

INSTALLATION INSTRUCTIONS



Integrated Motor Drive



Disclaimer

The contents of this document are subject to revision without notice. PRACTEK shall have no liability for any error or damages of any kind resulting from the use of this document. PRACTEK customers may copy and use the information from this manual in own manuals without additional permission from PRACTEK.

The English version of this document is the original language, and always takes precedence if there is any discrepancy with a translation of the document.

Trademarks

PRACTEK *PRACTEK* is a registered trademark of PRACTEK

Torx® Torx® is a registered trademark of Acument Intellectual Properties, LLC in the United States or other countries

All trademarks mentioned in this manual are the properties of their respective owners.

Copyright

© Copyright PRACTEK. All rights reserved.

Contents

1. Introduction	5
1.1 Conventions	5
2. Safety precautions	6
2.1 Mechanical work	6
2.2 Electrical work	6
2.3 Thermal precautions	7
3. Package content, required tools and handling	8
3.1 Package content	8
3.1.1 Standard package content:	8
3.1.2 Extra content in package for M-frame kit IMD 122 option:	8
3.1.3 Extra content in package for M-frame IMD 122 and IMD 135 option:	9
3.2 Required tools and accessories	9
3.3 Handling of the product	13
4. Mechanical assembly	14
4.1 Drilling and cutting mounting holes	14
4.2 Mounting accessories	17
4.2.1 IMD 122 C	17
4.2.2 IMD 122 B and early production of IMD 122 C	18
4.2.3 IMD 135 C	19
4.3 Mounting the IMD (with mounting frame) procedure	20
4.3.1 IMD 122	20
4.3.2 IMD 135	23
4.4 Mounting the IMD (without mounting frame) procedure	24
5. Electrical terminations	25
5.1 Prerequisites for electrical termination	27
5.2 Connecting wires to the different connector types	27
5.2.1 Using Phoenix PLH16 connector	28
5.2.2 Using Phoenix FK-MCP connectors	28
5.2.3 Using Phoenix SPT 2.5 connectors	30
5.2.4 Using D-sub connector	31
5.3 Mounting power connections (X1)	34
5.3.1 Preparing the motor cable for connections	34
5.3.2 Connecting the motor	39

5.3.3	Connecting the mains	40
5.3.4	Connecting protective earth from mains and motor	41
5.3.5	Earthing the shield of the motor cable	43
5.3.6	Connecting safe energy	45
5.3.7	Connecting external ballast resistor	47
5.4	Mounting peripheral connections (X2, X3, X4, X5, X6)	48
5.4.1	Connecting the brake	48
5.4.2	Connecting the temperature sensors (X3, optional)	48
5.4.3	Connecting the resolver (X4)	49
5.4.4	Connecting the SSI (X5)	49
5.4.5	Connecting the CAN (X6)	50
5.5	Connecting 24V, digital and safety I/O (X7, X8, X9)	51
5.5.1	Connecting 24V (X7)	51
5.5.2	Connecting safety I/O and digital outputs (X8)	51
5.5.3	Connecting digital inputs (X9)	52
5.5.4	Connecting the fan (IMD 122 B only)	52
6.	Finishing the installation	53
7.	Disposal of the IMD	54
8.	Revision history	55
9.	Product user documentation	56
10.	Glossary	59
10.1	Terms and abbreviations	59
10.2	Units	59

1. Introduction

This document describes how to mount, connect and perform initial start of the IMD at production. The initial start also includes upgrade of software and upload of parameters. It is assumed that a parameter file for the upload already exists. The manual described the standard way of installing the IMD.

Although this manual stands on its own, it is expected that turbine manufactures using the IMD, might use parts of this document in their installation or production documentation.

It is recommended to use the installation check list (Document no.: 4189360021) during the execution of the work.

The document can be printed on a monochrome printer. However, the details in the pictures will be better if a colour printer is used.

1.1 Conventions

The following conventions are used in this document:

Used in document	Description
Blue underlined font	Used to indicate that the text is also a hyperlink
	A yellow symbol illustrates hazard type (this symbol is an example for general hazard). There are different types such as electrical, chemical and so on.
Danger!	A signal word used to indicate an imminently hazardous situation, which if not avoided, will result in death or serious injury. (ISO 3864)
Warning!	A signal word used to indicate an imminently hazardous situation, which if not avoided, could result in death or serious injury. (ISO 3864)
Caution!	A signal word used to indicate a potentially hazardous situation, which if not avoided, could result in minor or moderate injury. (ISO 3864)
	A blue symbol illustrates a need for mandatory action. In this example read instructions. Other types of blue symbols exist and always indicate mandatory action.
	A symbol used to draw attention to extra information or an action that is not mandatory

2. Safety precautions



Attention

Company policy and local regulations regarding PPE must always be followed, regardless whether the PPE is shown in this manual or not.

International standards such as IEC 364 and any other relevant international or national standard regarding safety must be observed. Only qualified personnel who is fully capable of recognizing, understanding and judging the dangers of the task at hand may perform the work.

2.1 Mechanical work



Use eye, hand and hearing protection

Use protection for eyes, hand and hearing, if the mounting holes for bolts and heat sink need to be made during production.



Caution!

Assess the weight of the IMD (see datasheet) with regards to lifting and placing it in the designated location in the cabinet. Use lifting aid or a second person if necessary.

2.2 Electrical work



Disconnect power

Ensure that all power is disconnected when working with the IMD, except for during commissioning and service.



Danger!

Risk of burns and electrical shock from short circuit, electrical arc and uninsulated wires. Live work is not permitted, except for during verification, commissioning, and service. Observe local regulation when working with electrical components.



Danger!

Risk of burns and electrical shock from short circuit, electrical arc and uninsulated wires. Commissioning and maintenance work on this device may only be carried out by a qualified electrician.

When the IMD has been powered, there is a risk of stored energy even when the power is disconnected. Wait 5 minutes after the power is disconnected and verify zero energy according to company procedures on the outputs before performing any work.



Caution!

Risk of electrical shock from touch current if the protective earth is removed when the IMD is energized.

Do not remove the protective earth is removed when the IMD is energized.

2.3 Thermal precautions



Info

During operation, the IMD can reach high surface temperatures. The temperature levels depend on the ambient temperature inside and outside the cabinet.



Warning!

Risk of severe burns.

The heat sink of the IMD can reach high temperature.

Do not touch until the surface (see pos. 1 in [Figure 1](#) on page 7) is cooled down.



Caution!

Risk of burns.

The sides of the IMD can reach medium high temperature.

Do not touch until the surface (see pos. 2 in [Figure 1](#) on page 7) is cooled down.

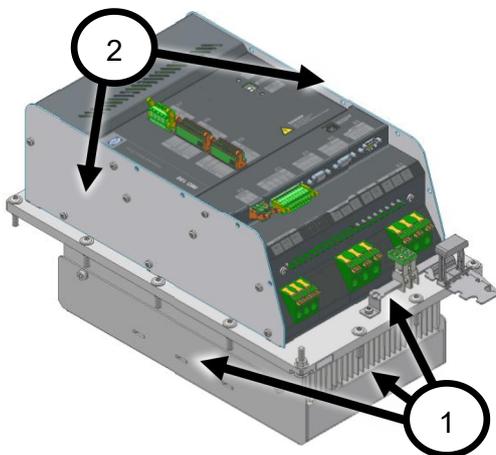
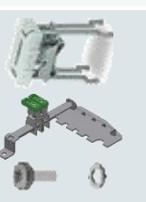
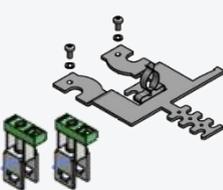


Figure 1 Hot surface areas – applies to both IMD 122 and 135

3. Package content, required tools and handling

3.1 Package content

3.1.1 Standard package content:

	Quantity	Description
	1	IMD 100 Integrated motor drive
	1	FK-MCP 2.5mm ² , 2 position plug-in connector
	1	FK-MCP 2.5mm ² , 4 position plug-in connector
	1	FK-MCP 1.5mm ² , 10 position plug-in connector
	1	FK-MCP 1.5mm ² , 18 position plug-in connector
	1	FK-MCP 1.5mm ² , 20 position plug-in connector
		IMD 122 type B and early production C only: Shield clamp (1 pcs) Bracket for Shield clamp (1 pcs) M4 hexagon screws (2 pcs)
		IMD 122 type C only: Shield clamp (1 pcs) Bracket for Shield clamp and PE terminals (1 pcs) M4 Torx 20 screws with washers (3 pcs)
		IMD 135 only: Bracket for Shield clamp and PE terminal incl. clamp and terminal (1 pcs) M5 screws with washers (2 pcs)

3.1.2 Extra content in package for M-frame kit IMD 122 option:

	Quantity	Description
	1	Mounting frame
	14	M6 hexagon screw for mounting frame
	2	M6 nut (thin)
	2	M6 nut

3.1.3 Extra content in package for M-frame IMD 122 and IMD 135 option:

	Quantity	Description
	1	Mounting frame

3.2 Required tools and accessories

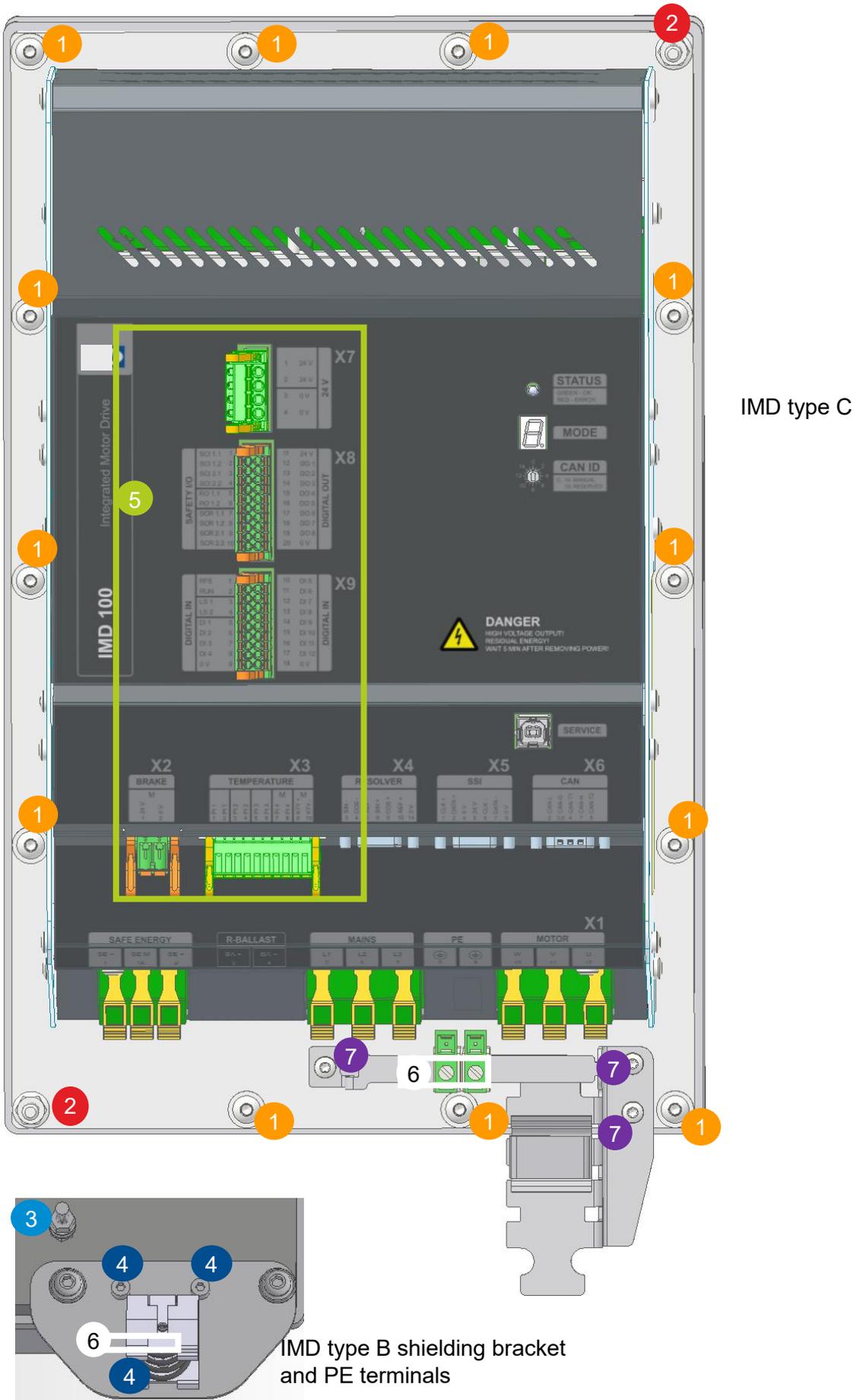
If the mounting frame option is not ordered, the screws/bolts for fastening the IMD to the cabinet are not delivered as part of the product, and are therefore not listed. The optional tools are needed when the mounting frame is ordered.

The tools in the following table are required for the installation of the IMD. The illustration reference is referencing to [Figure 2](#) on page [11](#). If no IMD type is mentioned, the tool is needed for both IMD 122 B and 122 C.

Table 1 Required tools and accessories

	Tool or accessory	Torque	Used to	Illustration reference
	Torque hexagon screwdriver 6 mm (Optional)	7 Nm	Fastening screws (M6) to the mounting frame	
	Torque wrench 10 mm (optional)	7 Nm	Fastening nuts (M6) (mounting frame → IMD)	
	Torque wrench 8 mm	4 Nm	Tighten earth connection (M5 nut) in IMD type B	
	Torque hexagon screwdriver 3 mm	2 Nm	Fasten the shielding clamp and the bracket (M4 screws) in IMD type B	
	Flat blade screwdriver 2.5 mm wide	N/A	Set CAN ID, insert / remove wires from X2, X3, X7, X8, X9	
	Flat blade screwdriver 3.5 mm wide	N/A	Push shielding clamp down when connecting cable shield (IMD type B), or PE terminals (IMD type C)	
	Torque Torx T20 screwdriver	2 Nm	Fasten shielding bracket in IMD type C Fasten motor connection cover (hand tighten) in IMD 135	
	Torque Torx T25 screwdriver	4 Nm	Fasten shielding bracket in IMD 135 C	
	Torque socket wrench 13 mm	15 Nm	Tighten motor connections (M8 nut) in IMD 135	

	Tool or accessory	Torque	Used to	Illustration reference
	Press tool for ferrules	N/A	Press ferrules on wires	
	Press tools for cable lugs	N/A	Press cable lugs on wires	
	Heat gun	N/A	Heat shrink tubes	
	2 cable lugs for M5 screw.	N/A	Terminate earth wires from mains and motor (IMD 122 B and early production of 122 C only)	
	3 cable lugs for M8 screw (max. 18 mm width).	N/A	Terminate motor wires (IMD 135 C only)	
	Ferrules	N/A	Terminate wires to connectors (recommended, different size according to wire size)	
	Heat shrink tubes with heat activated adhesive	N/A	Cover shields	
	Wire and cable stripping tools	N/A	Strip cable and wires insulation	



IMD type C

Figure 2 IMD 122 Tools designation overview (references to Table 1 on page 9)

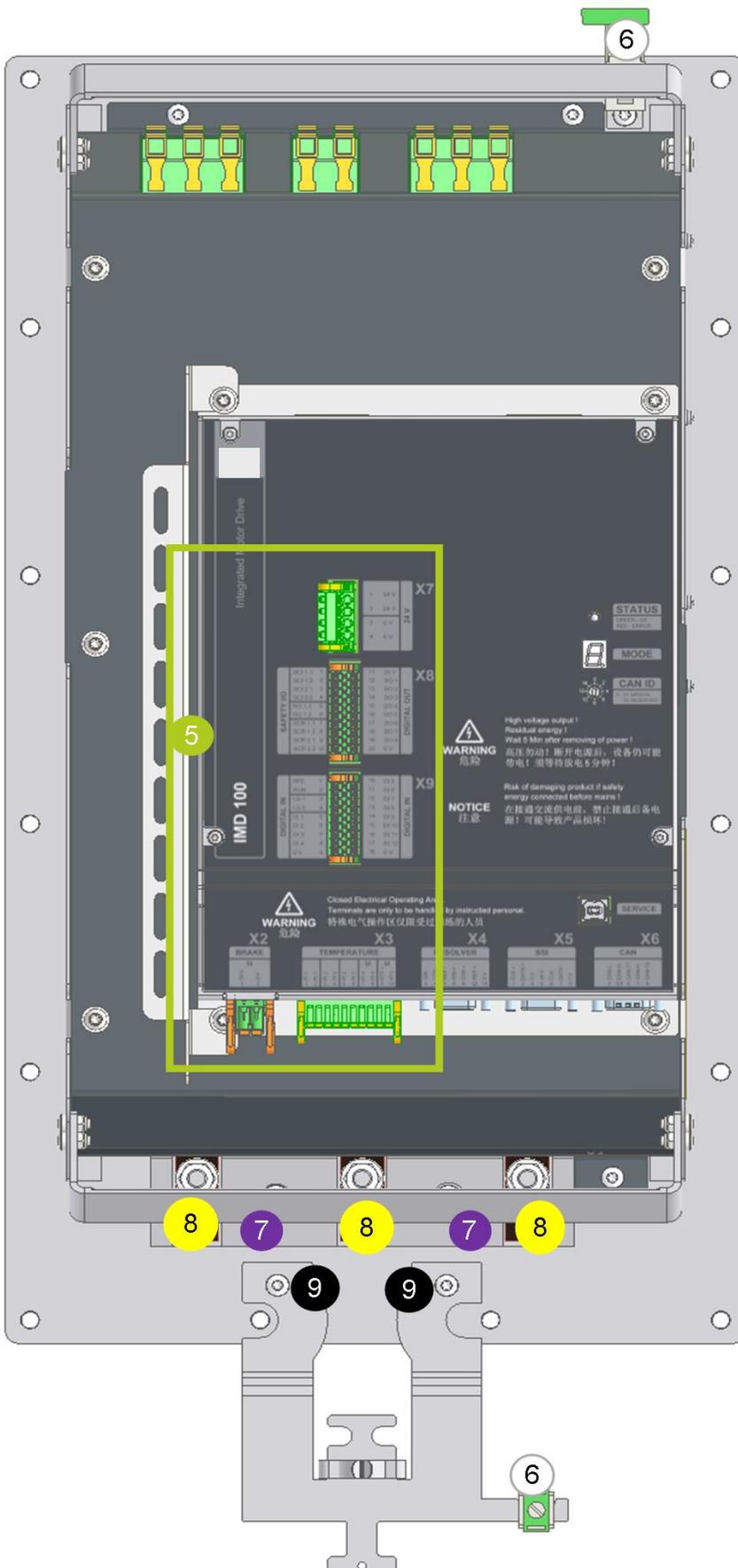


Figure 3 IMD 135 Tools designation overview (references to [Table 1](#) on page [9](#))

NOTE: IMD 135 is not delivered with mounting screws for mounting on the cabinet. The tool needed and torque depends on the chosen screws.

3.3 Handling of the product

**Attention**

Ensure that the IMD was not damaged during transport or storage. Pay attention when handling the IMD, not to damage any mechanical or electrical parts. Ensure that the fan cover is not bent, and the fan can rotate freely.

4. Mechanical assembly

The IMD can be mounted with the optional mounting frame or without, in which case the fastening screws (M6x30mm) and nuts are not delivered with the product.

It is recommended to use the optional mounting frame to mount the IMD in the cabinet. This will ensure even and uniform pressure on the gasket around the base of the IMD, as well as ease the installation process.

When tightening screws, use the torque values given section [3.1](#) on page [8](#).

Section [4.3](#) on page [20](#), and section [0](#) on page [23](#) contain detailed procedures for mounting the IMD with and without the mounting frame.



Info

The drawings in this section show the mechanical assembly of IMD 122B, but are applicable to IMD 122C as well. The mechanical assembly is the same for both versions.

4.1 Drilling and cutting mounting holes

It is assumed that the holes in the backside of the cabinet for the IMD are already made. If not, cut out a rectangle hole in the designated place and drill 6 mm holes according to [Figure 4](#) on page [15](#).



Info

There are further requirements to the location of the IMD in the cabinet. These requirements are described in the IMD 100 Integration manual.



Use eye, hand and hearing protection

Use protection for eyes, hand and hearing, if the mounting holes for bolts and heat sink need to be made at this point.



Attention

Clean the cabinet thoroughly after cutting and drilling. Make sure that no debris are left in the cabinet before mounting the IMD.

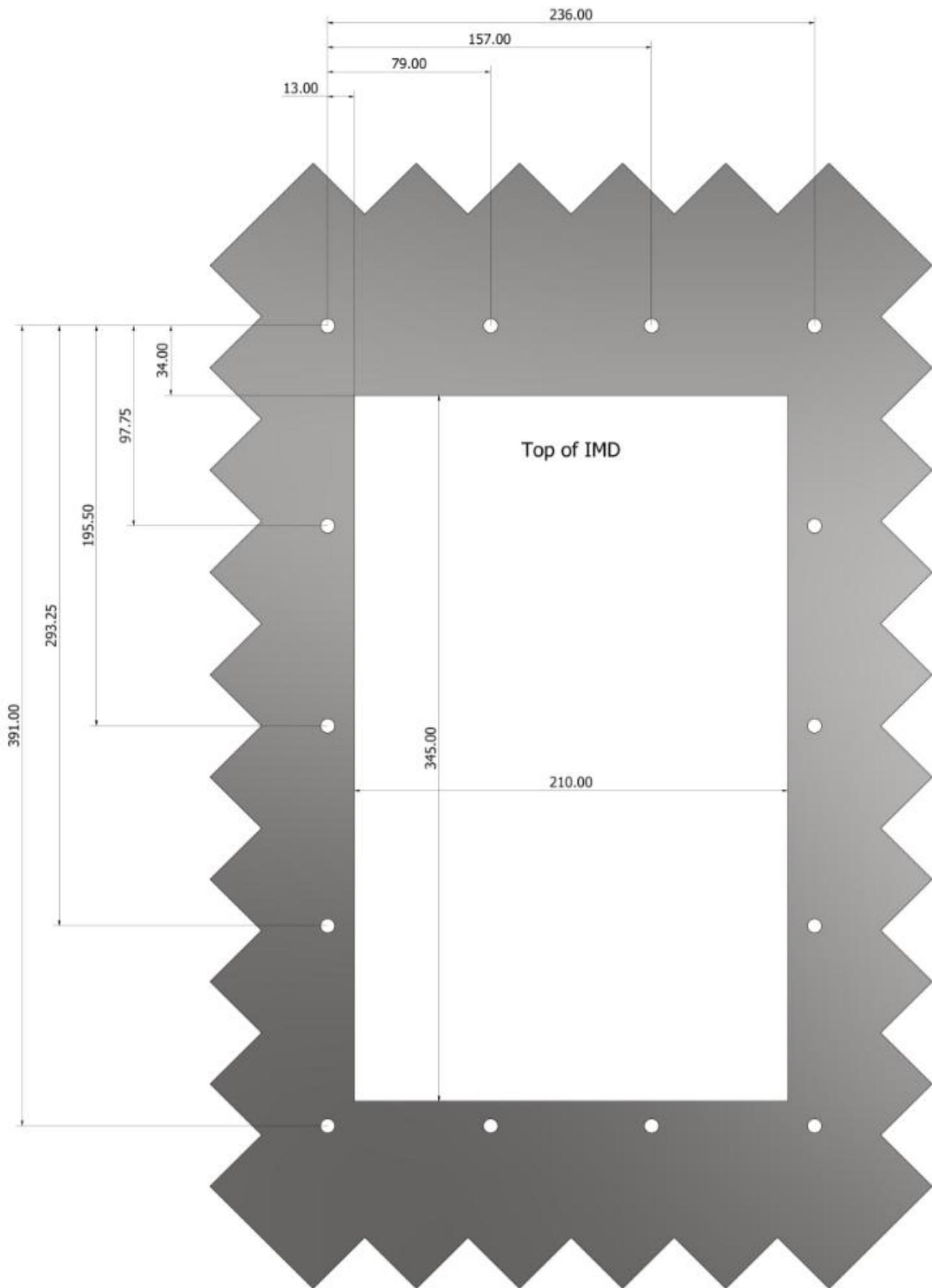


Figure 4 Cabinet cut-out schem for IMD 122

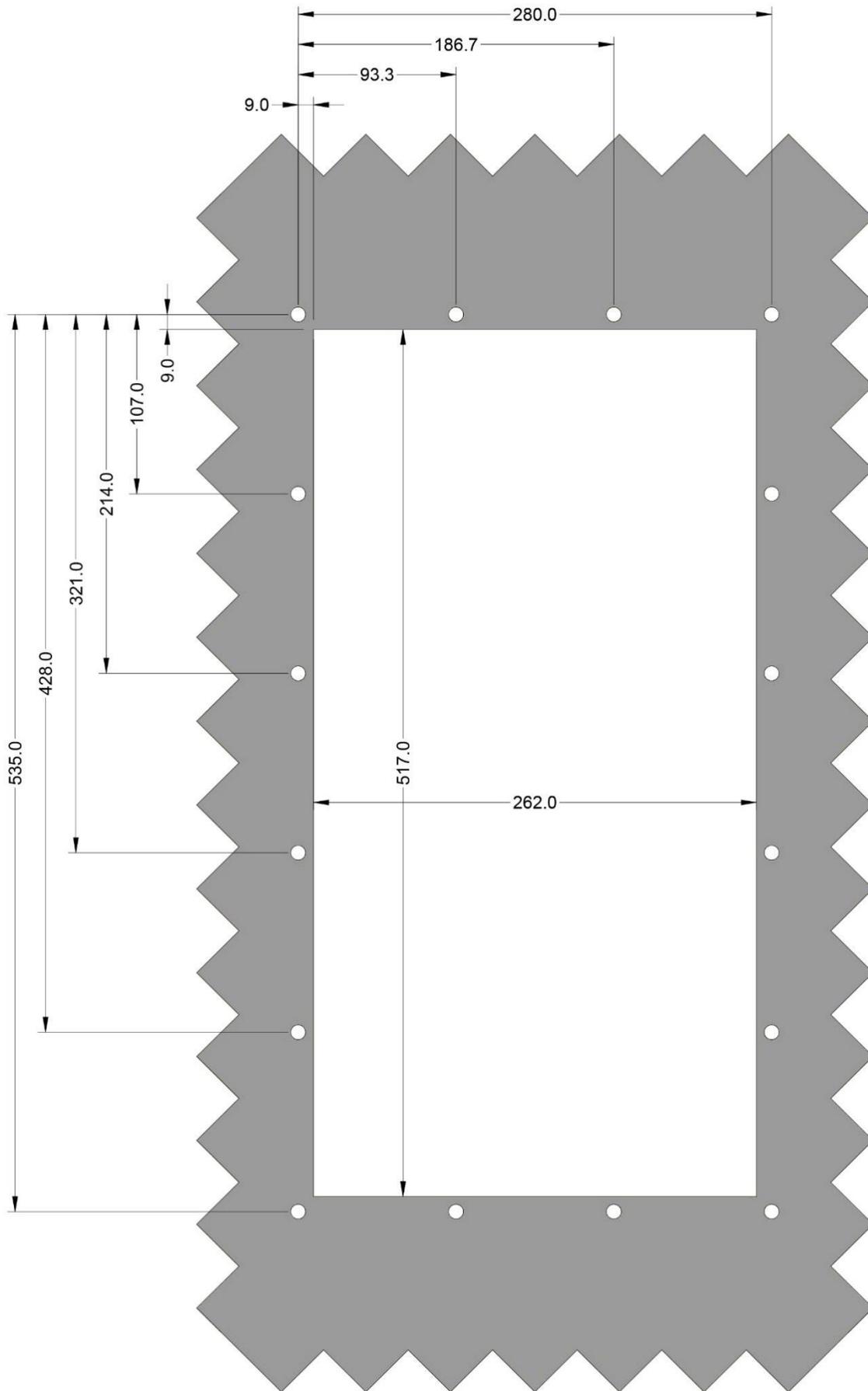
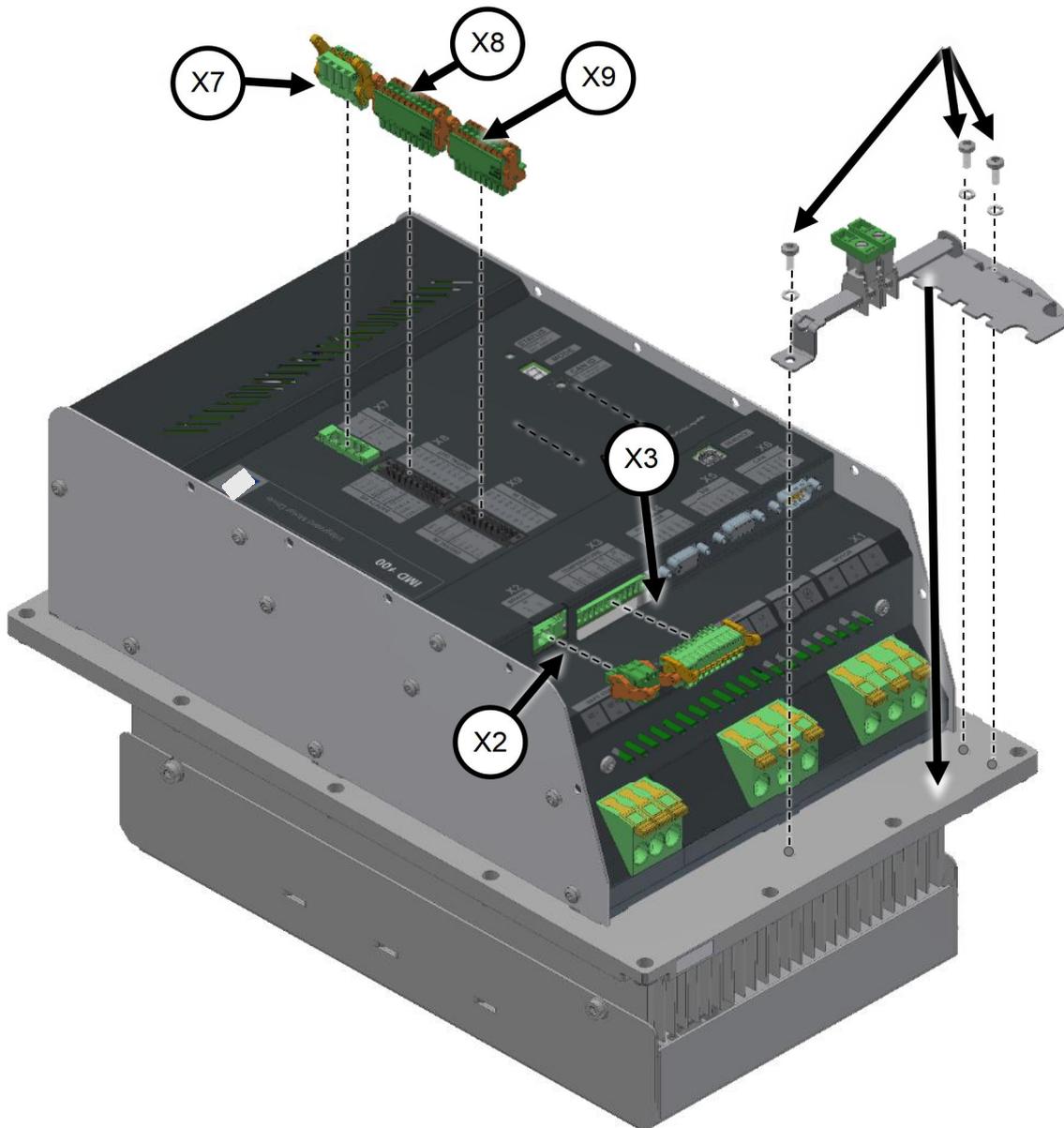


Figure 5 Cabinet cut-out schem for IMD 135

4.2 Mounting accessories

4.2.1 IMD 122 C

Mounting the shielding bracket and connectors on the IMD:



The shielding clamp is not mounted yet.

4.2.2 IMD 122 B and early production of IMD 122 C

The bracket (pos. 7) is optional when mounting the shielding clamp (pos. 6). The shielding clamp may be turned depending on the motor cable direction and routing. The clamp is mounted using 3 mm hexagonal key according to the torque given in [Table 1](#) on page [9](#).

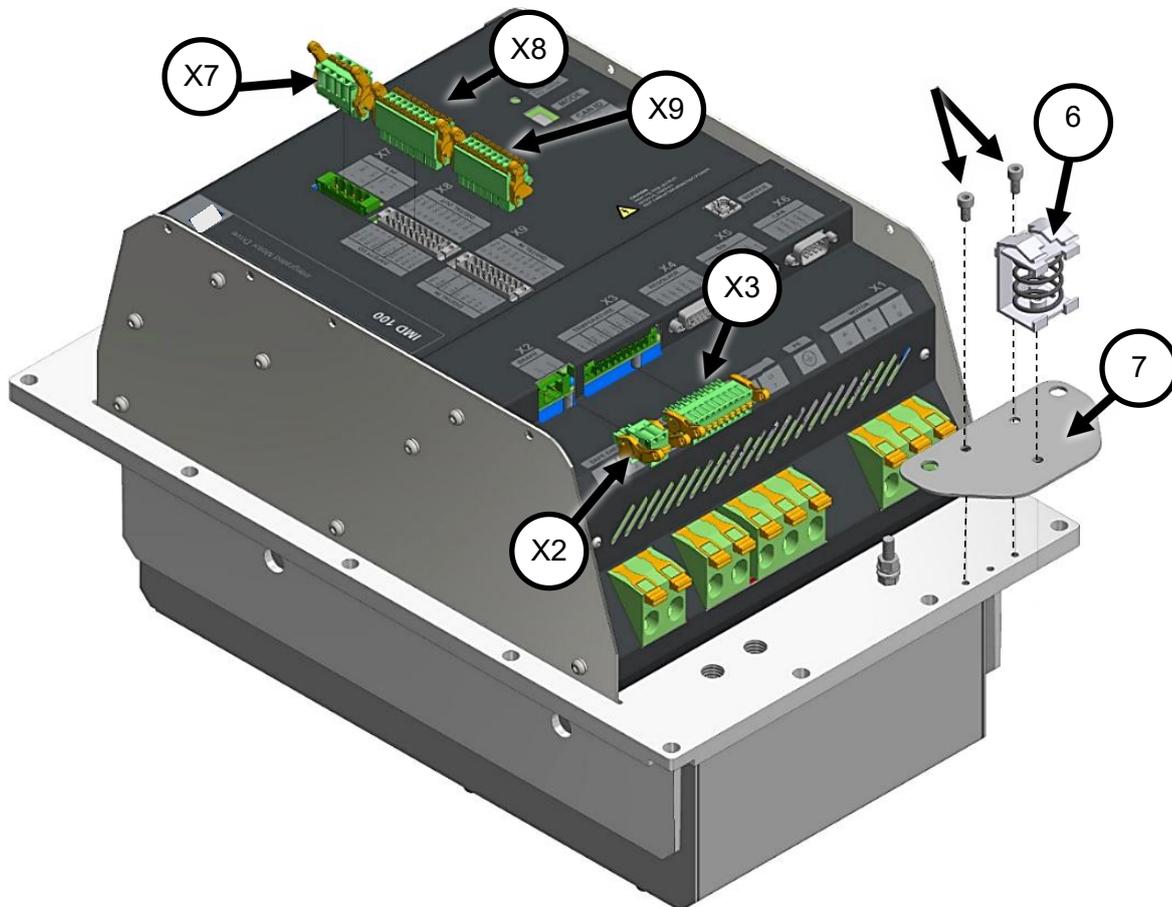


Figure 6 Mounting the shielding clamp with a bracket

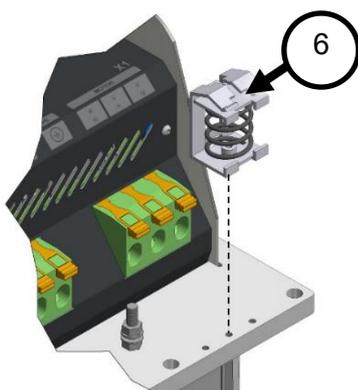
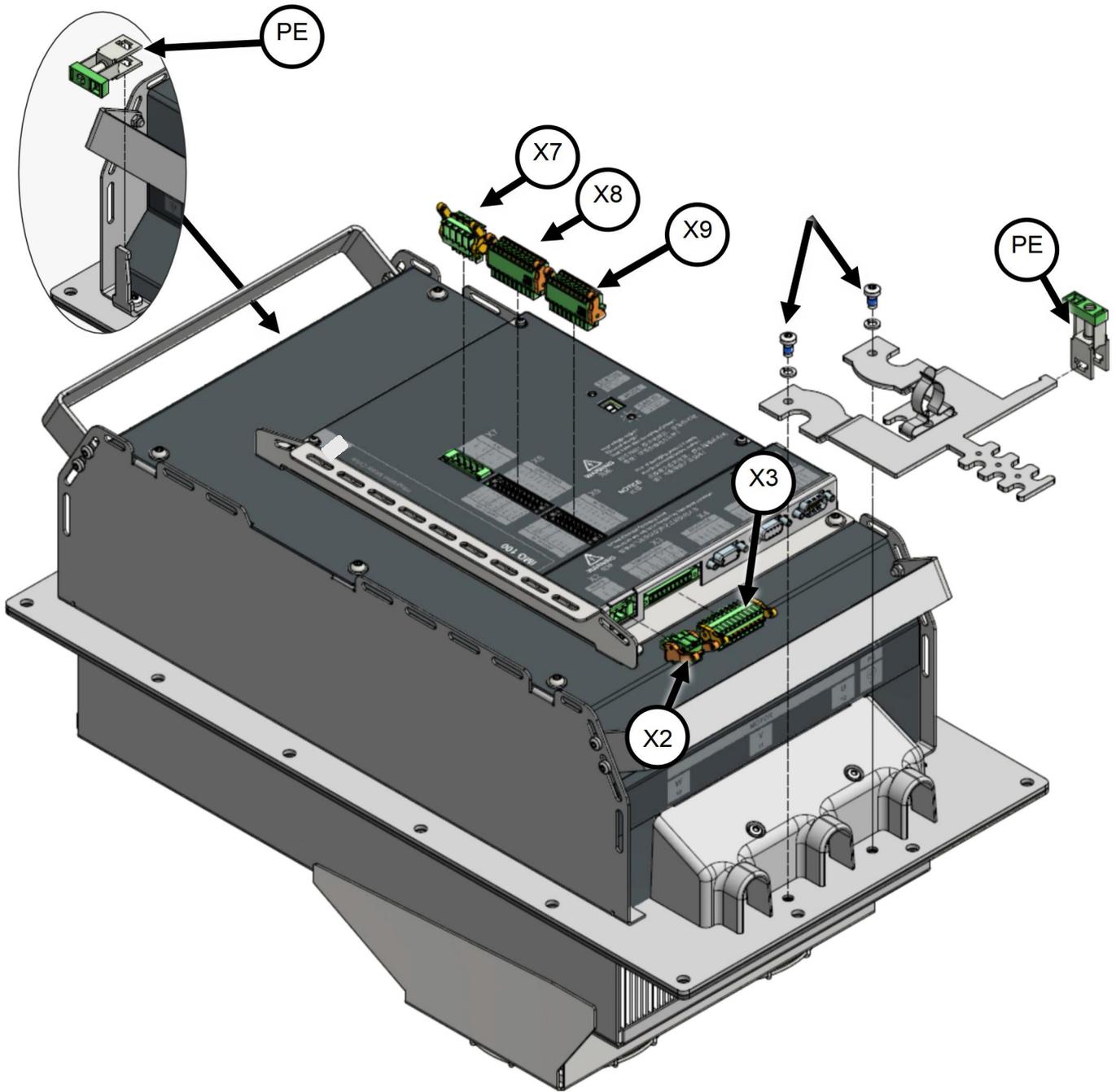


Figure 7 Mounting the shielding clamp directly on the heat sink

4.2.3 IMD 135 C

Mounting the shielding bracket and connectors on the IMD:

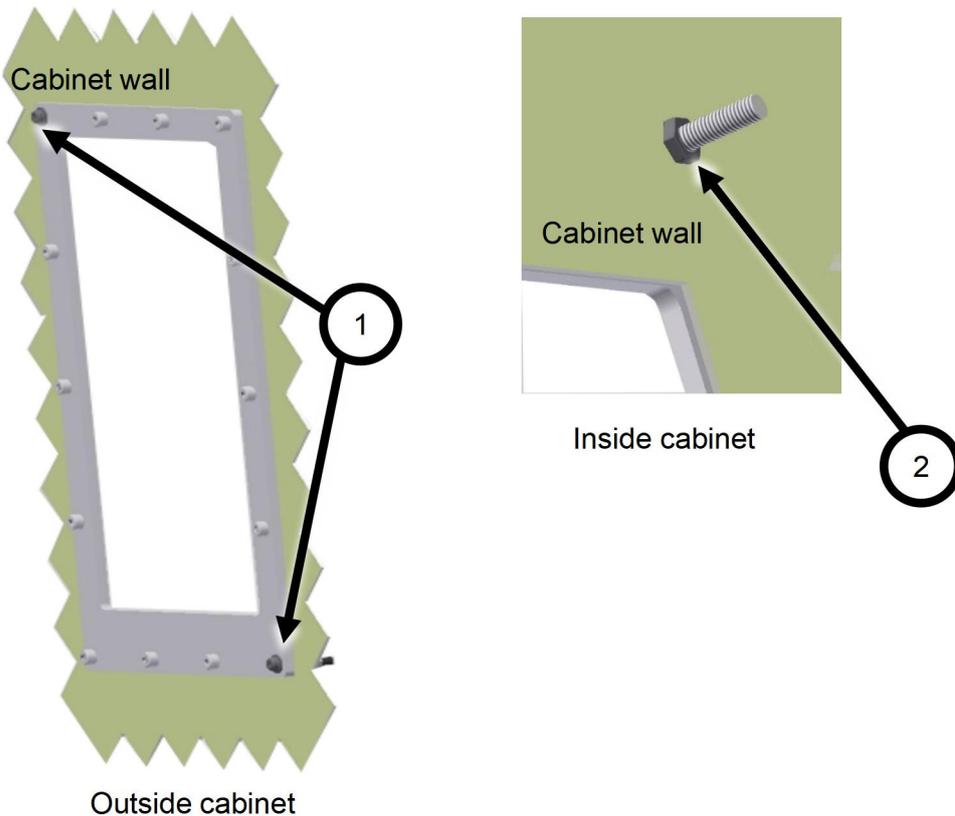


4.3 Mounting the IMD (with mounting frame) procedure

4.3.1 IMD 122

The following description describes how to mount the IMD with the “M-frame kit IMD 122”. It also applies to the “M-frame” with the following differences:

- M6 screws and nuts are not supplied by PRACTEK
 - The frame does not have threading – extra nuts are needed
1. Mount the mounting frame from the outside of the cabinet using the two M6x30 mm screws (pos. 1) and the low nuts (pos. 2). Holes at top right and bottom left (from the inside) are used. Ensure that all holes (cabinet and mounting frame) are aligned, and that the threaded inserts are facing outward from the cabinet:

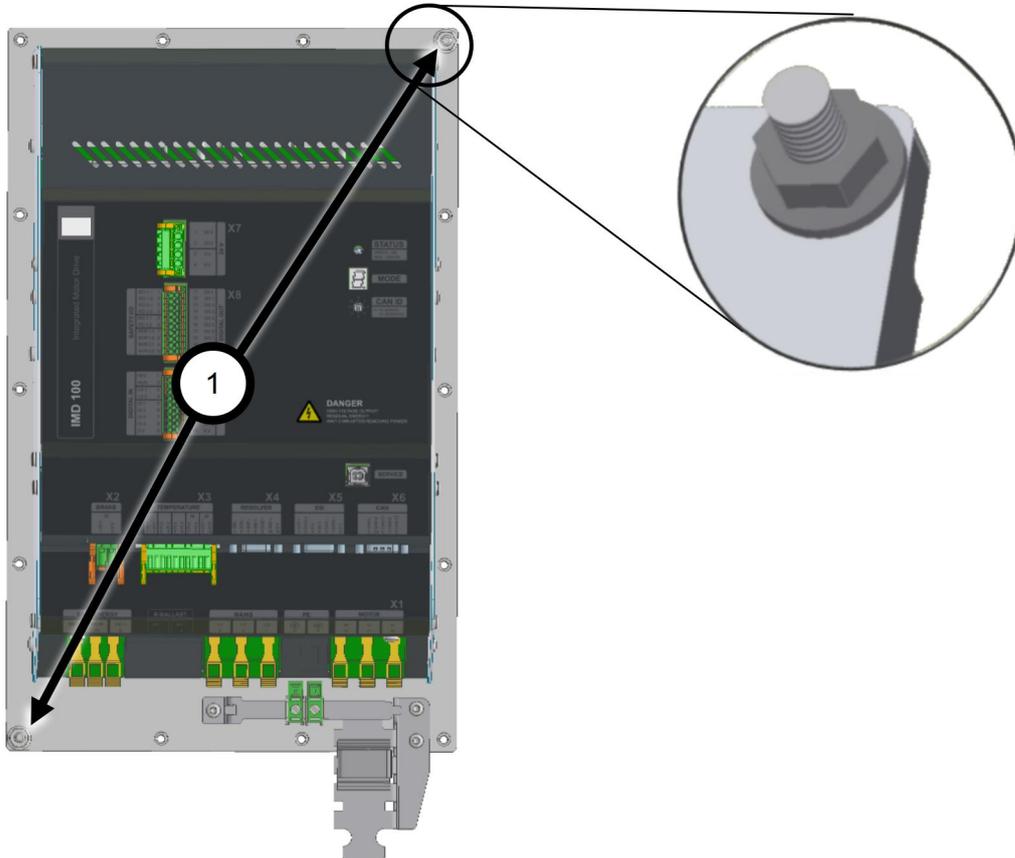


2. Mount the IMD on the two screws and fasten with nuts (Pos. 1). Ensure that all mounting holes in the heat sink are aligned with the holes in the cabinet (illustration of type C, applies also to type B).

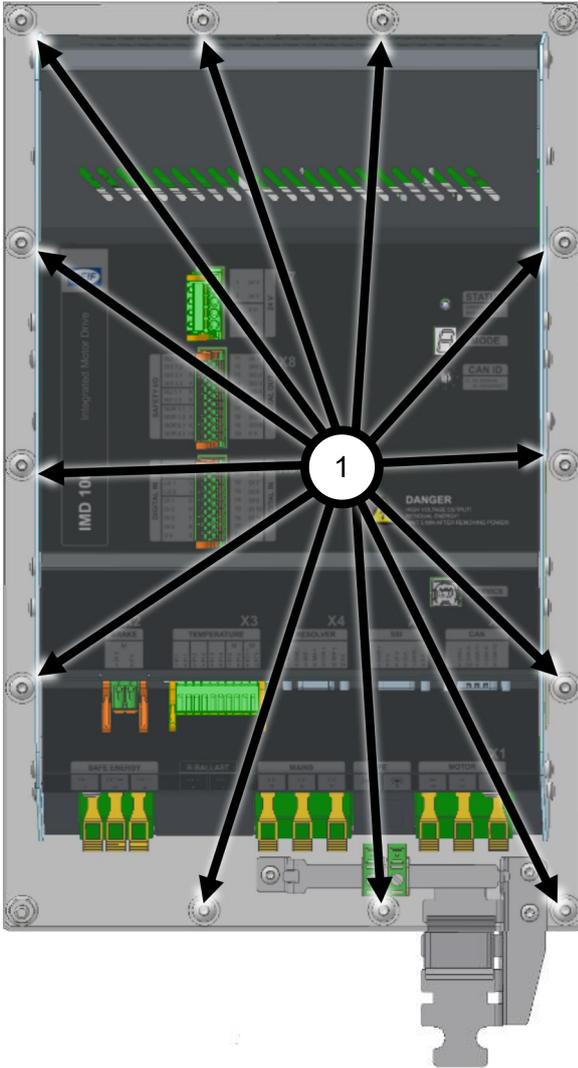


Caution!

Assess the lifting weight of the IMD (see datasheet) with regards to lifting and placing it in the designated location in the cabinet. Use lifting aid if necessary.



3. Mount all screws around the heat sink (pos. 1) with M6x30 mm screws. Tighten all screws and nuts:



NOTE The illustration (of IMD type C) applies also to IMD type B.

4.3.2 IMD 135

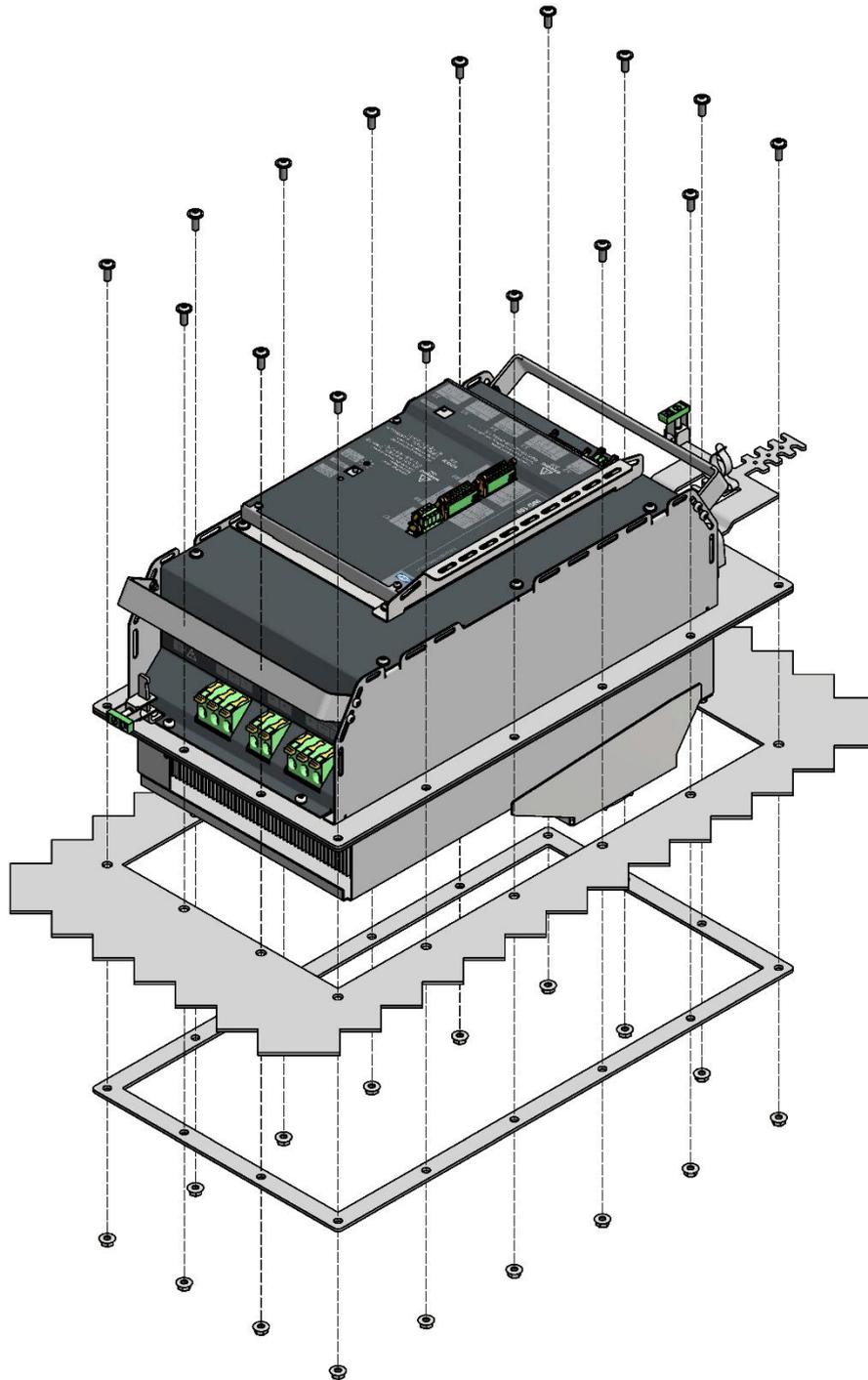
The following illustration shows how to mount the IMD with an optional "M-frame".

Note that screws and nuts are not supplied with the IMD. It is the customer's responsibility to ensure proper mounting in the cabinet.



Caution!

Assess the lifting weight of the IMD (see datasheet) with regards to lifting and placing it in the designated location in the cabinet. Use lifting aid if necessary.



4.4 Mounting the IMD (without mounting frame) procedure

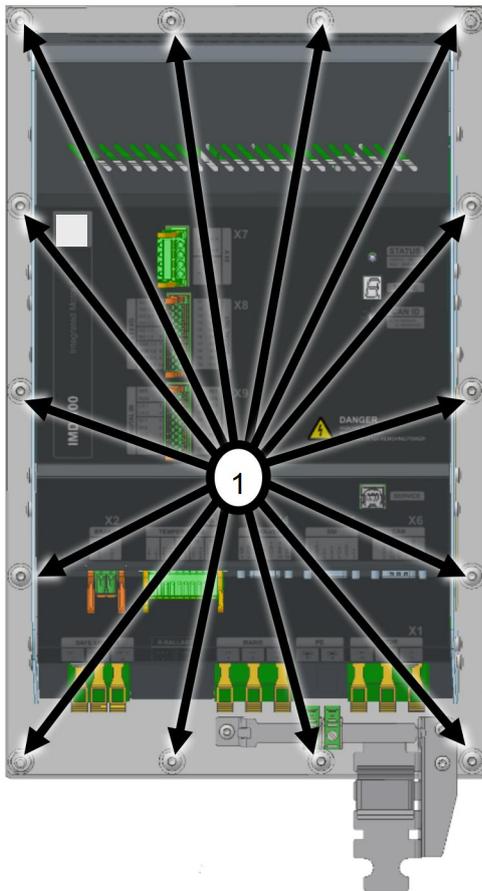
This procedure describes mounting of the IMD without a mounting frame, using M6 screws and nuts. Other mounting methods can also be used.

1. Mount all screws around the heat sink (pos. 1) with M6x30 mm screws (not delivered with the IMD). Tighten all screws and nuts. Note that actual screws might differ from the ones shown.

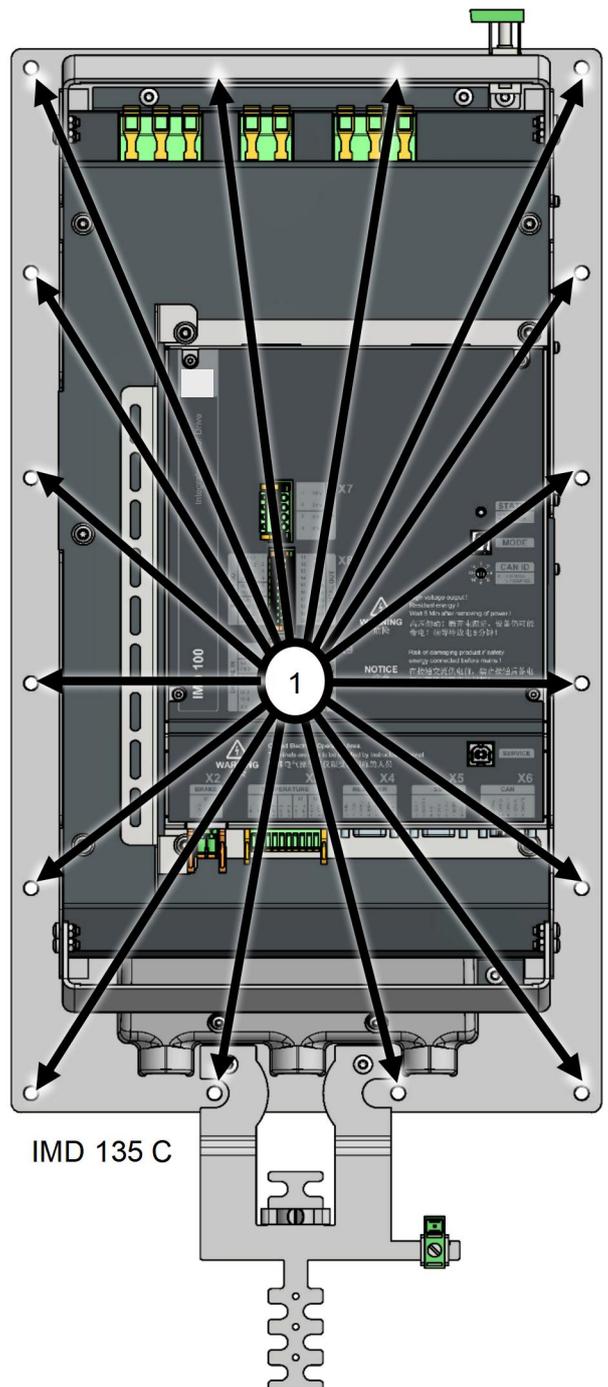


Caution!

Assess the lifting weight of the IMD (see datasheet) with regards to lifting and placing it in the designated location in the cabinet. Use lifting aid if necessary.



IMD 122 C
(applies also to IMD type B)



IMD 135 C

5. Electrical terminations

This section describes how to connect all electrical connections to the IMD. Following is an overview of the connections that need to be made.

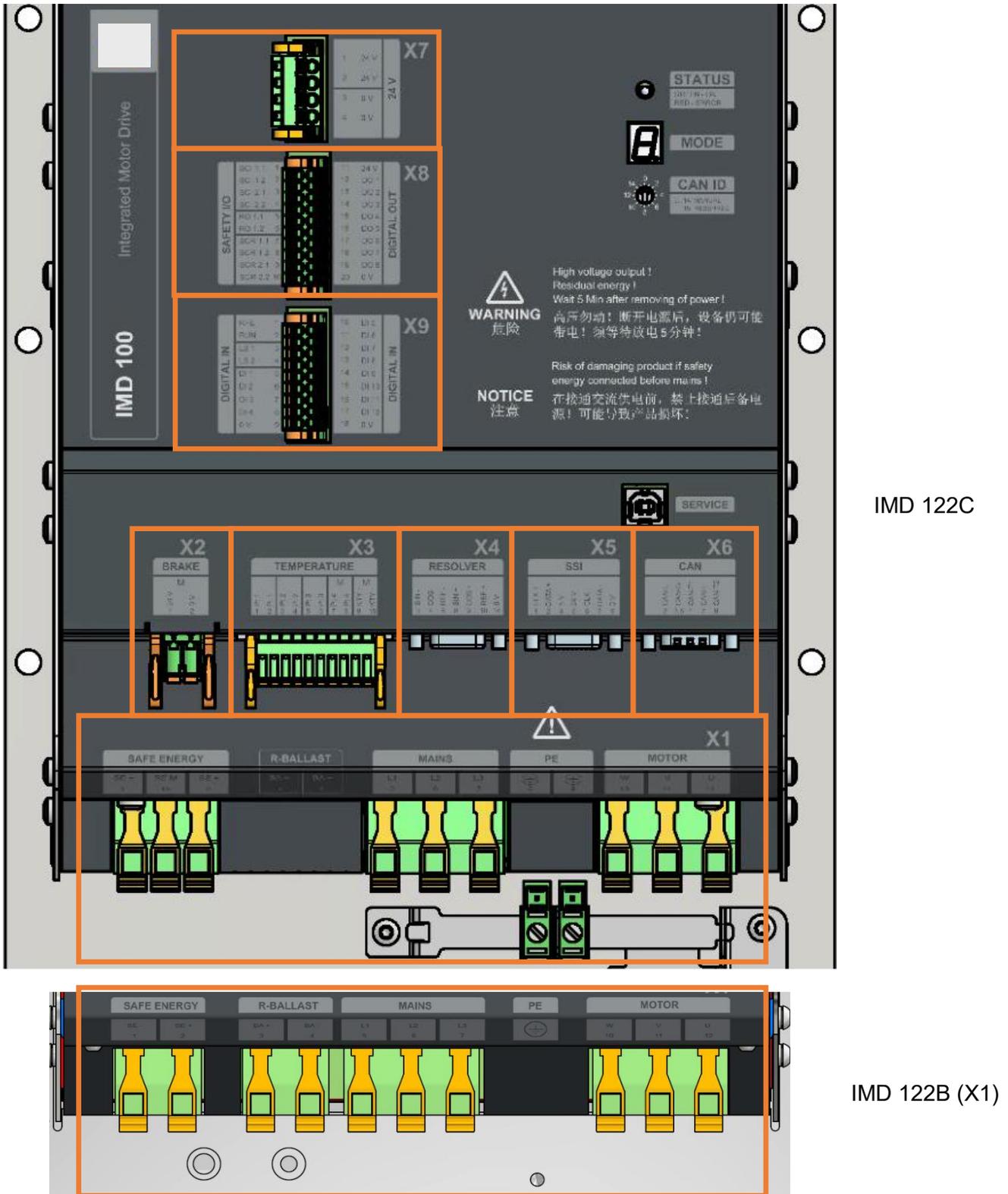


Figure 8 IMD 122 connections overview

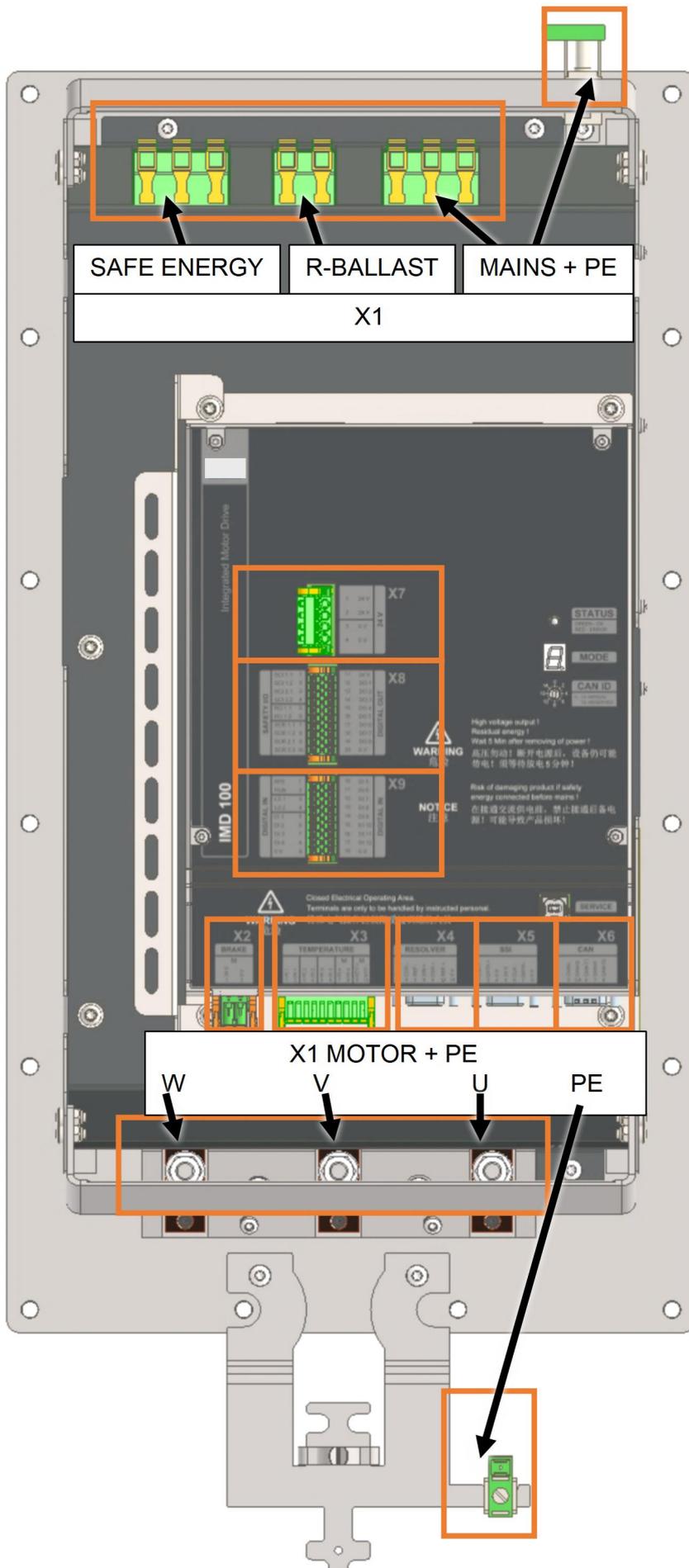


Figure 9 IMD 135 C connections overview



Attention

Ensure that no offcuts or stripped insulation pieces falls into the cabinet or IMD.

The following types of connectors are used in the IMD:

Table 2 IMD connector types

Connector type on IMD	IMD connector designation	Direct / removable connector
Phoenix PLH 16	X1	Directly to connector
M8 threaded rod with nuts	X1 motor (IMD 135)	Directly to connector
Phoenix SPT 2.5 (IMD 122C with external ballast resistor option)	X1 (R-BALLAST)	Directly to connector
M5 threaded rod with nuts (IMD 122 A, B, C early production)	X1 (PE terminal)	Direct (PE/Earth)
Phoenix AKG 16 GN (IMD 122 C)	X1 (PE terminals)	Direct (PE/Earth)
Phoenix FK-MCP 2,5	X2, X7	Connected through removable connector
Phoenix FK-MCP 1,5	X3, X8, X9	Connected through removable connector
15 pole Sub-D female	X4	Connected through removable connector
9 pole Sub-D female	X5	Connected through removable connector
9 pole Sub-D male	X6	Connected through removable connector

5.1 Prerequisites for electrical termination

A wiring or routing diagram for the specific installation must be available before starting with the electrical work. The diagrams must contain information about which cables/wires are connected to each connector terminal.

5.2 Connecting wires to the different connector types

This section describes how to connect wires to the different connection types. The length of ferrule (termination sleeve) given in the technical data is the uninsulated part of the ferrule:

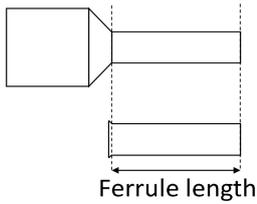


Figure 10 Ferrule length definition

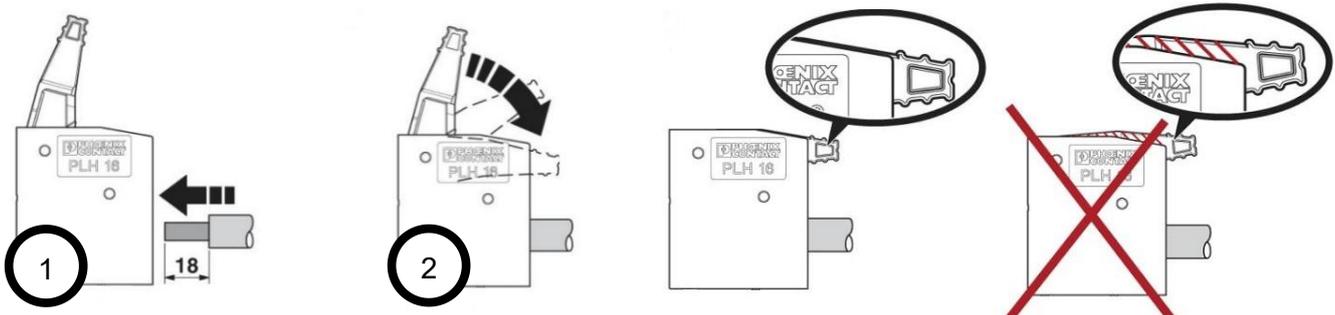
5.2.1 Using Phoenix PLH16 connector

PLH16 connectors can be used with or without ferrules on the wires (see ferrule length in the technical data). If used, follow the ferrule manufacturer instruction on how to use a ferrule.

Table 3 Technical data PLH16

Conductor cross section flexible, without ferrule	0.75 – 25 mm ²
Conductor cross section flexible, with ferrule without plastic sleeve	0.75 – 16 mm ²
Conductor cross section flexible, with ferrule with plastic sleeve	0.75 – 10 mm ²
Stripping length	18 mm
Ferrule length	18 mm

To connect wires to terminals:



To take the wires out: Lift the handle and pull out the wire.

5.2.2 Using Phoenix FK-MCP connectors

FK-MCP connectors can be used with or without ferrules on the wires (see ferrule length in the technical data). If used, follow the ferrule manufacturer instruction on how to use a ferrule.

When ferrules are used, it is possible just to push the sleeved wire into the connector.



Attention

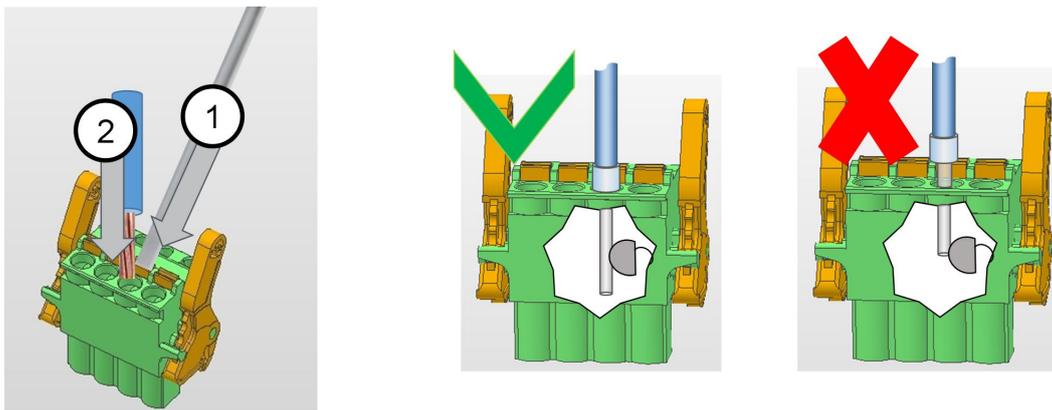
Ferrules are mandatory if multiple wires are connected to the same terminal.

FK-MCP 2.5 and FK-MCP 1.5 differ in the length of the stripped wire/termination sleeve and the maximum wire cross section.

Table 4 Technical data FK-MCP 1.5 and FK-MCP 2.5

	FK-MCP 1.5 (X3, X8, X9)	FK-MCP 2.5 (X2, X7)
Conductor cross section flexible, without ferrule	0.14 – 1.5 mm ²	0.2 – 2.5 mm ²
Conductor cross section flexible, with ferrule without plastic sleeve	0.25 – 1.5 mm ²	0.25 – 2.5 mm ²
Conductor cross section flexible, with ferrule with plastic sleeve	0.25 – 0.5 mm ²	0.25 – 2.5 mm ²
Stripping length	9 mm	10 mm
Ferrule length	10 mm	10 mm
Note: if the ferrule is with plastic sleeve and the sleeve is too thick to enter the hole, the length must be 12 mm instead of 10 mm.		

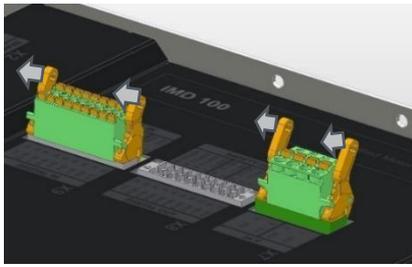
- To connect wires to the terminals:
 - If ferrules are used, just push the wire with the ferrule into the connector all the way.
 - If ferrules are not used, press the release button with a flat blade screwdriver (1) as illustrated, and push the wire all the way into the terminal (2). Release the button.



- To connect the female connector to the to the mail connector in the IMD:
- Press the female connector on both ends until you hear click at each end.



- To dismantle the female connector from the mail connector:
- Push both yellow handles as shown until the connector is free.



5.2.3 Using Phoenix SPT 2.5 connectors

SPT 2.5 connectors can be used with or without ferrules on the wires (see ferrule length in the technical data). If used, follow the ferrule manufacturer instruction on how to use a ferrule. When ferrules are used, it is possible just to push the sleeved wire into the connector.



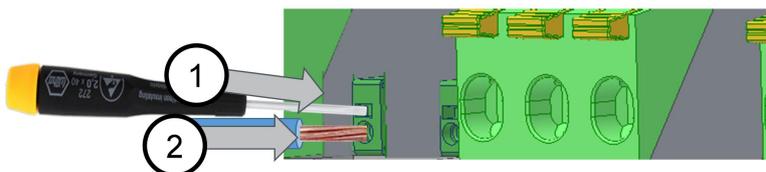
Attention

Ferrules are recommended if multiple wires are connected to the same terminal.

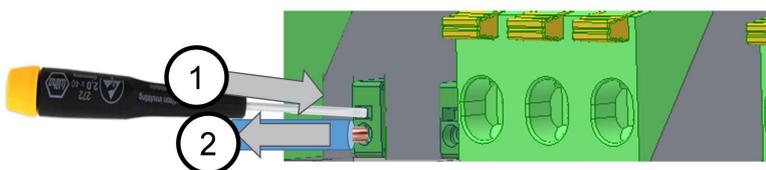
Table 5 Technical data SPT 2.5

Conductor cross section flexible, without ferrule	0.2 – 2.5 mm ²
Conductor cross section flexible, with ferrule without plastic sleeve	0.25 – 2.5 mm ²
Conductor cross section flexible, with ferrule with plastic sleeve	0.25 – 1.5 mm ²
Stripping length	10 mm
Ferrule length	10mm
Note: if the ferrule is with plastic sleeve and the sleeve is too thick to enter the hole, the length must be 12 mm instead of 10 mm.	

- To connect wires to the terminals:
 - If ferrules are used, just push the wire with the ferrule into the connector all the way.
 - If ferrules are not used, press a flat blade screwdriver (1) as illustrated, and push the wire all the way into the terminal (2). Pull the screwdriver out and pull the wire lightly to ensure that it is properly fastened.



- To disconnect the wire (with or without ferrule) press a flat blade screwdriver (1) as illustrated, and pull the wire out. Pull the screwdriver out.



5.2.4 Using D-sub connector

Use only metal or metalized house connectors. D-sub connectors can be used with the cable shielding connected to the connector housing or to one of the connector pins.



Read instructions

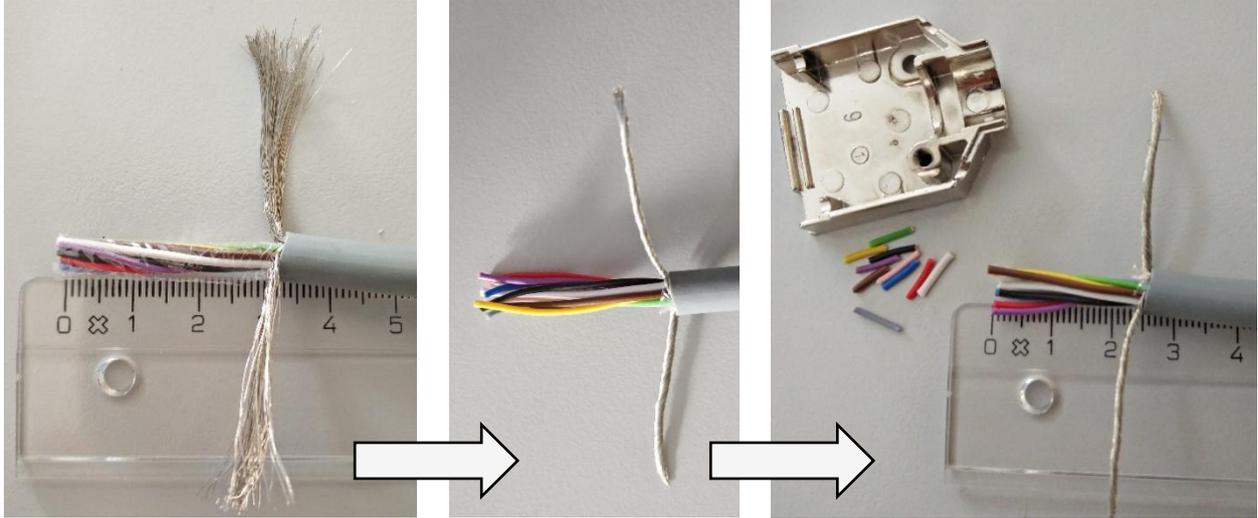
It is important to use the correct method. Consult the wiring documentation to determine which method to use for a specific connector.

The following two sub-sections describe how to use each method.

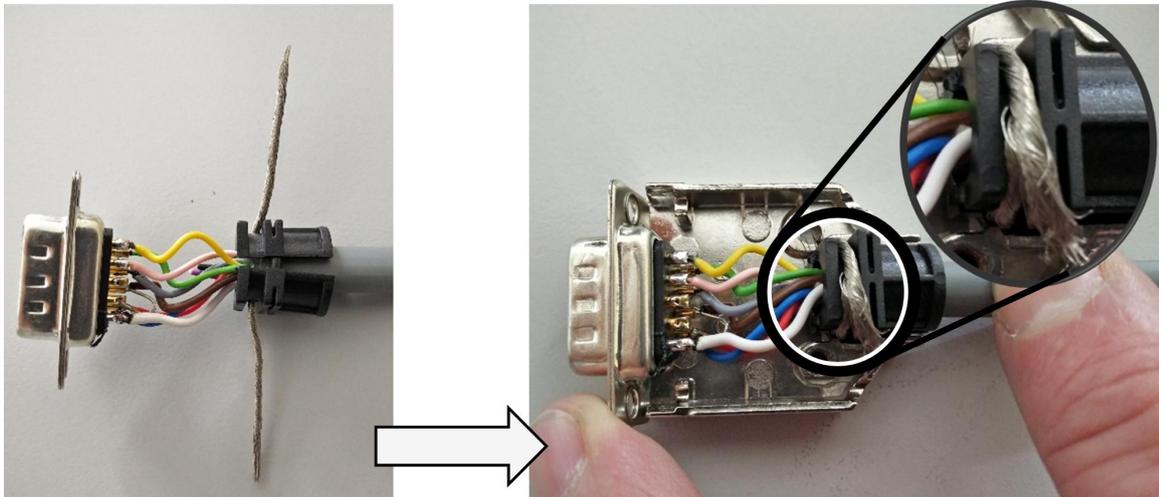
5.2.4.1 Using D-sub connector with shield to housing

The cable insulation must be stripped in order for the shield to make contact with the housing of connector. The exact type of the connector may vary. Measurements might need to be adapted to the specific type of connector used.

1. Strip 3 cm insulation, remove the plastic band and twist the shield in two ends (pigtailed). Cut the wires to 2.5 cm length



2. Strip approximately 3 mm insulation from the wires and solder the wires to the connector according to wiring diagram or instructions. Thread the shield's pigtailed ends through the holes in the strain relief and roll them around the strain relief (other connector types might have different strain relief than the one shown):



- 3.
4. Close the connector:

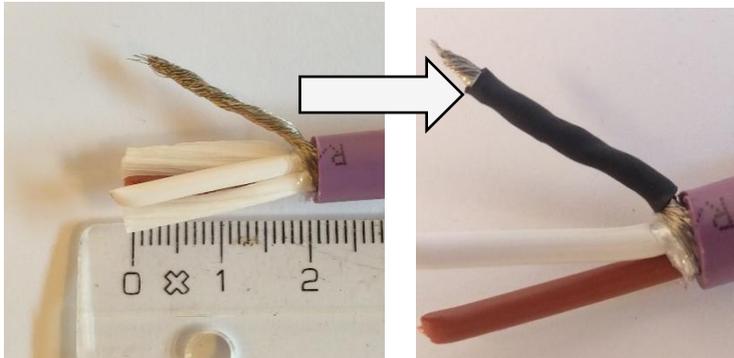


- 5.

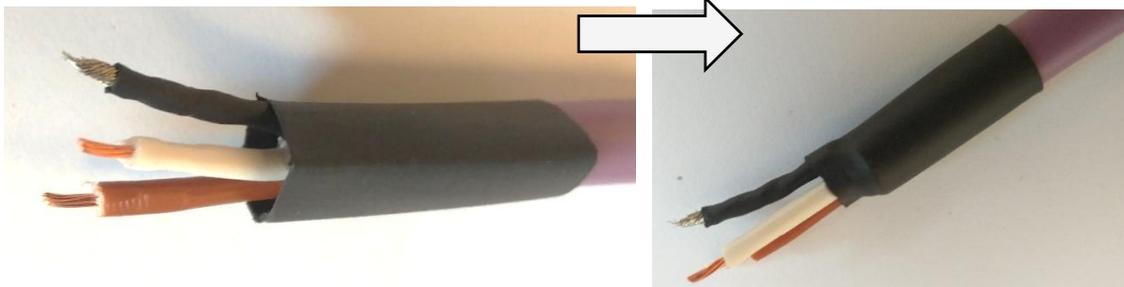
5.2.4.2 Using D-sub connector with shield to terminal

Only use metal or metalized house connectors. The exact type of the connector may vary. Measurements might need to be adapted to the specific type of connector used.

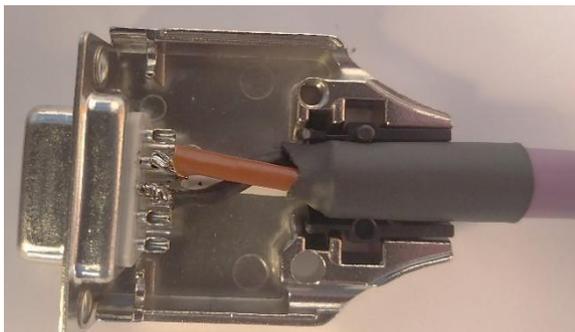
1. Strip 2 cm insulation, remove the plastic band and twist the shield. Cut the filling. Put 17 mm of appropriate size shrink tube around the twisted shield. Shrink it with a heat gun:



2. Strip approximately 3 mm insulation from the wires. Put 20 mm of appropriate size shrink tube around the cable. Ensure that the shield is covered. Shrink it with a heat gun:



- 3.
4. Solder the wires to the connector according to wiring diagram or instructions. Select the appropriate strain relief (other connector types might have different strain relief type than the one shown):



- 5.
6. Close the connector:



7.

5.3 Mounting power connections (X1)



Danger!

Risk of burns and electrical shock from short circuit, electrical arc and uninsulated wires.

Live work is not permitted, except for during commissioning and service.

Observe local regulation when working with electrical components.



Disconnect power

Ensure that all power is disconnected when connecting cables to the IMD.

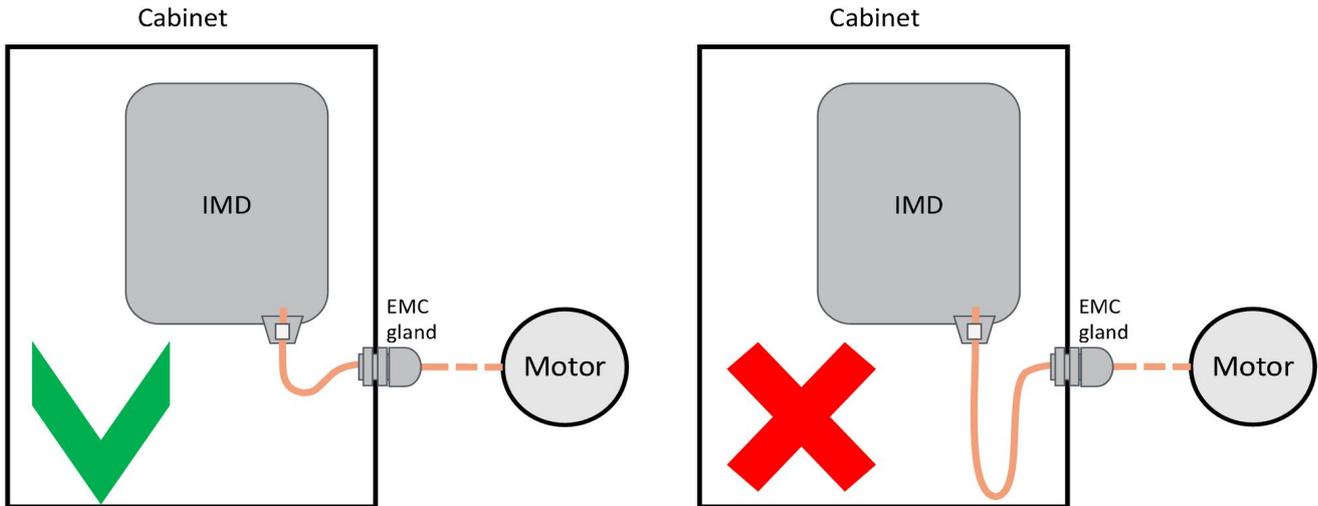
5.3.1 Preparing the motor cable for connections



Attention

Rout the cable the shortest way possible inside the cabinet. Any excess cable length must be cut off.

1. Determine the necessary length of the motor cable (the following figure is a principle figure):



5.3.1.1 IMD 122 B and C

1. Strip 25 cm of insulation at the end of the cable (consider the routing of the brake wires, longer wires may be required):



- 2.
- 3.
4. Cut 18 cm of the shield so there are 7 cm of the shield left. Remove the excessive shield and plastic band:



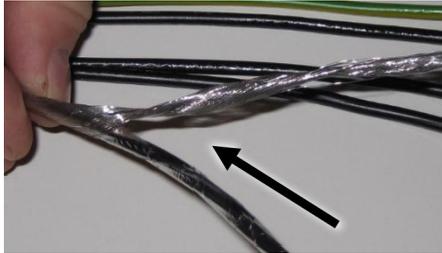
- 5.
- 6.
7. Fold the shield back onto the cable.:



8.

NOTE The shield clamp in IMD type B allow clamping a cable diameter of 5 to 20 mm.
 The shield clamp in IMD type C allow clamping a cable diameter of 6 to 20 mm.
 If too thick, strip extra 3 or 4 cm of the outer insulation (depending on the clamp used).

9. Unfold the shield from the brake wires:



10.

11.

12. Cut the brake wires shield to the same length as the cable shield

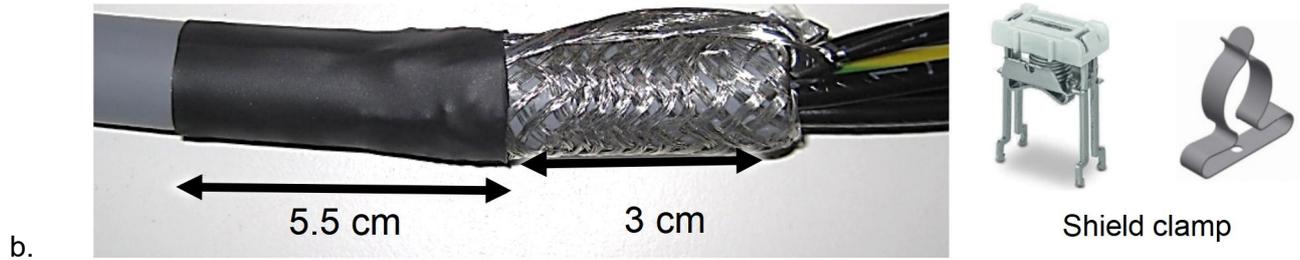


13.:

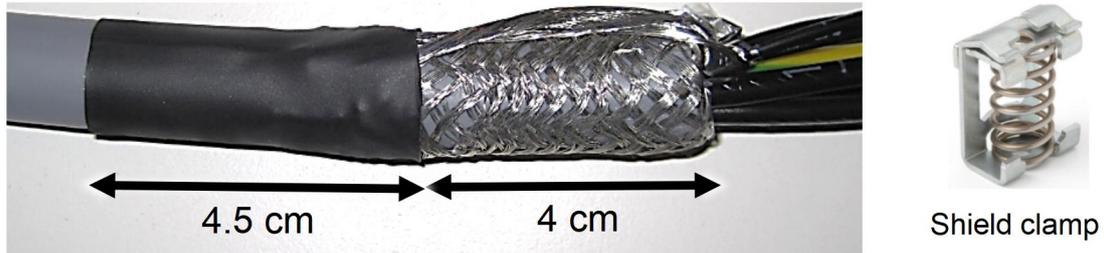
14.

15. Depending on the shielding clamp type, do the following:

- a. IMD 122 C and IMD 135 C: Cut 5.5 cm of appropriate shrinkable tube. Shrink the tube around the shield and cable, leaving 3 cm of uncovered shield:



- c. IMD 122 A, B, and early C production: Cut 4.5 cm of appropriate shrinkable tube. Shrink the tube around the shield and cable, leaving 4 cm of uncovered shield:



16. Depending on how the cable is routed in the cabinet, turn the shield clamp to accommodate easiest connections (IMD 122 B and early C only). Cut the motor and earth wires in appropriate length. Ensure that the shielding clamp presses the shield and not the shrinkable tube.

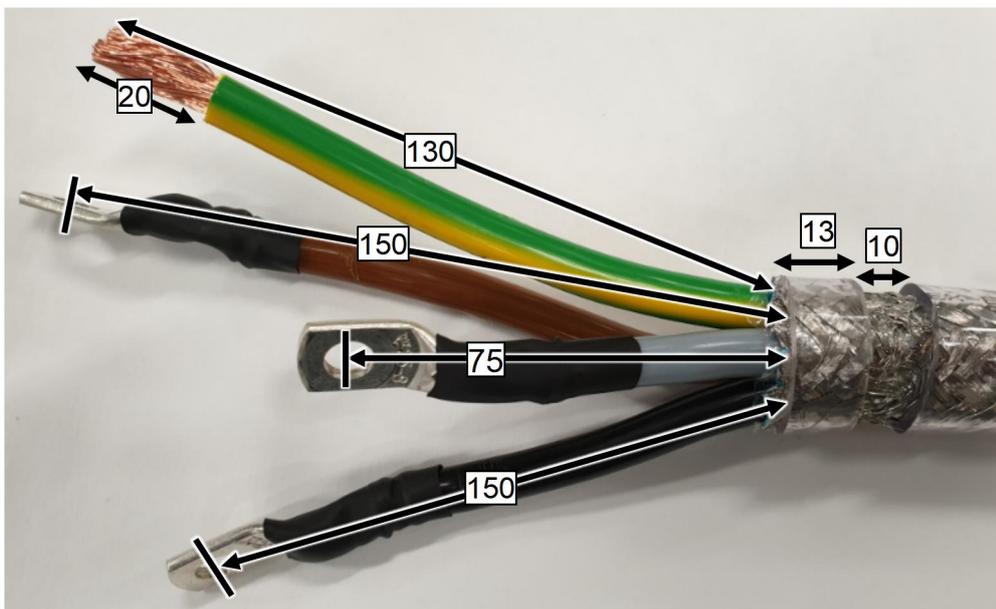
17. The motor cable is now ready for connections.

5.3.1.2 IMD 135 C

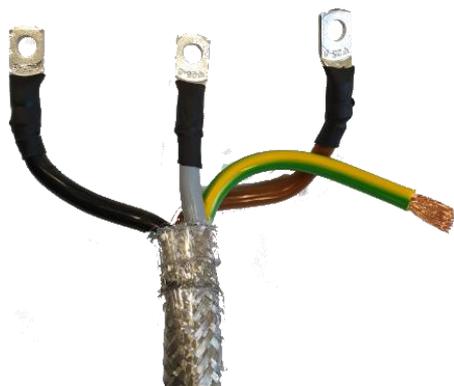
1. Depending on the thickness of the motor cable, determine whether the shield is folded backwards or the insulation is stripped. The shield thickness must be between 23 to 29 mm:



2. Determine the needed length of the wires, strip the cable and mount the cable lugs. Note that due to the touch protection of the cover, the wires need to be a little longer.
3. It is recommended to cover the lugs and the ends of the wires with heat shrink tubes.
4. The following figure shows the recommended wire length (all measures in mm):



- 5.
6. The motor cable is now ready for connections.



5.3.2 Connecting the motor



Attention

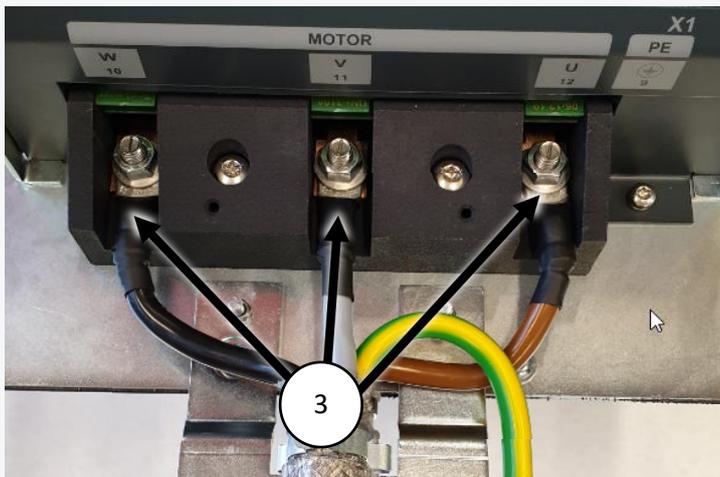
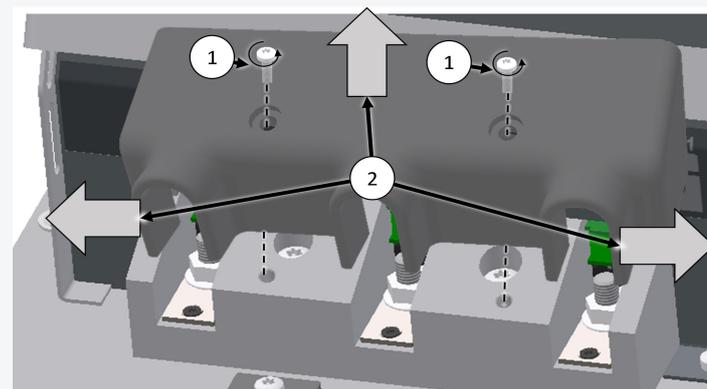
The motor wires must be as short as possible from the shielding clamp to terminals. Do not make any loops.



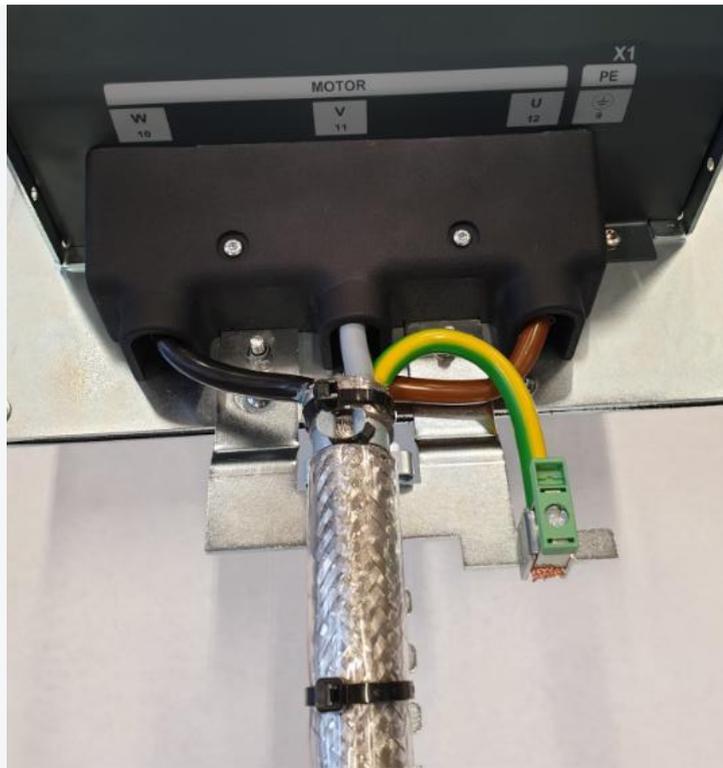
Prepare the motor cable according to section [5.3.1](#) on page [34](#) .

Connect the motor wires to the IMD connectors X1 MOTOR according to the wiring diagram and the instructions in section [5.2.1](#) on page [28](#).

IMD 122

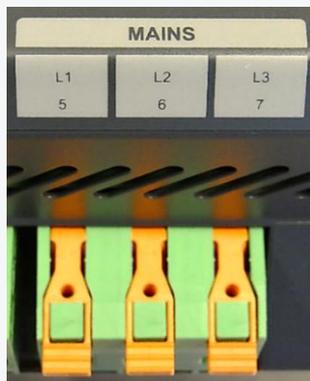


1. Prepare the motor cable according to section [5.3.1](#) on page [34](#) .
2. Press appropriate cable lugs on the three motor phases wires
3. Open the two Torx screws holding the cover (1), press the bottom of the cover outwards, and remove the cover (2)
4. Connect the motor wires to the IMD connectors X1 MOTOR according to the wiring diagram (3)
5. Torque the nuts (M8) according to [Table 1](#) on page [9](#)
6. Remount the cover and hand tighten the two screws holding it

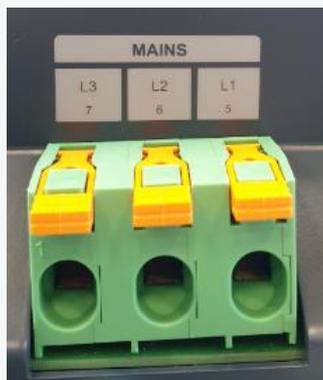


IMD 135

5.3.3 Connecting the mains



IMD 122



Connect the Mains wires to the IMD X1 MAINS connectors according to the wiring diagram and the instructions in section [5.2.1](#) on page [28](#).

IMD 135

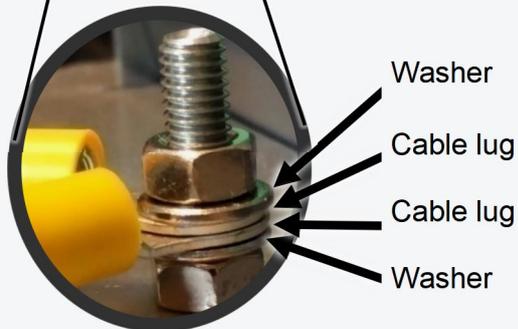
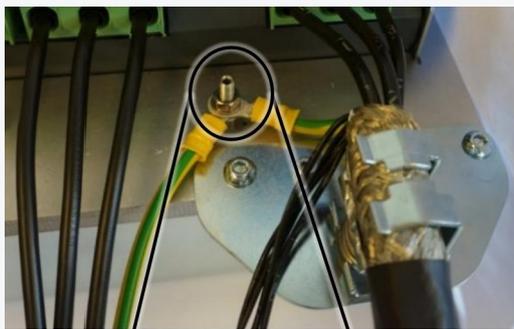
5.3.4 Connecting protective earth from mains and motor

5.3.4.1 IMD type C

Strip and connect the protective earth wires to the PE terminals using a flat blade screwdriver, hand tighten the screws:



5.3.4.2 IMD type A, B, and early production of C



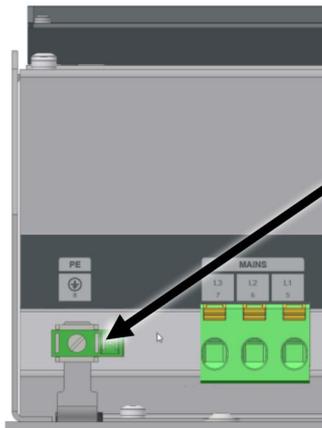
Connect the protective earth from the motor and the mains together on the earth terminal using cable lugs.

Use washers under and over the lugs as illustrated.

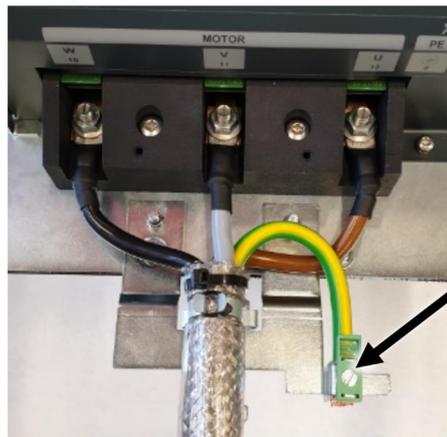
Tighten with an 8 mm wrench.

5.3.4.3 IMD 135 C

Strip and connect the protective earth wires to the PE terminals using a flat blade screwdriver, hand tighten the screws:



Mains PE



Motor PE

5.3.5 Earthing the shield of the motor cable

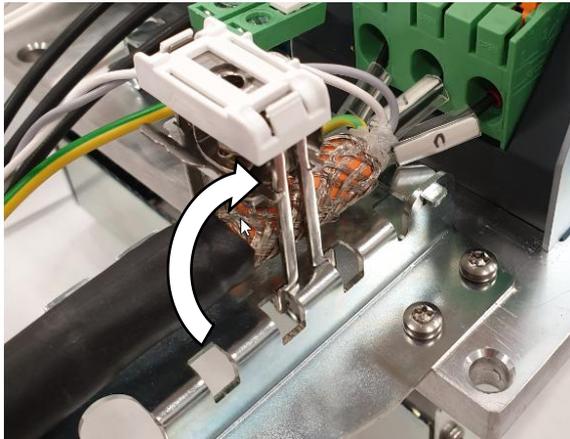
5.3.5.1 IMD 122 C

**Caution!**

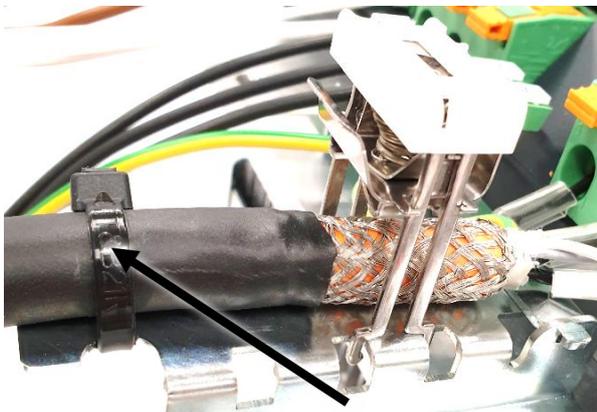
Hand or finger injury hazard.

Be careful with the spring-loaded plate

1. Place the shield clamp in the appropriate slot depending on the length of the wires, by tilting it and lifting to a vertical position. The spring-loaded plate must press the shield and not the shrinkable tube:

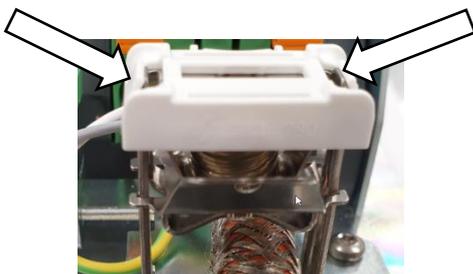


2. Fix the cable with a cable tie:



NOTE: If possible, add another cable tie on the other side of the clamp.

3. Press on both sides at the top of the clamp to release the spring-loaded plate:



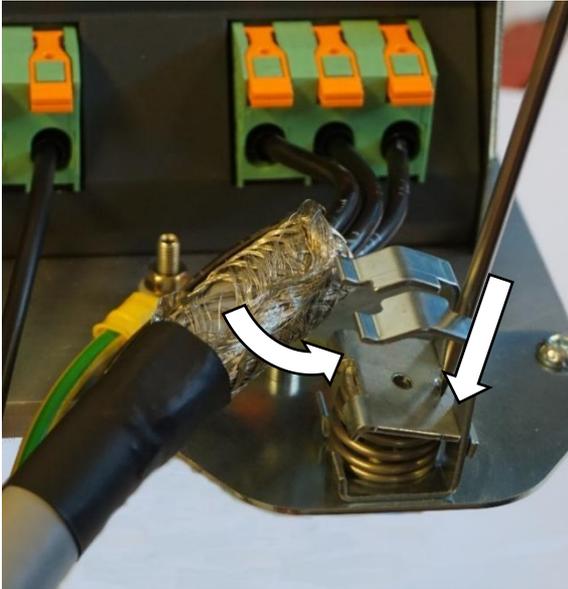
5.3.5.2 IMD 122 A, B, and early production of C



Use hand protection

Use hand protection to avoid hand injury from the screwdriver in case it slips.

1. Push the moving platform of the clamp down using a 3.5 mm flat blade screwdriver and insert the motor cable with the uninsulated shield into the clamp. Ensure that the brake wires shield(s) is either at the top or bottom of the clamp (not on the side)



2. Release the clamp

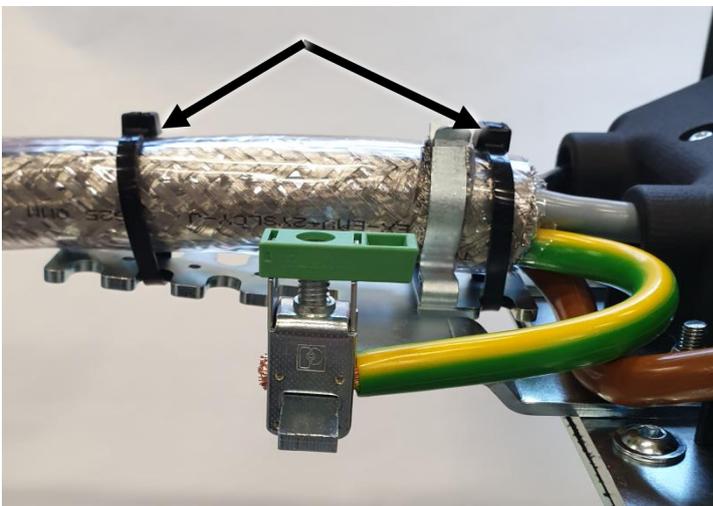


5.3.5.3 IMD 135 C

1. Push the cable into the shielding clamp. Ensure that the clamp is pressing the shield:



2. Fasten the cable with cable ties on both sides of the shielding clamp:



3. Fasten the shielding clamp with a cable tie:



5.3.6 Connecting safe energy

IMD 122B:

IMD 122B:



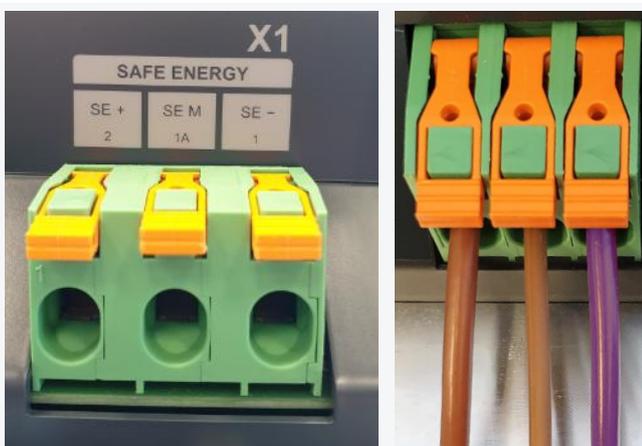
Connect the battery or Ultra Cap wires to the IMD X1 SAFE ENERGY connectors according to the wiring diagram and the instructions in section [5.2.1](#) on page [28](#).

IMD 122C:



Connect the battery or Ultra Cap wires to the IMD X1 SAFE ENERGY connectors according to the wiring diagram and the instructions in section [5.2.1](#) on page [28](#).

IMD 135C:



Connect the battery or Ultra Cap wires to the IMD X1 SAFE ENERGY connectors according to the wiring diagram and the instructions in section [5.2.1](#) on page [28](#).

5.3.7 Connecting external ballast resistor

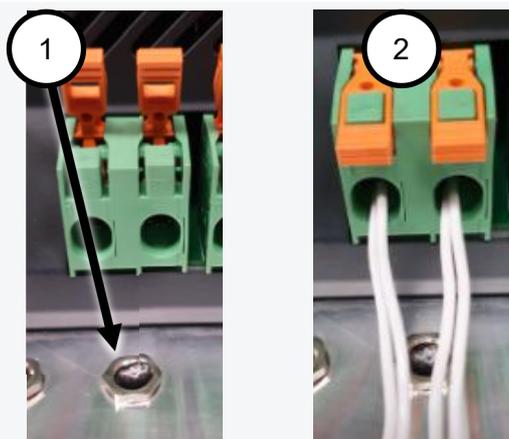
5.3.7.1 Option for IMD 122 C

If an external ballast resistor is used, connect the resistor's wires to the connectors.



Connect the resistor's wires to the IMD X1 R-BALLAST connectors according to the wiring diagram and the instructions in section [5.2.3](#) on page [30](#).

5.3.7.2 IMD 122 B



1. Disconnect the mounted wires and cut at the heatsink level.
2. Connect the resistor's wires to the IMD X1 R-BALLAST connectors according to the wiring diagram and the instructions in section [5.2.1](#) on page [28](#).

5.3.7.3 IMD 135 C

An external ballast resistor must always be connected to the IMD.



Connect the resistor's wires to the IMD X1 R-BALLAST connectors according to the wiring diagram and the instructions in section [5.2.1](#) on page [28](#).

5.4 Mounting peripheral connections (X2, X3, X4, X5, X6)

Connecting the peripheral motor connections depends on the actual motor used. The temperature sensor(s) connections may come in their own cables or as part of the resolver cable. It is recommended to use X4 (resolver connector) if the sensor cables are inside the resolver cable, and X3 if the sensor cables are separated from the resolver.

5.4.1 Connecting the brake

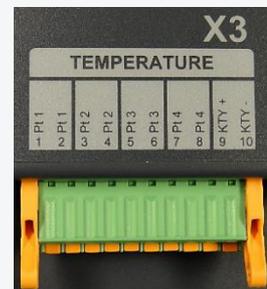


Connect the brake wires to the IMD X2 BRAKE connectors according to the wiring diagram and the instructions in section [5.2.2](#) on page [28](#).

Typically, the brake wires are in the motor cable. In this case the brake wires must bend directly at the end of the shield and not follow the motor wires (pos. 1, applies also for IMD 135).

5.4.2 Connecting the temperature sensors (X3, optional)

The motor temperature sensors (Pt4 and KTY) can be connected to the IMD through either X3 or X4. Never connect a sensor to both connectors.

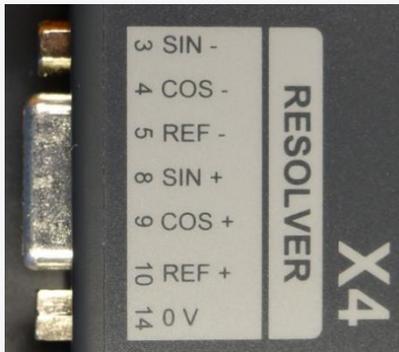


If applicable connect the sensors wires to the IMD X3 TEMPERATURE connectors according to the wiring diagram and the instructions in section [5.2.2](#) on page [28](#).



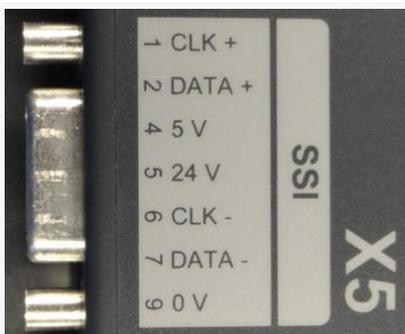
5.4.3 Connecting the resolver (X4)

The motor temperature sensors (Pt4 and KTY) can be connected to the IMD through either X3 or X4. Never connect a sensor to both connectors.



Mount a 15 pole D-sub male connector on the resolver cable according to the wiring diagram and the instructions in section [5.2.3](#) on page [30](#).
Connect the connector to X4 RESOLVER.

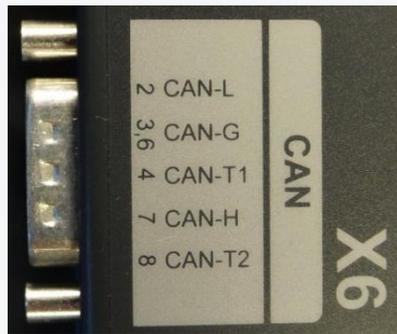
5.4.4 Connecting the SSI (X5)



Mount a 9 pole D-sub male connector on the SSI cable according to the wiring diagram and the instructions in section [5.2.3](#) on page [30](#).
Connect the connector to X5 SSI.

Note: The Synchronous Serial Interface (SSI) sensor is an optional component.

5.4.5 Connecting the CAN (X6)



Mount a 9 pole D-sub female connector on the CAN communication cable according to the wiring diagram and the instructions in section [5.2.3](#) on page [30](#).

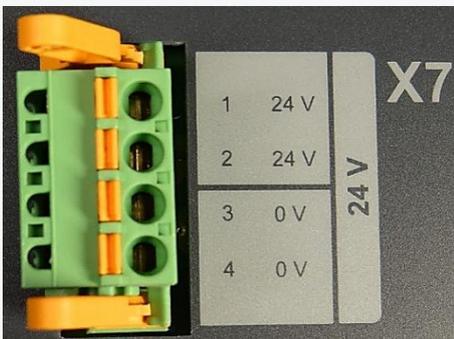
Connect the connector to X6 CAN.

5.5 Connecting 24V, digital and safety I/O (X7, X8, X9)

The following picture illustrates good workmanship for connecting X7, X8, and X9:

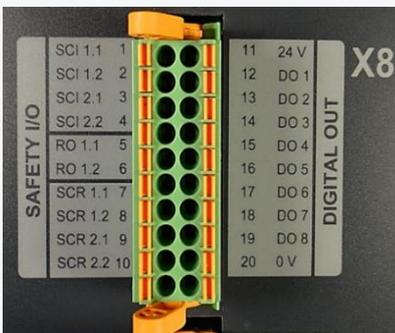


5.5.1 Connecting 24V (X7)



Mount the female FK-MCP 2.5 connector on X7 24 V, and connect the wires according to the wiring diagram and the instructions in section [5.2.2](#) on page [28](#).

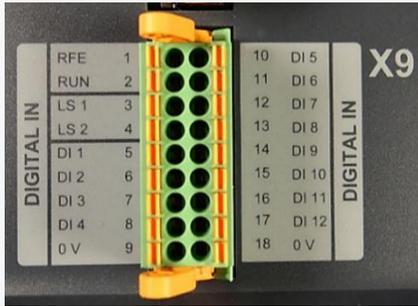
5.5.2 Connecting safety I/O and digital outputs (X8)



Mount the female FK-MCP 1.5 connector on X8 SAFETY I/O and DIGITAL OUT, and connect the wires according to the wiring diagram and the instructions in section [5.2.2](#) on page [28](#).

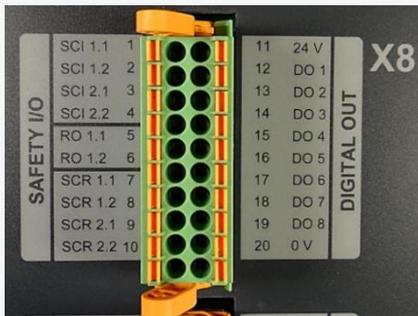
When connecting a digital output to another unit, the 0 V must also be connected to the same unit. A ferrule must be used if multiple wires are to be connected to the same terminal. Alternatively, the 0 V can be connected to another terminal in the cabinet, from which the 0 V can be distributed.

5.5.3 Connecting digital inputs (X9)

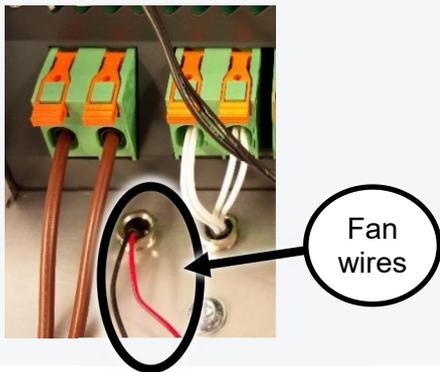


Mount the female FK-MCP 1.5 connector on X9 DIGITAL IN, and connect the wires according to the wiring diagram and the instructions in section [5.2.2](#) on page [28](#).

5.5.4 Connecting the fan (IMD 122 B only)

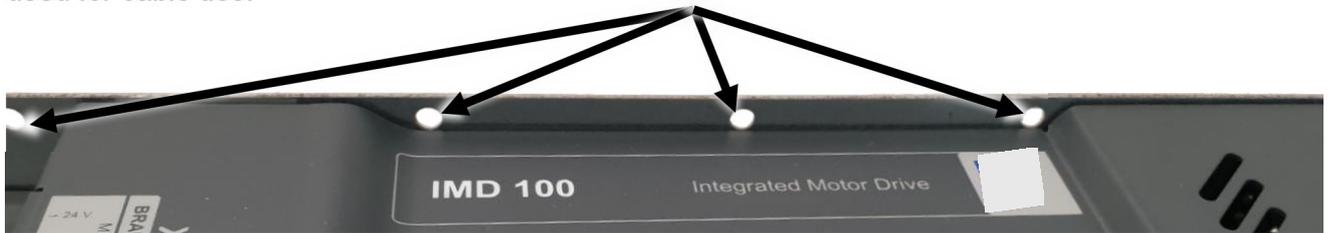


The fan wires are typically (check the wiring diagram) connected directly to DIGITAL OUT connector (X8). The location of the fan wires is indicated in the picture on the left.

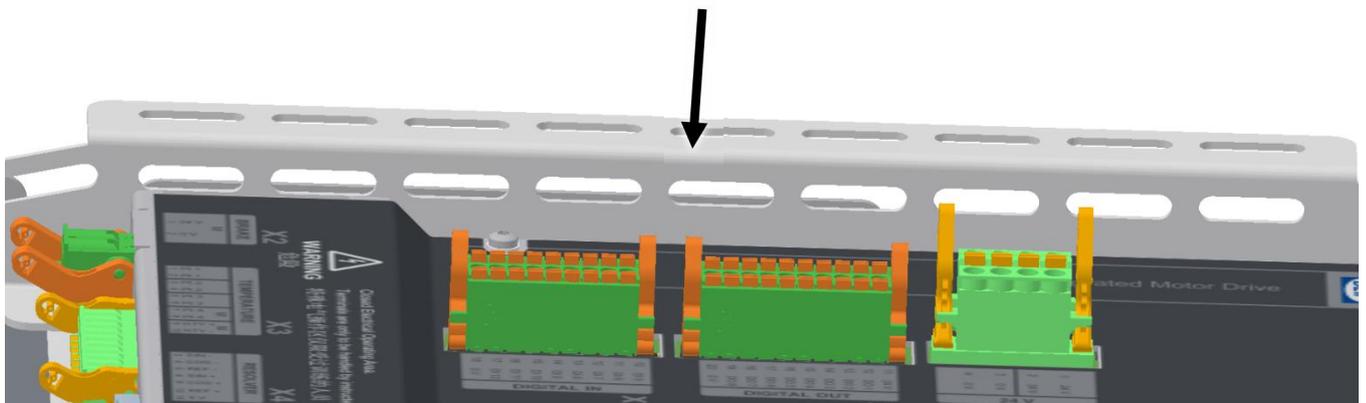


6. Finishing the installation

1. Fix all wires and cables with cable ties to the IMD or cabinet. Maximum wire or cable length from IMD connector to the cable tie should not exceed 15 cm. The holes on the side of the IMD can be used for cable ties:



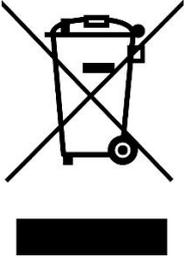
IMD 122



IMD 135

2. Clean the cabinet thoroughly with a vacuum cleaner when all installation tasks in the cabinet are finished. Debris may harm the IMD when the hub is rotating.

7. Disposal of the IMD



All products that are marked with the crossed-out wheeled bin (the WEEE symbol) are electrical and electronic equipment (EEE). EEE contains materials, components and substances that can be dangerous and harmful to people's health and to the environment. Waste electrical and electronic equipment (WEEE) must therefore be disposed of properly. In Europe, the disposal of WEEE is governed by the WEEE directive issued by the European Parliament. PRACTEK complies with this directive.

You must not dispose of WEEE as unsorted municipal waste. Instead, WEEE must be collected separately, to minimise the load on the environment, and to improve the opportunities to recycle, reuse and/or recover the WEEE. In Europe, local governments are responsible for facilities to receive WEEE. If you need more information on how to dispose of PRACTEK WEEE, please contact PRACTEK.

8. Revision history

Apart from editorial changes the following changes have been made in this revision:

Date	Revision	Changes
2021-01-29	D	<ul style="list-style-type: none"> IMD drawings updated with the latest IMD version
2020-06-29	C	<ul style="list-style-type: none"> Cross reference in “Connecting external ballast resistor” corrected “Package content”, “Required tools and accessories”, “Drilling and cutting mounting holes”, “Mounting accessories”, “Mounting the IMD” (with and without mounting frame), “Mounting power connections (X1)” updated with IMD 135
2020-01-15	B	<ul style="list-style-type: none"> “Finishing the installation” section added Overview in “Electrical terminations” updated Notes regarding cleaning of the cabinet added to “Drilling and cutting mounting holes” and “Electrical terminations” “Mechanical assembly” section updated with IMD type C Description of Phoenix SPT 2.5 connectors usage added to “Connecting wires to the different connector type” section “Mounting power connections” updated with descriptions for IMD type C “Connecting Safe energy for IMD 122C” added to “Connecting safe energy” section “Connecting external Ballast resistor” added to “Mounting power connections (X1)” section The section title “Connecting the fan” changed to “Connecting the fan (IMD 122 B only)” Screw sizes in “Mechanical assembly” corrected “Assembly drawing” section name changed to “Mounting accessories” and section updated
2016-12-02	A	This is the first version of the document.

9. Product user documentation

The IMD product has an extensive user documentation, targeted towards different audience and product use stages.

The following documents are part of the user documentation:

Table 6 IMD user documentation

Document	Target audience	Content
IMD 100 datasheet Document no.: 4921260015	Buyers and technicians of customers	Describes relevant specifications and give an overview of the IMD functions
IMD 100 function description Document no.: 4189360013	Mainly technicians and engineers of customers.	Describes the functions of the IMD. Gives the reader an understanding of the purpose of the IMD in a system, and which functions can be utilised in a pitch system. The functions are described so that the reader can understand what each function is used for.
IMD 100 integration manual Document no.: 4189360015	Engineers at customer R&D department	Describes how to integrate the IMD in a pitch system. Gives extensive knowledge about: IMD SW (parameters and how to achieve specific functionality) How to create customized parameter file for use in production Requirements for external interfaces/components
IMD Manager installation instructions Document no.: 4189360018	Engineers at customer R&D department, as well as commissioners and service personnel	Describes how to install the IMD Manager. The IMD Manager is an application used to configure and control the IMD using the Service USB connector.
IMD Manager user manual Document no.: 4189360019	Engineers at customer R&D department, as well as commissioners and service personnel	Describes how to use the IMD Manager. The IMD Manager is an application used to configure and control the IMD using the Service USB connector.
IMD 100 installation instructions Document no.: 4189360005	Technicians at production site where the IMD is mounted in the cabinet/hub	Describes how to mount, connect and perform initial start, test, and configuration (using a configuration file) of the IMD at production.
IMD 100 initial configuration and verification manual Document no.:	Commissioners or other personnel with similar qualifications, as well as service personnel (for SW upgrade)	Describes how to upgrade the IMD SW, how to load configuration file, and how to verify the IMD installation to the possible extent.

Document	Target audience	Content
4189360016		
IMD 100 service and maintenance manual Document no.: 4189360017	Service and warehouse personnel	Describes preventive (scheduled) and corrective maintenance of the IMD, as well as storage requirements.
IMD 100 installation checklist Document no.: 4189360021	Technicians at production site where the IMD is mounted in the cabinet/hub	Installation tasks with check boxes to document the tasks done during installation
IMD 100 configuration and verification checklist Document no.: 4189360022	Commissioners or other personnel with similar qualifications, as well as service personnel (for SW upgrade)	configuration and verification tasks with check boxes to document the tasks done during configuration and verification
Addendum to installation manual Document no.: 4189360023	Integration and installation personnel	Describes the how to replace a pitch drive when the IMD is equipped with Retrofit wiring harness var.1

The IMD 100 documentation is written anticipating an OEM (original equipment manufacturer) product use-cycle in a wind turbine. The envisioned cycle is described in the following figure. The description also explains the tasks, who is expected to execute the task, the location where the execution takes place and the supporting PRACTEK documentation for the task. Many details in these tasks depends on the actual implementation, which is why the IMD documentation will never stand alone.

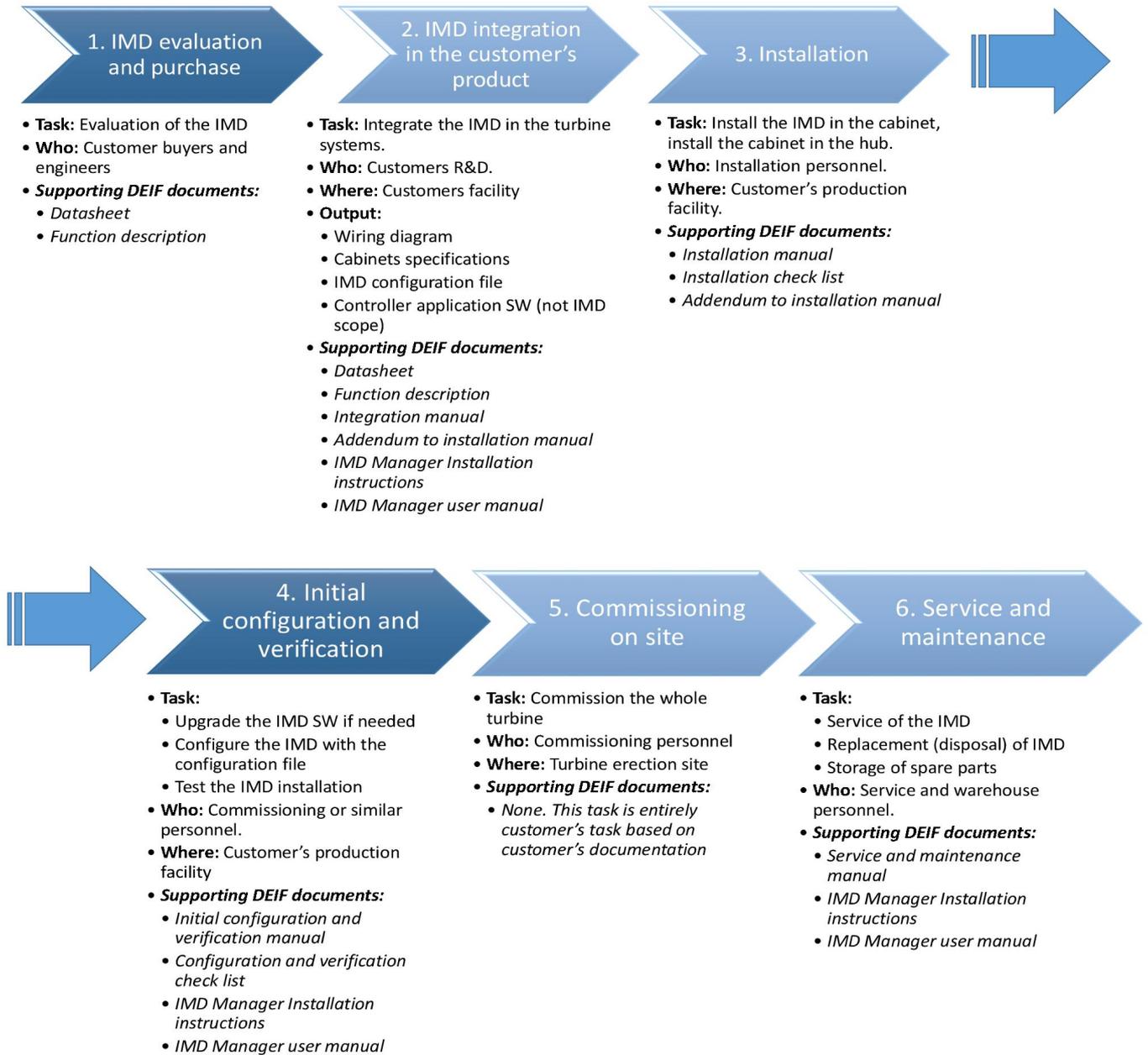


Figure 11 Tasks and documentation overview

The described product use-cycle might not apply as is for all customers, but the tasks are universal and can therefore be adapted. For example, if the SW upgrade, configuration and verification is done during the turbine commissioning, the applicable documentation can be used at this stage instead of a separate stage at the end of production.

10. Glossary

10.1 Terms and abbreviations

CAN	Controller Area Network (communication protocol)
IMD	Integrated Motor Drive
SCI	Safety-Chain Input
SCR	Safety-Chain Relay
SE	Safe Energy
SSI	Synchronous Serial Interface
USB	Universal Serial Bus

10.2 Units

Unit	Unit Name	Quantity name	US unit	US name	Conversion	Alternative units
A	ampere	Current				
°C	degrees Celsius	Temperature	°F	Fahrenheit		
g	gram	Weight	oz	ounce	1 g = 0.03527 oz	
Hz	hertz	Frequency (cycles per second)				
kg	kilogram	Weight	lb	pound	1 kg = 2.205 lb	
Nm	Newton metre	Torque				
m	metre	length	ft	foot (or feet)	1 m = 3.28 ft	
mA	milliampere	Current				
mm	millimetre	Length	in	inch	1 mm = 0.0394 in	
ms	millisecond	Time				
RPM	revolutions per minute	Frequency of rotation (rotational speed)				
s	second	Time				
V	volt	Voltage				
V AC	volt (alternating current)	Voltage (alternating current)				
V DC	volt (direct current)	Voltage (direct current)				
W	watt	Power				
Ω	ohm	Resistance				