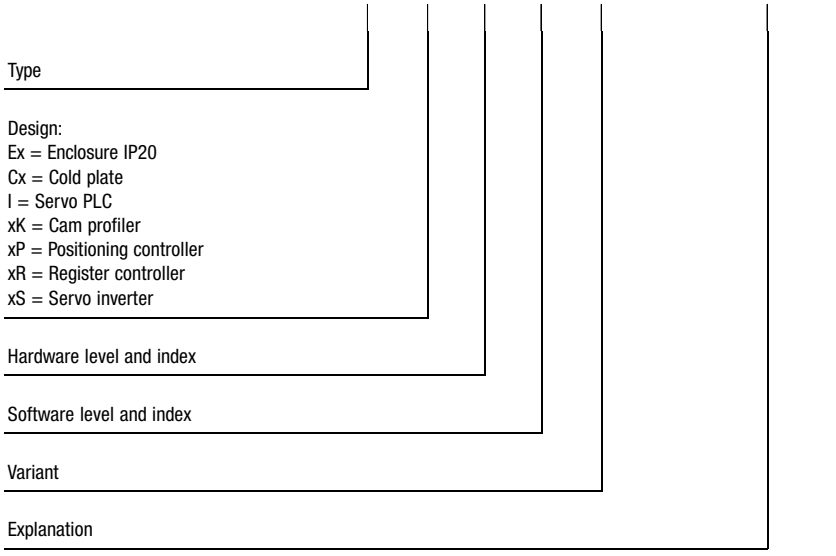
Application range

The fieldbus module can be used together with devices with the following nameplates:

820X	E.	2x.	1x.		(8201 - 8204)
820X	E./C.	2x.	1x.	Vxxx	(8201 - 8204)
821X	E.	2x.	2x.		(8211 - 8218)
821X	E./C.	2x.	2x.	Vxxx	(8211 - 8218)
822X	E.	1x.	1x.		(8221 - 8225)
822X	E.	1x.	1x.	Vxxx	(8221 - 8227)
824X	E.	1x.	1x.		(8241 - 8246)
824X	E./C.	1x.	1x.	Vxxx	(8241 - 8246)
82EVxxxxxBxxxXX		Vx	1x		(8200 vector)
82CVxxxxxBxxxXX		Vx	1x		(8200 vector, cold plate)



6.3 Technical data

6.3.1 General data and application conditions

Field	Values
Order name	EMF2171IB or EMF2172IB
Communication media	DIN ISO 11898
Protocol	based on CANopen
Baud rate [KBit/s]	50, 125, 250, 500, 1000
Ambient temperature	Operation: 0 °C to 40 °C Transport: -25 °C to 70 °C During storage -25 °C to 55 °C
Permissible humidity	Class 3K3 to EN 50178 (without condensation, average relative humidity 85%)
24-V-DC-voltage supply	• 820X / 8200 vector: only external supply 📖 6.4-4 • 821X / 822X / 8200 vector: internal or external supply 📖 6.4-4

6.3.2 Rated data

Field	Values	
Insulation voltage between bus and ...		
	Rated insulation voltage	**Type of insulation**
• Remote earth / PE	50 V AC	Mains isolation
• External supply	-	No mains isolation
• Power stage		
– 820X / 821X	270 V AC	Basic insulation
– 822X / 8200 vector	270 V AC	double insulation
– 93XX	270 V AC	double insulation
• Control terminals		
– 820X / 8200 vector [1]	-	No mains isolation
– 8200 vector [2]	100 V AC	Basic insulation
– 821X	50 V AC	Mains isolation
– 822X	270 V AC	Basic insulation
– 93XX	270 V AC	Basic insulation
• External bus systems	0 V AC	No mains isolation

6.3.3 Communication times

Note!

The communication time is the time between the start of a request and the corresponding response.

The CAN bus communication times depend on

- Processing time in the controller
- Telegram time
  - Baud rate
  - Telegram length
- Data priority
- Bus load

Processing times 820X

In opposite to the 821X/822X/824X series, which have parallel process data processing, the 8200 series process process and parameter data sequentially. Therefore the time needed to respond process data depends on previous actions.

The processing time needed for telegrams also depends on the actual value conditioning (process data from controller). If these data (status word, actual frequency) are not required, they can be deactivated with the control word "Bit 15" (PE inhibit).

The individual telegram times are:

Telegram	Processing time	
	PE-inhibit = 0	PE-inhibit = 1
Parameters	62...140 ms	62...70 ms
Change of a process data value to controller (*)	27...105 ms	27...35 ms
Change of both process data values to controller *	62...140 ms	4...70 ms
Process data from controller *	108...140 ms	not possible

* The processing times for the process data refer to to the sync telegram (📖 6.6-6)

Processing times 821X/8200 vector/822X

The processing times for the 8200 controllers differ from the times for the 821X/822X/8200 vector series.

The processing times are as follows:

- Parameter data: approx. 30 ms + 20 ms tolerance (typical)
- Process data: approx 3 ms + 2 ms tolerance

The telegram run time depends on the baud rate:

	Baud rate [kBit/s]				
	50	125	250	500	1000
Telegram time [ms]	2.7	1.05	0.52	0.26	0.13

Telegram run time

The telegram run time depends on the baud rate and the telegram length:

Baud rate [kBit/s]	**Telegram length** [Byte]		
	0	**2**	**8**
50	1.09	1.47	2.62
125	0.44	0.59	1.05
250	0.22	0.29	0.52
500	0.11	0.15	0.26
1000	0.05	0.07	0.13

Tab. 6.3-1 Maximum telegram time in [ms]

The telegram times indicated in the table above are calculated according to the following equation. This equation allows to calculate any intermediate value t_{Tmax}.

$$t_T \leq \frac{54.4 + 9.6 \cdot L_D}{d_{Ü}}$$

t_T = telegram time [ms]
L_D = telegram length [byte]
$d_Ü$ = baud rate [kBit/s]

6.3.4 Dimensions

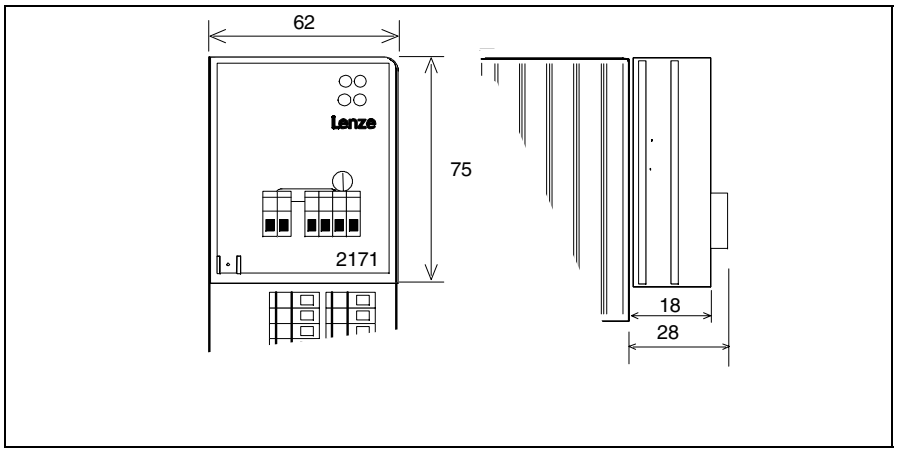


Fig. 6.3-1 Dimensions of the 2171 and/or 2172 fieldbus module (all dimensions in mm)

6.4 Installation

6.4.1 Components of the fieldbus module

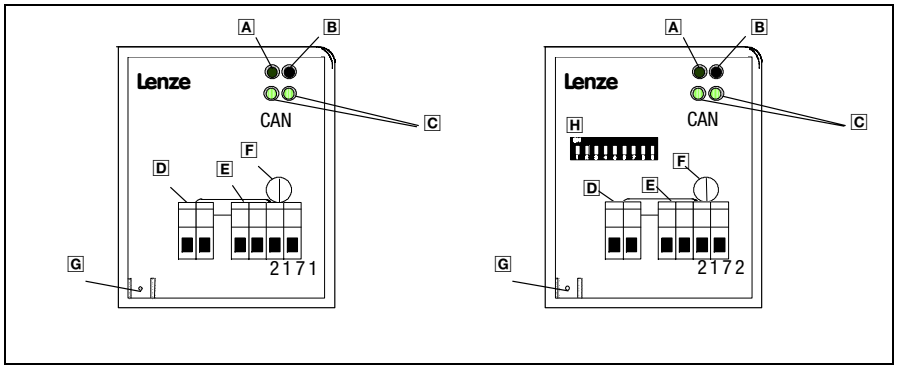


Fig. 6.4-1 2171/2172 fieldbus module

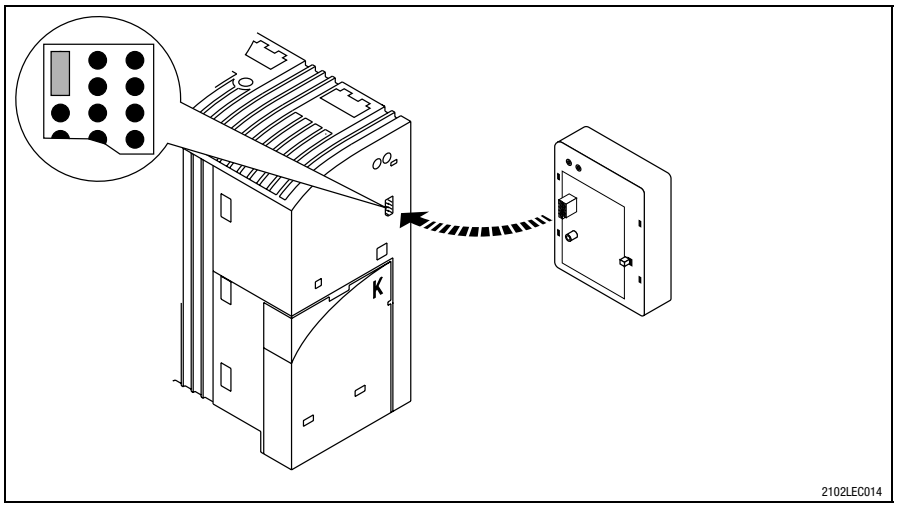
Pos.	Name	Meaning		Notes
A	**Connection status to the controller**	OFF		2171/2172 fieldbus module is not supplied with voltage; controller or external voltage supply switched off.
		GREEN	BLINKING	2171/2172 fieldbus module is supplied with voltage but is not connected to the controller (controller is switched off, initialising or not available).
			Constantly ON	2171/2172 fieldbus module is supplied with voltage and is connected to the controller.
B	**Connection status to the bus**	OFF		• No communication with the field bus module • Fieldbus module is not supplied with voltage
		YELLOW	BLINKING	Controller is receiving telegram (RxD)
C	**Green and red Drive LED (Drive)**	Operating status of the 82XX und 8200 vector (see the corresponding Operating Instructions).		
D	**Fixing screw**			
E	**Plug-in connector for external supply, 2-pole**			
F	**Plug-in connector for CAN bus, 4-pole**			
G	**PE cable connection**	See note below		
H	**DIP switch**	For settings see 📖 6.5-1		

Note!

Only for 820X and 821X:

If necessary use an additional PE shield cable which avoids EMC-related communication interference in especially noisy environments.

6.4.2 Mechanical installation



- Plug the fieldbus module onto the basic device (here: 8200 vector).
- Screw the fieldbus module to the basic device to ensure a good PE connection. F

Note!

An internal supply of the fieldbus module through the 8200 vector is only possible if the jumper in the interface cutout (see figure above) is changed. Please see the corresponding notes (📖 6.4-4).

6.4.3 Electrical installation

Note!

The communication of controllers 820X and 821X may be interfered by electromagnetic interferences.

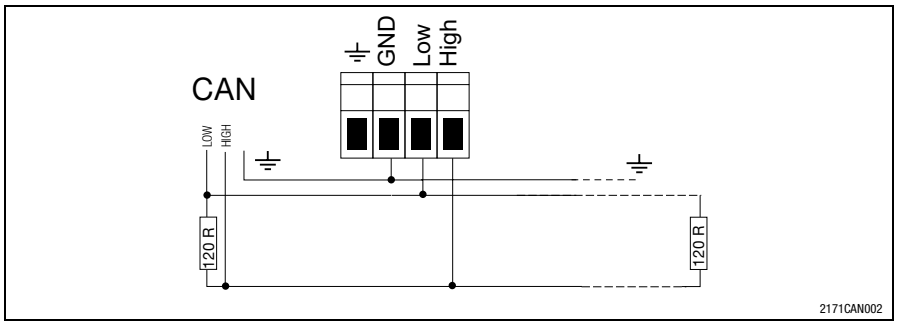
If necessary, use an additional PE shield cable at pos. G (📖 6.4-1).

Assignment of the plug-in connector for CAN connection

Name	Input/output	Explanation
⏚	–	Screening PE
GND	–	Reference potential CAN bus – with internal series resistance of 100 Ω max. current load 30 mA
low	Input/output	CAN-Bus Low
high	Input/output	CAN-Bus High

Tab. 6.4-1 Assignment of the plug connector

Wiring of the CAN bus



Please observe our recommendations for signal cables:

Total length up to 300 m	
Cable type	LIYCY 2 x 2 x 0.5 mm² (twisted in pairs with shield)
Line resistance	≤ 40 Ω/km
Capacitance per unit length	≤ 130 nF/km

Total length up to 1000 m	
Cable type	CYPIMF 2 x 2 x 0.5 mm² (twisted in pairs with shield)
Line resistance	≤ 40 Ω/km
Capacitance per unit length	≤ 60 nF/km

External voltage supply

Name	Input/output	Explanation
+	Input	External voltage supply +24 V DC ± 10 %, 60 mA
-	Input	GND; reference for external supply

Tab. 6.4-2 Assignment of the plug connector

If necessary, supply the 2171/2172 fieldbus module via the plug-in contacts +/- (📖 6.4-3) with a separate voltage supply 24 V DC ± 10 %.

820X controllers always require a separate voltage supply.

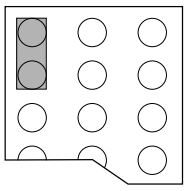
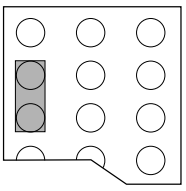
Use a separate supply unit in every control cabinet if the distance between the control cabinets is larger than normal.

Controller	External voltage supply
820X	Always required
821X / 822X / 824X	Only necessary if the mains which supply the corresponding controllers is to be switched off but the communication must not be interrupted.
8200 vector	See below

Note!

Controllers with an extended AIF interface (front of the 8200 vector) can be internally supplied. The part of the drawing highlighted in grey shows the jumper position.

With Lenze setting, the fieldbus module is not internally supplied. For internal voltage supply put the jumper on the position indicated in the illustration “internal voltage supply”.

Lenze setting only external voltage supply possible	**Internal voltage supply**
	

Wiring to a host

Danger!

An additional electrical isolation is required if

- a 820X, 821X or 8200 vector controller will be connected to a host
- a safe electrical isolation (double basic insulation) to VDE 0160 is required.

For this, you can use an interface module for the host with an additional electrical isolation (see the corresponding manufacturer's information).
For wiring, the electrical isolation of the supply voltage must be taken into account. The supply voltage is assigned to the same potential as the data bus.

6.4.4 Bus cable length

It is absolutely necessary to comply with the permissible cable lenghts.

1. Please check the compliance with the total cable length in Tab. 6.4-3.

The total cable length is specified by the baud rate.

Baud rate [kBit/s]	50	125	250	500	1000
Total cable length [m]	1550	630	290	120	25

Tab. 6.4-3 Total cable length

2. Please check the compliance with the segment cable length in Tab. 6.4-4.

The segment cable length is specified by the cable cross-section used and the number of devices connected. Without a repeater the segment cable length corresponds to the total cable length.

	Cable cross-section			
Participant	**0.25 mm²**	**0.5 mm²**	**0.75 mm²**	**1.0 mm²**
2	240 m	430 m	650 m	940 m
5	230 m	420 m	640 m	920 m
10	230 m	410 m	620 m	900 m
20	210 m	390 m	580 m	850 m
32	200 m	360 m	550 m	800 m
63	170 m	310 m	470 m	690 m

Tab. 6.4-4 Segment cable length

3. Please compare both detected values.

If the value from Tab. 6.4-4 is smaller than the total cable length from Tab. 6.4-3, repeaters must be used. Repeaters subdivide the total cable length into segments.

Note!

- Please note the reduction of the total cable length due to the signal delay of the repeater (see example (📖 6.4-7)).
- Mixed operation
  – There is a mixed operation, if different devices are connected to the same mains.
  – If the total cable lengths of the participants are different at the same baud rate, the smaller value must be used in order to determine the max. cable length.

Example: Selection help

Given:	
• Cable cross-section:	0.5 mm² (according to cable specification 📖 5.4-2)
• Number of devices connected:	63
• Repeater:	Lenze repeater, type 2176 (cable reduction: 30 m)

At maximum number of participants (63) the following cable lengths / number of repeaters must be complied with:

Baud rate [kBit/s]	**50**	**125**	**250**	**500**	**1000**
Max. cable length [m]	1550	630	290	120	25
Segment cable length [m]	310	310	290	120	25
Number of repeaters	4	2	-	-	-

Example: Check repeater application

Given:	
• Baud rate:	125 kBit/s
• Cable cross-section:	0.5 mm^2
• Number of devices connected:	28
• Cable length:	450 m
1. Total cable length at 125 kbits/s	
630 m	from Tab. 6.4-3
2. Segment cable length for 28 participants and a cable cross-section of 0.5mm^2.	
360 m	from Tab. 6.4-4
3. Comparison	
The value in point 2. is smaller than the cable length of 450 m.	
4. Conclusion	
• It is not possible to use a cable length of 450 m without applying a repeater.	
• After 360 m (point 2.) it is necessary to use a repeater.	
5. Max. cable length with repeater application	
• The Lenze repeater is used, type 2176 (cable reduction: 30 m)	
• Calculation of the max. cable length: 630 m (according to Tab. 6.4-3) minus 30 m (cable reduction)	
→ Max. possible cable length with repeater: 600 m.	
→ The cable length wanted is now possible.	

Note!

Repeaters are recommended as a

- Service interface
  Advantage: trouble-free connection during bus operation is possible.
- Calibration interface
  Advantage: calibration/programming unit remains electrically isolated.

Setting of the controller address

$$Address_{dec} = S_4 \cdot 2^0 + S_5 \cdot 2^1 + S_6 \cdot 2^2 + S_7 \cdot 2^3 + S_8 \cdot 2^4 + S_9 \cdot 2^5$$

The address (decimal number) is calculated by inserting the switch status S4 ... S9 ('0' = OFF and '1' = ON) into the equation above.

The equation also indicates the valency of a switch. The sum of valencies results in the controller addresses to be set (see examples 1 and 2):

Switch valencies:

Switch	S4	S5	S6	S7	S8	S9
Valency	1	2	4	8	16	32

Example 1:

Switch	S4	S5	S6	S7	S8	S9
Switch position	1	1	1	0	0	0
Address (= 7)	1	2	4	0	0	0

Example 2:

Switch	S4	S5	S6	S7	S8	S9
Switch position	1	0	0	1	1	0
Address (= 25)	1	0	0	8	16	0

Baud rate setting

Baud rate [kBit/s]	S1	S2	S3
500	OFF	OFF	OFF
250	ON	OFF	OFF
125	OFF	ON	OFF
50	ON	ON	OFF
1000	OFF	OFF	ON