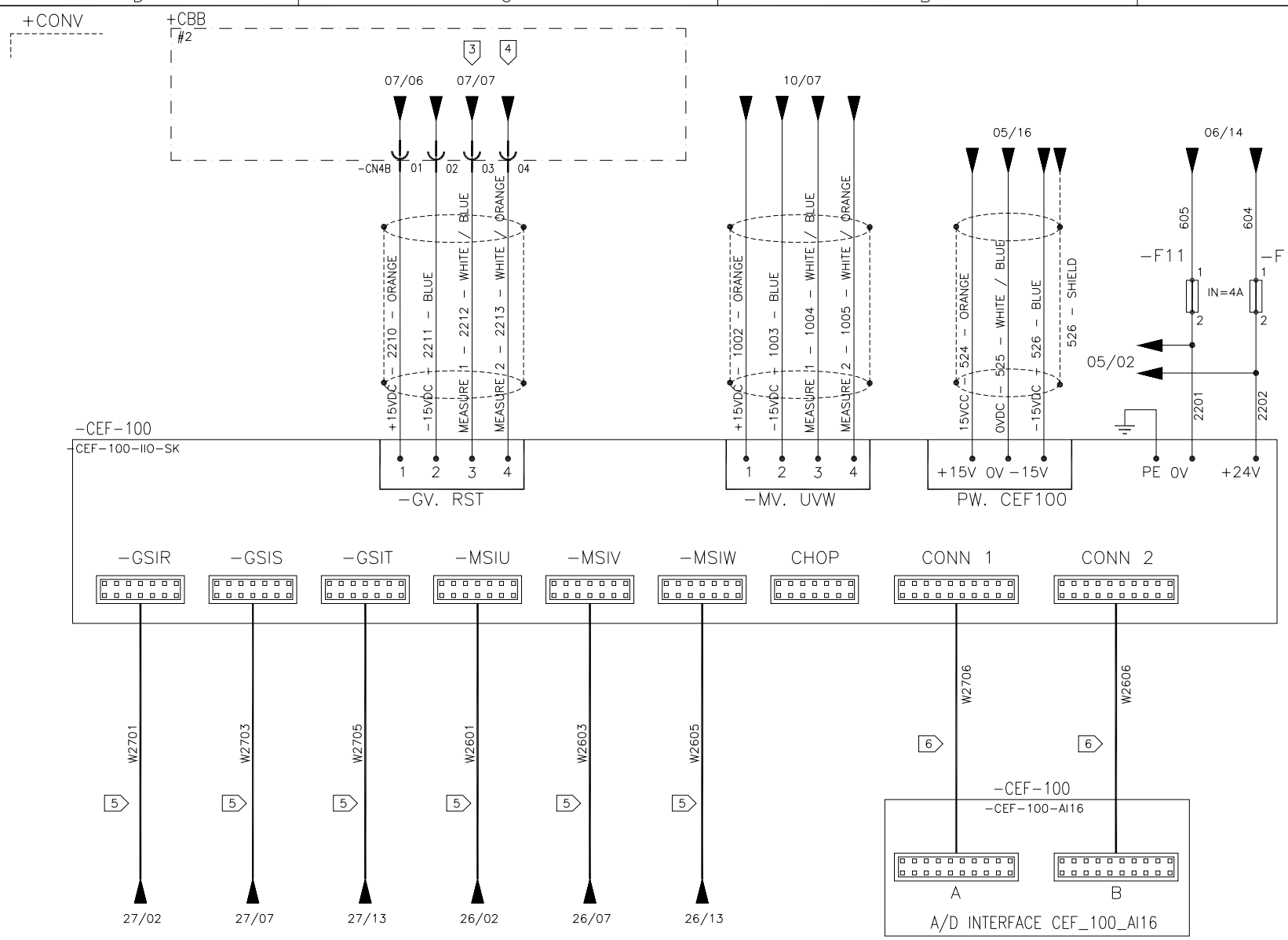

REFERENCES

1. VOLTAGE PHASE U-V GENERATOR SIDE
2. VOLTAGE PHASE V-W GENERATOR SIDE
3. VOLTAGE PHASE R-S LINE SIDE
4. VOLTAGE PHASE S-T LINE SIDE
5. CABLE TYCO E146425-14X28AWG
6. FLAT CABLE

#1 DRAWINGS 99835-680050
#2 DRAWINGS D9706-02-04
#3 DRAWINGS D9706-02-07
#5 DRAWINGS 99835-680052
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IRAM-A3 SISTEMA CAD ICSA

REV.	DENOMINATION	DATE	SIGN
04	GENERAL CHANGES	03/09/12	DAR
02	AS BUILT	17/06/08	UFE
01	AS BUILT	22/10/07	AGJ

DWG N? D9706-02-01 | EDITION DATE 01/11/2006

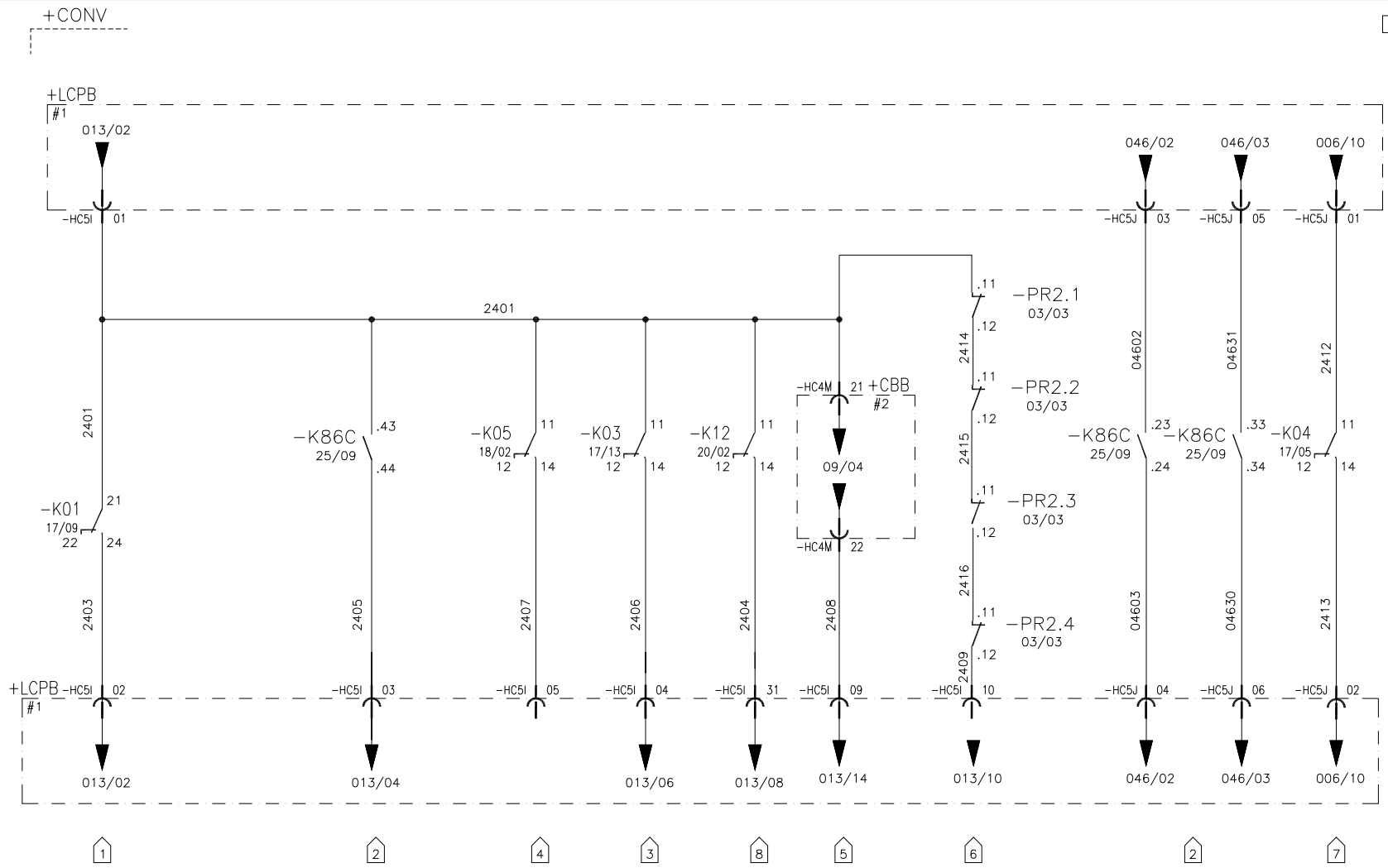
TITLE: STATIC FRECUENCY CONVERTER 1,5MVA
+CONV - CIRCUIT DIAGRAMS

JOB N§ D9706: STATIC FRECUENCY CONVERTER WIND GENERATOR

GROUP: CONTROL SYSTEM DIGITAL INPUTS

DESIGN	JVA	SHEET	22
APPD	FUB	CONT.	24

ICSA INGENIERIA Y COMPUTACION S.A. MENDOZA-ARGENTINA



REFERENCES

1. CONVERTER FAST SHUTDOWN
2. CONVERTER EMERGENCY SHUTDOWN
3. GRID LOSS SHUTDOWN
4. CONVERTER READY TO CONNECT
4. CONV. GENERATOR SIDE EMERGENCY SHUTDOWN
5. OVERVOLTAGE PROTECTION NORMAL. +CBB
6. OVERVOLTAGE PROTECTION NORMAL. +CONV
7. SWITCHGEAR CIRCUIT BREAKER OPEN ORDER
8. SPARE

#1 DRAWINGS 99835-680050
#2 DRAWINGS D9706-02-04
#3 DRAWINGS D9706-02-07
#4 DRAWINGS

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IRAM-A3 SISTEMA CAD ICSA

REV.	DENOMINATION	DATE	SIGN
04	GENERAL CHANGES	03/09/12	DAR
02	AS BUILT	17/06/08	UFE
01	AS BUILT	22/10/07	AGJ

DWG N? D9706-02-01 | EDITION DATE 01/11/2006

TITLE: STATIC FRECUENCY CONVERTER 1,5MVA +CONV - CIRCUIT DIAGRAMS

JOB N§ D9706: STATIC FRECUENCY CONVERTER WIND GENERATOR

GROUP: CONTROL SYSTEM SIGNALS TO +LCPB

DESIGN	JVA	SHEET	24
APPD	FUB	CONT.	25

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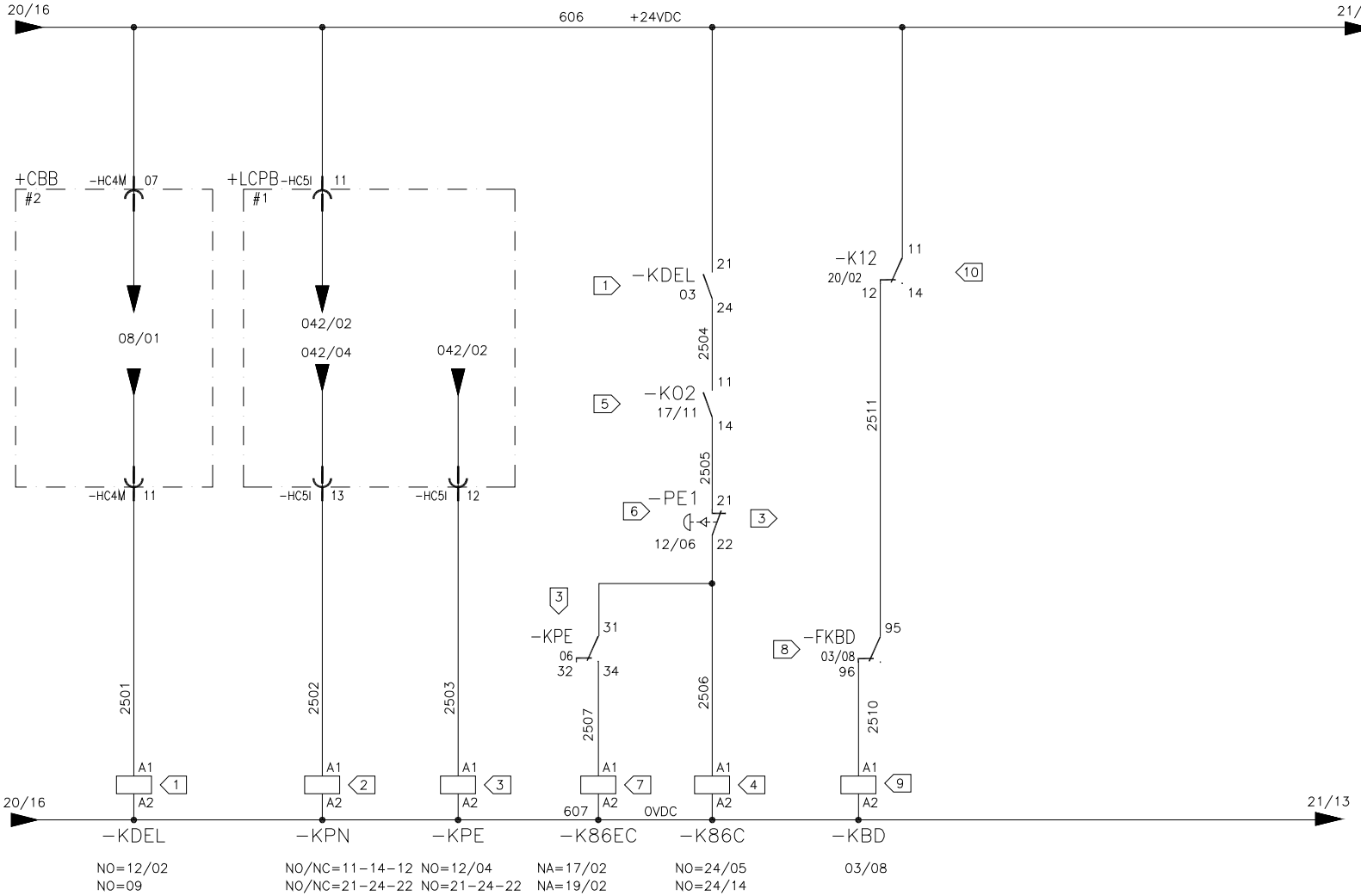
IRAM-A3 SISTEMA CAD ICSA

+CONV



REFERENCES

1. BASE CIRCUIT BREAKER ELECTRICAL FAULT (SDE)
2. NORMAL STOP
3. EMERGENCY SHUT DOWN FROM +LCPB
4. EMERGENCY SHUTDOWN
5. EMERGENCY SHUT DOWN BY CONVERTER
6. EMERGENCY SHUTDOWN BY LOCAL PUSHBUTTON
7. CONVERTER ELECTRICAL EMERGENCY
8. NORMAL CURRENTS DESCHARGE
9. BUS DC DESCHARGE CONTACTOR
10. BUS DC DESCHARGE

#1 DRAWINGS 99835-680050
#2 DRAWINGS D9706-02-04

01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16

REV.	DENOMINATION	DATE	SIGN
04	GENERAL CHANGES	03/09/12	DAR
02	AS BUILT	17/06/08	UFE
01	AS BUILT	22/10/07	AGJ

DWG N? D9706-02-01 | EDITION DATE 01/11/2006

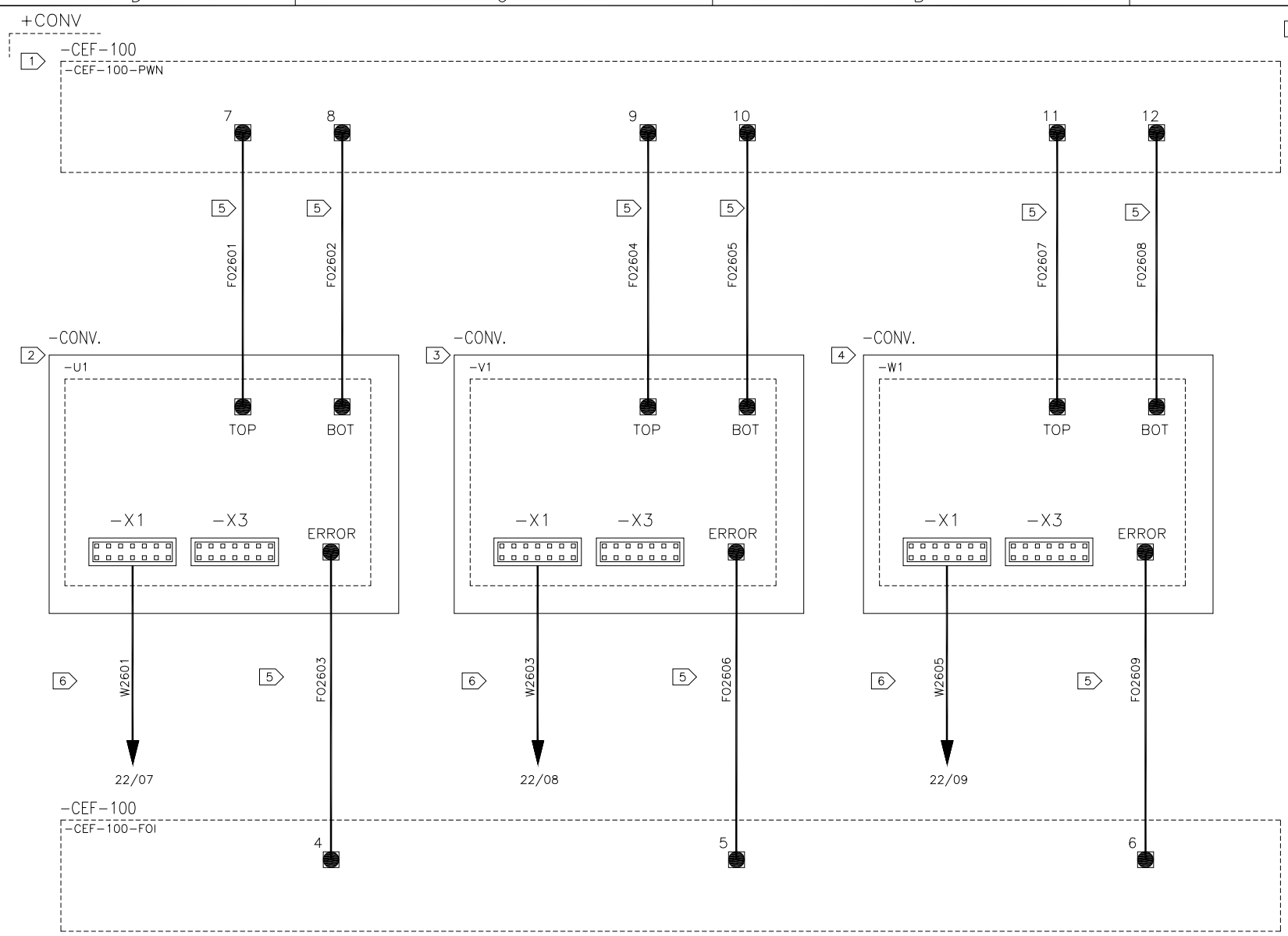
TITLE: STATIC FRECUENCY CONVERTER 1,5MVA +CONV - CIRCUIT DIAGRAMS

JOB N§ D9706: STATIC FRECUENCY CONVERTER WIND GENERATOR

GROUP: CONTROL SYSTEM CIRCUIT DIAGRAMS

DESIGN	JVA	SHEET	25
APPD	FUB	CONT.	26

ICSA INGENIERIA Y COMPUTACION S.A. MENDOZA-ARGENTINA



REFERENCES

1. CONTROLLER -CEF-100 OPTICAL INPUT SIGNAL
2. PARALLEL BOARD SKHBP2F PHASE U
3. PARALLEL BOARD SKHBP2F PHASE V
4. PARALLEL BOARD SKHBP2F PHASE W
5. FIBER OPTIC
6. CABLE TYCO E146425-14X28AWG

#1 DRAWINGS 99835-680050

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01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16

REV.	DENOMINATION	DATE	SIGN
04	GENERAL CHANGES	03/09/12	DAR
01	AS BUILT	22/10/07	AGJ

DWG N? D9706-02-01 | EDITION DATE 01/11/2006

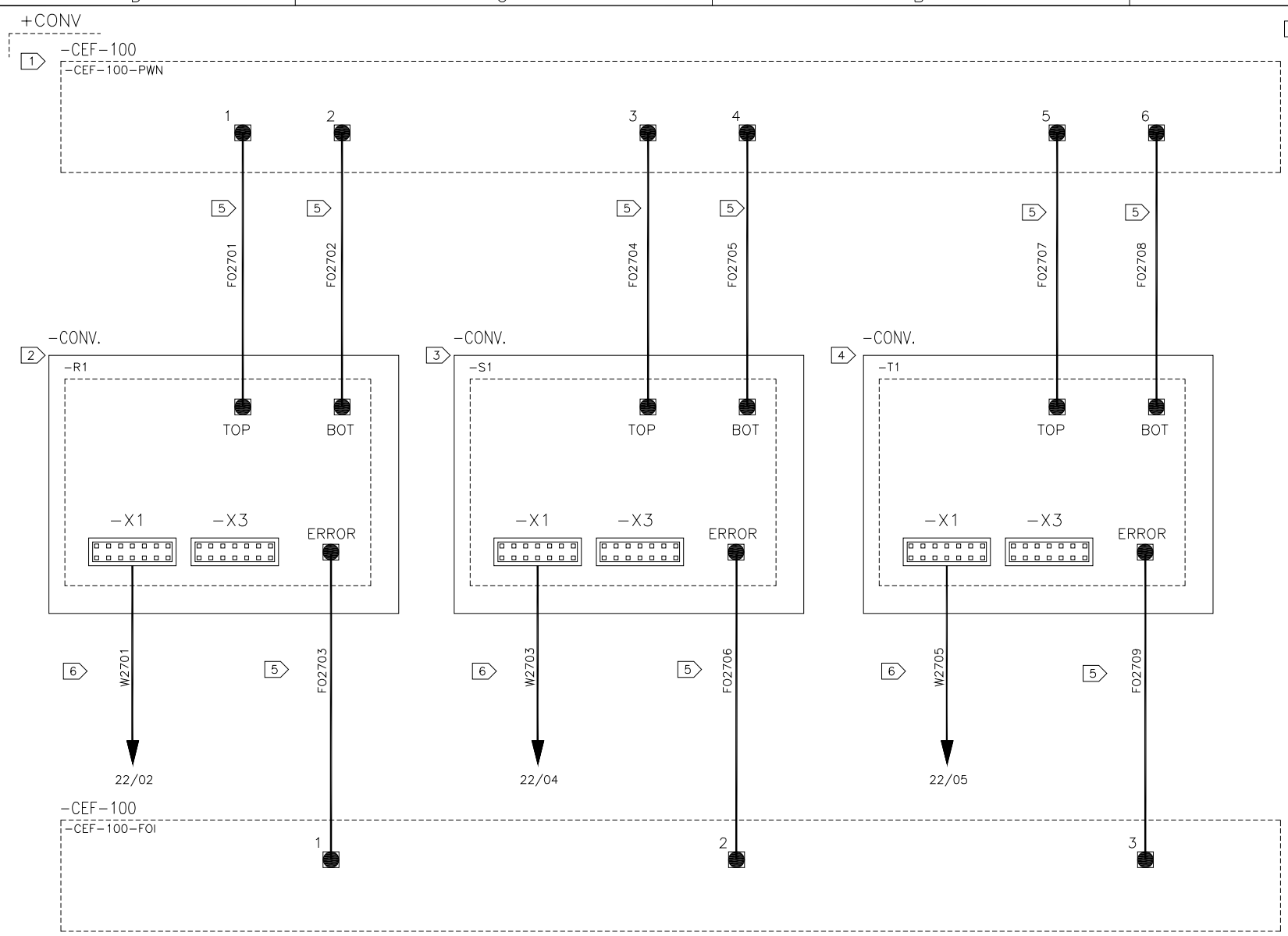
TITLE: STATIC FRECUENCY CONVERTER 1,5MVA
+CONV - CIRCUIT DIAGRAMS

JOB N§ D9706: STATIC FRECUENCY CONVERTER WIND GENERATOR

GROUP: CONTROL SYSTEM COMMUNICATION DIAGRAMS

DESIGN	JVA	SHEET	26
APPD	FUB	CONT.	27

ICSA INGENIERIA Y COMPUTACION S.A. MENDOZA-ARGENTINA



REFERENCES

1. CONTROLLER -CEF-100 OPTICAL INPUT SIGNAL
2. PARALLEL BOARD SKHBP2F PHASE R
3. PARALLEL BOARD SKHBP2F PHASE S
4. PARALLEL BOARD SKHBP2F PHASE T
5. FIBER OPTIC
6. CABLE TYCO E146425-14X28AWG

#1 DRAWINGS 99835-680050

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IRAM-A3 SISTEMA CAD ICSA

REV.	DENOMINATION	DATE	SIGN
04	GENERAL CHANGES	03/09/12	DAR
01	AS BUILT	22/10/07	AGJ

DWG N? D9706-02-01 | EDITION DATE 01/11/2006

TITLE: STATIC FRECUENCY CONVERTER 1,5MVA +CONV - CIRCUIT DIAGRAMS

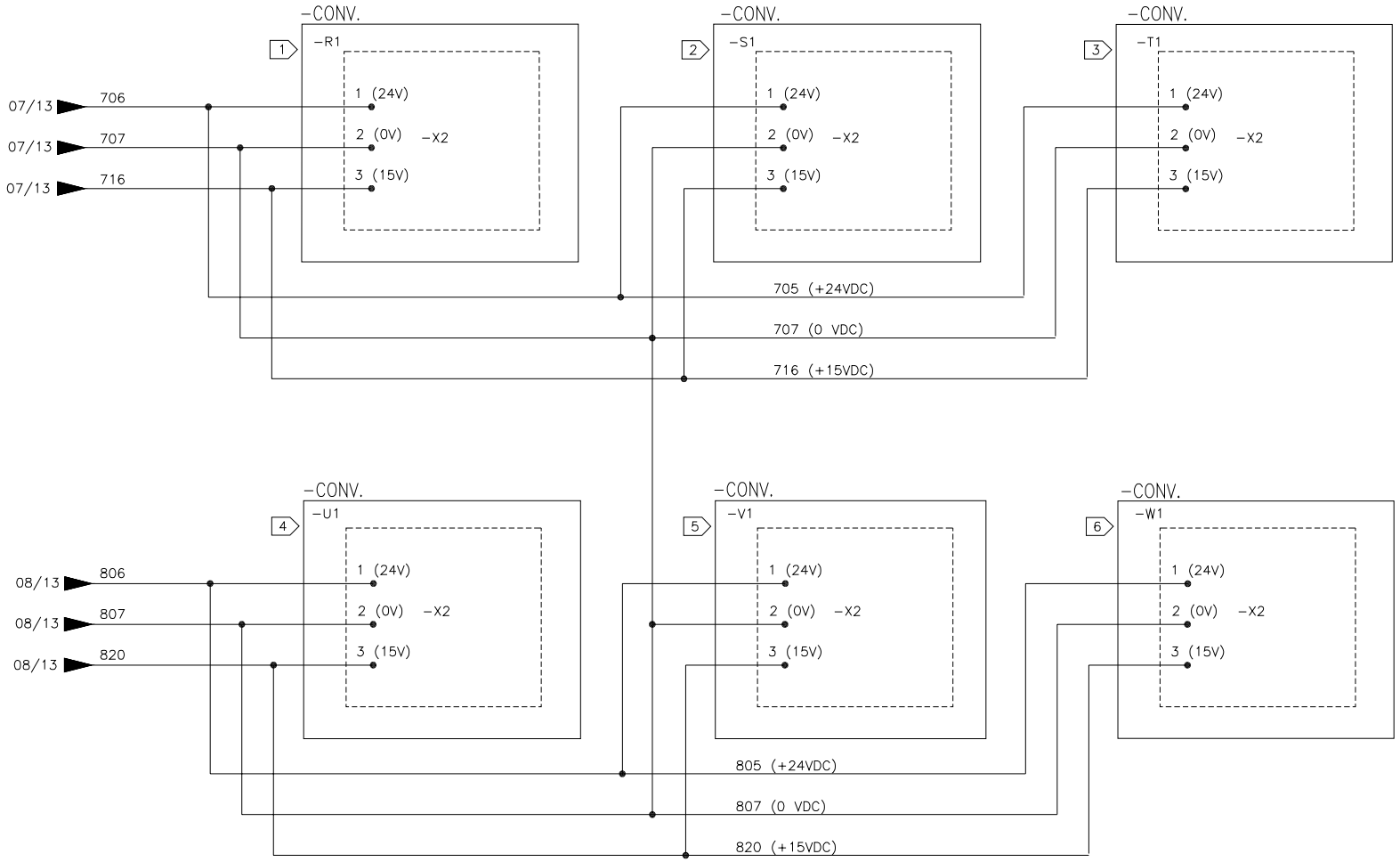
JOB N§ D9706: STATIC FRECUENCY CONVERTER WIND GENERATOR

GROUP: CONTROL SYSTEM COMMUNICATION DIAGRAMS

DESIGN	JVA	SHEET	27
APPD	FUB	CONT.	28

ICSA INGENIERIA Y COMPUTACION S.A. MENDOZA-ARGENTINA

+CONV



REFERENCES

1. PARALLEL BOARD SKHBP2F PHASE R
2. PARALLEL BOARD SKHBP2F PHASE S
3. PARALLEL BOARD SKHBP2F PHASE T
4. PARALLEL BOARD SKHBP2F PHASE U
5. PARALLEL BOARD SKHBP2F PHASE V
6. PARALLEL BOARD SKHBP2F PHASE W

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IRAM-A3 SISTEMA CAD ICSA

01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16

REV.	DENOMINATION	DATE	SIGN
05	GENERAL CHANGES	16/07/14	ICA
04	GENERAL CHANGES	03/09/13	DAR

DWG N? D9706-02-01 | EDITION DATE 01/11/2006

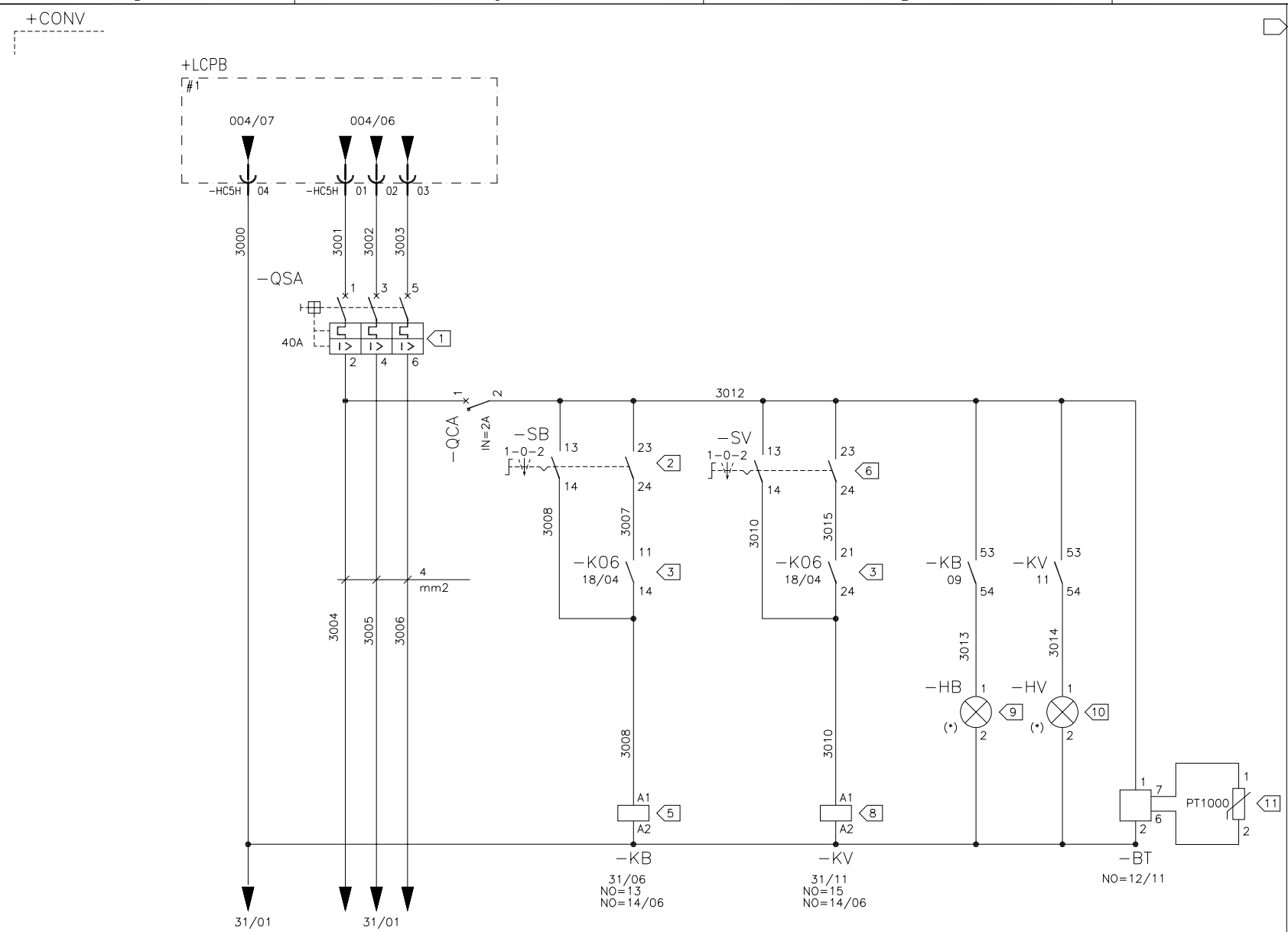
TITLE: STATIC FRECUENCY CONVERTER 1,5MVA
+CONV - CIRCUIT DIAGRAMS

JOB N§ D9706: STATIC FRECUENCY CONVERTER WIND GENERATOR

GROUP: CONTROL SYSTEM COOLING WATER DIAGRAMS

DESIGN	JVA	SHEET	28
APPD	FUB	CONT.	30

ICSA INGENIERIA Y COMPUTACION S.A. MENDOZA-ARGENTINA



REFERENCES

1. THERMOMAGNETIC CIRCUIT BREAKER
2. PUMP SELECTOR SWITCH MANUAL – AUTOMATIC
3. COOLING WATER SYSTEM START ORDER FROM CONV
4. PUMP MOTOR CIRCUIT BREAKER CONTACT
5. PUMP CONTACTOR
6. FAN SELECTOR SWITCH MANUAL – AUTOMATIC
7. FAN MOTOR CIRCUIT BREAKER CONTACT
8. FAN CONTACTOR
9. PUMP START INDICATOR
10. FAN START INDICATOR
11. MONITORING TEMPERATURE HOT WATER

#1 DRRAWINGS 99835-680050

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REV.	DENOMINATION	DATE	SIGN
01	AS BUILT	22/10/07	AGJ

DWG N? D9706-02-01 | EDITION DATE 01/11/2006

TITLE: STATIC FRECUENCY CONVERTER 1,5MVA
+CONV – CIRCUIT DIAGRAMS

JOB N§ D9706: STATIC FRECUENCY CONVERTER WIND GENERATOR

GROUP: CONTROL SYSTEM COOLING WATER DIAGRAMS

DESIGN	JVA	SHEET	30
APPD	FUB	CONT.	31

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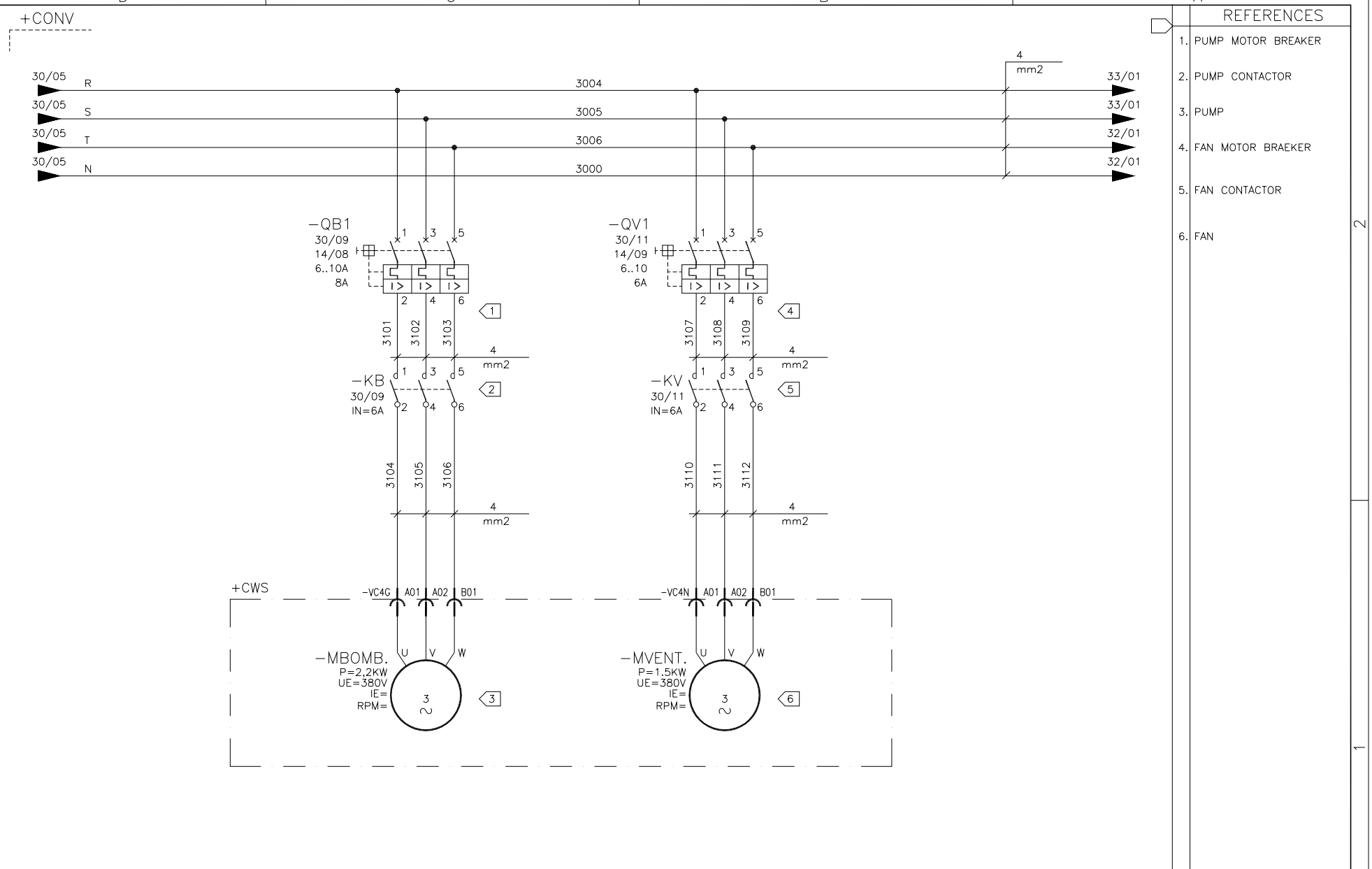

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IRAM-A3 SISTEMA CAD ICSA

01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16

REV.	DENOMINATION	DATE	SIGN
01	AS BUILT	22/10/07	AGJ

DWG N? D9706-02-01 | EDITION DATE 01/11/2006

TITLE: STATIC FRECUENCY CONVERTER 1,5MVA
+CONV – CIRCUIT DIAGRAMS

JOB N§ D9706: STATIC FRECUENCY CONVERTER WIND GENERATOR

GROUP: CONTROL SYSTEM
COOLING WATER DIAGRAMS

DESIGN	JVA	SHEET	31
APPD	FUB	CONT.	32

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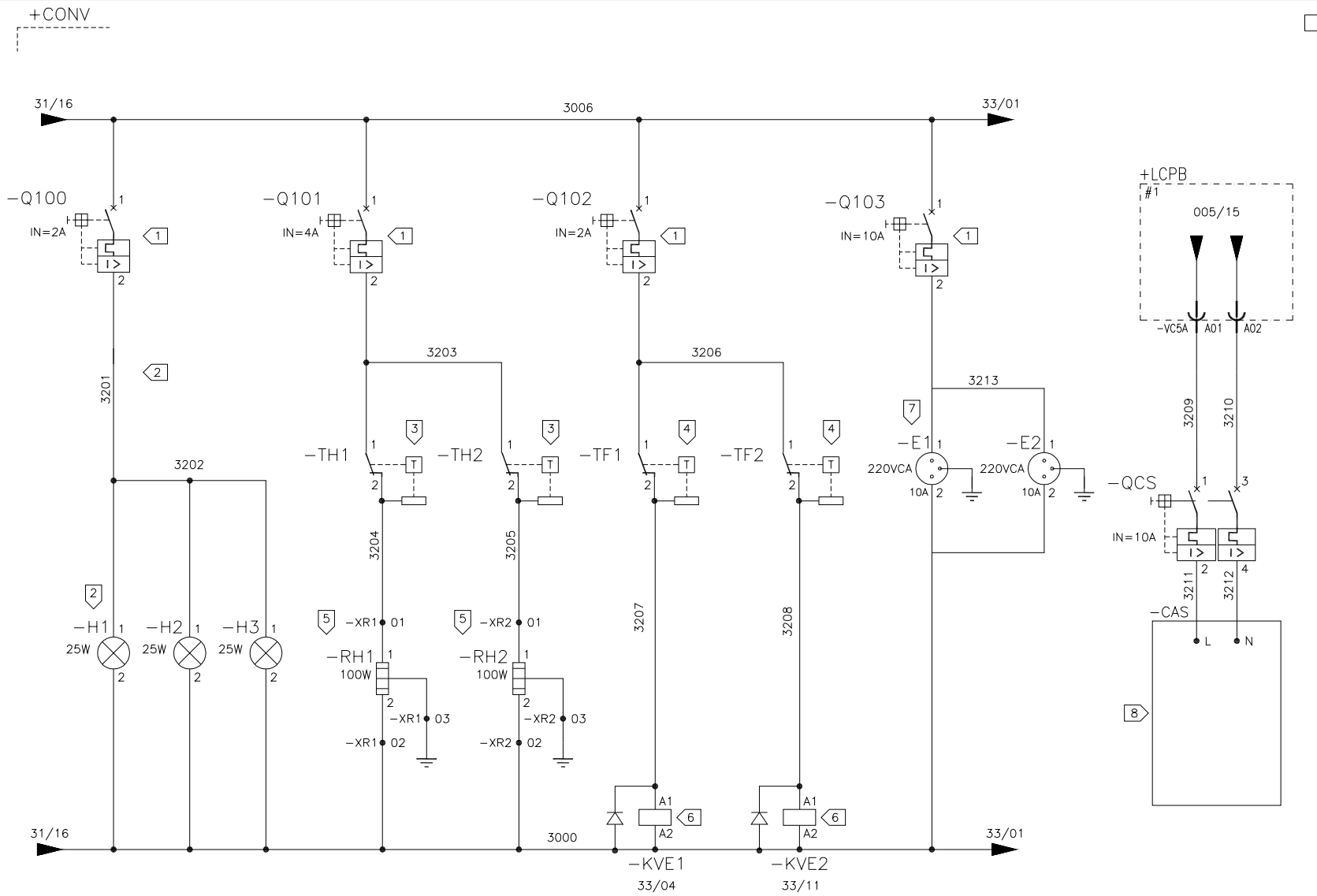

REFERENCES

1. CIRCUIT BREAKER
2. LIGHT PANEL
3. HEATER THERMOSTAT
4. FANS THERMOSTAT
5. HEATER
6. FANS COMAND CONTACTOR
7. OUTLET 10A
8. AIR CONDITIONED

#1 DRAWINGS
99835-680050

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IRAM-A3 SISTEMA CAD ICSA

01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16

REV.	DENOMINATION	DATE	SIGN
01	AS BUILT	22/10/07	AGJ

DWG N? D9706-02-01 | EDITION DATE 01/11/2006

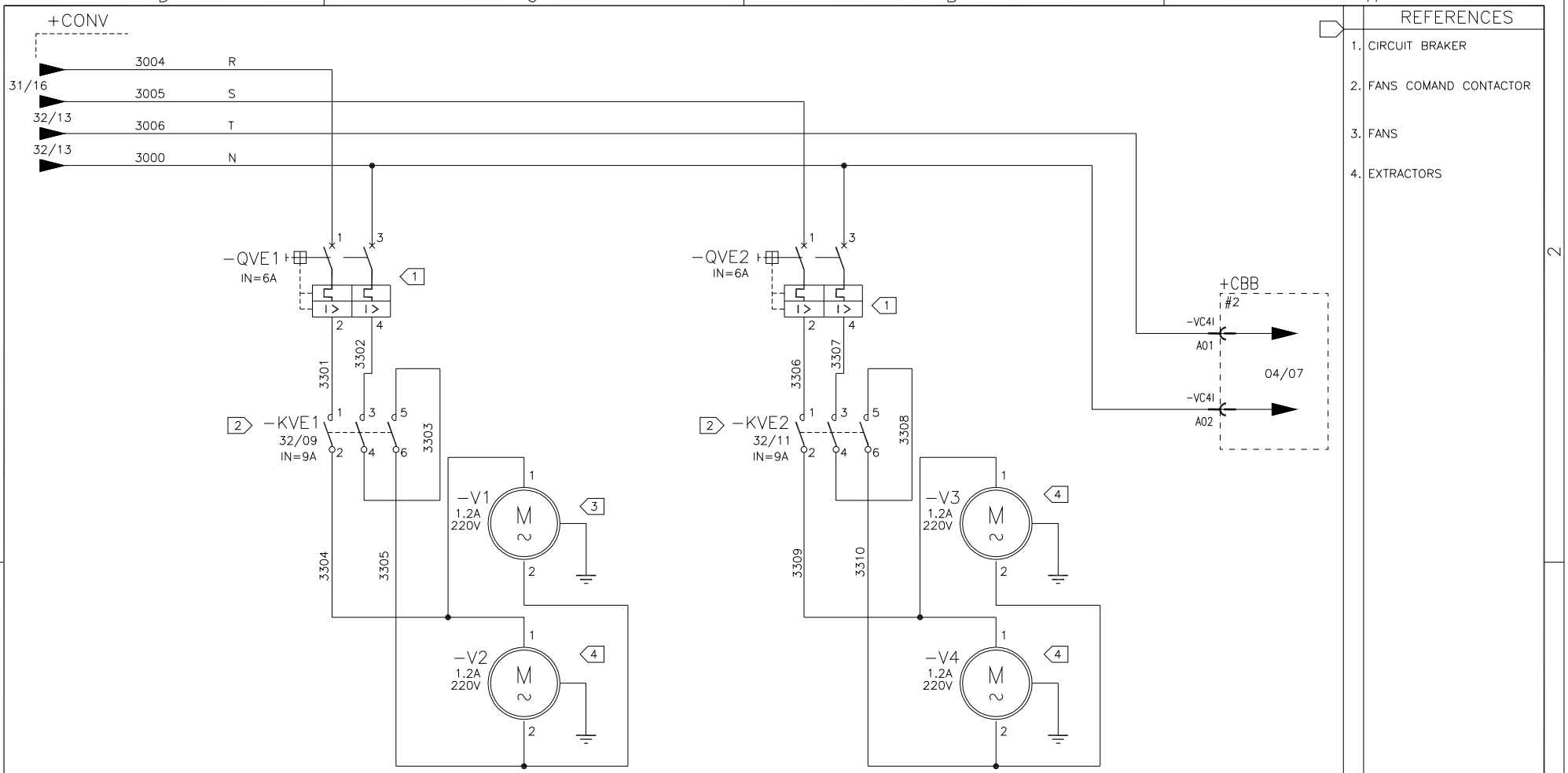
TITLE: STATIC FRECUENCY CONVERTER 1,5MVA
+CONV - CIRCUIT DIAGRAMS

JOB N§ D9706: STATIC FRECUENCY CONVERTER WIND GENERATOR

GROUP: CONTROL SYSTEM AUXILIARES SERVICES

DESIGN	JVA	SHEET	32
APPD	FUB	CONT.	33

ICSA INGENIERIA Y COMPUTACION S.A. MENDOZA-ARGENTINA



REFERENCES

1. CIRCUIT BRAKER
2. FANS COMAND CONTACTOR
3. FANS
4. EXTRACTORS

#2 DRAWINGS
D9706-02-04

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01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16

REV.	DENOMINATION	DATE	SIGN
01	AS BUILT	22/10/07	AGJ

DWG N? D9706-02-01 | EDITION DATE 01/11/2006

TITLE: STATIC FRECUENCY CONVERTER 1,5MVA
+CONV - CIRCUIT DIAGRAMS

JOB N§ D9706: STATIC FRECUENCY CONVERTER WIND GENERATOR

GROUP: CONTROL SYSTEM AUXILIARES SERVICES

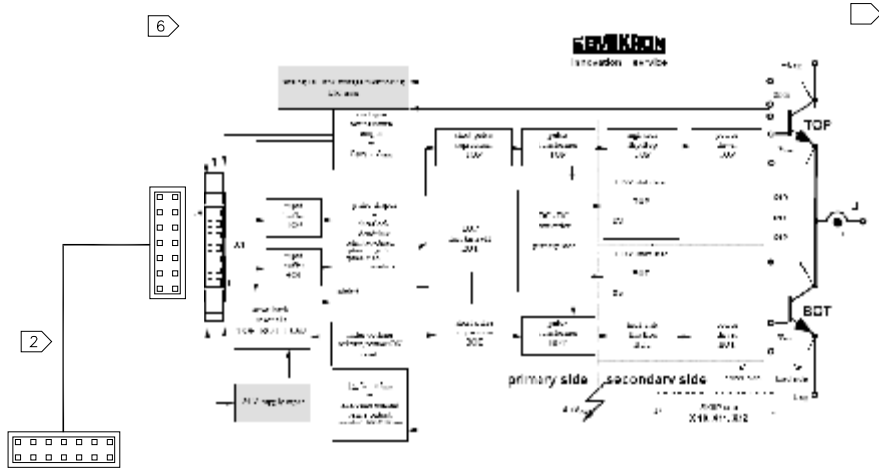
DESIGN	JVA	SHEET	33
APPD	FUB	CONT.	36

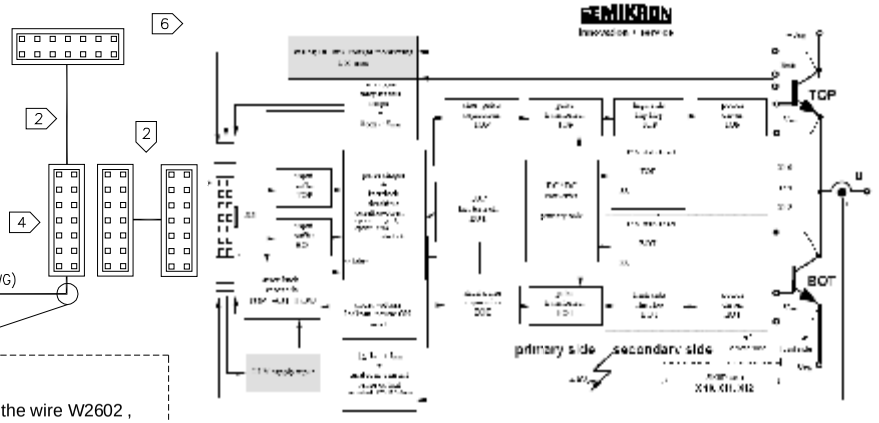
ICSA INGENIERIA Y COMPUTACION S.A. MENDOZA-ARGENTINA

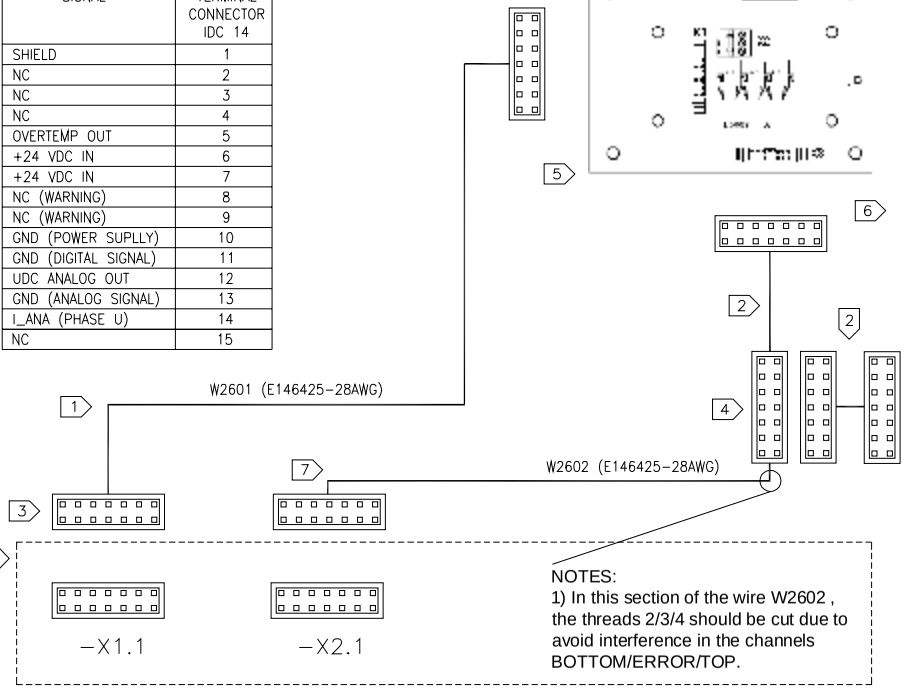
1	INTERCONNECTION WIRE	
	SIGNAL	TERMINAL CONNECTOR IDC 14
	SHIELD	1
	NA	2
	NA	3
	NA	4
	OVERTEMP OUT	5
	+24 VDC IN	6
	+24 VDC IN	7
	+15 VDC IN	8
	+15 VDC IN	9
	GND	10
	GND	11
	UDC ANALOG OUT	12
	GND (ANALOG SIGNAL)	13
	I_ANA SUM (PHASE U)	14
	NC	15

2	INTERCONNECTION WIRE	
	SIGNAL	TERMINAL CONNECTOR IDC 14
	SHIELD	1
	BOT IN	2
	ERROR OUT	3
	TOP IN	4
	OVERTEMP OUT	5
	+24 VDC IN	6
	+24 VDC IN	7
	NC (WARNING)	8
	NC (WARNING)	9
	GND (POWER SUPLLY)	10
	GND (DIGITAL SIGNAL)	11
	UDC ANALOG OUT	12
	GND (ANALOG SIGNAL)	13
	I_ANA (PHASE U)	14
	NC	15

7	INTERCONNECTION WIRE	
	SIGNAL	TERMINAL CONNECTOR IDC 14
	SHIELD	1
	NC	2
	NC	3
	NC	4
	OVERTEMP OUT	5
	+24 VDC IN	6
	+24 VDC IN	7
	NC (WARNING)	8
	NC (WARNING)	9
	GND (POWER SUPLLY)	10
	GND (DIGITAL SIGNAL)	11
	UDC ANALOG OUT	12
	GND (ANALOG SIGNAL)	13
	I_ANA (PHASE U)	14
	NC	15







NOTES:
1) In this section of the wire W2602 , the threads 2/3/4 should be cut due to avoid interference in the channels BOTTOM/ERROR/TOP.

REFERENCES

1. INTERCONNECTION WIRE W2601
2. INTERCONNECTION WIRE SKHBP2F TO SKIIP
3. IDC 14 CONNECTOR
4. 3M MODEL 4614-6001
5. PARALLEL BORAD SKHBP2F PHASE U
6. SKIIP 2403GB172-4DUW (INTELIGENT POWER MODULE)
7. INTERCONECTION WIRE W2602
8. CONTROLLER GENERATOR SIDE

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IRAM-A3 SISTEMA CAD ICSA

01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16

REV.	DENOMINATION	DATE	SIGN
01	AS BUILT	22/10/07	AGJ

DWG N? D9706-02-01 | EDITION DATE 01/11/2006

TITLE: STATIC FRECUENCY CONVERTER 1,5MVA +CONV - CIRCUIT DIAGRAMS

JOB N§ D9706: STATIC FRECUENCY CONVERTER WIND GENERATOR

GROUP: CONTROL SYSTEM COMMUNICATION DIAGRAMS

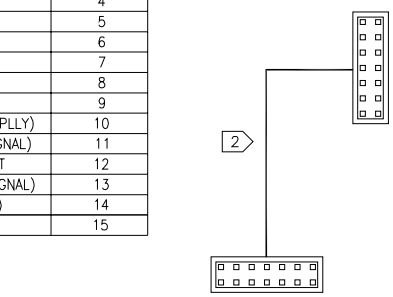
DESIGN	JVA	SHEET	36
APPD	FUB	CONT.	37

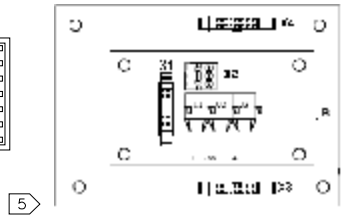
ICSA INGENIERIA Y COMPUTACION S.A. MENDOZA-ARGENTINA

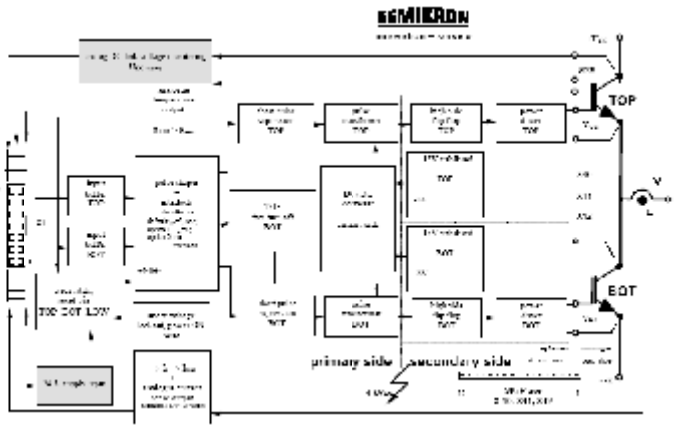
1	INTERCONNECTION WIRE	
	SIGNAL	TERMINAL CONNECTOR IDC 14
	SHIELD	1
	NA	2
	NA	3
	NA	4
	OVERTEMP OUT	5
	+24 VDC IN	6
	+24 VDC IN	7
	+15 VDC IN	8
	+15 VDC IN	9
	GND	10
	GND	11
	UDC ANALOG OUT	12
	GND (ANALOG SIGNAL)	13
	I_ANA SUM (PHASE V)	14
	NC	15

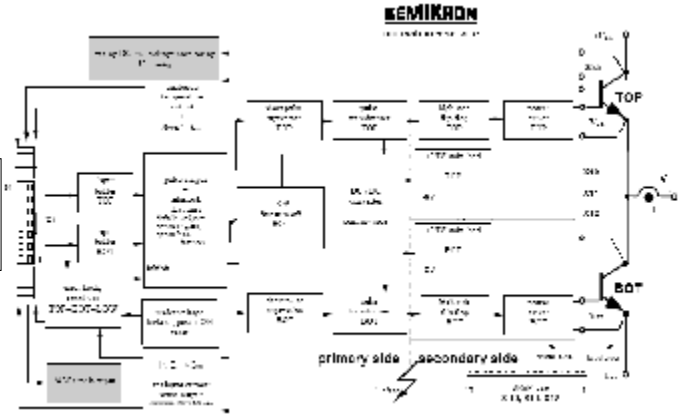
2	INTERCONNECTION WIRE	
	SIGNAL	TERMINAL CONNECTOR IDC 14
	SHIELD	1
	BOT IN	2
	ERROR OUT	3
	TOP IN	4
	OVERTEMP OUT	5
	+24 VDC IN	6
	+24 VDC IN	7
	NC (WARNING)	8
	NC (WARNING)	9
	GND (POWER SUPLLY)	10
	GND (DIGITAL SIGNAL)	11
	UDC ANALOG OUT	12
	GND (ANALOG SIGNAL)	13
	I_ANA (PHASE V)	14
	NC	15

7	INTERCONNECTION WIRE	
	SIGNAL	TERMINAL CONNECTOR IDC 14
	SHIELD	1
	NC	2
	NC	3
	NC	4
	OVERTEMP OUT	5
	+24 VDC IN	6
	+24 VDC IN	7
	NC (WARNING)	8
	NC (WARNING)	9
	GND (POWER SUPLLY)	10
	GND (DIGITAL SIGNAL)	11
	UDC ANALOG OUT	12
	GND (ANALOG SIGNAL)	13
	I_ANA (PHASE V)	14
	NC	15









W2603 (E146425-28AWG)

W2604 (E146425-28AWG)

NOTES:
1) In this section of the wire W2604 , the threads 2/3/4 should be cut due to avoid interference in the channels BOTTOM/ERROR/TOP.

REFERENCES

1. INTERCONNECTION WIRE W2603
2. INTERCONNECTION WIRE SKHBP2F TO SKIIP
3. IDC 14 CONNECTOR
4. 3M MODEL 4614-6001
5. PARALLEL BORAD SKHBP2F PHASE V
6. SKIIP 2403GB172-4DUW (INTELIGENT POWER MODULE)
7. INTERCONNECTION WIRE W2604
8. CONTROLLER GENERATOR SIDE

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REV.	DENOMINATION	DATE	SIGN
01	AS BUILT	22/10/07	AGJ

DWG N? D9706-02-01 | EDITION DATE 01/11/2006

TITLE: STATIC FRECUENCY CONVERTER 1,5MVA +CONV - CIRCUIT DIAGRAMS

JOB N§ D9706: STATIC FRECUENCY CONVERTER WIND GENERATOR

GROUP: CONTROL SYSTEM COMMUNICATION DIAGRAMS

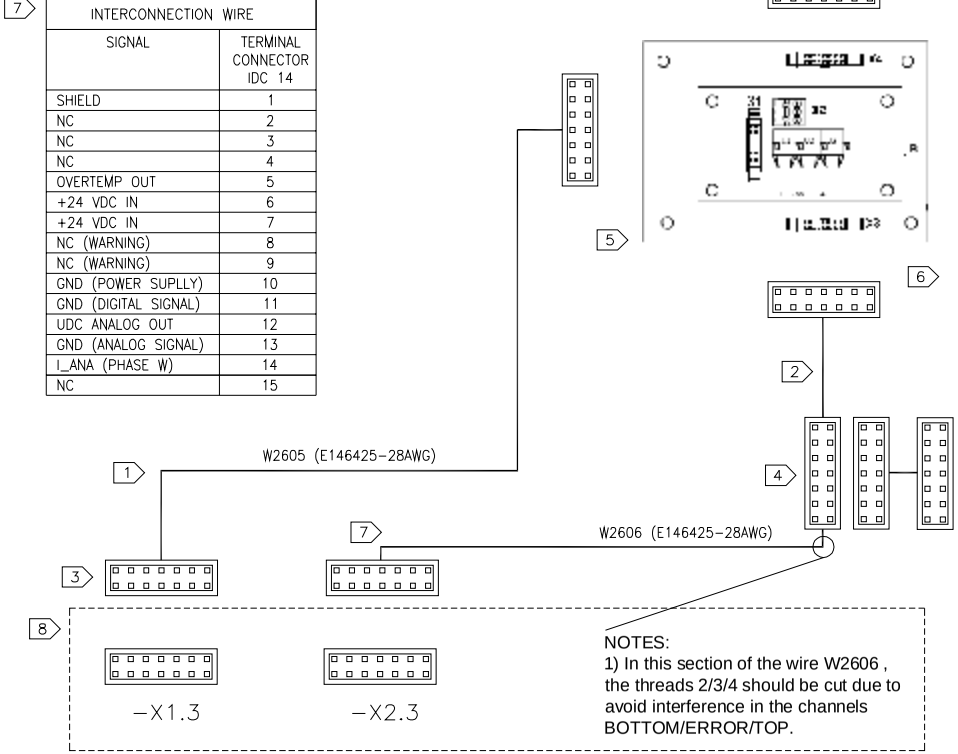
DESIGN	JVA	SHEET	37
APPD	FUB	CONT.	38

ICSA INGENIERIA Y COMPUTACION S.A. MENDOZA-ARGENTINA

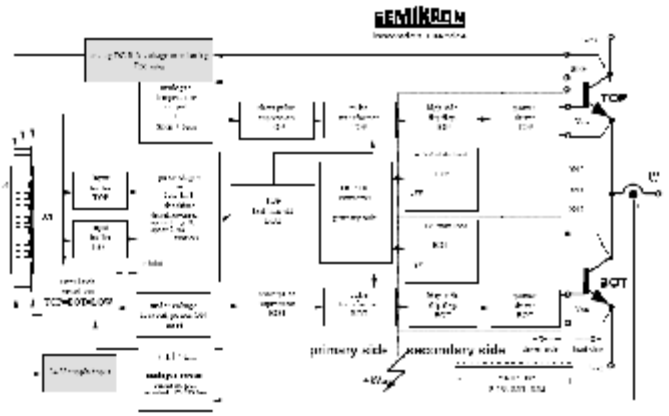
1	INTERCONNECTION WIRE	
	SIGNAL	TERMINAL CONNECTOR IDC 14
	SHIELD	1
	NA	2
	NA	3
	NA	4
	OVERTEMP OUT	5
	+24 VDC IN	6
	+24 VDC IN	7
	+15 VDC IN	8
	+15 VDC IN	9
	GND	10
	GND	11
	UDC ANALOG OUT	12
	GND (ANALOG SIGNAL)	13
	I_ANA SUM (PHASE W)	14
	NC	15

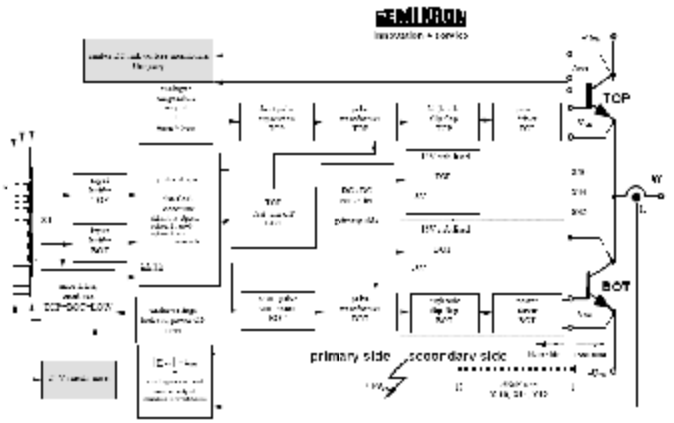
2	INTERCONNECTION WIRE	
	SIGNAL	TERMINAL CONNECTOR IDC 14
	SHIELD	1
	BOT IN	2
	ERROR OUT	3
	TOP IN	4
	OVERTEMP OUT	5
	+24 VDC IN	6
	+24 VDC IN	7
	NC (WARNING)	8
	NC (WARNING)	9
	GND (POWER SUPLLY)	10
	GND (DIGITAL SIGNAL)	11
	UDC ANALOG OUT	12
	GND (ANALOG SIGNAL)	13
	I_ANA (PHASE W)	14
	NC	15

7	INTERCONNECTION WIRE	
	SIGNAL	TERMINAL CONNECTOR IDC 14
	SHIELD	1
	NC	2
	NC	3
	NC	4
	OVERTEMP OUT	5
	+24 VDC IN	6
	+24 VDC IN	7
	NC (WARNING)	8
	NC (WARNING)	9
	GND (POWER SUPLLY)	10
	GND (DIGITAL SIGNAL)	11
	UDC ANALOG OUT	12
	GND (ANALOG SIGNAL)	13
	I_ANA (PHASE W)	14
	NC	15



NOTES:
1) In this section of the wire W2606 , the threads 2/3/4 should be cut due to avoid interference in the channels BOTTOM/ERROR/TOP.





REFERENCES

1. INTERCONNECTION WIRE W2605
2. INTERCONNECTION WIRE SKHBP2F TO SKIIP
3. IDC 14 CONNECTOR
4. 3M MODEL 4614-6001
5. PARALLEL BORAD SKHBP2F PHASE W
6. SKIIP 2403GB172-4DUW (INTELIGENT POWER MODULE)
7. INTERCONNECTION WIRE W2606
8. CONTROLLER GENERATOR SIDE

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IRAM-A3 SISTEMA CAD ICSA

01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16

REV.	DENOMINATION	DATE	SIGN
01	AS BUILT	22/10/07	AGJ

DWG N? D9706-02-01 | EDITION DATE 01/11/2006

TITLE: STATIC FRECUENCY CONVERTER 1,5MVA +CONV - CIRCUIT DIAGRAMS

JOB N§ D9706: STATIC FRECUENCY CONVERTER WIND GENERATOR

GROUP: CONTROL SYSTEM COMMUNICATION DIAGRAMS

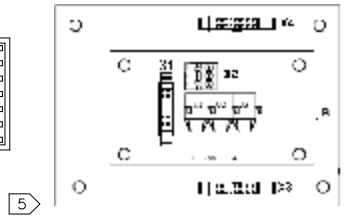
DESIGN	JVA	SHEET	38
APPD	FUB	CONT.	39

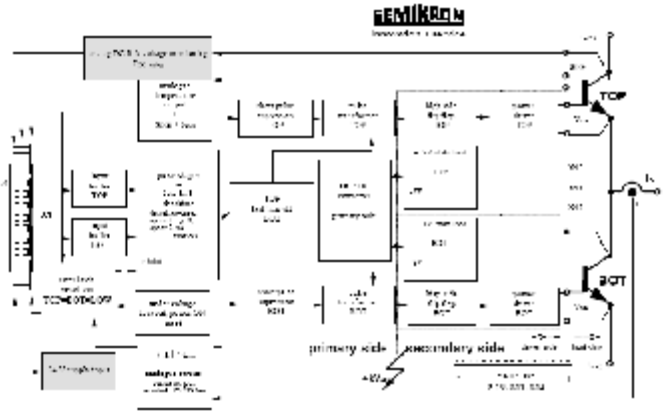
ICSA INGENIERIA Y COMPUTACION S.A. MENDOZA-ARGENTINA

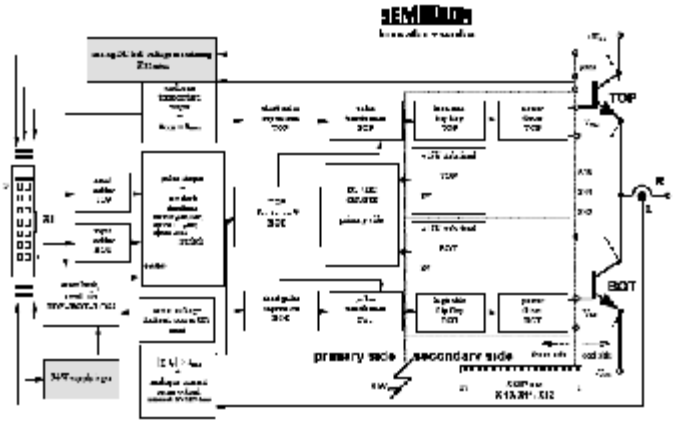
1	INTERCONNECTION WIRE	
	SIGNAL	TERMINAL CONNECTOR IDC 14
	SHIELD	1
	NA	2
	NA	3
	NA	4
	OVERTEMP OUT	5
	+24 VDC IN	6
	+24 VDC IN	7
	+15 VDC IN	8
	+15 VDC IN	9
	GND	10
	GND	11
	UDC ANALOG OUT	12
	GND (ANALOG SIGNAL)	13
	I_ANA SUM (PHASE R)	14
	NC	15

2	INTERCONNECTION WIRE	
	SIGNAL	TERMINAL CONNECTOR IDC 14
	SHIELD	1
	BOT IN	2
	ERROR OUT	3
	TOP IN	4
	OVERTEMP OUT	5
	+24 VDC IN	6
	+24 VDC IN	7
	NC (WARNING)	8
	NC (WARNING)	9
	GND (POWER SUPLLY)	10
	GND (DIGITAL SIGNAL)	11
	UDC ANALOG OUT	12
	GND (ANALOG SIGNAL)	13
	I_ANA (PHASE R)	14
	NC	15

7	INTERCONNECTION WIRE	
	SIGNAL	TERMINAL CONNECTOR IDC 14
	SHIELD	1
	NC	2
	NC	3
	NC	4
	OVERTEMP OUT	5
	+24 VDC IN	6
	+24 VDC IN	7
	NC (WARNING)	8
	NC (WARNING)	9
	GND (POWER SUPLLY)	10
	GND (DIGITAL SIGNAL)	11
	UDC ANALOG OUT	12
	GND (ANALOG SIGNAL)	13
	I_ANA (PHASE R)	14
	NC	15







W2701 (E146425-28AWG)

W2702 (E146425-28AWG)

−X1.1 −X2.1

NOTES:
1) In this section of the wire W2702 , the threads 2/3/4 should be cut due to avoid interference in the channels BOTTOM/ERROR/TOP.

REFERENCES

1. INTERCONNECTION WIRE W2701
2. INTERCONNECTION WIRE SKHBP2F TO SKIIP
3. IDC 14 CONNECTOR
4. 3M MODEL 4614-6001
5. PARALLEL BORAD SKHBP2F PHASE R
6. SKIIP 2403GB172-4DUW (INTELIGENT POWER MODULE)
7. INTERCONNECTION WIRE W2702
8. CONTROLLER LINE SIDE

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IRAM-A3 SISTEMA CAD ICSA

01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16

REV.	DENOMINATION	DATE	SIGN
01	AS BUILT	22/10/07	AGJ

DWG N? D9706-02-01 | EDITION DATE 01/11/2006

TITLE: STATIC FRECUENCY CONVERTER 1,5MVA +CONV - CIRCUIT DIAGRAMS

JOB N§ D9706: STATIC FRECUENCY CONVERTER WIND GENERATOR

GROUP: CONTROL SYSTEM COMMUNICATION DIAGRAMS

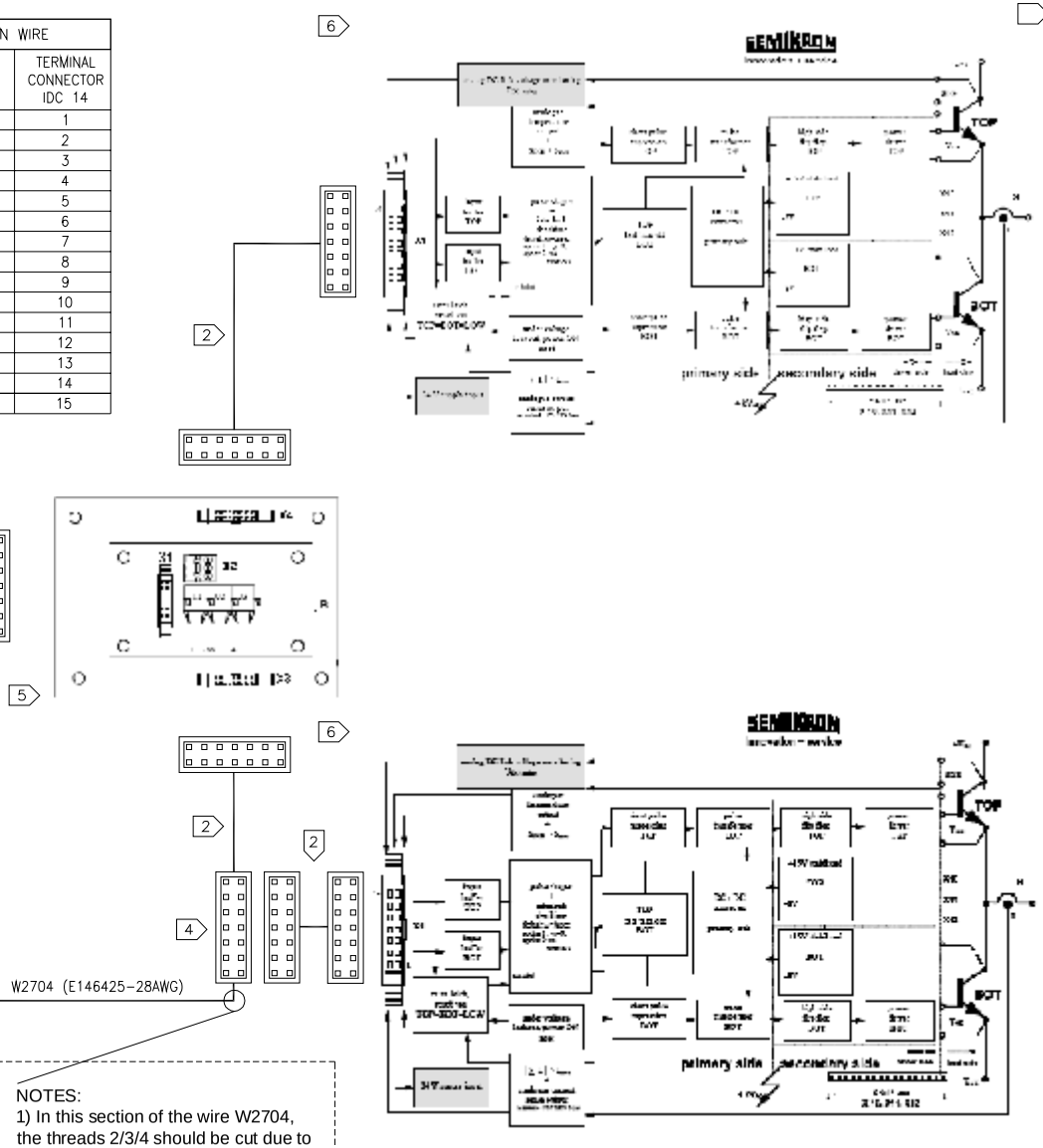
DESIGN	JVA	SHEET	39
APPD	FUB	CONT.	40

INGENIERIA Y COMPUTACION S.A. MENDOZA-ARGENTINA

1	INTERCONNECTION WIRE	
	SIGNAL	TERMINAL CONNECTOR IDC 14
	SHIELD	1
	NA	2
	NA	3
	NA	4
	OVERTEMP OUT	5
	+24 VDC IN	6
	+24 VDC IN	7
	+15 VDC IN	8
	+15 VDC IN	9
	GND	10
	GND	11
	UDC ANALOG OUT	12
	GND (ANALOG SIGNAL)	13
	I_ANA SUM (PHASE S)	14
	NC	15

2	INTERCONNECTION WIRE	
	SIGNAL	TERMINAL CONNECTOR IDC 14
	SHIELD	1
	BOT IN	2
	ERROR OUT	3
	TOP IN	4
	OVERTEMP OUT	5
	+24 VDC IN	6
	+24 VDC IN	7
	NC (WARNING)	8
	NC (WARNING)	9
	GND (POWER SUPLLY)	10
	GND (DIGITAL SIGNAL)	11
	UDC ANALOG OUT	12
	GND (ANALOG SIGNAL)	13
	I_ANA (PHASE S)	14
	NC	15

7	INTERCONNECTION WIRE	
	SIGNAL	TERMINAL CONNECTOR IDC 14
	SHIELD	1
	NC	2
	NC	3
	NC	4
	OVERTEMP OUT	5
	+24 VDC IN	6
	+24 VDC IN	7
	NC (WARNING)	8
	NC (WARNING)	9
	GND (POWER SUPLLY)	10
	GND (DIGITAL SIGNAL)	11
	UDC ANALOG OUT	12
	GND (ANALOG SIGNAL)	13
	I_ANA (PHASE S)	14
	NC	15



NOTES:
1) In this section of the wire W2704, the threads 2/3/4 should be cut due to avoid interference in the channels BOTTOM/ERROR/TOP.

REFERENCES

1. INTERCONNECTION WIRE W2703
2. INTERCONNECTION WIRE SHBP2F TO SKIIP
3. IDC 14 CONNECTOR
4. 3M MODEL 4614-6001
5. PARALLEL BORAD SKHBP2F PHASE S
6. SKIIP 2403GB172-4DUW (INTELIGENT POWER MODULE)
7. INTERCONNECTION WIRE W2704
8. CONTROLLER LINE SIDE

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IRAM-A3 SISTEMA CAD ICSA

01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16

REV.	DENOMINATION	DATE	SIGN
01	AS BUILT	22/10/07	AGJ

DWG N? D9706-02-01 | EDITION DATE 01/11/2006

TITLE: STATIC FRECUENCY CONVERTER 1,5MVA +CONV - CIRCUIT DIAGRAMS

JOB N§ D9706: STATIC FRECUENCY CONVERTER WIND GENERATOR

GROUP: CONTROL SYSTEM COMMUNICATION DIAGRAMS

DESIGN	JVA	SHEET	40
APPD	FUB	CONT.	41

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IRAM-A3 SISTEMA CAD ICSA

1

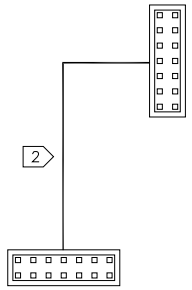
INTERCONNECTION WIRE	
SIGNAL	TERMINAL CONNECTOR IDC 14
SHIELD	1
NA	2
NA	3
NA	4
OVERTEMP OUT	5
+24 VDC IN	6
+24 VDC IN	7
+15 VDC IN	8
+15 VDC IN	9
GND	10
GND	11
UDC ANALOG OUT	12
GND (ANALOG SIGNAL)	13
I_ANA SUM (PHASE T)	14
NC	15

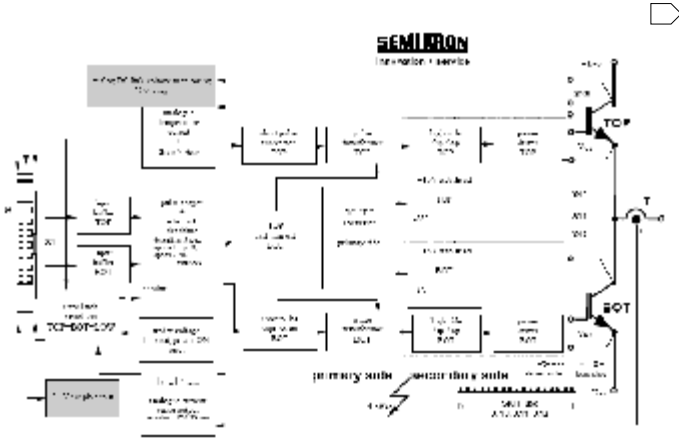
2

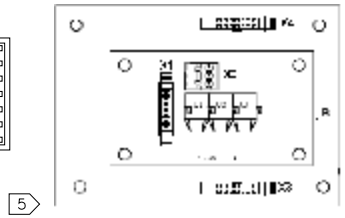
INTERCONNECTION WIRE	
SIGNAL	TERMINAL CONNECTOR IDC 14
SHIELD	1
BOT IN	2
ERROR OUT	3
TOP IN	4
OVERTEMP OUT	5
+24 VDC IN	6
+24 VDC IN	7
NC (WARNING)	8
NC (WARNING)	9
GND (POWER SUPLLY)	10
GND (DIGITAL SIGNAL)	11
UDC ANALOG OUT	12
GND (ANALOG SIGNAL)	13
I_ANA (PHASE T)	14
NC	15

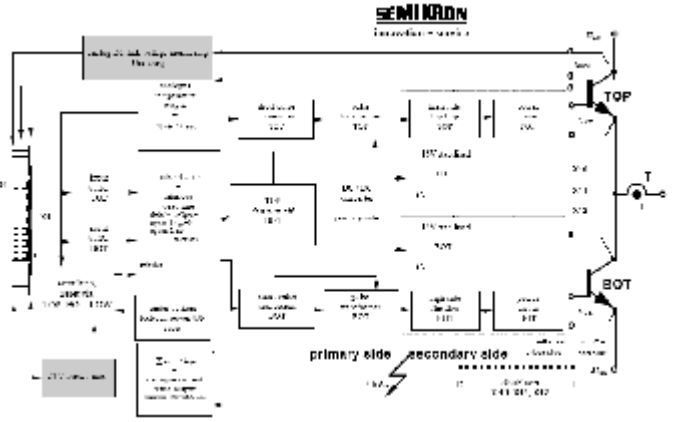
7

INTERCONNECTION WIRE	
SIGNAL	TERMINAL CONNECTOR IDC 14
SHIELD	1
NC	2
NC	3
NC	4
OVERTEMP OUT	5
+24 VDC IN	6
+24 VDC IN	7
NC (WARNING)	8
NC (WARNING)	9
GND (POWER SUPLLY)	10
GND (DIGITAL SIGNAL)	11
UDC ANALOG OUT	12
GND (ANALOG SIGNAL)	13
I_ANA (PHASE T)	14
NC	15









W2705 (E146425-28AWG)

W2706 (E146425-28AWG)

−X1.3

−X2.3

NOTES:
1) In this section of the wire W2706, the threads 2/3/4 should be cut due to avoid interference in the channels BOTTOM/ERROR/TOP.

REFERENCES

1. INTERCONNECTION WIRE W2705
2. INTERCONNECTION WIRE SHBP2F TO SKIIP
3. IDC 14 CONNECTOR
4. 3M MODEL 4614-6001
5. PARALLEL BORAD SKHBP2F PHASE T
6. SKIIP 2403GB172-4DUW (INTELIGENT POWER MODULE)
7. INTERCONNECTION WIRE W2706
8. CONTROLLER LINE SIDE

01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16

REV.	DENOMINATION	DATE	SIGN
01	AS BUILT	22/10/07	AGJ

DWG N° D9706-02-01 | EDITION DATE 01/11/2006

TITLE: STATIC FRECUENCY CONVERTER 1,5MVA +CONV - CIRCUIT DIAGRAMS

JOB N§ D9706 — STATIC FRECUENCY CONVERTER WIND GENERATOR

GROUP: CONTROL SYSTEM COMMUNICATION DIAGRAMS

DESIGN	JVA	SHEET	41
APPD	FUB	CONT.	--

ICSA INGENIERIA Y COMPUTACION S.A. MENDOZA-ARGENTINA

REV – *REV*	DESCRIPCIÓN DE LA MODIFICACIÓN – *DESCRIPTION OF THE MODIFICATION*	FECHA - *DATE*	FIRMA - *SIGNATURE*
00	EMISION INICIAL / *INITIAL RELEASE*	FEB ´07	OSO
01	MODIFICACIONES GENERALES / GENERAL MODIFICATIONS	MAY ´07	OSO
02	MODIFICACIONES GENERALES / GENERAL MODIFICATIONS	FEB ´08	OSO
03	MODIFICACIONES GENERALES / GENERAL MODIFICATIONS	ENE ´09	PGI
04	MODIFICACIONES GENERALES / GENERAL MODIFICATIONS	NOV ´12	PGI
05	CONFORME A OBRA / AS-BUILT	SET ´13	PGI
06	CONFORME A OBRA / AS-BUILT	JUL ´14	PGI

PROYECTO NRO. *PROJECT Nº*	CANTIDAD QUANTITY	OBSERVACIONES REMARKS	PEDIDO EN PLANO **ORDERED ON DWG. Nº**	*POS.* / ITEM
99835	1		-	-

IMPSA

MENDOZA - ARGENTINA

	NOMBRE - NAME	FIRMA - *SIGNATURE.*	FECHA – *DATE*	HOJA - *SHEET*
PROYECTADO POR DESIGNED BY	ICSA		01/02/07	1 of 11
REVISADO POR CHECKED BY	NRE		01/02/07	
APROBADO APPROVED BY	PGI		01/02/07	

WIND TURBINE IWP-70

TITULO *TITLE*

INTERRUPTOR EN BASE
DIAGRAMAS DE CIRCUITOS

CIRCUIT BREAKER BASE
CIRCUIT DIAGRAMS

DOCUMENTO NRO.
DOCUMENT NR.

99835-680054

REVISION – *REVISION*

06

DRAWING *	SHEET *	DENOMINATION
D9706-02-04	01	CONTENT INDEX
D9706-02-04	03...11	CIRCUIT DIAGRAMS

NOTES :

REVISIONS INDEX

SHEET	REVISION N°												
	0	1	2	3	4	5	6	7	8	9	10	11	12
01	X	X		X									
02													
03	X	X		X									
04	X	X		X									
05	X	X		X									
06	X	X		X									
07	X	X		X									
08	X	X		X									
09	X	X											
10	X	X		X									
11	X	X	X										

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IRAM-A3 SISTEMA CAD ICSA

REV.	DENOMINATION	DATE	SIGN
03	GENERAL CHANGES	03/09/12	DAR
02	UP DATE	22/01/09	UFE
01	AS BUILT	22/10/07	AGJ

DWG N? D9706-02-04

EDITION DATE 01/11/2006

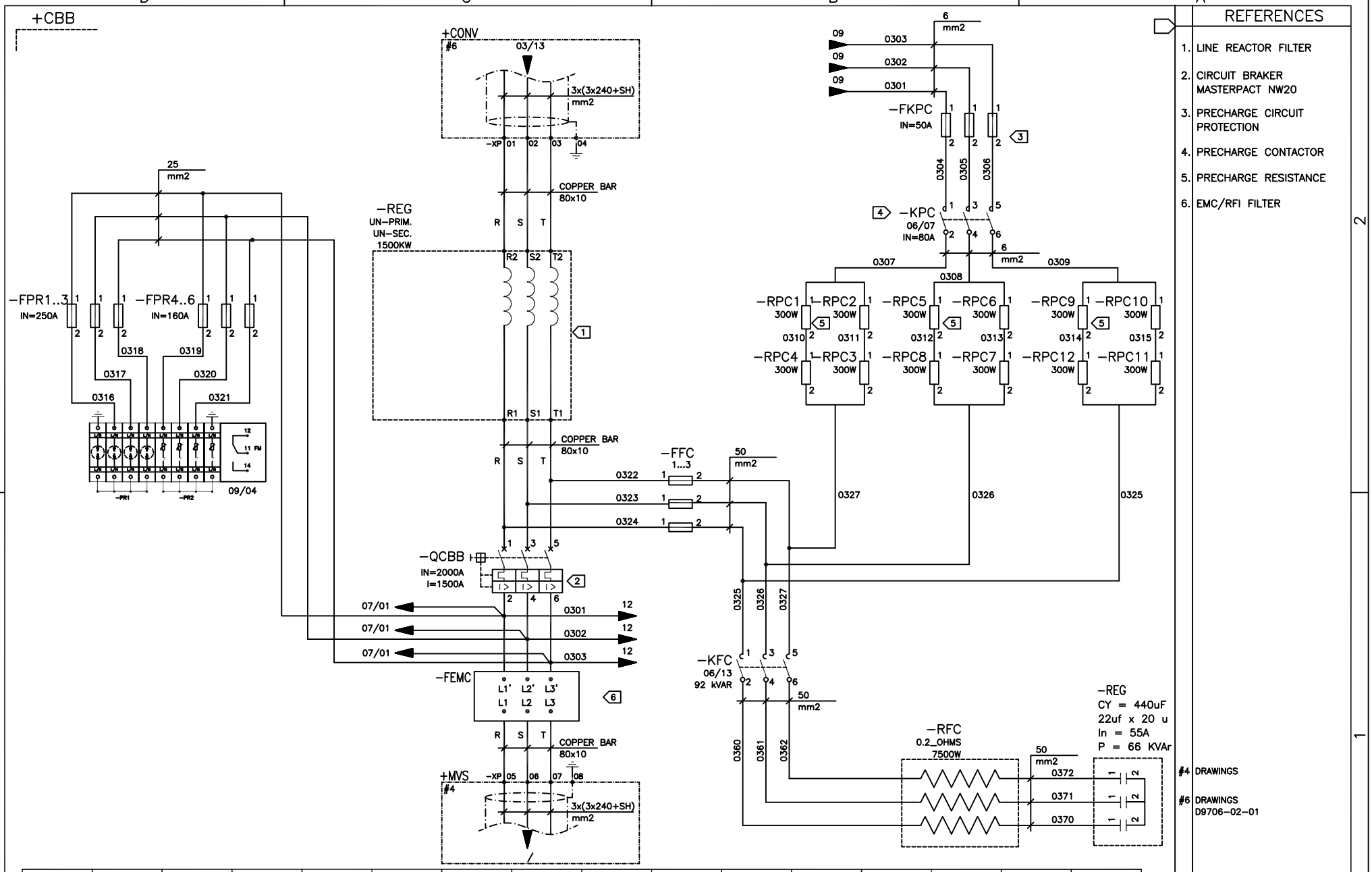
TITLE
BASE CIRCUIT BREAKER
+CBB CIRCUIT DIAGRAMS

JOB N§ D9706
STATIC FRECUENCY CONVERTER
WIND GENERATOR

GROUP
CONTROL SYSTEM
CONTENT INDEX

DESIGN	JVA	SHEET	01
APPD	FUB	CONT.	03

ICSA INGENIERIA Y COMPUTACION S.A.
MENDOZA-ARGENTINA



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IRAM-A3 SISTEMA CAD ICSA

REV.	DENOMINATION	DATE	SIGN
03	GENERAL CHANGES	03/09/12	DAR
01	AS BUILT	22/10/07	AGJ

DWG N° D9706-02-04 | EDITION DATE 01/11/2006

TITLE: BASE CIRCUIT BREAKER +CBB CIRCUIT DIAGRAMS

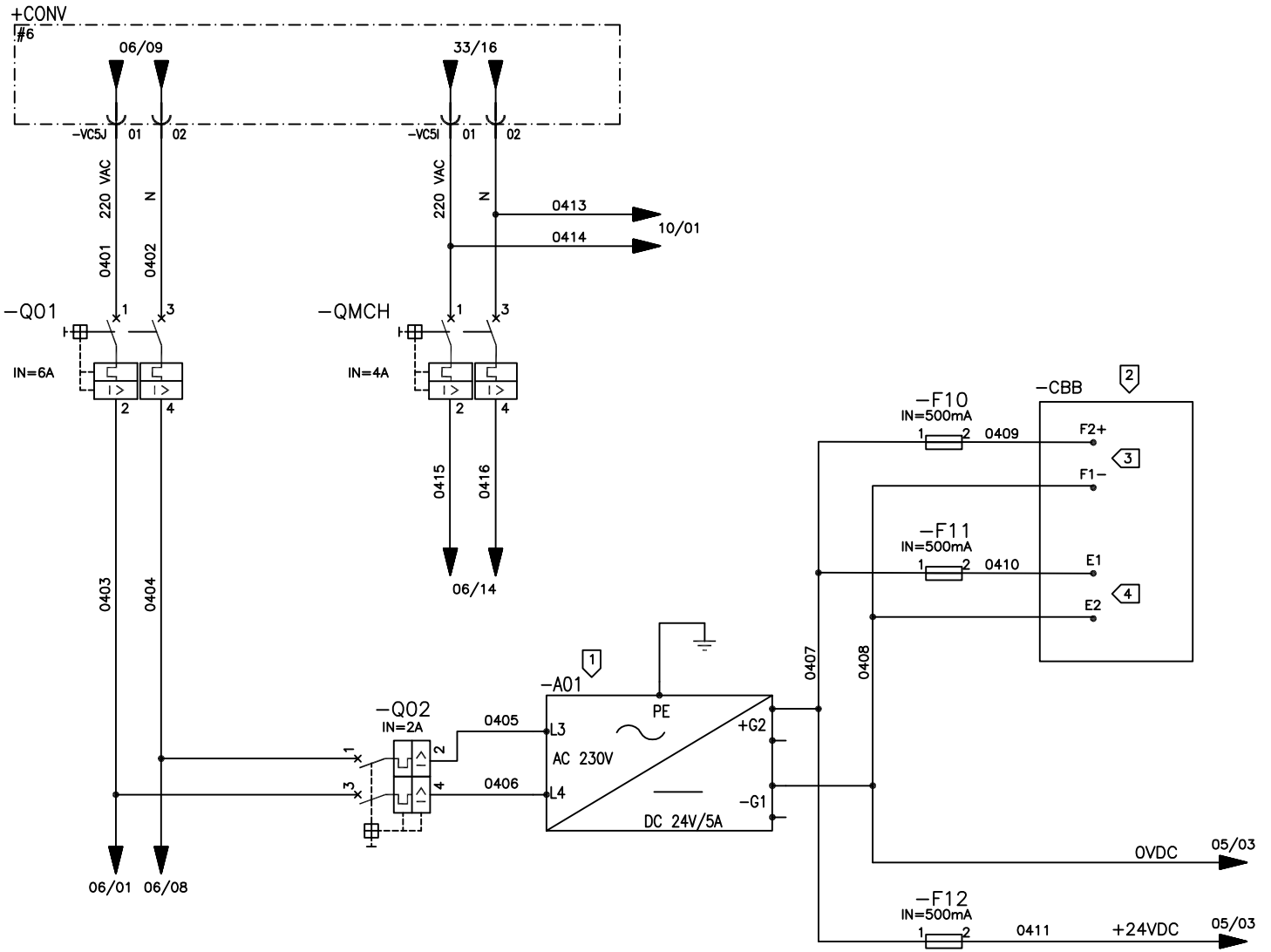
JOB N° D9706: STATIC FRECUENCY CONVERTER WIND GENERATOR

GROUP: CONTROL SYSTEM CIRCUIT DIAGRAMS

DESIGN JVA | APPD FUB | SHEET 03 | CONT. 04

ICSA INGENIERIA Y COMPUTACION S.A. MENDOZA-ARGENTINA

+CBB



REFERENCES

1. AUXILIARY POWER SUPPLY 220VAC/24VDC
2. BASE CIRCUIT BREAKER MICROLOGIC UNIT
3. MICROLOGIC UNIT FEEDING
4. COMMUNICATION MODULE FEEDING

#6 DRAWINGS
D9706-02-01

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IRAM-A3 SISTEMA CAD ICSA

REV.	DENOMINATION	DATE	SIGN
03	GENERAL CHANGES	03/09/12	DAR
01	AS BUILT	22/10/07	AGJ

DWG N? D9706-02-04
EDITION DATE 01/11/2006

TITLE
BASE CIRCUIT BREAKER
+CBB CIRCUIT DIAGRAMS

JOB N$ D9706
STATIC FRECUENCY CONVERTER
WIND GENERATOR

GROUP
CONTROL SYSTEM
CIRCUIT DIAGRAMS

DESIGN	JVA	SHEET	04
APPD	FUB	CONT.	05

ICSA INGENIERIA Y COMPUTACION S.A.
MENDOZA-ARGENTINA

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IRAM-A3 SISTEMA CAD ICSA

+CBB

04/15 0411 +24 VDC

04/15 0408 0 VDC

+LCPB
#1
044/02
HC4R
01
4
-PU1
IN
OUT
3
-PR10
1
+ 7 - 6
+TX 1
-TX 2
+RX3
-RX4
10/100 BASE TX
(802.2AF)
-CBB
2
E6/B' (+Rx)
E5/A' (-Rx)
E4/B (+Tx)
E3/A (-Tx)

GATEWAY DIP-SWITCH
CONFIGURATION:
RS485 / 4 WIRES

ON
OFF
1 2 3 4 5 6

1.....8

UTP CABLE - PIN OUT		
RJ45 Pin N°	SWITCH RJ45 WHITH SHIELD	RJ45 WHITHOUT SHIELD
1	White/Orange	White/Orange
2	Orange	Orange
3	White/Green	White/Green
4	Blue	Blue
5	White/Blue	White/Blue
6	Green	Green
7	White/Brown	White/Brown
8	Brown	Brown

REFERENCES

1. GATEWAY RS485 ETHERNET/MODBUS
2. BASE CIRCUIT BREAKER COMMUNICATION MODULE
3. UTP CAT.5 CABLE
4. OVER VOLTAGE PROTECTION UTP CABLE

#1 DRAWINGS
99835-680050

01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16

REV.	DENOMINATION	DATE	SIGN
03	GENERAL CHANGES	03/09/12	DAR
01	AS BUILT	22/10/07	AGJ

DWG N? D9706-02-04
EDITION DATE 01/11/2006

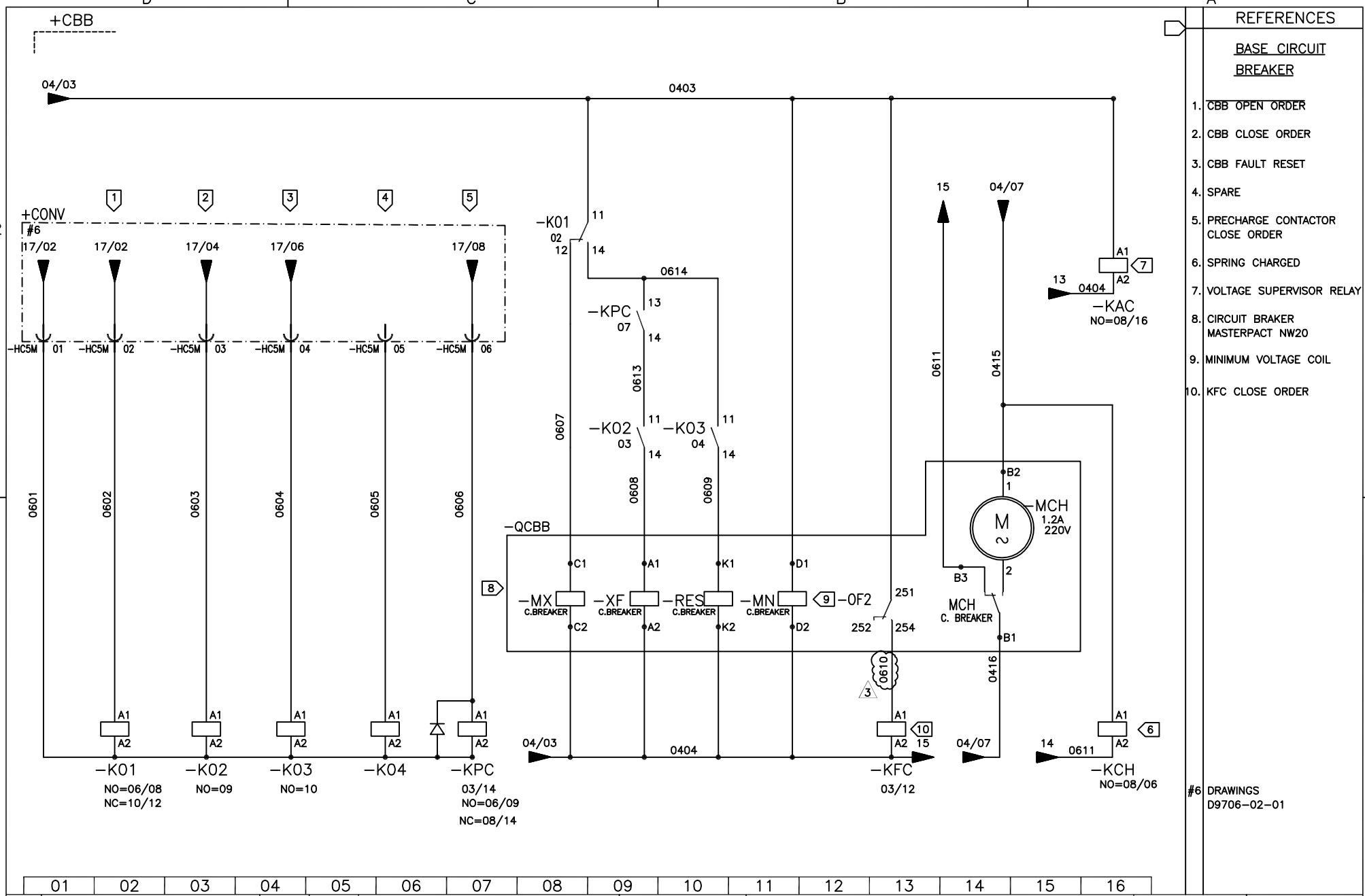
TITLE
BASE CIRCUIT BREAKER
+CBB CIRCUIT DIAGRAMS

JOB N§ D9706
STATIC FRECUENCY CONVERTER
WIND GENERATOR

GROUP
CONTROL SYSTEM
CIRCUIT DIAGRAMS

DESIGN	JVA	SHEET	05
APPD	FUB	CONT.	06

ICSA INGENIERIA Y COMPUTACION S.A.
MENDOZA-ARGENTINA



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IRAM-A3 SISTEMA CAD ICSA

01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16

REV.	DENOMINATION	DATE	SIGN
03	GENERAL CHANGES	03/09/12	DAR
01	AS BUILT	22/10/07	AGJ

DWG N° D9706-02-04 | EDITION DATE 01/11/2006

TITLE: BASE CIRCUIT BREAKER +CBB CIRCUIT DIAGRAMS

JOB N° D9706: STATIC FRECUENCY CONVERTER WIND GENERATOR

GROUP: CONTROL SYSTEM CIRCUIT DIAGRAMS

DESIGN	JVA	SHEET	06
APPD	FUB	CONT.	07

ICSA INGENIERIA Y COMPUTACION S.A. MENDOZA-ARGENTINA

+CBB

6 mm2

03/06 R — 0301

03/06 S — 0302

03/06 T — 0303

−U01 (1)

−U02 (1)

+HT −HT +15 −15 M

4

−W01
0.7 m

007.01 − ORANGE
007.02 − BLUE
007.03 − WHITE/BLUE
007.04 − WHITE/ORANGE

+CONV #1 −CN5B 01 02 03 04

21/02 21/03

2 3

NOTE 1:
THE EARTH MUST BE CONNECTED IN THE CN5A CONNECTOR

NOTE 2:
THE TRANSDUCERS MUST BE AS CLOSER AS POSSIBLE

REFERENCES

1. VOLTAGE TRANSDUCER
2. VOLTAGE IN PHASE R−S
3. VOLTAGE IN PHASE S−T

#6 DRAWINGS
D9706−02−01

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03	GENERAL CHANGES	03/09/12	DAR
01	AS BUILT	22/10/07	AGJ

DWG N? D9706−02−04 | EDITION DATE 01/11/2006

TITLE: BASE CIRCUIT BREAKER +CBB CIRCUIT DIAGRAMS

JOB N$ D9706 — STATIC FRECUENCY CONVERTER WIND GENERATOR

GROUP: CONTROL SYSTEM CIRCUIT DIAGRAMS

DESIGN	JVA	SHEET	07
APPD	FUB	CONT.	08

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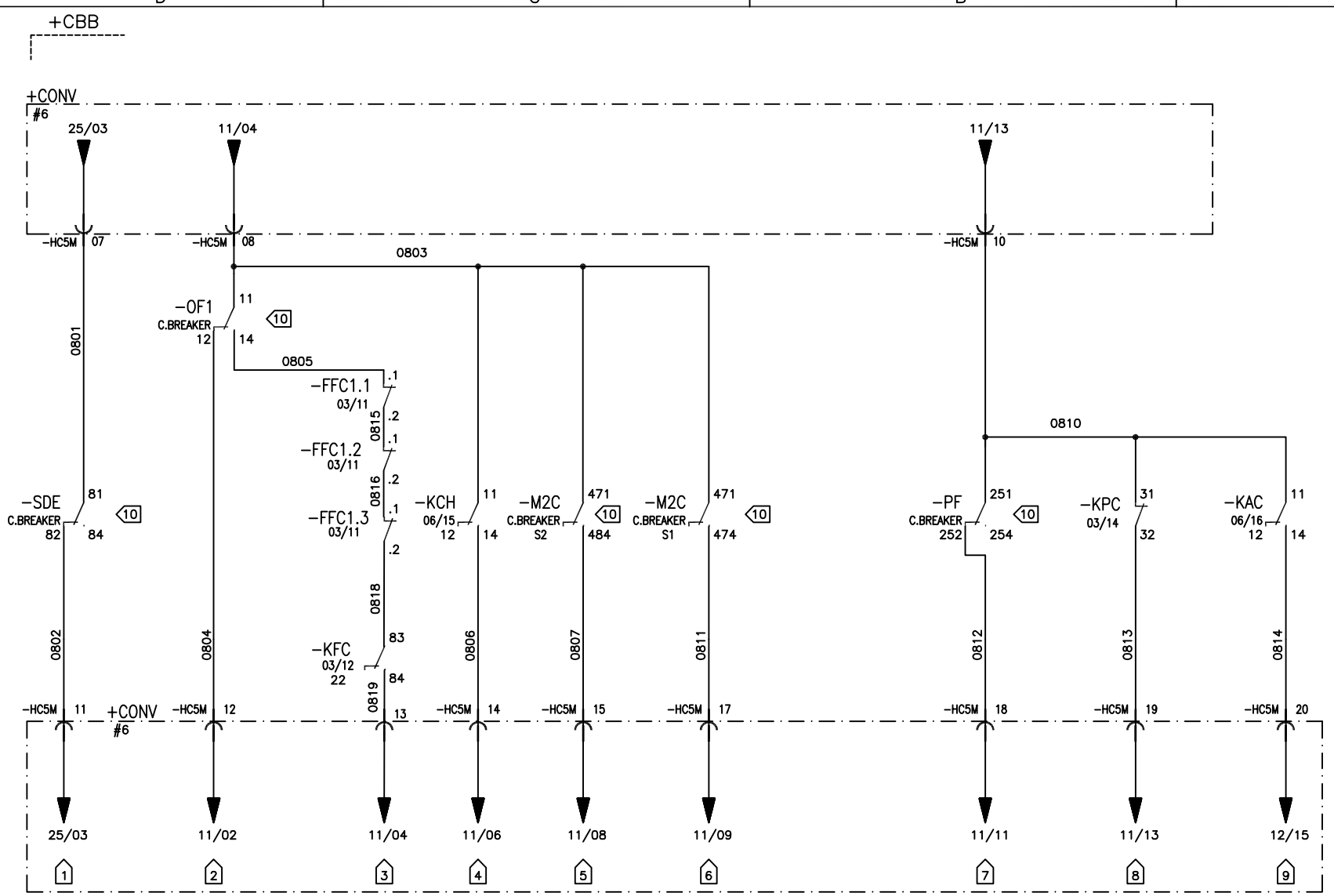

NOTES:
1) THIS CONTACT IS PROGRAMMED THROUGH MICROLOGIC PANEL AND WILL ACT LIKE NORMALLY CLOSED CONTACT.

REFERENCES

BASE CIRCUIT BREAKER

1. ELECTRIC FAULT
2. CIRCUIT BREAKER OPENED
3. CIRCUIT BREAKER CLOSED & CAPACITOR BANK OK
4. SPRING CHARGED
5. OVERCURRENT, OVERPOWER OR SHORTCIRCUIT TRIP (SEE NOTE 1)
6. GRID LOSS SIGNAL (SEE NOTE 1)
7. READY TO CLOSE
8. PRECHARGE CONTACTOR CLOSED
9. COMMAND VOLTAGE FAULT
10. INTERNAL AUXILIARES CONTACTS BLOCK

#6 DRAWINGS
D9706-02-01

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JOB N$ D9706: STATIC FRECUENCY CONVERTER WIND GENERATOR

GROUP: CONTROL SYSTEM CIRCUIT DIAGRAMS

DESIGN	JVA	SHEET	08
APPD	FUB	CONT.	09

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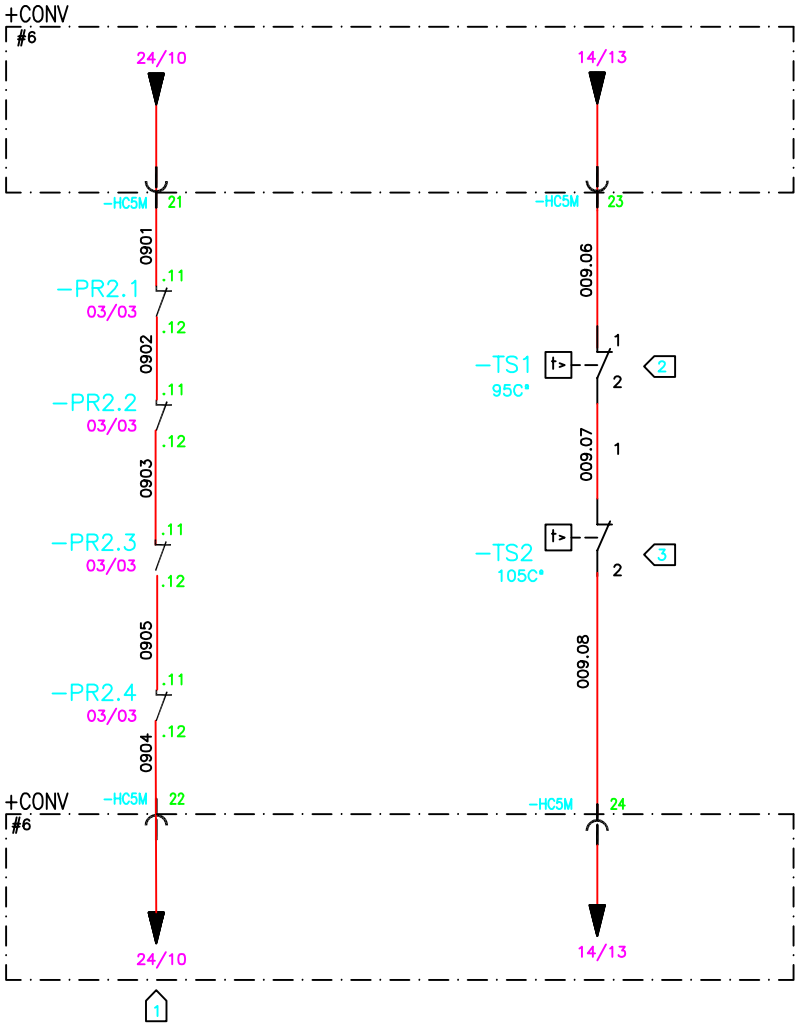
+CBB



REFERENCES

1. OVERVOLTAGE PROTECTION NORMAL
2. INDUCTOR CORE TEMPERATURE NORMAL
3. -RFC TEMPERATURE NORMAL

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DWG N? D9706-02-04
EDITION DATE 01/11/2006

TITLE
BASE CIRCUIT BREAKER
+CBB CIRCUIT DIAGRAMS

JOB N$ D9706
STATIC FRECUENCY CONVERTER
WIND GENERATOR

GROUP
CONTROL SYSTEM
CIRCUIT DIAGRAMS

DESIGN	JVA	SHEET	09
APPD	FUB	CONT.	10

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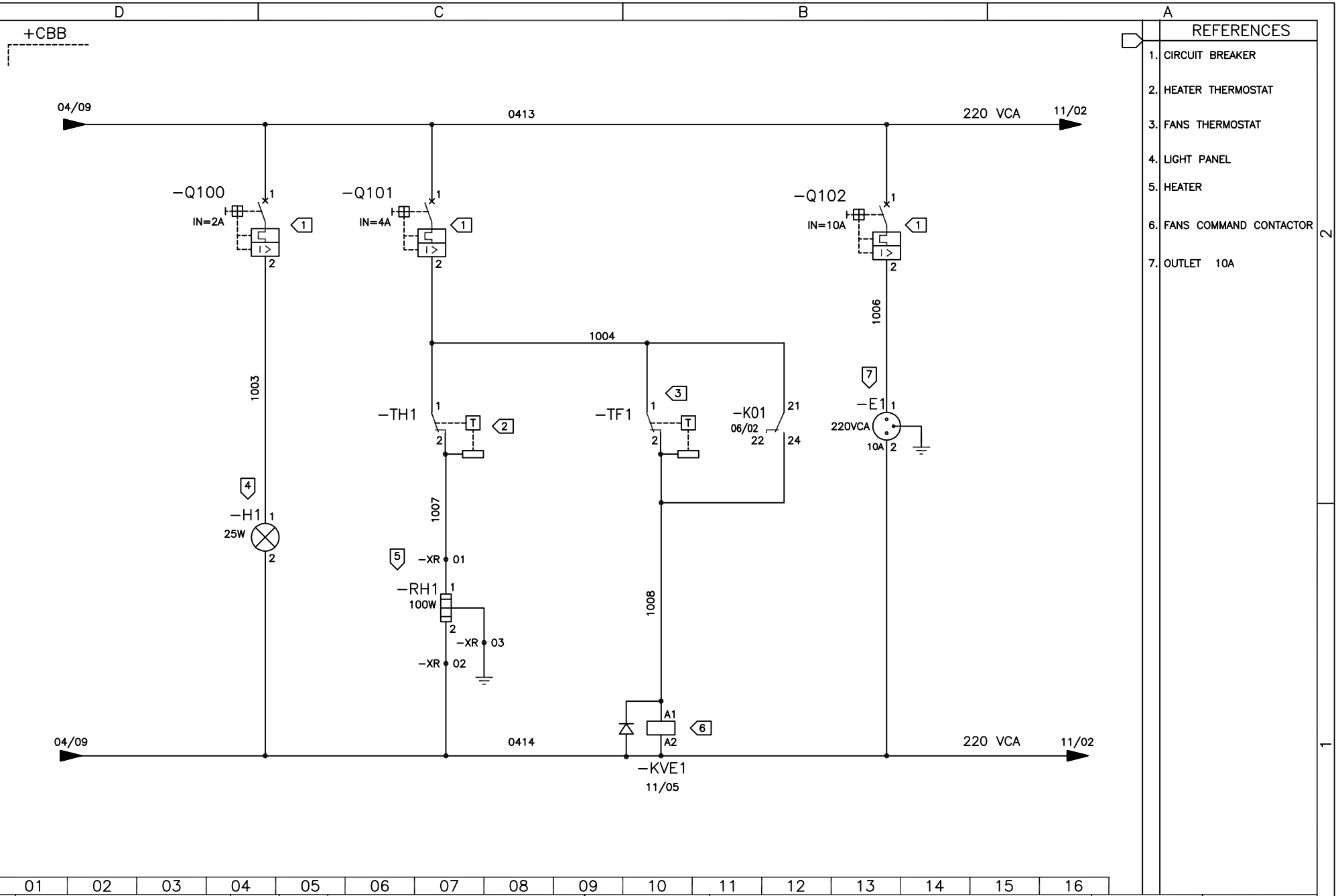
MENDOZA-ARGENTINA



REFERENCES

1. CIRCUIT BREAKER
2. HEATER THERMOSTAT
3. FANS THERMOSTAT
4. LIGHT PANEL
5. HEATER
6. FANS COMMAND CONTACTOR
7. OUTLET 10A

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JOB N$ D9706: STATIC FRECUENCY CONVERTER WIND GENERATOR

GROUP: CONTROL SYSTEM CIRCUIT DIAGRAMS

DESIGN	JVA	SHEET	10
APPD	FUB	CONT.	11

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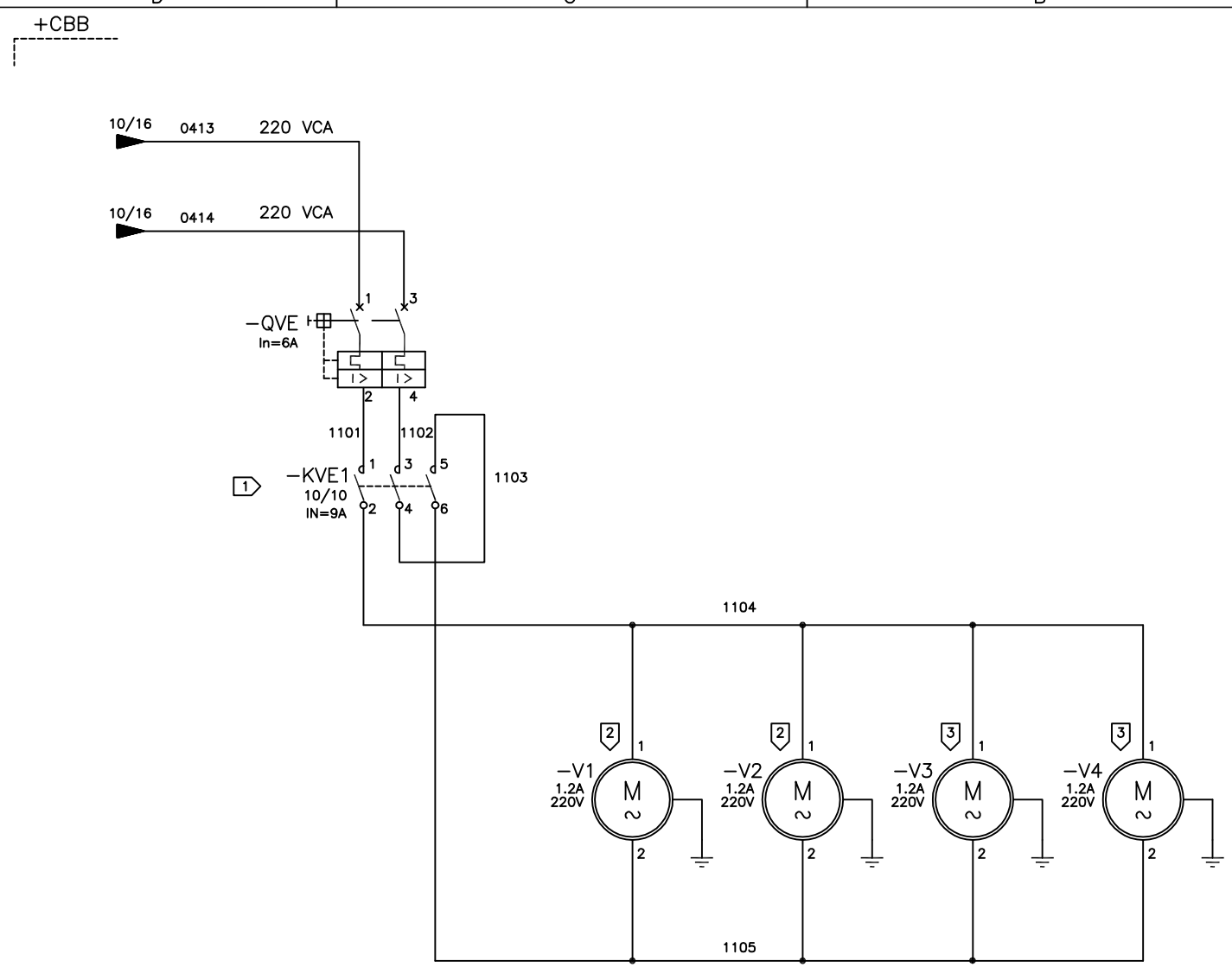

REFERENCES

1. FANS COMAND CONTACTOR
2. FAN
3. EXTRACTOR

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DESIGN	JVA	SHEET	11
APPD	FUB	CONT.	...

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00	EMISION INICIAL / *INITIAL RELEASE*	FEB ´07	OSO
01	MODIFICACIONES GENERALES / GENERAL MODIFICATIONS	MAY ´07	OSO
02	MODIFICACIONES GENERALES / GENERAL MODIFICATIONS	FEB ´08	OSO
03	MODIFICACIONES GENERALES / GENERAL MODIFICATIONS	ENE ´09	PGI
04	MODIFICACIONES GENERALES / GENERAL MODIFICATIONS	NOV ´12	PGI
05	CONFORME A OBRA / AS-BUILT	SET ´13	PGI
06	CONFORME A OBRA / AS-BUILT	JUL ´14	PGI

PROYECTO NRO. *PROJECT Nº*	CANTIDAD QUANTITY	OBSERVACIONES REMARKS	PEDIDO EN PLANO **ORDERED ON DWG. Nº**	*POS.* / ITEM
99835	1		-	-

IMPSA

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	NOMBRE - NAME	FIRMA - *SIGNATURE.*	FECHA – *DATE*	HOJA - *SHEET*
PROYECTADO POR DESIGNED BY	ICSA		01/02/07	1 of 8
REVISADO POR CHECKED BY	NRE		01/02/07	
APROBADO APPROVED BY	PGI		01/02/07	

WIND TURBINE IWP-70

TITULO *TITLE*

INTERRUPTOR EN GÓNDOLA
DIAGRAMAS DE CIRCUITOS

CIRCUIT BREAKER NACELLE
CIRCUIT DIAGRAMS

DOCUMENTO NRO.
DOCUMENT NR.

99835-680053

REVISION – *REVISION*

06

DRAWING *	SHEET *	DENOMINATION
D907-02-07	01	CONTENT INDEX
D907-02-07	03...11	CIRCUIT DIAGRAMS

NOTES :

REVISIONS INDEX

SHEET	REVISION N°												
	0	1	2	3	4	5	6	7	8	9	10	11	12
01	X	X											
02													
03	X	X											
04	X	X											
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08	X	X											
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10	X	X											
11	X	X	X										

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DWG N? D9706-02-07

EDITION DATE 01/11/2006

TITLE NACELLE CIRCUIT BRAKER +CBN - CIRCUIT DIAGRAMS

JOB N§ D9706 STATIC FRECUENCY CONVERTER WIND GENERATOR

GROUP CONTROL SYSTEM CONTENT INDEX

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APPD	FUB	CONT.	03

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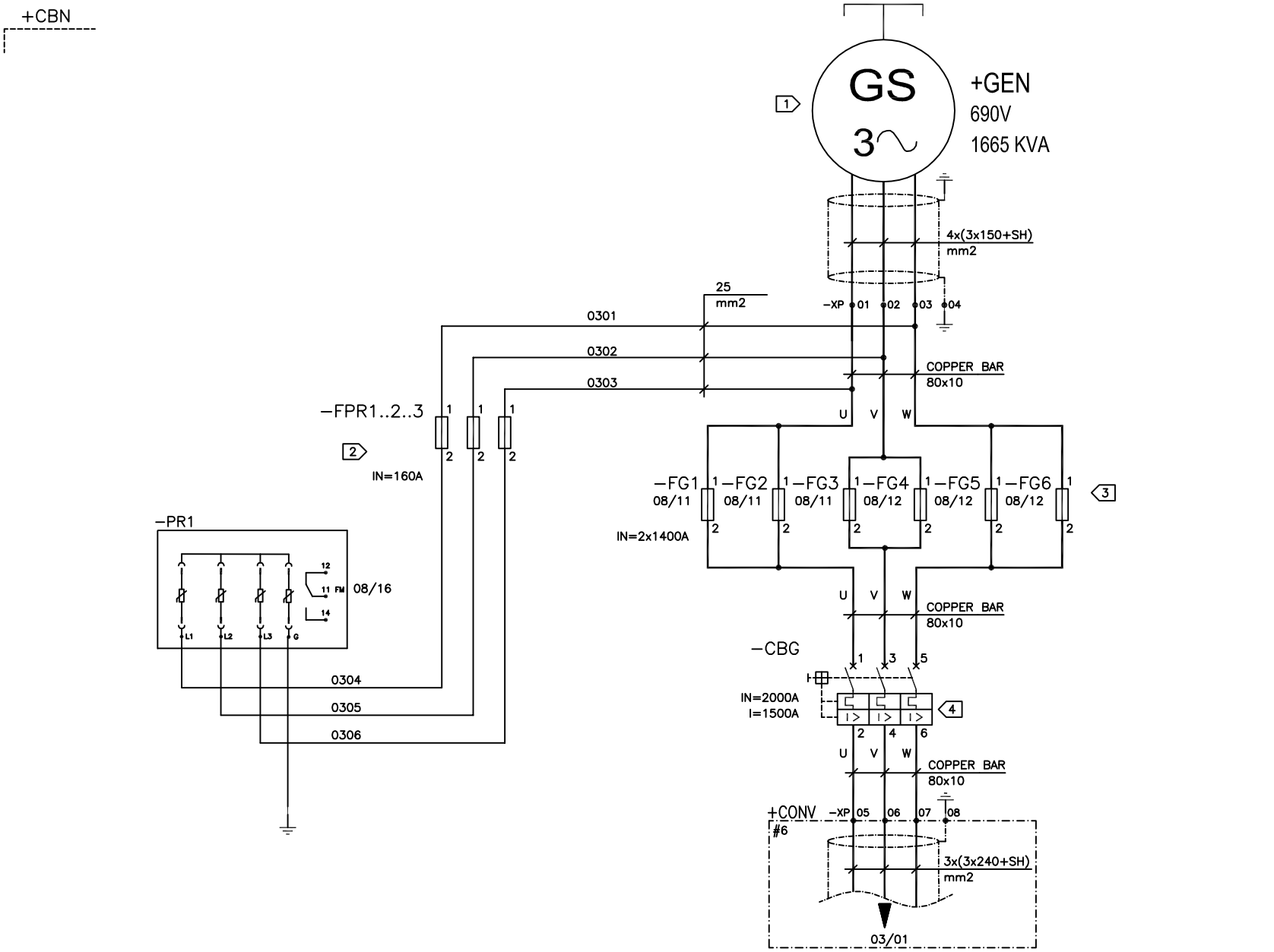

REFERENCES

1. GENERATOR
2. ATMOSPHERIC PROTECTIONS
3. FUSES
4. CIRCUIT BREAKER MASTERPACT

#6 DRAWING D9706-02-01

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JOB N$ D9706: STATIC FRECUENCY CONVERTER WIND GENERATOR

GROUP: CONTROL SYSTEM CIRCUIT DIAGRAMS

DESIGN	JVA	SHEET	03
APPD	FUB	CONT.	04

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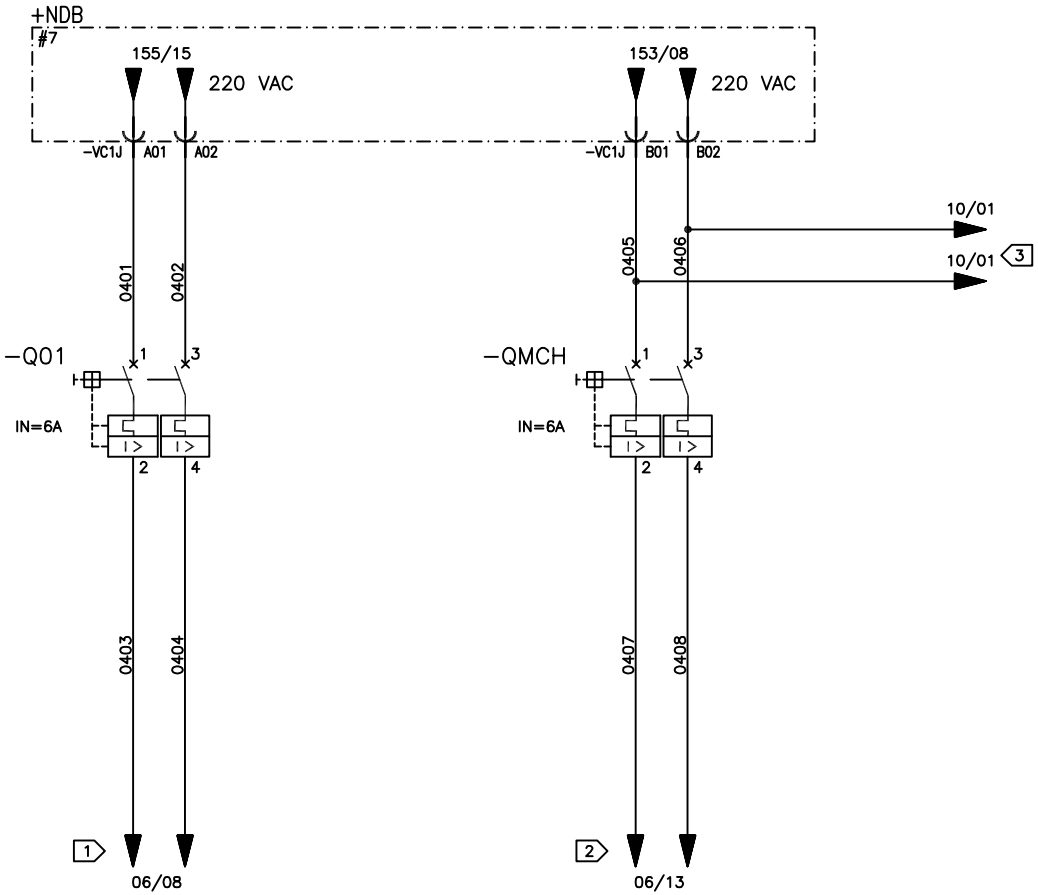
+CBN



REFERENCES

1. NACELLE CIRCUIT BRAKER COMAND FEEDING
2. MOTOCHARGER FEEDING
3. HEATER AND FANS FEEDING

#7 DRAWINGS 999835-680050

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JOB N$ D9706: STATIC FRECUENCY CONVERTER WIND GENERATOR

GROUP: CONTROL SYSTEM CIRCUIT DIAGRAMS

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APPD	FUB	CONT.	06

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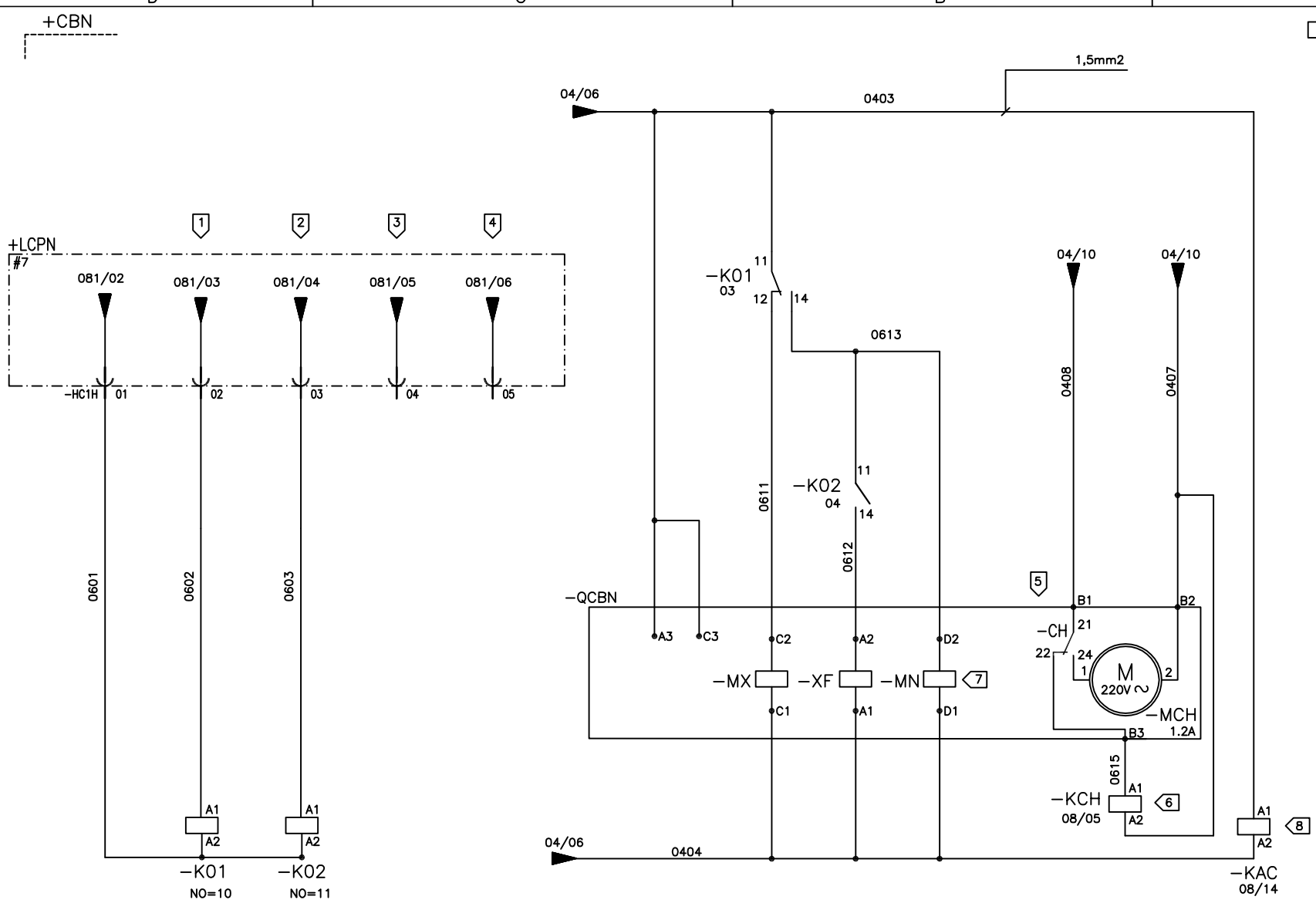

REFERENCES

NACELLE CIRCUIT BREAKER

1. OPEN ORDER
2. CLOSE ORDER
3. SPARE EQUIPED
4. SPARE EQUIPED
5. CIRCUIT BREAKER MASTERPACT
6. SPRING CHARGED
7. MINIMUN VOLTAGE COIL
8. VOLTAGE SUPERVISOR RELAY

#7 DRAWINS 99835-680050

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DESIGN	JVA	SHEET	06
APPD	FUB	CONT.	08

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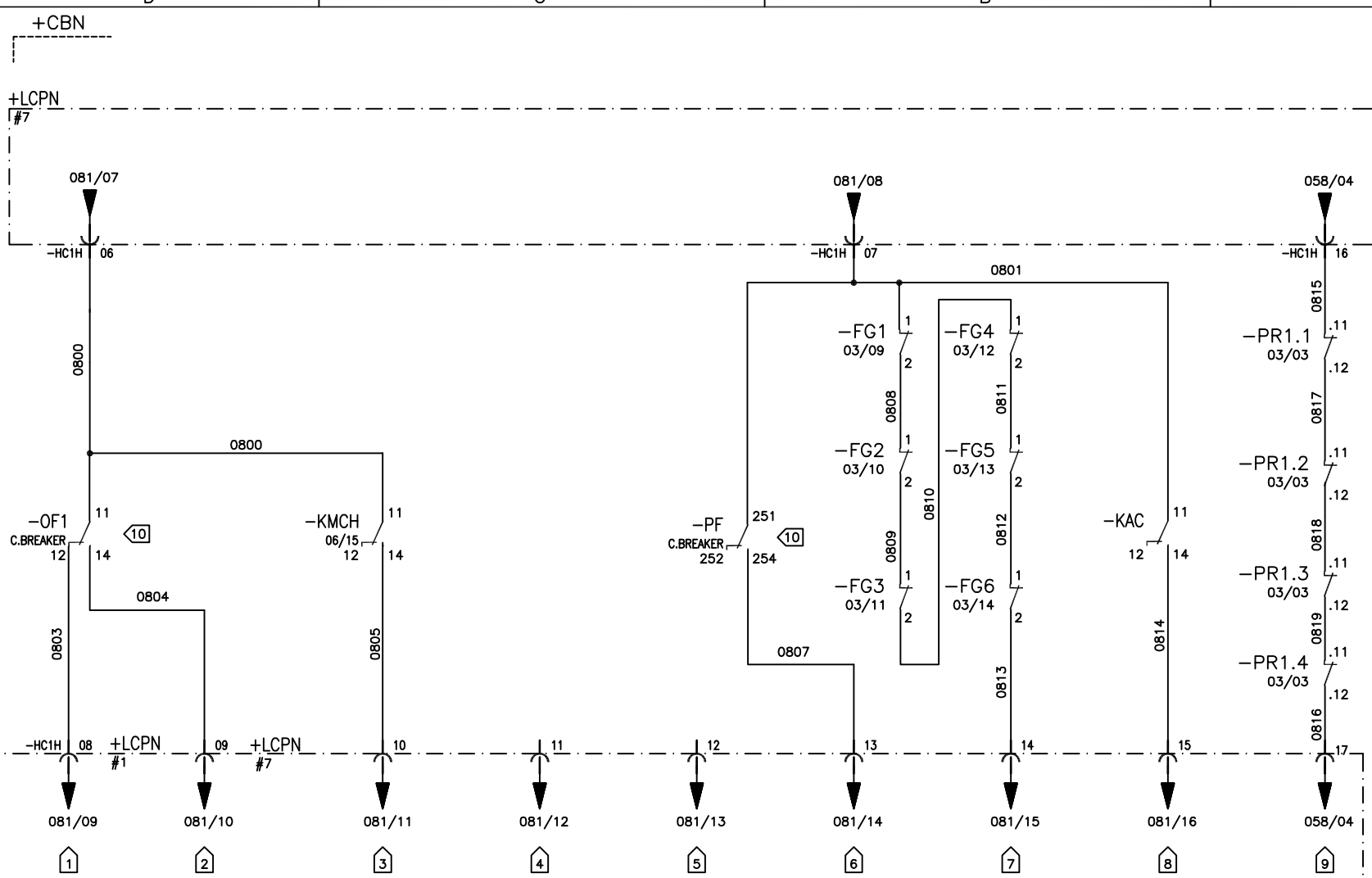

REFERENCES

NACELLE CIRCUIT BREAKER

1. CIRCUIT BREAKER OPENED
2. CIRCUIT BREAKER CLOSED
3. SPRING CHARGED
4. SPARE EQUIPED
5. SPARE EQUIPED
6. READY TO CLOSE
7. CBN FUSES OK
8. COMMAND POWER SOURCE OK
9. OVERVOLTAGE PROTECTION NORMAL
10. CIRCUIT BREAKER INTERNAL AUXILIARES CONTACT BLOCKS

#7 DRAWINGS
99835-680050

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JOB N$ D9706
STATIC FRECUENCY CONVERTER WIND GENERATOR
GROUP CONTROL SYSTEM CIRCUIT DIAGRAMS

DESIGN	JVA	SHEET	08
APPD	FUB	CONT.	10

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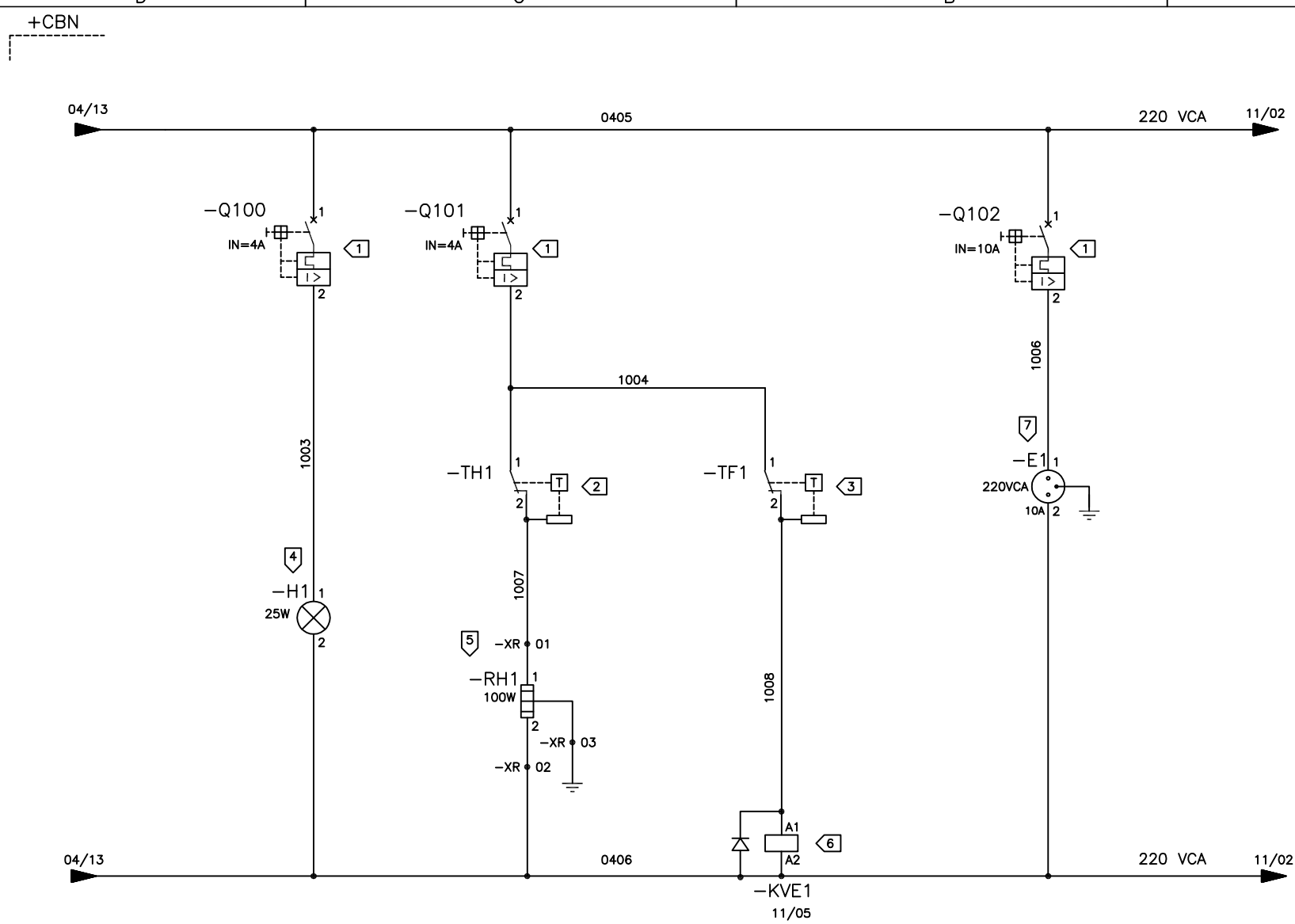

REFERENCES

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APPD	FUB	CONT.	11

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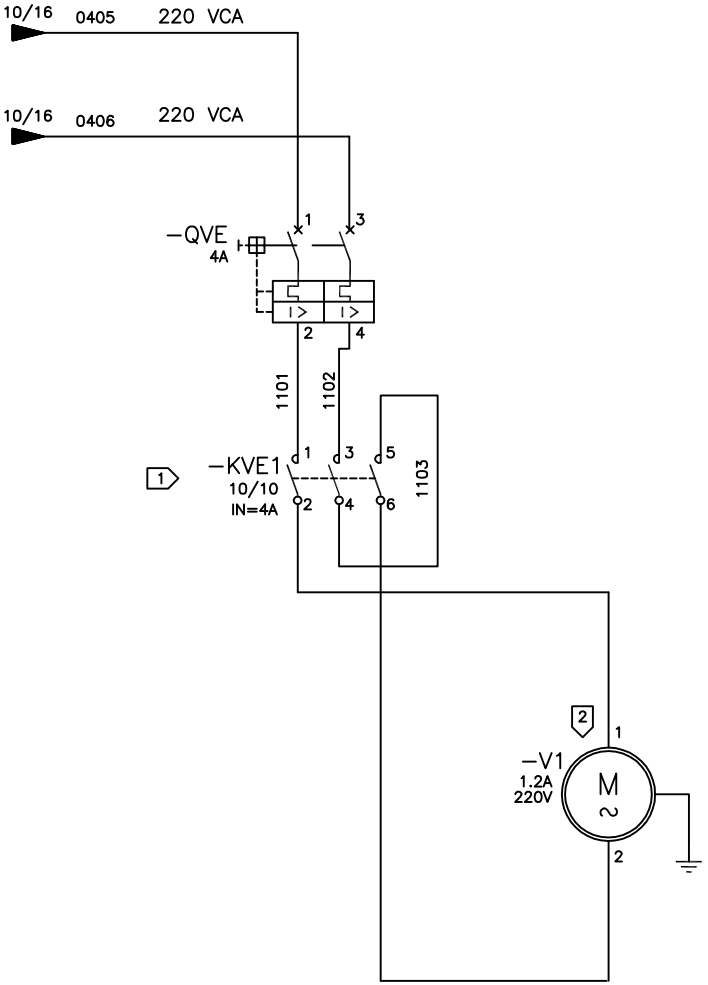
+CBN



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00	Emitido para información	11/04/08	GAC

998 35				
PROYECTO NRO. *PROJECT Nº*	CANTIDAD QUANTITY	OBSERVACIONES REMARKS	PEDIDO EN PLANO **ORDERED ON DWG. Nº**	*POS.* / ITEM

		NOMBRE - NAME	FIRMA - *SIGNATURE.*	FECHA - *DATE*	HOJA - *SHEET*
IMPSA wind	PROYECTADO POR DESIGNED BY	**GAC**		11/04/08	1 / 18
	REVISADO POR CHECKED BY	**NPE**		11/04/08	
MENDOZA - ARGENTINA	APROBADO APPROVED BY	**JMA**		11/04/08	

AEROGENERADOR IWP-70 1.5 MVA

TITULO *TITLE*

AEROGENERADOR IWP-70

MANUAL DE MANTENIMIENTO

DOCUMENTO NRO. *DOCUMENT NR.*	REVISION – *REVISION*
99835 – MO8601	**00**

Índice

Manual de Mantenimiento de Aerogenerador
para Prototipo IMPSA Wind IWP-70

La documentación y las instrucciones necesarias para realizar el mantenimiento del aerogenerador IWP-70 están divididas en tres documentos: El primero de ellos es este manual, considerado como documento principal. El documento general se completa con dos especificaciones de mantenimiento (especificación de mantenimiento eléctrico y especificación de mantenimiento mecánico).

Las personas que completen este documento deben incluir parámetros y valores apropiados en los casilleros que fueron previstos. El usuario debe señalar con sus iniciales todos los casilleros en los que se han llevado a cabo ensayos, agregado un valor, o realizado cualquier determinación o comentario respecto de la efectividad de la instalación.

General

Un mantenimiento periódico de acuerdo con las especificaciones de mantenimiento es absolutamente necesario para que el aerogenerador opere de forma segura. Además de las instrucciones que se detallan en cada una de las especificaciones, es importante seguir las recomendaciones de los fabricantes como así también del manual de operaciones. El mantenimiento debe ser efectuado solo por personal competente con la formación técnica necesaria e instruido por personal especializado de IMPSA WIND. El periodo de gracia de la garantía, el cual se especificará por contrato, perderá vigencia si los periodos de mantenimiento no son respetados o si el mismo se efectuara de manera inapropiada.

Propósito del manual y de las especificaciones:

El manual y las especificaciones proporcionan al personal de mantenimiento la información necesaria para realizar cada operación de mantenimiento, como valores límites y parámetros o instrucciones de seguridad.

1. Designación de Tipo

1.1. General

Fabricado por:	**IMPSA Wind**
Provisto por:	**IMPSA Wind**
Importado por:	**(fabricación nacional)**
Clase del aerogenerador:	**S**
Designación:	**Prototipo IWP-70**
Tipo y variante:	**Prototipo IWP-70**
Diámetro del rotor:	**70 m**
Altura del eje:	**72 m**
Potencia eléctrica nominal:	**1.5 MW**
Orientación:	**Upwind**
Celda de media tensión S/N:	
Pala 1 S/N:	
Pala 2 S/N:	
Pala 3 S/N:	
Vida de diseño:	**20 años**

1.2. Sitio

Nombre del Parque Eólico:	
Nro. del Aerogenerador dentro del Parque Eólico:	
Otros códigos identificatorios:	

1.3. Configuración General:

Plano de conjunto del Aerogenerador:	**99835-000010 Wind Turbine 1.5MW General Assembly**
Planos descriptivos del aerogenerador:	**99835-300000 Nacelle – Main Assembly** **99835-400000 UNIPOWER – Main Assembly** **99835-600000 Electrical – General Assembly** **99835-600010 Electrical Equipments – General Layout** **99835-600015 Electrical Equipment – General. Layout on Nacelle** **99835-600020 Equipment Position on Rotor** **99835-675015 General Earthing System** **99835-680050 Control and Supervision System Circuit Diagram** **99835-680053 Circuit Breaker Nacelle Circuit Diagrams** **99835-680054 Circuit Breaker Base Circuit Diagrams** **99835-MC0010 Wind Turbine – Frequencies Analysis Calculation Report** **99835-LT6401 Parameters List of the Control and Protections Systems**

1.4. Desempeño

Potencia Eléctrica Nominal (kW):	**1.5 MW**
Velocidad de Viento Nominal (m/s):	**12 m/s**
Velocidad de Cut-in (m/s):	**3.5 m/s**
Velocidad de Cut-out (m/s):	**25 m/s**
Velocidad de Viento Extrema (m/s):	**77 m/s**
Curva de Potencia: número de doc.	

1.5. Pala

Documento Descriptivo:	**99835-500000 Blade 1.5MW Class S – General Assembly**
Fabricante	**IMPSA Wind**
Modelo	**IMPSA Wind IWP-70**
Longitud (m):	**32,4 m**
Material:	**GFRP**
Primer Frecuencia Flapwise (Hz):	**1,53 Hz**
Primer Frecuencia Edgewise (Hz):	**1,73 Hz**
Masa (kg):	**6000 kg**

1.6. Rotor

Cantidad de Palas:	**3**
Área de Barrido (m^2):	**3848 m^2**
Velocidad de Rotación Nominal (rpm):	**19 rpm**
Max Velocidad Rotacional de Diseño (rpm):	**24 rpm**
Tipo de Cubo Rotor:	**UNIPOWER®**
Ángulo de Conicidad (º):	**0 °**
Ángulo de Inclinación de Rotor (º):	**6 °**
Ángulo de Pitch Nominal (º):	**-2.9 °**
Sentido de Rotación (downwind):	**Horario**
Masa del Rotor incl. Palas (kg):	**80 000 kg**

1.7. Generador

Generador:	**UNIPOWER®**
Fabricante:	**IMPSA Wind**
Tipo (sinc. o asinc.):	**Síncrono**
Tensión Nominal:	**690V**
Frecuencia:	**Variable**
Velocidad Nominal:	**19 rpm**
Velocidad Máxima:	**24 rpm**

1.8. Sistema de Frenado:

Documento Descriptivo:	**99835-440000 Breaking System Assembly**
Freno de Servicio/Parking: Fabricante & Tipo	**Svendborg - hidráulico**
Freno de Servicio/Parking: Ubicación	**Entre rotor y mainframe**
Freno de Parada: Fabricante y Tipo	**IMPSA – aerodinámico**
Freno de Parada: Ubicación	**Rotor**

1.9. Sistema de Yaw:

Sensor de Dirección de Viento:	**Veleta clásica + Veleta Ultrasónica**
Método de Control de Yaw:	**Activo**
Actuador de Yaw:	**Eléctrico**
Freno de Yaw: Fabricante, Tipo y Ubicación	**Svendborg – hidráulico – entre mainframe y torre**

1.10. Sistema Eléctrico y de Control:

Documento Descriptivo:	**99835-600000 / 99835-680050**
Controlador: Fabricante y Tipo	**IMPSA Wind**
Software: Edición, Número de Versión	
Sistema de Monitoreo: Fabricante, Tipo	**IMPSA – ICSA – Sitrack Vibes**
Regulación de Potencia:	**Regulación por Paso de Pala/Pitch**
Control de Sobrevelocidad:	**Pitch / Paso de pala**
Factor de Compensación de Potencia	**Convertidor de Potencia**
Conexión de Fases de Generador	**Y**
Output Eléctrico: Tensión, Frecuencia, Número de Fases	**13.2 kV, 50Hz, 3 fases**
Tolerancias de Red (tensión, frec.)	

1.11. Torre

Documento Descriptivo:	**99835-200000 Tower Main Assembly**
Tipo de Torre:	**Tubular de Acero**
Altura (m):	**70.27 m**
Primer frecuencia modal (Hz):	**0,49 Hz**
Masa total sobre la Torre (Ton):	**110 Ton**
Masa de la Torre (Ton):	**175 Ton**

1.12. Personal

Las tareas de mantenimiento deben realizarse por al menos dos personas. Esta regla se debe respetar **siempre**, para garantizar la seguridad e integridad del personal. Si es necesario puede participar mayor número de personas, pero es importante para todo el personal de mantenimiento conocer qué tareas deben realizar, para no interferir o poner en riesgo a otras personas.

La persona responsable del equipo de mantenimiento debe coordinar las tareas de manera de garantizar la seguridad e integridad de su equipo.

Completar la nómina de personas que participarán de la tarea de mantenimiento del aerogenerador y sus funciones.

Personal (indicar empresa si no pertenece a IMPSA)	Funciones

Regulaciones de Higiene y Seguridad

para Prototipo IMPSA Wind IWP-70

2. Regulaciones de Higiene y Seguridad

2.1. Entrenamiento

Todo el personal y los técnicos de servicio que vayan a realizar las tareas de mantenimiento descritas en este manual deben haber completado el entrenamiento técnico teórico-práctico dictado por personal de IMPSA. Asimismo, es obligatorio que hayan completado el curso de Seguridad e Higiene y tengan a su disposición el manual de Seguridad e Higiene para operaciones de campo.

Las instrucciones en este manual deben ser leídas y comprendidas en su totalidad, antes de realizar cualquier tarea de mantenimiento. Todas las regulaciones descritas aquí deben ser estrictamente respetadas.

Si las instrucciones aquí presentadas no son seguidas con cuidado, podrá exponerse a situaciones de alto riesgo tanto para el equipo como para su salud personal.

2.2. Propósito

El propósito de este capítulo es concientizar a las personas que trabajarán cerca o en el aerogenerador de los riesgos a los que se verá expuesto, y de cómo prevenirlos. Existen dos aspectos principales que hacen peligroso el trabajo en un aerogenerador:

- El trabajo en altura
- El trabajo con electricidad

Los riesgos asociados a estas actividades convierten a la industria eólica en una de las 10 más peligrosas para trabajar. Toda persona que realice trabajos en aerogeneradores debe ser consciente de esto, y no debe ignorar las reglas de seguridad, que buscan ante todo, proteger la salud de las personas.

Antes de proceder con las tareas de Mantenimiento, lea atentamente este capítulo, y refiérase al Manual de Seguridad e Higiene en caso de cualquier duda.

2.3. Versión

Este manual se aplicará exclusivamente al siguiente aerogenerador:

Prototipo IWP-70

Otras versiones del mismo aerogenerador pueden presentar cambios en el diseño y operación. Por esta razón, no intente utilizar este manual para cualquier otro modelo que no sea exactamente el indicado arriba. Si lo hace, podrá poner en peligro su salud y la integridad del aerogenerador.

2.4. Reservas sobre posibles cambios

IMPSA se reserva el derecho de realizar cambios en este instructivo o de reemplazarlo con una versión revisada en cualquier momento. IMPSA también ser reserva el derecho de cambiar el Prototipo IWP-70. La información incluida en este manual ha sido compilada con el propósito de describir con la mayor claridad posible todos los pasos para lograr el correcto mantenimiento del aerogenerador. Si se detecta algún error o falta de claridad en las

explicaciones, por favor contacte al Departamento de Ingeniería de IMPSA para reportarlo y así realizar las correspondientes correcciones.

2.5. Reglamento de Higiene y Seguridad

2.5.1. Ropas de Protección y Equipo de Seguridad

La empresa debe proveer a los empleados con ropa protectora y el equipo de seguridad necesario. Es obligatorio utilizar estos elementos durante el trabajo. Estas reglas se aplican a todos los empleados de la compañía SIN EXCEPCIÓN, y deben ser utilizadas en todas las áreas de trabajo.

2.5.2. Protección de los Pies

*Todos los empleados deben utilizar obligatoriamente **calzado de seguridad** en toda la superficie de la **granja eólica**.*

La compañía es responsable de proveer dicho calzado de seguridad a todo personal que asista a una granja eólica.

2.5.3. Protección de la Cabeza

*Todos los empleados están obligados a utilizar **cascos de seguridad** en toda la **granja eólica**.*

Los empleados de IMPSA están obligados a utilizar cascos de seguridad en toda zona de la granja eólica. Esto es obligatorio en todas las áreas con riesgo de caída de objetos, rotura de cables, u otra situación de riesgo mecánico o eléctrico que pueda provocar heridas personales. Los empleados que trabajen con niveles peligrosos de electricidad deben llevar cascos adecuados contra choques eléctricos según la norma IRAM-3520 Typ-1 Clase B u otro estándar equivalente.

2.5.4. Protección Auditiva

Todos los empleados están obligados a utilizar protección auditiva cuando trabajen en áreas ruidosas.
Un área es considerada ruidosa si presenta más de 85 dB(A) o si resulta incómodo para el oído debido a ruidos permanentes o temporarios causados por máquinas o trabajos de impacto, etc. El oído puede protegerse mediante el uso de tapones comerciales, cápsulas de protección, algodón, o cualquier otro método descrito en el manual de seguridad.

2.5.5. Protecciones para Ascenso y Equipo de Rescate

- El ascenso de la torres está prohibido a personas que no hayan recibido las instrucciones de seguridad respectiva.
- Es absolutamente necesario que cualquier persona que trabaje regularmente o haga mantenimiento en la góndola reciba el entrenamiento de seguridad adecuado para trabajo en altura, descenso y rescates en altura. Esta persona deberá utilizar equipos de seguridad y deberá conocer cómo operarlos adecuadamente. Además, se deberá hacer énfasis en que sea consciente de los riesgos de escalar sin equipo de seguridad.
- Ascender o trabajar en la góndola no está permitido a ninguna persona con habilidades reducidas o con cualquier problema de salud físico, mental o cardiovascular.
- Tampoco deberán ascender la torre o acceder a la góndola personas que sufran de vértigo.

Antes de ascender la torre, la luz de la torre debe encenderse desde el interruptor ubicado en el piso de acceso.

*Nunca se debe ascender la torre durante una **tormenta eléctrica**.*
*Nunca se debe ascender la torre si la velocidad de viento promedio de 10 minutos es mayor a **17 m/s**.*

Todas las personas que asciendan la torre deben en todos los casos llevar con ellos el siguiente equipo:

- 1 arnés de seguridad utilizado en todo momento.
- 2 colas de amarre.
- 1 carrete de seguridad (runner).

*En toda situación en que haya riesgo de caída durante el trabajo en el aerogenerador, los empleados deben estar asegurados en todo instante por **al menos un dispositivo de seguridad (cola de amarre o carrete de seguridad).***

Cualquier persona que ascienda la torre deberá entender las instrucciones para el uso adecuado del equipo de seguridad provisto. Estas instrucciones deben estar disponibles en las oficinas del sitio de instalación. El uso inadecuado del equipo de seguridad puede poner en riesgo la vida de las personas. No dude en preguntar o pedir ayuda en caso de duda.
La mayor parte de los equipos de seguridad poseen una fecha de caducidad que debe ser respetada. Los usuarios deben examinar el equipo de seguridad personal cuidadosamente antes de cada uso. El carrete de seguridad para la escalera de ascenso debe probarse funcionalmente cerca del suelo antes de cada ascenso. Además, se debe realizar un ensayo de suspensión cerca del suelo para corroborar el correcto ajuste del arnés.

2.5.6. Seguridad del personal

Ninguna persona está autorizada a trabajar solo en un aerogenerador. Por razones de seguridad, al menos dos personas deben estar presentes cuando se ingrese en una aerogenerador.

2.5.7. Ascenso

El riesgo de caída de objetos es permanente en turbinas eólicas. Existen una serie de reglamentaciones en este sentido que deben ser tomadas muy seriamente para lograr minimizar el riesgo de accidentes:

- Es obligatorio usar casco de seguridad dentro de la torre.
- Durante el ascenso y descenso, ambas manos deben estar libres para sujetarse a la escalera.
- Si una persona se siente temporalmente mareada o cansada, el mismo no debe ascender la torre.
- Sólo una persona a la vez debe ascender por la escalera de seguridad.
- Si una persona está ascendiendo, el resto de las personas en la base de la torre deben evitar ubicarse junto a la escalera o directamente debajo de la persona que asciende.
- Si más de una persona debe ascender al mismo tiempo, la distancia entre ellas debe ser tan pequeña como sea posible, para así minimizar la aceleración de cualquier objeto que caiga.
- Todo objeto transportado durante el ascenso o descenso debe estar seguramente ubicado dentro de una mochila resistente u otro tipo de bolsa que no corra riesgo de desgarrarse.
- Si se desea subir o bajar objetos de gran tamaño, los mismos deben sujetarse con seguridad con elementos de sujeción apropiados y transportados con el polipasto de material.
- Nunca intente retirar objetos de los bolsillos o bolsas mientras se encuentre en la escalera o cerca de escotillas abiertas.

- Se deberá tener especial cuidado con objetos pequeños como llaves, herramientas y radios manuales.
- Los empleados deberán adquirir el hábito de cerrar todas las escotillas tras pasar por ellas.

Antes de cada ascenso, el empleado debe verificar la condición del equipo de seguridad (riel de la escalera, escalones, etc). Cualquier error o falla en el equipo debe ser reparada o reemplazada inmediatamente, y el incidente debe registrarse en la bitácora del aerogenerador.
Es obligatorio que antes de iniciar el ascenso de la torre, los empleados hayan completado el entrenamiento práctico en el uso del equipo de seguridad. El entrenamiento debe ser provisto por el responsable de seguridad del sitio. Si esto no es posible, este entrenamiento podrá ser dictado por un empleado adecuadamente entrenado y con experiencia. El supervisor será responsable por el entrenamiento de sus empleados.

2.5.8. Puntos de Anclaje de Seguridad

*El personal deberá estar siempre anclado con **al menos un dispositivo de sujeción** cuando haya riesgo de caída. Existen varios puntos de anclaje especialmente diseñados para este uso. Los mismos están identificados con una **señalización** o pintados de **amarillo**. Sólo esto puntos de anclaje pueden ser usados con este fin, ya que han sido especialmente verificados para ello.*

- Antes de dejar la escalera de seguridad, el operario deberá sujetarse a un punto de anclaje con la cola de amarre y recién entonces liberar el carrete de seguridad. Este anclaje debe mantenerse hasta que la escotilla de la plataforma haya sido cerrada y el riesgo de caída haya desaparecido.
- Una segunda cola de amarre debe utilizarse cuando se cambie de punto de anclaje y haya riesgo de caída. La segunda cola de amarre debe anclarse antes de liberar la primera, de modo de estar anclado en todo momento.
- Cuando la escotilla del polipasto esté abierta, toda persona cerca de la escotilla debe estar seguramente sujetada a un punto de anclaje designado.
- Cuando se deba realizar una operación fuera de la góndola, el empleado deberá llevar dos colas de amarre, y se recomienda que una tercera cola de amarre (más larga, si es necesario) se mantenga anclada en todo momento a un punto de anclaje en el interior de la góndola.

2.5.9. Sustancias Peligrosas

- Todos los recipientes que contengan sustancias peligrosas deben estar claramente indicados con marcador permanente o un rótulo resistente.
- Los líquidos tóxicos no deben guardarse en recipientes de bebidas, como botellas de gaseosas, vasos, etc. Si esto es imposible, deberá evitar colocar líquidos tóxicos en botellas de bebidas que tengan un color similar (Ej: evite colocar líquidos tóxicos oscuros en botellas de gaseosa de cola). Siempre indique el contenido en el envase.
- Las sustancias peligrosas sólo deberán guardarse en los lugares de trabajo en las cantidades necesarias para el trabajo del día.
- Cualquier desecho o residuo debe ser colocado regularmente en contenedores designados para este fin.
- Si se va a utilizar una sustancia peligrosa, asegúrese de tener a mano la hoja de datos de seguridad y las instrucciones en caso de accidente de esa sustancia en particular antes de comenzar la operación.

2.5.10. Operación del Elevador y el Polipasto

Operación

Sólo personal calificado podrá operar el elevador y el polipasto. Antes de utilizarlos, el operario deberá verificar visualmente que todo el equipo asociado esté libre de defectos

Mantenimiento

La descripción del mantenimiento y requerimientos del elevador y el polipasto están descritos en la especificación de mantenimiento mecánico.

2.5.11. Protección Contra Incendios

Las sustancias inflamables deberán ser tratadas como sustancias peligrosas.
Se debe prestar especial atención a no dejar sustancias inflamables dentro del aerogenerador si no están siendo utilizadas.
Si el aerogenerador utiliza normalmente una sustancia inflamable, su recipiente debe ser claramente identificado.
Un número apropiado de extinguidores debe ser ubicado cerca de todas las áreas sujetas a peligro de fuego.

2.5.12. Reporte de Accidentes

Uno de los principales intereses del Departamento de Seguridad es el de prevenir posibles accidentes. Una de las mejores maneras de mejorar esta prevención es conociendo los accidentes e incidentes que realmente ocurrieron. Por ello, es de vital importancia reportar inmediatamente cualquier accidente o incidente al supervisor.

2.5.13. Etapas de las tareas de mantenimiento

Cada uno de los pasos necesarios en una tarea de mantenimiento debe efectuarse cuidadosamente y registrando todo por escrito. Las diferentes etapas en el mantenimiento de un componente específico como así también los valores límites o parámetros que deben tenerse en cuenta se describen en las especificaciones de mantenimiento. El personal responsable debe garantizar la correcta ejecución de las actividades y registrar cualquier problema o eventualidad que surgiera.

3. Especificaciones de Mantenimiento

La especificación de mantenimiento del aerogenerador IWP-70, está dividido en dos partes “Especificación de Mantenimiento Mecánico” y “Especificación de Mantenimiento Eléctrico”. La documentación relacionada con las instrucciones de trabajo está listada en el capítulo 1.3.

4. Mantenimiento de uniones roscadas

4.1. Elección de espárragos, tuercas o bulones para chequeo.

El número de bulones que se chequearán en cada unión roscada se proporciona en cada especificación. Debe seleccionar bulones en posiciones igualmente distribuidas y marcarlos luego de realizar el mantenimiento. Cuando realice las tareas de mantenimiento siguientes, deberá elegir otros bulones que no hayan sido marcados anteriormente, es decir que no hayan sido testeados, y repetir el procedimiento.

4.2. Definición de las categorías de ensayo

La categoría de test que se le aplicará a una unión roscada, es el método de chequeo que se empleará para verificar la pre-tensión. Este valor es establecido por el fabricante y se encuentra detallado para cada unión en la especificación de mantenimiento. La categoría de ensayo define el método de ajuste y el procedimiento de ensayo que se empleará.

4.3. Categoría de ensayo 1

4.3.1. Método de ajuste

Control de ajuste mediante torque, utilizando una llave para terquear hidráulica. Esta herramienta debe asegurar una precisión de +/- 3%.

4.3.2. Procedimiento de ensayo

El ángulo de rotación que puede aplicarse a una tuerca antes de alcanzar el torque de ajuste utilizando la herramienta para terquear, es indicador de la correcta o no pre-tensión de un bulón. Se recomienda seguir las siguientes instrucciones:

- Setear la herramienta para torquear con el valor de torque de ajuste requerido.
- Marcar con un marcador indeleble la tuerca para verificar el ángulo de rotación.
- Reajustar la tuerca con la herramienta.
- Marcar las tuercas chequeadas, realizando una marca coincidente entre la brida y la cara de la tuerca con un marcador indeleble.
- Si la tuerca gira más de 20°, todas las tuercas ce rcanas a la misma deben ser reajustadas.
- Si la tuerca gira más de 50°, esto puede indicar c onsiderable pérdida de pre-tensión, revisar la unión roscada, verificar si existen daños o asientos de la junta incorrectos, etc. El bulón deberá ser reemplazado por uno nuevo, y el resto de los bulones revisados.
- Indicar todos los bulones reemplazados claramente con una leyenda que indique “reemplazado” y registrarlo en las planillas que debe completar de las especificaciones de mantenimiento e informar a ingeniería y Aseguramiento de Calidad.
- Registrar el resultado del test.

4.4. Categoría de ensayo 2

Control del torque de ajuste con llave de esfuerzo de torsión.

La llave debe asegurar una precisión de al menos +/-5%.

4.4.1. Procedimiento de ensayo

- Setear la llave de esfuerzo de torsión con el torque especificado.
- Reajustar la tuerca con la llave hasta escuchar el primer “click” (Esto indica que la llave alcanzo el valor seteado).

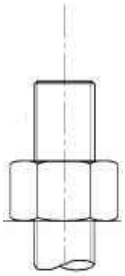
- La pre-tensión será correcta, si la llave se activa antes que bulón/tuerca comiencen a girar.
- Si la tuerca gira más de 20°, todas las tuercas ce rcanas a la misma deben ser reajustadas.
- Si la tuerca gira más de 50°, el bulón deberá ser reemplazado por uno nuevo, y el resto de los bulones revisados. Indicar todos los bulones reemplazados claramente con una leyenda que indique “reemplazado” y registrarlo en las planillas que debe completar de las especificaciones de mantenimiento.
- Si la tuerca/bulón comienzan a girar antes de escuchar el primer “clic”, chequear cuánto gira. Si la rotación es mayor a 90°, esto in dica una considerable pérdida de pre-tensión.
- Si la rotación supera los 90°, esto puede indicar considerable pérdida de pre-tensión, revisar la unión roscada, verificar si existen daños o asientos de la junta incorrectos, etc.
- Marcar las tuercas chequeadas, realizando una marca coincidente entre la brida y la cara de la tuerca con un marcador indeleble.
- Registrar los resultados del test.

4.5. Categoría de ensayo 3

Control del torque de ajuste con herramienta de tensionado hidráulico.

La herramienta debe asegurar una precisión de al menos +/-10%.

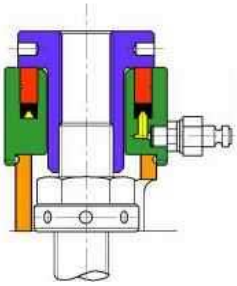
4.5.1. Procedimiento de ensayo



Primer paso:

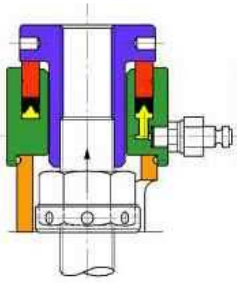
Se necesita que el perno exceda la tuerca por 1.5 diámetros de la rosca. Excepción: cuando se usan tuercas hidráulicas, que reemplazan a las tuercas convencionales y se quedan en el lugar de ellas, una vez tensionado.

Se enrosca la tuerca standard, ajustando a mano.



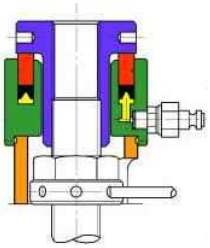
Segundo paso:

- Se coloca un anillo ó corona (hexagonal en el interior, circular en el exterior; en la gráfica de color blanco) y que tiene (mayormente) 6 agujeros radiales sobre la tuerca convencional.
- Se coloca el puente (en la gráfica de color naranja) sobre la tuerca y corona.
- Se coloca el cilindro (en la gráfica de color verde) sobre el puente.
- Se enrosca el jalador (en la gráfica de color azul) en el excedente del perno



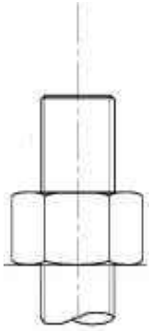
Tercer paso:

- Con una bomba hidráulica de alta presión (hasta 20,000 PSI), manual ó eléctrica, se inyecta aceite hasta cierto valor "A" preestablecido.
- El jalador estira el perno, de forma tal que la tuerca ya no choca sobre la pieza a ajustar.



Cuarto paso:

- Se mantiene la presión "A" preestablecida en la bomba.
- Se gira la corona a través de unos espacios en el puente, ajustando así manualmente la tuerca.
- Se retira la presión "A" preestablecida en la bomba, y el perno (estirado = ajustado) no puede regresar a su posición inicial, ya que la tuerca lo impide.



Quinto paso:

Se retiran las herramientas en el sentido inverso de montaje:

- Se desenrosca el jalador (antes hay que retirar la presión).
- Se retira el cilindro.
- Se retira el puente.
- Se retira el anillo ó corona

Para verificar si los espárragos tienen la elongación requerida se deben realizar los pasos 1, 2 y 3. Si la tuerca queda libre, esto indica que la elongación no era la adecuada. Reajustarla en este caso y revisar el resto de los espárragos. Este procedimiento deberá realizarse por ejemplo en los espárragos que se encuentran el eje del generador, la brida góndola y la estructura de góndola.

- Si la tuerca gira más de 20°, todas las tuercas ce rcanas a la misma deben ser reajustadas.
- Si la tuerca gira más de 50°, el bulón deberá ser reemplazado por uno nuevo, y el resto de los bulones revisados. Indicar todos los bulones reemplazados claramente con una leyenda que indique “reemplazado” y registrarlo en las planillas que debe completar de las especificaciones de mantenimiento.
- Marcar las tuercas chequeadas, realizando una marca coincidente entre la brida y la cara de la tuerca con un marcador indeleble.
- Registrar los resultados del test.

5. Instrucciones de trabajo

Antes de realizar cualquier tarea de mantenimiento debe colocar el selector que se encuentra en la puerta del panel LCPB en la posición que indica ***“maintenance”***. Un indicador luminoso se encenderá y esto indicará que las tareas de mantenimiento pueden ser ejecutadas.

5.1. Colocación del rotor lock

El rotor lock fija el rotor del aerogenerador IWP-70 durante las tareas de mantenimiento que solo pueden efectuarse accediendo al generador.

Luego que la turbina ha sido detenida, el rotor gira en vacío, “idling” a baja velocidad en cualquiera de las dos direcciones. Para bloquear el rotor, el IWP-70 posee un rotor lock ubicado en la línea media del rotor. Para accionarlo deberá llevar una de las tres palas hacia abajo, es decir que quede alineada con la torre. Una vez en esta posición se deben aplicar los frenos del rotor y luego en forma manual se aplica el rotor lock.

6. Protocolo de Mantenimiento

Fabricante: _____

Número de Serie: _____

Fecha de Comisionamiento: _____

Ubicación: _____

Operador: _____

Horas de funcionamiento (hs): _____

Energía Producida (kWh): _____

El mantenimiento pudo realizarse correctamente:

Si _____

No _____

El mantenimiento no pudo realizarse correctamente porque:

Fecha: _____

Firma: _____

Firma: _____

REV – *REV*	DESCRIPCIÓN DE LA MODIFICACIÓN – *DESCRIPTION OF THE MODIFICATION*	FECHA - *DATE*	FIRMA - *SIGNATURE*
00	Emitido para Información	ABR'2008	CAC
01	Modificaciones Generales	AGO'2014	ELO

IMPSA
MENDOZA - ARGENTINA

	OBSERVACIONES REMARKS		PEDIDO EN PLANO **ORDERED ON DWG. Nº**	*POS.* / ITEM
	NOMBRE - NAME	FIRMA - *SIGNATURE.*	FECHA - *DATE*	HOJA - *SHEET*
PROYECTADO POR DESIGNED BY		**GAC**	11/04/08	1 / 12
REVISADO POR CHECKED BY		**NPE**	11/04/08	
APROBADO APPROVED BY		**JMA**	11/04/08	

TITULO *TITLE*

AEROGENERADOR IWP-70 1.5MW

ESPECIFICACIÓN DE MANTENIMIENTO MECÁNICO

DOCUMENTO NRO.
DOCUMENT NR.

99835-MO8602

REVISION – *REVISION*

01

1.1. Versión

Este manual se aplicará exclusivamente al siguiente aerogenerador:

Prototipo IWP-70

Otras versiones del mismo aerogenerador pueden presentar cambios en el diseño y operación. Por esta razón, no intente utilizar este manual para cualquier otro modelo que no sea exactamente el indicado arriba. Si lo hace, podrá poner en peligro su salud y la integridad del aerogenerador.

1.2. Reservas sobre posibles cambios

IMPSA se reserva el derecho de realizar cambios en este instructivo o de reemplazarlo con una versión revisada en cualquier momento. La información incluida en este manual ha sido compilada con el propósito de describir con la mayor claridad posible todos los pasos para lograr el correcto mantenimiento del aerogenerador. Si se detecta algún error o falta de claridad en las explicaciones, por favor contacte al Departamento de Ingeniería de IMPSA para reportarlo y así realizar las correspondientes correcciones.

1.3. Documentos Relacionados

Documento: **99835-MO8601** Manual de Mantenimiento

2. Especificación de Mantenimiento Mecánico

2.1. Tareas Generales

Código	Tarea	Periodicidad		Instrucción	Observaciones
		semestral	anual		
MM01	Inspección visual para identificar posibles grietas, daños o corrosión	**X**		Si hubiera alguna grieta o daño, detenga la turbina e informe inmediatamente a ingeniería. Daños por corrosión pueden ser reparados siguiendo las instrucciones del esquema de pintura.	
MM02	Ruidos	**X**		Durante las tareas de mantenimiento preste atención si percibe ruidos extraños.	

2.2. Exterior de la torre

Código	Tarea	Periodicidad		Instrucción	Observaciones
		semestral	anual		
MM03	Inspección visual de la fundación y virolas de la torre.	**X**		Si hubiera alguna grieta o daño, detenga la turbina e informe inmediatamente a ingeniería. Daños por corrosión pueden ser reparados siguiendo las instrucciones del esquema de pintura.	
MM04	Brida 1 Unión Fundación/Torre	**X**		Inspección del grouting. Para bulonería ver **99835-MO8601_Manual de Mantenimiento cap.4**	

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MM05	Puerta de acceso		**X**	Inspección visual: impermeabilidad y corrosión. Inspección del mecanismo de cierre, engrase de bisagras. Verificar el funcionamiento del extractor de aire.	

2.3. Torre

2.3.1. Nivel 0

Precaución: Riesgo de choque eléctrico!

La celda de MT solo puede ser operada por personal autorizado y entrenado.

Precaución: Riesgo de choque eléctrico!

Si debe realizar tareas que requieran su ingreso a la jaula del transformador, asegúrese que la turbina esté detenida y el convertidor con potencial 0 antes de descender al nivel 0. Abra la celda de MT, y atérrela.

Código	Tarea	Periodicidad		Instrucción	Observaciones
		semestral	anual		
MM06	Inspección visual		**X**	Jaula de Transformador Principal, marcas de quemaduras, insectos, ingreso de agua, suciedad.	

2.3.2. Interior Torre

Código	Tarea	Periodicidad		Instrucción	Observaciones
		semestral	anual		
MM07	Inspección visual de escalera	**X**		Fijaciones, corrosión, daños, suciedad	
MM08	Ensayo funcional		**X**	Test funcional del equipamiento de seguridad	
MM09	Equipamiento de seguridad personal		**X**	Revisión del equipamiento sólo por personal autorizado.	
MM10	Inspección visual durante el ascenso		**X**	Fijaciones de la escalera, plataformas y cables de la torre. Corrosión, pintura, grietas en las bridas de la torre y virolas.	

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2.3.3. Bridas Torre
Torre HH72.5m

Precaución: Riesgo de choque eléctrico!

La celda de MT solo puede ser operada por personal autorizado y entrenado.

Precaución: Riesgo de choque eléctrico!

Si debe realizar tareas que requieran su ingreso a la jaula del transformador, asegúrese que la turbina esté detenida y el convertidor con potencial 0 antes de descender al nivel 0. Abra la celda de MT, y atérrela.

Nota: Si debe reemplazar alguna tuerca en las bridas de la torre, antes de ajustar con el torque recomendado, aplique una capa fina de MoS2 en el asiento de la tuerca contra la arandela.

Código	Tarea	Periodicidad		Instrucción	Observaciones
		semestral	anual		
MM11	Brida 1 Fundación/tramo inferior torre		10% 16 bulones	Chequear las uniones roscadas. Categoría de ensayo 1. 160 Bulones M42 – 8.8 **Torque: 3080 Nm**	
MM12	Brida 2		10% 12 bulones	Chequear las uniones roscadas. Categoría de ensayo 1. 112 Bulones M42 – 10.9 **Torque:3400 Nm**	
MM13	Brida 3		10% 15 bulones	Chequear las uniones roscadas. Categoría de ensayo 1. 144 Bulones M36 – 10.9 **Torque:2200 Nm**	
MM14	Brida 4		10% 13 bulones	Chequear las uniones roscadas. Categoría de ensayo 1. 128 Bulones M36 – 10.9 **Torque:2200 Nm**	
MM15	Brida 5 Rodamiento YAW-tramo superior torre		10% 6 bulones	Chequear las uniones roscadas. Categoría de ensayo 1. 60 Bulones M24 – 10.9 **Torque:650 Nm**	

2.3.4. Ascensor

Código	Tarea	Periodicidad		Instrucción	Observaciones
		Antes de utilizar	anual		
MM16	Inspección visual	**X**		Chequear estado general del ascensor	
MM17	Mantenimiento		**X**	Ver manual del proveedor del ascensor **AVANTI SERVICE LIFT User's Manual and Installation Manual Model SHARK**	

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2.4. Góndola

Código	Tarea	Periodicidad		Instrucción	Observaciones
		semestral	anual		
MM18	Inspección visual para identificar posibles grietas, daños o Corrosión.	**X**		Si hubiera alguna grieta o daño, detenga la turbina e informe inmediatamente a ingeniería. Daños por corrosión pueden ser reparados siguiendo las instrucciones del esquema de pintura.	
MM19	Cables de Potencia		**X**	Chequear las condiciones de los cables, fijaciones y peinado mientras suba por la torre. Asegurarse que los cables no rozan contra nada que los dañe.	
MM20	Plataformas		**X**	Chequear fijaciones y limpieza de la zona. Las plataformas laterales de la góndola (metal desplegado) no deben estar tapadas ya que sirven de ventilación para la góndola.	
MM21	Chequeo		**X**	Extintores de incendio: mantenimiento y recarga. Chequear: Botiquín de primeros auxilios y sistema de descenso de personas	
MM22	Chequeo		**X**	Chequear las puestas a tierra las conexiones.	
MM23	Anemómetro y veleta	**X**	**X**	Verificar condiciones estructurales, estado, orientación y fijaciones.	
MM24	Balizas	**X**		Chequear funcionamiento, estado y fijaciones.	

2.4.1. Brida Góndola

Código	Tarea	Periodicidad		Instrucción	Observaciones
		semestral	anual		
MM25	Inspección visual para identificar posibles grietas, daños o Corrosión.	**X**		Si hubiera alguna grieta o daño, detenga la turbina e informe inmediatamente a ingeniería. Daños por corrosión pueden ser reparados siguiendo las instrucciones del esquema de pintura.	
MM26	Brida / Main Frame		100% 16 espárragos	Chequear las uniones roscadas. Categoría de ensayo 3. 160 Espárragos M48 X 360 - 10.9 **Pretensión:500 kN**	

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MM27	Eje Principal/Brida		100% 12 espárragos	Chequear las uniones roscadas. Categoría de ensayo 3. 120 Espárragos M48 X 335 - 10.9 **Pretensión:500 kN**	

2.5. Sistema YAW

2.5.1. Motorreductores YAW (4 unidades)

Código	Tarea	Periodicidad		Instrucción	Observaciones
		semestral	anual		
MM28	Inspección visual	**X**		Rodamiento YAW, Piñones	
MM29	Motorreductores	**X**		Chequear condiciones externas del reductor, derrames de lubricante, suciedad.	
MM30	Fijación Motorreductores /Góndola		30% 7 bulones en cada motor	Chequear las uniones roscadas. Categoría de ensayo 1. 24 Bulones M14 – 10.9 **Torque: 146 Nm**	
MM31	Lubricación	**X**		Chequear nivel de aceite lubricante	

2.5.2. Rodamiento YAW

Código	Tarea	Periodicidad		Instrucción	Observaciones
		semestral	anual		
MM32	Inspección visual de los sellos		**X**	Estanqueidad y limpieza del sello, remover grasa sucia.	
MM33	Rodamiento YAW- main frame (góndola)		10% 6 bulones	Chequear las uniones roscadas. Categoría de ensayo 1. 60 Bulones M24 – 10.9 **Torque:650 Nm**	
MM34	Inspección visual (dentado de rodamiento y piñones)		**X**	Contacto constante entre dientes, corrosión, verificar película fina de grasa en el dentado. Remover suciedad.	
MM35	Chequear juego entre dentado de rodamiento y Piñones **(Backlash)**. ***VER FIGURA N°1***		**X**	Chequear los dientes marcados de verde del dentado del rodamiento. Juego permitido **0.55 (+ 0.8; - 0.8)mm.** Reajustar si fuese necesario.	
MM36	Engrase del dentado de la parte fija del rodamiento		**X**	Tipo de grasa: **Klüberplex AG 11-462**	

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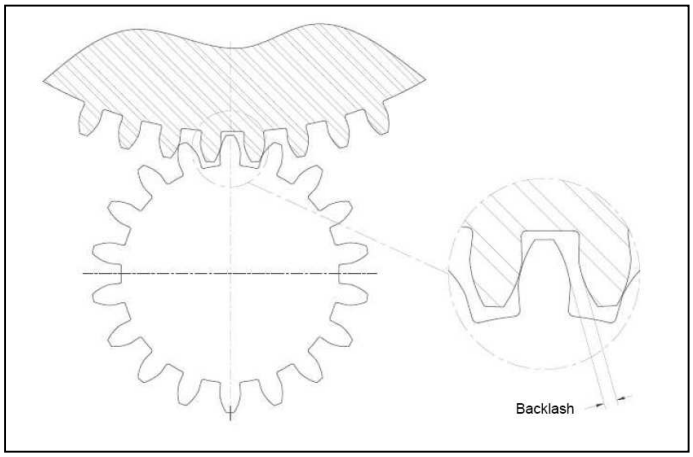

FIGURA N°1

2.6. Freno YAW

Código	Tarea	Periodicidad		Instrucción	Observaciones
		semestral	anual		
MM37	Inspección visual	**X**		Chequear todas las conexiones y mangueras.	
MM38	Inspección del disco de freno	**X**		Grietas, Corrosión. El disco debe estar libre de grasa o aceite (en caso de suciedad, removerla con acetona y reemplazar las zapatas)	
MM39	Inspección de las zapatas	**X**		Verificar estado de la zapatas (grietas, surcos, daños) Chequear el espesor > 5 mm. Ver **"Installation and Maintenance Manual" BSAB 90-S-401**	
MM40	Chequear unión roscada entre callipers y main frame (9 callipers)		20% 2 Bulones por calliper	Chequear las uniones roscadas. Categoría de ensayo 1. M27 – 10.9 **Torque:1000 Nm**	

2.6.1. Central Hidráulica Freno YAW / Rotor

Código	Tarea	Periodicidad		Instrucción	Observaciones
		semestral	anual		
MM41	Inspección visual	**X**		Chequear todas las conexiones, mangueras y el nivel de aceite.	
MM42	Mantenimiento	**X**		Ver **"Installation and maintenance Manual" HYDRAULIC BRAKE CONTROL UNIT 1010-0139-813**	

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2.7. Bomba de Lubricación

Código	Tarea	Periodicidad		Instrucción	Observaciones
		semestral	anual		
MM43	Inspección visual	**X**		Chequear todas las conexiones, mangueras y el nivel de grasa**. "Mobil SHC Grease 460"** o "**Mobil SHC Grease 460 WT"**	
MM44	Mantenimiento	**X**		Ver **99835-PO96010 BOMBA DE LUBRICACIÓN CIRVAL PROCEDIMIENTO DE OPERACIÓN**	

2.8. Sistema de izaje

2.8.1. Pescante con aparejo y Polipasto

Código	Tarea	Periodicidad		Instrucción	Observaciones
		semestral	anual		
MM45	Inspección visual		**X**	Chequear el estado de: cáncamos, ganchos, cadena, tambor (alojamiento de cadena) fijaciones y soportes).	
Mantenimiento: Una vez por año tanto pescante, aparejo y polipasto deben ser revisados por una persona especializada, verificando su integridad y la operabilidad de los elementos de seguridad. El estado general del equipo. Los resultados deben ser registrados por escrito en una hoja de inspección.					

2.9. Generador

Código	Tarea	Periodicidad		Instrucción	Observaciones
		semestral	anual		
MM46	Inspección visual para identificar posibles grietas, daños o Corrosión.	**X**		Si hubiera alguna grieta o daño, detenga la turbina e informe inmediatamente a ingeniería. Daños por corrosión pueden ser reparados siguiendo las instrucciones del esquema de pintura.	
MM47 *RV*	Entrehierro		**X**	Medir entrehierro en ocho o más puntos distintos, elaborar registros en planillas, marcar los puntos para realizar las futuras mediciones en los mismos lugares.	
MM48	Espárragos del núcleo		**X**	Revisión mediante un pequeño golpe de los pernos de apriete de paquete de chapas. Pos. 6 en plano 99835-422000 En caso de que este flojo, torquear a **48Nm**	
MM49	Ventilación	**X**		Chequear funcionamiento de ventiladores. Verificar estado de deflectores de aire. Verificar que no haya obstrucciones en el circuito de aire.	

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MM50	Calefacción	**X**		Verificar fijaciones y funcionalidad de resistencias calefactoras.	
MM51	Bobinado		**X**	Inspección visual de cabezas y puentes de bobina.	

2.9.1. Rotor lock

Código	Tarea	Periodicidad		Instrucción	Observaciones
		semestral	anual		
MM52	Inspección visual.	**X**		Deformación del perno, grietas. Revisar fijaciones. Chequear estado de los alojamientos ubicados en el rotor del generador.	
MM53	Unión Rotor Lock a góndola		100%	Verificar que no haya tornillos flojos.	
MM54	Test funcional	**X**		Chequear movilidad del vástago, palanca de accionamiento. Verificar funcionalidad de sensores (fines de carrera)	

2.9.2. Freno rotor

Código	Tarea	Periodicidad		Instrucción	Observaciones
		semestral	anual		
MM55	Inspección visual	**X**		Chequear todas las conexiones y mangueras.	
MM56	Inspección del disco de freno	**X**		Grietas, Corrosión. El disco debe estar libre de grasa o aceite (en caso de suciedad, removerla con acetona y reemplace las zapatas)	
MM57	Inspección de las zapatas	**X**		Verificar estado de la zapatas (grietas, surcos, daños) Chequear el espesor > 5 mm. Ver **"Installation and maintenance Manual" BSAB 90-S-417**	
MM58	Chequear unión roscada entre callipers y main frame (2 callipers)		20% 2 Bulones cada Calliper	Chequear las uniones roscadas. Categoría de ensayo 1. M27 – 10.9 **Torque:1000 Nm**	

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2.9.3. Rotor

Precaución: Solo está permitido permanecer en el hub si la velocidad promedio de viento de los últimos 10 minutos es inferior a **15 m/s**.

Antes de acceder al hub y mientras se permanezca en él, el rotor lock debe estar accionado.

Durante las tareas de movimiento manual de pitch, el personal de mantenimiento depermanecer en un sitio seguro.

Código	Tarea	Periodicidad		Instrucción	Observaciones
		semestral	anual		
MM59	Inspección visual	**X**		Verificar estado general del cubo rotor y sus partes mecánicas.	

2.9.4. Rodamientos Principales

Código	Tarea	Periodicidad		Instrucción	Observaciones
		semestral	anual		
MM60	Inspección visual		**X**	Chequeo de sellos. Remover grasa sucia o derramada.	
MM61	Inspección visual	**X**		Chequear todas las conexiones y mangueras de Lubricación.	
Nota: En caso de ser necesario, se podrán retirar los cobertores de los rodamientos lado góndola o viento para realizar chequeos.					

2.10. Sistema Pitch

2.10.1. Motorreductores de Pitch (3 unidades)

Código	Tarea	Periodicidad		Instrucción	Observaciones
		semestral	anual		
MM62	Inspección visual de los sellos		**X**	Estanqueidad y limpieza del sello, remover grasa sucia.	
MM63	Fijación Motorreductores /Rotor		30% Cada caja	Chequear las uniones roscadas. Categoría de ensayo 1. 12 Bulones M16 – 8.8 **Torque: 156 Nm**	
MM64	Fijación motor a reductor		100%	Verificar que los tornillos estén correctamente ajustados.	
MM65	Lubricación	**X**		Chequear nivel de aceite lubricante	

2.11. Rodamiento Pitch (3 unidades)

Código	Tarea	Periodicidad		Instrucción	Observaciones
		semestral	anual		
MM66	Inspección visual de los sellos		**X**	Estanqueidad y limpieza del sello, remover grasa sucia.	
MM67	Rodamiento pitch-Rotor		10% 6 bulones	Chequear las uniones roscadas. Categoría de ensayo 3. 54 Espárragos M30 - 10.9 **Pretensión:85 Kn**	

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MM68	Rodamiento pitch-Pala	500hr de operación.	**X**	Chequear las uniones roscadas. Categoría de ensayo 3. 54 T-Bolts M30- 10.9 **Pretensión:273 kN**	
MM69	Inspección visual (dentado de rodamiento y piñones)		**X**	Contacto constante entre dientes, corrosión, verificar película fina de grasa en el dentado. Remover suciedad.	
MM70	Chequear juego entre dentado de rodamiento y Piñones (Backlash). ***VER FIGURA N°1***		**X**	Chequear los dientes marcados de verde del dentado del rodamiento. Juego permitido: **0.49 (+ 0.7; - 0.7)mm.** Reajustar si fuese necesario.	
MM71	Engrase del dentado del rodamiento		**X**	Tipo de grasa: **Klüberplex AG 11-462**	

2.12. Palas

Las palas de una turbina eólica están constantemente sometidas a grandes esfuerzos, por este motivo es fundamental una inspección regular de las mismas. De esta manera se pueden detectar y reparar en una etapa temprana cualquier defecto, que si es localizado a tiempo no reducirá significativamente la vida útil de la pala ni generará ningún riesgo.

Precaución:

Por razones de seguridad, el mantenimiento solo debe realizarse en condiciones de velocidad de viento bajas. Los técnicos del servicio técnico de las turbinas determinarán cuando las condiciones diurnas permiten realizar el mantenimiento en forma segura.

Precaución:

Para realizar las tareas, el rotor debe estar en reposo y bloqueado mecánicamente con el rotor lock.

Instrucciones:

El ascensor para limpieza de palas debe contar con el certificado que lo habilite para realizar el trabajo. Se debe posicionar sobre suelo firme, no debe cruzar el área del rotor. No se debe sujetar a ninguna de las palas. Durante el ascenso y descenso el personal de mantenimiento debe permanecer en el interior de la guindola. Todas las personas en la guindola deben usar arneses de seguridad, y estos estar asegurados a la estructura de la guindola.

Nota: Si un rayo cayese sobre una o más palas, se deben realizar inspecciones en los receptores de rayos y en la superficie de las palas.

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Código	Tarea (realizar desde guindola)	Periodicidad		Instrucción	Observaciones
		semestral	anual		
MM72	Limpieza		**X**	Limpiar el orificio de drenaje de punta de pala.	
MM73	Chequear		**X**	Inspeccionar si existen grietas, indicios de erosión o peladas en el laminado. Cuando aplique, verificar estado de cinta anti erosión y accesorios aerodinámicos.	
MM74	Chequear		**X**	Inspeccionar la pala y verificar si existen defectos ocasionados por descargas atmosféricas.	
MM75	Chequear		**X**	Inspeccionar el sistema de recepción de descargas atmosféricas.	
MM76	Inspeccionar		**X**	Estado general de la raíz de pala.	
MM77	Inspección visual.		**X**	Chequear estado de la pala.	
MM78	Chequear		**X**	Inspeccionar que no exista agua en el interior de la pala	
MM79	Chequear **Tarea (realizar desde góndola)**		**X**	Inspeccionar la zona de la raíz, verificando que no existan grietas o daños por erosión.	
MM80	Chequeo **Tarea (realizar desde góndola)**		**X**	Chequear el sello entre la pala y la brida de la raíz.	

2.13. Limpieza del Aerogenerador

Código	Tarea	Periodicidad		Instrucción	Observaciones
		semestral	anual		
MM81	Limpieza	**X**		Luego de finalizar el mantenimiento, se debe limpiar toda la turbina. No deben quedar trapos, objetos perdidos en la turbina. Utilizar solo los detergentes recomendados.	

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Rev.	Descripción de la Modificación	Fecha	Firma
00	Emitido para Información	ABR'08	GAC
01	Modificaciones Generales	SET'14	ELO

	-		-	-
PROYECTO Nº	CANT.	OBSERVACIONES	PEDIDO EN PLANO N°	*POS.*

IMPSA

	NOMBRE / ***NAME***	**FIRMA /** ***INITIALS***	**FECHA /** ***DATE***
PROYECTADO		**GAC**	11/04/08
REVISADO		**NPE**	11/04/08
APROBADO		**JMA**	11/04/08

IWP-70

TITULO DEL DOCUMENTO:

Especificación de Mantenimiento Eléctrico

DOCUMENTO Nº	REVISIÓN	HOJA
99835-MO8603	**01**	**1/10**

1. Versión Del Aerogenerador

Esta especificación aplica exclusivamente al siguiente Aerogenerador:

IWP-70 – 1.5MW – HH72.5m

Otras versiones del mismo aerogenerador pueden presentar cambios en el diseño y operación. Por esta razón no intente utilizar este manual para cualquier otro modelo que no sea exactamente los indicados arriba. Si lo hace, podrá poner en peligro su salud y la integridad del aerogenerador.

2. Reserva sobre Posibles Cambios

IMPSA se reserva el derecho de realizar cambios en este instructivo o remplazarlo por una versión revisada en cualquier momento. IMPSA también se reserva el derecho a cambiar el Prototipo IWP-70. La información incluida en este manual ha sido compilada con el propósito de describir con la mayor claridad posible todos los pasos para lograr el correcto mantenimiento del aerogenerador. Si usted encontrara algún error o falta de claridad en las explicaciones, por favor contactarse con el Departamento de Ingeniería de IMPSA para reportarlo y así realizar las correspondientes correcciones.

3. Seguridad del Personal

Las tareas de mantenimiento deben ser llevadas a cabo por al menos dos personas. Las normas de seguridad deben ser respetadas siempre, puesto que están destinadas a asegurar la salud y seguridad del personal. Más personas pueden participar, pero es muy importante para el mantenimiento en equipo conocer las áreas que se están realizando para no interferir o poner en peligro a otras personas.
Los responsables del equipo de mantenimiento deben coordinar el orden de dichas tareas para garantizar la salud y seguridad de las personas del grupo.

4. Documentos Relacionados

- Documento: **99835-MO8601** Manual de Mantenimiento

5. Especificaciones de Mantenimiento eléctrico

5.1. Torre (Nivel 0)

Precaución: Riesgo de choque eléctrico!

La celda de MT solo puede ser operada por personal autorizado y entrenado para maniobras en media tensión.

Precaución: Riesgo de choque eléctrico!

Si debe realizar tareas que requieran su ingreso al recinto del transformador, asegúrese que la turbina esté detenida y el convertidor con potencial 0 antes de descender al nivel 0. Abra la celda +MVS y atérrela.

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❖ Transformador Principal +MT

Código	Tarea	Periodicidad		Instrucción	Observaciones
		semestral	anual		
ME01	Inspección visual	**X**		Chequear el estado general del transformador principal +MT. Chequear que no existan marcas o golpes. Para transformador con aceite, verificar que no haya pérdidas y verificar que el indicador de aceite indique nivel normal.	
ME02	Chequear	**X**		Conexión puesta a tierra: verificar que las conexiones se encuentren ajustadas y libres de corrosión	
ME03	Inspección visual	**X**		Chequear y Limpiar el recinto del transformador y revisar que no existan ingresos de agua.	
ME04	Cables de Potencia	**X**		Chequear que los cables no estén marcados ni dañados. Verifique el ajuste de las conexiones de los cables de media tensión (Celda / Transformador) y los cables de potencia (transformador / +LCPB).	
ME05	Test funcional			Actuación de los contactos del sistema de protección. **Realizar cada 3 años.**	
ME06	Mantenimiento	**X**		**Ver instrucciones de mantenimiento del fabricante.**	

❖ Celda de Media Tensión +MVS

Código	Tarea	Periodicidad		Instrucción	Observaciones
		Semestral	anual		
ME07	Inspección Visual	**X**		Chequear el estado general de la celda de media tensión +MVS. Chequear que no existan marcas o golpes. Chequear el nivel de presión del gas SF6.	
ME08	Chequear	**X**		Conexión puesta a tierra: verificar que las conexiones se encuentren ajustadas y libre de corrosión	
ME09	Inspección visual	**X**		Conductos de cables, fusibles, marcas de quemaduras, rejillas de protección, fijaciones de las conexiones de cables y puesta a tierra.	
ME10	Mantenimiento	**X**		**Ver instrucciones de mantenimiento del fabricante.**	

❖ Transformador de Servicios Auxiliares +AST

Código	Tarea	Periodicidad		Instrucción	Observaciones
		Semestral	anual		
ME11	Chequear	**X**		Conexión puesta a tierra: verificar que las conexiones se encuentren ajustadas y libre de corrosión	
ME12	Inspección visual	**X**		Limpiar la unidad y revisar que no existan ingresos de agua.	
ME13	Cables de potencia	**X**		Chequear que los cables no estén marcados ni dañados y las borneras correctamente apretadas.	
ME14	Mantenimiento		**X**	**Ver instrucciones de mantenimiento del fabricante**	

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❖ Convertidor de Potencia +CONV

Código	Tarea	Periodicidad		Instrucción	Observaciones
		Semestral	anual		
ME15	Chequear	X		Conexión puesta a tierra: verificar que las conexiones se encuentren ajustadas y libre de corrosión	
ME16	Chequear	X		Funcionamiento de sistema de refrigeración.	
ME17	Chequear	X		Estado de cierre de puertas de paneles. Limpieza.	
ME18	Cables de potencia	X		Chequear que los cables no estén marcados ni dañados.	
ME19	Mantenimiento		X	Reapretar contactos a tornillo y verificar ajuste adecuado de los cables en borneras a resorte de todos los componentes del panel (borneras, interruptores, etc.).	**ATENCION:** Esta tarea deber realizarse con el panel desenergizado.
ME20	Test funcional	X		**Ver instrucciones de mantenimiento del fabricante.**	

❖ Interruptor de Base +CBB

Código	Tarea	Periodicidad		Instrucción	Observaciones
		Semestral	anual		
ME21	Inspección visual	X		Chequear funcionamiento de sistema de refrigeración. Estado de cierre de puertas de paneles. Limpieza.	
ME22	Mantenimiento		X	Reapretar contactos a tornillo y verificar ajuste adecuado de los cables en borneras a resorte de todos los componentes del panel (borneras, interruptores, etc.).	**ATENCION:** Esta tarea deber realizarse con el panel desenergizado.
ME23	Test funcional	X		**Ver instrucciones de mantenimiento del fabricante.**	

❖ Paneles de Sistema de Control (Base Torre)

Código	Tarea	Periodicidad		Instrucción	Observaciones
		Semestral	anual		
ME24	Chequear	X		Conexión puesta a tierra: verificar que las conexiones se encuentren ajustadas y libre de corrosión	
ME25	Inspección visual	X		+LCPB, chequear gabinete, cierre de puerta. Verificar que no exista condensación ni puntos de oxidación. Limpieza.	
ME26	Test funcional	X		Luz interior, tomas de corriente.	
ME27	Chequear	X		Verificar sistema de ventilación y filtros	
ME28	Chequear	X		Resistencias calefactoras.	
ME29	Mantenimiento		X	Reapretar contactos a tornillo y verificar ajuste adecuado de los cables en borneras a resorte de todos los componentes del panel (borneras, interruptores, cabeceras, etc.).	**ATENCION:** Esta tarea deber realizarse con el panel desenergizado.

❖ Sistema de Alimentación Auxiliar +UPS

Código	Tarea	Periodicidad		Instrucción	Observaciones
		Semestral	anual		
ME30	Test funcional	X		Chequear la UPS durante 5 minutos. Durante este periodo el sistema de control debe ser alimentado únicamente por la UPS. Interrumpir alimentación auxiliar.	
ME31	Mantenimiento	X		**Ver instrucciones de mantenimiento del fabricante.**	

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5.2. Torre

Código	Tarea	Periodicidad		Instrucción	Observaciones
		Semestral	anual		
ME32	Inspección visual	X		Inspección visual: Bandejas porta cables, aislación, fijaciones, cajas de paso, conexiones. Limpieza	
ME33	Test funcional		X	Chequear el correcto funcionamiento de luces, tomas de corriente y luces de emergencia.	
ME34	Chequear	X		Conexión puesta a tierra: verificar que las conexiones se encuentren ajustadas y libre de corrosión	

5.3. Góndola

❖ Paneles de Sistema de Control (Góndola)

Código	Tarea	Periodicidad		Instrucción	Observaciones
		Semestral	anual		
ME35	Chequear	X		Conexión puesta a tierra: verificar que las conexiones se encuentren ajustadas y libre de corrosión	
ME36	Inspección visual	X		**+LCPN,+NDB** chequear gabinete, cierre de puerta. Verificar que no exista condensación ni puntos de oxidación. Limpieza.	
ME37	Test funcional	X		Luz interior, tomas de corriente.	
ME38	Chequear	X		Verificar sistema de ventilación y filtros (si aplica)	
ME39	Chequear	X		Resistencias calefactoras.	
ME40	Mantenimiento		X	Reapretar contactos a tornillo y verificar ajuste adecuado de los cables en borneras a resorte de todos los componentes del panel (borneras, interruptores, cabeceras, etc.).	**ATENCION:** Esta tarea deber realizarse con el panel desenergizado.

❖ Interruptor de Góndola +CBN

Código	Tarea	Periodicidad		Instrucción	Observaciones
		Semestral	anual		
ME41	Inspección visual	X		Chequear funcionamiento de sistema de refrigeración. Estado de cierre de puertas de paneles. Limpieza.	
ME42	Mantenimiento		X	Reapretar contactos a tornillo y verificar ajuste adecuado de los cables en borneras a resorte de todos los componentes del panel (borneras, interruptores, etc.).	**ATENCION:** Esta tarea deber realizarse con el panel desenergizado.
ME43	Mantenimiento	X		**Ver instrucciones de mantenimiento del fabricante.**	

❖ Panel Sistema Monitoreo Vibraciones +VMSN

Código	Tarea	Periodicidad		Instrucción	Observaciones
		Semestral	anual		
ME44	Chequear	X		Conexión puesta a tierra: verificar que las conexiones se encuentren ajustadas y libre de corrosión	
ME45	Inspección visual	X		Chequear gabinete, cierre de puerta. Verificar que no exista condensación ni puntos de oxidación. Limpieza	
ME46	Mantenimiento		X	Reapretar conectores y acelerómetros.	
ME47	Mantenimiento	X		**Ver manual de operación y mantenimiento provisto por el fabricante.**	

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❖ Instrumento Meteorológico

Código	Tarea	Periodicidad		Instrucción	Observaciones
		Semestral	anual		
ME48	Chequear	X		Chequear que la veleta y los anemómetros estén ubicados en la dirección correcta. Verificar la aislación del cable, la limpieza del anemómetro y que las conexiones se encuentren ajustadas.	
ME49	Test funcional		X	Realizar una marca de referencia en el soporte para dejar el anemómetro en el mismo lugar luego de las pruebas. Desajustarlo, girarlo para un sentido y el otro verificando el cambio de dirección en la HMI. Luego de las pruebas ajustar el anemómetro en la posición original.	

❖ Sistema de Balizas

Código	Tarea	Periodicidad		Instrucción	Observaciones
		Semestral	anual		
ME50	Chequear	X		Verificar visualmente el estado general en que se encuentra las balizas. Verificar el ajuste de los tornillos de fijación. Verificar funcionamiento.	
ME51	Mantenimiento		X	Limpiar la parte externa del acrílico protector con un paño húmedo y detergente neutro.	

5.4. Generador

Precaución: Antes de ingresar al generador, asegúrese de haber accionado el rotor lock y que el freno del rotor esté aplicado.

Precaución: Solo está permitido permanecer en el hub si la velocidad promedio de viento de los últimos 10 minutos es inferior a **15 m/s.**

Código	Tarea	Periodicidad		Instrucción	Observaciones
		Semestral	anual		
ME52	Inspección visual	X		Chequear estado de cabezas de bobinas, conexiones y puentes. Limpieza.	
ME53 ***RV***	Resistencia de aislación		X	Realizar el megado de los bobinados, registrar los datos en planillas.	Valor mínimo: 100 MOhm.
ME54	Ventilación	X		Controlar operación de ventiladores. Verificar estado de deflectores de aire. Comprobar que no haya obstrucciones en el circuito de aire.	
ME55	Chequear	X		Verificar las escobillas de puesta a tierra del rotor. Controlar que el espesor sea mayor a 5mm. Reemplazar si fuera necesario.	

❖ Paneles +TMB y +GCB

Código	Tarea	Periodicidad		Instrucción	Observaciones
		Semestral	anual		
ME56	Chequear	X		Conexión puesta a tierra: verificar que las conexiones se encuentren ajustadas y libre de corrosión	
ME57	Inspección visual	X		Chequear gabinete, cierre de puerta. Verificar que no exista condensación ni puntos de oxidación. Limpieza.	
ME58	Mantenimiento		X	Reapretar contactos a tornillo y verificar ajuste adecuado de los cables en borneras a resorte de todos los componentes del panel (borneras, interruptores, contactores, cabeceras, etc.).	**ATENCION:** Esta tarea deber realizarse con el panel desenergizado.

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5.5. HUB

Precaución: Solo está permitido permanecer en el hub si la velocidad promedio de viento de los últimos 10 minutos es inferior a **15 m/s.**

Antes de acceder al hub y mientras se permanezca en él, el rotor lock debe estar accionado.

❖ Unidad de Anillos Rozantes +SLR

Código	Tarea	Periodicidad		Instrucción	Observaciones
		Semestral	anual		
ME59	Mantenimiento	X		**Ver instrucciones de mantenimiento del fabricante.**	
ME60	Lubricación	X		Lubricar la unidad según indicaciones del fabricante	
ME61	Apretar contactos	X		Reapretar todas las conexiones eléctricas	

❖ Cajas de Sistema de Pitch +AC

Importante:

Reemplace el módulo de ultracapacitores del Sistema de Energía de Emergencias (-SC) cada 7 años.

Código	Tarea	Periodicidad		Instrucción	Observaciones
		Semestral	anual		
ME62	Inspección visual	X		Chequear gabinete, cierres (mariposas). Verificar que no exista condensación ni puntos de oxidación. Limpieza	
ME63	Mantenimiento		X	Reapretar contactos a tornillo y verificar ajuste adecuado de los cables en borneras a resorte de todos los componentes del panel (borneras, interruptores, cabeceras, etc.).	**ATENCION:** Esta tarea deber realizarse con el panel desenergizado.
ME64	Test funcional	X		Realizar ensayos de cajas +SE (ultra capacitores).	**ATENCION:** Estos ensayos funcionales también deben ser ejecutados cada vez que se reemplace un módulo o componente del sistema de pitch.

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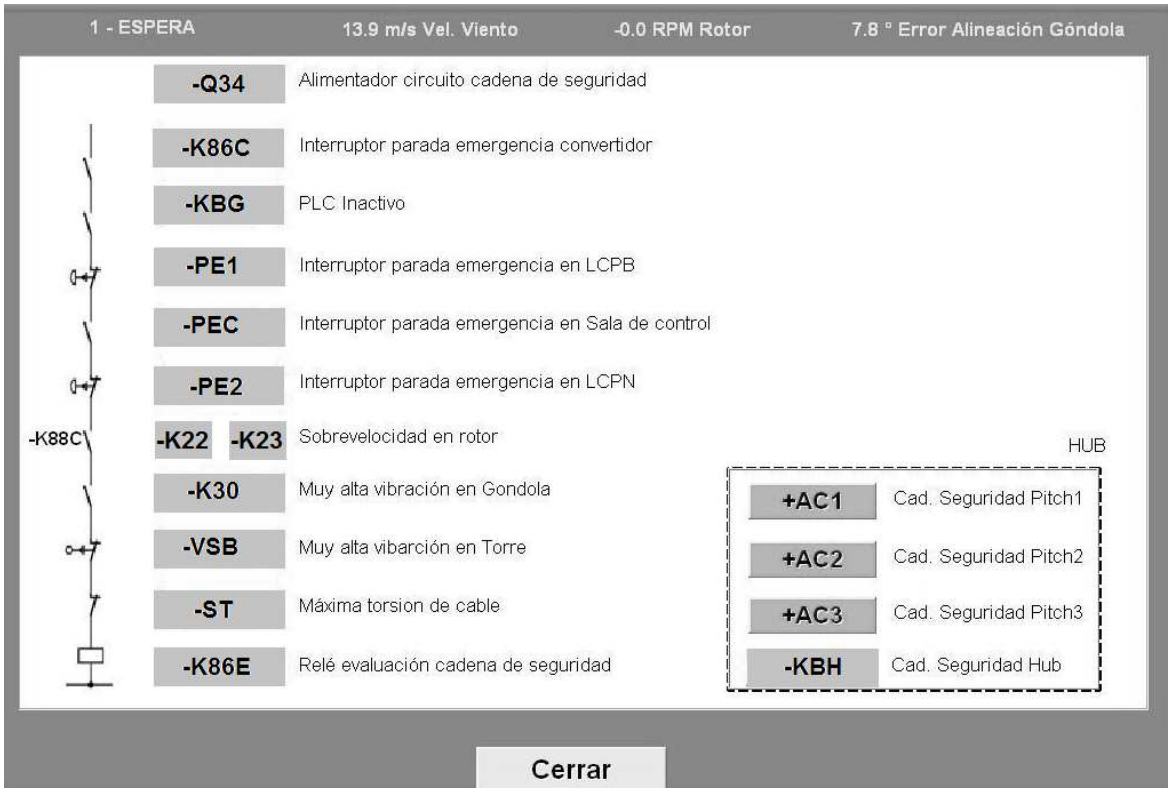
5.6. Cadena de Seguridad

La Cadena de Seguridad del IWP-70 debe ser ensayada en su totalidad **una vez al año**. Para ello, se acciona de a uno por vez, cada uno de los contactos que la constituyen y se verifica que el relé de seguridad **–K86E** reaccione correctamente. Previo a estas pruebas, se anula la activación del relé **–KBH**, para evitar que el sistema de pitch reaccione a cada prueba. Este relé se reconectará al final de los ensayos y se probará su adecuada reacción ante una Parada de Emergencia.

En la HMI, ingresar a la pantalla Cadena de Seguridad que muestra todos los componentes que la constituyen. Cuando la cadena está armada y sus componentes no han detectado ninguna condición insegura, los bloques se muestran en verde. Cuando se actúa algún sensor el bloque en cuestión cambia a rojo al igual que el bloque **–K86E.**



IMPORTANTE: Cada vez que se actué un contacto de la Cadena de Seguridad, debe verificarse que en el relé -K86E se actúa apagándose sus leds K1/K2 y encendiéndose el led del pulsador de emergencia –PE1 del +LCPB. En la HMI verificar que efectivamente el bloque asociado al contacto en cuestión cambia a rojo.

Una vez verificado, debe normalizarse el contacto de la Cadena de Seguridad y rearmar la Cadena de Seguridad presionando el botón azul de Reset –SR. Los leds K1/K2 deben encenderse nuevamente y todos los bloques deben estar en verde nuevamente. Pasar al contacto siguiente a evaluar.

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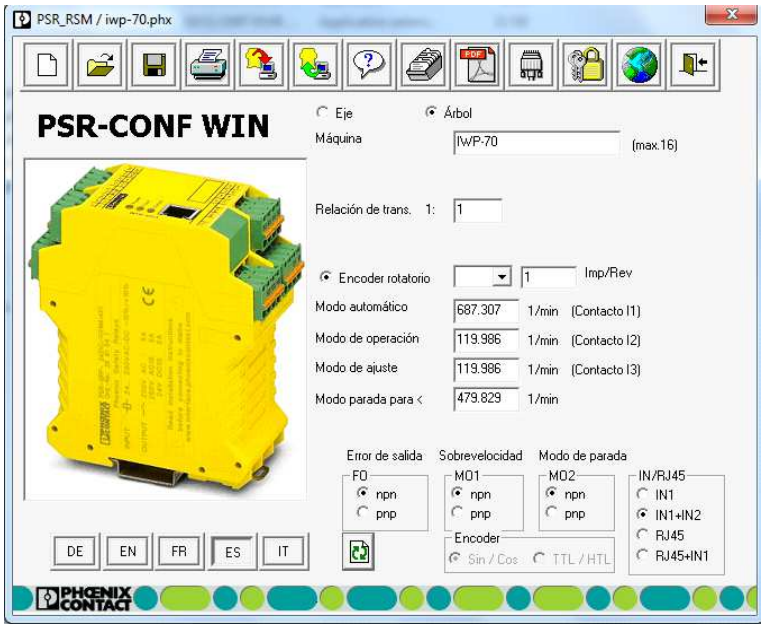
Código	Instrucción
ME65	Asegúrese de que el aerogenerador esté detenido y el selector esté en posición “Maintenance” (mantenimiento).
ME66	En el HMI, acceda al diagrama mímico de la cadena de seguridad y verifique que la misma se encuentre armada. Si no es así, realizar las tareas necesarias para poder armarla.
ME67	Durante estos ensayos, no queremos que el sistema de pitch reaccione a cada prueba. Por lo tanto, se deberá realizar un puente **PROVISORIO** (y muy bien identificado) entre los bornes **23** y **24** del relay **–K86E**.
ME68	Se activarán todos los contactos incluidos en la cadena de seguridad, comenzando por el **–K86C**. El mismo se accionará presionando el botón de parada de emergencia situado en la puerta del gabinete del Convertidor de Potencia.
ME69	Una vez accionado, verifique que el contacto del relay **–K86C** figure abierto en el diagrama mímico.
ME70	Libere el botón de parada de emergencia del convertidor y rearme la cadena presionando el botón de rearme **–SR**.
ME71	Para abrir el relay **–KBG**, quite la alimentación al relay **–KT2** desconectando el borne A1 del mismo en el tablero **+LCPB**.
ME72	Una vez desconectado, verifique que el contacto del relay **–KBG** figure abierto en el diagrama mímico.
ME73	Reconecte el borne **A1** del relay **–KT2** y rearme la cadena de seguridad.
ME74	Para probar el **–PE1**, simplemente presiónelo, verifique que éste se encienda y que el contacto del **–PE1** figure abierto en el diagrama mímico.
ME75	Libere el botón **–PE1** y rearme la cadena de seguridad.
ME76	Para probar el **–KAUX**, presione el botón **–PEC** ubicado en el container de control. Verifique que el **–PE1** se encienda y que el contacto del **–KAUX** figure abierto en el diagrama mímico.
ME77	Libere el botón **–PEC** y rearme la cadena de seguridad.
ME78	Para probar el **–PE2**, simplemente presiónelo y verifique que figure abierto en el diagrama mímico.
ME79	Libere el botón **–PE2** y rearme la cadena de seguridad.
ME80	Antes de continuar con el ensayo de los detectores de sobrevelocidad, verifique que los mismos están configurados como muestra la figura. La configuración del relé de sobre velocidad **–P03.** Requerirá del cable interfaz y de una PC con el software correspondiente. 
ME81	Para probar el contacto del **–K22**, levante la fusilera **–XF07**. El **–PO2** deberá quedarse sin energía y abrir el **–K22**.
ME82	Verifique que el contacto del **–K22** figure abierto en el diagrama mímico.
ME83	Reconecte la fusilera **–XF07** y rearme la cadena de seguridad.

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ME84	Para probar el contacto del **–K23**, levante la fusilera **–XF08**. El **–PO3** deberá quedarse sin energía y abrir el **–K23**.
ME85	Verifique que el contacto del **–K23** figure abierto en el diagrama mímico.
ME86	Reconecte la fusilera **–XF08** y rearme la cadena de seguridad.
ME87	Desmonte el **WP4084** quitando los tornillos que lo sujetan, haga oscilar el acelerometro a la frecuencia y aceleración de disparo seteadas hasta que el relay **–K30** abra.
ME88	Verifique que el contacto del **–K30** figure abierto en el diagrama mímico.
ME89	Instale nuevamente el **–WP4084** en su lugar y rearme la cadena de seguridad.
ME90	Deje caer la bola del contacto **–VSB**. Verifique que el contacto del **–VSB** figure abierto en el diagrama mímico.
ME91	Ubique la bola nuevamente en su lugar y rearme la cadena de seguridad.

5.7 Prueba funcional de la cadena de seguridad

Código	Introducción
ME92	Se han completado las pruebas de los contactos que disparan la cadena de seguridad. Ahora se verificará que los relays que accionan la parada de emergencia reaccionen como es debido. Para ello, primero retire el puente que colocó entre los bornes **23** y **24** del relay **–K86E**. Este relay deberá quedar sin **NINGUN** puente ni alteración.
ME93	Con la cadena de seguridad armada, verifique que los relays **–KBN** y **–KBH** se encuentren energizados.
ME94	Posicione el selector del panel **(LCPB)** en posición **"manual"**. Lleve las tres palas a **80°** (Ochenta grados). Repita este procedimiento cada vez que caiga la cadena de seguridad.
ME95	Dispare la cadena presionando el botón **–PE1** o **–PE2**. Verifique que tanto el **–KBN** como el **–KBH** estén desenergizados.
ME96	Verifique que los tres **–KD#** hayan caído, y que ninguno de los tres MD esté en falla. Esto significará que los sistemas de pitch han sido enviados a bandera.
ME97	Verificar: - Anulación de todos los enables de los **MT** (desenergización del **–K06**). - Desenergización de las válvulas 20, 22, 23, 24, 25, 26 y 31 de la central de frenos. - Desenergización de los solenoides de apertura de los frenos de motor (relay **–KB01**, en el **+NDB**)
ME98	Se ha completado el ensayo de la cadena de seguridad. Proceder con los ensayos de pitch normales antes de realizar cualquier ensayo operacional.

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Date: / /
WT serial number:
Location
Operator:

WT model: IWP-70
Rotor diameter:
Rotor blade:
Hub height:
Rated power: 1.5MW
Rated rot. speed:

Manufacturer: IMPSA
Supplier IMPSA
Importer: IMPSA
Wind class:
Vave:
Vref:
Cut in speed:
Cut out speed:

Energy produced KWh
Operating hours hs

Weather conditions:

MAINTENANCE RECORD AND CHECK LIST

Mechanical maintenance:

Write revision of mechanical maintenance specifications 99835-MO8602 rev

Check list

MM01 ☐OK ☐FAIL ☐NA	MM02 ☐OK ☐FAIL ☐NA	MM03 ☐OK ☐FAIL ☐NA	MM04 ☐OK ☐FAIL ☐NA	MM05 ☐OK ☐FAIL ☐NA	MM06 ☐OK ☐FAIL ☐NA	MM07 ☐OK ☐FAIL ☐NA	MM08 ☐OK ☐FAIL ☐NA	MM09 ☐OK ☐FAIL ☐NA	MM10 ☐OK ☐FAIL ☐NA	MM11 ☐OK ☐FAIL ☐NA	MM12 ☐OK ☐FAIL ☐NA
MM13 ☐OK ☐FAIL ☐NA	MM14 ☐OK ☐FAIL ☐NA	MM15 ☐OK ☐FAIL ☐NA	MM16 ☐OK ☐FAIL ☐NA	MM17 ☐OK ☐FAIL ☐NA	MM18 ☐OK ☐FAIL ☐NA	MM19 ☐OK ☐FAIL ☐NA	MM20 ☐OK ☐FAIL ☐NA	MM21 ☐OK ☐FAIL ☐NA	MM22 ☐OK ☐FAIL ☐NA	MM23 ☐OK ☐FAIL ☐NA	MM24 ☐OK ☐FAIL ☐NA
MM25 ☐OK ☐FAIL ☐NA	MM26 ☐OK ☐FAIL ☐NA	MM27 ☐OK ☐FAIL ☐NA	MM28 ☐OK ☐FAIL ☐NA	MM29 ☐OK ☐FAIL ☐NA	MM30 ☐OK ☐FAIL ☐NA	MM31 ☐OK ☐FAIL ☐NA	MM32 ☐OK ☐FAIL ☐NA	MM33 ☐OK ☐FAIL ☐NA	MM34 ☐OK ☐FAIL ☐NA	MM35 ☐OK ☐FAIL ☐NA	MM36 ☐OK ☐FAIL ☐NA
MM37 ☐OK ☐FAIL ☐NA	MM38 ☐OK ☐FAIL ☐NA	MM39 ☐OK ☐FAIL ☐NA	MM40 ☐OK ☐FAIL ☐NA	MM41 ☐OK ☐FAIL ☐NA	MM42 ☐OK ☐FAIL ☐NA	MM43 ☐OK ☐FAIL ☐NA	MM44 ☐OK ☐FAIL ☐NA	MM45 ☐OK ☐FAIL ☐NA	MM46 ☐OK ☐FAIL ☐NA	MM47 ☐OK ☐FAIL ☐NA	MM48 ☐OK ☐FAIL ☐NA
MM49 ☐OK ☐FAIL ☐NA	MM50 ☐OK ☐FAIL ☐NA	MM51 ☐OK ☐FAIL ☐NA	MM52 ☐OK ☐FAIL ☐NA	MM53 ☐OK ☐FAIL ☐NA	MM54 ☐OK ☐FAIL ☐NA	MM55 ☐OK ☐FAIL ☐NA	MM56 ☐OK ☐FAIL ☐NA	MM57 ☐OK ☐FAIL ☐NA	MM58 ☐OK ☐FAIL ☐NA	MM59 ☐OK ☐FAIL ☐NA	MM60 ☐OK ☐FAIL ☐NA
MM61 ☐OK ☐FAIL ☐NA	MM62 ☐OK ☐FAIL ☐NA	MM63 ☐OK ☐FAIL ☐NA	MM64 ☐OK ☐FAIL ☐NA	MM65 ☐OK ☐FAIL ☐NA	MM66 ☐OK ☐FAIL ☐NA	MM67 ☐OK ☐FAIL ☐NA	MM68 ☐OK ☐FAIL ☐NA	MM69 ☐OK ☐FAIL ☐NA	MM70 ☐OK ☐FAIL ☐NA	MM71 ☐OK ☐FAIL ☐NA	MM72 ☐OK ☐FAIL ☐NA
MM73 ☐OK ☐FAIL ☐NA	MM74 ☐OK ☐FAIL ☐NA	MM75 ☐OK ☐FAIL ☐NA	MM76 ☐OK ☐FAIL ☐NA	MM77 ☐OK ☐FAIL ☐NA	MM78 ☐OK ☐FAIL ☐NA	MM79 ☐OK ☐FAIL ☐NA	MM80 ☐OK ☐FAIL ☐NA	MM81 ☐OK ☐FAIL ☐NA			

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Recorded values:

MM 47 – Generator airgap

No1: mm No2: mm No3: mm No4: mm

No5: mm No6: mm No6: mm No8: mm

Electrical maintenance:

Write revision of electrical maintenance specifications: 99835-MO8603 rev

Check list:

ME01 ☐OK ☐FAIL ☐NA	ME02 ☐OK ☐FAIL ☐NA	ME03 ☐OK ☐FAIL ☐NA	ME04 ☐OK ☐FAIL ☐NA	ME05 ☐OK ☐FAIL ☐NA	ME06 ☐OK ☐FAIL ☐NA	ME07 ☐OK ☐FAIL ☐NA	ME08 ☐OK ☐FAIL ☐NA	ME09 ☐OK ☐FAIL ☐NA	ME10 ☐OK ☐FAIL ☐NA	ME11 ☐OK ☐FAIL ☐NA	ME12 ☐OK ☐FAIL ☐NA
ME13 ☐OK ☐FAIL ☐NA	ME14 ☐OK ☐FAIL ☐NA	ME15 ☐OK ☐FAIL ☐NA	ME16 ☐OK ☐FAIL ☐NA	ME17 ☐OK ☐FAIL ☐NA	ME18 ☐OK ☐FAIL ☐NA	ME19 ☐OK ☐FAIL ☐NA	ME20 ☐OK ☐FAIL ☐NA	ME21 ☐OK ☐FAIL ☐NA	ME22 ☐OK ☐FAIL ☐NA	ME23 ☐OK ☐FAIL ☐NA	ME24 ☐OK ☐FAIL ☐NA
ME25 ☐OK ☐FAIL ☐NA	ME26 ☐OK ☐FAIL ☐NA	ME27 ☐OK ☐FAIL ☐NA	ME28 ☐OK ☐FAIL ☐NA	ME29 ☐OK ☐FAIL ☐NA	ME30 ☐OK ☐FAIL ☐NA	ME31 ☐OK ☐FAIL ☐NA	ME32 ☐OK ☐FAIL ☐NA	ME33 ☐OK ☐FAIL ☐NA	ME34 ☐OK ☐FAIL ☐NA	ME35 ☐OK ☐FAIL ☐NA	ME36 ☐OK ☐FAIL ☐NA
ME37 ☐OK ☐FAIL ☐NA	ME38 ☐OK ☐FAIL ☐NA	ME39 ☐OK ☐FAIL ☐NA	ME40 ☐OK ☐FAIL ☐NA	ME41 ☐OK ☐FAIL ☐NA	ME42 ☐OK ☐FAIL ☐NA	ME43 ☐OK ☐FAIL ☐NA	ME44 ☐OK ☐FAIL ☐NA	ME45 ☐OK ☐FAIL ☐NA	ME46 ☐OK ☐FAIL ☐NA	ME47 ☐OK ☐FAIL ☐NA	ME48 ☐OK ☐FAIL ☐NA
ME49 ☐OK ☐FAIL ☐NA	ME50 ☐OK ☐FAIL ☐NA	ME51 ☐OK ☐FAIL ☐NA	ME52 ☐OK ☐FAIL ☐NA	ME53 ☐OK ☐FAIL ☐NA	ME54 ☐OK ☐FAIL ☐NA	ME55 ☐OK ☐FAIL ☐NA	ME56 ☐OK ☐FAIL ☐NA	ME57 ☐OK ☐FAIL ☐NA	ME58 ☐OK ☐FAIL ☐NA	ME59 ☐OK ☐FAIL ☐NA	ME60 ☐OK ☐FAIL ☐NA
ME61 ☐OK ☐FAIL ☐NA	ME62 ☐OK ☐FAIL ☐NA	ME63 ☐OK ☐FAIL ☐NA	ME64 ☐OK ☐FAIL ☐NA	ME65 ☐OK ☐FAIL ☐NA	ME66 ☐OK ☐FAIL ☐NA	ME67 ☐OK ☐FAIL ☐NA	ME68 ☐OK ☐FAIL ☐NA	ME69 ☐OK ☐FAIL ☐NA	ME70 ☐OK ☐FAIL ☐NA	ME71 ☐OK ☐FAIL ☐NA	ME72 ☐OK ☐FAIL ☐NA
ME73 ☐OK ☐FAIL ☐NA	ME74 ☐OK ☐FAIL ☐NA	ME75 ☐OK ☐FAIL ☐NA	ME76 ☐OK ☐FAIL ☐NA	ME77 ☐OK ☐FAIL ☐NA	ME78 ☐OK ☐FAIL ☐NA	ME79 ☐OK ☐FAIL ☐NA	ME80 ☐OK ☐FAIL ☐NA	ME81 ☐OK ☐FAIL ☐NA	ME82 ☐OK ☐FAIL ☐NA	ME83 ☐OK ☐FAIL ☐NA	ME84 ☐OK ☐FAIL ☐NA
ME85 ☐OK ☐FAIL ☐NA	ME86 ☐OK ☐FAIL ☐NA	ME87 ☐OK ☐FAIL ☐NA	ME88 ☐OK ☐FAIL ☐NA	ME89 ☐OK ☐FAIL ☐NA	ME90 ☐OK ☐FAIL ☐NA	ME91 ☐OK ☐FAIL ☐NA	ME92 ☐OK ☐FAIL ☐NA	ME93 ☐OK ☐FAIL ☐NA	ME94 ☐OK ☐FAIL ☐NA	ME95 ☐OK ☐FAIL ☐NA	ME96 ☐OK ☐FAIL ☐NA
ME97 ☐OK ☐FAIL ☐NA	ME98 ☐OK ☐FAIL ☐NA										

Recorded values:

ME53 – Generator isolation resistance:

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Components and parts replaced

Detail all components and parts replaced during maintenance tasks. Include SAP code and serial numbers from new and old parts.

SAP code	Description	Qty	S/N of old part	S/N of new part

REMARKS

Write down remarks, comments, outstanding points and findings. Specify here if this record sheet has any attachment associated.

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Maintenance staff signature		Supervisor signature
Signature 1:		
Signature 2:		
Signature 3:		

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AVANTI SERVICE LIFT

User's Manual and Installation Manual

Model SHARK

CE

Date of publication:
9th CE Edition: July 2010
Revision 3: 17/9/10

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CERTIFICATE

EC-Type Test Approval

EC-Directive 2006/42/EC, Article 12, Section 3b
Machinery

Number of registration: 01/205/0509B/10

TÜV CERT - certification body for machinery NB0035
at TÜV Rheinland Industrie Service GmbH
herewith confirms for the company

AVANTI WIND SYSTEMS A/S
Høgevej 19
DK- 3400 Hillerød
Denmark

the close conformity of the product

Service lift inside wind turbine systems

Technical data:

Type :	Shark M	Shark L	Shark XL
max. load capacity:	240 kg	320 kg	320 kg
traction hoist :	X402 or M500 L502P	X402P or M500 or L502P	X402P or M500 or L502P
speed :	18 m/min	18 m/min	18 m/min
dead weight :	90 kg	110 kg	120 kg

more combinations see Annex

Modification B: Supplement of a new hoist and a new safety break and taking into account the requirements of the Guide to application of Machinery Directive 2006/42/EC 2nd.

with the requirements according to annex I of Directive 2006/42/EC about machinery and amending the Directive 95/16/EC of the European Parliament and the Council from May 2006 for adaptation of legal and administration regulations of the member countries regarding safety of machinery.

The verification was proved by EC-type approval test, Test-Report- No.: 10_057 from 2010-07-19 and is valid only duly considering the requirements mentioned in this document. The examination was realized on site in Zaragoza, Spain.

This certificate is valid until **2015-07-22**

TÜV Rheinland Group Notified Body 0035 Industrie Service

TÜV CERT authority
Certified according to No. 0035

Cologne, 2010-07-22

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TÜVRheinland®
Precisely Right.

Only trained people may use this lift.
This manual must be available to staff at all times during installation and operation.
Additional copies are available from the manufacturer upon request.
All measurements are indicative only and subject to change without notice.

Contents

Installation manual

1. Limited Warranty

Avanti Wind Systems A/S warrants that commencing from the date of shipment to the Customer and continuing for a period of the longer of 365 days thereafter, or the period set forth in the standard Avanti warranty, the Avanti service lift ("Product") described in this Manual will be free from defects in material and workmanship under normal use and service when installed and operated in accordance with the provisions of this Manual.

This warranty is made only to the original user of the Product. The sole and exclusive remedy and the entire liability of Avanti under this limited warranty, shall be, at the option of Avanti, a replacement of the Product (including incidental and freight charges paid by the Customer) with a similar new or reconditioned Product of equivalent value, or a refund of the purchase price if the Product is returned to Avanti, freight and insurance prepaid. The obligations of Avanti are expressly conditioned upon return of the Product in strict accordance with the return procedures of Avanti.

This warranty does not apply if the Product (i) has been altered without the authorization of Avanti or its authorized representative; (ii) has not been installed, operated, repaired, or maintained in accordance with this Manual or other instructions from Avanti; (iii) has been subjected to abuse, neglect, casualty, or negligence; (iv) has been furnished by Avanti to Customer without charge; or (v) has been sold on an "AS-IS" basis.

Except as specifically set forth in this Limited Warranty,
ALL EXPRESS OR IMPLIED CONDITIONS, REPRESENTATIONS AND WARRANTIES, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OR CONDITION OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, NON-INFRINGEMENT, SATISFACTORY QUALITY, COURSE OF DEALING, LAW, USAGE OR TRADE PRACTICE ARE HERBY EXCLUDED TO THE MAXIMUM EXTENT PERMITTED BY APPLICABLE LAW AND ARE EXPRESSLY DISCLAIMED BY AVANTI. IF, PURSUANT TO ANY APPLICABLE LAW, TO THE EXTENT AN IMPLIED WARRANTY CANNOT BE EXCLUDED AS PROVIDED IN THIS LIMITED WARRANTY, ANY IMPLIED WARRANTY IS LIMITED IN TIME TO THE SAME DURATION AS THE EXPRESS WARRANTY PERIOD SET FORTH ABOVE. BECAUSE SOME STATES DO NOT PERMIT LIMITATIONS ON THE DURATION OF IMPLIED WARRANTIES, THIS MAY NOT APPLY TO A GIVEN CUSTOMER. THIS LIMITED WARRANTY GIVES CUSTOMER SPECIFIC LEGAL RIGHTS, AND CUSTOMER MAY HAVE OTHER LEGAL RIGHTS UNDER APPLICABLE LAWS.
This disclaimer shall apply even if the express warranty fails of its essential purpose.

In any cases of dispute the English original shall be taken as authoritative.

2. Explanation of symbols used in this manual

Symbol	Signal word	Meaning	Possible injury if not observed
Safety instructions			
	**DANGER!**	IMMEDIATE or possibly imminent danger:	Death or severe injury!
	**DANGER!**	IMMEDIATE or possibly imminent danger of hazardous voltage:	Death or severe injury!
	**CAUTION!**	Potentially hazardous situation:	Light injury or material damage.
Additional instructions			
	**Warning!**	Potentially dangerous situation:	Damage to equipment or workplace
	**Important!**	Useful tips for optimum working procedure	None
Order			
		Reference to written specification/documentation	

3. Cautions

CAUTION!
Avoid injury – follow all instructions!

a) Installation and/or maintenance and/or operation of the service lift and its suspension may be performed only by qualified personnel, hired by the employer for the job at hand.

b) The personnel must be at least 18 years of age. The staff must be familiar with the relevant accident prevention instructions and must have received proper training in these.

c) Personnel is obliged to read and understand this User's Manual.

d) A copy of the User's Manual must be handed out to the personnel and must always be available for reference.

e) If more than one person is entrusted with one of the above tasks, the employer shall appoint a supervisor in charge of the operation.

DANGER!

f) Whenever installation, ascending, and/or descending involves a danger of falling, all personnel inside the danger area must wear personal protective equipment which will prevent them from falling by means of a safety system secured to the building.

g) Only fault-free suspension devices, cabin components, traction hoist equipment, safety brake gripping devices, original traction hoist wires and stopping devices may be used.

h) Electrical connection of the system must be made in accordance with EN 60204-1.

i) Prior to mounting, all parts must be tested to ensure their completeness and full functionality.

j) Self-locking nuts must be used at all times, and the following must always be observed:
- The screw must extend from the nut by at least half of the thread diameter.
- The nut may not be used once it has become possible to loosen by hand!

k) Prior to mounting the suspension system, ensure that the building sections involved will be able to carry the load.

DANGER!
Do not use the lift in case of fire.

l) If any damage or faults are found during operation, or if circumstances arises which may jeopardize safety:
– Immediately interrupt the work in progress and notify the supervisor or employer!

m) All tests/repairs of electrical installations may only be performed by qualified electricians.

n) All repairs to the traction hoist, safety brake gripping device and the system's supporting parts may be performed only by qualified fitters.

o) If any supporting parts are repaired or replaced, the operational safety of the system must be tested and verified by an expert.

p) Use of non-original parts, in particular use of wires other than the prescribed original traction hoist wire will render the manufacturer's warranty void and the CE approval invalid.

q) No modification, extension or reconstruction of the service lift is allowed without the manufacturer's prior written consent.

r) No warranty is provided against damage resulting from reconstruction or modification of equipment or use of non-original parts which are not approved by the manufacturer.

s) Before using the lift an inspection by the authorised security organisation must be carried out.

t) The lift must be inspected at least once a year by an expert that has been trained by AVANTI. The traction hoist and saftey break must be overhauled at an authorised workshop and furnished with a new certificate for every 250 hours of operation.

u) The service lift may not be used by person under the influence of alcohol or drugs that may jeopardize working safety.

The tower owner must verify the need for third party service lift inspections with the local authority and comply with the standards specified.

CAUTION!
The service lift may only be used after the owner and Avanti had verified the maximum wind speed that will allow a safe use of the service lift. Maximum wind speed limits depend on WTG design.

4. Description of equipment

4.1 Purpose

The service lift described in this User's Manual serves the following purposes:
- transportation of staff and material inside wind turbine systems, lattice towers for wind turbines, and telecommunication towers.
- transportation for mounting, inspection and repairs.

The service lift may be used to transport two persons plus their tools and equipment to the most convenient height for performing work on the tower.

The service lift is designed for permanent installation in one specific tower.

The lift is not designed for use
- in silos,
- at drilling sites,
- as a permanently installed facade lift,
- as a crane lift,
- in environments with explosion hazards.

4.2 Function

The service lift uses a traction hoist for ascending and descending on a wire secured to the building.

Two safety brake safety gripping devices secure the service lift to a separate safety wire.

Upward and downward travel is controlled from inside the service lift in manual mode, from the remote control transmitter in remote mode (optional), or from the outside in the automatic mode (optional).

A lifting force limiter prevents upward travel in the event of an overload of the traction hoist.

Two guide wires on either side of the service lift prevent the lift from swivelling/tilting.

4.3 Service lift models

This User's Manual and Installation Manual describe the following models:

- SHARK M sliding door
  with 240 kg lifting capacity
- SHARK L sliding/double door/4-door
  with 240/320 kg lifting capacity
- SHARK XL sliding door
  with 320 kg lifting capacity.

4.4 Temperature

Operating temperature
-15ºC - +60ºC.

Survival temperature
-25ºC - +80ºC.

Low temperature kit is also available.
Operational temperature for low temperature kit
-25ºC - +40ºC.

4.5 Accesories

In order to fulfil the essential health and safety requirements from the regulations the design of the wind turbine and its components shall complement the safety systems supplied on the service lift making the ensemble safe as a whole.
A detailed evaluation of compliance to the EHSR and a risk assessment shall be completed. Avanti shall verify the compliance to such requirements prior to installation. Systems that may be considered to complement the service lifts are:

4.5.1 Fences & guards
The service lift hole must be adequately protected to prevent people from falling or being injured by the movement of the service lift. The fences and guards design shall comply with the relevant standards and local regulations.

4.5.2 Safety system for landing access doors
The service lift hole must be adequately protected to prevent risk of falling. When the service lift is not at the landing, access doors shall not be able to open. Such function may be achieved by using interlock systems on access doors linked to the position of the service lift.

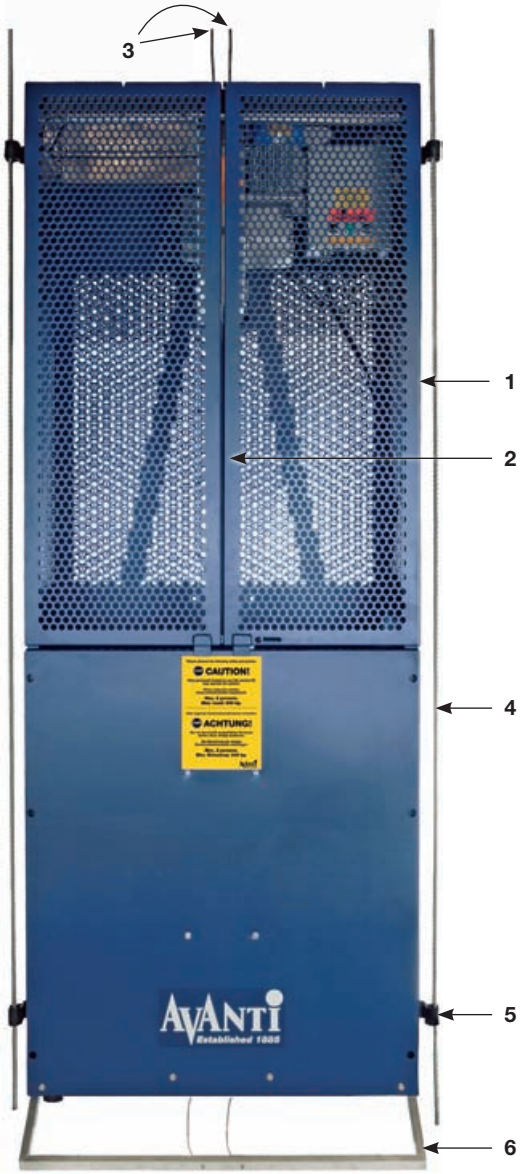
4.6 Components

4.6.1 Cabin overview

Fig. 1a SHARK L sliding door

1 Cabin
2 Sliding door
3 Drive and safety wires
4 Guide wire
5 Wire guides
6 Bottom safety stop
(For details see pages 14-19)

Fig. 1b SHARK L double door



1 Cabin
2 Double door
3 Drive and safety wires
4 Guide wire
5 Wire guides
6 Bottom safety stop
(For details see pages 14-19)

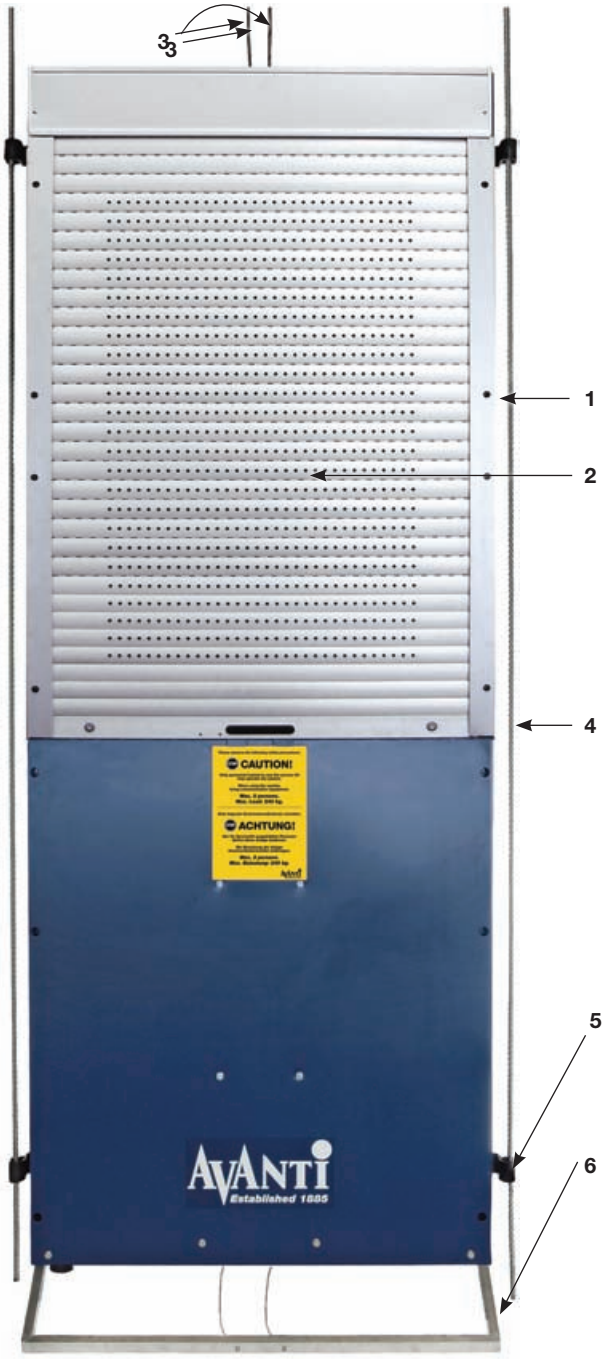
Fig. 1c SHARK L 4-door version

1 Cabin
2 4 door
3 Drive and safety wires
4 Guide wire
5 Wire guides
6 Bottom safety stop
(For details see pages 14-19)

Fig. 1d SHARK M sliding door

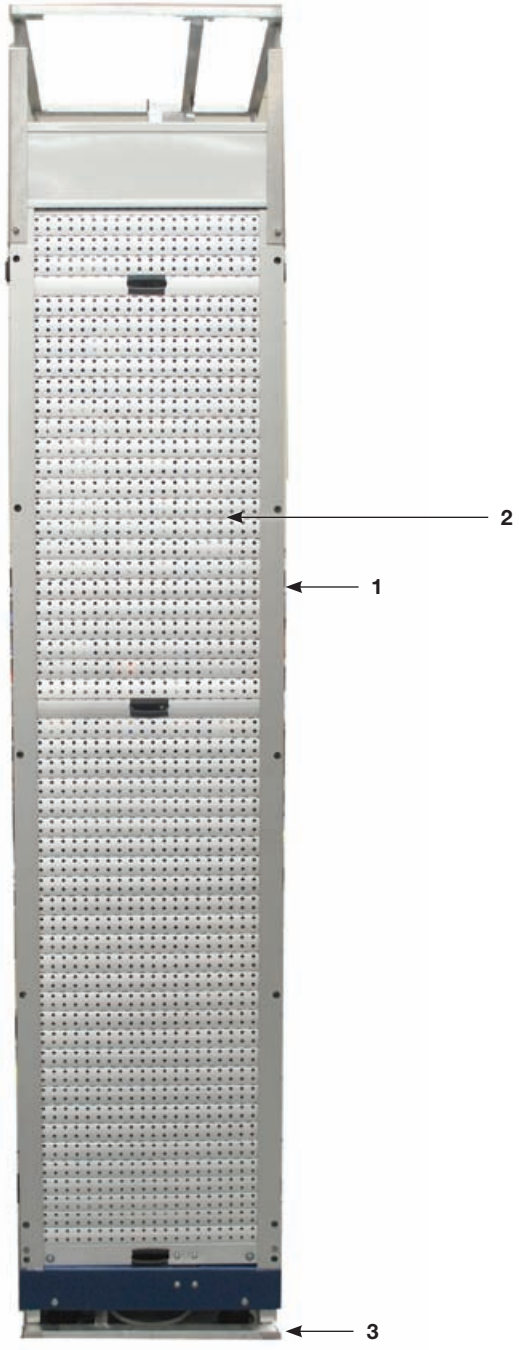
1 Cabin
2 Sliding door
3 Drive and safety wires
4 Guide wire
5 Wire guides
6 Bottom safety stop
(For details see pages 14-19)

Fig. 1e SHARK L Half roller door



1 Cabin
2 Roller door
3 Drive and safety wires
4 Guide Wire
5 Wire guides
6 Bottom safety stop
(For details see pages 14-19)

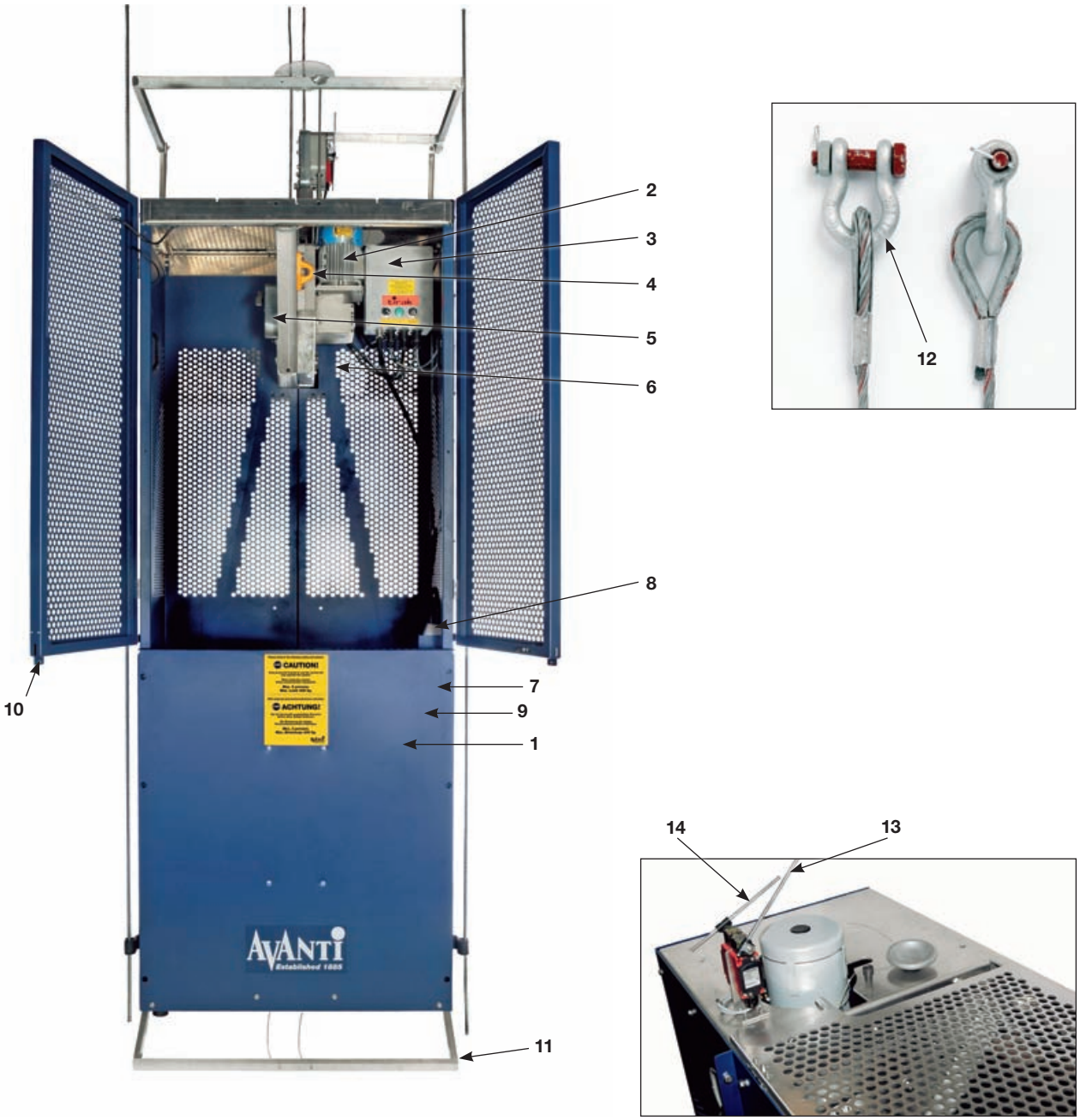
Fig. 1f SHARK M Roller door



1 Cabin
2 Roller door
3 Bottom safety stop
(For details see pages 14-19)

4.6.2 Cabin with safety gripping device, traction hoist, electrical control box and pendant control

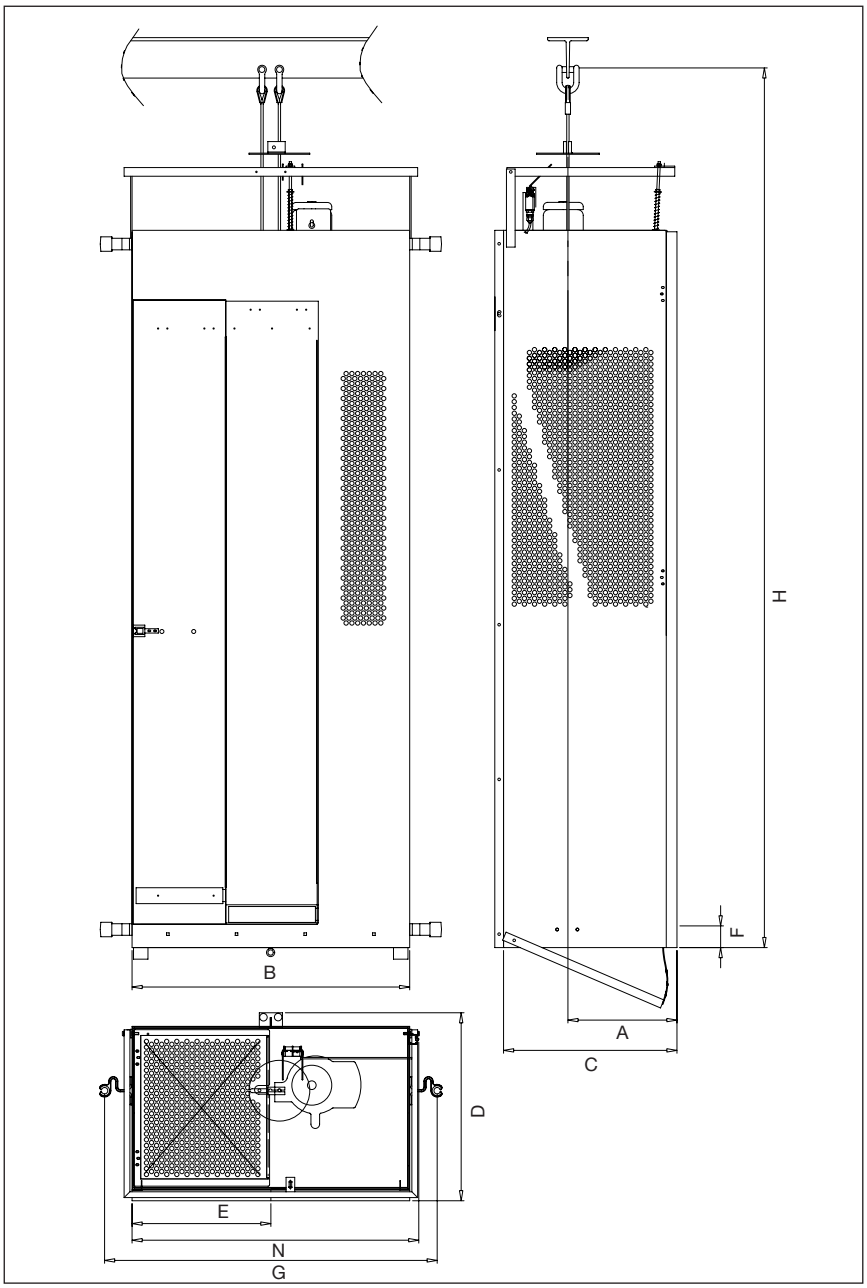
Fig. 2



1 Cabin
2 Traction hoist
3 Electrical control box
4 Anchor point
5 Safety brake safety gripping device
6 Cable connection (behind the lift)
7 EMERGENCY STOP button fixed (Inside cabin optional)
8 Pendant control
9 Override automatic operation switch (optional)
10 Door stop switch
11 Bottom safety stop
12 Shackle
13 EMERGENCY limit stop switch
14 Operation limit stop switch
(For details see pages 15-19)

4.6.3 Technical data for the service lift M, L and XL

Fig. 3a Dimensions, sliding door



Shark M lifting capacity:
- Motor X402P 240 kg
- Motor M500 240 kg
  (max 1 person)

Shark L lifting capacity:
- Motor X402P 240 kg
- Motor M500 240 kg
  (max 2 person)
- Motor L502P 320 kg
- Motor M500 320 kg
  (max 2 person)

Shark XL lifting capacity:
- Motor X402P 240 kg
- Motor M500 240 kg
  (max 2 person)
- Motor L502P 320 kg
- Motor M500 320 kg
  (max 3 person)

Weight of lift:
M: kg 90
L: kg 110
XL: kg 120

The weight of the power supply cable should be added to the weight of the lift (approx. 0.23 kg per m).

Standing height:
Under spine: 1980 mm
Under traction hoist: 2100 mm

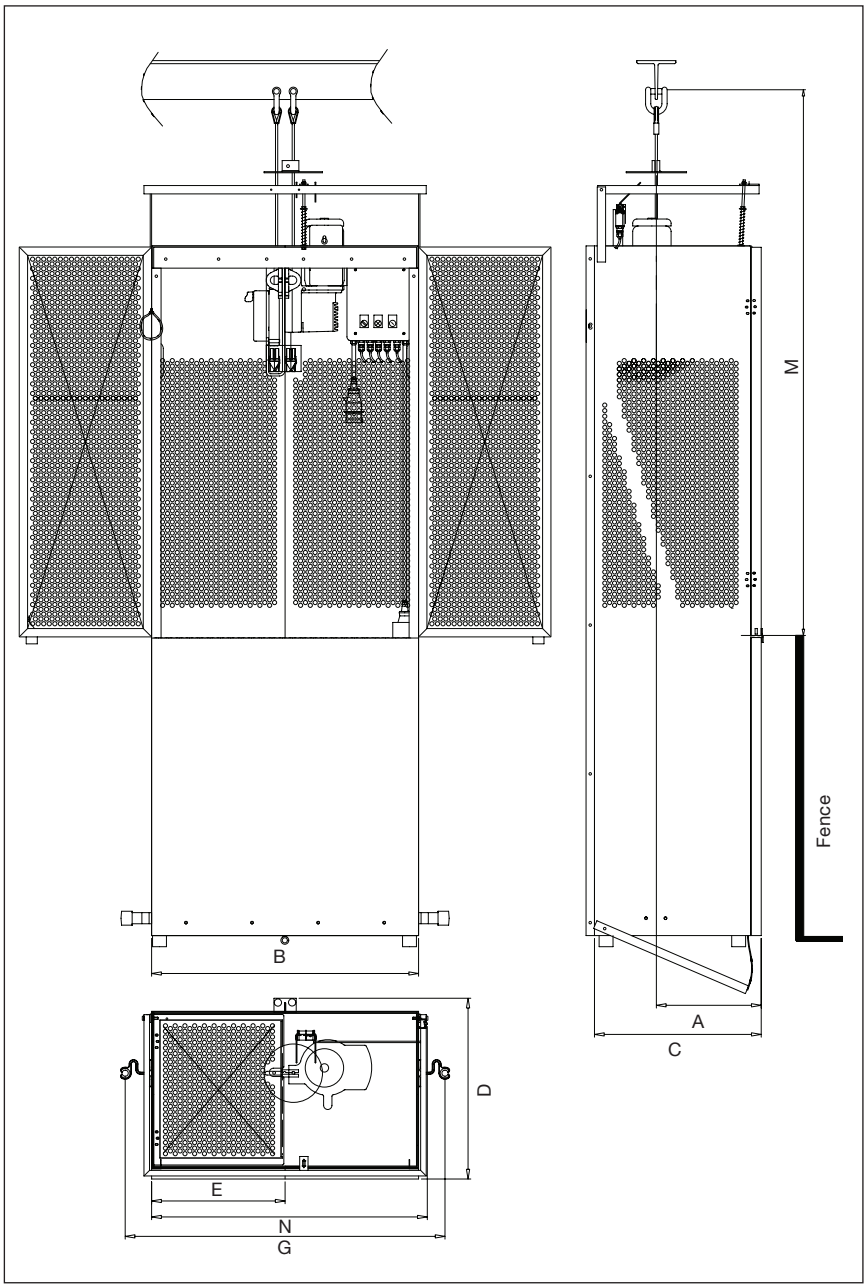
Sliding door opening:
M: 500 mm
X - XL: 550 mm

Dimensions in mm:

Shark	A	B	C	D	E	F	G[1)]	N	H
M	380	600	600	650	400	75	790/660	630	3000
L	380	960	600	650	475	75	1150/1020	990	3000
XL	480	960	800	850	475	75	1150/1020	990	3000

1) Standard wire guide/narrow wire guide. (Details p. 52)

Fig. 3b Dimensions, double door



Lifting capacity:

- Motor X402P 240 kg
- Motor M500 240 kg **(max 2 persons)**
- Motor L502P 320 kg
- Motor M500 320 kg **(max 3 persons)**

Weight of lift:
L: kg 115
XL: kg 125

The weight of the power supply cable should be added to the weight of the lift (approx. 0.23 kg per m).

Standing height:
Under spine: 1980 mm
Under traction hoist: 2100 mm

Dimensions in mm:

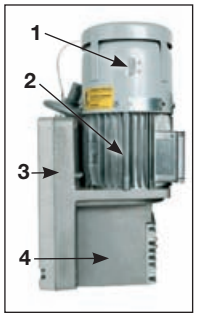
Shark	A	B	C	D	E	G[1)]	M	N
L	380	960	600	650	475	1150/1020	1900	990

1) Standard wire guide/narrow wire guide. (Details p. 52)

4.6.4 Drive system, safety gripping device and controls

Fig. 4 Traction hoist

X402P

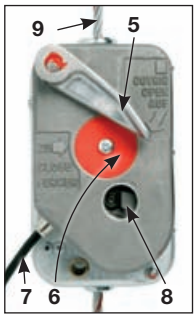


M500

1 Insertion point for brake lever
2 Motor
3 Wire traction w/overload protection
4 Drive system/ gearbox

Fig. 5 Safety brake

BSO 504E



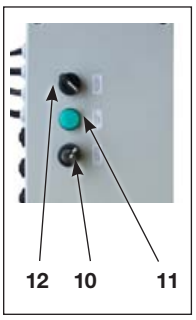
OSL500

5 Control handle/ brake lever
6 Safety brake stop button
7 Connection cable
8 Window
9 Wire

Fig. 6 Electrical control box

For X402P

For M500



10 Overide bottom limit stop switch
11 Ready lamp
12 HAND/AUTOM

Fig. 7 a
Pendant control

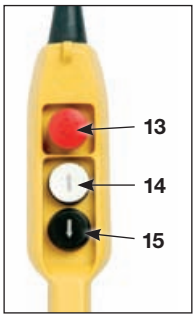


Fig. 7 b
Remote control

13 EMERGENCY STOP button
14 UP
15 DOWN

Table 1. Traction hoist

Hoist	Lifting capacity	Wire speed	Effect	Rated current	Traction hoist wire Ø	Unit weight approx.	Measures/dimensions a	b	c
Traction hoist type	**Kg**	**m/min**	**kW**	**A**	**mm**	**Kg**	**mm**	**mm**	**mm**
X402P/400V	400	18	1.5	3.5	8.3	35	485	250	250
X402P/690V	400	18	1.5	2.0	8.3	35	485	250	250
L502P/400V	500	18	1.5	3.5	8.3	35	485	250	250
L502P/690V	500	18	1.5	2.0	8.3	35	485	250	250
M500/400V	500	18	1.5	4.5	8.3	39	447	244	279
M500/690V	500	18	1.5	3	8.3	39	447	244	279

Table 2. Safety brake

Safety gripping device	Lifting capacity	To max. wire speed	Traction hoist wire Ø	Unit weight approx.	Measures/dimensions a	b	c
Safety brake type	**kg**	**m/min**	**mm**	**kg**	**mm**	**mm**	**mm**
BSO 504 E	400	18	8.3	4.7	214	121	131
BSO 1004 E [1)]	500	18	8.3	4.7	251	140	131
OSL500	500	18	8.3	7	269	176	101

[1)] Motor L502P must be installed with BSO 1004 E

Table 3. Drive wire, safety wire and guide wire

Wire type	Wire diameter	Surface treatment	Mark/ feature	Min. break resistance	Attached with	Anchoring	Tighten to
X402P / BSO504 E L502P / BSO1004 E	8mm, 4x26 or 5x19	galvanised	1 red string / cord	55 kN	2 t shackle, Form C	-	-
Guide Wire	12mm	galvanised	-	55 kN	Shackle,2t	Min. every 35m	2 to 4 kN
M500 / OSL500	8.3mm, 5x19	galvanised	none	51.5 kN	2 t shackle, Form C	-	-

4.7 Cabin safety devices

4.7.1 Safety brake

Electromagnetic spring-loaded brake which engages automatically

– on releasing the up/down push button and
– following a power failure.

4.7.2 EMERGENCY STOP

When the red EMERGENCY STOP (pendant control) switch is pushed in an emergency, all control is interrupted. After remedying the fault, control is reactivated by turning the switch clockwise, until it pops out again.

4.7.3 EMERGENCY STOP fixed (optional)

Only in service lifts with AUTOMATIC function installed. A backup switch to the pendant control EMERGENCY STOP switch is situated on one of the side panels inside the lift. For function, see above (Fig. 9).

4.7.4 Automatic operation switch

A switch situated inside the pendant control holder. It prevents the lift from being controlled from the inside when the control is in automatic mode.

4.7.5 Mechanical lifting force limiter

The lifting force limiter is built into the wire traction system and will prevent upward travel in the event of an overload. A warning signal (buzzer) is triggered which will stop only when the cause of the overload has been removed.
Possible reasons for activation of the limiter:
- The service lift is overloaded or
- The service lift encounters an obstacle during upward travel.

Operator intervention:
- Reduce the load to below the overload limit, or
- lower the lift until it is free of the obstacle and remove the obstacle before using the lift again.

4.7.6 Safety gripping device

Hoistable personal transportation means must be equipped with 2 safety gripping devices which will prevent the load from falling.

Safety brake Type BSO + OSL
The safety brake BSO + OSL safety gripping devices are opened manually (Fig. 8).

The speed of the safety wire passing through the device is continuously monitored, and the jaws automatically close in the event of sudden excessive speed.
This protects the lift from

a) Lifting wire breaks and
b) Hoist failures.

The safety gripping device can also be engaged manually in an emergency by pressing the Emergency stop button. The window is used to monitor the centrifugal force mechanism's function during operation. **For information on required intervention when the safety gripping device engages,** see section 8 on page 24.

Fig. 8
Safety brake BSO OSL500

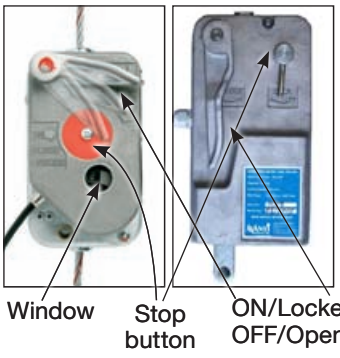
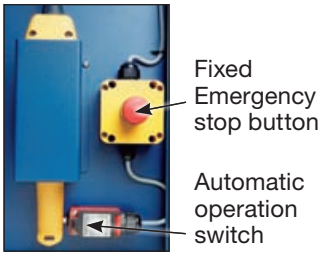


Fig. 9
Emergency stop and bottom stop switch



4.7.7 Drop down safety beam (Optional)

This device can be installed in sliding door lifts and it protects against accidental fall when the door is opened while working between platforms. The beam remains in closed position by means of a latch. The beam is opened by actuating on the latch and lifting up slightly the beam. (Fig. 9c)

See in 4.6.10.1 Guard locking switch how to open the sliding door between platforms.

Fig. 9a

Fig. 9b

Fig. 9c

4.7.8 Yellow flash (Optional)

An optional set of flashes can be mounted on the top and at the base of the lift. The flashes indicate when the lift is in movement (Fig 9a).

4.7.9 Emergency light (Optional)

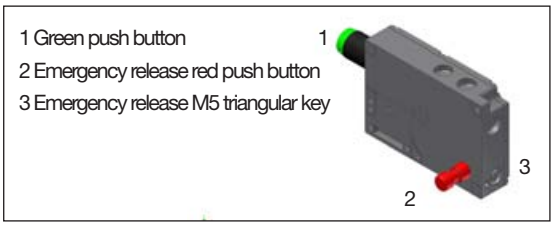
An emergency light can be installed to illuminate inside the lift with and without electric supply.
The operation modes can be selected

by means of a switch. (Fig .9b)

4.7.10 Door stop switch
4.7.10.1 Sliding door:
Sliding door is closed by pushing the actuator into the door guard locking switch. (Fig .15) The switch is unlocked by pushing the green button if the cabin is located at a height corresponding to a platform. In case of an emergency evacuation between platforms, the interlock is unlocked by pushing its emergency release red button from outside the cabin as well as using a M5 triangular key from inside the cabin.
4.7.10.2 Double door:
A switch (Fig. 12) will interrupt control if the door is not closed properly.
4.7.10.3 Half roller door:
A switch will interrupt control if the door is not closed properly.

4.7.11 Trapped-Key interlock system (Optional):
Control is interrupted by turning the trapped-key switch to OFF and then the key is able to be taken out. The key allows the user to open the platform fence doors. See the Trapped-Key Interlock System Manual for further information.

Fig. 15



4.7.12 Limit stop switch
4.7.12.1 Top limit stop switch
At the top of the cabin frame a top limit stop switch will stop upward travel when activated (Fig. 10). Downward travel will still be possible. A top stop disc which activates the top stop switch is installed below the lifting wire attachment. (Fig. 5 section 2 of the installation manual)

ATTENTION!
When the top limit stop switch is engaged, activate the DOWN switch until the top limit stop switch is released.

4.7.12.2 EMERGENCY top limit stop switch
Deactivates control if the top limit stop switch fails (Fig. 10). Manual downward travel is possible.

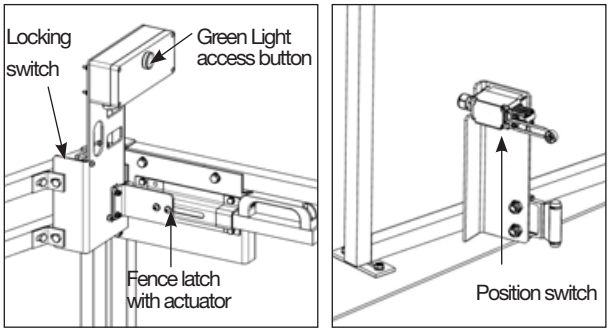
CAUTION!
Do not use the service lift until the top limit stop switch fault has been rectified.

4.7.12.3 Bottom safety stop
The bottom safety stop switch (Fig. 11a or Fig. 11b which shows an optional configuration) stops downward travel if the service lift
encounters an obstacle or touches the ground. Upward travel will be possible, for instance to remove the obstacle. In order to put the service lift on the ground, the contact plate's operation can be bypassed with the key switch in the control box. If it is possible to enter underneath the service lift a double button safety stop must be installed.(See part 1 of the installation manual).
4.7.12.4 Top safety stop (Optional)
The top safety stop switch stops upward travel if the lift:
- Type 1: encounters an obstacle (fig. 13).
- Type 2: Besides, the switch works as top limit stop switch. A top stop end bar is installed bellow the guiding wire attachment and activates the top safety stop. In this case the top stop end bar replaces the top stop disc. (fig. 14)

Downward travel will be possible, for instance to remove the obstacle.

4.8 Safety devices for fences with door
Safety devices for fences include devices to prevent people to access to the service lift area unless the service lift was in a safety condition of accessibility. Besides, the device guarantees the service lift doesn't move any moment the protected fence doors were open. There are two types of safety devices for fences:

4.8.1 Guard Locking System
The Guard Locking System uses a system of security locking switches installed on the fences. Another position switch detects the right position of the service lift on the protected platform.
The service lift cannot operate until all the protected fences are closed and locked.
The fences remain closed and locked until the service lift is stopped and properly positioned on the platform, actuating the position switch of the platform. In this position, the guard locking can be unlocked while pressing the green light button.

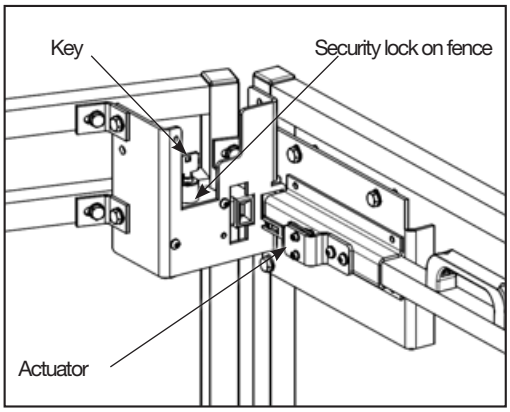


Consult the AVANTI Guard Locking System Manual for further information.

4.8.2 Trapped-key Interlock System

The Trapped-key Interlock System uses a system of security locks installed on the fences. These locks can be opened by using a key placed into the lift.
The key also activates the On/Off general switch placed into the service lift cabin. The key is linked to the lift by means of a wire rope, and can not be detached from it except using cutting tools.
The key cannot be taken out from the On/Off general switch in the lift, unless it is in Off position, and therefore, the lift is stopped. In the same way, the key cannot be taken out from the fence lock unless the fence door is closed, and the door actuator is put into the door lock.
The fences remain closed and locked until the service lift is stopped on the platform, and the key is transferred from the lift cabin to the fence lock.

Consult the AVANTI Trapped-key Interlock System Manual for further information.



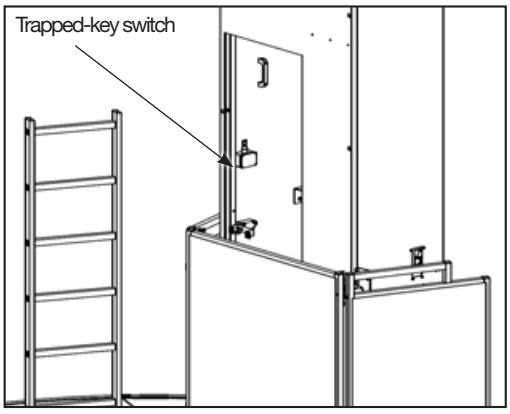


Fig. 10

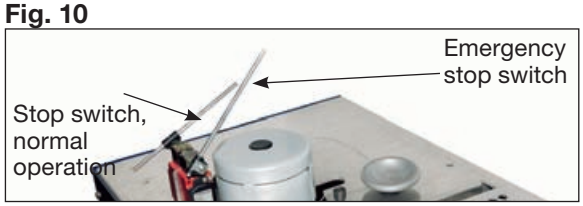


Fig. 11a

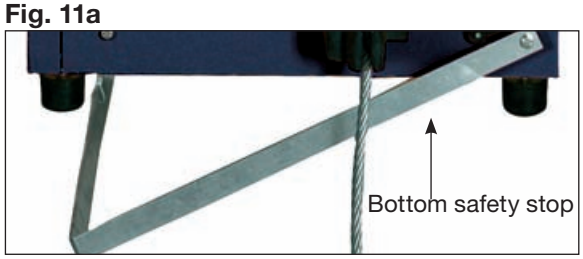


Fig. 11b

Fig. 12

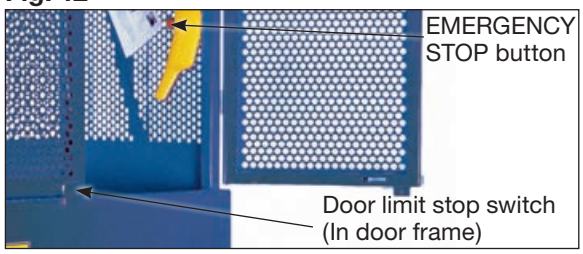
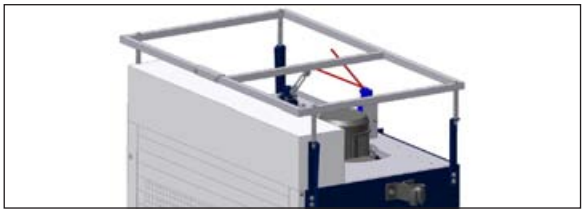


Fig. 13

Fig. 14



5. Daily inspection by the supervisor

If a safety device for fence doors is installed (see chapter 4.7 of the User's manual), every platform fence door must be closed to be able to drive the cabin.

5.1 Service lift

a) Before each operation, ensure that the traction hoist, the safety brake and all auxiliary components (stoppers, wire guide wheels, etc.) are mounted in accordance with the specifications and without any noticeable defects.

b) Check whether the drive, and safety wires are fed correctly around the two wire guide wheels.

c) Wire ends (of 3 m or more in length) must be coiled separately at the floor and tied with strips in at least 3 places.

d) Check lifting capacity: (see the rating plate or section 4.5.3) – the extra load (persons and materials!) must not exceed the maximum rated lifting capacity.

5.2 Operating area

a) Ensure that there are no obstacles within the service lift's operating area which may obstruct the travel of the cabin or cause the cabin to hit the ground.

b) Ensure that all relevant and required protection measures below the cabin are in place. Such measures could include pent roofs or barriers to protect the staff from falling objects.

5.3 Control function

a) Close the doors. Press the EMERGENCY STOP button. The lift should remain still when the UP/DOWN button is pressed. To restart, turn the EMERGENCY STOP button clockwise. If a FIXED EMERGENCY STOP button is installed (Fig. 9) test as above.

b) Test the top limit stop switch:
During upward travel, press the switch manually, and the service lift should stop immediately. Pressing the limit stop switch should enable the lift to travel down again.

c) Test the EMERGENCY top limit stop switch:
During upward travel, press the switch manually, and the service lift should stop immediately. Neither upward nor downward travel should now be possible.

d) Bottom safety stop. Lower the lift;
it should stop before the rubber feet of the cabin reach the tower ground level. When the "bypass switch" is activated, it should be possible to lower the lift all the way to the ground.

e) Door stop switch:
Open the door - it should not be possible to move the lift upwards or downwards.
Sliding door service lift: Move the cabin at a height no corresponding to a platform - it should not be possible to open the door. The door will be only able to be opened by pushing the emergency release red button from outside the cabin as well as using a M5 triangular key from inside the cabin.

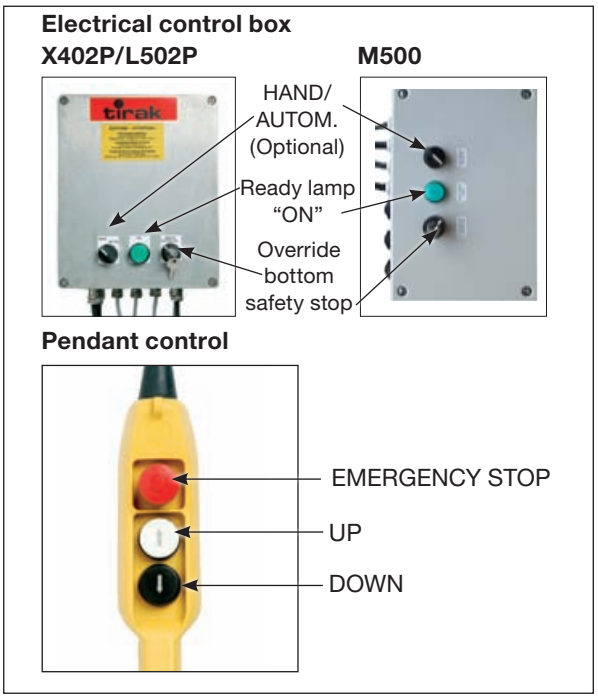
f) If the optional AUTOMATIC function is installed. Set the HAND/AUTOM. selector to AUTOM. When holding the handle, the lift should remain still when the UP or DOWN buttons are activated.

g) If the Trapped-Key interlock system is installed. Turn the trapped-key switch to OFF - it should be not possible to move the lift upwards or downwards. See the Trapped-Key Interlock System Manual for further information.

Warning! *If any faults occur during work,*
- stop working,
- if required secure the workplace and
- rectify the fault!

DANGER!
Make sure that nobody is exposed to danger below the service lift, for instance from falling parts. Suitable measures: Pent roof or barriers.

Fig. 13

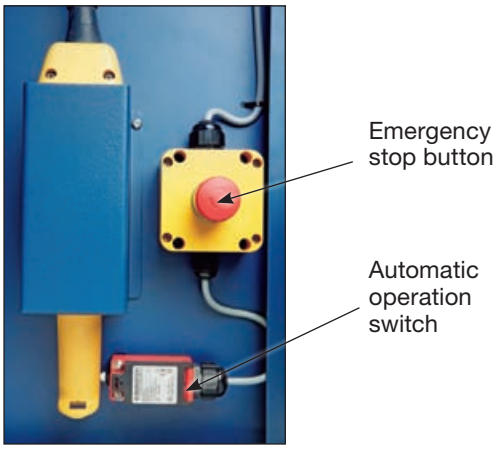


5.4 Automatic operation test

Perform this inspection only if the AUTOMATIC function is installed.

a) Press EMERGENCY STOP button on the pendant control. Turn the HAND/AUTOM. switch on the electrical control box to the right to activate automatic operation. (Fig. 13 page 20)
b) Deactivate the EMERGENCY STOP button by turning the button clockwise. (Check the EMERGENCY STOP button fixed is deactivated.) The service lift should stand still.
c) DO NOT try to activate the “automatic operation” switch.
d) If the trapped-Key interlock system is installed, turn the trapped-key switch to ON. With the doors closed, press the UP and DOWN buttons. Neither upward nor downward travel should be possible (Switch in pendant control holder blocks the operation).
e) Press the EMERGENCY STOP button on the pendant control.
f) Place the pendant control in its holder so it is operational from the outside.
g) Leave the cabin and close the door.
h) Deactivate the EMERGENCY STOP button. The service lift should stand still.
i) Press the UP button. The lift should travel upwards.
j) Press the EMERGENCY STOP button. The lift stops.
k) Turn the EMERGENCY STOP button clockwise and press the DOWN button. The service lift should travel downwards until the EMERGENCY STOP bottom stops the service lift.

Fig. 13b



l) Remove the pendant control from holder.
m) Return the HAND/AUTOM. button to HAND.
n) Check that the UP and DOWN buttons work again.

5.5 Remote operation test

Perform this inspection only if the remote control function is installed.

a) Set the electrical control box switch HAND/AUTOM to AUTOM (fig 7 a).
b) On top of the remote operation receiver switch the device on (fig 7 b).
c) Press the up arrow on the remote operation transmitter. The service lift should ascend.
d) Press the down arrow on the remote operation transmitter. The service lift should descend.
e) Once the test is complete, switch the remote operation function off.

5.6 Safety gripping device

a) Engage the **safety brake** by pressing the safety brake stop button - the handle should jump to the “ON” position (Fig. 8 section 4.7).
b) Reopen the safety brake by pressing down on the lever – the lever must engage.
c) During operation, regularly monitor the centrifugal force regulator relay’s rotation by looking through the window.

5.7 Wires and suspension

a) During operation: Check the **lifting and safety wires** for free passage through hoist and safety gripping device.
b) When the lift is at the top landing, inspect the **wire attachment** and all the building sections that suspend the lift.

6. Operation - lift transport

If a safety device for fence doors is installed (see chapter 4.7 of the User's manual), every platform fence door must be closed to be able to operate the cabin. **Transportation of people in AUTOM. mode is forbidden.**

6.1 Entry and exit

To ensure safe entry and exit:

a) Lower the service lift onto the access platform until the contact plate is activated and the cabin stops, or: bring the lift to a height corresponding to the correct level for exiting from the wind turbine's platform.

b) Open the door and exit/enter the lift through the door/over the cabin railing.

6.2 Stop/EMERGENCY STOP

a) Release the UP/DOWN push button; the service lift should stop
If it does not:

b) Push the EMERGENCY STOP switch, and all controls should be disabled. Open the door and enter/exit the lift through the door/over the cabin railing.

6.3 Normal operation

a) Close the door

b) Turn the red EMERGENCY STOP switch on the pendant control clockwise and the switch should pop out (Fig. 13 page 20). Do likewise with the EMERGENCY STOP fixed on the cabin (Fig. 9)

c) To go up or down, push and hold the UP or DOWN button . If the trapped-key interlock system is installed, the trapped-key switch should be ON in order to drive the lift.

d) To place the service lift on the floor after the bottom safety stop has stopped the lift.

-Turn the override bottom safety stop switch (fig. 6 section 4.6.4) clockwise and hold.
-Press the DOWN button until the service lift rests on the floor, then release.

6.4 Automatic operation

Only in service lifts with the AUTOMATIC function installed.
a) If the trapped-key interlock system is installed, the trapped-key switch should be ON in order to drive the lift.

b) Press the EMERGENCY STOP switch on the pendant control.

Turn the HAN/AUTOM switch on the power cabinet to activate the automatic operation.

c) Put the pendant control inside the holder. It should engage the automatic operation switch (fig.13b).
d)Close the door

e)Turn the EMERGENCY STOP switch on the pendant control clockwise and the switch should pop out.

f)Press the UP or DOWN button respectively and the cabin starts ascending/descending.

6.5 Remote operation

a) Set the electrical control box switch to AUTOM (fig.6).

b) On top of the remote operation receiver switch the device on (fig.7b).

c) For ascending press the up arrow on remote operation transmitter.

d) For descending press the down arrow on remote operation transmitter.

e) Once the operation is complete, switch the remote operation function off.

6.6 Lifting force limiter

a) In case of an overload, the lift's upward travel should be blocked, and a buzzer should sound in the connection cabinet.

DANGER!
Attempting to go up in an overloaded lift is prohibited!

b) Remove enough of the load to make the buzzer stop and enable upward travel.

WARNING!
On entering and starting the lift, the buzzer may sound briefly. This is due to temporary load peaks occurring as the lift takes off.

The control box is designed not to activate the buzzer or stop the lift because of peak loads caused by the cabin swinging.
If the problem persists have an AVANTI expert adjust the overload limiter (Appendix A).

7. Manual operation (EMERGENCY)

If a power failure or an operation fault etc. interrupts the lift, a manual EMERGENCY descent is possible.

7.1 EMERGENCY descent

a) Open the manhole by pushing the lid in the roof and operate the lift from above.
b) On top of the lift insert the lever into the break lever hole in front of the traction hoist (Fig. 14 (1)).
c) Pull the lever upwards. The service lift moves downwards. The built-in centrifugal force brake limits the pace of descent.
d) To stop, simply loosen the leaver.
e) After use, replace the lever in roof hole.

For emergency situation only

Fig. 14

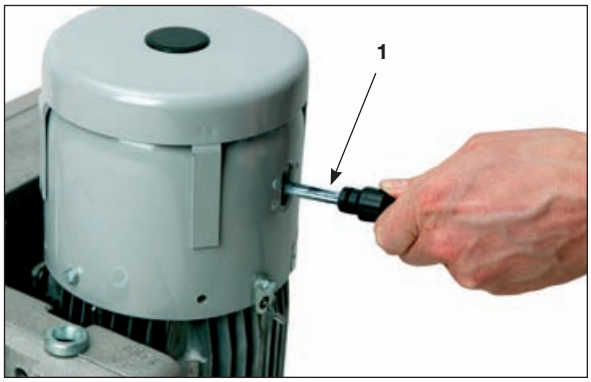
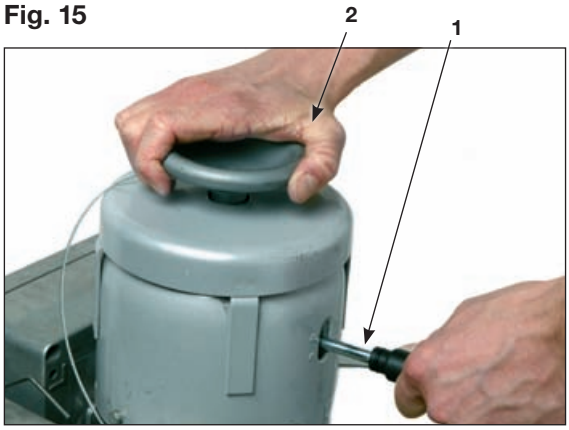


Fig. 15



7.2 Manual ascent

With the brake open, the service lift can be pulled upwards using the hand wheel (Fig. 15).

a) Remove the rubber cap.
b) Mount the hand wheel [2] on the motor shaft and turn it counter clockwise with the brake [1] open.
c) After use, retract the hand wheel and lever from the traction hoist and replace them in the roof holes. Replace the rubber cap.

8. What to do if the safety gripping device engages

If the safety brake engages simply disengage by pushing down the lever (Fig. 16A) until it click. However this is not possible if the service lift is hanging on the wire - if so, see below.

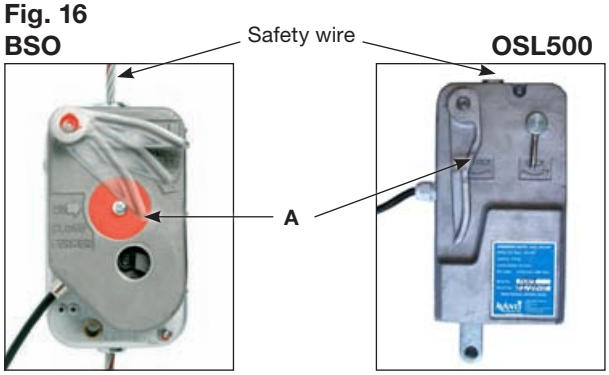
DANGER!
In the event of lift wire breaks or hoist fails, evacuate personnel from the service lift.

The safety wire suspension and the attachment between the safety brake and the service lift are exposed to dynamic loads when a fall is blocked.

If the **safety brake has locked** and the service lift is hanging on the wire, ascending is blocked. Do as follows:

a) Remove the load on the safety wire by taking the service lift upwards
   – In the event of a power failure, operate the lift manually as explained in section 7.2.
b) Manually open the safety brake by pressing down the leaver (Fig. 16A) until it disengage. On ground level perform test as specified in section 5. e) of the Installation Manual section and 5.6 of the User's Manual before resuming normal operation.

Fig. 16
BSO



ATTENTION!
When the service lift has returned to ground level, test the safety brake function as specified in 5. e) of the Installation Manual page 54 and 5.6 of the User's manual page 21.

CAUTION!
Replace any defective safety brake components and return them for repair to the manufacturer.

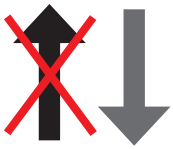
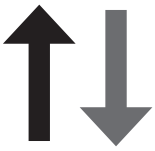
DANGER!
Avoid serious injuries:

9. Repair in the event of breakdown

1. All tests and repairs to the electronic components should be performed by an **authorised electrician only!** The power chart is placed in the traction hoist's power cabinet.

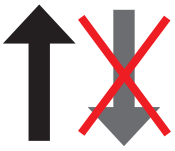
2. Repairs to the traction hoist, the safety brake and to the system's supporting components should be performed by **qualified fitters only!**

Breakdown	Cause	Solution
The service lift will **neither go up nor down!** 	**DANGER!** *Attempting to use the lift will jeopardize work safety*	
	A1 The fixed EMERGENCY STOP button has been activated.	Deactivate the button in question by turning it clockwise until it pops out.
	A2 Wire loop on traction hoist. Damaged or defective wire or wire outlet causes problems.	**Stop work immediately!** Ask the supplier or manufacturer for help.
	A3 The safety brake aligning device is holding the service lift on the safety wire. a) Lift wire breakage b) Hoist failure	a) + b) Evacuate the service lift and follow the directions in section 8
	A4 The service lift is stuck on an obstacle.	Carefully remove the obstacle. Test the operational safety of affected building sections. Inform the supervisor.
DANGER! *Unplug the power supply before opening the power cabinet.*	**A5 Power failure** a) Control not switched on or deactivated b)Grid voltage interrupted c)Supply between grid connection and control interrupted	a)Turn EMERGENCY STOP switch clockwise until it is released b) Find the cause and wait for the power to return c)Test and if necessary repair the supply cable, guide wires, fuses, and/or wiring from the control box
	A6 Limit stop switch functions a) EMERGENCY limit stop switch was pressed. **b) Door limit stop switch blocks** or is defective.	a) Manually take the lift down until the limit stop switch is released. b) Close the doors and test the limit stop switch.
	A7 Protection switch on overheating a) A phase is missing b) Motor is not cooling c) Voltage too high/low	a) Test/repair fuses, supply and connection. b) Clean the hood. c) Measure voltage and power consumption on the loaded motor. If voltage deviates from specifications, use cable with increased dimensions.
	A8 Brake does not open (no click on on/off) a) Supply, braking coil or rectifier defective. b) Braking rotor closes.	a) Have an electrician test, repair/replace the supply, braking coil and rectifier. b) Return traction hoist for repair.

Breakdown	Cause	Solution
The service lift will **neither go up nor down** 	**A8 The HAND/AUTOM.** switch is on AUTOM.	Turn the HAND/AUTOM. switch back to HAND.
	A9 The Trapped-key Interlock System for fences is installed. The Cabin switch of the system is in Off position.	Turn On the trapped-key switch. Consult the AVANTI Trapped-key Interlock System Manual for further information.
	A10 The Guard Locking System for fences is installed. The general On/Off switch of the Guard Locking System Control Box at the bottom platform is Off.	Turn On the general On/Off switch of the Guard Locking System Control Box at the bottom platform. Consult the AVANTI Guard Locking System Manual for further information.
	A11 The Guard Locking System for fences is installed. At least one of the protected fences is open.	Close all the protected fence doors. Consult the AVANTI Guard Locking System Manual for further information.
Service lift goes **down but not up** 	**DANGER!** *Irresponsible behaviour jeopardizes system safety!* **B1 The service lift is stuck on an obstacle.**	Carefully move the service lift downwards and remove the obstacle. **Test the operational safety of affected platform components. Inform the supervisor.**
	B2 Overload - Buzzer sounds in the connection cabinet.	Test and possibly reduce load until buzzer stops.
	B3 Limit stop UP: a) Limit stop defective or not connected. b) Operation limit stop was **activated.**	a) Test the limit stop connection/function. Replace if necessary. b) Move lift down until the limit stop switch is released.
	B4 A phase is missing	Test fuses and power supply.
	B5 Fault in UP control circuit in control box or traction hoist	Test and possibly repair connections, wiring and relays.
Motor hums loudly or wire ropes squeak,  but the lift can go both up and down.	**C1 Overheating**	For descriptions of individual causes and how to rectify faults, see page 25 under item **A5.**
	C2 Wire ropes dirty **WARNING!** *Further use of lift may result in damage to the wire traction.*	If possible, immediately replace the traction hoist and return it for test/repair at AVANTI.

DANGER!

Unplug the power supply before opening the power cabinet.

Breakdown	Cause	Solution
Service lift will **go up but not down!** 	**DANGER!** *Irresponsible behaviour jeopardizes system safety!*	
	D1 The service lift has encountered or is stuck on an obstacle.	Carefully take the service lift up and remove the obstacle. Test the operational safety of affected platform components. Inform the supervisor.
	D2 The safety brake device is holding the service lift on the wire. a) Excessive hoist speed b) Too low release speed on safety brake.	a) + b) Take the service lift upwards to relieve the safety wire. Open the safety brake by pressing the handle, and test its function as specified in section 5.6 on page 19! **Functional test when the lift is back on the ground: Replace the hoist and safety brake and return them for testing.**
	DANGER! *A defective safety brake will threaten the safety of the service lift! Replace immediately!*	
	D3 Fault in down controller circuit on traction hoist	Insert brake lever into the traction hoist and lower lift manually. (See details in section 7) Test, and if necessary have connections, wiring, and relays repaired. 
Green lamp not lit although operation is normal	**E The lamp is defective**	Have an electrician replace the bulb.
Hoist goes down when up button is pressed and up when down button is pressed.	**F Two phases changed in the supply**	Have an electrician switch the two phases in the plug

DANGER!

Unplug the power supply before opening the power cabinet.

If these steps do not identify the cause and rectify the fault: Consult a qualified electrician or contact the manufacturer.

10. Out of service

a) **Securing the service lift:**
Bring the service lift all the way down, until the contact plate switch stops the cabin.

b) **Switch off the power supply** to prevent inadvertent operation of the lift:
Push in the EMERGENCY STOP button fixed – all controls are now blocked. Mark the lift "OUT OF SERVICE". Contact the service technician for repair.

11. Removing wires for replacement

CAUTION!
Wear protective gloves when handling wires.

11.1 Parking the service lift

Lower the lift until bottom safety stop engages.

11.2 Wire ends

Beneath the access platform:
a) Loosen and uncoil all coiled and secured wire ends.
b) Remove the weight and the tightening spring.

11.3 Removing the lifting wire

a) Turn the "override bottom limit stop switch" key to the right and push the DOWN button until the cabin rests on the platform.
b) After having removed the drive wire counter weight turn the DOWN button. The wire now exits the traction hoist at the top.
c) From above the traction hoist remove the wire by hand.

11.4 Removing the safety wire

a) Keep the safety brake open and manually pull out the wire.
b) Pull out the wire on top of the lift.

12. Maintenance

Time (Performance)	Component	Details on page
Daily: (Supervisor)	**Attachment components** **traction hoist** **Control box** **Safety brake**	18-19
Annually: (Expert)	**Wires** **Electrical cable**	29-30
Annually: (Expert)	**Entire system**	29-30
Annually, however at least every 250 hours of operation: (Expert)	**Traction hoist**	29
Annually: (Expert)	**Safety brake**	29

12.1 Yearly inspection

Have the entire system, especially the traction hoist and the safety brake tested by an AVANTI trained expert at least once annually however more frequently if required depending on use and the conditions of use and operation.
The traction hoist and safety brake must be overhauled at an authorised workshop and furnished with new certificate for every 250 hours of operation. (Time counter is found in the power cabinet (Fig. 20 section 12.1.5).

ATTENTION!
If safety brake has engaged, an expert must verify the safety of the safety brake, the wire, and wire attachment.

The tower owner must ensure that the results of all annual and extraordinary testing are logged (Appendix B).

12.1.1 Traction hoist

The traction hoist is largely maintenance free. Clean only when very dirty. During cleaning always ensure sufficient air supply.

Annual test:
a) Ensure that no visual defects have appeared.
b) Test emergency descent function
(See Users's Manual section 7.1)

12.1.2 Safety brake

The safety brake is largely maintenance free. Clean only when very dirty. Keep free from dirt and lubricate often (See table 4, section 12.1). Using too much oil will not harm the equipment or the gripping function.

Annual test:
a) Test the safety brake stop button.
b) Test the safety brake stop button reset.
c) Release safety wire bottom attachment in tower and Perform wire acceleration test by hand (See Installation Manual 5. e) 2) page 54).

12.1.3 Service lift

Annual test:
Inspect the service lift as specified in section 5 of the User Manual.

12.1.4 Suspension/Wires/Cables

Always keep the wires clean and slightly greasy. Use ordinary universal lubricating grease, however, do **not** use bisulphide-containing lubricants like Molycote®.

Annual test:
a) Check and replace the respective wire(s) if one of the following defects are found:
- **8 wire strand breaks** or more on a wire length corresponding to 30 times the wire diameter (Fig. 17).
- Severe **corrosion** on the surface or inside.
- **Heat damage,** evident by the wire colour.
- **Reduction of the wire diameter** by 5% or more compare to the nominal wire diameter (Fig. 18)
- **Damage on the wire surface** – See fig. 19 for most common examples of wire damage.

These examples do not, however, replace the relevant provisions laid down by **ISO 4309!**

b) Check and ensure all wires are mounted at the top and ground level in accordance with the mounting instructions (See Installation Manual section 2.1, 2.3, and 2.6).

c) Power cables
Check and replace the supply and control cables if the cable jacket or cable connections are damaged.

d) Wire guide wheels
Ensure wires are led round the guide wheels in accordance with the fitting instructions (See Installation Manual section 2.5).

Fig. 17
Wire strand breaks

Fig. 18 Wire diameter

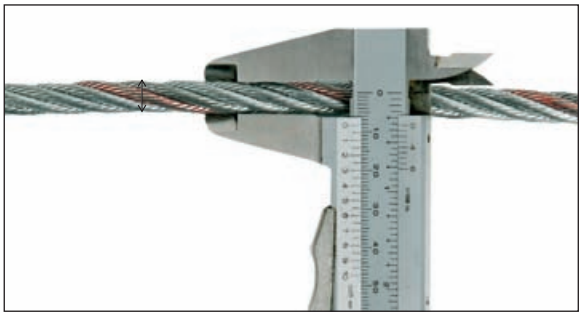


Fig. 19

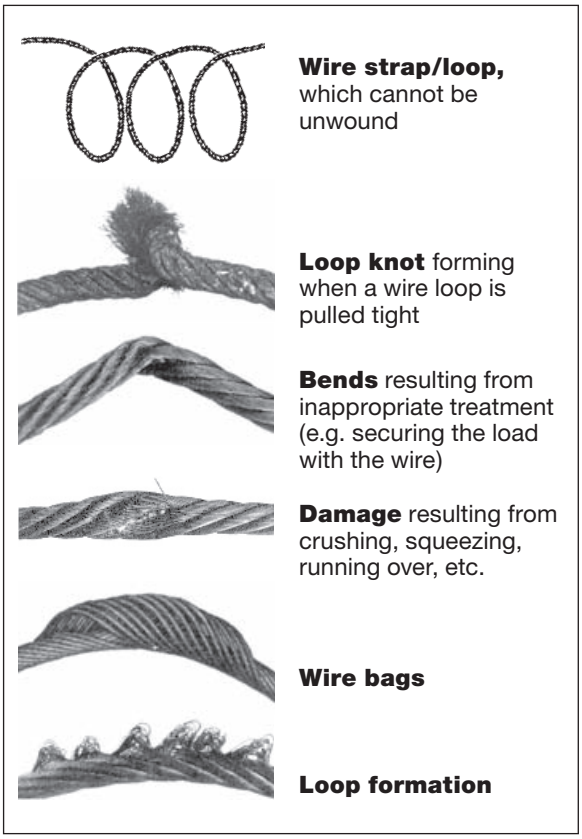


Table 4

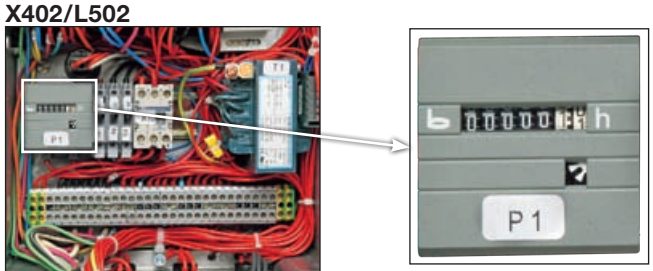
Temperature range	-15°C to 80°C	-35°C to 40°C
API specification	Synthetic oil	
	CLPPG or	CLPPG or
	PGLP ISO VG 460[1)]	PGLP ISO VG 100
Oil specification	Klübersynth GH6 460	Klübersynth GH6 100
[1)] Standard filling	Use of other synthetic oil only with approval by AVANTI.	

12.1.5 Overload limiter/information signs

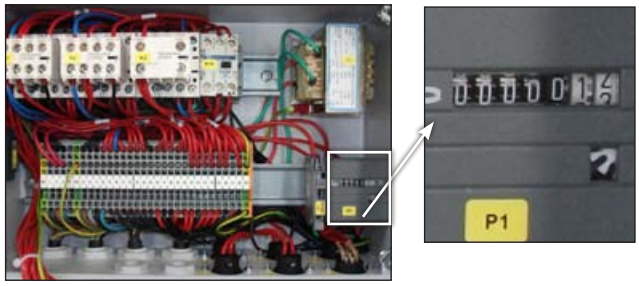
Annual test:
Test switches as specified in section 5.3 and 5.4 of the User's Manual.
Perform overload test as specified on page 54 of the Installation Guide.
Verify completeness and legibility of all rating plates and information signs. Replace missing or illegible plates and signs!

Fig. 20

X402/L502



M500



12.2 Repairs

Repairs to traction hoist equipment may ONLY be performed by the manufacturer or a hoist service centre, and only using original spare parts.

If the gearbox oil needs to be replaced, use one of the lubricants specified in the following table, corresponding to the temperature range in which the traction hoist equipment is used.
Amount required:
traction hoist X402P: 1.4 l.
traction hoist L502P: 1.4 l.
traction hoist M500: 1.4 l.
See table 4.

13. Ordering spare parts

13.1 Wire/ropes

In addition to the item number and name of the spare part, always state the traction hoist type, wire diameter and production number!

13.2 Motor and brake

In addition to the item number and name of the spare part, always state the motor type and the type and coil voltage of the brake!

13.3 Electric control

When ordering spare parts or making requests, always state the electricity category and wiring chart number. See the rating plate on the connection cabinet. There is a wiring chart in the connection cabinet and in the motor terminal box.

13.4 Safety brake

In addition to the item number and name of the spare part, always state the safety brake type, the wire diameter and lift serial no.

A spare parts list is available from the supplier or directly from AVANTI.

13.5 Rating plate/information signs

Verify the completeness and legibility of all rating plates/information signs (see Fig. 21). Replace missing or illegible plates/signs!

Rating plate on the service lift Spine

Information signs

Operating instructions inside the lift

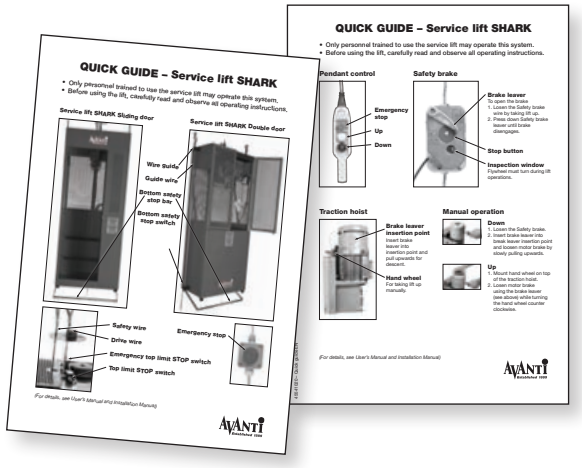


Fig. 21

Installation Manual

Please familiarise yourself with these instructions and the User Manual (Model SHARK) before installing the service lift. Ensure that all specified parts are present before commencing installation.

No warranty is provided against damage and injury resulting from not following this "User's Manual and Installation Manual" i.e. reconstruction or modification of equipment or use of non-original parts which are not approved by the manufacturer.

1. Assembling the SHARK cabin

Assemble the SHARK service lift close to its final place of installation. Assemble both versions, sliding doors and double doors, as follows:

Installation holes have been pre-drilled. Bolts, nuts etc can be found in the plastic bags supplied.

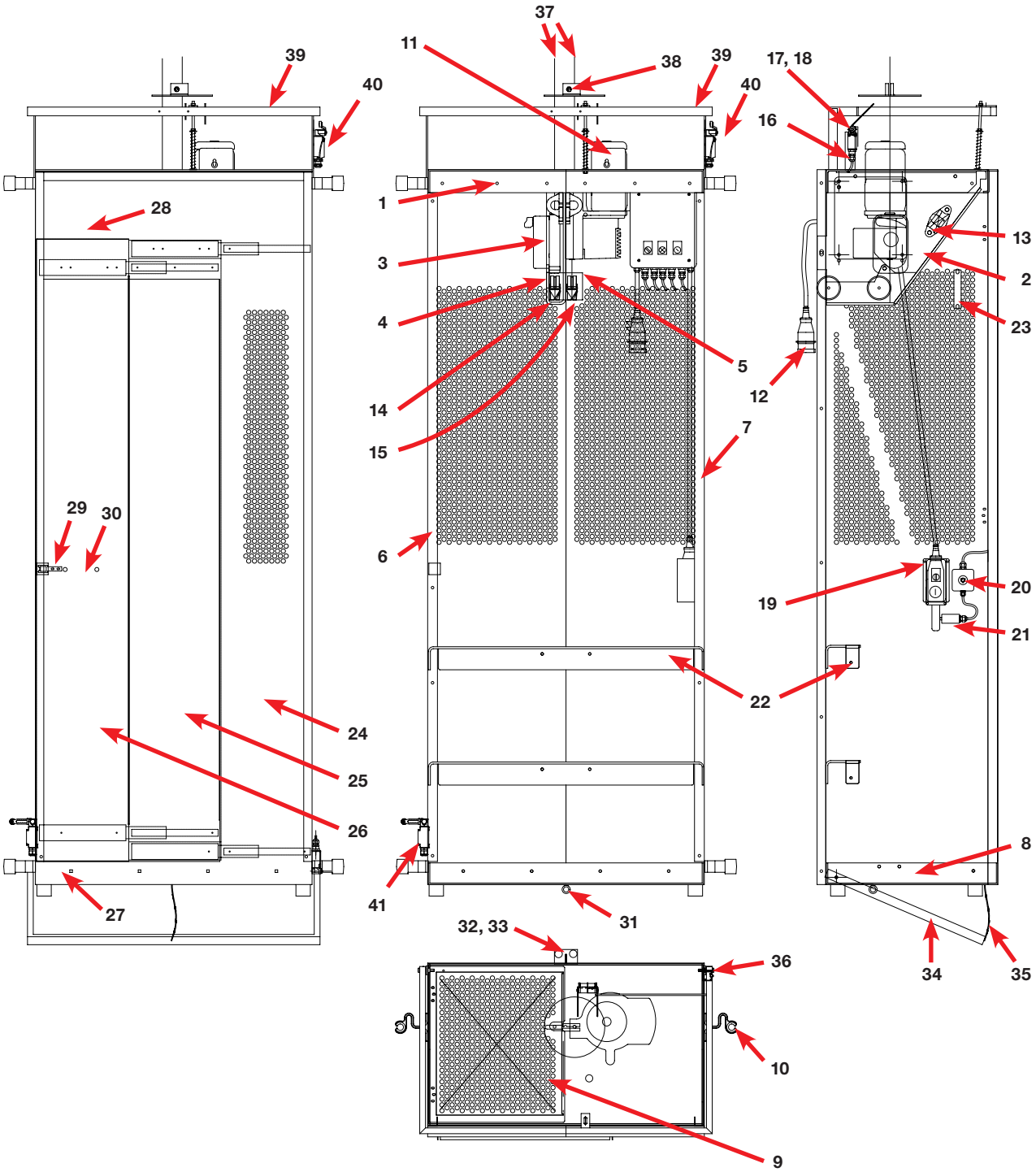
1. Assemble the right, left and bottoms sections with the cabin resting on its back.
2. Mount the roof spine and then slide the roof into position and fit to the cabin.
3. Fit the wire guides.
4. Mount the traction hoist and safety brake to the spine.
5. Attach the cabin front.
6. Mount the 4 bottom rubber feet to the bottom of the cabin.
7. Mount the operation limit stop switch and emergency limit stop switch on the roof using the contact bracket.
8. Attach the bottom safety stop beam including the wires that hold the bottom safety stop beam.
9. Bring the cabin to its upright position.
10. Mount the doors on the cabin. On the Double door version - remember to install the ground wire at the top hinge.
11. Mount the steps and handle inside the cabin.
12. Feed the power cable through the rear hole and fit the socket to the back using the strips.
13. Mount the bottom safety stop switch and adjust. Connect the switch cables to the power cabinet according to the colour code. All wires are secured using strips (max 200mm between strips).

All bolts and nuts are stainless steel.

DANGER!
If it is possible to enter underneath the service lift a double button safety stop must be fitted. (See Installation Manual pages 34-36).

1.1 Part list - Shark L/XL Sliding door

Fig. 1



1.1 Part list - Shark L/XL Sliding door

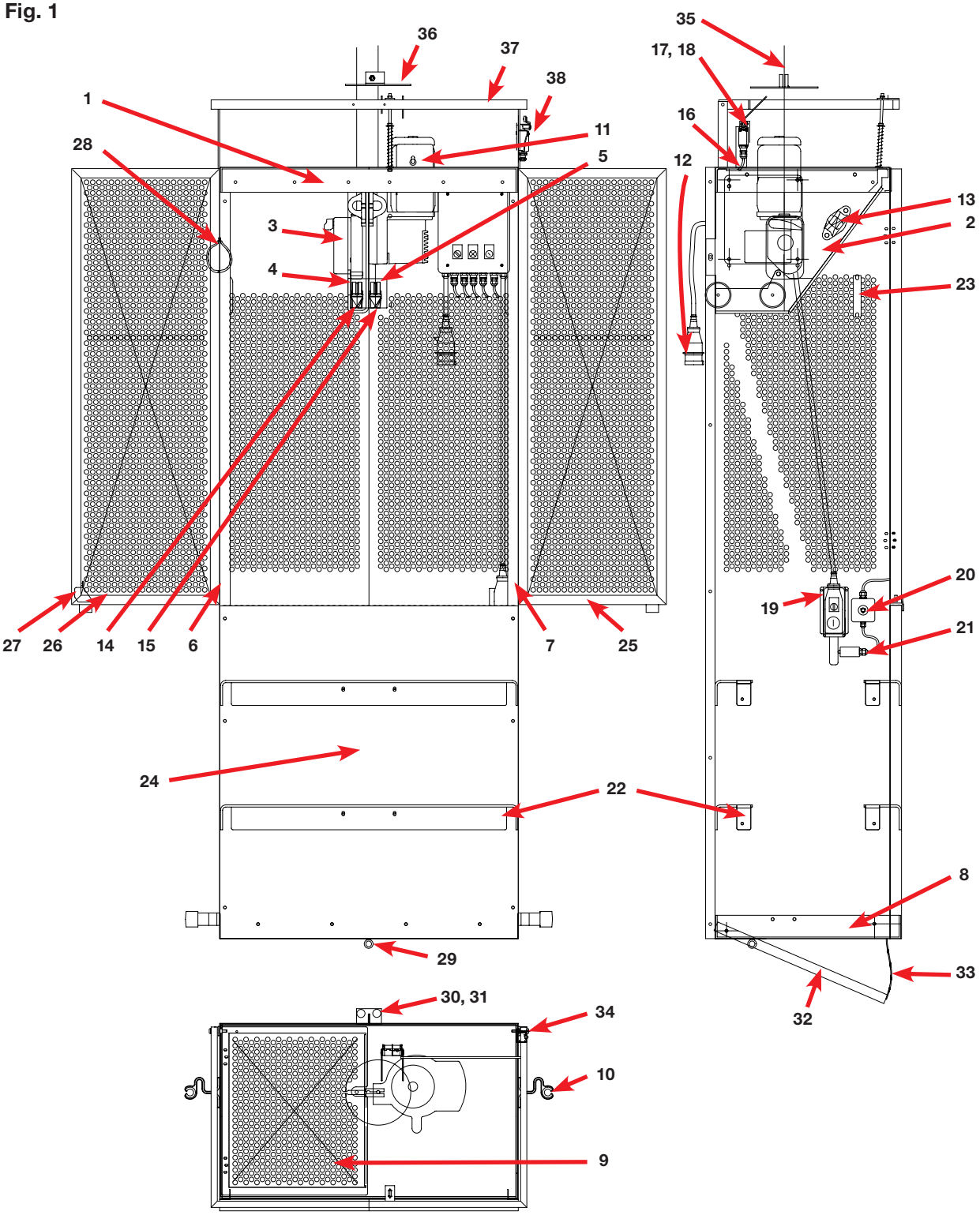
Pos.	Item no.	Part description	Qty	Reference
6	45303105 / 45303180	Cabin, right: Shark L / Shark XL	1	
7	45303106 / 45303181	Cabin, left: Shark L / Shark XL	1	
8	45303111 / 45303178	Bottom: Shark L / Shark XL	1	
9	45303117	Hatch (Shark)	1	
10	45511002	Wire guide	4	Install. fig. 14
12	45502004/45502045	Plug 690V/Plug 400V	1	
13	45512004/47870006	Anchor point, yellow/Spine Anchor	2	
16	45303119	Bracket for top switches	1	
17	45502035	Top stop swich (S1)	1	Manual fig. 10
18	45502036	Emergency top stop switch (S13)	1	Manual fig. 10
19	45303118	Pendant control holder (Shark)	1	Manual fig. 13b
20	45502038	Emergency stop box	1	Manual fig. 13b
21		Automatic operation switch		
22	45303116	Step (Shark)	3	
23	45512009	Handle for cabin, black	2	
24	45303113	Front for Shark sliding door	1	
25	45303114	Center door for Shark L w/slide	1	
26	45303115	Right door for Shark L w/slide		
27	45303125	Guide 1 for sliding door, Shark L, bottom	1	
28	45303126	Guide 2 for sliding door, Shark L, top	1	
29	45502217/45502218	Sliding door limit stop switch, left/right	1	
41	45502219	Platform position switch	1	
30	45303421	Sliding door handle - Interlock	1	
31	79999562	Eye nut, M8, FZV	1	
32	45303123	Angle for wirebush	1	
33	45512006	Guide for wirebush	2	
34	45303128	Bottom stop bar (Shark)	1	
35	45512064	Wire Ø2.3mm, coated	0.62	
36	45502031	Bottom limit stop switch	1	
37		Safety wire / Drive wire ø8	2	
		Guide wire Ø12mm	2	
	45512005	Shackle, 2 tonnes	2	Manual fig. 13
	45303100	Tripod	2	Install. fig. 8a
	45512060	Threaded rod, M16, FZV, L=330mm	2	Install. fig. 8a
	45515001	Push spring for safety wire	1	Install. fig. 12
	45512011	Counterweight 11 kg for drive wire	1	Install. fig. 12
	45512001	Cable bucket	1	
		Rubber cable 4G1.5/5G1.5/5G2.5	1	
		Connector 690V/Connector 400V	1	
	45512003	Cable suspension	1	Install. Fig 9
	45512056	Snap hook, Galv. L=70mm	1	Install. Fig 9
	45511001	Wire fix	10	Install. fig. 14
	45512010	Bracket for wire fix 70	10	Install. fig. 14

1.1 Part list - Shark L/XL Sliding door

Pos	Part no.	Part description	Qty	Reference
38	45303101	Top stop disc	1	Manual fig. 2
	45541020	Quick-guide, English	1	Manual fig. 21
	45541022	Quick-guide, Spanish	1	
	45541031	Label lift EN/ES 240 kg	1	Manual fig. 21
	45541007	Wall label UK/DE	1	
	45541025	Warning sign - hook on to anchor point	1	
	45541027	Serial number plate Shark lift	1	Manual fig. 21
	45512023	Counterweight 31 kg	1	
	45541009	Label lift EN/ES 320 kg	1	
	Driving system X402P/L502P-BSO504E/BSO1004E			
1	45303112 / 45303175	Top: Shark L / Shark XL	1	
2	45303107 / 45303177	Spine: Shark L / Shark XL	1	
3		Safety brake BSO 504E/BSO 1004E.	1	
4	45303121 / 45303176	Guard small for Spine: Shark L / Shark XL	1	
5	45303120 / 45303179	Guard large for Spine: Shark L / Shark XL	1	
11		Traction hoist, X402P/L502P	1	
14	45570001	Roller 1 for spine (Shark)	2	
15	45547002	Roller 2 for spine (Shark)	2	
	Driving system M500-OSL500			
2	45303397	Spine M500 Shark L	1	
1	45303398	Top M500 Shark L	1	
11	45408001	M500 690V CE	1	
	35412013	Rollers Assy M500 Shark L	1	
	45303400	Cover spine M500 Shark L	1	
3	45108043	OSL500	1	
	45303401	Bracket OSL500 Shark L	1	
	45303402	Support OSL500 Shark L	1	
	Optional			
	45511006	Click on wire fix		
	45511007	Click on wire guide		
	35499287	Roller wire guide	4	Manual fig. 14
	45502142	Remote control transmitter	1	Manual fig. 9
	45502140	Remote control receiver	1	Manual fig. 9
	45502001/55020011	Safety light top	1	
	45502002	Safety light bottom	1	
	35499074/35499075	Drop down safety beam Standard/Reverse	1	
	35499010 / 35499021	Double button stop: Shark L / Shark XL	1	
39	35499012/35499022	Top safety stop: Shark L/XL	1	
40	45512174	Top safety stop Switch	1	
	45502146	Emergency light	1	

1.2 Part list - Shark L/XL Double door

Fig. 1



1.2 Part list - Shark L/XL Double door

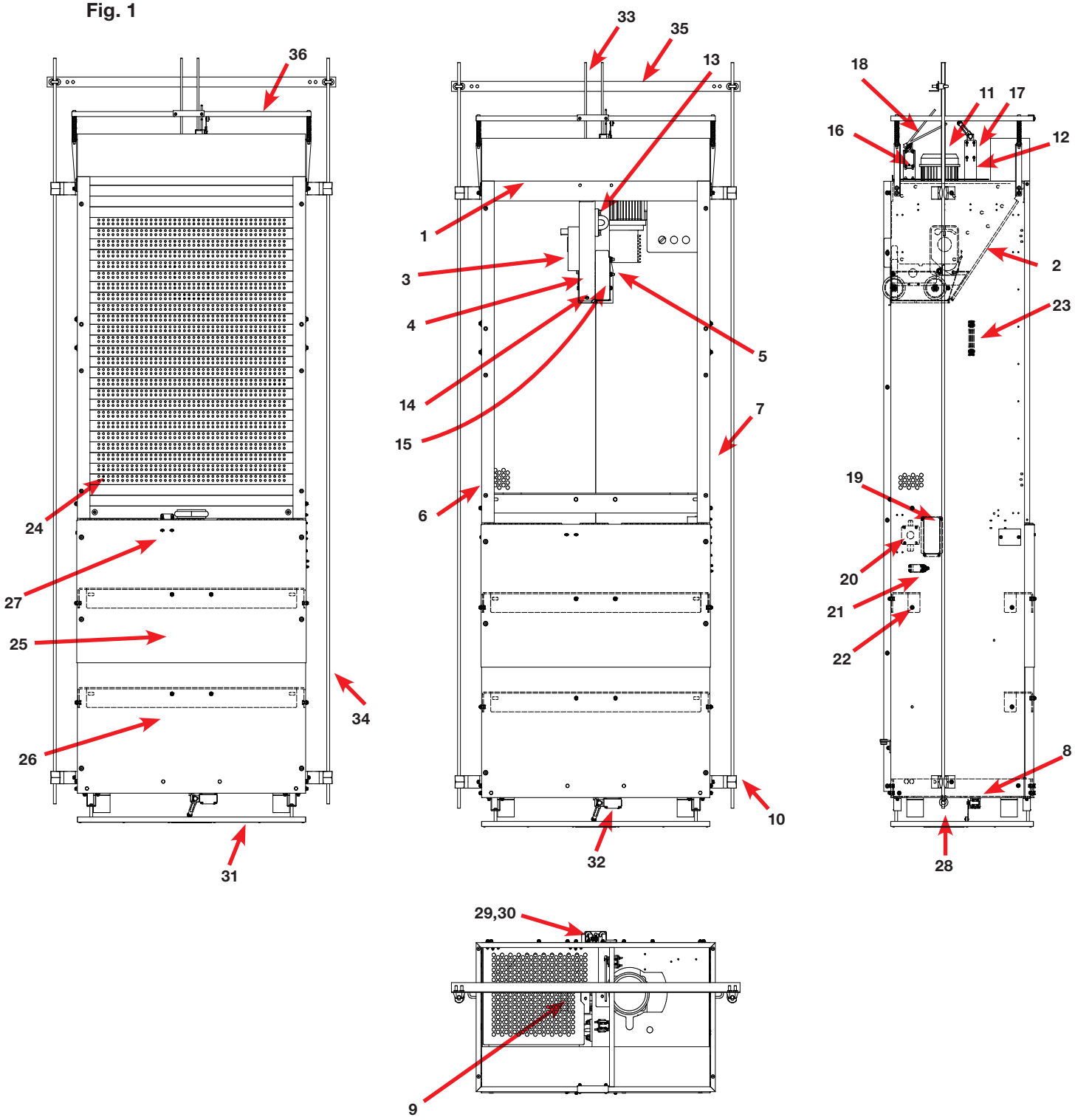
Pos	Part no.	Part description	Qty	Reference
6	45303105 / 45303180	Cabin, right: Shark L / Shark XL	1	
7	45303106 / 45303181	Cabin, left: Shark L / Shark XL	1	
8	45303111 / 45303178	Bottom: Shark L / Shark XL	1	
9	45303117	Hatch (Shark)	1	
10	45511002	Wire guide	4	Install. fig. 14
12	45502004/45502045	Plug 690V/Plug 400V	1	
13	45512004/47870006	Anchor point, yellow/Spine Anchor	1	
16	45303119	Bracket for top switches	1	
17	45502035	Top stop swich (S1)	1	Manual fig. 10
18	45502036	Emergency top stop switch (S13)	1	Manual fig. 10
19	45303118	Pendant control holder (Shark)	1	Manual fig. 13b
20	45502038	Emergency stop BOX	1	Manual fig. 13b
21		Automatic operation switch	1	
22	45303116	Step (Shark)	4	
23	45512009	Handle for cabin, black	2	
24	45303108	Front for Shark double door	1	
25	45303109	Double door right	1	
26	45303110	Double door left	1	
27	45502033	Double door limit stop switch	1	
28	45502007	Cable 1,5Q Flex yellow/green	0.55	
29	79999562	Eye nut, M8, FZV	1	
30	45303123	Angle for wirebush	1	
31	45512006	Guide for wirebush	2	
	45512023	Counterweight 31 kg		
	45541009	Label lift EN/ES 320 kg		
32	45303128	Bottom stop bar, (Shark)	1	
33	45512064	Wire Ø2.3mm, coated	0.62	
34	45502031	Bottom limit stop swich	1	
35		Safety wire / Drive wire ø8	2	
		Guide wire Ø12mm	2	
	45512005	Shackle, 2 tonnes	2	Manual fig. 13
	45303100	Tripod	2	Install. fig. 8a
	45512060	Threaded rod, M16, FZV, L=330mm	2	Install. fig. 8a
	45515001	Push spring for safety wire	1	Install. fig. 12
	45512011	Counterweight 11 kg for drive wire	1	Install. fig. 12
	45512001	Cable bucket	1	
		Rubber cable 4G1.5/5G1.5/5G2.5	1	
		Connector 690V/Connector 400V	1	
	45512003	Cable suspension	1	Install. fig 9
	45512056	Snap hook, Galv. L=70mm	1	Install. fig 9
	45511001	Wire fix	10	Install. fig. 14

1.2 Part list - Shark L/XL Double door

Pos	Part no.	Part description	Qty	Reference
	45512010	Bracket for wire fix 70	10	Install. fig. 14
36	45303101	Top stop disc	1	Manual fig. 2
	45541020	Quick-guide, English	1	Manual fig. 21
	45541022	Quick-guide, Spanish	1	
	45541031	Label lift EN/ES 240 kg	1	Manual fig. 21
	45541007	Wall label UK/DE	1	Manual fig. 21
	45541027	Serial number plate Shark lift	1	Manual fig. 21
	Driving system X402P/L502P-BSO504E/BSO1004E			
1	45303112 / 45303175	Top: Shark L / Shark XL	1	
2	45303107 / 45303177	Spine: Shark L / Shark XL	2	
3		Safety brake BSO 504E/BSO 1004E.	3	
4	45303121 / 45303176	Guard small for Spine: Shark L / Shark XL	4	
5	45303120 / 45303179	Guard large for Spine: Shark L / Shark XL	5	
11		Traction hoist, X402P/L502P	11	
14	45570001	Roller 1 for spine (Shark)	14	
15	45547002	Roller 2 for spine (Shark)	15	
	Driving system M500-OSL500			
2	45303397	Spine M500 Shark L	2	
1	45303398	Top M500 Shark L	1	
11	45408001	M500 690V CE	11	
	35412013	Rollers Assy M500 Shark L		
	45303400	Cover spine M500 Shark L		
3	45108043	OSL500	3	
	45303401	Bracket OSL500 Shark L		
	45303402	Support OSL500 Shark L		
	Optional			
	45511006	Click on wire fix		
	45511007	Click on wire guide		
	35499287	Roller wire guide	4	Manual fig. 14
	45502142	Remote control transmitter	1	Manual fig. 9
	45502140	Remote control receiver	1	Manual fig. 9
	45502001	Safety light top	2	
	45502002	Safety light bottom	2	
	35499011	Safety bar for sliding door	1	
	35499010 / 35499021	Double button stop: Shark L / Shark XL		
37	35499012/35499022	Top safety stop premounted	1	
38	45512174	Top safety stop Switch	1	
	45502146	Emergency light	1	

1.3 Part list - Shark L/XL Half Roller door

Fig. 1



1.3 Part list - Shark L/XL Half Roller door

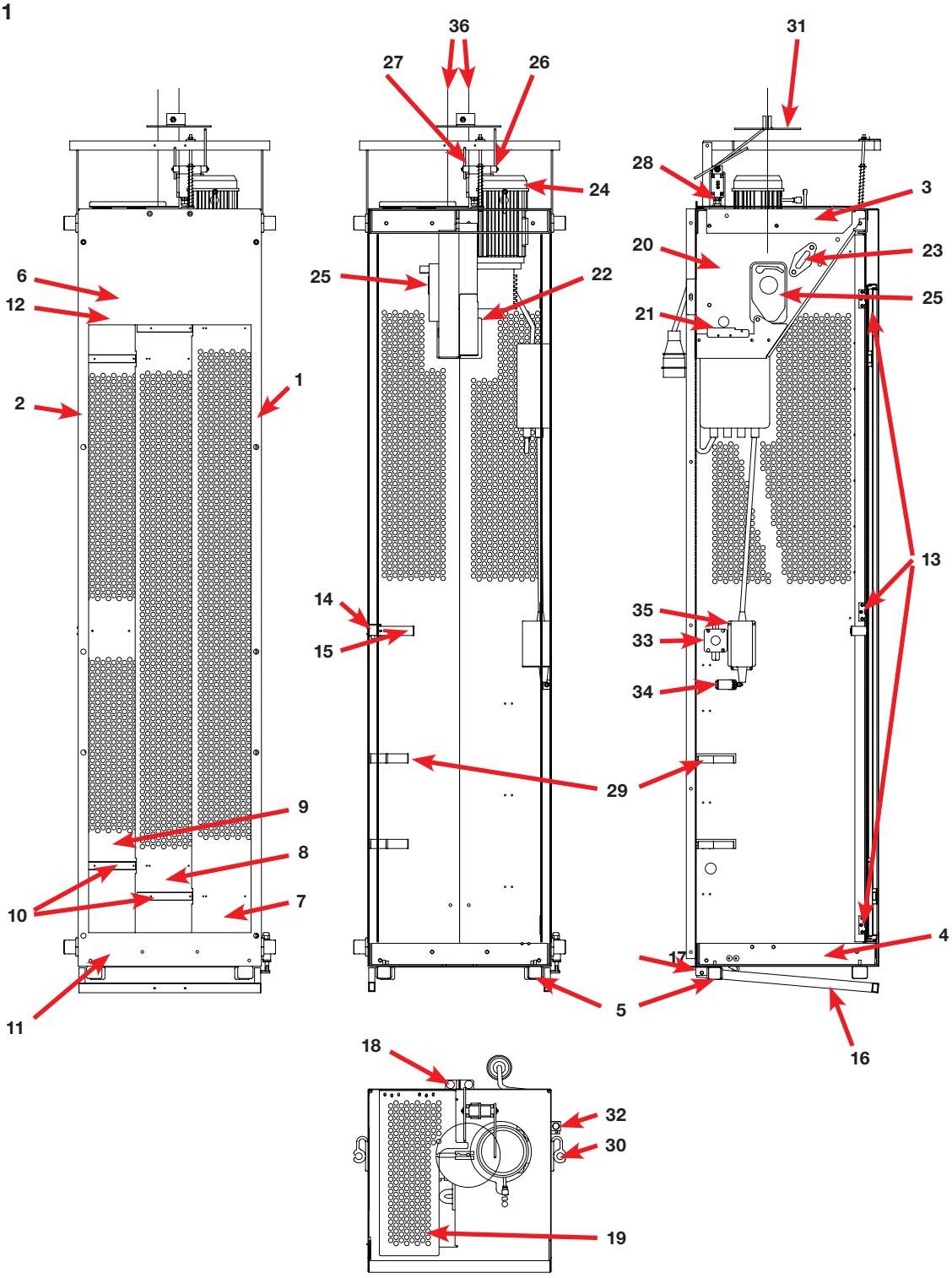
Pos	Part no.	Part description	Qty	Reference
6	45303105 / 45303180	Cabin, right: Shark L / Shark XL	1	
7	45303106 / 45303181	Cabin, left: Shark L / Shark XL	1	
8	45303111 / 45303178	Bottom: Shark L / Shark XL	1	
9	45303321	Hatch for half roller door	1	
10	45511002	Wire guide	4	Install. fig. 14
	45502004/45502045	Plug 690V/Plug 400V	1	
12	45303369	Top stop switch bracket	1	
13	45512004/47870006	Anchor point, yellow/Spine Anchor	1	
16	45303119	Bracket for top switches	1	
17	45502194	Top stop swich (S1)	1	
18	45502036	Emergency top stop switch (S13)	1	Manual fig. 10
19	45303118	Pendant control holder (Shark)	1	Manual fig. 13b
20	45502038	Emergency stop BOX	1	Manual fig. 13b
21		Automatic operation switch	1	
22	45303116	Step (Shark)	4	
23	45512009	Handle for cabin, black	2	
24	35499272	Set half roller door	1	
25	45303156	Front fence top	1	
26	45303157	Front fence bottom	1	
27	45502150	Switch for half roller door	1	
28	79999562	Eye nut, M8, FZV	1	
29	45303123	Angle for wirebush	1	
30	45512006	Guide for wirebush	2	
31	35499294/35499317	Bottom stop full cover Shark L/Shark XL	1	
32	45502170	Bottom limit stop switch	1	
33		Safety wire / Drive wire ø8	2	
34		Guide wire Ø12mm	2	
	45512023	Counterweight 31 kg		
	45541009	Label lift EN/ES 320 kg		
	45512005	Shackle, 2 tonnes	2	Manual fig. 13
	45303100	Tripod	2	Install. fig. 8a
	45512060	Threaded rod, M16, FZV, L=330mm	2	Install. fig. 8a
	45515001	Push spring for safety wire	1	Install. fig. 12
	45512011	Counterweight 11 kg for drive wire	1	Install. fig. 12
	45512001	Cable bucket	1	
		Rubber cable 4G1.5/5G1.5/5G2.5	1	
		Connector 690V/Connector 400V	1	

1.3 Part list - Shark L/XL Half Roller door

Pos	Part no.	Part description	Qty	Reference
	45512003	Cable suspension	1	Install. fig 9
	45512056	Snap hook, Galv. L=70mm	1	Install. fig 9
	45511001	Wire fix	10	Install. fig. 14
	45512010	Bracket for wire fix 70	10	Install. fig. 14
	45541020	Quick-guide, English	1	Manual fig. 21
	45541022	Quick-guide, Spanish	1	
	45541031	Label lift EN/ES 240 kg	1	Manual fig. 21
	45541007	Wall label UK/DE	1	Manual fig. 21
	45541027	Serial number plate Shark lift	1	Manual fig. 21
	Driving system X402P/L502P-BSO504E/BSO1004E			
1	45303112 / 45303175	Top: Shark L / Shark XL	1	
2	45303107 / 45303177	Spine: Shark L / Shark XL	2	
3		Safety brake BSO 504E/BSO 1004E.	3	
4	45303121 / 45303176	Guard small for Spine: Shark L / Shark XL	4	
5	45303120 / 45303179	Guard large for Spine: Shark L / Shark XL	5	
11		Traction hoist, X402P/L502P	11	
14	45570001	Roller 1 for spine (Shark)	14	
15	45547002	Roller 2 for spine (Shark)	15	
	Driving system M500-OSL500			
2	45303397	Spine M500 Shark L	2	
1	45303398	Top M500 Shark L	1	
11	45408001	M500 690V CE	11	
	35412013	Rollers Assy M500 Shark L		
	45303400	Cover spine M500 Shark L		
3	45108043	OSL500	3	
	45303401	Bracket OSL500 Shark L		
	45303402	Support OSL500 Shark L		
	Optional			
	45511006	Click on wire fix		
	45511007	Click on wire guide		
	45502142	Remote control transmitter	1	Manual fig. 9
	45502140	Remote control receiver	1	Manual fig. 9
	45502001	Safety light top	2	
	45502002	Safety light bottom	2	
	35499011	Safety bar for sliding door	1	
	35499010 / 35499021	Double button stop: Shark L / Shark XL		
	35499287	Roller wire guide		Manual fig. 14
35	35499296	Top limit stop for top floating stop Shark L/XL	1	
36	35499295/35499318	Top floating stop premounted Shark L/Shark XL	1	

1.4 Parts list - SHARK M

Fig. 1



1.4 Parts list - SHARK M

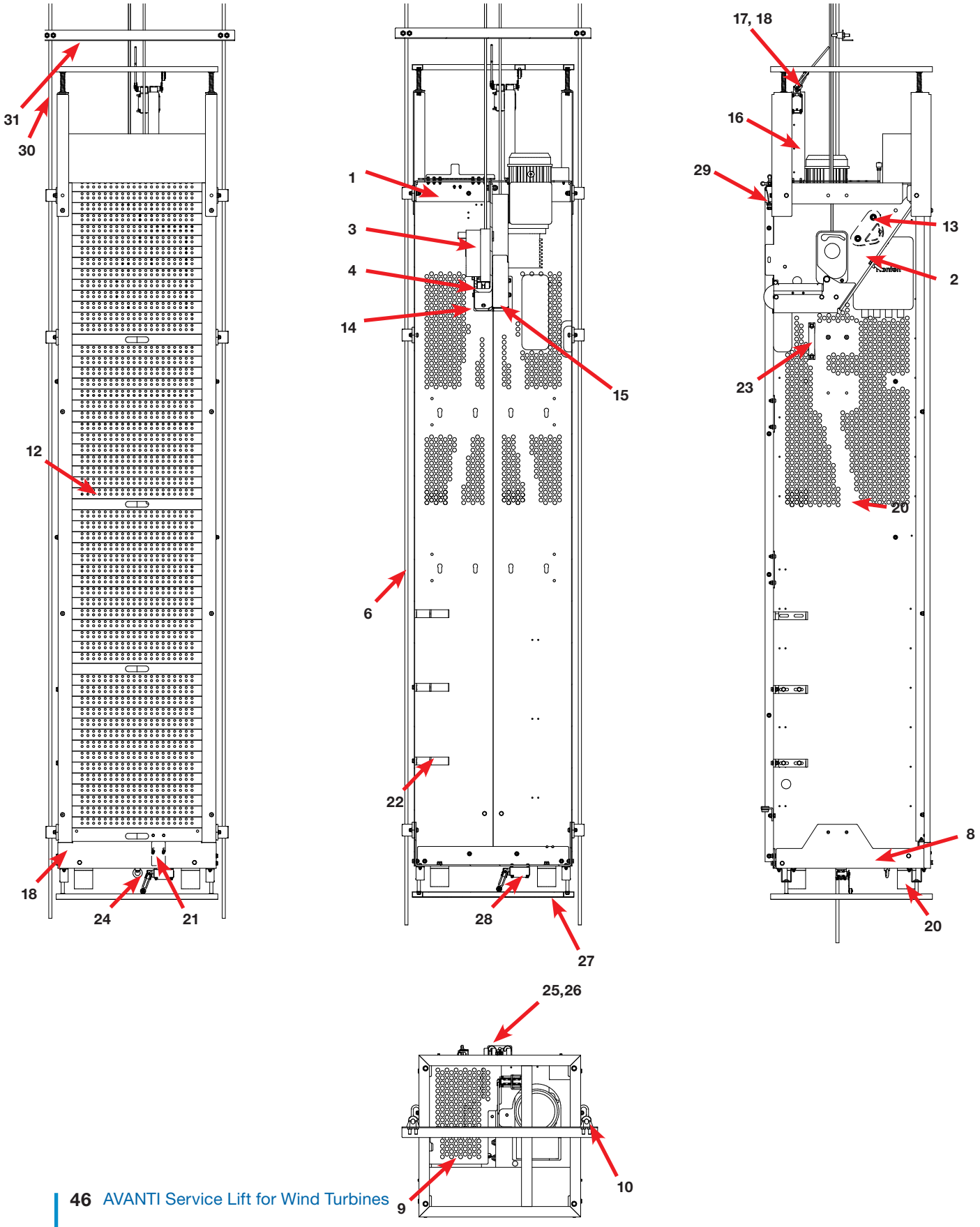
Pos.	Item no.	Part description	Qty	Reference
1	45303300	Cabin right (Shark M)	1	
2	45303301	Cabin left (Shark M)	1	
3	45303312	Top (Shark M)	1	
4	45303306	Bottom (Shark M)	1	
5	45512007	Landing rubber feet	4	
6	45303305	Sliding door fixture (Shark M)	1	
7	45303302	Sliding door w. hinge (SharkM)	1	
8	45303303	Sliding door middle (Shark M)	1	
9	45303304	Sliding door extreme (Shark M)	1	
10	45303314	Slide for Sliding door	4	
11	45303307	Bottom door guide (Shark M)	1	
12	45303308	Top door guide (Shark M)	1	
13	45512008	Hinge for double door	3	
14	45502037	Sliding door limit stop swich, Shark L,S19.3,3500mm	1	
15	45303124	Sliding door handle,Shark L	1	
16	45303310	Bottom stop (Shark M)	1	
17	45303311	Bottom stop holder(Shark M)	1	
18	45512006	Guide bush for pulling wire	2	
19	45303057	Hatch for Shark M	1	
20	45303107	Spine for Shark L	1	
21	45303121	Small cover for spine, Shark L	1	
22	45303120	Large cover for spine, Shark L	1	
23	45512004/47870006	Anchor point, yellow/Spine Anchor	1	
24		Traction hoist, X402 / M500	1	
25		Safety brake BSO504E / OSL 500	1	
26	45502040	Top stop switch, Shark M,(S1)	1	
27	45502041	Emergency top stop switch, Shark M,(S13)	1	
28	45303119	Bracket for limit stop switch	1	
29	45303005	Step for Shark L	2	
30	45511003	Wire guide, low	4	

1.4 Parts list - SHARK M

Pos.	Item no.	Part description	Qty	Reference
31	45303101	Top stop disc	1	
32	45502034	Bottom limit stop switch Shark L,1S2,3000mm	1	
33	45502038	Emergency stop box	1	
34		“automatic operation” switch	1	
35	45303118	Cover for pendant control	1	
36		Motor/safety wire Ø8mm	2	
		Guide wire Ø12mm,78m	2	
	45502004	Female connector 690V	2	
	45502026	Insulated terminal 1,5Q, black	1	
	45512001	Cable collect bin	1	
		Rubber cable 4G1,5 78m 3 phases + ground 690V	1	
	45541019	Quick guide multiple language	1	
	45512060	Threaded rod,M16x330mm FZV	2	
	45515001	Safety wire push spring	1	
	45303100	Tripod	2	
	45512005	Shackle 2T	4	
	45512011	Motor wire contra weight,11kg	1	
	45540005	CE conformaty declaration	1	
	45541020	Quick guide UK	1	
	45541022	Quick guide ES	1	
	45541008	Wall label UK/ES	1	
	45541025	Label Use Fall Protection	1	
	Optional			
	45511006	Click on wire fix		
	45511007	Click on wire guide		
	45502142	Remote control transmitter	1	Manual fig. 9
	45502140	Remote control receiver	1	Manual fig. 9
	45502001	Safety light top	2	
	45502002	Safety light bottom	2	
	35499010	Double button stop		

1.5 Parts list - SHARK M roller door

Fig. 1



1.5 Parts list - SHARK M roller door

Pos	Part no.	Part description	Qty	Reference
1	45303326	Top Shark M roller door	1	
2	45303107	Spine	1	
3		Safety brake BSO 504E/BSO 1004E/OSL500. 1	1	
4	45303121	Guard small for Spine (Shark)	1	
5	45303120	Guard large for Spine (Shark)	1	
6	45303331	Cabin right Shark M GE	1	
7	45303332	Cabin left Shark M GE	1	
8	45303327	Bottom Shark M roller door	1	
9	45303325	Top hatch Shark M roller door	1	
10	45511002 / 45511003	Wire guide long / Wire guide narrow	4	Install. fig. 14
11		Traction hoist, X402P/L502P/M500 1	1	
12	45512188	Roller door (Shark M)	1	
13	47870006	Spine Anchor	1	
14	45570001	Roller 1 for spine (Shark)	2	
15	45547002	Roller 2 for spine (Shark)	2	
16	45303340	Top stop switch bracket roller door	1	
17	45502165	Top stop switch S1	1	
18	45502166	Top limit switch S13	1	Manual fig. 10
19	45303333	Door switch bottom protection	1	Manual fig. 13b
20	45512183	Landing rubber feet 70x70	1	Manual fig. 13b
21	45502162	Roller door switch	1	
22	45303005	Step	4	
23	45512009	Handle for cabin, black	2	
24	79999562	Eye nut, M8, FZV 1	1	
25	45303123	Angle for wirebush 1	1	
26	45512006	Guide for wirebush 2	1	
27	35499281	Bottom safety stop premounted Shark M	1	
28	45502164	Bottom limit switch S2	1	
29	45502163	Hatch switch	1	
38	45303101	Top stop disc		

1.5 Parts list - SHARK M roller door

Pos	Part no.	Part description	Qty	Reference
		Safety wire / Drive wire ø8		
		Guide wire Ø12mm		
	45512005	Shackle, 2 tonnes		
	45303100	Tripod		
	45512060	Threaded rod, M16, FZV, L=330mm		
	45515001	Push spring for safety wire		
	45512011	Contra weight 11 kg for drive wire		
	45512001	Cable bucket		
		Rubber cable 4G1.5 /5G1.5		
		Connector 690V/Connector 400V		
	45512003	Cable suspension		
	45512056	Snap hook, Galv. L=70mm		
	45511001	Wire fix		
	45541020	Quick-guide, English		
	45541022	Quick-guide, Spanish		
	45541031	Label lift EN		
	45541007	Wall label UK/DE		
	45541025	Warning sign - hook on to anchor point		
	45541027	Serial number plate Shark lift		
	Optional			
	45511006	Click on wire fix		
	45511007	Click on wire guide		
	45502142	Remote control transmitter		
	45502140	Remote control receiver		
	45502001	Safety light top		
	45502002	Safety light bottom		
	45502146	Lift emergency light		
30	35499280	Top safety stop premoun. Shark M		
31	35499285	Top stop end Shark M		

2. Fitting the wires

2.1 Tower top

Wire lengths depend on the tower height and should be specified when ordering. The coils are marked with their length; check for accuracy prior to mounting. Do not pull wire over any edges. Uncoil correctly (Fig. 5a).

Warning!
Do not pull wire over edges.

Important!
Place all wire coils on the top platform when tower is raised or use the tower mounting crane to place the wires on the top platform before nacelle is mounted. (It may also be possible to use the internal tower crane to hoist wires).

1) Mount the Ø12 mm guide wire and the Ø8 mm drive and safety wires using the shackles supplied for the suspension beam at the top of the tower, with the guide wire outermost on either side. (Measures: See Fig. 6 and dimensions page 45).
2) Fit the nuts and bolts. Lock with cotters.
3) Fit the top stop disc on the suspension wire leaving at least 200mm between disc and shackle (See Fig. 5).
4) Feed all wires to the bottom of the tower (See Fig. 5).

Fig. 5

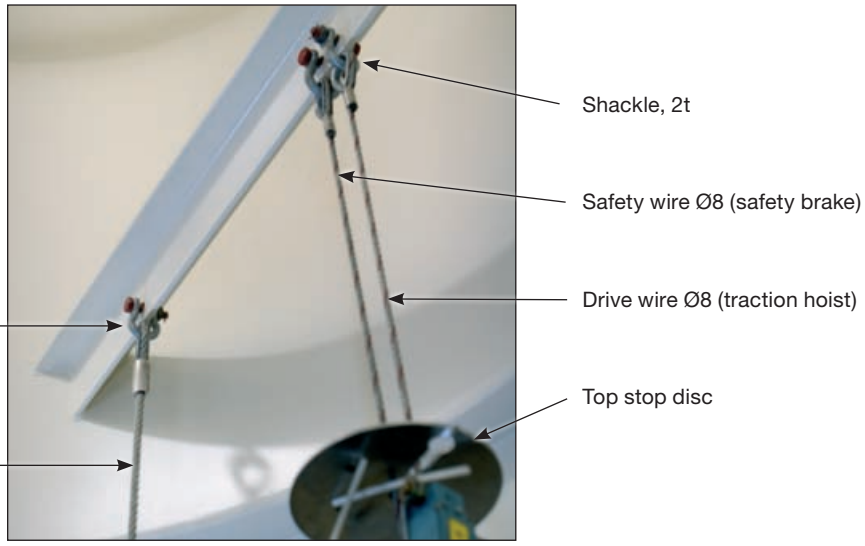
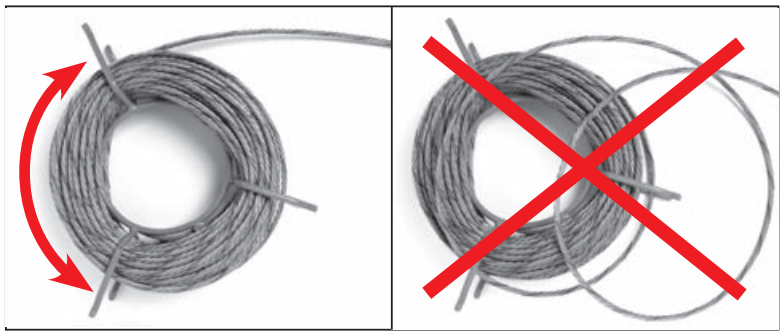


Fig. 5a

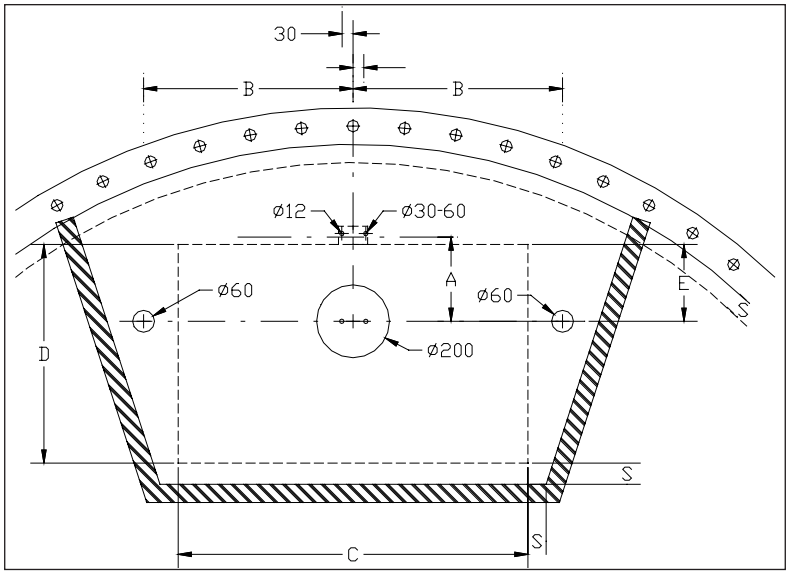


IMPORTANT!
All wires are evenly uncoiled as shown in Fig. 5a to prevent looping.

2.2 Wire positioning measurements

Holes in the base platform in the tower for wire bushing are positioned as outlined below.

Fig. 6



Minimum shaft clearance dimensions required for the service lift to run, and distance between the guide wires.

Dimensions:

Shark	A	B[1)]	C	D	E	S
M	250	395/330	600	600	220	50
L	250	575/510	960	600	220	50
XL	350	575/510	960	800	320	50

1) Standard wire guide/narrow wire guide (details page 46).

The holes are positioned with a tolerance of +/-5 mm. Holes with diameter Ø200 mm are fitted with rubber edging.

Warning!
Ensure that no obstacles are in the way of the service lift.

DANGER!
Ensure that lift evacuation to the tower ladder is possible.

2.3 Securing the guide wire - ground level

IMPORTANT:
Before feeding the guide wires through the platform, fit the correct number of wire fixes on the wire and feed through the wire guides (See Fig. 7 and Fig. 14 page 52). The wire fixes are fitted during the first run.

Feed the guide wire through the 2 Ø60mm holes in the platform. Underneath the platform the guide wires are fastened and tightened using one of the following three methods.

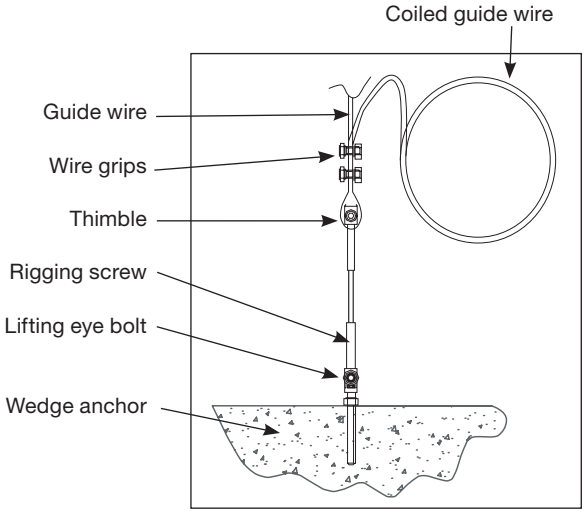
Fig. 7 Wire fix

2.3.1 Method 1: Wedge anchor

Mount wire as shown in Fig. 8 following procedure below.

1) Drill 2 Ø16x75mm holes in the floor underneath the 2 Ø60mm holes in the platform.
2) Fasten the wedge anchors in the holes and mount an M16 lifting eyebolt.
3) After loosening the rigging screw as much as possible, fasten the rigging screw to the eyebolt in one end and the wire using wire grips in the other.
4) Tighten the wire as described in section 2.3.4. (page 47)
5) Excess wire is coiled and hung by means of wire strips. Use at least 3 strips.
6) Mount the second wire.

Fig. 8 Method 1: Wedge anchor



2.3.2 Method 2: Tripod

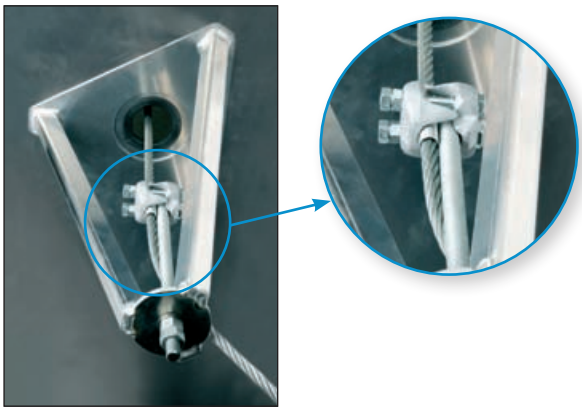
Pull the guide wire through the platform and fasten with the tripod (See Fig. 8a.)

1) After feeding the guide wire through the platform continue feeding the wire through the tripod and the Ø16 mm x 1.5 mm aluminium tube.
2) Lock the aluminium tube, the wire, and the treated rod using a wire locking device. Make sure the tube is placed so no contact is made between the wire and treated rod. (See Fig 8a).
3) Tighten the bolts to 75 Nm
4) Mount the second wire.

ATTENTION!
Check the distance between the wires so that the wire fix and wires are in the centre of the wire guides (See Fig. 6 section 2.2).

ATTENTION!
Tighten the wire locking device after the first run.

Fig. 8a Method 2: Tripod



2.3.3 Method 3: Steel beam

There may be a steel beam beneath the platform intended for lift mounting. If so, use rigging screws as described in method 2.3.1 for mounting the guide wire to the steel beam.

2.3.4 Tensioning the guide wires Ø12 mm

Tighten the wires by hand and mark with a water-resistant marker. Measure the distance to the floor.

- For 60 m long wires, stretch the wire 40 mm.
- For 80 m long wires, stretch the wire 50 mm.
- For 100 m long wires, stretch the wire 60 mm.

For each additional 20 m, stretch the wire by a further 10 mm.

After some time it may be necessary to stretch 60 m wire by another 5mm and longer wire by a further 7-10 mm (all wires stretches after some time).

ATTENTION!
This will tighten the wires to approximately 2000-4000 N.

2.4 Electrical connections

Connections

2.4.1 Power supply

DANGER!

The electrical connection of the traction hoist must be made in accordance with EN 60204-1.

The power supply must be protected by a fuse and an earth leak circuit breaker (30mA).

Disconnect the main power supply before handling power units.

Verify that the rated grid and motor voltages are identical.
The three-phase motor is normally supplied in a star connection configuration:

400 V,	3 phases + t 0 + gnd.	I = 3.5 A	1.5 kW
690 V,	3 phases + gnd.	I = 2.0 A	1.5 kW

Control voltage: 230 V / 240 V
Necessary equipment to comply with EN60204-1 can be supplied by Avanti as an option.

2.4.2 Supply cable

a) The length of the cable depends on the height of the tower and the positioning of the power outlet. The cable length is determined prior to ordering. The power cable is marked with its length; check for accuracy before installing.

b) Minimum cross-sectional dimension of the supply cable. Important with increased distance between grid connection, generator, and traction hoist, respectively:

Table 3	For cable lengths up to...
	190 m
1 hoist	**1.5**
	Cable-cross sectional dimension [mm2]

c) Use heavy rubber cable ducts for fastening live wire to service lift.

d) An installed generator will have to provide at least 2.5 times the output of the traction hoist.

Fig. 9
Cable suspension

Fig. 9b
Power cabinet X402 / L502 M500

2.4.3 Power connection

a) Push the EMERGENCY STOP button

b) Check that the various stop switch cables and safety brake cable are connected to the power cabinet according to colour code.

c) Place or hang the cable collect bin underneath the Ø200 mm hole in the platform.

d) If possible hang the bucket in the full length of the webbing. Keep the webbing as long as possible (Fig. 9c).

e) Cut the transport strips and tape which hold the wire inside the bin and connect the cable suspension (Fig. 9) to the eyebolt underneath the service lift floor.

f) Connect the socket to the lift plug on the back of the lift.

g) Connect the power cable plug to the grid: 400V / 3Ph + 0 + gnd. / 50 Hz
680V / 3Ph + gnd. / 50 Hz Pre-fuse: 16 A.

h) Turn the EMERGENCY STOP button (Fig. 10 and Fig. 10a) clockwise to deactivate.

i) The power is turned on and the green indicator on the electrical control box lit. In order for the service lift to be operational the door must be locked and the HAND/AUTOM switch must be in HAND mode.

The wiring diagram is found in the electrical control box.

Fig. 9c
Cable collect bin

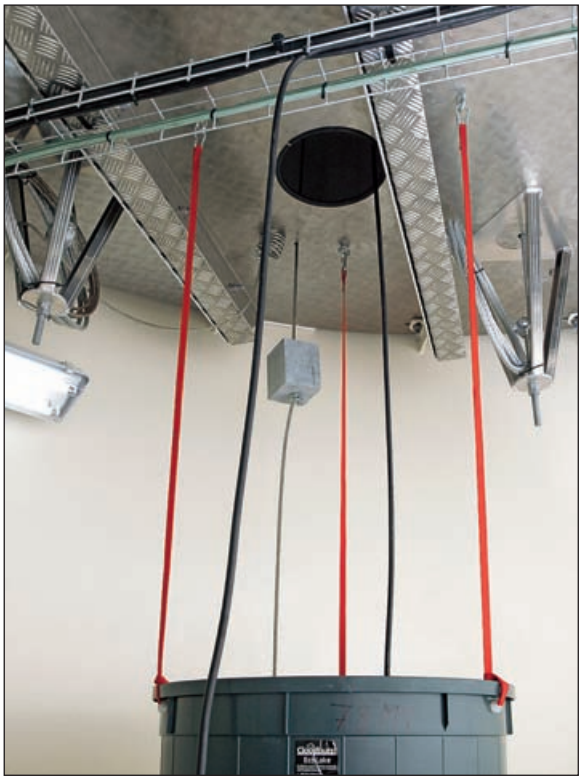


Fig. 10

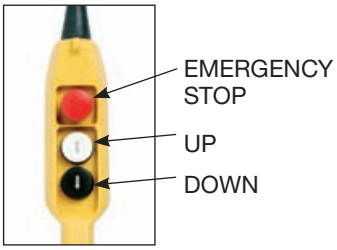
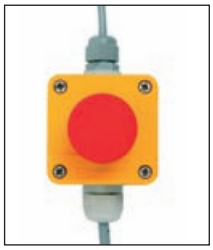


Fig. 10a



Important:
If the traction hoist does not start, two phases in the supply connection might have been switched around the phase protection relay. Remedy: Have an electrician check the phase lay.

2.5 Installation of drive and safety wire in lift

CAUTION!
Wear protective gloves when handling wires.

2.5.1 Drive wire installation

a) Remove protection guard above rollers
b) Feed the wire through the roof into the traction hoist's wire inlet opening. (Right side seen from front of lift).
c) Push the UP button on the pendant control and feed wire through until the traction hoist starts pulling. Ensure that the wire can exit without obstruction!
d) Continue feeding the wire underneath (round) the front guide wheel, over the back guide wheel, and through the back panel.
e) Let the lift wire pass through until it is slightly tightened.
f) Replace roller protection guard.
g) Feed wire through platform floor.

2.5.2 Safety wire installation

a) Remove protection guard above rollers.
b) Open the safety brake gripping device by pushing down the lever until it engages/clicks (Fig. 16 Appendix A). Feed the safety wire through the roof hole above the safety brake and continue by feeding through the safety brake.
c) Like the lifting wire, continue feeding the wire underneath (round) the front guide wheel, over the back guide wheel, and through the back panel.
d) On the back of the lift pull the safety wire to tighten it.
e) Replace roller protection guard.
f) Feed wire through platform floor.

Fig. 11
X402 / L502 M500

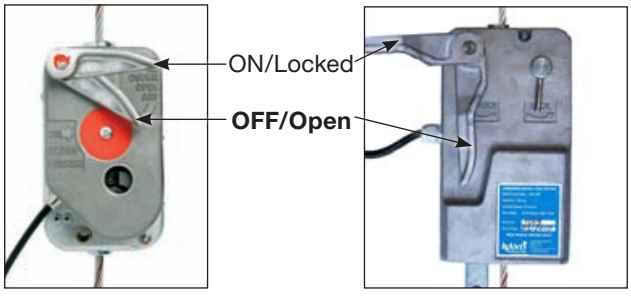
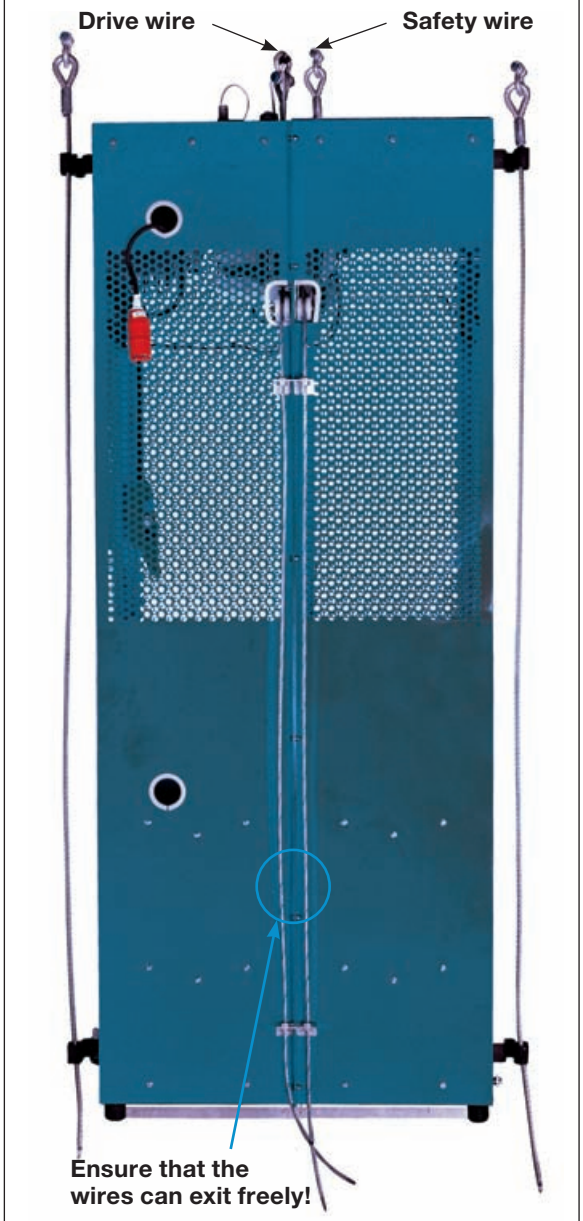


Fig. 12 Back side



Drive wire contra weight

Safety wire push spring

2.6 Securing the drive and safety wire

The drive wire is fastened as described in point 2.6.1 below and the safety wire is fastened in one of three ways described in point 2.6.2, 2.6.3 and 2.6.4.

IMPORTANT!
Before fastening the safety wire carry out the safety brake test (See Installation Manual section 5 e) page 54).

2.6.1 Drive wire contra weight

An 11 kg weight is mounted approximately 300mm below the floor on the drive wire. Excess wire is coiled with at least 3 strips (See Fig. 13).

CAUTION!

DO NOT fix the traction wire below the bottom platform.
The traction wire MUST be hanging freely so it can rotate.

Fig. 13 Drive wire contra weight

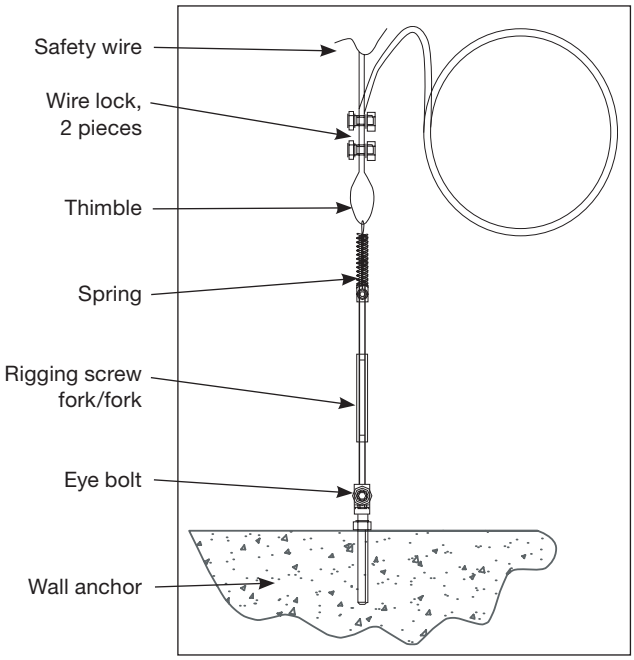
2.6.2 Safety wire method 1: Wedge anchor with spring

As in point 2.3.1 above the wire is fastened using a rigging screw **with spring** (See Fig. 13a). Mounting the safety wire without the spring will cause the safety brake to block frequently. Excess wire is coiled with at least 3 strips.

- At a wire length of 60 m, tighten the rigging screw so the wire stretches 9 mm.
- At a wire length of 100 m, tighten the rigging screw so the wire stretches 15 mm.

This will tighten the wire to approximately 400-500 N (40-50 kg).

Fig. 13a Safety wire method 1: Wedge anchor with spring. Left wire on lift viewed from the front



2.6.3 Safety wire method 2: Push spring

Underneath the platform the wire is fed through the two holes at each end of the push spring. The wire is then tightened as much as possible before being fastened with the wire locking device. If prior to mounting the spring was held tight by strips, cut them loose. If properly tightened, this will stretch the spring by approximately 15 mm (See Fig. 13b).

Fig. 13b Safety wire method 2: Push spring

2.6.4 Safety wire method 3: Steel beam with spring

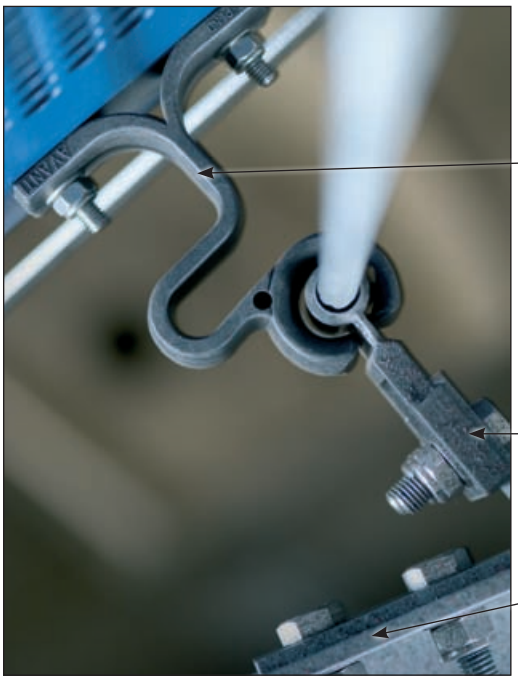
There may be a steel beam beneath the platform intended for lift mounting. If so, use wire screws as described in method 2.6.2 for mounting the safety wire to the steel beam.

2.7 Wire fix alignment

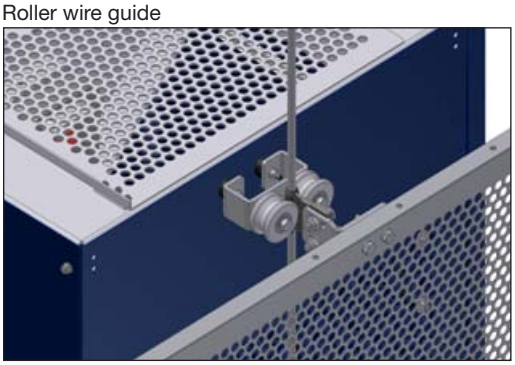
Having mounted the service lift, the wires, and the power, the wire fix fittings are adjusted during the initial ascent.

a) Perform the tests prescribed in section 5 of the User's Manual (page 19).
b) Install wires as shown in Fig. 14.

Fig. 14



Roller wire guide



By means of the oblong holes in the wire fix fittings, adjust the fittings so that the two parts pass each other easily, when the lift passes.

Clic-on wire guide

Clic-on wire fix

Standard wire guide

Narrow wire guide

CAUTION!
Wire fixe must be mounted on guide wires on all platforms with max. 30 m between each wire fix.

ATTENTION!
During the first run make sure the power cable untwists evenly.

ATTENTION!
If tripods are used for guide wire fixing tighten the wire locking device after the first run.

2.8 Adjustment of the safe-zone plates (Full open door lifts)

The service lift door should be able to be opened whenever the cabin is in alignment with the platform (tolerance ± 100 mm).

The safe-zone plate is adjusted in relation to the platform position switch fixed on the cabin (see Fig. 15).

Fig. 15

2.9 Adjustment of top stop disc

The top stop disc is adjusted so the top limit stop switch stops the lift in alignment with the top landing platform, however at least 200 mm before contact with the wire thimble.

The emergency limit stop switch is a backup. It is adjusted so it stops the lift in case the operation limit stop switch fails (See Fig. 10 on page 19 of the User's Manual).

The emergency limit stop shuts off the control, just like an emergency stop. If the emergency limit stop is activated, lowering can only be done manually as described on page 23 of the User's Manual. Manual lowering will activate the lift again.

3. Danger zone! sticker

Mount the "Danger Zone" sticker in the tower behind the lift and the yellow marking ribbon on the floor. Make sure the wall and platform are clean and dry before attaching the sticker and ribbon.

DANGER!

Make sure that nobody is exposed to danger below the service lift, for instance from falling parts.
Suitable measures: Pent roof or barriers.

The service lift is now ready for use.

Prior to use, however, carry out the inspection specified in Installation Guide section 5!

4. Disassembling

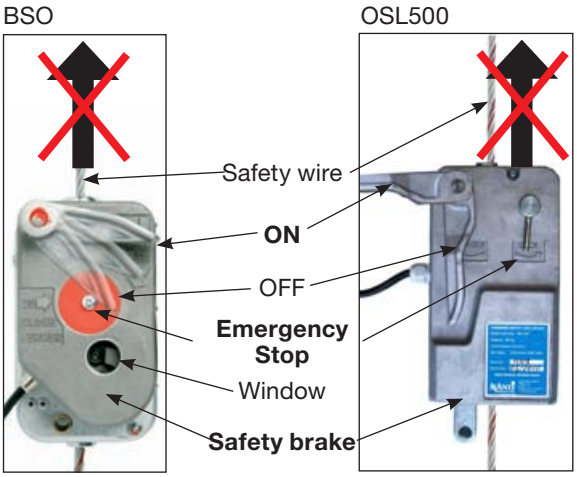
Disassemble in reverse order and dispose of in accordance with local authority regulations.

5. Inspection before initial use

An officially recognised expert must:

a) Inspect the lift as specified in section 12.1 of the User's Manual.
b) Carry out a test run with the maximum rated load.
c) Overload test: The test load depends on the lift motor. Load the cabin as follows:
Motor L402P: load kg 320 (125% of lifting capacity + weight of power cable). Motor L502P: load kg 420. When an attempt is made to start the lift, the platform should stop, and the buzzer in the connection cabinet should sound.
– If not, see Appendix A: "Adjusting instructions for overload limiter" on page 55.
d) The guide, drive and safety wires as well as the top and bottom wire fastenings must be tested at full length as part of the initial test run.

Fig. 15



e) Testing of the **safety brake safety gripping device:**

Important!
Before testing, the tightening spring beneath the access platform must be removed. Remember to secure it again after testing (Fig. 13a or 13b pages 50-51)!

DANGER!
If the safety brake safety gripping device is engaged, it must not be possible to pull the safety wire upwards!

1) Engage the safety brake by pressing the stop button – the handle should jump to the "ON" position (Fig. 15).
Should it nevertheless be possible to pull the safety wire upwards, the safety brake must be replaced and sent to the supplier for testing.
2) Reopen the safety brake by pressing down on the lever. On top of the lift, pull up the safety wire with a quick jerk – the safety brake should now engage automatically; if it does not, replace it and return to the supplier for testing.

f) If guide wires are mounted using the tripod, tighten the tripod wire locking device.

The results from this test must be recorded in writing and saved for later reference (Appendix B page 59).

Appendix A:
Regulation of overload limiter

CAUTION!
Avoid injuriy by strictly following the instructions!

a) Verification and/or adjustment of the overload device on the service lift can only be done by a qualified person, who must have been instructed by AVANTI to perform this task.
b) Verification and/or adjustment must be performed under the supervision of the site foreman or another person authorised by the manufacturer.
c) One copy of this instruction must be provided to the personnel and always be available.
d) Alterations/modifications of the service lift other than those necessary for adjusting the overload device are not allowed, unless the manufacturer has agreed in writing.
e) AVANTI assumes no liability for damage due to retrofitting/alterations to equipment or where non-original spare parts are used, which have not been approved by the company in writing, especially the prescribed traction hoist wire rope.
f) The manufacturer of the service lift assumes no liability for damage due to retrofitting or alterations to equipment or where non-original spare parts are used, which have not been approved by the company in writing. In the event of violation, the CE certification approval becomes invalid.
g) The result of the verification/adjustment of the overload device must be written down in the "Test report of annual inspection" and signed by the supervisor. If only adjusting takes place (no annual inspection) simply fill in point 6.9 and sign.

1 Purpose of this instruction

It is possible that the overload limited inside the traction hoist of the service lift stops upwards travel even through the service lift is not overloaded.

1) With older hoists you may need an allen key size 6.

Where other causes can be excluded by following the instructions of section 2.2, the overload limiter must be adjusted according to section 3.2.

2 Adjusting instruction

2.1 Preparation

Required tools/material:
- Allen keys, size 2 and 4 [1] - X402P & L502
- **Security TX40** - M500
- Ballast for applying the **test load;**
Note! Before driving to the service lift make sure that the service lift can be loaded with the **permissible test load,** i.e. "safe working load" + weight of power cable + 25%.

IMPORTANT!
Before leaving for the tower make sure you bring the required test load of 300-400kg.

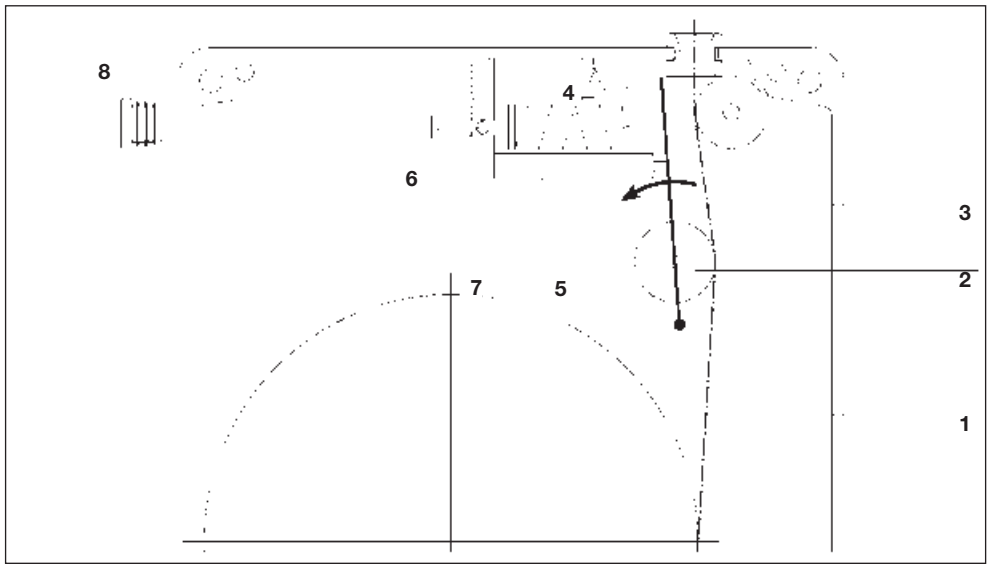
We recommend:
- weighing personnel who may climb into the lift during the test procedure, and
- bringing adequate **weighed ballast** (sandbags or similar).

2.2 Exclusion of other causes

Before modifying the overload limiter settings **check if the upwards travel stopping is caused by other reasons:**
a) If the cage is guided by wire ropes or ladder: Check for **obstructions** on the **guiding** device(s) and remove them.
b) Check that the **wire rope moves freely at the diverter** or similar:
- Is the rope blocked/pinched at any point?
- Do the pulleys freely rotate? (Check with the service lift set to ground with no load on the ropes, or by a person from outside the cage, when going up and down.)
c) When starting, does the **primary brake open?** You can hear the "click" sound or feel a mechanical shock when putting your hand on the motor fan cover.

In the cases b) or c) **have the problem corrected/repaired by a qualified person.**

Fig. 16



3 Overload limiter

a) Place the service lift on the lowest travel point
b) Apply the Setup load + 20 Kg from the table depending on the tower height.
c) Push the UP button. If the lift can go up modify the adjustment of the overload system until it is no longer possible to go UP following the procedure below:
   1. Loosen the set screw (7) in the casing cover with an Allen key (size 2)
   2. Remove the cap (8). Place an Allen key (size 41, 150 mm long) into the adjusting screw (6)
   3. Turn the adjusting screw (6) clockwise, until the test load can be lifted.
   4.Gradually reduce the trigger point of the limit switch (4) by means of the adjusting screw (6), until the test load can no longer be lifted: 1) Turn the adjusting screw by 1/4 turn anticlock wise to reduce the trigger point; 2) Press the UP-button
d) Apply Setup load. Push the UP button and verify the lift can go up. If not, return to b) until the lift is able to go UP with Setup load but is not able to go UP with Setup load + 20 Kg
e) Apply **Lift WLL** and verify that it can perform the travel to the top without triggering the overload limit. If it is not possible verify loads used and return to b), otherwise continue with f)
f) Go back to the lowest point and apply **Overload test load.**
g) Press the UP button and verify the overload is triggered. If it is not triggered verify test loads and return to b), otherwise continue with h)
h) Tighten the set screw (7).
i) Remove the tools.
j) Insert the cap (8) into the casing hole.
k) Fill in the “Annual inspection test report” check point 6.9 and sign.

OVERLOAD TABLE

LOAD CAPACITY = 240 Kg

LIFT WLL	240	Kg
CABIN WEIGHT	110	Kg
CABLE AND WIRE ROPE	0,45	Kg/m
HOIST WLL	400	Kg

WTG HEIGHT (m)	SETUP LOAD (KG)	OVERLOAD TEST LOAD (KG)
67	290	370
78	295	370
100	305	370

LOAD CAPACITY = 320 Kg

LIFT WLL	320	Kg
CABIN WEIGHT	120	Kg
CABLE AND WIRE ROPE	0,51	Kg/m
HOIST WLL	500	Kg

WTG HEIGHT (m)	SETUP LOAD (KG)	OVERLOAD TEST LOAD (KG)
67	374	485
78	380	485
100	391	485

SETUP LOAD = WLL Lift + WTG height x Wire rope linear weight + Tolerance Overload device < 1,25 x (WLL Hoist - CABIN WEIGHT)
OVERLOAD TEST LOAD[1] = WLL Hoist x 1,25 - CABIN WEIGHT - TOLERANCE OVERLOAD device

NOTE 1: Acc. To EN1808 8.3.5.5
Tolerance overload device = 20 Kg

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9th CE Edition: July 2010
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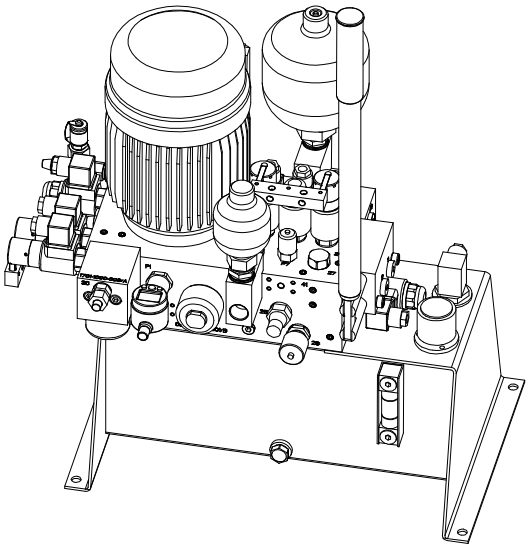
Name:	MEH-10100139-813
Date:	01.11.2007
Revision:	E

Installation and Maintenance Manual

HYDRAULIC
BRAKE CONTROL UNIT
1010-0139-813



SVENDBORG BRAKES

Table of content

1. General

Thank you for buying a Svendborg Brakes product.
Before using the product please read this manual carefully.

1.1 Who to contact

In case you have any questions to this manual please contact your local representative or nearest Svendborg Brakes Office:

Svendborg Brakes Offices:

Denmark:
Jernbanevej 9, DK-5882 Vejstrup
Tel +45 63 255 255
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Kirchnerstrasse 42, DE-32257 Bünde
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Tel: +34 975 233 655
E-Mail: sb@svendborg-brakes.es

USA:
. P.O. Box 1948, Denver, CO 80201-1948
Tel: +1 303 285 1271
E-Mail: sb@svendborg-brakes.us

or visit us at:
www.svendborg-brakes.com

1.2 Safety

The Svendborg Brakes brake line of products are designed to be mounted on a rotating brake disc for use in conjunction with parking brake applications, service brake applications or emergency brake applications only.

Note:

- Always make sure that you consult Svendborg Brakes A/S before using tools or any other equipment not recommended / specified in this manual.
- In order to maintain the guarantee always use original spare parts from Svendborg Brakes A/S.
- It is the customer's responsibility that the brake and hydraulic aggregate are always clean, and free from dirt, grease or oil.
- It is the customer's responsibility that the air gap between brake pads and brake disc never exceeds the air gap recommended.
- Always use a torque wrench when refitting mounting bolts or valves in order to ensure the torque obtained is the torque described in this manual.
- There should be one manual available for the service / maintenance crew as a minimum.

Hydraulic power unit:

- Do not operate the hydraulic power unit before correctly filling the reservoir / oil tank with oil.
- Do not adjust valves or pressure switches to higher operating pressure than specified in the manual.
- Do not change the size or type of components.
- Do not use hydraulic fluids not recommended in this manual.

Brakes:

- Do not operate the brake before removing the air from the hydraulic system by bleeding and then re-filling with oil.
- Do not use higher operating pressures than specified on the nameplate of the brake / or in the manual.
- Do not change the size or type of spring pack.
- Do not use the brake pads when they are worn to the minimum thickness as shown in the manual.
- Do not operate the brake if there is dirt or corrosion protection on disc or brake pads.

Personal safety

Do not work on the brake/ system before:

- The manual has been read and understood.
- The brake disc is locked and not able to rotate before adjusting the brake and / or air gap.
- Locking / securing the brake piston by using the air gap bolt / air gap nut if working on a spring applied brake.
- Being sure there is no pressure on the hydraulic power unit or circuit.
- Being sure the oil pressure in the accumulator(s) has been relieved / removed.
- The control signals has been shut off and blocked before working on the system.
- The electrical power has been shut off

1.3 Conventions used in this manual

To make sure that you perform certain tasks properly, please take note on the following symbols used throughout this manual.

WARNING: Information to prevent personal injury when trying to complete a task.

CAUTION: Information to prevent damage to the components when trying to complete a task.

WARNING: Electrical shock hazard

IMPORTANT: Information that you MUST follow to complete a task.

NOTE: Tips and additional information to aid in completing a task.

Figures within brackets ( ) relate to position number and appendix number i.e. (15-C) refers to position number 15 in appendix C on both drawing and bill of material (parts list).

1.4 Disclaimer

Svendborg Brakes A/S reserves the right to revise this document without prior notification. These documents have been proofread for errors in translation and accuracy. Despite this, technical and typographical deviations can sometimes occur.

This document is updated on a regular basis; changes will be published in future printings. Improvements and/or changes to the described products or manual can be implemented at any time without preceding notice.

In no event shall Svendborg Brakes A/S be liable for any special, incidental, consequential or punitive damages. This includes, but is not limited to: damage to other property or person, inconvenience, loss of goodwill, lost profits or revenue, loss of use of this product or any associated equipment, cost of substitutive equipment, downtime costs or claims of any party such damages, resulting from any misspellings or inaccurate information in this users guide.

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1.5 Transportation

When leaving the factory the hydraulic power unit is always packed / wrapped to ensure maximum security for the product during transport.

CAUTION

If the hydraulic power unit has been sent by air freight - please note that the gas (N2) pressure has been released / removed from the accumulator(s).
A label (see figure 1.1) is then attached to the accumulator.

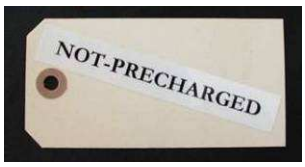


FIGURE 1.1

If the accumulator is not pre-charged it must be recharged before usage. See section 4.10 – “Recharging the accumulator” for details

Normally there is no hydraulic oil in the unit. A warning label is attached to it.

WARNING
FOR TRANSPORT REASONS
THE PUMP IS SHIPPED
WITHOUT OIL
FILL WITH RECOMMENDED OIL
BEFORE STARTING
REFER TO MANUAL

The hydraulic power unit must be filled with oil according to appendix G of this manual before usage. If running dry the pump will be destroyed.

1.6 Lifting

The hydraulic power unit weighs app. 60 kg (132 lbs). If it is necessary to use a lifting harness, under no circumstance place it around valves, gauges or accumulators.
See below how to lift.

If not mounted in cabinet the hydraulic power unit may be lifted in the motor – see figure 1.3.

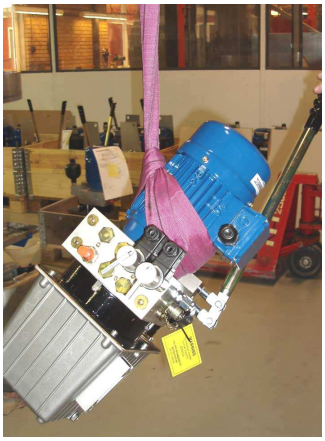


FIGURE 1.3

CORRECT WAY TO LIFT

CAUTION

Do not lift the hydraulic power unit in the valves etc. – see figure 1.4

FIGURE 1.4

WRONG WAY TO LIFT

If the hydraulic power unit is mounted in a cabinet the unit can be lifted by using the lifting point in the supporting frame.

FIGURE 1.5

1.7 Storage

Hydraulic power units must be stored indoor in a clean, dry area. They must be stored in such a way that it can not be damaged by passing or falling objects.
For indoor storage for up to 3 month the hydraulic power unit does not need any surface treatment. For longer periods you should cover it with plastic / a canvas cover to protect it against dirt

1.8 How to order spare parts

When ordering spare parts for your hydraulic power unit please refer to the specific item number in the parts list – see appendices.

For full identification of the hydraulic power unit please note the ID-number labelled on the manifold or on the tank.

FIGURE 1.6

2. Installation and commissioning

2.1 Mounting

In the bottom of the tank are 4 holes D11 for floor mounting.

2.2 Connections

Hydraulic pressure ports on the manifold are size 10L metric male according to DIN 20 078 N

2.3 Before starting the pump unit

Check accumulator before starting – if the accumulator has a warning sign telling that the accumulator has NOT been precharged (in case of air freight – see section 1.5).

Charge the accumulator before usage – see section 4.9 for details.

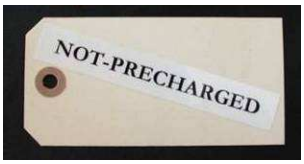


FIGURE 2.1

2.3.1 Fill up the tank on the pump unit with oil of the recommended quality (see appendix G). The oil volume is approx. 9 litres. Fill up the tank as described in section 4.5.4 & 4.5.5

FIGURE 2.2

2.3.2 Electrical connections

WARNING

Connect the valves (20, 22, 23, 24, 25, 26, 31), the motor (4), the pressure switches (41, P1, P2) and the level/thermo switch (5c) to the voltage described in Appendix E.

CAUTION

2.3.3 Start the electric motor.
Check that the rotation of the electric motor is correct as indicated on the motor – i.e. counter clockwise viewed from the fan end.

3. Description of the hydraulic system

3.1 General

The hydraulic unit has been developed to use together with active/failsafe brake calliper from Svendborg Brakes. The pump can be connected to one or more brakes.

3.2 Function

(See the hydraulic diagram section 3.3)

3.2.1 System energy

In the hydraulic system an electro motor (4) and a pump (2) converts electrical power into oil pressure and oil flow.

Pressure is limited by
a) the pressure switch (40) that turns off the motor when the preset pressure is reached
b) a safety relief valve (16).

Pressure is monitored by a pressure switch (40). If pressure drops below the preset value the motor will restart boosting the pressure.

The check valve (17) prevents pressure from going back to tank, when motor stops.

The accumulators (A1, P5) serve as pressure back-up preventing the motor from often restarts.

3.2.2 Applying the rotor brakes - slow
With pressure in the system (motor on) will opening of valve (24) (on) and closing the valves (25, 31) (off) and closing valve (26) (on) transfer and maintain pressure to/in the brakes through the throttle valve (28) applying these. Brakes will remain applied until the valve (25) is opened (on) and (26) is opened (off).

3.2.3 Applying the rotor brakes - quick
With pressure in the system (motor on) will opening of valve (24) (on), opening valve (31) (on) and closing the valves (25 (off) and 26) (on) transfer and maintain pressure to/in the brakes applying these quickly. Brakes will remain applied until the valves (25 (on) and or 26) are opened (off).

3.2.4 Releasing the rotor brakes – reduced torque
Opening valve (25) (on) will relief the pressure in the brakes to a preset pressure set on the relief valve 25.1 to tank which immediately releases the brakes.
It is recommended that valve (24) simultaneously is closed (off). If not the pump will circulate oil through the valves (24 & 25) using energy for no reason.

3.2.5 Releasing the rotor brakes – full torque
Opening valve (26) (off) will relief the pressure in the brakes to tank which immediately releases the brakes.
It is recommended that valve (24) simultaneously is closed (off). If not the pump will circulate oil through the valves (24 & 26) using energy for no reason.

3.2.6 Monitoring
Pressure switch (41) monitors the pressure in the brakes. If this pressure drops below 20 bar this switch gives a warning signal.

3.2.7 Applying the yaw brakes
With pressure in the system (motor on) will opening of valve (20) (off) and closing the valves (22, 23) (off) transfer and maintain pressure to/in the brakes applying these. Brakes will remain applied until the valves (22 and / or 23) are opened (on).

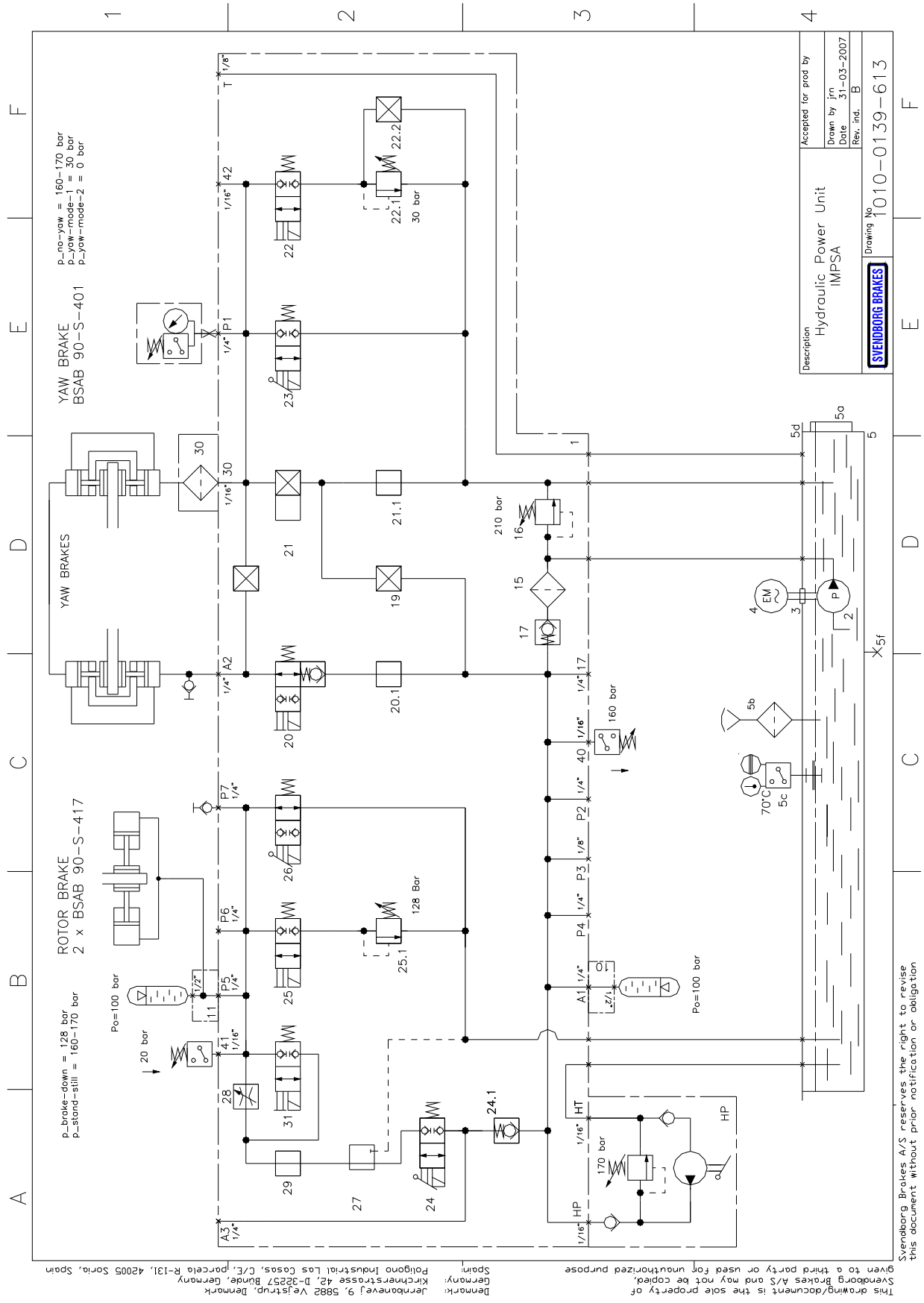
3.2.8 Releasing the yaw brakes reduced torque
Opening valve (22) (on) will relief the pressure in the brakes to tank which immediately releases the brakes to a preset torque.
It is recommended that valve (20) simultaneously is closed (on). If not the pump will circulate oil through the valves (22 & 22) using energy for no reason.

3.2.9 Releasing the yaw brakes full open
Opening valve (23) (on) will relief the pressure in the brakes to tank which immediately releases the brakes.
It is recommended that valve (20) simultaneously is closed (on). If not the pump will circulate oil through the valves (20 & 23) using energy for no reason

3.2.10 Hand pump:
If the rotor brake needs to be activated without the pump running, then it is possible to use the hand pump (HP).
Yaw brakes will be applied.
If the rotor brakes must be applied valve (24) must be opened (on) and valve (26) must be closed (on).
To relief the pressure operate valve (26) by hand.
If the yaw brakes must not be applied valve (20) must be energized or manually overridden. To relief the pressure operate valve (23) by hand.

Important: After using the hand pump the solenoid valves (20, 23, 24, and 26) **must** be left in an open position!

3.3 Hydraulic diagram



4. Maintenance

Maintenance is important for the ability of the hydraulic power unit to control the brakes at any time.
Maintenance consists of inspection and service.

4.1 Inspection

At initial commissioning inspection is done to check if adjustment of the pump unit is necessary.
Later inspection is done on a regular basis.

4.2 Adjustment

A number of components demands the right setting or charging in order to make the braking system work properly.
The correct setting and how to adjust it can be found in Appendix D.
All of these components in a pump unit are pre-set to the right pressure from the factory. They may need adjustment during initial commissioning.

4.3 Checks

By remaining alert and paying close attention to detail it is possible to detect faults in their early stages and so prevent then from developing into more serious malfunctions. This is particular true during the early stages, but also remains true throughout the service life of the pump unit.

A constant look out should be kept for:

- External leaks
- Dirt
- Damage, especially to hoses and pipes
- Unusual noises from pump, electrical motor, valves etc.
- Proper functioning of instruments

Inspection plan	See chapter	Initial commissioning and installation	Service intervals periods after commissioning. Whatever comes first of:
Function			
Test of each valve		Before first real operation	6 months / 1000 h
Hydraulic oil			
Level of oil		Continuous	Monthly / 160 h
If not using the level and termo switch (3 litre tank)		Continuous	Weekly / 40 h
Temperature		Continuous	Monthly / 160 h
Oil condition (sample)			6 months / 1000 h
Oil change			2 years / 4000 h
Filters			
Oil filter cleaning (change if necessary)		After one week	6 months / 1000 h
Air filter change			6 months / 1000 h
Accumulators			
Gas pressure		Daily	6 months / 1000 h
Other checks			According to legal requirements
Adjustments			
Valves etc.		Continuous	6 months / 1000 h
Checks			
External leaks		Daily	Monthly / 160 h or if decresing oil level
Dirt			Monthly / 160 h
Damage		Continuous	Monthly / 160 h
Noises		Continuous	Monthly / 160 h
Instruments / electrical connections		Continuous	6 months / 1000 h

4.4 Function test

Testing component position (see hydraulic diagram)	Component		Explantion
	Before action	Action	
Rotor brakes			
	20:on		Yaw brakes
2, 3, 4, 16, 17, 24, 40, A1	4: off 24: off	4: on	Motor should start and stop at the preset pressure signal from 40. For a period of 10 minutes motor should not re-start proving all connections and the valves 20, 24 are tight. CAUTION: Yaw brakes will be released during this test.
A1, P5, 25, 26, 28, P5 Testpoint: P7	4, 25, 24: off 26: on	24: on	Motor disconnected/off with pressure in the system and all valves closed. Opening 24 should transfer the pressure in the accumulator A1 to the brakes applying these slowly due to the trottle valve 28. Pressure should remain stable for a period of 10 minutes proving the valves 25, 26 and the brakes are tight. Pressure switch 41 shall change stage. CAUTION: Brakes will be applied during this test.
25 Testpoint: P7 Reduced torque	4: off 24, 25: off 26: on	25: on	Opening the valve 25 should drop the oil from the brake, to the preset pressure on the relief valve 25.1, and back to tank. CAUTION: Brakes will be released during this test.
A1, P5, 25, 26, 31, P5 Testpoint: P7	4, 24, 25, 31: off 26: on	24: on 31: on	Motor disconnected/off with pressure in the system and all valves closed. Opening 24 should transfer the pressure in the accumulator A1 to the brakes applying these quickly over valve 28. Pressure should remain stable for a period of 10 minutes proving the valves 25, 26 and the brakes are tight. Pressure switch 41 shall change stage. CAUTION: Brakes will be applied during this test.
26 Testpoint: P7 Full torque	4,24, 26: on 25: off	24, 26: off	Connecting the motor 4 it might start for a short while reboosting the system pressure.Closing valve 24 and opening the valve 26 should drop the oil from the brake and back to tank. Pressure switch 41 shall change stage. CAUTION: Brakes will be released during this test.
26 Testpoint: P7	4, 24: on 25, 26: off	26: on	Closing valve 26 should stop the motor at the preset pressure signal from 40. CAUTION: Brakes will be applied with low pressureduring this test.
Yaw brakes			
	24: off		Rotor brake
2, 3, 4, 16, 17, 20, 40 Testpoint: 17	4: off 20: on	4: on	Motor should start and stop at the preset pressure signal from 40. For a period of 10 minutes motor should not re-start proving all connections and the valves 20 and the brakes are tight. CAUTION: Brakes will be released during this test.
22, 23, P1 Test point: A2	4, 20: on 22, 23: off	20: off	Opening 24 should transfer the pressure in the accumulator A1 to the brakes applying these. CAUTION: Brakes will be applied during this test.
23 fully released	4: on 20, 22, 23: off	23: on	Pressure should remain stable for a period of 10 minutes proving the valves 25, 26 and the brakes are tight.
22 reduced torque	4: on 22, 23: off	22: on	Pressure switch 41 shall change stage.
HP Testpoint: A2, P7	4, 20, 22, 23: off 24: on	operate hand pump	CAUTION: Brakes will be applied during this test.

4.5 Dismantling the power unit

This should only be carried out in an authorised hydraulic workshop. Ask for separate information.

4.6 Changing the oil

WARNING:

4.6.1 Disconnect all power to the hydraulic power unit and relieve all internal oil pressure in the system.

With the drain valve:
Remove the end nut
Open the valve.
The location of the drain is on the side of the reservoir.

4.6.2 Make sure that the whole oil drains into a secondary container for proper disposal.

4.6.3 Close the drain valve and re-fit the end nut.

4.6.4 Refill the oil reservoir to the top level mark in the sight glass located on the reservoir sidewall.

CAUTION

Use only filtered oil of the right viscosity for refilling (see appendix F).

4.6.5 Connect the electrical power again and start the pump. Let the unit run 10 cycles (pressurising/de-pressurising).
With system pressurised bleed the brakes.
With system de-pressurised refill oil if necessary.

4.7 Changing the oil and cleaning the reservoir

4.7.1 Disconnect all power to the hydraulic power unit and relieve all internal oil pressure in the system.

This procedure is recommended always to be carried out in a hydraulic workshop to ensure clean environment.

Empty the reservoir as described in section 4.5.1 & 4.5.2

4.7.2 Unscrew the 4 nuts with a metric spanner

NOTE

Reservoir / tank for 10 litre: 8 mm nut.

4.7.3 Remove the motor and manifold / mounted assembly (40 – 45 kg).

IMPORTANT

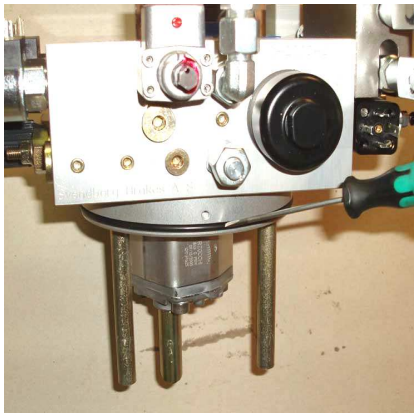
Lift straight up to protect the gasket and all parts.

FIGURE 4.5

4.7.4 Clean the reservoir with a flock free rag.

4.7.5 Refit the motor and manifold / mounted assembly onto the reservoir. Be sure not to damage the gasket during this step.

FIGURE 4.6



4.7.6 Refit the 4 nuts and torque tighten to 5 -10 Nm.

4.7.7 After connecting to power and brakes fill reservoir as described in chapter 4.5.4 & 4.5.5

4.8 Changing the oil filter

4.8.1 Disconnect all power to the hydraulic power unit and relieve all internal oil pressure in the system.

The oil filter is placed in the filter housing.

4.8.2 Using an open end spanner, turn the filter housing counter clockwise until it is disconnected from the filter manifold.

4.8.3 Remove the oil filter and clean the inside of the filter housing and cavity. Insert a new oil filter minding the orientation.

4.8.4 Clean the o-ring and Teflon-ring outside the filter housing.
Renew o-ring and Teflon-ring if necessary.

4.8.5 Refit the filter housing.

4.9 Changing the air breather

4.9.1 Disconnect all power to the hydraulic power unit and relieve all internal oil pressure in the system.

The air breather consists of two parts:
A strainer inside the reservoir and
A filter in the cap

NOTE
3 litre tanks does only have filter in the cap.

FIGURE 4.13

4.9.2 The air breather is connected to the reservoir with three small screws. Remove these screws with a screwdriver.
Remove the air breather along with the seals.

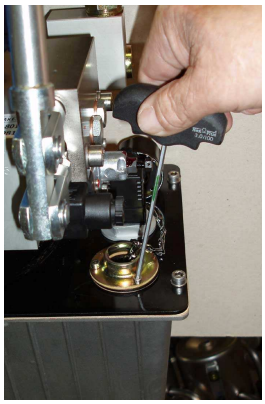


FIGURE 4.14

4.9.3 Mount a new complete air breather and torque tighten the three small screws to 1-2 Nm.

FIGURE 4.15

4.10 Measuring the gas pressure

CAUTION

4.10.1 Disconnect all power to the hydraulic power unit and relieve all internal oil pressure in the system.

Oil pressure must be zero to measure the gas pressure correctly. When working with a hydraulic power unit it is recommended to install two pressure gauges for measuring accumulator pressure and brake pressure.
Unscrew the threaded cap on top of the accumulator

FIGURE 4.16

4.10.2 Using the 6mm Allen key turn the plug by turning it counter clockwise (¼ turn). The screw is now loose without loosing gas

FIGURE 4.17

4.10.3 Mount the gas pressure gauge and close the side valve.

FIGURE 4.18

4.10.4 Open the top valve, measure the gas pressure and close the top valve again.

FIGURE 4.19

4.10.5 If the gas pressure does not meet the required value (see appendix C), the accumulator must be recharged.

4.11 Recharging the accumulator

WARNING

Recharging must be done according to local safety regulations for working with pressure tanks.

FIGURE 4.20

4.11.1 Establish a filling line between the gas pressure valve and a gas tank.
The accumulator charger kit contains gas pressure gauge and filling line.
Remember that the adaptor from the line and to the gas tank is country specific and may need to be ordered separately.

FIGURE 4.21

4.11.2 Open the gas tank valve and the top valve to fill gas into the accumulator.
Close gas tank valve and wait several minutes for the new gas to decline to accumulator temperature.

Measure the gas pressure.

If the pressure is too low apply more gas.

FIGURE 4.22

4.11.3 If the gas pressure is too high open the side valve to relieve gas.
Close the top valve when the gas pressure is correct.

FIGURE 4.23

4.11.4 Open the side valve, relieve the pressure completely and remove the gas pressure gauge.

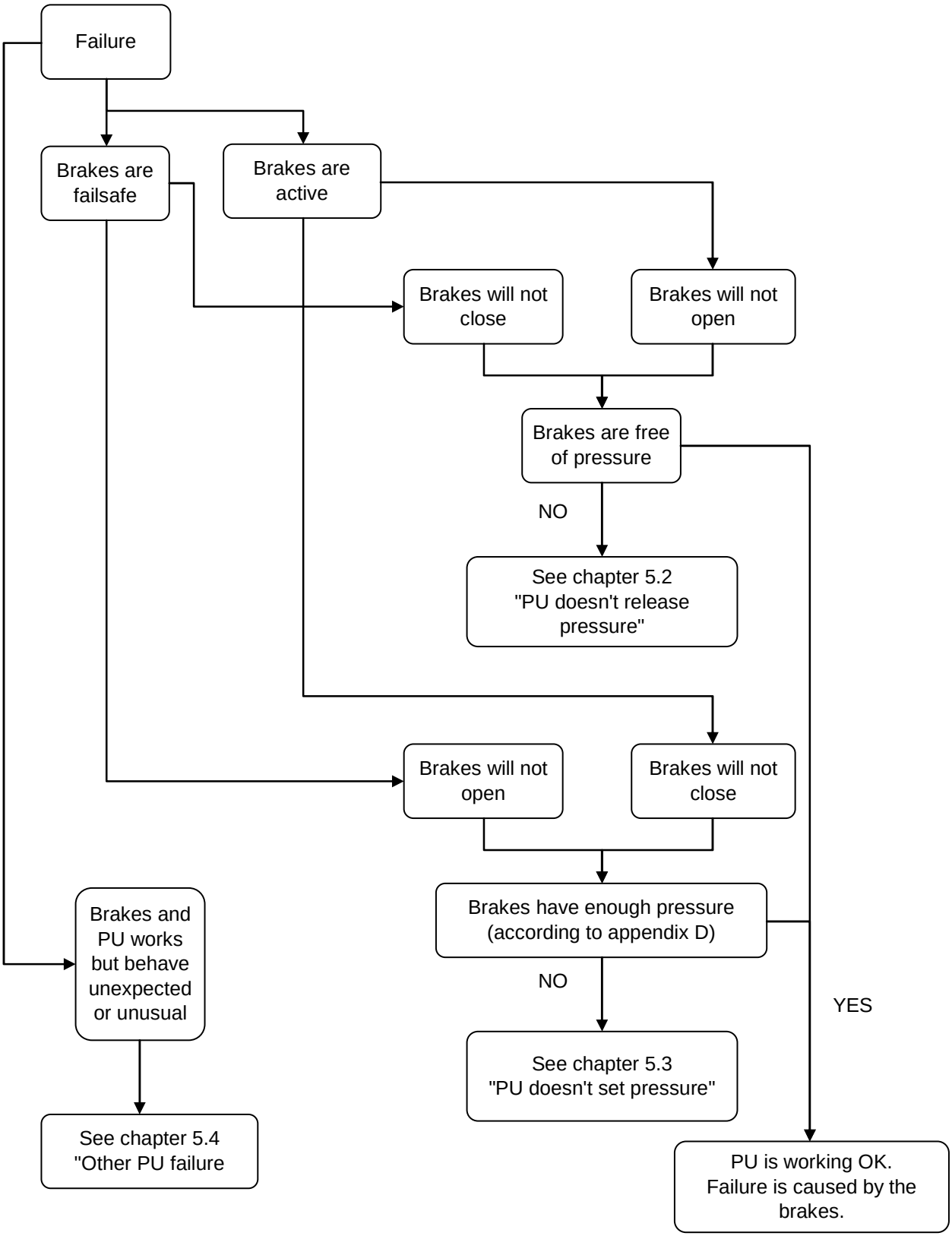
4.11.5 Tighten the plug (18 - 22Nm) using the 6mm Allen key (hexagonal) and mount the threaded end cap by use of hand

FIGURE 4.24

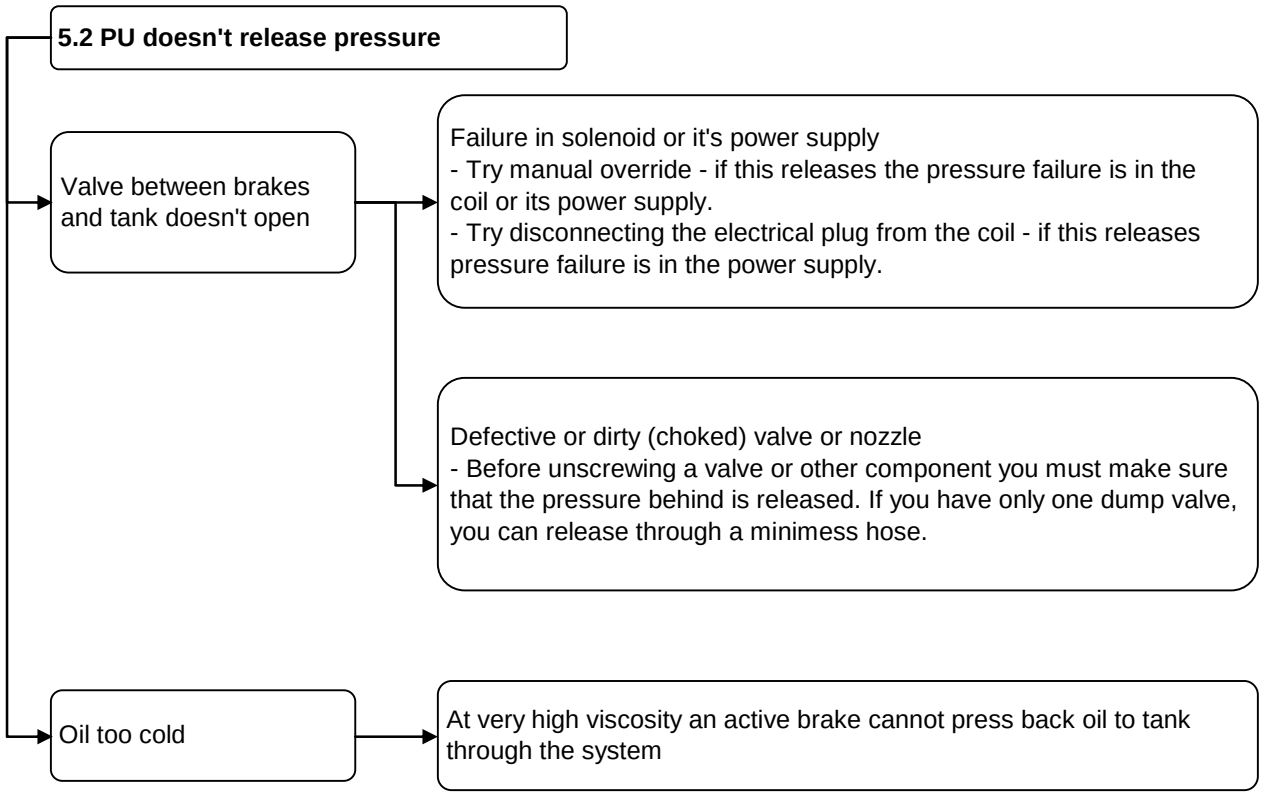
5. Trouble Shooting

5.1 Failure intro

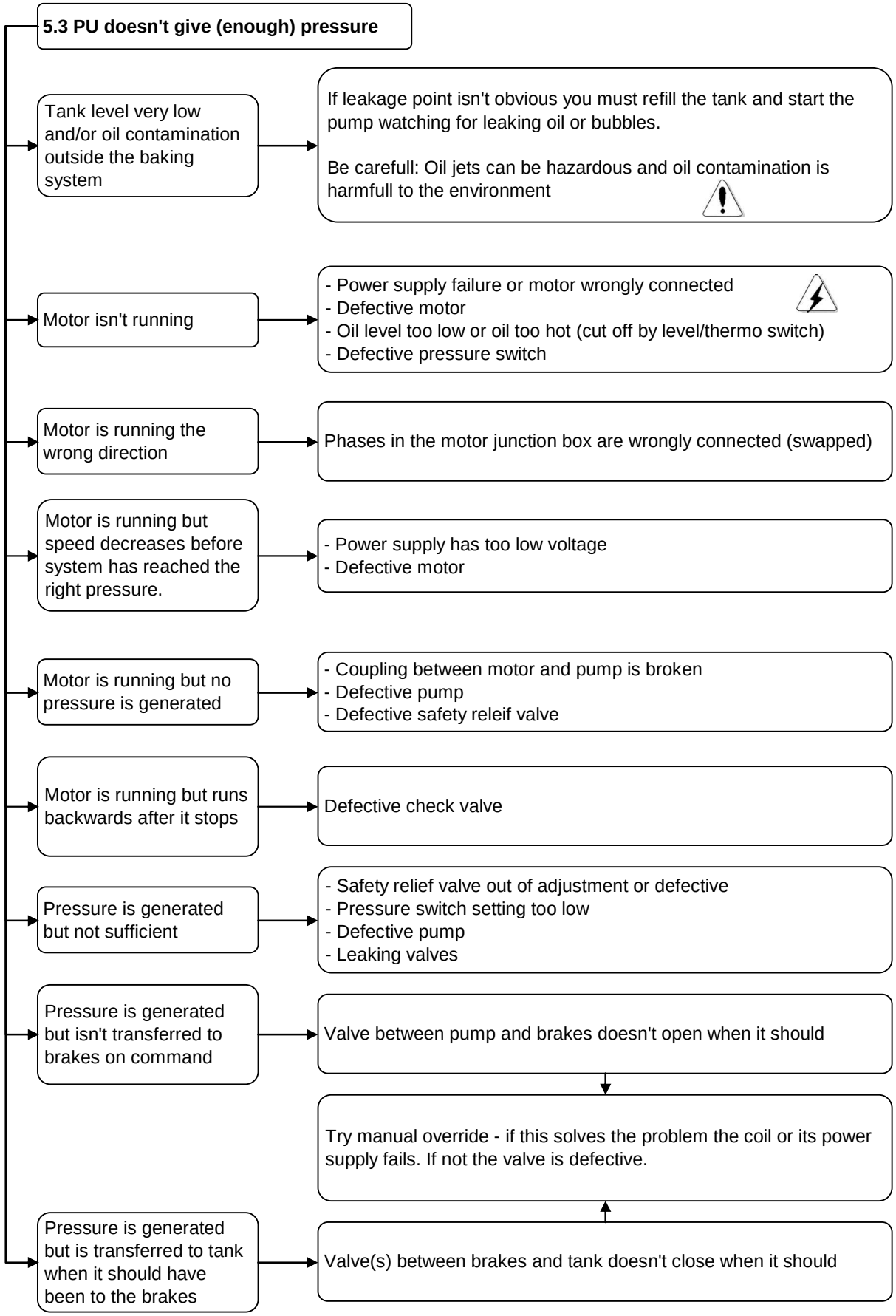
Locate which part of the braking system that causes the failure and proceed to the corresponding section.



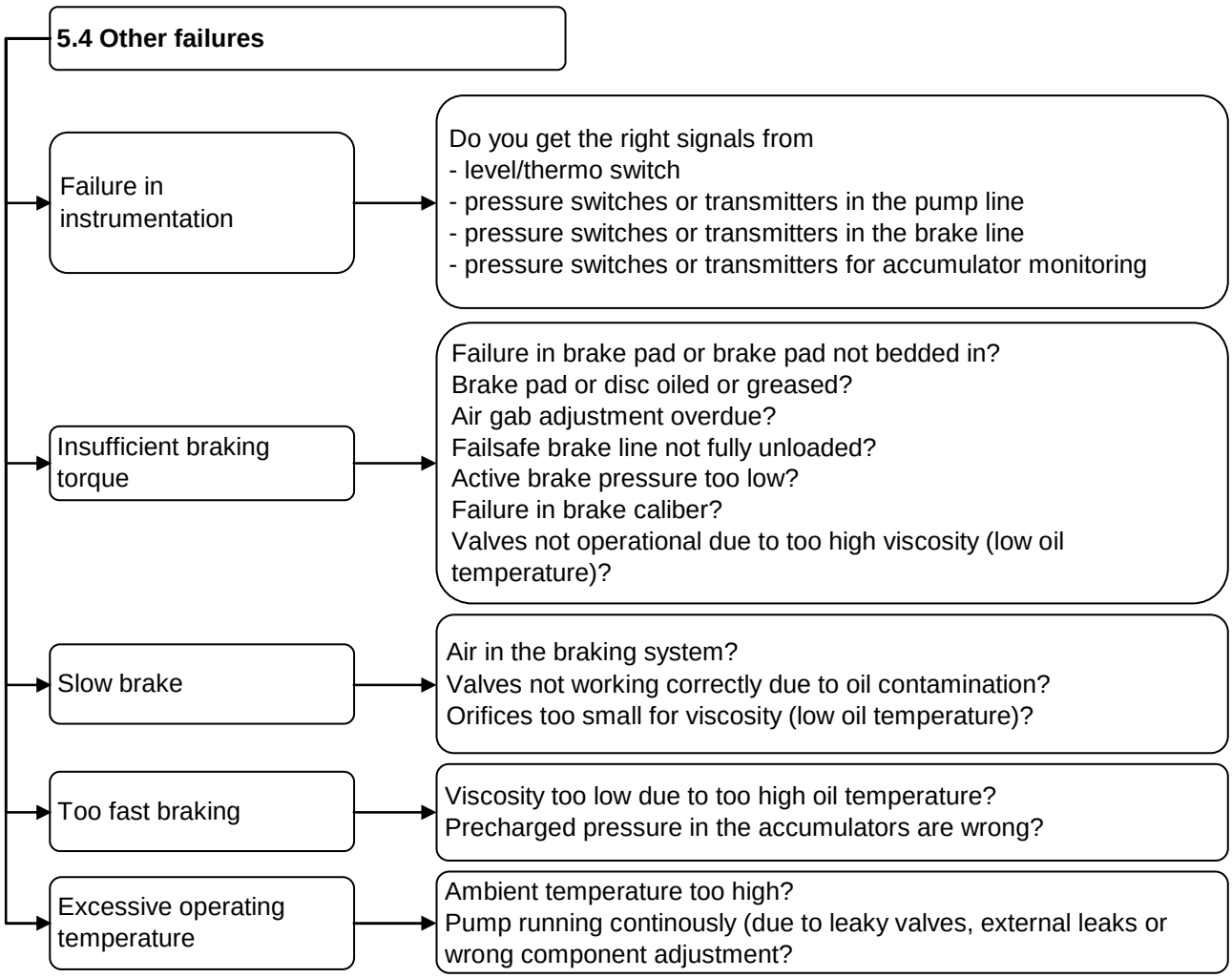
5.2 Power unit does not release pressure



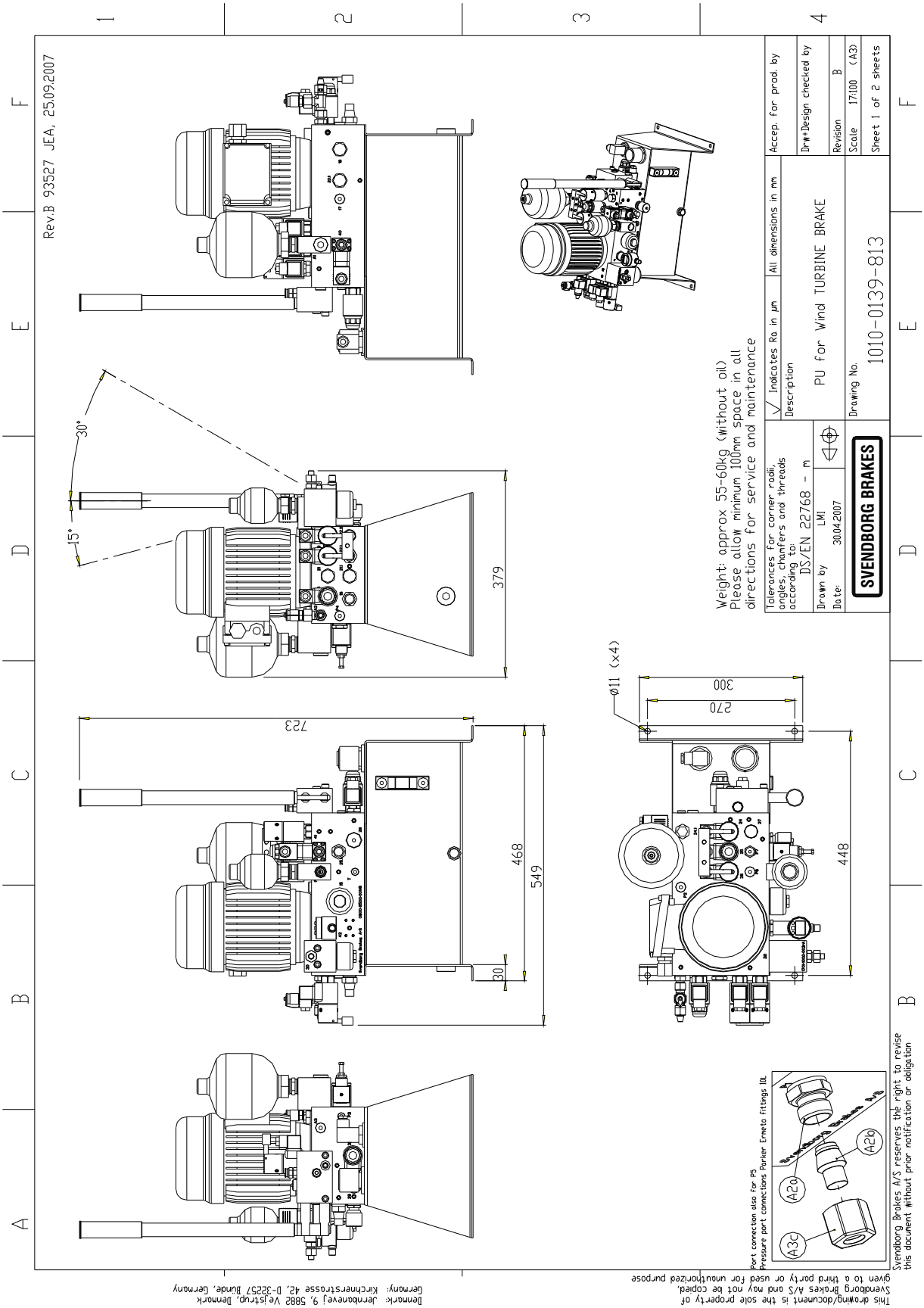
5.3 Power unit does not set / build pressure



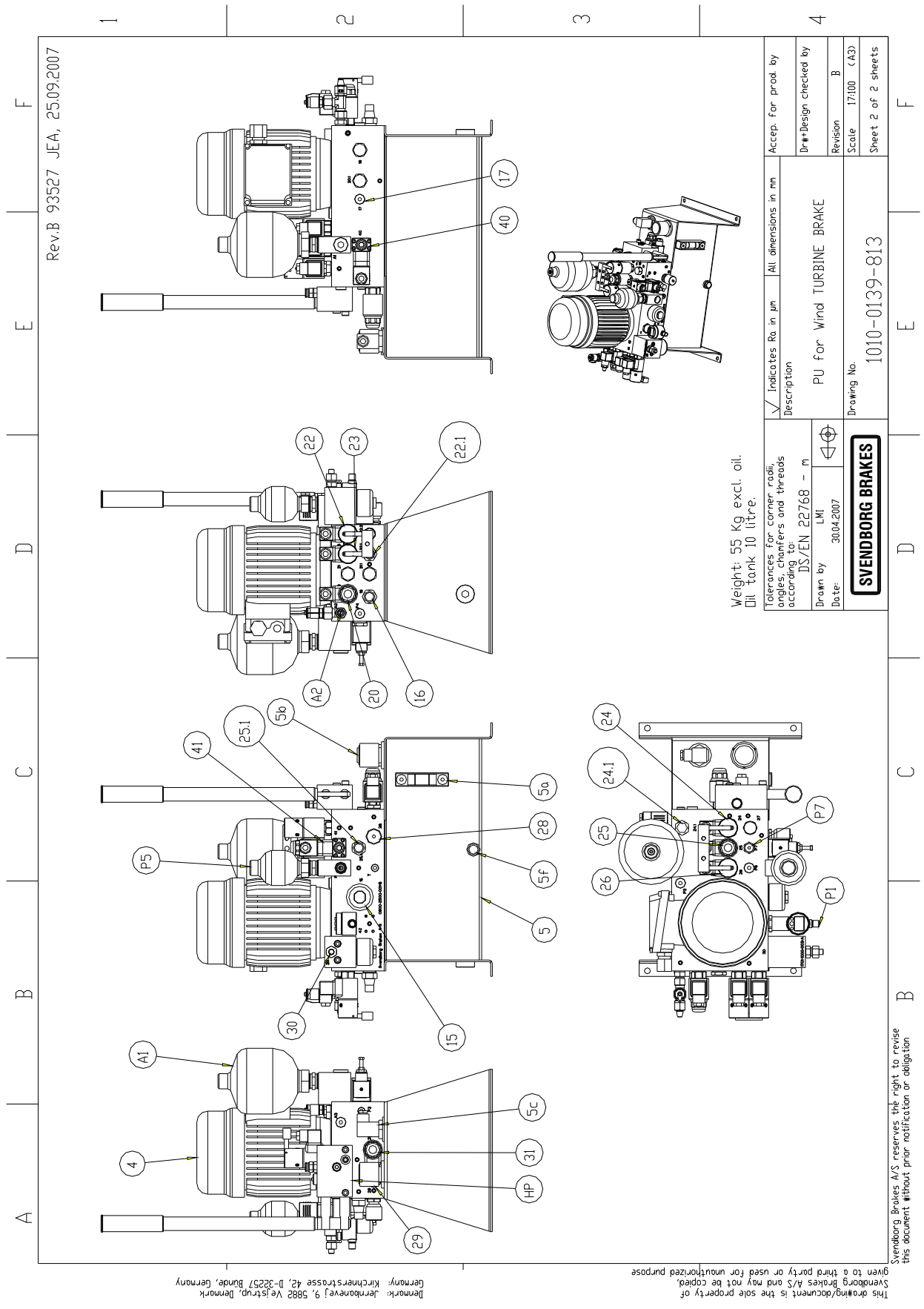
5.4 Other failures



Appendix A - Dimension drawing



Appendix B - Spare part drawing



Appendix B - Spare parts list

For brake control unit 1010-0139-813
according to Spare Part Drawing and Hydraulic Diagram (section 3.3)

Pos	Qty	Description		SB item no	Rec. spare parts qty. (note 1)	Mounting torque [Nm] (note 2)	Adjustment method (see apx. C & D)
15, 30b	2	FILTER ELEMENT	10 MICRON	1701-2024-003	2		
15.1, 30a	2	FILTER HOUSING		1701-1024-002		Note 3	
16, 25.1	2	RELIEF VALVE	MAX SETTING 210 BAR	9103-5000-801	1	50	2
17, 20	2	CHECK VALVE		6010-0024-001		50	
2	1	GEAR PUMP W/ BOLTS	1,2 CCM/REV	0305-1064-801			
20, 22, 23, 24, 25, 26, 31	7	ELECTRIC PLUG 24 VDC W.LED	24 VDC WITH LED	5105-0999-002			
20, 22, 23, 24, 25, 26, 31	7	SOLENOID COIL	24 VDC	2224-0024-002			
20, 26	2	DIRECTIONAL POPPET VALVE	2/2 NORMALLY OPEN	2222-1024-801	1	50	
22, 23, 24, 25, 31	5	DIRECTIONAL POPPET VALVE	2/2 NORMALLY CLOSED	2222-0024-801	1	50	
22.1	1	RELIEF VALVE	MAX SETTING 100 BAR	9101-0000-801	1	50	2
23, 26	2	HANDLE FOR VALVE		9322-0000-806			
24	1	HANDLE F/ VALVE	MANUAL OVERRIDE	9322-0000-801			
24.1	1	CHECK VALVE		6010-1024-001		50	
28	1	THROTTLE VALVE	ADJUSTABLE	6001-2024-002		50	
3	1	COUPLING MOTOR/PUMP		9803-1032-001			
30	1	HOUSING FOR FILTER		1701-1000-003			
4	1	MOTOR 50 HZ 3 X 400V	IP55 0,75 KW	5140-0999-001			
40	1	PRESSURE SWITCH	40-210 BAR W PLUG AND BOLTS	4002-1022-801	1	3	1
41	1	PRESSURE SWITCH	5-50 BAR W PLUG AND BOLTS	4000-5022-001			
5	1	TANK FOR TWO FUNCTION BLOCK	10 LITRE	1201-0999-005			
5a	1	LEVEL GLASS		1231-1052-001		10	
5b	1	BREATHER AND FILLING STRAINER	10 MICRON	1712-1024-001	1	Finger	
5c	1	LEVEL/THERMO		1232-2052-001		25	
5c, 40, 41	3	ELECTRIC PLUG 230 VAC	230 VAC	5105-0999-001			
5f	1	TANK DRAIN PLUG		1290-2999-040		15	
A1	1	ACCUMULATOR BLOCK	WITH FITTINGS	4890-1000-801			
A1	1	ACCUMULATOR	0,75 LTR	4807-5024-001		100	4
A2, P7	2	TEST POINT NIPPLE		9009-1010-040	1	30	
HP	1	HAND PUMP	W HANDLE	0350-0031-801		24	
P1	1	PRESSURE SENSOR	4-250BAR 1/4"	4002-5024-804			
P5	1	ACCUMULATOR	0,075 LTR	4800-8024-001		100	4

Notes

1) It is highly recommended to have the spare parts of the marked type in stock as this may reduce downtime in case of failure. The quantity stated is the minimum quantity recommended.
2) Mounting torque (Nm) (lb/ft = value x 0.74) for each component or bolt fixing the component.
3) Turn in to bottom and out ¼ revolutions.

Appendix C - Hydraulic settings

Extract from production settings report:

HYDRAULIC SETTINGS REPORT

Our order no:
Customer: Svendborg Brakes A/S,
Customer order no.: IMPSA

POWER UNIT:

No. of PU's:
Item no: 1010-0139-813
Variant:
Serial no from:
For brake: 2 x BSAB 90 - Rotor
9 x BSAB 90 - Yaw

Pressure settings:

Position:	Function:	Setting:		Tolerance:	Unit:
16	System relief valve	210	↑	+/-5	bar
22.1	Counter prs	30	↓	+/-2	bar
25.1	Counter prs	128	↓	+/-3	bar
A1	Accumulator	100		+/-2	bar
P5	Accumulator	100		+/-5	bar
HP	Relief hand pump	170	↑	+/-5	bar
P1	Brake on/off prs sw	customer		+/-	bar
40	Brake on/off prs sw	160	↓	+/-5	bar
41	Brake on/off prs sw	20	↓	+/-2	bar

Settings approved by:

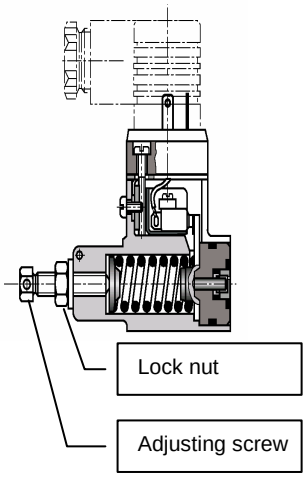
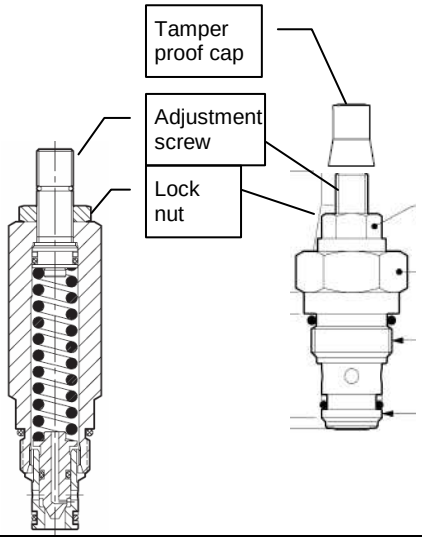
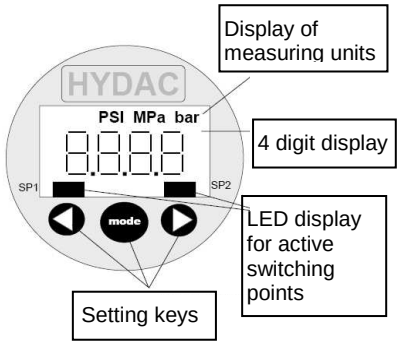
JRN / LMI

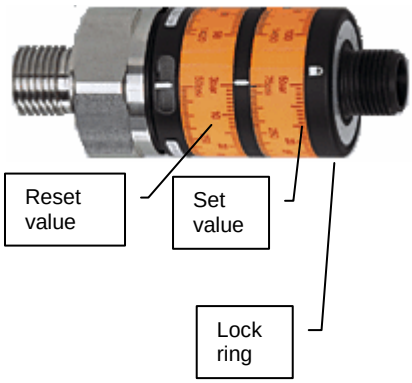
Date: **15-**10-2007

For actual information on how to adjust the settings see Appendix B – Spare parts and Appendix D - Adjustment

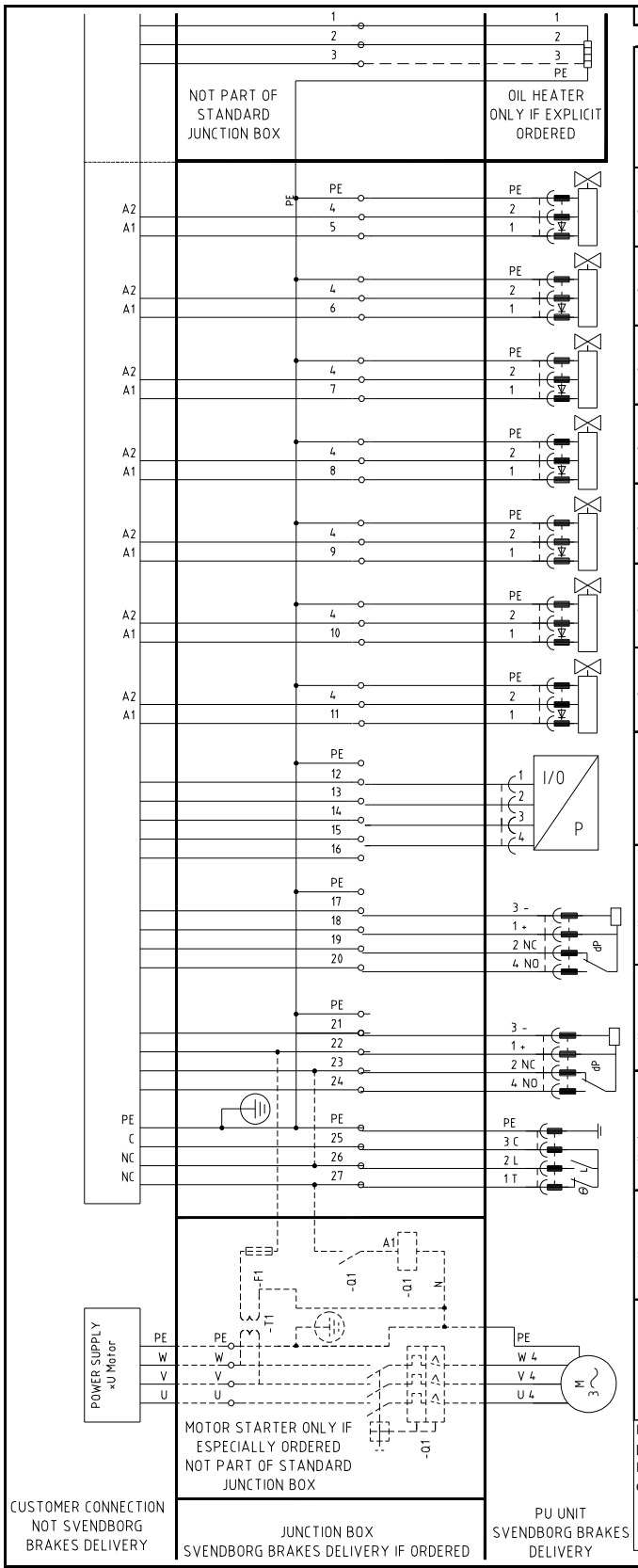
Appendix D - Adjusting

Choose method according to Appendix B “Spare parts list”

Adjustment method	Item type	Item drawing/Photo	Description
1	Pressure switch		The pressure switches have fixed hysteresis. To adjust the setting pressure the lock nut must be loosened. To increase the setting pressure at which the contact switches the setting screw must be turned clockwise. Remember to tighten the lock nut after adjusting.
2	Relief valve or Counter pressure valve (same item)		The system safety valve (Pos. 16 – relief valve) is preset at the factory to the correct pressure / setting. Do not adjust this valve. If the tamper proof cap is broken or missing the power unit is no longer covered by Svendborg Brakes warranty. For other relief valves if adjustment is needed, remove the tamper proof cap, loosen the lock nut and screw out (counter-clockwise) to decrease max. pressure setting. Screw in (clockwise) to increase max. pressure. Remember to re-tighten the lock nut.
3	Pressure switch	Display and setting keys: 	The settings are locked from factory. To unlock you must hold down both arrow keys for 3 sec. Display shows for 2 sec. “oP6” and then “FrEE”. Now you can change the settings for upper switch point and/or hysteresis by selecting mode. Changes are made by using the arrow keys. After the changes you press both arrows again for 3 sec. Display will show “Loc” for a moment and the new settings are saved. Afterwards display will again show the measured pressure.
4	Accumulator		See section 4.8 & 4.9

Adjustment method	Item type	Item drawing/Photo	Description
5	Pressure switch		To protect the pressure switch it is mounted with a cover. To demount this cover you must unplug the electrical plug and pull the cover off. The settings of the pressure switch are changed like this: 1) Unlock the lock ring 2) Change the set and reset values 3) Lock the lock ring 4) Remount the protection cover 5) Remount the electrical plug

Appendix E - Electrical diagram



Item	Present	Remark	Voltage (U)
Pos 20 Valve	x	Yaw brake apply	Solenoid(s) U=24V DC 19W
Pos 22 Valve	x	Yaw brake reduced torque	
Pos 23 Valve	x	Yaw brake dump	
Pos 24 Valve	x	Rotor brake apply	
Pos 25 Valve	x	Rotor brake reduced torque	
Pos 26 Valve	x	Rotor brake full torque	
Pos 31 Valve	x	Rotor brake quick apply	
Pos P1 Pressure switch	x	System pressure yaw brake	18-35VDC
Pos 41 Pressure switch	x	Brakes off indicator	9,6<U<32 V DC
Pos 40 Pressure switch	x	System pressure Motor start/stop	9,6<U<32 V DC
Pos 5c Level/ thermo switch	x	Safety device Motor start/stop	24<U<250V AC or DC 1: Thermo 2: Level 3: Common
Motor starter	Not part of SB delivery		50Hz: U = 400 V 3P 0,75 kW
Motor	x		

Motor is controlled by level/thermo switch pos. 5e (normally closed) and pressure switch pos. P2.
Motor is running until the temperature (70°C) or preset pressure is reached or oil level gets too low and one of the switches opens.

	Description:		Drawn by:	Date:
SVENDBORG BRAKES	Junction box for PU 1010-0139-813	Drawing No.: 1010-0139-313	JEA	01.11.2007
				Rev. ind.: D

Appendix F – Recommended Fluid

DATA SHEET

Date: 16.01.2004
No.: DEB-DIVE-005
Replace: 19.12.2003
Approved: N. Christensen

RECOMMENDED FLUID FOR DISC BRAKES & HYDRAULICS

Pressure fluids / Oil types

The following oil types are recommended by Svendborg Brakes – other types corresponding to these can be used.

The minimum and maximum temperatures for standard components are, -20℃ - +60℃ / -14℉ - +140℉.
Extreme temperature applications may require special options. Please contact Svendborg Brakes.

	Special option	**Standard**		Special option
Mineral Oil	-30℃ - +20℃ -22℉ - +68℉	-20℃ - +40℃ -14℉ - +104℉	+10℃ - +60℃ +50℉ - +140℉	+30℃ - +70° C +86℉ - +1 58℉
Shell	**Tellus Artic**	**Tellus TX32**	**Tellus TX46**	**Tellus TX68**
Mobil	-	DTE 13M	DTE 15M	DTE 16M
Hydro Texaco	Rando Ashless 8401	Rando HDZ32	Rando HDZ46	Rando HDZ68
Valvoline	-	Ultramax HVLP32	Ultramax HVLP46	Ultramax HVLP68
Syntethic Oil	-30℃ - +20℃ -22℉ - +68℉	-20℃ - +40℃ -14℉ - +104℉	+10℃ - +60℃ +50℉ - +140℉	+30℃ - +70° C +86℉ - +1 58℉
Mobil	-	SHC 524	SHC 525	SHC 526
Bio Oil (1) (Ester or Colza oil)	-30℃ - +20℃ -22℉ - +68℉	-20℃ - +30℃ -14℉ - +86℉	+10℃ - +60℃ +50℉ - +140℉	+30℃ - +70° C +86℉ - +15 8℉
Shell	-	Naturelle HF-E15	Naturelle HF-E32	Naturelle HF-E46

General: Mineral Pressure Fluids according to DIN 51524 Part 3
(1) There must be less than <200PPM water in the oil, due to the seals.

Viscosity
Recommended viscosity range: 20-200 cSt at working temperature.

Filtration
The oil in a hydraulic system and the oil added to the hydraulic system must always be filtered. The level of cleanliness in a hydraulic system is an important factor to the lifetime of the system.
When refilling the hydraulic tank, it is recommended that the oil added to the system is filtered through an off-line filter unit.

The hydraulic system, supplied by Svendborg Brakes, has a build-in oil filter with a standard 10-micron purity filter. To maintain a reliable system it is recommend that only hydraulic oil of the following classes of purity is used: NAS 1638, Class 8, or ISO 4406, Class 19/17/14.
It is recommended that the filter be changed at a minimum, once every six months or more often depending on the level of exposure to contamination.

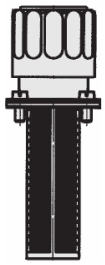
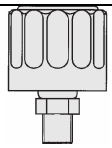
Service life of pressure fluids
Mineral oil: 8.000 Hours or at least once a year.
Other fluids: 2.000 Hours or at least once a year.

Change of pressure fluid
Note: The mixing or blending of different brands or types of pressure fluid can cause unintended chemical reactions, such as sludging, gumming etc. The complete hydraulic system should be thoroughly flushed prior to changing from one oil type to another.
The respective manufactures should be contacted prior to changing from one pressure fluid to another.

Seal material
Brakes from Svendborg Brakes A/S are normally supplied with PUR-seals (PolyURethane)
PTFE (PolyTetraFlourEthylene) seals can be delivered on request for most of the brake types.
Note: the BSFG 400 brake series are supplied with NBR rubber fabric seals (acrylNitrile Butadiene Rubber).

Appendix G - Recommended spare parts

Recommended spare parts for one brake

FILTERS Air filter for 6 and 10 litre tank, 10 µ	1712-1024-001	
Air filter for 3 litre tank, 10 µ	1712-0024-001	
Pressure filter element 10 micron	1701-2024-001	
ACCUMULATOR CHARGER KIT Goes for B, DK, D, SF, NL, N, A, PL, S, CH, CZ	4899-9024-002	
With adaptor for		
South-East Asia, ARG, AUS, BS, GB, GR, IRL, JA, M, NZ, P, E, TR, CY Africa except for Arab countries	4899-9024-006	
Arab countries, BG, COI, F, RG, Israel, MEX, RO, H	4899-9024-007	
Canada, USA, Puerto Rico	4899-9024-003	
Italy	4899-9024-001	
Japan	4899-9024-005	
Taiwan	4899-9024-008	
Korea	4899-9024-009	
South & Middle America except Argentine, Venezuela and Mexico	4899-9024-010	
China	4899-9024-004	
OIL SAMPLE KIT	9640-0024-001	
FILTER FILLING STATION	1702-0024-001	

Lubricación Centralizada

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E-mail: cirvalvenezuela@cirval.com / Web site: www.cirval.com

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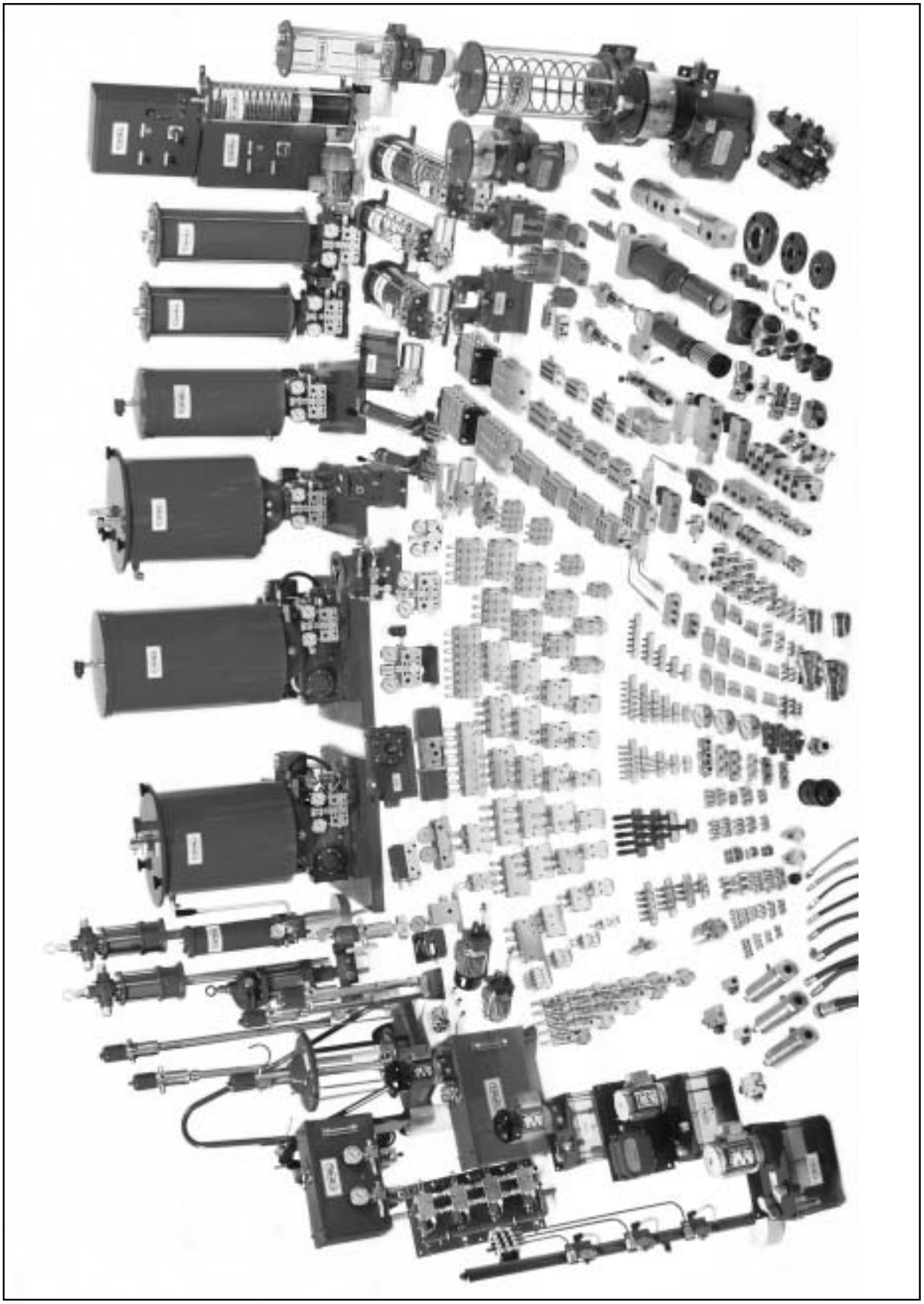
FOTO PACK DE PRODUCTOS



I N D I C E

ACCESORIOS

TUBERIAS VARIAS
DESARROLLOS ESPECIALES
LA EMPRESA

Doble Línea

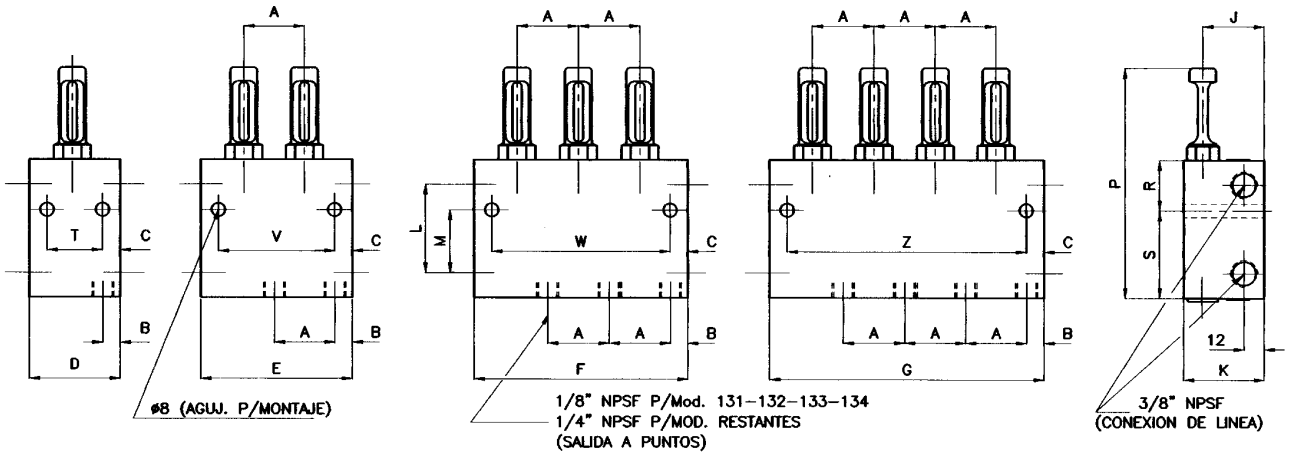
Distribuidores Modelo DC

Descripción

Los distribuidores de la serie DC son de operación completamente hidráulica y pueden suministrar tanto grasa como aceite en sistemas de doble línea.
En esta serie de distribuidores cada válvula puede lubricar un único punto. Disponiéndose entonces con distribuidores con 1, 2, 3, ó 4 salidas. Una característica importante de este tipo de válvulas es que no poseen válvulas de retención y sólo dos partes se encuentran en movimiento, permitiendo una de ellas una indicación positiva del funcionamiento, y facilidades para regulación del caudal.

Especificaciones

Lubricante	Aceites o grasa hasta grado NLGI 2
Presión de trabajo	Máxima: 250 bar - Mínima: 15 bar
Temperatura	Máxima: 80 ºC - Mínima: 0 ºC
Descarga	Regulable según modelo (ver tabla)



DC-131
DC-141
DC-151
DC-161

DC-132
DC-142
DC-152
DC-162
DC-162-101*

DC-133
DC-143
DC-153

DC-134
DC-144
DC-154

*Los distribuidores DC162-101 podrán ser provistos con una perforación interna unificando ambas descargas en una sola, duplicando el caudal en esta última.

Modelo	A	B	C	D	E	F	G	J	K	L	M	P	R	S	T	V	W	Z
DC-131		8,2	10,5	45				28	38	41	27,7	100,5	24,5	39	24			
DC-132-133-134	28,5	8,2	36,5		73	102	130	28	38	41	29,2	100,5	23	40,5			29	57
DC-141-142-143-144	31,8	8,2	10,7	48	80	111,5	143,	30	40	55,5	38,2	120	27,5	48,5	27	59	90,5	122
DC-151-152-153-154	36,6	10,2	10,5	54	90	127	4	33	44	55,5	37,2	138	30	52	33	69	106	142
DC-161-162	46	10,5	10,5	62	108		163	37	57	56	41	152,5	32	58	41	87		

Regulación de Caudal (cm^3) por Salida

Regulación	MODELOS				
	DC-130	DC-140	DC-150	DC-160	DC-162-101
MINIMO	0,40	1,10	2,40	5,90	10,80
MAXIMO	2,40	4,40	10,00	25,00	50,00

Código de Requerimiento

DC | 1 | ☐ ☐

Modelo	
30	3
40	4
50	5
60	6

Nº de salidas	
Una salida	1
Dos salidas	2
Tres salidas	3
Cuatro salidas	4

Ejemplo de pedido: DC-131

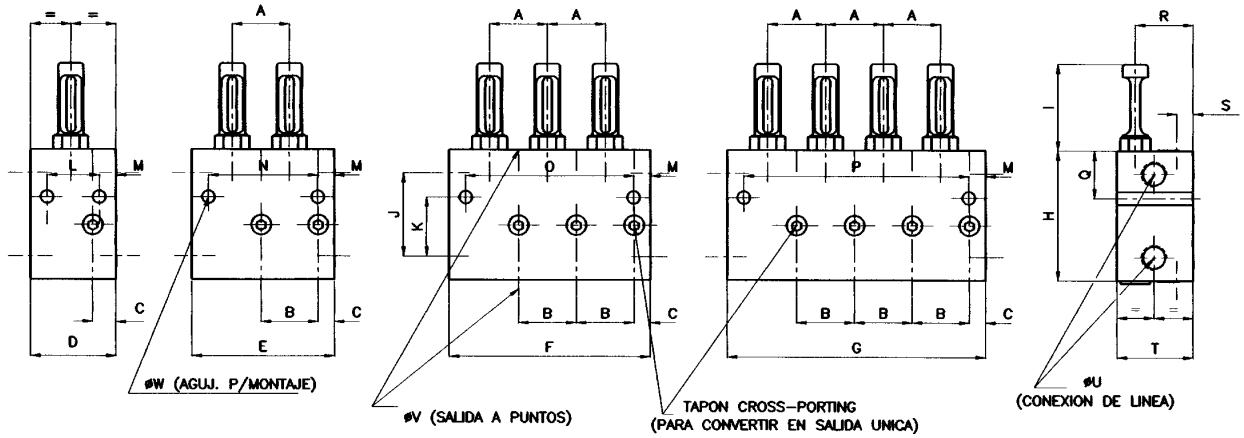
Distribuidores Modelo DDC

Descripción

Los distribuidores de la serie DDC son de operación completamente hidráulica y pueden suministrar tanto grasa como aceite en sistemas de doble línea.
Cada válvula dosificadora de un distribuidor puede alimentar 1 ó 2 puntos de lubricación, disponiéndose entonces de distribuidores con 2, 4, 6 u 8 salidas. Sin embargo, mediante un simple método, se puede unificar la descarga, convirtiendo la doble salida de un dosificador en una simple (mediante un “cross porting”) duplicando de esta manera también la capacidad de descarga del dosificador.
Una característica importante de este tipo de distribuidores es que no posee válvulas de retención y sólo dos partes se encuentran en movimiento, permitiendo una de ellas una indicación positiva del funcionamiento, y facilidades para regulación del caudal.

Especificaciones

Lubricante	Aceites o grasa hasta grado NLGI 2
Presión de trabajo	Máxima: 250 bar - Mínima: 15 bar
Temperatura	Máxima: 80 ºC - Mínima: 0 ºC
Descarga	Regulable según modelo (ver tabla)



DDC-222 DDC-232 DDC-242 DDC-252 — DDC-224 DDC-234 DDC-244 DDC-254 — DDC-226 DDC-236 DDC-246 DDC-256 — DDC-228 DDC-238 DDC-248 DDC-258

Modelo	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
DCC-220	14,3	14,3	14,3	28,6	42,9	57,2	71,4	53,9	27,8	38,1	26,9	15,9	6,35	30,2	44,5	58,7	19,05	30,2	7,5	38,1	R-NPSF 1/8"	R-NPSF 1/8"	ø6
DCC-230									37														
DCC-240	31,8	31,8	15,6	44	76	108	140	79	44	57	41	30	7	62	94	126	27	42	11,5	53,5	R-NPSF 3/8"	R-NPSF 3/8"	ø8
DCC-250									56														

Regulación de Caudal (cm³) por Salida

Regulación	MODELOS (Doble Salida)			
	DDC-220	DDC-230	DDC-240	DDC-250
MINIMO	0,09	0,20	0,50	0,60
MAXIMO	0,60	1,20	2,20	5,00
	MODELOS (Simple Salida)			
MINIMO	0,18	0,40	1,00	1,20
MAXIMO	1,20	2,40	4,40	10,00

Código de Requerimiento

DDC | 2 | ☐ ☐

Modelo	
20	2
30	3
40	4
50	5

Nº de salidas	
Dos salidas	2
Cuatro salidas	4
Seis salidas	6
Ocho salidas	8

Ejemplo de pedido: DDC-234

Distribuidores Modelo DCM

Descripción

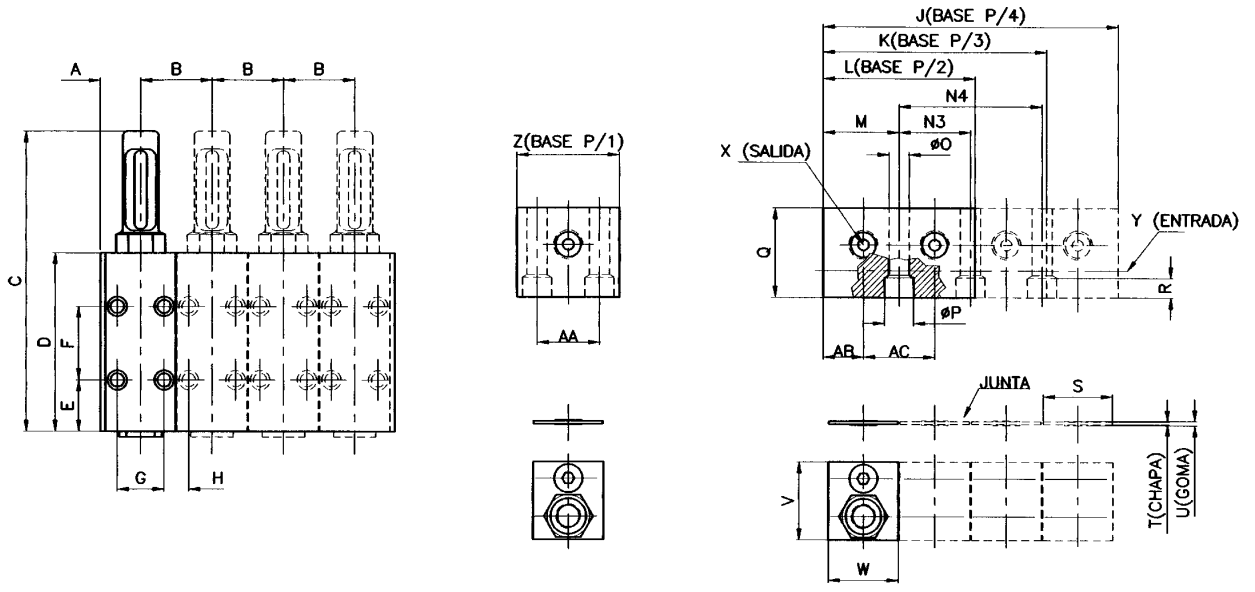
Esta serie de distribuidores de doble línea DCM incorpora un diseño que simplifica considerablemente la planificación, instalación y mantenimiento de los sistemas de lubricación, además de permitir minimizar los costos de inventario.
Esto se logra debido a su fabricación modular que permite el ensable de 1 a 4 módulos dosificadores por distribuidor, sobre la correspondiente base de conexionado.
De esta manera cada uno de ellos es fácilmente removible sin necesidad de desconectar el tendido de las tuberías principales o secundarias.
El módulo dosificador puede alimentar dos puntos de lubricación (salida doble) o unificar la descarga, duplicándola mediante el "cross porting" si se desea alimentar un único punto (salida simple superior o inferior). Estos distribuidores cuentan además con regulación de caudal independiente.

Regulación de Caudal (cm^3) por Salida

Regulación	MODELOS (Doble Salida)		
	DCM-220	DCM-230	DCM-250
MINIMO	0,09	0,20	0,60
MAXIMO	0,60	1,20	5,00
Regulación	MODELOS (Simple Salida)		
MINIMO	0,18	0,40	1,20
MAXIMO	1,20	2,40	10,00

Especificaciones

Lubricante	Aceites o grasa hasta grado NLGI 2
Presión de trabajo	Máxima: 250 bar - Mínima: 15 bar
Temperatura	Máxima: 80 ºC - Mínima: 0 ºC
Descarga	Regulable según modelo (ver tabla)



Modelo	A	B	C	D	E	F	G	H	J	K	L	M	N3	N4	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC
DCM-20	13	26	85	57	18	21	18	8	104	78	52	26	26	52	5	10	25,4	6,5	25,4	O'RING 2-011		25,1	25,4	NPSF1/8"	NPSF1/8"	36	22	13	26
DCM-30	18	32	117	80	23,5	33	21	11	132	100	68	34	32	64	9	13	40	10	31	0,63	1,7	35	31,5	NPSF1/4"	NPSF3/8"	48	28	18	32
DCM-50			135																										

Código de Requerimiento - Distribuidor

DCM | 2 | ☐ | ☐ | ☐

Tamaño	
20	2
30	3
50	5

Nº de salidas	
Dos salidas	2
Cuatro salidas	4
Seis salidas	6
Ocho salidas	8

Acero	
Inoxidable	I

Ejemplo de pedido: DCM-254
DCM-254-I

Código de Requerimiento de Repuesto - Módulo/Junta

Módulo DCM ☐

Tamaño
20
30
50

Junta DCM ☐

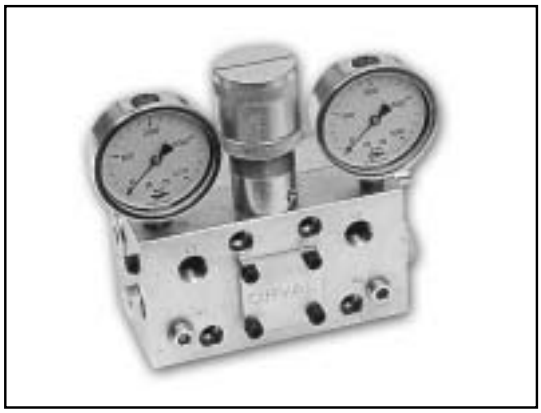
Tamaño
20
30
50

Ejemplo de pedido: Módulo DCM-20

Ejemplo de pedido: Junta DCM-30

Válvulas de Control

Válvula Inversora VCI-R40

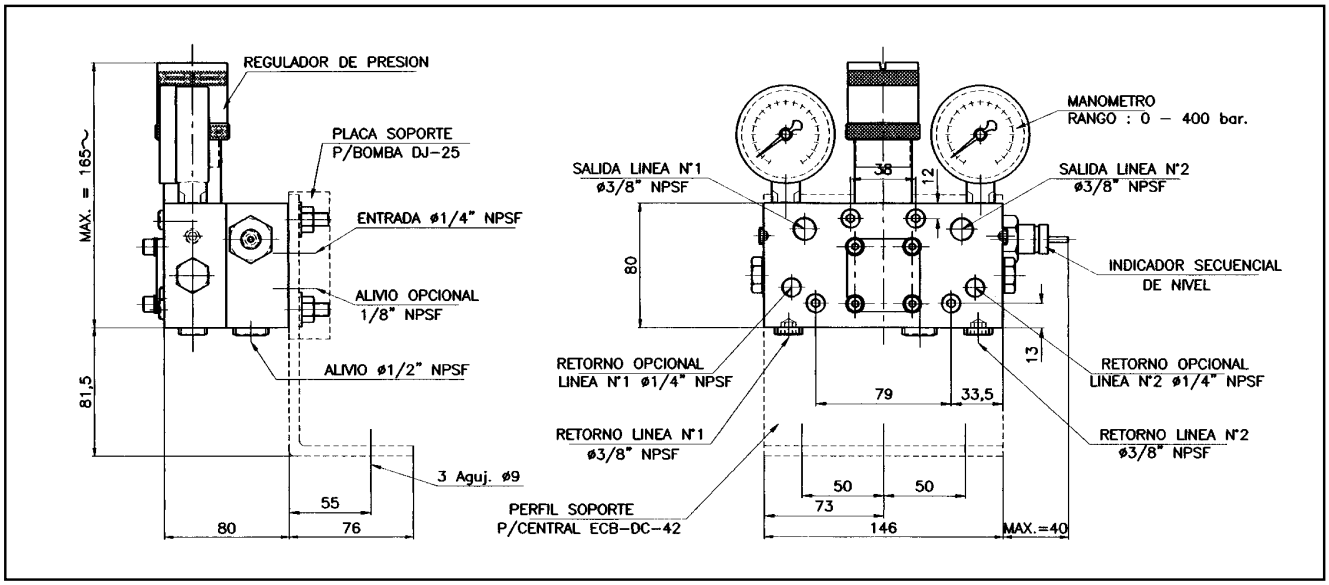


Descripción

Estas válvulas inversoras se activan mediante la presión del sistema. Pueden controlar sistemas con o sin retorno y se utilizan en estaciones centrales de bombeo ECB-DC10, ECB-DC25 y ECB-DC42. Además pueden ser usadas con bombas neumáticas, en sistemas de Doble Línea para pulverizado de lubricantes.

Especificaciones

Lubricante	Aceites hasta grasa grado NLGI 2.
Presión Trabajo	Mínima: 35 bar - Máxima: 250 bar
Temperatura	Mínima: 0 ºC - Máxima: 80 ºC
Materiales	Cuerpo y Pistones: Acero Sellos: Ac. Nitrilo Opcional: Vitón.



Código de Requerimiento

VCI-R40 ☐ ☐ ☐ ☐

Lubricante	
Grasa	A
Aceite	B

Manómetros	
Con manóm.	1
Sin manóm.	-

Adaptador y Microinterruptor	
Con adap. y microint. **Derecha**	2
Con adap. y microint. **Izquierda**	4
Sin adap. y microint.	-

Soporte Montaje	
Con Sop. Montaje	3
Sin Sop. Montaje	-

Ejemplo de pedido: VCIR-40-A-1-4-3

Válvula Inversora VCIR-40 para utilizar con grasa provista con manómetros, adaptador y microinterruptor a la izquierda y con placa soporte para montaje.

Válvulas de Control

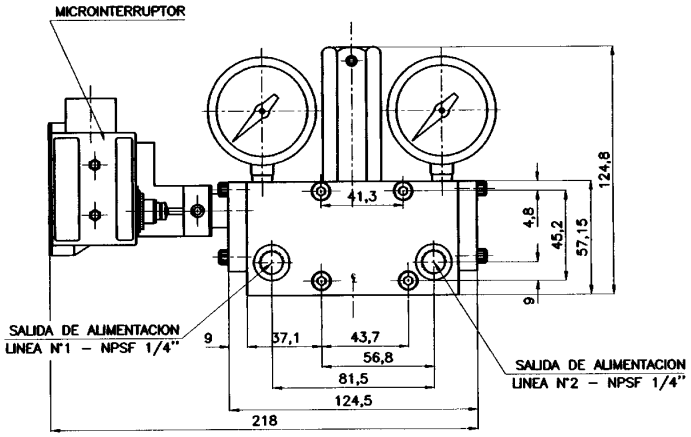
Válvula Inversora VCI-R1000

Descripción

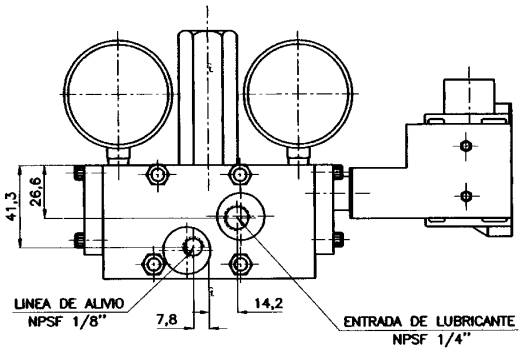
Estas válvulas inversoras se activan mediante la presión del sistema y se regula entre 35 bar y 140 bar.
Pueden controlar sistemas con o sin retorno y se utilizan en estaciones centrales de bombeo ECB-DC10. Además pueden usarse en bombas independientes para pequeños sistemas de Doble Línea sin retorno.

Especificaciones

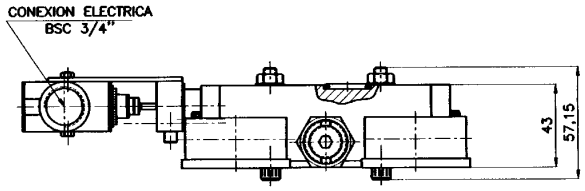
Lubricante	Aceites hasta grasa grado NLGI 2.
Presión Trabajo	Mínima: 35 bar - Máxima: 140 bar
Temperatura	Mínima: 0 ºC - Máxima: 80 ºC
Materiales	Cuerpo y Pistones: Acero Sellos: Acrilo Nitril. Opcional: Vitón



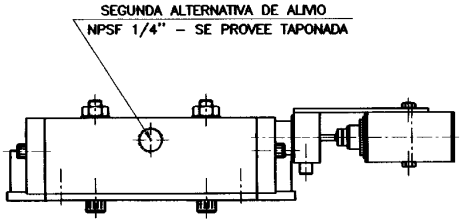
VISTA FRONTAL



VISTA POSTERIOR



VISTA SUPERIOR



VISTA INFERIOR

Ejemplo de pedido: VCIR-1000-B-1

Válvula Inversora VCIR-1000 para aceite con manómetros.

Código de Requerimiento

VCI-R1000 □

Lubricante	
Grasa	A
Aceite	B

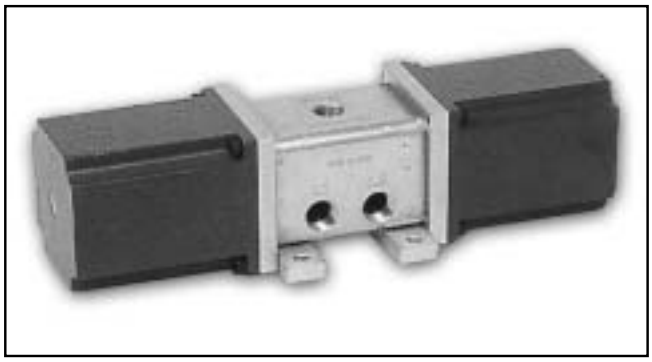
□

Manómetros	
Con manómetros	1
Sin manómetros	-

□

Adaptador y Microinterruptor	
Con adap. y microint.	2
Sin adap. y microint.	-

Válvulas de Control
Válvula inversora VCI-R10

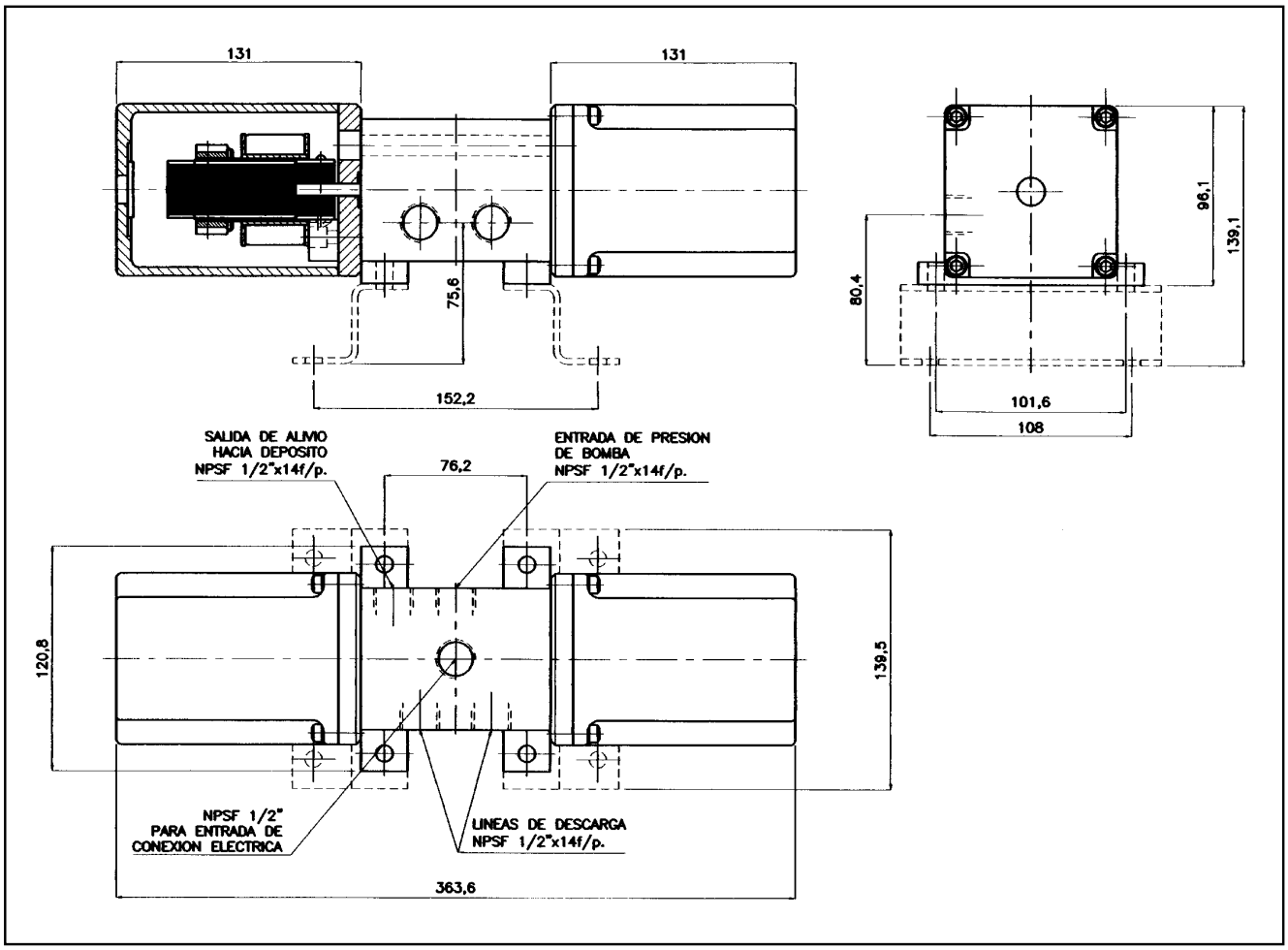


Descripción

Estas válvulas inversoras operan en conjunto con presostatos de línea. Controlan sistemas con final de línea. Se utiliza en estaciones centrales ECB-DC42 o en sistemas para servicio pesado operados neumáticamente

Especificaciones

Rango máx. de flujo	37,5 L./min.
Presión máx. de trabajo	350 bar
Corriente de desplazamiento	17,5 amp.
Corriente de retención	1.65 amp.



Ejemplo de pedido: VCI-R10-2-5-A

Válvula inversora, modelo VCI-R10 para grasa, con alimentación de tensión de 220V y 50 Hz de frecuencia.

Código de Requerimiento

VCI-R10 □ □ □

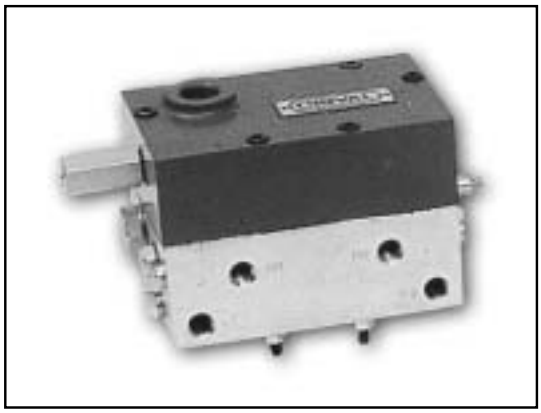
Tensión	
110 V	1
220 V	2
380 V	3
440 V	4

Frecuencia	
50 Hz	5
60 Hz	6

Lubricante	
Grasa	A
Aceite	B

Válvulas de Control

Válvula inversora VCI-R20

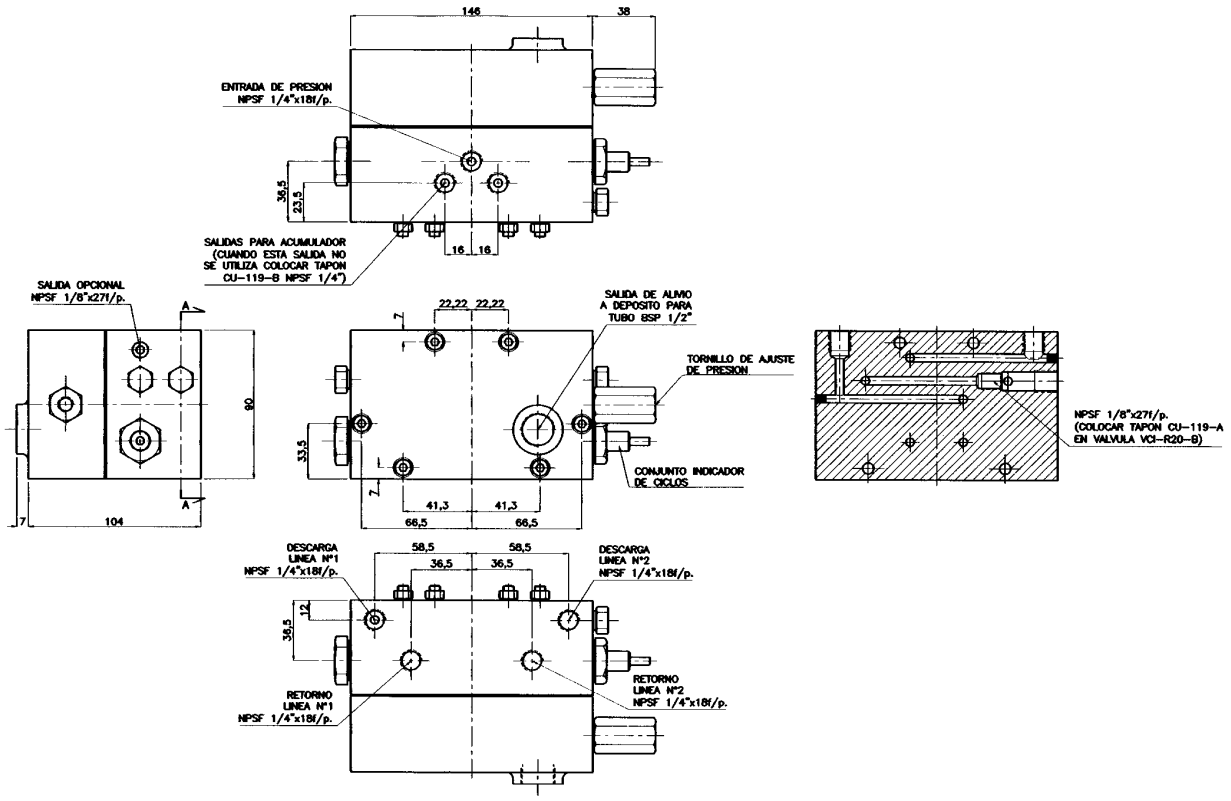


Descripción

Estas válvulas inversoras se activan mediante la presión del sistema y dirije el flujo de lubricante en forma alternada a las dos líneas de suministro.
La acción de inversión es automática, controlada hidráulicamente por la acción de un pistón sensor de presión dentro de la válvula.
Se aplican en estaciones centrales de bombeo ECB-DC10, ECB-DC25, ECB-DC42.

Especificaciones

Lubricante	Aceites hasta grasa grado NLGI 2
Presión de trabajo	Mínima: 21 bar - Máxima: 49 bar
Temperatura	Mínima: 0 ºC - Máxima: 80 ºC
Materiales	Cuerpo y pistones: acero Sellos: acrilo nitrilo. Opcional: vitón



Ejemplo de pedido: VCI-R20-A

Válvula Inversora VCI-R20 para grasa.

Código de Requerimiento

VCI-R20 ☐

Lubricante	
Grasa	A
Aceite	B