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**SYSTEM
ENGINEERING**

Project: Insert PJ

FTE2.0 - Manual controller

FTE2.0 - MANUAL CONTROLLER

Rev.	Date	Modification
1	08/09/23	Added cap. 2.4 Lis of parameters
0	22/03/18	

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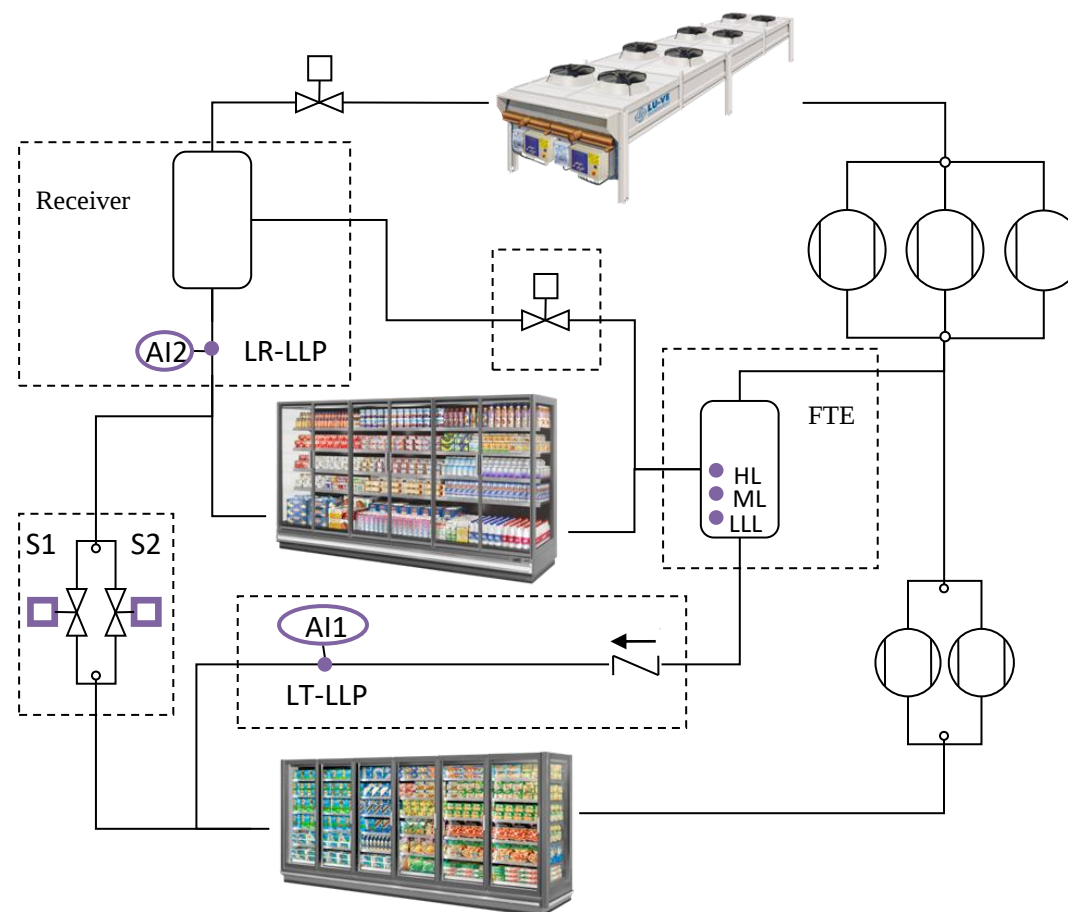
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1. CONCEPT LAYOUT OF BOOSTER SYSTEM WITH FTE2.0

The system sensors for the FTE:

CODE	NOMENCLATURE	DEFINITION	TYPE	DESCRIPTION
	LLL	Low liquid level	Liquid sensor	Located at bottom of the FTE
	MLL	Medium liquid level	Liquid sensor	Located at the medium of the FTE
	HLL	High liquid level	Liquid sensor	Located at the high of the FTE
	S1	Solenoid one	NC solenoid	Located on the LT liquid line;
	S2	Solenoid two	NC solenoid	Located on the LT liquid line in parallel (mechanically) with the S1.
	AI1 LT-LLP	LT liquid line pressure	Pressure probe	Located on the LT liquid line after the solenoid and the check valve
	AI2 LR-LLP	MAIN LIQUID RECEIVER liquid line pressure	Pressure probe	Located on the LT liquid line after the solenoid and the check valve



Elements of FTE2.0

2. ABOUT CONTROLLER

FTE2.0 has three new level of integration:

- Mechanical integration: FTE 2.0 is integrated in the rack;
- Electrical integration: FTE 2.0 electrical supply integrated in the rack;
- Control integration: from electromechanical control to PLC control.

The main purpose of this document is to describe the features of the FTE 2.0 with a focus on the control integration.

FTE 2.0 does not have any more an electromechanical control system. The control part has been replaced with a programmable PLC made by EPTA.

It has been developed a programmable controller able to manage:

- basic logics: the same that are currently implemented in electromechanical board of FTE;
- advanced logics: to permit to the FTE2.0 to became able to perform analysis of its own status in order to become more reliable and safer.

Elements of the new structure are:

- FTE tank: integrated in the packs for EC91 and EC93 4+3;
- PLC controller: integrated in the packs and based on a neutral platform developed by EPTA;
- Sensors level: KL1 – KL2.1 – KL3.

Hereafter the logic implemented into the controller to manage:

- the cycles of charging and discharging of FTE;
- the diagnostic and the alarm conditions.

2.1 Structure of software

Menu ALL (Level 0):

- no password

Menu USER (Level 1):

- with password (PASS 1 = 11)

Menu MANUFACTURER (Level 2):

- with password (PASS 2 = 22)

Menu ADVANCED (Level 3):

- with password (PASS 3 = 81)
- here there are all the parameters that manage the logic not just implemented in electromechanical FTE

Menu EPTA (Level 4):

- with password (PASS 4 = 5371) – **ATTENTION: THIS PASSWORD MUST BE SHARED ONLY WITHIN EPTA PEOPLE. THIS MEANS THAT FIRST CIRCULATION IS LIMITED TO SELECTED PEOPLE, WHO MUST NOT DIFFUSE IT TO OTHERS.**
- permit to enable the advanced control

The intended purpose of the advantage functions is to link the selling of the New Equipment to the Service. The advanced functions remain available for a specific timeframe after which the customer must ask to EPTA Service people to re-activate the features. So, advantage functions are available only if a service contract with EPTA is in place. When/if advanced functions are switched off the FTE maintains the same features as in the electro-mechanical configuration.

2.2 Legend (main variables)

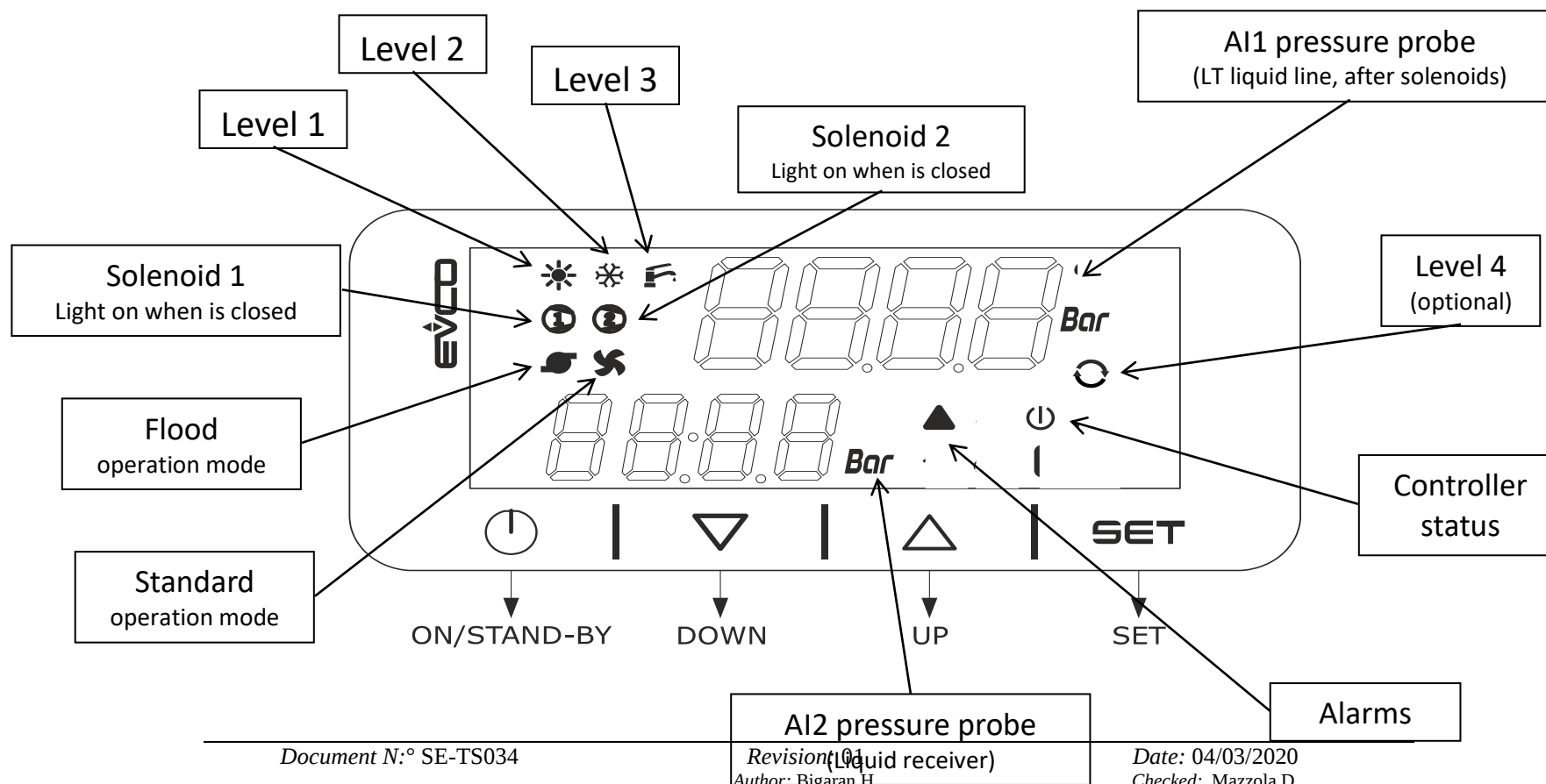
VARIABLE	LEVEL	DESCRIPTION	VALUE	MEANING	REFERENCE TIME
LEV1	BASIC	FTE 10% SENSOR	1	ON	
			0	OFF	
LEV2	BASIC	FTE 30% SENSOR	1	ON	Ti3
			0	OFF	
LEV3	BASIC	FTE 50% SENSOR	1	ON	
			0	OFF	
LEV4	ADVA (*1)	FTE 80% SENSOR	1	ON	
			0	OFF	
CSol	ADVA (*1)	SOLENOIDS STATUS	1	SOLENOIDS CLOSED (NOT ELECTRICALLY SUPPLY AND DISABLE)	
			0	SOLENOID OPEN (EXCHANGE FROM THE 2 SOLENOIDS DURING FTE CHARGING)	
FSol	AVDA (*1)	FORCE CLOSING OF SOLENOIS	1	SOLENOIDS CLOSED FOR TIME TIFS	
SOL1	ADVA (*1)	SOLENOID 1	1	SOLENOID CLOSED	Ti4

			0	SOLENOID OPEN	
SOL2	ADVA ^(*1)	SOLENOID 2	1	SOLENOID CLOSED	
			0	SOLENOID OPEN	
SHuP	BASIC	REQUEST OF INCREASE MT SH	0	OFF (LOW SH)	
			1	ON (HIGH SH)	
SHdW	BASIC	REQUEST OF DECREASE MT SH	0	OFF (HIGH SH)	
			1	ON (LOW SH)	
AI1	BASIC	PRESSURE PROBE IN LIQUID LINE			
AI2	ADVA ^(*2)	(IF PRESENT) PRESSURE PROBE REFERED TO MAIN LIQUID RECEIVER			

(*1): AVAILABLE ONLY IF ADVANCED PARAMETERES ARE ENABLE → **AdEn** = 1

(*2): AVAILABLE ONLY IF AI2 PRESSURE PROBE IS ENABLE → **A2En** = 1

2.3 Structure of display



2.3 Display tree structure

MENU

→ALL

- Status **Lev1** (R)
- Status **Lev2** (R)
- Status **Lev3** (R)
- Status **Lev4** (R)
- Value pressure probe 1 - **AI 1** (R)
- Value pressure probe 2 - **AI 2** (R) *IF ABLE*
- Status **SHup** (R)
- Status **SHdU** (R)
- (Loop)

→USER (Pass Lev1 = 11)

→AlrM

- parameter **P1** (R/W)
- parameter **d_P1** (R/W)
- parameter **tiP1** (R/W)
- parameter **ti 2** (R/W)
- parameter **P1Lo** (R/W)
- parameter **P1Hi** (R/W)
- (Loop)

→PCnf

- parameter **A1CF** (R/W)
- parameter **A1Lo** (R/W)

→parameter **A1Hi** (R/W)
→parameter **A1cA** (R/W)
→parameter **AiFt** (R/W)
→parameter **Ai0V** (R/W)
→parameter **Ai5V** (R/W)
(Loop)
→**rE**
→parameter **ti 3** (R/W)
→parameter **ti 4** (R/W)
(Loop)
→**rtC**
→data (R/W)
→**ManF** (Pass Lev2 = 22)
→parameter **SM** (R/W)
→parameter **EnSM** (R/W)
→parameter **EnSr** (R/W)
→**AdvA** (Pass Lev3 = 81 / 685)
→**ALrM**
→parameter **ti 5** (R/W)
→parameter **ti 7** (R/W)
→parameter **ti Ai** (R/W)
→parameter **P1A2** (R/W)
→parameter **d_A2** (R/W)
→parameter **tiA2** (R/W)
(Loop)

→**ConF**

→parameter **A2En** (R/W)
→parameter **A2CF** (R/W)
→parameter **A2Lo** (R/W)
→parameter **A2Hi** (R/W)
→parameter **A2cA** (R/W)
→parameter **dELt** (R/W)
→status **So11** (R)
→status **So12** (R)
(Loop)

→**Stat**

→status **CSol** (R)
→parameter **tiFS** (R/W)
→parameter **FSol** (R/W)
→value **tFSO** (R)
(Loop)

→**rEG**

→parameter **nuMr** (R/W)
→value **cntr** (R)
(Loop)

→**MdbS**

→parameter **Mb01** (R/W)
→parameter **Mb02** (R/W)
→parameter **Mb03** (R/W)
→parametro **Mb04** (R/W)

```
(Loop)
→MAP
  →SAvE
    →MEM
    →KEY
    →StAt
      →Ok
    →USb
  →rESt
    →MEM
    →KEY
    →StAt
      →Ok
    →USb
→dEFt
  →parameter HdEL (R/W)
  →parameter rdEF (R/W)
  (Loop)

→EptA (Pass Lev4 = 5371)
  →parameter AdEn (R/W)
  →parameter PdAy (R/W)
  →parameter CdAy (R/W)
  →parameter PSd4
→PSd
```

→parameter **PSd1** (R/W)
→parameter **PSd2** (R/W)
→parameter **PSd3** (R/W)
(Loop)

→**HIST** (alarm historic)

→**HIST** (R)

→**Info** (software info)

→value **ProJ** (R)

→value **Uer** (R)

→value **rEU** (R)

→value **YEAr** (R)

→value **MotH** (R)

→value **dAY** (R)

(Loop)

2.4 List of parameters

Name	Value	Min	Max	Level	Description	EN_enum	Measure Unit	Type	MENU
P1_SetPointPressure	32.0	0.0	100.0	-	Pressure reference for AL06		bar	Analog	USER
D_P1_DiffOverSet	2.0	0.1	99.0	-	Differential of P1		bar	Analog	USER
TiP1_TimeOverSetP	300	0	999	-	Delay time for AL06		min	Integer	USER
Ti2_TimeAL05	10	0	3600	-	Delay time for AL05		sec	Integer	USER
Ti5_Delay	15	0	999	3	Delay time for AL07 and AL08		min	Integer	AdvA
Ti7_TimeAL03	90	0	999	3	Delay time for AL03		min	Integer	AdvA
TiAi_ErrorProbeTimeout	10	1	255	3	Delay time for AL01		sec	Integer	AdvA
P1Lo_MinSetPress	15.0	0.0	100.0	-	Low limit for P1 parameter		bar	Integer	USER
P1Hi_MaxSetPress	40.0	0.0	100.0	-	Hight limit for P1 parameter		bar	Integer	USER
A1Cf_TypeProbe1	1	0	1	-	Configuration A1 pressure probe	(0 = 0-5V, 1 = 4...20mA)		Integer	USER
A1Lo_minBar_Probe1	0.0	0.0	100.0	-	Min value range of pressure probe A1		bar	Integer	USER
A1Hi_maxBar_Probe1	60.0	0.0	100.0	-	Max value range of pressure probe A1		bar	Integer	USER
A1ca_Calibration_Probe1	0.0	-15.0	15.0	-	Calibration of pressure probe A1		bar	Integer	USER
A2En_EnableProbe2	0	0	1	3	Enable A2 pressure probe			Integer	AdvA
A2Cf_TypeProbe2	1	0	1	3	Configuration A2 pressure probe	(0 = 0-5V, 1 = 4...20mA)		Integer	AdvA
A2Lo_minBar_Probe2	0.0	0.0	100.0	3	Min value range of pressure probe A2		bar	Integer	AdvA
A2Hi_maxBar_Probe2	60.0	0.0	100.0	3	Max value range of pressure probe A2		bar	Integer	AdvA
A2ca_Calibration_Probe2	0.0	-15.0	15.0	3	Calibration of pressure probe A2		bar	Integer	AdvA
DELt_DeltaProbes	1.0	0.0	10.0	3	Tollerance to compare A1 and A2 pressure probe			Integer	AdvA



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LEV1_DI	0	0	1	-	Status of level 1	(0 = OPEN, 1 = CLOSED)		Digital	ALL
LEV2_DI	0	0	1	-	Status of level 2	(0 = OPEN, 1 = CLOSED)		Digital	ALL
LEV3_DI	0	0	1	-	Status of level 3	(0 = OPEN, 1 = CLOSED)		Digital	ALL
LEV4_DI	0	0	1	-	Status of level 4	(0 = OPEN, 1 = CLOSED)		Digital	ALL
AI_PressProbe1	0.0	-3276.8	3276.7	-	Liquid line pressure probe		bar	Analog	ALL
AI_PressProbe2	0.0	-3276.8	3276.7	-	Main liquid receiver pressure probe		bar	Analog	ALL
Sol1	0	0	1	3	Status of solenoids 1	(0 = OPEN, 1 = CLOSED)		Digital	AdvA
Sol2	0	0	1	3	Status of solenoids 2	(0 = OPEN, 1 = CLOSED)		Digital	AdvA
SHuP	0	0	1	-	Request of superheat increasing	(0 = OVERFEED, 1 = STANDARD)		Digital	ALL
SHdW	0	0	1	-	Request of superheat decreasing	(0 = STANDARD, 1 = OVERFEED)		Digital	ALL
SM_UnitStatus	0	0	1	-	Status of machine	(0 = OFF, 1 = ON)		Digital	ManF
EnSM_EnOnOffByKey	1	0	1	-	Enable ON-OFF from display	(0 = OFF, 1 = ON)		Digital	ManF
EnSR_EnOnOffBySup	1	0	1	-	Enable ON-OFF from Supervisor	(0 = OFF, 1 = ON)		Digital	ManF
AdEn_EnableAdv	0	0	1	4	Enable advanced functions	(0 = OFF, 1 = ON)		Digital	Epta
CSol	0	0	1	3	Status of solenoids	(0 = FTE Charging, 1 = FTE discharging)		Digital	AdvA
Ti3_Level2OnTime	20	0	3600	-	Delay time activation Level 2		sec	Integer	USER
Ti4_TimeSwapSolenoid	20	0	999	-	Time permits exchange from the 2 solenoids during the FTE charging for safety the coil of solenoids valve		min	Integer	USER
FSol	0	0	1	3	Forced solenoids status	(0 = NOT ACTIVE, 1 = ACTIVE)		Digital	AdvA
TiFS_TimeFSol	10	0	120	3	Time forced solenoids		min	Integer	AdvA
PIA2_setLP_AI2	32.0	0.0	100.0	3	Pressure reference for AL15		bar	Analog	AdvA
D_A2_DiffSet	2.0	0.1	99.0	3	Differential of P2		bar	Analog	AdvA
TiA2_TimeLP_AI2	10	0	999	3	Delay time for AL15		min	Integer	AdvA
numR_maxAL06	4	0	20	3	Refecence number of AL06 per day			Integer	AdvA
cntR_Daily	0	0	100	3	Counting number of AL06 per day			Integer	AdvA

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Ai0V	0.5	0.0	5.0	3	Ratiometric probe minimum voltage reference		V	Integer	AdvA
Ai5V	4.5	0.0	5.0	3	Ratiometric probe maximum voltage reference		V	Integer	AdvA
AiFilter	10	0	100	3	Ratiometric probe filter			Integer	AdvA
PSW1_Modbus	11	-999	9999	3	Password Level 1				AdvA
PSW2_Modbus	22	-999	9999	3	Password Level 2				AdvA
PSW3_Modbus	81	-999	9999	3	Password Level 3			Integer	AdvA
PSW4_Modbus	5371	-999	9999	4	Password Level 4			Integer	Epta
AL01	0	0	1	-	FAULTY AI1 PRESSURE PROBE			Alarm	
AL02	0	0	1	-	FAULTY AI2 PRESSURE PROBE			Alarm	
AL03	0	0	1	-	LEV1 = 1 ALWAYS - Check the status of sensor level 1			Alarm	
AL04	0	0	1	-	LEV2 = 0 ALWAYS - Check the status of sensor level 2			Alarm	
AL05	0	0	1	-	LEV3 = 1 ALWAYS - Check the status of sensor level 3			Alarm	
AL06	0	0	1	-	FTE DOESN'T EMPTY			Alarm	
AL07	0	0	1	-	COIL OF SOL1 DOESN'T WORK			Alarm	
AL08	0	0	1	-	COIL OF SOL2 DOESN'T WORK			Alarm	
AL09	0	0	1	-	REDUCTION OF DAILY CYCLES			Alarm	
AL10	0	0	1	-	LEV4 = 1 ALWAYS - Check the status of sensor level 4			Alarm	
AL11	0	0	1	-	SOLENOIDS LEAKAGE			Alarm	
AL12	0	0	1	-	LEV2 = 1 ALWAYS - Check the status of sensor level 2			Alarm	
AL13	0	0	1	-	LEV1 = 0 ALWAYS - Check the status of sensor level 1			Alarm	
AL14_RTC	0	0	1	-	RTC FAILURE			Alarm	
AL15	0	0	1	-	MAIN RECEIVER LOW PRESSURE (AI2)			Alarm	
PdAY_ContractDays	4015	0	4015	4	PdAY_ContractDays		day	Integer	Epta
CdAY_DaysCounter	0	0	4015	4	CdAY_DaysCounter		day	Integer	Epta

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actual_ModbusReadAccess	0	0	1	3	actual_ModbusReadAccess			Integer	
actual_ModbusLevel	0	0	255	3	actual_ModbusLevel			Integer	
ModbusProtection	0	-999	9999	-	ModbusProtection			Integer	
OnOffBySup	0	0	1	3	ON - OFF from supervisor			Integer	
rALL_ResetAlarms	0	0	1	3	rALL_ResetAlarms			Digital	
Mb01	2	1	247	3	Modbus address				
Mb02	3	0	7	3	Modbus velocity	0=1200 1=2400 2=4800 3=9600 4=19200 5=28800 6=38400 7=57600			
Mb03	0	0	2	3	Modbus parity	0=None 1=Odd 2=Even			
Mb04	1	0	1	3	Modbus stop bit	0=1Bit 2=2Bit			
HDEL	0	0	1	3	Delete alarm history				
RDEF	0	0	1	3	Restore the default parameters				

2.5 Description of alarms

AL01. FAULTY A/1 PRESSURE PROBE	
WHY:	PRESSURE PROBE BROKED OR OUT OF RANGE
EFFECT:	DISABLE ALLARMS LINKS TO THIS PRESSURE PROBE (AL06 – AL07 – AL08 – AL11)
DELAY TIME:	TiAi
RESET:	AUTOMATIC
PROTECTION LEVEL:	BASIC

AL02. FAULTY A/2 PRESSURE PROBE	
WHY:	PRESSURE PROBE BROKED OR OUT OF RANGE
EFFECT:	DISABLE ALLARMS LINKS TO THIS PRESSURE PROBE (AL06 – AL07 – AL08 – AL11)
DELAY TIME:	TiAi
RESET:	AUTOMATIC
PROTECTION LEVEL:	IF A2En = 1

AL03. LEV1 = 1 ALWAYS	
WHY:	SENSOR DOESN'T WORK PROPERLY
GENERATE ALARM IF:	CSol = 1 AND LEV1 =1 for time $T > Ti7 \rightarrow$ AL03 = 1
EFFECT:	1. IF LEV2 = 1 $\rightarrow$ CSol = 1 for time TIFS . After time TIFS $\rightarrow$ CSol = 0 unless LEV2 = 1 yet; 2. IF LEV2 = 0 $\rightarrow$ CSol = 0
ALARM DELAY TIME:	Ti7
RESET:	AUTOMATIC WHEN LEV1 = 0
PROTECTION LEVEL:	IF AdEn = 1

AL04. LEV2 = 0 ALWAYS	
WHY:	SENSOR DOESN'T WORK PROPERLY / WIRING DOESN'T MAKE PROPERLY
GENERATE ALARM IF:	THROUGH COMPARISONG BETWEEN 2 VARIABLES $\rightarrow$ VARIABLE A: • CSol = 1 • FSol = 0, • LEV1 =1, • LEV2 = 0, • LEV3 = 1 OR LEV4 = 1. SET A = 1. $\rightarrow$ VARIABLE B: • CSol = 0,

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	• FSol = 0, • LEV1 =0, • LEV2 = 0, • LEV3 = 0 AND LEV4 = 0. SET B = 1. IF A = 1 AND AFTER B = 1 → AL04 = 1
EFFECT:	IF (LEV1) = 1 AND (LEV3) = 1 → CSol =1 WHEN LEV1, LEV2, LEV3 = 0 → CSol =0
ALARM DELAY TIME:	
RESET:	AUTOMATIC WHEN LEV2 = 1
PROTECTION LEVEL:	IF AdEn = 1

AL05. LEV3 = 1	
WHY:	LIQUID HAS REACHED LEV3 OF FTE
GENERATE ALARM IF:	LEV3 = 1 for T > Ti2 → AL05 = 1
EFFECT:	IF (LEV1 AND/OR LEV2 =1 AND LEV3 =1) → SHuP = 1 & SHdW = 0 until LEV1, LEV2, LEV3 = 0
ALARM DELAY TIME:	Ti2
RESET:	AUTOMATIC WHEN LEV3 = 0
PROTECTION LEVEL:	BASIC

AL06. FTE DOESN'T EMPTY		
WHY:	LIQUID HAS NOT REACHED LEV2 OF FTE FOR MORE THEN TiP1 TIME	
GENERATE ALARM IF:	1. IF AI1 >= P1 for time T > TiP1 → AL06 = 1	
	2. IF A2En = 1 & IF ABS(AI1-AI2) <= Delt for time T > TiP1 → AL06	
EFFECT:	Fsol = 1 for time TiFS . (at the end of TiFS time, FSol = 0)	
ALARM DELAY TIME:	TiP1	
RESET:	AUTOMATIC WHEN:	1. AI1 < P1 – D_P1 AND FSol = 0
		2. AI1 < AI2 – D_P1 AND FSol = 0
PROTECTION LEVEL:	BASIC	
AL07. COIL OF SOL1 DOESN'T WORK		
WHY:	ELECTRICAL PROBLEMS ON SOL1	
GENERATE ALARM IF:	1. IF A2En = 1 & IF { Sol1 = 0 AND ABS(AI1 - AI2) > Delt } → AL07	
	2. IF A2En = 0 & IF { Sol1 = 0 AND AI1 <= P1 } → AL07	
EFFECT:	SOL 2 = 0 UNTIL : 1. AL07 = 0 (NOT CONSIDERING Ti4) 2. CSol = 1 (→ SOL1 = 1 AND SOL2 = 1)	
ALARM DELAY TIME:	Ti5	
RESET:	MANUALLY WHEN:	1. ABS(AI1 – AI2) < Delt AND Sol1 = 0
		2. AI1 > P1 AND Sol1 = 0
PROTECTION LEVEL:	IF AdEn = 1	

AL08. COIL OF SOL2 DOESN'T WORK		
WHY:	ELECTRICAL PROBLEMS ON SOL2	
GENERATE ALARM IF:	1. IF A2En = 1 & IF { Sol2 = 0 AND ABS(AI1 - AI2) > Delt } → AL08	
	2. IF A2En = 0 & IF { Sol2 = 0 AND AI1 <= P1 } → AL08	
EFFECT:	SOL 1 = 0 UNTIL : 1. AL08 = 0 (NOT CONSIDERING Ti4) 2. CSol = 1 (→ SOL1 = 1 AND SOL2 = 1)	
ALARM DELAY TIME:	Ti5	
RESET:	MANUALLY WHEN:	1. ABS(AI1 - AI2) < Delt AND Sol2 = 0
		2. AI1 > P1 AND Sol2 = 0
PROTECTION LEVEL:	IF AdEn = 1	

AL09. REDUCTION OF DAILY CYCLES		
WHY:		
GENERATE ALARM IF:	IF N° AL06 IN 24 HOURS (04:00 – 04:00) > numR → AL09 (IN ALARM HISTORY). IF AL09 IS ACTIVE FOR MORE THAN 3 DAYS IT WILL APPARE ON SUPERVISOR AND DISPLAY.	
EFFECT:	ONLY REPORTING	
ALARM DELAY TIME:		
RESET:	MANUALLY WHEN N° AL06 IN 24 HOURS (04:00 – 04:00) < numR	
PROTECTION LEVEL:	IF AdEn = 1	

AL10. LEV4 = 1	
WHY:	LIQUID HAS REACHED LEV4 OF FTE
GENERATE ALARM IF:	IF LEV4 = 1 → AL10 = 1
EFFECT:	IF (LEV1 AND/OR LEV2 =1 AND LEV4 =1) SHuP = 1 & SHdW = 0 until LEV1, LEV2, LEVE4 = 0
ALARM DELAY TIME:	
RESET:	AUTOMATIC WHEN LEV4 = 0
PROTECTION LEVEL:	IF AdEn = 1

AL11. SOLENOIDS LEAKAGE	
WHY:	
GENERATE ALARM IF:	1. IF A2En = 1 & CSol = 1 & ABS(AI2 – AI1) <= Delt → AL11
	2. IF A2En = 0 & CSol = 1 & AI1 >= P1 → AL11
EFFECT:	SHuP = 1 UNTIL RESET
ALARM DELAY TIME:	Ti5
RESET:	MANUAL
PROTECTION LEVEL:	IF AdEn = 1

AL12. LEV2 = 1 ALWAYS	
WHY:	SENSOR DOESN'T WORK PROPERLY
GENERATE ALARM IF:	THROUGH COMPARISONG BETWEEN 2 VARIABLES → VARIABLE C: • CSol = 1 • FSol = 0, • LEV1 =1, • LEV2 = 1, SET C = 1. → VARIABLEDB: • CSol = 1, • FSol = 0, • LEV1 =0, • LEV2 = 1, SET D = 1. IF C = 1 AND AFTER D = 1 → AL12 = 1
EFFECT:	IF AL12 = 1 → CSol = 1 UNTIL LEV1, LEV2 = 1 IF AL12 = 1 AND { LEV1 = 0 AND LEV3 = 0 } → CSol = 0
ALARM DELAY TIME:	
RESET:	AUTOMATIC WHEN LEV2 = 0
PROTECTION LEVEL:	IF AdEn = 1

AL13. LEV1 = 0 ALWAYS

WHY:	DOESN'T WORK PROPERLY / WIRING DOESN'T MAKE PROPERLY
GENERATE ALARM IF:	IF LEV1 = 0 AND { LEV2 = 1 AND LEV3 = 1} → AL13 =1
EFFECT:	FSol = 1 FOR TIME TiFS IF CSol =1
ALARM DELAY TIME:	
RESET:	AUTOMATIC WHEN LEV1 = 1
PROTECTION LEVEL:	IF AdEn = 1

AL14. RTC FAILURE

WHY:	
GENERATE ALARM IF:	
EFFECT:	DISABLE AL09
ALARM DELAY TIME:	
RESET:	
PROTECTION LEVEL:	BASIC

AL15. MAIN RECEIVER LOW PRESSURE (AI2)	
WHY:	DOESN'T WORK PROPERLY / WIRING DOESN'T MAKE PROPERLY
GENERATE ALARM IF:	IF AI2 < PIA2 → AL15 = 1
EFFECT:	
ALARM DELAY TIME:	TiA2
RESET:	AUTOMATIC WHEN AI2 > (PIA2 + D_A2)
PROTECTION LEVEL:	BASIC