



Technical data MSENSE® DGA 2/3. Online Oil Analysis

TD4001325-12 EN



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The product is delivered in accordance with MR's technical specifications, which are based on information provided by the customer. The customer has a duty of care to ensure the compatibility of the specified product with the customer's planned scope of application.

The original operating instructions were written in German.

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1 Design/versions

This technical document contains detailed information about the technical properties of the product. To place an order, please use the "Bestellangabenblatt (Inquiry and order specifications)" form, which you will find on our website <http://www.reinhausen.com> below the respective product. Further information is available in the MR Reinhausen customer portal: <https://portal.reinhausen.com>.

The device is available in two versions:

	Measured variables			
	Hydrogen (H2)	Carbon monoxide (CO)	Moisture (H2O)	Oil temperature
MSENSE® DGA 2	Yes	No	Yes	Yes
MSENSE® DGA 3	Yes	Yes	Yes	Yes

Table 1: Device versions

MSENSE® DGA 2 for measuring and analyzing the fault gas hydrogen (H2) present in the transformer oil, for detecting the oil moisture content and for measuring the oil temperature.

MSENSE® DGA 3 for measuring and analyzing the fault gases hydrogen (H2) and carbon monoxide (CO) present in the transformer oil, for detecting the oil moisture content and for measuring the oil temperature.

The standard MSENSE® DGA 2 and MSENSE® DGA 3 scope of delivery includes a double screw connection for mounting a customer-side flange with 2" – 11 1/2 NPT internal thread.

The following options are available for both device versions:

- 2-line display with 3 operating keys
- Ball valve with DN50 or DN80 mounting flange (several versions available)
- Two measuring pipe lengths for optimal mounting position

- Communication protocol in combination with ETOS® or with additional protocol converter (e.g., MESSKO® protocol converter):
 - DNP3.0
 - Modbus TCP
 - IEC 61850-8-1 MMS
- Power supply unit for protocol converter (accessory)
- Housing color RAL 7033 or 7038
- Offshore version

The following sections illustrate the difference between the standard version with double screw connection and the version with optional ball valve and mounting flange.

1.1 Standard design (double screw connection)

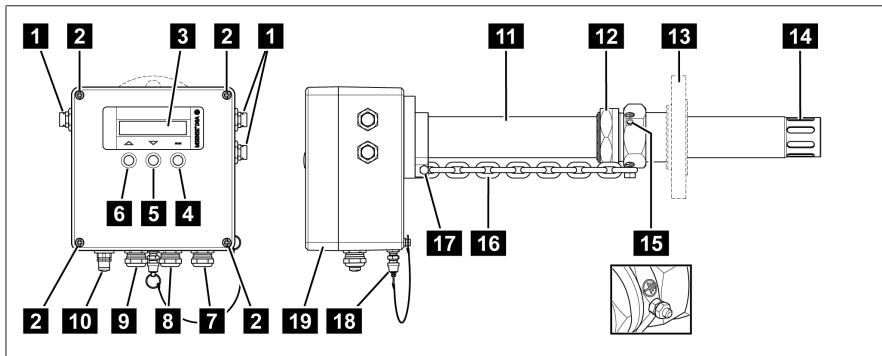


Figure 1: MSENSE® DGA 2/3

1	Ventilation	2	Housing cover screw connection
3	Display (optional)	4	ENTER key
5	DOWN key	6	UP key
7	Supply voltage cable screw connection (3 x M20x1.5 WADI or 3 x 1/2" NPT)	8	Signaling relay cable screw connection
9	Analog outputs cable screw connection	10	Interface (5-pole) for service PC and Modbus RTU communication

11	Measuring pipe (285 mm / 507 mm)	12	Clamp connection
13	Customer-side flange with 2" - 11 1/2 NPT internal thread	14	Measuring head
15	Grounding screw	16	Safety chain
17	Fixing screw for safety chain	18	Connection for venting and taking samples
19	Housing cover		

1.2 Design with optional ball valve and flange

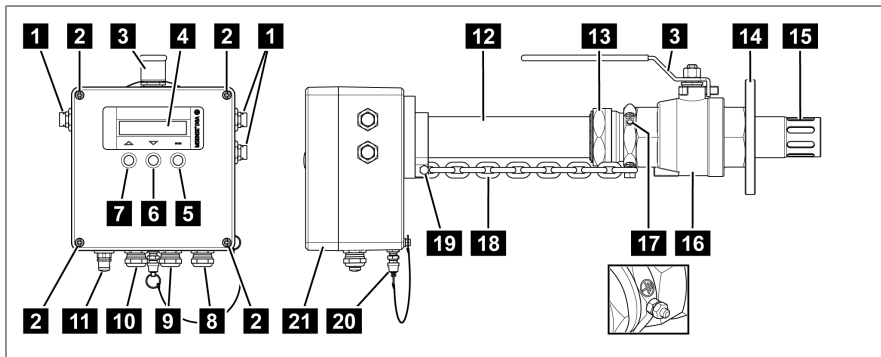


Figure 2: MSENSE® DGA 2/3

1	Ventilation	2	Housing cover screw connection
3	Ball valve locking lever	4	Display (optional)
5	ENTER key	6	DOWN key
7	UP key	8	Supply voltage cable screw connection (3x M20 x 1.5 WADI or 3x 1/2" NPT)
9	Signaling relay cable screw connection	10	Analog outputs cable screw connection
11	Interface (5-pole) for service PC and Modbus RTU communication	12	Measuring pipe (285 mm / 507 mm)

13	Ball valve clamp connection	14	Mounting flange o-ring gasket: DN50 PN6/PN16 and DN80 PN16 Mounting flange any gasket: DN50 PN16 and DN80 PN16
15	Measuring head	16	Ball valve
17	Grounding screw	18	Safety chain
19	Fixing screw for safety chain	20	Connection for venting and taking samples
21	Housing cover		

2 Technical data

2.1 Technical data

Measurement					
Application	Determination of the gas concentration of fault gases as well as moisture in oil and oil temperature of mineral-based transformer insulating oil in accordance with IEC 60296:2012 / ASTM D3487-09				
Measured variables	H ₂	CO (only for MSENSE DGA 3)	Humidity		Oil temper- ature
			Relative display can be switched	Absolute display can be switched	
Lower detection limit	15 ppm	25 ppm	0% RH	5 ppm	-20 °C
Upper detection limit	2,000 ppm	2,000 ppm	100% RH	2,000 ppm	+115 °C
Measuring accu- racy	±10% ^{1,2} or ³ ±20 ppm	±15% ^{1,2} or ³ ±20 ppm	±1.8% RH ⁵	±2% ⁴	±1 °C
Repetition accu- racy	±5% ² or ³ ±10 ppm	±5% ² or ³ ±10 ppm	±1% RH	±1% ⁴	±1 °C
Sensor resolution	1 ppm	1 ppm	1% RH	n. a.	1 °C

¹ Determination based on IEC 60567, Appendix E

² Of the measured value

³ Depending on which value is larger

⁴ Of the saturation curve; IEC 60422

⁵ At +23 °C

Conditions of use	
Locations of use	Indoors and outdoors, all climate zones
Installation altitude	Up to 4,000 m above sea level

Conditions of use	
Offshore	Optional
Mounting location	Directly on the transformer tank or in the oil closed circuit cooling pipe; installation horizontal
Operating temperature ⁶	-40...+60 °C
Insulating fluid temperature ^{6,7}	-20...+115 °C
DGA measuring range with respect to the operating temperature ⁶	-20...+60 °C
DGA measuring range with respect to the temperature of the insulating fluid ^{6,7}	+10...+90 °C
Ambient humidity	0...100% RH
Storage temperature	-40...+80 °C

⁶ Please contact MR to check the use in case of extreme conditions

⁷ At the point of measurement

Device properties	
Mechanical connection	Both versions including safety chain for secure installation and removal: Standard: With double screw connection; prerequisite: customer-side flange with 2" – 11 1/2 NPT internal thread Optional: With ball valve and configurable flange DN50 or DN80 (several flanges available)
Measuring pipe length	Two different lengths for optimum measuring conditions; Short measuring pipe: 285 mm; Long measuring pipe: 507 mm
Oil extraction connection	Luer lock socket on the device; Adapter set for safe and clean oil extraction included in the scope of delivery
Operation	Optional VFD display (suitable for use in daylight) with 3 operating keys for displaying measured values and messages as well as for calling up parameters

Device properties	
Materials used	Stainless steel and aluminum; All external parts and parts in contact with oil are weather-resistant, resistant to transformer oil and UV-resistant
Gasket material	FPM (Viton®)
Available colors (terminal box)	RAL 7033 RAL 7038
Vacuum resistance Pressure resistance	5 Pa for 48 hours Max. 400 kPa
Degree of protection	IP 66
Dimensions	435 / 657 x 218 x 264 mm (version with short / long measuring pipe)
Device weight	Version with short measuring pipe: approx. 12 kg Version with long measuring pipe: approx. 14 kg (without ball valve / flange / safety chain)
Double screw connection weight	Approx. 1.5 to 2 kg (including safety chain)
Ball valve weight	Approx. 6 kg (including flange and safety chain)
Electrical connection	
Power supply	95...280 V AC, 50/60 Hz or 95...280 V DC (protected against polarity reversal)
Power consumption	<13 W
Overvoltage category	III
Connection terminals	Voltage supply, relays and analog outputs: 2.5 mm ² , AWG 14
Cable gland	3 x M20 x 1.5 or 3 x 1/2" NPT; 8...15 mm lead diameter
Interfaces	

Device properties	
Relay outputs	4 freely configurable signaling relays (1 changeover contact each) for warning and alarm messages and for maintenance messages from the device-internal monitoring; 1 signaling relay for safety messages (e.g. loss of voltage) Contact current capacity: 250 V AC / 5 A; max. 400 V AC, $\cos \varphi = 1$ at 85 °C; 30 V DC / 5 A to 300 V DC / 0.25 A
Analog outputs	Passive, signal tolerance ± 0.03 mA, load resistance max. 700 Ω at 24 V DC MSENSE® DGA 2: 2 configurable outputs, 4...20 mA MSENSE® DGA 3: 3 configurable outputs, 4...20 mA
Service interface	5-pole socket (Molex) for communication via Modbus RTU and parameterization via MSET parameterization software

MESSKO® MSET parameterization software	
MESSKO® MSET parameterization software	
Delivery	On USB stick; included in the MSENSE® DGA 2/3 scope of delivery
Download	Customer portal: https://portal.reinhausen.com
Operating system	From Microsoft Windows 7 ⁸
Measured value display and evaluation	Display of the current measured values and device information; Event database with time stamp (date and time); Graphic display and evaluation of the temporal progression of the measured values; Export of the measured values (CSV format) or protocol settings (PDF format)
Parameterization	Configuration of the parameters for commissioning, communication and ongoing operation
Field calibration	Setting the time stamp of the oil sample extraction; Entry of the reference values in accordance with the laboratory report
Service	Reading out the internal device service database for further analysis by MR Service experts

⁸ Please note that Microsoft has stopped providing regular support for versions earlier than Windows 10.

Mechanical tests	
Vibration	10–150 Hz with 2g, 2 h (IEC 60068-2-6)
Seismic events	2–10 Hz, 22.5 mm, 1 h (IEC 60068-2-57)
Shock	10g, 10 ms (IEC 60068-2-27)

3 Drawings

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DATE	NAME	DOCUMENT NO.
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02.12.2024	SCHAEFERB	CHANGE NO.
02.12.2024	KLEYN	1129356
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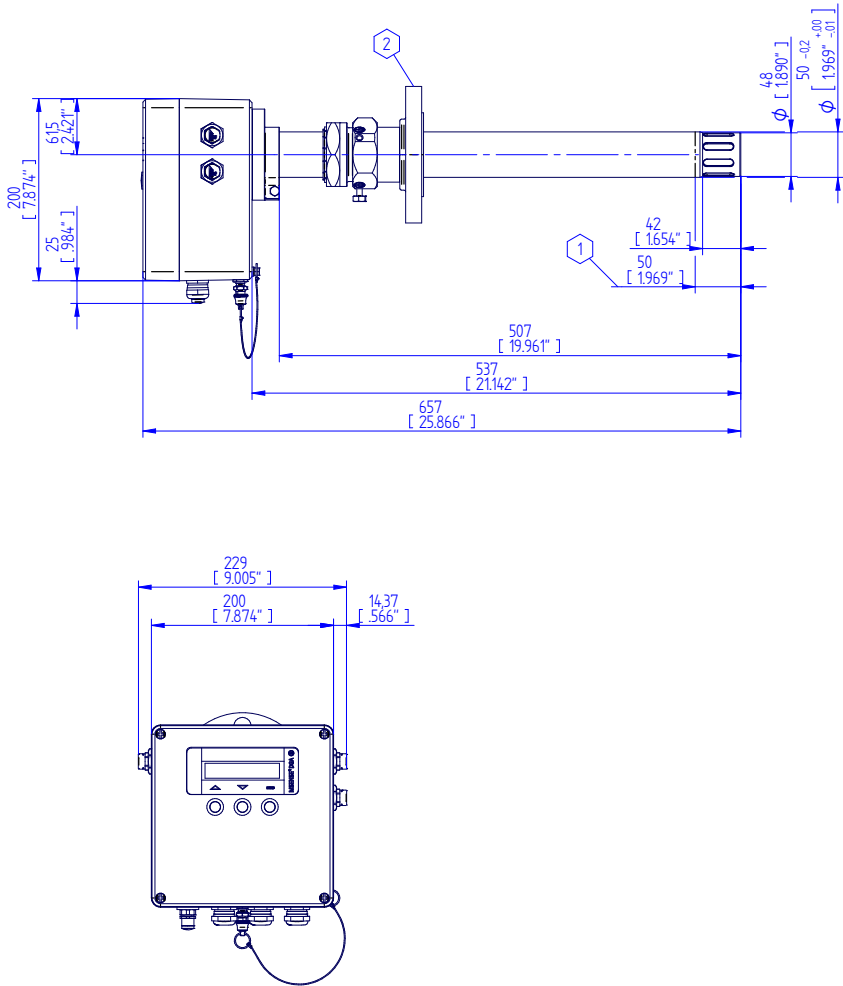
DIMENSION
 IN mm
 EXCEPT AS
 NOTED



TRANSFORMER ACCESSORIES
 MSENSE® DGA 2/3
 DEVICE DIMENSIONS WITH 507MM MEASURING PIPE & ADD. FLANGE

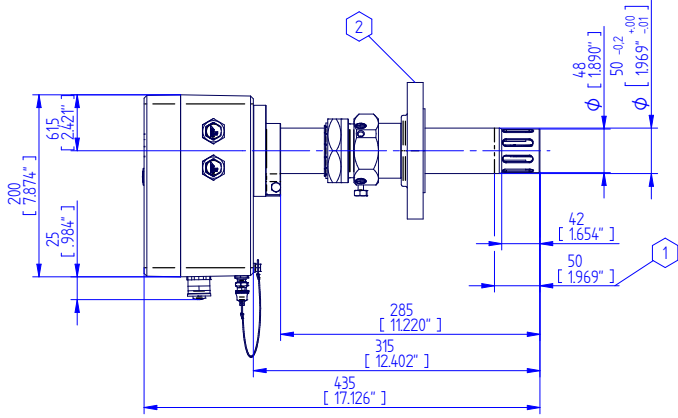
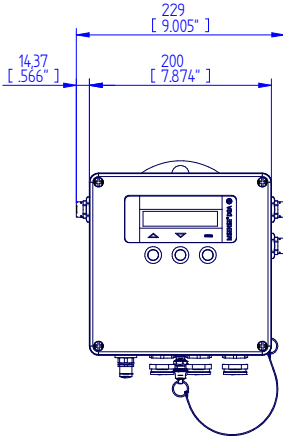
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MATERIAL NUMBER	101828710M
SHEET	1 / 1

- 1 Empfohlene Eintauchtiefe / RECOMMENDED IMMERSION DEPTH
- 2 Flansch nicht im Lieferumfang enthalten / FLANGE NOT INCLUDED IN DELIVERY PACKAGE



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CHKD 02.12.2024	SCHAEFERB	CHANGE NO.
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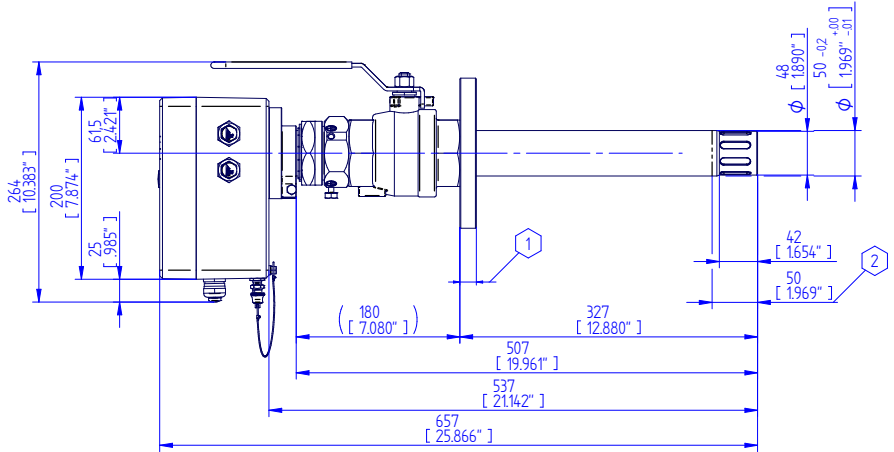
DIMENSION
 IN mm
 EXCEPT AS
 NOTED



TRANSFORMER ACCESSORIES
 MSENSE® DGA 2/3
 DEVICE DIMENSIONS WITH 285MM MEASURING PIPE & ADD. FLANGE

SERIAL NUMBER	-
MATERIAL NUMBER	101828730M
SHEET	1 / 1

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- 1 Flansch siehe Tabelle / FLANGE, SEE TABLE
- 2 Empfohlene Eintauchtiefe / RECOMMENDED IMMERSION DEPTH

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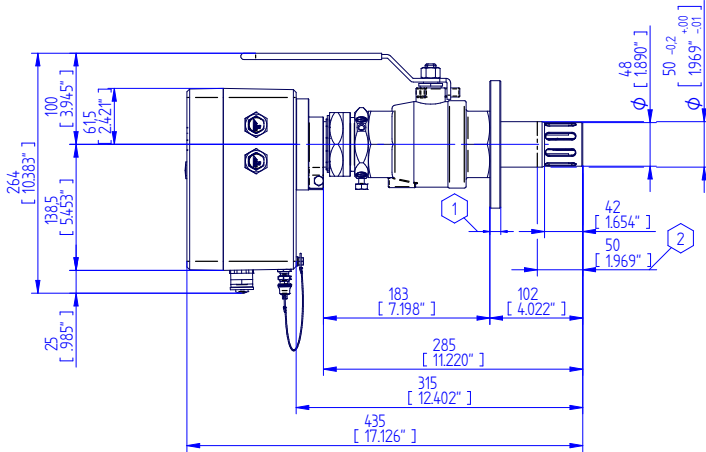
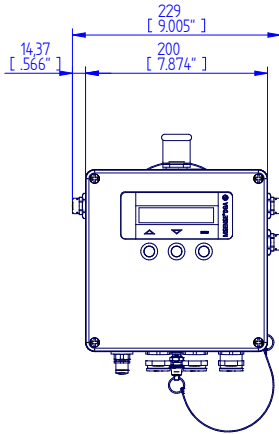
DIMENSION
 IN mm
 EXCEPT AS
 NOTED



TRANSFORMER ACCESSORIES
 MSENSE® DGA 2/3
 DEVICE DIMENSIONS WITH 507MM MEASURING PIPE

SERIAL NUMBER	-
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SHEET	1 / 1

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STAND_02.12.2024	KLEYN	1129356
		SCALE
		14



1 Flansch siehe Tabelle / FLANGE, SEE TABLE

2 Empfohlene Eintauchtiefe / RECOMMENDED IMMERSION DEPTH

DIMENSION
IN mm
EXCEPT AS
NOTED



TRANSFORMER ACCESSORIES
MSENSE® DGA 2/3
DEVICE DIMENSIONS WITH 285MM MEASURING PIPE

SERIAL NUMBER

-

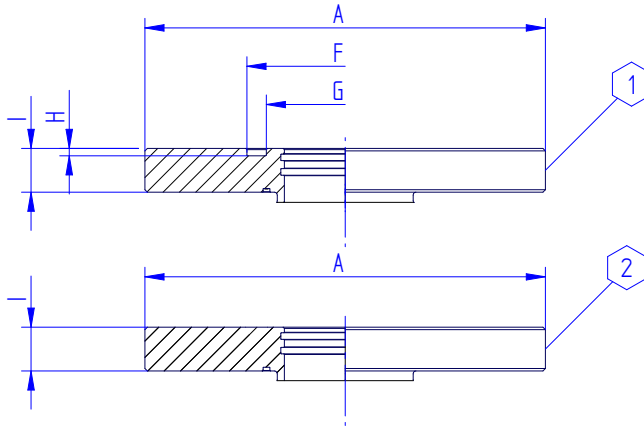
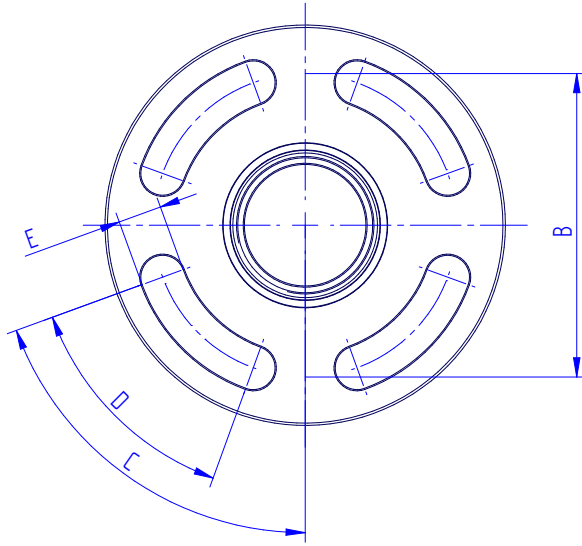
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SHEET

1 / 1

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- 1 FOR O-RING GASKET (INCLUDED IN DELIVERY)
- 2 FOR ANY GASKET (NOT INCLUDED IN DELIVERY)

DOCUMENT NO.	NAME	DATE
SED 11230416 000 02	ETTADJO	29.12.2024
SCALE	CHANGE NO.	CHKL 02.12.2024
115	1129356	STANO 05.12.2024
	KLEYN	

FLANGE VERSION	A mm [inch]	B mm [inch]	C	D	E mm [inch]	F mm [inch]	G mm [inch]
DN50 PN6	φ140 [5.51"]	φ110 [4.33"]	70°	4 x 50°	φ13 [.51"]	φ81 [3.19"]	φ65 [2.56"]
DN50 PN16	φ165 [6.50"]	φ125 [4.92"]	70°	4 x 50°	φ18 [.71"]	-	-
DN50 PN16	φ165 [6.50"]	φ125 [4.92"]	70°	4 x 50°	φ18 [.71"]	φ81 [3.19"]	φ65 [2.56"]

DIMENSION
 IN mm
 EXCEPT AS
 NOTED

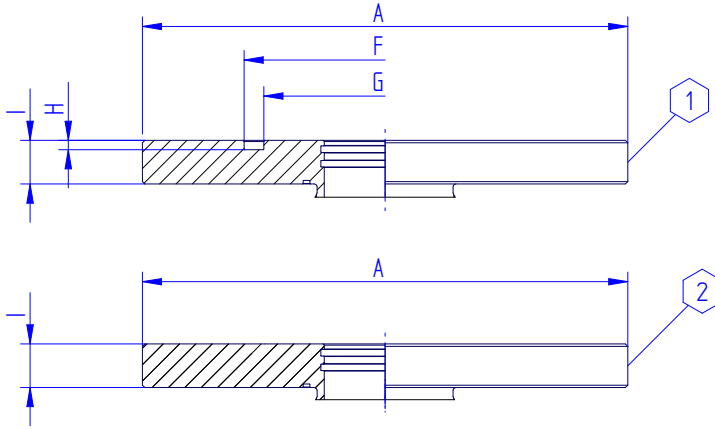
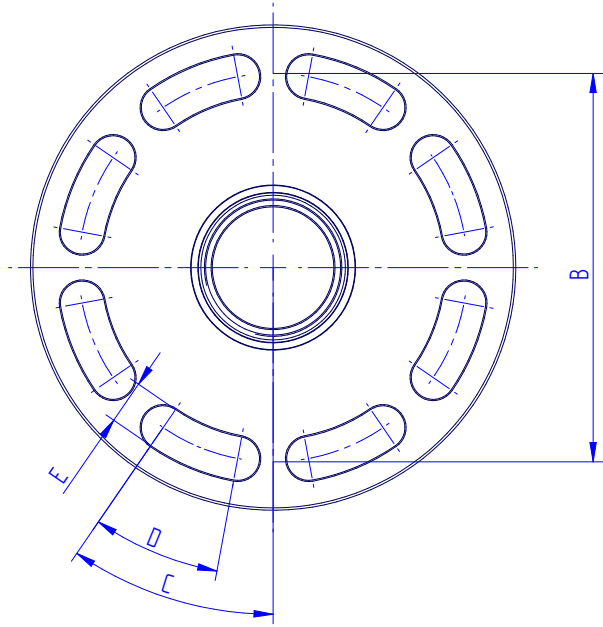


TRANSFORMER ACCESSORIES
 Anschlussflansch DN50/CONNECTING FLANGE DN50
 Maßzeichnung/DIMENSION DRAWING

SERIAL NUMBER

MATERIAL NUMBER 101834790M SHEET 1 / 1

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1 FOR O-RING GASKET (INCLUDED IN DELIVERY)

2 FOR ANY GASKET (NOT INCLUDED IN DELIVERY)

NAME	DOCUMENT NO.
DATE	SCALE
DFTR. 29.12.2024	SED 11250895 000 02
CHKD. 02.12.2024	CHANGE NO.
STAND. 05.12.2024	1129356
	115

FLANGE VERSION	A mm [inch]	B mm [inch]	C	D	E mm [inch]	F mm [inch]	G mm [inch]
DN80 PN16	φ200 [7.87"]	φ160 [6.30"]	34.5°	8 x 24°	φ18 [.71"]	-	-
DN80 PN16	φ200 [7.87"]	φ160 [6.30"]	34.5°	8 x 24°	φ18 [.71"]	φ116.2 [4.57"]	φ100 [3.94"]

DIMENSION
IN mm
EXCEPT AS
NOTED



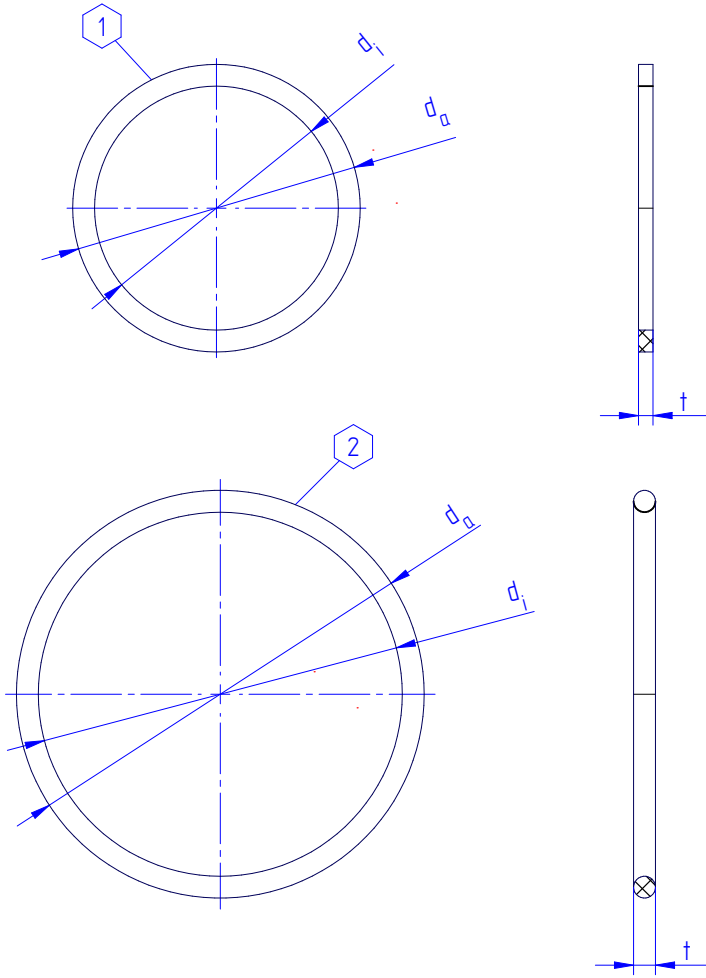
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Anschlussflansch DN80/CONNECTING FLANGE DN80
Maßzeichnung/DIMENSION DRAWING

SERIAL NUMBER

MATERIAL NUMBER
101834800M

SHEET
1 / 1

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- 1 GASKET FOR DN50/PN6/16
- 2 O-RING FOR DN80/PN16

DOCUMENT NO.	NAME	DATE
SED 11295808 000 02	ETTADJO	29.11.2024
SCALE	SCHAFFERB	02.12.2024
1:1	KLEYN	05.12.2024
CHANGE NO.		
1129356		

FLANGE VERSION	H mm [inch]	l mm [inch]	O-RING GASKET (di) x (da) x (t) MM [INCH]
DN50 PN6	3 [.12"]	12 [.47"]	Gasket 67 [2.64"] x 79 [3.11"] x 4 [.16"]
DN50 PN16	-	18 [.71"]	For any gasket (not included in delivery)
DN50 PN16	3 [.12"]	18 [.71"]	Gasket 67 [2.64"] x 79 [3.11"] x 4 [.16"]
DN80 PN16	-	18 [.71"]	For any gasket (not included in delivery)
DN80 PN16	3,9 [.15"]	18 [.71"]	O-ring ID100 [3.94"] x ϕ 6 [.24"]

DIMENSION
 IN mm
 EXCEPT AS
 NOTED



TRANSFORMER ACCESSORIES
 Flanschdichtungen/FLANGE GASKETS
 Maßzeichnung/DIMENSION DRAWING

SERIAL NUMBER	SHEET
-	1 / 1
MATERIAL NUMBER	
101834810M	

4 Appendix

4.1 Electrical connection

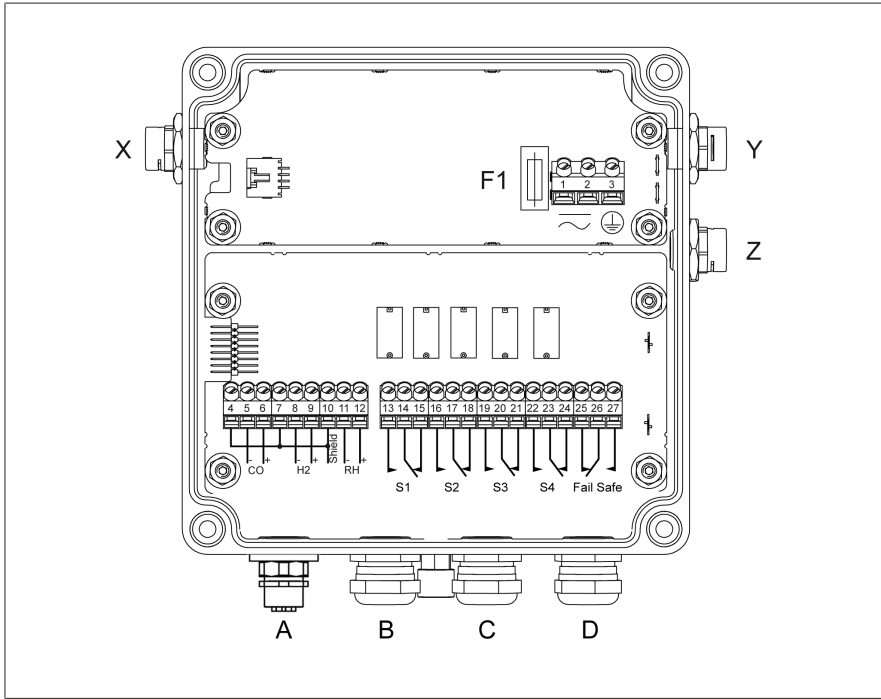


Figure 3: Electrical connection

1-2	Supply voltage (overvoltage category III) 95...280 V AC 50/60 Hz or 95...280 V DC (any polarity)
3	Protective conductor
4-12	Analog outputs 4...20 mA passive (must be supplied with 24 V DC)
13-27	Main switching contacts (change-over contacts for state signaling): capacity: 30 V DC / 5 A to 300 V DC / 0.25 A or 250 V AC / 5 A; max. 400 V AC, $\cos \varphi = 1$ at 85 °C, observe warning information.
F1	Safety fuse 500 V, 500 mA, delayed-action
A	M12 socket, type A for Modbus RTU (RS485) and for USB service adapter (included in delivery)

B	M20x1.5 cable screw connection for analog outputs
C	M20x1.5 cable screw connection for signaling relay
D	M20x1.5 cable screw connection for supply voltage
X, Y, Z	Vents

4.2 Data point table for Modbus RTU

Separate input register

No.	Address	Size	Description	Designation
1	0	1 byte	On / Off	CO limit 1
2	1	1 byte	On / Off	CO limit 2
3	2	1 byte	On / Off	H ₂ limit 1
4	3	1 byte	On / Off	H ₂ limit 2
5	4	1 byte	On / Off	H ₂ O limit 1
6	5	1 byte	On / Off	H ₂ O limit 2
7	6	1 byte	On / Off	CO rate limit 1
8	7	1 byte	On / Off	CO rate limit 2
9	8	1 byte	On / Off	H ₂ rate limit 1
10	9	1 byte	On / Off	H ₂ rate limit 2
11	10	1 byte	On / Off	H ₂ O rate limit 1
12	11	1 byte	On / Off	H ₂ O rate limit 2
13	12	1 byte	On / Off	Maintenance in 6 months
14	13	1 byte	On / Off	Maintenance required
15	14	1 byte	On / Off	CO Value Valid ¹⁾
16	15	1 byte	On / Off	H ₂ Value Valid ¹⁾
17	16	1 byte	On / Off	H ₂ O Value Valid ¹⁾
18	17	1 byte	On / Off	H ₂ O Mode %RH

¹⁾ If the "Value Valid = Off" status is present, it means the same as an asterisk (*) in the display or in the MSET status display, and the system is outside the specified measuring range in accordance with the "Technical data" [► Section 2.1, Page 8] chapter. The following applies to the transmitted measured value:

- During the first measurement after the running-in phase, the value of the lower detection limit is transmitted.
- If measured values within the specified measuring range have already been recorded, then the last valid measured value is transmitted.

If the status changes to "Value Valid = On", then the system is back in the valid measuring range.

Input register

No.	Address (dec.)	Size	Description	Designation
1	0	4 bytes, SFLOAT	None	CO value ppm
2	2	4 bytes, SFLOAT	None	H ₂ Value ppm
3	4	4 bytes, SFLOAT	None	H ₂ O Value ppm
4	6	4 bytes, SFLOAT	None	Oil Temperature
5	8	4 bytes, SFLOAT	-	Empty 2
6	10	4 bytes, SFLOAT	None	H ₂ O %RH
7	12	4 bytes, SFLOAT	-	Empty 4
8	14	4 bytes, SFLOAT	None	H ₂ O Rate %RH/d
9	16	4 bytes, SFLOAT	None	CO Rate ppm/d
10	18	4 bytes, SFLOAT	None	H ₂ Rate ppm/d
11	20	4 bytes, SFLOAT	None	H ₂ O Rate ppm/d

Glossary

Insulating fluid temperature

Permissible temperature of the insulating fluid in the product or directly on the product.

Operating temperature

Permissible temperature in the immediate surroundings of the device during operation taking ambient influences, for example due to the equipment and installation location, into consideration.

Storage temperature

Permissible temperature for storing the device in an unmounted state or in a mounted state so long as the device is not in operation.

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Please note:

The data in our publications may differ from the data of the devices delivered. We reserve the right to make changes without notice.

TD4001325-12 EN - MSENSE™ DGA 2/3 Technical data -
- 06/25

Maschinenfabrik Reinhausen GmbH 2025

THE POWER BEHIND POWER.