

# Safety Instructions

## Liquiphant FTL62

ATEX, IECEx: Ex db IIC/IIB T6 Ga/Gb  
Ex db IIC/IIB T6 Gb  
Ex ta/tb IIIC Txxx°C Da/Db  
Ex tb IIIC Txxx°C Db



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# Liquiphant FTL62

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Associated documentation

All documentation is available on the Internet:  
[www.endress.com/Deviceviewer](http://www.endress.com/Deviceviewer)  
(enter the serial number from the nameplate).

 If not yet available, a translation into EU languages can be ordered.

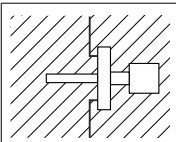
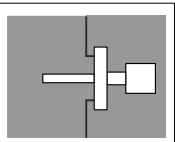
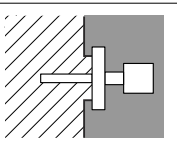
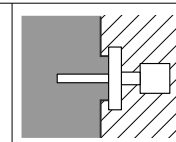
To commission the device, please observe the Operating Instructions pertaining to the device:  
BA02036F

Supplementary documentation


Explosion protection brochure: CP00021Z

The explosion protection brochure is available on the Internet:  
[www.endress.com/Downloads](http://www.endress.com/Downloads)

General notes:  
Combined approval

							
Ex db IIC		Ex ta/tb IIIC		Ex db IIC		Ex ta/tb IIIC	
Zone 0 or Zone 1	Zone 1	Zone 20 or Zone 21	Zone 21	Zone 0 or Zone 1	Zone 21	Zone 20 or Zone 21	Zone 1

The device is designed for operation in explosive gas or explosive dust atmosphere as shown in the sketch above. In the event of potentially explosive gas-air and dust-air mixtures occurring simultaneously: Suitability requires further assessment.

-  A sequential change between gas and dust explosion protection is only possible if:
- A period with non-explosive atmosphere is realized during the transition or
  - Special examinations are done which are not covered by the certificate

Certificates and declarations

EU Declaration of Conformity

Declaration Number:  
EC00721

The EU Declaration of Conformity is available on the Internet:  
[www.endress.com/Downloads](http://www.endress.com/Downloads)

**EU type-examination certificate**

Certificate number:  
KIWA 19ATEX0017X

List of applied standards: See EU Declaration of Conformity.

**IEC Declaration of Conformity**

Certificate number:  
IECEX KIWA 19.0010X

Affixing the certificate number certifies conformity with the following standards (depending on the device version):

- IEC 60079-0 : 2017
- IEC 60079-1 : 2014
- IEC 60079-26 : 2021
- IEC 60079-31 : 2013

**Certificate holder**

Endress+Hauser SE+Co. KG  
Hauptstraße 1  
79689 Maulburg, Germany

Address of the manufacturing plant: See nameplate.

**Other standards**

Among other things, the following standards shall be observed in their current version for proper installation:

- IEC/EN 60079-14: "Explosive atmospheres - Part 14: Electrical installations design, selection and erection"
- EN 1127-1: "Explosive atmospheres - Explosion prevention and protection - Part 1: Basic concepts and methodology"

**Extended order code**

The extended order code is indicated on the nameplate, which is affixed to the device in such a way that it is clearly visible. Additional information about the nameplate is provided in the associated Operating Instructions.

Structure of the extended order code

FTL62	-	*****	+	A*B*C*D*E*F*G*..
(Device type)		(Basic specifications)		(Optional specifications)

\* = Placeholder  
At this position, an option (number or letter) selected from the specification is displayed instead of the placeholders.

Basic specifications


The features that are absolutely essential for the device (mandatory features) are specified in the basic specifications. The number of positions depends on the number of features available.  
The selected option of a feature can consist of several positions.

Optional specifications

The optional specifications describe additional features for the device (optional features). The number of positions depends on the number of features available. The features have a 2-digit structure to aid identification (e.g. JA). The first digit (ID) stands for the feature group and consists of a number or a letter (e.g. J = Test, Certificate). The second digit constitutes the value that stands for the feature within the group (e.g. A = 3.1 material (wetted parts), inspection certificate).

More detailed information about the device is provided in the following tables. These tables describe the individual positions and IDs in the extended order code which are relevant to hazardous locations.

Extended order code: Liquiphant

-  The following specifications reproduce an extract from the product structure and are used to assign:
- This documentation to the device (using the extended order code on the nameplate).
  - The device options cited in the document.

Device type

FTL62


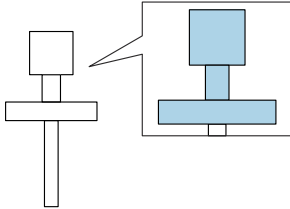
*Basic specifications*

Position 1, 2 (Approval)		
Selected option		Description
FTL62	BM	ATEX II 1/2 G Ex db IIC/IIB T6...T1 Ga/Gb
		ATEX II 2 G Ex db IIC/IIB T6...T1 Gb
		ATEX II 1/2 D Ex ta/tb IIIC Txxx°C Da/Db
		ATEX II 2 D Ex tb IIIC Txxx°C Db
		IECEX Ex db IIC/IIB T6...T1 Ga/Gb
		IECEX Ex db IIC/IIB T6...T1 Gb
		IECEX Ex ta/tb IIIC Txxx°C Da/Db
		IECEX Ex tb IIIC Txxx°C Db

Position 3, 4 (Output)		
Selected option		Description
FTL62	A1	FEL61, 2-wire 19-253VAC + test button
	A2	FEL62, 3-wire PNP 10-55VDC + test button
	A3	FEL64DC, relay DPDT 9-20VDC
	A4	FEL64, relay DPDT 19-253VAC/19-55VDC contact 253V/6A + test button
	A7	FEL67, 2-wire PFM + test button
	A8	FEL68, 2-wire NAMUR + test button
	GA	FEL60D, density/concentration

Position 5 (Display, Operation)		
Selected option		Description
FTL62	A	W/o; switch
	B <sup>1)</sup>	LED module outside visible; switch

- 1) Only in connection with Position 3, 4 = A2-A4, Position 6 = B, M

Position 6 (Housing, Material)		
Selected option		Description
FTL62	B	Single compartment; Alu, coated
	C	Single compartment; 316L, cast
	M	Dual compartment L-shape; Alu, coated
<div>  Shown in the temperature tables exemplary as follows: <div>  </div> </div>		

Position 7 (Electrical Connection)		
Selected option		Description
FTL62	F	Thread M20, IP66/68 NEMA Type 4X/6P
	G	Thread G1/2 <sup>1)</sup> , IP66/68 NEMA Type 4X/6P
	I	Thread NPT3/4, IP66/68 NEMA Type 4X/6P
	Y	Special version: Thread NPT1/2, IP66/68 NEMA Type 4X/6P


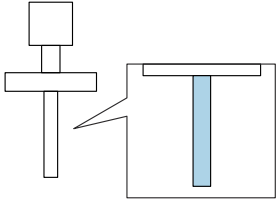
1) Reduction M20x1.5 to G1/2 enclosed

Position 8 (Application)		
Selected option		Description
FTL62	C <sup>1)</sup>	Process max 80°C/176°F, max 25bar
	N <sup>2)</sup>	Process max 120°C/248°F, max 40bar (ECTFE)
	P <sup>2)</sup>	Process max 150°C/302°F, max 40bar (PFA)
	T <sup>2)</sup>	Process max 150°C/302°F, max 25bar (Enamel)

- 1) Only in connection with Position 3, 4 = GA  
2) Only in connection with Position 3, 4 = A1-A4, A7, A8



Position 9 (Surface Refinement)		
Selected option		Description
FTL62	N	Coating ECTFE
	P	Coating PFA (Edlon)
	Q	Coating PFA (RubyRed)
	R	Coating PFA (conductive)
	T	Coating Enamel

Position 10 (Type of Probe)		
Selected option		Description
FTL62	2	Extension tube
	3	Short tube version
<div>  Shown in the temperature tables exemplary as follows: </div> <div>  </div>		

### Optional specifications

ID Jx, Kx (Test, Certificate, Declaration)		
Selected option		Description
FTL62	JL	Ambient temperature -50°C/-58°F
	JN <sup>1)</sup>	Ambient temperature -52°C/-62°F
	JT <sup>1)</sup>	Ambient temperature -60°C/-76°F

1) Only in connection with Position 3, 4 = A2-A4, A7, A8, Position 5 = A

ID Mx (Sensor Design)		
Selected option		Description
FTL62	MR	Temperature separator
	MS	Pressure tight feed through (Second line of defence)

ID Nx, Ox (Accessory Mounted)		
Selected option		Description
FTL62	NF <sup>1)</sup>	Bluetooth VU121, Labeling: VA13-02
	NG <sup>2)</sup>	Prepared for Heartbeat Verification + Monitoring + Bluetooth VU121, Labeling: VA13-01

- 1) Only in connection with Position 3, 4 = A1-A4, A7, Position 6 = B, M, Position 5 = A
- 2) Only in connection with Position 3, 4 = A8, Position 6 = B, M, Position 5 = A

ID Px, Rx (Accessory Enclosed)		
Selected option		Description
FTL62	PA <sup>1)</sup>	Weather protection cover, 316L
	PB <sup>2)</sup>	Weather protection cover, plastic
	R6 <sup>3)</sup>	Test magnet

- 1) Only in connection with Position 6 = M
- 2) Only in connection with Position 6 = B, C
- 3) Only in connection with Position 3, 4 = A2-A4, A8


**Safety instructions:**  
**General**

- The device is intended to be used in explosive atmospheres as defined in the scope of IEC 60079-0 or equivalent national standards. If no potentially explosive atmospheres are present or if additional protective measures have been taken: The device may be operated according to the manufacturer's specifications.
- Devices suitable for zone separation (marked Ga/Gb or Da/Db) are always suitable for installation in the less critical zone (Gb or Db). Due to space limitations the corresponding marking maybe not indicated on the nameplate.
- Staff must meet the following conditions for mounting, electrical installation, commissioning and maintenance of the device:
  - Be suitably qualified for their role and the tasks they perform
  - Be trained in explosion protection
  - Be familiar with national regulations
- Install the device according to the manufacturer's instructions and national regulations.
- Do not operate the device outside the specified electrical, thermal and mechanical parameters.
- Only use the device in media to which the wetted materials have sufficient durability.

- Avoid electrostatic charging:
  - Of plastic surfaces (e.g. enclosure, sensor element, special varnishing, attached additional plates, ..)
  - Of isolated capacities (e.g. isolated metallic plates)
- Refer to the temperature tables for the relationship between the permitted ambient temperature for the sensor and/or transmitter, depending on the range of application and the temperature class.
- Alterations to the device can affect the explosion protection and must be carried out by staff authorized to perform such work by Endress+Hauser.

**Safety  
instructions:  
Special conditions**

Permitted ambient temperature range at the electronics enclosure:  
 $-40\text{ °C} \leq T_a \leq +70\text{ °C}$

- Limitations of the maximum ambient temperature at the electronics enclosure may be required dependent on device configuration, process temperatures and temperature classification.
- Details of limitations: →  15, "Temperature tables".
- To avoid electrostatic charging: Do not rub surfaces with a dry cloth.
- In the event of additional or alternative special varnishing on the enclosure or other metal parts or for adhesive plates:
  - Observe the danger of electrostatic charging and discharge.
  - Do not install in the vicinity of processes ( $\leq 0.5\text{ m}$ ) generating strong electrostatic charges.

*Basic specification, Position 6 = B, M*

- Covers with glass window only permitted for the following ambient temperatures:  
 $-50\text{ °C} \leq T_a \leq +70\text{ °C}$
- Avoid sparks caused by impact and friction.

*Basic specification, Position 6 = C*

Covers with glass window not permitted.

*Optional specification, ID Px, Rx = PA*

Connect the weather protection cover to the local potential equalization.

*Optional specification, ID Px, Rx = PB*

Avoid electrostatic charging of the weather protection cover (e.g. friction, cleaning, maintenance, strong medium flow).

*Optional specification, ID Px, Rx = R6*

Suitable for use in explosion hazardous areas.

### Device group IIC/IIB and Device group III

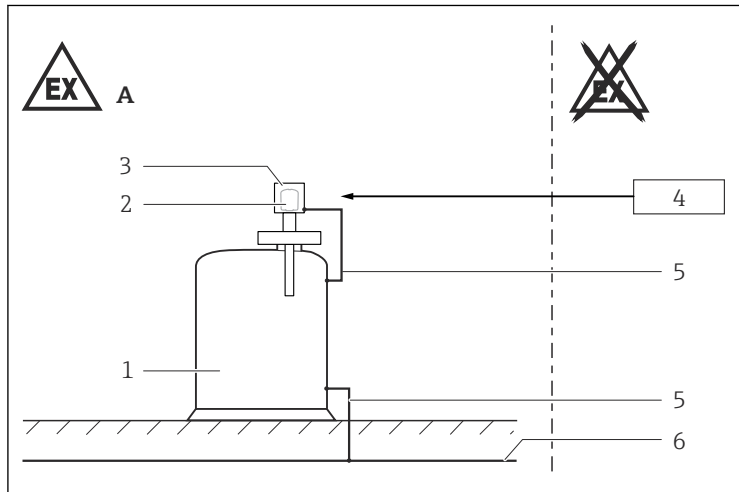
*Basic specification, Position 9 = N, P, Q*

- Probes can be used in gases of Group IIC or dust Group III if avoiding electrostatic charging (e.g. through friction, cleaning, maintenance, strong medium flow). These probes are marked by the warning sign "Avoid Electrostatic Charge".
- If electrostatic charging cannot be avoided:
  - Probe can be used in gases of Group IIB.
  - Probe must not be used in dust Group III.

*Basic specification, Position 9 = R, T*

- Due to the surface resistance 1 GΩ (|R| PFA-conductive) or the enamel (glass) surface, these coatings are suitable without restrictions.
- Prevent damage to the conductive surface layer (e.g. by abrasion).

### Safety instructions: Installation



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- A Zone 1, Zone 21
- 1 Tank; Zone 0, Zone 1, Zone 20, Zone 21
- 2 Electronic insert
- 3 Enclosure
- 4 Supply unit
- 5 Potential equalization line
- 6 Local potential equalization

- Before operation:
  - Screw in the cover all the way.
  - Tighten the securing clamp on the cover.
- In potentially explosive atmospheres:
  - Do not disconnect the electrical connection of the power supply circuit when energized.
  - Do not open the connection compartment cover and the electronics compartment cover.
- Continuous service temperature of the connecting cable / cable gland / cable entry:
  - *Basic specification, Position 3, 4 = GA, A1, A7, A8:  $\geq T_a + 20\text{ K}$*
  - *Basic specification, Position 3, 4 = A2:  $\geq T_a + 35\text{ K}$*
  - *Basic specification, Position 3, 4 = A3, A4:  $\geq T_a + 45\text{ K}$*
  - *Basic specification, Position 3, 4 = A2 in connection with  
Optional specification, ID Mx = MR, MS:  $\geq T_a + 20\text{ K}$*
  - *Basic specification, Position 3, 4 = A3, A4 in connection with  
Optional specification, ID Mx = MR, MS:  $\geq T_a + 25\text{ K}$*
- Perform the following to achieve the degree of protection IP66/68:
  - Screw the cover tight.
  - Mount the cable entry correctly.
- Observe the maximum process conditions according to the manufacturer's Operating Instructions.
- At high medium temperatures, note flange pressure load capacity as a factor of temperature.
- Install the device to exclude any mechanical damage or friction during the application. Pay particular attention to flow conditions and tank fittings.
- Support extension tube of the device if a dynamic load is expected.
- Only use certified cable entries suitable for the application. Observe national regulations and standards. Accordingly, the connection terminal does not include any ignition sources.
- Seal unused entry glands with approved sealing plugs that correspond to the type of protection. The plastic transport sealing plug does not meet this requirement and must therefore be replaced during installation.
- The built-in metallic sealing plug is examined and approved for explosion protection type Ex d with the device.
- When operating the transmitter enclosure at an ambient temperature under  $-20\text{ °C}$ , use appropriate cables and cable entries permitted for this application.

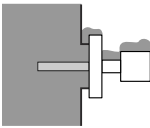
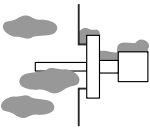
- When connecting through a conduit entry approved for this purpose, mount the associated sealing unit directly at the enclosure.
- The device can be equipped with the Bluetooth® module: refer to the Operating Instructions and specifications in the "Bluetooth® module" chapter.
- Flameproof equipment with G threaded entry holes is not intended for new installations but only for replacement of equipment in existing installations. Application of this equipment shall comply with the local installation requirements.

Device group III, Application in dust

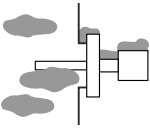
- To ensure the ingress protection IP66/67: Only use the unit-mounted sealing plugs and O-rings.
- Supplied metallic sealing plugs comply with the requirements of type of protection marked on the nameplate.
- In case of very strongly abrasive or corrosive media: Additionally protect the wetted surface of the sensor in order to avoid abrasion of the zone separation wall.

Permitted ambient conditions

Ex ta/tb IIIC Txxx°C Da/Db

Process Zone 20		Enclosure Zone 21
Continuous dust submersion		Dust accumulation or temporary explosive dust atmosphere
Continuous explosive dust atmosphere and deposits		Dust accumulation or temporary explosive dust atmosphere

Ex tb IIIC Txxx°C Db

Process Zone 21		Enclosure Zone 21
Continuous dust deposits or temporary explosive dust atmosphere		Dust accumulation or temporary explosive dust atmosphere

### Potential equalization

Integrate the device into the local potential equalization.

*Optional specification, ID Px, Rx = PA*

Connect the weather protection cover to the local potential equalization.

### Bluetooth® module

*Basic specification, Position 3, 4 = A7*

If the device is equipped with the Bluetooth® module, no battery is required or allowed.

*Basic specification, Position 3, 4 = A8*

- If the device is equipped with the Bluetooth® module, a battery is required.
- Removal or replacement of the battery is only permitted in non-hazardous areas.
- Observe the information in the Safety Instructions (XA) included with the Bluetooth® module.

### Safety instructions: Ex d joints

- If required or if in doubt: ask manufacturer for specifications.
- Flameproof joints are not intended to be repaired.

### Safety instructions: Zone 0

When using under non-atmospheric pressures and non-atmospheric temperatures: The sensor part of the device approved for Zone 0 does not cause any ignition hazards.

### Safety instructions: Zone separation Zone 0, Zone 1

The zone separation wall of the device is made of stainless steel or high corrosion-resistant alloy of thickness  $\geq 1$  mm.

### Temperature tables



*Optional specification, ID Jx, Kx = JL*

Lower limit of the ambient temperature for explosion protection changes to  $-50^{\circ}\text{C}$ .

*Optional specification, ID Jx, Kx = JN*

Lower limit of the ambient temperature for explosion protection changes to  $-52^{\circ}\text{C}$ .

*Optional specification, ID Jx, Kx = JT*

Lower limit of the ambient temperature for explosion protection changes to  $-60^{\circ}\text{C}$ .

## General notes

### Ex db IIC



*Optional specification, ID Px, Rx = PB*

When using the weather protection cover: Reduce the values  $T_a$  of P1, P2, P3 by 16 K.

### Ex ta/tb IIIC or Ex tb IIIC



*Optional specification, ID Px, Rx = PB*

When using the weather protection cover: Reduce the values  $T_a$  by 16 K.

## Description notes



Unless otherwise indicated, the positions always refer to the basic specification.

*Zone 0, Zone 1 or Zone 1*

1st line: Position 6 = A, B, ...

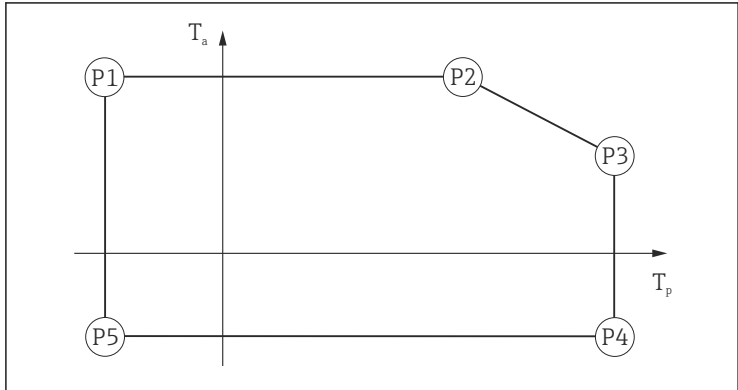
1st column: Position 8 = A, B, ...

2nd column: Maximum load current

3rd column: Temperature classes T6 (85 °C) to T1 (450 °C)

Column P1 to P5: Position (temperature value) on the axes of the derating

- $T_a$ : Ambient temperature in °C
- $T_p$ : Process temperature in °C



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*Zone 20, Zone 21 or Zone 21*

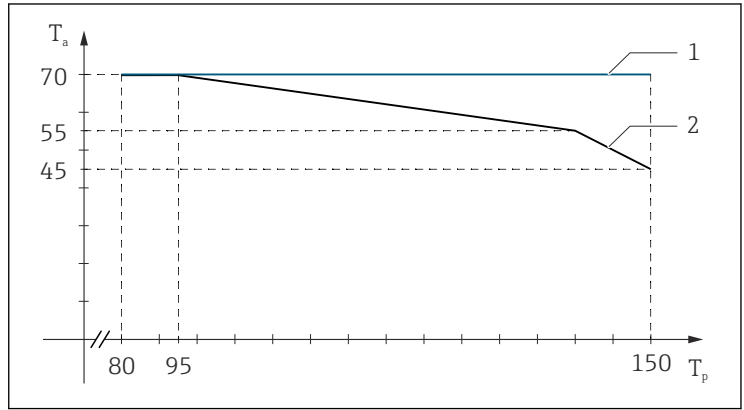
1st column: Position 8 = A, B, ...

2nd column: Maximum load current

3rd column: Process temperature range in °C

4th column: Ambient temperature range in °C

5th column: Maximum surface temperature in °C

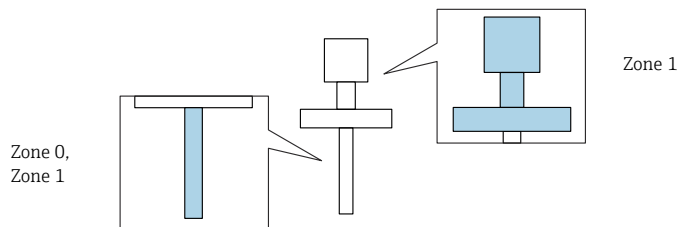


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 $T_a$  Ambient temperature in °C $T_p$  Process temperature in °C

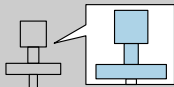
1 With Optional Specification, ID Mx = MR, ...

2 Without Optional Specification, ID Mx = MR, ...

**Zone 0, Zone 1**

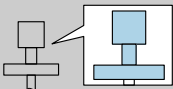
Position 3, 4 = A1

Without Optional specification, ID Mx = MR, MS

<div></div> <div>= B, C</div>												
N, P, T			P1		P2		P3		P4		P5	
			T <sub>p</sub>	T <sub>a</sub>	T <sub>p</sub>	T <sub>a</sub>	T <sub>p</sub>	T <sub>a</sub>	T <sub>p</sub>	T <sub>a</sub>	T <sub>p</sub>	T <sub>a</sub>
	180 mA											
		T6	-50	55	55	55	80	46	80	-40	-50	-40
		T5	-50	70	70	70	95	61	95	-50 <sup>1)</sup> -52 <sup>2)</sup>	-50	-50 <sup>1)</sup> -52 <sup>2)</sup>
		T4	-50	70	76	70	130 120 <sup>4)</sup>	50	130 120 <sup>4)</sup>	-60 <sup>3)</sup>	-50	-60 <sup>3)</sup>
		T3...T1	-50	70	76	70	150 120 <sup>4)</sup>	42	150 120 <sup>4)</sup>		-50	

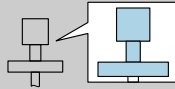
- 1) Only in connection with Optional specification, ID Jx, Kx = JL
- 2) Only in connection with Optional specification, ID Jx, Kx = JN
- 3) Only in connection with Optional specification, ID Jx, Kx = JT
- 4) Only in connection with Position 9 = N

With Optional specification, ID Mx = MR, MS

<div></div> <div>= B, C</div>												
N, P, T			P1		P2		P3		P4		P5	
			T <sub>p</sub>	T <sub>a</sub>	T <sub>p</sub>	T <sub>a</sub>	T <sub>p</sub>	T <sub>a</sub>	T <sub>p</sub>	T <sub>a</sub>	T <sub>p</sub>	T <sub>a</sub>
	180 mA											
		T6	-50	55	55	55	80	53	80	-40	-50	-40
		T5	-50	70	70	70	95	68	95	-50 <sup>1)</sup>	-50	-50 <sup>1)</sup>
		T4	-50	70	94	70	130	67	130	-52 <sup>2)</sup>	-50	-52 <sup>2)</sup>
		T3...T1	-50	70	94	70	120 <sup>4)</sup>	65	120 <sup>4)</sup>	-60 <sup>3)</sup>	-50	-60 <sup>3)</sup>
	350 mA											
		T6	-50	37	49	37	80	34	80	-40	-50	-40
		T5	-50	52	64	52	95	49	95	-50 <sup>1)</sup>	-50	-50 <sup>1)</sup>
		T4	-50	69	69	69	120 <sup>4)</sup>	64	120 <sup>4)</sup>	-52 <sup>2)</sup>	-50	-52 <sup>2)</sup>
		T3...T1	-50	69	69	69	120 <sup>4)</sup>	62	120 <sup>4)</sup>	-60 <sup>3)</sup>	-50	-60 <sup>3)</sup>

- 1) Only in connection with Optional specification, ID Jx, Kx = JL
- 2) Only in connection with Optional specification, ID Jx, Kx = JN
- 3) Only in connection with Optional specification, ID Jx, Kx = JT
- 4) Only in connection with Position 9 = N

Without Optional specification, ID Mx = MR, MS

<div> = M</div>												
N, P, T			P1		P2		P3		P4		P5	
			T <sub>p</sub>	T <sub>a</sub>	T <sub>p</sub>	T <sub>a</sub>	T <sub>p</sub>	T <sub>a</sub>	T <sub>p</sub>	T <sub>a</sub>	T <sub>p</sub>	T <sub>a</sub>
	180 mA											
		T6	-50	63	64	63	80	59	80	-40 -50 <sup>1)</sup>	-50	-40 -50 <sup>1)</sup>
		T5	-50	70	95	70	95	70	95	-52 <sup>2)</sup>	-50	-52 <sup>2)</sup>
		T4	-50	70	112	70	130 120 <sup>4)</sup>	66	130 120 <sup>4)</sup>	-60 <sup>3)</sup>	-50	-60 <sup>3)</sup>
		T3...T1	-50	70	112	70	150 120 <sup>4)</sup>	61	150 120 <sup>4)</sup>		-50	
	350 mA											
		T6	-50	38	39	38	80	29	80	-40 -50 <sup>1)</sup>	-50	-40 -50 <sup>1)</sup>
		T5	-50	53	54	53	95	44	95	-52 <sup>2)</sup>	-50	-52 <sup>2)</sup>
		T4	-50	70	72	70	130 120 <sup>4)</sup>	57	130 120 <sup>4)</sup>	-60 <sup>3)</sup>	-50	-60 <sup>3)</sup>
		T3...T1	-50	70	72	70	150 120 <sup>4)</sup>	53	150 120 <sup>4)</sup>		-50	

- 1) Only in connection with Optional specification, ID Jx, Kx = JL
- 2) Only in connection with Optional specification, ID Jx, Kx = JN
- 3) Only in connection with Optional specification, ID Jx, Kx = JT
- 4) Only in connection with Position 9 = N

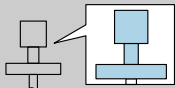
With Optional specification, ID Mx = MR, MS

<div></div> <div>= M</div>												
N, P, T			P1		P2		P3		P4		P5	
			T <sub>p</sub>	T <sub>a</sub>	T <sub>p</sub>	T <sub>a</sub>	T <sub>p</sub>	T <sub>a</sub>	T <sub>p</sub>	T <sub>a</sub>	T <sub>p</sub>	T <sub>a</sub>
	180 mA											
		T6	-50	62	70	62	80	62	80	-40	-50	-40
		T5	-50	70	95	70	95	70	95	-50 <sup>1)</sup>	-50	-50 <sup>1)</sup>
		T4	-50	70	130	70	130	70	130	-52 <sup>2)</sup>	-50	-52 <sup>2)</sup>
		T3...T1	-50	70	120 <sup>4)</sup>	70	120 <sup>4)</sup>	70	120 <sup>4)</sup>	-60 <sup>3)</sup>	-50	-60 <sup>3)</sup>
	350 mA											
		T6	-50	36	80	36	80	36	80	-40	-50	-40
		T5	-50	51	95	51	95	51	95	-50 <sup>1)</sup>	-50	-50 <sup>1)</sup>
		T4	-50	67	130	67	130	67	130	-52 <sup>2)</sup>	-50	-52 <sup>2)</sup>
		T3...T1	-50	66	120 <sup>4)</sup>	66	120 <sup>4)</sup>	66	120 <sup>4)</sup>	-60 <sup>3)</sup>	-50	-60 <sup>3)</sup>

- 1) Only in connection with Optional specification, ID Jx, Kx = JL
- 2) Only in connection with Optional specification, ID Jx, Kx = JN
- 3) Only in connection with Optional specification, ID Jx, Kx = JT
- 4) Only in connection with Position 9 = N

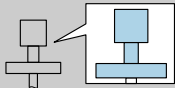
Position 3, 4 = A2

Without Optional specification, ID Mx = MR, MS

<div></div> <div>= B, C, M</div>												
N, P, T			P1		P2		P3		P4		P5	
			T <sub>p</sub>	T <sub>a</sub>	T <sub>p</sub>	T <sub>a</sub>	T <sub>p</sub>	T <sub>a</sub>	T <sub>p</sub>	T <sub>a</sub>	T <sub>p</sub>	T <sub>a</sub>
	350 mA											
		T6	-50	55	55	55	80	46	80	-40 <sup>1)</sup>	-50	-40 <sup>1)</sup>
		T5	-50	70	70	70	95	61	95	-52 <sup>2)</sup>	-50	-52 <sup>2)</sup>
		T4	-50	70	76	70	130 120 <sup>4)</sup>	50	130 120 <sup>4)</sup>	-60 <sup>3)</sup>	-50	-60 <sup>3)</sup>
		T3...T1	-50	70	76	70	150 120 <sup>4)</sup>	42	150 120 <sup>4)</sup>		-50	

- 1) Only in connection with Optional specification, ID Jx, Kx = JL
- 2) Only in connection with Optional specification, ID Jx, Kx = JN
- 3) Only in connection with Optional specification, ID Jx, Kx = JT
- 4) Only in connection with Position 9 = N

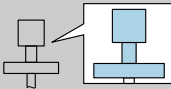
With Optional specification, ID Mx = MR, MS

<div></div> <div>= B, C, M</div>												
N, P, T			P1		P2		P3		P4		P5	
			T <sub>p</sub>	T <sub>a</sub>	T <sub>p</sub>	T <sub>a</sub>	T <sub>p</sub>	T <sub>a</sub>	T <sub>p</sub>	T <sub>a</sub>	T <sub>p</sub>	T <sub>a</sub>
	350 mA											
		T6	-50	55	55	55	80	53	80	-40 <sup>1)</sup>	-50	-40 <sup>1)</sup>
		T5	-50	70	70	70	95	68	95	-52 <sup>2)</sup>	-50	-52 <sup>2)</sup>
		T4	-50	70	94	70	130 120 <sup>4)</sup>	67	130 120 <sup>4)</sup>	-60 <sup>3)</sup>	-50	-60 <sup>3)</sup>
		T3...T1	-50	70	94	70	150 120 <sup>4)</sup>	65	150 120 <sup>4)</sup>		-50	

- 1) Only in connection with Optional specification, ID Jx, Kx = JL
- 2) Only in connection with Optional specification, ID Jx, Kx = JN
- 3) Only in connection with Optional specification, ID Jx, Kx = JT
- 4) Only in connection with Position 9 = N

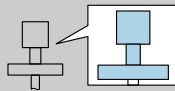
Position 3, 4 = A3, A4

Without Optional specification, ID Mx = MR, MS

<div></div> <div>= B, C</div>												
N, P, T			P1		P2		P3		P4		P5	
			T <sub>p</sub>	T <sub>a</sub>	T <sub>p</sub>	T <sub>a</sub>	T <sub>p</sub>	T <sub>a</sub>	T <sub>p</sub>	T <sub>a</sub>	T <sub>p</sub>	T <sub>a</sub>
	2 A											
		T6	-50	52	52	52	80	42	80	-40 -50 <sup>1)</sup> -52 <sup>2)</sup> -60 <sup>3)</sup>	-50	-40 -50 <sup>1)</sup> -52 <sup>2)</sup> -60 <sup>3)</sup>
		T5	-50	67	67	67	95	57	95		-50	
		T4	-50	70	77	70	130 120 <sup>4)</sup>	70	130 120 <sup>4)</sup>		-50	
		T3...T1	-50	70	77	70	150 120 <sup>4)</sup>	70	150 120 <sup>4)</sup>		-50	

- 1) Only in connection with Optional specification, ID Jx, Kx = JL
- 2) Only in connection with Optional specification, ID Jx, Kx = JN
- 3) Only in connection with Optional specification, ID Jx, Kx = JT
- 4) Only in connection with Position 9 = N

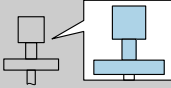
With Optional specification, ID Mx = MR, MS

<div></div> <div>= B, C</div>												
N, P, T			P1		P2		P3		P4		P5	
			T <sub>p</sub>	T <sub>a</sub>	T <sub>p</sub>	T <sub>a</sub>	T <sub>p</sub>	T <sub>a</sub>	T <sub>p</sub>	T <sub>a</sub>	T <sub>p</sub>	T <sub>a</sub>
	2 A											
		T6	-50	52	52	52	80	50	80	-40 -50 <sup>1)</sup> -52 <sup>2)</sup> -60 <sup>3)</sup>	-50	-40 -50 <sup>1)</sup> -52 <sup>2)</sup> -60 <sup>3)</sup>
		T5	-50	67	67	67	95	65	95		-50	-52 <sup>2)</sup> -60 <sup>3)</sup>
		T4	-50	70	100	70	130 120 <sup>4)</sup>	67	130 120 <sup>4)</sup>		-50	-60 <sup>3)</sup>
		T3...T1	-50	70	100	70	150 120 <sup>4)</sup>	66	150 120 <sup>4)</sup>		-50	
	4 A											
		T6	-50	41	50	41	80	39	80	-40 -50 <sup>1)</sup> -52 <sup>2)</sup> -60 <sup>3)</sup>	-50	-40 -50 <sup>1)</sup> -52 <sup>2)</sup> -60 <sup>3)</sup>
		T5	-50	56	65	56	95	54	95		-50	-52 <sup>2)</sup> -60 <sup>3)</sup>
		T4	-50	69	76	69	130 120 <sup>4)</sup>	64	130 120 <sup>4)</sup>		-50	-60 <sup>3)</sup>
		T3...T1	-50	69	76	69	150 120 <sup>4)</sup>	63	150 120 <sup>4)</sup>		-50	

- 1) Only in connection with Optional specification, ID Jx, Kx = JL
- 2) Only in connection with Optional specification, ID Jx, Kx = JN
- 3) Only in connection with Optional specification, ID Jx, Kx = JT
- 4) Only in connection with Position 9 = N

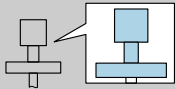


Without Optional specification, ID Mx = MR, MS

<div></div> <div>= M</div>												
N, P, T			P1		P2		P3		P4		P5	
			T <sub>p</sub>	T <sub>a</sub>	T <sub>p</sub>	T <sub>a</sub>	T <sub>p</sub>	T <sub>a</sub>	T <sub>p</sub>	T <sub>a</sub>	T <sub>p</sub>	T <sub>a</sub>
	2 A											
		T6	-50	55	56	55	80	50	80	-40 -50 <sup>1)</sup> -52 <sup>2)</sup> -60 <sup>3)</sup>	-50	-40 -50 <sup>1)</sup> -52 <sup>2)</sup> -60 <sup>3)</sup>
		T5	-50	70	71	70	95	65	95		-50	
		T4	-50	70	94	70	130 120 <sup>4)</sup>	61	130 120 <sup>4)</sup>		-50	
		T3...T1	-50	70	94	70	150 120 <sup>4)</sup>	57	150 120 <sup>4)</sup>		-50	

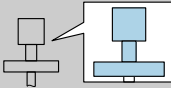
- 1) Only in connection with Optional specification, ID Jx, Kx = JL
- 2) Only in connection with Optional specification, ID Jx, Kx = JN
- 3) Only in connection with Optional specification, ID Jx, Kx = JT
- 4) Only in connection with Position 9 = N

With Optional specification, ID Mx = MR, MS

<div>= M</div>												
N, P, T			P1		P2		P3		P4		P5	
			T <sub>p</sub>	T <sub>a</sub>	T <sub>p</sub>	T <sub>a</sub>	T <sub>p</sub>	T <sub>a</sub>	T <sub>p</sub>	T <sub>a</sub>	T <sub>p</sub>	T <sub>a</sub>
	2 A											
		T6	-50	55	59	55	80	53	80	-40 -50 <sup>1)</sup>	-50	-40 -50 <sup>1)</sup>
		T5	-50	70	74	70	95	68	95	-52 <sup>2)</sup>	-50	-52 <sup>2)</sup>
		T4	-50	70	130 120 <sup>4)</sup>	70	130 120 <sup>4)</sup>	70	130 120 <sup>4)</sup>	-60 <sup>3)</sup>	-50	-60 <sup>3)</sup>
		T3...T1	-50	70	148 120 <sup>4)</sup>	70	150 120 <sup>4)</sup>	69	150 120 <sup>4)</sup>		-50	
	4 A											
		T6	-50	45	62	45	80	44	80	-40 -50 <sup>1)</sup>	-50	-40 -50 <sup>1)</sup>
		T5	-50	60	77	60	95	59	95	-52 <sup>2)</sup>	-50	-52 <sup>2)</sup>
		T4	-50	70	113	70	130 120 <sup>4)</sup>	69	130 120 <sup>4)</sup>	-60 <sup>3)</sup>	-50	-60 <sup>3)</sup>
		T3...T1	-50	70	115	70	150 120 <sup>4)</sup>	67 69 <sup>4)</sup>	150 120 <sup>4)</sup>		-50	

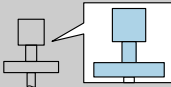
- 1)
- Only in connection with Optional specification, ID Jx, Kx = JL
- 2)
- Only in connection with Optional specification, ID Jx, Kx = JN
- 3)
- Only in connection with Optional specification, ID Jx, Kx = JT
- 4)
- Only in connection with Position 9 = N

Position 3, 4 = A7, A8

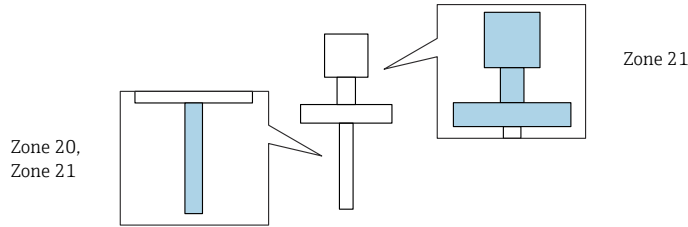
<div></div> <div>= B, C, M</div>												
N, P, T			P1		P2		P3		P4		P5	
			T <sub>p</sub>	T <sub>a</sub>	T <sub>p</sub>	T <sub>a</sub>	T <sub>p</sub>	T <sub>a</sub>	T <sub>p</sub>	T <sub>a</sub>	T <sub>p</sub>	T <sub>a</sub>
		T6	-50	70	80	70	80	70	80	-40	-50	-40
		T5	-50	70	95	70	95	70	95	-50 <sup>1)</sup> -52 <sup>2)</sup>	-50	-50 <sup>1)</sup> -52 <sup>2)</sup>
		T4	-50	70	130 120 <sup>4)</sup>	70	130 120 <sup>4)</sup>	70	130 120 <sup>4)</sup>	-60 <sup>3)</sup>	-50	-60 <sup>3)</sup>
		T3...T1	-50	70	150 120 <sup>4)</sup>	70	150 120 <sup>4)</sup>	65	150 120 <sup>4)</sup>		-50	

- 1) Only in connection with Optional specification, ID Jx, Kx = JL
- 2) Only in connection with Optional specification, ID Jx, Kx = JN
- 3) Only in connection with Optional specification, ID Jx, Kx = JT
- 4) Only in connection with Position 9 = N

Position 3, 4 = GA

<div></div> <div>= B, C, M</div>												
C			P1		P2		P3		P4		P5	
			T <sub>p</sub>	T <sub>a</sub>	T <sub>p</sub>	T <sub>a</sub>	T <sub>p</sub>	T <sub>a</sub>	T <sub>p</sub>	T <sub>a</sub>	T <sub>p</sub>	T <sub>a</sub>
		T6...T1	-50	70	80	70	80	70	80	-40	-50	-40

Zone 20, Zone 21



Position 3, 4 = A1

Without Optional specification, ID Mx = MR, MS

N, P, T				
	<b>150 mA</b>			
		$-50 \leq T_p \leq +80$	$-40 \leq T_a \leq +68$ $-50^{1)}/-52^{2)}/-60^{3)} \leq T_a \leq +68$	T -40 to +80
		$-50 \leq T_p \leq +95$	$-40 \leq T_a \leq +70$ $-50^{1)}/-52^{2)}/-60^{3)} \leq T_a \leq +70$	T -40 to +95
		$-50 \leq T_p \leq +130$ $-50 \leq T_p \leq +120^{4)}$	$-40 \leq T_a \leq +60$ $-50^{1)}/-52^{2)}/-60^{3)} \leq T_a \leq +60$	T -40 to +130 T -40 to +120 <sup>4)</sup>
		$-50 \leq T_p \leq +150$ $-50 \leq T_p \leq +120^{4)}$	$-40 \leq T_a \leq +50$ $-50^{1)}/-52^{2)}/-60^{3)} \leq T_a \leq +50$	T -40 to +150 T -40 to +120 <sup>4)</sup>
	<b>350 mA</b>			
		$-50 \leq T_p \leq +80$	$-40 \leq T_a \leq +60$ $-50^{1)}/-52^{2)}/-60^{3)} \leq T_a \leq +60$	T -40 to +80
		$-50 \leq T_p \leq +95$	$-40 \leq T_a \leq +67$ $-50^{1)}/-52^{2)}/-60^{3)} \leq T_a \leq +67$	T -40 to +95
		$-50 \leq T_p \leq +130$ $-50 \leq T_p \leq +120^{4)}$	$-40 \leq T_a \leq +54$ $-50^{1)}/-52^{2)}/-60^{3)} \leq T_a \leq +54$	T -40 to +130 T -40 to +120 <sup>4)</sup>
		$-50 \leq T_p \leq +150$ $-50 \leq T_p \leq +120^{4)}$	$-40 \leq T_a \leq +46$ $-50^{1)}/-52^{2)}/-60^{3)} \leq T_a \leq +46$	T -40 to +150 T -40 to +120 <sup>4)</sup>

- 1) Only in connection with Optional specification, ID Jx, Kx = JL
- 2) Only in connection with Optional specification, ID Jx, Kx = JN
- 3) Only in connection with Optional specification, ID Jx, Kx = JT
- 4) Only in connection with Position 9 = N

With Optional specification, ID Mx = MR, MS

N, P, T				
	<b>150 mA</b>			
		$-50 \leq T_p \leq +80$	$-40 \leq T_a \leq +70$ $-50^{1)}/-52^{2)}/-60^{3)} \leq T_a \leq +70$	T -40 to +80
		$-50 \leq T_p \leq +95$	$-40 \leq T_a \leq +70$ $-50^{1)}/-52^{2)}/-60^{3)} \leq T_a \leq +70$	T -40 to +95
		$-50 \leq T_p \leq +130$ $-50 \leq T_p \leq +120^{4)}$	$-40 \leq T_a \leq +70$ $-50^{1)}/-52^{2)}/-60^{3)} \leq T_a \leq +70$	T -40 to +130 T -40 to +120 <sup>4)</sup>
		$-50 \leq T_p \leq +150$ $-50 \leq T_p \leq +120^{4)}$	$-40 \leq T_a \leq +70$ $-50^{1)}/-52^{2)}/-60^{3)} \leq T_a \leq +70$	T -40 to +150 T -40 to +120 <sup>4)</sup>
	<b>350 mA</b>			
		$-50 \leq T_p \leq +80$	$-40 \leq T_a \leq +68$ $-50^{1)}/-52^{2)}/-60^{3)} \leq T_a \leq +68$	T -40 to +80
		$-50 \leq T_p \leq +95$	$-40 \leq T_a \leq +70$ $-50^{1)}/-52^{2)}/-60^{3)} \leq T_a \leq +70$	T -40 to +95
		$-50 \leq T_p \leq +130$ $-50 \leq T_p \leq +120^{4)}$	$-40 \leq T_a \leq +70$ $-50^{1)}/-52^{2)}/-60^{3)} \leq T_a \leq +70$	T -40 to +130 T -40 to +120 <sup>4)</sup>
		$-50 \leq T_p \leq +150$ $-50 \leq T_p \leq +120^{4)}$	$-40 \leq T_a \leq +69$ $-50^{1)}/-52^{2)}/-60^{3)} \leq T_a \leq +69$	T -40 to +150 T -40 to +120 <sup>4)</sup>

1) Only in connection with Optional specification, ID Jx, Kx = JL

2) Only in connection with Optional specification, ID Jx, Kx = JN

3) Only in connection with Optional specification, ID Jx, Kx = JT

4) Only in connection with Position 9 = N

Position 3, 4 = A2

N, P, T				
	350 mA			
		$-50 \leq T_p \leq +80$	$-40 \leq T_a \leq +60$ $-50^{1)}/-52^{2)}/-60^{3)} \leq T_a \leq +60$	T -40 to +80
		$-50 \leq T_p \leq +95$	$-40 \leq T_a \leq +70$ $-50^{1)}/-52^{2)}/-60^{3)} \leq T_a \leq +70$	T -40 to +95
		$-50 \leq T_p \leq +130$ $-50 \leq T_p \leq +120^{4)}$	$-40 \leq T_a \leq +70$ $-50^{1)}/-52^{2)}/-60^{3)} \leq T_a \leq +70$	T -40 to +130 T -40 to +120 <sup>4)</sup>
		$-50 \leq T_p \leq +150$ $-50 \leq T_p \leq +120^{4)}$	$-40 \leq T_a \leq +70$ $-50^{1)}/-52^{2)}/-60^{3)} \leq T_a \leq +70$	T -40 to +150 T -40 to +120 <sup>4)</sup>

- 1) Only in connection with Optional specification, ID Jx, Kx = JL
- 2) Only in connection with Optional specification, ID Jx, Kx = JN
- 3) Only in connection with Optional specification, ID Jx, Kx = JT
- 4) Only in connection with Position 9 = N

Position 3, 4 = A3, A4

Without Optional specification, ID Mx = MR, MS

N, P, T				
	<b>2 A, 4 A</b>			
		$-50 \leq T_p \leq +80$	$-40 \leq T_a \leq +50$ $-50^{1)}/-52^{2)}/-60^{3)} \leq T_a \leq +50$	T -40 to +80
		$-50 \leq T_p \leq +95$	$-40 \leq T_a \leq +65$ $-50^{1)}/-52^{2)}/-60^{3)} \leq T_a \leq +65$	T -40 to +95
		$-50 \leq T_p \leq +130$ $-50 \leq T_p \leq +120^{4)}$	$-40 \leq T_a \leq +50$ $-50^{1)}/-52^{2)}/-60^{3)} \leq T_a \leq +50$	T -40 to +130 T -40 to +120 <sup>4)</sup>
		$-50 \leq T_p \leq +150$ $-50 \leq T_p \leq +120^{4)}$	$-40 \leq T_a \leq +45$ $-50^{1)}/-52^{2)}/-60^{3)} \leq T_a \leq +45$	T -40 to +150 T -40 to +120 <sup>4)</sup>
	<b>6 A</b>			
		$-50 \leq T_p \leq +80$	$-40 \leq T_a \leq +37$ $-50^{1)}/-52^{2)}/-60^{3)} \leq T_a \leq +37$	T -40 to +80
		$-50 \leq T_p \leq +95$	$-40 \leq T_a \leq +50$ $-50^{1)}/-52^{2)}/-60^{3)} \leq T_a \leq +50$	T -40 to +95
		$-50 \leq T_p \leq +130$ $-50 \leq T_p \leq +120^{4)}$	$-40 \leq T_a \leq +45$ $-50^{1)}/-52^{2)}/-60^{3)} \leq T_a \leq +45$	T -40 to +130 T -40 to +120 <sup>4)</sup>
		$-50 \leq T_p \leq +150$ $-50 \leq T_p \leq +120^{4)}$	$-40 \leq T_a \leq +40$ $-50^{1)}/-52^{2)}/-60^{3)} \leq T_a \leq +40$	T -40 to +150 T -40 to +120 <sup>4)</sup>

- 1) Only in connection with Optional specification, ID Jx, Kx = JL
- 2) Only in connection with Optional specification, ID Jx, Kx = JN
- 3) Only in connection with Optional specification, ID Jx, Kx = JT
- 4) Only in connection with Position 9 = N

With Optional specification, ID Mx = MR, MS

N, P, T				
	<b>2 A, 4 A</b>			
		$-50 \leq T_p \leq +80$	$-40 \leq T_a \leq +58$ $-50^{1)}/-52^{2)}/-60^{3)} \leq T_a \leq +58$	T -40 to +80
		$-50 \leq T_p \leq +95$	$-40 \leq T_a \leq +65$ $-50^{1)}/-52^{2)}/-60^{3)} \leq T_a \leq +65$	T -40 to +95
		$-50 \leq T_p \leq +130$ $-50 \leq T_p \leq +120^{4)}$	$-40 \leq T_a \leq +70$ $-50^{1)}/-52^{2)}/-60^{3)} \leq T_a \leq +70$	T -40 to +130 T -40 to +120 <sup>4)</sup>
		$-50 \leq T_p \leq +150$ $-50 \leq T_p \leq +120^{4)}$	$-40 \leq T_a \leq +70$ $-50^{1)}/-52^{2)}/-60^{3)} \leq T_a \leq +70$	T -40 to +150 T -40 to +120 <sup>4)</sup>
	<b>6 A</b>			
		$-50 \leq T_p \leq +80$	$-40 \leq T_a \leq +52$ $-50^{1)}/-52^{2)}/-60^{3)} \leq T_a \leq +52$	T -40 to +80
		$-50 \leq T_p \leq +95$	$-40 \leq T_a \leq +60$ $-50^{1)}/-52^{2)}/-60^{3)} \leq T_a \leq +60$	T -40 to +95
		$-50 \leq T_p \leq +130$ $-50 \leq T_p \leq +120^{4)}$	$-40 \leq T_a \leq +60$ $-50^{1)}/-52^{2)}/-60^{3)} \leq T_a \leq +60$	T -40 to +130 T -40 to +120 <sup>4)</sup>
		$-50 \leq T_p \leq +150$ $-50 \leq T_p \leq +120^{4)}$	$-40 \leq T_a \leq +58$ $-50^{1)}/-52^{2)}/-60^{3)} \leq T_a \leq +58$	T -40 to +150 T -40 to +120 <sup>4)</sup>

- 1) Only in connection with Optional specification, ID Jx, Kx = JL
- 2) Only in connection with Optional specification, ID Jx, Kx = JN
- 3) Only in connection with Optional specification, ID Jx, Kx = JT
- 4) Only in connection with Position 9 = N

Position 3, 4 = A7, A8

N, P, T				
		$-50 \leq T_p \leq +80$	$-40 \leq T_a \leq +70$ $-50^{1)}/-52^{2)}/-60^{3)} \leq T_a \leq +70$	T -40 to +80
		$-50 \leq T_p \leq +150$ $-50 \leq T_p \leq +120^{4)}$	$-40 \leq T_a \leq +70$ $-50^{1)}/-52^{2)}/-60^{3)} \leq T_a \leq +70$	T -40 to +150 T -40 to +120 <sup>4)</sup>

- 1) Only in connection with Optional specification, ID Jx, Kx = JL
- 2) Only in connection with Optional specification, ID Jx, Kx = JN
- 3) Only in connection with Optional specification, ID Jx, Kx = JT
- 4) Only in connection with Position 9 = N



Position 3, 4 = GA

C				
		$-50 \leq T_p \leq +80$	$-40 \leq T_a \leq +70$	T -40 to +80

## Connection data

Optional specification, ID Nx, Ox = NF, NG

When using the Bluetooth® module: No changes to the connection values.

Basic specification, Position 3, 4	Power supply circuit	Output
A1	U = 19 to 253 V <sub>AC</sub> , 50/60 Hz; P <sub>max</sub> < 2 VA	I <sub>max</sub> = 180 mA I <sub>max</sub> = 350 mA <sup>1)</sup>
A2	U = 10 to 55 V <sub>DC</sub> ; P <sub>max</sub> < 0.5 W, P <sub>max</sub> < 1.2 W <sup>2)</sup>	I <sub>max</sub> = 350 mA
A3	U = 9 to 20 V <sub>DC</sub> ; P <sub>max</sub> < 1 W, P <sub>max</sub> < 1.7 W <sup>2)</sup>	2 potential free change-over contacts; 2 A Ex d, 6 A Ex t, 4 A Ex d, 6 A Ex t <sup>3)</sup>
A4	U = 19 to 253 V <sub>AC</sub> , 50/60 Hz or 19 to 55 V <sub>DC</sub> ; P <sub>max</sub> < 25 VA or < 1.3 W, P <sub>max</sub> < 31 VA or < 2 W <sup>2)</sup>	
A7	U = 9.5 to 12.5 V <sub>DC</sub> ; PFM; I <sub>max</sub> = 12 mA  Connection only to power supply unit FTL325P or FTL375P from Endress+Hauser.	
A8	U = 4 to 8.2 V <sub>DC</sub>	NAMUR; I <sub>max</sub> = 3.8 mA
GA	U = 21 to 26 V <sub>DC</sub> ; I <sub>max</sub> = 16 mA  Connection only to power supply unit FML621 from Endress+Hauser.	

- 1) Only in connection with Position 8 = A, B, Optional Specification ID Mx = MR, MS
- 2) Only in connection with Position 5 = B
- 3) Only in connection with Optional Specification ID Mx = MR, MS

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