# CADMATIC

## CADMATIC Electrical Drawing a schema

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### 1. Introduction

This guide introduces you to the CADMATIC Electrical, Schematics application. You will learn to create wiring diagrams, as well as draw cables and distribution board's internal wires with the database functions. The database functions excluded, this exercise is suitable for both CADMATIC Electrical Premium and Basic users.

In this exercise, we create a wiring diagram for a motorized valve. You will find the <u>example drawing</u> at the end of this guide.

**Note:** This exercise is based on CADMATIC Electrical version 2024T2. In other versions, some of the functions may work differently.

### 2. Start a drawing

With the drawing creation function, you can start a new electrical drawing and be sure that all the necessary settings are defined.

#### Do the following:

1. Select **Electrical** tab > **Documents** group > **New**.

The Start a new Electrical drawing dialog opens.

- 2. Define the following:
  - Drawing type Multi-line diagram
  - **Project directory** Draw 24 English\Samples\Electrical\Schema
  - **Drawing name** *Multiline\_exercise.drw*

If you are using the Premium level, you can add the drawing file to the project. This guide, however, will focus on drawing without the database.

3. Click OK.

Next, we will define the general project information that can be updated to the drawing frame.

In the **Electrical** window, open the settings by right-clicking *Multiline\_exercise.drw* and selecting **Project information/settings**.

The **Project information/settings** dialog opens. Fill in the information related to the project:

DB Proje	ect information / setti	igs	—	$\times$
6	5			
^ Tai	rget information			
Pr	oject name	Example project		
Pr	oject description			
Та	rget data 1			
Та	rget data 2	Address		
Та	rget data 3	City		
Та	rget data 4			
Та	rget data 5			
Та	rget data 6			
Di	strict			
	1-			

Click **Save**, and go to the drawing file to create the first sheet, SLEHTI1, by clicking the Greate new sheet) button in the **Frames and sheets** group on the **Schematics** tab.

The program also changes this sheet as the active sheet (layer SLEHTI1, SLEHTI2, etc.). The default drawing frame is also inserted on this sheet automatically.

### 3. Fill in drawing frame values

The drawing frame includes attributes for which you can define the desired values.

#### Do the following:

1. On the Schematics tab, in the Frames and sheets group, click the 妃 (Edit frame/label information) button.

The Sheet management dialog opens.

- 2. Define the following:
  - Drawing number 9.8.1-5
  - Object ID -= 123
  - Electrical position +MCC1
  - Title 1 PES mode
  - Title 2 Motor valve
  - Title 3 Continuous duty

Copy	na sheets Paste	X Remov	e Reor	der 💾 Add	new shee	t Copy	es	e Paste to same	
Sheet	T She	ets: T Object	ID: T	Electrical pos	sition: T	Title 1:	_	Title 2:	Title 3:
<b>I</b>	1	=123		+MCC1		PES mode		Motor valve	Continuous duty
Drawing Object II	number: ):	9.8.1-5	Job Elect	number: rical position:	1234 +MCC1	•	Title 1: Title 2: Title 3:	PES mode Motor valve Continuous duty	·
Date, pa	ticipants,	etc.					Revisions		
Date:		1.9.2024	Desi	gner:		-	A rev.:	• D rev.:	-
Drawer:			Che	cker:			B rev.:	- E rev.:	
Sheet:		1 1	Drav	ving group:			C rev.:	- F rev.:	-

3. Click **OK**. The values are updated to the drawing frame:

Example project	PFS mode	Desig. /13.2.2024	Object ID =123	Electrical position +MCC1	Job no.
Address City	Motor valve Continuous duty	Draw. Check.	Sheet Drawing 1/1	9.8.1-5	

4. Save the drawing by clicking the  $\Box$  button on the quick access toolbar.

### 4. Draw main circuit

### 4.1. Set ortho on

First, let's set ortho on, as it makes wiring and other designing easier.

On the Tools tab, in the Drawing settings group click the Ortho menu and select Ortho angle 45.



This will set the ortho on with an angle of 45.

### 4.2. Draw a 3-phase voltage supply bar

Let's first add a 3-phase voltage supply bar in the drawing.

- 1. Select **Schematics** tab > **Wiring** group > **Draw busbars**. The **Draw busbars** dialog opens.
- 2. Define the settings as in the following image:

raw busbars		
L1 400%C, 504z		
Crossing wires	D:	Busbar texts:
	<supply>            L1          4</supply>	400VAC, S0HZ V
		O Module spacing
		Module spacing x 2 Module spacing x 2
		Generat N/M has position
2	PE ~ 2 ~	Point N/M-bar position
Load Save	ОК	Cancel Help

- 3. Click OK.
- 4. Indicate the starting point for the busbar.
- 5. Indicate the ending point for the busbar.

6. Stop drawing by right-clicking.



You can assign an ID to a busbar, just like to any other device. The ID will later be found in the **Devices** project tree (see Edit IDs).

### 4.3. Draw 3-phase wiring

Let's continue by drawing a new busbar from the same starting point without the N and PE wires.

Do the following:

- 1. Select **Schematics** tab > **Wiring** group > **Draw busbars**. The **Draw busbars** dialog opens.
- 2. Define the settings according to the following image.

Crossing wires	□D:		Busbar texts:
Crossing wires	D: <supply></supply>	~	Busbar texts: 400VAC, 50Hz
Crossing wires	SUPPLY>	<ul> <li>✓</li> <li>▲ 4</li> </ul>	Busbar texts: 400VAC, 50Hz Drawing spacing
Crossing wires	SUPPLY>	<ul> <li>✓</li> <li>▲ 4</li> <li>✓</li> <li>▲ 4</li> <li>✓</li> </ul>	Busbar texts: 400VAC, 50Hz Drawing spacing Module spacing
Crossing wires	SUPPLY>		Busbar texts: 400VAC, 50Hz  Drawing spacing Module spacing Module spacing x 2
Crossing wires	D: <supply>           L1           L2           L3</supply>	↓     ↓       ↓     ↓       ↓     ↓       ↓     ↓	Busbar texts: 400VAC, 50Hz  Drawing spacing Module spacing Module spacing x 2 Module spacing x 3
Crossing wires	ID: <supply>           L1           L2           L3           N</supply>	✓       ▲ 4       ▲ 4       ▲ 4       ▲ 4       ▲ 2	Busbar texts: 400VAC, 50Hz  Drawing spacing Module spacing Module spacing x 2 Module spacing x 3 Const N/M-bar position

Note: Make sure to select Crossing wires.

- 3. Click OK.
- 4. Indicate the wiring point (= yellow square) for L1.
- 5. Move your mouse approximately halfway of the wire and click.

- Move your mouse downwards, and change the space between wires bigger by pressing Shift + Tab.
- 7. Indicate the end of wiring to the bottom part (row R) of the drawing.



8. Stop drawing by right-clicking.

### 4.4. Insert symbols

Let's insert the main circuit symbols next. While doing that, follow the command line instructions (Tab and F8).

- 1. Open the **Symbols** window by clicking **Symbols** in the **Devices** group. The window stays open on the screen until you choose to close it.
- 2. Select Motors.
- 3. Insert the 3-phase motor symbol by double-clicking it, or by right-clicking it and selecting **Insert symbol to drawing**:



**Note:** When you insert a symbol on a wire, the program cuts the wire. Wire information is also removed.

4. Enter *M01* as the motor symbol ID, and click **OK**.

review	Attributes				
	ID:	M01	~	ID	G
	Electrical position:				
	Object ID:			Location	
IM WH	Type:				
	Manufacturer:				
	Power:				
[" M @}	Current				
\ 3~ /	Rotation speed:				
	Connector 1:	U1			
	Connector 2:	V1			
	Connector 3:	W1			
	PE connector:	PE			
	PE connector.	PE			

5. Remove the extra lines from the drawing.



6. In the **Symbols** window, select **Safety switch** and insert the safety switch symbol:



7. Enter *Q10* as the safety switch symbol ID, and click **OK**.

8. In the **Symbols** window, select **Contactors** and insert the contactor symbol:

Syml	bols				⊞
*****	<del>~~ 1</del> 5	<del>111 (16</del>	<del>((((</del> #	******	
946-685E	weeks	WHERE NO.	WE LEN	***-00088	
<del>(** 0008</del>	<del>3/15 77</del> 2	<del>(((())</del>	<del>((( 1118</del>	*** *****	
·····	<del>w caxax</del>	2	$\begin{pmatrix} d^1 \\ - \\ 2 \end{pmatrix}_4^{d^3}$	$\left( \begin{array}{c} d^1 & d^3 & d^5 \\ d^2 & d^4 & d^6 \end{array} \right)$	
K#K	ż	Ħ	222	2222	

- 9. Enter Q01 as the contactor symbol ID, and click OK.
- 10. Insert another symbol into the drawing, and enter Q02 as the ID.

Tip: To insert the same symbol again, you do not need to go to the symbol menu. Instead, right-click to insert it.

11. In the Symbols window, select Protective devices and insert the protective device symbol:



12. Enter Q11 as the protective device symbol ID, and click OK.

### 4.5. Draw wires

Let's draw wires from Q01 to Q02. We will later define them as distribution board's internal wires.

Important: You should always draw from wiring point to another, so that the application will find the right connections when updating the databases. During wiring, wiring points are indicated with yellow squares.

#### Do the following:

- 1. Select to draw main circuit:
  - In Premium: Select Schematics tab > Wiring group > Draw wiring, and then select main circuit as the wire type.
  - In Basic: Select Schematics tab > Wiring group > Draw wiring menu > Draw wire (main circuit).
- 2. Select Q01:1 as the starting point.
- 3. Select **Q02:1** as the ending point.
- 4. Stop drawing by right-clicking.
- 5. Restart wiring by right-clicking, and continue as follows:
  - Q01:3 > Q02:3
  - Q01:5 > Q02:5
  - Q01:2 > Q02:6
  - Q01:4 > Q02:4
  - Q01:6 > Q02:2

Tip: You can draw a chamfer by pressing Tab during drawing.

### 4.6. Insert terminal blocks

Let's insert the **X02** terminal blocks into the drawing. The **X02** ID is only visible in the **L1** terminal block but it still needs to be inserted to all terminal blocks.

- 1. In the **Symbols** window, select **Terminals**.
- 2. Insert the terminal block symbol by double-clicking it or by right-clicking it and selecting **Insert** symbol to drawing. The **Insert terminal block / connector** dialog opens.
- 3. Define the following information:
  - ID X02
  - Number L1
  - Select Visible ID and Only first ID visible.
  - Number of symbols and insertion mode Space evenly, 4

Find:	Part	Direc	tion		
	× • 0	÷ 01	Vertical	OHorizonta	
d- Multiline_exercise.drw	Number Part nu	mber Type			_
		0	Terminal block		
i			Plug connector	•	
			Device connector	Select	
		ID:	X02		
		Number	: 11		
		Position	of ID: Up		
			Automatic increr	ment	
		2	Visible ID		
		2	Only first ID visit	ble	
		Num	ber of symbols a	nd insertion mode	
		0	One by one		
		0	Space evenly	4 pc	s
		0	Line crossing		
			ок Са	ncel He	lp

- 4. Click OK.
- 5. Insert the terminal block by indicating its location.
- 6. Insert the next terminal block.
- 7. Double-click the L4 terminal block, and change the number to PE.

#### 4.7. Draw protective earthing conductors

Let's draw two protective earthing conductors. Wiring can be drawn from the terminal blocks straight to the motor, because the wiring function knows to cut the wires when meeting security switches.

#### Do the following:

- 1. Select to draw main circuit:
  - In Premium: Select **Schematics** tab > **Wiring** group > **Draw wiring**, and then select main circuit as the wire type.
  - In Basic: Select Schematics tab > Wiring group > Draw wiring menu > Draw wire (main circuit).
- 2. Select **X02:PE** as the starting point.
- 3. Select M01:PE as the ending point.

#### 4.8. Edit IDs

Let's exclude the safety switch and the motor from the distribution board **+MCC1** by adding them the object ID **=123**. This way, they will not end up in the **+MCC1** device list.

#### Do the following:

- 1. Select the symbols **Q10** and **M01**.
- 2. Right-click and select Attribs. The Edit Attributes dialog opens.
- 3. Define **=123** as the object ID.

Attribute	Value
ID:	=123
Electrical position:	
Object ID:	
Elec. 1:	
Type:	
Manufacturer:	I
Position 1:	0
Position 2:	1
1st main contact's upper number:	1
1st main contact's lower number:	2

4. Click OK. The full IDs are now =123-Q10 and =123-M01

The motor **M01** and the safety switch **Q10** now belong to the object ID **=123** but are not devices of the electrical position (distribution board) **+MCC1**.

### 4.9. Draw area boundaries

Let's draw boundaries around the safety switch and the motor.

Note: The boundaries only indicate that the safety switch and the motor do not belong to the distribution board +MCC1. We only draw these boundaries to make the drawing easier to read; the application will not take it into account in any way. Components have been excluded from the distribution board with an ID: for example, =123-M01 means that the motor M01 belongs to =123 but is not a component of +MCC1.

#### Do the following:

- 1. Select **Home** tab > **Draw** group > **Line**.
- 2. In the **Properties** group, select the color **2** (red) from the drop-down menu.



- 3. Below the color drop-down menu, select **DASHDOT** as the line type.
- 4. Draw the lines.

Note: After drawing, change the line type back to CONTINUOUS.

### 5. Draw control circuit

### 5.1. Draw control voltage busbar

We will start drawing the control circuit by first drawing a busbar, using the same function as for the 3-phase voltage supply bar.

#### Do the following:

- 1. Select **Schematics** tab > **Wiring** group > **Draw busbars**. The **Draw busbars** dialog opens.
- 2. Select settings according to the following image.

Note: Make sure to select Point N/M-bar position.

aw dusdars		
		2L1 · 2N · · · · · · · · · · · · · · · · ·
211		
2N		
Crossing wires	🖂 ID:	Busbar texts:
	<supply> ~</supply>	×
	<supply> ~</supply>	Drawing spacing
	<supply> ~</supply>	Drawing spacing
	<supply> &gt; L1 &gt; 4 &gt;</supply>	Drawing spacing Module spacing
	<supply>     &gt;       L1        L2        4     &gt;</supply>	Drawing spacing Module spacing Module spacing x 2
	<supply>     &gt;       L1        L2        L3</supply>	Drawing spacing Module spacing Module spacing x 2 Module spacing x 3
	<supply>     &gt;       L1        L2        L3</supply>	Drawing spacing Module spacing Module spacing x 2 Module spacing x 3
	<supply>     &gt;       L1     •       L2     •       L3     •       2L1     •</supply>	Drawing spacing Module spacing Module spacing x 2 Module spacing x 3 Const N/M-bar position
	<supply>     &gt;       L1     4       L2     4       L3     4       2L1     2       2N     2</supply>	Drawing spacing     Module spacing     Module spacing x 2     Module spacing x 3     Const N/M-bar position     Point N/M-bar position
	<supply>       &gt;         L1       •       •         L2       •       •         L3       •       •         2L1       •       •         2N       •       •</supply>	Drawing spacing Module spacing Module spacing x 2 Module spacing x 3 Const N/M-bar position Original N/M-bar position

- 3. Indicate the starting point for **2L1**.
- 4. Indicate the ending point for **2L1**.
- 5. Indicate location for **2N** vertically as low as possible so that the auxiliary contact packs will still fit below it.

### 5.2. Insert coils

Next, we will insert control circuit symbols according to the example drawing. Let's start with coils.

#### Do the following:

1. In the In the **Symbols** window, select **Coils** and the coil symbol:



- 2. Insert the symbol two raster points (2x3,5mm) above **2N**.
- 3. Define the following:
  - Coil ID From the drop-down menu, select =123+MCC1-Q01. The =123+MCC1 part will be removed when the symbol is inserted because the same information is included in the drawing frame.
  - Coil upper number A1
  - Coil lower number A2

Symbol attributes					×
Preview	Attributes				
	Coil ID:	=123+MCC1-Q01	$\sim$	ID	R
	Electrical position:				
1	Object ID:			Location	
	Coil upper number:	A1			
	Coil lower number.	A2			
		ОК	Cano	el Hel	p

- 4. Click OK.
- 5. Insert the coils **Q02**, **K91** and **K9**2. You cannot select **K91** and **K92** from the drop-down menu so you need to enter them manually.

### 5.3. Insert auxiliary contacts

Let's insert auxiliary contacts below the coils.

#### Do the following:

1. In the **Symbols** window, select **Contact packs** and insert the contact pack symbol:



- 2. Select Q01 as the contact pack ID, and click OK.
- 3. Insert another symbol into the drawing, and select Q02 as the ID.

Tip: To insert the same symbol again, you do not need to go to the symbol menu. Instead, right-click to insert it.

4. In the Symbols window, select Contact packs and insert the contact pack symbol:



- 5. Enter *K91* as the contact pack ID, and click **OK**. You cannot select the ID from the drop-down menu so you need to enter it manually.
- 6. Insert another symbol into the drawing, and enter *K92* as the ID. You cannot select the ID from the drop-down menu so you need to enter it manually.

#### 5.4. Insert contacts

Let's insert contacts according to the example drawing. The cross-references for the auxiliary contact pack and the contact are automatically added.

#### Do the following:

1. In the **Symbols** window, select **Contacts** and insert the contact symbol:



- 2. Define the following:
  - ID From the drop-down menu, select =123+MCC1-Q01.

The **=123+MCC1** part will be removed when the symbol is inserted because the same information is included in the drawing frame.

- **Contacts upper number** From the drop-down menu, select **21** (available after the auxiliary contact pack has been inserted).
- **Contacts lower number** From the drop-down menu, select **22** (available after the auxiliary contact pack has been inserted).

Symbol attributes				×
Preview	Attributes			
	ID:	=123+MCC1-Q01	ID	R
	Electrical position:			
1	Object ID:		Location	
	Cross reference:			
	Pins			
	Contacts upper numb	21		
	Contacts lower numb	22 ~		
		OK Car	ncel Hel	p

When inserting the next contact, you can see the contacts already inserted: 1/25 = sheet 1, wiring reference pair 25:

Preview	Attributes			
	ID:	=123+MCC1-Q01	ID	k
	Electrical position:			
	Object ID:		Location	
	Cross reference:			
	Pins			
/	Contacts upper nur	nb	$\sim$	
	Contacts lower nun	nb 1		
		3		
(		5		
		21 -> 1/25		
l l		-> 1/23		
			_	

3. Insert the other contacts.

Tip: You can find the desired symbols quickly by entering the full symbol name in the **Symbols** window search field.

- Opening contact 21/22 for contactor Q02, symbol name Normally-closed contact
- Contactor 1/2 for the circuit breaker F10, symbol name Circuit breaker
- Normally-open contact 13/14 for the motor protection switch Q11, symbol name Normally-open contact
- Normally-open contact 13/14 for the safety switch Q10, symbol name Normally-open contact

Note: The ID is left empty as it will be taken from the device boundary =123-Q10.

• Contact 19/20 for motor's thermal protector **F1**, symbol name **Thermal protector**, **normally-closed contact** 

### 5.5. Insert change-over contacts

Let's insert change-over contacts next.

#### Do the following:

1. In the **Symbols** window, select **Contacts** and insert the change-over contact symbol:



- 2. Define the following:
  - ID *K10, K20*
  - Contact's 1st upper number and Contact's 2nd upper number 12 and 14
  - Contact's lower number 11
- 3. Click **OK**.

### 5.6. Draw device boundaries

Next, we will create device boundaries (=123-Q10 and =123-M01) with which you can define drawing elements for specific devices.

Tip: The ID for the bounded area can be added to the drawing as one text or three separate texts (objet ID, electrical position, and device ID). In addition, you can locate the text either inside or outside the bounded area. The bounded area can include all kinds of elements.

- Select Schematics tab > Other functions group > Boundaries menu > Device boundary. The Device boundary dialog opens.
- 2. Define the following:
  - **Object ID** =123
  - ID Q10; with the (Browse) button, you can easily select the device from the project tree:

Device bounda	ry	×	
Data Appeara	nce		
Object ID: Electrical position:	123		
ID: Type:	Not defined		
Description:	pe	Select Location/Device Search:	×
<ul> <li>Rectang</li> <li>Polygon</li> </ul>	le	Multiline_exercise.drw ====================================	

- 3. Indicate the first corner of the bounded area.
- 4. Indicate the second corner of the bounded area.

Note: If you need to edit the bounded area (the size or the shape) later, select it, right-click and select **Redefine bounding area**.

5. Create device boundaries for =123-M01 as described.

### 5.7. Insert terminal blocks

Let's insert control circuit terminal blocks next. We will first insert eight terminal blocks at once, to location (distribution board) **+MCC1**.

#### Do the following:

- 1. In the **Symbols** window, select **Terminals** and insert the terminal block symbol. The **Insert terminal block / connector** dialog opens.
- 2. Define the following information:
  - **ID** *X10*
  - Number 1
  - Select Visible ID.
  - Make sure **Only first ID visible** is not selected.
  - Number of symbols and insertion mode One by one, 8 (all terminal blocks of terminal strip X10)
- 3. Click OK.
- 4. Indicate the base point for the terminal block (= location): X10:1 inserted to 2N.
- 5. With your mouse, indicate the direction where you want to add the terminal block number and click.
- 6. Insert the other terminal blocks one by one:
  - X10:28
  - X10:PE (2 pieces)

Note: Leave the device terminal block ID empty as it will be taken from the device boundary.

### 5.8. Draw internal wires

Let's draw distribution board's internal wires next. The function is otherwise similar to drawing a control circuit but we also add wire information which is needed when creating a wiring report.

#### Do the following:

- 1. Select to draw main circuit:
  - In Premium: Select **Schematics** tab > **Wiring** group > **Draw wiring**, and then select control circuit as the wire type.
  - In Basic: Select **Schematics** tab > **Wiring** group > **Draw wiring**.
- 2. Select the other end of **2L1** (= the yellow square) as the wire's starting point.

Important: You should always draw from wiring point to another, so that the application will find the right connections when updating the databases. During wiring, wiring points are indicated with yellow squares.

- Select X10:1 as the ending point. You can draw the wire across symbols as the functions knows to cut the wire, for example, 2L1 > X10:3 > F10:1, F10:2 > Q11:13, Q11:14 > X10:4.
- 4. Finalize the wiring for the control circuit according to the example drawing.

### 6. Mark wires

Next, we'll add cable markings for cables W10 and W11 into the drawing.

- 1. Select Schematics tab > Markings group > Cable.
- 2. Draw cable accross the wires: first indicate the first point from the right side of the wire, then indicate the second point from the left side.
- 3. Add **W11** as the ID, and define the other information according to the following image.

Cable							×
ID:	W11				~	New	ОК
							Close
From							Help
	om Location om Device	=123+MC0	51	~	•••	Pick	
	Location						
<u>О</u> то	Device	=123		~		Pick	
Length/qu	antity:		]	Voltage:		~	
Spare ar	mount:		m				
Su	ipplier:		~	Installer:			~
	Class: Inst	allation cable		Remarks:			~
Hid	le type info in	cable markin	g				
Cable type							
	Filter:					Cable type	management

- 4. Because there are no cables defined for the project, add the cable:
  - a. Click Cable type management.
  - b. In the **Global filter** field, enter *MMO* 7x1,5.

c. Double-click the cable to add it to the project.

DB	Cable	type manage	ement										×
Sta	andar	d databases	Shared databases Of	ther proje	ct					Global filt	er D 7x1,5		
Dr	ag a co	lumn header and	d drop it here to group by the	at column									
		Item code	τ Electrical code τ	gtin T	Cable type	۲	Cable type 2	T Manufacturer T	Class, English	T Diameter	Weight	T Pair ca	a 🔭
	٠	0411822	0411822		MMO 7x1,5 VA		7x1,5	Kajote	Control cable	11.2	208		
	۲	0411829	0411829		MMO 27x1,5 VA		27x1,5	Kajote	Control cable	20.2	727		-
	٠	0411831	0411831		MMO 37x1,5 VA		37x1,5	Kajote	Control cable	22.5	914		
	٠	0412012	0412012		MMO 7x1,5 S		7x1,5	Prysmian Group	Control cable	12	210		
	٠	0412016	0412016		MMO 7x1,5 N		7x1,5	Prysmian Group	Control cable	12	210		
	٠	0412025	0412025		MMO 27x1,5		27x1,5	Prysmian Group	Control cable	21	680		
	٠	0412026	0412026		MMO 37x1,5		37x1,5	Prysmian Group	Control cable	24	900		
>	٠	0412822	0412822		MMO 7x1,5		7x1,5	REKA	Control cable	11	203		
_	+	0412825	0412825		MMO 27x1,5		27x1,5	REKA	Control cable	20	663		*
Q	uanti	ty: 20 ¥	Copy to shared		Add to project	pdate sele	cted					•••	,
$\odot$	Pack	ages											
	fault	project cable	types										_
	ioun	broject cable	i den it han to serve butto										
	ig a co	to and the adder and	storop in mere to group by the		T au	_	el a u a a	-	Ta ru		-	<b>T</b> a t	
		Item code	Electrical code	GIIN	Cable type		Cable type 2	Manufacturer	Class, English	Diameter	Weight	Pair	cabl
	٠	0412822	0412822		MMO 7x1,5		7x1,5	REKA	Control cable	11	203		_

- d. Close cable type management.
- 5. In the Cable dialog, click OK.
- 6. Assign the cable in the drawing to this cable, and click **OK**.
- 7. Insert the cable mark by following the command line instructions.
- 8. Mark the control circuit wires according to the example drawing.
- 9. Connect and mark cable **W10** in the same way, according to the example drawing.

### 7. Add cable marking

Next, we will connect and mark the cables W01 and W02.

- 1. Select Schematics tab > Markings group > Cable.
- 2. Draw the cable line across the wires: indicate the first and second points.
- 3. Define the cable information:
  - a. Select the safety switch cable **W01**.
  - b. For From and To, select From Device and To Device.
  - c. Select Cable type management, and find the cable type MCMK 3x1,5/1,5.
  - d. Click OK.
- 4. Mark the cable and wire information to the drawing.
- 5. Indicate the ending point for the cable marking.
- 6. Connect and mark cable **W02** in the same way.

### 8. Create the next sheet

The first sheet (SLEHTI1) is now ready, and we can continue by drawing the second sheet (SLEHTI2). We will also copy label information from the first sheet to the second.

#### Do the following:

- 1. Select Schematics tab > Frames and sheets group > G (Create new sheet).
- Still in the Frames and sheets group, click the (Edit frame/label information) button. The Sheet management dialog opens.
- 3. Select the whole **Sheet 1** row.
- 4. In the Label values section, click Copy.
- 5. Select the whole **Sheet 2** row.
- 6. In the Label values section, click Paste.

trical Schema sheets	× Pomovo	Boordor Add r	Label va	ues	En Dasta ta sama	
Sheet: T She	ets: T Object ID:	Electrical posit	tion: T Title 1:		Title 2:	Title 3:
Numbers and IDs				Drawing na	ame	
Drawing number:	9.8.1-5	Job number:	1234 -	Title 1:	PES mode	•
Object ID:	=123	Electrical position:	+MCC1	Title 2:	Motor valve	•
				Title 3:	Continuous duty	•
Date, participants,	etc.			Revisions		
Date:	1.9.2024	Designer:	•	A rev.:	D rev.:	-
Drawer:		Checker:		B rev.:	E rev.:	•
Sheet:	1 2	Drawing group:	•	C rev.:	• F rev.:	•
∃ 2 2	=123	+MCC1	PES mode		Motor valve	Continuous duty
Numbers and IDs				Drawing na	ame	
Drawing number:	9.8.1-5	Job number:	1234 -	Title 1:	PES mode	•
Object ID:	=123	Electrical position:	+MCC1	Title 2:	Motor valve	•
				Title 3:	Continuous duty	
Date, participants,	etc.			Revisions		
Date:	1.9.2024	Designer:		A rev.:	- D rev.:	•
Drawer:		Checker:		B rev.:	• E rev.:	
Sheet:	2 2	Drawing group:	•	C rev.:	F rev.:	

7. Click OK.

### 9. Draw boundaries

### 9.1. Draw boundaries for locations

Elements inside location boundaries are defined to belong to that location. By default, all elements on a sheet belong to the location (= electrical position) defined in the drawing frame – with the bounding area you can define elements to a different location than that used by default.

Let's create the bounding area for +CS1.

#### Do the following:

- 1. Select Schematics tab > Other functions group > Boundaries menu > Location boundary.
- 2. Define the following:
  - Object ID +CS1
  - **Description** CONTROL SYSTEM
- 3. Click OK.
- 4. Indicate the first corner for the bounding area.
- 5. Indicate the second corner for the bounding area.

Note: If you need to edit the shape/size afterwards, select a boundary, right-click and select

Redefine bounding area.

#### 9.2. Draw boundaries for devices

With device boundaries, you can define elements belonging to specific devices.

Let's create device boundaries =123-M01 and -B1.

- 1. Select **Schematics** tab > **Other functions** group > **Boundaries** menu > **Device boundary**.
- 2. Define the following:
  - Object ID -= 123
  - **ID** *MO1*

ata Appea	rance		
Object ID:	123		
Electrical position:			
ID:	M01		
Type:	Not defined	~	
Description:			
Boundary st	nape		
Rectar	igle		
0.00	n		

- 3. Click **OK**.
- 4. Indicate the first corner for the bounding area.
- 5. Indicate the second corner for the bounding area.
- 6. Create boundaries for **-B1** as described.

Note: If you need to edit the shape/size afterwards, select a boundary, right-click and select Redefine bounding area.

### 10. Insert symbols

### 10.1. Insert terminal blocks and connectors

Let's insert terminal blocks for the control system **+CS1** and the distribution board **+MCC1**. Let's also insert device connectors for **B1**.

#### Do the following:

- 1. In the **Symbols** window, select **Terminals** and insert the terminal block symbol. The **Insert terminal block / connector** dialog opens.
- 2. Define the following for the control system **+CS1**:
  - ID − X1
  - Number 1
  - Number of symbols and insertion mode Space evenly, 16
- 3. Indicate the insertion point for the first terminal block (= location).
- 4. Indicate the connector number inside the location boundaries, and click.
- 5. Indicate the insertion point for the second terminal block (space between terminal blocks 6 raster points = 6 x 3.5 mm.
- 6. Move the terminal blocks (5–16) according to the example drawing:
  - a. Select the terminal blocks to be moved (5-16) in the selection dialog.

Note: Select the terminal blocks from bottom to the top.

- b. Right-click and select **Move**.
- c. Indicate the new location.
- 7. Insert the rest of the control system +CS1 terminal blocks as described.
- 8. Insert the distribution board +MCC1 terminal blocks X11:10–14 and 17–18 as described.
  - a. Define the following:
    - ID X11
    - Number 10
    - Number of symbols and insertion mode One by one, 5

b. Insert terminal blocks 17 and 18.

Tip: Align the X11 terminal blocks with the +CS1 terminal blocks.

9. Insert **B1** device connectors - and +: first number -/+.

#### 10.2. Insert plug connectors

Let's insert plug connectors inside the device bounding area =123-M01.

#### Do the following:

1. In the **Symbols** window, select **Plug connector** from the **Terminals** menu and insert the plug connector symbol:



The Insert terminal block / connector dialog opens.

- 2. Define the following:
  - ID Leave empty.
  - Number 3
  - Number of symbols and insertion mode Space evenly, 10
- 5. Edit the connector numbers according to the example drawing, and move the connectors to where they belong.

### 10.3. Insert symbols to the second sheet

Let's insert symbols to the second sheet according to the example drawing.

- 1. Insert coils:
  - a. In the **Symbols** window, select **Coils** and insert the coil symbol:



- b. Define the following:
  - Coil ID From the drop-down menu, select K10 and K20.
  - Coil upper number A1
  - Coil lower number A2
- 2. Insert the auxiliary contacts:
  - a. In the **Symbols** window, select **Contact packs** and insert the contact symbol **1xchange**over contact.
  - b. Enter *K10* and *K20* as IDs.
- 3. Insert diodes next to the coils:
  - a. In the **Symbols** window, select **Diodes** from the **Electronics symbols** menu and insert the diode symbol:

	Q	$\nabla$
<ul> <li>Switches</li> <li>Components</li> <li>Converters and inverters</li> <li>Logic symbols</li> <li>Logic schema symbols</li> <li>Electronics symbols</li> <li>Diodes</li> <li>Coils</li> <li>Capacitors</li> <li>Optical</li> <li>Resistors</li> <li>Transistors</li> </ul>		
Symbols		
	₽	
****		

b. Insert the symbol into the drawing.

Tip: Turn the diode with F8.

c. Leave component ID empty.

### 10.4. Insert a switch and contacts

Let's insert a knob for the **S01** switch, and then add for the **S01** switch.

#### Do the following:

1. In the **Symbols** window, select **Switches** and insert the switch symbol (OPEN/0/CLOSED):



- 2. Select the switch **S01** from the drawing.
- 3. Right-click, and select Add auxiliary contact. The Adding contacts menu opens.
- 4. Select a normally-open contact, and indicate the insertion point.

- 5. Define 1 as the upper number and 2 as the lower number.
- 6. Insert contact **S01:3/4** as described.
- 7. After inserting the contact symbols, click **OK** in the icon menu.

#### 10.5. Insert change-over contacts

Let's insert change-over contacts and update cross-references.

#### Do the following:

1. In the **Symbols** window, select **Contacts** and insert the change-over contact symbol:



- 2. Define the following:
  - ID *K92* and *K91*
  - Contacts upper number 12 and 14
  - Contacts lower number 11
- 3. Click **OK**.

### 10.6. Insert motor valve contacts

Next, let's insert motor valve contacts.

#### Do the following:

- 1. Insert a moment contact:
  - a. In the **Symbols** window, select **Contacts** and insert the moment contact symbol:



- b. Define the following:
  - **ID** *S1* and *S2*
  - Contacts upper number- 1
  - Contacts lower number-2

#### 2. Insert a position switch:

a. In the **Symbols** window, select **Contacts** and insert the normally-open contact symbol:



- b. Define the following:
  - ID S3 and S4
  - Contacts upper number 3
  - Contacts lower number 4

The IDs and upper and lower numbers cannot be selected from the drop-down menus. Instead, you need to enter them manually.

### 11. Wiring

### 11.1. Draw wire

Important: You should always draw wires from wiring point to another so that the connection information is available when updating the databases. During wiring, wiring points are indicated with yellow squares.

You can draw over the symbols because this function knows how to cut the wire to separate wires.

#### Do the following:

- 1. Select to draw control circuit:
  - In Premium: Select Schematics tab > Wiring group > Draw wiring, and then select control circuit as the wire type.
  - In Basic: Select Schematics tab > Wiring group > Draw wiring.
- 2. Draw wires for diodes (K10 and K20).
  - =123-M01 internal wires
  - S01:2 > S01:4
- 3. Continue wiring according to the example drawing.

#### 11.2. Draw cable sheathing

Next, let's draw cable sheathing.

- 1. Select Schematics tab > Wiring group > Draw wiring menu > Draw cable shield.
- 2. Indicate the start point for the ellipse representing the cable sheathing.
- 3. Indicate the end point for the ellipse.
- 4. Draw wire for the connector.
- 5. Stop drawing by right-clicking.

6. Leave the text field empty, and click **OK**.



### 12. Create device texts

Finally, let's create the device texts for the drawing. Device texts (1–4) are free-form texts defined for devices, and they can be marked to the drawing, report or plate.

- Select the change-over contact K92, right-click it and select Insert devicetext to the drawing. The Device texts dialog opens.
- 2. In the first field, enter DISTRIBUTION BOARD FAILURE (0) and select Visible for it.

Devic	te texts X
Devi	ice
ID	=123+MCC1-K92 ~ 🕅
Devi	ice texts Visible
1	DISTRIBUTION BOARD FAILURE (0)
2	~
3	· · · ·
4	· · · ·
	OK Cancel Help

- 3. Click **OK**, and insert the device text in the drawing.
- 4. Insert device texts for each device as described: *FIELD FAILURE (0), CLOSE MOMENT, OPEN MOMENT,* etc.

### 13. Print

#### Do the following:

- 1. Select File > Print > Queue printing from drawing sheets. The Print sheets dialog opens.
- 2. Select sheets 1 and 2.
- 3. Close the dialog by clicking **OK**. The **Electrical queue printing** dialog opens.
- 4. Define settings according to the following image:

lectrical qu				
1	eue printing			
Print	Microsoft Print to PDF		~	ОК
Print style:	BW		~	Cance
Print area				Setting
<ul> <li>Limits</li> </ul>	Extents	Copies:	1	Help
View	Window			
Print layer w	vith sheet			
Print	Layer name:	0		
Sticker inser	t to drawing			
Insert st	ICKer	Date to sticker	ſ	
O Bid d	Irawing	13.2.2024		
Shop	drawing			
· · · ·				
O As-b	ulit drawing			
O As-b Text	uiit drawing :			
O As-b	uiit arawing :			
As-b Text:	uiit drawing : e (Drawing name + shee	et numbe		
As-b Text:	e (Drawing name + shee	et numbe all prints to one po	lf file	
As-bi Text:	e (Drawing name + shee Combine - ctory	et numbe all prints to one po	lf file	
As-bi Text: Print to file PDF file Printing dire	e (Drawing name + shee Combine - ctory ng settings	et numbe all prints to one po	lf file	
As-bi Text: Print to file PDF file Printing dire By printin Drawing	e (Drawing name + shee Combine - ctory ng settings directory	et numbe all prints to one po	lf file	
As-bi Text: Print to file PDF file Printing dire By printli Drawing Drawing	e (Drawing name + shee Combine - ctory ng settings directory directory/Prints	at numbe all prints to one po	if file	
As-bi Text: Print to file PDF file Printing dire By printin Drawing Drawing	e (Drawing name + shee Combine - ctory ng settings directory directory Prints directory Prints Date	et numbe all prints to one po	if file	

- 5. Click **OK**.
- 6. Check the line widths, and edit them if necessary.

You have now printed and completed the exercise.

### 14. Example drawing



