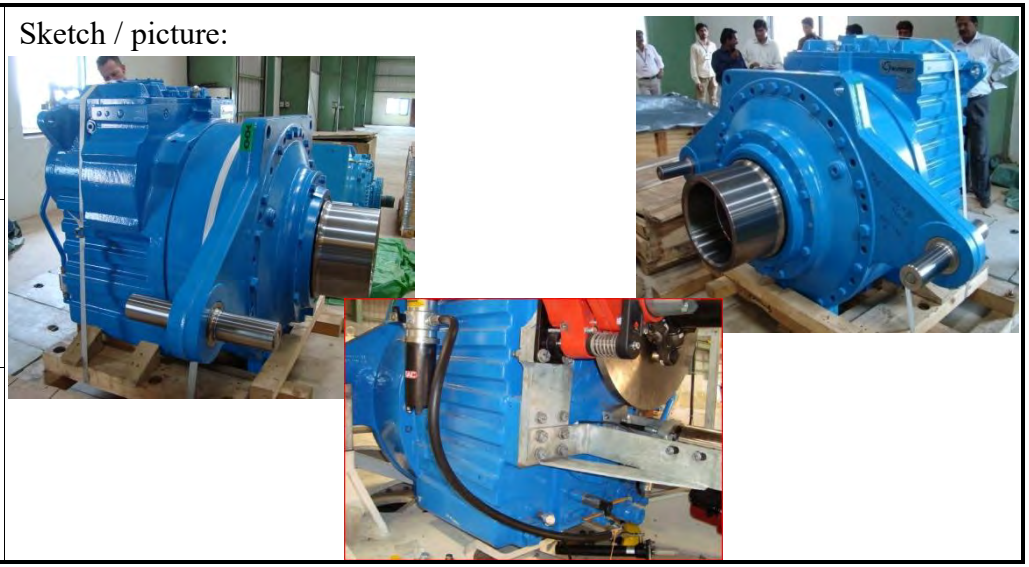
norwin wind turbine technologies www.norwin.dk	# DATA SHEET		Item: PEAS 4290.4
			Document №: NWX-111-10-1-(03)
			Revision №: (01)
	Made by: KN	Approved by: NPK	Date: 01.07.2011

Scope of supply: A. PEAS 4290.4 – 50HZ Or B. PEAS 4290.4 – 60HZ	Weight: 5500 kg without oil.	Sketch / picture: 
Technical requirements: According to documentation attached from supplier.	Surface treatment: Color: RAL 5010 Corrosion class: C3H	
Documentation requirements: Noise and vibration test	Additional notes: Gear box 50Hz or 60Hz must be based on local requirements.	

Supplier information:

[X] Supplier mandatory

[ ] Supplier optional

Supplier 1:

Name: Winergy

Link: www.winergy-group.com

Supplier`s reference:

A. Norwin PEAS 4290.4 – 50HZ
B. Norwin PEAS 4290.4 – 60HZ

[X] Supplier documentation attached (page 2 to 105)

Supplier 2:

Name:

Link:

Supplier`s reference:

-

[ ] Supplier documentation attached (page - to -)

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1 Technical data PEAS 4290.4 – 50Hz and 60Hz

Overview of the revisions

Revision	Date	Page	Description of the modifications
0	08.05.2008	-	issue
1	24.01.2011	-	Update 60 Hz version

General:

Customer	:	Norwin
Code	:	NW 46/47
Customer specification	:	S-NWB-1-2-3-1-(01)-03 08-05-09: Specification MAIN GEAR for : NW 46/47; 750 kW / **50 Hz Grid**; Nominal Rotor RPM/Generator RPM (25.26 /1500) S-NWB-1-2-3-1-(01)-Addendum 01.07.2010: Specification MAIN GEAR for: NWB 46/47; 825 kW / 750 kW electrical / **60 Hz Grid**; Nominal Rotor RPM / Generator RPM (25.2/1815)
Valid loads for gearbox design	:	Load-Result-NWB-IEC-1B-2A-Mar-31-07-Gearbox New, dated 10.12.2007

Wind turbine NW 47/ 750 kW:

Turbine type	:	upwind
Installation	:	on shore
Drive	:	wind rotor with 3 blades, ∅47 Meter
Regulation	:	active stall regulation
Driven machine	:	asynchronous generator
Direction of rotation		(view on shaft end)
Actuation (rotor shaft)	:	clockwise cw
Power take-off (generator shaft)	:	counter-clockwise ccw
Inclination of rotor shaft	:	4° (rotor side on top)
Main brake	:	active stall regulation of the blades
Auxiliary brake	:	mech. disk brake on generator side

Gear box :

Helical-Planetary Gearbox	:	2 helical stages 1 planetary stage incl. torque arm
Nom. rotor power rating (mech.)	:	825 kW
Nom. electrical power rating	:	750 kW
Nom. rotor torque	:	309 000 Nm (50 Hz) 311 896 Nm (60 Hz)
Actual ratio	:	59,385 (50 Hz) 71,203 (60 Hz)
Nom. rotor speed	:	25,5 min^{-1} (50 Hz) 25,28 min^{-1} (60 Hz)
Nom. generator speed	:	1519 min^{-1} (50 Hz) 1800,0 min^{-1} (60 Hz);
Max. loads	:	acc. to customer specification
Weight (without oil filling, coupling a. shrink disk)	:	≈ 5500 kg
Weight shrink disk	:	≈ 300 kg
Lubricants		
Quantity	:	≈ 105 l
Viscosity	:	ISO VG 320 / 460
Type	:	Mobilgear SHC XMP 320 / 460 Mobilgear XMP 320 / 460 Optimol Optigear Synthetic A 320 / 460
Connection rotor shaft – hollow shaft	:	shrink disk HSD 420-81 / Stüwe
Lubrication	:	combined splash / forced lubrication
Oil heating	:	none
Temperature control	:	temperature sensors
Noise power level	:	LW(A) = 98 dB(A), P = 825 [kW]
Ambient survival temperature	:	-25°C up to + 55°C
Nacelle temperature during operation	:	+10°C up to + 50°C
Main dimensions	:	≈ length x width x height ≈ 1650 mm x 1750 mm x 1350 mm
Dimension sheet	:	6175462
Assembly drawing	:	6180453 (50 Hz) 6245914 (60 Hz)
Spare part drawing	:	6180695
Piping drawing main system	:	6180454
Piping drawing auxiliary system	:	6180455
Painting drawing	:	6180481
Spare part list	:	EL 4835519-020 DE/EN
List of equipment	:	EGE-GL PEAS 4290,4 EN
Standard operating manual	:	EGE-BA-ST-001 EN 11.09

Operating values of the gear box:

Temperature

• Minimal operating temperatures in nacelle	+ 10 °C
• Maximal operating temperatures in nacelle	+ 50 °C
• oil sump temperatures:	
– during operation	≤ + 70 °C
– operation not allowed	< + 10 °C
– start up temperature	≥ + 10 °C
– shut down	> + 70 °C
or • bearing temperatures: – long term HSS bearings – shut down HSS bearings After a shut down an inspection of bearings and oil supply is necessary.	≤ + 90 °C > + 90 °C
• maximum temperature difference between oil sump and bearing at high speed shaft during operation (to be controlled during normal operation and not during start up procedure)	ΔT= 25 K

• Required oil-flow of the main oil supply system	54 l/min

Logic structure

sensor / switches				
operation mode	oil sump temperature [°C]	bearing temperature (HSS) [°C]	oil pressure at gear unit inlet [bar]	mech. pump valve (Part No. 752)
idling without grid connection *	≤ + 70	≤ + 90		on
idling *	≤ + 70	≤ + 90	> 0,8	off
production	< + 55	≤ + 90	> 0,8	off
production	55 ≤ T ≤ 65 (increasing)		> 0,8	off
production	> + 65	≤ + 90	> 0,8	off
production	55 ≤ T ≤ 65 (falling)		> 0,8	off
stop		> + 90		
stop	> + 70			
stop			≤ 0,8	

The pump of the cooling system which is not scope of supply Winergy has to assure, that the oil pressure at the gear unit inlet is at least minimum 0,8 bar.

***Idling**

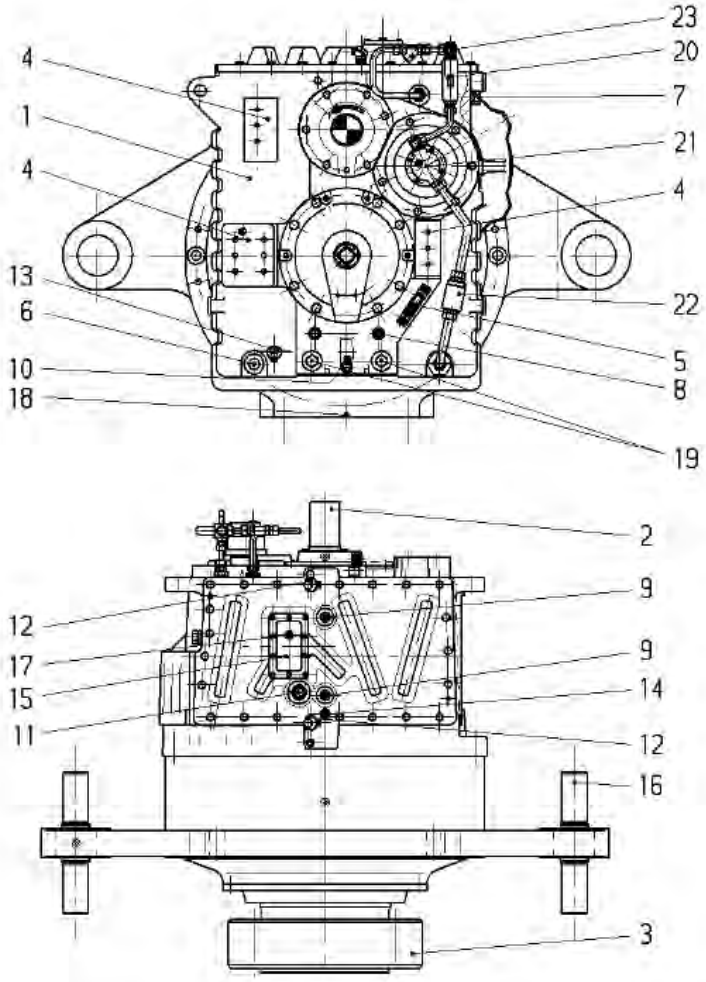
a) with grid:
If the turbine idles for more than 3 days the lubrication system has to be switched on for 2 minutes every 12 hours.
The operating dates have to be considered generally.

b) without grid
idling recommended

Oil level
Static oil level at marking of the oil glass: please look at the dimension sheet
At still stand, up to ≈ 40°C oil sump temperature
For more information please look at the operating manual EGE-BA-ST-001-EN 11.09, chapter 10.9

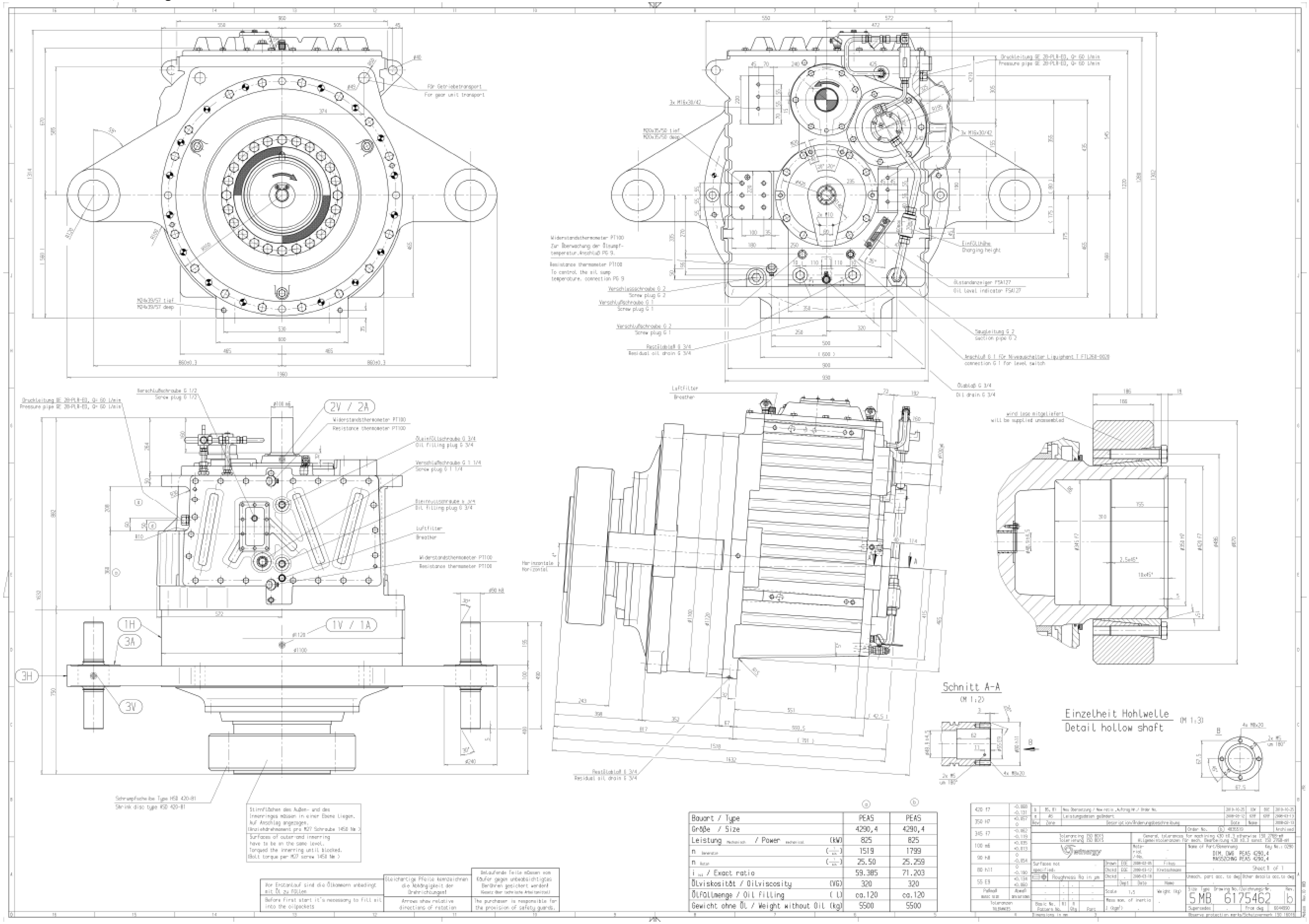
Oil filtration
Recommended fineness : 10 µm (absolute)

Recommended rate of filter reserve : $\beta_{10} \geq 200$



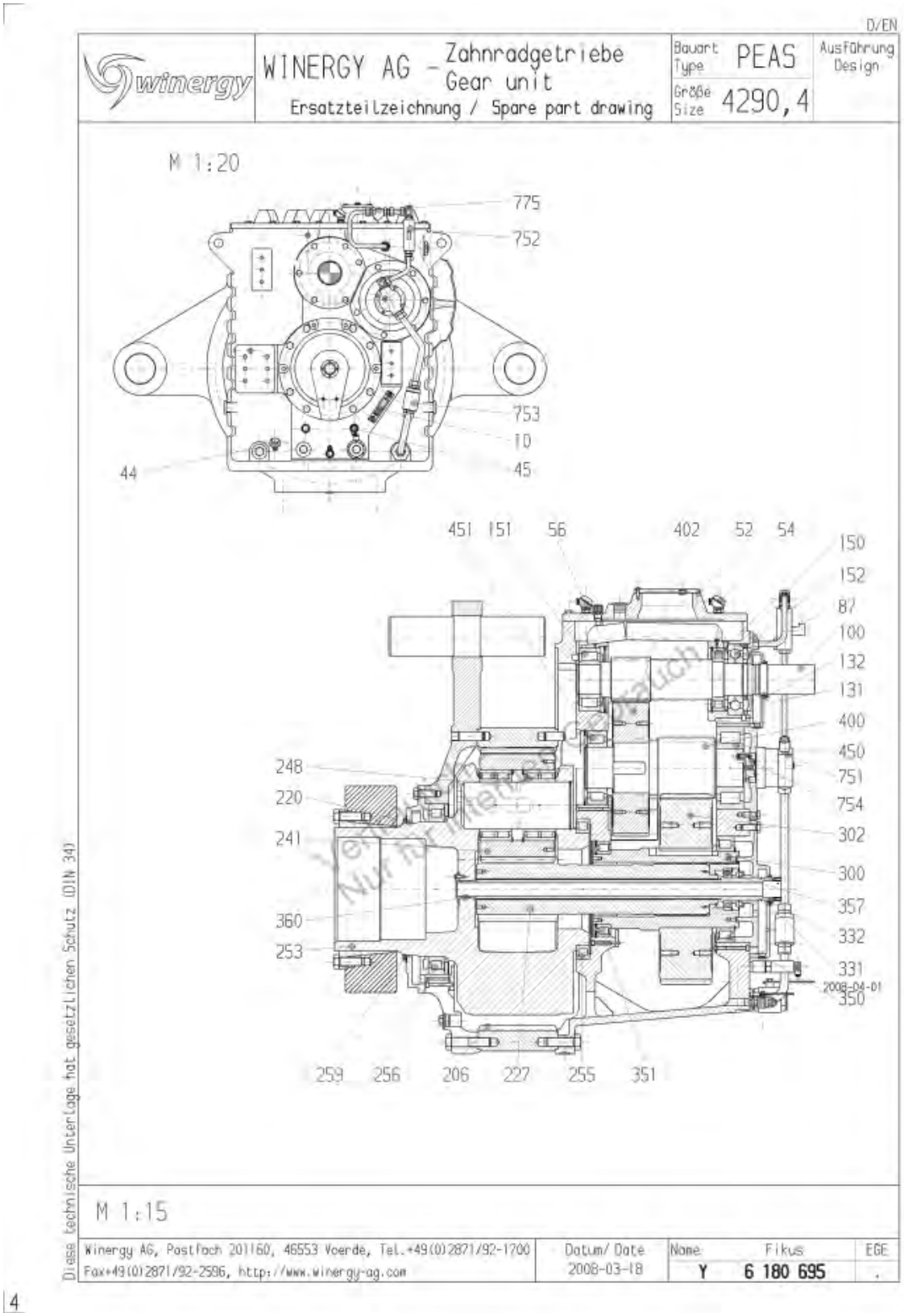
1 Gear unit

1.1 Overview mass/drawing Norwin PEAS 4290.4 – 50Hz and 60Hz – 5-6175 462-b



	a	b
Bauart / Type	PEAS	PEAS
Größe / Size	4290,4	4290,4
Leistung mechanisch / Power mechanical (kW)	825	825
n Generator (1/min)	1519	1799
n Rotor (1/min)	25.50	25.259
i ist / Exact ratio	59.385	71.203
Ölviskosität / Oilviscosity (VG)	320	320
Ölfüllmenge / Oil filling (L)	ca.120	ca.120
Gewicht ohne Öl / Weight without Oil (kg)	5500	5500

1.1.1 A. Assembly drawing Norwin PEAS 4290.4 – 50HZ – 6 180 695



1.1.1.1 Partlist Norwin PEAS 4290.4 – 50HZ – drawing 6 180 695

winergy

Ersatzteilliste (EL)
Spare parts list

Bauart / Type: **PEAS**
Größe / Size: **4290,4**
Übersetzung / ratio: **59,385**

Seite / Page 1/2

Bei Korrespondenz bitte angeben / Please quote in correspondence: GWL/MP/10-11/035
EL 4821533-020 DE/EN

Hierzu gehört Zeichnungs-Nr. / Please refer to DWG No. **6180695**

	Teil-Nr. Part No.	Menge No. off		Benennung Description	Zeichnungs-Nr. Drawings No.	Material-Nr. Ident no.	Gw(kg) Weight
E	0010	1	ST	OELSTANDANZEIGER OIL LEVEL INDICATOR		000.000.464.054	0,2
E	0044	1	ST	WIDERSTANDSTHERMOMETER RESISTANCE THEMOMETER		000.001.157.931	0,3
E	0045	1	ST	NIVEAUSCHALTER LEVEL SWITCH		000.000.800.609	0,3
E	0052	1	ST	DICHTUNG SEAL		000.000.342.287	0,0
E	0054	1	ST	WIDERSTANDSTHERMOMETER RESISTANCE THEMOMETER		000.000.649.506	0,2
E	0056	1	ST	WIDERSTANDSTHERMOMETER RESISTANCE THEMOMETER		000.000.649.506	0,2
E	0087	1	ST	NILOSRING NILOS RING		000.000.649.773	0,1
E	0100	1	ST	STIRNRADWELLE PINION SHAFT	6040954/D	000.001.277.258	73,9
E	0132	1	ST	 V-RING V-100A 98-105 PERBUNAN		000.000.775.102	0,1
E	0150	1	ST	WAELZLAGER ROLLING CONTACT BEARING		000.000.380.433	6,4
E	0151	1	ST	WAELZLAGER ROLLING CONTACT BEARING		000.000.380.185	13,6
E	0152	1	ST	WAELZLAGER ROLLING CONTACT BEARING		000.000.380.682	12,5
E	0206	1	ST	STIRNRAD (INNENVERZAHNUNG) INTERNALLY TOOTHED GEAR WHEEL	6008292/E	000.001.217.035	520,0
E	0227	1	ST	PLANETSTIRNRADWELLE PLANETARY CYLINDRICAL WHEEL SHAFT	6129859/-	000.001.368.456	128,0
E	0241	3	ST	PLANETSTIRNRAD PLANET PINION	6125967/C	000.001.368.460	125,0
E	0248	6	ST	WAELZLAGER ROLLING CONTACT BEARING		000.001.157.486	16,2
E	0253	1	ST	PLANETTRAEGER PLANETARY CARRIER	6105117/F	000.001.336.064	925,0
E	0255	1	ST	WAELZLAGER ROLLING CONTACT BEARING		000.001.151.641	18,9
E	0256	1	ST	WAELZLAGER ROLLING CONTACT BEARING		000.001.156.873	33,2
E	0259	1	ST	 V-RING V-450L 440-480 PERBUNAN		000.000.342.292	0,1
E	0300	1	ST	HOHLWELLE HOLLOW SHAFT	6081378/G	000.001.286.706	120,0
E	0302	1	ST	STIRNRAD GEAR WHEEL	8114841/H	000.000.653.536	383,0
E	0332	1	ST	 V-RING V- 80A 78- 83 PERBUNAN		000.000.776.525	0,1

Die mit * gekennzeichneten Teile gehören zu einer Baugruppe (G). Die Baugruppe ist nur komplett auszutauschen.
The parts marked with * belong to a subassembly (G). The subassemblymust be replaced complete.

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Fax+49(0)2871/922596,http://www.winergy-ag.com

Datum Date 01.07.2011 | KRETSCHMANN, FRANK 1727 | Rev.: | EGE.FR

winergy	**Ersatzteilliste (EL)** Spare parts list	Bauart **PEAS** Type Größe **4290,4** Size Übersetzung **59,385** ratio	Seite Page 2/2

Bei Korrespondenz bitte angeben
Please quote in correspondence
GWL/MP/10-11/035
EL 4821533-020 DE/EN

Hierzu gehört Zeichnungs-Nr.
Please refer to DWG No. **6180695**

	Teil-Nr. Part No.	Menge No. off		Benennung Description	Zeichnungs-Nr. Drawings No.	Material-Nr. Ident no.	Gw(kg) Weight
E	0350	1	ST	WAELZLAGER ROLLING CONTACT BEARING		000.000.650.820	18,5
E	0351	1	ST	WAELZLAGER ROLLING CONTACT BEARING		000.000.380.681	10,6
E	0357	1	ST	WAELZLAGER ROLLING CONTACT BEARING		000.000.772.699	1,4
E	0360	2	ST	O-RING O-RING		000.000.306.603	0,1
E	0400	1	ST	STIRNRADWELLE PINION SHAFT	6081485/B	000.001.286.721	105,0
E	0402	1	ST	STIRNRAD GEAR WHEEL	6040960/E	000.001.277.290	133,0
E	0450	1	ST	WAELZLAGER ROLLING CONTACT BEARING		000.000.380.670	29,2
E	0451	1	ST	WAELZLAGER ROLLING CONTACT BEARING		000.000.899.109	13,5
E	0751	1	ST	PUMPE PUMP		000.000.651.891	8,0
E	0752	1	ST	WEGEVENTIL DIRECTIONAL VALVE		000.000.651.893	2,2
E	0753	1	ST	RUECKSCHLAGVENTIL NON-RETURN VALVE		000.000.651.892	0,5
E	0754	1	ST	TEIL PART	6037960/A	000.001.250.297	1,0
E	0775	1	ST	FILTER FILTER		000.001.152.512	0,2
E*	0131	330,00	MM	STREIFEN STRIP		000.000.243.209	0,1
E*	0220	1.440,00	MM	STREIFEN STRIP		000.000.243.209	0,1
E*	0331	270,00	MM	STREIFEN STRIP		000.000.243.209	0,1

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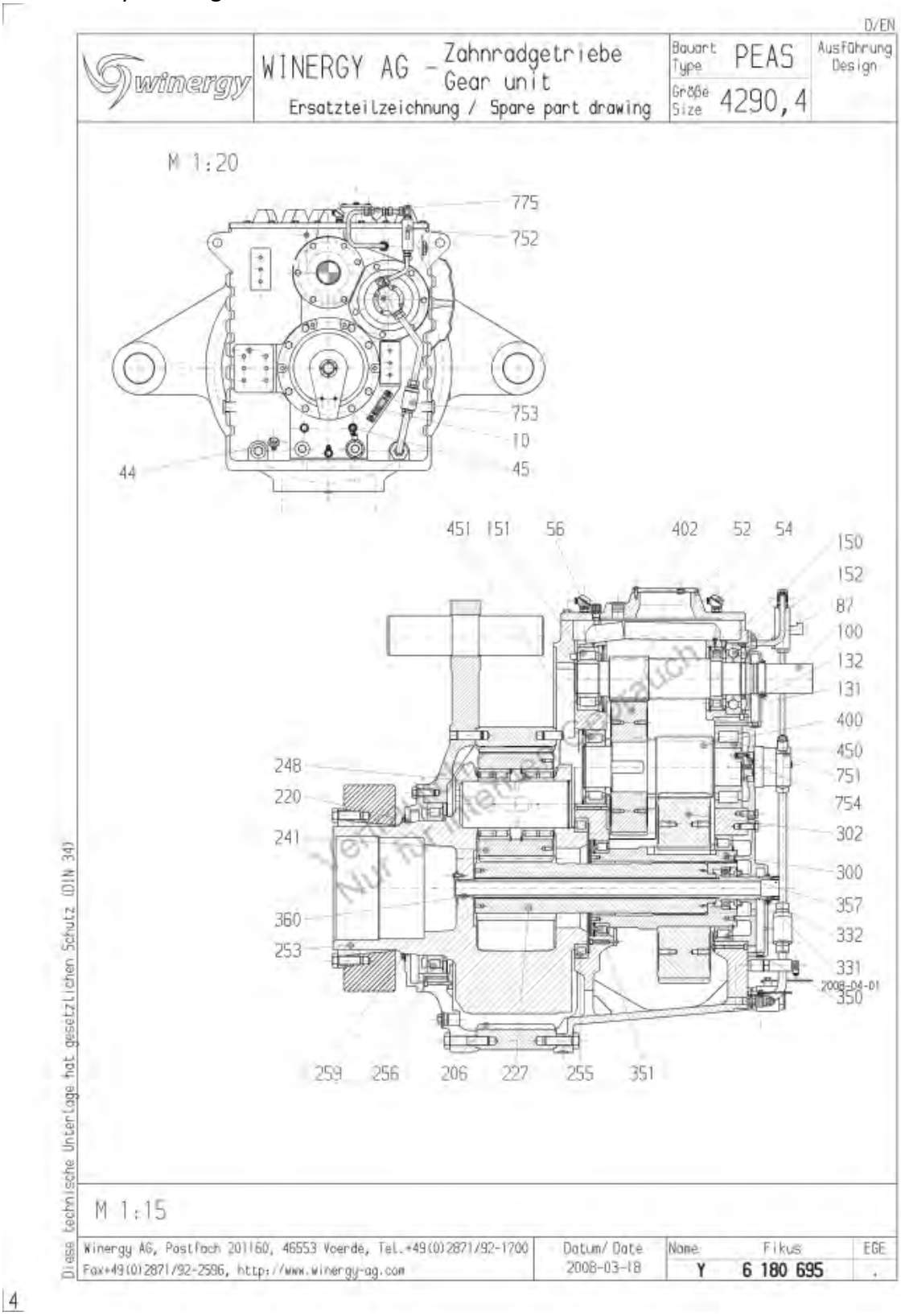
1.1.2 B. Assembly drawing Norwin PEAS 4290.4 – 60HZ – 6-180 695



1.1.2.1 Partlist Norwin PEAS 4290.4 – 60HZ – drawing 6-180 695

winergy

Ersatzteilliste (EL)
Spare parts list

Bauart PEAS
Type
Größe 4290,4
Size
Übersetzung 71,203
ratio

Seite
Page
1/2

Bei Korrespondenz bitte angeben
Please quote in correspondence
5213675
EL 4835519-020 DE/EN

Hierzu gehört Zeichnungs-Nr.
Please refer to DWG No. **6180695**

	Teil-Nr. Part No.	Menge No. off		Benennung Description	Zeichnungs-Nr. Drawings No.	Material-Nr. Ident no.	Gw(kg) Weight
E	0044	1	ST	WIDERSTANDSTHERMOMETER RESISTANCE THEMOMETER		000.001.159.981	0,3
E	0045	1	ST	NIVEAUSCHALTER LEVEL SWITCH		000.000.800.609	0,3
E	0052	1	ST	DICHTUNG SEAL		000.000.342.287	0,0
E	0054	1	ST	WIDERSTANDSTHERMOMETER RESISTANCE THEMOMETER		000.000.649.506	0,2
E	0056	1	ST	WIDERSTANDSTHERMOMETER RESISTANCE THEMOMETER		000.000.649.506	0,2
E	0087	1	ST	NILOSRING NILOS RING		000.000.649.773	0,1
E	0100	1	ST	STIRNRADWELLE PINION SHAFT	6182128/A	000.001.475.543	71,0
E	0132	1	ST	 V-RING V-100A 98-105 PERBUNAN		000.000.775.102	0,1
E	0150	1	ST	WAELZLAGER ROLLING CONTACT BEARING		000.000.380.433	6,4
E	0151	1	ST	WAELZLAGER ROLLING CONTACT BEARING		000.000.380.185	13,6
E	0152	1	ST	WAELZLAGER ROLLING CONTACT BEARING		000.000.380.682	12,5
E	0206	1	ST	STIRNRAD (INNENVERZAHNUNG) INTERNALLY TOOTHED GEAR WHEEL	6008292/E	000.001.217.035	520,0
E	0227	1	ST	PLANETSTIRNRADWELLE PLANETARY CYLINDRICAL WHEEL SHAFT	6129859/-	000.001.368.456	128,0
E	0241	3	ST	PLANETSTIRNRAD PLANET PINION	6125967/C	000.001.368.460	125,0
E	0248	6	ST	WAELZLAGER ROLLING CONTACT BEARING		000.001.157.486	16,2
E	0255	1	ST	WAELZLAGER ROLLING CONTACT BEARING		000.001.151.641	18,9
E	0256	1	ST	WAELZLAGER ROLLING CONTACT BEARING		000.001.156.873	33,2
E	0259	1	ST	 V-RING V-450L 440-480 PERBUNAN		000.000.342.292	0,1
E	0300	1	ST	HOHLWELLE HOLLOW SHAFT	6245911/-	000.001.506.845	118,7
E	0302	1	ST	STIRNRAD GEAR WHEEL	6216041/A	000.001.476.018	380,0
E	0332	1	ST	 V-RING V- 80A 78- 83 PERBUNAN		000.000.776.525	0,1
E	0350	1	ST	WAELZLAGER ROLLING CONTACT BEARING		000.000.650.820	18,5
E	0351	1	ST	WAELZLAGER ROLLING CONTACT BEARING		000.000.380.681	10,6

Die mit * gekennzeichneten Teile gehören zu einer Baugruppe (G). Die Baugruppe ist nur komplett auszutauschen.
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Datum Date 01.07.2011

BIEDER, CHRISTIAN 1568
Rev.: EGE.FR

winergy	**Ersatzteilliste (EL)** Spare parts list	**Bauart** PEAS Type **Größe** 4290,4 Size **Übersetzung** 71,203 ratio	**Seite** Page 2/2

Bei Korrespondenz bitte angeben 5213675
Please quote in correspondence **EL 4835519-020 DE/EN**

Hierzu gehört Zeichnungs-Nr.
Please refer to DWG No. **6180695**

	Teil-Nr. Part No.	Menge No. off		Benennung Description	Zeichnungs-Nr. Drawings No.	Material-Nr. Ident no.	Gw(kg) Weight
E	0357	1	ST	WAELZLAGER ROLLING CONTACT BEARING		000.000.772.699	1,4
E	0360	2	ST	O-RING O-RING		000.000.306.603	0,1
E	0400	1	ST	STIRNRADWELLE PINION SHAFT	6241633/-	000.001.476.035	78,0
E	0402	1	ST	STIRNRAD GEAR WHEEL	6196809/B	000.001.475.562	136,0
E	0450	1	ST	WAELZLAGER ROLLING CONTACT BEARING		000.000.380.670	29,2
E	0451	1	ST	WAELZLAGER ROLLING CONTACT BEARING		000.000.899.109	13,5
E	0751	1	ST	PUMPE PUMP		000.000.651.891	8,0
E	0752	1	ST	WEGEVENTIL DIRECTIONAL VALVE		000.000.651.893	2,2
E	0753	1	ST	RUECKSCHLAGVENTIL NON-RETURN VALVE		000.000.651.892	0,5
E	0754	1	ST	TEIL PART	6037960/A	000.001.250.297	1,0
E	0775	1	ST	FILTER FILTER		000.001.152.512	0,2
E*	0131	330,00	MM	STREIFEN STRIP		000.000.243.209	0,1
E*	0220	1.440,00	MM	STREIFEN STRIP		000.000.243.209	0,1
E*	0331	270,00	MM	STREIFEN STRIP		000.000.243.209	0,1

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1.1.3 List of equipment PEAS 4290.4-50Hz and 60Hz

winergy

List of equipment
Code: NW 47

Type **PEAS**
Size **4290,4**

Please quote in correspondance			**EGE-GL PEAS4290,4 EN**	
Part No.	**Qty.**	**Description**	**Manufacturer Operating instructions**	
10	1	**oil level control** type FSA 127-2.0/-/12 as per Flender Works Standard F 5302	**HYDAC / FLUTEC** BA HYC.ANZ.000 EN	
44	1	**resistance thermometer** as per Flender Works Standard F 6100-3 mounting length EL 100 mm precision resistor 2 x PT 100 DIN IEC cl. B two-wire circuit immersion tube length 100 mm connection immersion tube G 1/2 thread degree of protection: IP 65	**JUMO** **FLENDER** B 6100 EN	
45	1	**level switch** type liquiphant T-FTL 260-0020 mounting length EL 130 mm screw connection G 1	**ENDRESS-HAUSER**	
47	1	**ball tap** as per Flender Works Standard F 5102 nominal width DN 20 srew connection G 3/4	**FLENDER** B 5102 EN	
54	1	**resistance thermometer** as per Flender Works Standard F 6100-2 mounting length EL 130 mm precision resistor 2 x PT 100 DIN IEC cl. B two-wire circuit connection immersion tube G 1/2 thread degree of protection: IP 54	**JUMO** **FLENDER** B 6100 EN	
55	1	**breather filter** as per Flender Works Standard W 5122 screw connection R 3/4	**NIROSTA** **FLENDER** B 5122 EN	
56	1	**resistance thermometer** as per Flender Works Standard F 6100-2 mounting length EL 130 mm precision resistor 2 x PT 100 DIN IEC cl. B two-wire circuit connection immersion tube G 1/2 thread degree of protection: IP 54	**JUMO** **FLENDER** B 6100 EN	

Winergy AG, Postfach 201160, D 46553 Voerde,
Tel. 02871/92-1700, Fax 02871/921 490, http://www.winergy-ag.com

Date	Name: Kortz	EGE.FR
08.05.2008	REV.: 0	

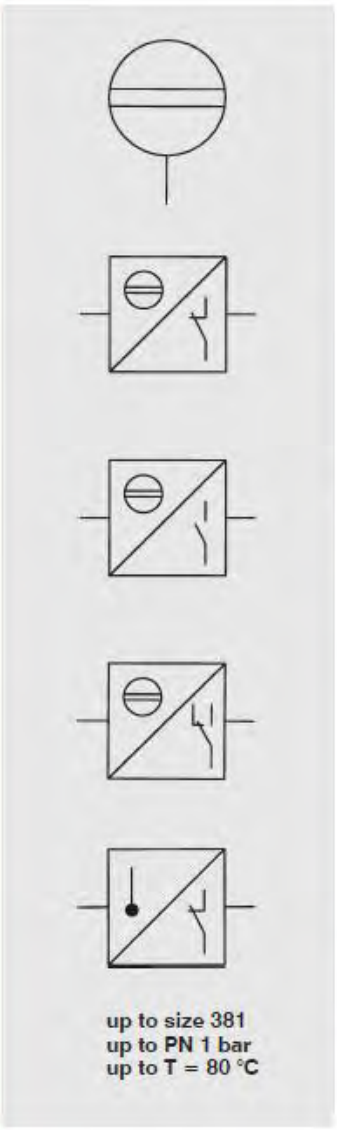
Please quote in correspondance			EGE-GL PEAS4290,4 EN	
Part No.	Qty.	Description	Manufacturer Operating instructions	
751	1	**vane pump** type KSW-3	**STOZ**	
752	1	**3/2 way valve** type MK 10DR-NO	COAX	
753	1	**non-return valve** GR3 G1	**STOZ**	
775	1	**coarse filter** as per Flender Works Standard W 5911 standard design type 1NI connection size R 1/2 nominal pressure PN 25 bar material MS ident No. 375 050	**FLENDER** B 5911 EN	
	1	**shrink disk HSD 420-81**	**Stüwe** HSD EN	

1.1.3.1 Technical data oil level control (equipment list)

BA HYC.ANZ.000 EN

HYDAC INTERNATIONAL

FLUTEC
Fluid Level Gauge
Fluid Level Sensor
Temperature Switch
FSA / FSK / TSE



up to size 381
up to PN 1 bar
up to T = 80 °C

1. DESCRIPTION

1.1. GENERAL

FLUTEC fluid level gauges FSA, fluid level sensors FSK and temperature switches TSE are units which serve to monitor and control the level of operating fluid.

The flexible product range means that many combinations are possible:

– FSA: five sizes.

Visual thermometer with °C and °F scale.

Temperature gauge which records the temperature of the operating fluid in the tank; display in °C. Dual scale in °C and °F is available on request.

Simple, standardised mounting conditions (FSA/K).

– FSK: four sizes.

Switching contact can be either type O (opens when fluid is at low level) or type C (closes when fluid is at low level) or type W (dual switching unit)

Temperature gauge which records the temperature of the operating fluid in the tank; display in °C. Dual scale in °C and °F is available on request.

Simple, standardised mounting conditions (FSA/K).

– TSE: three nominal temperatures possible: 60 °C, 70 °C and 80 °C.

Can be easily fitted into the FSA and FSK.

Simple, standardised mounting conditions (FSA/K).

Non-corroding surfaces.

1.2. FUNCTION OF THE FSA

By using a FLUTEC FSA, the fluid level can be easily seen on the outside of the tank. The fluid enters the unit via the lower connection bore and is clearly visible in the tube. Selection of the correct size allows the respective level of the fluid to be monitored.

FUNCTION OF THE FSK

By using a FLUTEC FSK, the fluid level is monitored via an electrical switching signal. This switching signal can be used as an warning message or to regulate the fluid level. The fluid enters the unit via the lower connection bore and pushes up a float in the tube. The float now shows the level of the fluid in the tank. If the level of fluid drops again, the float activates a switching contact.

On type C the circuit is then closed and on type O the circuit is then open.

The special dual switching model (type W) offers two possibilities. It can either be used to close on contact or to open on contact.

FUNCTION OF THE TSE

The FLUTEC TSE is a very useful additional option to the FSA and FSK products. However, it also has a useful application as a separate build-on unit on systems.

The temperature sensor of the TSE, when fitted, is surrounded by operating fluid. When the nominal temperature is reached, a contact opens and the circuit is broken.

This switching process can be used either as a warning message or to monitor the temperature.

When the temperature of the fluid drops by approx. 20K, the circuit closes again.

1.3. APPLICATION

FLUTEC fluid level gauges FSA, fluid level sensors FSK and temperature switches TSE are used to monitor and control levels of operating fluid.

Areas of application are for example:

Machine tools, system engineering, hydraulic oil, lubricating oil and cutting oil tanks as well as gearboxes.

1.4. NOTES

The upper viscosity limit is 2,000 mm²/s.

It is not possible to combine a temperature switch TSE with an FT temperature gauge.

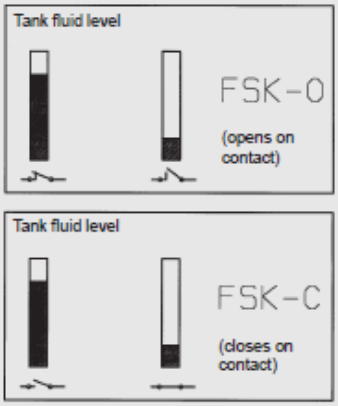
FSA/FSK

Not suitable for use with glycol or fluids containing glycol.

To ensure correct functioning, pressure, viscosity and temperature specifications must be observed.

FSK

Depending on the fluid level of the tank the following switching logic applies.



In the FSK type O the switching contact opens when the fluid level drops below the switching level. Correspondingly, in the FSK type C, the switching contact closes when the fluid level drops below the switching level.

2. TECHNICAL SPECIFICATIONS

2.1. GENERAL

2.1.1 **Designation and symbol**

Fluid level gauge FSA

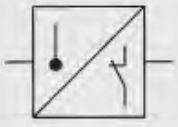
Fluid level sensor FSK

O - N/C contact

C - N/O contact

W - N/O or
N/C contact

Temperature switch TSE



2.1.2 **Model code for FSA**
(also order example)

FSA - 076 - 2 . X / FT200 / 12

Fluid level gauge

Size
= centre distance of bolts
076
127
176
254
381

Material of seals
2 = Viton (FKM)
1 = Perbunan (NBR)

Series
(determined by manufacturer)

Additional thermometer function
– = no additional function
T = thermometer in display tube
FT 200 = temperature gauge 200 mm
FT 300 = temperature gauge 300 mm
TSE 60 = temperature switch nominal temperature 60 °C
TSE 70 = temperature switch nominal temperature 70 °C
TSE 80 = temperature switch nominal temperature 80 °C

Mounting
Banjo bolt thread
M 12 (standard)
M 10 (not on TSE)

Model code for FSK
(also order example)

FSK - 127 - 2 . X / C / FT200 / 12

Fluid level sensor

Size
= centre distance of bolts
127
176
254
381

Material of seals
2 = Viton (FKM)

Series
(determined by manufacturer)

Switching function
O = opens at the switching level
C = closes at the switching level
W = opens or closes at the switching level
(form B plug)

Additional thermometer function
– = no additional function
FT 200 = temperature gauge 200 mm
FT 300 = temperature gauge 300 mm
TSE 60 = temperature switch nominal temperature 60 °C
TSE 70 = temperature switch nominal temperature 70 °C
TSE 80 = temperature switch nominal temperature 80 °C

Mounting
Banjo bolt thread
M 12 (standard)
M 10 (not on TSE)

HYDAC 3

Model code for TSE
(also order example)

TSE - 70 / X / 12

Temperature switch
TSE (with earth connection)

Nominal temperature
60 °C
70 °C
80 °C

Series
(determined by manufacturer)

Banjo bolt thread
M 12

2.1.3 **Standard models**

Type	Size ≡ centre distance of bolts	Order no. = stock no.	Weight [kg]
FSA-076-1.X/-/12	076	700 000	0.17
FSA-076-2.X/-/12	076	700 002	0.17
FSA-127-1.X/-/12	127	700 036	0.19
FSA-127-2.X/-/12	127	700 038	0.19
FSA-254-1.X/-/12	254	700 072	0.22
FSA-254-2.X/-/12	254	700 074	0.22
FSK-127-2.X/C/-/12	127	718 030	0.22
FSK-127-2.X/O/-/12	127	718 031	0.22
FSK-254-2.X/C/-/12	254	718 050	0.28
FSK-254-2.X/O/-/12	254	718 051	0.28
TSE-60/X/12	–	703 724	0.11
TSE-70/X/12	–	703 714	0.11
TSE-80/X/12	–	551 481	0.11
FT 200 0 - 100 °C / M12	200	700 154	0.03
FT 300 0 - 100 °C / M12	300	700 155	0.04

2.1.4 **Type of construction**
The units are designed to be mounted directly on to the operating fluid tank.

2.1.5 **Type of connection**
FSA / FSK

The unit is mounted using two banjo bolts. The connection bores can either be threaded holes or clearance holes (Ø 13, Ø 11).

TSE

The temperature switch can be fitted to the FSA / FSK in place of the lower banjo bolt.

2.1.6 **Mounting position**
FSA – vertically on the tank wall

FSK – vertically on the tank wall (connection plug at the bottom of the tank)

TSE – optional

2.1.7 **Weight**
(See table 2.1.3)

2.1.8 **Flow direction**
Optional

2.1.9 **Ambient temperature**
- 20 °C to + 80 °C

2.1.10 **Materials**
FSA / FSK

- End caps and tube in high quality synthetic material
- Housing in aluminium
- Soft seals in Viton (FKM) or Perbunan (NBR)
- Bolts, nuts and washers in steel (plated)
- Plug connections in high quality synthetic material (FSK)

TSE

- Housing with temperature sensor, washer and nut in steel (zinc-plated)
- Plug connections in high quality synthetic material

2.2. HYDRAULIC DETAILS

2.2.1 Nominal pressure
Max. 1 bar

2.2.2 Operating fluids
Mineral oil to DIN 51524, Part 1 and 2, water-oil emulsions and synthetic fluids, such as hydraulic fluids based on phosphate ester (NOT water glycol).

For other fluids, please contact our technical sales department.

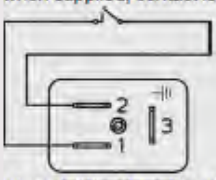
2.2.3 Temperature of operating fluid
- 20 °C to + 80 °C

2.2.4 Scale range of thermometer FSA / FSK
Thermometer T for FSA:
+ 20 °C to + 80 °C
Thermometer FT for FSA / FSK:
0 °C to + 100 °C

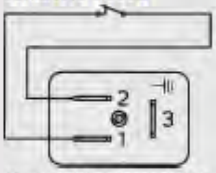
2.3. ELECTRICAL DETAILS OF FSK

2.3.1 Electrical functions

Type O
when fluid is at low level, contact opens
when supplied, contact is open

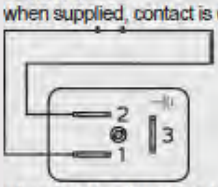


when fluid is at working level, contact is closed

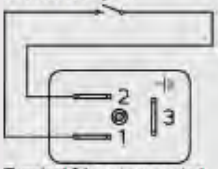


Terminal 3 is not connected

Type C
when fluid is at low level, contact closes
when supplied, contact is closed

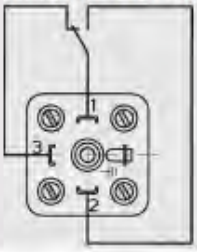


when fluid is at working level, contact is open



Terminal 3 is not connected

Type W / form B plug
Dual switching unit
When supplied, switching points correspond to the diagram below



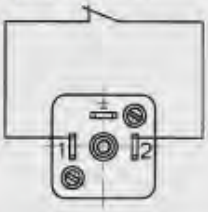
2.3.2 Contact load
Max. 8 W

2.3.3 Switching voltage
50 V AC / DC

2.3.4 Switching current
0.2 A

2.4. ELECTRICAL DETAILS OF TSE

2.4.1 Electrical function
opens on contact



2.4.2 Switching power
2.5 A/50 V -
10,000 switching operations
0.5 A/50 V -
100,000 switching operations

2.4.3 Minimum switching current
50 mA

2.4.4 Switching tolerance
± 5 K

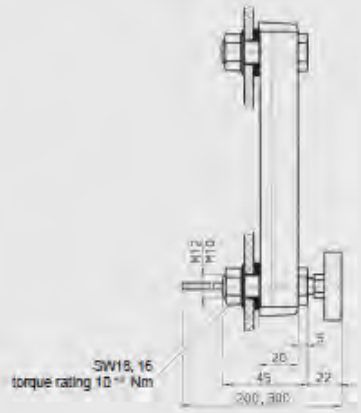
3. DIMENSIONS

3.1 FLUID LEVEL GAUGE FSA

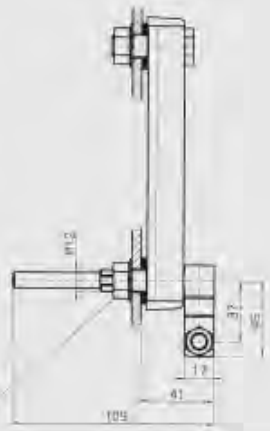
Standard FSA

FSA with thermometer

FSA with temperature gauge



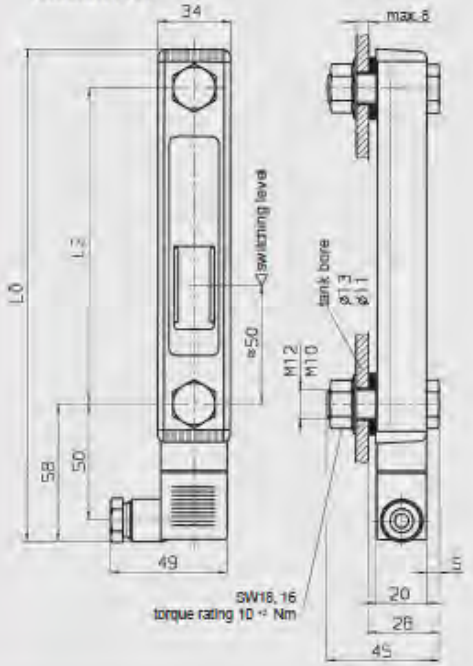
FSA with temperature switch



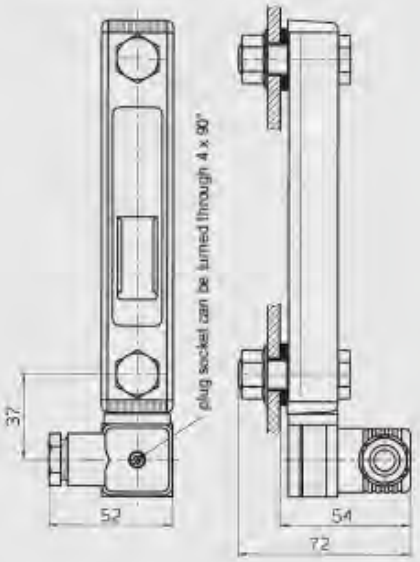
Size ≡ centre distance of bolts	L0	L1	L2
076	108	34	76
127	159	76	127
176	208	125	176
254	286	203	254
381	413	330	381

3.2. FLUID LEVEL SENSOR FSK

Standard FSK

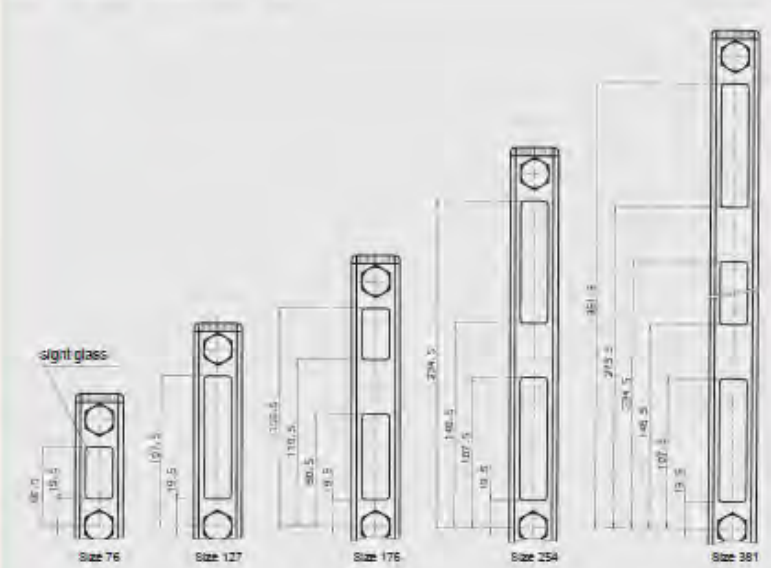


FSK form B plug



Size ≡ centre distance of bolts	L0	L2
127	201	127
176	250	176
254	328	254
381	455	381

3.3. SCALE RANGE FSA / FSK



3.4. TEMPERATURE SWITCH TSE

See FSA with TSE fitted

4. SPARE PARTS

4.1. SEAL KIT

Seal kit	Order no. = stock no.
FSA-076/127-1.X/	704 616
FSA-076/127-2.X/	704 627
FSA-176-1.X/	555 599
FSA-176-2.X/	555 600
FSA-254-1.X/	700 037
FSA-254-2.X/	704 649
FSA-381-1.X/	860 008
FSA-381-2.X/	860 009

5. NOTE

All details in this brochure are subject to technical modifications.

1.1.3.2 Technical data F6100-3 temperature gear oil (equipment list)

FLENDER	Operating Instructions Resistance Thermometer Pt 100	Edition: March 2002 **B 6100 EN** Page 1 of 5

General

The electric resistance in the resistance thermometer sensor changes as the temperature fluctuates. This change of resistance on the PT 100 or the converted output signal of the measuring transducer (4 to 20 mA) can be used to measure temperature with an evaluating instrument or to define a switch point by means of limit switches.

Operation

Pt 100 measuring thermometer sensor

The electrical conductivity of metal (here platinum) is based on the mobility of conduction electrons. As the temperature rises, the movement of the atoms in the metal lattice about their rest position intensifies and so obstructs the electrons flowing to the plus pole of a power source. This obstruction sets up a resistance in linear proportion to the temperature.

To generate the output signal a constant test current (approx. 1 mA) is applied to the Pt 100. The resistance in the Pt 100 causes a drop in voltage ($U = R \cdot I$), which can be evaluated.

Measuring transducer

The two-wire measuring transducer is mounted in the J-head only if requested by the customer. It should be noted that here only a single connection is possible.

The measuring transducer converts the temperature-dependent resistance to a standard uniform signal of 4 to 20 mA. This signal can be transmitted over long distances without interference.

Technical Date - Pt 100

– Type of protection Terminal head:	IP 65
– Tolerance class:	DIN IEC 60751 Class B (at 0 °C ±0.3 K, at 100 °C ±0.8 K)
– Ambient temperature range for J head:	–20 °C to +100 °C
– Ambient temperature range for protective tube:	–50 °C to +200 °C
– Test temperature range:	–50 °C to +150 °C
Material	
– Terminal head:	GD-AlSi9Cu3
– Protective sleeve for measuring thermometer sensor:	1.4571
– Spring:	wire DIN 2076-A-0.8 (stainless steel)
– Guide tube:	1.4571
– Terminal base:	ceramic
– Adapter:	1.4301
– Gasket	NBR (Perbunan)

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Technical data - Measuring transducer

– Measuring input:	Pt 100 (DIN EN 60751)
– Measuring range:	–50 °C to +150 °C
– Ambient temperature:	–20 °C to +85 °C
– Terminal type:	two-wire
– Minimum measuring range:	25 K
– Maximum measuring range:	1050 K
– Sensor line resistance with three-wire connection:	≤ 11 Ω per line
– Sensor line resistance with two-wire connection:	0 Ω per line resistance
– Sensor current:	≤ 0,5 mA
– Measuring rate:	continuous measurement, as signal path analog

Measuring circuit monitoring system

– Drop below range:	falling to ≤ 3.6 mA
– Rise over range:	rising to ≥ 22 mA ... < 28 mA (typical 24 mA)
– Probe short circuit:	≤ 3,6 mA
– Probe and line break:	positive: ≥ 22 mA ... < 28 mA (typical 24 mA) negative: ≤ 3,6 mA

Output

– Output signal:	impressed DC 4 ... 20 mA
– Transient response:	temperature-linear
– Transmission accuracy:	≤ ± 0.1 %
– Attenuation of residual ripple of feed voltage:	40 dB
– Working resistance (Rb):	$RB = \frac{U_B - 7{,}5\ V}{22mA}$
– Influence of working resistance:	≤ ± 0,02 % / 100 Ω relative to measuring range final value of 20 mA
– Adjustment time with temperature change:	≤ 10 ms
– Balancing conditions:	DC 24 V / approx. 22 °C
– Balancing accuracy:	≤ ± 0.2 % relative to measuring range final value of 20 mA

Voltage supply

– Voltage supply (Ub):	DC 7.5 ... 30 V
– Pole confusion protection:	yes
– Voltage supply influence:	≤ 0.01 % / V deviation of 24 V relative to measuring range final value of 20 mA

Environmental influences

– Operating temperature range:	–40 to +85 °C
– Temperature influence:	≤ 0.01 % / K deviation of 22 °C relative to measuring range final value of 20 mA
– Climate resistance:	rel. humidity ≤ 95 % on annual average without dew contact
– Vibration strength:	acc. to GL characteristic 2
– EMV:	EN 61326

Housing

– Material:	Polycarbonate (encapsulated)
– Screw connection:	≤ 1.5 mm²
– Assembly:	in terminal head Form J
– Mounting position:	any
– Weight:	approx. 12 g

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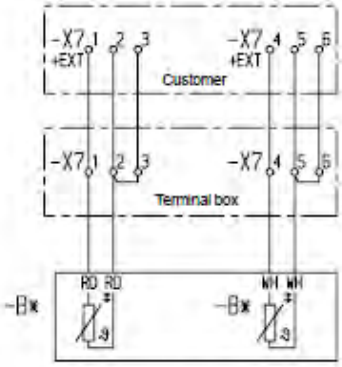
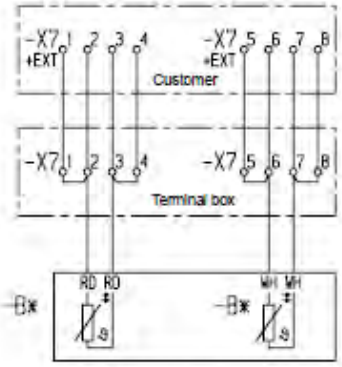
Connection

The customer can minimise measuring inaccuracies by using multiple wires. At Flender, as a rule, a 3- or 4-wire arrangement from an additional terminal box is provided for (Fig. 1, 2). At the customer's specific request, the 3/4-wire arrangement can be used from the J-head (Figure 4, 5). Through lack of space, however, the 4-wire arrangement is possible only with a single connection (Fig. 5).



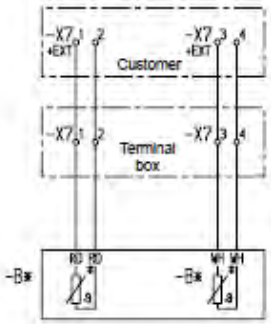
Resistance thermometer

Fig. 1: 3-wire arrangement from terminal box



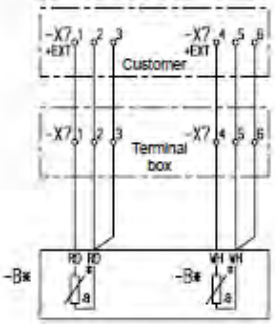
Resistance thermometer

Fig. 2: 4-wire arrangement from terminal box



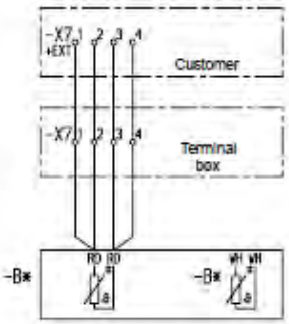
Resistance thermometer

Fig. 3: 2-wire circuit from terminal head of Pt 100



Resistance thermometer

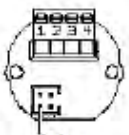
Fig. 4: 3-wire circuit from terminal head of Pt 100



Resistance thermometer

Fig. 5: 4-wire circuit from terminal head of Pt 100

Connection for measuring transducer



Connection for		Connection values		
	Voltage supply DC 7.5 ... 30 V	+1	$R_B = \frac{U_b - 7.5\,V}{22\,mA}$	1 2
	Current output 4 ... 20 mA	-2	R_B = Working resistance U_b = Voltage supply	+ −
Analog inputs				
	Resistance thermometer in two-wire circuit	3 4	series $R_L = 0\,\Omega$	3 4 ϑ

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Types

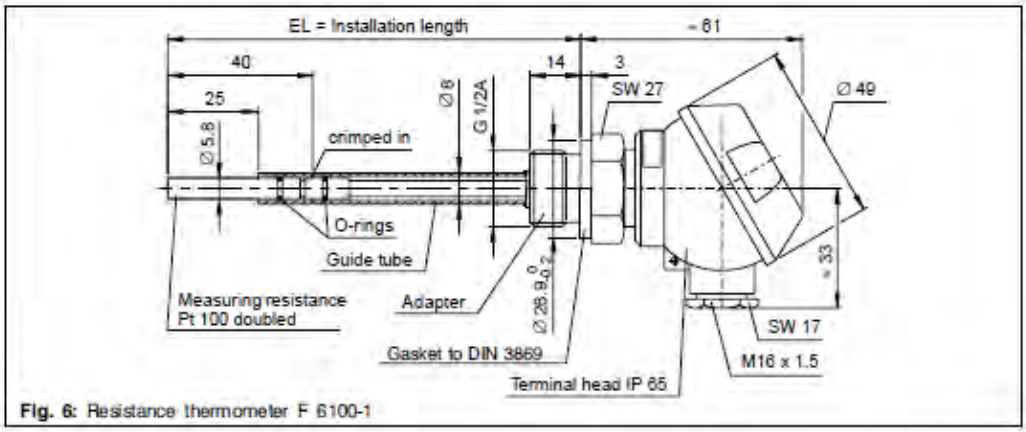


Fig. 6: Resistance thermometer F 6100-1

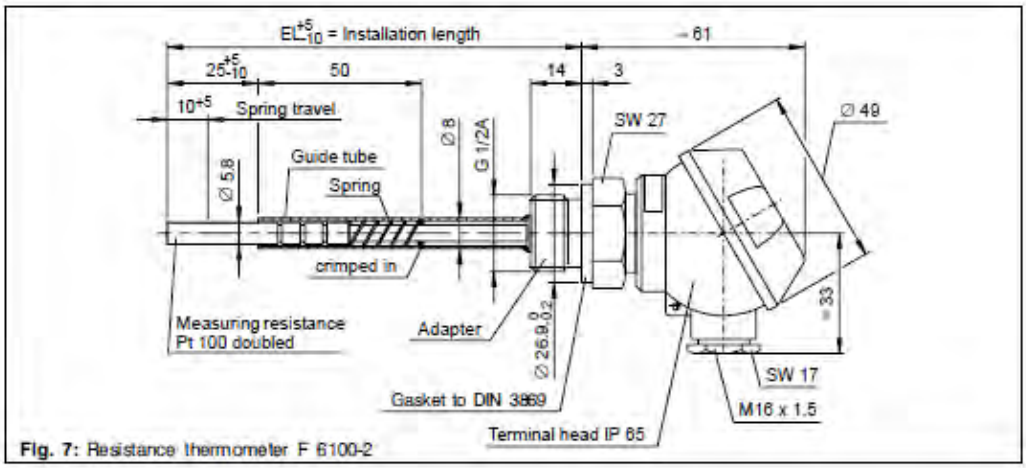


Fig. 7: Resistance thermometer F 6100-2

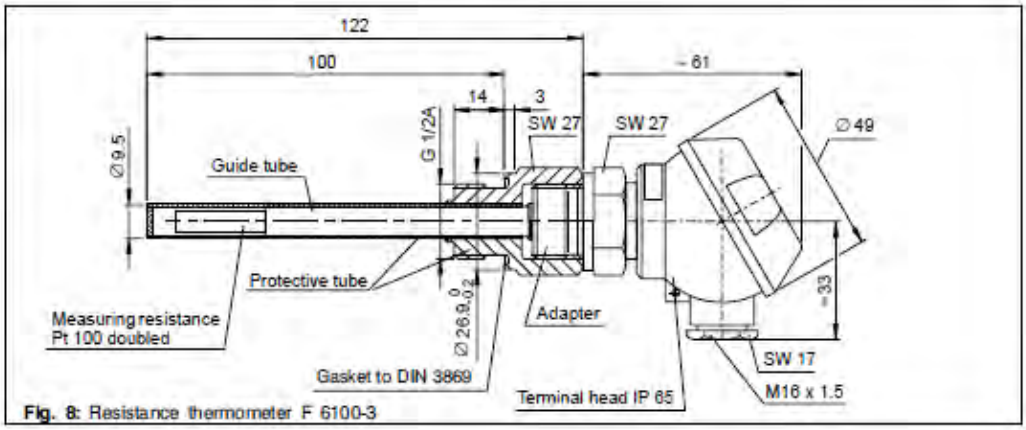


Fig. 8: Resistance thermometer F 6100-3

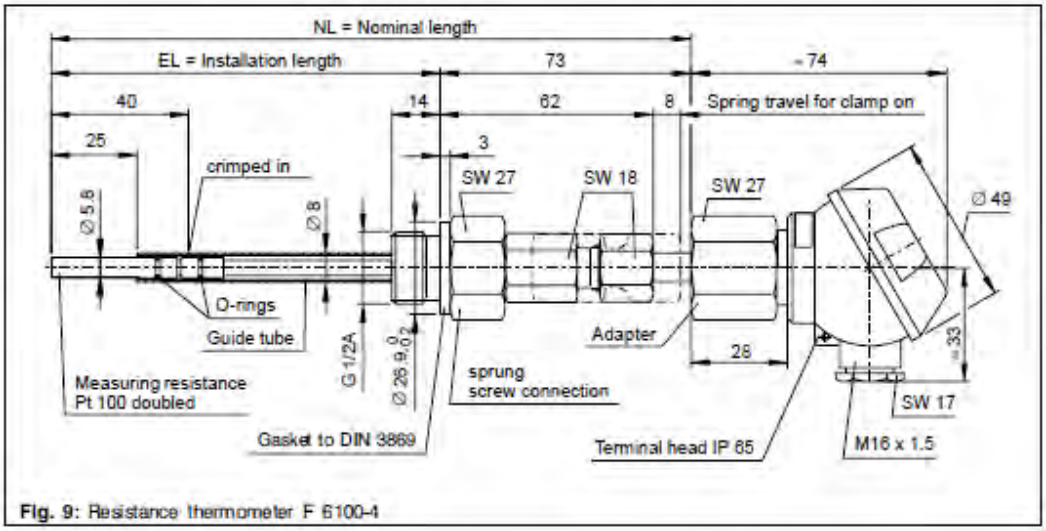
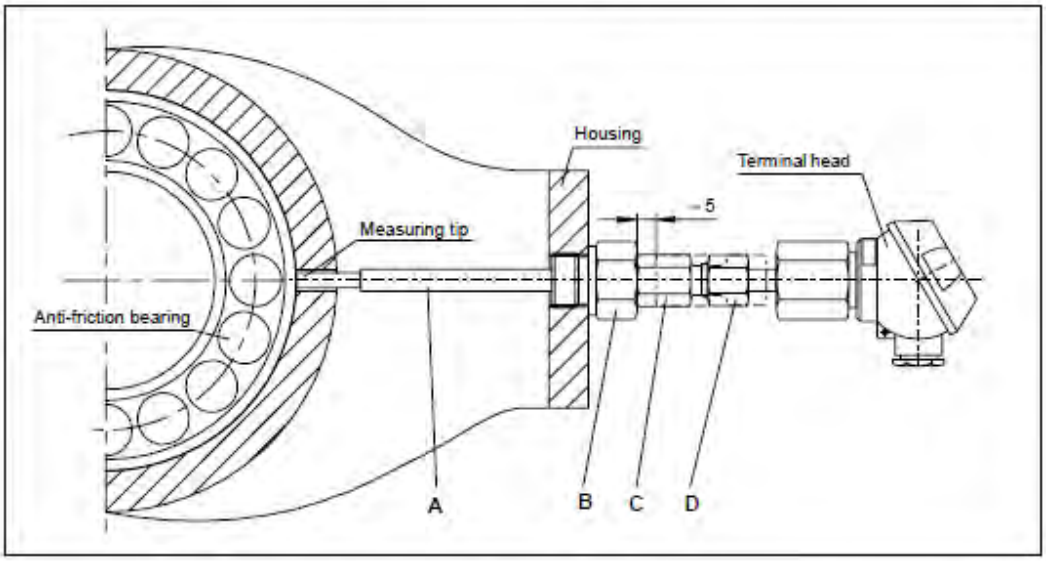


Fig. 9: Resistance thermometer F 6100-I

Adjustment by means of sprung screw connection



a) Insert guide tube "A" into hole in housing until the measuring tip of the resistance thermometer makes contact.

b) Screw screw connection "B" into the housing as far as it will go.

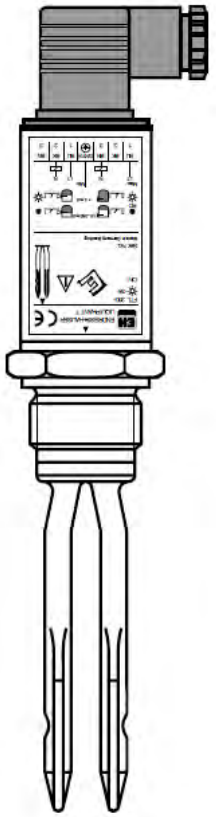
c) Pull out screw connection "C" approx. 5 mm towards the terminal head. Then lock nut "D" with screw connection "C". This ensures that the pretensioned spring keeps the measuring tip permanently in contact with the part to be measured.

A. Friedr. Flender AG, D 46393 Bocholt,
Tel. 02871/92-0, Telefax 02871/922596, http://www.flender.com

Datum 2002-03-26 | Name: Hesselmann | ENDD | Rev.:

1.1.3.3 Technical data level switch (equipment list)

KA 035F/00/a6/11.99 (a)
016757-0000



liquiphant T
FTL 260

d Füllstandgrenzschalter
e Level Limit Switch
f Détecteur de niveau
es Detector de nivel
i Interruttore di livello
nl Niveauschakelaar

Endress + Hauser
The Power of Know How

d Inhalt

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Sicherheitshinweise

Achtung!
= verboten; führt zu fehlerhaftem Betrieb oder Zerstörung.

Notes on Safety

Caution!
= forbidden; leads to incorrect operation or destruction.

Conseils de sécurité

Attention !
= interdit - peut provoquer des dysfonctionnements ou la destruction.

es Indice

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nl Inhoud

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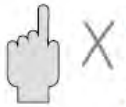
Notas sobre seguridad



¡Atención!
= Prohibido, peligro de mal funcionamiento o de destrucción.

Note sulla sicurezza

Attenzione!
= Vietato, pericolo di malfunzionamento o di distruzione.

Veiligheidsinstructies

Opgelet!
= verboden; leidt tot foutieve werking of storing.

d Sicherheitshinweise

Der Liquiphant FTL 260 darf nur als Füllstandgrenzschalter für Flüssigkeiten in nicht explosionsgefährdeten Bereichen verwendet werden.
Bei unsachgemäßem Einsatz können Gefahren von ihm ausgehen. Das Gerät darf **nur von qualifiziertem und autorisiertem Fachpersonal** unter besonderer Beachtung dieser Betriebsanleitung, der einschlägigen Normen, der gesetzlichen Vorschriften und der Zertifikate (je nach Anwendung) eingebaut, angeschlossen, in Betrieb genommen und gewartet werden.
In der Gebäudeinstallation ist ein Netzschalter für das Gerät leicht erreichbar in dessen Nähe zu installieren.
Der Schalter ist als Trennvorrichtung für das Gerät zu kennzeichnen.

e Notes on Safety

The Liquiphant FTL 260 is a level limit switch designed for use in non-hazardous areas. If used incorrectly it is possible that application-related dangers may arise.
The level limit switch Liquiphant FTL 260 may be installed, connected, commissioned, operated and maintained **by qualified and authorised personnel only**, under strict observance of these operating instructions, any relevant standards, legal requirements, and, where appropriate, the certificate.
Install an easily accessible power switch in the proximity of the device.
Mark the power switch as a disconnector for the device.

f Conseils de sécurité

Le Liquiphant FTL 260 doit être exclusivement utilisé comme détecteur de niveau pour liquides en zones non explosibles. Il peut être source de danger en cas d'utilisation non conforme aux prescriptions. L'appareil ne doit être installé, raccordé, mis en service et maintenu **que par un personnel qualifié et autorisé**, qui tiendra compte des indications contenues dans la présente mise en service, des normes en vigueur et des certificats disponibles (selon l'application).
Installer un commutateur réseau à proximité immédiate de l'appareil, en veillant à ce qu'il soit facilement accessible.
Marquer ce commutateur comme prise de coupure de l'appareil

es Notas sobre seguridad

El Liquiphant FTL 260 debe emplearse única y exclusivamente como detector de nivel con fluidos en zonas sin peligro de explosión. Su empleo inapropiado puede resultar peligroso. El equipo deberá ser montado, conectado, instalado y mantenido **única y exclusivamente por personal cualificado y autorizado**, bajo rigurosa observación de las presentes instrucciones de servicio, de las normativas y legislaciones vigentes, así como de los certificados (dependiendo de la aplicación).
Instalar un interruptor de fácil acceso en las proximidades del equipo.
Identificar el interruptor como desconectador del equipo.

i Note sulla sicurezza

Il Liquiphant FTL 260 può essere utilizzato come sicurezza di troppo pieno, solo in aree sicure.
Un'installazione non corretta può determinare una situazione di pericolo determinata dall'applicazione.
Lo strumento deve essere montato, connesso, messo in funzione ed operato **solamente da personale qualificato ed autorizzato**, sotto la stretta osservazione delle presenti norme di installazione e di manutenzione e delle ulteriori norme, regolamenti, disposizioni legali vigenti e, dove richiesto, dei certificati appropriati.
Installare un interuttore per l'alimentazione in prossimità del dispositivo.
Marcare l'interuttore come disconnessione del dispositivo.

nl Veiligheidsinstructies

Gebruik de Liquiphant FTL 260 alléén als niveauschakelaar voor vloeistoffen in niet explosiegevaarlijke gebieden. Het instrument **alleen door gekwalificeerd en geautoriseerd personeel** laten inbouwen, aansluiten, in bedrijf nemen en onderhouden. Neem de instructies in deze Inbedrijfstellingsvoorschriften, de desbetreffende normen, de wettelijke voorschriften en eventuele certificaten in acht.
Installeer een makkelijk bereikbare voedingschakelaar in de nabijheid van het instrument. Kenmerk de voedingschakelaar specifiek voor het instrument.

d **Geräte-Identifikation**

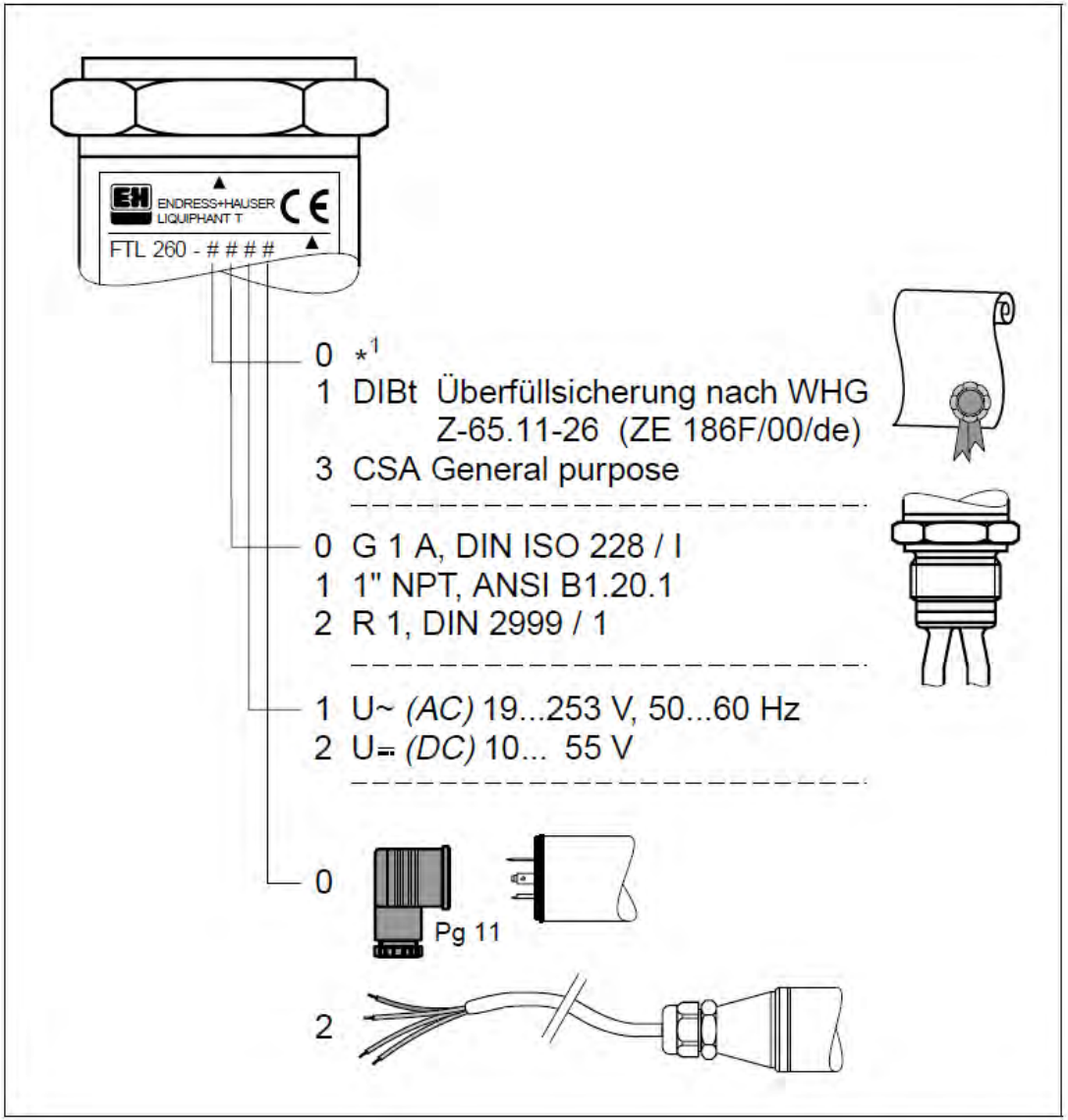
e **Device Identification**

f **Dénomination**

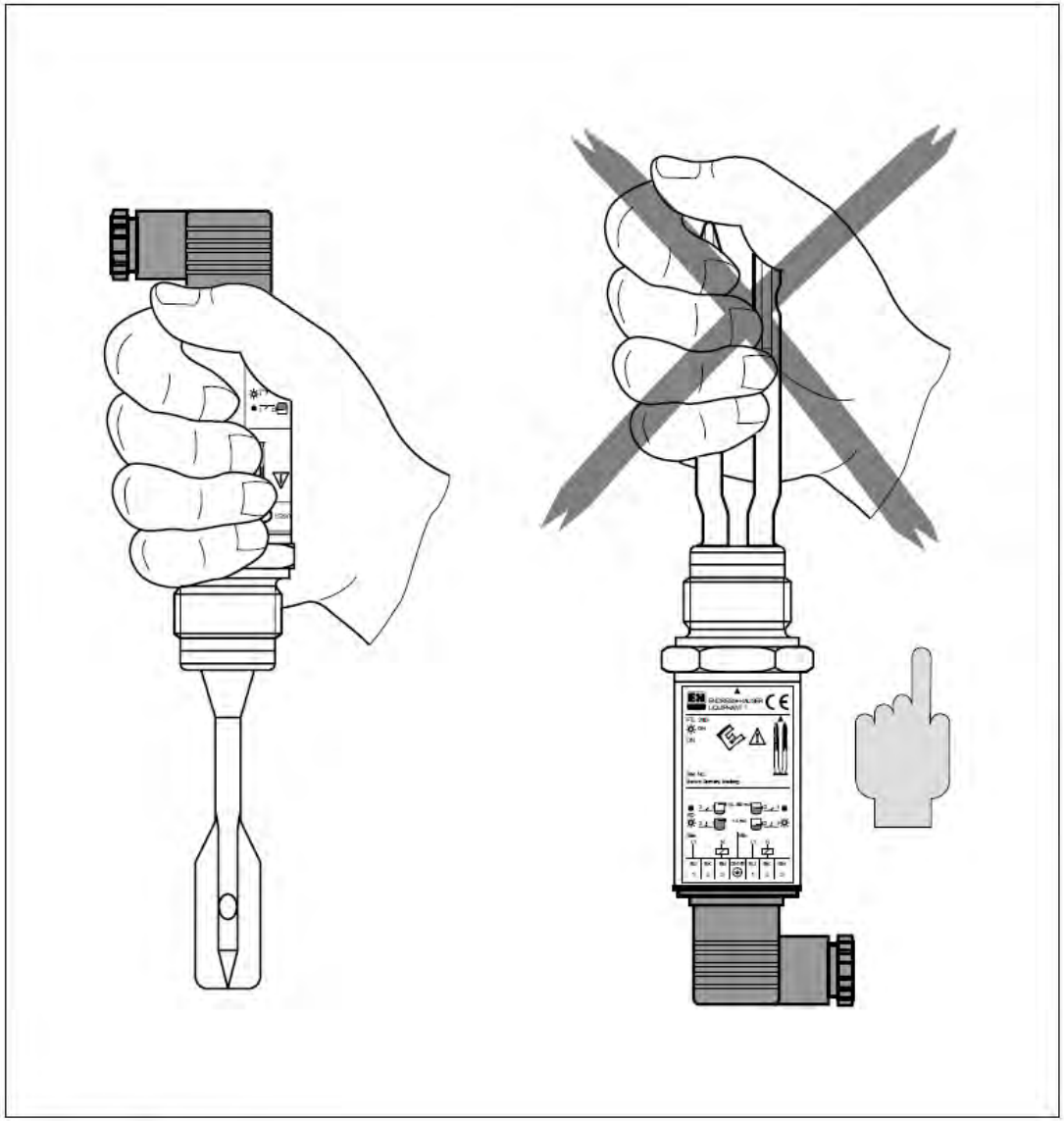
es **Identificación del equipo**

i **Identificazione dello strumento**

nl **Instrument-identificatie**



*1 = ohne / without / sans / sin / senza / zonder



d Behandlung
Am Gehäuse anfassen,
nicht an der Schwinggabel

e Handling
Hold by the housing,
not by the sensor forks

f Manipulation
Tenir par le boîtier,
et **non** par la fourche

es Modo de empleo
Coger por el cabezal,
no por las horquillas

i Accorgimenti
Afferrare la custodia,
non i rebbi

nl Behandeling
De behuizing vastpakken,
niet de trilvork

d **Nicht** verbiegen
Nicht kürzen
Nicht verlängern

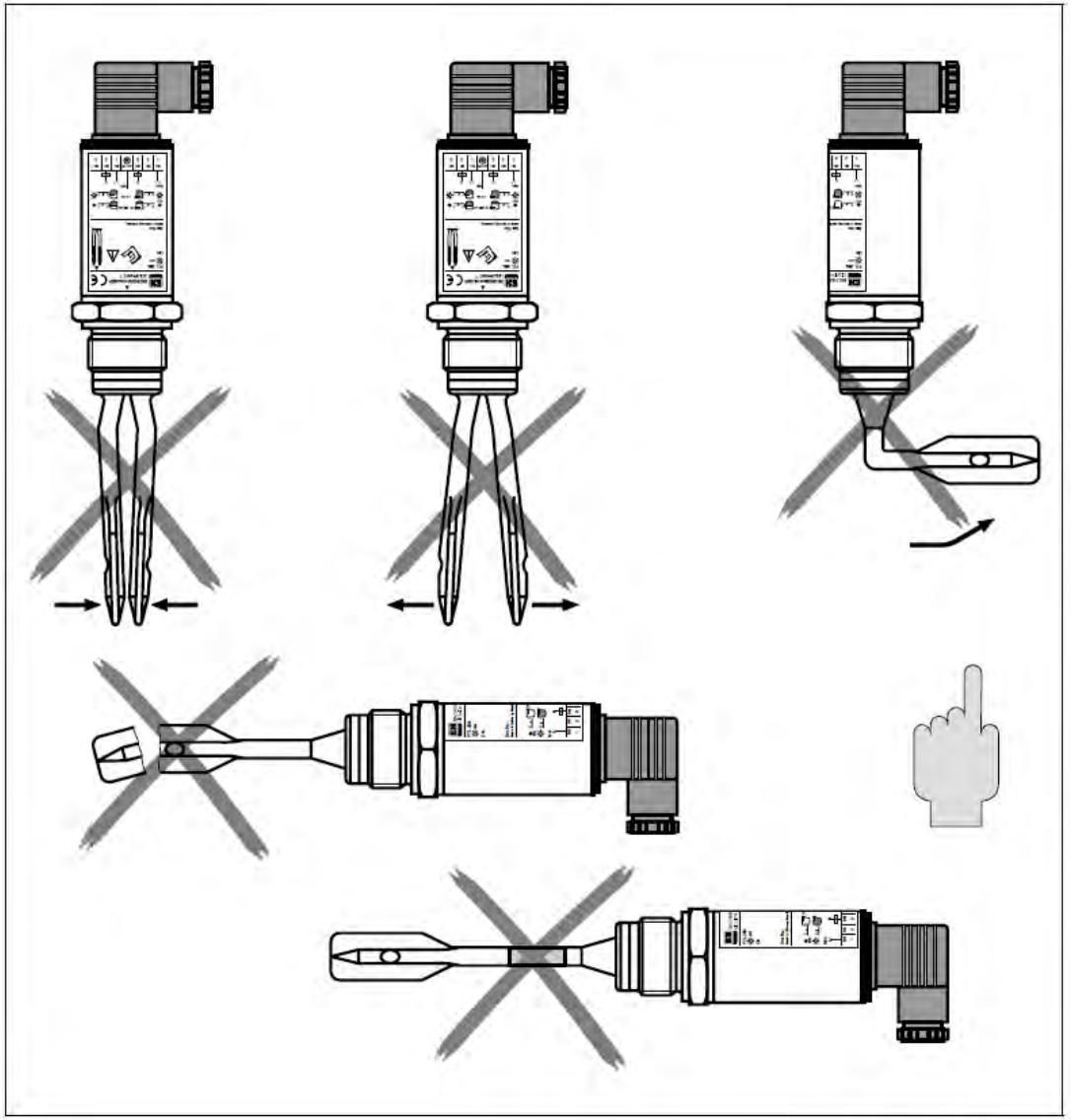
e Do **not** bend
Do **not** shorten
Do **not** lengthen

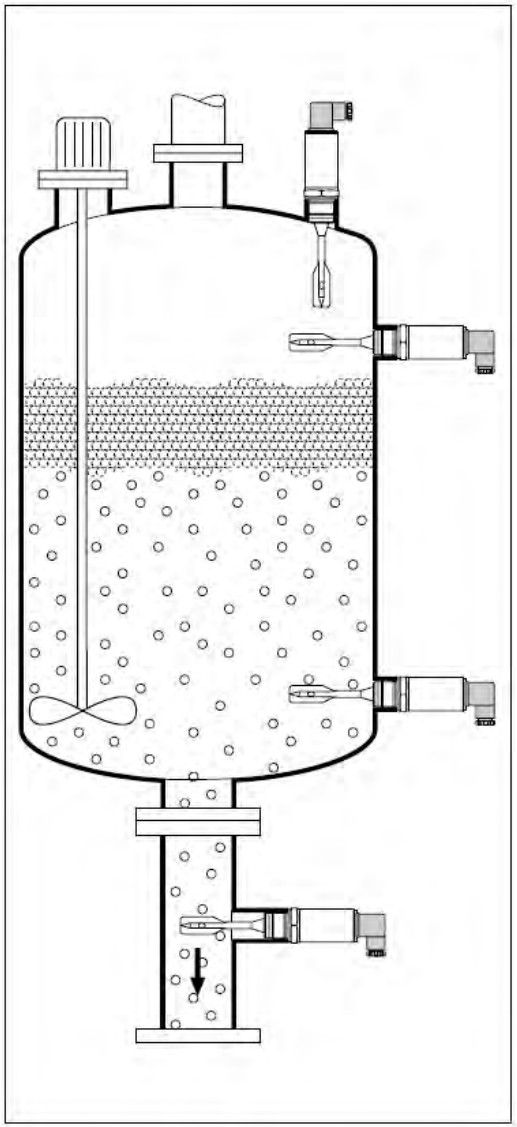
f **Ne pas** tordre
Ne pas raccourcir
Ne pas rallonger

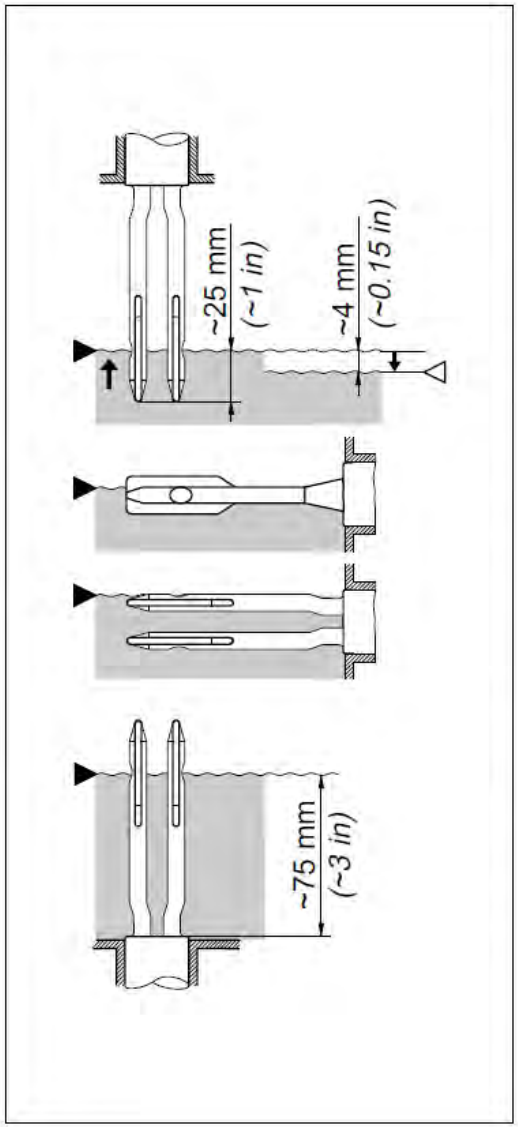
es **No** torcer
No acortar
No alargar

i **Non** stringere o allargare
Non accorciare o allungare
Non piegare

nl **Niet** verbuigen
Niet inkorten
Niet verlengen







d Einbaubeispiele
e Mounting examples
f Exemples d'implantation
es Ejemplos de montaje
i Esempi di montaggio
nl Inbouwvoorbeelden

▶
d Schaltpunkt
e Switchpoint
f Point de commutation
es Punto de conmutación
i Punto di commutazione
nl Schakelpunt

△
d Schalthysterese
e Switching hysteresis
f Hystérésis
es Histerésis de conmutación
i Isteresi
nl Schakelhysterese

d Viskosität und Ansatzbildung berücksichtigen

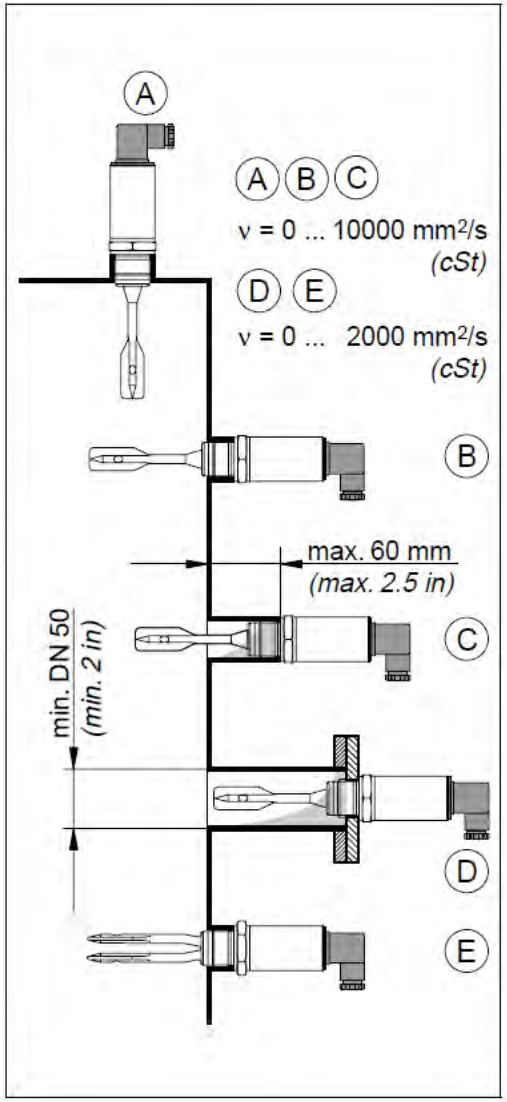
e Take account of viscosity and build-up

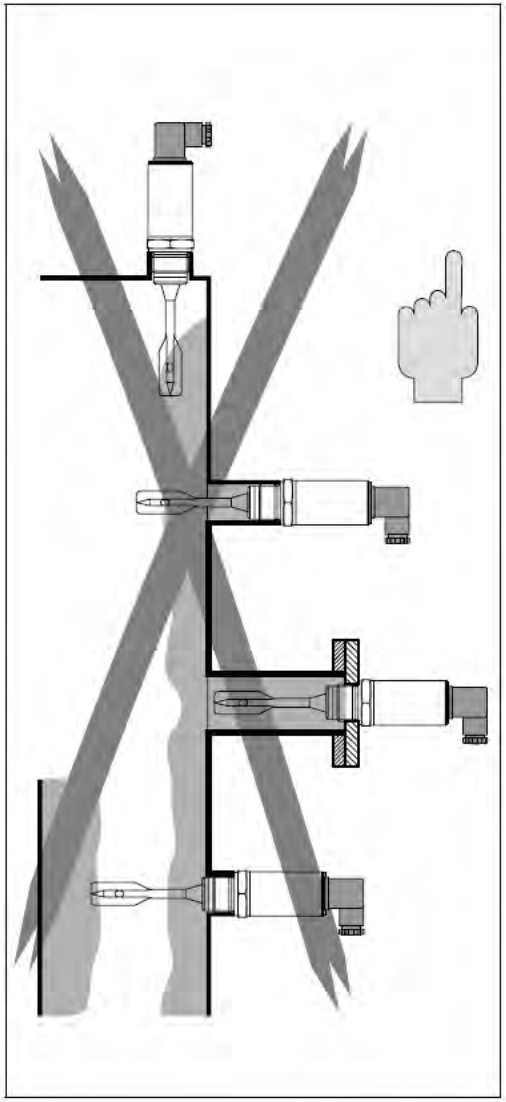
f Tenir compte de la viscosité et du colmatage

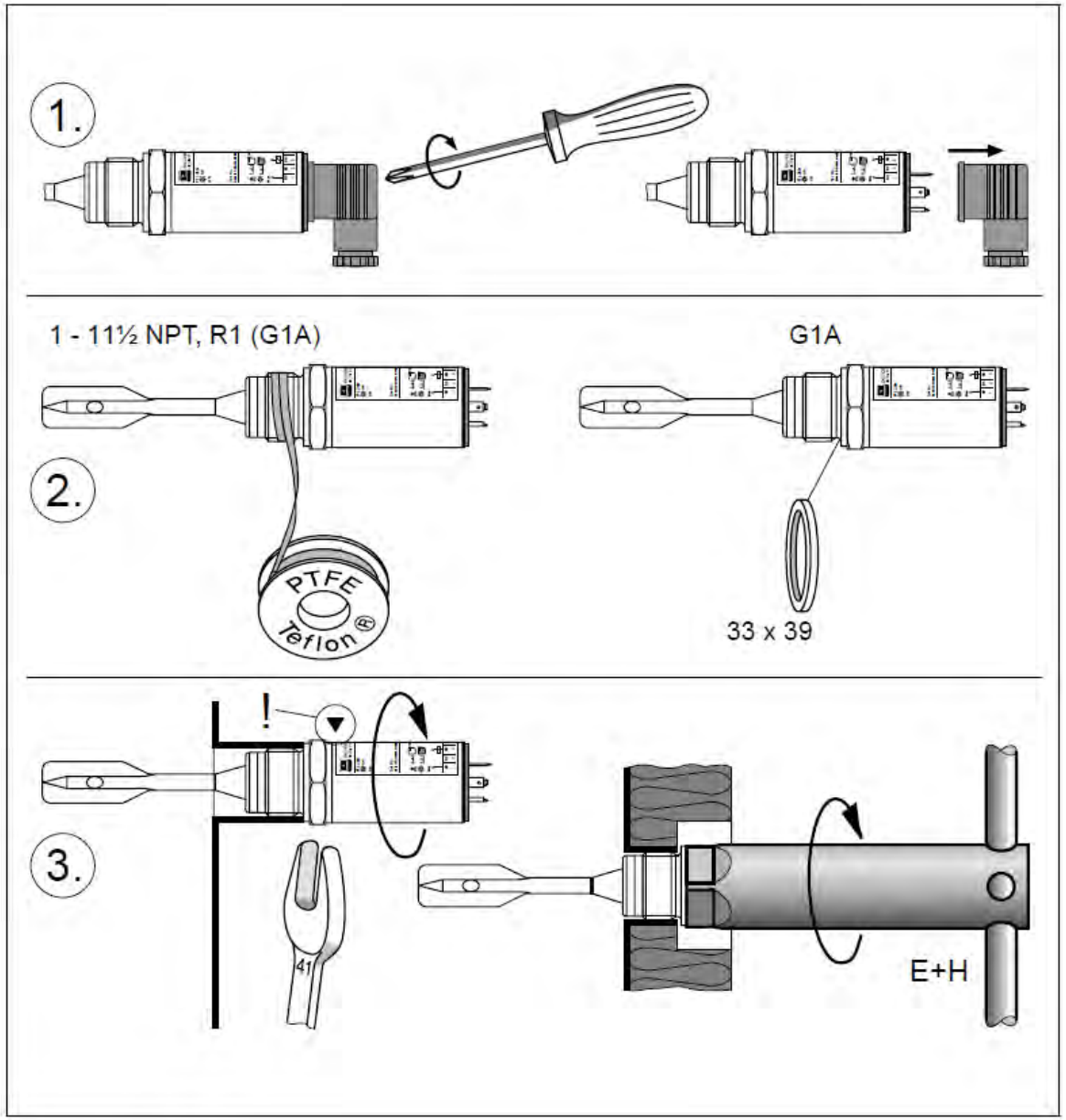
es Tener en cuenta la viscosidad y la formación de adherencias

i Attenzione alla viscosità e ai depositi

nl Houdt rekening met de viscositeit en de vorming van aangroei







d **Einbau**
Liquiphant einschrauben

e **Installation**
Screw Liquiphant into process connection

f **Montage**
Visser le Liquiphant

es **Montaje**
Atornillar el Liquiphant

i **Montaggio**
Avvitare il Liquiphant

nl **Inbouw**
Liquiphant vastschroeven

d Schwinggabel ausrichten
Markierung ▼ beachten

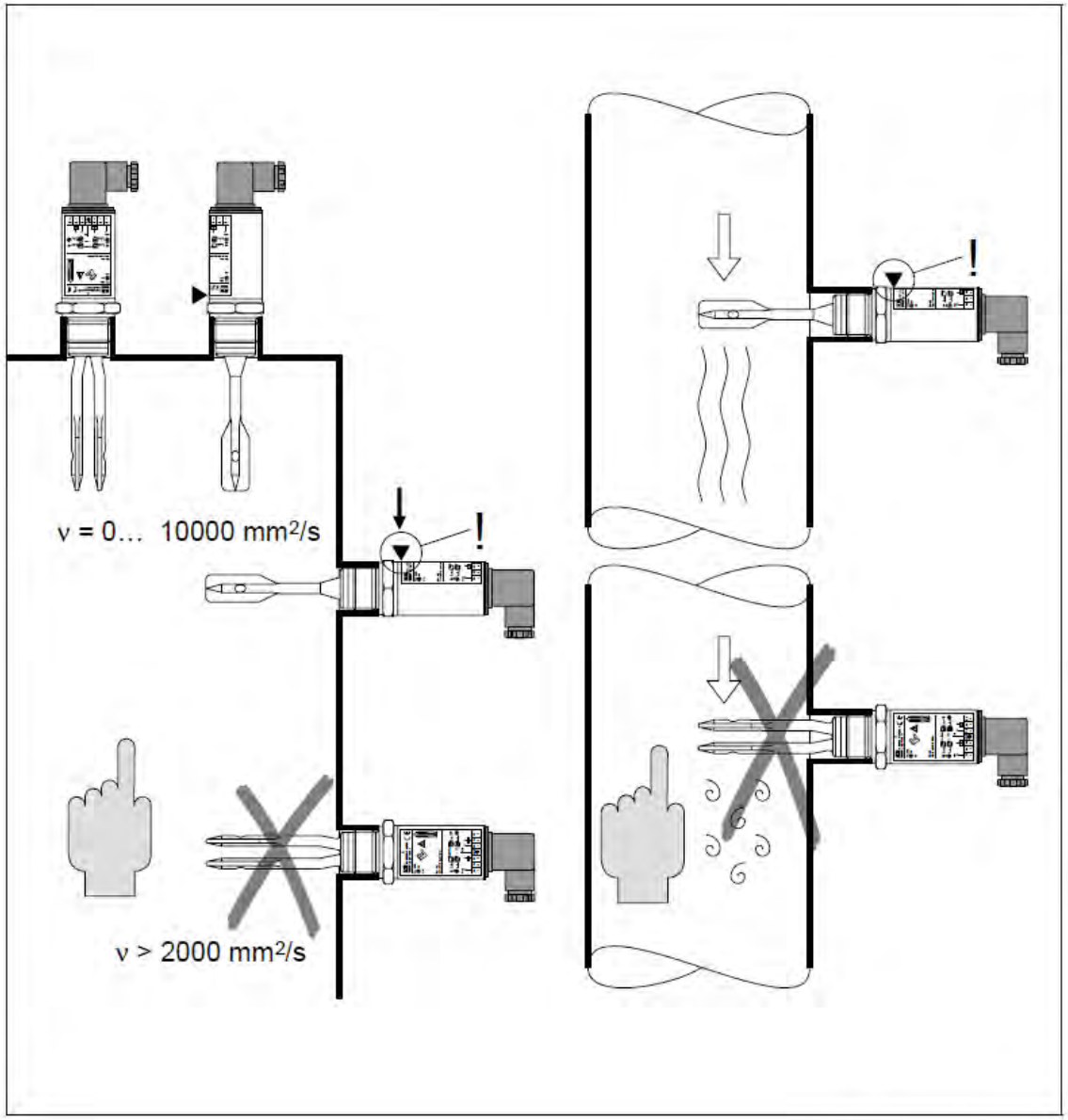
e Align sensor forks
Note mark ▼

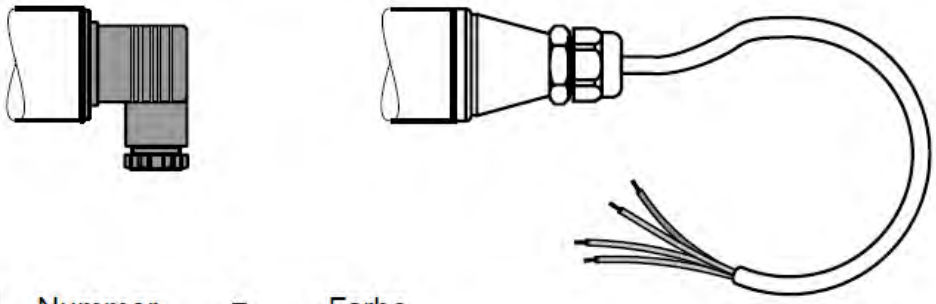
f Orienter la fourche
Tenir compte du repère ▼

es Orientación de las horquillas
Atención a la marca ▼

i Orientare la forcella.
Osservare il contrassegno ▼

nl Trilvork uitrichten
Let op de markering ▼





d	Nummer	=	Farbe
e	Number	=	Colour
f	Numéro	=	Couleur
es	Número	=	Color
i	Numero	=	Colore
nl	Nummer	=	Kleur

1	=	BU	blau, blue, bleu, azul, blu, blauw
2	=	BK	schwarz, black, noir, negro, nero, zwart
3	=	BN	braun, brown, brun, marron, marrone, bruin
⏚ (PE)	=	GNYE	grün/gelb, green/yellow, vert/jaune, verde/amarillo, verde/giallo, groen/geel

d Anschluß
Stecker oder Kabel

e Connection
Plug or cable

f Raccordement
Connecteur ou câble

es Conexiones
Conector o cable

i Collegamenti
Connettore o cavo

nl Aansluiting
Connector of kabel

d Spannung beachten
Leitung in Kabeldose einführen

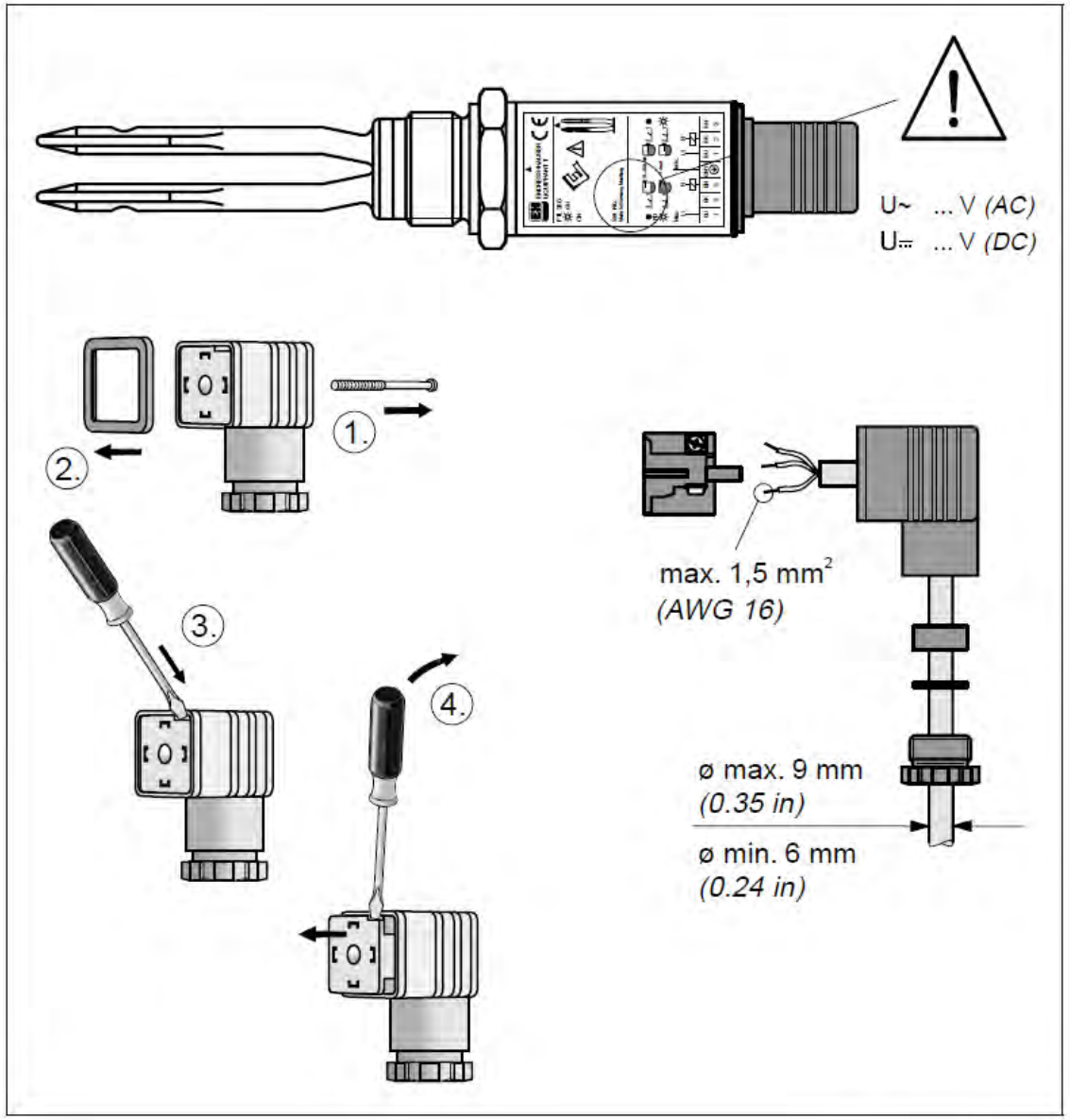
e Note voltage rating
Insert cable into plug housing

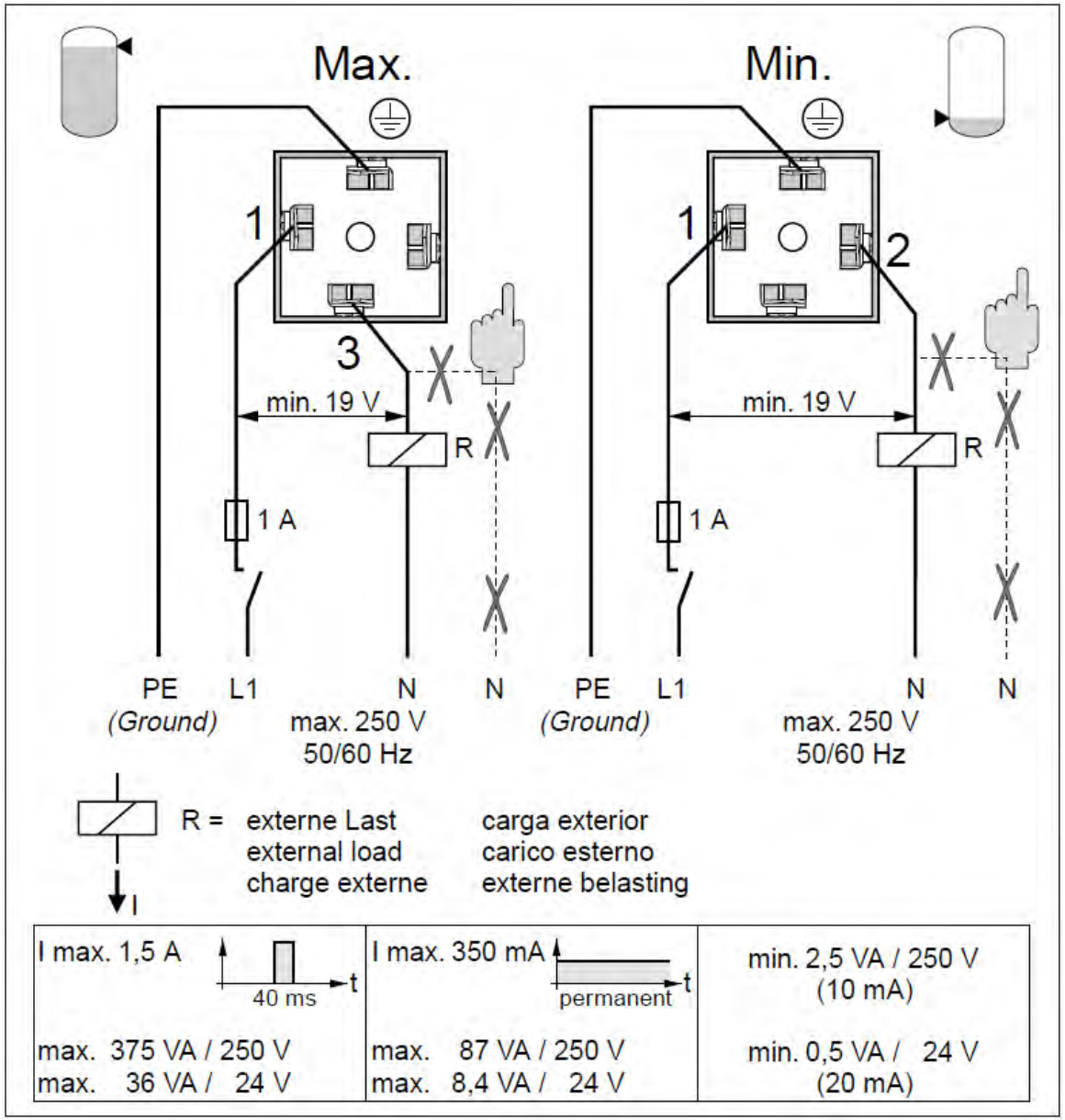
f Tenir compte de la tension
Insérer le câble dans le boîtier de raccordement

es Observar el voltaje
Introducir los hilos en la caja de conexiones

i Attenzione all'alimentazione.
Inserire il cavo nel vano connessioni

nl Let op de voedingsspanning
Bedrading in connector invoeren





d **Wechselstromvariante anschließen**

Max. = Maximum-
Min. = Minimum-Sicherheitsschaltung

e **Connection AC version**

Max. = max. fail-safe mode
Min. = min. fail-safe mode

f **Raccordement variante tension alternative**

Max. = sécurité maximum
Min. = sécurité minimum

es **Conectar las variantes de corriente alterna**

Máx. = Conexión de seguridad máxima
Mín. = Conexión de seguridad mínima

i **Collegamento della versione in corrente alternata**

Max. = Sicurezza di massimo
Min. = Sicurezza di minimo

nl **Wisselstroomvarianten aansluiten**

Max. = max. veiligheidsschakeling
Min. = min. veiligheidsschakeling (ruststroomprincipe)

d **Gleichstromvariante anschließen**

Max. = Maximum-
Min. = Minimum-
Sicherheitsschaltung

e **Connection DC version**

Max. = max. fail-safe mode
Min. = min. fail-safe mode

f **Raccordement variante tension continue**

Max. = sécurité maximum
Min. = sécurité minimum

es **Conectar las variantes de corriente continua**

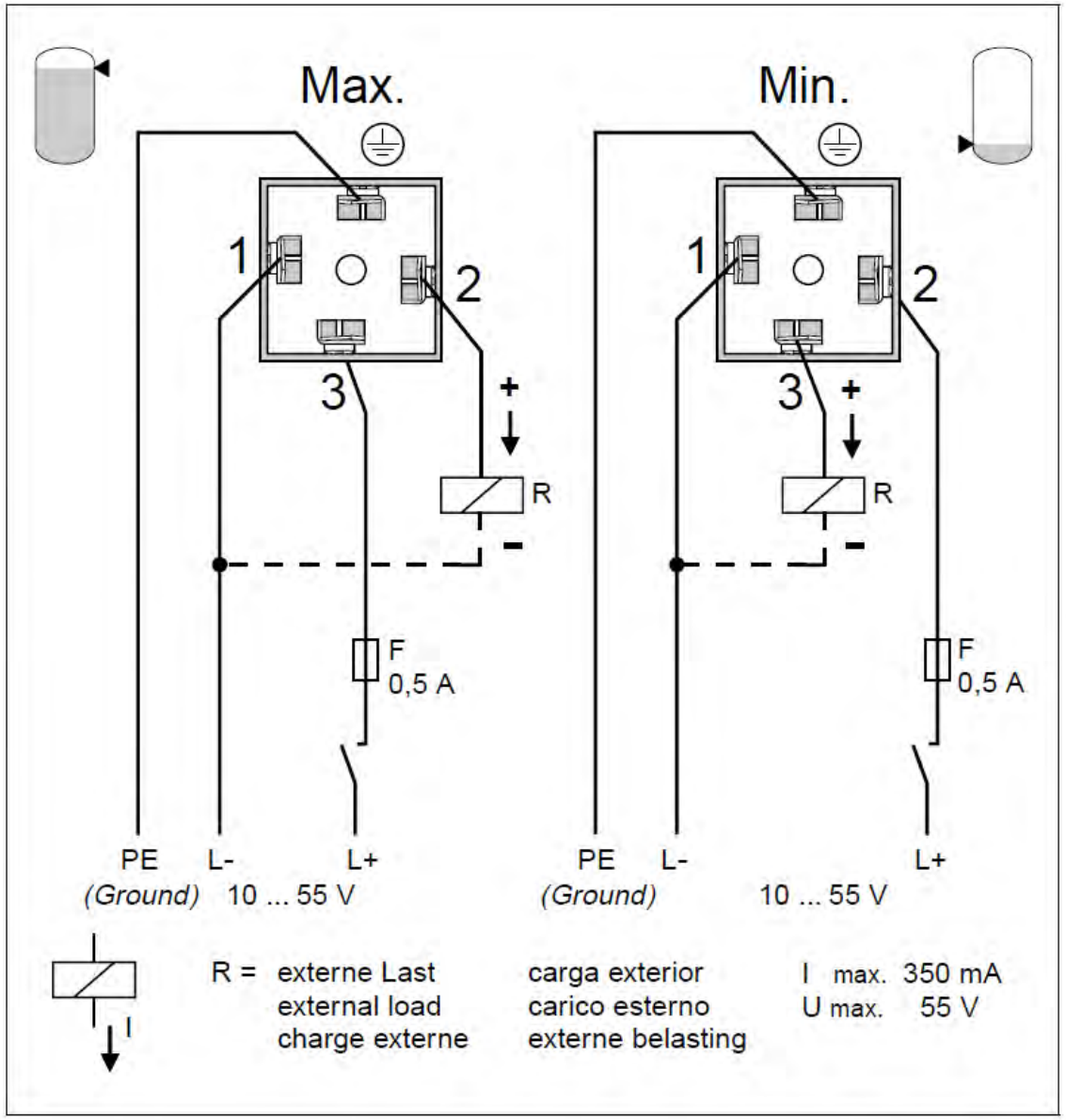
Máx. = Conexión de seguridad máxima
Mín. = Conexión de seguridad mínima

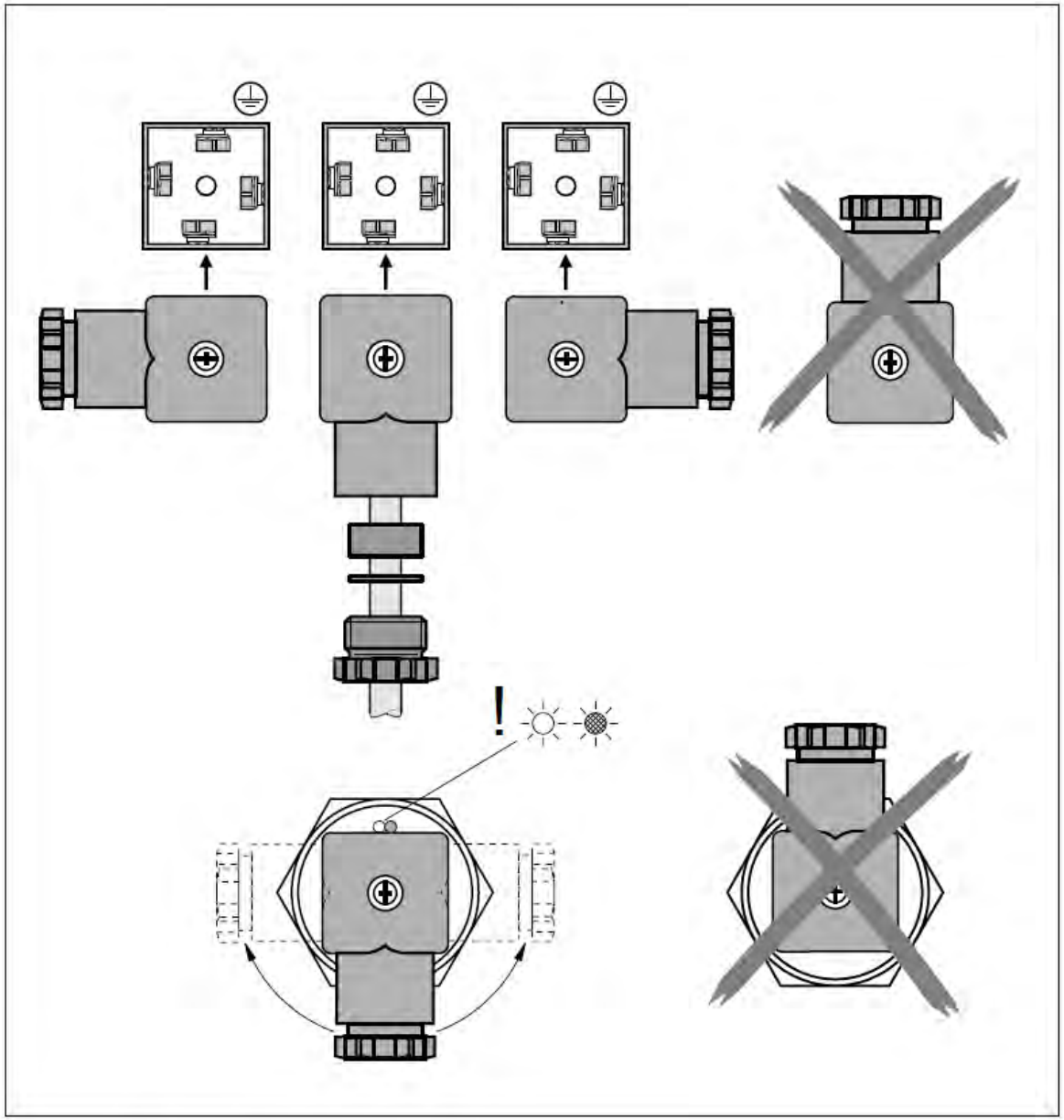
i **Collegamento della versione in corrente continua**

Max. = Sicurezza di massimo
Min. = Sicurezza di minimo

nl **Gelijkstroomvarianten aansluiten**

Max. = max. veiligheidsschakeling
Min. = min. veiligheidsschakeling (ruststroomprincipe)





d Kabeldose zusammenbauen und festschrauben

e Assemble plug and screw tight

f Assembler et visser le boîtier de raccordement

es Ensamblar y atornillar las cajas de conexiones

i Montare il vano connessioni avvitandolo a fondo

nl Connector samenbouwen en vastschroeven

d **Funktion**

Max. und Min. =
Sicherheitsschaltung

e **Function**

Max. and Min. =
fail-safe mode

f **Fonction**

Max. et Min. =
commutation de sécurité

es **Funcionamiento**

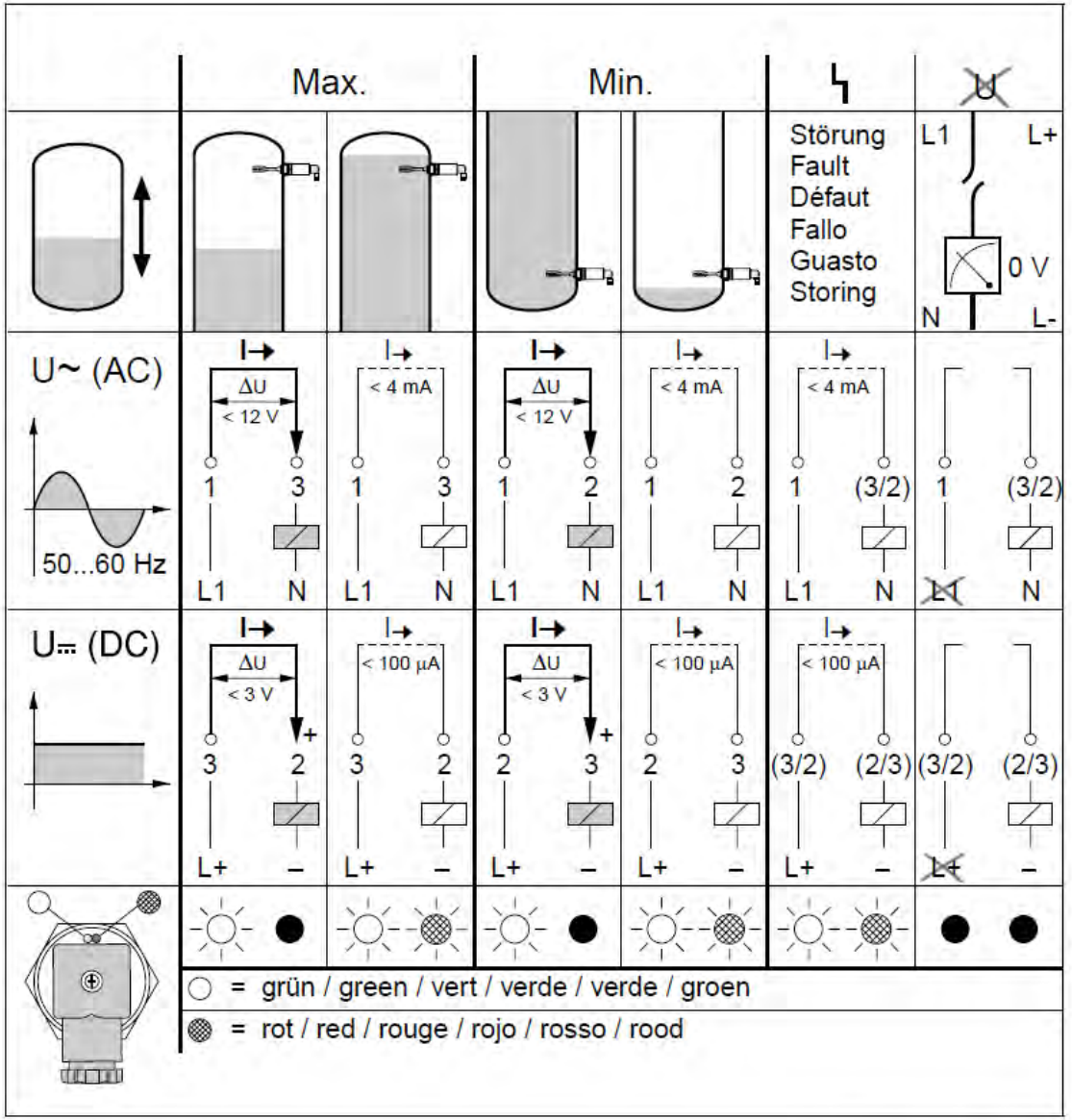
Conexión de seguridad
máxima y mínima

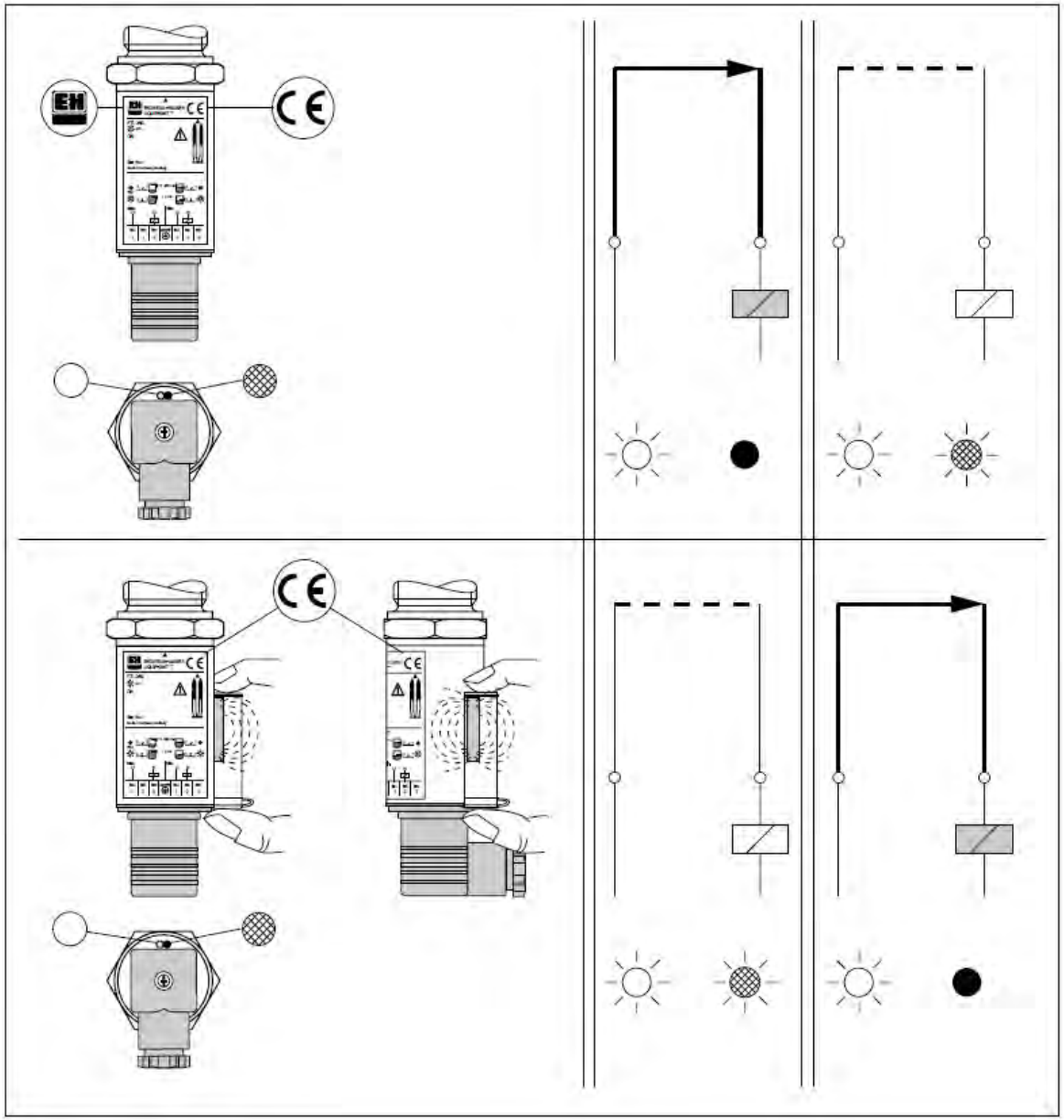
i **Funzionamento**

Sicurezza di massimo e di
minimo

nl **Functie**

Max. en Min. =
veiligheidsschakeling
(ruststroomprincipe)





d **Test**
mit Prüfmagnet

e **Test**
with test magnet

f **Test**
avec aimant de contrôle

es **Comprobación**
Prueba magnética

i **Test**
Test magnetico

nl **Test**
met testmagneet

d **Wartung**
Dicke Krusten entfernen

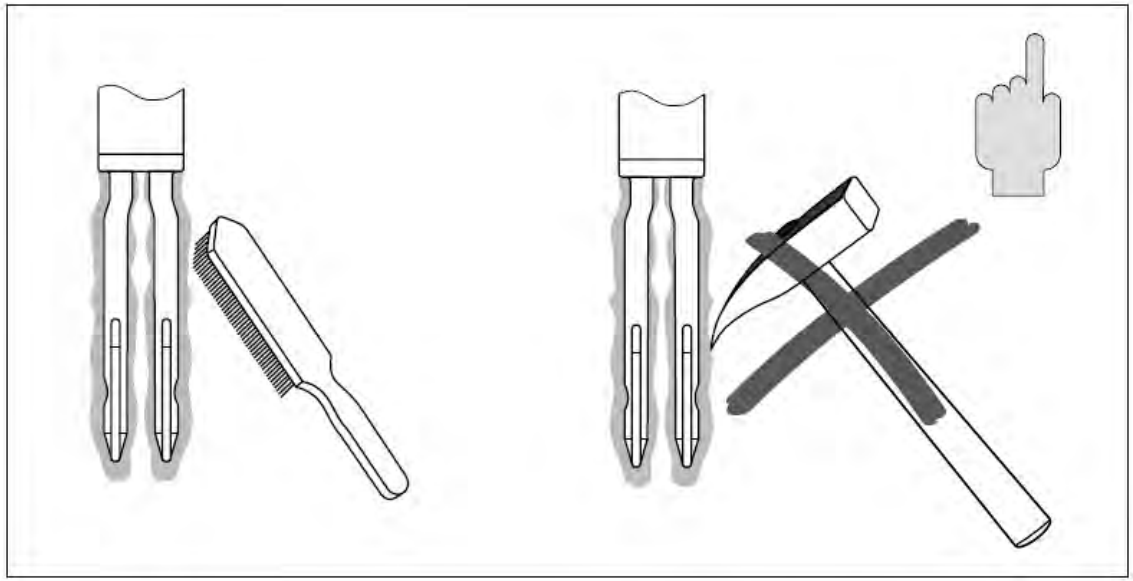
e **Maintenance**
Removal of thick encrustation

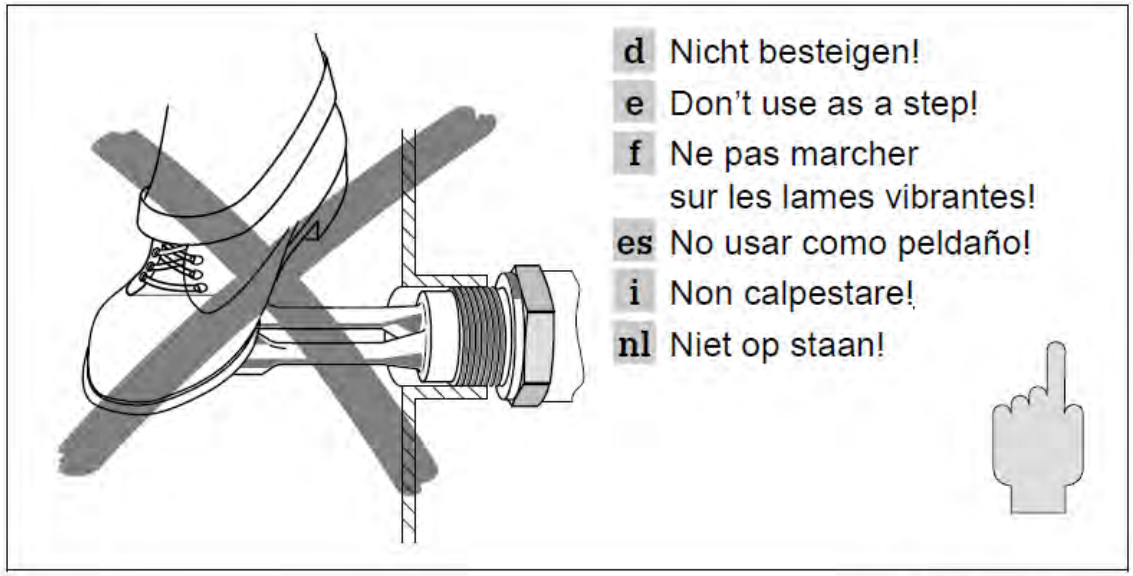
f **Maintenance**
Enlever les dépôts importants

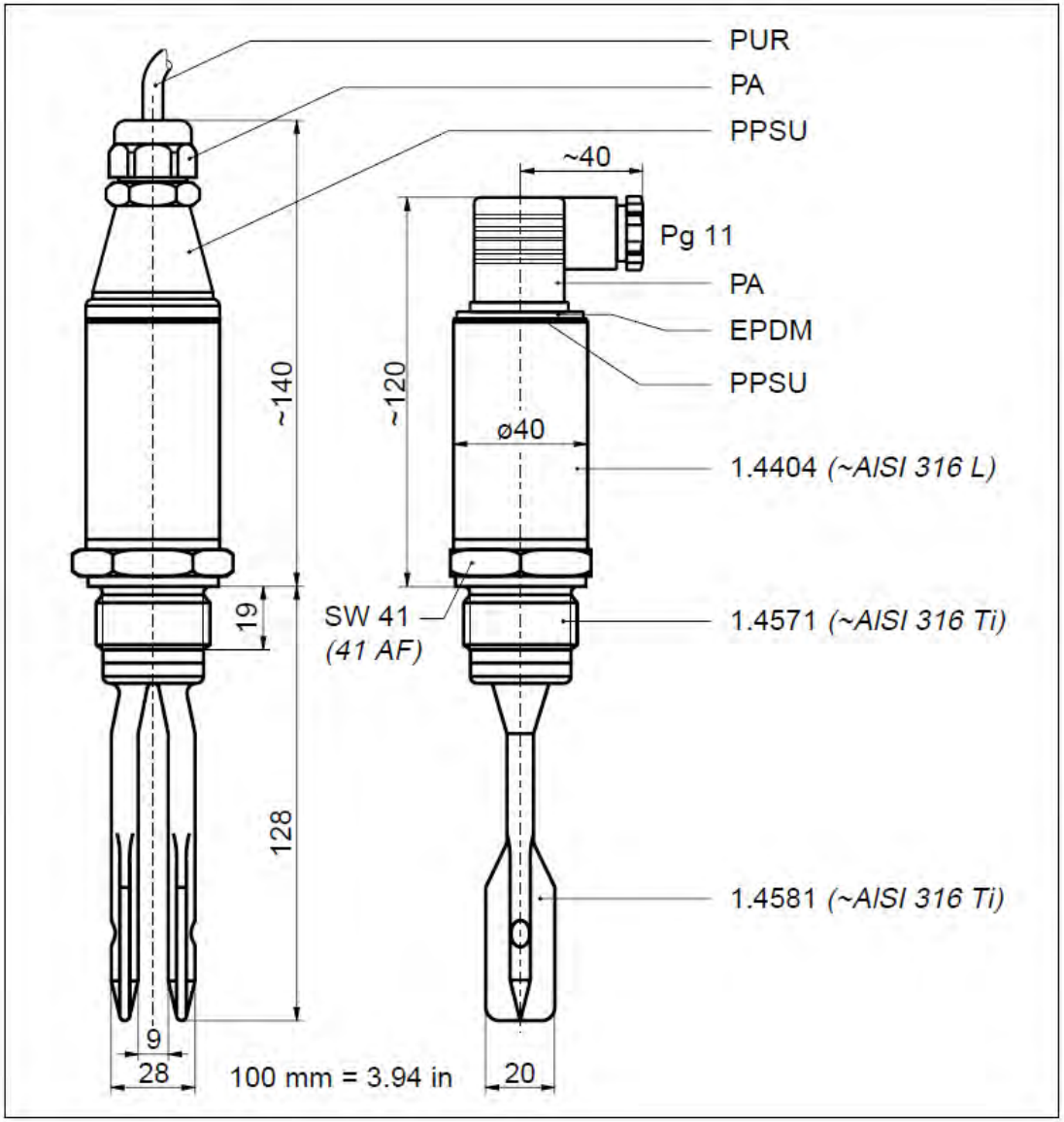
es **Mantenimiento**
Eliminación de adherencias

i **Manutenzione**
Rimozione di scarsi depositi

nl **Onderhoud**
Aangroei verwijderen







d **Technische Daten**
Abmessungen in mm
und Werkstoffe

e **Technical data**
Dimensions in mm
and materials

f **Caractéristiques techniques**
Dimensions en mm
et matériaux

es **Datos técnicos**
Dimensiones en mm
y materiales

i **Dati tecnici**
Dimensioni in mm
e materiali

nl **Technische gegevens**
Afmetingen in mm
en materialen

d Umgebungstemperatur T_U
Betriebstemperatur T_B
Betriebsdruck p_e

e Ambient temperature T_U
Operating temperature T_B
Operating pressure p_e

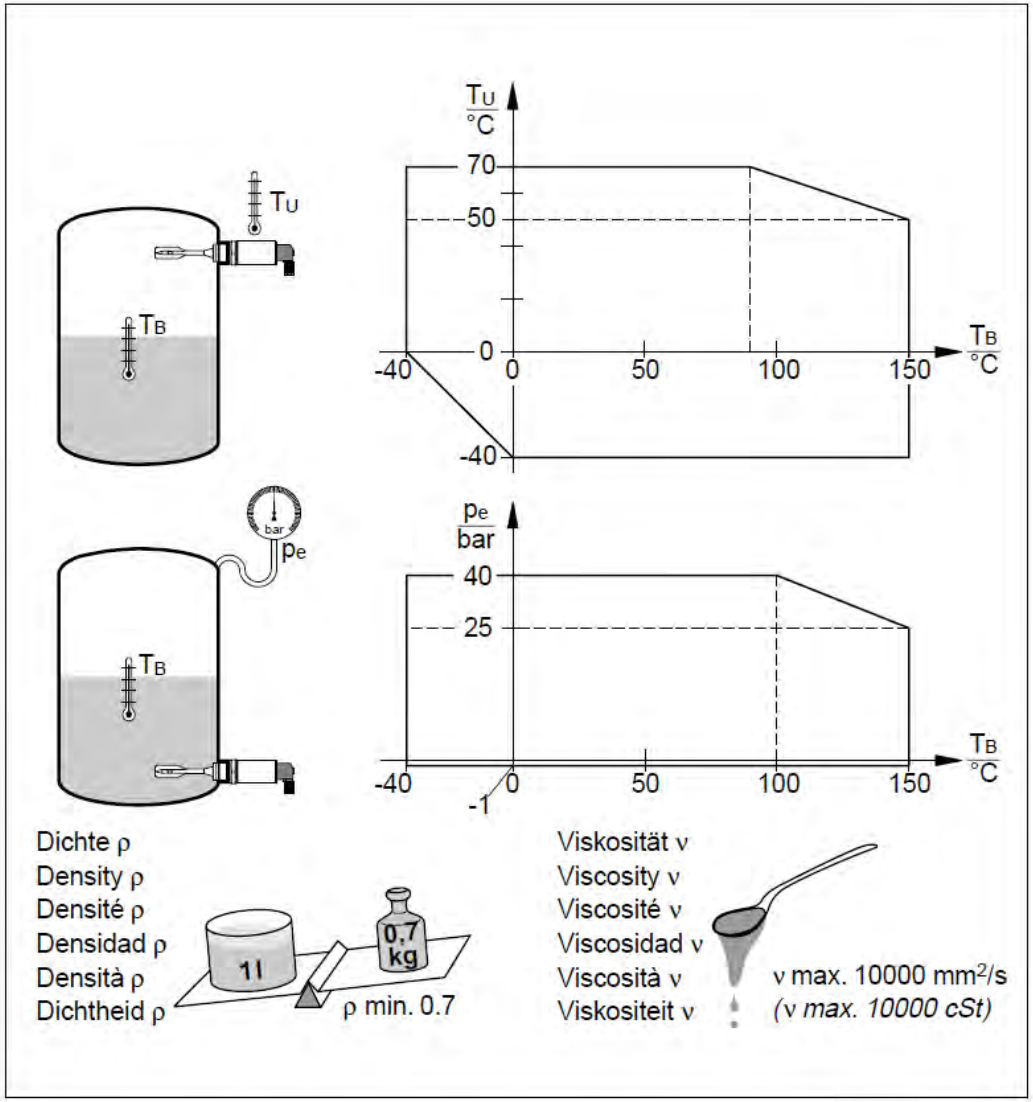
f Température ambiante T_U
Température de service T_B
Pression de service p_e

es Temperatura ambiente T_U
Temperatura de trabajo T_B
Presión de trabajo p_e

i Temperatura ambiente T_U
Temperatura d'esercizio T_B
Pressione d'esercizio p_e

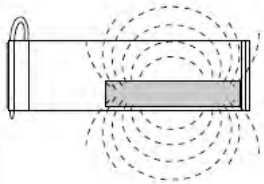
nl Omgevingstemperatuur T_U
Procestemperatuur T_B
Procesdruk p_e

x °C = (1.8·x + 32) °F
1 bar = 14.5 psi



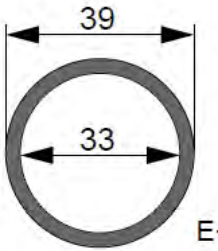
E+H 942667-0000

d Steckschlüssel SW 41
e Socket spanner 41 AF
f Clé de 41
es Llave de fijación SW 41
i Chiave a tubo SW 41
nl Pijpsleutel SW 41



E+H 016920-0000

d Prüfmagnet
e Test magnet
f Aimant de contrôle
es Imán
i Magnete di controllo
nl Testmagneet



E+H 003579-0000

d Dichtung für G 1 A
e Seal for G 1 A
f Joint pour G 1 A
es Junta para 1" G (G 1 A)
i Guarnizione per G 1 A
nl Afdichting voor G 1 A

d Zubehör, Ersatzteile

e Accessories, spare parts

f Accessoires
Piéces de rechange

es Accesorios y repuestos

i Accessori e ricambi

nl Toebehoren
Reserve-onderdelen

d	**Ergänzende Dokumentation**	**d**	TI 244F/00/de Technische Information für den Füllstandgrenzschalter Liquiphant T FTL 260
e	**Supplementary Documentation**	**e**	TI 244F/00/en Technical Information for level limit switch Liquiphant T FTL 260
f	**Documentation complémentaire**	**f**	TI 244F/14/fr Information technique Détecteur de niveau Liquiphant T FTL 260
es	**Documentación suplementaria**	**es**	TI 244F/23/es Información técnica sobre el detector límite Liquiphant T FTL 260
i	**Documentazione supplementare**	**i**	TI 244F/16/it Informazioni Tecniche per l'interruttore di livello Liquiphant T FTL 260
nl	**Aanvullende documentatie**	**nl**	TI 244F/15/nl Technische Informatie voor de niveauschakelaar Liquiphant T FTL 260

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http://www.endress.com 05.01/PT

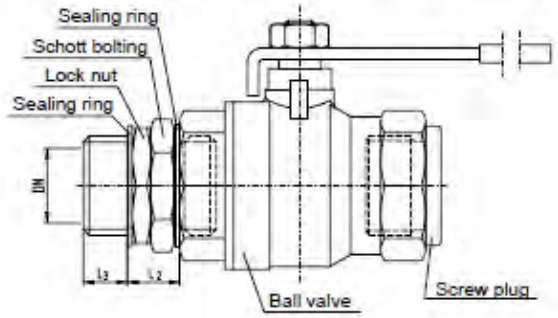
KA 035F/00/a6/11.99 (a), 016757-0000, GW/CV5

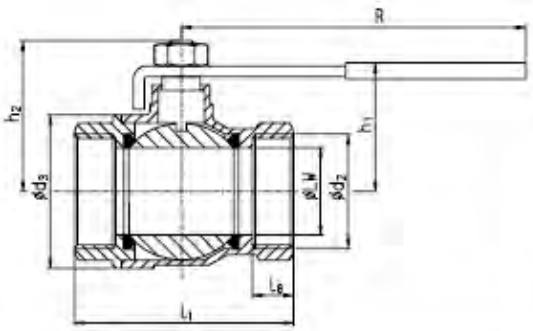
1.1.3.4 Technical data ball valve (equipment list)

FLENDER	Operating Instructions Ball valve direction-adjustable version	Edition: November 2002 B 5102 EN Page 1 of 1

These Operating Instructions are binding for ball valves (direction-adjustable version) to Flender Works Standard F 5102.

The ball valves are to be mounted without liquid plastic, because there is an appropriate sealing ring on each sealing place. The ball valve can be placed in any position due to the Schott bolting /counter nut combination.





Material:

Housing	: nickel-plated brass
Ball	: chromium-plated brass
Valve key	: galvanized steel with
	: yellow plastic sheathing
Ball seal	: Teflon (PTFE)
Sealing ring	: NBR
Double nipple	: GTW35-V
Plug	: GTW35-V

Operable temperature range:
from -20 °C to max. +170 °C

Nominal width of connection DN	Pipe thread d_2	LW	Rated pressure PN bar max.	d_3	h_1	h_2	l_1 ±2	l_2	Threaded length l_3	l_8	R	SW	Weight kg approx.
6	G 1/4	8	65	28	29	33	50	17	17	12	83	22	0,16
10	G 3/8	10	65	32	29	36	60	19	19	12	85	22	0,17
15	G 1/2	15	65	34	32	39	75	22	23	15	89	27	0,19
20	G 3/4	20	40	44	37	42	80	23	24	17	122	32	0,37
25	G 1	25	40	53	40	48	90	25	26	19,5	122	41	0,58
32	G 1 1/4	32	30	64	56	66	110	27	28	22,5	156	50	0,92
40	G 1 1/2	40	30	80	58	68	120	29	30	24,5	160	55	1,35
50	G 2	50	30	96	67	72	140	32	33	24,5	160	70	2,32

A. Friedr. Flender AG, D 46393 Bocholt, Tel. 02871/92-0, Telefax 02871/922596, http://www.flender.com	Datum 2002-11-08	Name: Hesselmann	QMND
		Rev.:	

1.1.3.5 Technical data F6100-2 temperature HSS bearings (equipment list)

FLENDER	Operating Instructions Resistance Thermometer Pt 100	Edition: March 2002 B 6100 EN Page 1 of 5

General

The electric resistance in the resistance thermometer sensor changes as the temperature fluctuates. This change of resistance on the PT 100 or the converted output signal of the measuring transducer (4 to 20 mA) can be used to measure temperature with an evaluating instrument or to define a switch point by means of limit switches.

Operation

Pt 100 measuring thermometer sensor

The electrical conductivity of metal (here platinum) is based on the mobility of conduction electrons. As the temperature rises, the movement of the atoms in the metal lattice about their rest position intensifies and so obstructs the electrons flowing to the plus pole of a power source. This obstruction sets up a resistance in linear proportion to the temperature.

To generate the output signal a constant test current (approx. 1 mA) is applied to the Pt 100. The resistance in the Pt 100 causes a drop in voltage ($U = R \cdot I$), which can be evaluated.

Measuring transducer

The two-wire measuring transducer is mounted in the J-head only if requested by the customer. It should be noted that here only a single connection is possible.

The measuring transducer converts the temperature-dependent resistance to a standard uniform signal of 4 to 20 mA. This signal can be transmitted over long distances without interference.

Technical Date - Pt 100

– Type of protection Terminal head:	IP 65
– Tolerance class:	DIN IEC 60751 Class B (at 0 °C ±0.3 K, at 100 °C ±0.8 K)
– Ambient temperature range for J head:	–20 °C to +100 °C
– Ambient temperature range for protective tube:	–50 °C to +200 °C
– Test temperature range:	–50 °C to +150 °C
Material	
– Terminal head:	GD-AlSi9Cu3
– Protective sleeve for measuring thermometer sensor:	1.4571
– Spring:	wire DIN 2076-A-0.8 (stainless steel)
– Guide tube:	1.4571
– Terminal base:	ceramic
– Adapter:	1.4301
– Gasket	NBR (Perbunan)

A. Friedr. Flender AG, D 46393 Bocholt, Tel. 02871/92-0, Telefax 02871/922596, http://www.flender.com	Datum 2002-03-26	Name: Hesselmann	ENDD
		Rev.:	

Technical data - Measuring transducer

– Measuring input:	Pt 100 (DIN EN 60751)
– Measuring range:	–50 °C to +150 °C
– Ambient temperature:	–20 °C to +85 °C
– Terminal type:	two-wire
– Minimum measuring range:	25 K
– Maximum measuring range:	1050 K
– Sensor line resistance with three-wire connection:	≤ 11 Ω per line
– Sensor line resistance with two-wire connection:	0 Ω per line resistance
– Sensor current:	≤ 0,5 mA
– Measuring rate:	continuous measurement, as signal path analog

Measuring circuit monitoring system

– Drop below range:	falling to ≤ 3.6 mA
– Rise over range:	rising to ≥ 22 mA ... < 28 mA (typical 24 mA)
– Probe short circuit:	≤ 3,6 mA
– Probe and line break:	positive: ≥ 22 mA ... < 28 mA (typical 24 mA) negative: ≤ 3,6 mA

Output

– Output signal:	impressed DC 4 ... 20 mA
– Transient response:	temperature-linear
– Transmission accuracy:	≤ ± 0.1 %
– Attenuation of residual ripple of feed voltage:	40 dB
– Working resistance (Rb):	$RB = \frac{U_B - 7{,}5\ V}{22mA}$
– Influence of working resistance:	≤ ± 0,02 % / 100 Ω relative to measuring range final value of 20 mA
– Adjustment time with temperature change:	≤ 10 ms
– Balancing conditions:	DC 24 V / approx. 22 °C
– Balancing accuracy:	≤ ± 0.2 % relative to measuring range final value of 20 mA

Voltage supply

– Voltage supply (Ub):	DC 7.5 ... 30 V
– Pole confusion protection:	yes
– Voltage supply influence:	≤ 0.01 % / V deviation of 24 V relative to measuring range final value of 20 mA

Environmental influences

– Operating temperature range:	–40 to +85 °C
– Temperature influence:	≤ 0.01 % / K deviation of 22 °C relative to measuring range final value of 20 mA
– Climate resistance:	rel. humidity ≤ 95 % on annual average without dew contact
– Vibration strength:	acc. to GL characteristic 2
– EMV:	EN 61326

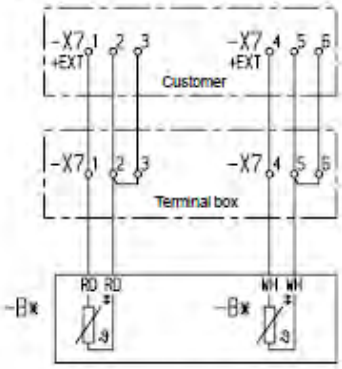
Housing

– Material:	Polycarbonate (encapsulated)
– Screw connection:	≤ 1.5 mm²
– Assembly:	in terminal head Form J
– Mounting position:	any
– Weight:	approx. 12 g

A. Friedr. Flender AG, D 46393 Bocholt,
Tel. 02871/92-0, Telefax 02871/922596, http://www.flender.com

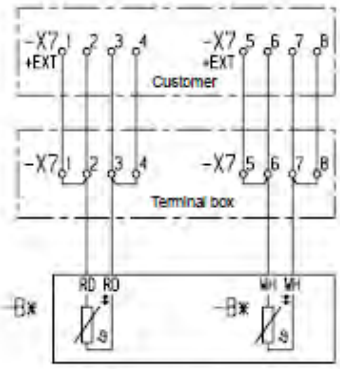
Connection

The customer can minimise measuring inaccuracies by using multiple wires. At Flender, as a rule, a 3- or 4-wire arrangement from an additional terminal box is provided for (Fig. 1, 2). At the customer's specific request, the 3/4-wire arrangement can be used from the J-head (Figure 4, 5). Through lack of space, however, the 4-wire arrangement is possible only with a single connection (Fig. 5).



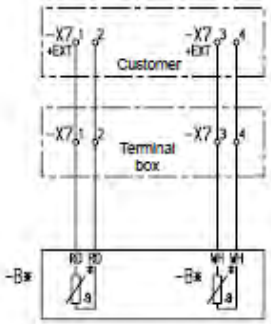
Resistance thermometer

Fig. 1: 3-wire arrangement from terminal box



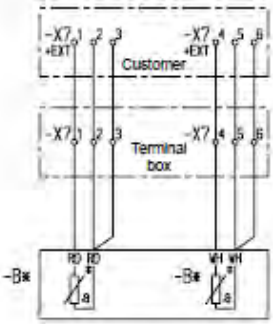
Resistance thermometer

Fig. 2: 4-wire arrangement from terminal box



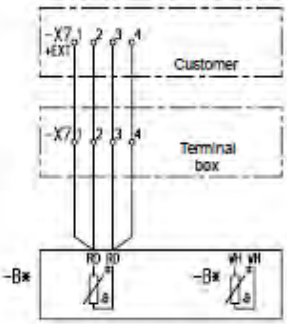
Resistance thermometer

Fig. 3: 2-wire circuit from terminal head of Pt 100



Resistance thermometer

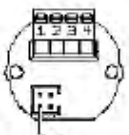
Fig. 4: 3-wire circuit from terminal head of Pt 100



Resistance thermometer

Fig. 5: 4-wire circuit from terminal head of Pt 100

Connection for measuring transducer



Connection for		Connection values		
	Voltage supply DC 7.5 ... 30 V	+1	$R_B = \frac{U_b - 7.5\,V}{22\,mA}$	1 2
	Current output 4 ... 20 mA	-2	R_B = Working resistance U_b = Voltage supply	+ −
Analog inputs				
	Resistance thermometer in two-wire circuit	3 4	series $R_L = 0\,\Omega$	3 4 ϑ

Types

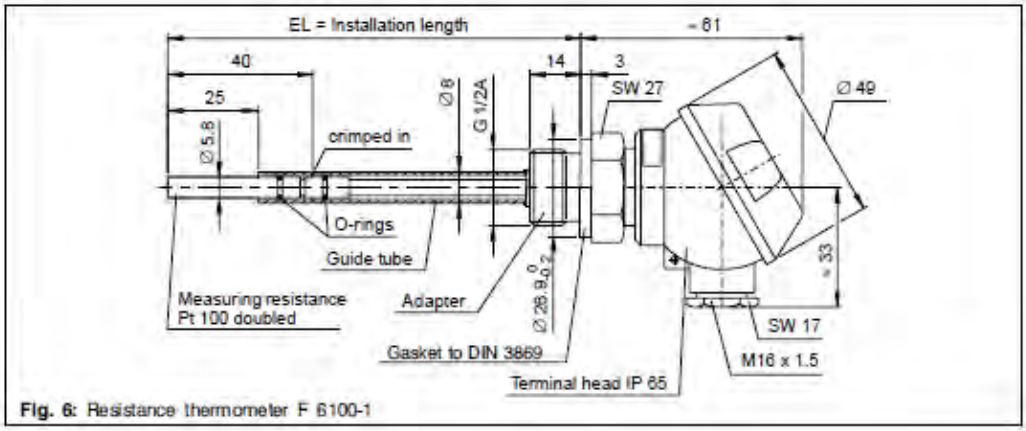


Fig. 6: Resistance thermometer F 6100-1

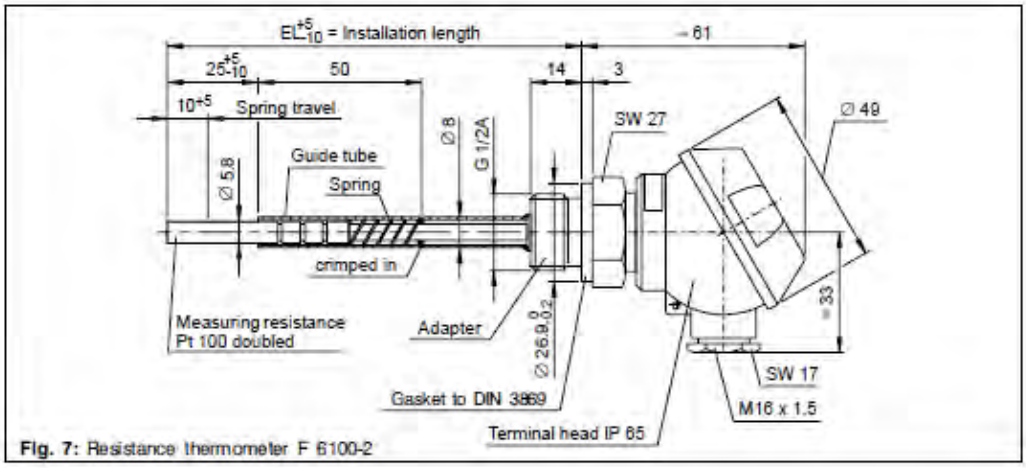


Fig. 7: Resistance thermometer F 6100-2

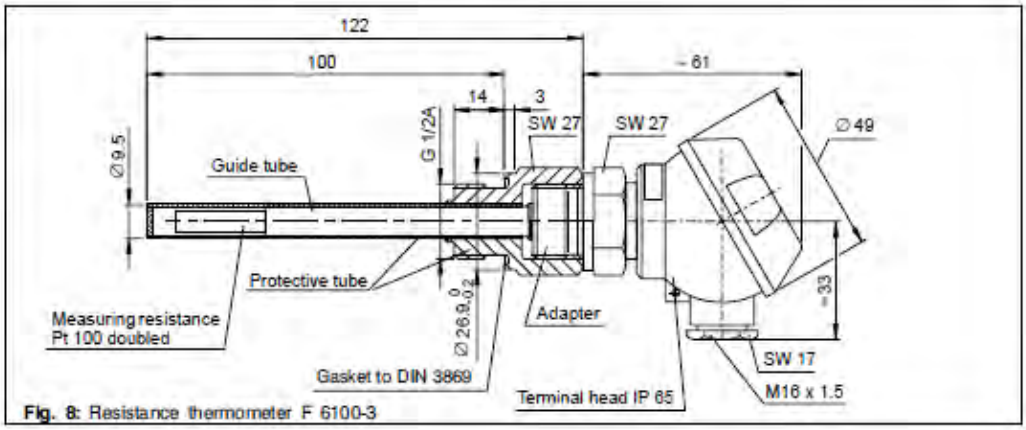


Fig. 8: Resistance thermometer F 6100-3

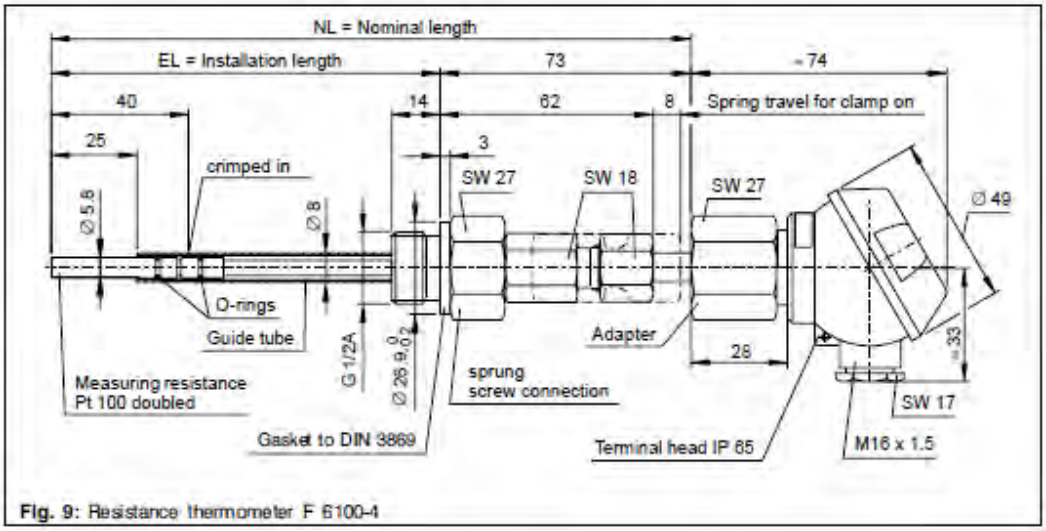
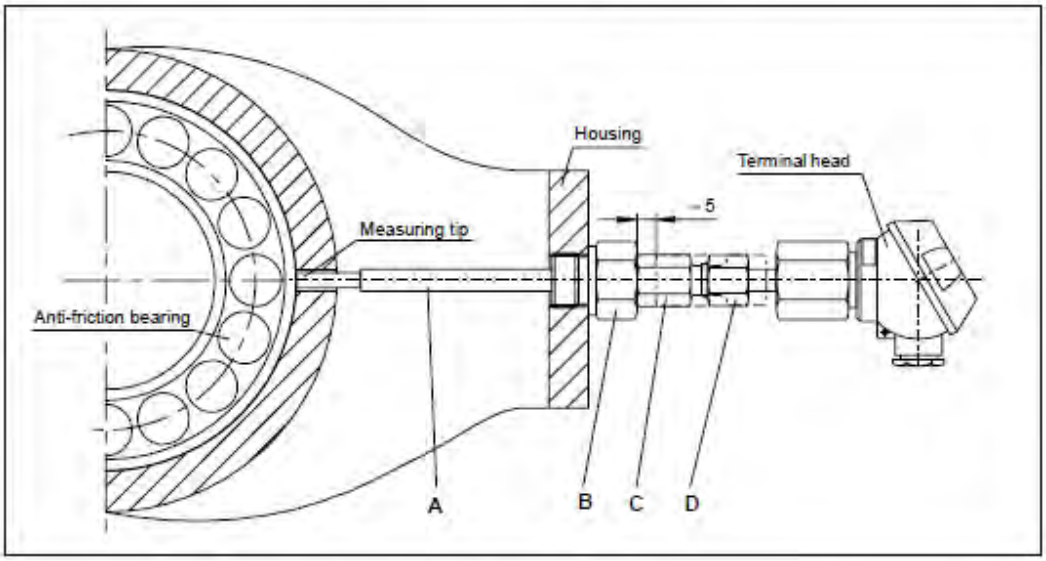


Fig. 9: Resistance thermometer F 6100-4

Adjustment by means of sprung screw connection



a) Insert guide tube "A" into hole in housing until the measuring tip of the resistance thermometer makes contact.

b) Screw screw connection "B" into the housing as far as it will go.

c) Pull out screw connection "C" approx. 5 mm towards the terminal head. Then lock nut "D" with screw connection "C". This ensures that the pretensioned spring keeps the measuring tip permanently in contact with the part to be measured.

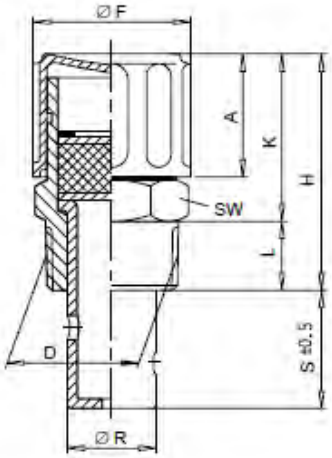
1.1.3.6 Technical data breather filter (equipment list)

FLENDER	Operating Instructions Breather	Edition: May 1995 B 5122 EN Page 1 of 1

These operating instructions are binding for breathers according to FLENDER works standard W 5122.

Mounting

The thread of the filter has to be coated with sealing compound LOCTITE 572 before screwing it into the female thread.



D	SW	L	K	H	A	F	R	S
R 1/4	22	8	23	35	19	28	8	16.5
R 1/2	22	12	26	38	19	28	10	17
R 3/4	27	14	32	46	25	32	18	23

Material: Stainless steel
Tubes made out of oil-resistant plastics

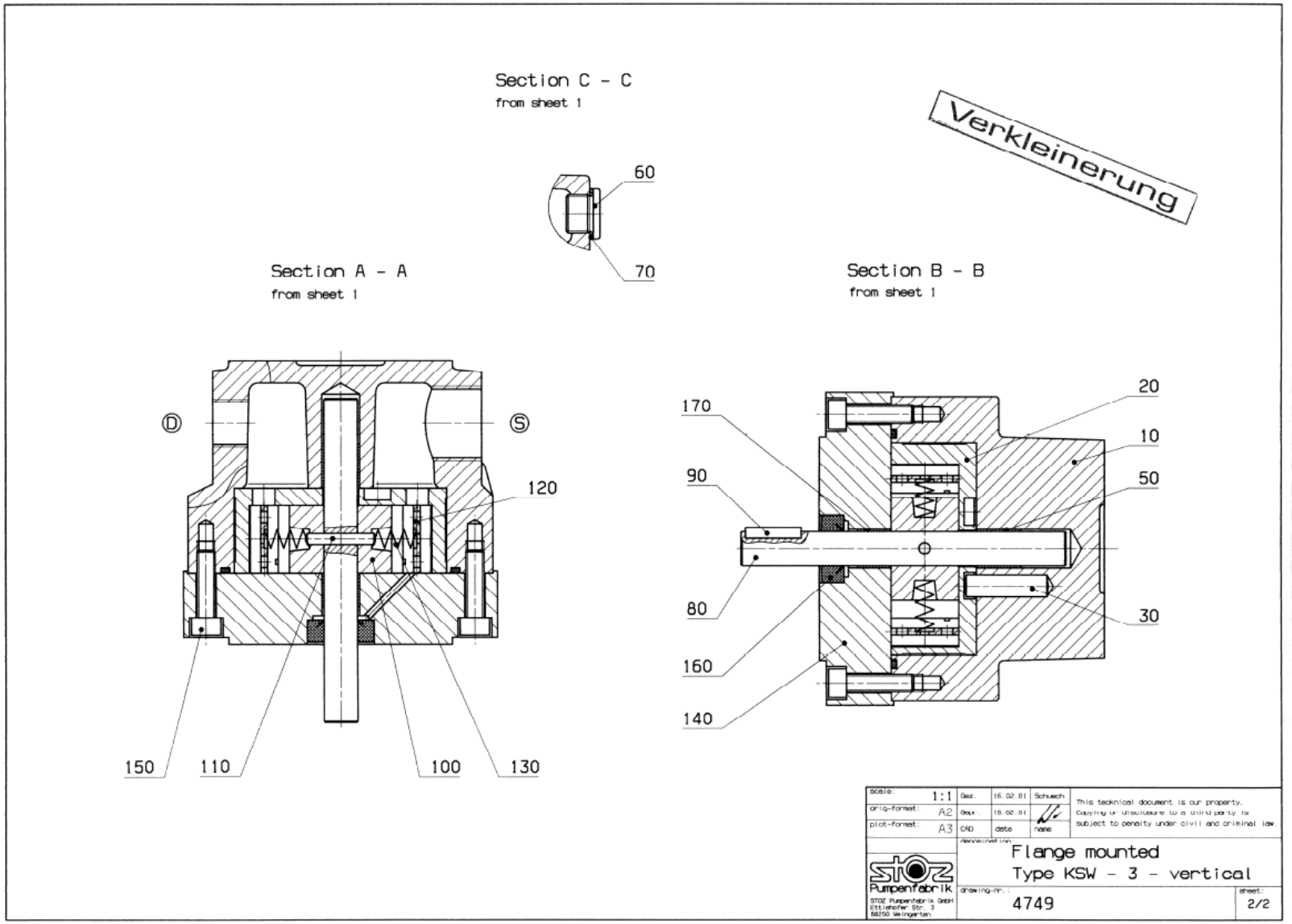
Temperature resistance: up to 120 °C

Design: Tapered thread acc. to DIN 2999 (Taper 1 : 16)

A. Friedr. Flender AG, D 46393 Bocholt,
Tel. 02871/92-0, Telefax 02871/922596, http://www.flender.com

Datum 24.05.1995 | Name: Paul | DOA | Rev.:

1.1.3.7 Technical data vane pump (equipment list)



item	part position	denomination	drawing number	unit	quantity
10.	3.4749.010	housing	4749.010	ST	1
20.	3.0380.081	reversing box	2.0380.081	ST	1
30.	SK 4.1175-3	stop pin	SK 4.1175	ST	1
30.10	D1475/010X036-ST	|toggle grooved dowel pin -------	DIN 1475	ST	1
40.	D3771/099X003/VI	o-ring	DIN 3771	ST	1
50.	MB1520DU	bearing bush		ST	1
60.	D0908/G3/8-ST	lock screw	DIN 908	ST	1
70.	D7603/018X022-CU	packing ring	DIN 7603	ST	1
80.	3.4749.050	shaft	4749.050	ST	1
90.	D6885/005X005X025	feather key	DIN 6885	ST	1
100.	3.4749.060	rotor	4749.060	ST	1
110.	D1472/005X026-ST	notch pin	DIN 1472	ST	1
120.	4.0130.070	steel vane	4.0130.070	ST	4
130.	4.0030.223	pressure spring	4.0030.223	ST	4
140.	3.4749.090	flange cover	4749.090	ST	1
150.	D0912/008X030-10.9	fillister head cap screw	DIN 912	ST	4
160.	D3760/15X30X10BAUM/V	rotary shaft seal	DIN 3760	ST	1
170.	MB1515DU	bearing bush		ST	1

denomination: KSW - 3 - flange viton-seals

PUMPENFABRIK
Ettishofer Straße 3
88250 Weingarten

date: 20.03.01

drawing-nr.: 4749 / A2

part-nr.: ZB 3.4749

sheet: 1

item	part position	denomination	drawing number	unit	quantity
40.	D3771/099X003/VI	o-ring	DIN 3771	ST	1
120.	4.0130.070	steel vane	4.0130.070	ST	4
130.	4.0030.223	pressure spring	4.0030.223	ST	4
160.	D3760/15X30X10BAUM/V	rotary shaft seal	DIN 3760	ST	1

denomination:
wearing part set
KSW - 3 - flange
viton seals

PUMPENFABRIK
Ettishofer Straße 3
88250 Weingarten

date: 20.03.01

drawing-nr.: 4749 / A2

part-nr.: BG 3.4749/001

sheet: 1

Connection:

the suction end is marked „S"

the pipelines must be connected oil and airtight

Direction of flow:

direction of flew remains the same when sense of rotation is reversed

Design:

self-priming roller vane pump

valveless reversal by means of reversing box

Installation:

„horizontal" and „vertical, shaft downward"

Erstinbetriebnahme:

Before the pump is startet for the first time, it must be filled with oil.

Herefore a lock screw is wounted at the front face of the pump.

Maintenance:

Not required as the pump is designed for lubrication by the liquids to be transportet.

We recommend to change the attrition and seal parts after a time of 45.000 working hours.

Denomination: short description/operating procedures KSW - 3 - flange viton-seals

PUMPENFABRIK
Ettishofer Straße 3
88250 Weingarten

date:	drawing-nr.:	part-nr.:	sheet:
20.03.01	4749 / A2	ZB 3.4749	1

1.1.3.8 Technical data 3/2 way valve (equipment list)

http:// www.co-ax.de

data sheet E4.01-09/2003

coaxial valve
type MK 10 DR

3/2 way valve	**direct acting**
pressure range	PN 0-25 bar
orifice	DN 10 mm
connection	thread
function	valve normally closed symbol **NC**
	valve normally open symbol **NO**
design	pressure balanced, with spring return, intersecting switch-over
body materials	The materials refer to parts in contact with the media
	① brass ②
	③ brass, nickel plated ⑤
	④ ⑥ stainless steel
valve seat	synthetic resin on metal
seal materials	NBR FPM, CR, EPDM

details needed:
- orifice
- port
- function NC/NO
- operating pressure
- inlet pressure at A, B or C
- flow rate
- media
- media temperature
- ambient temperature
- nominal voltage

general specifications			options
ports	MK	threads G 1/4 - G 3/4	special threads
function		NC	NO
pressure range	bar	0-16 / 0-25	
		A ⇔ B max. 25 / B ⇔ A max. 16 / A⇔ C max. 25 / C ⇔ A max. 25	
K$_v$ value	m³/h	2,6	
vacuum	leak rate		< 10⁻⁶ mbar l s⁻¹
pressure-vacuum	P$_1$ ⇔ P$_2$		upon request
back pressure	P$_2$ > P$_1$	see pressure range	
media		gaseous - liquid - contaminated	
abrasive media			
damping	opening		
	closing		
flow direction		see pressure range	
switching cycles	1/min	200	
switching time	ms	opening 40 closing 25	
media temperature	°C	DC: -10 to +80	-30 to +120
		AC: -10 to +80	-30 to +120
ambient temperature	°C	DC: -10 to +80	
		AC: -10 to +80	
limit switches			
manual override			
approvals			LR/GL/WAZ
mounting			mounting brackets
weight	kg	MK 2,2	
additional equipment			upon request

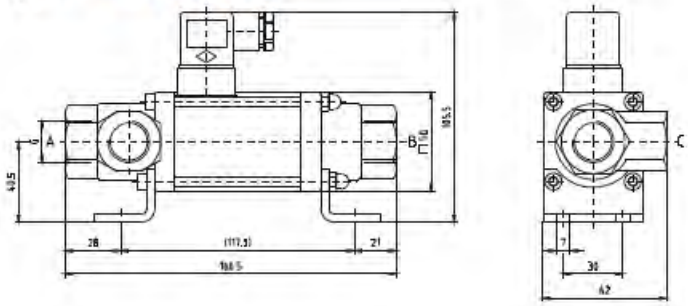
electrical specifications				options	
nominal voltage	U$_1$	24 V	DC	special voltages upon request	
	U$_2$	230 V 40-60 Hz	AC	special voltages upon request	
	U$_3$				
	U$_4$				
actuation	DC	direct-current magnet			
	AC	direct-current magnet with integrated rectifier			
insulation rating	H	180°C			
protection	IP65				
energized duty rating	ED	100%			
connection		plug acc. DIN EN 175301-803 form A 4 positions x 90° / wire diameter 6-8 mm		connector M12x1	
additional equipment		illuminated plug, with varistor			
current consumption	N-coil	24 V	DC 1,00 A		
		230 V 40-60 Hz	AC 0,13 A		
	H-coil			24 V	DC 1,29 A
				230 V 40-60 Hz	AC 0,16 A
explosion proof					
limit switches					

- Specifications not highlighted are standard.
- Specifications highlighted in grey are optional.

müller co-ax ag · Gottfried-Müller-Str. 1 · D-74670 Forchtenberg · Germany · fon +49(0)7947/828-0 · fax +49(0)7947/828-11 · Email info@co-ax.de

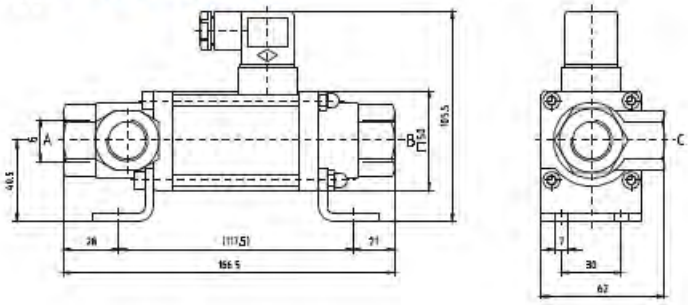
type **MK 10 DR**

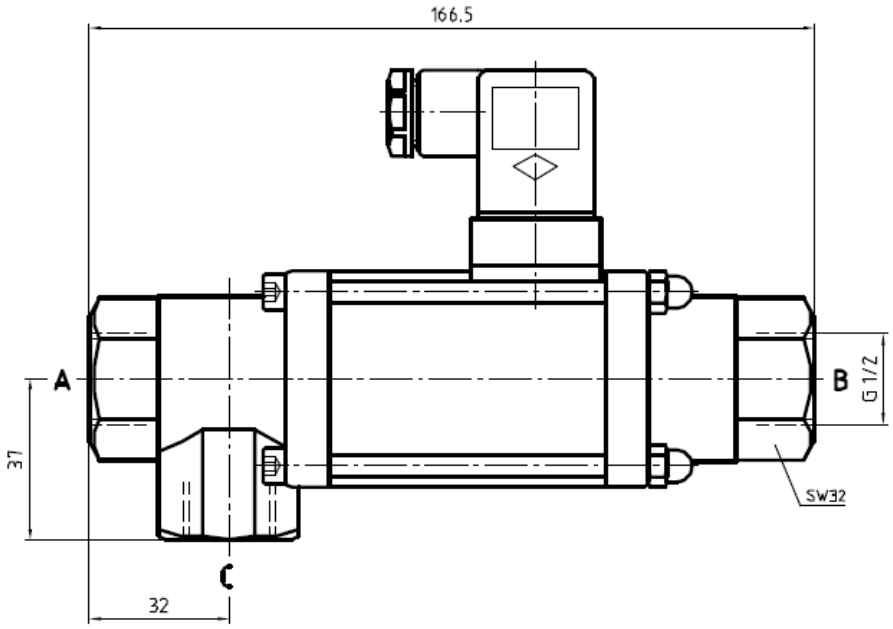
function: NC
closed when not energized

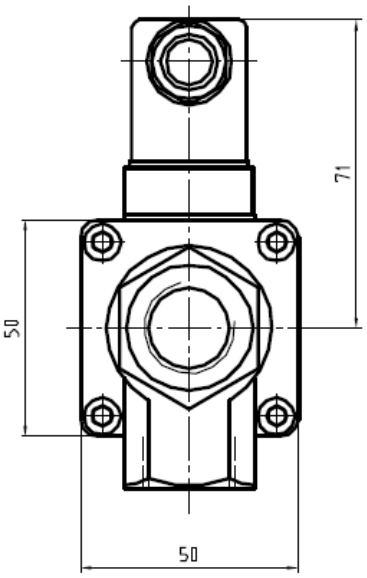


type **MK 10 DR**

function: NO
open when not energized





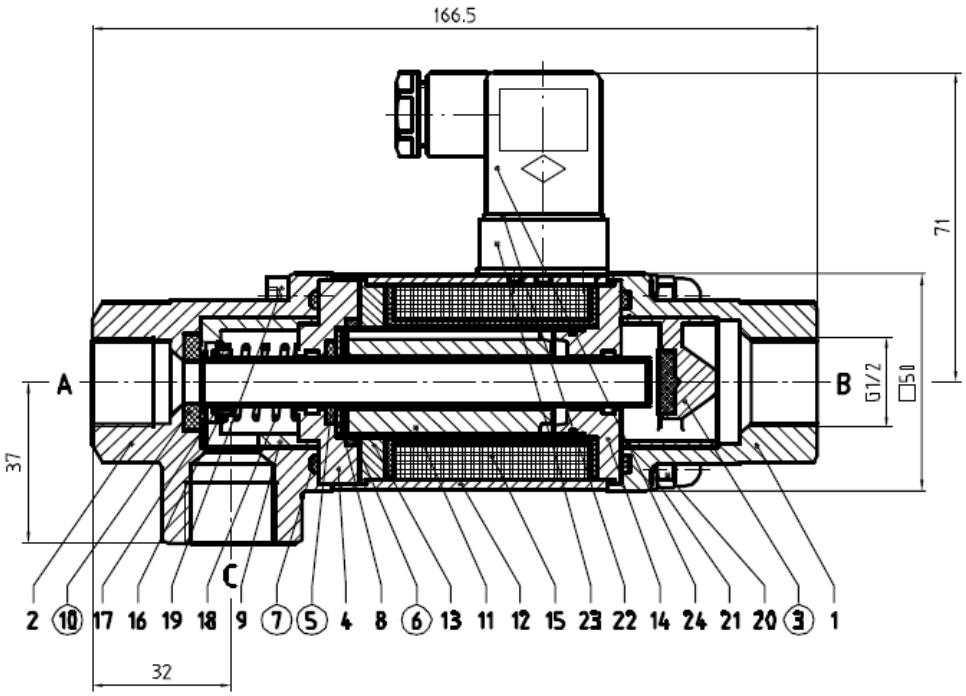


Änderungsauftrag Nr. ----	Werkstoff	Maßstab 1:1	Typ MK 10 DR NO
Allgemeintoleranz ISO 2768-m		Datum	Name
Nennmaß 0,5-6 / 6-30 / 31-120 / 121-400 / 401-1000	Bearb.	5.04.2012	KIPAR
Toleranz ±0,1 / ±0,2 / ±0,3 / ±0,5 / ±1,0	Geprüft	18.04.2012	MARGRAF
Funktionsmaße			
Werkstückkanten DIN 6784 (-0,4 zum)	CAD-Nr.	118111-0	
Toleranzen für Form und Lage ISO 2768-K			
Oberflächen DIN ISO 1302			
√ = √ / √Ra25 = √ / √Rz1 = √			
√Ra10 = √ / √Ra0,8 = √ / √Rz1,6 = √			

Bezeichnung: 3/2-Wege-Ventil, Ausführung Winergy

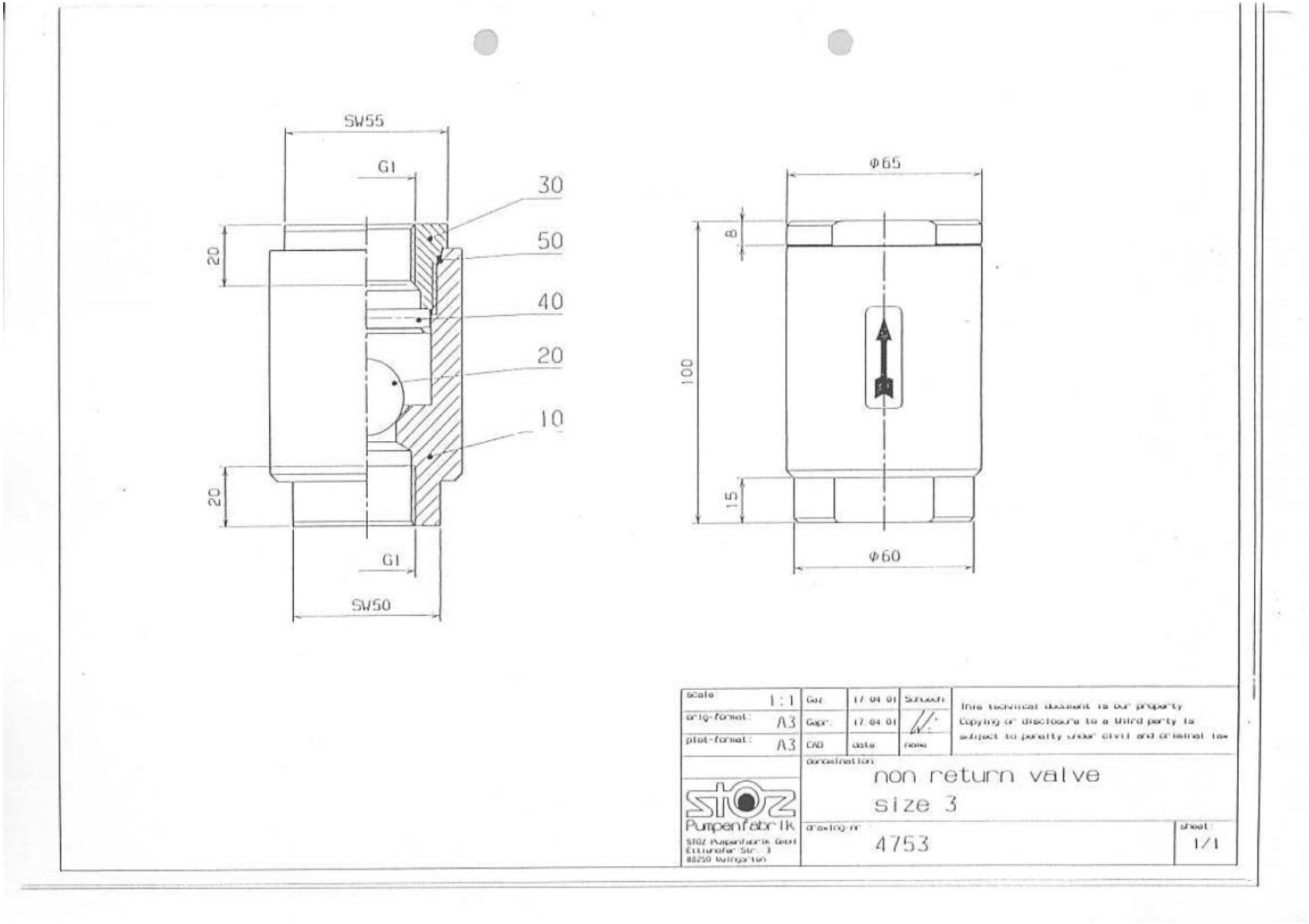
Zp-Art	Zeichnungsnummer	Index
MZ	K10 118000	

Ers. f. | Blatt 11 von 01 Blatt



Änderungsdienst-Nr. ----	Maßstab 1:1	Typ MK 10 DR NO	
Allgemeintoleranz ISO 2768-m		Benennung 3/2-Wege-Ventil	
	Datum	Name	Ausführung Winergy
Bearb.	18.04.2012	KIPAR	
Geprüft	18.04.2012	MARGRAF	
Funktionsanalyse			
Werkstückkanten DIN 6784 (-0,4 zum)	CAD-Nr. 118011_-		
Toleranzen für Form und Lage ISO 1101-K		Zg.-Art SZ	Zeichnungsnummer K10 118010
Oberflächen DIN ISO 1302			Index
√ = √ √R1,25 = √ √R1 = √ √R10 = √ √R6,3 = √ √R0,4 = √		Ers. f.	Blatt 01 von 01 Blatt

1.1.3.9 Technical data non return valve (equipment list)



item	part position	denomination	drawing number	unit	quantity
10.	3.4753.010	housing	4753.010	ST	1
20.	DS401/1.III	ball	DIN 5401	ST	1
30.	3.4753.090	cover	4753.090	ST	1
40.	D0007/006X045	cylinder pin	DIN 7	ST	1
50.	D3771/048X002/VI	o-ring	DIN 3771	ST	1

denomination:
non return valve
size 3

STOZ PUMPENFABRIK
Ettishofer Straße 3

date: 17.04.01

drawing-nr.: 4753 / 33

part-nr.: ZB 3.4753

sheet: 1

Installation:

At any chosen point in the suction line

Installaton position:

direction of flew remains the same when sense of rotation is reversed

Maintenance:

Not necessary

Denomination:
short description/operating procedures
Stoz SUGO non return valve size 3

stoz PUMPENFABRIK
Ettlinger Straße 3
88250 Weingarten

date:	drawing-nr.:	part-nr.:	sheet:
17.04.01	4753 / A3	ZB 3.4753	1

1.1.3.10 Technical data coarse filter (equipment list)

FLENDER	Operating Instructions Coarse mesh filters	Edition: May 1995 B 5911 EN Page 1 of 2

These operating instructions are binding for coarse mesh filters according to FLENDER works standard W 5911.

Configuration and principle of operation

Coarse mesh filters protect load-side systems, units, measurement and control devices form impurities.

The coarse mesh filters consist of a housing with threaded connections (1), a strainer (2) and a drain plug (4). The mesh insert itself consists of a coarse-mesh screen with an additional fine-mesh inner screen. The medium flows through the housing, the entrained dirt particles in the line being retained by the mesh insert and collected in the filter bowl.

Installation

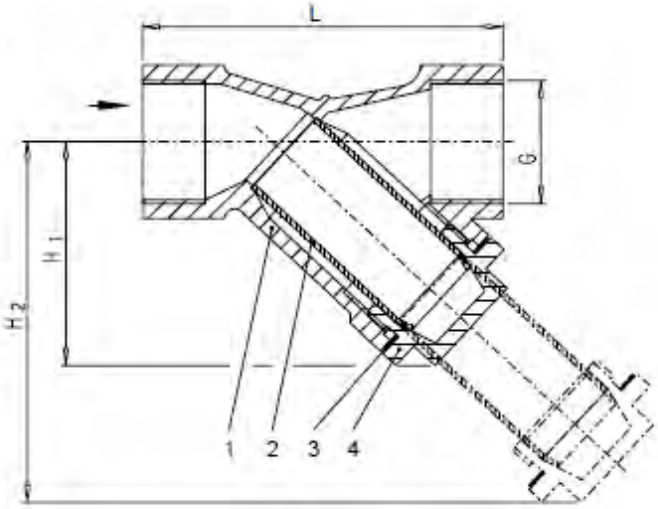
The coarse filters should be installed so that the direction of flow corresponds with the arrow cast on the housing. The filter bowl must be underneath at all times. Sufficient space should be provided for filter cleaning and filter change (see dimension H_2). For vertically running pipes with an upwards flow direction, the coarse mesh filter is exceptionally to be installed with the drain plug pointing upward.

Maintenance

Check from time to time, whether large quantities of dirt particles have collected which are adversely affecting the volume flow. For this purpose, the drain plug (4) is loosened and the strainer (2) is pulled out after the respective part of the plant has been put out of service. Damaged mesh screens (2) and seal rings (3) must be replaced.

A. Friedr. Flender AG, D 46393 Bocholt, Tel. 02871/92-0, Telefax 02871/922596, http://www.flender.com	Datum 24.05.1995	Name: Paul Rev.:	DOA

Type 1 NI



1. Housing — material: brass
2. Mesh insert (coarse and fine-mesh screens) — material: CrNiMo (1.4401)
3. Sealing ring — material: graphite with metallic support
4. Drain plug — material: brass

Connection thread size		G 1/2	G 3/4	G 1	G 1 1/2	G 2
Installation length L		64	74	90	120	150
Overall height H_1		40	45	84	84	108
Overall height H_2 (mesh insert withdrawn)		61	75	134	134	158
Mesh size	(µm)	250				
Oil rate of flow K_{VS}	(m^3/h)	5.1	9.1	14.3	36.6	57
Screen discharge area	(cm^2)	2.5 x cross section of pipe				
Weight	(kg)	0.2	0.3	0.47	1.35	1.9
Nominal pressure PN	(bar)	25				
Max. medium temperature	(°C)	200				

A. Friedr. Flender AG, D 46393 Bocholt,
Tel. 02871/92-0, Telefax 02871/922596, http://www.flender.com

Datum 24.05.1995

Name: Paul | DOA

Rev.:

Operating Instructions

B 5911 EN 02.08

Coarse filter

FLENDER

A. Friedr. Flender AG • D-46393 Bocholt • Tel. 02871/92-0 • Telefax 02871/92-2596 • www.flender.com

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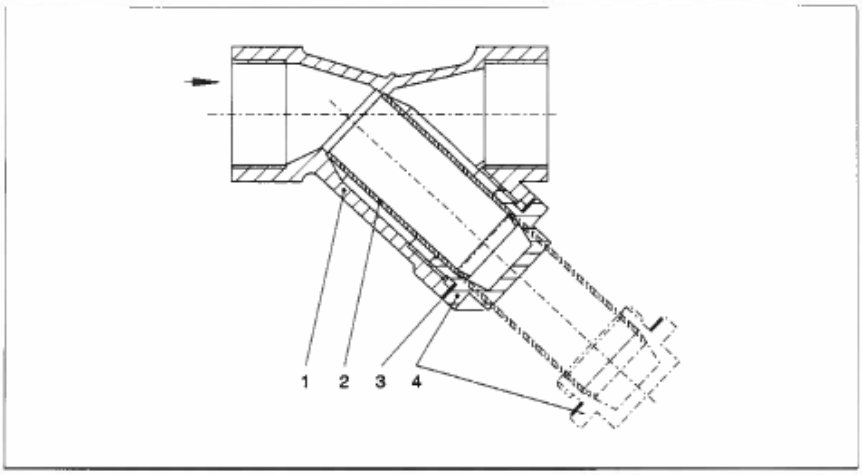
1. General

These Operating Instructions are binding for coarse filters according to FLENDER standard F 5911.

Caution! **Installation and start-up must be carried out by properly trained specialist personnel. Please read these operating instructions carefully before starting up. We accept no liability for personal injury or damage due to incorrect handling.**

The coarse filters can be used for mineral oil, synthetic oil and water.

Coarse filters comprise a housing with threaded connections (1), a filter element (2) and a drain plug (4) with a seal (3). The filter element consists of a bearer filter element with an additional fine-mesh inner filter element. The medium flows through the housing, the dirt particles carried in the line being retained by the filter element and collected in the filter basket.



1 Housing with threaded connections
2 Filter element
3 Seal
4 Drain plug

1.1 Proper use

Coarse filters filter only coarse dirt particles from the fluid flow, preventing spray nozzles, conduits and lines from becoming blocked. Similarly, systems, units and measuring and regulating equipment are protected against contamination.

Note: Any use other than that specified here is regarded as incorrect.

2. Warnings and symbols used in these Operating Instructions

⚠ This symbol indicates safety measures which must be observed to avoid **personal injury.**

Caution! This symbol refers to safety measures which must be observed to avoid **damage to the oil-supply system and gear unit.**

Note: This symbol indicates general **operating instructions** which are of particular importance.

3. Safety instructions

Caution! **Installation and start-up must be carried out by properly trained specialist personnel. Please read these operating instructions carefully before starting up. We accept no liability for personal injury or damage due to incorrect handling.**

⚠ **During operation the coarse filter is under pressure!**
Work should be done on the coarse filter only when it is in a pressure-free condition.

⚠ **Before work is carried out on the coarse filter or the system, the system must be taken out of operation!**

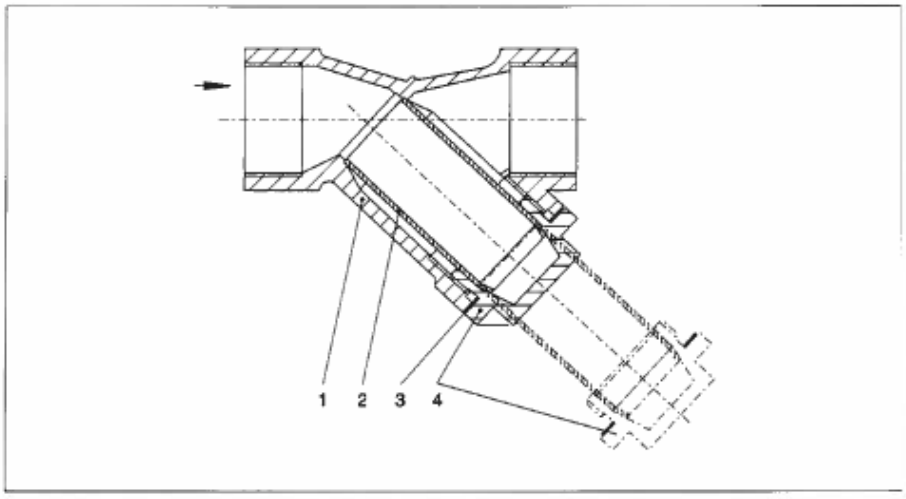
⚠ **Failure to observe the safety instructions may lead to serious injury from escaping hot operating media!**
When working on the coarse filter, personal safety equipment (safety gloves and safety glasses) must be worn!

4. Fitting

Caution! **Installation and start-up must be carried out by properly trained specialist personnel. Please read these operating instructions carefully before starting up. We accept no liability for personal injury or damage due to incorrect handling.**

Coarse filters must be fitted so that the direction of flow corresponds to the arrow on the housing. The filter basket must always point downwards. Sufficient fitting space must provided for cleaning or changing the filter element (see dimension H_2 in section 5.1).

Exceptionally, in the case of perpendicular lines with an upward flow the coarse filter must be fitted with the drain plug pointing upwards.



1 Housing with threaded connections
2 Filter element
3 Seal
4 Drain plug

Caution! **The threads, sealing surfaces and any gaskets or O-ring seals must not be damaged!**

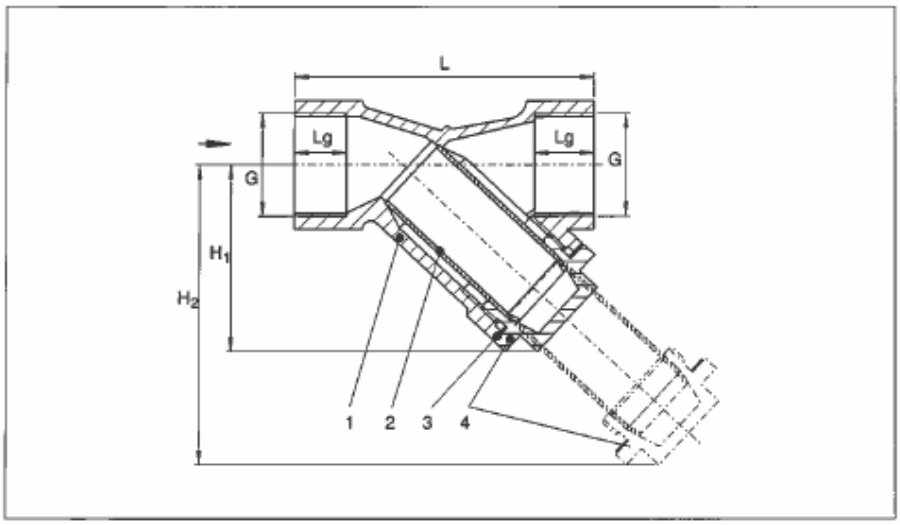
Caution! **The coarse filter must be allowed to heat up above 200 °C!**

⚠ **Remove any oil spillage immediately with an oil-binding agent.**
Oil leaks occurring during filling must be stopped immediately!
The local environmental protection requirements of the country concerned must be observed.

⚠ **Failure to observe the safety instructions may lead to serious injury from escaping hot operating media!**
When working on the coarse filter, personal safety equipment (safety gloves and safety glasses) must be worn!

5. Types and technical data

5.1 Type 1 NI



Connection size	G in inches	G 1/2	G 3/4	G 1	G 1 1/2	G 2
Overall length	L	65	75	90	120	150
Threaded length	Lg	11+1	12+1	14+1	18+1	20+1
Overall height	H_1	40	45	56	84	108
Overall height with filter element extended	H_2	61	75	90	134	158
Mesh opening	µm	250				
Flow rate	K_{vs} (m^3/h)	5.1	9.1	14.3	36.6	57
Free filter surface	cm^2	approx. 2.5 x pipe cross-section				
Weight	kg	0.2	0.3	0.47	1.35	1.9

6. Maintenance

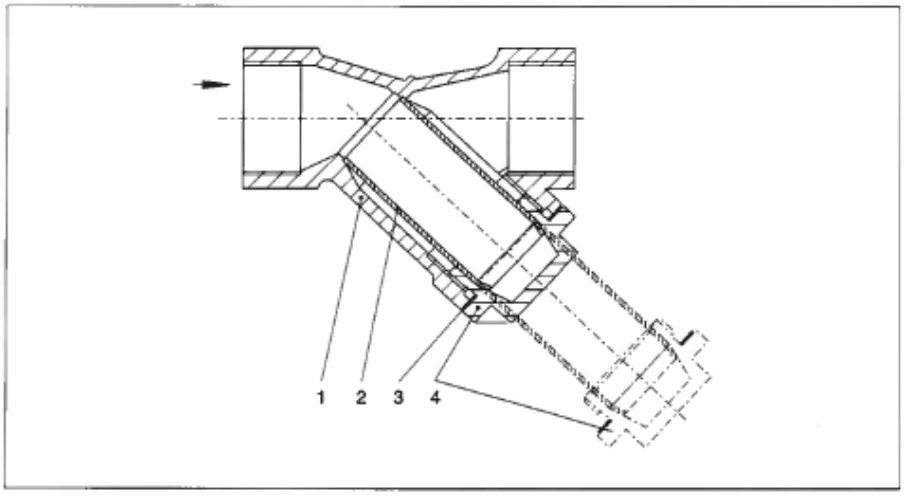
During operation the coarse filter is under pressure!
Work should be done on the coarse filter only when it is in a pressure-free condition.

Before work is carried out on the coarse filter or the system, the system must be taken out of operation!

Note: Appropriate measures must be taken to prevent the lines from emptying!

After regular maintenance work has been carried out, coarse filters must be checked for contamination which could impair the flow of medium and, if necessary, cleaned with benzine or compressed air. For this, the system part affected must first be taken out of operation, then the drain plug (4) undone and the filter element (2) pulled out. Damaged filter elements (2) and seals (3) must be replaced.

Failure to observe the safety instructions may lead to serious injury from escaping hot operating media!
When working on the coarse filter, personal safety equipment (safety gloves and safety glasses) must be worn!



1 Housing with threaded connections
2 Filter element
3 Seal
4 Drain plug

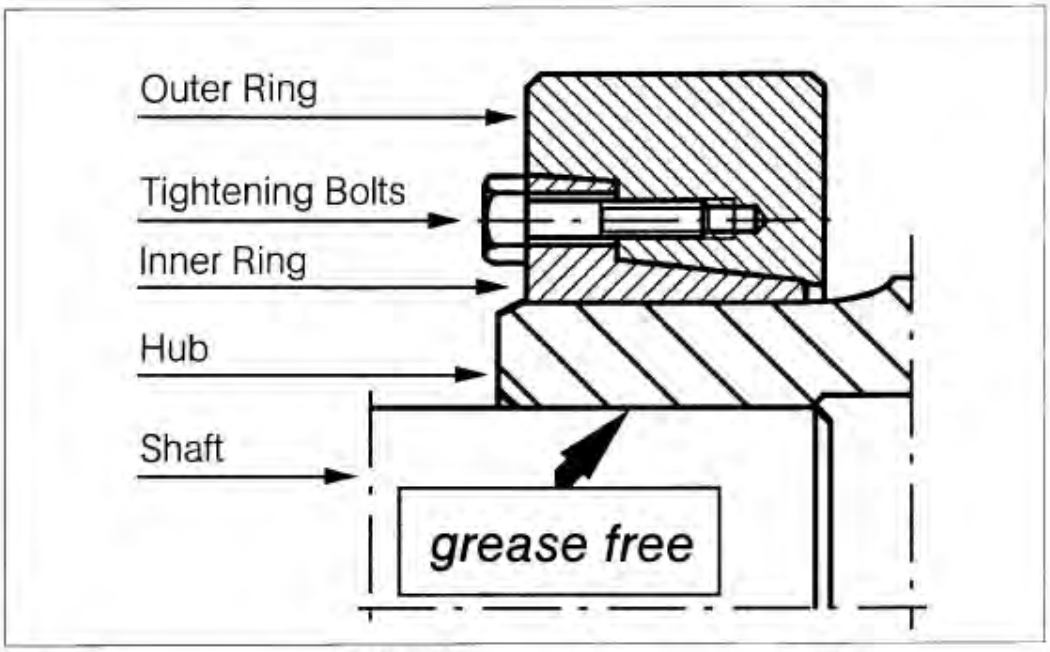
6.1 Environmental protection

- Any oil escaping while the oil is being changed or work is being done on the coarse filter must be caught in suitable receptacles. Any spillage of oil must be removed immediately.
- Used oil, preservative agent, oil-binding agents and oil-soaked cloths must be disposed of in accordance with environmental legislation.
- When changing oil, take care to prevent scalding by hot oil.

Remove any oil spillage immediately with an oil-binding agent.
Oil leaks occurring during filling must be stopped immediately!
The local environmental protection requirements of the country concerned must be observed.

1.1.3.11 Technical data shrink disk HSD 420-81 (equipment list)

STÜWE Frictional Connections	Mounting and Removal Instructions for Shrink Discs of Type HSD	HSD Ausgabe EDITION 10/01 | Page 1



Mounting
The shrink discs are supplied ready to be installed. Therefore they should not be dismantled prior to employing the unit for the first time.

1. Degrease shaft and hub bore.
2. Push shrink disc on hub. The outer surface of the hub may be greased in the area of the shrink disc fit.

CAUTION !
Do not tighten the tightening bolts before attaching the shaft.

3. Mount hub on the shaft.
4. Tighten all tightening bolts uniformly, one by one, over several revolutions until the outer ring and inner ring are in line and the full tightening torque is reached.

Demounting

1. Loosen all locking bolts uniformly one by one, initially not more than a quarter turn per bolt, until it is observed that the outer ring has released from the inner ring.

CAUTION !
Under no circumstances should the locking bolts be completely removed as this could be dangerous and result in injury.

2. Should the outer ring not-self release from the inner ring, this can be assisted by removing those locking bolts adjacent to the tapped holes provided for jacking purposes and screwing them into these tapped holes. The jacking procedure must continue until release of the outer ring is achieved.
3. Dismount shaft or draw off hub. Remove rust which may have formed on the shaft in front of the hub.
4. Remove shrink disc from hub.

Cleaning and greasing
Dismantled shrink discs do not have to be taken apart and regreased before remounting.
The shrink disc has to be cleaned and regreased only if employed in dirty environment.
Use a solid lubricant with a coefficient of friction of $\mu = 0{,}04$ for the **conical surfaces** as well as **bolts**.

Example:

Molykote 321 R Dow Corning	spray (varnish)
Molykote G Rapid Dow Corning	spray or paste
Molykote Spray Dow Corning	Spray (powder)
Aemasol MO 19 P A.C.Matthes	spray or paste
Unimoly P5 Klüber Lubric.	powder

Subject to modification

STÜWE
GmbH & Co. KG

Postfach 800557
D-45505 Hattingen

☎ (02324) *394-0
Telefax (02324) 39430

1.2 Assembly and operation instructions

Notes and symbols in these assembly and operating instructions

WARNING! Imminent personal injury!

The information indicated by this symbol is given to prevent **personal injury.**

WARNING! Imminent damage to the product!

The information indicated by this symbol is given to prevent **damage to the product.**

WARNING! Hot surfaces!

The information indicated by this symbol is given to prevent **risk of burns due to hot surfaces** and must always be observed.

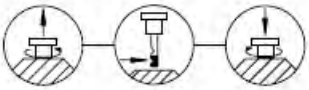
NOTE!

The information indicated by this symbol must be treated as general **operating information.**

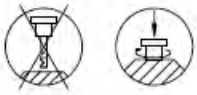
Earth connection point:			Air relief point:		yellow
Oil filling point:		yellow	Oil drain point:		white
Oil level:		red	Oil level:		red
Lubrication point:		red	Apply grease:		
Lifting eye:			Eye bolt:		
Do not unscrew:			Connection for vibration monitoring device:		

Alignment surfaces:

Horizontal:		Vertical:	



These symbols indicate the oil-level checking procedure using the oil dipstick.



These symbols indicate that the oil dipstick must always be firmly screwed in.

Note: The term "Assembly and operating instructions" will in the following also be shortened to "instructions" or "manual".

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1. Technical data

1.1 General technical data

The most important technical data (such as ident no., type, size, output data, speeds, lubricants) are shown on the rating plate. Refer to the separate data sheet "Technical data" for further details.

These data and the contractual agreements between Winergy and the customer for the gear unit determine the limits of its correct use.

2. General notes

2.1 Introduction

The present manual is an essential component of the gear unit delivery and the technical documentation and must always be kept safe in the vicinity of the gear unit.

All persons carrying out work on the gear unit must have read and understood these instructions and must adhere to them. Winergy accepts no responsibility for damage or disruption caused by disregard of these instructions.

The **"Winergy gear unit"** dealt with in these instructions has been developed for driving electricity generators in wind-energy conversion systems.

The gear unit is designed only for the application specified in section 1, "Technical data".

The gear unit described in these operating instructions reflects the state of technical development at the time these instructions went to print.

In the interest of technical progress we reserve the right to make changes to the individual assemblies and accessories which we regard as necessary to preserve their essential characteristics and improve their efficiency and safety.

2.2 Copyright

Technical enquiries should be addressed to the following works or to one of our customer services:

Winergy AG
Am Industriepark 2
D - 46562 Voerde-Friedrichsfeld

Tel.: +49 (0) 2871 / 92 0
Fax: +49 (0) 2871 / 92 2487
Internet: www.winergy-ag.com

3. Safety instructions

3.1 Proper use

- The gear unit has been manufactured in accordance with the state of the art and is delivered in a condition for safe and reliable use.
- The gear unit must be used and operated strictly in accordance with the conditions laid down in the contract governing performance and supply agreed by Winergy and the customer.

Entry to the gear unit is not permitted during operation!
Entry for maintenance and repair work is only permitted when the gear unit is at a stillstand!
Caution! Danger of dropping!

Any changes on the part of the user are not permitted. This applies equally to safety features designed to prevent accidental contact.

3.2 Obligations of the user

- The operator must ensure that everyone carrying out work on the gear unit has read and understood these instructions and is adhering to them in every point in order to:
  - avoid injury or damage.
  - ensure the safety and reliability of the unit.
  - avoid disruptions and environmental damage through incorrect use.
- During transport, assembly, installation, dismantling, operation and maintenance of the unit, the relevant safety and environmental regulations must be complied with at all times.
- The gear unit must be operated, maintained and/or repaired only by authorised, properly trained and qualified personnel.
- The outside of the gear unit must not be cleaned with high-pressure cleaning equipment.
- All work must be carried out with great care and with due regard to safety.

All work on the gear unit must be carried out only when it is secured to be at a standstill.
The drive unit must be secured against being switched on accidentally (e.g. by locking the key switch or removing the fuses from the power supply). A notice should be attached to the start switch stating clearly that work is in progress.

- No welding work must be done at all on the drive.
  The drives must not be used as an earthing point for welding operations. Toothed parts and bearings may be irreparably damaged by welding.
- A potential equalisation in accordance with the applying regulations and directives must be carried out! If no threaded holes for earth connection are available on the gear unit, other appropriate measures must be taken. This work must always be done by electrotechnical specialists.

If any inexplicable changes are noticed during operation of the gear unit, such as an important increase in temperature or unusual noises, the drive assembly must be switched off immediately.

Rotating and/or movable drive components must be fitted with suitable safeguards to prevent contact.

When the gear unit is incorporated in plant or machinery, the manufacturer of such plant or machinery must ensure that the contents of these instructions are incorporated in his own instructions.

- When removing the safety equipment the fixation means should be stored for later use. Removed safety equipment must be re-installed prior to starting up.
- Notices attached to the gear unit, e.g. rating plate, direction arrows etc., must always be observed. They must be kept free from dirt and paint at all times. Missing plates must be replaced.
- Screws which have been damaged during assembly or disassembly work must be replaced with new ones of the same strength class and type.
- Spare parts should always be obtained from Winergy (refer to section 11, "Spare parts, customer-service addresses".

3.3 Environmental protection

- Dispose of any packing material in accordance with regulations or separate it for recycling.
- When changing oil, the used oil must be collected in suitable containers. Any pools of oil which may have collected should be removed at once with an oil binding agent.
- Preservative agents should be stored separately from used oil.
- Used oil, preservative agents, oil-binding agents and oil-soaked cloths must be disposed of in accordance with environmental legislation.
- Disposal of the gear unit after its useful life:
  - Drain all the operating oil, preservative agent and/or cooling agent from the gear unit and dispose of in accordance with regulations.
  - Depending on national regulations, gear-unit components and/or add-on parts may have to be disposed of or sent for recycling separately.

3.4 Special dangers and personal protective equipment

- Depending on operating conditions, the surface of the gear unit may heat up or cool down to extreme temperatures.

In the case of hot surfaces (> 55 °C) there is a risk of burns!

In the case of cold surfaces (< 0 °C) there is a risk of frost injury (pain, numbness, frostbite)!

During oil changes there is a risk of scalding from escaping oil!

Small foreign matter such as sand, dust, etc. can get into the cover plates of the rotating parts and be thrown back by these.
Risk of eye injury!

In addition to any generally prescribed personal safety equipment (such as safety shoes, safety clothing, helmet) handling the gear unit requires wearing **suitable safety gloves** and **suitable safety glasses**!

The gear unit is not suitable for operation in explosion hazard locations. When operating in explosion hazard locations special additional safety procedures must be observed.

Before beginning work on oil-pressure lines and/or electrical systems the following must be ensured:
- **pressure lines must not be under pressure**
- **electrical systems must have been disconnected from the power mains.**

4. Transport and storage

Observe the instructions in section 3, "Safety instructions"!

4.1 Scope of supply

The products supplied are listed in the despatch papers. Check immediately on receipt to ensure that all the products listed have actually been delivered. Parts damaged and/or missing parts must be reported to Winergy in writing immediately.

STOP **If there is any visible damage, the gear unit must not be put into operation.**

4.2 Transport

When handling these products, use only lifting and handling equipment of sufficient load-bearing capacity!
Observe the notes regarding load distribution on the packing.

The gear unit is delivered in the fully assembled condition. Additional items (such as shrink disks, couplings, oil cooler, pipes and fittings) can be delivered separately packaged.

Different forms of packaging may be used, depending on the size of the unit and method of transport. Unless otherwise agreed, the packaging complies with the **HPE Packaging Guidelines.**

The symbols marked on the packing must be observed at all times. These have the following meanings:

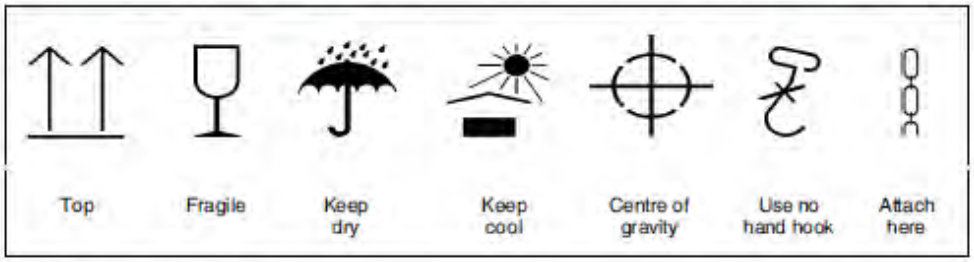

Fig. 1: Transport symbols

STOP **Transport of the gear unit must be carried out so as to avoid personal damage and damage to the gear unit.**
If, for example, the free shaft ends are knocked, this may damage the gear unit.
The gear unit must be moved only with the shaft in a horizontal position, as otherwise oil may escape by the labyrinth seals.

STOP **Use only the eyes provided to attach lifting equipment to the unit.**
Handling of the gear unit by attaching it to the piping is not permitted.
The pipework must not be damaged.
Slinging equipment must be adequate for the weight of the gear unit.

For the position of the attachment points, see the gear-unit drawing in the separate "Technical data" data sheet.

4.3 Storing the gear unit

The gear unit must be stored in the position of use in a sheltered place; it must be placed on a vibration-free, dry base and covered over.

When temporarily storing the gear unit and any single components supplied with it, the preservative agent should be left on them. It must not be damaged, otherwise there is a risk of corrosion.

Do not stack gear units on top of one another.

If the gear unit is being stored out of doors, it must be particularly carefully covered, and care must be taken that neither moisture nor foreign material can collect on the unit. Waterlogging should be avoided.

Unless otherwise agreed by contract, the gear units must not be exposed to harmful environmental factors such as chemically aggressive products.

Provision for special environmental conditions during transport (e.g. transport by ship) and intermediate storage (climate, termites, etc.) must be contractually agreed.

4.4 Standard coating and preservation

The gear unit is provided with an interior preservative agent; the free shaft ends are painted for protection.

The characteristics of the external coat depend on the ambient conditions stipulated in the order relating to method of transport and area of application.

Gear units are normally delivered completely ready, with a priming and finish coat.

Ensure that the coat is not damaged!

Any damage may cause failure of the external protective coating and corrosion. Visible damages to the coating must be repaired immediately.

Unless otherwise contractually agreed, the interior preservation is guaranteed for 24 months, and the preservation of the free shaft ends for 36 months, provided that storage is in dry, frostfree sheds.

The period of validity of the guarantee starts on the date of delivery of the gear unit.

The interior protection should be checked in case of protracted intermediate storage (> 6 months). If the corrosion protection is not renewed, the inspection is to be repeated every 3 months.

The exterior protection should be checked in case of protracted intermediate storage (> 12 months). If the external preservation is not renewed, the inspection should be repeated every 6 months.

5. Technical description

Observe the instructions in section 3, "Safety instructions"!

5.1 General description

The Winergy gear unit is normally fitted with the drive train of the wind-energy conversion system slightly inclined (rotor side pointing upward; for mounting position, see separate "Technical data" data sheet). The drive is effected via the rotor shaft (flange or shrink-disk connection), the output via the shaft to the generator.

5.2 Housing

The gear-unit housing comes with the following equipment:

- Lifting eyes (adequately dimensioned for transporting the gear unit)
- Inspection and/or assembly cover (for oil filling and/or inspection)
- Oil sight glass (for oil-level check)
- Oil-draining point (for changing the oil)
- Air filter (for venting)

Colour coding and symbols for identification of venting point, oil inlet, oil level and oil draining:

Air relief point:	yellow		Oil-draining point:	white	
Oil-filling point:	yellow		Lubrication:	red	
Oil level:	red				

☞ For the graphic representation of the gear unit, see the sketch of the gear unit (in the separate "Technical data" data sheet).

5.3 Shaft seal

The gear unit can be provided with contactless labyrinth, gap seals or radial-shaft rings.

☞ The labyrinth or gap seals are effective only in the specified mounting position with the specified oil filling. During transport and assembly the gear units must be moved only with the shaft continually in the horizontal position.

V-rings and/or felt rings protect the labyrinth or gap seals against dirt.

5.4 Oil supply to the gear unit

The oil supply to the various gear-unit components can be secured by means of:

- dip and splash lubrication system.
- pressure lubrication.

Also a combination of both versions is possible.

6. Fitting

Observe the instructions in section 3, "Safety instructions"!

6.1 General information on fitting

When transporting the gear unit observe the notes in section 4, "Transport and storage".

Fitting work must be done with great care by authorised, trained and qualified personnel. The manufacturer cannot be held liable for damage caused by incorrect assembly and installation.

During the planning phase sufficient space must be allowed around the gear unit for later care and maintenance work.

Adequate lifting equipment must be available before beginning the fitting work.

Use only the eyes provided to attach lifting equipment to the unit.
Handling of the gear unit by attaching it to the piping is not permitted.
The pipework must not be damaged.
Do not use the front threads at the shaft ends to attach slinging equipment for the transport.
Slinging equipment must be adequate for the weight of the gear unit.

No welding work must be done at all on the drive.
The drives must not be used as an earthing point for welding operations.
Toothed parts and bearings may be irreparably damaged by welding.

All the fastening points provided by the design of the unit must be used.
Screws which have been damaged during assembly or disassembly work must be replaced with new ones of the same strength class and type.

For the position of the attachment points, see the sketch of the gear unit (in the separate "Technical data" data sheet).

To ensure proper lubrication during operation, the mounting position specified on the drawings must always be observed.

6.2 Foundation

The foundation must be sufficiently stable and distortion-resistant. The foundation must designed so that reactive forces from the gear unit can be supported and no sympathetic vibrations can occur.

6.3 Description of installation work

6.3.1 Unpacking

The products supplied are listed in the despatch papers. Check immediately on receipt to ensure that all the products listed have actually been delivered. Parts damaged and/or missing parts must be reported to Winergy in writing immediately.

- Remove packaging material and transporting equipment and dispose of in accordance with regulations.
- Perform a visual check for any damage and contamination.

If there is any visible damage, the gear unit must not be put into operation. The instructions in section 4, "Transport and storage", must be observed.

6.3.2 Removing corrosion-preventive agent

- Remove the corrosion-preventive agent from the marked surfaces using a suitable cleaning agent.

For the surfaces treated with preservative agent, refer to the preservation drawing (see the separate "Technical data" data sheet). Other surfaces must not come into contact with the solvent.

The cleaner must not be allowed to come into contact with the shaft-seals.

Ensure adequate ventilation. Do not smoke!
Danger of explosion.

Avoid burns when working with corrosive cleaning agents. Always observe the manufacturers' instructions for safety and use.

6.3.3 Fitting coupling elements

- Couplings and/or coupling parts must be fitted with suitable pulling-on devices.

The parts must not be driven on by abrupt force, as this may damage the gear unit.
The shaft-sealing rings and running surfaces of the shaft must not be damaged when pulling in the coupling parts.

When pulling on couplings and/or coupling parts hot, the joining temperature must not exceed 100 °C.

For maintenance and operation of the couplings, refer to the specific operating instructions for the couplings.

Take precautions to avoid burns from hot components!
Wear suitable protective gloves!

Protect shaft seals from damage and heating to over + 100 °C (use heat-protective screens to protect against radiant heat).

Flange surfaces can be coated with friction modifier. These surfaces are specified on the dimension drawing (for drawing numbers see the separate "Technical data" data sheet).

The safety equipment for surfaces with friction modifier must only be removed just before assembly. If this surface is damaged or contaminated with oil and/or grease, always contact Winergy first.
In such cases the gear unit must not be put into operation.

Depending on the order, the gear unit may be fitted with a shrink disk. Information about this is contained in the separate "Technical data" data sheet and the list of equipment. The fitting dimension of the shrink disk is specified on the dimensioned drawing (see separate "Technical data" data sheet).

Observe the operating instructions to the oil-supply system.

6.3.4 Fitting the gear unit

The gear unit must be so aligned in the wind-energy conversion system that no axial load from the axial thrust of the rotor can act on the gear unit.

For a precise gear mounting position the gear unit input shaft (drive shaft) must be precisely aligned with the rotor shaft. Deformation of the gear unit relative to the rotor shaft and/or the foundation is not permissible in the load-free condition.

For specifications and instructions for aligning the gear unit output shaft (drive shaft) relative to the generator shaft, please refer to the system manufacturer's operating instructions.

☞ If a shrink disk is used, the shrink-disk operating instructions must be observed.

6.3.5 Gear unit with oil-supply system

- Remove the closing sockets of the suction and delivery lines prior to connecting the system.
- Fit the system to the gear unit or install it separately in accordance with the drawings supplied in the gear-unit documentation.

☞ The pipework and flexible hose connections must not be overstressed during the mounting procedure. No additional stresses must occur, even during operation.

STOP **Consult operating instructions for oil-supply system.**

☞ For technical specification of the oil-supply system, refer to separate "Technical data" data sheet.

6.3.6 Gear unit with heating element

- Connect heating element electrically.

6.3.7 Gear units with flow heater

- Connect the flow heater to the gear unit.

6.3.8 Gear unit with oil-level monitoring

- Connect oil-level monitor electrically.

☞ When filling the gear unit with oil, the oil-level monitor must be checked for correct function!

6.3.9 Final work

- After installation of the gear unit check all screw connections for tight fit.
- Check the alignment after tightening the fastening elements (the alignment must not be changed).
- Check that all the devices which have been demounted for transport reasons have been refitted.
  - To this purpose refer to the details in the separate "Technical date" data sheet and the associated drawings.
- Observe the operating instructions to the add-on parts.
- Check the tightness of the gear-unit.
- Check the opening condition of the stop valves.
  - Oil drain cock **closed**.
  - All other stop valves **open**.

6.4 Fastening bolts

For the tightening-torque values, see the assembly drawing (in the separate "Technical data" data sheet). Observe the tightening procedure detailed in item 6.4.1!

Lightly oiled steel bolts, black-annealed or phospatised should be used with this gear unit. The nating threads must have dry, cut threads with untreated surface (black phosphatised), not or slightly oiled, of steel or cast iron. Lubricants must not be used, because they may overload the screw connection.

6.4.1 Tightening procedure

One of the following tightening procedures must be applied to fastening bolts with specified tightening torque:

- hydraulic tightening with mechanical screwdriver
- torque-controlled tightening with torque wrench or signal-emitting torque wrench
- Tightening with precision mechanical screwdriver with dynamic torque measuring

☞ Usually the specified tightening processes lie within the stated tool distribution of ± 10 %.
The distribution range must not be exceeded!

6.4.2 Fastening bolts without specified tightening torque

☞ The tightening torques specified in table 1 apply to the generally usual fastening bolts (eg. inspection-hole bolts).
The toool distribution must here be max. 50 % of the specified tightening torque.

Table 1: Tightening torques applying to bolts without specified tightening torque

Thread size	Tightening torque per bolt Strength class 8.8 Nm
M 10	34.3
M 12	59
M 16	143
M 20	280
M 24	470
M 30	930
M 36	1600

☞ Damaged bolts must be replaced with new bolts of the same type and strength class.

7. Start-up

Observe the instructions in section 3, "Safety instructions"!

7.1 Procedure before start-up

STOP **The gear unit must not be started up if the required instructions are not to hand.**

7.1.1 Gear unit with oil-supply system

- Observe the operating instructions for the oil-supply system (see separate "Technical data" data sheet).
- Check the correct function of oil-supply system.

7.1.2 Filling with lubricant

The opening of the lubricant orifice is indicated on the dimensioned drawing (see separate "Technical data" data sheet).

STOP **Before the inspection cover and the seal are lifted, dirt and paint particles must be removed to prevent them falling into the interior of the gear unit. Screws and tools must be kept in a safe place before lifting the inspection cover.**

- Undo and remove the fastening bolts of the inspection cover, and keep them safe for later use.
- Remove the inspection cover with seal from the housing (seal will be used again).
- Fill the gear unit with cleaned oil (for purity class, see separate "Technical data" data sheet).

If no oil-purity class has been specified, the oil to be filled in should have at least purity class -/14/11 to ISO 4406.

- Record the purity class.

STOP **If oil pockets are provided (see separate "Technical data" data sheet) they must be filled with oil. The teeth must also be lubricated with oil.**

Remove any oil spillage immediately with an oil-binding agent.

On gear units with add-on flange pump, the flange pump, incl. suction line must be filled with oil by way of the filling screw.

- Check oil level.

STOP **The oil level must be checked while the oil is foam-free.**

The oil level should be at the top mark of the oil-sight glass during gear-unit standstill.

- Ensure that the gear unit and all the components of the oil-supply system are filled with oil.
- Place the inspection cover and seal on the housing again and thus cover the inspection hole.
- Screw the fastening bolts in and tighten them to the specified torque (for tightening torque, see item 6.4).

7.2 Start-up

- Check the oil level (see item 7.1.2) and, if necessary, top up oil.

7.2.1 Gear unit with oil-supply system

Pre-lubrication phase:

- Prior to start-up, the gear unit should be prelubricated for approx. 3 minutes by means of the oil-supply system.
- During this time, rolling bearings and gear teeth will be adequately supplied with oil for start-up. It must also be ensured that the all the pipings and components are filled with oil.
- Check the opening condition of the stop valves:
  - Oil drain cock **closed**.
  - All other stop valves **open**.

7.3 Checks during start-up

The following visual checks must be conducted during operation:

- Tightness of the oil-supply system.
- Opening condition of the stop valves.
- Leaktightness of the shaft seal on the gear unit.
- Freedom of the rotating parts from contact.
- The gear unit must be checked for leaks before starting it up and leaks must be prevented during operation.
- Leaktightness and oil level must be checked once again no later than 14 days after start-up.

8. Operation

Observe the instructions in section 3, "Safety instructions"!

8.1 Working values

To ensure that the system runs correctly and faultlessly, the operating values must be adhered to (see separate "Technical data" data sheet).

8.2 Removal from service

When the wind-energy conversion system is shut down, the drive train must be allowed to spin freely. For further information on the free-spin operation, refer to the separate "Technical data" data sheet.

Fastening on the generator shaft must be avoided and is not permitted for longer than 1 week. If the system nevertheless has to be fastened, this must preferably be done via the rotor locking system.

Fastening on the generator shaft can cause damage to the tooth flanks in the form of standstill marks.

The following requirements additionally apply to start-up after long periods at a standstill with fastening on the rotor shaft:

Table 2: Procedure before re-start-up

Period	Measures
up to **3** months	none
3 to **12** months	Maintenance instructions in accordance with section 10. Start-up instructions in accordance with section 7.
more than **12** months	Preservation procedure in accordance with section 10. Maintenance instructions in accordance with section 10. Start-up instructions in accordance with section 7.

9. Faults

Observe the instructions in section 3, "Safety instructions", and in section 10, "Maintenance and repair"!

9.1 General

The following irregularities can serve as a guide for fault tracing. Where the system is a complex one, all the other component units must be included when tracing faults. We therefore recommend that, if case of a fault, the manufacturer of the wind-energy conversion system be consulted when tracing possible causes.

☞ Faults occurring within the fault limitation period must be notified to the manufacturer of the wind-energy conerversion system.

9.2 Possible faults

☞ To rectify faults, the customer service of the manufacturer of the wind-energy conversion system must be consulted.

Table 3: Faults, causes and remedies

Possible faults	Possible causes	Possible remedy
Noise.	Bearing defective.	Replace defective bearings.
	Teeth defective.	Check teeth for damage and, if necessary, replace.
	Loose add-on parts.	Check fastening of add-on parts and, if necessary, fasten or repair.
	Loose gear unit fastening.	Check fastening of the gear unit and, if necessary, fasten or repair.
	Pump defective.	Replace defective pump.
	Coolers defective.	Replace defective coolers.
Temperatures.	Oil level outside the permitted range.	Adjust oil level in accordance with section 7.
	Oil-supply system defective.	Check oil-supply system and, if necessary, repair.
	Bearing defective.	Replace defective bearings.
	Teeth defective.	Check teeth for damage and, if necessary, replace.
	Ambient temperature beyond the permitted range.	Shut down gear unit (note limit values of permitted temperature).
Leaks.	Oil level outside the permitted range.	Adjust oil level in accordance with section 7.
	Oil-supply system leaky.	Check oil-supply system and, if necessary, repair.
	Shaft exit holes leaky.	Check oil level and, if necessary, adjust in accordance with section 7.
	Part joints leaky.	Check bolt tightening torques and, if necessary, adjust. (See item 6.4).
	Valves and screw plugs leaky.	Inspect valves and, if necessary, reseal.

10. Maintenance and repair

Observe the instructions in section 3, "Safety instructions"!

10.1 General

☞ All maintenance and servicing work must be recorded in the separate service schedule specially provided.

10.2 Service schedule

Each gear unit is assigned a separate service schedule. In the interest of further development we reserve the right to make changes to this service schedule.

Complete proof of inspection and maintenance work carried out is essential for fault liability claims.

This service schedule is an essential component of the gear unit delivery and the technical documentation and must always be kept safe in the vicinity of the gear unit.

Inspection and maintenance work must be carried out only by Winergy or by service personnel authorised by Winergy.

On completion of the order the inspection and maintenance work must be confirmed in the service schedule provided. This must be documented with the stamp and signature of the authorised service workshop.

10.3 Maintenance schedule for gear unit

Table 4: Maintenance and repair work

Interval	Measures	Remarks
permanent	Check the oil temperature (oil sump, bearings and, if provided, sensors)	For operating values, see separate "Technical data" data sheet
	Check oil pressure (if pressure lubrication provided)	For operating values, see separate "Technical data" data sheet
14 days after start-up	Check leaktightness	see item 7.3
	Check oil level.	see item 7.1.2
Every 6 months	Check leaktightness	see item 7.3
	Check oil level	see item 7.1.2.
	Check oil filter	see item 10.5
	Cleaning air filter	see item 10.6
	Check gear unit internals	see item 10.10
Every 12 months	Check oil	
	Cleaning air filter	see item 10.6
	Checking hose lines	see item 10.11
Every 2 years	Change oil in case of mineral oil	Oil check yearly. If the necessary oil values (viscosity, ageing, fouling, water content, etc.) are not met, an oil change more frequently than every 2 years is necessary; see item 10.4
Every 3 years	Change oil in case of synthetic oil	Oil check yearly. If the necessary oil values (viscosity, ageing, fouling, water content, etc.) are not met, an oil change more frequently than every 3 years is necessary; see item 10.4

10.4 Change oil

Observe the instructions in item 7.1.2.

When changing the oil, always re-fill the gear unit with the same type of oil. Never mix different types of oil and/or oils made by different manufacturers. Never mix synthetic oils with mineral-based oils or with other synthetic oils. If changing to a different oil grade, please consult Winergy first.

Drain the oil while it the gear unit is still warm, immediately after shutting down the machinery.

When changing the oil, the housing must be thoroughly flushed with oil to remove sludge, metal particles and oil residue. Use the same type of oil as is used for normal operation. High-viscosity oils must be heated beforehand using suitable means. Ensure that all residues have been removed before filling with fresh oil.

There is a danger of scalding from the hot oil emerging from the housing. Wear protective gloves.

- Place a suitable container under the oil-draining point of the gear-unit housing.
- Unscrew oil drain plug or open oil drain cock and drain the oil into the collecting container.
- Drain the oil from the oil-supply system (see operating instructions to the oil-supply system).

Check the condition of the sealing ring (the sealing ring is vulcanised onto the oil drain plug). If necessary, use a new oil drain plug.

- Clean the permanent magnet of the oil-drain plug (if available) thoroughly.
- Screw in the oil drain plug or close oil drain cock again.
- Clean the oil filter in the oil-cooling system (see item 10.5).
- Fill fresh oil into the gear unit (see item 7.1.2).

10.5 Check oil filter

The operating instructions for the respective type of oil filter used must be observed.

10.6 Cleaning the air filter

The operating instructions for the respective type of air filter used must be observed.

10.7 Fastening bolts

- Check tightness of all fastening bolts.

Damaged bolts must be replaced with new bolts of the same type and strength class (for tightening torques, see item 6.4).

10.8 Oil-supply system

Observe the operating instructions of the oil-supply system and ist components.

10.9 Oil level / refill oil

Observe item 7.1.2 when checking the oil level and topping up the oil.

10.10 General inspection of the gear unit

☞ Observe the instructions in item 7.1.2.

The visual check of the interior of the gear unit is carried out through the opened inspection cover(s).

10.11 Checking hose lines

Even when adequately stored and subjected to permissible loads, hoses and hose lines are subject to a natural ageing process. This limits their period of use.

STOP **The period of use of the hose lines must not exceed 6 years from the manufacturing date stamped on them.**

The period of use can be determined using available test and empirical values, taking into account the conditions of use.

☞ The operator of the system must ensure that hose lines are replaced at suitable intervals of time, even if no defects which may affect their safe operation are identifiable on them.

Hose lines must be inspected for safe working condition by an expert before the wind-energy conversion system is first put into operation and thereafter at least once a year.

STOP **If during inspections faults are found, these must be rectified immediately or suitable countermeasures taken.**

10.12 Lubricants

Only the lubricants specified in the separate "Technical data" data sheet have been approved for the gear unit.

11. Spare parts, customer-service addresses

11.1 Stocking spare parts

To order spare parts, refer to the spare-parts list.

Use only genuine Winergy spare parts as replacement parts.

STOP **We guarantee only the original spare parts supplied by us. Non-original spare parts have not been tested or approved by us. They may alter technical characteristics of the gear unit, thereby posing an active or passive risk to safety. Winergy will assume no liability or guarantee for damage caused by spare parts not supplied by Winergy. The same applies to any accessories not supplied by Winergy.**

When ordering spare parts, always state the following:

Order No. (see rating plate)
Part number
Quantity

11.2 Contact

Winergy AG
Am Industriepark 2
D - 46562 Voerde - Friedrichsfeld
Internet:

Tel.: +49 (0) 2871 / 92 0
Fax: +49 (0) 2871 / 92 2487

www.winergy-ag.com

12. Declaration by the manufacturer, declaration of incorporation

Declaration by the manufacturer

in accordance with EC Machinery Directive 98/37/EC, Appendix II B

We hereby declare that the components described in these assembly and operating instructions:

Winergy gear unit

are intended for incorporation in a machine, and that it is prohibited to put them into service before verifying that the machine into which they are incorporated complies with the EC Directive (original edition 98/37/EC including any subsequent amendments thereto).

This Declaration by the Manufacturer takes into account all the unified standards (inasmuch as they apply to our products) published by the European Commission in the Official Journal of the European Community.

This Declaration by the manufacturer is valid until 28.12.2009. The new Directive 2006/42/EC takes effect on 29.12.09. At this date this Declaration by the manufacturer will be superseded by the Declaration of incorporation attached as Annex II 1 B to this new directive.

Bocholt, 2009-11-24

Dr. Ralf Martin Dinter (Director Engineering Winergy)

Declaration of Incorporation

in accordance with Directive 2006/42/EC, Annex II 1 B

The manufacturer, A. Friedr. FLENDER AG, D - 46393 Bocholt, declares with regard to the partly completed machinery,

Winergy gear unit

developed for driving electricity generators in wind-energy conversion systems:

- The special technical documents described in Annex VII B have been prepared.
- The following basic health and safety requirements set out in Directive 2006/42/EC, Annex I, are applied and are satisfied:
  1.1, 1.1.2, 1.1.3, 1.1.5; 1.2.4.4, 1.2.6; 1.3.1 - 1.3.4, 1.3.6 - 1.3.8.1; 1.4.1, 1.4.2.1
  1.5.1 - 1.5.6,1.5.8 - 1.5.11, 1.5.13, 1.5.15, 1.5.16; 1.6.1 - 1.6.3; 1.7.1, 1.7.1.1, 1.7.2, 1.7.3 - 1.7.4.3
- The partly completed machinery must not be put into service until it has been established that the machinery into which the partly completed machinery is to be incorporated has been declared in conformity with the provisions of Directive 2006/42/EC, as appropriate,.
- The manufacturer undertakes, in response to a reasoned request by the national authorities, to transmit in electronic form relevant information about the partly completed machinery.
- The person authorised to compile the relevant technical documentation is:
  Dr. Ralf Martin Dinter (Director Engineering Winergy)

This Declaration of incorporation takes effect on 29.12.09. It supersedes the Declaration by the manufacturer made in accordance with Directive 98/37/EC, Appendix II B.

Bocholt, 2009-11-24

Dr. Ralf Martin Dinter (Director Engineering Winergy)

Bocholt, 2009-11-24

Dr. Volker Kreidler (Director Business Segment Wind)