond_9_10=TRUE AND "SCADA".STOP = TRUE THEN
    "States".State_actual := 11;
    "States".State_anterior := 9;
    "States".State_HOT_STAND_BY := FALSE;
    "States".State_despresurizacion := TRUE;
    "SCADA".STOP:=FALSE
    ;
END_IF;

IF "States".State_actual=12 AND "SCADA".ENCENDIDO_OFF=TRUE THEN
    "States".State_actual := 0;
    "States".State_anterior := 0;
    "SCADA".ENCENDIDO_OFF := 0;
    ;
END_IF;

IF "States".State_actual=10 AND "States".State_anterior=9 AND "STACK"."V10001">13 AND "STACK".V10001<14 THEN
    "States".State_actual := 6;
```

```
"States".State_anterior := 10;
    "States".State_presurizacion := TRUE;
    "States".State_rampa_subida_2 := FALSE;
    ;
END_IF;
IF "States".State_actual=11 AND "States".State_anterior=9 AND "SCADA"."RETURN"=TRUE AND "States".Gen_cond_11_x=TRUE THEN
    "States".State_actual := 1;
    "States".State_anterior := 11;
    "States".State_despresurizacion := FALSE;
    "States".State_Cold_Stand_By := TRUE;
    "SCADA"."RETURN" := FALSE;
    ;
END_IF;
IF "States".State_actual=11 AND "States".State_anterior=9 AND "SCADA".Calentamiento=TRUE AND "States".Gen_cond_11_x=TRUE THEN
"States".State_actual := 3;
"States".State_anterior := 11;
"States".State_despresurizacion := FALSE;
"States".State_calentamiento := TRUE;
"SCADA".Calentamiento := FALSE;
;
END_IF;
```

```
IF "States".State_actual=3 AND "SCADA".COLD_STAND_BY=TRUE THEN
    "States".State_actual := 1;
    "States".State_anterior := 3;
    "States".State_Cold_Stand_By := FALSE;
    "States".State_calentamiento := FALSE;
    "SCADA".COLD_STAND_BY := FALSE;
END_IF;
```

1.2. FC ALARMAS DE EMERGENCIA

```
// EN ESTA FUNCIÓN SE ACTIVARAN/DESACTIVARAN LAS ALARMAS EN CADA ESTADO Y SI TOCA PASAR AL ESTADO DE EMERGENCIA

IF "States".State_actual=1 THEN
    // Alarmas activas para el estado Cold Stand By
    IF "N2"."PS-501">15 THEN
        "N2".PL50100_H := TRUE;
        "IEC_Timer_0_DB".TON(IN := TRUE,
                             PT := T#2000ms);
IF "IEC_Timer_0_DB".Q THEN
            "Variables_importantes".contador_PL501_H := "Variables_importantes".contador_PL501_H + 1;
            "IEC_Timer_0_DB".TON(IN := FALSE,
                                 PT := T#2000ms);
        END_IF;

    ELSE
        "N2".PL50100_H := FALSE;
        "Variables_importantes".contador_PL501_H := 0;
        ;
    END_IF;
```

```
IF "N2"."PS-501"<8 THEN
    "N2".PL50100_L := TRUE;
    "IEC_Timer_0_DB".TON(IN := TRUE,
                         PT := T#2000ms);
    IF "IEC_Timer_0_DB".Q THEN
       "Variables_importantes".contador_PL501_L := "Variables_importantes".contador_PL501_L+ 1;
       "IEC_Timer_0_DB".TON(IN := FALSE,
                            PT := T#2000ms);
    END_IF;
  ELSE
    "N2".PL50100_L := FALSE;
    "Variables_importantes".contador_PL501_L := 0;
  END_IF;

  IF "Variables_importantes".contador_PL501_H > 10 OR "Variables_importantes".contador_PL501_L>10 THEN
    "States".State_actual := 12;
    ;
  END_IF;
  IF "O2".TT10006 < 2 THEN
    "O2".TH_10006_L := TRUE;
  ELSE
    "O2".TH_10006_L := FALSE;
    ;
  END_IF;

IF "H2"."TT-10007" < 2 THEN
    "H2".TH_10007L := TRUE;
  ELSE
    "H2".TH_10007L := FALSE;
```

```
        ;
    END_IF;
IF "Variables_importantes"."TT-40006"<2 THEN
        "WATER_REFRIG".TH_40006_L:=TRUE;
    ELSE
        "WATER_REFRIG".TH_40006_L := FALSE;
        ;
    END_IF;
    IF "Variables_importantes"."TT-40007" < 2 THEN
        "WATER_REFRIG".TH_40007_L := TRUE;
    ELSE
        "WATER_REFRIG".TH_40007_L := FALSE;
        ;
    END_IF;

    ;
END_IF;



IF "States".State_actual=2 THEN
    // Alarmas activas para el estado  INERTIZACIÓN
    IF "N2"."PS-501" > 15 THEN
        "N2".PL50100_H := TRUE;
        "IEC_Timer_0_DB".TON(IN := TRUE,
                             PT := T#2000ms);
        IF "IEC_Timer_0_DB".Q THEN
            "Variables_importantes".contador_PL501_H :=
"Variables_importantes".contador_PL501_H + 1;
            "IEC_Timer_0_DB".TON(IN := FALSE,
                                 PT := T#2000ms);
        END_IF;
```

```
        ELSE
            "N2".PL50100_H := FALSE;
            "Variables_importantes".contador_PL501_H := 0;
            ;
        END_IF;

        IF "N2"."PS-501" < 8 THEN
            "N2".PL50100_L := TRUE;
            "IEC_Timer_0_DB".TON(IN := TRUE,
                                 PT := T#2000ms);
            IF "IEC_Timer_0_DB".Q THEN
                "Variables_importantes".contador_PL501_L :=
"Variables_importantes".contador_PL501_L + 1;
                "IEC_Timer_0_DB".TON(IN := FALSE,
                                     PT := T#2000ms);
            END_IF;
        ELSE
            "N2".PL50100_L := FALSE;
            "Variables_importantes".contador_PL501_L := 0;
        END_IF;

        IF "Variables_importantes".contador_PL501_H > 10 OR
"Variables_importantes".contador_PL501_L > 10 THEN
            "States".State_actual := 12;
            ;
```

```
    END_IF;
    IF "O2".TT10006 < 2 THEN
       "O2".TH_10006_L := TRUE;
    ELSE
       "O2".TH_10006_L := FALSE;
       ;
    END_IF;

    IF "H2"."TT-10007" < 2 THEN
       "H2".TH_10007L := TRUE;
    ELSE
       "H2".TH_10007L := FALSE;
       ;
    END_IF;

  IF "Variables_importantes"."TT-40006" < 2 THEN
       "WATER_REFRIG".TH_40006_L := TRUE;
    ELSE
       "WATER_REFRIG".TH_40006_L := FALSE;
       ;
    END_IF;
    IF "Variables_importantes"."TT-40007" < 2 THEN
       "WATER_REFRIG".TH_40007_L := TRUE;
    ELSE
       "WATER_REFRIG".TH_40007_L := FALSE;
       ;
```

```
END_IF;
IF "STACK"."TT-10200">100 THEN
   "STACK"."TI-10002" := TRUE;
ELSE
   "STACK"."TI-10002" := FALSE;
   ;
END_IF;

IF "STACK"."TT-10300">100 THEN
   "STACK"."TI-10003" := TRUE;
ELSE
   "STACK"."TI-10003" := FALSE;
   ;
END_IF;
IF "STACK".V10001>15 THEN
   "STACK"."VH-10001" := TRUE;
   "IEC_Timer_0_DB_1".TON(IN := TRUE,
                          PT := T#2000ms);
 IF "IEC_Timer_0_DB_1".Q=TRUE THEN

"STACK".Contador_sobreintensidad:="STACK".Contador_sobreintensidad+1;
          "IEC_Timer_0_DB_1".TON(IN := FALSE,
                                 PT := T#2000ms);
             END_IF;
```

```
            ELSE
            "STACK"."VH-10001" := FALSE;
            "STACK".Contador_sobreintensidad := 0;
            ;
        END_IF;

        IF "STACK".Contador_sobreintensidad=11 THEN
            "States".State_actual := 12;
            ;
        END_IF;



        ;
    END_IF;

    IF "States".State_actual=3 THEN
        // ALARMAS ACTIVAS PARA ESTADO DE CALENTAMIENTO
        IF "N2"."PS-501" > 15 THEN
            "N2".PL50100_H := TRUE;
            "IEC_Timer_0_DB".TON(IN := TRUE,
                                 PT := T#2000ms);
            IF "IEC_Timer_0_DB".Q THEN
                "Variables_importantes".contador_PL501_H                    :=
"Variables_importantes".contador_PL501_H + 1;
                "IEC_Timer_0_DB".TON(IN := FALSE,
```

```
                                PT := T#2000ms);
        END_IF;

    ELSE
        "N2".PL50100_H := FALSE;
        "Variables_importantes".contador_PL501_H := 0;
        ;
    END_IF;

IF "H2"."TT-10007" < 2 THEN
        "H2".TH_10007L := TRUE;
    ELSE
        "H2".TH_10007L := FALSE;
        ;
    END_IF;
    IF "Variables_importantes"."TT-40006" < 2 THEN
        "WATER_REFRIG".TH_40006_L := TRUE;
    ELSE
        "WATER_REFRIG".TH_40006_L := FALSE;
        ;
    END_IF;
    IF "Variables_importantes"."TT-40007" < 2 THEN
        "WATER_REFRIG".TH_40007_L := TRUE;
    ELSE
```

```
            "WATER_REFRIG".TH_40007_L := FALSE;
            ;
         END_IF;
         IF "STACK"."TT-10200" > 100 THEN
            "STACK"."TI-10002" := TRUE;
         ELSE
            "STACK"."TI-10002" := FALSE;
            ;
         END_IF;

         IF "STACK"."TT-10300" > 100 THEN
            "STACK"."TI-10003" := TRUE;
         ELSE
            "STACK"."TI-10003" := FALSE;
            ;
         END_IF;
      IF "STACK".V10001 > 15 THEN
            "STACK"."VH-10001" := TRUE;
            "IEC_Timer_0_DB_1".TON(IN := TRUE,
                                   PT := T#2000ms);
            IF "IEC_Timer_0_DB_1".Q = TRUE THEN
               "STACK".Contador_sobreintensidad                    :=
"STACK".Contador_sobreintensidad + 1;
               "IEC_Timer_0_DB_1".TON(IN := FALSE,
                                      PT := T#2000ms);
               ;
```

```
        END_IF;



    ELSE
        "STACK"."VH-10001" := FALSE;
        "STACK".Contador_sobreintensidad := 0;
        ;
    END_IF;

    IF "STACK".Contador_sobreintensidad = 11 THEN
        "States".State_actual := 12;
        ;
    END_IF;

    IF "H2".AT0001=TRUE OR "H2".AT0002=TRUE THEN
        "H2".AH00001 := TRUE;
    ELSE
        "H2".AH00001 := FALSE;
        ;
    END_IF;

//PRESION CHILLER
    IF "WATER_REFRIG"."PA-40005" OR "WATER_REFRIG"."PA-40006" THEN
        "Variables_importantes".p_chiller_nook := TRUE;
```

```
        ELSE
            "Variables_importantes".p_chiller_nook := FALSE;
            ;
        END_IF;

        ;
    END_IF;

    IF "States".State_actual = 4 OR "States".State_actual=10 THEN
        // ALARMAS ACTIVAS PARA ESTADO RAMPA
        IF "STACK".V10001 > 15 THEN
            "STACK"."VH-10001" := TRUE;
            "IEC_Timer_0_DB_1".TON(IN := TRUE,
                                   PT := T#2000ms);
            IF "IEC_Timer_0_DB_1".Q = TRUE THEN
                "STACK".Contador_sobreintensidad                    :=
"STACK".Contador_sobreintensidad + 1;
                "IEC_Timer_0_DB_1".TON(IN := FALSE,
                                       PT := T#2000ms);
                ;
            END_IF;


    ELSE
            "STACK"."VH-10001" := FALSE;
            "STACK".Contador_sobreintensidad := 0;
```

```
    ;
END_IF;

IF "STACK".Contador_sobreintensidad = 11 THEN
    "States".State_actual := 12;
    ;
    ;
END_IF;
IF "STACK".V10001<12 THEN
    "IEC_Timer_0_DB_2".TON(IN := TRUE,
                           PT := T#60s);
    IF "IEC_Timer_0_DB_2".Q=TRUE THEN
        "States".State_actual:=12;
        ;
    END_IF;
ELSE
    "IEC_Timer_0_DB_2".TON(IN := FALSE,
                           PT := T#60s);

    ;
END_IF;
IF "STACK".V10001>13 AND "STACK".V10001<13.5 THEN
    "STACK".VI_CORRECT := TRUE;
ELSE
```

```
            "STACK".VI_CORRECT := FALSE;
            ;
        END_IF;

    IF "States".State_actual=5 THEN
        // ALARMAS PARA EL ESTADO DE VENTEO
        IF "N2"."PS-501" > 15 THEN
            "N2".PL50100_H := TRUE;
            "IEC_Timer_0_DB".TON(IN := TRUE,
                                 PT := T#2000ms);
            IF "IEC_Timer_0_DB".Q THEN
                "Variables_importantes".contador_PL501_H :=
"Variables_importantes".contador_PL501_H + 1;
                "IEC_Timer_0_DB".TON(IN := FALSE,
                                     PT := T#2000ms);
            END_IF;

        ELSE
            "N2".PL50100_H := FALSE;
            "Variables_importantes".contador_PL501_H := 0;
            ;
        END_IF;

        IF "N2"."PS-501" < 8 THEN
            "N2".PL50100_L := TRUE;
            "IEC_Timer_0_DB".TON(IN := TRUE,
```

```
                    PT := T#2000ms);
        IF "IEC_Timer_0_DB".Q THEN
            "Variables_importantes".contador_PL501_L := "Variables_importantes".contador_PL501_L + 1;
            "IEC_Timer_0_DB".TON(IN := FALSE,
                    PT := T#2000ms);
        END_IF;
    ELSE
        "N2".PL50100_L := FALSE;

        "Variables_importantes".contador_PL501_L := 0;
    END_IF;

    IF "Variables_importantes".contador_PL501_H > 10 OR "Variables_importantes".contador_PL501_L > 10 THEN
        "States".State_actual := 12;
        ;
    END_IF;
    IF "O2".TT10006 < 2 THEN
        "O2".TH_10006_L := TRUE;
    ELSE
        "O2".TH_10006_L := FALSE;
        ;
    END_IF;
```

```
        IF "H2"."TT-10007" < 2 THEN
            "H2".TH_10007L := TRUE;
        ELSE
            "H2".TH_10007L := FALSE;
            ;
        END_IF;
        IF "Variables_importantes"."TT-40006" < 2 THEN
            "WATER_REFRIG".TH_40006_L := TRUE;
        ELSE
            "WATER_REFRIG".TH_40006_L := FALSE;
            ;
        END_IF;
        IF "Variables_importantes"."TT-40007" < 2 THEN
            "WATER_REFRIG".TH_40007_L := TRUE;
        ELSE
      IF "States".State_actual = 6 OR "States".State_actual=7 THEN
        // ALARMAS PARA EL ESTADO DE PRESURIZACIÓN
        IF "N2"."PS-501" > 15 THEN
            "N2".PL50100_H := TRUE;
            "IEC_Timer_0_DB".TON(IN := TRUE,
                                 PT := T#2000ms);
            IF "IEC_Timer_0_DB".Q THEN
                "Variables_importantes".contador_PL501_H :=
"Variables_importantes".contador_PL501_H + 1;
                "IEC_Timer_0_DB".TON(IN := FALSE,
                                     PT := T#2000ms);
```

```
        END_IF;


    ELSE
        "N2".PL50100_H := FALSE;
        "Variables_importantes".contador_PL501_H := 0;
        ;
    END_IF;


    IF "N2"."PS-501" < 8 THEN
        "N2".PL50100_L := TRUE;
        "IEC_Timer_0_DB".TON(IN := TRUE,
                             PT := T#2000ms);
        IF "IEC_Timer_0_DB".Q THEN
            "Variables_importantes".contador_PL501_L :=
"Variables_importantes".contador_PL501_L + 1;
            "IEC_Timer_0_DB".TON(IN := FALSE,
                                 PT := T#2000ms);
        END_IF;
    ELSE
        "N2".PL50100_L := FALSE;
        "Variables_importantes".contador_PL501_L := 0;
    END_IF;


    IF "Variables_importantes".contador_PL501_H > 10 OR
"Variables_importantes".contador_PL501_L > 10 THEN
```

```
    "States".State_actual := 12;
    ;
END_IF;
IF "O2".TT10006 < 2 THEN
    "O2".TH_10006_L := TRUE;
ELSE
    "O2".TH_10006_L := FALSE;
    ;
END_IF;

IF "H2"."TT-10007" < 2 THEN
    "H2".TH_10007L := TRUE;
ELSE
    "H2".TH_10007L := FALSE;
    ;
END_IF;
IF "Variables_importantes"."TT-40006" < 2 THEN
    "WATER_REFRIG".TH_40006_L := TRUE;
ELSE
    "WATER_REFRIG".TH_40006_L := FALSE;
    ;
END_IF;
IF "Variables_importantes"."TT-40007" < 2 THEN
    "WATER_REFRIG".TH_40007_L := TRUE;
ELSE
    "WATER_REFRIG".TH_40007_L := FALSE;
```

```
    ;
END_IF;
IF "STACK"."TT-10200" > 100 THEN
    "STACK"."TI-10002" := TRUE;
ELSE
    "STACK"."TI-10002" := FALSE;
    ;
END_IF;

IF "STACK"."TT-10300" > 100 THEN
    "STACK"."TI-10003" := TRUE;
ELSE
    "STACK"."TI-10003" := FALSE;
    ;
END_IF;

IF "STACK".V10001 > 15 THEN
    "STACK"."VH-10001" := TRUE;
    "IEC_Timer_0_DB_1".TON(IN := TRUE,
                           PT := T#2000ms);
    IF "IEC_Timer_0_DB_1".Q = TRUE THEN
        "STACK".Contador_sobreintensidad := "STACK".Contador_sobreintensidad + 1;
        "IEC_Timer_0_DB_1".TON(IN := FALSE,
                               PT := T#2000ms);
```

```
            ;
        END_IF;
    "WATER_REFRIG".TH_40007_L := FALSE;
        ;
    END_IF;
    IF "STACK"."TT-10200" > 100 THEN
        "STACK"."TI-10002" := TRUE;
    ELSE
        "STACK"."TI-10002" := FALSE;
        ;
    END_IF;

    IF "STACK"."TT-10300" > 100 THEN
        "STACK"."TI-10003" := TRUE;
    ELSE
        "STACK"."TI-10003" := FALSE;
        ;
    END_IF;

    IF "STACK".V10001 > 15 THEN
        "STACK"."VH-10001" := TRUE;
        "IEC_Timer_0_DB_1".TON(IN := TRUE,
                               PT := T#2000ms);
        IF "IEC_Timer_0_DB_1".Q = TRUE THEN
            "STACK".Contador_sobreintensidad                    :=
"STACK".Contador_sobreintensidad + 1;
```

```
            "IEC_Timer_0_DB_1".TON(IN := FALSE,
                                   PT := T#2000ms);
            ;
        END_IF;



    ELSE
        "STACK"."VH-10001" := FALSE;
        "STACK".Contador_sobreintensidad := 0;
        ;
    END_IF;

    IF "STACK".Contador_sobreintensidad = 11 THEN
        "States".State_actual := 12;
        ;
    END_IF;

    IF "H2".AT0001 = TRUE OR "H2".AT0002 = TRUE THEN
        "H2".AH00001 := TRUE;
    ELSE
        "H2".AH00001 := FALSE;
        ;
    END_IF;
    //PRESION CHILLER
```

```
        IF "WATER_REFRIG"."PA-40005" OR "WATER_REFRIG"."PA-40006" THEN
            "Variables_importantes".p_chiller_nook := TRUE;
        ELSE
            "Variables_importantes".p_chiller_nook := FALSE;
            ;
        END_IF;
        // SEPARADORES Y BURBUJEADORES
        IF "H2"."LT-10001" + "O2"."LT-10002"<115 OR "H2"."DT-10001"+"O2"."DT-
10002"<115 THEN
            "H2".LL00001 := TRUE;
        ELSE
            "H2".LL00001 := FALSE;
            ;
        END_IF;
    ELSE
            "STACK"."VH-10001" := FALSE;
            "STACK".Contador_sobreintensidad := 0;
            ;
        END_IF;

        IF "STACK".Contador_sobreintensidad = 11 THEN
            "States".State_actual := 12;
            ;
        END_IF;

        IF "H2".AT0001 = TRUE OR "H2".AT0002 = TRUE THEN
```

```
        "H2".AH00001 := TRUE;
    ELSE
        "H2".AH00001 := FALSE;
        ;
    END_IF;
    //PRESION CHILLER
    IF "WATER_REFRIG"."PA-40005" OR "WATER_REFRIG"."PA-40006" THEN
        "Variables_importantes".p_chiller_nook := TRUE;
    ELSE
        "Variables_importantes".p_chiller_nook := FALSE;
        ;
    END_IF;
    // SEPARADORES Y BURBUJEADORES
    IF "H2"."LT-10001" + "O2"."LT-10002" < 115 OR "H2"."DT-10001" + "O2"."DT-
10002" < 115 THEN
        "H2".LL00001 := TRUE;
    ELSE
        "H2".LL00001 := FALSE;
        ;
    END_IF;
    IF "H2"."LT-10001" + "O2"."LT-10002" > 125 OR "H2"."DT-10001" + "O2"."DT-
10002" > 125 THEN
        "H2".LH00001 := TRUE;
    ELSE
        "H2".LH00001 := FALSE;
```

```
    ;
END_IF;
IF "H2".LT10003 > 60 THEN
    "H2".LA10003 := TRUE;
ELSE
    "H2".LA10003 := FALSE
    ;
END_IF;

IF "O2".LT10004 > 60 THEN
    "O2".LA10004 := TRUE;
ELSE
    "O2".LA10004 := FALSE;
    ;
END_IF;

//NIVEL DE PUREZA BAJO
IF "H2"."AT-30001"<98.0 THEN
    "H2".AC10003 := TRUE;
ELSE
    "H2".AC10003 := FALSE;
    ;
END_IF;

IF "O2"."AT-30012"<98.0 THEN
    "O2".AC10004 := TRUE;
```

```
        ELSE
            "O2".AC10004 := FALSE;
            ;
        END_IF;
        IF "Demi_Water".FT10002<2 THEN
            "Demi_Water".FL10002 := TRUE;
        ELSE
            "Demi_Water".FL10002 := FALSE;
        END_IF;

        ;
    END_IF;

    IF "States".State_actual = 8 THEN
        // ALARMAS PARA ESTADO RAMPA_BAJADA
        IF "STACK".V10001 > 12 THEN
            "STACK"."VH-10001" := TRUE;
            "IEC_Timer_0_DB_3".TON(IN := TRUE,
      PT := T#2000ms);
            IF "IEC_Timer_0_DB_3".Q = TRUE THEN
                "STACK".Contador_infraintensidad := "STACK".Contador_infraintensidad
+ 1;
                "IEC_Timer_0_DB_3".TON(IN := FALSE,
          PT := T#2000ms);
                ;
```

```
    END_IF;



ELSE
    "STACK"."VH-10001" := FALSE;
    "STACK".Contador_infraintensidad := 0;
    ;
END_IF;

IF "STACK".Contador_infraintensidad = 11 THEN
    "States".State_actual := 12;
    ;
    ;
END_IF;
IF "STACK".V10001 > 2 THEN
    "IEC_Timer_0_DB_3".TON(IN := TRUE,
PT := T#60s);
    IF "IEC_Timer_0_DB_3".Q = TRUE THEN
        "States".State_actual := 12;
        ;
    END_IF;
ELSE
    "IEC_Timer_0_DB_3".TON(IN := FALSE,
PT := T#60s);


    ;
```

```
            ;
        END_IF;
    END_IF;

    IF "States".State_actual=9 THEN
        // ALARMAS PARA EL ESTADO DE HOT-STAND-BY PARECIDOS A COLD STAND BY + CONTROL DE VOLTAJE
        IF "N2"."PS-501" > 15 THEN
            "N2".PL50100_H := TRUE;
            "IEC_Timer_0_DB".TON(IN := TRUE,
                                 PT := T#2000ms);
            IF "IEC_Timer_0_DB".Q THEN
                "Variables_importantes".contador_PL501_H := "Variables_importantes".contador_PL501_H + 1;
                "IEC_Timer_0_DB".TON(IN := FALSE,
                                     PT := T#2000ms);
            END_IF;

        ELSE
            "N2".PL50100_H := FALSE;
            "Variables_importantes".contador_PL501_H := 0;
            ;
        END_IF;

        IF "N2"."PS-501" < 8 THEN
```

```
            "N2".PL50100_L := TRUE;
            "IEC_Timer_0_DB".TON(IN := TRUE,
                                 PT := T#2000ms);
            IF "IEC_Timer_0_DB".Q THEN
               "Variables_importantes".contador_PL501_L := "Variables_importantes".contador_PL501_L + 1;
               "IEC_Timer_0_DB".TON(IN := FALSE,
                                    PT := T#2000ms);
            END_IF;
         ELSE
            "N2".PL50100_L := FALSE;
            "Variables_importantes".contador_PL501_L := 0;
         END_IF;

         IF "Variables_importantes".contador_PL501_H > 10 OR "Variables_importantes".contador_PL501_L > 10 THEN
            "States".State_actual := 12;
            ;
         END_IF;
         IF "O2".TT10006 < 2 THEN
            "O2".TH_10006_L := TRUE;
         ELSE
            "O2".TH_10006_L := FALSE;
            ;
         END_IF;

         IF "H2"."TT-10007" < 2 THEN
```

```
        "H2".TH_10007L := TRUE;
    ELSE
        "H2".TH_10007L := FALSE;
        ;
    END_IF;
    IF "Variables_importantes"."TT-40006" < 2 THEN
        "WATER_REFRIG".TH_40006_L := TRUE;
    ELSE
        "WATER_REFRIG".TH_40006_L := FALSE;
        ;
    END_IF;
    IF "Variables_importantes"."TT-40007" < 2 THEN
        "WATER_REFRIG".TH_40007_L := TRUE;
    ELSE
        "WATER_REFRIG".TH_40007_L := FALSE;
        ;
    END_IF;
    IF "STACK".V10001 > 15 THEN
        "STACK"."VH-10001" := TRUE;
        "IEC_Timer_0_DB_1".TON(IN := TRUE,
                               PT := T#2000ms);
        IF "IEC_Timer_0_DB_1".Q = TRUE THEN
            "STACK".Contador_sobreintensidad := "STACK".Contador_sobreintensidad + 1;
            "IEC_Timer_0_DB_1".TON(IN := FALSE,
```

```
                        PT := T#2000ms);
        ;
    END_IF;



ELSE
    "STACK"."VH-10001" := FALSE;
    "STACK".Contador_sobreintensidad := 0;
    ;
END_IF;

IF "STACK".Contador_sobreintensidad = 11 THEN
    "States".State_actual := 12;
    ;
END_IF;
;
END_IF;

IF "States".State_actual=11 THEN
    IF "H2"."PT-10100" > 2 THEN
        "IEC_Timer_0_DB_3".TON(IN := TRUE,
                        PT := T#300s);
        IF "IEC_Timer_0_DB_3".Q = TRUE THEN
            "States".State_actual := 12;
            ;
        END_IF;
```

```
        ELSE
           "IEC_Timer_0_DB_3".TON(IN := FALSE,
                                  PT := T#300s);


           ;
           ;
        END_IF;
        IF "O2"."PT-10200" > 2 THEN
           "IEC_Timer_0_DB_2".TON(IN := TRUE,
                                  PT := T#300s);
           IF "IEC_Timer_0_DB_2".Q = TRUE THEN
              "States".State_actual := 12;
              ;
           END_IF;
        ELSE
           "IEC_Timer_0_DB_2".TON(IN := FALSE,
                                  PT := T#300s);


           ;
           ;
        END_IF;
        ;
     END_IF;
     IF "H2"."LT-10001" + "O2"."LT-10002" > 125 OR "H2"."DT-10001" + "O2"."DT-
10002" > 125 THEN
```

```
        "H2".LH00001 := TRUE;
    ELSE
        "H2".LH00001 := FALSE;
        ;
    END_IF;
    //NIVEL ALTO EN BURBUJEADOR
    IF "H2".LT10003>60 THEN
        "H2".LA10003 := TRUE;
    ELSE
        "H2".LA10003:=FALSE
        ;
    END_IF;

    IF "O2".LT10004 > 60 THEN
        "O2".LA10004 := TRUE;
    ELSE
        "O2".LA10004 := FALSE;
        ;
    END_IF;

END_IF;
```

1.3. E0_APAGADO

```
//O2
"O2".VO10007:=FALSE;
```

```
"O2".VO10005 := FALSE;
"O2".VO10006 := FALSE;
"O2".VO100011 := FALSE;
"O2".VO30002 := FALSE;
"O2".LA10004 := FALSE;
"O2".LL00002 := FALSE;
"O2".LS10002A := FALSE;
"O2".LS10002B := FALSE;
"O2".TH_10006_L := FALSE;


// H2
"H2".VO10008 := FALSE;
"H2".VO10009 := FALSE;
"H2".VO100012 := FALSE;
"H2".AC10003 := FALSE;
"H2".AH00001 := FALSE;
"H2".LA10003 := FALSE;
"H2".LH00001 := FALSE;
"H2".LL00001 := FALSE;
"H2"."LS-10001A" := FALSE;
"H2"."LS-10001B" := FALSE;
"H2"."LS-10003A" := FALSE;
"H2"."LS-10003B" := FALSE;
```

```
"H2".TH_10007L := false;
"H2".VO30001 := FALSE;




// DEMIWATER
"Demi_Water".VO10010:=FALSE;
"Demi_Water".FL10002 := FALSE;
"Demi_Water"."LS-10008" := FALSE;
"Demi_Water"."LS-10009" := FALSE;
"Demi_Water"."P-102_Bool" := FALSE;

//KOH
"KOH"."P-101_Bool" := FALSE;

// N2
"N2".VO10001 := FALSE;
"N2".VO10002 := FALSE;
"N2".PL50100_H := FALSE;
"N2".PL50100_L := FALSE;
"N2".VO30003 := FALSE;
"N2".VO30004 := FALSE;

// STACK
"STACK".V10001:=0;
"STACK".Contador_infraintensidad := 0;
```

```
"STACK".Contador_sobreintensidad := 0;
"STACK".Contador_sobreintensidad2 := 0;
"STACK"."TI-10001" := FALSE;
"STACK"."TI-10002" := FALSE;
"STACK"."TI-10003" := FALSE;
"STACK".VI_CORRECT := FALSE;
"STACK"."VH-10001" := FALSE;

//SCADA
"SCADA".Apagado := FALSE;
"SCADA".Calentamiento := FALSE;
"SCADA".ENCENDIDO_OFF := FALSE;
"SCADA".HOT_STAND_BY := FALSE;
"SCADA".Operacion := FALSE;
"SCADA".RESTART := FALSE;
"SCADA"."RETURN" := FALSE;
"SCADA".Stand_BY := FALSE;
"SCADA".START := FALSE;
"SCADA".STOP := FALSE;

//WATER REFRIG.
"WATER_REFRIG"."COOLER-402" := FALSE;
"WATER_REFRIG"."P-103_Bool" := FALSE;
"WATER_REFRIG"."PA-40005" := FALSE;
```

"WATER_REFRIG"."PA-40006" := FALSE;

"WATER_REFRIG".TH_40006_L := FALSE;

"WATER_REFRIG".TH_40007_L := FALSE;

1.4. E1_COLD_STAND_BY

// CONTROL CAUDAL KOH ACTIVADO

//BOMBA P-1 := TRUE

"Variables_importantes"."Setpoint.P-01" := 2;// 25% del peso de la disolucion

"KOH"."P-101_Bool" := TRUE;

"Demi_Water"."P-102_Bool":=TRUE;

"CONTROL BOMBA 2"(Setpoint:="Variables_importantes"."Setpoint P-02",
Input:="Demi_Water".FT10002, // CAMBIAR FT DESPUES DE BOMBA
Output=>"Demi_Water"."P-102_OUT");

"CONTROL BOMBA 1"(Setpoint:="Variables_importantes"."Setpoint.P-01",
Input:="KOH"."FT-101",
Output=>"KOH"."P-101_OUT");

IF "KOH"."FT-101"*0.9 > "Variables_importantes"."Setpoint.P-01" AND "KOH"."FT-101"*1.1 < "Variables_importantes"."Setpoint.P-01" THEN

"Variables_importantes"."Setpoint P-02" := 8; // Agua

```
    ELSE
        "Variables_importantes"."Setpoint P-02" := 12; // Agua
        ;
    END_IF;

    // CONTROL DE TEMPERATURA
    IF "KOH"."TT-10005">90 THEN
        "CONTROL_BOMBA_3"(Setpoint := "Variables_importantes"."Setpoint P-03",
                          Input := "WATER_REFRIG".FT10300,
                          Output => "WATER_REFRIG"."P-103_OUT");

        ;
    "WATER_REFRIG"."COOLER-402" := TRUE;
    ELSE
    "WATER_REFRIG"."COOLER-402" := FALSE;
    END_IF;

    IF "STACK"."TT-10100" > 87 OR "STACK"."TT-10200" > 87 OR "STACK"."TT-10300" > 87 THEN
        "WATER_REFRIG"."P-103_Bool" := TRUE;
        "CONTROL_BOMBA_3"(Setpoint := "Variables_importantes"."Setpoint P-03",
                          Input := "WATER_REFRIG".FT10300,
                          Output => "WATER_REFRIG"."P-103_OUT");
    ELSE
        "WATER_REFRIG"."P-103_Bool" := FALSE;
```

```
    ;
END_IF;

// CONTROL N2 PRESION NECESARIO INERTIZADO Y NO FUGAS

IF "N2"."FS-501"=TRUE THEN
    "States".State_actual := 12; // AL ESTADO DE EMERGENCIA
    ;
END_IF;

// CONDICIONES GENERALES PARA PASAR DE ESTADO
IF "N2"."FS-501"=FALSE AND "STACK".V10001<1 AND "N2"."PS-501">8 AND "N2"."PS-501"<15 THEN
    "States".Gen_cond_1_2 := TRUE;
    ;
END_IF;
```

1.5. E2_INERTIZACION

```
IF "H2"."PT-10100" < 4.5 AND "O2"."PT-10200" < 4.5 AND "Variables_importantes".ciclos_inert<11 AND "Variables_importantes".turno_presu=FALSE THEN
    "N2".VO10001 := TRUE;
    "N2".VO10002 := TRUE;
    "N2".VO30003 := TRUE;
    "N2".VO30004 := TRUE;
    "H2".VO30001 := FALSE;
    "H2".VO100012 := TRUE;
```

```
        "O2".VO100011 := TRUE;
        "H2".VO10003 := 0;
        "O2".VO10004 := 0;
        IF "H2"."PT-10100">1.1* "O2"."PT-10200" OR "O2"."PT-10200"> 1.1 * "H2"."PT-10100" THEN
            "N2".VO10001 := TRUE;
            "N2".VO10002 := FALSE;
            ;
        END_IF;
        ;
    END_IF;
    IF "H2"."PT-10100" > 4.49 AND "O2"."PT-10200" > 4.49 AND "Variables_importantes".turno_presu=FALSE THEN
        "Variables_importantes".turno_presu := TRUE;
        "Variables_importantes".ciclos_inert := "Variables_importantes".ciclos_inert + 1;
        ;
    END_IF;
    IF "H2"."PT-10100" > 1.6 AND "O2"."PT-10200" > 1.6 AND "Variables_importantes".ciclos_inert < 11 AND "Variables_importantes".turno_presu = TRUE THEN

        "N2".VO30003 := TRUE;
        "N2".VO30004 := TRUE;
        "N2".VO10001 := FALSE;
        "N2".VO10002 := FALSE;
```

```
        "H2".VO100012 := TRUE;
        "O2".VO100011 := TRUE;
        "H2".VO30001 := FALSE;
        IF "H2"."DT-10001" + "O2"."DT-10002">125 OR "H2"."LT-10001" + "O2"."LT-
10002">125 THEN
           "H2".VO10003 := 100;
           "O2".VO10004 := 100;
           ;
        END_IF;
        IF  "H2"."DT-10001" + "O2"."DT-10002"<115 OR "H2"."LT-10001" + "O2"."LT-
10002"<115 THEN
           "H2".VO10003 := 0;
           "O2".VO10004 := 0;
           ;
        END_IF;



        ;
    END_IF;

    IF "H2"."PT-10100" < 1.61 AND "O2"."PT-10200" < 1.61 AND
"Variables_importantes".turno_presu = TRUE THEN
        "Variables_importantes".turno_presu := FALSE;

        ;
    END_IF;
```

```
IF "Variables_importantes".ciclos_inert = 11 AND "H2"."PT-10100" > 0.61 AND "O2"."PT-10200" > 0.61 THEN
    // Tratamos de rebajar la presion a 0.6 bares para pasar al siguiente estado .
    "H2".VO10003 := 100;
    "O2".VO10004 := 100;
    "H2".VO100012 := TRUE;
    "O2".VO100011 := TRUE;
    "Variables_importantes".ciclos_OK := TRUE;
    ;
END_IF;
// NO CONTROL DE KOH NI DE TEMPERATURA .
// CONDICIONES GENERALES PARA EL PASO DE ESTADO
IF "N2"."FS-501"=FALSE AND "STACK".V10001<1 AND "KOH"."FT-101">0.9*"Variables_importantes"."Setpoint.P-01" AND "KOH"."FT-101"< 1.1 *"Variables_importantes"."Setpoint.P-01" THEN
    "States".Gen_cond_2_3 := TRUE;

END_IF;
```

1.6. E3_CALENTAMIENTO

```
// En este estado bombeo de potasa continuo.
"CONTROL BOMBA 1"(Setpoint:="Variables_importantes"."Setpoint.P-01",
                  Input:="KOH"."FT-101",
                  Output=>"KOH"."P-101_OUT");
```

```
// ALARMA DE QUE SINO 0.9-1.1 CAUDAL KOH BAJO .



IF "KOH"."TT-10005" > 90 THEN
   "CONTROL_BOMBA_3"(Setpoint := "Variables_importantes"."Setpoint P-03",
                     Input := "WATER_REFRIG".FT10300,
                     Output => "WATER_REFRIG"."P-103_OUT");


   ;
END_IF;

IF "STACK"."TT-10200" > 87 OR "STACK"."TT-10300">87 THEN
   "Variables_importantes"."EH-101" := FALSE;
ELSE
   "Variables_importantes"."EH-101" := TRUE;
   ;
END_IF;

IF "STACK"."TT-10200" < 87 AND "STACK"."TT-10300"<87 AND "STACK"."TT-
10200">80 AND "STACK"."TT-10300">80 AND "KOH"."TT-10005" < 90  THEN
   "States".Gen_cond_3_4 := TRUE;
ELSE
   "States".Gen_cond_3_4 := FALSE;
   ;
END_IF;
```

1.7. E4_RAMPA_SUBIDA_INTENSIDAD

```
IF "Variables_importantes".Contador_rampa< 101 THEN
    "Variables_importantes".Contador_rampa_real := "Variables_importantes".Contador_rampa;
    "STACK".V10001 := (0.106 * "Variables_importantes".Contador_rampa_real) + (2.65);
    // RETARDO TEMPORIZADOR
    "IEC_Timer_0_DB".TON(IN := TRUE,
                         PT := T#200ms);
    IF "IEC_Timer_0_DB".Q THEN
      "Variables_importantes".Contador_rampa := "Variables_importantes".Contador_rampa + 1;
      "IEC_Timer_0_DB".TON(IN := FALSE,
                           PT := T#200ms);

    END_IF;

END_IF;
```

1.8. E5_VENTEO

```
// ESTE ESTADO CONSTA DE CICLOS PEQUEÑOS DE PRESURIZACION Y DESPRESURIZACION
"H2".VO100012 := TRUE;
"O2".VO100011 := TRUE;
```

```
"N2".VO30003 := FALSE;
"N2".VO30004 := FALSE;

IF "H2"."PT-10100">4.49 AND "O2"."PT-10200">4.49 AND "Variables_importantes".turno_presu=FALSE AND "Variables_importantes".ciclos_venteo<11 THEN
    "H2".VO10003 := 100;
    "O2".VO10004 := 100;
    "Variables_importantes".turno_presu := TRUE;
    ;
END_IF;

IF "H2"."PT-10100" < 1.61 AND "O2"."PT-10200" < 1.61 AND "Variables_importantes".turno_presu = TRUE AND "Variables_importantes".ciclos_venteo < 11 THEN
    "H2".VO10003 := 100;
    "O2".VO10004 := 100;
    "Variables_importantes".turno_presu := FALSE;
    "Variables_importantes".ciclos_venteo := "Variables_importantes".ciclos_venteo + 1;
    ;
END_IF;

// CONTROL DE SEPARADORES
IF "H2"."LT-10001" + "O2"."LT-10002" < 125 AND "H2"."LT-10001" + "O2"."LT-10002" > 115 AND "H2"."DT-10001" + "O2"."DT-10002" < 125 AND "H2"."DT-10001" + "O2"."DT-10002" > 115 AND
```

```
        "H2"."LT-10001" - "O2"."LT-10002" < 10 AND "O2"."LT-10002" - "H2"."LT-10001" < 10 AND "H2"."DT-10001" - "O2"."DT-10002" < 10 AND "O2"."DT-10002" - "H2"."DT-10001" < 10  THEN
            #separados5_ok := TRUE;
        ELSE
            #separados5_ok:=FALSE
            ;
        END_IF;

        // COND GENERALES PARA PASAR DE ESTADO .
        IF "STACK".V10001>13 AND "STACK".V10001<13.5 AND "N2"."FS-501"=FALSE AND "KOH"."FT-101">0.9*"Variables_importantes"."Setpoint.P-01" AND "KOH"."FT-101"< 1.1 *"Variables_importantes"."Setpoint.P-01"
            AND #separados5_ok=TRUE AND "STACK"."TT-10100" < 87 AND "STACK"."TT-10200" < 87   THEN
            "States".Gen_cond_5_6 := TRUE;
        ELSE
            "States".Gen_cond_5_6 := FALSE;
            ;
        END_IF;
```

1.9. E6_PRESURIZACIÓN

```
        "H2".VO10003 := 0;
        "O2".VO10004 := 0;
```

```
// Se pretende llegar a 12-12,5 bares para empezar la operación .
IF "H2"."PT-10100">12 AND "H2"."PT-10100"<12.5 AND "O2"."PT-10200">12 AND "O2"."PT-10200">12.5THEN
    "Variables_importantes".Presu_ok_presurizacion := TRUE;
ELSE
    "Variables_importantes".Presu_ok_presurizacion := FALSE;
    ;
END_IF;

IF ("H2"."LT-10001"<60 OR "O2"."LT-10002"<60) AND ("H2"."DT-10001"<60 OR "O2"."DT-10002"<60)  THEN
    "O2".VO10005 := TRUE; //Es condensado de OW no del todo O2
    // Statement section IF
    ;
END_IF;

// CONTROL DE SEPARADORES
IF "H2"."LT-10001" + "O2"."LT-10002" < 125 AND "H2"."LT-10001" + "O2"."LT-10002" > 115 AND "H2"."DT-10001" + "O2"."DT-10002" < 125 AND "H2"."DT-10001" + "O2"."DT-10002" > 115 AND
    "H2"."LT-10001" - "O2"."LT-10002" < 10 AND "O2"."LT-10002" - "H2"."LT-10001" < 10 AND "H2"."DT-10001" - "O2"."DT-10002" < 10 AND "O2"."DT-10002" - "H2"."DT-10001" < 10 THEN

    #separados6_ok := TRUE;
ELSE
    #separados6_ok := FALSE
```

```
    ;
END_IF;

IF "STACK".V10001>13 AND "STACK".V10001<13.5 AND "N2"."FS-501"=FALSE AND "KOH"."FT-101">0.9*"Variables_importantes"."Setpoint.P-01" AND "KOH"."FT-101"< 1.1 *"Variables_importantes"."Setpoint.P-01"
    AND #separados6_ok=TRUE AND "STACK"."TT-10100" < 87 AND "STACK"."TT-10200" < 87 AND "KOH"."TT-10005">90 AND "Variables_importantes".Presu_ok_presurizacion=TRUE AND "O2"."AT-30012">99.0 AND "H2"."AT-30001">99.0 THEN
        "States".Gen_cond_6_7 := TRUE;
    ELSE
        "States".Gen_cond_6_7 := FALSE;
    ;
END_IF;
```

1.10. E7_OPERACIÓN

```
// ESTADO OPERACION , EL ESTADOMAS IMPORTANTE
// MONOTORIZA POTENCIA DEL STACK DEL 10 - 100% DE POTENCIA

IF "FT-102"<12 THEN
    "O2".VO10005 := TRUE;
ELSE
    "O2".VO10005 := FALSE;
    ;
```

```
END_IF;


IF "H2"."LT-10001" + "O2"."LT-10002" < 125 AND "H2"."LT-10001" + "O2"."LT-10002" > 115 AND "H2"."DT-10001" + "O2"."DT-10002" < 125 AND "H2"."DT-10001" + "O2"."DT-10002" > 115 AND
   "H2"."LT-10001" - "O2"."LT-10002" < 10 AND "O2"."LT-10002" - "H2"."LT-10001" < 10 AND "H2"."DT-10001" - "O2"."DT-10002" < 10 AND "O2"."DT-10002" - "H2"."DT-10001" < 10 THEN
   #separados7_ok := TRUE;
ELSE
   #separados7_ok := FALSE
   ;
END_IF;


//EN BURBUJEADOR:
IF "Demi_Water".CT10003 > 30000 OR "Demi_Water".CT10004>30000 THEN
   "O2".VO10006 := TRUE;
   "O2".VO10007 := TRUE;
   IF "H2"."LS-10003A"=TRUE THEN


   "H2".VO10008 := FALSE;
   "H2".VO10009:=FALSE
   ;
END_IF;
IF "H2"."LS-10003B"=TRUE THEN
   "H2".VO10008 := FALSE;
   "H2".VO10009 := TRUE
```

```
        ;
        ;
    END_IF;
    IF "O2".LS10004A=TRUE THEN
        "O2".VO10007 := FALSE;
        "O2".VO10006 := FALSE;
        ;
    END_IF;
    IF "O2".LS10004B=TRUE THEN
        "O2".VO10007 := TRUE;
        "O2".VO10006 := FALSE;
        ;
    END_IF;




        ;
    END_IF;

    // EN TANQUE DE CONDENSACIÓN. V108
        IF  "Demi_Water"."LS-10008"=FALSE  AND  "Demi_Water"."LS-10009"=FALSE
THEN
            "Demi_Water".VO10010 := TRUE;


        END_IF;
```

```
        IF  "Demi_Water"."LS-10008"=TRUE  AND  "Demi_Water"."LS-10009"=FALSE
THEN
           "Demi_Water".VO10010 := TRUE;
           ;
        END_IF;

        IF  "Demi_Water"."LS-10008"=TRUE  AND  "Demi_Water"."LS-10009"=TRUE
THEN
           "Demi_Water".VO10010 := FALSE;
           ;
        END_IF;


        //PARA EL DEPOSITO TOMA MUESTRAS .
     IF "O2".LS10000=TRUE THEN
        "O2".VO30002 := TRUE;
     ELSE
        "O2".VO30002:=FALSE
        ;
     END_IF;
```

IF "STACK".V10001 > 13 AND "STACK".V10001 < 13.5 AND "N2"."FS-501" = FALSE AND "KOH"."FT-101" > 0.9 * "Variables_importantes"."Setpoint.P-01" AND "KOH"."FT-101" < 1.1 * "Variables_importantes"."Setpoint.P-01"AND #separados7_ok = TRUE AND "STACK"."TT-10100" < 87 AND "STACK"."TT-10200" < 87 AND "KOH"."TT-10005" > 90 AND "O2"."AT-30012">99.0 AND "H2"."AT-30001">99.0 THEN

```
    "States".Gen_cond_7_8 := TRUE;
ELSE
    "States".Gen_cond_7_8 := FALSE;
    ;
END_IF;

  //ACTIVAMOS LAS BOMBAS
"CONTROL_BOMBA_3"(Setpoint := "Variables_importantes"."Setpoint P-03",
                  Input := "WATER_REFRIG".FT10300,
                  Output => "WATER_REFRIG"."P-103_OUT");

"CONTROL BOMBA 2"(Setpoint := "Variables_importantes"."Setpoint P-02",
                  Input := "Demi_Water".FT10002,
                  Output => "Demi_Water"."P-102_OUT");


"CONTROL BOMBA 1"(Setpoint := "Variables_importantes"."Setpoint.P-01",
                  Input := "KOH"."FT-101",
                  Output => "KOH"."P-101_OUT");
```

1.11. E8_RAMPA_BAJADA_INTENSIDAD

```
IF "Variables_importantes".Contador_rampa_baj > 0 THEN
    "Variables_importantes".Contador_rampa_real_baj := "Variables_importantes".Contador_rampa_baj;
```

```
        "STACK".V10001 := (0.106 * "Variables_importantes".Contador_rampa_real_baj) + (2.65);
        // RETARDO TEMPORIZADOR
        "IEC_Timer_0_DB".TON(IN := TRUE,
                             PT := T#200ms);
        IF "IEC_Timer_0_DB".Q THEN
           "Variables_importantes".Contador_rampa_baj := "Variables_importantes".Contador_rampa_baj -1 ;
           "IEC_Timer_0_DB".TON(IN := FALSE,
                                PT := T#200ms);

        END_IF;

    END_IF;



    IF "Variables_importantes".Contador_rampa_baj=0 THEN
        "STACK".V10001 := 0;
        ;
    END_IF;

    IF "H2"."LT-10001" + "O2"."LT-10002" < 125 AND "H2"."LT-10001" + "O2"."LT-10002" > 115 AND "H2"."DT-10001" + "O2"."DT-10002" < 125 AND "H2"."DT-10001" + "O2"."DT-10002" > 115 AND
        "H2"."LT-10001" - "O2"."LT-10002" < 10 AND "O2"."LT-10002" - "H2"."LT-10001" < 10 AND "H2"."DT-10001" - "O2"."DT-10002" < 10 AND "O2"."DT-10002" - "H2"."DT-10001" < 10 THEN
```

```
        #separados_8_ok := TRUE;
    ELSE
        #separados_8_ok := FALSE
        ;
    END_IF;
    IF #separados_8_ok=TRUE AND "STACK".V10001<0.1 AND "N2"."FS-501"=FALSE AND "KOH"."FT-101">0.9*"Variables_importantes"."Setpoint.P-01" AND "KOH"."FT-101"< 1.1 *"Variables_importantes"."Setpoint.P-01"
        AND "STACK"."TT-10100" < 87 AND "STACK"."TT-10200" < 87 AND "KOH"."TT-10005">90 THEN
        "States".Gen_cond_8_9 := TRUE;
        ;
    END_IF;
    //APGAMOS LAS BOMBAS
    "CONTROL BOMBA 1"(Setpoint := 0,
                      Input := 0,
                      Output => "KOH"."P-101_OUT");

    "CONTROL BOMBA 2"(Setpoint :=0,
                      Input := 0,
                      Output => "Demi_Water"."P-102_OUT");


    "CONTROL_BOMBA_3"(Setpoint := 0,
                      Input := 0,
```

```
Output => "WATER_REFRIG"."P-103_OUT");
```

1.12. E9_HOT_STAND_BY

```
IF "H2"."LT-10001" + "O2"."LT-10002" < 125 AND "H2"."LT-10001" + "O2"."LT-10002" > 115 AND "H2"."DT-10001" + "O2"."DT-10002" < 125 AND "H2"."DT-10001" + "O2"."DT-10002" > 115 AND
   "H2"."LT-10001" - "O2"."LT-10002" < 10 AND "O2"."LT-10002" - "H2"."LT-10001" < 10 AND "H2"."DT-10001" - "O2"."DT-10002" < 10 AND "O2"."DT-10002" - "H2"."DT-10001" < 10 THEN
   #separados_9_ok := TRUE;
ELSE
   #separados_9_ok := FALSE
   ;
END_IF;
```

```
IF #separados_9_ok = TRUE AND "STACK".V10001 < 0.1 AND "N2"."FS-501" = FALSE AND "KOH"."FT-101" > 0.9 * "Variables_importantes"."Setpoint.P-01" AND "KOH"."FT-101" < 1.1 * "Variables_importantes"."Setpoint.P-01"
   AND "STACK"."TT-10100" < 87 AND "STACK"."TT-10200" < 87 AND "STACK"."TT-10300"<87 AND "KOH"."TT-10005" > 90 AND "H2".AT0001=FALSE AND "H2".AT0002=FALSE THEN
   "States".Gen_cond_9_10 := TRUE;
   ;
END_IF;
```

1.13. E10_RAMPA_SUBIDA_INTENSIDAD_II

```
//ESTADO RAMPA SUBIDA 2 PARA EMPEZAR A MEDIO PROCESO
IF "Variables_importantes".Contador_rampa < 101 THEN
    "Variables_importantes".Contador_rampa_real := "Variables_importantes".Contador_rampa;
    "STACK".V10001 := (0.106 * "Variables_importantes".Contador_rampa_real) + (2.65);
    // RETARDO TEMPORIZADOR
    "IEC_Timer_0_DB".TON(IN := TRUE,
                         PT := T#200ms);
    IF "IEC_Timer_0_DB".Q THEN
        "Variables_importantes".Contador_rampa := "Variables_importantes".Contador_rampa + 1;
        "IEC_Timer_0_DB".TON(IN := FALSE,
                             PT := T#200ms);

    END_IF;

END_IF;


IF "STACK".V10001>13 THEN
    "States".Gen_cond_10_x := TRUE;
ELSE
    "States".Gen_cond_10_x := FALSE;
```

```
    ;
END_IF;
```

1.14. E11_DESPRESURIZACIÓN

```
//CONTROL DE PRESIÓN DE DESPRESURIZACIÓN
IF "H2"."PT-10100"<0.6 AND "O2"."PT-10200"<0.6 THEN
    "States".Gen_cond_11_x := TRUE;
ELSE
    "States".Gen_cond_11_x := FALSE;
    ;
END_IF;

IF "H2"."PT-10100" >1.5 THEN
    "H2".VO10003 := 100;
    ;
END_IF;
IF "H2"."PT-10100" > 0.65 THEN
    "H2".VO10003 := 75;
    ;
END_IF;

IF "H2"."PT-10100" < 0.65 THEN
```

```
    "H2".VO10003 := 0;
    ;
END_IF;

IF "O2"."PT-10200" > 1.5 THEN
    "O2".VO10004 := 100;
    ;
END_IF;
IF "O2"."PT-10200" > 0.65 THEN
    "O2".VO10004 := 75;
    ;
END_IF;

IF "O2"."PT-10200" < 0.65 THEN
    "O2".VO10004 := 0;
    ;
END_IF;
```

1.15. E12_PARADA_DE_EMERGENCIA

```
IF "States".State_Cold_Stand_By=TRUE THEN
    "States".State_anterior:=1;
    ;
END_IF;
IF "States".State_inert = TRUE THEN
```

```
        "States".State_anterior := 2;
        ;
    END_IF;
    IF "States".State_calentamiento = TRUE THEN
        "States".State_anterior := 3;
        ;
    END_IF;
    IF "States".State_rampa = TRUE THEN
        "States".State_anterior := 4;
        ;
    END_IF;
    IF "States".State_venteo = TRUE THEN
        "States".State_anterior := 5;
        ;
    END_IF;
    IF "States".State_presurizacion = TRUE THEN
        "States".State_anterior := 6;
        ;
    END_IF;
    IF "States".State_operacion = TRUE THEN
        "States".State_anterior := 7;
        ;
    END_IF;
    IF "States".State_rampa_bajada = TRUE THEN
```

```
    "States".State_anterior := 8;
    ;
END_IF;
IF "States".State_HOT_STAND_BY = TRUE THEN
    "States".State_anterior := 9;
    ;
END_IF;
IF "States".State_rampa_subida_2 = TRUE THEN
    "States".State_anterior := 10;
    ;
END_IF;
IF "States".State_despresurizacion = TRUE THEN
    "States".State_anterior := 11;
    ;
END_IF;
```

Relación de documentos

(_) Memoria ..... 86 páginas
(X) Anexos ..... 74 páginas

La Almunia, a 6 de junio de 2023

Firmado: Eduardo Pérez González