

Installation manual

Motus References

Project Number:	00106	
Project Title:	MMC240 - Ifremer	
Document Number:	DOC-300980	
Revision:	2	
Revision date:	03-04-2025	
Issue description:	Issued for information	
Made: TALY	Check: WOSR	Appr.: TALY

Customer References

Rig / Vessel / Installation:	Ifremer
Customer Name:	Kongsberg Maritime AS
Customer Reference:	Rolv Jarle Seth
Customer P.O. number:	BR0465026


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Change Description

Rev.	Page/Chapter.	Change Description
0		First issue
1	11-17/3	Information about bolts and lubrication updated
2	20/5	Added table

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1. Introduction

This procedure describes assembly and installation of MMC 240 crane.

1.1 Delivery

Crane is delivered from factory partially assembled, see transport arrangement for details on how crane is received from factory. Assembly according to this manual and annexed drawings.



2. Inspection of foundation before lifting the crane on board

It is of great importance that the surface of the foundation / pedestal flange is within the tolerance of flatness. If the top flange is out of tolerance, the lifetime of the slewing ring might be considerably reduced. A condition for Motus guarantee is therefore, that the foundation top flange is within the tolerances or that possible deviation is approved by Motus Technology AS.

The foundation / pedestal is a flexible construction, and the top flange can quite easily come out of tolerance due to pushing and pulling foundation to correct dimension and welding activity.

Permissible out-of-flatness including slope of the machined top flange

The maximum permissible out-of-flatness including slope is specified on the drawing. **The drawing is delivered with the foundation as an attachment to this instruction.** Should the figure measured exceed the ones specified in the drawings, Motus Technology AS must be consulted. Please note that the maximum value shall be reached only once per 180° sector. To avoid larger deviations and the occurrence of peaks in smaller sectors, any deviations in the range of 0° - 90° - 180° must only rise or fall gradually. If not otherwise is specified on the drawings, the following guidelines can be used:

Diameter in mm	Permissible gap
<1000	0,10 mm
1000 - 1500	0,12 mm
1500 - 2000	0,15 mm
2000 - 2500	0,17 mm
2500 - 4000	0,20 mm
4000 - 6000	0,30 mm
6000 - 8000	0,40 mm



IMPORTANT!

When lifting on board the crane components, lifting equipment must not be in contact with machined surfaces. If there are any manufacturing problems due to the height of the foundation / pedestal, contact Motus Technology AS head office.

The shipyard, which is responsible for the installation of the pedestal as well as the crane, has to check the flatness of the top flange after all welding on the foundation / pedestal is completed.

The verification must be made before or in connection with the crane being lifted onboard. The records from the verification shall be presented to Motus Technology AS commissioning engineer.



There are two alternative methods to verify the flatness of the top flange on the foundation / pedestal.

2.1.1 Inspection by use of laser

The best method of inspection is by use of laser equipment. If laser equipment is used the result shall be recorded either on a printer connected to the equipment or in a protocol such as in section 2.1.3. Neither welding nor straightening is allowed to take place on the pedestal after the record of flatness.



IMPORTANT!

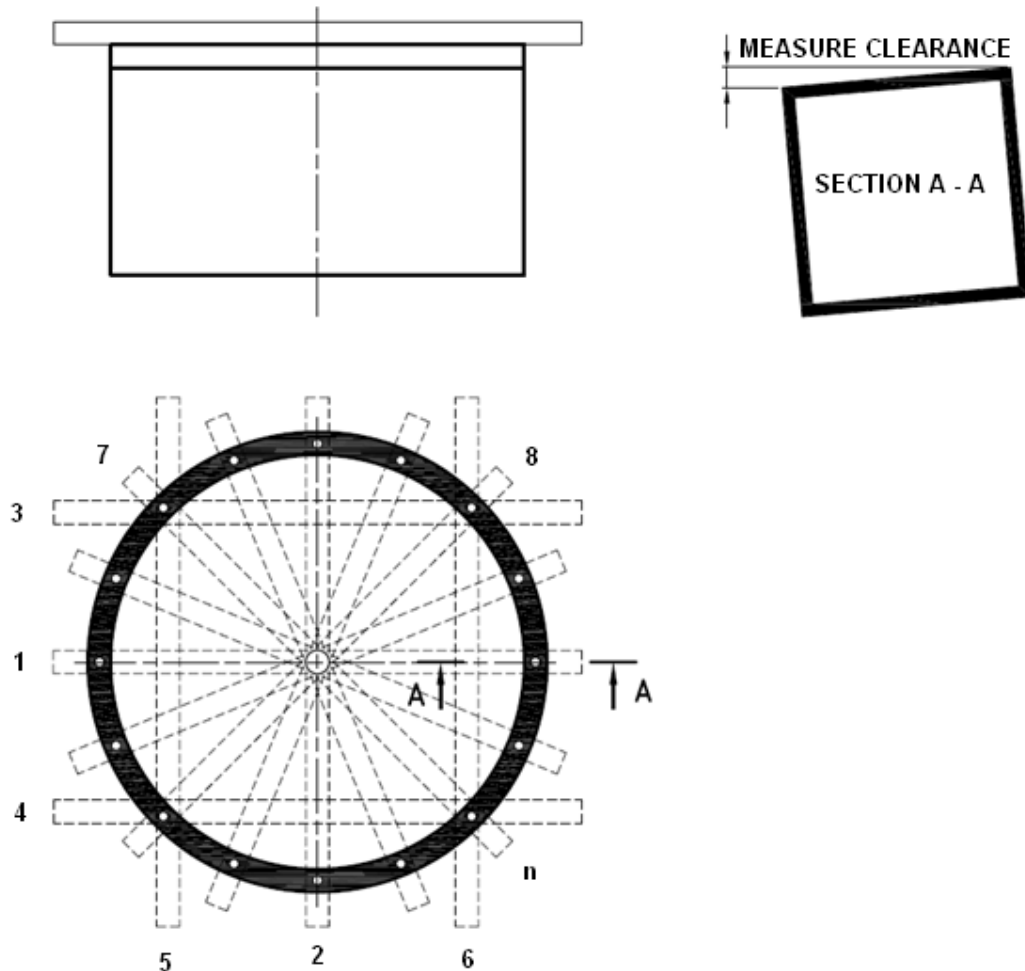
If the Quality Control department at Motus Technology AS is of the opinion that the shipyard does not have enough experience of welding foundation to pedestal, laser equipment shall be used.

2.1.2 Inspection of the flatness in two steps without use of laser

▪ **Step 1: Inspection before the crane is lifted on board**

After final welding and straightening the flatness check shall be performed by use of straightness batten with as a minimum the same length as the outer diameter of the foundation top flange. The batten has to be placed in “n” positions according to the figure below. At each position the clearance has to be checked on both sides with a thickness gauge. The result shall be recorded in a protocol such as in section 2.1.4.

Note! This check makes it possible to discover if the top flange is twisted. Possible clearance has to be checked on both sides to the straightness batten.



■ Step 2: Inspection during installation of the crane

The check using a straightness batten only verifies that the top flange has not been twisted. After lifting on board, but before tightening the screws between the top flange and the crane, **the yard shall carefully check that no daylight can be observed from the inside of the foundation.** If daylight is observed, the gap between the slewing ring and the top flange should be measured by use of a thickness gauge. (In case of installation during evenings and nights, the yard must arrange with sufficient lights in order for it to be possible to discover gaps). Any gaps shall be recorded in a protocol such as in section 2.1.5. If a gap exceeds the permissible flatness as specified on the drawing, **the crane must not be installed, and Motus Technology AS must be consulted.**

The slewing ring shall be assumed as flat, while the permissible gap shall be the same as the tolerance specified for the machined flange.

In order to correct the foundation, it can either be machined at spot by use of a mobile boring machine or cut down and re-welded again. **Correction by jacking or heating must not be used.**

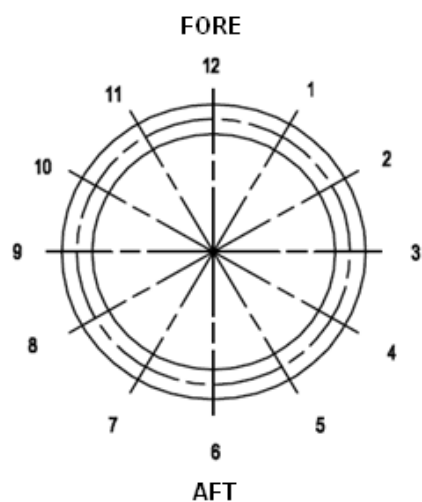
2.1.3 Measurement protocol – inspection with laser

Shipyard:

Hull no:

Crane no:

POSITION	RECORD	REMARK
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		



We hereby certify that no welding is carried out on the foundation pedestal after this measurement.

Date:

Signature:

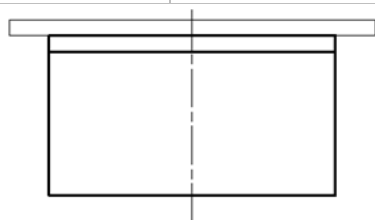
2.1.4 Measurement protocol – inspection without laser, step 1

Shipyard:

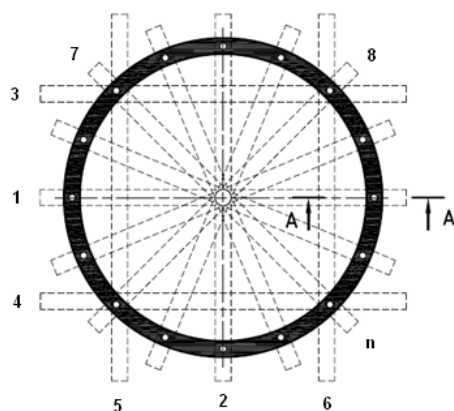
Hull no:

Crane no:

POSITION	MEASURED CLEARANCE	
	SIDE A	SIDE B
1		
2		
3		
4		
5		
6		
7		
8		
n		



MEASURE CLEARANCE



We hereby certify that no welding is carried out on the foundation pedestal after this measurement.

Date:

Signature:

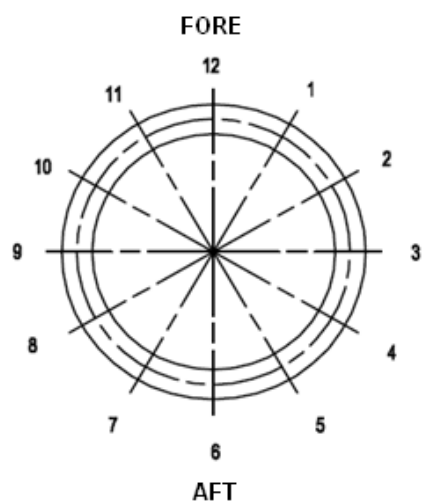
2.1.5 Measurement protocol – inspection without laser, step 2

Shipyard:

Hull no:

Crane no:

POSITION	RECORD	REMARK
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		



We hereby certify that no welding is carried out on the foundation pedestal after this measurement.

Date:

Signature:

3. Bolted connections

3.1 Procedure, content, torque table

- Order of tightening is performed after normal cross tightening.
- Threads and surfaces must be lubricated.
- Check surfaces underneath bolts and washers. Observe if surfaces beneath washers are covered with paint or metalizing layer. Remove any primer, metalizing, or paint.
- Make sure surface is flat and of bare metal.
- Use only hydraulic tool of recommended quality.
- If required, install new bolts. Do **not** reuse pretensioned bolts.
- Bolt thread lubrication will affect the applied torque. If a lubricant different from the one stated in this manual is used Motus Technology is to be notified.

Conversion factor for tightening torque

Tightening torques in this document are calculated using the lubricating paste Molykote 1000.

Materials used for the project are outlined in bold text in this table:

Alt. Matr.	Surface treated		Lubrication condition	Conversion factor*
	Bolts	Nuts		
1	Untreated	Untreated	<ul style="list-style-type: none"> • Dry • Oiled • MoS2 • Waxed 	<ul style="list-style-type: none"> • 0,96 • 1 • 0,86 • 0,63
2	Phosphated	Phosphated or untreated	<ul style="list-style-type: none"> • MoS2 	<ul style="list-style-type: none"> • 0,77
3	Hot dip galvanized	Hot dip galvanized or untreated	<ul style="list-style-type: none"> • Dry • Oiled/ emulsified • Waxed 	<ul style="list-style-type: none"> • 1,17 • 1,07 • 0,63
4	Stainless steel	Stainless steel	<ul style="list-style-type: none"> • Oiled/emulsified • Waxed 	<ul style="list-style-type: none"> • 1,17 • 1

* Refers to "Teknisk informasjon om feste-elementer/Arvid Nilsson AS" for conversion factors and calculated values on Hexagon bolts/Hexagon hole bolts.



Where not otherwise specified, pretension values shall be picked from the table below and multiplied with the conversion factor corresponding to the surface treatment and lubrication condition.

Thread M	D mm	P mm	As mm ²	(d+P)xAs mm ³	Pretension in Nm for Solidity Class					
					A4-80	4.6	5.8	8.8	10.9	12.9
6	6	1	20.1	140.4	9.3	3.7	6.1	9.8	14	17
8	8	1.25	36.6	338.5	22	8.9	15	24	33	40
10	10	1.5	58	667	44	17	29	47	65	79
12	12	1.75	84.3	1159	76	30	51	81	114	136
14	14	2	115	1840	121	48	80	128	181	217
16	16	2	157	2826	187	74	123	197	277	333
18	18	2.5	192	3936	261	103	172	275	386	463
20	20	2.5	245	5512	364	144	240	385	541	649
22	22	2.5	303	7423	-	194	324	518	278	874
24	24	3	353	9531	629	249	416	665	935	1120
27	27	3	459	13770	909	360	600	961	1350	1620
30	30	3.5	561	18793	1240	492	819	1310	1840	2210
33	33	3.5	694	25331	-	663	1100	1770	2480	2980
36	36	4	817	26680	2160	855	1420	2280	3210	3850
R _{el} or R _{po.2} N/mm ²					-	240	400	640	900	1080
$\left[\frac{k}{K \left(1 + \frac{S_F}{F_{Fm}} \right)} \right] \cdot \sigma_s \cdot \frac{N}{mm^2}$					-	26.16	43.6	69.76	98.1	117.7 2

Thread M	P mm	As mm ²	Pretension in Nm for Solidity Class				
			4.6	5.8	8.8	10.9	12.9
39	4	976	1100	1830	2930	4120	4940
42	4,5	1121	1360	2270	3640	5110	6140
45	4,5	1306	1690	2820	4510	6340	7610
48	5	1473	2040	3400	5450	7660	9190
52	5	1758	2620	4370	6990	9830	11800
56	5,5	2030	3270	5440	8710	12200	14700

NOTE 1:

If crane is equipped with tensioning system, the force will be specified for each crane number.

NOTE 2:

Bolt thread lubrication will affect the applied torque. Please use factor for applied lubrication.

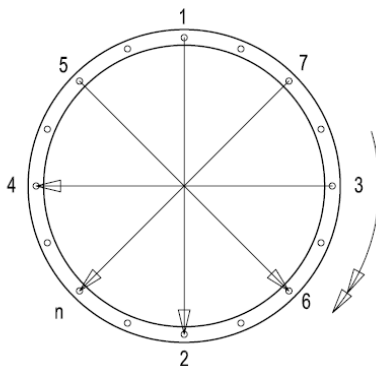


3.2 Installation of tower to pedestal & pedestal to foundation

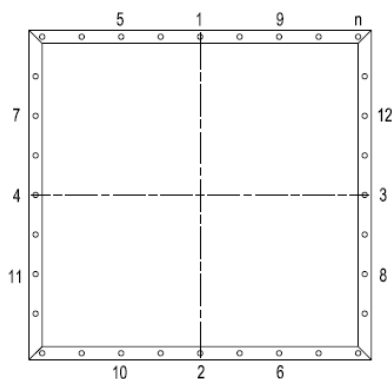
- Both surfaces must be clean without any metallization, paint, grease etc.
- Check the concentricity of the bolt holes in the bearing with the bore holes of the pedestal and tower flanges. **In case of incongruity the bearing can be deformed!**
- Insert all the fixing bolts (hand tight).
- Crosswise tension bolts to the correct value by means of hydraulic bolt-tensioning equipment. The bolt that is tensioned first is influenced by tensioning of subsequent bolts. Therefore, it is necessary to perform at least two rounds of tensioning.
- Complete tightening protocols (section 3.4) in this document to present to the commissioning engineer from Motus before equipment start-up and HAT.
- After all of the bolts are properly tightened, paint unprotected areas and bolts according to Motus ST System 38 touch-up (not applicable for coated bolts with grease caps).

3.3 Cross tightening order

3.3.1 Circular pedestal



3.3.2 Square pedestal



3.4 Tightening protocols

3.4.1 Pedestal to foundation (~80% pretension)

Bolt type	Bolt quality	Bolt certificate	Tightening factor	Tightening torques w/lubricating
M30 x 180	10.9	3.2	1,2	1582 Nm

Bolt No.	Torque [Tm]	OK	Bolt No.	Torque [Tm]	OK	Bolt No.	Torque [Tm]	OK
1.			2.			3.		
4.			5.			6.		
7.			8.			9.		
10.			11.			12.		
13.			14.			15.		
16.			17.			18.		
19.			20.			21.		
22.			23.			24.		
25.			26.			27.		
28.			29.			30.		
31.			32.			33.		
34.			35.			36.		
37.			38.			39.		
40.			41.			42.		
43.			44.			45.		
46.			47.			48.		
49.			50.			51.		
52.			53.			54.		
55.			56.			57.		
58.			59.			60.		
61.			62.			63.		
64.			65.			66.		
67.			68.			69.		
70.			71.			72.		
73.			74.			75.		
76.			77.			78.		
79.			80.					

Date/Signature:



3.4.2 Slew bearing outer bolts (~80% pretension)

Bolt type	Bolt quality	Bolt certificate	Tightening factor	Tightening torques w/lubricating
M30x300	10.9	3.2	1,2	1582 Nm

Slew bearing serial number:

Bolt No.	Torque [Tm]	OK	Bolt No.	Torque [Tm]	OK	Bolt No.	Torque [Tm]	OK
1.			2.			3.		
4.			5.			6.		
7.			8.			9.		
10.			11.			12.		
13.			14.			15.		
16.			17.			18.		
19.			20.			21.		
22.			23.			24.		
25.			26.			27.		
28.			29.			30.		
31.			32.			33.		
34.			35.			36.		
37.			38.			39.		
40.			41.			42.		
43.			44.			45.		
46.			47.			48.		
49.			50.			51.		
52.			53.			54.		
55.			56.			57.		
58.			59.			60.		
61.			62.			63.		
64.			65.			66.		
67.			68.			69.		
70.								

Date/Signature:



3.4.3 Slew bearing outer bolts (~80% pretension)

Bolt type	Bolt quality	Bolt certificate	Tightening factor	Tightening torques w/lubricating
M30x220	10.9	3.2	1,2	1582 Nm

Bolt No.	Torque [Tm]	OK	Bolt No.	Torque [Tm]	OK	Bolt No.	Torque [Tm]	OK
1.			2.			3.		
4.			5.			6.		
7.			8.			9.		
10.								

Date/Signature:

3.4.4 Slew bearing inner bolts (~80% pretension)


Bolt type	Bolt quality	Bolt certificate	Tightening factor	Tightening torques w/lubricating
M30 x 240	10.9	3.2	1,2	1582 Nm

Slew bearing serial number:

Bolt No.	Torque [Tm]	OK	Bolt No.	Torque [Tm]	OK	Bolt No.	Torque [Tm]	OK
1.			2.			3.		
4.			5.			6.		
7.			8.			9.		
10.			11.			12.		
13.			14.			15.		
16.			17.			18.		
19.			20.			21.		
22.			23.			24.		
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76.			77.			78.		
79.			80.					

Date/Signature:



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4. Hydraulic & electrical installation

Use the documents annexed for the hydraulic and electrical installation/interconnection of the MMC crane. The procedures and documents must be followed to ensure proper assembly of the product. All contents of these documents must be available to the persons/person involved in the assembly.

All electrical and hydraulic installation to follow best practice and be done by skilled workers. The Motus Commissioning Engineer will review the electrical and hydraulic connections prior to startup.

Hydraulic hoses and electrical cables are bundled, secured, and marked with hose/cable numbers for easy installation at yard. It is the yard's responsibility to connect the crane's hydraulic and electrical system after installation on the vessel, and to avoid damage to hoses and cables during lifting and rigging.

Check hoses and cables for damage before installation.

Ensure hydraulic hoses have **steel** caps to prevent foreign objects entering the hydraulic system.

Be aware that there may be residual oil in the hydraulic hoses.

See the Motus Technical Manual for guidelines.



4.1 Motor starter cabinet

Main motor starter cabinet is to be installed on the vessel, the cabinet is delivered without MCT or cable glands, these must be supplied by yard.

The cabinet has an IP degree of 55 and is not to be installed on open deck. It should be placed so that the door can be opened and the buttons and panel on the front can be operated. Dimensions of the cabinet are shown in the figure below.

With mounting plate

H	1800
W	800
D	500
h	1694
w	694
d	459
Weight (kg)	120.00
Item no.	MKS18085R5

Figure 1: Enclosure dimensions

Terminations inside starter cabinet according to annexed electrical schematics.

4.2 Oil Filling

The tank must be filled with clean hydraulic oil through a filter of at least 1500 liter. The oil cleanliness should be at least ISO 17.15.12 or better.

4.3 Release and lock of slew lock

The slew lock is disengaged prior to shipment, this must be activated to lock the slew of the crane. This can be done without power to the crane by using a manual handpump, example shown below.

In Order to lock the slew, the crane must be correctly positioned with the slew lock at the correct location.



Figure 2: Manual handpump

The procedure for manually operating the slew lock cylinders is as follows.

1. Disconnect pipes at cylinders and on load holding valve line to slew brake. Blank them at the load holding valve.
2. Connect the handpump to the cylinders and slew brake.
3. Slowly operate the Handpump(s), this will release the brake and operate the slew lock.

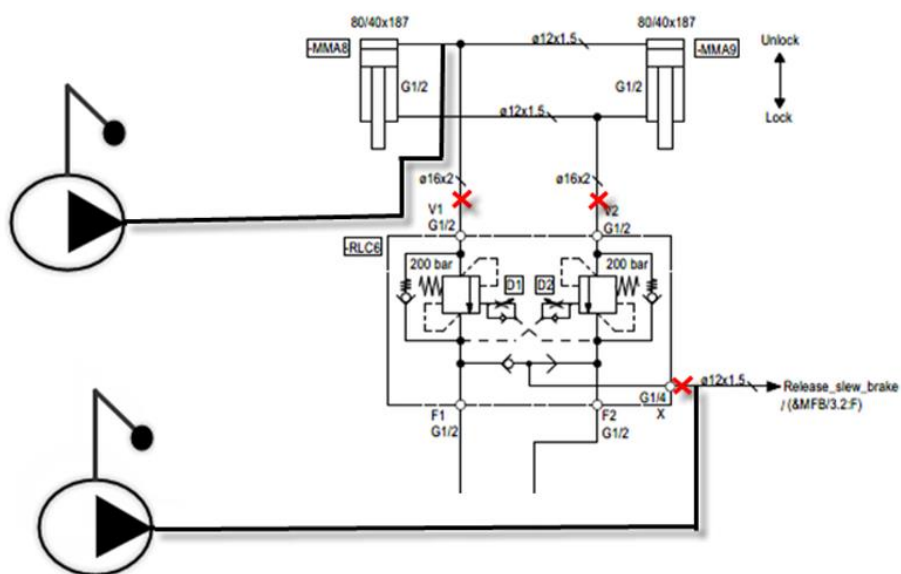
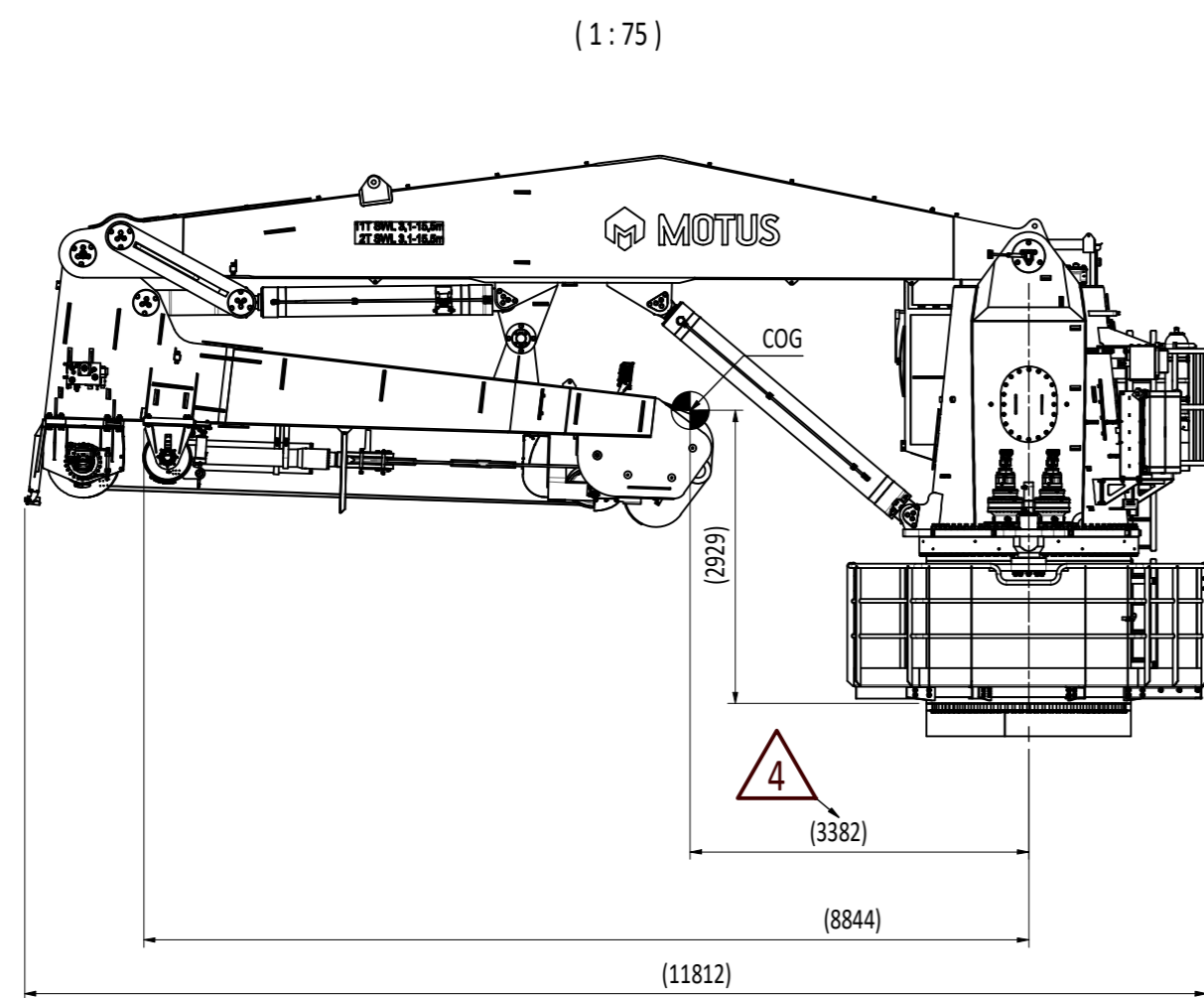


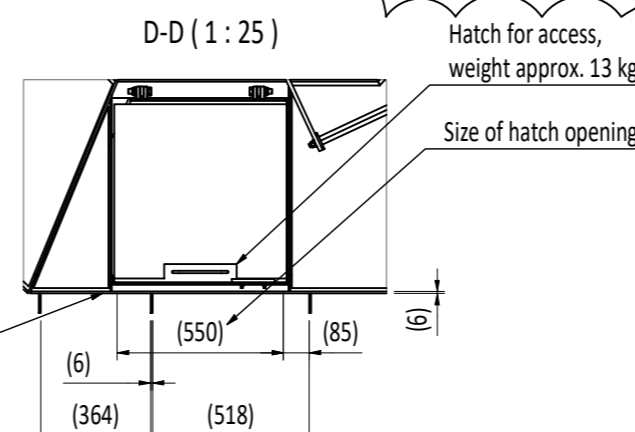
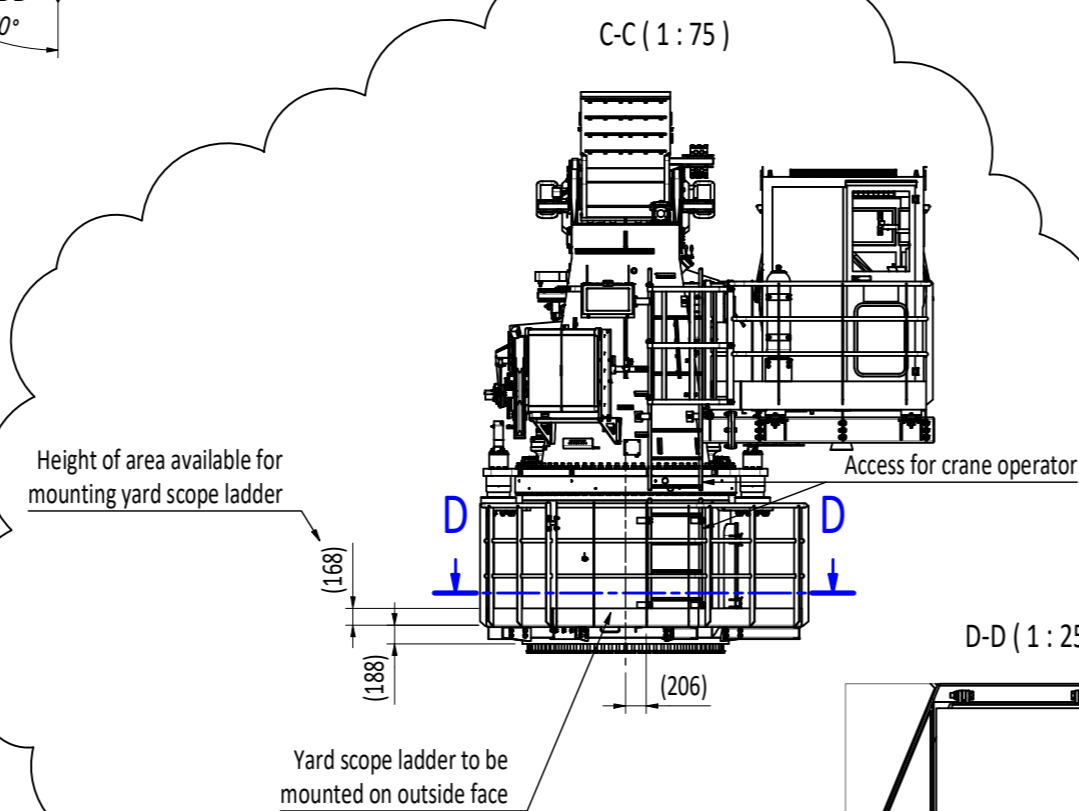
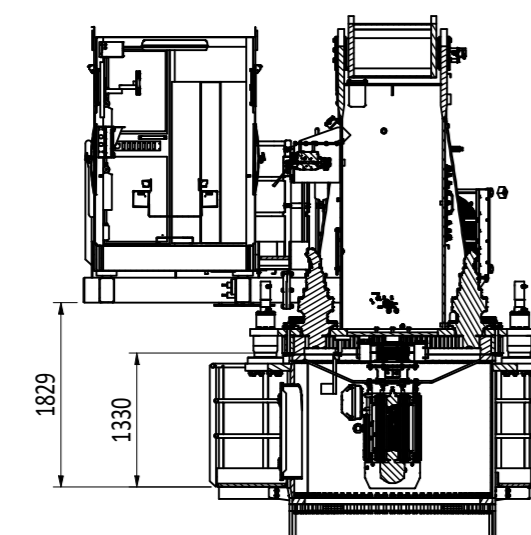
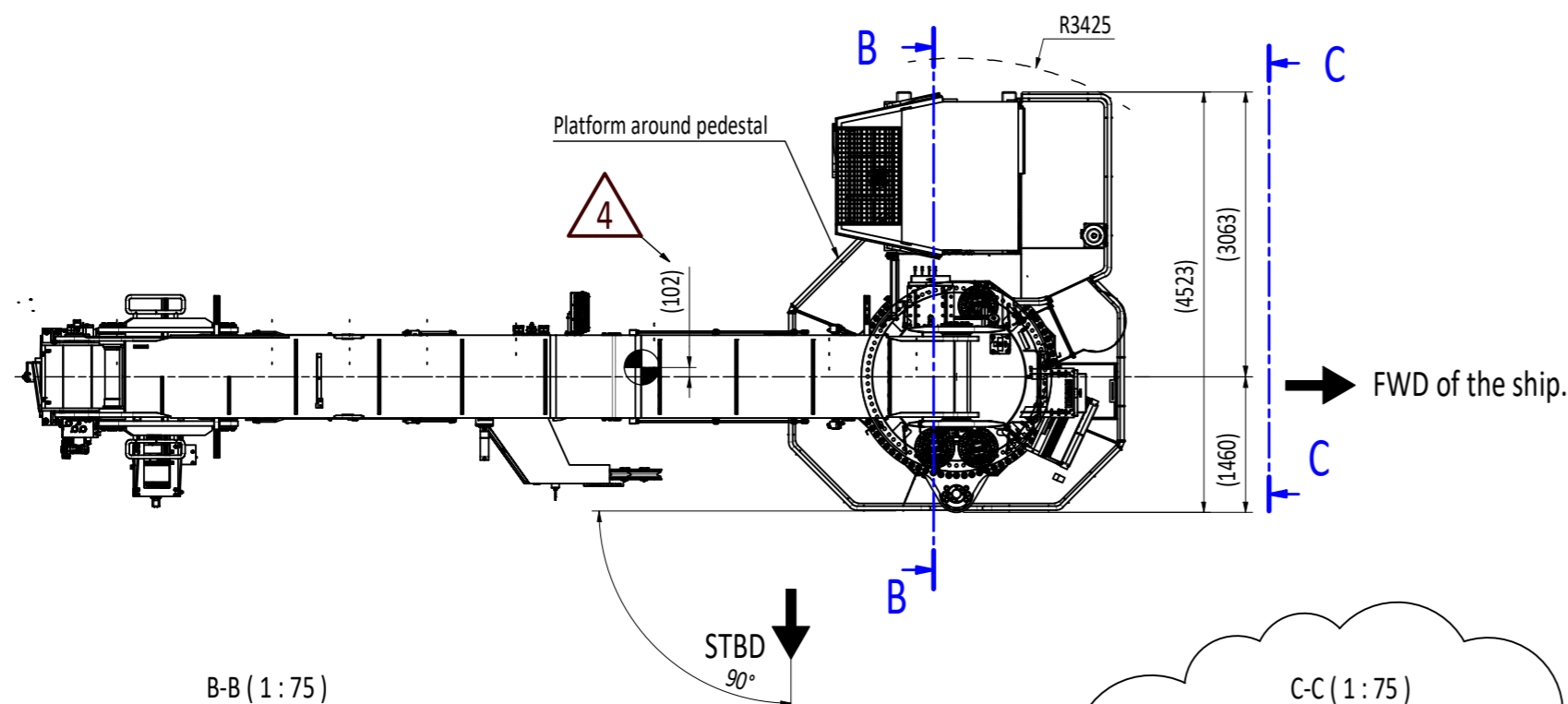
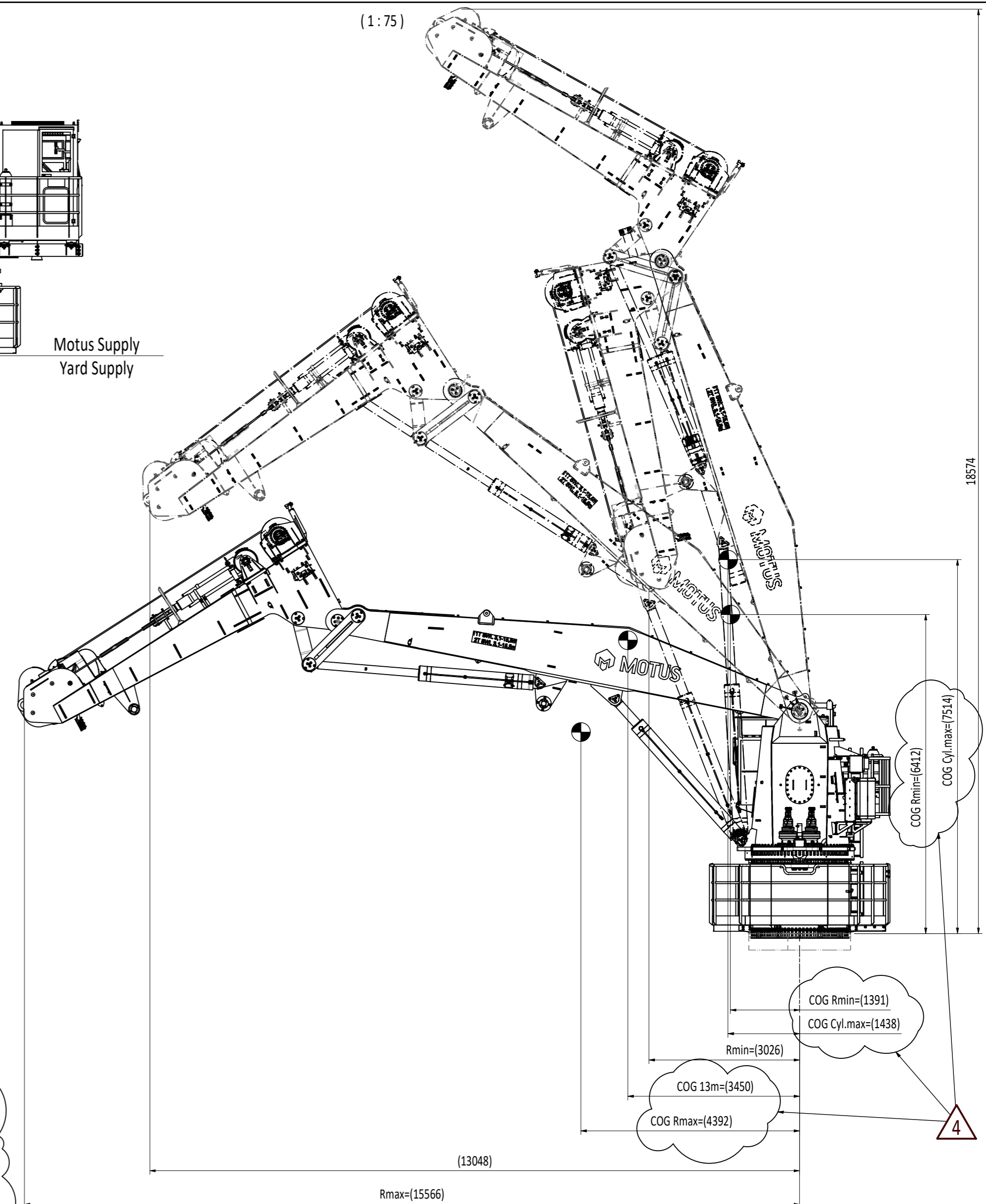
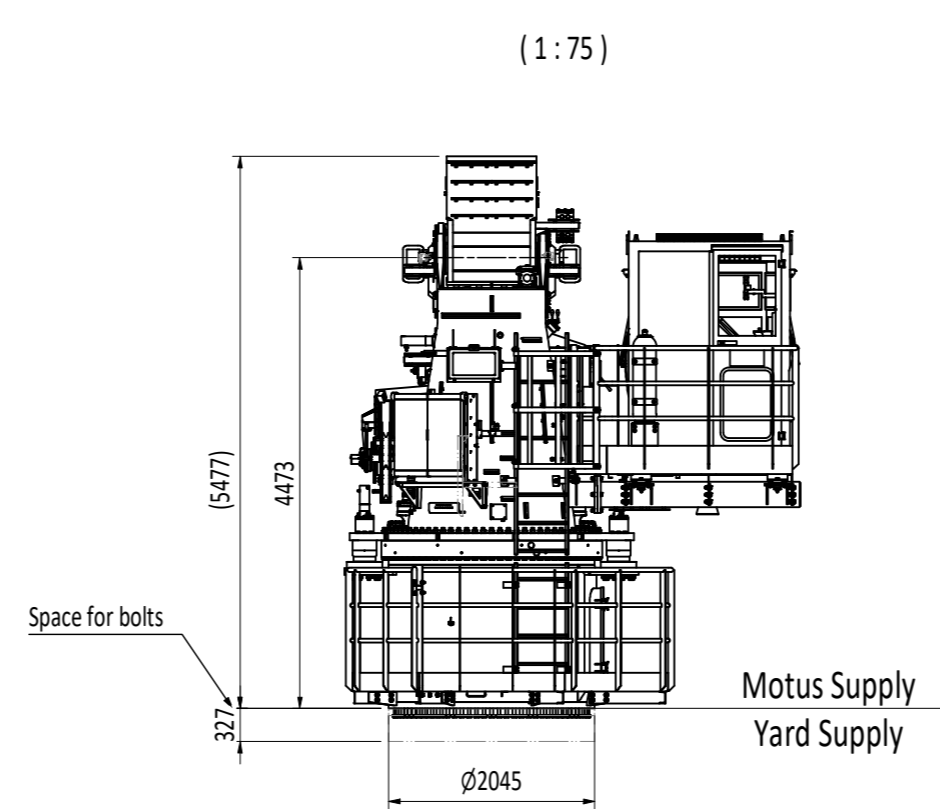
Figure 3: Closing of slew lock

5. Annex – drawings

#	Doc. No.	Title	Revision	Comment
1	327129	General arrangement drawing with interface foundation/pedestal	4	
2	328635	Transport arrangement	0	
3	324666	Pedestal outfit assembly	2	
4	329544	Lifting arrangement drawing	0	
5	DOC-323660-CR1 EFA	Single line & Network topology	4	
6	DOC-323660-VS-IN UCA1	Multiline motor starter cabinet	2	
7	DOC-323660-CR1 CB UCA2	Crane multiline and cabinet layout	3	
8	DOC-323660-CR1 EMB	Crane cable list	2	
9	DOC-323660-VS EMB	Vessel cable list	1	
10	DOC-323660-CR1 MFB	Hydraulic fluid power schematic	5	
11	DOC-300037	Motus technical manual	3	
12	DOC-300042	Painting Specification, Motus ST 38 touch-up	0	
13	DOC-300932	User manual wire tension unit	0	



Parked position



Notes:

- Total weight: 35 500kg (without oil).
- Foundation loads can be found in DOC-300927.

Summary of revision changes

Change description	Sheet
1 View C updated and view D added to show interface for ladder (yard scope).	1
2 CoGs updated.	

REVISION	ISSUE DESCRIPTION	REVISED BY	CHK BY	APPR BY	APPR DATE
4	Issued for information	JOME	WOSR	WOSR	28.02.2025

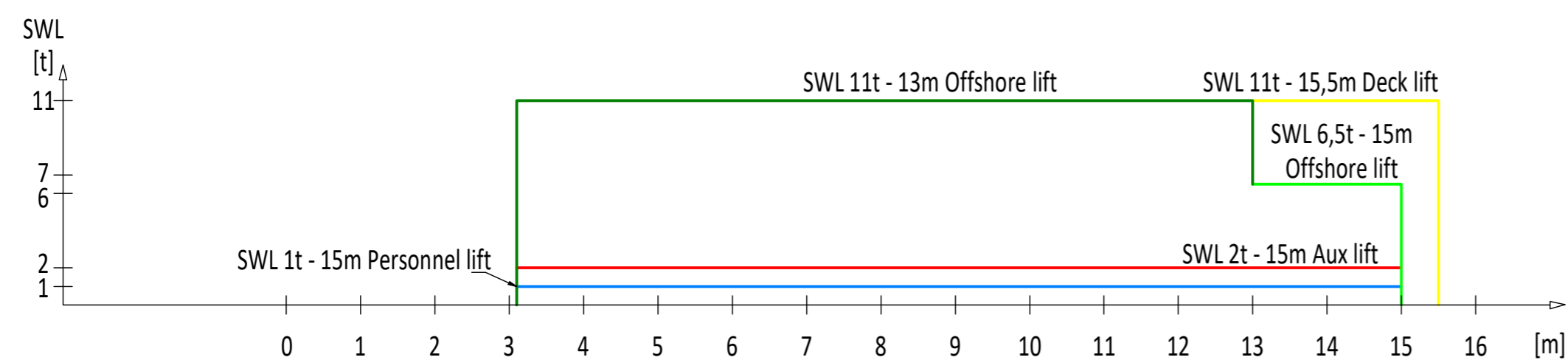
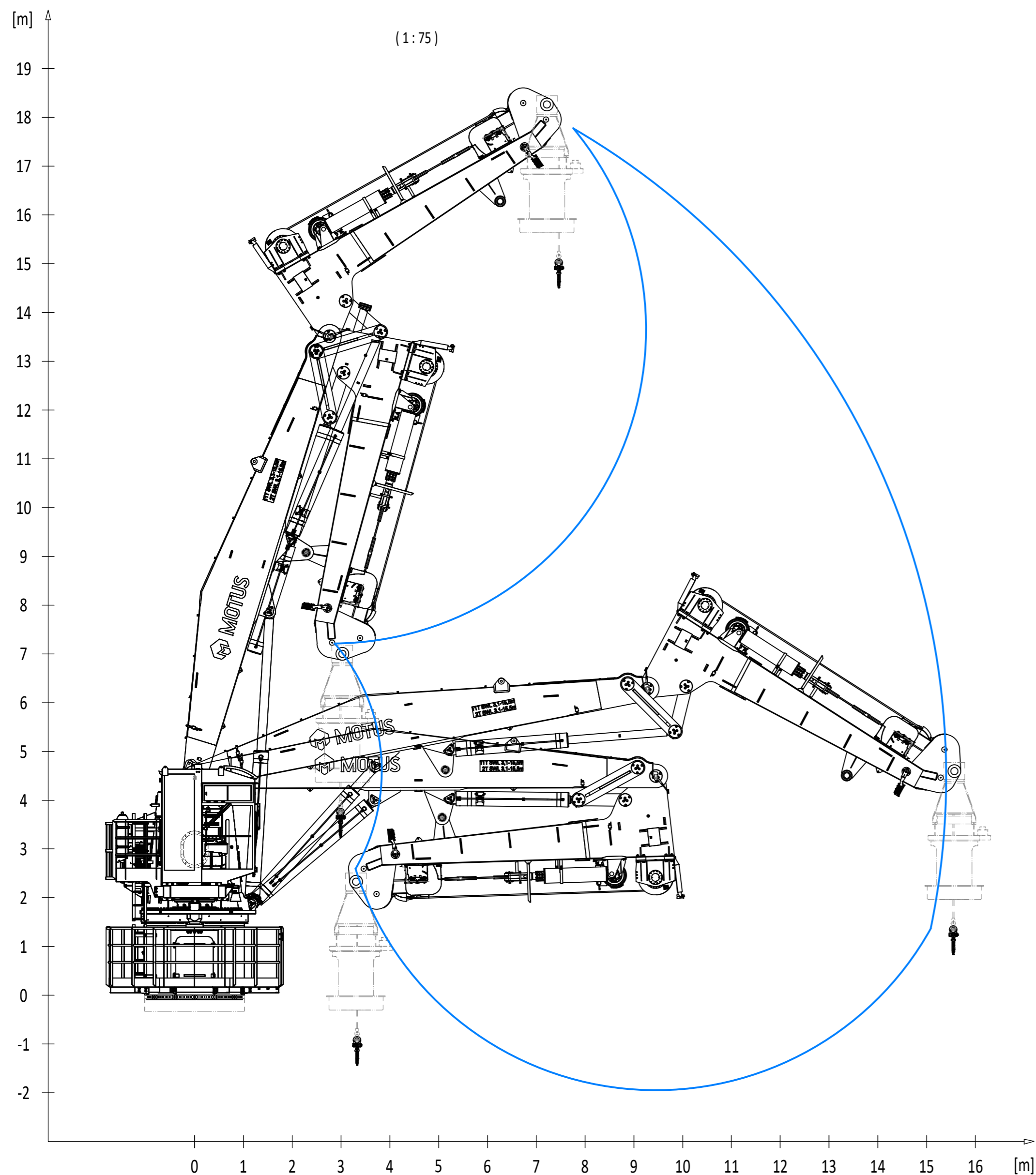
General Arrangement
MMC240-P-E-OC
Overview



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GENERAL TOLERANCES NS-ISO 2768-mK / Ra 6.3 EN ISO 13920-AE / Sa 2.5	CREATED BY JOME	MASS -
SHEET SIZE A2	CREATED DATE 09.02.2024	SCALE 1 : 75
DRAWING NUMBER 327129	SHEET 1 / 2	REVISION 4

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Notes:

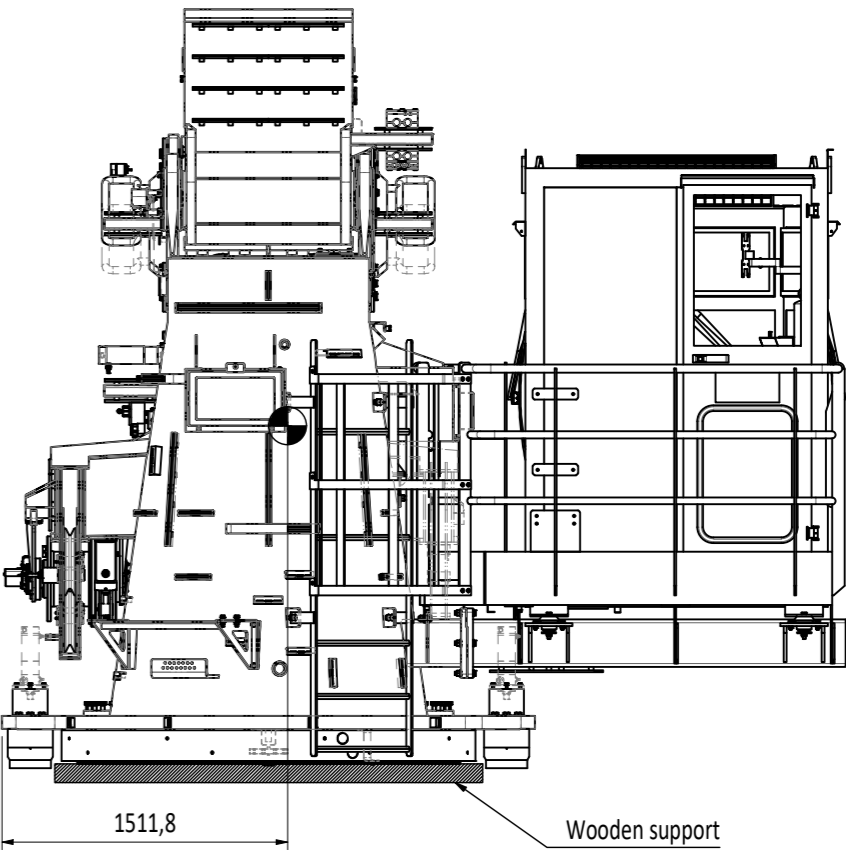
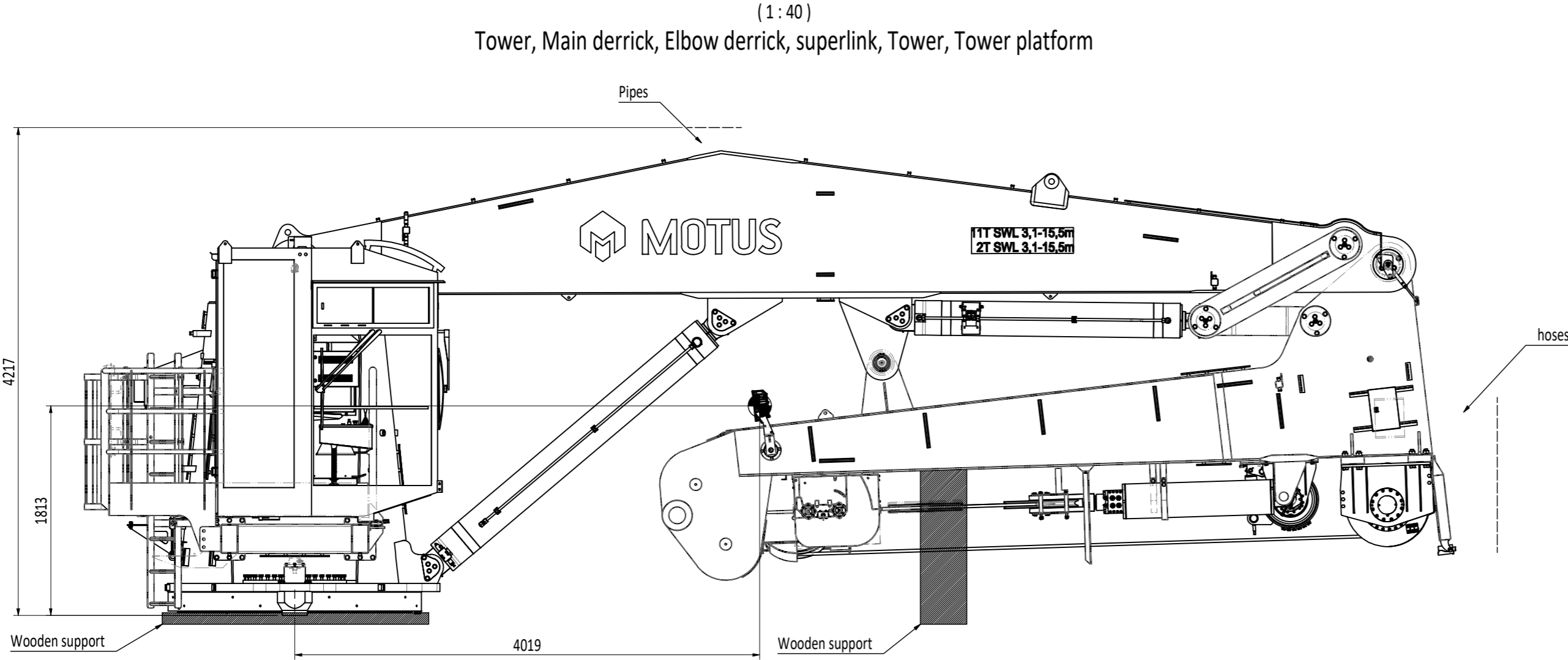
NB! SWL is dependent on selected HS. For more information see load charts DOC-300929.

General Arrangement
MMC240-P-E-OC
Load curves





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Tel. +47 712 59 540 - www.motustech.no

DRAWING NUMBER	SHEET	REVISION
327129	2 / 2	4
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		A2

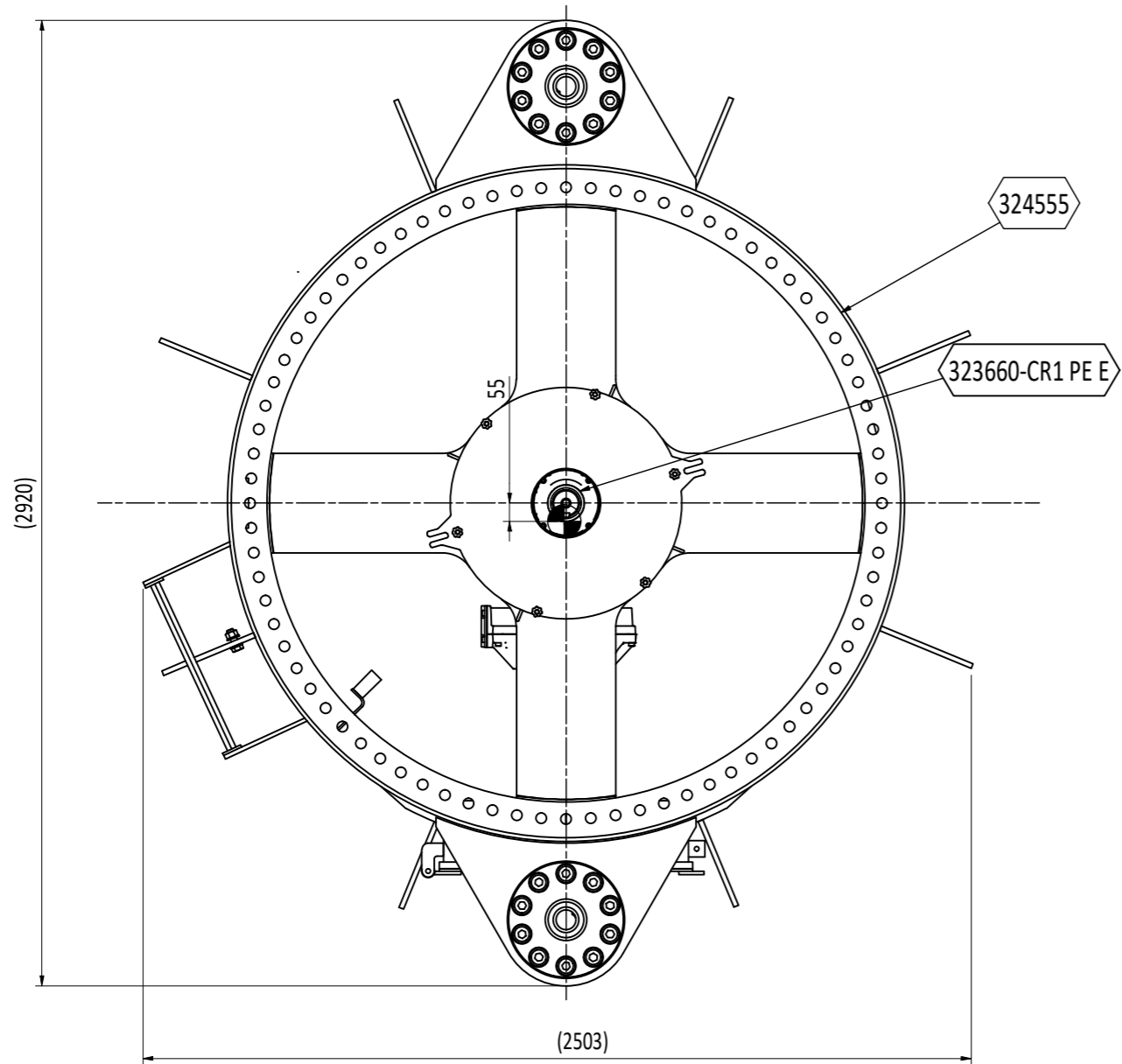
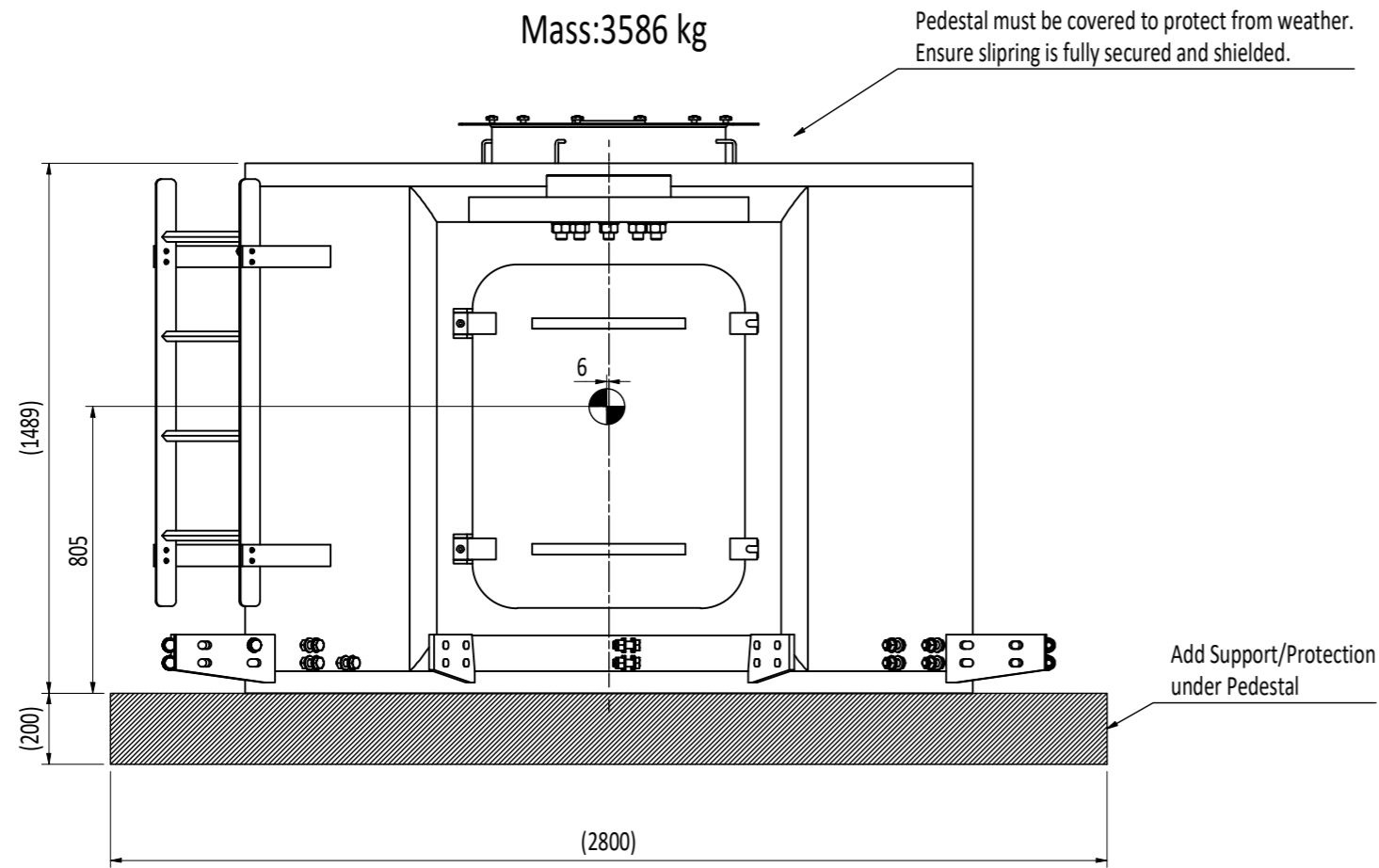


Notes!
-Ensure safe construction of supports and securing of loads according to governing rules and regulations.

REVISION	ISSUE DESCRIPTION	REVISED BY	CHK BY	APPR BY	APPR DATE	
0	Issued for information	ALPI	ANBJ	TALY	30.09.2024	
Transport Arrangement MMC240 Tower & Main derrick & Elbow derrick						
 <div>MOTUS</div> <div>MOTUS TECHNOLOGY AS - Verftsg. 10, 6416 Molde, Norway Tel. +47 712 59 540 - www.motustech.no</div>		GENERAL TOLERANCES NS-ISO 2768-mK / Ra 6.3 EN ISO 13920-AE / Sa 2.5		CREATED BY ALPI	MASS 29000	
			SHEET SIZE A2	CREATED DATE 13.03.2024	SCALE 1 : 40	
		DRAWING NUMBER 328635			SHEET 1 / 3	REVISION 0
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328635 (1 : 20)

Pedestal
Mass:3586 kg



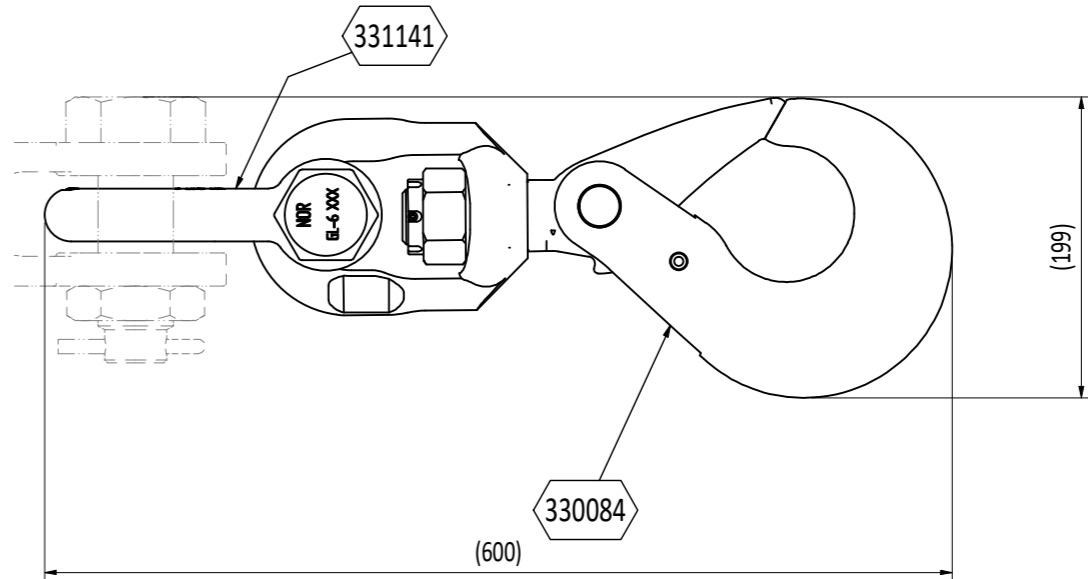
Notes!

- Ensure safe construction of supports and securing of loads according to governing rules and regulations.
- Loose components and bolts to be stored on seperate pallets.
- Add padding between loose components.
- Pedestal must be covered to protect from weather.
- Ensure slip ring is fully secured and shielded.

UNIT PICKING LIST				
QTY	ITEM NO.	TITLE	DESCRIPTION	MASS
2	CC10061	Washer	Nord-Lock NL12sp, SS	0 kg
1	CC15094	Bolt	Hex Head Bolt ISO 4017, M12x45, A4-80	0,1 kg
1	CC29009	Nut	Hex nut ISO 4032, M12, A4	0 kg
64	CC10024	Washer	Nord-Lock NL20sp, flZn	0 kg
1	323660-CR1 PE E	Kit of Electrical Components	Ifremer - MMC240 (CR1 PE)	893,5 kg
1	324555	Kit of Manufactured Components	Pedestal MMC240 Ifremer	2649 kg

328635 (1 : 5)

MMC240 Transport Arrangement
Hook
Mass: 18,18 kg



UNIT PICKING LIST				
QTY	ITEM NO.	TITLE	DESCRIPTION	MASS
1	331141	Shackle	Bow Shackle with Bolt, 13.5T, ILO Certificate,	6,5 kg
1	330084	Purchased Lifting hook	Hook with Swivel, 16,0T	11,9 kg

Transport Arrangement
MMC240
Pedestal

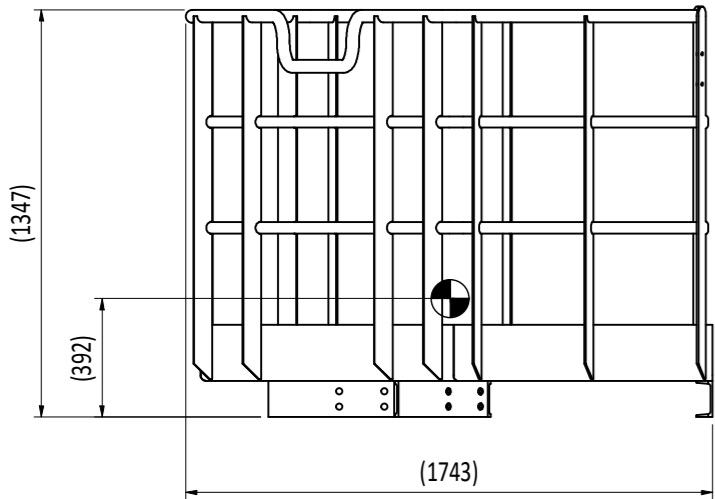


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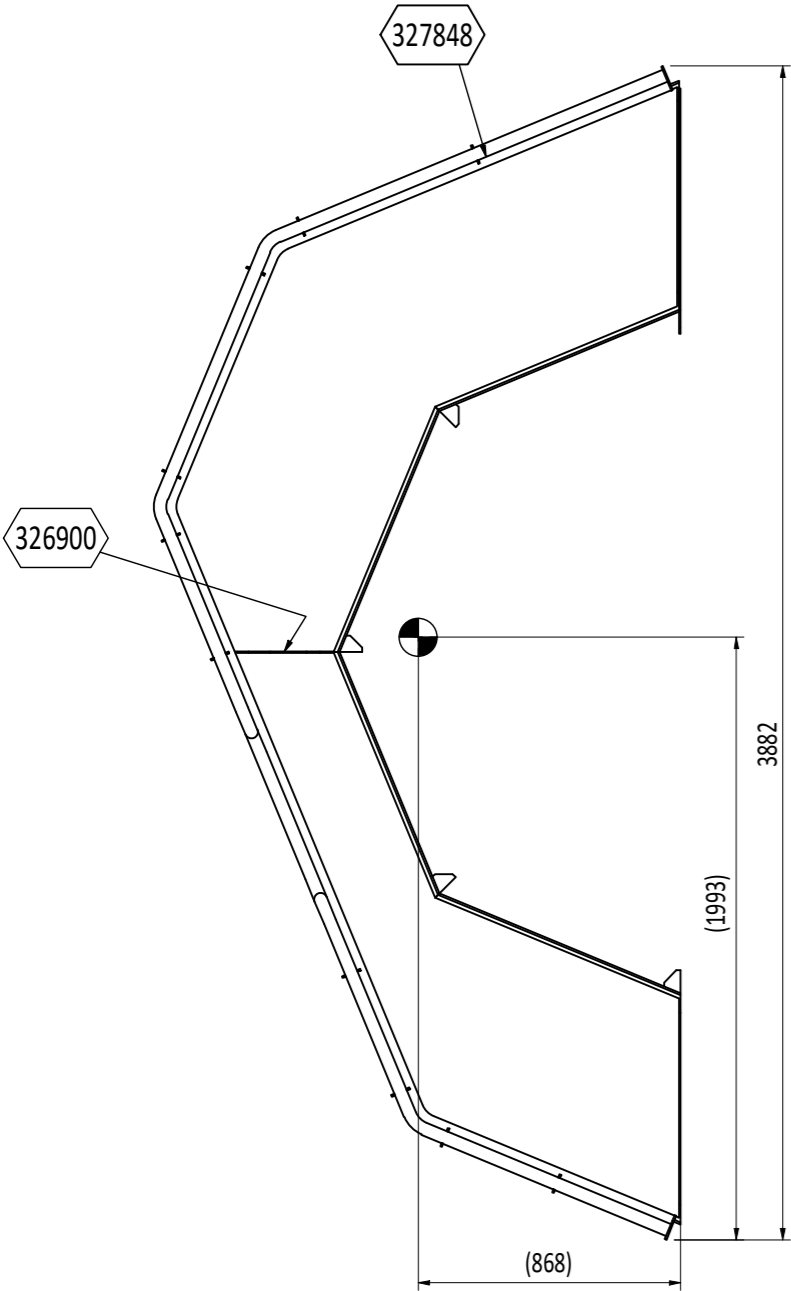
DRAWING NUMBER	SHEET	REVISION
328635	2 / 3	0
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		A2

Transport arrangement (1 : 25)

Pedestal Platform Front with Grating
Mass: 255,19 kg



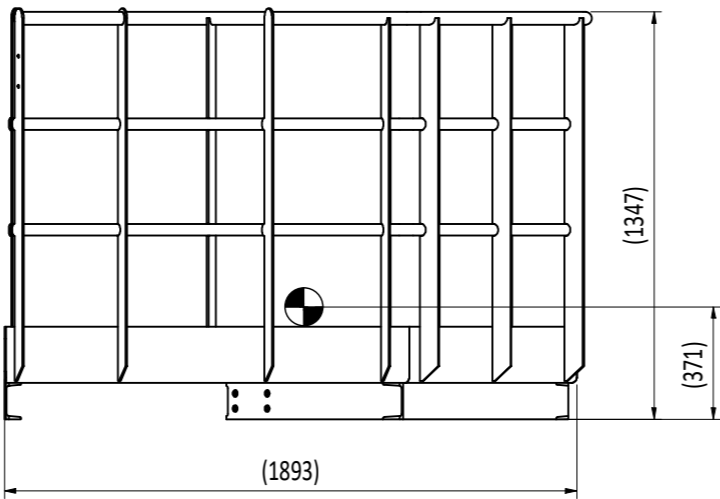
(1 : 25)



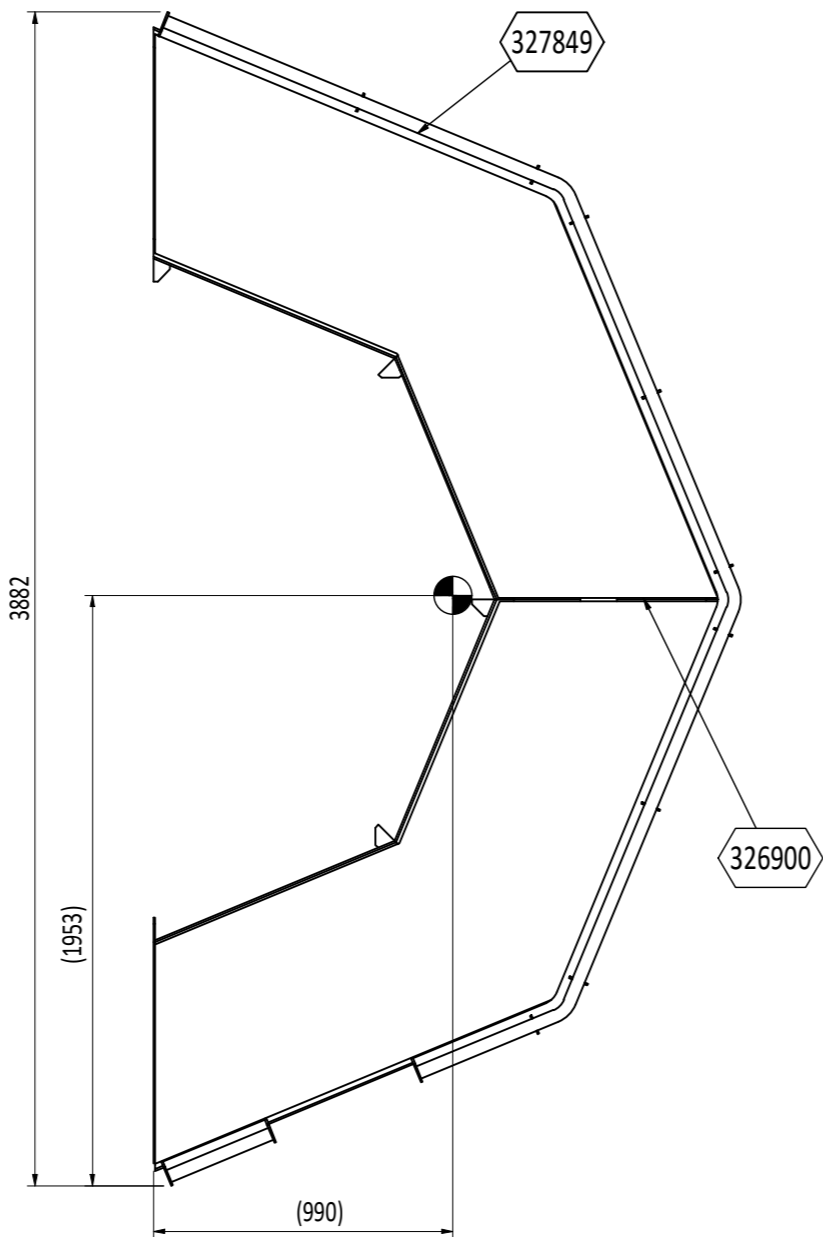
UNIT PICKING LIST				
QTY	ITEM NO.	TITLE	DESCRIPTION	MASS
1	326900	Kit of Manufactured Components	MMC 240 Grating for pedestal	35,6 kg
1	327848	Manufactured Steel assembly	Pedestal platform back	219,6 kg

Transport arrangement (1 : 25)

Pedestal Platform Front with Grating
Mass: 277,13 kg



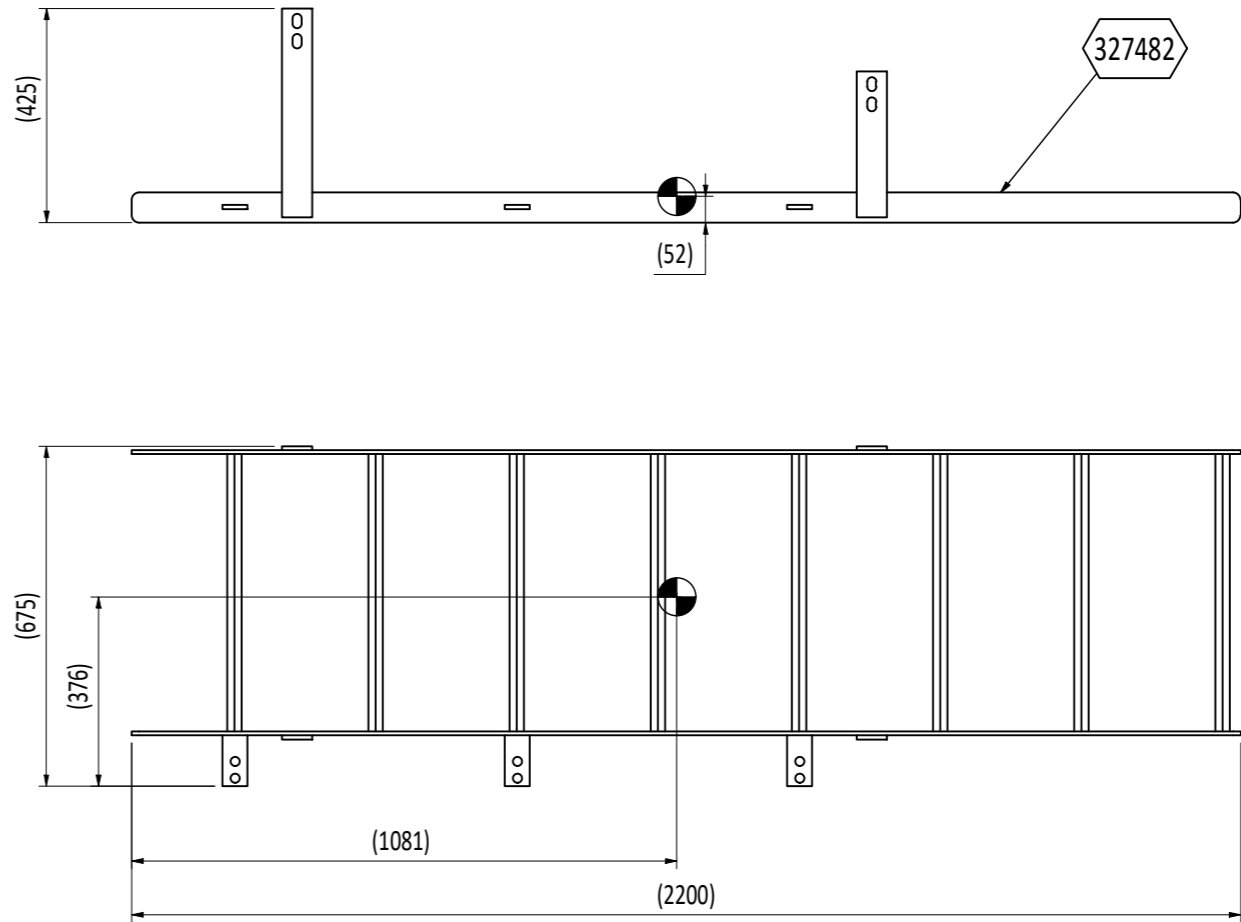
(1 : 25)



UNIT PICKING LIST				
QTY	ITEM NO.	TITLE	DESCRIPTION	MASS
1	326900	Kit of Manufactured Components	MMC 240 Grating for pedestal	45,3 kg
1	327849	Manufactured Steel assembly	Pedestal platform front	231,9 kg

Transport arrangement (1 : 15)

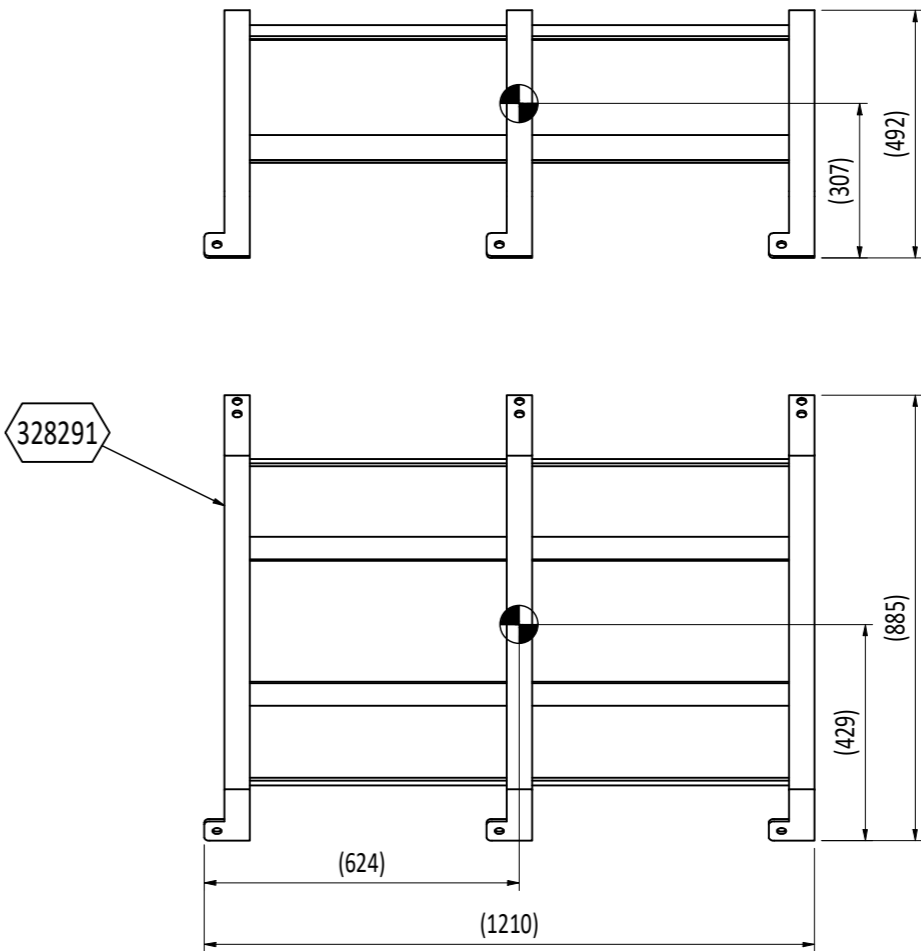
Tower Platform Ladder
Mass: 36,28 kg




UNIT PICKING LIST				
QTY	ITEM NO.	TITLE	DESCRIPTION	MASS
1	327482	Manufactured Ladder assembly	Tower Platform Ladder, H2200mm x W675mm	36,3 kg

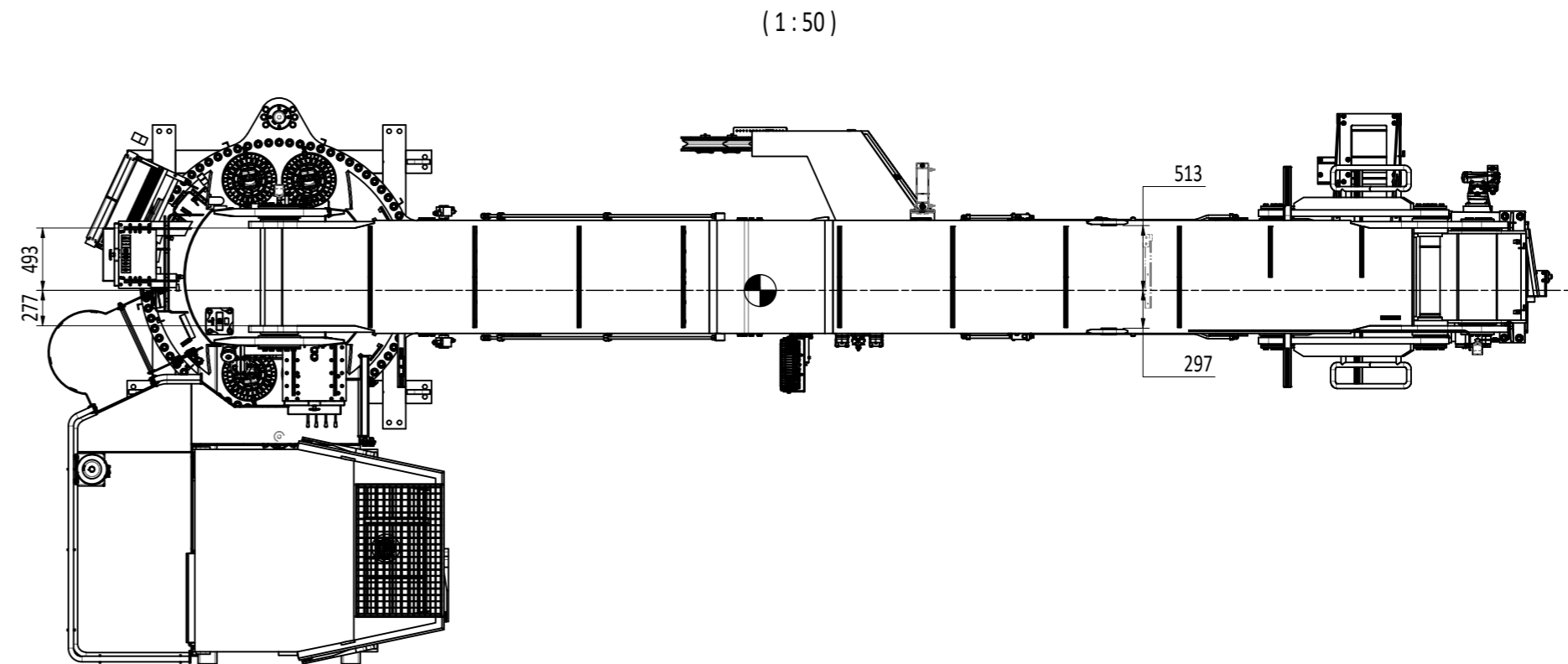
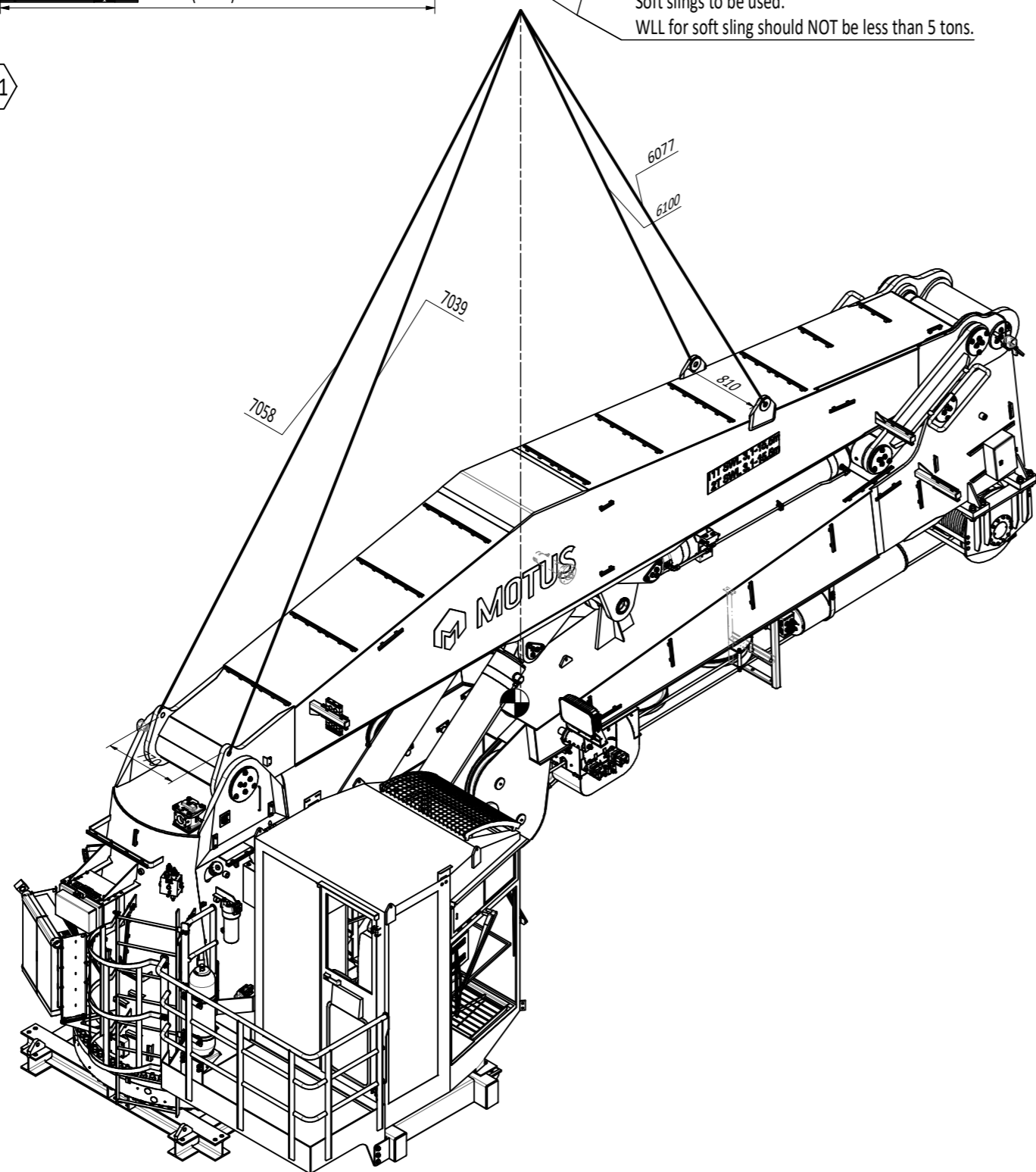
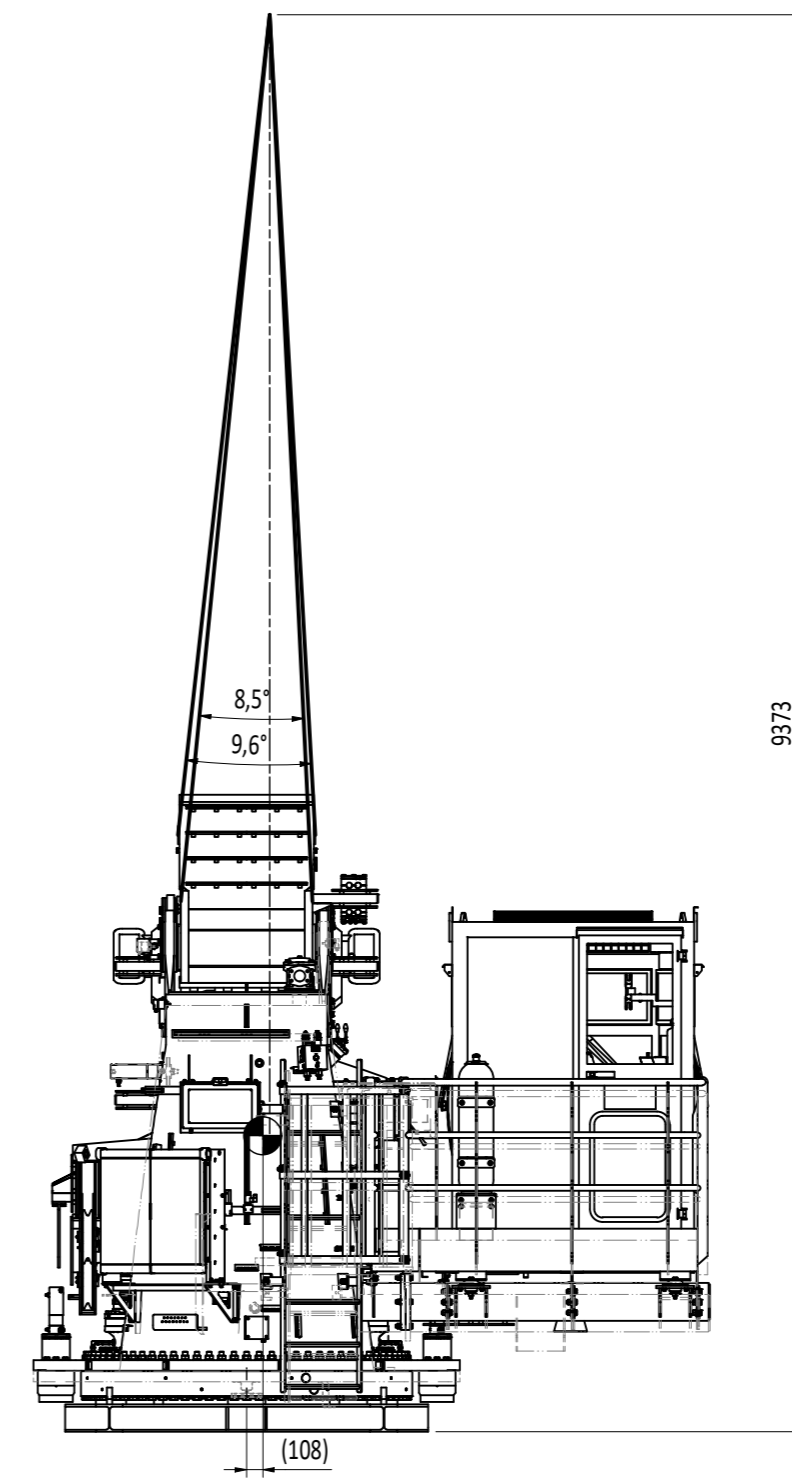
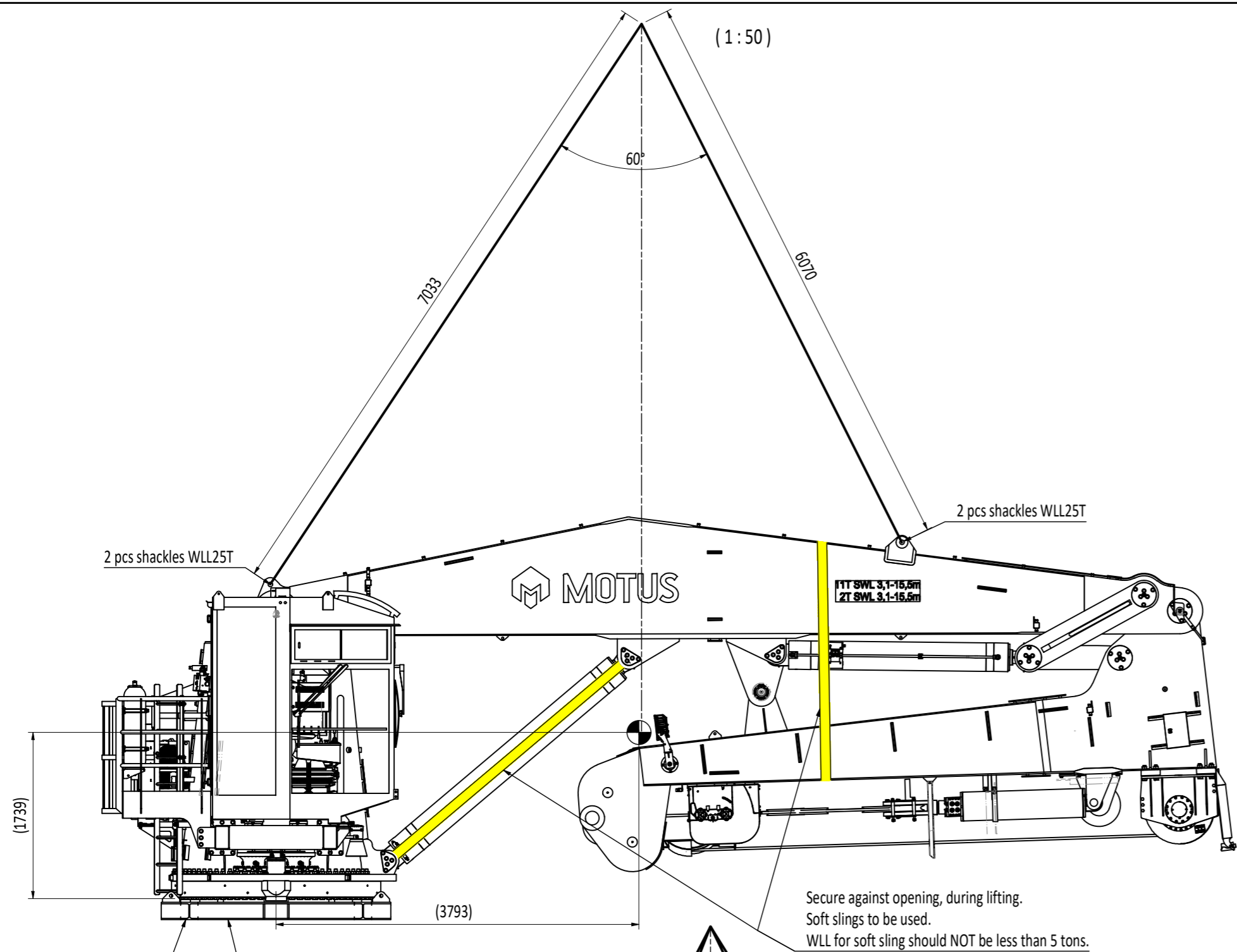
Transport arrangement (1 : 15)

Tower Platform Safety Cage
Mass: 21,25 kg


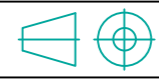


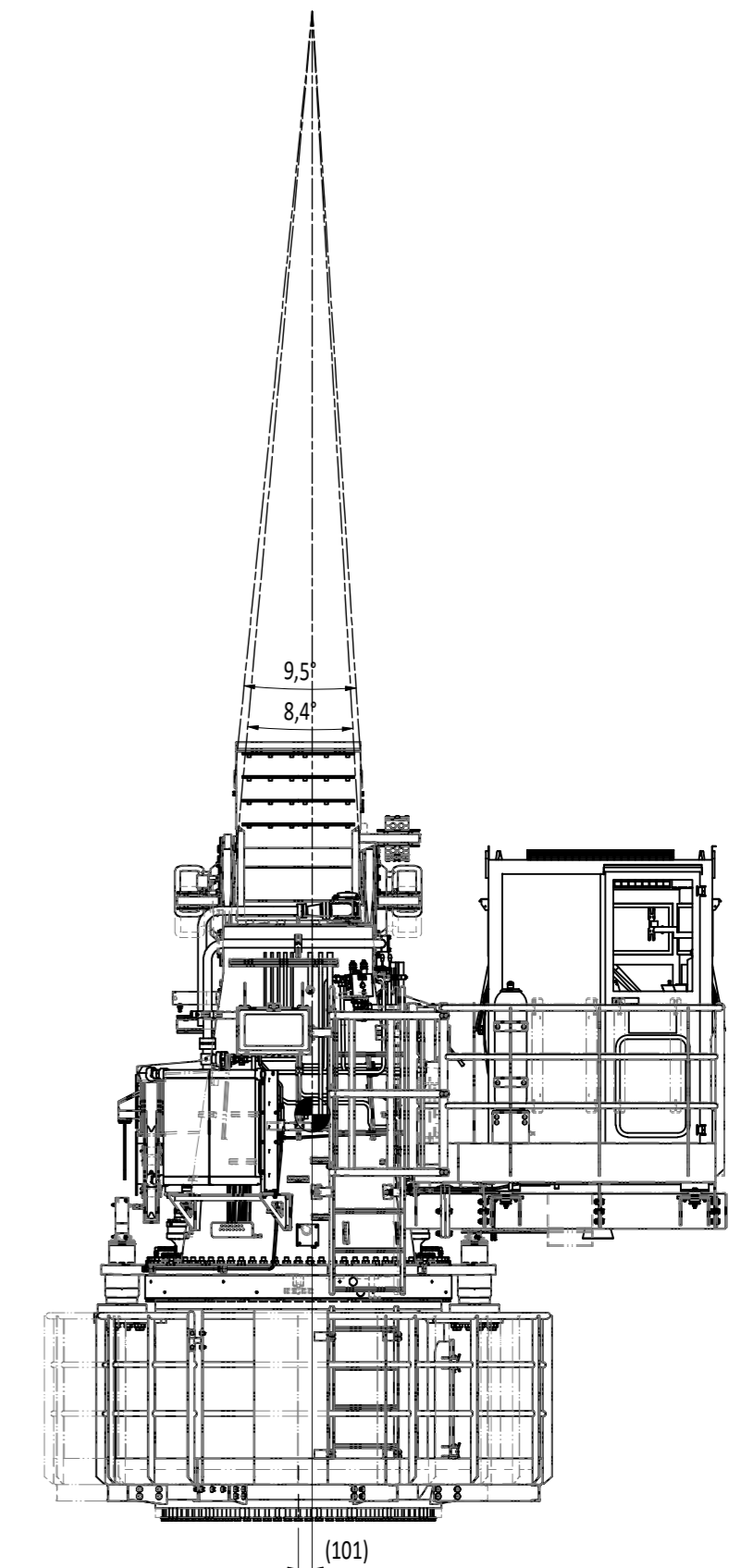
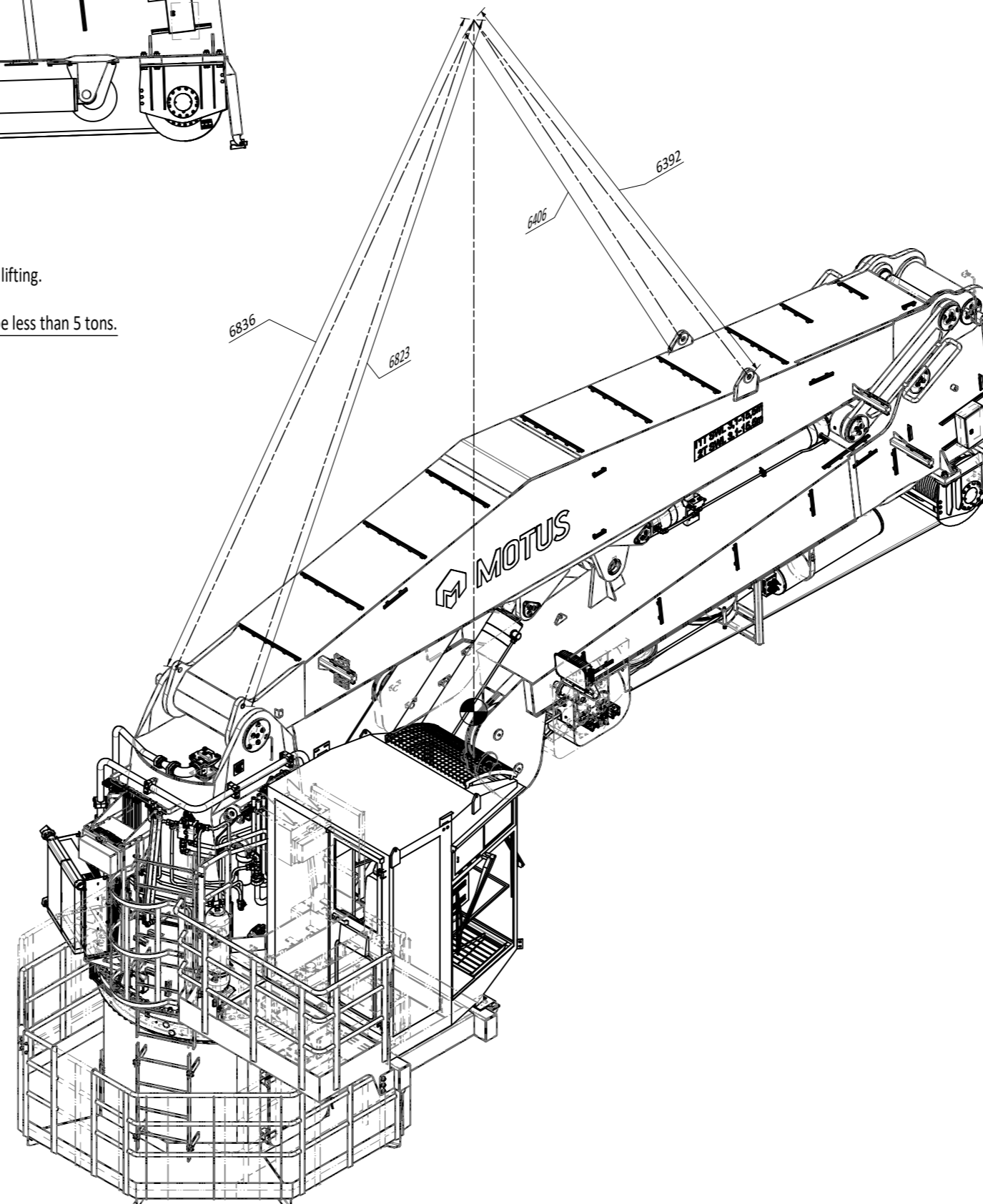
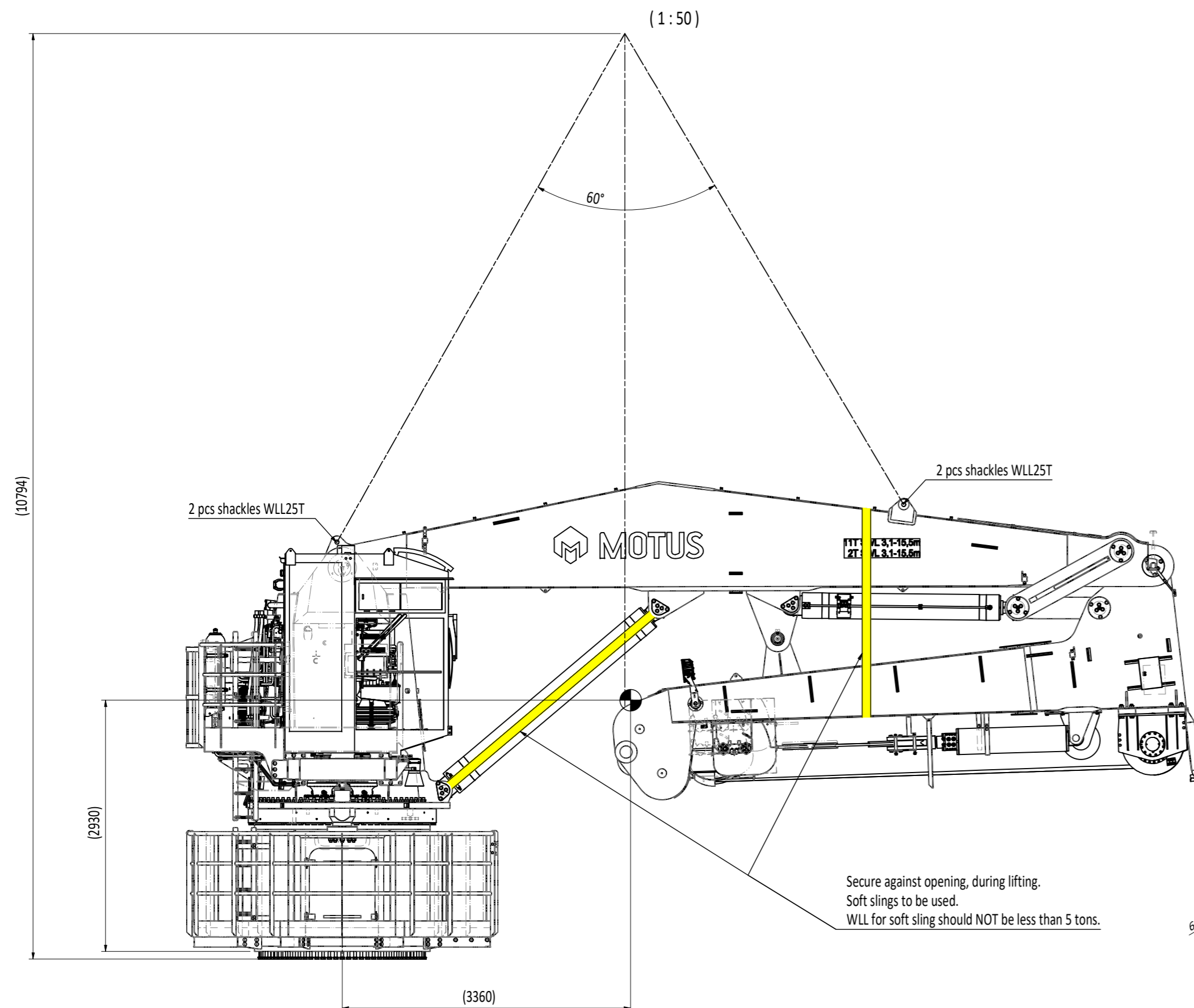
UNIT PICKING LIST				
QTY	ITEM NO.	TITLE	DESCRIPTION	MASS
1	328291	Manufactured Steel assembly	Tower Platform Safety Cage	21,2 kg

Transport Arrangement MMC240 Pedestal Platform with Grating, Tower Platform Ladder and Safety Cage			
	DRAWING NUMBER	SHEET	REVISION
	328635	3 / 3	0
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			A2



Total Weight: 31 500 kg

REVISION	ISSUE DESCRIPTION	REVISED BY	CHK BY	APPR BY	APPR DATE
0	Issued for information	KABA	GEVO	GEVO	01.10.2024
Lifting Arrangement MMC240-P-E-OC Elbow and Main derrick + tower + cabin					
 MOTUS TECHNOLOGY AS - Verftsg. 10, 6416 Molde, Norway Tel. +47 712 59 540 - www.motustech.no		GENERAL TOLERANCES NS-ISO 2768-mK / Ra 6.3 EN ISO 13920-AE / Sa 2.5		CREATED BY KABA	MASS
		 SHEET SIZE A2	CREATED DATE 27.03.2024	SCALE 1 : 50	
DRAWING NUMBER 329544				SHEET 1 / 2	REVISION 0
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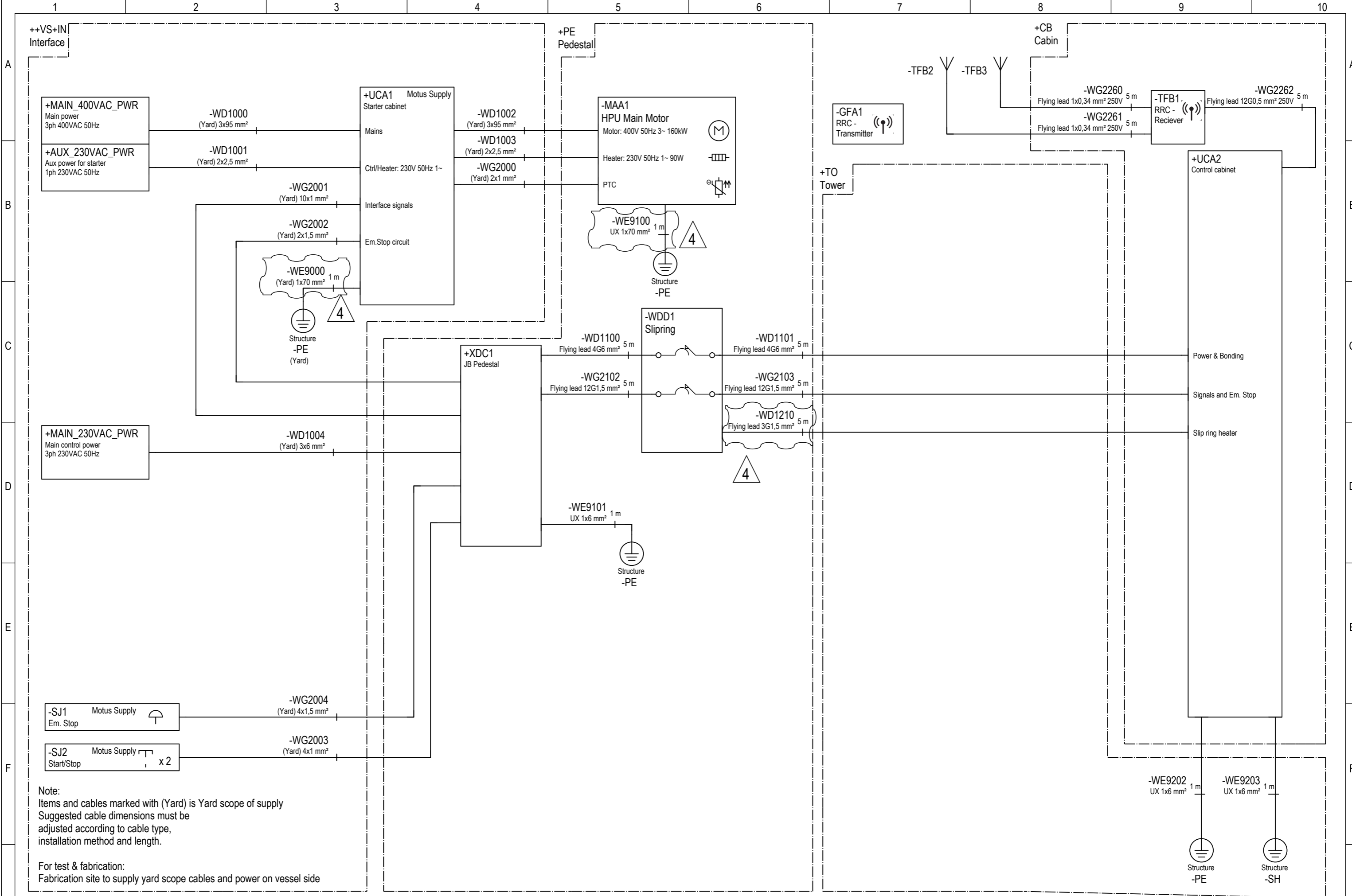
Total weight: 35 500 kg


Lifting Arrangement
MMC240-P-E-OC
Whole crane

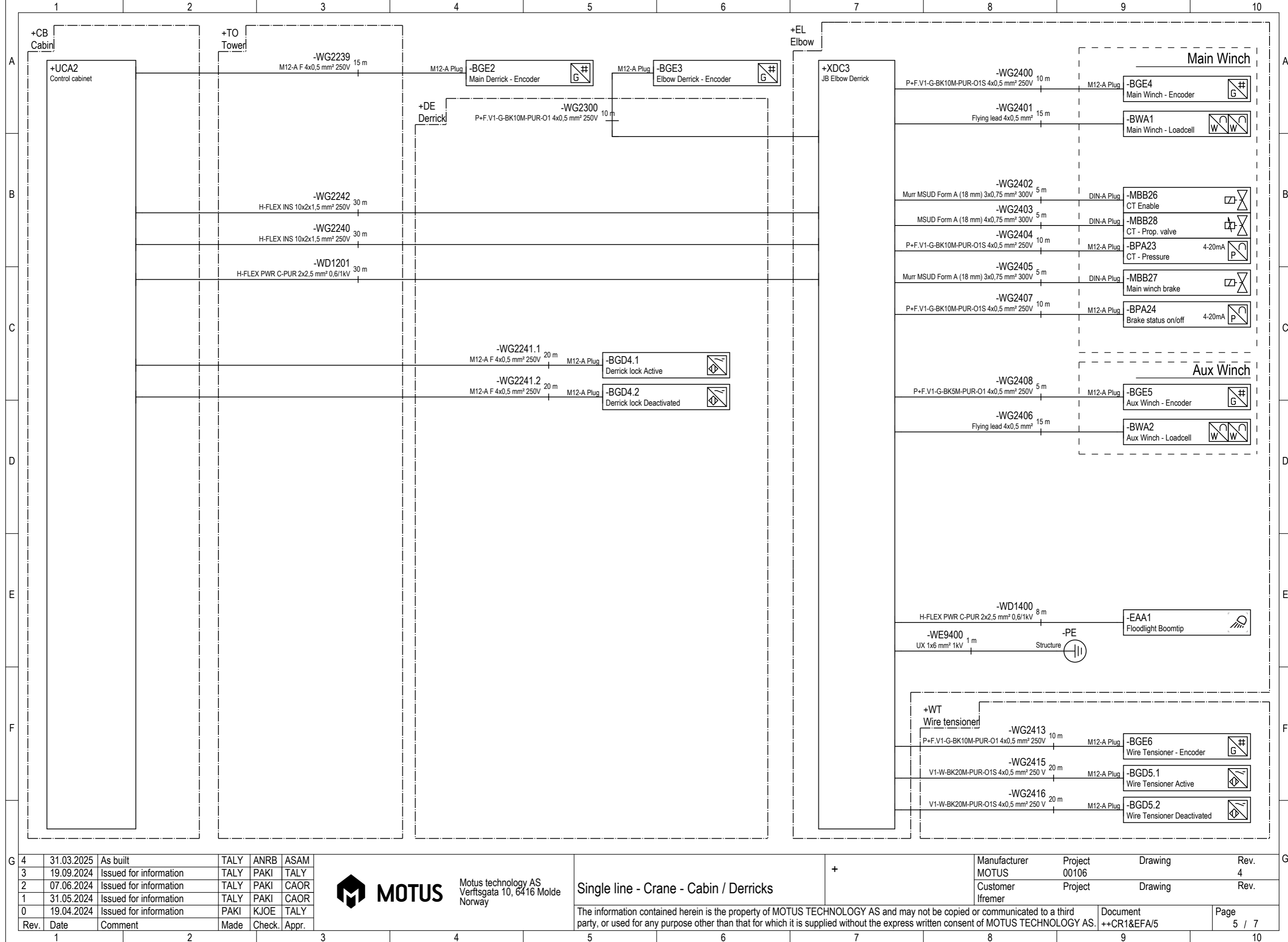


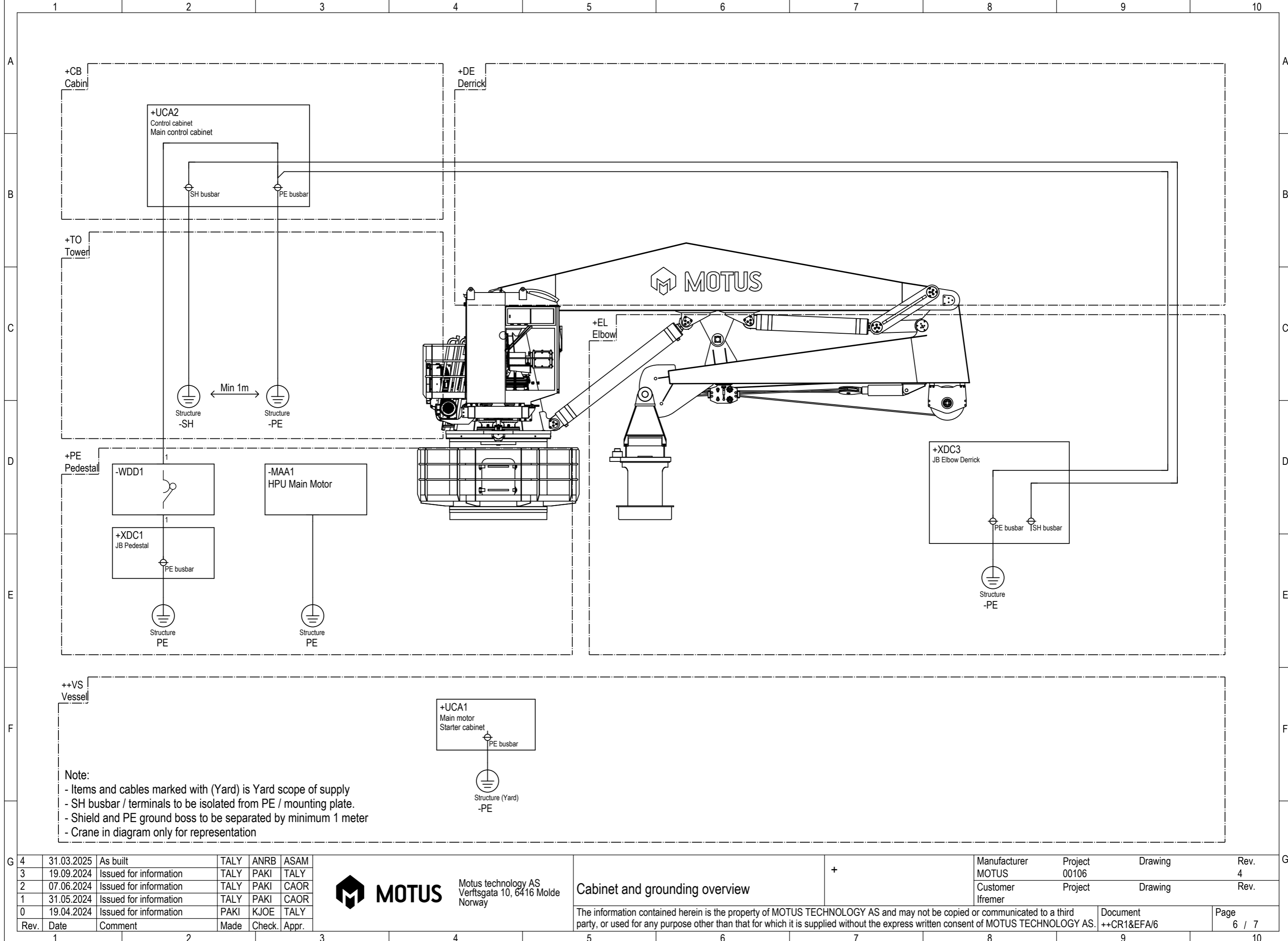
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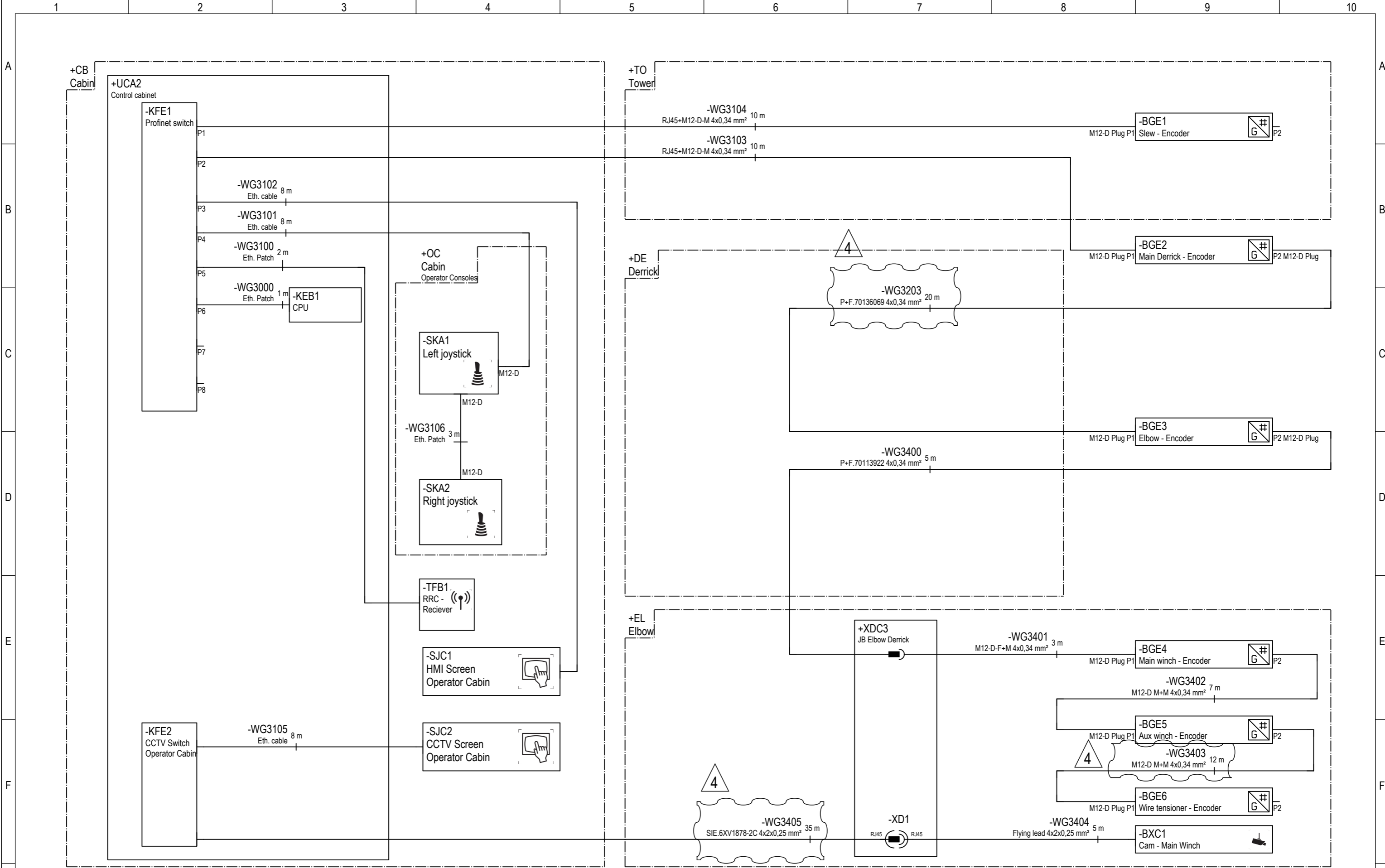
DRAWING NUMBER	SHEET	REVISION
329544	2 / 2	0
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		A2



G	4	31.03.2025	As built	TALY	ANRB	ASAM	<div> MOTUS</div> <div>Motus technology AS Verftsgata 10, 6416 Molde Norway</div>	Single line - Crane - Vessel interface	+	Manufacturer	Project	Drawing	Rev.	
	3	19.09.2024	Issued for information	TALY	PAKI	TALY				MOTUS	00106		4	
	2	07.06.2024	Issued for information	TALY	PAKI	CAOR				Customer	Project	Drawing	Rev.	
	1	31.05.2024	Issued for information	TALY	PAKI	CAOR				Ifremer				
	0	19.04.2024	Issued for information	PAKI	KJOE	TALY								
	Rev.	Date	Comment	Made	Check.	Appr.								
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Notes:
Open plugs on encoders to be blanked with stainless plug

4	31.03.2025	As built	TALY	ANRB	ASAM
3	19.09.2024	Issued for information	TALY	PAKI	TALY
2	07.06.2024	Issued for information	TALY	PAKI	CAOR
1	31.05.2024	Issued for information	TALY	PAKI	CAOR
0	19.04.2024	Issued for information	PAKI	KJOE	TALY
Rev.	Date	Comment	Made	Check.	Appr.



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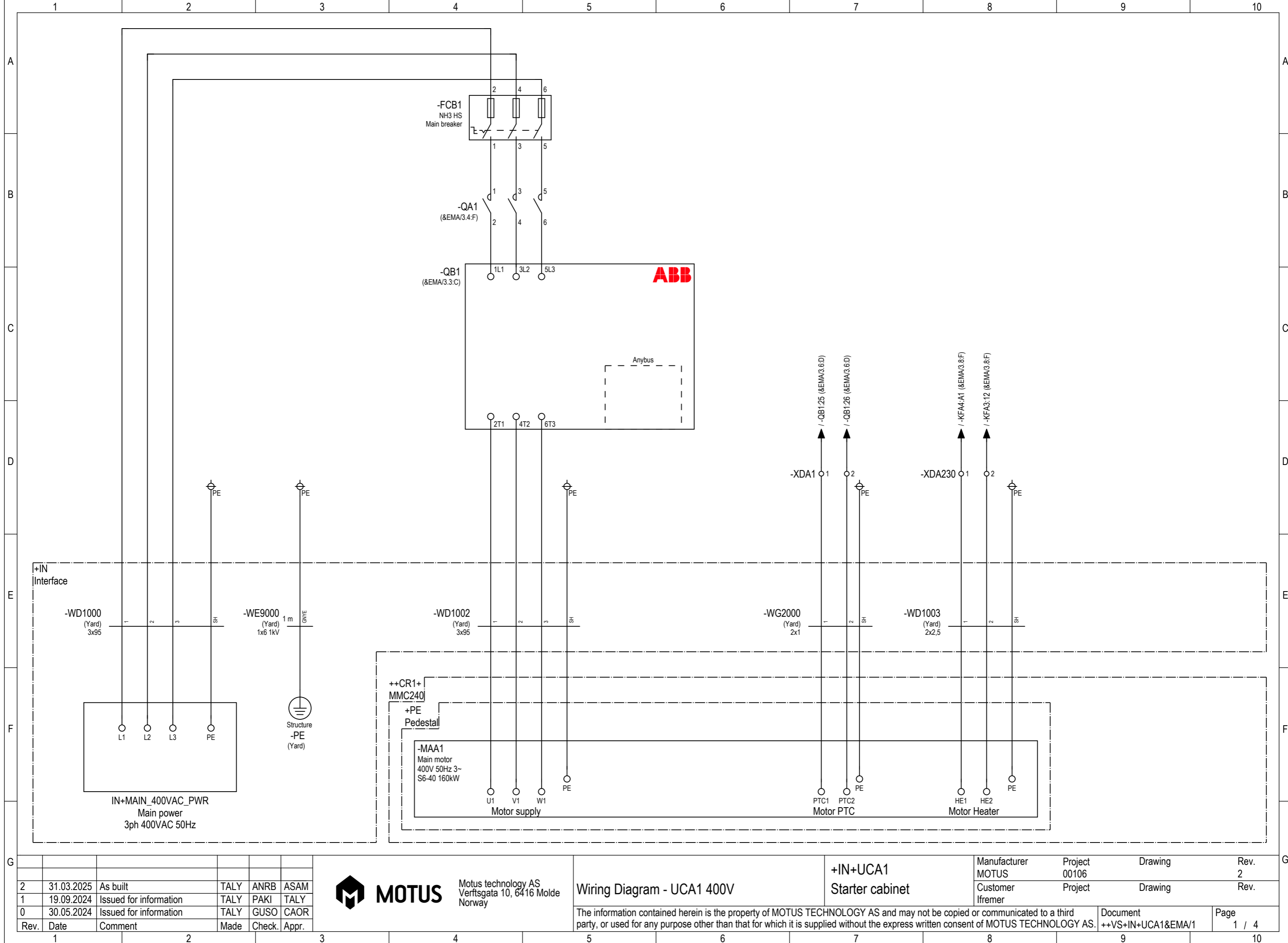
Network Topology

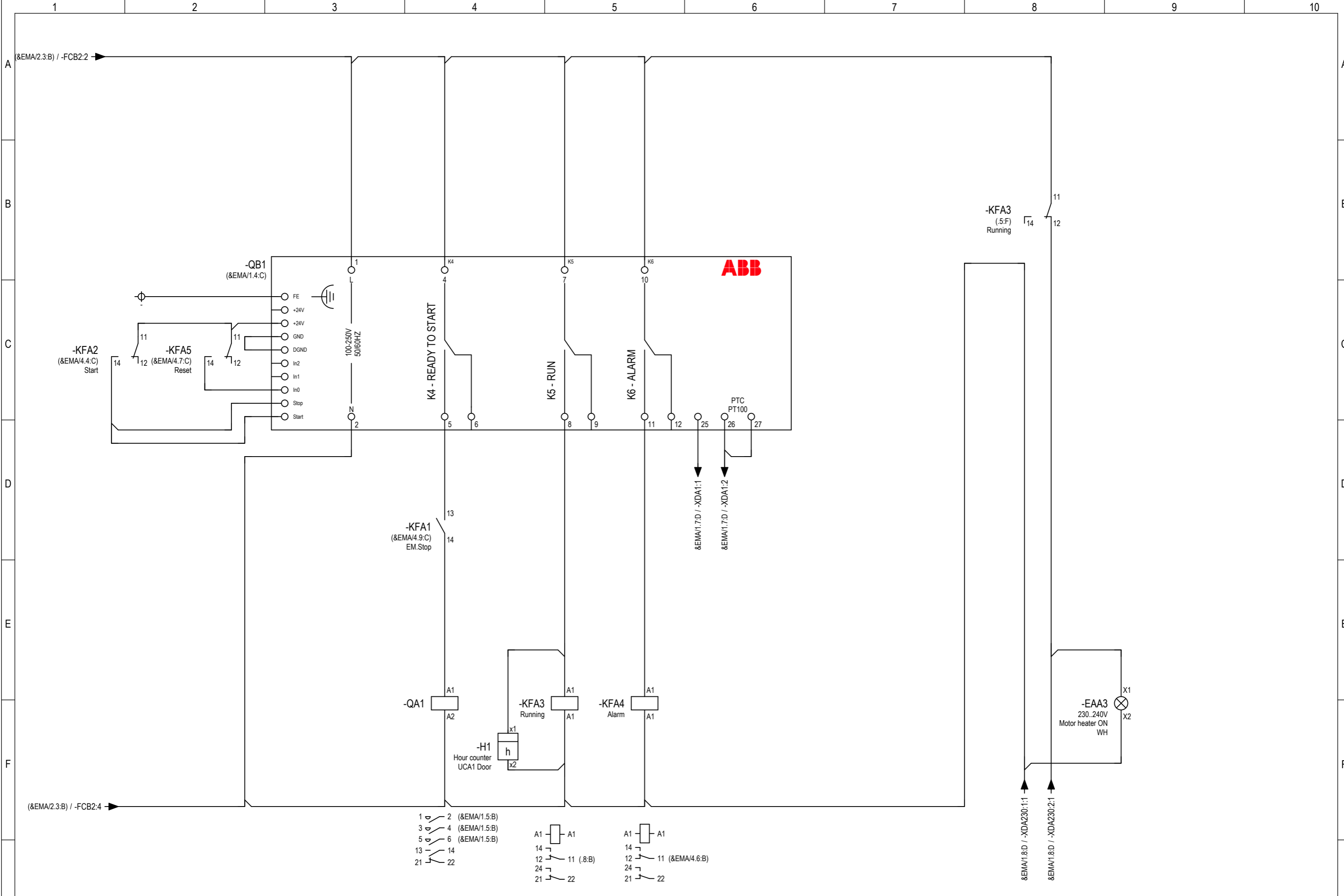
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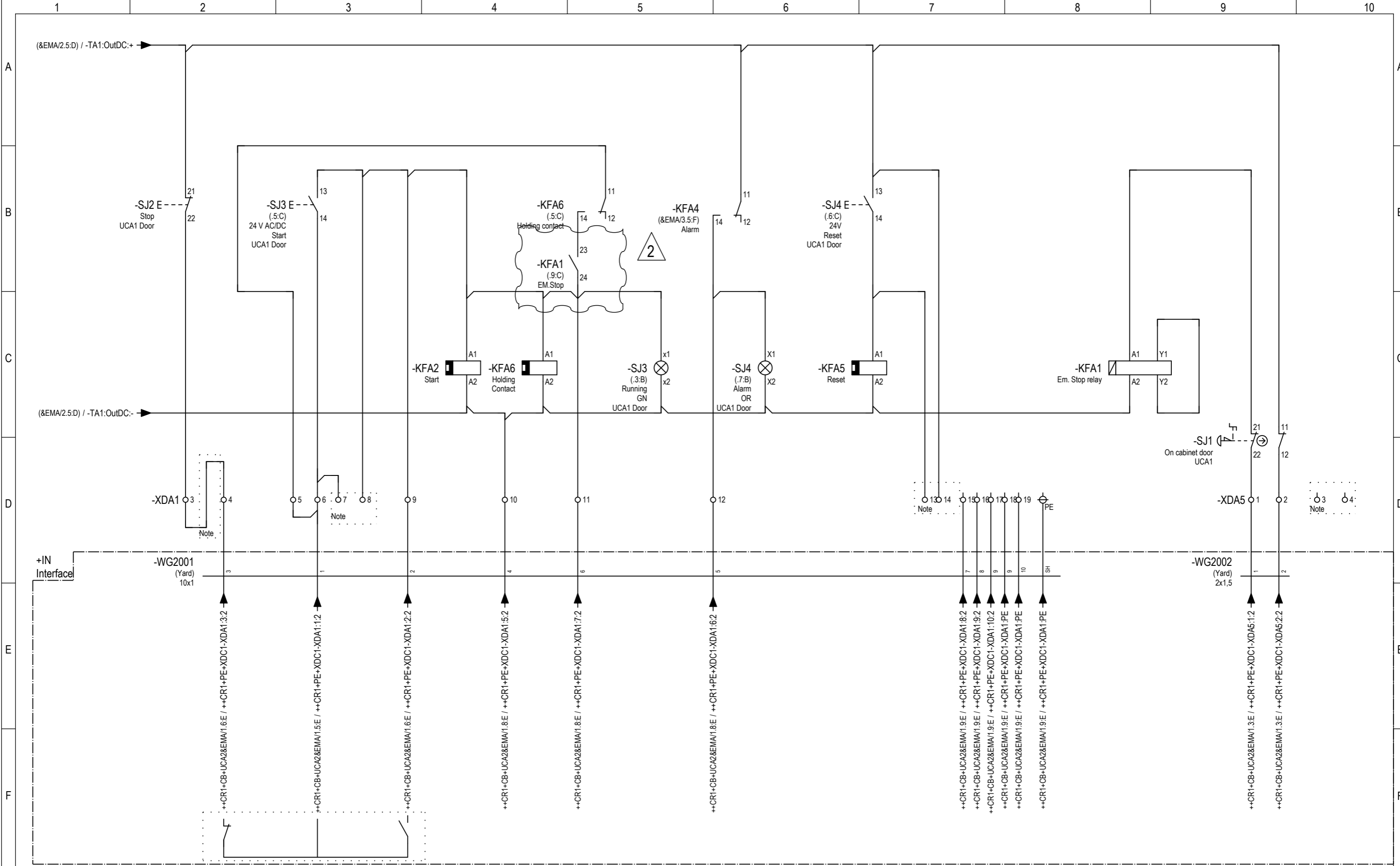
Manufacturer	Project	Drawing	Rev.
MOTUS	00106		4
Customer	Project	Drawing	Rev.
Ifremer			

Document	Page
++CR1&EFA/7	7 / 7

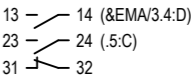
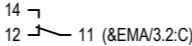
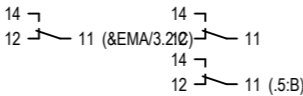




G						<div><div></div><div>MOTUS</div><div>Motus technology AS Verftsgata 10, 6416 Molde Norway</div></div>	Wiring Diagram - Starter cabinet	The information contained herein is the property of MOTUS TECHNOLOGY AS and may not be copied or communicated to a third party, or used for any purpose other than that for which it is supplied without the express written consent of MOTUS TECHNOLOGY AS.	+IN+UCA1 Starter cabinet	Manufacturer	Project	Drawing	Rev.
	2	31.03.2025	As built	TALY	ANRB	ASAM				MOTUS	00106	Drawing	2
	1	19.09.2024	Issued for information	TALY	PAKI	TALY				Customer	Project	Drawing	Rev.
	0	30.05.2024	Issued for information	TALY	GUSO	CAOR				Ifremer			
	Rev.	Date	Comment	Made	Check.	Appr.				Document ++VS+IN+UCA1&EMA/3		Page 3 / 4	



Note:
Possibility for additional start, stop, reset and em stop buttons



Rev.	Date	Comment	Made	Check.	Appr.
2	31.03.2025	As built	TALY	ANRB	ASAM
1	19.09.2024	Issued for information	TALY	PAKI	TALY
0	30.05.2024	Issued for information	TALY	GUSO	CAOR



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Verftsgata 10, 6416 Molde
Norway

Wiring Diagram - Starter cabinet

+IN+UCA1
Starter cabinet


Manufacturer MOTUS	Project 00106	Drawing	Rev. 2
Customer Ifremer	Project	Drawing	Rev.

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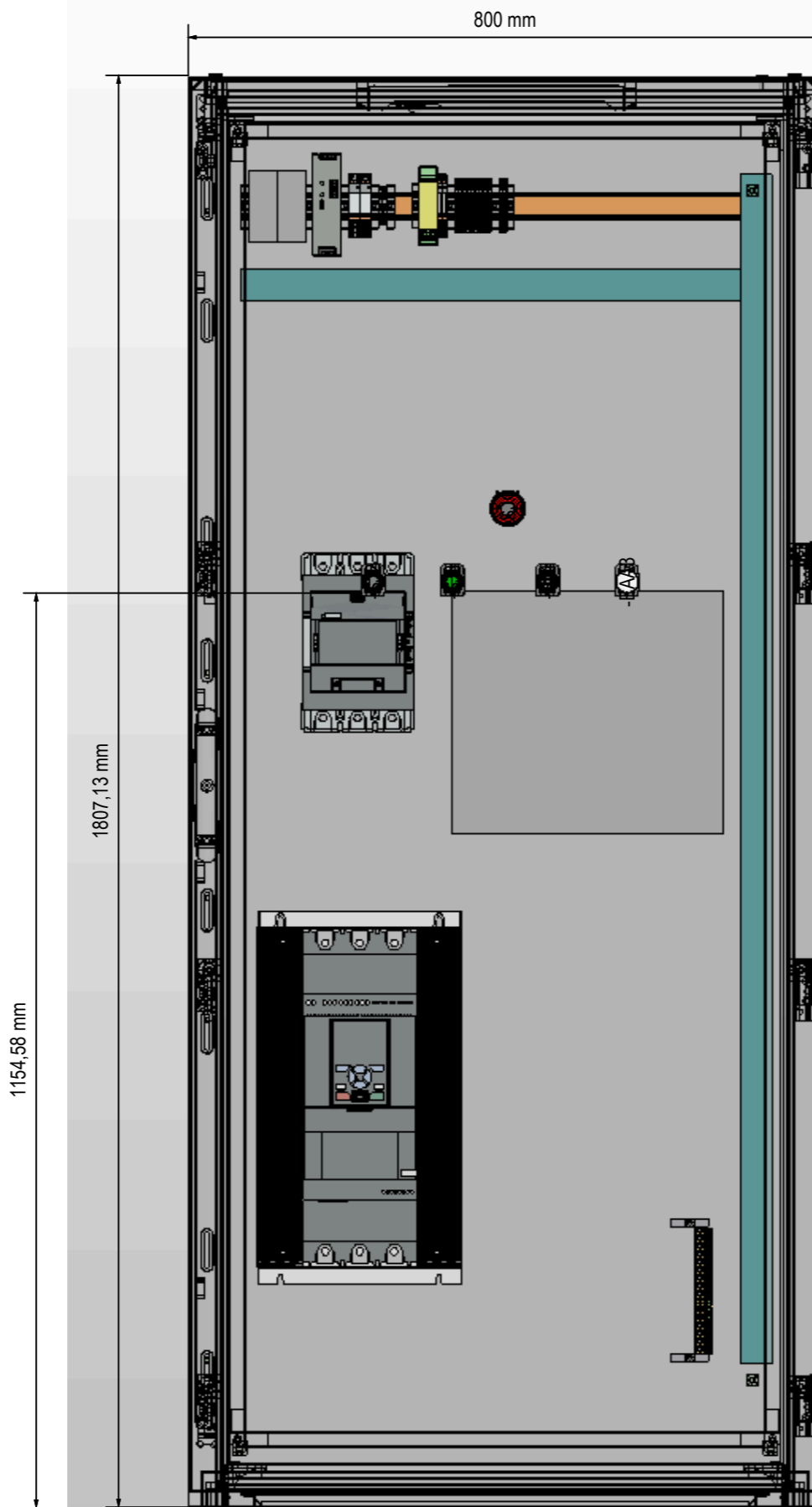
		1	2	3	4	5	6	7	8	9	10								
BOM: Starter cabinet																			
A	Qty	Pos	Part no.	ERP no.	Component type	Technical descr.	Manufacturer												
	2		ELD.MKS18085R5	331883	Floor standing enclosure	Eldon MKS 1800 x 800 x 500 Powder coated steel	Eldon Group												
B	2		HT.183-24040	301276	Cable duct / tray / conduit	Duct, WHD: 40x2000x40 mm	HellermannTyton GmbH												
	1		PXC.0402174	301766	Busbar	Neutral bus bar	Phoenix Contact												
	1		TKM.DIN F35H7	302540	Mounting rail	DIN, 2m	Teknomega srl												
	9	-XDA1;-XDA5	PXC.3022218	301901	Accessory - terminal	Merke for klemmer	Phoenix Contact												
	16		PXC.0423027	323084	Accessory - busbar	Connection terminal block GNYE, 16, 76A, 1.5 mm² - 16 mm², 300V	Phoenix Contact												
	1	-EAA1	ELD.CEL550M	303342	LED light fixture	24-240V AC/DC, 5W, 550lm, Enclosure Light w/motion sesnsor	Eldon Group												
C	1	-EAA1	ELD.CELC3001PBUL	302891	Prefabricated cable	Pre-fabricated cable for LED enclosure lights. Infeed, 3-pole, 100-240 V AC, 3m CEL550M	Eldon Group												
	1	-EAA1	ELD.CELA02MF	302890	Accessory - light fixture	Magnet fixation for CEL550M	Eldon Group												
	1	-EAA1	ELD.ELA02CF	303679	Accessory - light fixture	ELA02CF to attach CEL lights to SS or plastic enclosures.	Eldon Group												
	1	-EAA3	SE.XB4BVM1	302135	Signal device light / lamp	Pilot light, white, LED, 22mm, 230VAC	Schneider												
	1	-EAA3	SE.XB5AVB1	302144	Signal device light / lamp	Pilot light, white, LED, 22mm, 24VDC	Schneider												
	1	-EBB1	STE.06011.0-00	302972	Heating	CSF 060, 100W, 120-240V AC, switchoff 15°C. Starting current 4.5A.	Stego												
D	1	-FCB1	ABB.1SCA022825R2830	330390	Switch / breaker >= 230V	630A, Switch Fuses,Front Operated,3-pole,03 (Left Side),DIN,3,Handle and shaft included,	ABB												
	1	-FCB1	ETN.170M6812D	330731	Fuse link	NH3 800A, 690VAC,	Eaton												
	1	-FCB1	ABB.1SCA022776R7200	330729	Accessory - protection device	Terminal shroud/cover OSS800G1L/3	ABB												
	2	-FCB2;-FCB4	SE.A9F07202	302063	Circuit breaker	2P - 2A - C curve Double terminal	Schneider												
	1	-FCB3	SE.A9F06206	302058	Circuit breaker	2P - 6A - B curve Double terminal	Schneider												
	1	-KFA1	PXC.2981020	301885	Relay	Safety relay 24VDC, 2NO+1NC, 6A/250 V AC/DC	Phoenix Contact												
E	3	-KFA2;-KFA5;-KFA6	PXC.2900299	303457	Relay	24VDC, 1CO, 6A/250V AC/DC	Phoenix Contact												
	2	-KFA3;-KFA4	PXC.2900336	330640	Relay	Relay 230VAC	Phoenix Contact												
	1	-QA1	ABB.1SFL587002R3311	330728	Contactactor <= 230V	Line contactor 400V 160kW	ABB												
	2	-QA1;-QB1	ABB.1SFN125403R1000	330730	Accessory - power switchgear	Terminal shroud/cover LT370-30L	ABB												
	1	-QB1	ABB.1SFA898214R7000	330727	Soft starter	PSTX300-690-70 Softstarter	ABB												
	1	-SJ1	SE.XB4BS8444	302132	Switch / pushbutton < 230V	Emergency stop, 2NC, 22mm	Schneider												
F	1	-SJ1	SE.ZBZ1605	302168	Accessory - switch / pushb.	Yellow metal padlockable guard for Ø40 mushroom head	Schneider												
	1	-SJ1	SE.ZBY9320	302166	Accessory - switch / pushb.	Skilt Gult - Ø60mm	Schneider												
	1	-SJ2	SE.XB5AA42	330679	Switch / pushbutton < 230V	Red pusbutton Harmony, XB5 complete	Schneider												
G																			
							+IN+UCA1 Starter cabinet		Manufacturer MOTUS	Project 00106	Drawing	Rev. 2							
									Customer Ifremer	Project	Drawing	Rev.							
	2	31.03.2025	As built	TALY	ANRB	ASAM	BOM												
	1	19.09.2024	Issued for information	TALY	PAKI	TALY													
	0	30.05.2024	Issued for information	TALY	GUSO	CAOR													
	Rev.	Date	Comment	Made	Check.	Appr.			The information contained herein is the property of MOTUS TECHNOLOGY AS and may not be copied or communicated to a third party, or used for any purpose other than that for which it is supplied without the express written consent of MOTUS TECHNOLOGY AS.			Document ++VS+IN+UCA1&EPB/1	Page 1 / 2						
1		2		3		4		5		6		7		8		9		10	

	1	2	3	4	5	6	7	8	9	10
BOM: Starter cabinet										
A	Qty	Pos	Part no.	ERP no.	Component type	Technical descr.			Manufacturer	
	1	-SJ3	SE.XB5AW33B3	330681	Switch / pushbutton < 230V	Illuminated push button, plastic, flush, green, Ø22, spring return, 24 V AC/DC, 2 NO			Schneider	
	1	-SJ4	SE.XB5AW35B5	331895	Switch / pushbutton < 230V	Orange flush complete illum pushbutton Ø22 spring return 1NO+1NC 24V			Schneider	
B	1	-TA1	PXC.2904600	301866	Power supply - DC	5A/24V(120W), Input 230V AC 1ph			Phoenix Contact	
	11	-XDA1;-XDA5	PXC.3210567	301947	Terminal	PTTB 2,5, 0.14 - 4 mm²			Phoenix Contact	
	2	-XDA230	PXC.3209510	301941	Terminal	PT 2,5, 0.14 - 4 mm²			Phoenix Contact	
C										
D										
E										
F										
G										
	2	31.03.2025	As built	TALY	ANRB	ASAM	 MOTUS Motus technology AS Verftsgata 10, 6416 Molde Norway		<div><div></div><div>BOM</div></div>	
	1	19.09.2024	Issued for information	TALY	PAKI	TALY				
	0	30.05.2024	Issued for information	TALY	GUSO	CAOR				
	Rev.	Date	Comment	Made	Check.	Appr.				
		1	2	3	4	5	6	7	8	9
						+IN+UCA1 Starter cabinet		Manufacturer MOTUS	Project 00106	Drawing Rev. 2
								Customer Ifremer	Project Drawing	Rev.
						The information contained herein is the property of MOTUS TECHNOLOGY AS and may not be copied or communicated to a third party, or used for any purpose other than that for which it is supplied without the express written consent of MOTUS TECHNOLOGY AS.			Document ++VS+IN+UCA1&EPB/2	Page 2 / 2

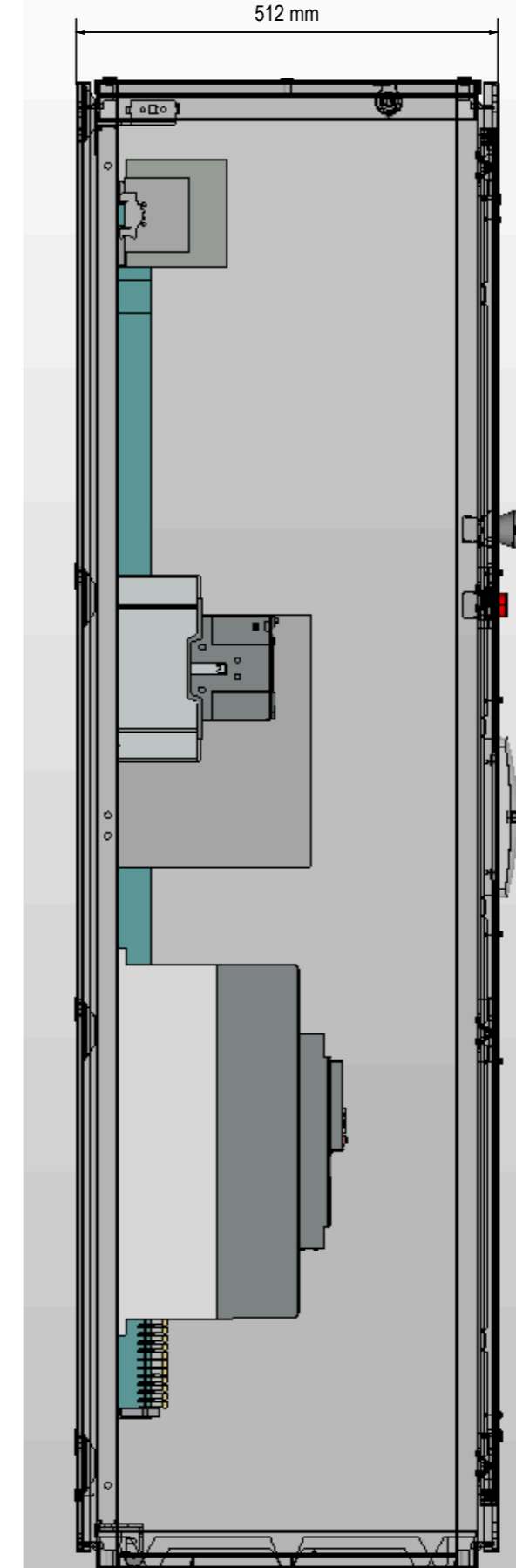
Notes:

To be installed in door:

- Soft starter screen at approx 1200mm height
- Handle for main switch



Overview



Side view

Rev.	Date	Comment	Made	Check.	Appr.
2	31.03.2025	As built	TALY	ANRB	ASAM
1	19.09.2024	Issued for information	TALY	PAKI	TALY
0	30.05.2024	Issued for information	TALY	GUSO	CAOR



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Verftsgata 10, 6416 Molde
Norway

Layout - Overview UCA1

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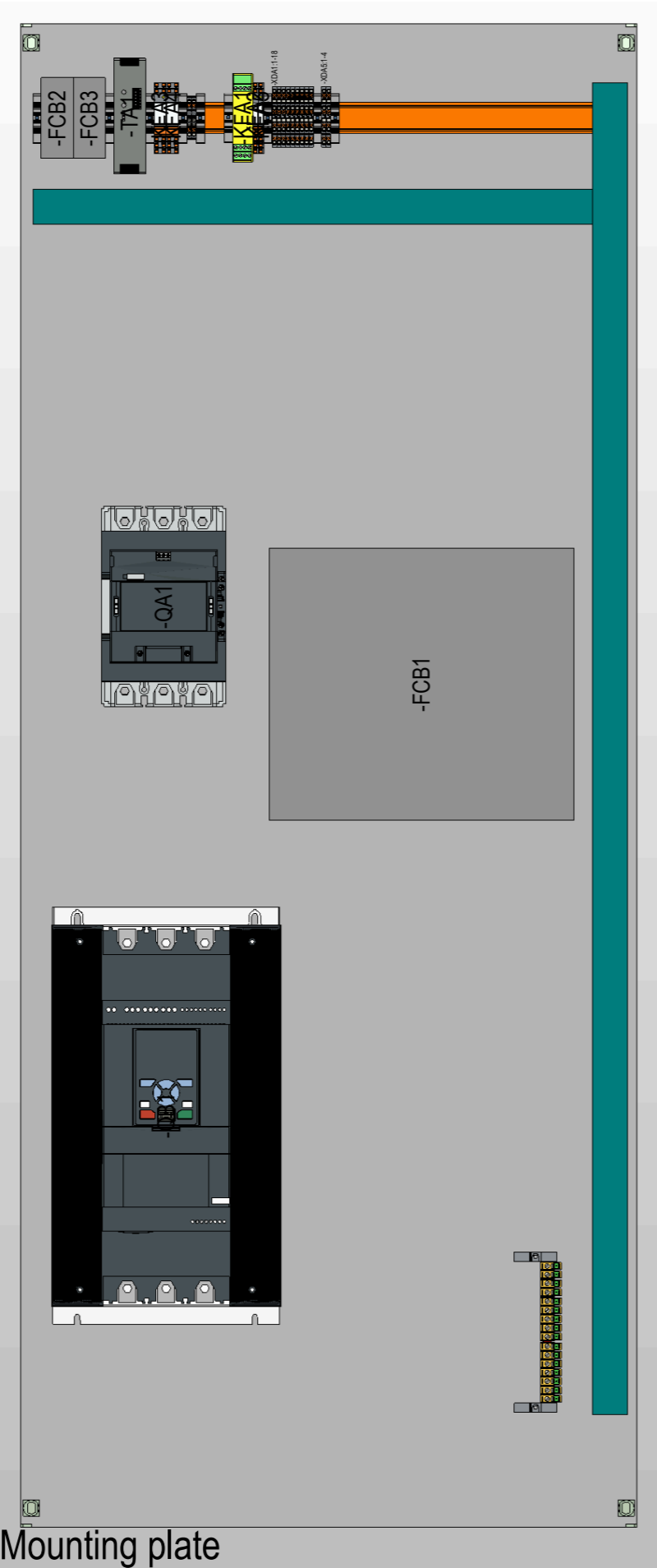
+IN+UCA1
Starter cabinet

Manufacturer MOTUS	Project 00106	Drawing	Rev. 2
Customer Ifremer	Project	Drawing	Rev.

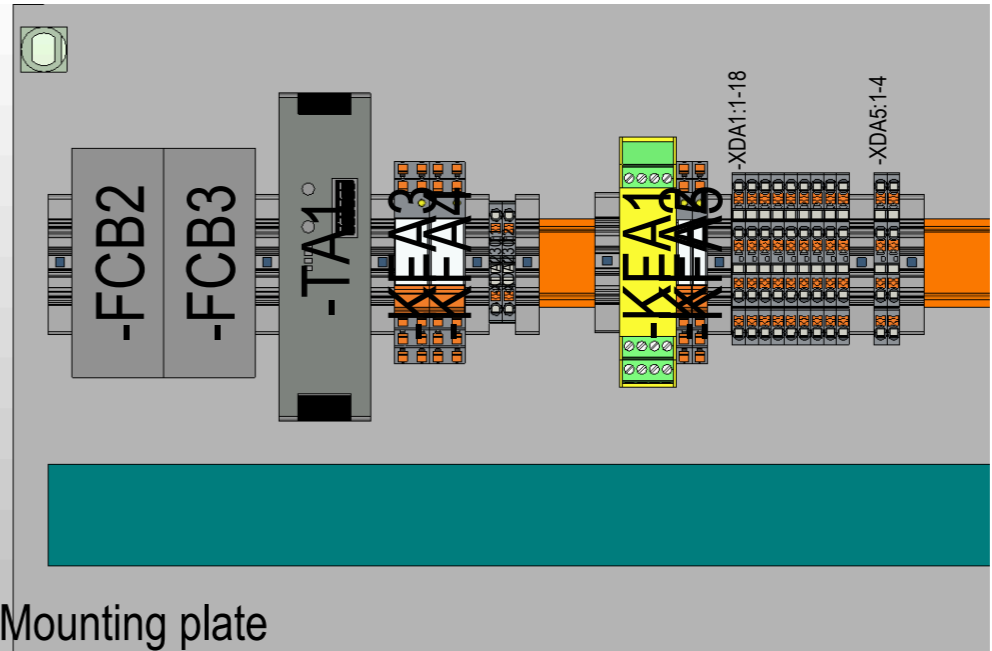
Document ++VS+IN+UCA1&ELU/1	Page 1 / 3
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Notes:

- PE and SH bar to be installed at the bottom of the cabinet
- Wire ducts: 40x40
- DIN rail: 35



Top of cabinet view



Rev.	Date	Comment	Made	Check.	Appr.
2	31.03.2025	As built	TALY	ANRB	ASAM
1	19.09.2024	Issued for information	TALY	PAKI	TALY
0	30.05.2024	Issued for information	TALY	GUSO	CAOR



MOTUS

Motus technology AS
Verftsgata 10, 6416 Molde
Norway

Layout - Overview UCA1

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+IN+UCA1
Starter cabinet


Manufacturer	Project	Drawing	Rev.
MOTUS	00106		2
Customer	Project	Drawing	Rev.
Ifremer			

Document	Page
++VS+IN+UCA1&ELU/2	2 / 3

Motus Information sign
Based on Phoenix contact EMLP 100x60
7mm black text

Function signs:
Based on Phoenix contact EMLP (27x18)
5mm text

60 mm

MOTUS

Tag. +UCA1
Crane. CR1 MMC240
Machin no. 00106-326662

100 mm

18 mm

Start/
Running

27 mm


Alarm/
Reset

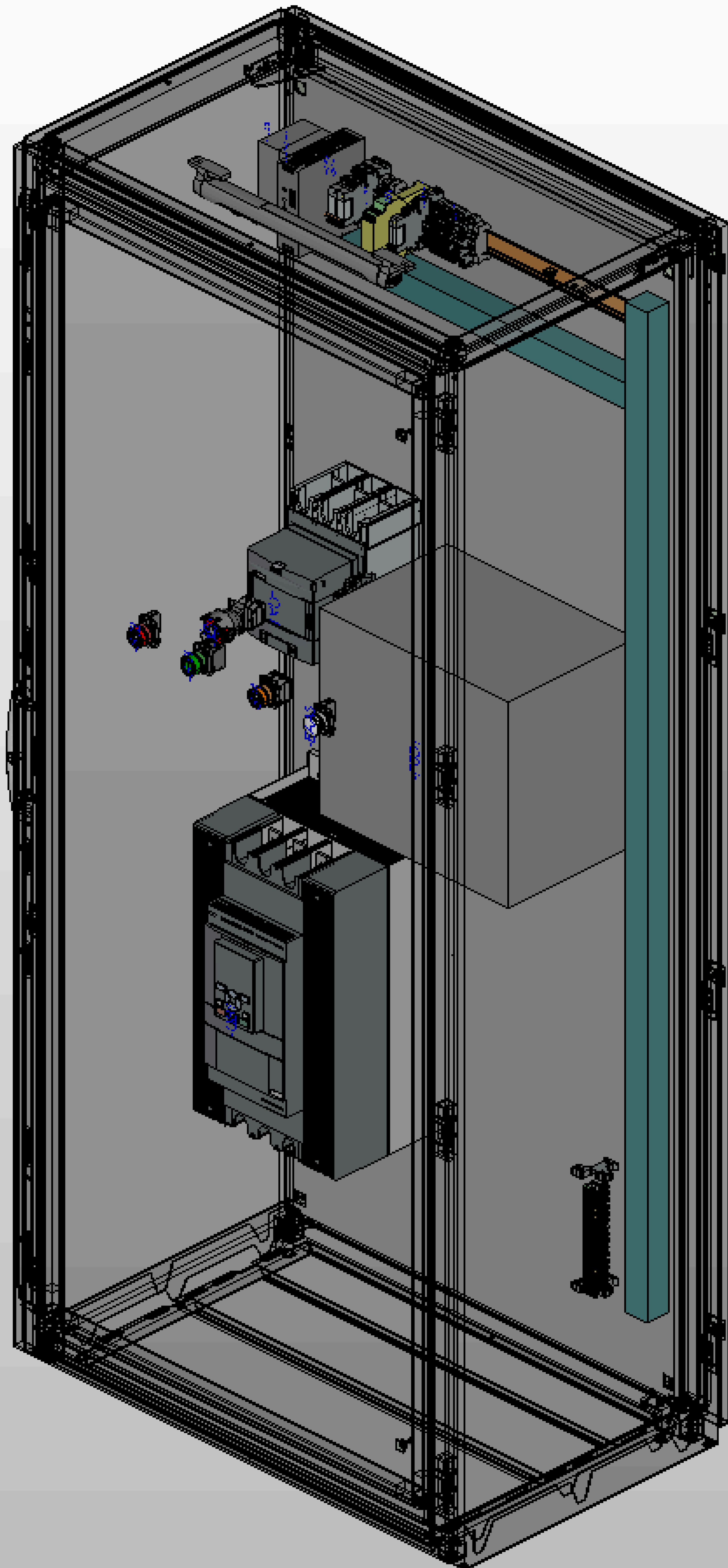
Motor
Heater ON

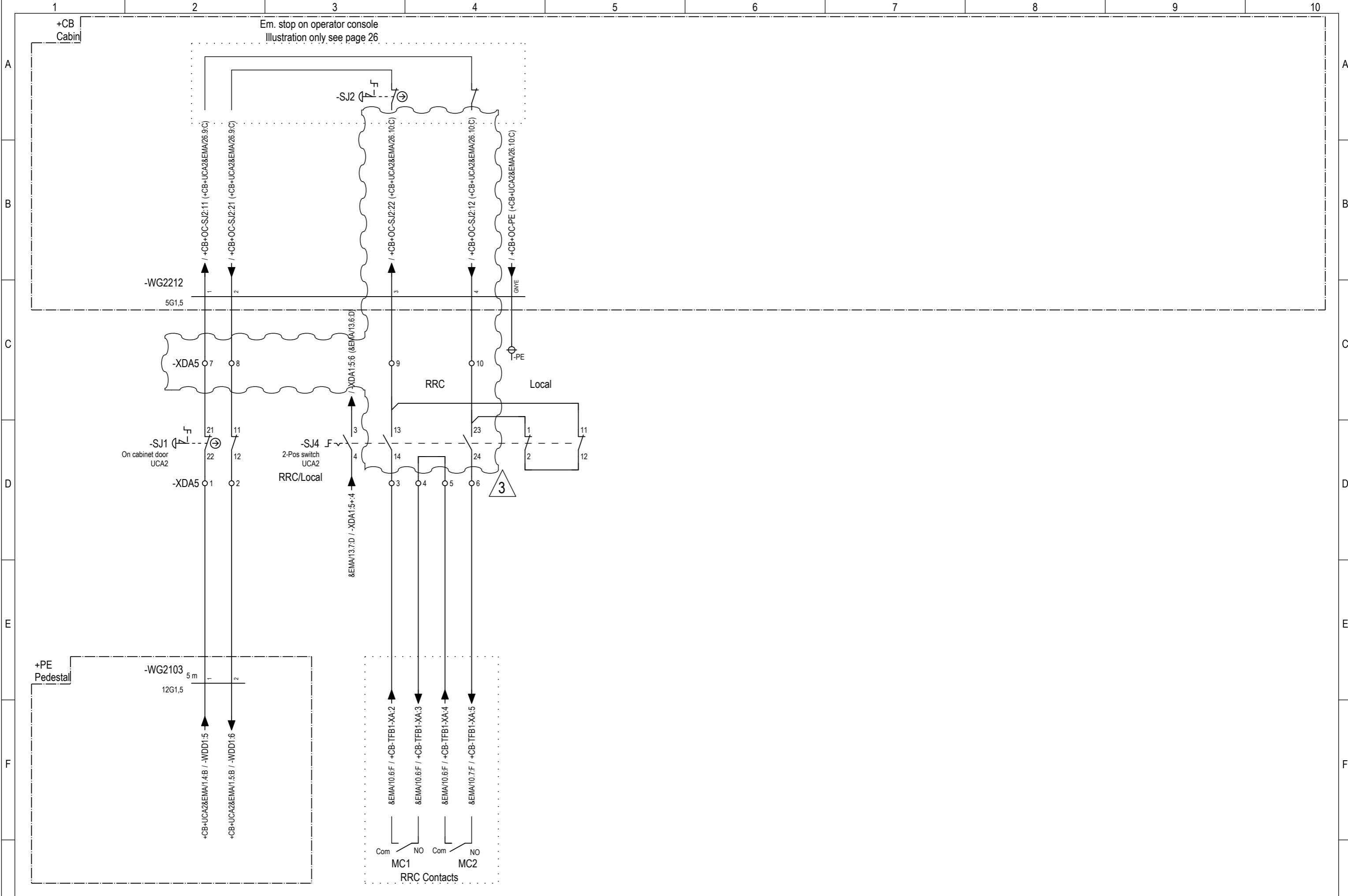
Stop


Fuse list

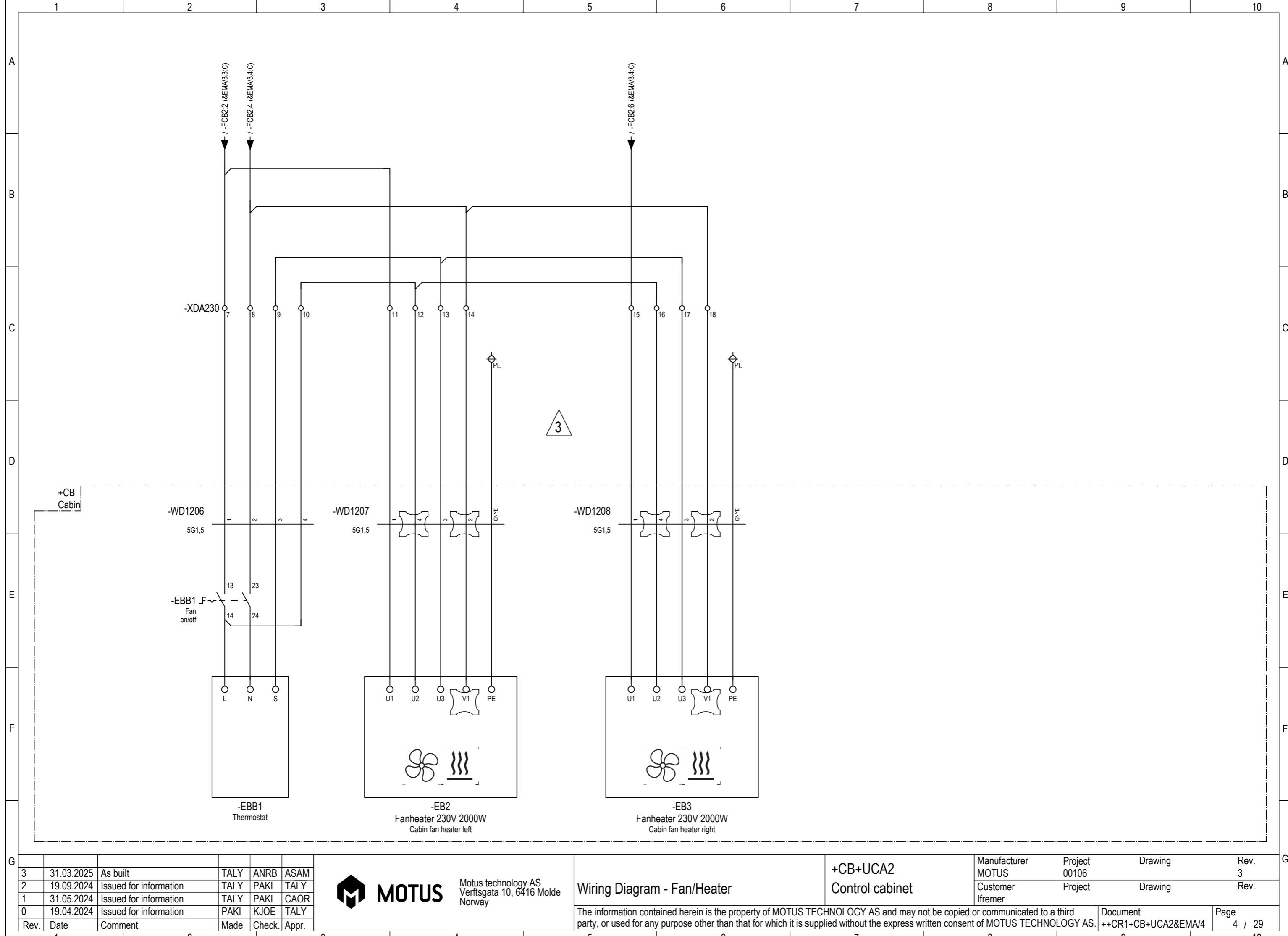
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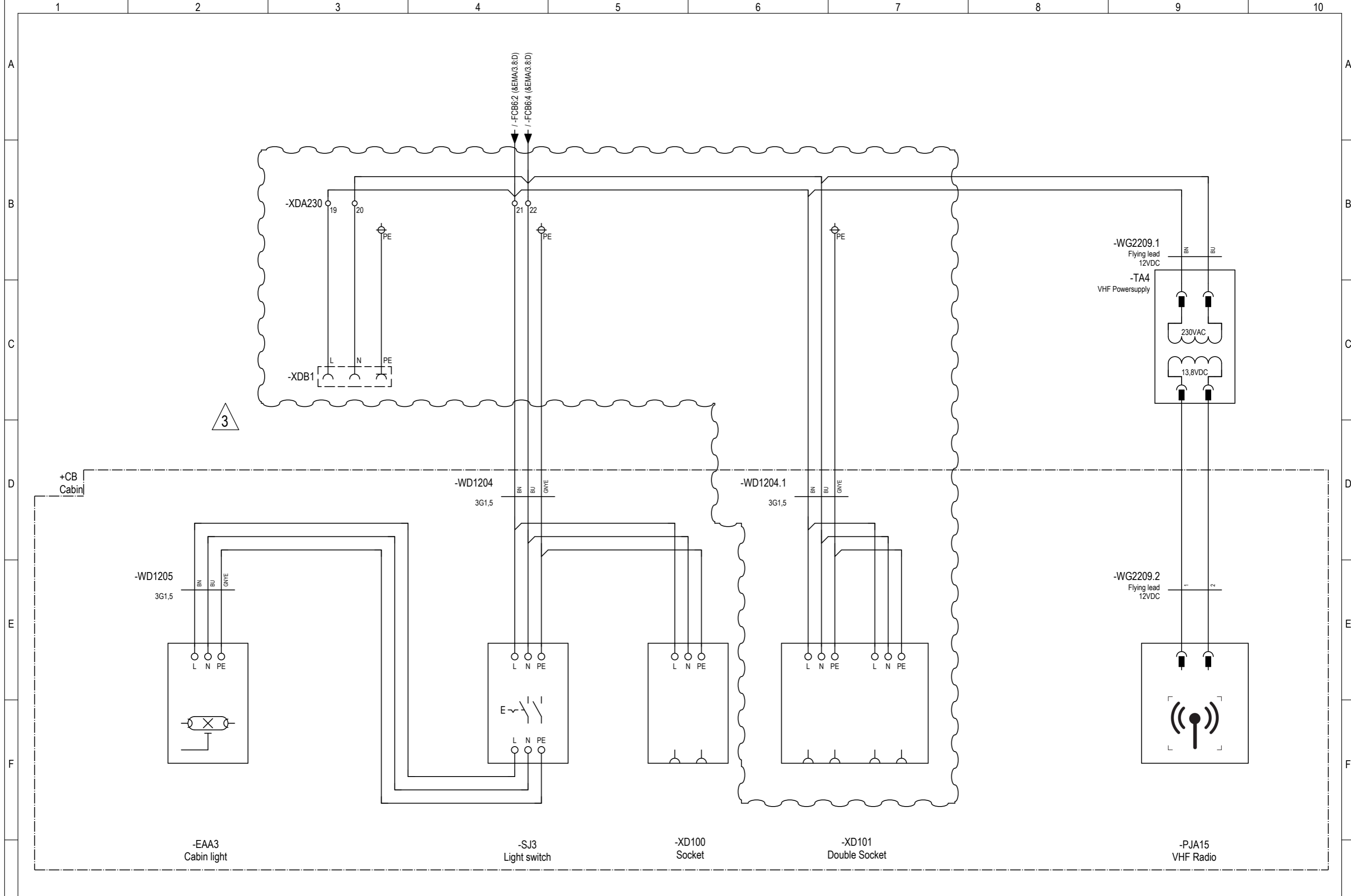
						<div><p>Motus technology AS Verftsgata 10, 6416 Molde Norway</p></div>	+IN+UCA1 Starter cabinet
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1	19.09.2024	Issued for information	TALY	PAKI	TALY		Customer Drawing
0	30.05.2024	Issued for information	TALY	GUSO	CAOR		Page 1 / 1
Rev.	Date	Comment	Made	Check.	Appr.		




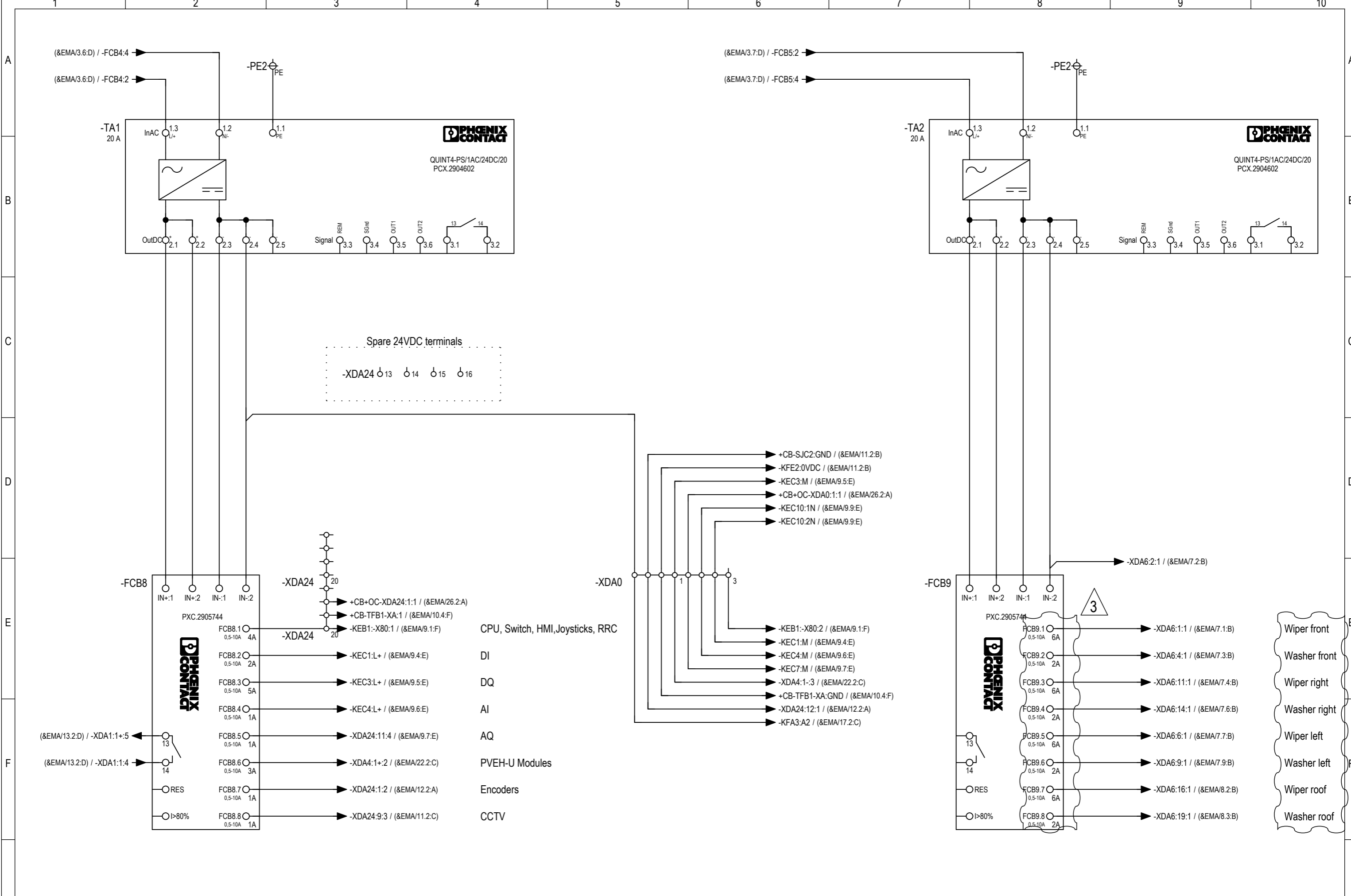


G						 MOTUS Motus technology AS Verftsgata 10, 6416 Molde Norway	Wiring Diagram - Em Stop	+CB+UCA2 Control cabinet	Manufacturer		Project	Drawing	Rev.	G		
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	2	19.09.2024	Issued for information	TALY	PAKI				TALY							
	1	31.05.2024	Issued for information	TALY	PAKI				CAOR	Customer	Project	Drawing	Rev.			
	0	19.04.2024	Issued for information	PAKI	KJOE				TALY	Ifremer						
	Rev.	Date	Comment	Made	Check.				Appr.	The information contained herein is the property of MOTUS TECHNOLOGY AS and may not be copied or communicated to a third party, or used for any purpose other than that for which it is supplied without the express written consent of MOTUS TECHNOLOGY AS.						
														Document		Page
														++CR1+CB+UCA2&EMA/2		2 / 29





						<div> MOTUS</div> <div>Motus technology AS Verftsgata 10, 6416 Molde Norway</div>	Wiring Diagram - Cabin utilities & VHF		+CB+UCA2 Control cabinet		Manufacturer		Project		Drawing		Rev.	
MOTUS		00106									3							
		Customer		Project			Drawing		Rev.									
		Ifremer																
Rev.		Date		Comment		Made		Check.		Appr.								
3		31.03.2025		As built		TALY		ANRB		ASAM								
2		19.09.2024		Issued for information		TALY		PAKI		TALY								
1		31.05.2024		Issued for information		TALY		PAKI		CAOR								
0		19.04.2024		Issued for information		PAKI		KJOE		TALY								
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3	31.03.2025	As built	TALY	ANRB	ASAM
2	19.09.2024	Issued for information	TALY	PAKI	TALY
1	31.05.2024	Issued for information	TALY	PAKI	CAOR
0	19.04.2024	Issued for information	PAKI	KJOE	TALY
Rev.	Date	Comment	Made	Check.	Appr.

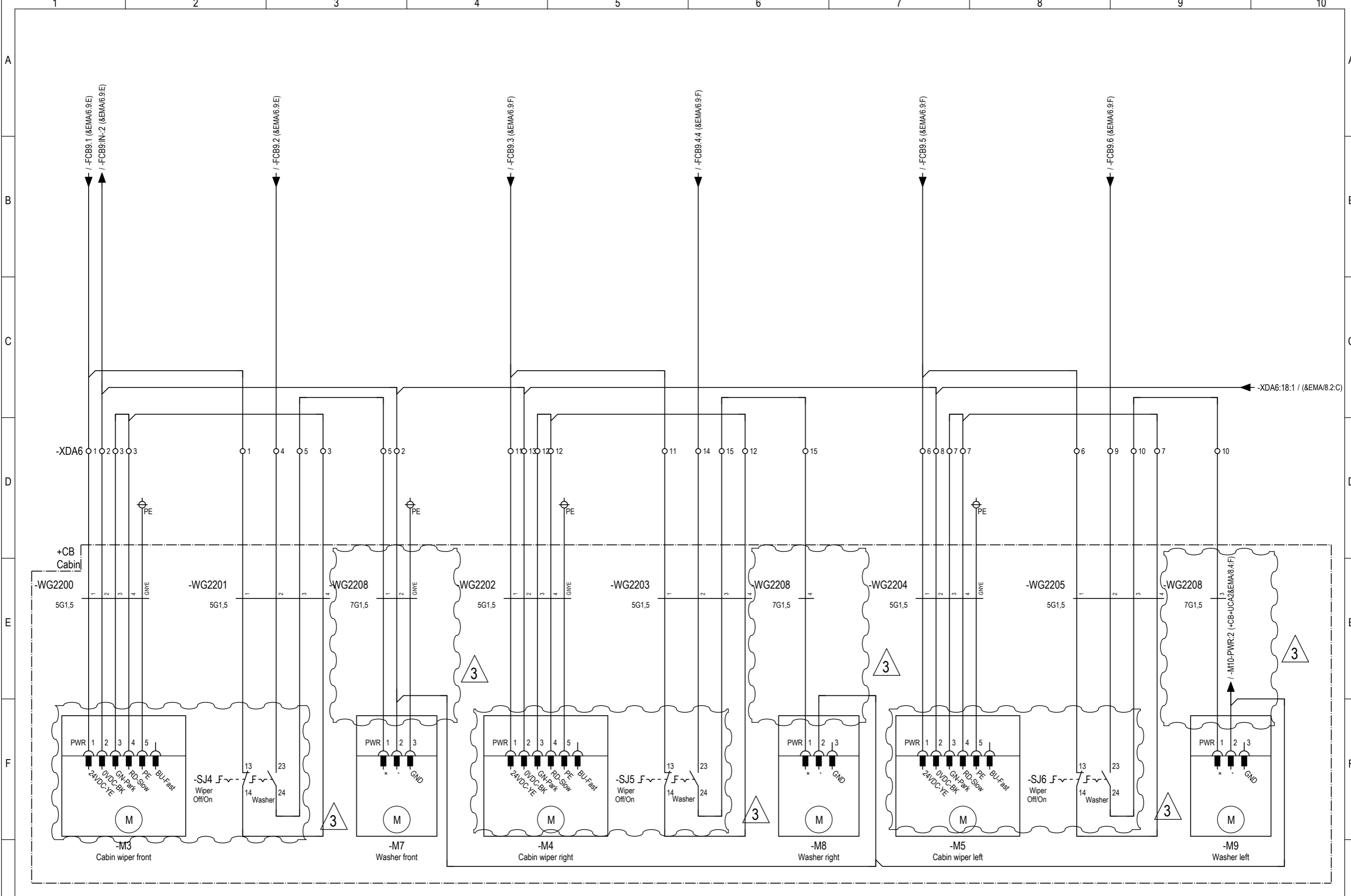


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Verftsgata 10, 6416 Molde
Norway

Wiring Diagram - Control Supply

+CB+UCA2
Control cabinet

Manufacturer MOTUS	Project 00106	Drawing	Rev. 3
Customer Ifremer	Project	Drawing	Rev.
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3	31.03.2025	As built	TALY	ANRB	ASAM
2	19.09.2024	Issued for information	TALY	PAKI	TALY
1	31.05.2024	Issued for information	TALY	PAKI	CAOR
0	19.04.2024	Issued for information	PAKI	KJOE	TALY
Rev.	Date	Comment	Made	Check.	Appr.

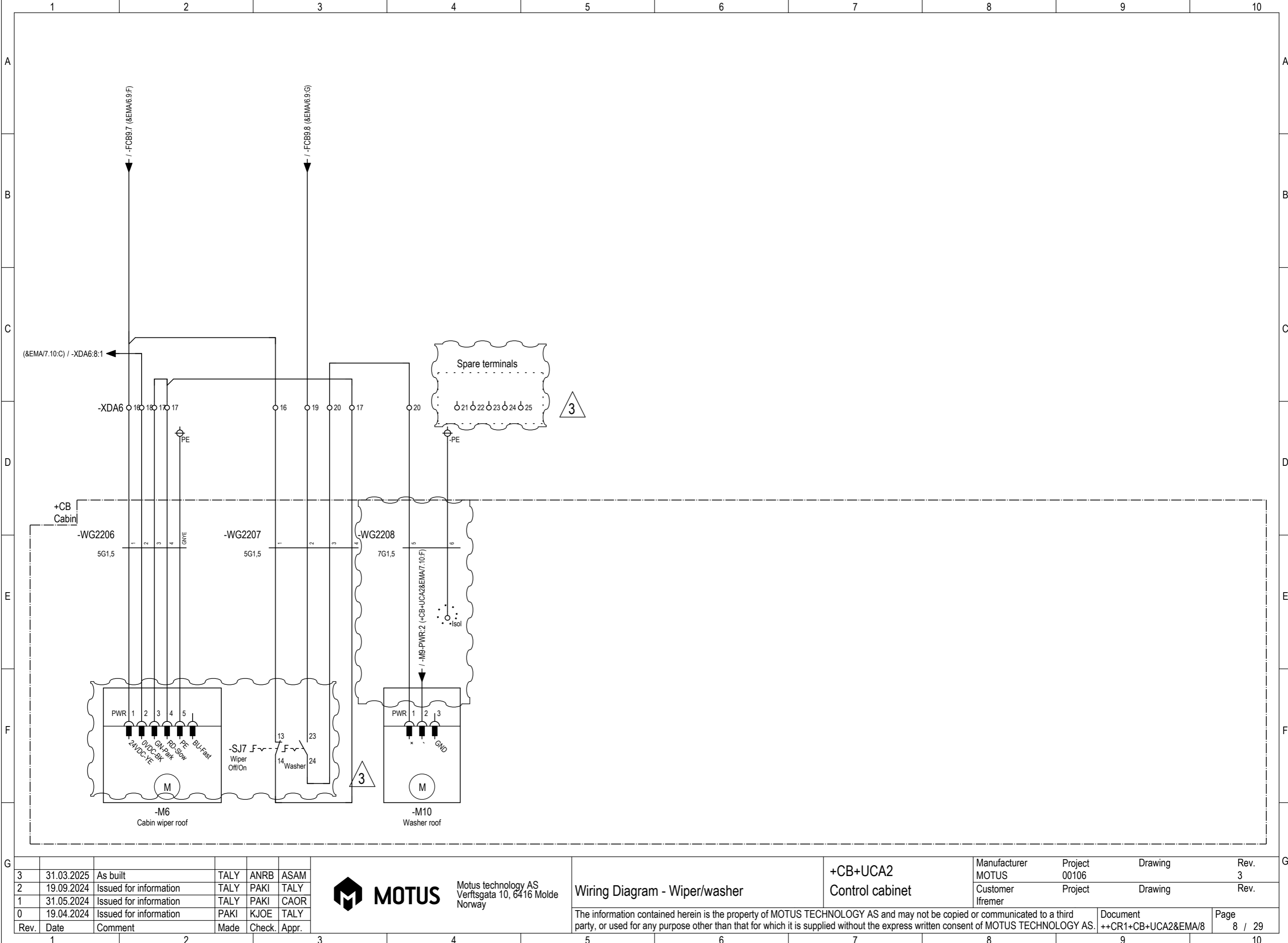


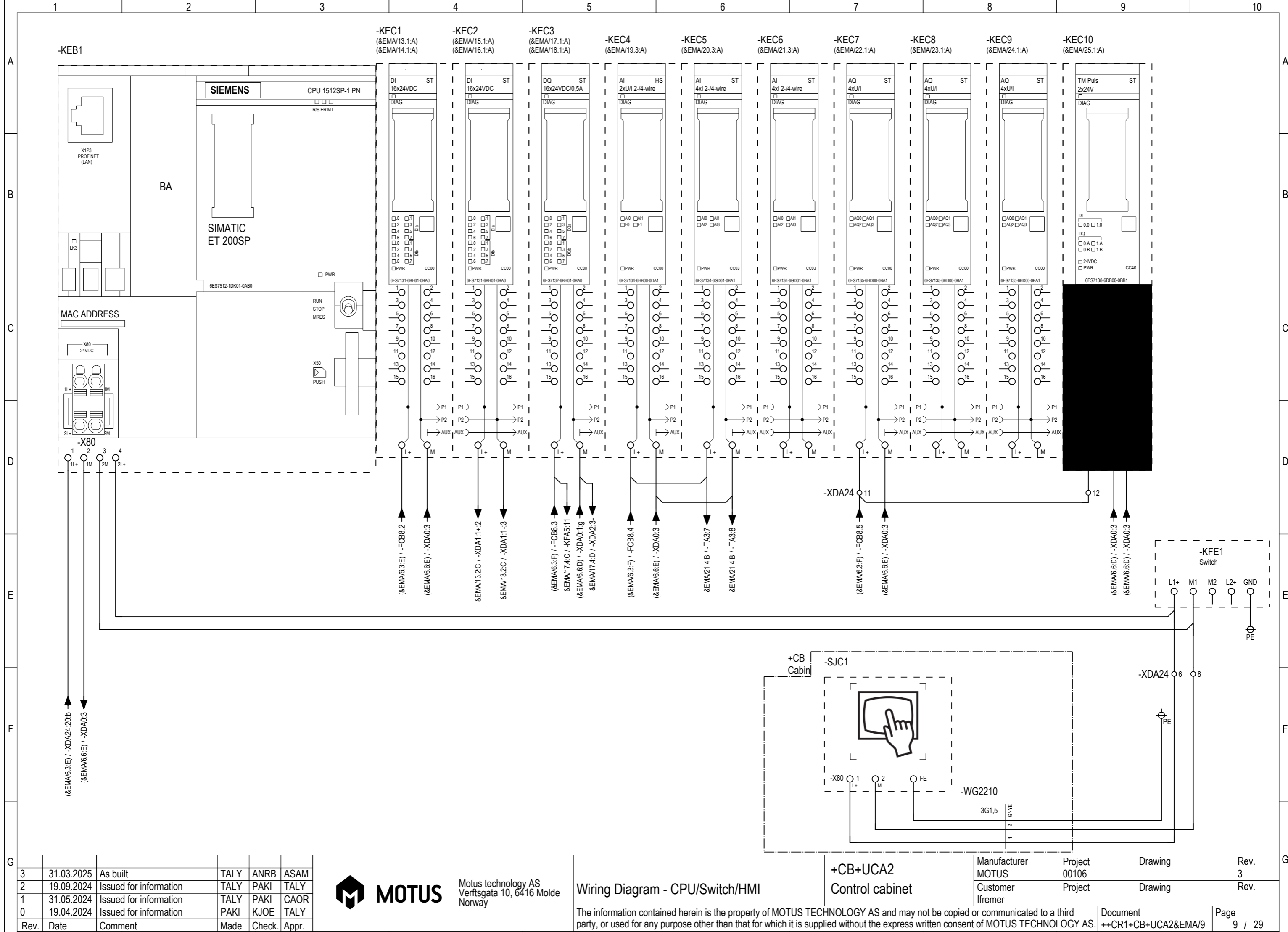
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Verftsgata 10, 6416 Molde
Norway

Wiring Diagram - Wiper/washer

+CB+UCA2
Control cabinet

Manufacturer MOTUS	Project 00106	Drawing	Rev. 3
Customer Ifremer	Project	Drawing	Rev.
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3	31.03.2025	As built	TALY	ANRB	ASAM
2	19.09.2024	Issued for information	TALY	PAKI	TALY
1	31.05.2024	Issued for information	TALY	PAKI	CAOR
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Rev.	Date	Comment	Made	Check.	Appr.



MOTUS

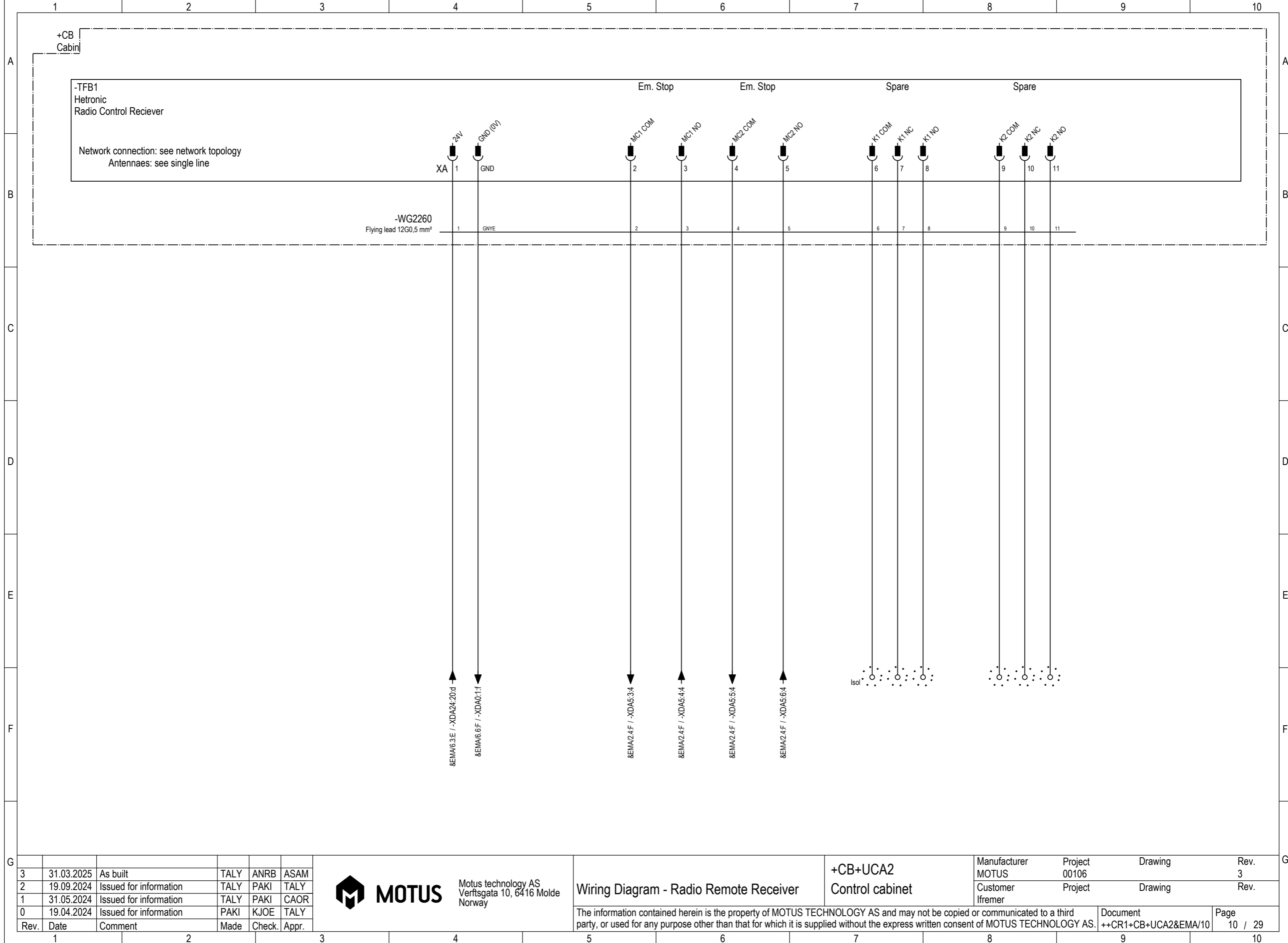
Motus technology AS
Verftsgata 10, 6416 Molde
Norway

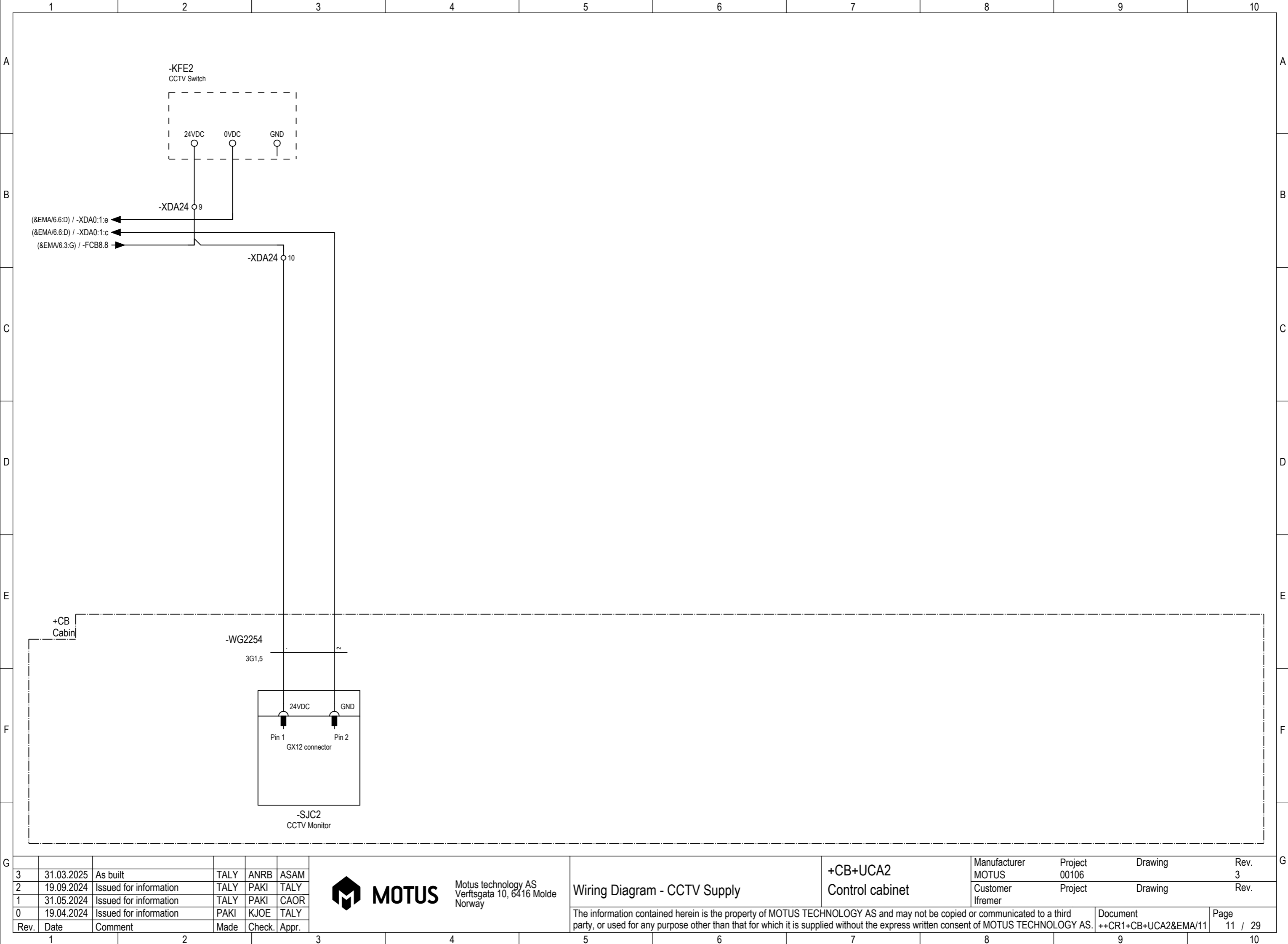
Wiring Diagram - CPU/Switch/HMI

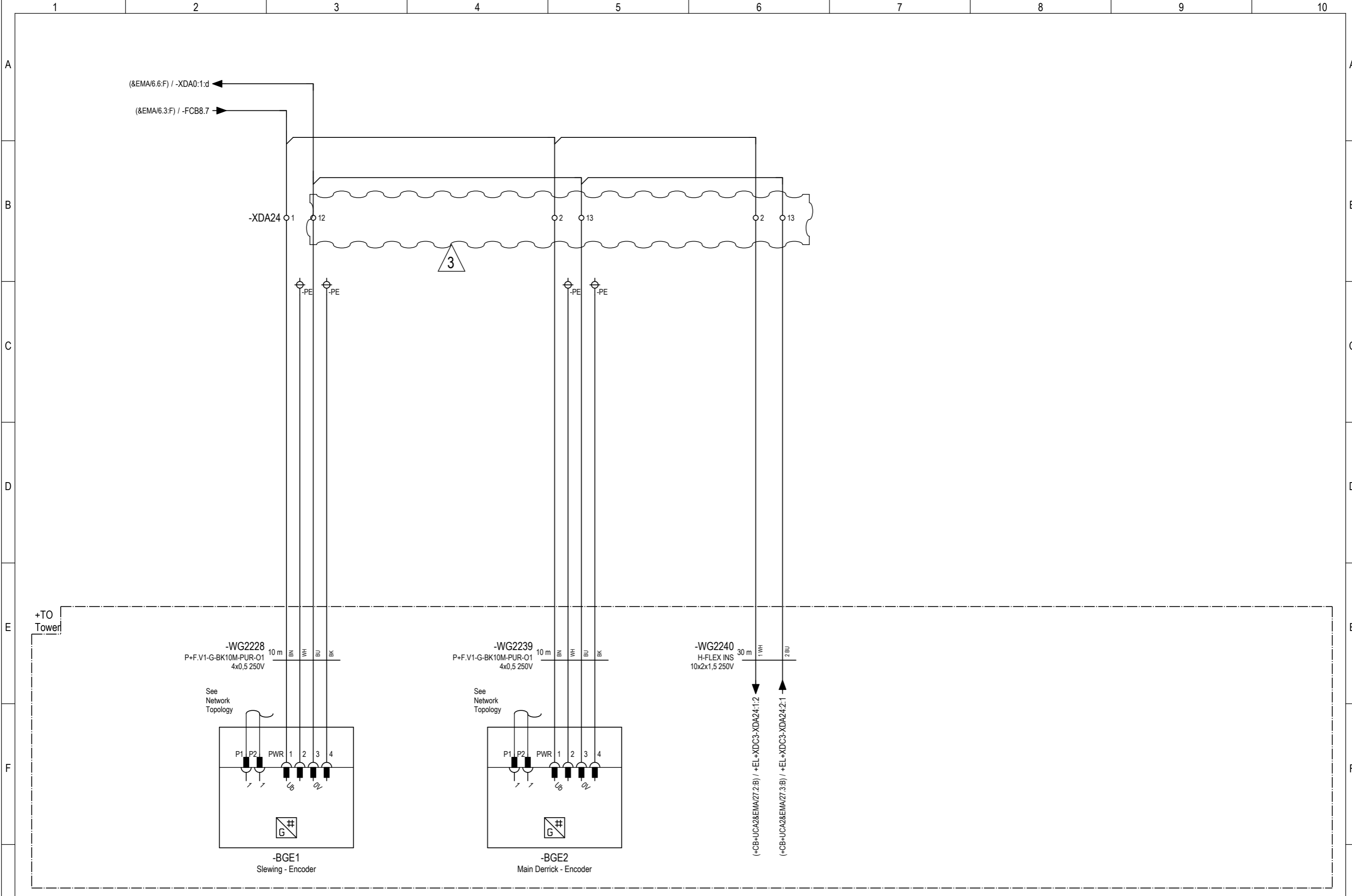
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+CB+UCA2
Control cabinet

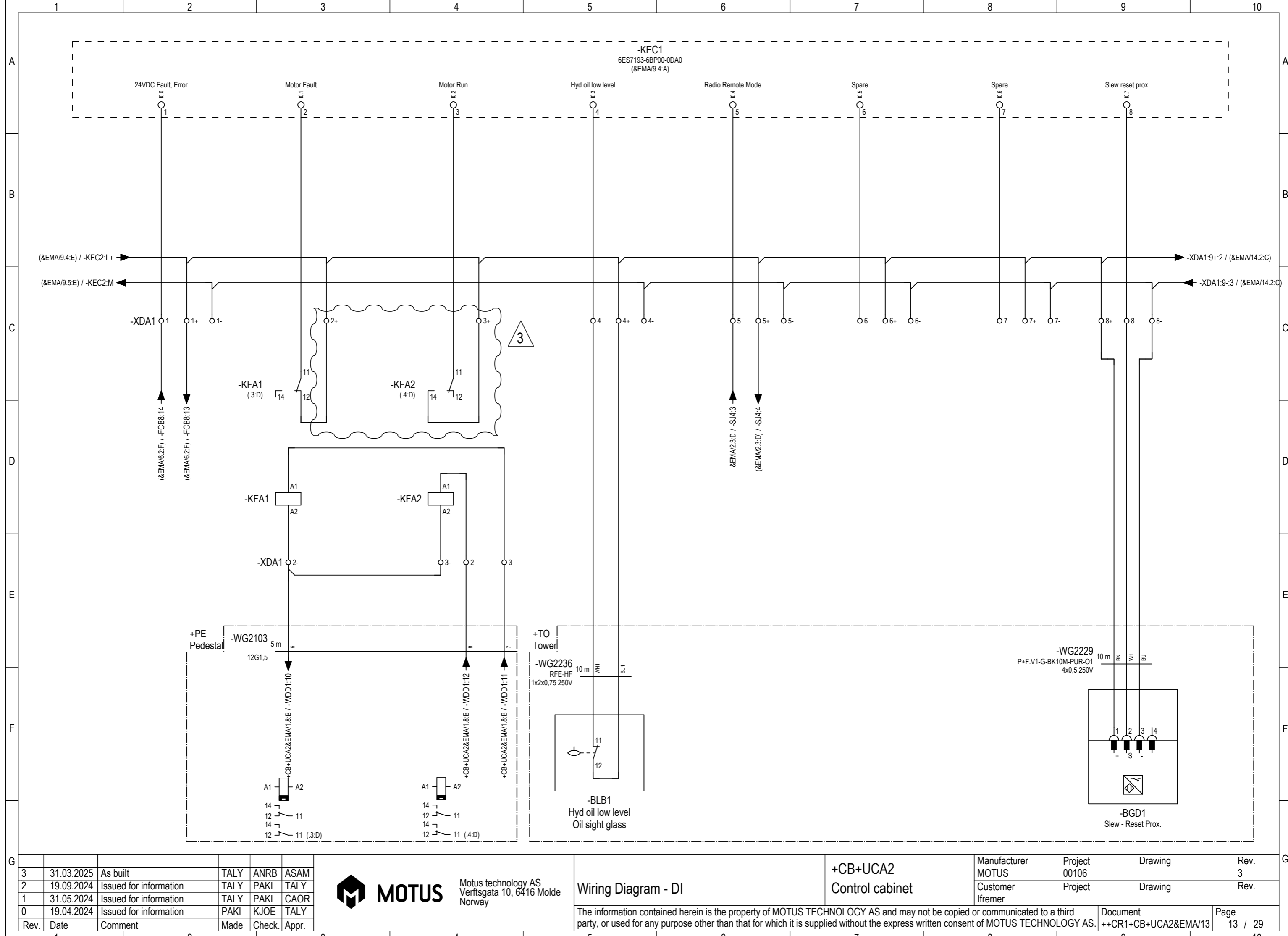
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Customer Ifremer	Project	Drawing	Rev.
Document ++CR1+CB+UCA2&EMA/9		Page 9 / 29	

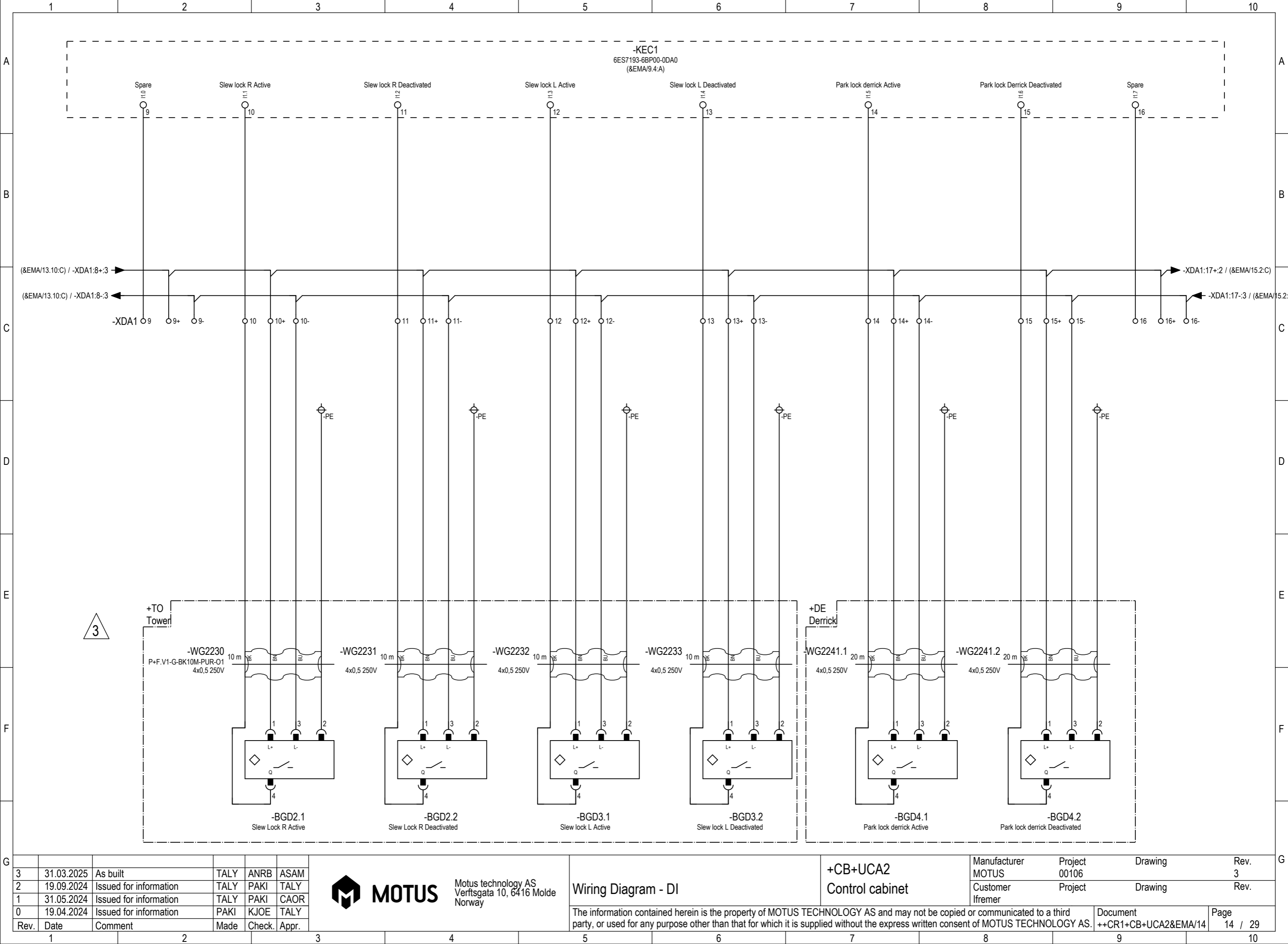






G	3	31.03.2025	As built	TALY	ANRB	ASAM	<div></div> <div>MOTUS</div> <div>Motus technology AS Verftsgata 10, 6416 Molde Norway</div>	Wiring Diagram - Encoder Supply	+CB+UCA2 Control cabinet	Manufacturer	Project	Drawing	Rev.
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	1	31.05.2024	Issued for information	TALY	PAKI	CAOR		The information contained herein is the property of MOTUS TECHNOLOGY AS and may not be copied or communicated to a third party, or used for any purpose other than that for which it is supplied without the express written consent of MOTUS TECHNOLOGY AS.	Customer	Project	Drawing	Rev.	
	0	19.04.2024	Issued for information	PAKI	KJOE	TALY			Ifremer				
	Rev.	Date	Comment	Made	Check.	Appr.		Document				Page	
		1		2				3	4	5	6	7	8





3	31.03.2025	As built	TALY	ANRB	ASAM
2	19.09.2024	Issued for information	TALY	PAKI	TALY
1	31.05.2024	Issued for information	TALY	PAKI	CAOR
0	19.04.2024	Issued for information	PAKI	KJOE	TALY
Rev.	Date	Comment	Made	Check.	Appr.



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Norway

Wiring Diagram - DI

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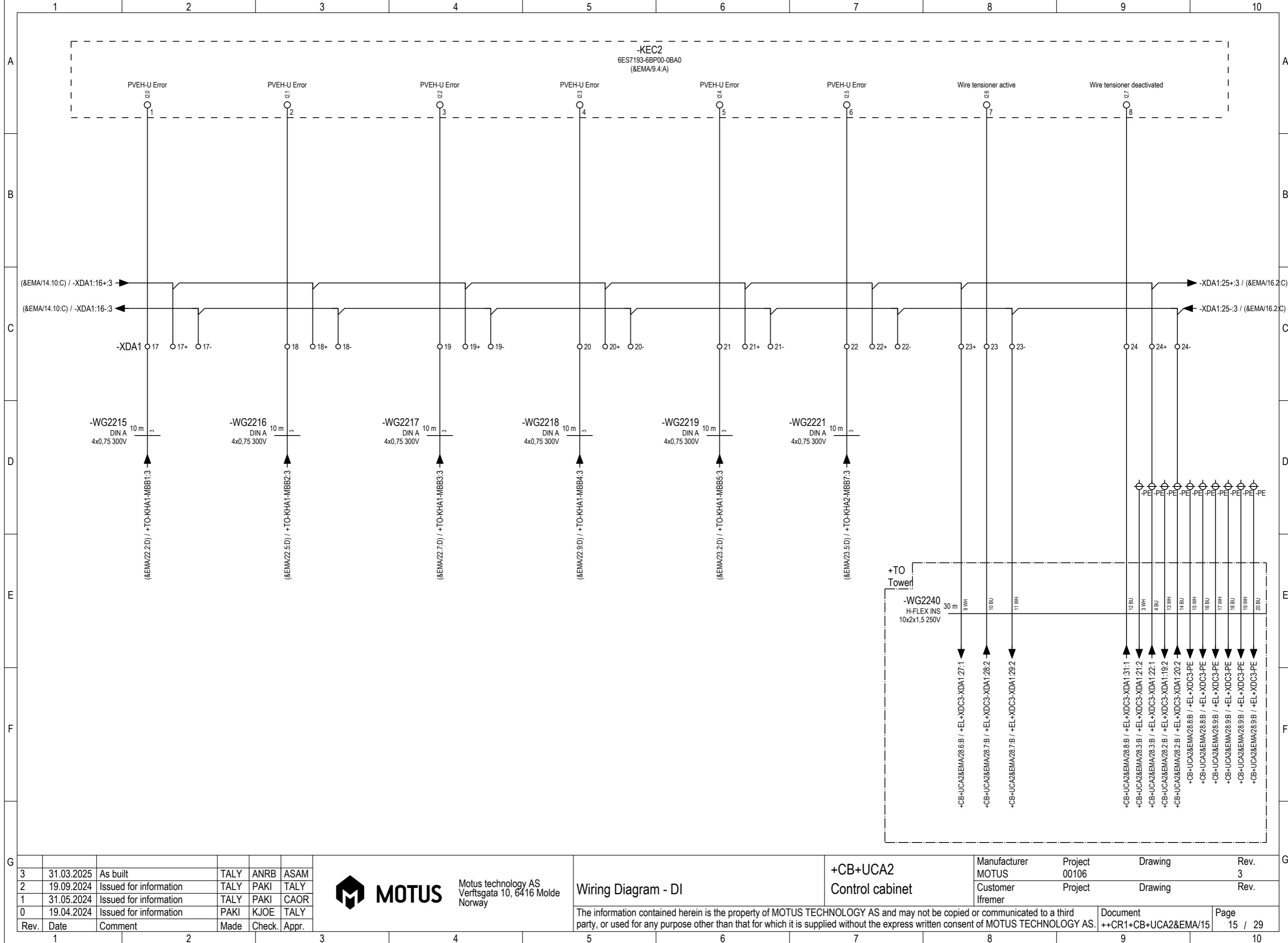
+CB+UCA2

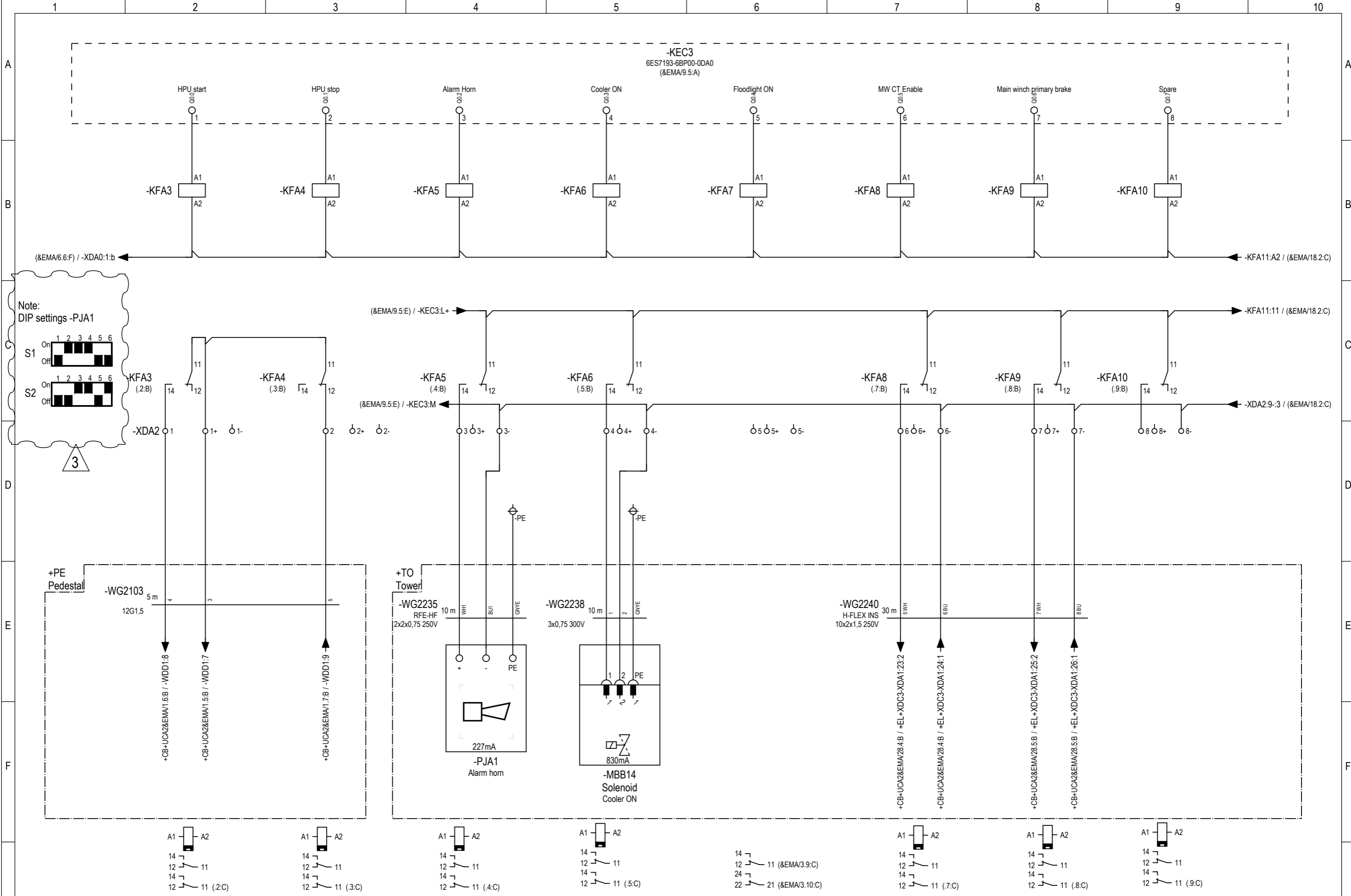
Control cabinet


Manufacturer MOTUS	Project 00106	Drawing	Rev. 3
Customer Ifremer	Project	Drawing	Rev.

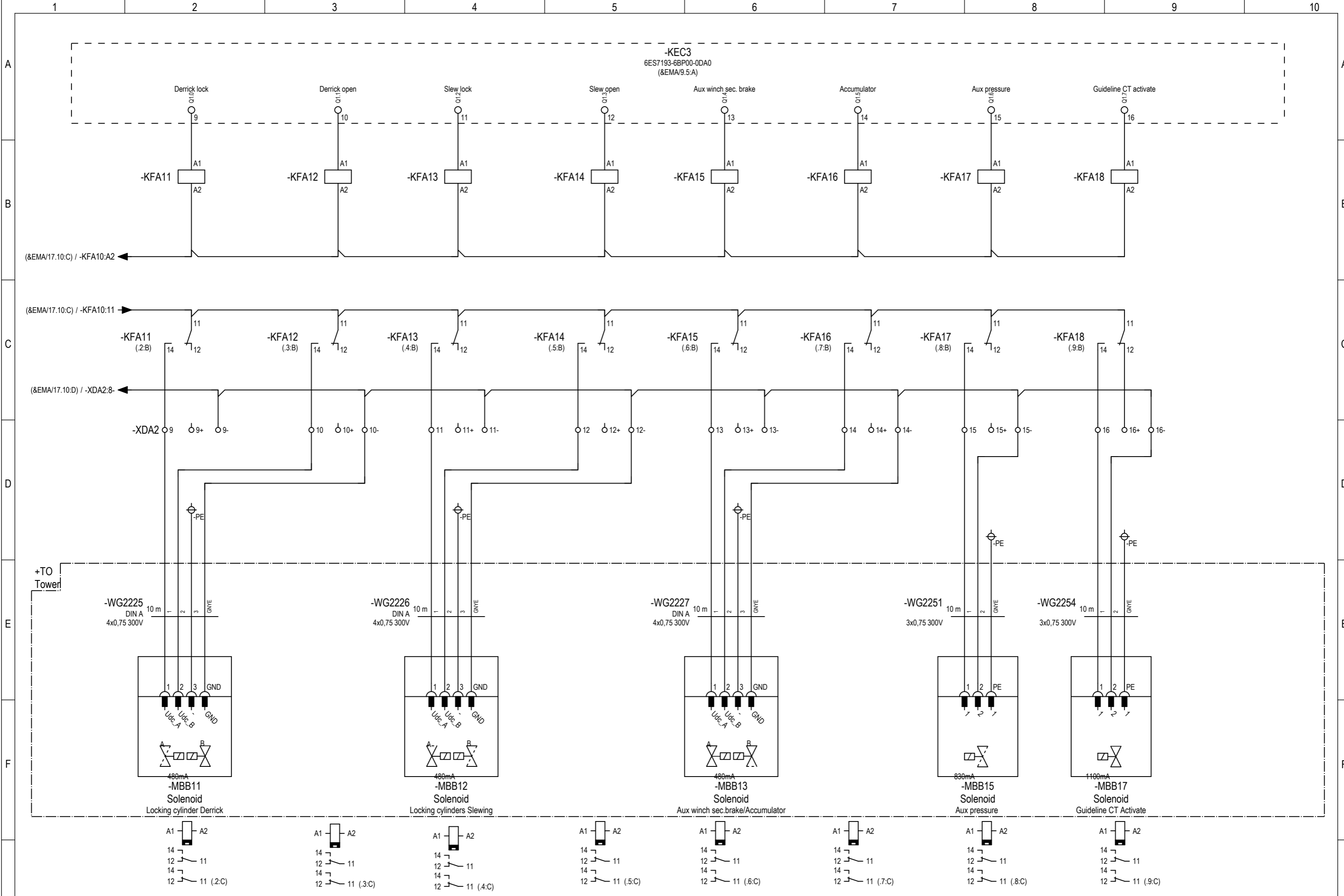
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	0	19.04.2024	Issued for information	PAKI	KJOE	TALY				Ifremer				
	Rev.	Date	Comment	Made	Check.	Appr.				The information contained herein is the property of MOTUS TECHNOLOGY AS and may not be copied or communicated to a third party, or used for any purpose other than that for which it is supplied without the express written consent of MOTUS TECHNOLOGY AS.			Document ++CR1+CB+UCA2&EMA/17	Page 17 / 29



MOTUS

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Norway

Wiring Diagram -DQ

+CB+UCA2
Control cabinet

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Manufacturer
MOTUS

Project
00106

Drawing

Rev.
3

Customer
Ifremer

Project

Drawing

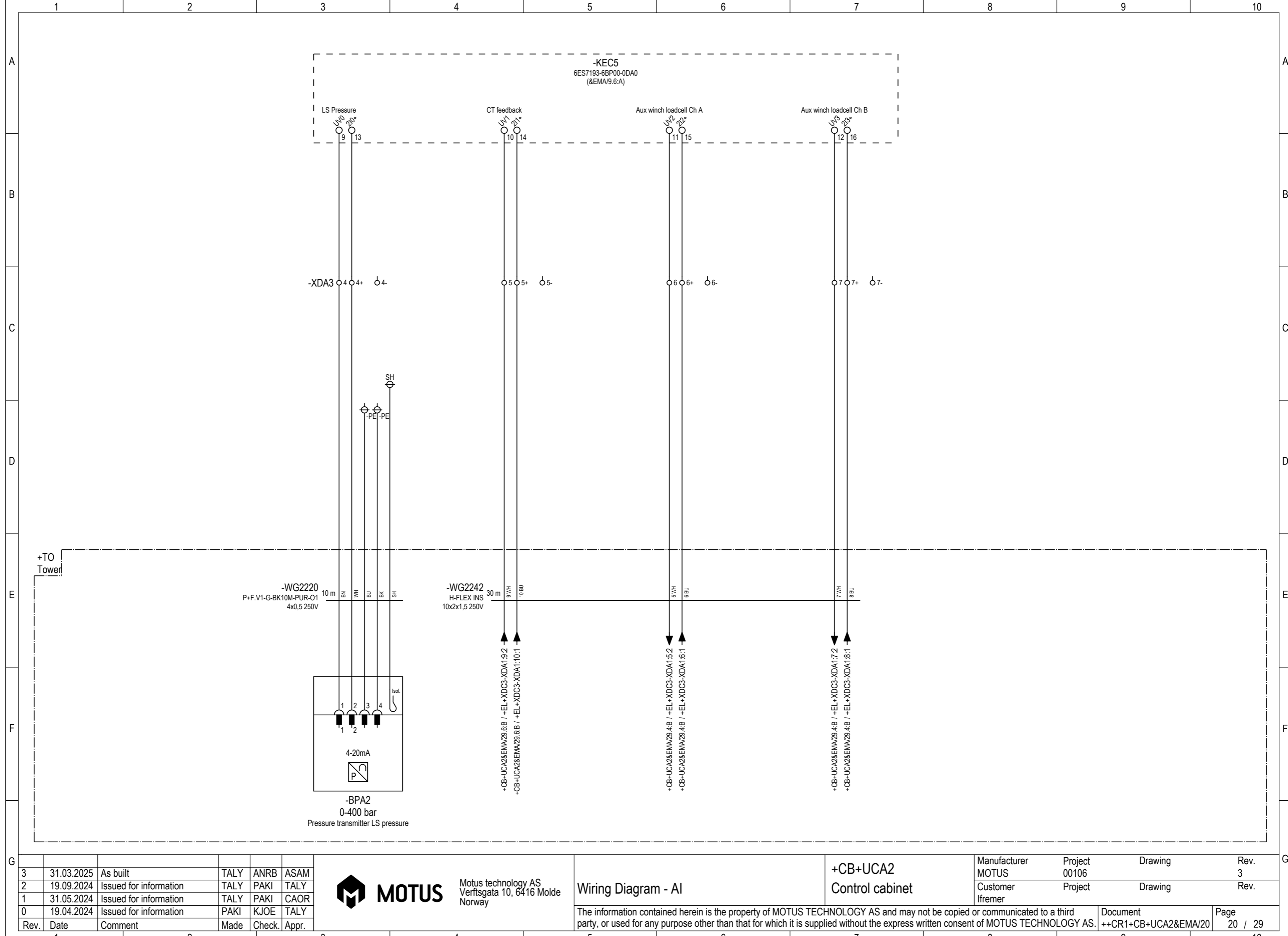
Rev.

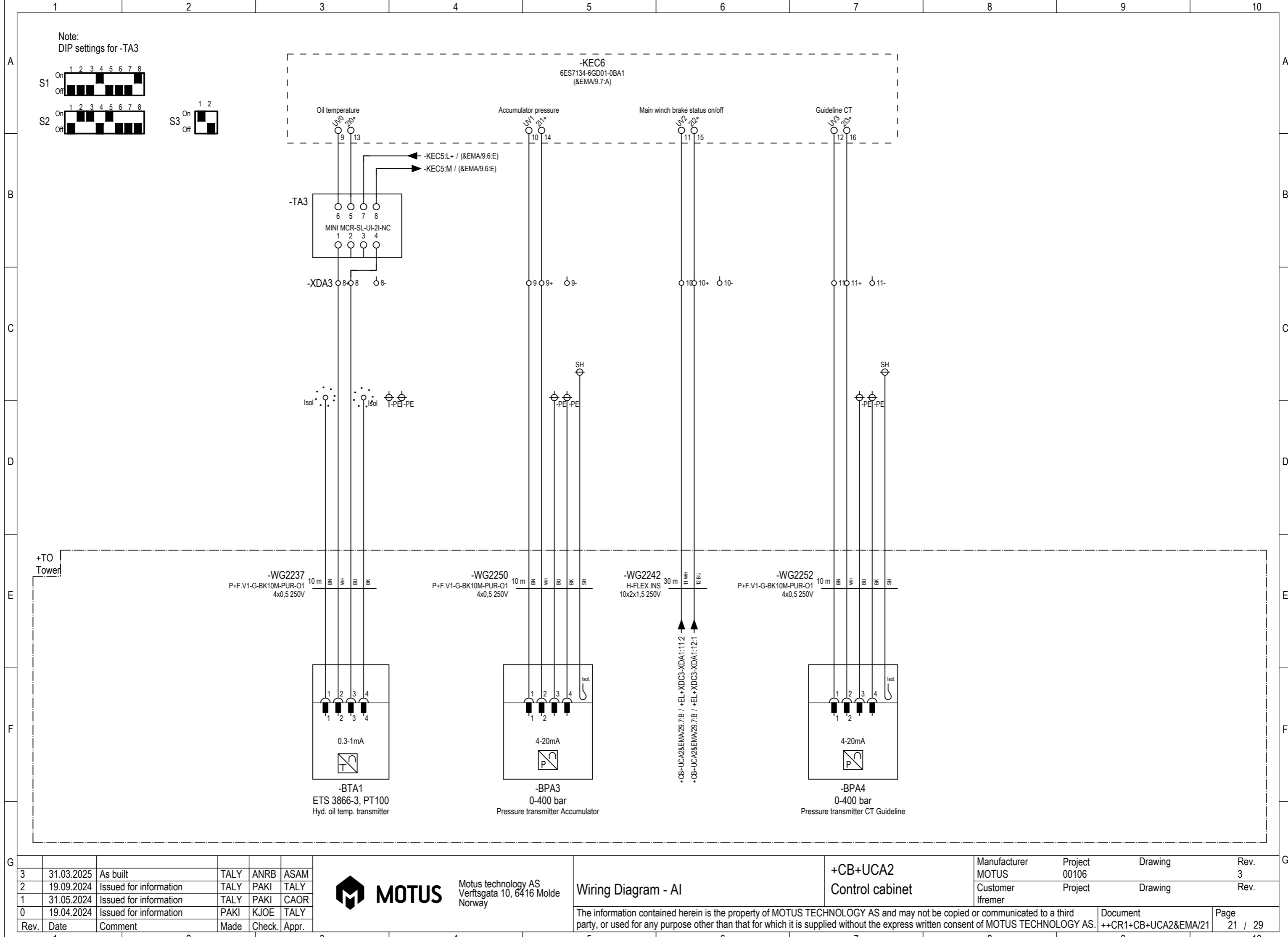
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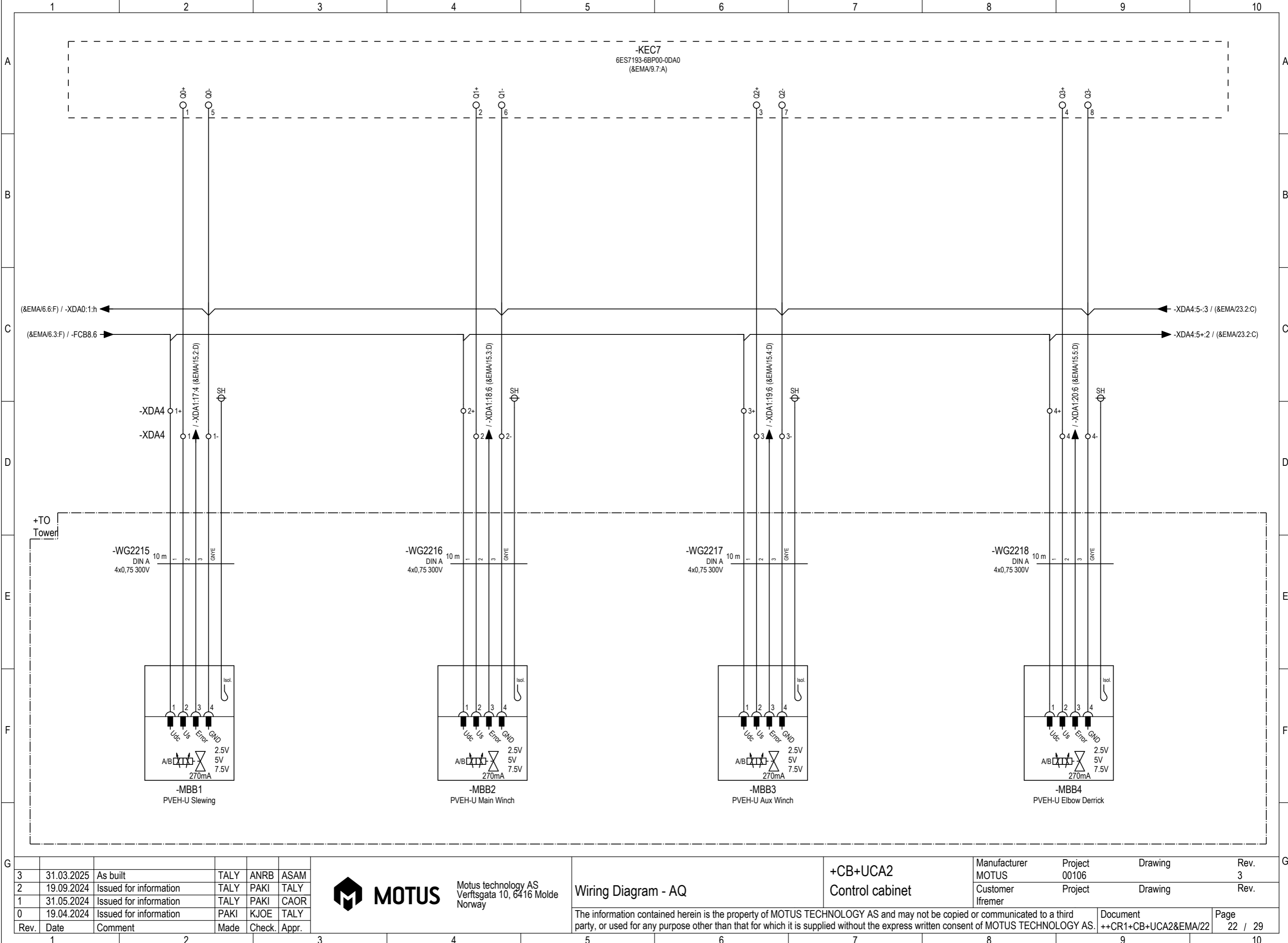
Page
18 / 29

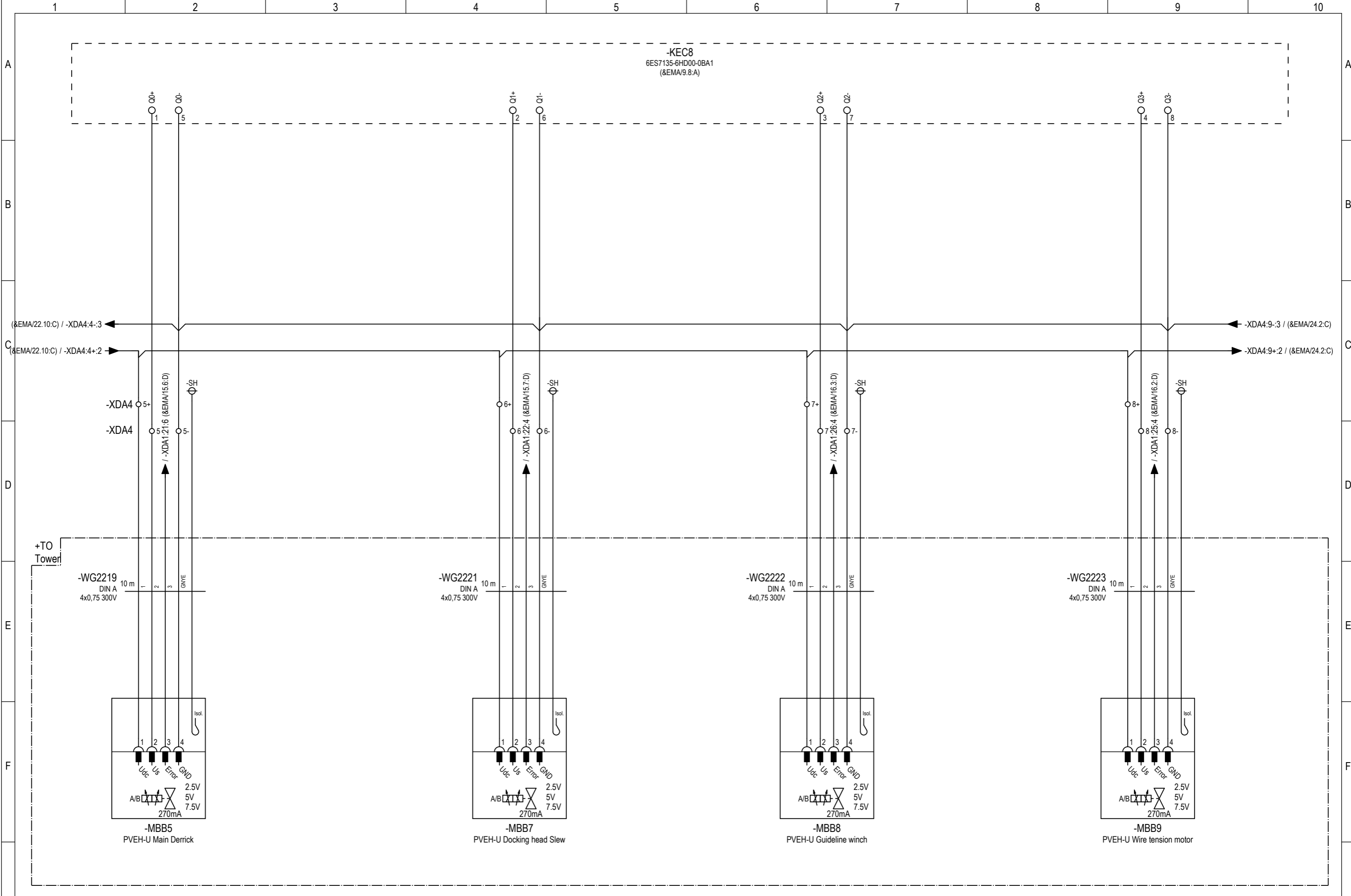
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0	19.04.2024	Issued for information	PAKI	KJOE	TALY
Rev.	Date	Comment	Made	Check.	Appr.

3	31.03.2025	As built	TALY	ANRB	ASAM
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Rev.	Date	Comment	Made	Check.	Appr.

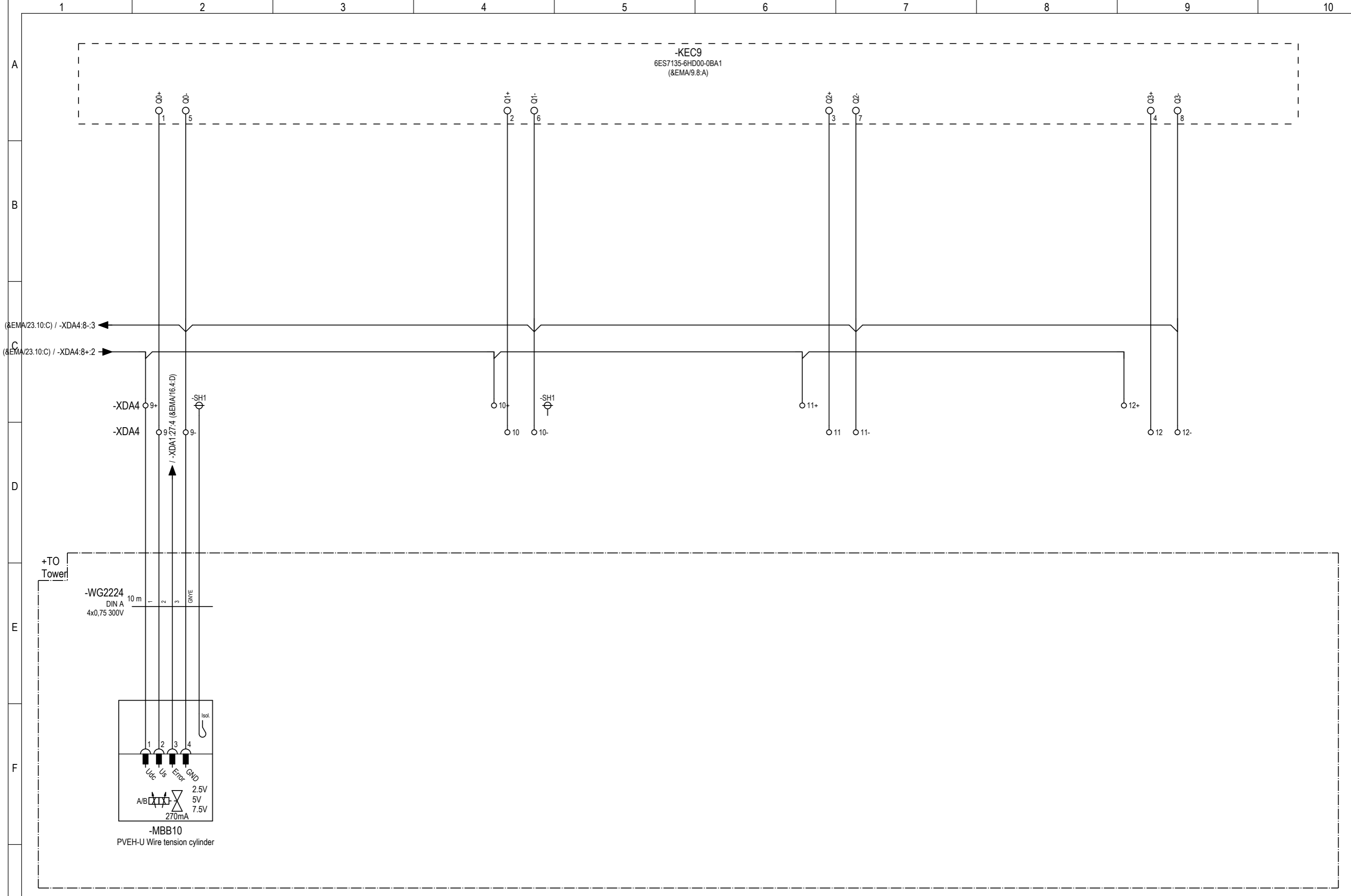





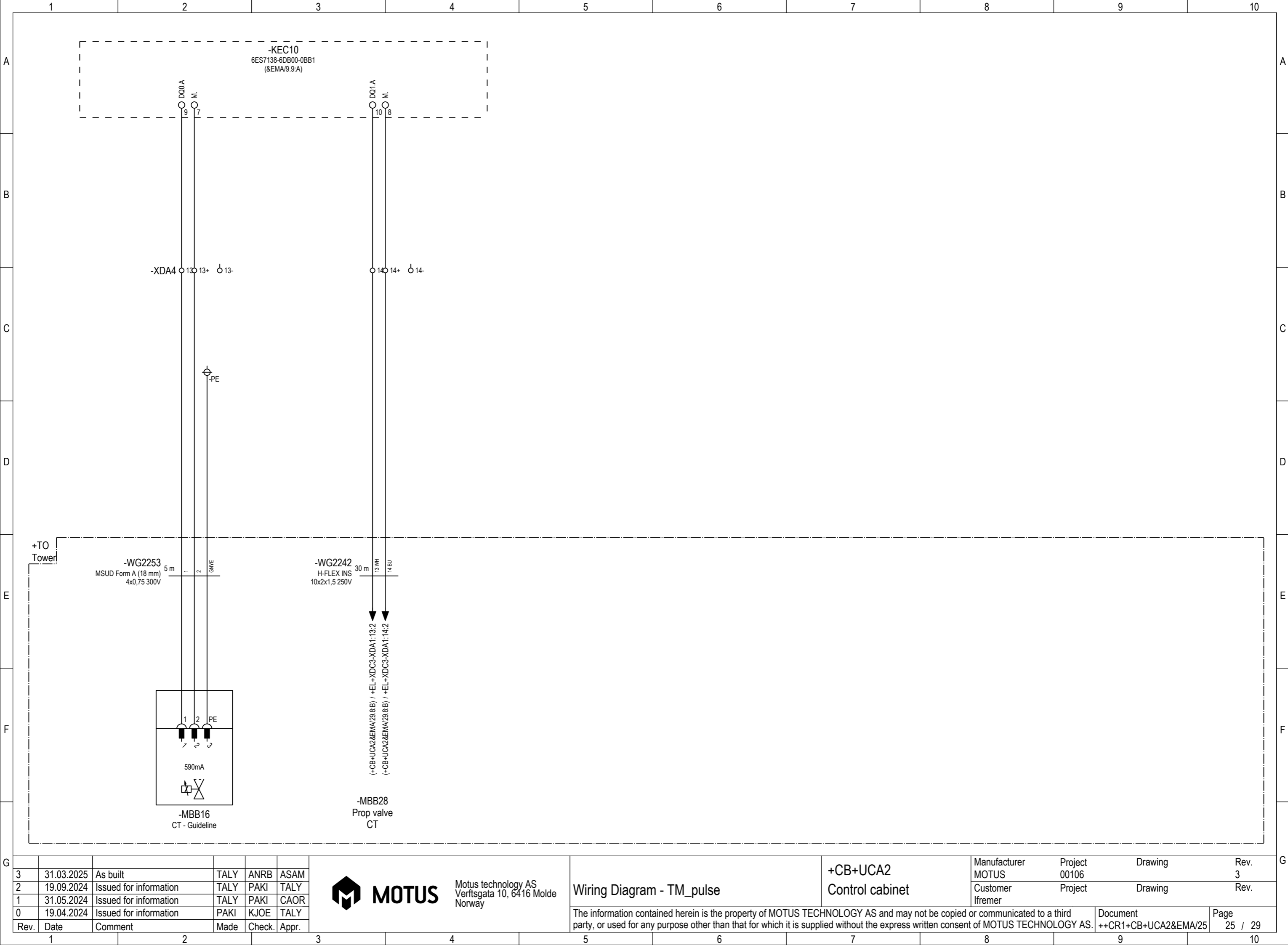




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	0	19.04.2024	Issued for information	PAKI	KJOE	TALY				Ifremer			
	Rev.	Date	Comment	Made	Check.	Appr.				The information contained herein is the property of MOTUS TECHNOLOGY AS and may not be copied or communicated to a third party, or used for any purpose other than that for which it is supplied without the express written consent of MOTUS TECHNOLOGY AS.		Document ++CR1+CB+UCA2&EMA/23	Page 23 / 29



G						<div><div></div><div>MOTUS</div><div>Motus technology AS Verftsgata 10, 6416 Molde Norway</div></div>	Wiring Diagram - AQ	+CB+UCA2 Control cabinet	Manufacturer	Project	Drawing	Rev.		
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	Rev.	Date	Comment	Made	Check.				Appr.					



3	31.03.2025	As built	TALY	ANRB	ASAM
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1	31.05.2024	Issued for information	TALY	PAKI	CAOR
0	19.04.2024	Issued for information	PAKI	KJOE	TALY
Rev.	Date	Comment	Made	Check.	Appr.



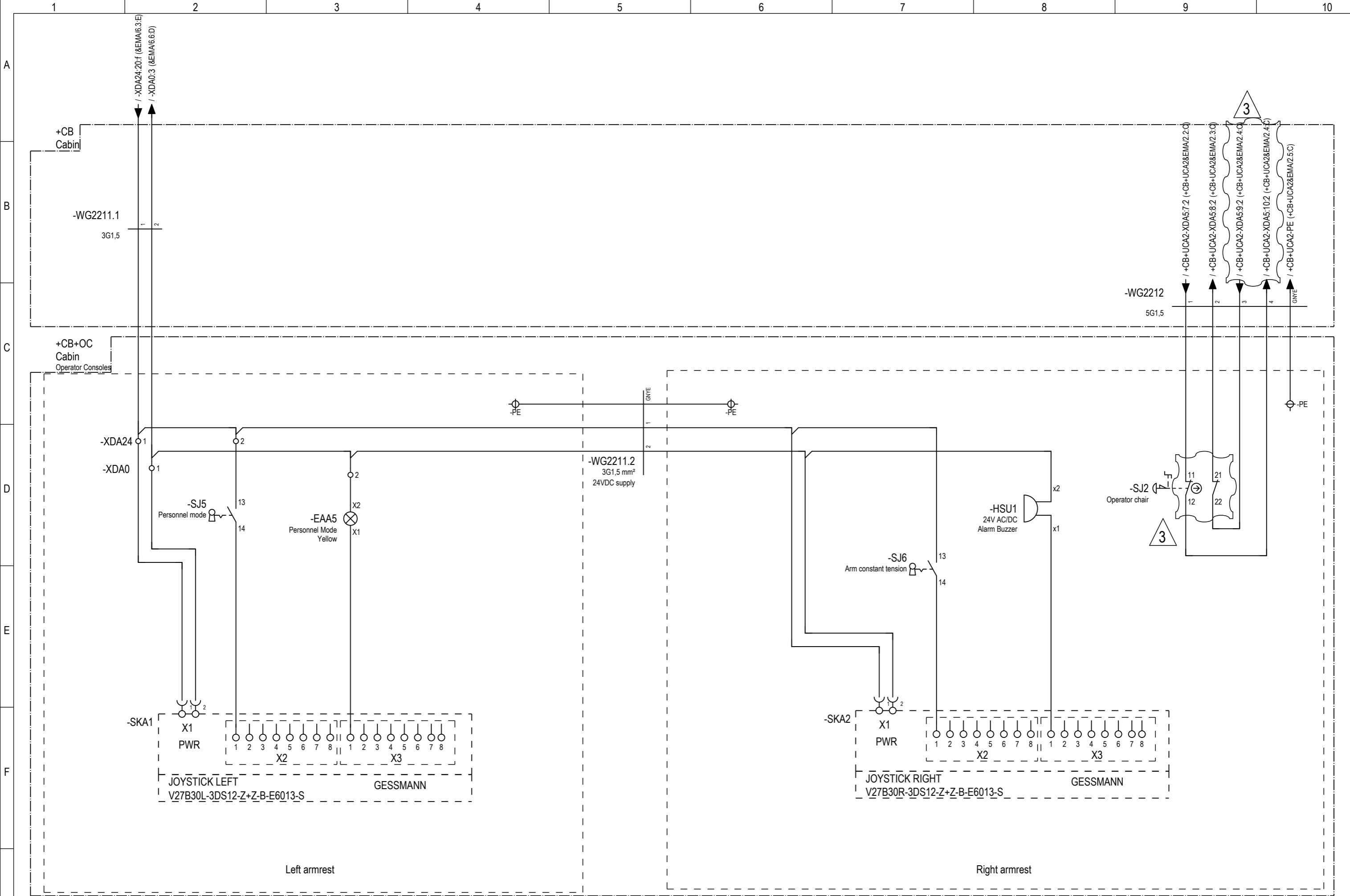
MOTUS


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Verftsgata 10, 6416 Molde
Norway

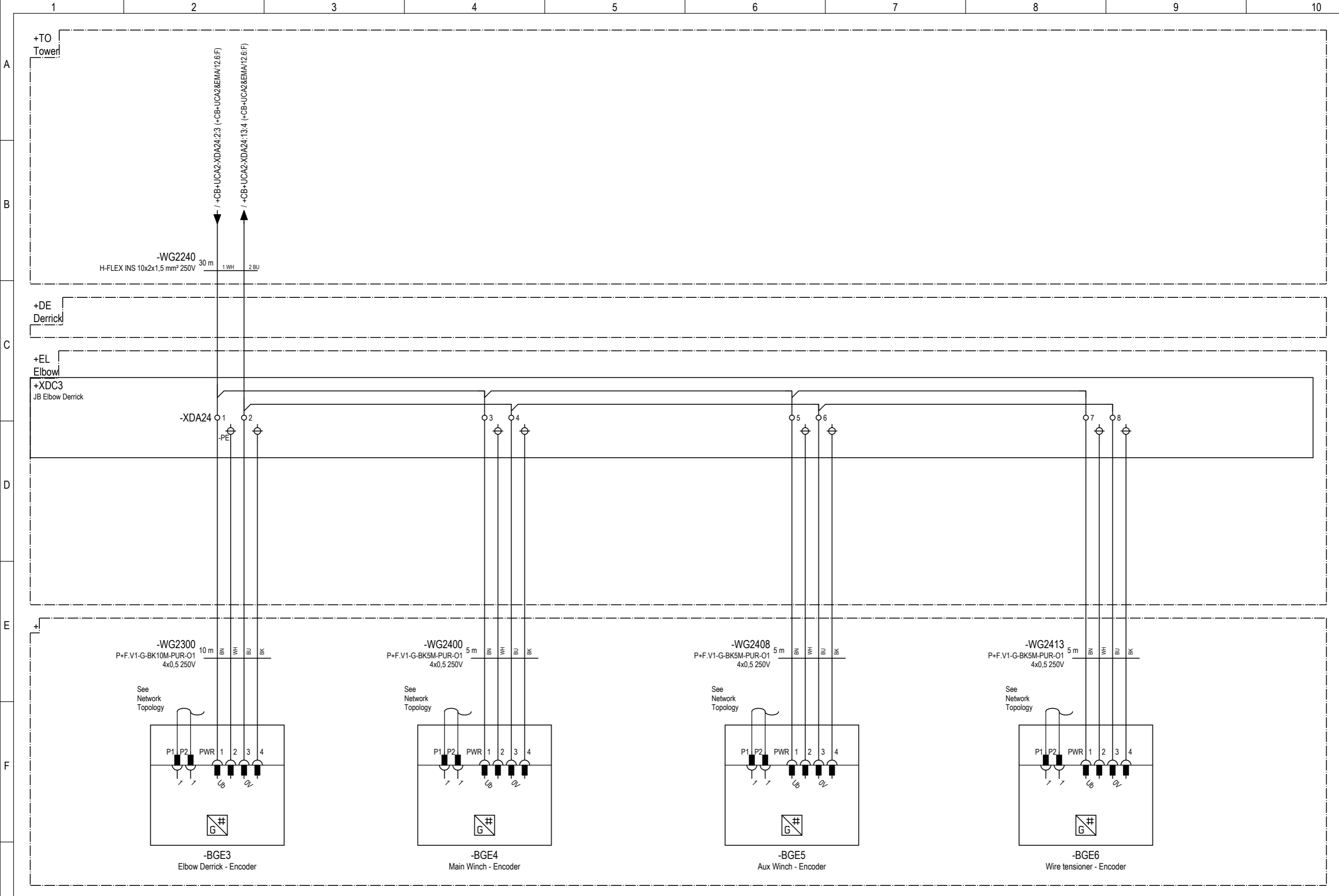
Wiring Diagram - TM_pulse


+CB+UCA2
Control cabinet

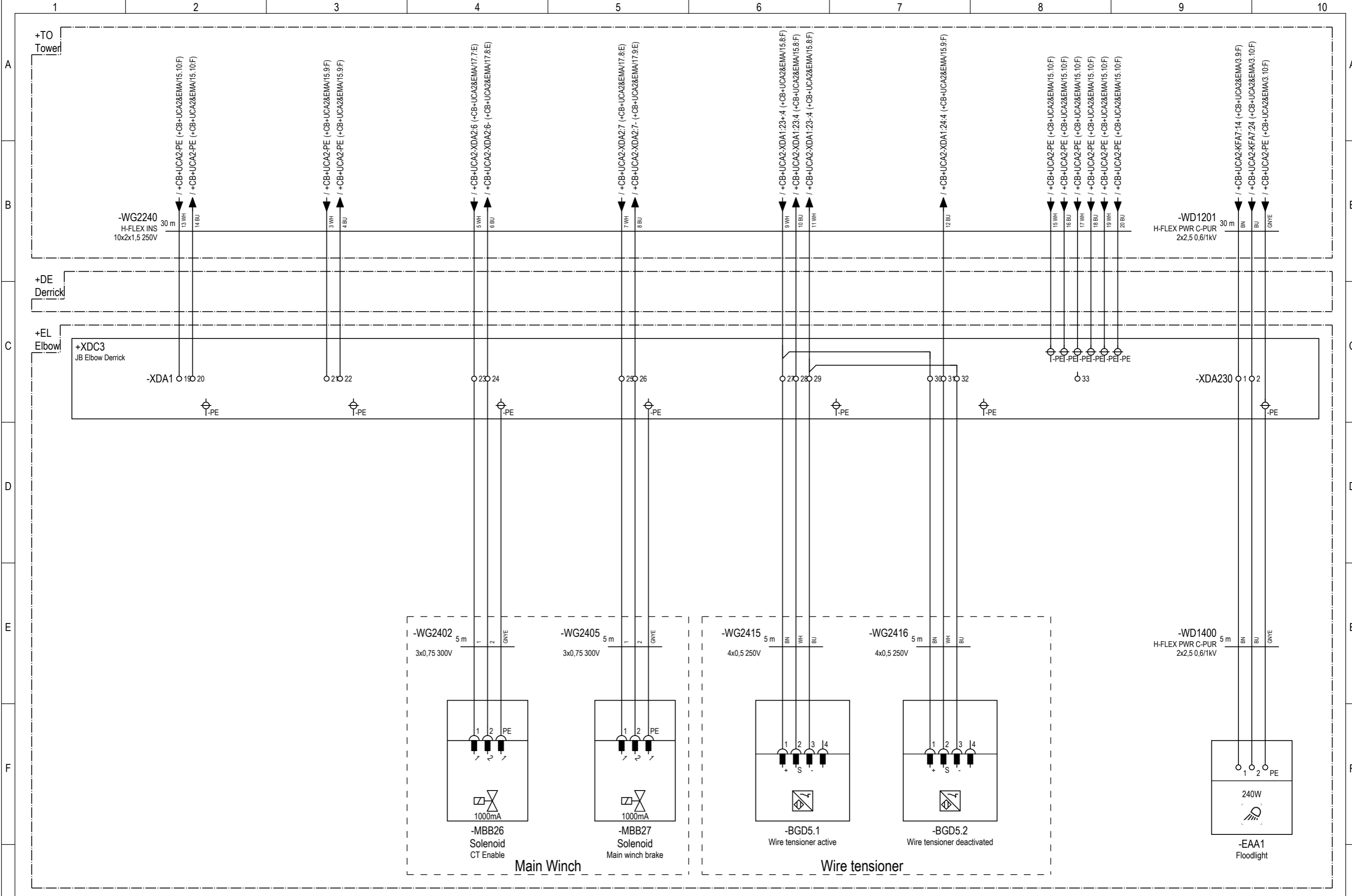
Manufacturer MOTUS	Project 00106	Drawing	Rev. 3
Customer Ifremer	Project	Drawing	Rev.
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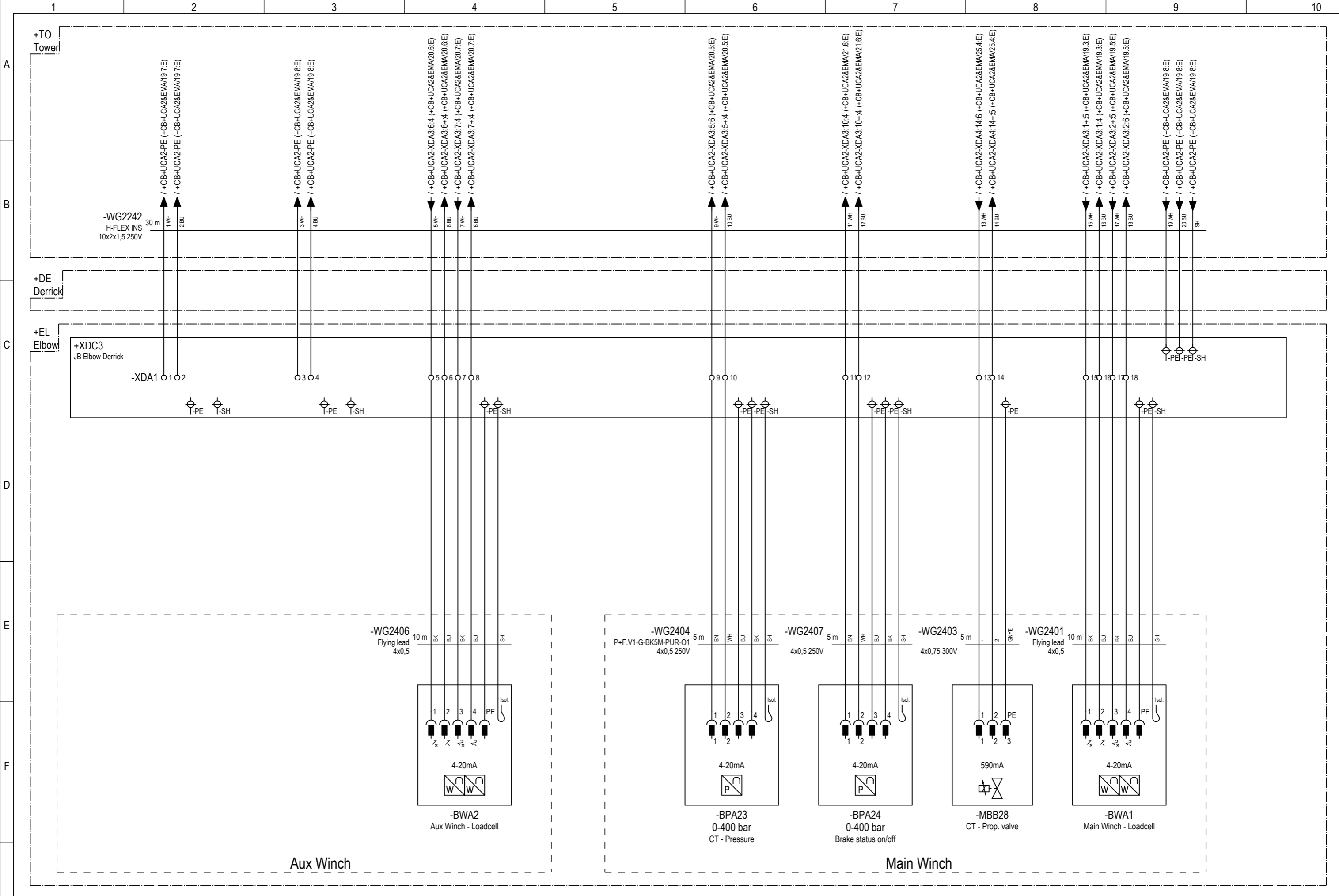
G						<div> MOTUS</div> <div>Motus technology AS Verftsgata 10, 6416 Molde Norway</div>	Wiring Diagram - Operator consoles	+CB+UCA2 Control cabinet	Manufacturer	Project	Drawing	Rev.	
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	1	31.05.2024	Issued for information	TALY	PAKI				CAOR	Ifremer			
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	Rev.	Date	Comment	Made	Check.				Appr.	The information contained herein is the property of MOTUS TECHNOLOGY AS and may not be copied or communicated to a third party, or used for any purpose other than that for which it is supplied without the express written consent of MOTUS TECHNOLOGY AS.			Document ++CR1+CB+UCA2&EMA/26



G	3	31.03.2025	As built	TALY	ANRB	ASAM	 MOTUS Motus technology AS Verftsgata 10, 6416 Molde Norway	Wiring Diagram - XDC3_JB_Encoder_24VDC	+CB+UCA2 Control cabinet	Manufacturer	Project	Drawing	Rev.		
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	Rev.	Date	Comment	Made	Check.	Appr.				The information contained herein is the property of MOTUS TECHNOLOGY AS and may not be copied or communicated to a third party, or used for any purpose other than that for which it is supplied without the express written consent of MOTUS TECHNOLOGY AS.				Document	Page
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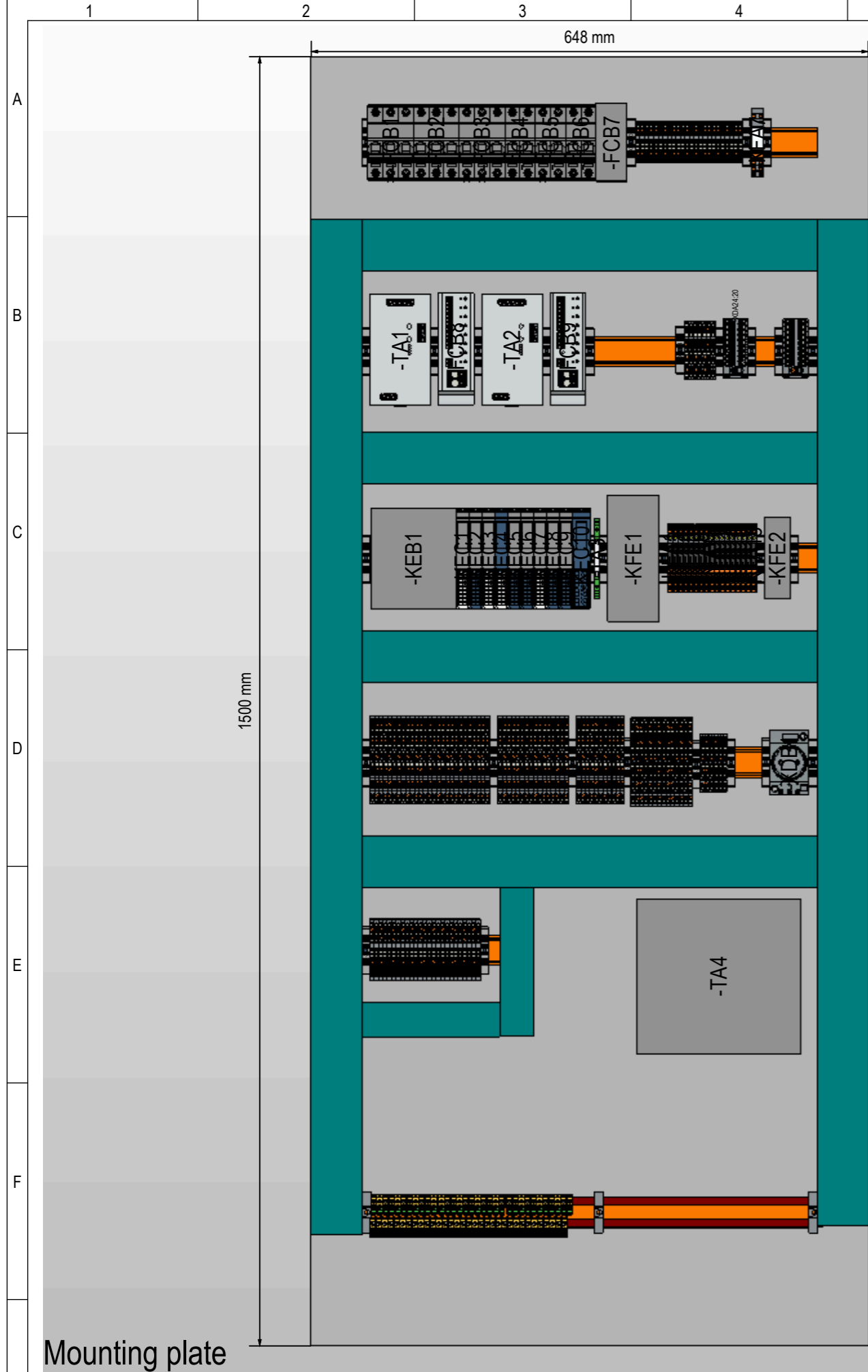


G	3	31.03.2025	As built	TALY	ANRB	ASAM	<div><div><div></div></div><div>MOTUS</div><div>Motus technology AS Verftsgata 10, 6416 Molde Norway</div></div>	Wiring Diagram - XDC3_JB_Digital	+CB+UCA2 Control cabinet	Manufacturer	Project	Drawing	Rev.
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	Rev.	Date	Comment	Made	Check.	Appr.				The information contained herein is the property of MOTUS TECHNOLOGY AS and may not be copied or communicated to a third party, or used for any purpose other than that for which it is supplied without the express written consent of MOTUS TECHNOLOGY AS.		Document ++CR1+CB+UCA2&EMA/28	Page 28 / 29

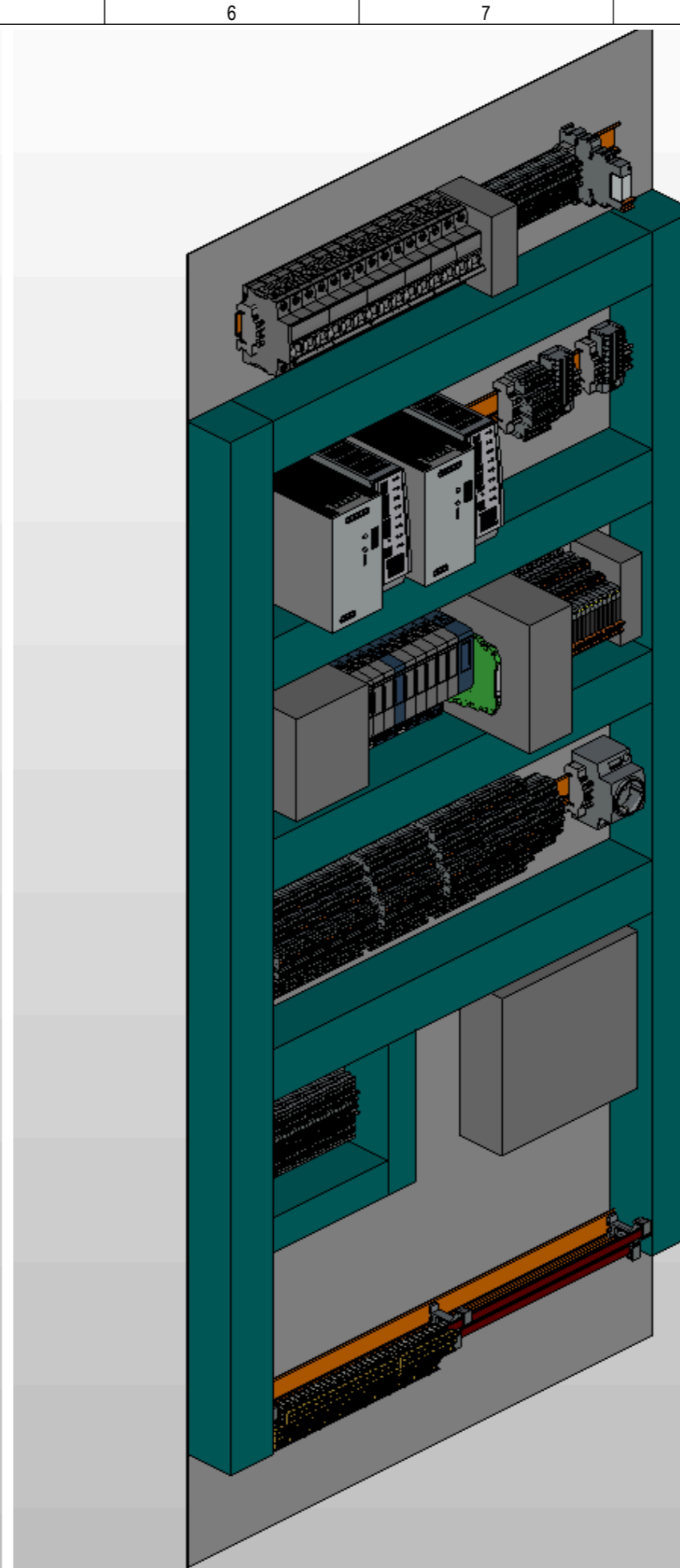


G	3	31.03.2025	As built	TALY	ANRB	ASAM	<div>MOTUS</div> <div>Motus technology AS Verftsgata 10, 6416 Molde Norway</div>	Wiring Diagram - XDC3_JB_Analog	+CB+UCA2 Control cabinet	Manufacturer	Project	Drawing	Rev.
	2	19.09.2024	Issued for information	TALY	PAKI	TALY				MOTUS	00106		3
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	0	19.04.2024	Issued for information	PAKI	KJOE	TALY				Ifremer			
	Rev.	Date	Comment	Made	Check.	Appr.				The information contained herein is the property of MOTUS TECHNOLOGY AS and may not be copied or communicated to a third party, or used for any purpose other than that for which it is supplied without the express written consent of MOTUS TECHNOLOGY AS.		Document ++CR1+CB+UCA2&EMA/29	Page 29 / 29

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Mounting plate



Overview

Notes:
- PE and SH bar to be installed
at the bottom of the cabinet

3	31.03.2025	As built	TALY	ANRB	ASAM
2	19.09.2024	Issued for information	TALY	PAKI	TALY
1	31.05.2024	Issued for information	TALY	PAKI	CAOR
0	19.04.2024	Issued for information	PAKI	KJOE	TALY
Rev.	Date	Comment	Made	Check.	Appr.



Motus technology AS
Verftsgata 10, 6416 Molde
Norway

Layout - Overview UCA2

+CB+UCA2
Control cabinet

Manufacturer MOTUS	Project 00106	Drawing	Rev. 3
Customer Ifremer	Project	Drawing	Rev.
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F



3,5 mm



3	31.03.2025	As built	TALY	ANRB	ASAM
2	19.09.2024	Issued for information	TALY	PAKI	TALY
1	31.05.2024	Issued for information	TALY	PAKI	CAOR
0	19.04.2024	Issued for information	PAKI	KJOE	TALY
Rev.	Date	Comment	Made	Check.	Appr.




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Manufacturer	Project	Drawing	Rev.
MOTUS	00106		3
Customer	Project	Drawing	Rev.
Ifremer			


Fuse list


Device tag	Description	Fuse size / setpoint	Voltage	Cable Cross section
-FCB1	Mains	32A /		6mm2
-FCB1		/		
-FCB2	Fan/Heater	13A-C /		1,5mm2
-FCB4	Control supply	10A-B /	230VAC	1,5mm2
-FCB5	Wiper/Washer	10A-B /	230VAC	1,5mm2
-FCB6	Cabin utilities	10A-B /	230VAC	1,5mm2
-FCB7	Floodlight	2A-C /	230VAC	1,5mm2
-FCB8		/		
-FCB8.1	CPU, Switch, HMI, Joysticks, RRC	0,5-10A / 4A	24VDC	0,75mm2
-FCB8.2	DI	0,5-10A / 2A	24VDC	0,75mm2
-FCB8.3	DQ	0,5-10A / 5A	24VDC	0,75mm2
-FCB8.4	AI	0,5-10A / 1A	24VDC	0,75mm2
-FCB8.5	AQ	0,5-10A / 1A	24VDC	0,75mm2
-FCB8.6	PVEH-U Modules	0,5-10A / 3A	24VDC	0,75mm2
-FCB8.7	Encoders	0,5-10A / 1A	24VDC	0,75mm2
-FCB8.8	CCTV	0,5-10A / 1A	24VDC	0,75mm2
-FCB9		/		
-FCB9.1	Wiper front	0,5-10A / 6A	24VDC	1,5mm2
-FCB9.2	Washer front	0,5-10A / 2A	24VDC	1,5mm2
-FCB9.3	Wiper right	0,5-10A / 6A	24VDC	1,5mm2
-FCB9.4	Washer right	0,5-10A / 2A	24VDC	1,5mm2
-FCB9.5	Wiper left	0,5-10A / 6A	24VDC	1,5mm2
-FCB9.6	Washer left	0,5-10A / 2A	24VDC	1,5mm2
-FCB9.7	Wiper roof	0,5-10A / 6A	24VDC	1,5mm2

						<div></div> <div>Motus technology AS Verftsgata 10, 6416 Molde Norway</div>	+CB+UCA2 Control cabinet
3	31.03.2025	As built	TALY	ANRB	ASAM		Drawing 323660 ++CR1+CB+UCA2&EEC/1
2	19.09.2024	Issued for information	TALY	PAKI	TALY		Customer Drawing
1	31.05.2024	Issued for information	TALY	PAKI	CAOR		
0	19.04.2024	Issued for information	PAKI	KJOE	TALY		
Rev.	Date	Comment	Made	Check.	Appr.		Page 1 / 2

Fuse list

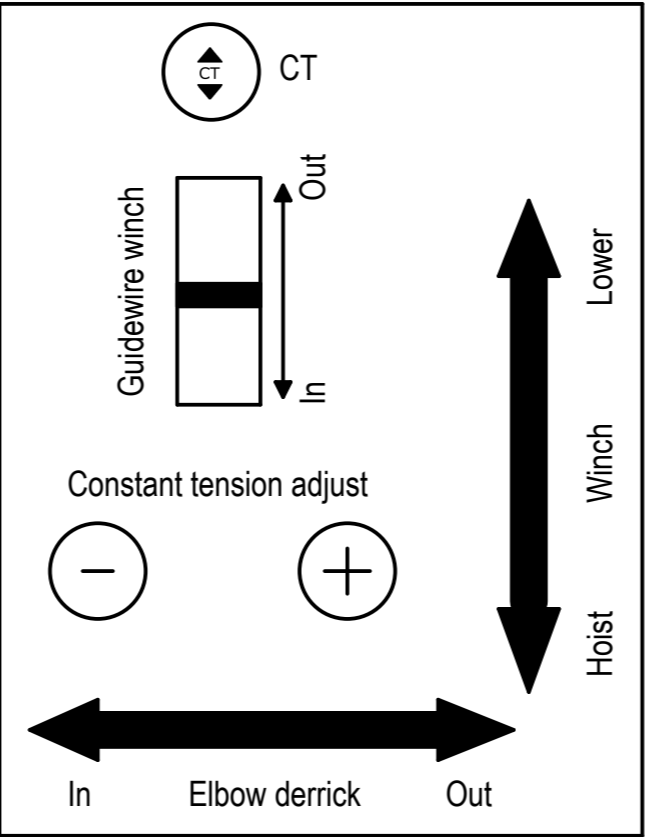
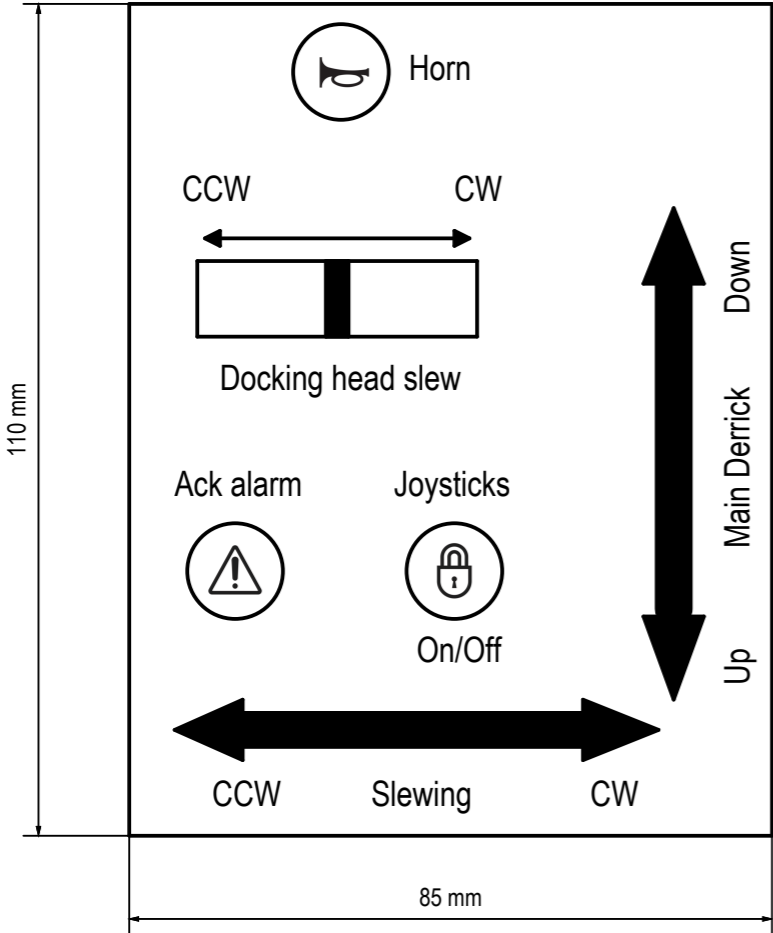
[illegible]


						 <p>Motus technology AS Verftsgata 10, 6416 Molde Norway</p>	+CB+UCA2 Control cabinet
3	31.03.2025	As built	TALY	ANRB	ASAM		Drawing 323660 ++CR1+CB+UCA2&EEC/2
2	19.09.2024	Issued for information	TALY	PAKI	TALY		Customer Drawing
1	31.05.2024	Issued for information	TALY	PAKI	CAOR		
0	19.04.2024	Issued for information	PAKI	KJOE	TALY		
Rev.	Date	Comment	Made	Check.	Appr.		Page 2 / 2

	1	2	3	4	5	6	7	8	9	10							
BOM: Operator consoles																	
A	Qty	Pos	Part no.	ERP no.	Component type	Technical descr.	Manufacturer										
	1	-EAA5	SE.XB5EVB8	325498	Signal device light / lamp	LED, Yellow, 24VAC/DC	Schneider										
	1	-HSU1	SE.XB5KSB	325499	Signal device acoustic	Complete buzzer, plastic, 22mm, continuous or intermittent tone, 24V AC DC	Schneider										
B	1	-SJ2	SE.XB4BS8444	302132	Switch / pushbutton < 230V	Emergency stop, 2NC, 22mm	Schneider										
	1	-SJ2	SE.ZBZ1605	302168	Accessory - switch / pushb.	Yellow metal padlockable guard for Ø40 mushroom head	Schneider										
	1	-SJ2	SE.ZBY9320	302166	Accessory - switch / pushb.	Skilt Gult - Ø60mm	Schneider										
	2	-SJ5;-SJ6	SE.XB4BG41	302130	Switch / pushbutton < 230V	Selector key switch, 1NO, 22mm, black, 2 positions 90°C	Schneider										
	1	-SKA1	GESS.V27B30L-3DS12-Z+Z-B-E6013-S	327674	EL Joystick	Multi Axis Controller V27, left											
	1	-SKA2	GESS.V27B30R-3DS12-Z+Z-B-E6013-S	329269	EL Joystick	Multi Axis Controller V27, right											
C																	
D																	
E																	
F																	
G																	
	3	31.03.2025	As built	TALY	ANRB	ASAM	 MOTUS Motus technology AS Verftsgata 10, 6416 Molde Norway	BOM		+CB+OC Operator consoles	Manufacturer	Project	Drawing	Rev.			
	2	19.09.2024	Issued for information	TALY	PAKI	TALY					MOTUS	00106		3			
	1	31.05.2024	Issued for information	TALY	PAKI	CAOR					Customer	Project	Drawing	Rev.			
	0	19.04.2024	Issued for information	PAKI	KJOE	TALY					Ifremer						
	Rev.	Date	Comment	Made	Check.	Appr.											
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	2																
	3																
	4																
	5																
	6																
	7																
	8																
	9																
	10																

Function signs for joysticks

White signs, black text and figures
2.5mm Text



						<div> MOTUS</div> <div>Motus technology AS Verftsgata 10, 6416 Molde Norway</div>	Layout - Signs Joysticks	+CB+OC Operator consoles	Manufacturer Project Drawing Rev.				
3	31.03.2025	As built	TALY	ANRB	ASAM				MOTUS	00106		3	
2	19.09.2024	Issued for information	TALY	PAKI	TALY				Customer	Project	Drawing	Rev.	
1	31.05.2024	Issued for information	TALY	PAKI	CAOR				Ifremer				
0	19.04.2024	Issued for information	PAKI	KJOE	TALY				Document			Page	
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A

B

B

C

C

D

D

E

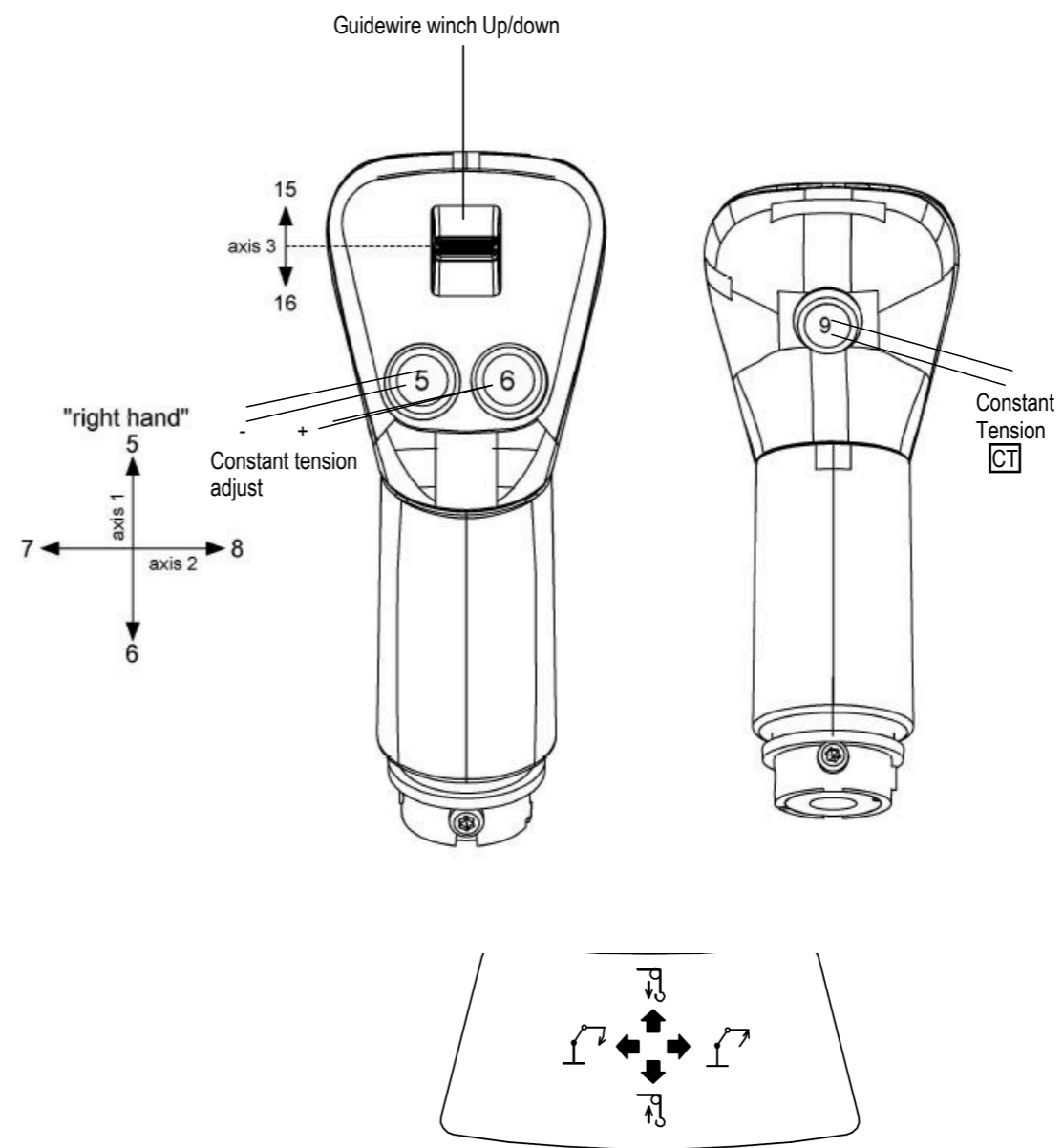
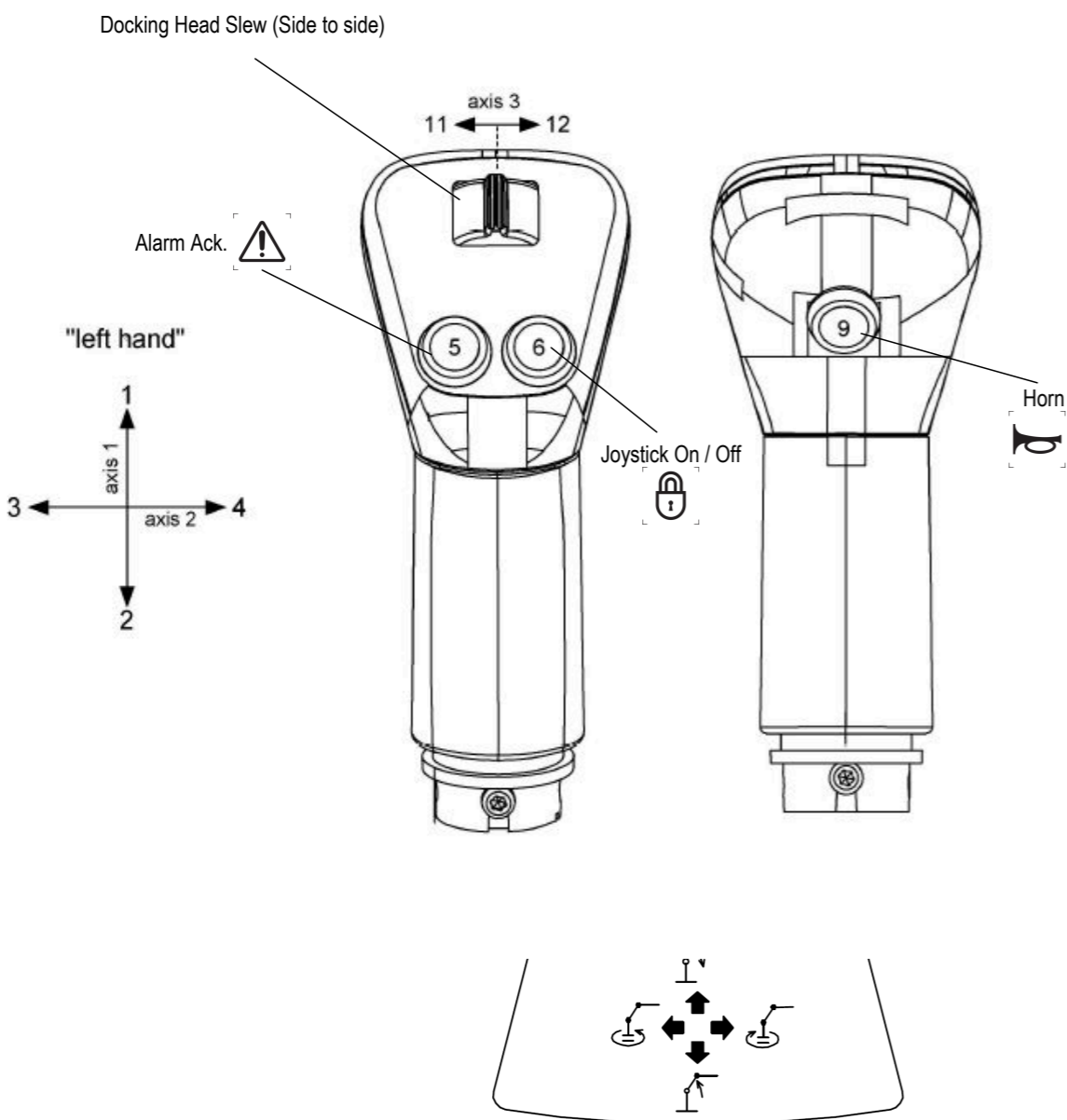
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3	31.03.2025	As built	TALY	ANRB	ASAM
2	19.09.2024	Issued for information	TALY	PAKI	TALY
1	31.05.2024	Issued for information	TALY	PAKI	CAOR
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Rev.	Date	Comment	Made	Check.	Appr.



MOTUS

Motus technology AS
Verftsgata 10, 6416 Molde
Norway

Layout - Joysticks

+CB+OC
Operator consoles

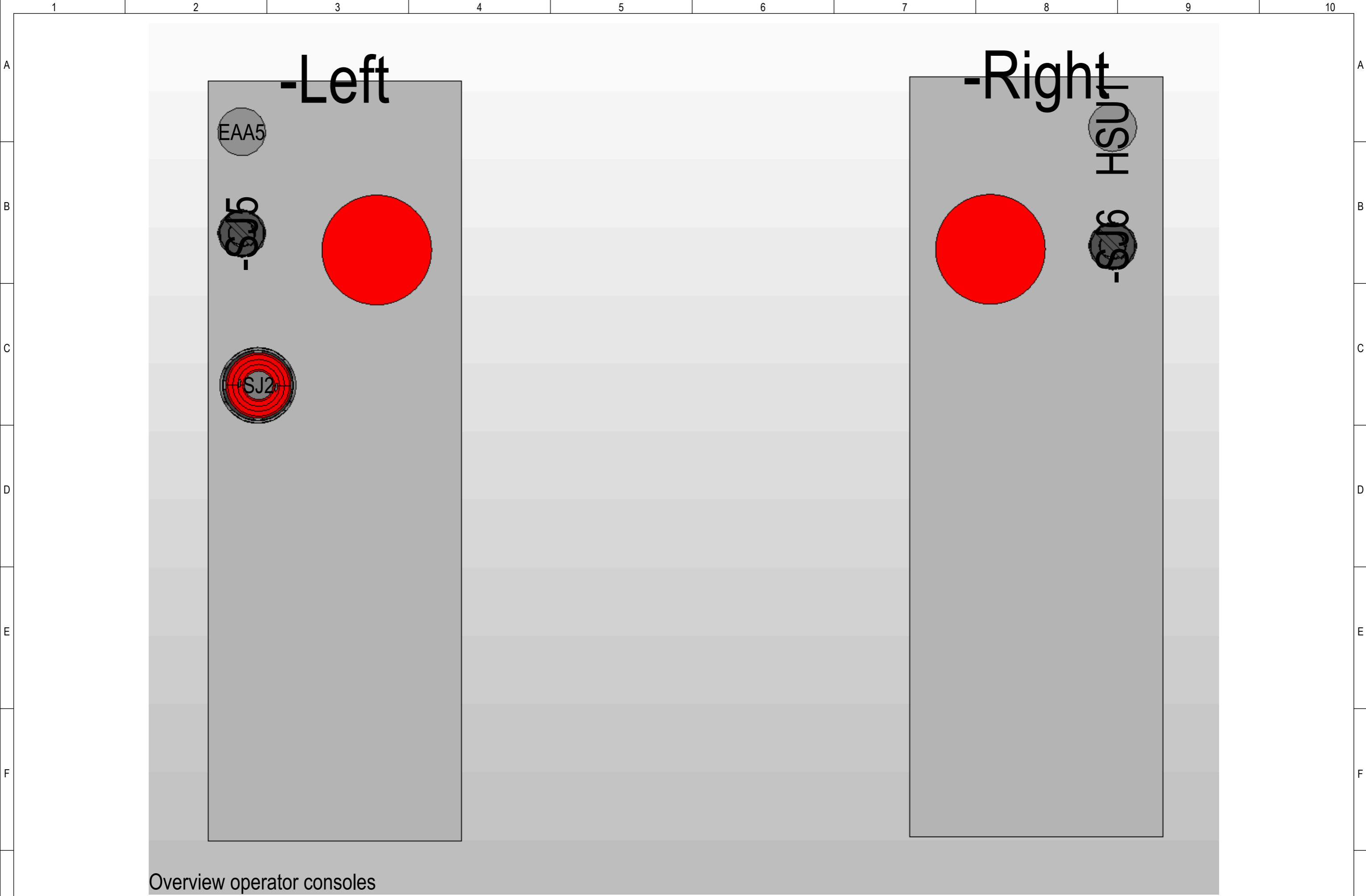
Manufacturer MOTUS	Project 00106	Drawing	Rev. 3
Customer Ifremer	Project	Drawing	Rev.

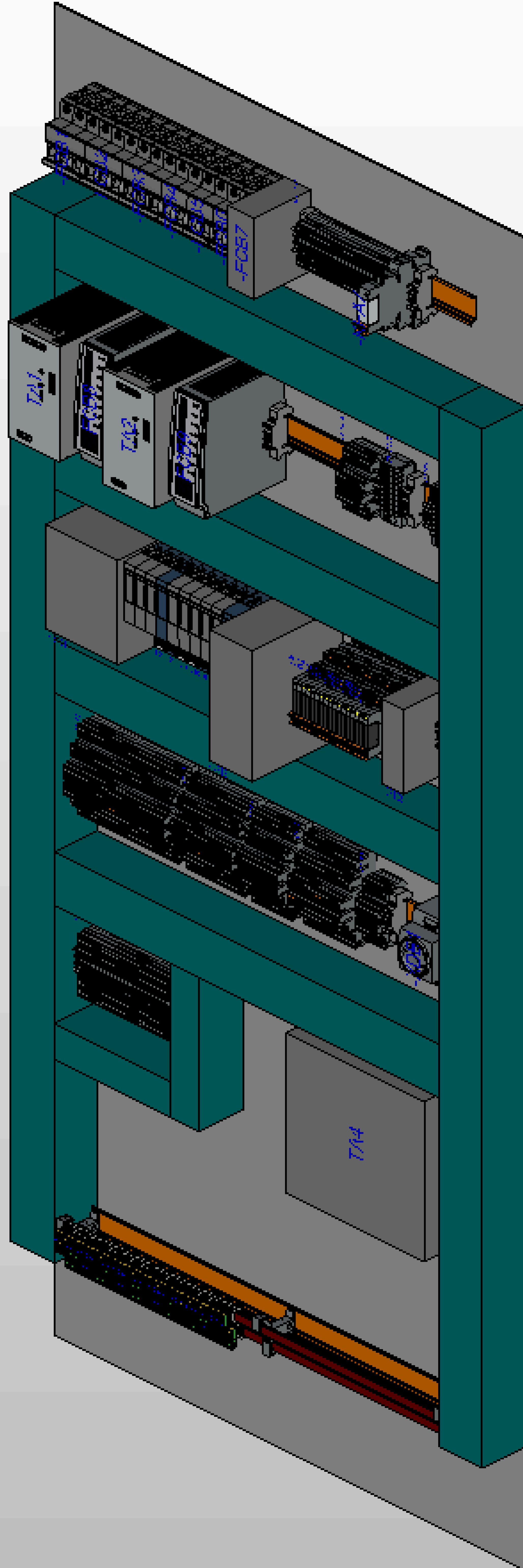
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MC Power/Signal Cables

Warning!
Continuity check only to be done on main earthing system
Insulation test only to be done on power cables >230V
Network and instrumentation cables not to be exposed to voltages >50V

1 Installation Check

☐

1.1

☐

Labelling / numbering / ferruling correct

☐

1.2

☐

Clamping / cleating correct

☐

1.3

☐

Glanding / locknuts correct

☐

1.4

☐

Cable grouping correct

☐

1.5

☐

Cable mechanically protected

☐

1.6

☐

Termination correct

☐

1.7

☐

Spare cores earthed or connected to terminals

2 Continuity Check (PE)

☐

2.1

☐

PE < 0,5Ω

3 Insulation Test

☐

3.1

☐

Phase/Phase >1MΩ

☐

3.2

☐

Phase/Screen or PE >1MΩ

1 Installation Check

2 Loop Check

3 Insulation test

Comment

Cable name	Source (from)	Target (to)	Cable type	Cores	Cross section	Voltage	Length	1 Installation Check	2 Loop Check	3 Insulation test	Comment
-WD1100	+PE#E-WDD1	+PE+XDC1#E-PE	Flying lead	4G	6 mm²		5 m				Sign..
-WD1101	+PE#E-WDD1	+CB+UCA2#E-PE	Flying lead	4G	6 mm²		-"				Sign..
-WD1201	+EL+XDC3#E-XDA230	+CB+UCA2#E-KFA7	H-FLEX PWR C-PUR	2	2,5 mm²	0,6/1kV	30 m				Sign..
-WD1202	+TO#E-EB1	+CB+UCA2#E-XDA230	LKSM-HF	3	2,5 mm²	0,6/1kV	10 m				Sign..
-WD1204	+CB+UCA2#E-XDA230	+CB#E-SJ3-L	110 H	3G	1,5 mm²	230V					Sign..
-WD1204.1	+CB+UCA2#E-XDA230	+CB#E-XD101-L	110 H	3G	1,5 mm²	230V					Sign..
-WD1205	+CB#E-EAA3-L	+CB#E-SJ3	110 H	3G	1,5 mm²	230V					Sign..
-WD1206	+CB+UCA2#E-XDA230	+CB#E-EBB1	110 H	5G	1,5 mm²	230V					Sign..
-WD1207	+CB+UCA2#E-XDA230	+CB#E-EB2	110 H	5G	1,5 mm²	230V					Sign..
-WD1208	+CB+UCA2#E-XDA230	+CB#E-EB3	110 H	5G	1,5 mm²	230V					Sign..
-WD1210	+PE#E-WDD1-EBB10	+CB+UCA2#E-FCB6	Flying lead	3G	1,5 mm²		5 m				Sign..
-WD1400	+EL#E-EAA1	+EL+XDC3#E-XDA230	H-FLEX PWR C-PUR	2	2,5 mm²	0,6/1kV	8 m				Sign..
-WE9100	+PE#E-MAA1	+PE#E-PE	UX	1	70 mm²	1kV	1 m				Sign..
-WE9101	+PE+XDC1#E	+PE#E-PE	UX	1	6 mm²	1kV	-"				Sign..
-WE9202	+TO#E-PE	+CB+UCA2#E	UX	1	6 mm²	1kV	-"				Sign..
-WE9203	+TO#E-SH	+CB+UCA2#E	UX	1	6 mm²	1kV	-"				Sign..
-WE9400	+EL#E-PE	+EL+XDC3#E	UX	1	6 mm²	1kV	-"				Sign..
-WG2102	+PE#E-WDD1	+PE+XDC1#E-XDA5	Flying lead	12G	1,5 mm²		5 m				Sign..
-WG2103	+PE#E-WDD1	+CB+UCA2#E-XDA5	Flying lead	12G	1,5 mm²		-"				Sign..
-WG2200	+CB#E-M3-PWR	+CB+UCA2#E-XDA6	110 H	5G	1,5 mm²	230V					Sign..
-WG2201	+CB+UCA2#E-XDA6	+CB#E-SJ4	110 H	5G	1,5 mm²	230V					Sign..
-WG2202	+CB#E-M4-PWR	+CB+UCA2#E-XDA6	110 H	5G	1,5 mm²	230V					Sign..
-WG2203	+CB+UCA2#E-XDA6	+CB#E-SJ5	110 H	5G	1,5 mm²	230V					Sign..
-WG2204	+CB#E-M5-PWR	+CB+UCA2#E-XDA6	110 H	5G	1,5 mm²	230V					Sign..
-WG2205	+CB+UCA2#E-XDA6	+CB#E-SJ6	110 H	5G	1,5 mm²	230V					Sign..
-WG2206	+CB#E-M6-PWR	+CB+UCA2#E-XDA6	110 H	5G	1,5 mm²	230V					Sign..
-WG2207	+CB+UCA2#E-XDA6	+CB#E-SJ7	110 H	5G	1,5 mm²	230V					Sign..
-WG2208	+CB#E-M7-PWR	+CB+UCA2#E-XDA6	110 H	7G	1,5 mm²	230V					Sign..
-WG2209.2	+CB#E-PJA15	+CB+UCA2#E-TA4	Flying lead			24V					Sign..
-WG2210	+CB#E-SJC1	+CB+UCA2#E	110 H	3G	1,5 mm²	230V					Sign..
-WG2211.1	+CB+UCA2#E-XDA24	+CB+OC#E-XDA24	110 H	3G	1,5 mm²	230V					Sign..
-WG2211.2	+CB+OC#E-X24	+CB+OC#E-SKA2	110 H	3G	1,5 mm²	230V					Sign..
-WG2212	+CB+UCA2#E-XDA5	+CB+OC#E-SJ2	110 H	5G	1,5 mm²	230V					Sign..
-WG2213	+CB#E-PJA15	+CB#E-TFB5	Flying lead			24V	5 m				Sign..
-WG2215	+TO#H-KHA1-MBB1	+CB+UCA2#E-XDA1	DIN A	4	0,75 mm²	300V	10 m				Sign..
-WG2216	+TO#H-KHA1-MBB2	+CB+UCA2#E-XDA1	DIN A	4	0,75 mm²	300V	-"				Sign..
-WG2217	+TO#H-KHA1-MBB3	+CB+UCA2#E-XDA1	DIN A	4	0,75 mm²	300V	-"				Sign..
-WG2218	+TO#H-KHA1-MBB4	+CB+UCA2#E-XDA1	DIN A	4	0,75 mm²	300V	-"				Sign..

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31.03.2025

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Cable list

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MC Power/Signal Cables

Warning!

Continuity check only to be done on main earthing system

Insulation test only to be done on power cables >230V

Network and instrumentation cables not to be exposed to voltages >50V

1 Installation Check

☐

1.1

Labelling / numbering / ferruling correct

☐

1.2

Clamping / cleating correct

☐

1.3

Glanding / locknuts correct

☐

1.4

Cable grouping correct

☐

1.5

Cable mechanically protected

☐

1.6

Termination correct

☐

1.7

Spare cores earthed or connected to terminals

2 Continuity Check (PE)

☐

2.1

PE < 0,5Ω

3 Insulation Test

☐

3.1

Phase/Phase >1MΩ

☐

3.2

Phase/Screen or PE >1MΩ

1 Installation Check

2 Loop Check

3 Insulation test

Comment

Cable name	Source (from)	Target (to)	Cable type	Cores	Cross section	Voltage	Length										
-WG2219	+TO#H-KHA1-MBB5	+CB+UCA2#E-XDA1	DIN A	4	0,75 mm²	300V	10 m										Sign..
-WG2220	+TO#E-BPA2	+CB+UCA2#E-XDA3	P+F.V1-G-BK10M-PUR-O1S	4	0,5 mm²	250V	-"										Sign..
-WG2221	+TO#H-KHA2-MBB7	+CB+UCA2#E-XDA1	DIN A	4	0,75 mm²	300V	-"										Sign..
-WG2222	+TO#H-KHA2-MBB8	+CB+UCA2#E-XDA1	DIN A	4	0,75 mm²	300V	-"										Sign..
-WG2223	+TO#H-KHA2-MBB9	+CB+UCA2#E-XDA1	DIN A	4	0,75 mm²	300V	-"										Sign..
-WG2224	+TO#H-KHA2-MBB10	+CB+UCA2#E-XDA1	DIN A	4	0,75 mm²	300V	-"										Sign..
-WG2225	+TO#H-KHA2-MBB11	+CB+UCA2#E-XDA2	DIN A	4	0,75 mm²	300V	-"										Sign..
-WG2226	+TO#H-KHA2-MBB12	+CB+UCA2#E-XDA2	DIN A	4	0,75 mm²	300V	-"										Sign..
-WG2227	+TO#H-KHA2-MBB13	+CB+UCA2#E-XDA2	DIN A	4	0,75 mm²	300V	-"										Sign..
-WG2228	+TO#E-BGE1-PWR	+CB+UCA2#E-XDA24	P+F.V1-G-BK10M-PUR-O1	4	0,5 mm²	250V	-"										Sign..
-WG2229	+TO#E-BGD1	+CB+UCA2#E-XDA1	P+F.V1-G-BK10M-PUR-O1	4	0,5 mm²	250V	-"										Sign..
-WG2230	+CB+UCA2#E-XDA1	+TO#E-BGD2.1	P+F.V1-G-BK10M-PUR-O1	4	0,5 mm²	250V	-"										Sign..
-WG2231	+CB+UCA2#E-XDA1	+TO#E-BGD2.2	P+F.V1-G-BK10M-PUR-O1	4	0,5 mm²	250V	-"										Sign..
-WG2232	+CB+UCA2#E-XDA1	+TO#E-BGD3.1	P+F.V1-G-BK10M-PUR-O1	4	0,5 mm²	250V	-"										Sign..
-WG2233	+CB+UCA2#E-XDA1	+TO#E-BGD3.2	P+F.V1-G-BK10M-PUR-O1	4	0,5 mm²	250V	-"										Sign..
-WG2235	+CB+UCA2#E-XDA2	+TO#E-PJA1	RFE-HF	2x2	0,75 mm²	250V	-"										Sign..
-WG2236	+CB+UCA2#E-XDA1	+TO#E-BLB1	RFE-HF	1x2	0,75 mm²	250V	-"										Sign..
-WG2237	+TO#E-BTA1	+CB+UCA2#E	P+F.V1-G-BK10M-PUR-O1	4	0,5 mm²	250V	-"										Sign..
-WG2238	+TO#H-KH1-MBB14	+CB+UCA2#E-XDA2	Murr MSUD Form A (18 mm)	3	0,75 mm²	300V	-"										Sign..
-WG2239	+TO#E-BGE2-PWR	+CB+UCA2#E-XDA24	M12-A F	4	0,5 mm²	250V	15 m										Sign..
-WG2240	+EL+XDC3#E-XDA24	+CB+UCA2#E-XDA24	H-FLEX INS	10x2	1,5 mm²	250V	30 m										Sign..
-WG2241.1	+CB+UCA2#E-XDA1	+DE#E-BGD4.1	M12-A F	4	0,5 mm²	250V	20 m										Sign..
-WG2241.2	+CB+UCA2#E-XDA1	+DE#E-BGD4.2	M12-A F	4	0,5 mm²	250V	-"										Sign..
-WG2242	+EL+XDC3#E-XDA1	+CB+UCA2#E-XDA3	H-FLEX INS	10x2	1,5 mm²	250V	30 m										Sign..
-WG2250	+TO#E-BPA3	+CB+UCA2#E-XDA3	P+F.V1-G-BK10M-PUR-O1S	4	0,5 mm²	250V	10 m										Sign..
-WG2251	+TO#H-KH2-MBB15	+CB+UCA2#E-XDA2	Murr MSUD Form A (18 mm)	3	0,75 mm²	300V	-"										Sign..
-WG2252	+TO#E-BPA4	+CB+UCA2#E-XDA3	P+F.V1-G-BK10M-PUR-O1S	4	0,5 mm²	250V	-"										Sign..
-WG2253	+TO#H-KH3-MBB16	+CB+UCA2#E-XDA4	MSUD Form A (18 mm)	4	0,75 mm²	300V	5 m										Sign..
-WG2254	+TO#H-KH7-MBB17	+CB+UCA2#E-XDA2	MSUD Form A (18 mm)	4	0,75 mm²	300V	-"										Sign..
-WG2254	+CB#E-SJC2	+CB+UCA2#E-XDA0	110 H	3G	1,5 mm²	230V											Sign..
-WG2260	+CB#E-TFB1-XA	+CB+UCA2#E-XDA5	Flying lead	1	0,34 mm²	250V	5 m										Sign..
-WG2261	#E-TFB2	+CB#E-TFB1	Flying lead	1	0,34 mm²	250V	-"										Sign..
-WG2262	+CB#E-TFB1	+CB+UCA2#E	Flying lead	12G	0,5 mm²	250V	-"										Sign..
-WG2300	#E-BGE3-PWR	+EL+XDC3#E-XDA24	P+F.V1-G-BK10M-PUR-O1	4	0,5 mm²	250V	10 m										Sign..
-WG2400	#E-BGE4-PWR	+EL+XDC3#E-XDA24	P+F.V1-G-BK10M-PUR-O1S	4	0,5 mm²	250V	-"										Sign..
-WG2401	+EL#E-BWA1	+EL+XDC3#E-XDA1	Flying lead	4	0,5 mm²		15 m										Sign..
-WG2402	+EL#H-KH4-MBB26	+EL+XDC3#E-XDA1	Murr MSUD Form A (18 mm)	3	0,75 mm²	300V	5 m										Sign..
-WG2403	+EL#H-KH5-MBB28	+EL+XDC3#E-XDA1	MSUD Form A (18 mm)	4	0,75 mm²	300V	-"										Sign..

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Cable list

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MC Power/Signal Cables

Warning!
 Continuity check only to be done on main earthing system
 Insulation test only to be done on power cables >230V
 Network and instrumentation cables not to be exposed to voltages >50V

1 Installation Check

- ☐ 1.1 Labelling / numbering / ferruling correct
- ☐ 1.2 Clamping / cleating correct
- ☐ 1.3 Glanding / locknuts correct
- ☐ 1.4 Cable grouping correct
- ☐ 1.5 Cable mechanically protected
- ☐ 1.6 Termination correct
- ☐ 1.7 Spare cores earthed or connected to terminals


2 Continuity Check (PE)

- ☐ 2.1 PE < 0,5Ω

3 Insulation Test

- ☐ 3.1 Phase/Phase >1MΩ
 - ☐ 3.2 Phase/Screen or PE >1MΩ

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MC Power/Signal Cables

Warning!
Continuity check only to be done on main earthing system
Insulation test only to be done on power cables >230V
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1 Installation Check

- ☐ 1.1 Labelling / numbering / ferruling correct
- ☐ 1.2 Clamping / cleating correct
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- ☐ 1.5 Cable mechanically protected
- ☐ 1.6 Termination correct
- ☐ 1.7 Spare cores earthed or connected to terminals


2 Continuity Check (PE)

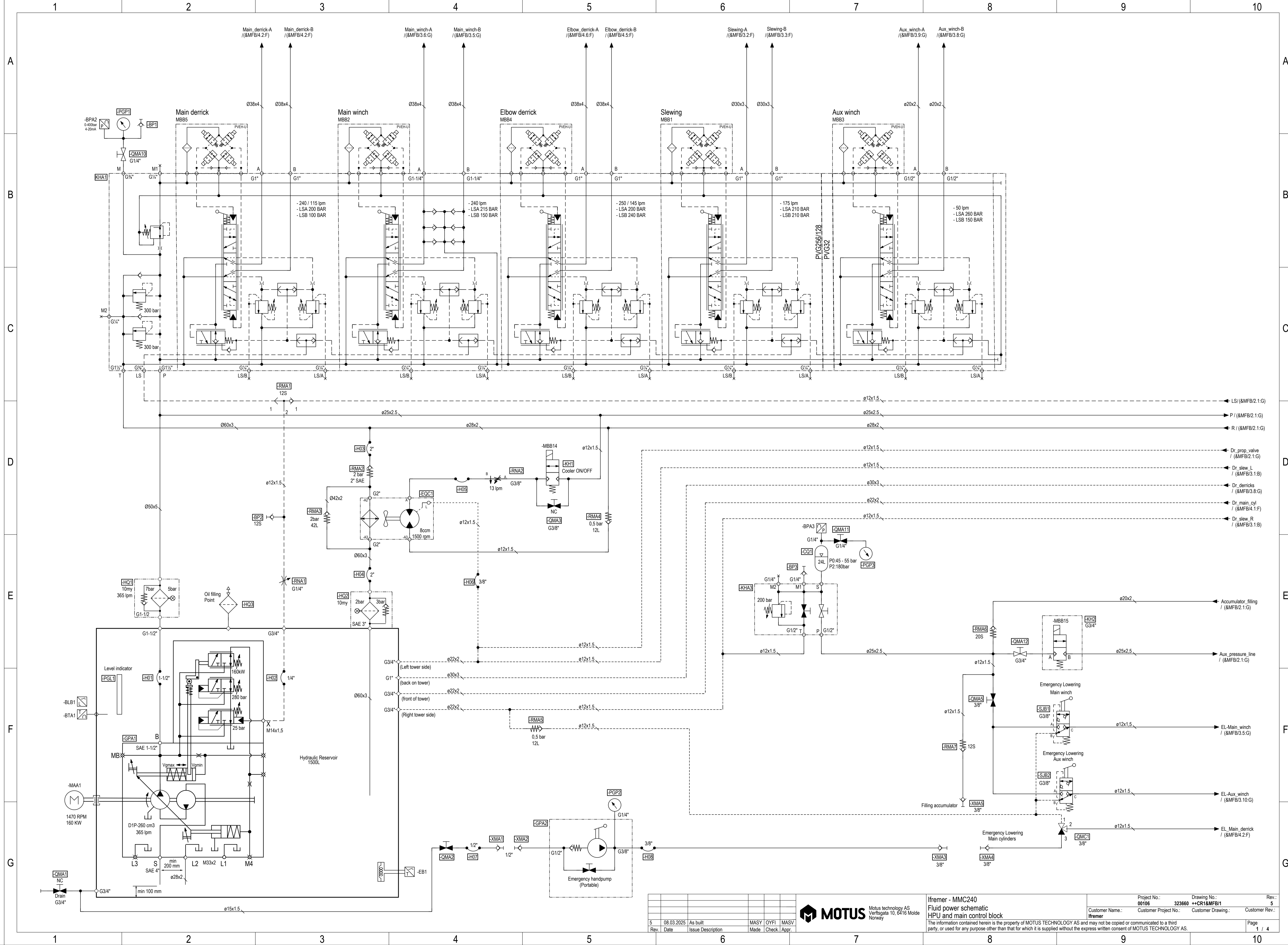
- $$\square 2.1 \text{ PE} < 0,5\Omega$$

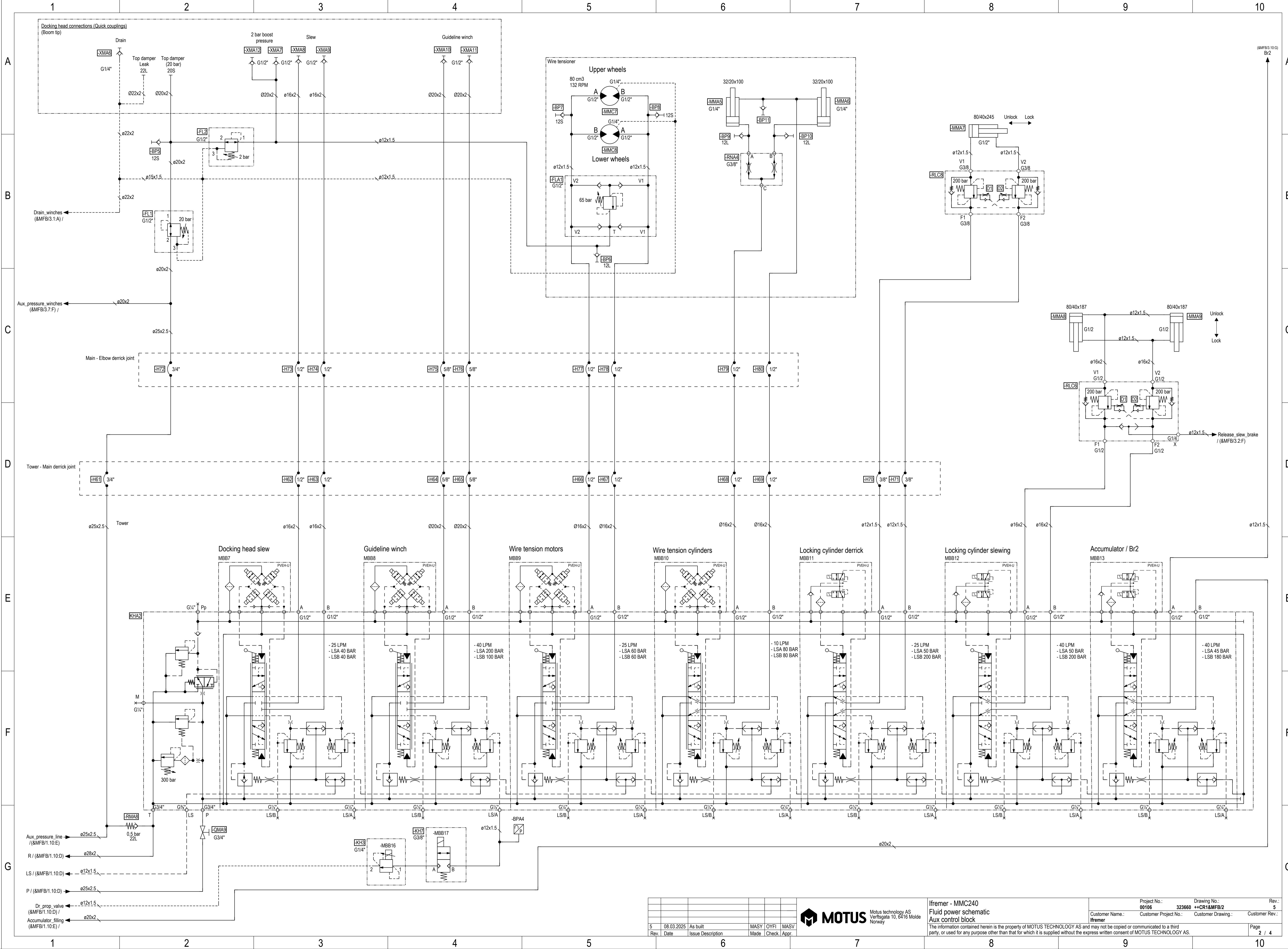
3 Insulation Test

- ☐ 3.1 Phase/Phase >1MΩ
- ☐ 3.2 Phase/Screen or PE >1MΩ

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						<div></div> <div>MOTUS</div> <div>Motus technology AS Verftsgata 10, 6416 Molde Norway</div>	Ifremer - MMC240 Cable overview Cable list	+	Project No.: 00106	Drawing No.: 323660 ++VS&EMB/1	Rev.: 1
1	07.06.2024	Issued for information	TALY	PAKI	CAOR				Customer name: Ifremer	Customer Project No.:	Customer Drawing No.:
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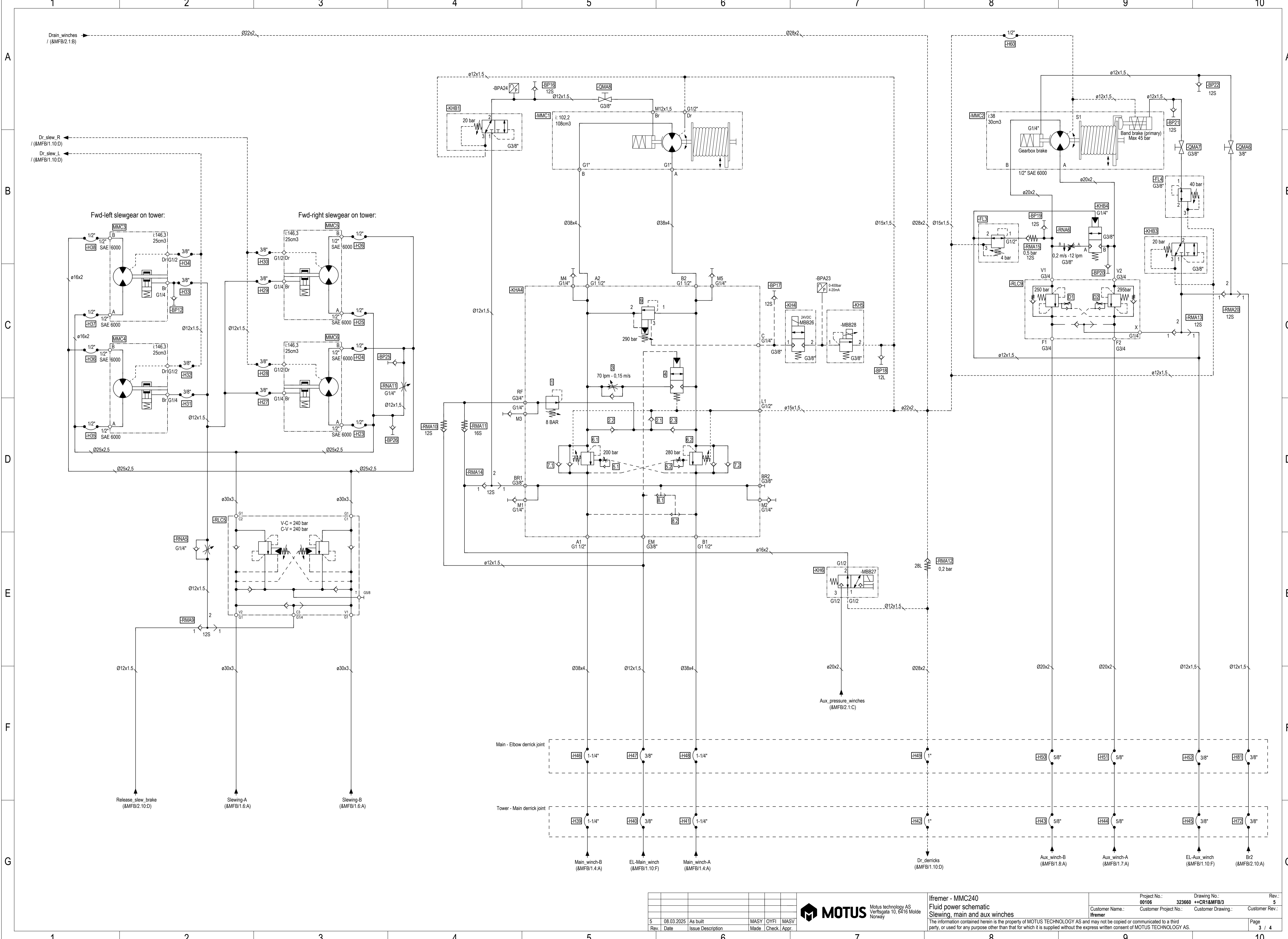


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Ifremer - MMC240 Fluid power schematic Slewing, main and aux winches	Project No.: 00106		Drawing No.: 323660		Rev.: 5	
	Customer Name.: Ifremer		Customer Project No.: ++CR1&MFB/3		Customer Rev.: 	
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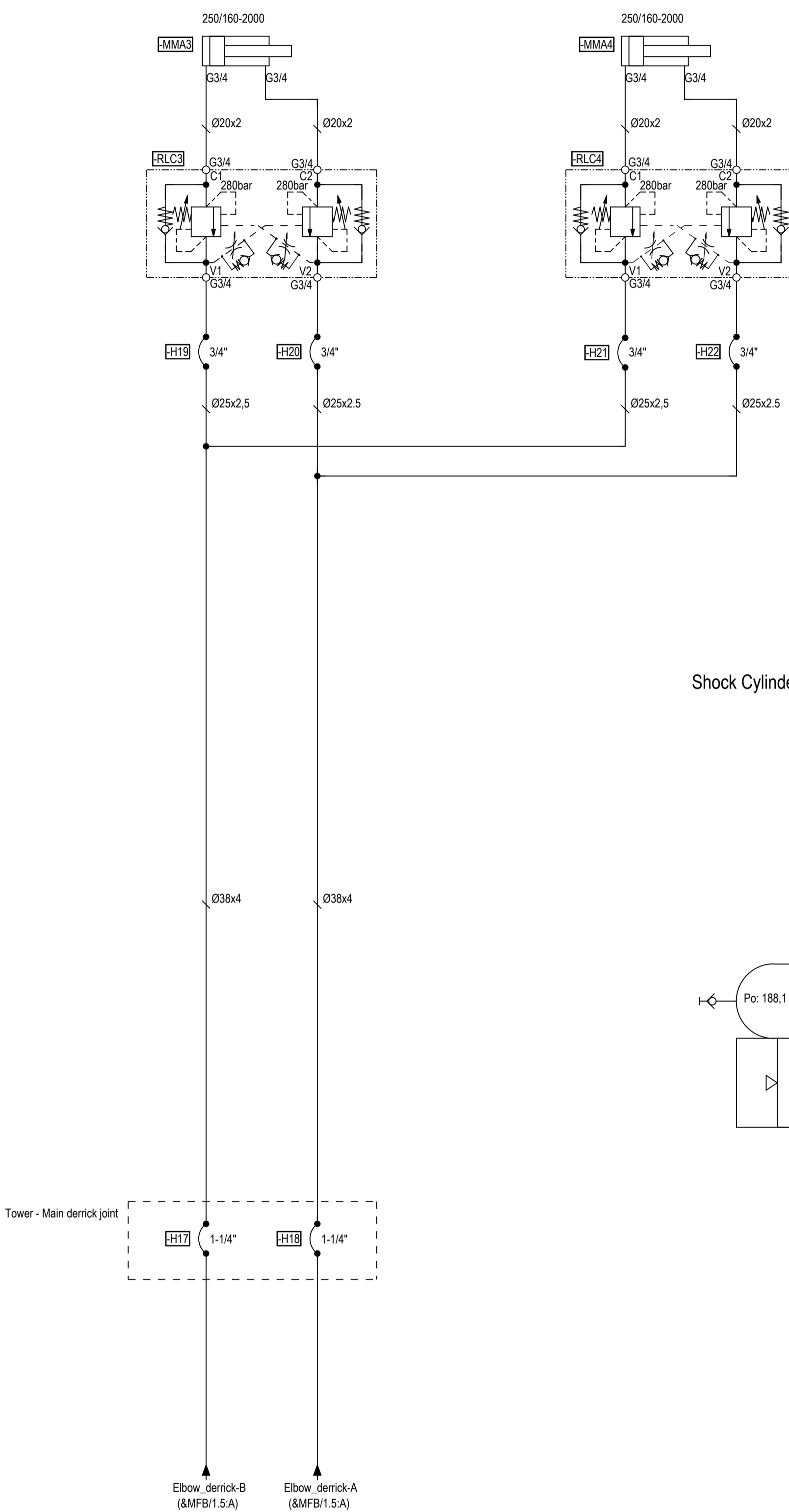
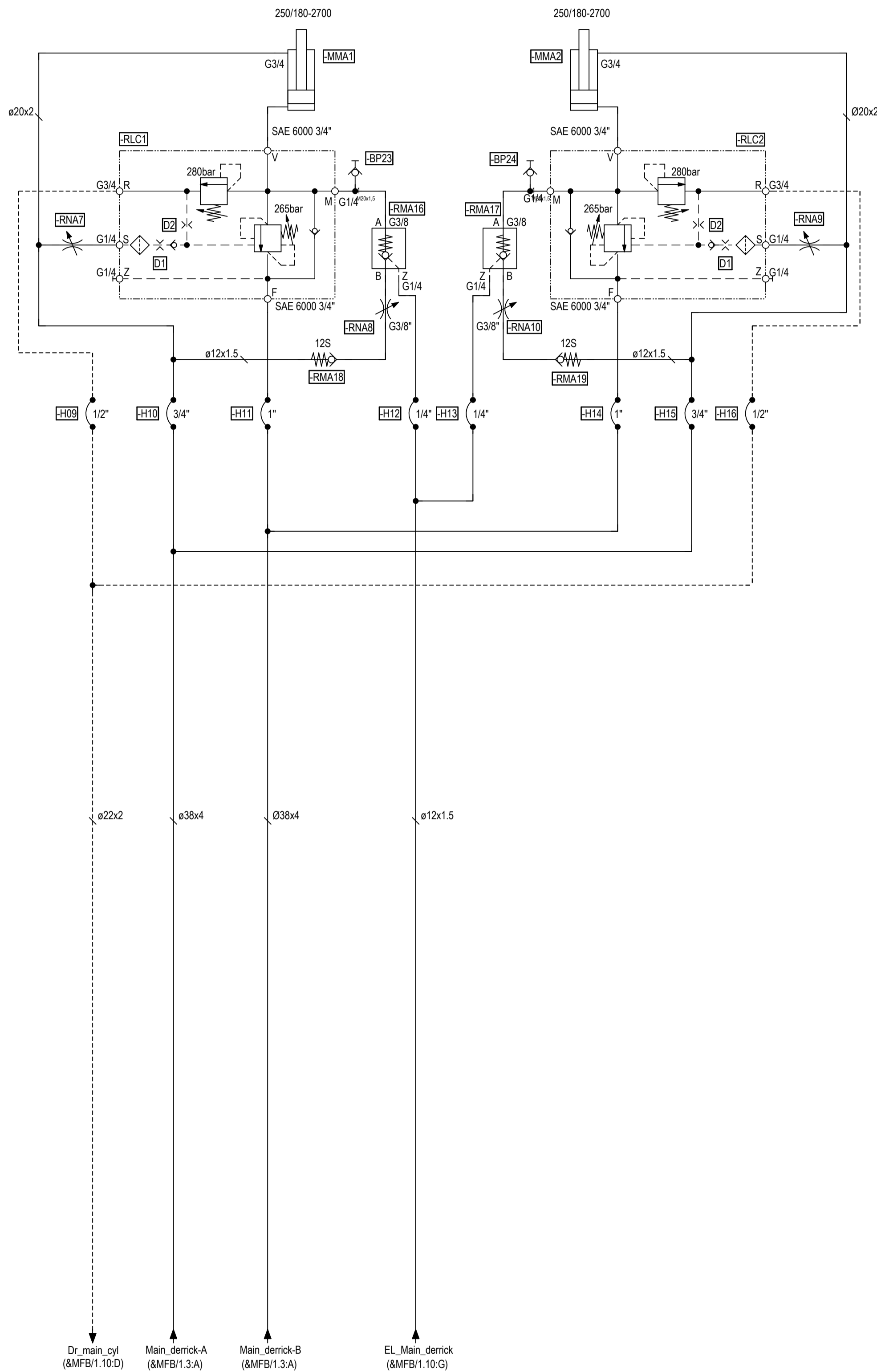
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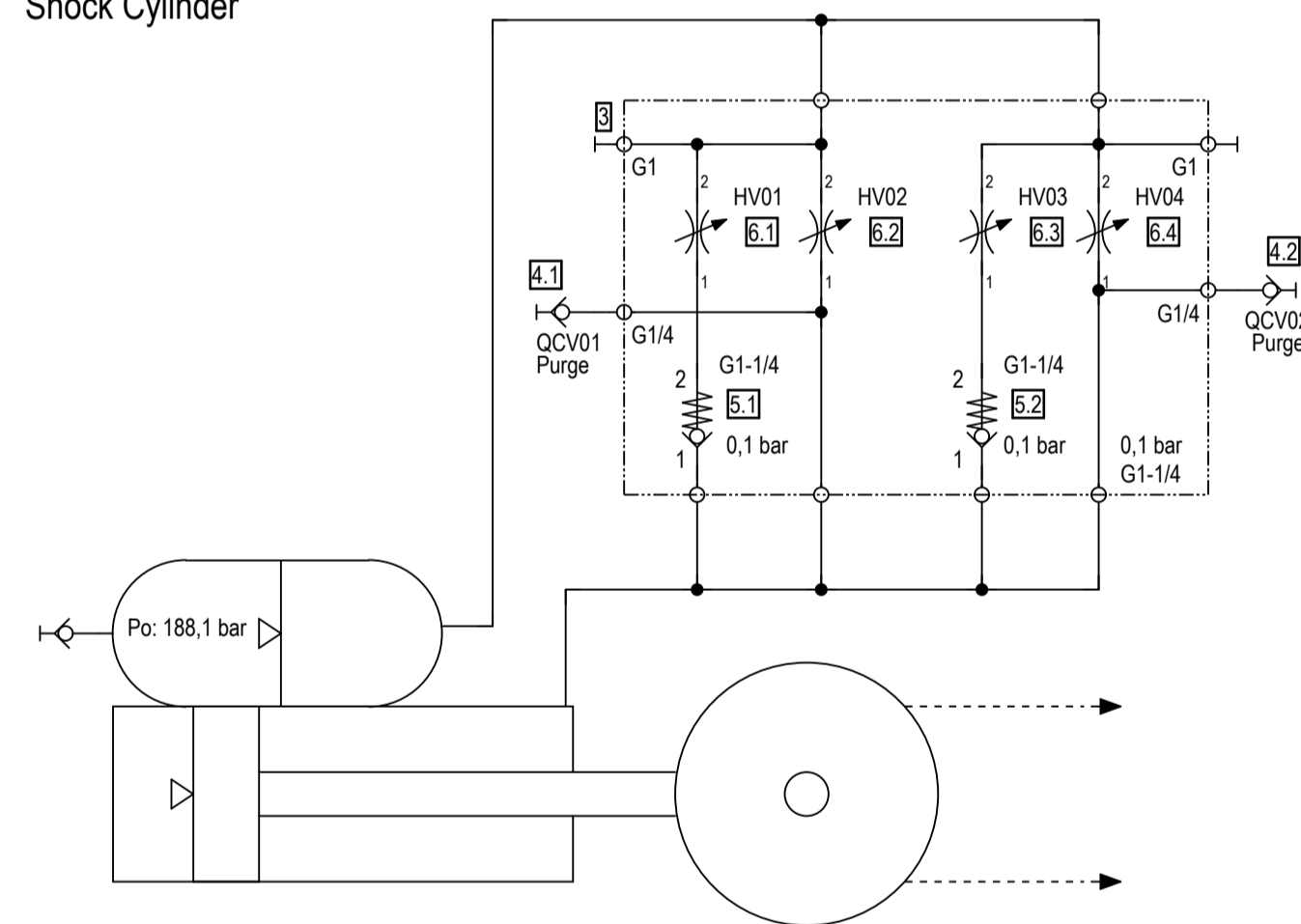
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Shock Cylinder



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Ifremer - MMC240
Fluid power schematic
Main and elbow cylinders

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Customer Name.: Ifremer	Customer Project No.: ++CR1&MFB/4	Customer Rev.: Customer Rev.:

STANDARD DOCUMENTATION

Motus Technical Manual

References

Document type:	MA - Manual		
Document ID:	DOC-300037		
Revision:	3		
Revision date:	20-01-2025		
Issue description:	Approved for use		
Made:	ZSKA	Checked:	BJVO
		Approved:	INHA

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Change Log

Rev.	Page	Chapter	Change description
0	X	X	First Issue



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1. Introduction

The Technical Manual is to be used as a guiding document and covers the minimum requirements for fabrication and assembly of Motus equipment. Specifications from Motus Technology, variation orders, purchase orders or class requirements can at any time override the technical manual.

If for some reason, there are contradicting information between the Technical Manual and other documents, contact Motus Technology assembly supervisor/coordinator.

The Technical Manual is divided into the different technical disciplines: Mechanical, Hydraulic and Electrical/Instrumentation.

2. References

Listed below are standards and specifications which are referred to in this Technical Manual.

1. PARKER HANNIFIN, Catalogue 4100-9
2. EN 10216-5

3. Mechanical Assembly

All mechanical assembly to be done by qualified personnel.

3.1 General assembly

1. Locking plates material to be EN1.4404. Fasteners for locking plates to be A4-80 no matter bolt size. Nord-Lock washer with A4 quality to be used on all locking plates.
2. Bushings, bolts, axles and other items that are machined according to a tolerance are not to be ground down to fit. Freezing or heating depending on what kind of tolerance it is, is to be done.
 - a. Freezing can be done with liquid nitrogen or a common household freezer.
 - b. Heating to be preferably done with an inductive heater, but a cooking top can be used.
3. Avoid direct contact between stainless/A4 and other steels, use nylon/polyamide washers between the stainless-steel washer and the contact surface.

3.2 Lubrication

1. Lubrication points and grease and oil types to be used is presented in the lubrication procedure/chart. Other types of grease and oil can be used as long as Motus approves of its use.
2. Wood tar to be used on untreated surfaces when assembling.
3. Grease nipples to be A4.
4. All lubrication points (grease nipples) to be marked with red circle, and protected by a red cap. All lubrication points also to be marked with coin stamped with lubrication point number according to lubrication chart.

3.3 Fasteners

1. Bolts, nuts and washers of M12 and below to be A4-80.
2. Bolts, nuts and washers of M14 and above to be HDG8.8. Exception is for locking plates ref **3.1**.

For certain applications such as slew bearings, winches, gears etc 10.9 bolts are to be used. If you are uncertain contact Motus Technology.
3. All bolts must be lubricated before assembly with Molykote G-rapid plus or similar paste.
4. Bolts with locking nuts such as nyloc and palnut needs to have minimum three threads protruding from the end of the locking nut.
5. When sewing bolts, do not sew more than 3 bolts together.
6. All Fasteners to be supplied with at least material certificate EN 10204-2.2.

3.4 Marking and tagging

1. All items that can be operated such as ball valves, emergency stops, PVG valves with levers and so on to be marked with a sign clearly stating what function the item is supposed to fulfil. If signs are missing in drawings contact Motus.
2. Marking and tagging to be fastened with high tensile adhesive, stainless-steel thread/wire, screws or pins. The adhesive must be able to handle temperature changes and seawater/harsh conditions.

4. Hydraulic

All hydraulic assembly to be done by qualified personnel.

4.1 General

1. Piping, tubing, hoses and supports cannot be mounted in such a way that it blocks access for personnel to platforms or areas that are used on a regular basis for the operation of the equipment.
2. Piping, tubing, hoses and supports for the installation shall be mounted in accordance with fabrication drawings and the Manufacturers recommendations.
3. All Pipes, tubing and hoses shall be installed in a way that they do not interfere with each other or other equipment and construction steels. See example below.

Example of an area that is accessible and needs to be clear of piping/structure (platform).

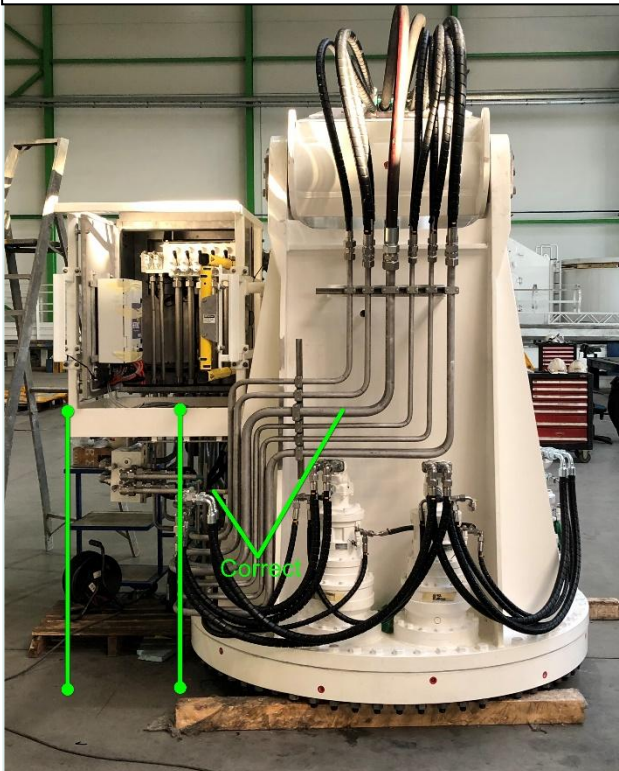
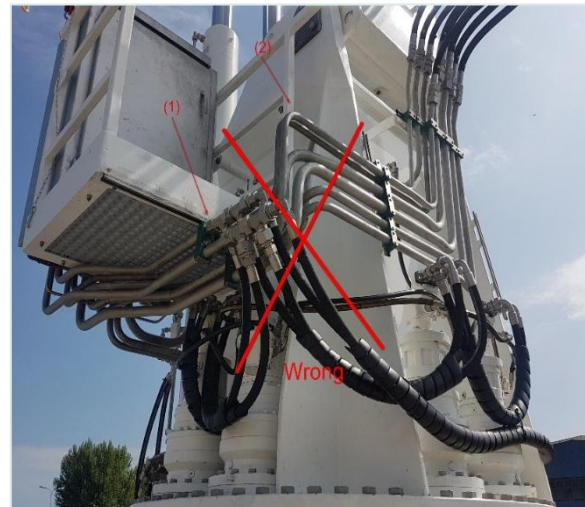


Figure 4-1 Correct



- (1) Piping going too far away from tower, make access difficult.
- (2) Piping also builds too much in height on platform.

Figure 4-2 Wrong

4.2 Piping and tubing

1. Always use pipes acc to hydraulic drawings, be careful with pipes of the same OD, as the wall thickness may vary. Any requests to change pipe dimension must be approved by Motus Hydraulic Engineering department.
2. All pipes to be preserved in clean and dust free conditions.
3. The following equipment is needed to properly manufacture piping:
 - a. Tube cutting tool
 - b. Deburring tool
 - c. Tube bending machine
 - d. Reshape machine for EO2-Form
 - e. Pre-assembly machine for EO-2 fittings
 - f. Jet clean system, for effective cleaning of tubes

4.3 Materials

The following lists represents the standard Motus approved materials, may deviate from project specific requirements.

Part	Materials
Nut	Zinc plated Chromatized steel
Sealing ring	NBR, Nitrile Rubber
Retaining ring (EO2)	Stainless steel
Body (GE etc)	Zinc plated Chromatized steel
Tube/pipe	AISI 316 according to EN10216-5
Tube clamps	Polypropylene (dark green) – all metal parts stainless, AISI316 according to EN10216-5
Hose fittings	Zinc plated chromatized steel

Table 4–1 Standard Motus approved materials

4.4 Bending and preparing pipes

1. **Cutting:** All pipes and tubes shall be cut with a saw intended for cutting of hydraulic pipes, square cut is important. Other cutting tools such as angle cutters, bayonet saws and so on are **NOT** to be used.
2. **Deburring:** After cutting remove internal and external burrs with a deburring tool, max chamfer 0,3mmx45°
3. **Cleaning:**
 - a. Control the pipe/tube of any sharp edges or burrs.
 - b. Pipes/tubes shall be cleaned after cutting, use two E-cleaner plugs with a cleaning remedy (jet clean system). This cleaning is to avoid any chips or splinters to be squeezed into the material.
4. **Bending and forming:**
 - a. To properly bend the pipes/tubes a machine meant for the task must be used an example would be a Tubomat Trachto Teknik.
Use a mandrel on larger dimensions so as to not deform the pipes.

Smaller tubes 6-12mm can be bend using a bending tool such as a Ridgid tube bender.
 - b. Form the pipe in both ends using a EO2-Form machine with nuts and seals, or put on the EO2 rings.
 - c. Immediately after bending the pipe is to be cleaned, two wet plugs and two dry plugs to be shot through the pipe. Pipe is then to be sealed by either using a plastic plug or steel.

Rags, paper or any remedy that can leave any particles or dust shall not be used.

4.5 Fittings

Standard pipe fittings on pipes up to 42mm are BIT TYPE Fittings according to standard DIN 2353 / DIN EN ISO 8434-1

Motus standard fittings type are of type **EO2 or EO2-Form**.

Type of fittings differing from EO2 or EO2-Form, to be used shall be addressed to and approved by Motus prior to assembly.

EO2 fittings: Compression fitting with Elastomeric seal.

Function nut and fittings body according to DIN 2353 (ISO 8434-1).

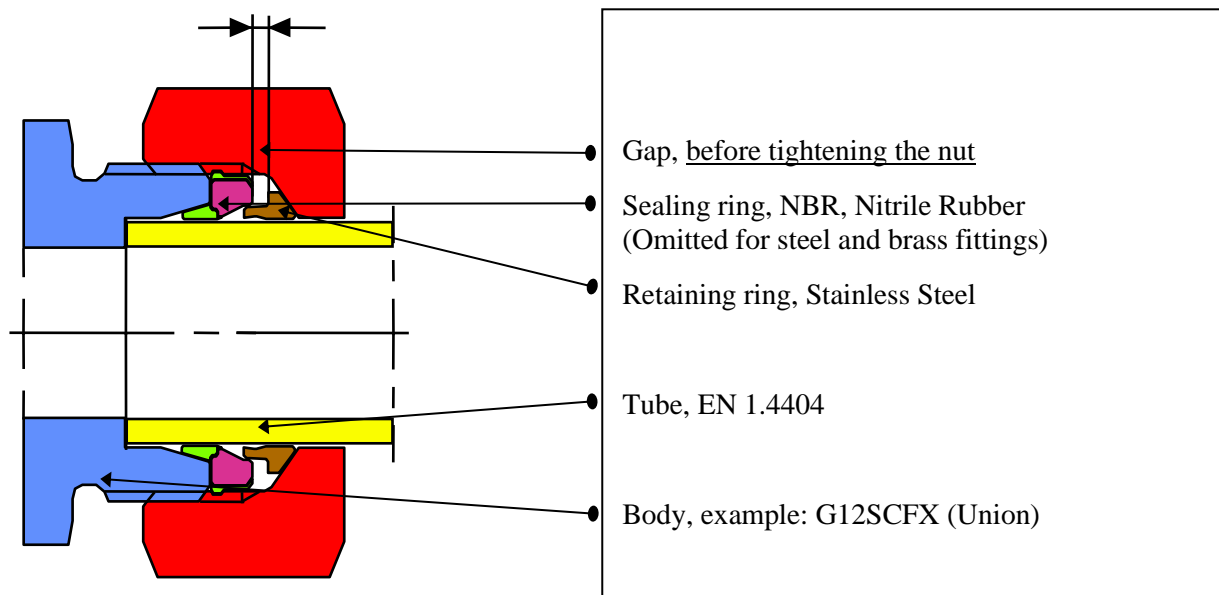


Figure 4-3: EO2 fittings

EO2-Form

When using EO2-Form the pipe is deformed so that there is no need for a retaining ring. Unlike with EO2 which has two loose parts including the nut, EO2-Form only has one loose part (sealing, DOZ). EO2-Form is preferable to any other type of fitting.

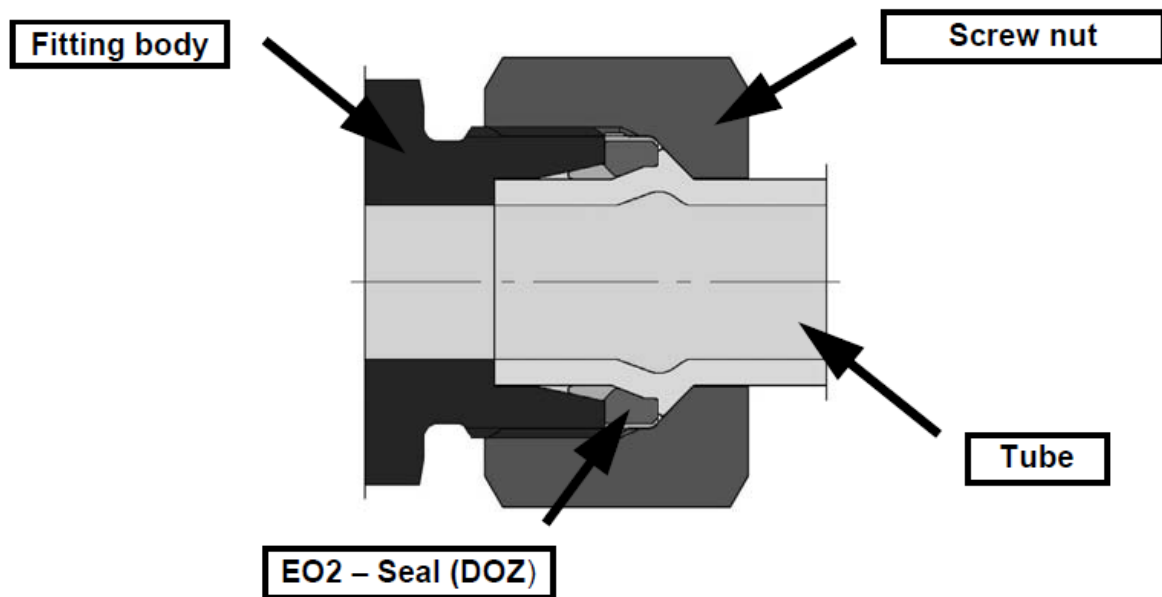


Figure 4-4: EO2-Form

4.6 Pipe/Tubing Support

- All piping shall be arranged to facilitate supporting and shall be planned for ease of removal of equipment for inspection and servicing.
- Pipes/tubing shall not normally be supported by other pipes/tubing i.e. individual supports are required.
- Equipment that can cause vibrations are not to be used for pipe support.
- Thermal expansions shall be taken into account when designing the supports
- A pipe bend should be supported as close to the bend as possible (whenever needed on both sides of the bend)
- The support should be located as close to the end of the pipe as possible when connecting to hose.
- Installations shall be adequately supported and fixed at distances not exceeding:

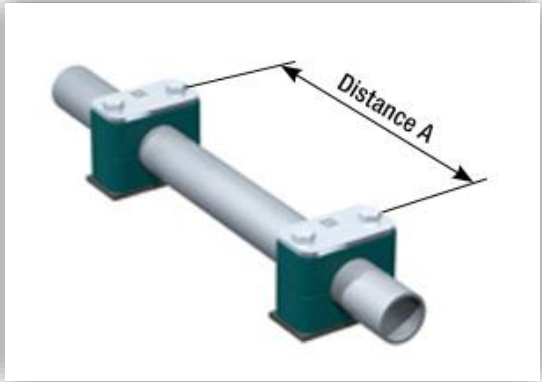
Max. distance between clamps	Pipe size (mm)	Marine hydraulics (m)
	20 x 2	1,1
	25 x 2.5	1,3
	30 x 3	1,4
	38 x 4	1,5
	42 x 4	1,6
	50 x 3	1,7
	50 x 5	1,8

Table 4-2: pipe/tubing support

4.7 Hose Specifications

1. Hose type to be used is presented in the hose lists for each project. If for any reason, there is a need to deviate from the specified hose type, contact Motus Technology for approval.
2. Hoses must always be used between pipes and equipment that can cause vibrations.
3. Only hard pipes/tubing is allowed to be installed between loadholding valve and cylinder, no hoses allowed:

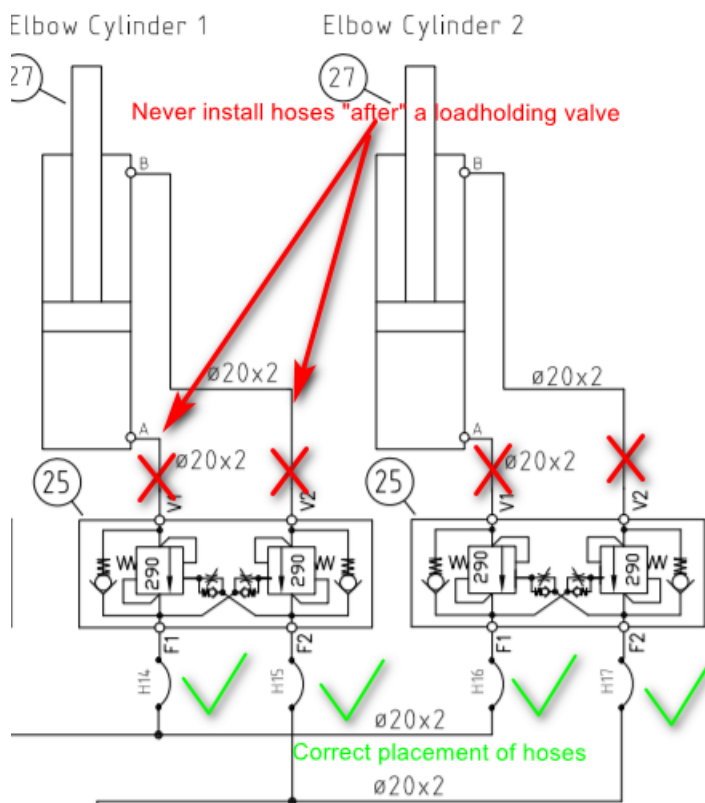


Figure 4-5: Hose specifications.

4.8 Hose Installation

1. Hoses to be installed according to hose producer specifications.
2. Avoid at all cost unnecessary: bending, twisting and gnawing. As this will damage the hose or lead to damage in the long-term usage of the hose.
3. Use spiralguard on hoses where they can be exposed to gnawing and sharp edges.
4. One end of the hose should always be straight, this is for ease of installation.
5. Male hose ends are not to be used.
6. After installation, the ends of the hoses to be covered with densotape.



Figure 4-7: Right way.



Figure 4-6: Wrong way.

4.9 Marking And Tagging

1. Hoses are to be marked according to drawings and hose lists. Plastic marking with plastic zip tie is acceptable.
2. Valves to be marked with position number according to drawing. Stainless steel “coin” stamped with pos number and fastened to valve with high tensile adhesives or stainless-steel wire/thread.

5. Electrical and instrumentation

All electrical and instrumentation installation to be done by qualified personnel. Unless otherwise specified the following sub chapters are to be followed.

5.1 Cabling

1. Cabling to be done in such a way that the cable is not in danger of being damaged by: sharp edges, unnecessary bending, twisting or moving components.
2. Cables to be secured with stainless-steel zip ties outside of cabinets, plastic zipties to be used inside cabinets.
3. Small amount of cables should preferably be dragged through stainless steel pipes. Each end of the cable pipe is to be open and fitted with drainage holes. Alternatively, be fitted with heat shrink tubing with glue. This is to prevent water intrusion and corrosion.
4. Instrumentation cables and power cables need to be separated so that electromagnetic interference is avoided. This is done either by using a partition wall or separate pipes/cable ducts

5.2 Preservation

1. Junction boxes and cabinets to be fitted with cortec pad for preservation.
2. To avoid corrosion in M12 plugs, dielectric grease to be applied inside. Molykote 4 electrical insulation compound or similar to be used prior to mounting the plugs.

5.3 Termination

1. Wires are to be fitted with end ferrules of correct size according to wire dimension.
2. Terminals must be within the range of the wire that is to be connected.

Example: a 2,5mm² wire is not to be connected to a 1,5mm² terminal.

3. Radio controller antennae to be isolated from GND by use of nylon washer or other non-conducting material.

5.4 Marking and tagging

1. Cables to be marked according to cable list and drawings. Plastic marking with plastic zip tie acceptable.
2. All Individual wires to be marked according to where they are connected.
3. Electrical components to be marked in accordance with drawings. Plastic sign acceptable.

ST Spec. 38: Surface treatment for equipment assembled above deck, including top coat

1.0	Reference standard:	EN ISO 12944, GRADE C5-M H
2.0	Steel surface condition:	ISO 8501: GRADE B OR BETTER
3.0	Preparation and steam degreasing:	ISO 8502-6, ISO 8502-9:Max water-soluble salt content: 30mg/m ²
4.0	Ambient conditions:	EN ISO 12944, GRADE C5-M H
5.0	Blast / abrasive cleaning:	EN ISO 12944, GRADE C5-M H
6.0	Cleanliness/ Roughness:	ISO 8501-1: Sa 2 1/2, ISO 8503 Grade Medium G (50µm to 85µm, R _{y5}).
7.0	Ambient conditions during coating:	EN ISO 12944, GRADE C5-M H
8.0	Coating and performance specification:	EN ISO 12944, GRADE C5-M H

For blast cleaned surfaces:

Coat No.	Manufacturer ref.	Brand name	Colour	Recoating: note 2		Dry film thickness D.F.T(µm)		
				Min drying time	At temp	Min	Nom/NFT	Max
1	52 Note 1	Interzinc 52 (Zinc epoxy) Primer	Grey	4 h	15 °C	50	60	70
2	420/400	Intercure 420/Intergard 400	EBA408, Light grey	3 h/ 16 h	15 °C	100	125	150
3	979	Interfine 979 (Polysiloxan)	Acc to customer spec.	6 h	15 °C	100	125	150
Total DFT:						250	310	370

For “Touch up”, and primer on none blast cleaned surfaces. (Like: Cu, Al, St. steel, galv. steel, and mach. surfaces.): (Note 4)

Coat No.	Manufacturer ref.	Brand name	Colour	Recoating: Note 2		Dry film thickness D.F.T(µm)		
				Min drying time	At temp	Min	Nom/NFT	Max
1	269	Intergard 269 (Epoxy) Primer	Red	12 h	15 °C	25	40	50
2	420/400	Intercure 420/Intergard 400	EBA408, Light grey	3 h/ 16 h	15 °C	100	150	175
3	979	Interfine 979 (Polysiloxan)	Acc. to customers spec.	6 h	15 °C	100	125	150
Total DFT:						225	315	375

NOTE 1: Cast material to be coated by coat no.1, before machining.

NOTE 2: Always use technical data sheet from International Protective Coatings.

NOTE 3: When shot blast to ISO 8503 grade medium S (30-60µm): 25% grit to be added.

NOTE 4: Sweep blasting with non-metallic and chloride free abrasive to obtain anchor profile of 25-45 µm



REV. BY: BESA

Date: 28.01.2016

PAGE 1

REPLACES:

PREP. BY: KJAT

Date: 28.01.2016

OF 1

ABOVE DECK INCLUDING TOP COAT
ST = Surface Treatment

DOC-300042

REV
0

REPL. BY:


User manual wire tension unit

Motus References

Project Number:	00106	
Project Title:	Ifremer - MMC240	
Document Number:	DOC-300932	
Revision:	0	
Revision date:	30-05-2024	
Issue description:	Approved for use	
Made: ROVO	Check: KJTA	Appr.: WOSR

Customer References

Rig / Vessel / Installation:	Klikk eller trykk her for å skrive inn tekst
Customer Name:	Click or tap here to enter text.
Customer Reference:	Click or tap here to enter text.
Customer P.O. number:	Click or tap here to enter text.

User manual wire tension unit	Doc. No.:	DOC-300932	 MOTUS
	Rev.:	0	
	Page:	2 of 23	

Change Description

Rev.	Page / Chapter.	Change Description



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1. Introduction

1.1 General

The manual is composed in accordance with the Norwegian Standard NS5820. Operators and maintenance personnel must read and understand this user manual prior to operating and maintaining the equipment. The owner of the equipment is responsible to ensure no unauthorised personnel operate or maintain the equipment.

Illustrations used in this manual may deviate from the actual product.

1.2 Purchase information

Equipment: Motus Marine Wire Tension Unit

Machine number: 00106-326662

1.3 If problems occur

In case of any problem, please contact:

Motus Technology AS

Verftsgata 10

NO-6416 MOLDE

NORWAY

Duty Phone: **+47 702 39 339**

Switchboard: **+47 712 59 540**

E-mail: **service@motustech.no**

Refer to actual equipment and machine number for exact identification of components and service advice.

1.4 Safety instructions

1.4.1 General

The wire tension unit consist of moving and rotating parts. Be aware of risk of injury. If the unit needs to be run with open covers or with removed covers, keep a safe distance to moving and rotating parts.



1.4.2 Safety precautions before and during maintenance

- Park the crane in a secure position, ideally in the cradle.
- Isolate all hydraulic power, avoiding unintentional operation. Either turn off HPU or Isolate the crane from the HPU.
- Make sure that all electrical power is shut off before maintenance of electrical equipment.
- Always turn off the crane and activate the emergency stop when performing maintenance on the crane.
- Hatch covers must be secured in open position before entering crane.

**WARNING****POSSIBLE INJURY OR DEATH**

All tools and equipment brought on to the crane shall be secured at all times to avoid fallen objects.

-

**WARNING****POSSIBLE INJURY OR DEATH**

Make sure that hydraulic system is depressurized before any work starts.

-

**WARNING****POSSIBLE INJURY OR DEATH**

Make sure that hands and any other body parts are at a safe distance from handled components to avoid any pinching.

-

**WARNING****POSSIBLE INJURY OR DEATH**

Handling of components and equipment that contains hydraulic oil, cooling liquid or other chemicals must be handled in a safe manner to avoid injury of personnel and contamination of environment.

-

**WARNING****POSSIBLE INJURY OR DEATH**

Make sure that electrical system is switched **off** before any work starts.

2. Main data

2.1 Design criteria

Environmental conditions

Design temperature:	-20°C
Ambient temperature:	-20°C to +35°C
Relative air humidity:	up to 96%

Wind exposure

With closed covers:	44 m/s
---------------------	--------

Classification rules / approval

Classification:	Unclassified
-----------------	--------------

2.2 Operation capacity

Nominal wire tension:	2500 N
Wire speed:	Reference to main winch
Wire dimension range:	Appr. Ø20 - Ø30 mm

2.3 Weight and outline dimensions

Weights:	Appr. 200 kg
----------	--------------

Outer dimensions:	777 x 559 x 679 (LxWxH), pipes and cables not included.
-------------------	---

Surface treatment:

- Primary structure: Stainless steel, untreated.
- Equipment: Motus Surface Treatment: 38

3. Technical description

3.1 General technical description

In closed position, a total of four rubber wheels clamp over the steel rope with a force high enough to give the specified tension. The wheels will in open position disengage from the steel rope, and the steel rope will run freely through the unit. A set of link arms control the motion.

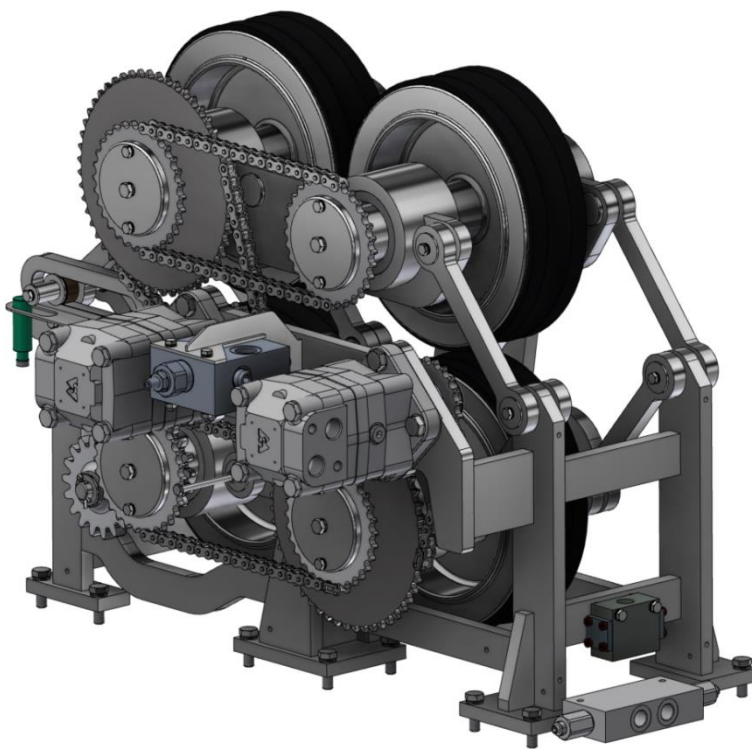


Figure 3-1 Unit shown without covers

Two hydraulic cylinders are used to provide necessary clamping force.

A set of total four chains transfer the motor torque to the wheels. The unit has two motors, each motor are running in opposite direction. Each motor drives two wheels. The motors are fixed to the foundation.

The unit is equipped with covers to protect the internal parts, and prevent injury. The upper cover is hinged, and can easily be opened for limited access to the internal parts. When the unit is assembled to the crane, the cover can be opened appr. 100 degrees. When the unit is removed from the crane, the cover can be opened almost 180

degrees. All covers are screwed to the foundation and can easily be removed for access for service and repairs.

The unit is located close to the derrick head.

4. Preparation

4.1 Introduction

The purpose with this procedure is:

1. Ensure that the unit is handled / used in a safe and correct way to avoid any damages on personnel or equipment.
2. Ensure that the installation “first time start up” will be performed in a safe and correct way.

4.2 Unloading and handling

The unit is shipped on a wooden pallet, and can be handled with a forklift, crane forks or pallet jack trolley.

4.3 Preservation

Storage for 6 months or less

If the unit is temporary stored (up to 6 months) before installation at site, following requirements for preservation must be performed:

Item to be checked	Preservation	Date	Sign.
In general, for all items on the unit	To be cleaned thoroughly, and dried before stored indoor. Unit to be placed on a wooden pallet.		
All loose hydraulic hoses and all ports on hydraulic components	Plugged or blinded with appropriated device.		
All extended cylinder rods	Apply a layer of grease.		
All lubrication nipples	Fill up with grease.		
Paint in general	Check that all parts not made of stainless steel, are fully painted, according to procedure.		

Table 4.3-1 Preservation requirements

Storage exceeding 6 months

For storage exceeding 6 months, please consult MOTUS TECHNOLOGY AS for storage procedures.



4.4 Installation of unit

The unit is not equipped with lifting lugs. Before lifting, upper cover to be removed. Use lifting straps around main components, e.g. wheels, foundation, and upper main arm. Ensure that lifting straps do not come close to chains or sprockets. A separate lifting drawing has not been made.

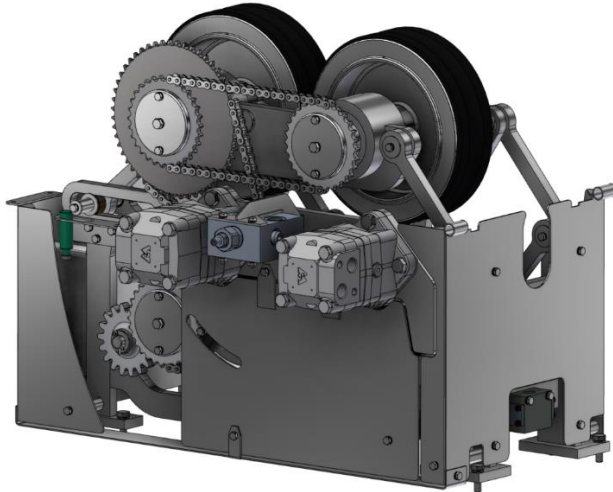


Figure 4-1: Unit without upper cover

For better access to foundation screws, all covers should be removed.

The unit to be lifted to its final location, close to the derrick head. 16 pcs. M10x30 screws to be lubricated with molybdenum sulphide-based grease or similar. Nord-Lock washers to be added, and screws to be tightened according to table.

Connect all hydraulic pipes and electrical cables. Re-assemble the covers and tighten screws according to table.

4.5 Installation of steel rope

The steel rope can be assembled in the unit in two different ways. If the wire rope already is threaded through the sheaves in derrick head and shock absorber, use alternative 1. If not, use alternative 2.

Alternative 1:

Remove upper cover.
Remove both upper wheels with drive shafts.
Lay the steel rope upon the two lower wheels.

Alternative 2:

Upper cover opened, wheels in open position.
Thread wire through the unit.

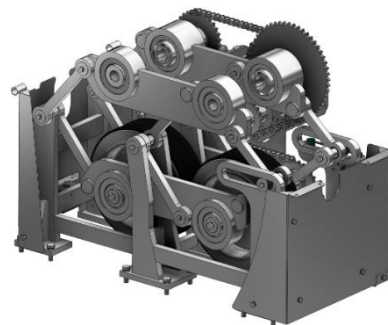


Figure 4-2: Unit without upper cover and upper wheels

4.6 Commissioning / First time start-up

The commissioning and first-time start-up of the unit is to be performed by management of a supervisor from MOTUS TECHNOLOGY AS.

MOTUS TECHNOLOGY AS issues test procedure together with pre-commissioning check list prior to arriving for commissioning.

5. Operation

5.1 General information

The unit will run automatically when use of joystick or remote control.
Function according to sequence diagram below.

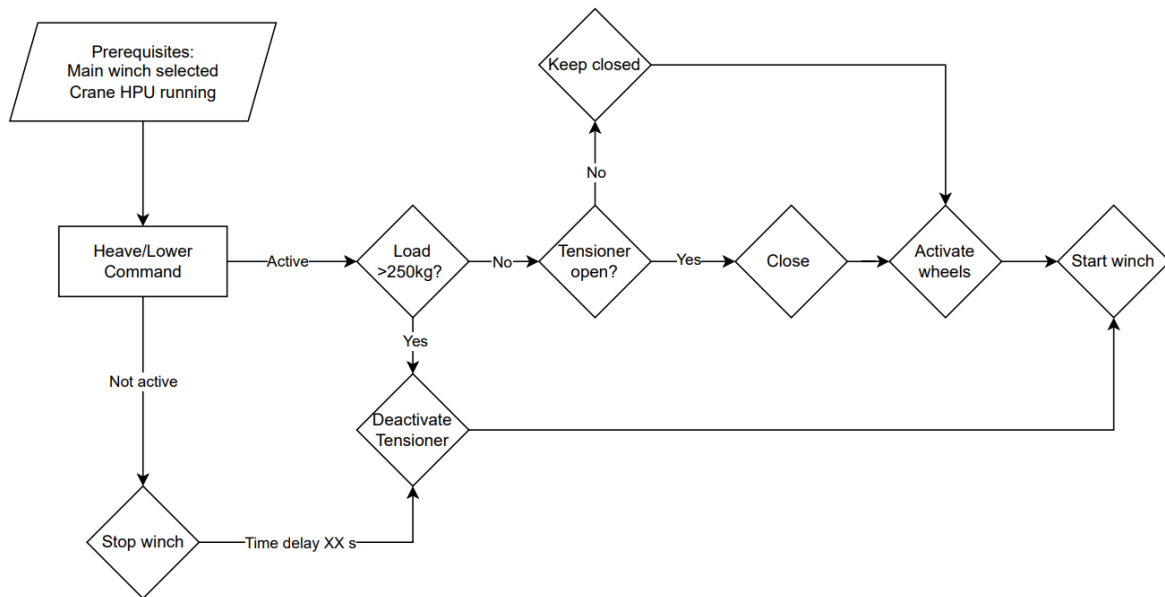


Figure 5-1: Sequence diagram.

5.2 Maintenance of unit

The unit does not have a “service-mode” and needs to be run manually. See safety instructions before servicing.

6. Maintenance

6.1 Cleaning of unit

Clean wheels and surrounding parts with detergent and high-pressure washer. Do not aim the nozzle directly to shaft seals, sensors, encoder, chains or other sensitive parts.

Clean prox sensors and encoder with a mild detergent and water.

6.2 Cleaning and lubrication of chains and sprockets

Use a chain cleaning spray and a chain brush to remove salt and dirt from the chains and the sprockets.



Dry the chains and apply lubricant. Lubricants to be according to table below.

Above -10°C	Wippermann WKS-C (spray), or similar
Below -10°C	Wippermann WKS-T (oil), or similar

Figure 6-1: Chain brush

Table 6.2-1 Lubricant types

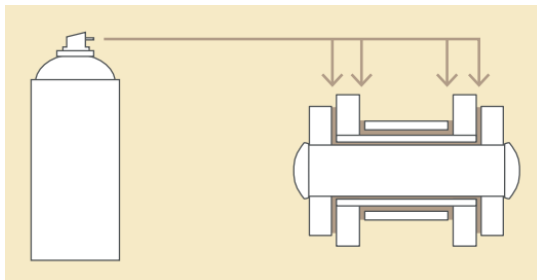


Figure 6-2: Lubrication targets on chain.

Targeted lubricating of the joint spaces according to figure.

Only minor sections of the chains will be reachable. To clean and lubricate the full length of the chains, motors have to be run manually. Run the motors to expose new reachable sections of the chains, until the entire length of all chains has been cleaned and lubricated. Due to risk of injury, do not run motors while cleaning or lubricating.

6.3 Chains and sprockets

There is no possibility to adjust the chain tension. When the chains reach the wear limit, they need to be replaced with new ones. To increase the lifespan of the chain, the sprocket should also be replaced at the same time.

6.4 Wheel position indicator

A screw in the slot indicates the wheel position. The slot is located in cover below the motors.

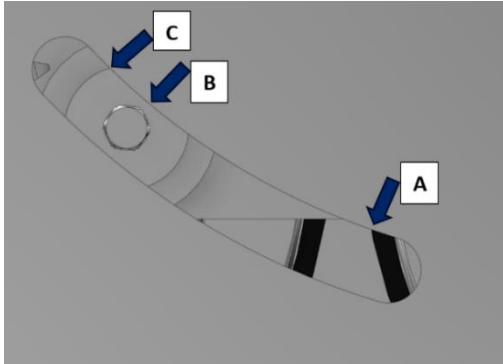


Figure 6-3: Wheel position indicator

Position A	Wheels are open
Position B	Wheels are in contact with rope
Position C	Wheels are completely together

Table 6.4-1 Positions

If the wheel position indicator reaches position C with presence of steel rope, the tires are worn out and need to be replaced.

6.5 Cylinders

Each cylinder is equipped with two grease nipples for lubrication of bearings.

6.6 Shaft seals

Shaft seals are packed with grease. If disassembled, shaft seals to be refilled with grease.

6.7 Bushings

Link arm bushings (24 pcs.) are maintenance free, and to be replaced when worn.

Slide bushings (2 pcs.) are maintenance free, and to be replaced when worn. The sliding slot (marked with light blue on figure) to be lightly covered with grease.



Figure 6-4: Lubricating of sliding slot

6.8 Roller bearings

Roller bearings should normally not be necessary to change.

6.9 Wheel removal procedure

For removal and assembling of the wheels, the described procedure to be followed.

- Remove M8x20 screw (A) and Ø33 locking plate (B) on left side.
- Remove 2 pcs. M6x16 screws (C) on right side.
- Secure the wheel, prevent it from dropping when removing the drive shaft.
- Pull out the drive shaft together with the Ø90 locking plate (D).

Assembling in reverse order. For easy assembling of the wheel, please note that the spline is located on the left side of the rim. When assembling the drive shaft, splines to be lightly covered with grease.

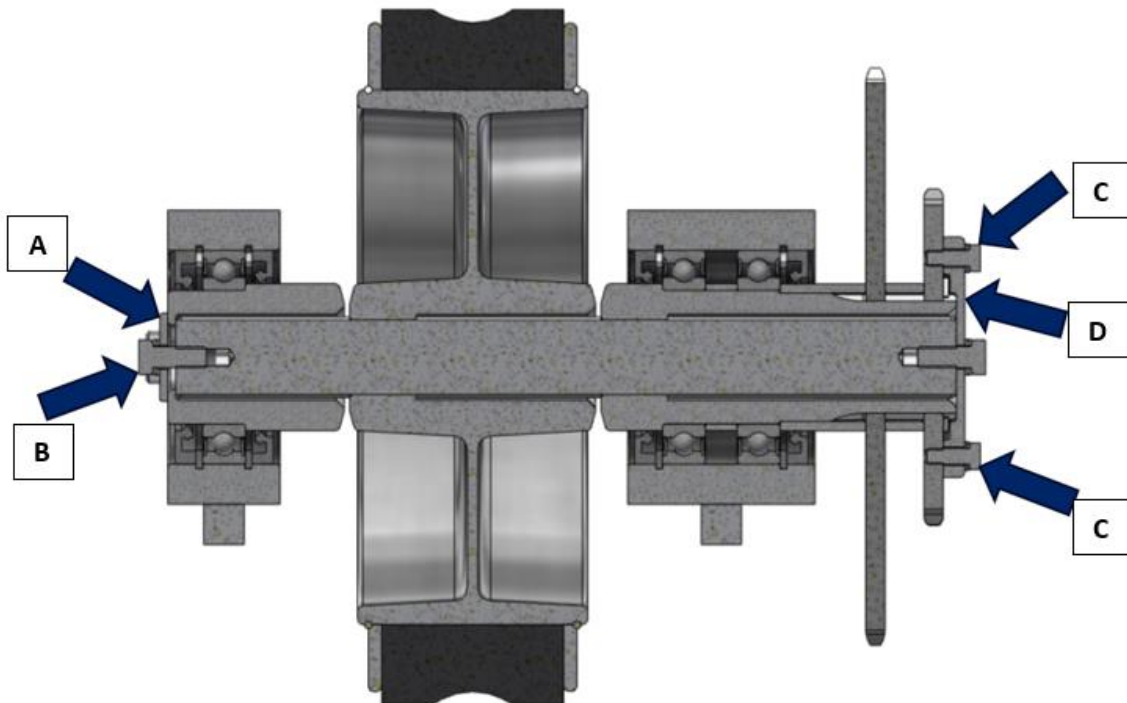


Figure 6-5: Cross section of wheel arrangement

6.10 Tire change

A tire change requires special tools. We strongly advise this to be done by MOTUS TECHNOLOGY AS.

6.11 Tightening torque

Screw size	Quality	Tightening torque	
M5	A4-80	4,6	Nm
M6	A4-80	8,0	Nm
M8	A4-80	18,9	Nm
M10	A4-80	37,8	Nm
M12	A4-80	65,8	Nm
M14 *	A4-80	20 - 60	Nm

Table 6.11-1 Tightening torque

Note to M14: Low tightening torque to avoid deformation of cover.

6.12 Removal of unit

The unit can be removed with steel rope still present by following this procedure:

- Slacken the steel rope.
- Remove all covers.
- Remove upper wheels and drive shafts.
- Disconnect all hydraulic pipes and electrical cables.
- Lift the steel rope out off the unit and lay it down on the derrick, next to the unit.
- Attach lifting ropes.
- Remove foundation screws.
- Remove unit from derrick.

6.13 Lubrication intervals

Item	Frequency
Chain	Weekly / 50 crane operating hours
Slot for slide bearing	Weekly / 50 crane operating hours
Cylinder	Monthly / 200 crane operating hours
Shaft seal	When assembling
Spline shaft / hub	When assembling

Table 6.13-1 Lubrication intervals

6.14 Major repairs and modifications

Contact MOTUS TECHNOLOGY AS regarding major repairs and modifications.

6.14.1 Daily inspection

Before starting operation of crane, perform the following spot checks.

Item	What to inspect	State of failure	Action to be taken	Notes:
Wheel position indicator	Open/close movement of wheel	Not moving when opening or closing	Repair	

Table 6.14-1 Daily inspection

6.14.2 Weekly inspection

Item	What to inspect	State of failure	Action to be taken	Notes:
Cylinders, pipes, hoses, fittings	Oil leakage	Leakage	Repair or replace	
Rubber tires	Wear / damage	Diameter < 240 mm	Replace	
Chains	Wear	Elongation	Replace	
Sprockets	Wear	Hooked shape of teeth	Replace	
Sensors	Purity	Dirty	Clean	

Table 6.14-2 Weekly inspection

6.14.3 Monthly inspection

Item	What to inspect	State of failure	Action to be taken	Notes:
Link arm bushings	Wear	Slack	Replace	
Slide bushings	Wear	Slack	Replace	
Gearwheel on encoder (plastic)	Wear	80% remaining tooth thickness	Replace	
Wheel bearings	Wear	Slack	Replace	
Shaft seals	Wear	Decayed / leaking	Replace	
Nuts and bolts	Tightening	Loose	Tighten	

Table 6.14-3 Monthly inspection



6.14.4 Hydraulic system

Regular inspection and maintenance are crucial for ensuring the optimal performance and longevity of hydraulic systems. Begin by conducting a comprehensive visual inspection, checking all components for signs of wear, leaks, or damage. Pay special attention to hoses, fittings, and connections, promptly addressing any issues discovered.

Monitor fluid levels in the reservoir and adhere to the recommended fluid specifications. Regularly analyse fluid condition and replace it as per the guidelines. Proper fluid management helps prevent contamination and ensures the system operates efficiently.

Inspect moving parts such as pumps, actuators, and valves for mechanical damages, corrosive break out and leaks. Follow the lubrication chart recommendations for lubrication intervals and use the appropriate lubricants to enhance component lifespan and minimize friction-related wear.

Conduct routine pressure and temperature checks during system operation. Monitor for any unusual noises, vibrations, or fluctuations, as these may indicate underlying problems. If abnormalities are detected, refer to the system manual for troubleshooting procedures and take corrective actions promptly.

Scheduled preventive maintenance should include tightening loose connections, replacing worn-out seals and replacing filter elements. Additionally, inspect the reservoir for cleanliness and ensure proper ventilation to prevent overheating.

Keep detailed maintenance records, documenting inspections, replacements, and any modifications made to the system. This documentation serves as a valuable resource for tracking the system history, facilitating future troubleshooting, and ensuring compliance with recommended maintenance schedules.

By adhering to these inspection and maintenance guidelines, you can maximize the reliability and efficiency of your hydraulic system, reducing the risk of unexpected failures and extending the overall lifespan of the components.

IMPORTANT

- Analyse hydraulic fluid to ISO 17/15/12 or better for proper functioning.
- If metallic particles are found during filter replacement. Troubleshooting shall be performed to find the root component for replacement.
- Leaks must be repaired before continuing lifting operations.
- Inspect hydraulic hoses for cracks and abrasions.
- Pay attention to abnormal vibrations and sounds.
- Assess correct viscosity grade of hydraulic fluid based on environmental temperature and geographical location.



7. Spare parts

Refer to drawing number when ordering spare parts.

7.1 Ordering spare parts

Direct all enquiries regarding service and spare parts to:

Motus Technology AS

Verftsgata 10

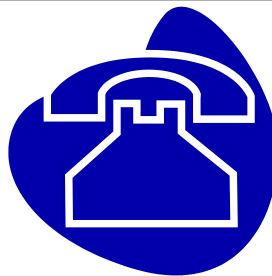
NO-6416 MOLDE

NORWAY

Duty Phone: **+47 702 39 339**

Switchboard: **+47 712 59 540**

E-mail: **service@motustech.no**



Remember to refer to actual equipment machine number for exact definition of components and service advice.

Attention:

During the warranty period, all necessary spare parts must be supplied by MOTUS TECHNOLOGY AS. The use of spare parts supplied by other suppliers violates and forfeits the warranty.

7.2 Spare part list

For spare parts, contact MOTUS TECHNOLOGY Services

spareparts@motustech.no


In this table the recommended set of operational spares for 5 years operation, spare parts for additional start-up, commissioning, and capital spares are presented.

The listed spare parts can be purchased through Motus upon request. Relevant capital spares depend on criticality for operation of the vessel and crane and must be evaluated by the owner / operator.

For drawing, see Ch.9.

Description	Qty. Recommended:	I&C Spare	5 Year Oper. spare	Capital Spare
Rubber tires	4		4	-
Wheel rims	-		-	✓
Chain 65 links	1		1	-
Chain 71 links	1		1	-
Chain link	2		2	-
Sprocket z=20	-		1	-
Sprocket z=30	-		1	-
Sprocket z=52	-		1	-
Gearwheel z=18 (plastic)	1		1	-
Slide bushing	2		2	-
Link arm bushing	12		24	-
Shaft seal, set 1	-		1	-
Shaft seal, set 2	-		1	-
Bearing, set	-		1	-
Cylinder	-		-	✓
Link arm 1	-		-	✓
Link arm 2	-		-	✓
Link arm 3	-		-	✓
Hydraulic motors	-		-	✓
Hydraulic hose, set	1		1	-
Encoder		1	1	-
Actuator		1	1	-
Proximity sensor		1	1	-
Split pin	1		1	-
Retaining ring	1		16	-
Compression plate	1		1	-
Lock ring	1		1	-

Table 7.2-1 Spare part list

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8. Warranty

8.1 Warranty Condition

8.2 Limited Warranty

The Manufacturer provides this limited warranty based on the conditions outlined in the next section, and it remains valid for the specified warranty period.

The Manufacturer commits to delivering a product free from design, functionality, material, and craftsmanship defects at the time of buyer's receipt, as stated in this limited warranty. The duration of this warranty depends on the period specified in the product's Contract.

If the product needs warranty service during the agreed-upon warranty period, compliance with the conditions in the following section is mandatory.


Manufacturer is under no circumstance liable for any loss or consequential loss of any kind, including but not limited to, lost profits or business losses, so far responsible for such loss lawfully can be excluded.

The warranty does not affect the buyer's statutory rights under applicable legislation in force.

8.2.1 Terms

1. The warranty expressly excludes coverage for defects or damage to the product arising from ordinary wear and tear or misuse, encompassing, but not limited to: (i) utilization beyond normal parameters, (ii) use of the product in a manner inconsistent with its originally intended purpose, and (iii) use of the product in a manner contrary to the instructions provided by the Manufacturer.
2. The warranty explicitly excludes coverage for defects or damage to the product resulting directly from alterations or modifications to the equipment or software that have not been expressly approved in writing by the Manufacturer.
3. The warranty does not cover defects or damage on product caused by maintenance activities, modifications, repairs, adjustments, or software installations carried out by personnel not authorized by Manufacturer or by personnel who are lacking documented education or specific training from the Manufacturer.
4. The warranty does not cover defects or damage on product caused by external influences such as force majeure, accidents, natural disaster, noise, overvoltage, overpressure, vibrations, shock, heat, extreme cold etc.
5. Installation and commissioning shall be performed by Manufacturer. If agreed between companies, installation and commissioning can be performed by buyer. In such case, all documentation (procedures, reports, test results etc.), shall be sent to Manufacturer for verification



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and approval. Installation and commissioning performed by buyer or 3rd party without Manufacturers written verification and approval violates and forfeits the warranty.

6. It is a prerequisite for the validity of the warranty provisions that the Buyer enters into a Service Agreement for the duration of the warranty period with Motus Technology AS. Service and maintenance activities shall be carried out in accordance with the instructions given in operation and maintenance manuals provided with the product, irrespective of the operator of the product or the use of the product. All performed activities shall be registered in a logbook or a maintenance system. The registered information shall include all relevant information concerning the operation (such as date, operational hours, parts used, results of oil analysis etc.) and who carried out the activity. Information to be registered on paper or in electronic format. Manufacturer reserves the right to access this information in its handling of warranty claims. It is a prerequisite for the validity of the warranty provisions that annual service is carried out by Motus Technology AS.

7. The warranty does not cover defects or damage to the Product due to the use of non-original manufacturer parts or parts not approved by the manufacturer, accessories or other external devices that are not original accessories that were delivered or intended for use with the Product. During the warranty period, all necessary spare parts shall be supplied by Manufacturer. Use of spare parts supplied by other suppliers violates and forfeits the warranty.

8. The warranty offered herein shall be void if the seal on important valve-settings and/or safety device has been broken by personnel who have not been authorized by manufacturer or personnel who are lacking documented education or specific training from the manufacturer.

9. If the products has been exposed to external strain during transport, storage, installation, normal operation at final destination or if the product has been moved to a different geographical destination than the destination originally intended for when entering into Contract, then certain allowances shall be considered by covering the product using adequate protective covering if exposed to welding, sandblasting, sharpening, various use of chemicals etc. and introduce extraordinary measures. The warranty will therefore no longer be valid if these measures are not met.


10. In the event that manufacturer repairs or replaces parts of the product, the warranty, in respect of the repaired or replaced parts shall remain valid for the remaining duration of the original warranty period or for 1 (one) year maximum from the date of repair or replacement, whichever is the longest. The repair or replacement may be performed using equivalent overhauled parts. Replaced parts or components will remain the property of manufacturer.

8.2.2 Warranty requirements

All prospective claims from Buyer shall be submitted to Manufacturer immediately after the defect has been discovered. The claim shall be in writing and contain a detailed explanation describing what has happened and a statement of why the Buyer considers this to be a warranty matter. Manufacturer shall be given a reasonable period of time to investigate any such claim.

Manufacturer reserves the right to dismiss liability if the limited warranty requirements have not been met.



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The manufacturer-approved warranty covers the following:

- Replacement or repair of parts, upon receipt of documentation concluding the cause of the defect attributable to either design/functional flaws or manufacturing errors.
- Use of normal working hours for rectifying the defect.

The manufacturer-approved warranty explicitly excludes coverage for the following:

- Cost of transportation
- Waiting time
- Express deliveries
- Premium or overtime labour costs
- Travel expenses.
- Costs associated with investigating complaints.

8.3 Restrictions in guarantee

During the warranty period, all necessary spare parts must be supplied by MOTUS TECHNOLOGY AS. The use of spare parts supplied by other suppliers violates and forfeits the warranty.

Unintended use and/or wrong/missing maintenance of the equipment, forfeits the warranty. Removal and/or loss of the equipment identification plates, also forfeits the warranty.

It is a prerequisite for the validity of the warranty provisions that the Buyer enters into a Service Agreement for the duration of the warranty period with Motus Technology AS. Annual service shall be carried out by Motus Technology AS or supplier approved by Motus Technology AS.



9. Technical drawing

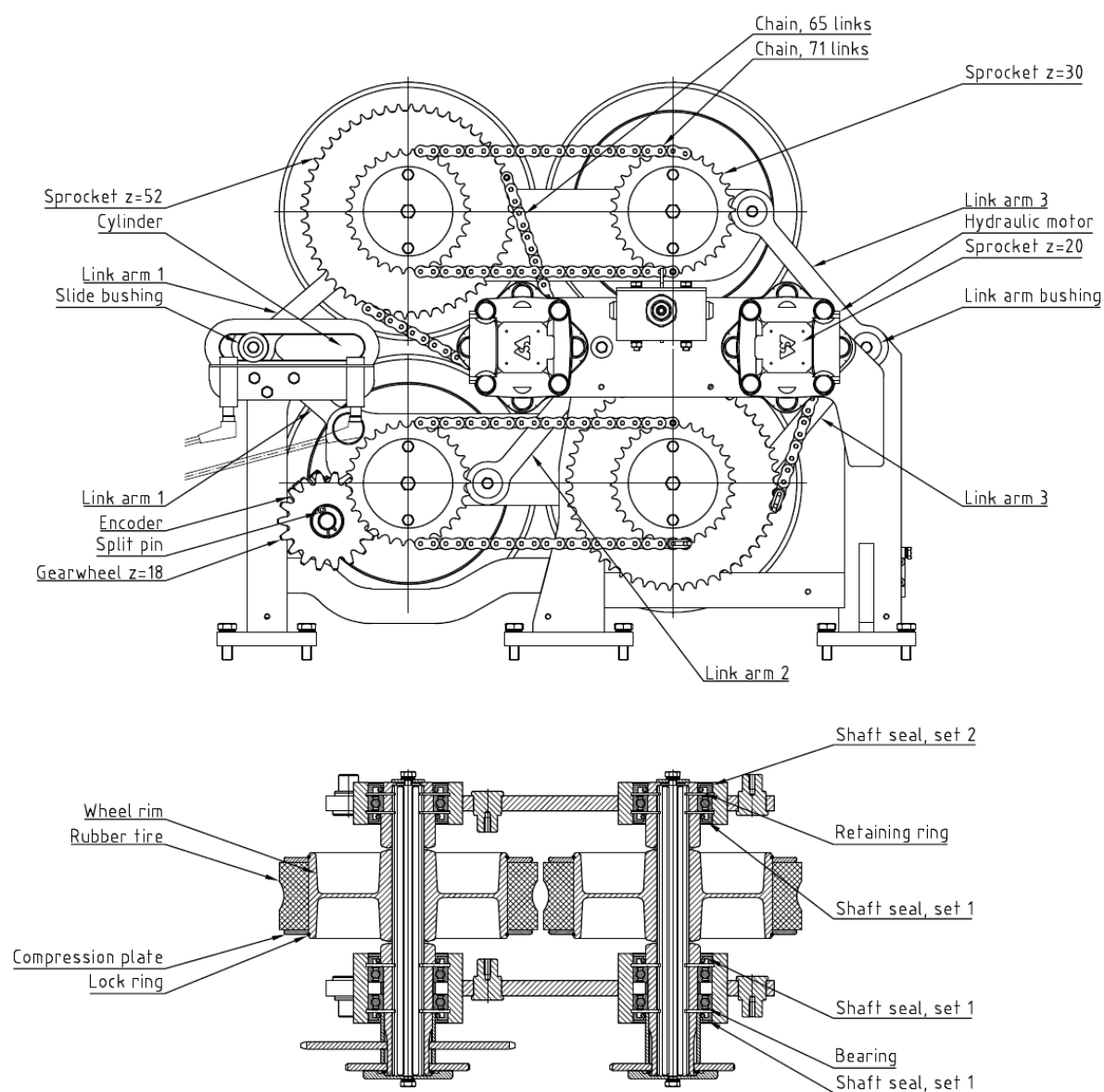


Figure 9-1: Drawing