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1. Information on This Operating Instruction

- The manual is aimed at specialists and semi-skilled personnel.
- Please read the instructions carefully before carrying out any operation and keep the specified order.
- Thoroughly read and understand the information in chapter 2 "Safety Instructions".

If you have any problems or questions, please contact your supplier or contact us directly at:



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Operating Instructions Bourdon Tube Pressure Gauges RSCh / RSChOe with Integrated Pressure Transmitter Model DMU

1.1 Pictographs Used

In this manual, pictographs are used as hazard warnings.

Particular information, instructions and restrictions designed for the prevention of personal or substantial property damage:



WARNING! Is used to warn you against an imminent danger that may result in personal injury or death.

IMPORTANT! Is used to warn you against a possibly hazardous situation that may result in personal, property or environmental damage.

CAUTION! Is used to draw your attention to important recommendations to be observed. Disregarding them may result in property damage.



Passages in the text containing **explanations, information or advice** are highlighted with this pictograph.



The following symbol highlights **actions** you have to conduct or **instructions** that have to be strictly observed.

1.2 Exclusion of Liability

We accept no liability for any damage or malfunction resulting from incorrect installation, inappropriate use of the device or failure to follow the instructions in this manual.

1.3 General Information

Please inspect the transport packaging and the delivered items immediately upon their receipt to determine their integrity and completeness.

You have purchased an instrument that was manufactured according to high quality standards in our company, which is certified according to DIN ISO 9001. Should a reason for complaint however arise, please return your instrument with a precise description of faults to our factory.

The Bourdon tube pressure gauge models RSCh and RSChOe with integrated pressure transmitter model DMU are manufactured according to the valid standards. The following manual was composed with due care. It is not possible, however, to take into account all versions and possible cases of application in this operating instruction. If you have any questions regarding a special application, instruments, storage, mounting, operation or difficulties, please contact us as manufacturer or the distributor.

Please support us in improving this operating instruction. We will gladly accept your advice.

2. Safety Instructions

Please read this operating instruction thoroughly before installing the device.

Disregarding the containing warnings, especially the safety instructions, may result in danger for people, the environment, and the device and the system it is connected to.

The device corresponds with the state of engineering at the time of printing. This concerns the accuracy, the operating mode and the safe operation of the device. In order to guarantee that the device operates safely, the operator must act competently and be conscious of safety issues.

The ARMANO Messtechnik GmbH provides support for the use of its products either personally or via relevant literature. The customer verifies that our product is fit for purpose based on our technical information. The customer performs customer and application specific tests to ensure that the product is suitable for the intended use. With this verification, all hazards and risks are transferred to our customers. Our warranty expires in case of inappropriate use.

Operating Instructions Bourdon Tube Pressure Gauges RSCh / RSChOe with Integrated Pressure Transmitter Model DMU



Qualified personnel:

- The personnel that is charged for the installation, operation and maintenance of the instrument must hold a relevant qualification. This can be based on training or relevant tuition. The personnel must be aware of this manual and have access to it at all times.
- The electrical connection shall be carried out by a fully qualified electrician only.



General safety instructions:

- In all work, the existing national regulations for accident prevention and safety at the workplace must be complied with. Any internal regulations of the operator must also be complied with, even if these are not mentioned in this manual.
- Please regard relevant national and international safety instructions.
- All works must take place in a de-energised state.
- The instruments are not of the pressure sustaining type with a safety function in the sense of PED 2014/68/EU.
- Degree of protection according to DIN EN 60529: Ensure that the ambient conditions at the installation location do not exceed the requirements of the specified degree of protection (⇒ chapter 4 "Technical Data").
- Use the instrument in its perfect technical condition only. Damaged or defective instruments need to be checked immediately and replaced if necessary.
- In case of visible damage (e.g. leaking liquids) or malfunctions, the instrument must be put out of operation immediately and the installation and commissioning must not take place! Only use intact, faultless Bourdon tube pressure gauges with integrated pressure transmitters!
- All parts have to be protected against incorrect handling during installation of the device. To avoid any damage, only touch the designated surfaces with the specified tool.
- It must be ensured that the cable diameters match the nominal widths of the sealing inserts. Screw fittings must be tightened firmly. Only then compliance with certified degrees of protection can be ensured. The centred fixing screw in the terminal box has to be tightened hand-tight.

- Please regard that the CE mark according to the EMC directive for instruments with magnetic contact only applies, when the frequency of operation does not exceed 5 switching cycles per minute.
- If specified, suitable switch amplifiers or multifunctional relays have to be used (e.g. for instruments with inductive contact). The valid operating requirements have to be regarded.
- Before dismantling the pressure gauge, the measuring unit has to be depressurised. If necessary, the measuring line needs to be relieved. Medium residues in dismantled pressure gauges might endanger personnel, facilities and the environment. Adequate precautionary measures shall be taken.
- Only use appropriate tools for mounting, connecting and dismantling the device.
- Nameplates or other information on the device shall neither be removed nor obliterated, since otherwise any warranty and manufacturer responsibility expires.



IMPORTANT! Disregarding the respective regulations may result in severe personal injuries and / or property damage.



Special safety instructions:

Warnings, which are specifically relevant to individual operating procedures or activities, are to be found at the beginning of the relevant sections of this operating instruction.

Operating Instructions Bourdon Tube Pressure Gauges RSCh / RSChOe with Integrated Pressure Transmitter Model DMU

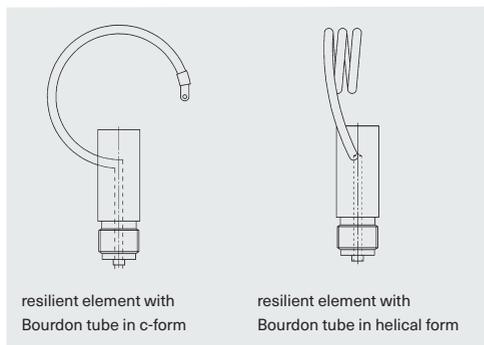
3. Device Description

The information provided in this operating instruction, concerning selection, application, measuring arrangements, installation and operation, applies to pressure measuring instruments with an elastic measuring element.

3.1 Resilient Elements, Construction Types of Pressure Gauges

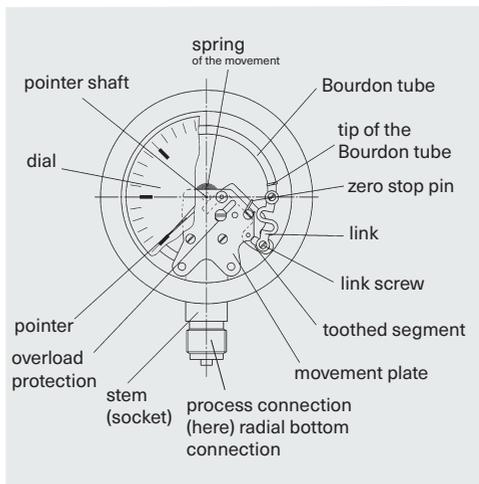
3.1.1 Resilient Elements

Resilient elements with Bourdon tube:

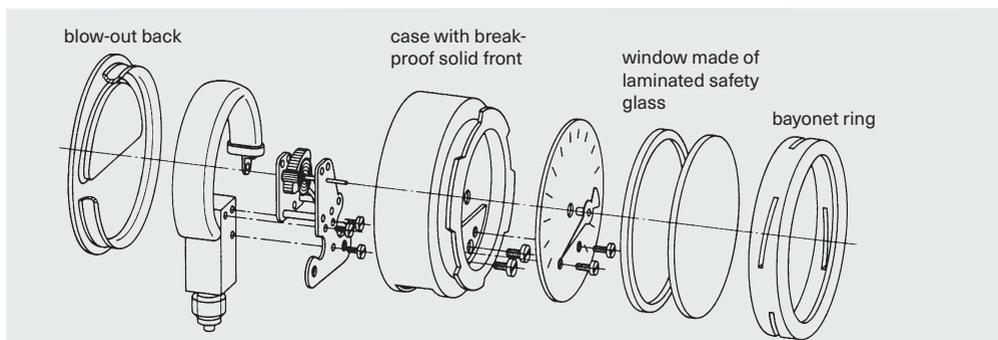


3.1.2 Construction Type Pressure Gauge

Bourdon tube pressure gauge:



Pressure gauges for safety requirements according to DIN EN 837-1, S3 (former DIN 16006 part 1 and 2):



3.2 Measuring Principles

The pressure measuring instruments, described in this operating instruction, contain measuring elements, which deform elastically when subjected to pressure. This motion is transferred to a movement. Due to their robustness and easy handling, these instruments (pressure gauges) are widely used in technical pressure measurement. The measuring elements are generally made of copper alloys or alloyed steels.

Bourdon tube pressure measuring instruments:

Bourdon tubes are circular bent tubes with an oval cross-section. The pressure to be measured acts on the inside of the tube, which results in the oval cross-section becoming almost circular. Due to the curvature of the tube, hoop stresses occur, which bend the Bourdon tube. The end of the Bourdon tube, which is not fixed, performs a motion, which is a measure for the pressure. For pressure ranges up to 40 bar, generally circular bent Bourdon tubes with a torsion angle of 270° are used. For higher pressure ranges, helical Bourdon tubes with several torsions are applied.

Bourdon tubes have a relatively low restoring force. When using additional accessories, such as drag indicators, limit switch contact assemblies or potentiometric transducers, therefore their influence on the indication has to be taken into account.

Bourdon tube resilient elements can only be protected against overload to a limited extent by supporting the measuring element at a specific pressure limit value.

Bourdon tube pressure gauges are applied for pressure ranges from 1.0 bar to 1600 bar, mostly with accuracy class 1.0.

The influence of temperature changes on the mechanical indication mainly depends on the temperature coefficient of the modulus of elasticity of the Bourdon tube. Depending on the material used, the temperature-related error is between 0.3 % and 0.4 % per 10 K.

3.3 Pressure Ranges

The operating pressure should be within the middle third of the pressure range specified for the pressure gauge. The maximum pressure load should not exceed 75 % of the full scale value at steady load or 65 % of the full scale value at dynamic load (⇒ DIN EN 837-2).

3.4 Error Limits

The error limits for pressure measuring instruments are defined in DIN EN 837-1 (Bourdon tube pressure gauges).

3.5 Operating Conditions



When selecting pressure measuring instruments, attention should be paid on the selection criteria and installation recommendations according to DIN EN 837-2 as well as the information provided in this manual (⇒ chapters 3.6., 3.7. and 3.9). The application of pressure measuring instruments that are not suited for the actual operating conditions may cause considerable consequential damage.

3.6 Medium Properties, Pressure Profile



CAUTION! Material damage!

Rapid pressure changes or pressure strokes must not act abruptly on the measuring element. Pressure strokes must not exceed the pressure limits of the pressure measuring instruments.

If required, upstream overload protection devices (⇒ chapter 3.8 "Additional Accessory") shall be provided. Pressure changes of > 10 % of the full scale values per second impair the reading of the measured values. Moreover, this severely reduces the service life of the devices. In such cases, attenuators must be provided.

With snubber devices (restrictor screw or adjustable snubber), the inlet cross-section is significantly reduced. This results in a delay of the pressure change in the measuring element. The installation of a throttle section (reduction of the measuring line cross-section) is also possible. In both cases, the susceptibility to contamination is disadvantageous. Attenuators on the movement only decelerate the pointer motion. Liquid filled cases dampen the motion of the measuring element and reduce the wear of moving components.

Temperature:



If the medium temperature at the measuring point deviates from the permissible operating temperature of the pressure measuring instrument (⇒ chapter 3.11 "Intended Use" as well as DIN EN 837-1, -2, -3), a measuring line with sufficient length, a siphon or a chemical seal with capillary line must be connected upstream to the pressure gauge. The influence on the indication due to instrument temperatures deviating from +20 °C (+68 °F) has to be regarded.

Highly viscous, crystallising or solid-containing media:



For the pressure measurement of highly viscous, crystallising or solid-containing media, diaphragm pressure gauges or Bourdon tube pressure gauges with attached chemical seal (⇒ chapter 3.8 "Additional Accessory") are recommended.

Corrosive media:

If corrosive media can be kept away from the measuring element by separating agents, standard devices may be used.



Otherwise, the selection of the suitable material is mandatory, whereas the operator has to provide the manufacturer with any information concerning the materials that are compatible with the medium under the specific measuring conditions (⇒ DIN EN 837-2, 4.3). Due to the limited choice of materials for the elastic elements, chemical seals made of media resistant materials need to be connected upstream to a Bourdon tube pressure gauge.

Safety:

A higher risk exists, for example, with gases or liquids under high pressure. In case of leakage or bursting of pressure-retaining components, employees standing in front of the window of the device, must not be endangered by medium emerging to the front. Safety pressure gauges with a blow-out device at the rear side, e.g. a blow-out back, provide for protection (⇒ chapter 3.1.2). For hazardous media, such as

- oxygen
 - acetylene
 - combustible substances
 - toxic substances
- as well as for refrigerating units, compressors etc., the applicable regulations have to be regarded.

3.7 Ambient Conditions

Vibrations:



If vibrations of the pressure gauge cannot be eliminated by appropriate installation, devices with movement attenuation or liquid filling should be used.

Ambient temperature:



The error limit given on the dial applies at a reference temperature of +20 °C (+68 °F). Deviating temperatures have an influence on the indication.

The extent of the influence depends on the measuring principle (⇒ chapter 3.2).

At outdoor installations, the prevailing ambient conditions must be taken into account by selection or protection, e.g. to prevent the pressure gauge from freezing over at temperatures below 0 °C (+32 °F). In liquid filled instruments, the viscosity of the fluid increases as the ambient temperature drops – causing a considerable indication delay.

The ambient temperature must also be taken into account regarding the maximum permissible operating temperature specified for the device.

Corrosive atmosphere:



In corrosive atmospheres, suitable casings and components made of resistant materials must be provided.

Special surface treatments serve as exterior protection.

3.8 Additional Accessory

Shut-off valves for pressure gauges:



It is recommended to install a shut-off device between measuring point and pressure gauge, which allows for an exchange of the pressure gauge and a zero point check while the system is running. Depending on the intended application, either cocks or valves are used.

Cocks have three positions:

- Ventilation:
The feed line is closed, the measuring element is open to the atmosphere. The zero point can be checked.
- Operation:
The feed line is open, the measuring element is pressurised.
- Blow-out:
The feed line is open, the medium is vented to the atmosphere. The measuring element is not in use.

For valves (e.g. according to DIN 16270 and DIN 16271), a vent screw is usually provided between valve seating and pressure gauge.



IMPORTANT! Ventilation to the atmosphere shall be arranged in a way that employees are not endangered by escaping medium.

Potential environmental damage is to be avoided. In certain applications (e.g. steam boilers), the shut-off valves require a test connection, so that the pressure measuring instrument can be checked without being disassembled.

Gauge holder bracket:



A suitable gauge holder is to be provided if the measuring line is not rigid enough for a vibration-free installation of the pressure measuring instrument.

Siphons:



Use measuring lines with an adequate length or siphons to protect the shut-off valves and the pressure gauges against heating due to hot media (e.g. steam).

Chemical seals:



For aggressive, hot, highly viscous or crystallising media, which must not enter the pressure element, chemical seals can be mounted to Bourdon tube pressure gauges to provide separation.

For transmission of the pressure to the pressure element, a neutral liquid is used, which is chosen to match the measuring range, temperature, viscosity and other influences by taking into account the compatibility of this liquid with the medium.

Chemical seals are available in various construction types.

For in-line seals and flange type chemicals seals, the pressure gauge has to be mounted to the chemical seal by the manufacturer in accordance with the given installation position.

The connection between pressure gauge and chemical seal must not be separated.

Potential errors, influenced by mounting a chemical seal to a pressure gauge, have to be regarded.

Overrange protection devices:



CAUTION! If the indication range has to be lower than the maximum operating pressure due to operational reasons, the pressure gauge can be protected against damage by fitting an overrange protection device.

In the event of a pressure stroke, the protection device closes instantly. If the pressure rises slowly, it closes gradually. The closing pressure to be set thus depends on the temporal pressure profile.

However, highly viscous and contaminated media might impair or disable the function of the protection device.

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3.9 Measuring Arrangements

General remarks:

Proven arrangements for pressure measurement and suggestions for component parts are specified in VDE / VDI 3512 sheet 3. The following table gives an overview on the possible measuring arrangements:

State of the filling in the measuring line	liquid			gaseous		
	liquid	partly gas emitting	completely gas emitting	gaseous	partly condensed (moist)	completely condensed
Examples	condensate	boiling liquids	"liquid gases"	dry air	moist air flue gases	steam
a) Pressure gauge higher than measuring port	1 	2 	3 	4 	5 	6
b) Pressure gauge lower than measuring port	7 	8 		9 	10 	11

The arrangements 3, 4, 5, 7, 8 and 11 are to be preferred.

Pressure measuring port:



The pressure measuring port should be arranged at a position with unimpaired flow and consistent measuring conditions. It is recommended to choose a sufficiently large orifice for the pressure measurement and to close the measuring port with a shut-off device.

Measuring line:



The measuring line is the connection between measuring port and pressure gauge. The inner diameter of the line should be large enough to avoid plugging.

The measuring line should be installed with a steady incline (1:15 is recommended). If the medium is gaseous, a drain should be provided at the lowest point. If the medium is a highly viscous liquid, a vent should be provided at the highest point. If the gases or liquids contain solids, separators should be provided, which can be disconnected from the assembly by shut-off valves and emptied during operation. The measuring line should be arranged and fitted in a way that it can withstand stresses caused by expansion, vibration or the influence of heat.

Operating Instructions Bourdon Tube Pressure Gauges RSCh / RSChOe with Integrated Pressure Transmitter Model DMU

Shut-off valves at the pressure gauge:

Shut-off valves at the pressure measuring instrument serve to check the zero point or to exchange the measuring instrument during operation (⇒ chapter 3.8 “Additional Accessory”).

Pressure measuring instrument:



The pressure measuring instrument needs to be mounted vibration-free and positioned for easy readability.

Parallax errors are to be avoided when reading the dial. It has to be ensured that any blow-out devices on the pressure gauge are protected against blocking (⇒ DIN EN 837-1, 9.7). The pressure gauge shall be arranged in a way that the temperature does not fall below or exceed the permissible operating temperature (⇒ chapter 3.5 “Operating Conditions” and chapter 3.11 “Intended Use”). Here, the influence of convection and thermal radiation has to be regarded. If the measuring element of a pressure gauge is filled with water or a water mixture, the instrument has to be protected against freeze. The pressure gauge is generally mounted with vertical dial. In all other cases, the position symbol on the dial according to DIN EN 837 applies.

A height difference between measuring port and pressure gauge causes a shift of the measuring start value if the medium in the measuring line does not have the same density as the ambient air. This shift of the measuring start Δp results from the density difference $(\rho_M - \rho_L)$ and the height difference Δh : $10^{-5} \cdot (\rho_M - \rho_L) g \cdot \Delta h$

Δ	= shift of measuring start	[bar]
ρ_M	= density of the medium	[kg / m ³]
ρ_L	= density of the air (1.205 at 20 °C)	[kg / m ³]
Δh	= difference in height	[m]
g	= gravitational acceleration	[m / s ²]
	(medium gravitational acceleration 9.81 m / s ²)	

The indication is decreased by Δp if the pressure gauge is positioned higher than the pressure measuring port, and increased by Δp if it is positioned lower.

3.10 Installation of the Bourdon Tube Pressure Gauge

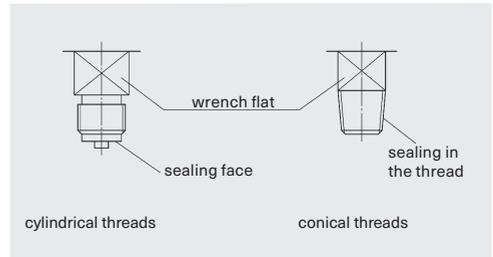
The mounting of pressure measuring instruments must be carried out by qualified personnel only. For the measuring arrangement ⇒ chapter 3.9. During installation or removal, the pressure gauge should never be held at the case, but at the wrench flat of the socket.



It must be ensured that the matching process connection has been selected (nominal width, if required, suitable sealing face etc.).

For instruments with thread connection, an installation with clamping sleeve or union nut is recommended, in order to position it for proper readability. Instruments with flange connections are fitted to the counter flange and secured with suitable screws. It must be ensured that the screws are firmly tightened.

The connections need to be **leaktight**. Therefore, sealings made of suitable medium-resistant material should be used for the connection. For the sealing of pressure measurement connections with cylindrical thread spigots, e.g. flat sealing rings according to DIN EN 837-1, profile packings or lens-type sealing rings for corresponding high pressure connections have to be applied at the sealing face. Conical threads (e.g. NPT-threads) are sealed with additional sealing materials such as PTFE tape (⇒ DIN EN 837-2).



For pressure gauges with pressure ranges of ≤ 6 bar and pressure relief vent $\varnothing 13$ mm (0.51") at the top of the case, it is recommended to cut off the nipple on the filling plug in order to allow for internal pressure compensation by venting the pressure gauge.

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If the pressure gauge is positioned lower than the pressure measuring port, the measuring line should be rinsed thoroughly before putting into operation to remove any foreign objects.

During pressure tests on pipes and vessels, no pressure higher than indicated on the dial by the maximum value mark ▼ must be applied to the pressure gauge and the specified application limit at steady load must not be exceeded (⇒ chapter 3.11 "Intended Use").

For instruments with attached chemical seal, the connections between pressure gauge and chemical seal and, if applicable, between chemical seal and capillary line must not be loosened.



IMPORTANT! Before dismantling the pressure gauge, the measuring unit has to be depressurised.

If necessary, the measuring line needs to be relieved. Medium residues in dismantled pressure gauges might endanger personnel, facilities and the environment. Adequate precautionary measures shall be taken.

3.11 Intended Use



CAUTION! Shut-off devices shall only be opened slowly in order to avoid sudden pressure strokes during commissioning.

Application range:

On many pressure measuring instruments, the application range for steady loads is indicated on the dial by the maximum value mark ▼ (⇒ DIN EN 837-1, DIN EN 837-3).

At steady load, the Bourdon tube pressure gauge with nominal case size 100 is loadable up to the full scale value. At dynamic load, only 0.9 times of this pressure is permissible as peak load. Bourdon tube pressure gauges are overrange protected up to 1.3 times the full scale value.

Zero point check:

In order to check the zero point of the pressure gauge during operation, the shut-off device, required for this purpose (⇒ chapter 3.8 "Additional Accessory"), will be shut and the pressure gauge will be relieved. The pointer must be positioned within the zero range indicated by ⊥.

If the pointer remains outside of this range, this generally results from a lasting deformation of the measuring element, which needs to be submitted for a closer examination in order to avoid accidents due to measuring errors. In such a case, the device should be replaced and, if required, returned to the manufacturer for checking and repair.

Indication check:

If a check of the indication during operation is necessary, the pressure gauge is separated from the process via the required shut-off device with test connection (⇒ chapter 3.8 "Additional Accessory") and pressurised with test pressure. The error limits according to DIN EN 837-1 and DIN EN 837-3 apply.

Temperature resistance:



The permissible operating temperature of the pressure gauge must not be exceeded.

Special versions with corresponding dial inscription (t_A / t_R) might be suitable for higher temperatures.



Please note: these are only specifications concerning the temperature resistance of the materials as well as the soldered joints or weld seams. The specifications concerning indication errors due to deviations from the reference temperature are to be regarded! Detailed information can be found in our model overview 1000 for Bourdon tube pressure gauges.

Cleaning temperature:



During rinsing of the measuring line, the permissible operating temperature of the pressure gauge (see above) must not be exceeded.

If necessary, the device needs to be shut-off or removed. For pressure gauges with attached chemical seals, the maximum cleaning temperature t_R must not be exceeded.

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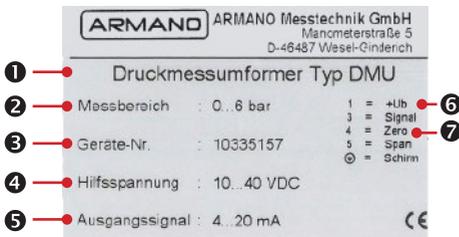
3.12 Integrated Pressure Transmitter Model DMU

The pressure transmitter, which is mounted inside the Bourdon tube pressure gauge, is a temperature-compensated pressure sensor with integrated measuring amplifier. It converts the measured pressure value into a calibrated output signal that is suitable for transmission and control purposes.

The measuring point of the pressure transmitter is separated from the Bourdon tube measuring unit of the pressure gauge, so that both measurements are independent from each other.

A defective movement of the pressure gauge does not influence the measurement of the pressure transmitter.

The instrument version is indicated on the nameplate:



- 1 Basic model
- 2 Pressure range
- 3 Serial no.
- 4 Supply voltage
- 5 Output signal
- 6 Pin assignment
- 7 Zero adjustment ($\leq 0 - 60$ bar)

3.13 Electric Limit Switch Contact Assemblies

The mounting and the electrical connection must be carried out by qualified personnel only.

Instruments with electrical accessories are marked with a nameplate, which indicates how the electric connection has to be carried out.

It is necessary to regard the load limits. Exceeding the load limits might cause damage.

The national and international safety regulations (e.g. VDE 0100) have to be regarded during installation, commissioning and operation of the instruments.

Detailed information on the operation of Bourdon tube pressure gauges with electric limit switch contact assemblies are specified in a separate operating instruction.

4. Technical Data

The relevant technical data can be found in the data sheet valid for the instrument type you purchased. The data sheets are available for download on our website.



IMPORTANT! It is obligatory to observe the limit values specified in the data sheet! Exceeding the limit values may cause a breakdown of the instrument and result in serious personal and property damage!

Bourdon Tube Pressure Gauge

Accuracy (DIN EN 837-1)	class 1.0
Case	with bayonet ring, stainless steel 1.4301
Degree of protection acc. to DIN EN 60529 / IEC 60529	IP54 (RSCh) IP65 (RSChOe)
Blow-out device	blow-out back; when pressure increases in the case, the entire case back separates, allowing full relief
Case ventilation	model RSChOe via screw with ventilation bore
Case filling	model RSChOe: special oil
Nominal size	100, 160 mm
Wetted parts	connection: stainless steel 316L (1.4404) Bourdon tube: stainless steel 316L (1.4404) shielded arc welding ≤ 40 bar c-form ≥ 60 bar helical 1600 bar NiFe alloy, helical
Case configuration	Connection: screwed Position of connection: bottom Mounting device: without, back flange for surface mounting (Rh)
Pressure ranges (DIN EN 837-1)	0 – 0.6 bar to 0 – 1600 bar
Process connection	G $\frac{1}{2}$ B
Window	laminated safety glass
Movement	stainless steel
Dial	aluminum white, scale black
Safety category according to DIN EN 837-1	S3, safety pressure gauge with break-proof solid front and blow-out back, proved: pressure ranges up to 1000 bar, bottom connection: RSCh and RSChOe marking S

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Pressure Transmitter

Piezoresistive sensor (up to and including 60 bar)

Output signal	Supply voltage	Load impedance [Ω]
4...20 mA (2-wire)	10...40 V DC	$(U_B - 10 \text{ V}) / 0.02 \text{ A}$
0...20 mA (3-wire)	8...28 V DC	$(U_B - 8 \text{ V}) / 0.02 \text{ A}$
0...10 V (3-wire)	13...28 V DC	min. 10 k Ω

Thin film sensor (100 bar and above)

Output signal	Supply voltage	Load impedance [Ω]
4...20 mA (2-wire)	9...30 V DC	$(U_B - 9 \text{ V}) / 0.02 \text{ A}$
0...20 mA (3-wire)	9...30 V DC	$(U_B - 9 \text{ V}) / 0.02 \text{ A}$
0...10 V (3-wire)	14...30 V DC	min. 10 k Ω

Accuracy	
	$\pm 0.5\%$ FS, including non-linearity and hysteresis

Temperature ranges for pressure gauges with DMU

Storage temperature	-40 / +70 °C (for RSCh) -20 / +70 °C (for RSChOe)
Rated temperature	-40 / +60 °C (for RSCh) -20 / +60 °C (for RSChOe)
Medium temperature	max. +80 °C

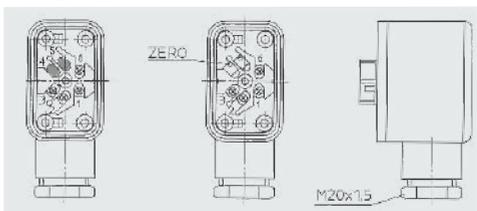
Temperature influence in the rated temperature range

Zero point	<0.3 % FS / 10 K
Span	<0.2 % FS / 10 K

Reference temperature	+20 °C
-----------------------	--------

Long-term stability of zero point and span	better than 0.25 % p. a
--	-------------------------

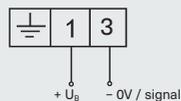
Wiring diagram:



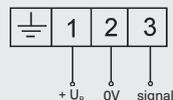
Electrical connection:

The electrical connection is made in a terminal box, the terminals are numbered according to the wiring diagrams. A protective conductor terminal is provided. The terminal box is equipped with a screwed cable gland M20x1.5 with a pull relief.

For assuring the electromagnetic compatibility (EMC), please use a shielded cable (e.g. LP/LiMYCY). The shield has to be connected to the case.



2-wire
4...20 mA



3-wire
0...20 mA, 0...10 V

Degree of protection according to DIN EN 60529 / IEC 60529:

IP65 (terminal box)

The indicated degree of protection can only be obtained with a firmly mounted cable box and a corresponding seal.

Operating Instructions Bourdon Tube Pressure Gauges RSCh / RSChOe with Integrated Pressure Transmitter Model DMU

Zero adjustment:

Pressure ranges up to and including 0 – 60 bar

Our pressure transmitters are factory-calibrated. Therefore, an adjustment must not be carried out. For a nonetheless required process-related zero point adjustment:

- Loosen the central screw of the terminal box and remove the cover.
- Then, adjust the zero point at the exposed potentiometer (ZERO, see wiring diagram) with a screw-driver.

The limit value (SPAN, potentiometer at the upper right, next to ZERO, see drawing) must not be adjusted by any means!

Pressure ranges from and including 0 – 100 bar

A possible zero-adjustment can only be carried out (only ex-factory) via computer with a special software (programmable ASIC electronics).

5. Installation and Operation

Remove the packaging with due care! Dispose of the packaging according to environmental conditions and in accordance with the local waste disposal regulations! Store the plastic protection caps for future de-commissioning.



CAUTION! Before installation, commissioning and operation, ensure that you have the suitable pressure measuring instrument regarding pressure range, version, degree of protection and materials (Risk of corrosion!) for the specific case of application!



Please note!

Avoid any kind of contamination and damage at the process connection and especially at the sealing face!

Do not insert any objects into the process connection!

Connections between chemical seals and pressure transmitters must never be loosened! Possibly existing seals must not be damaged! The sealing screw at the chemical seal must never be loosened.

At process connections with wrench flats, only use the matching torque wrench for installation at the measuring point.

The wrench must be applied at the designated wrench flat only.

The right tightening torque depends on material and form of the used sealing and sealing materials.

- For pressure connections according to DIN EN 837 use profile sealings / flat sealing rings according to DIN 16258.
- For pressure connections according to DIN 3852 form E use pre-installed elastomer profile packing!
- Tighten conical pressure connections. Use sealing material!
- For chemical seal connections, e.g. diaphragm seals for the food industry, use the suitable sealing for this chemical seal!
- Ensure that sealing faces are clean and intact!



IMPORTANT! The matching sealings for each connection must be used under all circumstances.

Depending on the type of application, even the smallest leak may result in unpredictable personal and property damage!

The installation position is optional, but the instrument must be installed free of vibration and must not be exposed to strong changes in temperature.

Additional measurement errors caused by deviations from the reference temperature of +20 °C have to be observed!

Avoid a direct pressure blast on the internal sensor diaphragm! In case of doubt, use damping elements (dampers without orifice, etc.), as far as this is possible!

Operating Instructions Bourdon Tube Pressure Gauges RSCh / RSChOe with Integrated Pressure Transmitter Model DMU

6. Maintenance / Cleaning, Storage and Transport



CAUTION! Material damage and loss of warranty!

Any modifications or interventions in the device, made by the customer, might damage important parts or components. Such intervention leads to the loss of any warranty and manufacturer's responsibility!

→ Never modify the device or perform any repairs yourself.

Maintenance:

The instruments are maintenance-free.

To ensure measurement accuracy, we recommend checking the instruments regularly (once or twice a year). For this, the instrument must be separated from the process and checked by using a pressure test device.

The instrument cannot be repaired by the operator. In case of faults, which cannot be eliminated without interference in the device, please return the instrument to the manufacturer for repair, together with a precise description of the faults (⇒ chapter 9 "Electrical Malfunctions"). Any arising repairs may only be executed by the manufacturer.

Storage and transport:



Bourdon tube pressure gauges with integrated pressure transmitter contain sensitive sensors and have to be handled with due care.

- Use the original packaging or comparable packaging for storage / for transport. Especially the protection cap has to be attached carefully to the process connection and must not be removed until the installation of the device.
- Avoid impacts or strong vibrations.
- Protect the device against damage caused by external influences.
- During storage, the specified temperature limits must not be exceeded.

7. Dismounting and Disposal



WARNING! Risk of injury!

Never remove the device from a system in operation.

Make sure that the system is switched off professionally.

Before dismounting:

Check before dismounting, whether the system

- is switched off,
- is in a safe and currentless state,
- is unpressurised and cooled down.

Dismounting:

→ Pay attention to potentially leaking media. Take appropriate precautions to collect them.

Disposal:



NO DOMESTIC WASTE!

The device comprises various materials. It shall not be disposed of together with domestic waste.

→ Bring the device to your local recycling plant

or

→ send the device back to your supplier or to the ARMANO Messtechnik GmbH.

8. CE Conformity



The CE marking of the instruments certifies the conformity with prevailing EU directives for placing products on the market within the European Union. The following directives apply:

2014/68/EU (PED)

2014/30/EU (EMC)

Operating Instructions Bourdon Tube Pressure Gauges RSCh / RSChOe with Integrated Pressure Transmitter Model DMU

9. Electrical Malfunctions

Fault Description	Potential Cause	Correction
No output signal	missing operating voltage	apply operating voltage
	broken cable	check the cable and repair it
	wiring fault	check the wiring and correct it
	missing input pressure	check the pressure connection, apply pressure
	operating conditions not permissible	return to works with description of faults and operating conditions
Output signal constant	clogged orifice	check the measuring point, clean it carefully, if necessary return to works with description of faults
	defective pressure transmitter	return to works with description of faults
Output signal too high	pressure range incorrect	replace pressure transmitter
	defective pressure transmitter	return to works with description of faults
Output signal too low	pressure range incorrect	replace pressure transmitter
	for current signal: load impedance too high	reduce load impedance or increase operating voltage
	operating voltage too low	increase operating voltage
	defective pressure transmitter	return to works with description of faults
Incorrect zero signal	zero point altered due to non-permissible operating conditions	return to works with description of faults
	operating voltage not permissible	apply permissible operating voltage
	defective pressure transmitter	return to works with description of faults
Output signal non-linear	measuring span altered due to non-permissible operating conditions or improper adjustment at the potentiometer	return to works with description of faults
	defective pressure transmitter	return to works with description of faults

Operating Instructions Bourdon Tube Pressure Gauges RSCh / RSChOe with Integrated Pressure Transmitter Model DMU

10. Declaration of Conformity

EU-Konformitätserklärung

EU Declaration of Conformity

Für die nachfolgend bezeichneten Erzeugnisse

**ROHRFEDER-MANOMETER
MIT INTEGRIERTEM DRUCKMESSUMFORMER TYP DMU**
gemäß Datenblatt 9631

**KAPSELFEDER-MANOMETER
MIT INTEGRIERTEM DRUCKMESSUMFORMER TYP DIGPTM**
gemäß Datenblatt 9632

wird hiermit erklärt, dass sie den wesentlichen Schutzanforderungen entsprechen, die in den nachfolgend bezeichneten Richtlinien festgelegt sind:

RICHTLINIE 2014/30/EU DES EUROPÄISCHEN PARLAMENTS UND DES RATES vom 26. Februar 2014 zur Angleichung der Rechtsvorschriften der Mitgliedstaaten über die elektromagnetische Verträglichkeit – kurz: **EMV-Richtlinie**

Des Weiteren fallen Manometer mit Messbereichsendwerten > 200 bar als „Druckhaltende Ausrüstungsteile“ unter die

RICHTLINIE 2014/68/EU DES EUROPÄISCHEN PARLAMENTS UND DES RATES vom 15. Mai 2014 über Druckgeräte – kurz: **Druckgeräterichtlinie**

Soweit zutreffend erstreckt sich die CE-Kennzeichnung dann auch auf diese Richtlinie.

Zur Beurteilung der Erzeugnisse wurden folgende Normen herangezogen:

Norm: Standard:	Richtlinienbezug Reference to directive
DIN EN 61000-6-3:2022-06 DIN EN 61000-6-2:2019-11	EMV-Richtlinie 2014/30/EU EMC Directive 2014/30/EU
DIN EN 837-1:1997-02 DIN EN 837-3:2019-08	Druckgeräterichtlinie 2014/68/EU Pressure Equipment Directive 2014/68/EU

We hereby declare for the following named goods

**BOURDON TUBE PRESSURE GAUGES
WITH INTEGRATED PRESSURE TRANSMITTER TYPE DMU**
according to data sheet 9631

**CAPSULE GAUGES FOR LOW PRESSURE
WITH INTEGRATED PRESSURE TRANSMITTER TYPE DIGPTM**
according to data sheet 9632

that they meet the essential protective requirements, which have been fixed in the following directives:

DIRECTIVE 2014/30/EU OF THE EUROPEAN PARLIAMENT AND THE COUNCIL from February 26, 2014 on the approximation of the laws of the Member States relating to the electromagnetic compatibility – short: **EMC Directive**

Moreover, pressure gauges with upper range values > 200 bar are, as pressure equipment parts, subject to

DIRECTIVE 2014/68/EU OF THE EUROPEAN PARLIAMENT AND THE COUNCIL from May 15, 2014 relating to pressure equipment – short: **Pressure Equipment Directive**

As far as they are concerned, the CE-marking then also applies to this directive.

The following standards have been used to assess the goods:

Diese Erklärung wird verantwortlich für den Hersteller:
This declaration is issued under the sole responsibility of the manufacturer:

ARMANO Messtechnik GmbH

abgegeben durch / by
Grünhain-Beierfeld, 2023-06-12

Bernd Vetter
Geschäftsführender Gesellschafter / Managing Director

ARMANO

ARMANO Messtechnik GmbH

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