

# REGION OF WATERLOO

925 ERB STREET WEST  
WATERLOO, ON  
N2J 3Z4

CUSTOMER NO.: 2474  
MANUAL NO.: 2474-080421



M A C H I N E X

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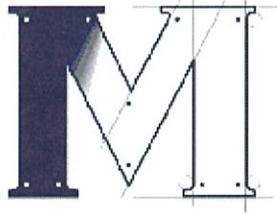
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## ***SECTION 1***

### ***INTRODUCTION AND DESCRIPTION***



# SECTION 1

## INTRODUCTION AND DESCRIPTION

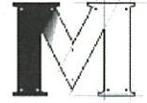
### *1.1 INTRODUCTION*

Thank you for choosing equipment manufactured by **INDUSTRIES MACHINEX INC.** Please read this manual and call us if you have any questions. Proper review of this manual should answer most of your questions.

This manual was written to give you a better understanding of the functioning of your equipment. You will find the complete listing of your equipment with specifications, and all the secrets you need to know that will help you keep the equipment properly maintained. Also, the list of spare parts has been adapted to allow easy identification. A table of content, an index and the bottom page annotations will help you find information quickly.

The safety rules mentioned in this manual are there to help you prevent any risks of personal injury or damage to the equipment. That is why we ask you to read this manual carefully and follow the safety rules. The maintenance program shown in Section 5 must be followed to keep your equipment running well and assure long lasting performance and reliability. Each section of this manual was carefully prepared and contains all the essential information for good comprehension. Each operator needs to be familiar with the precision of the terms outlined in this manual.

Please keeps this manual easily accessible to personnel operating the equipment.



## **1.2 WARRANTY**

Machinery is covered with a warranty of 12 months against manufacturer's equipment material defaults while in normal use.

**The guarantee becomes effective from the date of delivery.**

The guarantee will lapse if the equipment sold is repaired or altered by a personnel that has not been authorized by **INDUSTRIES MACHINEX INC.**, or if operation and maintenance instructions for the machine have not been followed and approved (see section 1.2.1 to know what are the exclusions to this warranty).

**INDUSTRIES MACHINEX INC.** or anyone having participated to the delivery or to the installation of the equipment cannot be held responsible for damage of any kind, or from any cause, incidental or consequential (including damage caused by loss of revenue or profit, termination of activities or others) following or resulting from the use of the equipment sold under the foregoing terms and conditions, and that even if the vendor has been informed of those possible damages.

Any parts or equipment provided by **INDUSTRIES MACHINEX INC.** suppliers shall be subject only to the warranties of those suppliers.

The guarantee covers replacement parts only, and does not include labor and consequential damages.

Buyer shall notify **INDUSTRIES MACHINEX INC.** in writing within fifteen (15) days of discovery, within the warranty period, of any alleged defect in order to allow **INDUSTRIES MACHINEX INC.** or its representative to make such investigation, examination and tests as it seems appropriate. If requested by **INDUSTRIES MACHINEX INC.**, the buyer will return the alleged defective product to **MACHINEX's** factory for examination and testing. If **INDUSTRIES MACHINEX INC.** determines the product defective, **INDUSTRIES MACHINEX INC.** will either repair or replace such product with a similar item of **MACHINEX's** manufacture, F.O.B. **MACHINEX's** factory or allow buyer credit for an amount equal to the one invoiced for the said product.

This limited warranty is in lieu of all other warranties.

**WARRANTY EFFECTIVE DATE: MAY 18<sup>TH</sup> 2009, MANUAL NO.: (2474-080421)**



### ***1.2.1 EXCLUSIONS TO THE WARRANTY***

This warranty does not cover expendable parts, maintenance (alignment, adjustments etc.), wear or impact on Machinex products, including but not limited to, lubrication grease, oils, hydraulic connectors, gaskets and seals and any other items that may show evidence of negligent use or overloading, abuse, accident, improper maintenance or storage, improper use, or unauthorized alterations.

As an example the followings situations do not qualify for a refund pursuant to the warranty.

Exclusions:

- Product damaged during storage.
- Transportation of product or parts for inspection and/or repair purposes.
- Labor, cost of transportation and communications during repairs under warranty.
- Motors, gear reducer, PLC opened without the consent of MACHINEX.
- Parts from which the identification number or serial number has been removed.
- Etc.

### ***1.2.2 RETURN OF PARTS POLICY***

1. All parts or merchandise that has to be returned to Industries Machinex under the warranty must bear an RGA number (return goods authorization). These numbers will be issued from Industries Machinex and can be obtained by contacting the after-sales service department. When you call, be sure to have the following information available:

- Serial number of the defective part (Reference in Parts Manual)
- Reason for returning the part,
- Effective date of warranty and name of project.

2. When the part is being returned to Industries Machinex, make sure to include the form for the return of parts and it is very important to mention the RGA number that was attributed.

3. The part has to be returned according to the instructions received from Machinex (mode of transportation, name of carrier, name of custom broker).

4. All parts under warranty will be invoiced. If warranty applies, a credit will be issued after reception and inspection of the defective part. Please note that any delay for returning the part within three (3) weeks after shipment of the replacement part will reduce credit, if applicable, by 20% each week.

5. New parts ordered and then returned will be subject to restocking charges of 15%.

6. The RGA number has to be inscribed on the packing slip or bill of lading.



### 1.3 HOW TO ORDER PARTS

To help get better and faster service when ordering spare parts, please follow the steps bellow:

- 1) Have your service manual at hand,
- 2) Identify the parts with the following information:
  - a) the catalog number,
  - b) the list number of the spare part,
  - c) the number and the description of the part,
  - d) the quantity of parts that are required.
- 3) Give the complete address of delivery, the telephone number and a contact at the delivery site. Keep in mind that parts cannot be delivered to a Post Office box.
- 4) Specify the shipping method desired and the date the package is required. When no instruction are given, shipping method will be best way, depending on nature of part and urgency of repair. Freight costs will be paid by customer.
- 5) When returning parts, you will need a "Return Goods" authorization number that will be issued by the Machinex Service Department.
- 6) If the parts ordered are missing, contact us immediately.

### 1.4 MACHINEX CONTACTS

If you would like more information or, if you have any questions, do not hesitate to contact us. It will be our pleasure to help you.

How to reach the after-sales service department:

Position/Department	Personnel
President	Pierre Paré
Technical Director	Karl Paré
Project Manager	David Marcouiller
After-sales Services	Michel Houde & Serge Beurivage
Parts	Jean Diamond Jr



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Pager: (819) 751-5200 (after hour service)  
E-mail: sales@machinex.ca

\* DIMENSIONS ONLY include ONE length of belt.



## 1.5 LIST OF EQUIPMENT

Since each piece of equipment has to answer to conditions of the type of material or product that is to be conveyed, MACHINEX uses a design appropriate for each installation to the needs of your application.

*Chart 1 List of equipment*

No Equip.*	Model*	Dimensions*	Information**	Reducer***	No. of List****
C-1	Z-Shape Conveyor	36" wide X 24'-8 1/2" long	Section 3.4	SK5382 M5	CCA-1783L
C-2	Z-Shape Conveyor	36" wide X 47'-11 1/2" long.	Section 3.4	SK8382 M6	CCA-1784L
C-3	Slider Bed Conveyor	36" wide X 28'-2 1/2" long.	Section 3.5	SK3282 M-6	CSRT-024L
C-5	Slider Bed Conveyor	30" wide X 33'-9" long.	Section 3.5	SK2282 M6	CSR3-190L
CF-6A	Can Flattener	24" dia. X 2 rolls	Section 3.8	SK4282 M1	EC-003L
CF-6B	Can Flattener	24" dia. X 2 rolls	Section 3.8	SK4282 M1	EC-004L
C-7	Idler Conveyor	30" wide X 28'-3 1/2" long.	Section 3.5	SK2282 M6	CRP2-079L
GB-8	Glass Breaker Screen	48" wide X 19 Shafts	Section 3.6	SK3282 M3	DS-163L
C-9	Idler Conveyor	60" wide X 24'-3 1/2" long.	Section 3.5	SK2282 M6	CRP2-059L
PP-10	Plastic Perforator	36" wide X 2 Rolls 24" dia.	Section 3.7	SK4282 M1	EP-033L
C-11	Slider Bed Conveyor	30" wide X 41'-3" long.	Section 3.5	SK4282 M5	CSR3-192L
VIB-12	Vibrating Conveyor	Model KDSNBD-48	ANNEX 1	N/A	VIB-007L
C-13	Slider Bed Conveyor	48" wide X 16'-2 1/2" long.	Section 3.5	SK92372 M3	CSO-041L
AS-14	Optical Sorter	Model Mistral 1208T	ANNEX 2	N/A	PST-043L
C-15	Slider Bed Conveyor	24" wide X 22'-3 1/2" long.	Section 3.5	SK2282 M6	CSR3-193L



C-16	Slider Roller Conveyor	30'' wide X 67'-1'' long.	Section 3.5	SK4282 M6	CSRT-026L
C-18	Slider Roller Conveyor	24'' wide X 34'-3'' long.	Section 3.5	SK2282 M6	CSR3-194L
C-19	Slider Bed Conveyor	30'' wide X 13'-9'' long.	Section 3.5	SK2282 M6	CSRT-027L
C-20	Slider Bed Conveyor	24'' wide X 28'-3½'' long.	Section 3.5	SK2282 M6	CSR3-195L
C-21	Slider Bed Conveyor	30'' wide X 52'-1½'' long.	Section 3.5	SK2282 M6	CSRT-025L

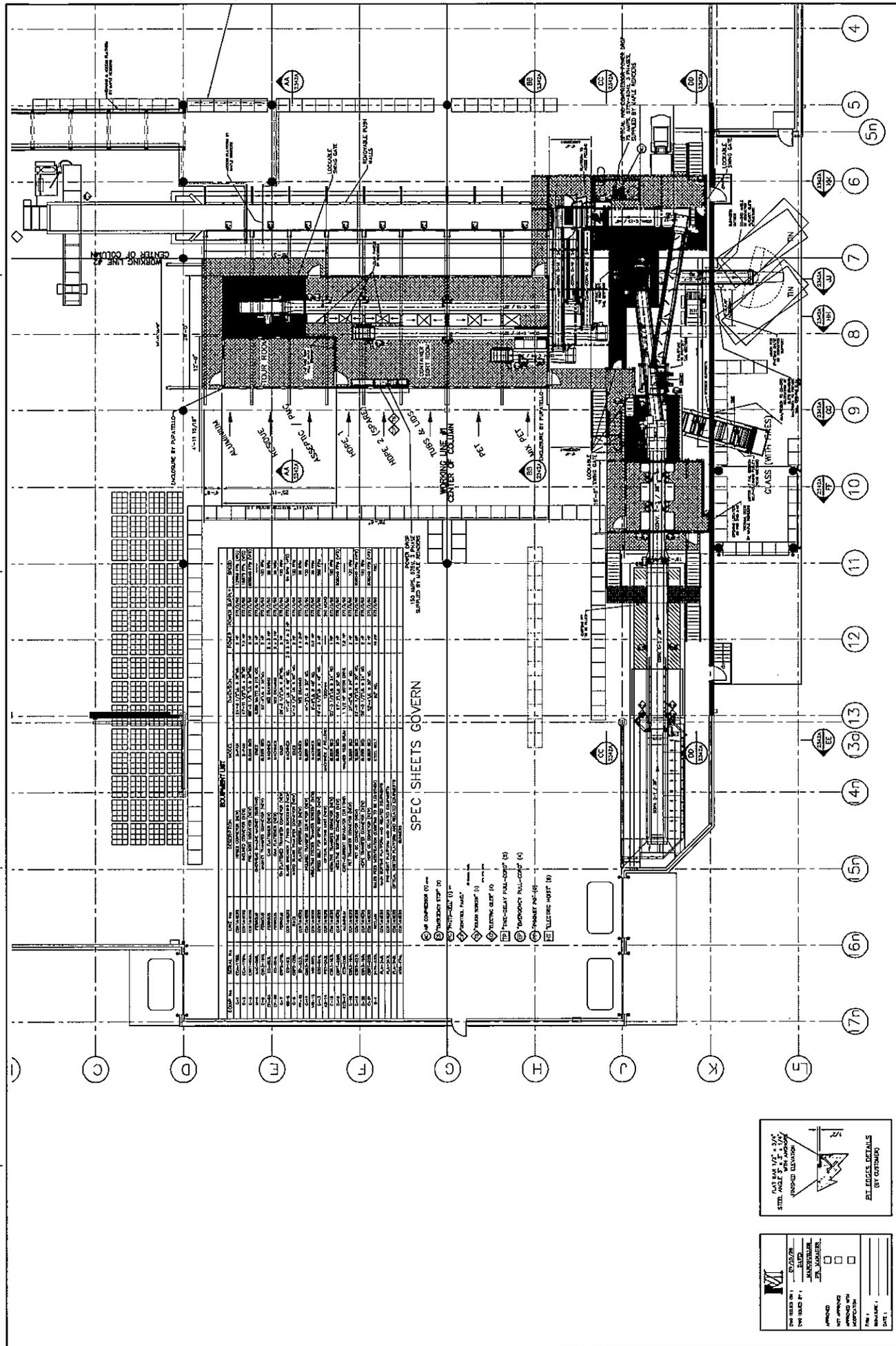
For the general arrangement of the equipment described above, check figure 1 on the next page.

\* The number, the model and the dimensions of the machine will help you identify your equipment.

\*\* You will find specific information of the machine in the column entitled "Information".

\*\*\* The column entitled "Reducer" tells you the model and the mounting position of the speed reducer; you will find the information in section 3.2.

\*\*\*\* The column entitled "No. of List" indicates the number of the "spare part listing" of this equipment. You will find this list in section 4.

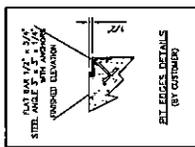


**EQUIPMENT LIST**

ITEM NO.	DESCRIPTION	QTY	MANUFACTURER	MODEL	DATE
1	CONCRETE	1	CONCRETE	CONCRETE	1970/01/01
2	STEEL	1	STEEL	STEEL	1970/01/01
3	GLASS	1	GLASS	GLASS	1970/01/01
4	ALUMINUM	1	ALUMINUM	ALUMINUM	1970/01/01
5	ASBESTIC / PVC	1	ASBESTIC / PVC	ASBESTIC / PVC	1970/01/01
6	ROPE 1	1	ROPE 1	ROPE 1	1970/01/01
7	ROPE 2	1	ROPE 2	ROPE 2	1970/01/01
8	ROPE 3	1	ROPE 3	ROPE 3	1970/01/01
9	ROPE 4	1	ROPE 4	ROPE 4	1970/01/01
10	ROPE 5	1	ROPE 5	ROPE 5	1970/01/01
11	ROPE 6	1	ROPE 6	ROPE 6	1970/01/01
12	ROPE 7	1	ROPE 7	ROPE 7	1970/01/01
13	ROPE 8	1	ROPE 8	ROPE 8	1970/01/01
14	ROPE 9	1	ROPE 9	ROPE 9	1970/01/01
15	ROPE 10	1	ROPE 10	ROPE 10	1970/01/01
16	ROPE 11	1	ROPE 11	ROPE 11	1970/01/01
17	ROPE 12	1	ROPE 12	ROPE 12	1970/01/01
18	ROPE 13	1	ROPE 13	ROPE 13	1970/01/01
19	ROPE 14	1	ROPE 14	ROPE 14	1970/01/01
20	ROPE 15	1	ROPE 15	ROPE 15	1970/01/01
21	ROPE 16	1	ROPE 16	ROPE 16	1970/01/01
22	ROPE 17	1	ROPE 17	ROPE 17	1970/01/01
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31	ROPE 26	1	ROPE 26	ROPE 26	1970/01/01
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36	ROPE 31	1	ROPE 31	ROPE 31	1970/01/01
37	ROPE 32	1	ROPE 32	ROPE 32	1970/01/01
38	ROPE 33	1	ROPE 33	ROPE 33	1970/01/01
39	ROPE 34	1	ROPE 34	ROPE 34	1970/01/01
40	ROPE 35	1	ROPE 35	ROPE 35	1970/01/01
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42	ROPE 37	1	ROPE 37	ROPE 37	1970/01/01
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44	ROPE 39	1	ROPE 39	ROPE 39	1970/01/01
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46	ROPE 41	1	ROPE 41	ROPE 41	1970/01/01
47	ROPE 42	1	ROPE 42	ROPE 42	1970/01/01
48	ROPE 43	1	ROPE 43	ROPE 43	1970/01/01
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59	ROPE 54	1	ROPE 54	ROPE 54	1970/01/01
60	ROPE 55	1	ROPE 55	ROPE 55	1970/01/01
61	ROPE 56	1	ROPE 56	ROPE 56	1970/01/01
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69	ROPE 64	1	ROPE 64	ROPE 64	1970/01/01
70	ROPE 65	1	ROPE 65	ROPE 65	1970/01/01
71	ROPE 66	1	ROPE 66	ROPE 66	1970/01/01
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73	ROPE 68	1	ROPE 68	ROPE 68	1970/01/01
74	ROPE 69	1	ROPE 69	ROPE 69	1970/01/01
75	ROPE 70	1	ROPE 70	ROPE 70	1970/01/01
76	ROPE 71	1	ROPE 71	ROPE 71	1970/01/01
77	ROPE 72	1	ROPE 72	ROPE 72	1970/01/01
78	ROPE 73	1	ROPE 73	ROPE 73	1970/01/01
79	ROPE 74	1	ROPE 74	ROPE 74	1970/01/01
80	ROPE 75	1	ROPE 75	ROPE 75	1970/01/01
81	ROPE 76	1	ROPE 76	ROPE 76	1970/01/01
82	ROPE 77	1	ROPE 77	ROPE 77	1970/01/01
83	ROPE 78	1	ROPE 78	ROPE 78	1970/01/01
84	ROPE 79	1	ROPE 79	ROPE 79	1970/01/01
85	ROPE 80	1	ROPE 80	ROPE 80	1970/01/01
86	ROPE 81	1	ROPE 81	ROPE 81	1970/01/01
87	ROPE 82	1	ROPE 82	ROPE 82	1970/01/01
88	ROPE 83	1	ROPE 83	ROPE 83	1970/01/01
89	ROPE 84	1	ROPE 84	ROPE 84	1970/01/01
90	ROPE 85	1	ROPE 85	ROPE 85	1970/01/01
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95	ROPE 90	1	ROPE 90	ROPE 90	1970/01/01
96	ROPE 91	1	ROPE 91	ROPE 91	1970/01/01
97	ROPE 92	1	ROPE 92	ROPE 92	1970/01/01
98	ROPE 93	1	ROPE 93	ROPE 93	1970/01/01
99	ROPE 94	1	ROPE 94	ROPE 94	1970/01/01
100	ROPE 95	1	ROPE 95	ROPE 95	1970/01/01

**SPEC SHEETS GOVERN**

- 1. CONCRETE (S)
- 2. STEEL (S)
- 3. GLASS (S)
- 4. ALUMINUM (S)
- 5. ASBESTIC / PVC (S)
- 6. ROPE 1 (S)
- 7. ROPE 2 (S)
- 8. ROPE 3 (S)
- 9. ROPE 4 (S)
- 10. ROPE 5 (S)
- 11. ROPE 6 (S)
- 12. ROPE 7 (S)
- 13. ROPE 8 (S)
- 14. ROPE 9 (S)
- 15. ROPE 10 (S)
- 16. ROPE 11 (S)
- 17. ROPE 12 (S)
- 18. ROPE 13 (S)
- 19. ROPE 14 (S)
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- 21. ROPE 16 (S)
- 22. ROPE 17 (S)
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- 38. ROPE 33 (S)
- 39. ROPE 34 (S)
- 40. ROPE 35 (S)
- 41. ROPE 36 (S)
- 42. ROPE 37 (S)
- 43. ROPE 38 (S)
- 44. ROPE 39 (S)
- 45. ROPE 40 (S)
- 46. ROPE 41 (S)
- 47. ROPE 42 (S)
- 48. ROPE 43 (S)
- 49. ROPE 44 (S)
- 50. ROPE 45 (S)
- 51. ROPE 46 (S)
- 52. ROPE 47 (S)
- 53. ROPE 48 (S)
- 54. ROPE 49 (S)
- 55. ROPE 50 (S)
- 56. ROPE 51 (S)
- 57. ROPE 52 (S)
- 58. ROPE 53 (S)
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- 60. ROPE 55 (S)
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- 63. ROPE 58 (S)
- 64. ROPE 59 (S)
- 65. ROPE 60 (S)
- 66. ROPE 61 (S)
- 67. ROPE 62 (S)
- 68. ROPE 63 (S)
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- 70. ROPE 65 (S)
- 71. ROPE 66 (S)
- 72. ROPE 67 (S)
- 73. ROPE 68 (S)
- 74. ROPE 69 (S)
- 75. ROPE 70 (S)
- 76. ROPE 71 (S)
- 77. ROPE 72 (S)
- 78. ROPE 73 (S)
- 79. ROPE 74 (S)
- 80. ROPE 75 (S)
- 81. ROPE 76 (S)
- 82. ROPE 77 (S)
- 83. ROPE 78 (S)
- 84. ROPE 79 (S)
- 85. ROPE 80 (S)
- 86. ROPE 81 (S)
- 87. ROPE 82 (S)
- 88. ROPE 83 (S)
- 89. ROPE 84 (S)
- 90. ROPE 85 (S)
- 91. ROPE 86 (S)
- 92. ROPE 87 (S)
- 93. ROPE 88 (S)
- 94. ROPE 89 (S)
- 95. ROPE 90 (S)
- 96. ROPE 91 (S)
- 97. ROPE 92 (S)
- 98. ROPE 93 (S)
- 99. ROPE 94 (S)
- 100. ROPE 95 (S)



**REVISIONS**

NO.	DATE	BY	DESCRIPTION
1	06/27/78	DAVID	ISSUED FOR PERMITS
2	06/27/78	DAVID	REVISION FOR OWNER ACCEPTANCE
3	06/27/78	DAVID	REVISION FOR PERMITS
4	06/27/78	DAVID	REVISION FOR PERMITS
5	06/27/78	DAVID	REVISION FOR PERMITS
6	06/27/78	DAVID	REVISION FOR PERMITS
7	06/27/78	DAVID	REVISION FOR PERMITS
8	06/27/78	DAVID	REVISION FOR PERMITS
9	06/27/78	DAVID	REVISION FOR PERMITS
10	06/27/78	DAVID	REVISION FOR PERMITS

NOTES: ALL DIMENSIONS ARE TO THE FINISHED INSIDE SURFACE UNLESS OTHERWISE NOTED. THE FINISHED FLOOR SHALL HAVE AN ELEVATION OF 100.00.

**REGION OF WATERLOO**  
205 ERIE STREET WEST  
WATERLOO, ONTARIO

**PROJECT NO.:** 2018  
**DATE:** 06/27/78

**CLIENT:** MRC OF WATERLOO

**PROJECT NO.:** 2018  
**DATE:** 06/27/78

**REGION OF WATERLOO**  
205 ERIE STREET WEST  
WATERLOO, ONTARIO

**PROJECT NO.:** 2018  
**DATE:** 06/27/78

**CLIENT:** MRC OF WATERLOO

**PROJECT NO.:** 2018  
**DATE:** 06/27/78

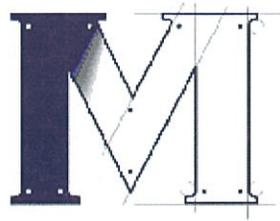
**REGION OF WATERLOO**  
205 ERIE STREET WEST  
WATERLOO, ONTARIO

**PROJECT NO.:** 2018  
**DATE:** 06/27/78

**CLIENT:** MRC OF WATERLOO

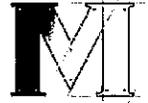
**PROJECT NO.:** 2018  
**DATE:** 06/27/78





## ***SECTION 2***

### ***GENERAL INFORMATION***



## SECTION 2

### GENERAL INFORMATION

#### 2.1 *PRE START-UP INSPECTION*

Before you start the units for the first time, it is essential to check the following:

- Assure that the oil level of the speed reducers, gear drives are adequate.
- Check the safety guards to assure that they haven't been moved and are fixed properly to the equipment.
- Check the alignment of the shafts to assure that they were not modified during installation. The shafts must turn freely.
- Check the amperage of the motors to assure it is within specifications of the manufacturer (descriptive plate). This check-up should also be performed once the equipment is running (full load).
- To have a smooth running and to reduce the noise, closely check the bearings and the speed reducers gear motor, to be certain that they are fixed securely and that they are not damaged.
- Check the alignment and the tension of the belts. (See Section 3 for further details on proper belt alignment tension.)
- Check all bolts and anchor bolts for proper tightness.
- Check to assure that all electrical connections and conduits are properly secured.

You can start-up your equipment only after the verification of all the points mentioned above.



## 2.2 SAFETY MEASURES

- ⇒ The equipment should never be used by the staff before they have read and understood this manual.
- ⇒ Before starting a machine, be sure that nothing or nobody is near the mobile parts of the machine.
- ⇒ Before starting a machine, be sure that all the safety guards are in place.
- ⇒ Do not use a machine if the safety system is not operational and designed by Machinex.
- ⇒ Cut the power supply to the equipment at first sight of malfunction.
- ⇒ Properly lockout electrical power to any piece of equipment before carrying out repairs or maintenance.
- ⇒ Never walk, stand, sit or lie on a equipment.
- ⇒ Keep the signal safety stickers visible and in good condition.
- ⇒ A equipment must transport only the material that it was designed for.
- ⇒ Do not overload a machine.
- ⇒ Do not load a equipment when it is not running, unless it was designed for this purpose.
- ⇒ Never use equipment with damaged or defective parts.
- ⇒ Never run the conveyor in any other way except for what it was designed for.
- ⇒ Only qualified staff may perform maintenance and the repairs on the equipment.
- ⇒ Nobody should never climb or hang on a machine or on a structure support.
- ⇒ Use only the provided stairs and ladders provided to access the platforms.



## 2.3 ELECTRICAL EQUIPMENT

The electrical controls provided by INDUSTRIES MACHINEX INC. are CSA approved under the following categories:

- ⇒ Class 3211 07 INDUSTRIAL CONTROL EQUIPMENT
  - Miscellaneous
- ⇒ Class 3211 87 INDUSTRIAL CONTROL EQUIPMENT
  - Certified to U.S. Standards

### 2.3.1 REPAIRING THE ELECTRICAL CONTROLS

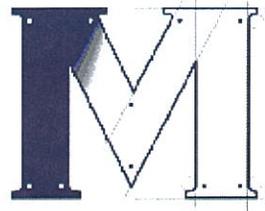
The following chart enumerates different problem that could happen with your equipment and how to resolve them. It was prepared to guide you during these situations.

**Chart 2 Electrical control panel problems**

Problems	Probable causes	Solutions
The motor stop without any visible reason.	Burnt fuses	Change the burnt fuses
	Overload relay disengaged	-Re-engage the overload relay -Check for a mechanical jam
The motor do not start.	Burnt fuses and/or overload disengaged	Replace the fuse and/or re-engage the overload relay
	Check photocell	Clean it
	Check emergency stop button (Red push-button)	Re-engage the button
	Check pull-cord system	Check the cable

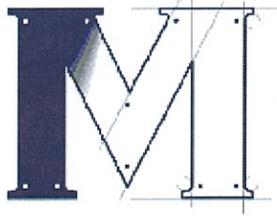
*Note: This chart is written according to a general electrical installation. To know the characteristics of your installations or for more information, do not hesitate to contact MACHINEX INDUSTRIES where qualified personnel will give you the information.*

**Section 3**  
**MAINTENANCE AND**  
**EQUIPMENT**



## ***SECTION 3***

# ***MAINTENANCE AND EQUIPMENT***



## ***SECTION 3***

# ***MAINTENANCE AND EQUIPMENT***



## SECTION 3

### MAINTENANCE AND EQUIPMENT

#### *3.1 INTRODUCTION*

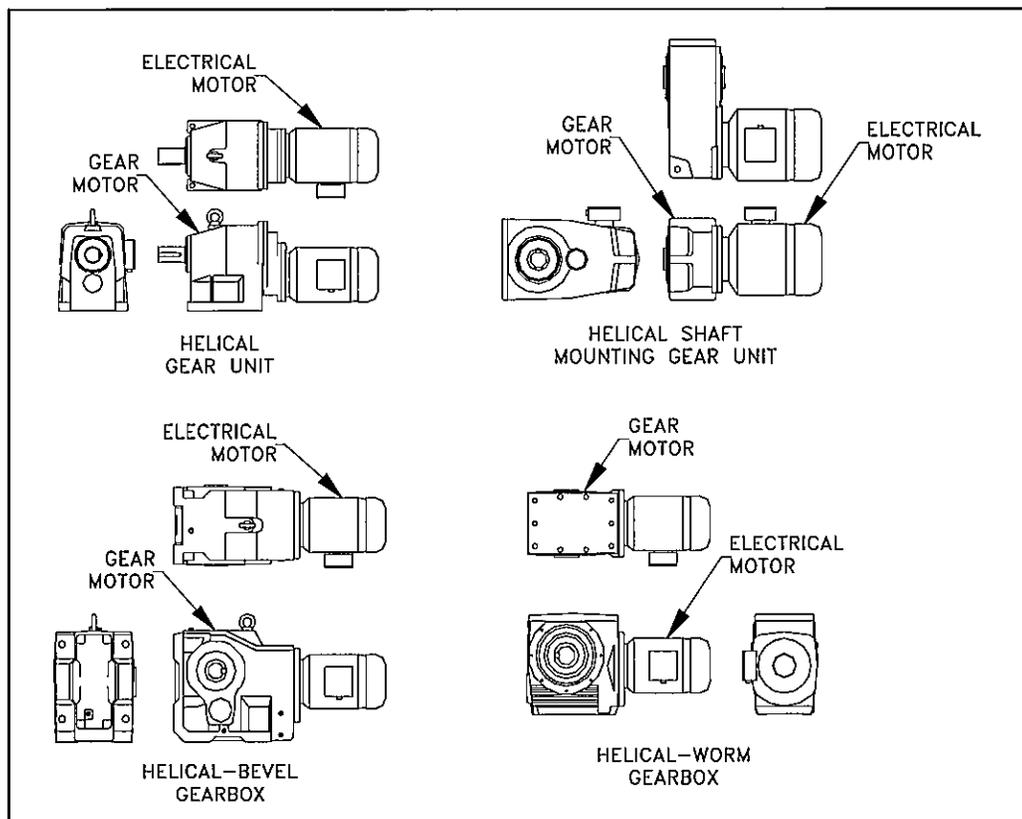
This section contains all the relevant information about your equipment, how it operates, its particular features, and the maintenance required. You will also find instructions and explanations about the maintenance program that we propose.

The maintenance program prepared by **INDUSTRIES MACHINEX INC.** will stretch the life span of your equipment and maintain the quality of your operations. To help you, we have distinguished two types of maintenance: the "continuous maintenance" and "periodical maintenance". The continuous maintenance portion of this section contains all of the necessary maintenance required to assure smooth operation of the equipment while the periodical maintenance portion of this section consists of more in-depth maintenance to be carried out at certain intervals. The next pages will list the necessary maintenance, while explaining the causes and consequences of each. Figures and Charts accompany explanations for a better understanding.

#### *3.1.1 MAINTENANCE CARD*

The major tool of this maintenance program from **INDUSTRIES MACHINEX INC.** is the maintenance card, separating the constant maintenance and the periodic maintenance. It sums up all the maintenance points and their different intervals. Each piece of equipment has its own maintenance card adapted to it. It is important to fill it in and to keep it up to date. That way, it will give you an easy follow-up of your equipment. These cards are given to you in the annex and are easily detachable. For more information, do not hesitate to contact us.

### 3.2 GEAR MOTOR



**Figure 2 Gear motor type**

The MACHINEX equipment is usually equipped with gear motors of the types shown above. The helical shaft mounting gear unit is the one mostly used. The helical gear unit, the helical level gearbox and helical-worm gearbox are used for specific needs. Section 3.2.1 will give you information on the maintenance of the electrical motor. Section 3.2.2 will inform you on the gear motors.



### 3.2.1 ELECTRICAL MOTORS

#### 3.2.1.A MAINTENANCE OF ELECTRICAL MOTORS

	<b>Before proceeding to the maintenance of your equipment, be sure to respect all the security measures.</b>	
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- Make sure that the motor is not exposed to water, acid materials or gas vapors. These situations may cause premature wear on the motor and expose the staff to dangers such as electrocution or explosion
- Free the motor of any debris such as dirt, cardboard, fabric, etc. Bad ventilation may cause the motor to overheat.
- A high level of humidity reduces the efficiency of the lubricants, therefore increasing the risk of malfunctioning of the motor.
- Listen closely to the sound of the motor, a sound of rubbing or thumping of metallic parts is a sign of a malfunction.
- Watch out for odors coming from the motor; a burnt smell is a sign of an overload.
- Twice every year, at the general inspection, check the amperage of the motor, and be sure that all the wires are installed securely.



### 3.2.1.B ELECTRICAL MOTOR TROUBLESHOOTING

**Chart 3 Motor malfunction**

Faults	Causes	Remedy
Motor overheated (can only be determined by measurement)	Motor connected in delta instead of in star as intended.	Correct the wiring connection.
	Mains voltage deviates from the rated motor voltage by more than 5%. Too high voltage is particularly detrimental for multi-pole motors, since such motors have a "no-load" current approximately equal to the full load current even when operating on normal current.	Arrange for the correct mains voltage to be applied.
	Volume of cooling air inadequate, air ducts clogged up.	Ensure the unimpeded access and discharge of cooling air.
	Cooling air is preheated.	Arrange for cool air supply.
	Overload at normal mains voltage. Current excessive. Speed too low.	Install larger motor (determine the frame size by measuring the power).
	Motor capability exceeded (S1 to S8, DIN 57 530). The motor e.g. becomes overheated due to excessive starting frequency here it is not sufficient simply to use a larger motor since in all probability the same conditions would still arise.	Adapt to the duty-cycle rating necessary for the operating conditions. It is preferable under these circumstances to consult a qualified electrical engineer to determine the correct size of motor required in order that the motor may be adapted to suit the actual mode of operation.
	Supply cable has loose contact (temporary single phasing!). Fuse burn out.	Correctly secure the loose contact. Replace the fuse.
Motor does not start	Fuse burnt out.	Replace the fuse.
	Motor protection switch has tripped.	Check protection switch for correct setting and adjust.
	Motor contactor inoperative. Control fault.	Check contactor operation and control and rectify.
Motor does not start or starts with difficulty	Designed for delta connection but connected in star.	Connect motor correctly.
	Voltage or frequency of electrical supply deviates considerably from required rated value during starting conditions.	Improve mains supply conditions.
Motor does not start when connected in star, however, starts in delta	Torque insufficient from the connection in star.	If delta current is not excessive then reconnect for DIRECT-ON-LINE starting, otherwise a larger size of motor or motor having special windings will be required.
	Contact fault on the star/delta starter.	Rectify starter fault.
Motor hums and takes excessive current	Fault in windings.	Motor must be examined and repaired by an electrical service center
	Rotor grazing.	
Fuses blow or motor protection switch trips immediately	Short circuit on the line or motor.	Remove short circuit.
	Short circuit to motor frame or between the winding turns.	Fault to be remedied by a qualified electrical engineer.
	Motor incorrectly wired up.	Correct the connections.
Wrong direction of rotation	Motor incorrectly connected.	Interchange any two of the incoming mains phases.
For winding faults		The motor MUST be repaired at an electrical service center.



### 3.2.2 GEAR MOTOR

#### 3.2.2.A GEAR MOTOR IDENTIFICATION

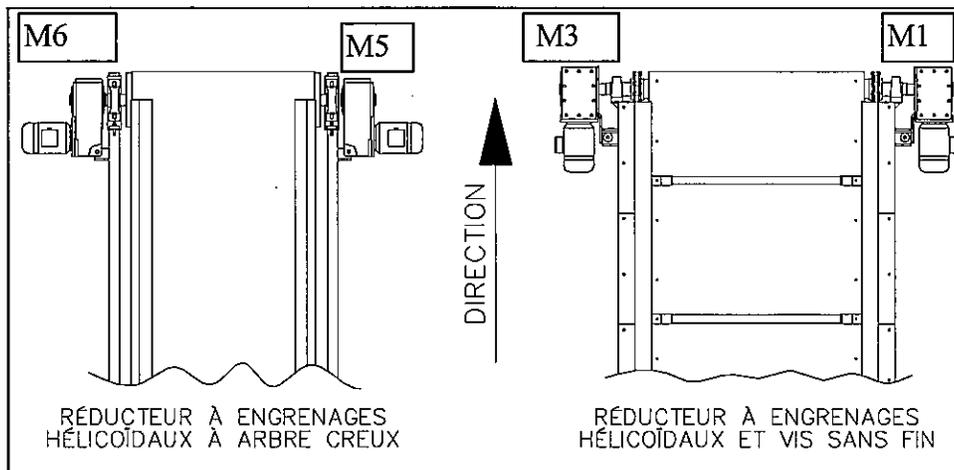
For all the necessary maintenance of your gear motor, you will need to know two things: the model number and the mounting position of the gear motor. This information will be given to you in the "Reducer" column in Chart 1 in Section 1.5. The number of the model (ex : SK 5282) corresponds to the format and to the type of the gear motor. Here is the list of the types of gear motors and the model corresponding number.

**Chart 4 Models numbers list**

Gear motor model	Corresponding models numbers
Helical gear units	SK1E SK21E SK31E SK41E SK51E SK02 SK12 <u>SK22</u> SK32 SK42 SK52 SK62 SK72 SK82 SK92 SK102 SK03 SK13 SK23 SK33N SK43 SK53 SK63 SK73 SK83 SK93 SK103
Helical shaft mounting gear units	<u>SK1282</u> <u>SK1382</u> <u>SK2282</u> <u>SK2382</u> <u>SK3282</u> <u>SK3382</u> <u>SK4282</u> <u>SK4382</u> <u>SK5282</u> <u>SK5382</u> <u>SK6282</u> <u>SK6382</u> <u>SK7282</u> <u>SK7382</u> <u>SK8282</u> <u>SK8382</u> SK9282 SK9382 SK10282 SK10382 SK11282 SK11382
Helical-bevel gearboxes	SK9012 SK9013 SK9022 SK9023 SK9032 SK9033 SK9042 SK9043 SK9052 SK9053 SK9062 SK9082 SK9086 SK9092 SK92072 SK92172 SK92372 SK92672 SK92772
Helical-worm gearboxes	SK02050 SK12063 SK12080 SK13050 SK13063 SK13080 SK32100 SK33100 <u>SK42125</u> SK43125

*NOTE: Underline numbers are the most frequently employed.*

Mounting positions numbers (ex.: M5, M6, M1 or M3) indicates how the gear motors are mounted on your equipment.



**Figure 3 Mounting positions**



### **3.2.2.B MAINTENANCE OF THE GEAR MOTORS**

The gear motor's condition is easy to determine. Silent operation showing few vibrations indicates the gear motor is in good condition. On the other hand, noisy operation showing lots of vibration indicates it is not well adjusted or a mechanical break has occurred. In a situation like that, simple maintenance might not resolve the problem. Please call the Service Department at **INDUSTRIES MACHINEX INC.**

The principal maintenance to perform on a gear motor is the oil change<sup>1</sup>. If mineral oil is used, the manufacturer recommends changing the oil every 10 000 hours or every two (2) years. In extreme conditions (dirty or humid environment) it is recommended that oil be changed every 5 000 hours. If synthetic oil is used, the oil change should be done every 20 000 hours or every (4) years. In extreme conditions (dirty or humid environment) it is recommended to change the oil every 10 000 hours.

To complete the maintenance of the gear motors, the oil level has to be maintained and keep any filth such as dirt, sand or water from getting in the gear motor. A lack of oil may cause premature wear of the gear teeth which would cause a diminishing of the transmission movement efficiency. Any penetration of debris or dirt inside the gear motor's frame may cause a premature wear of the gear; it may also contaminate the lubricant. A contaminated lubricant does not have its initial features which imply it does not fill the functions for which it was selected. The waterproofing of the joints is specially designed to help eliminate leaks and lubricant contamination, which is why they require particular attention.

So, for good maintenance of the gear motor, you need to change the oil, to inspect the waterproofing of the seals, be sure that the frame is not cracked, prevent any lubricant leaks and clean the frame of the gear motor periodically to reduce any risk of dirt penetration.

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<sup>1</sup> See section 3.2.2.c for the oil change instructions.



### 3.2.2.C OIL CHANGE OF THE GEAR MOTORS



**Before proceeding to the maintenance of your equipment, be sure to respect all the security measures.**



- 1) First of all, be sure to follow all the security measures. The power should be cut-off, the main switch turned off and locked. For additional safety measures, keep the key on you or at hand.
- 2) To prevent the introduction of dirt or any other debris in the reducer, clean it well before removing the plug.
- 3) To help the oil flow, remove the ventilation plug before and the drain plug after. Take care not to lose the seals joints.
- 4) Once the used oil has completely flown out, put the drain plug back in place (put the seal joint back carefully) and take off the oil level plug.
- 5) Next, fill the gear motor by inserting the new oil by the ventilation hole. Fill the gear motor until the oil is up to the oil level plug. Then, put the plugs back on while taking care to put the seals joints back on correctly.

**TAKE NOTE THAT MINERAL OIL AND SYNTHETIC OIL CANNOT BE MIXED.**

The following charts and figures will give you additional information on the oil change on the reducers.



**3.2.2.D RECOMMENDED OIL FOR GEAR MOTORS**

Gear units leave the factory ready for operation filled with mineral oil.

**Chart 5 Recommended oil for:  
Helical gear units  
Helical shaft mounting gear units  
Helical-bevel gearboxes**

Type of lubricant	Ambient temperature °C	ISO viscosity class	CASTROL	TEXACO	ESSO	MOBIL	SHELL	TRIBOL
Mineral Oil	-5 to 40 (normal)	ISO VG 220	Alpha SP 220 Alpha MW 220	Meropa 220	Spartan EP 220	Mobilgear 630	Shell Omala Oel 220**	Tribol 1100/220
	-15 to 25	ISO VG 100	Alpha SP 100 Alpha MW 100	Meropa 150	Spartan EP 100	Mobilgear 629	Shell Omala Oel 100	Tribol 1100/100
	* -50 to -15	ISO VG 15	Hyspin AWS 15 Hyspin SP 15	Pinnacle EP 150	Univis J 13	Mobil DTE 11 M	Shell Tellus Oel 15	Tribol 770
Synthetic oil	-25 to 80	ISO VG 220	Alphasyn T 220 Alphasyn EP220	Pinnacle EP 150	Umlauföl S 220	Glygoyle 30	Shell Tivela Oel WB	Tribol 800/220

\* Special oil must be used for temperature below -50°C.

\*\* Standard oil supply

**Chart 6 Recommended oil for:  
Helical-worm gearboxes**

Type of lubricant	Ambient temperature °C	ISO viscosity class	CASTROL	TEXACO	ESSO	MOBIL	SHELL	KLOBER	TRIBOL
Synthetic oil	-5 to 80 (normal)	ISO VG 680		Synlube CLP 680		Glygoyle HE 680		Klübersynth GH 6-680	Tribol 800/680
	-25 to 20	ISO VG 220	Castrol Alpha PG 220	Synlube CLP 220	Glycolub 220	Glygoyle 30	Tivela Oel WB	Klübersynth GH 6-220	Tribol 800/220



### 3.2.2.E OIL CAPACITY OF THE GEAR MOTORS

The following chart provides the oil quantity for the helical shaft mounting gear unit only. Take note that these quantities are approximate. To make sure you have the right amount of oil, maintain the oil level equal to the oil-level plug.

**Chart 7 Oil level for helical shaft mounting gear units**

		GEAR MOTOR SIZE											
		1282	2282	2382	3282	3382	4282	4382	5282	5382	6282	6382	7282
H3	1.00 (0.95)	1.90 (1.79)	1.59 (1.50)	3.33 (3.15)	3.49 (3.30)	4.97 (4.70)	5.18 (4.90)	7.61 (7.20)	8.77 (8.30)	14.79 (14.00)	13.21 (12.50)	22.79 (21.57)	20.08 (19.00)
H4	1.00 (0.95)	1.90 (1.79)	1.59 (1.50)	3.33 (3.15)	3.49 (3.30)	4.97 (4.70)	5.18 (4.90)	7.61 (7.20)	8.77 (8.30)	10.57 (10.00)	14.79 (14.00)	16.91 (16.00)	24.30 (21.00)

*Note: The first measures given in the chart are in US QUARTS and the second one, in parenthesis, are in LITER.*

**Filling quantities are approximates.  
Oil level must be checked according to oil-level plug.**



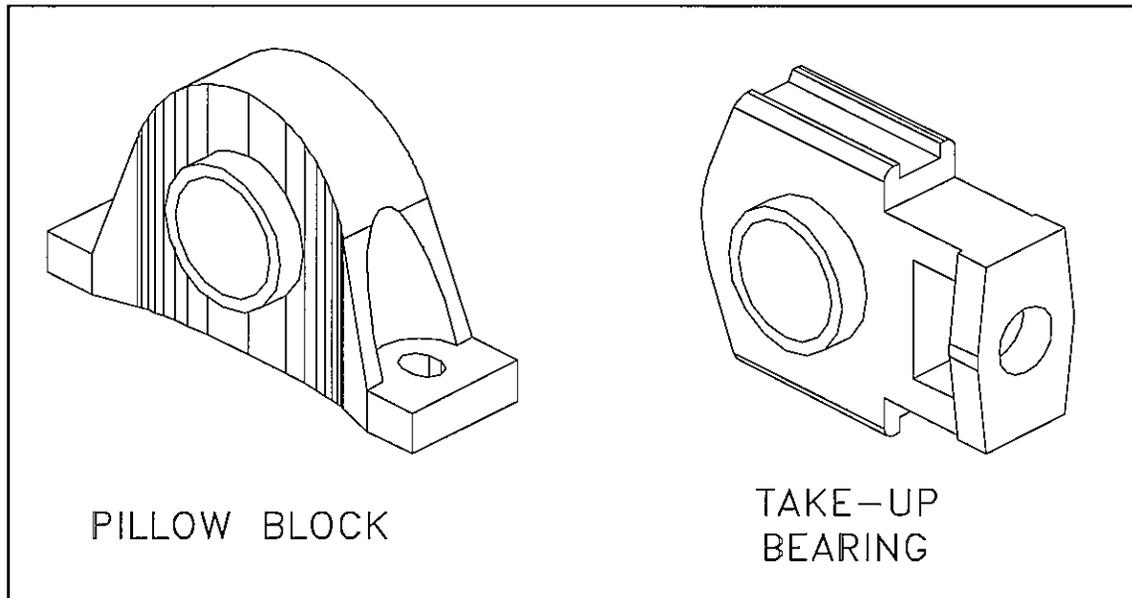
### 3.2.2.F POSITION OF THE PLUGS.

The following chart indicates the position of the plugs for the model of gear motors most commonly used on our equipment. Take note that the same principle is applied on every type, there is a ventilation plug, an oil-level plug, and a drain plug.

**Chart 8 Plugs positions**

HELICAL SHAFT MOUNTING GEAR UNITS				
H3		H4		
SK 6282 - SK 11282 SK 6382 - SK 11382		SK 1282 - SK 5282 SK 1382 - SK 5382		
SK 1282 - SK 5282 SK 1382 - SK 5382		SK 6382 - SK 11382 SK 6282 - SK 11282		
HELICAL-WORM GEARBOXES				
H2A and H2B				
<b>Symbols:</b>		<b>Ventilation plug</b>		<b>Oil-level plug</b>
		<b>Drain plug</b>		<b>Rubber buffer</b>

### 3.3 BEARINGS



*Figure 4 Bearings types*

The roller bearing and the cast-iron structure, called pillow block housing, are the principal components of these bearings. The pillow block housing, of various forms, supports the roller bearing and distributes the charges in different ways. The roller bearings usually stay the same while the cast-iron structure changes to fill specific functions. For the maintenance of your bearings, consult Section 3.3.1. Since the cast-iron housing varies and the roller bearing stays the same, the maintenance recommendations mentioned later in the manual are valid for most bearings that have roller bearings of the same type. The types of bearings shown above are the most commonly used on **MACHINEX** equipment, the size differs depending on the usage.



### **3.3.1 MAINTENANCE OF ROLLER BEARINGS**

As for any essential parts on a machine, the bearings need to be checked and cleaned periodically. Changes of temperature, noise or vibration informs you on the condition of the rollers. A simple visual inspection can also inform you on the condition of the roller bearings. An adequate clean-up of the bearing helps to keep them longer-lasting.

Certain types of bearings have greasing nipples, it will then be possible to lubricate them. To know the details, consult section 3.3.2 called Lubrication of the roller bearings.

#### ***Temperature***

Unless there is an extreme source of external heat, you should be able to put your hand on the pillow block housing. Take care not to get burned!

#### ***Sound***

A roller bearing in good shape makes a small purring sound and a broken or defective bearing will do an irregular and loud rumbling.

#### ***Vibrations***

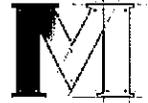
The vibrations usually stay at a low level. Loud vibrations may be a sign of a bad adjustment or a broken bearing. Usually, a change of vibration causes an increase of the sound.

#### ***Visual inspection***

Be sure that the lubricant does not leak off the bearing. An overflow of the grease is a sign of excessive greasing and causes breaking of the seals. Be sure also that the bearing is fixed securely, if need is, tighten the retaining bolts.

#### ***Cleaning***

To clean the bearings, it is recommended to use "white spirit", petroleum of good quality, gasoline or benzol. After the cleaning, the parts need to be coated with oil or clean grease to protect them from oxidization.



### 3.3.1.A REPAIRING THE ROLLER BEARINGS

**Chart 9 Malfunction of the roller bearings**

Problem	Possible cause	Solution
Elevation of the temperature.	Not enough grease.	Add grease of the same type and quality.
	Too much grease	Check the temperature. If it doesn't go down after 4 hours, purge all the old grease and fill the bearing halfway with new grease.
The temperature keeps on going up..	Wrong grease	Be sure that the greases are compatible. In case of doubt, verify with the manufacturer of the grease. .
	Non-appropriate rolling	Contact an agent of the service Dept. at <b>INDUSTRIES MACHINEX INC.</b>
Elevation of the temperature and increase of the vibrations.	Old grease crystallizing	If the grease crystallizes, replace it with new grease.
	Breakage of the bearing.	If the bearing components are broken, change the bearing.
Increase of the vibrations	Wearing out of the bearing	Replace the bearing.
	Contamination coming from the outside	Find the cause of the contamination. Check the seals to see if they are cracked. Replace the bearing if damaged.

If a problem cannot be resolved with the help of this manual or, if you have any questions, do not hesitate to contact one of our service agents at **INDUSTRIES MACHINEX INC.** who will gladly help you.



### 3.3.2 ROLLER BEARINGS LUBRICATION

A red oval with the word "DANGER" in white capital letters on a black background.	<b>Before proceeding to the maintenance of your equipment, be sure to respect all the security measures.</b>	A red oval with the word "DANGER" in white capital letters on a black background.
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For reliable functioning, the bearings must be lubricated correctly. A good lubrication helps to avoid direct metallic contacts between the rolling elements, and also, it helps prevent wear and protects the surfaces from corrosion.

The bearings used on our equipment are pre-greased in the factory. The bearings that have a greasing nipple may be greased again. Please refer to the maintenance card for schedules bearing lubrication.

#### **Procedure**

- 1) To lubricate the bearing, first of all, clean the greasing nipple to be sure that no dirt gets in the bearing.
- 2) Then, with a greasing pistol, put the new grease inside the bearing; a slight rotation of the shaft is recommended while greasing.
- 3) Be sure not to put too much grease on the greasing nipple, a bearing saturated with grease will overheat and wear rapidly. Be careful not to mix different types of grease<sup>2</sup>.

*Note: After the greasing, there may be a slight increase in the temperature. However, if the temperature does not come back to normal, check to see if you have used compatible types of grease or if you have not **overgreased** the bearing.*

**Overgreasing of the bearings could greatly shorten the bearing's life expectancy.**



### 3.3.2.A RECOMMENDED GREASE FOR ROLLER BEARINGS

**Chart 10 Recommended grease for roller bearings**

Range	Temperatures	Greases	Companies
Standard	-20°C à 90°C	Alvania R3 Alvania RA Energrease LS3 Beacon 3 Multis Special 3 Lupus A3 Mobilux 3	Shell UK Oil Shell UK Oil BP Esso Petroleum Total Century Oils Mobil Oil Co
Low temperature	-55°C À -20°C	Molykote 33 Medium (type silicone)	Dow Corning
High temperature	90°C à 150°C	Molykote 44 Medium (type silicone)	Dow Corning

If, for any reason, it is necessary to change one grease to another, it is important to take into consideration the compatibility of the lubricants. If you mix incompatible greases, the consistency may be greatly affected, resulting in considerably reducing the bearing's life expectancy.

### 3.3.2.B QUANTITY OF GREASE FOR THE ROLLER BEARINGS

According to the general use of the bearings on MACHINEX equipment, it is recommended to fill the bearings between 30 % and 50 % of their capacity. Since it is difficult to evaluate the quantity of grease injected in the bearing, it is better to put less grease than too much.

A standard recommendation for the quantity of grease is once a year, one grease-gun shot per inch of shaft diameter by bearing.

### 3.4 CHAIN ROLLER CONVEYOR

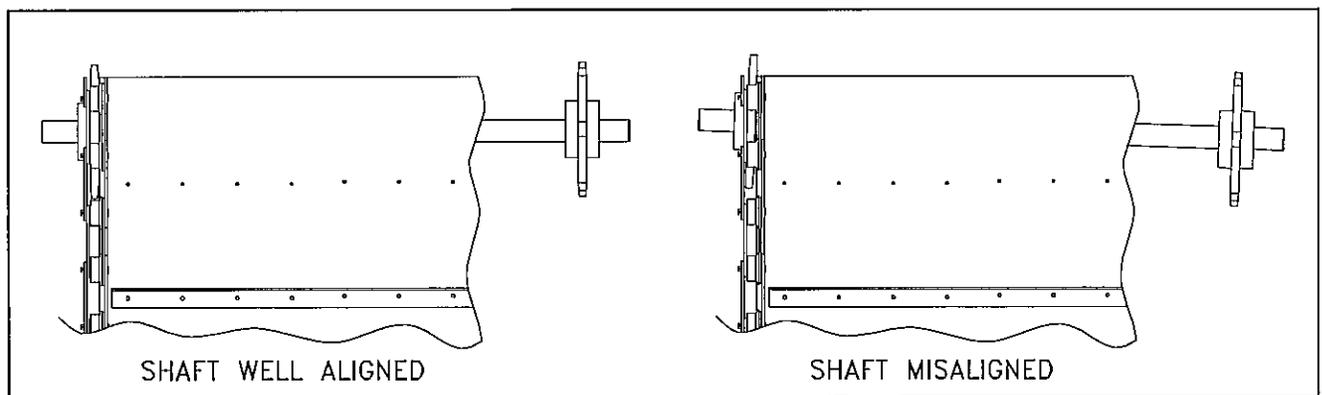
#### 3.4.1 DESCRIPTION

MACHINEX chain roller conveyors are especially design for hard conditions. Sturdy construction and functional design are built into every conveyor we make at MACHINEX. What's more, we use only quality materials to build our conveyors, so you are guaranteed reliable components with minimal maintenance. Notice that there are 3 types of belt: the PVC belt type and the Z-shape type & the Apron belt. There is also two type of frame the first one is the standard type which has a closed sides frame for sturdy applications. The second one is the open frame type, with opened sides making the maintenance easier and faster.

#### 3.4.2 ALIGNMENT AND TENSION OF THE BELT

##### *Alignment of the belt*

The design of MACHINEX Chain Roller conveyors allows an automatic alignment of the belt; the sprockets with their large diameter that drive the belt also serve as a guide for it. A misalignment of the belt is rarely noticed on this type of conveyor because of those sprockets, which are securely fixed on the head shaft. You have to pay a special attention to the alignment of the driving shaft. A misalignment of the shaft may cause a premature wear of the chains and the sprockets.



**Figure 5 Alignment of shafts on apron belt conveyor**

### 3.4.2 ALIGNMENT AND TENSION OF THE BELT (CONTINUED)

#### *Tension of the belt*

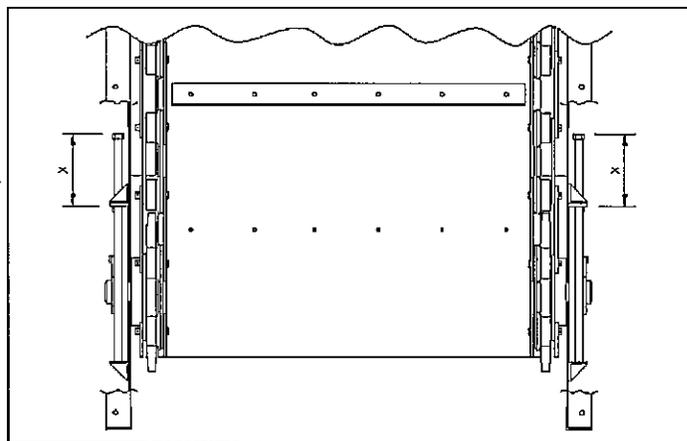
The tension of the belt is very important for its life span. Too much tension will cause premature wear of the chains and increase the risks of tears. Also, too much tension may cause the driving shafts to bend and damage the sprockets, the bearings and the reducer.

There could be too much tension on the belt when the chains have difficulties fitting into the sprockets. Tension is not sufficient when an undulation is clearly visible at the head shaft exit and at the beginning of the tail shaft. The belt tension is right when at low speed, a slight undulation of the belt is noticed when teeth fit into the chains. This undulation can be seen under the curved section at the top of the conveyor, when there is one.

#### *How to adjust the alignment and the tension of the belt.*

The driving shafts (head and tail) of the apron, PVC & "z-shaped" belt conveyors are usually mounted and correctly aligned on their section at the factory. The tension of the belt is adjusted at the time of the final assembly of the conveyor; this stage generally takes place during the installation of the equipment.

To adjust correctly the tension of the belt, use the belt take-ups located on the tail section. In order to check the alignment of the tail shaft, measure the length of the threaded rods sticking out of the belt take-ups, for a good alignment, the measures should be identical.



**Figure 6 Belt of an apron belt, PVC or a "z-shape" belt conveyor correctly aligned**

*Advice: When you modify the tension of the belt with the take-ups, always apply the same number of turns to both take-ups, it will then be easier to keep a good alignment.*

For more information, do not hesitate to contact the After-Sale Service at  
**INDUSTRIES MACHINEX INC.**

### 3.4.3 ASSEMBLY OF CHAINS ON DIFFERENT TYPE OF CHAIN ROLLER

The following instructions will show you how to proceed with the assembly of the chains (with assembly rods) on your conveyor. The drawing at the bottom of the page will help you understand the different type of belt.

#### FOR APRON & Z SHAPE STEEL BELT

- 1) Loosen the belt take-ups.
- 2) Unbolt the pans at the both ends where they're joined together.
- 3) Assemble the chains while keeping an equal number of links on each side of the belt. Take care to insert the assembly rod in the same direction as the other rods (head toward the inside of the conveyor).
- 4) Bolts the pans again.
- 5) Adjust the belt tension properly.

#### FOR PVC BELT

- 6) Loosen the belt take-ups.
- 7) Unbolt the splice plate.
- 8) Assemble the chains while keeping an equal number of links on each side of the belt. Take care to insert the assembly rod in the same direction as the other rods (head toward the inside of the conveyor).
- 9) Bolts the pans again.
- 10) Readjust the tension on the belt.

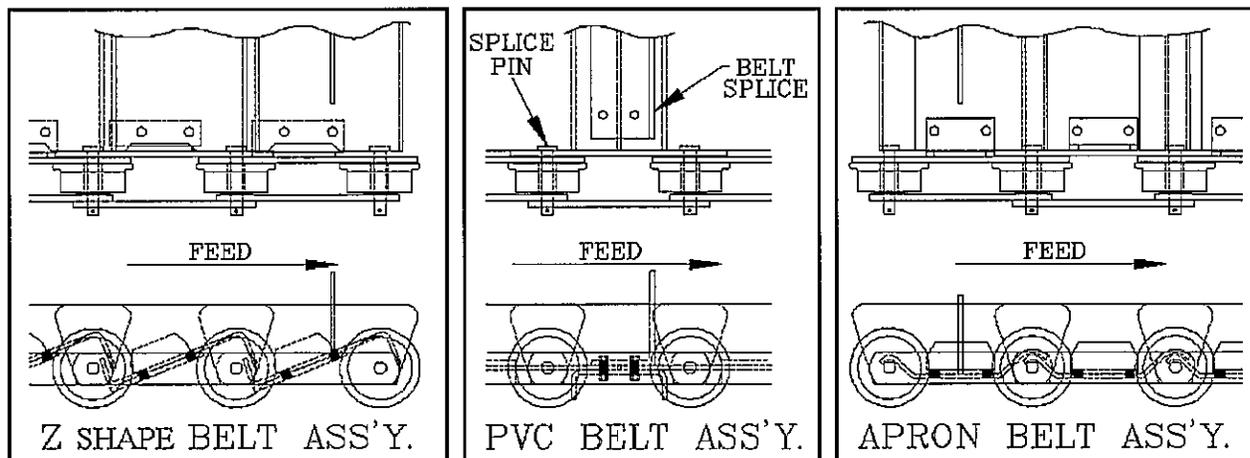
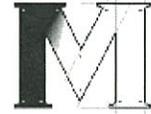


Figure 7 Different type of belt on chain roller



### 3.4.4 MAINTENANCE (CONTINUED)

#### *Plastic strips*

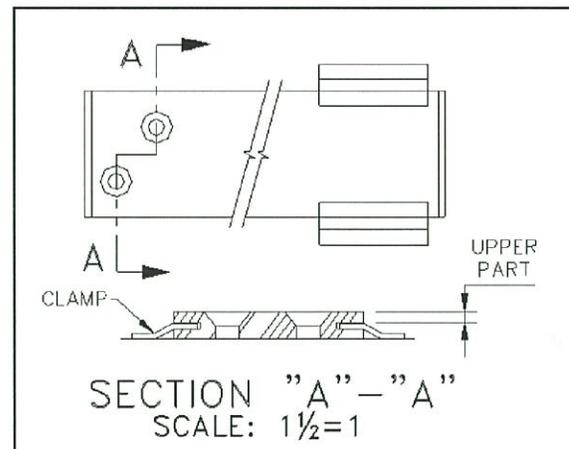
The plastic strips are usually located in the tail section of the conveyor. Some models have strips on all of their sections while some models do not have any at all. The plastic strips are located at the bottom of the conveyor, under the belt. They allow the sliding of the pans via the impact shoes. Since they support the belt and its entire load, these parts can wear rapidly. A normal use and a regular cleaning of the conveyor will help keep the strips work longer.

It is very important to inspect these plastic strips (1000 hours), because an excessive wear may cause other damages on the conveyor such as the wear of the impact shoes, the wear of the chains, the loss of retaining clamps, etc. If abrasive material, such as glass, sand and rocks gets in the conveyor, you should inspect them more often.

For a PVC belt, inspect these plastic strips, unbolt and open the belt splice (one row is enough or remove one or two steel pans). Next, move over the belt to be able to inspect the plastic strips. Inspect the strips on the whole length of the conveyor by moving the belt slowly.

For an Apron or Z-shape steel belt type conveyor, using the inspection doors can inspect these parts or for open frame type conveyor, these parts are easy to access by the opening on the frame sides.

To determine the wear of the plastic strips, check the thickness of the upper part as shown in figure on the right. As the thickness of the plastic strips equals the level of the flat socket cap screws, it is recommended to have them changed.



**Figure 8 Plastic strip**



### 3.4.4 MAINTENANCE (CONTINUED)

#### *Automatic oilers (optional)*

These parts don't require a lot of maintenance; in fact, they help you by reducing the frequency and normalizing the intervals of lubrication of your conveyor chains. All you have to do is to fill them regularly and make sure that they are still operating properly.

Operation: you can check if the oils are functioning only when they are energized. When they are, you should see oil dropping at the bottom of the oiler. If there is no oil dropping, manually open the oil flow needle valve to get the oil dropping. If doesn't work, disassemble and clean the needle valve. Type of oil: use regular SAE 10-30 oil to fill the oiler.



## **3.5 SLIDER AND IDLER CONVEYOR**

### **3.5.1 DESCRIPTION**

**MACHINEX** Slider and Idler conveyors are built for high-volume throughput with a maximum efficiency. Made from the best materials on the market, they are designed to respond to a large variety of applications. Our conveyors are also known for their high level security aspects.

### **3.5.2 ALIGNMENT AND TENSION OF THE BELT**

The alignment and tension of the belt interact with one another. There are, however, some differences to be noted between the two.

#### ***Alignment***

The belt of a slider-bed conveyor is correctly aligned when it is at an equal distance on each side of the conveyor. Many factors may cause misalignment of the belt:

- A pulley misaligned;
- A fragment glued to a pulley or a belt;
- A belt joint damaged;
- A tear in the belt;
- A return idler misaligned;
- A tensioner badly adjusted;
- A load on the conveyor not well distributed;
- An overloaded conveyor.

Once the source of the problem is identified and corrected, run the conveyor at low speed and be sure that the belt is correctly aligned.

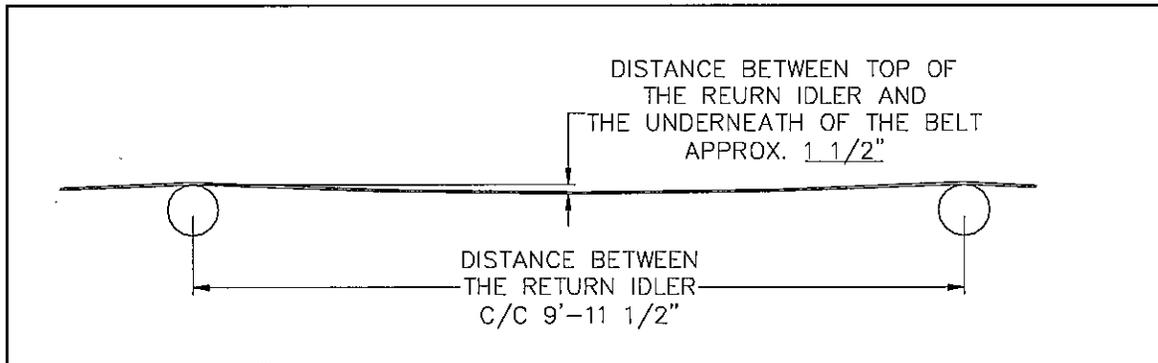


### 3.5.2 ALIGNMENT AND TENSION OF THE BELT (CONTINUED)

#### *Tension of the belt*

The tension of the belt is very important for its life span. Too much tension will stretch the belt prematurely and will increase the risks of tears near the joints or the cleats (if applicable). Also, too much tension may cause the shaft to bend and damage the bearings and the reducer.

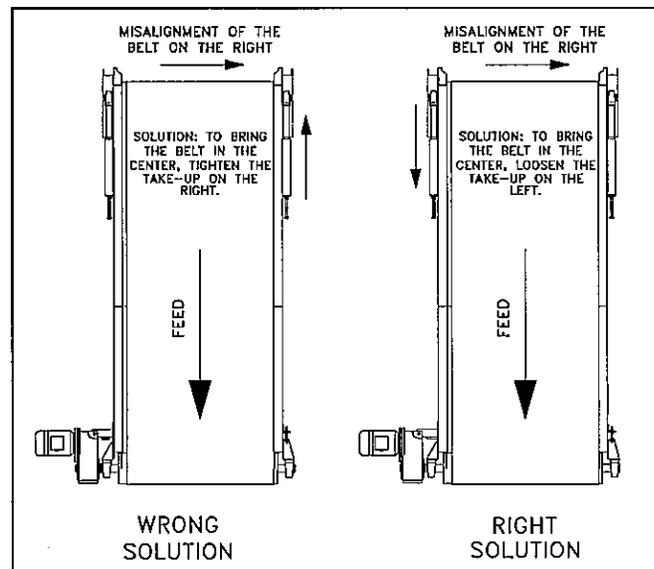
The belt tension is correct when it doesn't skid (upon starting or loading) and a slight undulation of the belt between the return idlers is noticed (see figure below). All the tension exceeding these conditions may damage the belt. For more information, do not hesitate to consult **MACHINEX INDUSTRIES INC.**



**Figure 9 Adjustment of the belt on the Slider and Idler conveyor**

#### *To align the belt*

As shown in figure on the side, the alignment of the belt should be done by releasing the tension on the side opposite the misalignment of the belt. This way, you will avoid putting too much tension on your belt which may cause the bending of the shafts. If the tension is to its minimum (if the belt skids), you can, in this case only, tighten the tensioner to push the belt toward the center.

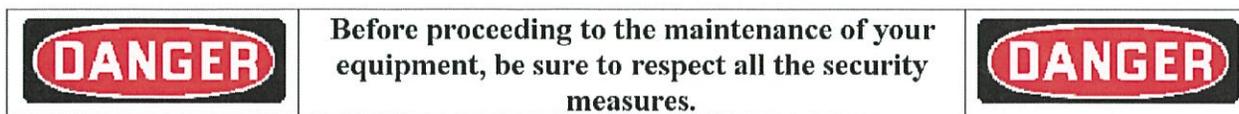


**Figure 10 Alignment of the belt on a Slider and Idler conveyor**



### 3.5.3 MAINTENANCE

The next lines will list and explain the maintenance required for good functioning of the Slider and Idler conveyor. As explained previously, for a good follow-up of your equipment, use



the maintenance cards in an appropriate manner.

#### *Cleaning methods*

To keep the Slider and Idler conveyor running smoothly, you have to keep it clean. A cleaning of the belt, the speed reducer, the bearings and most of all of the photocells will help having a better control of the conveyor. It is important to make sure that all the mobile parts are clear of fragments such as paper, broken glass, crushed containers, etc.

#### *Gear Motor and bearings*

For the maintenance of these components, consult their respective sections.

#### **\*\*Waterbath conveyors particularity\*\***

**Waterbath conveyors bearings are particular. Underwater bearings must be lubricated with Lithium based grease Esso Unirex EP.2. One grease gun shot every month is necessary.**

#### *Belt*

A simple inspection of the belt would be to look at it carefully while it is turning to find notches or tears. This kind of inspection may be made at any time by the operators. The same measure may be used to check the tension and the alignment.

For a more thorough inspection of the belt, check the following points:

- The belt of a conveyor normally has a low friction back-side, is it still efficient?
- it is very rare that the belt wears out evenly, check the back side on its full width;
- make sure that the joint of the belt is fixed firmly and completely on the belt;
- check the wear of the joint on both sides;
- Remove any dirt glued on the belt.

**Note:** *The inspection doors have been designed to make inspections easier.*



### 3.5.3 MAINTENANCE (CONTINUED)

#### *Shafts*

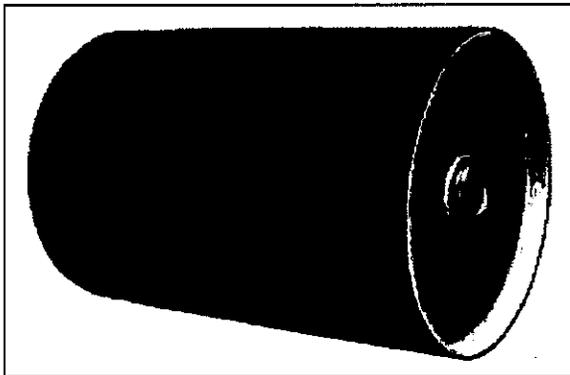
This part of the conveyor doesn't need much attention; just make sure that it did not bend under excessive tension on the belt or under an excessive load. To check this point, look at the shaft while it turns at medium speed, a straight shaft will turn on its axis while a bent shaft will give the impression that it jumps and it may cause vibrations.

#### *Pulley*

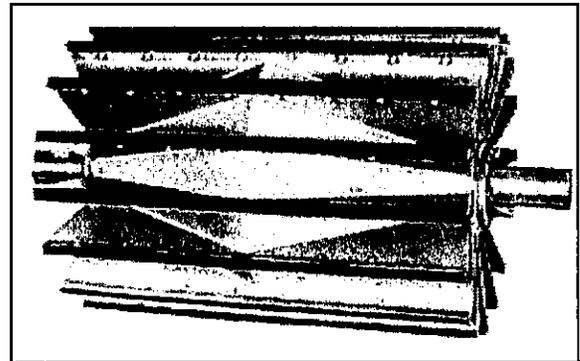
The head pulley is the one that drives the belt, make sure that it is always covered with rubber, this rubber is called lagging. The loss of rubber covering may cause the belt to skid.

Normally self-cleaning or wing pulley, the role of the tail pulley is to clean the underneath of the belt. Inspect it to make sure that no parts have detached. Make sure also that no material has piled up between its wings, which would cause misalignment and premature wear of the belt.

Make sure that they are secured on the driving shaft.



*Figure 11 Pulley with lagging*



*Figure 12 Wing pulley*



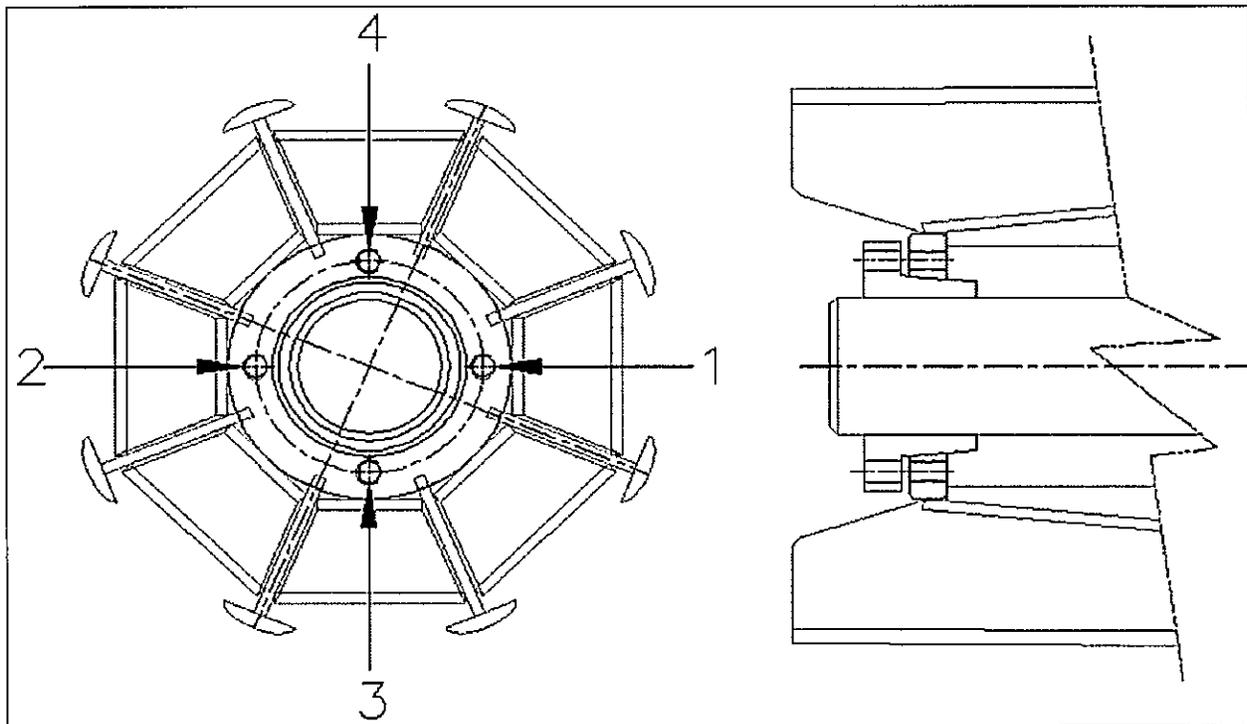
### 3.5.3 MAINTENANCE (CONTINUED)

#### *Pulley hubs & bushings*

**Important:** After the first 100 hours of operation be sure to tight all the maintaining screws of the bushings in an alternate manner (3, 9, 6 & 12 o'clock) to prevent pulleys from moving. Please refer to the chart below to know the right torque for each shaft diameter.

**Chart 11 Wrench torque for bushing screws**

Diameter of the shaft	Wrench Torque (in. lbs)	Cap screw size
2 7/16"	350	3/8"
2 15/16"	550	7/16"
3 7/16"	840	1/2"



**Figure 13 Order of tightening**

### 3.5.3 MAINTENANCE (CONTINUED)

#### **Take-ups**

The Slider and Idler conveyors are usually equipped with tubular take-ups or threaded rod take-ups. In order to keep good maintenance of this type of take-up, follow these procedures:

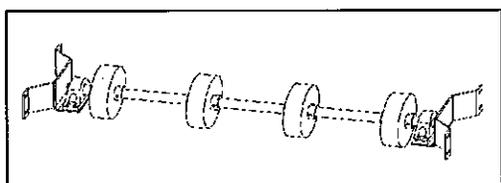
- Are the maintaining bolts tight?
- The threaded rod should be straight and without rust.
- The guide tubes should be straight and without rust for tubular take-ups.

*If needed, apply a mixture of 50% oil, 50% diesel on the take-ups to protect them from corrosion.*

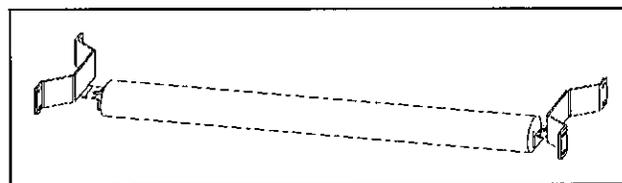
#### **Return idlers**

The return idlers help support the belt even when there is no material on it. You can find two types of return idlers, the one for the belts without cleats and the other one for belt with cleats. The inspection of these idlers consists of:

- Checking that they are always in place.
- Making sure that they are fixed correctly.
  - The types without cleats should be well inserted in their supports.
  - The types with cleats should be bolted firmly on the supports.
- Make sure that their shafts are not bent.



**Figure 14 Return idler with cleats**



**Figure 15 Return idler without cleats**

#### **Cleats (on certain types)**

Make sure that their bolts are tightened and not worn out. Verify the holes in the belt to make sure that they are not tearing it. Last of all; make sure that the cleats are not twisted.



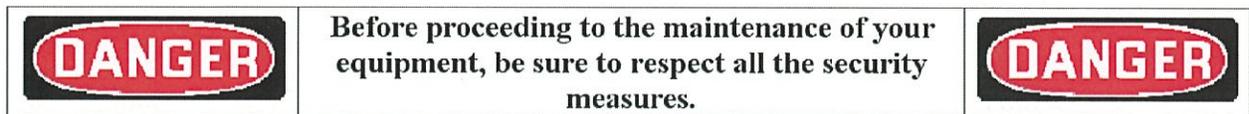
## **3.6 GLASS BREAKER SCREEN**

### **3.6.1 DESCRIPTION**

**MACHINEX Glass breaker screen** is designed to offer high volume through-put and increase your sorting productivity. The **MACHINEX Glass breaker screen** ensures steady performance, cut down on man power use in sorting operation and maximizes efficiency. The **MACHINEX Glass breaker screen** is using to sort commercial and institutional waste by breaking glass and separating from the rest of the stream.

### **3.6.2 MAINTENANCE**

The following will explain the maintenance required for a good functioning of the **Glass breaker screen**. As explained previously, for a good follow-up of your equipment, use the maintenance cards in an appropriate manner.



#### ***Cleaning the machine***

To keep the glass breaker screen running smoothly, you have to keep it clean. Cleaning the speed reducer, the bearings, the chains and the shafts will help having an efficiency of the separator. It is important to make sure that all the mobile parts are clear of fragments such as paper, broken glass, crushed containers, paper strings, etc. We recommend cleaning the machine once a day or more often if required.

#### ***Gear Motor and roller bearings***

For the maintenance of these components, please consult their respective sections.

#### ***Chains and Sprockets***

The safety guards on your chains and sprockets protect you from injuries, but they are also protecting these parts from any pieces that might cause premature wear to them, so make sure that they are kept in place. We suggest inspecting these parts once a week and going over these few points:



### **3.6.2 MAINTENANCE (CONTINUED)**

#### ***Chains and Sprockets***

- Check for any pieces stuck in chains, clean them when needed.
- Check the tension of the chains, a misalignment of simply one shaft can slack some chains and bend some others. Too much tension may cause the chain to break.
- Check the alignment of the sprockets, a misalignment may prematurely wear both chains and sprockets. To check their alignment, look carefully at the inner face of the chain, a shiny surface indicates an excessive friction between chain and sprocket teeth.

We recommend lubricating all chains after every 40 hours of use with oil. It will protect them from corrosion and wear.

#### ***Shafts***

These parts of the separator affect the sorting quality of your equipment. It is very important to constantly check them to make sure that there is no piece accumulating around the shafts. Such accumulation may enlarge the shaft diameter and also reduces the opening between shafts, the efficiency of your separator will be badly affected and it may cause serious damages to the discs. We recommend checking these accumulations at least twice a day. Also make sure that they haven't bent under excessive loads and that the disc welded on the shaft are in good conditions.

#### ***Safety guards***

Safety guards are installed on equipment to prevent injuries and, as mentioned earlier, to protect rotating parts. Simply make sure that they are in place before starting your equipment. Inspect them frequently to ensure that they are installed properly.



### **3.7 PLASTIC PERFORATOR**

#### **3.7.1 DESCRIPTION**

The perforation of plastic containers allows the recycling facility operators to maximize their productivity and profitability. Therefore, the plastic perforator must perform in a reliable way with a minimum of maintenance. The Machinex plastic perforators are made to process a high volume of material and to deliver a quality product in a constant way.

#### **3.7.2 CHARACTERISTICS OF THE MACHINEX PLASTIC PERFORATORS**

The Machinex plastic perforators are recognized for their minimum maintenance requirement and for their sturdiness. Their design allows an easy access to the important parts to reduce the delay of the maintenance periods. Furthermore, they are made to operate in security.

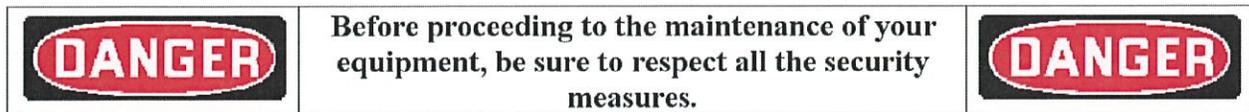
##### ***Characteristics of the plastic perforators***

- Main body made of thick steel
- Covers and safety guards on all driving systems
- Capacity of up to 5 ton/hr
- 2 gear motors 3 hp.
- Heavy duty bearings
- Heavy duty drums equipped with teeth made of hard steel
- Gas spring moving drum to flatten the plastic containers and reduce the volume
- Operate with container up to 1 gallon size jug
- A small disc screen underneath is part of the perforator to screen the smaller particles.



### 3.7.3 MAINTENANCE

The following lines will explain the necessary maintenance steps to keep your plastic perforator in good condition. As explain earlier, for a good follow-up of your equipment, use the maintenance cards in an appropriate manner.



#### *Cleaning methods*

To preserve your plastic perforator in good condition, you must first of all keep it clean. It is important to make sure that there is no debris blocking the mobile parts.

#### *Motor*

For the maintenance of your motor, please consult the section 3.2 of this manual.

#### *Bearings*

The bearings of the plastic perforator need a particular attention. They must be cleaned and lubricated regularly to assure a good performance.

#### *Perforator roller*

To keep the equipment operating properly, the components of the perforator need to be inspected and cleaned on a regular basis. If the plastic perforator can not turn freely, the plastic perforator will loose its effectiveness. In that case, take out any fragments that can jam this rotation. A weekly inspection of the springs is also recommended in order to verify their condition. The teeth must be in good condition, without cracks and too much wear and tear. Always stop the machine and lock all the electric controls before doing these inspections

#### *Chain*

To verify the chain, immobilize the machine and lock the electric controls. Inspect all the faces of the chain to find weaknesses. Also, frequently verify the tension, the alignment and the lubrication of the chain.



### 3.7.4 *END OF STROKE STOPPER ADJUSTMENT*

The plastic perforator consists of a fixed and a movable drum. The Figure 16 below shows the shaft of the fixed drum as the item # 1 and the shaft of the movable as item # 2. The mounting is nearly identical on each side with the exception of the motorization side as shown on Figures 16 and 17. The movable drum slides on a linear bearing. The fixed part of the linear bearing is shown as item # 3 on Figure 16. The movable part of the linear bearing is fixed to the carriage of the movable drum. The gas spring, item #4, pushes the movable drum against the end stroke stopper, item #6, when there is no material falling into the perforator. The drums are close to one another to crush the entering material.

The end of stroke stopper limits the movable drum movement to stop the gas spring from going to its end of stroke. Because of the weight of the drums and the frequency of opening and closing, it would damage the gas spring if it would constantly hit the end of stroke.

For the end of stroke rest support, adjustments are as follow (refer to Figure 18):

1. Unscrew each of the # 8 screws (on each side of the machine).
2. To allow the springs to stretch to the end of stroke, unscrew the #7 screw until the stopper #6 doesn't touch the movable carriage #9 on each side of the perforator. The movable drum is always aligned with the fixed drum because the liaison mechanism #5 (Figures 16 and 17) serves to keep the alignment of the drums.
3. Prop up the support #6 against the carriages #9 on each side. Each nut # 7 has to be propped up properly on the welded support face #10.
4. Bring each #8 nut at a D1 distance of 3/16" to 1/4" from the #10 support face.
5. Without touching the #8 nut, completely tighten #7.

With this procedure the end of stroke of the movable drum will not be the end of stroke of the gas spring. Therefore, there will be 1/4" to 5/16" of clearance before the end of stroke of the gas spring which will increase their life expectancy.



### 3.7.4 END OF STROKE STOPPER ADJUSTMENT (CONTINUED)

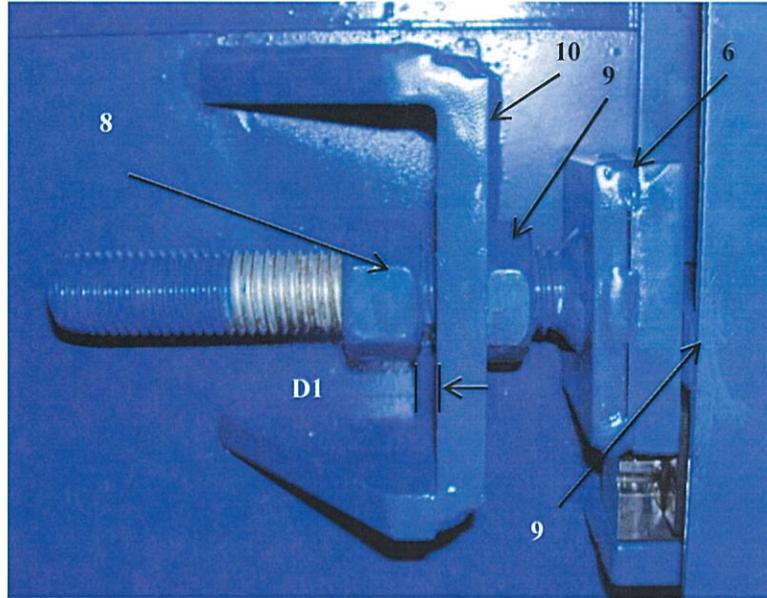


Figure 16 Idler side of Perforator



Figure 17 Motorization side of Perforator

### 3.7.4 END OF STROKE STOPPER ADJUSTMENT (CONTINUED)



*Figure 18 Adjustment details of end of stroke stopper*



## 3.8 CAN FLATTENER

### 3.8.1 DESCRIPTION

**MACHINEX** Can Flatteners are built rough, with quality materials, for a better efficiency and a longer duration.

### 3.8.2 MAINTENANCE

The next lines will list and explain the maintenance required for the good functioning of the Can Flattener. As explained previously, for a good follow-up of your equipment, use the maintenance cards in an appropriate manner.



**Before proceeding to the maintenance of your equipment, be sure to respect all the security measures.**



#### *Cleaning methods*

To keep your equipment running fine, you have to keep it clean. Be sure that all the mobile parts of the Can Flattener are free of fragments. Always stop the machine and lock the electrical controls before doing any maintenance on the Can Flattener.

#### *Gear Motor and roller bearings*

For the maintenance of these components, consult their respective sections.

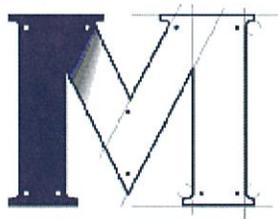
#### *Chain*

For a good maintenance of the chain, check if it is not put under too much tension. Check the tension of the chains, specially the one between the two fixed rolls. Meticulously inspect the internal and external surfaces of your chain. A shiny, worn or non-lubricated surface may indicate an unusual rubbing of the chain. This rubbing may happen with the sprockets. To prevent chain from corrosion, it should be lubricated correctly. Check if the chain is lubricated enough. Chain must also be aligned correctly.

#### *Sprockets*

These parts do not require much attention, only a good inspection. Meticulously check to find any cracks, corrosion or other damages. Also check that if there is no broken thooth and verify that the sprockets are maintain in their position and properly aligned.

Section 4  
SPARE PARTS



## ***SECTION 4***

## ***SPARE PARTS***

# 4.1 SPARE PARTS OF CHAIN ROLLER Z-SHAPE CONVEYOR

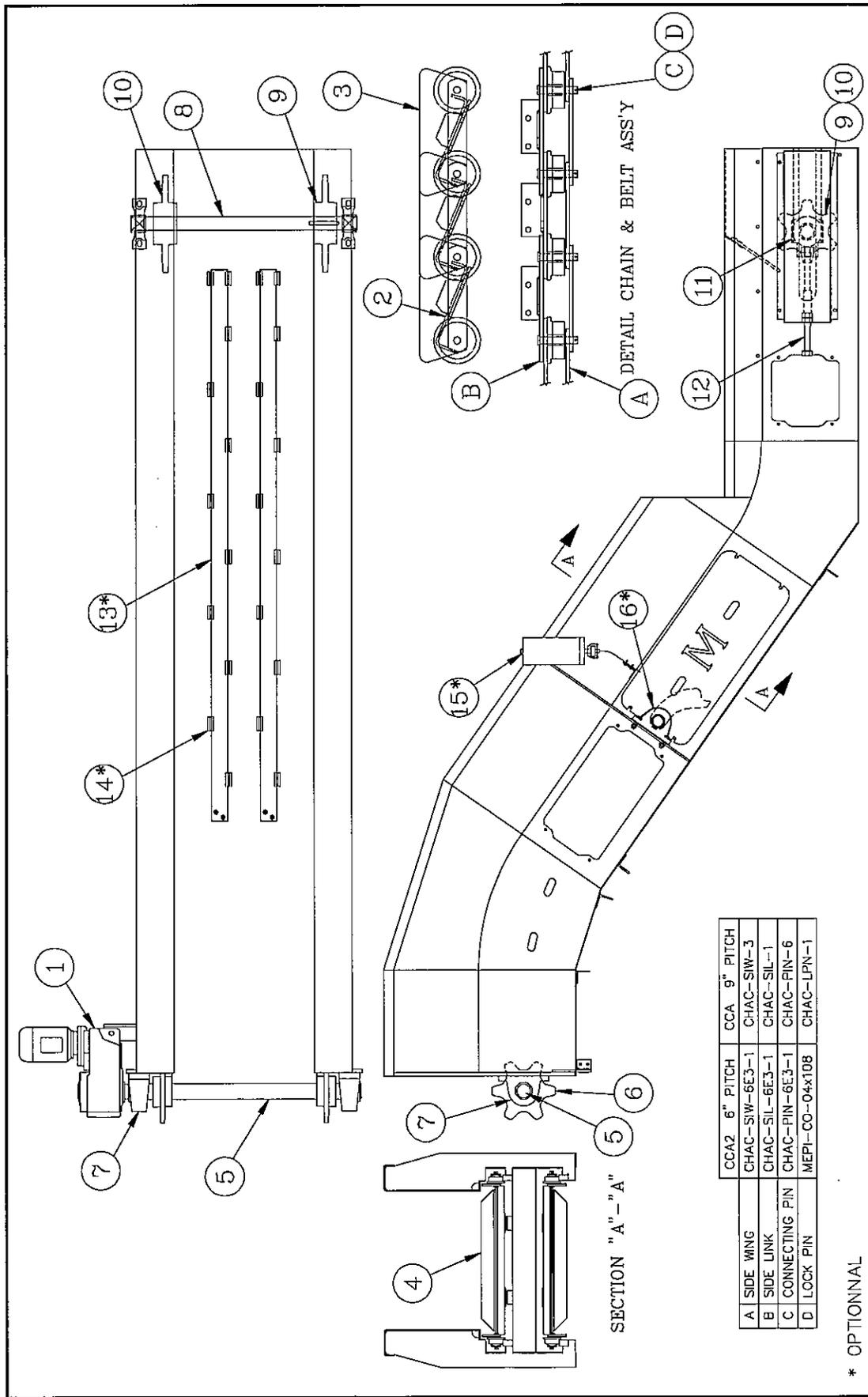
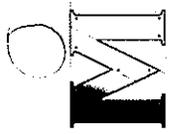


Figure 19 Spare parts drawing of Chain roller Z-Shape conveyor



#### 4.1 SPARE PARTS OF CHAIN ROLLER Z-SHAPE CONVEYOR (CONT'D)

\* According to conveyor function, these items may not be required.

\*\* Item not illustrated on drawing

() = No item of drawing

CCA-1783L CONVEYOR Z SHAPE (C-1)

1	NC538-2.05-C06.7M5-1	GEARMOTOR	1.00
2	CCA-3492D-14	"Z" SHAPE	64.00
3	CCA-3496D-1	CHAIN ASS'Y	---
4	CCA-3271D-42	CLEATS	18.00
5	MAS-008D-17	HEAD SHAFT	1.00
6,9	CCA-3027D-5	SPROCKET	3.00
7	BRRHP-PB-215-S-S-1	PILLOW BLOCK	2.00
8	CCA-3028D-10	TAIL SHAFT	1.00
10	CCA-3027D-6	SPROCKET	1.00
11	BRRHP-TU-215-S-S-1	TAKE-UP BEARING	2.00
12	CCA-2017D	TAKE-UP	2.00
13	CCA-408D	WEAR STRIP	3.00
14	CCA-407D	BRACKET FOR WEAR STRIP	26.00
15	MESLU-SG-24V-1S-1G-1	LUBRICATOR	2.00

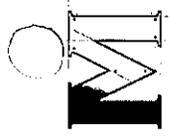
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CCA-1784L CONVEYOR Z SHAPE (C-2)

1	NC838-7.55-C08.6M6-1	GEARMOTOR	1.00
2	CCA-3492D-14	"Z" SHAPE	134.00
3	CCA-3496D-1	CHAIN ASS'Y	---
4	CCA-3271D-42	CLEATS	61.00
5	MAS-008D-58	HEAD SHAFT	1.00
6	CCA-3027D-7	SPROCKET	2.00
7	BRRHP-PB-307-S-S-1	PILLOW BLOCK	2.00
8	CCA-3028D-10	TAIL SHAFT	1.00
9	CCA-3027D-5	SPROCKET	1.00
10	CCA-3027D-6	SPROCKET	1.00
11	BRRHP-TU-215-S-S-1	TAKE-UP BEARING	2.00
12	CCA-2017D	TAKE-UP	2.00
13	CCA-408D	WEAR STRIP	1.00
14	CCA-407D	BRACKET FOR WEAR STRIP	4.00
15	MESLU-SG-24V-1S-1G-1	LUBRICATOR	2.00



## 4.2 SPARE PARTS OF IDLER CONVEYOR

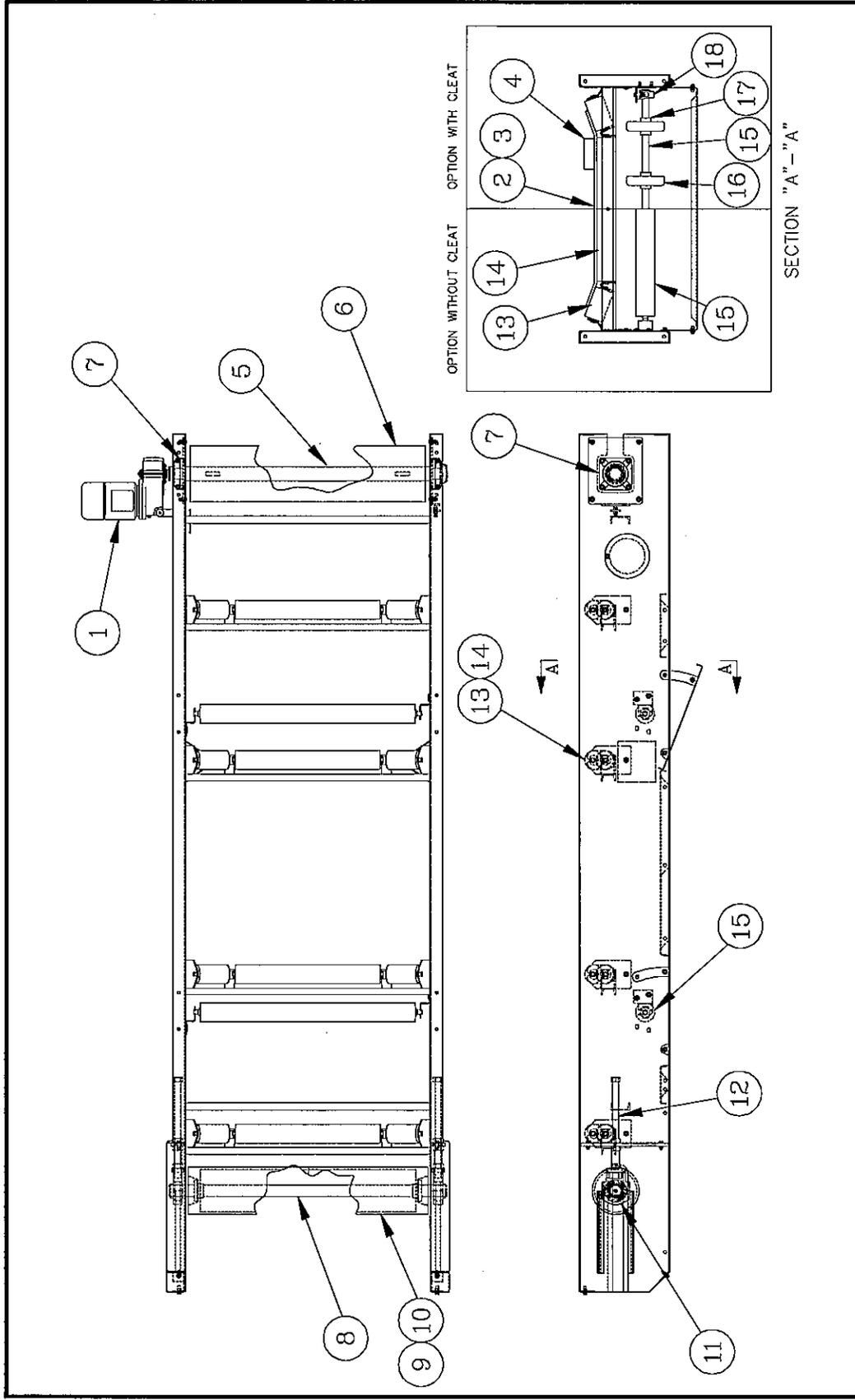
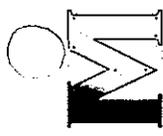


Figure 20 Spare parts drawing of Idler conveyor



## 4.2 SPARE PARTS OF IDLER (CONT'D)

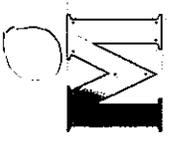
\* According to conveyor function, these items may not be required.

\*\* Item not illustrated on drawing

() = No item of drawing

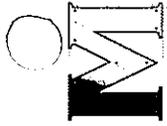
### CRP2-079L IDLER CONVEYOR (C-7)

1	NC228-2.05-C38.0M6-4	GEARMOTOR	1.00
2	BECO-R30201-330-30-1	BELT	1.00
3	BESJ-187MEG3P-00S-1	JOINT	1.00
4	CRP2-144D-2	CLEATS	12.00
5	CRP2-123D-32	HEAD SHAFT	1.00
6,9	POU-1230T-1	PULLEY	2.00
7	BRRHP-F4-215-S-S-1	FLANGE BEARING	2.00
8	CRP2-124D-140	TAIL SHAFT	1.00
10	MEBXT-XTB30-215-AVKE	TAPER BUSHING	4.00
11	BRRHP-PB-215-S-S-1	PILLOW BLOCK	2.00
12	CRP2-110A-1	TAKE-UP	2.00
13	IDLU-SRI-C-4X0612-S	IDLER	20.00
14	IDLU-SRI-C-4X1512-S	IDLER	10.00
15	IDLU-PSR-C-4X2712-S	RETURN IDLER	5.00



CRP2-059L IDLER CONVEYOR (C-9)

1	NC228-2.05-C38.0M6-4	GEARMOTOR	1.00
2	BECO-R30301-330-60C2	BELT	1.00
3	BESJ-187MEG3P-00S-1	JOINT	1.00
5	CRP2-123D-31	HEAD SHAFT	1.00
7	BRRHP-F4-215-S-S-1	FLANGE BEARING	2.00
8	CRP2-124D-139	TAIL SHAFT	1.00
9	POU-1260T-1	PULLEY	2.00
10	MEEXT-XTB30-215-AVKE	TAPER BUSHING	4.00
11	BRRHP-PB-215-S-S-1	PILLOW BLOCK	2.00
12	CRP2-110A-1	TAKE-UP	2.00
13	IDLU-SRI-C-5X0612-S	IDLER	18.00
14	IDLU-SRI-C-5X4512-S	IDLER	9.00
15	IDLU-PSR-D-5X5712-S	RETURN IDLER	4.00



### 4.3 SPARE PARTS OF SLIDER ROLLER CONVEYOR

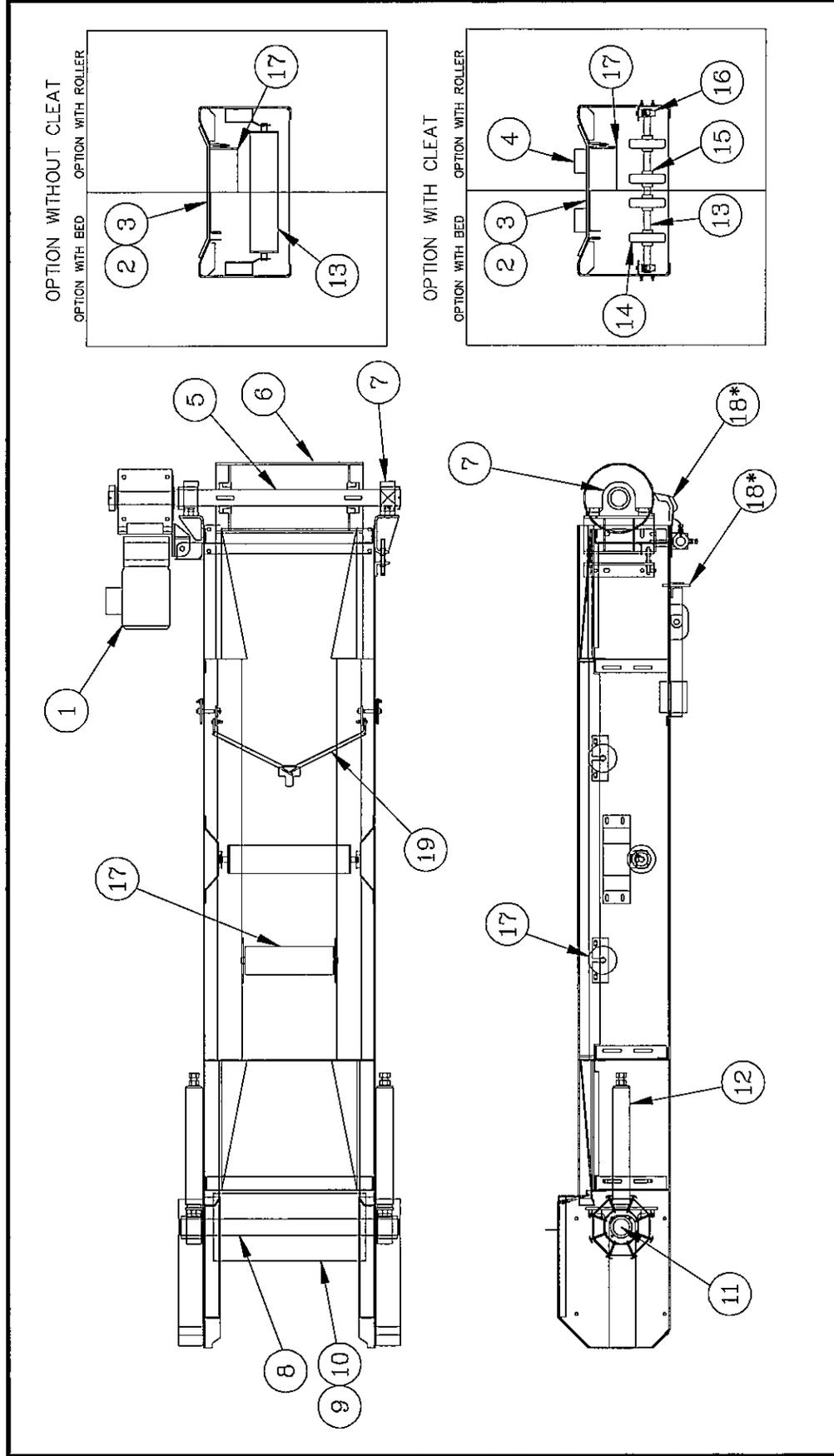
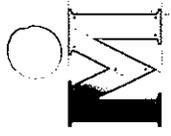


Figure 21 Spare parts drawing of Slider roller conveyor



### 4.3 SPARE PARTS OF SLIDER ROLLER CONVEYOR (CONT'D)

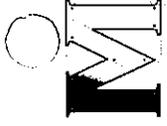
\* According to conveyor function, these items may not be required.

\*\* Item not illustrated on drawing

( ) = No item of drawing

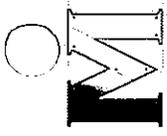
CSRT-024L SLIDER BED CONVEYOR (C-3)

1	NC328-3.05-C41.0M6-2	GEARMOTOR	1.00
2	BECO-R303BB-330-3601	BELT	2.00
3	ST-JT-VULF-3PLY-36-5	JOINT	1.00
5	CRP2-124D-10	HEAD SHAFT	1.00
6	POCO-12-36-215-C-04L	PULLEY	1.00
7	BRRHP-F4-215-S-S-1	FLANGE BEARING	2.00
8	CRP2-123D-3	TAIL SHAFT	1.00
9	POU-1236T-1	PULLEY	1.00
10	MEBXT-XTB30-215-AVKE	TAPER BUSHING	2.00
11	BRRHP-PB-215-S-S-1	PILLOW BLOCK	2.00
13	IDLJ-PSR-C-4X3500-S	RETURN IDLER	5.00
18	MEBC-IR-PRI-36-1	BLADE FOR SCRAPER	1.00



CSR3-190L SLIDER BED CONVEYOR (C-5)

1	NC228-2.05-C38.0M6-3	GEARMOTOR	1.00
2	BECO-R202BB-220-3001	BELT	1.00
3	BESJ-187MEG3P-00S-1	JOINT	1.00
4	CRP2-144D-3	CLEATS	7.00
5	CRP2-124D-141	HEAD SHAFT	1.00
6	POCO-12-30-215-C-04L	PULLEY	1.00
7	BRRHP-F4-215-S-S-1	FLANGE BEARING	2.00
8	CRP2-123D-32	HEAD SHAFT	1.00
9	POU-1230T-1	PULLEY	1.00
10	MEBXT-XTB30-215-AVKE	TAPER BUSHING	2.00
11	BRRHP-PB-215-S-S-1	PILLOW BLOCK	2.00
12	CRP2-110A-1	TAKE-UP	2.00
13	IDLU-PSR-C-4X2712-S	RETURN IDLER	4.00



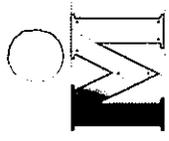
CSR3-192L SLIDER BED CONVEYOR (C-11)

1	NC428-3.05-C38.0M5-1	GEARMOTOR	1.00
2	BECO-R302BB-330-30C1	BELT	1.00
3	BESJ-187MEG3P-00S-1	JOINT	1.00
5	CRP2-124D-16	HEAD SHAFT	1.00
6	POCO-12-30-215-C-04L	PULLEY	1.00
7	BRRHP-F4-215-S-S-1	FLANGE BEARING	2.00
8	CRP2-123D-2	TAIL SHAFT	1.00
9	POU-1230T-1	PULLEY	1.00
10	MEBXT-XTB30-215-AVKE	TAPER BUSHING	2.00
11	BRRHP-PB-215-S-S-1	PILLOW BLOCK	2.00
12	CRP2-110A-1	TAKE-UP	2.00
13	IDLU-PSR-C-4X2712-S	RETURN IDLER	5.00



CSR3-193L SLIDER BED CONVEYOR (C-15)

1	NC228-1.05-C37.0M6-1	GEARMOTOR	1.00
2	BECO-R202BB-220-2401	BELT	1.00
3	BESJ-187MEG2P-00A-1	JOINT	1.00
4	CRP2-144D-2	CLEATS	16.00
5	CRP2-124D-1	HEAD SHAFT	1.00
6	POCO-12-24-215-C-04L	PULLEY	1.00
7	BRRHP-F4-215-S-S-1	FLANGE BEARING	2.00
8	CRP2-123D-1	TAIL SHAFT	1.00
9	POU-1224T-1	PULLEY	1.00
10	MEBXT-XTB30-215-AVKE	TAPER BUSHING	2.00
11	BRRHP-PB-215-S-S-1	PILLOW BLOCK	2.00
12	THROD-100C-ZP	TAKE-UP	2.00
13	IDLU-PSR-C-4X2112-S	RETURN IDLER	3.00

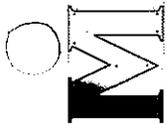


CSRT-026L SLIDER ROLLER CONVEYOR (C-16)

1	NC428-3.05-C38.0M6-2	GEARMOTOR	1.00
2	BECO-R202BB-220-3001	BELT	1.00
2	ST-JT-VULF-2PLY-30-3	JOINT	1.00
5	CRP2-124D-16	HEAD SHAFT	1.00
6	POCO-12-30-215-C-04L	PULLEY	1.00
7	BRRHP-F4-215-S-S-1	FLANGE BEARING	2.00
8	CRP2-123D-2	TAIL SHAFT	1.00
9	POU-1230T-1	PULLEY	1.00
10	MEBXT-XTB30-215-AVKE	TAPER BUSHING	2.00
11	BRRHP-PB-215-S-S-1	PILLOW BLOCK	2.00
12	THROD-100C-ZP	TAKE-UP	2.00
13	IDLU-PSR-C-4X2900-S	RETURN IDLER	10.00
17	IDLU-PSR-C-4X1700-S	IDLER	2.00

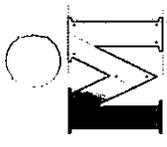
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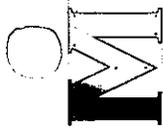
CSR3-194L SLIDER ROLLER CONVEYOR(C-18)

1	NC228-2.05-C38.0M6-3	GEARMOTOR	1.00
2	BECO-R202BB-220-2401	BELT	1.00
3	BESJ-187MEG2P-00A-1	JOINT	1.00
4	CRP2-144D-2	CLEATS	24.00
5	CRP2-124D-1	HEAD SHAFT	1.00
6	POCO-12-24-215-C-04L	PULLEY	1.00
7	BRRHP-F4-215-S-S-1	FLANGE BEARING	2.00
8	CRP2-123D-1	TAIL SHAFT	1.00
9	POU-1224T-1	PULLEY	1.00
10	MEBXT-XTB30-215-AVKE	TAPER BUSHING	2.00
11	BRRHP-PB-215-S-S-1	PILLOW BLOCK	2.00
12	THROD-100C-ZP	TAKE-UP	2.00
13	IDLU-PSR-C-4X2112-S	RETURN IDLER	5.00
17	IDLU-PSR-C-4X1512-S	IDLER	2.00



CSRT-027L SLIDER ROLLER CONVEYOR (C-19)

1	NC228-1.05-C37.0M6-1	GEARMOTOR	1.00
2	BECO-R202BB-220-3001	BELT	1.00
3	ST-JT-VULF-2PLY-30-5	JOINT	1.00
5	CRP2-124D-2	HEAD SHAFT	1.00
6	POCO-12-30-215-C-04L	PULLEY	1.00
7	BRRHP-F4-215-S-S-1	FLANGE BEARING	2.00
8	CRP2-123D-2	TAIL SHAFT	1.00
9	POU-1230T-1	PULLEY	1.00
10	MEBXT-XTB30-215-AVKE	TAPER BUSHING	2.00
11	BRRHP-PB-215-S-S-1	PILLOW BLOCK	2.00
12	THROD-100C-ZP	TAKE-UP	2.00
13	IDLU-PSR-C-4X2900-S	RETURN IDLER	3.00

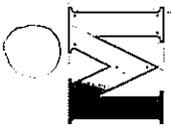


CSR3-195L SLIDER BED CONVEYOR (C-20)

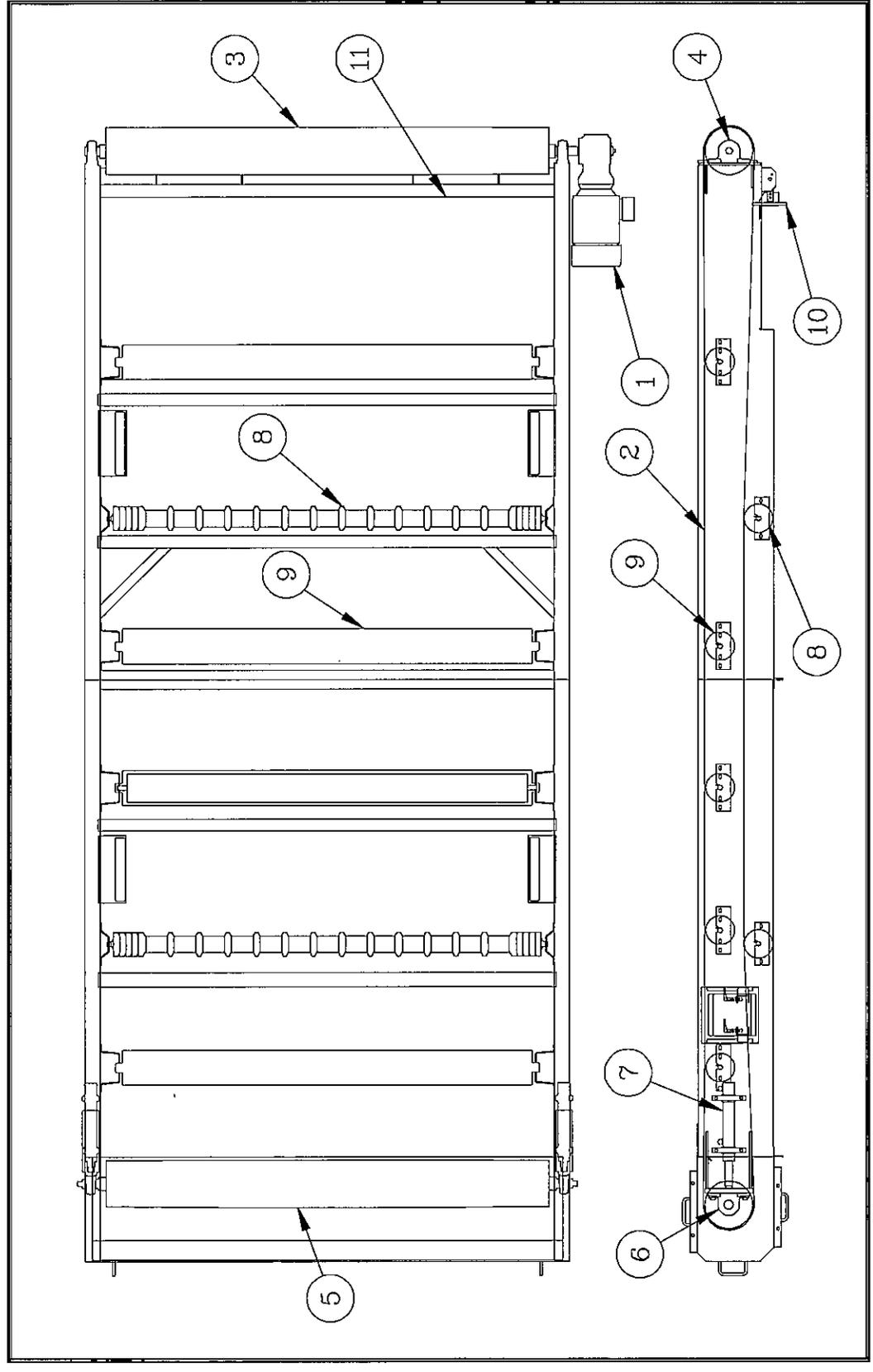
1	NC228-2.05-C38.0M6-3	GEARMOTOR	1.00
2	BECO-R202BB-220-2401	BELT	1.00
3	BESJ-187MEG2P-00A-1	JOINT	1.00
4	CRP2-144D-2	CLEATS	20.00
5	CRP2-124D-1	HEAD SHAFT	1.00
6	POCO-12-24-215-C-04L	PULLEY	1.00
7	BRRHP-F4-215-S-S-1	FLANGE BEARING	2.00
8	CRP2-123D-1	TAIL SHAFT	1.00
9	POU-1224T-1	PULLEY	1.00
10	MEBXT-XTB30-215-AVKE	TAPER BUSHING	2.00
11	BRRHP-PB-215-S-S-1	PILLOW BLOCK	2.00
12	THROD-100C-ZP	TAKE-UP	2.00
13	IDLU-PSR-C-4X2112-S	RETURN IDLER	4.00

CSRT-025L SLIDER BED CONVEYOR(C-21)

1	NC228-2.05-C38.0M6-2	GEARMOTOR	1.00
2	BECO-R202BB-220-3001	BELT	1.00
3	ST-JT-VULF-2PLY-30-3	JOINT	1.00
5	CRP2-124D-2	HEAD SHAFT	1.00
6	POCO-12-30-215-C-04L	PULLEY	1.00
7	BRRHP-F4-215-S-S-1	FLANGE BEARING	2.00
8	CRP2-123D-2	TAIL SHAFT	1.00
9	POU-1230T-1	PULLEY	1.00
10	MEBXT-XTB30-215-AVKE	TAPER BUSHING	2.00
11	BRRHP-PB-215-S-S-1	PILLOW BLOCK	2.00
12	THROD-100C-ZP	TAKE-UP	2.00
13	IDLU-PSR-C-4X2900-S	RETURN IDLER	7.00



**4.4 SPARE PARTS OF SLIDER CONVEYOR**



*Figure 22 Spare parts drawing of Slider conveyor*

#### 4.4 SPARE PARTS OF SLIDER CONVEYOR (CONT'D)

\* According to conveyor function, these items may not be required.  
 \*\* Item not illustrated on drawing  
 () = No item of drawing

CSO-041L SLIDER BED CONVEYOR (C-13)

1	NB92372-35-C263-M3-1	GEARMOTOR	1.00
2	BECO-M43TBB-180-47P4	BELT	1.00
3	CSO2-012D-03	HEAD PULLEY	1.00
4, 6	BRNSK-PB-115-T-B-1	PILLOW BLOCK	4.00
4, 6	BRNSK-ADP-HA-001	ADAPTOR	4.00
5	CSO2-009D-05	TAIL PULLEY	1.00
7	CSO-007D-02	TAKE-UP	2.00
8	IDRD-500X41-C-2	RETURN IDLER	2.00
10	CSO-003D-09	HEAD SCRAPER	1.00
11	CSO-019D-05	PLASTIC PLATE	1.00

*motor side*

# 4.5 SPARE PARTS OF GLASS BREAKER SCREEN

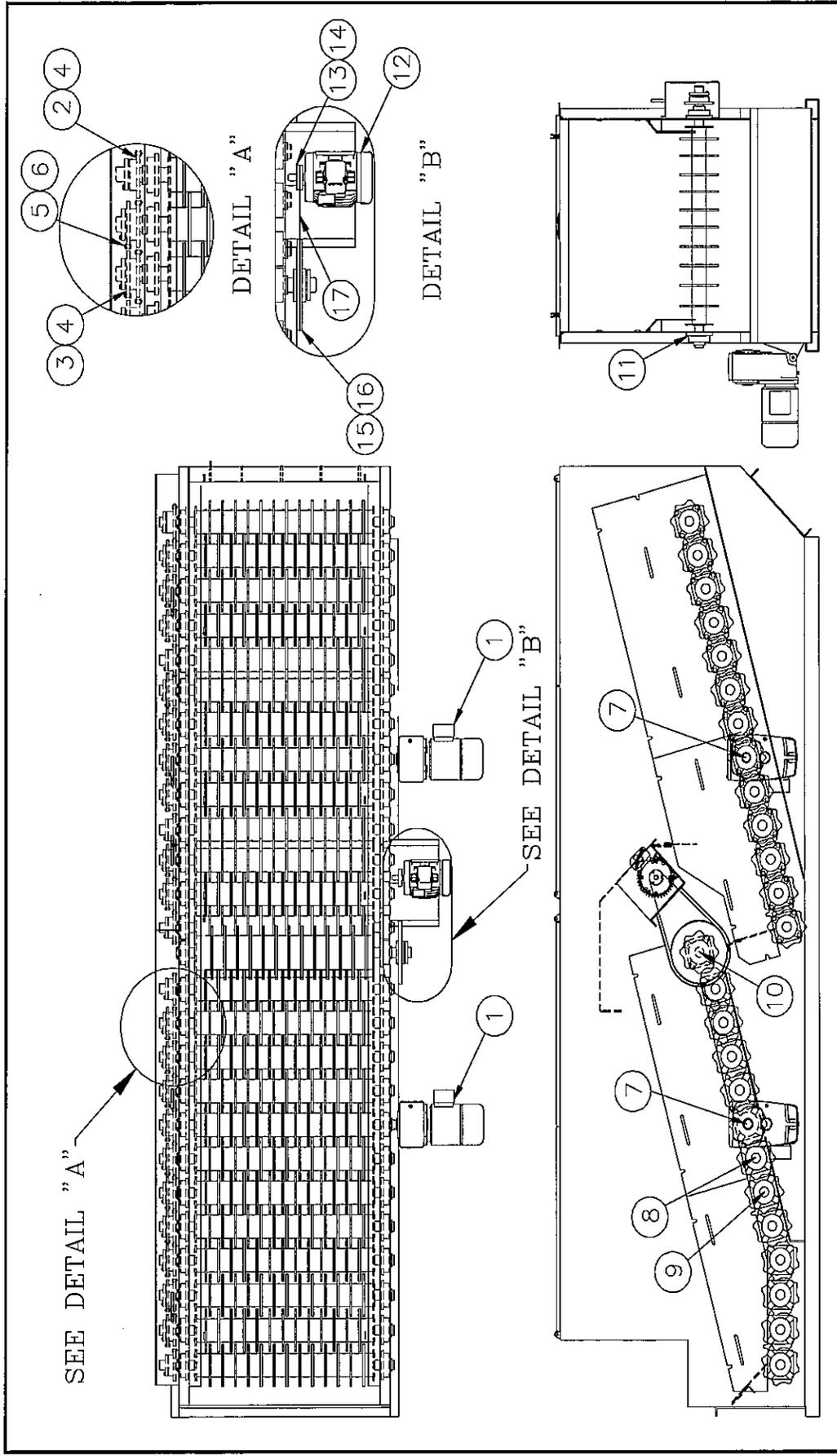
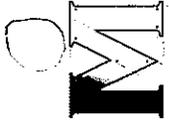


Figure 23 Spare parts drawing of Glass Breaker Screen



### 4.5 SPARE PARTS OF GLASS BREAKER SCREEN (CONT'D)

\* According to conveyor function, these items may not be required.

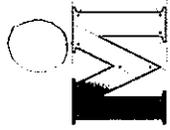
\*\* Item not illustrated on drawing

() = No item of drawing

DS-163L GLASS BREAKER SCREEN (GB-8)

1	NC328-3.05-C84.0M3-1	GEARMOTOR	2.00
2	SPRE-060S-24STB0Q1-1	SPROCKET	4.00
3	SPRE-060DS240STB0Q-1	SPROCKET	14.00
4,16	MEBST-0Q1-115-04x08	BUSHING	19.00
5	CHRE-S-060-R-2	CHAIN	---
6	CHCL-S-00060-2	CONNECTING LINK	16.00
7	DS-458D-5	DRIVE SHAFT	2.00
8	DS-460D-10	DRIVEN SHAFT	6.00
8	DS-460D-11	DRIVEN SHAFT	3.00
9	DS-460D-12	DRIVEN SHAFT	2.00
9	DS-460D-9	DRIVEN SHAFT	5.00
10	DS-456D-8	HIGH SPEED SHAFT	1.00
11	BRHP-F4-115-S-S-1	FLANGE BEARING	38.00
12	EIMO4-A2.0-14T-TEO-2	MOTOR	1.00
13	POVB1-0TA-03.250P-S1	SHEAVE	1.00
14	MEBST-0P1-014-015x03	TAPER BUSHING	1.00
15	POVB1-0TA-12.250Q-S1	SHEAVE	1.00
17	BEVB-000A0-00580	V-BELT	1.00





#### 4.6 SPARE PARTS OF PLASTIC PERFORATOR (CONT'D)

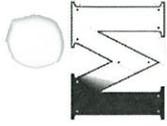
\* According to conveyor function, these items may not be required.

\*\* Item not illustrated on drawing

( ) = No item of drawing

#### EP-033L PLASTIC PERFORATOR (PP-10)

1	NC428-2.05-C18.0M1-1	GEARMOTOR	2.00
2	EP-053D	FIX DRUM	1.00
3	EP-054D	MOBILE DRUM	1.00
4	EP-053D-2	TEETH	---
5	BRRHP-F4-207-S-S-1	FLANGE BEARING	6.00
6	BRTOR-SB-010-000-1	RADIAL BEARING	4.00
7	MEGSP-CO-28-200-BBR	CYLINDER	2.00



EC-003L CAN FLATTENER (CF-6A)

Item	Code	Description	Total
1	NC428-3.05-C28.0M1-1	GEARMOTOR	2.00
2,3	EC-021D-01	DRUM	1.00
4	EC-019D-01	TEETH	1.00
5	BRRHP-F4-207-S-S-1	FLANGE BEARING	6.00
6	BRTOR-SB-010-000-1	RADIAL BEARING	4.00
7	MEGSP-CO-28-200-BBR	CYLINDER	2.00

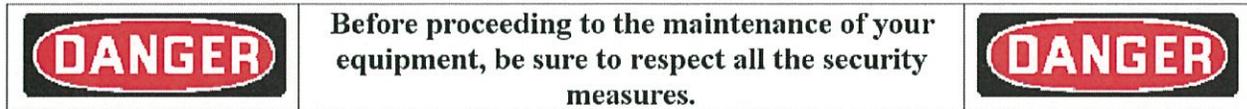
CA  
 — 2 DRUMS  
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EC-004L CAN FLATTENER (CF-6B)

Item	Code	Description	Total
1	NC428-3.05-C28.0M1-1	GEARMOTOR	2.00
2,3	EC-021D-01	DRUM	1.00
4	EC-019D-02	SLOTTED PLATES	2.00
5	BRRHP-F4-207-S-S-1	FLANGE BEARING	6.00
6	BRTOR-SB-010-000-1	RADIAL BEARING	4.00
7	MEGSP-CO-28-200-DDR	CYLINDER	2.00

### 3.4.4 MAINTENANCE

The next lines will enumerate and explain the necessary maintenance for a good functioning of the conveyor. As explained earlier, for a good follow-up of your equipment, use the maintenance cards in an appropriate manner.



#### *Cleaning methods*

For a good maintenance of the apron and "z-shape" belt conveyor, you have to keep it clean. A cleaning of the chains, of the belt, of the gear motors and the bearings will allow a better control of the conveyor. It is important to make sure that the mobile parts are free of fragments such as paper, broken glass, crushed containers, plastic bags, etc.

#### *Gear motors and roller bearings*

For the maintenance of these components, consult their respective sections.

#### *Chains*

For a good maintenance of the chains, check that they are not being put under too much tension (see tension of the belt). Be sure also that there is no accumulation of material in between the links and the wheels. Inspect meticulously the internal and external surface of your chains; a shiny, worn or non-lubricated surface may indicate an unusual rubbing of the chain. This rubbing may occur between the chains and the sprockets or between the chain rollers and their iron angle (or i-beam) rails, and is usually caused by a misalignment of the belt. Finally, to prevent corrosion of the chains and to assure a good sliding of the chain rollers, lubricate them each week with a mixture of 50% oil, and 50% diesel, applied with a brush. Be sure that all the cavities of the chains are covered with lubricant.

#### *Shafts*

This part of the conveyor doesn't require much attention, just make sure that it did not bend under excessive tension on the belt or under an excessive load. To check this point, look at the shaft while it turns at medium speed, a straight shaft will turn on its axis while a bent shaft will give the impression that it jumps and may cause vibrations when at high speed.

### 3.4.4 MAINTENANCE (CONTINUED)

#### ***Belt***

A simple inspection of the belt would be to look at it carefully while it is turning to find deformation or corrosion. The operators may make this kind of inspection at any time. The same measure may be used to check the tension and the alignment.

For a more thorough inspection of the belt, check the following points:

- Check the pans to ensure there good condition (deformation and corrosion);
- Are the bolts still tight and in good condition?
- Check the weld joints of the attachments against the chains;
- Check condition of cleats;
- Remove any dirt stuck on the belt.
- Check the wear of the belt reinforcement pieces and on the impact shoes.
- Is there a tearing around the attachment holes, the cleats and belt joint for PVC belt?

#### ***Sprockets***

As mentioned earlier, the sprockets are used to drive and guide the chains. These parts do not require much attention, only a good inspection. Check meticulously to find any cracks, corrosion or other damages. Also check that all the teeth are there and verify that the socket cap screws maintain the sprockets in their position.

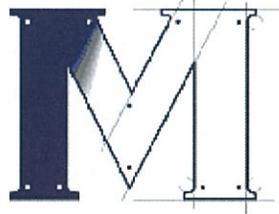
#### ***Take-ups***

The chain roller conveyors are normally equipped with sliding take-ups. For this kind of take-up, follow these instructions:

- Are they maintaining the bolts tight?
- The threaded rod should be straight and exempt of rust.
- The guide rods should be straight and exempt of rust.

If need be, apply a mixture of 50 % oil, 50 % diesel on the take-ups to protect them from corrosion and to help the sliding.

Section 5  
MAINTENANCE CARD



***SECTION 5***

***MAINTENANCE CARD***

# MAINTENANCE SCHEDULE

PROJECT / LOCATION: REGION OF WATERLOO      EQUIPMENT: CHAIN ROLLER WITH BELT "Z-SHAPE" TYPE  
 SUPERVISOR: \_\_\_\_\_      EQUIP. NO.: C-1      LIST NO.: CCA-1783L  
 MAINTENANCE EMPLOYEE: \_\_\_\_\_      MONTH \_\_\_\_\_

<b>CONTINUAL MAINTENANCE</b>																									
DAYS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1. CLEAN CONVEYOR AND ITS SURROUNDINGS.																									
2. REMOVE MATERIAL STOCKED INTO THE DRIVING CHAIN																									
3. CHECK Z-SHAPE STEEL BELT CONDITION (DEFORMATIONS & CORROSION).																									

<b>PERIODICAL MAINTENANCE</b>					
WEEKS	1	2	3	4	5
4. CHECK CLEATS CONDITION AND ALIGNMENT.					
5. CHECK BEARINGS.					
6. CHECK SHAFTS.					
7. CHECK BOTH CHAINS.					
8. CHECK AUTOMATIC OILER OIL LEVEL AND FUNCTIONMENT.					
9. CLEAN PHOTOELECTRIC SENSORS (IF APPLICABLE).					
10. CHECK SPROCKETS, CHAINS AND BELT ATTACHMENT CONDITION (lubricate chains).					
11. INSPECT BACKSIDE OF THE BELT AND BOLTS CONDITION.					
12. INSPECT PLASTIC STRIPS CONDITION.					
13. INSPECT BOTH BELT TENSIONERS AND BELT TENSION.					
14. CHECK SPEED REDUCER OIL LEVEL.					
15. TIGHTEN ALL BOLTS.					
16. LUBRICATE SPEED REDUCER AND BEARINGS.					

**ACCORDING TO SERVICE MANUAL RECOMMENDATIONS**

LEGEND	MAINTENANCE REQUIRED
<input type="checkbox"/>	MAINTENANCE REQUIRED
<input checked="" type="checkbox"/>	MAINTENANCE IF REQUIRED
<input type="checkbox"/>	MAINTENANCE DONE
<input type="checkbox"/>	REMARKS, SEE COMMENTS ON NEXT PAGE
	Before maintaining, servicing or inspecting the system, the circuit breaker and power to the circuit breaker must be off and locked.

FOR SERVICE:		
 <b>M A C H I N E R Y</b> <small>TECHNOLOGIES</small>	 <b>M A C H I N E R Y</b> <small>TECHNOLOGIES</small>	 <b>M A C H I N E R Y</b> <small>TECHNOLOGIES</small>
PLESSISVILLE Quebec Tel: (819) 362-3281 Fax: (819) 362-2280 E-mail: sales@machinex.ca	TORONTO Ontario Tel: (905) 420-0466 Fax: (905) 420-0319 E-mail: sales@mt-machinex.ca	CHICAGO Illinois Tel: (773) 867-8801 Fax: (773) 867-8802 E-mail: sales@mti.machinex.ca

REMARKS ON MAINTENANCE SCHEDULE

PROJECT / LOCATION: \_\_\_\_\_ REGION OF WATERLOO \_\_\_\_\_ EQUIPMENT: CHAIN ROLLER WITH BELT "Z-SHAPE" TYPE  
EQUIP. NO.: \_\_\_\_\_ C-1 \_\_\_\_\_ LIST NO.: CCA-1783L

No.	COMMENTS
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APPROVAL \_\_\_\_\_

SUPERVISOR : \_\_\_\_\_ MAINTENANCE EMPLOYEE: \_\_\_\_\_  
DATE : \_\_\_\_\_ DATE : \_\_\_\_\_

# MAINTENANCE SCHEDULE

PROJECT / LOCATION: REGION OF WATERLOO      EQUIPMENT: CHAIN ROLLER WITH BELT "Z-SHAPE" TYPE  
 SUPERVISOR: \_\_\_\_\_      LIST NO.: CCA-1784L  
 MAINTENANCE EMPLOYEE: \_\_\_\_\_      EQUIP. NO.: C-2      MONTH \_\_\_\_\_

<b>CONTINUAL MAINTENANCE</b>																												
DAYS	MONTH																											
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25			
1. CLEAN CONVEYOR AND ITS SURROUNDINGS.																												
2. REMOVE MATERIAL STOCKED INTO THE DRIVING CHAIN																												
3. CHECK Z-SHAPE STEEL BELT CONDITION (DEFORMATIONS & CORROSION).																												

<b>PERIODICAL MAINTENANCE</b>					
WEEKS	MONTH				
	1	2	3	4	5
4. CHECK CLEATS CONDITION AND ALIGNMENT.					
5. CHECK BEARINGS.					
6. CHECK SHAFTS.					
7. CHECK BOTH CHAINS.					
8. CHECK AUTOMATIC OILER OIL LEVEL AND FUNCTIONMENT.					
9. CLEAN PHOTOELECTRIC SENSORS (IF APPLICABLE).					
10. CHECK SPROCKETS, CHAINS AND BELT ATTACHMENT CONDITION (lubricate chains).					
11. INSPECT BACKSIDE OF THE BELT AND BOLTS CONDITION.					
12. INSPECT PLASTIC STRIPS CONDITION.					
13. INSPECT BOTH BELT TENSIONERS AND BELT TENSION.					
14. CHECK SPEED REDUCER OIL LEVEL.					
15. TIGHTEN ALL BOLTS.					

ACCORDING TO SERVICE MANUAL RECOMMENDATIONS

LEGEND	
<input type="checkbox"/>	MAINTENANCE REQUIRED
<input checked="" type="checkbox"/>	MAINTENANCE IF REQUIRED
<input type="checkbox"/>	MAINTENANCE DONE
<input type="checkbox"/>	REMARKS, SEE COMMENTS ON NEXT PAGE
	Before maintaining, servicing or inspecting the system, the circuit breaker and power to the circuit breaker must be off and locked.

 <b>M A C H I N E R Y</b> PLESSISVILLE Quebec Tel: (819) 362-3281 Fax: (819) 362-2280 E-mail: sales@machinex.ca	 <b>M A C H I N E R Y</b> EQUIPME INDIARIES TORONTO Ontario Tel: (905) 420-0466 Fax: (905) 420-0319 E-mail: sales@mrt.machinex.ca	 <b>M A C H I N E R Y</b> TECHNOLOGIES CHICAGO Illinois Tel: (773) 867-8801 Fax: (773) 867-8802 E-mail: sales@mrt.machinex.ca
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**REMARKS ON MAINTENANCE SCHEDULE**

PROJECT / LOCATION: \_\_\_\_\_ REGION OF WATERLOO \_\_\_\_\_ EQUIPMENT: CHAIN ROLLER WITH BELT "Z-SHAPE" TYPE  
EQUIP. NO.: \_\_\_\_\_ C-2 \_\_\_\_\_ LIST NO.: CCA-1784L

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APPROVAL \_\_\_\_\_

SUPERVISOR : \_\_\_\_\_ MAINTENANCE EMPLOYEE: \_\_\_\_\_  
DATE : \_\_\_\_\_ DATE : \_\_\_\_\_

# MAINTENANCE SCHEDULE

<b>PROJECT / LOCATION:</b>	REGION OF WATERLOO	<b>EQUIPMENT:</b>	SLIDER BED CONVEYOR
<b>SUPERVISOR:</b>	C-3	<b>EQUIP. NO.:</b>	CSRT-024L
<b>MAINTENANCE EMPLOYEE:</b>		<b>MONTH:</b>	

### CONTINUAL MAINTENANCE

	DAYS																																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31		
1. CLEAN CONVEYOR AND ITS SURROUNDINGS.																																	
2. CHECK BELT CONDITION (TEARS AND SCRATCHES).																																	
3. CHECK BELT ALIGNMENT.																																	
4. INSPECT BELT JOINT ON BOTH SIDES																																	
5. CLEAN PHOTOELECTRIC SENSORS (IF APPLICABLE).																																	

### PERIODICAL MAINTENANCE

	WEEKS				
	1	2	3	4	5
6. CHECK BELT TENSION.					
7. CHECK BEARINGS.					
8. CHECK SHAFTS.					
9. CHECK RETURN IDLERS.					
10. CHECK CLEATS ( IF APPLICABLE).					
11. INSPECT BACKSIDE OF THE BELT.					
12. INSPECT BOTH BELT TENSIONERS.					
13. CHECK SPEED REDUCER OIL LEVEL.					
14. TIGHTEN ALL BOLTS.					
15. LUBRICATE BEARINGS.					

<b>LEGEND</b>	<input type="checkbox"/>	MAINTENANCE REQUIRED
	<input checked="" type="checkbox"/>	MAINTENANCE IF REQUIRED
	<input checked="" type="checkbox"/>	MAINTENANCE DONE
	<input type="checkbox"/>	REMARKS, SEE COMMENTS ON NEXT PAGE
	Before maintaining, servicing or inspecting the system, the circuit breaker and power to the circuit breaker must be off and locked.	

 <b>MACHINEX</b> PLEISSVILLE Quebec Tel.: (819) 362-3281 Fax: (819) 362-2280 E-mail: sales@machinex.ca	 <b>MACHINEX</b> RELIABLE TECHNOLOGIES TORONTO Ontario Tel.: (905) 420-0466 Fax: (905) 420-0319 E-mail: sales@mt.machinex.ca	 <b>MACHINEX</b> TELELOGISTICS CHICAGO Illinois Tel.: (773) 867-8801 Fax: (773) 867-8802 E-mail: sales@mt.machinex.ca	
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**REMARKS ON MAINTENANCE SCHEDULE**

PROJECT / LOCATION:		REGION OF WATERLOO	EQUIPMENT:	SLIDER BED CONVEYOR	
			EQUIP. NO.:	C-3	LIST NO.:
					CSRT-024L
<b>COMMENTS</b>					
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<b>APPROVAL</b>					

SUPERVISOR :

DATE :

MAINTENANCE EMPLOYEE:

DATE :

# MAINTENANCE SCHEDULE

<b>PROJECT/LOCATION:</b>	REGION OF WATERLOO	<b>EQUIPMENT:</b>	SLIDER BED CONVEYOR
<b>SUPERVISOR:</b>		<b>EQUIP. NO.:</b>	C-5
<b>MAINTENANCE EMPLOYEE:</b>		<b>LIST NO.:</b>	CSR3-190L
		<b>MONTH:</b>	

### CONTINUAL MAINTENANCE

DAYS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
1. CLEAN CONVEYOR AND ITS SURROUNDINGS.																															
2. CHECK BELT CONDITION (TEARS AND SCRATCHES).																															
3. CHECK BELT ALIGNMENT.																															
4. INSPECT BELT JOINT ON BOTH SIDES																															
5. CLEAN PHOTOELECTRIC SENSORS (IF APPLICABLE).																															

### PERIODICAL MAINTENANCE

	WEEKS	1	2	3	4	5
6. CHECK BELT TENSION.						
7. CHECK BEARINGS.						
8. CHECK SHAFTS.						
9. CHECK RETURN IDLERS.						
10. CHECK CLEATS ( IF APPLICABLE).						
11. INSPECT BACKSIDE OF THE BELT.						
12. INSPECT BOTH BELT TENSIONERS.						
13. CHECK SPEED REDUCER OIL LEVEL.						
14. TIGHTEN ALL BOLTS.						
15. LUBRICATE BEARINGS.						

<b>LEGEND</b>	<input type="checkbox"/> MAINTENANCE REQUIRED
	<input checked="" type="checkbox"/> MAINTENANCE IF REQUIRED
	<input checked="" type="checkbox"/> MAINTENANCE DONE
	<input type="checkbox"/> REMARKS, SEE COMMENTS ON NEXT PAGE
	Before maintaining, servicing or inspecting the system, the circuit breaker and power to the circuit breaker must be off and locked.

 <b>MACHINEX</b> PLESSISVILLE Quebec Tel.: (819) 362-3281 Fax: (819) 362-2280 E-mail: sales@machinex.ca	 <b>MACHINEX</b> RELIABLE TECHNOLOGIES TORONTO Ontario Tel.: (905) 420-0466 Fax: (905) 420-0319 E-mail: sales@mt.machinex.ca	 <b>MACHINEX</b> TECHNOLOGIES CHICAGO Illinois Tel.: (773) 867-8801 Fax: (773) 867-8802 E-mail: sales@mt.machinex.ca	
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**REMARKS ON MAINTENANCE SCHEDULE**

PROJECT / LOCATION:	REGION OF WATERLOO	EQUIPMENT:	SLIDER BED CONVEYOR
		EQUIP. NO.:	C-5 LIST NO.: CSR3-190L
<b>COMMENTS</b>			
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**APPROVAL**

SUPERVISOR : \_\_\_\_\_ MAINTENANCE EMPLOYEE: \_\_\_\_\_  
 DATE : \_\_\_\_\_ DATE : \_\_\_\_\_

# MAINTENANCE SCHEDULE

PROJECT / LOCATION: REGION OF WATERLOO EQUIPMENT: CAN FLATTENER  
 SUPERVISOR: \_\_\_\_\_ EQUIP. NO.: CF-6A LIST NO.: EC-003L  
 MAINTENANCE EMPLOYEE: \_\_\_\_\_ MONTH \_\_\_\_\_

<b>CONTINUAL MAINTENANCE</b>																									
DAYS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1. CLEAN CAN FLATTENER AND ITS SURROUNDINGS.	✓																								

<b>PERIODICAL MAINTENANCE</b>					
WEEKS	1	2	3	4	5
2. CHECK BEARINGS.					
3. CHECK SHAFTS.					
4. CHECK SPROCKETS AND CHAINS.					
5. LUBRICATE CHAINS					
6. LUBRICATE BEARINGS.					
7. CHECK SPEED REDUCER OIL LEVEL.					
8. TIGHTEN ALL BOLTS.					

<b>LEGEND</b>	<input type="checkbox"/>	MAINTENANCE REQUIRED
	<input checked="" type="checkbox"/>	MAINTENANCE IF REQUIRED
	<input checked="" type="checkbox"/>	MAINTENANCE DONE
	1	REMARKS, SEE COMMENTS ON NEXT PAGE
		Before maintaining, servicing or inspecting the system, the circuit breaker and power to the circuit breaker must be off and locked.

 <b>MACHINE</b> <small>INDUSTRIALS</small> PLESSISVILLE Quebec Tel.: (819) 362-3281 Fax: (819) 362-2280 E-mail: sales@machine.ca	 <b>MACHINE</b> <small>INDUSTRIALS</small> TORONTO Ontario Tel.: (905) 420-0466 Fax: (905) 420-0319 E-mail: sales@mrt.machine.ca	 <b>MACHINE</b> <small>INDUSTRIALS</small> CHICAGO Illinois Tel.: (773) 867-8801 Fax: (773) 867-8802 E-mail: sales@mtl.machine.ca
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**REMARKS ON MAINTENANCE SCHEDULE**

PROJECT / LOCATION: \_\_\_\_\_ REGION OF WATERLOO \_\_\_\_\_ EQUIPMENT: \_\_\_\_\_ CAN FLATTENER \_\_\_\_\_  
 EQUIP. NO.: \_\_\_\_\_ CF-6A \_\_\_\_\_ LIST NO.: \_\_\_\_\_ EC-003L \_\_\_\_\_

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**APPROVAL**

SUPERVISOR : \_\_\_\_\_ MAINTENANCE EMPLOYEE: \_\_\_\_\_  
 DATE : \_\_\_\_\_ DATE : \_\_\_\_\_

# MAINTENANCE SCHEDULE

PROJECT / LOCATION: REGION OF WATERLOO EQUIPMENT: CAN FLATTENER  
 SUPERVISOR: \_\_\_\_\_ EQUIP. NO.: CF-6B LIST NO.: EC-004L  
 MAINTENANCE EMPLOYEE: \_\_\_\_\_ MONTH \_\_\_\_\_

<b>CONTINUAL MAINTENANCE</b>																									
DAYS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1. CLEAN CAN FLATTENER AND ITS SURROUNDINGS.	✓																								

<b>PERIODICAL MAINTENANCE</b>				
WEEKS	1	2	3	5
2. CHECK BEARINGS.				
3. CHECK SHAFTS.				
4. CHECK SPROCKETS AND CHAINS.				
5. LUBRICATE CHAINS				
6. LUBRICATE BEARINGS.				
7. CHECK SPEED REDUCER OIL LEVEL.				
8. TIGHTEN ALL BOLTS.				

<b>LEGEND</b>	
<input type="checkbox"/>	MAINTENANCE REQUIRED
<input checked="" type="checkbox"/>	MAINTENANCE IF REQUIRED
<input checked="" type="checkbox"/>	MAINTENANCE DONE
<input type="checkbox"/>	REMARKS, SEE COMMENTS ON NEXT PAGE.
	Before maintaining, servicing or inspecting the circuit breaker and power to the circuit breaker must be off and locked.

<p style="text-align: center;"><b>MACHINERY</b></p> <p style="text-align: center;"><b>PLESSISVILLE</b> Quebec Tel.: (819) 362-3281 Fax: (819) 362-2280 E-mail: sales@machinex.ca</p>	<p style="text-align: center;"><b>MACHINERY</b></p> <p style="text-align: center;"><b>TORONTO</b> Ontario Tel.: (905) 420-0466 Fax: (905) 420-0319 E-mail: sales@mrt.machinex.ca</p>	<p style="text-align: center;"><b>MACHINERY</b></p> <p style="text-align: center;"><b>CHICAGO</b> Illinois Tel.: (773) 867-8801 Fax: (773) 867-8802 E-mail: sales@mtlmachinex.ca</p>
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**REMARKS ON MAINTENANCE SCHEDULE**

PROJECT / LOCATION: \_\_\_\_\_ REGION OF WATERLOO \_\_\_\_\_ EQUIPMENT: \_\_\_\_\_ CAN FLATTENER \_\_\_\_\_  
 EQUIP. NO.: \_\_\_\_\_ CF-6B \_\_\_\_\_ LIST NO.: \_\_\_\_\_ EC-004L \_\_\_\_\_

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**APPROVAL**

SUPERVISOR : \_\_\_\_\_ MAINTENANCE EMPLOYEE: \_\_\_\_\_  
 DATE : \_\_\_\_\_ DATE : \_\_\_\_\_

# MAINTENANCE SCHEDULE

<b>PROJECT/LOCATION:</b>	REGION OF WATERLOO	<b>EQUIPMENT:</b>	IDLER BELT CONVEYOR																														
<b>SUPERVISOR:</b>		<b>EQUIP. NO.:</b>	C-7																														
<b>MAINTENANCE EMPLOYEE:</b>		<b>MONTH:</b>	CRP2-079L																														
<b>CONTINUOUS MAINTENANCE</b>																																	
DAYS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31		
1. CLEAN CONVEYOR AND ITS SURROUNDINGS.																																	
2. CHECK BELT CONDITION (TEARS AND SCRATCHES)																																	
3. CHECK BELT ALIGNMENT.																																	
4. INSPECT BELT JOINT ON BOTH SIDES.																																	

<b>PERIODICAL MAINTENANCE</b>						
	WEEKS	1	2	3	4	5
5. CHECK BELT TENSION.						
6. CHECK BEARINGS.						
7. CHECK SHAFTS.						
8. CHECK RETURN IDLERS.						
9. CHECK CLEATS (IF APPLICABLE).						
10. TROUGHING IDLER.						
11. INSPECT BACKSIDE OF THE BELT.						
12. INSPECT BOTH BELT TENSIONERS.						
13. CHECK SPEED REDUCER OIL LEVEL.						
14. TIGHTEN ALL BOLTS.						
15. LUBRICATE BEARINGS.						

<b>LEGEND</b>	<input type="checkbox"/> MAINTENANCE REQUIRED
	<input checked="" type="checkbox"/> MAINTENANCE IF REQUIRED
	<input checked="" type="checkbox"/> MAINTENANCE DONE
	1 REMARKS, SEE COMMENTS ON NEXT PAGE
	Before maintaining, servicing or inspecting the system, the circuit breaker and power to the circuit breaker must be off and locked.

 <b>M A C H I N E R Y</b> PLESSISVILLE Quebec Tel.: (819) 362-3281 Fax: (819) 362-2280 E-mail: sales@machinex.ca	 <b>M A C H I N E R Y</b> RECELADE TECHNOLOGIES TORONTO Ontario Tel.: (905) 420-0466 Fax: (905) 420-0319 E-mail: sales@mrt.machinex.ca	 <b>M A C H I N E R Y</b> TECHNOLOGIES CHICAGO Illinois Tel.: (773) 867-8801 Fax: (773) 867-8802 E-mail: sales@mti.machinex.ca
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**REMARKS ON MAINTENANCE SCHEDULE**

PROJECT / LOCATION:		REGION OF WATERLOO		EQUIPMENT:		IDLER BELT CONVEYOR	
				EQUIP. NO.:		C-7	
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						CRP2-079L	
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<b>APPROVAL</b>							
SUPERVISOR :				MAINTENANCE EMPLOYEE:			
DATE :				DATE :			

# MAINTENANCE SCHEDULE

PROJECT / LOCATION: REGION OF WATERLOO EQUIPMENT: GLASS BREAKER  
 SUPERVISOR: \_\_\_\_\_ EQUIP. NO.: GB-8 LIST NO.: DS-163L  
 MAINTENANCE EMPLOYEE: \_\_\_\_\_ MONTH: \_\_\_\_\_

CONTINUOUS MAINTENANCE																									
DAYS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1. CLEAN GLASS BREAKER AND ITS SURROUNDINGS.																									
2. CHECK DRUM CONDITION, INCLUDING TEETH																									
3. CHECK CHAIN ALIGNMENT.																									

PERIODICAL MAINTENANCE					
WEEKS	1	2	3	4	5
4. CHECK BEARINGS.					
5. CHECK SHAFTS.					
6. CHECK RAKE.					
7. CHECK SPROCKETS CONDITION.					
8. CHECK SPRINGS.					
9. CHECK BELT TENSION.					
10. INSPECT INSIDE PERFORATOR.					
11. CHECK ARM TENSION (SPRINGS).					
12. INSPECT TEETH ON DRUM FOR WEAR.					
13. CHECK SPEED REDUCER OIL LEVEL.					
14. TIGHTEN ALL BOLTS.					
15. LUBRICATE SPEED REDUCER AND BEARINGS.					

ACCORDING TO SERVICE MANUAL RECOMMENDATIONS

<b>LEGEND</b>	
<input type="checkbox"/>	MAINTENANCE REQUIRED
<input checked="" type="checkbox"/>	MAINTENANCE IF REQUIRED
<input checked="" type="checkbox"/>	MAINTENANCE DONE
<input type="checkbox"/>	REMARKS, SEE COMMENTS ON NEXT PAGE
	Before maintaining, servicing or inspecting the circuit breaker and power to the circuit breaker must be off and locked.

 <b>MACHINEX</b> <small>TECHNOLOGIES</small>	 <b>MACHINEX</b> <small>TECHNOLOGIES</small>	 <b>MACHINEX</b> <small>TECHNOLOGIES</small>	 <b>MACHINEX</b> <small>TECHNOLOGIES</small>
PLESSISVILLE Quebec Tel: (819) 362-3281 Fax: (819) 362-2280 E-mail: sales@machinex.ca	TORONTO Ontario Tel: (905) 420-0466 Fax: (905) 420-0319 E-mail: sales@mrt.machinex.ca	CHICAGO Illinois Tel: (773) 867-8801 Fax: (773) 867-8802 E-mail: sales@mfi.machinex.ca	

# REMARKS ON MAINTENANCE SCHEDULE

PROJECT / LOCATION: \_\_\_\_\_ REGION OF WATERLOO \_\_\_\_\_ EQUIPMENT: \_\_\_\_\_ GLASS BREAKER \_\_\_\_\_  
 EQUIP. NO.: \_\_\_\_\_ GB-8 \_\_\_\_\_ LIST NO.: \_\_\_\_\_ DS-163L \_\_\_\_\_

No.	COMMENTS
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**APPROVAL**

SUPERVISOR : \_\_\_\_\_ MAINTENANCE EMPLOYEE: \_\_\_\_\_  
 DATE : \_\_\_\_\_ DATE : \_\_\_\_\_

# MAINTENANCE SCHEDULE

PROJECT/LOCATION:	REGION OF WATERLOO	EQUIPMENT:	IDLER BELT CONVEYOR																														
SUPERVISOR:		EQUIP. NO.:	C-9																														
MAINTENANCE EMPLOYEE:		MONTH:																															
<b>CONTINUAL MAINTENANCE</b>																																	
DAYS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31		
1. CLEAN CONVEYOR AND ITS SURROUNDINGS.																																	
2. CHECK BELT CONDITION (TEARS AND SCRATCHES)																																	
3. CHECK BELT ALIGNMENT.																																	
4. INSPECT BELT JOINT ON BOTH SIDES.																																	

<b>PERIODICAL MAINTENANCE</b>	
WEEKS	1      2      3      4      5
5. CHECK BELT TENSION.	█
6. CHECK BEARINGS.	█
7. CHECK SHAFTS.	█
8. CHECK RETURN IDLERS.	█
9. CHECK CLEATS (IF APPLICABLE).	█
10. TROUGHING IDLER.	█
11. INSPECT BACKSIDE OF THE BELT.	█
12. INSPECT BOTH BELT TENSIONERS.	█
13. CHECK SPEED REDUCER OIL LEVEL.	█
14. TIGHTEN ALL BOLTS.	█
15. LUBRICATE BEARINGS.	█

**LEGEND**

- MAINTENANCE REQUIRED
- MAINTENANCE IF REQUIRED
- MAINTENANCE DONE
- 1 REMARKS, SEE COMMENTS ON NEXT PAGE
- Before maintaining, servicing or inspecting the system, the circuit breaker and power to the circuit breaker must be off and locked.

**FOR SERVICE:**

<b>M A C H I N E X</b> <small>PLESSISVILLE</small> Quebec Tel.: (819) 362-3281 Fax: (819) 362-2280 E-mail: sales@machinex.ca	<b>M A C H I N E X</b> <small>RELIABLE TECHNOLOGIES</small> TORONTO Ontario Tel.: (905) 420-0466 Fax: (905) 420-0319 E-mail: sales@mrl.machinex.ca	<b>M A C H I N E X</b> <small>PERILLIERS</small> CHICAGO Illinois Tel.: (773) 867-8801 Fax: (773) 867-8802 E-mail: sales@mtl.machinex.ca
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**REMARKS ON MAINTENANCE SCHEDULE**

PROJECT / LOCATION:	REGION OF WATERLOO	EQUIPMENT:	IDLER BELT CONVEYOR	
		EQUIP. NO.:	C-9	LIST NO.: CRP2-059L
<b>COMMENTS</b>				
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<b>APPROVAL</b>				
<b>SUPERVISOR :</b>		<b>MAINTENANCE EMPLOYEE:</b>		
<b>DATE :</b>		<b>DATE :</b>		

# MAINTENANCE SCHEDULE

PROJECT / LOCATION: REGION OF WATERLOO EQUIPMENT: PLASTIC PERFORATOR  
 SUPERVISOR: \_\_\_\_\_ EQUIP. NO.: PP-10 LIST NO.: EP-033L  
 MAINTENANCE EMPLOYEE: \_\_\_\_\_ MONTH \_\_\_\_\_

CONTINUAL MAINTENANCE																												
DAYS	WEEKS																											
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25			
1. CLEAN PLASTIC PERFORATOR AND ITS SURROUNDINGS.																												
2. CHECK DRUM CONDITION, INCLUDING PERFORATING TEETH																												
3. CHECK CHAIN ALIGNMENT.																												

PERIODICAL MAINTENANCE					
WEEKS	WEEKS				
	1	2	3	4	5
4. CHECK BEARINGS.					
5. CHECK SHAFTS.					
6. CHECK RAKE.					
7. CHECK SPROCKETS CONDITION.					
8. CHECK SPRINGS.					
9. CHECK BELT TENSION.					
10. INSPECT INSIDE PERFORATOR.					
11. CHECK ARM TENSION (SPRINGS).					
12. INSPECT TEETH ON DRUM FOR WEAR.					
13. CHECK SPEED REDUCER OIL LEVEL.					
14. TIGHTEN ALL BOLTS.					
15. LUBRICATE SPEED REDUCER AND BEARINGS.					

ACCORDING TO SERVICE MANUAL RECOMMENDATIONS

<b>LEGEND</b>	
<input type="checkbox"/>	MAINTENANCE REQUIRED
<input checked="" type="checkbox"/>	MAINTENANCE IF REQUIRED
<input checked="" type="checkbox"/>	MAINTENANCE DONE
<input type="checkbox"/>	REMARKS, SEE COMMENTS ON NEXT PAGE
	Before maintaining, servicing or inspecting the system, the circuit breaker and power to the circuit breaker must be off and locked.

 <b>MACHINEX</b> PLESSISVILLE Quebec Tel: (819) 362-3281 Fax: (819) 362-2280 E-mail: sales@machinex.ca	 <b>MACHINEX</b> REGINA HEADQUARTERS TORONTO Ontario Tel: (905) 420-0466 Fax: (905) 420-0319 E-mail: sales@mrt.machinex.ca	 <b>MACHINEX</b> CHICAGO Illinois Tel: (773) 867-8801 Fax: (773) 867-8802 E-mail: sales@mfi.machinex.ca	
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**REMARKS ON MAINTENANCE SCHEDULE**

PROJECT / LOCATION: \_\_\_\_\_ REGION OF WATERLOO \_\_\_\_\_ EQUIPMENT: PLASTIC PERFORATOR  
EQUIP. NO.: PP-10 LIST NO.: EP-033L

No.	COMMENTS
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APPROVAL \_\_\_\_\_

SUPERVISOR : \_\_\_\_\_ MAINTENANCE EMPLOYEE: \_\_\_\_\_  
DATE : \_\_\_\_\_ DATE : \_\_\_\_\_

# MAINTENANCE SCHEDULE

<b>PROJECT/LOCATION:</b>	REGION OF WATERLOO	<b>EQUIPMENT:</b>	SLIDER BED CONVEYOR
<b>SUPERVISOR:</b>		<b>EQUIP. NO.:</b>	C-11
<b>MAINTENANCE EMPLOYEE:</b>		<b>LIST NO.:</b>	CSR3-192L

CONTINUOUS MAINTENANCE																																
DAYS	WEEKS																															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
1. CLEAN CONVEYOR AND ITS SURROUNDINGS.																																
2. CHECK BELT CONDITION (TEARS AND SCRATCHES).																																
3. CHECK BELT ALIGNMENT.																																
4. INSPECT BELT JOINT ON BOTH SIDES																																
5. CLEAN PHOTOELECTRIC SENSORS (IF APPLICABLE).																																

PERIODICAL MAINTENANCE					
WEEKS	WEEKS				
	1	2	3	4	5
6. CHECK BELT TENSION.					
7. CHECK BEARINGS.					
8. CHECK SHAFTS.					
9. CHECK RETURN IDLERS.					
10. CHECK CLEATS ( IF APPLICABLE).					
11. INSPECT BACKSIDE OF THE BELT.					
12. INSPECT BOTH BELT TENSIONERS.					
13. CHECK SPEED REDUCER OIL LEVEL.					
14. TIGHTEN ALL BOLTS.					
15. LUBRICATE BEARINGS.					

<b>LEGEND</b>	<input type="checkbox"/> MAINTENANCE REQUIRED
	<input checked="" type="checkbox"/> MAINTENANCE IF REQUIRED
	<input type="checkbox"/> MAINTENANCE DONE
	1. REMARKS, SEE COMMENTS ON NEXT PAGE
	Before maintaining, servicing or inspecting the system, the circuit breaker and power to the circuit breaker must be off and locked.

 <b>MACHINEX</b> <small>ILLINOIS</small>	 <b>MACHINEX</b> <small>ONTARIO</small>	 <b>MACHINEX</b> <small>ILLINOIS</small>	
PLESSISVILLE Quebec Tel.: (819) 362-3281 Fax: (819) 362-2280 E-mail: sales@machinex.ca	TORONTO Ontario Tel.: (905) 420-0466 Fax: (905) 420-0319 E-mail: sales@mmt.machinex.ca	CHICAGO Illinois Tel.: (773) 867-8801 Fax: (773) 867-8802 E-mail: sales@mml.machinex.ca	

**REMARKS ON MAINTENANCE SCHEDULE**

PROJECT / LOCATION:		REGION OF WATERLOO	EQUIPMENT:	SLIDER BED CONVEYOR	
			EQUIP. NO.:	C-11	LIST NO.: CSR3-192L
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**APPROVAL**

SUPERVISOR : \_\_\_\_\_

DATE : \_\_\_\_\_

MAINTENANCE EMPLOYEE: \_\_\_\_\_

DATE : \_\_\_\_\_



**REMARKS ON MAINTENANCE SCHEDULE**

PROJECT / LOCATION:	REGION OF WATERLOO	EQUIPMENT: EQUIP. NO.:	SLIDER BED CONVEYOR C-13	LIST NO.: CSO-041L
<b>NO COMMENTS</b>				
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SUPERVISOR : \_\_\_\_\_ DATE : \_\_\_\_\_  
 MAINTENANCE EMPLOYEE: \_\_\_\_\_ DATE : \_\_\_\_\_  
 APPROVAL \_\_\_\_\_



**REMARKS ON MAINTENANCE SCHEDULE**

PROJECT / LOCATION:		REGION OF WATERLOO		EQUIPMENT:		SLIDER BED CONVEYOR	
				EQUIP. NO.:		LIST NO.:	
				C-15		CSR3-193L	
No.	COMMENTS						
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**APPROVAL**

SUPERVISOR :

MAINTENANCE EMPLOYEE:

DATE :

DATE :

# MAINTENANCE SCHEDULE

PROJECT / LOCATION:	REGION OF WATERLOO	EQUIPMENT:	SLIDER ROLLER CONVEYOR
SUPERVISOR:		EQUIP. NO.:	C-16
MAINTENANCE EMPLOYEE:		LIST NO.:	CSRT-026L
		MONTH	

### CONTINUAL MAINTENANCE

	DAYS							WEEKS																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
1. CLEAN CONVEYOR AND ITS SURROUNDINGS.																															
2. REMOVE MATERIAL STOCKED INTO THE DRIVING CHAIN																															
3. CHECK BELT CONDITION (TEARS AND SCRATCHES).																															

### PERIODICAL MAINTENANCE

	1	2	3	4	5
9. CHECK CLEATS CONDITION AND ALIGNMENT.					
10. CHECK BEARINGS.					
11. CHECK SHAFTS.					
12. CHECK BOTH CHAINS.					
13. CLEAN PHOTOELECTRIC SENSORS (IF APPLICABLE).					
14. CHECK SPROCKETS, CHAINS AND BELT ATTACHMENT CONDITION (lubricate chains).					
15. INSPECT BACKSIDE OF THE BELT, BELT JOINT AND BOLTS CONDITION.					
16. INSPECT PLASTIC STRIPS AND IMPACT SHOES CONDITION.					
17. INSPECT BOTH BELT TENSIONERS AND BELT TENSION.					
18. CHECK SPEED REDUCER OIL LEVEL.					
19. TIGHTEN ALL BOLTS.					
20. LUBRICATE BEARINGS.					

#### LEGEND

<input type="checkbox"/>	MAINTENANCE REQUIRED
<input checked="" type="checkbox"/>	MAINTENANCE IF REQUIRED
<input type="checkbox"/>	MAINTENANCE DONE
1	REMARKS, SEE COMMENTS ON NEXT PAGE
	Before maintaining, servicing or inspecting the system, the circuit breaker and power to the circuit breaker must be off and locked.

**FOR SERVICE:**

 <b>MACHINEX</b> <small>INDUSTRIAL</small> PLEISSISVILLE Quebec Tel.: (819) 362-3281 Fax: (819) 362-2280 E-mail: sales@machinex.ca	 <b>MACHINEX</b> <small>INDUSTRIAL</small> TORONTO Ontario Tel.: (905) 420-0466 Fax: (905) 420-0319 E-mail: sales@mrt.machinex.ca	 <b>MACHINEX</b> <small>INDUSTRIAL</small> CHICAGO Illinois Tel.: (773) 867-8801 Fax: (773) 867-8802 E-mail: sales@mti.machinex.ca
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## REMARKS ON MAINTENANCE SCHEDULE

PROJECT / LOCATION: \_\_\_\_\_ REGION OF WATERLOO \_\_\_\_\_ EQUIPMENT: SLIDER ROLLER CONVEYOR LIST NO.: CSRT-026L  
 EQUIP. NO.: C-16

No.	COMMENTS
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**APPROVAL**

SUPERVISOR : \_\_\_\_\_ MAINTENANCE EMPLOYEE: \_\_\_\_\_  
 DATE : \_\_\_\_\_ DATE : \_\_\_\_\_

# MAINTENANCE SCHEDULE

<b>PROJECT/LOCATION:</b>	REGION OF WATERLOO	<b>EQUIPMENT:</b>	SLIDER ROLLER CONVEYOR
<b>SUPERVISOR:</b>	C-18	<b>EQUIP. NO.:</b>	CSR3-194L
<b>MAINTENANCE EMPLOYEE:</b>		<b>MONTH:</b>	

## CONTINUOUS MAINTENANCE

DAYS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
1. CLEAN CONVEYOR AND ITS SURROUNDINGS.																																
2. CHECK BELT CONDITION (TEARS AND SCRATCHES).																																
3. CHECK BELT ALIGNMENT.																																
4. INSPECT BELT JOINT ON BOTH SIDES																																
5. CLEAN PHOTOELECTRIC SENSORS (IF APPLICABLE).																																

## PERIODICAL MAINTENANCE

	WEEKS	1	2	3	4	5
6. CHECK BELT TENSION.						
7. CHECK BEARINGS.						
8. CHECK SHAFTS.						
9. CHECK RETURN IDLERS.						
10. CHECK CLEATS ( IF APPLICABLE).						
11. INSPECT BACKSIDE OF THE BELT.						
12. INSPECT BOTH BELT TENSIONERS.						
13. CHECK SPEED REDUCER OIL LEVEL.						
14. TIGHTEN ALL BOLTS.						
15. LUBRICATE BEARINGS.						

**LEGEND**

<input type="checkbox"/>	MAINTENANCE REQUIRED
<input checked="" type="checkbox"/>	MAINTENANCE IF REQUIRED
<input checked="" type="checkbox"/>	MAINTENANCE DONE
<input type="checkbox"/>	REMARKS, SEE COMMENTS ON NEXT PAGE
	Before maintaining, servicing or inspecting the circuit breaker and power to the circuit breaker must be off and locked.

**FOR SERVICE:**

 <b>MACHINEX</b> <small>INDUSTRIAL TECHNOLOGIES</small>	 <b>MACHINEX</b> <small>REPAIR TECHNOLOGIES</small>	 <b>MACHINEX</b> <small>TELETECHNOLOGIES</small>
PLESSISVILLE Quebec Tel.: (819) 362-3281 Fax: (819) 362-2280 E-mail: sales@machinex.ca	TORONTO Ontario Tel.: (905) 420-0466 Fax: (905) 420-0319 E-mail: sales@mnt.machinex.ca	CHICAGO Illinois Tel.: (773) 867-8801 Fax: (773) 867-8802 E-mail: sales@mtl.machinex.ca

**REMARKS ON MAINTENANCE SCHEDULE**

PROJECT / LOCATION:		REGION OF WATERLOO	EQUIPMENT:	SLIDER ROLLER CONVEYOR	
			EQUIP. NO.:	C-18	LIST NO.: CSR3-194L
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<b>APPROVAL</b>					

SUPERVISOR :

DATE :

MAINTENANCE EMPLOYEE:

DATE :

## MAINTENANCE SCHEDULE

PROJECT / LOCATION:	REGION OF WATERLOO	EQUIPMENT:	SLIDER BED CONVEYOR
SUPERVISOR:		EQUIP. NO.:	C-19
MAINTENANCE EMPLOYEE:		LIST NO.:	CSRT-027L
		MONTH	

### CONTINUOUS MAINTENANCE

	DAYS							WEEKS																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
4. CLEAN CONVEYOR AND ITS SURROUNDINGS.																														
5. REMOVE MATERIAL STOCKED INTO THE DRIVING CHAIN																														
6. CHECK BELT CONDITION (TEARS AND SCRATCHES).																														

### PERIODICAL MAINTENANCE

	1	2	3	4	5
21. CHECK CLEATS CONDITION AND ALIGNMENT.					
22. CHECK BEARINGS.					
23. CHECK SHAFTS.					
24. CHECK BOTH CHAINS.					
25. CLEAN PHOTOELECTRIC SENSORS (IF APPLICABLE).					
26. CHECK SPROCKETS, CHAINS AND BELT ATTACHMENT CONDITION (lubricate chains).					
27. INSPECT BACKSIDE OF THE BELT, BELT JOINT AND BOLTS CONDITION.					
28. INSPECT PLASTIC STRIPS AND IMPACT SHOES CONDITION.					
29. INSPECT BOTH BELT TENSIONERS AND BELT TENSION.					
30. CHECK SPEED REDUCER OIL LEVEL.					
31. TIGHTEN ALL BOLTS.					
32. LUBRICATE BEARINGS.					

<b>LEGEND</b>	
<input type="checkbox"/>	MAINTENANCE REQUIRED
<input checked="" type="checkbox"/>	MAINTENANCE IF REQUIRED
<input type="checkbox"/>	MAINTENANCE DONE
<input type="checkbox"/>	REMARKS, SEE COMMENTS ON NEXT PAGE
	Before maintaining, servicing or inspecting the system, the circuit breaker and power to the circuit breaker must be off and locked.

 <b>M A C H I N E R Y</b> <small>INDUSTRIAL EQUIPMENT</small>	 <b>M A C H I N E R Y</b> <small>INDUSTRIAL EQUIPMENT</small>	 <b>M A C H I N E R Y</b> <small>INDUSTRIAL EQUIPMENT</small>
PLESSISVILLE Quebec Tel: (819) 362-3281 Fax: (819) 362-2280 E-mail: sales@machinex.ca	TORONTO Ontario Tel: (905) 420-0466 Fax: (905) 420-0319 E-mail: sales@mnt.machinex.ca	CHICAGO Illinois Tel: (773) 867-8801 Fax: (773) 867-8802 E-mail: sales@mtimachinex.ca

**REMARKS ON MAINTENANCE SCHEDULE**

PROJECT / LOCATION: REGION OF WATERLOO      EQUIPMENT: SLIDER BED CONVEYOR      LIST NO.: CSRT-027L  
 EQUIP. NO.: C-19

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SUPERVISOR : \_\_\_\_\_      MAINTENANCE EMPLOYEE: \_\_\_\_\_  
 DATE : \_\_\_\_\_      DATE : \_\_\_\_\_

**APPROVAL**

# MAINTENANCE SCHEDULE

<b>PROJECT/LOCATION:</b>	REGION OF WATERLOO	<b>EQUIPMENT:</b>	SLIDER BED CONVEYOR
<b>SUPERVISOR:</b>	C-20	<b>LIST NO.:</b>	CSR3-195L
<b>MAINTENANCE EMPLOYEE:</b>	MONTH		

## CONTINUAL MAINTENANCE

DAYS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
1. CLEAN CONVEYOR AND ITS SURROUNDINGS.																															
2. CHECK BELT CONDITION (TEARS AND SCRATCHES).																															
3. CHECK BELT ALIGNMENT.																															
4. INSPECT BELT JOINT ON BOTH SIDES																															
5. CLEAN PHOTOELECTRIC SENSORS (IF APPLICABLE).																															

## PERIODICAL MAINTENANCE

	WEEKS	1	2	3	4	5
6. CHECK BELT TENSION.						
7. CHECK BEARINGS.						
8. CHECK SHAFTS.						
9. CHECK RETURN IDLERS.						
10. CHECK CLEATS ( IF APPLICABLE).						
11. INSPECT BACKSIDE OF THE BELT.						
12. INSPECT BOTH BELT TENSIONERS.						
13. CHECK SPEED REDUCER OIL LEVEL.						
14. TIGHTEN ALL BOLTS.						
15. LUBRICATE BEARINGS.						

### LEGEND

<input type="checkbox"/>	MAINTENANCE REQUIRED
<input checked="" type="checkbox"/>	MAINTENANCE IF REQUIRED
<input checked="" type="checkbox"/>	MAINTENANCE DONE
<input type="checkbox"/>	REMARKS, SEE COMMENTS ON NEXT PAGE
	Before maintaining, servicing or inspecting the system, the circuit breaker and power to the circuit breaker must be off and locked.

### FOR SERVICE:

 <b>MACHINEX</b> PLEISSISVILLE Quebec Tel: (819) 362-3281 Fax: (819) 362-2280 E-mail: sales@machinex.ca	 <b>MACHINEX</b> RELIABLE TECHNOLOGIES TORONTO Ontario Tel: (905) 420-0466 Fax: (905) 420-0319 E-mail: sales@mrt.machinex.ca	 <b>MACHINEX</b> TECHNOLOGIES CHICAGO Illinois Tel: (773) 867-8801 Fax: (773) 867-8802 E-mail: sales@mti.machinex.ca
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**REMARKS ON MAINTENANCE SCHEDULE**

PROJECT / LOCATION:		REGION OF WATERLOO	EQUIPMENT:	SLIDER BED CONVEYOR
			EQUIP. NO.:	LIST NO.: CSR3-195L
			C-20	
<b>No.</b>	<b>COMMENTS</b>			
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**APPROVAL**

SUPERVISOR :

DATE :

MAINTENANCE EMPLOYEE:

DATE :



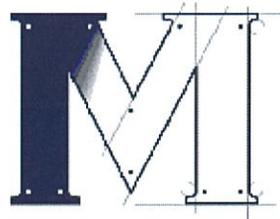
**REMARKS ON MAINTENANCE SCHEDULE**

PROJECT / LOCATION: \_\_\_\_\_ REGION OF WATERLOO \_\_\_\_\_ EQUIPMENT: SILDER BED CONVEYOR LIST NO.: CSRT-025L  
EQUIP. NO.: C-21

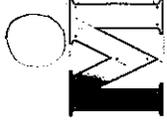
No.	COMMENTS
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SUPERVISOR : \_\_\_\_\_ APPROVAL \_\_\_\_\_  
DATE : \_\_\_\_\_ MAINTENANCE EMPLOYEE: \_\_\_\_\_ DATE : \_\_\_\_\_

**Section 6**  
SUGGESTED SPARE  
PARTS



***SECTION 6***  
***SUGGESTED SPARE PARTS***

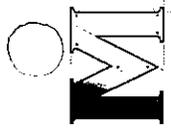


6.1 FIRST EMERGENCY PARTS LIST

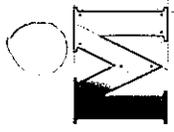
BRRHP-F4-115-S-S-1	FLANGE BEARING	4.00
BRRHP-F4-207-S-S-1	FLANGE BEARING	2.00
BRRHP-F4-215-S-S-1	FLANGE BEARING	2.00
BRRHP-PB-100-S-S-1	PILLOW BLOCK	2.00
BRRHP-PB-215-S-S-1	PILLOW BLOCK	2.00
BRRHP-PB-307-S-S-1	PILLOW BLOCK	2.00
BRRHP-TU-215-S-S-1	TAKE-UP BEARING	2.00
CCA-408D	WEAR STRIP	2.00
CCA-407D	BRACKET FOR WEAR STRIP	20.00
CHRE-S-060-R-2	CHAIN	10'-0"
CHCL-S-00060-2	CONNECTING LINK	4.00
PRNG-STATOR-5-1.0	STATOR 1HP	1.00
PRNG-STATOR-5-2.0	STATOR 2HP	1.00
PRNG-STATOR-5-3.0	STATOR 3HP	1.00
PRNG-STATOR-5-7.5	STATOR 7,5HP	1.00
CCA-4610D-3	INSIDE BLOCK LINK	2.00
CCA-4610D	SIDE WING	2.00
CHAC-SIL-1	SIDE LINK	8.00
CHAC-PIN-6	PINS	10.00
CHAC-LPN-1	LOCK PIN	20.00
BECO-MINET-45-60-14M	JOINT	2.00
SAV-BECOJDC-60-187M1	JOINT	2.00
IDLU-PSR-C-4X1512-S	IDLER	1.00
IDLU-PSR-C-4X1700-S	IDLER	1.00
IDLU-PSR-C-4X2112-S	IDLER	1.00
IDLU-PSR-C-4X2712-S	IDLER	1.00
IDLU-PSR-C-4X2900-S	IDLER	2.00
IDLU-PSR-C-4X3500-S	IDLER	1.00

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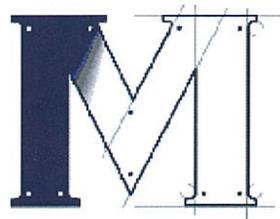
IDLU-PSR-D-5X5712-S	IDLER	1.00
IDLU-SRI-C-4X0612-S	IDLER	1.00
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IDLU-SRI-C-5X0612-S	IDLER	1.00
IDLU-SRI-C-5X4512-S	IDLER	1.00
SPRE-060DS240STB0Q-1	SPROCKET	2.00
MEGSP-CO-28-200-DDR	CYLINDRE	1.00



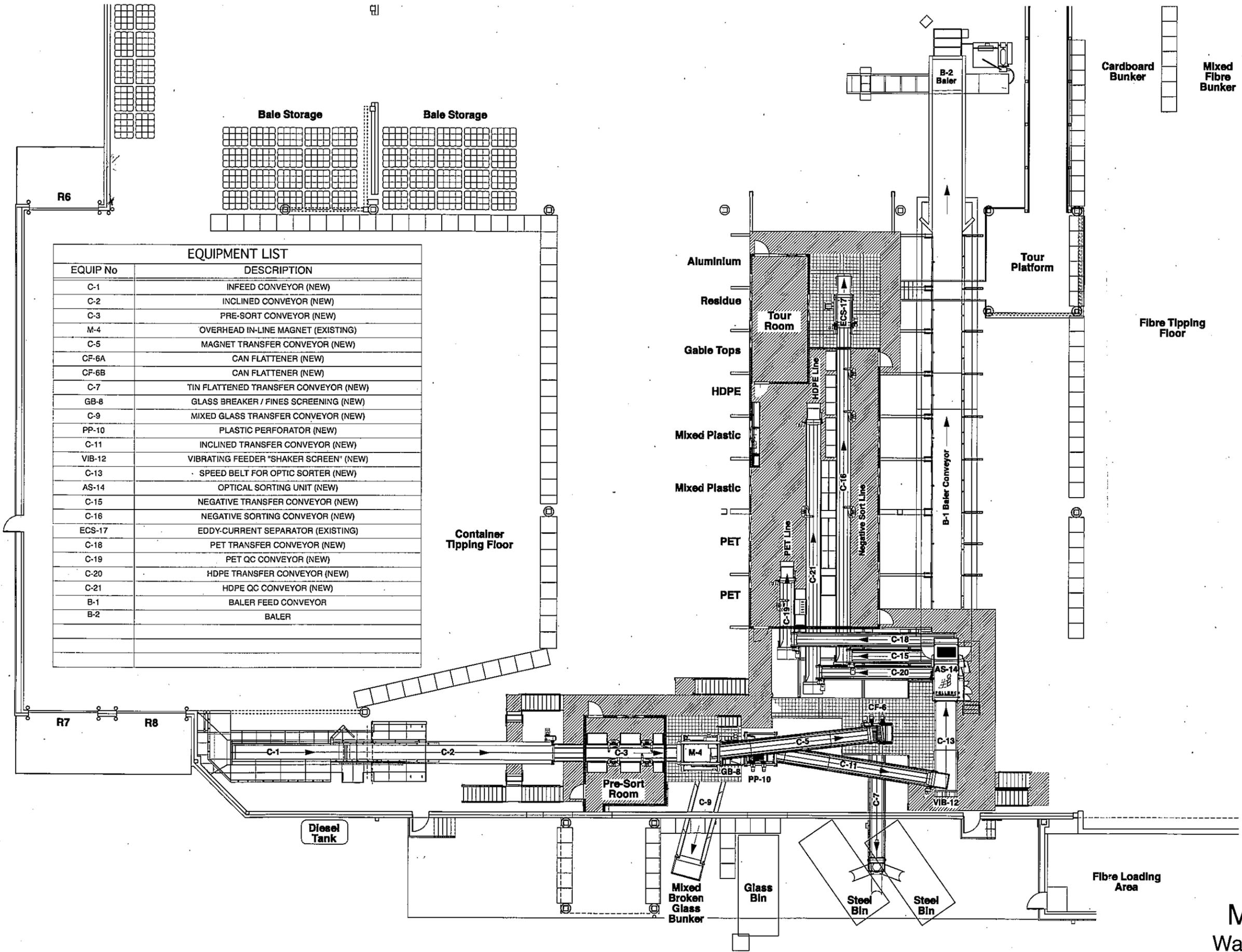
## 6.2 SECOND EMERGENCY PARTS LIST

CCA-3027D-5	SPROCKET	1.00
CCA-3027D-7	SPROCKET	1.00
BECO-MINET-45-60-14M	JOINT	5.00
BECO-R202BB-220-2401	BELT 24"	20'-0"
BECO-R302BB-330-30C1	BELT 30"	20'-0"
BECO-R30301-330-60C2	BELT 60"	20'-0"
BECO-R303BB-330-3601	BELT 36"	20'-0"
BECO-M43TBB-180-47P4	BELT 47"	35'-4"
CSO2-012D-03	HEAD PULLEY	1.00
CSO2-009D-05	TAIL PULLEY	1.00
CSO-003D-09	HEAD SCRAPER	1.00
DS-458D-5	DRIVE SHAFT	1.00
DS-460D-10	DRIVEN SHAFT	1.00
DS-460D-11	DRIVEN SHAFT	1.00
DS-460D-12	DRIVEN SHAFT	1.00
DS-460D-9	DRIVEN SHAFT	1.00
BRTOR-SB-010-000-1	RADIAL BEARING	2.00

LAYOUT



## *LAYOUT*

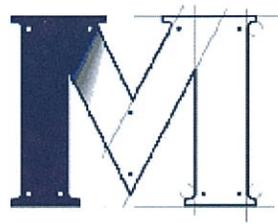


**EQUIPMENT LIST**

EQUIP No	DESCRIPTION
C-1	INFEED CONVEYOR (NEW)
C-2	INCLINED CONVEYOR (NEW)
C-3	PRE-SORT CONVEYOR (NEW)
M-4	OVERHEAD IN-LINE MAGNET (EXISTING)
C-5	MAGNET TRANSFER CONVEYOR (NEW)
CF-6A	CAN FLATTENER (NEW)
CF-6B	CAN FLATTENER (NEW)
C-7	TIN FLATTENED TRANSFER CONVEYOR (NEW)
GB-8	GLASS BREAKER / FINES SCREENING (NEW)
C-9	MIXED GLASS TRANSFER CONVEYOR (NEW)
PP-10	PLASTIC PERFORATOR (NEW)
C-11	INCLINED TRANSFER CONVEYOR (NEW)
VIB-12	VIBRATING FEEDER "SHAKER SCREEN" (NEW)
C-13	SPEED BELT FOR OPTIC SORTER (NEW)
AS-14	OPTICAL SORTING UNIT (NEW)
C-15	NEGATIVE TRANSFER CONVEYOR (NEW)
C-16	NEGATIVE SORTING CONVEYOR (NEW)
ECS-17	EDDY-CURRENT SEPARATOR (EXISTING)
C-18	PET TRANSFER CONVEYOR (NEW)
C-19	PET QC CONVEYOR (NEW)
C-20	HDPE TRANSFER CONVEYOR (NEW)
C-21	HDPE QC CONVEYOR (NEW)
B-1	BALER FEED CONVEYOR
B-2	BALER

**MRC Sort Line  
Waterloo Landfill Site**





# ***ELECTRICAL SCHEMATICS***



# MACHINEX INDUSTRIES inc.

2121, Olivier Street  
Plessisville (Québec)  
G6L 3G9  
Canada

Tel: (819) 362-3281 Fax: (819) 362-2280

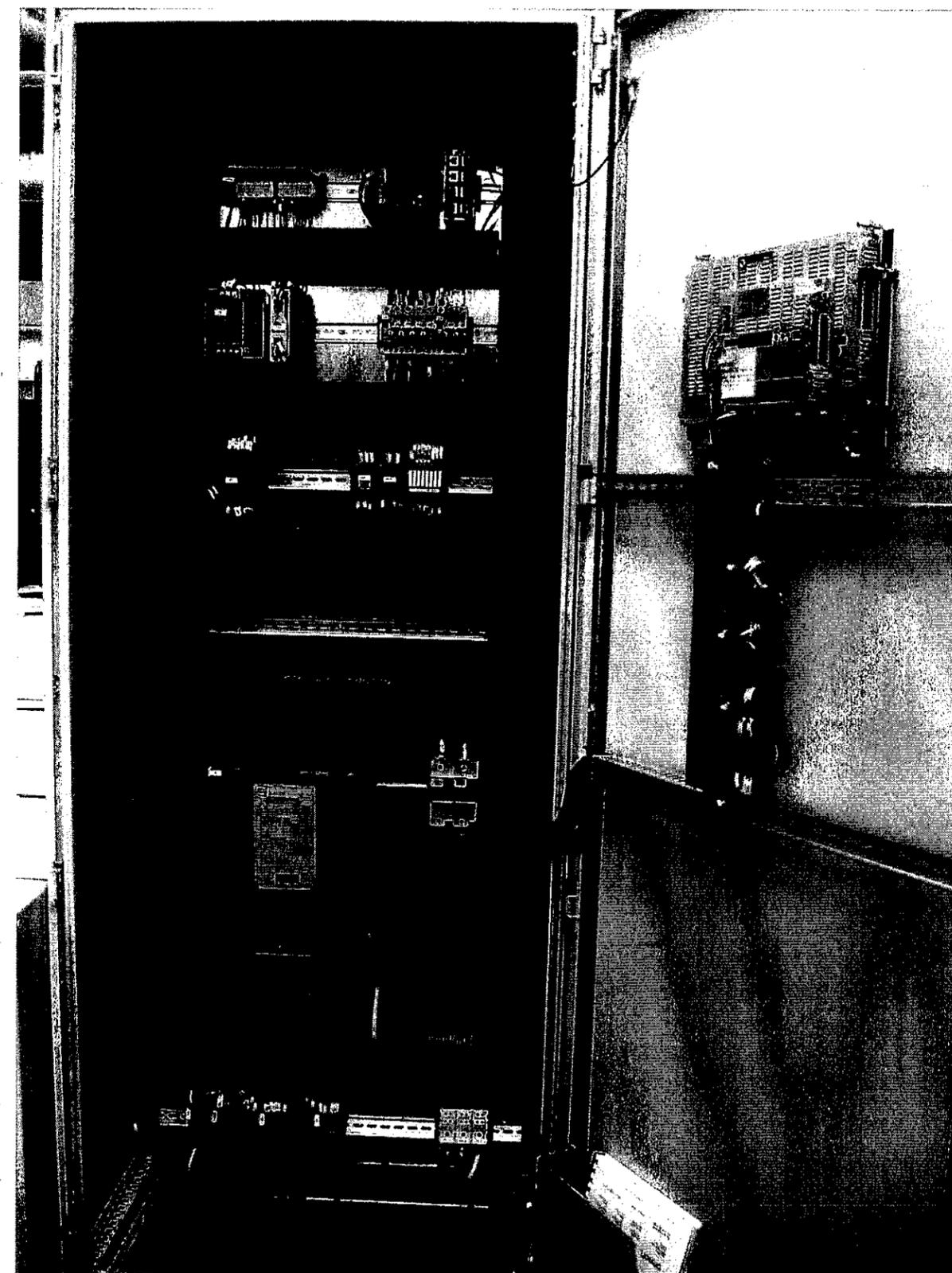
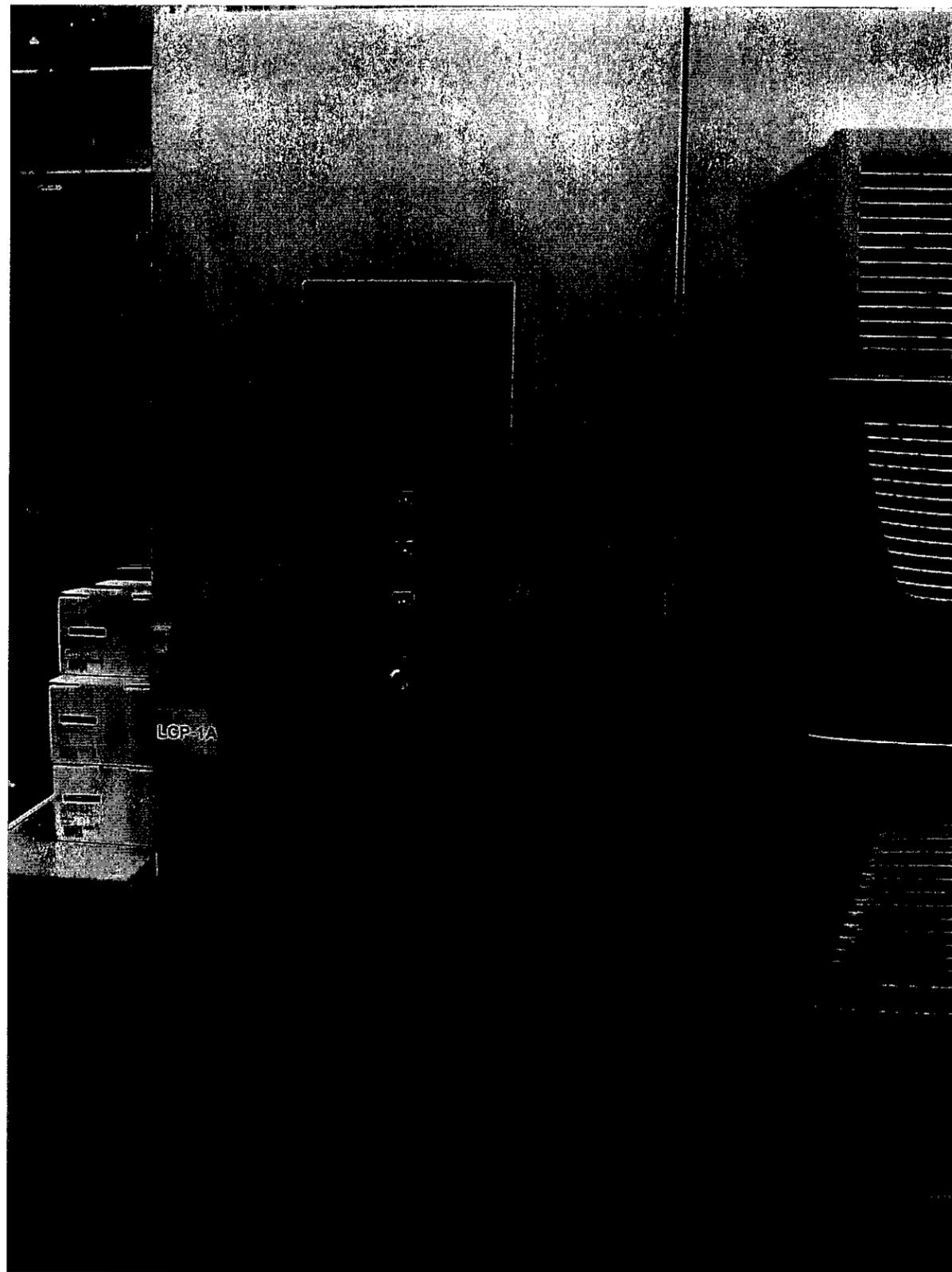


Customer	Region of Waterloo
Plant designation	CONTAINERS LINE
Drawing number	PC-449L
Commission	
Manufacturer (company)	Machinex Industries Inc.
Power voltage	575 V AC
Control voltage	120 V AC / 24 V DC
Mechanical project manager	SÉBASTIEN ROY
Electrical project manager	YANICK SAVARD
Responsible for project	DAVID MARCOUILLER
Edit date	2009-05-05 by (short name) MARCL
Number of pages	58

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				2	AS BUILT	2009-02-24	MARCL											
				3	AS BUILT	2009-03-24	MARCL											
				4	AS BUILT	2009-04-29	MARCL											
				5	FINAL	2009-05-05	MARCL											

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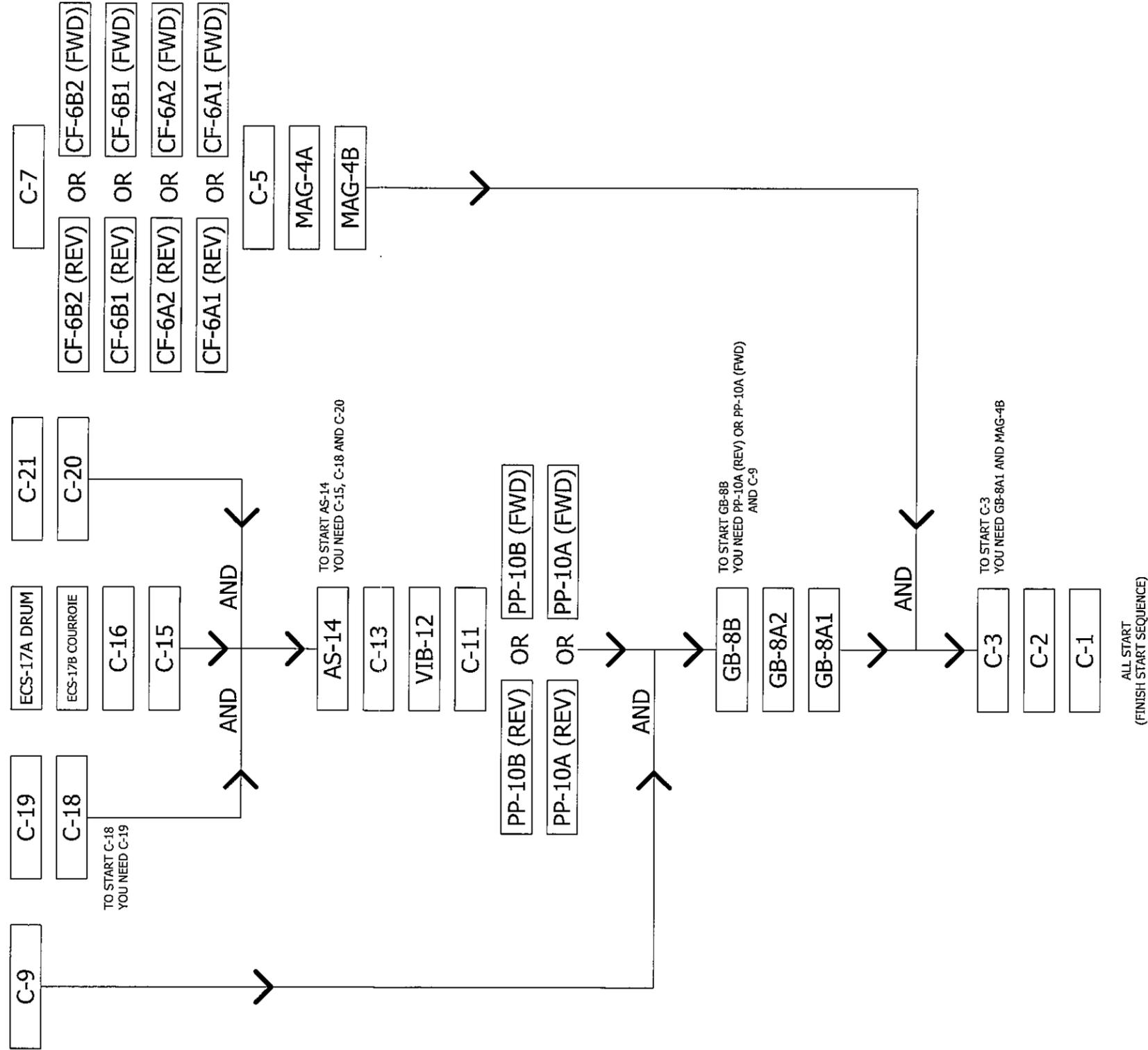
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				1	FOR CONSTRUCTION	2009-01-09	MARCL			PJ MNGR : DAVID MARCOUILLER    DATE : 2008-11-25 DRAWN : DANY TURCOTTE        DATE : 2009-05-05 CHECKED : DANY TURCOTTE        DATE : 2008-11-28 APPROVED :            DATE :	<div style="text-align: center;">   <b>INDUSTRIES</b>  <b>MACHINEX</b>            MACHINEX INDUSTRIES INC.            2121, Olivier Street            Plessisville, Québec, Canada, G6L 3G9            Phone: (819) 362-3281            Fax: (819) 362-2280      E-mail : sales@machinex.ca         </div>	REGION OF WATERLOO 925, ERB STREET WEST WATERLOO, ONTARIO		CONTAINERS LINE	
			2	AS BUILT	2009-02-24	MARCL									
			3	AS BUILT	2009-03-24	MARCL									
			4	AS BUILT	2009-04-29	MARCL									
			5	FINAL	2009-05-05	MARCL									

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# START SEQUENCE

FIRST: C-9, C-19, ESC-17A DRUM, C-21 AND C-7  
START AT THE SAME TIME



FOR C-1 START IN AUTOMATIC MODE  
YOU NEED ALL OTHER MOTOR ABOVE

REV.	DESCRIPTION	DATE	BY	REV.	DESCRIPTION	DATE	BY
1	FOR CONSTRUCTION	2009-01-09	MARCL				
2	AS BUILT	2009-02-24	MARCL				
3	AS BUILT	2009-03-24	MARCL				
4	AS BUILT	2009-04-29	MARCL				
5	FINAL	2009-03-05	MARCL				

STAMP	STAMP

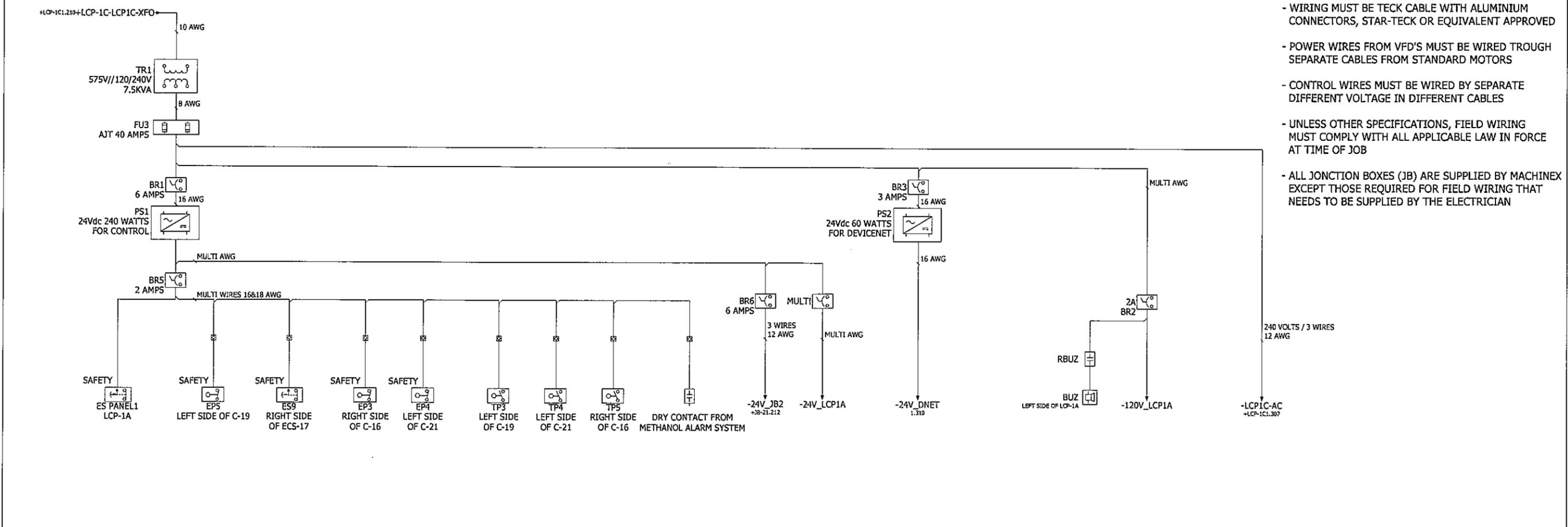
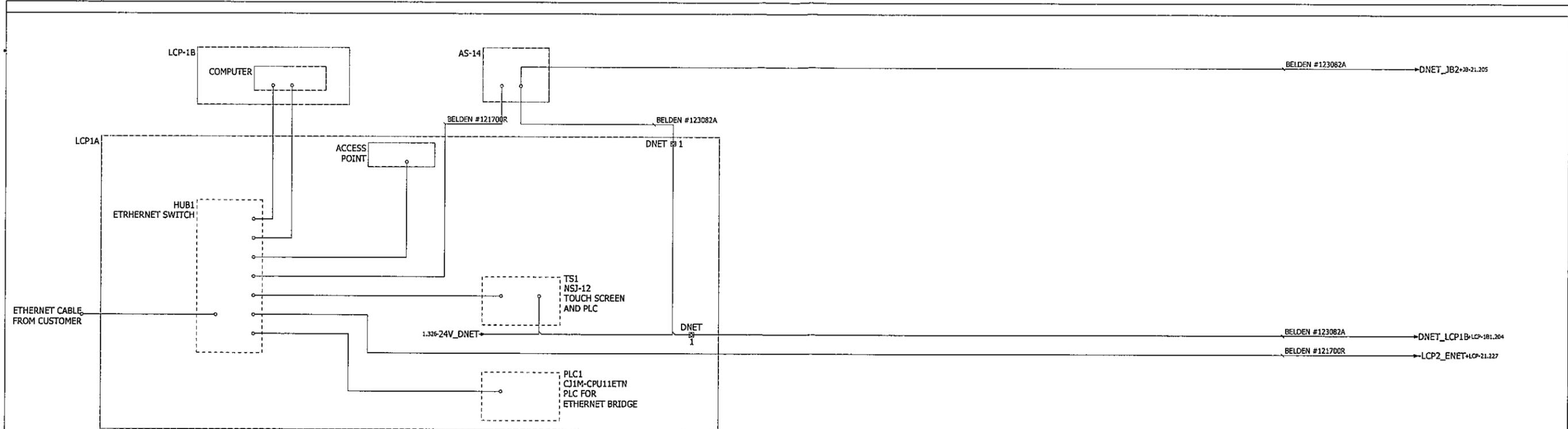
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PJ MNGR : DAVID MARCOUILLER	DATE : 2008-11-25
DRAWN : DANY TURCOTTE	DATE : 2009-05-05
CHECKED : DANY TURCOTTE	DATE : 2008-11-28
APPROVED :	DATE :

DESIGNED BY :

MACHINEX INDUSTRIES INC.  
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Plessisville, Québec, Canada, G6L 3G9  
Phone: (819) 362-3281  
Fax: (819) 362-2280 E-mail: sales@machinex.ca

CLIENT :		
REGION OF WATERLOO		
925, ERB STREET WEST WATERLOO, ONTARIO		
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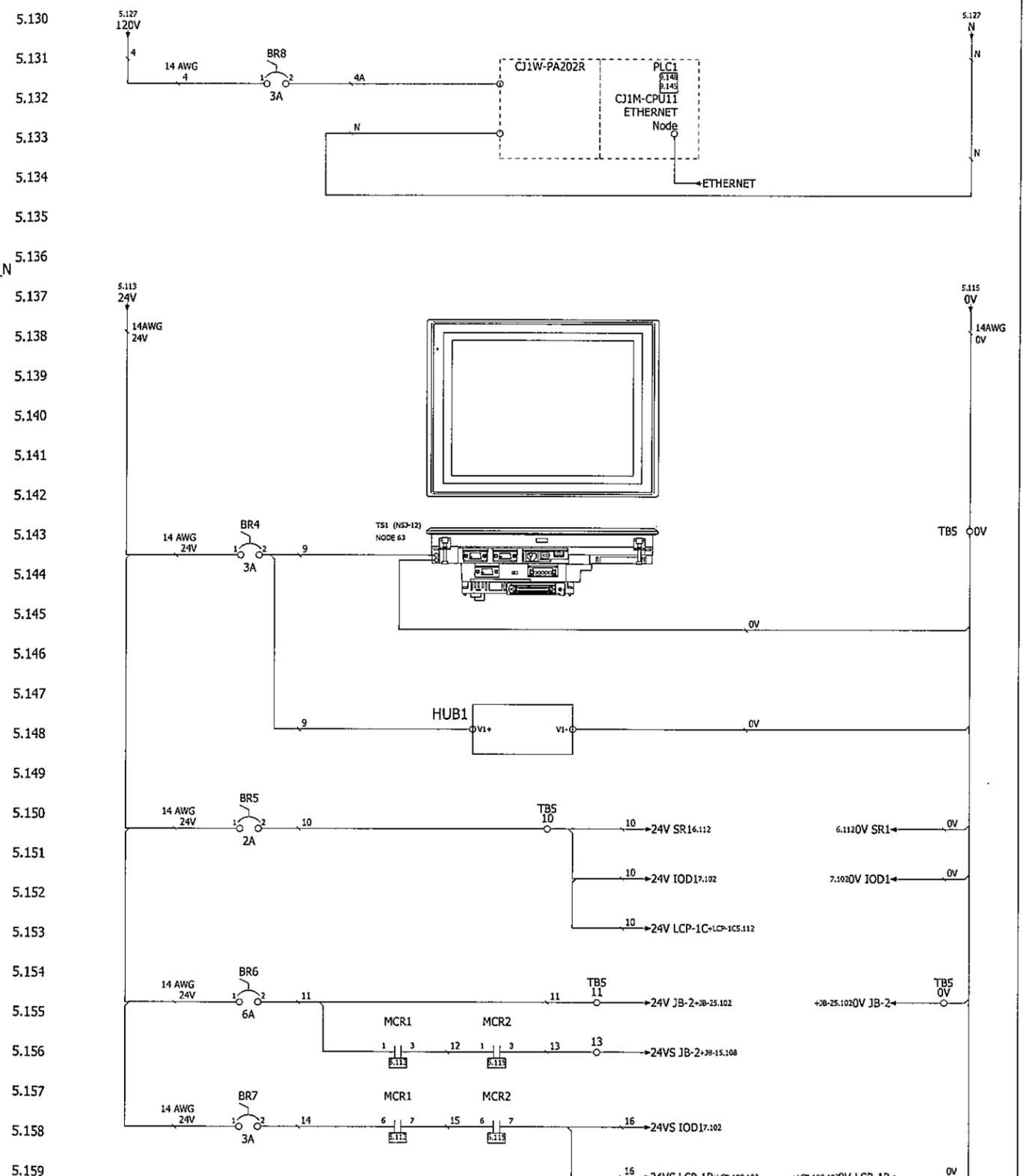
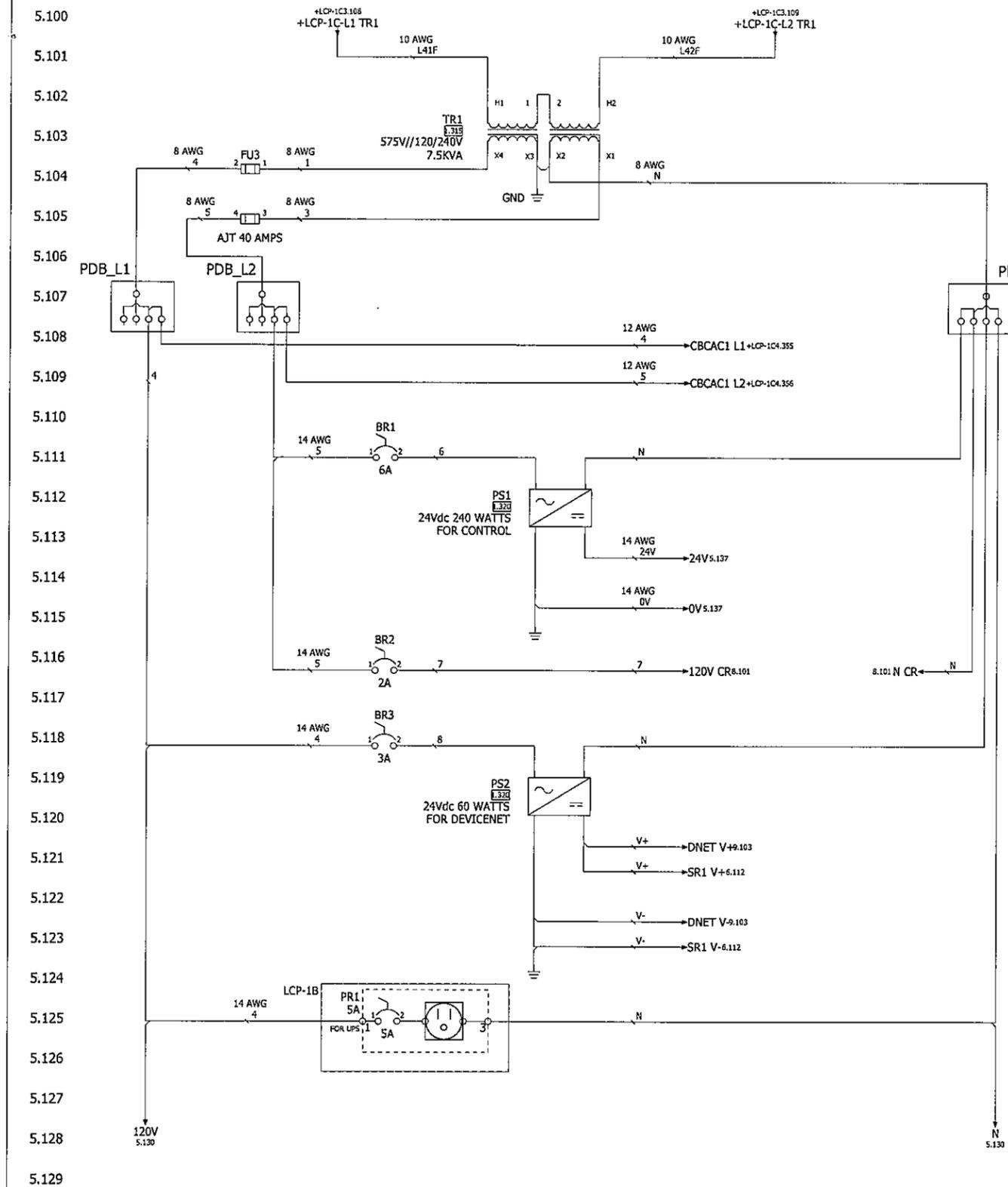
MATERIAL RECYCLING CENTER	
CONTAINERS LINE	
MOUNTING LOCATION : LCP-1A	PAGE DESCRIPTION : Sequence motor
PROJECT NO :	DRAWING NO :



- WIRING MUST BE TECK CABLE WITH ALUMINIUM CONNECTORS, STAR-TECK OR EQUIVALENT APPROVED
- POWER WIRES FROM VFD'S MUST BE WIRED THROUGH SEPARATE CABLES FROM STANDARD MOTORS
- CONTROL WIRES MUST BE WIRED BY SEPARATE DIFFERENT VOLTAGE IN DIFFERENT CABLES
- UNLESS OTHER SPECIFICATIONS, FIELD WIRING MUST COMPLY WITH ALL APPLICABLE LAW IN FORCE AT TIME OF JOB
- ALL JUNCTION BOXES (JB) ARE SUPPLIED BY MACHINEX EXCEPT THOSE REQUIRED FOR FIELD WIRING THAT NEEDS TO BE SUPPLIED BY THE ELECTRICIAN

REV.	DESCRIPTION	DATE	BY	REV.	DESCRIPTION	DATE	BY	STAMP	STAMP	SCALE	DESIGNED BY :	CLIENT :	MOUNTING LOCATION :	PAGE DESCRIPTION :			
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				2	AS BUILT	2009-02-24	MARCL			DRAWN : DANY TURCOTTE	DATE : 2009-05-05			Previous Page 1.2	CONTROL SINGLE LINE DIAGRAM		
				3	AS BUILT	2009-03-24	MARCL			CHECKED : DANY TURCOTTE	DATE : 2008-11-28					Page 1.2	NEXT Page
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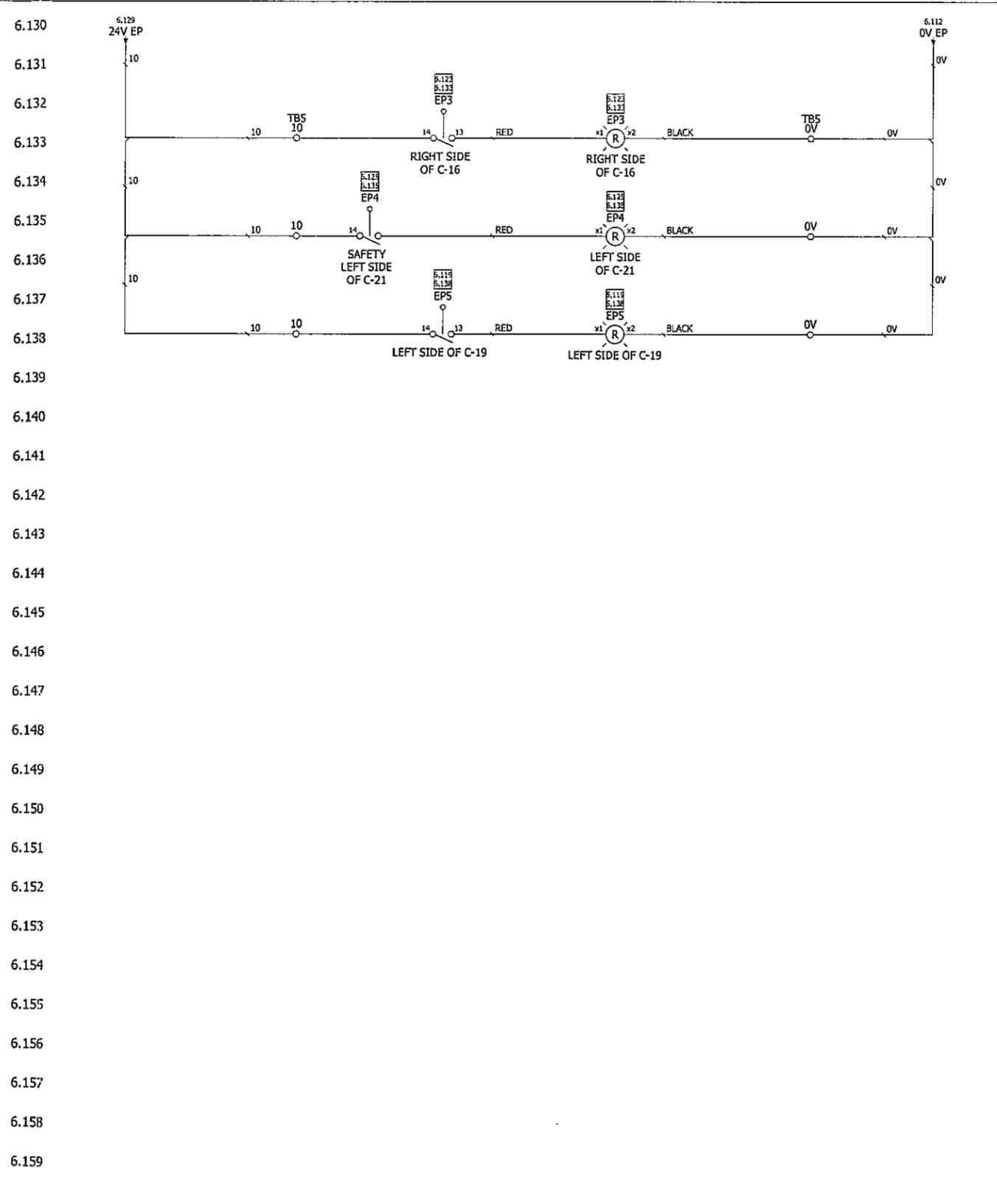
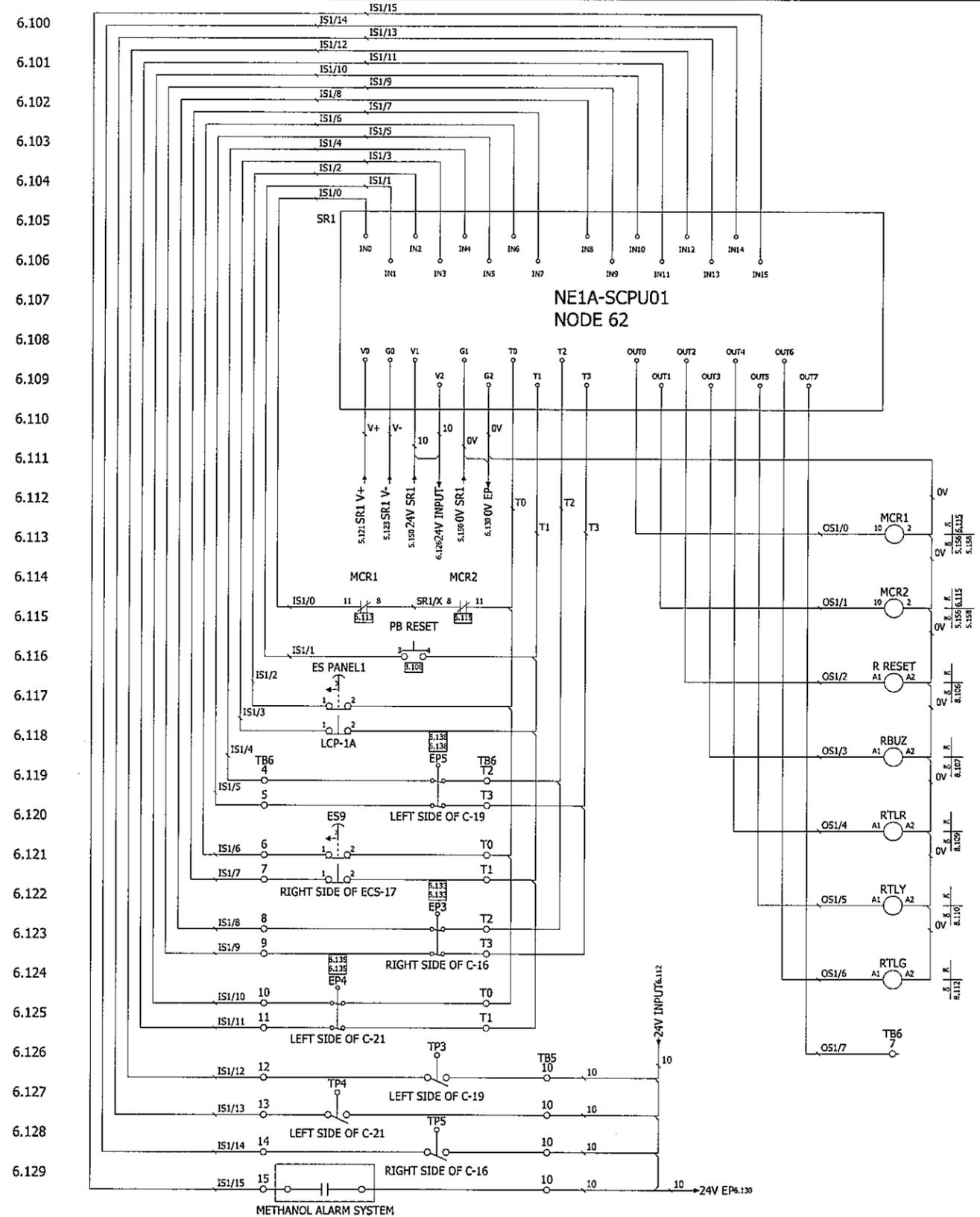




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				3	AS BUILT	2009-03-24	MARCL					WATERLOO, ONTARIO			
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				5	FINAL	2009-05-05	MARCL					CONTAINERS LINE			



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1.3	5.1	6.1	LCP-1A	Control Distribution	
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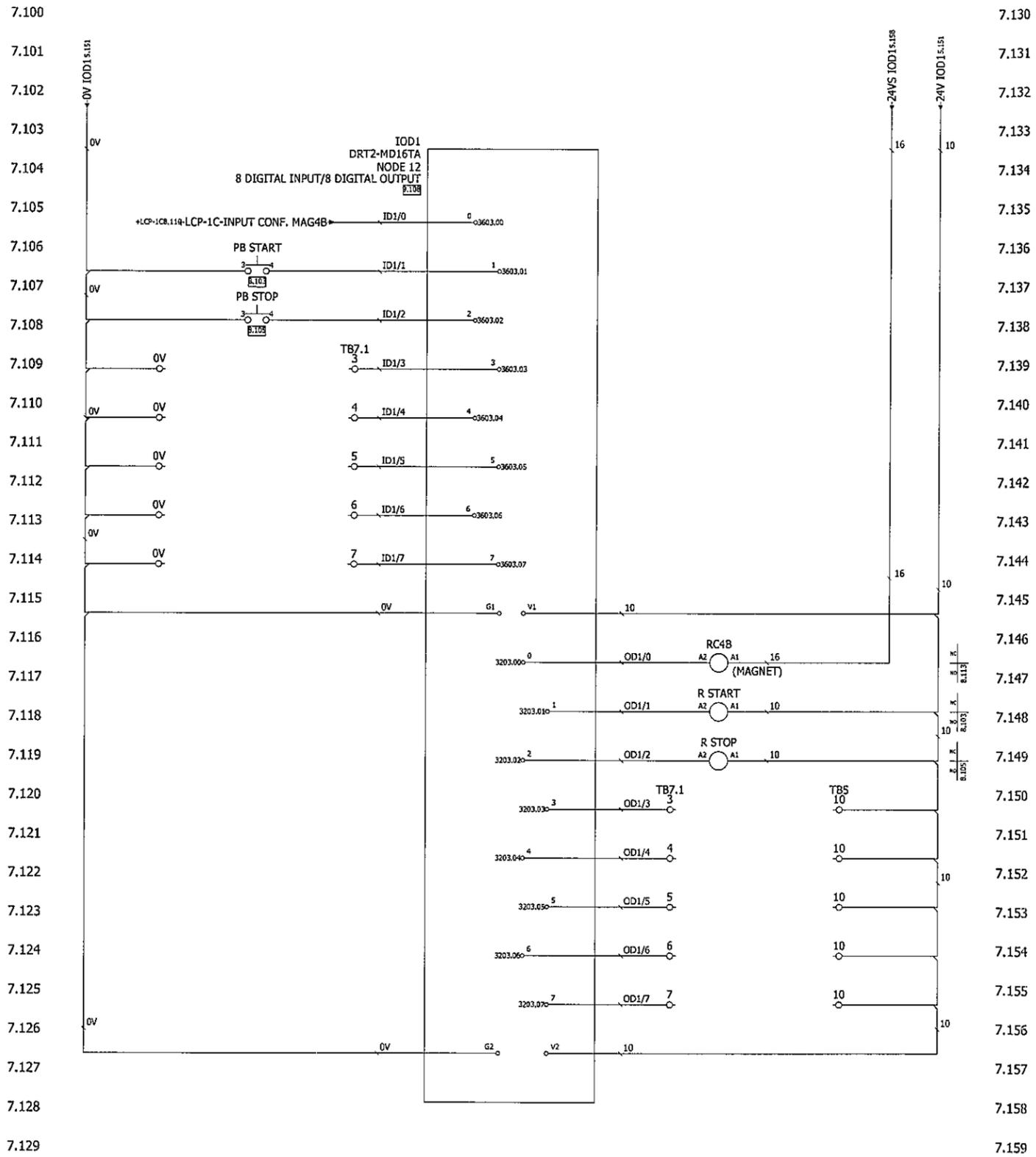


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				2	AS BUILT	2009-02-24	MARCL			DRAWN : DANY TURCOTTE	DATE : 2009-05-05			Previous Page	Page	NEXT Page	LCP-1A	Security	
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				4	AS BUILT	2009-04-29	MARCL			APPROVED :	DATE :								
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Previous Page: 5.1  
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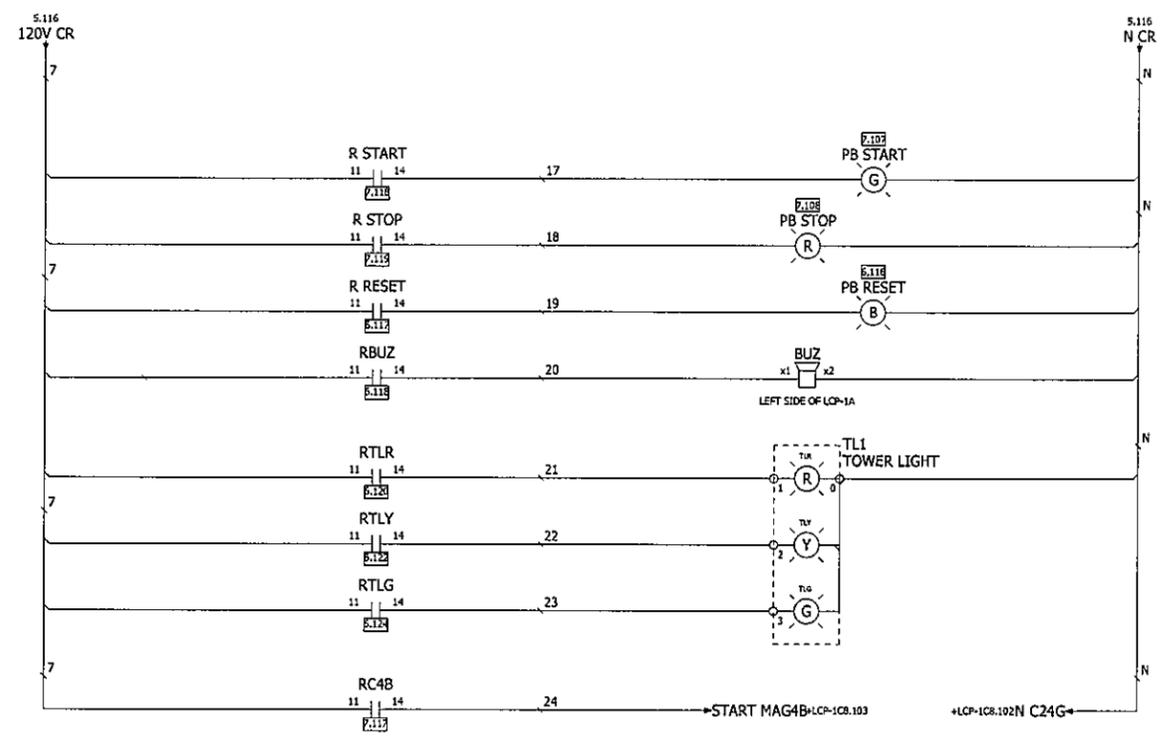


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				3	AS BUILT	2009-03-24	MARCL			CHECKED : DANY TURCOTTE	DATE : 2008-11-28			Page	
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PROJECT NO :	247408	REV.	
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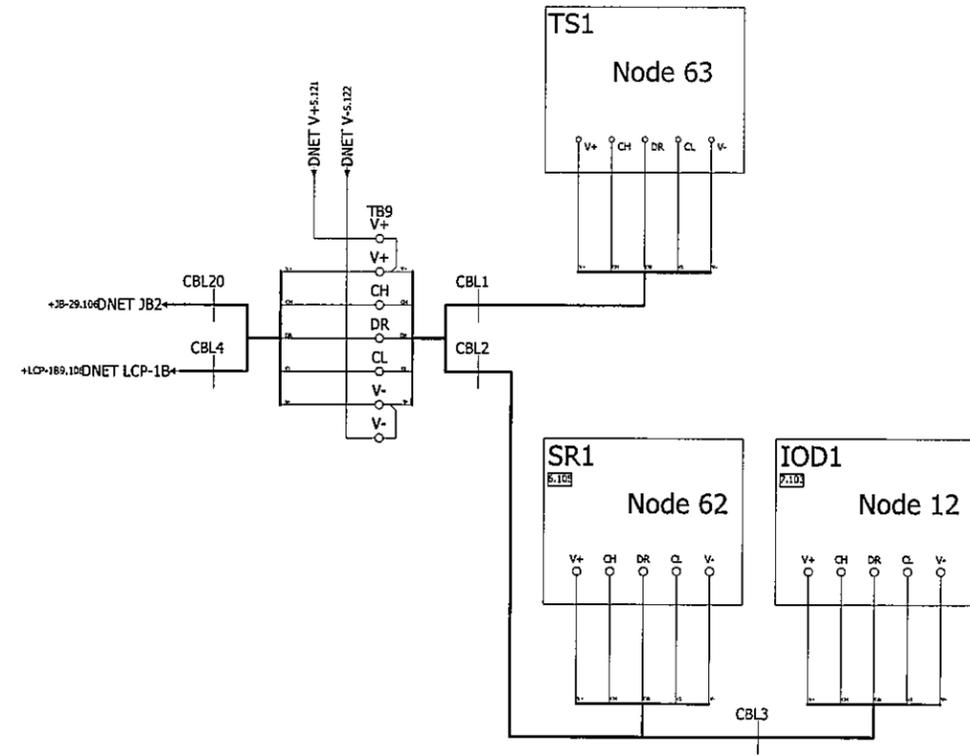
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			2	AS BUILT	2009-02-24	MARCL			DRAWN : DANY TURCOTTE DATE : 2009-05-05	Previous Page				Page	NEXT Page	LCP-1A	Contact Relay			
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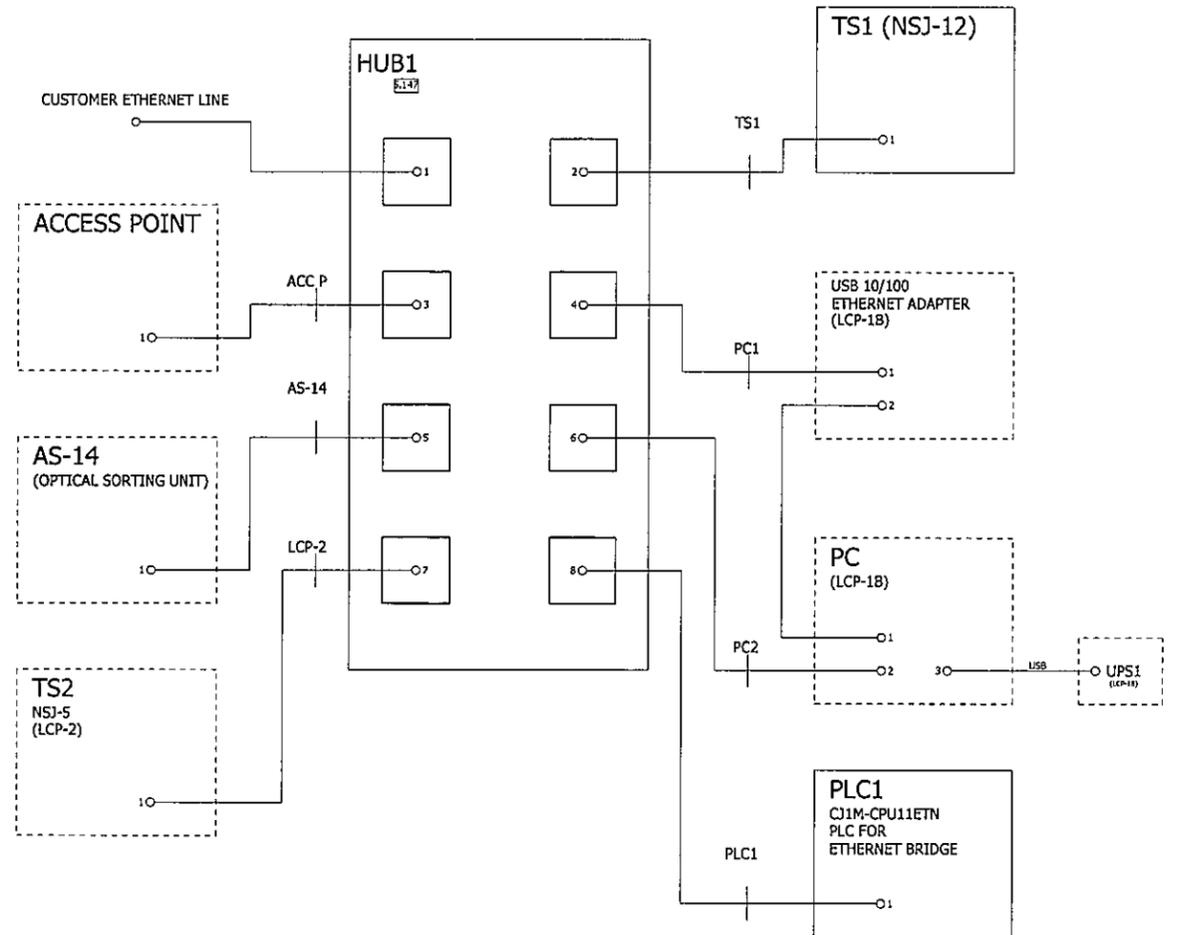
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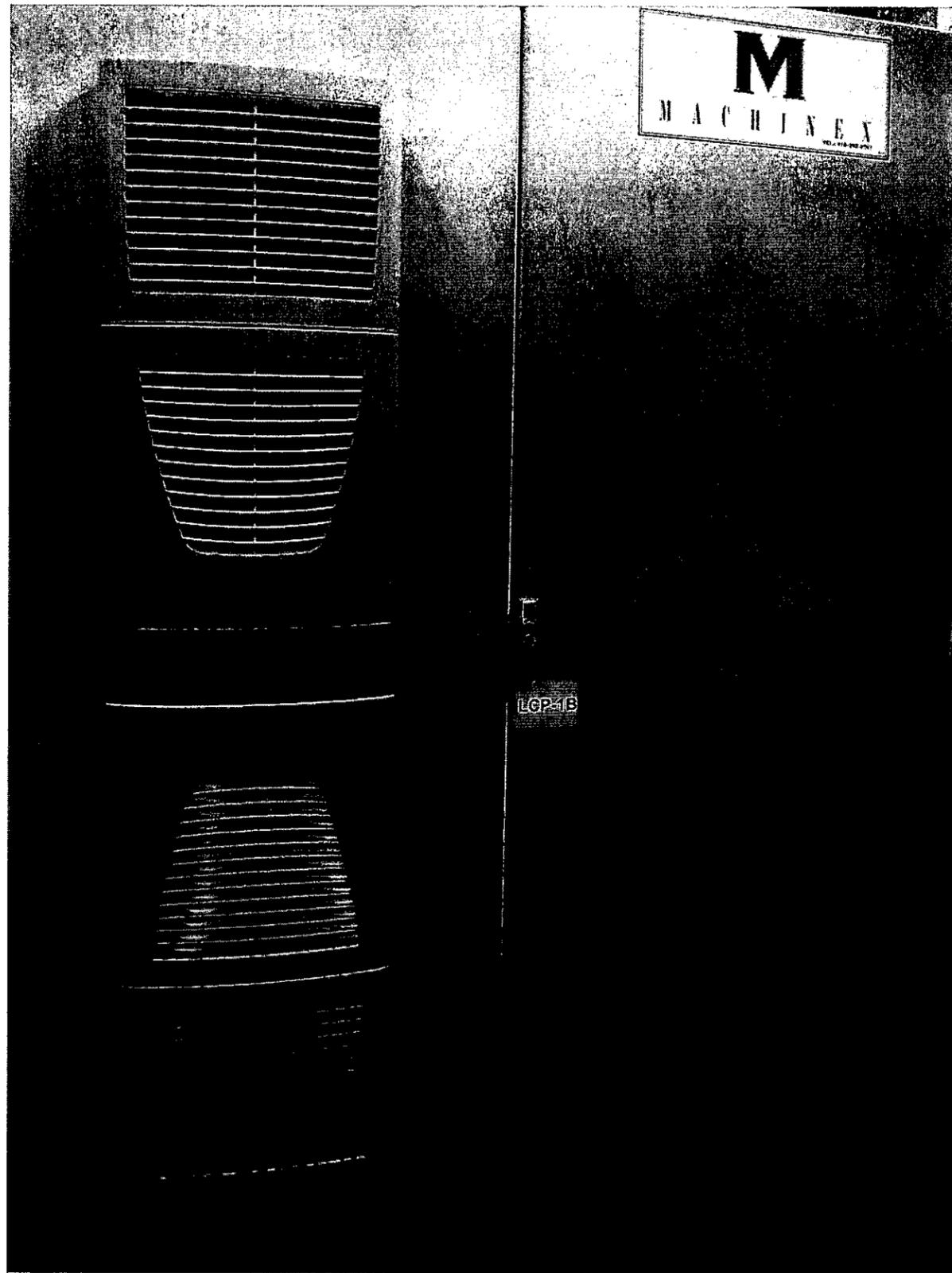


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				2	AS BUILT	2009-02-24	MARCL			DRAWN : DANY TURCOTTE	DATE : 2009-05-05			Previous Page	Page	NEXT Page	MOUNTING LOCATION : LCP-1A	PAGE DESCRIPTION : Communication	
				3	AS BUILT	2009-03-24	MARCL			CHECKED : DANY TURCOTTE	DATE : 2008-11-28			8.1	9.1	+LCP-1B/1.1			
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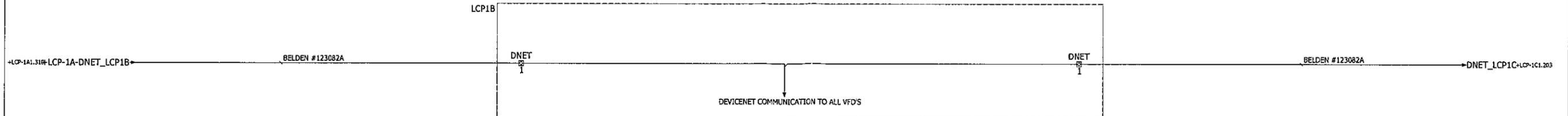


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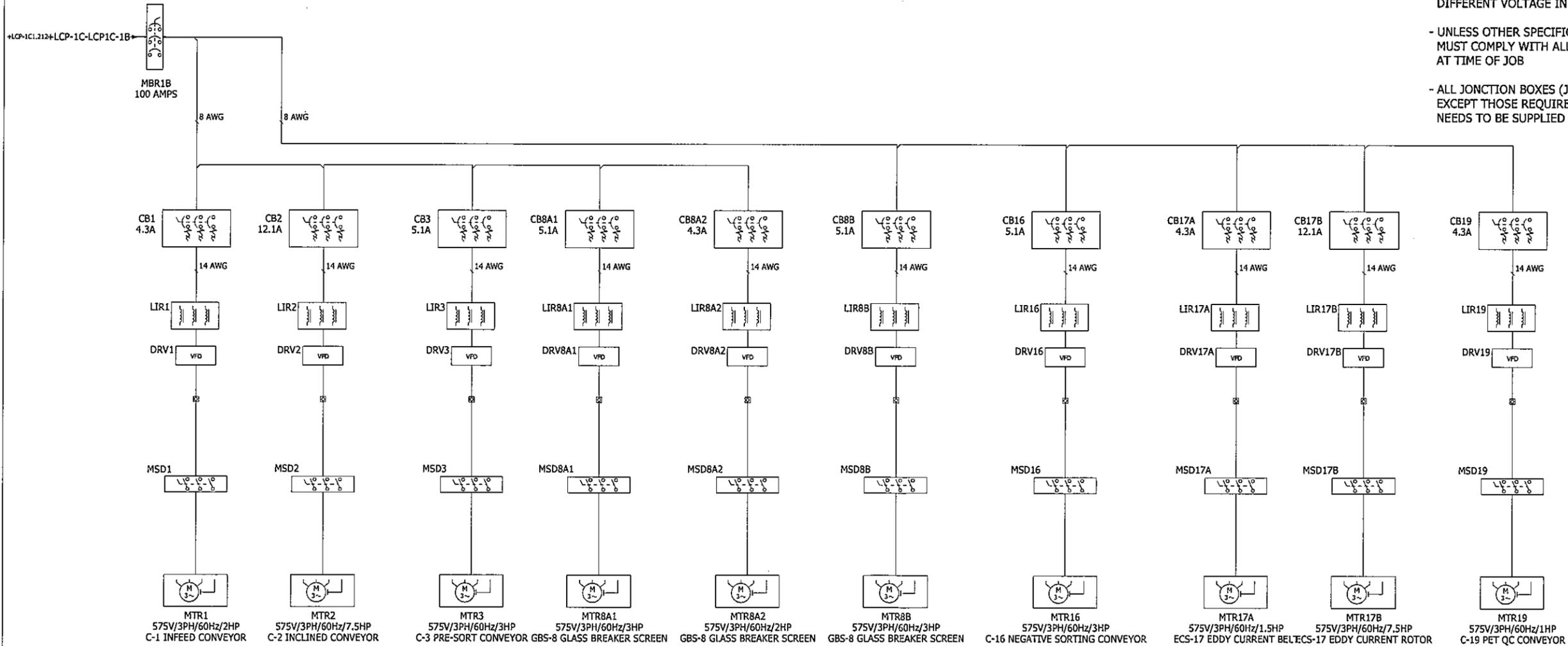
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Previous Page: +LCP-1A/9.1  
 Page: R:\clients\Region of Waterloo 2474080421\Electrique\Plan\PLAN\PC-449L (PC-449L Waterloo).e13  
 NEXT Page:



- WIRING MUST BE TECK CABLE WITH ALUMINIUM CONNECTORS, STAR-TECK OR EQUIVALENT APPROVED
- POWER WIRES FROM VFD'S MUST BE WIRED THROUGH SEPARATE CABLES FROM STANDARD MOTORS
- CONTROL WIRES MUST BE WIRED BY SEPARATE DIFFERENT VOLTAGE IN DIFFERENT CABLES
- UNLESS OTHER SPECIFICATIONS, FIELD WIRING MUST COMPLY WITH ALL APPLICABLE LAW IN FORCE AT TIME OF JOB
- ALL JUNCTION BOXES (JB) ARE SUPPLIED BY MACHINEX EXCEPT THOSE REQUIRED FOR FIELD WIRING THAT NEEDS TO BE SUPPLIED BY THE ELECTRICIAN



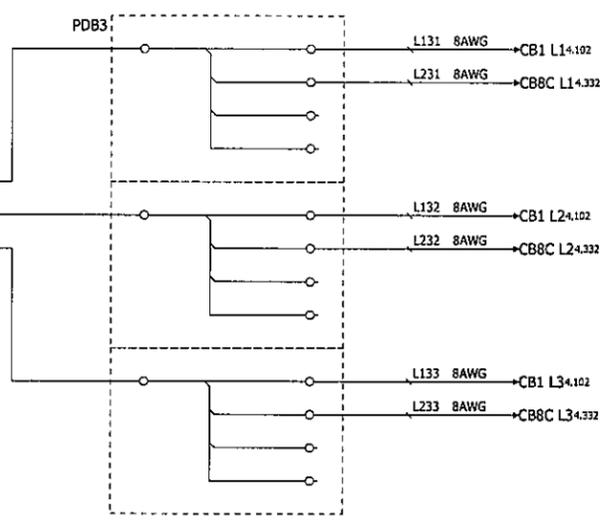
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				2	AS BUILT	2009-02-24	MARCL			DRAWN : DANY TURCOTTE	DATE : 2009-05-05		
				3	AS BUILT	2009-03-24	MARCL			CHECKED : DANY TURCOTTE	DATE : 2008-11-28		
				4	AS BUILT	2009-04-29	MARCL			APPROVED :	DATE :		
				5	FINAL	2009-05-05	MARCL						

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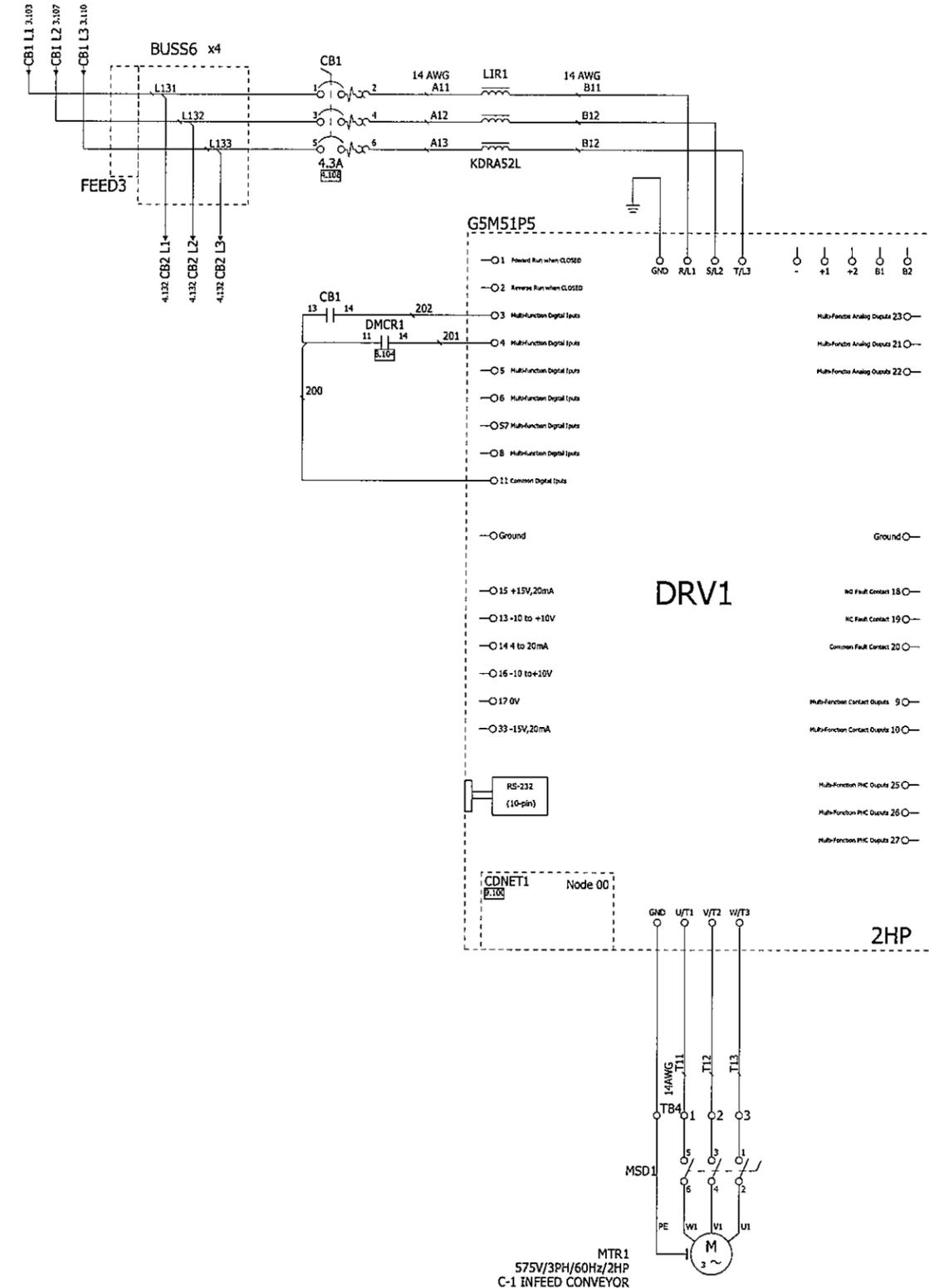


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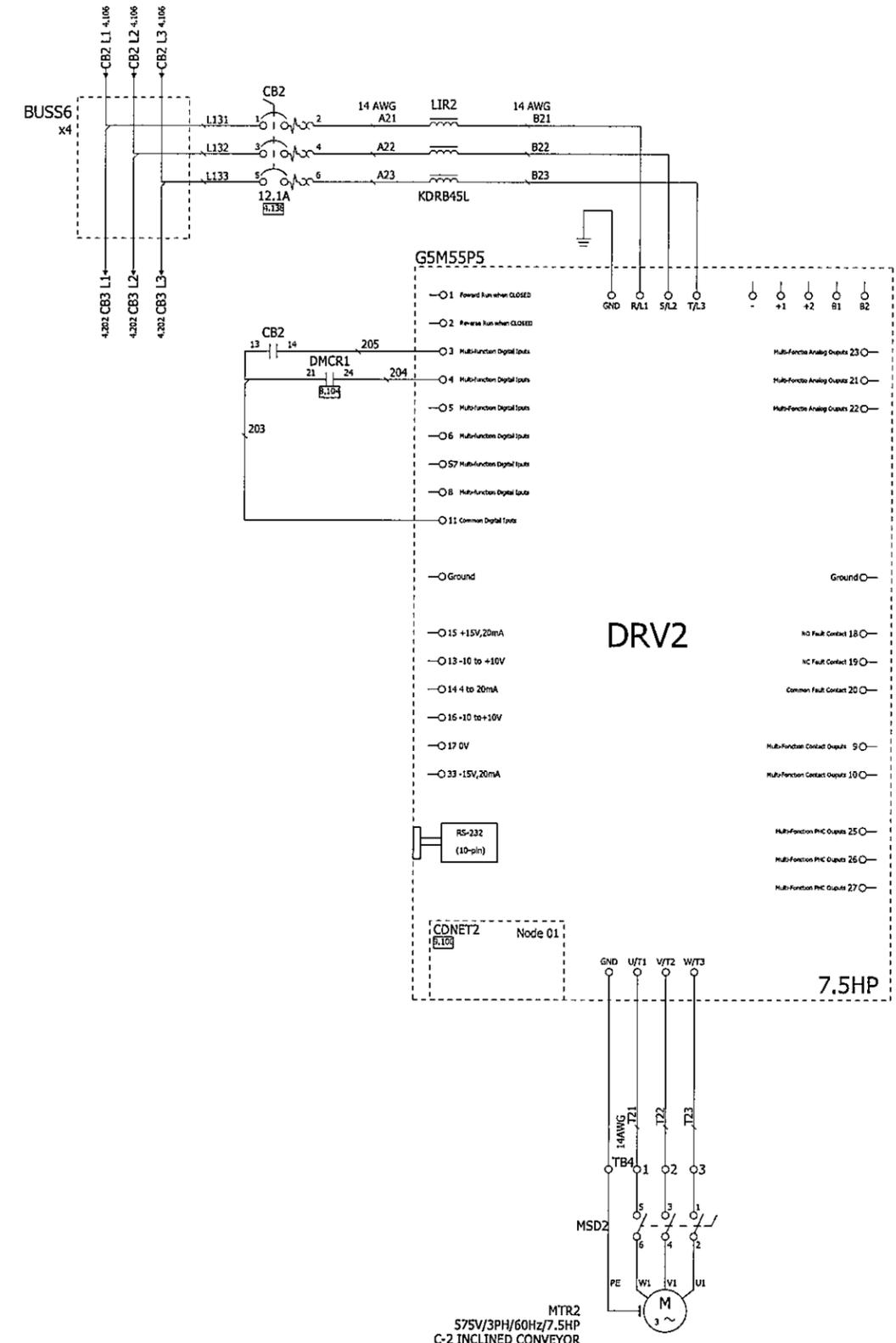
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				1	FOR CONSTRUCTION	2009-01-09	MARCL			PJ MNGR : DAVID MARCOUILLER DATE : 2008-11-25	 MACHINEX INDUSTRIES INC. 2121, Olivier Street Plessisville, Québec, Canada, G6L 3G9 Phone: (819) 362-3281 Fax: (819) 362-2280 E-mail: sales@machinex.ca	<b>REGION OF WATERLOO</b> 925, ERB STREET WEST WATERLOO, ONTARIO	<b>MATERIAL RECYCLING CENTER</b> CONTAINERS LINE							
			2	AS BUILT	2009-02-24	MARCL			DRAWN : DANY TURCOTTE DATE : 2009-05-05	Previous Page				Page	NEXT Page	LCP-18	Power Distribution			
			3	AS BUILT	2009-03-24	MARCL			CHECKED : DANY TURCOTTE DATE : 2008-11-28	1.2				3.1	4.1					
			4	AS BUILT	2009-04-29	MARCL			APPROVED :											
			5	FINAL	2009-05-05	MARCL														

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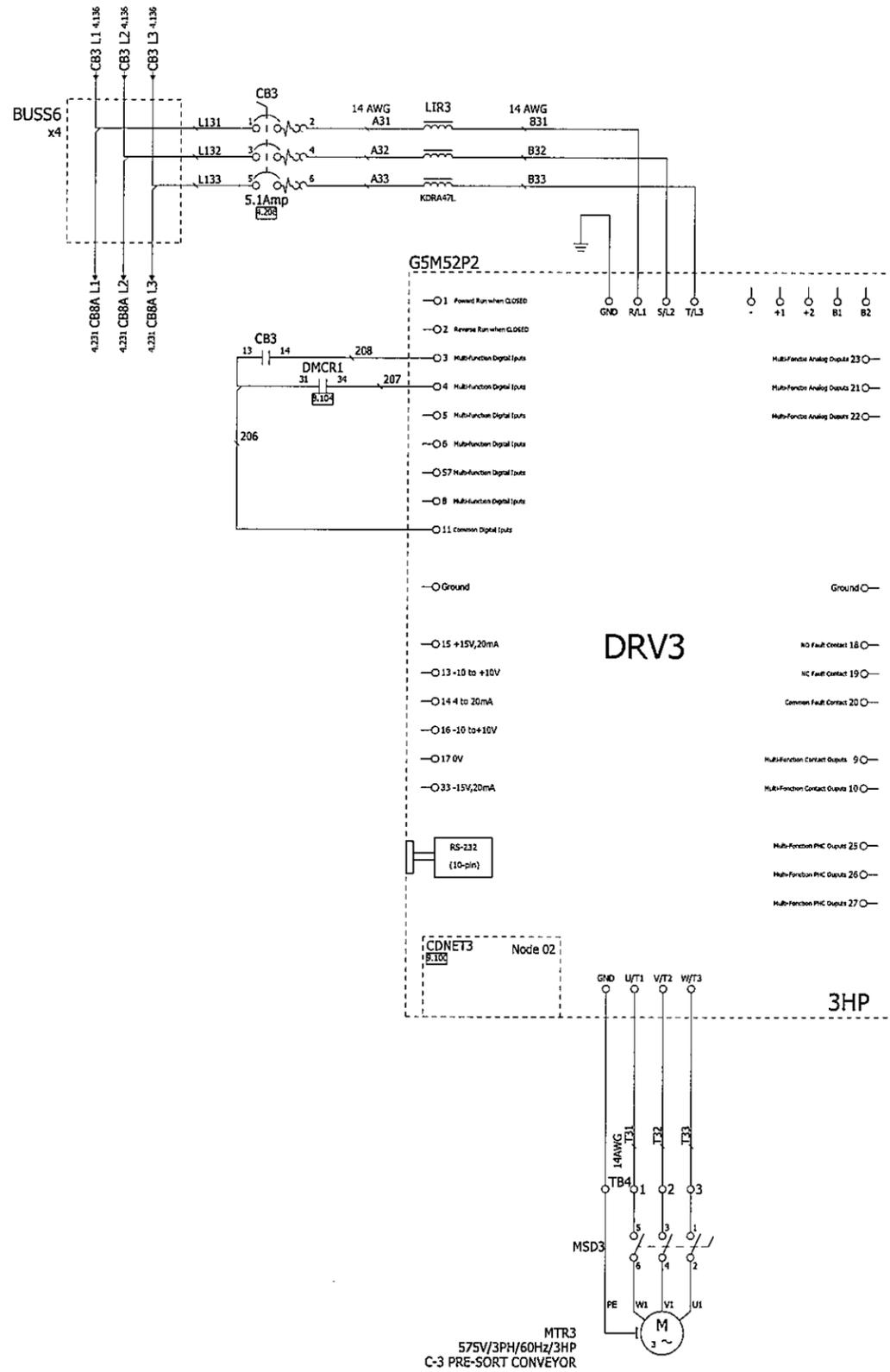


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2	AS BUILT	2009-02-24	MARCL							DRAWN : DANY TURCOTTE	DATE : 2009-05-05		Previous Page	
3	AS BUILT	2009-03-24	MARCL							CHECKED : DANY TURCOTTE	DATE : 2008-11-28		Page	
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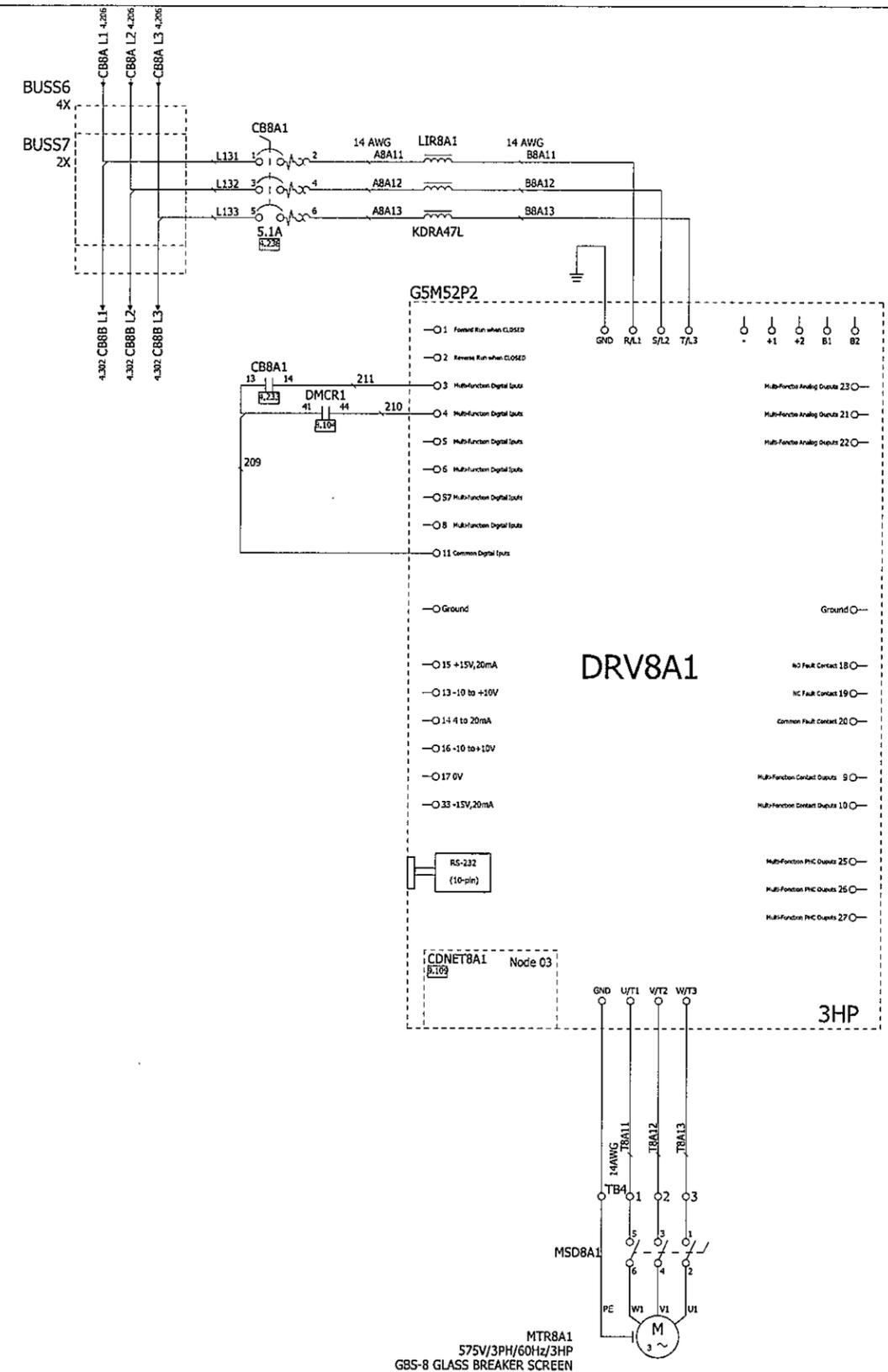
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3.1	4.1	4.2	MOUNTING LOCATION : LCP-1B	PAGE DESCRIPTION : Power	
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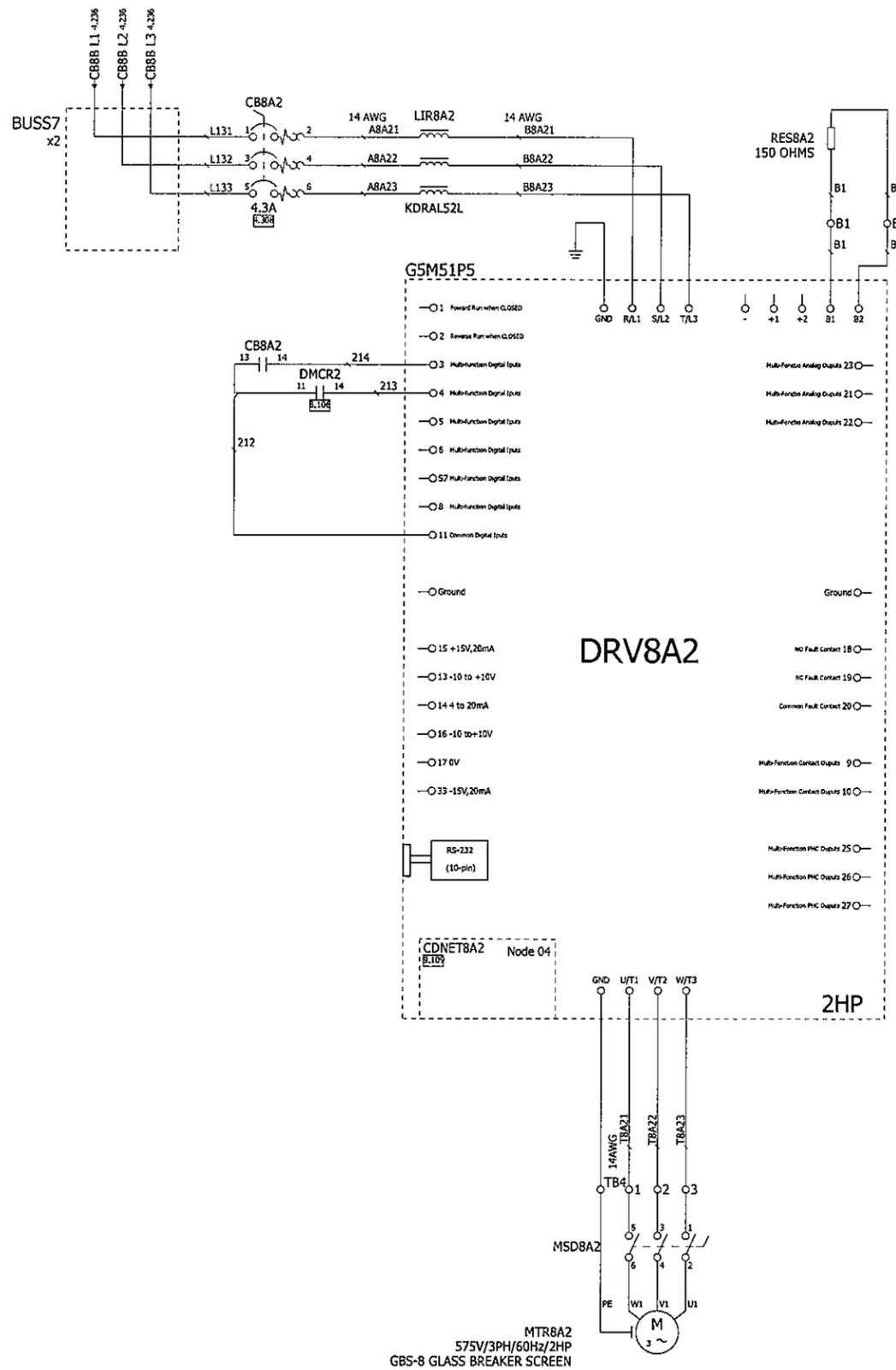
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**REGION OF WATERLOO**  
925, ERB STREET WEST  
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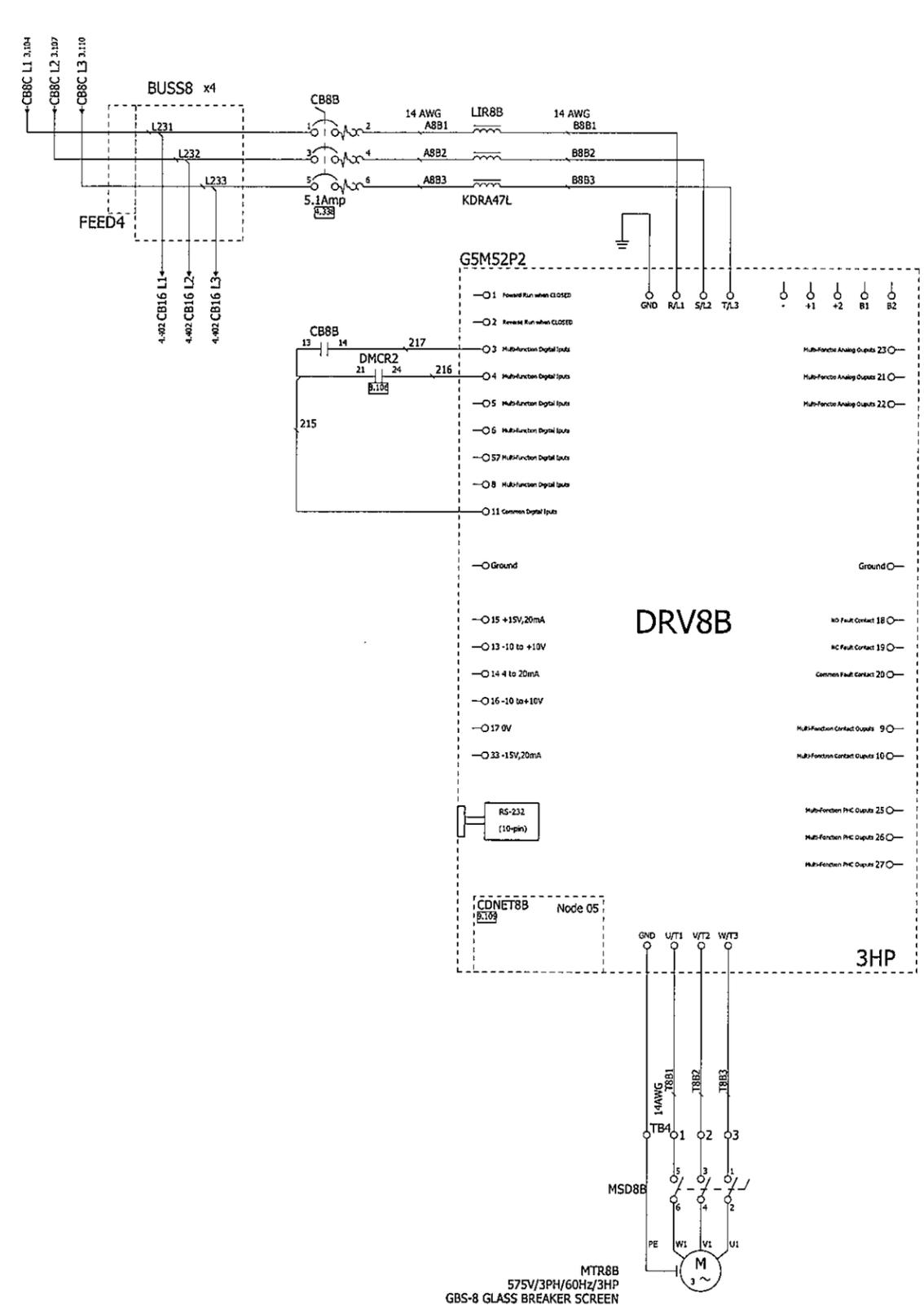
**MATERIAL RECYCLING CENTER**  
CONTAINERS LINE

Previous Page 4.1	Page 4.2	NEXT Page 4.3	MOUNTING LOCATION : LCP-1B	PAGE DESCRIPTION : Power
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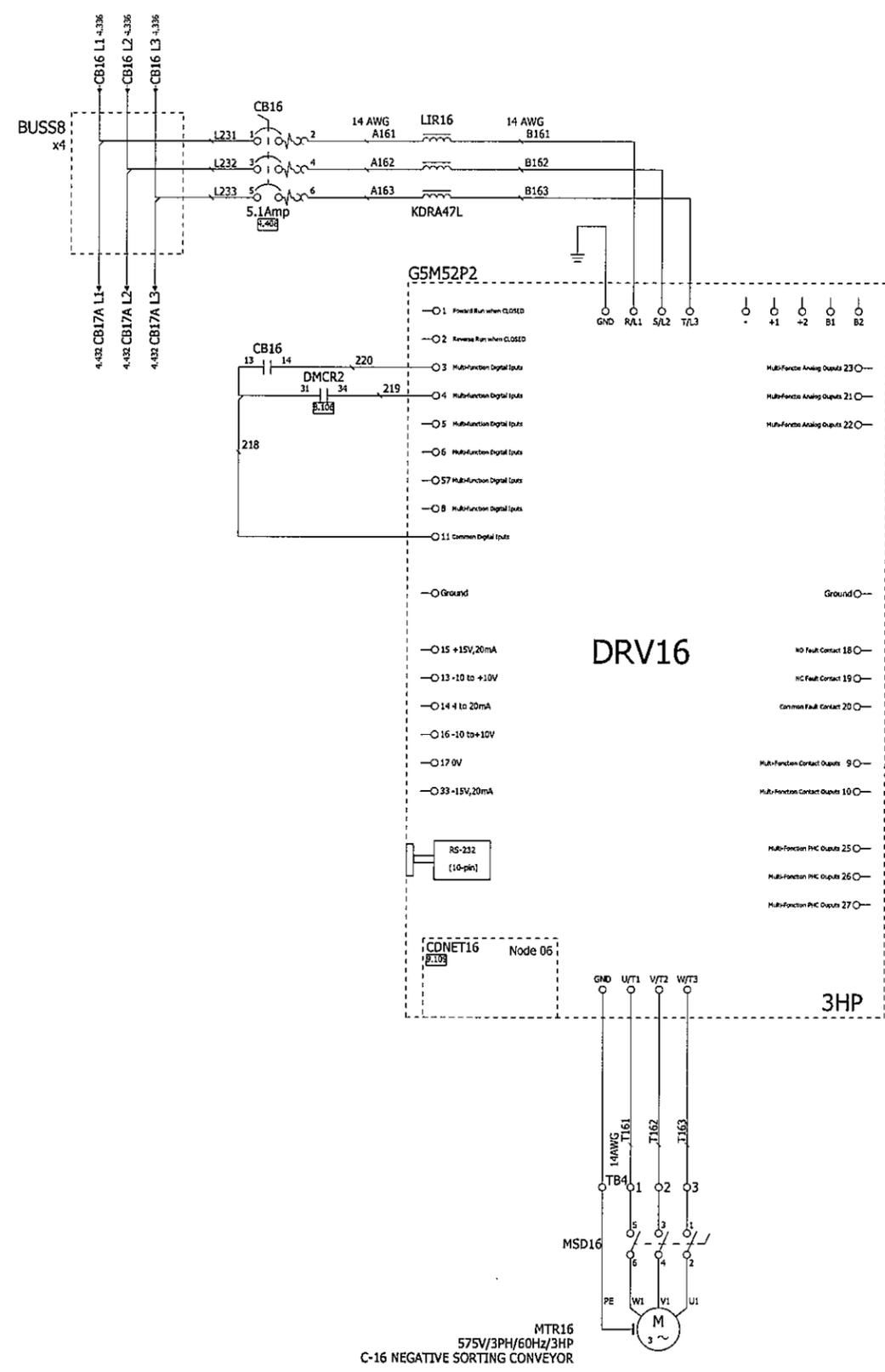


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3	AS BUILT	2009-03-24	MARCL							CHECKED : DANY TURCOTTE	DATE : 2008-11-28			
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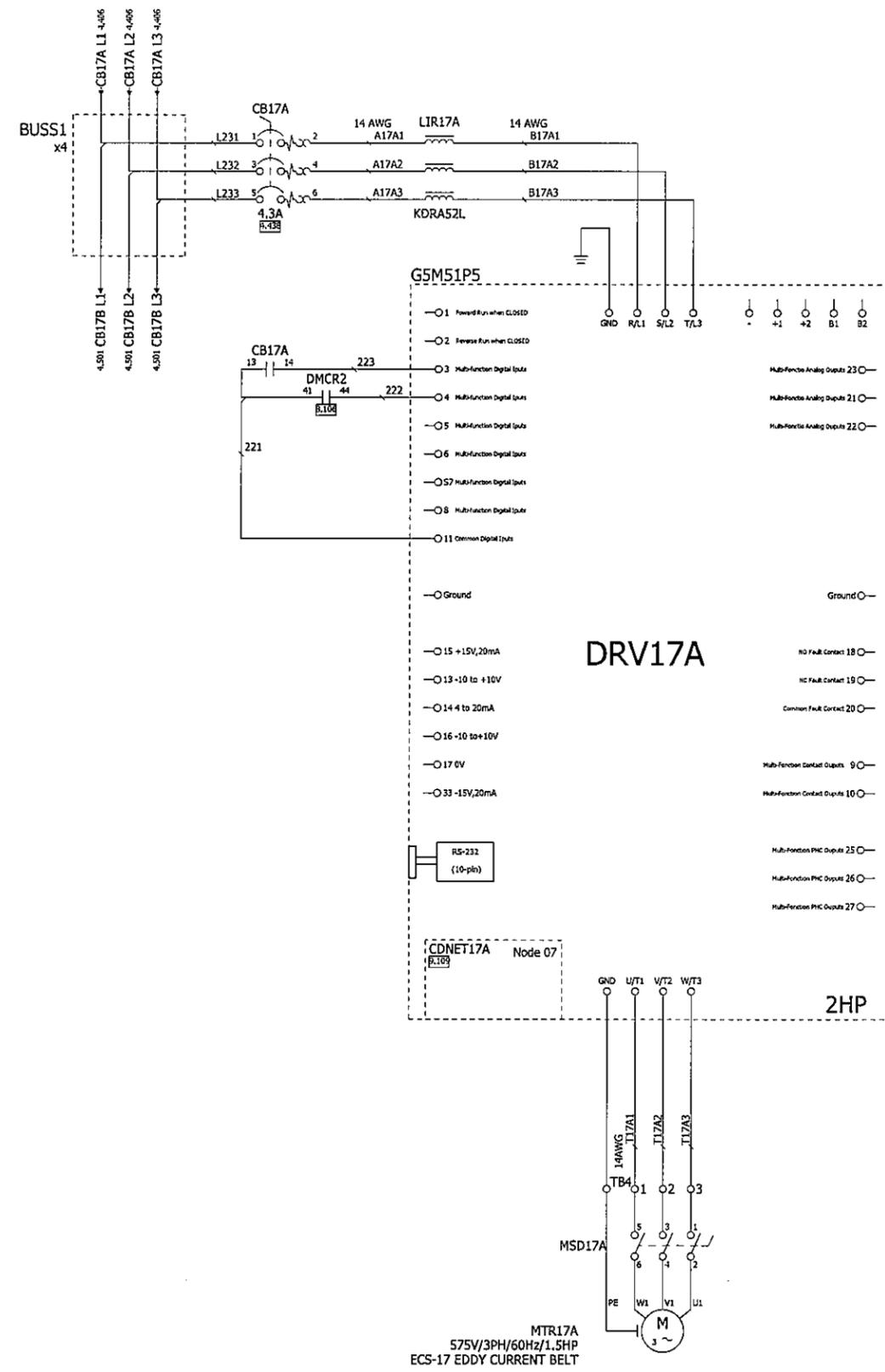


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925, ERB STREET WEST WATERLOO, ONTARIO CONTAINERS LINE  
Previous Page 4.2 Page 4.3 NEXT Page 4.4  
MOUNTING LOCATION : LCP-1B PAGE DESCRIPTION : Power  
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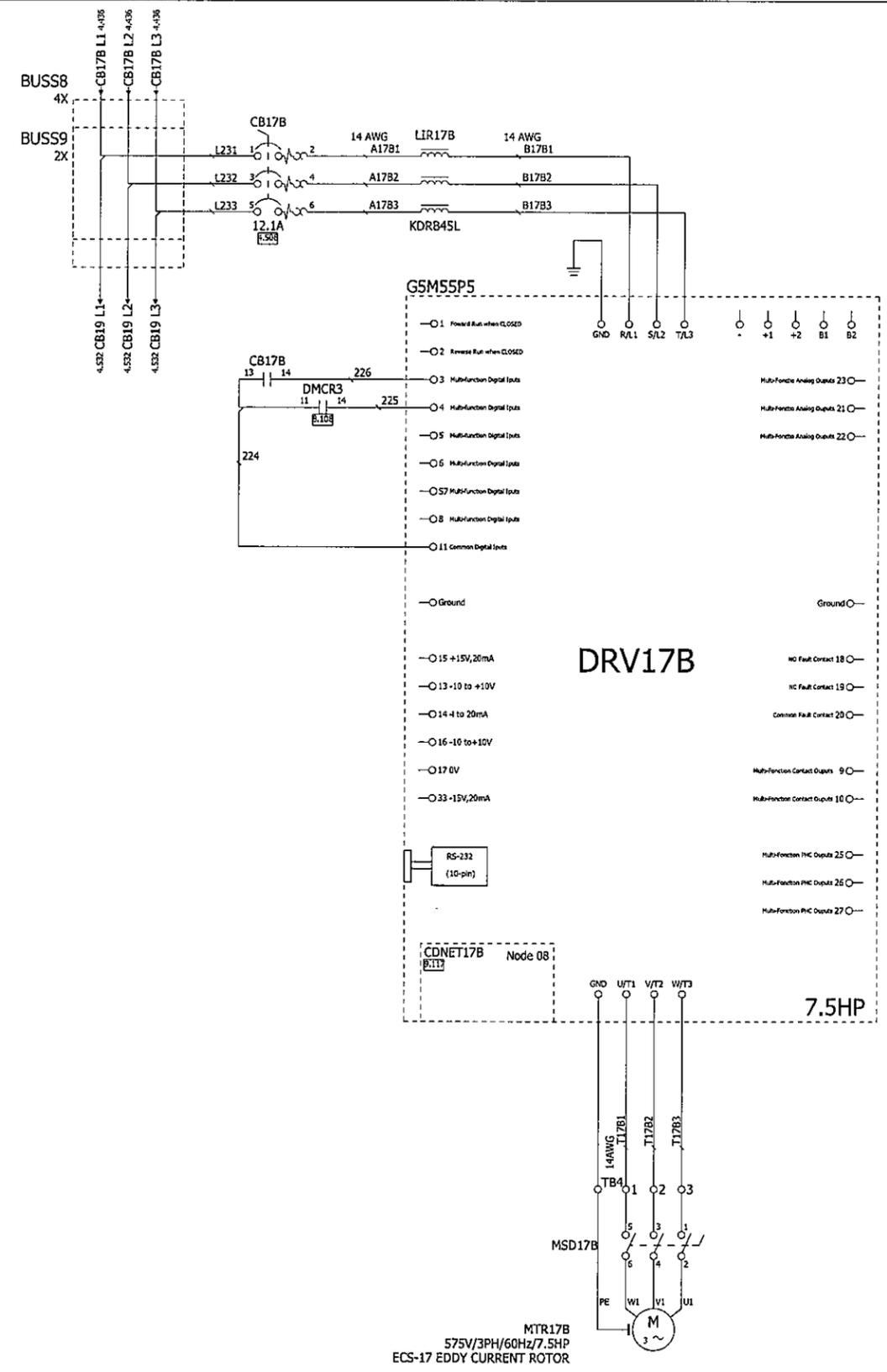


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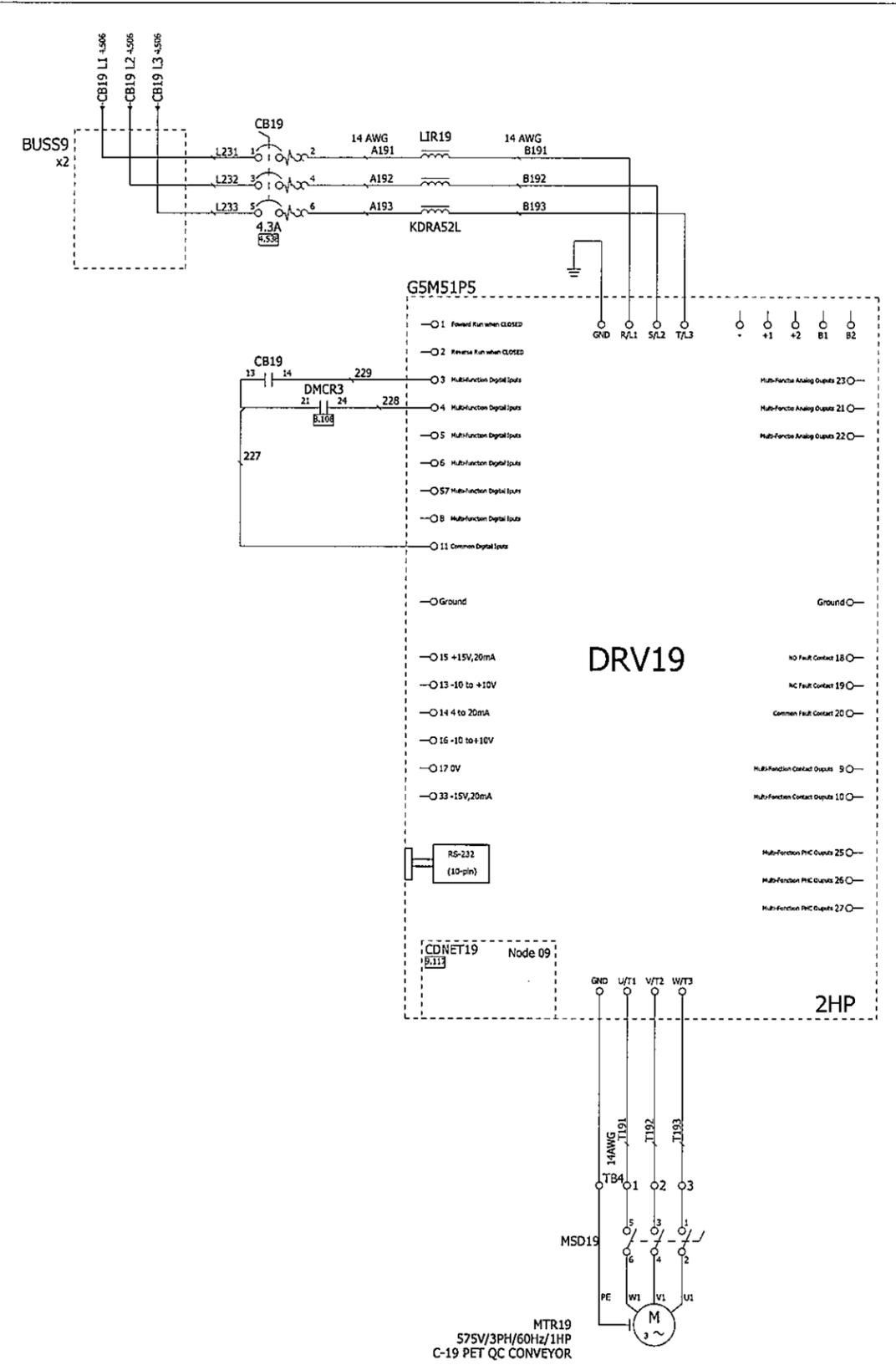
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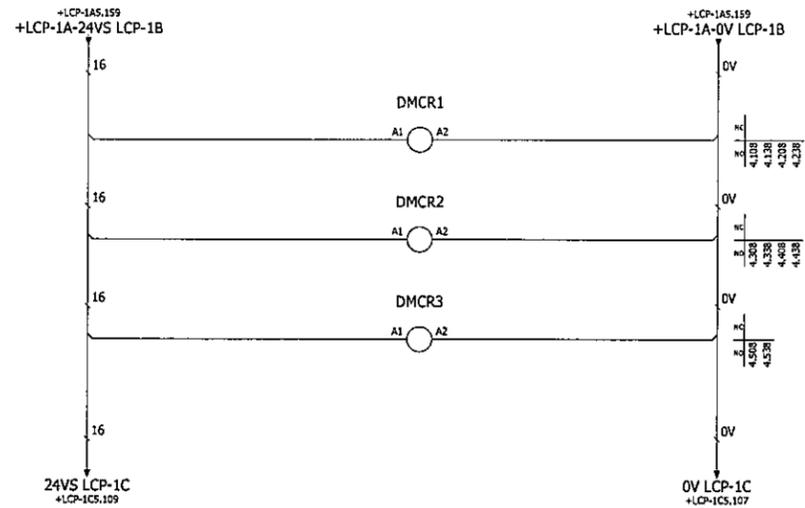


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				2	AS BUILT	2009-02-24	MARCL			DRAWN : DANY TURCOTTE	DATE : 2009-05-05		Previous Page	
				3	AS BUILT	2009-03-24	MARCL			CHECKED : DANY TURCOTTE	DATE : 2008-11-28		Page	4.4
				4	AS BUILT	2009-04-29	MARCL			APPROVED :	DATE :		NEXT Page	4.5
				5	FINAL	2009-05-05	MARCL						Page	8.1

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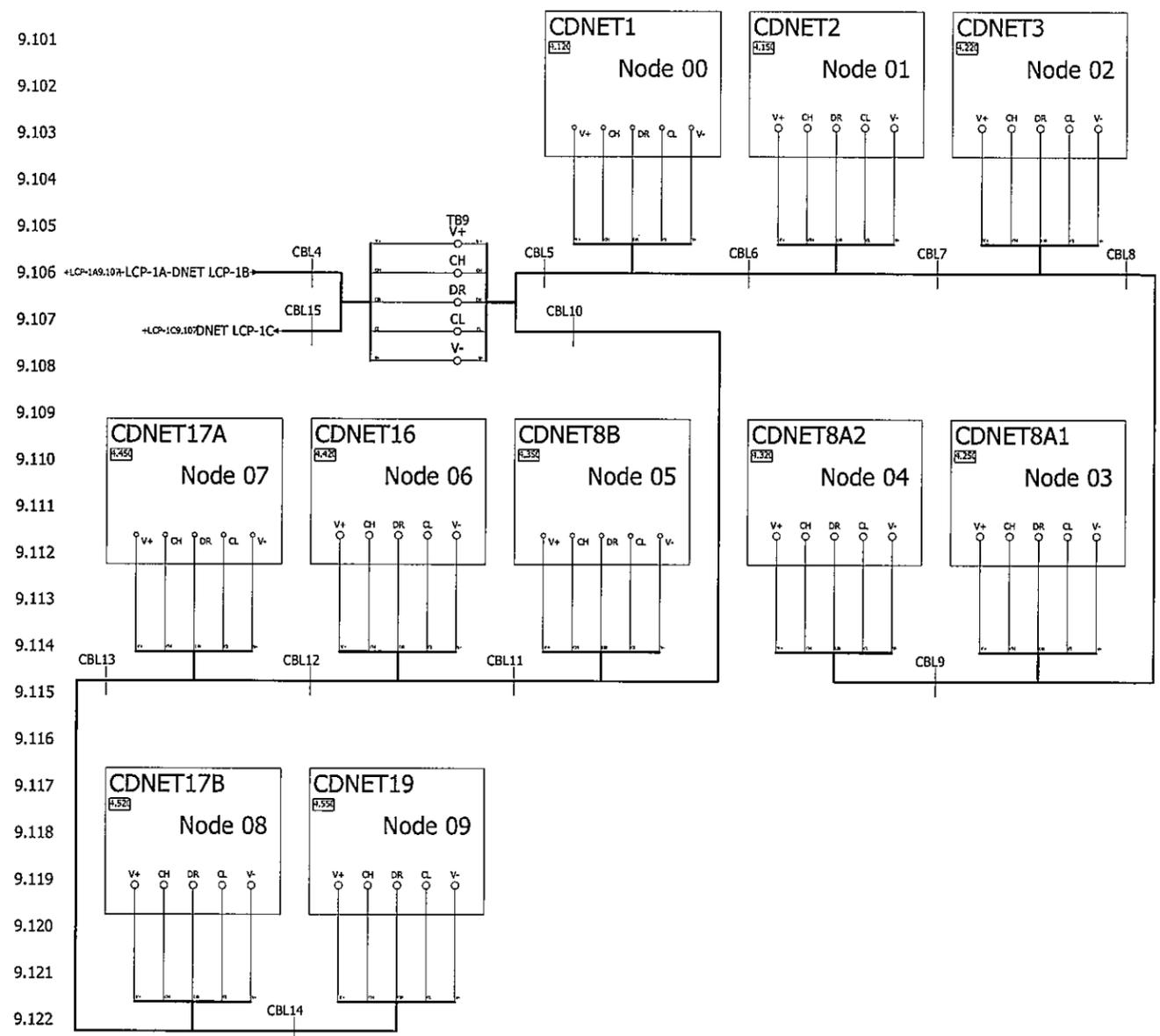


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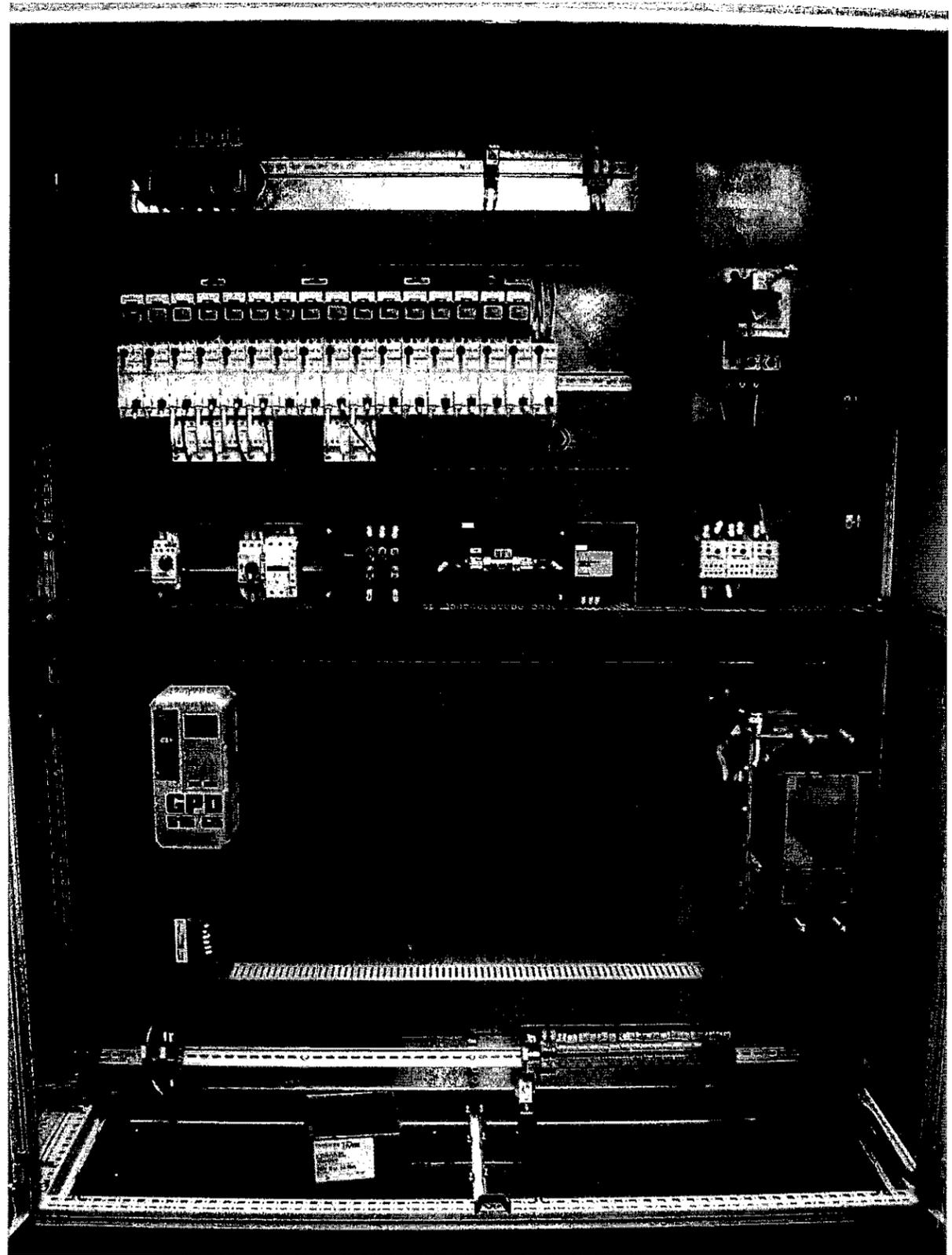
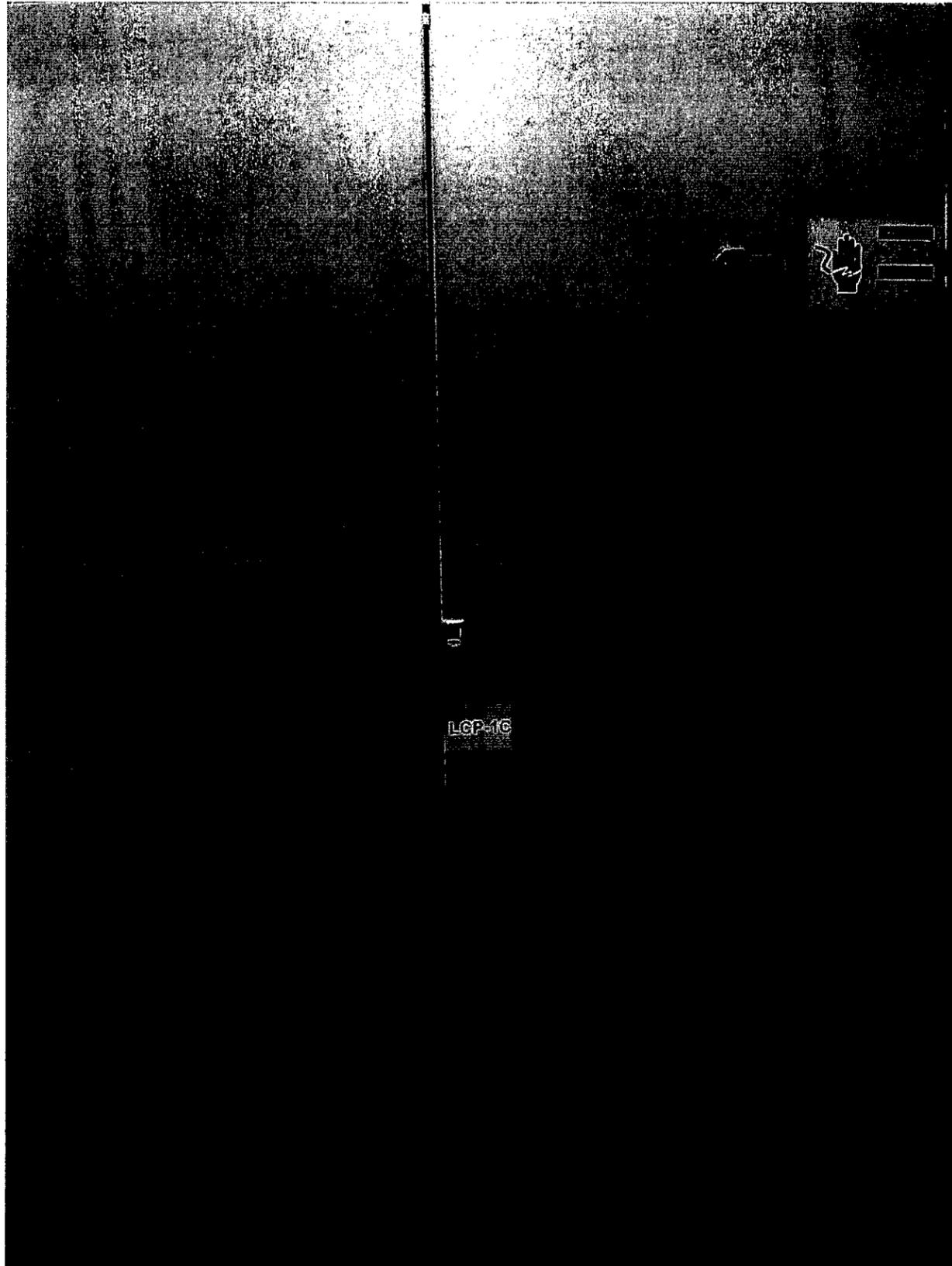
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			2	AS BUILT	2009-02-24	MARCL			DRAWN : DANY TURCOTTE	DATE : 2009-05-05	Previous Page				Page	NEXT Page	PROJECT NO :	DRAWING NO :
			3	AS BUILT	2009-03-24	MARCL			CHECKED : DANY TURCOTTE	DATE : 2008-11-28	8.1				9.1	+LCP-1C/1.1		
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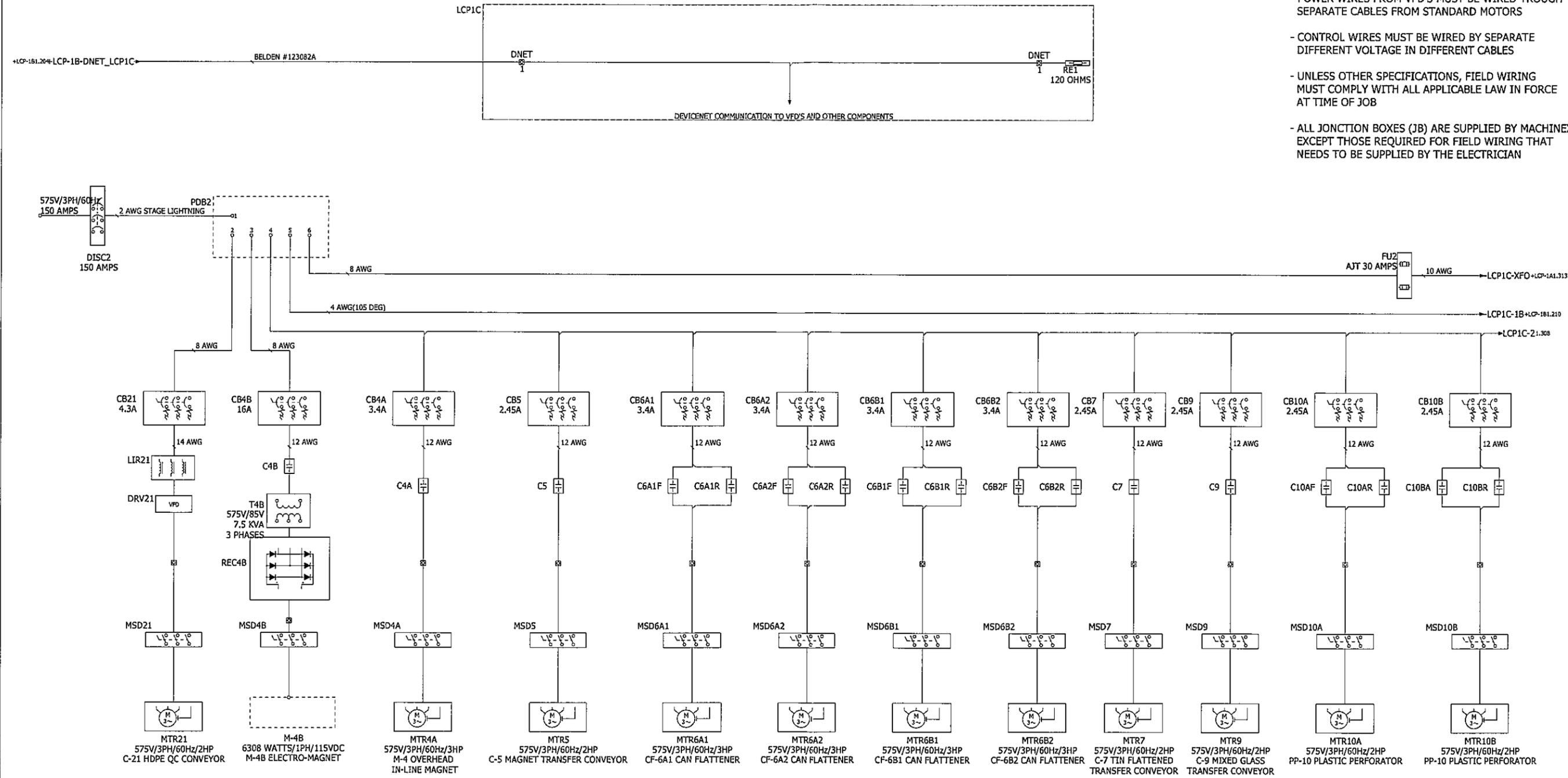


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				1	FOR CONSTRUCTION	2009-01-09	MARCL				<b>M</b> <b>INDUSTRIES</b> <b>MACHINEX</b> MACHINEX INDUSTRIES INC. 2121, Olivier Street Plessisville, Québec, Canada, G6L 3G9 Phone: (819) 362-3281 E-mail: sales@machinex.ca Fax: (819) 362-2280	<b>REGION OF WATERLOO</b> 925, ERB STREET WEST WATERLOO, ONTARIO	<b>MATERIAL RECYCLING CENTER</b> CONTAINERS LINE		LCP-1C		Panel Layout		0421(Electrique)Plan	EPLAN/PC-449L (Region of Waterloo).e12	1					
			2	AS BUILT	2009-02-24	MARCL																				
			3	AS BUILT	2009-03-24	MARCL																				
			4	AS BUILT	2009-04-29	MARCL																				
			5	FINAL	2009-05-05	MARCL																				

LCP-1C

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- WIRING MUST BE TECK CABLE WITH ALUMINIUM CONNECTORS, STAR-TECK OR EQUIVALENT APPROVED
- POWER WIRES FROM VFD'S MUST BE WIRED THROUGH SEPARATE CABLES FROM STANDARD MOTORS
- CONTROL WIRES MUST BE WIRED BY SEPARATE DIFFERENT VOLTAGE IN DIFFERENT CABLES
- UNLESS OTHER SPECIFICATIONS, FIELD WIRING MUST COMPLY WITH ALL APPLICABLE LAW IN FORCE AT TIME OF JOB
- ALL JUNCTION BOXES (JB) ARE SUPPLIED BY MACHINEX EXCEPT THOSE REQUIRED FOR FIELD WIRING THAT NEEDS TO BE SUPPLIED BY THE ELECTRICIAN

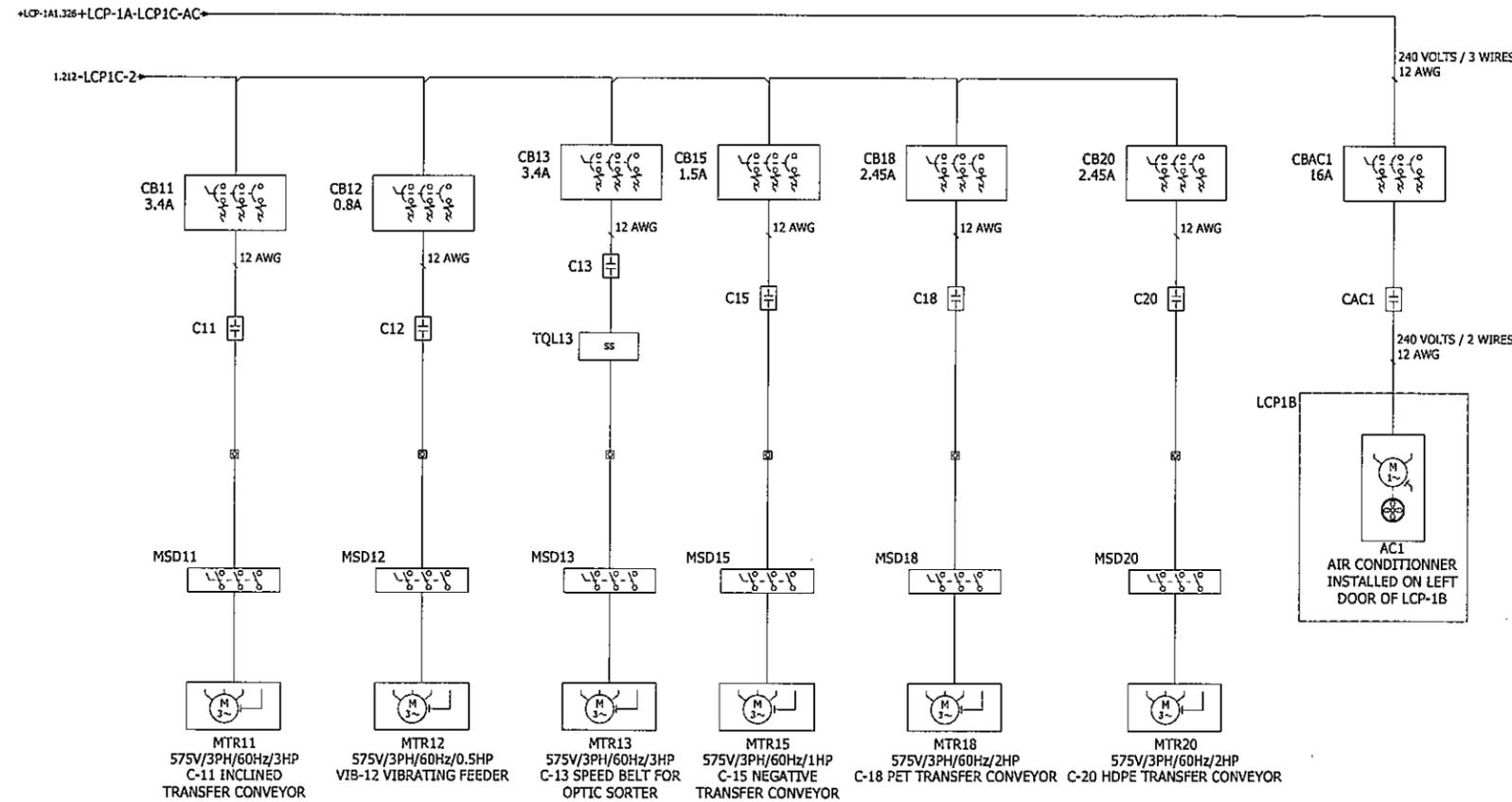


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2	AS BUILT	2009-02-24	MARCL							DRAWN : DANY TURCOTTE	DATE : 2009-05-05	925, ERB STREET WEST WATERLOO, ONTARIO	CONTAINERS LINE	
3	AS BUILT	2009-03-24	MARCL							CHECKED : DANY TURCOTTE	DATE : 2008-11-28	Previous Page 1.1	Page 1.1	
4	AS BUILT	2009-04-29	MARCL							APPROVED :	DATE :	NEXT Page 1.2	REV.	
5	FINAL	2009-05-05	MARCL											



MOUNTING LOCATION : LCP-1C  
 PAGE DESCRIPTION : POWER PANEL SINGLE LINE DIAGRAM  
 PROJECT NO : R:\clients\Region of Waterloo 247408\04211\Electrique\Plan\EPLAN\PC-449L (PC-449L Waterloo).el2  
 DRAWING NO :  
 E-mail : sales@machinex.ca  
 Phone : (819) 352-3281  
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- WIRING MUST BE TECK CABLE WITH ALUMINIUM CONNECTORS, STAR-TECK OR EQUIVALENT APPROVED
- POWER WIRES FROM VFD'S MUST BE WIRED TROUGH SEPARATE CABLES FROM STANDARD MOTORS
- CONTROL WIRES MUST BE WIRED BY SEPARATE DIFFERENT VOLTAGE IN DIFFERENT CABLES
- UNLESS OTHER SPECIFICATIONS, FIELD WIRING MUST COMPLY WITH ALL APPLICABLE LAW IN FORCE AT TIME OF JOB
- ALL JUNCTION BOXES (JB) ARE SUPPLIED BY MACHINEX EXCEPT THOSE REQUIRED FOR FIELD WIRING THAT NEEDS TO BE SUPPLIED BY THE ELECTRICIAN



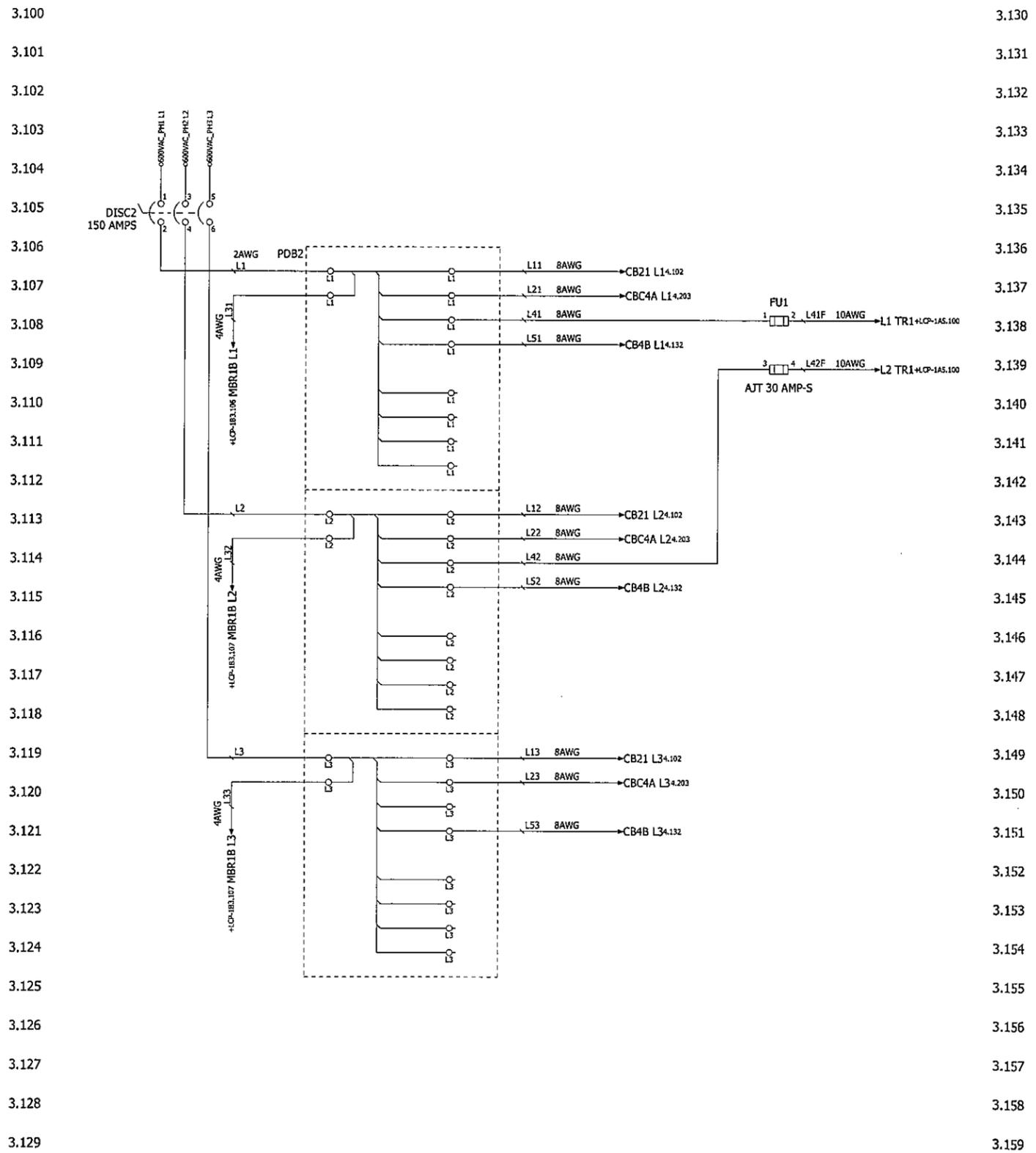
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				2	AS BUILT	2009-02-24	MARCL			DRAWN : DANY TURCOTTE	DATE : 2009-05-05		
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				5	FINAL	2009-05-05	MARCL						



Previous Page	Page	NEXT Page
1.2	3.1	3.1

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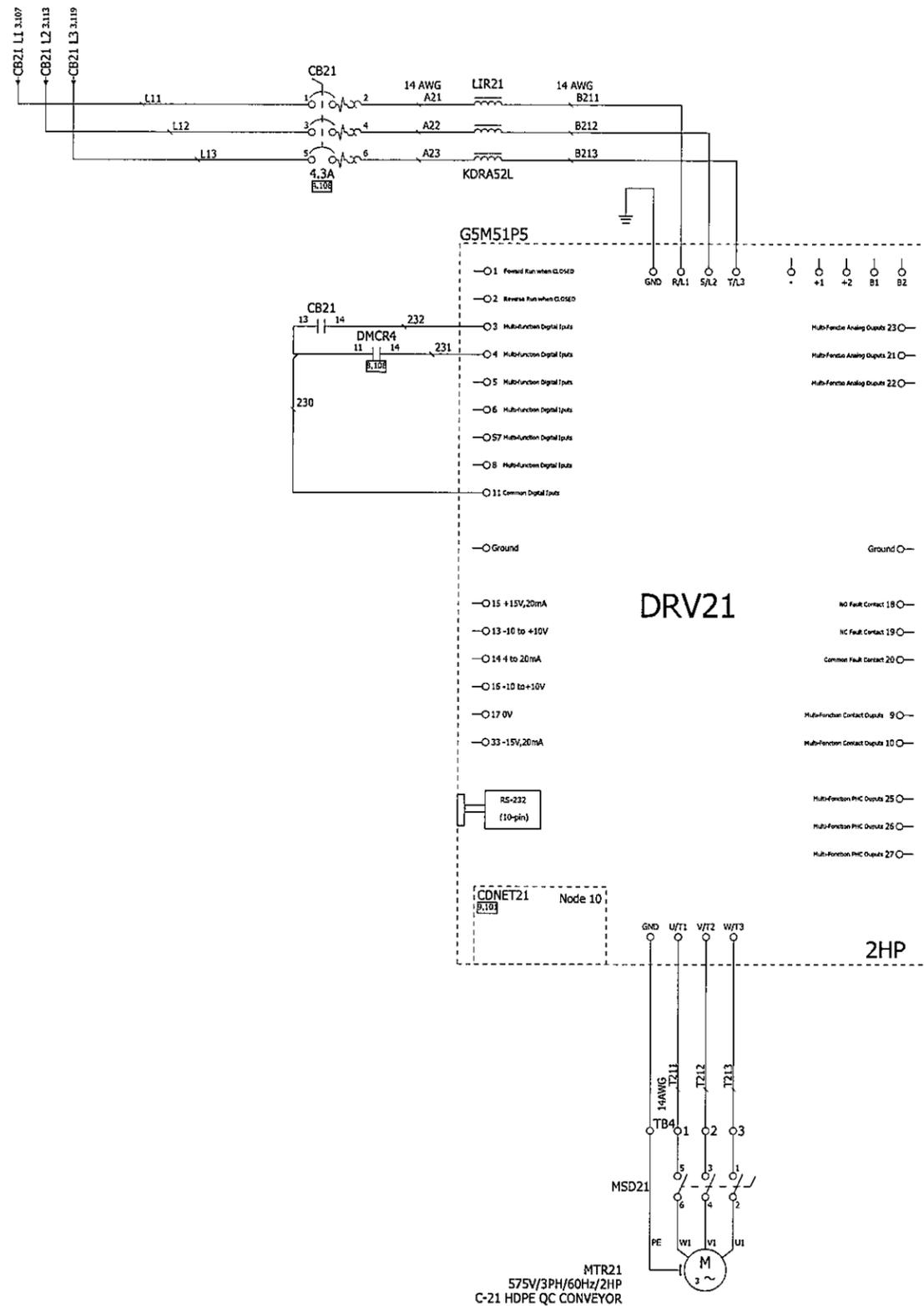


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				2	AS BUILT	2009-02-24	MARCL		DRAWN : DANY TURCOTTE	DATE : 2009-05-05	Previous Page				Page	NEXT Page	MOUNTING LOCATION :	PAGE DESCRIPTION :
				3	AS BUILT	2009-03-24	MARCL		CHECKED : DANY TURCOTTE	DATE : 2008-11-28	1.3				3.1	4.1	LCP-1C	Power Distribution
				4	AS BUILT	2009-04-29	MARCL		APPROVED :	DATE :							PROJECT NO :	DRAWING NO :
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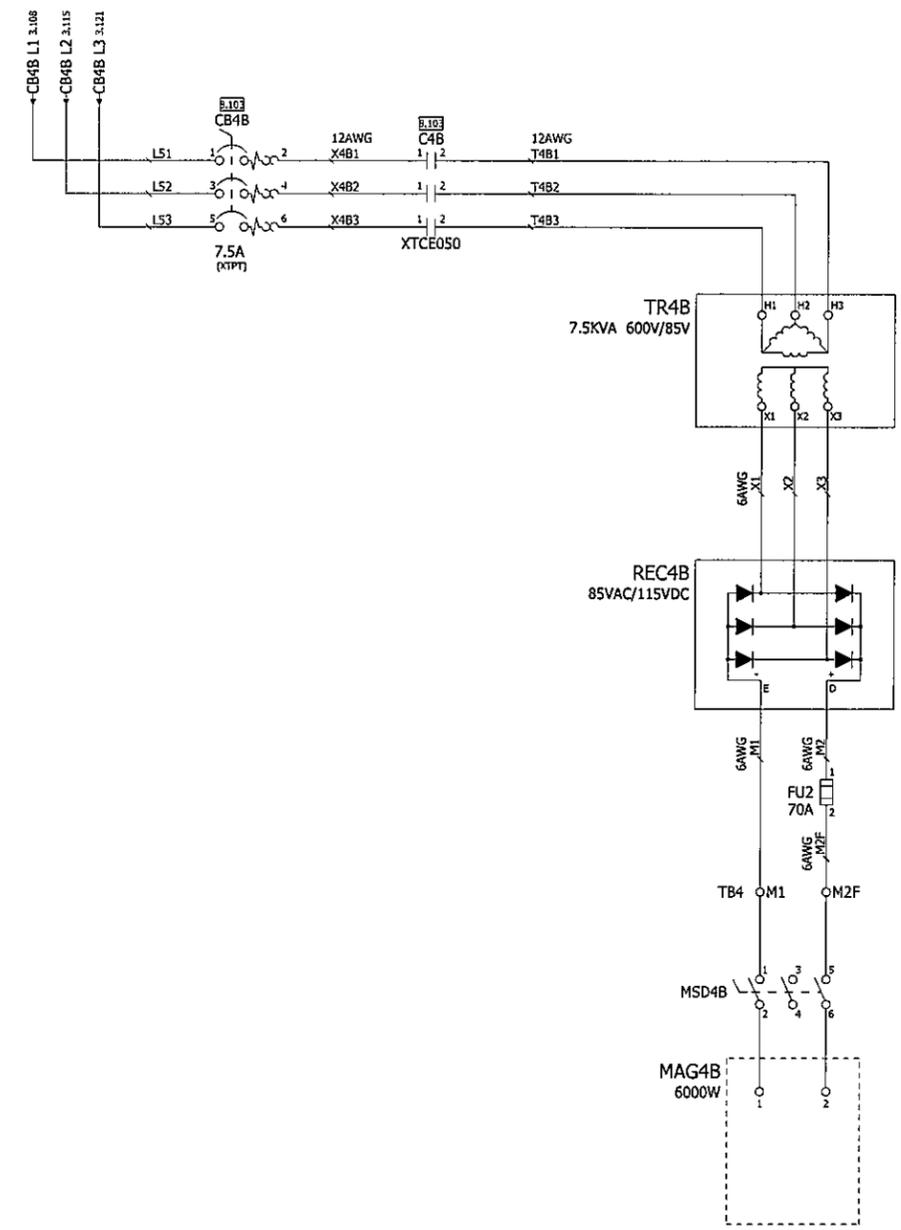


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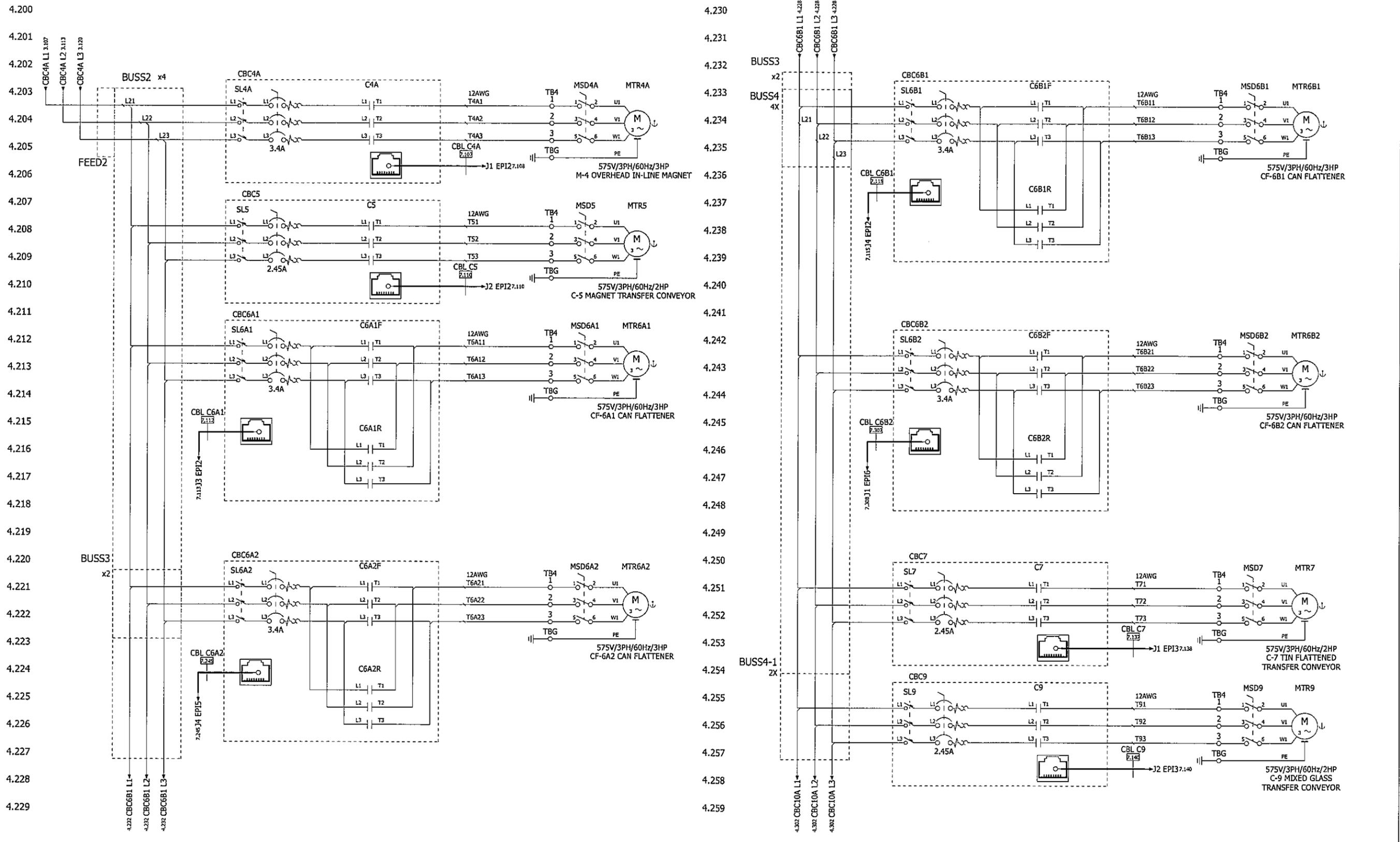


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				3	AS BUILT	2009-03-24	MARCL			CHECKED : DANY TURCOTTE	DATE : 2008-11-28	MATERIAL RECYCLING CENTER					
				4	AS BUILT	2009-04-29	MARCL			APPROVED :	DATE :	CONTAINERS LINE					
				5	FINAL	2009-05-05	MARCL						Previous Page	Page	Next Page		



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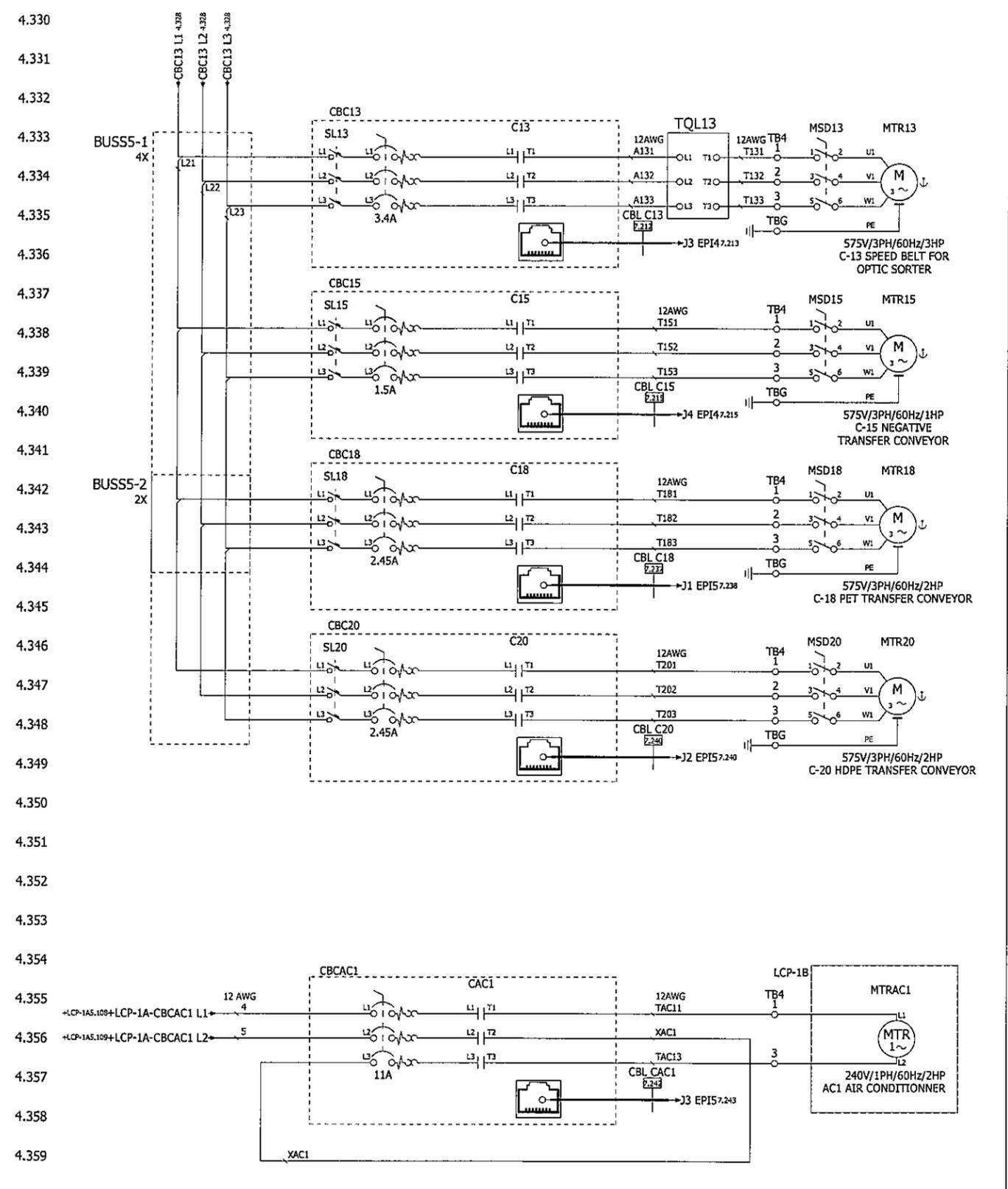
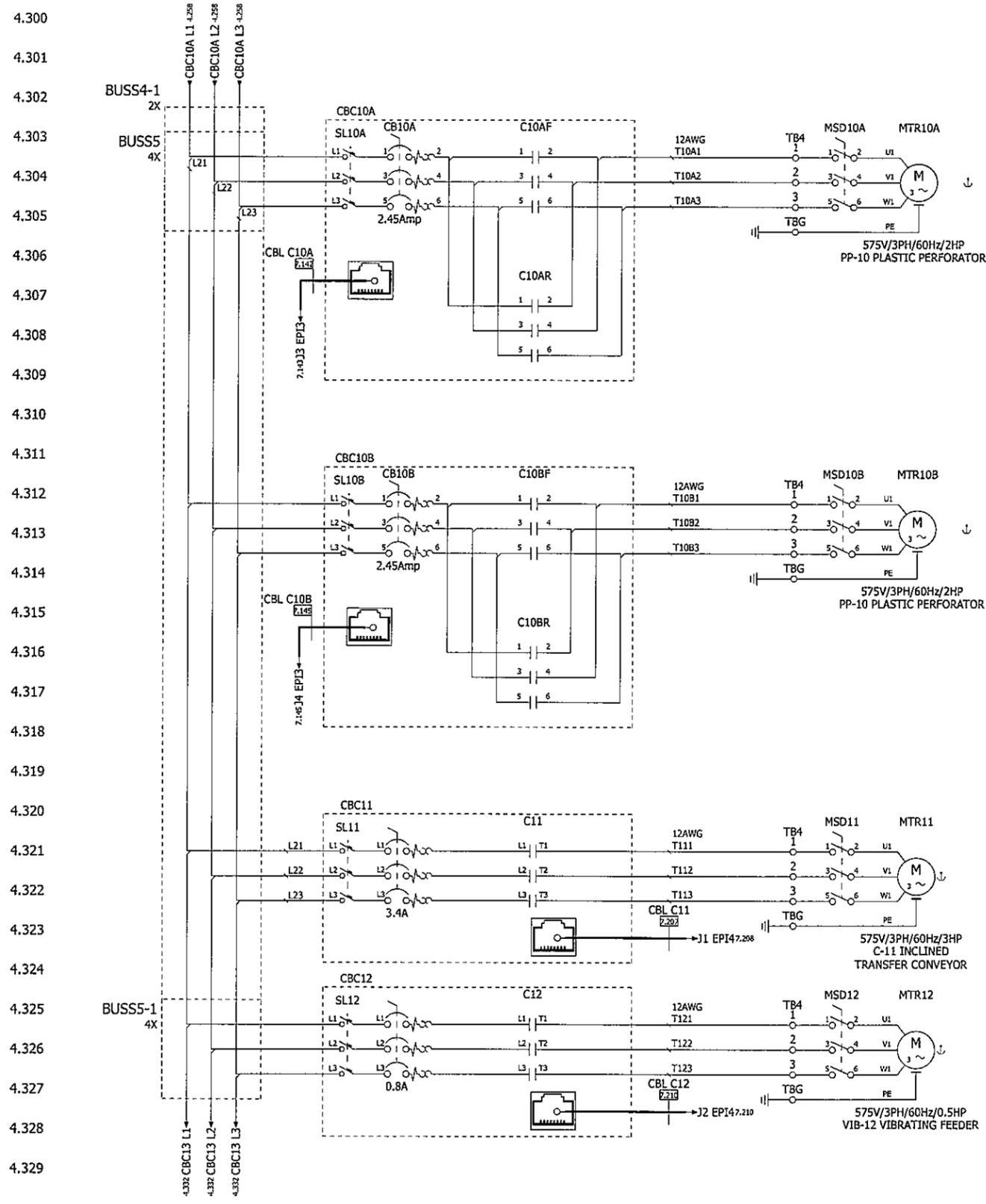
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DRAWING NO: PC-449L



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				3	AS BUILT	2009-03-24	MARCL			CHECKED : DANY TURCOTTE	DATE : 2008-11-28	Previous Page	Page	NEXT Page
				4	AS BUILT	2009-04-29	MARCL			APPROVED :	DATE :	4.1	4.2	4.3
				5	FINAL	2009-05-05	MARCL					4.1	4.2	4.3

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REGION OF WATERLOO			MATERIAL RECYCLING CENTER		
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Previous Page	Page	NEXT Page	MOUNTING LOCATION :	PAGE DESCRIPTION :	REV.
4.1	4.2	4.3	LCP-1C	Power	
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				2	AS BUILT	2009-02-24	MARCL			DRAWN : DANY TURCOTTE	DATE : 2009-05-05	925, ERB STREET WEST WATERLOO, ONTARIO		
				3	AS BUILT	2009-03-24	MARCL			CHECKED : DANY TURCOTTE	DATE : 2008-11-28			
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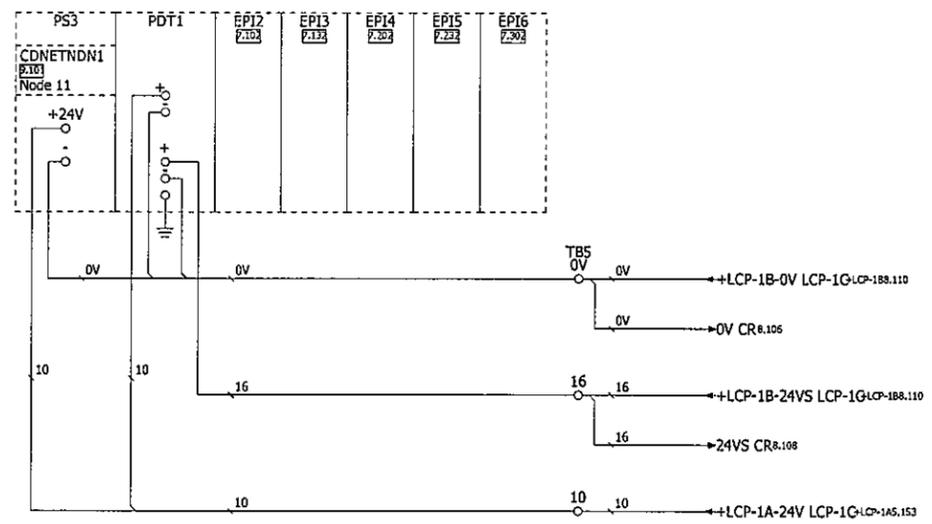
  
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**REGION OF WATERLOO**  
 MATERIAL RECYCLING CENTER  
 CONTAINERS LINE

Previous Page	Page	NEXT Page	MOUNTING LOCATION :	PAGE DESCRIPTION :
4.2	4.3	5.1	LCP-1C	Power
			PROJECT NO :	DRAWING NO :
			2474080421	PC-449L

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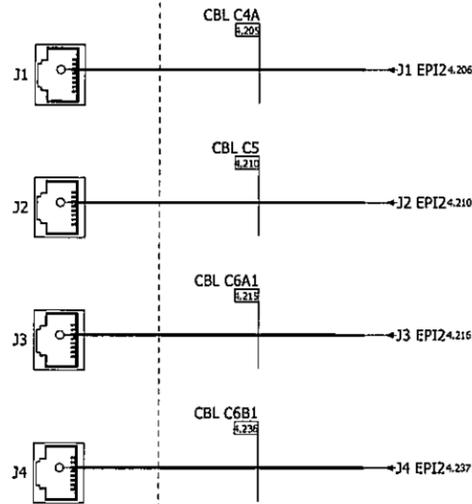
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4	AS BUILT	2009-04-29	MARCL						APPROVED :	DATE :				
5	FINAL	2009-05-05	MARCL											



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4.3	5.1	7.1	LCP-1C	Control Distribution	
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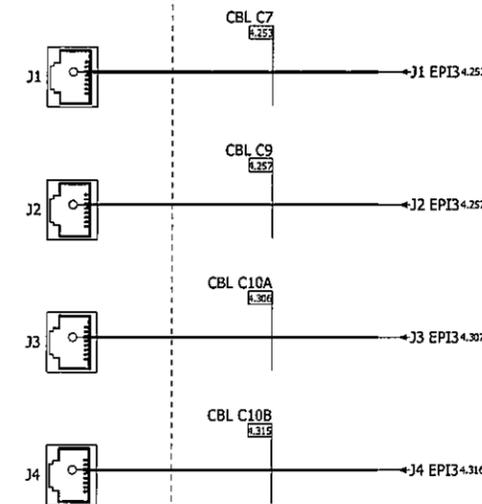
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EPI3  
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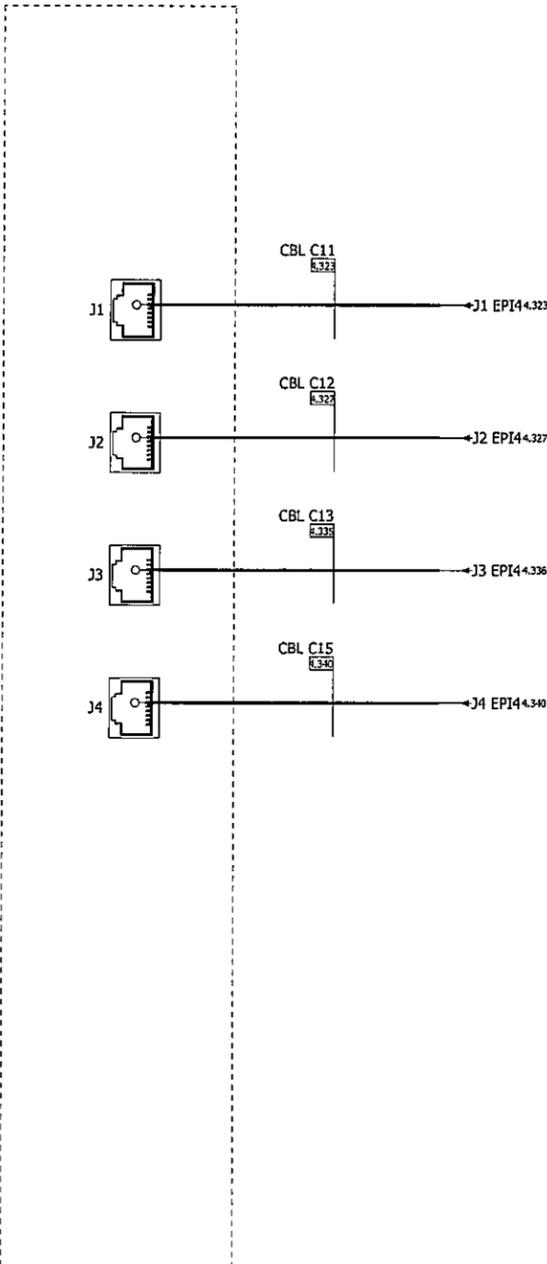
  
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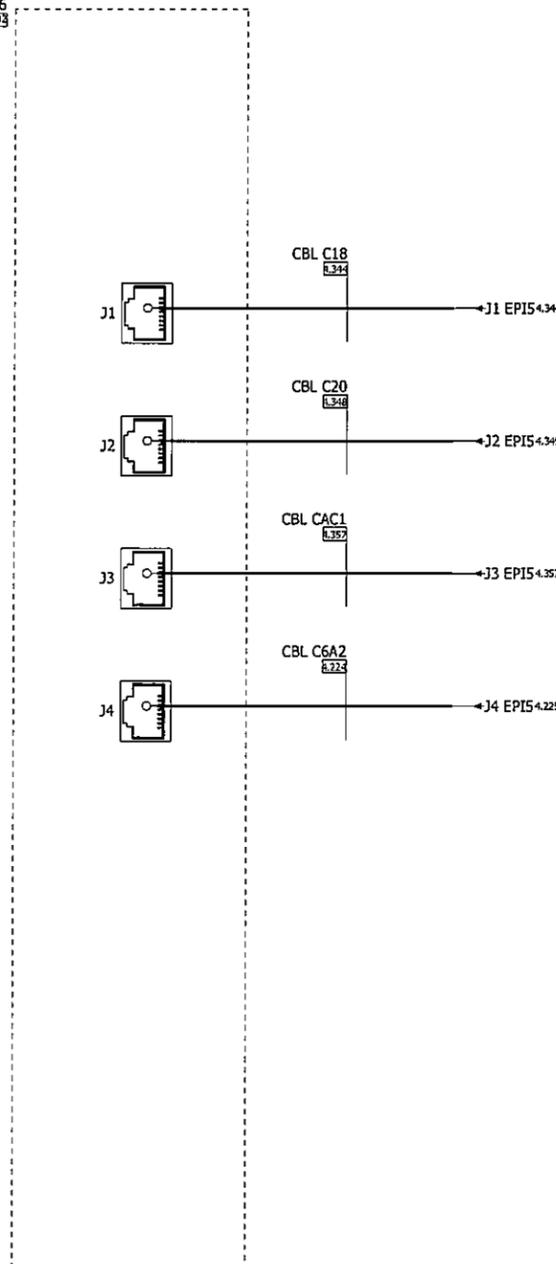
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EPI4  
Parallel Interface  
SLOT 5  
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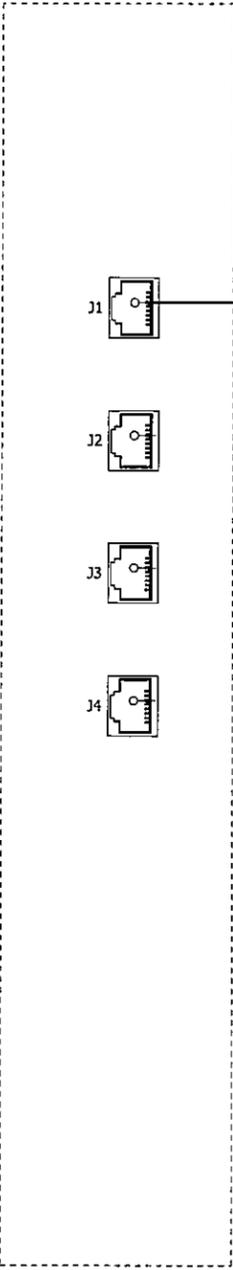
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				2	AS BUILT	2009-02-24	MARCL			DRAWN : DANY TURCOTTE DATE : 2009-05-05		Previous Page	Page	NEXT Page	MOUNTING LOCATION :	PAGE DESCRIPTION :	
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				4	AS BUILT	2009-04-29	MARCL			APPROVED :							
				5	FINAL	2009-05-05	MARCL										

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PROJECT NO :  
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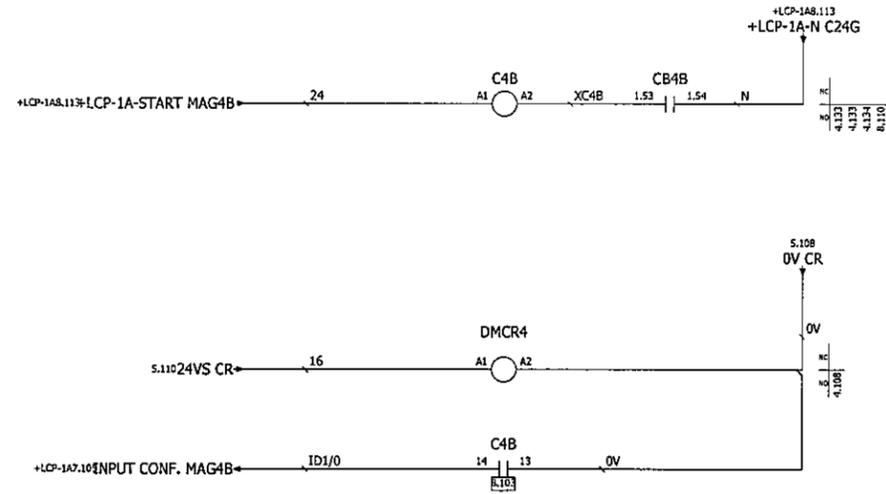
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				3	AS BUILT	2009-03-24	MARCL			CHECKED : DANY TURCOTTE	DATE : 2008-11-28			R:\Clients\Region of Waterloo 2474080421\Electrique\Plan\PC-449L		PC-449L		Waterloo	
				4	AS BUILT	2009-04-29	MARCL			APPROVED :	DATE :			R:\Clients\Region of Waterloo 2474080421\Electrique\Plan\PC-449L		PC-449L		Waterloo	
				5	FINAL	2009-05-05	MARCL							R:\Clients\Region of Waterloo 2474080421\Electrique\Plan\PC-449L		PC-449L		Waterloo	



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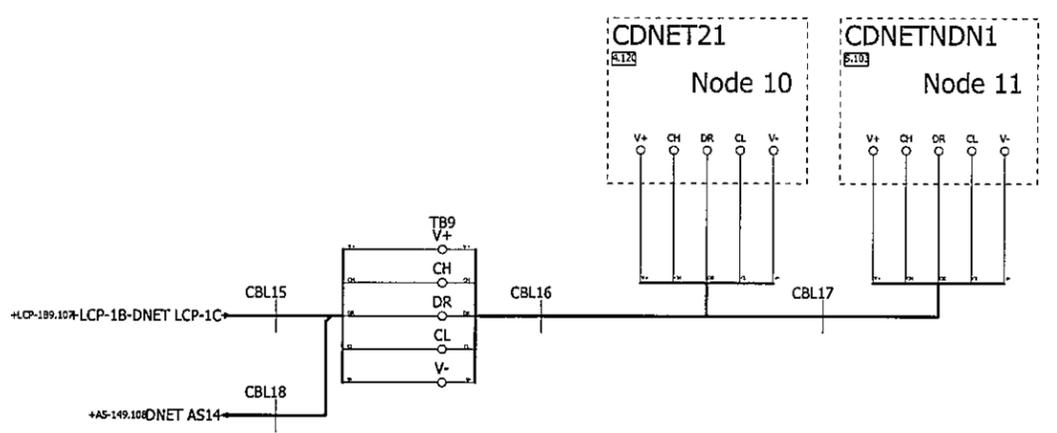


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				5	FINAL	2009-05-05	MARCL												
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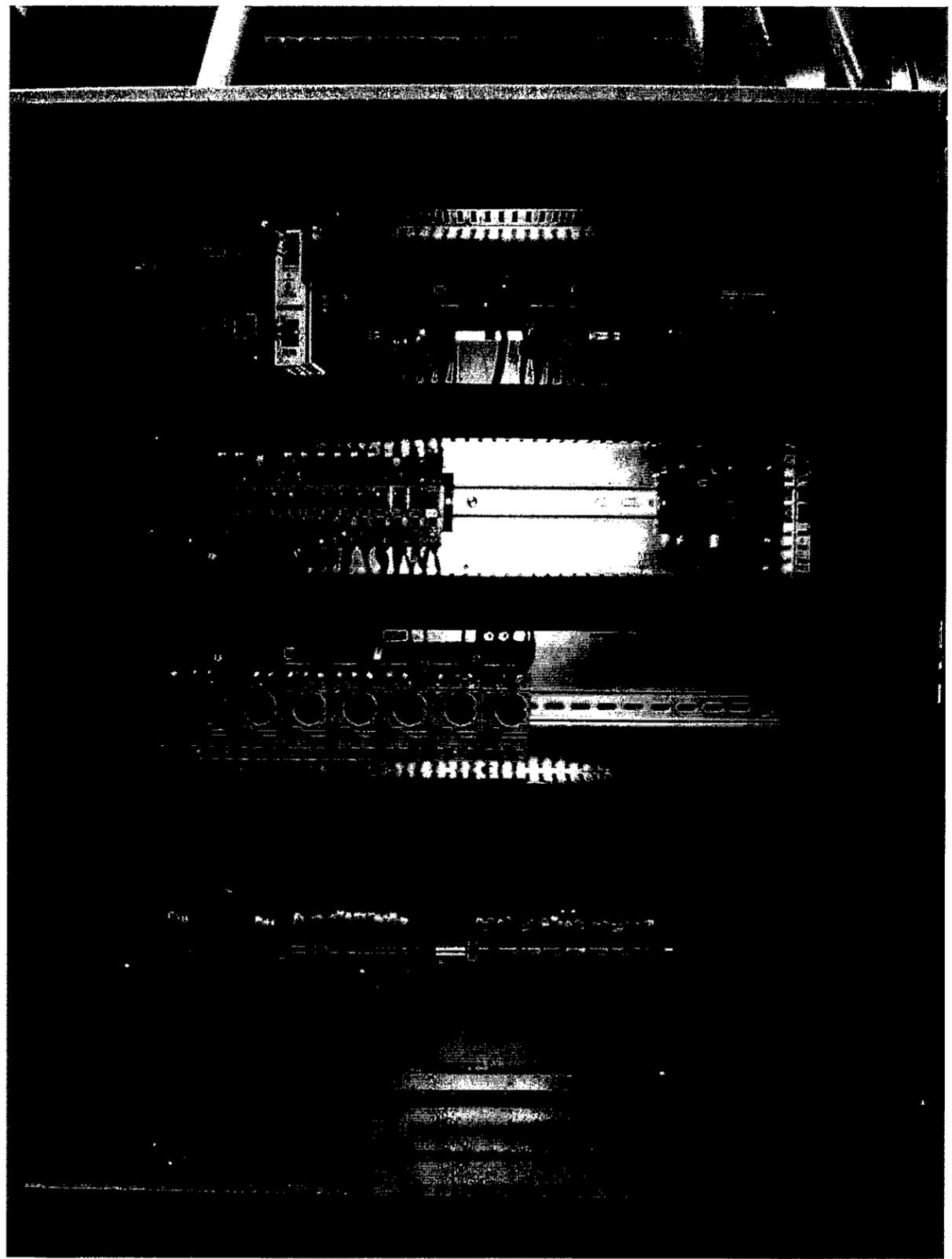
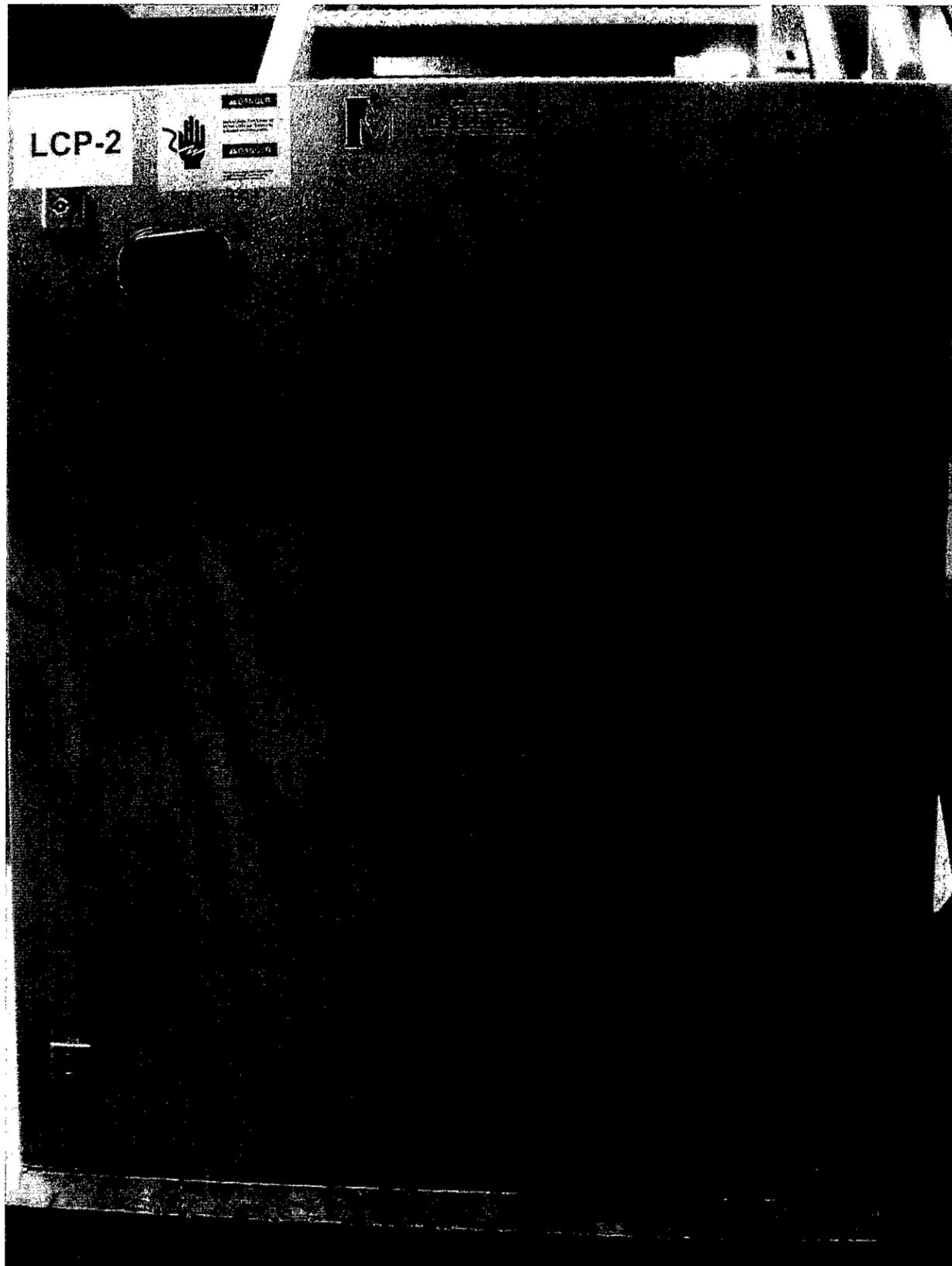
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				1	FOR CONSTRUCTION	2009-01-09	MARCL			PJ MNGR : DAVID MARCOUILLER DATE : 2008-11-25	 MACHINEX INDUSTRIES INC. 2121, Olivier Street Plessisville, Québec, Canada, G6L 3G9 Phone: (819) 362-3281 Fax: (819) 362-2280 E-mail : sales@machinex.ca	<b>REGION OF WATERLOO</b> 925, ERB STREET WEST WATERLOO, ONTARIO	<b>MATERIAL RECYCLING CENTER</b> CONTAINERS LINE	
			2	AS BUILT	2009-02-24	MARCL			DRAWN : DANY TURCOTTE DATE : 2009-05-05					
			3	AS BUILT	2009-03-24	MARCL			CHECKED : DANY TURCOTTE DATE : 2008-11-28					
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			5	FINAL	2009-05-05	MARCL								

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Previous Page	Page	NEXT Page	MOUNTING LOCATION :	PAGE DESCRIPTION :	REV.
8.1	9.1	+LCP-2/1.1	LCP-1C	Communication	
			PROJECT NO :	DRAWING NO :	
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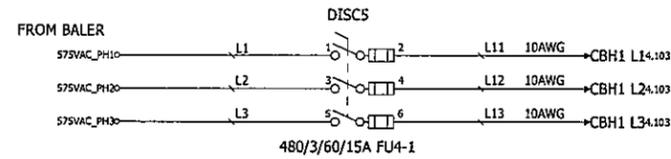


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				2	AS BUILT	2009-02-24	MARCL		DRAWN : DANY TURCOTTE DATE : 2009-05-05	925, ERB STREET WEST WATERLOO, ONTARIO		PROJECT NO :			
				3	AS BUILT	2009-03-24	MARCL		CHECKED : DANY TURCOTTE DATE : 2008-11-28	Previous Page		Page	NEXT Page		DRAWING NO :
				4	AS BUILT	2009-04-29	MARCL		APPROVED :	+LCP-1C/9.1					R:\clients\Region of Waterloo 2474080421\Electrique\Plan\PLAN-PC-449L (PC-449L Waterloo).e12
				5	FINAL	2009-05-05	MARCL		<small>THIS DRAWING IS THE PROPERTY OF MACHINEX INDUSTRIES INC. IT MAY NOT BE COPIED, REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS WITHOUT THE WRITTEN CONSENT OF MACHINEX INDUSTRIES INC. EQUIPMENT DRAWINGS OR THE DRAWINGING BEING RELEASED FOR MANUFACTURE. ANY CHANGE WILL RESULT IN A NOTICE OF CHANGE AND DELIVERY REWORKING.</small>						REV.



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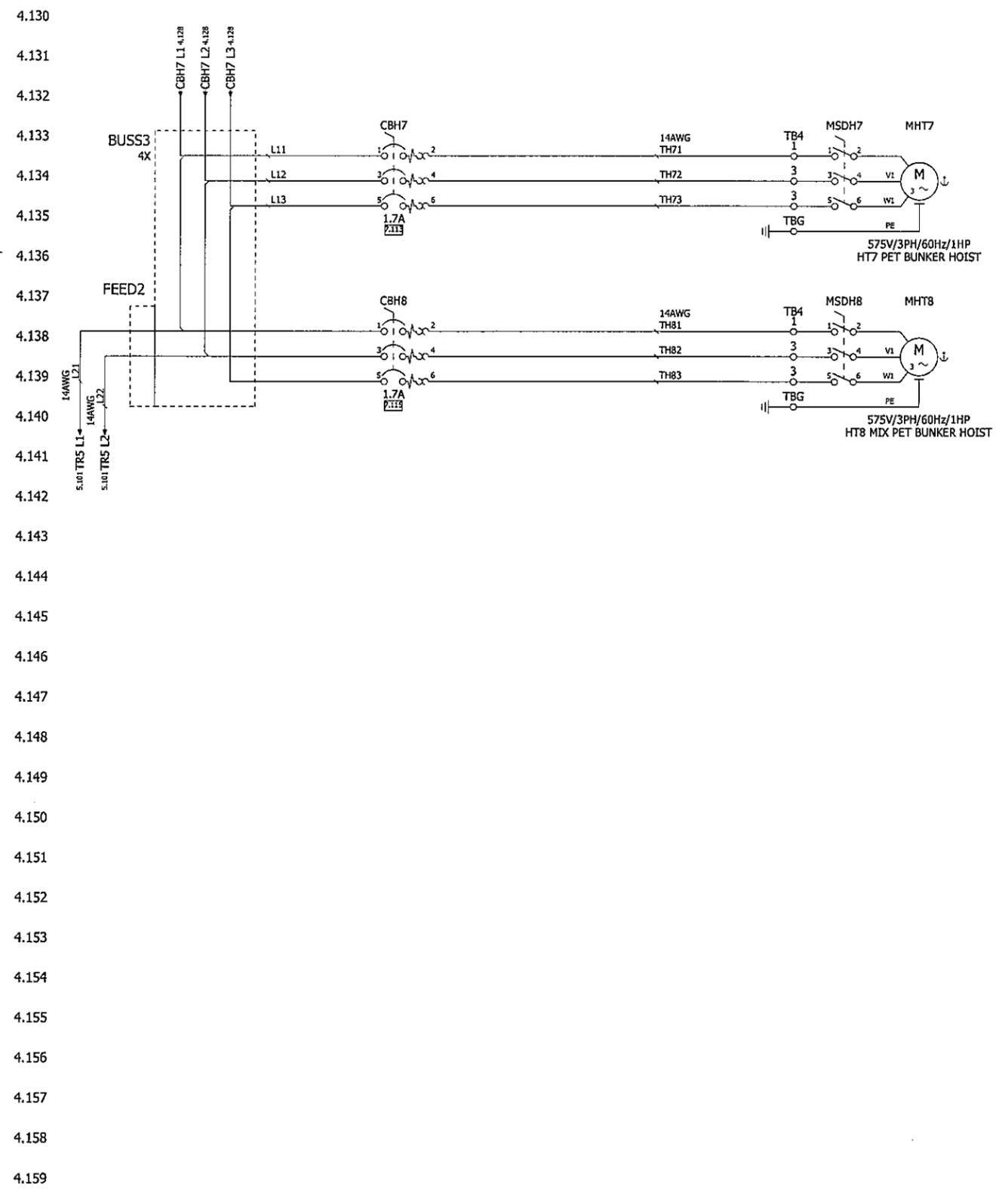
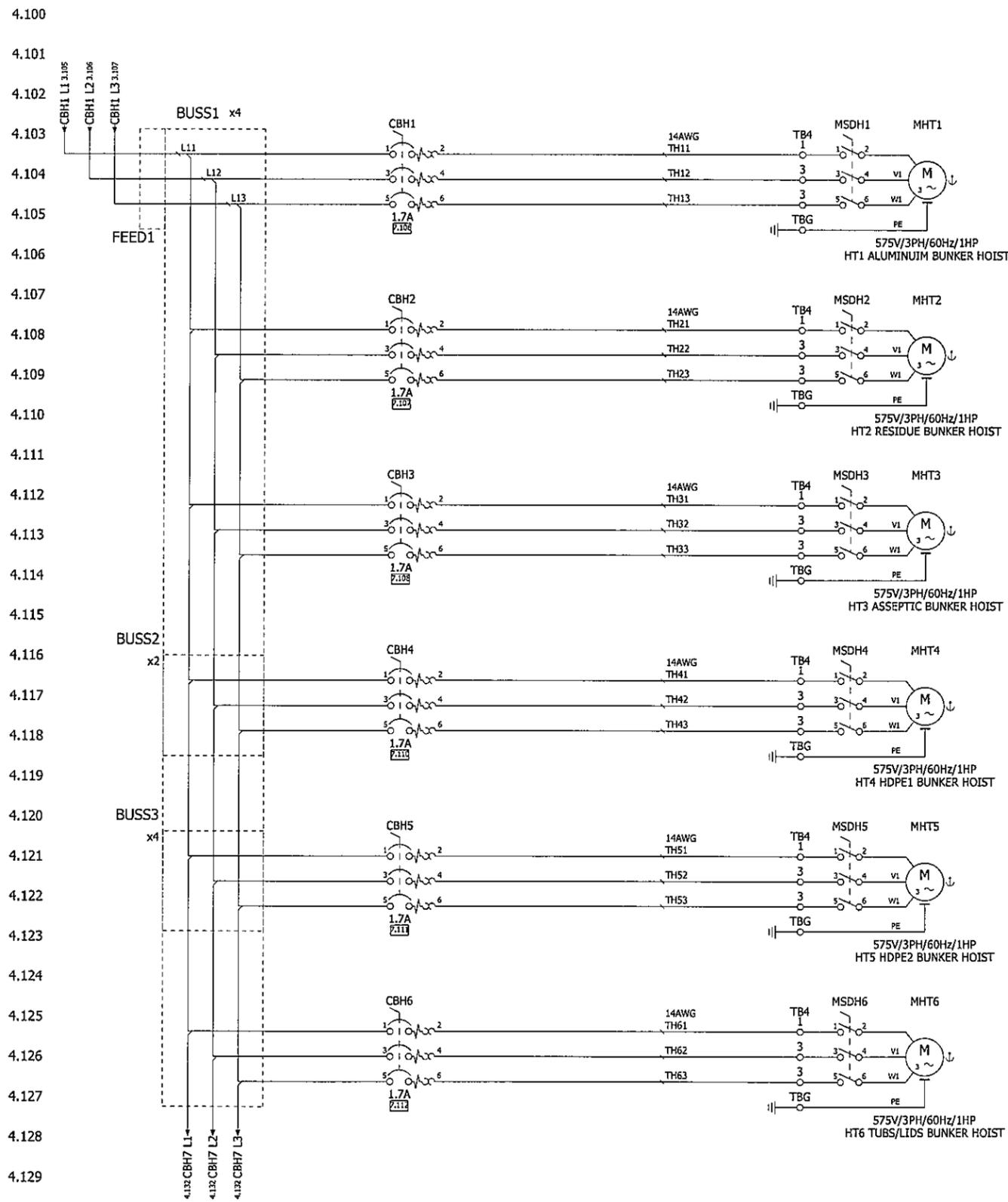
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				2	AS BUILT	2009-02-24	MARCL			DRAWN : DANY TURCOTTE	DATE : 2009-05-05					Previous Page	Page	NEXT Page
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				4	AS BUILT	2009-04-29	MARCL			APPROVED :	DATE :					MOUNTING LOCATION : LCP-2 PAGE DESCRIPTION : Power Distribution PROJECT NO : DRAWING NO :		
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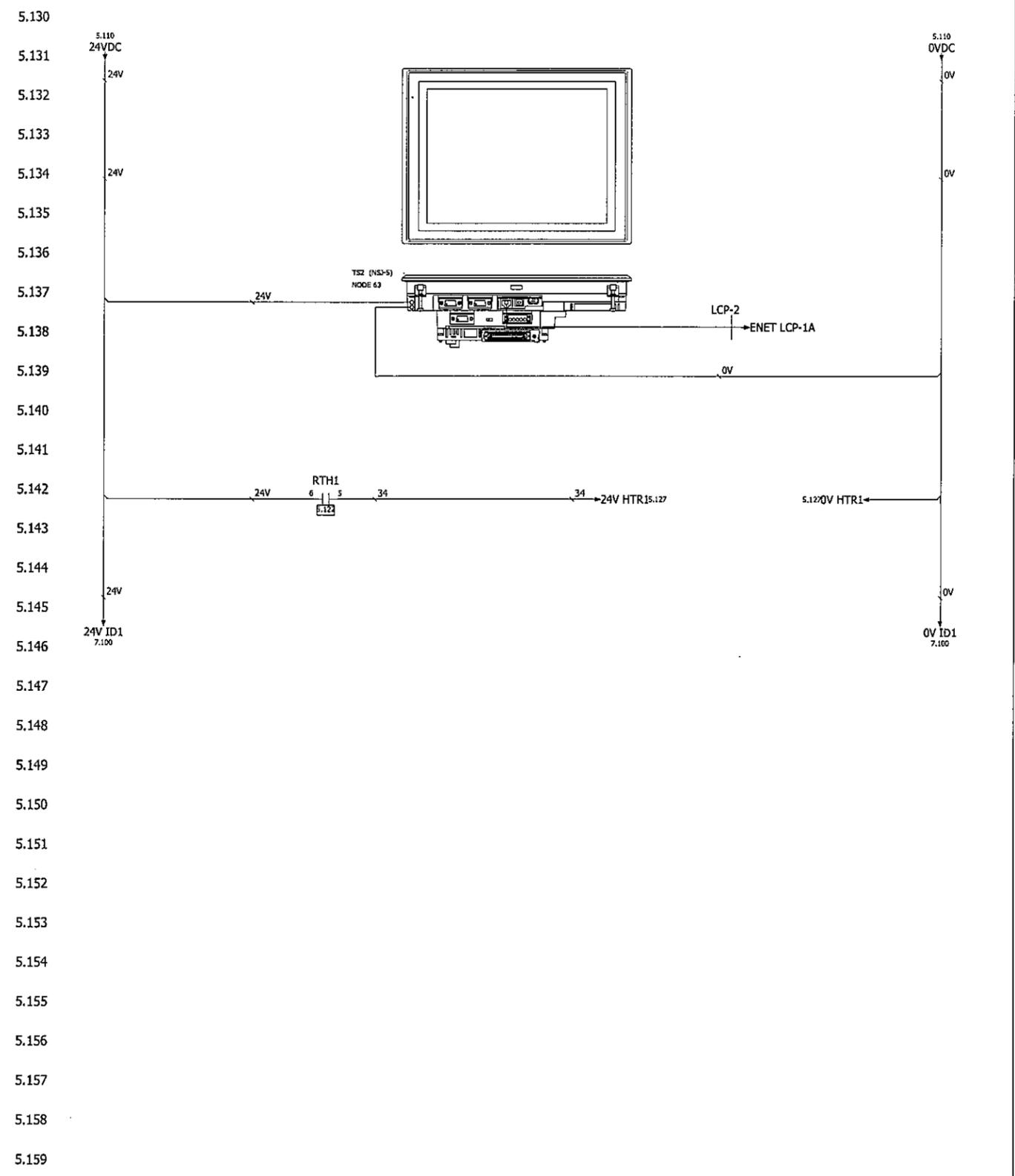
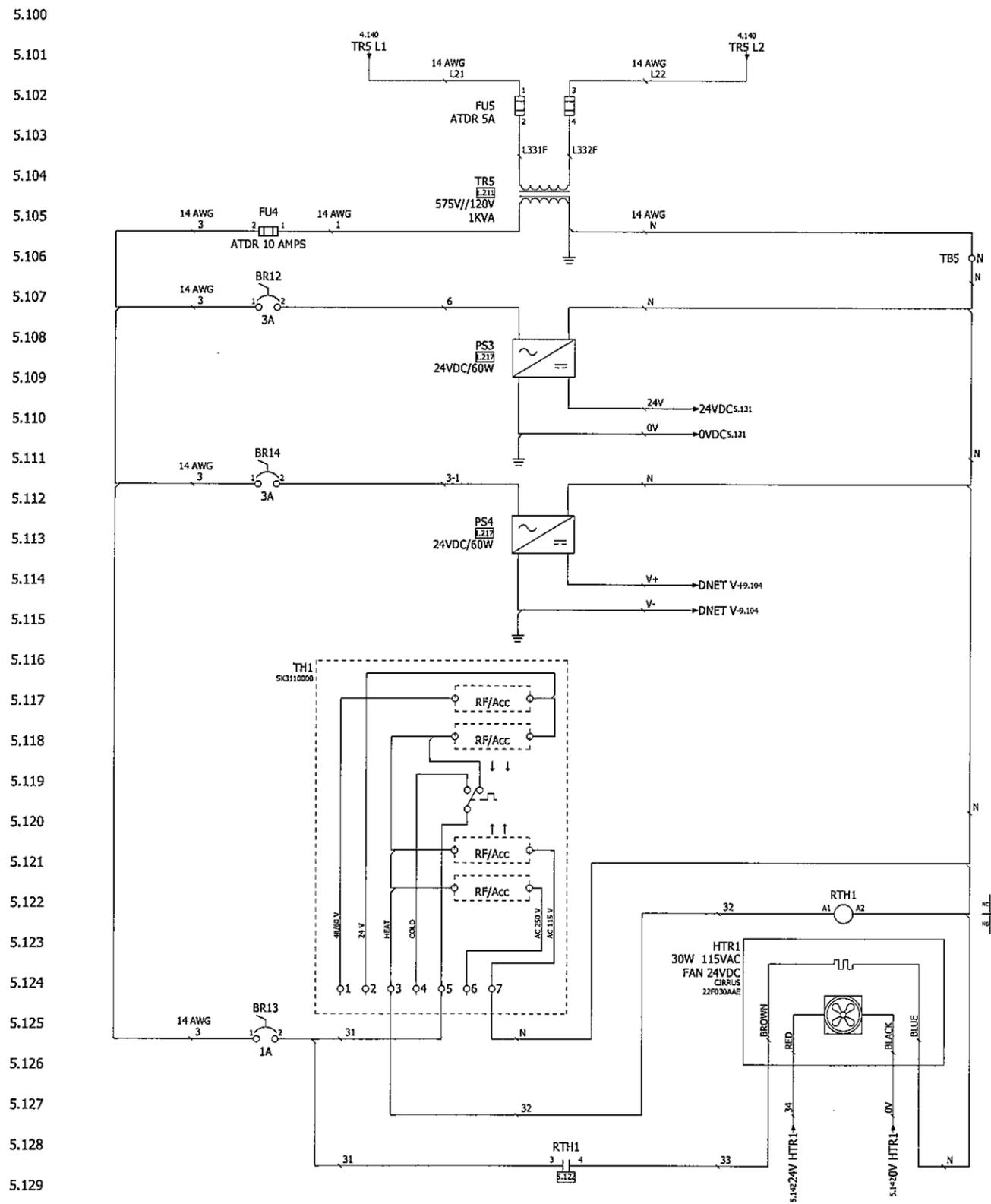


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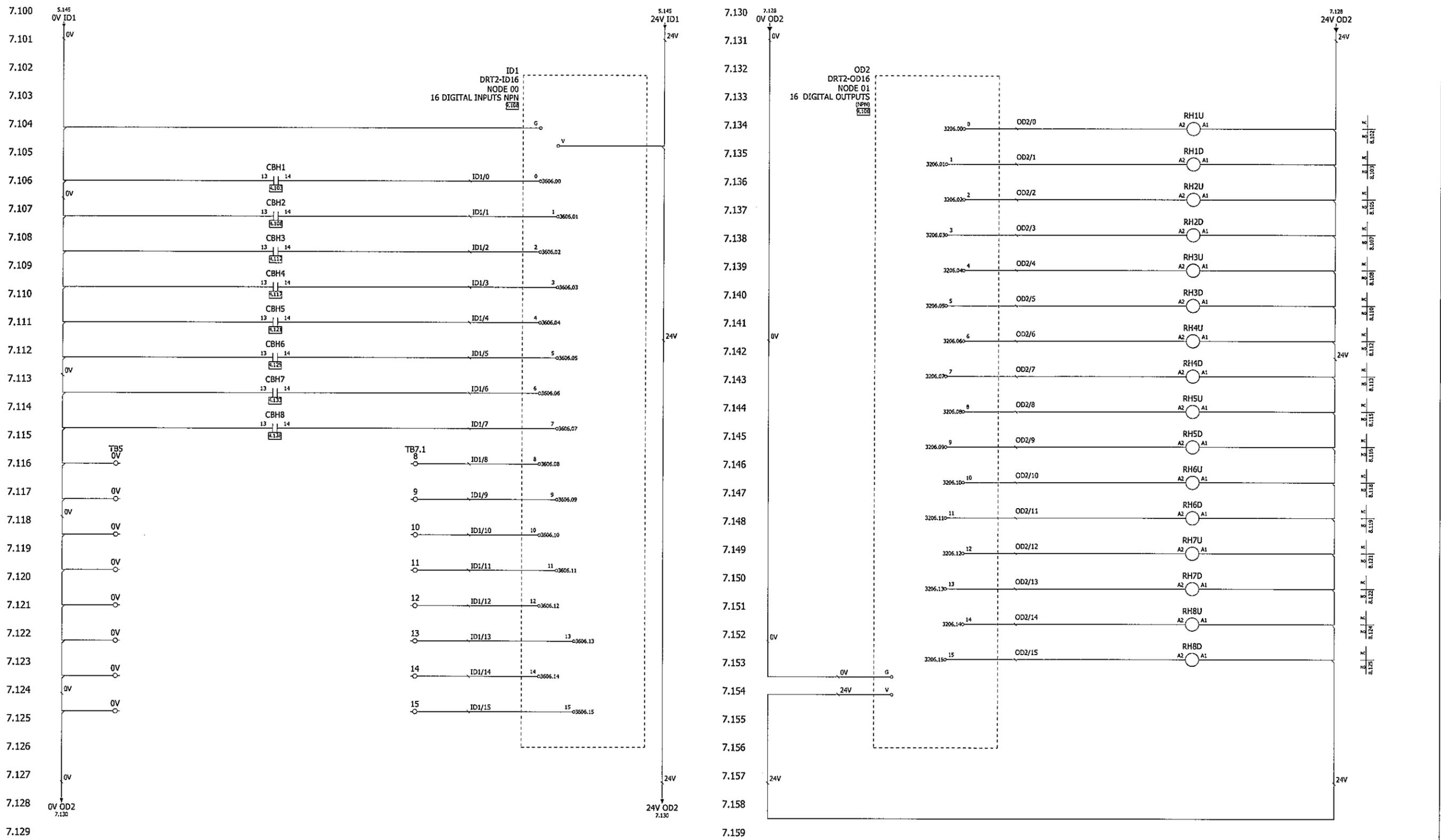


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2	AS BUILT	2009-02-24	MARCL						DRAWN : DANY TURCOTTE DATE : 2009-05-05	925, ERB STREET WEST WATERLOO, ONTARIO						
3	AS BUILT	2009-03-24	MARCL						CHECKED : DANY TURCOTTE DATE : 2008-11-28	Previous Page		Page	NEXT Page			
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5	FINAL	2009-05-05	MARCL												PROJECT NO :	DRAWING NO :

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REV.	DESCRIPTION	DATE	BY	REV.	DESCRIPTION	DATE	BY	STAMP	STAMP	SCALE	DESIGNED BY :	CLIENT :	MATERIAL RECYCLING CENTER			
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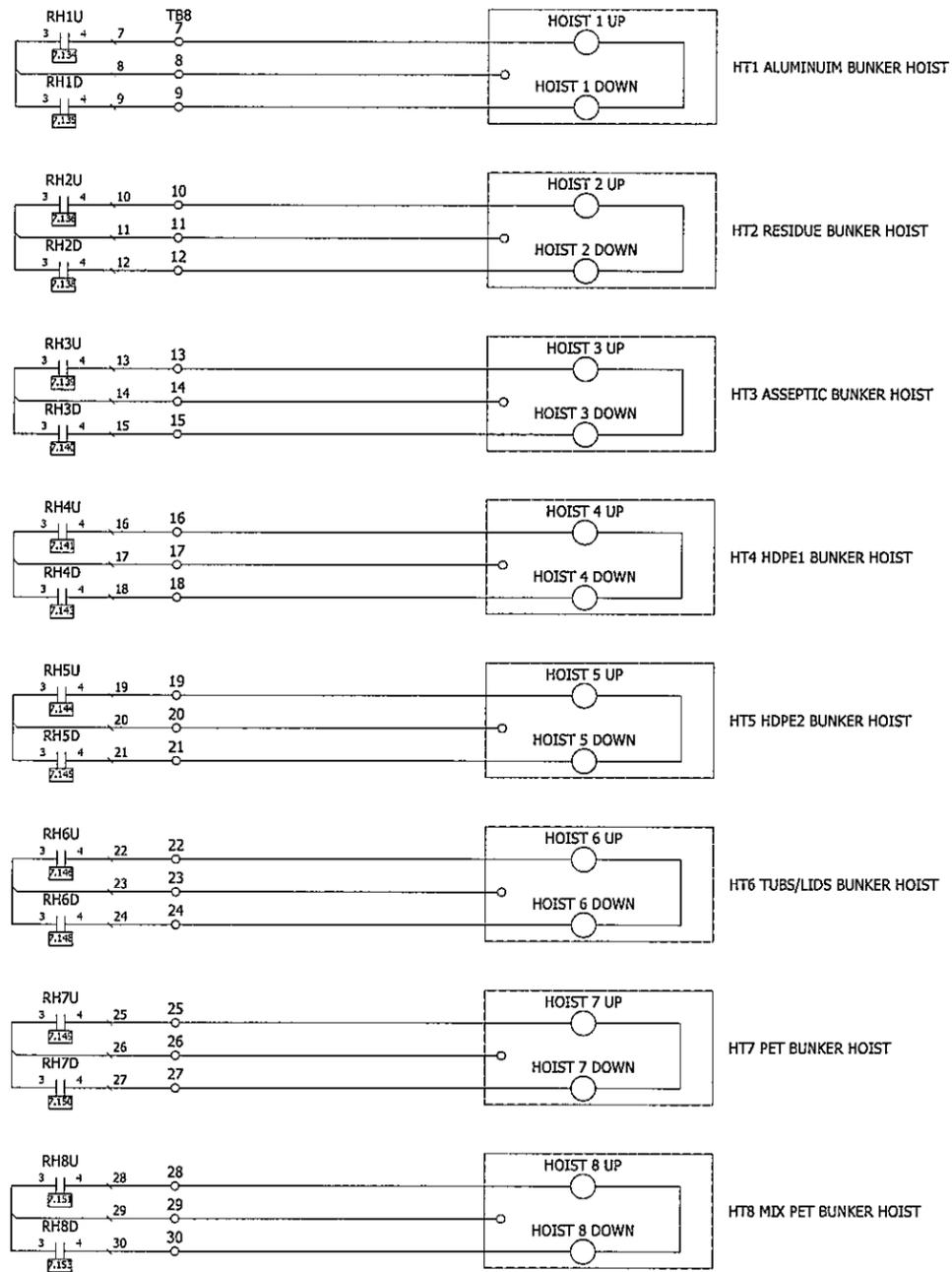
  

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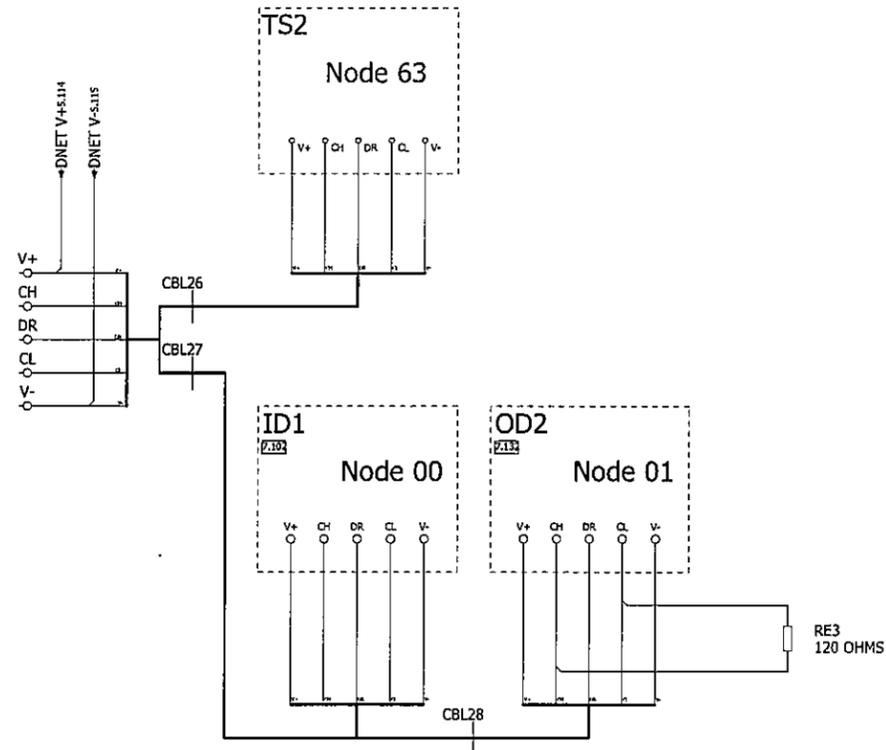
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REV.	DESCRIPTION	DATE	BY	REV.	DESCRIPTION	DATE	BY	STAMP	STAMP	SCALE	DESIGNED BY :	CLIENT :	MATERIAL RECYCLING CENTER			
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			2	AS BUILT	2009-02-24	MARCL			DRAWN : DANY TURCOTTE DATE : 2009-05-05	Previous Page			Page	NEXT Page	MOUNTING LOCATION : LCP-2	PAGE DESCRIPTION : Contact Relay
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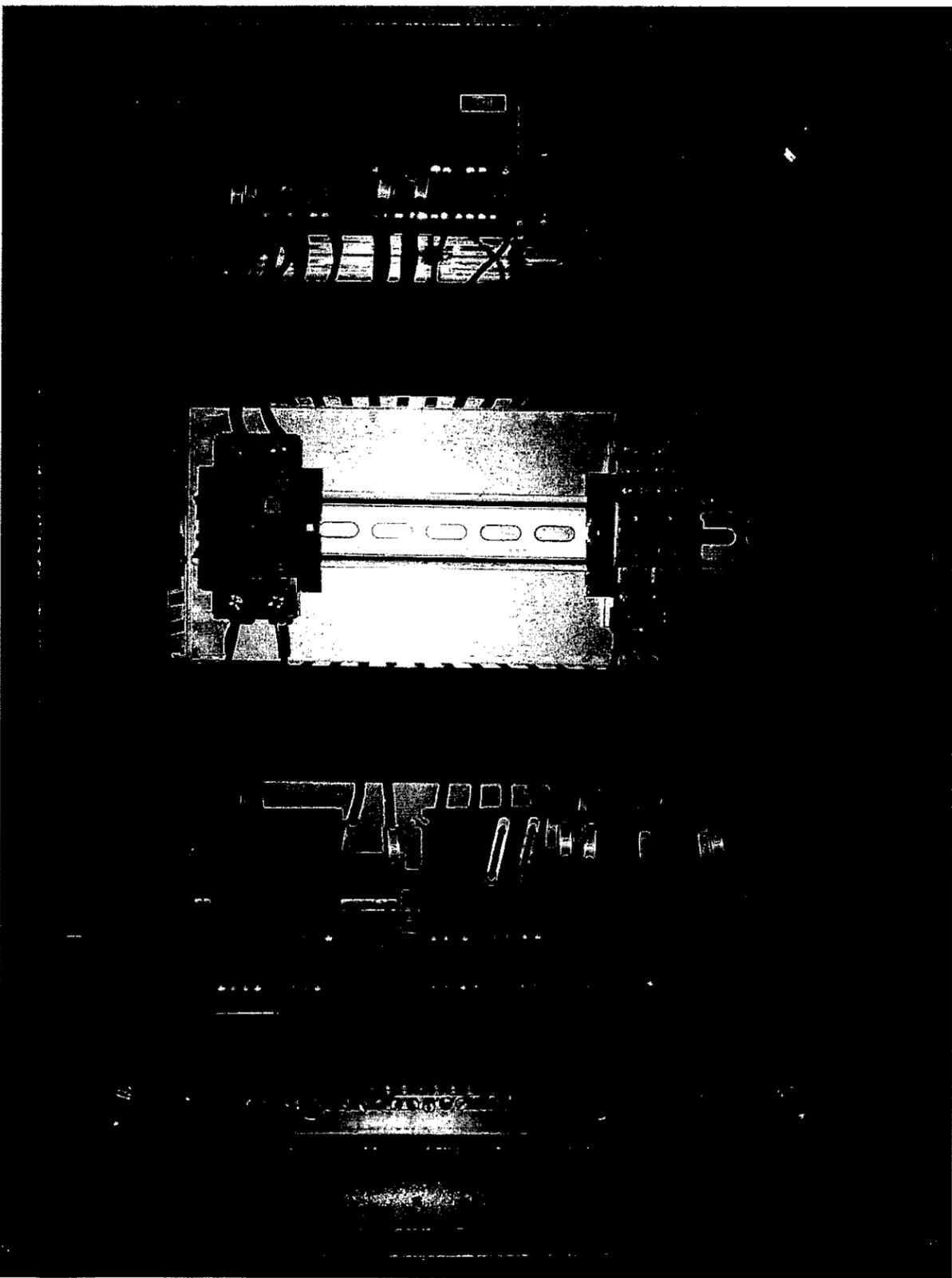
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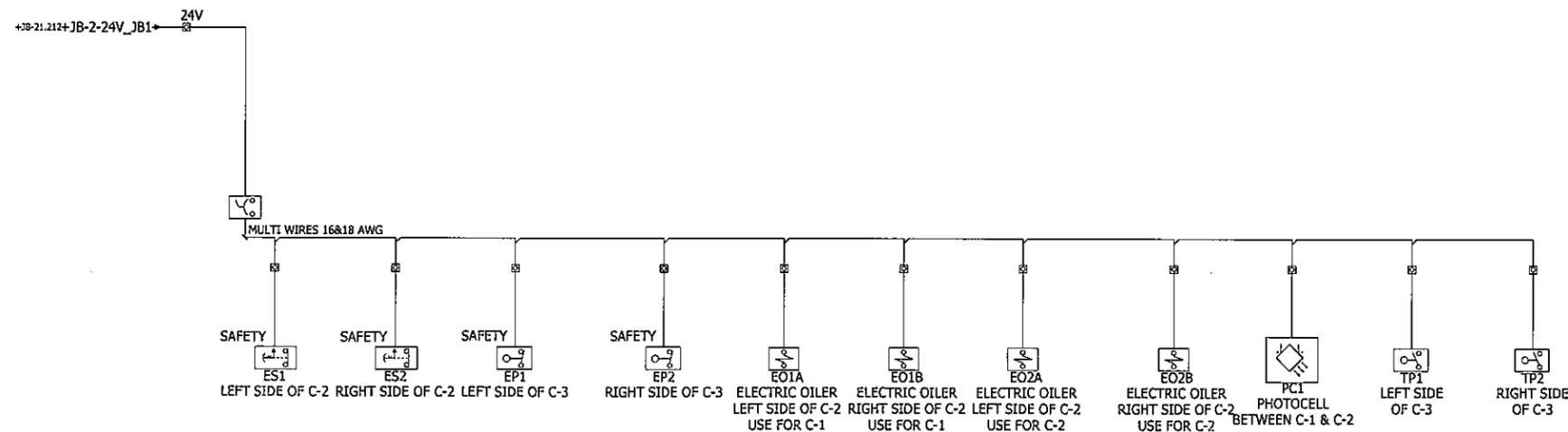
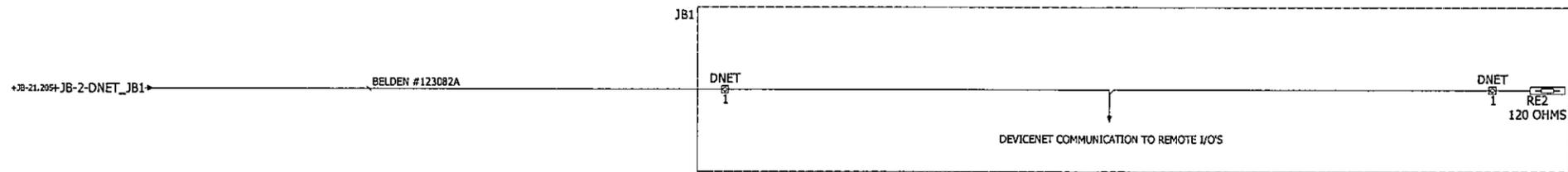
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REV.	DESCRIPTION	DATE	BY	REV.	DESCRIPTION	DATE	BY	STAMP	STAMP	SCALE	DESIGNED BY :	CLIENT :	MATERIAL RECYCLING CENTER				
				1	FOR CONSTRUCTION	2009-01-09	MARCL			PJ MNGR : DAVID MARCOUILLER	DATE : 2008-11-25	<b>REGION OF WATERLOO</b> 925, ERB STREET WEST WATERLOO, ONTARIO	<b>CONTAINERS LINE</b>				
				2	AS BUILT	2009-02-24	MARCL			DRAWN : DANY TURCOTTE	DATE : 2009-05-05						
				3	AS BUILT	2009-03-24	MARCL			CHECKED : DANY TURCOTTE	DATE : 2008-11-28						
				4	AS BUILT	2009-04-29	MARCL			APPROVED :	DATE :						
				5	FINAL	2009-05-05	MARCL										
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BJ-1



REV.	DESCRIPTION	DATE	BY	REV.	DESCRIPTION	DATE	BY	STAMP	STAMP	SCALE	DESIGNED BY :	CLIENT :	MATERIAL RECYCLING CENTER				
				1	FOR CONSTRUCTION	2009-01-09	MARCL			PJ MNGR : DAVID MARCOUILLER DATE : 2008-11-25	 <p>MACHINEX INDUSTRIES INC. 2121, Olivier Street Flessisville, Québec, Canada, G6L 3G9 Phone: (819) 362-3281 Fax: (819) 362-2280 E-mail: sales@machinex.ca</p>	<p>REGION OF WATERLOO</p> <p>925, ERB STREET WEST WATERLOO, ONTARIO</p>	<p>MATERIAL RECYCLING CENTER</p> <p>CONTAINERS LINE</p>				
			2	AS BUILT	2009-02-24	MARCL			DRAWN : DANY TURCOTTE DATE : 2009-05-05								
			3	AS BUILT	2009-03-24	MARCL			CHECKED : DANY TURCOTTE DATE : 2008-11-28								
			4	AS BUILT	2009-04-29	MARCL			APPROVED :								
			5	FINAL	2009-05-05	MARCL											
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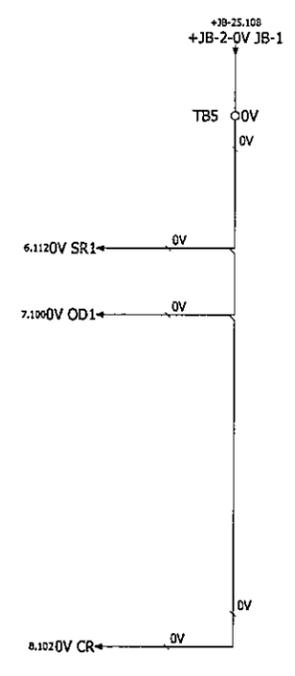
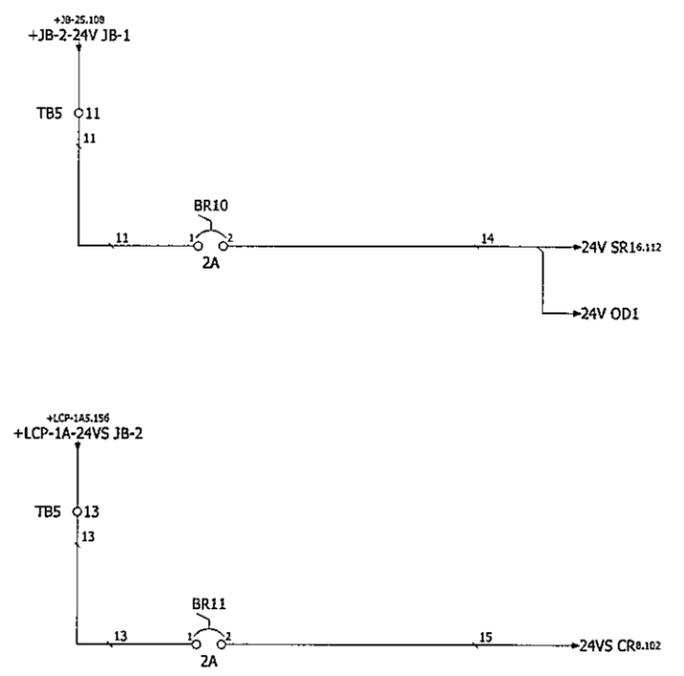
- WIRING MUST BE TECK CABLE WITH ALUMINIUM CONNECTORS, STAR-TECK OR EQUIVALENT APPROVED
- POWER WIRES FROM VFD'S MUST BE WIRED THROUGH SEPARATE CABLES FROM STANDARD MOTORS
- CONTROL WIRES MUST BE WIRED BY SEPARATE DIFFERENT VOLTAGE IN DIFFERENT CABLES
- UNLESS OTHER SPECIFICATIONS, FIELD WIRING MUST COMPLY WITH ALL APPLICABLE LAW IN FORCE AT TIME OF JOB
- ALL JUNCTION BOXES (JB) ARE SUPPLIED BY MACHINEX EXCEPT THOSE REQUIRED FOR FIELD WIRING THAT NEEDS TO BE SUPPLIED BY THE ELECTRICIAN

REV.	DESCRIPTION	DATE	BY	REV.	DESCRIPTION	DATE	BY	STAMP	STAMP	SCALE	DESIGNED BY :	CLIENT :	MATERIAL RECYCLING CENTER CONTAINERS LINE		
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				2	AS BUILT	2009-02-24	MARCL			DRAWN : DANY TURCOTTE	DATE : 2009-05-05		Previous Page	Page	NEXT Page
				3	AS BUILT	2009-03-24	MARCL			CHECKED : DANY TURCOTTE	DATE : 2008-11-28		1.1	1.1	1.1
				4	AS BUILT	2009-04-29	MARCL			APPROVED :	DATE :		PROJECT NO : DRAWING NO : REV.		
				5	FINAL	2009-05-05	MARCL						R:\clients\Region of Waterloo 2474080421\Electrique\Plan\PLAN\PC-449L @ 449L Waterloo.dwg		



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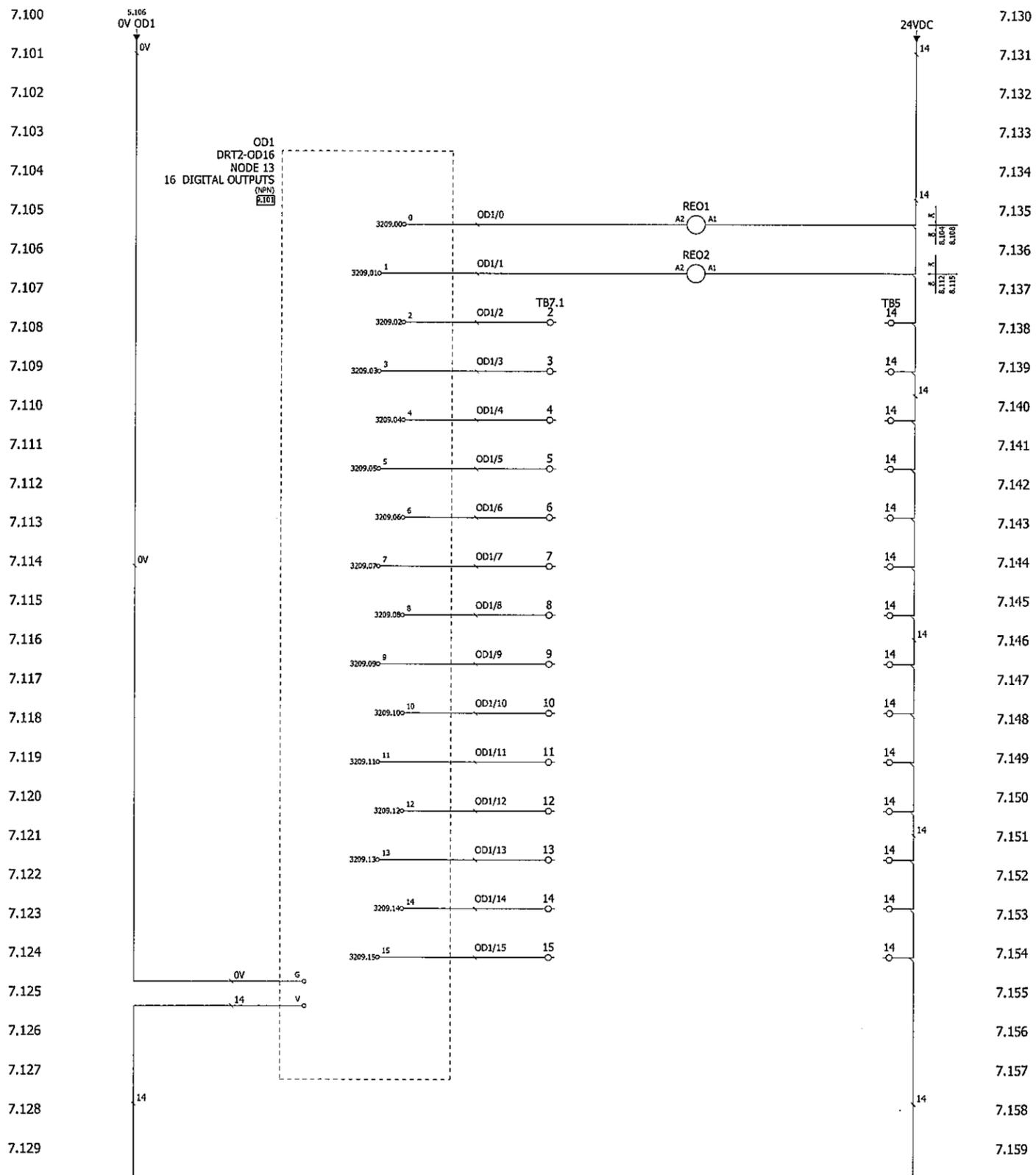
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REV.	DESCRIPTION	DATE	BY	REV.	DESCRIPTION	DATE	BY	STAMP	STAMP	SCALE	DESIGNED BY :	CLIENT :	MATERIAL RECYCLING CENTER				
1	FOR CONSTRUCTION	2009-01-09	MARCL							PJ MNGR : DAVID MARCOUILLER DATE : 2008-11-25	 MACHINEX INDUSTRIES INC. 2121, Olivier Street Flessville, Québec, Canada, G6L 3G9 Phone: (819) 362-3281 Fax: (819) 362-2280 E-mail: sales@machinex.ca	REGION OF WATERLOO 925, ERB STREET WEST WATERLOO, ONTARIO			CONTAINERS LINE		
2	AS BUILT	2009-02-24	MARCL						DRAWN : DANY TURCOTTE DATE : 2009-05-05	Previous Page		Page	NEXT Page	MOUNTING LOCATION :	PAGE DESCRIPTION :	REV.	
3	AS BUILT	2009-03-24	MARCL						CHECKED : DANY TURCOTTE DATE : 2008-11-28	1.2		5.1	6.1	JB-1	Control Distribution		
4	AS BUILT	2009-04-29	MARCL						APPROVED :					PROJECT NO :	DRAWING NO :		
5	FINAL	2009-05-05	MARCL											R:\Clients\Region of Waterloo 2474080421\Electrique\Plan\PLAN\PC-449L	PC-449L	Waterloo	

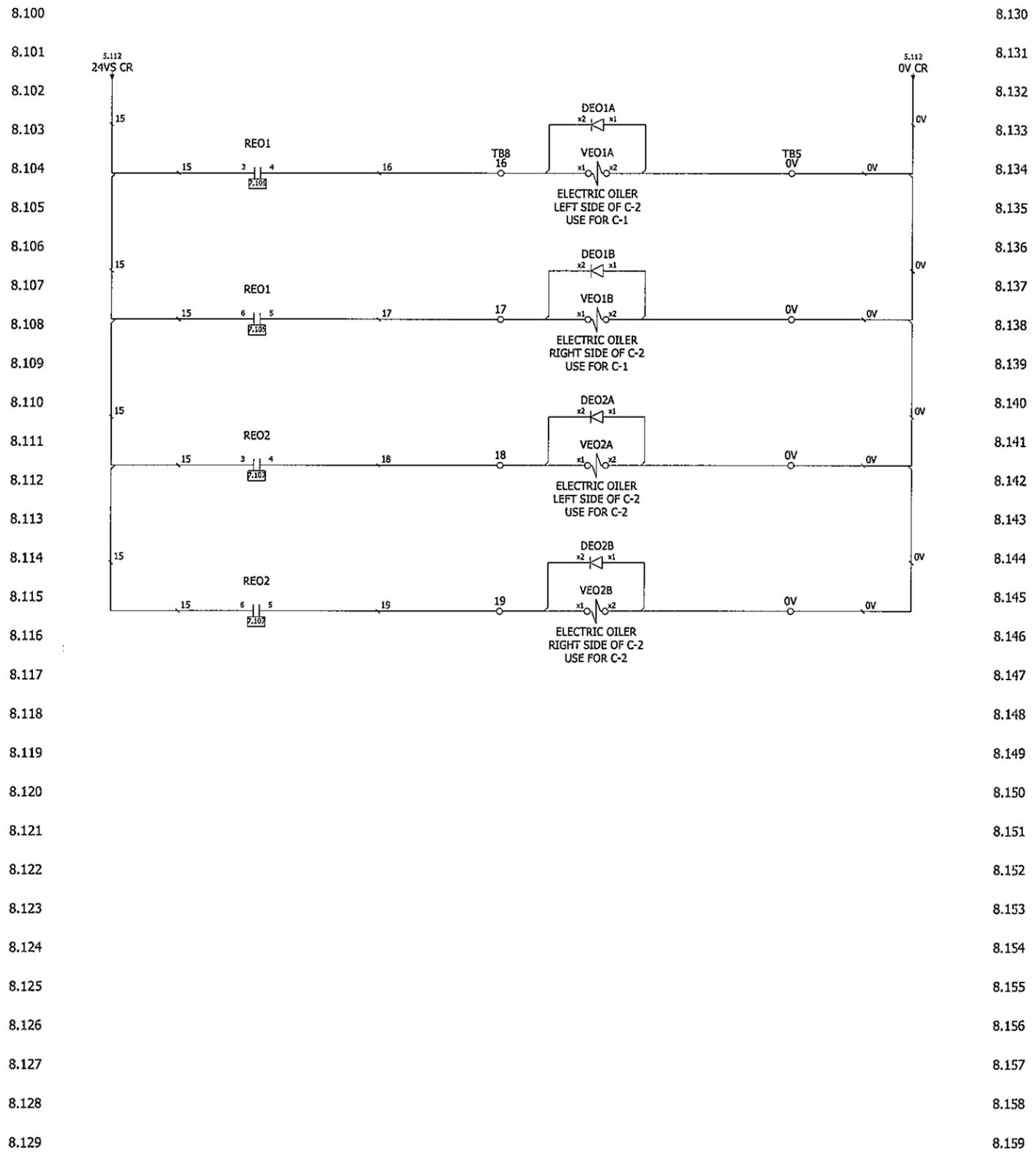




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REV.	DESCRIPTION	DATE	BY	REV.	DESCRIPTION	DATE	BY	STAMP	STAMP	SCALE	DESIGNED BY :	CLIENT :	MOUNTING LOCATION :	PAGE DESCRIPTION :	REV.		
1	FOR CONSTRUCTION	2009-01-09	MARCL							PJ MNGR : DAVID MARCOUILLER DATE : 2008-11-25	 MACHINEX INDUSTRIES INC. 2121, Olivier Street Mississauga, Québec, Canada, G6L 3G9 Phone: (819) 362-3281 Fax: (819) 362-2280 E-mail : sales@machinex.ca	<b>REGION OF WATERLOO</b> 925, ERB STREET WEST WATERLOO, ONTARIO	<b>MATERIAL RECYCLING CENTER</b> CONTAINERS LINE				
2	AS BUILT	2009-02-24	MARCL						DRAWN : DANY TURCOTTE DATE : 2009-05-05	Previous Page				Page	NEXT Page	JB-1	I/O
3	AS BUILT	2009-03-24	MARCL						CHECKED : DANY TURCOTTE DATE : 2008-11-28	6.1				7.1	8.1		
4	AS BUILT	2009-04-29	MARCL						APPROVED :								
5	FINAL	2009-05-05	MARCL														

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REV.	DESCRIPTION	DATE	BY	REV.	DESCRIPTION	DATE	BY	STAMP	STAMP
1	FOR CONSTRUCTION	2009-01-09	MARCL						
2	AS BUILT	2009-02-24	MARCL						
3	AS BUILT	2009-03-24	MARCL						
4	AS BUILT	2009-04-29	MARCL						
5	FINAL	2009-05-05	MARCL						

SCALE	
PJ MNGR : DAVID MARCOUILLER	DATE : 2008-11-25
DRAWN : DANY TURCOTTE	DATE : 2009-05-05
CHECKED : DANY TURCOTTE	DATE : 2008-11-28
APPROVED :	DATE :

DESIGNED BY :

MACHINEX INDUSTRIES INC.  
 2122, Olivier Street  
 Plessisville, Québec, Canada, G6L 3G9  
 Phone: (819) 362-3281  
 Fax: (819) 362-2280 E-mail: sales@machinex.ca

CLIENT : REGION OF WATERLOO MATERIAL RECYCLING CENTER

925, ERB STREET WEST  
 WATERLOO, ONTARIO

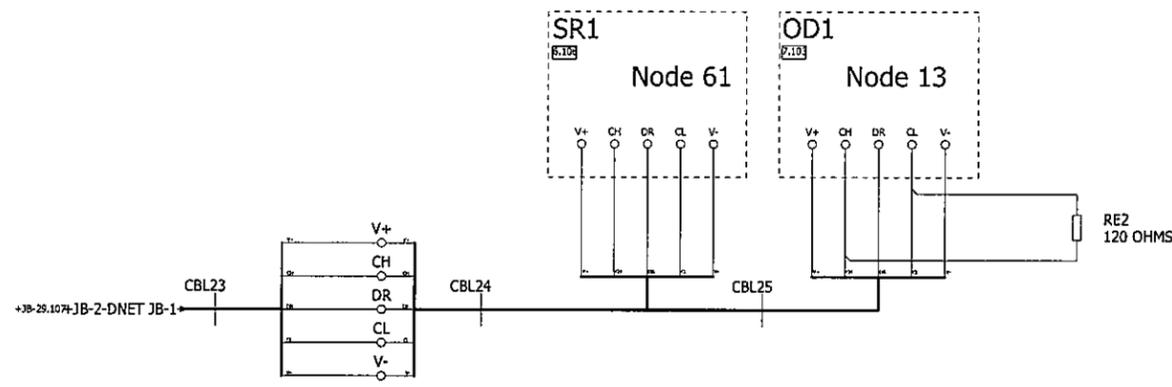
CONTAINERS LINE

Previous Page	Page	NEXT Page	MOUNTING LOCATION :	PAGE DESCRIPTION :
7.1	8.1	9.1	JB-1	Contact Relay
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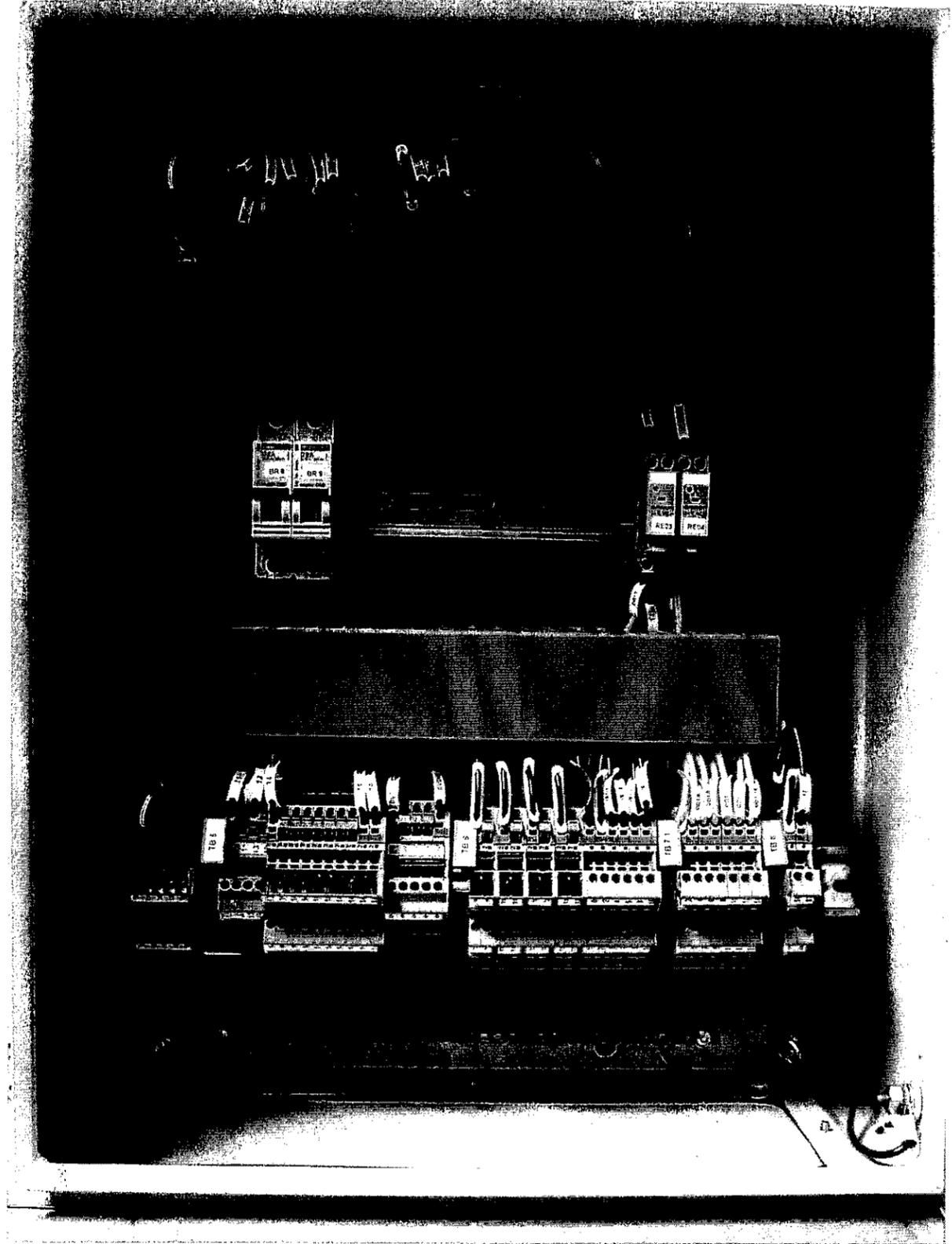
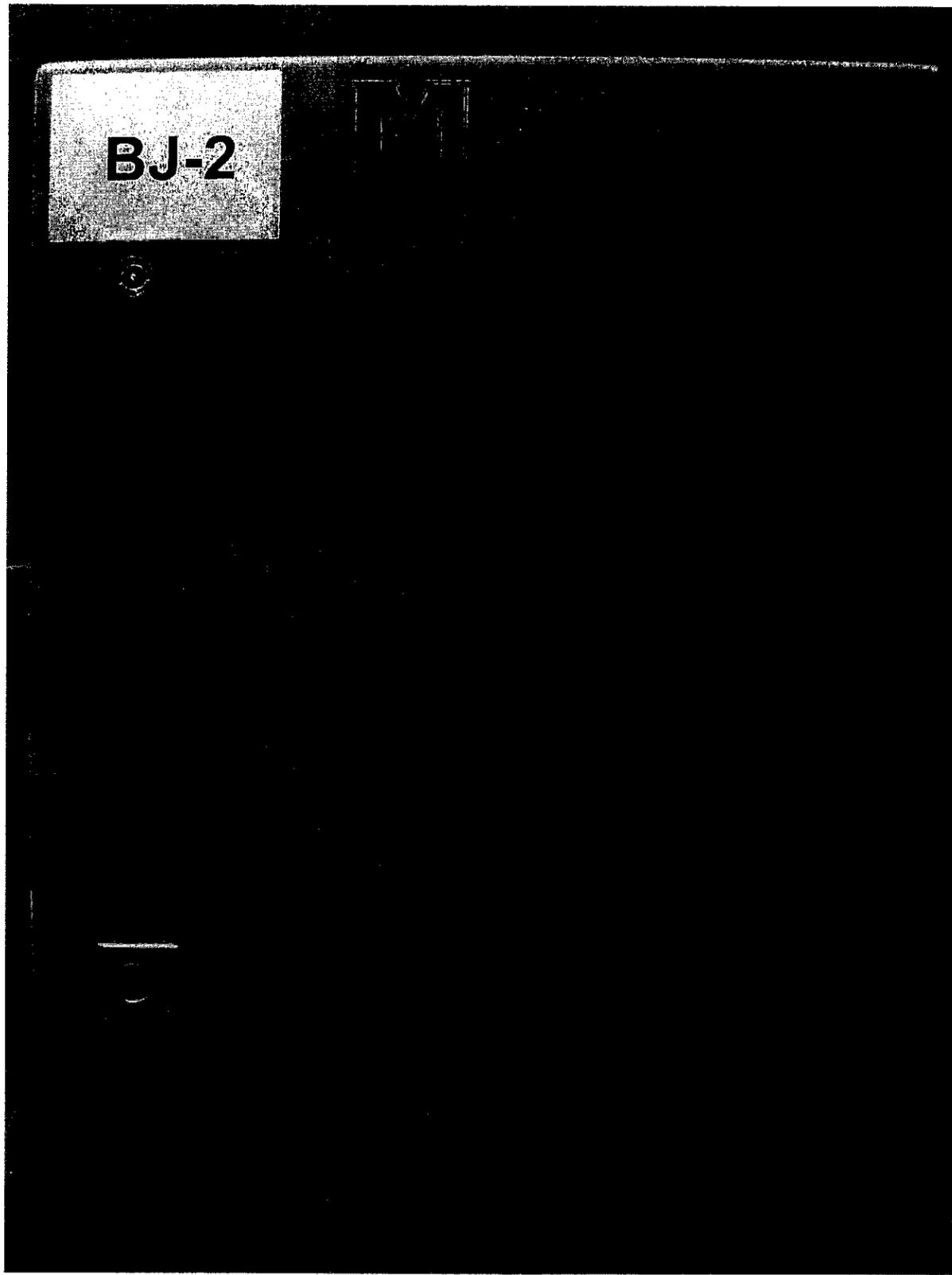
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REV.	DESCRIPTION	DATE	BY	REV.	DESCRIPTION	DATE	BY	STAMP	STAMP	SCALE	DESIGNED BY :	CLIENT :	MATERIAL RECYCLING CENTER	
				1	FOR CONSTRUCTION	2009-01-09	MARCL			PJ MAIGR : DAVID MARCOUILLER	DATE : 2008-11-25	<b>REGION OF WATERLOO</b> 925, ERB STREET WEST WATERLOO, ONTARIO	<b>CONTAINERS LINE</b>	
				2	AS BUILT	2009-02-24	MARCL			DRAWN : DANY TURCOTTE	DATE : 2009-05-05			
				3	AS BUILT	2009-03-24	MARCL			CHECKED : DANY TURCOTTE	DATE : 2008-11-28			
				4	AS BUILT	2009-04-29	MARCL			APPROVED :	DATE :			
				5	FINAL	2009-05-05	MARCL							
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REV.	DESCRIPTION	DATE	BY	REV.	DESCRIPTION	DATE	BY	STAMP	STAMP	SCALE	DESIGNED BY :	CLIENT :	MOUNTING LOCATION :		PAGE DESCRIPTION :		PROJECT NO :	DRAWING NO :	REV.	
				1	FOR CONSTRUCTION	2009-01-09	MARCL					REGION OF WATERLOO	MATERIAL RECYCLING CENTER	JB-2		Panel Layout				
				2	AS BUILT	2009-02-24	MARCL					925, ERB STREET WEST	CONTAINERS LINE	Previous Page	Page	NEXT Page				
				3	AS BUILT	2009-03-24	MARCL					WATERLOO, ONTARIO		+JB-1/9.1						
				4	AS BUILT	2009-04-29	MARCL													
				5	FINAL	2009-05-05	MARCL													

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2121, Olivier Street  
Plessisville, Québec, Canada, G6L 3G9  
Phone: (819) 362-3281  
Fax: (819) 362-2280 E-mail: sales@machinex.ca

DESIGNED BY :

CLIENT :

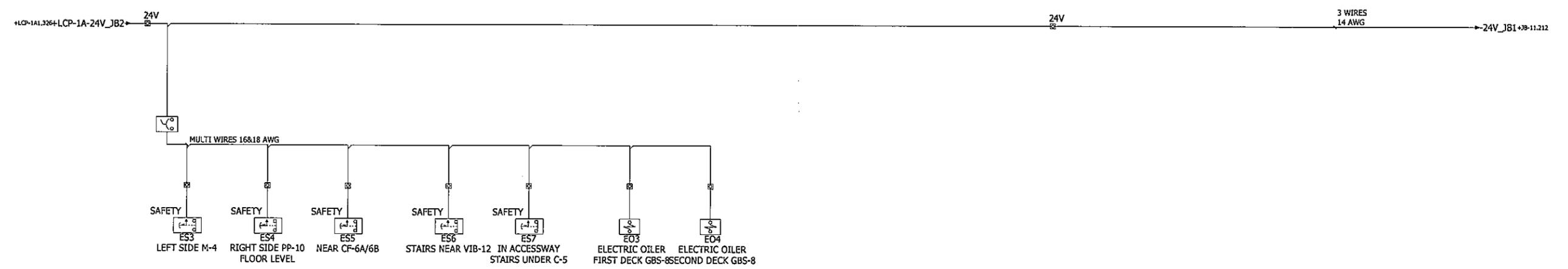
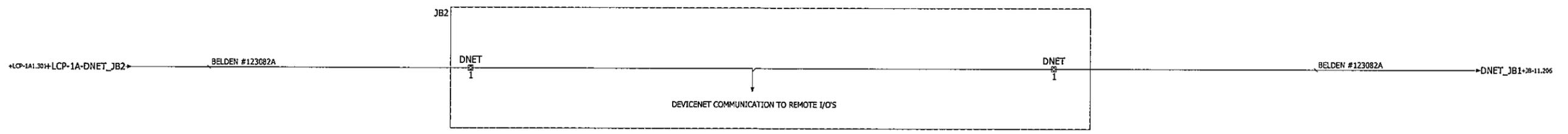
REGION OF WATERLOO

925, ERB STREET WEST

WATERLOO, ONTARIO

MATERIAL RECYCLING CENTER

CONTAINERS LINE

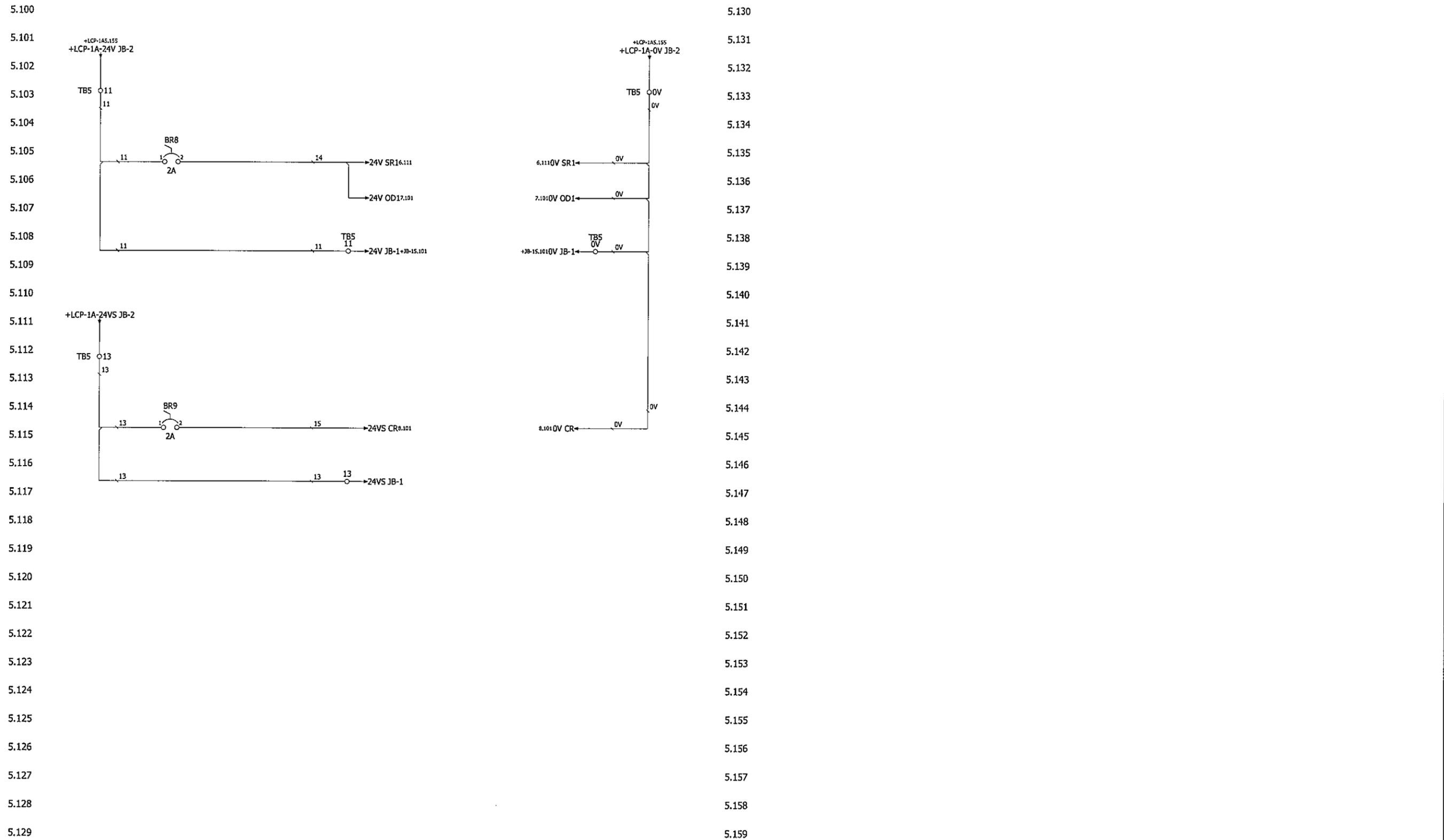


- WIRING MUST BE TECK CABLE WITH ALUMINIUM CONNECTORS, STAR-TECK OR EQUIVALENT APPROVED
- POWER WIRES FROM VFD'S MUST BE WIRED TROUGH SEPARATE CABLES FROM STANDARD MOTORS
- CONTROL WIRES MUST BE WIRED BY SEPARATE DIFFERENT VOLTAGE IN DIFFERENT CABLES
- UNLESS OTHER SPECIFICATIONS, FIELD WIRING MUST COMPLY WITH ALL APPLICABLE LAW IN FORCE AT TIME OF JOB
- ALL JONCTION BOXES (JB) ARE SUPPLIED BY MACHINEX EXCEPT THOSE REQUIRED FOR FIELD WIRING THAT NEEDS TO BE SUPPLIED BY THE ELECTRICIAN

REV.	DESCRIPTION	DATE	BY	REV.	DESCRIPTION	DATE	BY	STAMP	STAMP	SCALE	DESIGNED BY :	CLIENT :	MOUNTING LOCATION :	PAGE DESCRIPTION :	PROJECT NO :	DRAWING NO :	REV.
				1	FOR CONSTRUCTION	2009-01-09	MARCL						REGION OF WATERLOO	SINGLE LINE DIAGRAM			
				2	AS BUILT	2009-02-24	MARCL						925, ERB STREET WEST				
				3	AS BUILT	2009-03-24	MARCL						WATERLOO, ONTARIO				
				4	AS BUILT	2009-04-29	MARCL										
				5	FINAL	2009-05-05	MARCL										

PJ MNGR : DAVID MARCOUILLER DATE : 2008-11-25 DRAWN : DANY TURCOTTE DATE : 2009-05-05 CHECKED : DANY TURCOTTE DATE : 2008-11-28 APPROVED : DATE :	<p>MACHINEX INDUSTRIES INC.          2121, Olivier Street          Plessisville, Quebec, Canada, G6L 3G9          Phone: (819) 362-3281          Fax: (819) 362-2280 E-mail: sales@machinex.ca</p>	REGION OF WATERLOO 925, ERB STREET WEST WATERLOO, ONTARIO	MATERIAL RECYCLING CENTER CONTAINERS LINE
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REV.	DESCRIPTION	DATE	BY	REV.	DESCRIPTION	DATE	BY
				1	FOR CONSTRUCTION	2009-01-09	MARCL
				2	AS BUILT	2009-02-24	MARCL
				3	AS BUILT	2009-03-24	MARCL
				4	AS BUILT	2009-04-29	MARCL
				5	FINAL	2009-05-05	MARCL

STAMP	STAMP	SCALE
		PJ MNGR : DAVID MARCOUILLER DATE : 2008-11-25
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		APPROVED : DATE :

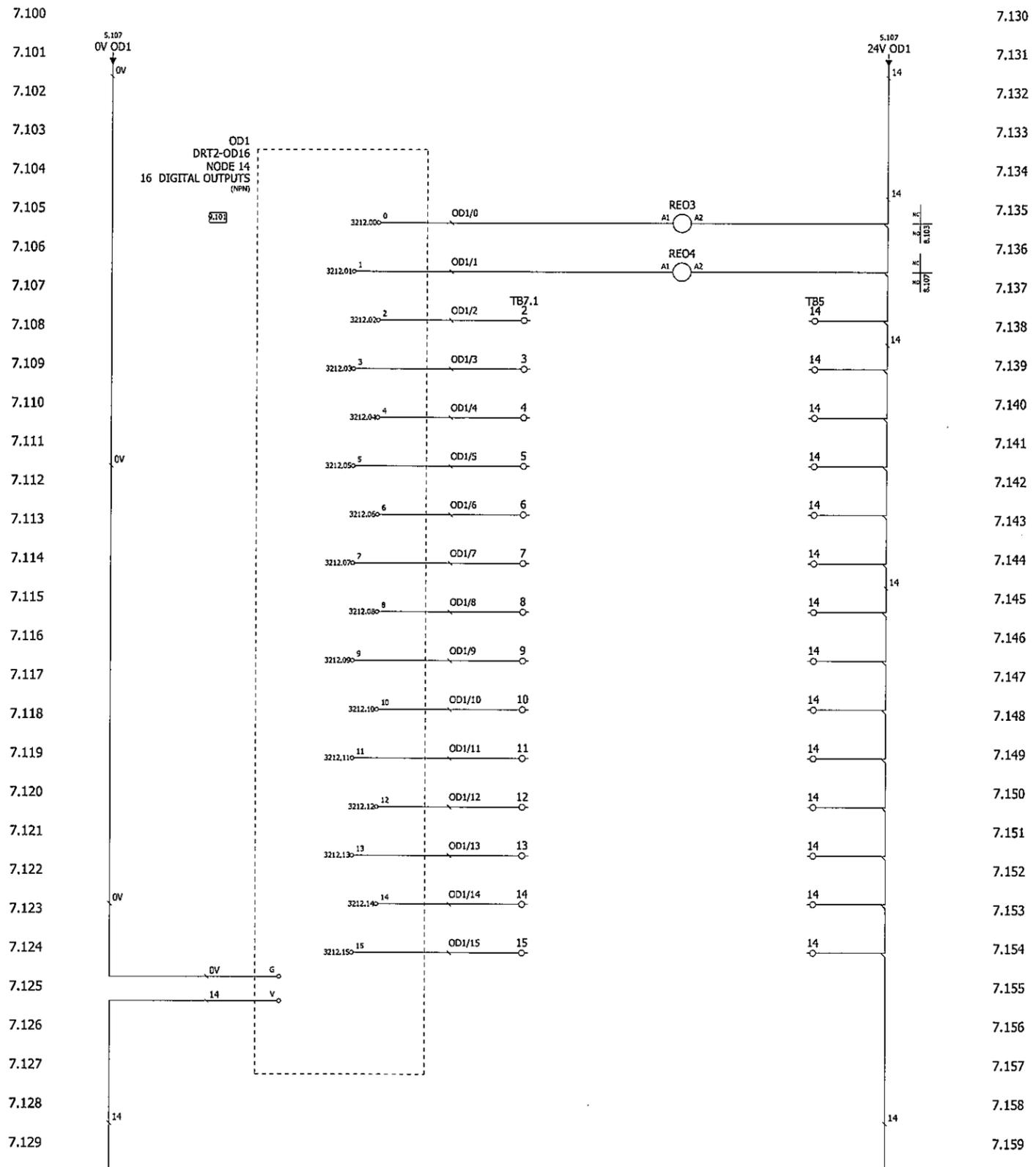
DESIGNED BY :

MACHINEX INDUSTRIES INC.  
2121, Olivier Street  
Plessisville, Québec, Canada, G6L 3G9  
Phone: (819) 362-3281  
E-mail: sales@machinex.ca  
Fax: (819) 362-2280

CLIENT :			REGION OF WATERLOO		MATERIAL RECYCLING CENTER	
			925, ERB STREET WEST		CONTAINERS LINE	
			WATERLOO, ONTARIO			
Previous Page	Page	NEXT Page	MOUNTING LOCATION :	PAGE DESCRIPTION :		
1.2	5.1	6.1	JB-2	Control Distribution		
			PROJECT NO :	DRAWING NO :		
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REV.	DESCRIPTION	DATE	BY	REV.	DESCRIPTION	DATE	BY	STAMP
				1	FOR CONSTRUCTION	2009-01-09	MARCL	
				2	AS BUILT	2009-02-24	MARCL	
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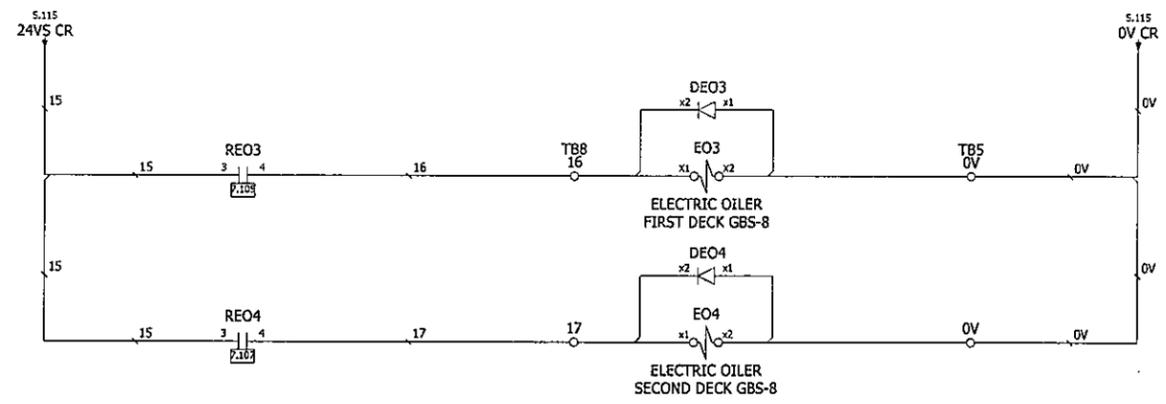
SCALE	DESIGNED BY :
PJ MNGR : DAVID MARCOUILLER DATE : 2008-11-25	 MACHINEX INDUSTRIES INC. 2121, Olivier Street Plessisville, Québec, Canada, G6L 3G9 Phone: (819) 362-3281 Fax: (819) 362-2280 E-mail: sales@machinex.ca
DRAWN : DANY TURCOTTE DATE : 2009-05-05	
CHECKED : DANY TURCOTTE DATE : 2008-11-28	
APPROVED :	

CLIENT :	MOUNTING LOCATION :	PAGE DESCRIPTION :
REGION OF WATERLOO	JB-2	I/O
925, ERB STREET WEST WATERLOO, ONTARIO		
Previous Page 6.1	Page 7.1	NEXT Page 8.1

PROJECT NO :	DRAWING NO :	REV.
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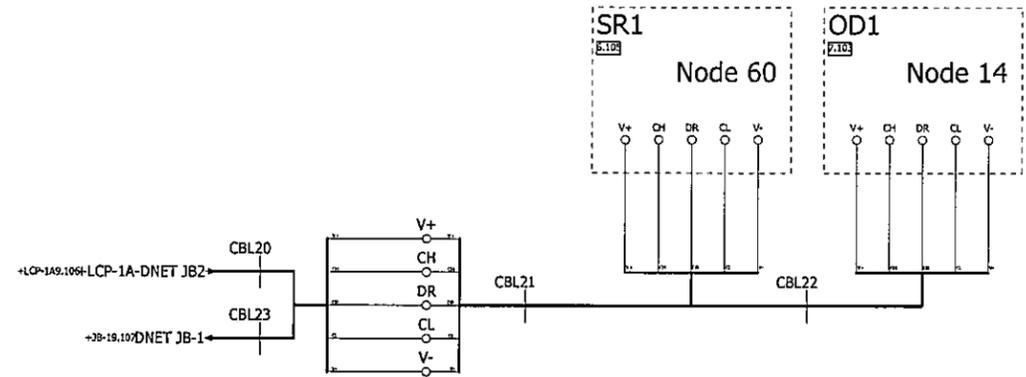
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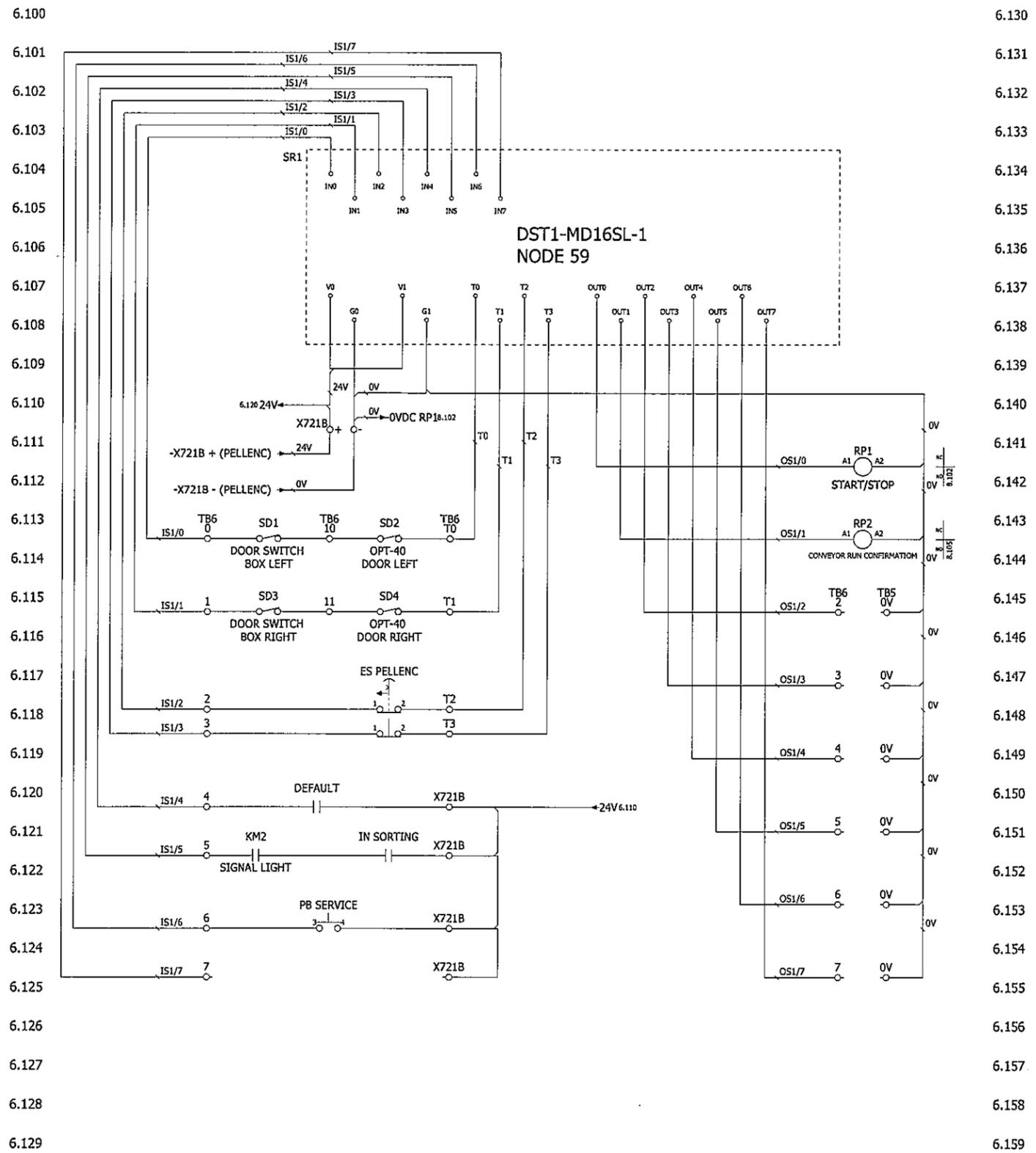
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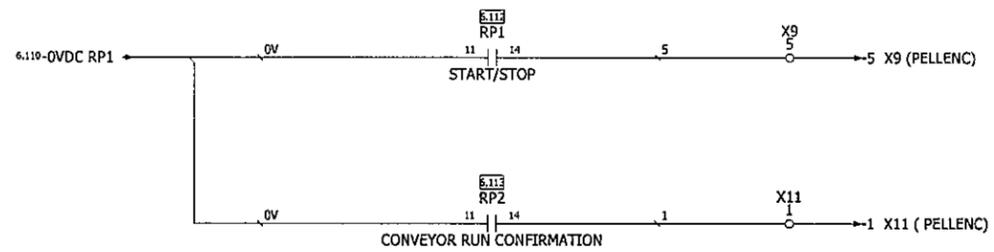


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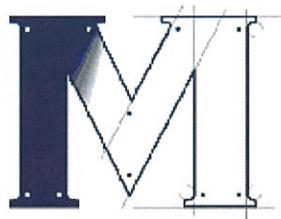
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***ANNEX 1***  
***VIBRATING CONVEYOR***

**Kinergy  
Corporation**



The most complete  
line of vibratory  
machines for  
"inducing" bulk solid  
materials to  
either Vertically Flow  
or Convey.

**Instruction  
Manual  
for Kinergy  
Driven  
Vibrating  
Feeder**



**KINERGY DRIVEN VIBRATING FEEDERS**

**INDUCED CONVEYING**

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IM-KDF-191-HD  
Rev. March, 1999

**KINERGY CORPORATION**

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Louisville, Kentucky 40219  
Phone: (502) 366-5685

**INSTRUCTION MANUAL**

FOR

**KINERGY DRIVEN VIBRATING FEEDER  
OPEN TROUGH OR DUST TIGHT**

**LIGHT, STANDARD, HEAVY, AND EXTRA HEAVY DUTY TYPES**

**INSTALLATION, OPERATION, AND MAINTENANCE**

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**NOTICE** Limited "routine" type field service is available by the local KINERGY Engineering Sales Representative. See the Instruction Manual transmittal form for the name, address, and telephone number of the KINERGY Representative to contact.

## KINERGY DRIVEN VIBRATING FEEDERS

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### OPEN TROUGH OR DUST TIGHT

### LIGHT, STANDARD, HEAVY, AND EXTRA HEAVY DUTY TYPES

#### INSTALLATION

#### OPERATION

#### MAINTENANCE

#### I. PRELIMINARY INSPECTION

**Damage in Transit** – Examine the unit(s) carefully for any damage in transit. The Vibrating Feeder is usually shipped as a complete assembly and should be visually inspected for physical damage. Normally, auxiliary items such as extra tuning plates, flexible socks, isolation springs, electrical controls, or the like, will be packed in separate cartons. If so, they should be inspected for loss or damage.

If a discrepancy is noted, notify the transporting carrier immediately and advise your local KINERGY Representative.

**Missing Parts** – Check the packing slip carefully upon arrival. Any missing parts should be immediately called to the attention of the transporting carrier and your local KINERGY Representative.

## II. INSTALLATION

Confirm that the proper "Interface Layout" of the feeder's installation into the material handling system has been made. (See Section V.) Then, refer to the feeder's outline drawings and proceed as follows:

- A. **Lifting** – All units should be lifted by connecting to the feeder's counterbalance. Lift by attaching to the side brackets used for the mounting of the isolation springs.

If it is necessary to hoist the unit by the feeding trough, confirm the lifting force is fully distributed, or spread out, along its length.

- B. **Installing and Securing** – The feeder will be of the "counterbalanced" type. The feeder is supported by isolation springs installed on the counterbalance.

Set the feeder into position by means of blocks under the counterbalance. Obtain reasonable alignment with the material's input and discharge ports. Maintain a vertical clearance of at least 2" with surrounding or underside fixed equipment or objects. Also, make certain a clearance exists to service the vibratory motor and to remove it. When flexible socks are utilized, a vertical clearance of 2" is recommended at the point of connection.

Vibrating Feeders of the heavy or extra heavy designs are always recommended to be supported from underneath on compression springs. However, they can be suspended by overhead springs from above provided no large impact or high shock loading will be encountered. The following comments apply to each of these two supporting methods.

1. **Undersupport** – These units are normally supplied with steel coil or rubber compression type isolation springs. In either case, the compression spring or mount should be checked to ensure it has been properly seated and stands vertically "plumb".
  - a. For steel coil springs, the internal diameter of the spring will slip over and around an internal, circular sleeve which is located on both the top and bottom mounting plate.
  - b. Rubber mounts – Insert the round hole of the mount and slide it into its centered retaining peg.

Before permanently fixing the bottom mounting plate, the compression springs should be checked to confirm that they

are standing vertical and that they are not tilted in any direction.

2. **Overhead Springs** – When the Feeder is suspended by cables from above, the steel coil or rubber type isolation springs are usually supplied with a top, circular cap and eye bolts. The isolation spring should always be located at the top of the suspension point. The threaded shank of the eye bolt permits vertical adjustment to ensure proper load distribution at each of the points of suspension.

Standard, stranded, steel type, flexible cable may also be needed. If so, it should be “sized” in accordance with the load rating per isolator shown on the outline drawing. Thimbles will be required at the bends of the cable. It is good practice to laterally shim any “jaw-eye” connections with round washers to hold the “eye bolt” in the center of the jaw. All of the suspension cable points should have approximately the same length. This will assure that the appropriate portion of the load will be carried on all of the suspension points.

When looking into either end of the Feeder, the overhead springs should be vertical or slightly sloped outboard from the axial centerline of the Feeder. Preferably, the outboard slope of the suspension should be less than  $15^\circ$  from the vertical. Slopes up to  $30^\circ$  may be tolerated. However, field adjustment of the load distribution will be more sensitive, and higher loads on the isolation springs and the cable can be expected.

At start-up, these support points should all be checked for lateral whip in any suspension cable. If whipping does occur, adjust the eye bolt upward or downward (while the Feeder is vibrating) until this whip has been eliminated. This will correct for improper load distribution.

**WARNING: Do not use the overhead type of suspension when high impact or shock loading can occur. For this type of loading, support the Feeder from underneath on compression springs.**

Further, an overhead suspension must have appropriate safety cables or underside “stops”. This kind of suspension must have the proper maintenance attention to ensure its safety over the years ahead. (See Figure 13.)

- C. **Trough Slope** – It is preferred that a slight decline be maintained even on horizontally mounted units. This is particularly true when a high head load is expected at the inlet which could cause that end of the Feeder to settle more under load, thus, possibly causing uphill feeding.

A purposely declined trough installation should slope at least the declination angle shown on the outline drawing. Shimming under the inlet end compression springs or adjusting the overhead eye bolt can provide the proper feeder trough slope.

When the feeding is uphill, confirm that the angle of inclination does not exceed the one shown on the outline drawing.

- D. **Locating the Feeder Under the Outlet of a Bin** – When the Feeder is mounted directly under a storage bin, the inlet of the Feeder must be properly “interfaced” as described in Section V of this manual.
- E. **Vibratory Motor Inspection** – The eccentric weight covers should be removed and the holding bolts on both ends of the input motor checked to make certain they are snug tight.

**The conduit box of the motor should be inspected to ensure it has been properly packed and that it is secured to the motor’s center frame.**

**The motor must be greased.** Only Chevron SRI-2 (preferred), Texaco Premium RB, and Unirex N-2 (Humble Oil) lubricants are recommended. (See the included greasing schedule). Lubricants must be applied by first removing the grease plug and then pumping grease into the fitting. When clean grease is emitted from the open plug, the bearing is properly lubricated. It is good practice to run the input motor for 10 to 15 minutes with the grease plug removed to allow any pressure built up in the bearings to relieve.

**DO NOT OPERATE THE FEEDER UNTIL BOTH BEARINGS OF THE VIBRATORY MOTOR ARE CONFIRMED TO BE ADEQUATELY GREASED AND THE CONDUIT BOX HAS BEEN FULLY PACKED AND PROPERLY SECURED TO THE CENTER FRAME OF THE MOTOR.**

- F. **Vibratory Motor Wiring and Rotation** – The input motor is electrically wired in the same manner as any standard dual or single voltage, A.C. squirrel cage, induction type motor. (See Figure 22.)

1. The incoming power leads to the motor should be of rubber sheathed, stranded wire cable. The cable can be enclosed in a

flexible metal conduit if required by a local code. It should be at least 4'-0" in flexible length. The flexible cable or conduit should pass from the rigid conduit over to the mounting assembly, and then to the conduit box of the motor. (See Figure 22) This will prevent wear of the incoming power cable or flexible conduit caused by rubbing against the motor's mounting assembly when the Feeder is vibrating.

**CAUTION:** Any explosion-proof type flexible conduit must be mounted perpendicular to the longitudinal centerline of the Feeder's trough. This avoids excessive stress on the motor's conduit box and a restriction to the motor assembly's vibratory movement.

2. **The conduit box of the motor must be totally stuffed with packing.** This prevents the leads from "working" within the conduit box when the unit is vibrating. The packing recommended is Johns-Manville "dux-seal" (normal) or "tran-o-seal" (higher temperature).

The internal wall surfaces of the conduit box should first be lined with this packing, and then the motor leads coated. The leads should then be pressed into the conduit box to make them totally immersed in the packing. Attention is called to the second half of the conduit box, which must also be totally stuffed.

3. On single motor units, the motor rotation is as shown on the outline drawing and as shown in Figure 33. However, if two motors are used, their rotation will be in opposite directions as shown on the Feeder's outline drawing.
4. **The warranted amperage rating of the vibratory motor(s) is listed on the unit's outline drawing.** However, the best steady state over-current protection will be achieved by measuring the full load current of the motor while feeding the rated amount of material. Select an overload relay heater rated as nearly as possible to this load current, which still avoids nuisance tripping. If the motor current exceeds the amount shown on the unit's outline drawing, the local KINERGY Representative should be consulted.

- G. Electrically Connecting the Adjustable Feed Rate Control** – When an adjustable feed rate control is supplied, it will usually be a "variable voltage" type of either a Manual Variable Auto-Transformer or a Silicon Controlled Rectifier (SCR) unit. The SCR is specifically utilized when the automatic "follow" of the feed rate by a process control signal is required

or when multi-point remote control is needed. Both the auto-transformer and the SCR will be reviewed.

1. **Manual Variable Auto-Transformer** – The transformer should be wired to the load side of the line starter, and its output should be connected to the proper terminals of the vibratory motor. Unless specified otherwise, it is supplied in a NEMA 1 (general purpose) enclosure. If the atmosphere is dusty, a NEMA 12 (dust-tight) enclosure is recommended. If the atmosphere contains moisture or if the area is washed down occasionally, a water-tight (NEMA 4) enclosure is recommended. NEMA 7 and 9 explosion proof enclosures are required for hazardous locations. **Do not build a second enclosure around the provided transformer enclosure.** This will reduce its heat dissipating capabilities and cause premature failure. Use an “open” type transformer for installation in larger panels.

The transformer dial markings indicate the percentage of the applied voltage, but not the percent feed rate. Usually, the motor will not start on less than 60% voltage if wired per diagram AE-100. If this is objectionable, a timer and second contactor can be inserted to automatically accomplish an assured full voltage start (see diagram AE-101). Once started, the motor will continue to run at voltages down to approximately 30%, but “zero feed” will have occurred at approximately 35% of the dial marking. “Zero feed” does not align with zero voltage on the transformer dial.

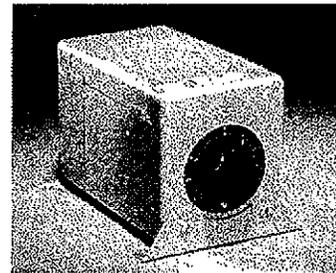
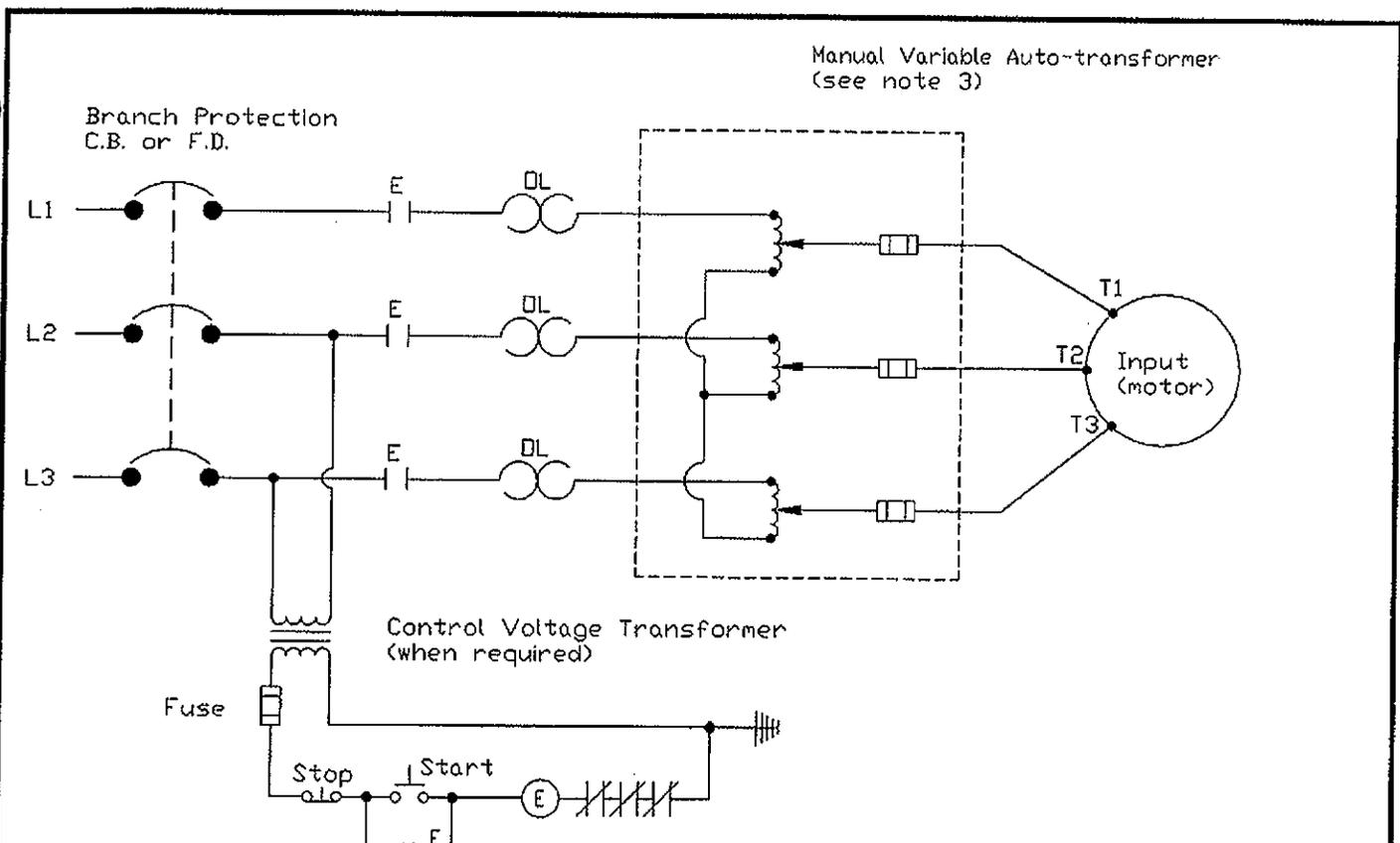


Fig. 1: A manual, variable auto-transformer.

2. **Silicon Controlled Rectifier Control (SCR)** – The unit should be wired to the load side of the line starter and its output should be connected to the specified terminals of the vibratory motor. The incoming control signal is wired to the respective terminals indicated on the electrical schematic drawing provided (see AE-116). If the control cable is 100 feet or longer, shielded cable should be used and/or strengthening the incoming D.C. signal may be needed.

**The wrong input phasing is corrected by reversing any two input power lines (L1, L2, or L3). To reverse the motor rotation, interchange any two output lines (T1, T2, or T3).**



	I (Input)	J (Jumper)	O (Output)	(Note 2) AMP Rating	Fuse Rating
KO-216BU-3	1-1-1	4-4-4	3-3-3	5	5
KO-226U-3	1-1-1	4-4-4	3-3-3	10	10
KO-246BU-3	1-1-1	4-4-4	3-3-3	19	20
KO-1256DU-3Y	4-4-4	1-1-1	3-3-3	28	30

**NOTES:**

- Connections shown are for CW (0 to 100) rotation with knob on base end (opposite of wiper) of transformer.
- All manual variable auto-transformers that are supplied with nameplates that read 240V can be properly applied to the following in accordance with this schematic: 200V/50HZ, 380V/50HZ, 460V/60HZ, 575V/60HZ. Amp rating of manual variable auto-transformer is the same for all above voltages.
- The fuse supplied with the transformer is mounted inside the enclosure.

**COMPONENT LIST:**

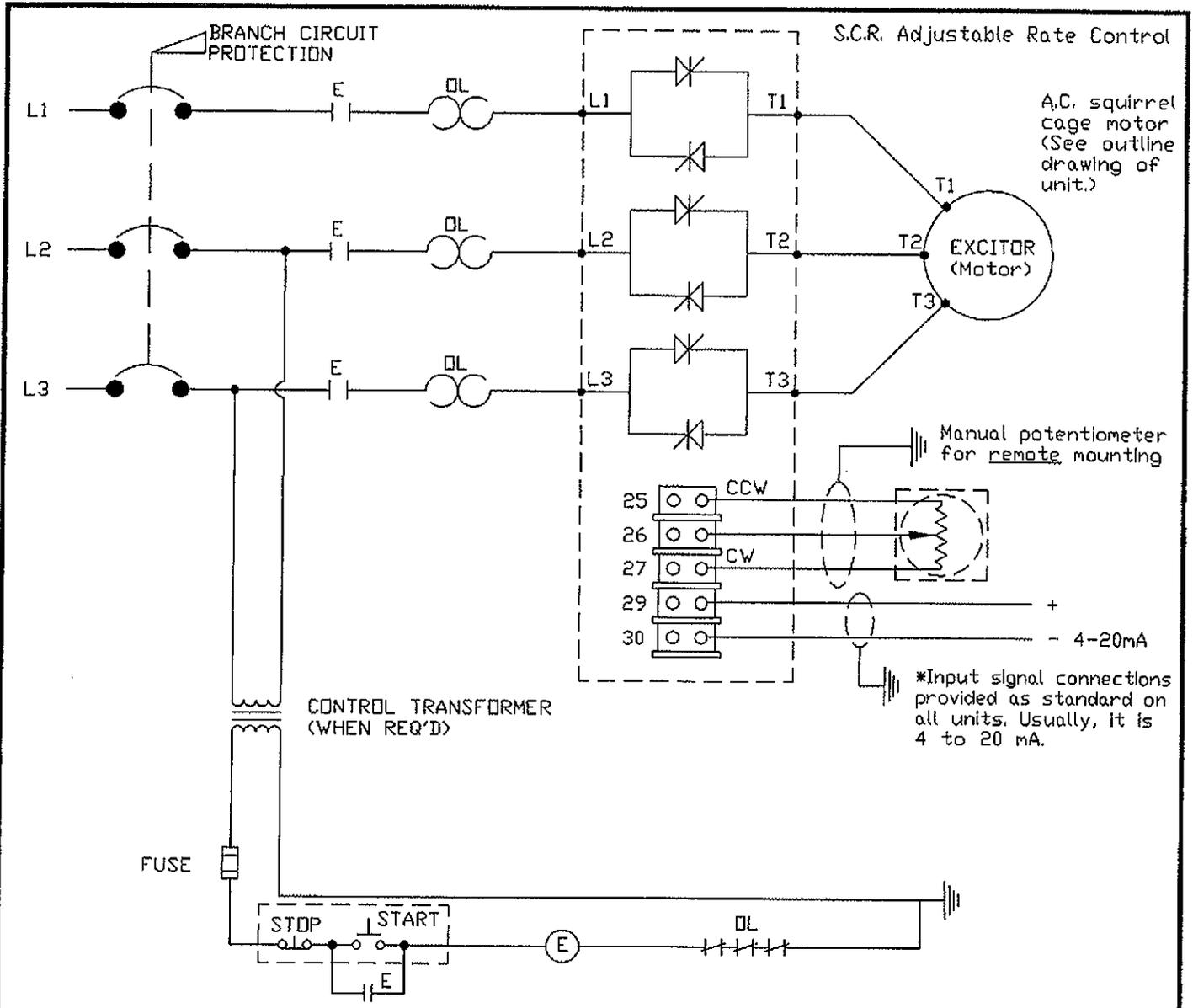
- 1-FV non-reversing linestarter (by others unless specified).
- 1-Manual variable auto-transformer (by Kinery when specified).

**NOTE:** This schematic represents the least initial cost, but it does require the operator to turn the dial to near full voltage for each "starting" of the unit. (see AE-101 for corrective comparison.)

REV.	DATE	DESCRIPTION	FILE DATA	Kinery Corporation	
1	...		DRAWN ...	MANUAL VARIABLE AUTO-TRANSFORMER	
2	...		CHECKED	FOR Electrical Schematic for Adjustable Rate	
3	...		ENGINEER ...	Control for any Kinery Driven Vibratory	
4	...		SCALE ...	Machine	
5	...		FILE NO. ...		
6	...		P.O. NO. ...	OWG. NO. AE-100	REV. NO. .
7	...		SERIAL NO. ...	THIS DRAWING IN DETAIL AND DESIGN IS THE PROPERTY OF KINERGY CORPORATION AND IS LOANED WITH THE UNDERSTANDING THAT IT IS NOT TO BE USED IN ANY WAY THAT IS HARMFUL TO KINERGY CORPORATION AND IT IS TO BE RETURNED UPON REQUEST.	
8	...		S.O. NO. ...		





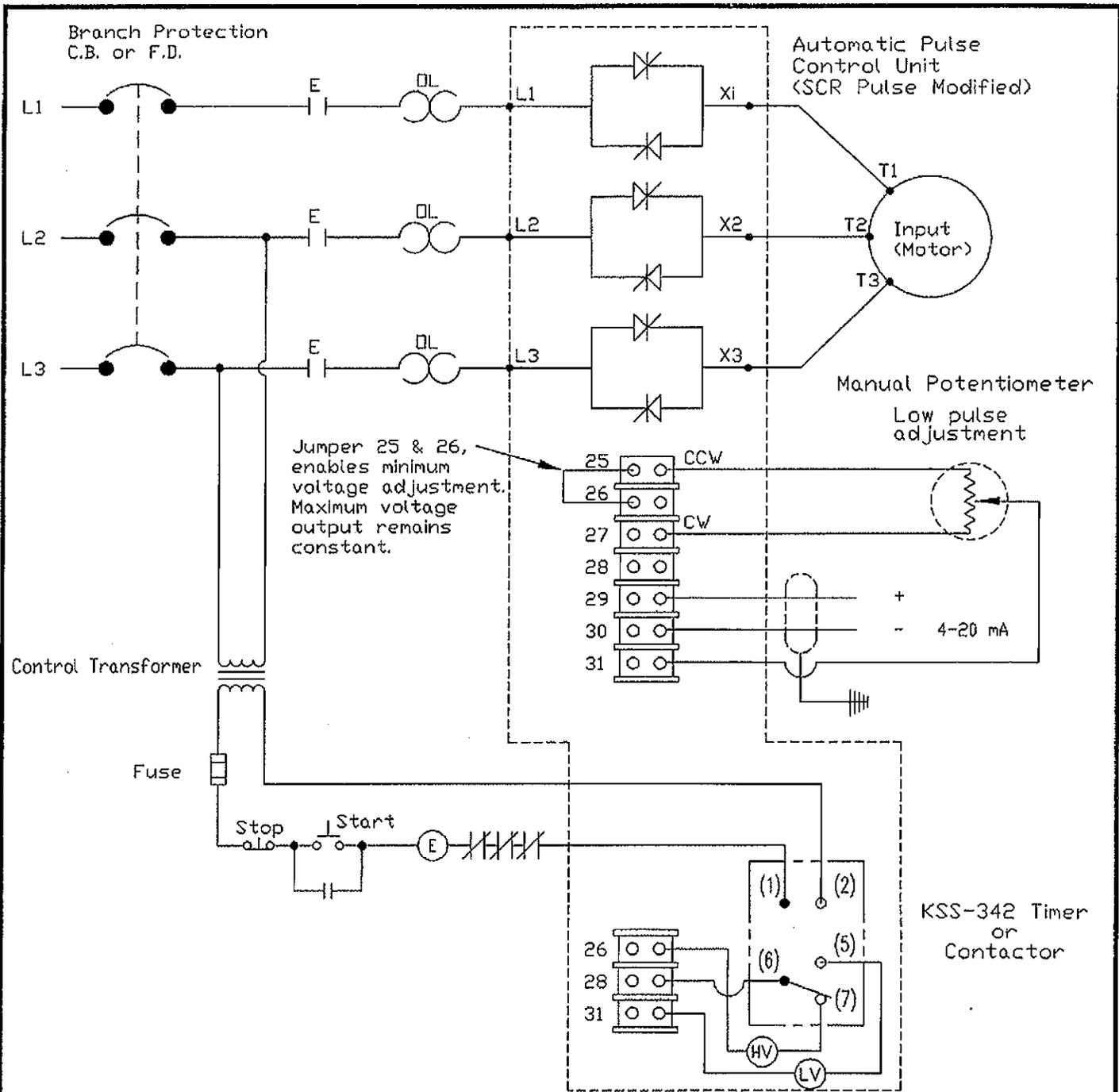


**NOTES:**

1. SCR unit is only provided by Kinergy. The branch circuit protection and line starter are normally not included.
2. All SCR units have an inherent 'full voltage start' feature.
3. If two motors are used, the overload relays should be connected in series so both motors are de-energized.

REV.	DATE	DESCRIPTION	FILE DATA	Kinergy Corporation	
1	--		DRAWN ...		
2	--		CHECKED		
3	--		ENGINEER ...	FOR	Electrical Schematic for Adjustable Rate
4	--		SCALE ...		S.C.R. Type for any Kinergy Driven
5	--		FILE NO. ...		Vibratory Machine
6	--		P.O. NO. ...	DWG. NO. AE-116	REV. NO. ...
7	--		SERIAL NO. ...	THIS DRAWING IN DETAIL AND DESIGN IS THE PROPERTY OF KINERGY CORPORATION AND IS LOANED WITH THE UNDERSTANDING THAT IT IS NOT TO BE USED IN ANY WAY THAT IS HARMFUL TO KINERGY CORPORATION AND IT IS TO BE RETURNED UPON REQUEST.	
8	--		S.O. NO. ...		



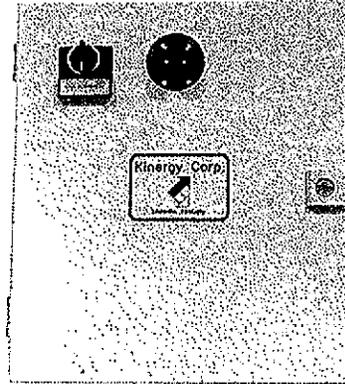


- NOTES:** 1. Pulse unit is only provided by Kinergy. Branch circuit protection and line starter by others.  
2. If two motors are used the overload relays should be connected in series so both motors are de-energized.

REV.	DATE	DESCRIPTION	FILE DATA	Kinergy Corporation	
1	...		DRAWN ...	AUTOMATIC 'PULSING' OR 'MAX-MIN'	
2	...		CHECKED	FOR	
3	...		ENGINEER ...		
4	...		SCALE ...		
5	...		FILE NO. ...		
6	...		P.O. NO. ...	DWG. NO. AE-210	REV. NO. .
7	...		SERIAL NO. ...	THIS DRAWING IN DETAIL AND DESIGN IS THE PROPERTY OF KINERGY CORPORATION AND IS LOANED WITH THE UNDERSTANDING THAT IT IS NOT TO BE USED IN ANY WAY THAT IS HARMFUL TO KINERGY CORPORATION AND IT IS TO BE RETURNED UPON REQUEST.	
8	...		S.O. NO. ...		



The front of the SCR control panel is usually equipped with a manual potentiometer and a selector switch. The three positions of the switch are: "Auto", "Local", and "Remote". In the "Auto" position, the unit operates automatically from an input signal. In the "Local" control and "Remote" control positions, the unit operates from either the manual potentiometer on the panel or from one at a remote location, respectively.



All SCR control units have an automatic "full voltage start" feature.

Figure 2: An SCR type of "Variable Voltage" control.

The SCR enclosure should be qualified for the environment in which it is installed. Unless otherwise specified, all units are supplied with NEMA 4 (weather-proof) enclosure. Explosion proof NEMA 7 or 9 enclosures are also available when they are needed.

**IMPORTANT NOTE:** An Instruction Manual for the SCR type of "Variable Voltage" Control has been separately provided.

#### H. Accessories (When Supplied or Specified)

1. **Flexible Socks** – The flexible sock should be slipped over or wrapped around the "socking neck" and the drawband or bolting bars tightened. These bolted connections are normally mounted on their respective socking points for shipment. If a material is dusty, it is recommended that some caulking sealant, such as Daps Butyl-Flex, or equivalent, be applied to the neck before the sock and the drawband are applied. Wrap-around socks also require caulking in the vertical seams. This will provide a good dust seal. Proper sag in the inlet sock is required. At least a 1" lateral sag is suggested. Lateral sag is less important in the outlet sock, but it should allow the trough to vibrate freely.
2. **Gates** – The gates are normally factory mounted and should be checked for proper operation. Air cylinders or power operating devices will require flexible connections that fix first to the feeding trough and then pass over to the operating device. The flexible

length should be about 4'-0" and observed for any excessive whip when the Feeder vibrates.

3. **Spray Nozzles** – Almost always, the spray nozzles and their piping are non-vibrating. The entire pipe circuit is separately supported by the structure adjoining the Feeder.

### III. PRINCIPLE OF OPERATION

The Kinergy Drive System utilizes a motor with a "free force" input, and is combined with the output of sub-resonant tuned drive springs to power the vibrating Feeder. Stated differently, rotating eccentric weights installed on the extended shaft of the motor(s) sustain the action of the stiff, strong, reactive power producing drive springs. **It is the most versatile and "energy efficient" vibratory drive system known.**

The vibratory motor is of the A.C. squirrel cage, induction type. It is important to realize that the vibratory motor supplies only a fractional amount of the total driving force required to power the Feeder. The "kinergy" producing drive springs supply most of the required driving force. The term "kinergy" is defined as the specific kinetic energy developed by a spring's motion during the drive portion of its cycle. **Therefore, the total input power to the Feeder is a combination of both the vibratory motor and the kinergy producing drive springs.** (See Figure 16.)

#### A. Sub-Resonant Tuning

Since the Feeder always vibrates at the running speed of the motor, the actual "Natural Frequency" of the drive springs cannot be seen, or visually realized. Nonetheless, it does play an important role in how the Feeder performs under load.

When the Feeder is in the empty or "no load" condition, the Natural Frequency of the drive springs is markedly above the maximum motor speed. For example, if the motor has a full voltage top speed of 855 RPM, the Natural Frequency of the drive springs would be approximately 950 CPM (or RPM). Then, as material load is applied, the Natural Frequency decreases as a result of the added weight or load to the vibrating trough. This causes the drive spring's frequency to decrease and approach the speed of the vibratory motor. The result is the drive springs inherently work harder under load because their natural speed (frequency) is now more in unison with the motor's top running speed. This is called "Sub-Resonant" tuning. "Sub" means "under". Resonant means "Natural Frequency". Therefore, "Sub-Resonant" tuning always maintains the motor's speed under the Natural Frequency of the stiff drive springs. This

is the reason the Feeder will not markedly change its operating stroke from "No Load" to "Full Load".

**B. Mechanical Tuning Adjustments**

Removing bolted "tuning" weights or adding more of the stiff drive springs increases the kinergety producing drive spring's Natural Frequency. This will decrease the Feeder's "no load" or empty stroke value. Conversely, adding tuning weights or removing drive springs decreases the drive spring's Natural Frequency. This will increase the no load or empty stroke value. (See Figure 23.)

When the vibratory Feeder is extremely heavy, adjusting the tuning plates may have little effect. In those instances, steel coil drive springs are added to reduce the "no load" stroke. To increase the "no load" stroke drive springs are removed.

The ability to feed a load on the Feeder's trough is a function of the amount of eccentric weights installed on the motor. Increasing their output improves its load-carrying capability. If the eccentric weights are increased, the unit should be "back-checked" in the "no load" condition. If the stroke of the trough in the empty condition is too high, it should be reduced by removing tuning plates or adding more drive springs. Otherwise, unnecessary maintenance could be experienced. (See Figure 24.)

Flat bar type stabilizer springs act as "guides" for the steel coil drive springs. On some smaller or light weight Feeders, these leaf springs also perform the function of "drive springs".

The prescribed operating "no load" stroke value is shown on the Feeder's outline drawing. This stroke length should be adhered to for the operation, tuning, and maintenance of the Feeder. When a lower stroke will achieve the wanted output, use that stroke as the operating limit.

**C. Effect of Field Modifications**

Unauthorized modifications to the Feeder should not be made because it could inherently void Kinergety's expressed warranty. This is particularly true when the change adversely affects the structural integrity, performance capability, or the safety of the Feeder's operation.

Kinergety does recognize the occasional, practical need for acceptable changes to better adapt the Feeder to the "actual operating conditions" in some applications. Examples of this would be the addition of a liner in the trough, adding a needed trough divider, or adding a cover over the trough.

Consequently, the resulting effect of a Kinerger approved field modification to the Feeder should be discussed.

Adding any "fixed" (bolted or welded) weight to the trough member or the counterbalance will cause an increase in the stroke for the no load or empty condition. Removing "fixed" weight will cause a decrease in that stroke. **Therefore, field modifications to the trough or the counterbalance member may require a complete mechanical "retuning" of the Vibratory Feeder.** Generally, added weight by a trough modification is compensated for by removing tuning plates from the counterbalance assembly. The opposite is true for trough weight reductions. After the modification is made, the "no load" or empty full voltage stroke of the Feeder must be confirmed. The stroke must be returned to its proper amount by the adjustment of tuning plates or drive springs.

**D. Operating Versatility**

To achieve a successful application, the design of the Vibrating Feeder will usually be only part of the assignment. The other aspect will depend upon how the Feeder is operated. In some applications, this will make the difference between success and failure.

The Kinerger Drive System, which makes the Feeder vibrate, provides the most operating versatility. This is accomplished by conscientiously making the needed mechanical type of adjustments during the "start-up" stage to better adapt to the actual feeding conditions. When it's needed, the simple method of electrical control can be utilized to manually or automatically change the feed rate while the Feeder is in operation.

**E. Repetitive Starts and Stops**

Since the vibratory motor accelerates and decelerates independent of the stiff kinerger producing drive springs, the Feeder can be started and stopped frequently, under full head load, without harm to the vibratory machine. The repetitive starts and stops can be up to 5 times per minute.

**F. Smooth and Quiet Operation**

A properly tuned and operated Kinerger Driven Feeder generates essentially the same amount of vibratory stroke from no load to full load, with full voltage applied to the motor, and shows a continual decrease in stroke when the applied voltage is gradually reduced or when the motor is de-energized. The Feeder will vibrate very smoothly and operate very quietly. Usually, only the mild whine of the motor is all that is heard

when it is vibrating. (Sometimes the steel coil isolation springs will have a slight chatter which is permissible.)

#### G. The "Look and Listen" Check for Maintenance

By observing the "no load" stroke occasionally, the scheduled greasing of the input motor, and tracing and correcting any noise in the unit's operation, the Feeder is properly maintained. In short, just routinely "Look and Listen" to the Feeder to maintain it. Even though the Feeder continually vibrates, it should not require much maintenance.

### IV. CHARACTERIZING THE MATERIAL BEING FED

Normally, the more "rigid" and dry the material, the better it will feed with a vibratory action. When vibrated, the fed material will appear to settle downward or vertically densify. This happens because the vibratory action reduces the material's "inter-particle" friction. There are many different kinds of materials that can be fed with vibration. To better understand their feeding characteristics, the material can be classified as "Unit Pieces", "Bulk Solids" that have "Flake", "Floodable", or "Generally Granular" type particles, or are "Liquid Laden".

#### A. Unit Pieces

These are whole solids that are a complete entity. Examples are tomatoes, apples, foundry castings, boxes, cartons, filled bags, metal stampings, briquettes, or wooden logs. (See Figure 3.)

In some applications, unit pieces need to be fed as fast as possible. For instance, husked cobs of corn in a food plant. In these situations use the maximum stroke capability of the Feeder.

However, **when unit pieces make unwanted noise, or are being damaged while being fed**, reduce the feeder's trough stroke to the least amount that's practical. Then, let the mat depth of the fed material to proportionately increase to achieve the wanted capacity.

Sometimes unit pieces with comparatively large flat surfaces are coated with a liquid. For example, water drenched diced carrots in a food plant or oil coated metal stampings. When they are, a trough liner to break the liquid's surface tension will probably be required.



Fig. 3: A steel casting is an example of a "Unit Piece".

**B. Identifying Bulk Solid Particles as “Flake”, “Floodable”, or “Generally Granular”**

This kind of material is made up of “particles” that can be grouped into three categories. Most of them are best fed with the deepest mat depth that can be practically obtained combined with the least amount of vibratory stroke.

1. **Flakes** – These are flat shaped particles or strands that are usually fibrous and they will compress when squeezed by hand. Wood bark, shavings, or chips are examples. Others are glass fibers, polystyrene film, refuse derived fuel (RDF), bagasse, shredded rubber tires, metal turnings, brass needles, stranded insulation, tobacco shreds, or the like. (See Figure 4.)



Fig. 4: Wood bark typifies “Flake” type particles.

To feed deep mat depths, the stroke length needs to be adequate to penetrate through to the top layers.

2. **Floodable** – The particles are very fine and dry. They easily aerate so they are said to be “Floodable”. The name calls attention to their being able to flow uncontrolled unless the proper precautionary measures are taken. A particle size smaller than 100 mesh and less than 2% moisture content more specifically describes this kind of bulk solid. Hydrated lime, fly ash, kaolin clay, pesticides, virtually all the different “dusts” from collectors, acetylene black, stucco, bentonite, talcum powder, diatomaceous earth, cement, ink dyes, carbon black, powdered milk, dextrose, powdered sugar, or anything similar, exemplify bulk solids that are “Floodable”. (See Figure 5.)

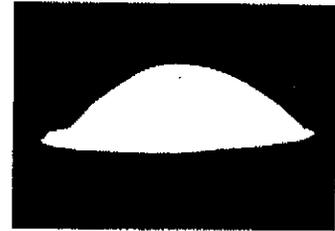


Fig. 5: “Floodable” materials are very fine and dry.

To avoid creating dust by aeration, purposely utilize a minimal operating stroke and proportionately increase the mat depth as much as practical to achieve the wanted capacity.

3. **Generally Granular** – Bulk solids that do not qualify as being either a “Flake” or “Floodable” are in this group. The particles are typically granular in texture and often have lumps in their size distribution. Coal, limestone, gypsum, sawdust, bottom ash, rice grits, salt, bone meal, corn gluten, soybean meal, granulated sugar, fertilizer beads, molding sands, and potash denote the General classification of bulk solids. (See Figure 6.)



Fig. 6: A granular texture, usually with lumps, denotes a “Generally Granular” type of bulk solid.

To minimize impact type of abrasive wear, or if the material is sticky and adhesive, avoid dropping it into an empty trough at the Feeder's inlet. To accomplish the needed capacity, feed the material as slowly as possible and let the mat depth proportionately increase to its practical limit.

### C. **Liquid Laden**

When a bulk solid becomes saturated with a liquid, it approaches the characteristics of a slurry. An example is water laden boiler bottom ash from burning a solid, waste type fuel in a Power Plant.

Some shredding operations utilize water sprays to facilitate their operations. When they do, the discharged, shredded material can often have an excess amount of water. If the installation is outside, and subjected to the weather conditions, precautions must be taken to avoid the “freezing” of the liquid to the Feeder's trough surfaces during the winter months.

Since a liquid such as water does not feed by a vibratory action, the Feeder is purposely declined at least 2 degrees. This downward slope permits the liquid to flow and drain along the length of the feeding trough.

When feeding materials with excess moisture, it is best to accumulate an appropriate mat depth to enable the material to feed at about the same speed as the liquid is flowing or draining down the trough. To feed faster, increase the stroke or consider declining the Feeder a few more degrees.

## V. INTERFACING WITH OTHER EQUIPMENT

This involves the reasonably conscientious coordination of the Vibrating Feeder with the adjoining equipment. The fed material must properly flow into and out of the Feeder. In other words, the Feeder must be properly adapted to this portion of the "Material Handling System". The resulting combination should not be detrimental to the performance or maintenance of any of the "interfaced" equipment. If specified in writing and the necessary information is provided, Kinerly will prepare the proper interface drawings. Otherwise, it is the responsibility of the installation designer (purchaser or "others") to properly coordinate the interface of the Feeder to the adjoining equipment at its inlet and outlet.

The inlet of the Kinerly Feeder will most likely be "interfaced" with a supply chute, storage bin, hopper, the outlet of a crusher, or the like installed above it. On the downstream end, the fed material should be able to discharge without any restrictive obstruction.

When the Feeder is installed under the outlet of a storage means such as a bin or hopper, the "interface" should be as shown in Figures 7 and 8. **This can also be a transfer chute that can occasionally back up and fill with the material to be fed. When the chute temporarily backs up with material, it immediately becomes a storage means which vertically flows with the same characteristics as a hopper or bin.** For these storing situations, the length of the bin's outlet should not exceed 1.25 times the anticipated mat depth. The slant length of the 45° sloped rear baffle is equal to the mat depth at the bin's outlet as shown in Figure 7. The 1/4" (preferred) to 3/8" vertical clearance with the Feeder's trough bottom as seen in Figure 8 must be maintained. When used, the needed longitudinal skirtboard clearance with the trough is denoted in the same diagram.

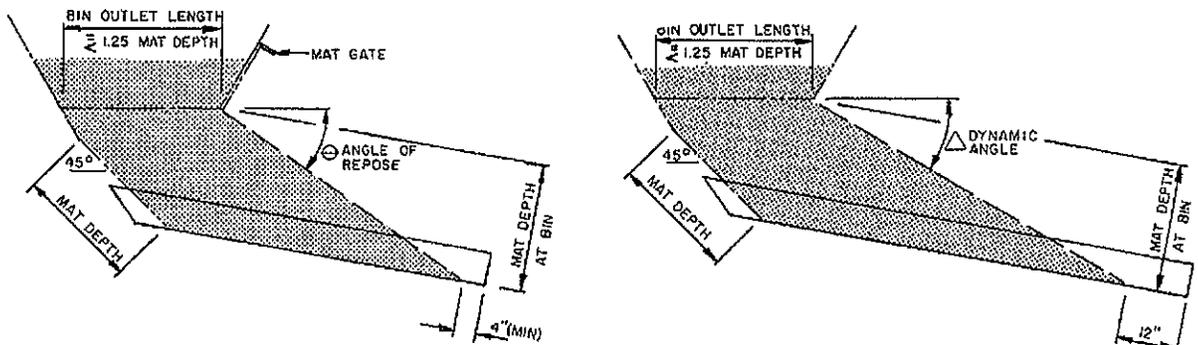


Fig. 7: Interfacing with a storage bin at the Feeder's inlet.

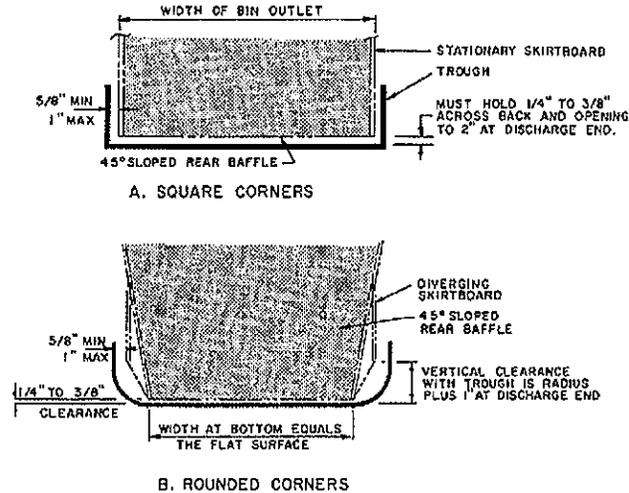


Fig. 8: The needed rear baffle configuration and skirtboard clearances in the "no load" condition.

**IMPORTANT NOTE:** When big "Unit Pieces" or large "Flake" type bulk solids are being stored, a mat depth gate that is a vertical sliding plate may not be practical. Further, and quite often, the downstream sidewall of the storage hopper will almost always be omitted. For guidance on how to best control the fed mat depth of these kind of materials, contact Kinergety.

A more detailed explanation of interfacing with storage bins is available. Ask your local Representative or Kinergety for a copy of the yellow paged Bulletin IL-KDF entitled, "Interfacing Vibrating Feeders". It can be found in any Kinergety equipment catalog.

Consult Bulletin IL-KDF for applying Feeders to storage bins with "long slot" type openings. Do the same when the Feeder is combined with a "dump hopper" or installed under the long slots typically used with flat bottom type surge bins.

## VI. ABRASION, CORROSION, AND LINERS

Each of these subjects deserves a brief discussion.

### A. Abrasion

Abrasive wear from "sliding" needs to be differentiated from abrasion caused by "impacting".

As a material is being conveyed, minimal sliding abrasion takes place because of the gentle "pitch and catch" action of the vibratory movement.

This is the reason vibrating feeders are preferred when very abrasive materials are to be fed.

Impact abrasion occurs when the incoming material strikes an exposed surface. When this repeatedly happens, the wear will be considerable. This is why liners are used at the inlets of some feeders. To minimize this type of abrasion, the material's vertical free fall can be decreased by allowing it to slide down a chute or have it impact on its own particles as is cleverly done with the use of a so-called "rock box". Other ideas are stated in the "Trouble Shooting" portion of this manual.

## **B. Corrosion**

If the material being fed is corrosive, the feeder's trough surfaces need to be properly protected. For instance, trough liners must be completely sealed. When corrosion is coupled with "sliding" abrasion, the potential of the abrasive wear compounding the corrosive action needs to be taken into account. It would be the same as continually rubbing the rust off a corroded water pipe. Therefore, when the material is both abrasive and corrosive, the corrosion dictates the trough construction or liner selection and not the abrasive characteristic.

An example is feeding wet coal that has some content of sulfur. If an A.R. liner is used, it will appear to excessively wear. Actually, the difficulty stems from the moisture in combining with the sulfur in the coal to form a weak solution of sulfuric acid. This acid corrodes the surfaces of the A.R. Consequently, it rubs off very easily. Therefore, a stainless steel liner would be the correct choice because it eliminates the corrosion, and the hardness of its surface easily contends with the minimal sliding abrasion. This is the reason a thin stainless steel liner may not require replacement throughout the life of the feeder in many coal handling applications.

## **C. Liners**

The conveying troughs of the feeder can be lined with "abrasion resistant" (A.R.) plate or other alloys such as stainless steel. Ceramic brick, rubber, polyurethane, UHMW, or the like, are also available.

When the liners are made of metal, they are always recommended to be "plug" welded through relatively small holes as compared to being bolted. The life expectancy of the vibrating feeder is well beyond 20 years. Over this time period, a bolt holding a liner can come loose. When it does, the feeding trough is usually filled with material so it isn't readily accessible to maintenance personnel. Consequently, and as a practical solution, the flat heads of the bolts and the fastening nuts are eventually welded. When this is done, it is virtually the same as plug welding the liner initially, and

therefore eliminating the need for any maintenance follow over the long term.

In most instances, and as a benefit of the gentle vibratory conveying action, the original metal liner will probably not be replaced over the life of the feeder because of the "sliding" kind of abrasive wear.

## **VII. PERFORMING OTHER FUNCTIONS WHILE FEEDING**

Sometimes another function(s) is wanted to be achieved as the material is being fed. For example, orienting Unit Pieces, screening particles, draining liquids, transferring heat, or the like.

In these situations, it is often best to temporarily ignore the added function(s) during the first stages of the "start-up". Proceed to mechanically adjust the Feeder to achieve the wanted feed rate capacity over the conventional or standard portions of the trough length. After that has been accomplished, observe the fed material performing the wanted function.

Look for obstructions to the material's movement down the trough and try to minimize their effect. This could require repeated "trial and observations" that might involve some changes to the configurations that are part of the feeding trough. For example, if screening is being done with woven wire with large openings, consider changing to perforated plate with round openings. This alternative will provide a better feeding surface with less obstruction to the material being fed.

When transferring heat, a very slow feed rate will most likely be needed to acquire as much retention time as possible.

To have more versatility with the operation of the Feeder, consider the use of the electrical control to manually or automatically alter the vibratory action as required. This is advantageous for smoothly adjusting the feed rate. The control's ability to automatically "pulse" with a momentary change in the operating stroke and frequency of the Feeder could also be useful, particularly when a repetitive, abrupt change in the vibratory action is needed.

Almost always, a Feeder performing added functions will demand more dedicated attention during the "start up" phase of the application. Referring to the Feeder's outline drawing, other instructions previously sent, or discussing the difficulty with Kinery will usually expedite the Feeder's adaptation to the "actual operating conditions".

## VIII. SAFETY PRECAUTIONS

The Kinergy Driven Vibrating Feeder must be installed, operated, and maintained in accordance with the provided outline drawing(s) and instruction manuals. With respect to any auxiliary items from another manufacturer that are also supplied by Kinergy, the provided engineering drawings and the instruction manual for that unit(s) will apply.

Even though a Vibrating Feeder is a relatively safe machine, some of the safety practices that should be observed are:

1. **When performing maintenance work**, the machine should be de-energized and electrically "locked out", particularly, when working on the vibratory motor.
2. **The rotating eccentric weights** on the vibratory motor should always be covered when the Feeder is in operation.
3. **When high shock or large impacting loads** can occur at the inlet sometime during the tenure or life of the application, do not suspend the Feeder on cables. Instead, support the Feeder from underneath on an adequate structure. (See Figures 13, 14 and 15.)

When a large storage bin or pile is being fed, confirm the design avoids a "funnel flow" kind of vertical flow pattern. The high and deep "rat hole" can collapse. When it does, the falling mass of material could damage any overhead suspension and possibly the Feeder. (Figures 9, 10, 11 & 12.)

4. **If suspension cables are appropriately used** for overhead support, make sure an adequate secondary support, by means of structural "stops" on the Feeder's underside or some type of non-vibrating "safety slings", are also used. (See Figures 13 and 21.)
5. **When "Floodable" materials are being fed**, some method of quickly shutting off an uncontrolled flow must be available, particularly when a storage bin with a large volumetric capacity is being utilized at the Feeder's inlet.

For example, use a quick closing gate at the outlet of the storage bin or at the discharge end of the "dust-tight" feeding trough, or both.

6. **If feeding a very hot material**, an open-holed grating should appropriately enclose it to protect personnel from being inadvertently burned.

Another option is to adequately insulate the external surfaces.

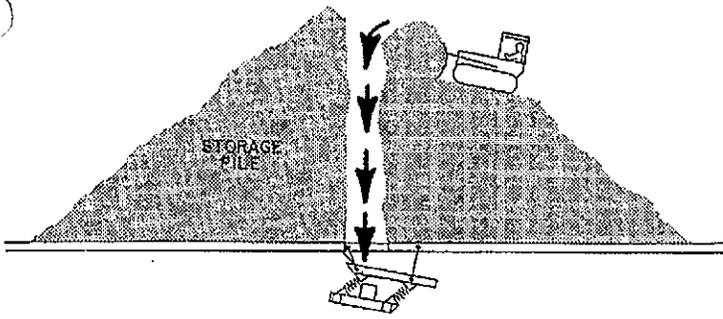


Fig. 9: Storage piles that can't have ground level openings that are based upon the stored material's "critical core" dimension or a Storage Pile Discharger will most likely "rathole". When they do, a front-bladed vehicle repeatedly pushes the peripheral material into the big opening at the top of the pile. Consequently, the feeder must endure the resulting impact loading.

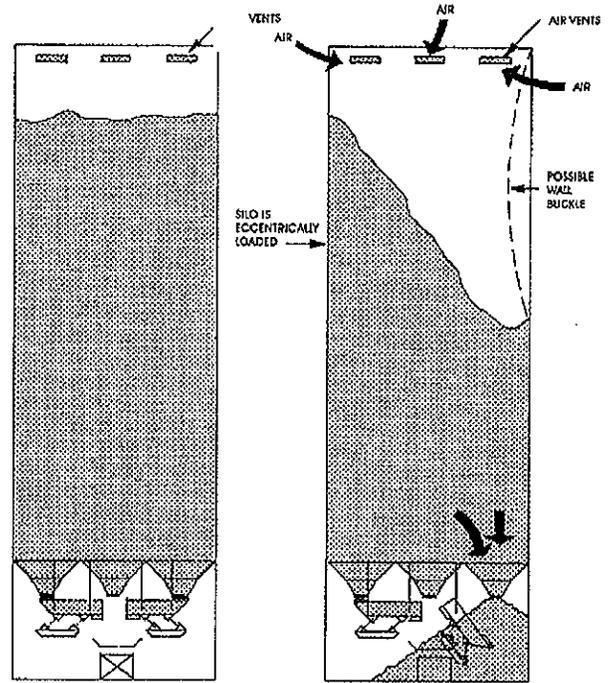


Fig. 10: If the vibrating feeder should ever fall and leave a large outlet unobstructed, the stored materials flow out so fast that it causes a partial vacuum to form in the silo above because air can't enter quickly to refill the vacated space. When that happens, the silo could be severely damaged or may completely collapse.

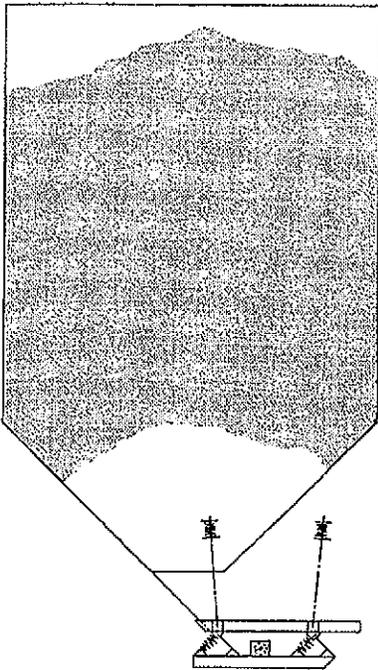


Fig. 11: A temporary material bridge in the bin or silo above. The bridge can ultimately be broken or fall. When it does, tons of stored material can fall and slam in the feeder installed at the outlet. This is called an "unexpected" impact loading.

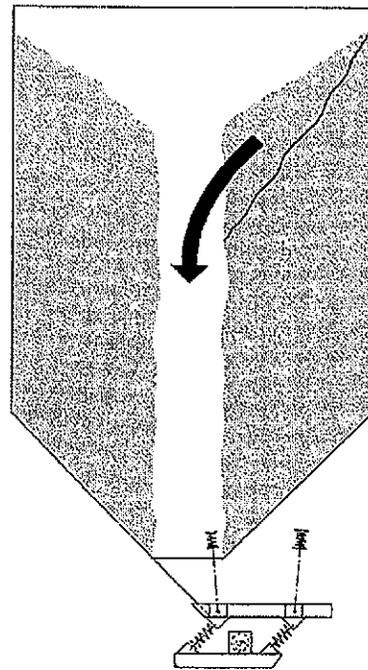


Fig. 12: A "core" or "rathole" could eventually collapse and cause massive amounts of material to impact against the unsuspecting feeder below.

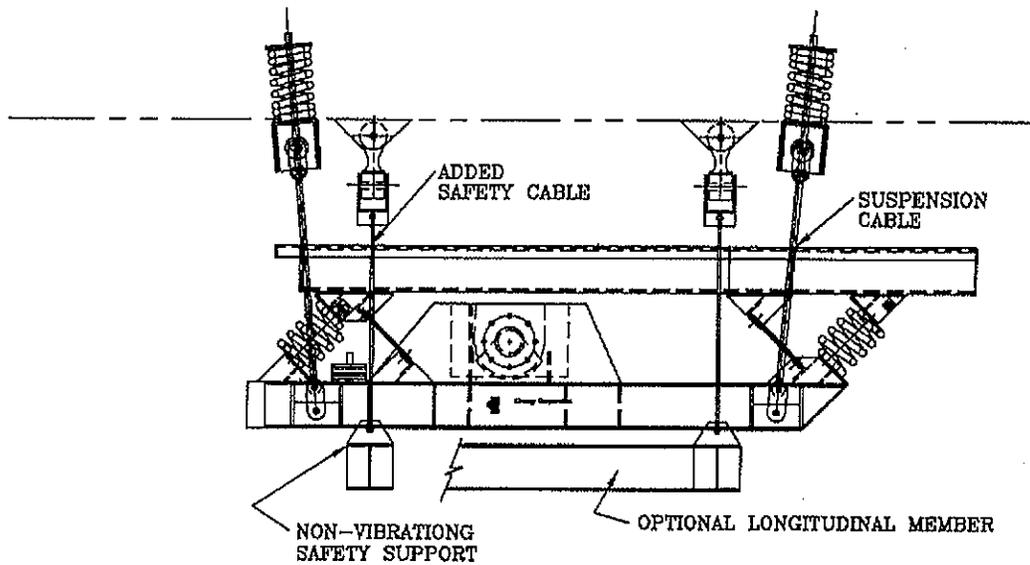


Fig. 13: When the feeder must be suspension mounted, a non-vibrating safety support or structural stops are recommended.

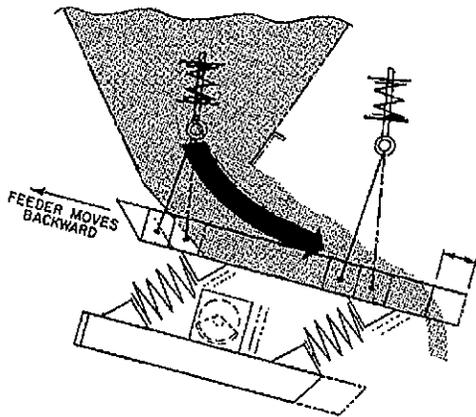


Fig. 14: A unidirectional feeder that is vertically suspended will inherently shift backward when it changes from the "empty" to the fully loaded condition, and the material is being fed.

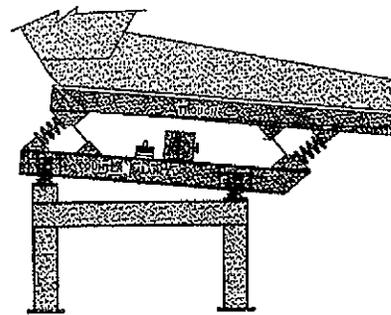


Fig. 15: All vibrating feeders are recommended to be supported from underneath. Particularly, heavy & extra-heavy duty applications..

Otherwise, declare the vicinity in which the Feeder is installed to be a "restricted" area to all unescorted or unauthorized personnel.

7. For ecological reasons, and when the fed material is "dusty" or otherwise in need to be contained, a "dust-tight" feeding trough is recommended. Appropriate flexible connections will be used at both the inlet(s) and outlet(s). (See Figure 32.)

## IX. INITIAL START-UP "NO LOAD"

Before energizing the unit, make each of the following checks:

- A. Confirm the vibratory motor's mounting bolts, eccentric weights, and bolted covers are all tight or securely mounted. Also, confirm the conduit box is firmly secured to the motor's center frame.
- B. Confirm the eccentric weights have a total thickness as shown in the component list of the provided outline drawing on each of the double extended motor shafts. (There are four shaft extensions when two motors are being used.)
- C. The vibratory motor's conduit box is totally stuffed with packing, and the size of the overload heater protection is in agreement with the ampere rating shown on the Feeder's outline drawing. Also, the rotation is in the direction indicated on the outline drawing.
- D. If a bin, hopper, or other means of storage is situated at the Feeder's inlet, confirm that the "interface" configuration is reasonably correct. For example, check for the sloping, rear baffle and the correct skirtboard clearances. (See Section V.)

Inspect the discharge end of the Feeder to ensure the fed material can easily flow to the adjoining unit.

- E. It is good practice to electrically bypass the adjustable feed rate control for the initial start-up and during the mechanical tuning. After confirming the unit's proper vibratory action, the motor can then be connected to the adjustable rate controller. (If an SCR is used, locate and refer to the separately provided instruction manual for that kind of electrical control.)
- F. Locate and have "on hand" the extra eccentric weight adders, tuning plates, and/or drive springs shipped "loose" with the Feeder.
- G. The unit is free of loose gear and obstructions. This includes the underside of the counterbalance.

After the above points are confirmed, energize the Feeder in the empty or no load condition at full voltage for about 30 seconds and "read" the stroke plate (see Figures 25 and 26).

If the trough stroke exceeds the amount shown on the outline drawing, symmetrically remove tuning plates or add drive springs. Repeat removing tuning plates or the addition of drive springs until the proper stroke is obtained. (See Figure 23.)

The unit should be allowed to vibrate for about 30 minutes in the "no load" or empty condition to observe both the stroke and the operating sound level. If the stroke creeps upward, confirm that all the drive spring bolts and flat bar stabilizer bolts are tight. If all the bolts are snug, remove a tuning plate to bring the stroke back to the proper level. No noise other than the "whine" of the motor should be heard. If an unusual noise exists, a bolt is probably loose or the Feeder is rubbing an obstruction. Trace the source of this noise and eliminate it. (Sometimes the steel coil isolation springs can have a slight chatter which is permissible.)

Connect the electrical, adjustable, feed rate speed control (if supplied). The unit will simultaneously decrease the stroke and frequency quietly and smoothly as the dial is turned down. "Zero feed rate" will usually occur at about 35% of the line voltage, and the motor will stall at near 30%. The dial is graduated in the percent of the line voltage, which is not the same as the percent of feed rate.

## **X. INITIAL APPLICATION OF THE LOAD**

To achieve a successful application, the design of the Vibrating Feeder will usually be only part of the assignment. The other aspect will depend upon how the Feeder is operated. In some applications, this will make the difference between success and failure.

The best operating method is accomplished by conscientiously making the needed mechanical adjustments during the "start-up" stage to better adapt the Feeder to the actual feeding conditions. When it's needed, the simple method of electrical control can be utilized to manually or automatically change the feed rate while the Feeder is in operation.

After all the "No Load" checks of Section IX have been accomplished, and after noting the maximum stroke limit shown on the Feeder's outline drawing, the unit is ready for the material load.

The usual objective is to feed the rated capacity at an appropriate mat depth which requires the least amount of trough stroke when full voltage is being applied to the motor. The desired capacity should be accomplished with an adequate thickness

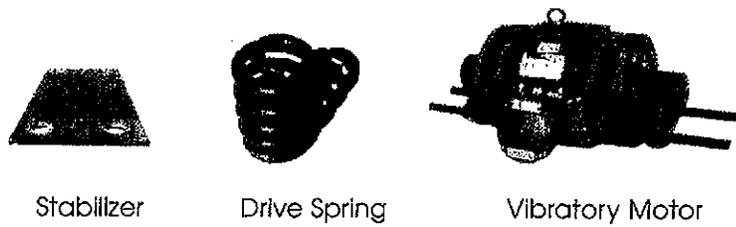


Fig. 16: The Kinergy Drive System has only three component parts. The strong and "stiff" steel coil drive springs that produce "kinergy", the flat bar stabilizers to guide it, and the motor that supplies the needed heat energy to sustain the vibratory motion. Light weight feeders will often omit the steel coil drive springs as shown in Figure 19.

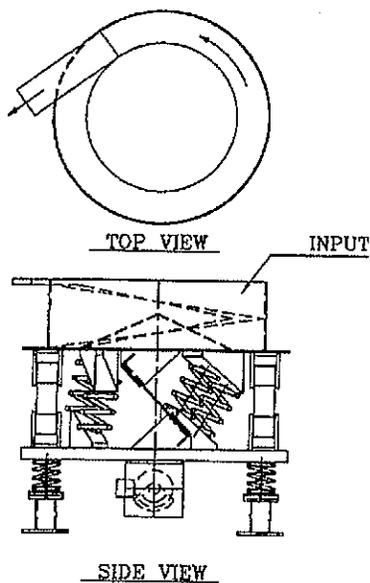


Fig. 17: A Circular Feeder

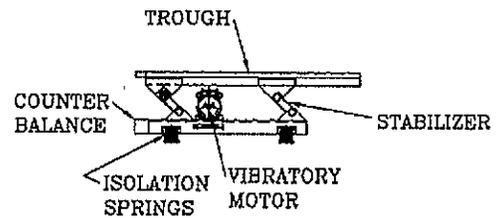


Fig. 18: A small, Light Duty Feeder.

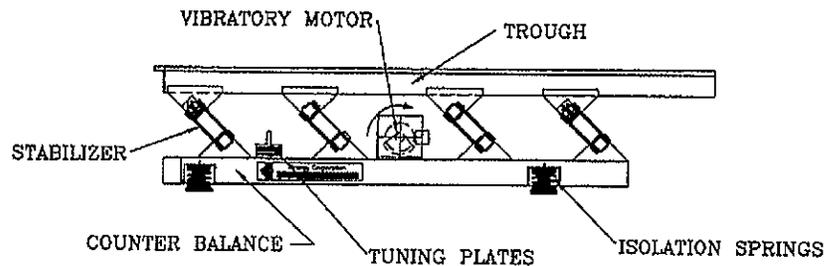


Fig. 19: A Light Duty Feeder.

Note: All the above feeder designs either add or remove flat bar type stabilizers to respectively decrease or increase the "no load" stroke.

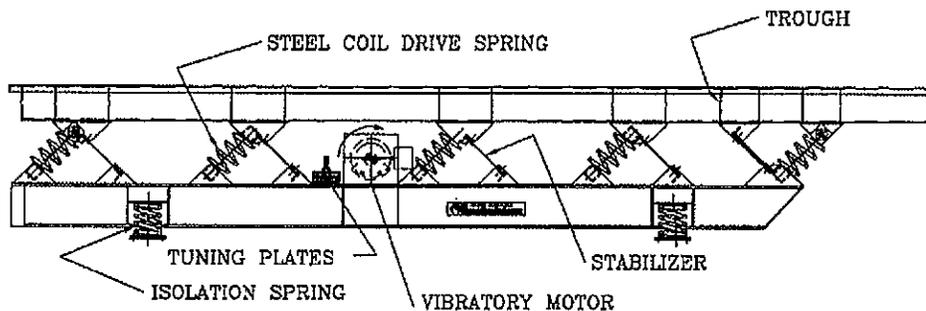


Fig. 20: A typical Standard Duty Design Feeder.

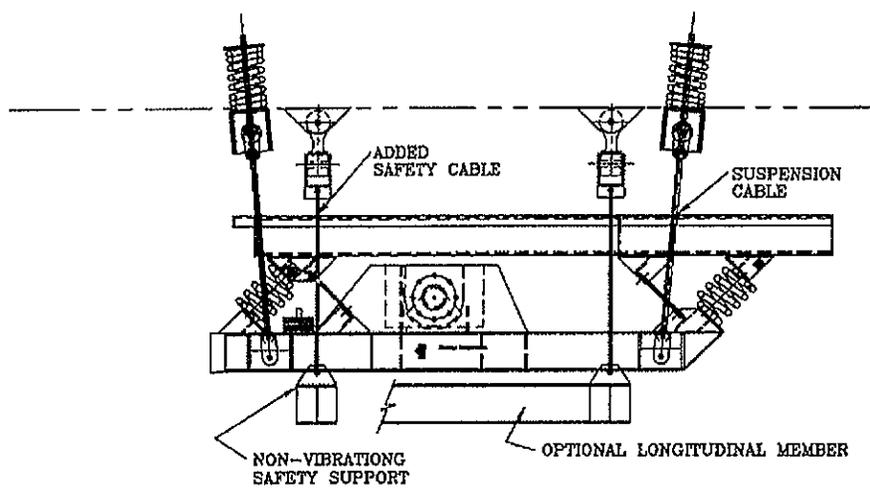


Fig. 21: Feeders acceptably suspended on cables need non-vibrating safety cables as shown or structural stops positioned under the counterbalance.

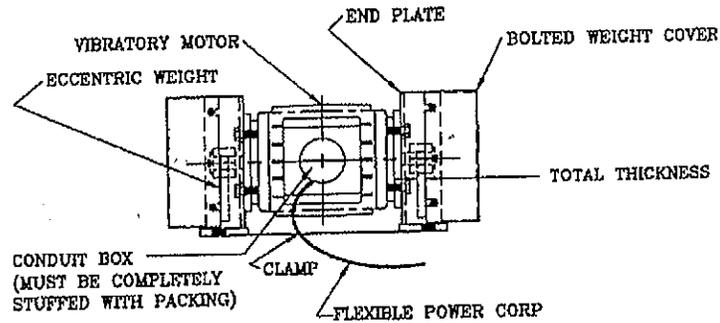


Fig. 22: Illustration of the vibratory motor.



Fig. 23: Illustrates the bolted "tuning plate" adjustment.

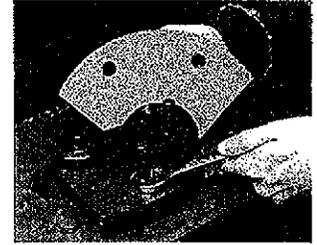
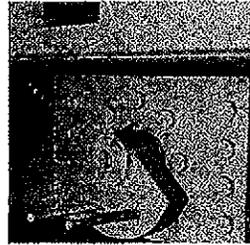


Fig. 24: Shows the bolted adjustment of the motor's eccentric weights. **Caution:** Do not arbitrarily add eccentric weights to the motor.

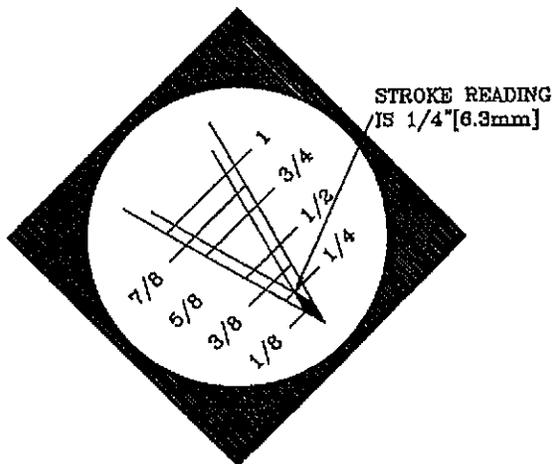


Fig. 25: The vibratory movement intersects the 5/8" line. Therefore the stroke reading is 5/8" or 16mm.

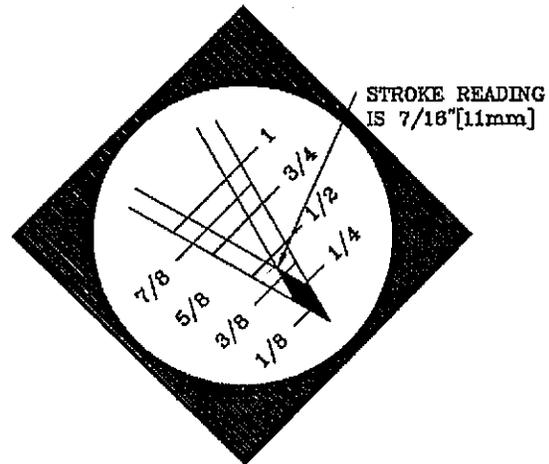


Fig. 26: The vibratory movement is halfway between 1/4" and 3/8". Consequently, the stroke is judged to be 7/16" or 11mm.

## How To Read a Stroke Plate

**Important Notes About The Feeder:** (See the text of this manual for more detail.)

- A. A properly "tuned" unit by mechanical adjustments holds essentially the same stroke from "No Load" to "Full Load".  
When the applied voltage is reduced or the unit is de-energized, the stroke will continually decrease.
- B. Do not arbitrarily add eccentric weights to the motor.
- C. The electric power cable should be rubber sheathed, stranded wire and free of any rubs or whip when the unit is vibrating.
- D. The motor's overload heaters in the linestarter should agree with the amperage rating shown on the unit's outline drawing.
- E. The underside of the counterbalance must be clear of any obstruction. It needs to be free to vibrate in response to the trough's movement.
- F. Units suspended on cables need a safety support or structural stops. (See Figure 13.)
- G. The unit will vibrate very smoothly and quietly. Any unusual noise should be traced to its source and eliminated. Typically it is a loose bolt securing a drive spring, stabilizer, or the motor.
- H. Do not tolerate excessive maintenance. A properly applied and operated unit should not require extra attention.
- I. Do not arbitrarily make modifications to the unit.

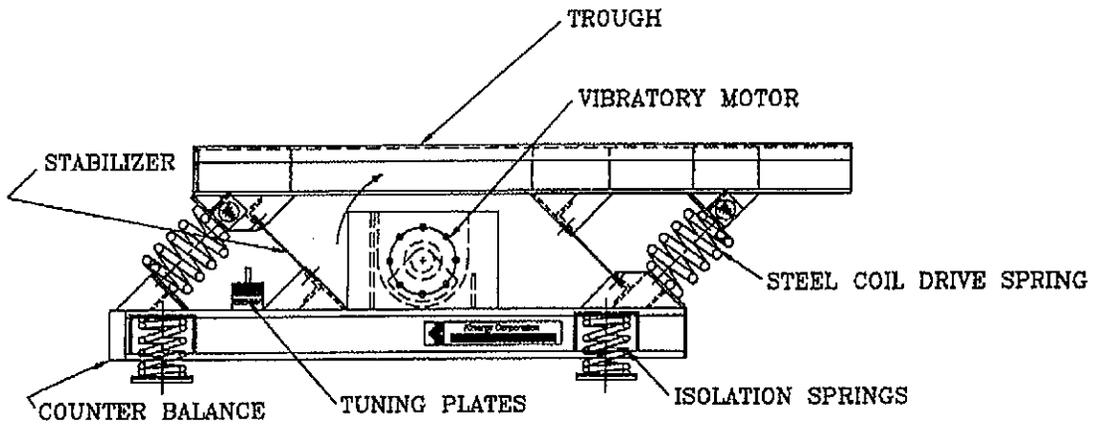


Fig. 27: Typical Heavy Duty Design Feeder

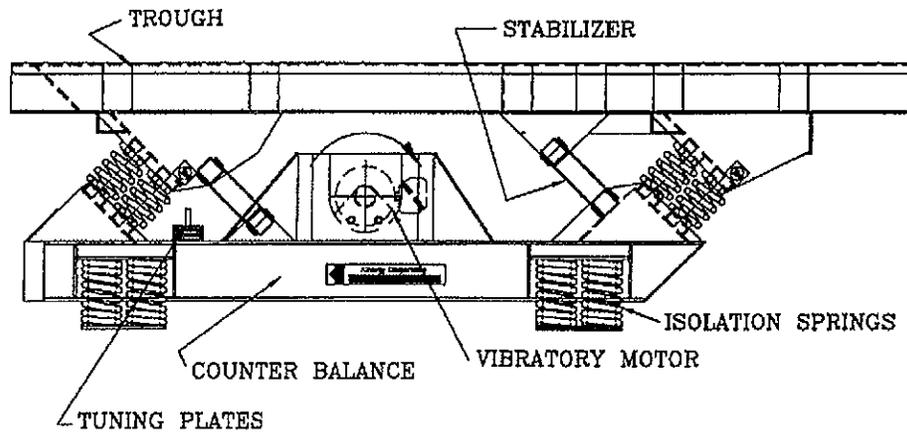


Fig. 28: Heavy Duty Design with two rows of drive springs per bracket

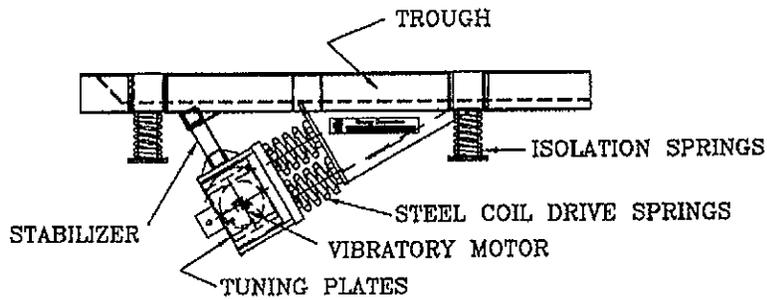


Fig. 29: "Concentrated" Drive Spring Design

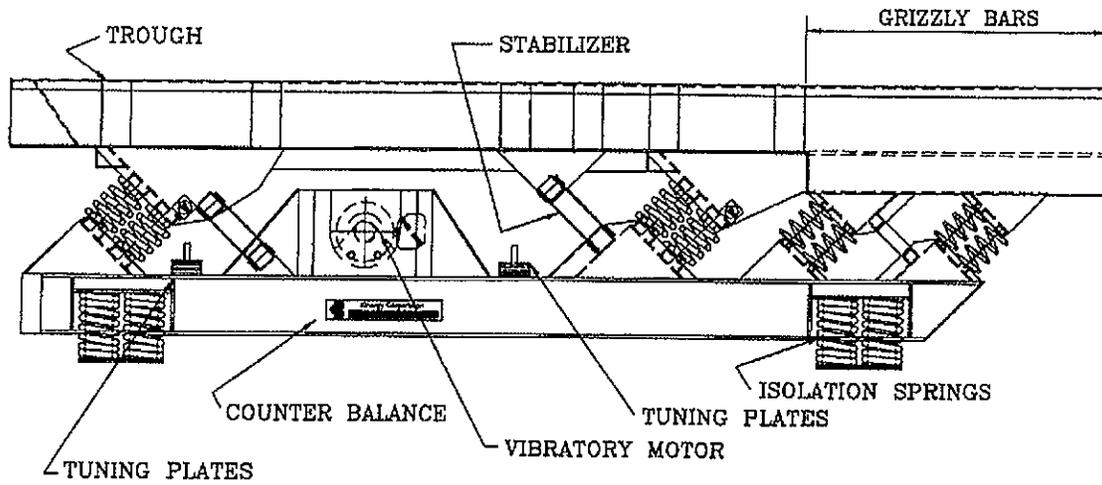


Fig. 30: Extra Heavy Duty Feeder with grizzly bar screening section. Often used as a Primary Crusher Feeder.

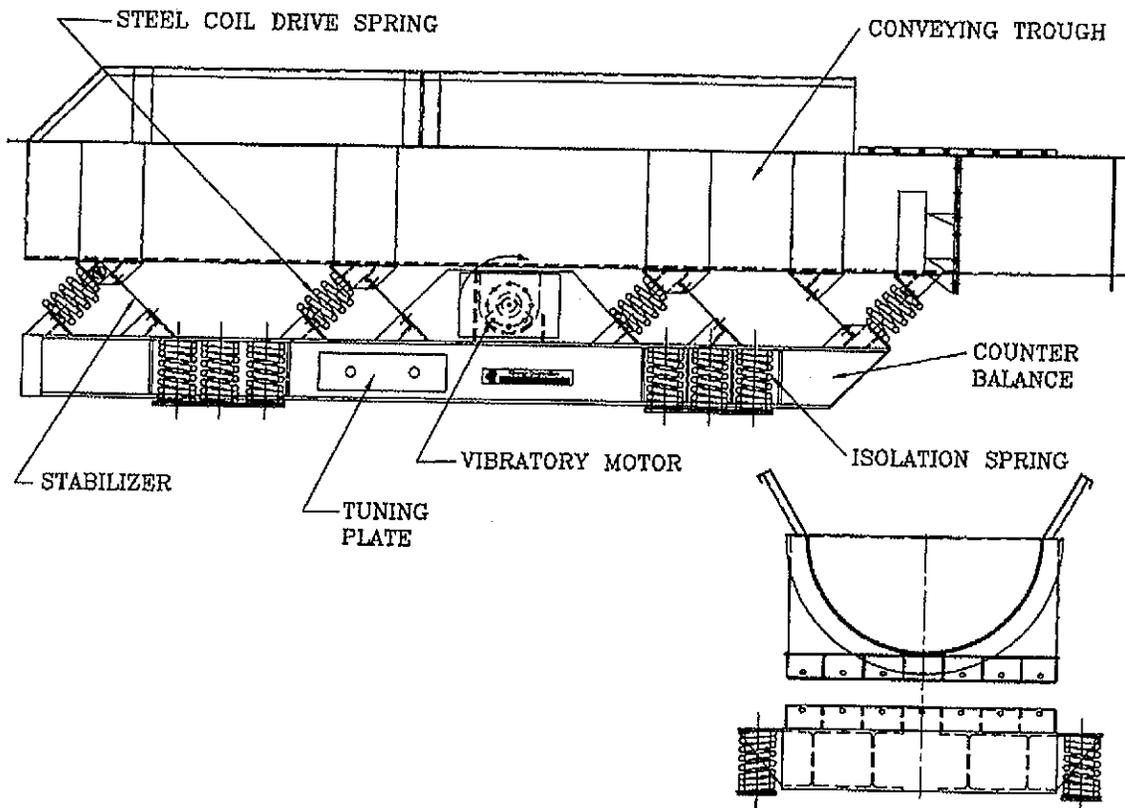


Fig. 31: A Feeder with an integral "dump hopper"

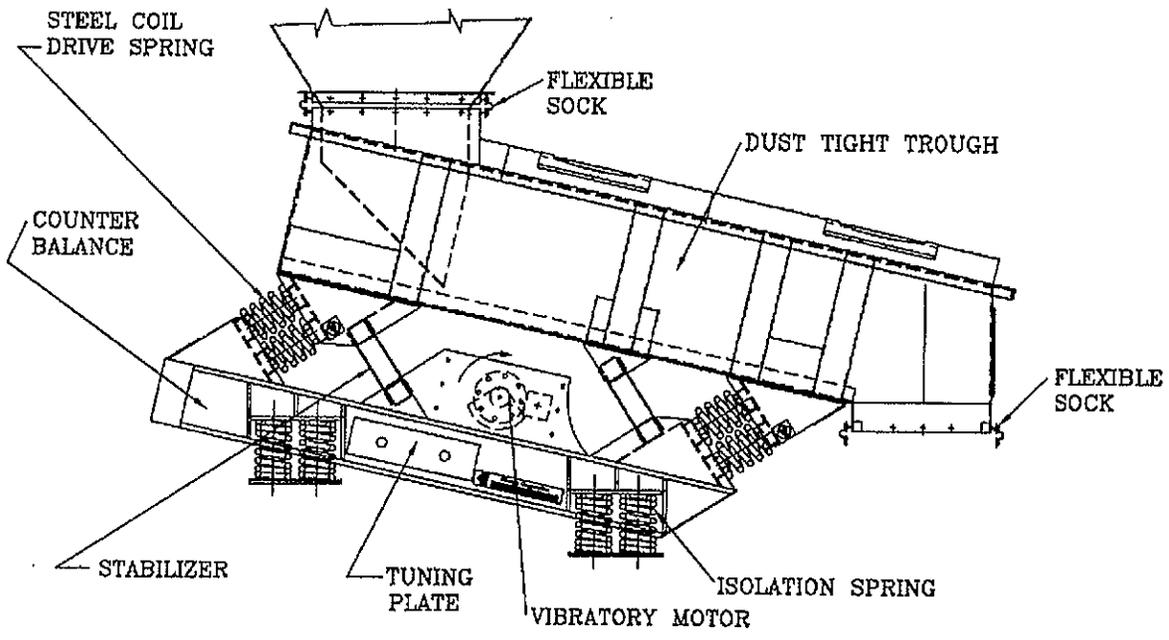


Fig. 32: A Feeder with an integral "dust-tight" trough

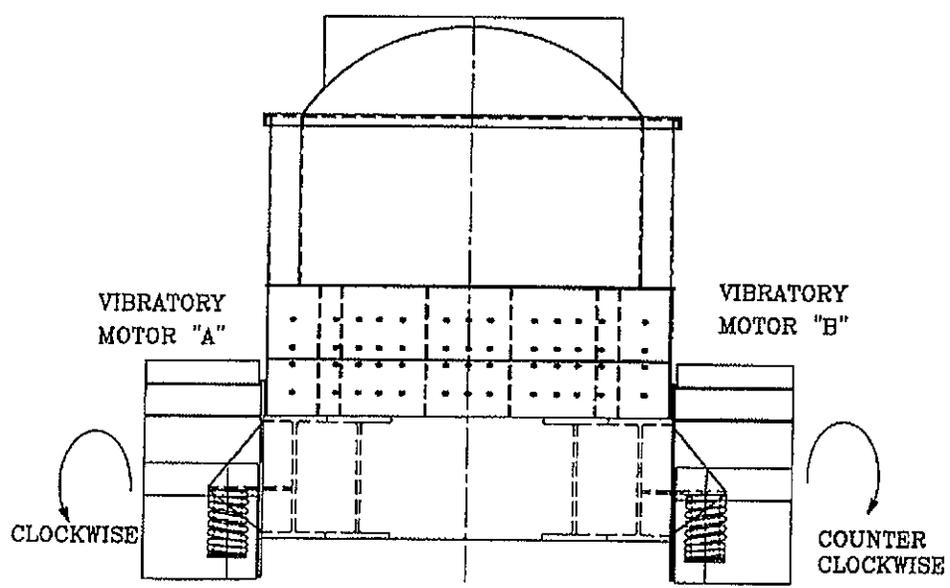


Fig. 33: When two motors are utilized, the rotation is in opposite directions

of eccentric weights installed on the motor, but be sure this input force is not arbitrarily excessive. **Once these mechanical adjustments have been completed, they should remain "fixed" for the duration of the use of the Feeder in this specific application.**

Observe the stroke (at full voltage) as the material load is applied. The unit should not lose more than 20% of its "no load" value. If it does, check for:

- A. Incorrect interfacing at the inlet with the outlet of a bin, hopper, or other means of storage. For example, the presence of the rear 45° sloping baffle and the needed skirtboard clearances. (See Section V).
- B. The Feeder assembly is rubbing against something fixed or is striking an underside obstruction. (Particularly under the counterbalance.) The Feeder will settle or move downward under load.
- C. Confirm the correct motor rotation.
- D. A blocked discharge configuration.
- E. An incorrect power supply voltage.
- F. All the drive springs and flat bar stabilizer bolts are snug tight.

If the above are all correct, and the stroke still dampens excessively under load, add eccentric weights to the motor in appropriate increments. This is more quickly accomplished by de-energizing the Feeder with full load in the trough. Add more eccentric weights to the motor. Energize the Feeder and observe the results. Continue this procedure until the machine's output is adequate. Then, empty the Feeder to re-check the "no load" stroke. Most likely it will be excessive. Remove tuning plates or add drive springs until the stroke returns to the desired amount. **Please see "Summary of the Mechanical Tuning Adjustments" shown in the chart of Figure 34.**

After the unit has been placed "on line", a check for particle build-up on the surfaces of the trough should be made. If build-up exists, the "no load" (empty) stroke should be rechecked. If it is excessive, refer to the "Trouble Shooting" section of this manual.

Also, the moving of high temperature material (above 250° F) could cause a slight rise in stroke when the feeding trough becomes hot. Monitor the Feeder (and other related equipment) for at least two hours with hot product. Re-check the "no load" stroke while the Feeder is in the hot or heated condition. If the stroke is excessive, remove tuning plates or add a drive spring.

**Fig. 34: SUMMARY OF THE MECHANICAL "TUNING" ADJUSTMENTS  
FOR ANY KINERGY DRIVEN VIBRATORY MACHINE**

**IMPORTANT:** All of the adjustments are made with 100% or the rated voltage being applied to the motor. If an electrical variable voltage control is used with the unit, temporarily disconnect it while these changes are being made or confirm full voltage is at the motor of the machine.

**THE ADJUSTMENTS**

Function	Adjustment (Bolted)	Typical Increment	ADD	REMOVE
Minimizes Maintenance by Limiting the Machine's "No Load" Stroke	Tuning Plates	1/2 inch thickness	Increases the unit's "No Load" stroke	Decreases the unit's "No Load" stroke
	Drive Springs	One at a time	Decreases the unit's "No Load" stroke	Increases the unit's "No Load" stroke
Adjusts the Machine's Maximum Output (TPH) Capability	The Motor's Eccentric Weights	1/4 inch thickness to each shaft	Increases capacity by increasing the unit's stroke under full load	Reduces output by decreasing the unit's stroke under load

**INFORMATIVE COMMENTS:**

Since all units are "Mechanically Tuned" in the "No Load" condition at the factory prior to shipment, only minor adjustments will usually be required.

**OBJECTIVE:** The goal is to ensure the motor's Eccentric Weights are adequate, but not excessive to achieve the specified output, and to "back check" the machine to confirm it has the proper "No Load" stroke.

All the adjustments are made symmetrically or evenly about the machine. It is a procedure of "Adjust and Observe". The steps should be repeated as necessary to adapt the unit to the conditions of its "actual use". Once the adjustments have been completed, they should remain "fixed" for the life of the machine in that application.

**"NO LOAD" STROKE:** Allowing an excessive amount of "No Load" stroke will normally cause unnecessary maintenance to be required by the machine. If all the Tuning Plate have been removed and the stroke is still too high, add a Drive Spring.

**ECCENTRIC WEIGHTS:** These are often adjusted while the machine is fully loaded. Add eccentric weights in increments to increase the machine's output. Remove the eccentrics to decrease the output. After the addition has been completed, purposely schedule the machine to become empty and make the necessary adjustments to achieve the proper "No Load" stroke.

**ADJUSTING DRIVE SPRINGS:** Sometimes the addition or removal of a "Drive Spring" will markedly change the unit's stroke. If this occurs, diligently pursue the addition or removal of the bolted "Tuning Plates" until the required "No Load" stroke has been re-established.

**MODIFICATIONS:** If any approved modification is made to the unit, the "Mechanical Tuning" will normally need to be readjusted. This compensates for any change in the machine's overall weight.

**STROKE LIMIT:** The prescribed stroke length for any unit is shown on its submitted outline drawing. The actual "No Load" stroke can be less, but not more than 1/32 of an inch of the specified amount to avoid unnecessary maintenance.

**Remember, all tuning checks are observed at full voltage to the motor and at "no load".** Do not tolerate any unusual noise; track and correct the source of the noise (usually it is a loose bolt).

The electrically adjustable feed rate feature is accomplished by varying the applied voltage to the A.C. squirrel cage motor. Note the unit will stop feeding at about 35% of the applied voltage, but the motor will still be running. **Namely the "zero conveying speed" does not align with "zero voltage"**. Instead, it occurs at about 35% on the dial. If the material output is excessive at full voltage and causes continual operation at low voltages (say from 30% to 50%), remove some eccentric weights from the motor. This will permit running at higher voltages with less material output and provide a wider range of dial settings of feed rate control.

**The flexible, electrical cable to the vibratory motor should again be checked for unwanted rubs, whip, and potential wear.** The flexible cable or conduit should be first fixed to the motor's mounting frame and then pass over to the conduit box.

For any other difficulty experienced with either the start-up or excessive maintenance, refer to the "Trouble Shooting" section of this manual.

## **XI. TROUBLE SHOOTING**

The following points should be helpful if operating, performance, or excessive maintenance difficulty is experienced.

### **A. The Feeder excessively dampens in stroke under load.**

1. The Feeder is striking or rubbing against a fixed object as it settles downward under load. Check along the trough length and under the Feeder's counterbalance for any obstruction.
2. When used with a bin, hopper, or other storage means at the Feeder's inlet, the 45° rear baffle plate of the storage configurations outlet is not installed or it has excessive vertical clearance with the Feeder's trough bottom. This clearance should be limited to 3/8", with 1/4" preferred. (See Interface - Section V.)
3. When combined with a bin, hopper, or similar storage means, the fed mat depth is not deep enough when compared to the length of the opening. Consequently, the upstream portion of the material's vertical flow is dormant. Check the length of the rear baffle to confirm it is equal to the mat depth. This condition will be

prevalent when the bin's outlet length exceeds 1.25 times the material's mat depth. (See Interface - Section V.)

If all the above is reasonably correct and the packing of the material at the Feeder's inlet still persists, then consider automatically "pulsing" the operating stroke of the Feeder.

4. The input configuration to a "covered" or "dust tight" unit is arbitrary. See the unit's outline drawing for the proper inlet arrangement or the interfacing instructions in Section V.
5. After confirming all of the above is reasonably correct, increase the thickness of the rotating eccentric weights installed on the motor until the proper stroke under load is achieved. Usually, they are added in 1/4" increments. When the needed amount has been applied, let the Feeder run empty to recheck its "no load" stroke. Chances are, the stroke will be excessive and either tuning plates will need to be removed or drive springs added to reduce it to its proper length.

**B. The Feeder's capacity (TPH) is not adequate.**

1. Confirm that the rotation of the vibratory motor is correct. When a single motor is used, it should be rotating in the direction of feeding. For example, the rotation is clockwise when the viewed feeding direction is from the left to right. Otherwise, refer to the outline drawing or contact Kinergy when two motors are utilized. (In some situations the material may feed better if the rotation of the motor is in the opposite direction. Therefore, purposely rotate the motor in the other direction and observe the results. If the change is gainful, let the motor rotate in that direction.)

If two motors are utilized the rotation must be opposite to one another.

2. Confirm the proper "no load" stroke is being reasonably achieved. This may require adding tuning plates or removing drive springs.
3. If excessive stroke dampening is occurring, check the trough (and the underside of the counterbalance) for striking or rubbing against an obstruction as the Feeder settles downward under load.
4. If the Feeder is installed under a storage means, confirm the mat depth limiting gate has an appropriate opening height. (See Section V.)

5. Confirm the proper interface layout of the Feeder at both the inlet and the outlet. (See Section V).
6. The head load from a storage means at the inlet may be causing the upstream end of the Feeder to settle more than the discharge end. This would cause the material to be fed uphill. If so, shim under the inlet end of the Feeder as needed.

Any inlet end "dormancy" in the material flow as it changes from the vertical to the horizontal direction should be eliminated. This usually means the bin throat opening is too large. If so, correspondingly increase the mat depth. (See Section V.)

7. If the Feeder has a cover, confirm the material's entry through the cover is an appropriate design. See the Feeder's outline drawing or the "Interfacing" instructions in Section V.
8. After confirming all of the above is reasonably correct, increase the thickness of the rotating eccentric weights installed on the motor until the proper stroke under load is achieved. Usually, they are added in  $\frac{1}{4}$ " increments. When the needed amount has been applied, let the Feeder run empty to recheck its "no load" stroke. Chances are, the stroke will be excessive and either tuning plates will need to be removed or drive springs will need to be added to reduce it to its proper length.

**C. The feed rate is too fast.**

1. Equally remove eccentric weights from each end of the vibratory motor shafts. The rate will decrease in direct proportion. That is, if 25% thickness is removed, the feeding speed will also diminish by about 25%.

Another option is to remove tuning plates or add drive springs to reduce the trough's stroke.

2. If applicable, decrease the angle of declination.
3. When it is beneficial, place the Feeder on an uphill incline by shimming under the supports at the discharge end of the trough.

**D. The material does not feed because it is either coated or saturated with a liquid.**

1. If a liquid saturated bulk solid is being moved, consider declining the Feeder at least 2°. This allows the liquid to flow or drain down the Feeder's trough length.
2. If liquid coated unit pieces with large flat surfaces are being fed, an appropriate trough liner to break the fluid's surface tension may be needed. Contact Kinergy.
3. Consider the use of the automatic, repetitive, momentary, electrical "pulsing" of the Feeder's operating stroke and frequency.
4. Increase the trough stroke to its maximum amount.

**E. Excessive particle adhesion to the surfaces of the feeding trough.**

The goal is to have the incoming material to impact against its own particles as they enter the Feeder's inlet. The particles should not impact against an exposed surface. Further, the fed mat depth should become as deep as is practical by reducing the feeding trough's operating stroke.

1. If acceptable, use an operating practice of shutting down the Feeder with a full load or allow the inlet section to fill with material. Don't empty the feeding trough. Otherwise, try to avoid starting the Feeder when its inlet section is completely empty. Instead, purposely delay the "start-up" of an empty trough until the incoming particles have sufficiently accumulated to totally cover the surfaces of the inlet section. An electrically time delayed start could accomplish this wanted condition. Another option is to utilize a small surge hopper at the Feeder's inlet.
2. Increase the fed mat depth by decreasing the operating stroke. Add drive springs or remove tuning plates until the minimum effective stroke is achieved.
3. Instead of falling vertically, try to have the incoming material slide into the Feeder's inlet. Study the inlet configuration to determine if this is feasible.
4. Consider the use of the occasional, automatically repetitive, electrical, momentary "pulsing" of the Feeder's operating stroke and frequency to "break loose" the adhered particles.

5. A low friction type of trough liner may be ultimately needed. It will usually be of SS-304 or polyurethane.

**F. The fed material generates too much noise.**

The Feeder's trough stroke length is too long. Therefore, reduce the operating stroke by removing tuning plates or adding drive springs and allow the material's mat depth to proportionately increase.

**G. The fed material is being damaged.**

The Feeder's trough stroke length is too long. Therefore, reduce the operating stroke by removing tuning plates or adding drive springs and allow the fed mat depth to proportionately increase.

**H. When a storage means is utilized, the material packs at the inlet end of the feeding trough.**

1. Check the installation of the 45° rear baffle plate to ensure that it has a slant length equal to the initial mat depth. Its vertical clearance is limited to 3/8" (1/4" preferred) with the Feeder's trough bottom.
2. If the bin outlet length is excessive for the mat depth, try to increase the initial mat depth. (See Interface - Section V.) If the bin throat to mat depth ratio is still excessive (greater than 1.25), convert to a "long slot" type of "interface".

**I. The feeding trough excessively wears.**

**Important Note:** Sometimes the material being fed is mildly corrosive. Consequently, the slight sliding action over the chemically attacked surface will appear to be the results of abrasion. In this situation, install a chemically inert trough liner such as one made of SS-304.

The act of feeding a very abrasive material over the length of the trough by means of a vibratory action should not cause any significant wear. If it does, reduce the operating stroke and let the fed mat depth increase to maintain the same capacity.

Therefore, excessive trough bottom wear can almost always be traced to the incoming particles or pieces repeatedly striking an exposed metal surface. This is called "Impact Abrasion" which is not the same as the wear derived from "sliding" over a surface.

The corrective measures would be dedicated to decreasing or eliminating this repeated impact of the incoming material on the exposed trough

surfaces. Further, the fed mat depth should become as deep as practical by reducing the trough stroke. These changes could be:

1. Increase the fed mat depth by decreasing the operating stroke. The volumetric feeding capacity (TPH) will remain the same.

To reduce the stroke, either remove tuning plates or add more drive springs as needed. Most likely, the revised feeding speed will be at least 50% less.

When the Feeder is in the empty condition, purposely delay the "start-up" to permit an adequate, initial accumulation of material that totally covers the surfaces of the inlet section. An electrically, time delayed start could accomplish this wanted condition. An alternative is to always shut the Feeder down under load with its inlet section filled with material. Another possibility is to consider the use of a small surge hopper at the Feeder's inlet that maintains a reasonable level of stored material.

The operating goal is to have the incoming material to impact against its own particles as they fall into the Feeder's inlet.

2. Instead of falling vertically, try to have the incoming material slide into the Feeder's inlet. Study the inlet configuration to determine if this is feasible.
3. When it is acceptable, utilize an electrical cycle timer to automatically turn the Feeder "on" and "off" on a repetitive basis. This would permit the inlet to become filled when the supply is intermittent or not very consistent. This same kind of operation can be achieved with a "variable voltage" control performing a "maximum-minimum" type of output.
4. If none of the above are practical, then a replaceable trough protecting liner at the Feeder's inlet should be considered.

It can be thick bonded rubber for absorbing energy, polyurethane, stainless steel if corrosion is a factor, or hard surfaced abrasion resisting steel. Sometimes AR plate with a thick rubber pad sandwiched underneath is beneficial.

If it is wanted, contact Kinerger for more assistance.

**J. Premature vibratory motor failure.**

Note: When a vibratory motor appears to have failed, make the following checks before removing it from the Feeder. Chances are, the incoming, flexible, electrical power cable to the motor's conduit box connections is all that needs to be repaired.

1. An electrical arc occurred in the conduit box because it was not properly packed. Therefore, motor leads either fatigued or the insulation failed from rubbing against the rough surfaced inner wall of the conduit box (see Figure 22).
2. After turning the conduit box to the wanted position, it was not made secure to the motor's center frame.
3. The incoming flexible cable is not of a rubber sheathed, stranded wire, or it is not fixed to the motor mounting assembly. Therefore, the incoming wire of the flexible cable either broke from metal fatigue or it rubbed against a contacting surface until the insulation failed (see Figure 22).
4. An improper greasing schedule was followed or grease utilized does not tolerate a vibratory action. Therefore, the bearings failed. See the grease schedule situated in the back of this manual, or utilize a more appropriate lubricant.
5. The vibratory motor has been repaired by an unauthorized repair station. Consequently, the incorrect winding securing methods, bearings, or bearing fits were not obtained. Have the repair shop contact Kinergy for the proper repair instructions if it is necessary.
6. Incorrect wiring connection to the incoming power supply.
7. If two motors are used, their electrical overloads were wired in parallel instead of being connected in series. Consequently, one motor still runs while the other is stopped. The vibration will create "flat spots" in the spherical rollers of the bearings of the motor that has "tripped out". This will cause a premature bearing failure.
8. The thickness of the eccentric weights installed on the motor are arbitrarily excessive. Reduce the thickness to an amount that is adequate but not excessive.
9. If the small center frame bolts are failing, the motor is installed with too much tension in its mounting assembly. Loosen the larger

bolts that secure the end brackets. Then, appropriately shim between the face of the motor and the one end plate to ensure the motor is installed in compression when the flange bolts are made snug tight.

**K. Excessive drive spring failure.**

1. The Feeder is not mechanically adjusted to maintain essentially the same stroke No Load to Full Load. In other words, the unit overstrokes when empty, but dampens to an acceptable amount under load. Correct by following the tuning procedures outlined in the Initial Start-Up (Section IX).
2. An incorrect clamping washer is being used to bolt either end of the spring. Utilize the round washer provided by Kinergy.
3. The "seating" of the spring's bolting washer is incorrect. Loosen the bolt and move that end of the drive spring until the clamp evenly and concentrically seats. **Do not strike the steel coils of the drive springs directly with a steel head hammer.** This damages their peened surfaces which will cause premature failure at that spot.
4. The drive spring bolts are not kept tight. Use only self-locking nuts and Grade 5 bolts with standard threads.

**To identify a bolt with damaged threads, try to turn it on one end after tightening. If it turns, the threads are damaged and the bolt must be replaced.**

5. Incorrect drive spring installation. Either the drive spring coils are rubbing against the coils of one next to it or the bolt has damaged threads. Move the spring slightly to avoid a rubbing contact or remove the bolt with the damaged threads and replace it.
6. The Feeder is repeatedly allowed to run empty and then is subjected to unexpected high impact or shock loads dropped from excessive heights. Correct this by maintaining a level of material in the feeding trough when the load is dumped. (This condition may require heavy or extra-heavy duty units.)
7. The Feeder is arbitrarily continued in operation with a failed stabilizer or steel coil drive spring. This can cause multi-spring and stabilizer failures.

8. The Feeder is electrically controlled by a "Variable Frequency" type of control and its operating frequency can exceed 60 hertz or CPS. This will cause an "overstroke" and the drive springs could fail. Either absolutely limit the operating frequency to 60 hertz maximum or replace the electrical control with one of the "Variable Voltage" type from Kinergy.

**L. When overhead suspended, excessive failure of the eye bolts or the isolation springs.**

1. The isolation springs are not carrying the same load; thus, they vibrate laterally and excessively. To correct this, adjust the eye bolts until the suspension cable stands steadily.
2. The isolation spring is mounted adjacent to the Feeder trough instead of being installed at the top of the cable or to the fixed support.
3. The Feeder is being subjected to repetitive high impact type loading. Consider changing to an undersupport with the isolators in compression.

**M. Excessive electrical control failure or fuse blowing.**

1. Incorrect wiring connection.
2. An arcing lead in the conduit box of the motor sparked or faulted because it was not properly packed.
3. If an auto-transformer fails, the motor was attempted to be started at too low of a voltage. It needs to be 60% applied voltage or more to start if wired to schematic AE-100. Correct (if wanted) by wiring to AE-101.

All the SCR controllers have the inherent "full voltage start" feature.

4. An SCR controller is being used, but the "minimum" voltage is set too low. Consequently, the motor stalls and draws high amps. Please see the separately provided SCR Instruction Manual which is a separate booklet sent with the Feeder.
5. The enclosure is not suitable for the surrounding atmosphere.
6. The conduit box is not secured to the motor's center frame.

N. Excessive difficulty with the SCR type of "variable voltage" controller.

See the separately provided SCR Instruction Manual.

XII. MINIMIZING MAINTENANCE

A properly tuned Feeder will vibrate very smoothly and quietly at a "given" amount of stroke on the feeding trough. By observing the "no load" stroke occasionally to confirm it is within the proper limit, greasing the motor as scheduled (usually every 4 months), and tracing any unwanted noise to its source and eliminating it, the Feeder is properly maintained. In short, **just "look and listen" to the Feeder to maintain it.** The repeated "Looking" and "Listening" could be done by a cooperative operator that regularly patrols the area in which the Feeder is installed. When an unwanted condition is observed by the operator, it can be promptly reported to the maintenance personnel for immediate correction.

The Kinergy Driven Vibrating Feeder should provide long term, maintenance-free operation. When high maintenance is experienced, do not tolerate it. The trouble can usually be traced to these most common causes of unnecessary trouble:

1. Overstroke of the unit caused by it not being properly adjusted to maintain the same stroke "No Load" to "Full Load". (That is, the stroke is over its limit empty, but dampens to the proper limit under load.)
2. Overstroking caused by arbitrarily adding eccentric weights to the motor without regard to holding the stroke essentially the same "No Load" to "Full Load". While the eccentric weights should be adequate, they should not be excessive.
3. Overstroking being derived from not adjusting the "no load" stroke of the Feeder after particle build-up on the trough surfaces has been experienced. Remove tuning plates or add drive springs to compensate for the particle build-up. Also see Section XI, Troubleshooting, entry "E".
4. Overstroking derived from arbitrarily adding "fixed" weight to the trough such as a cover, wear plates, etc. Compensate by removing tuning weights or adding a drive spring(s). If possible, remove the modification.
5. Trying to start the motor on less than 60% voltage (auto-transformer units, per AE-100), or the control enclosure is not suitable for the atmosphere (dust, moisture, etc.).

6. Incorrect installation of the drive springs, their bolting clamps, using bolts with damaged threads, or prolonged operation of the unit with a failed (broken) drive spring or flat bar type stabilizer.

To prevent these common reasons for failures, the following checks should be made. As said, it simply amounts to "looking and listening" to the Feeder.

1. **Observe the stroke plate at least once per week.** All checks should be made with full voltage (100%) applied to the motor. If the stroke of the unit has crept upward, it means the drive springs have become loose (provided all trough build-up has already been compensated). Always tighten the drive springs first when creep is experienced.

Once the drive springs have "broken in" and back-checked for tightness (48 hours initial operation), they should only require occasional tightening. If, by chance, creep still persists, it is most likely being derived from particle build-up on the trough. To correct for this situation, see Section XI, Troubleshooting, entry "E". If creep is allowed to go uncorrected, the unit will gradually increase in stroke and pass into an overstroking condition.

2. **The input motor should be lubricated as prescribed.** Motor failure should seldom be experienced. However, if it occurs, **the motor should be returned to the manufacturer's authorized repair shop.** This is a must for warranty repairs. Any repair by an unauthorized repair station will void the warranty of the manufacturer.

The vibratory motors are unique from the standpoint of the kind of bearings, bearing fits, insulation, the method of securing the motor leads as they pass from the inner frame to the conduit box and the like. Therefore, it is always a good practice to return a failed motor to the manufacturer's authorized shop because they have specific instructions about the proper repair of vibratory motors.

3. **Any unusual sound indicates trouble.** A properly operating Vibrating Feeder will make little or no noise. Usually, any noise will be traced to a loose drive spring or stabilizer bolt.

A loose drive spring can be detected by slipping a screwdriver under the spring at its clamp connection. The loose spring will make a slight chattering sound. By inserting the screwdriver, the noise will be reduced which locates the loose spring. If the threads of a bolt are damaged, it will still turn after it appears to have been tightened. Therefore, to confirm the threads are damaged, try to turn one end of a tightened bolt with a wrench.

## KINERGY CORPORATION

Louisville, Kentucky 40219

**VIBRATORY MOTOR LUBRICATION & MAINTENANCE**

EXCITOR SERIES	FRAME	SPEED	INITIAL GREASE PER BRG.	0 - 16 HRS./DAY	24 HRS./DAY	AMT. OF GREASE PER BEARING
KES-145	145	All	*0.2 oz.	6 mos.	3 mos.	*0.10 oz.
KEI-184	184	All	*1.6 oz.	6 mos.	3 mos.	*0.15 oz.
KEH-184	184	All	*1.6 oz.	2 mos.	1 mos.	*0.25 oz.
KEI-215	215	All	*1.6 oz.	6 mos.	3 mos.	*0.15 oz.
KEH-215	215	All	*2.5 oz.	2 mos.	1 mos.	*0.50 oz.
KEI-256	256	All	*2.0 oz.	6 mos.	3 mos.	*0.4 oz.
KEH-256	256	All	*6.0 oz.	2 mos.	1 mos.	*1.0 oz.
KEI-286	286	All	*5.0 oz.	6 mos.	3 mos.	*1.0 oz.
KEH-286	286	All	*8.5 oz.	2 mos.	1 mos.	*1.5 oz.

The vibratory motor is double flanged, with a double shaft extension, A.C. squirrel cage type induction motor. It has specific bearings, bearing fits, end brackets, shafts, and the needed securing methods for the electrical windings.

The following points must be observed:

- (1) Recommended greases include Chevron SRI-2 (preferred), Texaco Premium RB, and Unirex N-2 (Humble Oil). Darina EP-1 (Shell Oil) and Rykin EP-2 (American Oil) can also be used, but greasing interval will be decreased by at least one-half. (i.e. grease twice as often). Do not overgrease the bearings.
- (2) Warranty repairs are honored only at the motor manufacturer's authorized repair stations.
- (3) All motor holding bolts should be SAE Grade 5 and "torqued" as follows:  
(Values are in foot-pounds.)

<u>BOLT SIZE</u>	<u>TORQUE</u>	<u>BOLT SIZE</u>	<u>TORQUE</u>
3/8-16	32	3/4-10	250
1/2-13	75	1-8	585
5/8-11	150	1-1/4 -7	1100

Any replacement bolt should be Grade 5 and should be installed using "Loctite #262".

- (4) Removable top or end bolting plate cannot be warped or bent (use shims to hold the motor in slight compression).
- (5) Conduit box of excitor must be totally stuffed with suitable packing. Johns-Manville dux-seal is recommended.
- (6) All vibratory motors are originally supplied with minimal grease. Before the "start-up", the grease plug should be removed and the locally available grease pumped into each bearing until the grease emits through the relief plug.

**Note: Small motors that are less than frame 145 are normally supplied with non-greasable bearings. Therefore, these motors will not be greased.**

duced Vertical Flow  
duced Conveying

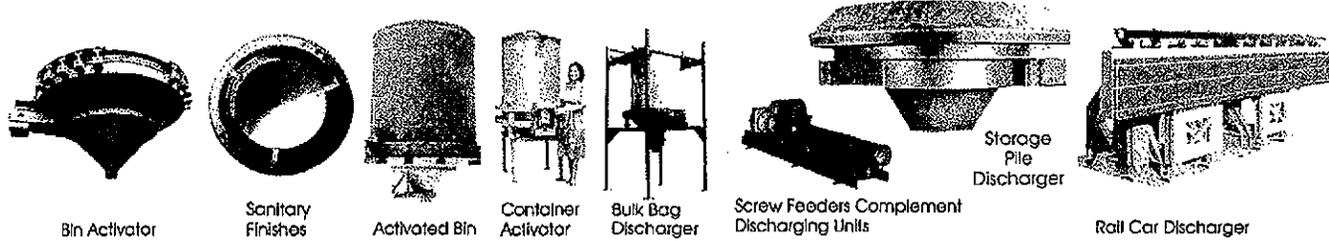
# Kinergy's Many Vibratory Machines

**Kinergy Corporation**  
7310 Grade Lane  
Louisville, Kentucky 40219  
Phone: 502/366-5685  
FAX: 502/366-3701

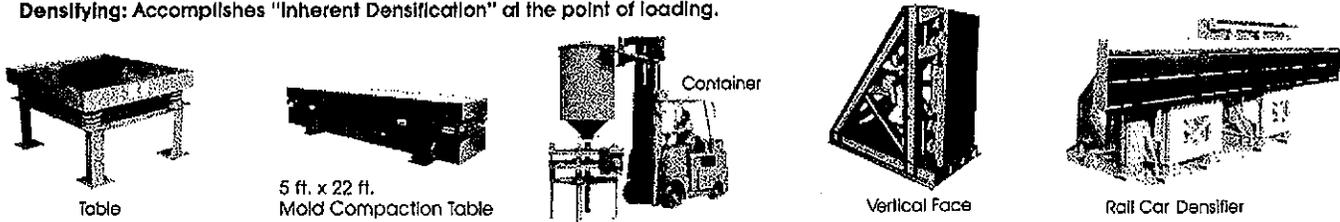
The most complete line of vibratory machines for "inducing" bulk solid materials to either Vertically Flow or Convey.

**duced Vertical Flow:** The vibratory action supplements the forces of gravity.

**Discharging:** The objective is a uniform, symmetrical and concentric vertical flow pattern.

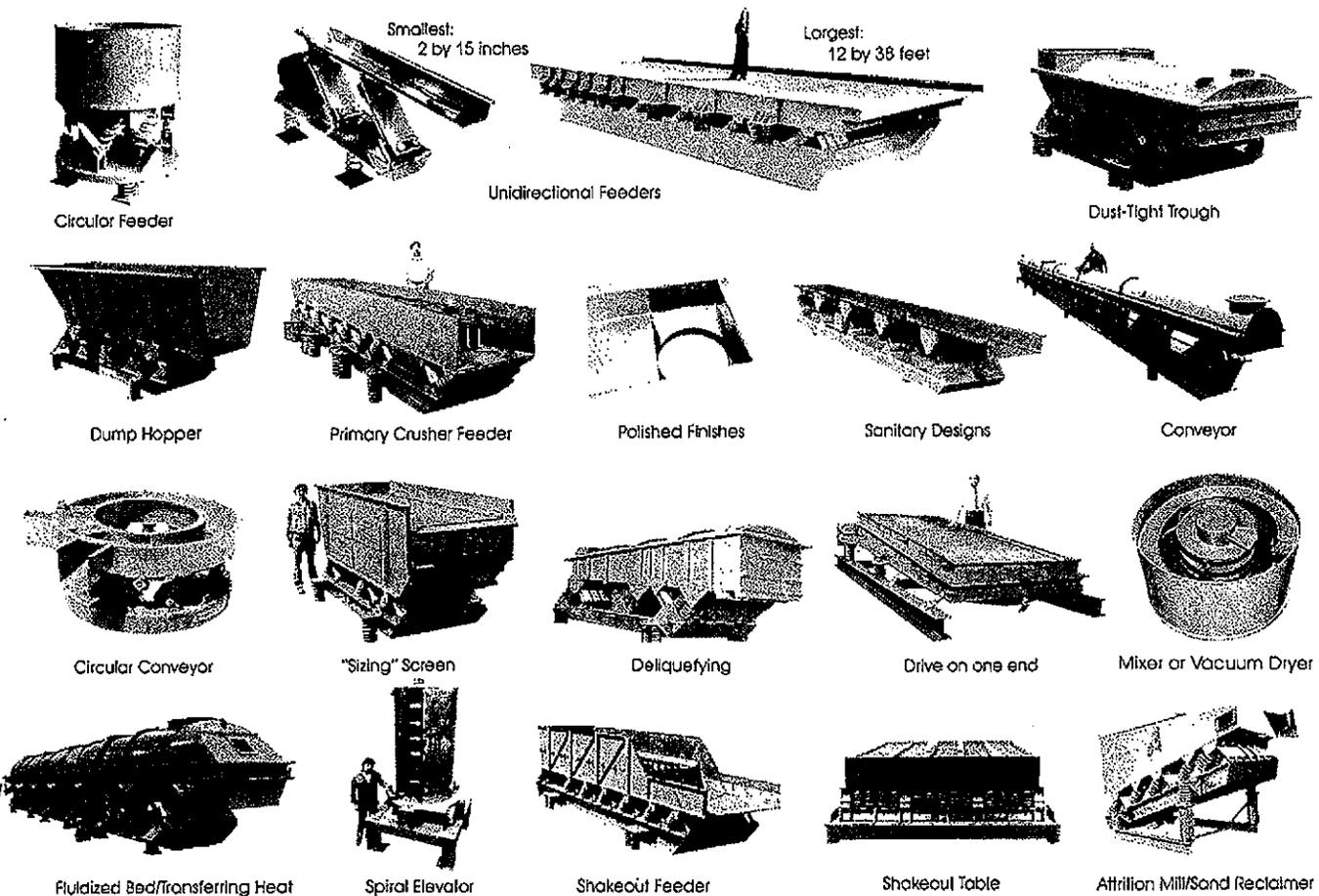


**Densifying:** Accomplishes "Inherent Densification" at the point of loading.



**duced Conveying:** The intentional vibration is the prime mover of the bulk solid or unit pieces.

For the first time in the history of "Induced Conveying" machines, all these different units of various functions are powered by the same type of drive which inherently includes a full range of adjustable output by a simple method of electrical control.



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Nairobi, Kenya  
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**save  
energy  
use  
kinergy**

The most complete line of vibratory machines for bulk solid material handling and processing

# Induced Vertical Flow

Discharging / Densifying

**DISCHARGING** "Inducing" a uniformly expanded vertical flow pattern in bins, silos, containers, storage piles, and rail cars.

**DENSIFYING** Accomplishing "Inherent densification" while loading containers, molds, and rail cars.

***Kinergy Driven\****

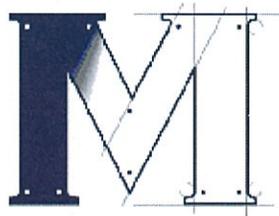
# Induced Conveying

Circular & Unidirectional

VIBRATING FEEDERS  
VIBRATING CONVEYORS  
VIBRATING MIXERS  
VIBRATING SCREENS  
VIBRATING COOLERS/DRYERS  
VIBRATING SPIRAL ELEVATORS  
FOUNDRY SHAKEOUTS  
FOUNDRY RECLAIMERS  
BOILER FEED CIRCUITS

*\*All are powered by the Electrically-  
Controlled Versatile and Energy-  
Efficient Kinergy Drive System*





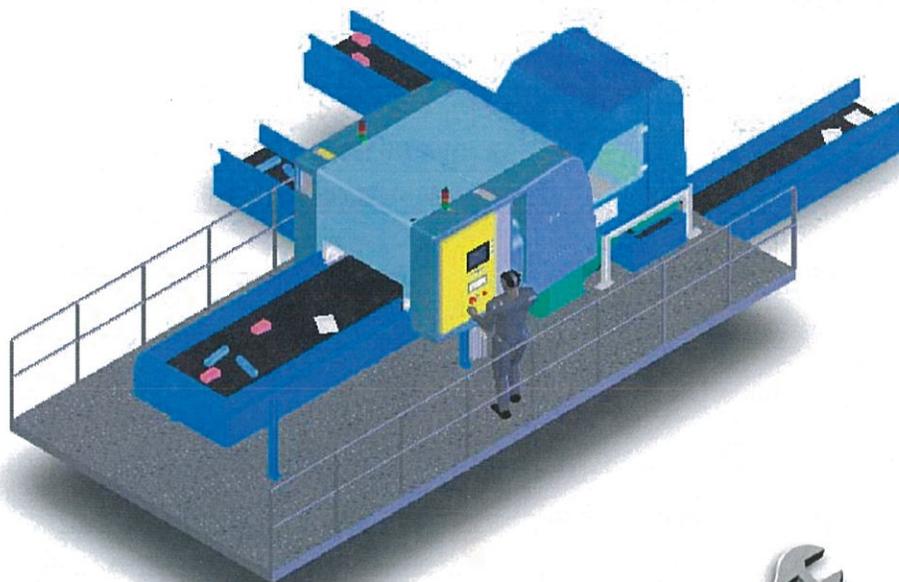
***ANNEX 2***  
***OPTICAL SORTER***

PELLENC  
selective technologies



# SORTING MACHINE INSTRUCTIONS

OPERATING MAINTENANCE



Ref : PROC\_TRG802

VERSION 02/2008



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# ***SUMMARY***

CHAPTER	TITLE	CONTENTS
<b>1</b>	<b>GETTING STARTED</b>	<ul style="list-style-type: none"> <li>• Safety</li> <li>• System description</li> <li>• Start up</li> </ul>
<b>2</b>	<b>SOFTWARE</b>	<ul style="list-style-type: none"> <li>• Description of software functions</li> </ul>
<b>3</b>	<b>MAINTENANCE</b>	<ul style="list-style-type: none"> <li>• Description of all maintenance operations to carry out on the machine</li> <li>• Location of the parts to clean and frequency of maintenance</li> </ul>
<b>4</b>	<b>PART REPLACEMENT</b>	<ul style="list-style-type: none"> <li>• Description of all maintenance operations to carry out on the machine</li> <li>• Location of the parts to change</li> </ul>
<b>5</b>	<b>ASSISTANCE</b>	<ul style="list-style-type: none"> <li>• Trouble-shooting in case of problems</li> <li>• Suggested solutions in case of screen error messages</li> <li>• Remote maintenance</li> </ul>
<b>6</b>	<b>PERIPHERALS</b>	<ul style="list-style-type: none"> <li>• Technical and maintenance descriptions for conveyors, ejection boxes and rollers</li> </ul>
<b>7</b>	<b>INFORMATION</b>	<ul style="list-style-type: none"> <li>• Machine technical characteristics</li> <li>• Purity and efficiency</li> </ul>
<b>8</b>	<b>CERTIFICATES AND DRAWINGS</b>	<ul style="list-style-type: none"> <li>• Certificates of compliance concerning the machine</li> <li>• Machine electrical and pneumatic drawings</li> </ul>



# ***CHAPTER 1-***

# ***GETTING STARTED***

## **Chapter abstract**

In this chapter, you will find the following information:

<b>Thème</b>	<b>Explications</b>
<b>Security</b>	Safety rules Safety instructions Safety symbols
<b>System description</b>	System components description Machine identification
<b>Starting up the system</b>	Controls Machine start up procedure Automatic Shut down procedure Manual shut down procedure Setting machine to zero pressure Starting up machine after shutting down with zero pressure



# CHAPTER 1- SAFETY

## Operating Conditions – Safety Rules

- Before using the machine, make sure it is stable (check the tightness of the machine-conveyor attaching fittings and re-tighten them if necessary).
- If the protective items have been removed, re-install them before operating the machine. Failure to install these protective items may lead to serious injury.
- When the machine is in the sorting phase, make sure the operator or surrounding persons keep way from the ejection area. The projection of sorted objects is hazardous.
- **HR machine: Do not lean over the nozzle ramps when the conveyor is running because of the risk of being pulled in between the nozzle ramps and the conveyor belt. .**
- For all the machines excepted the HR machine: When the conveyor is in service or powered, do not touch (clean or clear) the nozzle assembly scraper: this could cause serious injury (risk of being caught by the conveyor).
- When the machine is powered, make sure the operator or surrounding persons keep away from the nozzles. Even without sorting material (sorting belt OFF), the projection of air is hazardous for the eyes.
- When the machine is in service, if the noise level reaches 85dB (A) (continuous sound pressure level), hearing protection for the operators (e.g. ear muffs) is required. This protective equipment must be worn by all persons close to the machine.
- The belt is also a dangerous part: Never grab objects on the belt when it is in service (risk of being caught by the conveyor or risk of injury if the object is cutting).





## Safety instructions

- READ all of the labels affixed to the machine and comply with all safety instructions prior to operating the machine, during operation and when performing maintenance.
- Replace any labels which are damaged or illegible. These can be ordered from PELLENC Selective Technologies.
- This machine must only be operated by qualified personnel who have received operational training for this machine.
- All maintenance operations must be performed by qualified personnel only, with the machine shut down, disconnected from the electrical power source or with the master switch set to OFF.
- This machine was designed for the sorting of products and objects in accordance with the operating instructions specified in the user manual. PELLENC Selective Technologies declines any responsibility if the above operating conditions are not complied with.
- Any defective item which is affected by impact, distortion or wear must be replaced. However, do not remove working parts from the machine as these are essential to ensure the correct operation of the machine and to ensure the maximum level of safety.



### **IMPORTANT:**

**Before performing any work on the machine, make sure that all safety requirements are met:**

- Equipment items located up-stream and down-stream from the machine are switched off and do not present a risk of untimely start-up.
- In case of electrical servicing, ensure the control cabinets are completely isolated.
- **Switch off the control cabinet before performing any work.**



*(See Shut-down procedure and Re-starting procedure in chapter 1)*



## Safety symbols

### Introduction

The following table shows the safety symbol labels which are affixed to your machine.

### **Caution!**

Compliance with the safety instructions corresponding to each symbol is mandatory.

Failure to comply with these instructions may lead to serious injury or damage to equipment.

### Location of safety symbols

The safety symbols are located on the blue doors of the machine. The following photo shows the location of the labels.

### List of safety symbols

These safety labels are affixed to the areas concerned by the risk and are located in the most visible section.



A detailed list of these symbols is provided in the table on the following page:



Symbol No.	Illustration	Meaning	Part No.
1		<b>Danger :</b> Do not touch or approach during operation	<b>06669</b>
2		<b>Risk of projection :</b> Wear of eye protection is mandatory	<b>16983</b>
3	 <b>D</b> Vor inbetriebnahme die Betriebsanleitung und Sicherheitshinweise lesen und beachten. <b>F</b> Lire le livret d'entretien et les conseils de sécurité avant la mise en marche, et en tenir compte pendant le fonctionnement. <b>GB</b> Carefully read Operator's Manual before handling the machine, observe instructions and safety rules when operating. <b>E</b> Leer las instrucciones de mantenimiento y los consejos de seguridad antes la puesta en marcha y aplicarlos durante el funcionamiento.	<b>Prior to starting :</b> Carefully read the Operator's manual before handling the machine, observe instructions and safety rules when operating.	<b>16987</b>
4		<b>Risk of being caught in the machine :</b> Keep at a safe distance from the machine	<b>17201</b>
5		<b>Risk of projection :</b> Keep at a safe distance from the machine	<b>17202</b>
6		<b>Noise hazard :</b> Ear protection mandatory	-



# ***TOME 1- SYSTEM DESCRIPTION***

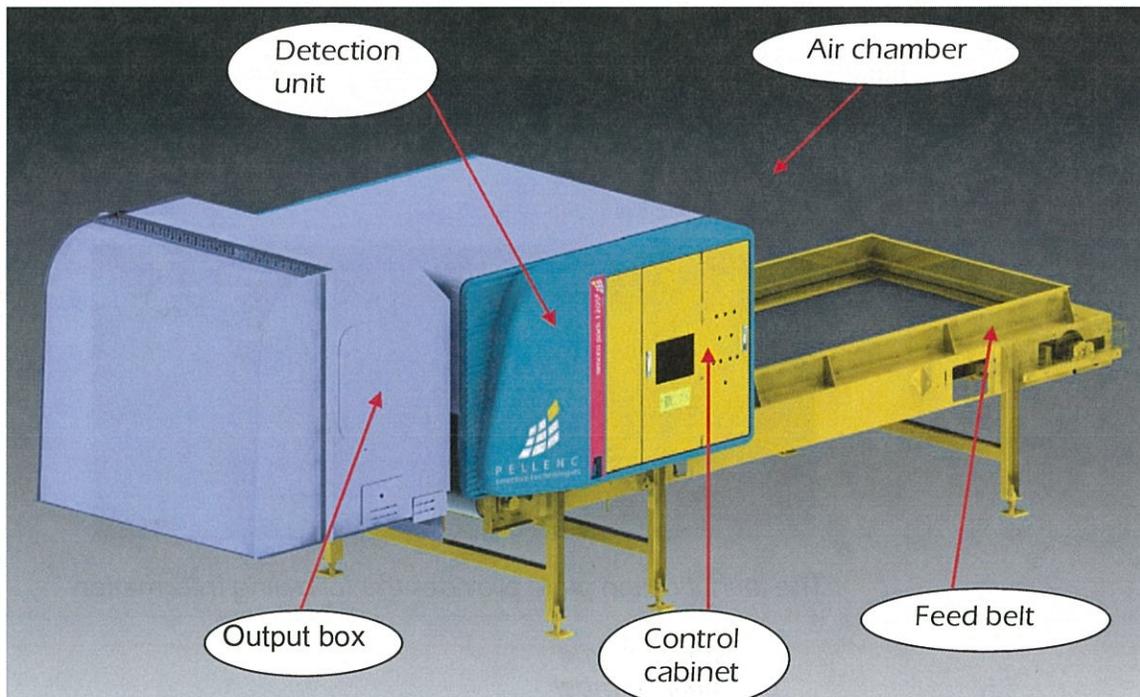
## **System components description**

### System components

Each PELENC Selective Technologies system comprises a feed belt, a control cabinet, a detection unit, an air chamber inside unit and a output box according to machine functions.

### System description diagram

The following diagram shows the location of the various system components:





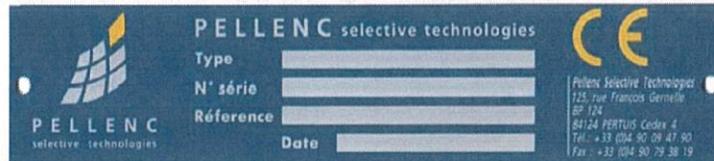
## Machine Identification

### Identification plate

Each machine bears an identification plate. . There are two types depending on the norm in force in the country.

- *Machine type*
- *Serial Number*
- *Part Number*
- *Date*

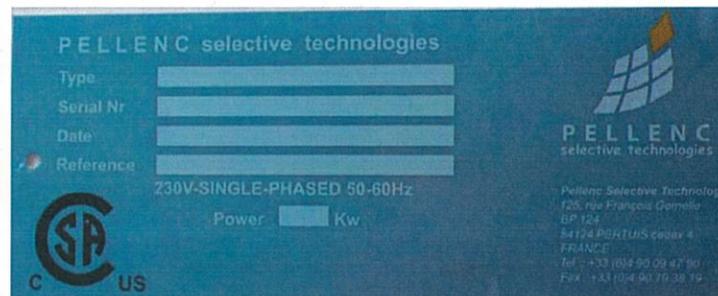
### Identification plate CE norm



The identification plate provides the following information

- *Machine type*
- *Serial Number*
- *Part Number*
- *Date*

### Identification plate CSA norm



The identification plate provides the following information

- *Machine type*
- *Serial Number*
- *Part Number*
- *Date*
- *Power*



## **Manufacturer data**

See the document appended to the manual providing relevant information for your machine as follows:

### **MANUFACTURER PLATE**

Type:

Serial No. :

Part Number :

Date :

Chamber :

Valve :

Lead seals :



If the removal of lead seals or sealing is found by one of our technicians, the guarantee may be invalid.



In the event of work performed by our technicians on the valves, chamber or lead seals, the new lead seal numbers will be provided for update purposes and a new certificate of conformity will be issued.



# CHAPTER 1-

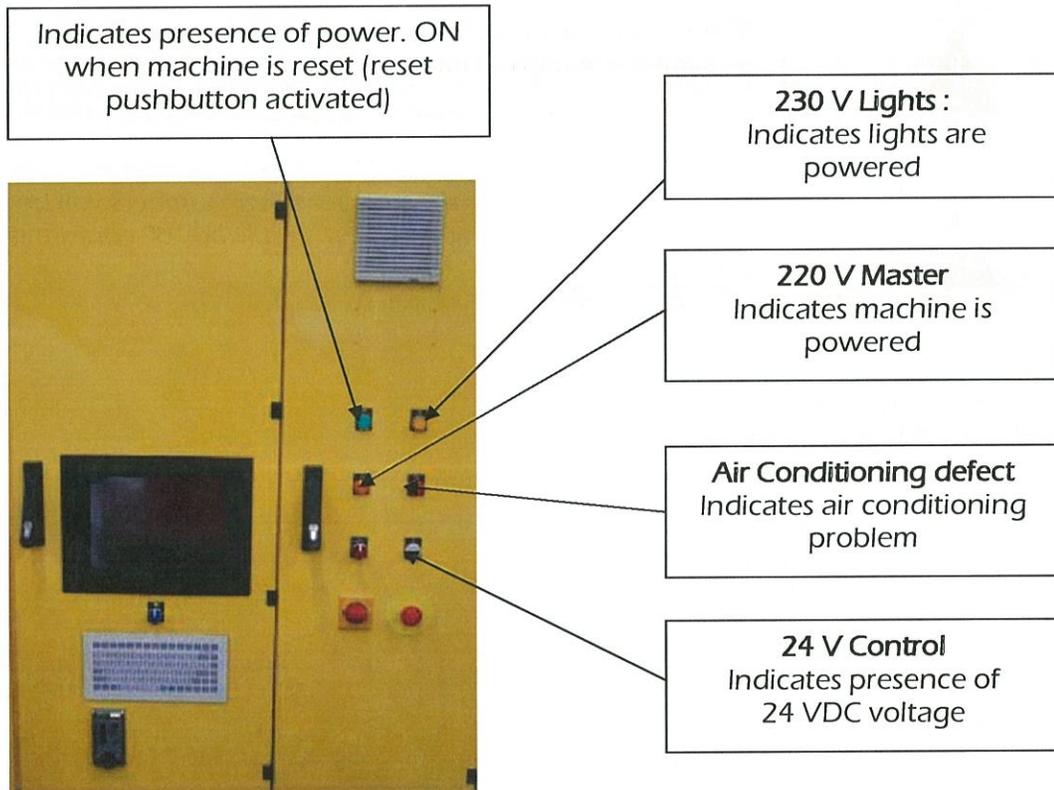
## STARTING UP THE SYSTEM

### Controls

A column of three lights (green, orange, red) is positioned on top of the machine. The green light comes on when the machine is ready to sort. This light is controlled by the software. The orange light indicates a fault on the machine (air, jamming, power supply, lighting, etc.). This light is also controlled by the software. The red light comes on for an emergency stop. This light is not controlled by the software.

Electrical  
indicator  
lights

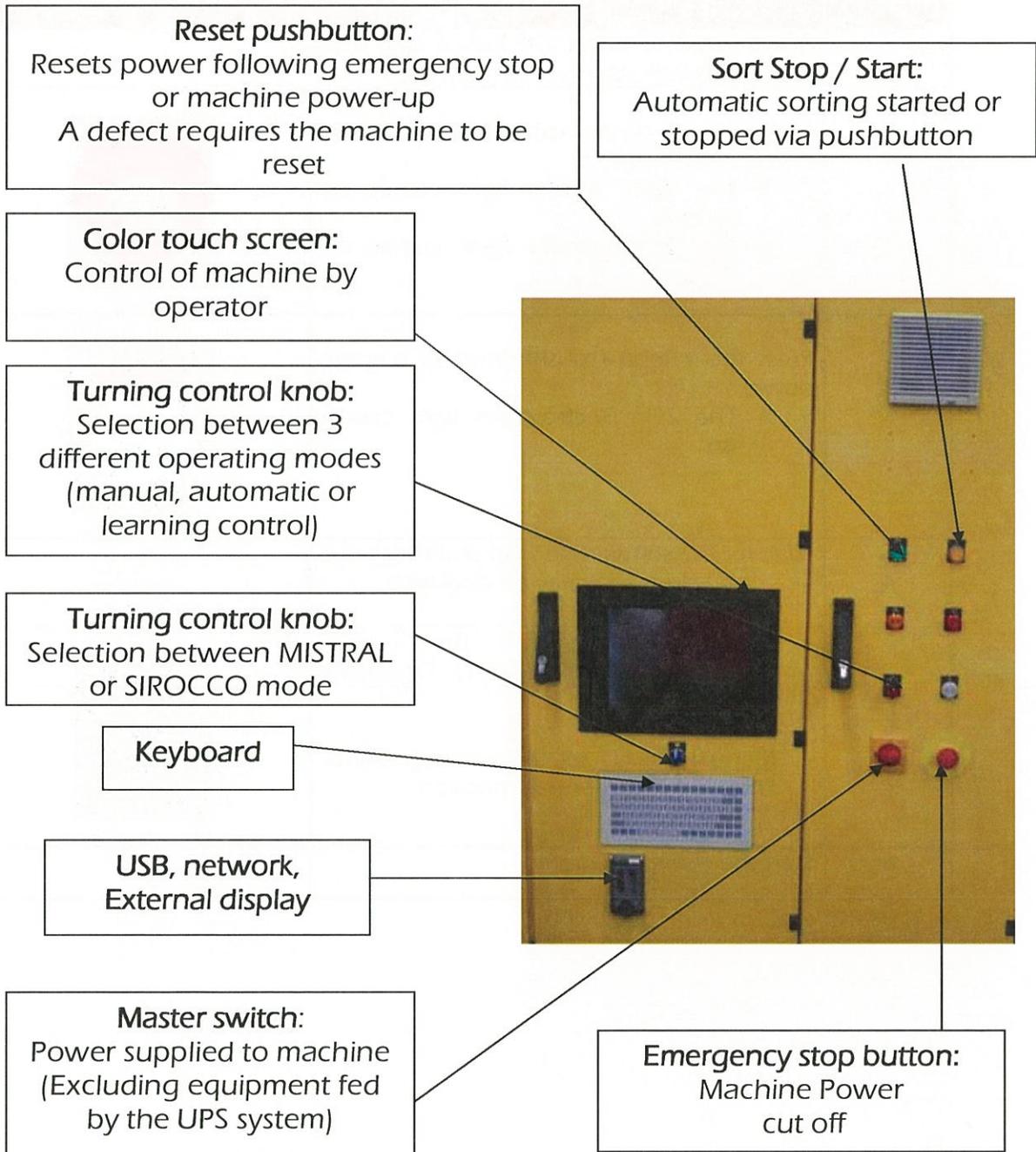
Here are the details of the various electrical indicator lights:





System Control:

Here are the details of the various system controls:





## Machine Start Up Procedure

STEPS	TASKS REQUIRED	ILLUSTRATIONS
1	Make sure the doors are locked and that the emergency stop button is released.	
2	Power up the control cabinet by setting the master switch to ON : <ul style="list-style-type: none"> <li>➤ The 220V Master light comes on (item 4)</li> <li>➤ The 24V Control light comes on (item 6)</li> </ul>	
3	Press the « Reset » pushbutton to engage power : <ul style="list-style-type: none"> <li>➤ The 24V Electrovalves light comes on</li> </ul>	
4	Wait for the software to load and check out any alerts that may be displayed	
5	<ul style="list-style-type: none"> <li>- <u>Automatic mode</u>: set the turning control knob to the « I/O Terminal » position</li> <li>- <u>Manual mode</u>: set the turning control knob to the « Manual » position</li> </ul>	
6	Start the conveyor line	



### Automatic Shut Down Procedure

STEPS	TASKS REQUIRED	ILLUSTRATIONS
1	Shut down the conveyor line	
2	Set the master switch to the OFF position.	
3	Check that the W2K has been closed correctly and that the UPS has been shut off (shown by a LED on the screen). This should not take more than 5 minutes.	

### Manual Shut Down Procedure

STEPS	TASKS REQUIRED	ILLUSTRATIONS
1	Stop the conveyor line.	
2	Set the master switch to the OFF position.	
3	Check that the W2K has been closed correctly and that the UPS has been shut off (shown by a LED on the screen). This should not take more than 5 minutes.	



### Setting machine to zero pressure

STEPS	TASKS REQUIRED
1	Perform step 1 of the « automatic shut down » procedure.
2	Close the air intake valve (any noise heard is normal, due to the purging of the chamber when valve is closed). Wait until the noise stops.
3	Perform step 2 of the « machine shut down » procedure.
4	Switch off the Q0 circuit breaker in the cabinet

### Starting up machine after shutting down with zero pressure

STEPS	TASKS REQUIRED
1	Switch on the Q0 circuit breaker in the cabinet
2	Perform steps 1 to 3 of the « machine start up » procedure.
3	<b>FULLY</b> open the air intake valve.
4	Perform steps 4 to 6 of the « machine start up » procedure.



# ***CHAPTER 2 - SOFTWARE DRIVER***

## **Chapter abstract**

The table below gives all of the software functions that are explained in the instructions:

<b>N°</b>	<b>Functions</b>
F1	Operating Menu
F2	Selection et direction of ejected objects
F3	Sort Starting and Stopping
F4	Management of sort results
F5	Consulting the event log
F6	Material identification and validation by image acquisition

## **Introduction**

The software for MISTRAL and BITECHNO works in exactly the same manner

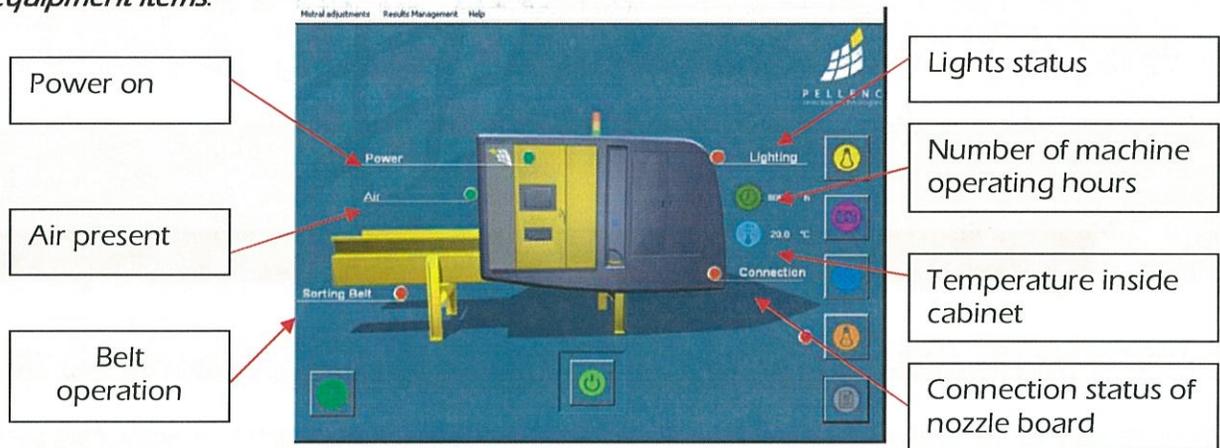
The bitechnology machine offers two types of detection: material detection and color detection. Consequently, the machine is equipped with two PCs with two software drivers: the Mistral software for material detection and the Sirocco software for color detection.

The transfer from one PC to another, or from one software program to another, is performed using the switch located under the screen.



## F1: Operating Menu : general information

The main panel provides general information concerning the *status of the machine equipment items*.



It also provides direct access to several *functions* according to the softwares:

Start automatic sorting



Quit application



Control lights status



Check lights status



Perform nozzle test



Acquire image



Open events log





## Status of Equipment Items

On the main panel, the status of the machine equipment items is given by lights which indicate the following when green:

- « **Lights** » : lights switched on ;
- « **Power** » : presence of 24VDC electrovalve ;
- « **Connection** » : connection set up with nozzle control board ;
- « **Air** » : minimum pressure reached in pneumatic system (5 bars) ;
- « **Sorting belt** » : conveyor in service (constant speed: between 2 and 3 m/s)

## List of frequently displayed symbols



VALIDATE



CANCEL



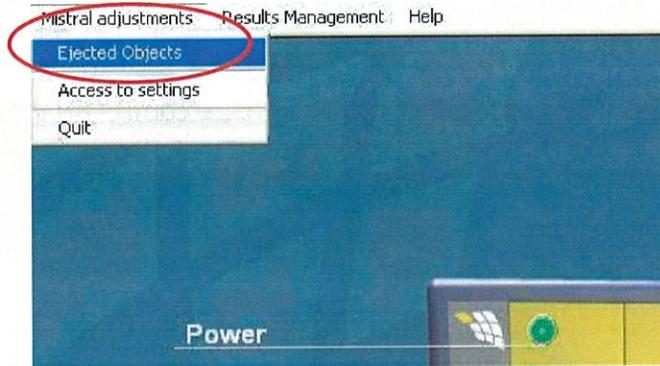
QUIT



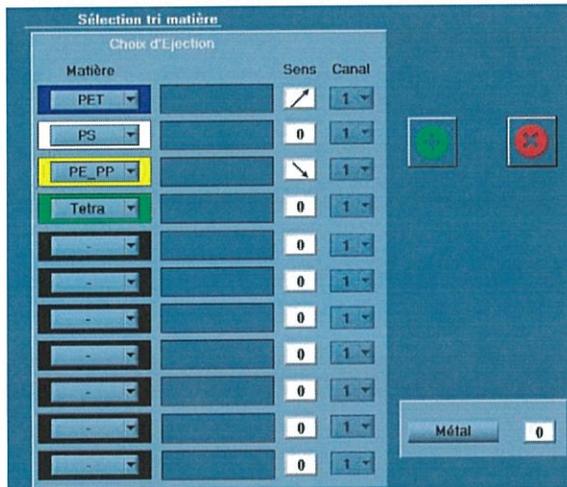
### F2: Selection and direction of ejected objects

The steps to be taken are as follows :

- Select « Mistral adjustments » or “adjustments” in the gray menu bar of the main screen, then select « Ejected Objects » :



To detect matter with MISTRAL machines, the following panel is then displayed on the screen :



- Material ejected upward*
- Material ejected downward*
- Material not ejected*

*In the previous example, the machine ejects PET objects in the upward direction, and PE\_PP objects downward. The other materials are not ejected.*

- To select a material to be ejected, press on a “Material” box and choose the material from the displayed list.
- To choose the direction, press on the “direction” box as many times as necessary to obtain the required direction.
- Press « Validate » to save the modified parameters and to return to the main panel, or press « Cancel » to return to the main panel without saving the modified parameters.



To detect color with SIROCCO machines, the following panel is then displayed on the screen :

Choix d'Ejection			
Matière	Vision	Sens	Canal
-	bleu	↗	1
-	rouge	0	1
-	vert	↘	1
-	-	0	1
-	-	0	1
-	-	0	1
-	-	0	1
-	-	0	1
-	-	0	1
-	-	0	1
-	-	0	1

Métal 0

↗

Colour ejected upward

↘

Colour ejected downward

0

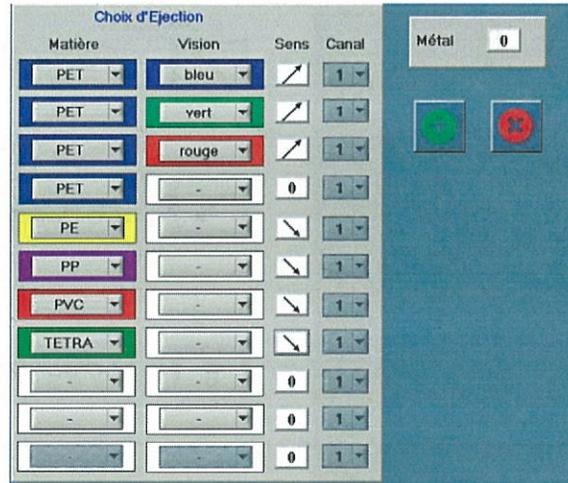
Colour not ejected

*In the previous example, the machine ejects "Bleu" in the upward direction, and "Vert" objects downward. The other materials, for example "Rouge" are not ejected.*

- To select the color to be ejected, press on a "Color" box and choose the material from the displayed list.
- To choose the direction, press on the "direction" box as many times as necessary to obtain the required direction.
- Press « Validate » to save the modified parameters and to return to the main panel, or press « Cancel » to return to the main panel without saving the modified parameters.



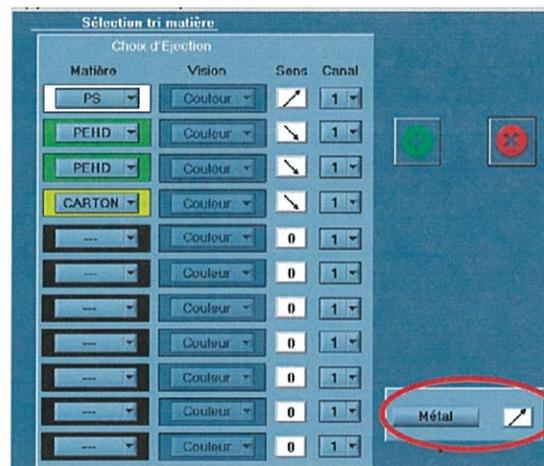
To combine the two technologies, material and color as with the BITECHNO machines, go into the Sirocco software, select the “Settings” and then the “Ejected Objects” boxes and choose the characteristics of the objects to be ejected as indicated on the previous pages for the color and for the material.



In this way, in the above example, the blue, green or red colored PET objects are ejected upwards. The other plastics, PE, PP, PVC and TETRA are ejected downwards, and the rest, like the clear PET, are not ejected.

**CAUTION:** as the Vision PC is the master PC, it is necessary to check that the settings made on the Vision PC have been correctly recorded in the Material PC. To do this, check in the Mistral software that the objects to be ejected are the same as those that have been programmed in the Sirocco software.

Si vous avez un détecteur métal, la procédure pour éjecter le métal est identique : Choisir « Réglages » ou Réglages Mistral » puis « Objets éjectés » et sélectionner la direction de l'éjection dans la case Métal.





## F3: Sort Starting and Stopping



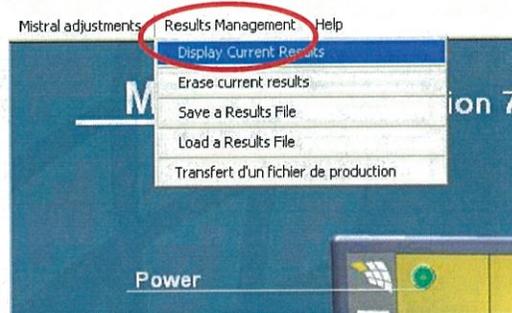
- Start and Stop sorting by pressing the « Mistral ON/OFF » button located on the control cabinet.



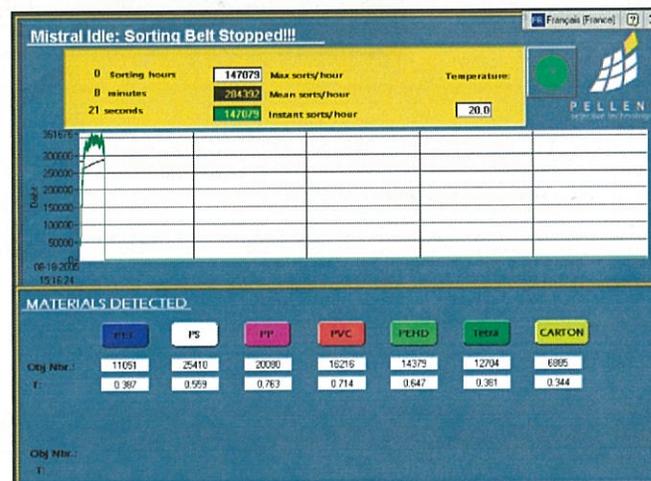
## F4: Management of Sort Results

### In-sort results

While the machine is in the automatic sorting mode, select « Results Management » in the gray menu bar of the main screen, then select « Display Current Results » :



The main screen then displays :



This screen is used for real-time monitoring of the number of sorted objects and their approximate weight.

This panel provides real-time sorting results :

- maximum number of ejected objects since the last time the sort results were cleared ;
- the average number of objects sorted per hour ;
- a snap shot of the number of objects sorted per hour ;
- the number of objects ejected in each selected class.

The panel disappears when automatic sorting is stopped.



## Post-sorting results

After automatic sorting is stopped, select « Results Management » in the gray menu bar of the main screen. The following sub-menu is then displayed :

Mistral adjustments	Results Management	Help
<ul style="list-style-type: none"> <li>Display Current Results</li> <li>Erase current results</li> <li>Save a Results File</li> <li>Load a Results File</li> <li>Transfert d'un fichier de production</li> </ul>		

Displays the latest measured results

Clears the latest measured results

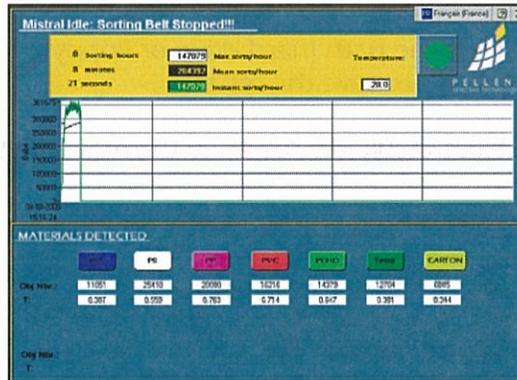
Saves the current results in a file

Retrieves previously saved results

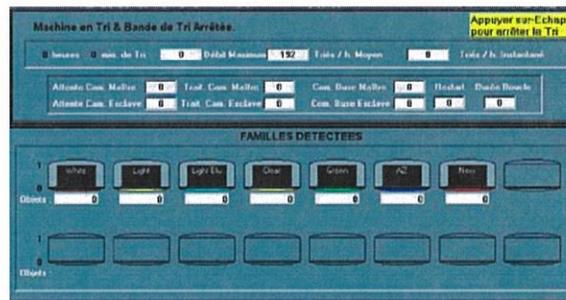
Retrieval of text file containing the average flowrate and the instantaneous flowrate

➤ « Display Current Results » :

The Results window is identical to the Sort window :



The following window is displayed with the SIROCCO software:





➤ « Erase current results » :

- Select « **Erase current results** » ; the panel « **MISTRAL SORT RESULTS** » or « **SIROCCO SORT RESULTS** » is displayed on the screen with the current sort results.

A dialog box requesting confirmation appears on the panel.

- Select « **YES** » to clear these results; a new counting session is then possible.

- Select « **Quit** » to return to the main menu.

➤ « Save a Results File » :

The current sort results may be saved in a file.

- Select « **Save a Results File** » ; the panel « **MISTRAL SORT RESULTS** » or « **SIROCCO SORT RESULTS** » is displayed with the current sort results.

A Save dialog box is displayed on the panel.

- Select the path (hard drive or floppy) ; enter file name and select « **Record** » to save the results.

- Select « **Quit** » to return to the main menu.

➤ « Load a Results File » :

A former results file can be loaded. The current results are overwritten with your former results file on the hard drive or floppy.

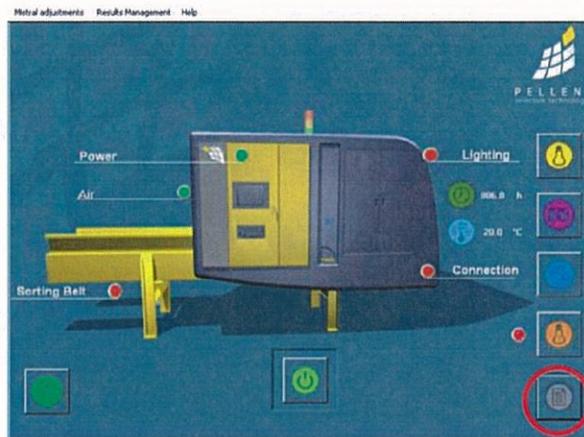
- Select « **Load a Results File** » ; a file load dialog box is displayed.

- Select the path and file name ; the panel « **MISTRAL RESULTS** » or « **SIROCCO RESULTS** » is displayed with the file sort results.

- Select « **Quit** » to return to the main menu.



## F5: Consulting the Events Log



The events log displays a list of the actions or errors recorded :

03-30-2005	16:18:17	CARTE ACQUISITION NIR NON PRESENTE !
03-30-2005	16:18:18	Problème de communication avec la Carte Pilotage Bures
03-30-2005	16:18:18	CARTE EPS PILOTAGE MISTRAL NON PRESENTE !
03-30-2005	16:18:18	Lancement logiciel de pilotage Mistral
03-30-2005	16:08:06	Défaut Température
03-30-2005	16:08:05	Lecture des aletas.
03-30-2005	16:08:01	Défaut Température
03-30-2005	16:07:56	Défaut Température
03-30-2005	16:07:51	Défaut Température
03-30-2005	16:07:45	Arrêt in automatique MISTRAL
03-30-2005	16:07:45	Défaut Température
03-30-2005	16:07:45	Lance MISTRAL en in automatique
03-30-2005	16:06:03	CARTE ACQUISITION NIR NON PRESENTE !
03-30-2005	16:06:02	Problème de communication avec la Carte Pilotage Bures
03-30-2005	16:06:01	CARTE EPS PILOTAGE MISTRAL NON PRESENTE !
03-30-2005	16:06:01	Lancement logiciel de pilotage Mistral
03-30-2005	16:05:41	Défaut Température
03-30-2005	16:05:36	Défaut Température
03-30-2005	16:05:31	Défaut Température
03-30-2005	16:05:25	Défaut Température
03-30-2005	16:05:21	Défaut Température
03-30-2005	16:05:16	Défaut Température
03-30-2005	16:05:11	Défaut Température
03-30-2005	16:05:07	Arrêt in automatique MISTRAL
03-30-2005	16:05:03	Défaut Température
03-30-2005	16:05:00	Lance MISTRAL en in automatique
03-30-2005	16:04:55	Arrêt in automatique MISTRAL
03-30-2005	16:04:09	Défaut Température

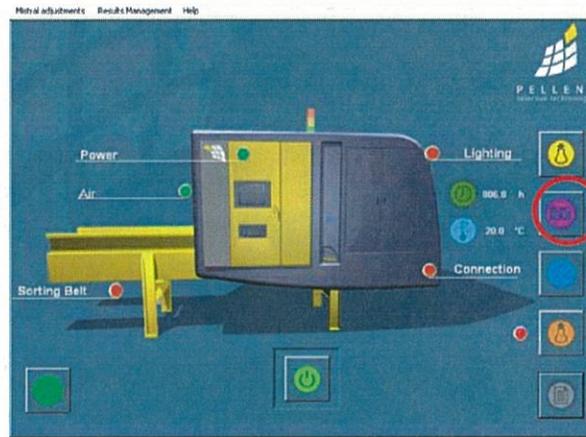
- red background : error messages leading to machine shut down ;
- yellow background : alerts ;
- white background : other events.

To record the events log, press the save icon. The file is automatically saved on the hard drive (« LOG » directory), with the extension *.jrn*. It is automatically named with the date.

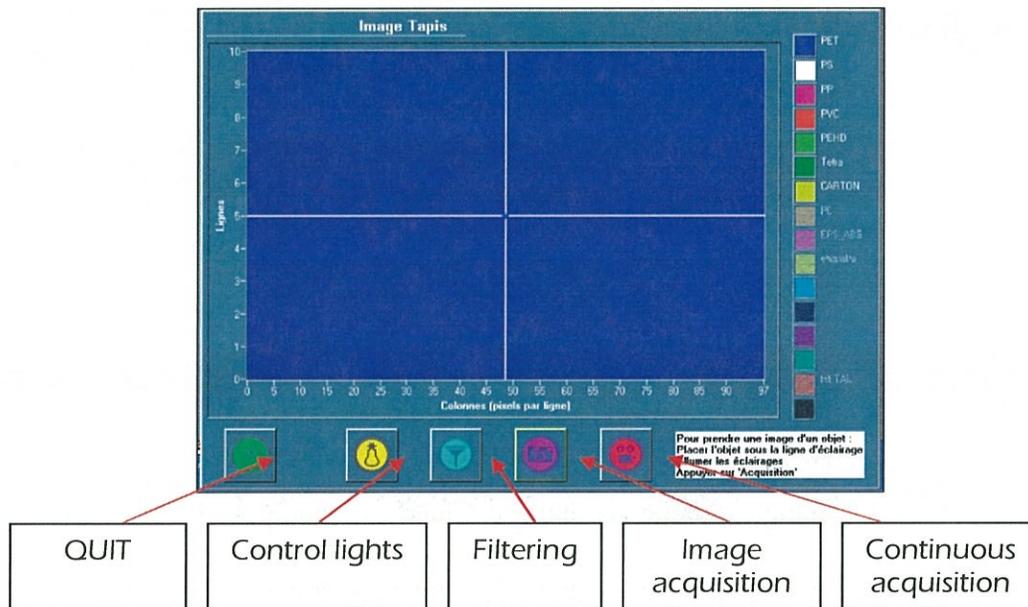
Press  to return to the main menu.



## F6: Material identification and validation by image acquisition



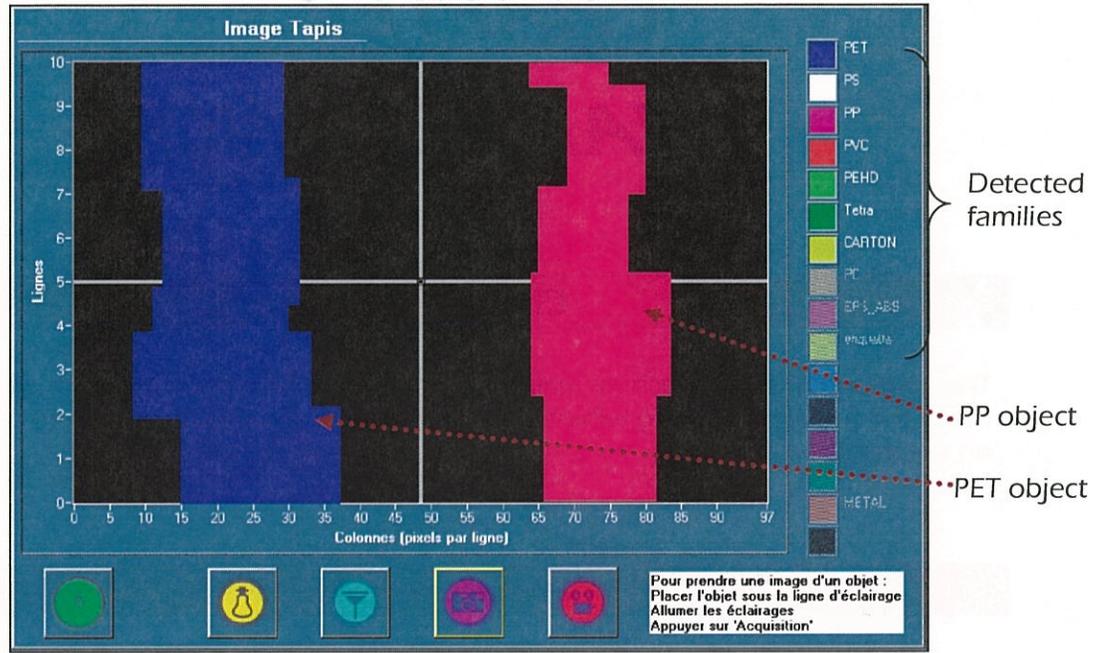
The following panel is displayed on the screen :



It shows the entire length of the belt in horizontal sections.



*Example :*



This panel displays the image captured by the acquisition software. It is used to check detected objects. A different color is attributed to each material. The detected families are shown in the RH column.

To graphically view an object or material, **switch on the belt** and:

- Position one or several objects to be checked on the conveyor belt

- Switch on the lights :



- Perform an image acquisition to capture and display a new image, when the object is under the measuring section :



*NB : There are two objects in the previous example : one made from PET, the other from PP.*

- Press « Quit » to return to the main menu :



N.B. It is preferable to perform this operation with two people.



# ***CHAPTER 3 – MAINTENANCE***

## **Chapter Abstract**

This chapter concerns machine maintenance, where the various parts are, how to clean them and a table indicating which types of maintenance should be carried out regularly on the machine.

## **Preliminary Steps**

Maintenance frequency varies depending on the equipment item. Maintenance is performed every day, each week or each month depending on the machine component and mainly depending on the surrounding environment (dust, airborne particles, type of stream, etc.)

The items requiring maintenance are located in the 3 following assemblies: control cabinet, detection unit and pneumatic system.



**PRIOR TO PERFORMING MAINTENANCE, MAKE SURE THE MACHINE IS NOT IN THE PROCESS OF SORTING AND THAT THE CONVEYOR BELT IS TURNED OFF !**



## **Meaning of icons**



: Clean designated component using a soft cloth and a window type cleaner.



: Perform the required checks or settings.



These intervals and times are given for informational use only and must not be used as a point of reference. In fact, each operator must define the interval and duration of the maintenance tasks according to the machine environment and its use.

This maintenance concerns all PELLENC Selective Technologies machines.

### Summary table for daily maintenance

These maintenance operations are to be carried out daily or at each change of shift.

N°	Maintenance	Duration	Equipment to be used	Precautions to take
Q1	Check the functioning of the nozzles and clean them using the software	5 min	« test all nozzles » button	Manual use Exit sorting if necessary Electro valve button
Q2	Clean the jam sensors	1 min	- Non-greasy window type cleaner - Soft cloth	
Q3	Clean the air conditioning filter	5 min	- Blower	Remove the system filter from inside the system.
Q4	Clean the glass panels of the reflectors, the reading unit and/or the camera	5 min	- Soft cloth - Window type cleaner - Scraper	Wait until it cools down
Q5	Perform the halogen brightness test	2 min	ceramic plate	



**Summary table for weekly maintenance**

N°	Maintenance	Duration	Equipment to be used Precautions to take
H1	Check the purge valve of the compressor	2 min	Electro valve test button
H2	Check the jam alert cells	1 min	
H3	Check the pressure on the pressure gages	1 min	General compressor pressure: 8 to 10 bars Service pressure: 6 to 6.5 bars
H4	Clean the nozzles bar	3 min	- scraper

**Summary table for monthly maintenance**

N°	Maintenance	Duration	Equipment to be used
M1	Clean the glass panel of the reflectors	2 min	Bowl of hot soapy water
M2	Control the air chamber filter	5 min	Removal can be a dangerous operation.

**Summary table for yearly maintenance**

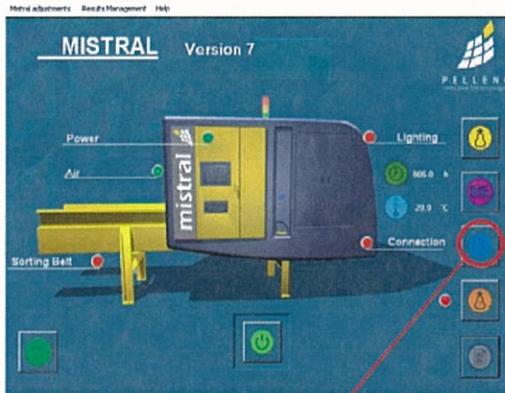
N°	Maintenance
A1	Air - conditioning maintenance



### Q1: Nozzle Control and Cleaning

It is advisable to perform this test before starting the machine or every day at the end of the day.

Using the software, use the "Test All Nozzles" function to check if all the nozzles are operational.



	<p>Activates all nozzles one by one</p> <p>Three possible choices of bars to be blown Select option «All »</p> <p>Tests requested nozzle (see numbering)</p> <p>Performs 15 blowing cycles. During one cycle, air is blown into each nozzle successively.</p> <p>Checks nozzle board status</p> <p>QUIT</p>
--	---



- In the « **Test all nozzles** » sub-menu, the software controls each nozzle in numerical order with a given blowing time and a given time between each nozzle command.

This test checks the correct operation of each nozzle, and its corresponding electrovalve by noise analysis during air ejection. In the event of a faulty nozzle, clean it and repeat the individual test on the computer. If air is still ejected incorrectly (whistling sound), replace the corresponding electrovalve (*Refer to the electrovalve replacement procedure chapter 4*).

Press « Cancel » to stop the test in progress.

- In the « **No. of nozzle driven** » sub-menu, an individual test is performed by selecting the nozzle number using the + and – buttons, then by pressing the nozzle test button.
- In the « **Board Status** » sub-menu, the software interrogates and displays the status of the nozzle control board :
  - « **OK** » : nothing to report ;
  - « **Pressure fault** » : the chamber air pressure is less than (i.e. 4.5 to 5.5 bars) the nozzle operating pressure ;
  - « **Unknown** » : Communication problem with the nozzle board

Press « Quit » to return to the main panel.

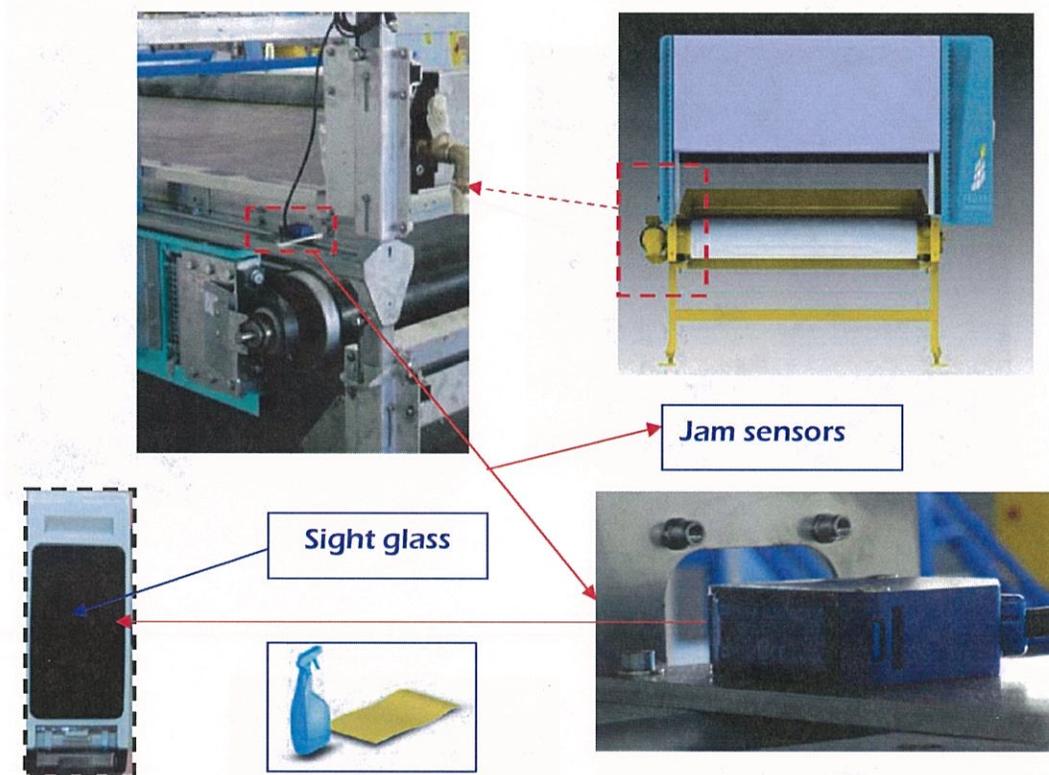


### Q2: Jam sensors

➤ **Equipment to be used:**

Non-greasy window type cleaner and soft cloth

➤ **Location :**



***Important:*** The jam sensors detect an accumulation of objects to be sorted at the outlet of the conveyor, which could cause our machine to malfunction and, above all, a fire because of the intensity of the lighting. The sensors thereby eliminate the risks caused by such a potentially dangerous situation, by stopping the machine (and therefore the lighting) if the detection of the jam lasts longer than 6 seconds.

**The cleaning of the 2 sight glasses is therefore mandatory for guaranteeing the safety of the site** (caused, for instance, by a label stuck on the glass).

➤ **Maintenance :**

- Clean the **sight glass** of the jam sensors located on each side of the conveyor, using a soft cloth impregnated with non-greasy window type cleaner, or using wet wipes, to avoid scoring the glass. Wipe the glass dry.
- Repeat this process for the jam alert cells.

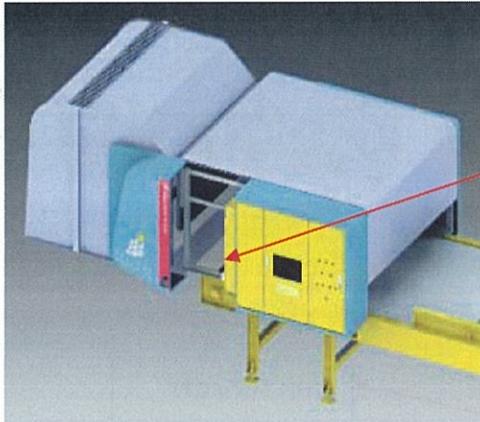


## Q3: Air conditioning filter

➤ **Equipment to be used:**

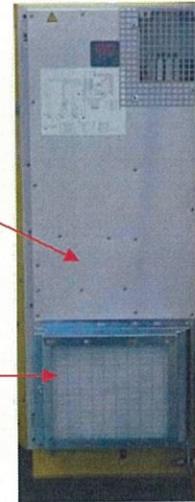
Blower

➤ **Location :**

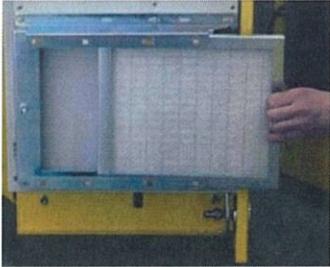


Air  
conditioning

Filter



➤ **Maintenance :**

1	Remove the filter <div style="text-align: right; margin-top: 10px;">  </div>
2	Use a blower to clean the filter
3	Reinstall the filter

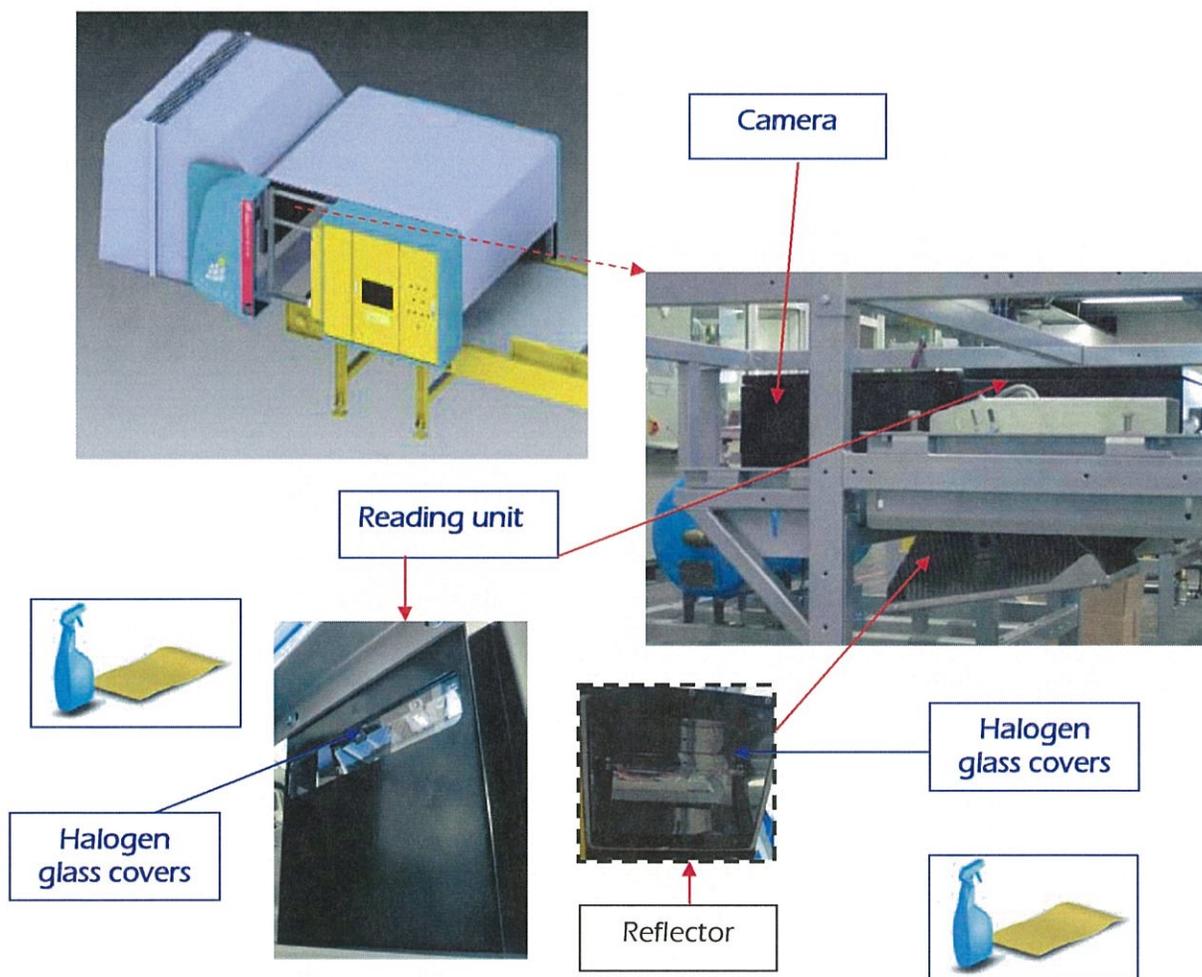


**Q4: Reflectors, reading unit and camera**

➤ **Range of application :**

Part to clean	Machines concerned
Reflectors	All
Reading unit	All except SIROCCO
camera	All except MISTRAL

➤ **Location :**





➤ **Equipment to be used:**

Soft cloth, Window type cleaner and Scraper

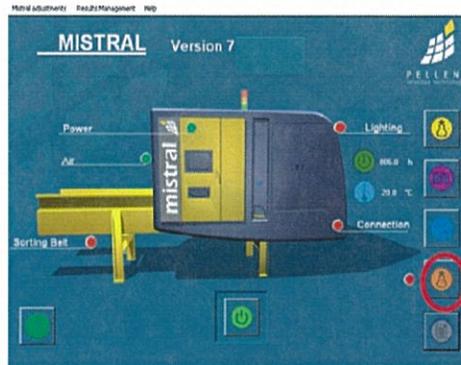
➤ **Maintenance :**

- Wait for 15 minutes so that the windows can cool before starting work
- Clean the **glasses** of the camera, the reading unit and the reflectors using a car windscreen type scraper, to remove any labels.



## Q5: Lights monitoring

This test is performed using the software



After pressing the icon, the menu prompts you to:

Position a reference plate (ceramic) under the measuring section under the master scanner

Lighting strip

Ceramic plate



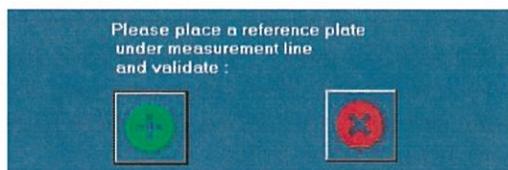
Validate by pressing the green button:

The displayed panel indicates whether the lights must be replaced or not.

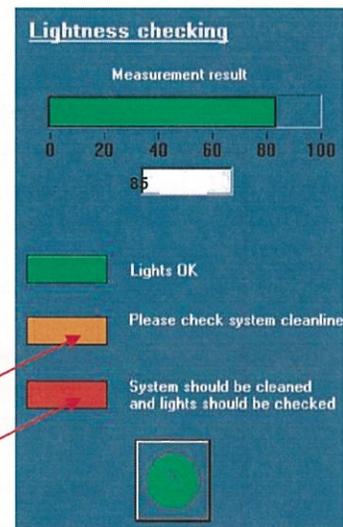
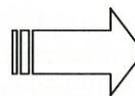
***NB:*** A percentage of 70 to 100 % displayed on the final panel is strongly recommended.

Press « Quit » to return to the main menu :

Illustrations :



Validation



Inconvenience

Obstruction

This test checks whether the halogen and scanner glass covers need to be cleaned so as to reduce preventive maintenance time.

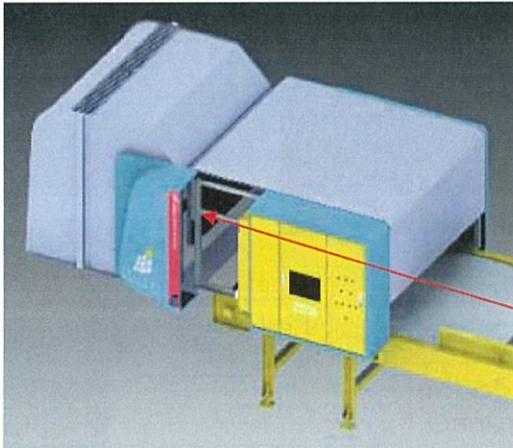


## H1: Compressor purge valve

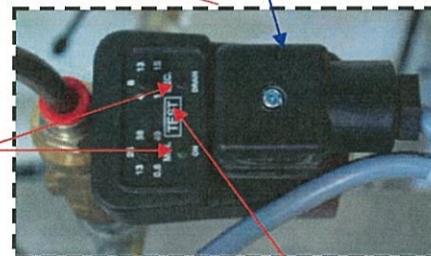
➤ **Equipment to be used:**

Flat blade screwdriver

➤ **Location :**



2 potentiometers



Purge  
valve

« TEST » button

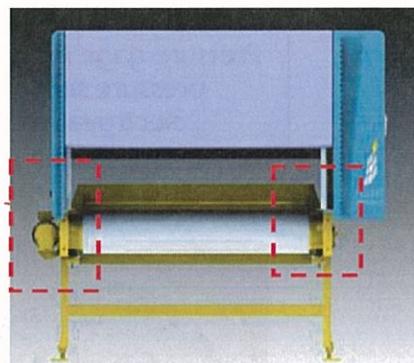
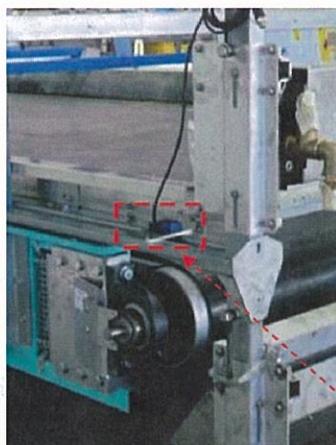
➤ **Maintenance :**

- In principle, purging takes place automatically every 20 - 40 minutes for 2 mn, with the emission of a relatively loud noise. The valve opening time and the interval between 2 automatic purging operations can be adjusted but parameters set by PELENC ST must not be modified.
- It is important to listen to the noise made by automatic draining at least once per week and to contact PST if the machine does not drain. A malfunction can seriously damage the sorting machine.
- Drain it manually every week by pressing the « TEST » button.



## H2 : Checking that the jam alert cells work correctly

### ➤ Location:



Jam alert cells

### ➤ Checking they work correctly:

- Locate the transmitter cell. It is on the right side of the machine and has several controls on the top.



- Pass your hand in front of the cell.

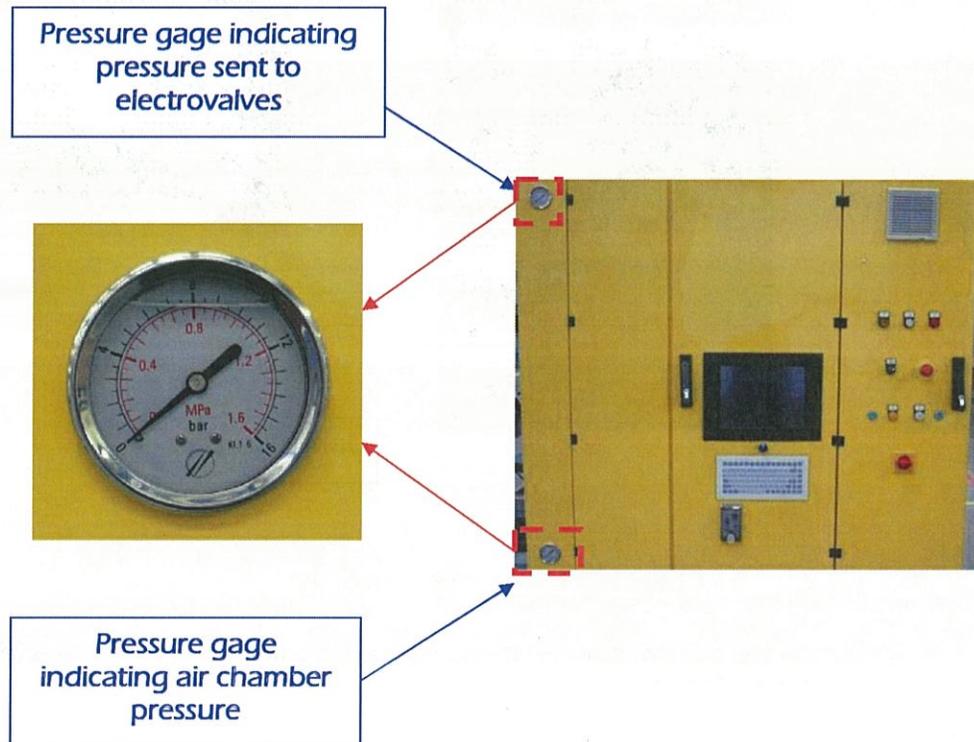
- The cell is considered to work correctly if a yellow lamp turns off after 3 seconds.

- In the contrary case, change the jam alert cells (follow procedure 10 in chapter 4).



## H3: Pressure gages

### ➤ Location :



### ➤ Maintenance :

Check the readings of the 2 **pressure gages** :

- The pressure in the air chamber must be between 8 and 10 bars ;
- The pressure sent to the electrovalves is between 6 and 6.5 bar
- If this is not the case, please contact your compressor supplier and have the compressor/plant dryer pack checked.



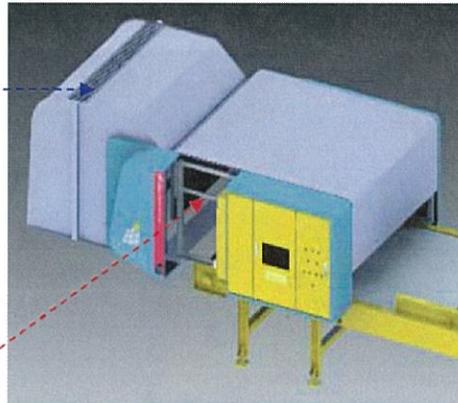
## H4: Maintenance of the nozzles

➤ **Equipment to be used:**

- Scraper

➤ **Location:**

Outgoing air gate  
on casing



Nozzle bar

Nozzle bar (up)

Nozzle bar (down)



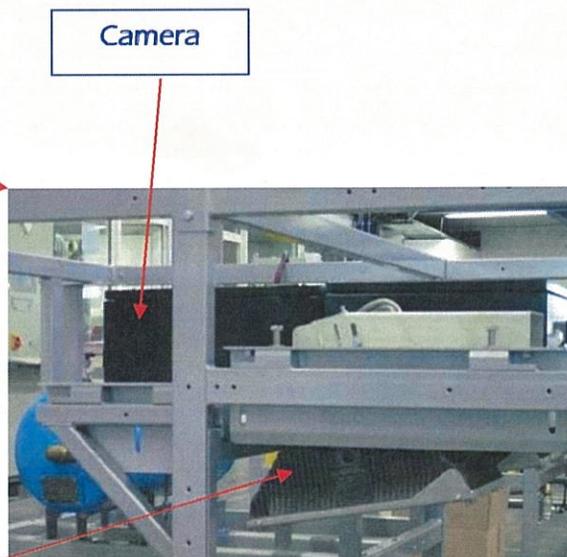
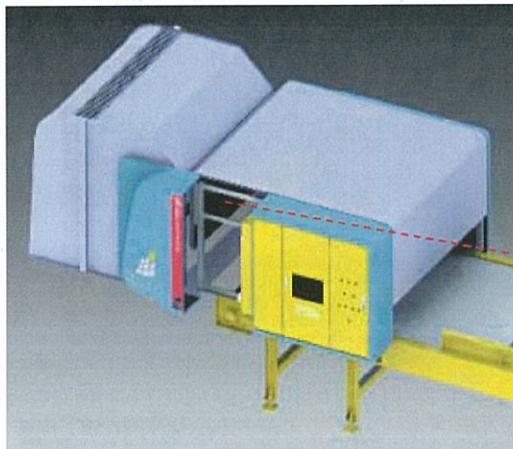
➤ **Inspection and maintenance:**

- Use a scraper to clean the nozzle bar. The purpose is to remove all dirt clogging them up (scraper/electro valves)  
**CAUTION : Do not use water**
- Immediately afterwards, test the nozzles and clean them (Q1) to flush out all dirt
- Check the outgoing air gate on the casing. If it is blocked, clean it with an air gun.



## M1: Cleaning halogen glass covers

### ➤ Location :



Camera



Reflector

Halogen  
glass covers



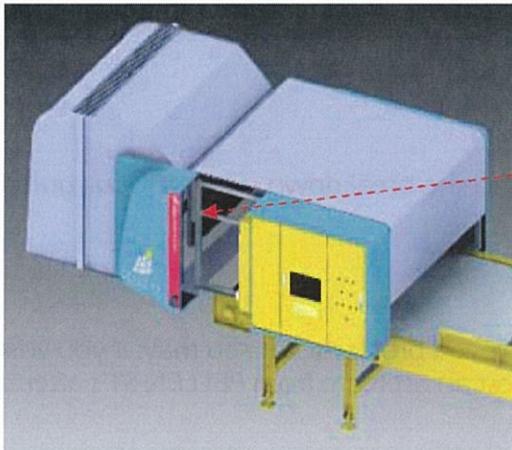
### ➤ Maintenance :

- Wait 15 minutes for the covers to cool down before beginning maintenance.
- Remove the covers and clean them in a bowl of hot soapy water
- Dry them completely
- Put them back into place

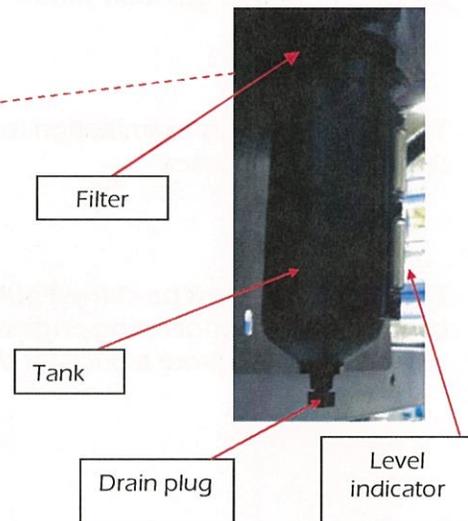


## M2: Air chamber filter

### ➤ Location:



*Blanking plate removed:  
(4 'butterfly' screws)*



### ➤ Maintenance:

- 1) Switch off the equipment air supply and close the air valve of the machine
- 2) Wait until bleeding has completely finished.
- 3) Use the level indicator to check that there is no water in the tank

#### **If there is water in the tank :**

- 4) Unscrew the drain plug
- 5) Drain the system
- 6) Unscrew and clean the tank

#### **Note:**

**Air must be dry when it enters the machine. If water is detected, call an air specialist immediately.**



## **OPERATING AND MAINTENANCE INSTRUCTIONS** **SORTING MACHINES**



### **A1: Air-conditioning Maintenance**

All air-conditioning systems, with the exception of new systems of one year or less from PELLENC ST, must undergo an annual inspection. Inspection is notably intended to check the coolant gas load status.

The purpose of this examination is to avoid machine breakdown when the surrounding temperature increases.

This inspection must be carried out by an approved professional. You may, if you wish, contact a local refrigerating engineer or request an estimate from PELLEN ST's after sales service who will quote a price for this service.



# ***CHAPTER 4 - PARTS REPLACEMENT PROCEDURE***

The following table lists the parts replacement procedures for the different machines:

<b>N°</b>	<b>Procedures</b>	<b>Machines</b>	<b>Duration**</b>
1	Replacement of a nozzle board	All	5 min
2	Replacement of a halogen	All	5 min
3	Replacement of an electrovalve	All	30 min
4	Replacement of a MATERIAL PC	All except SIROCCO	20 min
5	Replacement of a PC VISION	All except f MISTRAL	20 min
6	Replacement of the air conditioning	All	30 min
7	Changing the encoder	All	10 min
8	Changing the UPS System	All	10 min
9	Replacement of a jam cell	All	30 min
10	Replacement of an halogen socket	All	20 mn

\*\* These times are given for informational use only and must not be used as a point of reference. In fact, the duration of each procedure can vary according to the machine environment and the person performing this task.

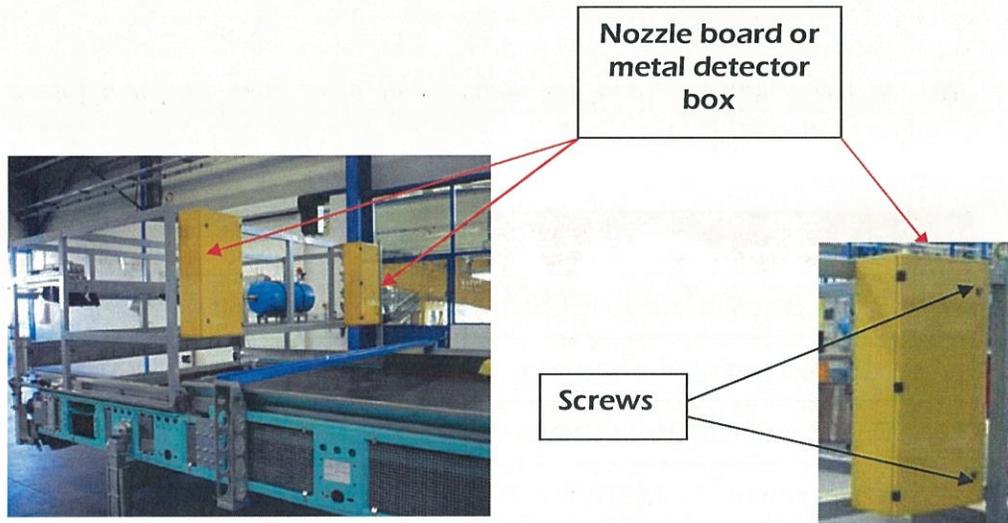


**Procedure n°1: REPLACEMENT OF A NOZZLE BOARD**

➤ **Range of application :**

This procedure applies to all machines.

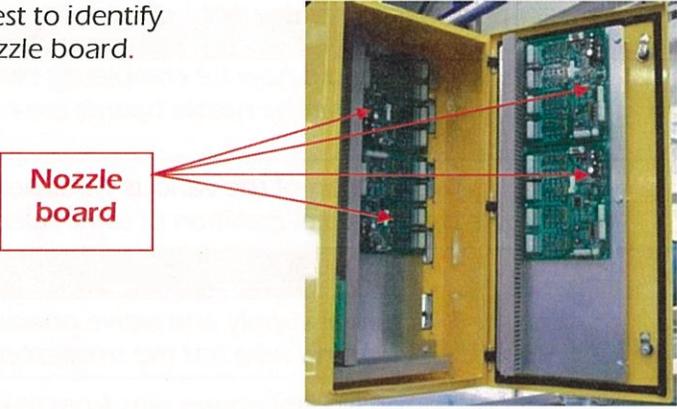
➤ **Location:**



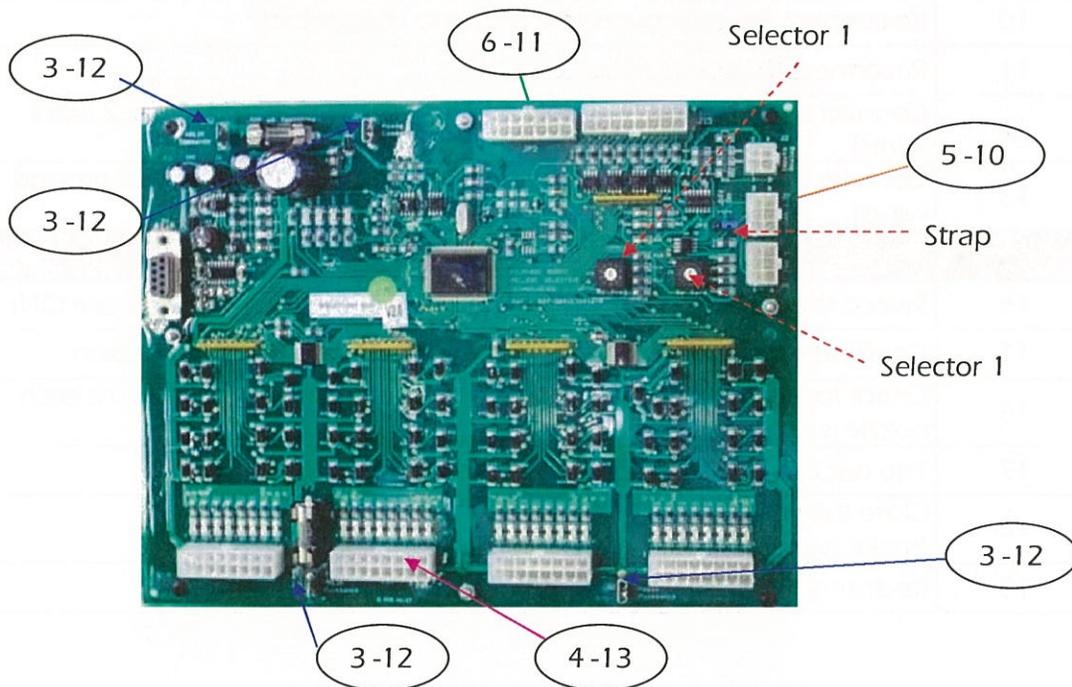
➤ **Access to nozzle board :**

<b>Procedure to be complied with:</b>	
1	The "setting machine to zero pressure" and "automatic shutdown" procedures, explained in chapter 1, are used for implementing the operations necessary for the machine electrical and pneumatic isolation.  Note: The conveyor is not controlled by the machine and must therefore be made safe. Please follow the conveyor shutdown procedure to ensure it does not start up.
2	Unscrew the two screws of the yellow box in order to access to the nozzle board.



3	<p>Perform a nozzle test to identify the defective nozzle board.</p> <div style="text-align: center;">  <p><b>Nozzle board</b></p> </div>
4	<p>Once the nozzle board has been identified, the operator must precisely follow the procedure for replacing the nozzle board described on the following page</p>
5	<p>After completing this procedure, the machine can be returned to its initial configuration by performing the above operations in the reverse order.</p>

➤ **Replacement of a nozzle board :**





Preliminary steps	
1	The machine should now be completely switched off. Check that there is no current and that the nozzle boards are no longer powered (all lights OFF)
2	<b>Identify the position of the various wires before disconnecting them!</b> No mistake is admissible! (position of the 2 selectors and of the strap)
Disconnection	
3	Cut the 24V power supply and active power (2 red wires, 2 black wires). <i>NB: the 24V control wire has the smallest diameter</i>
4	Disconnect the (white) power pins from the nozzle unit and the associated ground wires
5	Unplug the communication cable from the PC
6	Unplug the pressure switch cable
Installation of new board	
7	Remove the 6 screws securing the board
8	Remove the board to be replaced
9	Install the new board and select its number using the two encoder disks (the number is the same as the one on the out of order board) and the position of the strap
Reconnections	
10	Re-connect the communication cable to the cabinet
11	Reconnect the pressure switch cable
12	Connect the 24V power supply and active power (2 red wires, 2 black wires)
13	Connect the (white) pins of the nozzle unit (and the associated ground wires)
Return to the initial situation	
14	Switch the machine back on (all the lights of the nozzle boards are ON)
15	Confirm the defect on screen after pressing the green reset button
16	Check for correct operation (perform a nozzle test and make sure each nozzle is active)
17	Trip out the 24V power supply in the upright cabinet (FU1)
18	Close the yellow box (4 screws) (make sure the ground wire is correctly in place)
19	Re-energize the nozzle boards (FU1)



## Procedure n°3 : CHANGING A HALOGEN

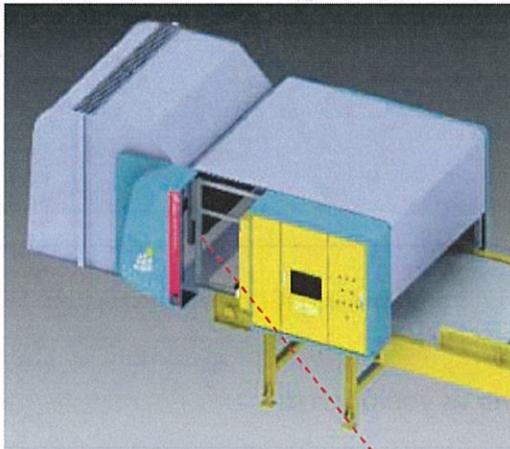
### ➤ Range of application:

This procedure applies to all machines.

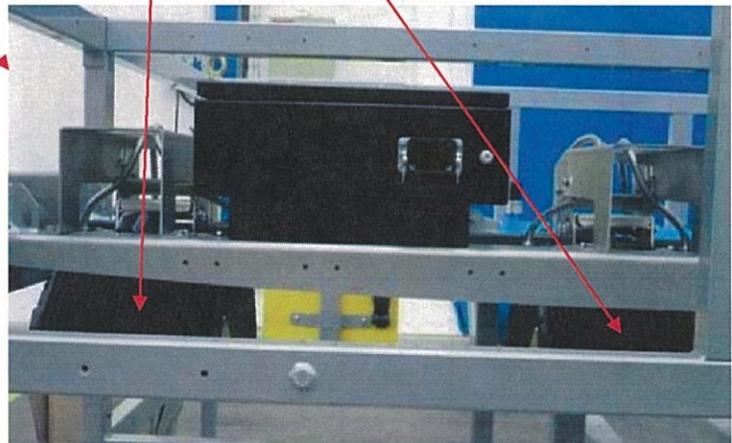
**Warning:** You must never touch the reflective metal sheets with either your fingers or a soft cloth.

### ➤ Location :

Locate the reflector where the halogen to be replaced is located by testing the lighting (Q6).

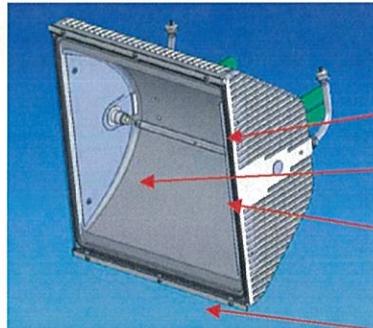


Reflectors





### Reflector description



Screw

Socket

Halogen

Reflecting glass

### Opening the glass cover

1

- Remove the 6 screws



2

- Open the glass cover with care by pulling it downwards (step 1) and swinging it down gently (step 2).

Note: Do not let go of the cover as you open it.

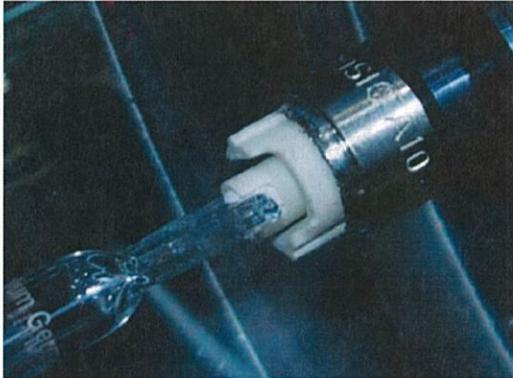
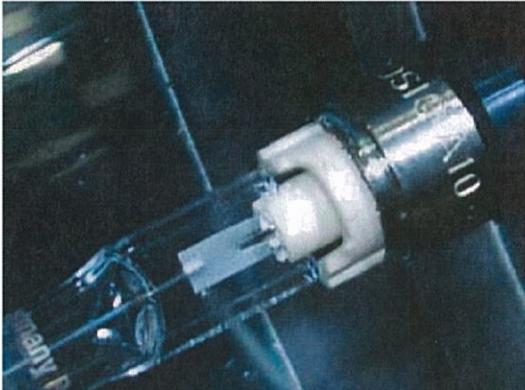


Step 1



Step 2



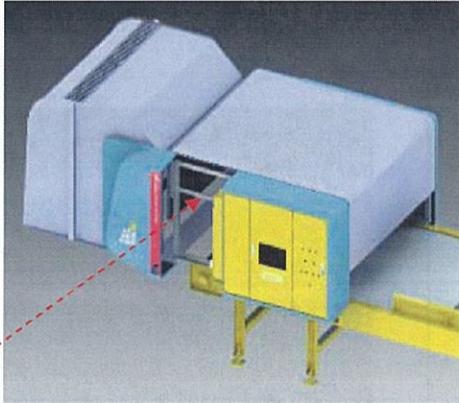
<b>REPLACEMENT OF THE HALOGEN</b>	
1	<p>➤ Remove the halogen by pushing it against one of the sockets (similar to domestic halogen lamps)</p>
2	<p>Position the new halogen (without touching it) in the same manner.</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p><i><u>Correctly positioned</u></i></p> </div> <div style="text-align: center;">  <p><i><u>Incorrectly positioned</u></i></p> </div> </div>
3	<p>Close the glass cover by swinging it back up and pushing closed.</p>
4	<p>Replace the 6 screws and tighten them.</p>



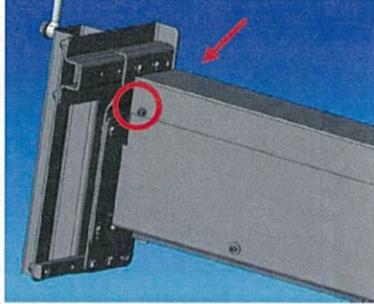
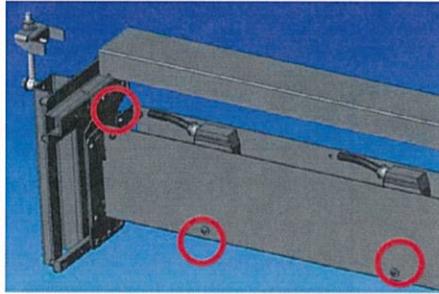
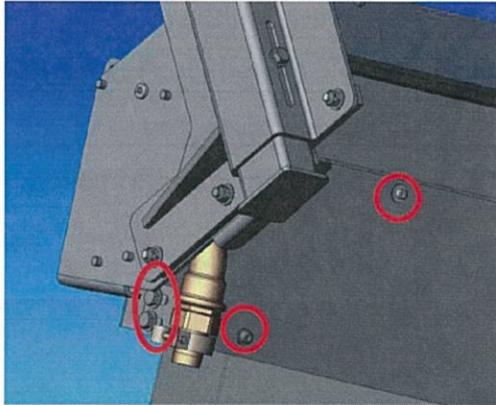
## Procedure n°3: REPLACING AN ELECTROVALVE

➤ **Range of application:**

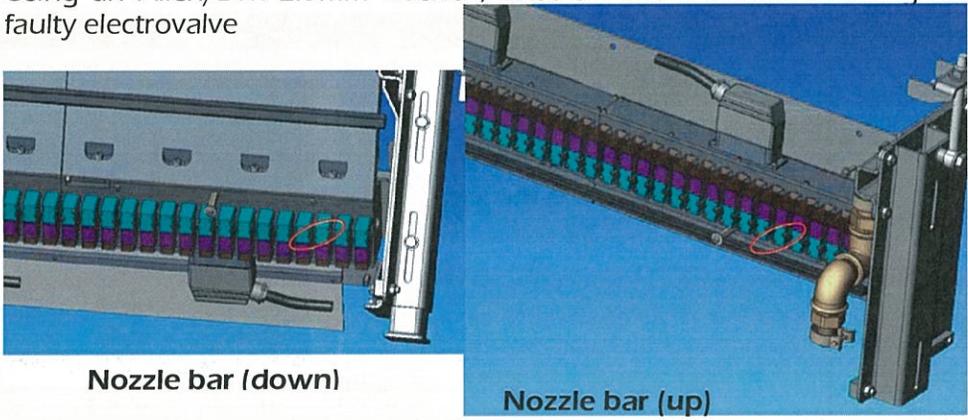
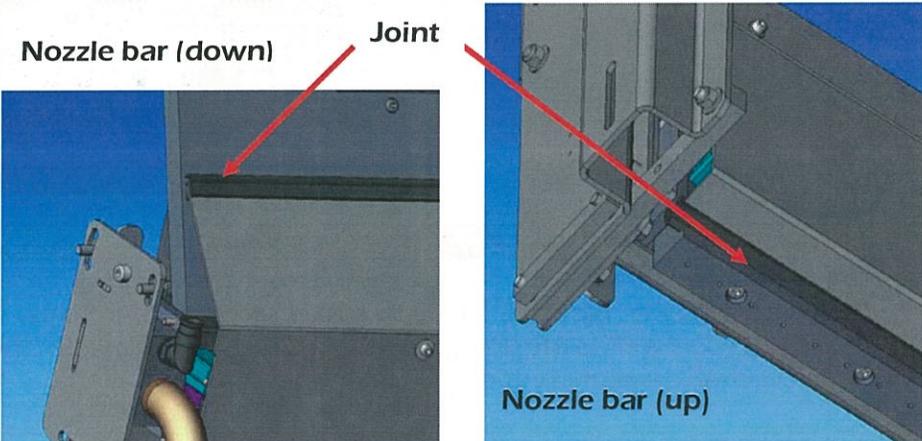
This procedure applies to all machines.

Location	
	
<div style="border: 1px solid black; padding: 2px; display: inline-block;">Nozzle bar</div>	
<div style="border: 1px solid black; padding: 2px; display: inline-block;">Nozzle bar (up)</div>	
<div style="border: 1px solid black; padding: 2px; display: inline-block;">Nozzle bar (down)</div>	
Preliminary steps	
1	<p>Shut off the air supply located near the air-conditioning by cutting off the air valve (horizontal position) Wait until bleeding ends (no more air in the tank).</p>
	



<b>Nozzle bar (up)</b>	
1	<p>Unscrew and remove the top cover</p> 
2	<p>Unscrew and remove the side cover</p> 
<b>Nozzle bar (down)</b>	
1	<p>Unscrew and remove the side cover</p> 
<b>Installation of new electrovalve</b>	
3	<p>Using a blower, blow the hexagon socket recess of each screw to be removed as well as the unit so as to avoid dirt getting in after the electrovalve is dismantled</p>



4	<p>Using an Allen/BTR 2.5mm wrench, unscrew the 2 screws securing the faulty electrovalve</p>  <p style="text-align: center;"><b>Nozzle bar (down)</b>                      <b>Nozzle bar (up)</b></p>
5	Remove the electrovalve by pulling it perpendicularly to its seating plane ( <b>CAUTION</b> : the electrical connector is fragile)
6	Using a cloth, clean the location of the electrovalve (residual grease) <b>CAUTION</b> : prevent contamination from entering the feeder openings
7	Position the seal in the hollow section on the new electrovalve
8	Reposition the new electrovalve by positioning it perpendicular to the seating plane ( <b>CAUTION</b> : the electrical connector is fragile)
9	Tighten the 2 screws
<b>Return to the initial situation</b>	
10	Open the air intake
11	Make sure there are no leaks when pressure is re-applied
12	Perform a nozzle test
13	<p>Screw on the cover and check that the joint is placed correctly</p>  <p style="text-align: center;"><b>Nozzle bar (down)</b>                      <b>Joint</b>                      <b>Nozzle bar (up)</b></p>



## Procedure n°4: REPLACEMENT OF A MISTRAL PC

➤ **Range of application:**

This procedure applies to all machines except the SIROCCO ones.

➤ **Location :**

*Opened doors :*



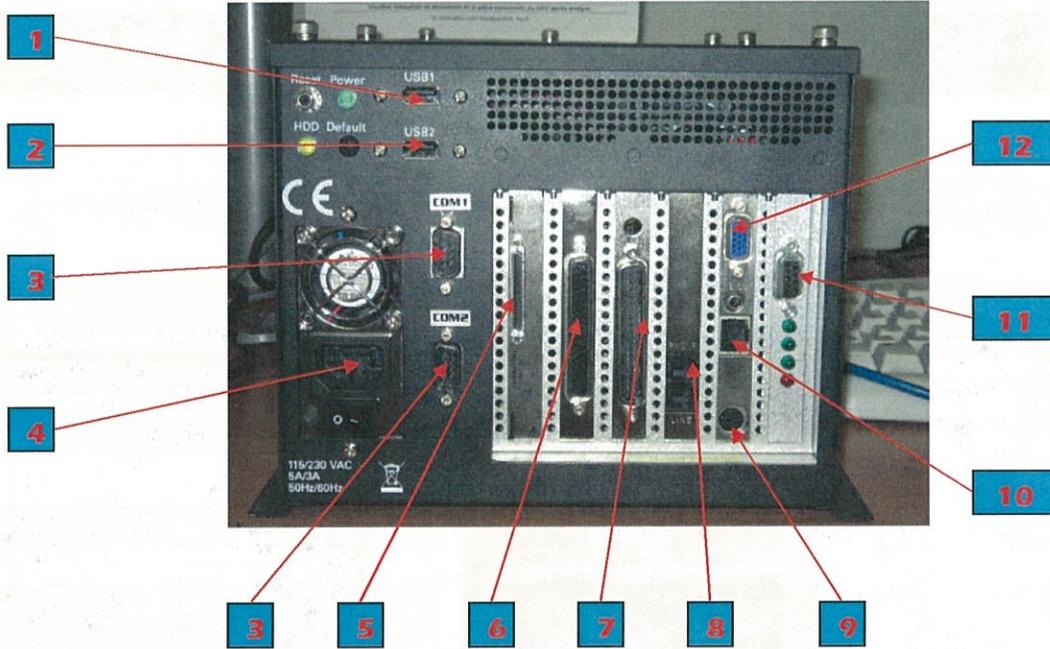
**MATERIAL PC**

➤ **PC Replacement :**

STEPS	TASKS REQUIRED
1	Switch off the PC (electrical precautions)
2	Check there is no current
3	Switch off the cabinet
4	Open the cabinet and disconnect the cables connected to the PC (7 minimum)
5	Remove the screws securing the PC (2 screws)
6	Unpack the replacement PC and turn over the assembly rails (inverted during shipment)
7	Position and secure the PC using the PC attaching screws (2 screws)
8	Reconnect the cable assembly (7 minimum) according to the indications below ( <i>Wiring</i> )
9	Power up the cabinet then the PC, and make sure all the components are operational (inverter, nozzle board...)



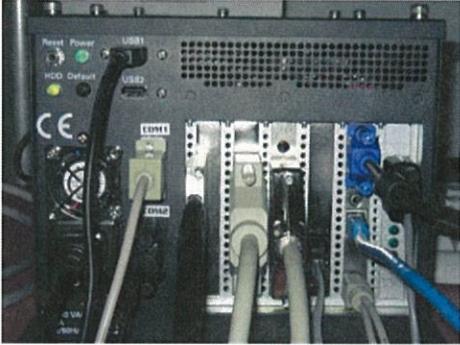
➤ **Wiring :**



Connect the various peripheral devices to the connectors by respecting the different configurations. Tighten the connectors.

1		5		9	
2	<b>USB connected to the commutator</b> 	6		10	
3		7		11	
4		8		12	



<p><b>MISTRAL 800 – 1200 Configuration</b></p>	
<p><b>MISTRAL 1600 – 2000 – 2400 Configuration</b></p>	
<p><b>BiTECHNO 800 – 1200 Configuration</b></p>	
<p><b>BiTECHNO 1600 – 2000 – 2400 Configuration</b></p>	



## Procedure n°5: REPLACEMENT OF A VISION PC

➤ **Range of application:**

This procedure applies to all machines except the MISTRAL ones.

➤ **Location :**

*Opened doors :*



VISION PC

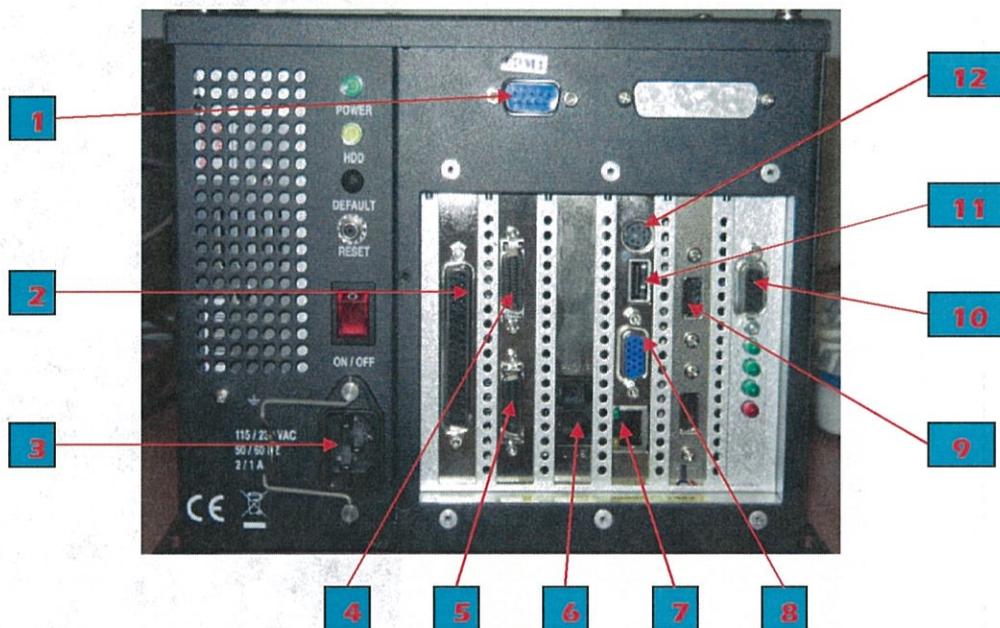
➤ **PC Replacement :**

STEPS	TASKS REQUIRED
1	Switch off the PC (electrical precautions)
2	Check there is no current
3	Switch off the cabinet
4	Open the cabinet and disconnect the cables connected to the PC (8 minimum)
5	Remove the screws securing the PC (2 screws)
6	Unpack the replacement PC and turn over the assembly rails (inverted during shipment)
7	Position and secure the PC using the PC attaching screws (2 screws)
8	Reconnect the cable assembly (8 minimum) according to the indications below ( <i>Wiring</i> )
9	Power up the cabinet then the PC, and make sure all the components are operational (inverter, nozzle board...)



➤ **Wiring :**

Connect the various peripheral devices to the connectors by respecting the different configurations. Tighten the connectors.



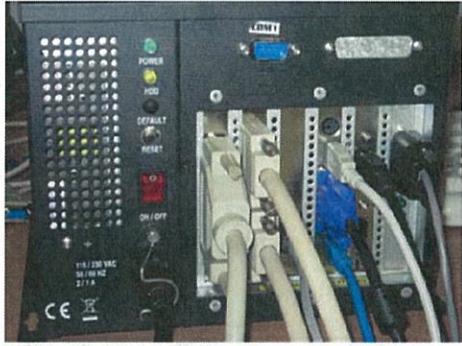
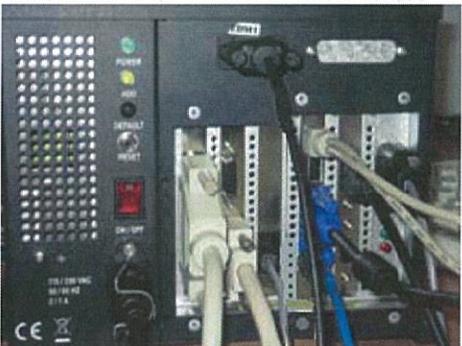
<b>1</b>	
<b>2</b>	
<b>3</b>	
<b>4</b>	
<b>5</b>	

<b>6</b>	
<b>7</b>	
<b>8</b>	
<b>9</b>	<p>USB connected to the uninterruptible power supply</p>

<b>10</b>	
<b>11</b>	<p>USB connected to the commutator</p>
<b>12</b>	



**Wiring of the PC VISION**

<p align="center"><i>BiTECHNO 1600 - 2000 Configuration</i></p>	
<p align="center"><i>BiTECHNO 800 - 1200 Configuration</i></p>	
<p align="center"><i>SIROCCO 1600 - 2000 - 2400 Configuration</i></p>	
<p align="center"><i>SIROCCO 800 - 1200 Configuration</i></p>	



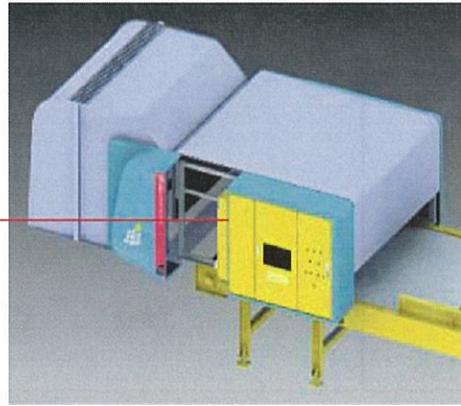
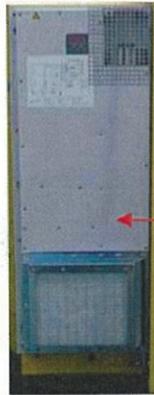
## Procedure n°6: REPLACING THE AIR CONDITIONING

N.B. It is preferable to perform this procedure with two people.

**Caution:**

The air conditioning system must remain vertical for 24 hours after starting up.

➤ **Location**



➤ **Replacement of air conditioning**

Removal of air conditioning	
1	Switch off the machine
2	Open the control cabinet and disconnect the quick-disconnect cable
3	Unscrew the 4 or 6 screws from the air conditioning (according to the model)
4	Remove the air conditioning and the cover with the sticker
Installation of the air conditioning	
5	Correctly position the air conditioning and then tighten the screws. <b>CAUTION:</b> place the cover attachment fittings between the control cabinet and the air conditioning
6	Check the air conditioning is correctly attached and that there is no play between the air conditioning and the control cabinet.
7	Connect the quick-disconnect cable
8	Switch Q1 to ON and check that the air-conditioning is running correctly



**Procedure n°7 : CHANGING THE ENCODER**

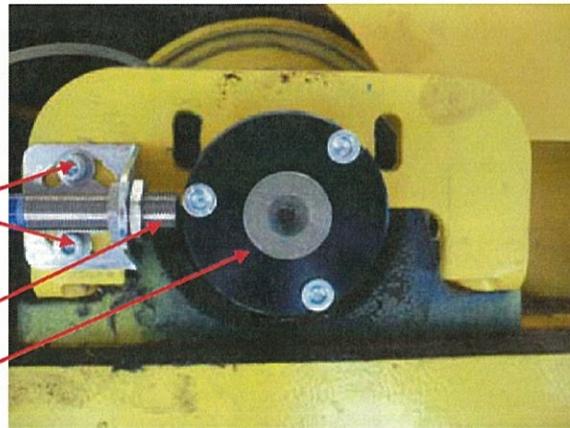
**Locating**

The encoder is located on the side of the conveyor

**M5 Screw**

**Encoder**

**Disc**

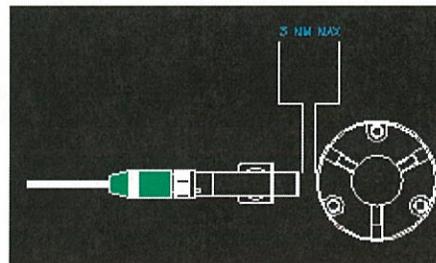


**Removing the encoder**

- 1 Unscrew the cable
- 2 Undo the two M5 screws
- 3 Remove the encoder sensor.

**Installing the new encoder**

- 4 Insert a new encoder where the old one was.  
Note: When remounting, tighten the sensor completely because there must not be more than 3mm between the disc and the encoder sensor or rotation will not be detected.



**Checking it works correctly**

- 5 Start the conveyor
- 6 A LED should flash to indicate that the belt is running. If this is not the case, tighten up the sensor.



## Procedure n°8 : CHANGING THE UPS SYSTEM

### Locating

*Opened doors :*



UPS

### Removing the UPS

- |   |                                    |
|---|------------------------------------|
| 1 | Unscrew the 4 nuts                 |
| 2 | Unplug the cables from the back.   |
| 3 | Remove the damaged UPS (in black). |

### Installing a new UPS

- |   |                                |
|---|--------------------------------|
| 4 | Put a new UPS into place       |
| 5 | Reconnect the cables as shown: |

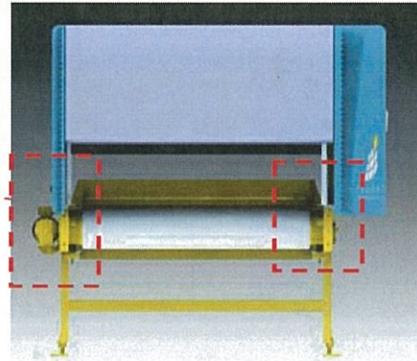
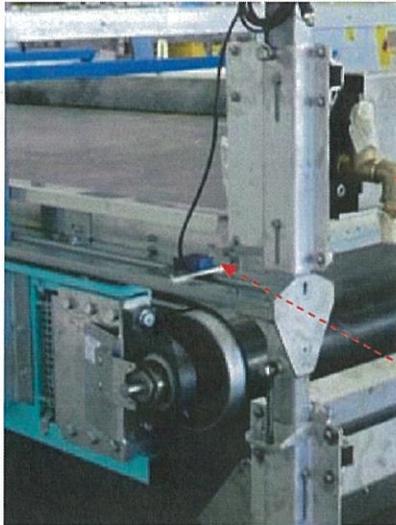


- |   |                               |
|---|-------------------------------|
| 6 | Replace and tighten the nuts. |
|---|-------------------------------|



**Procedure n°9 : CHANGING A JAM ALERT CELL**

**Location**



**Jam alert cells**

**Identifying the jam alert cells**

The jam alert cells have two sensors:

- A transmitter:  
on the right hand side of the machine,  
composed of several controls

- A receiver:  
on the left hand side of the machine  
and has no controls





### Changing the cells

1	Remove the two screws on both cells
2	Disconnect the cables
3	Disconnect the connector 
4	Replace both cells (transmitter and receiver)
5	Replace the screws and tighten them
6	Reconnect the cables
7	Reconnect the connector

### Sensor controls



**Sensitivity control**

**Time control (4s)**

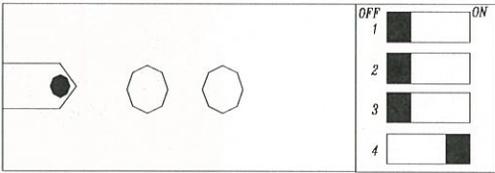
**Open cover**

**Switch control**

### Switch control

REGLAGE DES SWITCHS

CELLULE EMETTRICE



### Checking that it works correctly

Put your hand in front of the receiver, if a yellow lamp turns off after 3 seconds then it is working correctly



## Procedure n°10 : Changing a halogen socket

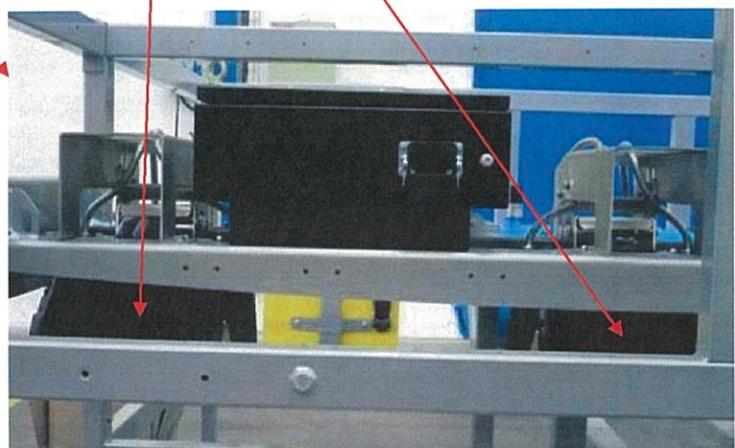
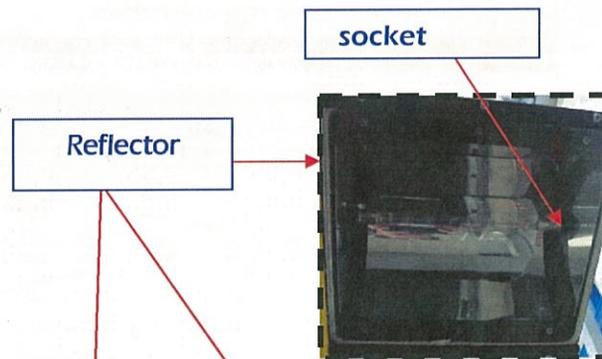
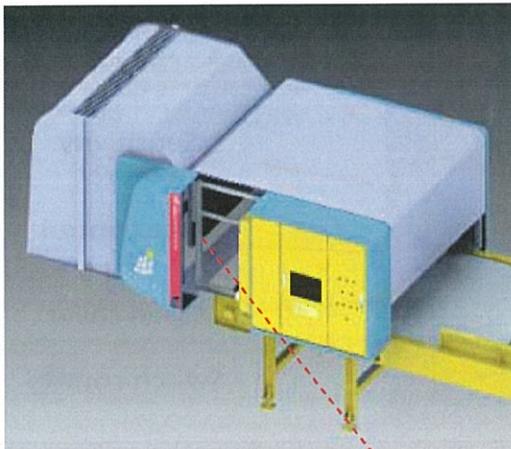
### ➤ Range of application :

This procedure concerns all machines.

**Warning:** You must never touch the reflective plates with your fingers or a soft cloth.

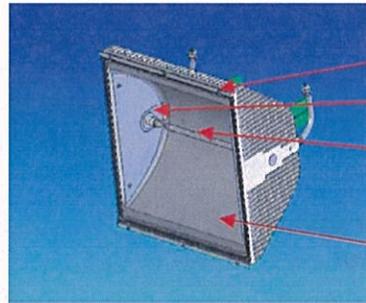
### ➤ Location :

Locate the halogen where the socket is to be changed.





### Reflector description



Screw

Socket

Halogen bulb

Reflector glass cover

### Opening the glass cover

1

- Remove the 6 screws.



2

- Open the cover with care by pulling downwards (step 1) then swinging it open (step 2).

Warning: hold the glass cover while you open it.

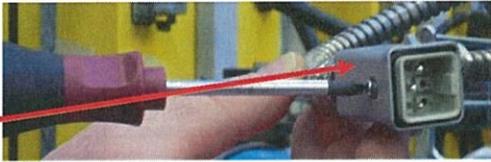


Step 1

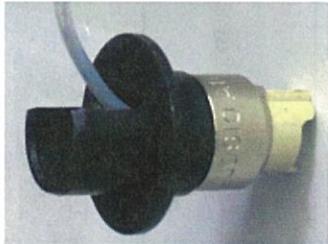


Step 2



Replacing the socket	
1	Remove the halogen lamp
2	<p>Unplug the connector situated at the back of the reflector</p> 
3	<p>Undo the connector screws to remove the contact unit.</p> <p style="text-align: center;"><b>Contact unit</b> </p>
4	<p>Note the position of the wire coming from the socket to change (position 1 or 2) then fetch the tool that was supplied with the machine for this purpose.</p> <div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="text-align: center;">  </div> <div style="text-align: center;">  <p><b>Tool for the operation</b></p> </div> </div> <p style="text-align: center;"><b>Possible locations of the wire (Please note it before removal)</b></p>
5	<p>Insert the tool in the contact unit slot and pull the wire out.</p> <div style="display: flex; justify-content: space-around;">   </div>



6	<p>Unscrew the connector steel sheath.</p>	
7	<p>Unclip the socket and pull the wire. If the wire proves difficult to remove, see "Socket wire and ground wire".</p>	
8	<p>Clip the new socket into place with the slot facing upwards (so the wire can be easily inserted)</p>	
9	<p>Hold the sheath straight to avoid bending and to simplify threading, then insert the wire.</p>	
10	<p>Fasten the steel sheath to the connector.</p>	
11	<p>Put the wire back into the place that you noted in the contact unit. Push it into place until you hear a click.</p>	
12	<p>Replace the contact unit in the connector and tighten the screws.</p>	
13	<p>Plug the connector back in.</p>	
14	<p>Replace the halogen.</p>	
15	<p>Swing the glass cover back up and push into place.</p>	
16	<p>Insert and tighten the 6 screws.</p>	



### Socket wire and ground wire

16	<p>If you have trouble inserting the wire (step 7) due to the ground wire, unscrew the threaded cover located on the side of the reflector.</p>  <p>The wire should pass through more easily. If it still cannot be done, unscrew the steel sheath on the side of the reflector.</p>
17	Insert the new wire and the ground wire into the red high voltage sheath and then insert that into the steel sheath.
18	Screw the steel sheath back on again.
19	Replace and tighten the threaded cover on the side of the reflector.
20	Follow the previous procedure from step 11 onwards.



# ***CHAPTER 5 - HELP NOTES***

This chapter gives help on trouble shooting and remote maintenance.

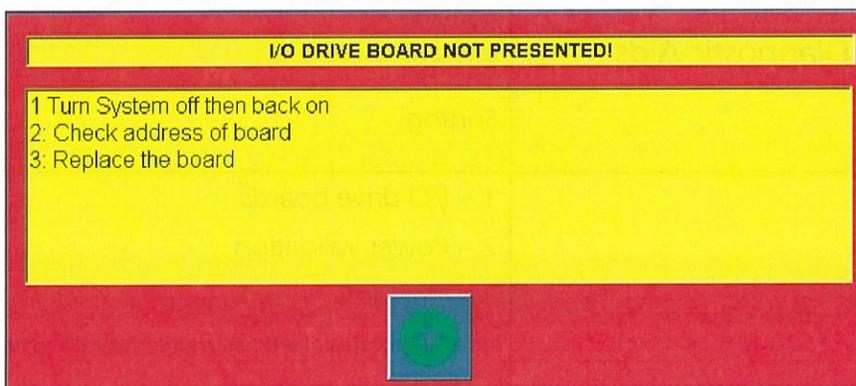
<b>Subject</b>	<b>Causes of problems</b>
<b>Diagnostic Aids</b>	Lights Software Ejection Sorting
<b>Diagnostic of displayed messages</b>	1 – I/O drive boards 2 – Power validation 3 – No lights 4 - Connexion with nozzle control unit 5 – Low air pressure 6 – Problem with nozzle board 7 – Nozzle control board diagnostic in nozzle control board unit 8 – Acquisition 9 – Initialization vision 10 – Initialization caméra
<b>Remote maintenance</b>	



# ***CHAPTER 5 – ERRORS MESSAGES AND SOLUTIONS***

## **Diagnosis of displayed messages common to all machines**

### ***Problem 1 : I/O Drive Board***



#### **Cause :**

The I/O Drive Board is not detected by the software.

#### **Solutions :**

Validate the error.

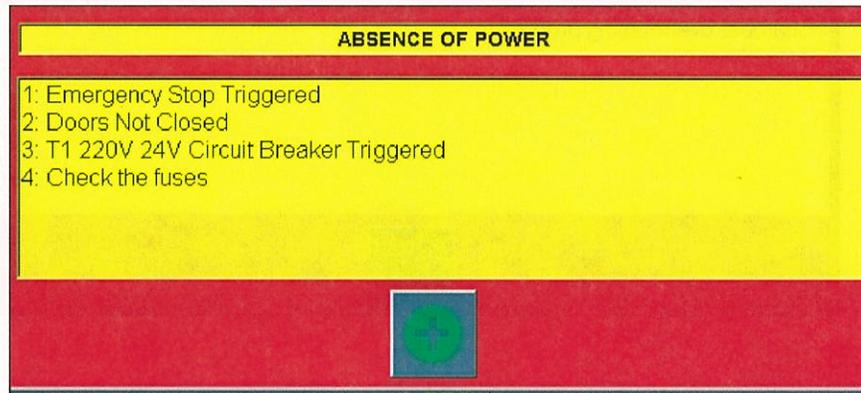
The I/O Drive Board is faulty or has not been detected, it is impossible to use the MISTRAL :

- quit the software driver ;
- switch off the control cabinet (PC included);
- wait several seconds ;
- re-start the MISTRAL.

If the problem persists, please contact PELLENC Selective Technologies After Sales Service.



## Problem 2 : Power Validation



### Cause :

The software starts, power OFF..

### Solutions :

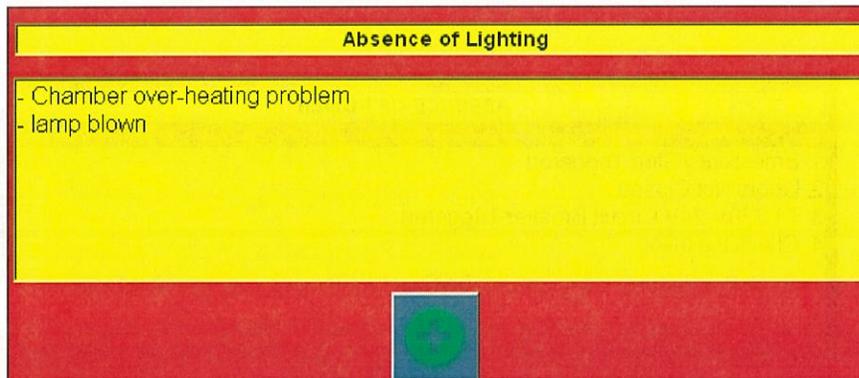
The 24VDC electrovalve light of the control cabinet is also OFF :

- release the emergency stop button ;
- engage power by pressing the reset pushbutton ;
- validate the error message.

In addition, check that all the circuit breakers are ON. If this is not the case, switch any circuit breakers that are OFF to ON then reset and confirm.



*Problem 3 : No lights*



Cause :

The software starts up without lights.

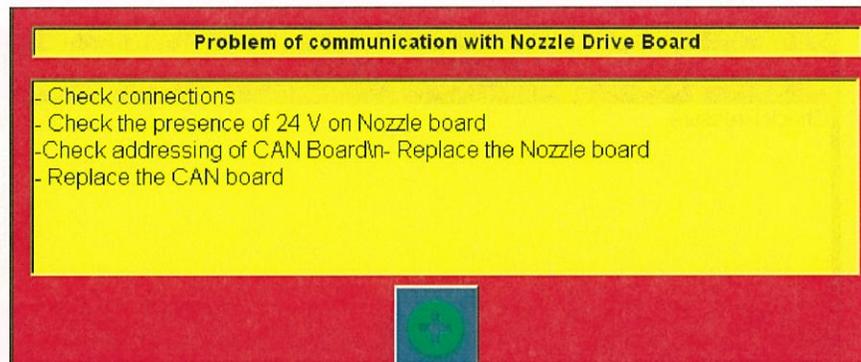
Solutions :

The 220V Lights indicator of the control cabinet must also be OFF :

- check circuit breaker **Q4**, it must be closed ;
- check if lights are powered ;
- validate error message ;
- check the halogen tubes



## *Problem 4 : Connection with Nozzle Control Unit*



### Cause :

The nozzle electrovalves are controlled by a printed circuit board located inside the nozzle control unit.

This board is controlled by the software driver via an industrial network. It is connected to a card installed inside the industrial PC of the control cabinet.

Upon initialization, the software sets up a link with the nozzle control board. If the connection is not established, the above error message is displayed.

### Solutions :

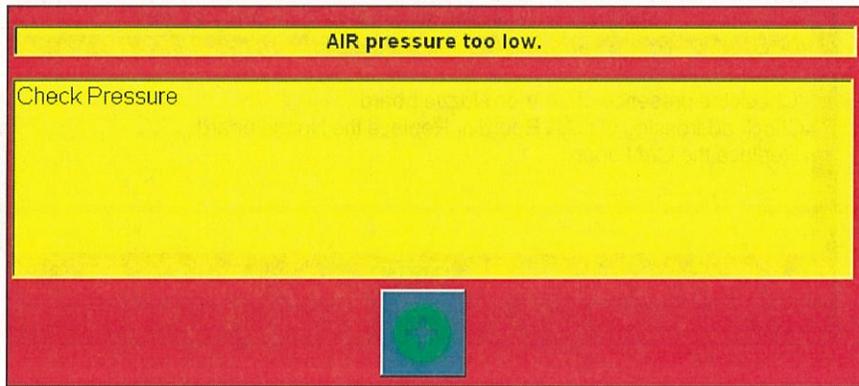
Validate the error message, the ejection nozzles can not be controlled :

- make sure the nozzle control unit is powered, 24VDC control light (see next page) ;
- make sure this power is present on the nozzle control board (see next page) ;
- check the fuse on the nozzle control board (see next page).

Once the connection is established, the software regularly interrogates the status of the nozzle control board ; the following error messages may be displayed :



*Problem 5 : Low air pressure*



Cause :

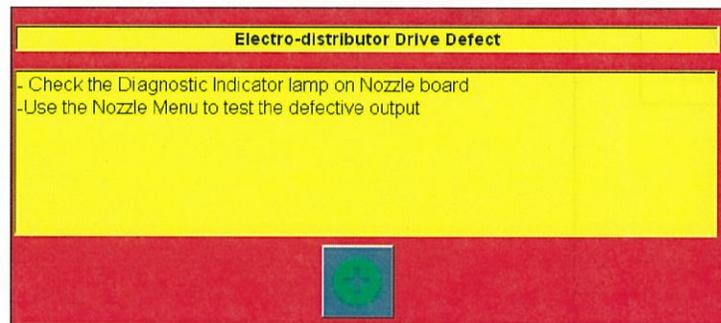
The chamber air pressure is less than the nozzle operating pressure.

Solutions :

- check the compressed air supply : it must be above 6 bars ;
- check the supply system ;
- make sure the pressure regulator is set to 6 bars ;
- validate the error message.



## Problem 6 : Problem with Nozzle Board



### Cause :

An output stage is faulty.

### Solutions :

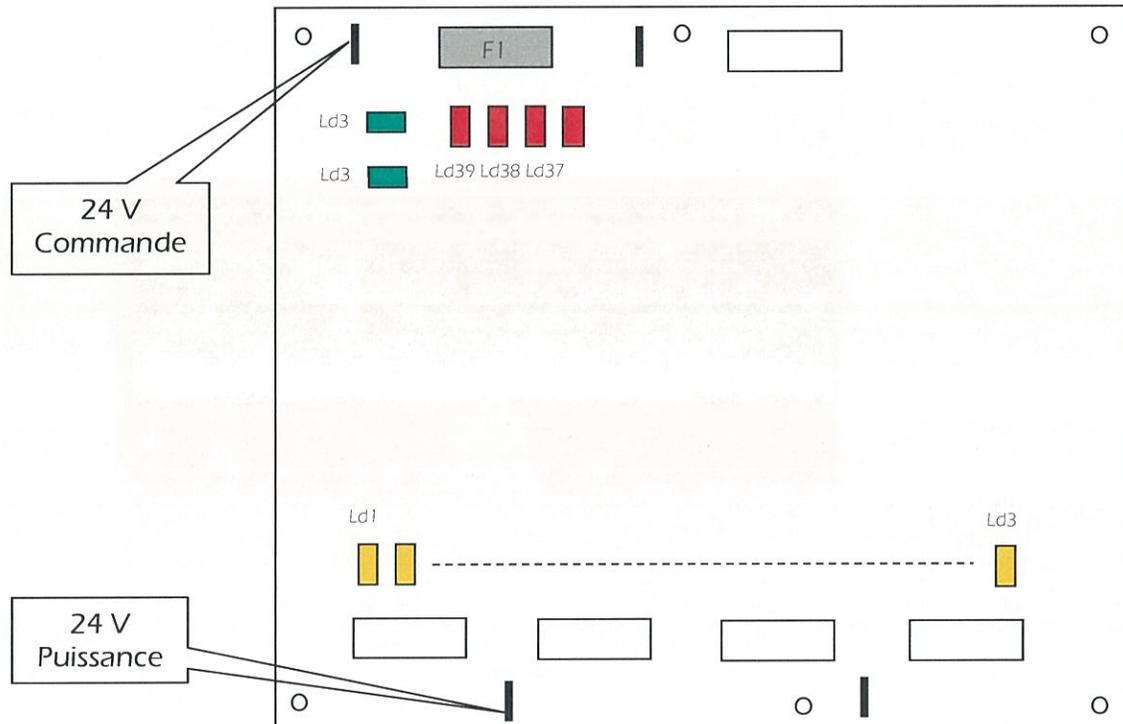
- (see next page) ;
- switch off the control cabinet (master switch) ;
- check the connections between the output and the nozzle wire bundle ;
- re-start the MISTRAL.

If the problem persists, replace the nozzle control PCB.

Please return the defective PCB to PELLENC ST After Sales Service along with number you were given that authorizes the return of goods.



### Problem 7: Nozzle control board diagnostic in nozzle control unit



Ld i : Lights welded onto PCB

#### Power indicators

Ld33 : Presence of 24 V Control (check fuse F1)

Ld34 : Presence of 5 V Control

#### Electrodistributor control indicators

With the presence of « **24V Power** », Leds Ld1 to Ld32 must be ON.

If one of the Leds (Ld1 to Ld32) is OFF, this indicates a problem with the electrical connection between the board and the coil :

- open circuit (cable cut, faulty connector crimping or coil unserviceable)
- short-circuit (cable crushed or coil unserviceable)

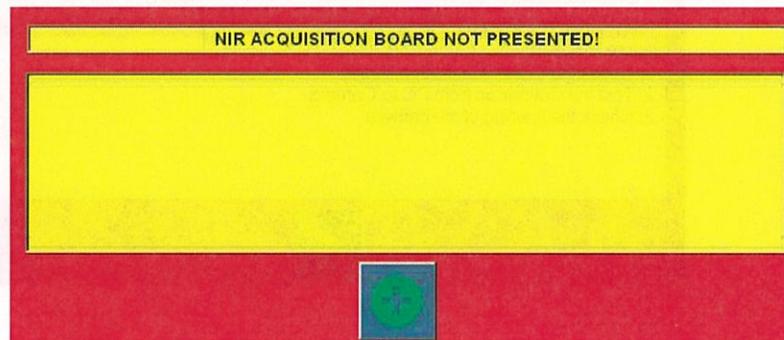
**Ld39 ON** : indicates a program error or micro defect. Switch off and then switch on the Mistral. If fault persists, replace the board. **Ld36 flashing** : indicates board OK.

**Ld37 flashing** : indicates normal communication between board and computer.



## Diagnosis of displayed messages specific to MISTRAL software

### *Problem 8 : Acquisition*



#### Cause :

- ✘ The acquisition card is not detected by the software.

#### Solutions :

Validate the error by pressing the « Validate defect » icon on the screen.

The acquisition card is faulty or has not been detected, it is impossible to use the MISTRAL :

- quit the software driver ;
- switch off the control cabinet (PC included);
- wait several seconds ;
- re-start the MISTRAL.

If the problem persists, please contact PELLENC Selective Technologies After Sales Service.



**Diagnosis of displayed messages specific to SIROCCO software**

*Problem 9 : Initialization vision*



**Cause :**

Before the software graphic interface is displayed, the initialization of the vision board is launched.

If the vision board is not detected by the software, the above error message is displayed on the screen.

**Solutions :**

Validate the error.

The vision board is defective or is not detected, it is impossible to use the machine:

- Exit the software driver;
- Switch off the control cabinet (PC included);
- Wait a few seconds;
- Re-start the machine.

If the problem persists, contact the PELLENC ST Product Support Department.



### *Problem 10 : Initialization camera*



#### Cause :

Once the vision board is initialized, the software performs an image acquisition to test the camera. If the program has not detected the camera, the above error message is displayed on the screen.

#### Solutions :

Validate the error message.

The camera is defective or not connected, it is impossible to use the machine:

- Switch the cabinet off (master switch) (PC included);
- Check the connection between the camera and the PC;
- Re-start the machine.



# **CHAPTER 5 –**

# **DIAGNOSTIC AIDS AND**

# **FAULT-TRACING**

## **Lights**



*What should I do if the lights don't come on ?*

- ✚ Make sure the lights power indicator is ON.
- ✚ Make sure the doors are locked.
- ✚ Check the halogens (cleanliness and operation)
- ✚ Check the "machine status". If the conveyor is running and the machine says "belt stopped", check the encoder.

## **Software**



*What should I do if the error "acquisition card missing" appears when the software starts up ?*

- ✚ Switch off the machine, wait several seconds, then switch it on again (PC stopped)
- ✚ If the problem persists, call Pellenc Selective Technologies After Sales Service.



*What should I do if the error "No Power" appears ?*

- ✚ Make sure the emergency stop button is not applied.
- ✚ Press the "Reset" button
- ✚ Check the status of the circuit breakers
- ✚ Confirm on screen



*What should I do if the objects are not in the « image acquisition » panel ?*

- ✚ Make sure the object belongs to a programmed family.
- ✚ Check that the article (as opposed to the label) is correctly placed under the light beam
- ✚ Perform programming if this model is systematically not sorted (Level 2 Customer Training )
- ✚ Call Pellenc Selective Technologies After Sales Service.



### Software



*What should I do if the objects are incorrectly ejected?*

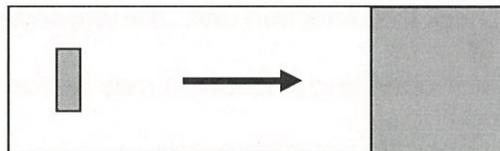
- ✚ Check the service air and that the nozzles are working correctly
- ✚ Try and identify the trajectory of the object when it is blown out by passing it through the belt several times (twisting ?)
- ✚ Make sure the nozzles are not directing the air stream next to the object.
- ✚ Check the operation of the nozzle board.



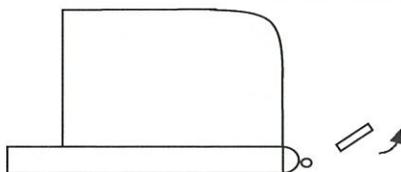
*How do I check the synchronization (this requires 2 persons)?*

- ✚ Check the **lateral synchronization** (perform a mirror centering – Access reserved to customers having received Level 2 training)
- ✚ Perform a **blowing synchronization** test :

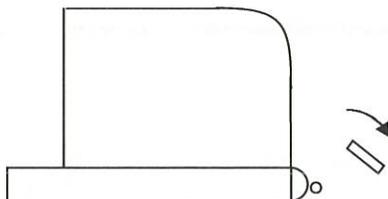
- ✓ Take a PE bottle
- ✓ Select the material to be blown : PE if possible
- ✓ Check for correct detection (there are PP caps)
- ✓ Set to sorting mode
- ✓ Position the bottle on the belt cross-wise and accompany it to prevent it from moving when released.



The object must be clearly ejected and must not swirl around itself.



The nozzles start blowing too early: call Pellenc ST After Sales Service and report the diagnostic



The nozzles start blowing too late: call Pellenc ST After Sales Service and report the diagnostic



### *What should I do in the event of nozzle failure ?*

-  Check for the presence of air
-  Check the connection between the PC and the nozzle boards (nozzle test)
-  Check that the nozzles are not blocked ("clean nozzles")
-  Check that there is not a wire crushed in the 16-pin connector on the nozzle ramp
-  Check the nozzle board safety fuses

## Sorting



### *What should I do if the machine does not sort ?*

-  Make sure the belt is in operation
-  Check the "machine status". If the conveyor is running and the machine says "belt stopped", check the encoder.
-  Check the connection with the nozzle board



### *What should I do in the event of a drop in sorting purity or efficiency?*

-  Check the lights : all the reflectors must be ON
-  Check that the reflectors are clean (test)
-  If the test fails:: Check the detection unit : the windows and the inside must be clean
-  Check the regulator operating pressure, it may be too low and the objects are incorrectly ejected
-  Check for correct operation of each nozzle
-  Check the position of the separating plate of the output box
-  Check the quality of the flow: too much paper results in a shovel effect during ejection. Similarly, a wet stream can cause detection to be faulty.



# CHAPTER 5 – REMOTE MAINTENANCE

After consulting the previous chapters, if you still cannot resolve your problem, you can call us for remote maintenance.

## BEFORE REMOTE MAINTENANCE :

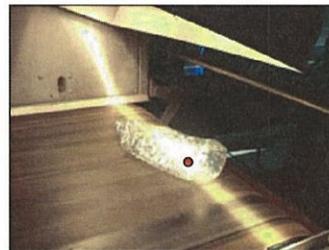
- Identify the remote maintenance mode of your machine: MODEM or ADSL (if you subscribed to this option when you bought it)
- Make sure the telephone line is connected to the machine



## DURING REMOTE MAINTENANCE :

- Make sure the machine is not in the sorting process
- Set the machine to the learning mode
- Follow the instructions given by the After Sales Technician
- During remote maintenance, the After Sales Technician may ask you to place an object under the light, on the measuring section.  
In this case, place the object under the red point on the belt

**If possible choose an object which  
does not have a label.**



## AFTER REMOTE MAINTENANCE :

- Return to the sorting mode (press the black ON/OFF button)
- Return to automatic mode (turning button «Control» position « Automatic »).



# ***CHAPTER 6 – PERIPHERALS***

This chapter gives instructions for the adjustment and maintenance of machine conveyors, outer casing and rollers.

These operations are carried out after machine shutdown.

## **Outer maintenance**

➤ **Cleaning the side panes:**

You should clean the side panes when you can no longer see inside the casing. Use a soft wet cloth to do this.

➤ **Cleaning the separator bars:**

To ensure the machine functions efficiently, you must regularly remove any waste that has stuck to the separator bars.

## **Roller maintenance**

➤ **Cleaning the rollers:**

Remove any objects that may impede or block the rollers for each station.



# ***CHAPTER 6 – CONVEYOR***

This chapter concerns customers whose conveyor was supplied by Pellenc ST. Here you will find the supplier's instructions and further explanations for certain maintenance and adjustment on/for the conveyor.

## **Mechanical maintenance**

### ***Belt centering***

Regularly check that the belt is correctly centered with respect to the ends. Check the distance between the belt end and the side plate, on each side of the conveyor (*item 1*).



### ***Guard***

The guard is only located on the lower nozzle bar (*item 2*). Its purpose is to prevent objects from falling between the nozzle bar and the conveyor belt. If residual products were to remain in this position, there is a risk of damaging the belt.

Perform a visual and mechanical check of this system DAILY.





Regularly check the rotating components (bearing blocks, drums, rollers)

To operate correctly, the drum requires a bearing block (*item 3*). The bearing block is a cast iron body housing a bearing. Regularly check that the bearing blocks are greased. Also make sure that there is no magnetic tape wound around the encoder.



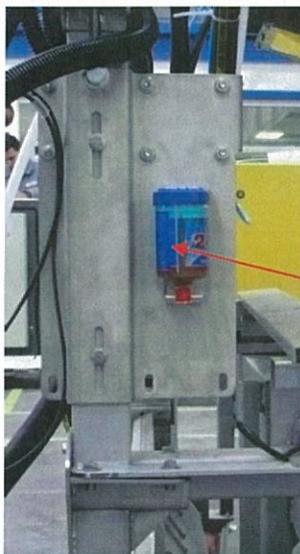
3

### Conveyor grease cartridges

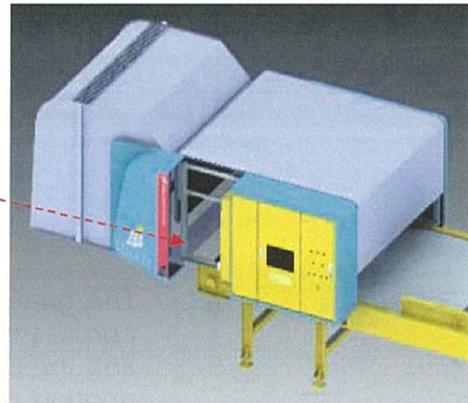
➤ **How often to do this maintenance:**

This maintenance is to be carried out weekly.

➤ **Location :**



Grease cartridges



There are two grease cartridges at the front of the conveyor (access via the doors of the machine) and two cartridges at the rear

➤ **Verification:**

- Check the grease level is correct in the cartridges on each side of the conveyor
- Replace the cartridge if empty



### Washing procedure for fast conveyor belt

The purpose of this procedure is to explain how to clean a fast conveyor belt.

Material required

To wash a conveyor belt, it is recommended to use a sponge or brush with water.

Washing frequency

The fast conveyor belt must be washed regularly.

The conveyor and its environment

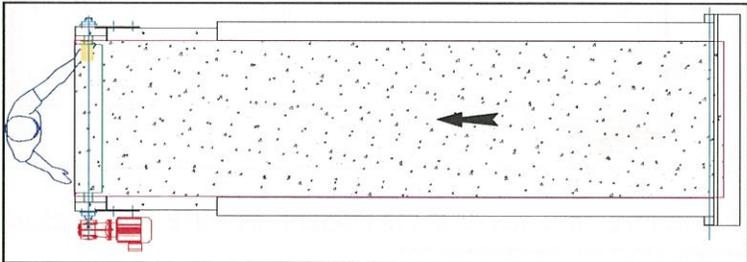
During the washing operation, the conveyor must be in the no-load operating mode.

To prevent objects from remaining on the belt during washing, ensure equipment items upstream from the conveyor are shut down.

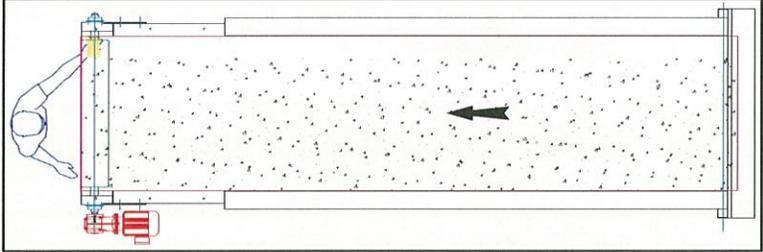
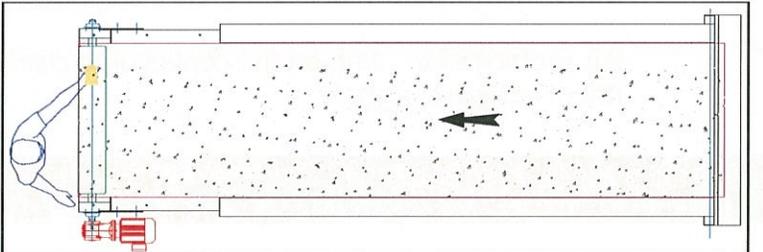
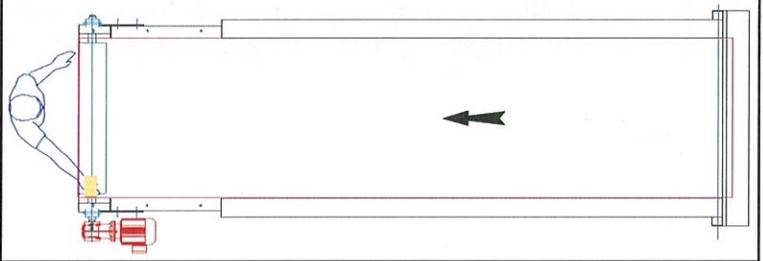
In order to guarantee personnel safety during washing, equipment items located downstream from the conveyor must be shut down.



**It is prohibited to climb on the conveyor to clean the belt, there is a risk of getting caught !**

STEPS	DESCRIPTION
1	Make sure the equipment items located both upstream and downstream from the conveyor to be washed are shut down;
2	Make sure the conveyor to be washed is in the no-load operating mode.
3	<p>Take a household type sponge or brush, wet it with water, then position on the first edge of the conveyor belt in operation.</p> 



4	<p>The cleaning object must be firmly maintained on the operating conveyor belt until the first edge of the belt has been cleaned over one or several complete turns. If the belt is very dirty, rinse the sponge and repeat the operation until this section of the belt is clean.</p> 
5	<p>Repeat step 4 by placing the sponge next to the belt section previously cleaned. If necessary, (if the belt is very dirty) rinse the sponge and repeat the operation until this section of the belt is clean.</p> 
6	<p>Repeat step 5 as many times as necessary to reach the 2nd edge of the belt. Belt washing is finished when the entire conveyor belt is clean.</p>  <p>If cleaning with water is insufficient, the use of industrial alcohol type products may be necessary. Cleaning personnel may also stand on the side of the conveyor and change sides when it is clean.</p>



## Adjusting the belt

- The tension of the belt must be frequently checked according to how often the conveyor is used.
- Excessive tension may cause unnecessary expenditure of energy and risks of deterioration to the belt and drums.
- Excessive slack may cause the conveyor to slide on the driving drum.
- Before adjusting the belt tension, remove any accumulated deposits on the slides of the transmitter head.

### ➤ **Adjusting the tension of the rubber belt**

The adaptation of the belt fibers may cause the belt to elongate. The belt must be re-tensioned and re-centered approximately two weeks after the machine is first run.

The procedure for re-tensioning correctly is as follows:

1. Remove the protective housing of the transmitter head.
2. Tension the belt by adjusting the tension units on the tensioning head of the conveyor. It is important to adjust the two tensioning heads identically in order to keep the drum axis perpendicular to the transporter (and the belt) axis.
3. Check the belt tension.
4. Reinstall the protective housing.

To replace the belt, proceed as follows:

- Remove the tensioning drum
- Remove the edges
- Remove the current belt
- Fit the new belt
- Install the tensioning drum and tension the belt

### ➤ **Replacing the belt :**

To replace the belt, proceed as follows:

- Remove the tensioning drum
- Remove the edges
- Remove the current belt
- Fit the new belt
- Install the tensioning drum and tension the belt s
- Reinstall the edge



➤ **Correcting the belt side-shift :**

Before any adjustment:

Ensure flatness and parallelism:

Flatness: do not deform the belt :

ABCD must be level.

(see figure 1)

Parallelism: the tensioning (or tail)

drum is adjusted on the horizontal plane.

(see figure 2)

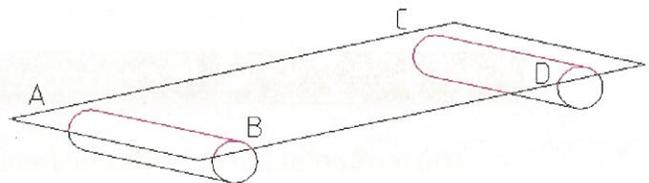


Fig 1

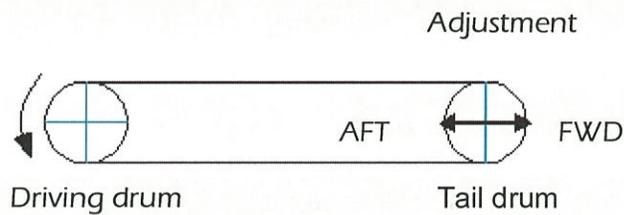


Fig 2

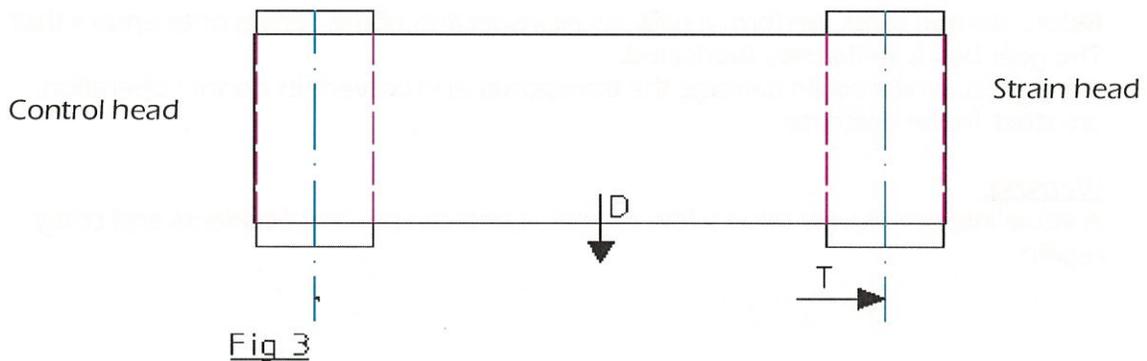
General Rules:

- First, the adjustment is performed with the conveyor unloaded, before the conveyor is loaded.
- All belts require a running-in period to allow the fibers to settle. Repeated adjustments may be required during the initial hours of operation.
- The operation of the belt must be monitored closely during the first hours of operation to prevent any deterioration caused by rubbing against the edges.



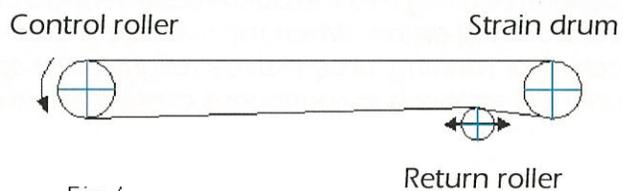
**- Adjusting the belt side-shift :**

If the side-shift occurs in the direction of the arrow D, the position of the rollers must be corrected, as per the arrows T (see figure 3), by always adjusting the strain roller (In exceptional cases only, fast and very tensioned belts may move in the opposite direction)



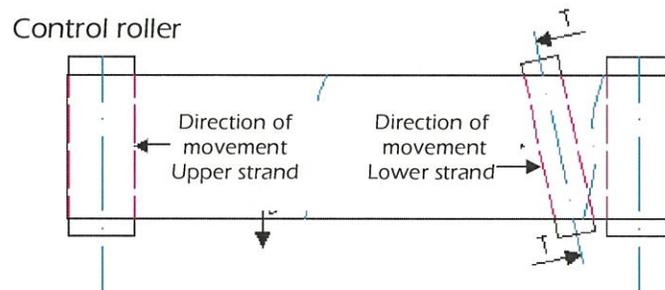
**- Adjusting the carrying rollers of the return belt :**

If adjusting the drums is not sufficient, it may be necessary to adjust the return roller (see figure 4)



Side-shift : D ( adjustment: T (see figure 5)

Warning: in general, this is a very delicate adjustment.





➤ **Belt skidding:**

Skidding may be caused by insufficient belt tension. It may also be caused by excessive belt tension. In such a case, slacken the belt first before re-tensioning it.

➤ **Visually inspecting the machine :**

Before starting work, perform a daily visual inspection of the conveyor to ensure that:  
The gear box is sufficiently lubricated.  
No objects, which could damage the transporter and prevent its normal operation, are stuck in the machine.

Warning:

A visual inspection only takes a few moments and can prevent accidents and costly repairs.

## **Adjusting the scraper**

The scraper must not rest too heavily on the belt as this could constrain or prematurely wear out the belt, or cause damage to the scraper itself. Adjustment is performed using two threaded rods inserted through "half-clamp assemblies" on the control head drums. When the machine is started, loosen the scraper, then, with the conveyor running, progressively retighten the springs using the two threaded rods, until the scraper is in continuous contact with the belt.

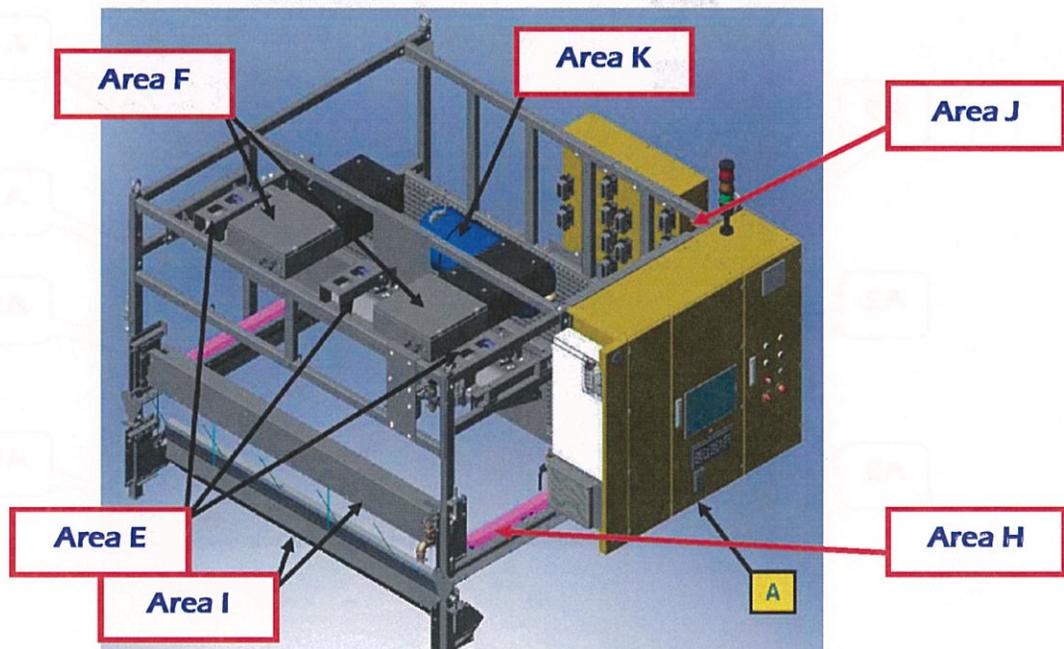
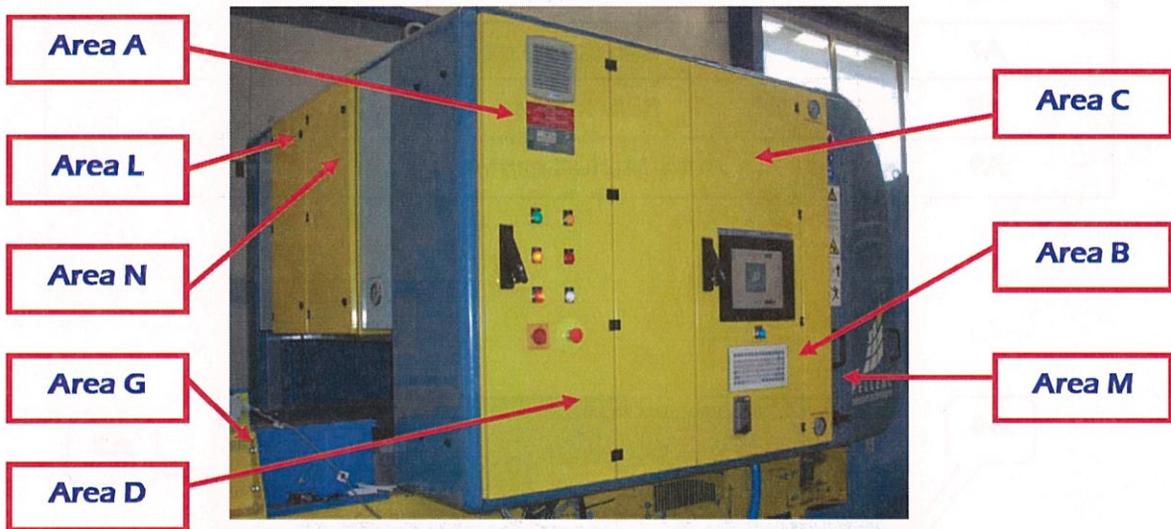


# **CHAPTER 7 –**

# **SPARE PARTS**

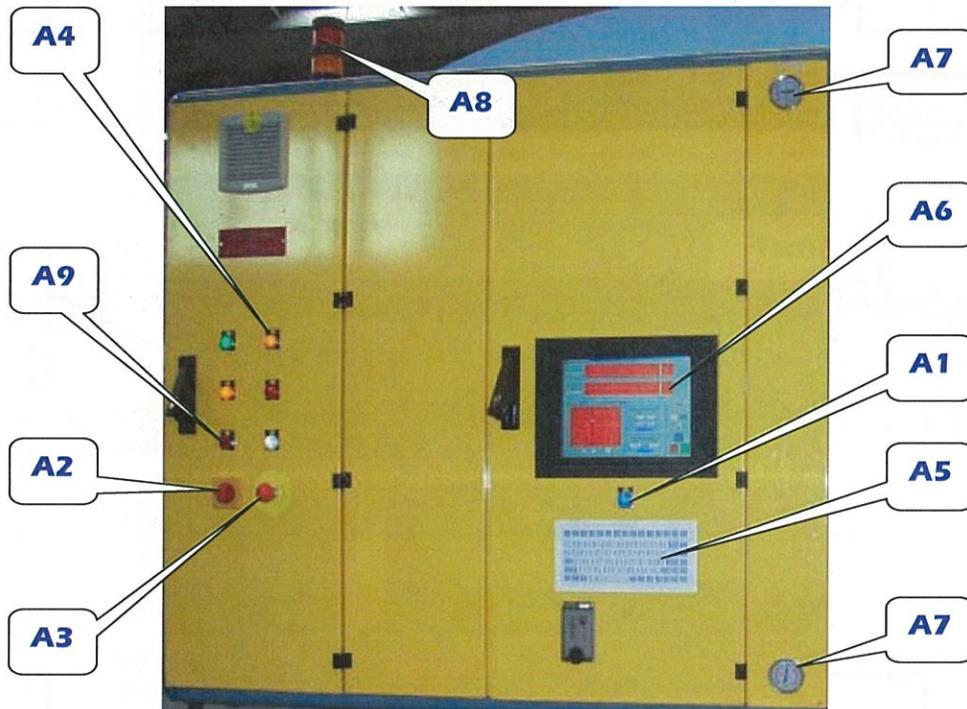
In this chapter is a list of the important spare parts that you are most likely need to order one day.

The parts are given by area and are numbered in the photos.





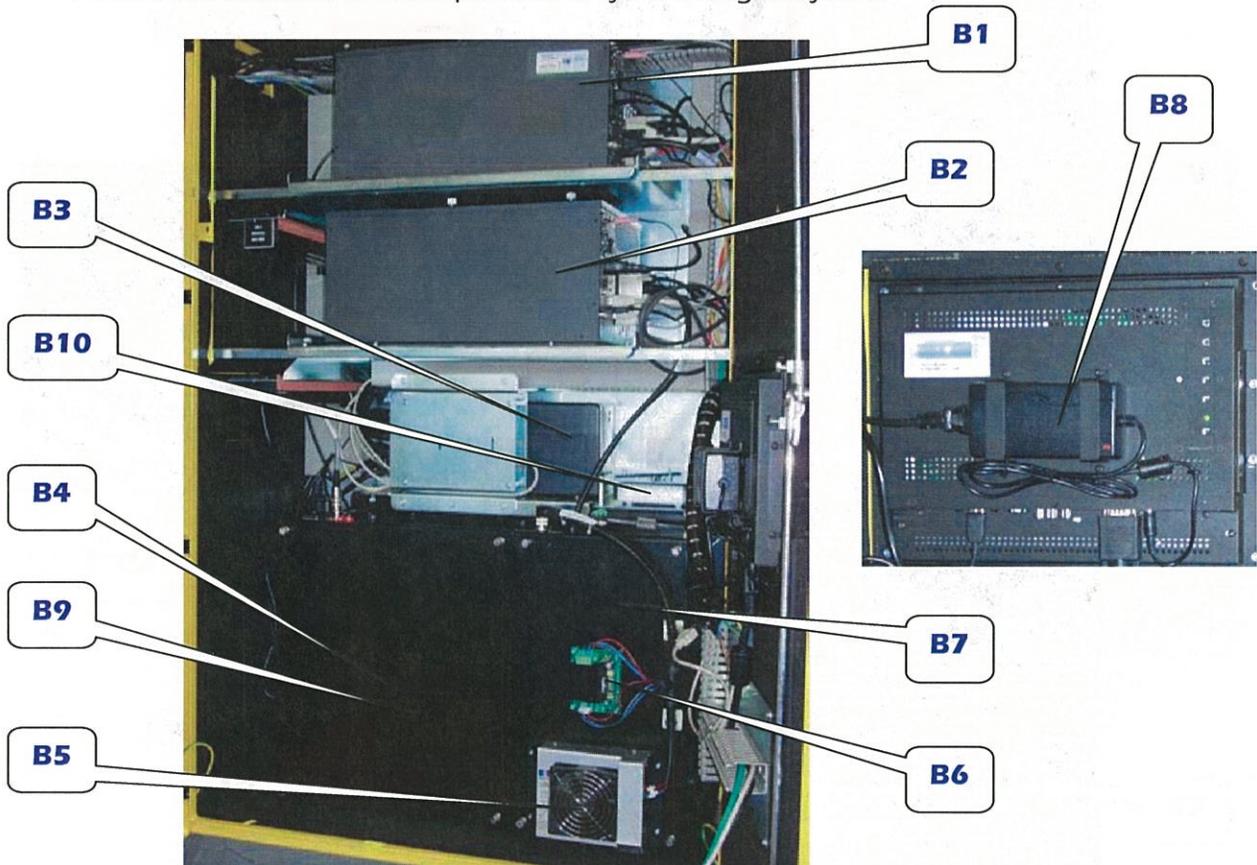
Area - Number	Description	Quantity
A1	Screen on/off	
A2	Main on/off switch	
A3	Emergency shutdown button	
A4	Sorting on/off button	
A5	Keyboard	
A6	Touch screen	
A7	Pressure gage	
A8	Bulb for stack light	
A9	Auto/Manu/Learning switch	





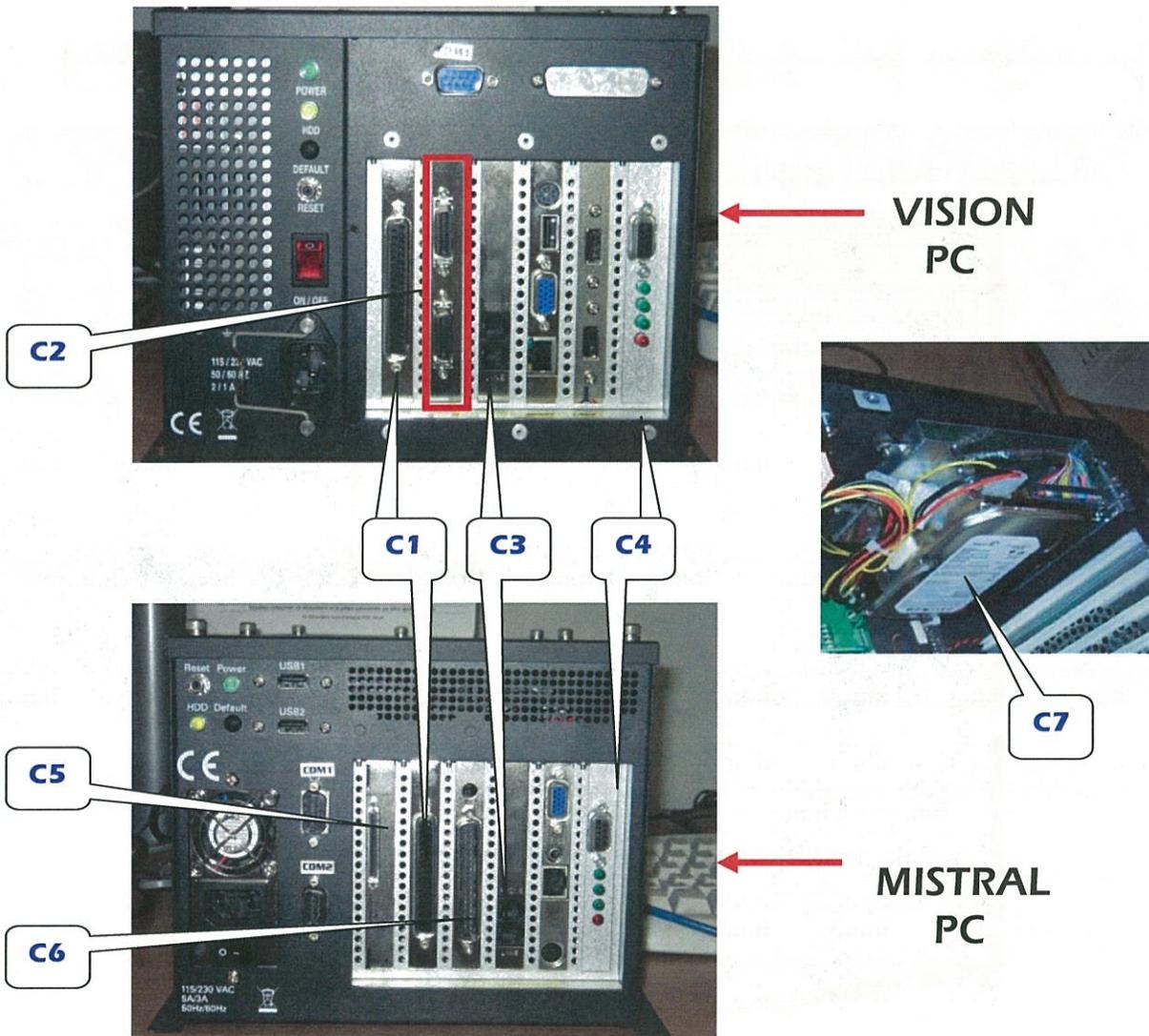
Area - Number	Description *	Quantity
B1	SIROCCO PC	
B2	MISTRAL PC	
B3	UPS	
B4	Spectrometer/Biplexer	
B5	PELTIER effect module *	
B6	PELTIER pilot board	
B7	Diode ampli board *	
B8	Screen power supply	
B9	Biplexer pilot board*	
B10	Switch or router (depending on the configuration)	

\* An asterisk indicates that this part can only be changed by PST.



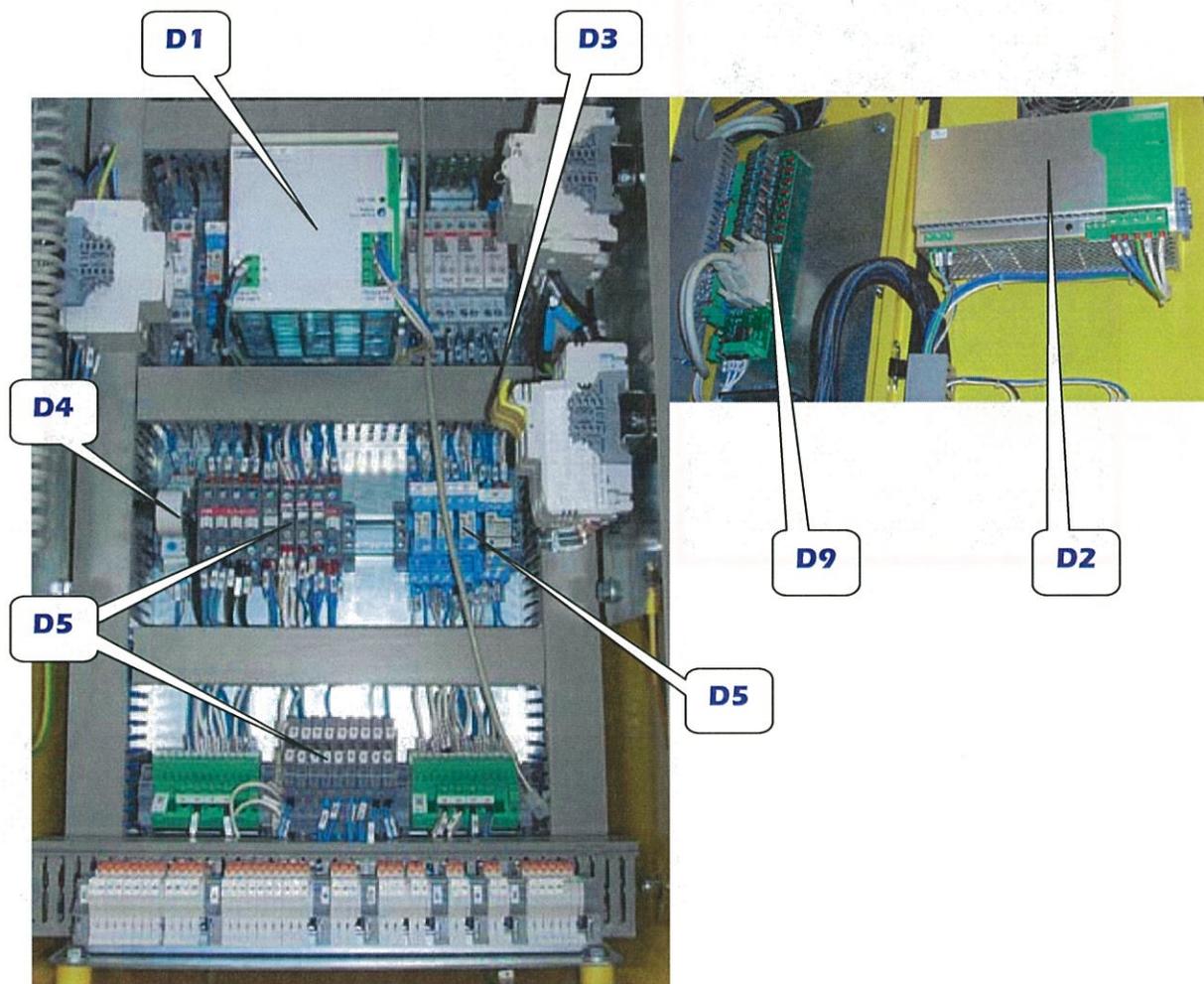


Area - Number	Description	Quantity
C1	I/O board	
C2	2 way VISION board	
C3	Modem card	
C4	CAN module	
C5	National Instrument board	
C6	Metal board	
C7	Hard drive	





Area - Number	Description		Quantity
D1	20 A Power supply		
D2	40 A Power supply		
D3	Fusadee cartridge		
D4	Intensity control relay		
D5	Fuses	Dimensions	
		Amperage :	
		Voltage :	
D9	I/O Power card		





Area - Number	Description	Quantity
E1	Halogen tube	
E2	Lampholder bundle unit	
E3	Reflector glass cover	
E4	Reflector unit	



**E4**

**E3**

**E2**



**E1**





Area - Number	Description	Quantity
F1	Mirror set *	
F2	Camera box*	

\* An asterisk indicates that this part can only be changed by PST.



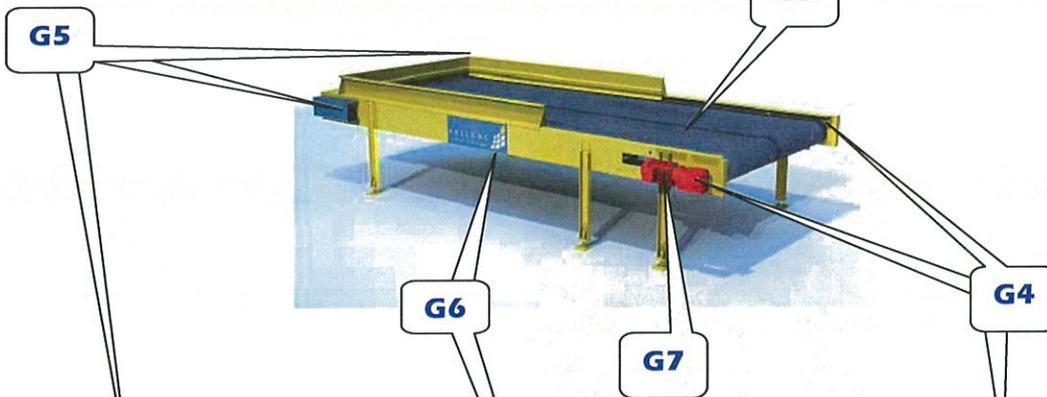
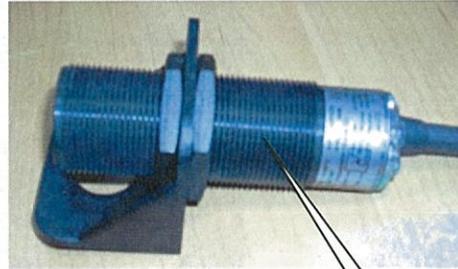
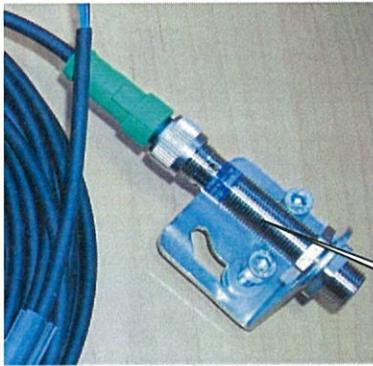
**F1**



**F2**

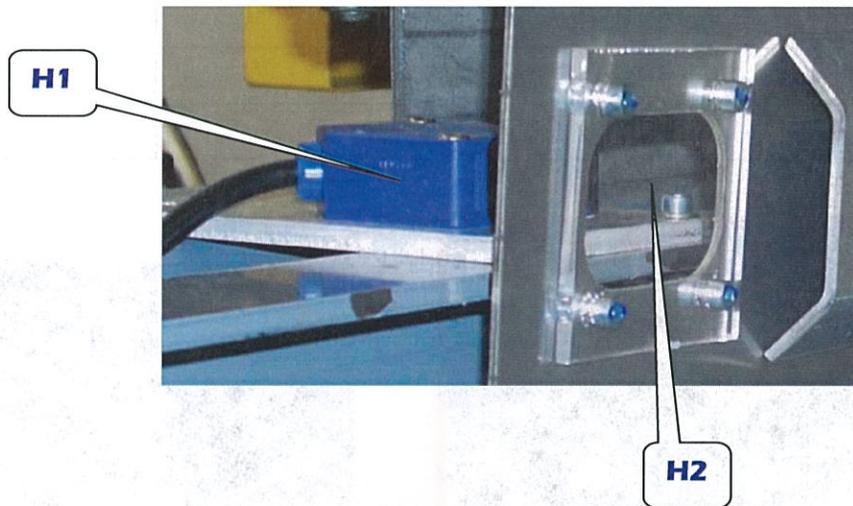


Area - Number	Description	Quantity
G1	Encoder	
G2	Belt rotation sensor	
G3	Belt	
G4	Rolling bearing 1	
G5	Rolling bearing 2	
G6	Return rolling bearing	
G7	Gear motor	



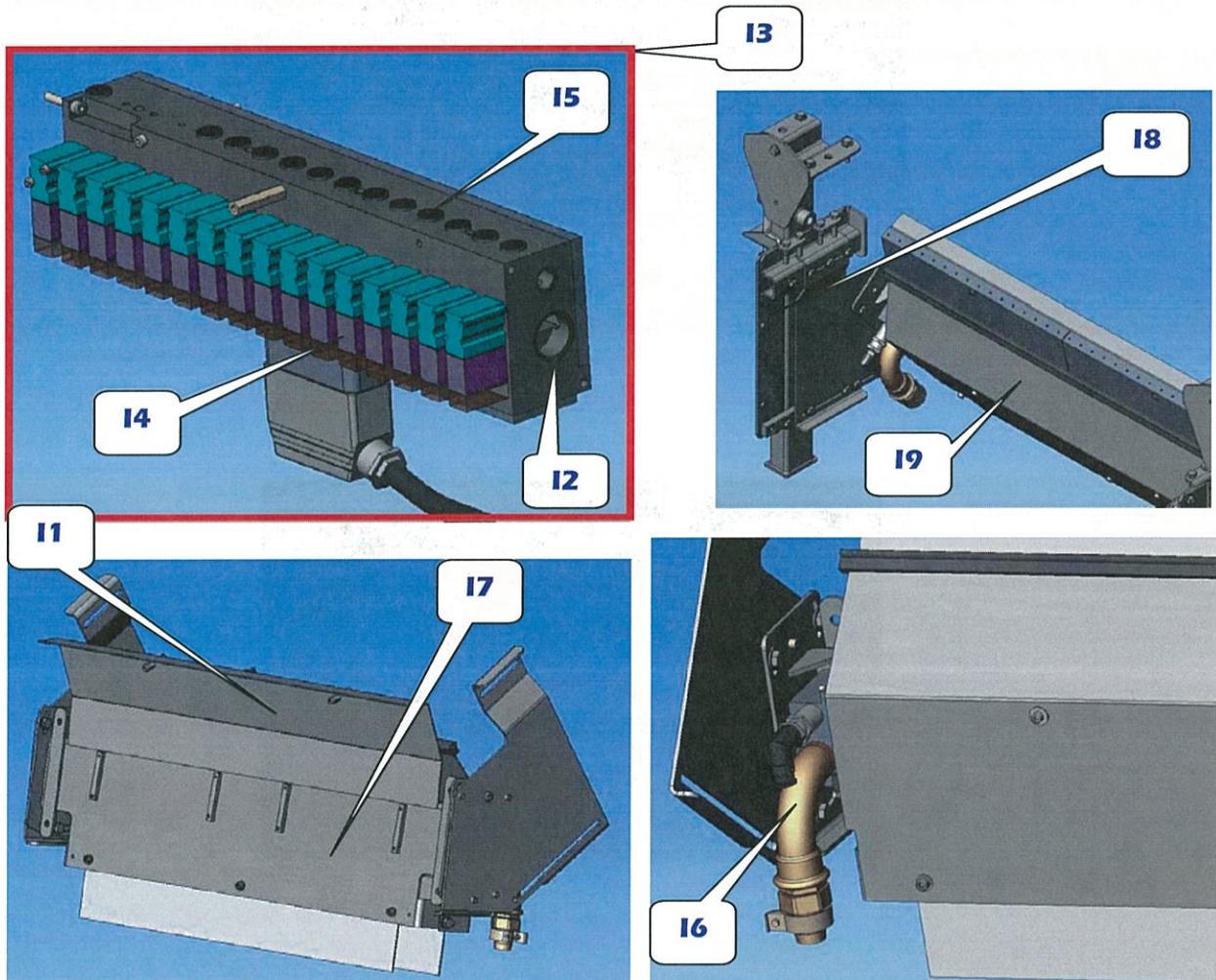


Area - Number	Description	Quantity
H1	Jam alert cells (pair)	
H2	Protective cover	
H3	Magnetic door switch	



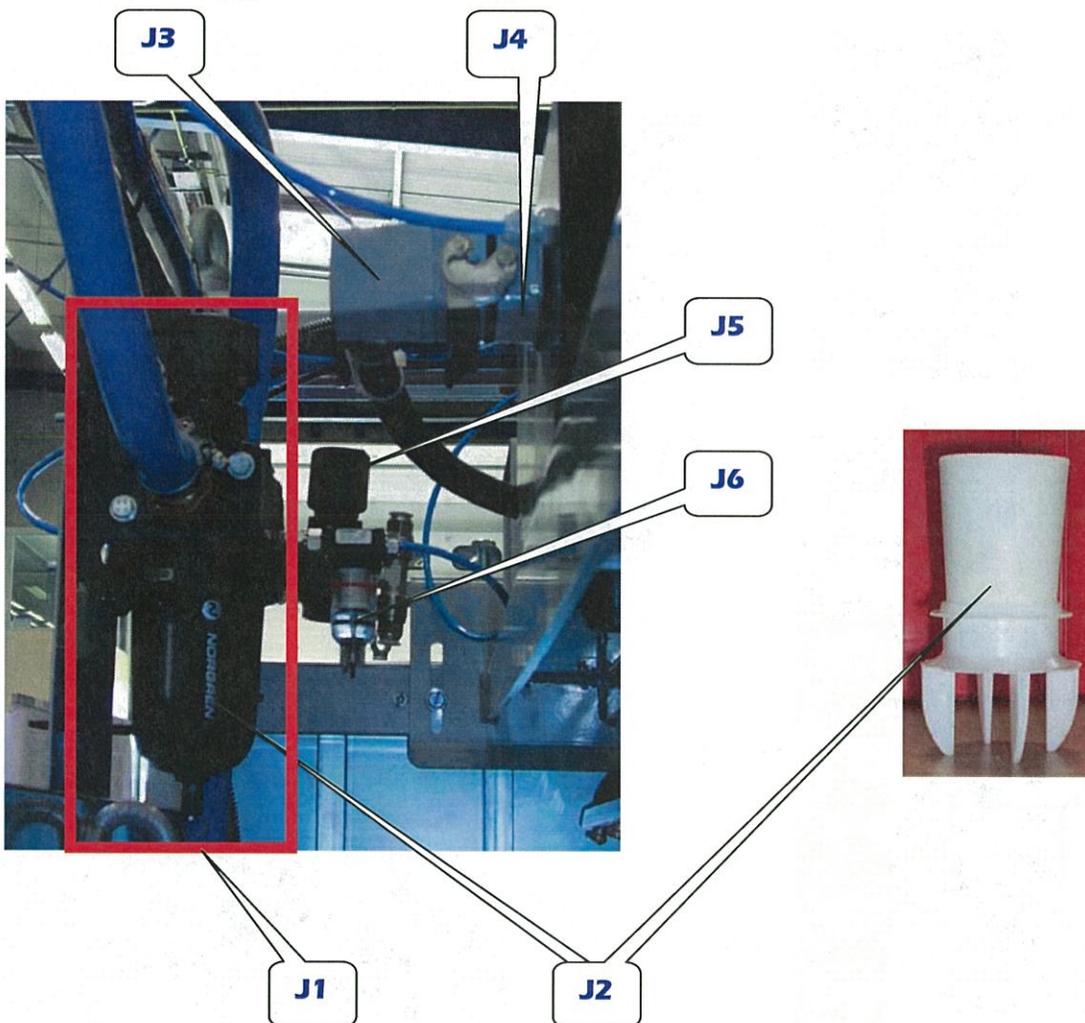


Area - Number	Description	Quantity
11	Scraper	
12	Electrovalve unit joint	
13	Electrovalve unit	
14	Electrovalve	
15	Joint + electrovalve filter	
16	Electrovalve unit air supply	
17	Electrovalve unit holder	
18	Nozzle ramp fitting holder	
19	EV protective cover	



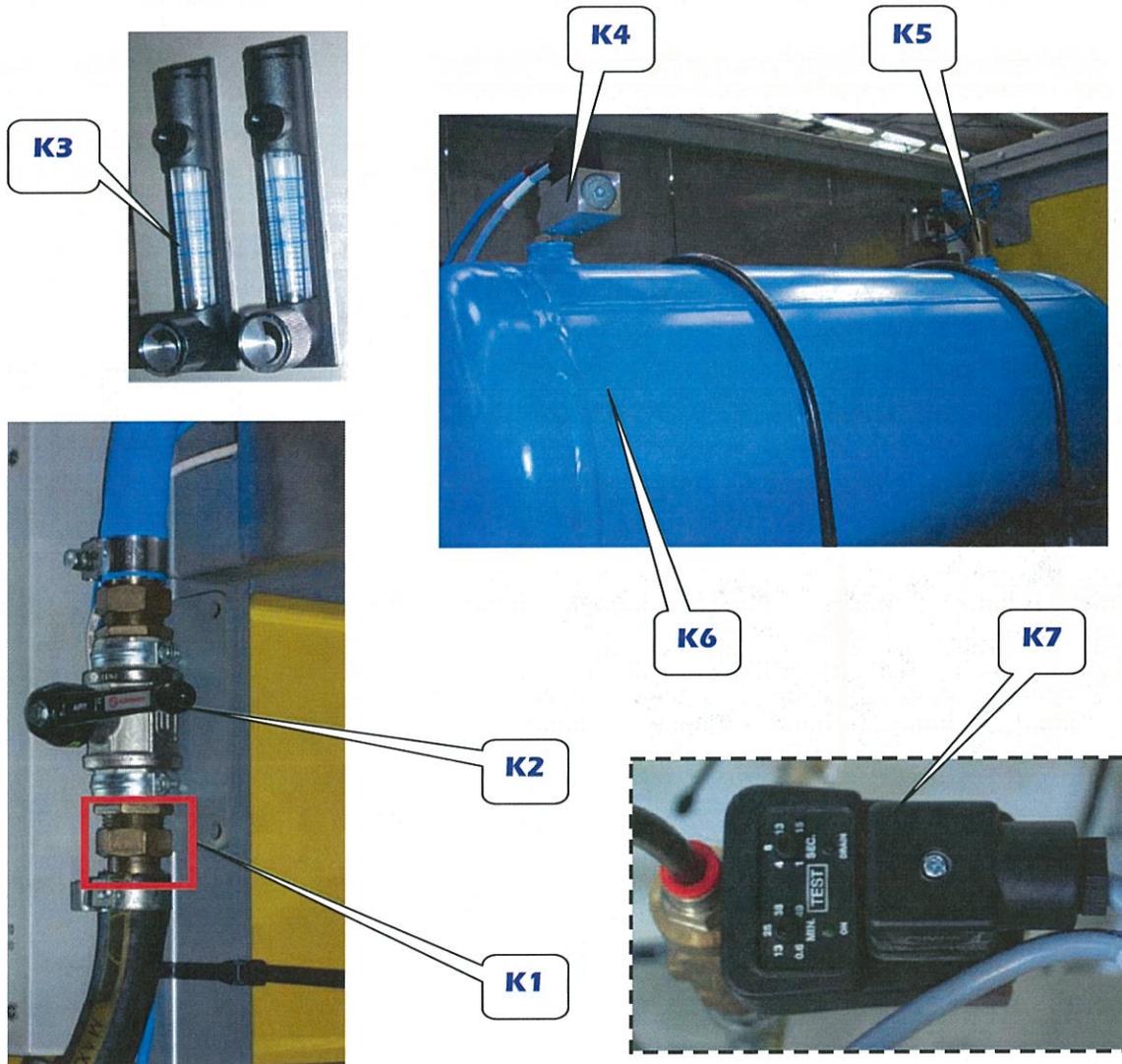


Area - Number	Description	Quantity
J1	FRL unit	
J2	FRL filter	
J3	Harting connector	
J4	Harting socket	
J5	Continuous output pressure regulator	
J6	Oil trap filter	



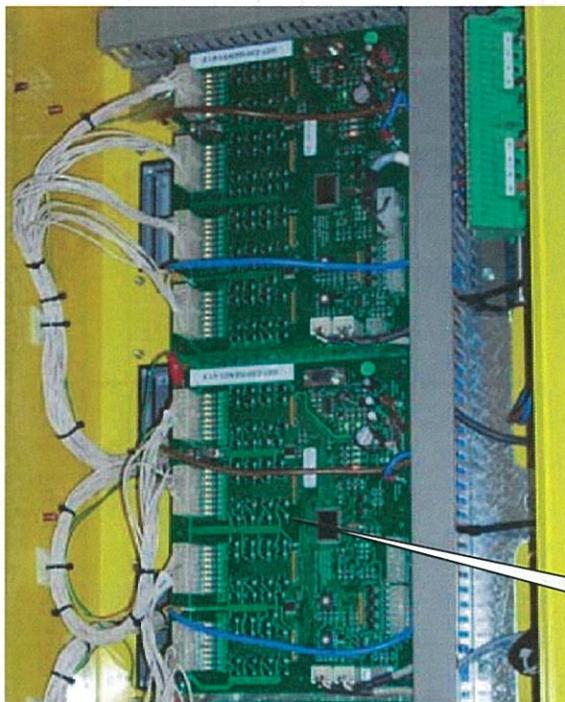


Area - Number	Description	Quantity
K1	Air connection unit	
K2	Air valve	
K3	Flowmeter	
K4	Pressure switch	
K5	Safety valve	
K6	Air tank	
K7	Automatic drain valve	





Area - Number	Description	Quantity
L1	Air-conditioning	
L2	Air-conditioner filter	
M1	Nozzle board	
N1	Metal sensor relay	



**M1**



**N1**



**L1**

**L2**



# CHAPTER 7 – TECHNICAL CHARACTERISTICS

## Technical characteristics for MISTRAL, SIROCCO and BITECHNO machines

Technical data	Machine width						
	800	1200	1600	2000	2400	2800	
Width of working passage (in mm)	730	1130	1530	1930	2330	2730	
Air chamber capacity (in litres)	50	50	50	50	50	50	
Lighting power (in kW)	2	3	3	4,5	4,5	6	
Total electrical power of the machine (in kW)	4	5	5,5	7	7,5	8	
Mass of optical separator alone (in Kg)	710	840	970	1100	1230	1360	
Power supply	Single phase 230 Volts ± 10% - 50/60 Hz						
Relative humidity	< 95%						
Working temperature	From - 15°C to + 43°C (+5°F to +110°F)						
Distance between detection and ejection	100 to 150 mm						
Standard noise level	Between 85 dB and 90 dB						

\* Measurement of the noise level of the whole machine running at the conveyor belt design output, measured with a sound meter at a distance of one meter all around the machine.

## OPERATING AND MAINTENANCE INSTRUCTIONS SORTING MACHINES



SORT BY MATERIAL	NIR system					
Minimum size of objects detected	10 mm					
Minimum size of objects ejected	30 mm					
Nozzle spacing	25 mm					
SORT BY COLOR	VISION system					
Minimum size of objects detected	30 mm					
Minimum size of objects ejected	30 mm					
Nozzle spacing	25 mm					
Technical data						
	Machine width					
Binary configuration (1 nozzle ramp – high or low)	800	1200	1600	2000	2400	2800
Ternary configuration (2 nozzle ramps)	Yes	Yes	Yes	Yes	Yes	High
Single-material configuration	Yes	Yes	Yes	Yes	Yes	No
Multi-material configuration	Yes	Yes	Yes	Yes	Yes	Yes
Metal detector option	Yes	Yes	Yes	Yes	Yes	Yes
Two channel option (modifiable width)	No	Yes	Yes	Yes	Yes	Yes

**OPERATING AND MAINTENANCE INSTRUCTIONS**  
**SORTING MACHINES**



**HR machine technical characteristics**

HIGH RESOLUTION MATERIAL SORTING	HR NIR system					
Minimum size of objects detected	5 mm					
Minimum size of objects detected	10 mm					
Nozzle spacing	12,5 mm					
<b>Technical data</b>	<b>Largeur Machine</b>	<b>800</b>	<b>1200</b>	<b>1600</b>	<b>2000</b>	<b>2400</b>
Binary configuration (1 nozzle ramp – high or low)		Yes	Yes	Yes	Yes	Yes
Single-material configuration		Yes	Yes	Yes	Yes	Yes
Multi-material configuration		Yes	Yes	Yes	Yes	Yes
Metal detector option		Yes	Yes	Yes	Yes	Yes

## OPERATING AND MAINTENANCE INSTRUCTIONS SORTING MACHINES



### **Machine pneumatic system**

Pressure	8 bars
Quality of air entering the chamber	Unlubricated dehumidified air Air filtration at 5 $\mu$ Oil filtration at 0,01 mgr/m <sup>3</sup> maximum Dew point from -40° to 3°C at chamber inlet depending on climate



# CHAPTER 7 - Sorting Efficiency and Purity

## Definitions

Once the machine has sorted the various materials, its performance can be measured by means of two indicators: **efficiency** and **purity**.

**Sorting efficiency** refers to the sorting output or yield.

**Sorting purity** refers to the quantity of objects sorted without error.

In the examples below, we will consider numbers but performance can also be measured in volume.

## Material Efficiency/Purity-Positive Sorting

**Example:** 100 objects made from PET and 50 objects made from another material are present at the input stream of the machine.

- **Efficiency:** Out of 100 bottles made from PET, 93 are ejected into the PET outlet and the 7 other PET bottles into another outlet. PET sorting efficiency is 93%.
- **Purity:** 97 objects are counted in the PET outlet. Of these 97 objects, 93 are objects made from PET. PET sorting purity is 93/97, i.e. 95.8%.

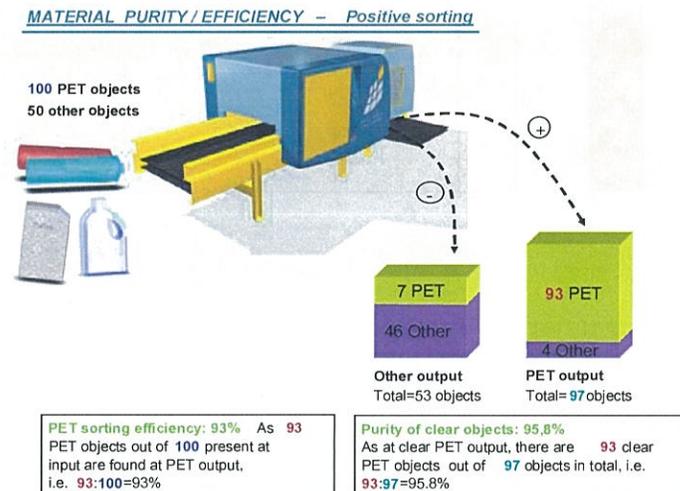


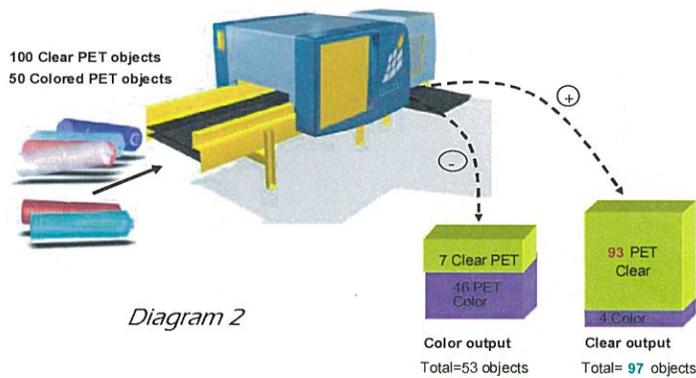
Diagram 1



### Color Efficiency/Purity-Positive Sorting

**Example:** 100 objects made from clear PET and 50 objects made from colored PET are present at the input stream of the machine.

- **Efficiency:** Of the 100 clear PET bottles, 93 are ejected in the *Clear* PET outlet and the 7 other clear PET bottles are ejected into the *Colored* outlet. PET sorting efficiency is 93%.
- **Purity:** 97 objects are counted in the clear PET outlet. Of these 97 objects, 93 are clear PET objects. Clear PET sorting purity is  $93/97$ , i.e. 95.8%.



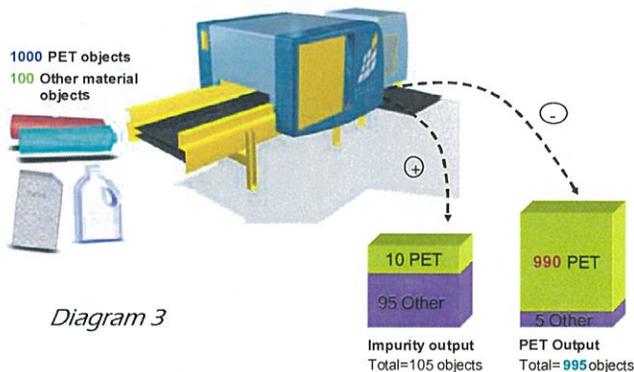
**Efficiency of clear PET : 93%**  
 As at clear PET output, there are **93** clear PET objects out of **100** clear PET in total  
 i.e.  $93:100=93\%$

**Purity of clear PET : 95.8%**  
 As at clear PET output, there are **93** clear PET objects out of **97** objects in total, i.e.  
 $93:97 = 95.8\%$

### Material Efficiency/Purity-Negative Sorting

**Example:** 1000 objects made from PET and 100 objects made from another material are present at the input stream of the machine.

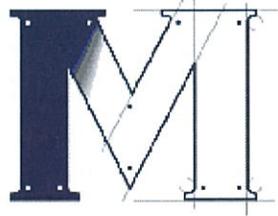
- **Efficiency:** Of the 100 impurities present at the input, 95 are ejected. PET classification efficiency is 95%.
- **Purity:** In the PET outlet there are 990 bottles made from PET out of 995 objects in total. PET output purity is 99.5%.



**Efficiency of impurity sort :**  
 As at Impurity output, there are **95** impurities out of **100**, i.e.  $95 : 100 = 95\%$

**Purity of PET fraction : 99.5%**  
 As at PET output, there are **990** PET objects out of **995** objects in total, i.e.  $990:995$  i.e.=99.5%

**Annex 3**  
**COMPRESSOR FOR**  
**OPTICAL SORTER**



***ANNEX 3***  
***COMPRESSOR FOR OPTICAL SORTER***

# Technical Description

## SIGMA CONTROL BASIC

Program module for load/idle control from  
a remote contactor

7.7006.0000x for machine nominal pressure 8 bar  
7.7006.0001x for machine nominal pressure 11 bar  
7.7006.0002x for machine nominal pressure 15 bar

Document: 7\_7006\_0\_15E

**KAESER KOMPRESSOREN GmbH**

96410 Coburg • Postfach 2143 • Germany • Tel. +49 9561 6400 • Fax +49 9561 640130

## 1. General

### **Specified Use**

The software delivered with the program module is exclusively for use with KAESER compressors. The program module may only be applied together with a SIGMA CONTROL BASIC controller.

Any other use is considered incorrect.

Specified use also means adherence to the installation, removal, commissioning, operational and maintenance conditions laid down by the manufacturer.

### **Liability**

KAESER accepts no liability for any damages arising from installing the program module or retrofitting the volt-free contacts.

### **Copyright**

The copyright of the software supplied is the property of KAESER KOMPRESSOREN. The end user is not entitled to pass on the software to any third party, either fully or in part.

The copyright of this description is the property of KAESER KOMPRESSOREN. This description may not be copied, either fully or in part, distributed or evaluated for competitive purposes or communicated to third parties unless authorized to do so.

### **Support Hotline**

+49 9561 640 7979

### **Scope of Supply**

- This description
- Program module with compressor software for controlling the load/idle phases of Kaeser compressors by means of a remote contact.

## 2. Function

**2.1** With the module plugged in it is possible to control the load/idle phases by means of a remote, volt-free contact connected to input 14. The compressor runs under load when the contact is closed and in idle when it is open. After a specific idling time, determined by the control mode in use (min. 30s, max. 240s) the motor switches off and the compressor is then standby. If the compressor ON key (I) is pressed when the contact is open the compressor remains in the standby state. In the event of an unclear load signal (contact permanently closed) a degree of emergency control can be achieved and unnecessarily high system pressure and power consumption avoided by setting the cut-out pressure (parameter 8) at 0.4 bar above the required system pressure. In the case of a fault the controller regulates system pressure by means of parameters 8 and 7 (cut-out pressure and switching differential).

**2.2** If the inserted program module, rather than the remote contact, is required to regulate the network pressure then:

- the network pressure (parameter 8) must be set to the required value,
- the remote contact input I4/X3:7 must be bridged to P24/X3:9.

**2.3** When the program module is plugged in and powered-up, the program in the controller memory is overwritten by the module program and irretrievably lost.

**2.4** If the module is withdrawn the controller then has no program. Operation of the compressor is no longer possible.

**2.5** So long as the module is in place its program data can be changed. Installing the module in a different SIGMA CONTROL BASIC controller can lead to functional defects, despite having the same program.

**2.6 ATTENTION: Compressor functional deviations where applicable**

On software versions earlier than 01.08 (display SBS01.08...) plugging in the program module changes the function of the machine when switched off via the OFF key on the controller as follows:

Applies to controllers with KAESER material numbers 7.7005.0 and 7.7005.1.

Switching the machine off

While under load

- Press the OFF key.  
The machine runs in idle for 15 seconds then stops.  
The 'machine ON' LED flashes during idling.

While idling

- Press the OFF key.  
The machine stops immediately.  
The 'machine ON' LED is extinguished.

While running up

- Press the OFF key.  
The machine stops immediately.  
The 'machine ON' LED is extinguished.

## **3. Installation**

### **3.1 Check the delivery**

The module program is designed for a specific compressor nominal pressure. The nominal pressure is encoded in the module material number:

Material number	Nominal pressure [bar]
7.7006.0000x	8
7.7006.0001x	11
7.7006.0002x	15

**The nominal pressure contained in the module material number must coincide with compressor nominal pressure.**

**If there is any discrepancy, the module should not be used!**

### **3.2 Saving the settings**

Counter readings and settings are not taken over by the new software.

Note the following counter readings and settings:

- Parameter 0: Operating hours
- Parameter 1: Hours under load
- Parameter 2: Service interval
- Parameter 4: Temperature units
- Parameter 5: Pressure units
- Parameter 6: Refrigeration dryer operating mode
- Parameter 7: Network pressure switching differential
- Parameter 8: Network pressure set point

### **3.3 Install the program module**

**Attention!**

**Carry out the following measures in the sequence shown before attempting any work on the electrical system:**

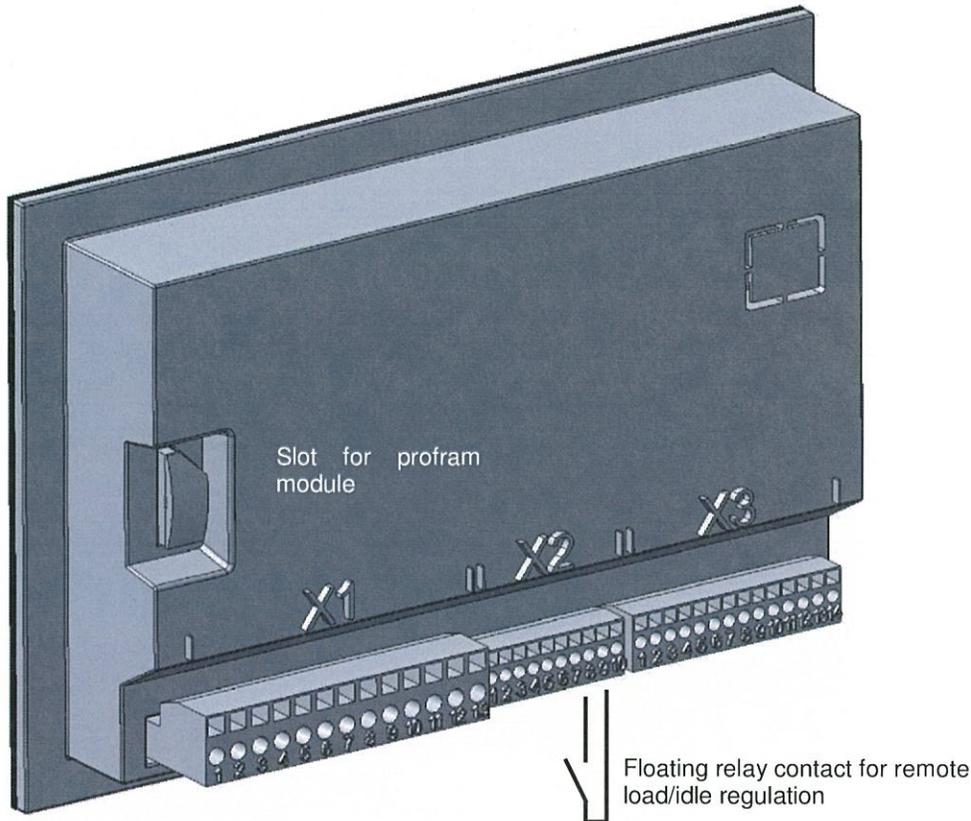
- 1. Switch off all phases**
- 2. Lock them out,**
- 3. Check that no voltage is present.**

**Only a qualified electrician may carry out the following work, as the machine control cabinet must be opened. The control cabinet is designed to prevent entry of dirt and moisture. After exchanging the controller make sure that gaskets and assembly parts are properly replaced.**

4. The module aperture is on the rear of the controller to the left and above the plug connector X1. The aperture is protected by a cover.
5. Insert a screwdriver carefully in the slot on the left of the cover and prize it out of the aperture.
6. The aperture is beveled on the upper right side. The module has a corresponding beveled corner. Push the module into the aperture until it clicks into place.

The connection of the volt-free contact for load/idle control is directly on the rear of the controller.

Only flexible cable may be used with conductor section 0.5 - 1.5 mm<sup>2</sup> (AWG 22 - 16) - recommended cable is NYSLYÖ 2 x 1.0mm<sup>2</sup>. Maximum cable length 100m.



Make connections as follows

- 1.) Connections should only be made by a qualified electrician, following local regulations. KAESER accepts no liability for damage caused by the retrofit.
- 2.) Holes must be drilled through the canopy near the power supply lines to provide entry for the cables. The cable entry must be equipped with appropriate cable fittings or grommets to exclude moisture and foreign bodies.
- 3.) The cable must be laid in such a way that no compressive or tensional stress is imposed on it when the switch cabinet door is opened.
- 4.) A screwdriver DIN5264 A 0.4 x 2.5 should be used to open the spring-loaded terminals. The screwdriver is inserted in the rectangular opening above the corresponding terminal. Strip 8 mm of insulation from the end of the conductor for insertion in the terminal.
- 5.) Make connection to pin 7 (input 14) and pin 9 (24V DC power supply) by means of X2 plug.
- 6.) Secure the cable so there is no tension on the X2 plug.

**3.5 Checking acceptance of the new program**

1. Start the controller and allow it to boot up.
2. Switch the controller off.
3. Switch the controller on again. During booting up the display should show:

SBSxx.xx\_R\_pp      pp = code for machine nominal pressure:  
 pp                      Nominal pressure [bar]  
 08                      8  
 11                      11  
 15                      15

The pressure indicated by the pp must correspond to the machine nominal pressure. Changing the machine nominal pressure from that given on the nameplate is not permitted when the program module is used.

#### **4. Removing the program module**

1. The program module should not be removed from the controller.
2. If removal becomes essential, however, the following must be observed:
  - 2.1. Switch off the power supply.  
The module must not be removed while under power as this can lead to a defect in the controller.  
Do not insert fingers or objects in the module aperture as they may come into contact with live components.
  - 2.2 Without the module there is no program in the controller. The compressor will not run and the controller displays the error message "SYSTEM ERROR, call service". When the module is inserted again the machine can operate.



# Service Manual

## Screw Compressor

**SK SIGMA CONTROL BASIC**

9\_5742 03 USE

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# 1 Regarding this Document

## 1.1 Using the Document

The service manual is part of the machine.

- Keep the service manual in a safe place throughout the life of the machine.
- Pass the manual on to the next owner/user of the machine.
- Ensure that all amendments received are entered in the manual.
- Enter details from the machine nameplate and individual items of equipment in the table in chapter 2.

## 1.2 Additional Documents

Included with this service manual are additional documents intended to assist in the safe operation of the machine:

- Certificate of acceptance / operating instructions for the pressure vessel.

Missing documents can be requested from KAESER.

- Make sure all documents are complete and observe the instructions contained in them.
- Make sure you give the data from the nameplate when ordering documents.

## 1.3 Copyright

This service manual is copyright protected. Queries regarding use or duplication of the documentation should be referred to KAESER. Correct use of information will be fully supported.

## 1.4 Symbols and Identification

### 1.4.1 Warnings

Warning notices indicate three levels of danger signified by the signal word.

- DANGER
- WARNING
- CAUTION



#### **DANGER**

These show the kind of danger and its source!

The possible consequences of ignoring a warning are shown here.

The word "Danger" indicates that death or severe injury can result from ignoring the instruction.

- The measures required to protect yourself from danger are shown here.

- Always read and comply with warning instructions.

Signal word	Meaning	Consequences of non-observance
DANGER	Warns of an imminent threat of danger	Death or serious injury may result
WARNING	Warns of possible danger	Death or serious injury are possible

# 1 Regarding this Document

## 1.4 Symbols and Identification

Signal word	Meaning	Consequences of non-observance
CAUTION	Warns of a possibly dangerous situation	Light injuries or material damage are possible

Tab. 1 The levels of danger and their meaning

### 1.4.2 Other instructions and symbols



This symbol refers to particularly important information.

**Material** Here you will find details on special tools, operating materials or spare parts.

**Precondition** Here you will find conditional requirements necessary to carry out the task.  
Here conditions relevant to safety are named that will help you to avoid dangerous situations.

**Option H1** ➤ This bullet is placed by lists of actions comprising one stage of a task.  
In lists of actions with several stages the sequence of actions is numbered.  
Information that refers to only one option is marked with an indicator (e.g.: H1 means that this section is only valid for machines with adjustable machine mountings). Option indicators used in this service manual are explained in chapter 2.2 .



Information referring to potential problems are identified by a question mark.  
The cause is named in the help text ...  
➤ ... and a remedy given.



This symbol refers to important information or measures concerning environmental protection.

**Further information** Here, your attention is drawn to further topics.

## 2 Technical Data

### 2.1 Nameplate

The model designation and important technical information are given on the machine's nameplate.

The nameplate is located on the outside of the machine:

- above the cooler  
or
- on the rear of the machine.

➤ Enter data from the nameplate here as reference:

Characteristic	Value
Model	
Part no.	
Year	
Serial no.	
psig	
cfm	
Voltage	
Hz/RPM	
Package FLA	
Phase	
HP	
Wiring Diagram	
FOR SERVICE, REFER TO EQUIPMENT NUMBER	

Tab. 2 Nameplate

### 2.2 Options

The table contains a list of possible options.

➤ Enter options here as a reference

Option	Option code	Exsts?
Modulating control	C1	
Machine mountings	H1	
Air-cooling	K1	
Transformer power supply	T2	
Refrigeration dryer	T3	
Prepared for heat recovery	W1	

Tab. 3 Options

**2.3 Weight**

The weight given is the maximum. Actual weight of individual machine is dependent on equipment fitted.

	<b>SK 15</b>	<b>SK 20</b>
Weight [lbs]	705	705

Tab. 4 Machine weight

**2.4 Temperature**

	<b>SK 15</b>	<b>SK 20</b>
Minimum cut-in temperature [°F]	40	40
Typical airend discharge temperature during operation [°F]	167-200	167-200
Maximum airend discharge temperature (automatic safety shut-down) [°F]	230	230

Tab. 5 Temperature

**2.5 Ambient Conditions**

	<b>SK 15</b>	<b>SK 20</b>
Maximum elevation AMSL* [ft.]	3000	3000
Permissible ambient temperature [°F]	40-115	40-115
Cooling air temperature [°F]	40-115	40-115
Inlet air temperature [°F]	40-115	40-115
Maximum relative humidity of inlet air	see figure 1	see figure 1

\* Higher elevations are permissible only after consultation with the manufacturer

Tab. 6 Ambient Conditions

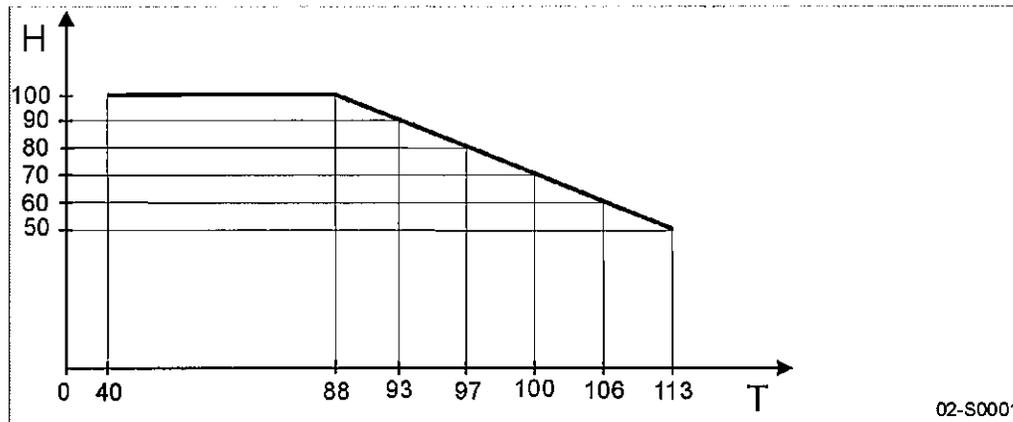


Fig. 1 Maximum relative humidity  
 (T) Inlet air temperature [°F]  
 (H) Maximum relative humidity of inlet air [%]

## 2.6 Ventilation

The values given are minimum guide values.

	SK 15	SK 20
Inlet opening (see illustration 10 [sq.ft.])	3.2	3.8
Forced ventilation with exhaust ventilator: Flow rate [cfm] at 0.4 in wc	2354	2943
Exhaust duct: Dimension [in]	13 3/4 x 23 5/8	13 3/4 x 23 5/8

Tab. 7 Ventilation

## 2.7 Pressure

Maximum working pressure: see nameplate

Safety relief valve activating pressure [psig]:

Maximum working pressure [psig]	SK 15	SK 20
125	155	155
160	155	155
217	230	230

Tab. 8 Safety relief valve activating pressure

**2.8 Delivery**

FAD [cfm]:

Maximum working pressure [psig]	SK 15	SK 20
125	63.6	77.7
160	53.7	65.3
217	38.8	47.7

Tab. 9 Free air delivery

**2.9 Cooling Oil Recommendation**

A sticker showing the type of oil filled is located near the oil separator filler. Information for ordering cooling oil can be found in chapter 13.4.

**2.9.1 Basic Information**

Lubrication of an air compressor is essential to reliable operation. Carbon and varnish can form in compressor cooling oils. These deposits block the flow of lubricant and cause excessive wear and failure of moving parts. Contamination of the lubricant can allow the formation of acids, causing extensive internal corrosion. Water may be condensed decreasing the lubricity.

Lubricants in rotary compressors do much more than lubricate. During the compression process, it acts as a sealant in the airend which is important for maximum efficiency. The lubricant also absorbs much of the heat of compression to cool the airend and reduce the temperature of the compressed air. It's not enough that a compressor cooling oil lubricates well, it must stand up to the heat, pressure and contaminants that are present in every air compressor.

**2.9.2 KAESER Lubricants**

KAESER synthetic lubricants should be stored in a protected location to prevent contamination. Do not re-use drums; flush and send to reconditioner.

Although the KAESER synthetic is not highly flammable, it will burn. While KAESER synthetic compressor cooling oil is less flammable than equal viscosity mineral oils, it cannot be classified as a fire-resistant fluid. It has a flash point above 460 °F. Since the user has total control over the conditions of the compressor lubricant, he assumes total responsibility for its safe usage.

Material Safety Data Sheets are available for each lubricant from your authorized KAESER Service representative.

Regardless of the lubricant selected, the KAESER SIGMA lubricants will separate readily from water. If condensate occurs it can easily be removed. Let the compressor sit so that any water can drain back to the separator tank and separate to the bottom. See chapter 10.15 proper draining procedure.

KAESER has several lubricants available that are specially formulated to match these demands. They feature excellent lubricity, outstanding demulsibility (ability to separate from water), and long life.

M-SERIES:

- M-Series SIGMA compressor cooling oils are **semi-synthetic** lubricants.
- M-Series SIGMA compressor cooling oils are the highest quality petroleum lubricants. M-460 is specially blended to provide reliable performance in KAESER screw compressors.

## 2 Technical Data

### 2.10 Cooling oil charge

**S-SERIES:**

- S-Series SIGMA compressor cooling oils are **synthetic** lubricants.
- S-Series SIGMA compressor cooling oils are formulated from the most advanced synthetic lubricants. These "synthetic" lubricants begin as high quality petroleum feed stock. They are then refined, processed and purified into fluids with very consistent molecular structure. These oils are carefully blended to produce extremely consistent lubricants with superior properties. SIGMA synthetic lubricants feature all the advantages of both PAO and diester fluids.
- S-460 lubricant is recommended for compressors operating in ambient temperatures between 40 °F and 105 °F.

**Specialty KAESER LUBRICANTS:**

- S-680 lubricant may be used when ambient temperatures are always between 70 °F and 105 °F.
- FG-460 synthetic hydrocarbon based food grade lubricant is designed for use in rotary screw compressors in the application where incidental food contact may occur with the discharge air. This lubricant meets the requirements of the FDA Regulation 21 CFR §178.3570 and is USDA H-1 approved and NSF certified. FG-460 is approved for canning, food packing, meat and poultry processing and other applications where incidental food contact may occur.

### 2.10 Cooling oil charge



The charge of cooling oil for machines with heat recovery is increased by the volume of oil in the heat exchanger and connecting lines.

	<b>SK 15</b>	<b>SK 20</b>
Total charge [qt]	7.4	7.4
Topping up volume [qt]	0.3	0.3
(minimum–maximum)		

Tab. 10 Cooling oil charge

### 2.11 Motors and Power

#### 2.11.1 Drive motor

	<b>SK 15</b>	<b>SK 20</b>
Rated power [HP]	15	20
Enclosure protection	TEFC	TEFC

Tab. 11 Drive motor

**Rated speed [rpm]:**

<b>Maximum working pressure [psig]</b>	<b>SK 15</b>	<b>SK 20</b>
125	3540	3555
160	3540	3555

## 2 Technical Data

### 2.12 Sound Pressure Level

Maximum working pressure [psig]	SK 15	SK 20
217	3540	3555

Tab. 12 Drive motor: nominal speed

### 2.12 Sound Pressure Level

Operational state:

- Nominal volume flow
- Nominal pressure

Measurement conditions:

- Free-field measurement to CAGI/PNEUROP PN8 NTC 2.3
- Measurement distance: 1 m

	SK 15	SK 20
Sound pressure level [dB(A)]	65	66

Tab. 13 Sound Pressure Level

### 2.13 Power Supply

#### Basic requirements

The machine is designed for an electrical supply according to National Electric Code (NEC) NEC-670, particularly NFPA 79, section 5.7. In the absence of any user-specified alternatives, the limits given in these standards must be adhered to. Consult manufacturer for any other specific power supply.

#### Three-phase

Do **NOT** operate package on any unsymmetrical power supply. Also do **NOT** operate package on power supplies like, for example, a three-phase (open) delta or three-phase star with non-grounded neutral.

The machine requires a symmetrical three-phase power supply transformer with a WYE configuration output as shown in Figure 2 and Figure 3. In a symmetrical three phase supply the phase angles and voltages are all the same.

Other power supplies are not suitable.



Fig. 2 Three-phase star (wye); 4 wire; grounded neutral



Fig. 3 Three-phase star (wye); 3 wire; grounded neutral

Further information Please contact authorized KAESER Service representative for options.  
The electrical diagram 13.4 contains further specifications for electrical connection.

**2.14 Power Supply Specifications**

The following multi-strand copper core wires are given according to 2005 NEC 310.15, Table 310.16 for 40 °C ambient temperature.

If other local conditions prevail, like for example high temperature, the cross section should be checked and adjusted according to 2005 NEC 110.14©, 220.3,310.15, Table 310.16, 430.6, 430.22, 430.24 and other local codes.

Dual element time delay fuses are selected according to 2005 NEC 240.6,430.52 and tables 430.52, 430.248 and 430–250.

We strongly suggest using a separate copper conductor for the equipment GROUNDING. NEC Table 250.122 will point out the "minimum size", however, we recommend a ground conductor the same size as the power leads, if local codes allow.

**Rated power supply 380V±10%/3/60Hz**

	<b>SK 15</b>	<b>SK 20</b>
Pre-fus [A]	30	40
Supply	4xAWG8	4xAWG6
Consumption [A]	23	29

Tab. 14 Power supply details 380V/3/60Hz

**Rated power supply 460V±10%/3/60Hz**

	<b>SK 15</b>	<b>SK 20</b>
Pre-fus [A]	25	35
Supply	4xAWG10	4xAWG8
Consumption [A]	19	25

Tab. 15 Power supply details 460V/3/60Hz

**Rated power supply 575V ±10%, 3-ph, 60Hz**

	<b>SK 15</b>	<b>SK 20</b>
Pre-fuse [A]	20	30
Supply	4xAWG12	4xAWG8
Consumption [A]	12	20

Tab. 16 Power supply details 575V/3/60Hz

**2.15 Option W1**  
**Available heat capacity**

The quality of the heat transfer medium and its required flow rate depend on the type of heat exchanger used.

<b>Maximum heat capacity available</b>	<b>SK 15</b>	<b>SK 20</b>
[kW]	8.8	11.0
[MJ/h]	32	40
[BTU/h]	7573	9467

Tab. 17 Heat capacity (option W1)

## 3 Safety and Responsibility

### 3.1 Basic Information

The machine is manufactured to the latest engineering standards and acknowledged safety regulations. Nevertheless, dangers can arise through its operation:

- Danger to life and limb of the operator or third parties.
- Impairments to the machine and other material assets.

**DANGER**

Disregarding these instructions can result in serious injury.

- Read the service manual carefully and take notice of the contents for safe machine operation.
- Use this machine only if it is in a technically perfect condition and only for the purpose for which it is intended; observe all safety measures and the instructions in the service manual.
- Immediately rectify (have rectified) any faults that could be detrimental to safety.

### 3.2 Specified Use

The machine is intended solely for industrial use in generating compressed air. Any other use is incorrect and does not comply with requirements. The manufacturer is not liable for any resulting damages. The risk involved in such incorrect use is taken solely by the user.

- Keep to the specifications listed in this service manual.
- Operate the machine only within its performance limits and under the permitted ambient conditions.
- Do not use compressed air for breathing purposes unless it is specifically treated for such.
- Do not use compressed for any application that will bring it into direct contact with food products unless it is specifically treated for this.

### 3.3 Improper Use

- Never direct compressed air at persons or animals.
- Cooling air, warmed after passing through the machine, may be used for heating purposes but only when it poses no health risk to humans or animals. If necessary, hot cooling air should be treated by suitable means.
- Do not allow the machine to take in toxic, acidic, flammable or explosive gases or vapors.
- Do not operate the machine in areas in which specific requirements with regard to explosion protection are applied.

### 3.4 User's Responsibilities

#### 3.4.1 Observe statutory and universally accepted regulations

This is, for example, nationally applied European directives and/or valid national legislation, safety and accident prevention regulations.

- Observe relevant statutory and accepted regulations during installation, operation and maintenance of the machine.

### 3.4.2 Qualified personnel

These are people who, by virtue of their training, knowledge and experience as well as their knowledge of relevant regulations can assess the work to be done and recognize the possible dangers involved.

Authorized operators possess the following qualifications:

- are of legal age,
- are conversant with and adhere to the safety instructions and sections of the service manual relevant to operation,
- have received adequate training and authorization to operate electrical and compressed air devices.
- Additional qualifications for compressors with refrigeration dryers:
  - Adequate training and authorization on refrigeration devices.

Authorized installation and maintenance personnel have the following qualifications:

- are of legal age,
  - have read, are conversant with and adhere to the safety instructions and sections of the service manual applicable to installation and maintenance,
  - are fully conversant with the safety concepts and regulations of electrical and compressed air engineering,
  - are able to recognize the possible dangers of electrical and compressed air devices and take appropriate measures to safeguard persons and property,
  - have received adequate training and authorization for the safe installation and maintenance on this equipment.
  - Additional qualifications for compressors with refrigeration dryers:
    - fully conversant with the safety concepts and regulations concerning refrigeration devices,
    - must be able to recognize the possible dangers of refrigeration devices and take appropriate measures to safeguard persons and property.
- Ensure that operating, installation and maintenance personnel are qualified and authorized to carry out their tasks.

### 3.4.3 Inspection Schedules and Accident Prevention Regulations

The machine is subject to local inspection schedules.

- Ensure that local inspection schedules are adhered to.

## 3.5 Dangers

### Basic Information

Information concerning the various forms of danger that can arise during machine operation are found here.

Basic safety instructions are found in this service manual at the beginning of each chapter in the section entitled 'Safety'.

Warning instructions are found before a potentially dangerous task.

### 3.5.1 Safely Dealing with Sources of Danger

Information concerning the various forms of danger that can arise during machine operation are found here.

#### Electricity

- Allow only qualified and authorized electricians or trained personnel under the supervision of a qualified and authorized electrician to carry out work on electrical equipment according to electrical engineering regulations .
- Before every start-up, the user must make sure there is adequate protection against electric shock from direct or indirect contact.
- Before starting any work on electrical equipment:  
Switch off and lock out the power supply disconnecting device and check that no voltage is present.
- Switch off any external power sources.  
These could be connections to floating contacts or electrical machine heating, for example.
- Use fuses corresponding to machine power.
- Check regularly that all electrical connections are tight and in order.

#### Forces of compression

Compressed air is contained energy. Uncontrolled release of this energy can cause serious injury or death. The following information concerns work on components that could be under pressure.

- Close shut-off valves or otherwise isolate the machine from the air main to ensure that no compressed air can flow back into the machine.
- Vent all pressurized components and chambers completely.
- Do not carry out welding, heat treatment or mechanical modifications to pressurized components (e.g. pipes and vessels) as this influences the component's resistance to pressure.  
The safety of the machine is then no longer ensured.

#### Compressed air quality

- Never directly inhale compressed air.
- Use appropriate systems for air treatment before using the compressed air from this machine as breathing air and/or for the processing of food products.
- Use food-grade cooling oil whenever compressed air is to come into contact with food products.

#### Spring tension

Springs under tension or compression represent contained energy. Uncontrolled release of this energy can cause serious injury or death.

Minimum pressure/check valves, pressure relief valves and inlet valves are powerfully spring-loaded.

- Do not open or dismantle any valves.

#### Rotating components

Touching the fan wheel, the coupling or the belt drive while the machine is switched on can result in serious injury.

- Do not open the enclosure while the machine is switched on.

- Switch off and lock out the power supply disconnecting device and check that no voltage is present.
- Wear close-fitting clothes and a hair net if necessary.
- Make sure all covers and safety guards are in place and secured before starting.

**Temperature**

- Avoid contact with hot components.  
These include, for example, compressor air ends or blocks, oil and compressed air lines, coolers, oil separator tanks, motors and machine heaters.
- Wear protective clothing.
- If welding is carried out on or near the machine, take adequate measures to prevent sparks or heat from igniting oil vapors or parts of the machine.

**Noise**

- Operate the machine only with full soundproofing.
- Wear hearing protection if necessary.  
The pressure relief valve blowing off can be particularly loud.

**Operating materials**

- Strictly forbid fire, open flame and smoking.
- Follow safety regulations when dealing with lubricants and chemical substances.
- Avoid contact with skin and eyes.
- Do not inhale oil mist or vapor.
- Do not eat or drink while handling cooling and lubricating fluids.
- Keep suitable fire extinguishing agents ready for use.
- Use only KAESER approved operating materials.

**Unsuitable spare parts**

- Use only spare parts approved by the manufacturer for use in this machine.  
Unsuitable spare parts compromise the safety of the device.
- Use only genuine KAESER pressure components.

**Conversion or modification of the machine**

- Do not permit conversion or modification of the machine as this can compromise function and safe working.

**Extension or modification of the compressed air system**

- Extension or modification of the compressor station:  
Check the blow-off capacity of pressure relief valves on air receivers and compressed air lines before installing any new machines.
- If the blow-off capacity is insufficient:  
Install pressure relief valves with larger blow-off capacity.

### 3.5.2 Safe Machine Operation

Information on safe conduct when handling the machine is found here.

#### Transport

- Use suitable lifting gear that conforms to local safety regulations.
- Allow transport only by personnel trained in the safe movement of goods.
- Attach lifting gear only to suitable lifting points.
- Be aware of the center of gravity to avoid tipping.
- Make sure the danger zone is clear of personnel.

#### Installation

- Install the machine in a suitable compressor room.
- If installed outdoors, the machine must be protected from frost, direct sunlight, dust, rain and splashing water.
- Do not operate in areas in which specific requirements with regard to explosion protection are in force.  
For instance, the requirements of ATEX directive 94/9/EC "Equipment and Protective Systems intended for use in Potentially Explosive Atmospheres".
- Ensure adequate ventilation.
- Ensure that required ambient conditions are maintained with regard to:
  - ambient temperature and humidity,
  - clean inlet air with no damaging contaminants,
  - inlet air free of explosive or chemically unstable gases or vapors,
  - inlet air free of acid/alkaline forming substances, particularly ammonia, chlorine or hydrogen sulfide.
- Do not position the machine in warm exhaust air from other machines.
- Ensure accessibility so that all work on the machine can be carried out without danger or hindrance.

#### Decommissioning, storage, disposal

- Drain out fluids and dispose of according to environmental regulations.  
These include, for example, compressor oil and cooling water.
- Give refrigerant only to authorized groups for disposal.
- Dispose of the machine in accordance with local environmental regulations.

### 3.5.3 Organizational Measures

- Designate personnel and their responsibilities.
- Give clear instructions on reporting faults and damage to the machine.
- Give instructions on fire reporting and fire-fighting measures.

### 3.5.4 Danger Areas

The table gives information on the areas dangerous to personnel.  
Only authorized personnel may enter these areas.

Activity	Danger area	Authorized personnel
Transport	Within a 10 ft radius of the machine.	Installation personnel for transport preparation. No personnel during transport.
Installation	Beneath the lifted machine.	No personnel!
	Within the machine. Within 3 ft radius of the machine and its supply cables.	Installation personnel
Operation	Within a 3 ft radius of the machine.	Operating personnel
Maintenance	Within the machine.	Maintenance personnel
	Within a 3 ft radius of the machine.	

Tab. 18 Danger Areas

### 3.6 Safety Devices

Various safety devices ensure safe working with the machine.

- Do not change, bypass or disable safety devices.
- Check safety devices for correct function regularly.
- Do not remove or obliterate labels and notices.
- Ensure that labels and notices are clearly legible.

Further information More information on safety devices is contained in chapter 4, section 4.6.

### 3.7 Safety Signs

The diagram shows the positions of safety signs on the machine. The table lists the various safety signs used and their meanings.

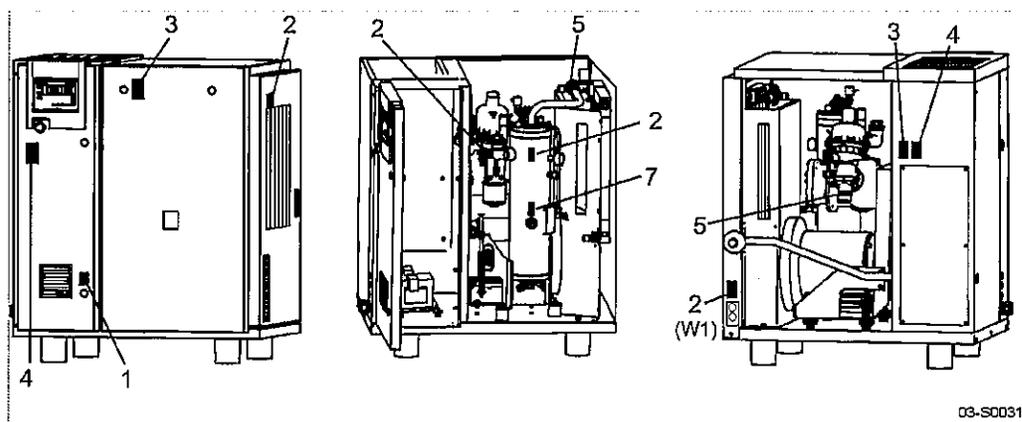


Fig. 4 Location of safety signs

### 3 Safety and Responsibility

#### 3.7 Safety Signs

Item	Symbol	Meaning
8		Danger of fatal injury from touching electrically live components! ➤ Switch off and lock out the supply disconnecting device and check that no voltage is present.
9		Machine starts automatically! Severe injury could result from rotating components, electrical voltage and air pressure. ➤ Isolate from the power supply and lock out before opening any machine enclosure or guard.
10	 	Severe injury could result from touching the belt drive or fan blade! ➤ Operate the machine only with fully closed safety guards, access doors and panels. ➤ Isolate from the power supply and lock out before opening any machine enclosure or guard.
11		Injury and/or contamination can result from breathing compressed air! Contamination of food can result from using untreated compressed air for food processing! ➤ Never breathe untreated compressed air. ➤ Air from this compressor must meet OSHA 29CFR1910.134 and FDA 21CFR178.3570 standards, if used for breathing or food processing. Use proper compressed air treatment.
13		Hot surface can cause burns! ➤ Let the machine cool down. ➤ Wear long-sleeved garments (not synthetics such as polyester) and protective gloves.
16		Wrong cooling oil level can cause machine defects or rising oil consumption (oil content for pure air)! ➤ Check the oil level regularly and top up as necessary.
23		Serious injury or death can result from loosening or opening component that is under pressure and heavily spring loaded! ➤ Do not open or dismantle the valve. ➤ Call for authorized KAESER Service representative if a fault occurs.
24		Serious injury or death can result from loosening or opening component under pressure! ➤ De-pressurize all pressurized components and enclosures. ➤ Secure that machine keeps de-pressurized. ➤ Check that machine is de-pressurized.
25		Ear damage and burns can result from loud noise and/or oil mist when the safety relief valve opens! ➤ Wear ear protection and protective clothing. ➤ Close all access doors and cover panels.
27		Risk of electric shock! If the interrupter has tripped current-carrying components of the controller should be examined and replaced if damaged to reduce the risk of fire or electric shock.

Item	Symbol	Meaning
28		Risk of electric shock! To maintain overcurrent short-circuit, and ground-fault protection, the manufacturer's instructions for setting the interrupter must be followed to reduce the risk of fire or electric shock.

Tab. 19 Safety Signs

## 3.8 In Emergency

### 3.8.1 Fire fighting

Suitable extinguishing media

- Foam
- Carbon dioxide
- Sand or dirt

Unsuitable or unsafe extinguishing media

- Strong water jet

1. Keep calm.
2. Give the alarm.
3. Switch off the main power supply disconnect device if possible.
4. Move to safety:
  - warn any persons in danger
  - help incapacitated persons
  - close the doors
5. Try and extinguish the fire if you have the knowledge to do so.

### 3.8.2 Remove any compressor cooling oil from your person.

- > Eye contact  
Rinse thoroughly with lukewarm water and seek medical assistance.
- > Skin contact  
Wash off immediately

## 3.9 Warranty

This service manual contains no independent warranty commitment. Our general terms and conditions of business apply with regard to warranty.

A condition of our warranty is that the machine is used for the purpose for which it is intended under the conditions specified.

Due to the multitude applications for which the machine is suitable the obligation lies with the user to determine its suitability for his specific application.

In addition, we accept no warranty obligation for:

- the use of unsuitable parts or operating materials,
- unauthorized modifications,

- incorrect maintenance,
- incorrect repair.

Correct maintenance and repair includes the use of original spare parts and operating materials.

- Obtain confirmation from KAESER that your specific operating conditions are suitable.

### **3.10 Environmental Protection**

- Store and dispose of operating materials and replaced parts in accordance with local environmental protection regulations.
- Observe relevant national regulations.  
This applies particularly to parts contaminated with cooling oil.



- Do not allow cooling oil to escape to the environment or into the sewage system.

## 4 Design and Function

### 4.1 Cabinet

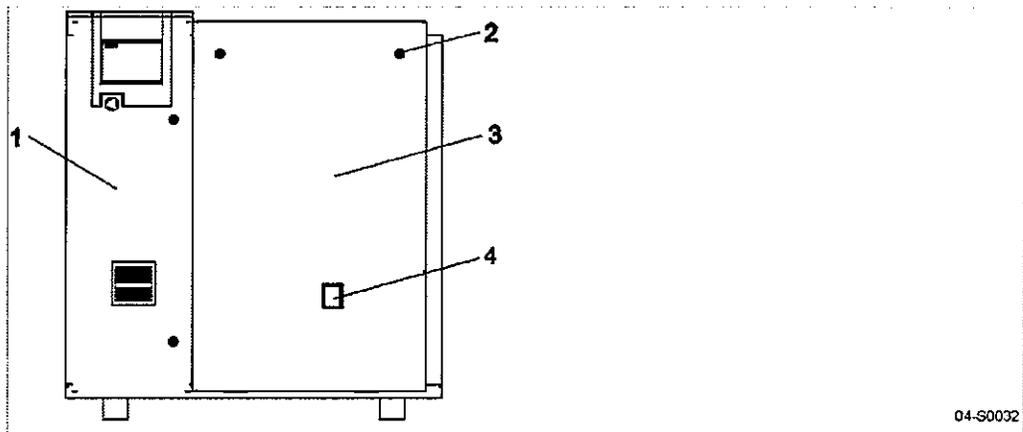


Fig. 5 Cabinet

- |                        |                                      |
|------------------------|--------------------------------------|
| ① Control cabinet door | ③ Panel                              |
| ② Latch                | ④ Oil level indicator viewing window |

The cabinet, when closed, serves various functions:

- Sound insulation
- Protection against contact with components
- Control of cooling air flow

Safe and reliable operation is only assured with the cabinet closed.

Access doors are hinged to swing open and removable panels can be lifted off.

Latches are released by a key supplied with the machine.

### 4.2 Functional Description of the Machine

Functional description using an air-cooled machine as an example.

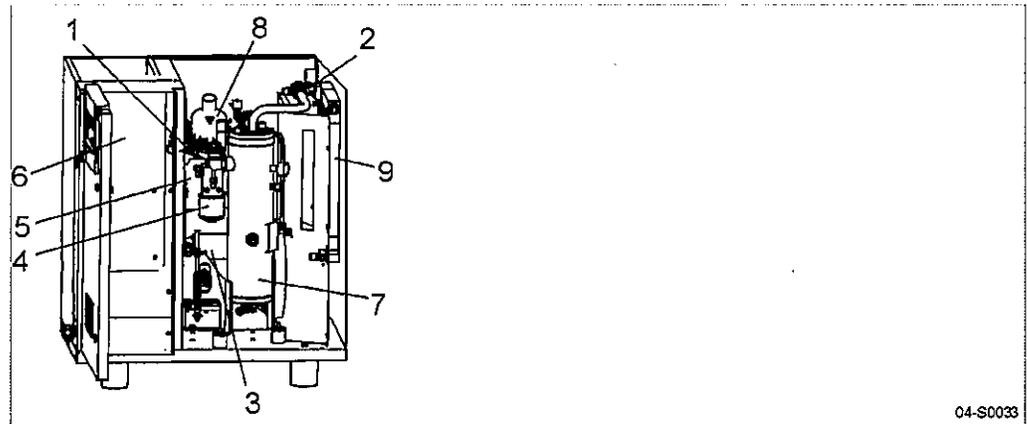


Fig. 6 Machine layout

- |                                |                      |
|--------------------------------|----------------------|
| ① Inlet valve                  | ⑥ Control cabinet    |
| ② Minimum pressure/check valve | ⑦ Oil separator tank |
| ③ Drive motor                  | ⑧ Air filter         |
| ④ Oil filter                   | ⑨ Oil/air cooler     |
| ⑤ Airend                       |                      |

Ambient air is cleaned as it is drawn in through the filter ⑧.

The air is then compressed in the airend ⑤.

The airend is driven by an electric motor ③.

Cooling oil is injected into the airend. It lubricates moving parts and forms a seal between the rotors themselves and between them and the airend casing. This direct cooling in the compression chamber ensures a very low airend discharge temperature.

Cooling oil recovered from the compressed air in the oil separator tank ⑦ gives up its heat in the oil cooler ⑨. The oil then flows through the oil filter ④ and back to the point of injection. Pressure within the machine keeps the oil circulating. A separate pump is not necessary. A thermostatic valve maintains optimum cooling oil temperature.

Compressed air, freed of cooling oil in the oil separator tank ⑦, flows through the minimum pressure/check valve ② into the air cooler ⑨. The minimum pressure/check valve ensures that there is always a minimum internal air pressure sufficient to maintain cooling oil circulation in the machine.

The air cooler brings down the compressed air temperature of only 5 to 10 K above ambient. Most of the moisture carried in the air is removed during this cooling process.

### 4.3 Floating relay contacts

Floating relay contacts are provided for the transfer of signals, messages.

Information on location, loading capacity and type of message or signal is found in the electrical diagram.



If the floating relay contacts are connected to an external voltage source, voltage may be present even when the machine is isolated from the power supply.

### 4.4 Options

The options available for your machine are described below.

#### 4.4.1 Option H1 Machine mountings

These mountings allow the machine to be anchored firmly to the floor.



04-S0034

Fig. 7 Machine mountings

#### 4.4.2 Option W1 Prepared for external heat recovery

Connections are provided for an external system to recover surplus heat.

A thermostatic valve in the machine keeps the cooling oil at the ideal working temperature. The thermostatic valve does not function when the machine is delivered. The necessary working element must be installed when installing the heat recovery system.

The external heat recovery system takes heat from the cooling oil via a heat transfer medium. The available heat to be recovered depends on the operating conditions of the machine.

### 4.5 Operating States and Control Modes

#### 4.5.1 Operating states of the machine

The machine operates in the following states:

- **LOAD:**  
The inlet valve is open. The airend delivers compressed air to the compressed air system.  
The drive motor runs under full load.
- **IDLE:**  
The inlet valve is closed. The minimum pressure/check valve shuts off the oil separator from the compressed air system. The oil separator tank is vented.  
A small volume of air circulates through the bleed hole in the inlet valve, through the airend and back to the inlet valve via the venting valve.  
The drive motor runs unloaded and consumes very low power.
- **STOPPED:**  
The inlet valve is closed. The minimum pressure/check valve shuts off the oil separator from the compressed air system. The oil separator tank is vented.  
The drive motor is stopped.
- Option C1 ■ **PARTIAL LOAD:**  
With the help of a control valve (the proportional controller), the degree of opening of the inlet valve is continuously varied in relation to the actual air demand. The airend delivers compressed air to the compressed air system.  
The load and power consumption of the drive motor rises and falls with the air demand.  
The regulating valve is factory set. Consult with authorized KAESER Service representative before making alterations.

**4.5.2 Control modes**

Using the selected control mode, the controller switches the compressor between its various operational states in order to compensate for air being drawn off by consumers and maintain system pressure between the set minimum and maximum values.

The SIGMA CONTROL BASIC can work with the following control modes:

- DUAL
- QUADRO
- MODULATING control

Option C1

**DUAL**

In the DUAL control mode, the compressor is switched back and forth between LOAD and IDLE to maintain network pressure between the set minimum and maximum values. When the maximum pressure is reached the machine switches to IDLE. When the preset *idling time* has elapsed the machine is STOPPED.

The *idling time* is fixed in SIGMA CONTROL BASIC.

**QUADRO**

In the QUADRO mode, the controller operates as in the DUAL mode during periods of high air demand by switching between LOAD and IDLE but during periods of high air demand it switches directly between LOAD and STOPPED.

This mode of control requires two pre-set time periods: the *running time* and the *idling to stop time*. The *idling/stopped* and the *running time* are set in SIGMA CONTROL BASIC.

**Option C1 MODULATING control mode**

The MODULATING control mode is an extension of DUAL control. The difference being that, in DUAL, the delivery of the compressor is steplessly varied within the control range of the machine. This control mode is not available on frequency-controlled variable speed compressors (SFC).

Compressed air demand	Operating states
rises	PARTIAL LOAD LOAD
falls	PARTIAL LOAD IDLE STOPPED

Tab. 20 Operating states under MODULATING control

**4.6 Safety Devices**

The following safety devices are provided and may not be modified in any way:

- «EMERGENCY STOP» button,  
The «EMERGENCY STOP» button shuts down the machine immediately. The motor remains stopped. The pressure system is vented.
- Safety relief valve:  
The safety relief valve protects the machine from excessive pressure. This is factory set.

- Door interlock switches:  
The machine will stop automatically if a safety interlocked door or panel is opened or removed.
- Enclosures and covers for moving parts and electrical connections:  
These protect against accidental contact.

**4.7 SIGMA CONTROL BASIC Keys and Indicators**

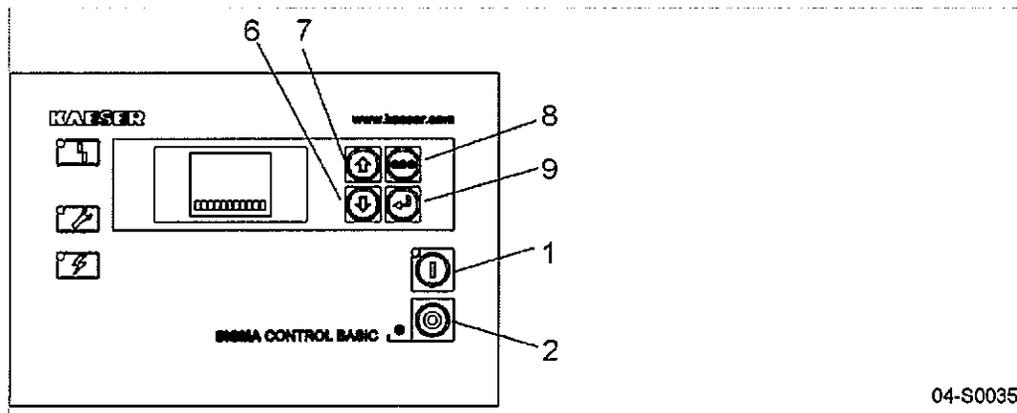


Fig. 8 Keys

Item	Description	Function
1	«ON»	Switches the machine on.
2	«OFF»	Switches the machine off. Resets alarms. Resets the maintenance interval counter.
6	«DOWN»	Scrolls down the parameter list. Reduces a parameter value.
7	«UP»	Scrolls up the parameter list. Increases a parameter value.
8	«escape»	Exits the edit mode without saving.
9	«enter»	Enters edit mode. Exits the edit mode and saves. Only affects the value in the third line of the display.

Tab. 21 Keys

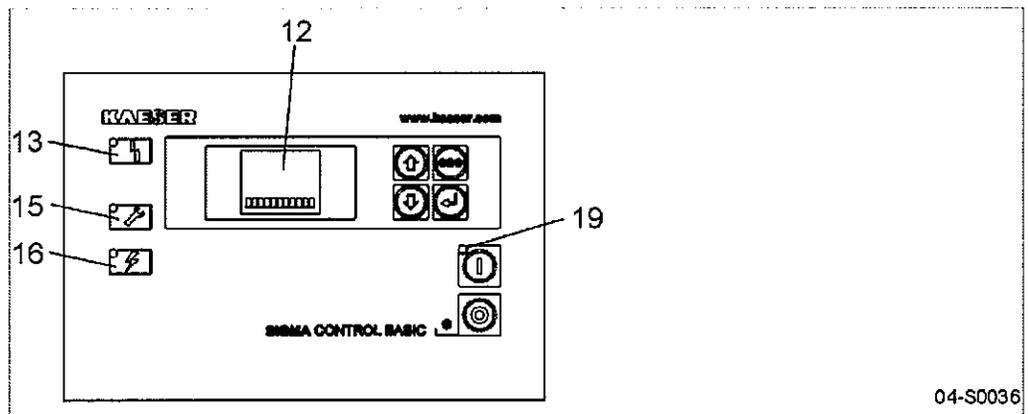


Fig. 9 Indicators

Item	Description	Function
12	Display field	Alphanumeric display with 4 lines.
13	<i>Alarm</i>	Flashes red when an alarm occurs. Lights continuously when acknowledged.
15	<i>Warning</i>	Lights yellow for: <ul style="list-style-type: none"> <li>■ maintenance work due,</li> <li>■ warning messages</li> </ul>
16	<i>Controller power</i>	Lights green when the power supply to the controller is switched on.
19	<i>Machine ON</i>	Lights green when the machine switched on.

Tab. 22 Indicators

## 4.8 Function of the SIGMA CONTROL BASIC

### 4.8.1 Display layout

xx.x bar	Line 1
yy °C	Line 2
z 0000 h	Line 3
12345678SpTi	Line 4

Line	Display	Meaning
1	xx.x	Current network pressure in bar, psi or MPa.
2	yy	Current airend discharge temperature (ADT) in °C or °F.
3	z	Display and settings for parameters (see table 24)
4	1, 2, ...	Code for alarm and warning messages (see table 28 and table 29).

Tab. 23 Display field

**4.8.2 Parameters**

Pa- ra- me- ters	Meaning
0	Operating hours counter Displays the period over which the motor was switched on.
1	Load hours counter This shows the number of hours the drive motor has run under LOAD.
2	Maintenance interval counter Displays the number of operating hours until the next scheduled maintenance. SIGMA CONTROL BASIC counts the operating hours backwards from a set value. The warning message 'S' is displayed when the counter reaches zero. The maintenance interval counter is reset to its original value after the maintenance work has been carried out. The interval starts anew.
3	Safety relief valve check mode on/off (password protected) This function switches the safety relief valve blow-off pressure check mode on and off. The warning message /is displayed when the check mode is switched on. See chapter 10.11 for the password and to carry out the check.
4	Units of measurement for display of temperature The airend discharge temperature can be displayed in either °C or °F.
5	Units of measurement for display of pressure The current working pressure can be displayed in bar, psi or MPa.
6	Compressor/refrigeration dryer ON/OFF control mode This parameter selects the control mode of the compressor and the internal refrigeration dryer (if fitted). Factory setting: OFF  OFF: <ul style="list-style-type: none"> <li>■ Compressor: QUADRO</li> <li>■ Dryer: TIMER</li> </ul> ON: <ul style="list-style-type: none"> <li>■ Compressor: DUAL</li> <li>■ Dryer: CONTINUOUS</li> </ul>
7	Pressure setpoint: switching differential The switching differential determines the difference between cut-in pressure and cut-out pressure (system pressure setpoint: switching pressure) and therefore the switching frequency from LOAD to IDLE. Range of adjustment [psi]: -1.5 ... -70
8	System pressure setpoint: switching point The the switching point corresponds to the working pressure of the air main and the cut-out pressure of the compressor. Range of adjustment [psig]: 80 ... maximum working pressure

<b>Pa- ra- me- ters</b>	<b>Meaning</b>
9	Maximum working pressure The machine can deliver air up to this working pressure (see nameplate). The maximum working pressure is factory-set and can only be changed by an authorized KAESER Service representative.

Tab. 24 Parameters

### 4.8.3 Messages

#### **Alarm message**

An alarm shuts the machine down automatically. The red LED **13** blinks (Figure 9).

#### **Warning message**

The countdown of the maintenance interval counter is displayed. The yellow LED **15** lights (Figure 9).

## 5 Installation and Operating Conditions

### 5.1 Safety

- Strictly forbid fire, open flame and smoking.
- If welding is carried out on or near the machine, take adequate measures to prevent sparks or heat from igniting oil vapors or parts of the machine.
- The machine is not explosion-proof:  
Do not operate in areas in which specific requirements with regard to explosion protection are in force.  
For instance, the requirements of ATEX directive 94/9/EC "Equipment and Protective Systems intended for use in Potentially Explosive Atmospheres".
- Ensure that required ambient conditions are maintained with regard to:
  - ambient temperature and humidity,
  - clean inlet air with no damaging contaminants,
  - inlet air free of explosive or chemically unstable gases or vapors,
  - inlet air free of acid/alkaline forming substances, particularly ammonia, chlorine or hydrogen sulfide.
- Keep suitable fire extinguishing agents ready for use.

### 5.2 Installation Conditions

#### 5.2.1 Place of installation and distances

The machine is intended for installation in an appropriate machine room. Information on distances from walls and ventilation is given below.



The distances quoted are recommended distances and ensure unhindered access to all machine parts.

- Please consult KAESER if they cannot be adhered to.

**Precondition** The floor must be level, firm and capable of bearing the weight of the machine.

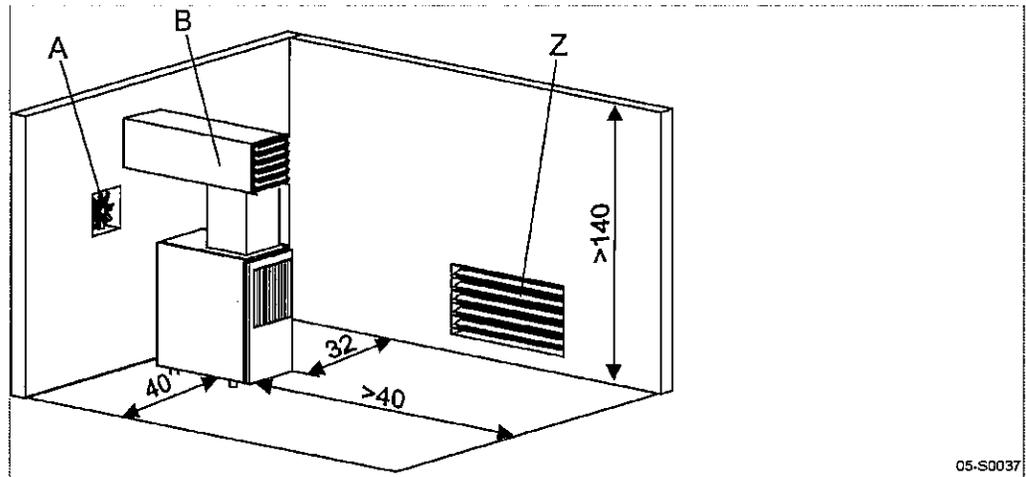


Fig. 10 Recommended installation and dimensions [inch]

- (A) Exhaust fan
- (B) Exhaust air duct
- (Z) Cooling air inlet aperture



**CAUTION**

Ambient temperature too low!

Frozen condensate and highly viscous cooling oil can cause damage when starting the machine.

- Make sure that the temperature of the machine is at least +40 °F before starting.
- Heat the machine room adequately or install an auxiliary heater.

1. If installed outdoors, protect the machine against frost, direct sunlight, dust and rain.
2. Ensure accessibility so that all work on the machine can be carried out without danger or hindrance.

**5.2.2 Ensure adequate ventilation**



If the ventilation is insufficient, a dangerous vacuum can build up in the machine room.

- Ensure that the volume of air flowing into the machine room is at least equivalent to that being removed from it by the machine and exhaust fan.
- Make sure that the machine and exhaust fan can only operate when the inlet aperture is actually open.
- Keep the inlet and exhaust apertures free of obstructions so that the cooling air can flow freely through the machine room.

**5.2.3 Exhaust duct design**

The machine can only overcome the air resistance at the cooling air inlet and exhaust determined by the duct design. Any additional air resistance will reduce airflow and deteriorate machine cooling.

## 5 Installation and Operating Conditions

### 5.3 Using the Compressor to Supply A Compressed Air System.

- Consult the KAESER service representative before deciding on:
  - the design of the exhaust air ducting
  - the intersection between the machine and the exhaust air duct
  - the length of the ducting
  - the number of duct bends
  - the design of flaps or shutters



Use only motorized ventilation flaps and louvers on variable frequency drive (SFC) machines. Flaps or louvers that open through the pressure of the airflow against the force of gravity do not open sufficiently at low cooling fan speeds.

Further information Further information on installation of exhaust air ducts can be found in chapter 13.3.

### 5.3 Using the Compressor to Supply A Compressed Air System.

When the machine is connected to a compressed air system, the system operating pressure must not exceed 232 psig.

Initial filling of a fully vented air network generally creates a very high rate of flow through air treatment devices. These conditions are detrimental to correct treatment. Air quality suffers.

To ensure maintenance of desired air quality when filling a vented compressed air system we recommend the installation of an air main charging system.

- Please allow KAESER to advise on this subject.

## **6 Installation**

### **6.1 Safety**

The following instructions must be followed for safe installation.

Warning instructions are always given before a potentially dangerous action.

#### **Basic Safety Instructions**

1. Follow the instructions in chapter 3 'Safety and Responsibility'.
2. Installation work may only be carried out by authorized personnel.
3. Before switching on, make sure that:
  - no one is working on the machine,
  - all access doors and panels are closed and secure.

#### **Working on electrically conducting components**

1. Work on electrically conducting components may only be carried out by authorized electricians.
2. Switch off and lock out the supply disconnecting device and check that no voltage is present.
3. Check that there is no voltage on floating relay contacts.

#### **Working on pressure systems**

1. Close shut-off valves or otherwise isolate the machine from the compressed air system to ensure that no compressed air can flow back into the machine.
2. Vent all pressurized components and chambers completely.
3. Check all machine hose connectors with a handheld pressure gauge to ensure that all read zero.
4. Do not open or dismantle such valves.

#### **Working on the drive**

1. Switch off and lock out the supply disconnecting device and check that no voltage is present.
2. Do not open the enclosure while the machine is switched on.

Further information

Specification of authorized personnel is found in chapter 3.4.2.

Specification of dangers and their avoidance is found in chapter 3.5.

### **6.2 Reporting Transport Damage**

1. Check the machine for visible and hidden transport damage.
2. Inform the carrier and the manufacturer in writing of any damage without delay.

### **6.3 Making the Compressed Air Connection**

Precondition The compressed air system is vented completely.



Fig. 11 Compressed air connection

- ① Axial compensator or hose
- ② Shut-off valve

**WARNING**

Serious injury or death can result from loosening or opening components under pressure.

- > Vent all pressurized components and chambers completely.

1. A shut off valve must be installed by the user in the connection line.
2. Make the compressed air connection with an axial compensator or hose.

## 6.4 Making the Power Supply Connection

**Precondition** The power supply disconnecting device is switched off  
The disconnecting device is locked in the off position  
A check has been made to ensure no voltage is present

1. Have the electrical connections carried out by authorized personnel only.
2. Carry out protection measures as stipulated in relevant regulations (IEC 364 or example) and in national accident prevention regulations. In addition, the regulations of the local electricity supplier must be observed.
3. Test the overload protection cut-out to ensure that the time it takes to disconnect in response to a fault is within the permitted limit.
4. Use supply conductors and fuses in accordance with local regulations.
5. The user must provide the machine with a lockable supply disconnecting device. This could be, for example, a switch-disconnector with fuses. If a circuit breaker is used it must be suitable for the motor starting characteristics.
6. Check that the correct taps on the control voltage transformer are connected according to the supply voltage.  
If this is not correct, change the connection to suit the power supply voltage.

**DANGER**

Danger of fatal injury from electric shock!

- > Switch off and lock out the supply disconnecting device and check that no voltage is present.

7. Connect the power supply.

**Further information** The electrical diagram 13.4 contains further specifications for electrical connection.

**6.5 Options****6.5.1 Option H1  
Anchoring the machine**

- Use appropriate fixing bolts to anchor the machine.

Further information Details of the fixing holes are contained in the dimensional drawing in chapter 13.3.

**6.5.2 Option W1  
Connecting the external heat recovery system**

An unsuitable heat exchanger or incorrect installation may influence the cooling oil circuit within the compressor. Damage to the machine will follow.

- Consult KAESER on a suitable heat exchanger and expert installation.

**Material** Working element for the thermostatic valve  
(delivered with the KAESER heat recovery system or should be ordered separately)  
Heat recovery system with installation material

**Precondition** The supply disconnecting device is switched off,  
the device is locked off,  
a check has been made that no voltage is present.

**WARNING**

Pressure in the cooling oil circuit

Devices under pressure can injure or cause death if the contained energy is released suddenly or uncontrolled.

- Vent all pressurized components and chambers completely.

**Fitting the working element in the thermostatic valve**

The machine is delivered without a working element in the thermostatic valve.  
The working element moves the valve plunger in response to the temperature of the cooling oil. This makes the connection to the heat exchanger.

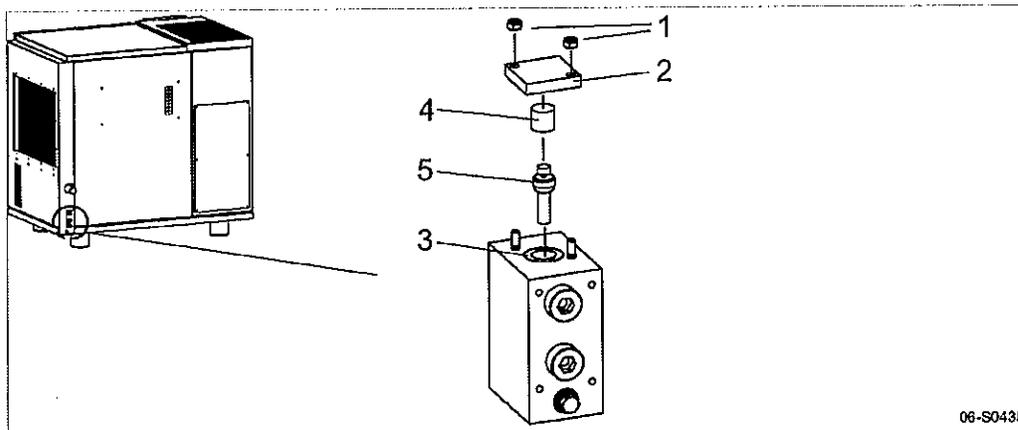


Fig. 12 Fitting the working element in the thermostatic valve

- |           |                   |
|-----------|-------------------|
| ① Screw   | ④ Spacer          |
| ② Cover   | ⑤ Working element |
| ③ Plunger |                   |

1. Undo the screws ① and remove the cover ②.  
The valve plunger ③ is lifted by spring force.
2. Take out the valve plunger and the spacer ④.
3. Place the working element ⑤ and the spacer in the valve plunger.
4. Replace the valve plunger in the thermostatic valve and screw down the cover.

**Connecting the heat exchanger**



Fig. 13 Heat exchanger connection

- |              |
|--------------|
| ① Screw plug |
|--------------|

1. Remove the screw plug ①.
2. Connect the heat exchanger according to specifications from KAESER and the exchanger manufacturer.

Further information The dimensional drawing in chapter 13.3 gives the flow direction, size and location of the connection ports.

## **7 Initial Start-up**

### **7.1 Safety**

The following instructions must be followed for safe machine commissioning. Warning instructions are always given before a potentially dangerous action.

#### **Basic safety instructions**

1. Follow the instructions in chapter 3 'Safety and Responsibility'.
2. Commissioning may only be carried out by authorized personnel.
3. Before switching on, make sure that:
  - no one is working on the machine,
  - all access doors and panels are closed and secure.

#### **Working on electrically conducting components.**

1. Work on electrically conducting components may only be carried out by authorized electricians.
2. Switch off and lock out the supply disconnecting device and check that no voltage is present.
3. Check that there is no voltage on floating relay contacts.

#### **Working on pressure systems**

1. Close shut off valves or otherwise isolate the machine from the compressed air system to ensure that no compressed air can flow back into the machine. .
2. Vent all pressurized components and chambers completely.
3. Check all machine hose connectors with a handheld pressure gauge to ensure that all read zero.
4. Do not open or dismantle such valves.

#### **Working on the drive**

1. Switch off and lock out the supply disconnecting device and check that no voltage is present.
2. Do not open the enclosure while the machine is switched on.

Further information    Specification of authorized personnel is found in chapter 3.4.2.  
                                 Specification of dangers and their avoidance is found in chapter 3.5.

### **7.2 To be noted before commissioning**

Incorrect or improper commissioning can cause injury to persons or damage to the machine.

## 7 Initial Start-up

### 7.3 Check Installation and Operational Conditions

- Commissioning of the machine may only be carried out by trained and authorized installation or maintenance personnel.

#### Special measures for re-commissioning after storage

Storage period longer than...	Remedy
12 months	<ul style="list-style-type: none"> <li>➤ Change the oil filter.</li> <li>➤ Change the oil separator cartridge.</li> <li>➤ Change the cooling oil.</li> <li>➤ Have the motor bearings checked by an authorized KAESER Service representative.</li> </ul>
36 months	<ul style="list-style-type: none"> <li>➤ Have the overall technical condition checked by an authorized KAESER Service representative.</li> </ul>

Tab. 25 Re-commissioning after storage

### 7.3 Check Installation and Operational Conditions

- Check and confirm all the items in the checklist before commissioning the machine.

To be checked	See chapter	OK?
➤ Are the operators fully conversant with safety regulations?	–	
➤ Have all the installation conditions been fulfilled?	5	
➤ Is the user's lockable supply disconnecting device installed?	6.4	
➤ Does the power supply conform to the specifications on the nameplate?	2.1	
➤ Are the supply cable core cross-sections and fuse ratings adequate?	2.14	
➤ Check that all screw-type electrical connections are firmly tightened.	–	
➤ Have checks been repeated 50 operating hours after commissioning?	–	
➤ Is a shut-off valve fitted to compressed air outlet?	6.3	
➤ Are connections made to the compressed air system with hose or axial compensator?	6.3	
➤ Has the belt tension been checked?	10.9	
➤ Is there sufficient cooling oil in the separator tank? (cooling oil level indicator outside the red zone)	10.10	
➤ Is there sufficient cooling oil in the airend?	7.5	
➤ Is the machine firmly anchored to the floor? (option H1)	6.5.1	
➤ Are door interlock switches aligned and their function checked?	7.8	
➤ Are all access doors closed and latched and all removable panels in place and secured?	–	

Tab. 26 Installation conditions checklist

## 7.4 Setting the Overload Protection Cut-Out

In the star-delta configuration the phase current is fed via the overload protection cut-out. This phase current is 0.58-times the rated motor current (see nameplate in the control cabinet).



To prevent the overload protection cut-out from being triggered by voltage fluctuations, temperature influences or component tolerances, the setting can be higher than the calculated phase current.

- Set up the overload protection cut-out.



The overload cut-out drops out despite being correctly set?

- Contact authorized KAESER Service representative.

## 7.5 Pouring Cooling Oil into the Airend

Fill the airend manually with cooling oil before initial start-up and after a shutdown period of more than 3 months.

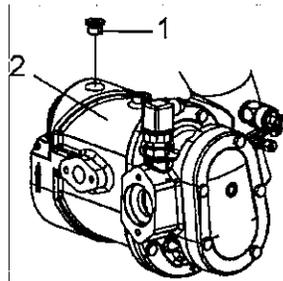


A label showing the type of oil used is found near the oil separator tank filling port.

- Use the same type of oil.

Material 0.5 quart Cooling oil

Precondition The power supply disconnecting (isolating) device is switched off, the switch is locked in the off position, a check has been made that no voltage is present.



07-S0048

Fig. 14 Airend filling port

- ① Filler plug
- ② Airend

1. Unscrew the filler plug from the airend.
2. Pour cooling oil into the airend and tighten the filler plug.
3. Turn the rotors manually by means of the belt pulley to distribute the oil.

## 7.6 Check Direction of Rotation

The machine is designed for a clockwise phase sequence.

Ideally, the direction of phase rotation should be measured with a phase sequence meter.

Alternatively, start the machine very briefly and observe the direction of rotation of the motor cooling fan.

1. Check the direction of phase rotation with a phase sequence meter.
2. If the direction is incorrect, reverse the supply phases L1 and L2.



You have no phase sequence meter?

- Switch the machine on and off again the moment the drive motor begins to turn.
- Compare the direction of rotation of the motor with the arrows on the motor and the airend casing.
- If the direction is incorrect, reverse supply phases L1 and L2.

## 7.7 Starting the machine for the first time

**Precondition** No one is working on the machine,  
all access doors are closed,  
all removable panels in place and secured.

1. Open the shut-off valve to the compressed air system.
2. Switch on the main power supply disconnecting device.  
After the controller has carried out a self-test, the green LED *Power ON* lights.
3. Press the «ON» key.

The green LED *Machine ON* lights.

The motor starts up and after a short time the machine switches to **LOAD** and delivers compressed air.



- Keep an eye on the machine during the first few hours of operation to ensure that it is operating correctly.
- After the first 50 operating hours, all screw-type electrical connections should be checked and tightened if necessary.

## 7.8 Checking the Door Interlock Switch

The interlock switch stops the machine as soon as a door or access panel is opened.  
Check the interlock switch function on commissioning.



The door interlock switch is an important safety device.  
The machine may only be operated with a correctly functioning interlock switch.

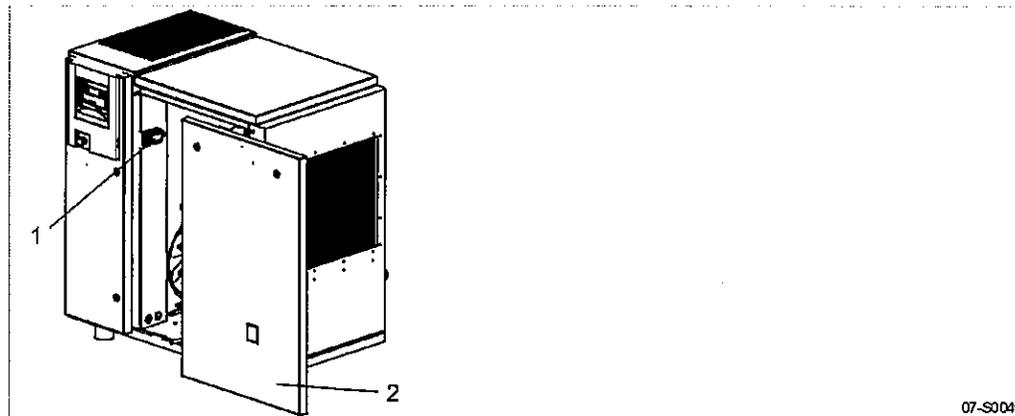


Fig. 15 Interlock switch position

- ① Door interlock switch
- ② Panel

1. Open the access panel ② while the machine is running.  
The machine switches off automatically. The controller displays an alarm message.
2. Close the panel and acknowledge the alarm.



The machine does not switch off automatically?.

- Have the interlock switch checked by an authorized KAESER Service representative agent.

## 7.9 Network Pressure Setting

The cut-out pressure is factory set at the maximum permissible working pressure of the machine. Adjustment is necessary for individual operating conditions.



Do not set the machine's cut-out pressure higher than the maximum working pressure of the compressed air system.

The machine may not toggle more than twice per minute between LOAD and IDLE.

To reduce switching (toggling) frequency:

- Increase the difference between cut-in and cut-out pressure.
- Add an air receiver downstream to increase buffer capacity.

### System pressure setpoint: switching point

1. Scroll with the arrow keys until the parameter 8 "System pressure: switching point" is displayed in line 3.
2. Depress the «enter» key for at least three seconds until the cursor blinks.
3. Use the arrow keys to set the desired switching point and confirm with the «enter» key.

### Pressure setpoint: switching differential

This switching differential is factory set. Adjust this parameter if the motor starting frequency is too high.

1. Scroll with the arrow keys until the parameter 7 "System pressure: switching differential" is displayed in line 3.

2. Depress the «enter» key for at least three seconds until the cursor blinks.
3. Use the arrow keys to set the desired differential and confirm with the «enter» key.

## 8 Operation

### 8.1 Switching On and Off

Always switch the machine on with the «ON» key and off with the «OFF» key.  
A power supply disconnecting device has been installed by the user.

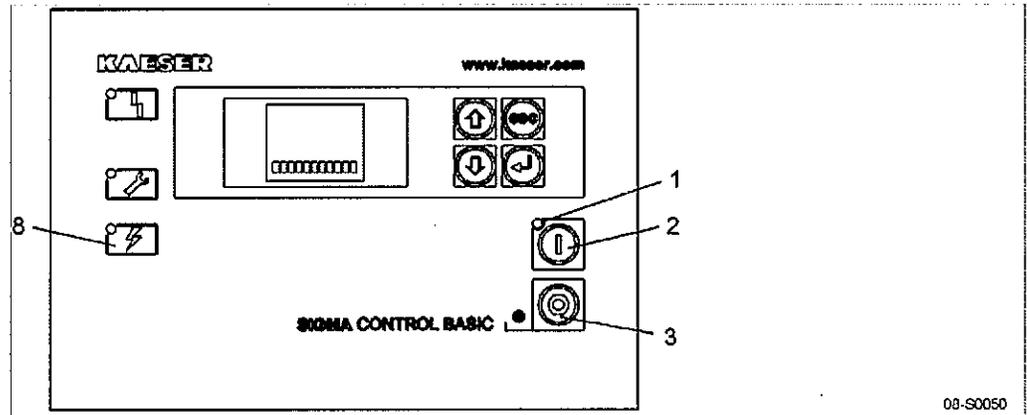


Fig. 16 Switching On and Off

- |                                 |                                    |
|---------------------------------|------------------------------------|
| ① <i>Machine ON</i> LED (green) | ③ «OFF» key                        |
| ② «ON» key                      | ④ <i>Controller ON</i> LED (green) |

#### 8.1.1 Switching on

**Precondition** No personnel are working on the machine,  
All access doors and panels are closed and secure.

1. Switch on the power supply disconnecting device.  
After the controller has carried out a self-test, the green *Power ON* LED lights continuously.
2. Press the «ON» key.  
The green *Machine ON* LED lights continuously.



If a power failure occurs, the machine is **not** prevented from automatic re-starting.  
It can start automatically again as soon as power is restored.

**Result** The compressor motor starts as soon as system pressure is lower than the setpoint pressure (cut-out pressure).

#### 8.1.2 Switching off

Depending on current operating condition, the machine shuts down after a protective run-on period.

## 8 Operation

### 8.2 Switching Off in an Emergency and Switching On again

#### LOAD

The machine switches to IDLE.  
The *Machine ON* LED flashes.  
The drive motor comes to a stop after about 15 seconds.  
The *Machine ON* LED extinguishes.

#### IDLE

The motor stops immediately.  
The *Machine ON* LED extinguishes.

Tab. 27 Switching off with/without run-on time.

1. Press the «OFF» key.  
The machine is ready to operate as soon as the *Machine ON* LED is extinguished. The machine can be started again.
2. Switch off and lock out the power supply disconnecting device.  
The machine is switched off and isolated from the mains supply. The *Controller Power* LED extinguishes.

## 8.2 Switching Off in an Emergency and Switching On again

The EMERGENCY STOP pushbutton is located below the control panel.



Fig. 17 Switching off in an emergency  
⑨ EMERGENCY STOP pushbutton

#### Shutdown

- Press the EMERGENCY STOP pushbutton.  
The pushbutton remains latched in.  
The compressor's pressure system is vented and the machine is prevented from automatically re-starting.

#### Switching on

Precondition The fault has been rectified

1. Turn the EMERGENCY STOP pushbutton in the direction of the arrow to unlatch it.
2. Press the reset key to reset any alarm messages.  
The machine can now be started again.

### 8.3 Acknowledging Alarm and Warning Messages

Messages are displayed on the "new value" principle:

- Message received: LED flashes
- Message acknowledged: LED lights
- Message gone: LED extinguished

or

- Message received: LED flashes
- Message gone: LED flashes
- Message reset: LED extinguished

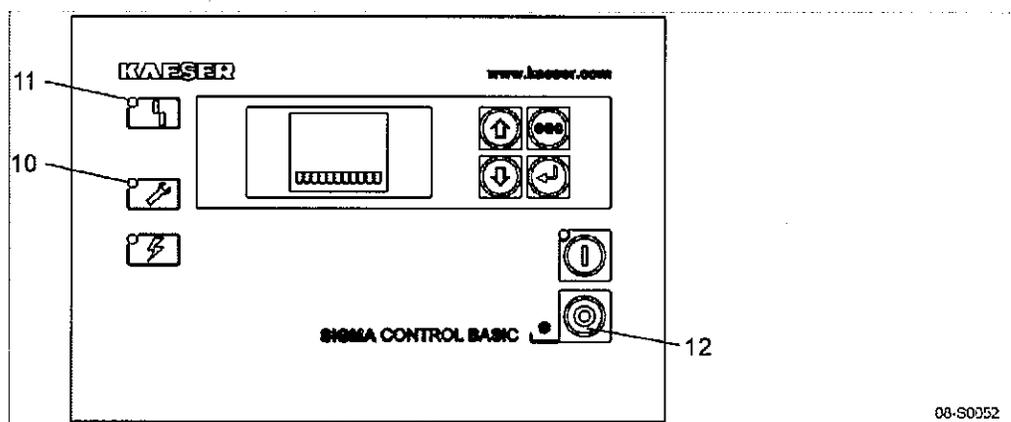


Fig. 18 Acknowledging/resetting messages

- 10 warning (yellow) LED
- 11 alarm (red) LED
- 12 «acknowledge/reset» key

#### Alarm message

Precondition Fault has been rectified

- Reset the message with the «acknowledge/reset» key.  
*alarm* LED extinguishes.  
The machine is now ready to start again.

#### Warning message

Precondition The danger of an alarm is eliminated.  
Maintenance has been carried out

- Reset the message with the «acknowledge/reset» key.  
*warning* LED extinguishes.

### 8.4 Setting Parameters

If a password is needed it is requested automatically.

Every action can be cancelled with the «escape» key.



If no key is pressed in the edit mode for ten seconds, the display automatically returns to the previous mode.

Restarting the controller is not necessary. Edited parameters are immediately effective.

Compressed air systems pressure and airtend discharge temperature are neither updated nor displayed while in the edit mode.

#### **Entering the edit mode.**

1. Scroll with the «UP»/«DOWN» keys until the desired parameter appears in line 3.
2. Depress the «enter» key for at least 3 seconds.

**Result** Depending on the parameter, either the indicated word flashes or the position for the first character of the required password.

#### **Changing a parameter that is not password protected.**

**Precondition** The current parameter setting flashes.

- Use the «UP»/«DOWN» keys to change the value of the parameter and confirm with the «enter» key.

#### **Changing a password protected parameter.**

Some parameters can only be accessed for changing after a password has been given. The password consists of five characters.

**Precondition** The first character flashes.

1. Select the first character with the «UP»/«DOWN» key and confirm with «enter».  
The next character flashes.
2. Repeat setting until all characters are entered.  
When the correct password is entered the parameters are displayed.
3. Use the «UP»/«DOWN» keys to change the value of the parameter and confirm with the «enter» key.

## 9 Fault Recognition and Rectification

### 9.1 Basic Information

The following tables are intended to assist in locating causes of faults.

There are three types of fault:

- Alarm: red LED flashes - see chapter 9.2.
- Warning: yellow LED flashes - see chapter 9.3.
- Other faults: no indication - see chapter 9.4.

The messages valid for your machine are dependant on the controller and individual equipment.

1. Do not attempt fault removal measures other than those given in this manual.
2. In all other cases:  
have the fault rectified by an authorized KAESER Service representative agent.

### 9.2 Alarm Messages (machine shutdown)

The error code appears in the 4th line of the display field.

A sticker with symbols explains the error code.

Error code	Symbol	Meaning	Remedy
1		EMERGENCY STOP button pressed. Access door open or panel removed.	<ul style="list-style-type: none"> <li>➤ Unlatch the EMERGENCY STOP button</li> <li>➤ Close the access door or replace the panel.</li> </ul>
2		Motor alarm Overload protection of drive or fan motor (if fitted). Machine with frequency-controlled drive: fault in the frequency converter.	<ul style="list-style-type: none"> <li>➤ Check overload protection setting / motor protection switch.</li> <li>➤ Change the oil separator cartridge.</li> <li>➤ Check minimum pressure/check valve.</li> <li>➤ Have the frequency converter checked by an authorized KAESER Service representative.</li> </ul>
3		Build-up of back pressure: <ul style="list-style-type: none"> <li>■ Incorrect motor rotation direction.</li> <li>■ Drive belts damaged.</li> <li>■ Compressor not venting correctly when STOPPED.</li> </ul>	<ul style="list-style-type: none"> <li>➤ Change over phase lines L1 and L2.</li> <li>➤ Replace drive belts.</li> </ul>
4		Maximum permissible air end discharge temperature exceeded.	<ul style="list-style-type: none"> <li>➤ Clean the cooler.</li> <li>➤ Maintain sufficient distance between the cooling air inlet and exhaust openings and any wall. Check the cooling oil level.</li> <li>➤ Ensure that the permissible room temperature is not exceeded.</li> <li>➤ Replace the oil filter.</li> </ul>

## 9 Fault Recognition and Rectification

### 9.3 Warning messages (yellow LED lights)

Error code	Symbol	Meaning	Remedy
5		Fault in the refrigeration dryer.	<ul style="list-style-type: none"> <li>➤ Clean the refrigerant condenser.</li> <li>➤ Ensure adequate ventilation.</li> <li>➤ Install an extractor fan.</li> </ul>
6		Defective analog input (pressure or temperature sensor).	<ul style="list-style-type: none"> <li>➤ Check lines and connections.</li> </ul>
7		Maximum permissible temperature of the controller casing exceeded.	<ul style="list-style-type: none"> <li>➤ Ensure adequate ventilation.</li> <li>➤ Ensure that the permissible room temperature is not exceeded.</li> </ul>
8	–	Spare.	–

Tab. 28 Alarm messages

### 9.3 Warning messages (yellow LED lights)

The error code appears in the 4th line of the display field.  
 A sticker with symbols explains the error code.

Error code	Symbol	Meaning	Remedy
S		Maintenance interval elapsed.	<ul style="list-style-type: none"> <li>➤ Carry out maintenance.</li> </ul>
p		Back pressure present.	<ul style="list-style-type: none"> <li>➤ Check direction of drive motor rotation.</li> <li>➤ Call authorized KAESER Service representative.</li> </ul>
T		Machine below minimum permissible starting temperature.	<ul style="list-style-type: none"> <li>➤ Increase room temperature.</li> </ul>
i		Safety relief valve check mode switched on.	<ul style="list-style-type: none"> <li>➤ Check safety relief valve.</li> <li>➤ Deactivate check mode.</li> </ul>

Tab. 29 Warning messages

**9.4 Other Faults**

<b>Fault</b>	<b>Possible cause</b>	<b>Remedy</b>
Machine runs but produces no compressed air.	Inlet valve not opening or only opening partially.	Call authorized KAESER Service representative.
	Venting valve not closing.	Call authorized KAESER Service representative.
	Leaks in the pressure system.	Check pipework and connections for leaks and tighten any loose fittings.
	Air consumption is greater than the capacity of the compressor.	Check the air system for leaks. Shut down the consumer(s).
	Hose coupling or maintenance hose still plugged into the quick-release coupling on the oil separator tank.	Remove coupling or maintenance hose.
Cooling oil runs out of the air filter.	Oil level in the oil separator tank too high.	Drain off oil until the correct level is reached.
	Inlet valve defective.	Call authorized KAESER Service representative.
Compressor switches between LOAD and IDLE more than twice per minute.	Air receiver too small.	Increase size of air receiver.
	Airflow into the compressed air network restricted.	Increase air pipe diameters. Check filter elements.
	The differential between cut-in and cut-out pressure too is small.	Check switching differential.
Cooling oil leaking into the floor pan.	Hose coupling or maintenance hose still plugged into the quick-release coupling on the oil separator tank.	Remove coupling or maintenance hose.
	Oil cooler leaking.	Call authorized KAESER Service representative.
	Leaking joints.	Tighten joints. Replace seals.
Cooling oil consumption too high.	Unsuitable oil is being used.	Use SIGMA FLUID cooling oil.
	Oil separator cartridge split.	Change the oil separator cartridge.
	Oil level in the oil separator tank too high.	Drain off oil until the correct level is reached.
	Oil return line clogged.	Check dirt trap in the return line.

Tab. 30 Other faults and actions

## 10 Maintenance

### 10.1 Safety

The following instructions must be followed for safe machine maintenance.  
Warning instructions are always given before a potentially dangerous action.

#### Basic safety instructions

1. Follow the instructions in chapter 3 'Safety and Responsibility'.
2. Maintenance work may only be carried out by authorized personnel!
3. Before switching on, make sure that:
  - no one is working on the machine,
  - all access doors and panels are closed and secure.

#### Working on electrically conducting components.

1. Work on electrically conducting components may only be carried out by authorized electricians.
2. Switch off and lock out the supply disconnecting device and check that no voltage is present.
3. Check that there is no voltage on floating relay contacts.

#### Working on pressure systems

1. Close shut-off valves or otherwise isolate the machine from the air main to ensure that no compressed air can flow back into the machine.
2. Vent all pressurized components and chambers completely.
3. Check all machine hose connectors with a handheld pressure gauge to ensure that all read zero.
4. Do not open or dismantle such valves.

#### Working on the drive

1. Switch off and lock out the supply disconnecting device and check that no voltage is present.
2. Do not open the enclosure while the machine is switched on.

Further information

Specification of authorized personnel is found in chapter 3.4.2.

Specification of dangers and their avoidance is found in chapter 3.5.

## 10.2 Maintenance Schedule

### 10.2.1 Logging maintenance work



The maintenance intervals given are those recommended for average operating conditions.

- Maintenance tasks should be carried out more frequently where operating conditions are unfavorable (e.g. dusty atmosphere) or when the equipment is heavily utilized.
- Adjust the maintenance intervals with regard to operating conditions.

- Keep a log of all maintenance and repair work.

This enables the frequency of individual maintenance tasks and deviations from our recommendations to be determined.

Further information A prepared list is provided in chapter 10.18.

**10.2.2 Resetting maintenance interval counters**

SIGMA CONTROL BASIC has a maintenance interval counter that counts down the operating hours to the next maintenance.

The counter reading shows the number of operating hours to the next periodic machine maintenance. Reset the counter to the original value once the task has been carried out.

1. Select parameter 2 (maintenance interval counter) with the «UP»/«DOWN» keys.
2. Depress the «enter» key for at least 3 seconds.
3. When the cursor blinks, confirm the offered value with the «enter» key.

**10.2.3 Regular maintenance tasks**

The table below lists maintenance tasks required.

- Take note of the controller's service messages and carry out tasks punctually, taking ambient and operating conditions into account.

Interval	Maintenance task	See chapter
Weekly	Check the cooling oil level.	10.10
	Cooler: Check the filter mat.	10.3
	Control cabinet: Check the filter mat.	10.4
	Up to 1,000 h	Maintain the drive belts. 10.9 Check the air filter. 10.7 Clean the cooler. 10.5 Cooler: Clean the filter mat. 10.3 Control cabinet: Clean the filter mat. 10.4
Up to 3,000 h	Change the air filter element.	10.7
	Cooler: Change the filter mat.	10.3
	Control cabinet: Change the filter mat.	10.4
Up to 3,000 h	Change the oil filter.	10.16
At least annually		
Up to 3,000 h	Change the oil separator cartridge.	10.17
At the latest every 3 years		
Variable, see table 32	Change the cooling oil.	10.15

h = operating hours

Interval	Maintenance task	See chapter
Annually	Check that all electrical connections are tight.	-
	Check the pressure relief valve.	10.11
	Check the over-heating safety shutdown function.	10.12
	Check the cooler for leaks.	10.5
	Maintain the heat recovery system.	10.6

h = operating hours

Tab. 31 Regular maintenance tasks

**10.2.4 Cooling oil changing interval**

Machine utilization and ambient conditions are important criteria for the number and length of the change intervals.



Authorized KAESER Service representative will support you in determining appropriate intervals and provide information on the possibilities of oil analysis.

- Please observe national regulations regarding the use of cooling oil in oil-injected screw compressors.
- Check operating conditions and adjust intervals as necessary.

**KAESER LUBRICANTS**

SIGMA Lubricant	Description	Maximum Recommended Change Interval	
		First oil change	Subsequent oil change
M-460	ISO 46 Semi-Synthetic Lubricant	2,000 Hours	3,000 Hours
S-460	ISO 46 Synthetic Lubricant	6,000 Hours	8,000 Hours
S-680	ISO 68 Synthetic Lubricant	6,000 Hours	8,000 Hours
FG-460	ISO 46 Food Grade Synthetic Fluid	2,000 Hours	3,000 Hours

Tab. 32 Oil change intervals lubricants

**10.2.5 Regular service work**

The table below lists necessary service tasks.

- Only authorized KAESER Service representatives should carry out service work.
- Carry out service tasks punctually and with consideration of ambient and operating conditions.

Interval	Service task
Up to 12,000 h	Check valves.
Up to 12,000 h, at the latest every 3 years	Check drive motor bearings.

h = operating hours

Interval	Service task
Up to 36,000 h, at the latest every 8 years	Check hose lines.
h = operating hours	

Tab. 33 Regular service work

### 10.3 Cooler: Cleaning or Renewing the Filter Mats

The filter mats help to keep the cooler clean. If the filter mats are clogged, adequate cooling of the components is no longer ensured.

**Material** Filter mats:  
Warm water and household detergent  
Spare parts (as required)

**Precondition** The machine is switched off.

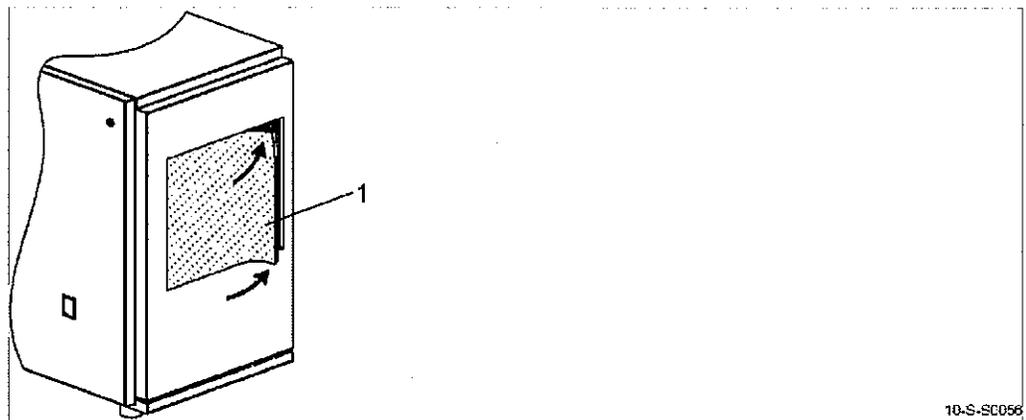


Fig. 19 Filter mat for the air and oil cooler

① Filter mat

No tools are needed to remove the filter mat.

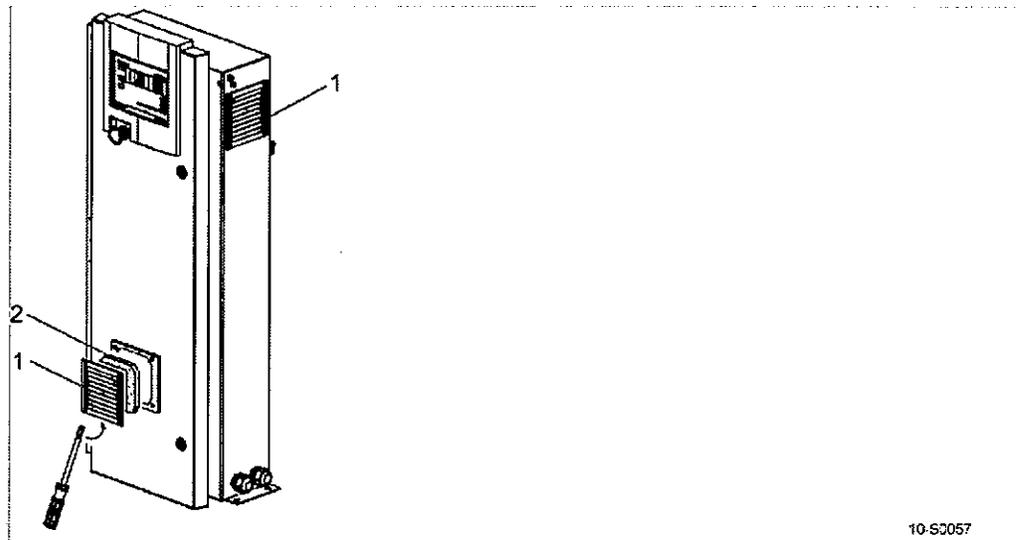
1. Carefully remove the filter mat from the retaining frame.
2. Beat the mat or use a vacuum cleaner to remove loose dirt. If necessary, wash with lukewarm water and household detergent.
3. Change the filter mat if cleaning is not possible or if the change interval has expired.
4. Carefully insert the filter mat in the retaining frame.

### 10.4 Cleaning or Replacing the Control Cabinet Filter Mats

Filter mats protect the control cabinet from ingress of dirt. If the filter mats are clogged, adequate cooling of the components is no longer ensured. In such a case, clean or replace the filter mats.

**Material** Warm water and household detergent  
Spare parts (as required)

**Precondition** The power supply disconnecting (isolating) device is switched off,  
the disconnect device is locked in the off position,  
a check has been made that no voltage is present.  
The machine has cooled down.



**Fig. 20** Control cabinet ventilation grill

- ① Ventilation grill
- ② Filter mat

1. Carefully remove the ventilation grill ① and take out the filter mat ②.
2. Beat the mat or use a vacuum cleaner to remove loose dirt. If necessary, wash with lukewarm water and household detergent.
3. Change the filter mat if cleaning is not possible or if the change interval has expired.
4. Lay the filter mat in the frame and latch in the ventilation grill.

## 10.5 Cooler Maintenance

Regular cleaning of the cooler ensures reliable cooling of the machine and the compressed air. The frequency is mainly dependent on local operating conditions.

A leaking cooler results in loss of cooling oil and reduced air delivery.

**Material** Brush and vacuum cleaner.  
Breathing mask (if required)

**Precondition** The power supply disconnecting device is switched off  
The disconnecting device is locked in the off position  
A check has been made no voltage is present  
The machine has cooled down.

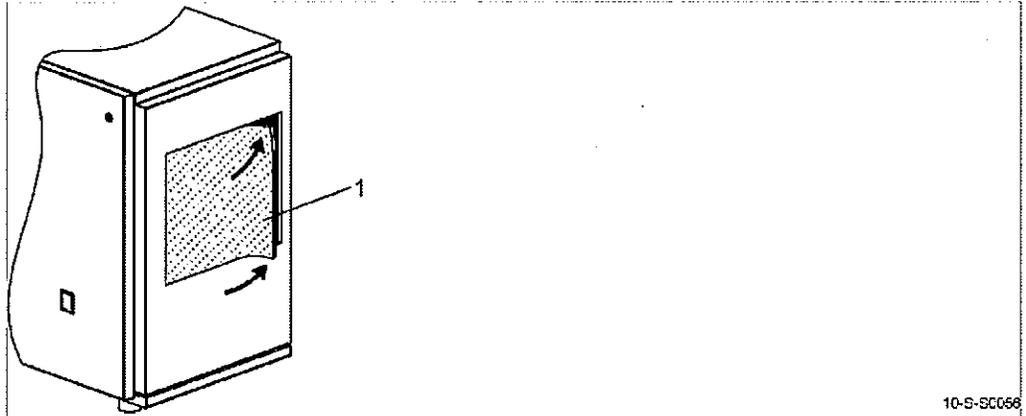


Fig. 21 Filter mat for air and oil cooler

- ① Filter mat

#### **Cleaning the cooler.**

A filter mat helps to keep the cooler clean but cooler cleaning is necessary after a period of time.

Do not clean the cooler with a sharp instrument, otherwise it could be damaged.

Avoid dust disturbance.

1. Carefully remove the filter mat from the retaining frame.
2. Dry brush the oil and air coolers and use a vacuum cleaner to remove the dirt.
3. Carefully insert the filter mat in the retaining frame.



The air and oil coolers can no longer be properly cleaned?

- Heavy and stubborn contamination should be removed by authorized KAESER Service representative.

#### **Check the cooler for leaks.**

- Visual check: Is cooling oil dripping from the cooler?



Is the cooler leaking?

- Have the cooler repaired immediately by an authorized KAESER Service representative.

## **10.6 Option W1 Maintaining the external heat recovery system**

Deposits in the heat exchanger can significantly reduce its capacity to transfer heat.

Check the heat exchanger regularly for leaks and contamination. Frequency of checking is dependant on the characteristics of the heat transfer medium.

- Monitor the pressure in the heat transfer medium line to detect any drop in pressure.
- Have the external heat recovery system checked annually by an authorized KAESER Service Technician.

## 10.7 Air Filter Maintenance



Check that all sealing surfaces match each other. The use of an unsuitable air filter element can permit dirt to ingress the pressure system and cause damage to the machine.

The air filter element cannot be cleaned.

**Material** Replacement part

**Precondition** The power supply disconnecting (isolating) device is switched off, the disconnect device is locked in the off position, a check has been made that no voltage is present.  
The machine has cooled down.

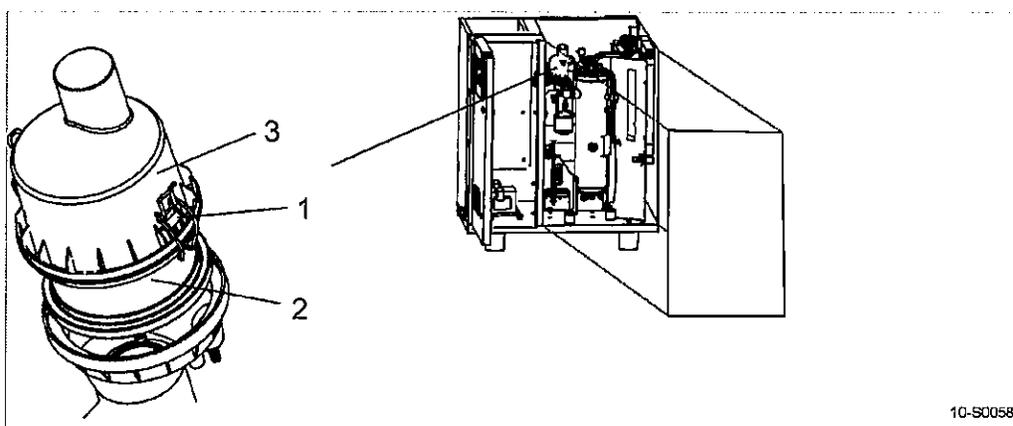


Fig. 22 Air filter maintenance

- ① Snap fastener
- ② Air filter element
- ③ Air filter housing

1. Release the spring clips and remove the element.
2. Clean all parts and sealing surfaces.
3. Insert the new element in the housing.
4. Clip the air filter housing onto the inlet valve.

## 10.8 Drive Motor Maintenance

The drive motor bearings are permanently greased. Subsequent greasing is not necessary.

- Have the motor bearings checked by an authorized KAESER Service representative during servicing.

**10.9 Maintaining the Drive Belts**

Material Spare parts (if required)

Precondition The power supply disconnecting (isolating) device is switched off, the switch is locked in the off position, a check has been made that no voltage is present.  
The machine has cooled down.

**WARNING**

Touching rotating drive belts may result in severe bruising or even loss of limb or extremities.

- Switch off and lock out the power supply disconnecting (isolating) device and check that no voltage is present.

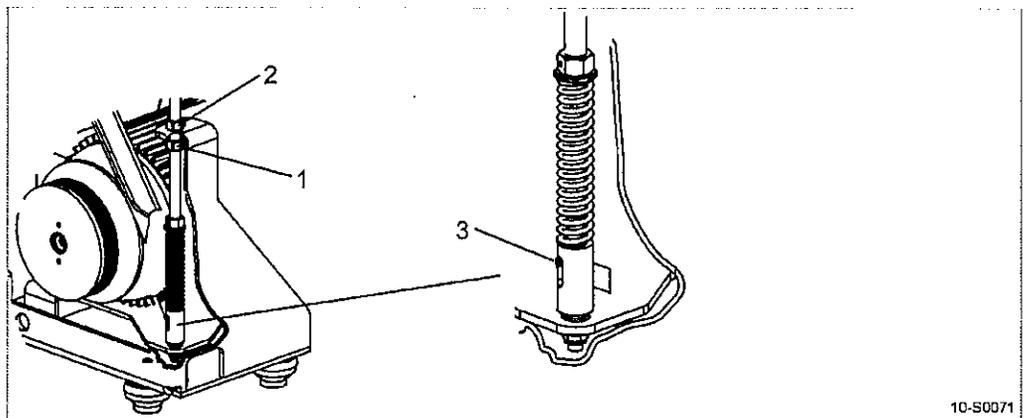


Fig. 23 Drive Belt Maintenance

- ① Nut
- ② Nut
- ③ Marker pin (the illustration shows that belt tensioning is required)

**Checking the belt tension and adjustment**

The tensioning device uses spring force to apply correct tension to the belts.

Adjust the tension when the marker pin reaches the **top** of the elongated hole.

1. Loosen the locking nut ②.
2. Use the adjusting nut ① to adjust spring tension until the marker pin reaches the lower end of the elongated hole.
3. Tighten the locking nut ②.

**Visual damage check**

1. Turn the pulley by hand so that all of the belt can be inspected for damage.
2. Change any damaged belts immediately.

**Changing the belts**

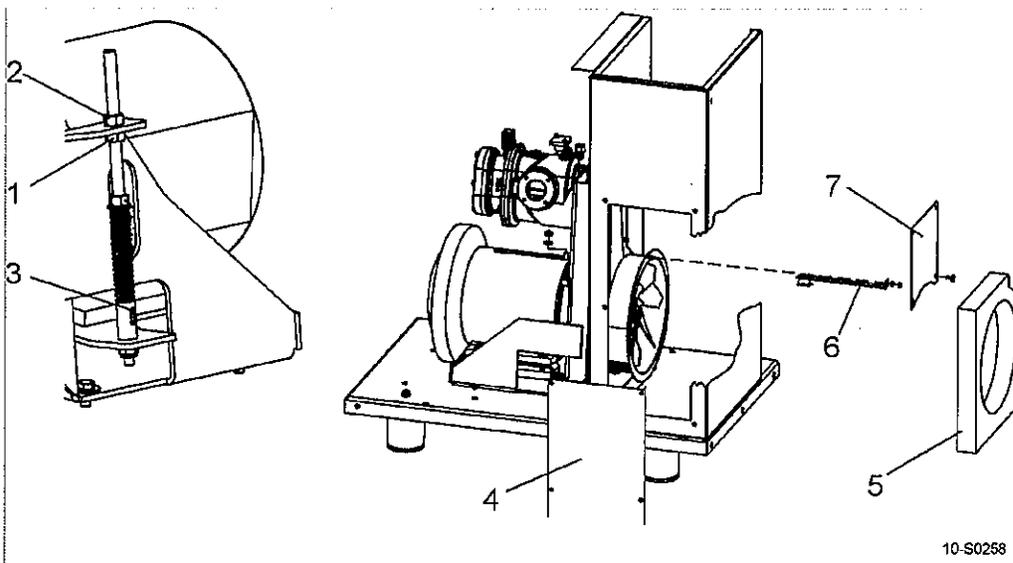


Fig. 24 Changing the belts

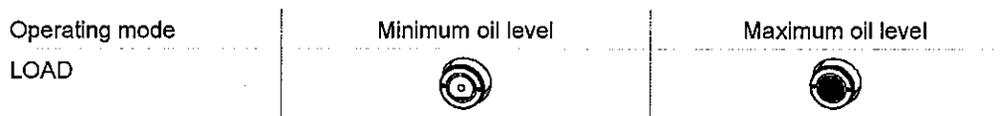
- |  |                |
|--|----------------|
| ① Nut  | ⑤ Insulation   |
| ② Nut  | ⑥ Bracket rail |
| ③ Marker pin (the illustration shows that belt tensioning is required) | ⑦ Plate        |
| ④ Plate  |                |

1. Loosen the locking nut ②.
2. Turn adjusting nut ① to loosen the tension on the belts until they can be removed from the pulley.
3. Remove the panel ④ and the insulation piece ⑤.
4. Remove the plate ⑦ and the bracket ⑥.
5. Remove the belts, drawing them carefully over the fan wheel, and replace with a new set of belts.
6. Replace the bracket ⑥ the plate ⑦ and insulating piece ⑤.
7. Use the adjusting nut ① to adjust spring tension until the marker pin ③ reaches the **lower end** of the elongated hole.
8. Tighten the locking nut ②.

**10.10 Checking the Cooling Oil Level**

The oil level can be seen through a window in the front access door.

The ideal situation is with the oil level around the optimum mark when the machine is running.



Tab. 34 Checking the Cooling Oil Level

Precondition The machine has been running at least 5 minutes under LOAD.

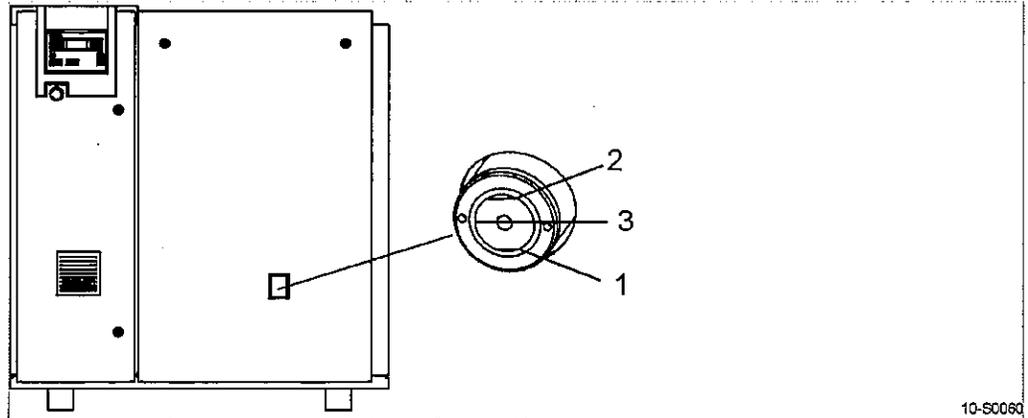


Fig. 25 Checking the Cooling Oil Level

- ① Minimum oil level
- ② Maximum oil level
- ③ Optimum level

➤ Check the oil level with machine running under LOAD.

Result Top up when the indicator shows minimum level.

## 10.11 Checking the Safety Relief Valve

In order to check the safety relief valve, the machine's working pressure is raised above the blowoff pressure of the valve.



Blowoff protection and network pressure monitoring are switched off during the test.

➤ Operate the machine only with a fully functioning safety relief valve.

### Preparation for the test

Precondition The machine is switched off.

1. Close the user's shut-off valve between the machine and the compressed air system.
2. Read the blowoff pressure on the valve.  
(the blowoff pressure is usually to be found at the end of the part identification)
3. Use the arrow keys to scroll the parameter 3 "Safety relief valve check mode" and confirm by depressing the «enter» key at least three seconds.
4. Enter the password "BASIC" and confirm with the «enter» key.
5. Use the arrow keys to select parameter "on" and confirm.

### Carrying out the check

The machine starts in IDLE as soon as it is switched on.

So long as the «ON» key is depressed and held, the machine switches to LOAD and pressure builds up in the oil separator tank. When the «ON» key is released, the machine switches back to IDLE and stops automatically when the preset idling period has elapsed.

Precondition The machine is switched off.

**WARNING**

Safety relief valve blows off.

Excessive noise is caused when the safety relief valve blows off.

There is danger of scalding from hot oil.

There is danger of injury from bursting components and compressed air.

- Close all access doors and replace and secure all removable panels.
- Wear ear and eye protection.
- Abort the test if the working pressure reaches 10% above the blowoff pressure of the valve.

1. Press the «ON» key.  
The machine starts in IDLE.
2. Observe the pressure indicator on the SIGMA CONTROL BASIC while depressing the «ON» key.
3. Stop the test as soon as the pressure relief valve blows off or working pressure reaches 10% above the blowoff set point.
4. If necessary, vent the machine and replace the safety relief valve.

**Return to operational state.**

1. Call up the edit mode again and enter the password "BASIC".
2. Use the arrow keys to select parameter "off" and confirm with the enter key.
3. Open the user's shut-off valve between the machine and the compressed air system.

**10.12 Checking the Overheating Safety Shutdown Function**

The machine should shut down if the airend discharge temperature reaches a maximum of 230 °F.

- Have the safety shutdown function checked by an authorized KAESER Service representative.

**10.13 Venting the machine (depressurizing)**

The machine must be isolated from the compressed air system and completely vented before undertaking any work on the pressure system.

The oil circuit vents automatically as soon as the machine is stopped.

Venting takes place in three stages:

- Isolate the compressor from the compressed air system.
- Vent air from the oil separator tank.
- Vent air manually from the air cooler.

**Material** The hose coupling, shut-off valve and maintenance hose lie beneath the oil separator tank.

**Precondition** The mains disconnecting device is switched off  
The disconnecting device is locked in the off position  
A check has been made no voltage is present



**WARNING**

Compressed air!

Compressed air and devices under pressure can injure or cause death if the contained energy is released suddenly or uncontrolled.

- Vent all pressurized components and chambers completely.

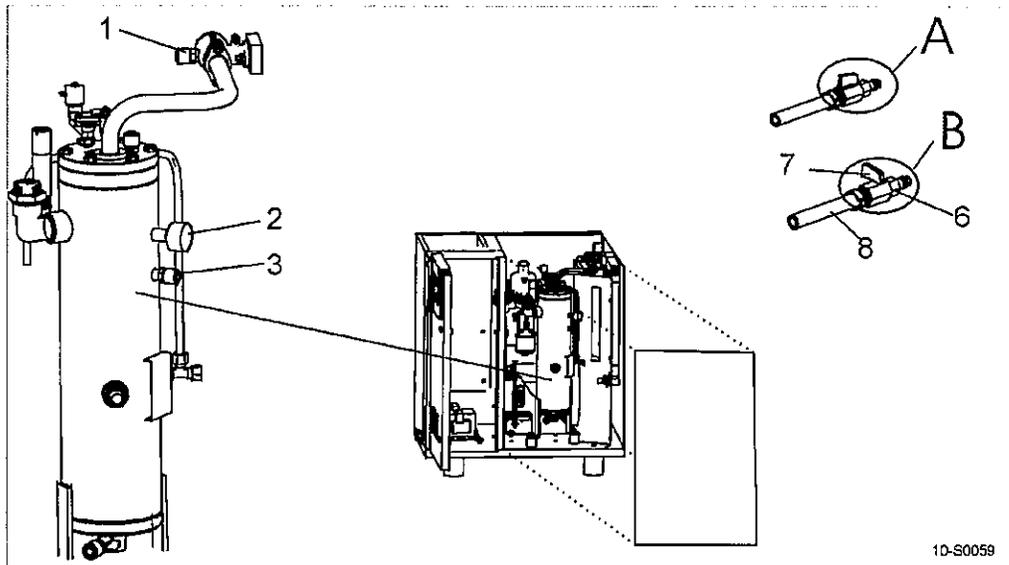


Fig. 26 Venting the machine

- |  |                         |
|--|-------------------------|
| ① Hose coupling (air cooler venting)         | ⑦ Shut-off valve.       |
| ② Pressure gauge                             | Ⓐ Shut-off valve open   |
| ③ Hose coupling (oil separator tank venting) | Ⓑ Shut-off valve closed |
| ⑥ Male hose coupling/fitting                 | ⑧ Maintenance hose      |

**Isolate the machine from the compressed air system.**

- Close the user's shut-off valve between the machine and the compressed air system.
- If no shut-off valve is provided, the complete compressed air system must be vented.



**Vent air from the oil separator tank.**



**WARNING**

Escaping oil mist is damaging to health.

- Do not direct the maintenance hose at a person while venting.
- Do not inhale the oil mist.
- Check that the oil separator tank pressure gauge reads 0 psig.



After automatic venting the pressure gauge does not read zero?

- Make sure that the shut-off valve is closed or that the compressed air system is vented to atmospheric.
- With the shut-off valve closed, insert the male hose fitting **⑥** into the hose coupling **③**.
- Slowly open the shut-off valve **⑦** to release pressure.
- Withdraw the male hose fitting **⑥** and close the shut-off valve **⑦**.
- If manual venting does **not** bring the oil separator tank pressure gauge to 0 psig, call an authorized KAESER Service representative.

**Vent air manually from the air cooler.**

After shutting down the compressor and venting the oil separator tank, there is still pressure on the machine from the compressed air system or in the section from the shut-off valve to the minimum pressure/check valve.

1. With the shut-off valve closed, insert the male hose fitting **⑥** into the hose coupling **①**.
2. Slowly open the shut-off valve **⑦** to release pressure.
3. Withdraw the male hose fitting **⑥** and close the shut-off valve **⑦**.

**10.14 Topping up the Cooling Oil**

The machine must be isolated from the compressed air system and completely vented before undertaking any work on the pressure system.

**Material** The hose coupling, shut-off valve and maintenance hose lie beneath the oil separator tank.

**Precondition** The power supply disconnecting device is switched off  
The disconnecting device is locked in the off position  
A check has been made no voltage is present

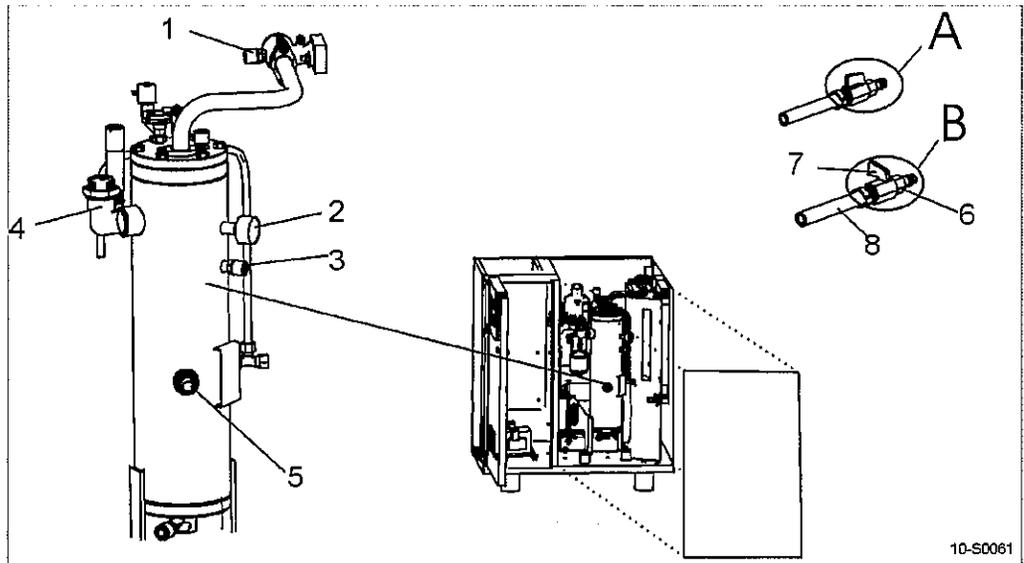


Fig. 27 Topping up the Cooling Oil

- |  |                              |
|--|------------------------------|
| ① Hose coupling (air cooler venting)         | ⑥ Male hose coupling/fitting |
| ② Pressure gauge                             | ⑦ Shut-off valve.            |
| ③ Hose coupling (oil separator tank venting) | Ⓐ Shut-off valve open        |
| ④ Oil filler with plug                       | Ⓑ Shut-off valve closed      |
| ⑤ Cooling oil level indicator                | ⑧ Maintenance hose           |

1. Vent the machine as described in 10.14.1.
2. Fill with cooling oil and test run as described in 10.14.2.

### 10.14.1 Venting the Machine (depressurizing)

The oil circuit vents automatically as soon as the machine is stopped.

Venting takes place in three stages:

- Isolate the compressor from the compressed air system.
- Vent air from the oil separator tank.
- Vent air manually from the air cooler.



**WARNING**

Compressed air!

Compressed air and devices under pressure can injure or cause death if the contained energy is released suddenly or uncontrolled.

- Vent all pressurized components and chambers completely.

**Isolate the machine from the compressed air system**

- Close the user's shut-off valve between the machine and the compressed air system.



If no shut-off valve is provided, the complete compressed air system must be vented.

**Vent air from the oil separator tank****WARNING**

Escaping oil mist is damaging to health.

- Do not direct the maintenance hose at a person while venting.
- Do not inhale the oil mist.

- Check that the oil separator tank pressure gauge reads 0 psig.



After automatic venting the pressure gauge does not read zero?

- Make sure that the shut-off valve is closed or that the compressed air system is vented to atmosphere.
- With the shut-off valve closed, insert the male hose fitting **6** into the hose coupling **3**.
- Slowly open the shut-off valve **7** to release pressure.
- Withdraw the male hose fitting **6** and close the shut-off valve **7**.
- If manual venting does **not** bring the oil separator tank pressure gauge to 0 psig, call an authorized KAESER Service representative.

**Vent air manually from the air cooler**

After shutting down the compressor and venting the oil separator tank, there is still pressure on the machine from the compressed air system or in the section from the shut-off valve to the minimum pressure/check valve.

1. With the shut-off valve closed, insert the male hose fitting **6** into the hose coupling **1**.
2. Slowly open the shut-off valve **7** to release pressure.
3. Withdraw the male hose fitting **6** and close the shut-off valve **7**.

**10.14.2 Top up with cooling oil and test run****Topping up the Cooling Oil**

A sticker on the oil separator tank gives the type of oil it contains.

**CAUTION**

The machine could be damaged by unsuitable oil

- Never mix different types of oil.
- Top up only with the same type of oil as already in the machine.

1. Unscrew the filler plug **4** slowly.
2. Top up to bring the oil to the correct level.
3. Replace the plug sealing ring if necessary and screw in the plug.

**Start the machine and carry out a test run**

1. Close all access doors; replace and secure all removable panels.
2. Open the user's shut-off valve between the machine and the compressed air system.
3. After about 10 minutes, check the oil level again and top up if necessary.
4. Switch off the machine and visually check for leaks.

**10.15 Changing the cooling oil**

The machine must be isolated from the compressed air network and completely vented before undertaking any work on the pressure system.

Drain the oil completely from the following components:

- Oil separator tank
- Oil cooler
- Thermostatic valve (option W1)

Always change the oil filter and oil separator cartridge when changing the oil.

Compressed air helps to expel the oil. This compressed air can be taken either from the compressor itself or from an external source.

An external source of compressed air is necessary in the following cases:

- The machine is not operational.
- The machine is to be restarted after a long period of standstill.

**Material**

Cooling oil

Cooling oil receptacle

The maintenance hose with hose coupling and shut-off valve needed for venting is stowed beneath the oil separator tank.

**WARNING**

There is risk of burns from hot components and oil.

- Wear long-sleeved clothing and gloves.

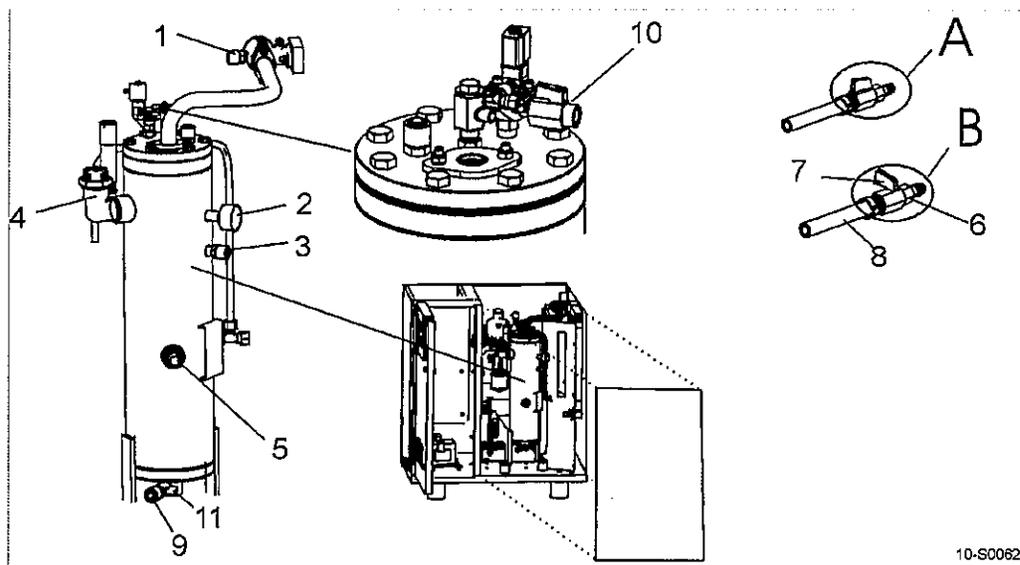


Fig. 28 Changing the cooling oil, oil separator tank

- |  |                                  |
|--|----------------------------------|
| 1 Hose coupling (air cooler venting)         | A Shut-off valve open            |
| 2 Pressure gauge                             | B Shut-off valve closed          |
| 3 Hose coupling (oil separator tank venting) | 8 Maintenance hose               |
| 4 Oil filler port with plug                  | 9 Hose coupling (oil drain)      |
| 5 Cooling oil level indicator                | 10 Shut-off valve (venting line) |
| 6 Male hose fitting                          | 11 Shut-off valve (oil drain)    |
| 7 Shut-off valve                             |                                  |

**Changing the oil with internal pressure**

The machine has been running for at least 5 minutes under LOAD.

The machine is fully vented, the pressure gauge on the oil separator tank reads 0 psig.

1. Close the shut-off valve (10) in the venting line.
2. Start the machine and watch the oil separator tank pressure gauge (2) until it reads 44–73 psig.
3. Switch off the machine.
4. Wait at least 2 minutes to allow the oil to flow back to the separator tank.

**Changing the oil using an external compressed air source**

The supply disconnecting device is switched off, the device is locked off, a check has been made that no voltage is present.

The machine is fully vented, the pressure gauge on the oil separator tank reads 0 psig.

An external source of compressed air is available.

1. Close the shut-off valve (10) in the venting line.
2. With the shut-off valve closed, insert the male hose fitting (6) into the hose coupling (3).
3. Connect the maintenance hose to the external air supply.
4. Open the shut-off valve (7) until the pressure gauge on the oil separator tank reads 44–73 psig.
5. Close the shut-off valve (7) and remove the male hose fitting from the coupling.

**Draining the oil from the separator tank**



Contact KAESER Service if condensate is detected in the cooling oil.  
It is necessary to adapt the aird discharge temperature to individual ambient conditions.

**Precondition** The supply disconnecting device is switched off, the device is locked off, a check has been made that no voltage is present.

1. Have an oil receptacle ready.
2. With the shut-off valve closed, insert the male hose fitting ⑥ into the hose coupling ②.
3. Place the end of the maintenance hose in the oil receptacle and secure it in place.
4. Open the shut-off valve ⑪.
5. Slowly open the shut off valve ⑦ in the maintenance hose to release oil and close immediately when air escapes.
6. Close the shut-off valve ⑪ and unplug the male hose fitting.



➤ Dispose of used oil in accordance with environmental protection regulations.

**Draining the oil from the cooler**

**Precondition** The supply disconnecting device is switched off, the device is locked off, a check has been made that no voltage is present.

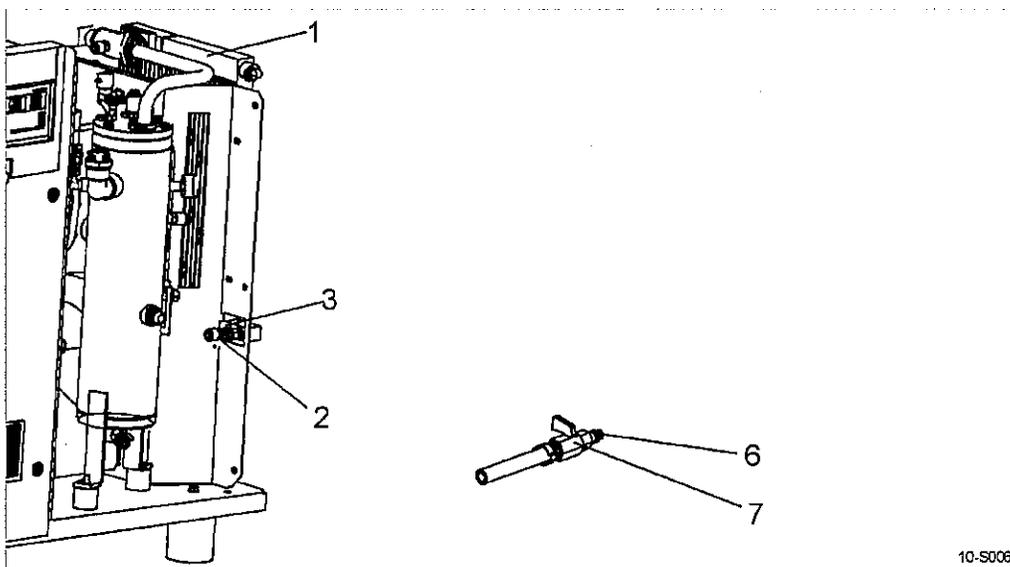


Fig. 29 Changing the cooling oil, oil cooler

- |                                |                     |
|--------------------------------|---------------------|
| ① Oil cooler                   | ⑥ Male hose fitting |
| ② Hose coupling (oil drainage) | ⑦ Shut-off valve    |
| ③ Shut-off valve               |                     |

1. Have an oil receptacle ready.
2. With the shut-off valve closed, insert the male hose fitting ⑥ into the hose coupling ②.
3. Place the end of the maintenance hose in the oil receptacle and secure it in place.

4. Open the shut-off valve ③.
5. Slowly open the shut-off valve ⑦ of the maintenance hose and allow oil and air to drain completely. Pressure gauge on the oil separator tank indicates 0 psig.
6. Close the shut-off valve ② and unplug the male hose fitting.
  - Dispose of used oil in accordance with environmental protection regulations.

**Option W1 Draining the oil from the thermostatic valve**

A drain plug is provided to drain oil from the thermostatic valve. If the machine is connected to an external heat recovery system, oil should also be drained from the heat exchanger at a suitable point.

**Precondition** The supply disconnecting device is switched off, the device is locked off, a check has been made that no voltage is present.

The machine is fully vented, the pressure gauge on the oil separator tank reads 0 psig.

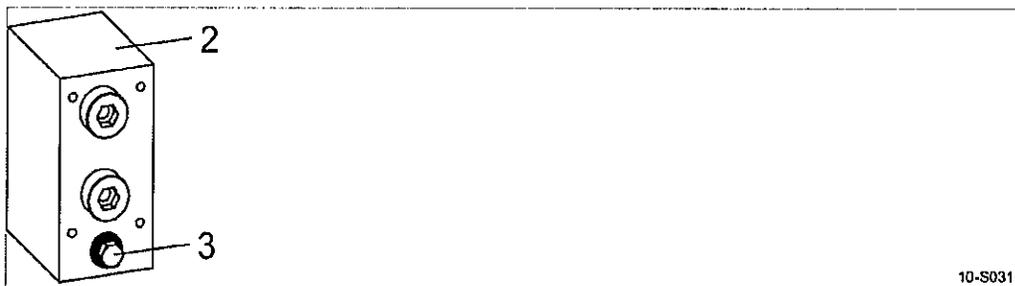


Fig. 30 Changing the cooling oil, heat recovery system

- ② Thermostatic valve
- ③ Screw plug

1. Have an oil receptacle ready.
2. Remove the drain plug ③ and allow the oil to drain completely.
3. Replace the plug ③.

**Filling with oil**

1. Slowly unscrew the filler plug ④ (see illustration 28).
2. Fill with cooling oil.
3. Check the filler plug and ring seal for damage and screw the plug back in again.

**Starting the machine and carrying out a trial run**

1. Close all access doors, replace and secure all removable panels.
2. Open the user's shut-off valve between the machine and the compressed air network.
3. Switch on the power supply and reset the maintenance interval counter.
4. Start the machine and check the oil level again after about 10 minutes, topping up if necessary.
5. Switch off the machine and check visually for leaks.

**10.16 Changing the Oil Filter**



The machine must be isolated from the compressed air system and completely vented before undertaking any work on the pressure system.

**Material** Replacement part  
Cooling oil container

**Precondition** The power supply disconnecting device is switched off  
The disconnecting device is locked in the off position  
A check has been made no voltage is present  
The machine is fully vented, the pressure gauge reads 0 psig.



**WARNING**

There is risk of burns from hot components and oil.

> Wear long-sleeved clothing and gloves.

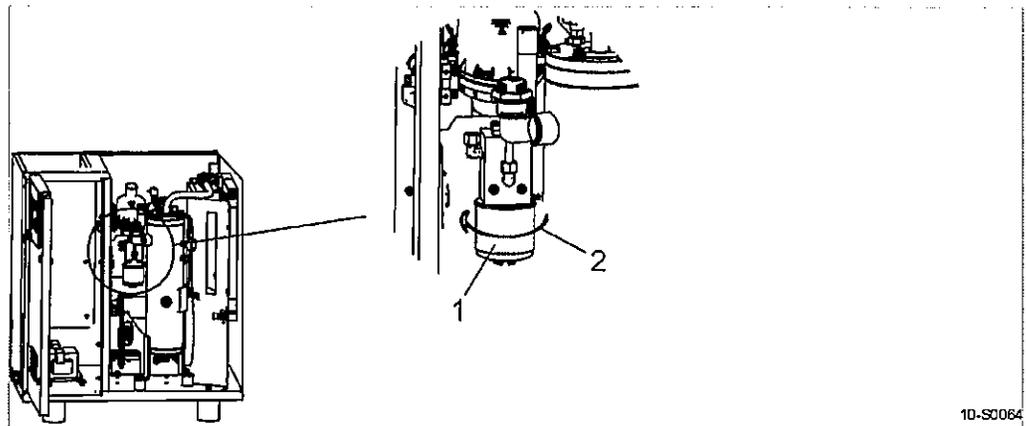


Fig. 31 Changing the oil filter

- ① Oil filter
- ② Direction to unscrew

**Changing the oil filter**

1. Unscrew the oil filter counter-clockwise, catch oil spillage and dispose of in accordance with environmental protection regulations.
2. Lightly oil the new filter's O-ring.
3. Turn the oil filter clockwise by hand to tighten.



> Dispose of parts and materials contaminated with oil in accordance with environmental protection regulations.

**Start the machine and carry out a test run**

1. Close all access doors; replace and secure all removable panels.
2. Open the user's shut-off valve between the machine and the compressed air system.
3. Switch on the power supply and reset the maintenance interval counter.

4. After about 10 minutes, check the oil level again and top up if necessary.
5. Switch off the machine and visually check for leaks.

**10.17 Changing the Oil Separator Cartridge**



The machine must be isolated from the compressed air system and completely vented before undertaking any work on the pressure system.

The oil separator cartridge cannot be cleaned.

The life of the oil separator cartridge is influenced by:

- contamination in the air drawn into the compressor,
- adherence to the changing intervals for:
  - cooling oil
  - oil filter
  - air filter

**Material** Replacement part  
Cleaning rag

**Precondition** The power supply disconnecting device is switched off  
The disconnecting device is locked in the off position  
A check has been made no voltage is present  
The machine is fully vented, the pressure gauge reads 0 psig.

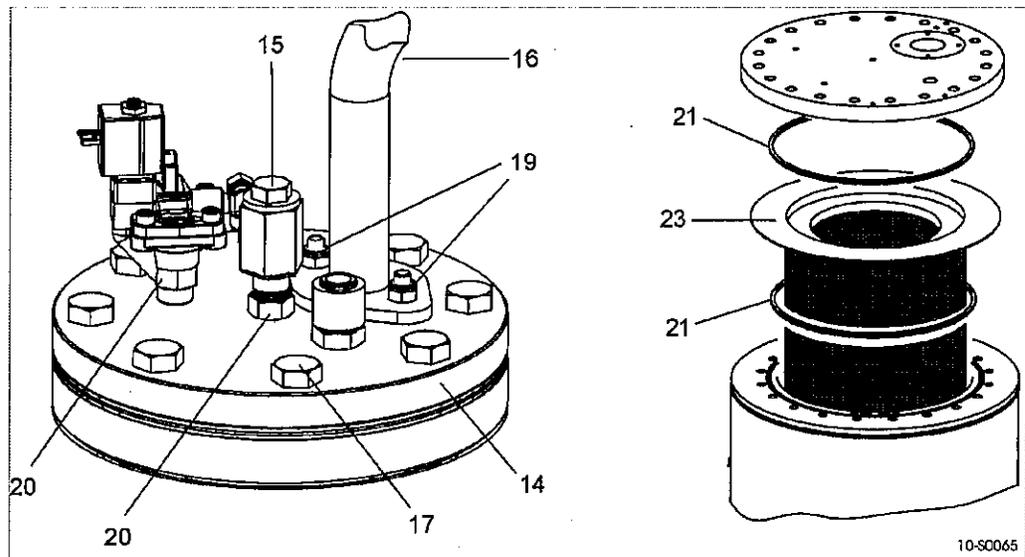


Fig. 32 Changing the Oil Separator Cartridge

- |                    |                            |
|--------------------|----------------------------|
| 14 Cover           | 19 Nut (self locking)      |
| 15 Dirt trap       | 20 Fitting                 |
| 16 Air pipe        | 21 Gasket                  |
| 17 Retaining screw | 23 Oil separator cartridge |

**Changing the Oil Separator Cartridge**

1. Unscrew the fitting (20) and carefully put the parts to one side, then pull out the copper pipe at item (15).
2. Unscrew the nut (19) and turn the air pipe (16) to one side.
3. Remove the cover retaining screws (17) and carefully lift the cover (14).
4. Take out the old oil separator cartridge (23) together with the gaskets (21) and dispose of these according to environmental protection regulations.
5. Clean all sealing faces.
6. Insert the new oil separator cartridge with gaskets and screw down the cover.
7. Install a new O-ring and strainer in the dirt trap (15).
8. Attach the air pipe to the cover (14) with a new, self-locking nut.
9. Replace and tighten all fittings.



- Dispose of parts and materials contaminated with oil in accordance with environmental protection regulations.

**Start the machine and carry out a test run**

1. Close all access doors; replace and secure all removable panels.
2. Open the user's shut-off valve between the machine and the compressed air system.
3. Switch on the power supply and reset the maintenance interval counter.
4. Stop the machine after 10 minutes and visually check for leaks.



## 11 Spares, Operating Materials, Service

### 11.1 Note the nameplate

The nameplate contains all information to identify your machine. This information is essential to us in order to provide you with optimal service.

- Please give the information from the nameplate with every inquiry and order for spares.

### 11.2 Ordering Consumable Parts and Operating Materials

The characteristics of KAESER consumable parts and operating materials correspond to the original and are particularly suited to the machine.



**WARNING**

Personal injury or damage to the machine may result from the use of unsuitable spare parts or operating materials.

Unsuitable or poor quality consumable parts and operating materials may damage the machine or impair its proper function.

In the event of damage, personal injury can result.

- Use only original KAESER parts and operating materials.
- Have an authorized KAESER Service representative carry out regular maintenance.

**Machine**

Name	Quantity	Number
Air filter element	1	1250
Filter mat (cooler)	1	1050
Filter mat (control cabinet)	2	1100
Oil filter	1	1200
Oil separator cartridge	1	1450
Cooling oil	1	1600
Drive belts	1	1800

Tab. 36 Consumable parts

### 11.3 SIGMA AIR SERVICE

SIGMA AIR SERVICE offers:

- authorized service technicians with KAESER factory training,
- increased operational reliability ensured by preventive maintenance,
- energy savings achieved by avoidance of pressure losses,
- optimum conditions for operation of the compressed air system,
- the security of genuine KAESER spare parts,
- increased legal certainty as all regulations are kept to.

- Why not sign a SIGMA AIR SERVICE maintenance agreement!

Result Your advantage:  
lower costs and higher compressed air availability.

## 11.4 Service Addresses

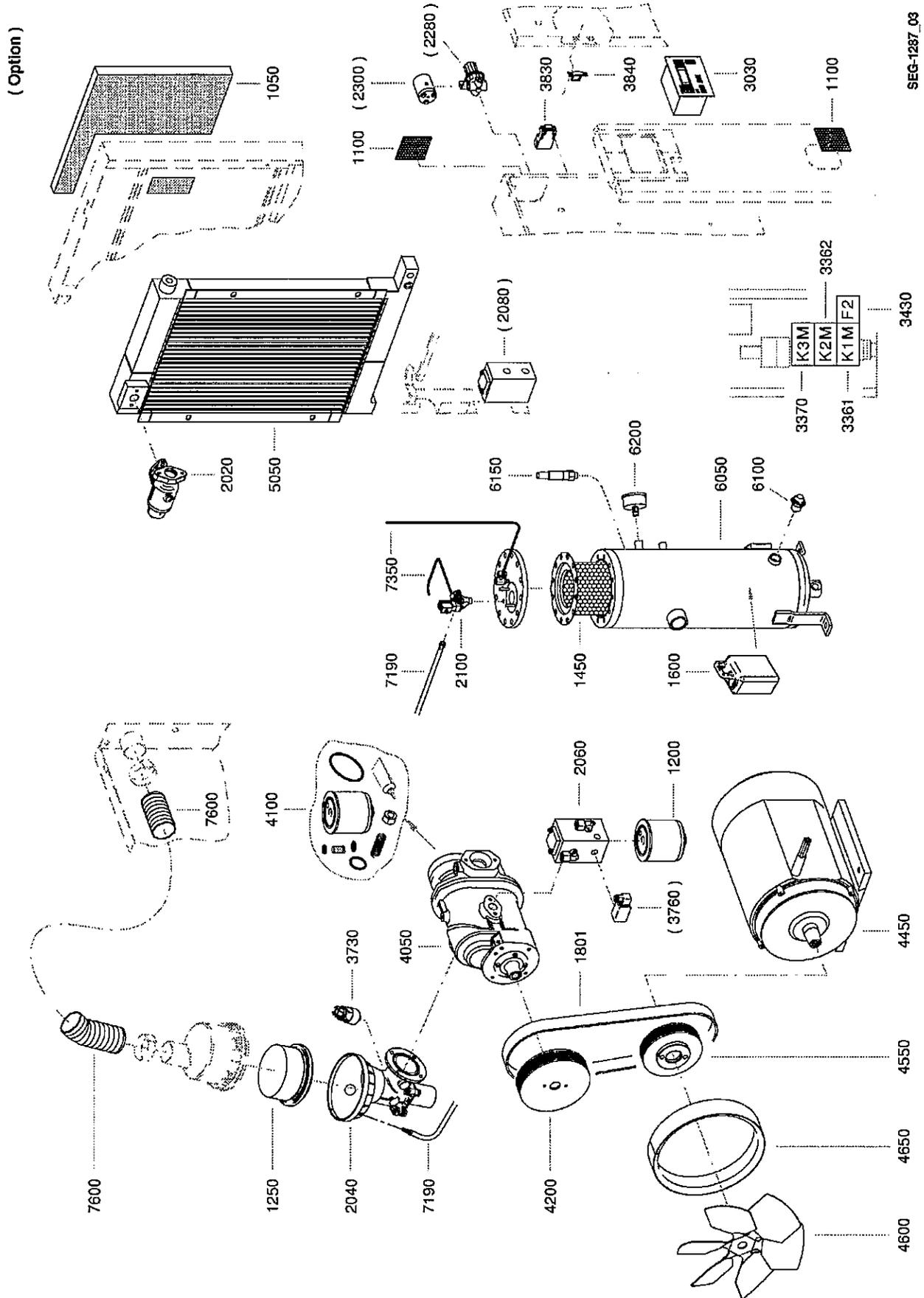
Addresses of KAESER representatives are given at the end of this manual.

## 11.5 Spare Parts for Service and Repair

With the help of this parts list you can plan your material requirement according to operating conditions and order the spare parts you need.



Make sure that any service or repair tasks not described in this manual are carried out by an authorized KAESER Service representative.



SEG-1287\_03

		<b>Legend</b>	<b>KAESER</b>
		SK	SEL-1458_04E
Item	Description	Option	
1050	Filter mat		
1100	Filter mat		
1200	Oil filter		
1250	Air filter		
1450	Oil separator cartridge		
1600	Sigma Fluid *)		
1801	Drive belts		
2020	Minimum pressure/check valve		
2022	Maintenance kit, MP/CV		
2024	Overhaul kit, MP/CV		
2040	Inlet valve		
2042	Maintenance kit, Inlet valve		
2044	Overhaul kit, Inlet valve		
2080	Thermostatic valve		
2062	Maintenance kit, thermostatic valve		
2064	Overhaul kit, thermostatic valve		
2080	Thermostatic valve		X
2062	Maintenance kit, thermostatic valve		
2064	Overhaul kit, thermostatic valve		
2100	Venting control valve		
2102	Maintenance kit, VC valve		
2104	Overhaul kit, VC valve		
2280	Proportional controller		X
2300	Pneumatic valve		X
2302	Maintenance kit, pneumatic valve		
3030	SIGMA controller		
3361	Contacteur		
3362	Contacteur		
3370	Contacteur		
3430	Overload protection cut-out		
3730	Safety pressure switch		
3732	Protective cap		
3760	Pressure differential switch		X
3830	Safety interlock switch		
3840	Actuator (interlock switch)		
4050	SIGMA airend		
4100	Airend installation kit		
4200	Belt pulley		
4450	Engine		
4451	Motor bearing kit		
4550	Belt pulley		
4600	Fan wheel		
4650	Fan spacer ring		
5050	Cooler		
6050	Oil separator tank		
6100	Oil level indicator		
6150	Pressure relief valve		
6200	Pressure gauge		
7190	Hose		
7350	Control line kit		
7600	Inlet hose		

Please quote the part number and serial number of the machine together with the item number and the description of the part when ordering.

Before and during all work, be sure to read and follow the safety and service instructions in the machine's service manual.

Maintenance intervals under good ambient and operating conditions, such as low to moderate ambient temperature and dry, clean inlet air.

Maintenance intervals may decrease due to ambient and operating conditions.

\*) See cooling fluid recommendations

## 12 Decommissioning, Storage and Transport

### 12.1 Putting Out of Operation

This is necessary under the following circumstances:

- The machine is temporarily not needed.
- The machine is to be moved to another location.
- The machine is to be scrapped.

#### Temporarily putting out of operation

Precondition The machine can be started at regular intervals.

- Run the machine once a week for at least 30 minutes under LOAD to ensure sufficient protection against corrosion.

#### Putting out of operation for a longer period

Precondition Before putting out of operation, the machine should be run under LOAD for at least 30 minutes.

Switch off the power supply disconnecting device, the disconnect device is locked in the off position, check that no voltage is present.

Machine fully vented (no pressure).

1. Allow the machine to cool down completely.
2. Disconnect all air and electrical connections.

### 12.2 Packing

A wooden crate is required for ground transport to protect the machine from mechanical damage. Consult an authorized KAESER Service representative for advice on packing for sea or air transport.

Material Desiccant  
Plastic sheeting  
Wooden transport crate

Precondition The machine is decommissioned.  
Machine is dry and cooled down.

1. Place desiccant inside the machine cabinet.
2. Wrap the machine in plastic sheeting.

### 12.3 Storage

Moisture can lead to corrosion, particularly on the surfaces of the airend and oil separator tank. Frozen moisture can damage components, diaphragms, valves and gaskets.



Advice can be obtained from KAESER on storage and re-commissioning.

**CAUTION**

Machine damage from moisture and frost.

- Prevent ingress of moisture and condensation.
- Maintain >32 °F storage temperature.
  
- Store the machine in a dry, frost-proof room.

## 12.4 Transporting

### 12.4.1 Safety

Weight and center of gravity determine the suitable transporting method. The center of gravity is shown in the drawing in chapter 13.3.

Precondition Transport only by fork truck or lifting cradle and with personnel trained in the safe use of the transport equipment.

- Make sure the danger zone is clear.

### 12.4.2 Transporting with a forklift

Precondition The whole machine must be over the forks.

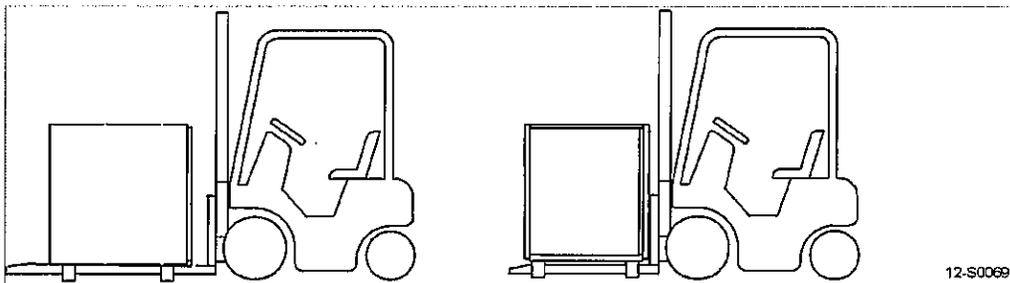


Fig. 33 Transporting with a forklift

- Drive the forks completely under the machine or palette and lift carefully.

### 12.4.3 Transporting with a crane

A suitable lifting cradle ensures correct transportation.

The lifting slings must be fully under the machine.

The slings must not press on the side of the machine.

Examples of unsuitable fixing points:

- Pipe supports
- Flanges
- Attached components such as centrifugal separators, condensate drains or filters
- Rain protection covers

Precondition The lifting cradle complies with local safety regulations.  
No pressure should bear on the sides of the machine cabinet.

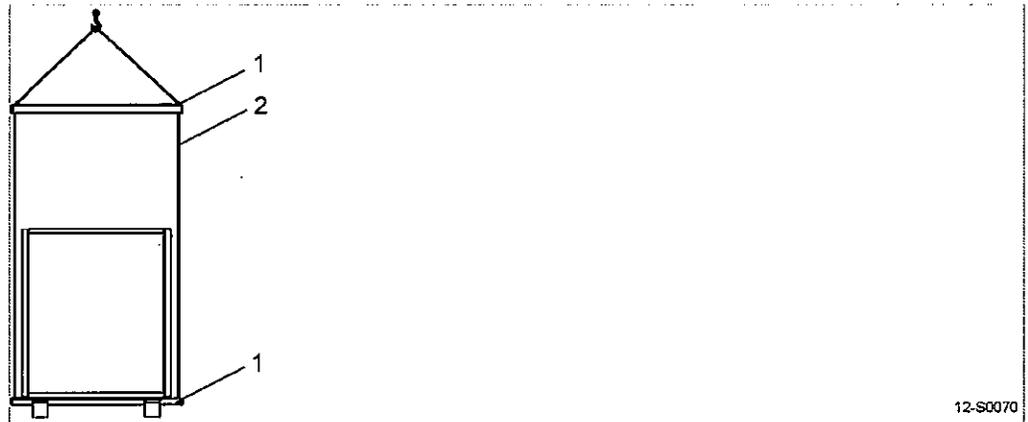


Fig. 34 Transporting with a crane

**CAUTION**

Machine damage by incorrect lifting cradle attachment.

- Do not attach the lifting cradle to any of the machine components.
- The machine manufacturer can advise on application of a suitable lifting cradle.
  
- Use the lifting cradle correctly and lift the machine carefully.

## 12.5 Disposal

When disposing of a machine, drain out all liquids and remove dirty filters.

Precondition The machine is decommissioned.

1. Completely drain the cooling oil from the machine.
2. Remove used filters and the oil separator cartridge.
3. Hand the machine over to an authorized disposal expert.



- Parts contaminated with cooling oil must be disposed of in accordance with local environment protection regulations.

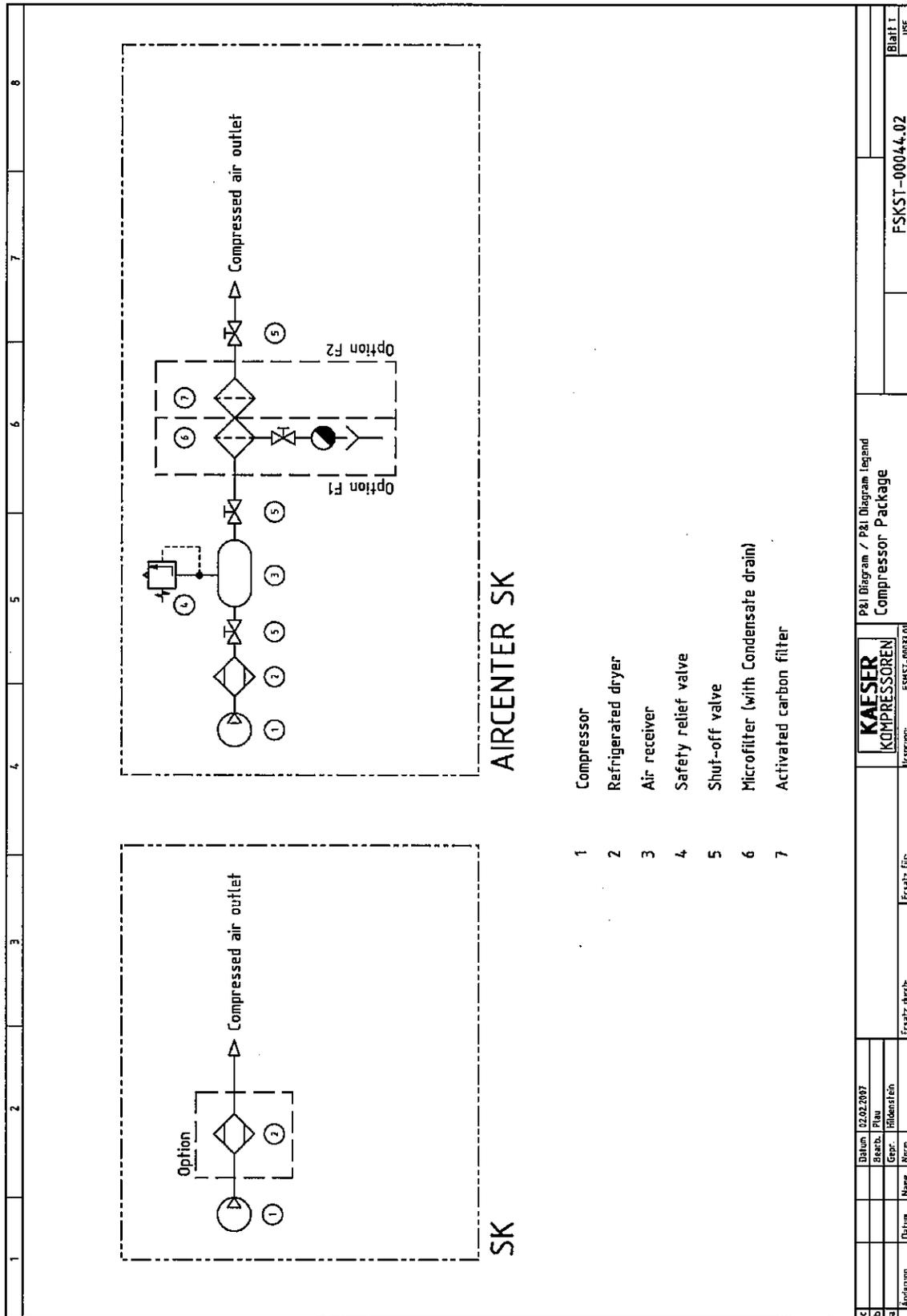
**Compressors with refrigeration dryers**

The sealed refrigerant circuit still contains both refrigerant and oil.

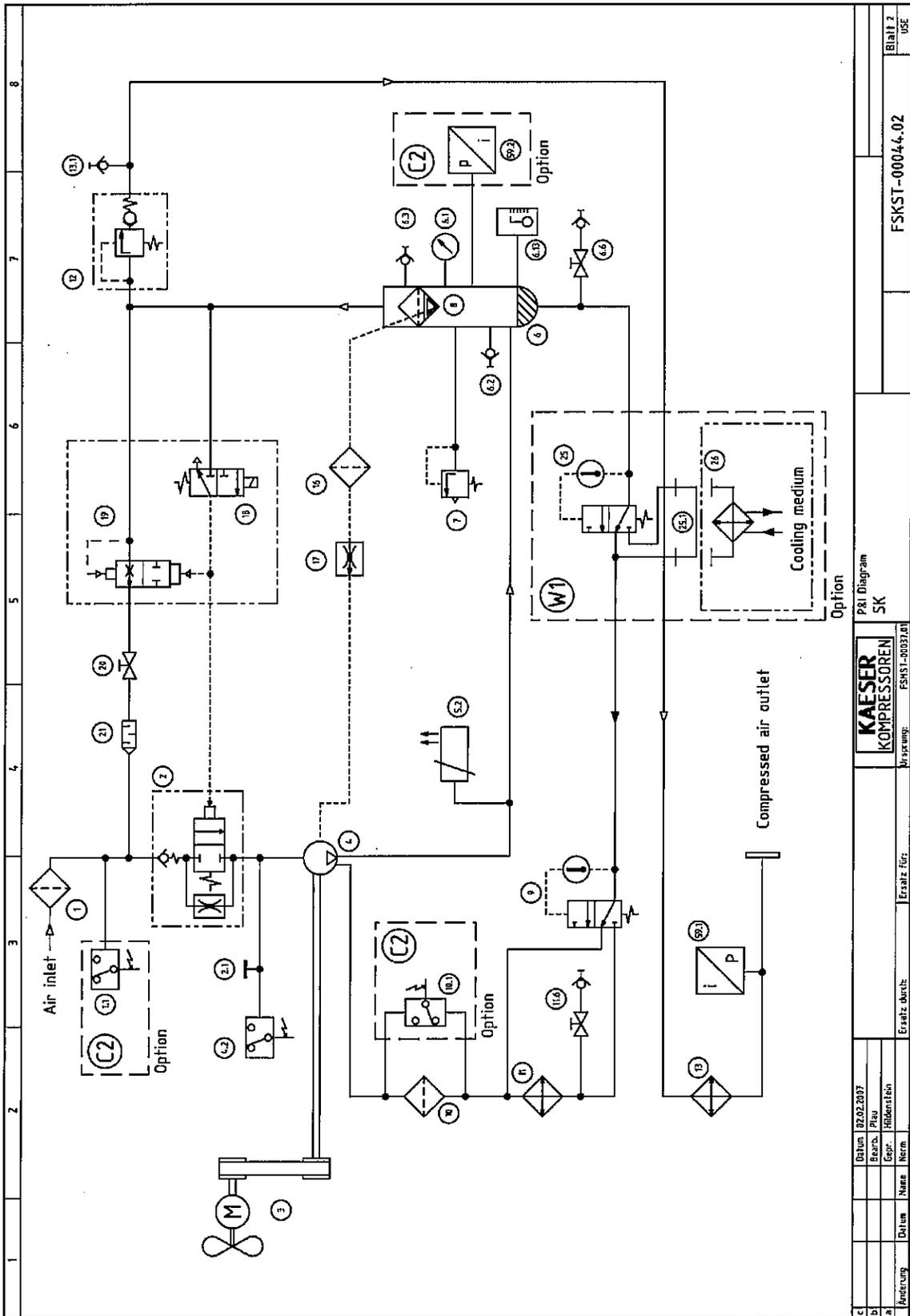
- Refrigerant and oil must be drained and disposed of by authorized personnel.

**13 Annex**

**13.1 Pipeline and instrument flow diagram (P+I diagram)**



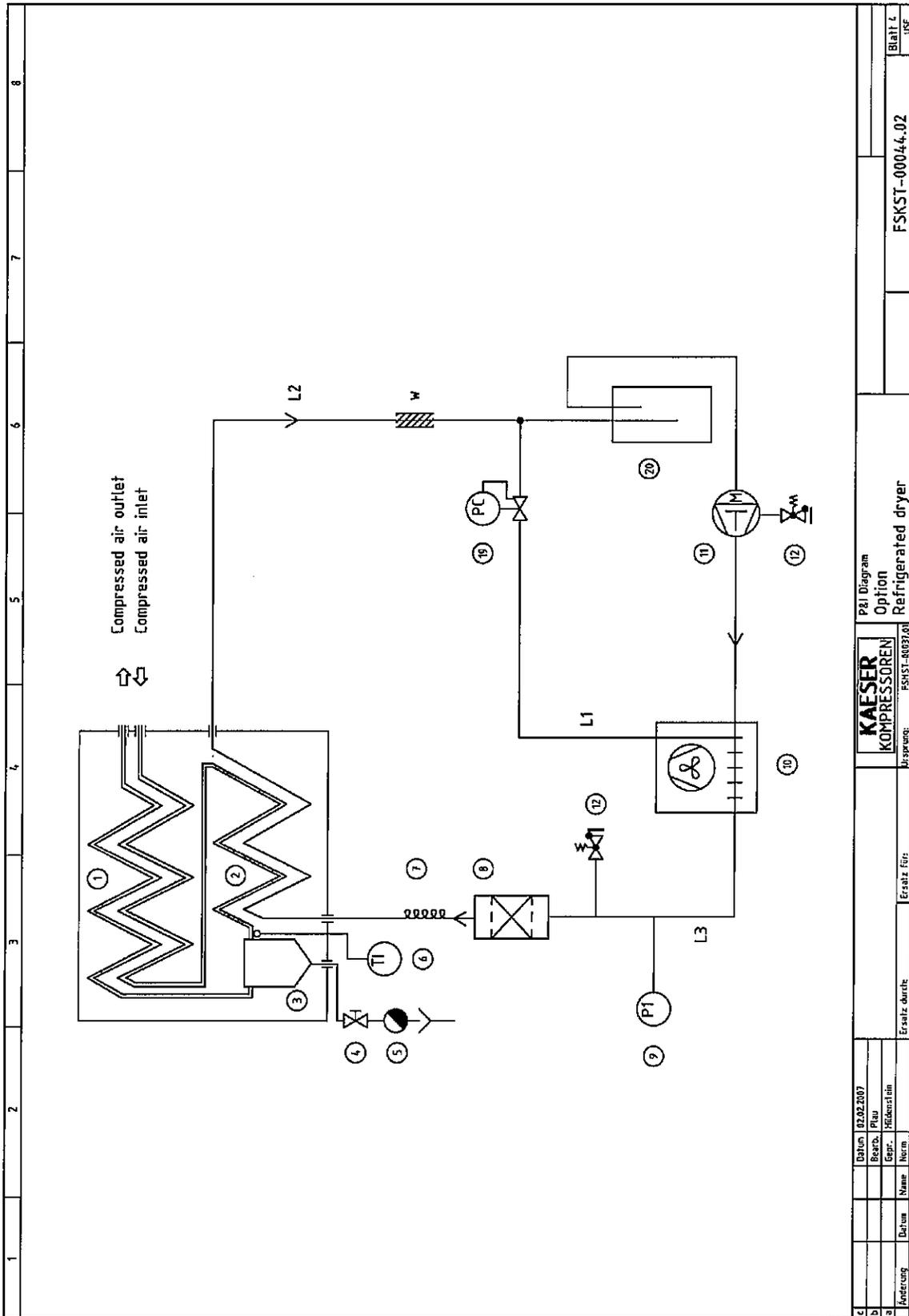
Date: 12.02.2007		P&I Diagram / P&I Diagram Legend	
Bearb. Plau		Compressor Package	
Grav. Hiltner/Fin		Blatt 1	
Name		USE	
Date		FSKST-00044-02	
Erreicht durch:		Kaufpreis: FSKST-0003120	
Erreicht durch:		Kaufpreis:	

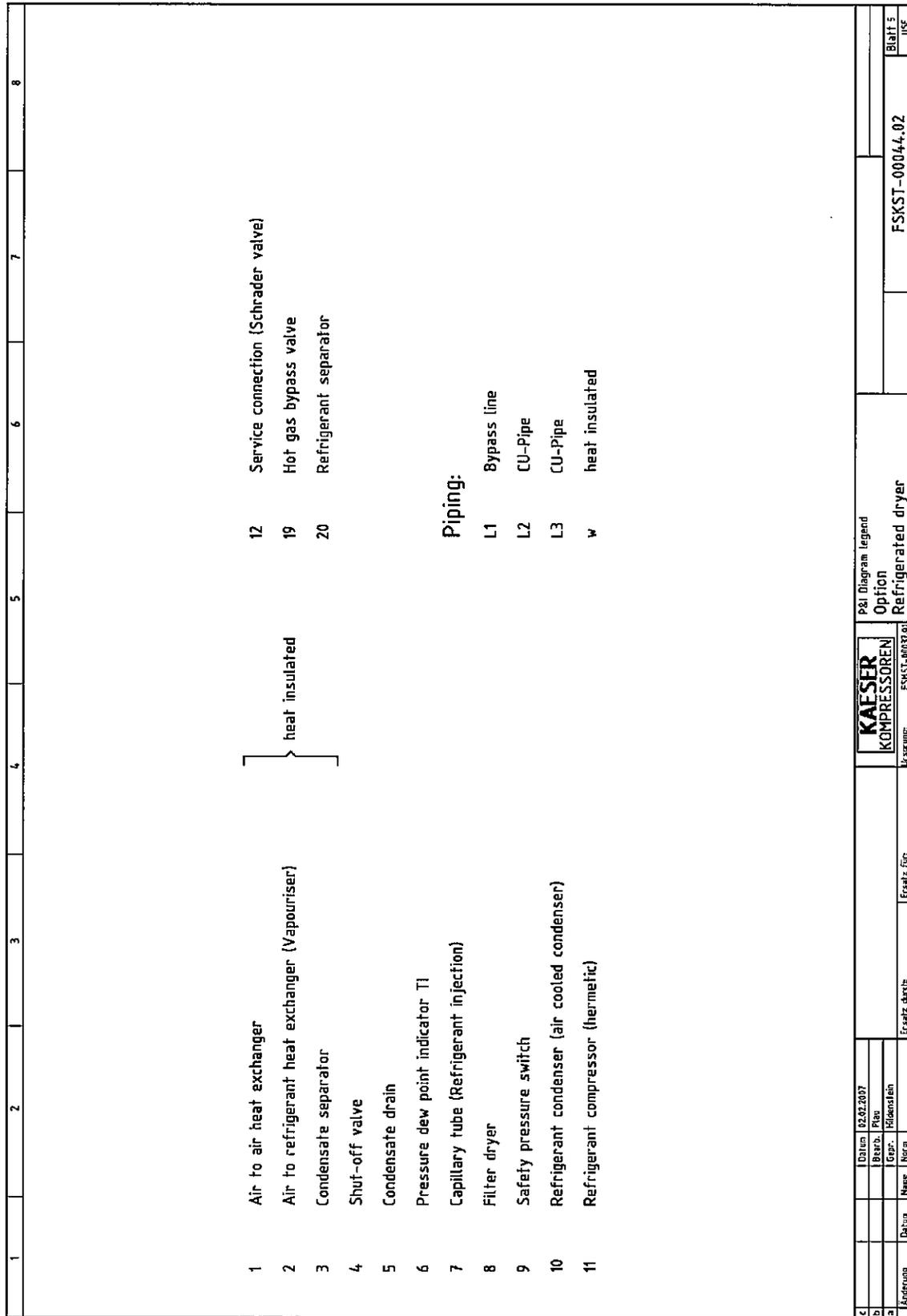


Date: 02.02.2007		Blatt 2	
Bearb.: Pflau		USE	
Exp.: Hildenstein		FSKST-00044.02	
Name: Norm.		P&I Diagram	
Ersatz durch:		SK	
Erstellt durch:		FSKST-00037.01	
Aenderung:		Date:	
Name:		Date:	
Norm.:		Date:	
Exp.:		Date:	
Bearb.:		Date:	
Date:		Date:	

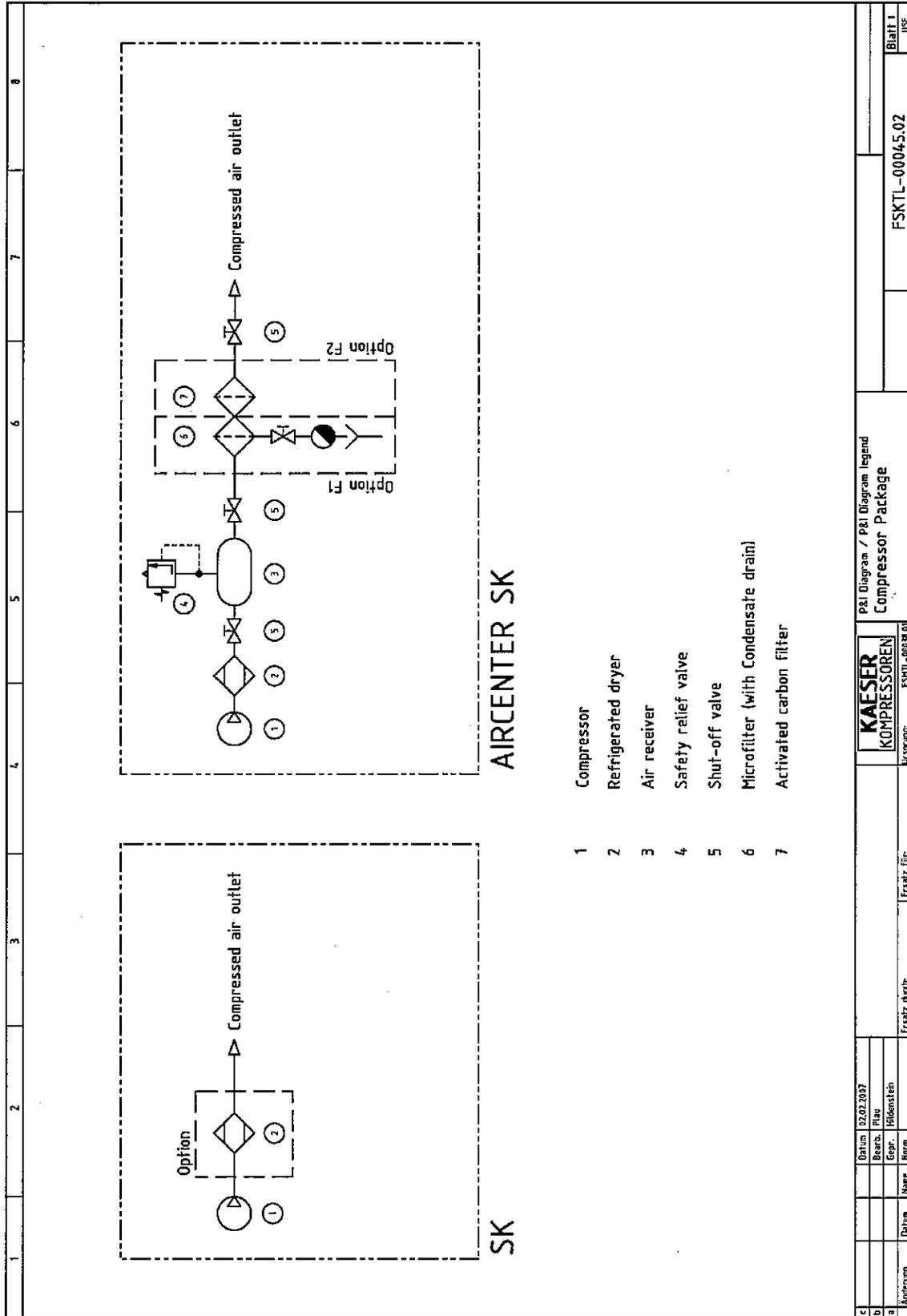
1	2	3	4	5	6	7	8
1	Air filter						
1.1	Vacuum switch - Air filter				12		Minimum pressure check valve
2	Inlet valve				13		Air aftercooler
2.1	Oil filler port with screw plug				13.1		Hose coupling
3	Drive motor				16		Dirt trap
4	Airend				17		Nozzle
4.2	Pressure switch - Wrong direction of rotation				18/19		Combined control/venting valve
5.2	PT100-sensor				18		Control valve
6	Oil separator tank				19		Venting valve
6.1	Pressure gauge				20		Shut-off valve - Venting line
6.2	Hose coupling (oil side)				21		Silencer
6.3	Hose coupling (air side)				25		Oil temperature thermostat for heat recovery system
6.6	Shut-off valve with hose coupling - Oil drain				25.1		Hose line
6.13	Oil level indicator				26		Heat recovery system
7	Safety relief valve				59.1		Pressure transducer - System pressure
8	Oil separator cartridge				59.2		Pressure transducer - Internal pressure
9	Oil temperature controller				Option		
10	Oil filter				C2		Filter monitoring
10.1	Differential pressure switch - Oil filter				W1		Heat recovery system, external
11	Oil cooler						
11.6	Shut-off valve with hose coupling - Oil drain						

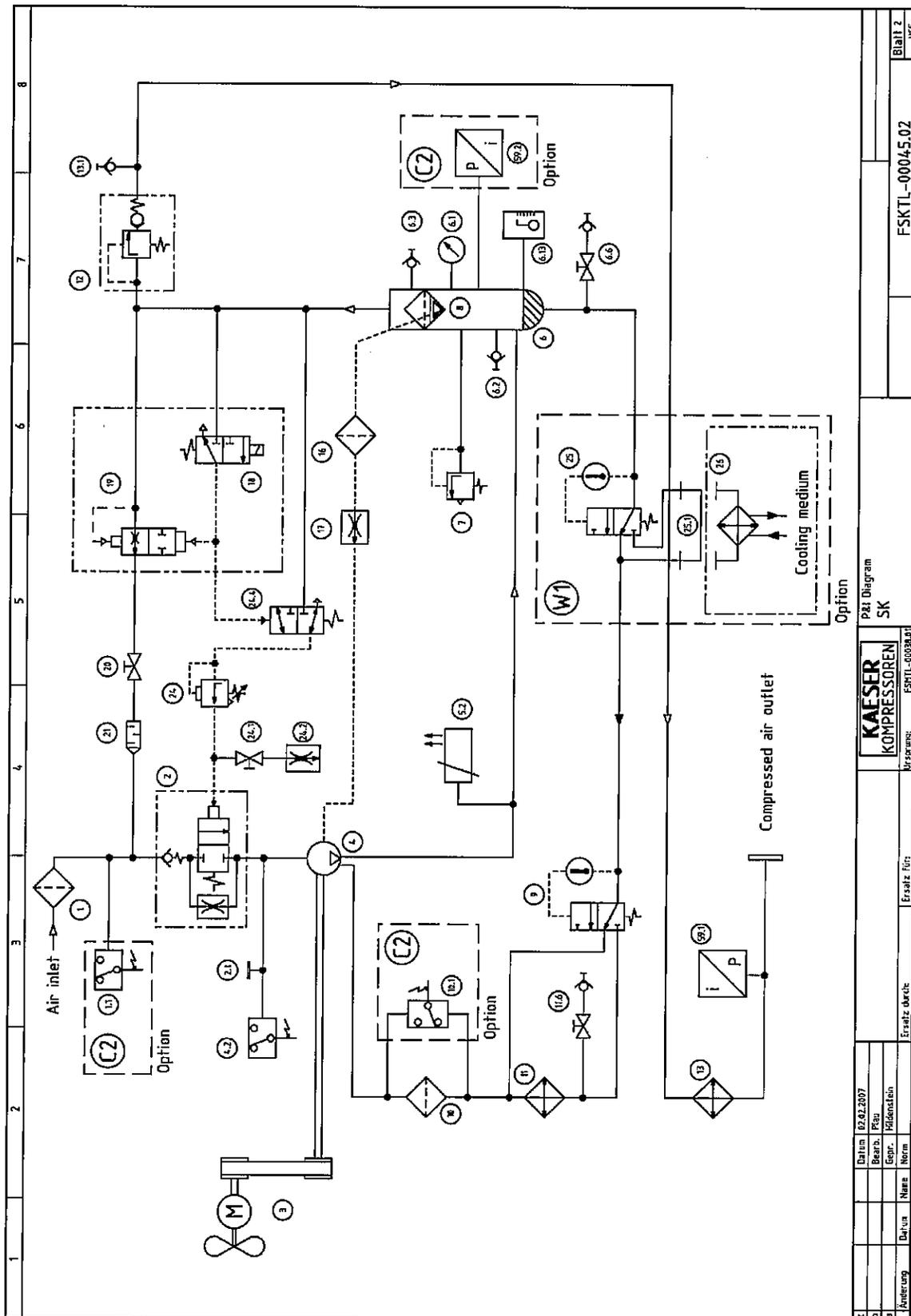
Kaeser logo		P&I Diagram legend	
SK		SK	
FSKST-00034a		FSKST-00044.02	
Ersatz: Etc.		Blatt 3	
Ersatz: Etc.		USE	





**13.2 Option C1**  
**Pipe and Instrument Flow Diagram (P+I diagram): MODULATING control mode**





Date: 02.02.2007		P&I Diagram		Blatt 2	
Bearb.: P&I		SK		USE	
Gepr.: Hildner/Fin		KOMPRESSOREN		FSKTL-00045.02	
Norm:		Ersatz für:		FSKTL-0038A.01	
Anfertigung:		Ersatz durch:			
Date:	Name:	Date:	Name:	Date:	Name:

1	2	3	4	5	6	7	8
1	Air filter		13	Air aftercooler			
1.1	Vacuum switch - Air filter		13.1	Hose coupling			
2	Inlet valve		16	Dirt trap			
2.1	Oil filler port with screw plug		17	Nozzle			
3	Drive motor		18/19	Combined control/venting valve			
4	Airend		18	Control valve			
4.2	Pressure switch - Wrong direction of rotation		19	Venting valve			
5.2	PT100-sensor		20	Shut-off valve - Venting line			
6	Oil separator tank		21	Silencer			
6.1	Pressure gauge		24	Proportional controller			
6.2	Hose coupling (oil side)		24.1	Shut-off valve open: machine in modulating control			
6.3	Hose coupling (air side)		24.2	Shut-off valve closed: package running in DUAL-/QUADRO or VARIO mode			
6.6	Shut-off valve with hose coupling - Oil drain		24.4	Nozzle			
6.13	Oil level indicator		25	3/2-Directional control valve			
7	Safety relief valve		25.1	Oil temperature thermostat for heat recovery system			
8	Oil separator cartridge		26	Hose line			
9	Oil temperature controller		59.1	Heat recovery system			
10	Oil filter		59.2	Pressure transducer - System pressure			
10.1	Differential pressure switch - Oil filter		Option	Pressure transducer - Internal pressure			
11	Oil cooler		C2	Filter monitoring			
11.6	Shut-off valve with hose coupling - Oil drain		W1	Heat recovery system, external			
12	Minimum pressure check valve						

Date: 12.02.2007		P&I Diagram legend	
Bearb. Plan	SK	Blatt 3	
Erstg.		USE	
Hilfsknoten		FSKTL-00045.02	
Bezeichnung	Bezeichnung	Kaufpreis: ESMIL-0003801	
	Ersatzbezeichnung	Ersatz. f.:	
		Ersatz. f.:	
		Ersatz. f.:	





13.3 Dimensional Drawing





## 13.4 Electrical Diagram

1	2	3	4	5	6	7	8
<p style="text-align: center;">Wiring Diagram compressor series SK with SIGMA CONTROL BASIC 380V±10% 3Ø 60CY      460V±10% 3Ø 60CY 575V±10% 3Ø 60CY Power supply: WYE system with center point solidly grounded</p> <p style="text-align: center;">manufacturer: KAESER COMPRESSORS 96450 COBURG GERMANY</p>							
<p><b>ATTENTION !!!</b> The document gives collective information on power supply voltages and frequencies for all machines. The voltage and frequency and local conditions under which any particular machine may be used are given on the nameplate of the machine and in the accompanying service manual.</p>							
<p>The drawings remain our exclusive property. They are entrusted only for the agreed purpose. Copies or any other reproductions, including storage, treatment and dissemination by use of electronic systems must not be made for any other than the agreed purpose. Neither originals nor reproductions must be forwarded or otherwise made accessible to third parties.</p>							
c		Datum		27.10.2005		USE	
b		ÄNDERUNG		26.04.07		Bauz. SHTer	
a		ÄNDERUNG		18.11.05		Bauz. SHTer	
A		Änderung		Datum		Name	
				Ersatz durch:		Ersatz für:	
KAESER KOMPRESSOREN Ursprung: UAS0200_02				cover page compressor series SK			
				DSK.B-U2000.00			
				Blatt 1			
				Bl.			

Lfd. Nr. No.	Benennung Name	Zählungsnummer (Kunde) Drawing No. (customer)	Zeichnungsnummer (Hersteller) Drawing No. (manufacturer)	Blatt Page	Anlagenkennzeichen Unit designation
1	cover page		DSK.B-U2000.00	1	
2	list of contents		ZSK.B-U2000.00	1	
3	block diagram		USK.B-U2000.00	1	
4	block diagram	performance-related components	USK.B-U2000.00	2	
5	block diagram	performance-related components	USK.B-U2000.00	3	
6	wiring diagram	power unit	SSK.B-U2000.00	1	
7	wiring diagram	control voltage tapping	SSK.B-U2000.00	2	
8	wiring diagram	supply/Relay-outputs	SSK.B-U2000.00	3	
9	wiring diagram	inputs inside	SSK.B-U2000.00	4	
10	wiring diagram	inputs/outputs external	SSK.B-U2000.00	5	
11	wiring diagram	control voltage supply	SSK.B-U2000.00	6	
12	wiring diagram	transformer diagrams	SSK.B-U2000.00	7	
13	terminal connection	terminal strip-X0,-X11	KSK.B-U2000.00	1	
14	terminal connection	option T3/-X31,-1X31,-2X31	KSK.B-U2000.00	2	
15	lay-out	control panel	ASK.B-U2000.00	1	

c		Datum 27.01.2005		list of contents		ZSK.B-U2000.00		Blatt 1	
b		Bearb. Siller		compressor series SK				Bl.	
a		Gene. Büdner		KAESER KOMPRESSOREN		Ursprung			
B) Änderung		Datum Name		Ersatz für:		Ersatz durch:			

1	2	3	4	5	6	7	8
<p><b>general instructions</b></p> <p><b>ATTENTION !!!</b> Install supplies, grounding and shock protection to local safety regulations. Control circuits are single-end-grounded, if they are floating they may only be used together with insulation monitoring. Do not make or break live plug-in connectors.</p> <p>control cabinet wiring for non-designated conductors primary circuits: black control voltage AC: red 18 AWG UL-Style 1015, CSA-TEW control voltage AC 15V: brown 18 AWG UL-Style 1015, CSA-TEW control voltage DC: blue 18 AWG UL-Style 1015, CSA-TEW external voltage: orange 16 AWG UL-Style 1015, CSA-TEW measuring circuits: violet 18 AWG UL-Style 1015, CSA-TEW ground conductor: green/yellow</p>							
<p>option F1 = microfilter AIR CENTER option T3 = option refrigeration dryer</p>							
<p><b>electrical equipment identification</b></p> <p><b>general components</b></p> <ul style="list-style-type: none"> <li>-A10 SIGMA CONTROL BASIC</li> <li>-1FU, -2FU primary control fuse</li> <li>-3FU secondary control fuse</li> <li>-K1M main contactor</li> <li>-K2M delta contactor</li> <li>-K3M wye contactor</li> <li>-M1 compressor motor</li> <li>-T1 control transformer</li> <li>-Y1 control valve</li> </ul> <p><b>option T3 - refrigeration dryer</b></p> <ul style="list-style-type: none"> <li>-A04 condensate drain</li> <li>-A05 condensate drain - option F1</li> <li>-K8M motor starter</li> <li>-M11 compressor motor</li> <li>-M12 vent motor</li> <li>-Q12 circuit breaker</li> <li>-T2 transformer</li> </ul>							
<p><b>terminal strips/plug-in connections</b></p> <ul style="list-style-type: none"> <li>-X0 terminal strip, power supply</li> <li>-X11 terminal strip, control</li> <li>-X31 terminal strip refrigeration dryer, option T3</li> <li>-1X31, -2X31 connector plug refrigeration dryer, option T3</li> </ul> <p><b>malfunction indicators</b></p> <p><i>automatic shutdown and indicating function:</i></p> <ul style="list-style-type: none"> <li>-B2 safety air pressure switch-direction of rotation</li> <li>-B11 temperature probe, airend discharge temperature</li> <li>-B30 safety air pressure switch, option T3</li> <li>-F2 overload relay compressor motor</li> <li>-S3 emergency stop pushbutton</li> <li>-S10 door safety interlock switch</li> </ul> <p><i>indicating function:</i></p> <ul style="list-style-type: none"> <li>-B1 pressure transducer, air main pressure</li> </ul>							
<p>a) option F1 24.04.97 B1/S1 Bearb. Sitter</p> <p>a) AN. 9559 18.11.05 B1/S1 Gepr. Böhmer</p> <p>c) Änderung Datum Name Notiz</p>		<p>Erstsz. durch: Ersatz für:</p>		<p>block diagram compressor series SK</p>		<p>USK.B-U2000.00</p>	
<p>1 Datum 12.01.2005</p>		<p>block diagram compressor series SK</p>		<p>USK.B-U2000.00</p>		<p>Blatt 1 Bl.</p>	

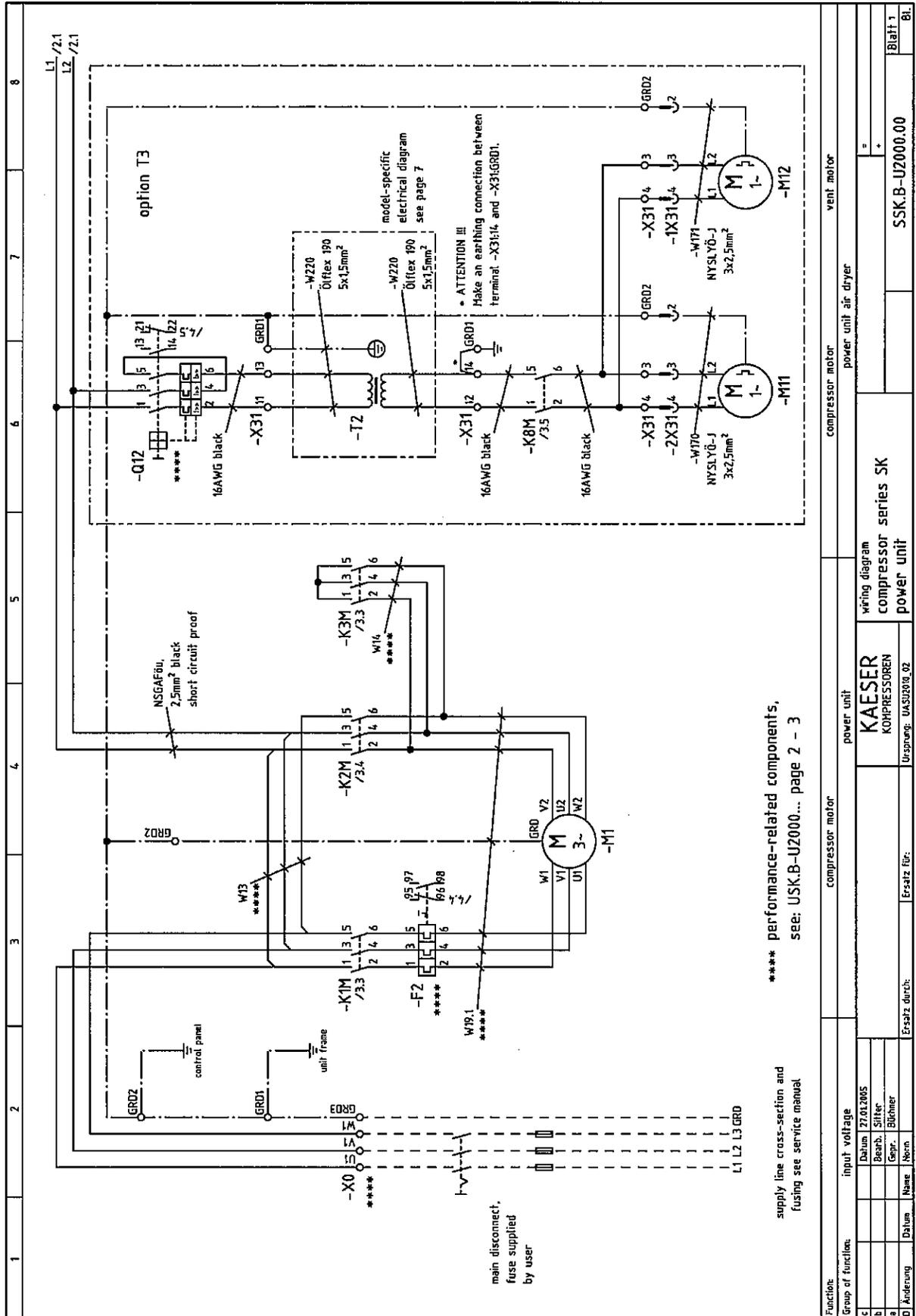
model		performance-related components SK 15 / SK 15 T			Blatt 2	Bl.
machine power supply		380 V ±10 %, 60 CY	460 V ±10 %, 60 CY	575 V ±10 %, 60 CY		
motors	-M1	15hp	15hp	15hp		
supply terminals	-X0 Siemens	7.314.0.02080 3RV1915-5A	7.314.0.02080 3RV1915-5A	7.314.0.02080 3RV1915-5A		
terminal strips	-X11	7.6836.00110 Wieland	7.6836.00110 Wieland	7.6836.00110 Wieland		
option T3	-X11/-X31	7.6836.00120 Wieland	7.6836.00120 Wieland	7.6836.00120 Wieland		
contactor	-K1M	7.6866.00010 3RT1026-1AK60	7.6865.00010 3RT1025-1AK60	7.6864.00010 3RT1024-1AK60		
auxiliary switch		2x 7.314.0.01690 3RH1921-1CA10	2x 7.314.0.01690 3RH1921-1CA10	2x 7.314.0.01690 3RH1921-1CA10		
interference suppressor	Siemens	7.314.0.02040 3RT1926-1CC00	7.314.0.02040 3RT1926-1CC00	7.314.0.02040 3RT1926-1CC00		
contactor	-K2M	7.6866.00010 3RT1026-1AK60	7.6865.00010 3RT1025-1AK60	7.6864.00010 3RT1024-1AK60		
auxiliary switch		7.314.0.02030 3RH1921-1CA01	7.314.0.02030 3RH1921-1CA01	7.314.0.02030 3RH1921-1CA01		
interference suppressor	Siemens	7.314.0.02040 3RT1926-1CC00	7.314.0.02040 3RT1926-1CC00	7.314.0.02040 3RT1926-1CC00		
contactor	-K3M	7.6865.00010 3RT1025-1AK60	7.6863.00010 3RT1023-1AK60	7.6863.00010 3RT1023-1AK60		
auxiliary switch		7.314.0.01690 3RH1921-1CA10	7.314.0.01690 3RH1921-1CA10	7.314.0.01690 3RH1921-1CA10		
auxiliary switch		7.314.0.02030 3RH1921-1CA01	7.314.0.02030 3RH1921-1CA01	7.314.0.02030 3RH1921-1CA01		
interference suppressor	Siemens	7.314.0.02040 3RT1926-1CC00	7.314.0.02040 3RT1926-1CC00	7.314.0.02040 3RT1926-1CC00		
contactor	-K8M	7.6874.00010 3RT1016-1AK61	7.6874.00010 3RT1016-1AK61	7.6874.00010 3RT1016-1AK61		
option T3		7.314.0.02060 3RT1916-1CC00	7.314.0.02060 3RT1916-1CC00	7.314.0.02060 3RT1916-1CC00		
interference suppressor	Siemens	7.314.0.02060 3RT1916-1CC00	7.314.0.02060 3RT1916-1CC00	7.314.0.02060 3RT1916-1CC00		
overload relay	-F2 Siemens	7.6873.00190 3RB2026-1QB0 6-25 A	7.6873.00190 3RB2026-1QB0 6-25 A	7.6873.00180 3RB2026-1SB0 3-12 A		
fuses	-1FU/-2FU Gould	2x 7.3311.1 ATQR 8/10 (0,8 A, 600 V)	2x 7.3311.1 ATQR 8/10 (0,8 A, 600 V)	2x 7.3310.1 ATQR 1/2 (0,5 A, 600 V)		
fuses	-3FU Gould	7.3303.00040 TRM 8/10 (0,8 A, 250 V)	7.3303.00040 TRM 8/10 (0,8 A, 250 V)	7.3303.00040 TRM 8/10 (0,8 A, 250 V)		
fuse socket	-1FU/2FU/3FU Gould	7.3320.00010 USM 3	7.3320.00010 USM 3	7.3320.00010 USM 3		
circuit breaker	-Q12	7.6860.00160 3RV1011-1FA10 3,5-5 A	7.6860.00160 3RV1011-1FA10 3,5-5 A	7.6860.01150 3RV1021-1EA10 2,8-4 A		
auxiliary switch	Siemens	7.314.0.01890 3RV1901-1E	7.314.0.01890 3RV1901-1E	7.314.0.01890 3RV1901-1E		
transformer	-T1	7.6852.0 4AM3896-0EP80-0FA1 120 VA diagram 1, Sht. 6	7.6844.0 4AM3496-0ET10-0CS1 120 VA diagram 2, Sht. 6	7.6852.0 4AM3896-0EP80-0FA1 120 VA diagram 3, Sht. 6		
fuse	Siemens	7.6849.0 T3,15H / 3,15 A, 250 V	7.6849.0 T3,15H / 3,15 A, 250 V	7.6849.0 T3,15H / 3,15 A, 250 V		
transformer	-T2	7.2292.10060 USTE1600 7,0 A diagram 2, Sht. 7	7.2292.10080 B0312006 7,0 A diagram 1, Sht. 7	7.2292.10060 USTE1600 7,0 A diagram 2, Sht. 7		
connection	-W13 Siemens	7.314.0.02110 3RT1926-4CC20	7.314.0.02110 3RT1926-4CC20	7.314.0.02110 3RT1926-4CC20		
connection	-W14 Siemens	7.314.0.02130 3RA1923-3D	7.314.0.02130 3RA1923-3D	7.314.0.02130 3RA1923-3D		
cables	-W19.1./2	BETATHERM 155 7x1x4 mm <sup>2</sup>	BETATHERM 155 7x1x4 mm <sup>2</sup>	BETATHERM 155 7x1x4 mm <sup>2</sup>		
compressor control	-A10 Siemens	7.7005.2 SIGMA CONTROL BASIC	7.7005.2 SIGMA CONTROL BASIC	7.7005.2 SIGMA CONTROL BASIC		
emergency stop pushbutton	-S3	7.3217.0 QRUV	7.3217.0 QRUV	7.3217.0 QRUV		
auxiliary contact	Schlegel	7.3218.0 MHT00	7.3218.0 MHT00	7.3218.0 MHT00		
control cabinet	KAESER	7.7678.00011	7.7678.00011	7.7678.00011		
control panel	KAESER	211261.0	211261.0	211261.0		

block diagram	compressor series SK
KAESER	KOMPRESSOREN
Ursprung	Ersatz für:
Ersatz durch:	
Datum	27.02.2005
Bearb.	SITler
Exp.	Bilchner
Name	
Datum	
Änderung	

		performance-related components				
model		SK 20 / SK 20 T			Blatt 3	
machine power supply		380V ±10%, 60CY	460V ±10%, 60CY	575V ±10%, 60CY		
motors	-M1	20 hp	20 hp	20 hp		
supply terminats	-X0 Siemens	7.314.0.02080 3RV1915-5A	7.314.0.02080 3RV1915-5A	7.314.0.02080 3RV1915-5A		
terminal strips	-X11	7.6835.00060 Wieland	7.6836.00060 Wieland	7.6836.00110 Wieland		
option T3	-X11/-X31	7.6836.00070 Wieland	7.6836.00070 Wieland	7.6836.00120 Wieland		
contactor	-K1M	7.6866.00010 3RT1026-1AK60	7.6866.00010 3RT1026-1AK60	7.6865.00010 3RT1025-1AK60		
auxiliary switch		2x 7.314.0.01690 3RH1921-1CA10	2x 7.314.0.01690 3RH1921-1CA10	2x 7.314.0.01690 3RH1921-1CA10		
interference suppressor		7.314.0.02040 Siemens 3RT1926-1CC00	7.314.0.02040 3RT1926-1CC00	7.314.0.02040 3RT1926-1CC00		
contactor	-K2M	7.6866.00010 3RT1026-1AK60	7.6866.00010 3RT1026-1AK60	7.6865.00010 3RT1025-1AK60		
auxiliary switch		7.314.0.02030 3RH1921-1CA01	7.314.0.02030 3RH1921-1CA01	7.314.0.02030 3RH1921-1CA01		
interference suppressor		7.314.0.02040 Siemens 3RT1926-1CC00	7.314.0.02040 3RT1926-1CC00	7.314.0.02040 3RT1926-1CC00		
contactor	-K3M	7.6865.00010 3RT1025-1AK60	7.6865.00010 3RT1025-1AK60	7.6863.00010 3RT1023-1AK60		
auxiliary switch		7.314.0.01690 3RH1921-1CA10	7.314.0.01690 3RH1921-1CA10	7.314.0.01690 3RH1921-1CA10		
auxiliary switch		7.314.0.02030 3RH1921-1CA01	7.314.0.02030 3RH1921-1CA01	7.314.0.02030 3RH1921-1CA01		
interference suppressor		7.314.0.02040 Siemens 3RT1926-1CC00	7.314.0.02040 3RT1926-1CC00	7.314.0.02040 3RT1926-1CC00		
contactor	-K8M	7.6874.00010 3RT1016-1AK61	7.6874.00010 3RT1016-1AK61	7.6874.00010 3RT1016-1AK61		
option T3		7.314.0.02060	7.314.0.02060	7.314.0.02060		
interference suppressor		7.314.0.02060 Siemens 3RT1916-1CC00	7.314.0.02060 3RT1916-1CC00	7.314.0.02060 3RT1916-1CC00		
overload relay	-F2	7.6873.00190 3RB2026-1QB0 6-25 A	7.6873.00190 3RB2026-1QB0 6-25 A	7.6873.00190 3RB2026-1QB0 6-25 A		
fuses	-1FU/-2FU	7.3303.00040 Gould ATQR 8/10 (0,8 A, 600 V)	7.3303.00040 ATQR 8/10 (0,8 A, 600 V)	7.3303.00040 ATQR 1/2 (0,5 A, 600 V)		
fuses	-3FU	7.3303.00040 Gould TRM 8/10 (0,8 A, 250 V)	7.3303.00040 TRM 8/10 (0,8 A, 250 V)	7.3303.00040 TRM 8/10 (0,8 A, 250 V)		
fuse socket	-1FU/2FU/3FU	7.3320.00010 Gould USM 3	7.3320.00010 USM 3	7.3320.00010 USM 3		
circuit breaker	-Q12	7.6860.00160 3RV1011-1FA10 3,5-5 A	7.6860.00160 3RV1011-1FA10 3,5-5 A	7.6860.01150 3RV1021-1EA10 2,8-4 A		
auxiliary switch		7.314.0.01890 Siemens 3RV1901-1E	7.314.0.01890 3RV1901-1E	7.314.0.01890 3RV1901-1E		
transformer	-T1	7.6852.0 4AM3896-0EP80-0FA1 120 VA diagram 1, Sht. 6	7.6844.0 4AM3496-0ET10-0CS1 120 VA diagram 2, Sht. 6	7.6852.0 4AM3896-0EP80-0FA1 120 VA diagram 3, Sht. 6		
fuse		7.6849.0 Siemens T3,15H / 3,15 A, 250 V	7.6849.0 T3,15H / 3,15 A, 250 V	7.6849.0 T3,15H / 3,15 A, 250 V		
transformer	-T2	7.2292.10060 option T3	7.2292.10080 B0312006 7,0 A diagram 1, Sht. 7	7.2292.10060 USTE1600 7,0 A diagram 2, Sht. 7		
connection	-W13	7.314.0.02110 Siemens 3RT1926-4CC20	7.314.0.02110 3RT1926-4CC20	7.314.0.02110 3RT1926-4CC20		
connection	-W14	7.314.0.02130 Siemens 3RA1923-3D	7.314.0.02130 3RA1923-3D	7.314.0.02130 3RA1923-3D		
cables	-W19.1/2	BETATHERM 155 7x1x6 mm <sup>2</sup>	BETATHERM 155 7x1x6 mm <sup>2</sup>	BETATHERM 155 7x1x4 mm <sup>2</sup>		
compressor control	-A10	7.7005.2 Siemens SIGMA CONTROL BASIC	7.7005.2 SIGMA CONTROL BASIC	7.7005.2 SIGMA CONTROL BASIC		
emergency stop pushbutton	-S3	7.3217.0 QRUV	7.3217.0 QRUV	7.3217.0 QRUV		
auxiliary contact		7.3218.0 Schlegel MHT00	7.3218.0 MHT00	7.3218.0 MHT00		
control cabinet	KAESER	7.7678.00011	7.7678.00011	7.7678.00011		
control panel	KAESER	211261.0	211261.0	211261.0		

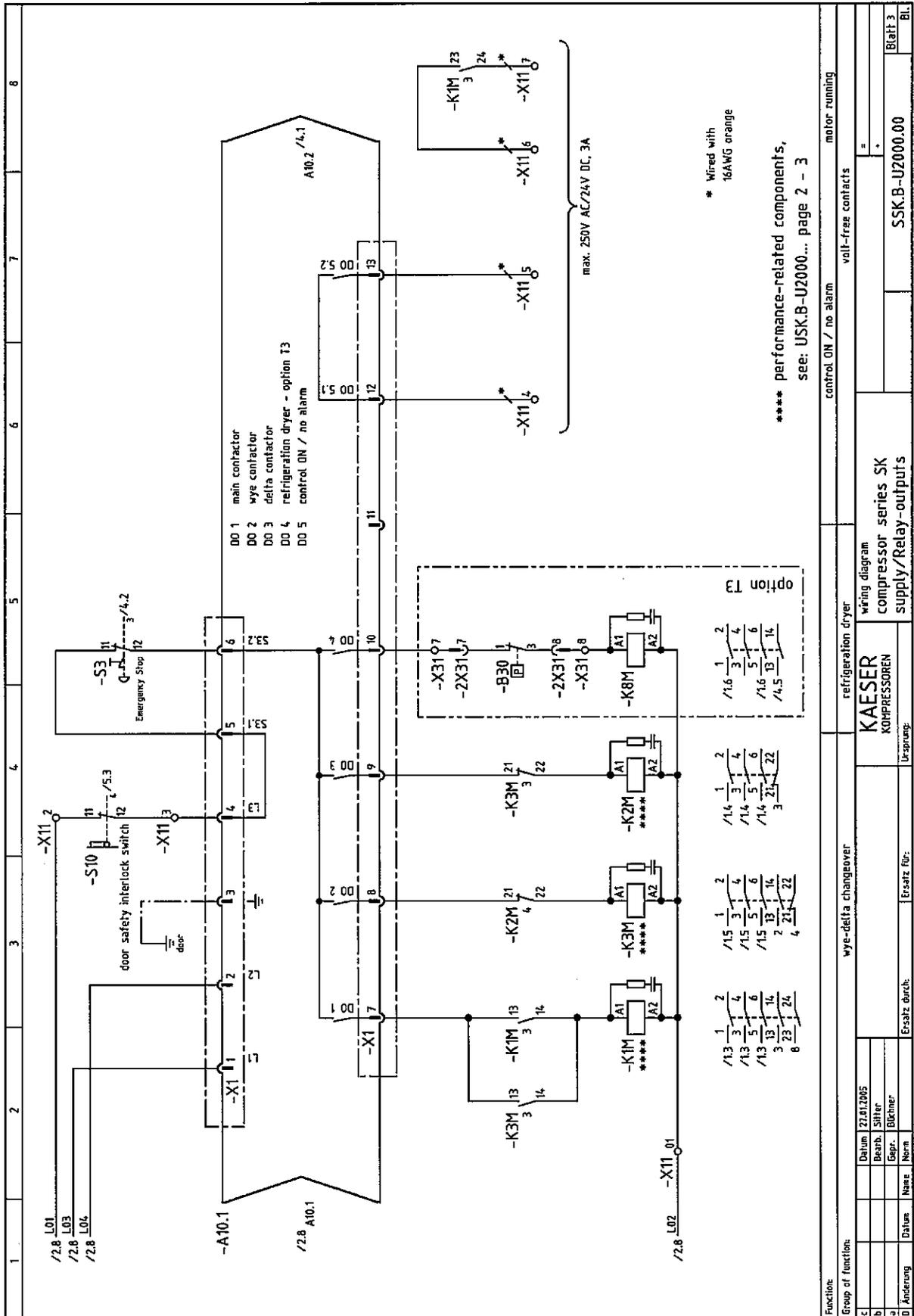
block diagram  
 compressor series SK  
 KAESER  
 KOMPRESSOREN  
 Ursprung:  
 Ersatz für:  
 Datum 27.03.2005  
 Bearb. Sittler  
 Gepr. Blüthner  
 Datum 26.04.07  
 R17/31  
 Änderung

USK.B-U2000.00

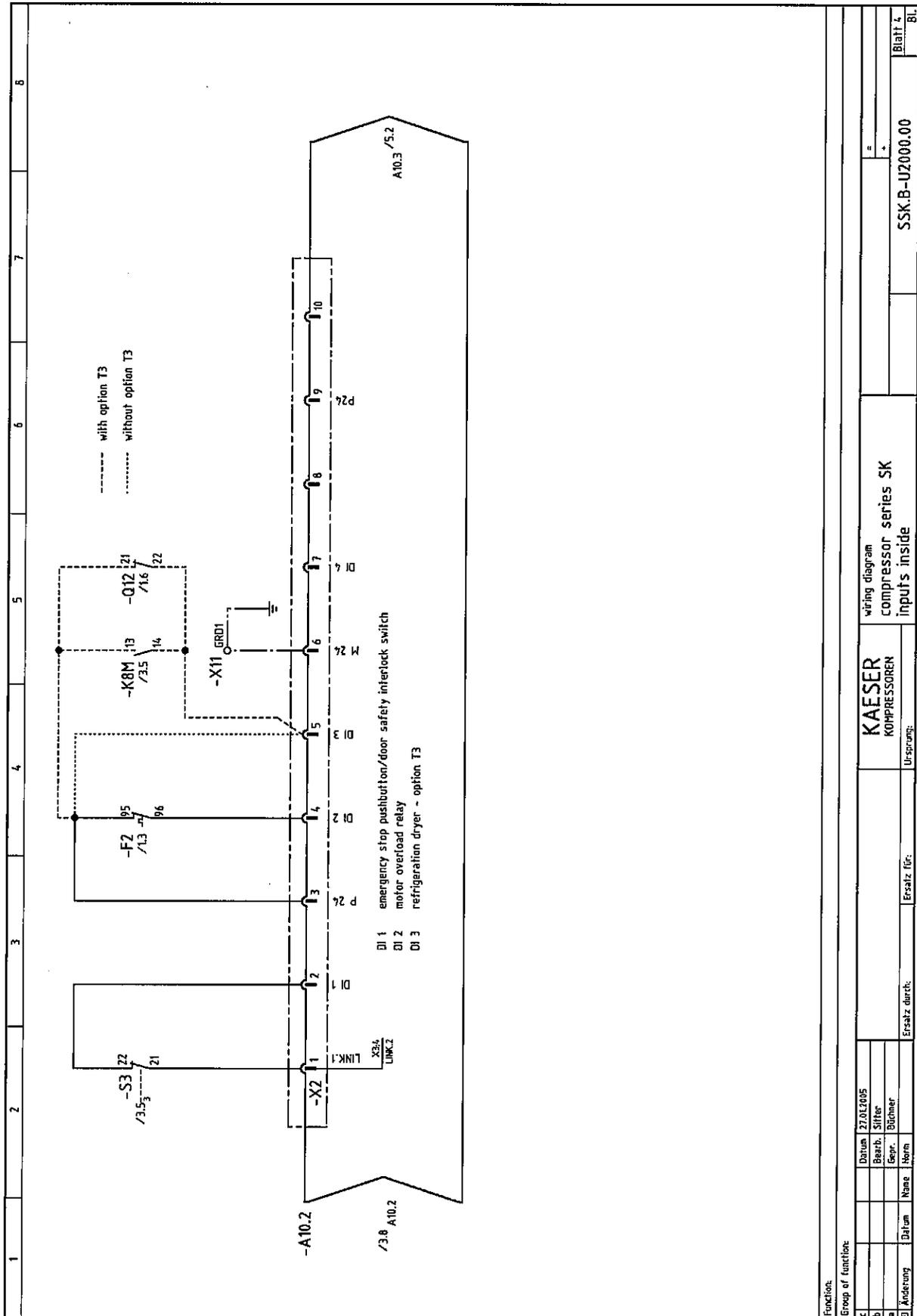


Functions:		compressor motor		compressor motor		power unit air dryer		vent motor	
Group of function:		input voltage		power unit		wiring diagram		compressor series SK	
c		Datum 27.01.2005		KAESER		compressor series SK		SSK.B-U2000.00	
b		Bearb. Sifker		KOMPRESSOREN		power unit		Blatt 1	
a		Genr. Blüher		Ursprung: UASU2002_02					
D	Änderung	Datum	Name	Ersatz für:					

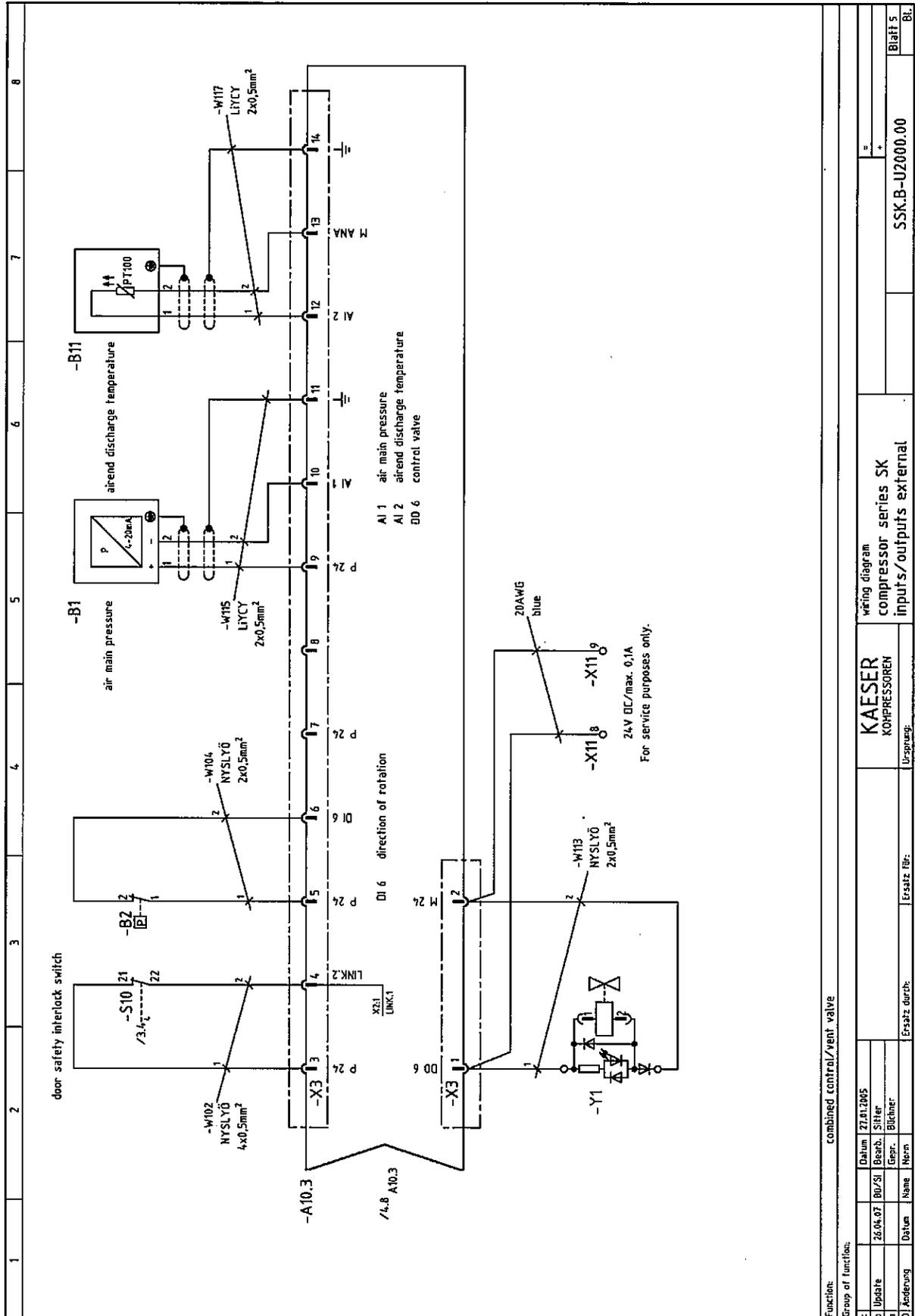




Function:		refrigeration dryer		motor running	
Group of function:		wye-delta changeover		valv-free contacts	
c	Datum	27.01.2005	wiring diagram		
b	Beauf.	Silber	compressor series SK		
a	Gepr.	BÜchner	supply/Relay-outputs		
d	Änderung	Datum	Name	Ersatz durch	Ersatz für
					SSK.B-U2000.00
					Blatt 3
					Bl.



Funktion:		wiring diagram		SSK.B-U2000.00	
Group of functions:		compressor series SK		Blatt 4	
c		KAESER		SSK.B-U2000.00	
b		KOMPRESSOREN		inputs inside	
a		Ursp.: Sprung:		Ersatz für:	
d		Datum		Name	
d		Datum		Name	





1	2	3	4	5	6	7	8
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**diagram 1**

primary	power connection
460V	L1 L2
	0 460V

**diagram 2**

primary	power connection 1-2
380V 575V	jumper between:
	31-38 33-35

**\* ATTENTION !!!**  
 Make an earthing connection between terminal -X31:14 and -X31:GRD1.

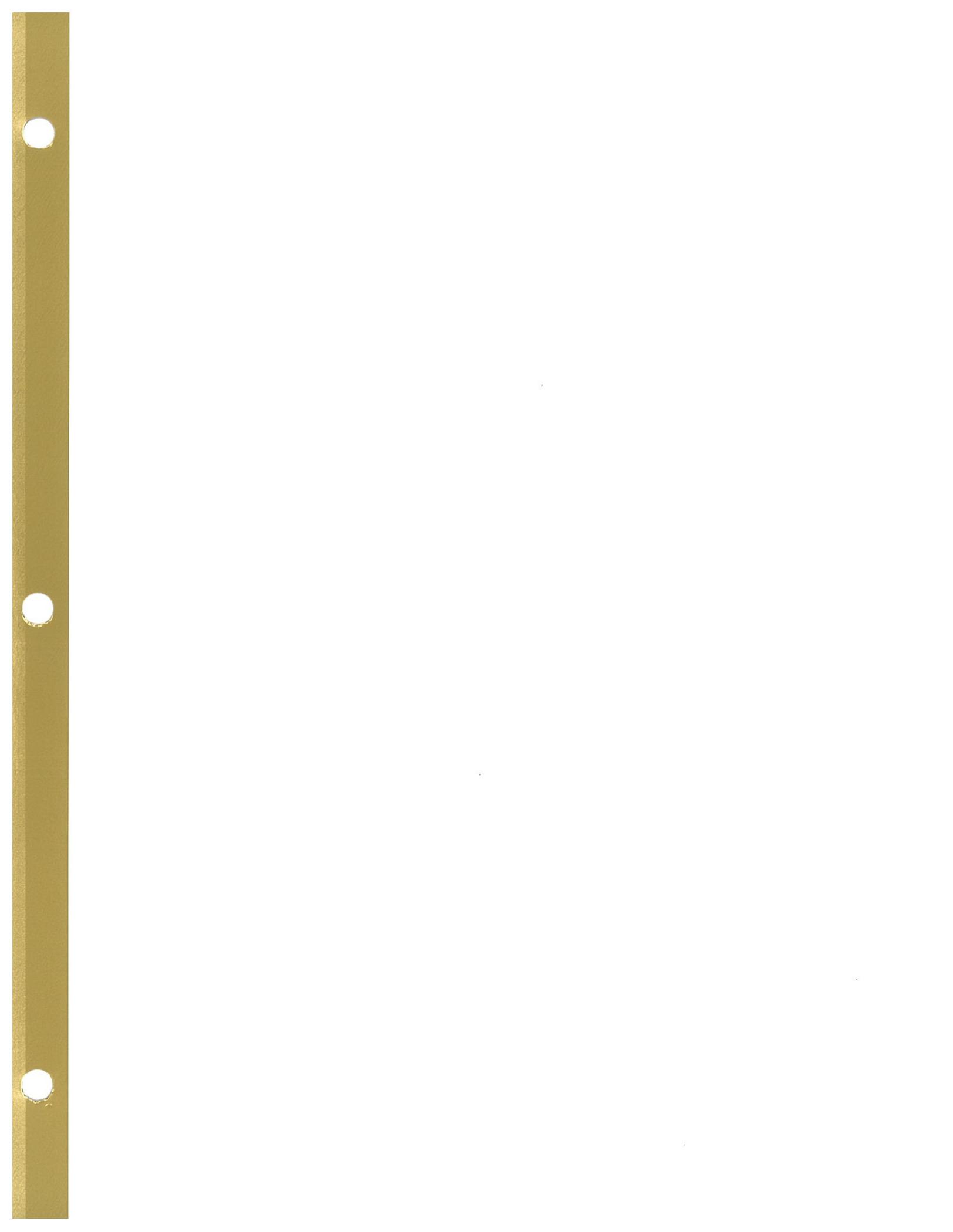
  

c	Datum	27.01.2005	Kaeser	wiring diagram	SSK.B-U2000.00	Blatt 7	Bl.
b	Bearb.	Siffer	KAESER	compressor series SK			
a	Gepr.	Büchner	KOMPRESSOREN	transformer diagrams			
Änderung	Name	Nern	Ursprung:				
	Datum		Ersetzt durch:				









## Instruction for adjusting pressure on an external load system

### Instructions pour régler la pression sur un système ayant un signal marche en charge externe

#### English

To set the pressure of a system using an external load signal, the user must select a wide pressure range on Sigma Control Basic, and a narrow pressure range on the pressure switch.

1. Set wide pressure range on Sigma Control Basic, using menu #8 for maximum pressure and menu #7 for pressure differential

Ex: Maximum pressure 125psig (menu #8 : 125psig)  
Minimum pressure 100psig (menu # 7 : -25psig)

2. Set narrow pressure range (desired pressure) on pressure switch

Ex: Maximum Pressure 120psig (plastic screw)  
Minimum Pressure 110psig (metal screw)

Thus, the user's pressure is set on the pressure switch, but the pressure switch's range must fit within the SCB's range.

#### Francais

Pour régler la pression d'un système utilisant un signal de marche en charge externe, l'utilisateur doit sélectionner une plage de réglage large, sur le Sigma Control Basic, et une plage de pression étroite sur l'interrupteur de pression (pressure switch).

1. Régler la plage de pression sur le Sigma Control Basic, utilisant menu 8 pour la pression maximale et menu 7 pour le differential de pression.

Ex. Pression maximale 125psig (menu 8 : 125psig)  
Pression minimum 100psig (menu 7 : -25psig)

2. Régler la plage de pression étroite (pression desirée) sur l'interrupteur de pression

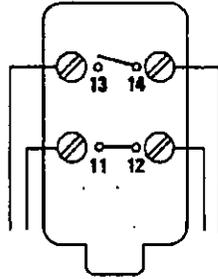
Ex: Pression maximum 120 psig (vis plastique)  
Pression minimum 110 psig (vis métallique)

Donc, la pression de l'utilisateur est réglé sur l'interrupteur, mais la plage de l'interrupteur doit se situer dans la plage du SCB.

# Montageanleitung 7.1488.0 MDR 43/11

SCHALTBILD  
SCHEMA DE BRANCHEMENT  
WIRING DIAGRAM  
SCHEMA DE COLLEGAMENTO

Schaltleistung  
Breaking Capacity  
Pouvoir de coupure  
Potere di rottura



V	MDR 43
250 V	0,6 kW

**Condor Werke**  
Gebr. Frede GmbH & Co KG

Postfach 20 20    Telefon (0 25 87) 89-0  
Westkirchen    Telex 89 925 condw  
D-59311 Ennigerloh    Telefax (0 25 87) 15 14

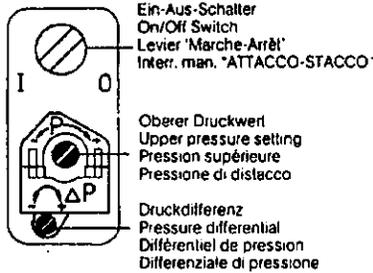
0.0800.3311/6.94

Einbau/Anschluß nur durch Fachkraft;  
nach Anbringung von Zubehör Funktionsüberprüfung durch Elektro-Fachkraft erforderlich.

Verwendung von Aluminium-Leitern nur bedingt zulässig.

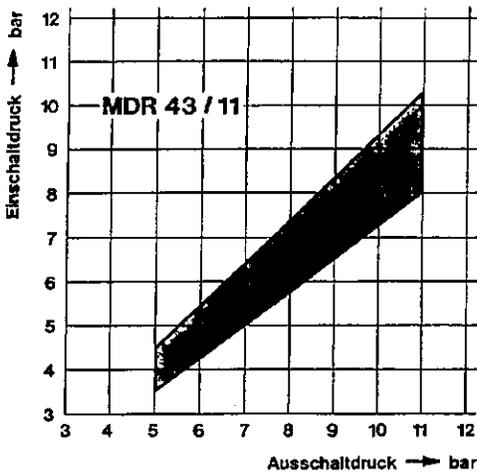
Caution! The installation and assembly of electrical equipment may be carried out only by a skilled person.

Druckeinstellung    (nur unter Druck vornehmen)  
Réglage de Pression    (à effectuer sous pression)  
Adjustment of Pressure    (only when under pressure)  
Taratura pressione!    (regolare sotto pressione!)



DRAUFSICHT    TOPVIEW  
VUE SUPERIEURE    VISTA DALL'ALTO

Type	Oberer Druckwert Upper pressure setting Pression supérieure Pressione di distacco Pa bar	Druckdifferenz Pressure differential Différentiel de pression Differenziale di pressione $\Delta P - P_a - P_b$ bar
MDR 43		
MDR 43/3	0,5 1,5 3,0	0,3 0,3-1 0,5-1,5
MDR 43/6	2,5 4,0 6,0	0,3-1,5 0,5-1,5 0,5-2
MDR 43/11	5 8 11	0,5-1,5 0,5-1,5 0,5-3
MDR 43/16	8 12 16	0,5-2 1-2,5 1-3



**DRUCKSCHALTER / PRESSURE SWITCH**

## MDR 43/11

MDR43 GAA BAAA 090A100 XAA XXZ

---

1 x Art.-No. 230236
9,0-10,0 bar
7.1488.0

### 7.1488.0

4014502 230236

CE

000682

08.11.02  
Schäfer



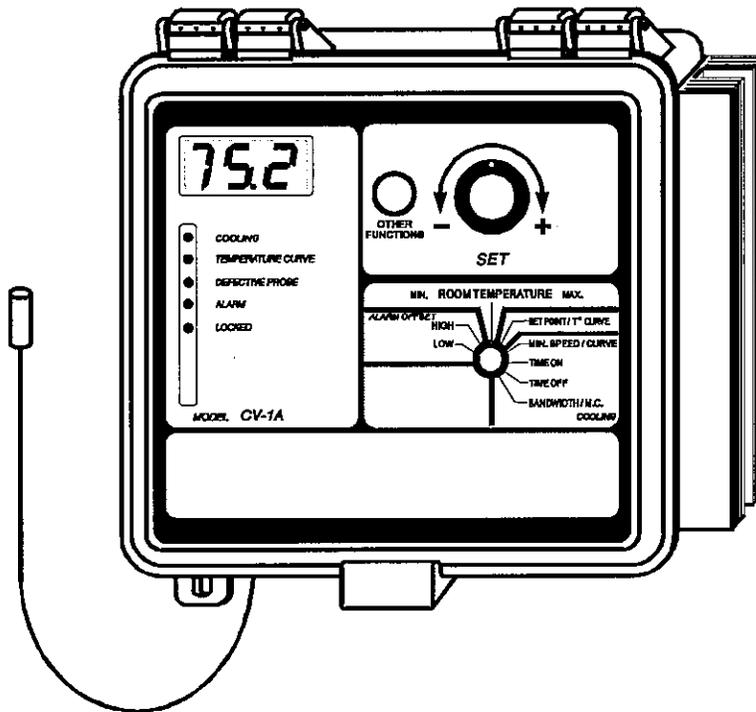
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# Temperature Controller

# CV-1A

## User's Guide

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Read this guide carefully before using the controller.



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**FOR CUSTOMER USE**

Enter below the serial number located on the side of the controller and retain this information for future reference.

Model number CV-1A  
Serial number \_\_\_\_\_

## FEATURES

The CV-1A is an electronic device used for environmental control in livestock buildings. It allows the user to maintain a specified target temperature by controlling the operation of one stage of variable speed cooling fans.

The main features of the controller are as follows:

### ▶ THREE-DIGIT DISPLAY

A three-digit display provides a high level of accuracy, allowing the user to specify a temperature to within one tenth of a degree (Fahrenheit or Celsius).

### ▶ PILOT LIGHTS INDICATING STATE OF OUTPUTS

Pilot lights indicating the status of outputs allow the user to monitor the operation of the system from a distance.

### ▶ MINIMUM VENTILATION CYCLE

When ventilation is not required for cooling, the fans can be operated either continuously or intermittently to reduce the level of humidity and supply oxygen to the room.

### ▶ TEMPERATURE AND MINIMUM VENTILATION SPEED CURVES

The controller can be set to automatically change the temperature set point and the minimum ventilation speed over a given period of time in accordance with the user's requirements by specifying a temperature curve and a minimum ventilation curve with up to six different set points.

### ▶ CHOICE OF TEN MOTOR CURVES

The variation in motor speed resulting from a change in voltage will depend on the make and capacity of the motor. In order to achieve a high degree of compatibility between controller and motor, the user can choose from among ten different motor curves, thus ensuring that the correct voltages are supplied

► **FULL-SPEED FAN START-UP**

In order to overcome the inertia of the ventilation system components, and de-ice the fan blades in cold weather conditions, the controller supplies maximum voltage to the variable speed fans during the 2 seconds immediately following each start-up.

► **HIGH/LOW TEMPERATURE AND POWER FAILURE ALARMS**

The controller generates an output signal that will activate any alarm system in case of a rise or fall in temperature beyond a specified limit, a power failure or a fault in the supply circuit.

► **FOUR INDEPENDENT TEMPERATURE SENSOR INPUTS**

Up to four temperature sensors can be connected to the controller in order to obtain a more accurate reading of the average ambient temperature and a faster reaction time.

► **OVERLOAD AND OVERVOLTAGE PROTECTION**

Fuses are located at the input and outputs of the controller to protect its circuitry in the case of an overload or overvoltage and a connector can be used to detect blown fuses.

► **COMPUTER CONTROL**

The controller can be connected to a computer, thus making possible the centralization of information management and a more diversified control strategy.

► **CONTROL OF AIR INLET MOVEMENT**

If the CV-1A is used in combination with a WR-F-1A controller, the movement of the air inlets can be coordinated with the operation of the fans using a potentiometer located on the panel drive. This allows the air inlets to be adjusted correctly, free of the influence of uncontrollable factors such as wind or air from adjoining rooms.

## PRECAUTIONS

We strongly recommend the installation of supplementary natural ventilation, an independent failure alarm system as well as a back-up thermostat (refer to the wiring diagram enclosed with this user's manual to connect the thermostat).

Although fuses at the input and outputs of the controller protect its circuitry in the case of an overload or overvoltage, we recommend the installation of an additional protection device on the controller's supply circuit.

The room temperature where the controller is located **MUST ALWAYS REMAIN BETWEEN 32° AND 104°F (0° AND 40°C).**

To avoid exposing the controller to harmful gases or excessive humidity, it is preferable to install it in a corridor.

**DO NOT SPRAY WATER ON THE CONTROLLER**

## INSTALLATION

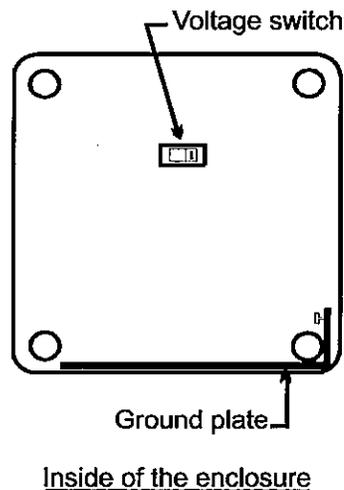
### Mounting Instructions

Remove the four screws in the front cover and lift the cover. Remove the black caps located on the three mounting holes. Mount the enclosure to the wall using three screws. Be sure the electrical knockouts are at the bottom of the enclosure in order to prevent water from entering the controller. Insert the screws into the mounting holes and tighten. **Fasten the black caps onto the mounting holes.**

### Connections

To connect the controller, refer to the wiring diagram enclosed with this user's manual.

- Set the voltage switch to the appropriate line voltage.
- Route the cables through the electrical knockouts provided at the bottom of the enclosure. Do not make additional holes in the enclosure, particularly on the side of the enclosure when using a computer communication module.



**CONCERNING THE ALARM CONNECTION:** There are two types of alarms on the market. One type activates when current is cut off at its input, whereas the other activates when current is supplied at its input. For an alarm of the first type, use the NO terminal as shown on the wiring diagram. For an alarm of the second type, use the NC terminal.



ALL WIRING MUST BE DONE BY AN AUTHORIZED ELECTRICIAN AND MUST COMPLY WITH APPLICABLE CODES, LAWS AND REGULATIONS. BE SURE POWER IS OFF BEFORE DOING ANY WIRING TO AVOID ELECTRICAL SHOCK AND EQUIPMENT DAMAGE.

## Temperature Probes

The controller is supplied with one room probe connected to terminal # 1.

**CAUTION:** The probes operate under low voltage and are isolated from the supply. Be sure the probe cables remain isolated from all high voltage sources. Do not route the probe cables and other power cables through the same electrical knockout. Do not run the probe cables next to other power cables. When crossing over other cables, cross at 90°.

### Extending the Probes

Each probe can be extended up to 500 feet (150 meters). To extend a probe:

- Use a shielded cable of outside diameter between 0.245 and 0.260 in (6.22 and 6.60 mm) to ensure the cable entry is liquid-tight (the cable dimension should not be under 18 AWG).
- It is preferable to solder the cable joint to ensure a proper contact between the two cables.
- **Do not ground the shielding.**

## Connecting Additional Room Probes

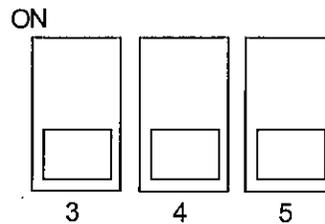
Up to three additional room probes may be connected to the controller in order to obtain a more accurate reading of the average room temperature and a faster reaction time.

- Connect each additional room probe using terminals # 2, # 3 and # 4, as shown on the wiring diagram enclosed with this user's manual.

Switches are used to activate or deactivate the additional room probes connected to the controller.

- Activate each additional probe by setting the appropriate switch to ON:

- Switch # 3 activates terminal # 2.
- Switch # 4 activates terminal # 3.
- Switch # 5 activates terminal # 4.



**FACTORY SETTING:** When the controller is shipped from the factory, switches # 3, 4 and 5 are set to OFF (room probes are deactivated).

## Defective Probes

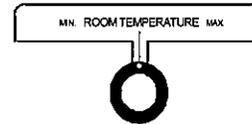
If one or many room probes are defective, the defective probe pilot light turns on. If all the room probes are defective, the display shows the letter "P" when the parameter selection knob is set to ROOM and the controller operates according to the minimum ventilation cycle (refer to "Minimum Ventilation Cycle", page 21). Otherwise, the display shows the average value of all temperatures measured by the room probes remaining in proper condition and the controller operates according to this temperature.

To identify the defective probe:

■ Set the selection knob to **ROOM**. The room temperature is displayed.

■ Press the push-button. If the probe connected to terminal # 1 and supplied with the controller is not defective, the letters "**PR1**" are displayed, alternating with the temperature measured by the probe. Otherwise, the letters "**PR1**" are displayed, alternating with the letter "**P**".

○  
OTHER  
FUNCTIONS



For each additional probe connected to the controller:

■ Press the push-button once again. If the probe is not defective, the letters "**PR#**" (where # is the number of the terminal the probe is connected to) are displayed, alternating with the temperature measured by the probe. If the probe is defective, the letters "**PR#**" are displayed, alternating with the letter "**P**".

## Motor Curves

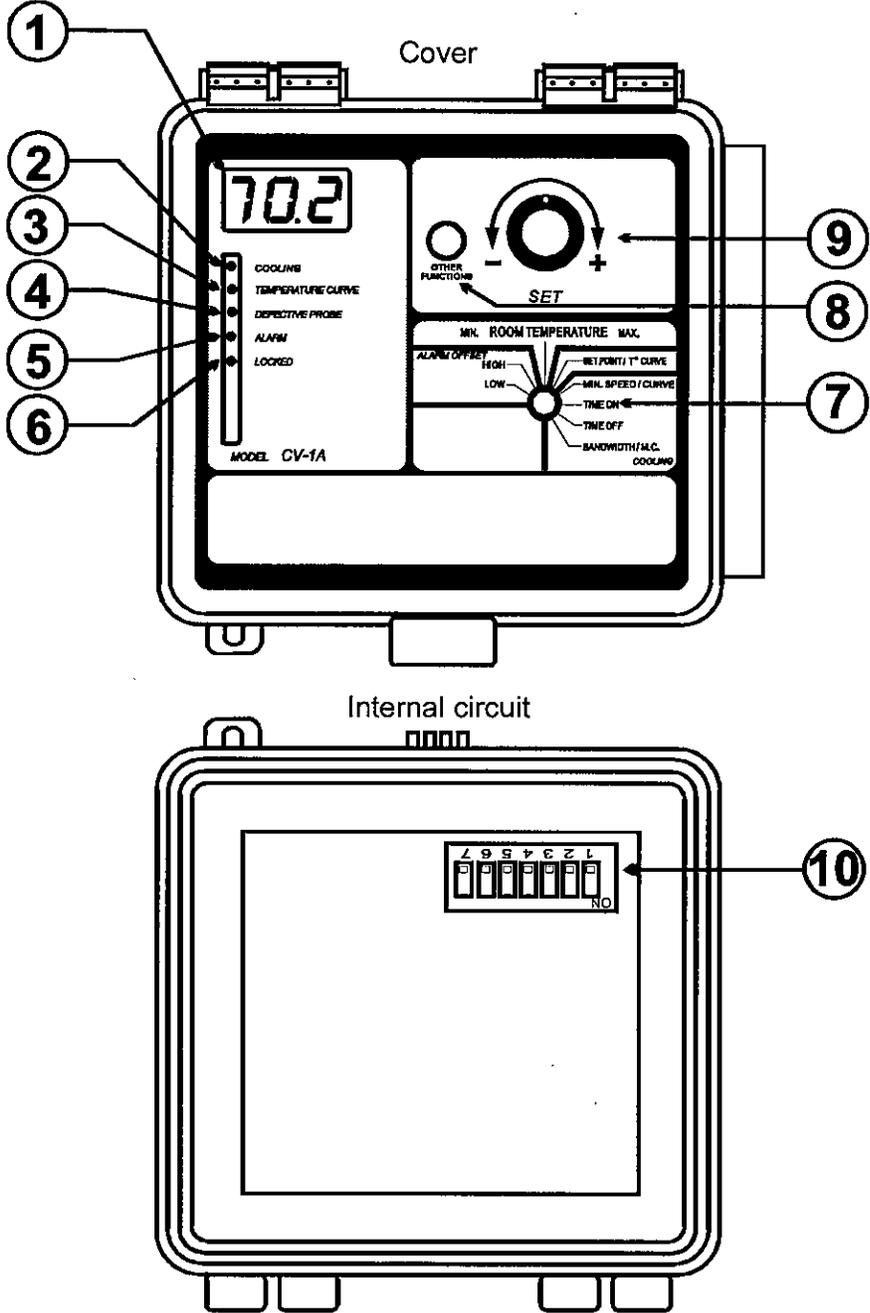
The relationship between the voltage supplied to a motor and its operating speed is described by a motor curve. This curve varies with the make and capacity of the motor. The various motors available in the industry have been divided into ten categories and the controller has been programmed with a different motor curve for each of these categories. Select the appropriate curve to ensure that the controller supplies the correct voltage to the variable speed fan motors.

### To Select a Motor Curve

- In the list of motors enclosed with this user's manual, locate the make and capacity of your variable speed motors and note the corresponding curve number (1 to 10).
- Set the parameter selection knob to BANDWIDTH / M.C. The bandwidth appears flashing on the display.
- Press the push-button. The currently selected curve number appears flashing on the display.
- Using the adjustment knob, adjust the curve number to the desired value.
- Return to the bandwidth display either by pressing the push-button once again or by waiting 10 seconds without changing the position of the adjustment knob.

**FACTORY SETTING:** When the controller is shipped from the factory, curve number 4 has been selected.

## LOCATION OF THE CONTROLS



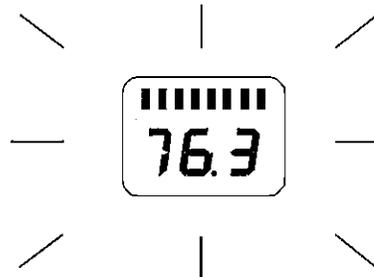
- 1** **THREE DIGIT DISPLAY**  
Displays temperatures and other parameters shown around the parameter selection knob.
- 2** **STAGE 1 PILOT LIGHT**  
Turns on when the fans are on.
- 3** **TEMPERATURE AND MINIMUM VENTILATION CURVE PILOT LIGHT**  
Turns on when the temperature curve is activated and flashes when both curves are activated.
- 4** **DEFECTIVE PROBE PILOT LIGHT**  
Turns on when a defective probe is detected.
- 5** **ALARM PILOT LIGHT**  
Turns on when the alarm is activated.
- 6** **LOCKED PARAMETER PILOT LIGHT**  
Turns on when the parameters are locked.
- 7** **PARAMETER SELECTION KNOB**  
Use this selection knob to select a parameter.
- 8** **TEMPERATURE CURVE PUSH-BUTTON**  
Use this push-button to view or set the points of the temperature curve.
- 9** **ADJUSTMENT KNOB**  
Use this adjustment knob to adjust the value of the selected parameter.
- 10** **SWITCHES**  
Use these switches to set the operating modes as described in the table below.

DESCRIPTION	SWITCH		OPERATING MODE
	#	POSITION	
LOCKING THE PARAMETERS	1	ON	Locked parameters
		OFF	Unlocked parameters
TEMPERATURE UNITS	2	ON	Degrees Celsius
		OFF	Degrees Fahrenheit
PROBE # 2	3	ON	Activated probe
		OFF	Deactivated probe
PROBE # 3	4	ON	Activated probe
		OFF	Deactivated probe
PROBE # 4	5	ON	Activated probe
		OFF	Deactivated probe
—	6	—	—
—	7	—	—

## USING THE CONTROLLER

### The Meaning of a Flashing Display

The display flashes certain values and does not flash others. The flashing indicates that the displayed value can be adjusted. A value that is not flashing can not be adjusted.

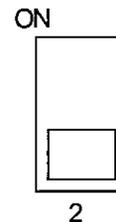


### Temperature Units

Temperatures can be displayed either in degrees Celsius or in degrees Fahrenheit.

■ Set switch # 2 to the desired position:

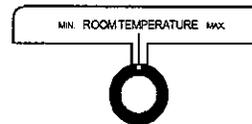
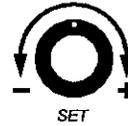
- ON to display temperatures in degrees Celsius.
- OFF to display temperatures in degrees Fahrenheit.



**FACTORY SETTING:** When the controller is shipped from the factory, switch # 2 is set to OFF (temperatures are displayed in degrees Fahrenheit).

## Viewing Temperatures

OTHER  
FUNCTIONS



### Room Temperature Display

The room temperature is the average value of all temperatures measured by room probes that are activated and in proper operating condition.

#### TO DISPLAY THE ROOM TEMPERATURE

- Set the parameter selection knob to ROOM TEMPERATURE. The room temperature appears on the display.

#### TO DISPLAY PROBE TEMPERATURES

- Set the parameter selection knob to ROOM TEMPERATURE. The room temperature appears on the display.
- Press the push-button. The letters "PR1" are displayed, alternating with the temperature measured by the probe connected to terminal # 1 (supplied with the controller).

For each additional probe connected to the controller:

- Press the push-button. The letters "PR#" (where # is the number of the terminal to which the probe is connected) are displayed, alternating with the temperature measured by the probe.

## Minimum and Maximum Temperature Recall

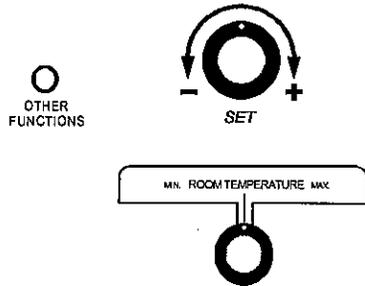
The minimum and maximum temperatures are the lowest and highest values of all room temperatures measured since the last reset.

### TO RECALL MINIMUM AND MAXIMUM TEMPERATURES

- Set selection knob to ROOM TEMPERATURE. The room temperature appears on the display.
- Turn adjustment knob clockwise by one notch. The minimum temperature appears flashing on the display.
- Turn adjustment knob clockwise one notch further. The maximum temperature appears flashing on the display.
- Turn adjustment knob clockwise a third notch. The room temperature again appears on the display.
- If adjustment knob is turned counterclockwise rather than clockwise, the display sequence will be reversed (room-maximum-minimum-room).

The minimum and maximum temperatures are the lowest and highest values of all room temperatures measured since the last reset.

## Minimum and Maximum Temperature Reset



The reset erases the current minimum and maximum temperatures. From the moment the reset is completed, the controller begins to store in memory the new minimum and maximum temperatures measured by the probes.

### TO RESET THE MINIMUM AND MAXIMUM TEMPERATURES

- Set the parameter selection knob to ROOM TEMPERATURE. The room temperature appears on the display.
- Turn the adjustment knob clockwise (or counterclockwise) by one notch and leave it in this position. The minimum (or maximum) temperature first appears flashing on the display. After 10 seconds, the display stops flashing and the room temperature again appears on the display, indicating that the reset is completed.

**NOTE :** To avoid resetting the minimum et maximum temperatures while recalling them, be sure to return to the room temperature display within the 10 second delay.

## Room Set Point / Temperature Curve

There are two ways to specify the target room temperature:

- 1 Adjust the room set point to the desired value and do not activate the temperature curve. The controller will operate according to this target room temperature as long as the temperature curve remains deactivated.
- 2 Program a temperature curve comprised of six points and activate the temperature curve. For each of the six points, you must specify a day number and a room set point for this day number. The controller will automatically change the target room temperature every hour in a linear fashion between two consecutive points. When the last point is reached, the temperature curve becomes deactivated. The controller continues to operate according to the last room set point until you activate the temperature curve once again or specify a new room set point. You can also deactivate the temperature curve before the last point is reached.

### **The room set point and the points of the temperature curve can be adjusted only if the temperature curve is deactivated:**

- If the temperature curve pilot light is off, the temperature curve is presently deactivated and you can proceed with the adjustment.
- If the temperature curve pilot light is on, the temperature curve is presently activated. Before proceeding with the adjustment, deactivate the curve as follows.

### **To deactivate the temperature curve**

- Set the parameter selection knob to SET POINT/ T°CURVE. The current room set point appears flashing on the display.
- Press the push-button repeatedly until the word ON appears flashing on the display.
- Turn the adjustment knob counterclockwise one notch and leave it in this position for at least 10 seconds. The word OFF appears flashing on the display and after 10 seconds, the temperature curve pilot light turns off, indicating that the temperature curve is now deactivated. Set the parameter selection knob to ROOM TEMPERATURE.

## TO ADJUST THE ROOM TEMPERATURE SET POINT

- Be sure the temperature curve is deactivated (read the instructions on page 17).
- Set the parameter selection knob to SET POINT/T°CURVE. The current room set point appears flashing on the display.
- Using the adjustment knob, adjust the set point to the desired value.

## TO PROGRAM THE TEMPERATURE CURVE

**NOTES:** • All six points of the curve must be specified. If you do not need six different points, repeat your last room set point for each unnecessary point of the curve.

- To reduce the risk of errors:

- The highest possible day number is 99.
- You can not specify decreasing day numbers.
- You can not specify an increasing temperature curve.
- The temperature variation can not exceed 3°F (1.6°C) per day.

### To specify the six points of the temperature curve:

- Be sure the temperature curve is deactivated (read the instructions on page 17).
- Set the parameter selection knob to SET POINT/T°CURVE. The current room set point appears flashing on the display.
- Press the push-button. The word OFF appears on the display, indicating that the temperature curve is deactivated.

## TO PROGRAM THE TEMPERATURE CURVE (CONT'D)

Repeat the following steps for each of the six points:

- Press the push-button once again. A day number, preceded by the letter "d", appears flashing on the display.
- Using the adjustment knob, adjust the day number to the desired value.
- Press the push-button once again. The current room set point for this day number appears flashing on the display.
- Using the adjustment knob, adjust the room set point to the desired value.

When the six points of the temperature curve have been specified, activate the curve as follows.

### To activate the temperature curve

- Press the push-button once again. The word OFF appears flashing on the display.
- Turn the adjustment knob clockwise one notch and leave it in this position for at least 10 seconds. The word ON appears flashing on the display and after 10 seconds, the temperature curve pilot light turns on, indicating that the temperature curve is now activated.
- Set the parameter selection knob to ROOM TEMPERATURE.

**NOTE:** When the temperature curve is activated, the current target room temperature can be viewed at any time by setting the parameter selection knob to SET POINT / T°CURVE. The current day number can then be viewed by pressing the push-button.

**TO DISPLAY CURRENT SET POINT  
TO DISPLAY / MODIFY CURRENT DAY NUMBER**

When the temperature curve is activated, the current temperature set point and day number can be displayed at any time. The current day number can also be adjusted in order to move forward or backward on the temperature curve.

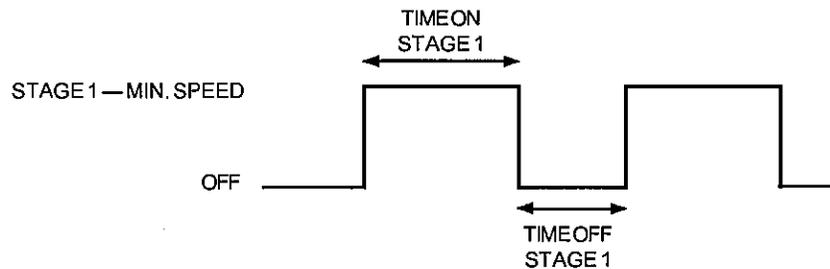
- Set the parameter selection knob to SET POINT / T° CURVE. The current temperature set point appears on the display.
- Press the push-button. The current day number is displayed.
- Use the adjustment knob to set the day number to the desired value.

## Fan Parameters

**Description of Operation** (👉 Refer to figure 1 on next page)

### 1 Minimum Ventilation Cycle

When the room temperature is below the room set point, the cooling fans run according to the timer settings.



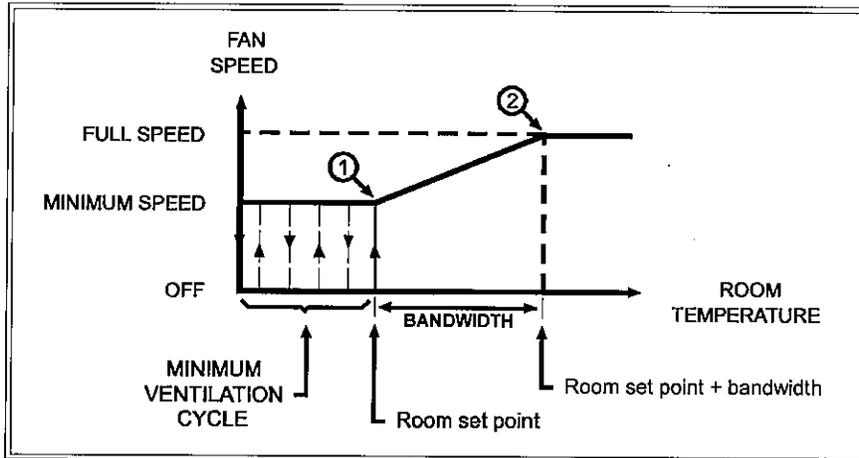
During TIME ON, the fans run at minimum speed. During TIME OFF, the fans do not run.

The fans can be set to operate in three different ways:

- 1 - To run the fans continuously, set time off to zero and time on to any value other than zero.
- 2 - To stop the fans, set time on to zero and time off to any value equal to or other than zero.
- 3 - To run the fans intermittently, set time on to the desired running time and time off to the desired off time.

Running the fans continuously or intermittently even though ventilation is not required for a cooling purpose is useful to reduce the level of humidity and supply oxygen to the room. It also prevents the fans from freezing in the winter.

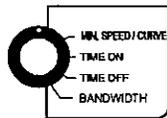
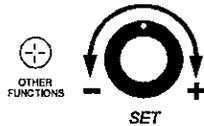
Figure 1 : Cooling Fans - Operation Diagram



## 2 Variable Speed Ventilation

When the room temperature rises to the room set point (point 1), the cooling fans stop running according to the minimum ventilation cycle. They begin to run continuously and increase in speed proportionally to the room temperature. When the room temperature rises to "room set point + bandwidth" (point 2), the cooling fans reach full speed. Above this temperature, the controller continues to supply full speed voltage.

## Adjusting the Fan Parameters



### TO ADJUST TIME ON

- Set selection knob to TIME ON. The current time on appears flashing on the display.
- Using adjustment knob, adjust the time on to the desired value.

Time on can be adjusted between 0 and 900 seconds, by increments of 15 seconds.

### TO ADJUST TIME OFF

- Set selection knob to TIME OFF. The current time off appears flashing on the display.
- Using adjustment knob, adjust the time off to the desired value.

Time off can be adjusted between 0 and 900 seconds, by increments of 15 seconds.

The minimum speed can be specified in two ways: either with a single minimum speed or with a minimum speed curve, as described hereafter.

#### 1 - With a single minimum speed

When a single minimum speed is specified and the minimum speed curve is inactivated (or the minimum speed curve is activated but not effectively operating), the fans run at this speed.

### **Single Minimum Speed**

The single minimum speed can be adjusted only if the minimum speed curve is deactivated or if the minimum speed curve is activated but not effectively operating. If it is effectively operating, deactivate the curve as follows.

#### **To Deactivate the Minimum Speed Curve**

- Set selection knob to MIN. SPEED. The current single minimum speed appears flashing on the display.
- Press push-button repeatedly until the word ON appears flashing on the display.
- Turn adjustment knob counterclockwise one notch. The word OFF appears flashing on the display, indicating that the minimum speed curve is now deactivated.

#### **To Adjust the Single Minimum Speed**

- Set selection knob to MIN. SPEED. The current stage 1 single minimum speed appears flashing on the display.
- Turn adjustment knob to adjust the minimum speed to the desired value.

The minimum speed can be adjusted between 10 and 100% of the full speed of the fans.

## 2 - With a minimum speed curve

When a minimum speed curve is specified and activated, the controller automatically adjusts the minimum speed over a given period of time. The minimum speed curve is comprised of six points. A day number as well as a minimum speed for this day number must be specified for each of the six points. When the minimum speed curve is activated, the controller adjusts the minimum speed every hour in a linear fashion between two consecutive points.

However, if the room temperature falls below "Set point - 5.0°F (2.8°C)", the fans will begin to run at the minimum speed specified for the first point of the curve and will continue to do so as long as the room temperature remains below the set point. When the room temperature rises above the set point, the fans will return to the current minimum speed.

When the last point of the curve is reached, the curve becomes deactivated. The controller maintains the minimum speed specified for this point until the curve is reactivated or until a new single minimum speed is specified.

The minimum speed curve and the temperature curve are related in the following ways:

- The minimum speed curve can be activated only if the temperature curve is already activated.
  
- All points of the minimum speed curve, other than the first one, are automatically given day numbers identical to those specified for the temperature curve. Only the first point of the minimum speed curve has an adjustable day number. This day number must be higher or equal to the day number specified for the first point of the temperature curve and lower than the day number specified for the second point of the temperature curve.

For example:

	TEMPERATURE CURVE	MINIMUM SPEED CURVE
POINT 1	d5	d5 to d9 (adjustable)
POINT 2	d10	d10 (not adjustable)

- When the minimum speed curve is activated, it will effectively be operating (i.e. the controller will begin to adjust the minimum speed according to the specified points of the curve) only when the current day number of the temperature curve reaches the first day number of the minimum speed curve.

For example:

	TEMPERATURE CURVE		MINIMUM SPEED CURVE	
	Day number	Temperature	Day number	Speed
POINT 1	d5	90.0 °F	d7	10 %
POINT 2	d10	85.0 °F	d10	20 %

☞ If you activated the temperature curve yesterday, the current day number of the temperature curve is d6. Therefore, if you activate the minimum speed curve today, it will effectively be in operation only tomorrow, when the current day number of the temperature curve reaches d7. In the meantime, the fans will run at the specified single minimum speed.

☞ If you activated the temperature curve three days ago, the current day number of the temperature curve is d8. Therefore, if you activate the minimum speed curve today, it will effectively be in operation the moment you activate it. In this case, the current minimum speed will be a value between 10% and 20%.

## Minimum Speed Curve

The points of the minimum speed curve can be adjusted only if the minimum speed curve is deactivated. If the minimum speed curve is activated, deactivate the curve as follows.

### To Deactivate the Minimum Speed Curve

- Set selection knob to MIN. SPEED. The current stage 1 single minimum speed appears flashing on the display.
- Press push-button repeatedly until the word ON appears flashing on the display.
- Turn adjustment knob counterclockwise one notch. The word OFF appears flashing on the display, indicating that the minimum speed curve is now deactivated.

### To Specify the Points of the Minimum Speed Curve

- Set selection knob to MIN.SPEED. The current stage 1 single minimum speed appears flashing on the display.
- Press push-button. The word OFF appears on the display, indicating the minimum speed curve is deactivated.

Repeat the following steps for each of the six points:

- Press push-button once again. A day number, preceded by the letter "d", appears flashing on the display.

## Minimum Speed Curve (cont'd)

- For the first point of the curve, use adjustment knob to adjust the day number to the desired value. For all other points of the curve, the day number can not be adjusted.
- Press push-button once again. The current minimum speed for this day number appears flashing on the display.
- Turn adjustment knob to adjust the minimum speed to the desired value.

### NOTES:

(1) All six points of the curve must be specified. If you do not need six different points, repeat your last minimum speed for each unnecessary point of the curve.

(2) To reduce the risk of errors:

- it is not permitted to specify decreasing minimum speeds;
- the minimum speed variation can not exceed 10% per day.

When the six points of the minimum speed curve have been specified, activate the minimum speed curve as described below (the minimum speed curve can be activated only if the temperature curve is activated).

### To Activate the Minimum Speed Curve

- Press push-button once again. The word OFF appears flashing on the display.
- Turn adjustment knob clockwise by one notch. The word ON appears flashing on the display, indicating that the minimum speed curve is now activated.

**NOTE:** When the minimum speed curve is operating, the current minimum speed can be viewed at any time by setting selection knob to MIN.SPEED. The current day number can then be viewed by pressing the push-button.

### **TO ADJUST THE BANDWIDTH**

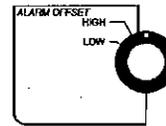
- Set the parameter selection knob to BANDWIDTH. The current differential appears flashing on the display.
- Using the adjustment knob, adjust the differential to the desired value.

## Alarms



Pilot light 5 turns on when the alarm is activated.

### HIGH TEMPERATURE ALARM



The controller activates the alarm when the room temperature rises above the value "*set point + high offset*".

#### TO ADJUST HIGH ALARM OFFSET

- Set selection knob to ALARM OFFSET - HIGH. The current high offset appears flashing on the display.
- Using adjustment knob, adjust the offset to the desired value.

The high offset can be adjusted between 0.5° and 40.0°F (0.3° and 22.0°C).

### LOW TEMPERATURE ALARM

The controller activates the alarm when the room temperature falls below the value "*set point - low offset*".

#### TO ADJUST LOW ALARM OFFSET

- Set selection knob to ALARM OFFSET - LOW. The current low offset appears flashing on the display.
- Using adjustment knob, adjust the offset to the desired value.

The low offset can be adjusted between 0.5° and 40.0°F (0.3° and 22.0°C).

## POWER FAILURE OR FAULT IN THE SUPPLY CIRCUIT

The controller activates the alarm in the event of a power failure or a fault in the supply circuit.

### Locking the Parameters

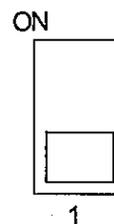
The parameters can be locked to prevent their settings from being accidentally modified. When the parameters are locked, only the temperature set point (if the temperature curve is deactivated) and the minimum speed (as long as the minimum speed curve is deactivated) can be modified.

To lock the parameters:

- Set switch # 1 to ON. Pilot-light 6 turns on.

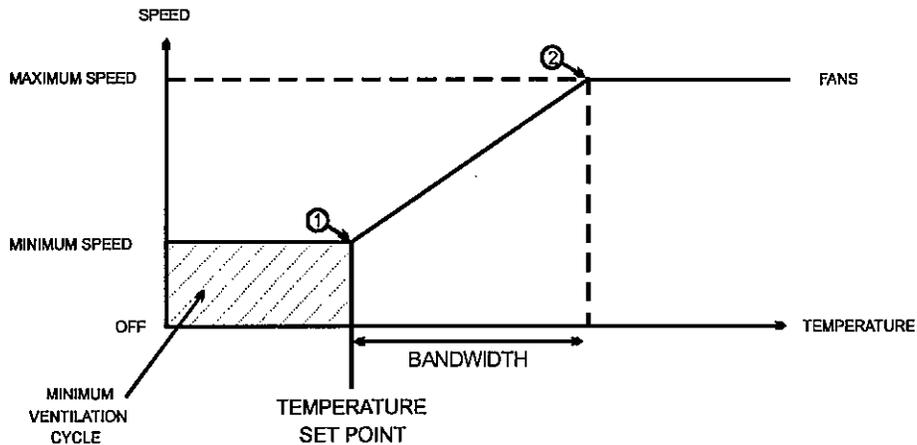
To unlock the parameters:

- Set switch # 1 to OFF. Pilot-light 6 turns off.



**FACTORY SETTING :** When the controller is shipped from the factory, switch # 1 is set to OFF (parameters are unlocked).

## HOW THE CONTROLLER OPERATES



### If the room temperature rises:

- When  $room < set\ point$ , the fans run at minimum speed according to the minimum ventilation cycle.
- When  $room = set\ point$ , the fans stop operating according to the minimum ventilation cycle (point 1) and increase in speed as the room temperature rises.
- When  $room = set\ point + bandwidth$ , the fans reach full speed (point 2).
- When  $room > set\ point + bandwidth$ , the fans run at full speed.

### If the room temperature falls:

- When  $room = set\ point + bandwidth$ , the fans start to decrease in speed (point 2).
- When  $room = set\ point$ , the fans reach minimum speed (point 1).
- When  $room < set\ point$ , the fans run at minimum speed according to the minimum ventilation cycle.

## TROUBLESHOOTING GUIDE

PROBLEM	CAUSE	SOLUTION
There is no display.	<p>The circuit breaker at the service panel is off or tripped.</p> <p>The wiring is incorrect.</p> <p>The F5 input fuse is open.</p> <p>The voltage selector switch is in the wrong position.</p> <p>The display board interconnect cable is unplugged from the power supply board.</p>	<p>Reset the circuit breaker.</p> <p>Correct the wiring.</p> <p>Replace the fuse.</p> <p>Set the switch to the correct position.</p> <p>Plug in the cable.</p>
The display shows the letter "P".	Sensor # 1 is connected improperly.	Correct the sensor's connection.
Pilot light 4 is turned on.	One or many sensors are defective.	Follow the procedure described in DEFECTIVE SENSORS to identify which sensor(s) is (are) defective. Replace the defective sensor(s).

PROBLEM	CAUSE	SOLUTION
<p>The display shows sudden variations in the room temperature.</p>	<p>A variation in resistance is induced on a sensor.</p> <p>There is electrical noise near the cable of an extended sensor.</p>	<p>Be sure the sensors are dry and move them away from drafts and from all sources of radiant heating.</p> <p>Do not run sensor cables next to other power cables. When crossing other power cables, cross at 90 °.</p>
<p>The fans are not running.</p>	<p>The wiring is incorrect.</p> <p>The stage's F1 fuse is open.</p> <p>The display board inter-connect cable is not plugged into the power supply board properly.</p> <p>The minimum speed is too low.</p> <p>The fan motor is defective.</p>	<p>Correct the wiring. In particular, be sure two different lines are connected to each motor: line L1 modulated by the controller should be combined with another line (N for 115V or L2 for 230V) to activate the motor. Also, be sure the stage's COMMON is supplied by line L1.</p> <p>Replace the fuse.</p> <p>Be sure the cable is firmly plugged in.</p> <p>Adjust the minimum speed to a higher value.</p> <p>Verify if the motor is defective by connecting it to an alternate power supply. If it still is not operating, replace the motor.</p>

PROBLEM	CAUSE	SOLUTION
The fans run continuously at full speed.	<p>The wiring is incorrect.</p> <p>The room temperature is above the set point.</p>	<p>Correct the wiring.</p> <p>Adjust the set point to the desired value.</p>
The fans run erratically.	<p>The selected motor curve is inappropriate.</p> <p>The bandwidth is too small.</p> <p>The time on or time off is too short.</p>	<p>Select an appropriate motor curve.</p> <p>Adjust the bandwidth to a higher value.</p> <p>Adjust the time on or time off to a higher value.</p>
The fans do not stop running when the controller is operating in minimum ventilation cycle.	<p>Time on is set to a value other than zero.</p> <p>The wiring is incorrect.</p>	<p>Set time on to zero.</p> <p>Correct the wiring. In particular, be sure two different lines are connected to each motor: line L1 modulated by the controller should be combined with another line (N for 115V or L2 for 230V) to activate the motor. Also, be sure the stage's COMMON is supplied by line L1.</p>

## TECHNICAL SPECIFICATIONS

**Supply:** - 115/230 VAC, (-18%, +8%), 60 Hz, L1 same phases as Stage 1, overload and overvoltage protection fuse F5-1A fast blow.

- 12VDC for AC back-up supply; can activate alarm if supplied with DC back-up voltage.

**Stage 1:** Variable output, 115/230 VAC, 60 Hz, 10A FAN (1/2 HP/115VAC)/ (1.5 HP/230VAC), same phases as supply, fuse F1-15A slow blow.

**Alarm:** ON-OFF output, 115/230 VAC, 60 Hz, 30 VDC, 3A, fuse F3-3A slow blow.

**Probes:** Low voltage (< 5V), isolated from the supply. Operating range: -40.0 °F to 120.0 °F (-40.0 °C to 48.9 °C). Accuracy: 1.8°F (1°C) between 41° and 95°F (5° and 35°C).

**Enclosure:** ABS, moisture and dust-tight.

**The room temperature where the controller is installed MUST AT ALL TIMES REMAIN BETWEEN 32° and 104°F (0° and 40°C).**

## FACTORY SETTINGS

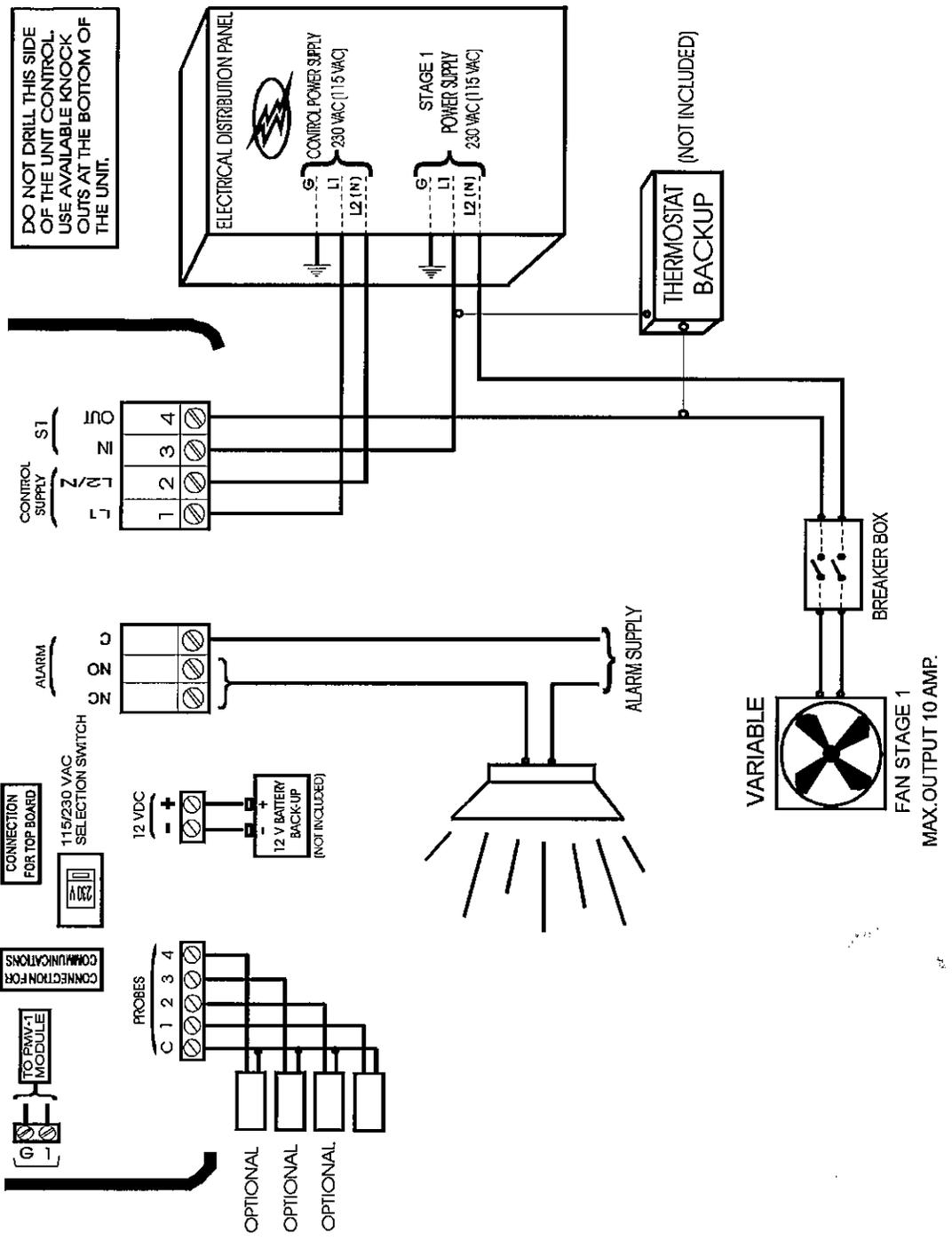
The controller is programmed at the factory with the settings shown below. You may leave as such the settings that are convenient for you and change the others.

These initial parameter settings will not be retained in the controller's memory. Each new setting will replace the preceding one.

If the power supply is cut off, the last parameter setting will be retained in memory until the power is restored.

PARAMETER		INITIAL SETTING
TEMPERATURE SET POINT	Temperature set point	75°F (23.9°C)
	Temperature curve	OFF
FANS	Minimum speed	40%
	Time on	15 seconds
	Time off	0 seconds
	Bandwidth	3°F (1.7°C)
ALARM	High offset	12°F (6.7°C)
	Low offset	10°F (5.6°C)

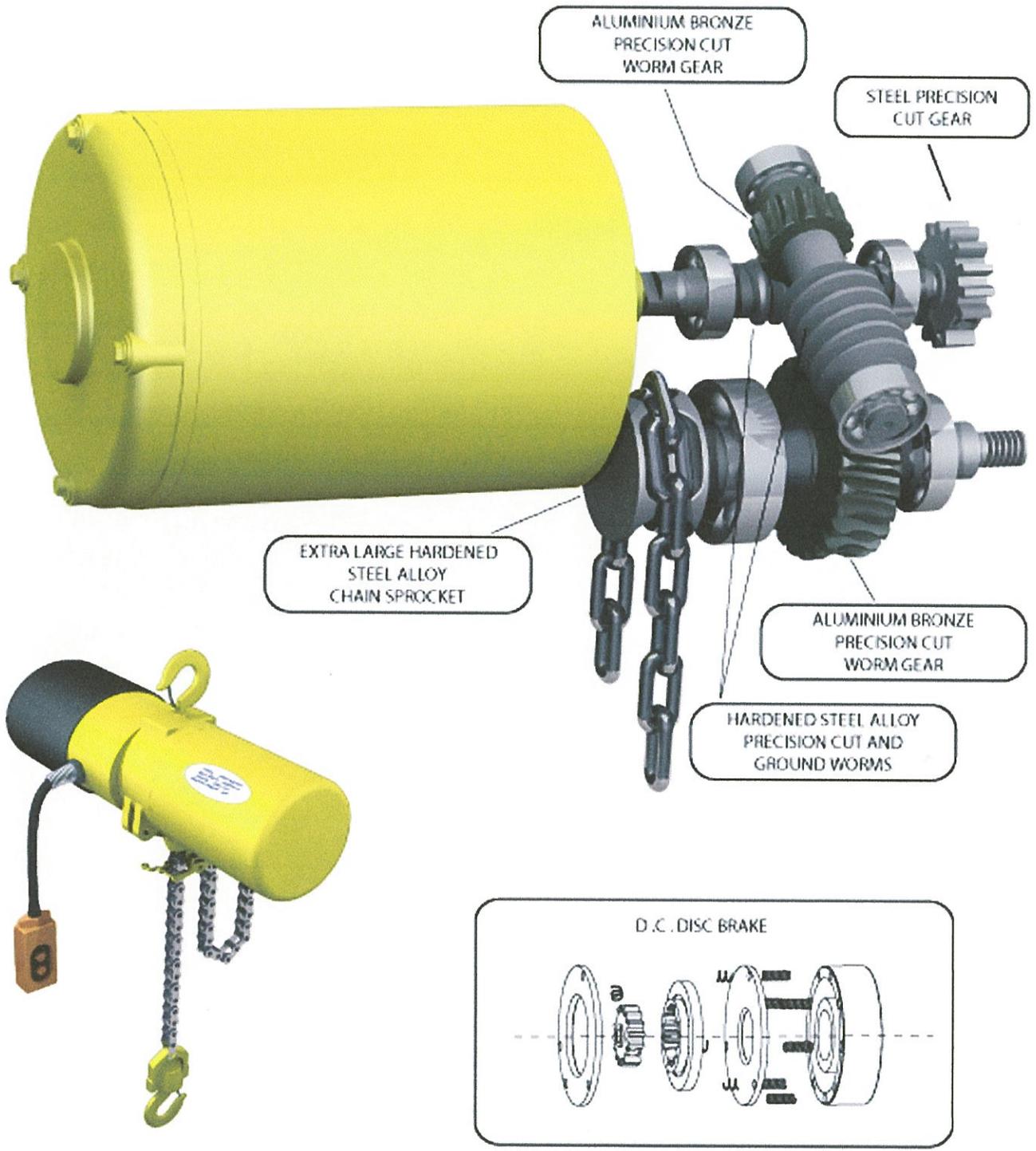
- NOTES**
1. INSTALLATION OF A GOOD QUALITY ALARM SYSTEM IS STRONGLY ADVISED TO WARN OF POWER FAILURES AND HIGH-TEMPERATURES.
  2. PROVIDE SURGE PROTECTION (TO INCLUDE PROTECTION FROM LIGHTNING) FROM POWER SUPPLY TO CONTROL AND FROM CONTROL TO OUTPUT EXTENDED PROBE. CONSULT A CERTIFIED ELECTRICIAN FOR SPECIFIC RECOMMENDATIONS.
  3. SAME PHASES MUST BE USED TO POWER VARIABLE FANS AND CONTROLS ON 3 PHASES POWER.
  4. WE RECOMMEND SEPARATE CIRCUIT BREAKERS FOR EACH OUTPUT STAGE.



DO NOT DRILL THIS SIDE OF THE UNIT CONTROL. USE AVAILABLE KNOCK-OUTS AT THE BOTTOM OF THE UNIT.



Double worm gear drive has less moving parts, requires less maintenance than conventional spur-gear hoists  
 Transmission sealed in oil for continuous lubrication: reduces wear & maintenance  
 Double gearing provides extra load holding brake



The hoists are guaranteed for 1 year against mechanical & material defects & workmanship  
 Any modification or addition of any kind, will nullify guarantee  
 The hoists must not be used as elevators, nor to carry people,  
 nor attached to a guided platform of any kind & are not guaranteed for these applications

## TANDEM OPERATION

2 to 4 hoists to operate together  
OR together & separately

## INTERCHANGEABLE PARTS

more than 88% of all parts are interchangeable in all hoist models

## 2 BRAKE SYSTEMS

### Very reliable

built-in safety is provided by the double braking system:

- 1 - electro mechanical disc brake
  - + self locking double worm gear drive
- both work together to give double protection

## TRANSMISSION SEALED IN OIL

### Reduces maintenance & wear

power is transmitted from the motor to the hook by 2 worm gears, which operate sealed in an oil bath.

Hardened steel alloy worms.

Aluminium bronze gears.

Load gear is splined to hardened steel sprocket shaft

## CAST STEEL FRAME

(Not steel plates)

the frame casting is made of shock-resisting steel, providing the most in strength, safety & durability

## HOOKS

¼ to 3T are forged carbon steel  
5 Tons & over are forged alloy steel  
all equipped with safety latches

ZINC PLATED ON REQUEST

ROLLER CHAIN BOTTOM  
HOOK SWING & SWIVELS

## SUSPENSION

Standard swivel hook  
Eye lug or fixed on request

COIL CHAIN made of special alloy  
case-hardened and heat treated steel

Chain break test  
17,846 lb

ZINC PLATED ON REQUEST

## ROLLER CHAIN

hoist type : solid roller  
can be lengthened or shortened  
& repaired quickly

LONG LASTING : less friction-wear  
as chain is machined

STAINLESS STEEL ON REQUEST

## CHAIN CONTAINER ON REQUEST

keeps tail chain up, out of the way & prevents kinking & twisting



THEATRE  
HOISTS

AVAILABLE

## HOIST MOTORS :

extra high H.P. ball bearing motor  
Motors are specially wound to provide extra torque & rated for intermittent duty  
115/230/1/60, 230/460 or 575/3/60  
Other voltages on request

## MOTOR OPTIONS

humidity / acidity treatment

fan cooled motor increases duty cycle  
( working time ) and important on long lifts

T.E.F.C. ( Totally enclosed fan cooled )  
motor recommended for dusty atmosphere

## ADJUSTABLE UPPER & LOWER LIMIT SWITCH

prevent over traveling

## EXTRA LIMIT SWITCH ON REQUEST

electro-mechanical type

POWER CABLE has a spring strain  
reliever & cable grip connector

## 3 STRAIN RELIEVERS ON P.B. CABLE

- 1<sup>st</sup>. spring strain reliever
- 2<sup>nd</sup>. cable grip connector
- 3<sup>rd</sup>. exterior wire rope strain reliever attached to the push-button, eliminates the invisible breakage of a built-in cable strain reliever  
Permits cable to be shortened and lengthened instantly

## PUSH-BUTTON CONTROL

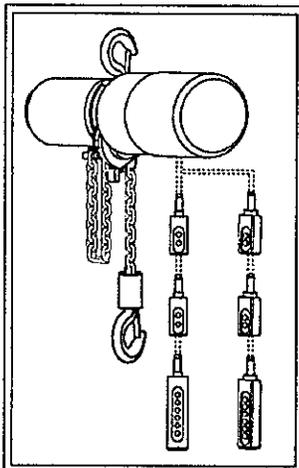
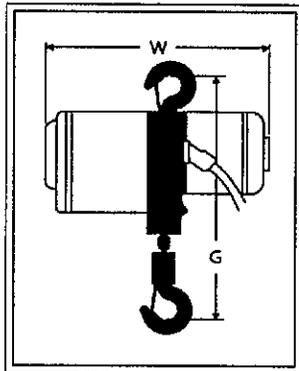
24 Volts (115 Volts on request)  
Humidityproof ( weatherproof Nema 4 on request )

## MULTI LEVEL PUSH-BUTTONS

multiple push button :  
pendant or wall type :  
4, 6, 8, 10, 12, buttons single or 2 speeds  
w / emergency stop mushroom type & alarm

## MECHANICAL & ELECTRICAL INTERLOCKS

on single speed when more than 1 pendant. Mechanical interlock on any 2 speeds, so that in 2 above options, 2 operators on different levels cannot operate the hoist at the same time, in order not to reverse motor at full speed



VULCAN CHAIN HOISTS		Link chain specs.			HEADROOM "G" Low headroom specs on request					
Single Speed		Swivel hook suspension			Swivel hook suspension			Eye hook / lug on request		
CAPACITY TONS	MODEL NO	SINGLE PHASE			Hoist length W"	Hoist only G"	Hoist		Hoist	
		FPM	Motor HP	lb			w/Nova trolley	w/electric trolley	w/Nova trolley	w/electric trolley
1/4 T 500 lb 1 Fall	L05F15	15	3/4	87	23	20.5	24.5	24.7	20.5	20.6
	L05F28	28	1.5	91	24	20.5	24.5	24.7	23.7	23.9
	L05F36	36	1.5	91	24	20.5	24.5	24.7	23.7	23.9
	L05F50	50	1.5	91	24	20.5	31.2	31.5	28	28.1
1/2 T 1 000 lb 1 Fall	L1F08	08	3/4	88	23	20.5	24.5	24.7	20.5	20.6
	L1F16	16	3/4	90	23	20.5	24.5	24.7	20.5	20.6
	L1F20	20	1.5	91	24	20.5	24.5	24.7	20.5	20.6
	L1F28	28	1.5	92	24	20.5	24.5	24.7	20.5	20.6
	L1F40	40	2	96	24.2	27.2	31.2	31.5	28	28.1
1 T 2 000 lb 1 Fall	L2F08	08	3/4	94	23	20.7	25.7	25	20.9	20.6
	L2F14	14	1.5	96	24	20.7	25.7	25	20.9	20.6
	L2F20	20	1.5	97	24	20.7	25.7	25	20.9	20.6
	L2F26	26	2	98	24.2	20.7	25.7	25	20.9	20.6
1.5 T 3 000 lb 1 Fall	L3A07	07	1.5	98	24	22.6	28	27.1	22.7	22.5
	L3F13	13	2	100	24.2	22.6	28	27.1	22.7	22.5
2 T 4 000 lb 2 Falls	L4F05	05	3/4	139	23	27	32.4	31.5	26.5	26.2
	L4F08	08	1.5	147	24	27	32.4	31.5	26.5	26.2
	L4F13	13	2	150	24.2	27	32.4	31.5	26.5	26.2
3 T 6 000 lb 2 Falls	L6F05	05	1.5	147	24	27	33.7	32.7	27.5	26.9
	L6F08	08	2	150	24.2	27	33.7	32.7	27.5	26.9
5 T 10 000 lb 3 Falls	L10F03	03	1.5	169	24	29.2	38.2	35.7	31.5	30.2
6 T 12 000 lb 3 Falls	L12F03	03	2	179	24.2	31.2	40.2	37.7	33.5	32.2
		◆ 115 Volts only			■ 230 Volts only		Ⓢ 115V. In model no. Replace letter F by A			
		575/3/50 * <b>THREE PHASE</b>								
1/4 T 500 lb 1 Fall	L05V16	16	1	89	22.5	20.5	24.5	24.7	20.5	20.6
	L05V28	28	2	95	23	20.5	24.5	24.7	23.7	23.9
	L05V40	40	2	96	23	27.2	31.2	31.5	28	28.1
	L05V50	50	2	96	23	27.2	31.2	31.5	28	28.1
1/2 T 1 000 lb 1 Fall	L1V09	09	1	90	22.5	20.5	24.5	24.7	20.5	20.6
	L1V16	16	1	90	22.5	20.5	24.5	24.7	20.5	20.6
	L1V28	28	2	96	23	20.5	24.5	24.7	23.7	23.9
	L1V40	40	2	97	23	27.2	31.2	31.5	28	28.1
1 T 2 000 lb 1 Fall	L1V50	50	2	105	23	27.2	31.2	31.5	28	28.1
	L2V09	09	1	93	22.5	20.7	25.7	25	20.9	20.6
	L2V15	15	1	93	22.5	20.7	25.7	25	20.9	20.6
	L2V20	20	2	108	23	20.7	25.7	25	24.1	23.9
	L2V24	24	2	108	23	20.7	25.7	25	24.1	23.9
	L2V30	30	2	108	23	20.7	25.7	25	24.1	23.9
1.5 T 3 000 lb 1 Fall	L2V40	40	3	120	24	27.5	32.5	31.7	28.4	28.1
	L2V50	50	3	128	24	27.5	32.5	31.7	28.4	28.1
	L3V20	20	3	122	24	22.6	28	27.1	22	25.7
	L3V35	35	4.5	127	24.7	27.9	33.2	32.4	28.7	28.5
2 T 4 000 lb 2 Falls	** L4V04	04	2	126	23	24.7	30.1	29.2	24.2	24
	** L4V10	10	2	128	23	24.7	30.1	29.2	24.2	24
	** L4V15	15	3	130	24	24.7	30.1	29.2	24.2	24
	L4V20	20	3	149	24	30.2	35.6	35.7	30.5	30.2
	L4V26	26	3	149	24	30.2	35.6	35.7	30.5	30.2
2.5 T 5 000 lb 2 Falls	L5V20	20	4.5	155	24.7	30.2	37	36	31.5	30.9
	L6V05	05	1.5	137	23	27	33.7	32.7	27.5	26.9
	L6V09	09	3	144	24	27	33.7	32.7	27.5	26.9
	L6V16	16	3	144	24	27	33.7	32.7	27.5	26.9
3 T 6 000 lb 2 Falls	L6V20	20	4.5	155	24.7	30.2	37	36	31.5	30.9
	L10V05	05	3	166	24	29.2	38.2	35.7	31.5	30.2
	L10V10	10	4.5	172	24.7	29.2	38.2	35.7	31.5	30.2
5 T 10 000 lb 3 Falls	L10V13	13	4.5	172	24.7	29.2	38.2	35.7	31.5	30.2
	L14V07	07	4.5	179	24.7	31.2	42	40.8	38	33
10 T 20 000 lb 6 Falls	L20V07	07	2x 4.5	350	24.7 x 2	--	--	--	33	33

**OPTIONS, w/standard delivery:**  
 Slower/faster speeds      2 Speeds, Ratio 3 to 1, 3 phase only      \* 3 phase: 230 V. replace V by H  
 Electro-mechanical overload      Thermal overload with automatic reset to protect motor against overheating      460 V. replace V by T  
 Weatherproof NEMA 4 push-button, hoist comes w/humidity push-button      Standard lift 10' Control cable 6'      208 & 380 V. and 50 cycle on request  
 Zinc coated chain/hook      Humidity/acidity motor treatment      Power cable 15'      ALL PARTS IN STOCK