ESIE07-03

Service Manual

EWAD190-600AJYNN
EWAD210-500AJYNN/Q
EWAD260-650AJYNN/A
EWAD200-600AJYNN/H

Air-cooled units with R134a refrigerant

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1 Introduction

1.1 About This Manual

Target group

This service manual is intended for and should only be used by qualified engineers.

Purpose of this manual

This service manual contains all the information you need to carry out the necessary repair and maintenance tasks for the EWAD650-C18BJYNN, EWAD550-C12BJYNN/Q, EWAD650-C21BJYNN/A and EWAD600-C10BJYNN/Z.

4 different lines

EWAD-BJYNN line is available with two different efficiencies in order to satisfy every kind of requirements. Acoustic flexibilty down to 65 dBA thanks to different noise level versions:

- **Standard efficiency** with COP up to 3.15 (nominal conditions and only compressor power input).
  - EWAD-BJYNN (standard noise – 79.0 / 80.0 dBA) with low noise option OPRN and OPLN.
  - EWAD-BJYNN/Q (super quiet – 65.0 / 66.5 dBA)
- **High efficiency** with COP up to 3.70 (nominal conditions and only compressor power input).
  - EWAD-BJYNN/A (standard noise – 79.0 / 80.0 dBA) with low noise option OPRN and OPLN.
  - EWAD-BJYNN/Z (super quiet – 65.0 / 66.5 dBA)

OPRN-option

Standard version with additional base frame for compressors and oil separators installed on rubber isolators to eliminate the vibrations. Discharge flexible pipes and condenser fans rotating at fixed low speed.

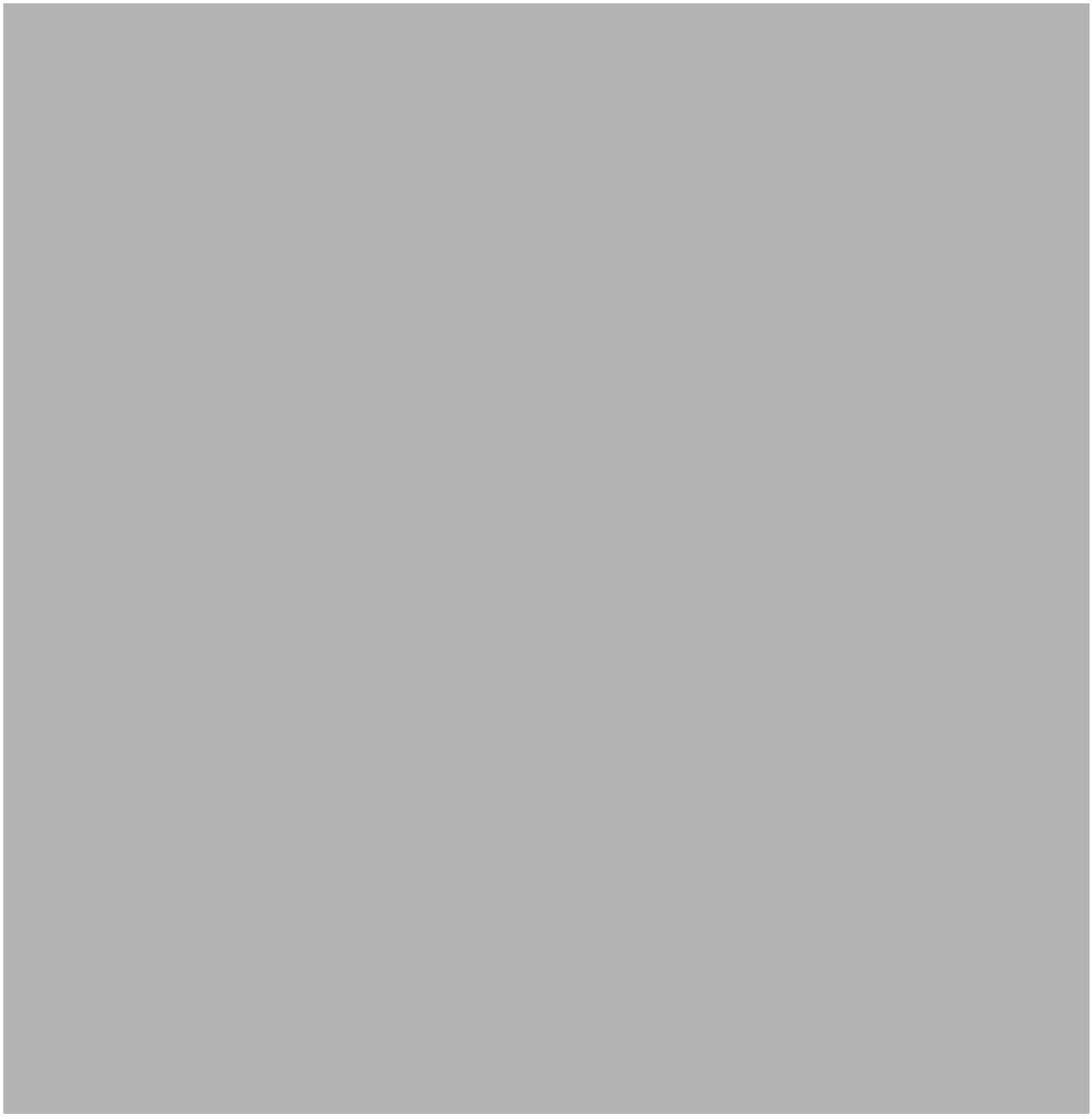
OPLN-option

The main components are the same of the OPRN version (same cooling capacity) but to reduce the sound level the compressors, the oil seperators and delivery and suction pipes are located inside a cabinet which is sound insulated with highly absorbent acoustic material. Discharge flexible pipes and condenser fans rotating at fixed low speed are supplied as standard.

/Q and /Z

The main components are the same of the OPRN version (same cooling capacity) but to reduce the sound level the compressors, the oil seperators and delivery and suction pipes are located inside a cabinet which is sound insulated with highly absorbent acoustic material. Discharge flexible pipes and condenser fans rotating at extremely low speed and fan speed control device are supplied as standard.

1.2 Nomenclature



Part 1
System Outline

Introduction

This part contains an outline of all the relevant elements in the EWAD-AJYNN Air-cooled units with R134a refrigerant installation.

What is in this part?

This part contains the following chapters:

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1 General Outline

1.1 What Is in This Chapter?

Introduction

This chapter contains the following information:

- Technical specifications
- Electrical specifications
- Outlook drawings: Outlook, dimensions, installation and service space.

Overview

This chapter contains the following topics:

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1.2 Technical Specifications: EWAD-AJYNN

Technical specifications

The table below contains the technical specifications for EWAD190-280AJYNN.

Model		**EWAD-AJYNN**				
Unit Size		**190**	**200**	**230**	**260**	**260**
Screw compressors	N.	2	2	2	2	2
Refrigerant circuits	N.	2	2	2	2	2
Refrigerant charge R-134a	kg	36	40	50	50	53
Oil charge	kg	26	26	26	26	26
Min % of capacity reduction	%	12.5	12.5	12.5	12.5	12.5
Condenser fans						
No. of fans / nominal power fan	N. / kW	4 / 1.16	4 / 1.16	6 / 1.16	6 / 1.16	6 / 1.16
Fan speed	rpm	900	900	900	900	900
Diameter	mm	710	710	710	710	710
Total air flow	m^3/s	15.3	14.9	22.9	22.9	22.6
Evaporator						
Evaporators / water volume	N. / l	1 / 25	1 / 31	1 / 93	1 / 93	1 / 90
Max operating pressure	bar	10.5	10.5	10.5	10.5	10.5
Water connection diameter	"	3	3	4	4	4
Condenser coil						
Coil type		Lanced fins - Internally spiral wound tubes				
Weight and dimensions						
Standard unit shipping weight	kg	2380	2466	2766	2766	2806
Standard unit operating weight	kg	2405	2497	2859	2859	2896
Unit length	mm	2240	2240	3140	3140	3140
Unit width	mm	2235	2235	2235	2235	2235
Unit height	mm	2340	2340	2340	2340	2340

Note: (1) Nominal cooling capacity and power input are based on: 12/7°C entering/leaving evaporator water temperature; 35°C ambient temperature. The power input is for compressor only.

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Technical specifications

The table below contains the technical specifications for EWAD300-360AJYNN.

Model		EWAD-AJYNN			
Unit Size		**300**	**320**	**340**	**360**
Screw compressors	N.	2	2	2	2
Refrigerant circuits	N.	2	2	2	2
Refrigerant charge R-134a	kg	56	56	64	66
Oil charge	kg	26	26	26	26
Min % of capacity reduction	%	12.5	12.5	12.5	12.5
Condenser fans					
No. of fans / nominal power fan	N. / kW	6 / 1.16	6 / 1.16	8 / 1.16	8 / 1.16
Fan speed	rpm	900	900	900	900
Diameter	mm	710	710	710	710
Total air flow	m^3/s	22.3	22.3	30.6	30.6
Evaporator					
Evaporators / water volume	N. / l	1 / 90	1 / 90	1 / 113	1 / 113
Max operating pressure	bar	10.5	10.5	10.5	10.5
Water connection diameter	"	4	4	4	4
Condenser coil					
Coil type		Lanced fins - Internally spiral wound tubes			
Weight and dimensions					
Standard unit shipping weight	kg	2846	2846	3166	3186
Standard unit operating weight	kg	2936	2936	3279	3299
Unit length	mm	3140	3140	4040	4040
Unit width	mm	2235	2235	2235	2235
Unit height	mm	2340	2340	2340	2340

Note: (1) Nominal cooling capacity and power input are based on: 12/7°C entering/leaving evaporator water temperature; 35°C ambient temperature. The power input is for compressor only.

Technical specifications

The table below contains the technical specifications for EWAD400-600AJYNN.

Model		EWAD-AJYNN					
Unit Size		**400**	**440**	**480**	**500**	**550**	**600**
Screw compressors	N.	2	2	2	2	2	2
Refrigerant circuits	N.	2	2	2	2	2	2
Refrigerant charge R-134a	kg	70	80	78	76	76	76
Oil charge	kg	32	32	32	32	32	32
Min % of capacity reduction	%	12.5	12.5	12.5	12.5	12.5	12.5
Condenser fans							
No. of fans / nominal power fan	N. / kW	6 / 1.73	8 / 1.73	8 / 1.73	8 / 1.73	8 / 1.73	8 / 1.73
Fan speed	rpm	890	890	890	890	890	890
Diameter	mm	800	800	800	800	800	800
Total air flow	m^3/s	32.3	44.9	44.0	43.0	43.0	43.0
Evaporator							
Evaporators / water volume	N. / l	1 / 128	1 / 170	1 / 164	1 / 164	1 / 160	1 / 160
Max operating pressure	bar	10.5	10.5	10.5	10.5	10.5	10.5
Water connection diameter	"	5.5	5.5	5.5	5.5	5.5	5.5
Condenser coil							
Coil type		Lanced fins - Internally spiral wound tubes					
Weight and dimensions							
Standard unit shipping weight	kg	3552	3932	3997	4052	4092	4122
Standard unit operating weight	kg	3680	4102	4161	4216	4252	4282
Unit length	mm	3140	4040	4040	4040	4040	4040
Unit width	mm	2235	2235	2235	2235	2235	2235
Unit height	mm	2340	2340	2340	2340	2340	2340

Note: (1) Nominal cooling capacity and power input are based on: 12/7°C entering/leaving evaporator water temperature; 35°C ambient temperature. The power input is for compressor only.

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1.3 Technical Specifications: EWAD-AJYNN/Q

Technical specifications

The table below contains the technical specifications for EWAD210-280AJYNN/Q.

Model		**EWAD-AJYNN/Q**			
Unit Size		**210**	**240**	**260**	**280**
Screw compressors	N.	2	2	2	2
Refrigerant circuits	N.	2	2	2	2
Refrigerant charge R-134a	kg	56	64	76	80
Oil charge	kg	26	26	26	26
Min % of capacity reduction	%	12.5	12.5	12.5	12.5
Condenser fans					
No. of fans / nominal power fan	N. / kW	6 / 0.45	8 / 0.45	8 / 0.45	8 / 0.45
Fan speed	rpm	500	500	500	500
Diameter	mm	710	710	710	710
Total air flow	m^3/s	12.9	17.9	17.2	17.2
Evaporator					
Evaporators / water volume	N. / l	1 / 90	1 / 113	1 / 113	1 / 164
Max operating pressure	bar	10.5	10.5	10.5	10.5
Water connection diameter	"	4	4	4	4
Condenser coil					
Coil type		Lanced fins - Internally spiral wound tubes			
Weight and dimensions					
Standard unit shipping weight	kg	3046	3366	3466	3546
Standard unit operating weight	kg	3136	3479	3579	3710
Unit length	mm	3140	4040	4040	4040
Unit width	mm	2235	2235	2235	2235
Unit height	mm	2340	2340	2340	2340

Note: (1) Nominal cooling capacity and power input are based on: 12/7°C entering/leaving evaporator water temperature; 35°C ambient temperature. The power input is for compressor only.

Technical specifications

The table below contains the technical specifications for EWAD300-340AJYNN/Q.

Model		**EWAD-AJYNN/Q**		
Unit Size		**300**	**320**	**340**
Screw compressors	N.	2	2	2
Refrigerant circuits	N.	2	2	2
Refrigerant charge R-134a	kg	80	80	80
Oil charge	kg	26	26	26
Min % of capacity reduction	%	12.5	12.5	12.5
Condenser fans				
No. of fans / nominal power fan	N. / kW	8 / 0.45	8 / 0.45	8 / 0.45
Fan speed	rpm	500	500	500
Diameter	mm	710	710	710
Total air flow	m^3/s	17.2	17.2	17.2
Evaporator				
Evaporators / water volume	N. / l	1 / 159	1 / 159	1 / 159
Max operating pressure	bar	10.5	10.5	10.5
Water connection diameter	”	4	4	4
Condenser coil				
Coil type		Lanced fins – Internally spiral wound tubes		
Weight and dimensions				
Standard unit shipping weight	kg	3556	3556	3556
Standard unit operating weight	kg	3715	3715	3715
Unit length	mm	4040	4040	4040
Unit width	mm	2235	2235	2235
Unit height	mm	2340	2340	2340

Note: (1) Nominal cooling capacity and power input are based on: 12/7°C entering/leaving evaporator water temperature; 35°C ambient temperature. The power input is for compressor only.

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Technical specifications

The table below contains the technical specifications for EWAD400-500AJYNN/Q.

Model		**EWAD-AJYNN/Q**			
Unit Size		**400**	**440**	**460**	**500**
Screw compressors	N.	2	2	2	2
Refrigerant circuits	N.	2	2	2	2
Refrigerant charge R-134a	kg	72	80	83	86
Oil charge	kg	32	32	32	32
Min % of capacity reduction	%	12.5	12.5	12.5	12.5
Condenser fans					
No. of fans / nominal power fan	N. / kW	8 / 0.77	8 / 0.77	9 / 0.77	10 / 0.77
Fan speed	rpm	500	500	500	500
Diameter	mm	800	800	800	800
Total air flow	m^3/s	28.4	27.4	32.1	36.8
Evaporator					
Evaporators / water volume	N. / l	1 / 170	1 / 170	1 / 164	1 / 164
Max operating pressure	bar	10.5	10.5	10.5	10.5
Water connection diameter	"	5.5	5.5	5.5	5.5
Condenser coil					
Coil type		Lanced fins - Internally spiral wound tubes			
Weight and dimensions					
Standard unit shipping weight	kg	3567	3722	3912	3972
Standard unit operating weight	kg	3737	3892	4076	4136
Unit length	mm	4040	4040	4940	4940
Unit width	mm	2235	2235	2235	2235
Unit height	mm	2340	2340	2340	2340

Note: (1) Nominal cooling capacity and power input are based on: 12/7°C entering/leaving evaporator water temperature; 35°C ambient temperature. The power input is for compressor only.

1.4 Technical Specifications: EWAD-AJYNN/A

Technical specifications

The table below contains the technical specifications for EWAD260-340AJYNN/A.

Model		**EWAD-AJYNN/A**			
Unit Size		**260**	**280**	**320**	**340**
Screw compressors	N.	2	2	2	2
Refrigerant circuits	N.	2	2	2	2
Refrigerant charge R-134a	kg	60	68	80	80
Oil charge	kg	26	26	26	26
Min % of capacity reduction	%	12.5	12.5	12.5	12.5
Condenser fans					
No. of fans / nominal power fan	N. / kW	6 / 1.16	8 / 1.16	8 / 1.16	8 / 1.16
Fan speed	rpm	900	900	900	900
Diameter	mm	710	710	710	710
Total air flow	m^3/s	22.3	30.6	29.7	29.7
Evaporator					
Evaporators / water volume	N. / l	1 / 93	1 / 113	1 / 113	1 / 164
Max operating pressure	bar	10.5	10.5	10.5	10.5
Water connection diameter	"	4	4	4	4
Condenser coil					
Coil type		Lanced fins - Internally spiral wound tubes			
Weight and dimensions					
Standard unit shipping weight	kg	2866	3186	3286	3366
Standard unit operating weight	kg	2959	3299	3399	3530
Unit length	mm	3140	4040	4040	4040
Unit width	mm	2235	2235	2235	2235
Unit height	mm	2340	2340	2340	2340

Note: (1) Nominal cooling capacity and power input are based on: 12/7°C entering/leaving evaporator water temperature; 35°C ambient temperature. The power input is for compressor only.

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Technical specifications

The table below contains the technical specifications for EWAD360-420AJYNN/A

Model		**EWAD-AJYNN/A**		
Unit Size		**360**	**380**	**420**
Screw compressors	N.	2	2	2
Refrigerant circuits	N.	2	2	2
Refrigerant charge R-134a	kg	80	80	80
Oil charge	kg	26	26	26
Min % of capacity reduction	%	12.5	12.5	12.5
Condenser fans				
No. of fans / nominal power fan	N. / kW	8 / 1.16	8 / 1.80	8 / 1.80
Fan speed	rpm	900	900	900
Diameter	mm	710	800	800
Total air flow	m^3/s	29.7	44.0	43.0
Evaporator				
Evaporators / water volume	N. / l	1 / 159	1 / 159	1 / 159
Max operating pressure	bar	10.5	10.5	10.5
Water connection diameter	"	4	4	4
Condenser coil				
Coil type		Lanced fins - Internally spiral wound tubes		
Weight and dimensions				
Standard unit shipping weight	kg	3376	3321	3386
Standard unit operating weight	kg	3535	3480	3545
Unit length	mm	4040	4040	4040
Unit width	mm	2235	2235	2235
Unit height	mm	2340	2340	2340

Note: (1) Nominal cooling capacity and power input are based on: 12/7°C entering/leaving evaporator water temperature; 35°C ambient temperature. The power input is for compressor only.

Technical specifications

The table below contains the technical specifications for EWAD500-650AJYNN/A.

Model		**EWAD-AJYNN/A**			
Unit Size		**500**	**550**	**600**	**650**
Screw compressors	N.	2	2	2	2
Refrigerant circuits	N.	2	2	2	2
Refrigerant charge R-134a	kg	80	104	104	104
Oil charge	kg	32	32	32	32
Min % of capacity reduction	%	12.5	12.5	12.5	12.5
Condenser fans					
No. of fans / nominal power fan	N. / kW	8 / 1.73	10 / 1.73	10 / 1.73	10 / 1.7
Fan speed	rpm	890	890	890	890
Diameter	mm	800	800	800	800
Total air flow	m^3/s	43	53.8	53.8	53.8
Evaporator					
Evaporators / water volume	N. / l	1 / 263	1 / 263	1 / 256	1 / 256
Max operating pressure	bar	10.5	10.5	10.5	10.5
Water connection diameter	"	6.5	6.5	6.5	6.5
Condenser coil					
Coil type		Lanced fins - Internally spiral wound tubes			
Weight and dimensions					
Standard unit shipping weight	kg	4252	4642	4652	4652
Standard unit operating weight	kg	4515	4905	4908	4908
Unit length	mm	4040	4940	4940	4940
Unit width	mm	2235	2235	2235	2235
Unit height	mm	2340	2340	2340	2340

Note: (1) Nominal cooling capacity and power input are based on: 12/7°C entering/leaving evaporator water temperature; 35°C ambient temperature. The power input is for compressor only.

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1.5 Technical Specifications: EWAD-AJYNN/H

Technical specifications

The table below contains the technical specifications for EWAD200-280AJYNN/H.

Model		**EWAD-AJYNN/H**				
Unit Size		**200**	**210**	**240**	**260**	**280**
Screw compressors	N.	2	2	2	2	2
Refrigerant circuits	N.	2	2	2	2	2
Refrigerant charge R-134a	kg	36	40	50	50	53
Oil charge	kg	26	26	26	26	26
Min % of capacity reduction	%	12.5	12.5	12.5	12.5	12.5
Condenser fans						
No. of fans / nominal power fan	N. / kW	4 / 1.80	4 / 1.80	6 / 1.80	6 / 1.80	6 / 1.80
Fan speed	rpm	900	900	900	900	900
Diameter	mm	800	800	800	800	800
Total air flow	m^3/s	23.9	22.8	35.9	35.9	35.0
Evaporator						
Evaporators / water volume	N. / l	1 / 25	1 / 31	1 / 93	1 / 93	1 / 90
Max operating pressure	bar	10.5	10.5	10.5	10.5	10.5
Water connection diameter	”	3	3	4	4	4
Condenser coil						
Coil type		Lanced fins – Internally spiral wound tubes				
Weight and dimensions						
Standard unit shipping weight	kg	2380	2466	2766	2766	2806
Standard unit operating weight	kg	2405	2497	2859	2859	2896
Unit length	mm	2240	2240	3140	3140	3140
Unit width	mm	2235	2235	2235	2235	2235
Unit height	mm	2340	2340	2340	2340	2340

Note: (1) Nominal cooling capacity and power input are based on: 12/7°C entering/leaving evaporator water temperature; 35°C ambient temperature. The power input is for compressor only.

Technical specifications

The table below contains the technical specifications for EWAD300-400AJYNN/H.

Physical data		**EWAD-AJYNN/H**			
Unit Size		**300**	**320**	**340**	**400**
Screw compressors	N.	2	2	2	2
Refrigerant circuits	N.	2	2	2	2
Refrigerant charge R-134a	kg	56	56	64	66
Oil charge	kg	26	26	26	26
Min % of capacity reduction	%	12.5	12.5	12.5	12.5
Condenser fans					
No. of fans / nominal power fan	N. / kW	6 / 1.80	6 / 1.80	8 / 1.80	8 / 1.80
Fan speed	rpm	900	900	900	900
Diameter	mm	800	800	800	800
Total air flow	m^3/s	34.1	34.1	47.9	47.9
Evaporator					
Evaporators / water volume	N. / l	1 / 90	1 / 113	1 / 113	1 / 90
Max operating pressure	bar	10.5	10.5	10.5	10.5
Water connection diameter	”	4	4	4	4
Condenser coil					
Coil type		Lanced fins - Internally spiral wound tubes			
Weight and dimensions					
Standard unit shipping weight	kg	2846	2846	3166	3186
Standard unit operating weight	kg	2936	2936	3279	3299
Unit length	mm	3140	3140	4040	4040
Unit width	mm	2235	2235	2235	2235
Unit height	mm	2340	2340	2340	2340

Note: (1) Nominal cooling capacity and power input are based on: 12/7°C entering/leaving evaporator water temperature; 35°C ambient temperature. The power input is for compressor only.

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Technical specifications

The table below contains the technical specifications for EWAD420-600AJYNN/H.

Physical data		**EWAD-AJYNN/H**					
Unit Size		**420**	**460**	**480**	**500**	**550**	**600**
Screw compressors	N.	2	2	2	2	2	2
Refrigerant circuits	N.	2	2	2	2	2	2
Refrigerant charge R-134a	kg	76	86	95	104	104	104
Oil charge	kg	32	32	32	32	32	32
Min % of capacity reduction	%	12.5	12.5	12.5	12.5	12.5	12.5
Condenser fans							
No. of fans / nominal power fan	N. / kW	8 / 1.73	10 / 1.73	10 / 1.73	10 / 1.73	10 / 1.73	10 / 1.73
Fan speed	rpm	890	890	890	890	890	890
Diameter	mm	800	800	800	800	800	800
Total air flow	m^3/s	43	56.2	55	53.8	53.8	53.8
Evaporator							
Evaporators / water volume	N. / l	1 / 170	1 / 170	1 / 164	1 / 164	1 / 160	1 / 160
Max operating pressure	bar	10.5	10.5	10.5	10.5	10.5	10.5
Water connection diameter	”	5.5	5.5	5.5	5.5	5.5	5.5
Condenser coil							
Coil type		Lanced fins - Internally spiral wound tubes					
Weight and dimensions							
Standard unit shipping weight	kg	3942	4202	4277	4332	4392	4402
Standard unit operating weight	kg	4112	4372	4441	4496	4552	4562
Unit length	mm	4040	4940	4940	4940	4940	4940
Unit width	mm	2235	2235	2235	2235	2235	2235
Unit height	mm	2340	2340	2340	2340	2340	2340

Note: (1) Nominal cooling capacity and power input are based on: 12/7°C entering/leaving evaporator water temperature; 35°C ambient temperature. The power input is for compressor only.

1.6 Electrical Specifications: EWAD-AJYNN

Electrical specifications

The tabel below contains the electrical specifications for EWAD190-280AJYNN.

Model		EWAD-AJYNN				
Unit Size		**190**	**200**	**230**	**260**	**280**
Standard voltage (1)		400 V - 3ph - 50 Hz				
Nominal unit current (2)	A	138.9	136.4	145.2	158.9	171.8
Max compressor current (3)	A	152.7	154.0	164.3	182.7	191.5
Fans current	A	9.3	9.3	14.0	14.0	14.0
Max unit current (3)	A	162.0	163.3	178.2	196.7	205.5
Max unit inrush current (4)	A	209.3	208.4	219.7	219.7	263.8
Max unit current for wires sizing (5)	A	178.2	179.7	196.1	216.4	226.1
Cos for maximum current (3)		0.87	0.87	0.88	0.88	0.89

Notes: (1) Allowed voltage tolerance ± 10%. Voltage unbalance between phases must be within ± 3%.

(2) Nominal current are based on: 12/7°C entering/leaving evaporator water temperature and 35°C ambient temp.

(3) Maximum current are based on:

Unit Size		**190**	**200**	**230**	**260**	**280**
Entering / leaving evaporator water temperature	°C	18 / 13	20 / 15	18 / 13	18 / 13	16 / 11
Ambient temperature	°C	40	40	44	44	44

(4) Inrush current of biggest compressor + 75% of nominal absorbed current of the other compressor + fans current.

(5) Compressor FLA + fans current.

Electrical specifications

The tabel below contains the electrical specifications for EWAD300-360AJYNN.

Model		EWAD-AJYNN			
Unit Size		**300**	**320**	**340**	**360**
Standard voltage (1)		400 V - 3ph - 50 Hz			
Nominal unit current (2)	A	183.5	197.0	206.2	220.7
Max compressor current (3)	A	203.8	217.0	233.3	246.6
Fans current	A	14.0	14.0	18.6	18.6
Max unit current (3)	A	217.7	231.0	252.0	265.2
Max unit inrush current (4)	A	272.5	282.7	284.0	289.4
Max unit current for wires sizing (5)	A	239.5	254.1	277.2	291.7
Cos for maximum current (3)		0.89	0.89	0.90	0.90

Notes: (1) Allowed voltage tolerance ± 10%. Voltage unbalance between phases must be within ± 3%.

(2) Nominal current are based on: 12/7°C entering/leaving evaporator water temperature and 35°C ambient temp.

(3) Maximum current are based on:

Unit Size		**300**	**320**	**340**	**360**
Entering / leaving evaporator water temperature	°C	16 / 11	19 / 14	18 / 13	20 / 15
Ambient temperature	°C	44	40	44	40

(4) Inrush current of biggest compressor + 75% of nominal absorbed current of the other compressor + fans current.

(5) Compressor FLA + fans current.

1

1.7 Electrical Specifications: EWAD-AJYNN+OPLN

Electrical specifications

The tabel below contains the electrical specifications for EWAD190-280AJYNN+OPLN.

Model		EWAD-AJYNN+OPLN				
Unit Size		**190**	**200**	**230**	**260**	**280**
Standard voltage (1)		400 V - 3ph - 50 Hz				
Nominal unit current (2)	A	142.3	140.4	145.5	160.4	174.3
Max compressor current (3)	A	154.1	152.3	165.8	185.1	191.9
Fans current	A	6.0	6.0	9.0	9.0	9.0
Max unit current (3)	A	160.1	158.3	174.8	194.1	200.9
Max unit inrush current (4)	A	208.5	207.8	217.2	217.2	261.3
Max unit current for wires sizing (5)	A	176.1	174.1	192.3	213.5	221.0
Cos for maximum current (3)		0.87	0.87	0.88	0.88	0.89

Notes: (1) Allowed voltage tolerance ± 10%. Voltage unbalance between phases must be within ± 3%.

(2) Nominal current are based on: 12/7°C entering/leaving evaporator water temperature and 35°C ambient temp.

(3) Maximum current are based on:

Unit Size		**190**	**200**	**230**	**260**	**280**
Entering / leaving evaporator water temperature	°C	20 / 15	20 / 15	20 / 15	20 / 15	17 / 12
Ambient temperature	°C	35	35	40	40	40

(4) Inrush current of biggest compressor + 75% of nominal absorbed current of the other compressor + fans current.

(5) Compressor FLA + fans current.

Electrical specifications

The tabel below contains the electrical specifications for EWAD300-360AJYNN+OPLN.

Model		EWAD-AJYNN+OPLN			
Unit Size		**300**	**320**	**340**	**360**
Standard voltage (1)		400 V - 3ph - 50 Hz			
Nominal unit current (2)	A	186.8	201.9	207.3	226.0
Max compressor current (3)	A	205.1	217.3	236.5	240.4
Fans current	A	9.0	9.0	12.0	12.0
Max unit current (3)	A	214.1	226.3	248.5	252.4
Max unit inrush current (4)	A	270.7	282.0	280.2	287.3
Max unit current for wires sizing (5)	A	235.5	248.9	273.4	277.7
Cos for maximum current (3)		0.89	0.89	0.90	0.90

Notes: (1) Allowed voltage tolerance ± 10%. Voltage unbalance between phases must be within ± 3%.

(2) Nominal current are based on: 12/7°C entering/leaving evaporator water temperature and 35°C ambient temp.

(3) Maximum current are based on:

Unit Size		**300**	**320**	**340**	**360**
Entering / leaving evaporator water temperature	°C	17 / 12	20 / 15	20 / 15	14 / 9
Ambient temperature	°C	40	35	40	40

(4) Inrush current of biggest compressor + 75% of nominal absorbed current of the other compressor + fans current.

(5) Compressor FLA + fans current.

1.8 Electrical Specifications: EWAD-AJYNN/Q

Electrical specifications

The tabel below contains the electrical specifications for EWAD210-280AJYNN/Q.

Model		EWAD-AJYNN/Q			
Unit Size		**210**	**240**	**260**	**280**
Standard voltage (1)		400 V – 3ph – 50 Hz			
Nominal unit current (2)	A	137.8	147.6	160.8	177.7
Max compressor current (3)	A	153.9	167.1	184.3	188.9
Fans current	A	7.6	10.2	10.2	10.2
Max unit current (3)	A	161.5	177.3	194.5	199.1
Max unit inrush current (4)	A	207.9	218.7	218.1	262.7
Max unit current for wires sizing (5)	A	177.7	195.0	213.9	219.0
CosF for maximum current (3)		0.87	0.87	0.87	0.89

Notes: (1) Allowed voltage tolerance ± 10%. Voltage unbalance between phases must be within ± 3%.

(2) Nominal current are based on: 12/7°C entering/leaving evaporator water temperature and 35°C ambient temp.

(3) Maximum current are based on:

Unit Size		210	240	260	280
Entering / leaving evaporator water temperature	°C	18 / 13	20 / 15	20 / 15	15 / 10
Ambient temperature	°C	40	40	40	40

(4) Inrush current of biggest compressor + 75% of nominal absorbed current of the other compressor + fans current.

(5) Compressor FLA + fans current.

Electrical specifications

The tabel below contains the electrical specifications for EWAD300-340AJYNN/Q.

Model		EWAD-AJYNN/Q		
Unit Size		**300**	**320**	**340**
Standard voltage (1)		400 V - 3ph - 50 Hz		
Nominal unit current (2)	A	193.1	210.1	224.8
Max compressor current (3)	A	205.8	218.0	236.3
Fans current	A	10.2	10.2	10.2
Max unit current (3)	A	216.0	228.1	246.4
Max unit inrush current (4)	A	273.8	285.7	285.7
Max unit current for wires sizing (5)	A	237.6	251.0	271.1
Cos for maximum current (3)		0.89	0.89	0.90

Notes: (1) Allowed voltage tolerance ± 10%. Voltage unbalance between phases must be within ± 3%.

(2) Nominal current are based on: 12/7°C entering/leaving evaporator water temperature and 35°C ambient temp.

(3) Maximum current are based on:

Unit Size		300	320	340
Entering / leaving evaporator water temperature	°C	20 / 15	18 / 13	18 / 13
Ambient temperature	°C	35	35	35

(4) Inrush current of biggest compressor + 75% of nominal absorbed current of the other compressor + fans current.

(5) Compressor FLA + fans current.

1

1.9 Electrical Specifications: EWAD-AJYNN/A

Electrical specifications

The tabel below contains the electrical specifications for EWAD260-340AJYNN/A.

Model		EWAD-AJYNN/A			
Unit Size		**260**	**280**	**320**	**340**
Standard voltage (1)		400 V - 3ph - 50 Hz			
Nominal unit current (2)	A	136.8	150.6	161.0	176.6
Max compressor current (3)	A	160.4	176.8	192.4	201.0
Fans current	A	14.0	18.6	18.6	18.6
Max unit current (3)	A	174.4	195.4	211.0	219.7
Max unit inrush current (4)	A	211.4	224.8	223.4	267.8
Max unit current for wires sizing (5)	A	191.9	215.0	232.1	241.6
Cos for maximum current (3)		0.88	0.88	0.88	0.89

Notes: (1) Allowed voltage tolerance ± 10%. Voltage unbalance between phases must be within ± 3%.

(2) Nominal current are based on: 12/7°C entering/leaving evaporator water temperature and 35°C ambient temp.

(3) Maximum current are based on:

Unit Size		260	280	320	340
Entering / leaving evaporator water temperature	°C	18 / 13	20 / 15	17 / 12	16 / 11
Ambient temperature	°C	46	46	48	46

(4) Inrush current of biggest compressor + 75% of nominal absorbed current of the other compressor + fans current.

(5) Compressor FLA + fans current.

Electrical specifications

The tabel below contains the electrical specifications for EWAD360-420AJYNN/A.

Electrical data		EWAD-AJYNN/A		
Unit Size		**360**	**380**	**420**
Standard voltage (1)		400 V - 3ph - 50 Hz		
Nominal unit current (2)	A	191.1	202.2	212.4
Max compressor current (3)	A	215.0	231.8	247.0
Fans current	A	18.6	26.4	26.4
Max unit current (3)	A	233.6	258.2	273.4
Max unit inrush current (4)	A	278.3	291.1	291.1
Max unit current for wires sizing (5)	A	257.0	284.0	300.7
Cos for maximum current (3)		0.89	0.90	0.90

Notes: (1) Allowed voltage tolerance ± 10%. Voltage unbalance between phases must be within ± 3%.

(2) Nominal current are based on: 12/7°C entering/leaving evaporator water temperature and 35°C ambient temp.

(3) Maximum current are based on:

Unit Size		360	380	420
Entering / leaving evaporator water temperature	°C	15 / 10	20 / 15	20 / 15
Ambient temperature	°C	46	46	46

(4) Inrush current of biggest compressor + 75% of nominal absorbed current of the other compressor + fans current.

(5) Compressor FLA + fans current.

1.10 Electrical Specifications: EWAD-AJYNN/A+OPLN

Electrical specifications

The tabel below contains the electrical specifications for EWAD260-340AJYNN/A+OPLN.

Model		EWAD-AJYNN/A+OPLN			
Unit Size		**260**	**280**	**320**	**340**
Standard voltage (1)		400 V – 3ph – 50 Hz			
Nominal unit current (2)	A	138.1	149.3	161.4	178.1
Max compressor current (3)	A	157.6	170.4	192.8	200.7
Fans current	A	9.0	12.0	12.0	12.0
Max unit current (3)	A	166.6	182.4	204.8	212.7
Max unit inrush current (4)	A	208.8	220.6	219.4	263.9
Max unit current for wires sizing (5)	A	183.3	200.6	225.3	233.9
CosF for maximum current (3)		0.87	0.88	0.88	0.89

Notes: (1) Allowed voltage tolerance ± 10%. Voltage unbalance between phases must be within ± 3%.

(2) Nominal current are based on: 12/7°C entering/leaving evaporator water temperature and 35°C ambient temp.

(3) Maximum current are based on:

Unit Size		260	280	320	340
Entering / leaving evaporator water temperature	°C	12 / 7	13 / 8	16 / 11	20 / 15
Ambient temperature	°C	46	46	46	40

(4) Inrush current of biggest compressor + 75% of nominal absorbed current of the other compressor + fans current.

(5) Compressor FLA + fans current.

Electrical specifications

The tabel below contains the electrical specifications for EWAD360-420AJYNN/A+OPLN.

Model		EWAD-AJYNN/A+OPLN		
Unit Size		**360**	**380**	**420**
Standard voltage (1)		400 V – 3ph – 50 Hz		
Nominal unit current (2)	A	193.4	206.0	217.6
Max compressor current (3)	A	218.3	228.6	241.4
Fans current	A	12.0	21.6	21.6
Max unit current (3)	A	230.3	250.2	263.0
Max unit inrush current (4)	A	275.0	290.1	290.1
Max unit current for wires sizing (5)	A	253.3	275.2	289.3
CosF for maximum current (3)		0.89	0.90	0.90

Notes: (1) Allowed voltage tolerance ± 10%. Voltage unbalance between phases must be within ± 3%.

(2) Nominal current are based on: 12/7°C entering/leaving evaporator water temperature and 35°C ambient temp.

(3) Maximum current are based on:

Unit Size		360	380	420
Entering / leaving evaporator water temperature	°C	20 / 15	14 / 9	13 / 8
Ambient temperature	°C	40	46	46

(4) Inrush current of biggest compressor + 75% of nominal absorbed current of the other compressor + fans current.

(5) Compressor FLA + fans current.

1

1.11 Electrical Specifications: EWAD-AJYNN/H

Electrical specifications

The tabel below contains the electrical specifications for EWAD200-280AJYNN/H.

Model		EWAD-AJYNN/H				
Unit Size		**200**	**210**	**240**	**260**	**280**
Standard voltage (1)		400 V - 3ph - 50 Hz				
Nominal unit current (2)	A	135.5	133.1	147.0	159.1	171.2
Max compressor current (3)	A	151.7	154.0	166.8	185.0	195.8
Fans current	A	16.0	16.0	24.0	24.0	24.0
Max unit current (3)	A	167.7	170.0	190.8	209.0	219.8
Max unit inrush current (4)	A	212.2	211.3	226.1	226.1	270.1
Max unit current for wires sizing (5)	A	184.4	187.0	209.9	229.9	241.8
Cos for maximum current (3)		0.87	0.87	0.88	0.88	0.89

Notes: (1) Allowed voltage tolerance ± 10%. Voltage unbalance between phases must be within ± 3%.

(2) Nominal current are based on: 12/7°C entering/leaving evaporator water temperature and 35°C ambient temp.

(3) Maximum current are based on:

Unit Size		**200**	**210**	**240**	**260**	**280**
Entering / leaving evaporator water temperature	°C	17 / 12	20 / 15	20 / 15	20 / 15	19 / 14
Ambient temperature	°C	46	46	48	48	48

(4) Inrush current of biggest compressor + 75% of nominal absorbed current of the other compressor + fans current.

(5) Compressor FLA + fans current.

Electrical specifications

The tabel below contains the electrical specifications for EWAD300-400AJYNN/H.

Model		EWAD-AJYNN/H			
Unit Size		**300**	**320**	**340**	**400**
Standard voltage (1)		400 V – 3ph – 50 Hz			
Nominal unit current (2)	A	182.2	193.6	207.9	217.9
Max compressor current (3)	A	207.4	217.6	236.4	247.2
Fans current	A	24.0	24.0	32.0	32.0
Max unit current (3)	A	231.4	241.6	268.4	279.2
Max unit inrush current (4)	A	278.3	286.9	293.0	296.7
Max unit current for wires sizing (5)	A	254.5	265.8	295.2	307.1
CosF for maximum current (3)		0.89	0.89	0.90	0.90

Notes: (1) Allowed voltage tolerance ± 10%. Voltage unbalance between phases must be within ± 3%.

(2) Nominal current are based on: 12/7°C entering/leaving evaporator water temperature and 35°C ambient temp.

(3) Maximum current are based on:

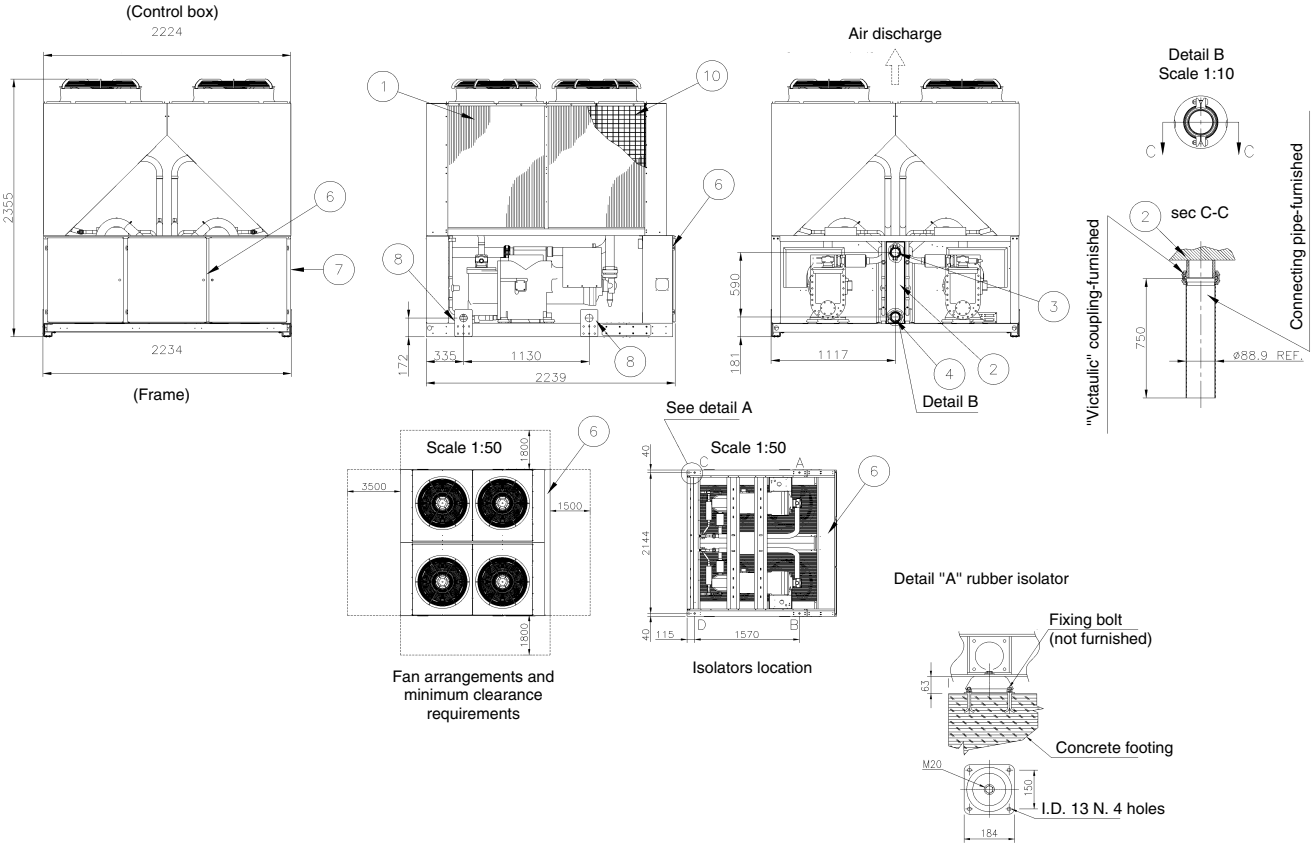
Unit Size		**300**	**320**	**340**	**400**
Entering / leaving evaporator water temperature	°C	19 / 14	19 / 14	20 / 15	14 / 9
Ambient temperature	°C	48	46	48	46

(4) Inrush current of biggest compressor + 75% of nominal absorbed current of the other compressor + fans current.

(5) Compressor FLA + fans current.

1.12 Outlook Drawing: EWAD190-200AJYNN and EWAD200-210AJYNN/H

The illustration below shows the outlook, the dimensions and the installation and service space of the unit (mm).



Version	Condenser Type	Weight KG		Isolators load KG			
		Shipping	Operating	A	B	C	D
EWAD190-200AJYNN EWAD200-210AJYNN/H	Aluminum Acrylic coated	2470	2500	692	692	558	558
EWAD190-200AJYNN EWAD200-210AJYNN/H	Rubber isolators	Type (q/ty)		786010-w (4 Pz.)			

Components

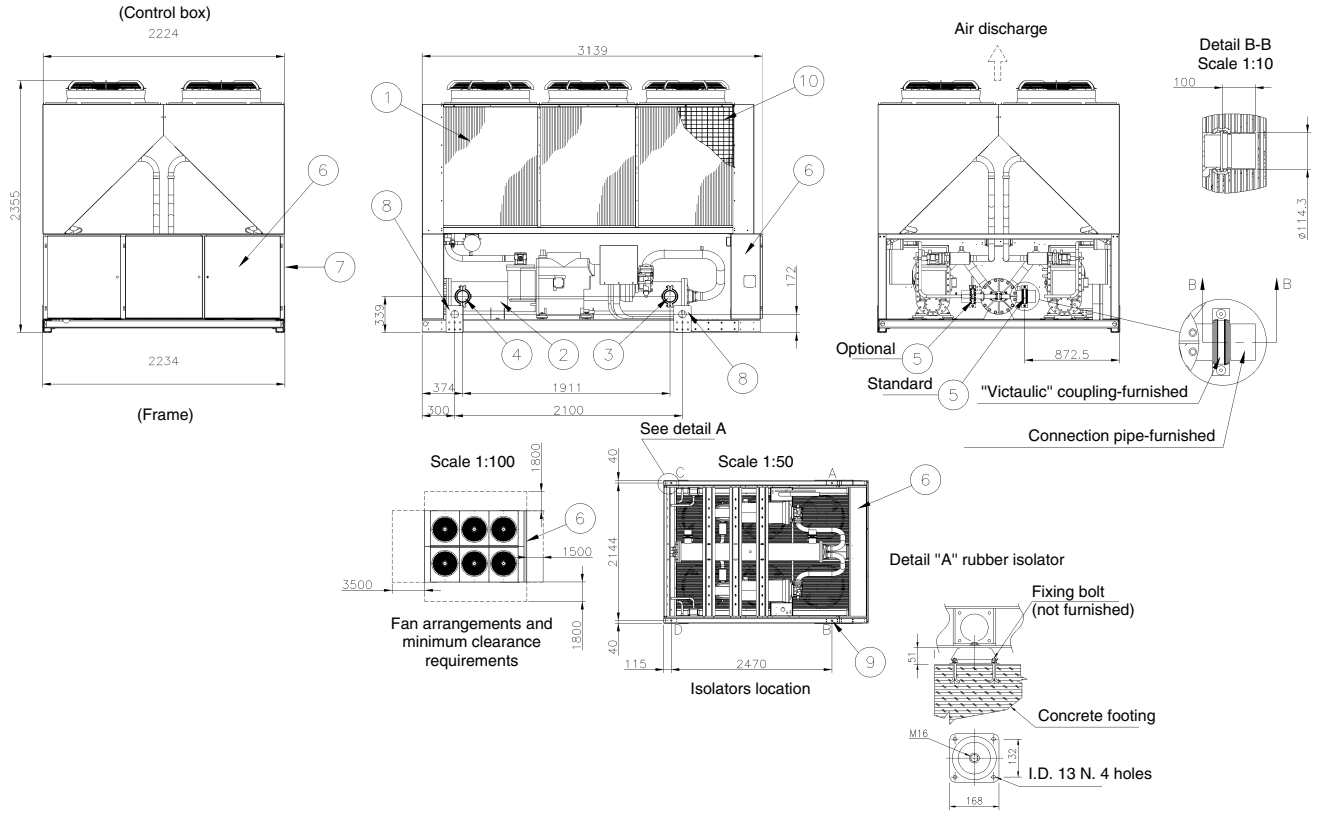
The table below lists the components.

No.	Component
1	Condenser coil
2	Evaporator
3	Pump water inlet 3" gas connection
4	Evaporator water outlet 3" gas connection
5	Victaulic connections for 88.9 O.D. tube
6	Operating and control panel
7	330x180 slot for power and control panel connection
8	4 Raising plate
9	4 isolator mounting holes 25 mm DIA.
10	Coil protection guards (optional)
11	Compressor enclosure (optional)

1

1.13 Outlook Drawing: EWAD230-320AJYNN and EWAD240-320AJYNN/H

The illustration below shows the outlook, the dimensions and the installation and service space of the unit (mm).



Version	Condenser Type	Weight KG		Isolators load KG			
		Shipping	Operating	A	B	C	D
EWAD230-320AJYNN EWAD240-320AJYNN/H	Aluminum	2860	2960	775	775	705	705
	Acrylic coated						
EWAD230-320AJYNN EWAD240-320AJYNN/H	Rubber isolators	Type (q/ty)		786011-h (4 Pz.)			

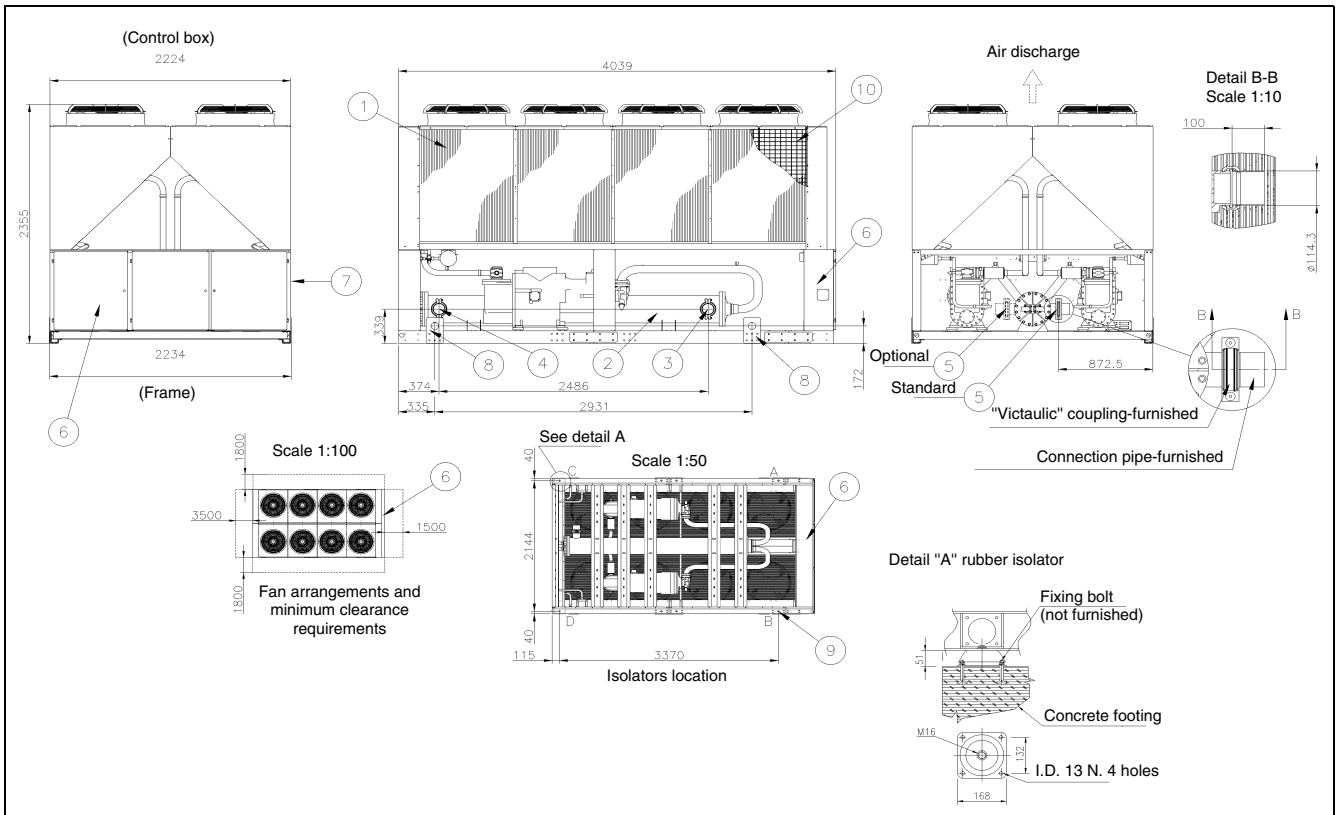
Components

The table below lists the components.

No.	Component
1	Condenser coil
2	Evaporator
3	Evaporator water inlet
4	Evaporator water outlet
5	Victaulic connections for 114.3 O.D. tube
6	Operating and control panel
7	330x180 slot for power and control panel connection
8	4 Raising plate
9	4 isolator mounting holes 25 mm DIA.
10	Coil protection guards (optional)
11	Compressor enclosure (optional)

1.14 Outlook Drawing: EWAD340-360AJYNN and EWAD340-400AJYNN/H

The illustration below shows the outlook, the dimensions and the installation and service space of the unit (mm).



Version	Condenser Type	Weight KG		Isolators load KG			
		Shipping	Operating	A	B	C	D
EWAD340-360AJYNN EWAD340-400AJYNN/H	Aluminum Acrylic coated	3187	3300	790	790	860	860
EWAD340-360AJYNN EWAD340-400AJYNN/H	Rubber isolators	Type (q/ty)		786011-h (4 Pz.)			

Components

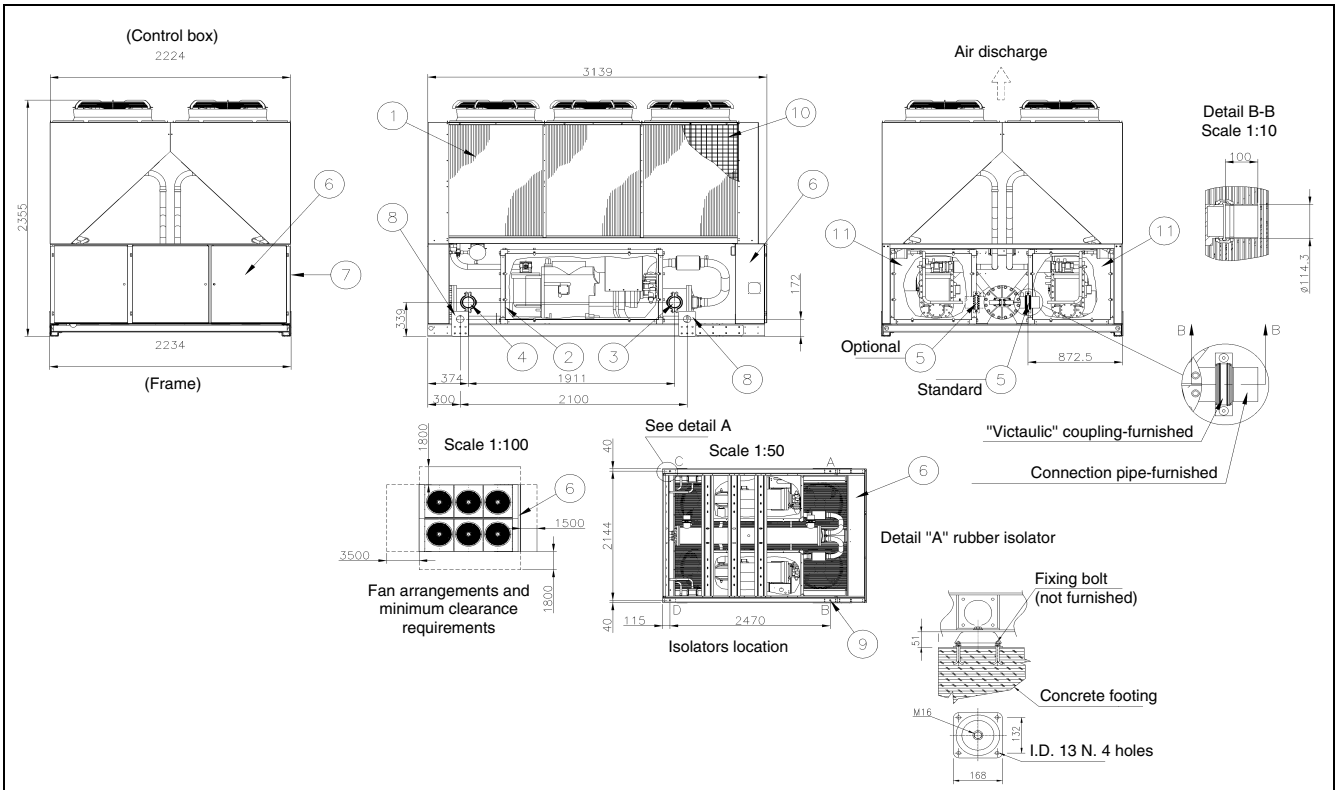
The table below lists the components.

No.	Component
1	Condenser coil
2	Evaporator
3	Evaporator water inlet
4	Evaporator water outlet
5	Victaulic connections for 114.3 O.D. tube
6	Operating and control panel
7	330x180 slot for power and control panel connection
8	4 Raising plate
9	4 isolator mounting holes 25 mm DIA.
10	Coil protection guards (optional)
11	Compressor enclosure (optional)

1

1.15 Outlook Drawing: EWAD230-320AJYNN+OPLN

The illustration below shows the outlook, the dimensions and the installation and service space of the unit (mm).



Version	Condenser Type	Weight KG		Isolators load KG			
		Shipping	Operating	A	B	C	D
EWAD230-320AJYNN+OPL	Aluminum	2890	3100	815	815	735	735
	Acrylic coated						
	Rubber isolators	Type (q/ty)		786011-h (4 Pz.)			

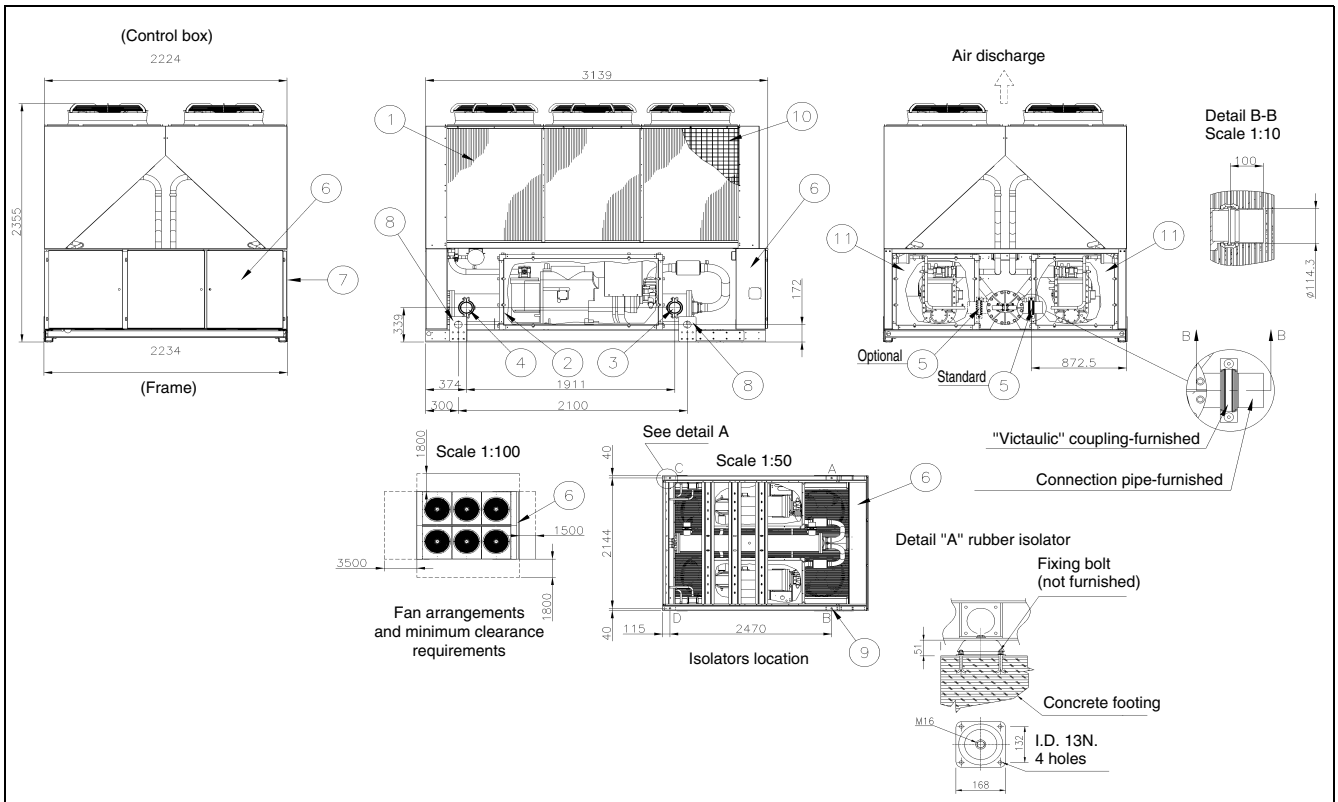
Components

The table below lists the components.

No.	Component
1	Condenser coil
2	Evaporator
3	Evaporator water inlet
4	Evaporator water outlet
5	Victaulic connections for 114.3 O.D. tube
6	Operating and control panel
7	330x180 slot for power and control panel connection
8	4 Raising plate
9	4 isolator mounting holes 25 mm DIA.
10	Coil protection guards (optional)
11	Compressors enclosure

1.16 Outlook Drawing: EWAD230AJYNN+OPLN

The illustration below shows the outlook, the dimensions and the installation and service space of the unit (mm).



Version	Condenser Type	Weight KG		Isolators load KG			
		Shipping	Operating	A	B	C	D
EWAD230AJYNN+OPLN	Aluminum / Acrylic coated	2890	3100	815	815	735	735
EWAD230AJYNN+OPLN	Rubber isolators	Type (q/ty)		786011-h (4 Pz.)			

Components

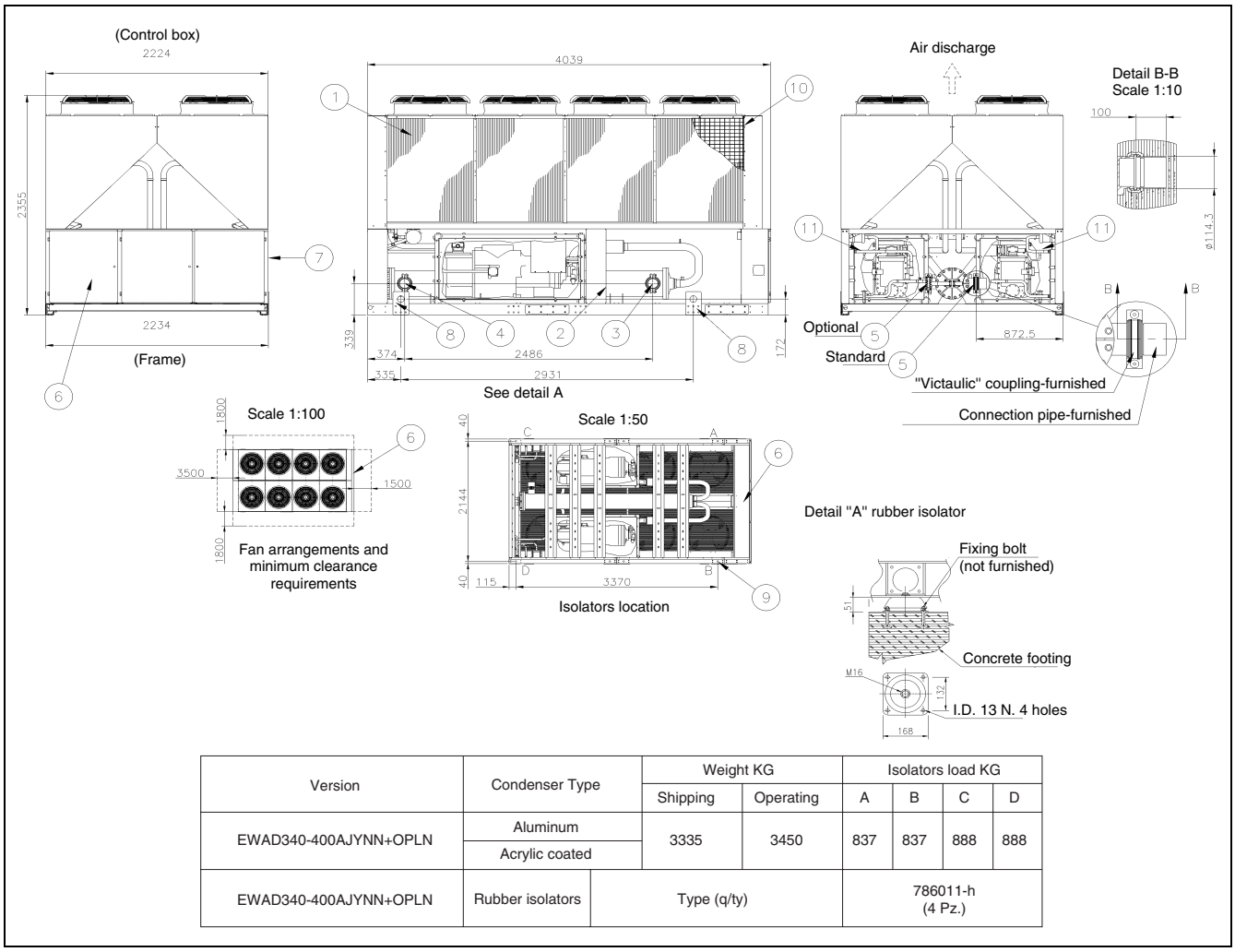
The table below lists the components.

No.	Component
1	Condenser coil
2	Evaporator
3	Evaporator water inlet
4	Evaporator water outlet
5	Victaulic connections for 114.3 O.D. tube
6	Operating and control panel
7	330x180 slot for power and control panel connection
8	4 Raising plate
9	4 isolator mounting holes 25 mm DIA.
10	Coil protection guards (optional)
11	Compressors enclosure

1

1.17 Outlook Drawing: EWAD340-400AJYNN+OPLN

The illustration below shows the outlook, the dimensions and the installation and service space of the unit (mm).



Version	Condenser Type	Weight KG		Isolators load KG			
		Shipping	Operating	A	B	C	D
EWAD340-400AJYNN+OPLN	Aluminum	3335	3450	837	837	888	888
	Acrylic coated						
EWAD340-400AJYNN+OPLN	Rubber isolators	Type (q/ty)		786011-h (4 Pz.)			

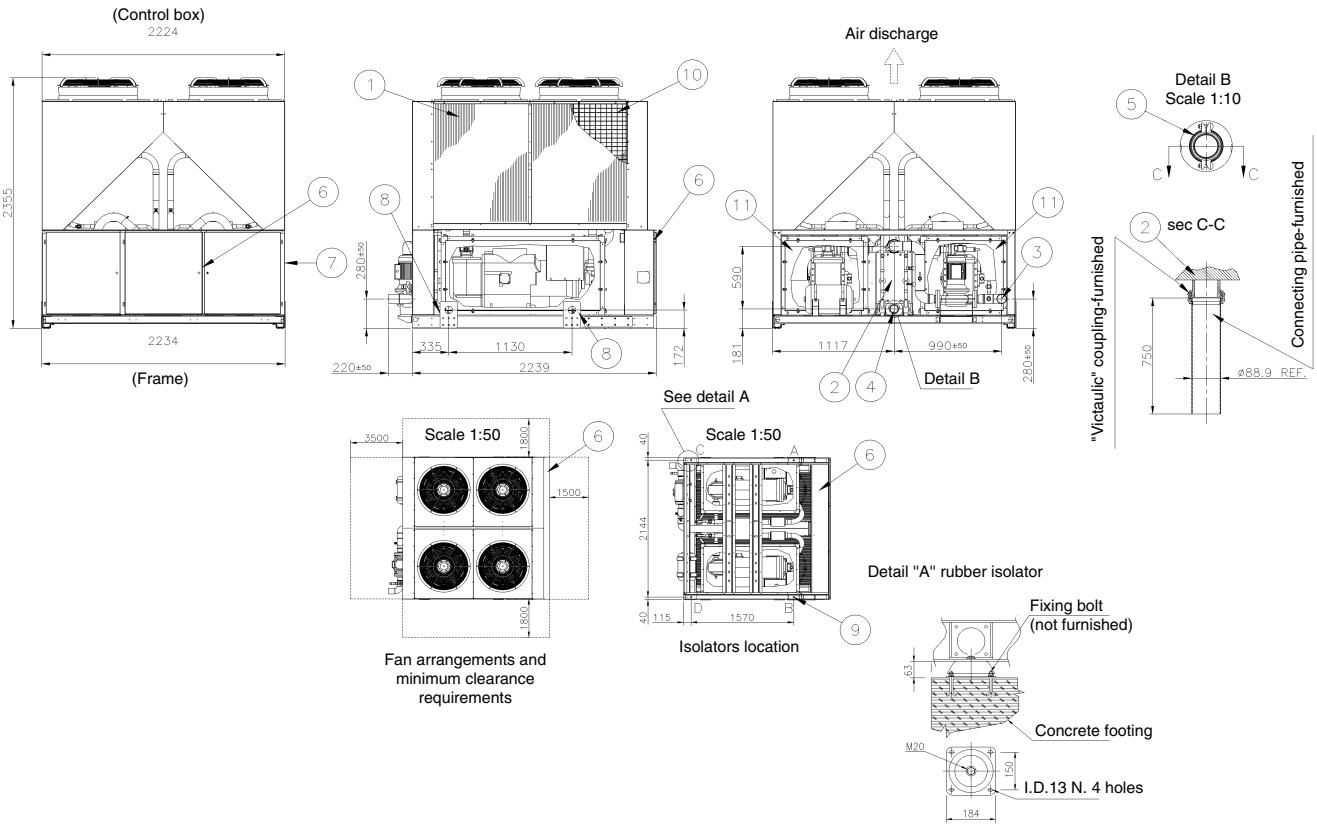
Components

The table below lists the components.

No.	Component
1	Condenser coil
2	Evaporator
3	Evaporator water inlet
4	Evaporator water outlet
5	Victaulic connections for 114.3 O.D. tube
6	Operating and control panel
7	330x180 slot for power and control panel connection
8	4 Raising plate
9	4 isolator mounting holes 25 mm DIA.
10	Coil protection guards (optional)
11	Compressors enclosure

1.18 Outlook Drawing: EWAD190-200AJYNN+OPLN+OPSP

The illustration below shows the outlook, the dimensions and the installation and service space of the unit (mm).



Version	Condenser Type	Weight KG		Isolators load KG			
		Shipping	Operating	A	B	C	D
EWAD190-200AJYNN+OPLN+OPSP	Aluminum / Acrylic coated	2720	2750	685	685	690	690
EWAD190-200AJYNN+OPLN+OPSP	Rubber isolators	Type (q/ty)		786010-w (2 Pz.)			

Components

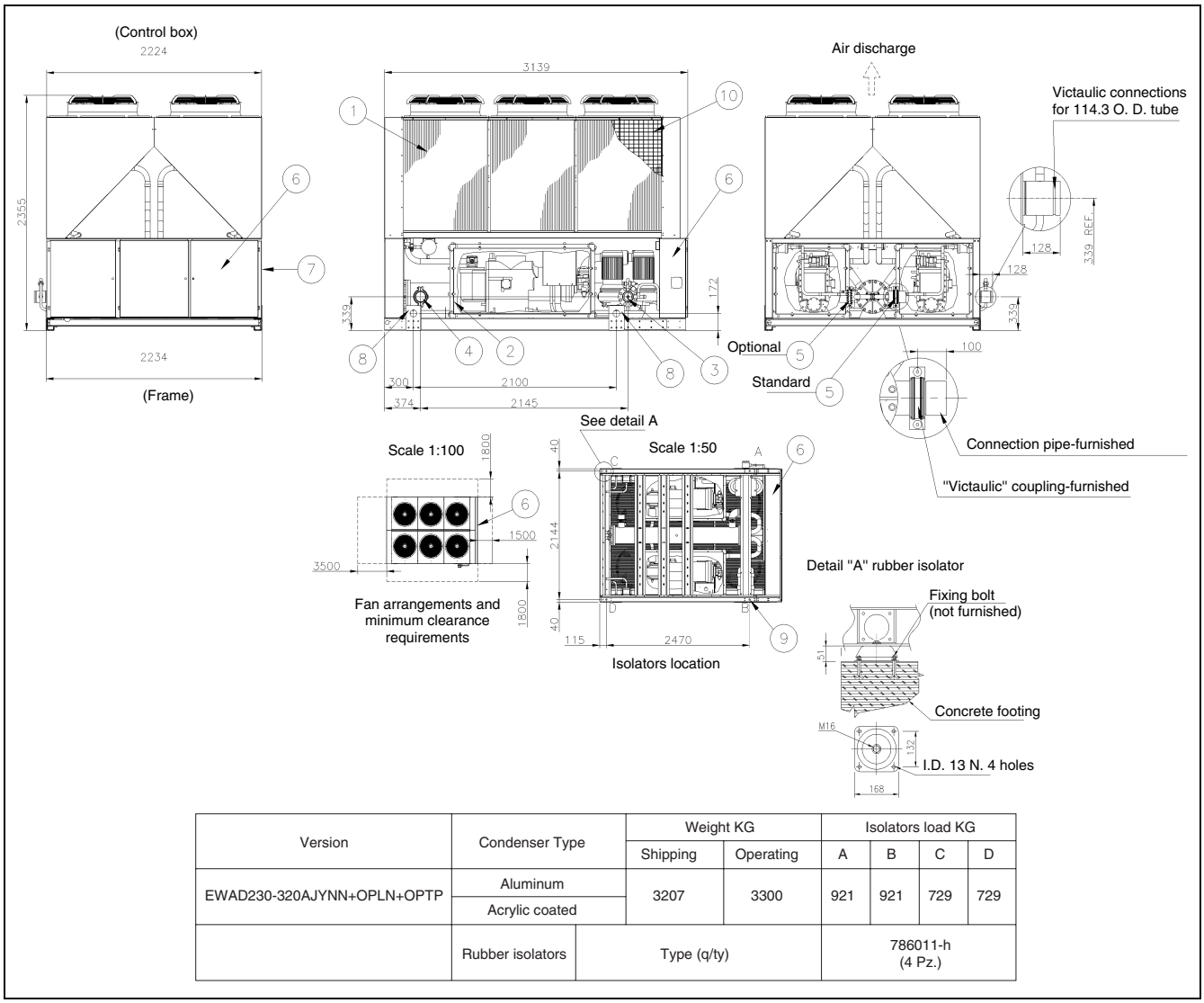
The table below lists the components.

No.	Component
1	Condenser coil
2	Evaporator
3	Pump water inlet 3" gas connection
4	Evaporator water outlet 3" gas connection
5	Victaulic connections for 88.9 O.D. tube
6	Operating and control panel
7	330x180 slot for power and control panel connection
8	4 Raising plate
9	4 isolator mounting holes 25 mm DIA.
10	Coil protection guards (optional)
11	Compressors enclosure

1

1.19 Outlook Drawing: EWAD230-320AJYNN+OPLN+OPTP

The illustration below shows the outlook, the dimensions and the installation and service space of the unit (mm).



Version	Condenser Type	Weight KG		Isolators load KG			
		Shipping	Operating	A	B	C	D
EWAD230-320AJYNN+OPLN+OPTP	Aluminum	3207	3300	921	921	729	729
	Acrylic coated						
	Rubber isolators	Type (q/ty)		786011-h (4 Pz.)			

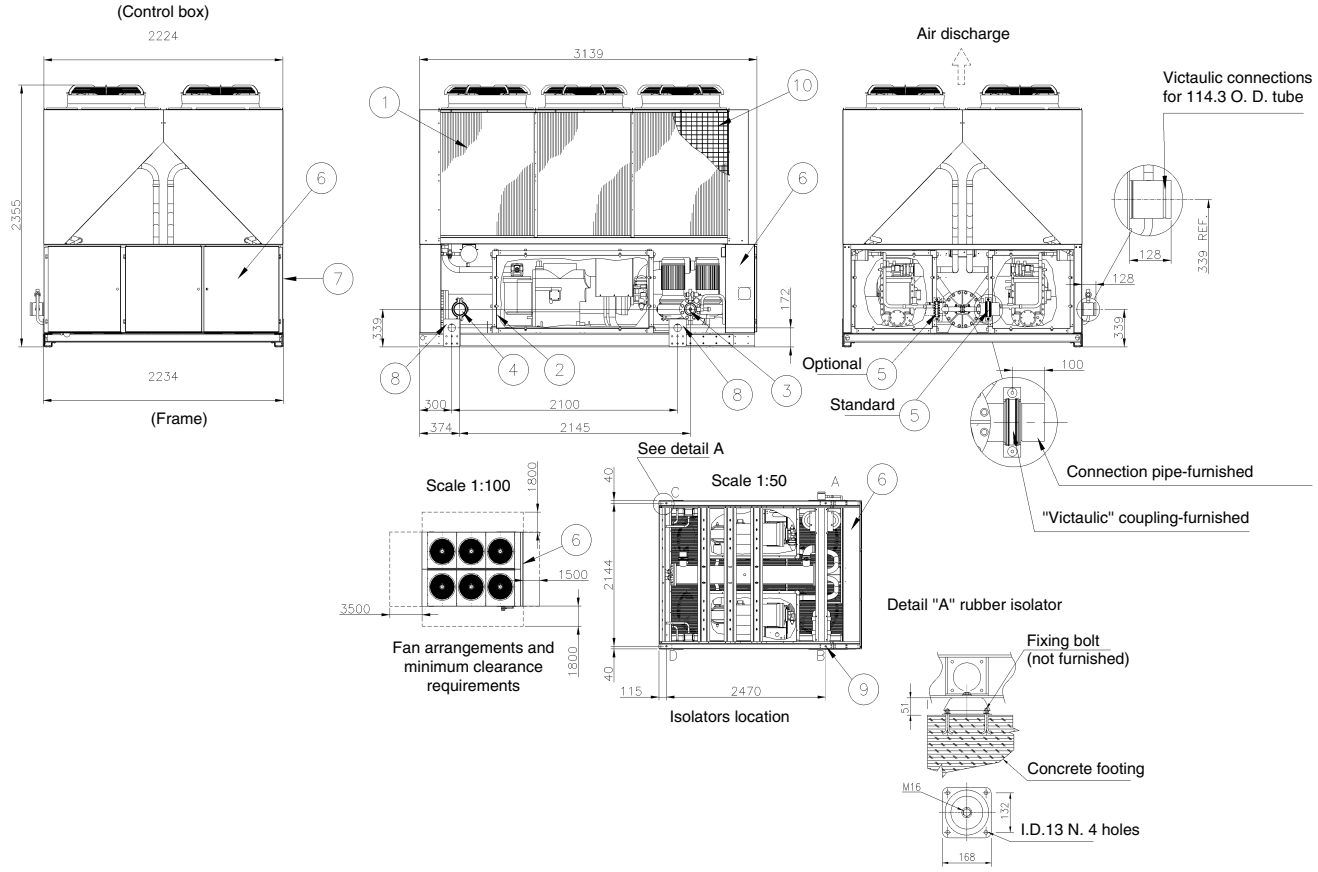
Components

The table below lists the components.

No.	Component
1	Condenser coil
2	Evaporator
3	Evaporator water inlet
4	Evaporator water outlet
5	Victaulic connections for 114.3 O.D. tube
6	Operating and control panel
7	330x180 slot for power and control panel connection
8	4 Raising plate
9	4 isolator mounting holes 25 mm DIA.
10	Coil protection guards (optional)
11	Compressors enclosure

1.20 Outlook Drawing: EWAD230AJYNN+OPLN+OPTP

The illustration below shows the outlook, the dimensions and the installation and service space of the unit (mm).



Version	Condenser Type	Weight KG		Isolators load KG			
		Shipping	Operating	A	B	C	D
EWAD230AJYNN+OPLN+OPTP	Aluminum Acrylic coated	3207	3300	921	921	729	729
EWAD230AJYNN+OPLN+OPTP	Rubber isolators	Type (q/ty)		786011-h (4 Pz.)			

Components

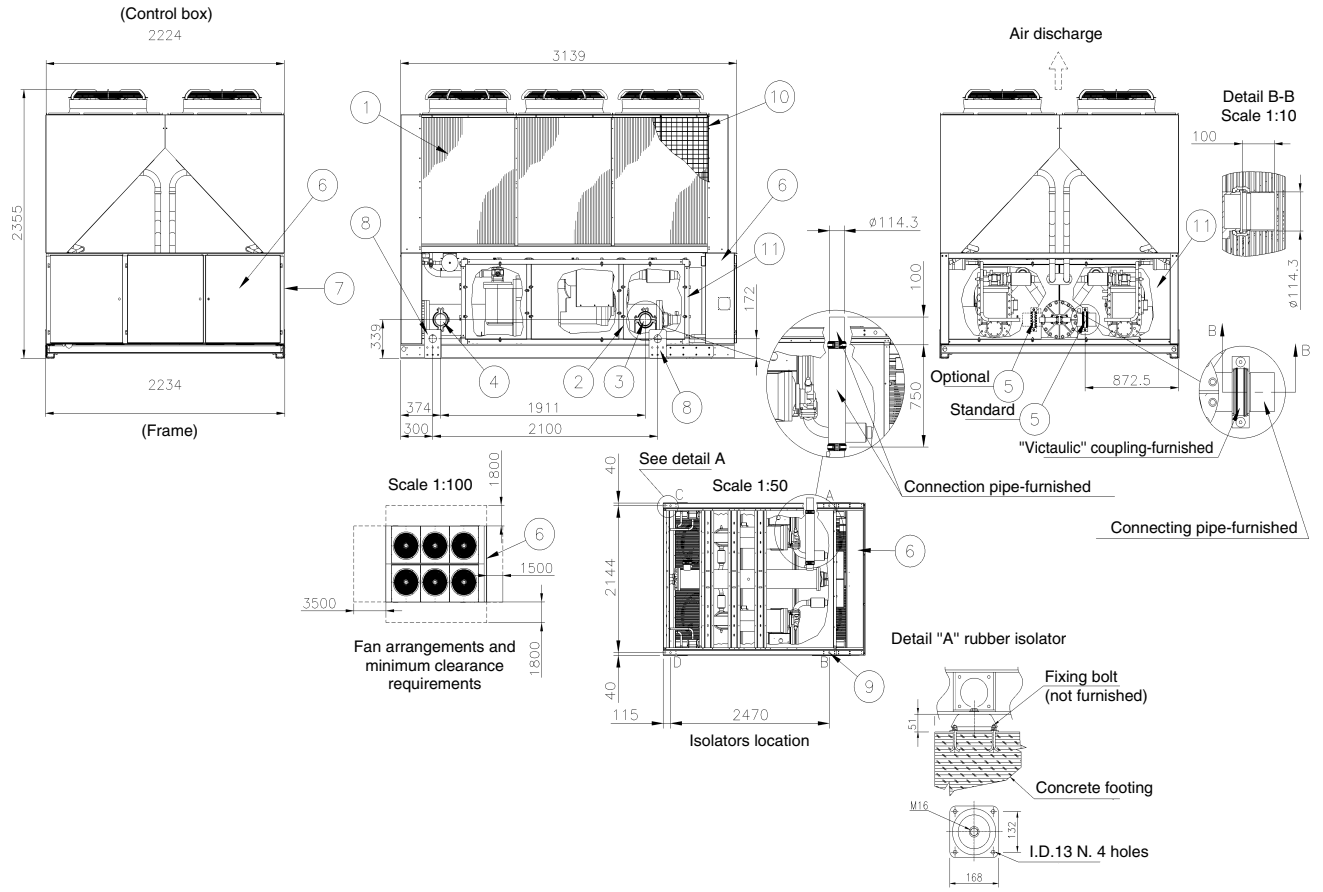
The table below lists the components.

No.	Component
1	Condenser coil
2	Evaporator
3	Evaporator water inlet
4	Evaporator water outlet
5	Victaulic connections for 114.3 O.D. tube
6	Operating and control panel
7	330x180 slot for power and control panel connection
8	4 Raising plate
9	4 isolator mounting holes 25 mm DIA.
10	Coil protection guards (optional)
11	Compressors enclosure

1

1.21 Outlook Drawing: EWAD210AJYNN/Q

The illustration below shows the outlook, the dimensions and the installation and service space of the unit (mm).



Version	Condenser Type	Weight KG		Isolators load KG			
		Shipping	Operating	A	B	C	D
EWAD210AJYNN/Q	Aluminum	3100	3200	840	840	760	760
	Acrylic coated						
EWAD210AJYNN/Q	Rubber isolators	Type (q/ty)		786011-h (4 Pz.)			

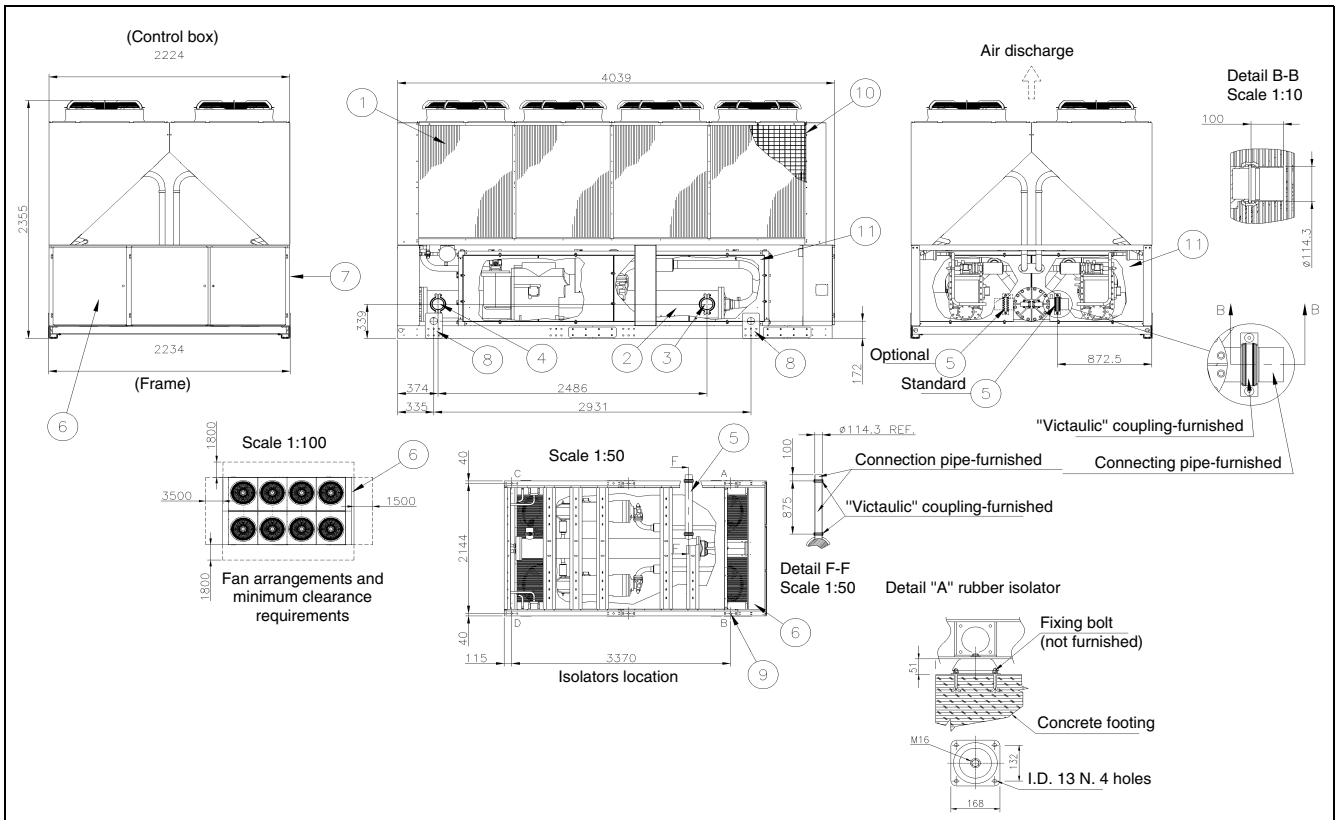
Components

The table below lists the components.

No.	Component
1	Condenser coil
2	Evaporator
3	Evaporator water inlet
4	Evaporator water outlet
5	Victaulic connections for 114.3 O.D. tube
6	Operating and control panel
7	330x180 slot for power and control panel connection
8	4 Raising plate
9	4 isolator mounting holes 25 mm DIA.
10	Coil protection guards (optional)
11	Compressors enclosure

1.22 Outlook Drawing: EWAD230AJYNN/Q

The illustration below shows the outlook, the dimensions and the installation and service space of the unit (mm).



Version	Condenser Type	Weight KG		Isolators load KG			
		Shipping	Operating	A	B	C	D
EWAD230AJYNN/Q	Aluminum	3475	3590	874	874	921	921
	Acrylic coated						
EWAD230AJYNN/Q	Rubber isolators	Type (q/ty)		786011-h (4 Pz.)			

Components

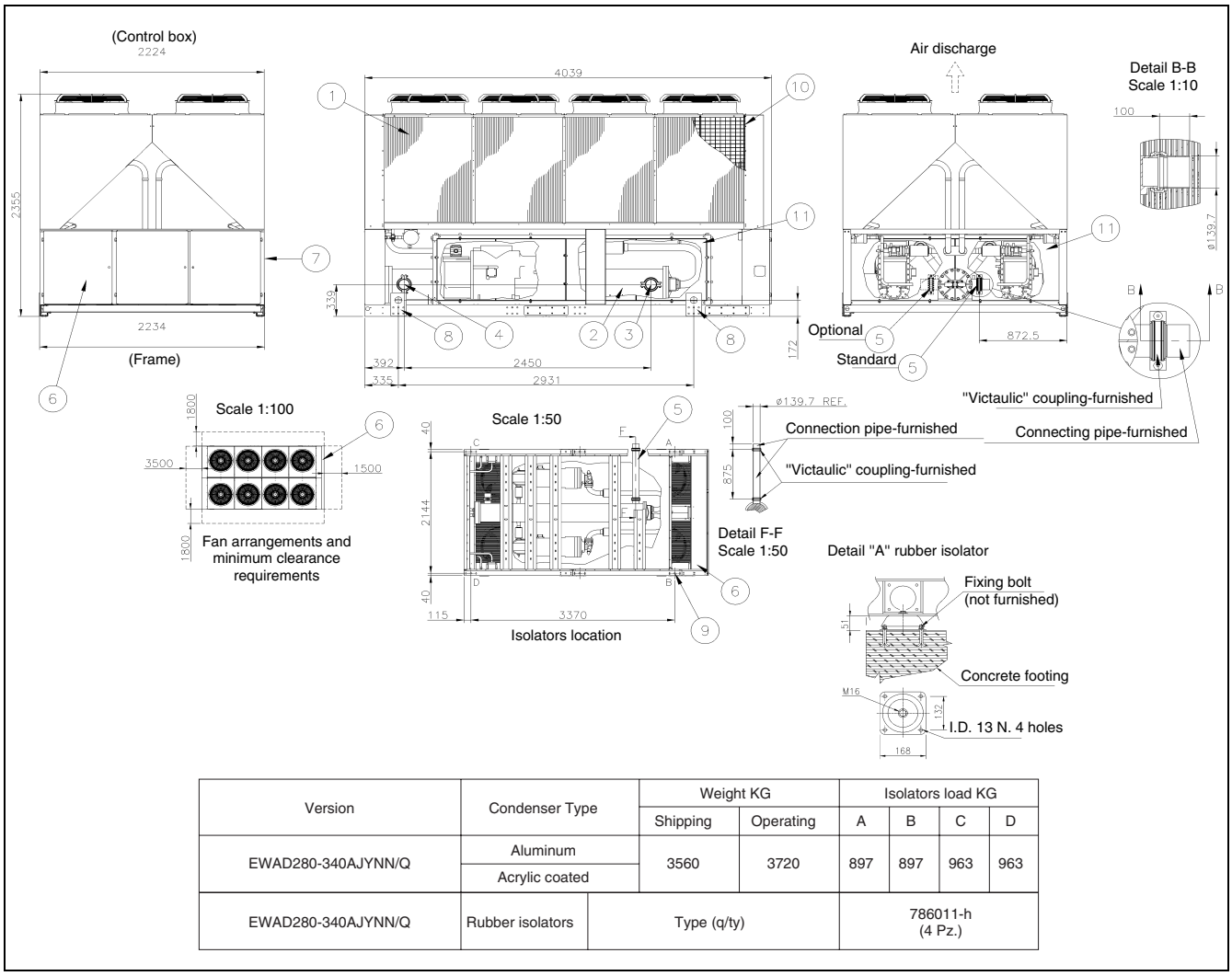
The table below lists the components.

No.	Component
1	Condenser coil
2	Evaporator
3	Evaporator water inlet
4	Evaporator water outlet
5	Victaulic connections for 114.3 O.D. tube
6	Operating and control panel
7	330x180 slot for power and control panel connection
8	4 Raising plate
9	4 isolator mounting holes 25 mm DIA.
10	Coil protection guards (optional)
11	Compressors enclosure

1

1.23 Outlook Drawing: EWAD280-340AJYNN/Q

The illustration below shows the outlook, the dimensions and the installation and service space of the unit (mm).



Version	Condenser Type	Weight KG		Isolators load KG			
		Shipping	Operating	A	B	C	D
EWAD280-340AJYNN/Q	Aluminum	3560	3720	897	897	963	963
	Acrylic coated						
EWAD280-340AJYNN/Q	Rubber isolators	Type (q/ty)		786011-h (4 Pz.)			

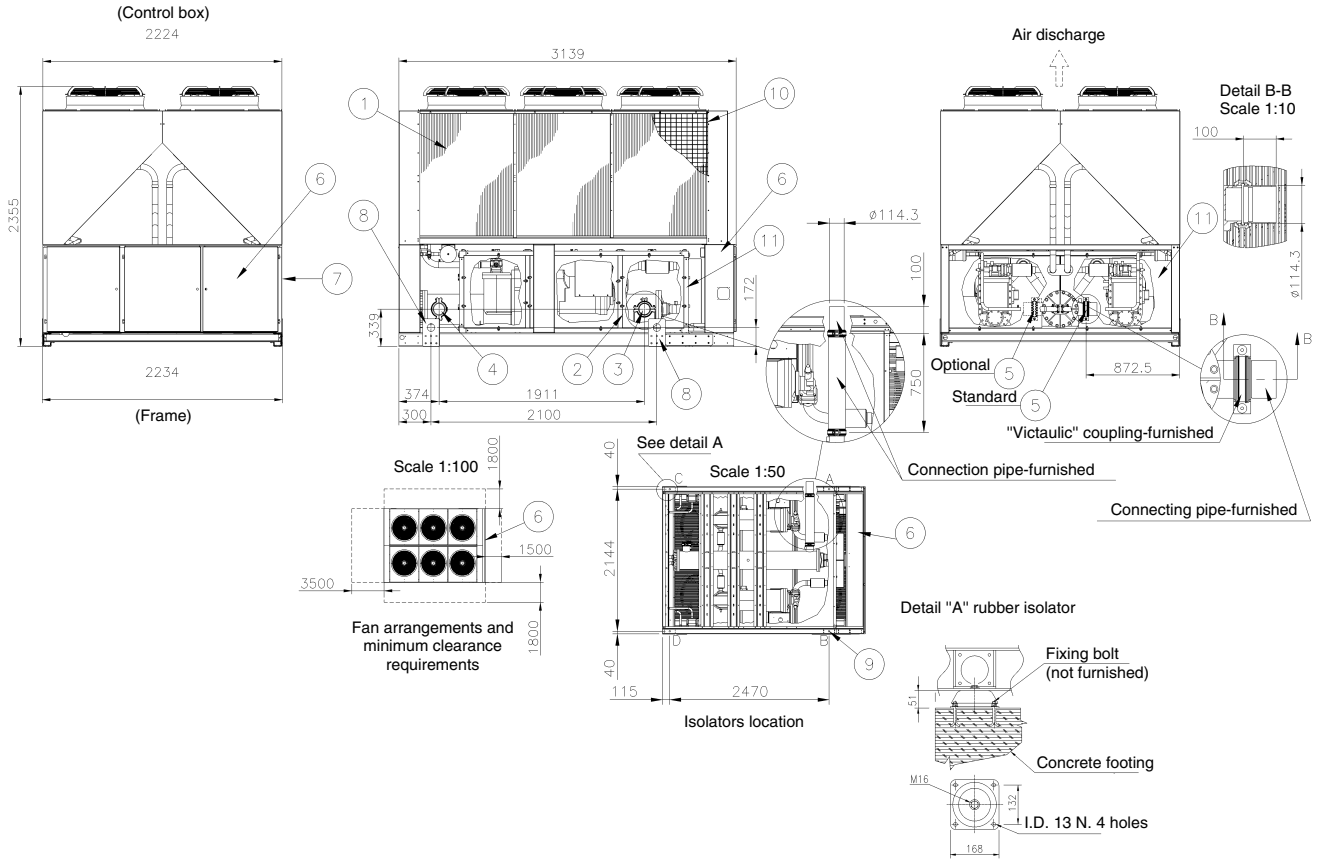
Components

The table below lists the components.

No.	Component
1	Condenser coil
2	Evaporator
3	Evaporator water inlet
4	Evaporator water outlet
5	Victaulic connections for 139.7 O.D. tube
6	Operating and control panel
7	330x180 slot for power and control panel connection
8	4 Raising plate
9	4 isolator mounting holes 25 mm DIA.
10	Coil protection guards (optional)
11	Compressors enclosure

1.24 Outlook Drawing: EWAD210AJYNN/Q+OPCU

The illustration below shows the outlook, the dimensions and the installation and service space of the unit (mm).



Version	Condenser Type	Weight KG		Isolators load KG			
		Shipping	Operating	A	B	C	D
EWAD210AJYNN/Q+OPCU	Aluminum	3450	3550	927	927	848	848
	Acrylic coated						
EWAD210AJYNN/Q+OPCU	Rubber isolators	Type (q/ty)		786011-h (4 Pz.)			

Components

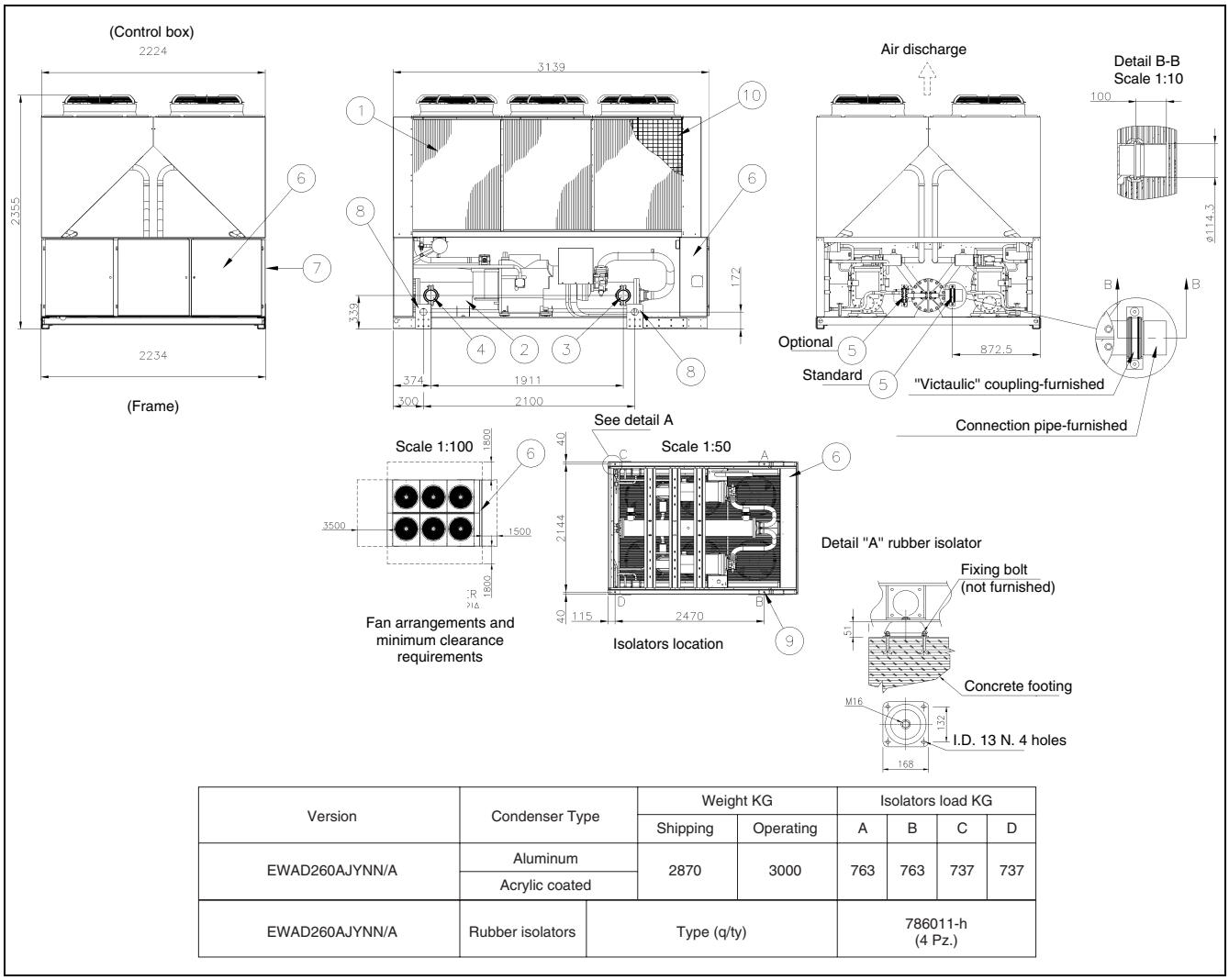
The table below lists the components.

No.	Component
1	Condenser coil
2	Evaporator
3	Evaporator water inlet
4	Evaporator water outlet
5	Victaulic connections for 114.3 O.D. tube
6	Operating and control panel
7	330x180 slot for power and control panel connection
8	4 Raising plate
9	4 isolator mounting holes 25 mm DIA.
10	Coil protection guards (optional)
11	Compressors enclosure

1

1.25 Outlook Drawing: EWAD260AJYNN/A

The illustration below shows the outlook, the dimensions and the installation and service space of the unit (mm).



Version	Condenser Type	Weight KG		Isolators load KG			
		Shipping	Operating	A	B	C	D
EWAD260AJYNN/A	Aluminum Acrylic coated	2870	3000	763	763	737	737
EWAD260AJYNN/A	Rubber isolators	Type (q/ty)		786011-h (4 Pz.)			

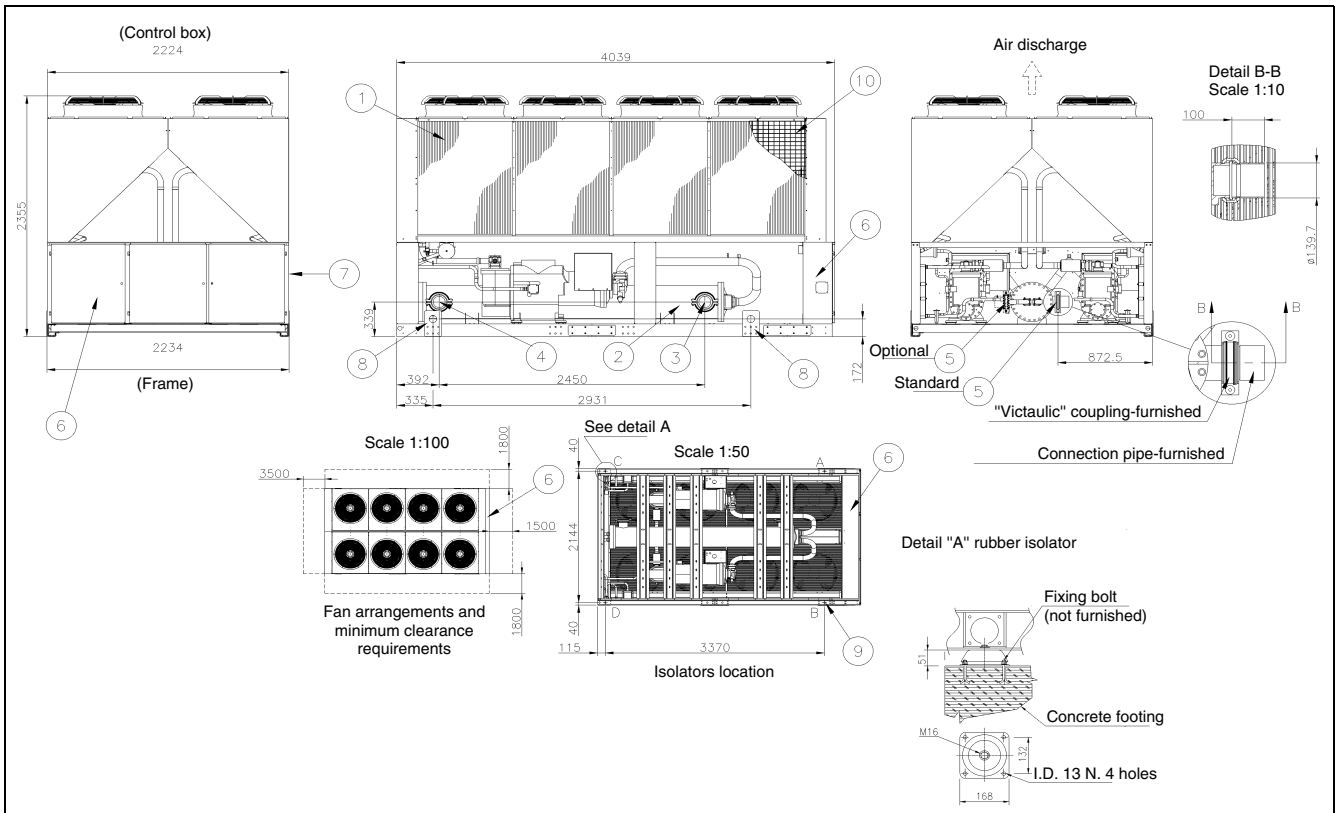
Components

The table below lists the components.

No.	Component
1	Condenser coil
2	Evaporator
3	Evaporator water inlet
4	Evaporator water outlet
5	Victaulic connections for 114.3 O.D. tube
6	Operating and control panel
7	330x180 slot for power and control panel connection
8	4 Raising plate
9	4 isolator mounting holes 25 mm DIA.
10	Coil protection guards (optional)
11	Compressor enclosure (optional)

1.26 Outlook Drawing: EWAD280-320AJYNN/A

The illustration below shows the outlook, the dimensions and the installation and service space of the unit (mm).



Version	Condenser Type	Weight KG		Isolators load KG			
		Shipping	Operating	A	B	C	D
EWAD280-320AJYNN/A	Aluminum	3285	3400	828	828	872	872
	Acrylic coated						
EWAD280-320AJYNN/A	Rubber isolators	Type (q/ty)		786011-h (4 Pz.)			

Components

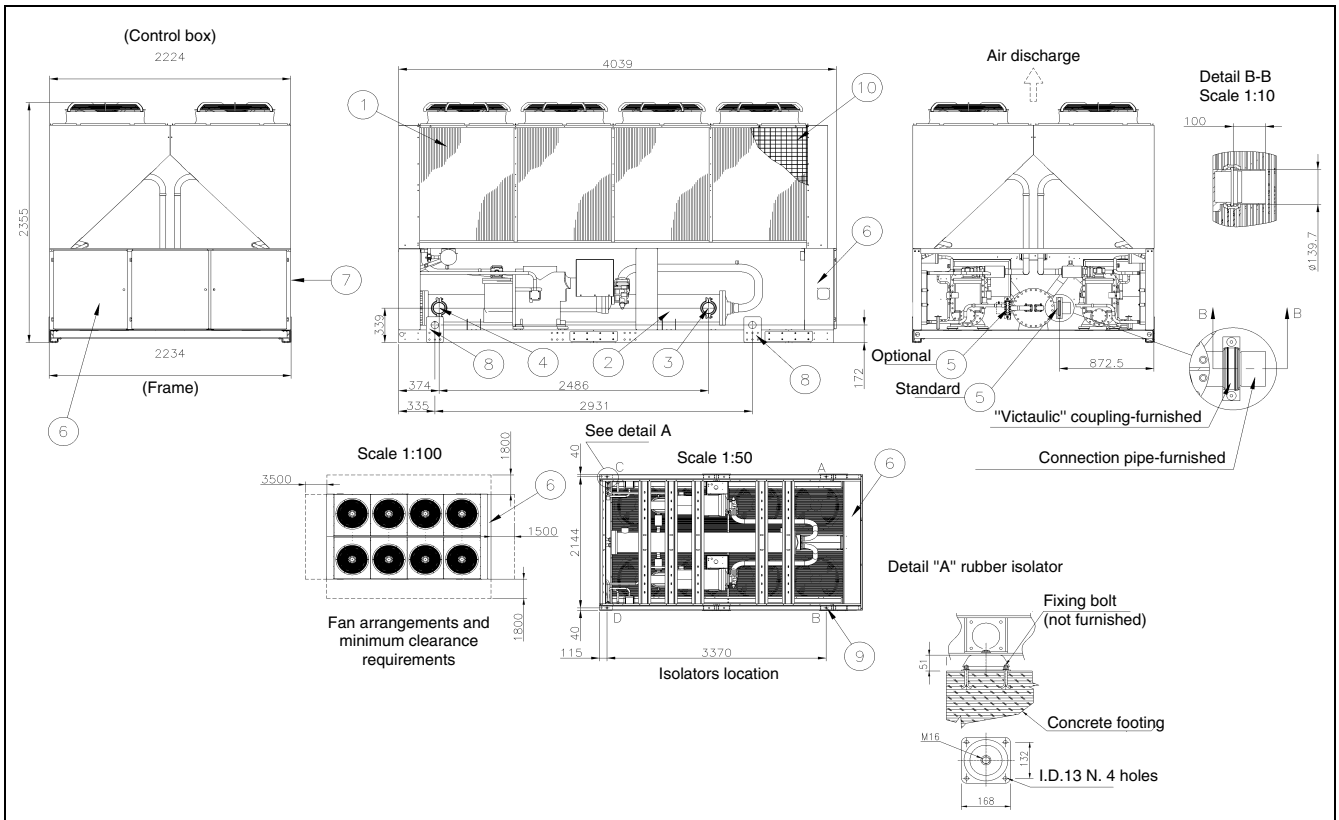
The table below lists the components.

No.	Component
1	Condenser coil
2	Evaporator
3	Evaporator water inlet
4	Evaporator water outlet
5	Victaulic connections for 139.7 O.D. tube
6	Operating and control panel
7	330x180 slot for power and control panel connection
8	4 Raising plate
9	4 isolator mounting holes 25 mm DIA
10	Coil protection guards (optional)
11	Compressor enclosure (optional)

1

1.27 Outlook Drawing: EWAD340-420AJYNN/A

The illustration below shows the outlook, the dimensions and the installation and service space of the unit (mm).



Version	Condenser Type	Weight KG		Isolators load KG			
		Shipping	Operating	A	B	C	D
EWAD340-420AJYNN/A	Aluminum	3386	3560	878	878	902	902
	Acrylic coated						
EWAD340-420AJYNN/A	Rubber isolators	Type (q/ty)		786011-h (4 Pz.)			

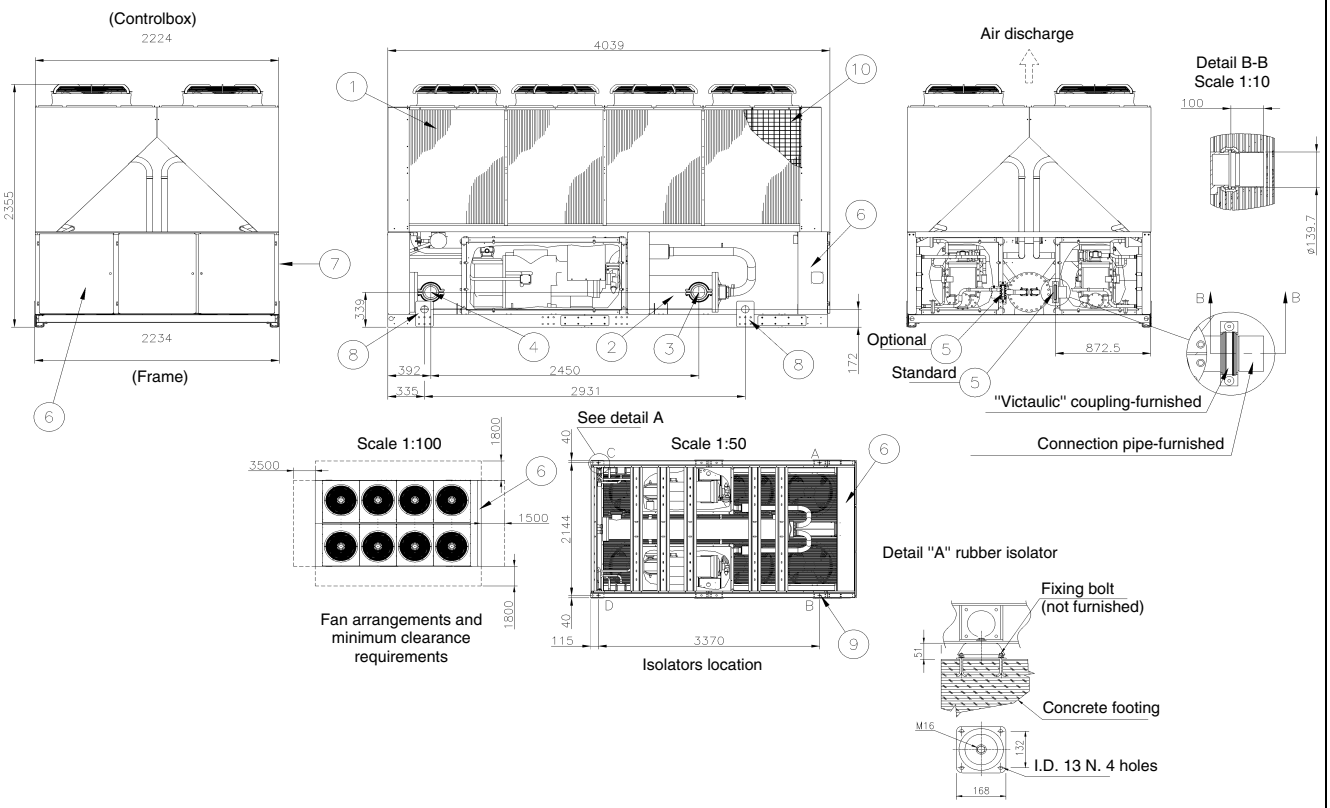
Components

The table below lists the components.

No.	Component
1	Condenser coil
2	Evaporator
3	Evaporator water inlet
4	Evaporator water outlet
5	Victaulic connections for 139.7 O.D. tube
6	Operating and control panel
7	330x180 slot for power and control panel connection
8	4 Raising plate
9	4 isolator mounting holes 25 mm DIA.
10	Coil protection guards (optional)
11	Compressor enclosure (optional)

1.28 Outlook Drawing: EWAD280-320AJYNN/A and EWAD280-320AJYNN/A+OPLN

The illustration below shows the outlook, the dimensions and the installation and service space of the unit (mm).



Version	Condenser Type	Weight KG		Isolators load KG			
		Shipping	Operating	A	B	C	D
EWAD280-320AJYNN/A EWAD280-320AJYNN/A+OPLN	Aluminum Acrylic coated	3435	3550	865	865	910	910
EWAD280-320AJYNN/A EWAD280-320AJYNN/A+OPLN	Rubber isolators	Type (q/ty)		786011-h (4 Pz.)			

Components

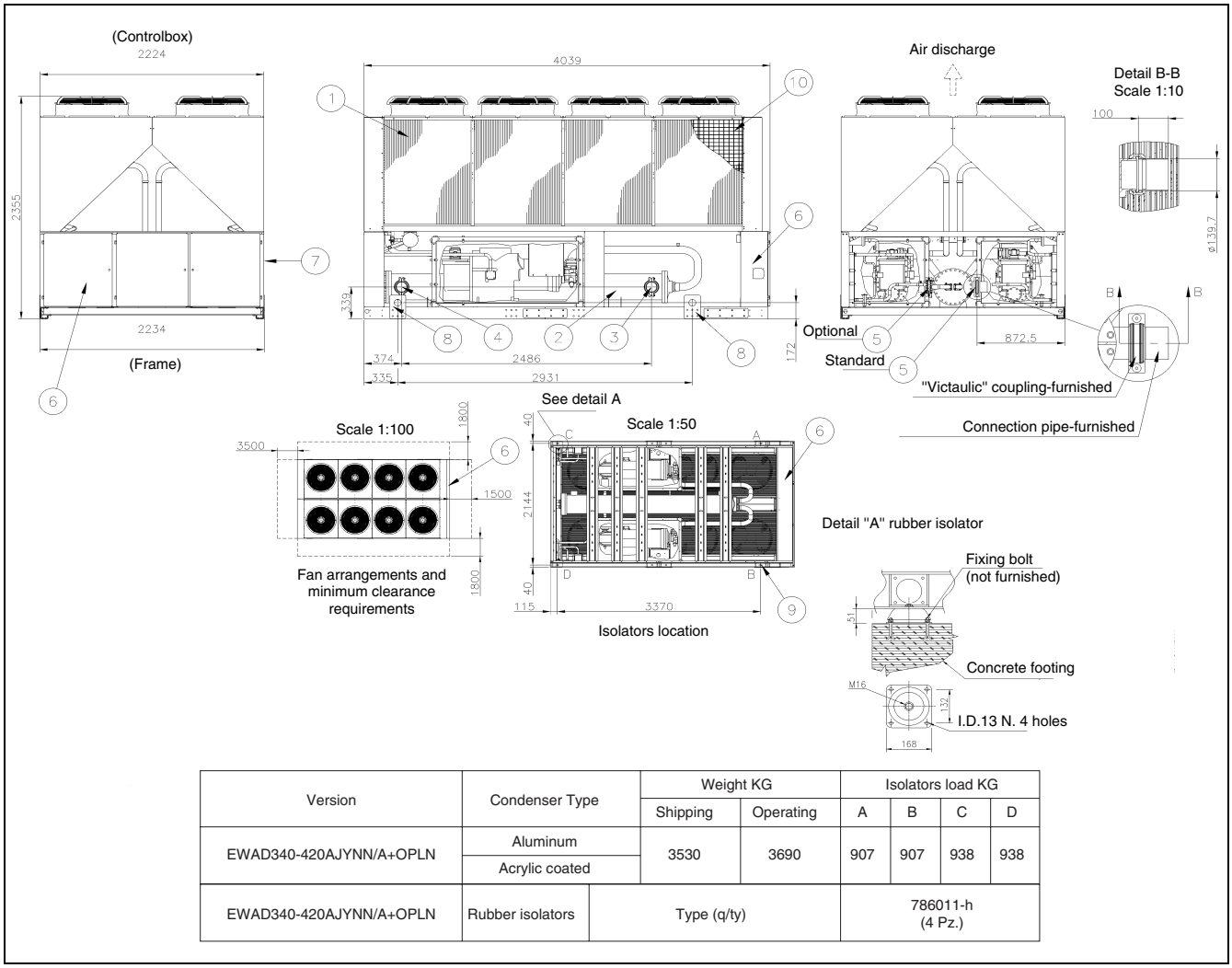
The table below lists the components.

No.	Component
1	Condenser coil
2	Evaporator
3	Evaporator water inlet
4	Evaporator water outlet
5	Victaulic connections for 139.7 O.D. tube
6	Operating and control panel
7	330x180 slot for power and control panel connection
8	4 Raising plate
9	4 isolator mounting holes 25 mm DIA.
10	Coil protection guards (optional)
11	Compressors enclosure

1

1.29 Outlook Drawing: EWAD340-420AJYNN/A and EWAD340-420AJYNN/A+OPLN

The illustration below shows the outlook, the dimensions and the installation and service space of the unit (mm).



Version	Condenser Type	Weight KG		Isolators load KG			
		Shipping	Operating	A	B	C	D
EWAD340-420AJYNN/A+OPLN	Aluminum	3530	3690	907	907	938	938
	Acrylic coated						
EWAD340-420AJYNN/A+OPLN	Rubber isolators	Type (q/ty)		786011-h (4 Pz.)			

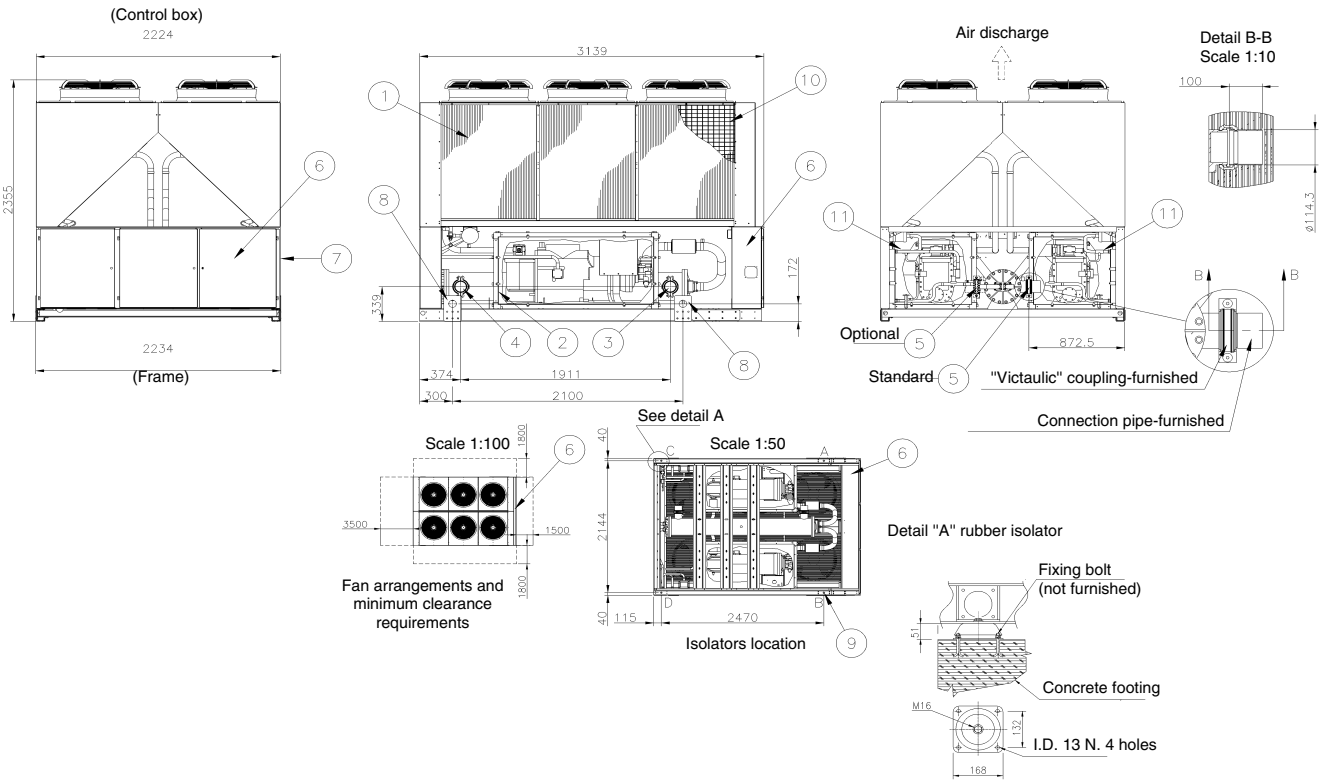
Components

The table below lists the components.

No.	Component
1	Condenser coil
2	Evaporator
3	Evaporator water inlet
4	Evaporator water outlet
5	Victaulic connections for 114.3 O.D. tube
6	Operating and control panel
7	330x180 slot for power and control panel connection
8	4 Raising plate
9	4 isolator mounting holes 25 mm DIA.
10	Coil protection guards (optional)
11	Compressors enclosure

1.30 Outlook Drawing: EWAD260AJYNN/A+OPLN

The illustration below shows the outlook, the dimensions and the installation and service space of the unit (mm).



Version	Condenser Type	Weight KG		Isolators load KG			
		Shipping	Operating	A	B	C	D
EWAD260AJYNN/A+OPLN	Aluminum Acrylic coated	2970	3100	800	800	750	750
EWAD260AJYNN/A+OPLN	Rubber isolators	Type (q/ty)		786011-h (4 Pz.)			

Components

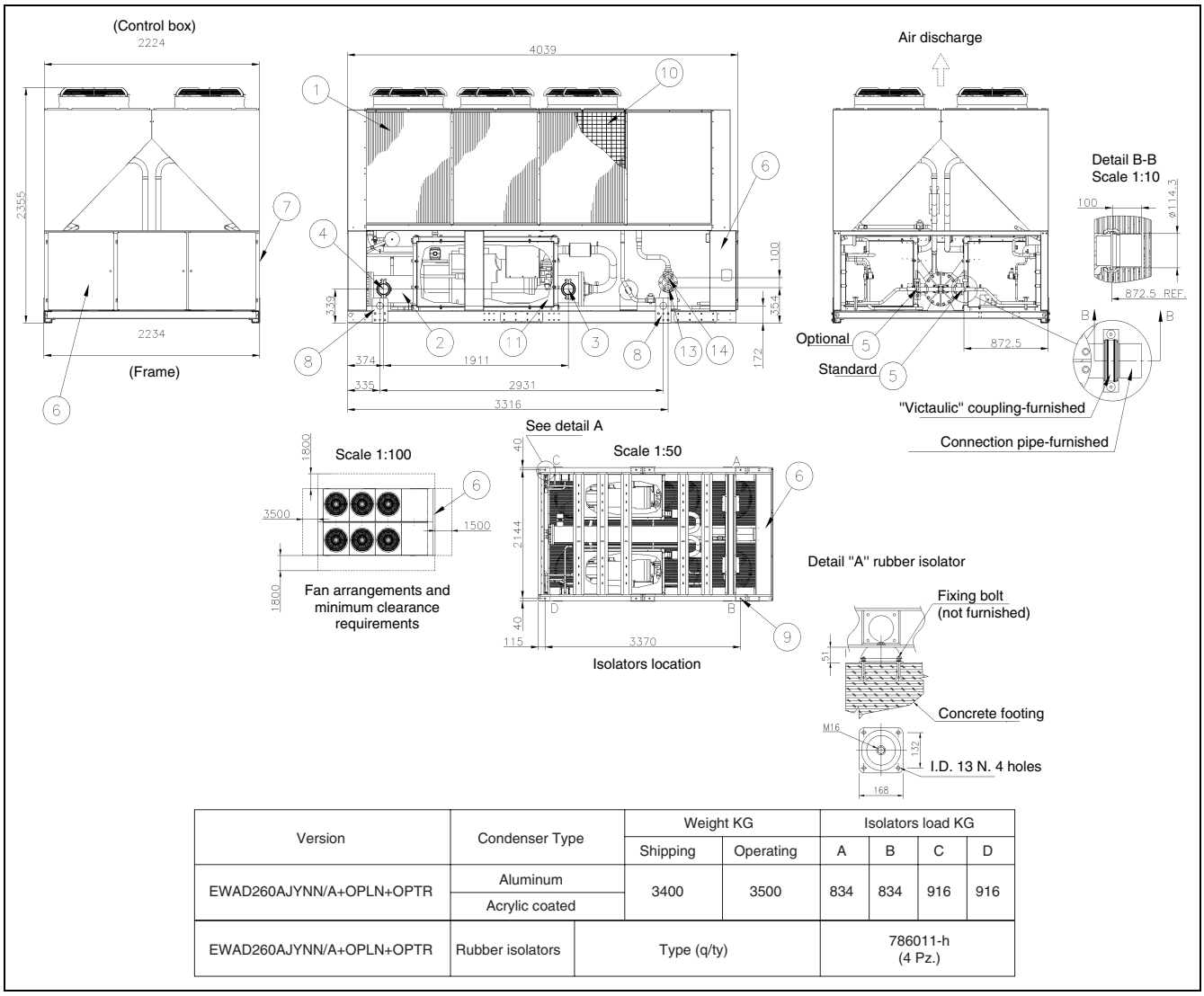
The table below lists the components.

No.	Component
1	Condenser coil
2	Evaporator
3	Evaporator water inlet
4	Evaporator water outlet
5	Victaulic connections for 114.3 O.D. tube
6	Operating and control panel
7	330x180 slot for power and control panel connection
8	4 Raising plate
9	4 isolator mounting holes 25 mm DIA.
10	Coil protection guards (optional)
11	Compressors enclosure

1

1.31 Outlook Drawing: EWAD260AJYNN/A+OPLN+OPTR

The illustration below shows the outlook, the dimensions and the installation and service space of the unit (mm).



Version	Condenser Type	Weight KG		Isolators load KG			
		Shipping	Operating	A	B	C	D
EWAD260AJYNN/A+OPLN+OPTR	Aluminum Acrylic coated	3400	3500	834	834	916	916
EWAD260AJYNN/A+OPLN+OPTR	Rubber isolators	Type (q/ty)		786011-h (4 Pz.)			

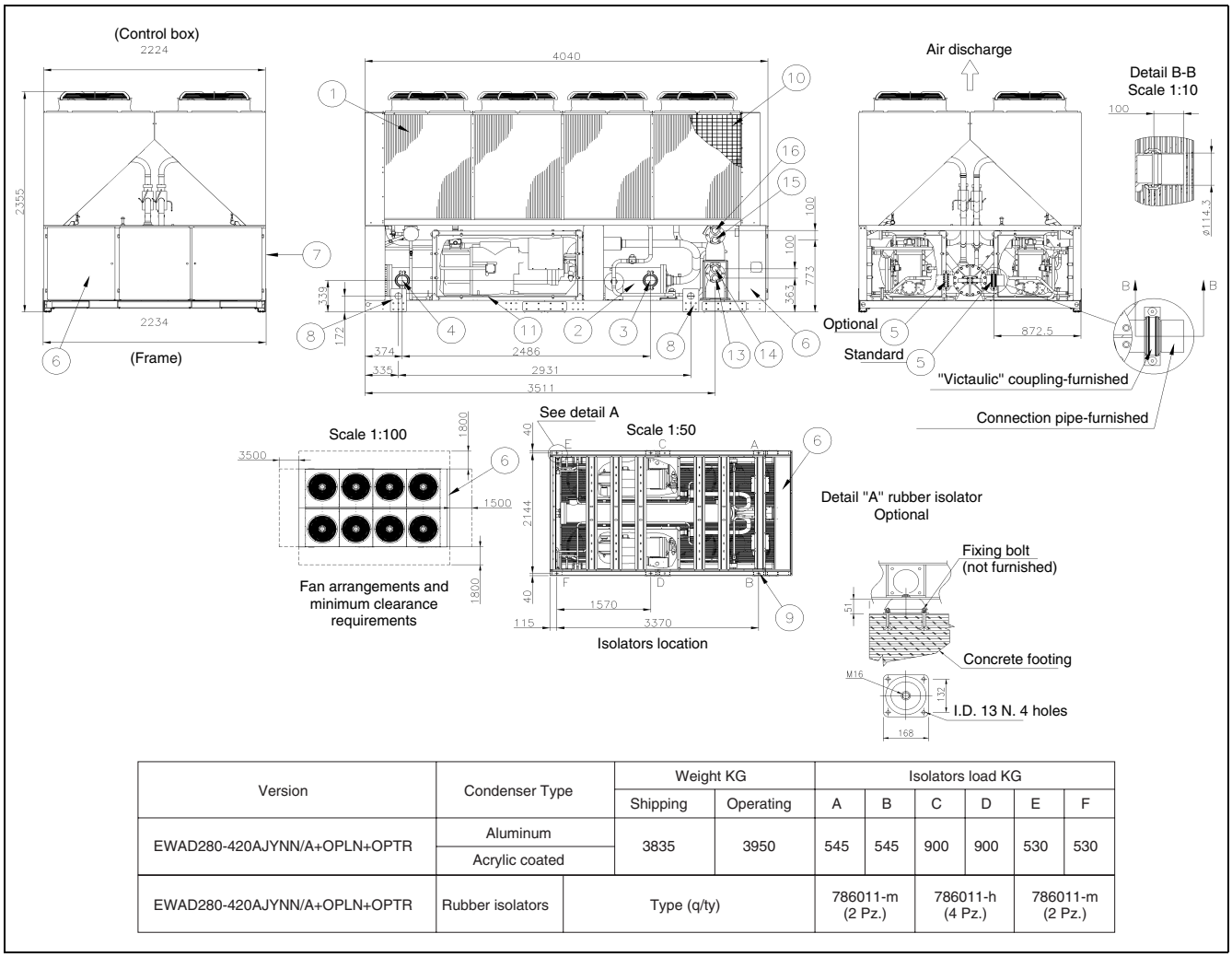
Components

The table below lists the components.

No.	Component
1	Condenser coil
2	Evaporator
3	Evaporator water inlet
4	Evaporator water outlet
5	Victaulic connections for 114.3 O.D. tube
6	Operating and control panel
7	330x180 slot for power and control panel connection
8	4 Raising plate
9	4 isolator mounting holes 25 mm DIA.
10	Coil protection guards (optional)
11	Compressors enclosure
12	Heat recovery condenser
13	Heat recovery condenser water inlet 4'' female connection
14	Condenser coil

1.32 Outlook Drawing: EWAD280-420AJYNN/A+OPLN+OPTR

The illustration below shows the outlook, the dimensions and the installation and service space of the unit (mm).



Version	Condenser Type	Weight KG		Isolators load KG					
		Shipping	Operating	A	B	C	D	E	F
EWAD280-420AJYNN/A+OPLN+OPTR	Aluminum	3835	3950	545	545	900	900	530	530
	Acrylic coated								
EWAD280-420AJYNN/A+OPLN+OPTR	Rubber isolators	Type (q/ty)		786011-m (2 Pz.)		786011-h (4 Pz.)		786011-m (2 Pz.)	

Components

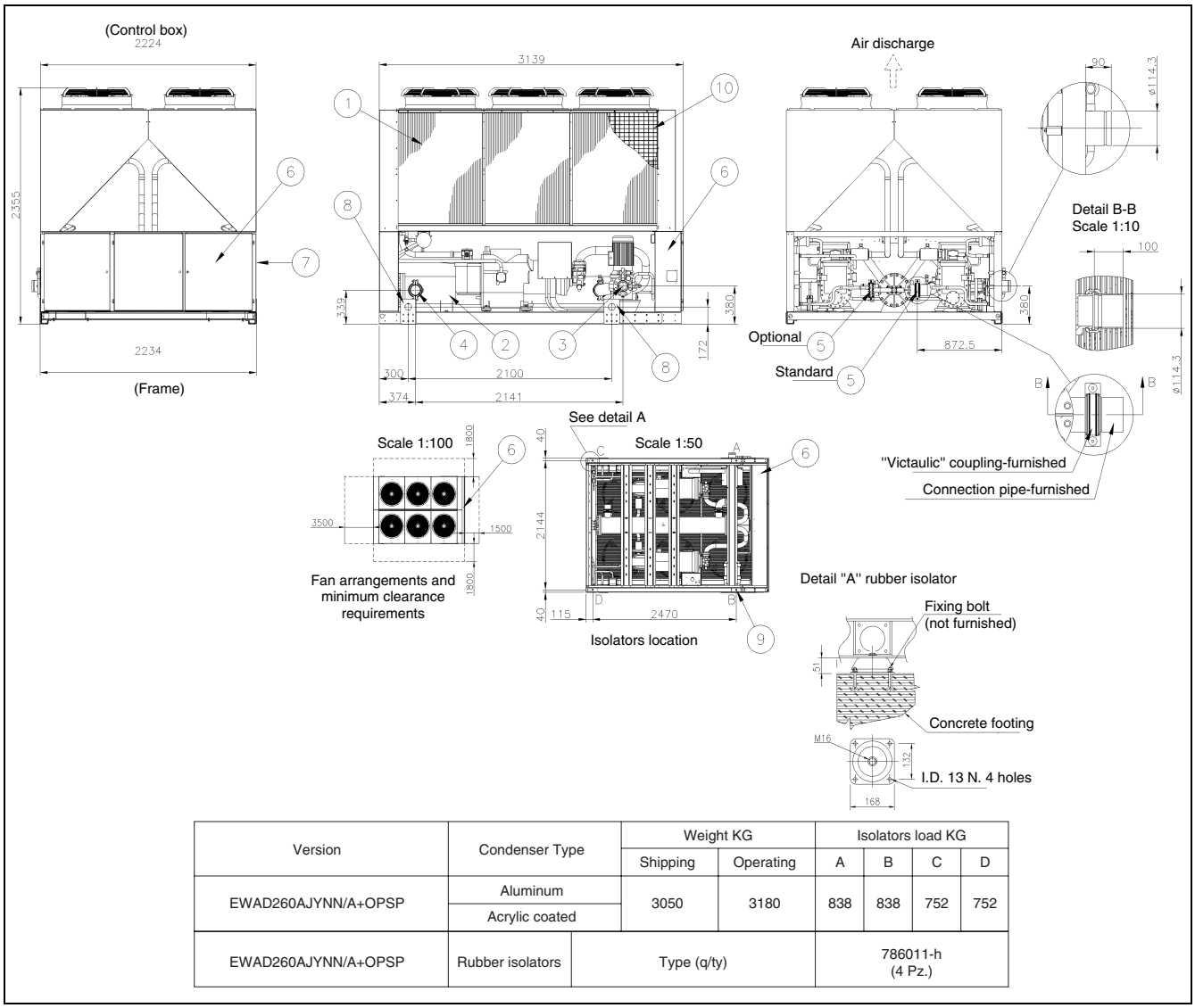
The table below lists the components.

No.	Component
1	Condenser coil
2	Evaporator
3	Evaporator water inlet
4	Evaporator water outlet
5	Victaulic connections for 114.3 O.D. tube
6	Operating and control panel
7	330x180 slot for power and control panel connection
8	4 Raising plate
9	4 isolator mounting holes 25 mm DIA.
10	Coil protection guards (optional)
11	Compressors enclosure
12	Heat recovery condenser
13	Heat recovery condenser water inlet 4" female connection (CIRCUIT 2)
14	Condenser coil
15	Evaporator
16	Evaporator water inlet

1

1.33 Outlook Drawing: EWAD260AJYNN/A+OPSP

The illustration below shows the outlook, the dimensions and the installation and service space of the unit (mm).



Version	Condenser Type	Weight KG		Isolators load KG			
		Shipping	Operating	A	B	C	D
EWAD260AJYNN/A+OPSP	Aluminum Acrylic coated	3050	3180	838	838	752	752
EWAD260AJYNN/A+OPSP	Rubber isolators	Type (q/ty)		786011-h (4 Pz.)			

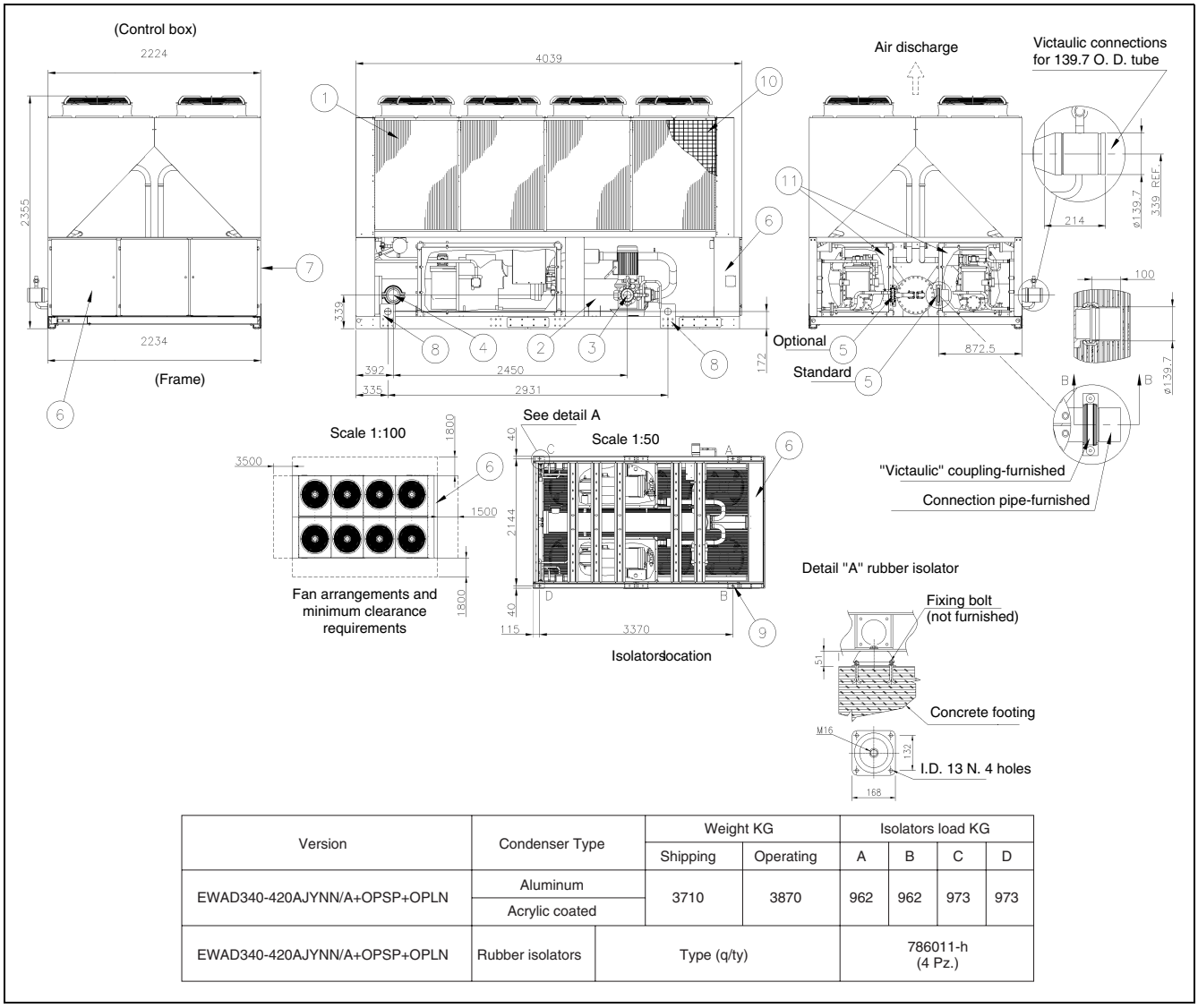
Components

The table below lists the components.

No.	Component
1	Condenser coil
2	Evaporator
3	Evaporator water inlet
4	Evaporator water outlet
5	Victaulic connections for 114.3 O.D. tube
6	Operating and control panel
7	330x180 slot for power and control panel connection
8	4 Raising plate
9	4 isolator mounting holes 25 mm DIA.
10	Coil protection guards (optional)
11	Compressor enclosure (optional)

1.34 Outlook Drawing: EWAD340-420AJYNN/A+OPSP and EWAD340-420AJYNN/A+OPSP+OPLN

The illustration below shows the outlook, the dimensions and the installation and service space of the unit (mm).



Version	Condenser Type	Weight KG		Isolators load KG			
		Shipping	Operating	A	B	C	D
EWAD340-420AJYNN/A+OPSP+OPLN	Aluminum	3710	3870	962	962	973	973
	Acrylic coated						
EWAD340-420AJYNN/A+OPSP+OPLN	Rubber isolators	Type (q/ty)		786011-h (4 Pz.)			

Components

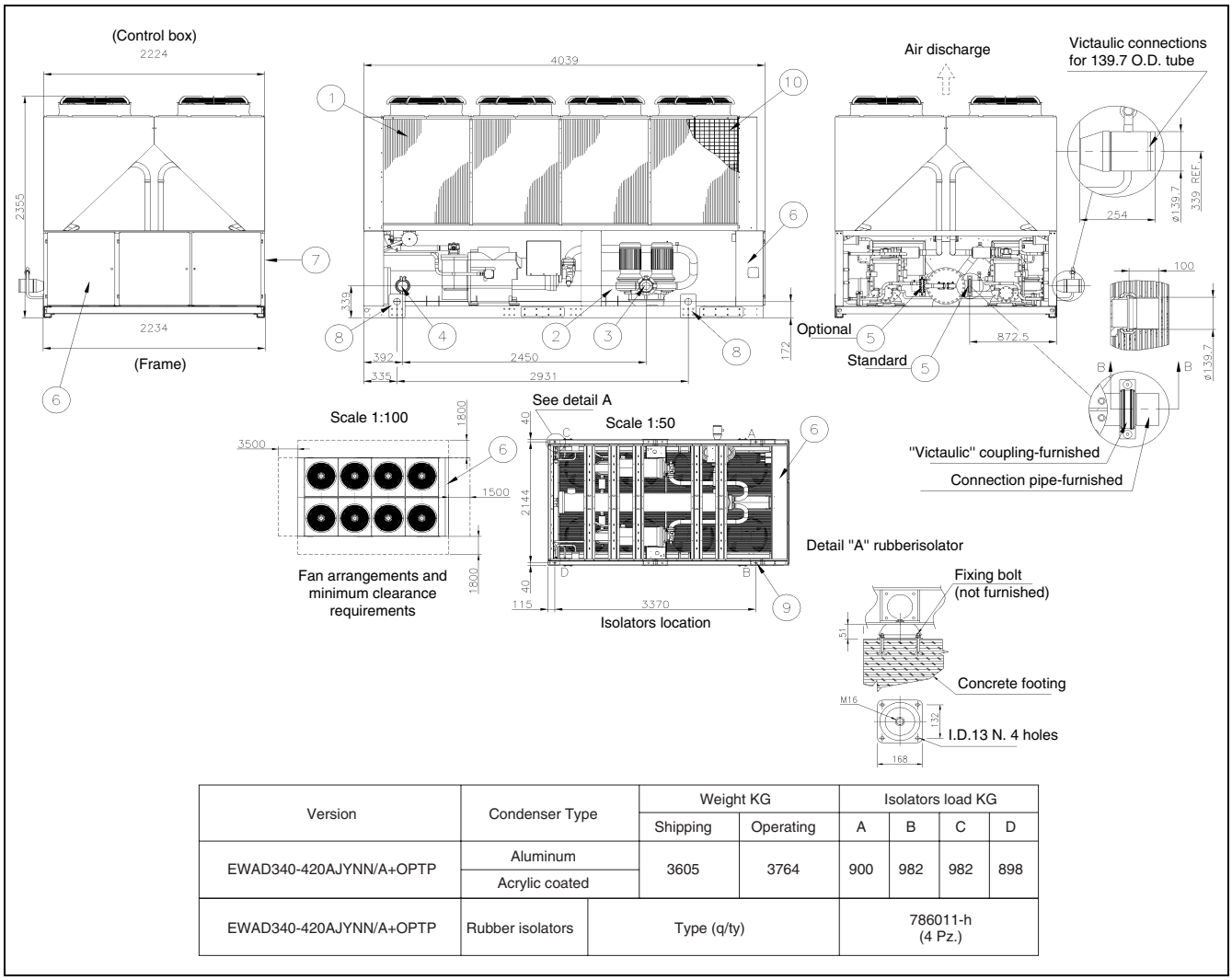
The table below lists the components.

No.	Component
1	Condenser coil
2	Evaporator
3	Evaporator water inlet
4	Evaporator water outlet
5	Victaulic connections for 139.7 O.D. tube
6	Operating and control panel
7	330x180 slot for power and control panel connection
8	4 Raising plate
9	4 isolator mounting holes 25 mm DIA
10	Coil protection guards (optional)
11	Compressors enclosure

1

1.35 Outlook Drawing: EWAD340-420AJYNN/A+OPTP

The illustration below shows the outlook, the dimensions and the installation and service space of the unit (mm).



Version	Condenser Type	Weight KG		Isolators load KG			
		Shipping	Operating	A	B	C	D
EWAD340-420AJYNN/A+OPTP	Aluminum	3605	3764	900	982	982	898
	Acrylic coated						
EWAD340-420AJYNN/A+OPTP	Rubber isolators	Type (q/ty)		786011-h (4 Pz.)			

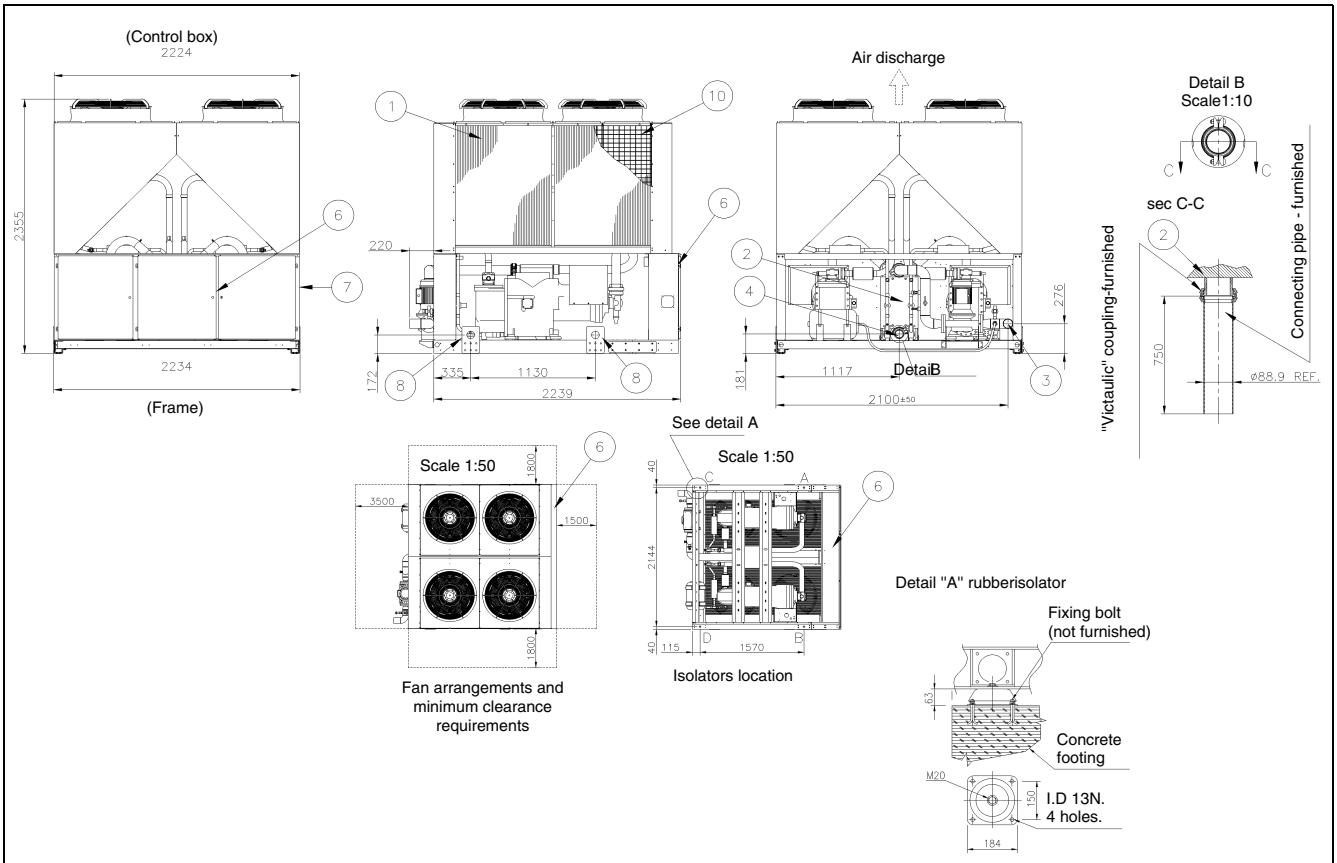
Components

The table below lists the components.

No.	Component
1	Condenser coil
2	Evaporator
3	Evaporator water inlet
4	Evaporator water outlet
5	Victaulic connections for 139.7 O.D. tube
6	Operating and control panel
7	330x180 slot for power and control panel connection
8	4 Raising plate
9	4 isolator mounting holes 25 mm DIA.
10	Coil protection guards (optional)
11	Compressor enclosure (optional)

1.36 Outlook Drawing: EWAD200-210AJYNN/H+OPSP and EWAD200-210AJYNN/H+OPSP+OPRN

The illustration below shows the outlook, the dimensions and the installation and service space of the unit (mm).



Version	Condenser Type	Weight KG		Isolators load KG			
		Shipping	Operating	A	B	C	D
EWAD200-210AJYNN/H+OPSP EWAD200-210AJYNN/H+OPSP+OPRN	Aluminum Acrylic coated	2540	2570	675	672	613	613
EWAD200-210AJYNN/H+OPSP EWAD200-210AJYNN/H+OPSP+OPRN	Rubber isolators	Type (q/ty)		786010-w (4 Pz.)			

Components

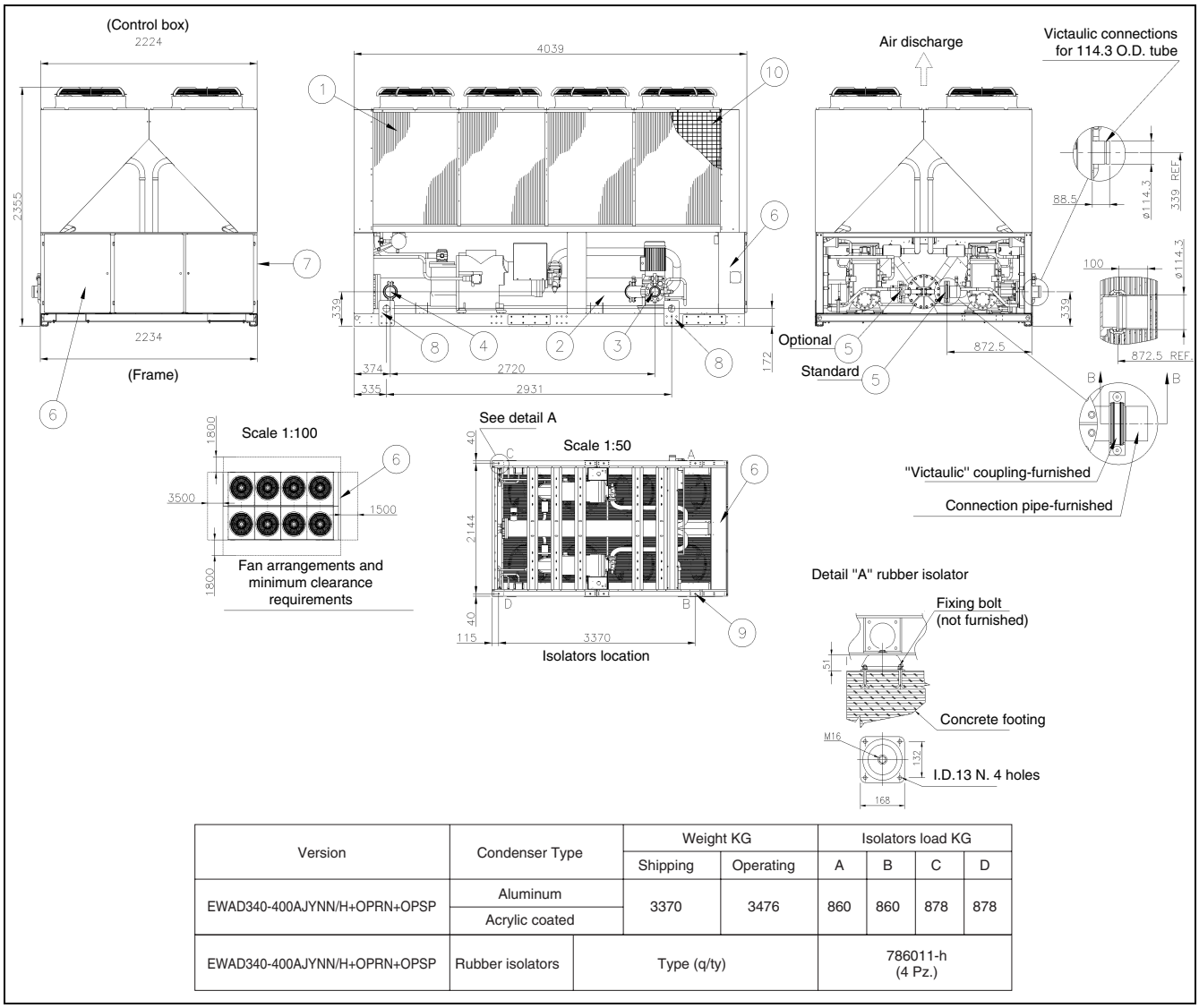
The table below lists the components.

No.	Component
1	Condenser coil
2	Evaporator
3	Pump water inlet 3" gas connection
4	Evaporator water outlet 3" gas connection
5	Victaulic connections for 88.9 O.D. tube
6	Operating and control panel
7	330x180 slot for power and control panel connection
8	4 Raising plate
9	4 isolator mounting holes 25 mm DIA.
10	Coil protection guards (optional)
11	Compressor enclosure (optional)

1

1.37 Outlook Drawing: EWAD340-400AJYNN/H+OPRN+OPSP

The illustration below shows the outlook, the dimensions and the installation and service space of the unit (mm).



Version	Condenser Type	Weight KG		Isolators load KG			
		Shipping	Operating	A	B	C	D
EWAD340-400AJYNN/H+OPRN+OPSP	Aluminum	3370	3476	860	860	878	878
	Acrylic coated						
EWAD340-400AJYNN/H+OPRN+OPSP	Rubber isolators	Type (q/ty)		786011-h (4 Pz.)			

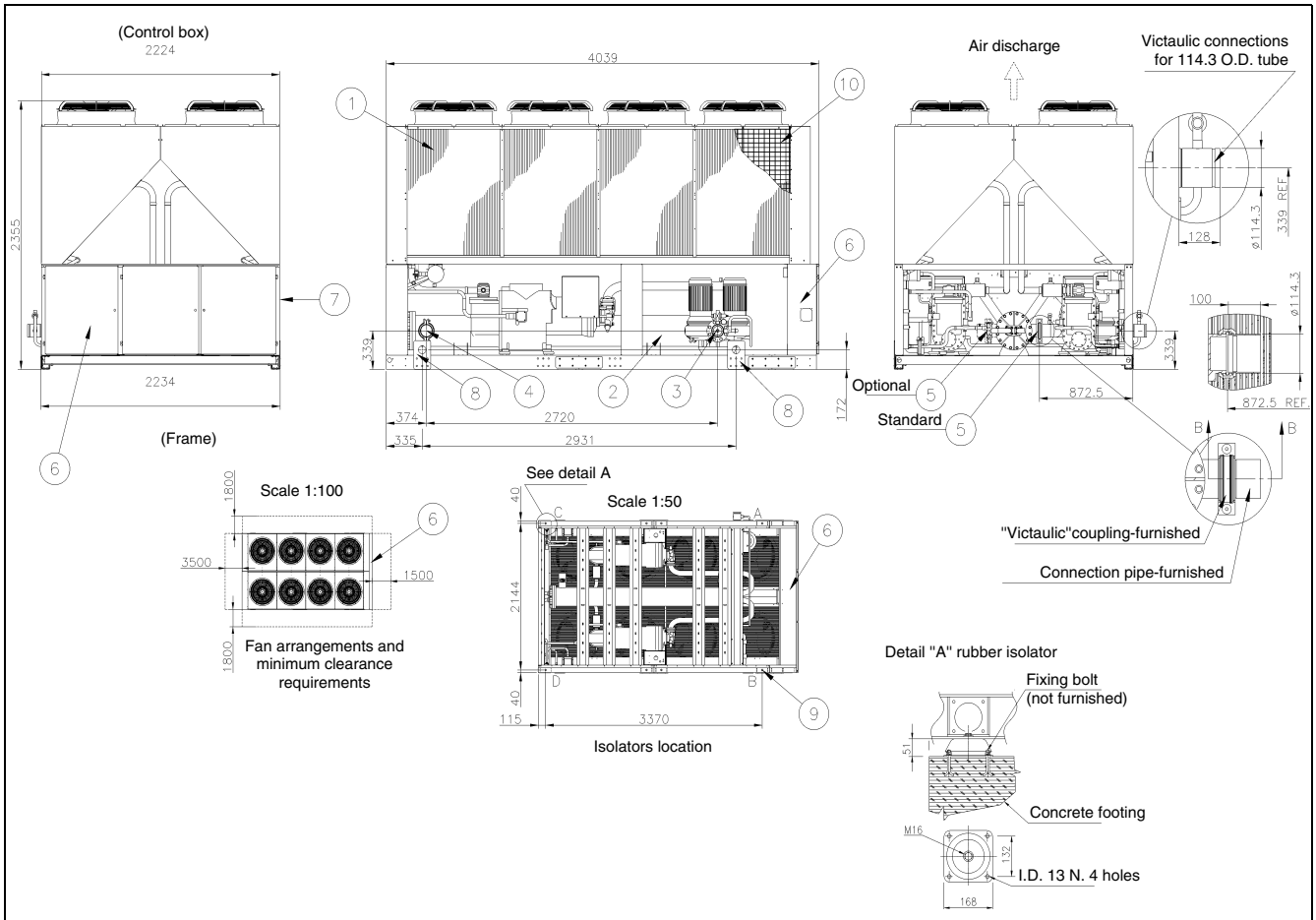
Components

The table below lists the components.

No.	Component
1	Condenser coil
2	Evaporator
3	Evaporator water inlet
4	Evaporator water outlet
5	Victaulic connections for 114.3 O.D. tube
6	Operating and control panel
7	330x180 slot for power and control panel connection
8	4 Raising plate
9	4 isolator mounting holes 25 mm DIA.
10	Coil protection guards (optional)
11	Compressor enclosure (optional)

1.38 Outlook Drawing: EWAD340-400AJYNN/H+OPTP+OPRN

The illustration below shows the outlook, the dimensions and the installation and service space of the unit (mm).



Version	Condenser Type	Weight KG		Isolators load KG			
		Shipping	Operating	A	B	C	D
EWAD340-400AJYNN/H+OPTP+OPRN	Aluminum / Acrylic coated	3400	3510	857	857	898	898
EWAD340-400AJYNN/H+OPTP+OPRN	Rubber isolators	Type (q/ty)		786011-h (4 Pz.)			

Components

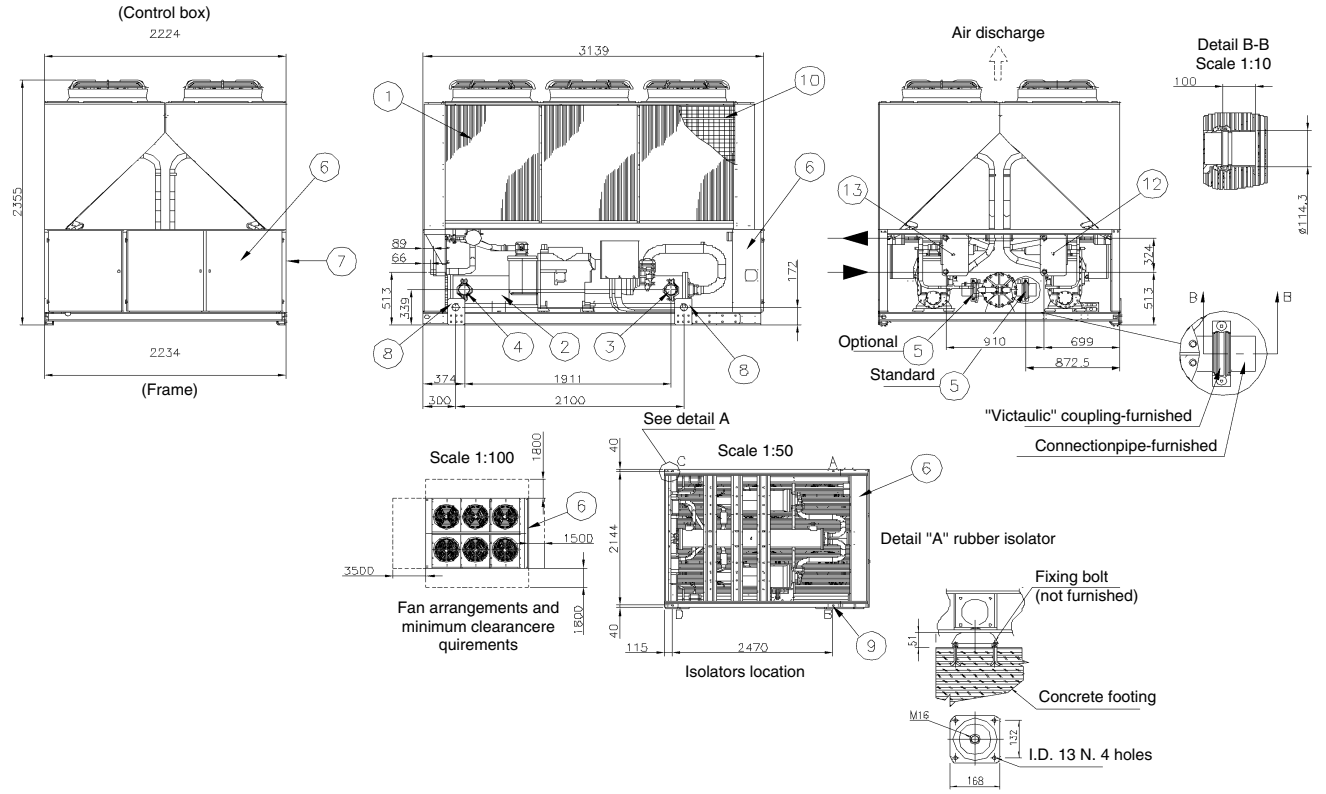
The table below lists the components.

No.	Component
1	Condenser coil
2	Evaporator
3	Evaporator water inlet
4	Evaporator water outlet
5	Victaulic connections for 114.3 O.D. tube
6	Operating and control panel
7	330x180 slot for power and control panel connection
8	4 Raising plate
9	4 isolator mounting holes 25 mm DIA.
10	Coil protection guards (optional)
11	Compressor enclosure (optional)

1

1.39 Outlook Drawing: EWAD230AJYNN+OPPR and EWAD240AJYNN/H+OPPR

The illustration below shows the outlook, the dimensions and the installation and service space of the unit (mm).



Version	Condenser Type	Weight KG		Isolators load KG			
		Shipping	Operating	A	B	C	D
EWAD230AJYNN+OPPR EWAD240AJYNN/H+OPPR	Aluminum	2930	3030	800	800	715	715
	Acrylic coated						
EWAD230AJYNN+OPPR EWAD240AJYNN/H+OPPR	Rubber isolators	Type (q/ty)		786011-h (4 Pz.)			

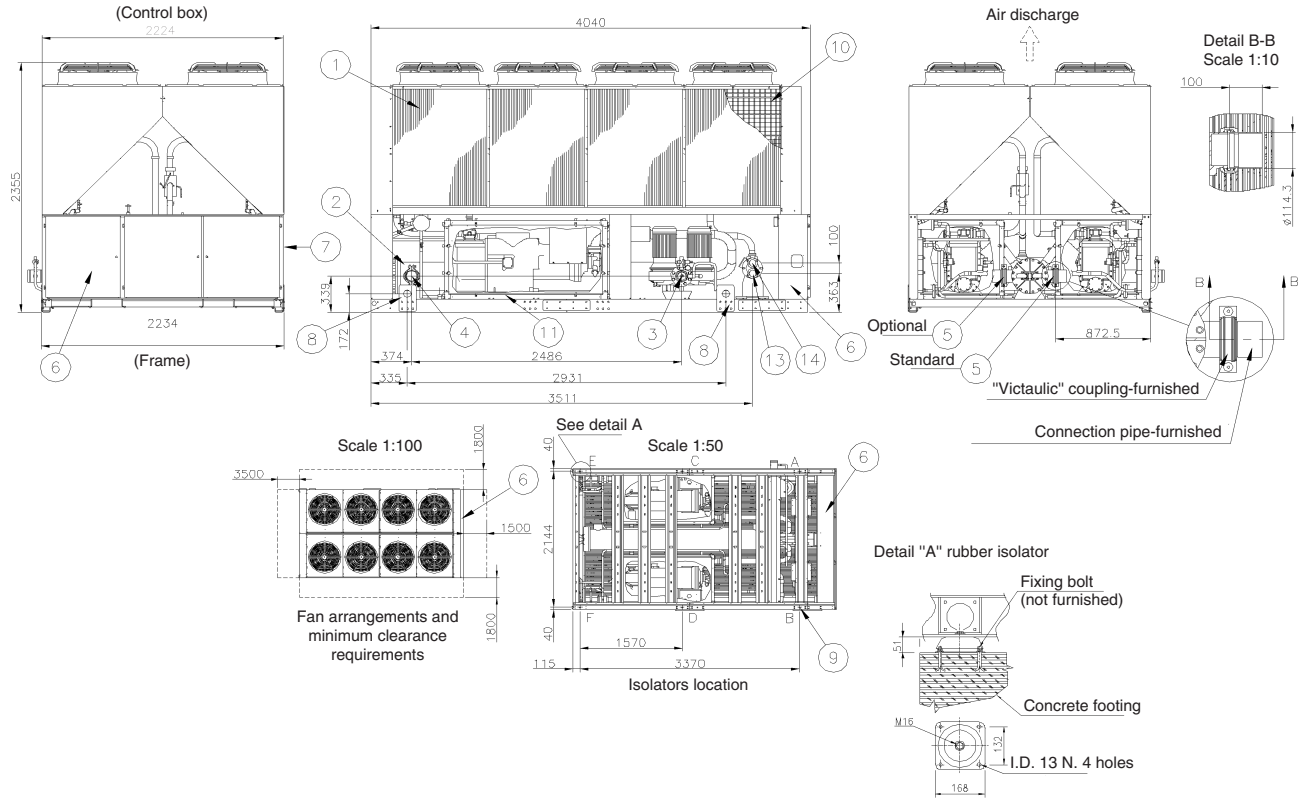
Components

The table below lists the components.

No.	Component
1	Condenser coil
2	Evaporator
3	Evaporator water inlet
4	Evaporator water outlet
5	Victaulic connections for 114.3 O.D. tube
6	Operating and control panel
7	330x180 slot for power and control panel connection
8	4 Raising plate
9	4 isolator mounting holes 25 mm DIA.
10	Coil protection guards (optional)
11	Compressor enclosure (optional)
12	Desuperheater circ. 1 (ISO-G 1 1/2" gas connection)
13	Desuperheater circ. 2 (ISO-G 1 1/2" gas connection)

1.40 Outlook Drawing: EWAD340-360AJYNN+OPPR+OPTP and EWAD340-400AJYNN/H+OPPR+OPTP

The illustration below shows the outlook, the dimensions and the installation and service space of the unit (mm).



Version	Condenser Type	Weight KG		Isolators load KG					
		Shipping	Operating	A	B	C	D	E	F
EWAD340-360AJYNN+OPPR+OPTP EWAD340-400AJYNN/H+OPPR+OPTP	Aluminum Acrylic coated	3835	3950	545	545	900	900	530	530
EWAD340-360AJYNN+OPPR+OPTP EWAD340-400AJYNN/H+OPPR+OPTP	Rubber isolators	Type (q/ty)		786011-m (2 Pz.)		786011-h (4 Pz.)		786011-m (2 Pz.)	

Components

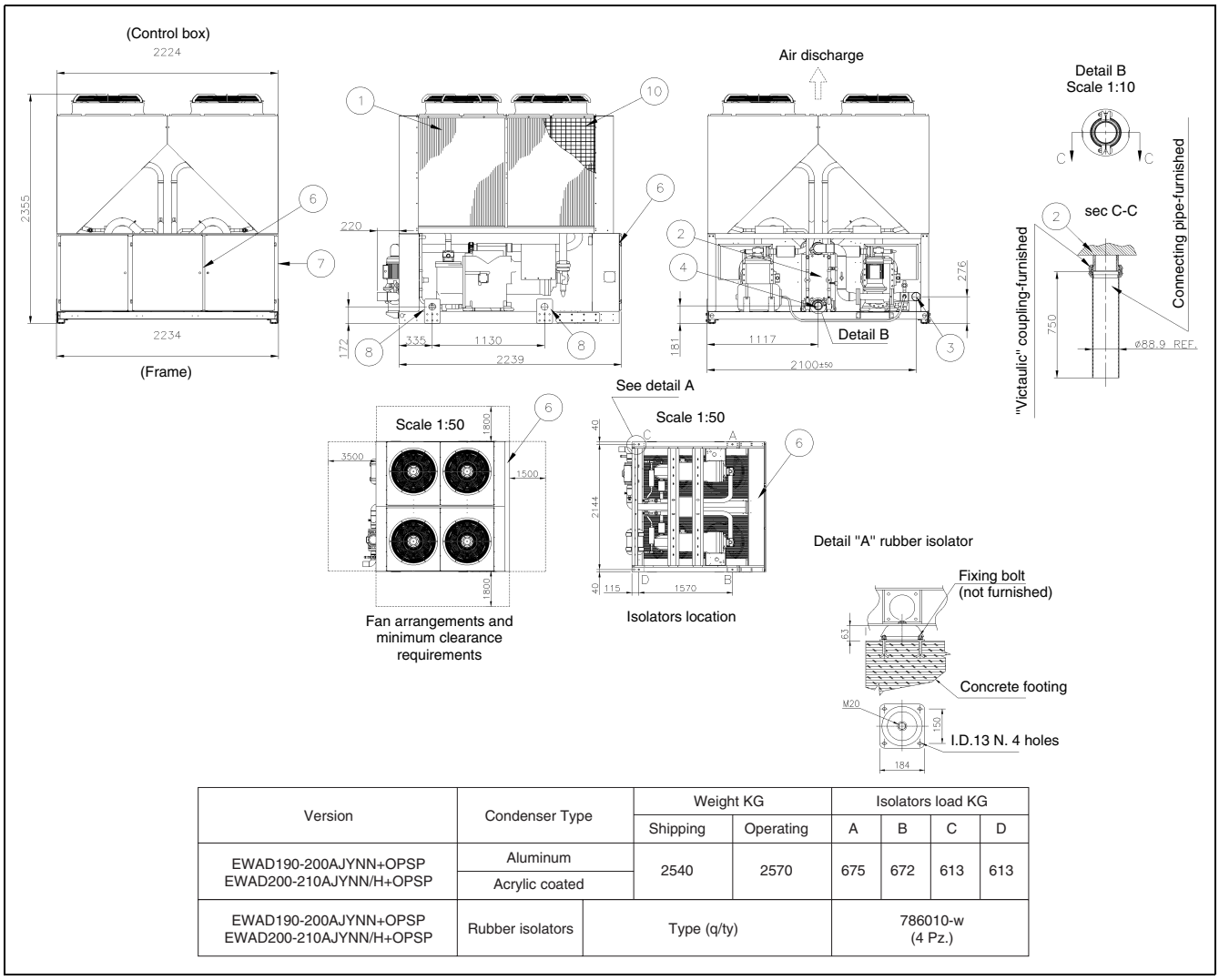
The table below lists the components.

No.	Component
1	Condenser coil
2	Evaporator
3	Evaporator water inlet
4	Evaporator water outlet
5	Victaulic connections for 114.3 O.D. tube
6	Operating and control panel
7	330x180 slot for power and control panel connection
8	4 Raising plate
9	4 isolator mounting holes 25 mm DIA.
10	Coil protection guards (optional)
11	Compressors enclosure
12	Heat recovery condenser
13	Heat recovery condenser water inlet 4" female connection (CIRCUIT 2)
14	Heat recovery condenser water outlet 4" female connection (CIRCUIT 2)

1

1.41 Outlook Drawing: EWAD190-200AJYNN+OPSP and EWAD200-210AJYNN/H+OPSP

The illustration below shows the outlook, the dimensions and the installation and service space of the unit (mm).



Version	Condenser Type	Weight KG		Isolators load KG			
		Shipping	Operating	A	B	C	D
EWAD190-200AJYNN+OPSP EWAD200-210AJYNN/H+OPSP	Aluminum Acrylic coated	2540	2570	675	672	613	613
EWAD190-200AJYNN+OPSP EWAD200-210AJYNN/H+OPSP	Rubber isolators	Type (q/ty)		786010-w (4 Pz.)			

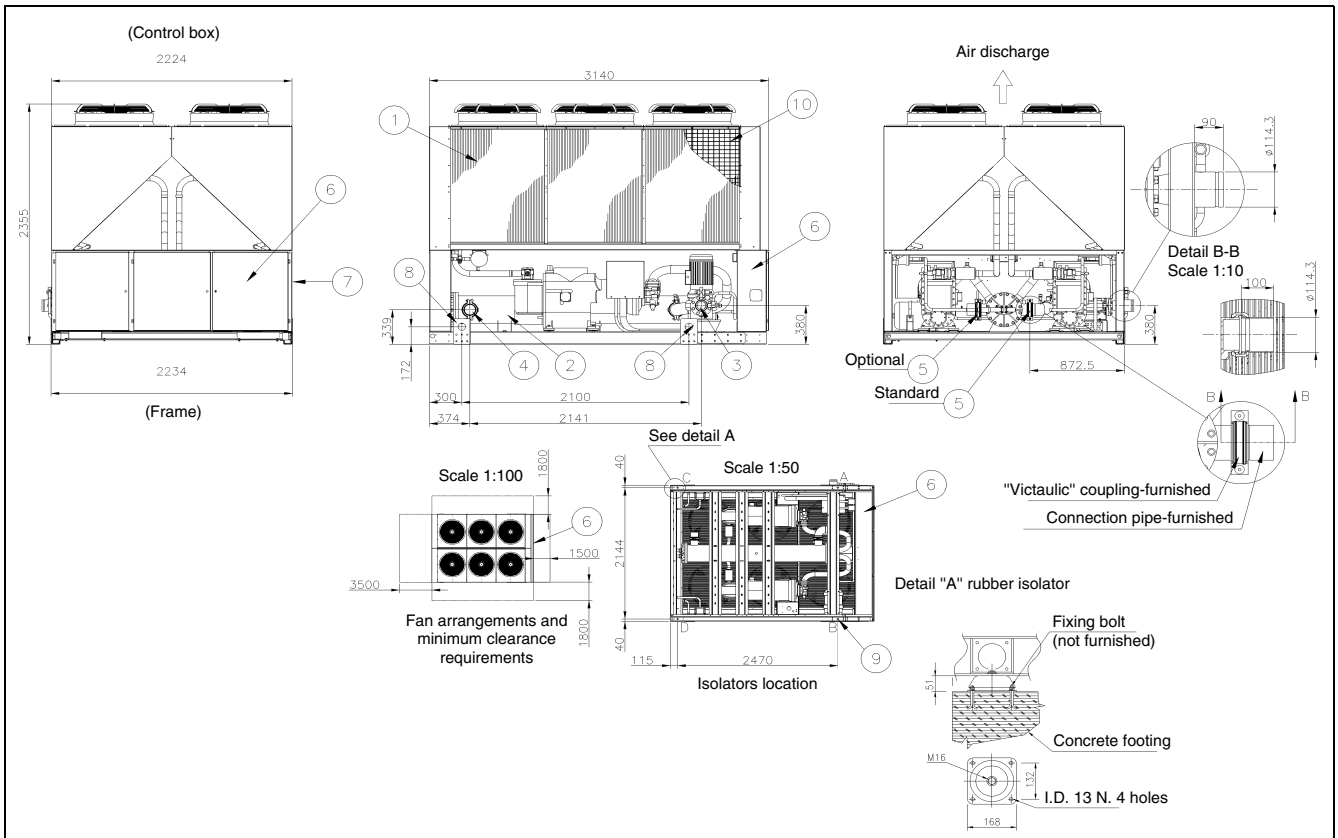
Components

The table below lists the components.

No.	Component
1	Condenser coil
2	Evaporator
3	Pump water inlet 3" gas connection
4	Evaporator water outlet 3" gas connection
5	Victaulic connections for 88.9 O.D. tube
6	Operating and control panel
7	330x180 slot for power and control panel connection
8	4 Raising plate
9	4 isolator mounting holes 25 mm DIA.
10	Coil protection guards (optional)
11	Compressor enclosure (optional)

1.42 Outlook Drawing: EWAD230-320AJYNN+OPSP and EWAD240-320AJYNN/H+OPSP

The illustration below shows the outlook, the dimensions and the installation and service space of the unit (mm).



Version	Condenser Type	Weight KG		Isolators load KG			
		Shipping	Operating	A	B	C	D
EWAD230-320AJYNN+OPSP EWAD240-320AJYNN/H+OPSP	Aluminum	3025	3116	881	881	677	677
	Acrylic coated						
EWAD230-320AJYNN+OPSP EWAD240-320AJYNN/H+OPSP	Rubber isolators	Type (q/ty)		786011-h (4 Pz.)			

Components

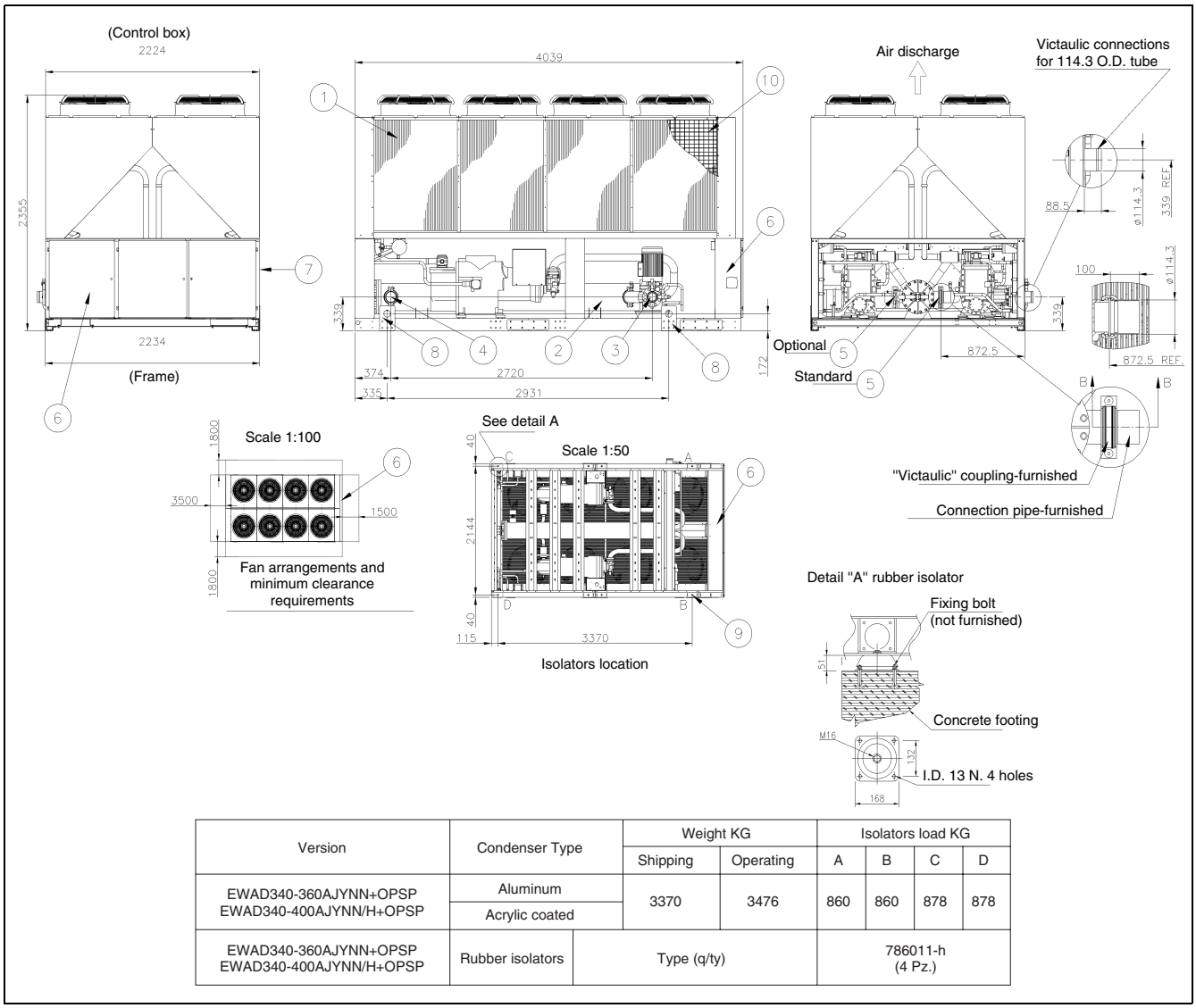
The table below lists the components.

No.	Component
1	Condenser coil
2	Evaporator
3	Evaporator water inlet
4	Evaporator water outlet
5	Victaulic connections for 114.3 O.D. tube
6	Operating and control panel
7	330x180 slot for power and control panel connection
8	4 Raising plate
9	4 isolator mounting holes 25 mm DIA.
10	Coil protection guards (optional)
11	Compressor enclosure (optional)

1

1.43 Outlook Drawing: EWAD340-360AJYNN+OPSP and EWAD340-400AJYNN/H+OPSP

The illustration below shows the outlook, the dimensions and the installation and service space of the unit (mm).



Version	Condenser Type	Weight KG		Isolators load KG			
		Shipping	Operating	A	B	C	D
EWAD340-360AJYNN+OPSP EWAD340-400AJYNN/H+OPSP	Aluminum Acrylic coated	3370	3476	860	860	878	878
EWAD340-360AJYNN+OPSP EWAD340-400AJYNN/H+OPSP	Rubber isolators	Type (q/ty)		786011-h (4 Pz.)			

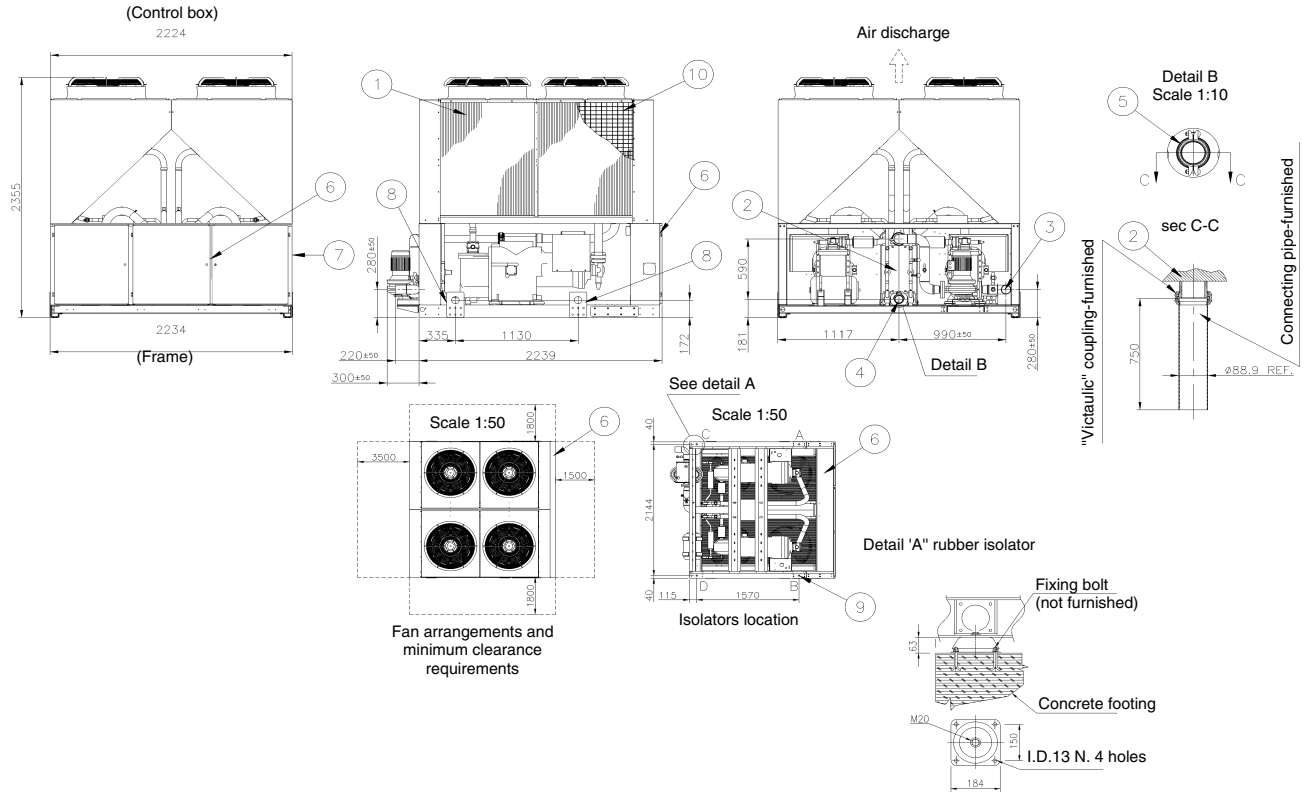
Components

The table below lists the components.

No.	Component
1	Condenser coil
2	Evaporator
3	Evaporator water inlet
4	Evaporator water outlet
5	Victaulic connections for 114.3 O.D. tube
6	Operating and control panel
7	330x180 slot for power and control panel connection
8	4 Raising plate
9	4 isolator mounting holes 25 mm DIA.
10	Coil protection guards (optional)
11	Compressor enclosure (optional)

1.44 Outlook Drawing: EWAD190-200AJYNN+OPTP and EWAD200-210AJYNN/H+OPTP

The illustration below shows the outlook, the dimensions and the installation and service space of the unit (mm).



Version	Condenser Type	Weight KG		Isolators load KG			
		Shipping	Operating	A	B	C	D
EWAD190-200AJYNN+OPTP EWAD200-210AJYNN/H+OPTP	Aluminum Acrylic coated	2570	2600	663	663	637	637
EWAD190-200AJYNN+OPTP EWAD200-210AJYNN/H+OPTP	Rubber isolators	Type (q/ty)		786010-w (4 Pz.)			

Components

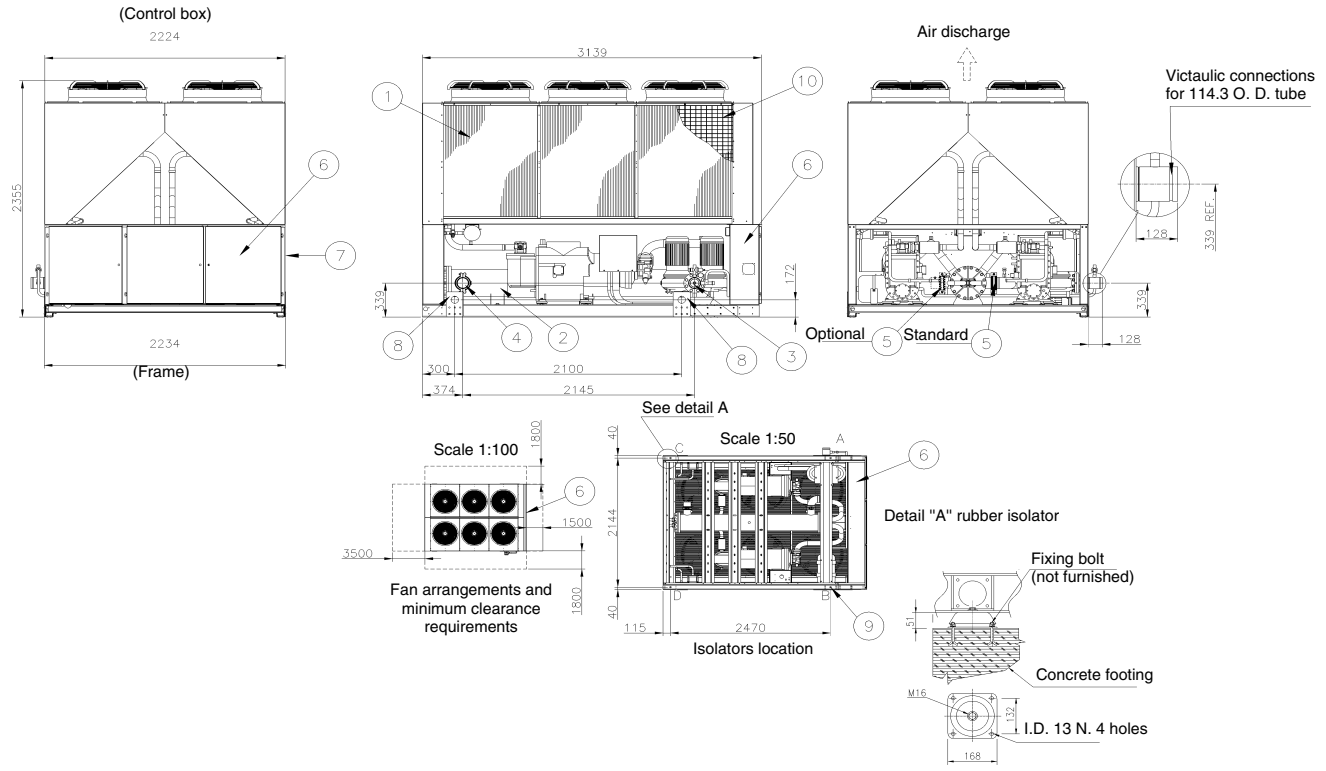
The table below lists the components.

No.	Component
1	Condenser coil
2	Evaporator
3	Pump water inlet 3" gas connection
4	Evaporator water outlet 3" gas connection
5	Victaulic connections for 88.9 O.D. tube
6	Operating and control panel
7	330x180 slot for power and control panel connection
8	4 Raising plate
9	4 isolator mounting holes 25 mm DIA.
10	Coil protection guards (optional)
11	Compressor enclosure (optional)

1

1.45 Outlook Drawing: EWAD230-320AJYNN+OPTP and EWAD240-320AJYNN/H+OPTP

The illustration below shows the outlook, the dimensions and the installation and service space of the unit (mm).



Version	Condenser Type	Weight KG		Isolators load KG			
		Shipping	Operating	A	B	C	D
EWAD230-320AJYNN+OPTP EWAD240-320AJYNN/H+OPTP	Aluminum Acrylic coated	3055	3150	875	875	700	700
EWAD230-320AJYNN+OPTP EWAD240-320AJYNN/H+OPTP	Rubber isolators	Type (q/ty)		786011-h (4 Pz.)			

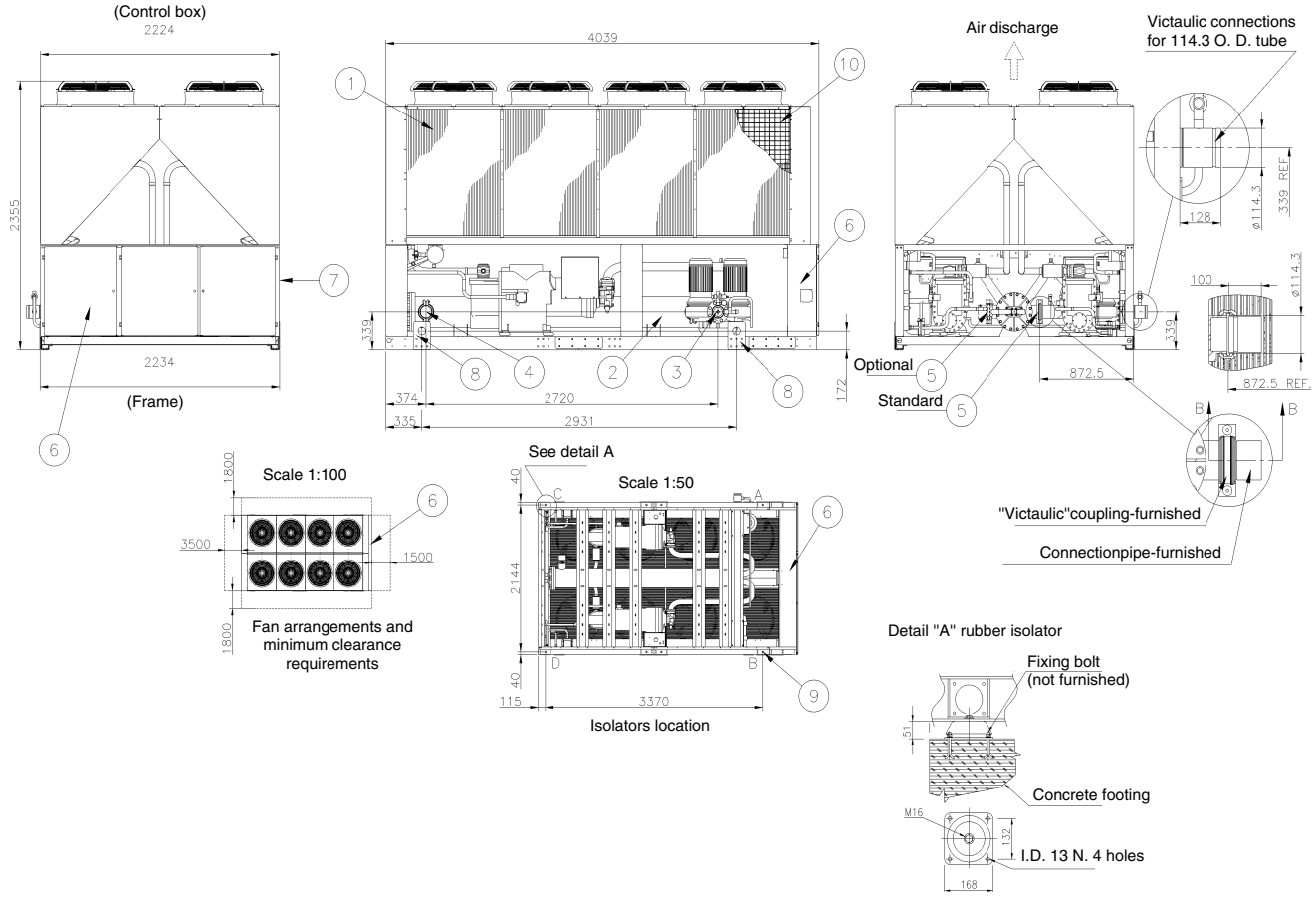
Components

The table below lists the components.

No.	Component
1	Condenser coil
2	Evaporator
3	Evaporator water inlet
4	Evaporator water outlet
5	Victaulic connections for 114.3 O.D. tube
6	Operating and control panel
7	330x180 slot for power and control panel connection
8	4 Raising plate
9	4 isolator mounting holes 25 mm DIA.
10	Coil protection guards (optional)
11	Compressor enclosure (optional)

1.46 Outlook Drawing: EWAD340-360AJYNN+OPTP and EWAD340-400AJYNN/H+OPTP

The illustration below shows the outlook, the dimensions and the installation and service space of the unit (mm).



Version	Condenser Type	Weight KG		Isolators load KG			
		Shipping	Operating	A	B	C	D
EWAD340-360AJYNN+OPTP EWAD340-400AJYNN/H+OPTP	Aluminum	3400	3510	857	857	898	898
	Acrylic coated						
EWAD340-360AJYNN+OPTP EWAD340-400AJYNN/H+OPTP	Rubber isolators	Type (q/ty)		786011-h (4 Pz.)			

Components

The table below lists the components.

No.	Component
1	Condenser coil
2	Evaporator
3	Evaporator water inlet
4	Evaporator water outlet
5	Victaulic connections for 114.3 O.D. tube
6	Operating and control panel
7	330x180 slot for power and control panel connection
8	4 Raising plate
9	4 isolator mounting holes 25 mm DIA.
10	Coil protection guards (optional)
11	Compressor enclosure (optional)

1

1

2 Piping Layout

2.1 What Is in This Chapter?

Introduction

This chapter describes the internal refrigeration circuit. The water piping is considered as common practice and is therefore not expained.

Overview

This chapter contains the following topics:

1

2.2 Operator's Responsibilities

It is important that the operator become familiar with the apparatus before operating the machine. In addition to reading this manual, the operator should study the operating manual and the wiring diagram in order to understand the startup, operation and shutdown sequence, along with the operation of the safety devices. During the machine's initial startup phase, the Daikin technician is available to answer any questions and to give instructions as to the correct operating procedures.

The operator is advised to keep a record of operating data for every installed machine. Another record should also be kept of all the periodical maintenance and servicing activities.

This Daikin machine is a good investment and deserves attention and care if it is to be kept in good operating condition. If the operator notes abnormal or unusual operating conditions, he is advised to consult the Daikin technical service.

1

2.3 Description of the machine

This machine, of the air-cooled condenser type, is made up of the following main components:

Compressor: the state-of-the-art single-screw compressor of the Fr3100 series is of the semi-hermetic type and utilises gas from the evaporator to cool the engine and allow optimal operation under all foreseen load conditions. The oil-injection lubrification system does not require an oil pump as its flow is ensured by the pressure difference between delivery and intake. In addition to ensuring lubrification of ball bearings, oil injection seals the screw dynamically thus ensuring the compression process.

Evaporator: high-efficiency plate type for the first two models and direct-expansion shell and tube type for all the others; the evaporator is of ample size in order to ensure optimum efficiency under all load conditions.

Condenser: Finned-pack type with internally microfinned tubes, that expand directly on the high-efficiency open fin. The condenser batteries are provided with an undercooling section which, in addition to improving the machine's overall efficiency, compensates the thermal load variations by adapting the refrigerant load to every foreseen operating condition.

Ventilator: High-efficiency axial type. Allows silent operation of the system, also during adjustment.

Expansion valve: The standard machine has a thermostatic expansion valve with an external equaliser. Optionally, an electronic expansion valve can be installed, which is controlled by an electronic device called Driver that optimises its operation. Use of the electronic valve is recommended in case of prolonged operation at partial loads with very low outdoor temperatures or if the machine is installed in variable flow rate systems.

2.4 Description of the Refrigerant Cycle

The low-temperature refrigerant gas from the evaporator is taken in by the compressor and crosses the electrical engine, cooling it. It is subsequently compressed and during this phase the refrigerant mixes with the oil from the separator.

The high-pressure oil-refrigerant mixture is introduced into the centrifuge-type high-efficiency oil separator, which separates it. The oil that has deposited on the bottom of the separator owing to a pressure difference is sent once again to the compressor while the refrigerant that has been separated from the oil is sent to the condenser.

Inside the condenser, the refrigerant fluid is evenly distributed to all the battery circuits; during this process it cools after overheating and starts to condense.

The fluid condensed at saturation temperature travels through the undercooling section, where it yields further heat, thus increasing cycle efficiency. The heat taken from the fluid during the de-overheating, condensation and undercooling phase is yielded to the cooling air which is expelled at a higher temperature.

The undercooled fluid travels through the high-efficiency dehydration filter and then through the lamination organ which launches the expansion process by means of a pressure drop, vaporising part of the refrigerant liquid.

The result at this point is a low-pressure and low-temperature liquid-gas mixture, requiring much heat, that is introduced into the evaporator.

After the liquid-vapour refrigerant has been evenly distributed in the direct-expansion evaporator tubes, it exchanges heat with the water to be cooled, thus reducing its temperature, and it gradually changes state until evaporating completely and then overheating.

Once it has reached the overheated-vapour state, the refrigerant leaves the evaporator and is once again taken into the compressor and restarts the cycle.

1

2.5 Compressor

The series 3100 single-screw compressor is of the semi-hermetic type with asynchronous three-phase two-pole engine which is directly splined to the main shaft. The intake gas from the evaporator cools the electrical engine before entering the intake ports. Inside the electrical engine, there are temperature sensors completely covered by the coil winding that constantly monitor engine temperature. Should the coil winding temperature become very high (120°C), a special external apparatus that is connected to the sensors and to the electronic controller will de-activate the corresponding compressor.

There are only two moving rotating parts and there are no other parts in the compressor with an eccentric and/or alternative movement.

The basic components are therefore only the main rotor and an upper satellite that carry out the compression process, meshing perfectly together. Compression sealing is done thanks to a suitably shaped special composite material that is interposed between them. The main shaft on which the main rotor is splined is supported by 2 ball bearings. The system made up in this way is both statically and dynamically balanced before assembly. The upper part of the compressor has a large access cover allowing quick and easy maintenance of the compressor.

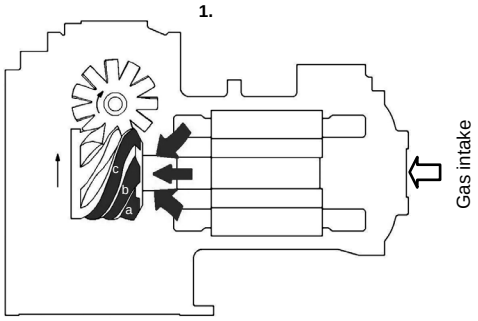
2.6 Compression Process

Introduction

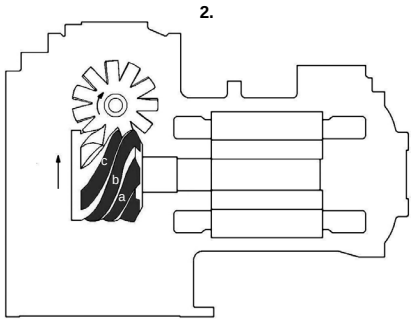
With the single-screw compressor the intake, compression and discharge process takes place in a continuous manner thanks to the upper satellite. In this process the intake gas penetrates into the profile between the rotor, the teeth of the upper satellite and the compressor body. The volume is gradually reduced by compression of the refrigerant. The compressed gas under high pressure is thus discharged in the built-in oil separator. In the oil separator the gas/ oil mixture and the oil are collected in a cavity in the lower part of the compressor, where they are injected into the compression mechanisms in order to ensure the compression's sealing and lubrification of the ball bearings.

1. and 2. Intake

Grooves 'a', 'b' and 'c' on the main rotor are connected at one end with the intake cavity and sealing is done by the upper satellite's tooth. As the main rotor turns, the effective length of the groove increases, thus increasing the volume open to the intake chamber. Figure 1. shows this process clearly. As groove 'a' takes up the position of groove 'b' and 'c', the volume increases, thus inducing intake vapour to enter the groove.

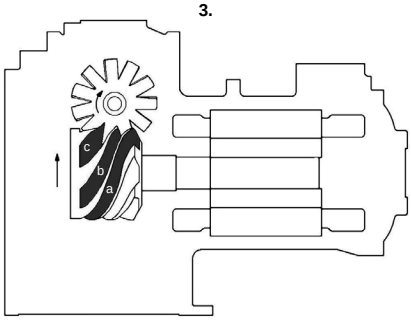


With a further rotation of the main rotor. The groove that had been open to intake is taken up by the satellite's tooth. This operation coincides with each groove that is gradually closed to the main rotor. Once the gas is enclosed within the groove and the intake room is separated, the intake process can be considered too.



3. Compression

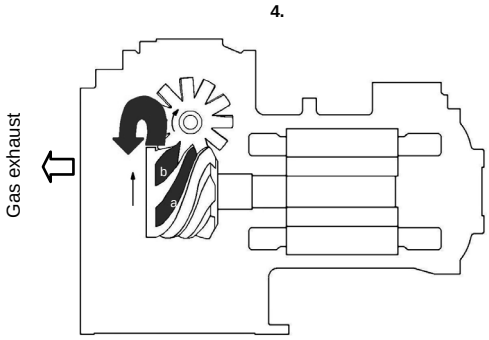
With the main rotor's rotation, the volume of the gas that is trapped within the screw's groove is reduced, thus reducing its length, and the compression phase begins.



1

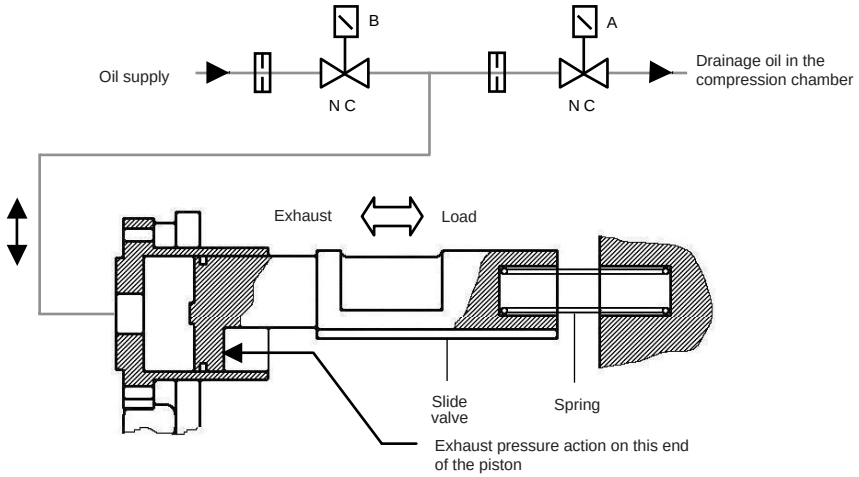
4. Exhaust

When the satellite's tooth approaches the end of the groove, the trapped vapour reaches maximum pressure near the triangular openring on the exhaust port. the compression phase ceases immediately and the gas is sent to the exhaust manifold. The satellite tooth continues pushing the vapour until the volume in the groove reaches its lowest level. The compression process is repeated for each groove on the screw at each rotation.



Note: The oil separator is not shown.

2.7 Chilling Capacity Control



The compressor is factory-equipped with a perpetual control system for its own capacity. The shutter valve reduces the groove's intake capacity and reduces its actual length. The shutter valve is controlled by the pressure of the oil from the separator.

1

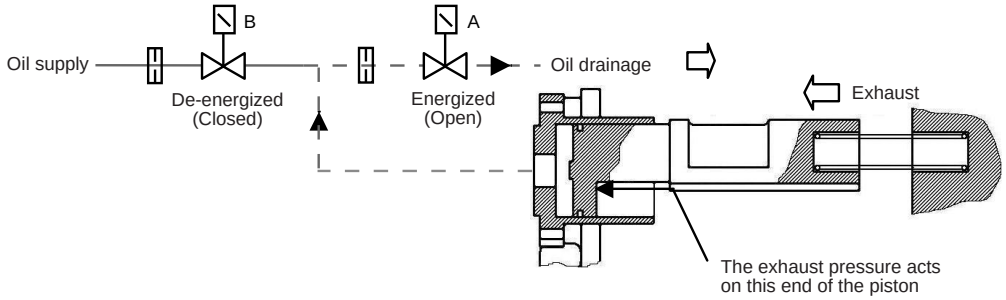
2.8 Shutter Valve Control

Introduction

The shutter control method is described in the figures below.

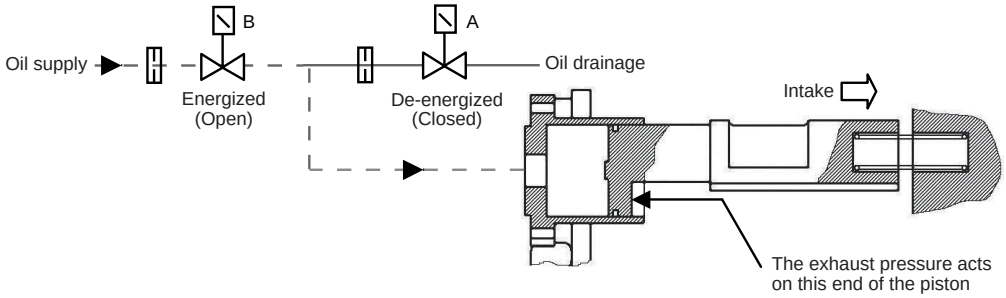
One end of the shutter valve is shaped like a hydraulic piston installed in a cylinder near the compressor exhaust. The other end contains a spring. The change in volume elaborated by the compressor takes place by alternating the force on the valve/ piston group. Internal holes allow the pressurised oil to communicate with the capacity control cylinder and allow its drainage. The solenoids normally are closed (NC) and open when powered. During operation of the compressor, the position of the valves is controlled by the pressure within the cylinder. The oil under pressure is introduced into the cylinder and acts on a surface that is larger than the piston, thus ensuring greater thrust than that resulting from the exhaust pressure plus the force of the spring. In this way, the valve is brought to load the compressor. If the cylinder is unloaded during intake, the force applied by the exhaust pressure plus the spring is greater and the valve moves, thus choking the compressor. If the compressor is stopped under any load, the spring will push the valve until it reaches a minimum load position. In this way, the startup of the compressor under minimum load is ensured.

Compressor exhaust



Spring Force + Exhaust pressure > Cylinder pressure = Valve moves to unload the compressor

Compressor intake



Cylinder pressure > Exhaust pressure + Spring Force = Valve moves to load the compressor

Table

CAPACITY CONTROL ACTION	SOLEN. VALVE A	SOLEN. VALVE B
Compressor intake The oil under high pressure is introduced into the capacity control cylinder. In this case, the oil pressure overcomes the force of the spring plus the exhaust pressure, moving the shutter valve towards the highest load position.	De-energized (closed)	Energized (open)
Compressor exhaust The oil is discharged from the choke cylinder. The force of the spring plus the high pressure thrust move the piston thus reducing the compressor's (capacity.	Energized (open)	De-energized (closed)
Fixed load The shutter valve stays still in the last position.	De-energized (closed)	De-energized (closed)

1

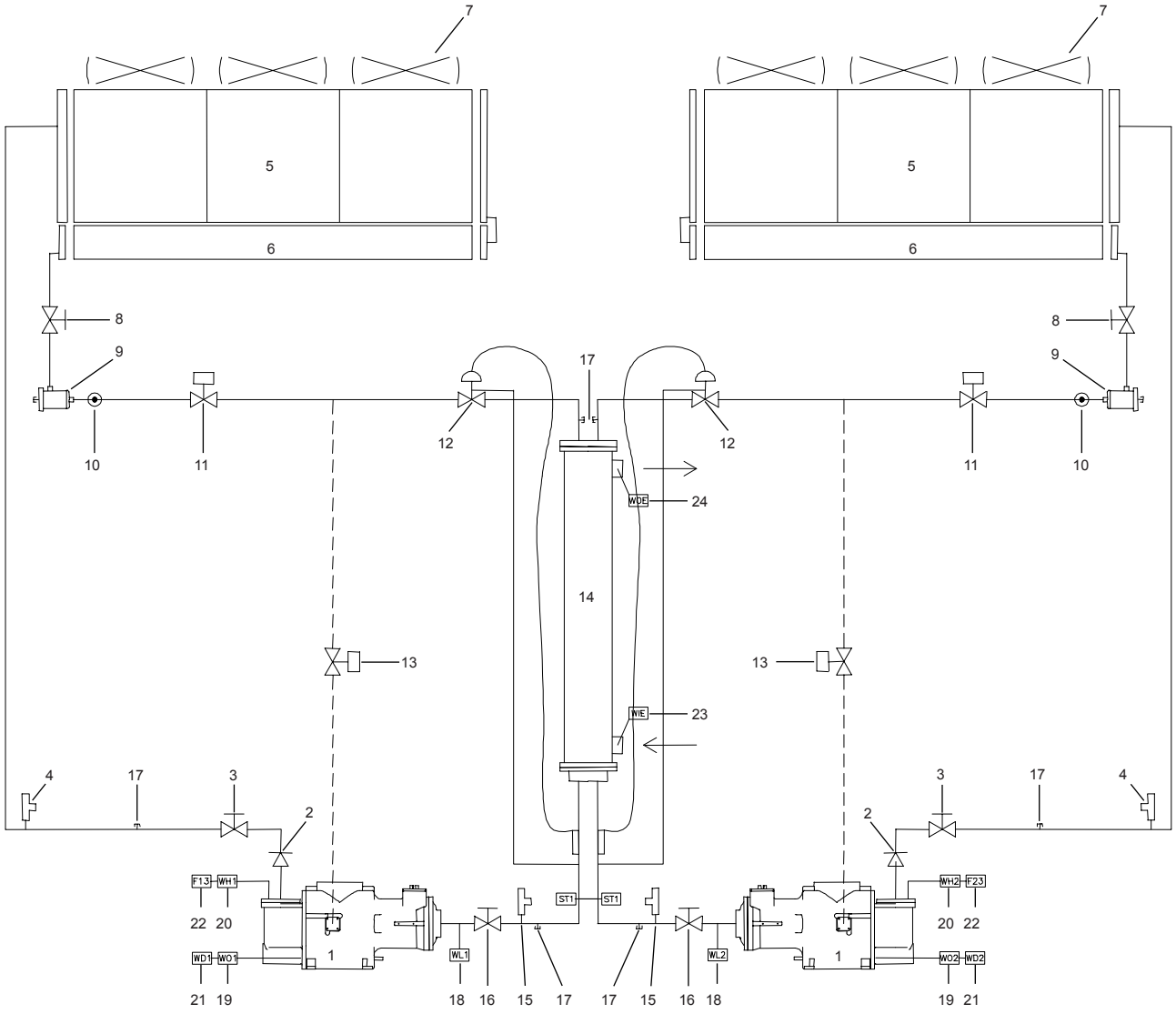
2.9 Piping Diagram for Standard Units with Thermostatic Expansion Valve

Components

N°	Components	Function/Remark
1	Compressor	Single screw compressor
2	Discharge non-return valve	To avoid that liquid from condenser returns into compressor when unit does not work
3	Discharge stop valve	Closed position when unit is delivered at site
4	High pressure relief valve	Setting 24.5 bar
5	Air-cooled condenser	Depending on the application, this battery can be delivered in different protection coatings
6	Sub-cool section	To guarantee sufficient under cooling
7	Axial ventilator	
8	Liquid stop valve	Closed position when unit is delivered at site
9	Filter drier	To absorb possible humidity and small particles
10	Sight glass	Give an indictation of the dryness of the installation
11	Pump down solenoid valve	Before stopping the compressor, the unit will activate this valve
12	Thermostatic expansion valve	
13	Liquid injection valve	Will be activated if the discharge temperature of the compressor becomes too high
14	Evaporator	Shell and Tube evaporator with 2 independent refrigerant circuits and 1 water circuit
15	Low pressure relief valve	Setting 15.5bar
16	Suction shut off valve	Closed position when unit is delivered at site
17	Loading joint with valve	
18	Low pressure transducer	-0.5 → +7 bar
19	Oil pressure transducer	0 → +30 bar
20	High pressure transducer	0 → +30 bar
21	Discharge temperature sensor (oil)	
22	Mechanical high pressure switch	21.5 bar
23	Inlet evaporator sensor	
24	Outlet evaporator sensor	

1

Functional diagram The illustration below shows the functional diagram of the refrigerant cycle for standard units with Thermostatic Expansion Valve.



1

2.10 Piping Diagram for Standard Units with Electronic Expansion Valve

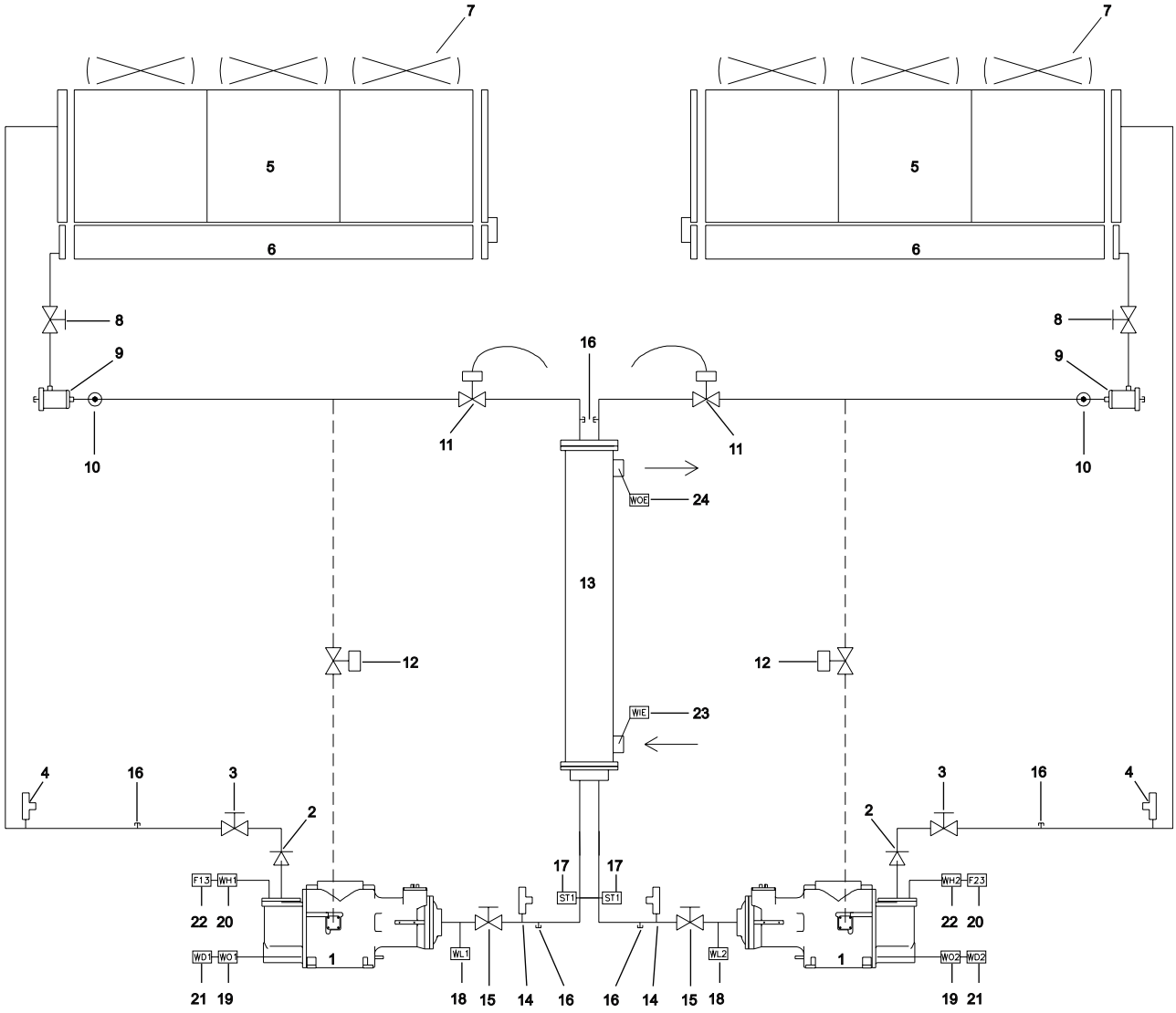
Components

N°	Components	Function/Remark
1	Compressor	Single screw compressor
2	Discharge non-return valve	To avoid that liquid from condenser returns into compressor when unit does not work
3	Discharge stop valve	Closed position when unit is delivered at site
4	High pressure relief valve	Setting 24.5 bar
5	Air-cooled condenser	Depending on the application, this battery can be delivered in different protection coatings
6	Sub-cool section	To guarantee sufficient under cooling
7	Axial ventilator	
8	Liquid stop valve	Closed position when unit is delivered at site
9	Filter drier	To absorb possible humidity and small particles
10	Sight glass	Give an indictation of the dryness of the installation
11	Electronic expansion valve	
12	Liquid injection valve	Will be activated if the discharge temperature of the compressor becomes too high
13	Evaporator	Shell and Tube evaporator with 2 independent refrigerant circuits and 1 water circuit
14	Low pressure relief valve	Setting 15.5bar
15	Suction shut off valve	Closed position when unit is delivered at site
16	Loading joint with valve	
17	Suction temperature sensor	
18	Low pressure transducer	-0.5 → +7 bar
19	Oil pressure transducer	0 → +30 bar
20	High pressure transducer	0 → +30 bar
21	Discharge temperature sensor (oil)	
22	Mechanical high pressure switch	21.5 bar
23	Inlet evaporator sensor	
24	Outlet evaporator sensor	

1

Functional diagram

The illustration below shows the functional diagram of the refrigerant cycle for standard units with Electronic Expansion Valve.



1

2.11 Piping Diagram for High Efficiency Units with Thermostatic Expansion Valve

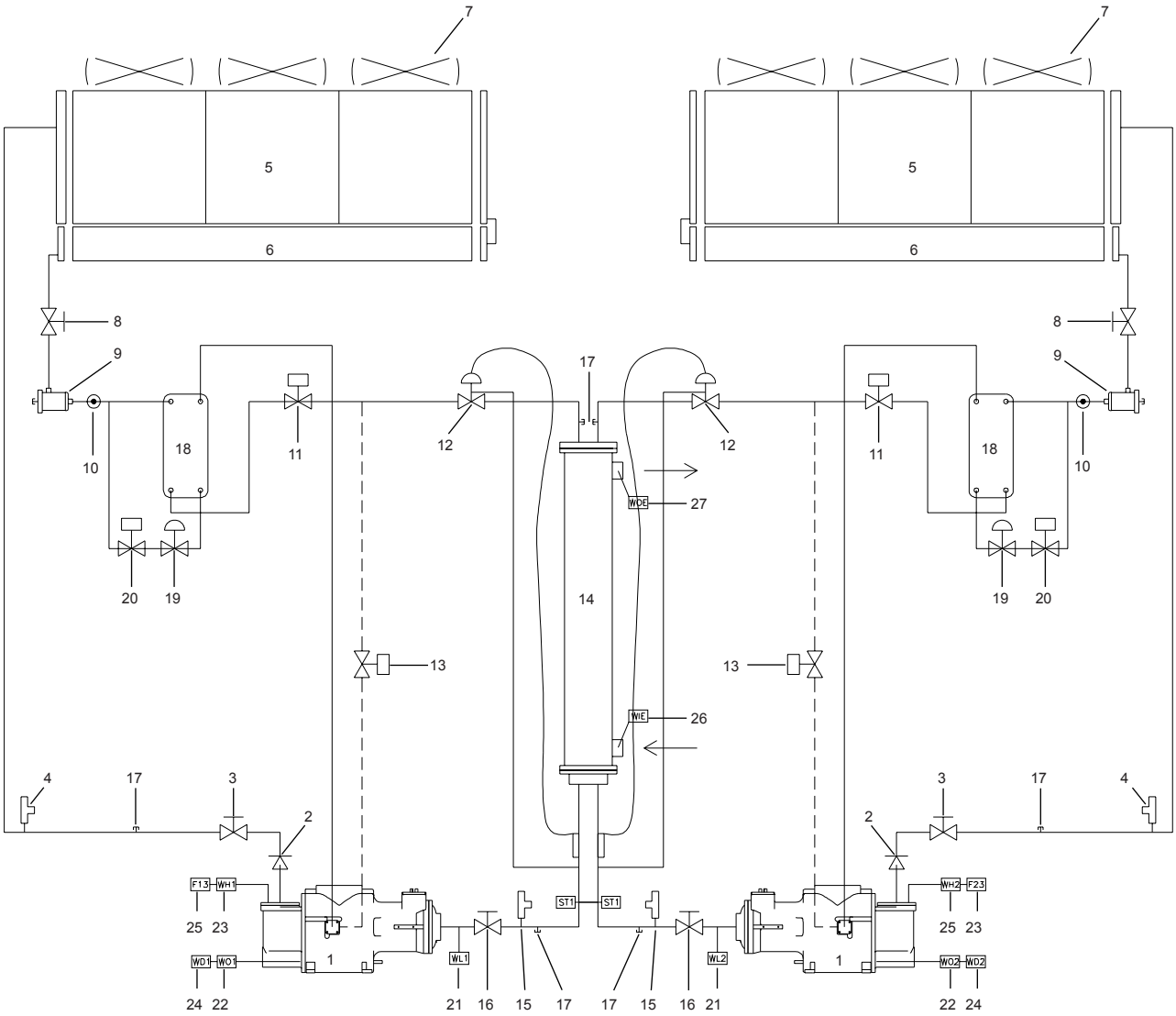
Components

N°	Components	Function/Remark
1	Compressor	Single screw compressor
2	Discharge non-return valve	To avoid that liquid from condenser returns into compressor when unit does not work
3	Discharge stop valve	Closed position when unit is delivered at site
4	High pressure relief valve	Setting 24.5 bar
5	Air-cooled condenser	Depending on the application, this battery can be delivered in different protection coatings
6	Sub-cool section	To guarantee sufficient under cooling
7	Axial ventilator	
8	Liquid stop valve	Closed position when unit is delivered at site
9	Filter drier	To absorb possible humidity and small particles
10	Sight glass	Give an indictation of the dryness of the installation
11	Liquid line solenoid valve	
12	Thermostatic expansion valve	
13	Liquid injection valve	Will be activated if the discharge temperature of the compressor becomes too high
14	Evaporator	Shell and Tube evaporator with 2 independent refrigerant circuits and 1 water circuit
15	Low pressure relief valve	Setting 15.5bar
16	Suction shut off valve	Closed position when unit is delivered at site
17	Loading joint with valve	
18	Economizer	
19	Economizer expansion valve	
20	Economizer solenoid valve	
21	Low pressure transducer	-0.5 → +7 bar
22	Oil pressure transducer	0 → +30 bar
23	High pressure transducer	0 → +30 bar
24	Discharge temperature sensor (oil)	
25	Mechanical high pressure switch	21.5 bar
26	Inlet evaporator sensor	
27	Outlet evaporator sensor	

1

Functional diagram

The illustration below shows the functional diagram of the refrigerant cycle for high efficiency units with Thermostatic Expansion Valve.



1

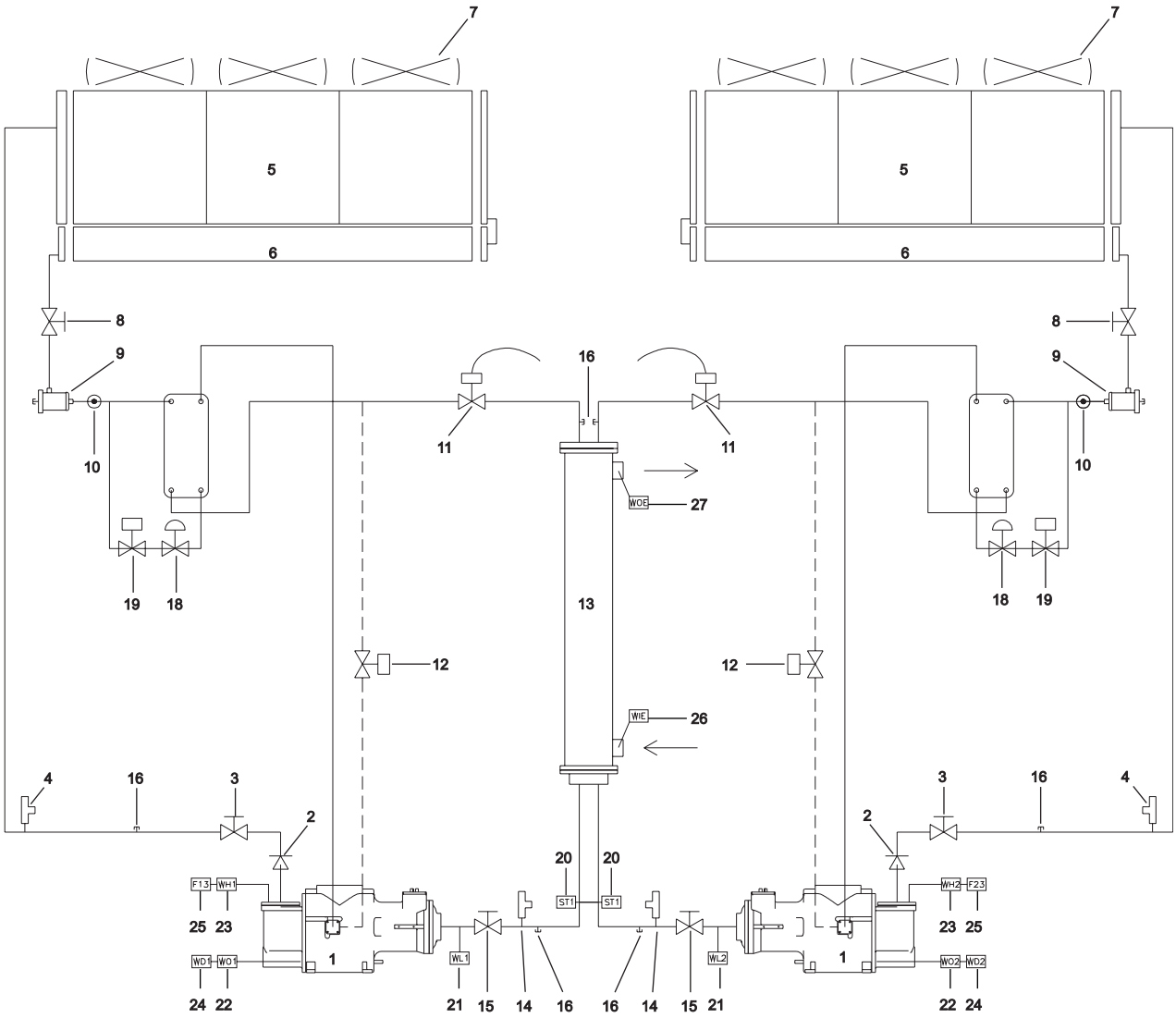
2.12 Piping Diagram for High Efficiency Units with Electronic Expansion Valve

Components

N°	Components	Function/Remark
1	Compressor	Single screw compressor
2	Discharge non-return valve	To avoid that liquid from condenser returns into compressor when unit does not work
3	Discharge stop valve	Closed position when unit is delivered at site
4	High pressure relief valve	Setting 24.5 bar
5	Air-cooled condenser	Depending on the application, this battery can be delivered in different protection coatings
6	Sub-cool section	To guarantee sufficient under cooling
7	Axial ventilator	
8	Liquid stop valve	Closed position when unit is delivered at site
9	Filter drier	To absorb possible humidity and small particles
10	Sight glass	Give an indictation of the dryness of the installation
11	Electronic expansion valve	
12	Liquid injection valve	Will be activated if the discharge temperature of the compressor becomes too high
13	Evaporator	Shell and Tube evaporator with 2 independent refrigerant circuits and 1 water circuit
14	Low pressure relief valve	Setting 15.5bar
15	Suction shut off valve	Closed position when unit is delivered at site
16	Loading joint with valve	
17	Economizer	
18	Economizer expansion valve	
19	Economizer solenoid valve	
20	Suction temperature	
21	Low pressure transducer	-0.5 → +7 bar
22	Oil pressure transducer	0 → +30 bar
23	High pressure transducer	0 → +30 bar
24	Discharge temperature sensor (oil)	
25	Mechanical high pressure switch	21.5 bar
26	Inlet evaporator sensor	
27	Outlet evaporator sensor	

Functional diagram

The illustration below shows the functional diagram of the refrigerant cycle for high efficiency units with Electronic Expansion Valve.



1

2.13 Piping Diagram for Standard Units with Partial Heat-Recovery and Thermostatic Expansion Valve

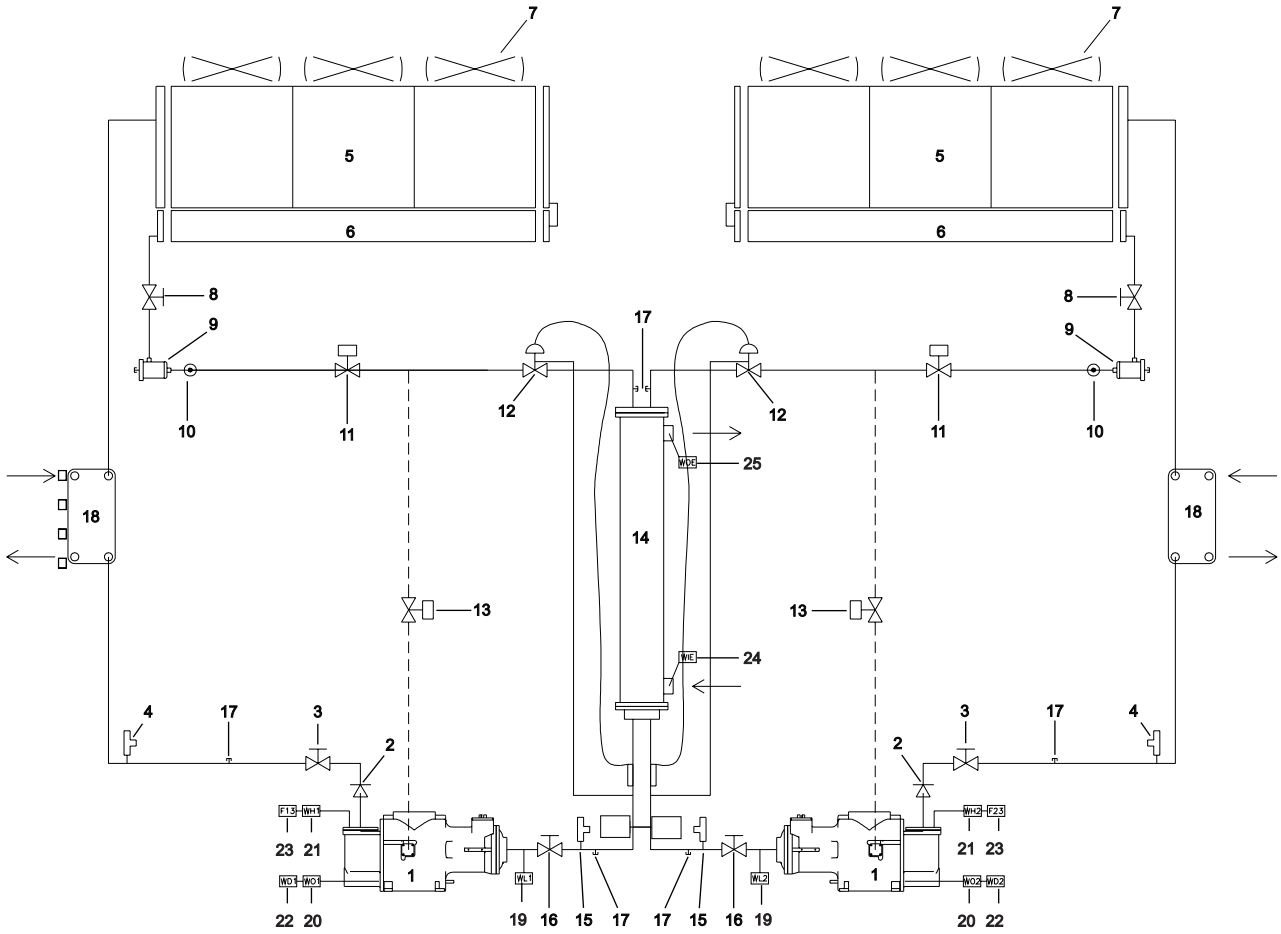
Components

N°	Components	Function/Remark
1	Compressor	Single screw compressor
2	Discharge non-return valve	To avoid that liquid from condenser returns into compressor when unit does not work
3	Discharge stop valve	Closed position when unit is delivered at site
4	High pressure relief valve	Setting 24.5 bar
5	Air-cooled condenser	Depending on the application, this battery can be delivered in different protection coatings
6	Sub-cool section	To guarantee sufficient under cooling
7	Axial ventilator	
8	Liquid stop valve	Closed position when unit is delivered at site
9	Filter drier	To absorb possible humidity and small particles
10	Sight glass	Give an indictation of the dryness of the installation
11	Pump down solenoid valve	
12	Thermostatic expansion valve	
13	Liquid injection valve	Will be activated if the discharge temperature of the compressor becomes too high
14	Evaporator	Shell and Tube evaporator with 2 independent refrigerant circuits and 1 water circuit
15	Low pressure relief valve	Setting 15.5bar
16	Suction shut off valve	Closed position when unit is delivered at site
17	Loading joint with valve	
18	Partial recovery heat exchanger	
19	Low pressure transducer	-0.5 → +7 bar
20	Oil pressure transducer	0 → +30 bar
21	High pressure transducer	0 → +30 bar
22	Discharge temperature sensor (oil)	
23	Mechanical high pressure switch	21.5 bar
24	Inlet evaporator sensor	
25	Outlet evaporator sensor	

1

Functional diagram

The illustration below shows the functional diagram of the refrigerant cycle for standard units with Partial Heat-Recovery and Thermostatic Expansion Valve.



1

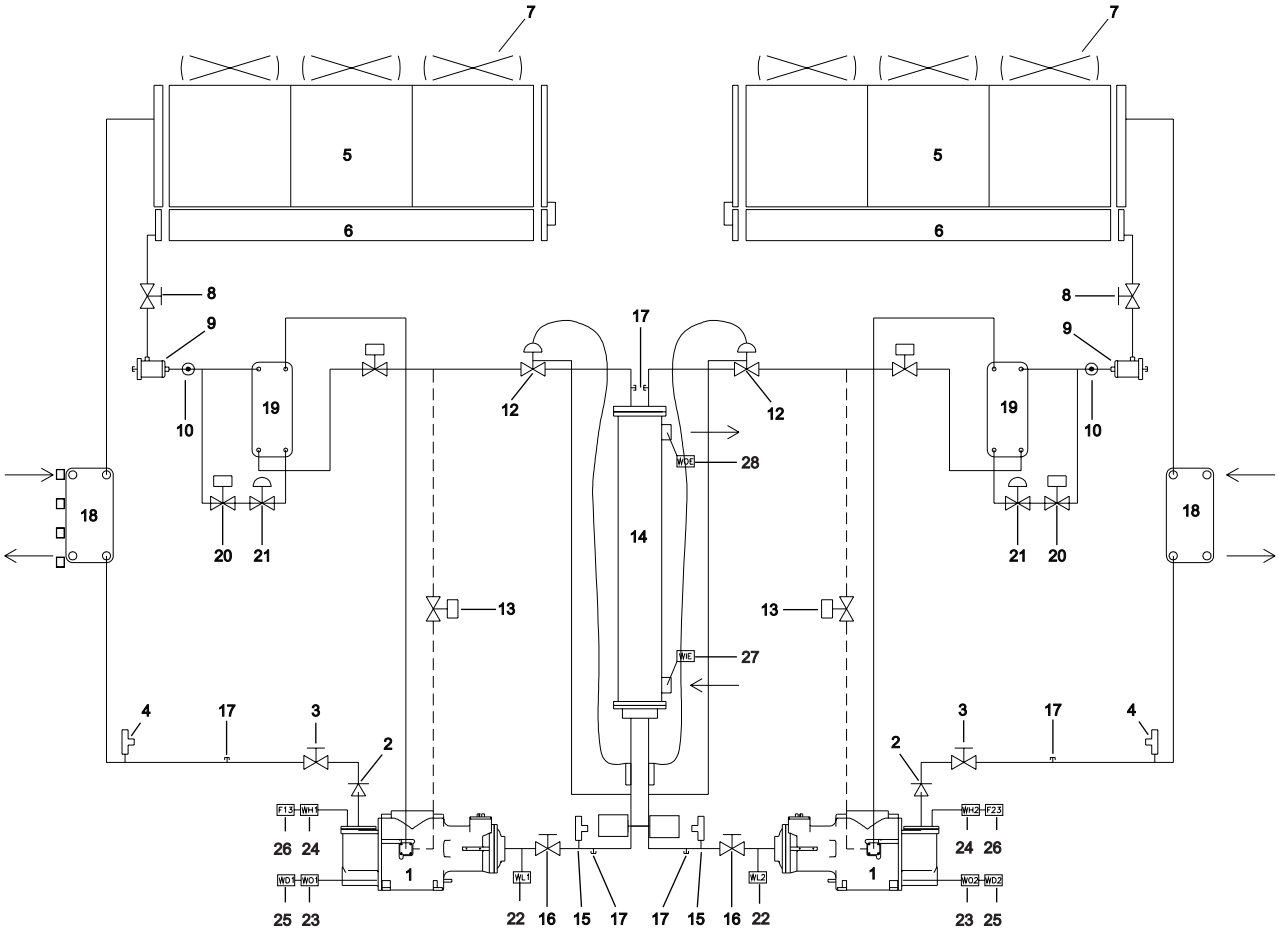
2.14 Piping Diagram for High Efficiency Units with Partial Heat-Recovery and Thermostatic Expansion Valve

Components

N°	Components	Function/Remark
1	Compressor	Single screw compressor
2	Discharge non-return valve	To avoid that liquid from condenser returns into compressor when unit does not work
3	Discharge stop valve	Closed position when unit is delivered at site
4	High pressure relief valve	Setting 24.5 bar
5	Air-cooled condenser	Depending on the application, this battery can be delivered in different protection coatings
6	Sub-cool section	To guarantee sufficient under cooling
7	Axial ventilator	
8	Liquid stop valve	Closed position when unit is delivered at site
9	Filter drier	To absorb possible humidity and small particles
10	Sight glass	Give an indictation of the dryness of the installation
11	Pump down solenoid valve	
12	Thermostatic expansion valve	
13	Liquid injection valve	Will be activated if the discharge temperature of the compressor becomes too high
14	Evaporator	Shell and Tube evaporator with 2 independent refrigerant circuits and 1 water circuit
15	Low pressure relief valve	Setting 15.5bar
16	Suction shut off valve	Closed position when unit is delivered at site
17	Loading joint with valve	
18	Partial recovery heat exchanger	
19	Economizer	
20	Solenoid valve economizer	
21	Expansion valve economizer	
22	Low pressure transducer	-0.5 → +7 bar
23	Oil pressure transducer	0 → +30 bar
24	High pressure transducer	0 → +30 bar
25	Discharge temperature sensor (oil)	
26	Mechanical high pressure switch	21.5 bar
27	Inlet evaporator sensor	
28	Outlet evaporator sensor	

Functional diagram

The illustration below shows the functional diagram of the refrigerant cycle for high efficiency units with Partial Heat-Recovery and Thermostatic Expansion Valve.



1

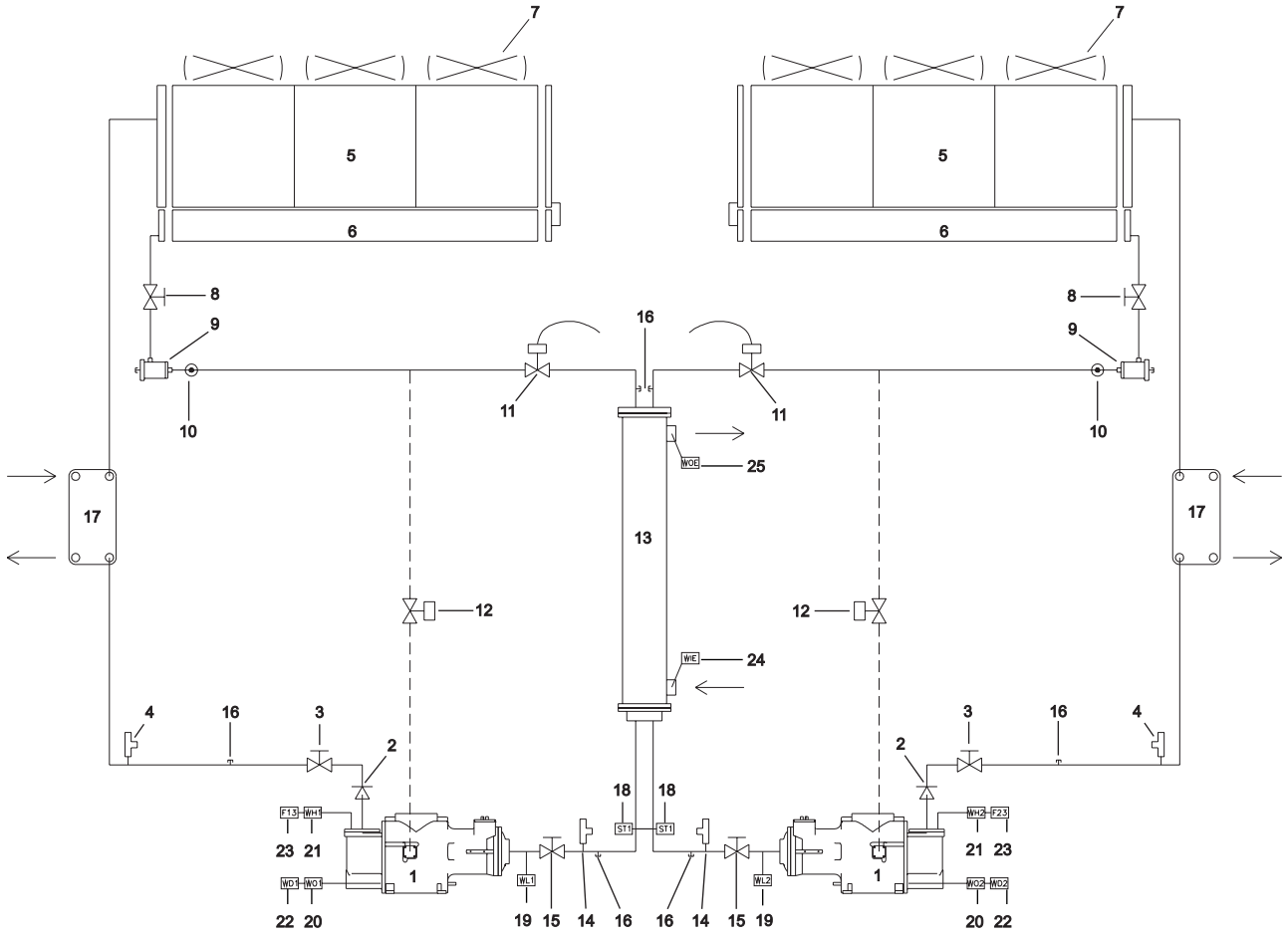
2.15 Piping Diagram for Standard Units with Partial Heat-Recovery and Electronic Expansion Valve

Components

N°	Components	Function/Remark
1	Compressor	Single screw compressor
2	Discharge non-return valve	To avoid that liquid from condenser returns into compressor when unit does not work
3	Discharge stop valve	Closed position when unit is delivered at site
4	High pressure relief valve	Setting 24.5 bar
5	Air-cooled condenser	Depending on the application, this battery can be delivered in different protection coatings
6	Sub-cool section	To guarantee sufficient under cooling
7	Axial ventilator	
8	Liquid stop valve	Closed position when unit is delivered at site
9	Filter drier	To absorb possible humidity and small particles
10	Sight glass	Give an indictation of the dryness of the installation
11	Electronic expansion valve	
12	Liquid injection valve	Will be activated if the discharge temperature of the compressor becomes too high
13	Evaporator	Shell and Tube evaporator with 2 independent refrigerant circuits and 1 water circuit
14	Low pressure relief valve	Setting 15.5bar
15	Suction shut off valve	Closed position when unit is delivered at site
16	Loading joint with valve	
17	Partial recovery heat exchanger	
18	Suction sensor	
19	Low pressure transducer	-0.5 → +7 bar
20	Oil pressure transducer	0 → +30 bar
21	High pressure transducer	0 → +30 bar
22	Discharge temperature sensor (oil)	
23	Mechanical high pressure switch	21.5 bar
24	Inlet evaporator sensor	
25	Outlet evaporator sensor	

Functional diagram

The illustration below shows the functional diagram of the refrigerant cycle for standard units with Partial Heat-Recovery and Electronic Expansion Valve.



1

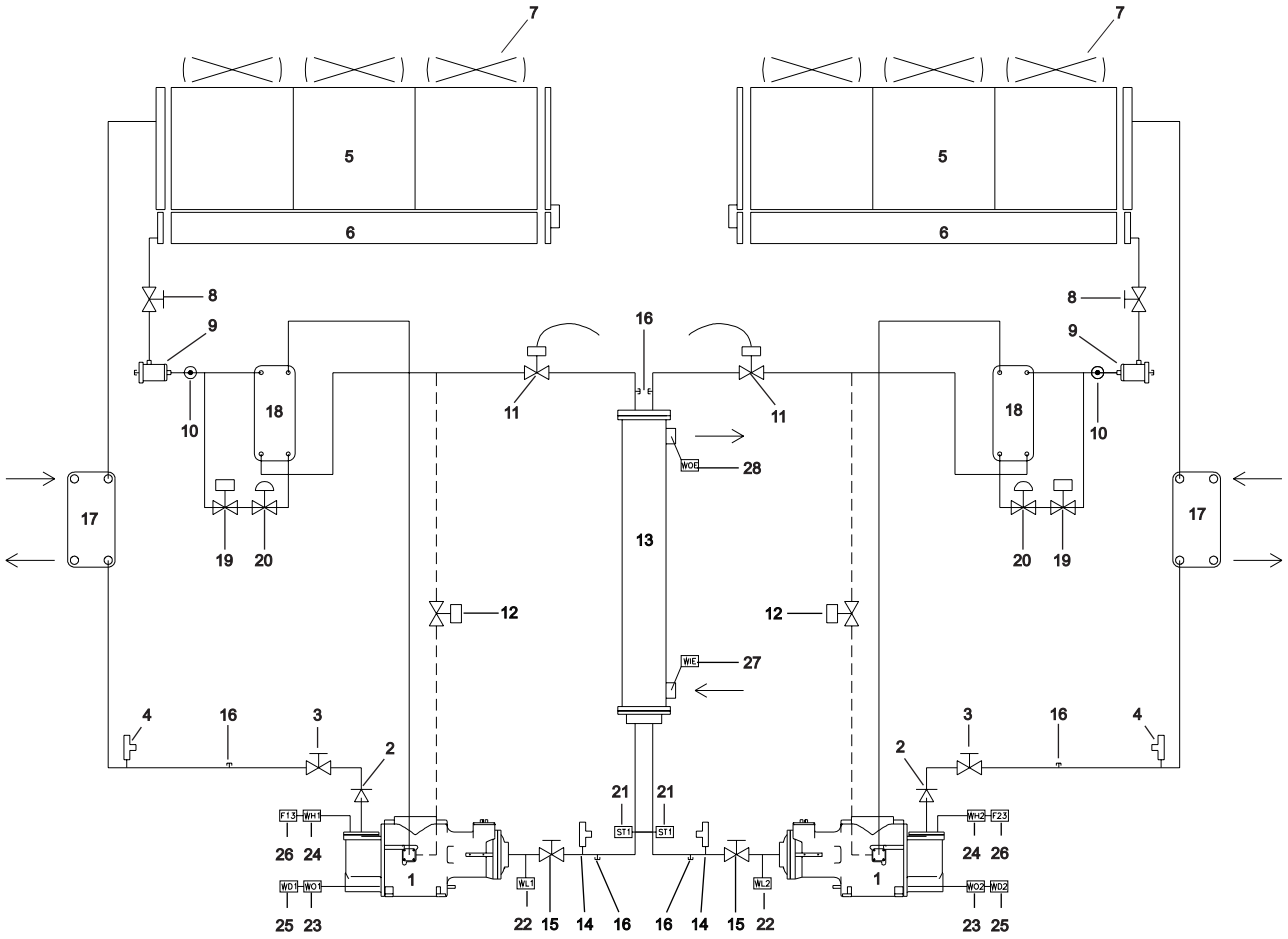
2.16 Piping Diagram for High Efficiency Units with Partial Heat-Recovery and Electronic Expansion Valve

Components

N°	Components	Function/Remark
1	Compressor	Single screw compressor
2	Discharge non-return valve	To avoid that liquid from condenser returns into compressor when unit does not work
3	Discharge stop valve	Closed position when unit is delivered at site
4	High pressure relief valve	Setting 24.5 bar
5	Air-cooled condenser	Depending on the application, this battery can be delivered in different protection coatings
6	Sub-cool section	To guarantee sufficient under cooling
7	Axial ventilator	
8	Liquid stop valve	Closed position when unit is delivered at site
9	Filter drier	To absorb possible humidity and small particles
10	Sight glass	Give an indictation of the dryness of the installation
11	Electronic expansion valve	
12	Liquid injection valve	Will be activated if the discharge temperature of the compressor becomes too high
13	Evaporator	Shell and Tube evaporator with 2 independent refrigerant circuits and 1 water circuit
14	Low pressure relief valve	Setting 15.5bar
15	Suction shut off valve	Closed position when unit is delivered at site
16	Loading joint with valve	
17	Partial recovery heat exchanger	
18	Economizer	
19	Solenoid valve economizer	
20	Expansion valve economizer	
21	Suction sensor	
22	Low pressure transducer	-0.5 → +7 bar
23	Oil pressure transducer	0 → +30 bar
24	High pressure transducer	0 → +30 bar
25	Discharge temperature sensor (oil)	
26	Mechanical high pressure switch	21.5 bar
27	Inlet evaporator sensor	
28	Outlet evaporator sensor	

Functional diagram

The illustration below shows the functional diagram of the refrigerant cycle for high efficiency units with Partial Heat-Recovery and Electronic Expansion Valve.



1

2.17 Description of the Refrigerant Cycle with Partial Heat-Recovery

The low-temperature refrigerant gas from the evaporator is taken in by the compressor and travels through the electric engine cooling it. It is subsequently compressed and after this phase the refrigerant is mixed with the oil from the separator.

The high-pressure oil-refrigerant mixture is introduced within the high-efficiency centrifugal-type oil separator which separates it. The oil depositing on the bottom of the separator through pressure difference is sent back to the compressor while the refrigerant that has been separated from the oil il sent to the partial recovery exchanger, where it dissipates the heat from post-overheating cooling, warming the water which travels through the exchanger. On leaving the exchanger the refrigerant fluid enters the condenser battery where it is condensed by forced ventilation.

The fluid that is condensed at saturation temperature travels through the undercooling section where it yields further heat thus increasing cycle efficiency. The undercooled fluid travels through the high-efficiency dehydration filter and then through the lamination organ which launches the expansion process through a pressure drop, vaporising part of the refrigerant liquid.

The result is a low-pressure and low-temperature liquid and gas mixture requiring considerable heat, which is introduced into the evaporator.

After having been evenly distributed within the direct-expansion evaporator piping, the liquid-vapour refrigerant exchanges heat with the water to be cooled, thus reducing its temperature, and it gradually changes state until it evaporates completely and then overheats.

Once it has reached the overheated vapour state, the refrigerant leaves the evaporator to be once again taken in by the compressore and restart its cycle.

2.18 Controlling the Partial Recovery Circuit and Installation Recommendations

The partial heat recovery system is not managed and/or controlled by the machine. The installer should follow the suggestions below for best system performance and reliability:

1 Install a mechanical filter at exchanger entrances

2 Install sectioning valves to exclude the exchanger from the hydraulic system during periods of inactivity or during system maintenance.

3 Install a discharge tap to empty the heat exchanger, in the event that air temperature can be expected to fall below 0°C during periods of inactivity of the machine.

4 Interpose flexible anti-vibration joints on recuperator water input and output piping, to keep transmission of vibrations, and therefore of noise, to the hydraulic system as low as possible.

5 Do not load exchanger joints with the weight of recuperator piping. Hydraulic joints of exchangers are not designed to support their weight.

6 Should recovery water temperature be lower than ambient temperature, it is advised to switch off the recovery water pump 3 minutes after having switched off the last compressor.

1

2.19 Piping Diagram for Standard Units with Total Heat-Recovery and Thermostatic Expansion Valve

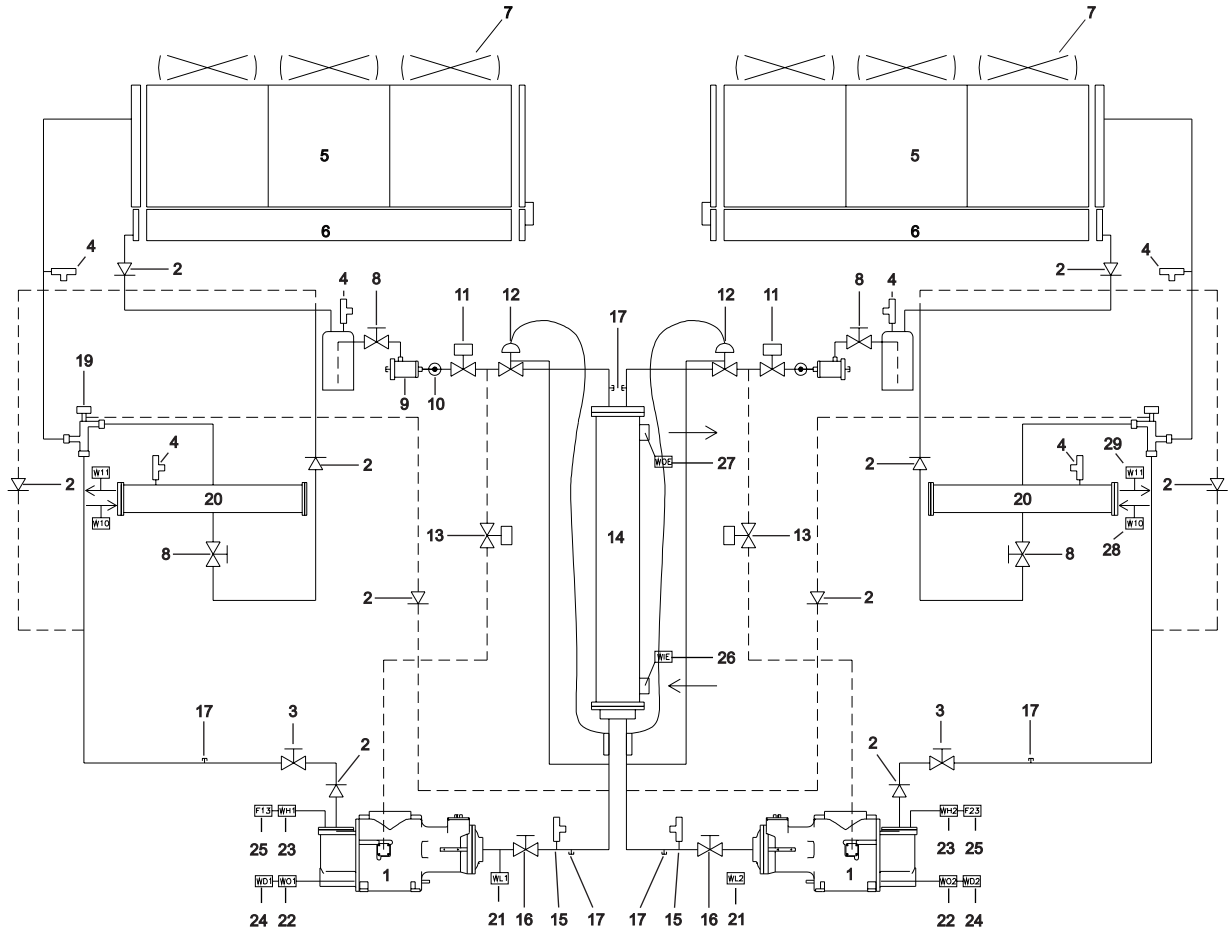
Components

N°	Components	Function/Remark
1	Compressor	Single screw compressor
2	Discharge non-return valve	To avoid that liquid from condenser returns into compressor when unit does not work
3	Discharge stop valve	Closed position when unit is delivered at site
4	High pressure relief valve	Setting 24.5 bar
5	Air-cooled condenser	Depending on the application, this battery can be delivered in different protection coatings
6	Sub-cool section	To guarantee sufficient under cooling
7	Axial ventilator	
8	Liquid stop valve	Closed position when unit is delivered at site
9	Filter drier	To absorb possible humidity and small particles
10	Sight glass	Give an indication of the dryness of the installation
11	Pump down solenoid valve	
12	Thermostatic expansion valve	
13	Liquid injection valve	Will be activated if the discharge temperature of the compressor becomes too high
14	Evaporator	Shell and Tube evaporator with 2 independent refrigerant circuits and 1 water circuit
15	Low pressure relief valve	Setting 15.5 bar
16	Suction shutt of valve	Closed position when unit is delivered at site
17	Loading joint with valve	
18	Liquid receiver	
19	Recovery cycle three-way valve	
20	Recovery exchanger	
21	Low pressure transducer	-0.5 → +7 bar
22	Oil pressure transducer	0 → +30 bar
23	High pressure transducer	0 → +30 bar
24	Discharge temperature sensor (oil)	
25	Mechanical high pressure switch	21.5 bar
26	Inlet evaporator sensor	
27	Outlet evaporator sensor	
28	Recovery water input temperature sensor (*)	(*) Probes W10 and W11 must be positioned in the recuperators' common connection piping. Positioning to be handled by the client
29	Recovery water output temperature sensor (*)	

1

Functional diagram

The illustration below shows the functional diagram of the refrigerant cycle for standard units with Total Heat-Recovery and Thermostatic Expansion Valve.



1

2.20 Piping Diagram for High Efficiency Units with Total Heat-Recovery and Thermostatic Expansion Valve

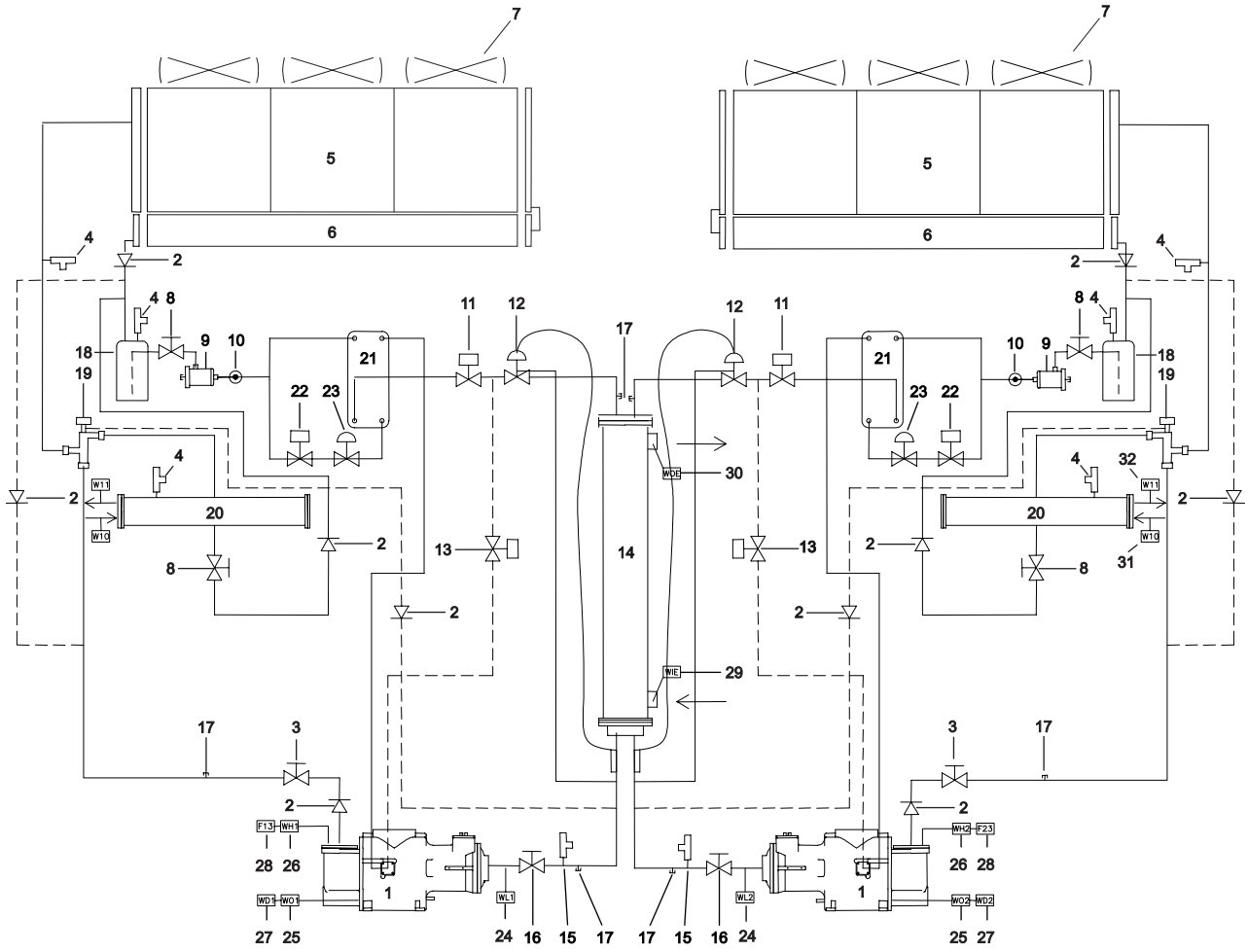
Components

N°	Components	Function/Remark
1	Compressor	Single screw compressor
2	Discharge non-return valve	To avoid that liquid from condenser returns into compressor when unit does not work
3	Discharge stop valve	Closed position when unit is delivered at site
4	High pressure relief valve	Setting 24.5 bar
5	Air-cooled condenser	Depending on the application, this battery can be delivered in different protection coatings
6	Sub-cool section	To guarantee sufficient under cooling
7	Axial ventilator	
8	Liquid stop valve	Closed position when unit is delivered at site
9	Filter drier	To absorb possible humidity and small particles
10	Sight glass	Give an indication of the dryness of the installation
11	Pump down solenoid valve	
12	Thermostatic expansion valve	
13	Liquid injection valve	Will be activated if the discharge temperature of the compressor becomes too high
14	Evaporator	Shell and Tube evaporator with 2 independent refrigerant circuits and 1 water circuit
15	Low pressure relief valve	Setting 15.5 bar
16	Suction shutt of valve	Closed position when unit is delivered at site
17	Loading joint with valve	
18	Liquid receiver	
19	Recovery cycle three-way valve	
20	Recovery exchanger	
21	Economizer	
22	Solenoid valve economizer	
23	Thermostatic expansion valve economizer	
24	Low pressure transducer	-0.5 → +7 bar
25	Oil pressure transducer	0 → +30 bar
26	High pressure transducer	0 → +30 bar
27	Discharge temperature sensor (oil)	
28	Mechanical high pressure switch	21.5 bar
29	Inlet evaporator sensor	
30	Outlet evaporator sensorz	
31	Recovery water input temperature sensor (*)	(*) Probes W10 and W11 must be positioned in the recuperators' common connection piping. Positioning to be handled by the client
32	Recovery water output temperature sensor (*)	

1

Functional diagram

The illustration below shows the functional diagram of the refrigerant cycle for high efficiency units with Total Heat-Recovery and Thermostatic Expansion Valve.



1

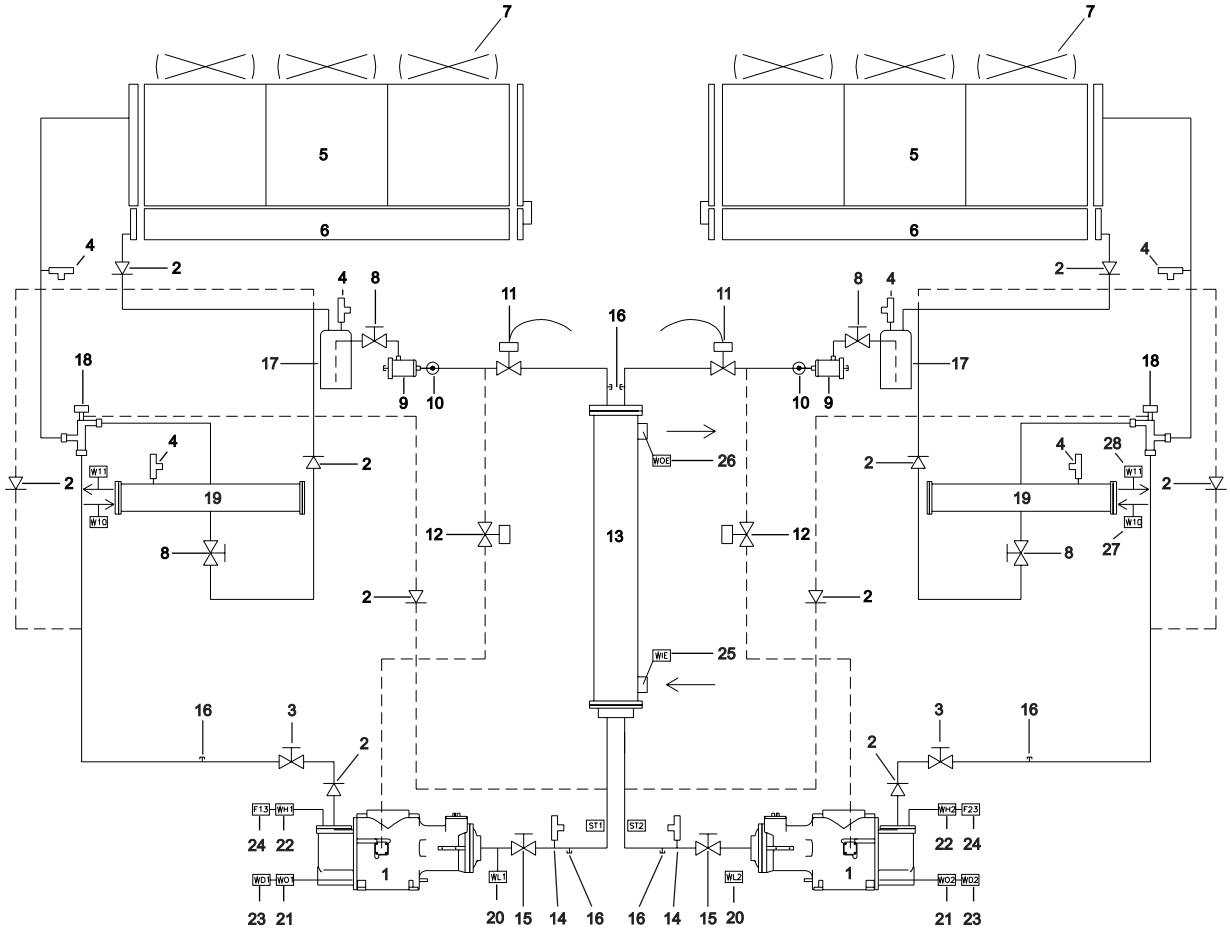
2.21 Piping Diagram for Standard Units with Total Heat-Recovery and Electronic Expansion Valve

Components

N°	Components	Function/Remark
1	Compressor	Single screw compressor
2	Discharge non-return valve	To avoid that liquid from condenser returns into compressor when unit does not work
3	Discharge stop valve	Closed position when unit is delivered at site
4	High pressure relief valve	Setting 24.5 bar
5	Air-cooled condenser	Depending on the application, this battery can be delivered in different protection coatings
6	Sub-cool section	To guarantee sufficient under cooling
7	Axial ventilator	
8	Liquid stop valve	Closed position when unit is delivered at site
9	Filter drier	To absorb possible humidity and small particles
10	Sight glass	Give an indication of the dryness of the installation
11	Electronic expansion valve	
12	Liquid injection valve	Will be activated if the discharge temperature of the compressor becomes too high
13	Evaporator	Shell and Tube evaporator with 2 independent refrigerant circuits and 1 water circuit
14	Low pressure relief valve	Setting 15.5 bar
15	Suction shutt of valve	Closed position when unit is delivered at site
16	Loading joint with valve	
17	Liquid receiver	
18	Recovery cycle three-way valve	
19	Recovery exchanger	
20	Low pressure transducer	-0.5 → +7 bar
21	Oil pressure transducer	0 → +30 bar
22	High pressure transducer	0 → +30 bar
23	Discharge temperature sensor (oil)	
24	Mechanical high pressure switch	21.5 bar
25	Inlet evaporator sensor	
26	Outlet evaporator sensor	
27	Recovery water input temperature sensor (*)	(*) Probes W10 and W11 must be positioned in the recuperators' common connection piping. Positioning to be handled by the client
28	Recovery water output temperature sensor (*)	

Functional diagram

The illustration below shows the functional diagram of the refrigerant cycle for standard units with Total Heat-Recovery and Electronic Expansion Valve.



1

2.22 Piping Diagram for High Efficiency Units with Total Heat-Recovery and Electronic Expansion Valve

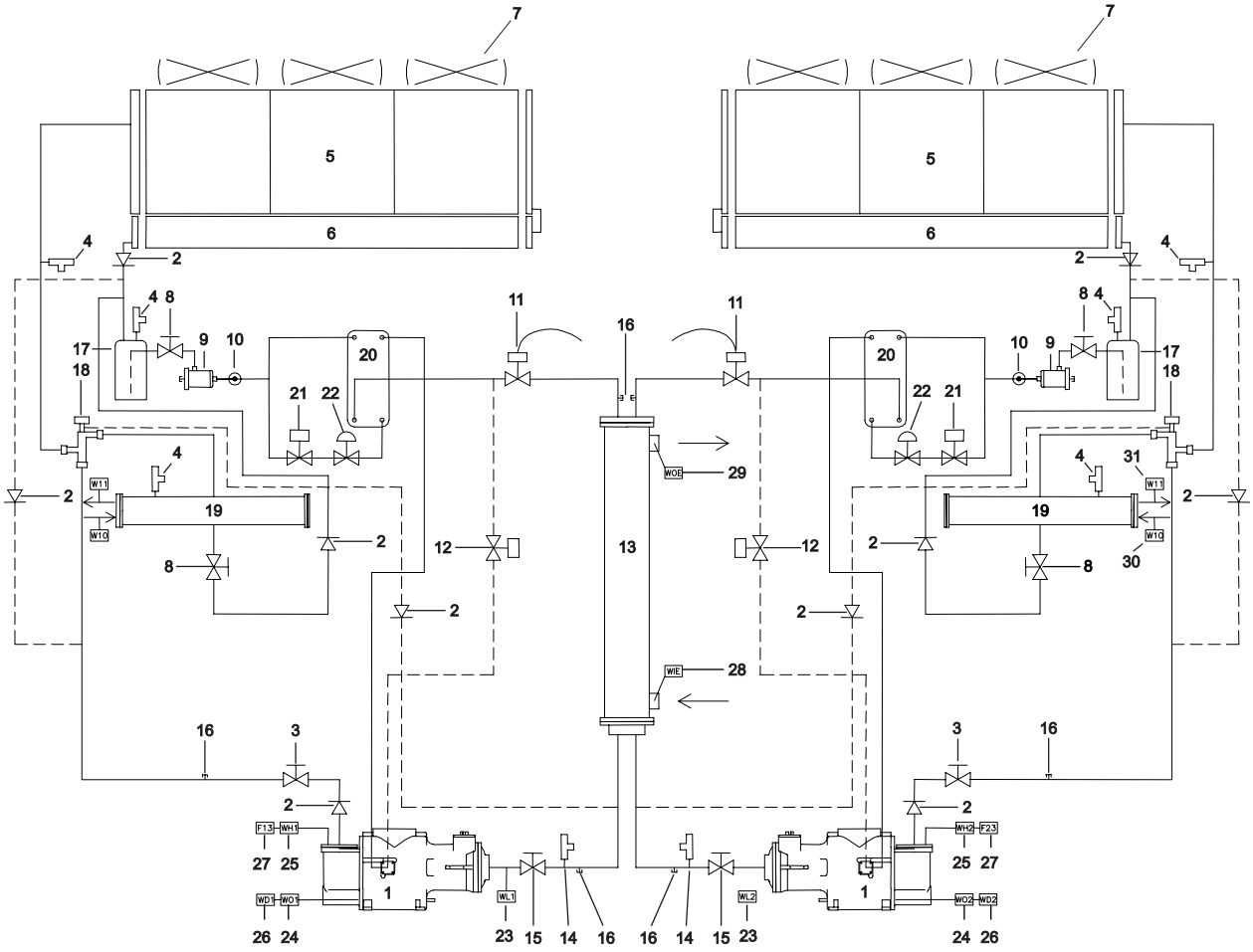
Components

N°	Components	Function/Remark
1	Compressor	Single screw compressor
2	Discharge non-return valve	To avoid that liquid from condenser returns into compressor when unit does not work
3	Discharge stop valve	Closed position when unit is delivered at site
4	High pressure relief valve	Setting 24.5 bar
5	Air-cooled condenser	Depending on the application, this battery can be delivered in different protection coatings
6	Sub-cool section	To guarantee sufficient under cooling
7	Axial ventilator	
8	Liquid stop valve	Closed position when unit is delivered at site
9	Filter drier	To absorb possible humidity and small particles
10	Sight glass	Give an indication of the dryness of the installation
11	Electronic expansion valve	
12	Liquid injection valve	Will be activated if the discharge temperature of the compressor becomes too high
13	Evaporator	Shell and Tube evaporator with 2 independent refrigerant circuits and 1 water circuit
14	Low pressure relief valve	Setting 15.5 bar
15	Suction shutt of valve	Closed position when unit is delivered at site
16	Loading joint with valve	
17	Liquid receiver	
18	Recovery cycle three-way valve	
19	Recovery exchanger	
20	Economizer	
21	Solenoid valve economizer	
22	Thermostatic expansion valve economizer	
23	Low pressure transducer	-0.5 → +7 bar
24	Oil pressure transducer	0 → +30 bar
25	High pressure transducer	0 → +30 bar
26	Discharge temperature sensor (oil)	
27	Mechanical high pressure switch	21.5 bar
28	Inlet evaporator sensor	
29	Outlet evaporator sensorz	
30	Recovery water input temperature sensor (*)	(*) Probes W10 and W11 must be positioned in the recuperators' common connection piping. Positioning to be handled by the client
31	Recovery water output temperature sensor (*)	

1

Functional diagram

The illustration below shows the functional diagram of the refrigerant cycle for high efficiency units with Total Heat-Recovery and Electronic Expansion Valve.



1

2.23 Description of Refrigerant Cycle Operating with Full Heat-Recovery

Low-temperature refrigerant gas from the evaporator is taken in by the compressor and travels through the electric engine, cooling it. It is subsequently compressed and during this phase the refrigerant mixes with oil from the separator.

The high-pressure oil-refrigerant mixture is introduced into the high-efficiency centrifuge-type oil separator, che separates these. The oil that has deposited on the bottom of the separator through a pressure difference is once again sent to the compressor while the refrigerant that has been separated from the oil is sent to the three-way valve. If the recovery switch Q7 is positioned on Heating and the temperature of recovery water is below its setpoint value, the three-way valve is oriented towards the recovery exchanger and the gas is therefore forced inside.

The refrigerant fluid is distributed inside the recovery condenser along the shell and tubes and during this process cools after overheating and starts to condensate.

The condensed fluid at saturation temperature travels through the undercooling section, where it yields further heat, thus increasing cycle efficiency. Heat drawn from the fluid during the cooling after overheating, condensation and undercooling phase is supplied to the recovery water, which gains heat.

Undercooled fluid travels through the high-efficiency dehydration filter, the liquid receiver and subsequently the lamination organ which launches the expansion process through a pressure drop, thus vaporising part of the refrigerant liquid.

The result at this point is a low-pressure and low-temperature liquid and gas mixture requiring considerable heat and which is introduced into the evaporator.

After having been uniformly distributed in the direct expansion evaporator piping, it exchanges heat the the water to be cooled, thus reducing its temperature, and it gradually changes state until it evaporates completely and then overheats.

On reaching the vapour state, the refrigerant at this point leaves the evaporator and is once again taken into the compressor and restarts the cycle. During the heating cycle, through a capillary pipe connected to the intake piping, the condenser battery empties, thus re-establishing the proper refrigerant charge and filling the liquid receiver.

Once the water from the recuperators has reached setpoint temperature, according to a PID pattern the circuit three-way valve changes state and the refrigerant discharged from the compressor is sent to the condenser battery in order to perform its normal function of cooling evaporator water. At the same time, the ventilators of the corresponding condenser section are turned on.

2.24 Total Heat Recovery Circuit Control

Units with total heat recovery differ from the basic version in the following additional components for each circuit:

- Gas/Water shell and tube heat exchanger complete with safety valve and 10 mm thermal insulation (20 mm on request).
- Three-way valve for Heating/ Cooling cycle switching.
- No-return valves.
- Compensation liquid receiver.
- Additional electronic expansion card.
- Recovery water temperature control sensors.
- Q7 switch for recovery circuit enablement

3 Wiring Layout

3.1 What Is in This Chapter?

Introduction

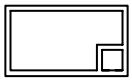
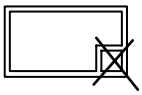
This part gives a general overview of the wiring layout for the standard and fan speed modulation version with electronic or thermostatic expansion valve.

Overview

This chapter contains the following topics:

Symbols

The following symbols are used on the wiring diagrams:

	Optional equipment
	Equipment installed
	Field wiring connections

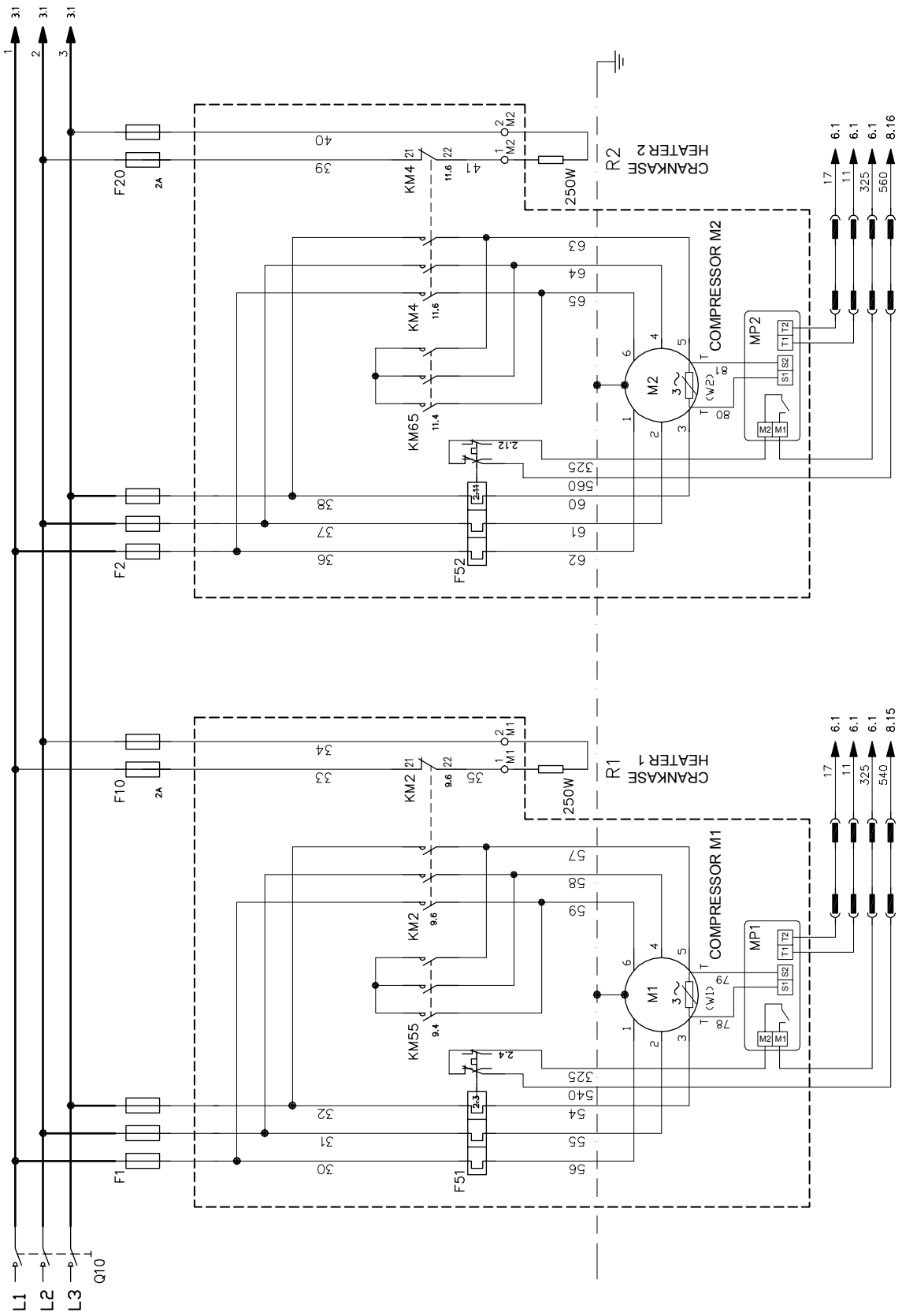
1

3.2 Wiring Diagram - Standard Version with Electronic Expansion Valve

Overview

This chapter contains the following topics:

3.2.1 Compressor 1-2 Power Supply



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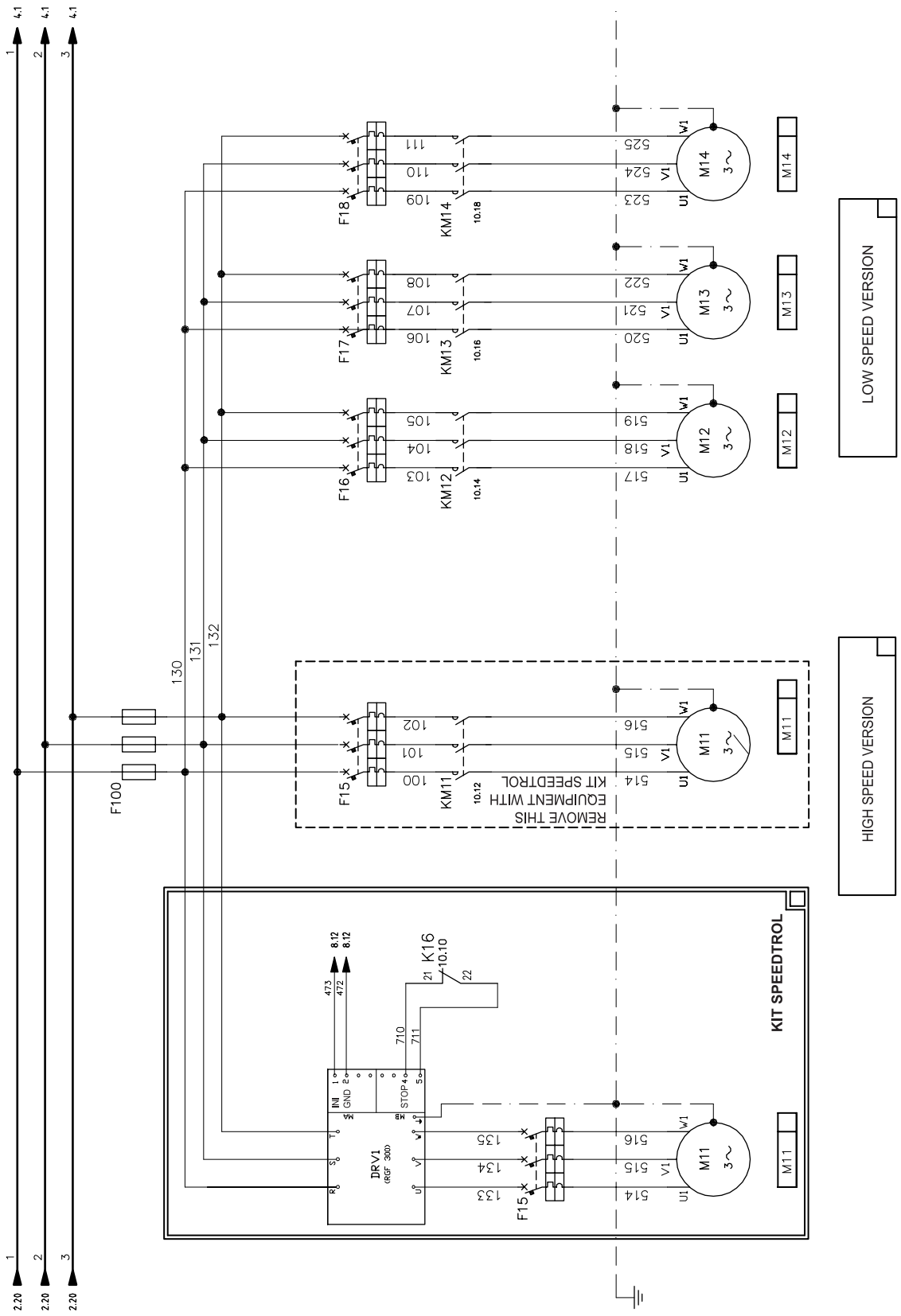
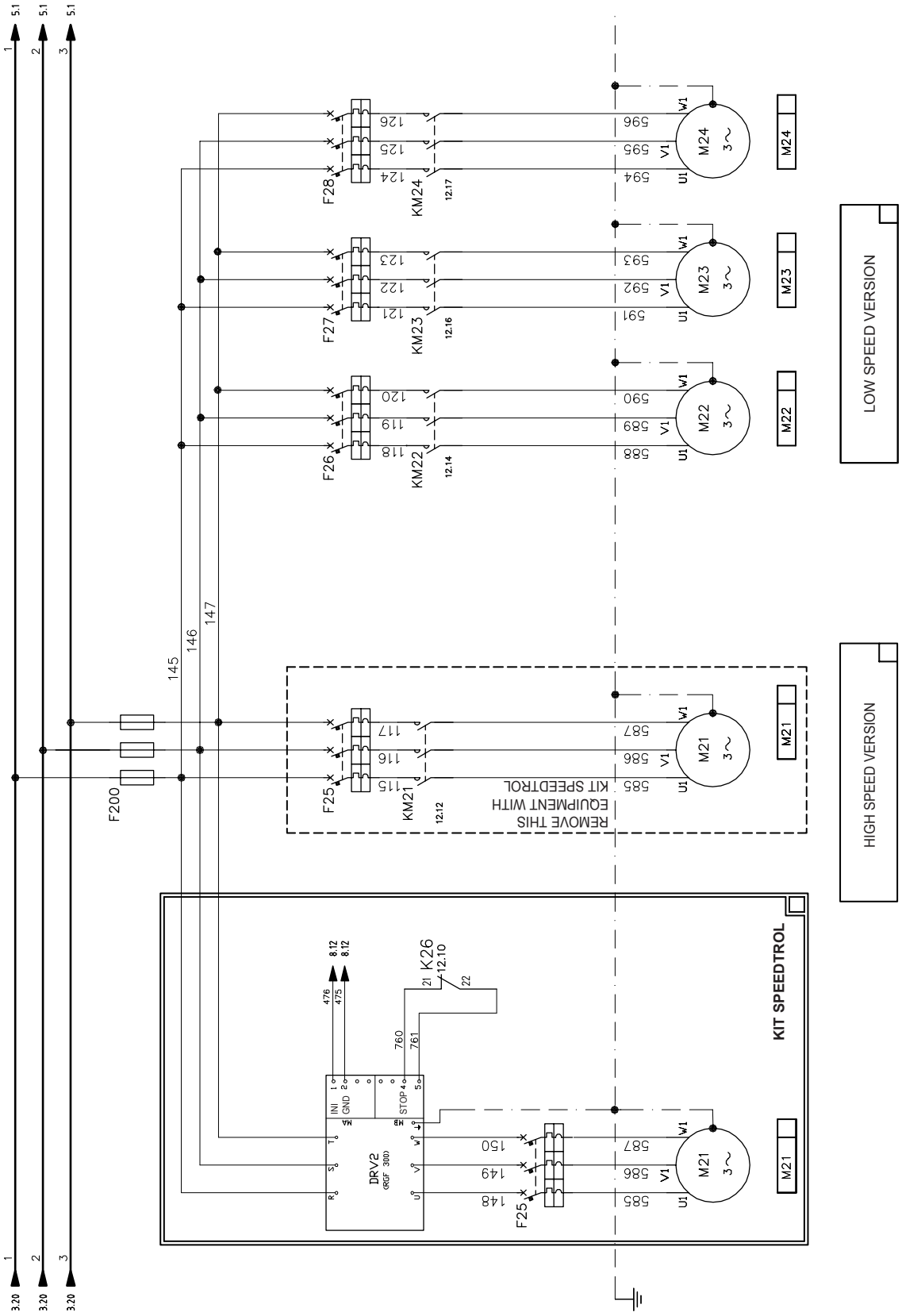
3.2.2 Circuits 1 Fan Power Supply



For more details on kit speedtrol, see page 1–114.

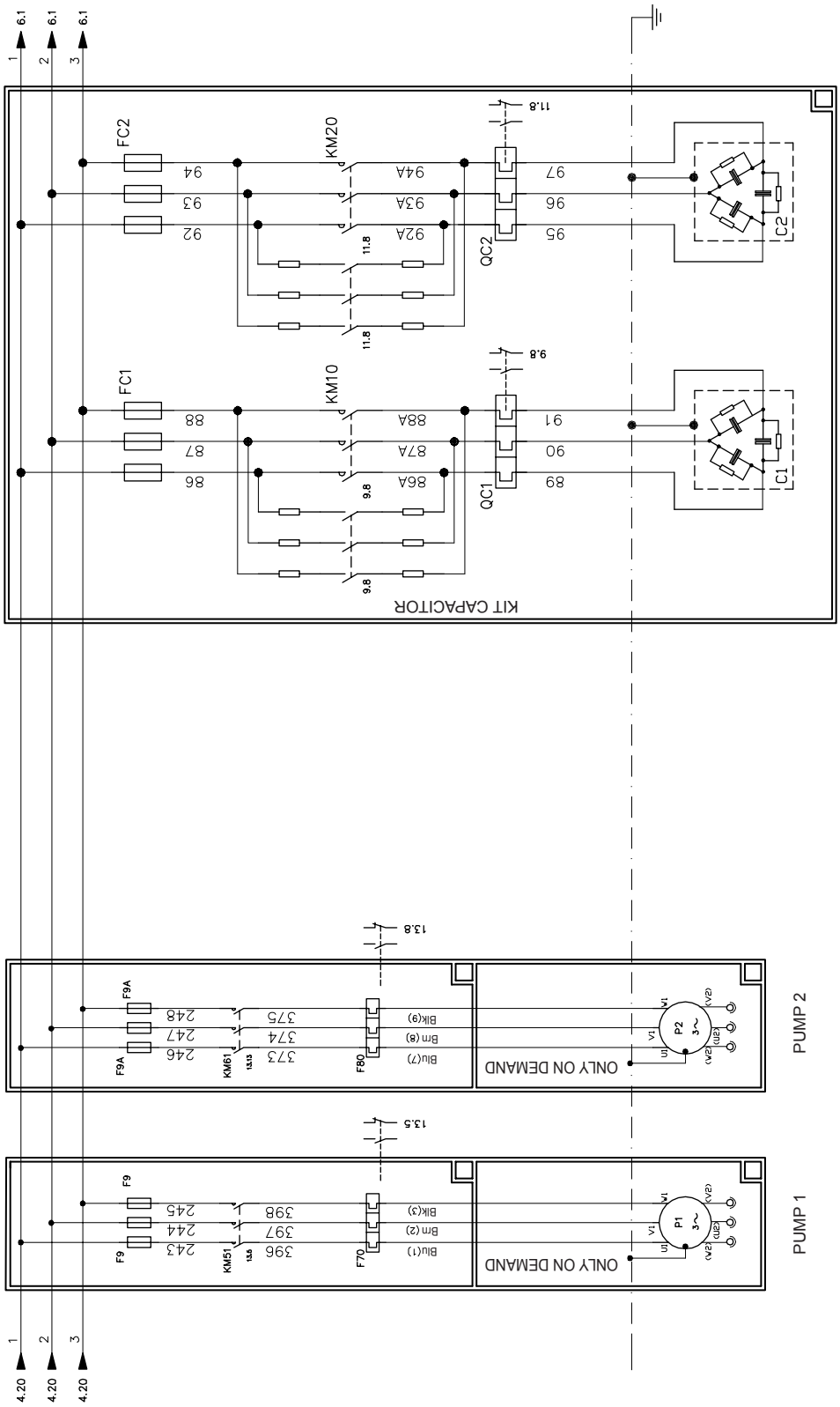
3.2.3 Circuits 2 Fan Power Supply



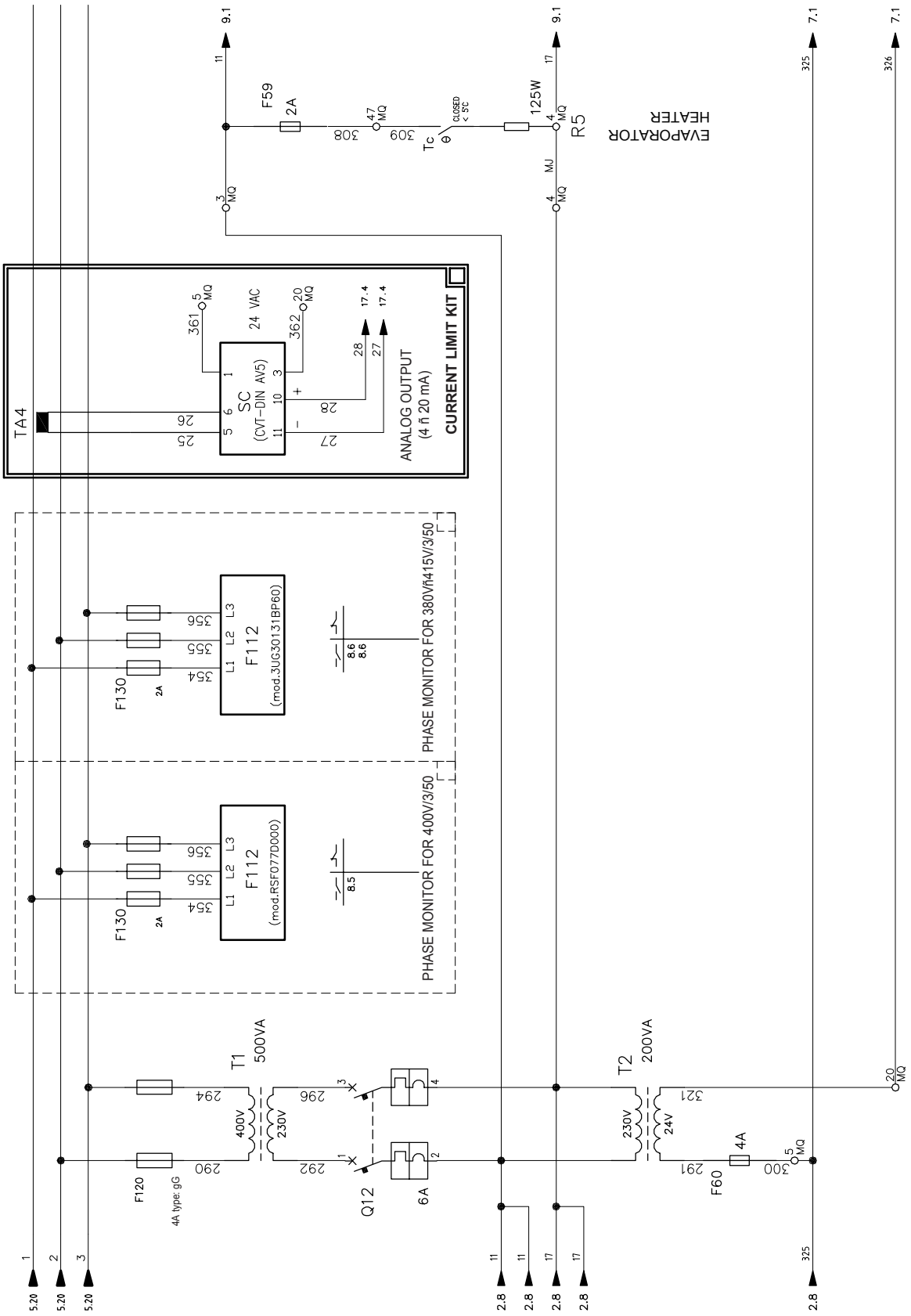
For more details on kit speedtrol, see page 1–114.

1

3.2.4 Kit Pumps



3.2.5 Unit Control Circuit Power Supply



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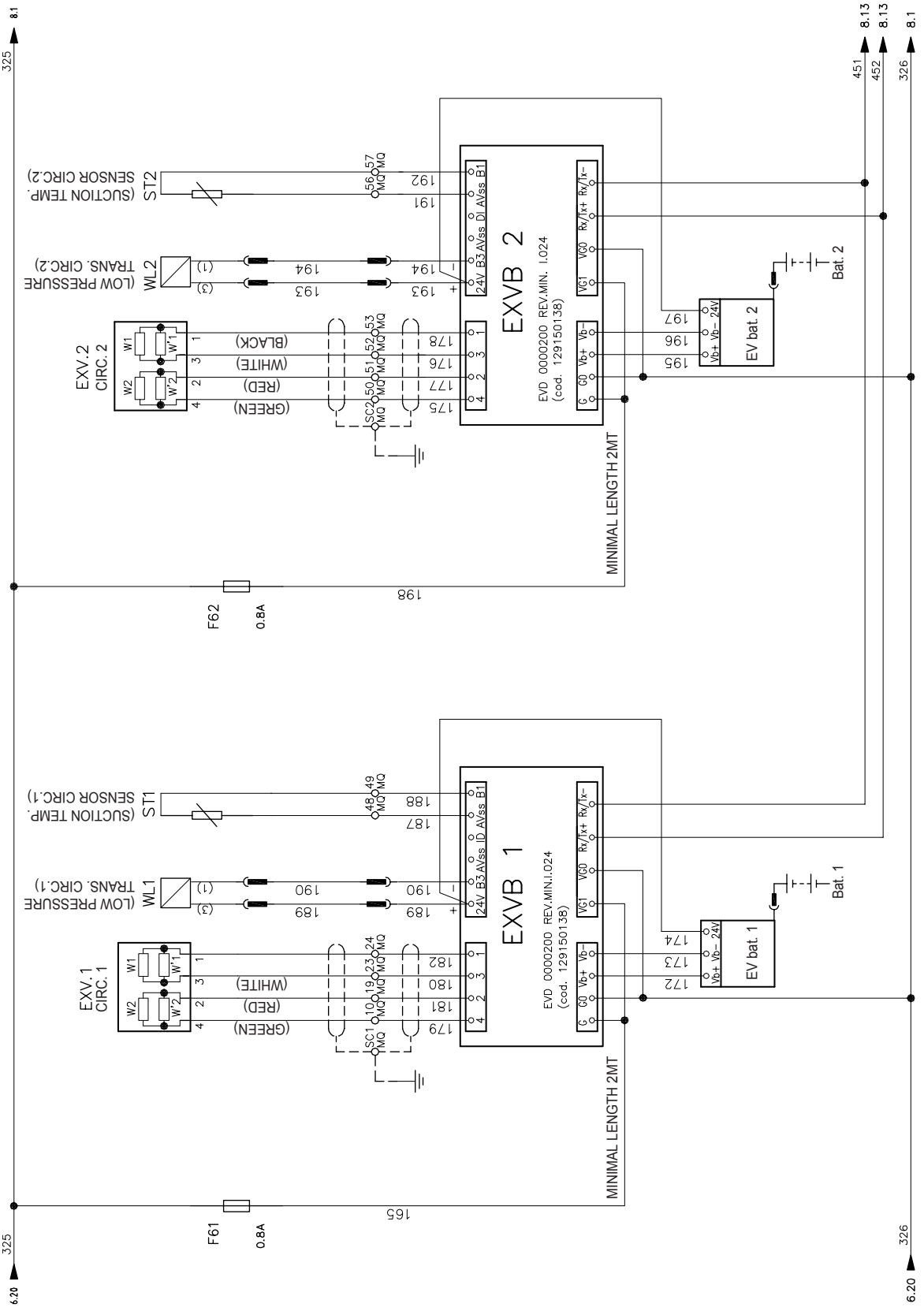
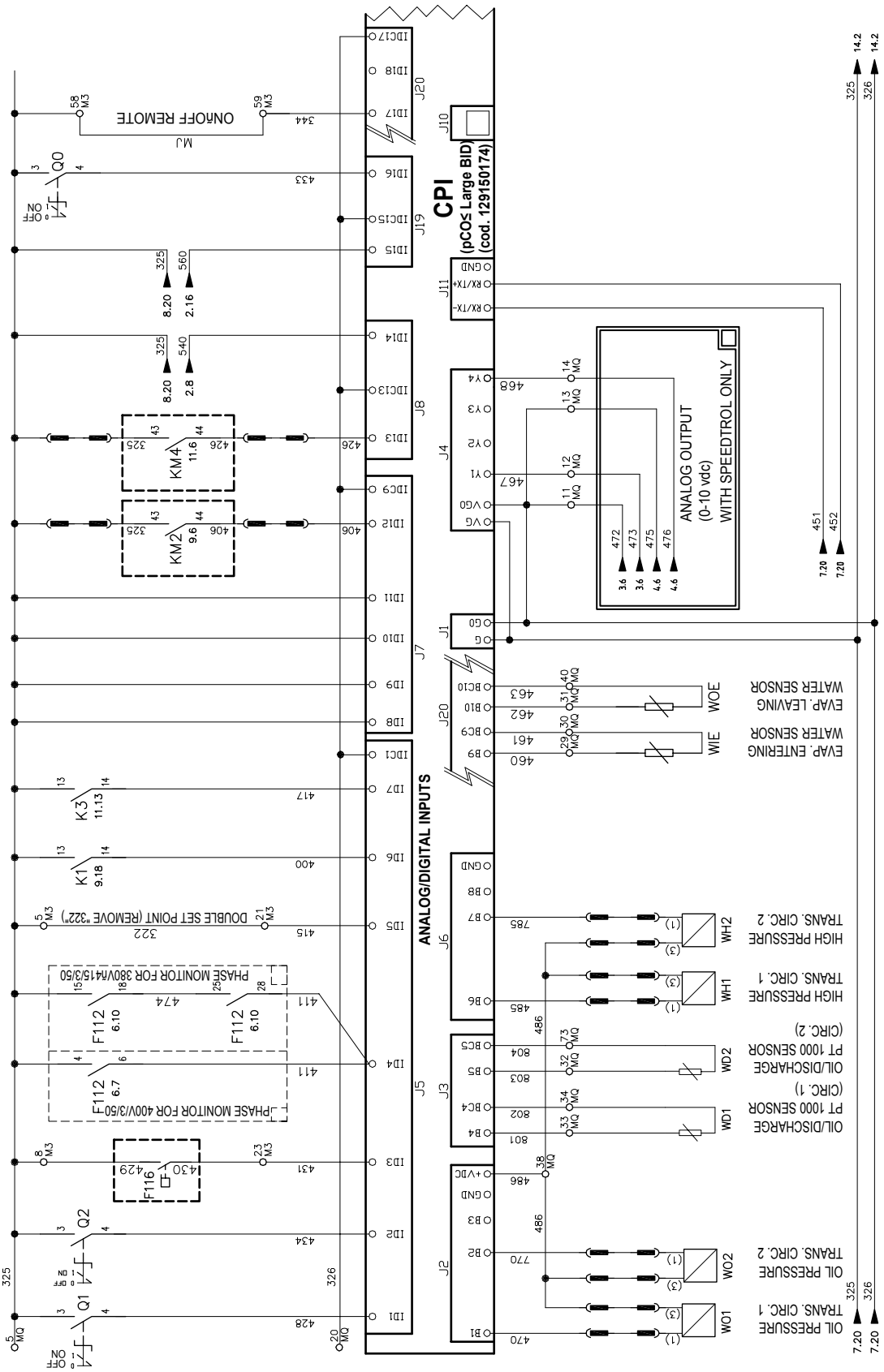
3.2.6 Electronic Expansion Valve Board 1/2



3.2.7 Analog-Digital Inputs Board 1/2



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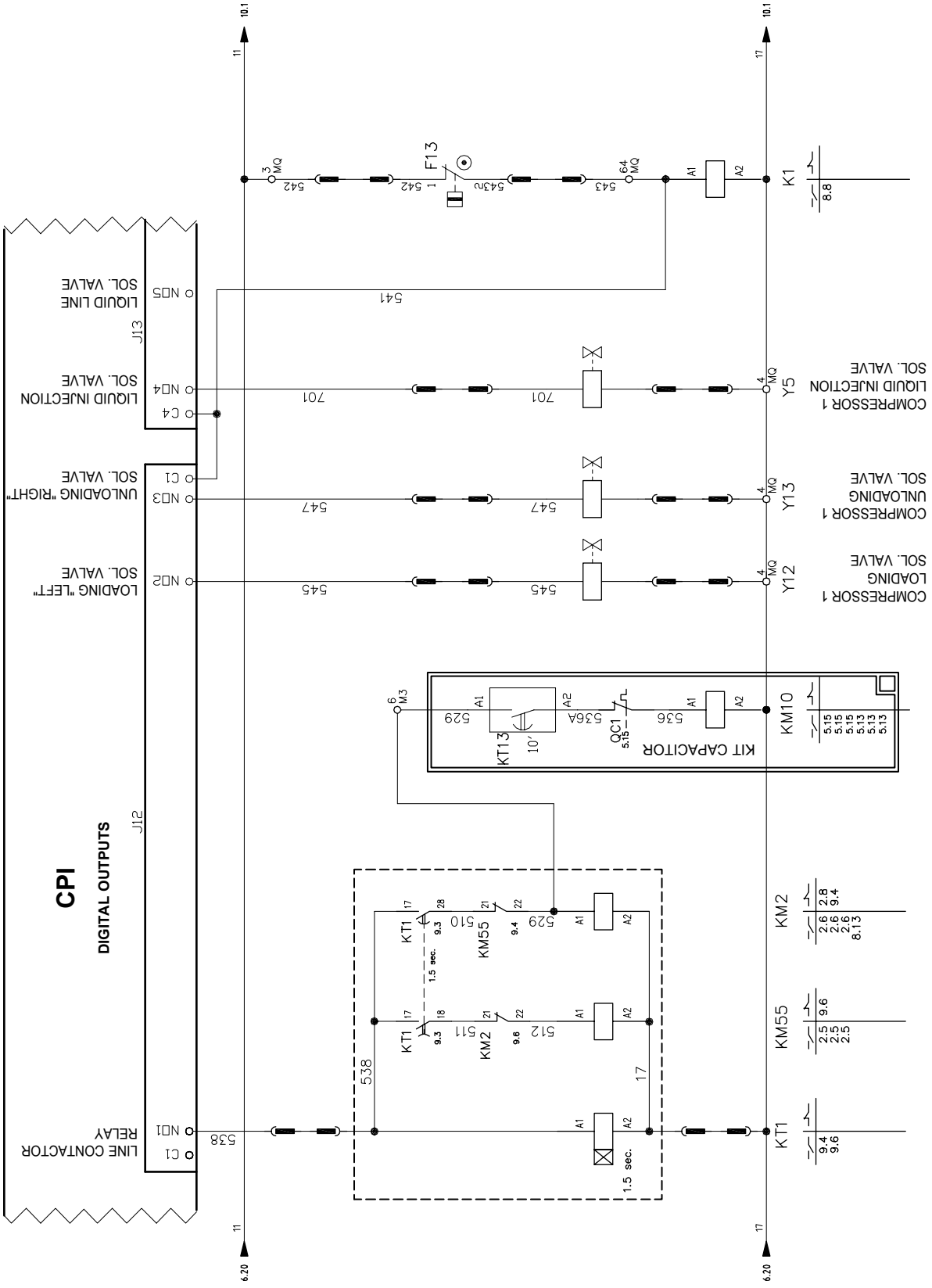
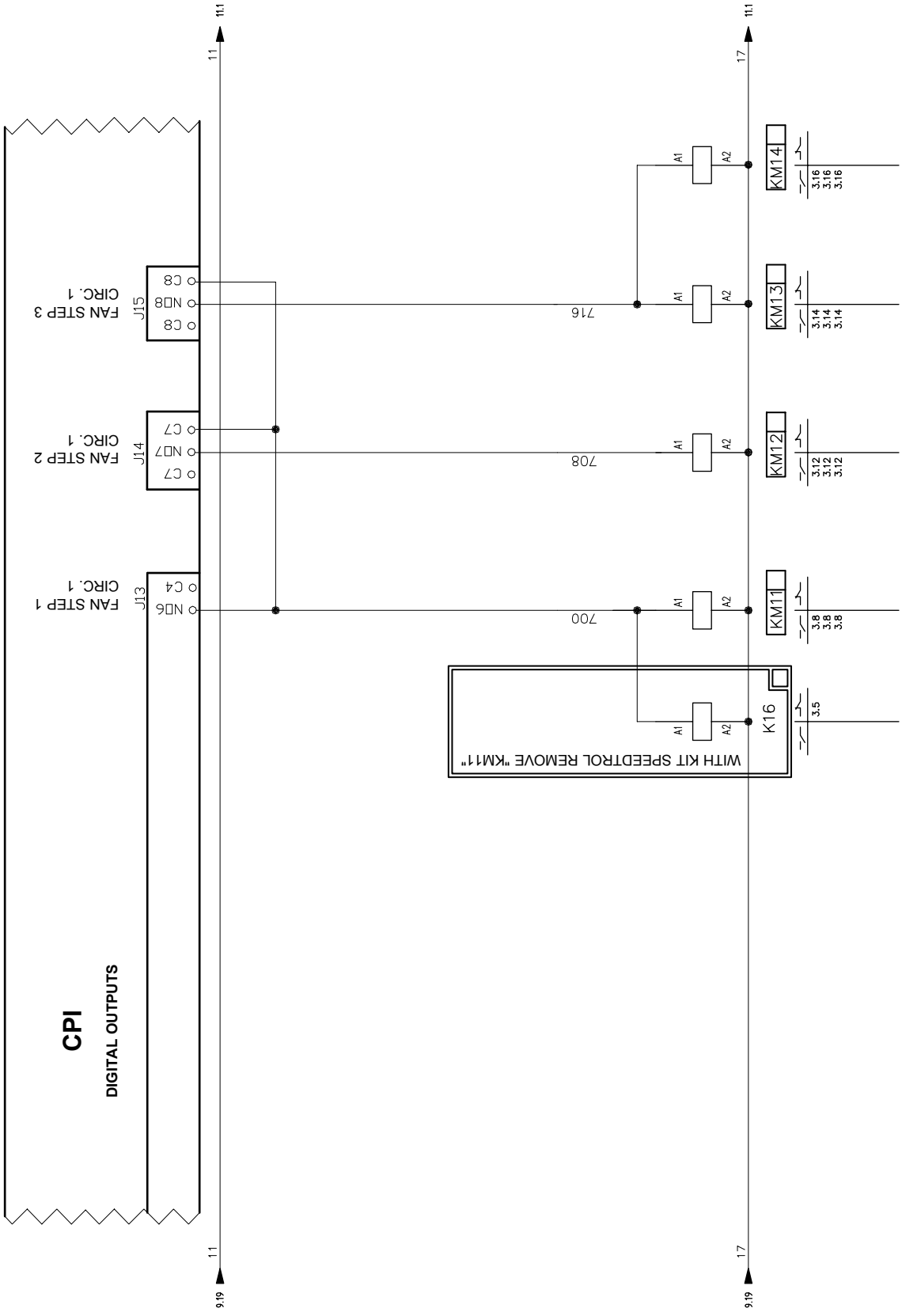
3.2.8 Compressor 1 Control



3.2.9 Fan Control Circuits 1



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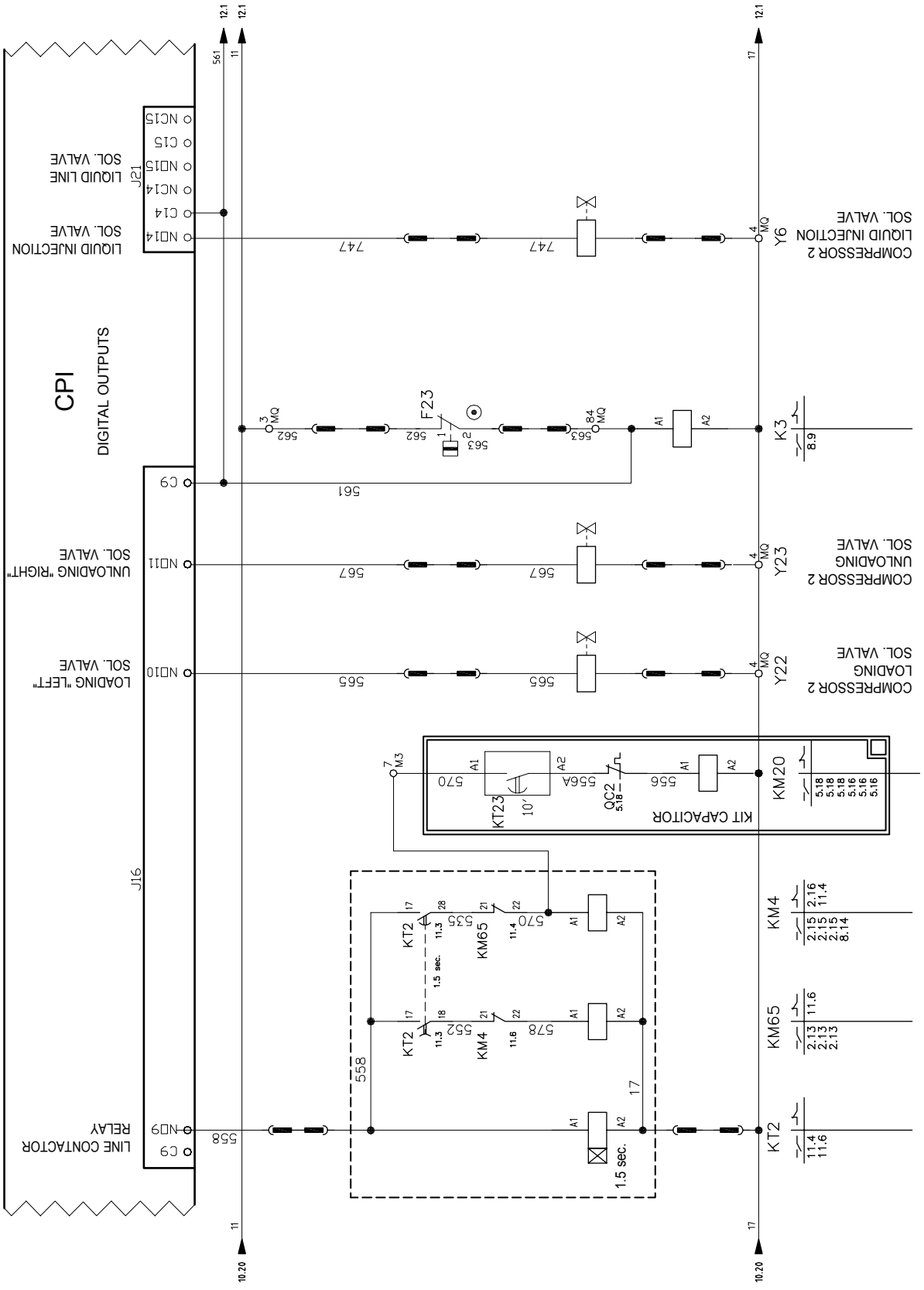
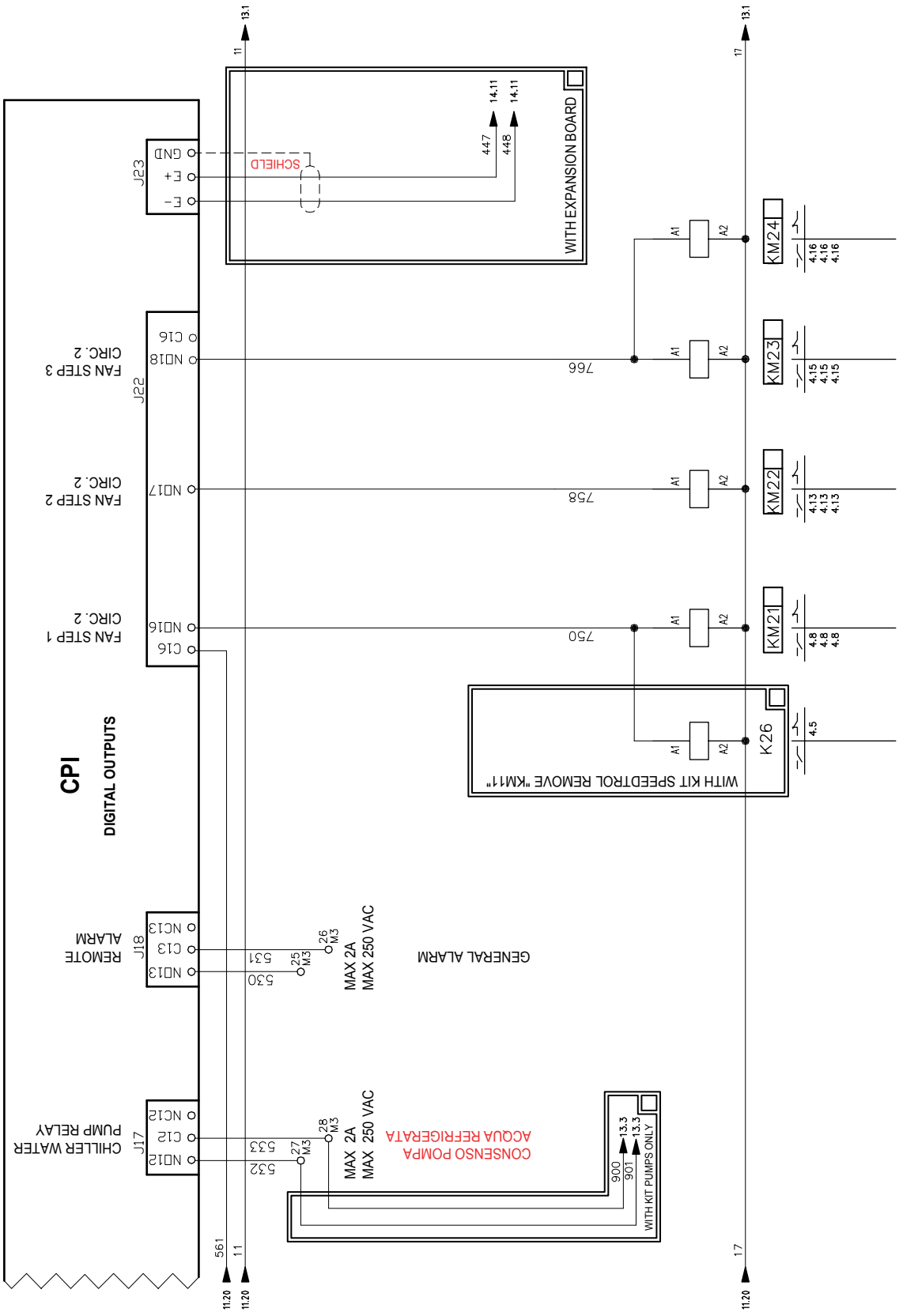
3.2.10 Compressor 2 Control Circuit



3.2.11 Fan Control Circuits 2



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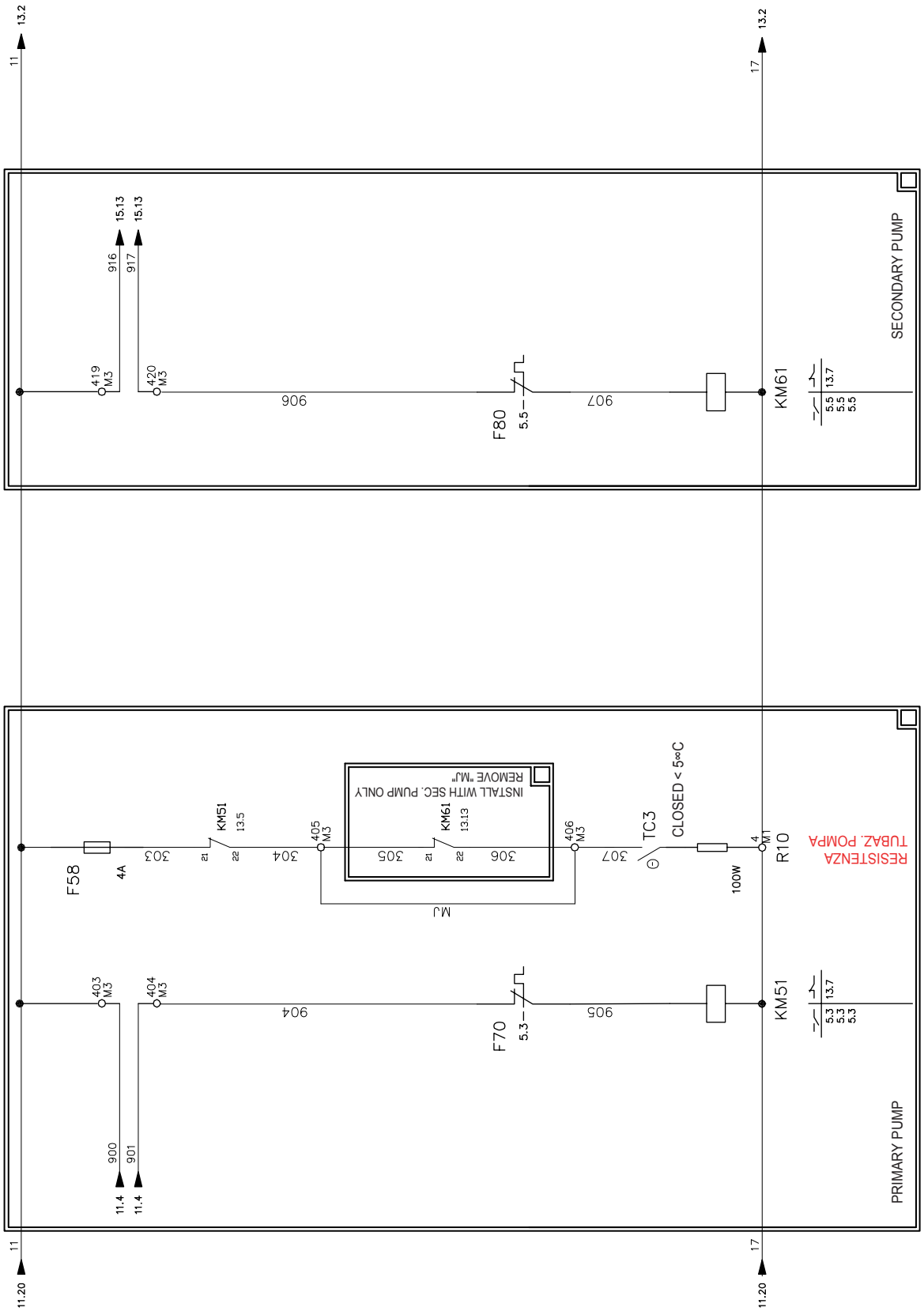
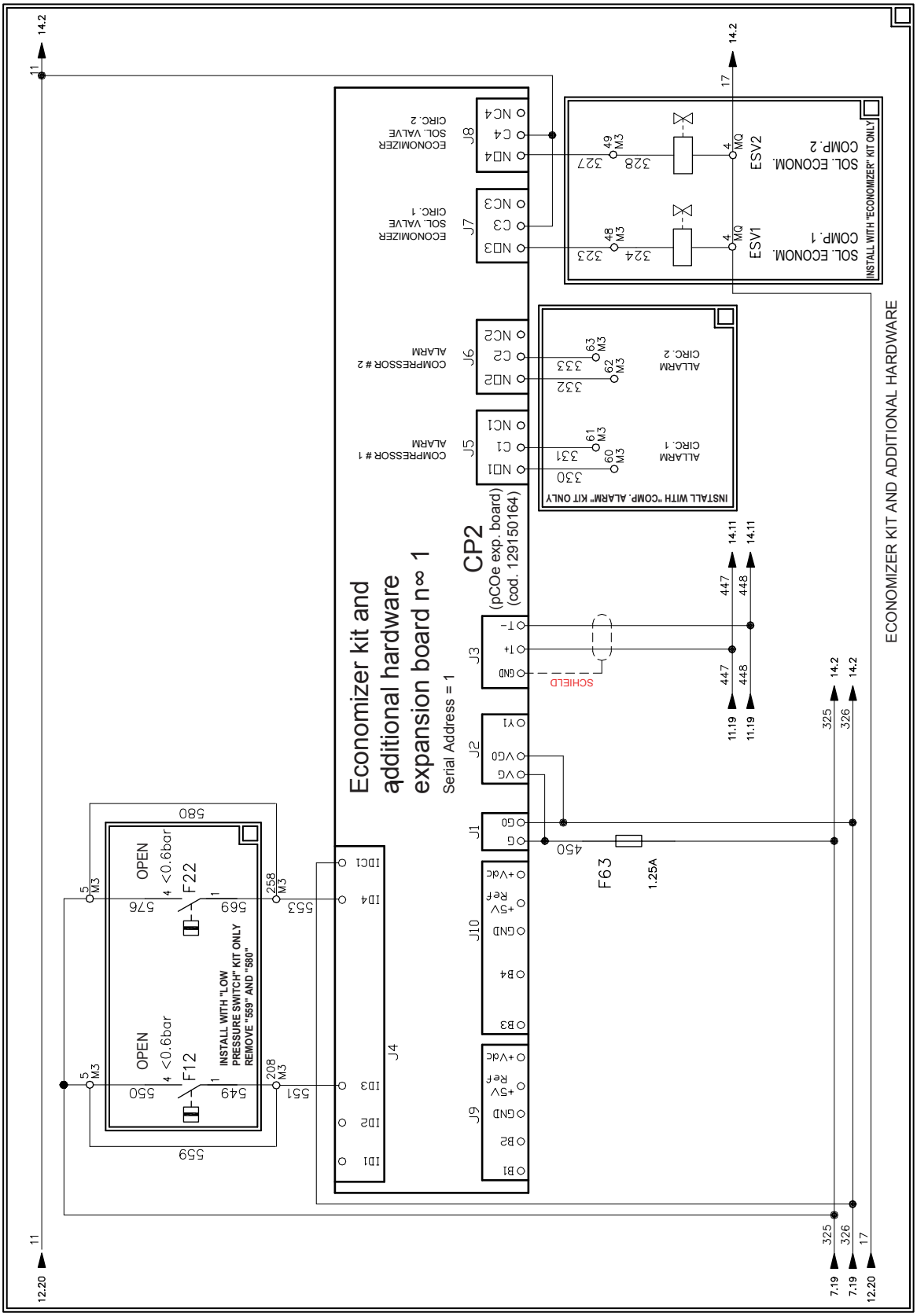
3.2.12 Pump Control



3.2.13 Economizer Expansion Board Kit



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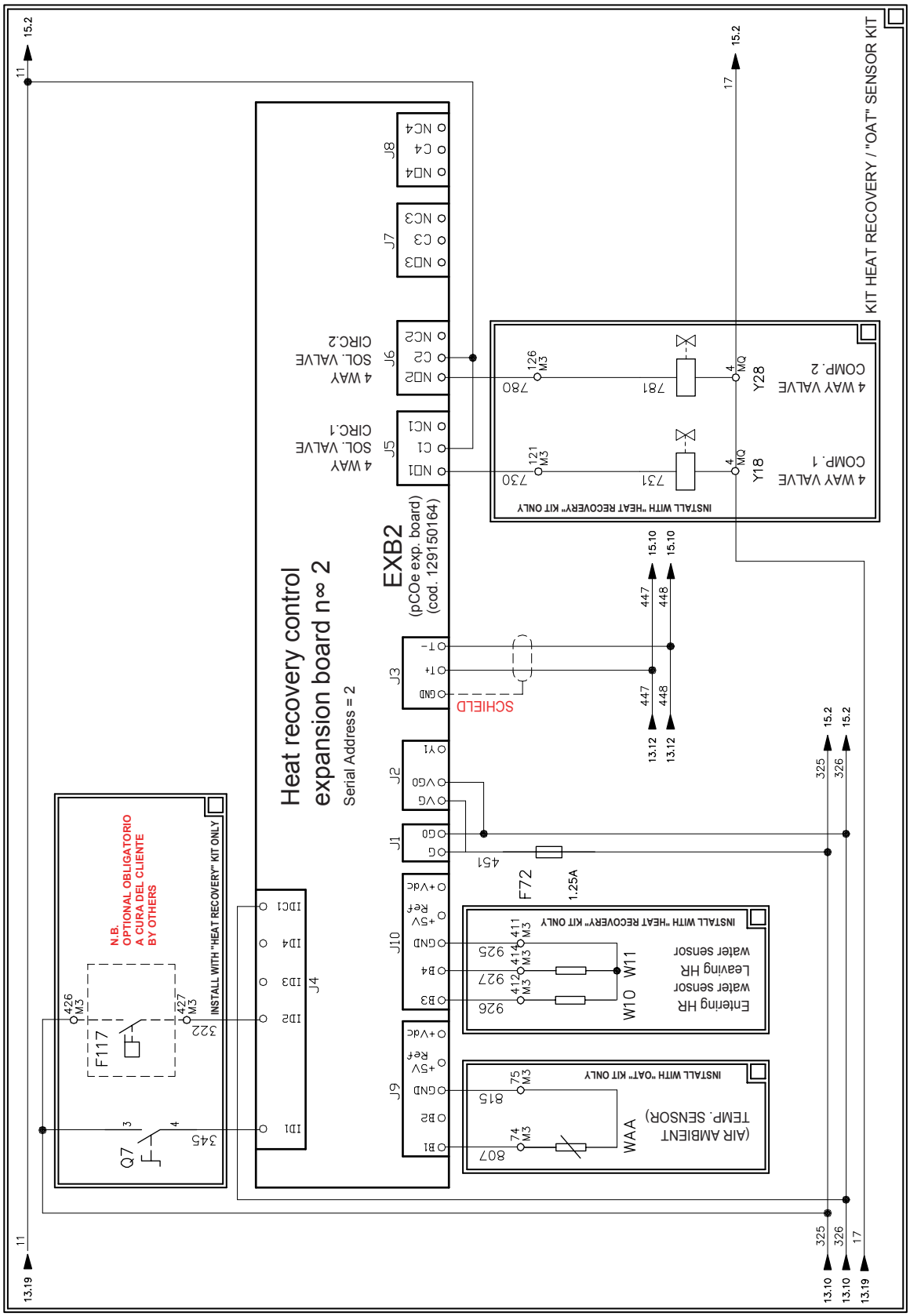
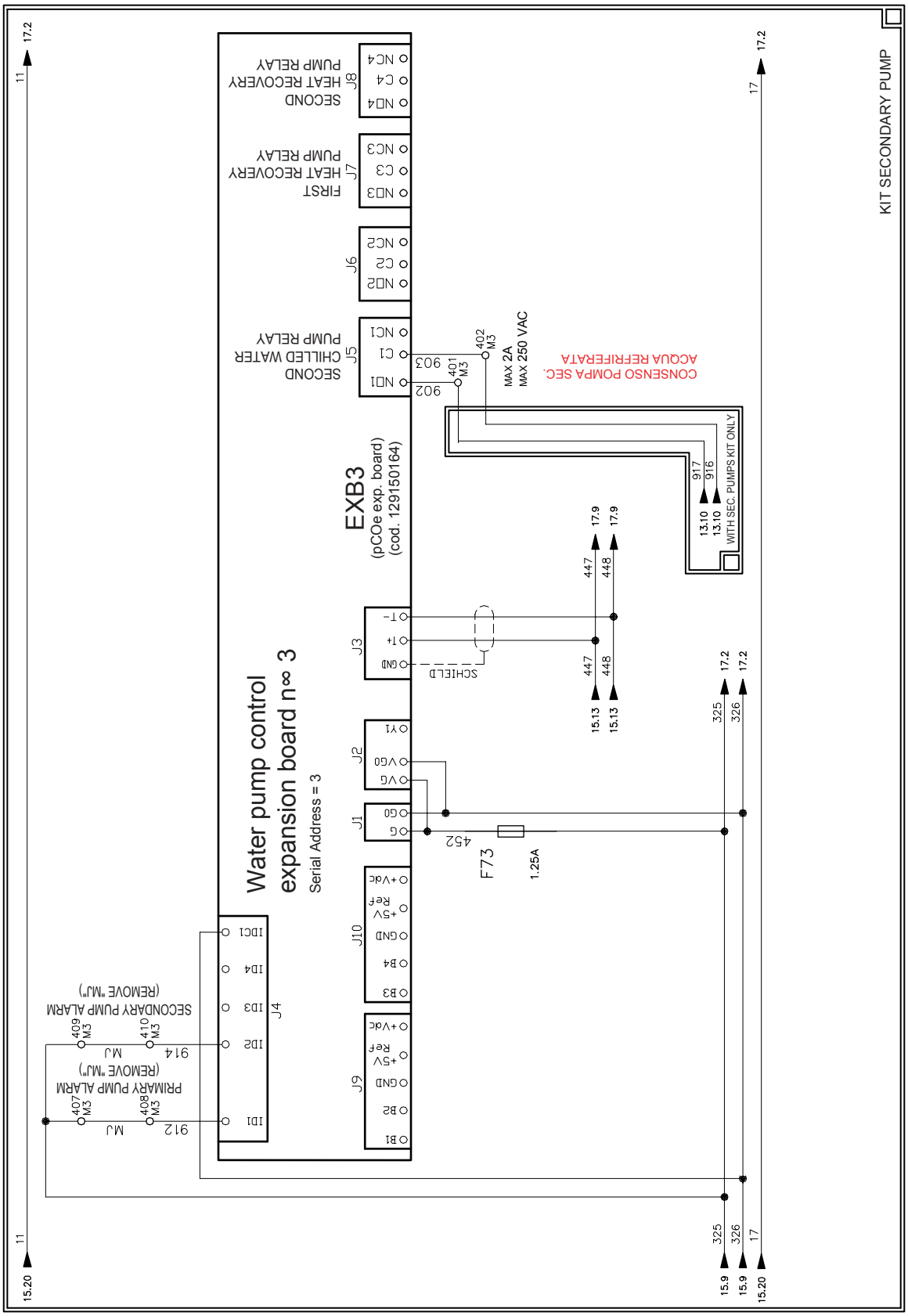
3.2.14 Heat Recovery Expansion Board Kit



3.2.15 Pump Control Expansion Board



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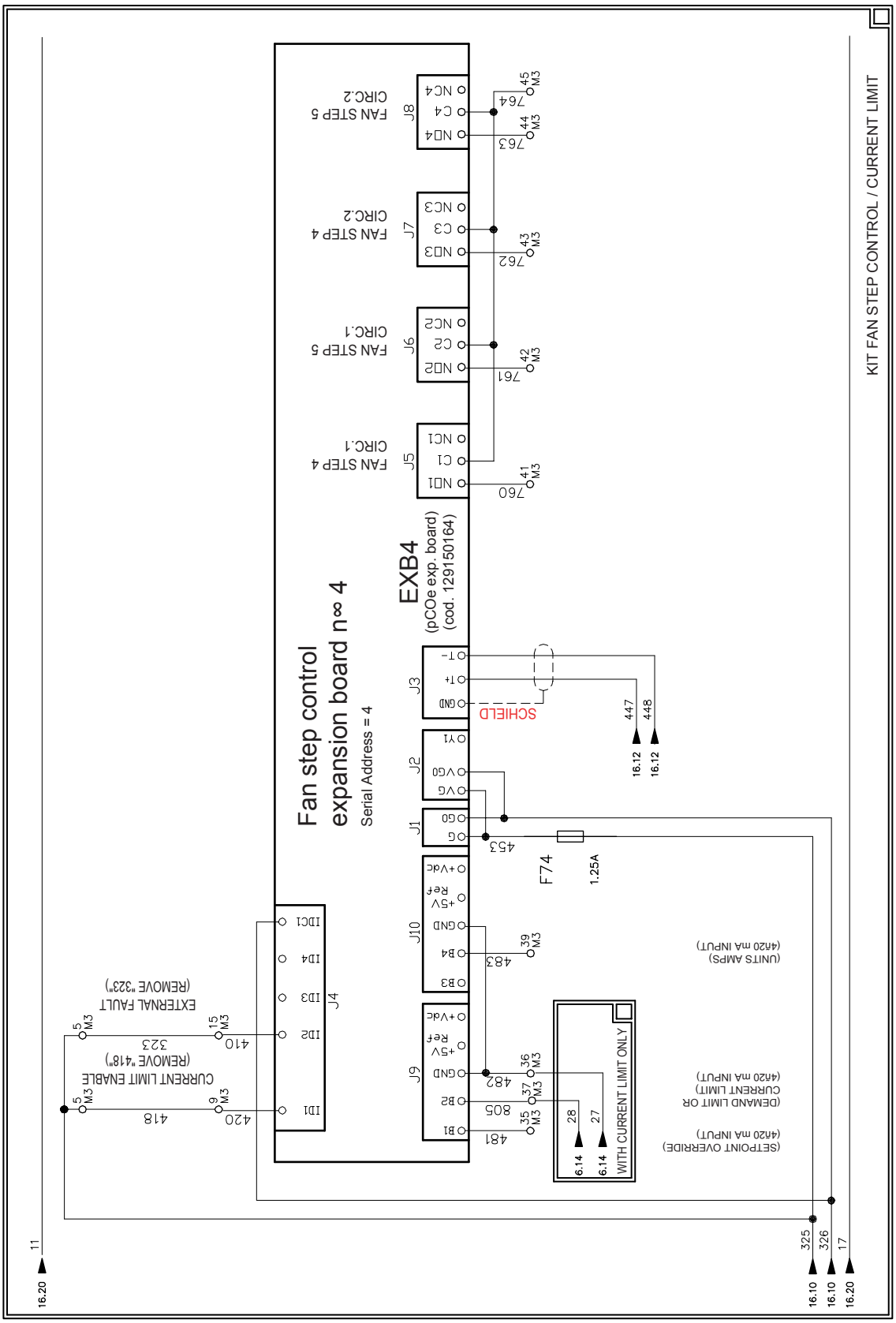
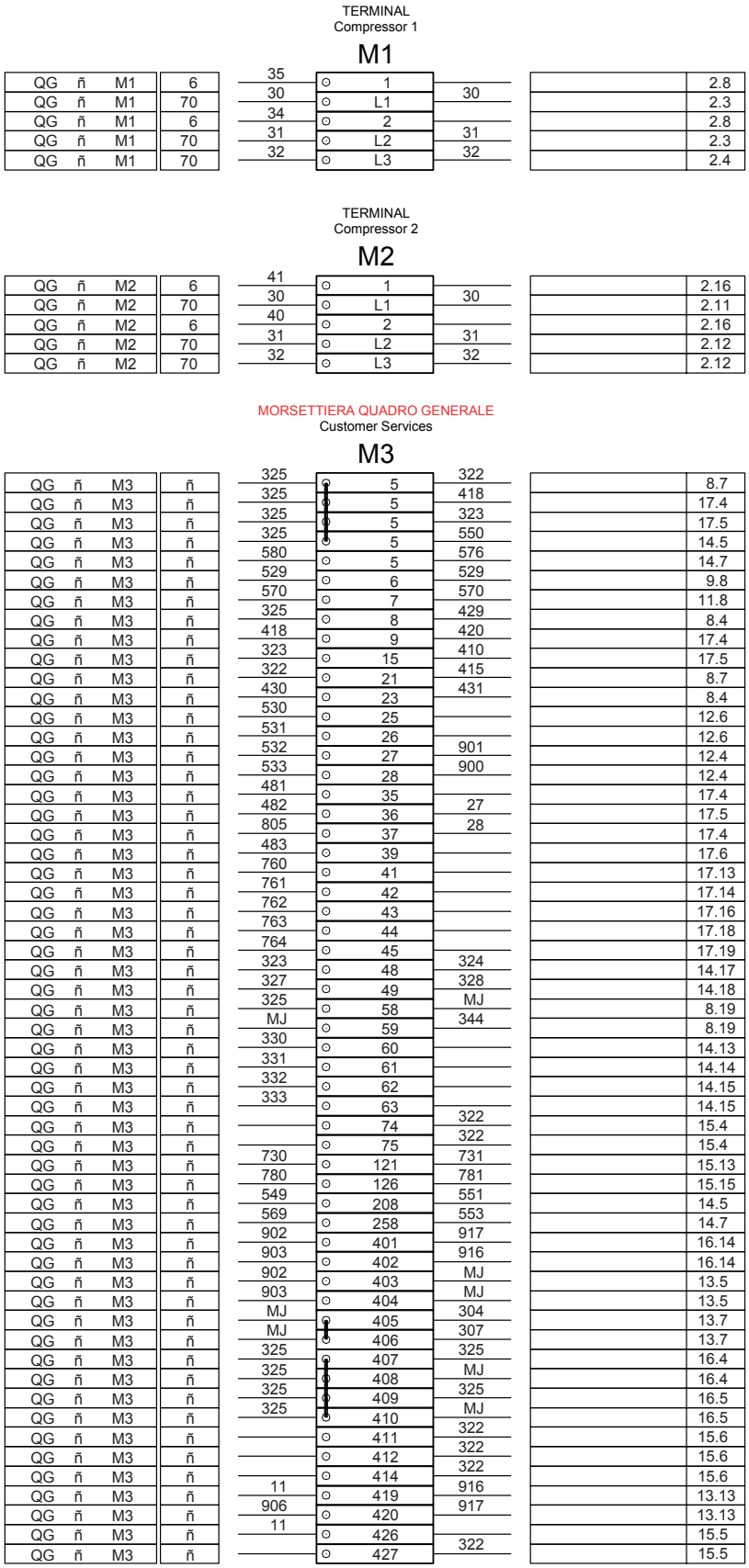
3.2.16 Fan Step Control Board



3.2.17 Terminals M1-M2-M3



1

3.2.18 Terminals MQ

MORSETTIERA QUADRO GENERALE
Compressor 1

MQ

QG	ñ	MQ	ñ	SC1	⊙	SC1	SC1		7.5
QG	ñ	MQ	ñ	SC2	⊙	SC2	SC2		7.15
QG	ñ	MQ	ñ	11	⊙	3	542		9.18
QG	ñ	MQ	ñ	325	⊙	3	562		11.13
QG	ñ	MQ	ñ	11	⊙	3	11		6.17
QG	ñ	MQ	ñ	17	⊙	4	17		9.13
QG	ñ	MQ	ñ	17	⊙	4	17		9.11
QG	ñ	MQ	ñ	17	⊙	4	17		9.10
QG	ñ	MQ	ñ	17	⊙	4	17		11.10
QG	ñ	MQ	ñ	17	⊙	4	17		11.11
QG	ñ	MQ	ñ	17	⊙	4	17		11.16
QG	ñ	MQ	ñ	17	⊙	4	17		6.18
QG	ñ	MQ	ñ	17	⊙	4	17		6.17
QG	ñ	MQ	ñ	17	⊙	4	17		14.17
QG	ñ	MQ	ñ	17	⊙	4	17		14.18
QG	ñ	MQ	ñ	17	⊙	4	17		15.14
QG	ñ	MQ	ñ	17	⊙	4	17		15.15
QG	ñ	MQ	ñ	325	⊙	5	325		8.1
QG	ñ	MQ	ñ	300	⊙	5	325		6.3
QG	ñ	MQ	ñ	359	⊙	5			6.14
QG	ñ	MQ	ñ	179	⊙	10	179		7.5
QG	ñ	MQ	ñ	326	⊙	11	472		8.13
QG	ñ	MQ	ñ	467	⊙	12	473		8.14
QG	ñ	MQ	ñ	326	⊙	13	475		8.14
QG	ñ	MQ	ñ	468	⊙	14	476		8.15
QG	ñ	MQ	ñ	181	⊙	19	181		7.6
QG	ñ	MQ	ñ	326	⊙	20	326		8.1
QG	ñ	MQ	ñ	360	⊙	20			6.14
QG	ñ	MQ	ñ	321	⊙	20	326		6.4
QG	ñ	MQ	ñ	180	⊙	23	180		7.6
QG	ñ	MQ	ñ	182	⊙	24	182		7.6
QG	ñ	MQ	ñ	460	⊙	29	460		8.10
QG	ñ	MQ	ñ	801	⊙	30	801		8.10
QG	ñ	MQ	ñ	462	⊙	31	462		8.10
QG	ñ	MQ	ñ	803	⊙	32	803		8.5
QG	ñ	MQ	ñ	801	⊙	33	801		8.4
QG	ñ	MQ	ñ	802	⊙	34	802		8.4
QG	ñ	MQ	ñ	486	⊙	38	486		8.3
QG	ñ	MQ	ñ	463	⊙	40	463		8.10
QG	ñ	MQ	ñ	308	⊙	47	309		6.18
QG	ñ	MQ	ñ	187	⊙	48	187		7.8
QG	ñ	MQ	ñ	188	⊙	49	188		7.8
QG	ñ	MQ	ñ	175	⊙	50	175		7.15
QG	ñ	MQ	ñ	177	⊙	51	177		7.15
QG	ñ	MQ	ñ	176	⊙	52	176		7.16
QG	ñ	MQ	ñ	178	⊙	53	178		7.16
QG	ñ	MQ	ñ	191	⊙	56	191		7.18
QG	ñ	MQ	ñ	192	⊙	57	192		7.18
QG	ñ	MQ	ñ	543	⊙	64	541		9.18
QG	ñ	MQ	ñ	804	⊙	73	804		8.5
QG	ñ	MQ	ñ	563	⊙	84	563		11.13

3.2.19 Legend

Item	Description
CP1	Analog digital inputs board
EXVB.1-2	Electronic expansion valve board
EXV.1-2	Electronic expansion valve
EXVb.1-2	Electronic expansion battery valve
F1-2	Compressor fuses
F13-23	High pressure switch
F51-52	Compressor thermal relays
F59	Evaporator heater fuse
F60/62	Protection auxiliary circuit fuse
F100/200	Fan fuse
F112	Phase volt monitor
F116	Evaporator flow switch (not installed)
F120	Transformer T1 protection
F130	Phase voltage monitor protection
KM2-4-55-65	Compressor contactors
KM11/15 21/25	Fan contactors
K1-3-16-26	Auxiliary relay
K12	ON-OFF remote unit auxiliary relay
KT13-23	Time delay relay
M1/2	Compressor motor
M11/17 21/27	Fan motor
MP1-2	Motor thermal protection
Q0	ON-OFF unit switch
Q1-2	ON-OFF compressor switch
Q10	Main switch
Q11	Emergency stop
Q12	Automatic circuit breaker
R1-2	Compressor crankase heater
R5	Evaporator heater
T1	230/24V transformer
Y5-6	Liquid injection solenoid valve
Y12/23	Unloader solenoid valve
WH1-2	High pressure transducer (0/30 Bar)
WIE	Entering evaporator water sensor
WD1-2	Discharge sensor
WL1-2	Low pressure transducer (-0.5/7 Bar)
WOE	Leaving evaporator water sensor
WO1-2	Oil pressure transducer (0/30 Bar)
W1-2	Compressor termistors
LCD	Key pad switch and display

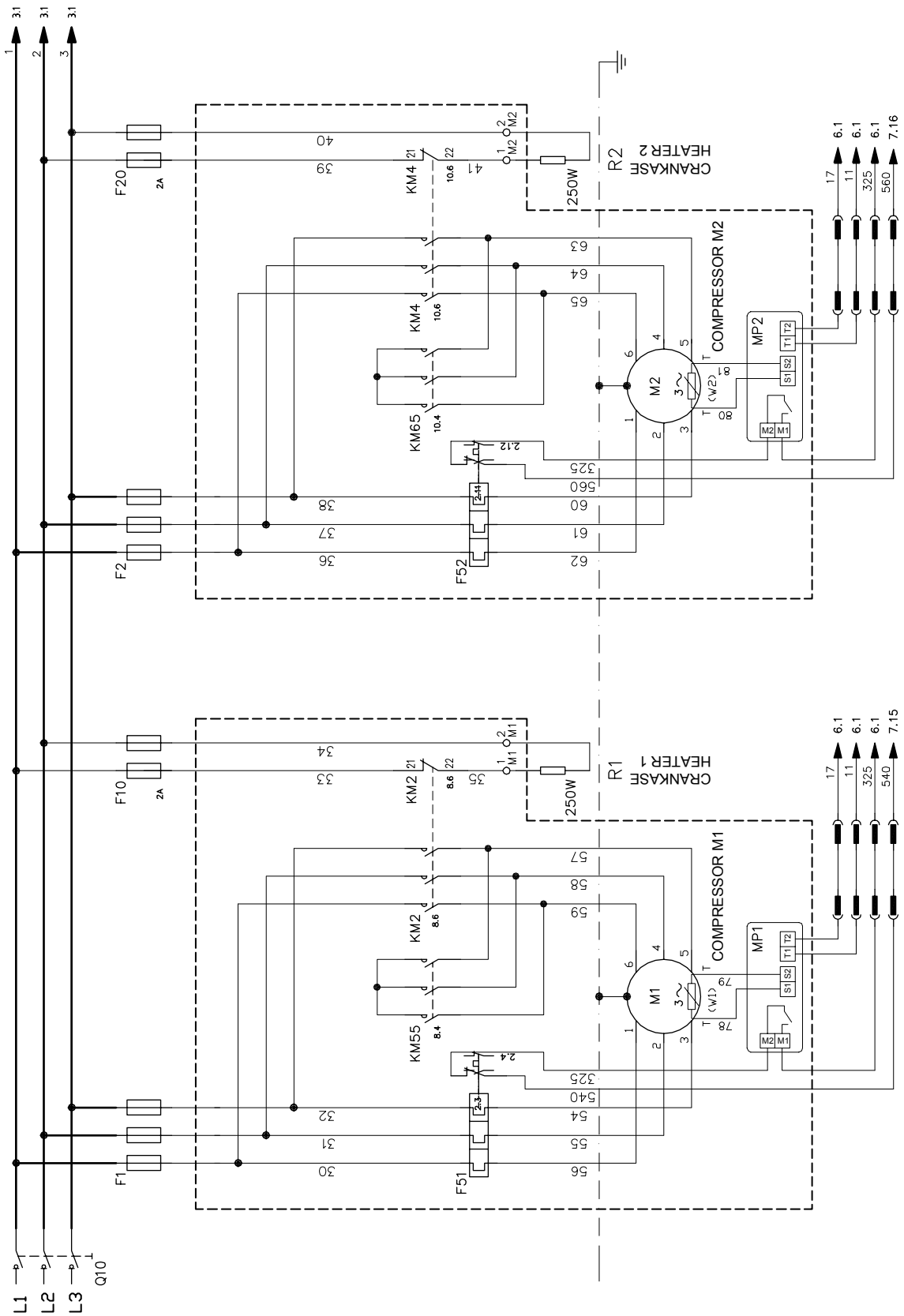
1

3.3 Wiring Diagram - Standard Version with Thermostatic Expansion Valve

Overview

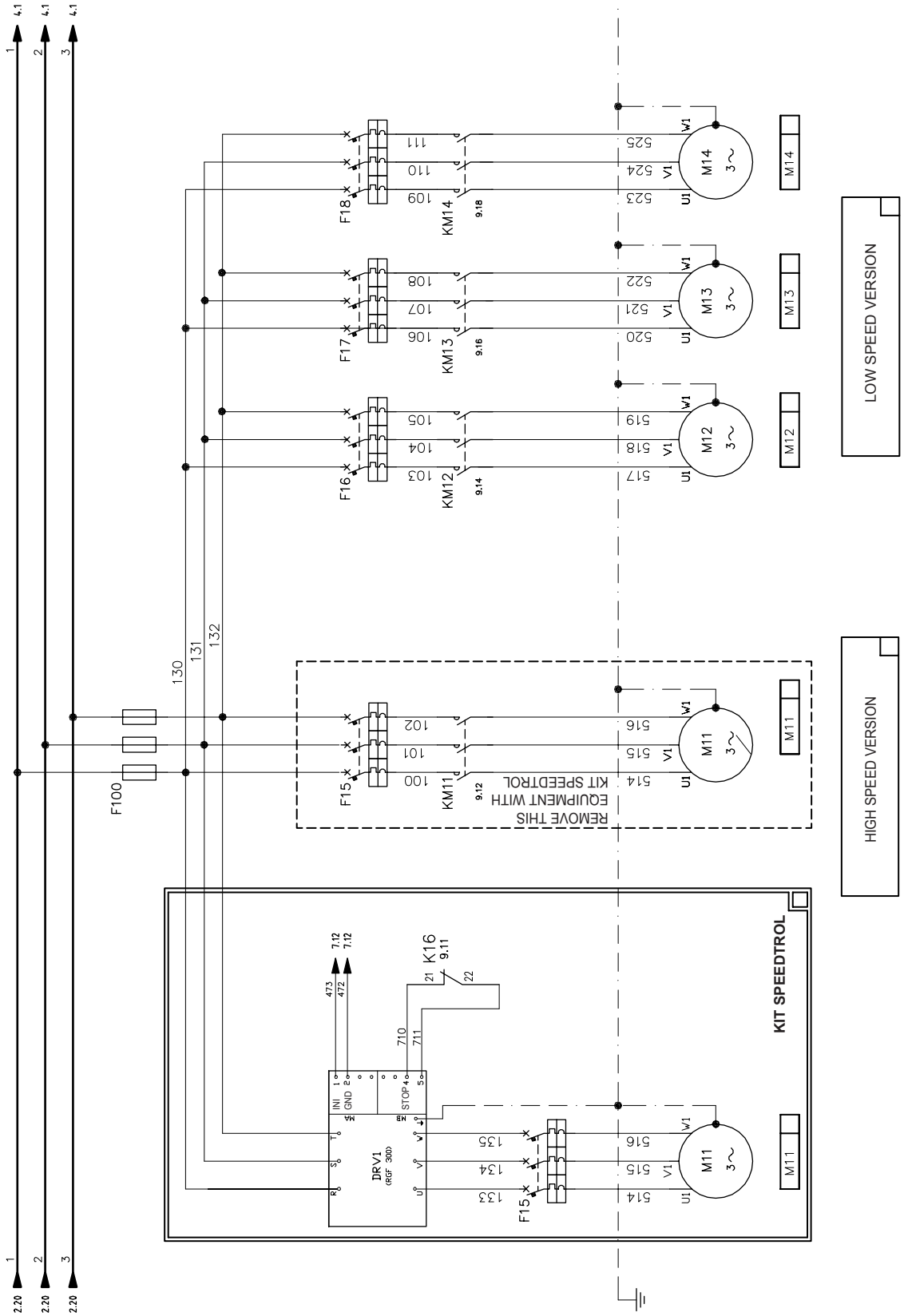
This chapter contains the following topics:

3.3.1 Compressor 1-2 Power Supply



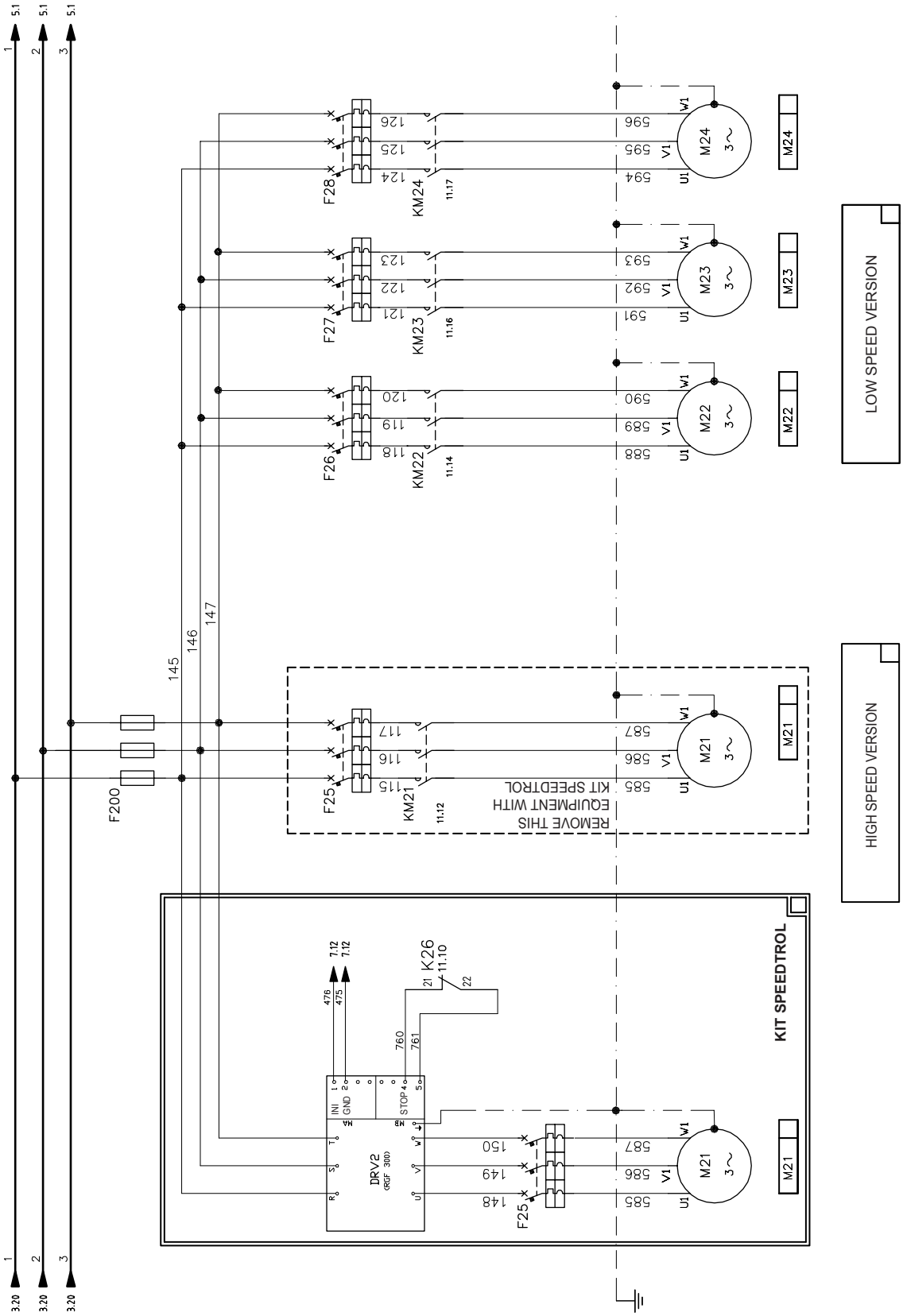
1

3.3.2 Circuits 1 Fan Power Supply



For more details on kit speedtrol, see page 1–134.

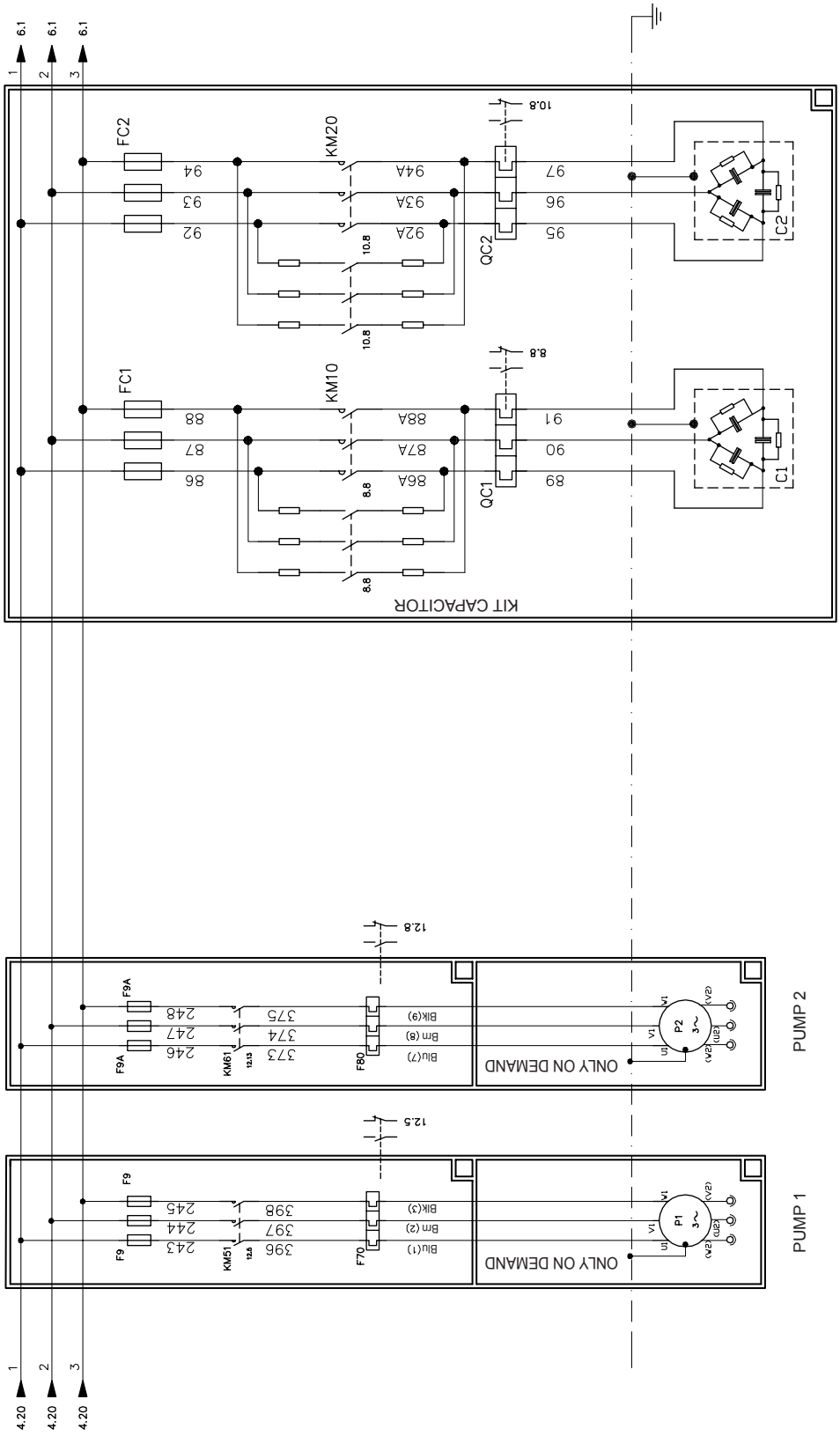
3.3.3 Circuits 2 Fan Power Supply



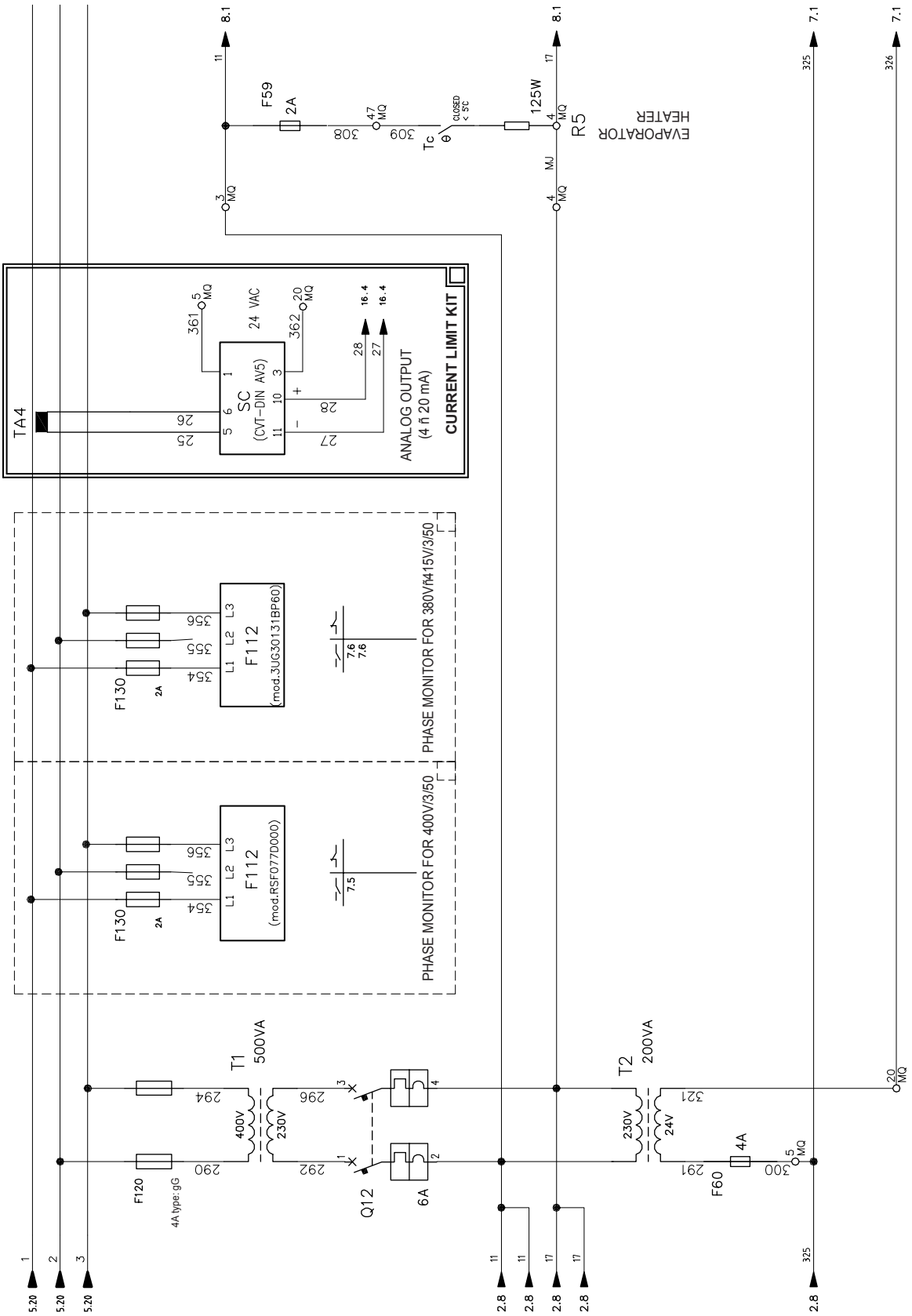
For more details on kit speedtrol, see page 1–134.

1

3.3.4 Kit Pumps



3.3.5 Unit Control Circuit Power Supply



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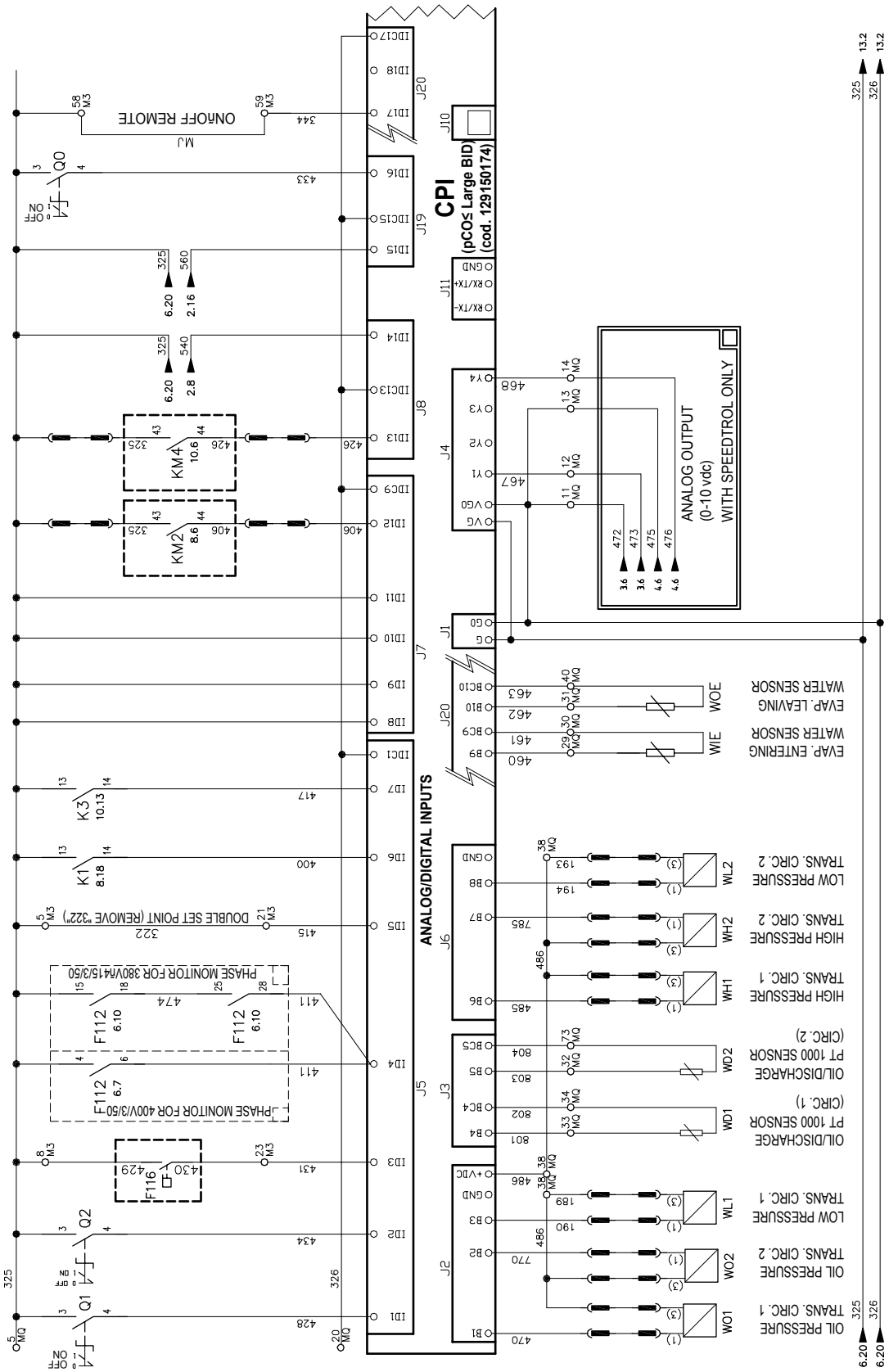
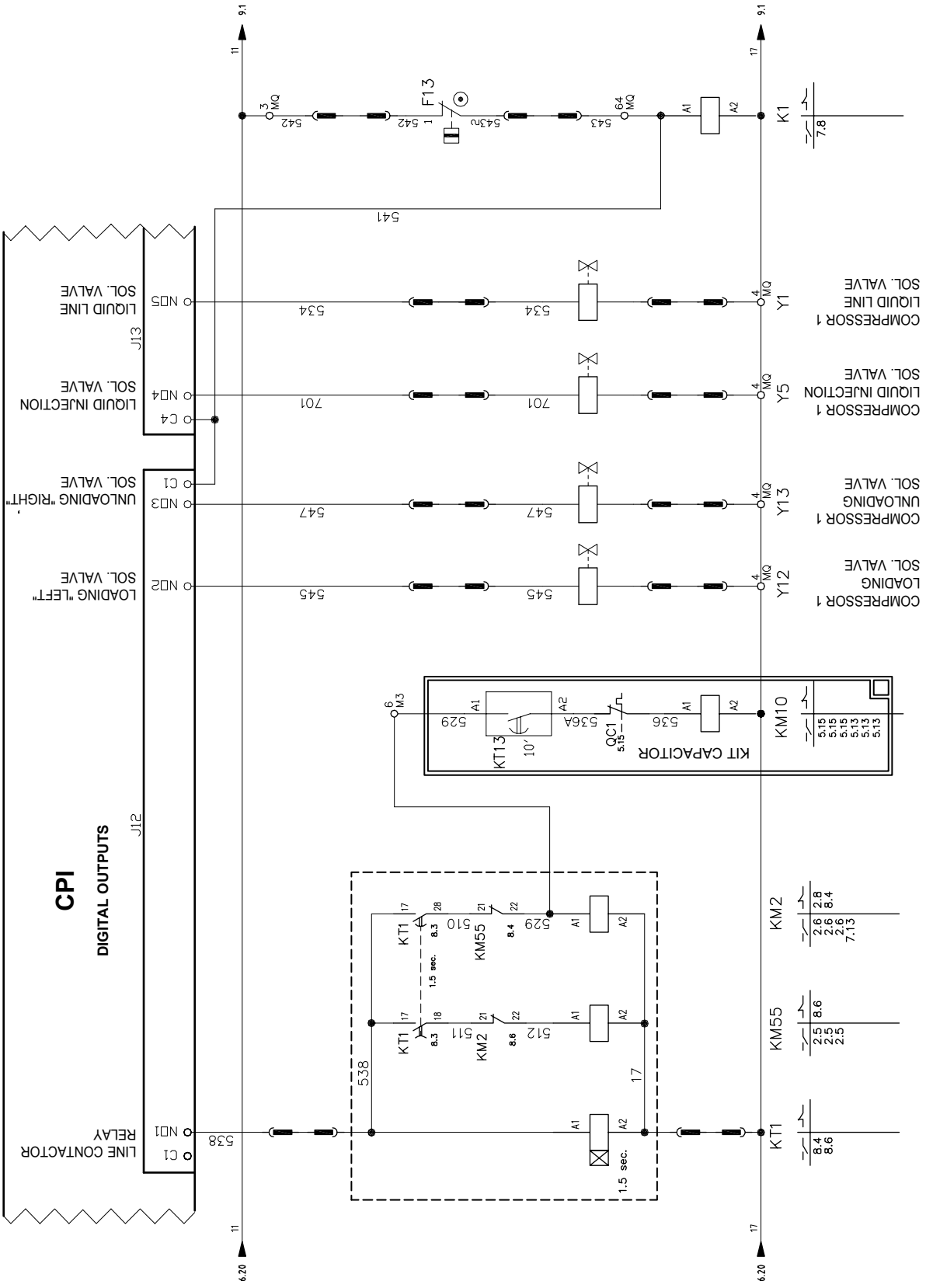
3.3.6 Analog-Digital Inputs Board 1/2



3.3.7 Compressor 1 Control



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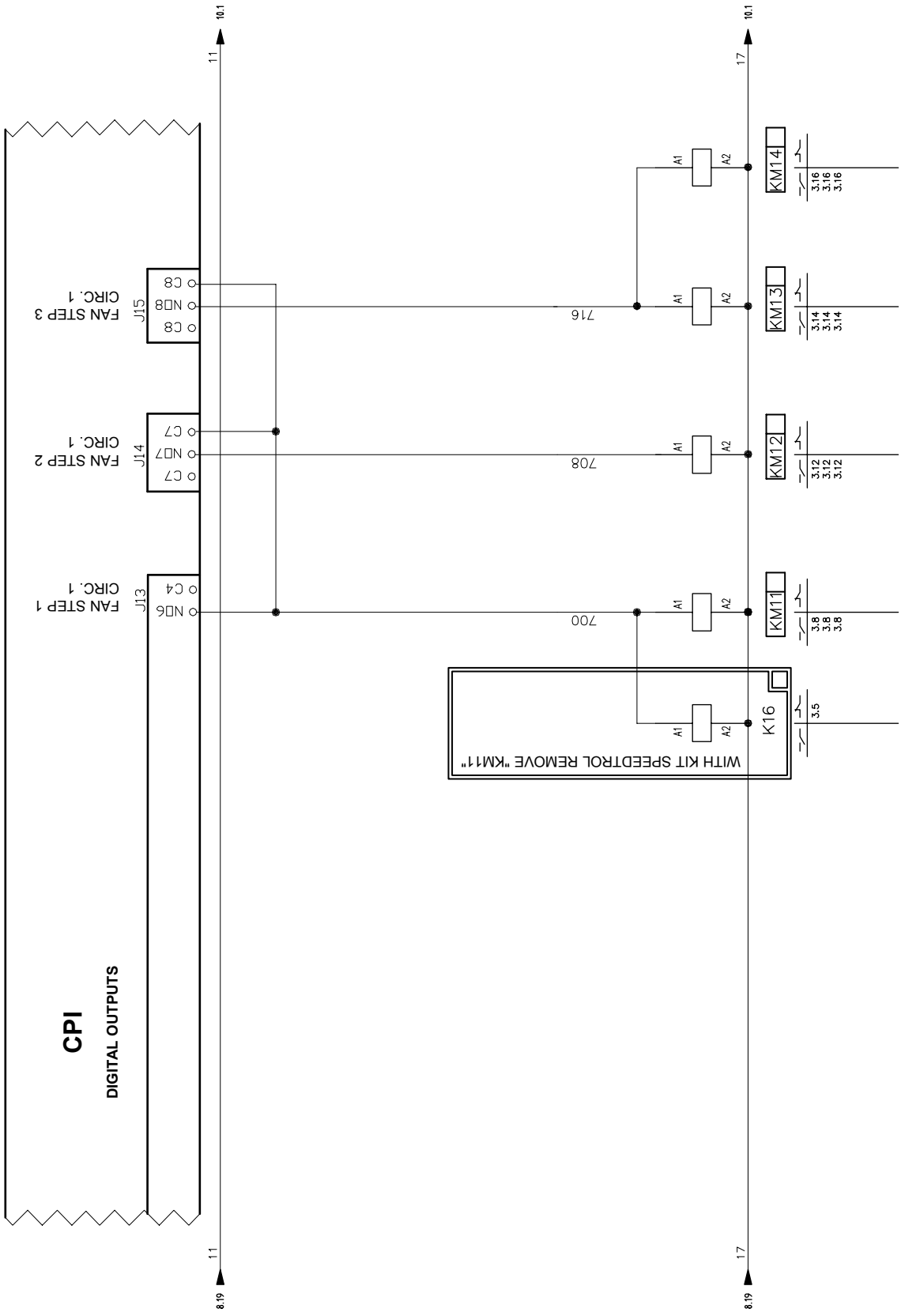
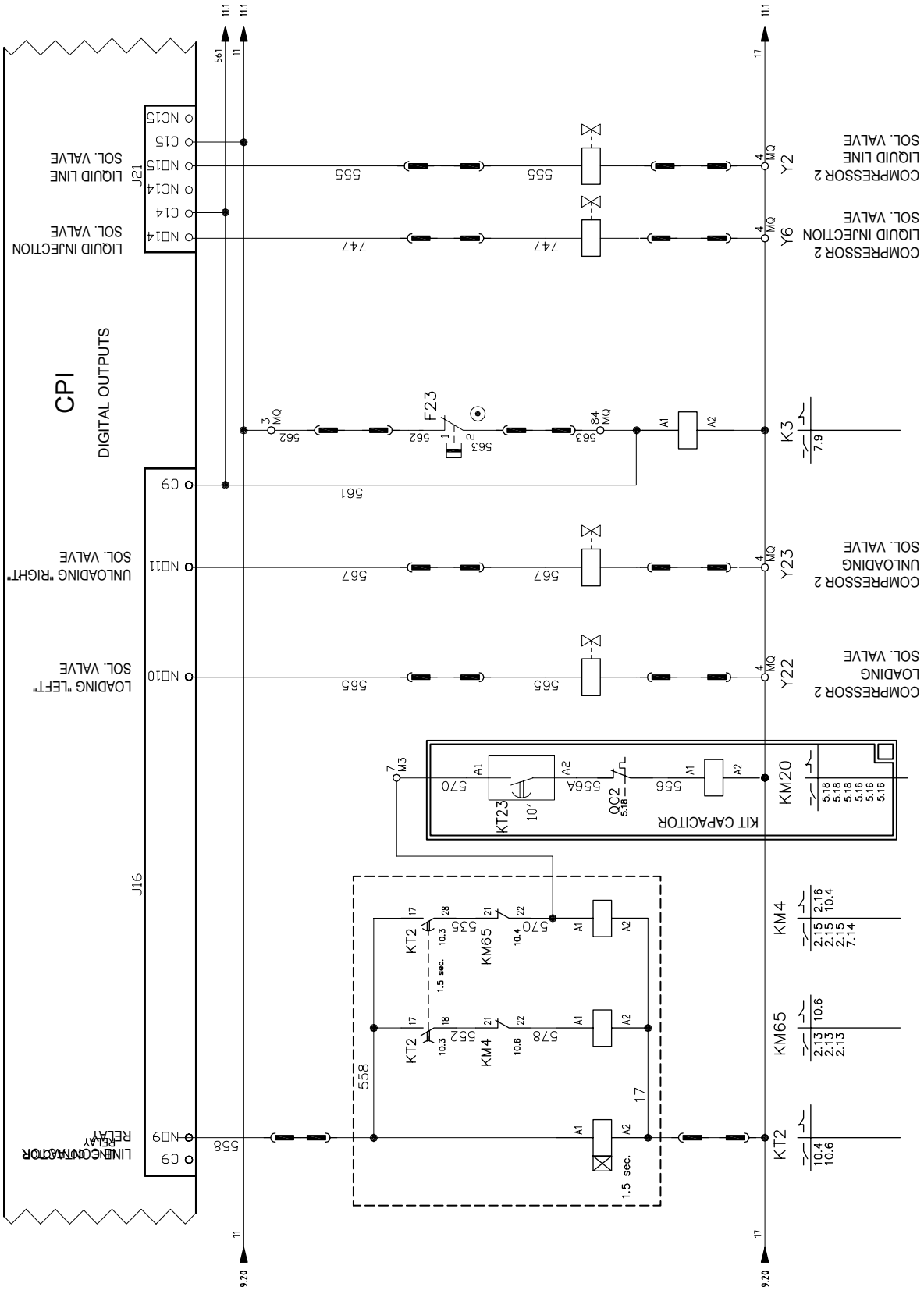
3.3.8 Fan Control Circuits 1



3.3.9 Compressor 2 Control Circuit



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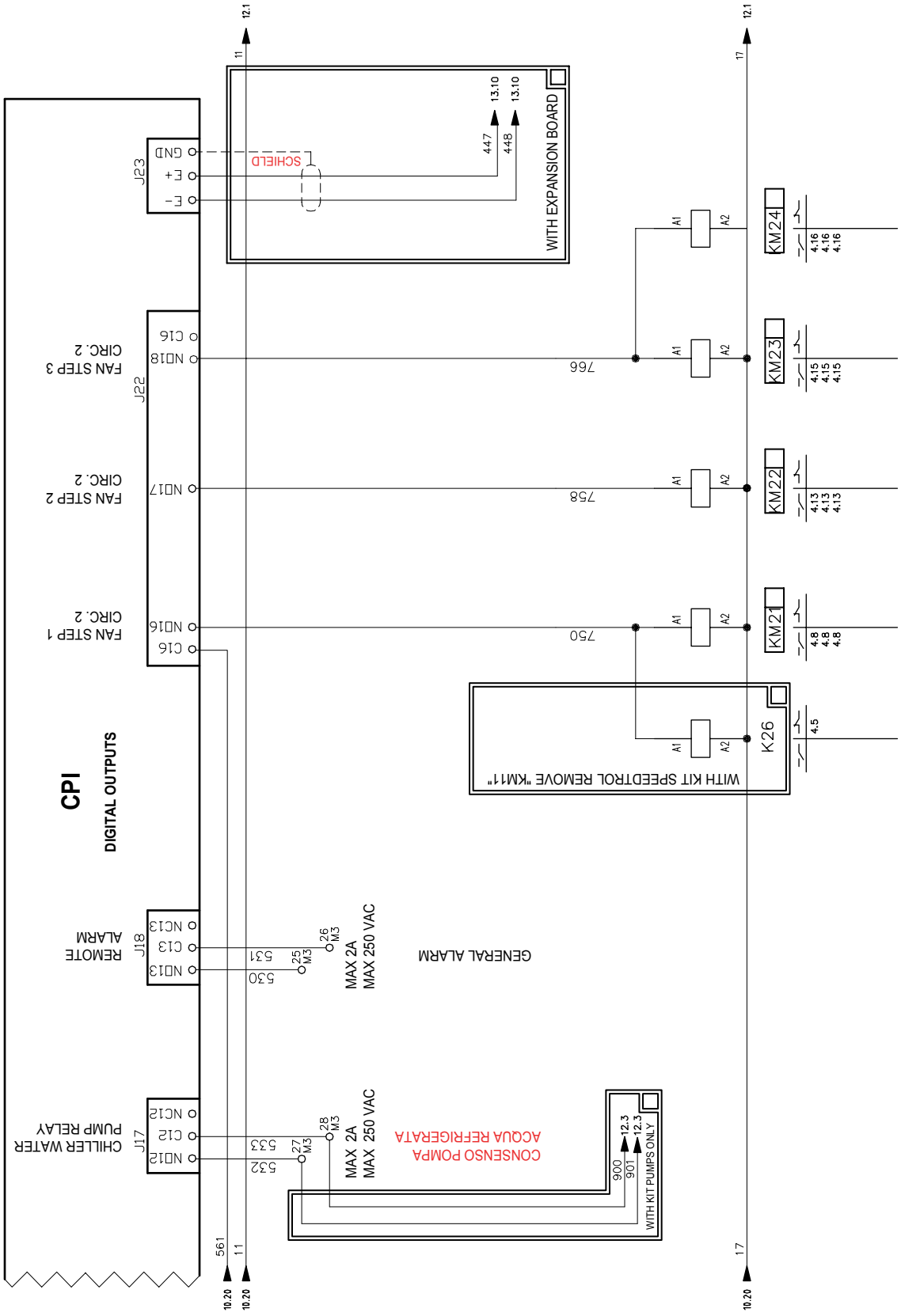
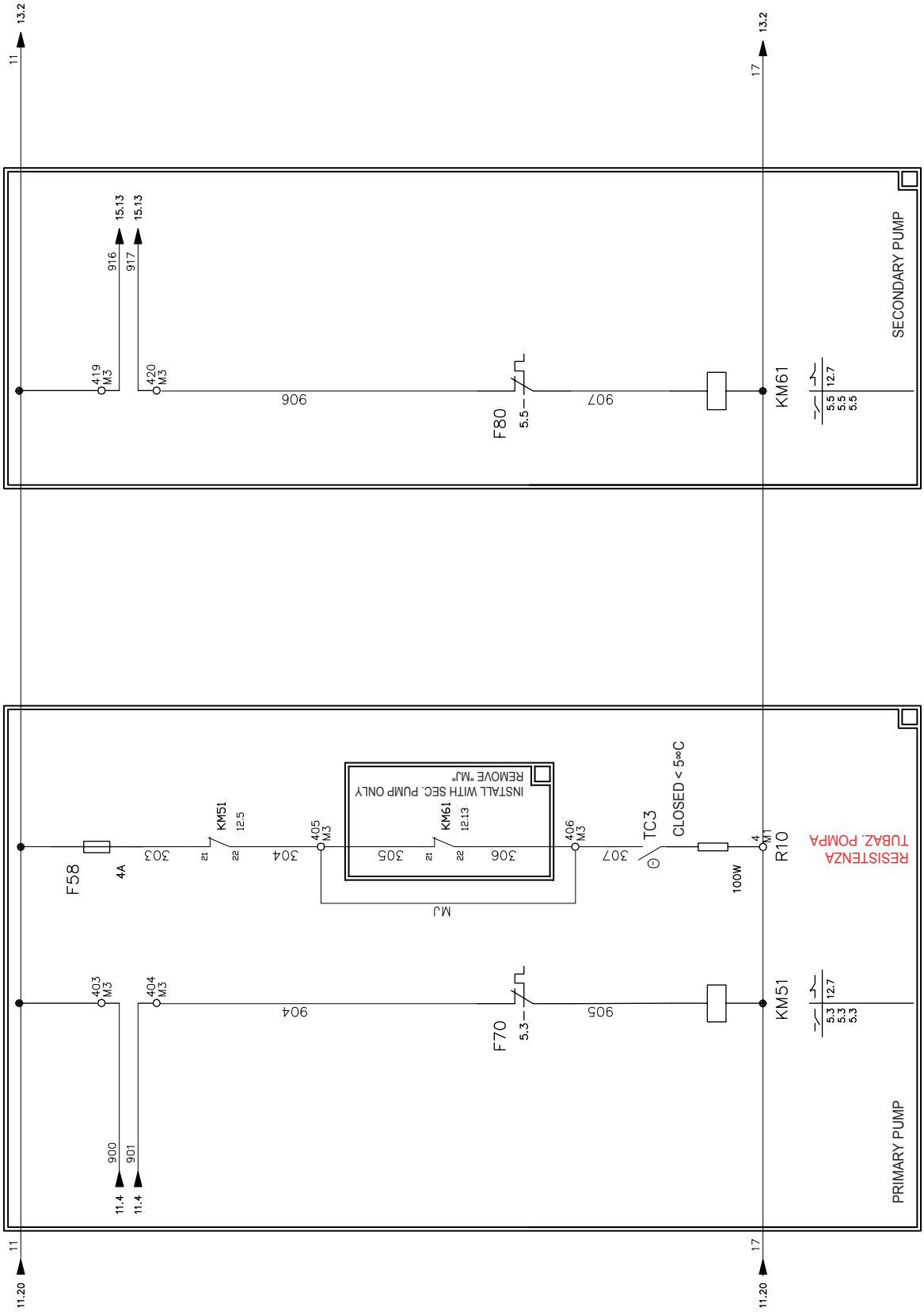
3.3.10 Fan Control Circuits 2



3.3.11 Pump Control



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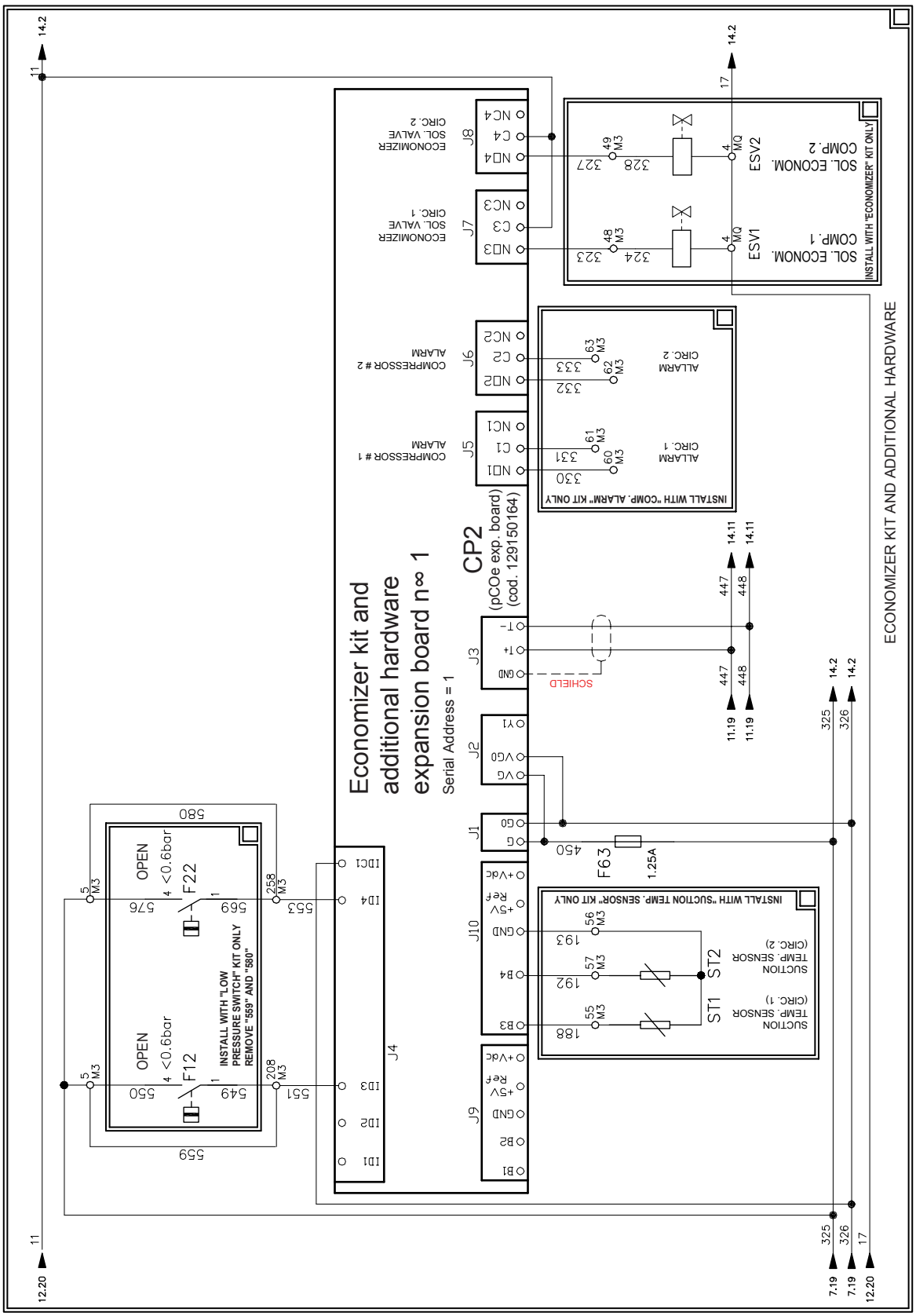
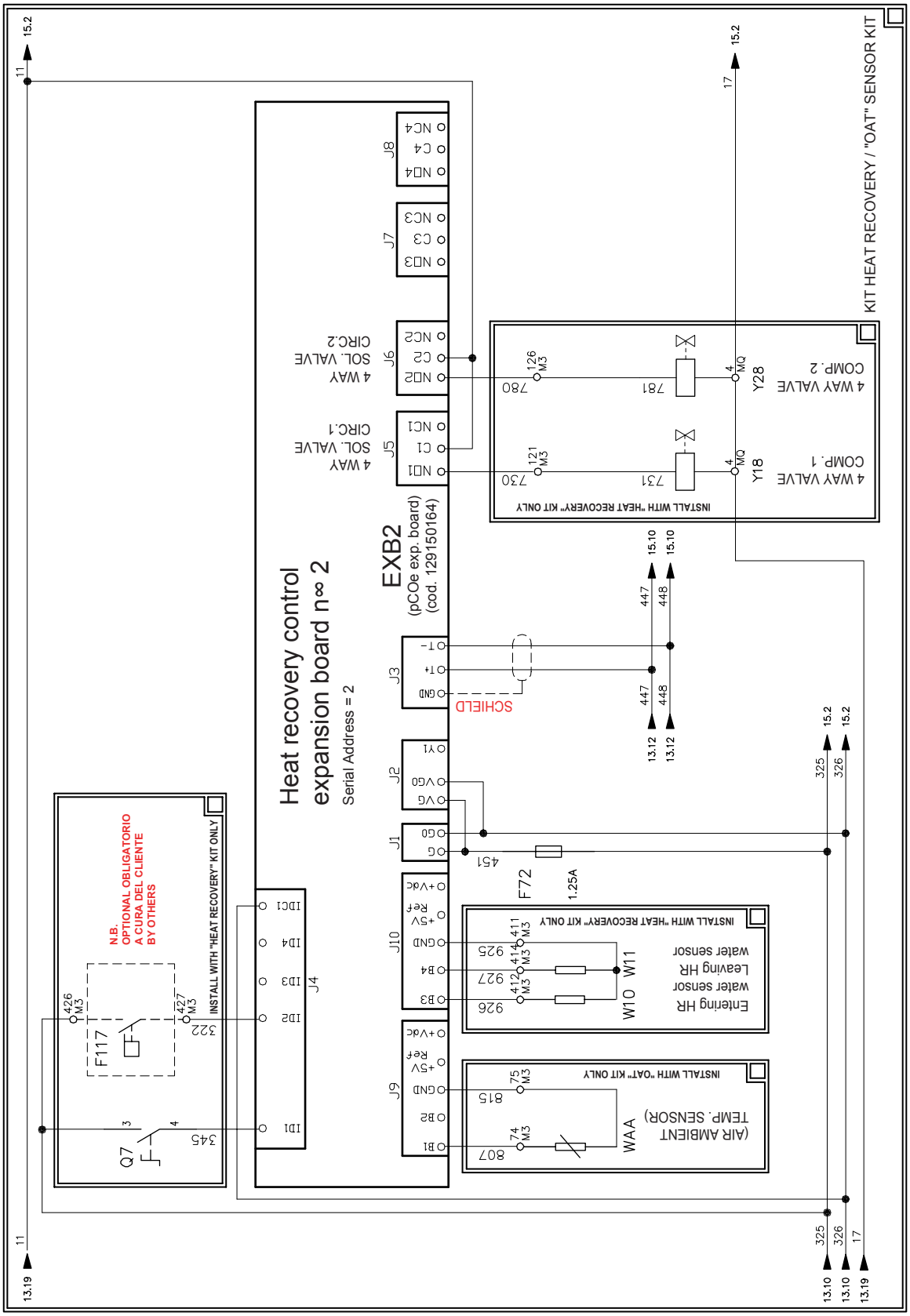
3.3.12 Economizer Expansion Board Kit



3.3.13 Heat Recovery Expansion Board Kit



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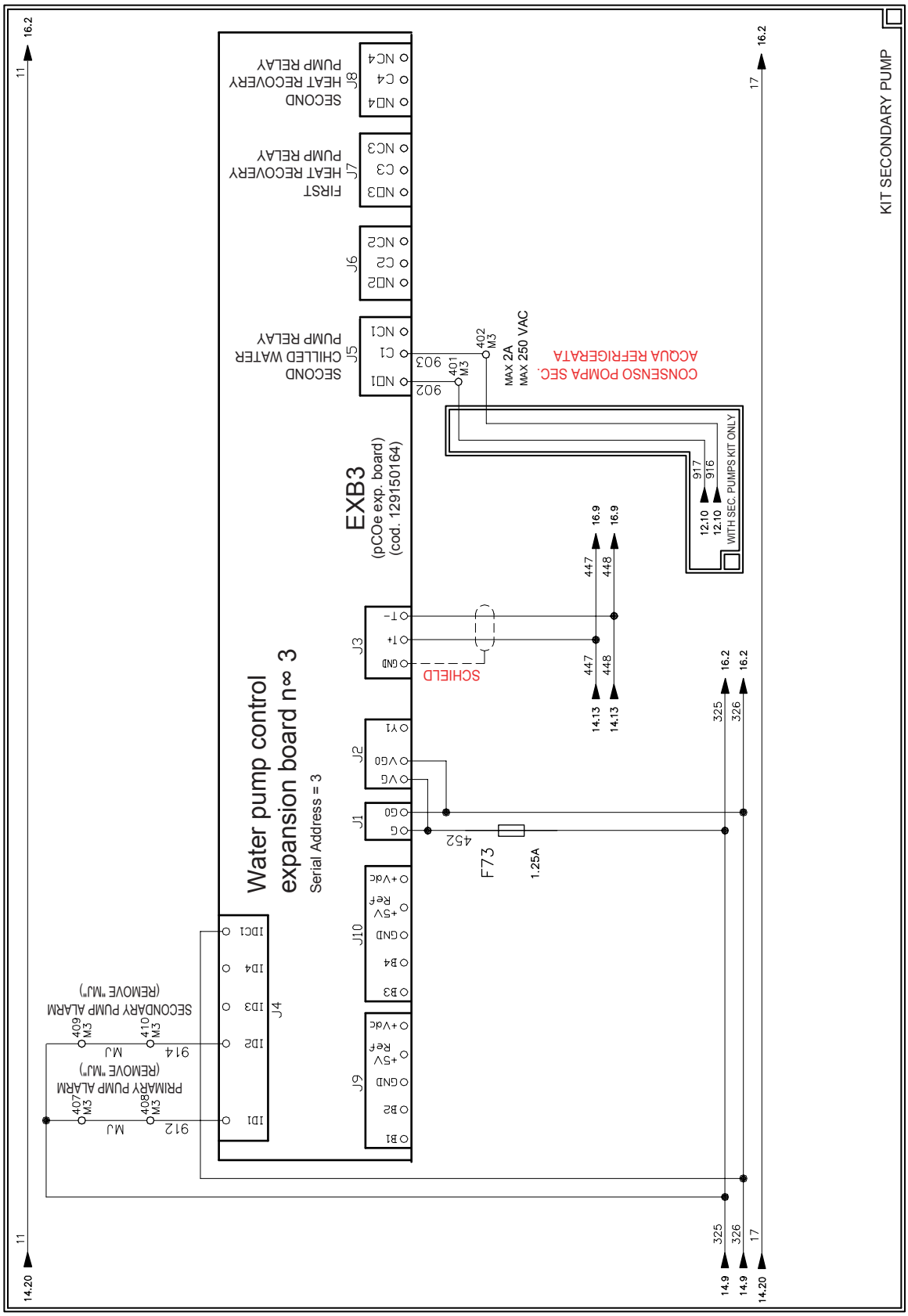
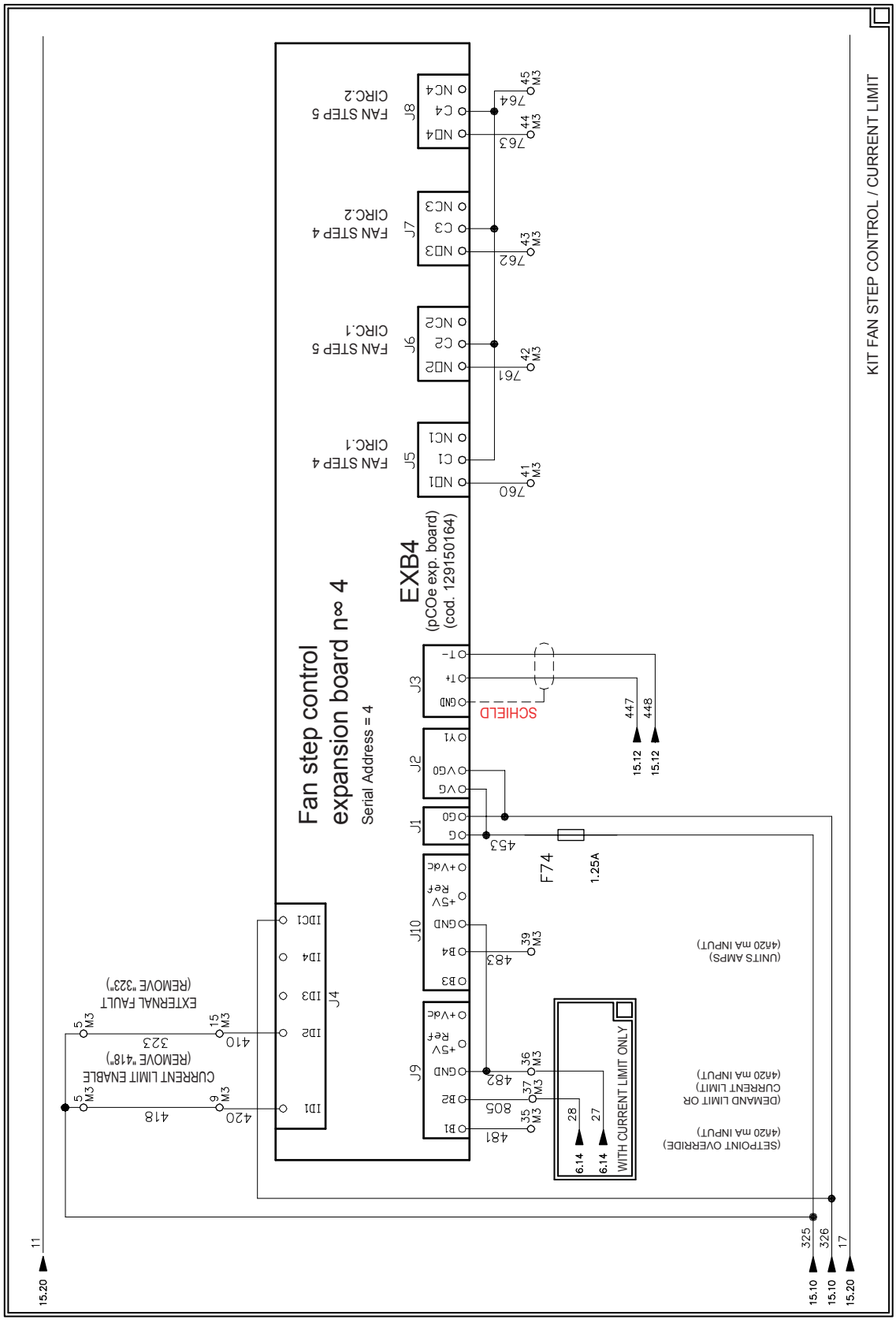
3.3.14 Pump Control Expansion Board



3.3.15 Fan Step Control Board



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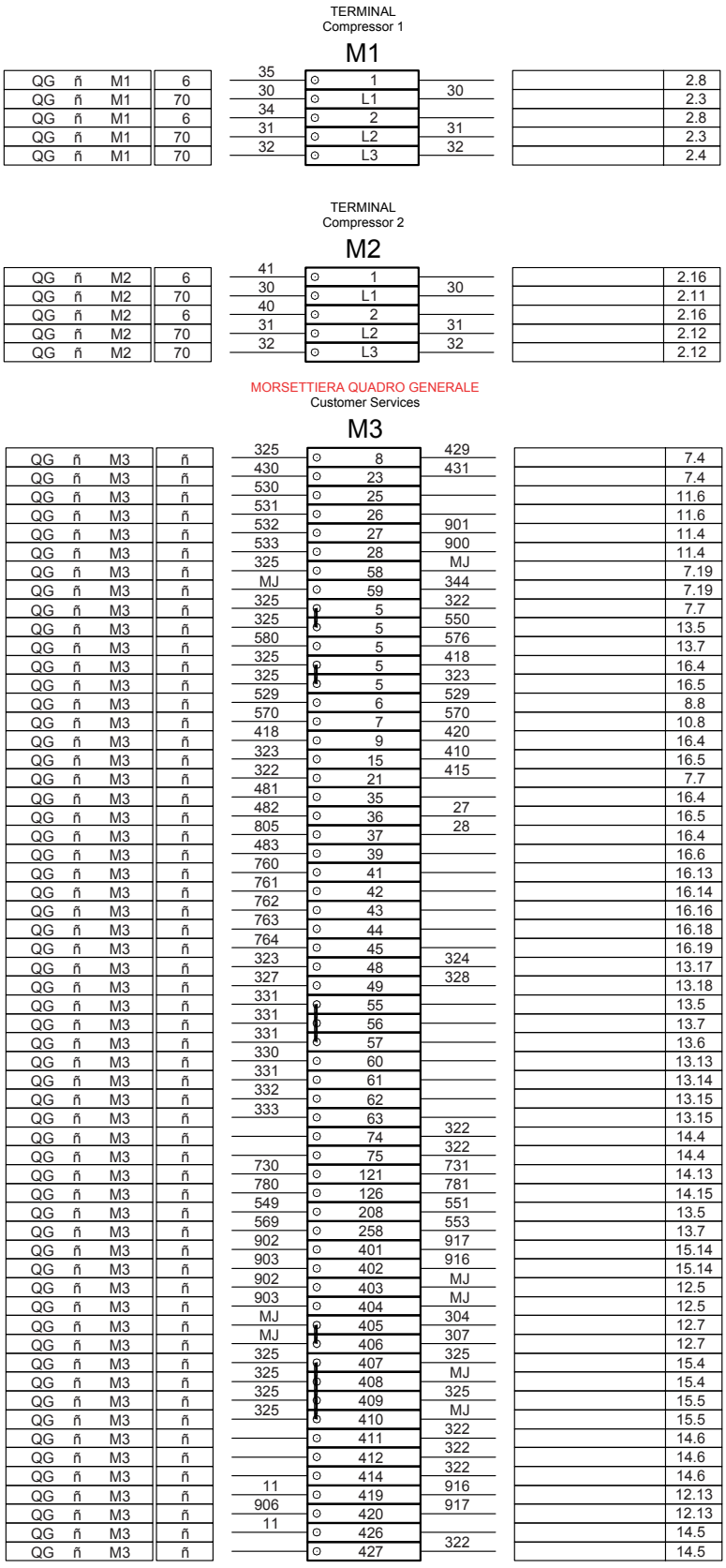
3.3.16 Terminals M1-M2-M3



3.3.17 Terminals MQ

MORSETTIERA QUADRO GENERALE
Compressor 1

MQ

QG	ñ	MQ	ñ	325	3	562		10.13
QG	ñ	MQ	ñ	11	3	11		6.17
QG	ñ	MQ	ñ	11	3	542		8.18
QG	ñ	MQ	ñ	17	4	17		6.18
QG	ñ	MQ	ñ	17	4	17		14.15
QG	ñ	MQ	ñ	17	4	17		6.17
QG	ñ	MQ	ñ	17	4	17		13.17
QG	ñ	MQ	ñ	17	4	17		13.18
QG	ñ	MQ	ñ	17	4	17		14.14
QG	ñ	MQ	ñ	17	4	17		8.11
QG	ñ	MQ	ñ	17	4	17		8.10
QG	ñ	MQ	ñ	17	4	17		10.16
QG	ñ	MQ	ñ	17	4	17		8.14
QG	ñ	MQ	ñ	17	4	17		10.11
QG	ñ	MQ	ñ	17	4	17		10.10
QG	ñ	MQ	ñ	17	4	17		8.13
QG	ñ	MQ	ñ	17	4	17		10.17
QG	ñ	MQ	ñ	359	5			6.14
QG	ñ	MQ	ñ	325	5	325		7.1
QG	ñ	MQ	ñ	300	5	325		6.3
QG	ñ	MQ	ñ	326	11	472		7.13
QG	ñ	MQ	ñ	467	12	473		7.14
QG	ñ	MQ	ñ	326	13	475		7.14
QG	ñ	MQ	ñ	468	14	476		7.15
QG	ñ	MQ	ñ	360	20			6.14
QG	ñ	MQ	ñ	326	20	326		7.1
QG	ñ	MQ	ñ	321	20	326		6.4
QG	ñ	MQ	ñ	189	38	486		7.3
QG	ñ	MQ	ñ	193	38	486		7.8
QG	ñ	MQ	ñ	486	38	486		7.3
QG	ñ	MQ	ñ	543	64	541		8.18
QG	ñ	MQ	ñ	563	84	563		10.13
QG	ñ	MQ	ñ	460	29	460		7.10
QG	ñ	MQ	ñ	801	30	801		7.10
QG	ñ	MQ	ñ	462	31	462		7.10
QG	ñ	MQ	ñ	803	32	803		7.5
QG	ñ	MQ	ñ	801	33	801		7.4
QG	ñ	MQ	ñ	802	34	802		7.4
QG	ñ	MQ	ñ	463	40	463		7.10
QG	ñ	MQ	ñ	308	47	309		6.18
QG	ñ	MQ	ñ	804	73	804		7.5

1

3.3.18 Legend

Item	Description
CP1	Analog digital inputs board
F1-2	Compressor fuses
F13-23	High pressure switch
F51-52	Compressor thermal relays
F59	Evaporator heater fuse
F60/62	Protection auxiliary circuit fuse
F100/200	Fan fuse
F112	Phase volt monitor
F116	Evaporator flow switch (not installed)
F120	Transformer T1 protection
F130	Phase voltage monitor protection
KM2-4-55-65	Compressor contactors
KM11/15 21/25	Fan contactors
K1-3-16-26	Auxiliary relay
K12	ON-OFF remote unit auxiliary relay
KT13-23	Time delay relay
M1/2	Compressor motor
M11/17 21/27	Fan motor
MP1-2	Motor thermal protection
Q0	ON-OFF unit switch
Q1-2	ON-OFF compressor switch
Q10	Main switch
Q11	Emergency stop
Q12	Automatic circuit breaker
R1-2	Compressor crankase heater
R5	Evaporator heater
ST1-2	Suction temperature sensor
Y1-2	Liquid line solenoid valve
T1	230/24V transformer
Y5-6	Liquid injection solenoid valve
Y12/23	Unloader solenoid valve
WH1-2	High pressure transducer (0/30 Bar)
WIE	Entering evaporator water sensor
WD1-2	Discharge sensor
WL1-2	Low pressure transducer (-0.5/7 Bar)
WOE	Leaving evaporator water sensor
WO1-2	Oil pressure transducer (0/30 Bar)
W1-2	Compressor termistors

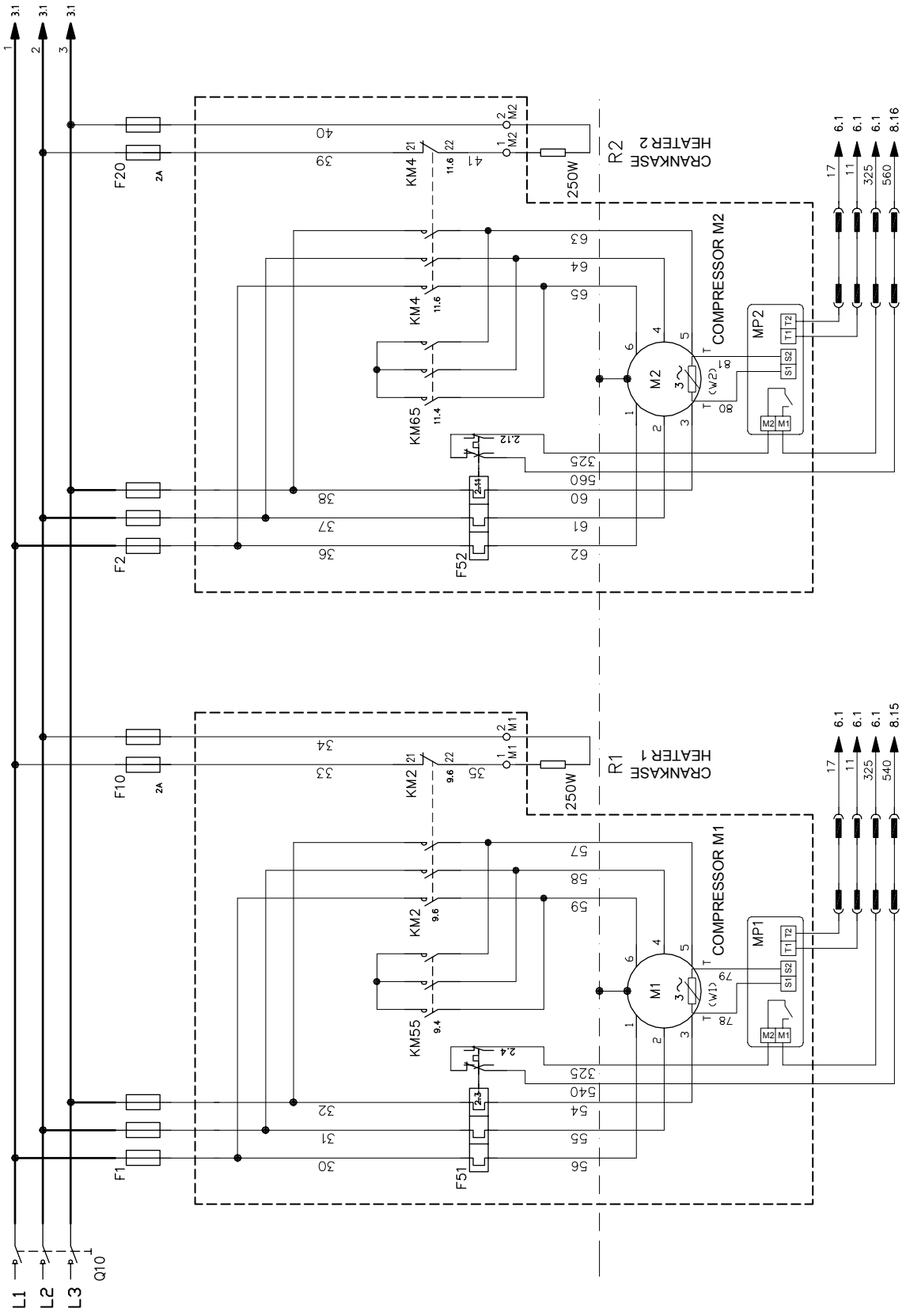
3.4 Wiring Diagram - Fans Speed Modulation Version with Electronic Expansion Valve

Overview

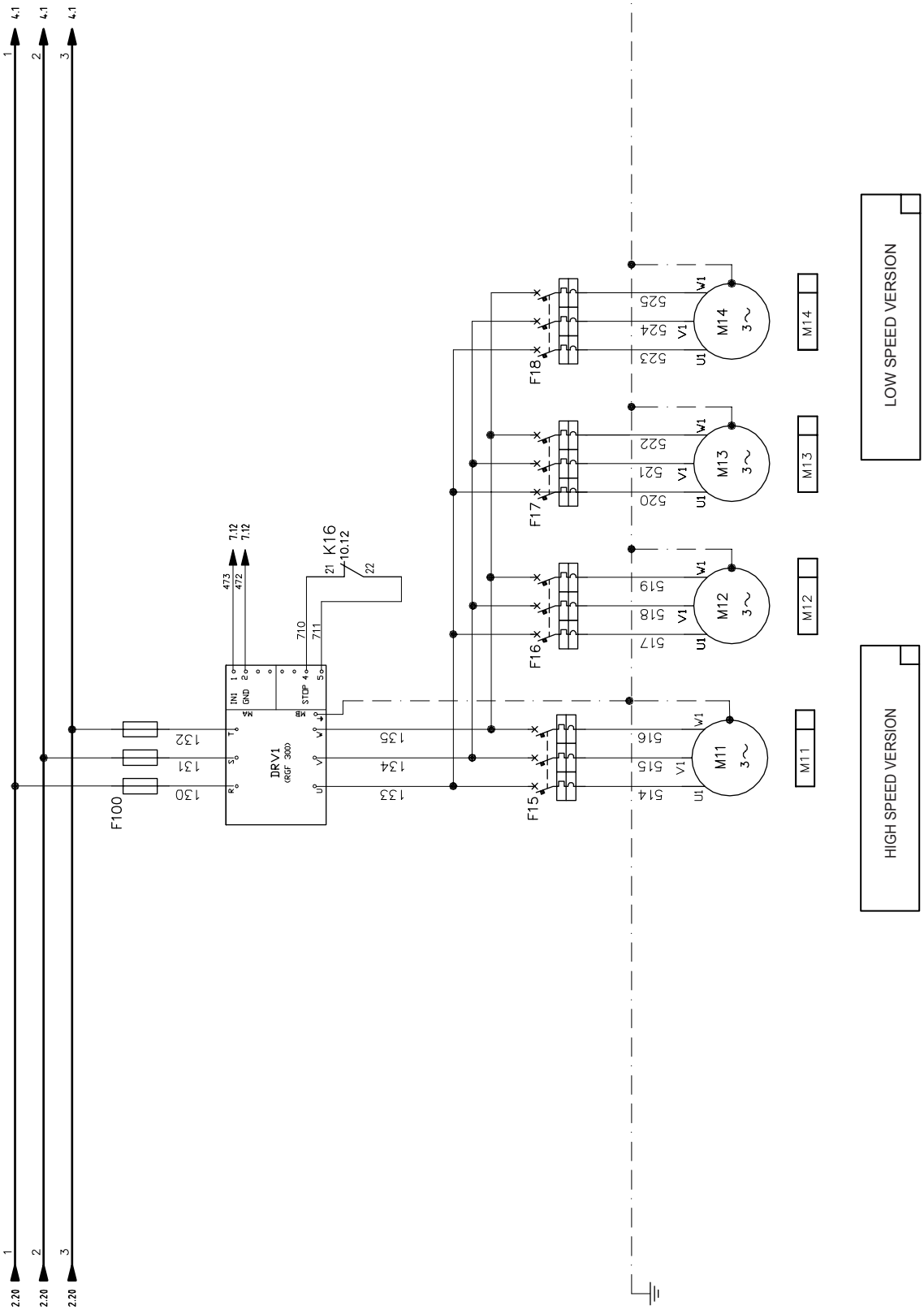
This chapter contains the following topics:

1

3.4.1 Compressor 1-2 Power Supply



3.4.2 Circuits 1 Fan Power Supply



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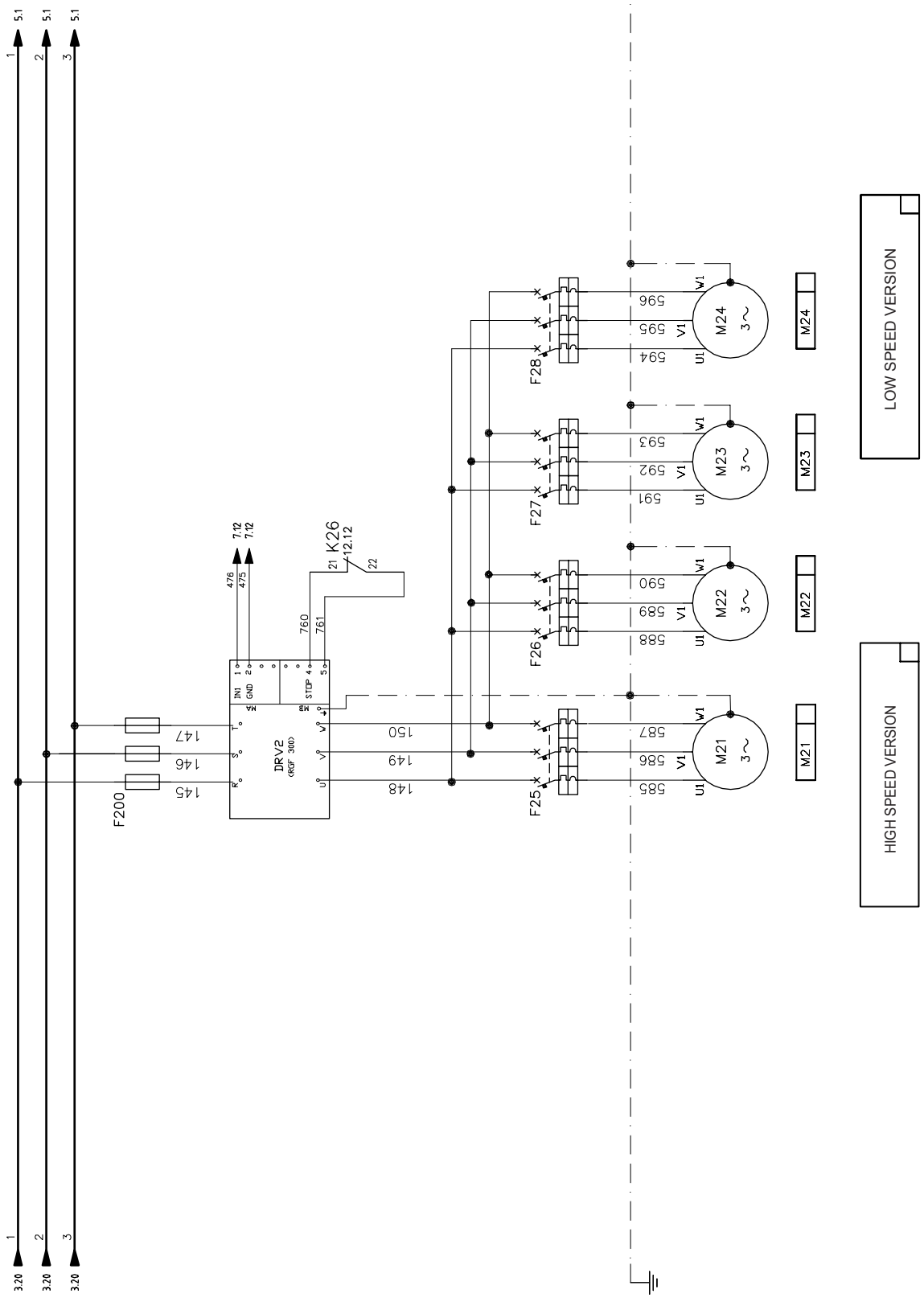
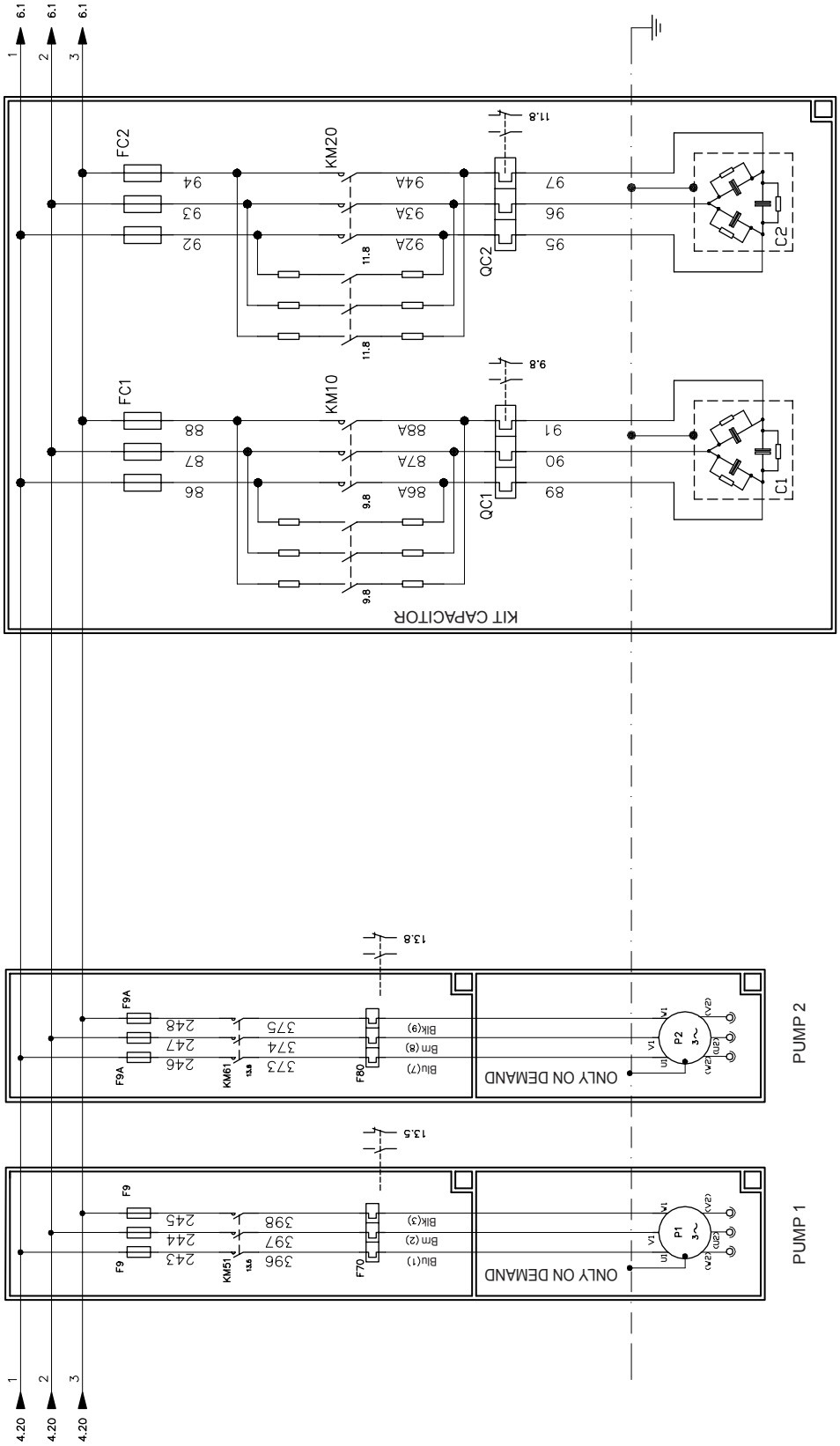
3.4.3 Circuits 2 Fan Power Supply



3.4.4 Kit Pumps



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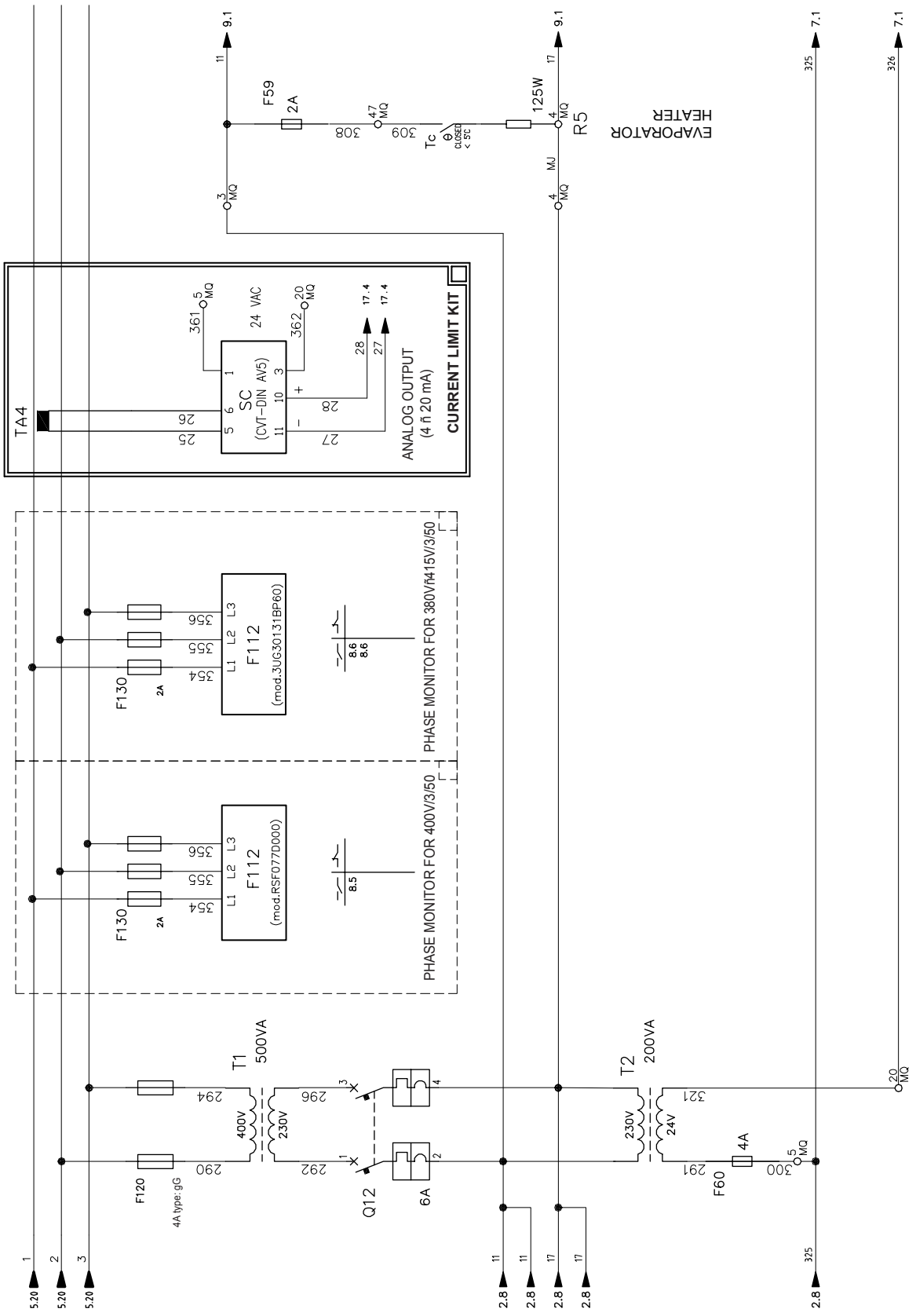
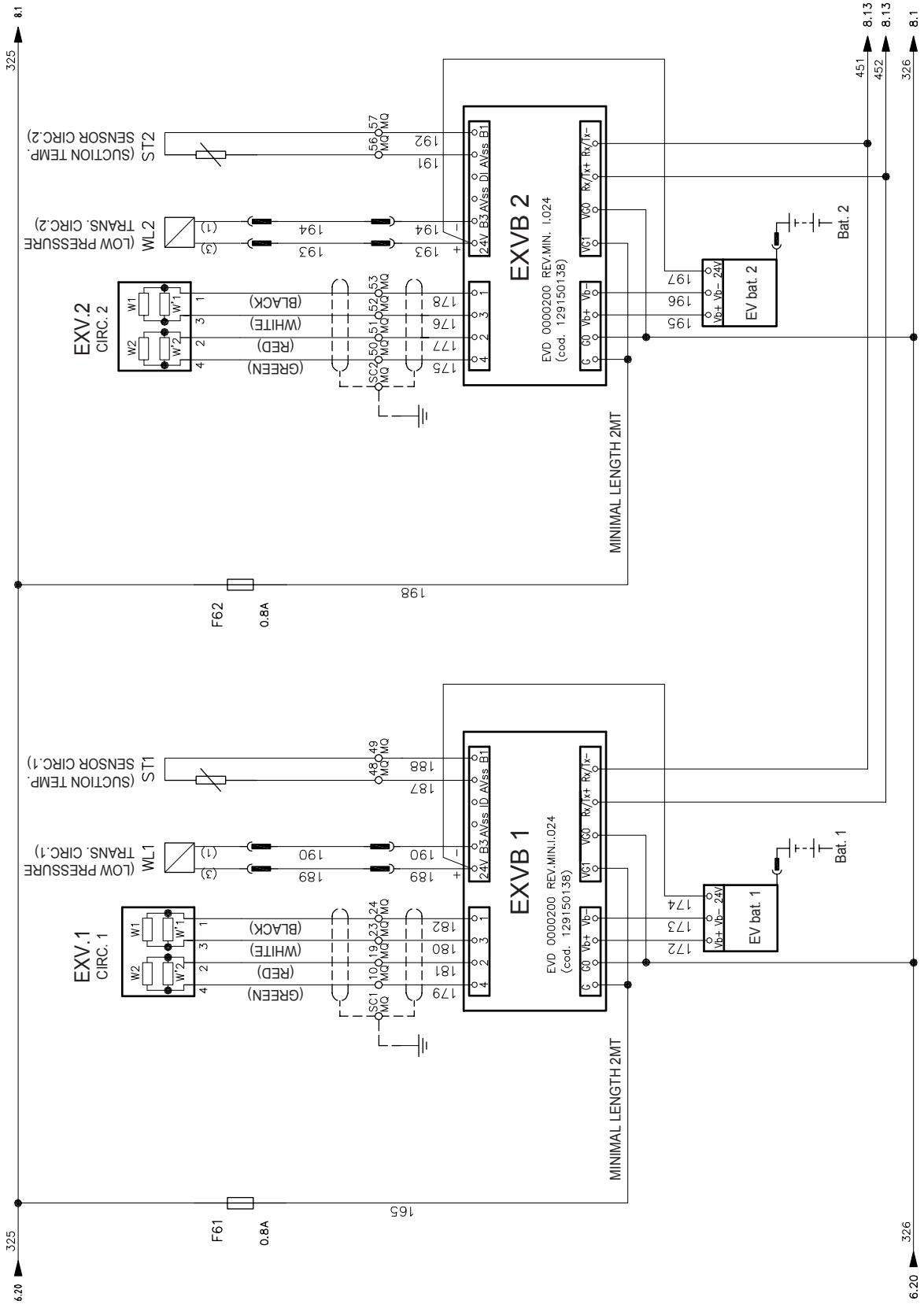
3.4.5 Unit Control Circuit Power Supply



3.4.6 Electronic Expansion Valve Board 1/2



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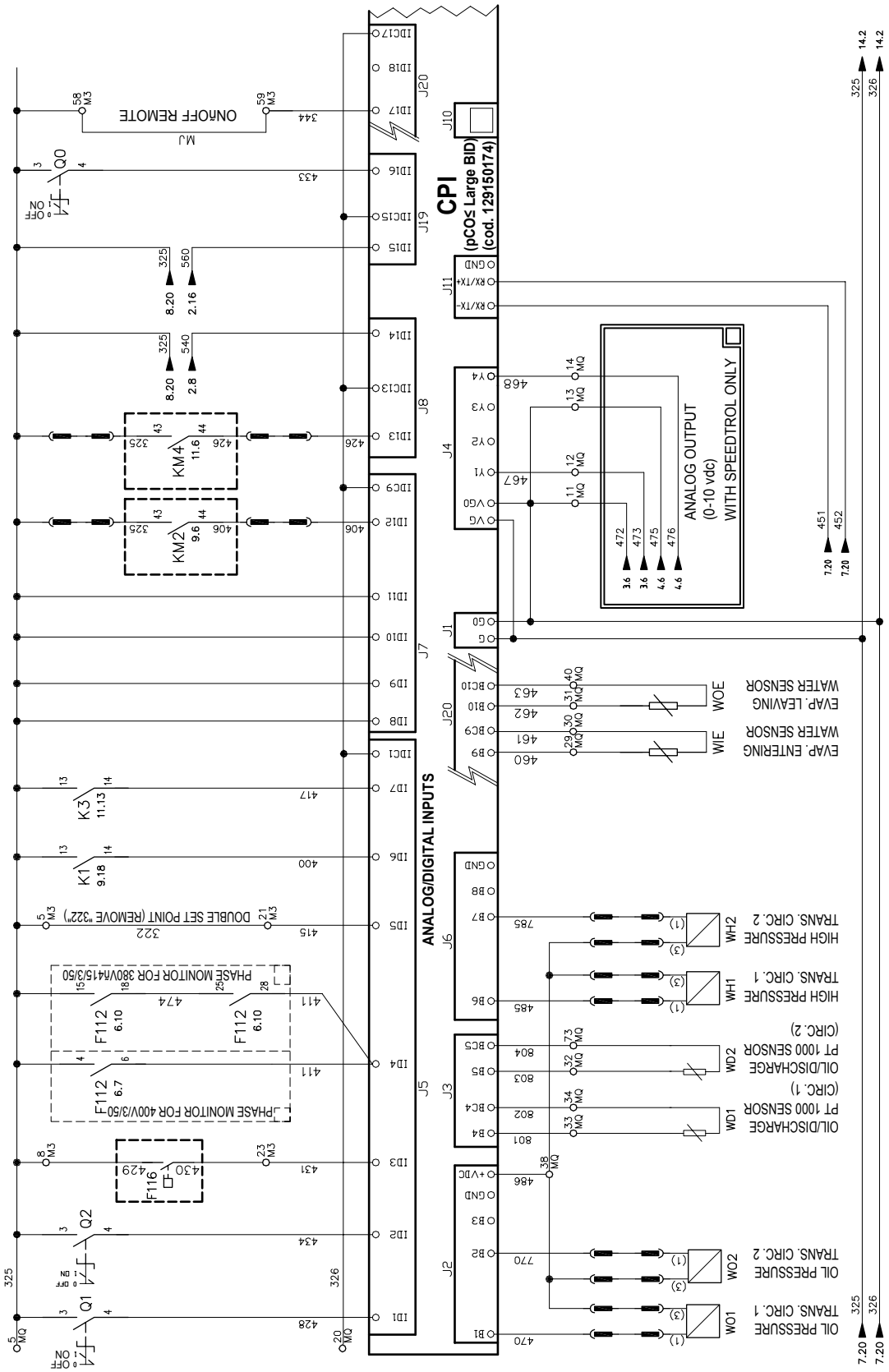
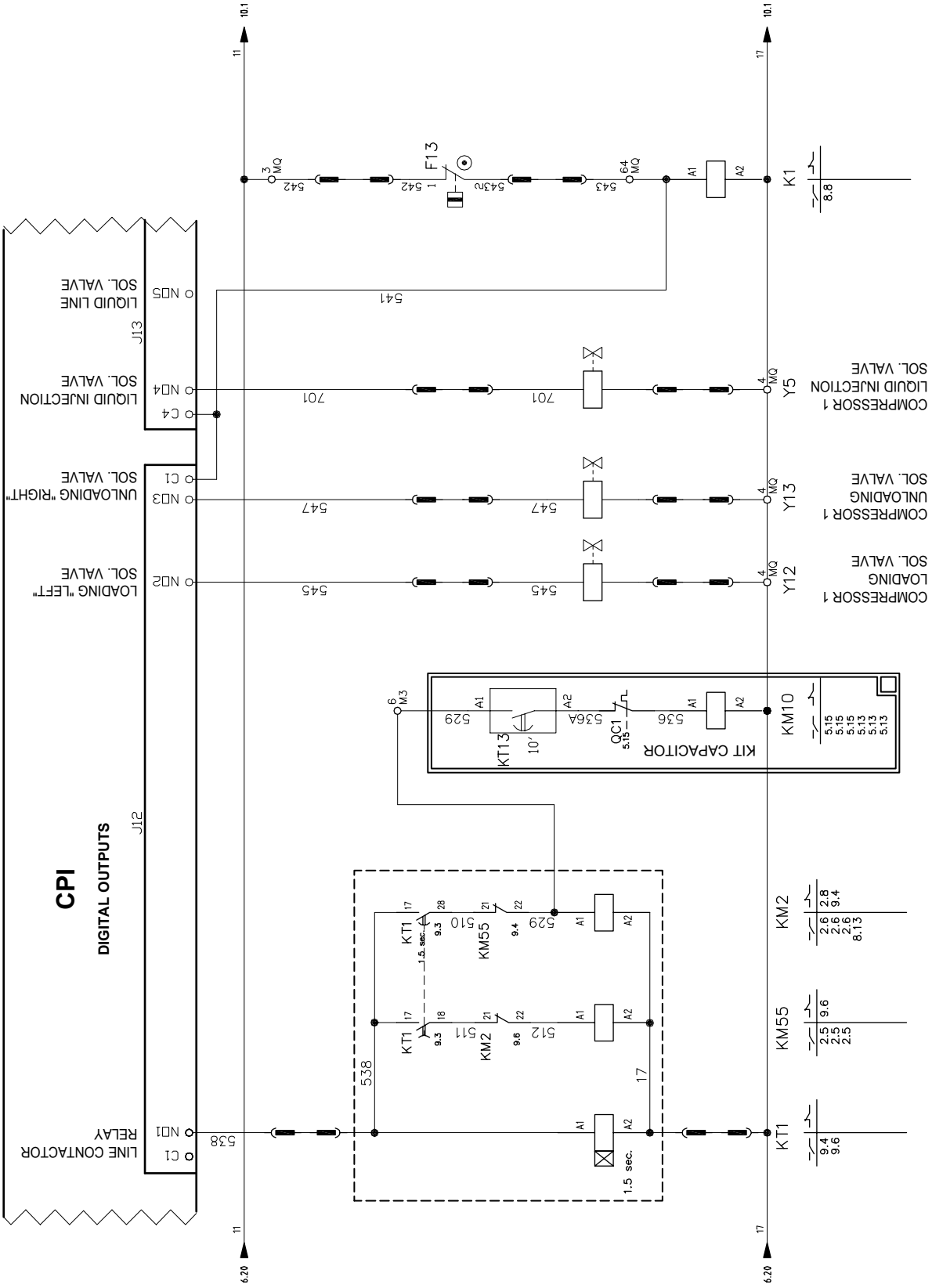
3.4.7 Analog-Digital Inputs Board 1/2



3.4.8 Compressor 1 Control



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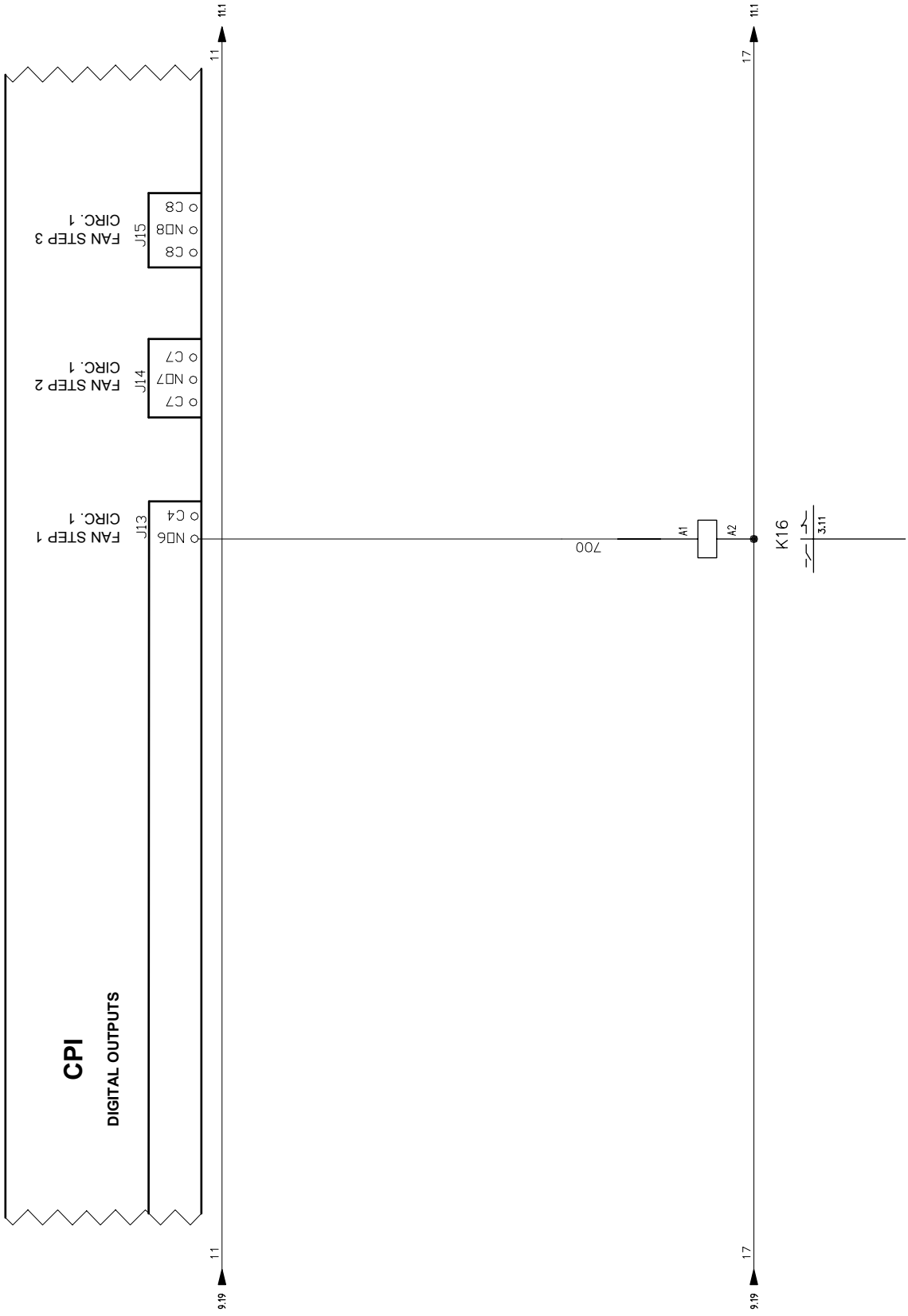
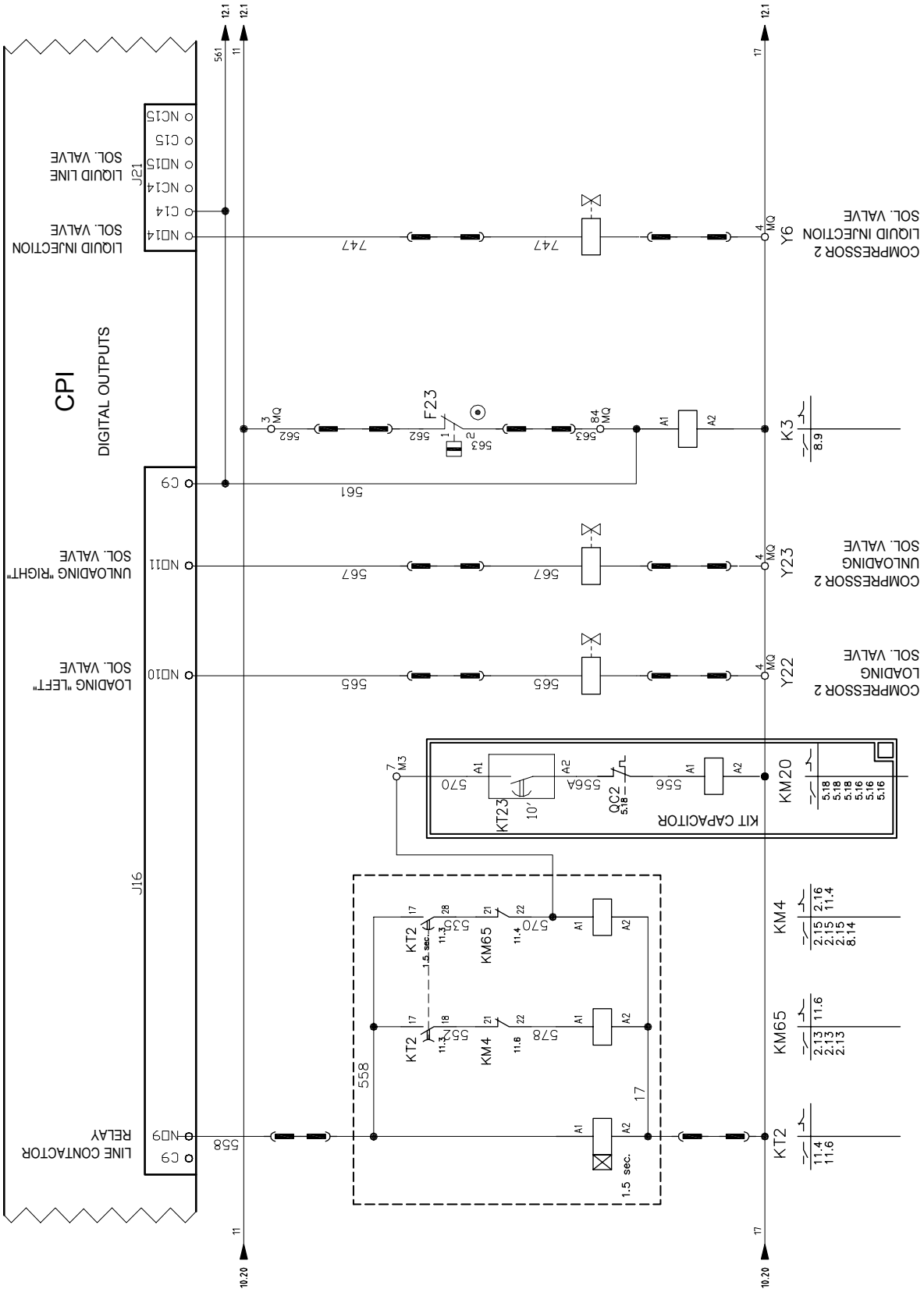
3.4.9 Fan Control Circuits 1



3.4.10 Compressor 2 Control Circuit



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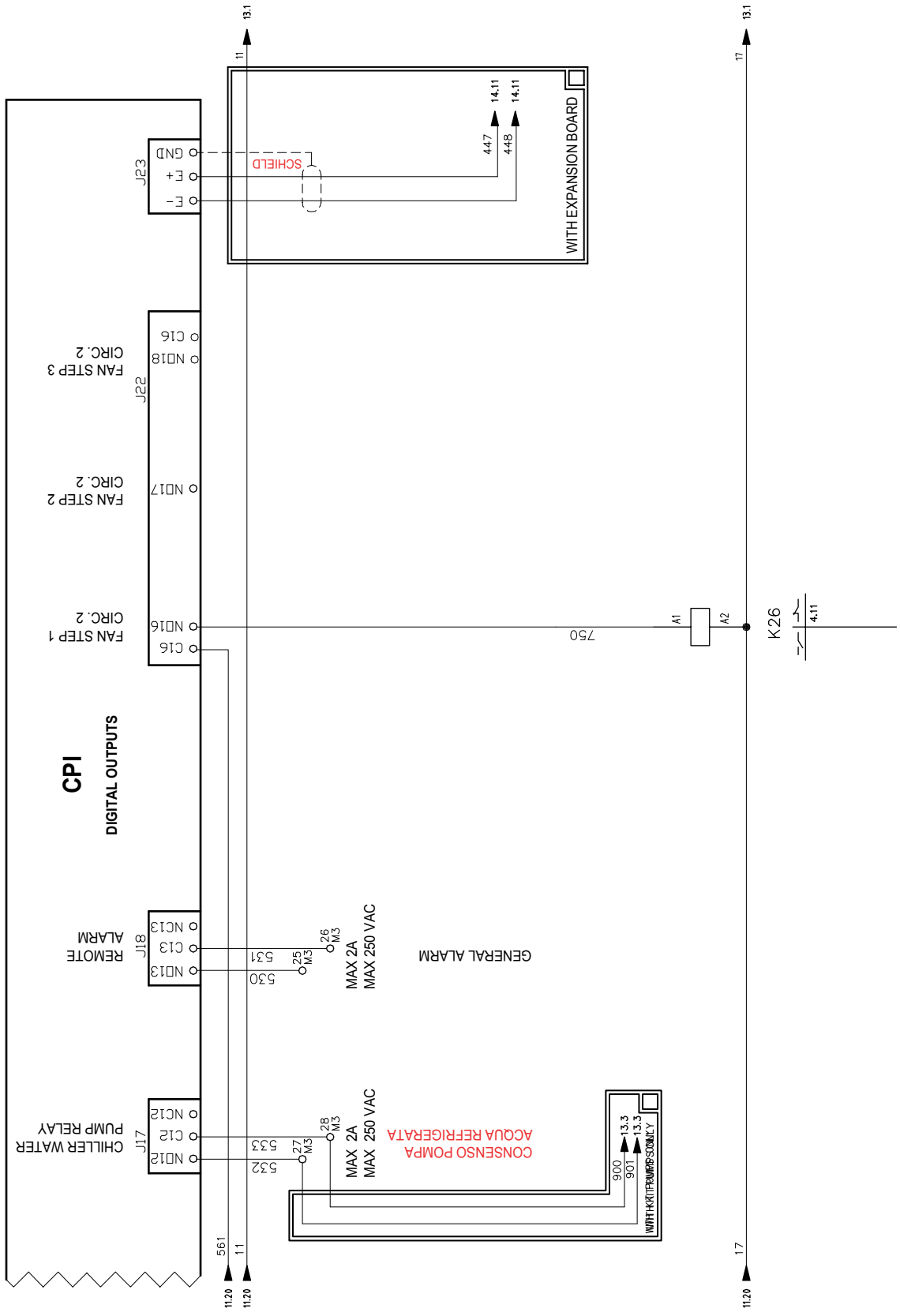
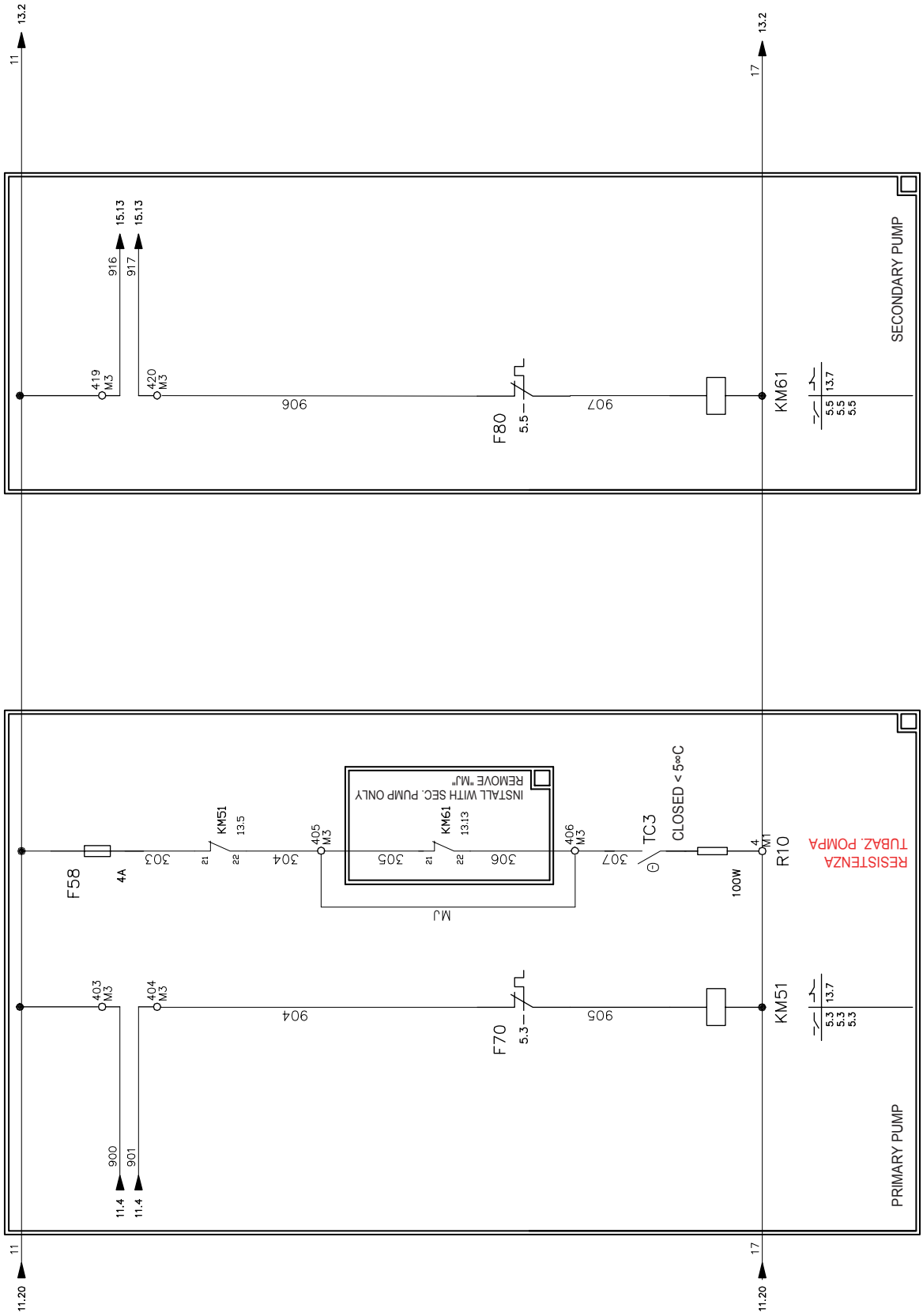
3.4.11 Fan Control Circuits 2



3.4.12 Pump Control



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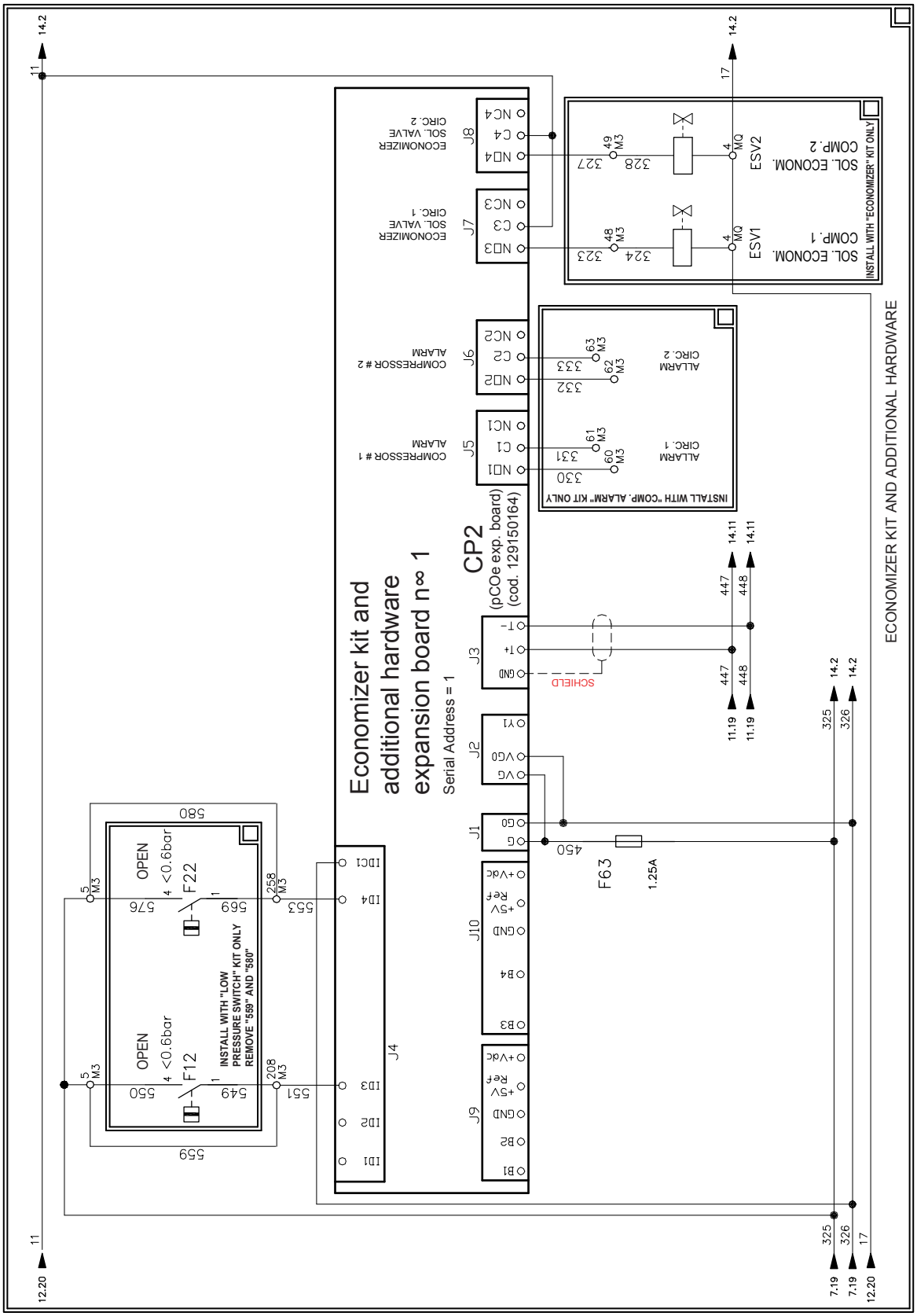
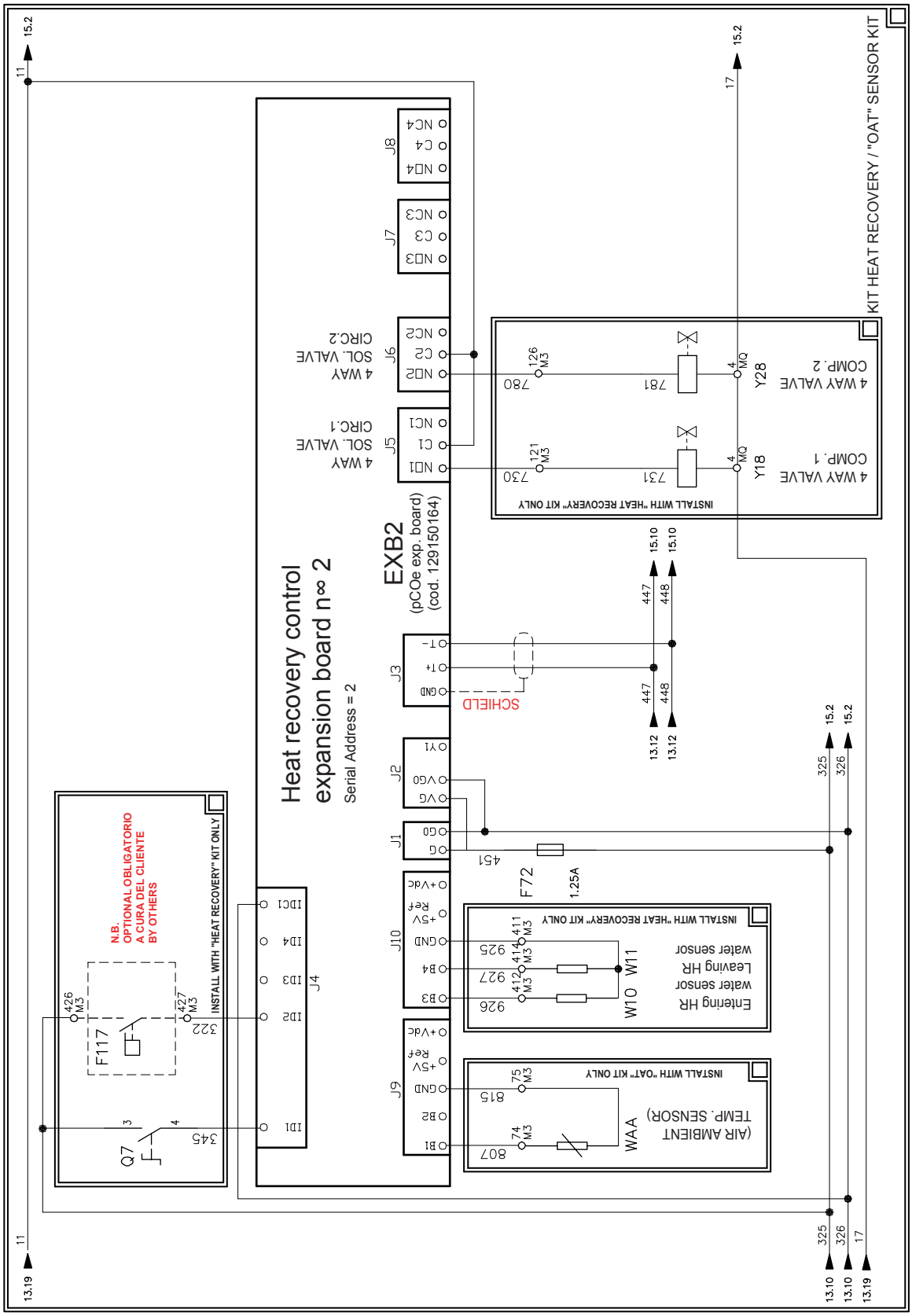
3.4.13 Economizer Expansion Board Kit



3.4.14 Heat Recovery Expansion Board Kit



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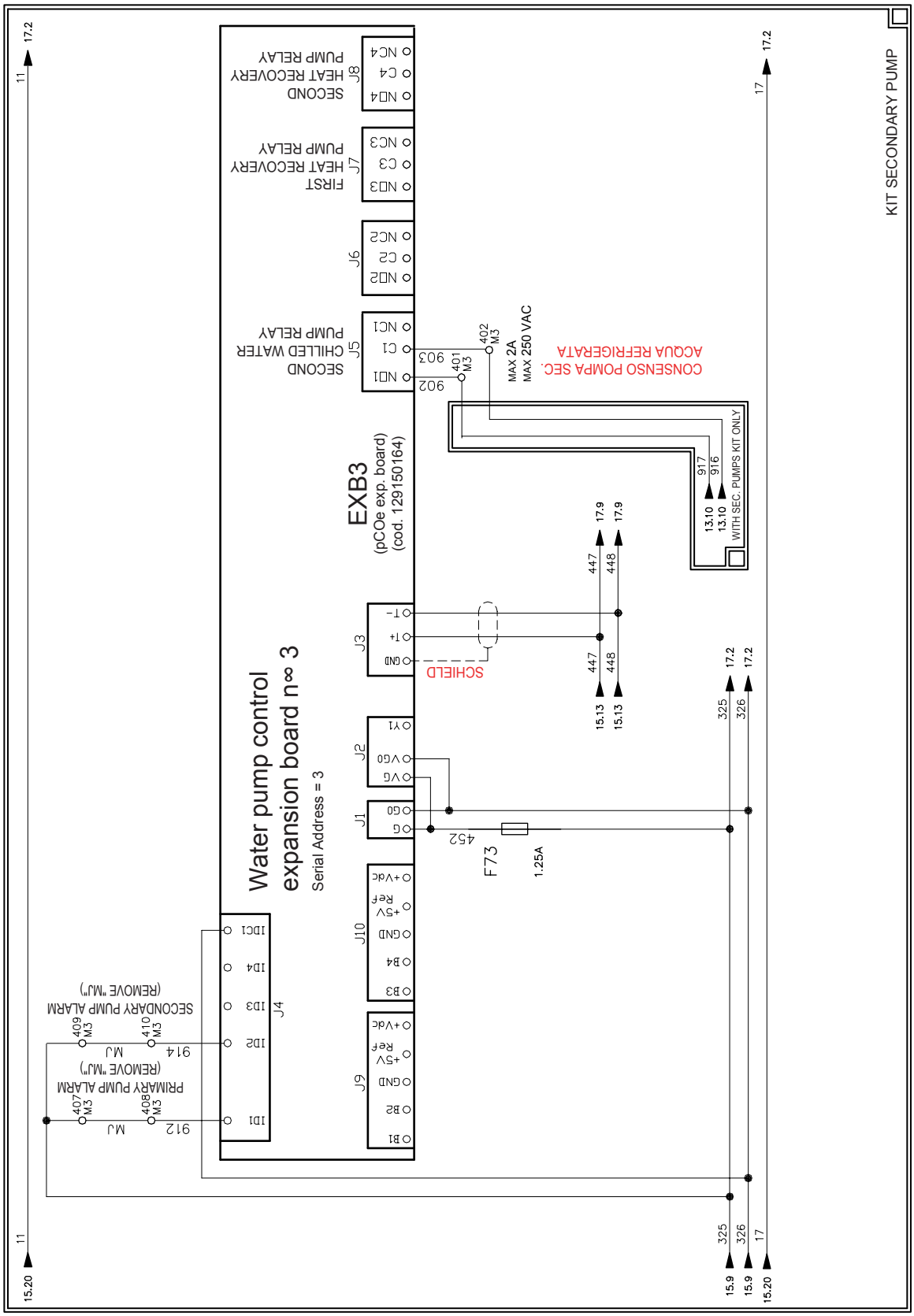
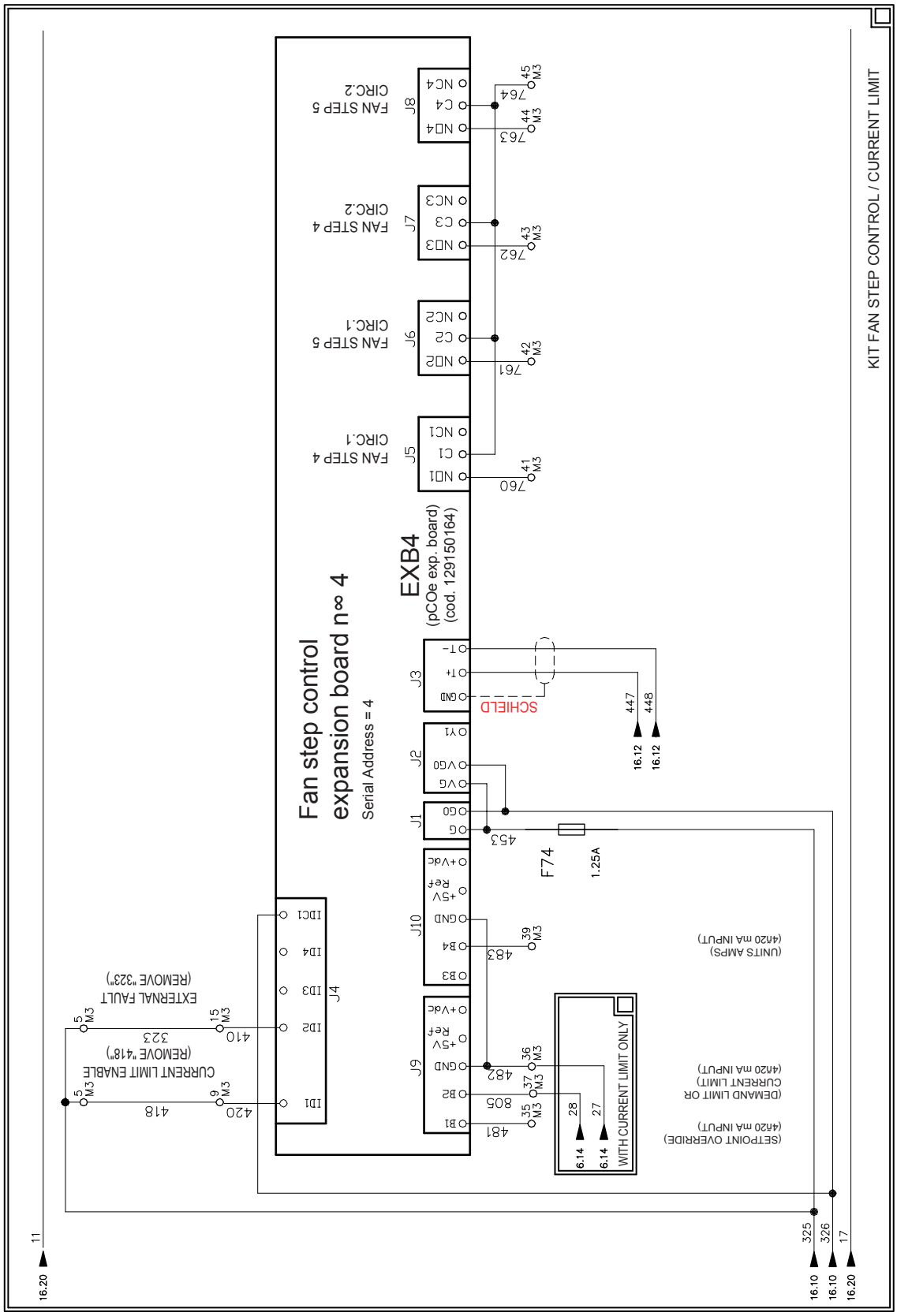
3.4.15 Pump Control Expansion Board



3.4.16 Fan Step Control Board



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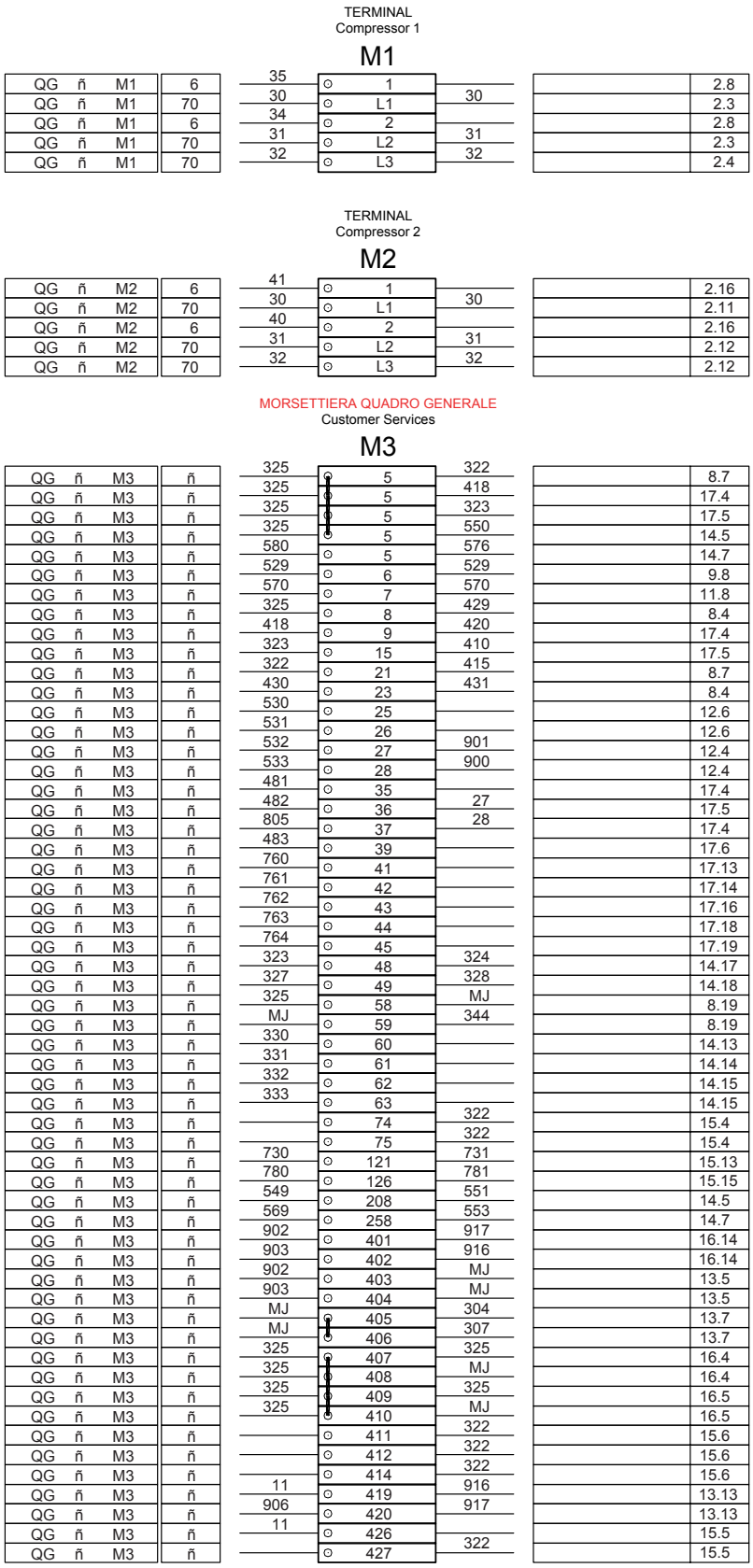
3.4.17 Terminals M1-M2-M3



3.4.18 Terminals MQ

MORSETTIERA QUADRO GENERALE
Compressor 1

MQ

QG ñ MQ	ñ	SC1	SC1	SC1		7.5
QG ñ MQ	ñ	SC2	SC2	SC2		7.15
QG ñ MQ	ñ	11	3	542		9.18
QG ñ MQ	ñ	325	3	562		11.13
QG ñ MQ	ñ	11	3	11		6.17
QG ñ MQ	ñ	17	4	17		9.13
QG ñ MQ	ñ	17	4	17		9.11
QG ñ MQ	ñ	17	4	17		9.10
QG ñ MQ	ñ	17	4	17		11.10
QG ñ MQ	ñ	17	4	17		11.11
QG ñ MQ	ñ	17	4	17		11.16
QG ñ MQ	ñ	17	4	17		6.18
QG ñ MQ	ñ	17	4	17		6.17
QG ñ MQ	ñ	17	4	17		14.17
QG ñ MQ	ñ	17	4	17		14.18
QG ñ MQ	ñ	17	4	17		15.14
QG ñ MQ	ñ	17	4	17		15.15
QG ñ MQ	ñ	325	5	325		8.1
QG ñ MQ	ñ	300	5	325		6.3
QG ñ MQ	ñ	359	5			6.14
QG ñ MQ	ñ	179	10	179		7.5
QG ñ MQ	ñ	326	11	472		8.13
QG ñ MQ	ñ	467	12	473		8.14
QG ñ MQ	ñ	326	13	475		8.14
QG ñ MQ	ñ	468	14	476		8.15
QG ñ MQ	ñ	181	19	181		7.6
QG ñ MQ	ñ	326	20	326		8.1
QG ñ MQ	ñ	360	20			6.14
QG ñ MQ	ñ	321	20	326		6.4
QG ñ MQ	ñ	180	23	180		7.6
QG ñ MQ	ñ	182	24	182		7.6
QG ñ MQ	ñ	460	29	460		8.10
QG ñ MQ	ñ	801	30	801		8.10
QG ñ MQ	ñ	462	31	462		8.10
QG ñ MQ	ñ	803	32	803		8.5
QG ñ MQ	ñ	801	33	801		8.4
QG ñ MQ	ñ	802	34	802		8.4
QG ñ MQ	ñ	486	38	486		8.3
QG ñ MQ	ñ	463	40	463		8.10
QG ñ MQ	ñ	308	47	309		6.18
QG ñ MQ	ñ	187	48	187		7.8
QG ñ MQ	ñ	188	49	188		7.8
QG ñ MQ	ñ	175	50	175		7.15
QG ñ MQ	ñ	177	51	177		7.15
QG ñ MQ	ñ	176	52	176		7.16
QG ñ MQ	ñ	178	53	178		7.16
QG ñ MQ	ñ	191	56	176		7.18
QG ñ MQ	ñ	192	57	178		7.18
QG ñ MQ	ñ	543	64	541		9.18
QG ñ MQ	ñ	804	73	804		8.5
QG ñ MQ	ñ	563	84	563		11.13

1

3.4.19 Legend

Item	Description
CP1	Analog digital inputs board
EXVB.1-2	Electronic expansion valve board
EXV.1-2	Electronic expansion valve
EXVb.1-2	Electronic expansion battery valve
F1-2	Compressor fuses
F13-23	High pressure switch
F51-52	Compressor thermal relays
F59	Evaporator heater fuse
F60/62	Protection auxiliary circuit fuse
F100/200	Fan fuse
F112	Phase volt monitor
F116	Evaporator flow switch (not installed)
F120	Transformer T1 protection
F130	Phase voltage monitor protection
KM2-4-55-65	Compressor contactors
KM11/15 21/25	Fan contactors
K1-3-16-26	Auxiliary relay
K12	ON-OFF remote unit auxiliary relay
KT13-23	Time delay relay
M1/2	Compressor motor
M11/17 21/27	Fan motor
MP1-2	Motor thermal protection
Q0	ON-OFF unit switch
Q1-2	ON-OFF compressor switch
Q10	Main switch
Q11	Emergency stop
Q12	Automatic circuit breaker
R1-2	Compressor crankase heater
R5	Evaporator heater
T1	230/24V transformer
Y5-6	Liquid injection solenoid valve
Y12/23	Unloader solenoid valve
WH1-2	High pressure transducer (0/30 Bar)
WIE	Entering evaporator water sensor
WD1-2	Discharge sensor
WL1-2	Low pressure transducer (-0.5/7 Bar)
WOE	Leaving evaporator water sensor
WO1-2	Oil pressure transducer (0/30 Bar)
W1-2	Compressor termistors
LCD	Key pad switch and display

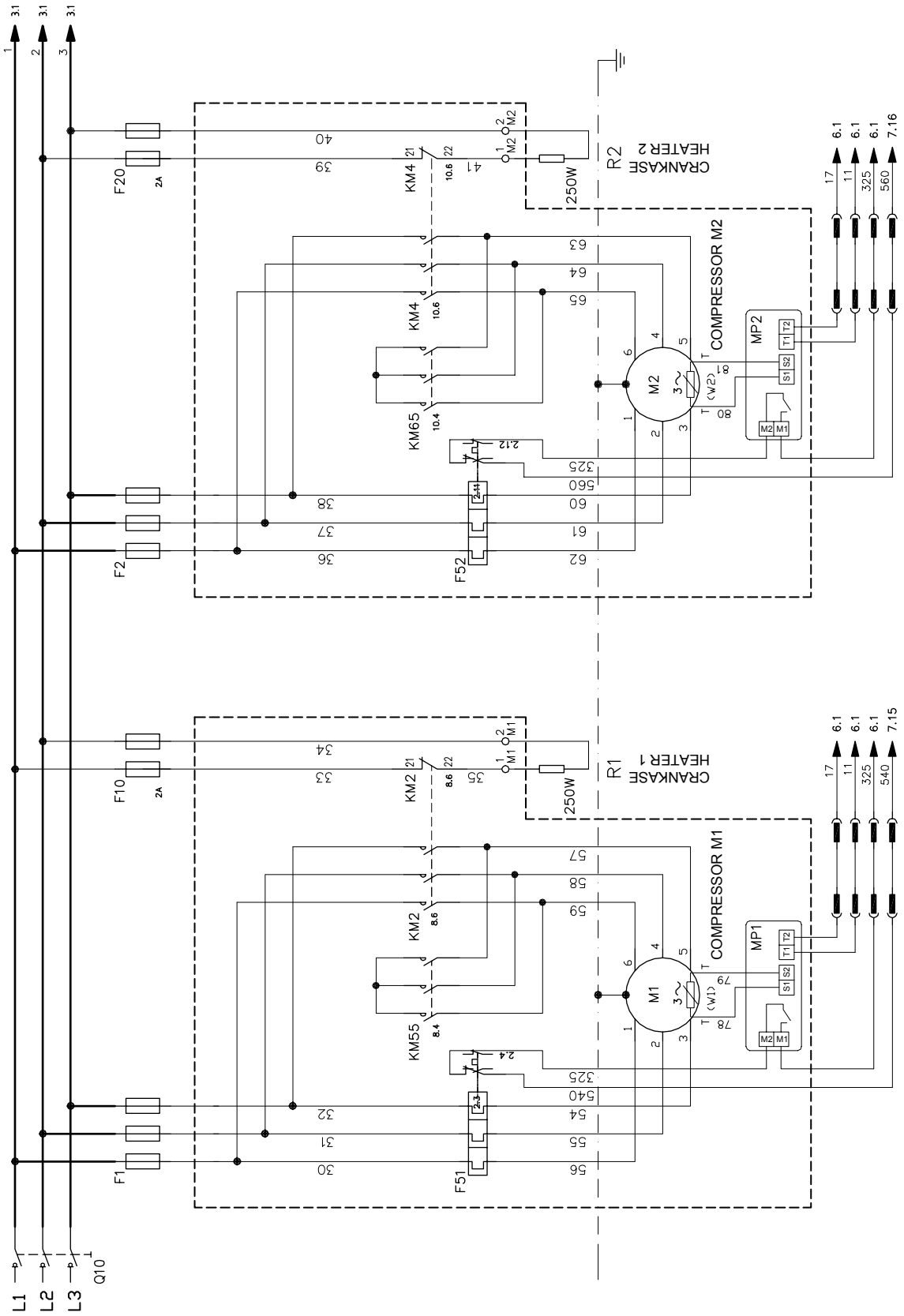
3.5 Wiring Diagram - Fans Speed Modulation Version with Thermostatic Expansion Valve

Overview

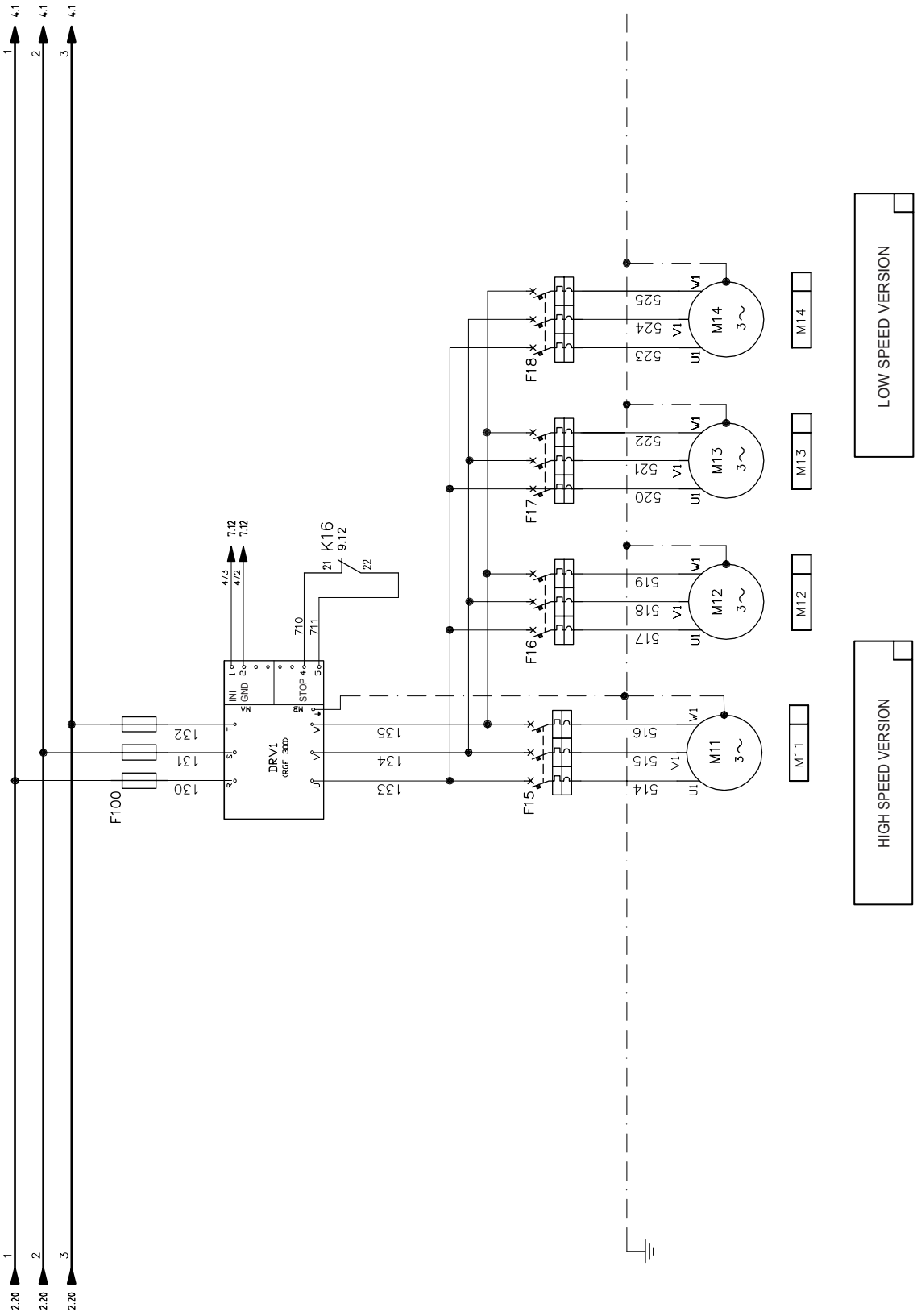
This chapter contains the following topics:

1

3.5.1 Compressor 1-2 Power Supply



3.5.2 Circuits 1 Fan Power Supply



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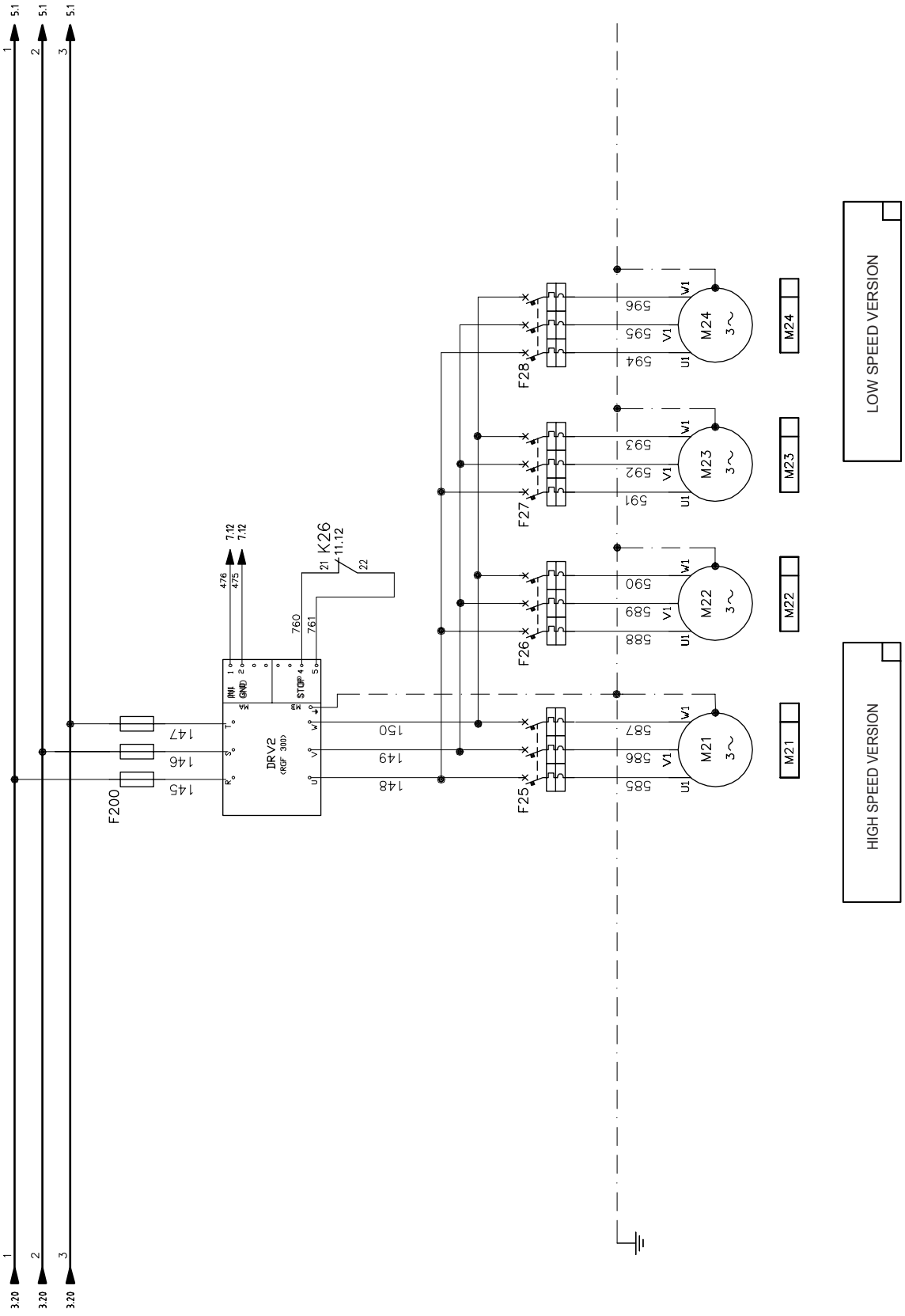
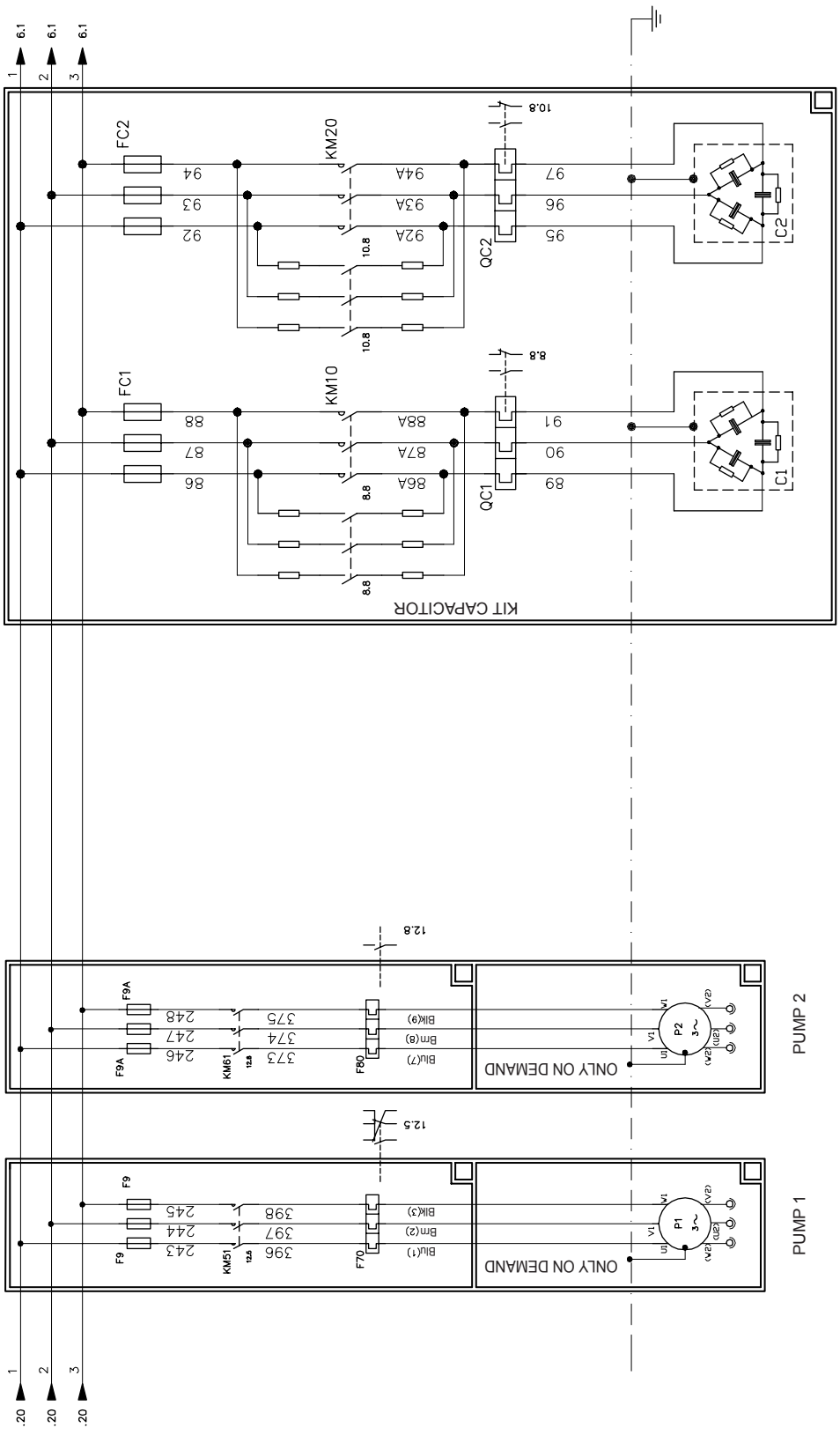
3.5.3 Circuits 2 Fan Power Supply



3.5.4 Kit Pumps



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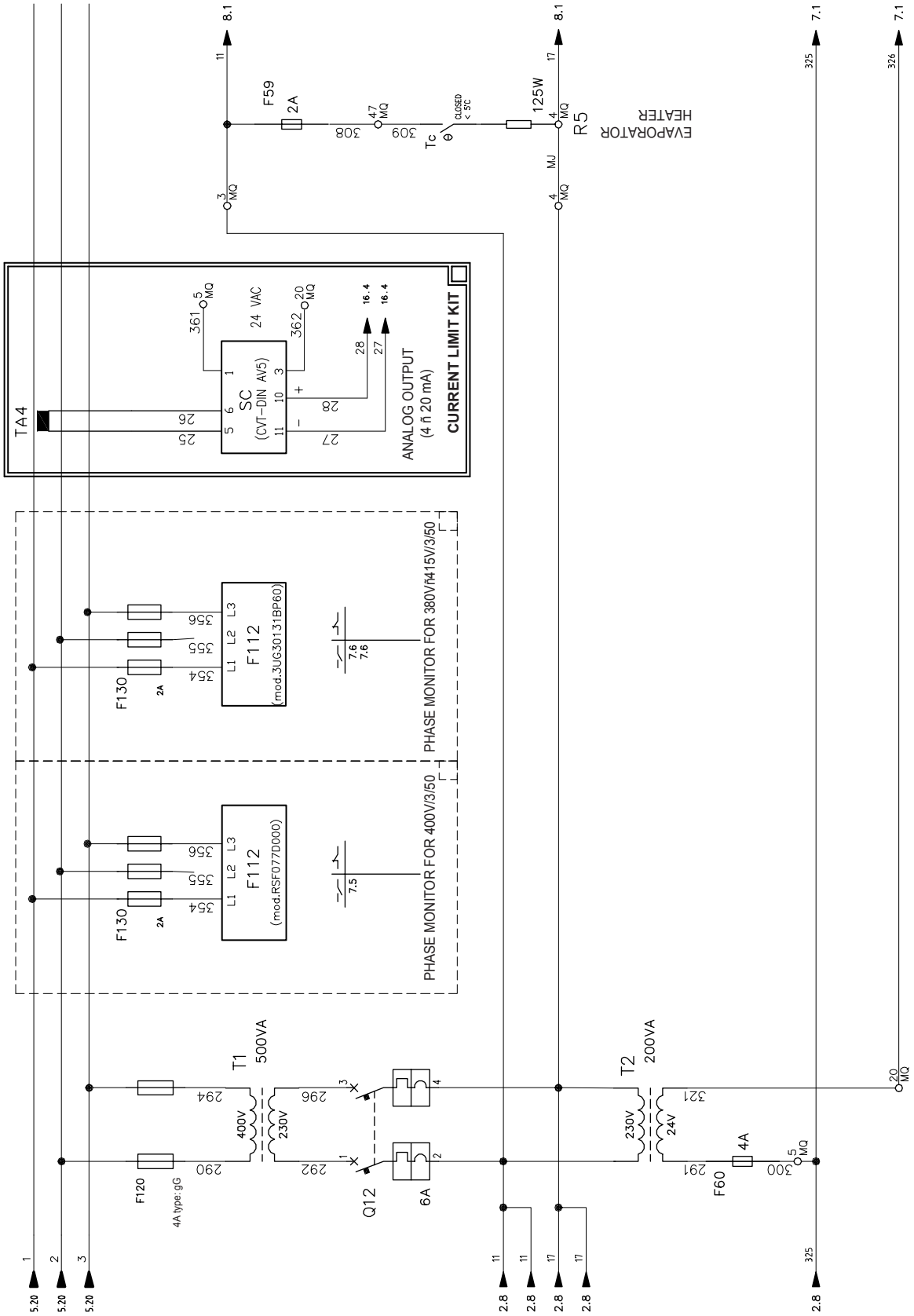
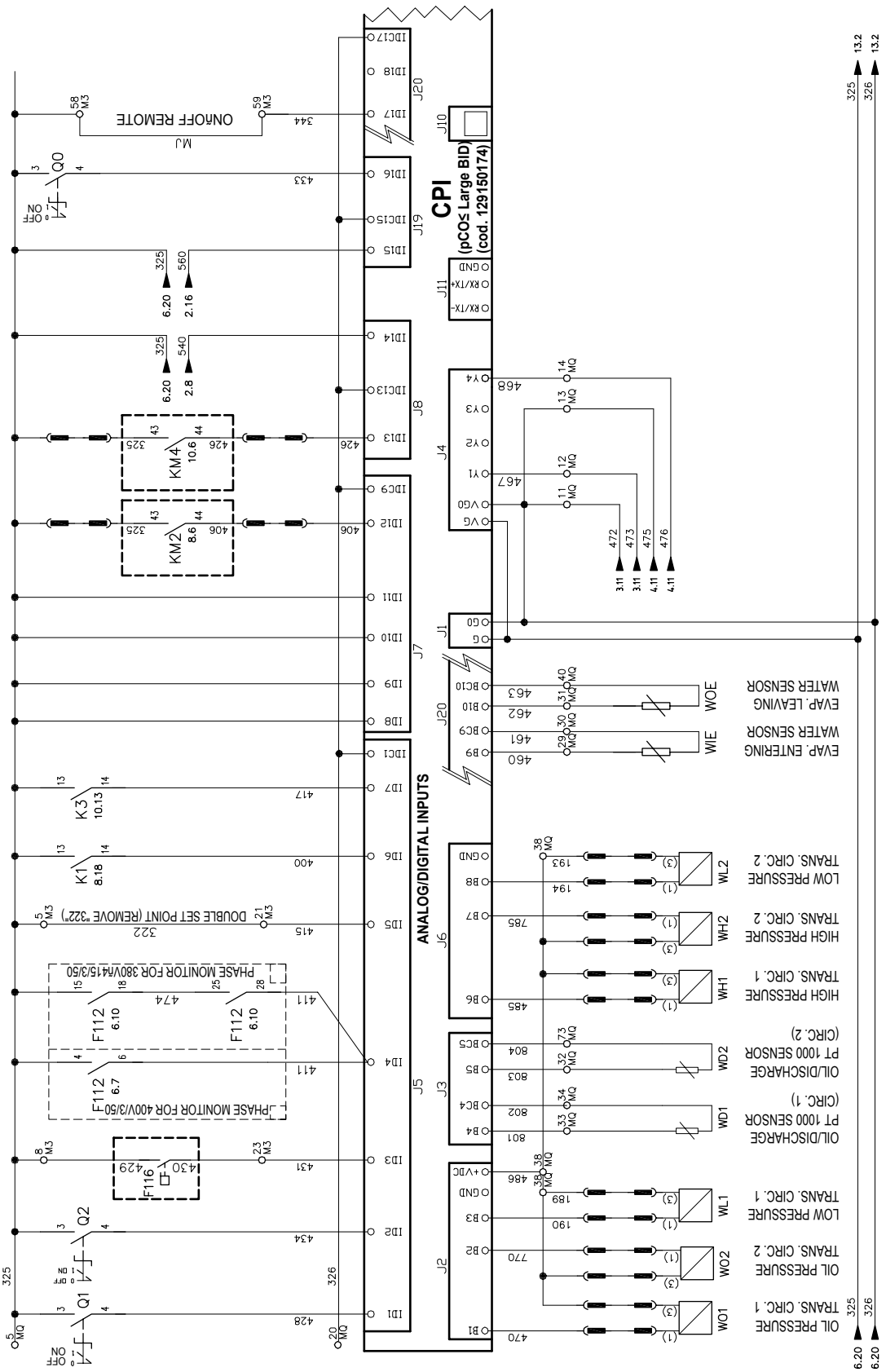
3.5.5 Unit Control Circuit Power Supply



3.5.6 Analog-Digital Inputs Board 1/2



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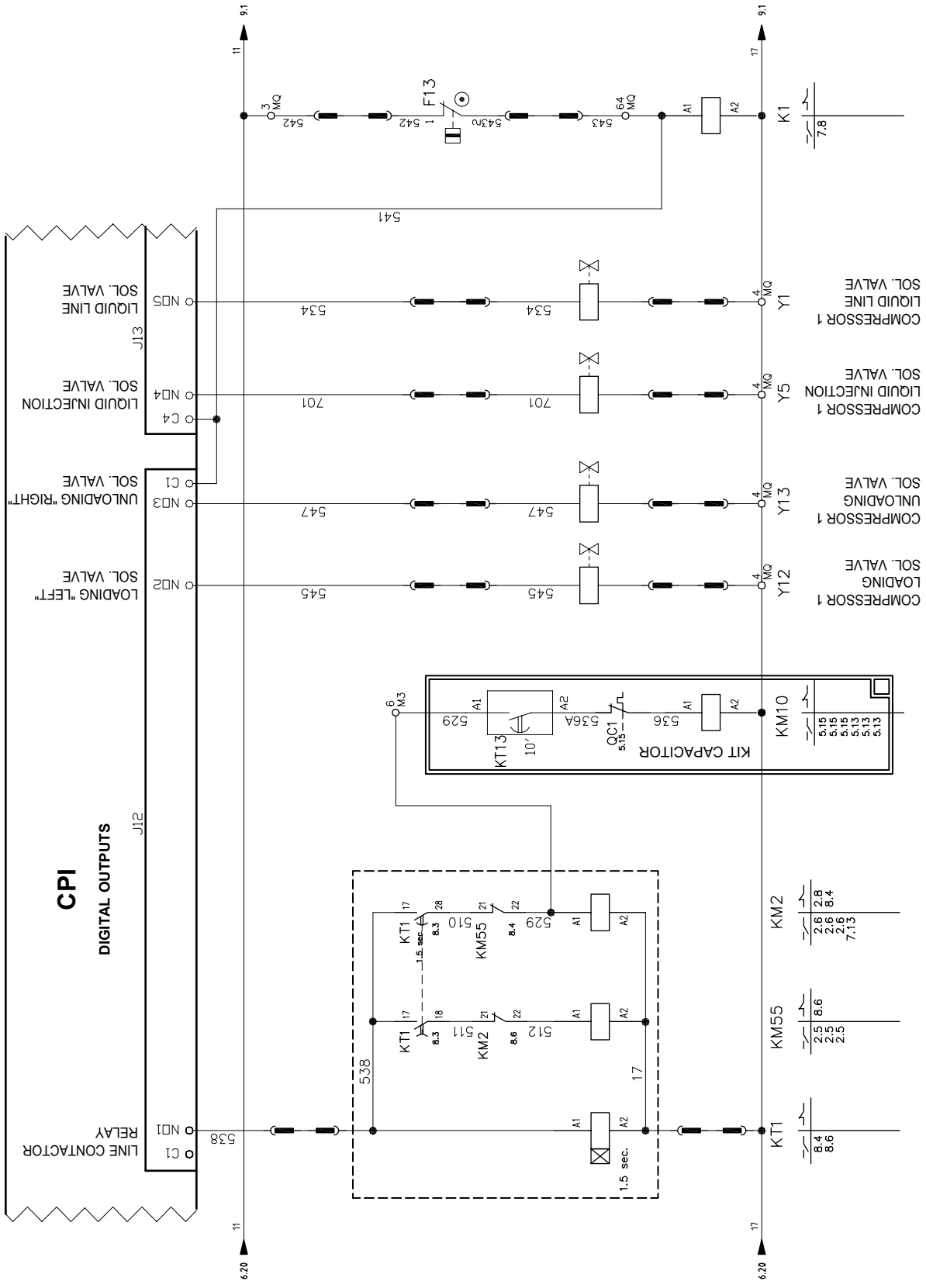
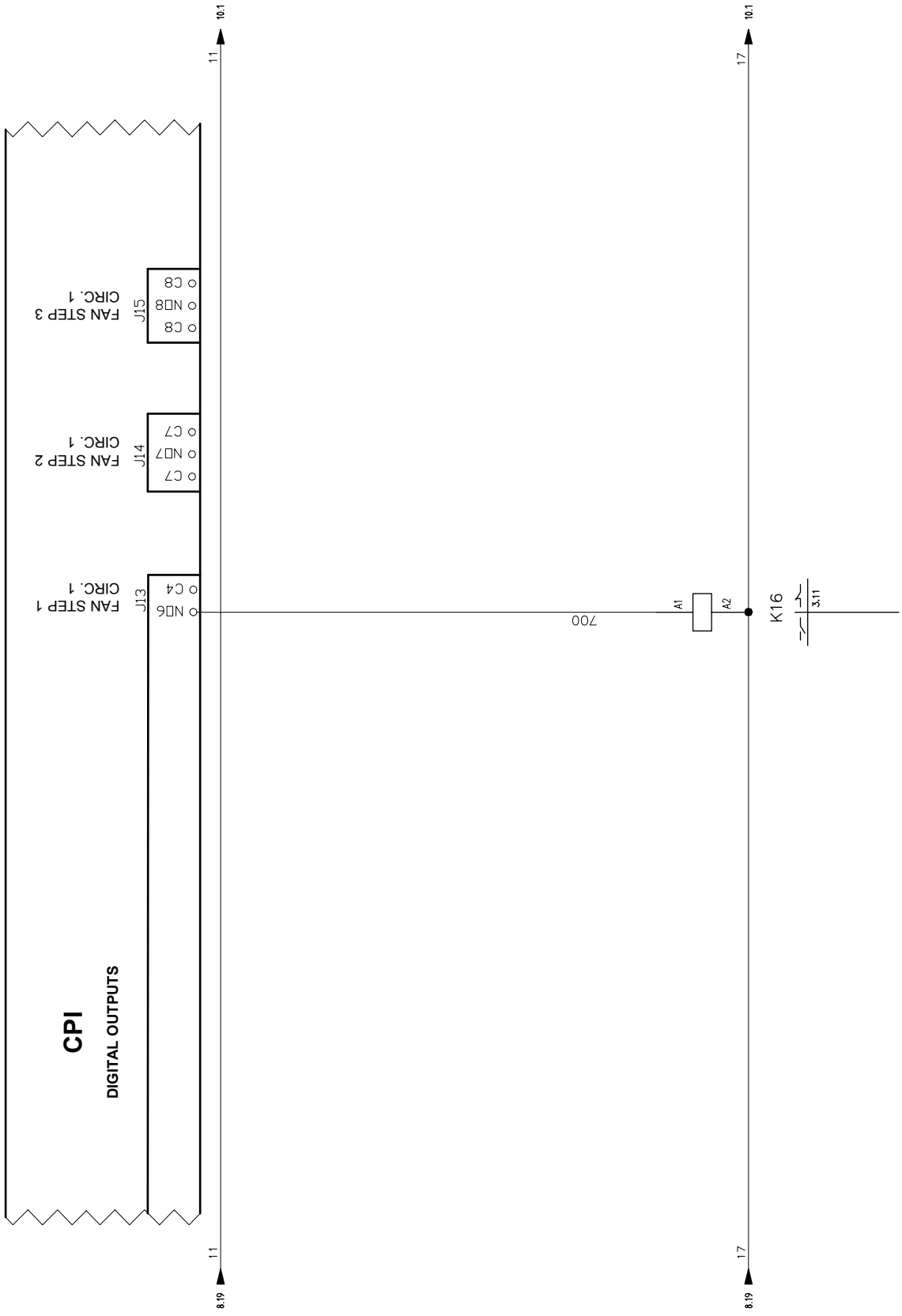
3.5.7 Compressor 1 Control



3.5.8 Fan Control Circuits 1



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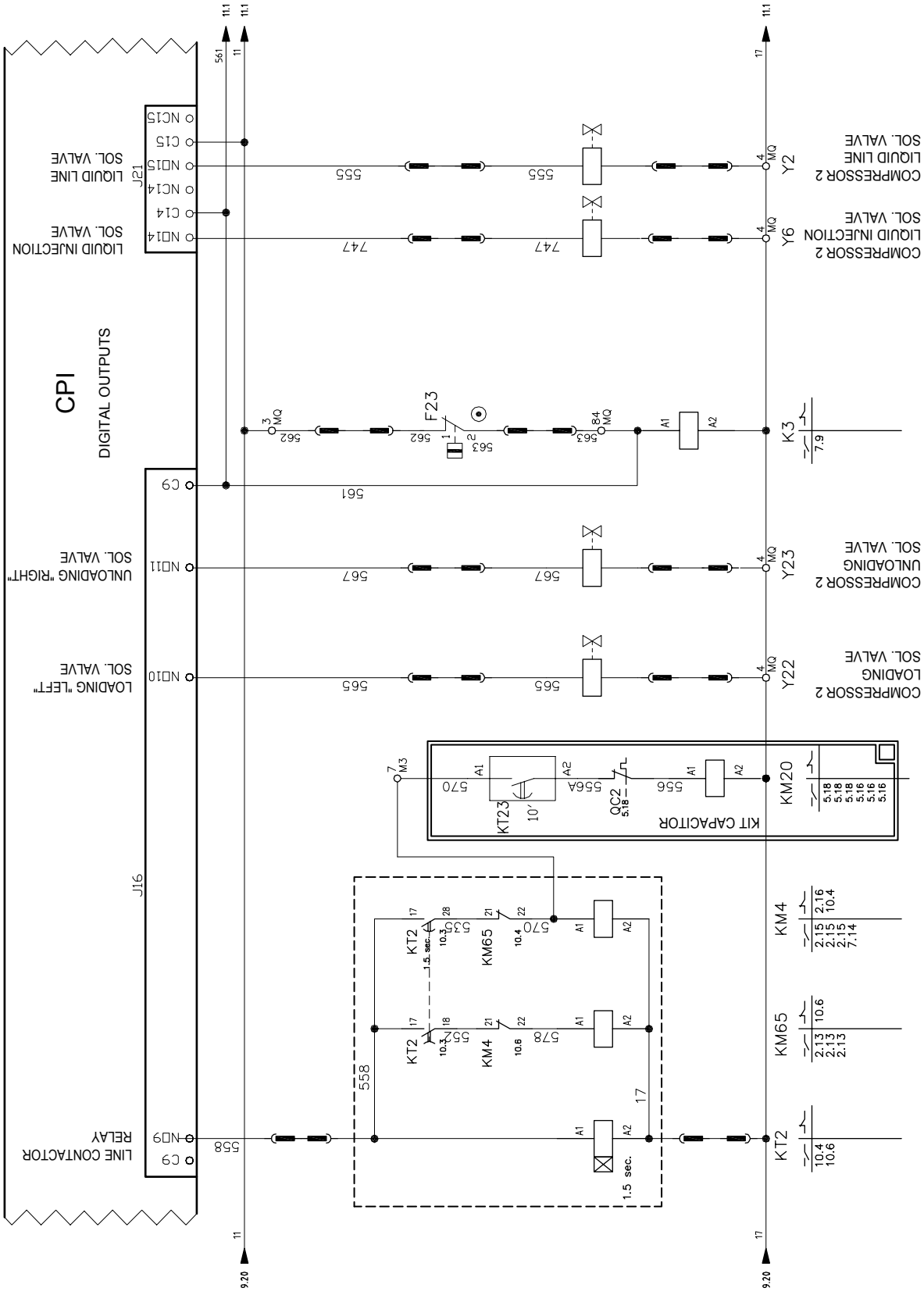
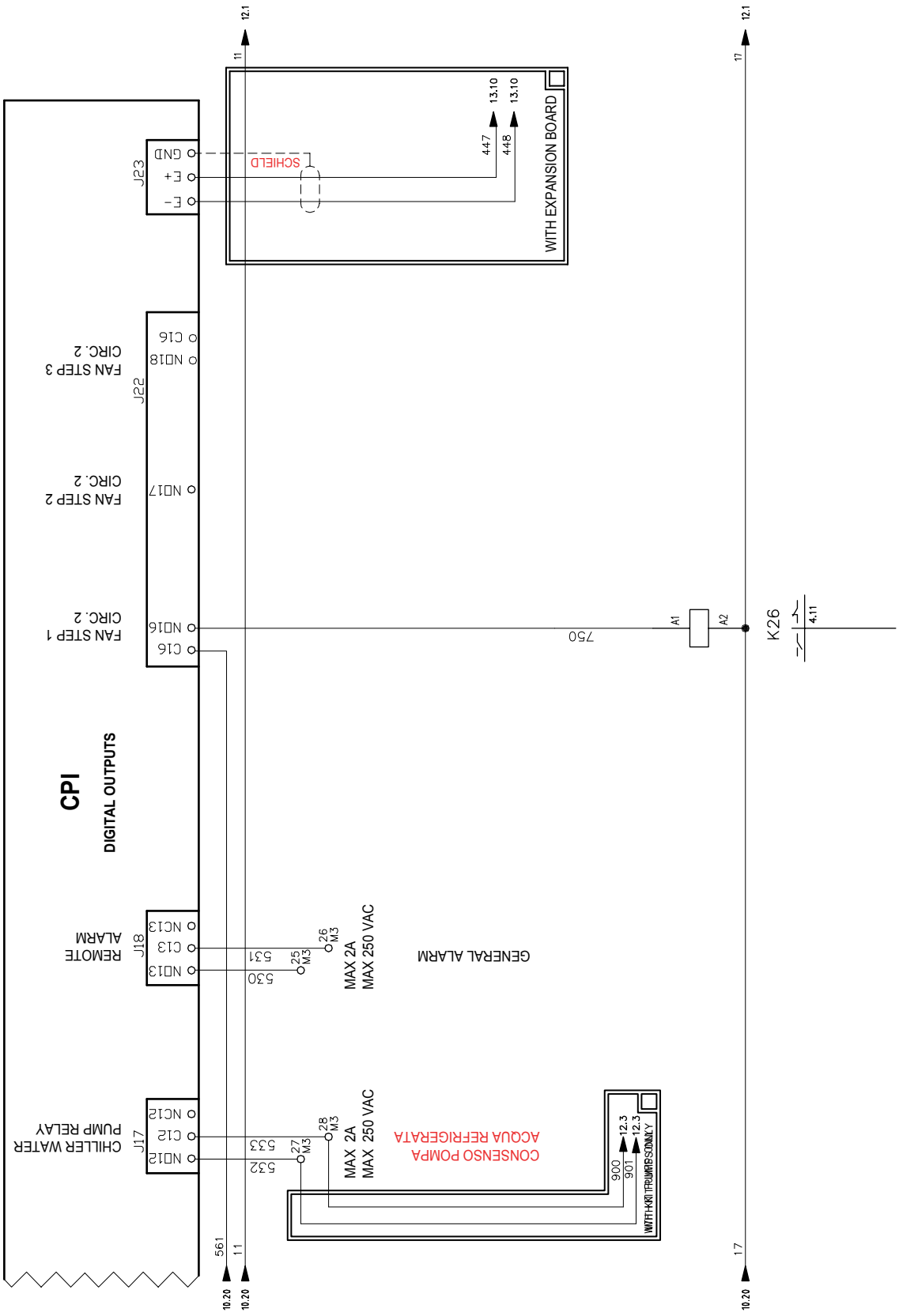
3.5.9 Compressor 2 Control Circuit



3.5.10 Fan Control Circuits 2



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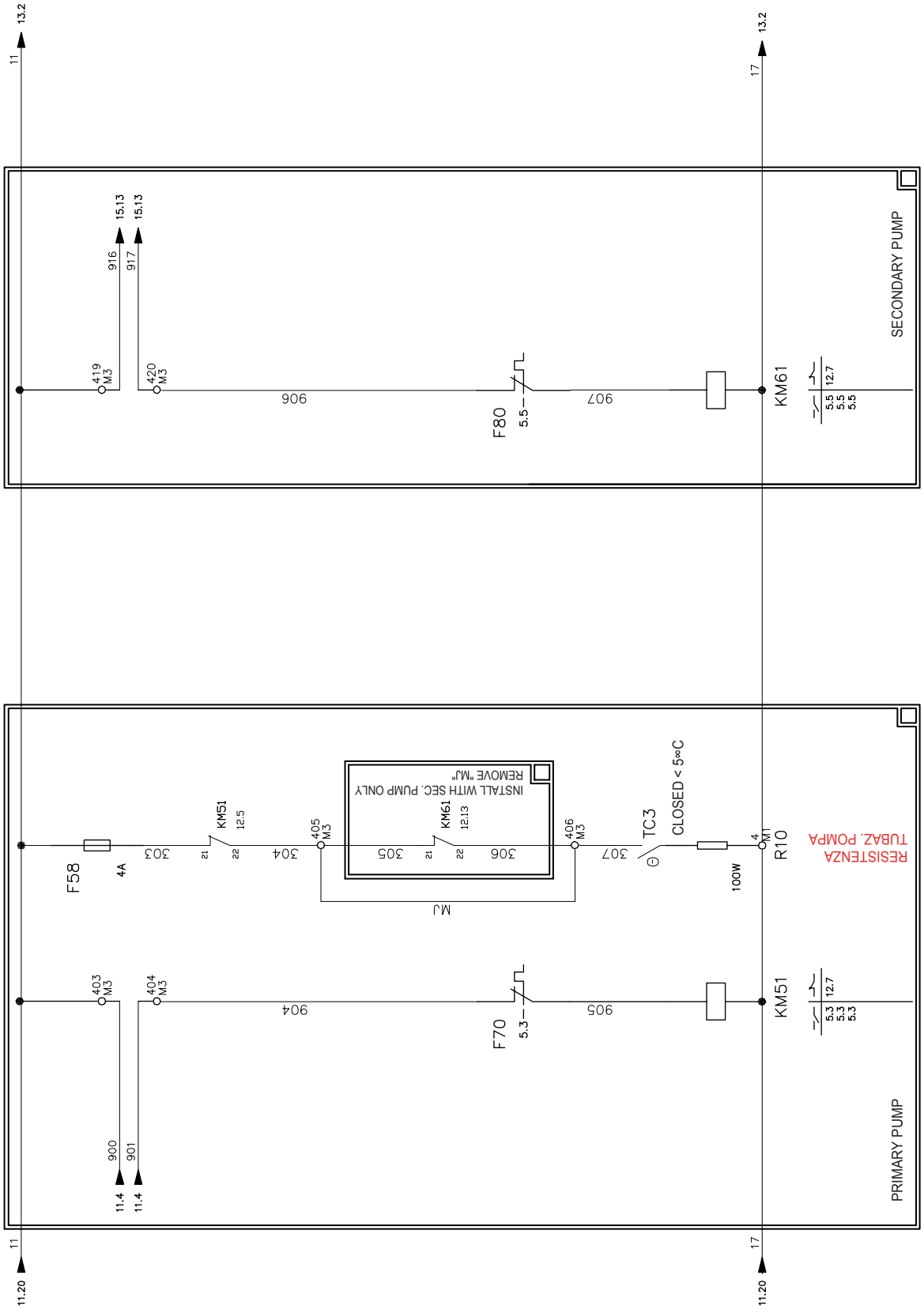
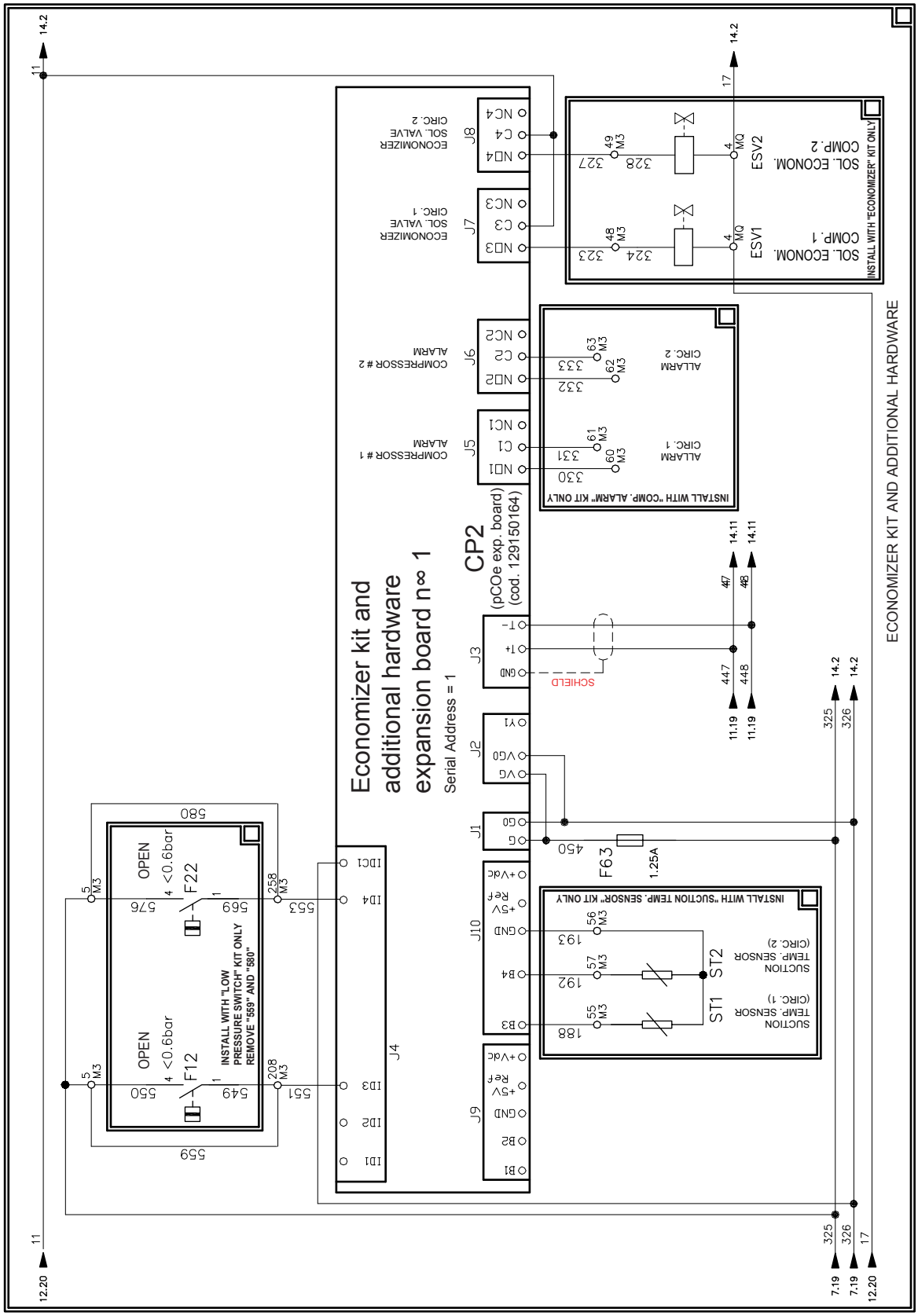
3.5.11 Pump Control



3.5.12 Economizer Expansion Board Kit



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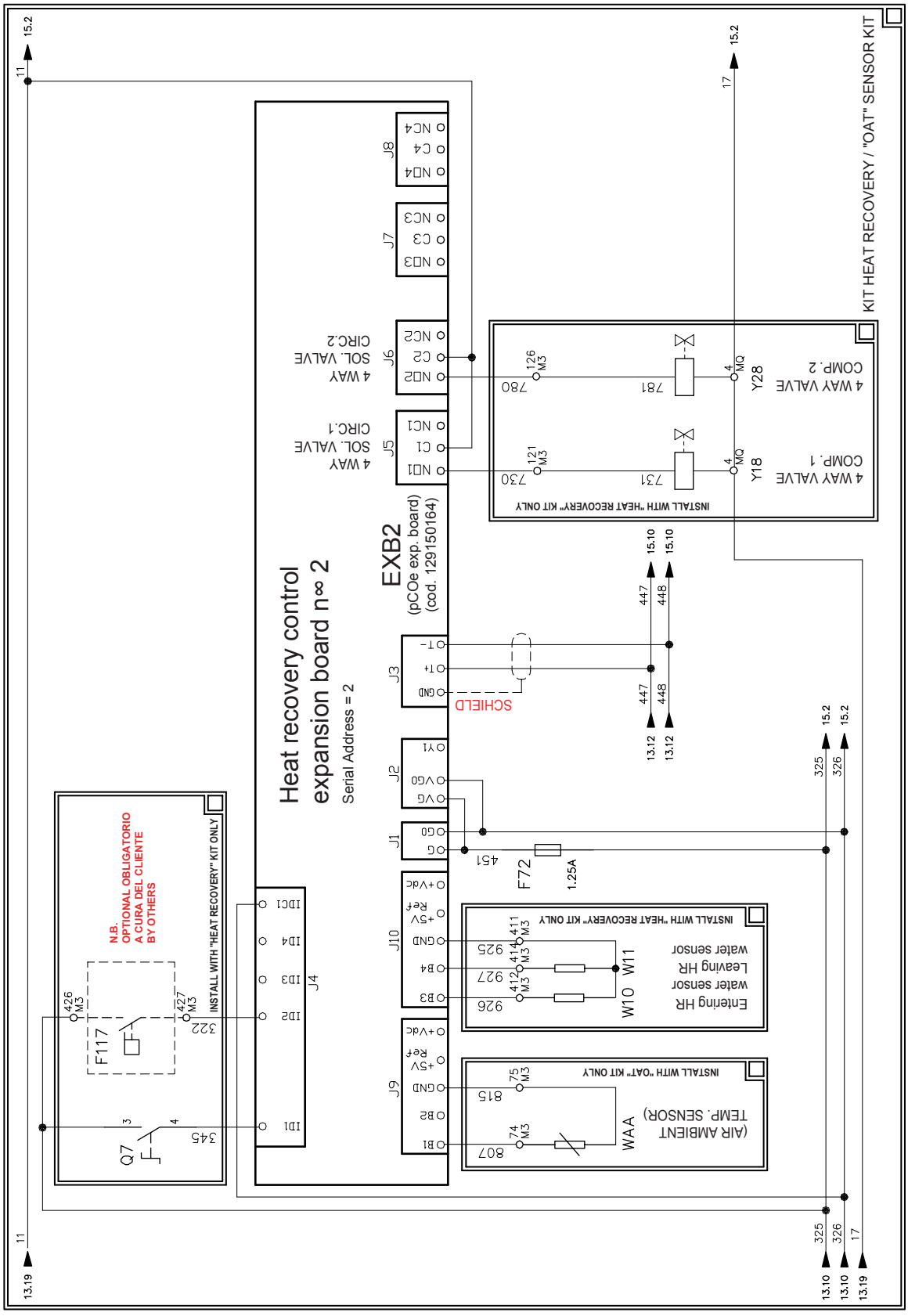
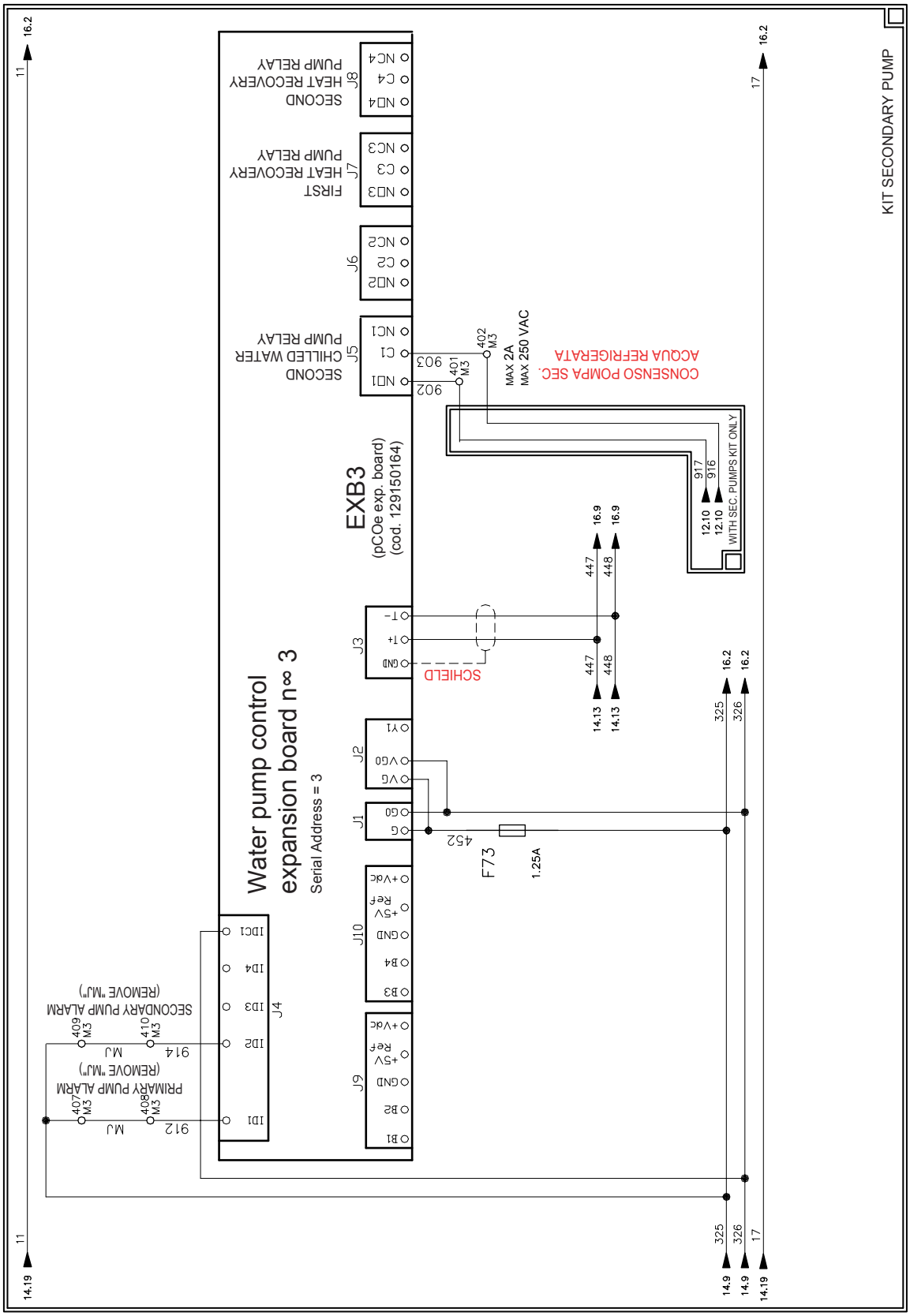
3.5.13 Heat Recovery Expansion Board Kit



3.5.14 Pump Control Expansion Board



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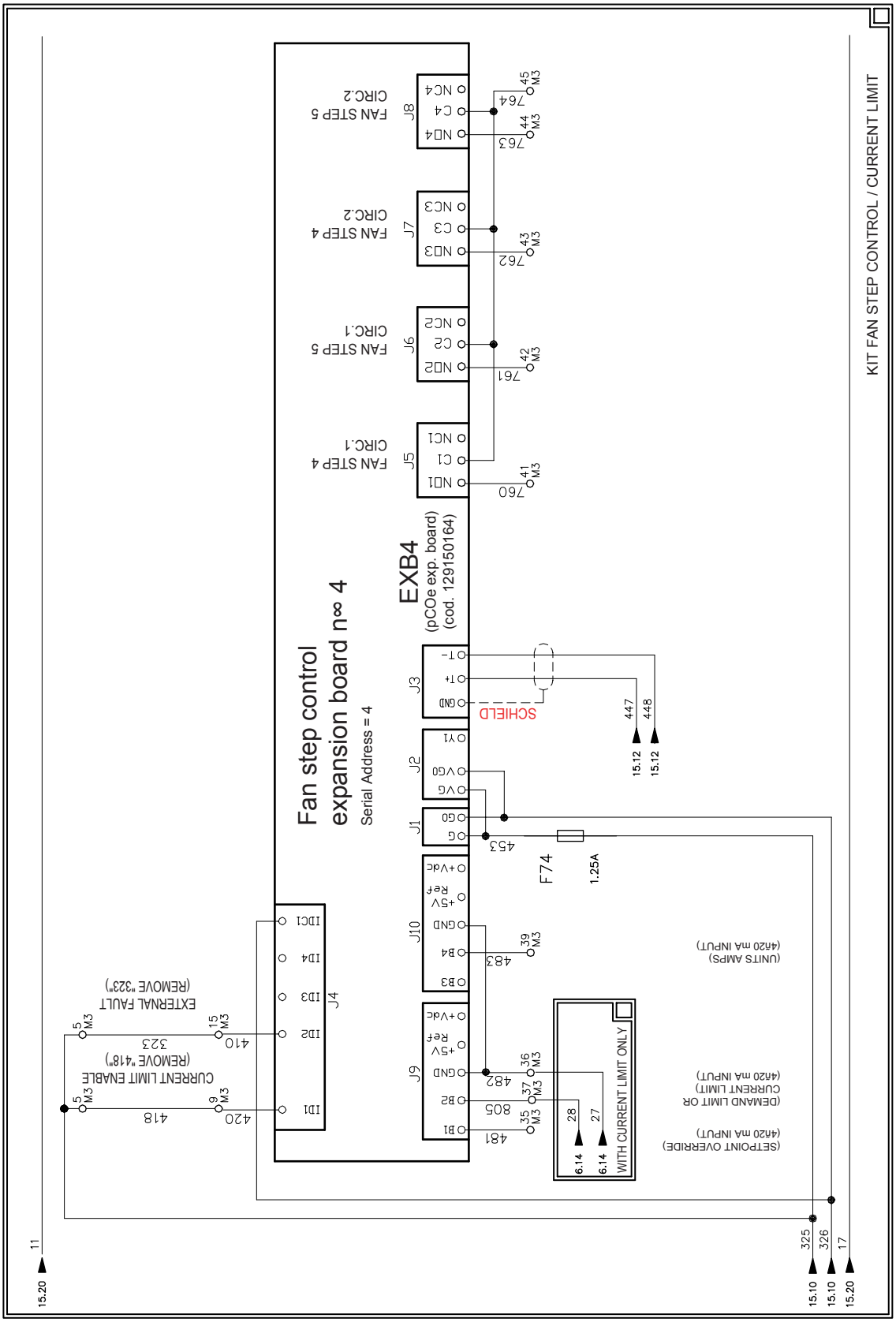
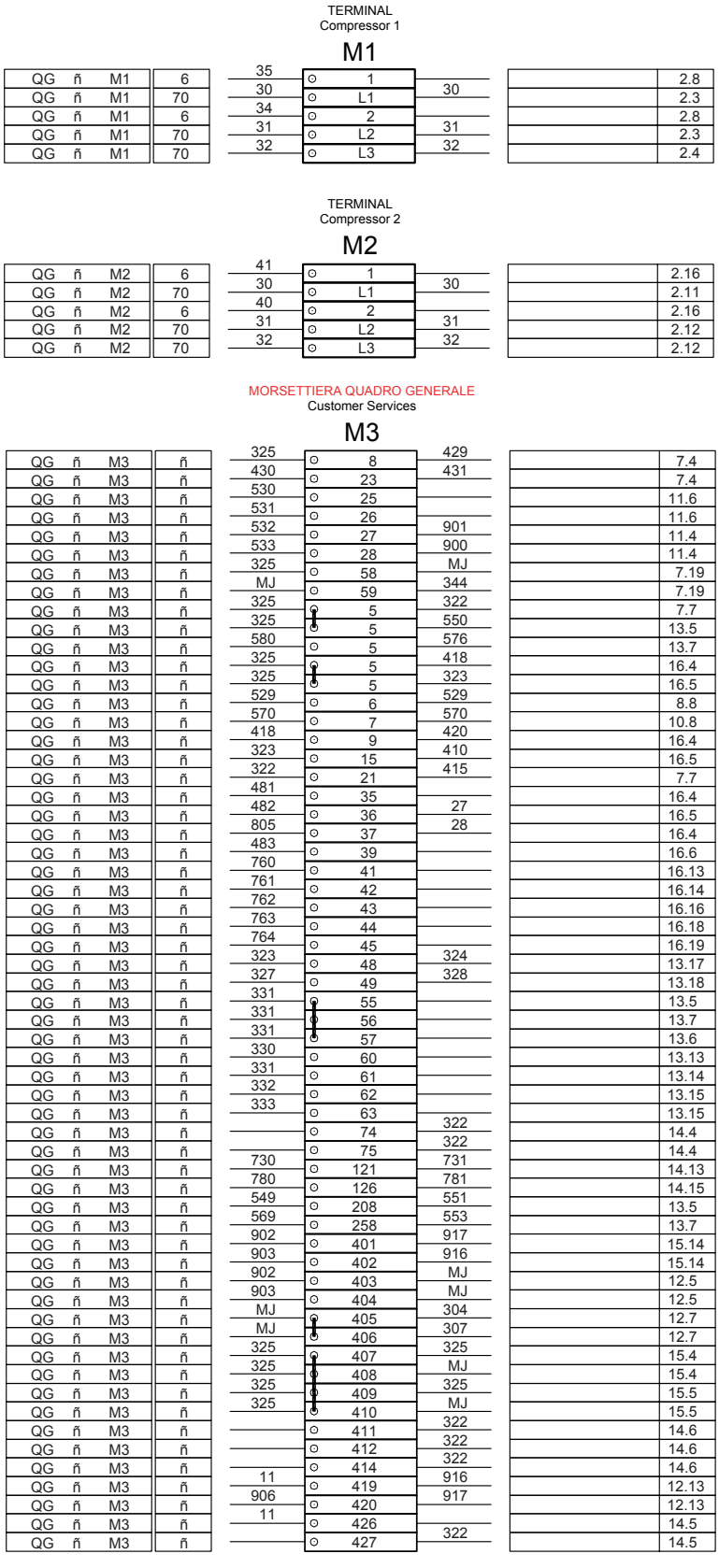
3.5.15 Fan Step Control Board



3.5.16 Terminals M1-M2-M3



1

3.5.17 Terminals MQ

MORSETTIERA QUADRO GENERALE
Compressor 1

MQ

QG ñ MQ	ñ	11	3	542		8.18
QG ñ MQ	ñ	325	3	562		10.13
QG ñ MQ	ñ	11	3	11		6.17
QG ñ MQ	ñ	17	4	17		8.10
QG ñ MQ	ñ	17	4	17		8.13
QG ñ MQ	ñ	17	4	17		10.16
QG ñ MQ	ñ	17	4	17		10.10
QG ñ MQ	ñ	17	4	17		10.11
QG ñ MQ	ñ	17	4	17		8.11
QG ñ MQ	ñ	17	4	17		6.17
QG ñ MQ	ñ	17	4	17		6.18
QG ñ MQ	ñ	17	4	17		13.17
QG ñ MQ	ñ	17	4	17		13.18
QG ñ MQ	ñ	17	4	17		14.14
QG ñ MQ	ñ	17	4	17		14.15
QG ñ MQ	ñ	17	4	17		8.14
QG ñ MQ	ñ	17	4	17		10.17
QG ñ MQ	ñ	325	5	325		7.1
QG ñ MQ	ñ	300	5	325		6.3
QG ñ MQ	ñ	359	5			6.14
QG ñ MQ	ñ	326	11	472		7.13
QG ñ MQ	ñ	467	12	473		7.14
QG ñ MQ	ñ	326	13	475		7.14
QG ñ MQ	ñ	468	14	476		7.15
QG ñ MQ	ñ	326	20	326		7.1
QG ñ MQ	ñ	321	20	326		6.4
QG ñ MQ	ñ	360	20			6.14
QG ñ MQ	ñ	460	29	460		7.10
QG ñ MQ	ñ	801	30	801		7.10
QG ñ MQ	ñ	462	31	462		7.10
QG ñ MQ	ñ	803	32	803		7.5
QG ñ MQ	ñ	801	33	801		7.4
QG ñ MQ	ñ	802	34	802		7.4
QG ñ MQ	ñ	486	38	486		7.3
QG ñ MQ	ñ	193	38	486		7.8
QG ñ MQ	ñ	189	38	486		7.3
QG ñ MQ	ñ	463	40	463		7.10
QG ñ MQ	ñ	308	47	309		6.18
QG ñ MQ	ñ	543	64	541		8.18
QG ñ MQ	ñ	804	73	804		7.5
QG ñ MQ	ñ	563	84	563		10.13

3.5.18 Legend

Item	Description
CP1	Analog digital inputs board
DVR1-2	Fan speed modulation
F1-2	Compressor fuses
F13-23	High pressure switch
F51-52	Compressor thermal relays
F59	Evaporator heater fuse
F60/62	Protection auxiliary circuit fuse
F100/200	Fan fuse
F112	Phase volt monitor
F116	Evaporator flow switch (not installed)
F120	Transformer T1 protection
F130	Phase voltage monitor protection
KM2-4-55-65	Compressor contactors
K1-3-16-26	Auxiliary relay
K12	ON-OFF remote unit auxiliary relay
KT13-23	Time delay relay
M1/2	Compressor motor
M11/17 21/27	Fan motor
MP1-2	Motor thermal protection
Q0	ON-OFF unit switch
Q1-2	ON-OFF compressor switch
Q10	Main switch
Q11	Emergency stop
Q12	Automatic circuit breaker
R1-2	Compressor crankase heater
R5	Evaporator heater
ST1-2	Suction temperature sensor
Y1-2	Liquid line solenoid valve
T1	230/24V transformer
Y5-6	Liquid injection solenoid valve
Y12/23	Unloader solenoid valve
WH1-2	High pressure transducer (0/30 Bar)
WIE	Entering evaporator water sensor
WD1-2	Discharge sensor
WL1-2	Low pressure transducer (-0.5/7 Bar)
WOE	Leaving evaporator water sensor
WO1-2	Oil pressure transducer (0/30 Bar)
W1-2	Compressor termistors

4 System Architecture

4.1 What Is in This Chapter?

Introduction

This part gives a general overview of the system architecture.

Overview

This chapter contains the following topics:

1

4.2 General Description

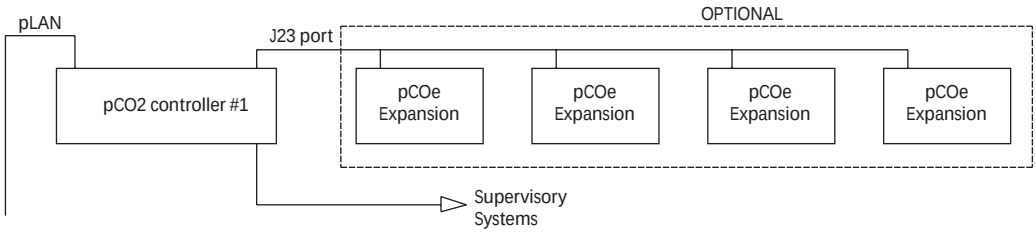
The configuration modular architecture is based on the use of the pCO2 control.

In particular, a base MicroTech II C+ controller (large version, built-in display, or, optionally, semi graphical additional display) is used to control the basic unit functions and to manage the two compressors.

Up to four expansion boards are used to add optional features to the control.

Drivers for electronic expansion valve are foreseen as an optional feature.

The overall architecture is shown in the figure below:



pCO² controllers, electronic expansion valves drivers and the additional display are connected using pLAN network of MicroTech II controls while pCOe expansion boards are connected to MicroTech II C+ controllers using the RS485 network dedicated to expansion.

4.3 Hardware Configuration

Board	Type	Function	Mandatory
pCO2	Large built in	Unit control Compressor 1 and 2	Y
Expansion board 1		Additional hardware for Compressor 1 and 2	N
Expansion board 2		Heat recovery or pump control	N
Expansion board 3		Water pump control	N
Expansion board 4		Additional fan steps	N
EEV driver 1	EVD200	EEV valve for circuit 1	N
EEV driver 2	EVD200	EEV valve for circuit 2	N
Additional display	PGD	Additional display	N

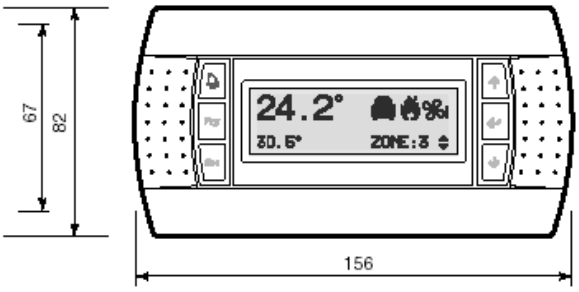
1

4.4 Control Panel

The Control Panel is constituted by a backlight display 4 lines by 20 characters with a 6 key keypad whose functions will be illustrated in the following.

This display can be built-in as a part of the master MicroTech II C+ controller (standard option), or it can be optionally a separate device based on the MicroTech II PGD serigraphic technology.

No setting is required for the built in display, while PGD device require addressing based on a procedure through keypad (see plan appendix for details).



4.5 Layout pCO² Controller

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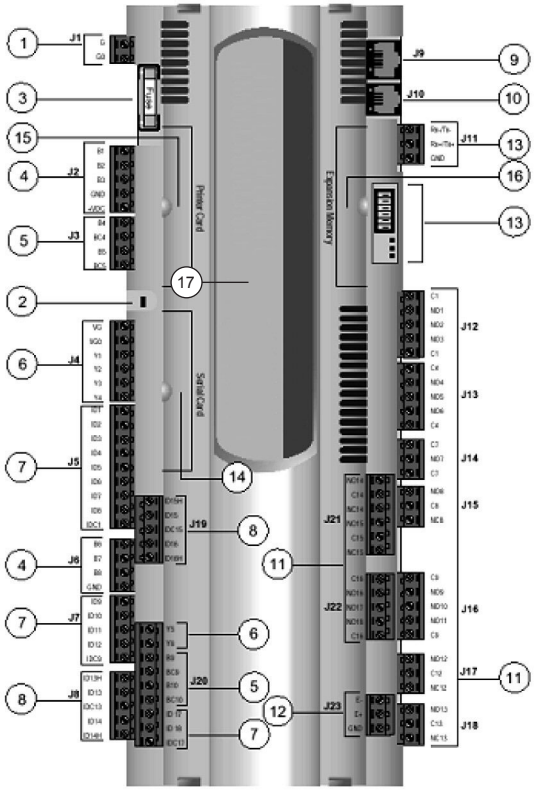
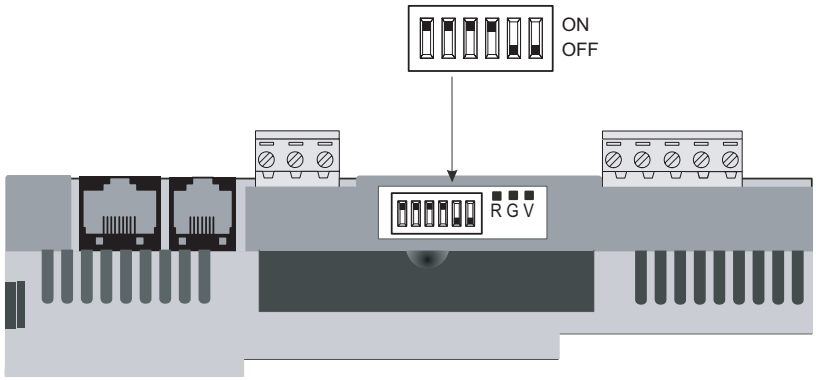
pCO² controller



1	Power supply G (+), G0 (-)
2	Status LED
3	Fuse 250Vac
4	Universal analog inputs (NTC, 0/1V, 0/10V,0/20mA, 4/20mA)
5	Passive analog inputs (NTC, PT1000, On- off)
6	Analog outputs 0/10V
7	24Vac/Vdc Digital inputs
8	230Vac or 24Vac/Vdc Digital inputs
9	Synoptic terminal connection
10	Standard terminal (and program download) connector
11	Digital outputs (relays)
12	Expansion board connection
13	pLAN connection and microswitches
14	Serial card connection
15	Printer card connection
16	Memory expansion connection
17	Built-in display

1

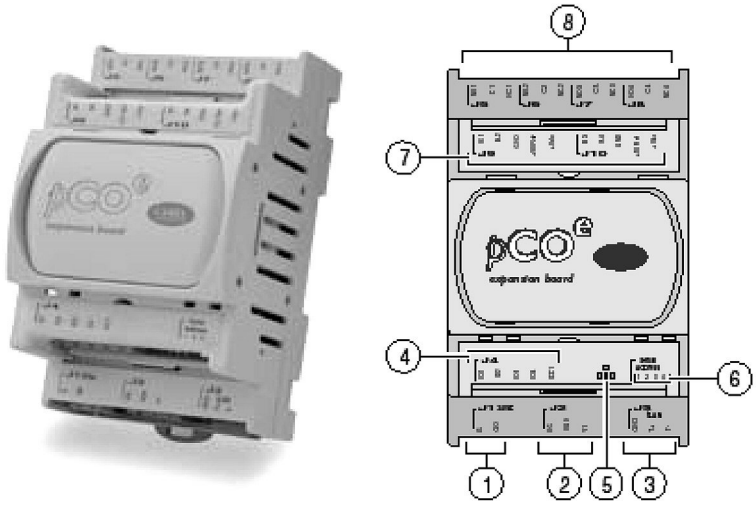
Address microswitches



4.6 Layout pCO² Expansion Driver

pCO² driver

The introduction of additional (optional) functionality in MTM architecture requires the use of expansion boards.



1	Power supply connector (G(+), G0 (-))
2	Analogue output 0 to 10 V
3	Network connector for expansions in RS485 (GND, T+, T-) or tLAN (GND, T+)
4	24 Vac/Vdc digital inputs
5	Yellow LED showing power supply voltage and 3 signalling LEDs
6	Serial address
7	Analogue inputs and probe supply
8	Relay digital outputs

This device needs to be addressed to ensure correct communication with controller via RS485 protocol. Addressing micro-switches are placed nearby status leds (refer to key 6).

Once the address is correctly set the expansion could be linked to pCO² controller.

The correct connection is achieved connecting J23 pin on the pCO² controller with J3 pin on the expansion board (note that expansion board connector is different from the controller one, but wires must be placed in the same positions of connectors). Expansion boards are only I/O extensions for the controller and don't need any software.

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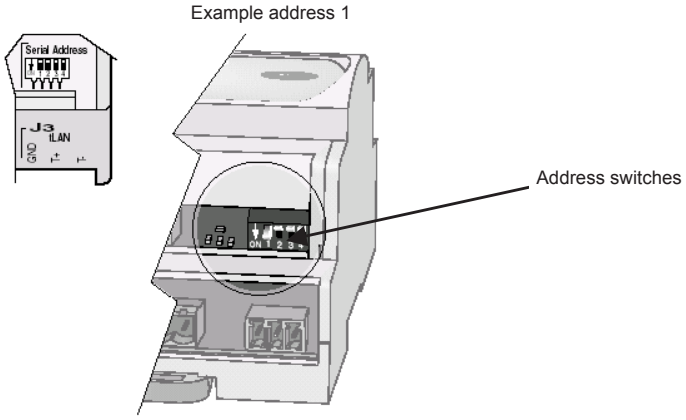
Detail switches



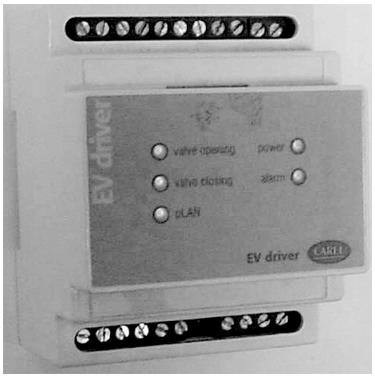
Meaning LED on driver

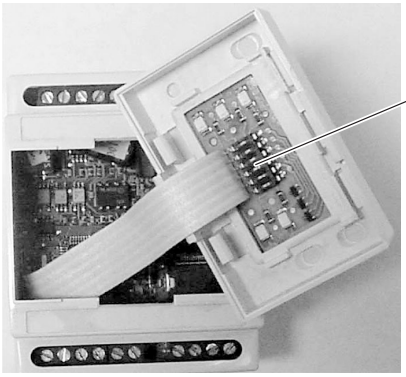
RED	YELLOW	GREEN	Meaning
-	-	ON	Active CAREL/tLAN supervisor protocol
-	ON	-	Probe error
ON	-	-	"I/O mismatch" error caused by the inhibition matrix
flashing	-	-	Lack of communication
-	-	-	Waiting for the system startup by the master (max. 30 s)

4.7 Layout EEV Driver

General description

The valve drivers contain the software for the control of the electronic expansion valve and are connected to the battery group that provides to close valve in case of power failure.





Normal conditions

Under normal conditions five(5) LED indicates:

- POWER: (yellow) if power ON. Remains OFF in case of battery operation
- OPEN: (green) Flashing when valve is opening. ON when valve is completely open.
- CLOSE: (green) Flashing when valve is closing. ON when valve is completely closed.
- Alarm: (red) ON or flashing in case of hardware alarm.
- pLAN: (green) ON during the normal working of pLAN.

Alarm situations

In presence of critical alarm situations, the combination of LED On identifies the alarm as shown below.

Highest priority is level 7. In the case more alarms occur is visualized that with higher priority.

Alarms that stop the system	**PRIORITY**	**LED OPEN**	**LED CLOSE**	**LED POWER**	**LED ALARM**
Eprom reading error	7	Off	Off	On	Flashing
Valve open in case of lack of supply	6	Flashing	Flashing	On	Flashing
At start up, wait for battery loading (parameter…….)	5	Off	On	Flashing	Flashing
Other alarms	**PRIORITY**	**LED OPEN**	**LED CLOSE**	**LED POWER**	**LED ERROR**
Motor connection error	4	Flashing	Flashing	On	On
Probe error	3	Off	Flashing	On	On
Eeprom writing error	2	-	-	On	On
Battery error	1	-	-	Flashing	On

pLAN	**LED pLAN**
Connection OK	On
Driver connection or address error = 0	Off
The Pco master does not answer	Flashing

1

4.8 Addressing of the Different Parts

Setting addresses

pLAN component	Microswitch					
	1	**2**	**3**	**4**	**5**	**6**
pCO1	**ON**	OFF	OFF	OFF	OFF	OFF
Driver 1	**ON**	**ON**	OFF	OFF	OFF	OFF
Driver 2	OFF	OFF	**ON**	OFF	OFF	OFF
Driver 3	**ON**	OFF	**ON**	OFF	OFF	OFF
Driver 4	OFF	**ON**	**ON**	OFF	OFF	OFF
Additional display	**ON**	**ON**	**ON**	OFF	OFF	OFF

RS485 component	Microswitch			
	1	**2**	**3**	**4**
Expansion board 1	**ON**	OFF	OFF	OFF
Expansion board 2	OFF	**ON**	OFF	OFF
Expansion board 3	**ON**	**ON**	OFF	OFF
Expansion board 4	OFF	OFF	**ON**	OFF

4.9 Identification of Software

Introduction

Unique control software is installed on Pco² controller, the unit controller is directly recognized on the basis of the pLAN address.

No software is installed on the expansion boards and on EEXV drivers (factory-installed software is used).

A pre-configuration procedure is available in each pCO² controller to recognize the whole network hardware configuration; the configuration is stored in the controller in a permanent memory and an alarm is generated if the hardware configuration would change during the operation (network or boards faults or added boards).

The pre-configuration procedure will automatically start at the first bootstrap of the unit. (after the software is installed); it is possible to activate it manually (network refresh) if network configuration changes, either if an expansion is permanently removed or if a new expansion is linked after the first software bootstrap.

Changes in the network configuration without network refresh will generate alarms, either if an expansion is removed (or faulted) or if a new expansion is added.

The configuration of functions requiring expansion boards are allowed only if expansion boards have been recognized in the network configuration.

Network refresh is required in case of a substitution of a pCO² controller.

Network refresh is not required in case of a substitution of a fault expansion board already used in the system.

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Version identification

To identify unambiguously the software class and version (also with respect to other control software) a string made of four fields is used:

C_1	C_2	C_3	F	M	M	m

An identification three-digit literal field ($C_1C_2C_3$) to identify the class of units for which the software is usable

C_1	Type of chiller	A	Air-cooled chiller
		W	Water-cooled chiller
C_2	Compressor type	S	Screw compressor
		R	Reciprocating compressor
		Z	Scroll compressor
		C	Centrifugal compressor
		T	Turbocor compressor
C_3	Evaporator	D	Direct axpansion evaporator
		R	Remote evaporator
		F	Flooded evaporator
F	Unit family	A	Frame 3100 family
		B	Frame 3200 family
		C	Frame 4 family
		U	Software applicable for all families
M	Major change		
M	Major change		
M	Minor change		

Within the scope of this document the first version is: **ASDU33A**

Any version is also identified by a release date.

The first three digits of the version string are never changed (otherwise a new unit class and consequently new software is released).

The fourth digit is changed if a family-specific feature is added and it is not applicable to other families; in this case the U value may not be used anymore and software for any family is released. When this happens the versions (**MMm**) digit is reset to the lower value.

The major version number (**MM**) is increased any time a completely new function is introduced in the software, or the minor version digit as reached the maximum allowed value (Z).

The minor version digit (m) is increased any time minor modification is introduced in the software without modifying its main working mode (this includes bugs fixing and minor interface modifications). A label is added in the case of engineering versions; it is made by a literal digit E followed by a two digit number for progressive identification.

Engineering versions are version preceding final release of the software; they may also for in-field validation. (Trial version).

New screens with Daikin data needed!

1

4.10 Description Connectors

Overview

This chapter contains the following topics:

4.10.1 Standard Version with Electronic Expansion Valve

Connector Pco² controller

The table below describes the connectors for the CP1 control board.

Block	Connection	Wiring diagram symbol	Description
J1	G GO		24 V power supply microprocessor board
J2	B	WO1	Oil pressure transmitter circuit 1
	B1	WO2	Oil pressure transmitter circuit 2
	B2		
	B3		
	GND		
	+VDC		
J3	B4 BC4	WD1	Oil discharge PT 1000 sensor circuit 1
	B5 BC5	WD2	Oil discharge PT 1000 sensor circuit 2
J4	VG		24 V power supply
	VGO		
	Y1		Only used with speedtrol control for circuit 1
	Y2		
	Y3		
	Y4		Only used with speedtrol control for circuit 2
J5	ID1	Q1	Internal protector compressor circuit 1
	ID2	Q2	Internal protector compressor circuit 2
	ID3	F116	Flow switch evaporator (field supply)
	ID4	F112	Phase reverse protector
	ID5		Double set point activation
	ID6	K1	Auxiliary contact
	ID7	K3	Auxiliary contact
	IDC1		24 V power supply
J6	B6	WH1	High pressure transmitter circuit 1
	B7	WH2	High pressure transmitter circuit 2
	B8	Not used	
	GND		

Block	Connection	Wiring diagram symbol	Description
J7	ID8		
	ID9		
	ID10		
	ID11		
	ID12	KM2	Compressor contactor circuit circuit 1
	IDC9		24 V power supply
J8	ID13	KM4	Compressor contactor circuit circuit 2
	IDC13		
	ID14	F51	Compressor terminal/thermal?? relay circuit 1
J9		Not used Not used	
J10			Terminal connector for display and download of software
J11	RX/TX- RX/TX+ GND		pLAN communication
J12	NO1	K1T	Line contactor relay circuit 1
	NO2	Y12	Loading left solenoid valve circuit 1
	NO3	Y13	Unloading right solenoid valve circuit 1
	C1		Power supply 220 V
J13	C4		Power supply 220 V
	NO4	Y5	Liquid injection solenoid valve circuit 1
	NO5	Not used	
	NO6	KM11	Fan step 1 circuit 1
J14	C7		Power supply 220 V
	NO7	KM12	Fan step 2 circuit 1
J15	C8		Power supply 220 V
	NO8	KM13, KM14	Fan step 3 circuit 1
J16	C9	Not used	
	CO9	KT2	Line contactor relay circuit 2
	NO10	Y22	Loading left solenoid valve circuit 2
	NO11	Y23	Unloading right solenoid valve circuit 2
J17	NO12		Chiller water pump relay (Max 2A 250 V)
	C12		
	NC12	Not used	
J18	NO13		General alarm (Max 2A 250 V)
	C13		
	NC13		Not used
J19	ID15	F52	Compressor terminal/thermal?? relay circuit 2
	IDC15	QO	ON/OFF switch
	ID16		

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Block	Connection	Wiring diagram symbol	Description
J20	B9	WIE	Evaporator inlet water sensor
	BC9		
	B10	WOE	Evaporator outlet water sensor
	BC10		
	ID17	Not used	Remote start/stop
	ID18		
	IDC17		
J21	NO14	Y6	Liquid injection solenoid valve circuit 2
	C14		
	NC14	Not used	
	NO15	Not used	
	C15	Not used	
	NC15	Not used	
J22	C16		
	NO16	KM21	Fanstep 1 circuit 2
	NO17	KM22	Fanstep 2 circuit 2
	NO18	KM23/24	Fanstep 3 circuit 3
J23	E-		Connection to expansion boards
	E+		
	GND		

Connector expansion board 1

The table below describes the connectors for the Economizer kit and additional hardware expansion board n°1 (serial address 1).

Block	Connection	Wiring diagram symbol	Description
J1	G		24 V power supply microprocessor board
	GO		
J2	VG		
	VGO		
	Y1	Not used	
J3	GND		
	T+		Connection to CP1 control board (J23)
	T-		
J4	IDC1		
	ID4	F22	Low pressure switch circuit 2 (only when low pressure kit is installed)
	ID3	F12	Low pressure switch circuit 1 (only when low pressure kit is installed)
	ID2		
	ID1		
J5	NO1	Y18	Alarm circuit 1 (only if compressor kit installed)
	C1		
	NC1	Not used	
J6	NO2		Alarm circuit 2 (only if compressor kit installed)
	C2		
	NC2	Not used	
J7	NO3	ESV1	Economizer circuit 1 (only if economizer is installed)
	C3		
	NC3		
J8	NO4	ESV2	Economizer circuit 2 (only if economizer is installed)
	C4		
	NC4		
J9	B1	Not used	
	B2	Not used	
	GND	Not used	
	+5 Vref	Not used	
	+Vdc	Not used	
J10	B3	Not used	
	B4	Not used	
	GND	Not used	
	+5 Vref	Not used	
	+Vdc	Not used	

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Connector expansion board 2

The table below describes the connectors for the Heat recovery control expansion board n°2.

Block	Connection	Wiring diagram symbol	Description
J1	G GO		24 V power supply microprocessor board
J2	VG		
	VGO		
	Y1	Not used	
J3	GND		
	T+		Connection to CP1 control board (J23)
	T-		
J4	IDC1		
	ID4	Not used	
	ID3	Not used	
	ID2	F117	Flow switch condenser side (only if heat recovery installed)
	ID1	Q7	Selector switch normal or heat recovery operation (only if heat recovery installed)
J5	NO1	Y18	4 way valve circuit 1
	C1		
	NC1	Not used	
J6	NO2	Y28	4 way valve circuit 2
	C2		
	NC2	Not used	
J7	NO3	Not used	
	C3	Not used	
	NC3	Not used	
J8	NO4	Not used	
	C4	Not used	
	NC4	Not used	
J9	B1	WAA	Ambient temperature sensor (only if OAT kit is installed)
	B2	Not used	
	GND		
	+5 Vref	Not used	
	+Vdc	Not used	
J10	B3	W10	Entering heat recovery water sensor (only if heat recovery installed)
	B4	W11	Leaving heat recovery water sensor (only if heat recovery installed)
	GND		
	+5 Vref	Not used	
	+Vdc	Not used	

Connector expansion board 3

The table below describes the connectors for the Waterpump control expansion board n°3 (serial address 3).

Block	Connection	Wiring diagram symbol	Description
J1	G		24 V power supply microprocessor board
	GO		
J2	VG		
	VGO		
	Y1	Not used	
J3	GND		
	T+		Connection to CP1 control board (J23)
	T-		
J4	IDC1		
	ID4	Not used	
	ID3	Not used	
	ID2		Second pump alarm
	ID1		First pump alarm
J5	NO1	Y18	Second evaporator water pump relay
	C1		
	NC1	Not used	
J6	NO2	Not used	
	C2	Not used	
	NC2	Not used	
J7	NO3	Not used	
	C3	Not used	
	NC3	Not used	
J8	NO4	Not used	
	C4	Not used	
	NC4	Not used	
J9	B1	Not used	
	B2	Not used	
	GND	Not used	
	+5 Vref	Not used	
	+Vdc	Not used	
J10	B3	Not used	
	B4	Not used	
	GND	Not used	
	+5 Vref	Not used	
	+Vdc	Not used	

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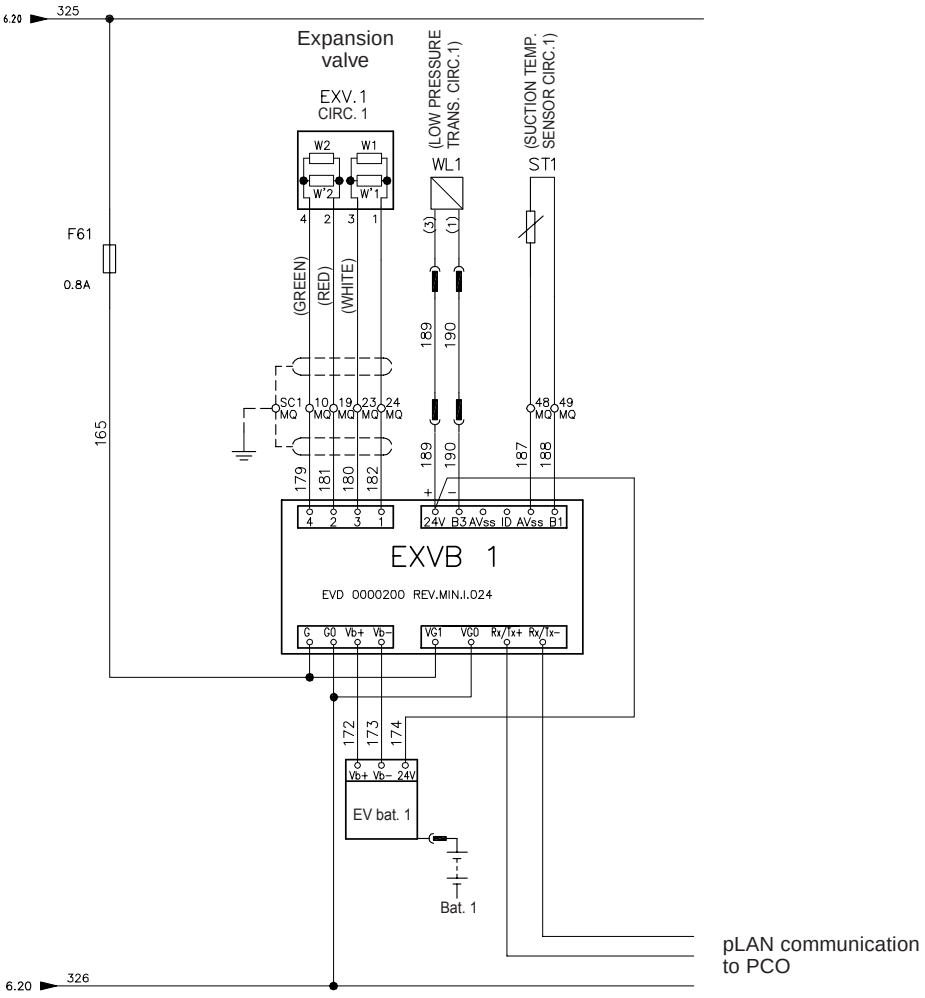
Connector expansion board 4

The table below describes the connectors for the Fan step control expansion board n°4 (serial address 4).

Block	Connection	Wiring diagram symbol	Description
J1	G GO		24 V power supply microprocessor board
J2	VG		
	VGO		
	Y1	Not used	
J3	GND		
	T+		Connection to CP1 control board (J23)
	T-		
J4	IDC1		
	ID4	Not used	
	ID3	Not used	
	ID2		External fault indication
	ID1		Current limit enable
J5	NO1		Fan step 4 circuit 1
	C1		
	NC1	Not used	
J6	NO2		Fan step 5 circuit 1
	C2		
	NC2	Not used	
J7	NO3		Fan step 4 circuit 2
	C3		
	NC3	Not used	
J8	NO4		Fan step 5 circuit 2
	C4		
	NC4	Not used	
J9	B1		Set point override (4-20mA)
	B2		Demand limit (4-20mA)
	GND		
	+5 Vref	Not used	
	+Vdc	Not used	
J10	B3	Not used	
	B4		Unit amps (4-20mA)
	GND	Not used	
	+5 Vref	Not used	
	+Vdc	Not used	

Electronic expansion valve driver

The table below describes the connectors for the EEV driver.



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4.10.2 Standard Version with Thermostatic Expansion Valve

Connector Pco² controller

The table below describes the connectors for the CP1 control board.

Block	Connection	Wiring diagram symbol	Description
J1	G GO		24 V power supply microprocessor board
J2	B1	WO1	Oil pressure transmitter circuit 1
	B2	WO2	Oil pressure transmitter circuit 2
	B3	WL1	Low pressure transmitter circuit 1
	GND		
	+VDC		
J3	B4 BC4	WD1	Oil discharge PT 1000 sensor circuit 1
	B5 BC5	WD2	Oil discharge PT 1000 sensor circuit 2
J4	VG		24 V power supply
	VGO		
	Y1		Only used with speedtrol control for circuit 1
	Y2		
	Y3		
	Y4		Only used with speedtrol control for circuit 2
J5	ID1	Q1	Internal protector compressor circuit 1
	ID2	Q2	Internal protector compressor circuit 2
	ID3	F116	Flow switch evaporator (field supply)
	ID4	F112	Phase reverse protector
	ID5		Double set point activation
	ID6	K1	Auxiliary contact
	ID7	K3	Auxiliary contact
	IDC1		24 V power supply
J6	B6	WH1	High pressure transmitter circuit 1
	B7	WH2	High pressure transmitter circuit 2
	B8	WL2	Low pressure transmitter circuit 2
	GND		
J7	ID8		
	ID9		
	ID10		
	ID11		
	ID12	KM2	Compressor contactor circuit circuit 1
	IDC9		24 V power supply
J8	ID13	KM4	Compressor contactor circuit circuit 2
	IDC13		
	ID14	F51	Compressor terminal/thermal?? relay circuit 1
J9		Not used Not used	
J10			Terminal connector for display and download of software

Block	Connection	Wiring diagram symbol	Description
J11	RX/TX- RX/TX+ GND		pLAN communication
J12	NO1	K1T	Line contactor relay circuit 1
	NO2	Y12	Loading left solenoid valve circuit 1
	NO3	Y13	Unloading right solenoid valve circuit 1
	C1		Power supply 220 V
J13	C4		Power supply 220 V
	NO4	Y5	Liquid injection solenoid valve circuit 1
	NO5	Y1	Liquid line solenoid valve circuit 1
	NO6	KM11	Fan step 1 circuit 1
J14	C7		Power supply 220 V
	NO7	KM12	Fan step 2 circuit 1
J15	C8		Power supply 220 V
	NO8	KM13, KM14	Fan step 3 circuit 1
J16	C9		
	CO9	KT2	Line contactor relay circuit 2
	NO10	Y22	Loading left solenoid valve circuit 2
	NO11	Y23	Unloading right solenoid valve circuit 2
J17	NO12		Chiller water pump relay (Max 2A 250 V)
	C12		
	NC12	Not used	
J18	NO13		General alarm (Max 2A 250 V)
	C13		
	NC13		Not used
J19	ID15	F52	Compressor terminal/thermal?? relay circuit 2
	IDC15	QO	ON/OFF switch
	ID16		
J20	B9	WIE	Evaporator inlet water sensor
	BC9		
	B10	WOE	Evaporator outlet water sensor
	BC10		
	ID17	Not used	Remote start/stop
	ID18		
	IDC17		
J21	NO14	Y6	Liquid injection solenoid valve circuit 2
	C14		
	NC14	Not used	
	NO15	Y2	Liquid solenoid valve circuit 2
	C15	Not used	
	NC15	Not used	
J22	C16		
	NO16	KM21	Fanstep 1 circuit 2
	NO17	KM22	Fanstep 2 circuit 2
	NO18	KM23/24	Fanstep 3 circuit 3

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Block	Connection	Wiring diagram symbol	Description
J23	E-		Connection to expansion boards
	E+		
	GND		

Connector expansion board 1

The table below describes the connectors for the Economizer kit and additional hardware expansion board n°1 (serial address 1).

Block	Connection	Wiring diagram symbol	Description
J1	G GO		24 V power supply microprocessor board
J2	VG		
	CGO		
	Y1	Not used	
J3	GND		
	T+		Connection to CP1 control board (J23)
	T-		
J4	IDC1		
	ID4	F22	Low pressure switch circuit 2 (only when low pressure kit is installed)
	ID3	F12	Low pressure switch circuit 1 (only when low pressure kit is installed)
	ID2		
	ID1		
J5	NO1	Y18	Alarm circuit 1 (only if compressor kit installed)
	C1		
	NC1	Not used	
J6	NO2		Alarm circuit 2 (only if compressor kit installed)
	C2		
	NC2	Not used	
J7	NO3	ESV1	Economizer circuit 1 (only if economizer is installed)
	C3		
	NC3		
J8	NO4	ESV2	Economizer circuit 2 (only if economizer is installed)
	C4		
	NC4		
J9	B1	Not used	
	B2	Not used	
	GND	Not used	
	+5 Vref	Not used	
	+Vdc	Not used	
J10	B3	ST1	Suction sensor circuit 1(only with suction sensor kit)
	B4	ST2	Suction sensor circuit 2 (only with suction sensor kit)
	GND		
	+5 Vref	Not used	
	+Vdc	Not used	

1

Connector expansion board 2

The table below describes the connectors for the Heat recovery control expansion board n°2.

Block	Connection	Wiring diagram symbol	Description
J1	G GO		24 V power supply microprocessor board
J2	VG		
	VGO		
	Y1	Not used	
J3	GND		
	T+		Connection to CP1 control board (J23)
	T-		
J4	IDC1		
	ID4	Not used	
	ID3	Not used	
	ID2	F117	Flow switch condenser side (only if heat recovery installed)
	ID1	Q7	Selector switch normal or heat recovery operation (only if heat recovery installed)
J5	NO1	Y18	4 way valve circuit 1
	C1		
	NC1	Not used	
J6	NO2	Y28	4 way valve circuit 2
	C2		
	NC2	Not used	
J7	NO3	Not used	
	C3	Not used	
	NC3	Not used	
J8	NO4	Not used	
	C4	Not used	
	NC4	Not used	
J9	B1	WAA	Ambient temperature sensor (only if OAT kit is installed)
	B2	Not used	
	GND		
	+5 Vref	Not used	
	+Vdc	Not used	
J10	B3	W10	Entering heat recovery water sensor (only if heat recovery installed)
	B4	W11	Leaving heat recovery water sensor (only if heat recovery installed)
	GND		
	+5 Vref	Not used	
	+Vdc	Not used	

Connector expansion board 3

The table below describes the connectors for the Waterpump control expansion board n°3 (serial address 3).

Block	Connection	Wiring diagram symbol	Description
J1	G		24 V power supply microprocessor board
	GO		
J2	VG		
	VGO		
	Y1	Not used	
J3	GND		
	T+		Connection to CP1 control board (J23)
	T-		
J4	IDC1		
	ID4	Not used	
	ID3	Not used	
	ID2		Second pump alarm
	ID1		First pump alarm
J5	NO1	Y18	Second evaporator water pump relay
	C1		
	NC1	Not used	
J6	NO2	Not used	
	C2	Not used	
	NC2	Not used	
J7	NO3	Not used	
	C3	Not used	
	NC3	Not used	
J8	NO4	Not used	
	C4	Not used	
	NC4	Not used	
J9	B1	Not used	
	B2	Not used	
	GND	Not used	
	+5 Vref	Not used	
	+Vdc	Not used	
J10	B3	Not used	
	B4	Not used	
	GND	Not used	
	+5 Vref	Not used	
	+Vdc	Not used	

1

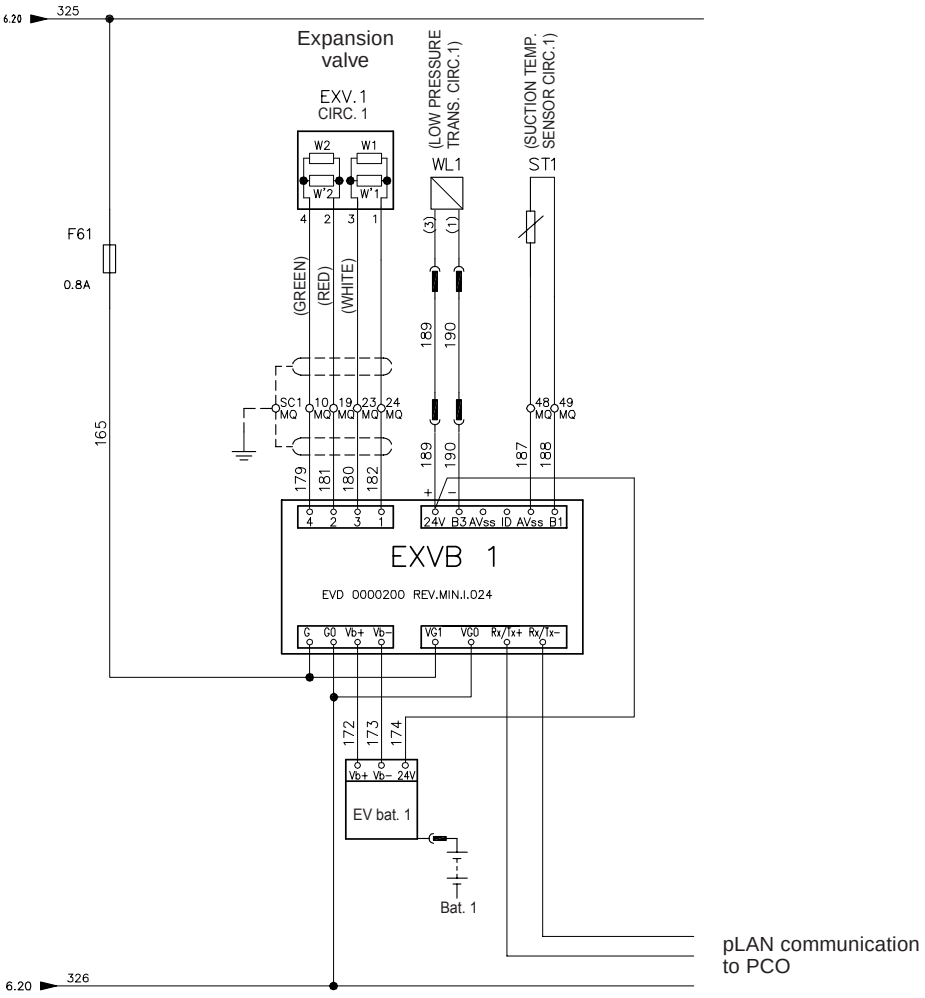
Connector expansion board 4

The table below describes the connectors for the Fan step control expansion board n°4 (serial address 4).

Block	Connection	Wiring diagram symbol	Description
J1	G GO		24 V power supply microprocessor board
J2	VG		
	VGO		
	Y1	Not used	
J3	GND		
	T+		Connection to CP1 control board (J23)
	T-		
J4	IDC1		
	ID4	Not used	
	ID3	Not used	
	ID2		External fault indication
	ID1		Current limit enable
J5	NO1		Fan step 4 circuit 1
	C1		
	NC1	Not used	
J6	NO2		Fan step 5 circuit 1
	C2		
	NC2	Not used	
J7	NO3		Fan step 4 circuit 2
	C3		
	NC3	Not used	
J8	NO4		Fan step 5 circuit 2
	C4		
	NC4	Not used	
J9	B1		Set point override (4-20mA)
	B2		Demand limit (4-20mA)
	GND		
	+5 Vref	Not used	
	+Vdc	Not used	
J10	B3	Not used	
	B4		Unit amps (4-20mA)
	GND	Not used	
	+5 Vref	Not used	
	+Vdc	Not used	

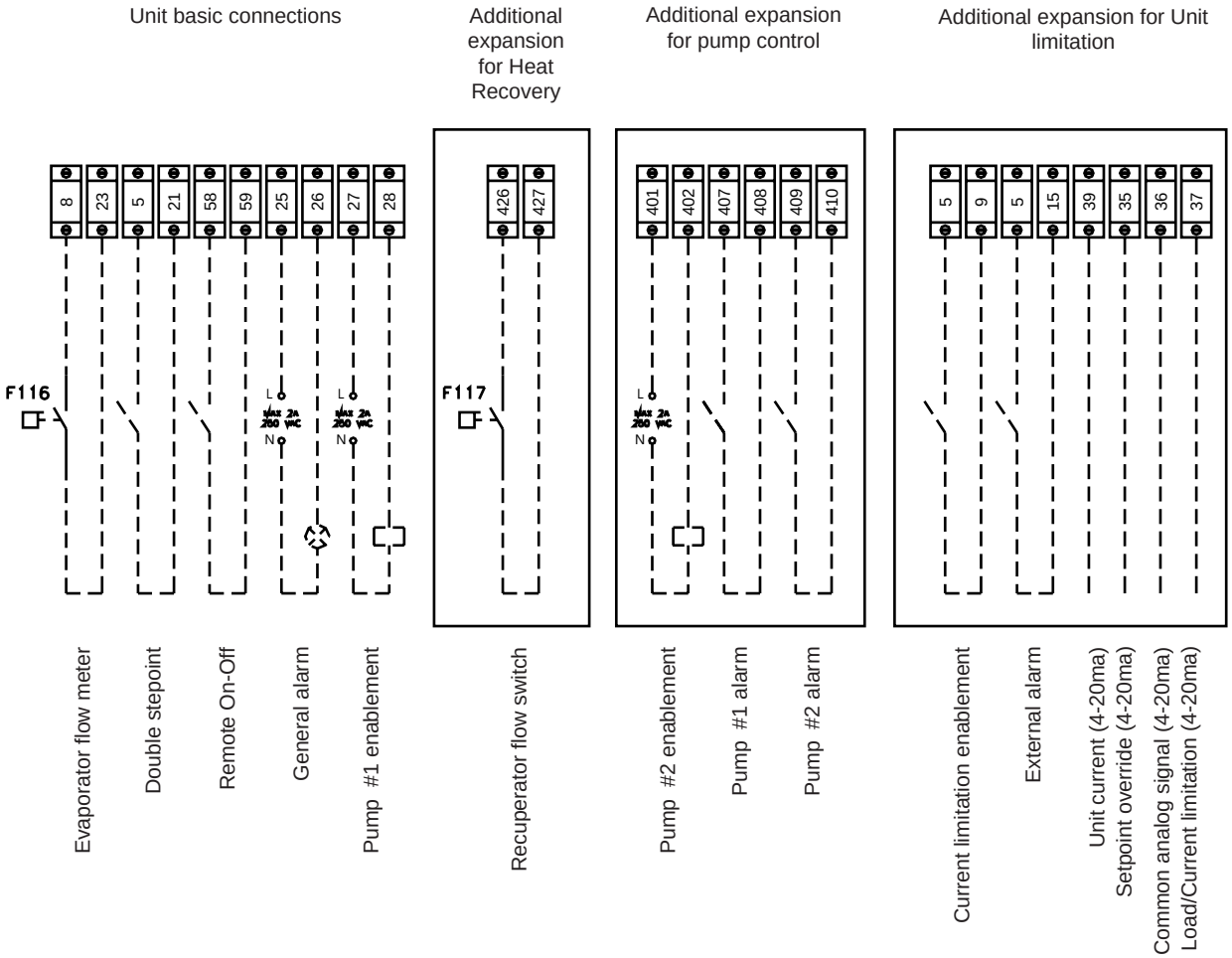
Electronic expansion valve driver

The table below describes the connectors for the EEV driver.



1

4.11 Field Wiring for the Interface M3 Terminal Boards



Part 2
Functional Description

Introduction

This part gives more detailed information on the functions and controls of the unit. This information is used as background information for troubleshooting. An extensive overview of the functioning of the controller is also given in this part. Knowledge of the controller is essential to gather information prior to servicing and troubleshooting.

What is in this part?

This part contains the following chapters:

1 Operation Range

1.1 What Is in This Chapter?

Introduction

This chapter contains information on the functions used to control the system. Understanding these functions is vital when diagnosing a malfunction that is related to the functional control.

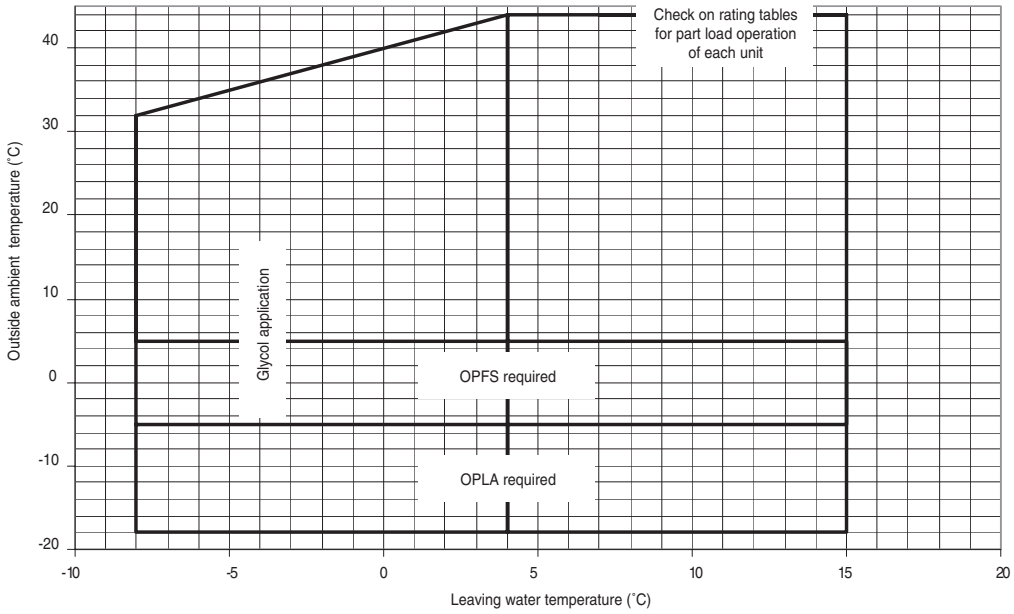
Overview

This chapter contains the following topics:

1.2 Operational Range: EWAD-AJYNN

Operational range

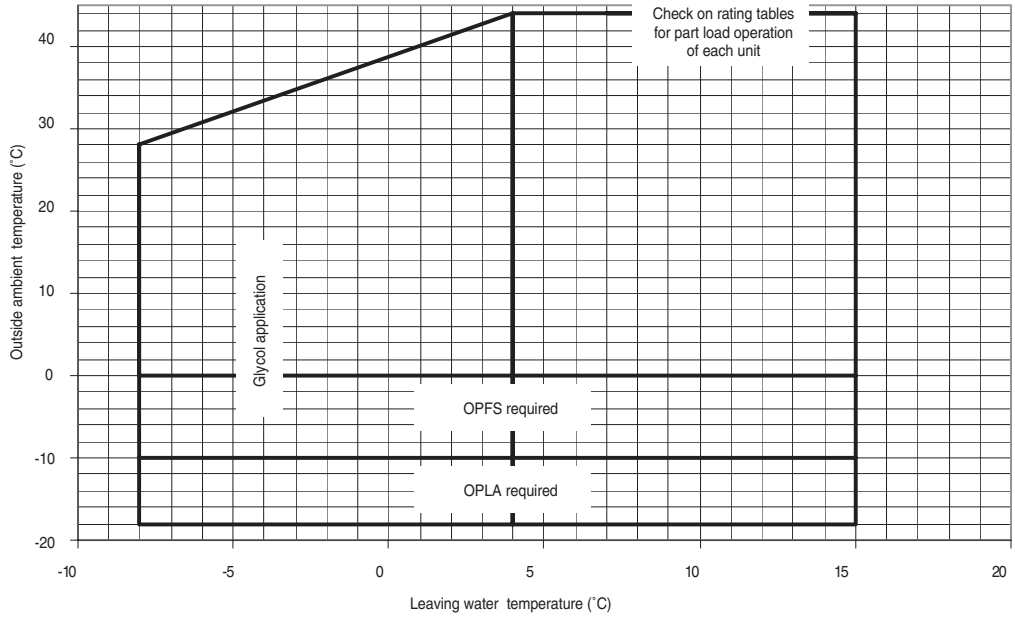
The illustration below shows the operational range of EWAD-AJYNN.



1.3 Operational Range: EWAD-AJYNN+OPLN

Operational range

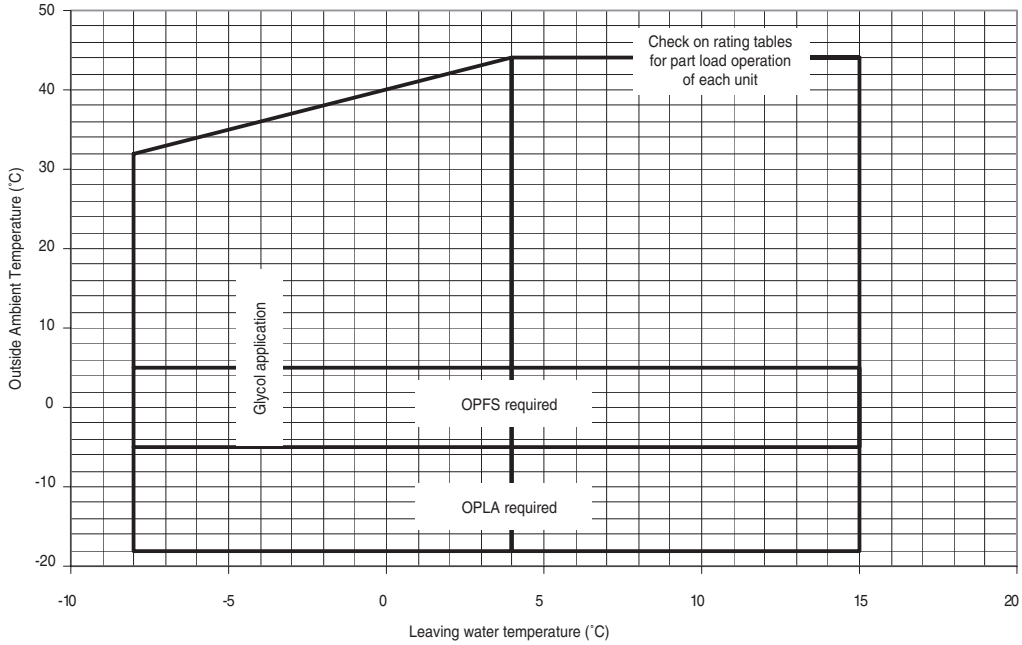
The illustration below shows the operational range of EWAD-AJYNN+OPLN.



1.4 Operational Range: EWAD-AJYNN/Q

Operational range

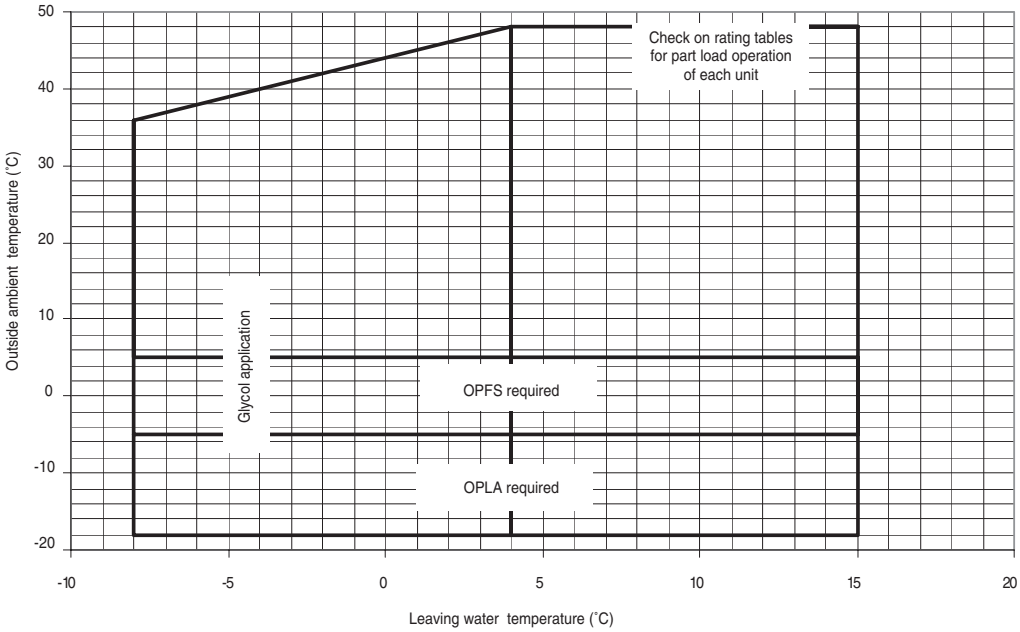
The illustration below shows the operational range of EWAD-AJYNN/Q.



1.5 Operational Range: EWAD-AJYNN/A

Operational range

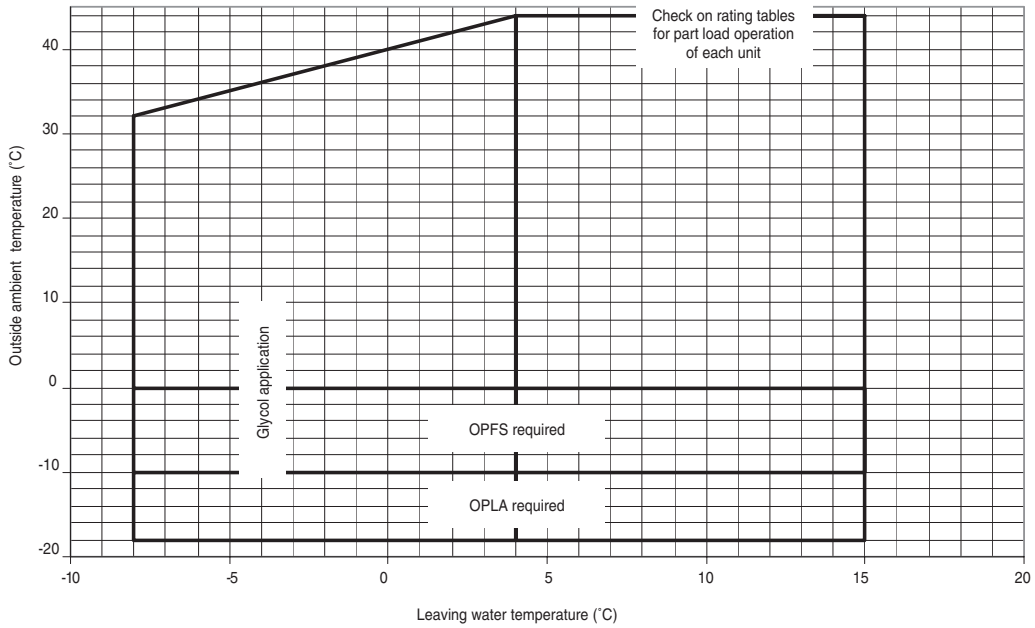
The illustration below shows the operational range of EWAD-AJYNN/A.



1.6 Operational Range: EWAD-AJYNN/A+OPLN

Operational range

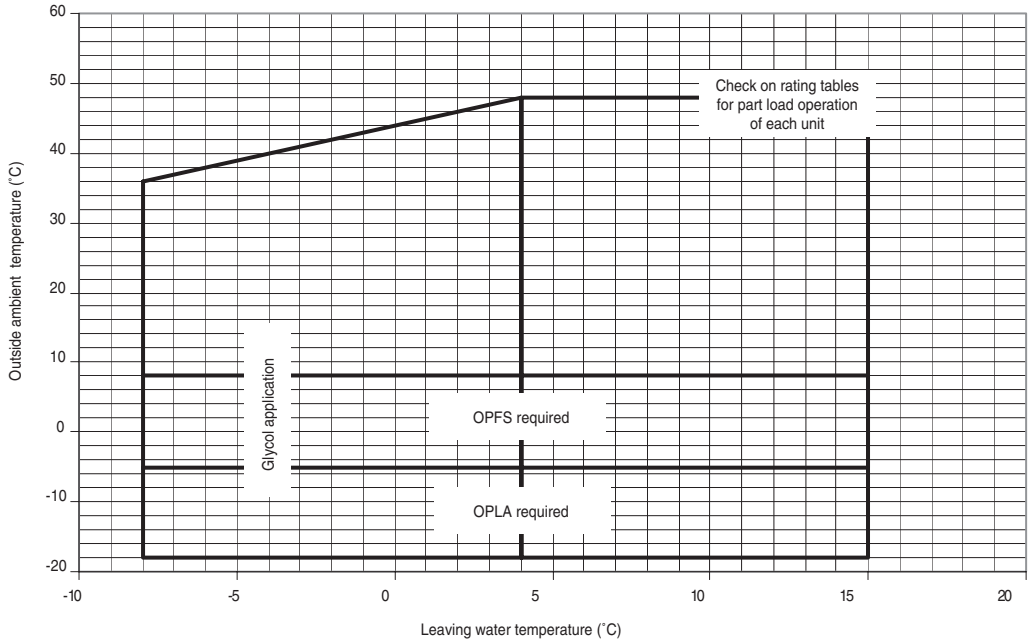
The illustration below shows the operational range of EWAD-AJYNN/A+OPLN.



1.7 Operational Range: EWAD-AJYNN/H

Operational range

The illustration below shows the operational range of EEWAD-AJYNN/H.



2

2 The Digital Controller

2.1 What Is in This Chapter?

Introduction

This chapter gives more detailed information about the controller and the software. Understanding these functions is vital when diagnosing a malfunction, which is related to system architecture or software.

Overview

This chapter contains the following topics:

2.2 Controller Menus

Overview

This chapter contains the following topics:

2.2.1 Main Screen

2.2.2 Alarm Menu

Main screen

Active menu

Indication current fault.

LOG menu

- History of last 10 faults.
- Possible to see operation.
- Condition of the unit at the moment of the failure.

2.2.3 View Menu

Main screen

```
UNIT
COMPRESSOR
I / O
```

Unit menu

```
STATUS
WATER
EVAP
```

1 Status menu

```
DATE                          HOUR
UNIT        STATUS            □ □
CONDITION   UNIT
SETPOINT    SOURCE
```

PUSH ↓

```
ACTUAL SETPOINT
COOLING :              VALUE
```

PUSH ↓

```
COMPRESSOR # 1
STATE       AUTO
COMP1       LOAD              000%
```

PUSH ↓

```
COMPRESSOR # 2
STATE       AUTO
COMP2       LOAD              000%
```

PUSH ↓

Bios Version	...
Bios Date	...
Boot Version	...
Boot Date	...

2 Water menu

WATER TEMPERATURE	
ENT EVAP	...
LVG EVAP	...

■ **If heat recovery is selected:**

HEAT RECOVERY WATER	
ENT COND	. . . . .
LVG COND	. . . . .

3 Evap menu

VIEW EVAPORATOR	(01)
CIRCUIT 1	
SUCTION SUPERHEATER	
APPROACH :	...

PUSH ↓

VIEW EVAPORATOR	(02)
CIRCUIT 2	
SUCT SH :	. . . . .
APPROACH :	. . . . .

Compressor Menu

COMP 01	
STATUS :	...

PUSH ↓

EVAP PRESS	... barg
EVAP TEMP	... ˚ C
COND PRESS	... barg
COND TEMP	... ˚ C

PUSH ↓

2

SUCTION TEMP	...
SUCTION SUPERHEAT	...
DISCHARGE SUPERHEAT	...

PUSH ↓

OIL PRESS	... bar
DISCH. TEMP	... ˚ C

PUSH ↓

STAGING UP	☐
STAGING DOWN	☐
STAGING FIXED	☐
COMPRESSOR OFF	☐

PUSH ↓

COMPRESSOR	
HOUR COUNTER	...
NUMBER OF STARTS	...

PUSH ↓

LAST COMP START			
DATE	...	HOUR	...
LAST COMP STOP			
DATE	...	HOUR	...

PUSH →

COMP 02	
STATUS :	...

I/O Menu

DIGITAL INPUTS
X X X X X X X X X X X X X X X X
DIGITAL OUTPUTS
X X X X X X X X X X X X X X X X

PUSH ↓

Analog Inputs		
B1 :	OIL PR 1	...
B2 :	OIL PR 2	...

PUSH ↓

Analog Inputs		
B3 :	LOW PR 1	... bar
B4 :	DISCHARGE T1	... ˚ C
B5 :	DISCHARGE T2	... ˚ C

PUSH ↓

Analog Inputs		
B6 :	CONDPR 1	... bar
B7 :	CONDPR 2	... bar
B8 :	LOW PR 2	... bar

PUSH ↓

Analog Inputs		
B9 :	IN WATER	... ˚ C
B10 :	OUT WATER	... ˚ C

PUSH ↓

Analog Outputs		
Y1 :		0.0 V
Y2 :		0.0 V

PUSH ↓

Analog Outputs		
Y4 :		0.0 V
Y5 :		0.0 V

2.2.4 Setting Menu

Main screen

UNIT
COMPRESSOR
USER
ALARM

Unit menu

CONFIGURATION
SETPOINT
CONDENSATION

1 Configuration menu

To change settings in the configuration menu, you need the technician. Password 01331 07211.

	default
EXPANSION VALVE	depends on unit
THERMOSTATIC / ELECTRONIC	
GAS TYPE	
R22 / R407c / R404a / R134a	R134a

Confirm setting with ↵ key

PUSH ↓

1 If heat recovery selected:

- I/O EXP board B
- go to I/O menu press →→

B1 :	OAT	... ˚C
B2 :	NO USE	
B3 :	entering heat recovery	... ˚C

OAT: Outside temperature

PUSH ↓

B4 :	Leaving heat recovery	... ˚C	
DI1 :	HR Switch	O/R	← Open/Recovery
DI2 :	HR Flowswitch	O/C	← Open/Close

PUSH ↓

DO1 :	4-way valve	HR1	N/Y
D02 :	4-way valve	HR2	N/Y
D03 :	4-way valve	HR3	N/Y

DO4 :	4-way valve HR4	N/Y
A01 :	HR valve :	... V

2 If economizer selected :

- I/O EXP board A
- go to I/O menu press →

B1 :	NO USE	
B2 :	NO USE	
B3* :	Suction temp C1	... ˚C

*: Only if electronic expansion valve installed

PUSH ↓

B4* :	Suction temp	C2	... ˚C
DI3 :	LP Switch	C1	Y/N
DI4 :	PP Switch	C2	Y/N

*: Only if electronic expansion valve installed

PUSH ↓

DO1 :	Comp. Alarm	C1	N/Y
DO2 :	Comp. Alarm	C2	N/Y
DO3 :	Economizer	1	N/Y

DO4 :	Economizer 2	N/Y

PUSH ↓

		default
Unit Configuration		
N of Compr.	1 / 2 / 3 / 4	2

PUSH ↓

2

		default
Condensation fans number		
Circuit 1 / Circuit 2	1 / 2 / 3 / 4	depends on type of unit

PUSH ↓

		default
Low Press Transit Limits		
Min	... bar	– 0.5 bar
Max	... bar	7.0 bar

PUSH ↓

		default
Condensation		
Control ver.	PRESS / NONE / PR*	depends
Type	FANTR / VSD / FAN MODULAR* / DBLVSD / SPEED	on type of unit

Definitions:

- FANTROL
  A step control is used: fan steps are activated or deactivated to keep compressor operation conditions within allowed envelop.
  Fan steps are activated or deactivated keeping condensing (or evaporating pressure) change to a minimum; therefore one net fan is started or stopped at timed.
- FAN MODULAR (* NOT USED)
  The Fan Modular method is similar to the Fantrol method (staging sequence), but it uses analog output instead of digital output.
  In particular the analog output will assume a value, in volts, equal to the stage number (at stage 2: 2V, at stage 3: 3V,...)
- VSD - Variable Speed Driver
  A continuous control is used: fan speed is modulated to keep saturated condensation pressure at a setpoint; a PID control is used to allow a stable operation.
- SPEEDTROL
  A mixed step-VSD control is used. The first fan steps are managed using a VSD (with related PID control). The next steps are activated as in step control, only if the cumulated stage-up and stage-down error is reached and the VSD output is at maximum or minimum respectively.
- PRESSURE CONTROL
  Depending on the settings of high pressure, fans will be switched OFF and ON.
- PR - Pressure/ratio control (* NOT USED)
  Depending on the ratio between high and low pressure, fans will be switched OFF and ON.

PUSH ↓

		default
ENABLE OIL HEATING	Y/N	Y

PUSH ↓

		default
RS485 net		
Time check	... sec	30 sec
Refresh	N/Y	N

PUSH ↓

	default
EXP BOARD Configuration	
NONE / HEAT RECOVERY / HEATPUMP	NONE

(Depends on address selling expansion board)

■ **Expansion board 1: economizer**

		default
ECONOMIZER	N/Y	* ← YES if unit has economizer

If selected Y:

		default
ECON THRESHOLD	65 ˚C	65 ˚C
ECON DIFFERENCE	5	5
ECON ON	90%	90%
ECON OFF	75%	75%

■ **Expansion board 2: heat recovery**

				default
HR Select				
C1	N/Y	C2	N/Y	N
Recovery type		TOTAL / PARTIAL		TOTAL

PUSH ↓

2

		default
AUTO RESTART AFTER POWER FAILURE :	Y/N	Y

PUSH ↓

		default
SWITCH OFF UNIT ON EXTERNAL ALARM	N/Y	N

PUSH ↓

	default
COMMUNICATION SUPERVISOR / CSC	SUPERVISOR

PUSH ↓

		default
Reset all parameters to default :	N/Y	N

Note: Should always be done when reprogramming unit!

2 Setpoint menu

		default
Temp Regulation Der. time	60 sec	60 sec

PUSH ↓

		default
Number pre-purge	0 – 9	1
Pre-purge on time	2 sec	2 sec
EVAP Threshold	– 10 ˚C	– 10 ˚C

PUSH ↓

		default
Pre-purge time out	120 sec	120 sec
Downloading time	10 sec	10 sec

PUSH ↓

		default
Pump down configuration	Y/N	Y
Max time	120 sec	120 sec
Minimum pressure	1 barg	1barg

PUSH ↓

		default
Main pump	OFF	
delay	180 sec	180 sec

PUSH ↓

		default
Liquid injection setpoint	85 ˚C	85 ˚C
Liquid injection difference	10 ˚C	10 ˚C

PUSH ↓

		default
LOW AMBIENT PARAMETER		
Cond Temp Threshold	15.5 ˚C	15.5 ˚C
Low Ambient Timer	120 sec	120 sec

PUSH ↓

■ **If heat recovery selected:**

		default
HEAT RECOVERY PARAMETER		
Dead band	2 ˚C	2 ˚C
Stage time	45 sec	45 sec
Condensing Temp Threshold	30 ˚C	30 ˚C

PUSH ↓

2

		default
HEAT RECOVERY INTERSTAGE		
PAUSE		
Time	2 min	2 min

PUSH ↓

		default
HR bypass valve		
Min temp	40 ˚C	40 ˚C
Max temp	30 ˚C	30 ˚C

3 Condensation menu

		default
CONDENSATION		
Setpoint	40 ˚C	40 ˚C

PUSH ↓

		default
Fantroll Setpoint		
Stage up	10 ˚C	10 ˚C
Stage down	10 ˚C	10 ˚C

PUSH ↓

		default
Fantroll Setpoint		
Dead band 1		
Stage up	3 C	3 C
Stage down	10 C	10 C

PUSH ↓

		default
Fantroll Setpoint		
Dead band 2		
Stage up	6 C	6 C
Stage down	6 C	6 C

PUSH ↓

		default
Fantroll Setpoint		
Dead band 3		
Stage up	10 C	10 C
Stage down	3 C	3 C

PUSH ↓

		default
VSD Configuration		
Max speed	10 V	10 V
Min speed	0 V	0 V
Stage down	0 sec	0 sec

PUSH ↓

		default
Condensing regulation VSD		
Regulation band	20 C	20 C
Neutral band	1 C	1 C

PUSH ↓

		default
Condensing regulation VSD		
Int time	150 sec	150 sec
Der time	1 sec	1 sec

Compressor menu

		default
Min time same compr		
starts	600 sec	600 sec
Min time between		
different compr	120 sec	120 sec

PUSH ↓

			default
Min time compr	ON	30 sec	30 sec
Min time compr	OFF	180 sec	180 sec

PUSH ↓

2

		default
Interstage time	120 sec	120 sec

PUSH ↓

		default
Low pressure		
Hold temp	– 3 ˚C	– 3 ˚C
Down temp	– 4 ˚C	– 4 ˚C
Down delay	20 sec	20 sec

PUSH ↓

		default
High pressure		
Hold temp	65 ˚C	65 ˚C
Down temp	68 ˚C	68 ˚C

PUSH ↓

		default
Discharge Superheat Threshold	1 ˚C	1 ˚C
Discharge Superheat T	30 sec	30 sec

PUSH ↓

		default
N Load pulses	10	10
N Unload pulses	10	10

PUSH ↓

		default
Loading		
Pulse time	0.1 sec	0.1 sec
Min pulse period	30 sec	30 sec
Max pulse period	150 sec	150 sec

PUSH ↓

		default
Unloading		
Pulse time	0.3 sec	0.3 sec
Min pulse period	1 sec	1 sec
Max pulse period	150 sec	150 sec

PUSH ↓

		default
1st pulse duration		
Loading	1 sec	1 sec
Unloading	0.8 sec	0.8 sec

User menu

1 Main menu

Setpoints
Time schedule
FSM schedule
Clock

2 Setpoints menu

Cooling setpoint	4 ˚C – 15 ˚C

		default
Enable double setpoint	N/Y	N

	default
Leaving water temp setpoint reset	
None / Ambient temp / 4 - 20mA / Return	None

1 If selected OAT:

		default
OAT CHLWT Reset		
Max reset	3 ˚C	3 ˚C
Reset DT	8 ˚C	8 ˚C
Start reset	35 ˚C	35 ˚C

2 If selected return:

		default
CHLWT Return Reset		
Start DT	3 ˚C	3 ˚C
Max Reset	3 ˚C	3 ˚C

PUSH ↓

		default
Heat recovery setpoint	45 ˚C	45 ˚C

■ **If selected heat recovery:**

	default
Working mode	
Cooling / Ice / Glycol	Cooling

PUSH ↓

		default
Enable soft load	N/Y	N

■ **If selected Y:**

		default
Enable soft load	Y	
Max stage	50%	50%
Max time	20 min	20 min

PUSH ↓

		default
Enable Ambient Lockout	N/Y	N

■ **If selected Y:**

		default
Enable Ambient Lockout	Y	
Setpoint	5	5
Difference	1	1

PUSH ↓

		default
Enable supervisor demanding limit	N/Y	N

■ **If selected Y:**

		default
Enabling supervisor demand limiting	Y	
Type	Unit / Circuit	Unit

PUSH ↓

		default
Compressor sequence	Auto / Manual	Auto

■ **If selected manual:**

Set comp stage	
C1 / 1st / 2nd	C2 / 2nd / 1st

PUSH ↓

2

		default
Protocol	Local/Bacnet/Modsha/ Lonworks/Modbus/Remote	Local
19200	(RS 485 only)	19200
9600	(RS 485 only)	
4800	(RS 485 / RS 422)	
2400	(RS 485 / RS 422)	
1200	(RS 485 / RS 422)	
Address n	001	001

PUSH ↓

		default
Supervisory remote ON / OFF	Y/N	N

PUSH ↓

		default
Interface Units	S1 / P1	S1
Supervisory Units	S1 / P1	S1

PUSH ↓

		default
Choose language	English	English

3 Time schedule menu

		default
Enable time schedule	N/Y	N

- **If selected Y:**
  - Possible to program start/stop of the unit.
  - Possible to program Holidays.

4 FSM schedule

		default
Fan silent mode	N/Y	N

■ **If selected Y:**

		default
Fan silent mode	Y	
Misc inverter output	6V	6V

Note: Rest of the screen time schedule to program fan silent mode.

5 Clock menu

Clock configuration		
Time	:	...
Date	:	...
Weekday	:	...

Alarms menu

		default
Anti-freeze alarm		
Setpoint	2.0 ˚C	2.0 ˚C
Difference	1.4 ˚C	1.4 ˚C

PUSH ↓

		default
Freeze prevent		
Setpoint	3 ˚C	3 ˚C
Difference	1 ˚C	1 ˚C

PUSH ↓

		default
Oil low pressure alarm delay		
Start-up delay	300 sec	300 sec
Run delay	90 sec	90 sec

2

PUSH ↓

		default
Saturated discharge temp alarm		
Setpoint	70.5 ˚C	70.5 ˚C
Difference	12 ˚C	12 ˚C

PUSH ↓

		default
Saturated suction temp alarm		
Setpoint	– 8 ˚C	– 8 ˚C
Difference	2 ˚C	2 ˚C

PUSH ↓

		default
High discharge temp alarm		
Setpoint	110 ˚C	110 ˚C

PUSH ↓

		default
Oil pressure difference		
alarm setpoint	2.5 bar	2.5 bar

PUSH ↓

		default
Select PVM or GRF		
alarm type	Unit / Comp	Unit

PUSH ↓

		default
Evap flow switch alarm		
Start up delay	20 sec	20 sec
Run delay	5 sec	5 sec

■ **If heat recovery selected:**

		default
HR high water temp alarm		
Threshold	50 ˚C	50 ˚C

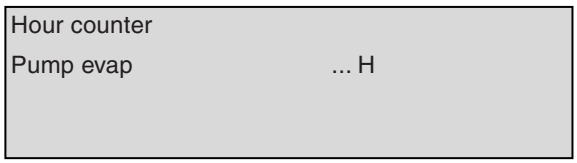
■ **If heat recovery selected:**

		default
HR flow switch alarm delay		
Start up delay	20 sec	20 sec
Run delay	5 sec	5 sec

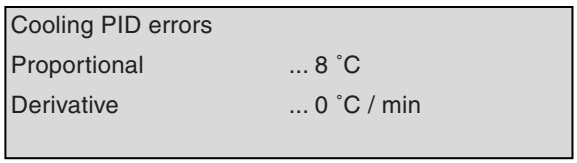
2.2.5 Maintenance Menu

Main menu

View menu



PUSH ↓

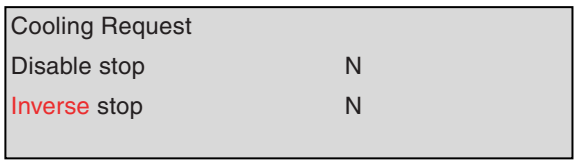


Note: Both values depend on the difference between setpoint and leaving water of evaporator.

PUSH ↓

Note: Both values depend on the difference between setpoint and leaving water of evaporator.

PUSH ↓



PUSH ↓

Note: Values depend on operation of the unit.

Following screens are of no compliance if Heat recovery selected!

PUSH ↓

Hour counter	
HR pump	... H

PUSH ↓

Heat Recovery Working		
Working	Y / N	
disp steps	1 / 2	*
oct steps	1 / 2	

Note: depends on quantity of current

PUSH ↓

				default
HR fan disabling circuit				
1	N/Y	2	N/Y	N ... N
3	N/Y	4	N/Y	N ... N

- Current 3 and 4 are not used.
- When current 1 or 2 is used in heat recovery indicates of fan disabled
- When heat recovery disabled, set fan disabling to No. by digital input

PUSH ↓

HR bypass valve opening	... pulses

- If outlet water condensor 30°C → bypass valve 1000
- If outlet water condensor 40°C → bypass valve 0
- The value of setpoints 30°C and 40°C can be programmed in the setpoint menu:

SETTING → UNIT → SETPOINT

Setting menu

		default
EVAP pump hour counter		
Threshold	10 X 1000	
Reset	N/Y	N
Adjust	...	

Note: When replacing a pump, running hours should be adjusted.

PUSH ↓

Comp C1 hour counter	
Threshold	10 X 1000
Reset	N/Y
Adjust	...

Note: When replacing a pump, running hours should be adjusted.

PUSH ↓

		default
Comp C1 starts		
Reset	N/Y	N
Adjust	...	

Note: When replacing a pump, running hours should be adjusted.

PUSH ↓

		default
Regulation band	4.0 C	4.0 C
Neutral band	0.1 C	0.1 C
Max pull down rate	0.7 C / min	0.7 C / min

PUSH ↓

		default
Start up DT	2.6 ˚C	2.6 ˚C
Shutdown DT	1.7 ˚C	1.7 ˚C

PUSH ↓

		default
High chilled water outlet	25 ˚C	25 ˚C
Max comp stage	70%	70%

PUSH ↓

		default
Load for comp		
Min load	40%	40%
Full load	100%	100%
Enable slide vane	N/Y	N

Note: This slide vane is no longer used in these units.

PUSH ↓

		default
Chilled water temperature limits		
Low	4 ˚C	4 ˚C
High	15 ˚C	15 ˚C

PUSH ↓

Probe enables			
B1	B2	B3	B4
B5	B6	B7	B8
B9	B10		

Note: Each probe can be enabled or disabled. DO NOT TOUCH IF NOT REQUIRED!

PUSH ↓

Exp probe enable expansion board 1	
B101	B102
B103	B104
B201	B202

Note: Each probe can be enabled or disabled. DO NOT TOUCH IF NOT REQUIRED!

PUSH ↓

Exp probe enable expansion board 2	
B203	B204
B301	B302

Note: Each probe can be enabled or disabled. DO NOT TOUCH IF NOT REQUIRED!

PUSH →

Input probe offset	
B1	B2
B3	B4
B5	

Note: Can be used to change offset of each probe.

Input probe offset	
B6	B7
B8	B9
B10	

Note: Can be used to change offset of each probe.

PUSH ↓

2

Expansion A probe offset
B103
B104

PUSH ↓

Expansion B probe offset	
B201	B202
B203	B204

Note: Can be used to change offset of each probe.

PUSH ↓

		default
DT to reload and reunload compressor	0.7 ˚C	0.7 ˚C

PUSH ↓

		default
Reset alarm buffer	Y/N	N

PUSH ↓

		default
Supervisor auto comp selection		
Enabling	N/Y	N
Delay	30 sec	30 sec

PUSH ↓

		default
Heat Rec pump hour counter		
Threshold	000 X 100 sec	
Reset	N/Y	N
Adjust	0000	

3 Functional Control

3.1 What Is In This Chapter?

Introduction

This chapter gives more detailed information on the functions and controls of the unit.

Overview

This chapter contains the following topics:

3.2 Control Possibilities

Overview

- Local control
- Remote control
- Network control
- Time schedule
- Ambient lock out

2

Explanation

The control allows different ways to enable/disable the unit:

Local Switch:
- When the digital input “Unit On/Off” is open, the unit is in “Local switch Off”.
- When the digital input “Unit On/Off” is closed, the unit may be in “Unit On” or “Remote switch Off” depending on the “Remote On/Off “ digital input.

Remote Switch:
- When the local switch is On (“Unit On/Off” digital input closed) if the digital input “Remote On/Off “ is closed, the unit is in “Unit On”.
- When digital input “Remote On/Off “ is open, the unit is in “Remote switch Off”.

Network:
- A BAS or a Monitoring system may send an On/Off signal trough the serial line connection to put the unit on or in “Rem. Comm. Off”.

Time schedule:
- A timetable allows to program “Time Schedule Off” on a week base; several holiday days are included.

Ambient LockOut:
- The unit is not enabled to operate unless the ambient temperature is higher than an adjustable value (default 15.0° C / 59.0 F).

Note: To be in “Unit On” all the allowed signals must enable the unit.

3.3 Operating Modes

Overview

- Cooling mode
- Cooling / Glycol mode
- Ice operation
- Heating
- Cooling + Heat recovery
- Cooling / Glycol + Heat recovery
- Ice + Heat recovery

Explanation

MODE	RANGE (° C)	Freeze up prevention (° C)	Freeze up protection (° C)
Cooling	+ 4.4 / + 15.5	+ 3° C	+ 2° C
Cooling / Glycol	– 6.7 / + 15.5	– 9	– 10
Ice	– 6.7 / + 15.5	– 9	– 10 6.5.3
Heating	+ 30 / + 45	46	50
Cooling / Heat recovery	+ 4.4 / + 15.5	+ 3° C	+ 2° C
Cooling / Glycol / Heat recovery	– 6.7 / + 15.5	– 9	– 10
Ice / Heat recovery	– 6.7 / + 15.5	– 9	– 10 6.5.3

The selection between cooling, cooling/glycol and ice mode can be done by the operator using the interface password.

The switching between cooling and ice and heating modes will cause the unit shutdown and then the switching between the two modes.

3.4 Set-point Management

Overview

- Local set-point control
- Double set-point control
- Set-point controlled by external input
  - 4 – 20 mA
  - Floating set-point
  - Inlet water control
  - Set-point controlled by BMS system

Explanation

The control is able to manage the evaporator leaving water temperature on the base of several inputs:

- Local set-point : Selected from the controller
- Double set-point : Through an external contact (by customer), it is possible to vary the local set-point of control between two well defined values. This option can be used for ice bank applications. This application normally asks for a positive diurnal set-point (e.g. 7° C) and a negative nighttime set-point (e.g. -5° C). When the temperatures of the evaporator outgoing water are inferior to 4° C, the introduction of the correct quantity of antifreeze in the hydraulic system is required.

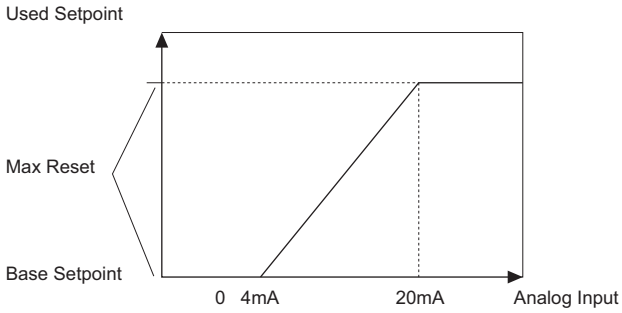
Set-point reset methods

The following set-point reset methods are available to modify the local or double set-point:

- None : local or double set-point is used on the base of the double set-point digital input. This is called “base set-point”
- 4-20mA : base set-point is modified on the base of a user analog input
- OAT : base set-point is modified on the base of outside ambient temperature (if available)
- Inlet : base set-point is modified on the base of evaporator entering temperature
- Network : the set-point sent by serial line is used In the case of a failure in the serial connection or in the 4-20mA input the base set-point is used. In case of a set-point reset, the system display will show the type of reset.

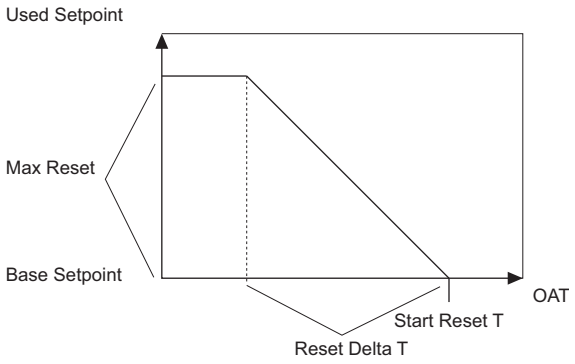
4-20 mA set-point control

Through an external signal 4-20mA, it is possible to change the value of the local set-point within the minimum and maximum set limits.



Floating set-point

This function is enabled under password "Consumer", setting the set-points in accordance with the range of external temperature set. A reduction of the external temperature corresponds to an increase in the set-point control. This system allows energy saving when the external temperature goes down under the projected value.



To enable the OAT set-point override, an expansion board with an ambient sensor installed is required. The base set-point is modified on the basis of an outside ambient temperature, a reset temperature start, a max reset value, a value of OAT to start reset and a value of OAT to apply max reset.

Example:

Maximum reset : 10° C

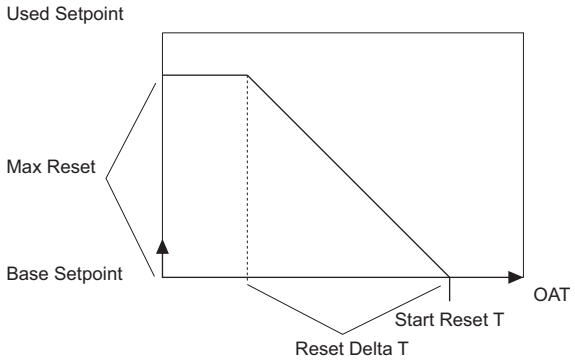
Reset DT : 8° C

Start reset : 35° C

2

Delta T reset

Allowable under password "Consumer", a reduction of the water evaporator delta T corresponds to an increase of the set-point control of the refrigerated water. This logic of control allows energy saving when the unit works at partial load.



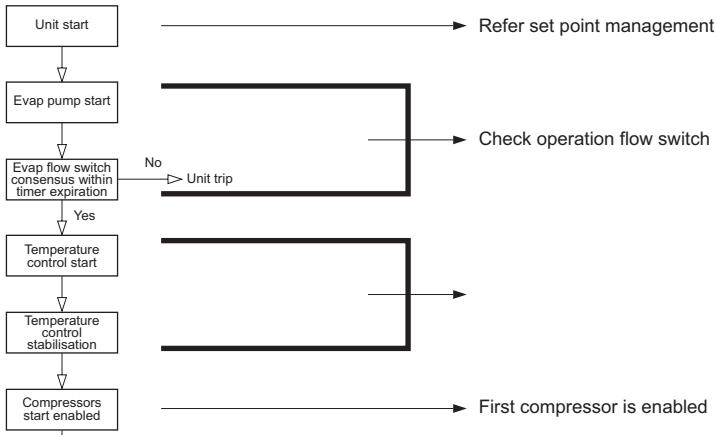
3.5 Unit Start Sequence

Overview

This chapter contains the following topics:

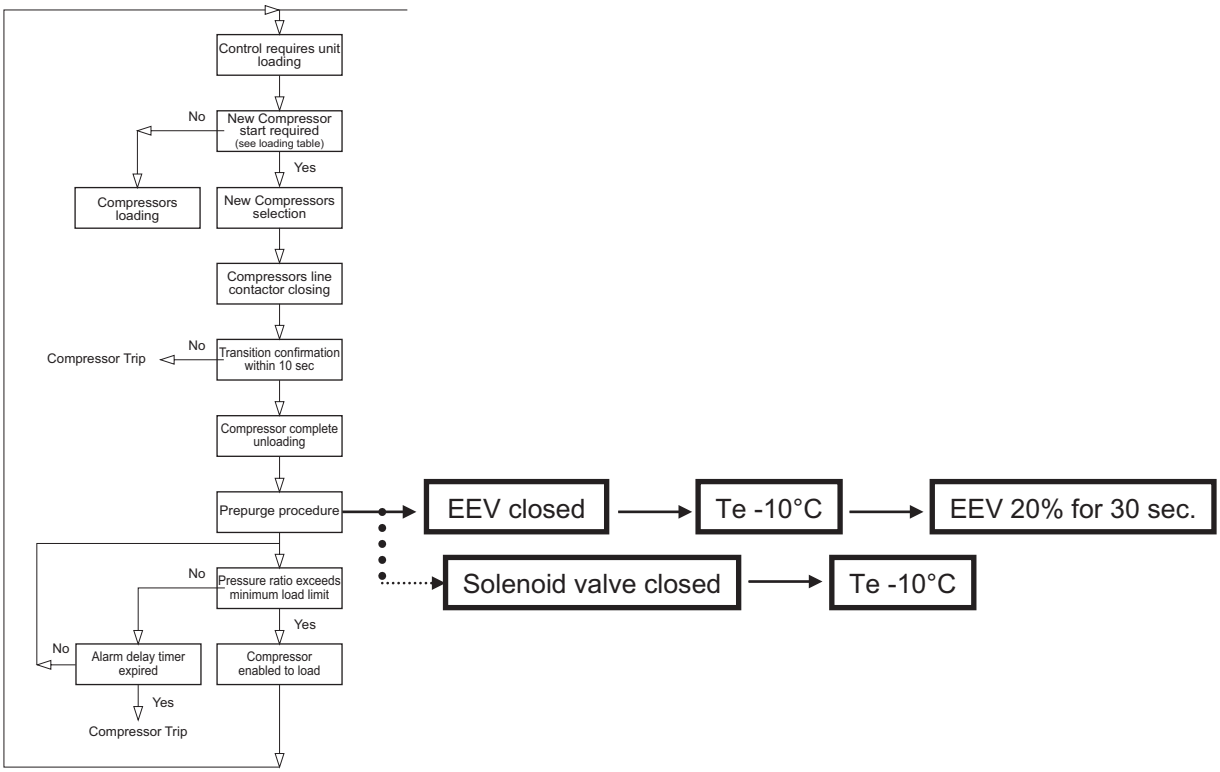
3.5.1 Unit Starting Sequence Flow Charts

Flow chart 1

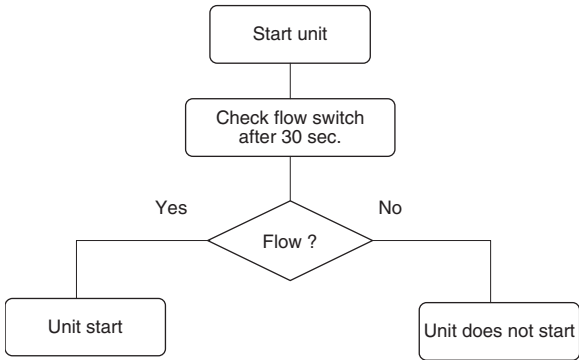


2

Flow chart 2



3.5.2 Water Pump Operation



- The second pump is optional.
- When 2 pumps are installed, the pump with the lowest running hours will start.
- It is possible to program the sequence.

3.5.3 Oil Heating

Explanation

Oil heating is required to avoid accumulation of liquid inside the compressor during start up.

The startup of compressors will not be allowed if the following formula is not respected:

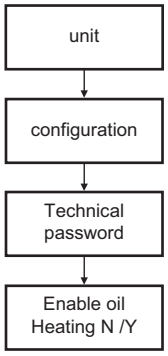
Discharge Temperature – TOilPress > 5 ° C

Where:

Discharge Temperature is the compressor discharge temperature (corresponding to oil temperature).

TOilPress is the refrigerant saturated temperature at the oil pressure.

Programming oil heating



Step	Action
1	Unit
2	Configuration
3	Technical password
4	5 X ↓
5	Enable oil heating (default Y)

3.5.4 Pre-purge Operation

General description

- Principal control is the same for thermostatic and electronic expansion valve.
  - Thermostatic expansion valve
    - Close liquid solenoid valve till LP < –10° C
    - When LP < –10° C, compressor operates at 25%
  - Electronic expansion valve (EEV)
    - Close EEV till LP < –10° C, ,compressor operates at 25%
- If LP does not drop below –10° C at a certain time, an alarm is generated.

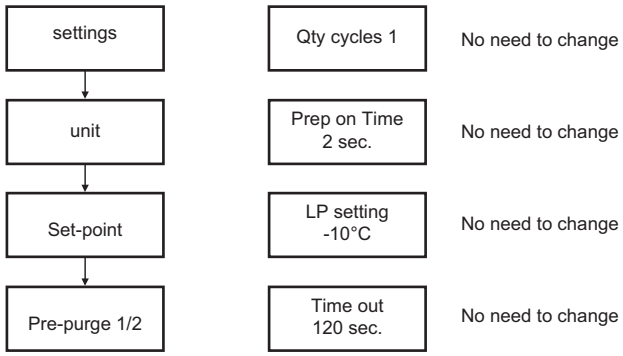
Pre-purge with electronic expansion valve

At the compressor start the EEXV is completely closed up to the saturated temperature as the evaporator pressure reaches the value of –10 ° C (Adjustable at the range –12 ÷ –4 ° C) Then the valve is opened up at a fixed position (adjustable by the manufacturer with a default value equal to 20% of total valve step) when the timer is expired (default 30 sec). This procedure can be repeated for a number of times according to the operator's adjustments (default is 1 time).

Pre-purge with thermostatic expansion valve

At the compressor start the liquid line solenoid is completely closed up to the saturated temperature as the evaporator pressure reaches the value of –10° C (Adjustable in the range –12 ÷ –4 ° C). Then the valve is opened up when the timer is expired. This procedure is repeated for a number of times according to the operator's adjustments (default is 1 time).

Programming pre-purge operation



Step	Action
1	Setting
2	Unit
3	Set-point
4	2 X ↓
5	Set technical password
6	Number of pre-purge cycle (default 1)
7	Pre-purge on time (default 2 seconds)
8	1 X ↓
9	Pre-purge time out (default 120 seconds)
10	Downloading time (default 10 seconds)

Compressor starts with liquid line closed and will open only after the saturated suction pressure gets below –10° C. It is only at this value when the pre-purge will be considered successful and will put the compressor at 25% capacity.

Number of cycles at 1 means that the liquid line solenoid can be closed only once – only at the start. If more than 1 cycle is necessary, it must be set at 2 or 3.

The pre-purge time at 002s is the actual time wheb the liquid line solenoid is energized.

Downloading time is the actual time when the unloading solenoid is energized, making sure that the compressor while starting is at 25% capacity.
The electronic expansion valve works like the thermostat, but when the pre-purge time is expired the EEV will pre-open at 35% capacity.

3.6 Compressor Management Control

Overview

This chapter contains the following topics:

3.6.1 Overview and Explanation

Overview

- Automatic control
- Manual control

Explanation

- Automatic control : The compressor start/stop and its capacity are automatically managed by the software to allow the set-point control.
- Manual control : The compressor is started by the operator and its capacity is managed by the operator's programming the controller. In this case the compressor will not be used by the software to allow the set-point control.

  Manual control is automatically switched to Automatic control if any safety action is required on the compressor (safety standby or unloading or safety shutdown). In this case the compressor remains in Automatic and must be re-switched to Manual by the operator if required.

  Compressors in manual mode are automatically switched to automatic mode during shutdown.

3.6.2 Definitions

Number load pulses

Quantity of pulses required to load up from 0 to 100 %. The default quantity of pulses is programmed at 6. This should not be changed.

Number unloading pulses

Quantity of pulses required to load down from 100 to 0 %. The default quantity of pulses is programmed at 9. This should not be changed.

Programming loading and unloading pulses

Step	Action
1	Setting
2	Compressor
3	7 X ↓
4	N Load pulse 10 N Unloading pulse 10

Loading

The pulse time is always 0.2 sec (except for the first pulse). The value of 0.1 sec is default, programmed from the factory and should not be changed.The pulse period will depend on the PID calculation and can change between the 30 and 150 seconds. Both values are programmed from the factory and should not be changed.

Programming loading pulses and pulse period

Step	Action
1	Setting
2	Compressor
3	8 X ↓
4	Pulse time 0.2 second Minimum pulse period 30 seconds Maximum pulse period 150 seconds

Unloading

The pulse time is always 0.4 sec (except for the first pulse). The value of 0.3 sec is default, programmed from the factory and should not be changed. The pulse period will depend on the PID calculation and can change between the 1 and 150 seconds. Both values are programmed from the factory and should not be changed.

Programming unloading pulses and pulse period

Step	Action
1	Setting
2	Compressor
3	9 X ↓
4	Pulse time 0.4 second Minimum pulse period 30 seconds Maximum pulse period 150 seconds

1st pulse duration

The first pulse will be longer to make sure that the slide vane is moving correctly (increase in oil pressure).

- Loading: 1 sec.
- Unloading: 0.8 sec.

During start up there is no pressure difference to move the sliding vanes, therefore the first pulse duration will be 1 second to create a pressure difference for the capacity vanes.

Remark: The same is applicable for the 100 % operation. The oil needs to be drained to unload the sliding valve.

Programming 1st pulse duration

Step	Action	
1	Setting	
2	Compressor	
3	10 X ↓	
4	Loading Unloading	1 second 0.8 second

3.6.3 Compressor Load Evaluation

Overview

- Calculation of quantity of lading and unloading pulses.
- Fixed puse duration of the loading and unloading pulses.
- Time interval between 2 pulses evaluated by PD controller (variable).
- Integral control

Calculation of loading and unloading pulses

The compressor loading or unloading is obtained by keeping the loading or unloading solenoid energized for a fixed time (pulse duration), while the time interval between two subsequent pulses are evaluated by a PD controller.

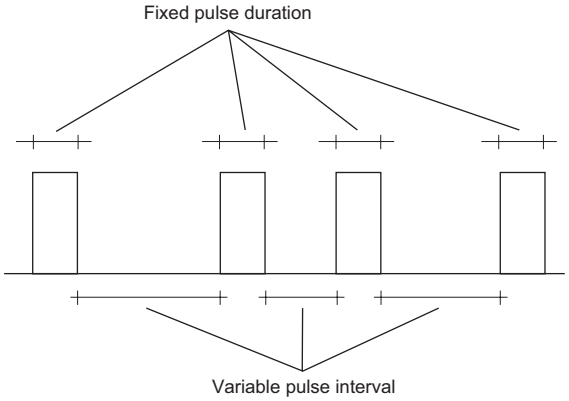
If the output of the PD algorithm doesn't change, the time interval among pulses is constant; this is the integral effect of the controller. At a constant error, the action is repeated with a constant time (with the additional feature of a variable integral time).

The compressor load evaluation (based on analog slide valve position or calculation1) is used to allow the start of another computer or the stop of a running one.

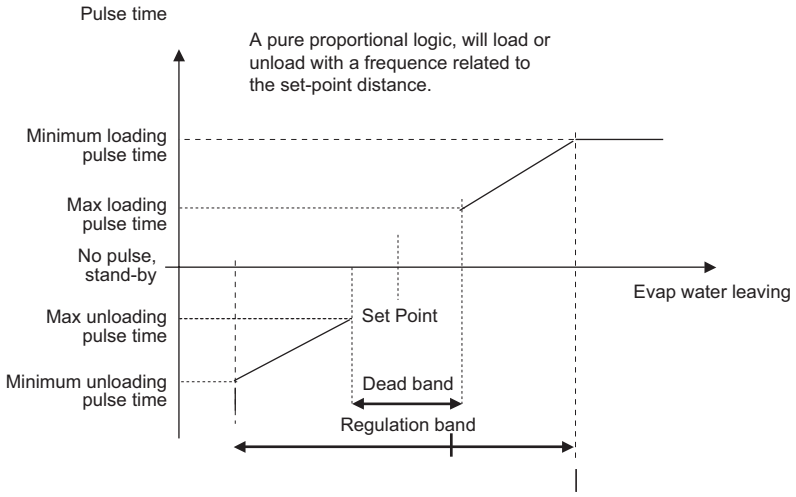
It is required to define the proportional band and the derivative time of the PD controller, together with the pulse duration and a minimum and maximum value for pulses interval.

A dead band is introduced to allow having a stable compressor condition.

Pulse durations



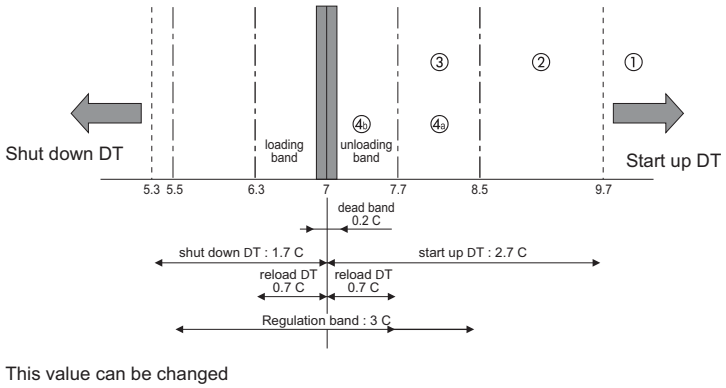
The minimum pulse interval is applied when the maximum correction action is required; while the maximum interval is applied when the minimum correction action is required.



The farther the temperature of the leaving water is from the set-point the shorter the pulse period.

The closer the temperature the longer the pulse period.

Water temperature control



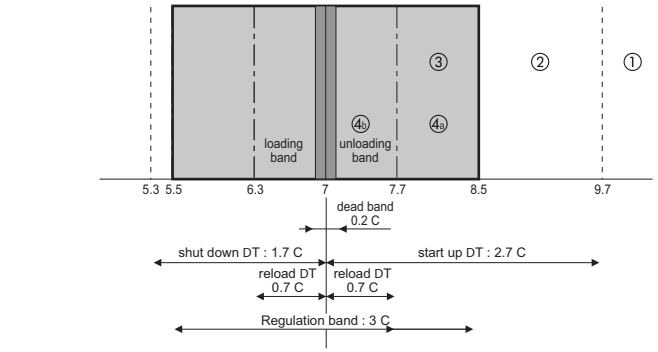
To have a smooth control of the water temperature, several controls are incorporated.

- Start up DT: Temperature where the first compressor will start.
- Shut down DT: Temperature where the unit will stop.

Both values can be programmed as follows:

Step	Action
1	Maintenance
2	Settings
3	7 X ↓
4	Start up DT (Default 2.6 ° C) Shut down DT (Default 1.5 ° C)

Regulation band

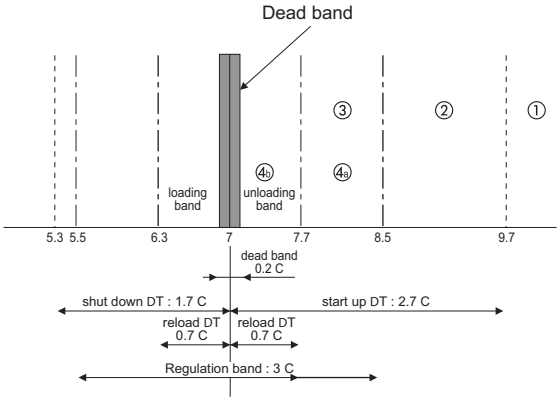


This value can be changed

Values can be programmed as follows:

Step	Action
1	Maintenance
2	Settings
3	6 X ↓
4	Regulation band (Default 4 ° C)

Dead band

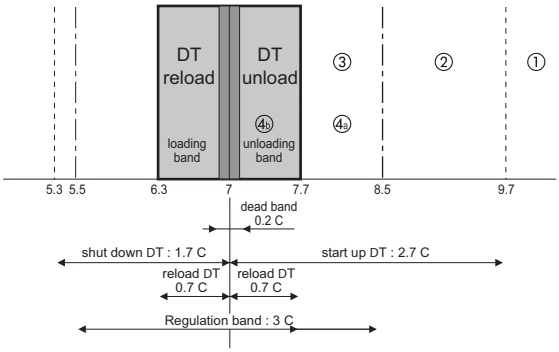


This value can be changed

Values can be programmed as follows:

Step	Action
1	Maintenance
2	Settings
3	6 X ↓
4	Neutral band (Default 0.1 ° C)

DT reload-unload



In the DT reload or unload area if a second compressor is requested, the first compressor will go to 50% and start up the second compressor at 25%.

Step	Action
1	Maintenance
2	Settings
3	17 X ↓
4	DT to reload and re-unload the compressor. (Default 0.7 ° C)

3.6.4 Maximum Pull Down Rate

Overview

- Water temperature can only drop a certain ° C per minute. (Example: 0.7° C/minute)
- If decrease in water temperature is higher, the compressor will limit capacity.

Explanation

In addition to the specialized PID controller, a max pull-down-rate is introduced in the control; this means that if the controlled temperature is approaching the set-point with a rate greater than a set value, any loading action is inhibited, even if required by the PID algorithm. This makes the control slower but allows to avoid oscillations around set-point.

Step	Action
1	Maintenance
2	Settings
3	6 X ↓
4	Maximum pulldown rate (Default 0.7 ° C)

3.6.5 Compressor Timers

Overview

- Anti-recycling timer
- Minimum time between 2 different compressors starts
- Minimum operating time compressor
- Quard timer of compressor

Anti-recycling timer

Minimum time between a same compressor starts.

The compressor is allowed to start up 6 times per hour.

Step	Action
1	Setting menu
2	Compressor menu
3	**Min. T. same compressor 600 seconds (Default value)** Min. T. different compressor 120 seconds
4	Min. T. compresson ON 30 seconds Min. T. compressor OFF 180 seconds

Minimum time between 2 different compressors starts

The minimum time between two different compressor starts.

Step	Action
1	Setting menu
2	Compressor menu
3	Min. T. same compressor 600 seconds **Min. T. different compressor 120 seconds (Default value)**
4	Min. T. compresson ON 30 seconds Min. T. compressor OFF 180 seconds

Minimum operating time compressor

Minimum time compressor on (start to stop timer)

The minimum time the compressor has to run; the compressor cannot be stopped (unless an alarm occurs) if this timer is not expired.

Step	Action
1	Setting menu
2	Compressor menu
3	Min. T. same compressor 600 seconds Min. T. different compressor 120 seconds
4	**Min. T. compresson ON 30 seconds (Default value)** Min. T. compressor OFF 180 seconds

Quard timer of compressor

Minimum time compressor off (stop to start timer)

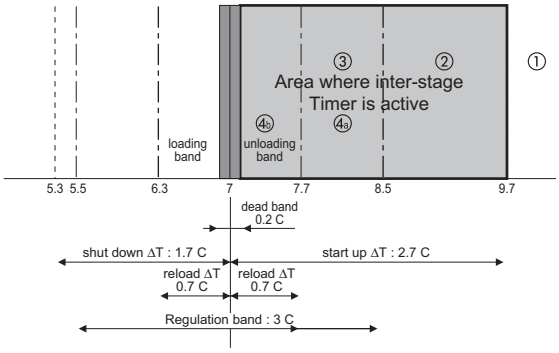
The minimum time the compressor has to be stopped; the compressor cannot be started if this timer is not expired.

Step	Action
1	Setting menu
2	Compressor menu
3	Min. T. same compressor 600 seconds Min. T. different compressor 120 seconds
4	Min. T. compresson ON 30 seconds **Min. T. compressor OFF 180 seconds Default value)**

3.6.6 Inter-stage Timer

Explanation

Time required to decide if second compressor will start.



Note:

In the grey area the inter-stage timer is active.

3.6.7 Compressor Rotation Management

Overview

There are two possibilities:

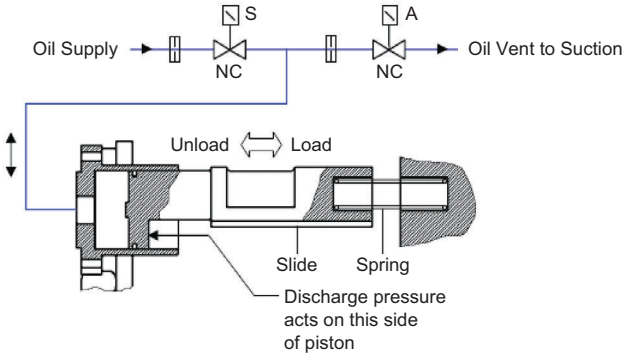
- Automatic rotation: The selection of the compressor sequence will be done by the controller depending on the running hours.
- Manual rotation: The operator can select which compressor will start first.

Programming

Step	Action
1	Setting menu
2	User menu
3	Set-points
4	6 X ↓
5	Operator password
6	Compressor sequence auto/manual (default auto)

3.7 Compressor Capacity Control

Principal capacity control



HSS 3100 series compressors is provided with infinitely variable capacity control as standard.

Since the compressor utilizes fixed intake and discharge ports instead of valves, the overall compression ratio is determined by the configuration of these ports. The degree of compression is governed by the ratio between the flute volume when it is sealed off by the star tooth at the beginning of the compression process, to that immediately before the discharge port is uncovered. This is known as the built-in volume ratio (VR) and is an important characteristic of all fixed-port compressors.

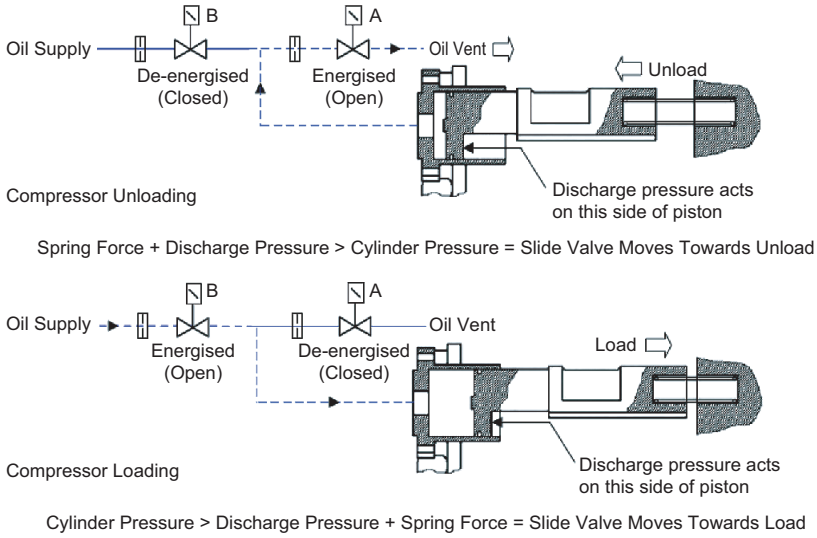
In order to achieve maximum efficiency, the pressure within the flute volume at the end of the compression process should equal the pressure in the discharge line at the instant the flute volume opens to discharge.

Should these conditions not prevail, either over-compression or undercompression will occur, both of which result in internal losses. Although in no way detrimental to the compressor, inefficient compression will increase power consumption.

The slide valve is housed in a semicircular slot in the wall of the annular ring which encloses the main rotor. As the slide valve travels axially from the full load position it uncovers a port, which vents part of the gas trapped in the main rotor flute back to suction, before compression can begin.

When the flute has passed beyond the port, compression commences with a reduced volume of gas. However, a simple bypass arrangement without any further refinement would produce an undesirable fall in the effective volume ratio which in turn causes under compression and inefficient part load operation. To overcome this problem, the slide valve is shaped so that it delays the opening of the discharge port at the same time as the bypass slot is created.

Loading / unloading compressor



One end of the slide valve is machined to form a hydraulic piston, housed inside a cylinder and mounted internally at the discharge end of the compressor. The other end of the slide incorporates a spring.

Variation in compressor pumping capacity is achieved by altering the forces acting on the slide valve/piston assembly.

Internal drillings communicate pressurized oil to the capacity control cylinder and vent the oil from the cylinder. The flow of oil is controlled by two separate solenoid valves, A and B; the solenoids are normally closed (NC), energize to open.

While the compressor is running, the position of the slide valve is controlled by the pressure in the capacity control cylinder. Oil pressure which is introduced into the cylinder acts on a larger area of the piston. This will result in a force which is greater than the pressure applied by the discharge pressure and spring, thereby moving the slide to load.

If the cylinder is vented to suction, the force applied by the discharge pressure and spring will be greater and the side will move to unload. If the compressor is stopped at part load, the slide valve will return to minimum load by the spring only if the pressure in the cylinder is vented to the casing pressure, unload solenoid valve energized (opened). When the compressor starts, the unload solenoid should remain open until there is a requirement to load.

Two solenoid valves A and B control the venting from and the oil flow to the capacity control cylinder.

3.8 Compressor Stopping Sequence

Overview

This chapter contains the following topics:

2

3.8.1 Pump Down Control

Explanation

Every time before the compressor stop, the compressor starts downloading and will finally do a pump-down.

From the factory the pump-down is selected to YES.

Procedure

1 What:

- Activation of the pump down function can be selected in the set-point menu.
- Active when temperature reached or stop the unit with ON/OFF bottom.

2 How:

- Electronic expansion valve: close valve.
- Thermostatic expansion valve: close liquid valve.

3 Result:

- Pump down finished
- Pump down failed

Programming the pump-down operation

Step	Action
1	Setting
2	Unit
3	Set-point
4	4 X ↓
5	Enable Y / N (Default Y) Maximum time (Default 120 sec) Minimum pressure (Default 1 bar)

3.8.2 Manual Control

Explanation

- Can be used to operate the compressor in a certain capacity step
- No temperature control available
- All safeties are active
- If safety activated unit returns to automatic mode

Manual mode is mainly used during commisioning and trouble shooting. In the manual mode the installer can select the requested capacity.

Prodedure to enter manual mode

Step	Action
1	Start up unit
2	View menu
3	Unit menu
4	Status menu
5	3 X ↓
6	Enter Manager password
7	Change AUTO to MANUAL
8	Change capacity step using ↓ and ↑ bottom for 5 seconds

Notes:

- Manual mode can be programmed per circuit.
- If a fault occurs the unit goes into automatic mode.
- If you switch OFF the unit, the unit returns to automatic mode.
- If there is a power failure, the unit returns to automatic mode when the power is back.

3.9 Fan Control Management

Overview

- Fan Troll
  - Pressure control
  - Pressure ratio control
- Variable speed driver
- Speed Troll

Explanation

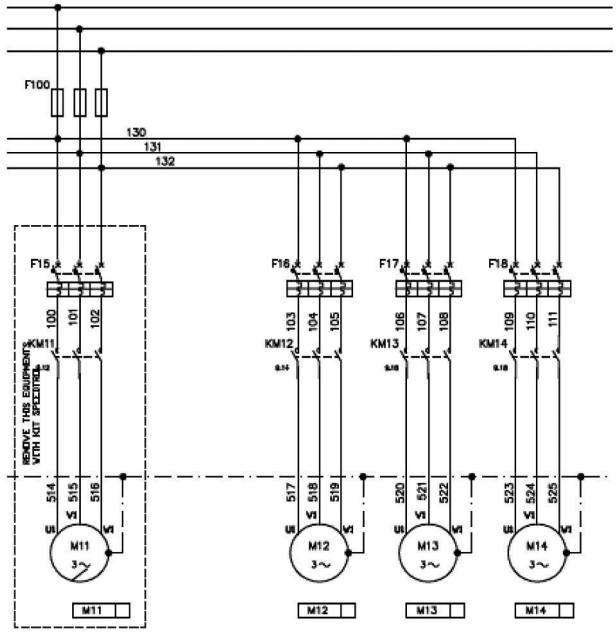
- Fan Troll: : A step control is used; fan steps are activated or deactivated to keep compressor operation conditions within allowed envelop.

  Fan steps are activated or deactivated keeping condensing (or evaporating pressure) change to a minimum; to do this one net fan is started or stopped at a time.

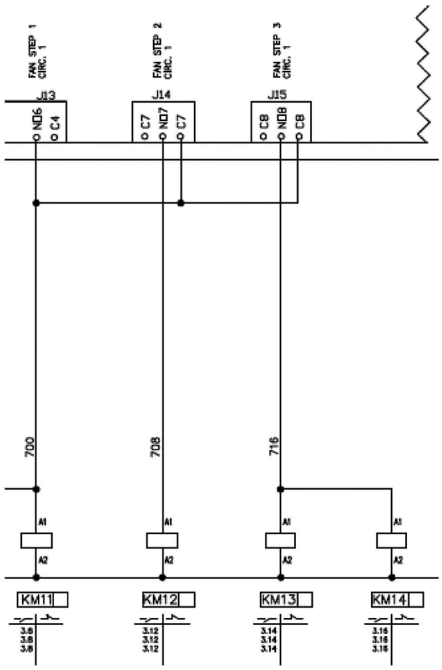
  Customer can select between pressure control and pressure ratio control.
- Variable speed driver : A continuous control is used; fans speed is modulated to keep saturated condensation pressure at a set-point; a PID control is used to allow a stable operation.
- Speed Troll : A mixed step-VSD control is used; the first fans step are managed using a VSD (with related PID control), next steps are activated as in the step control, only if the cumulated stage-up and stage-down error is reached and the VSD output is at maximum or minimum respectively.

Fan troll pressure / Fan troll pressure ratio

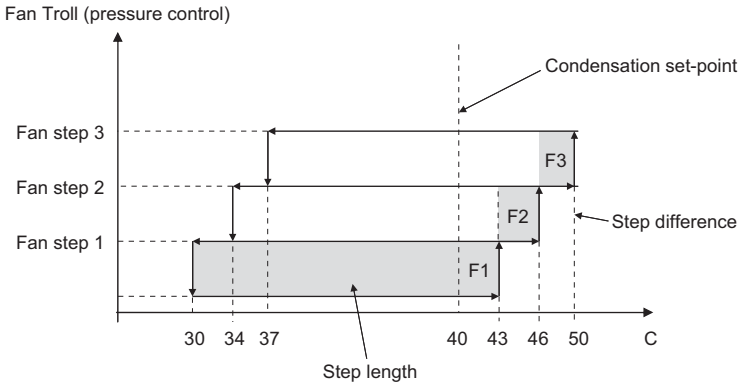
4 ON / OFF fans are used per circuit.



Each of the fan contactors is controlled with a digital output.



Fan Troll (pressure control)



Depending on the installation and weather conditions, installer can program to head pressure control.

A stage up is executed (the next stage is activated) if the condensing saturated temperature (saturated temperature at discharge pressure) exceeds the target set-point (default 40 ° C) by an amount equal to a stage up dead band by a time depending on the difference between the reached values and the target set-point plus stage up dead band (high condensing temperature error).

In particular, the stage up is executed when the integral of the high condensing temperature error reaches the value 10 ° C x sec. In the same manner a stage down is executed (the previous stage is activated) if the condensing saturated temperature falls below the target set-point by an amount equal to a stage down dead band by a time depending on the difference between the reached target set-point minus the stage down dead band values and the reached value (low condensing temperature error). In particular, the stage down is executed when the integral of the low condensing temperature error reaches the value 10 ° C x sec.

The condensing temperature error integral is reset to zero when condensing temperature is within the dead-band or a new stage is activated.

Each fan stage will have its own adjustable stage up and stage down deadband.

Three parameters need to be programmed:

1 Condensation set-point

2 Step difference: Switching point between the different fan motors

3 Step length: Band to decide to start the first fan or stop the last fan.

All above settings are programmed in the controller, but can be changed in function of the operation conditions.

Step	Action
1	Setting
2	Unit
3	Condensation
4	Manager password
5	Condensation set-point (default 40° C)
6	Fan Troll 1 Set-points (step length) Stage up err 10° C Stage down err 10° C
7	Fan Troll 1 Set-points (step difference) Dead band n° 1 Stage up: 3° C Stage down: 10° C
8	Fan Troll 2 Set-points (step difference) Dead band n° 2 Stage up: 6° C Stage down: 6° C
9	Fan Troll 3 Set-points (step difference) Dead band n° 3 Stage up: 10° C Stage down: 3° C

Fan troll (pressure ratio control)

The customer has the possibility to change between pressure and pressure ratio.

The control will operate to keep pressure ratio equal to a target adjustable value (default 2.8)

A stage up is executed (the next stage is activated) if the pressure ratio exceeds the target pressure ratio by an amount equal to an adjustable stage up dead band by a time depending by the difference between the reached values and the target value plus stage up dead band (high pressure ratio error).

In particular, the stage up is executed when the integral of the pressure ratio error reaches the value 25 sec.

In the same manner, a stage down is executed (the previous stage is activated) if the pressure ratio falls below the target set-point by an amount equal to a stage down dead band depending on the difference between the target set-point minus the stage down dead band values and the reached value (low pressure ratio error).

In particular, the stage down is executed when the integral of the low pressure ratio error reaches the value 10 sec.

The pressure ratio error integral is reset to zero when condensing temperature is within the dead-band or a new stage is activated.

Each fan stage will have its own adjustable stage up and stage down deadband.

Selection of method of head pressure control (pressure or pressure ratio):

Step	Action
1	Setting
2	Unit
3	Configuration
4	4 X ↓
5	Technical password
6	Condensation Control possibility : PRESS / NONE / PR (pressure ratio) Type : DBL / SPEED / FANTROL / VSD / FAN modular

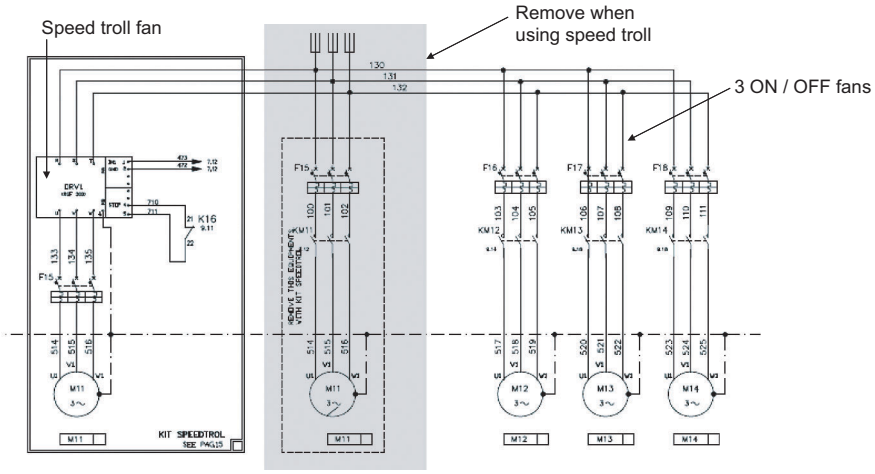
Selection of the settings of the head pressure control:

Step	Action
1	Setting
2	Unit
3	Condensation
4	Manager password
5	Condensation set-point (2.8)
6	Fan Troll 1 Set-points (step length) Stage up err 25 sec. Stage down err 10 sec.
7	Fan Troll 1 Set-points (step difference) Dead band n° 1 Stage up: 0.2 Stage down: 0.2
8	Fan Troll 2 Set-points (step difference) Dead band n° 2 Stage up: 0.2 Stage down: 0.2
9	Fan Troll 3 Set-points (step difference) Dead band n° 3 Stage up: 0.2 Stage down: 0.2

2

Speed Troll pressure / Speed Troll pressure ratio

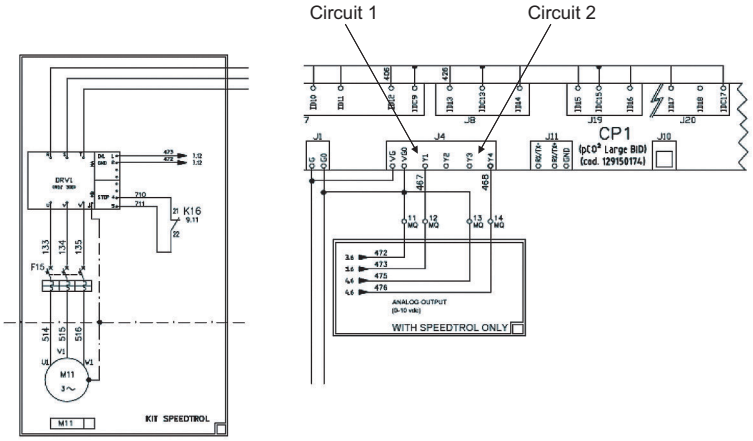
- Fan speed controlled using an analogue output signal 0 – 10Vdc.
- Only one fan per circuit is controlled by speed troll.
- Three other fans are ON / OFF controlled.



Another way to control the head pressure control is the use of the speed troll.

Speed troll is built up of one fan speed controller and 3 ON / OFF fans.

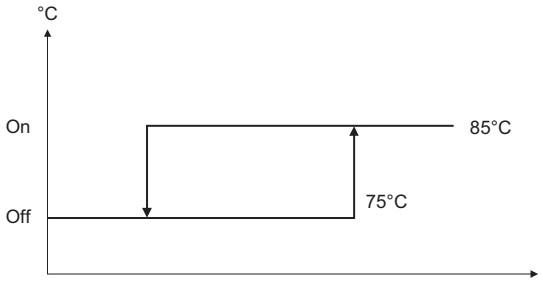
The fan speed is controlled using an analogue output signal from 0 – 10Vdc.



An analogue signal (10 – 10Vdc) coming from the pico² controller gives a signal to the fan driver.

3.10 Liquid Injection

Liquid injection when discharge temperature becomes too high

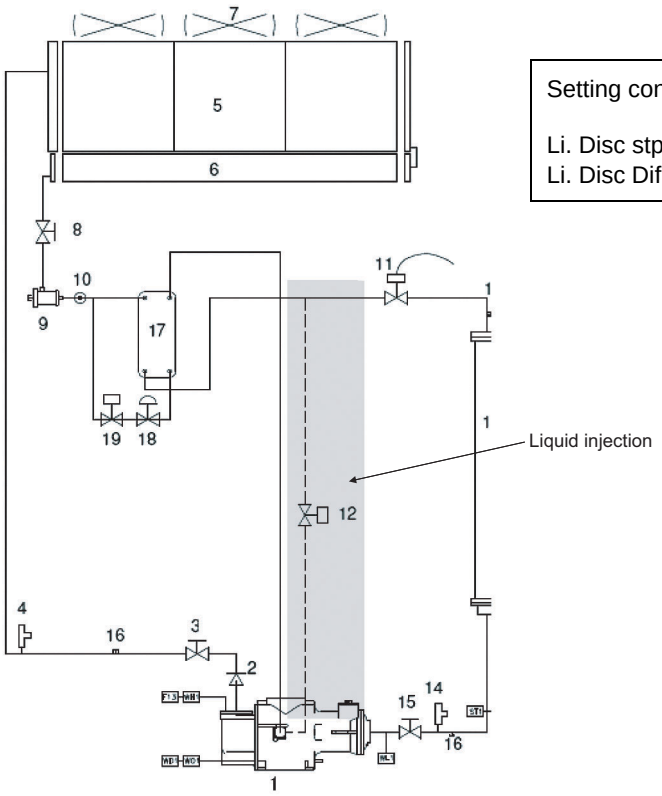


To avoid possible overheating of the compressor, a liquid injection is activated when the discharge temperature becomes higher than 85° C.

This control is reset when the discharge temperature becomes 10° C lower.

These values can be changed in the controller. It is not recommendable to change these settings.

Position of the liquid injection valve

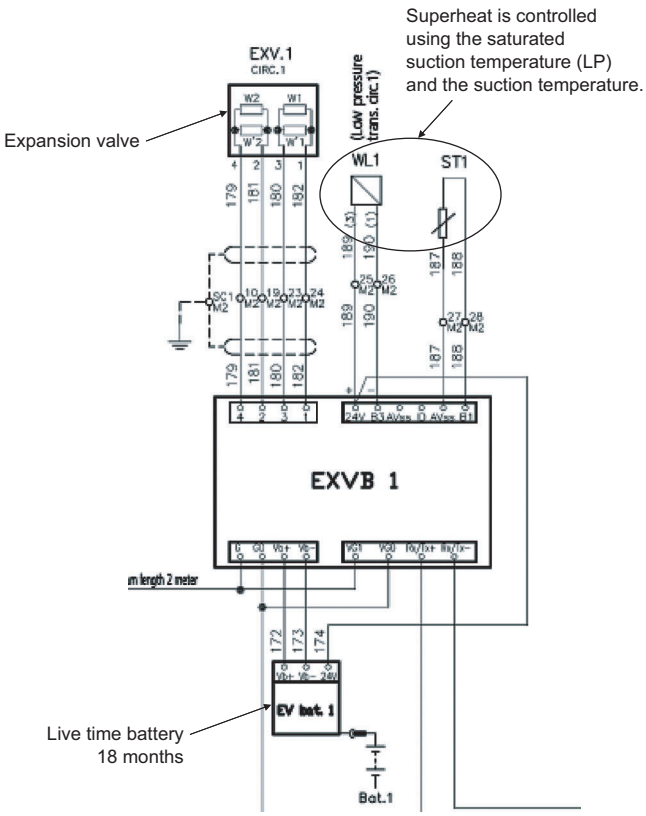


Setting controller

Li. Disc stp 85° C
Li. Disc Dif 10° C

3.11 Electronic Expansion Valve Control

EEV valve control



The Electronic expansion valve (EEV) circuit is build up of the following parts:

1 Expansion valve

2 Suction sensor

3 Low pressure sensor (Saturated suction temperature)

4 EEV driver

5 Battery charger

6 Battery

Driver EVD200 with Electronic EXV

The driver has the following functions:

1 Opening or closing the expansion valve.

2 To maintain the pre-programmed superheat.

3 To avoid that the low pressure will drop below a certain value.

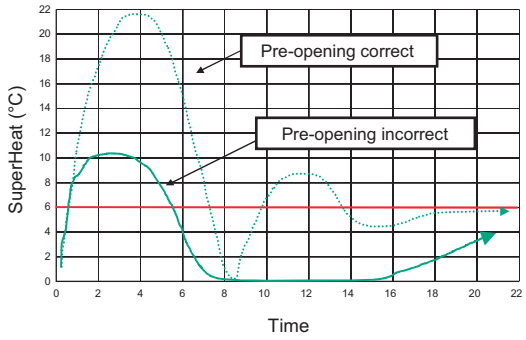
4 To avoid that the low pressure will rise above a certain value.

Parameters

- Pre-opening valve
- Type of valve
- Type of refrigerant
- Superheat Set-Point e Dead Band
- Proportional, Integral time and Derivative time
- Low Superheat protection
- LOP Protection
- MOP Protection
- High suction temperature
- Low pressure sensor temperature
- Hardware configuration (battery and plan)

Pre-opening valve

A set percentage value of the valve at the compressor start up.



- An excessive pre-opening can cause liquid return from the suction to the compressor (use default value).
- A small pre-opening can cause the compressor to trip for low pressure (use default value).

Valve and refrigerant type

Those values that are set in the factory must not modified:

An incorrect valve selection can cause:

- Step motor ERROR (the motor can be damaged by high current)
- Valve not opening or closing
- Valve to move in the opposite direction
- The circuit to stop for low or high pressure after start up

An incorrect refrigerant selection can cause:

- Wrong Suction Super Heat
- Incorrect suction pressure value (transducer range difference)

2

Driver EXV status LED

Under normal conditions, the five (5) LEDs indicate:

- POWER (yellow) : remains On in presence of supply. Remains Off in case of battery operation
- OPEN (green) : Flashing during the valve opening. On when valve is fully open.
- CLOSE (green): Flashing during the valve closing. On when valve is fully closed.
- Alarm (red) : On or flashing in case of hardware alarm.
- pLAN (green) : On during the normal working of pLAN.

In presence of critical alarm situations, the combination of LED On identifies the alarm as shown in the next page.

Driver EXV LED meaning alarm

Alarms that stops the system	**PRIORITY**	**LED OPEN**	**LED CLOSE**	**LED POWER**	**LED ALARM**
Eeprom reading error	7	Off	Off	On	Flashing
Valve open in case of lack of supply	6	Flashing	Flashing	On	Flashing
At start up, wait for battery loading (parameter...)	5	Off	On	Flashing	Flashing
Other alarms	**PRIORITY**	**LED OPEN**	**LED CLOSE**	**LED POWER**	**LED ERROR**
Motor connection error	4	Flashing	Flashing	On	On
Probe error	3	Off	Flashing	On	On
Eeprom wirting error	2	-	-	On	On
Battery error	1	-	-	Flashing	On

pLan	**LED pLAN**
Connection OK	On
Driver connection or address error = 0	Off
The Pco Master doesn't answer	Flashing

LOP protection

Is activated when...		The Valve
The saturated suction temperature is below the LOP limit	→	The valve will open to increase the suction pressure

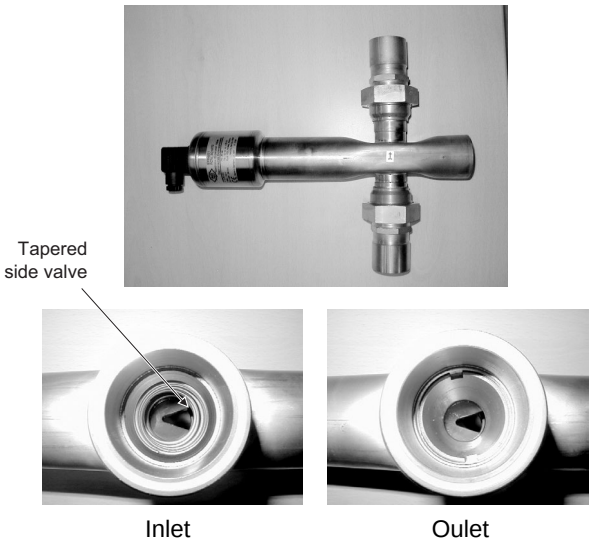
Warning: The protection will only work if the suction SH is away from the limit for low SH. (It could flood the evaporator!)

MOP protection

Is activated when...		The Valve
The saturated suction temperature is above the MOP limit	→	The valve will close to decrease the saturated suction temperature

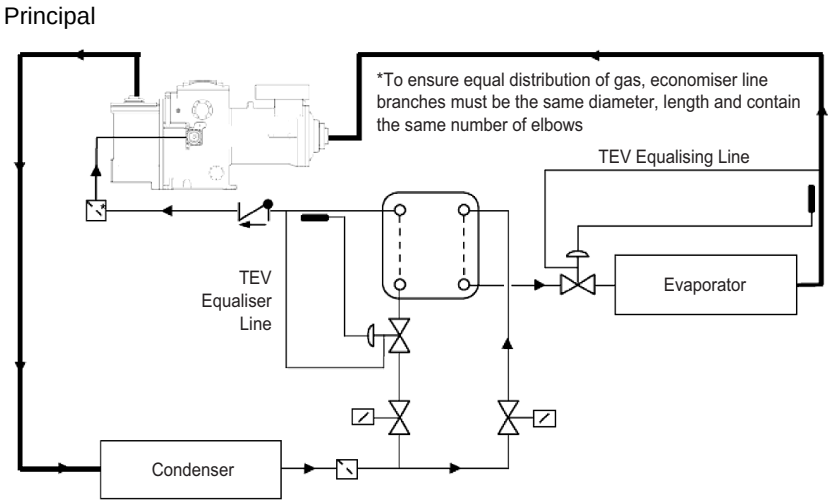
Warning: This protection will only work if the temperature is below the maximum limit. (The closing of the valve can increase the saturated temperature).

Electronic expansion valve



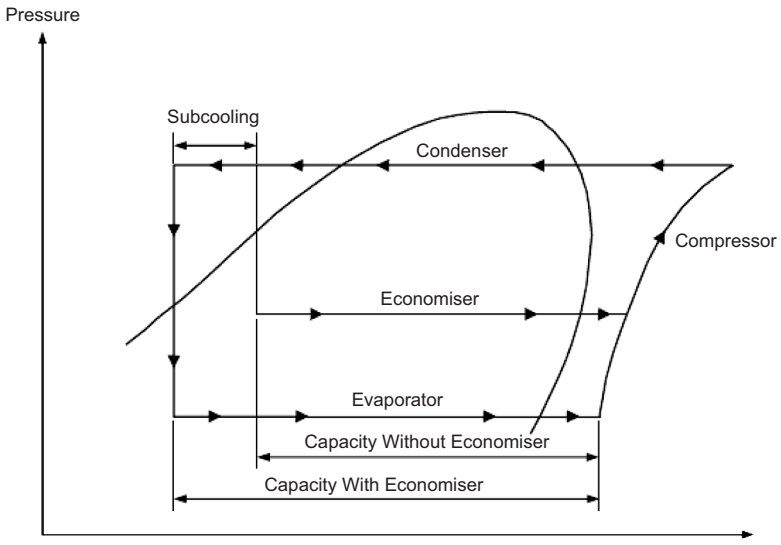
3.12 Economizer

Typical single compressor application



The compressor is provided with an economizer facility. This enables an additional charge of gas to be handled by the compressor, over and above that which is normally pumped. It is, in effect, a form of supercharging which has the net result of increasing refrigerating capacity by a significantly greater percentage than power consumption, hence improving the coefficient of performance (kW refrigeration / kW power input) or Coefficient of Performance (COP) of the compressor.

Economizer cycle on pressure/ Enthalpy (p-h) diagram



The economizer principle is illustrated on a pressure/enthalpy (p-h) diagram.

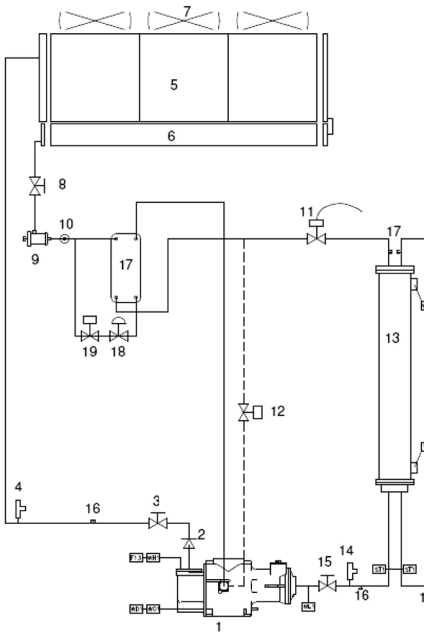
Suction gas is drawn into the main rotor flutes, these are sealed off in sequence by the star rotor teeth and compression begins. An extra charge of gas now enters the sealed flute through a port in the casing enclosing the main rotor. This gas supply is taken from an intermediate source at a slightly higher pressure than that prevailing in the flute at the instant the gas is introduced, hence the gas is induced to enter the flute.

The original and additional charges of gas are then compressed and discharged in the normal way. The full load pumping capacity of the compressor at suction conditions is not affected by the additional flow through the economizer connection. Typical for all screw compressors, as the compressor

unloads, the pressure at the economizer port falls towards suction pressure and the additional capacity and improved efficiency economizer system is no longer available.

As a guide to this effect, approximately half of the improvement due to using an economizer system will be lost by the time the compressor unloads to 90 % capacity, and falls to zero at around 70 % capacity.

Piping layout economizer



1. Single-screw compressor
2. No-return valve
3. Compressor delivery tap
4. High-pressure safety valve (24.5 bars)
5. Condenser battery
6. Built-in undercooling section
7. Axial ventilator
8. Liquid line isolating tap
9. Dehydration filter
10. Liquid and humidity indicator
11. Electronic expansion valve
12. Liquid injection solenoid valve
13. Direct expansion evaporator
14. Low-pressure safety valve (15.5 bars)
15. Compressor intake tap
16. Loading joint with valve
17. Economizer
18. Economizer expansion valve
19. Economizer solenoid valve

ST1-2. Intake temperature sensor
WL1-2. Low-pressure transducer (-0.5:7.0 bars)
WO1-2. Oil pressure transducer (0.0:30.0 bars)
WH1-2. High-pressure transducer (0.0:30.0 bars)
WD1-2. Discharge temperature sensor/Oil
F13. High-pressure switch (21.5 bars)
WIE. Water input temperature sensor
WOE. Water output temperature sensor

2

pCOe expansion # 1 - additional hardware & economizer

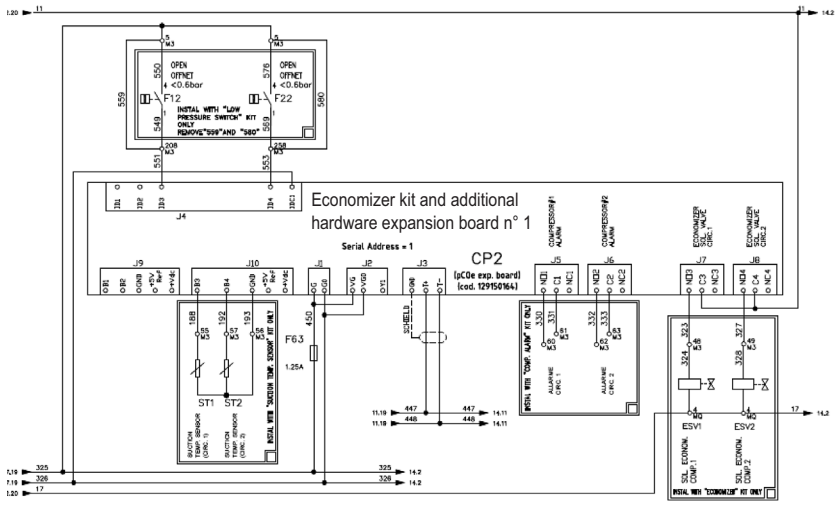
To have this function an additional expansion board is required. This board will control the 2 economizer valves.

Analog Input				Digital Input	
Ch.	**Description**	**Type**		**Ch.**	**Description**
B1	Comp. Capacity Sensor # 1	4-20mA		D11	SPARE
B2	Comp. Capacity Sensor # 2	4-20mA		D12	SPARE
B3	Suction Temp # 1 (**)	NTC		D13	Low Pressure Switch # 1 (*)
B4	Suction Temp # 2 (**)	NTC		D14	Low Pressure Switch # 2 (*)

Analog Output				Digital Output	
Ch.	**Description**	**Type**		**Ch.**	**Description**
AO1	SPARE			DO1	Compressor # 1 alarm (*)
				DO2	Compressor # 2 alarm (*)
				DO3	Economizer # 1 (*)
				DO44	Economizer # 2 (*)

(*) Optional
(**) In case EEXV driver is not installed. If EEXV driver is installed, suction temperature is detected through EEXV driver.

Wiring economizer kit and additional hardware



Economizer conditions

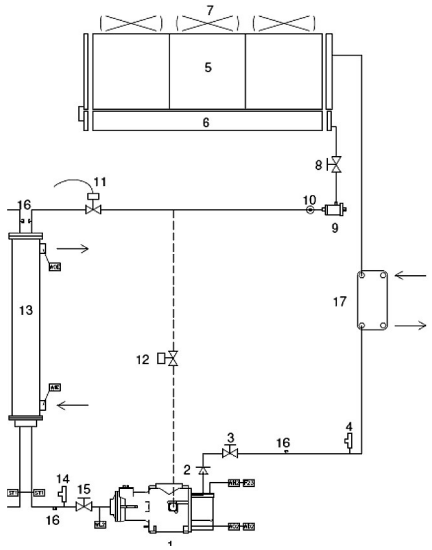
- Installation of expansion board
- Address of expansion board: 1
- Economizer activated if compressor capacity = 90%
- Economizer switch OFF if compressor capacity = 75%
- Precaution
  - Economizer switch OFF if HP saturated > 65° C
  - Economizer switch ON if HP saturated < 65°
- Above setting can be programmed in the controller

3.13 Heat Recovery

pCOe expansion # 2 – heat recovery

Analog Input				Digital Input	
Ch.	Description	Type		Ch.	Description
B1	Ambient temperature sensor			D11	Heat Recovery switch
B2	SPARE			D12	Heat Recovery Flow switch
B3	Entering HR water sensor	NTC		D13	SPARE
B4	Leaving HR water sensor	NTC		D14	SPARE

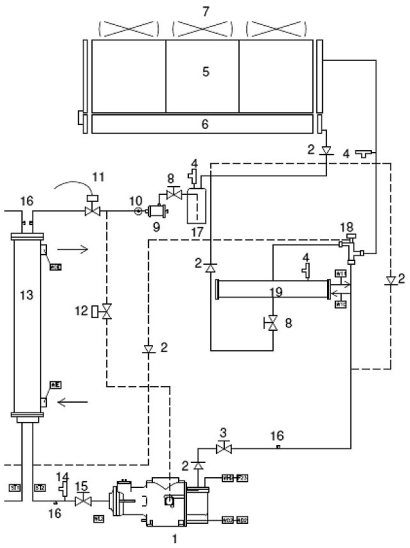
Partial heat recovery



1. Single-screw compressor
2. No-return valve
3. Compressor delivery tap
4. High-pressure safety valve (24.5 bars)
5. Condenser battery
6. Built-in undercooling section
7. Axial ventilator
8. Liquid line isolating tap
9. Dehydration filter
10. Liquid and humidity indicator
11. Thermostatic expansion valve
12. Liquid injection solenoid valve
13. Direct expansion evaporator
14. Low-pressure safety valve (15.5 bars)
15. Compressor intake tap
16. Loading joint with valve
17. Partial recovery exchanger (*)

ST1-2. Intake temperature sensor
WL1-2. Low-pressure transducer (-0.5:7.0 bars)
WO1-2. Oil pressure transducer (0.0:30.0 bars)
WH1-2. High-pressure transducer (0.0:30.0 bars)
WD1-2. Discharge temperature sensor/Oil
F13. High-pressure switch (21.5 bars)
WIE. Water input temperature sensor
WOE. Water output temperature sensor

Full heat recovery



1. Single-screw compressor
2. No-return valve
3. Compressor delivery tap
4. High-pressure safety valve (24.5 bars)
5. Condenser battery
6. Built-in undercooling section
7. Axial ventilator
8. Liquid line isolating tap
9. Dehydration filter
10. Liquid and humidity indicator
11. Thermostatic expansion valve
12. Liquid injection solenoid valve
13. Direct expansion evaporator
14. Low-pressure safety valve (15.5 bars)
15. Compressor intake tap
16. Loading joint with valve
17. Liquid receiver
18. Recovery cycle three-way switch valve
19. Recovery exchanger

WL1-2. Low-pressure transducer (-0.5:7.0 bars)
WO1-2. Oil pressure transducer (0.0:30.0 bars)
WH1-2. High-pressure transducer (0.0:30.0 bars)
WD1-2. Temperature discharge sensor/Oil
F13. High-pressure switch (21.5 bars)
WIE. Water input temperature sensor
WOE. Water output temperature sensor
W10. Recovery water input temp. sensor (*)
W11. Recovery water output temp. sensor (*)

When heat recovery is activated the control activates or deactivates recovery circuits with a step logic.

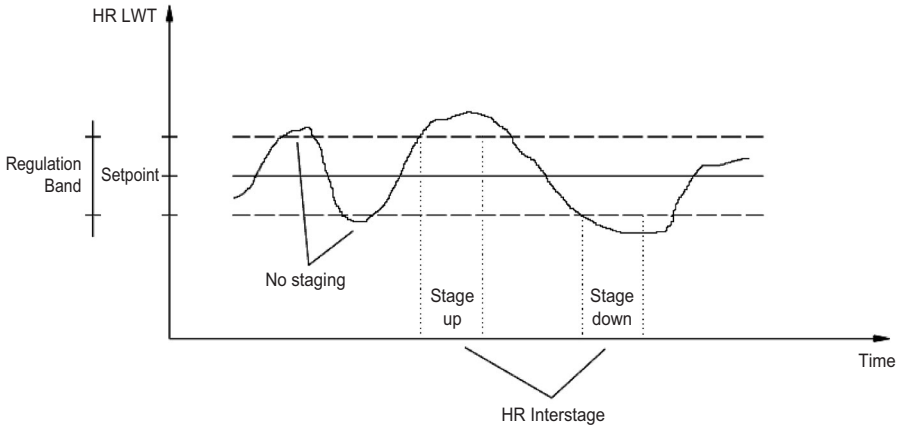
In particular a next heat recovery stage is activated (a new heat recovery circuit is inserted) if the heat recovery leaving water temperature remains below the set-point by an amount greater than an adjustable regulation band for a timer greater than an adjustable value (heat recovery interstage).

In the same manner a heat recovery stage is deactivated (a heat recovery circuit is removed) if the heat recovery leaving water temperature remains above the set-point by an amount greater than an adjustable dead regulation band for a timer greater than the previous defined value. A high temperature alarm set-point is active in the recovery loop; it will disable recovery circuits.

A three-way valve is used to increase recovery water temperature at startup; a proportional control is used to establish valve position; at low temperature the valve will re-circulate recovery water, while at temperature increasing the valve will bypass a portion of the flow.

2

Heat recovery operation



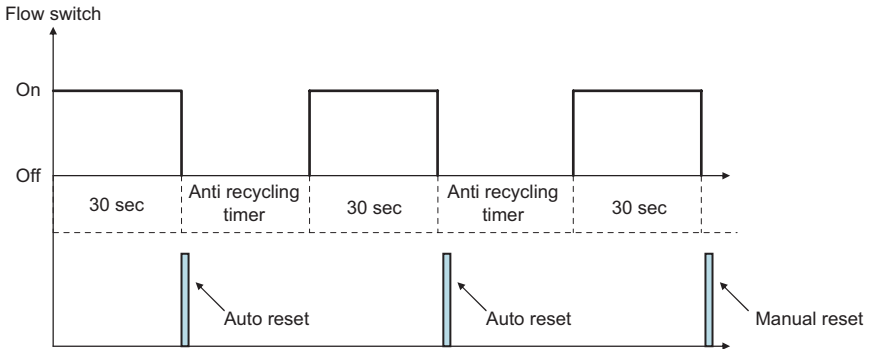
- Heat recovery dead band: area where the capacity of the compressor remains the same.
- Stage timer: Time between 2 capacity step increases or decreases.
- Condensing threshold time: When changing from water to air-cooled condenser and the saturated discharge temperature is below 30° C, the compressor will not load up to avoid liquid pumping.
- HR inter-stage timer:
  - If temperature is higher than the upper limit of the dead band for a time longer than the inter-stage time, the unit returns to the cooling mode.
  - If temperature is lower than the lower limit of the dead band for a time longer than the inter-stage time, the unit switch on the second compressor.
- HR Bypass valve Min. Time:
  - If the water temperature is 40° C the 3-way valve is100% open.
  - If the water temperature is 30° C the 3-way valve is100 % closed.
- The valve has proportional control with a signal of 0 to 10V.

Heat recovery operation conditions

- Installation of expansion board
- Address of expansion board: 2
- Possible to select partial recovery
- Possible to select full recovery
- Settings to be programmed in the controller:
  - Dead band
  - Stage timer
  - Set-point leaving water condenser
  - Heat recovery inter-stage timer
  - Heat recovery bypass valve minimum temperature
  - Heat recovery bypass valve maximum temperature

Flow switch problem during operation

- Failure if flow is not within specification
- Same function if unit is switched OFF (no)



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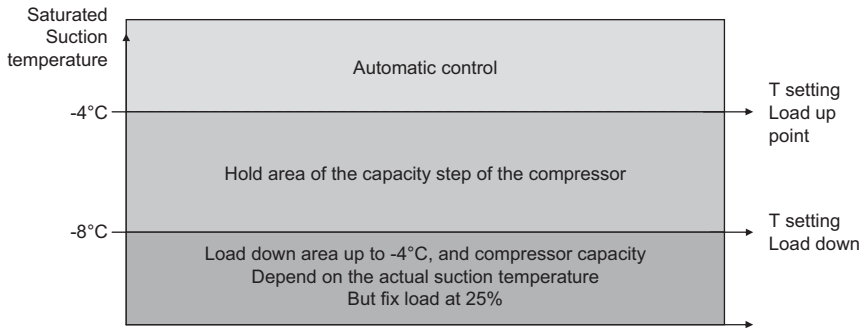
3.14 Limitation

Overview

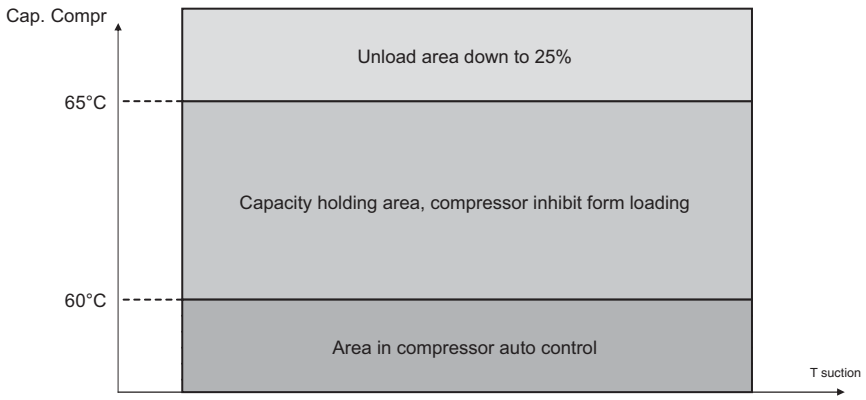
- High pressure limitations (software / hardware)
- Low pressure limitations (software / hardware)
- Oil heating (software)
- Chilled water limitation (software)
- High leaving water start up
- Enable outdoor ambient lock out

Low pressure limitation



Setting controller	
Hold T	-4° C
Down T	-8° C
Alarm T	-10° C
Down delay	20 sec

High pressure limitation



Setting controller	
Hold T	60° C
Down T	65° C

Oil heating

Start up compressor not allowed if:

- Discharge temperature sensor in PT 1000 – T oil pressure < 50° C
- No fault appears
- Check at compressor status for oil heating

Discharge superheat threshold

Condition:

- Only control during start up of compressor
- If discharge superheat is < 1° C for 30 sec.

Setting controller	
Discgarge SH	1° C
Discgarge SH T	30 sec

High leaving water evaporator start up

- Setting upper limit leaving water: 25° C
- Maximum compressor stage: 70%

This function limits the load of each compressor to a default value (default 70%), until the outlet water temperature is over the set value (default 25° C). This logic helps the start up of the unit when the water temperature is very high (35-40° C).

This feature avoids dangerous super-heat of the motor and disagreeable interventions for high pressure. The values of maximum load of the compressors and the limit water temperature are modifiable under password "User".

Set-point limitations

- Lowest allowable set-point: 4° C
- Highest allowable set-point: 15° C

Remark: Both values can be changed.

To avoid that the customer would select set-points out of the operation range, a maximum and minimum set-point can be programmed.

Enable ambient lock-out

- Y / N
- Set-point: 5° C
- Differential: 1° C

If the ambient temperature is below the programmed set-point, the unit will not start.

Remark: This control can be disabled.

Unit current limitation

- The unit load is inhibited if the absorbed current is near a maximum current set-point
- (within -5% from set-point)
- The unit is unloaded if the absorbed current is higher than a maximum current set-point.