FISCHER MESS- UND REGELTECHNIK

Instruction Manual

DS21 || Differential Pressure Switch

Table of Contents

1. Safety Instructions

1.1. General

This manual contains detailed information about the product, and instructions for its installation, operation and maintenance. Operators and other technical personnel responsible for the equipment must read this thoroughly before attempting to install or operate this equipment. A copy of this manual must always be kept accessible at the place of work for reference by concerned personnel.

Chapter 1 (sections 1.2 through 1.7) contains general as well as specific safety instructions. Chapters 2 through 10, covering topics ranging from intended purpose of the equipment to its final disposal, also include important points relating to safety. Overlooking or ignoring any of these safety points can endanger humans and animals, and possibly cause damage to other equipment.

1.2. Personnel Qualification

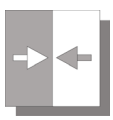
Personnel responsible for installation, operation, maintenance and inspection of this product must have the qualifications, training and experience necessary to carry out such work on this type of equipment.

1.3. Risks of Disregarding Safety Instructions

Disregarding safety instructions, use of this product for purposes for which it is not intended, and/or operation of this product outside the limits specified for any of its technical parameters, can result in harm to persons, the environment, or the plant on which it is installed. Fischer Mess- und Regeltechnik GmbH will not be responsible for consequences in such circumstances.

1.4. Safety Instructions for Operators

Safety instructions for the proper use of this product must be followed. This information must be available at all times by personnel responsible for installation, operation, maintenance and inspection of this product. Adequate steps must be taken to prevent the occurrence of hazardous conditions that can be caused by electric energy and the convertible energy of the process media. Such conditions can, for example, be the result of improper electrical or process connections. Detailed information is available in relevant published norms (DIN EN, UVW in Germany; and equivalents in other countries), industrial standards such as DVWG, Ex-, GL-, VDE guidelines, as well as regulations of the local authorities (e.g., EVUs in Germany).



1.5. Modifications Forbidden

Modification or other technical alteration of the product is not permissible. This also applies to the use of unauthorized spare parts for repair / maintenance of the product. Any modifications to this product, if and as necessary, should be done only by Fischer Mess- und Regeltechnik GmbH.

1.6. Operational Restrictions

The operational reliability of the product is guaranteed only when used for intended purposes. The product must be selected and configured for use specifically with defined process media. The limiting values of operating parameters, as given in the product specification sheet, must never be crossed.

1.7. Safety Considerations during Installation and Maintenance

The safety instructions given in this manual, existing national regulations relating to accident prevention, and the internal safety rules and procedures of the user organization regarding safety during installation, operation and servicing must all be followed meticulously.

It is the responsibility of the users to ensure that only suitably qualified and experienced technical personnel are used for installation, operation and servicing of this equipment.

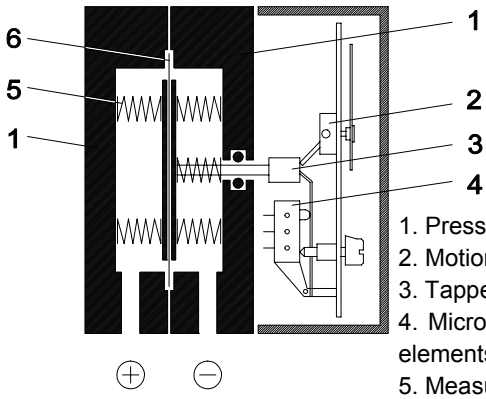
2. Intended Applications

These type series instruments are used as flow-operation safety device in heat carrier oil plants acc. to DIN 32 727 and hot water plants acc. to VdTÜV data sheet flow 100. The flow-operation safety devices consist of a differential pressure device, e.g. an orifice plate, differential pressure switch and adequate shut-off valves. Follow mounting instructions in accordance to application. All instruments of this type series meet these demands. Successful structural testing of this type series is confirmed by the following marks of conformity:

- for flow-operated safety devices
  DIN 32 727 DIN record No. 1B012/07
- acc. to VdTÜV data sheet flow 100
  TÜV . SW/SB . 07 - 020

3. Product Description and Functions

3.1. Schematic Diagram



1. Pressure chamber
2. Motion work
3. Tappet
4. Microswitch actuating elements
5. Measuring springs
6. Measuring diaphragm

3.2. Principles of Operation

The monitoring and switching instrument is based on a rugged and uncomplicated diaphragm movement suitable for overpressure, partial vacuum, and differential pressure measurements. The operating principle of the system is identical in all three applications.

In a state of equilibrium, the forces of the springs on both sides of the diaphragm are balanced. The pressure or differential pressure to be measured creates an unbalanced force at the diaphragm. This force moves the diaphragm system against the force of the springs for the measuring range until a new equilibrium is reached. When subjected to excessive pressure, the diaphragm rests on metal supporting plates.

A centre-mounted tapped transfers the motion of the diaphragm system to the motion work and to the actuating elements of the microswitches.

4. Installation

4.1. General

The instrument is intended for wallmounting by default. The instrument can be attached directly to flat walls by three mounting feet cast to the casing. The instrument can be mounted into switchboard by panel mounting kit DZ11. It is factory-callibrated in vertical position and may not be mounted otherwise. To ensure proper operation during installation and maintenance, appropriate shut-off fittings have to be installed at the plant.

4.2. Installation Regulations for Flow-operated Safety Devices in Heat Transfer Plants acc. to DIN 4754

- The set-up of measuring instruments has to be done acc. to VDE/VDI 3512, sheet 1 for differential pressure producers acc. to DIN 1952/ VDI 2041.
- Shut-off valves in differential pressure pipes may only be manipulated with tools. Screw joints in these pipes need to be conducted that way they are leak proof wit-

hout aid of sealants.

- The clear diameter of the differential pressure pipes' length needs to be designed that way, that with cold pipework (approx. 20°C) the reaction time of the instrument is no more than 5 secs.
- Differential pressure pipes need to be of metal, their clear width may be no less than 4mm and their stretched length must be at least 500mm. When arranged acc. to VDE/VDI 3512, sheet 1 with valve block the stretched length of the differential pressure pipe between valve block and differential pressure transmitter must be at least 500mm.
- Locking und unlocking conditions must be made sure by subsequent electrical wiring during installation.

4.3. Installation Regulations for Flow Limiters in Steam Boiler and Hot Water Plants

- Apply measuring instruments acc. to DIN 1952 / VDI 3212, sheet 1, Itabar or Annubar sensors.
- The set-up of measuring instruments has to be done acc. to VDE/VDI 3512, sheet 1 for differential pressure producers acc. to DIN 1952 / VDI 2041.
- The differential pressure pipes must be suitable to be shut off and blown out with fivefold valve block.
- The differential pressure pipes need to be of metal and their clear width must be at least 8mm. The stretched length of the differential pressure pipes must be at least 500mm.
- Shut-off valves in differential pressure pipes may only be manipulated with tools. Screw joints in these pipes need to be conducted that way they are leak proof without aid of sealants or the conjunction needs to be welded or brazed.

4.4. Process Connections

- Only qualified technicians authorized for this type of work should undertake installation.
- Ensure that process equipment and pressure lines are at atmospheric pressure before making pressure connections.
- The instrument should be provided with suitable protection against pressure surges (e.g., snubber or pulsation damper).
- Ensure that the mechanical configuration and materials of construction of the instrument are compatible with the process media.
- Ensure that process pressure is always less than the specified safe pressure rating.

4.5. Electrical Connections

- Only qualified technicians authorized for this type of work should undertake installation.
- Electrical connections must comply with relevant international, national and local regulations and norms relating to electrical and instrumentation installations.
- Switch off electrical power to the plant before attempting electrical installation work of any kind.
- Make electrical connections to the instrument through a suitable fuse.

5. Commissioning

Power supply and signal cabling to the instrument must be correctly selected to meet operational requirements, and installed in a way that does not cause physical stress to the instrument.

Pressure lines must have a downward gradient throughout, from the pressure instrument to the process vessel / pipe. This is to prevent formation of air / gas pockets (for liquid applications) and liquid plugs (for air / gas applications). If this continuous downward gradient cannot be provided for any reason, then suitable water and / or air separation devices must be inserted in the pressure line.

The pressure lines must be kept as short as possible and must not have short bends to avoid measurement errors induced by pressure line delays.

When used with liquid media the lines must be vented to avoid measurement errors induced by different heights in liquid columns. The instrument and lines must be protected against frost when used with water.

Check all pressure connections for leaks before commissioning.

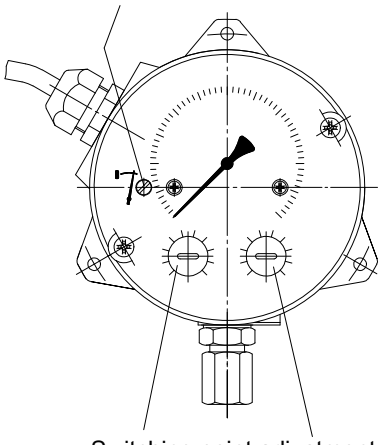
5.1. Pressure Connections

The instruments pressure ports are marked by "+" and "–" symbols. The pressure applications need to be installed according to the label.

Differential pressure measurement:	+ higher pressure – lower pressure
Pressure measurement:	+ pressure port
Negative pressure measurement:	– negative pressure port

5.2. Zero Point Adjustment and Setting of Switching Points

Zero point adjustment screw



Switching point adjustment

5.2.1. Zero Point Adjustment

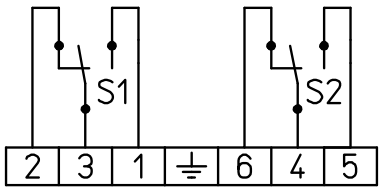
- Charge pressure chamber with existent static pressure.
- Remove cover.
- Set measuring indicator to zero by zero point adjustment screw.
- Mount cover.

5.2.2. Setting of Switching Points

- Unscrew plugs from cover.
- Set desired switching points according to marks on reference value scale by screwdriver. Achievable accuracy: 5% FS. More exact settings can be achieved by using accessories like testing manometer, ohmmeter on site or ex factory.
- Screw plugs in.

5.3. Connection Scheme

Instrument pressureless and dead



6. Maintenance

The instrument is inherently maintenance-free.

However, to ensure reliable operation and maximize the operating life of the instrument, it is recommended that the instrument, its external electrical and process connections, and external connected devices be regularly inspected, e.g.:

- Check the display.
- Check the switching function in connection with external devices.
- Check all pressure connections for leak-tightness.
- Check the integrity of all electrical connections of the instruments.

Inspection and test schedules depend on operating and site conditions. The operating manuals of other equipment to which the instrument is connected must be read thoroughly to ensure that all of them work correctly when connected together.

7. Transport

The product must be protected against shock and vibration during transport. It must therefore be properly packed, preferably in the original factory packaging, whenever it is to be transported.

8. Service

Any defective devices or devices with missing parts should be retourned to Fischer Mess- und Regeltechnik GmbH. For quick service contact our service department.

Remaining medium in and on dismantled measuring instruments may cause danger to persons, environment and equipment. Take reasonable precautions! Clean the instrument thoroughly if necessary.

9. Accessories

N.A.

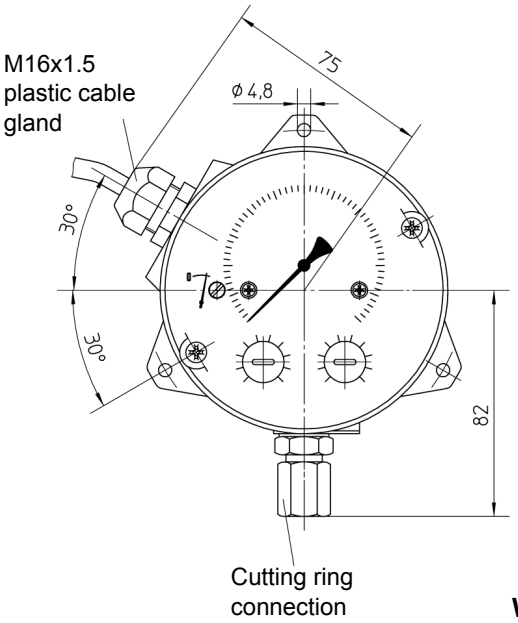
10. Disposal

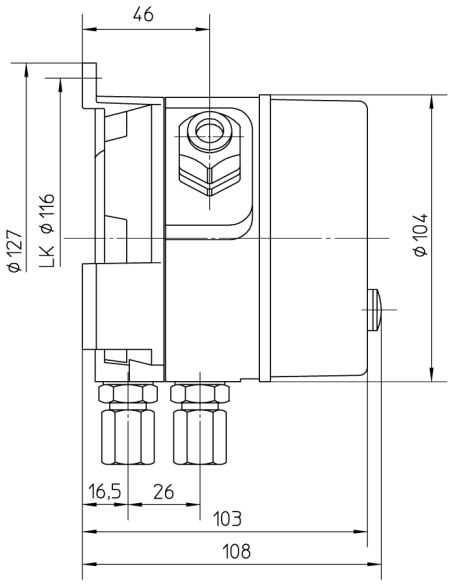
Protect your environment!
Use the product in accordance with relevant regulations. Please be aware of environmental consequences of disposal at the end of the product's life, and take care accordingly.

11. Specifications

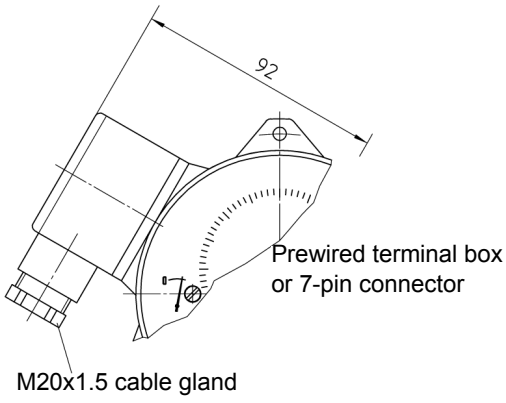
General	
Measuring range	0... 400 mbar up to 0... 6 bar (see ordering code)
Nominal pressure	25 bar
Max. static operating pressure	Acc. to measuring range (see ordering code)
Max. pressure load	One-sided overpressure protected up to nominal pressure on (+) - and (–) side of diaphragm, partial vacuum protected
Perm. ambient temperature	-10... +70°C
Perm. medium temperature	70°C
Protection class	IP 54 acc. to DIN EN 60529
Mounting position	Vertical
Measuring accuracy	± 2.5% FS
Zero adjustment	Located in the dial
Switching Elements	
Contact output	1 or 2 microswitches, 1-channel change-over contacts
Adjustment of switching points	External adjustment by standard value scales smallest adjustable value: approx. 5% FS
Switching hysteresis	Approx. 2.5% FS
Load data / contacts	$U\sim_{max.}$ = 250 V AC, $I_{max.}$ = 5 A, $P_{max.}$ = 250 VA $U=_{max.}$ = 30 V DC, $I_{max.}$ = 0.4 A, $P_{max.}$ = 10 W
Electrical Connection	Numbered cable, prewired terminal box, 7-channel plug
Pressure Connection	Thread G1/4 female, cutting ring connection for 6, 8, 10,12 mm ∅ tube of brass, zinced steel or chrome nickel steel connection shank G1/4 male DIN EN 837
Measuring System	Diaphragm measuring system, diaphragm of reinforced Viton®
Materials	
Pressure chamber	Aluminium GkAlSi10(Mg), varnished black Aluminium GkAlSi10(Mg) HART-COAT® surface protection Chrome nickel steel 1.4305
Measuring diaphragm	Diaphragm measuring system and gaskets of Viton®
Materials: medium	Stainless steel 1.4310, 1.4305
Materials: housing	Macrolon
Weight	Pressure chamber of Aluminium = 1.2 kg, pressure chamber of 1.4305 = 3.5 kg
Mounting	Wallmounting - 3 fastening elements Panel mounting - panel mounting kit DZ11 ø132 mm Pipe mounting, pressure connections = (+), (–) symbols - by screwed-in cutting ring or clamping ring connection - by screwed-in connection shank acc. to DIN EN 837 for nipple fitting acc. to DIN 16284

12. Dimensions (all units in mm unless otherwise stated)

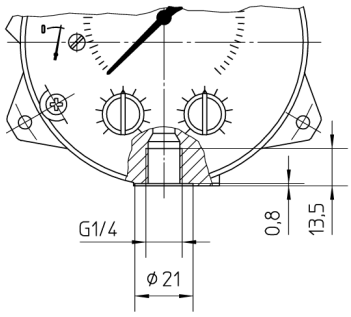




DS21
Wallmounting
(standard)



Variants of Electrical Connection



Connections G¼ female

Variants of Process Connection

13. Ordering Code

Differential Pressure Switch **DS21**

		0						#	#	#	0

Range	Max. static pressure		
0 . . . 250 mbar	6 bar	8	2
0 . . . 400 mbar	6 bar	8	3
0 . . . 0.6 bar	10 bar	0	1
0 . . . 1 bar	16 bar	0	2
0 . . . 1.6 bar	16 bar	0	3
0 . . . 2.5 bar	16 bar	0	4
0 . . . 4 bar	16 bar	0	5
0 . . . 6 bar	16 bar	0	6

Application

Thermal oil DIN 32727 / Hot water / Flow 100	0

Pressure Chamber

Aluminium	A
Aluminium HART COAT®	D
Chrome-nickel-steel 1.4305	W

Pressure Connection

Female thread G1/4	0	1
Cutting ring fitting of steel for 6 mm tube	2	0
Cutting ring fitting of steel for 8 mm tube	2	1
Cutting ring fitting of steel for 10 mm tube	2	2
Cutting ring fitting of steel for 12 mm tube	2	3
Cutting ring fitting of 1.4571 for 6 mm tube	2	4
Cutting ring fitting of 1.4571 for 8 mm tube	2	5
Cutting ring fitting of 1.4571 for 10 mm tube	2	6
Cutting ring fitting of 1.4571 for 12 mm tube	2	7

Switching Elements

1 adjustable microswitch	A
2 adjustable microswitches	B

Electrical Connection

1 m numbered cable, prewired	1
2.5 m numbered cable, prewired	2
5 m numbered cable, prewired	5
Prewired terminal box	K
GL approved model, 3 m supply cable H07 RNF	Z

Shaded marks are not indicated in data sheet and only available on request!

14. Declaration of Conformity

FISCHER
MESS- UND REGELTECHNIK

Zertifiziert nach DIN EN ISO 9001
Zertifizierungs-Nr.: **08 100 1999**

Konformitätserklärung

Wir erklären in alleiniger Verantwortung, dass nachstehend genannte Produkte gemäß gültigem Datenblatt

Declaration of Conformity

We declare under our sole responsibility that the products mentioned below, according to the current data sheet

Fischer-Typen / Fischer-models
Datenblätter - Bedienungsanleitung / data sheets - operating instructions

Differenzdruck- Mess- u. Schaltgerät / Differential Pressure Switch
(Strömungssicherung für / (Flow Switches for
Wärmeübertragungsanlagen) / Heat Transfer Installations)

DS21 ############
(21D##...mit Wirkdruckgeber / with Differential Pressure Element)

DB_D_DS21 / DB_GB_DS21
BA_D_DS21 / BA_GB_DS21

mit folgender Richtlinie übereinstimmt:

Druckgeräterichtlinie 97 / 23 / EG

Ausrüstungsteil mit Sicherheitsfunktion Kategorie IV

EG-Baumusterprüfung - Modul B
Zertifikat Nr. 07 202 5435 Z 0063/2/2

Zertifizierung der Produktion - Modul B

Überwachende Stelle:

correspond with the following directives:

Pressure Equipment Directive 97 / 23 / EC

Safety devices category IV

EC-type examination
Certificate no. 07 202 5435 Z 0063/2/2

Certification of manufacturing - module B

Notified body:

TÜV-Nord Anlagentechnik, CE 0045
Rheinische Str. 15, D-49084 Osnabrück

Mitgeltende EG-Richtlinie:
Niederspannungsrichtlinie 72/23/EG

Angewandte Normen und Regelwerke:

EN 61010-1
Sicherheitsbestimmungen für elektrische Mess-, Steuer-, Regel- und Laborgeräte - Allgemeine Anforderungen

EN 837-1
Druckmeßgeräte - Druckmeßgeräte mit Rohrfedern; Maße, Meßtechnik, Anforderungen und Prüfung

DIN 32727
Strömungssicherungen für Wärmeübertragungsanlagen; Sicherheitstechnische Anforderungen und Prüfung

prEN 13445
Unbefeuerte Druckbehälter

Vd-TÜV Merkblatt Strömung 100

Further applicable EC-directive:
Low Voltage Directive 72/23/EC

Applied standards and rule types:

EN 61010-1
Safety requirements for electrical equipment for measurement, control and laboratory use - general requirements

EN 837-1
Pressure gauges - bourdon tube pressure gauges; dimensions, metrology, requirements and testing

EN 32727
Flow switches for heat transfer installations; safety requirements and test

prEN 13445
Unfired pressure vessels

Vd-TÜV code of practise flow 100

Bad Salzuflen, 27.04.2005
(Ort, Datum / place, date)

(rechtsverb. Unterschrift / authorized signature)

003/7/503

Fischer · Meß- und Regeltechnik GmbH · Bielefelder Str. 37a · D-32107 Bad Salzuflen · Tel. (0 52 22) 9 74-0 · Fax (0 52 22) 71 70
eMail: info@klaus-fischer.de · Internet: www.fischer.ag

15. Annex

DIN CERTCO certificate DIN 32723

DIN CERTCO
Gesellschaft für Konformitätsbewertung mbH

CERTIFICATE

The company

Fischer
Mess- und Regeltechnik GmbH
Bielefelder Straße 37a
32107 Bad Salzuflen

hereby receives the confirmation that the product/s

Flow switches for heat transfer installations

of the type

DS 21...

conforms to

DIN 32727:1981-02

and is granted the licence to use the mark

DIN Geprüft

in conjunction with the Registration No. below.

Registration No.: 1B012/07

This Certificate is valid until 2012-02-28.

See annex for further information.

DIN CERTCO Gesellschaft für
Konformitätsbewertung mbH
Alboinstraße 56, 12103 Berlin

GESELLSCHAFT FÜR KONFORMITÄTSBEWERTUNG MBH DINCERTCO

2007-05-15

Dipl.-Ing. Dipl.-Wi.-Ing. Sören Scholz
- Acting Head of Certification Body -

Annex

to the Certificate with Registration No. 1B012/07, dated 2007-05-15

Technical data

Item Designation: DS 21... (previous designation 21 D../..)
Construction Type: Differential pressure gauge with differential pressure transducer
Differential pressure transducer: Orifice flowmeter .../MB, flowmeter .../SB, Annubar senor .../AS, Itabar senor .../IS

Design Types: DS 21...I/F
Device for explosion prone areas with a bayonet housing IP 65 made of chromium-nickel steel, which contains the electrics.

Comments:
1. When using a differential pressure transducer according to DIN 1952/VDI 2041 the measuring arrangement shall be carried out according to VDE/VDI 3512, Sheet 1.

2. Shut-off valves in differential pressure pipes may only be activable using tools.
Threaded connections in these pipes must be designed in such a manner that they seal tightly without sealing agents.

3. The inside diameter and length of differential pipes must be such that when the pipes are cold (ca. 20 °C) the response time of the device is no longer than 5 seconds.

4. The differential pressure pipes must be of metal construction with a clear width of no less than 4 mm and the length before bending must be at least 500 mm. With an arrangement according to VDE/VDI 3512, Sheet 1 with block valves, the length before bending of the differential pressure pipe between the block valve and the differential pressure transducer must be at leatest 500 mm.

5. The blocking and unblocking mechanisms must be secured by electrical switches to be fitted consecutively.

Testing laboratory / Inspection body

TÜV NORD
Systems GmbH & Co. KG
Prüflab. für Feuerungsanlagen
Am TÜV 1
30519 Hannover

Test report(s)

SSW 7002/07 dated 2007-03-14

TÜV Certificate

quality & safety

Bescheinigung
Certificate

über die Zuerkennung eines Bauteilkennzeichens für — for the grant of a type-test approval mark in respect of

Strömungswächter/-begrenzer

Aufgrund einer Bauteilprüfung - Prüfbericht der — In virtue of a type-test - test report by

der TÜV NORD CERT GmbH vom 12.04.2007

wird dem Antragsteller, der Firma — the applicant, the company

Fischer Mess- und Regeltechnik GmbH
Bielefelder Straße 37a, 32107 Bad Salzuflen

zuerkannt das Bauteilkennzeichen-Nr. — is granted the type-test approval mark No.

TÜV . SW/SB . 07 - 020

für — for

Differenzdruckgerät

Typ — type

DS 21...

Die Zuerkennung erfolgt in Anwendung der — The adjudication is made pursuant to

VdTÜV-Merkblatt „Strömung 100“, Ausgabe 03.90

Sie ist bis zum **30.06.2012** befristet und kann widerrufen werden. Die Bescheinigung vom 08.04.2002 wird hierdurch ersetzt.

It expires on **2012-06-30** and is revocable. The certificate dated 2002-04-08 is replaced herewith.

Hinweis: Der Hersteller oder Importeur ist verpflichtet, den zuständigen Sachverständigen zu beauftragen, Bauteile aus der laufenden Fertigung auf Übereinstimmung mit dem Baumuster einmal jährlich stichprobenweise zu überprüfen.

Note: The manufacturer or importer is obliged to the competent Authorized Inspector to conduct a random check on the accessories concerning identity to the type once a year. The accessories have to be taken from the current production.

Berlin, 29. Mai 2007
Blo/Wei

Verband der TÜV e. V.
Geschäftsbereich Anlagentechnik,
Arbeitswelt, Systemsicherheit, Regelwerke
– Zertifizierungen und Registrierungen –

Blohm

Verband der TÜV e. V. · Friedrichstraße 136 · 10117 Berlin · Deutschland
Telefon +49 30 760095-400 · Telefax +49 30 760095-401 · Internet: www.vdtuev.de

EC type-examination certificate acc. to directive 97/23/EC

TÜV NORD

CERTIFICATE

EC type-examination
according to directive 97/23/EC

Certificate No.: 07 202 5435 Z 0063/2/2

Name and address of bearer/ manufacturer:	**Klaus Fischer Mess- und Regeltechnik GmbH** **Bielefelder Str. 37a** **D-32107 Bad Salzuflen**

We hereby certify that the type examination mentioned below fulfills the requirements of directive 97/23/EC.

Tested according to directive 97/23/EC:	**EC type-examination (module B)**
Test report No.:	**5435P0063/2/2**
Description of type:	**Minimum flow control for thermaltransfer plant** **Type differential pressure gauge 21D.../...** **with differential pressure sensor**
Place of manufacture:	**D-32107 Bad Salzuflen**
valid until:	**08/2012**

Osnabrück, 03.09.02

TÜV CERT-Zertifizierungsstelle
für Druckgeräte
der TÜV NORD Systems
GmbH & Co. KG

Fisse
Notified Body 0045

TÜV NORD Systems GmbH & Co. KG
Rheinische Str. 15
D-49084 Osnabrück
Germany, 03.09.02
Tel. +49-(0) 541/5823-230
Fax +49-(0) 541/5823-269
e-mail kfisse@tuev-nord.de

Member of CEOC
CONFÉDÉRATION EUROPÉENNE D'ORGANISMES DE CONTRÔLE

GL type approval certificate

Type Approval Certificate

This is to certify that the undernoted product(s) has/have been tested in accordance with the relevant requirements of the GL Type Approval System.

Certificate No.	**93 823 - 88 HH**
Company	**Fischer** **Mess- und Regeltechnik GmbH** **Bielefelder Straße 37a** **32107 Bad Salzuflen, GERMANY**
Product Description	**Pressure Indicator and Switching Device**
Type	**DS11** **21D**
Environmental Category	**C, H, EMC1**
Technical Data / Range of Application	**Pressure indicator: 270° scale, Indicator class: 2.5** **Ranges — Max. Static Pressure [bar]** **0 - 400 mbar — 6** **0 - 0.6 bar — 10** **0 - 1 bar — 16** **0 - 1.6; 0 - 2.5; 0 - 4; 0 - 6; 0 - 10 bar — 25** **Max. medium temperature: 70° C** **Wetted parts: 1.4310, 1.4305** **Pressure gauge: GK - AlSi 12 (Cu), with hart coat or 1.4305** **Output: 2 c/o - contacts separate adjustable** **Rating: 3A, 250 V AC, 250 VA** **Connection: fixed cable type A 07 RNF or equivalent** **Degree of protection: IP 54** **Type 21D: identical technical data, gaskets and membrane = viton** ***H: Vibration test: 2 to 17 Hz amplitude = 1.6 mm, 17 to 100 Hz acceler. = 2g**
Test Standard	**Guidelines for the Performance of Type Approvals, Chapter 2, Edition 2003**
Documents	**Technical data sheets: "Typ 21D-DS21" and "Typ DS11",** **Drawings: No. 02.021.00.06067.2/06023.2 and 02.011.00.04855.27/04857.2,** **Test report: "TÜV 57 011 7" dated 04.06.1982**
Remarks	**None**
Valid until	**2014-09-28**

Page 1 of 1

File No. I.D.01

Hamburg, 2010-03-23

Type Approval Symbol GL

Germanischer Lloyd

i.V. Matthias Wiese

i.A. P. Klaus-Peter Schröder

This certificate is issued on the basis of "Guidelines for the Performance of Type Approvals Part 1, Procedure".

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