

Betriebsanleitung

Druckmessumformer mit
RS485 Modbus RTU / i°C-Schnittstelle

LPT 531i + LPT 541



VOR GEBRAUCH SORGFÄLTIG LESEN
AUFBEWAHREN FÜR SPÄTERES NACHSCHLAGEN
Rel. 20241007

1. Allgemeine Informationen und sicherheits-technische Hinweise über diese Betriebsanleitung

Diese Betriebsanleitung ermöglicht den sicheren und sach-gemäßen Umgang mit dem Produkt und ist Bestandteil des Gerätes. Sie ist in unmittelbarer Nähe des Einsatzortes, für das Personal jederzeit zugänglich, aufzubewahren.

Alle Personen, die mit der Montage, Installation, Inbetriebnahme, Betrieb, Wartung, Außerbetriebnahme und Entsorgung des Gerätes beauftragt sind, müssen diese Betriebsanleitung und insbesondere die sicherheitstechnischen Hinweise gelesen und verstanden haben.

Ergänzend zu dieser Betriebsanleitung ist das aktuelle Datenblatt zu beachten.

Laden Sie dies unter www.druck-temperatur.de herunter oder fordern Sie es an: dt-info@leitenberger.de

Zusätzlich sind die geltenden Unfallverhütungsvorschriften, Sicherheitsbestimmungen sowie landesspezifische Installations-standards und die anerkannten Regeln der Technik einzuhalten.

1.1 Verwendete Symbole

	- Art und Quelle der Gefahr - Maßnahmen zur Vermeidung der Gefahr
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Warnwort	Bedeutung
	- Unmittelbar drohende Gefahr! - Bei Nichtbeachtung folgt Tod oder schwere Verletzung.
	- Möglicherweise drohende Gefahr! - Bei Nichtbeachtung kann Tod oder schwere Verletzung folgen .
	- Gefährliche Situation! - Bei Nichtbeachtung kann geringfügige oder mäßige Verletzung folgen .

HINWEIS – Macht auf eine möglicherweise gefährliche Situation aufmerksam, die bei Nichtbeachtung Sachschäden zur Folge haben kann.

- ✓ Voraussetzung einer Handlung

1.2 Qualifikation des Personals

Qualifizierte Personen sind Personen, die mit der Montage, Installation, Inbetriebnahme, Betrieb, Wartung, Außerbetriebnahme und Entsorgung des Produktes vertraut sind und über, für ihre Tätigkeit entsprechende Qualifikation verfügen.

Dazu zählen Personen, die mindestens eine der drei folgenden Voraussetzungen erfüllen:

- Ihnen sind die Sicherheitskonzepte der Mess- und Automatisierungstechnik bekannt und sie sind als Projektpersonal damit vertraut.
- Sie sind Bedienpersonal der Mess- und Automatisierungsanlagen und sind im Umgang mit den Anlagen unterwiesen. Sie sind mit der Bedienung der in dieser Dokumentation beschriebenen Geräte und Technologien vertraut.
- Sie sind Inbetriebnehmer oder für den Service eingesetzt und haben eine Ausbildung absolviert, die Sie zur Reparatur der Anlage befähigt. Außerdem haben sie die Berechtigung, Stromkreise und Geräte gemäß den Normen der Sicherheitstechnik in Betrieb zu nehmen, zu erden und zu kennzeichnen.

Alle Arbeiten mit diesem Produkt sind von diesen qualifizierten Personen auszuführen!

1.3 Bestimmungsgemäße Verwendung

Die Geräte dienen zum Umwandeln von der physikalischen Größe Druck in ein digitales elektrisches Signal. Es ist ausschließlich zu diesem Verwendungszweck, unter Berücksichtigung der nachfolgenden Angaben, zu nutzen.

Geräte mit 3-A- und / oder EHEDG-zugelassenen Prozessanschluss wurden speziell für den Einsatz in der Lebensmittelindustrie und Pharmazie konzipiert. Der Prozessanschluss ist hygienegerecht und sterilisierbar.

Als Mess- und Reinigungsmedien kommen Gase oder Flüssigkeiten in Frage, die mit den medienberührten Werkstoffen des Druckmessgerätes (gemäß Datenblatt) sowie Ihrer Anlage kompatibel sind. Dies ist für den Einsatzfall sicherzustellen.

Eine Überprüfung, ob das Gerät für den gewählten Einsatz geeignet ist, muss vom Anwender durchgeführt werden. Im Zweifelsfall setzen Sie sich mit unserem Vertrieb in Verbindung dt-info@leitenberger.de | Tel. +49-(0)7121-90920-0

Für eine fehlerhafte Auswahl und deren Folgen übernimmt DRUCK & TEMPERATUR Leitenberger keine Haftung!

Die im aktuellen Datenblatt aufgeführten technischen Daten sind verbindlich und müssen unbedingt eingehalten werden. Sollte Ihnen das Datenblatt nicht vorliegen, fordern Sie es bitte an oder laden Sie es auf unserer Homepage herunter:

<https://www.druck-temperatur.de>

1.4 Fehlgebrauch

	Gefahr durch falsche Verwendung - Setzen Sie das Gerät gemäß der bestimmungsgemäßen Verwendung, in geeigneten Messmedien, ein. - Verwenden Sie das Gerät nicht als Kletter- oder Steighilfe. - Am Gerät dürfen keine Veränderungen oder Umbauten vorgenommen werden. - Für Schäden durch unsachgemäße oder falsche Verwendung haftet D+T Leitenberger nicht.
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1.5 Haftungs- und Gewährleistungsbeschränkung

Nichtbeachtung der Anleitungen und technischen Vorschriften, unsachgemäße und nicht bestimmungsgemäße Verwendung, Veränderung oder Beschädigung des Gerätes führen zu Verlust der Gewährleistungs- und Haftungsansprüche.

1.6 Sichere Handhabung

HINWEIS - Wenden Sie zum Einbau der Geräte keine Gewalt an, um Schäden am Gerät und der Anlage zu verhindern!

HINWEIS - Behandeln Sie das Gerät sowohl im verpackten als auch im unverpackten Zustand vorsichtig!

HINWEIS - Gerät nicht werfen und nicht fallen lassen!

HINWEIS - Staubablagerungen am Gerät und das völlige Einschütten in Staub ist zu verhindern!

HINWEIS - Das Gerät entspricht dem Stand der Technik und ist betriebssicher. Von dem Gerät können Restgefahren ausgehen, wenn es unsachgemäß eingesetzt oder bedient wird.

1.7 Lieferumfang

Überprüfen Sie, dass alle aufgelisteten Teile im Lieferumfang unbeschadet enthalten sind und entsprechend Ihrer Bestellung geliefert wurden:

- Druckmessumformer
- für mech. Anschlüsse DIN 3852: O-Ring (vormontiert)
- diese Betriebsanleitung

1.8 UL-Zulassung (für Geräte mit UL-Kennzeichnung)

Die UL-Zulassung erfolgte unter Anwendung der US-amerikanischen Normen, welche auch mit den anwendbaren kanadischen Normen zur Sicherheit übereinstimmen.

Beachten Sie folgende Punkte, damit das Gerät die Anforderungen der UL-Zulassung erfüllt:

- Betrieb ausschließlich in „Innenräumen“!
- maximale Betriebsspannung: gemäß Datenblatt
- Der Messumformer muss über eine Versorgung mit Energiebegrenzung (nach UL 61010) oder NEC Class 2 Energieversorgung betrieben werden

2. Produktidentifikation

Zur Identifikation des Gerätes dient das Typenschild mit Bestellcode. Die wichtigsten Daten können diesem entnommen werden.

Typenbezeichnung		Bestellcode		Seriennummer	

6.2 Detaillierte Registerbeschreibung

Map of Input registers (read only, function #4 - Read Input Registers)		
Adress	Register	Data type
0x0000	Serial number	Uint32
0x0001		
0x0002		
0x0003	Date of last calibration	Date
0x0004		
0x0005	Upper range of pressure channel	Float, IEEE754
0x0006		
0x0007	Lower range of pressure channel	Float, IEEE754
0x0008		
0x0009	Actual pressure	Float, IEEE754
0x000A		
0x000B	Maximal pressure	Float, IEEE754
0x000C		
0x000D	Minimal pressure	Float, IEEE754
0x000E		
0x000F	Upper range of temperature channel	Float, IEEE754
0x0010		
0x0011	Lower range of temperature channel	Float, IEEE754
0x0012		
0x0013	Actual temperature	Float, IEEE754
0x0014		
0x0015	Maximal temperature	Float, IEEE754
0x0016		
0x0017	Minimal temperature	Float, IEEE754

Map of Holding registers (read, write, fce #3 - Read Holding Registers , fce #6 - Write Single Register)		
Adress	Register	Data type
0x0000	Unit of pressure channel	Uint16
0x0001	Unit of temperature channel	Uint16
0x0002	Device address	Uint16
0x0003	Baud rate	Uint16
0x0004	Parity	Uint16

Pressure unit	
Code (Uint16)	Unit
0x0003	mmH ₂ O
0x0004	mmHG
0x0005	psi
0x0006	bar
0x0007	mbar
0x0008	g/cm²
0x0009	kg/cm²
0x000A	Pa
0x000B	kPa
0x000C	torr
0x000D	atm
0x000E	mHzO
0x000F	MPa

Temperature unit	
Code (Uint16)	Unit
0x0000	°C
0x0001	°K
0x0002	°F

Baud rate	
Code (Uint16)	Baud Rate [Bd]
0x0004	4800
0x0005	9600
0x0006	19200
0x0007	38400

Parity	
Code (Uint16)	Parity
0x0000	none
0x0001	odd
0x0002	even

6.3 Reset-Funktion für LPT 531i und LPT 541:

Bei der Resetfunktion des Gerätes handelt es sich um eine Servicefunktion, die im regulären Betrieb (Busbetrieb) nicht verwendet wird. Die Resetfunktion dient dazu das Geräte auf die Werkseinstellungen zurück zu setzen, was insbesondere bei der Busadresse extrem hilfreich ist. Im regulären Betrieb darf am Reseteingang kein Signal angeschlossen werden.

Aktivierung der Resetfunktion:

Um den Reset auf Werkseinstellungen vorzunehmen, muss der Reseteingang zusammen mit dem Eingang der positiven Versorgungsspannung zeitgleich an 24 V angeschlossen werden. Die Bussignale A+B können zu diesem Zeitpunkt beschalten oder unbeschalten sein.

Nach dem einmaligen Anschluss von 24 V wurde intern der Reset durchgeführt und der Reseteingang muss wieder frei geschaltet werden.

7. i²C-Schnittstelle

7.1 Konfiguration i²C-Schnittstelle

Betrifft nur LPT 532i							
Werkseinstellung	050	0	0	0	0	0	00001
Slave Address							
address	1 ... 127						
Type of result register							
32bit IEEE float		0					
16bit integer		1					
Byte order of values							
Low byte first			0				
High byte first			1				
Mode of result register							
Value				0			
Percent of nominal				1			
Restore of address pointer							
no restore					0		
to last set address on next start					1		
Digital meaning							
Count of result							00001 ... 10000

7.2 Register Übersicht

Register	Type 0 (Float)	Type 1 (Int 16)
0x00	Status	Status
0x01	Pressure	Pressure
0x02		
0x03		Temperature
0x04		
0x05	Temperature	
0x06		
0x07		
0x08		
0x40	Configuration	Configuration
0x41	Oversampling	Oversampling
0x42		
0x43	Slave Address	Slave Address
0x44	Pressure unit	Pressure unit
0x45	Nominal pressure lower	Nominal pressure lower
0x46		Decimal places
0x47		
0x48	Nominal pressure upper	Nominal pressure upper
0x49		
0x4A		
0x4B		
0x4C	Temperature unit	Temperature unit
0x4D		
0x4E		
0x4F		
0x50	Nominal temperature lower	Decimal places
0x51		
0x52	Nominal temperature upper	Nominal temperature upper
0x53		
0x54		
0x55		

7.3 Detaillierte Registerbeschreibung

Erklärung:

r = only readable

r/w = read and write capable

d = don't care

0x00 – Status register:

7	6	5	4	3	2	1	0
ABS			ERR	SAT	OVER	UNDER	READY
r	d	d	r	r	r	r	r

bit 0	Result registers is READY						
0 b =	Outdated values will be read						
1 b =	Registers contain new values						
Note:	This bit has same behaviour as hardware ready connector. Logic level is inverted because of open collector at output stage.						
Note:	It is possible to poll update without using hard wiring, or to check which sensor has updated if more than one is used on bus.						
bit 2	Value is out of UNDER nominal range						
0 b =	Pressure value is in nominal range						
1 b =	Pressure is to low Note: OVER and UNDER						
bit 3	Value SAT urated						
0 b =	No saturation						
1 b =	Output value or ADC is out of range						
bit 4	Internal ERR or, transmitter does not work						
0 b =	Transmitter is in normal operation						
1 b =	Internal error or wrong setting is active						
bit 7	Transmitter is ABS olute						
0 b =	Pressure type of transmitter is relative						
1 b =	Pressure type of transmitter is absolute						

0x40 – Configuration register

7	6	5	4	3	2	1	0
ADD			RESTORE	MODE	ORDER	TYPE	
r/w	d	d	r/w	r/w	r/w	r/w	

bit 0	TYPE of result register						
0 b =	32bit IEEE float						
1 b =	16bit integer						
bit 1	Byte ORDER of values						
0 b =	Low byte first						
1 b =	High byte first						
bit 2...3	MODE of result register						
00b=	Value						
01b=	Percent of nominal						
10b=	reserved 11b= reserved						
bit 4	RESTORE address pointer						
0 b =	No restore						
1 b =	Restore to last set address on restart						
Note:	Using this setting causes reset of register pointer to last written after each stop condition of readout.						
bit 7	Set new I2C slave ADDRESS						
0 b =	Slave address stays as it is						
1 b =	Set this bit to apply previously set slave address						

0x43 – Slave adress register

7	6	5	4	3	2	1	0
SLAVE_ADDRESS							
r/w						d	

bit 1...7	SLAVE ADDRESS which this transmitter acknowleges						
Note:	To apply new address, it is necessary to set ADD bit in configuration register after new address is written.						

0x44 – Pressure unit register

7	6	5	4	3	2	1	0
UNIT							
r/w							

bit 0...7	Pressure UNIT (according to units in HART protocol)						
0x01	inH2O @ 68°F						
0x02	inHg @ 0°C						
0x03	ftH2O @ 68°F						
0x04	mmH2O @ 68°F						
0x05	mmHG @ 0°C						
0x06	psi						
0x07	bar						
0x08	mbar						
0x09	g/cm²						
0x0A	kg/cm²						
0x0B	Pa						
0x0C	kPa						
0x0D	Torr						
0x0E	atm						
0x91	inH2O @ 60°F						
0xAA	cmH2O @ 4°C						
0xAB	mH2O @ 4°C						
0xAC	cmHg @ 0°C						
0xAD	lb/ft²						
0xAE	hPa						
0xB0	kg/m²						
0xB1	ftH2O @ 4°C						
0xB2	ftH2O @ 60°F						
0xB3	mHg @ 0°C						
0xED	Mpa						
0xEE	inH2O @ 4°C						
0xEF	mmH2O @ 4°C						

0x4d – Temperature unit register

7	6	5	4	3	2	1	0
UNIT							
r/w							

bit 0...7	Temperature UNIT (according to units in HART protocol)	
	0x20	°C
	0x21	°F
	0x22	°R
	0x23	K
	Note:	If pressure or temperature unit is set to an invalid value, slave will not acknowledge.
	Note:	If 16bit integer mode is selected and nominal values can not be displayed with 0...5 decimal places, ERROR flag is set and DECIMAL_PLACES will be 0xff.



Operating Manual

Pressure Transmitter DCT
with RS485 Modbus RTU Interface / i°C Interface

LPT 531i + LPT 541



READ THOROUGHLY BEFORE USING THE DEVICE
KEEP FOR FUTURE REFERENCE

Rel. 20241007

1. General and safety-related information on this operating manual

This operating manual enables safe and proper handling of the product, and forms part of the device. It should be kept in close proximity to the place of use, accessible for staff members at any time.

All persons entrusted with the mounting, installation, putting into service, operation, maintenance, removal from service, and disposal of the device must have read and understood the operating manual and in particular the safety-related information.

Complementary to this operating manual the current data sheet has to be adhered to.

Download this by accessing www.druck-temperatur.de or request it: dt-export@leitenberger.de

In addition, the applicable accident prevention regulations, safety requirements, and country-specific installation standards as well as the accepted engineering standards must be observed.

1.1 Symbols Used

	- Type and source of danger - Measures to avoid the danger
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Warning word	Meaning
	- Imminent danger! - Non-compliance will result in death or serious injury.
	- Possible danger! - Non-compliance may result in death or serious injury.
	- Hazardous situation! - Non-compliance may result in minor or moderate injury.

NOTE - draws attention to a possibly hazardous situation that may result in property damage in case of non-compliance.

- ✓ Precondition of an action

1.2 Staff qualification

Qualified persons are persons that are familiar with the mounting, installation, putting into service, operation, maintenance, removal from service, and disposal of the product and have the appropriate qualification for their activity.

This includes persons that meet at least one of the following three requirements:

- They know the safety concepts of metrology and automation technology and are familiar therewith as project staff.
- They are operating staff of the measuring and automation systems and have been instructed in the handling of the systems. They are familiar with the operation of the devices and technologies described in this documentation.
- They are commissioning specialists or are employed in the service department and have completed training that qualifies them for the repair of the system. In addition, they are authorized to put into operation, to ground, and to mark circuits and devices according to the safety engineering standards.

All work with this product must be carried out by qualified persons!

1.3 Intended use

The device is intended for converting the physical parameter of pressure into an electric signal. It has to be used only for this purpose, considering the following information.

Devices with 3-A and / or EHEDG certified process connection have been developed especially for applications in food and pharmaceutical industry. The process connection is hygienic and can be sterilized.

Permissible measuring and cleaning media are gases or liquids, which are compatible with the media wetted parts of the device (according to data sheet) and your system. This must be ensured for the application.

The user must check whether the device is suited for the selected use. In case of doubt, please contact our sales department: dt-export@leitenberger.de

DRUCK & TEMPERATUR Leitenberger assumes no liability for any wrong selection and the consequences thereof!

The technical data listed in the current data sheet are engaging and must absolutely be complied with. If the data sheet is not available, please order or download it from our homepage:

<https://www.druck-temperatur.de>

	Danger through incorrect use - Only use the device in permissible media and in accordance with its intended use. - Do not use the device as a ladder or climbing aid. - The device must not be altered or modified in any way. - Leitenberger is not liable for damage caused by improper or incorrect use.
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1.5 Limitation of liability and warranty

Failure to observe the instructions or technical regulations, improper use and use not as intended, and alteration of or damage to the device will result in the forfeiture of warranty and liability claims.

1.6 Safe handling

NOTE - Do not use any force when installing the device to prevent damage of the device and the plant!

NOTE - Treat the device with care both in the packed and unpacked condition!

NOTE - Do not throw or drop the device!

NOTE - Excessive dust accumulation and complete coverage with dust must be prevented!

NOTE - The device is state-of-the-art and is operationally reliable. Residual hazards may originate from the device if it is used or operated improperly.

1.7 Scope of delivery

Check that all parts listed in the scope of delivery are included free of damage, and have been delivered according to your purchase order:

- pressure transmitters
- for DIN 3852 mech. connectors: O-ring (pre-fitted)
- this operating manual

1.8 UL approval (for devices with UL marking)

The UL approval was effected by applying the US standards, which also conform to the applicable Canadian standards on safety.

Observe the following points so that the device meets the requirements of the UL approval:

- only indoor usage
- maximum operating voltage: according to data sheet
- The device must be operated via a supply with energy limitation (acc. to UL 61010) or an NEC Class 2 energy supply.

2. Product identification

The device can be identified by means of the manufacturing label with ordering code. The most important data can be gathered therefrom.

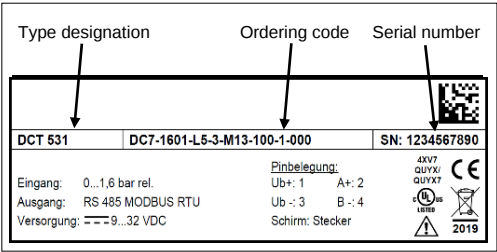


Fig. 1: Example of manufacturing label

NOTE - The manufacturing label must not be removed!

3. Mounting

3.1 Mounting and safety instructions

	Danger of death from airborne parts, leaking fluid, electric shock - Improper installation may result in electric shock! - Always mount the device in a depressurized and de-energized condition!
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NOTE - Do not remove the packaging or protective caps of the device until shortly before the mounting procedure, in order to exclude any damage to the diaphragm and the threads! Protective caps must be kept! Dispose of the packaging properly!

NOTE - If there is increased risk of damage to the device by lightning strike or overvoltage, increased lightning protection must additionally be provided!

NOTE - Treat any unprotected diaphragm with utmost care; this can be damaged very easily.

NOTE - Provide a cooling line when using the device in steam piping and and clarify the material compatibility.

NOTE - The measuring point must be designed in such a way that cavitation and pressure surges are avoided.

NOTE - When installing the device, avoid high mechanical stresses on the pressure port! This will result in a shift of the characteristic curve or to damage, in particular in case of very small pressure ranges and devices with a pressure port made of plastic.

NOTE - In hydraulic systems, position the device in such a way that the pressure port points upward (ventilation).

NOTE - If the device is installed with the pressure port pointing upwards, ensure that no liquid drains off on the device. This could result in humidity and dirt blocking the gauge reference in the housing and could lead to malfunctions. If necessary, dust and dirt must be removed from the edge of the screwed joint of the electrical connection.

NOTE - The permissible tightening torque depends on the conditions on site (material and geometry of the mounting point). The specified tightening torques for the pressure transmitter must not be exceeded!

NOTES - for mounting outdoors or in a moist environment:

- Please note that your application does not show a dew point, which causes condensation and can damage the pressure transmitter. There are specially protected pressure transmitters for these operating conditions. Please contact us in such case.
- Connect the device electrically straightaway after mounting or prevent moisture penetration, e.g. by a suitable protective cap. (The ingress protection specified in the data sheet applies to the connected device.)
- Select the mounting position such that splashed and condensed water can drain off. Stationary liquid on sealing surfaces must be excluded!
- If the device has a cable outlet, the outgoing cable must be routed downwards. If the cable needs to be routed upwards, this must be done in an initially downward curve.
- Mount the device such that it is protected from direct solar radiation. In the most unfavourable case, direct solar radiation leads to the exceeding of the permissible operating temperature.
- For devices with gauge reference in the housing (small hole next to the electrical connection), install the device in such a way, that the gauge reference is protected from dirt and moisture. Should the device be exposed to fluid admission, the functionality will be blocked by the gauge reference. An exact measurement in this condition is not possible. Furthermore, this can lead to damages on the device.

3.2 Conditions for devices with 3-A symbol

The device or its connecting piece must be installed in such a way that the surfaces are self-draining (permissible installation position 273° ... 87°).

Make sure that the welding socket is mounted flush inside the tank.

The user is responsible for:

- the correct size of the seal and the choice of an elastomeric sealing material that complies with the 3-A standard
- an easy to clean installation position of the pressure transmitter with little dead space, as well as definition / verification / validation of a suitable cleaning process
- defining adequate service intervals

3.3 Conditions for devices, with EHEDG certificate

Install the device according to the requirements given in EHEDG Guidelines 8, 10 and 37. That is to mount the device in a self-draining orientation. The device should be installed flush to the process area. If mounting in a T-piece, the ratio between the depth of the upstand (L) and the diameter (D) of the upstand shall be L/D<1. If welded adapters are used, the food contact surface must be smooth, and the welding has to be done according to EHEDG Guideline 9 and 35. Suitable pipe couplings and process connections must be applied according to the EHEDG Position Paper. (List the available ones.)

3.4 Conditions for oxygen applications

	Danger of death from explosion - when used improperly
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Make sure that your device was ordered for oxygen applications and delivered accordingly. (see manufacturing label - ordering code ends with the numbers "007")

Unpack the device directly prior to the installation.

Skin contact during unpacking and installation must be avoided to prevent fatty residues remaining on the device. Wear safety gloves!

The entire system must meet the requirements of BAM (DIN 19247)!

For oxygen applications > 25 bar, devices without seals are recommended.

Transmitters with o-rings of FKM (Vi 567): permissible maximum values: 25 bar / 150° C (BAM approval)

3.5 Mounting steps for connections according to DIN 3852

NOTE - Do not use any additional sealing material such as yarn, hemp, or Teflon tape!

- ✓ The O-ring is undamaged and seated in the designated groove.
- ✓ The sealing face of the mating component has a flawless surface. (Rz 3.2)

- 1 Screw the device into the corresponding thread by hand.
- 2 Devices equipped with a knurled ring: only tighten by hand
- 3 Devices with a spanner flat must be tightened using a suitable open-end wrench. Permissible tightening torques for pressure transmitter:
 - Wrench flat made of steel:
G1/4": approx. 5 Nm G1/2": approx. 10 Nm
G3/4": approx. 15 Nm G1": approx. 20 Nm
 - Wrench flat made of plastic: max. 3 Nm

3.6 Mounting steps for connections according to EN 837

- ✓ A suitable seal for the medium and the pressure to be measured is available. (e.g. a copper seal)
- ✓ The sealing face of the mating component has a flawless surface. (Rz 6.3)

- 1 Screw the device into the corresponding thread by hand.
- 2 Then tighten it using an open-end wrench. Permissible tightening torques for pressure transmitter:
G1/4": approx. 20 Nm; G1/2": approx. 50 Nm

3.7 Mounting steps for NPT connections

- ✓ Suitable fluid-compatible sealing material, e.g. PTFE tape, is available.
- 1 Screw the device into the corresponding thread by hand
 - 2 Then tighten it using an open-end wrench. Permissible tightening torques for pressure transmitter:
1/4" NPT: approx. 30 Nm; 1/2" NPT: approx. 70 Nm

3.8 Mounting steps for G1" cone connection

- 1 Screw the device into the mating thread by hand (seal produced metalically)
- 2 Then tighten it using an open-end wrench. Permissible tightening torques for pressure transmitter:
p_N < 10 bar: 30 Nm
p_N ≥ 10 bar: 60 Nm

3.9 Mounting steps for Clamp and Varivent® connections

- ✓ A suitable seal for the measured fluid and the pressure to be measured is available.
- ✓ Chapter "3.2 and/or 3.3" have been noticed. EHEDG conformity is only ensured in combination with an approved seal. This is e.g.:
for Clamp connections - codes C61, C62, C63:
T-ring seal from Combit International B.V.
for Varivent® connections - codes P40, P41:
EPDM-O-ring which is FDA-listed
Note, that P40 can only be used for tank flanges.

- 1 Place the seal onto the corresponding mounting part.
- 2 Centre the clamp connection or Varivent® connection above the counterpart with seal.
- 3 Then fit the device with a suitable fastening element (e. g. semi-ring or retractable ring clamp) according to the supplier's instructions.

4. Electrical connection

4.1 Connection and safety instructions

	Danger of death from electric shock - Always mount the device in a depressurized and de-energized condition!
--	---

- ✓ The supply corresponds to protection class III (protective insulation).

NOTE - Use a shielded and twisted multicore cable for the electrical connection.

NOTE - for devices with **cable outlet**

- When routing the cable, following bending radiuses have to be complied with:

cable without ventilation tube:

static installation: 8-fold cable diameter
dynamic application: 12-fold cable diameter

cable with ventilation tube:

static installation: 10-fold cable diameter
dynamic application: 20-fold cable diameter

- In case of devices with **cable outlet** and integrated ventilation tube, the PTFE filter located at the cable end on the air tube must neither be damaged nor removed! Route the end of the cable into an area or suitable connection box which is as dry as possible and free from aggressive gases, in order to prevent any damage.

4.2 Electrical installation

Establish the electrical connection of the device according to the technical data shown on the manufacturing label, the following table and the wiring diagram.

Pin configuration

RS 485 Modbus RTU:

Electrical connections	M12x1, metal (4-pin)	Binder 723 (5-pin)	cable colours (IEC 60757)
Supply +	1	1	WH (white)
Supply -	3	3	BN (brown)
not inverted A +	2	2	GN (green)
inverted B -	4	4	YE (yellow)
Shield	plug housing	plug housing	GNYE (green-yellow)

RS 485 Modbus RTU with reset function for LPT 541

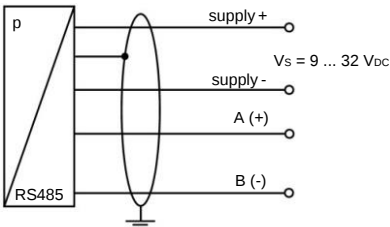
Electrical connections	M12x1, metal (5-pin)
Supply +	1
Supply -	3
not inverted A +	2
inverted B -	4
Reset	5
Shield	plug housing

i°C:

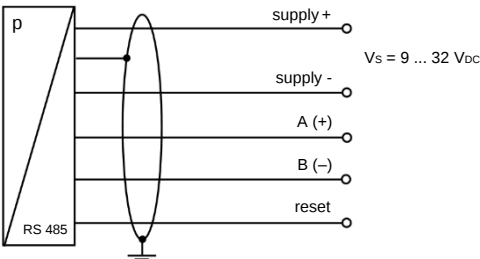
Electrical connections	M12x1, metal (5-pin)	Binder 723 (5-pin)	cable colours (IEC 60757)
Supply +	1	1	WH (white)
Supply -	3	3	BN (brown)
SDA	2	2	YE (yellow)
SCL	4	4	GN (green)
INT	5	5	PK (pink)
Shield	plug housing	plug housing	GNYE (green-yellow)

Wiring diagrams

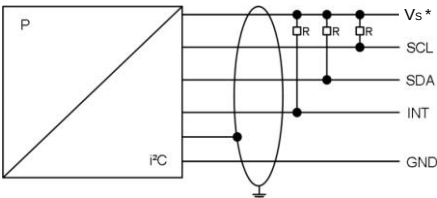
RS 485 / Modbus RTU:



RS 485 / Modbus RTU with reset function for LPT 541:



i°C:



* max. I/O current 10 mA

5. Commissioning

	Danger of death from airborne parts, leaking fluid, electric shock - Operate the device only within the specification! (according to data sheet)
--	---

- ✓ The device has been installed properly.
- ✓ The device does not have any visible defect.

6. Modbus RTU communication

6.1 Configuration of Modbus RTU

- ✓ Delay time (start-up time) of 500 msec has been considered.

concerns only LPT 531i

Factory setting	1	1	1
Address	1 ... 247		
Baud-Rate			
4800		0	
9600		1	
19200		2	
38400		3	
Paritate			
none			0
odd			1
even			2

6.2 Explicit register description

Map of input registers (read only, function #4 - Read Input Registers)		
Address	Register	Data type
0x0000	Serial number	UInt32
0x0001		
0x0002	Date of last calibration	Date
0x0003		
0x0004	Upper range of pressure channel	Float, IEEE754
0x0005		
0x0006	Lower range of pressure channel	Float, IEEE754
0x0007		
0x0008	Actual pressure	Float, IEEE754
0x0009		
0x000A	Maximal pressure	Float, IEEE754
0x000B		
0x000C	Minimal pressure	Float, IEEE754
0x000D		

Map of Input registers (read only, function #4 - Read Input Registers)		
Address	Register	Data type
0x000E	Upper range of temperature channel	Float, IEEE754
0x000F		
0x0010	Lower range of temperature channel	Float, IEEE754
0x0011		
0x0012	Actual temperature	Float, IEEE754
0x0013		
0x0014	Maximal temperature	Float, IEEE754
0x0015		
0x0016	Minimal temperature	Float, IEEE754
0x0017		

Map of Holding registers (read, write, fce #3 - Read Holding Registers , fce #6 - Write Single Register)		
Address	Register (description)	Data type
0x0000	Unit of pressure channel	Uint16
0x0001	Unit of temperature channel	Uint16
0x0002	Device address	Uint16
0x0003	Baud rate	Uint16
0x0004	Parity	Uint16

Pressure unit enumeration	
Code (Uint16)	Unit
0x0003	mmH ₂ O
0x0004	mmHG
0x0005	psi
0x0006	bar
0x0007	mbar
0x0008	g/cm²
0x0009	kg/cm²
0x000A	Pa
0x000B	kPa
0x000C	torr
0x000D	atm
0x000E	mH ₂ O
0x000F	MPa

Temperature unit enumeration	
Code (Uint16)	Unit
0x0000	°C
0x0001	°K
0x0002	°F

Baud rate enumeration	
Code (Uint16)	Baud rate [Bd]
0x0004	4800
0x0005	9600
0x0006	19200
0x0007	38400

Parity enumeration	
Code (Uint16)	Parity
0x0000	none
0x0001	odd
0x0002	even

6.3 Reset function for LPT 541:

The reset function of the device is a service function that is not used in regular operation (bus operation). The reset function is used to reset the device to the factory settings, which is extremely helpful, especially with the bus address. In normal operation, no signal may be connected with the reset input.

Activation of the reset function:

To reset the device to the factory settings, the reset input must be connected to 24 V at the same time as the positive supply voltage input. The bus signals A + B can be connected or not connected at this time.

After connecting 24 V once, the reset was carried out internally and the reset input must be disconnected again.

7. i²C-Interface

7.1 Configuration of i²C-interface

Concerns only LPT 532i

Factory setting	050	0	0	0	0	00001
Slave address						
address	1 ... 127					
Type of result register						
32bit IEEE float		0				
16bit integer		1				
Byte order of values						
Low byte first			0			
High byte first			1			
Mode of result register						
Value				0		
Percent of nominal				1		
Restore of address pointer						
no restore					0	
to last set address on next start					1	
Digital meaning						
Count of result						00001 ... 10000

7.2 Register overview

Register	Type 0 (Float)	Type 1 (Int 16)
0x00	Status	Status
0x01	Pressure	Pressure
0x02		
0x03		
0x04		
0x05	Temperature	Temperature
0x06		
0x07		
0x08		
0x40	Configuration	Configuration
0x41	Oversampling	Oversampling
0x42		
0x43	Slave Address	Slave Address
0x44	Pressure unit	Pressure unit
0x45	Nominal pressure lower	Nominal pressure lower
0x46		Decimal places
0x47		
0x48	Nominal pressure upper	Nominal pressure upper
0x49		
0x4A		
0x4B		
0x4C	Temperature unit	Temperature unit
0x4D		
0x4E		Nominal temperature lower
0x4F		
0x50	Nominal temperature lower	Decimal places
0x51		
0x52	Nominal temperature upper	Nominal temperature upper
0x53		
0x54		
0x55		

7.3 Explicit register description

Explanation:

r = only readable

r/w = read and write capable

d = don't care

0x00 – Status register:

7	6	5	4	3	2	1	0
ABS			ERR	SAT	OVER	UNDER	READY
r	d	d	r	r	r	r	r

bit 0	Result registers is READY	
	0 b =	Outdated values will be read
	1 b =	Registers contain new values
	Note:	This bit has same behaviour as hardware ready connector. Logic level is inverted because of open collector at output stage.
	Note:	It is possible to poll update without using hard wiring, or to check which sensor has updated if more than one is used on bus.
bit 2	Value is out of UNDER nominal range	
	0 b =	Pressure value is in nominal range
	1 b =	Pressure is to low
	Note:	OVER and UNDER flags are stored until state register is read.

bit 3	Value SAT urated	
	0 b =	No saturation
	1 b =	Output value or ADC is out of range
bit 4	Internal ERROR , transmitter does not work	
	0 b =	Transmitter is in normal operation
	1 b =	Internal error or wrong setting is active
bit 7	Transmitter is ABS olute	
	0 b =	Pressure type of transmitter is relative
	1 b =	Pressure type of transmitter is absolute

0x40 – Configuration register

7	6	5	4	3	2	1	0
ADD			RESTORE	MODE	ORDER	TYPE	
r/w	d	d	r/w	r/w	r/w	r/w	r/w

bit 0	TYPE of result register	
	0 b =	32bit IEEE float
	1 b =	16bit integer
bit 1	Byte ORDER of values	
	0 b =	Low byte first
	1 b =	High byte first
bit 2...3	MODE of result register	
	00b=	Value
	01b=	Percent of nominal
	10b=	reserved
	11b=	reserved
bit 4	RESTORE address pointer	
	0 b =	No restore
	1 b =	Restore to last set address on restart
	Note:	Using this setting causes reset of register pointer to last written after each stop condition of readout.
bit 7	Set new I2C slave ADD ress	
	0 b =	Slave address stays as it is
	1 b =	Set this bit to apply previously set slave address

0x43 – Slave address register

7	6	5	4	3	2	1	0
SLAVE_ADDRESS							
r/w							d

bit 1...7	SLAVE ADDRESS which this transmitter acknowledges	
	Note:	To apply new address, it is necessary to set ADD bit in configuration register after new address is written.

0x44 – Pressure unit register

7	6	5	4	3	2	1	0
UNIT							
r/w							

bit 0...7	Pressure UNIT (according to units in HART protocol)	
	0x01	inH2O @ 68°F
	0x02	inHg @ 0°C
	0x03	ftH2O @ 68°F
	0x04	mmH2O @ 68°F
	0x05	mmHG @ 0°C
	0x06	psi
	0x07	bar
	0x08	mbar
	0x09	g/cm²
	0x0A	kg/cm²
	0x0B	Pa
	0x0C	kPa
	0x0D	Torr
	0x0E	atm
	0x91	inH2O @ 60°F
	0xAA	cmH2O @ 4°C
	0xAB	mH2O @ 4°C
	0xAC	cmHg @ 0°C
	0xAD	lb/ft²
	0xAE	hPa
	0xB0	kg/m²
	0xB1	ftH2O @ 4°C
	0xB2	ftH2O @ 60°F
	0xB3	mHg @ 0°C
	0xED	Mpa
	0xEE	inH2O @ 4°C
	0xEF	mmH2O @ 4°C

0x4d – Temperature unit register

7	6	5	4	3	2	1	0
UNIT							
r/w							

bit 0...7	Temperature UNIT (according to units in HART protocol)	
	0x20	°C
	0x21	°F
	0x22	°R
	0x23	K
	Note:	If pressure or temperature unit is set to an invalid value, slave will not acknowledge.
	Note:	If 16 bit integer mode is selected and nominal values can not be displayed with 0...5 decimal places, ERROR flag is set and DECIMAL_PLACES will be 0xf.

0x47 / 0x50 – Decimal places register

7	6	5	4	3	2	1	0
DECIMAL_PLACES							
r							

bit 0...7	Count of DECIMAL_PLACES	
	Note:	Available only when 16bit integer type is selected.
	Note:	Value will be calculated automatically according to nominal range.

8. Maintenance

	DANGER	Danger of death from airborne parts, leaking fluids, electric shock - Always service the device in a depressurized and de-energized condition!
	WARNING	Danger of injury from aggressive fluids or pollutants - Depending on the measured medium, this may constitute a danger to the operator. - Wear suitable protective clothing e.g. gloves, safety goggles.

If necessary, clean the housing of the device using a moist cloth and a non-aggressive cleaning solution.

During the cleaning processes, note the compatibility of the cleaning media used in combination with the media-wetted materials of the pressure measuring devices. Permissible concentrations and temperatures must be observed. Verification/ validation by the user is essential.

For EHEDG certified devices in tanks, the cleaning device must be positioned in such a way that the sensor is directly assessed and wetted for cleaning. The device has been developed for Cleaning in Place (CIP) applications and must not be dismantled for cleaning.

Deposits or contamination may occur on the diaphragm/ pressure port in case of certain media. Depending on kind and quality of the process, suitable cyclical maintenance intervals must be specified by the operator. As part of this, regular checks must be carried out regarding corrosion, damage of diaphragm/seal(s) and signal shift. A periodical replacement of the seal(s) may be necessary.

If the diaphragm is calcified, it is recommended to send the device to DRUCK & TEMPERATUR Leitenberger for decalcification. Please note the chapter "Service / repair" below.

NOTE - Wrong cleaning or improper touch may cause an irreparable damage on the diaphragm. Therefore, never use pointed objects or pressured air for cleaning the diaphragm.

9. Troubleshooting

	DANGER	Danger of death from airborne parts, leaking fluids, electric shock - If malfunctions cannot be resolved, put the device out of service (proceed according to chapter 10 up to 12)
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In case of malfunction, it must be checked whether the device has been correctly installed mechanically and electrically. Use the following table to analyse the cause and resolve the malfunction, if possible.

Fault: no output signal	
Possible cause	Fault detection / remedy
Connected incorrectly	Checking of connections
Conductor/wire breakage	Checking of <u>all</u> line connections.
Defective measuring device (signal input)	Checking of ammeter (miniature fuse) or of analogue input of your signal processing unit

Fault: incorrect signal behaviour	
Possible cause	Fault detection / remedy
Load resistance too high	Checking of load resistance (value)
Supply voltage too low	Checking of power supply output voltage
Defective energy supply	Checking of the power supply and the supply voltage being applied to the device
Diaphragm of senor is severely contaminated or damaged	Checking of diaphragm; if necessary, send the device to Leitenberger for repair

Fault: wrong or no output signal	
Possible cause	Fault detection / remedy
Cable damaged mechanically, thermally or chemically	Checking of cable; pitting corrosion on the st.st. housing as a result of damage on cable; when damaged, send the device to Leitenberger for repair

10. Removal from service

	DANGER	Danger of death from airborne parts, leaking fluids, electric shock - Disassemble the device in a depressurized and de-energized condition!
	WARNING	Danger of injury from aggressive media or pollutants - Depending on the measured medium, this may constitute a danger to the operator. - Wear suitable protective clothing e.g. gloves, goggles.

NOTE - After dismounting, mechanical connections must be fitted with protective caps.

11. Service / repair

Information on service / repair:

- www.druck-temperatur.de
- dt-export@leitenberger.de
- Service phone: +49 -7121-90920-0

11.1 Recalibration

During the life-time of a transmitter, the value of offset and span may shift. As a consequence, a deviating signal value in reference to the nominal pressure range starting point or end point may be transmitted. If one of these two phenomena occur after prolonged use, a recalibration is recommended to ensure furthermore high accuracy.

11.2 Return

	WARNING	Danger of injury from aggressive media or pollutants - Depending on the measured medium, this may constitute a danger to the operator. - Wear suitable protective clothing e.g. gloves, goggles.
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Before every return of your device, whether for recalibration, decalcification, modifications or repair, it has to be cleaned carefully and packed shatter-proofed. You have to enclose a notice of return with detailed defect description when sending the device. If your device came in contact with harmful substances, a declaration of decontamination is additionally required.

Appropriate forms can be downloaded from our homepage. Request them:

dt-export@leitenberger.de, or see www.druck-temperatur.de

In case of doubt regarding the fluid used, devices without a declaration of decontamination will only be examined after receipt of an appropriate declaration!

12. Disposal

	WARNING	Danger of injury from aggressive media or pollutants - Depending on the measured medium, this may constitute a danger to the operator. - Wear suitable protective clothing e.g. gloves, goggles.
---	----------------	--

The device must be disposed of according to the European Directive 2012/19/EU (waste electrical and electronic equipment). Waste equipment must not be disposed of in household waste!

NOTE - Dispose of the device properly!

13. Warranty terms

The warranty terms are subject to the legal warranty period of 24 months, valid from the date of delivery. If the device is used improperly, modified or damaged, we will rule out any warranty claim. A damaged diaphragm will not be accepted as a warranty case. Likewise, there shall be no entitlement to services or parts provided under warranty if the defects have arisen due to normal wear and tear.

14. EU declaration of conformity / CE