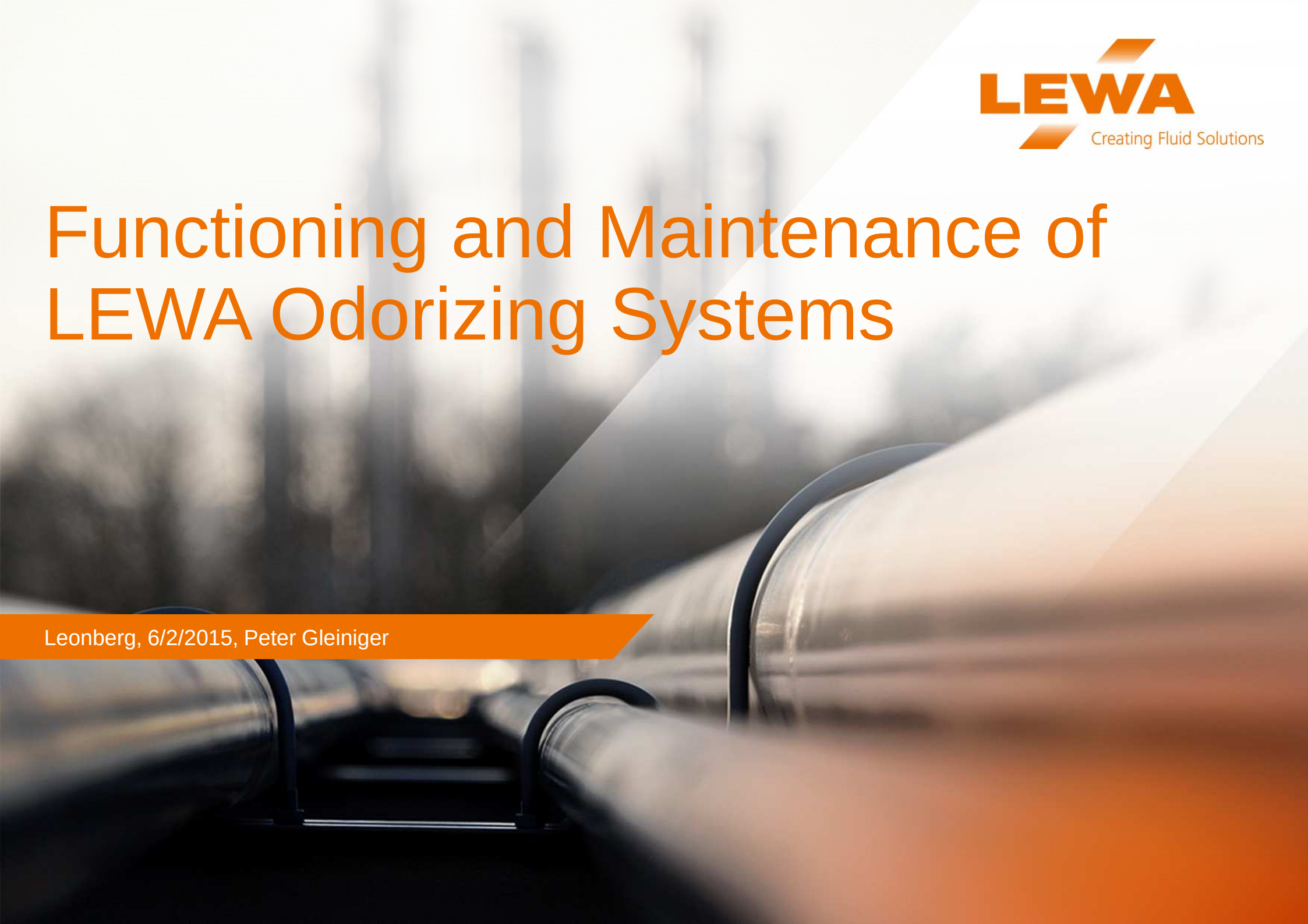
LEWA
Creating Fluid Solutions

Operation and Maintenance of LEWA odourizing systems (S3)

Training handout

LEWA Academy



LEWA
Creating Fluid Solutions

Functioning and Maintenance of LEWA Odorizing Systems

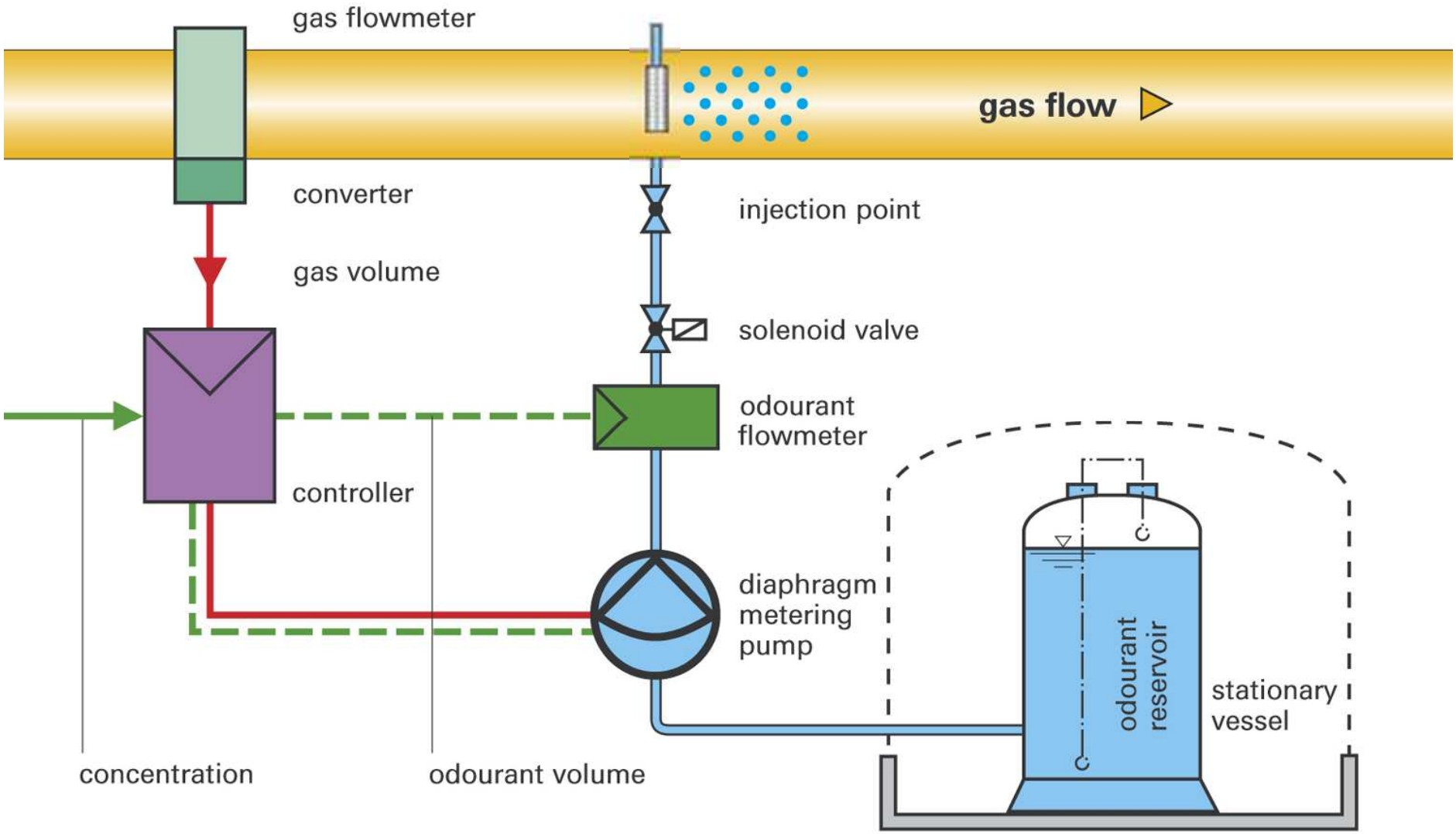
Leonberg, 6/2/2015, Peter Gleiniger

Overview

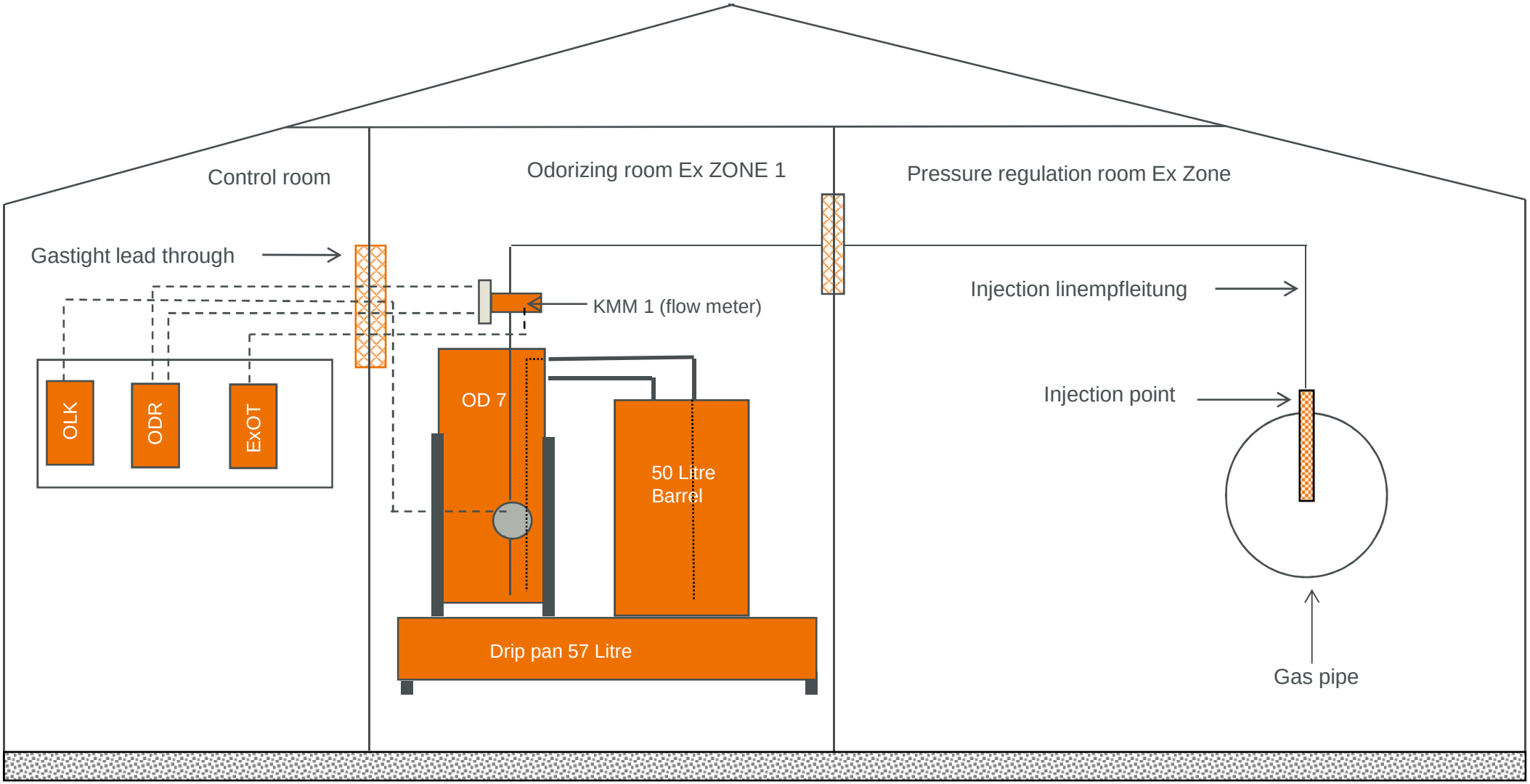
- Principle of the Odorization
- LEWA Pumps for Odorizing
- LEWA Control units for Odorizing
- LEWA Standard Odorizing systems
- Customer Benefit Arguments
- What data is required for the design ?
- Odorization units – not only for odorant
- LEWA customised Odorizing systems
- The new odorant Gasodor TM S-Free TM

Typical example of an odorant system (located in France)

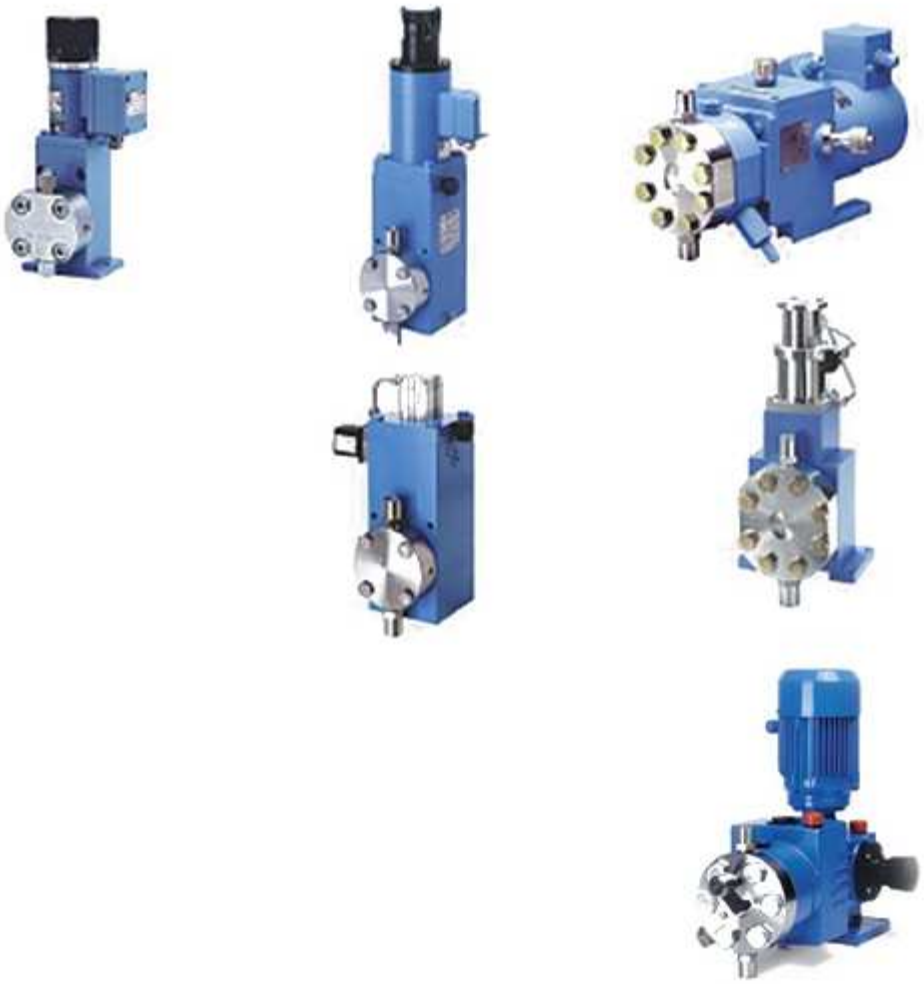
Principle of the odorization



Assembly control station



LEWA Pumps for Odorizing



Series: MAH, MBH, MLM

Flow rate: 0,001 – 22,5 l/h

Discharge pressure: 0,1 – 250 bar

flow: 0,003 gph -5,9 gph

pressure: 1,5 PSI – 3625,9 PSI

Series: PBH, PKH

Flow rate: 0,1 – 10 l/h

Discharge pressure: 0,1 – 250 bar

flow: 0,3 gph – 2,6 gph

pressure: 1,5 PSI – 3625,9 PSI

Series: LDB

Flow rate: 0,25 – 200 l/h

Discharge pressure: 0,1 – 250 bar

flow: 0,66 gph – 52,83 gph

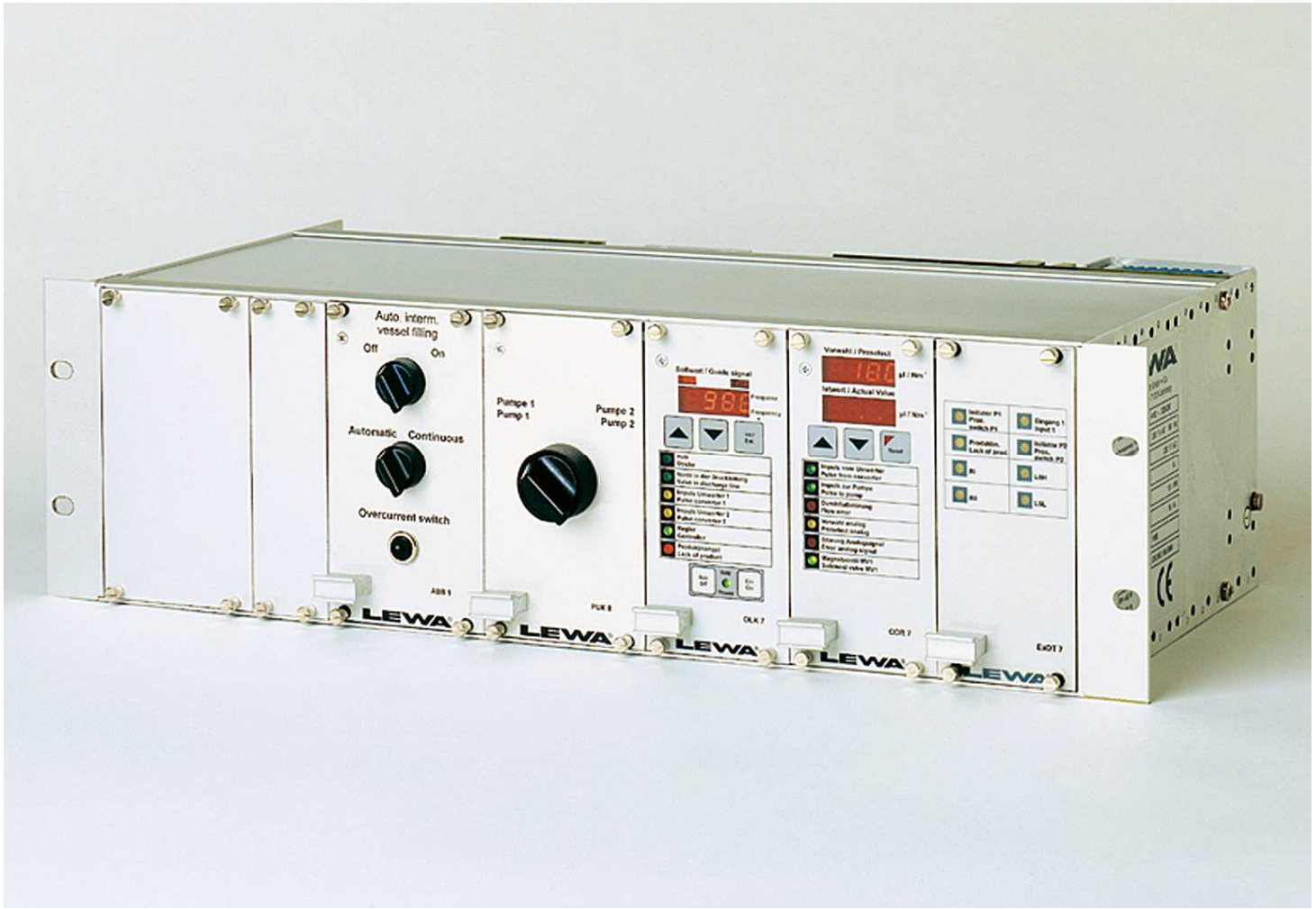
pressure:1,5 PSI – 3625,9 PSi

LEWA Control Units for Odorizing

– wall mounting housing with standard cards

– OLK 7
– ODR 7
– ExOT 7
– PUK 8

LEWA Control Units for Odorizing



- 19“ Rack with
- standard cards

- OLK 7
- ODR 7
- ExOT 7
- PUK 8
- ABB 1

LEWA Control Units for Odorizing

- 19” Rack with
- standard cards

- OKR 7
- ExOT 7
- FMC 671

LEWA Control Units for Odorizing

– OEXD
  for Div. 1 / EX PROOF

LEWA Standard Odorizing Systems

– OD 8

– MAH
– drip pan
– KMM1
– solenoid valve
– 50 GAL drum
– air pump

LEWA Standard Odorizing Systems

– OD 450

– 4 x MBH
– drip pan
– 4 x KMM1
– 4 x solenoid valve
– 1 x SV filling line
– flame arrestor
– terminal box
– filling hose

LEWA Odorizing Systems

– LEWA systems delivered in 1999 / 2000
– Sizes:
  300 l
  500 l
  800 l
  1.200 l

The new odorant GasodorTM S-FreeTM

– For GasodorTM S-FreeTM is the first approved sulphur-free odorant

– Manufacturer: Symrise GmbH + Co. KG (www.gasodor-s-free.com)

– Chemical composition:

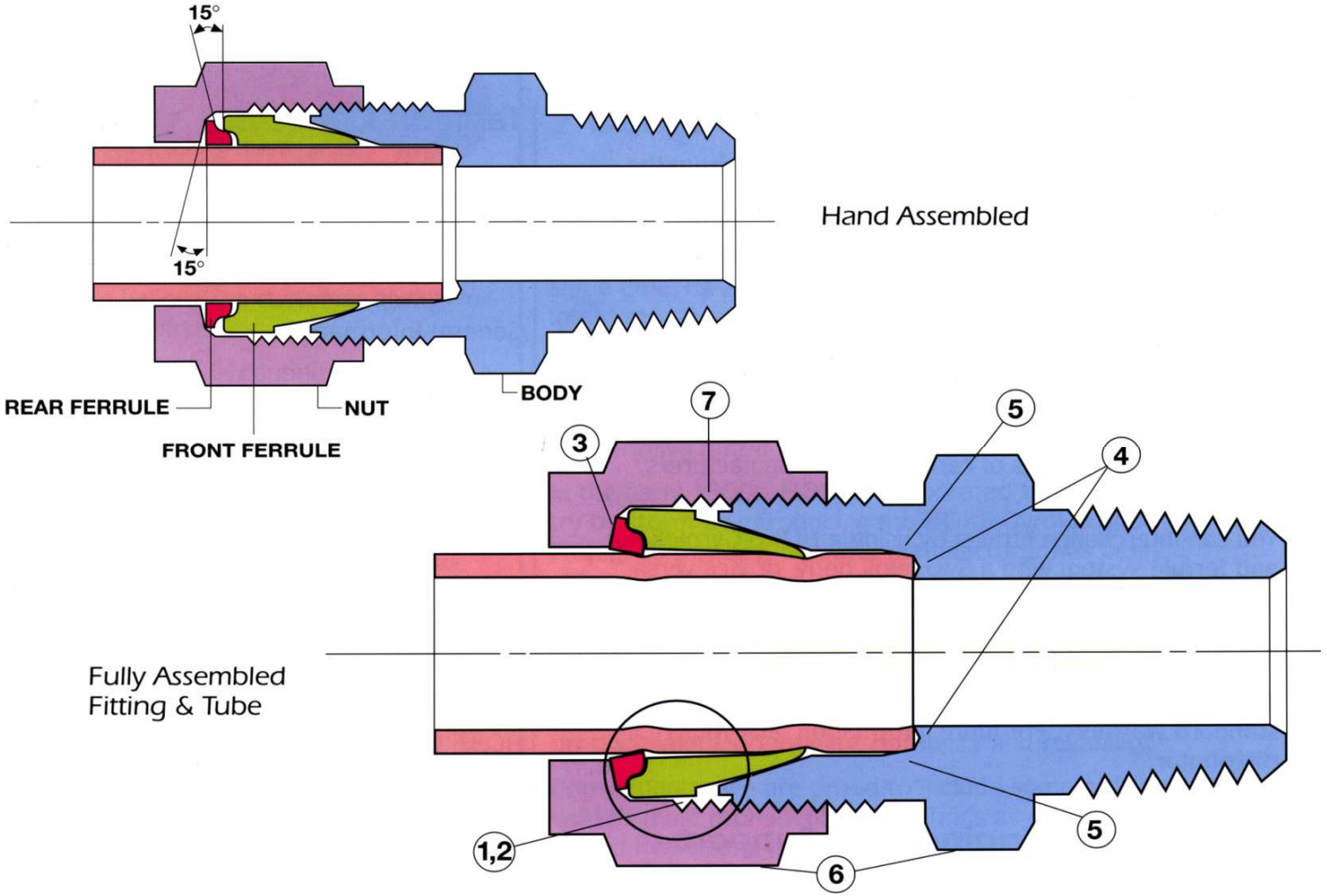
Methyl acrylate	37.4 %
Ethyl acrylate	60.0 %
Ethyl-methylpyrazine	2.5 %

– Why a new odorant? reduction of SO2 emission,
less corrosion,
suitable for fuel cells

– What will change:
- since January 2006, supply of S-free design only
- redundant design becomes increasingly important

LEWA Odorizing Systems

Features and benefits



Injection point

LEWA Standard Odorizing Systems

– Exhibition unit

– OD 60
– drip pan
– 2 x MAH
– 1 x KMM1
– 1 x LFM 10
– 1 x solenoid valve
– 1 x SV filling valve
– level probe
– terminal box
– OKR 7 19”-Rack

LEWA Customized Odorizing Systems

- 2.642 GAL Tank
- 4 x EK1
- control cabinet
- USV, 3h

LEWA Customized Odorizing Systems

2.642 GAL Tank, 264 GAL Tank in SS cabinet, 2 x LDB Pumps

LEWA Customized Odorizing Systems

TBC dosing unit

Customer Benefit Arguments

– For all kinds of gases
(natural gas, liquefied propane gas (LPG), oxygen, hydrogen, etc.)
– Solenoid pumps
(wide control range via stroke frequency >1:1,000)
– Metal diaphragm
(absolutely tight pump head, no obnoxious smell)
– Closed loop control
(regulations, pressure fluctuations, less personnel)
– Pneumatic pumps also available
(if no power is available on site)

What data is required for the design?

– Q max: Gas flow
– P max: Pressure at the injection point
– Ambient conditions:
  Temperature
  Installation indoor / outdoor
  Maritime / continental climate
– How is the odorant supplied
  (in barrels / by tank truck)
– Control
  (for hazardous area / for non-hazardous area)
– Power supply

Who are our contact persons / possible customers ?

– Engineering companies for gas pressure control units (GPC units)
– Packagers for GPC units
– Operators of GPC units
– Odorant suppliers
(e.g. Philipps Petroleum / Arkema / Symrise)
– Shipyards / steel works
(oxygen odorisation)
– Refineries (producers of liquid gas, Propane / Butane)
– Engineering companies for biogas systems

Odorization Units – not only for Odorant

- Requirements:
  - Flow < appr. 2 l/h (0.53 GPH)
  - Pressure appr. 20 - 250 bar (290 - 3626 PSI)
  - Viscosity < 50 cP
  - Wide control range (up to 1: 1.000)
  - Fluid in 50 or 200l containers

- Examples:
  - TBC unit (tertiary butyl cathechol) (OD240 in cabinet)
  - DMDS unit (dimethyl sulphide)(OD7 in cabinet / OD8 in cabinet)
  - Perchloroethylene unit (OD60)

Your partner at LEWA

- Product Manager:
  - Mr. Richter, Phone: +49 (0)7152-14-1375 Fax: 14-2375,
    e-mail: walter.richter@lewa.de

- Sales packages:
  - Mr. Richter, Phone: +49 (0)7152-14-1375, Fax: 14-2375,
    e-mail: walter.richter@lewa.de
  - Mrs. Heinsohn, Phone: +49 (0)7152-14-1384, Fax: 14-2384,
    e-mail: karin.heinsohn@lewa.de

- Service and maintenance / Sales spare parts:
  - Mr. Keller, Phone +49 (0)7152-14-1338, Fax: 14-2338,
    e-mail: guenter.keller@lewa.de

- Special controls related questions:
  - Mr. Kneschke, Phone +49 (0)7152-14-1226, Fax: 14-2226,
    e-mail: michael.kneschke@lewa.de

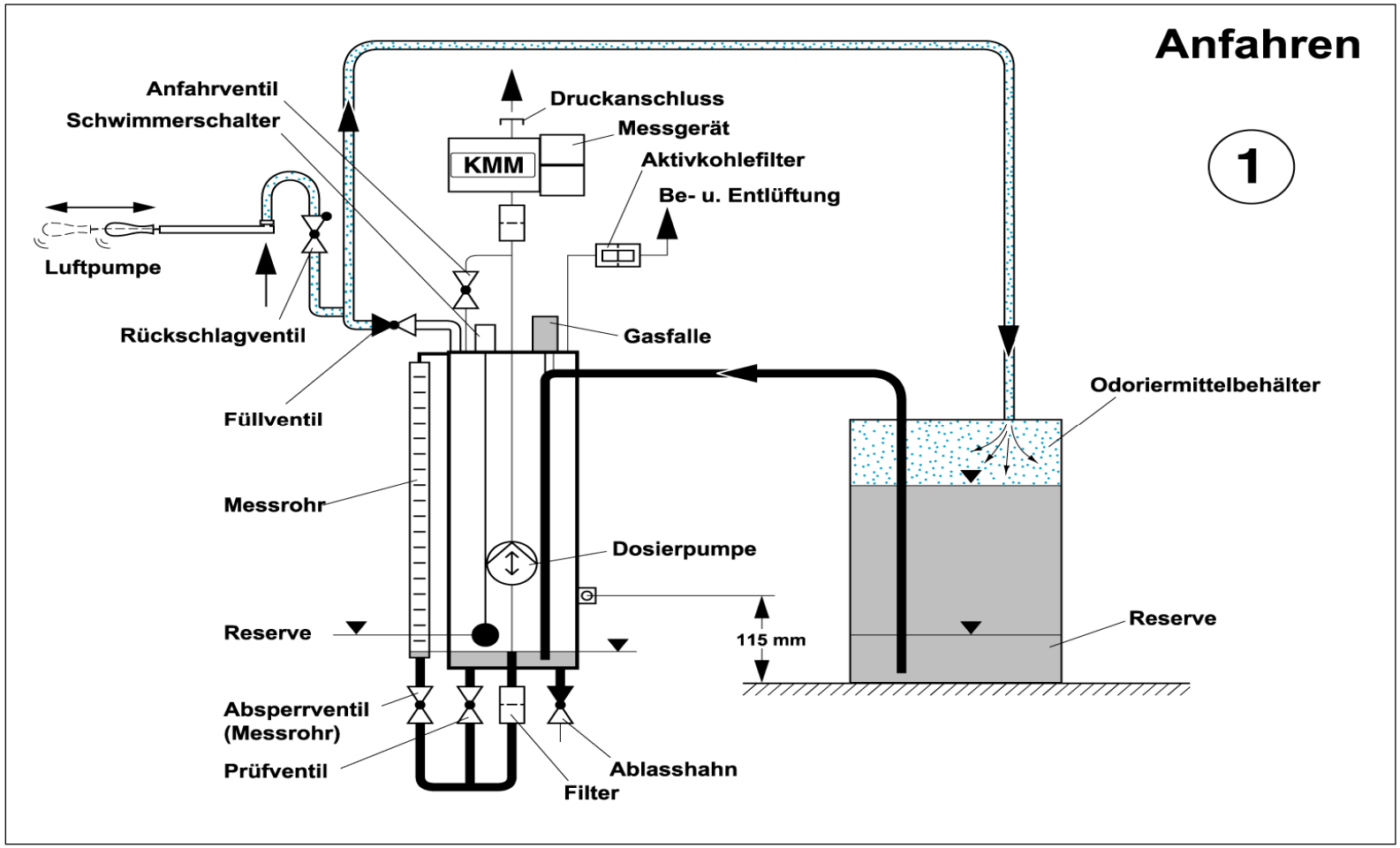
When can you reach us?

– On working days:
  – Monday through Thursday from 8.00 am – 5.00 pm
  – Friday from 8.00 am – 3.00 pm

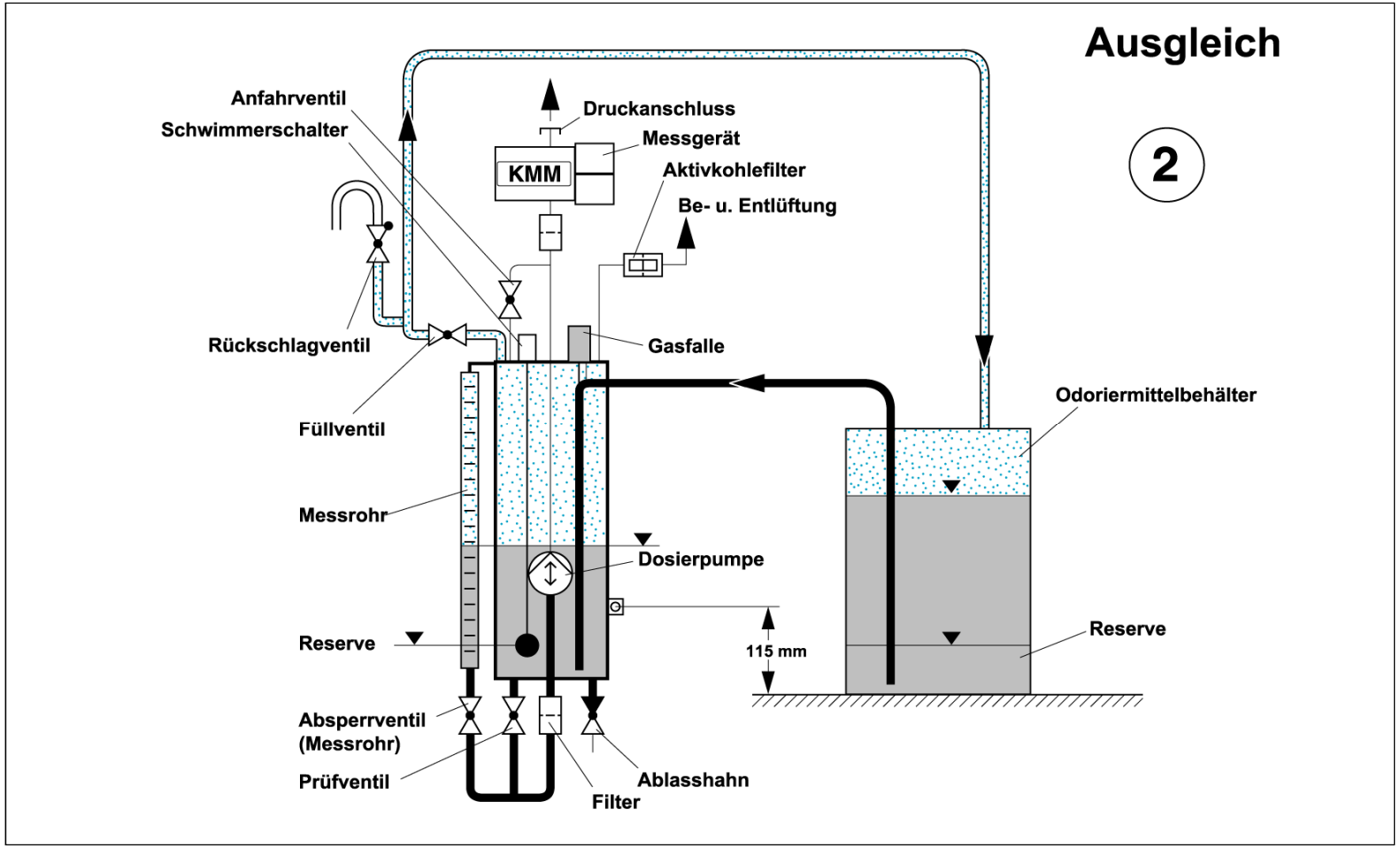
– In case of emergencies only you can reach our service department
  – On working days from 5.00 pm – 10.00 pm
  – Saturday from 8.00 am – 3.00 pm
  ⟶ By phone: +49 (0)172 - 74 02 526

Systems Engineering Flow Chart – Start-up

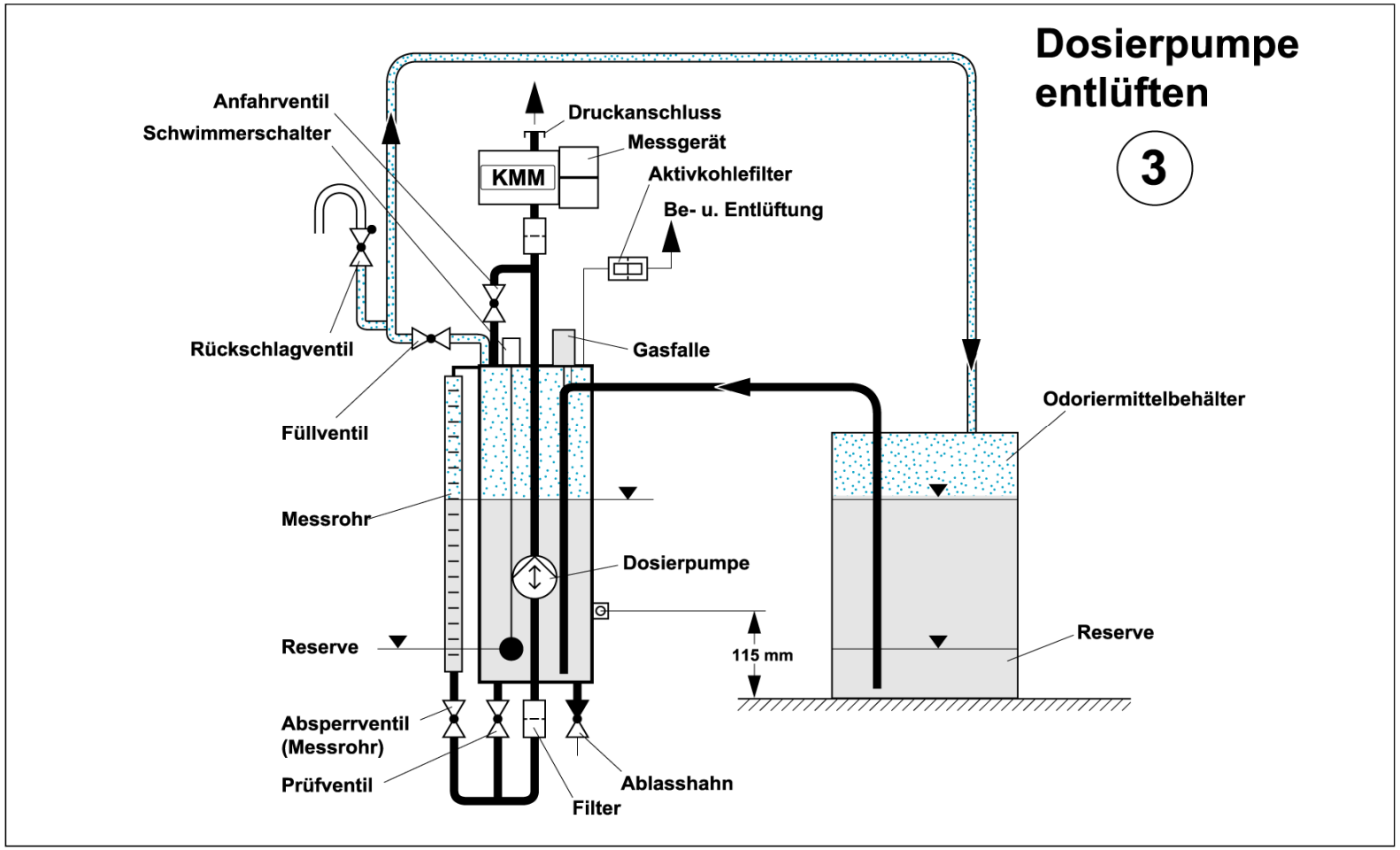
Without System Pressure



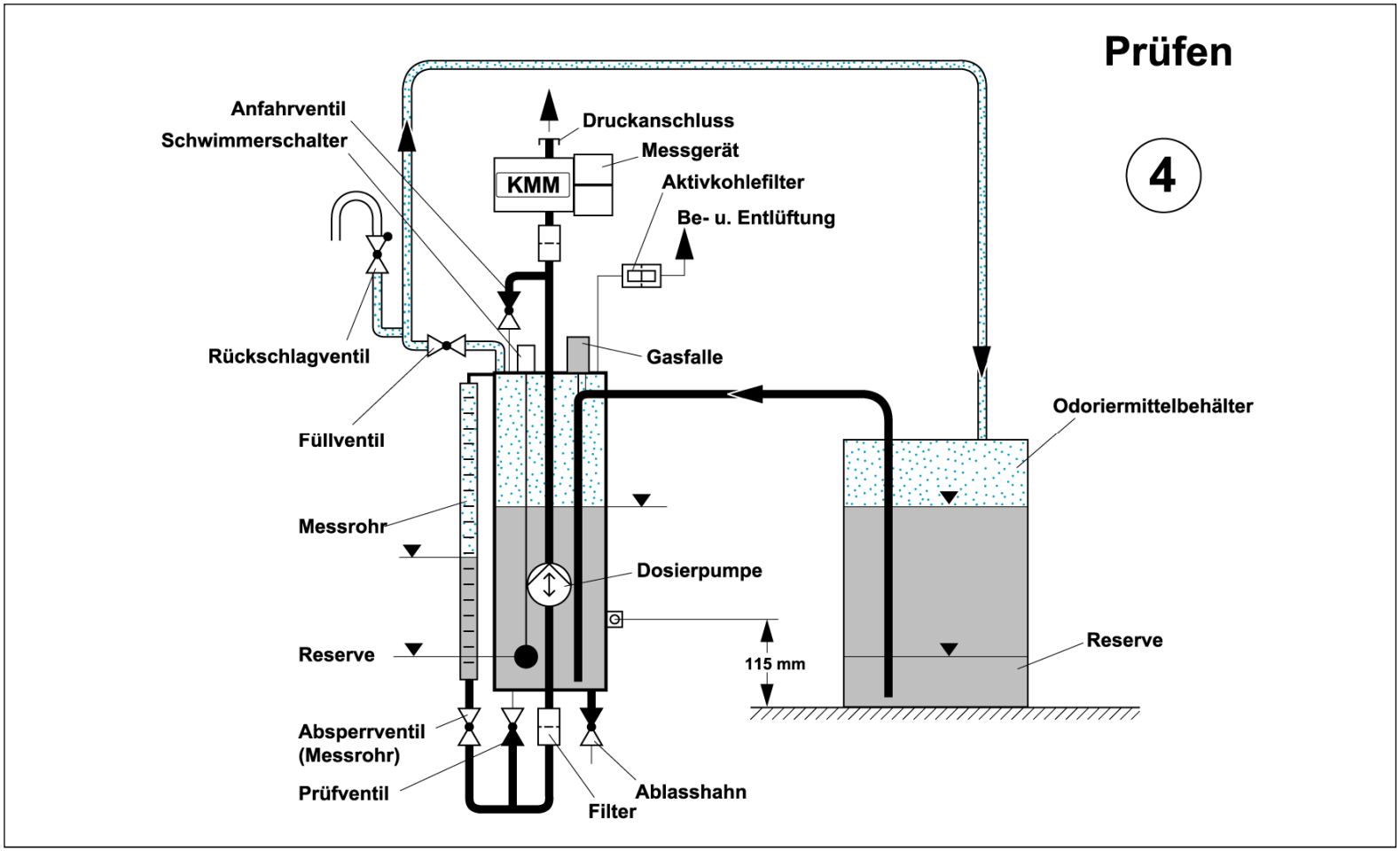
Systems Engineering Flow Chart - Balancing



Systems Engineering Flow Chart - Venting

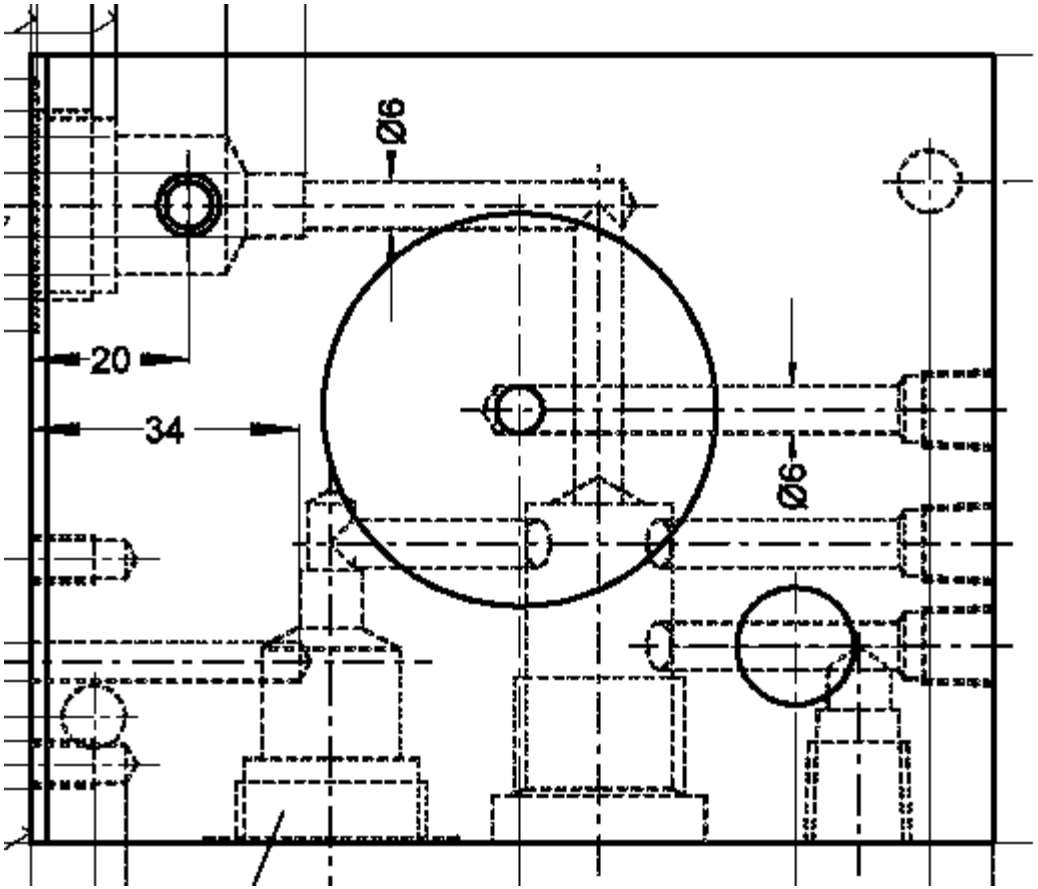


Systems Engineering Flow Chart - Checking

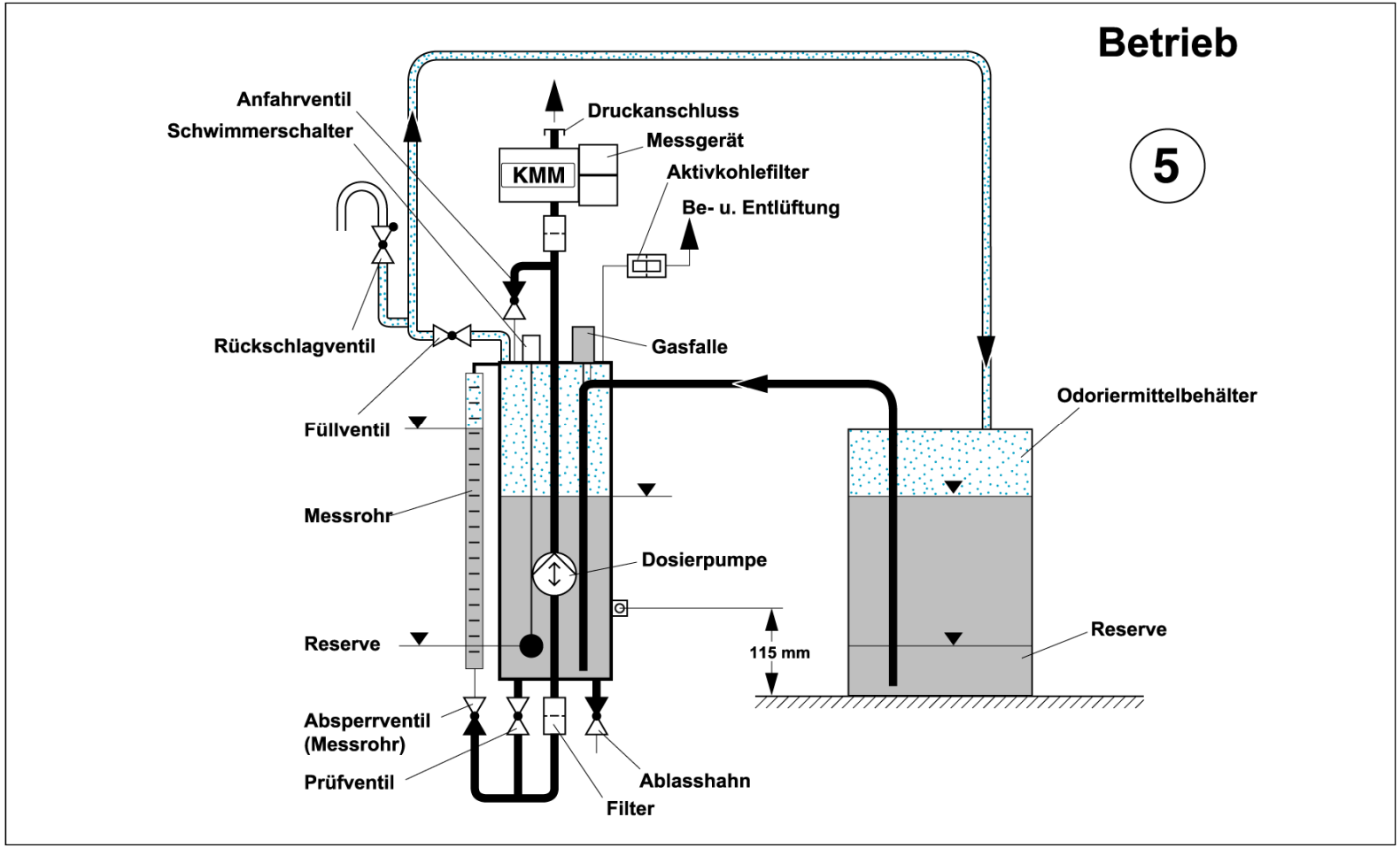


Systems Engineering Flow Chart

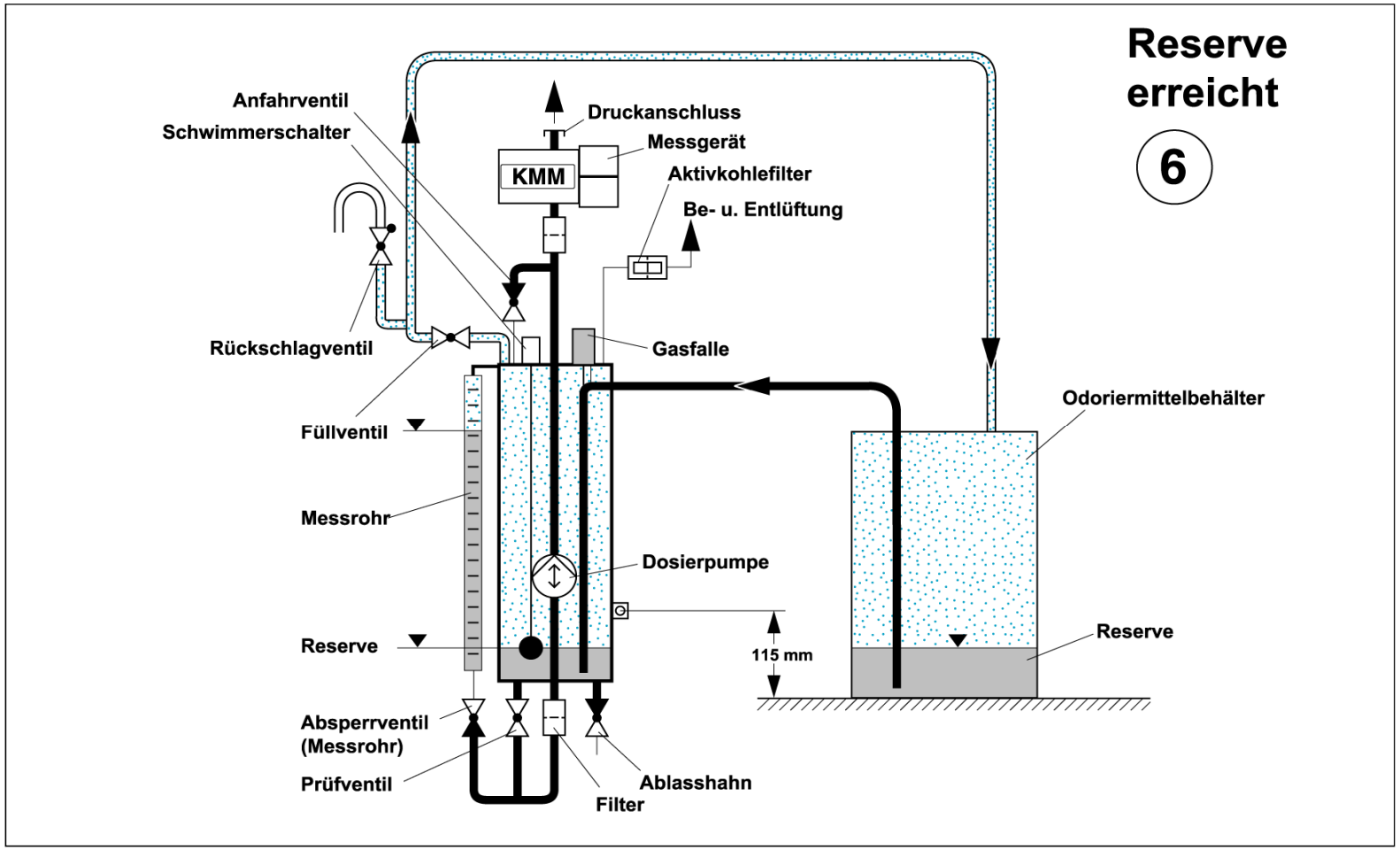
Base OD7/ 8



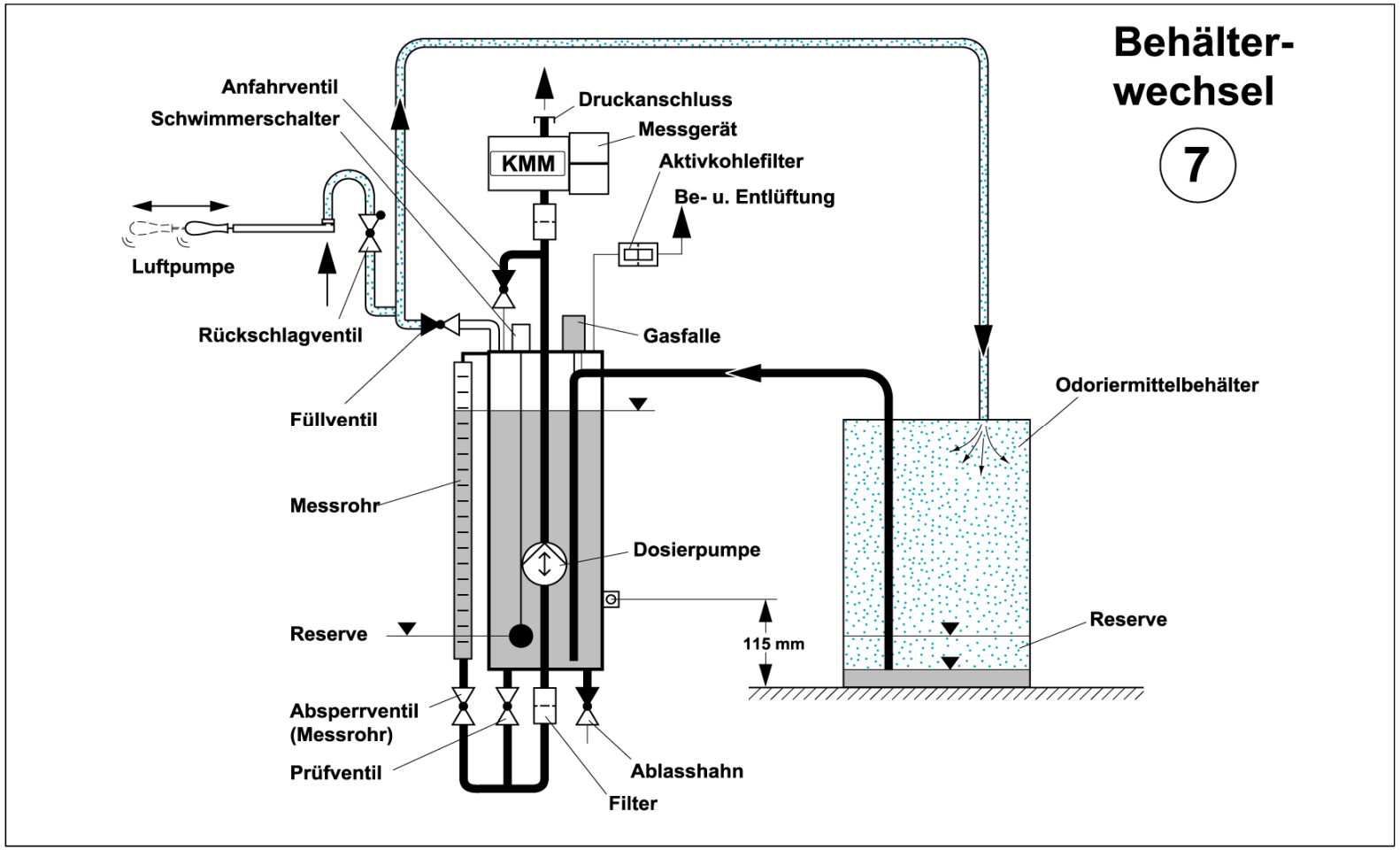
Systems Engineering Flow Chart - Operation



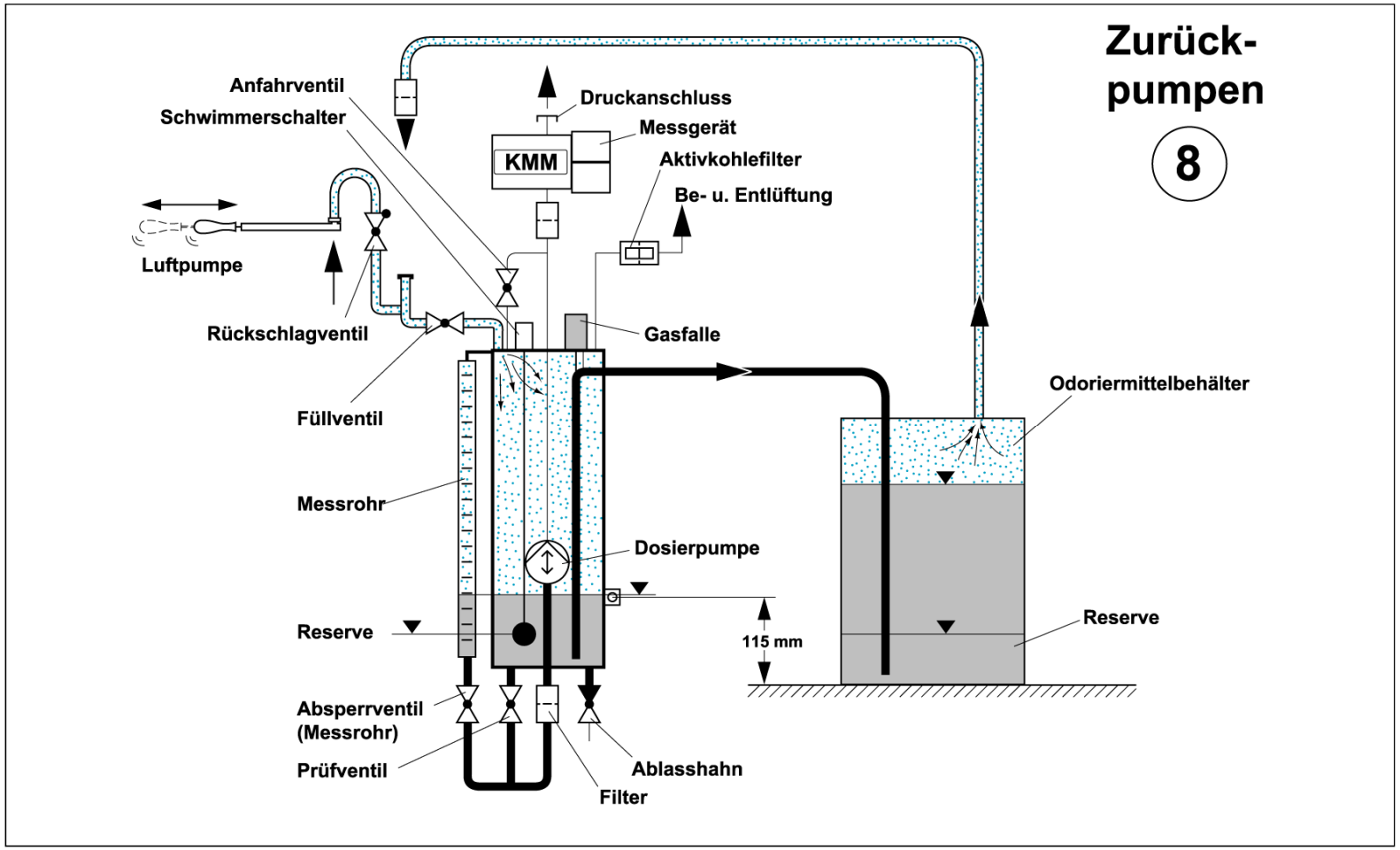
Systems Engineering Flow Chart – Hit Reserve Level



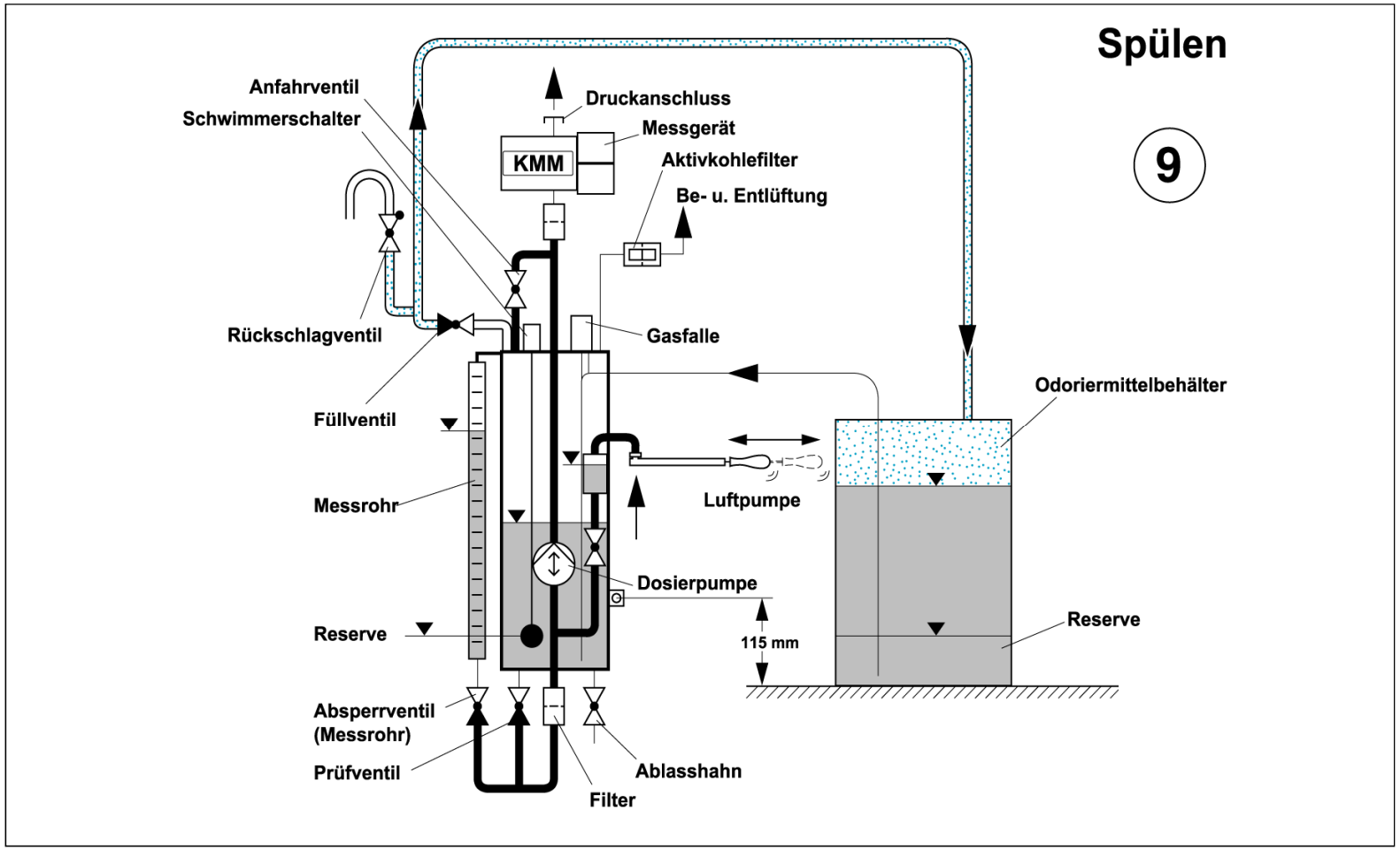
Systems Engineering Flow Chart – Returnable Drum



Systems Engineering Flow Chart - Pumping back

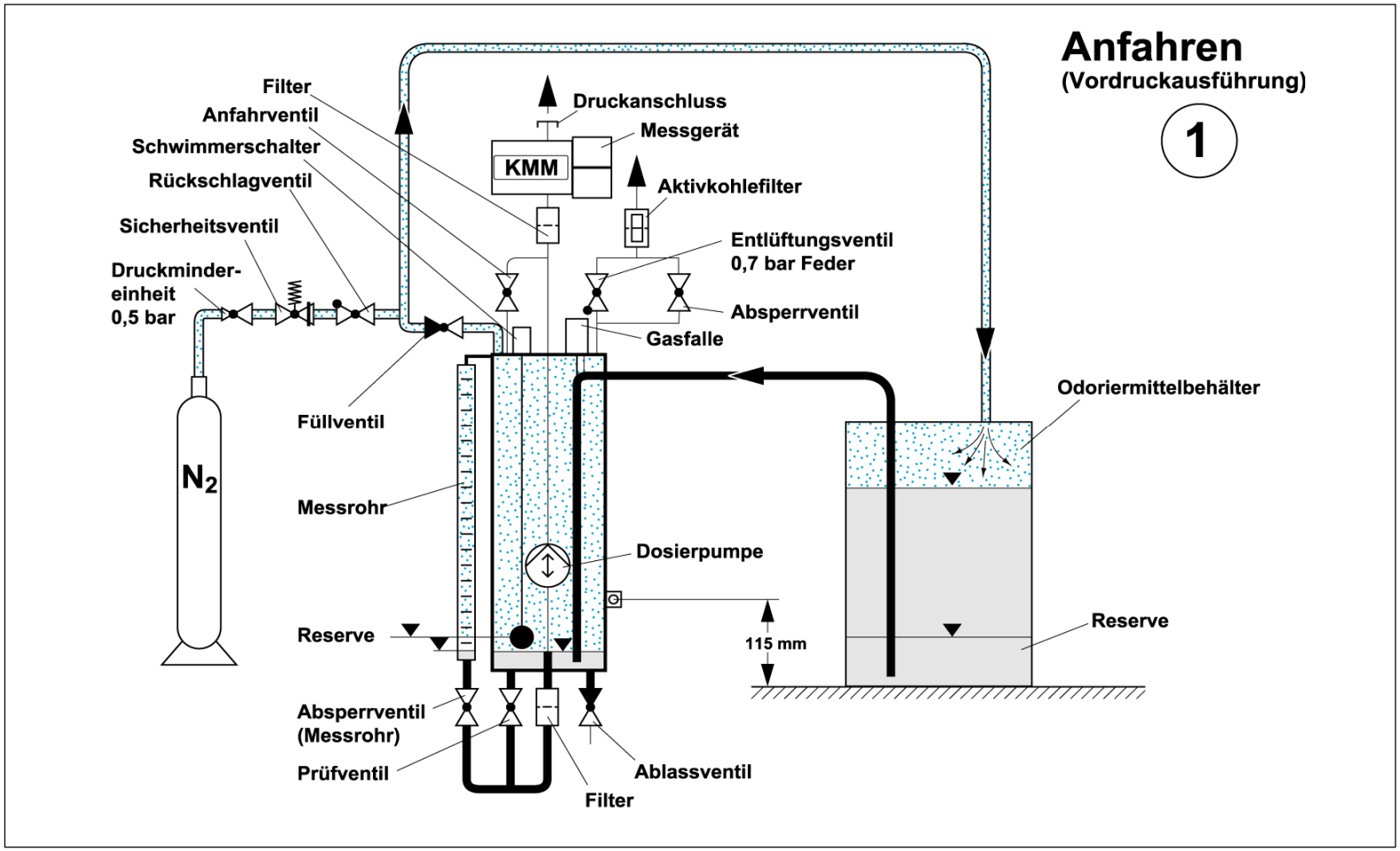


Systems Engineering Flow Chart - Flushing

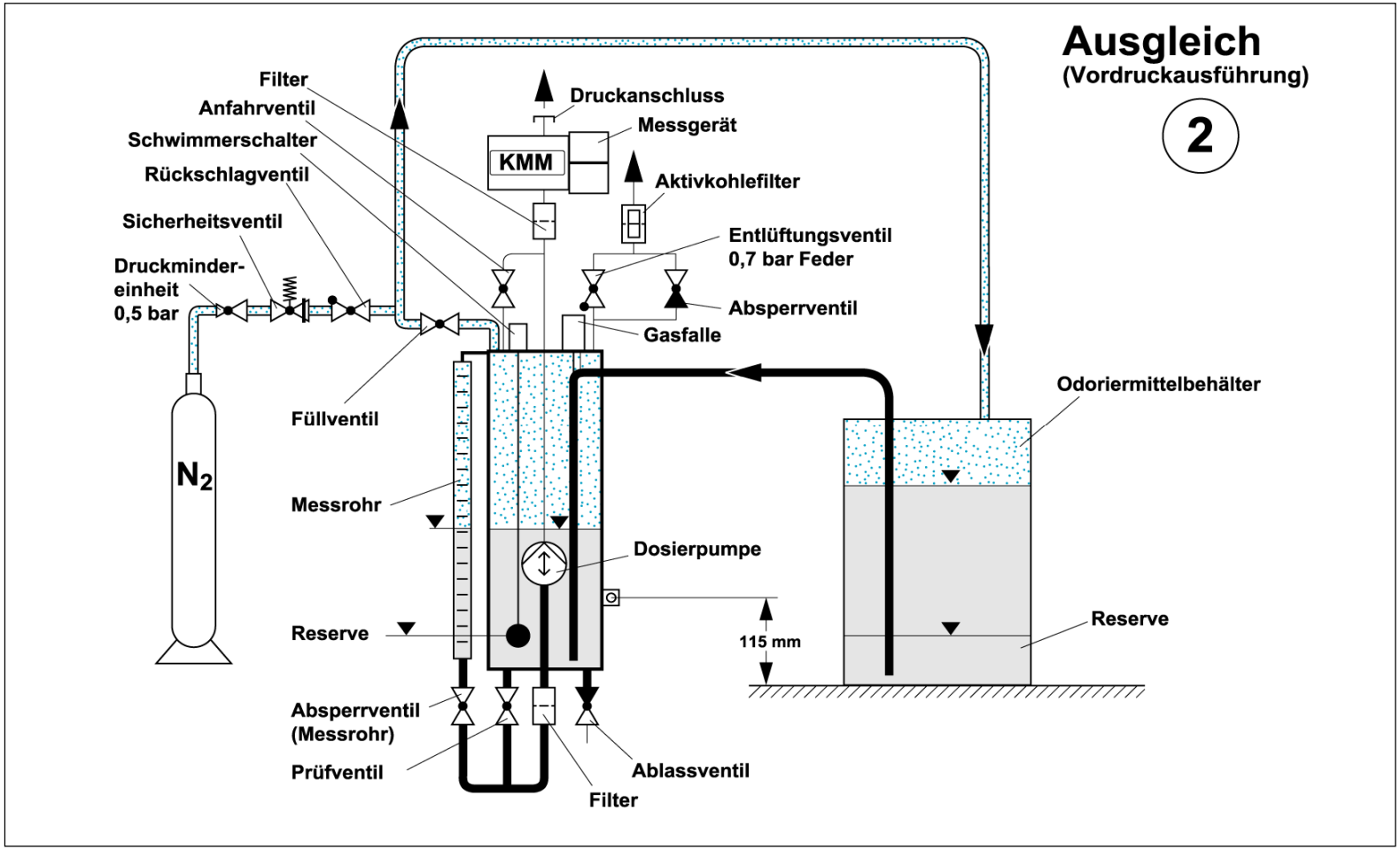


Systems Engineering Flow Chart – Start-up

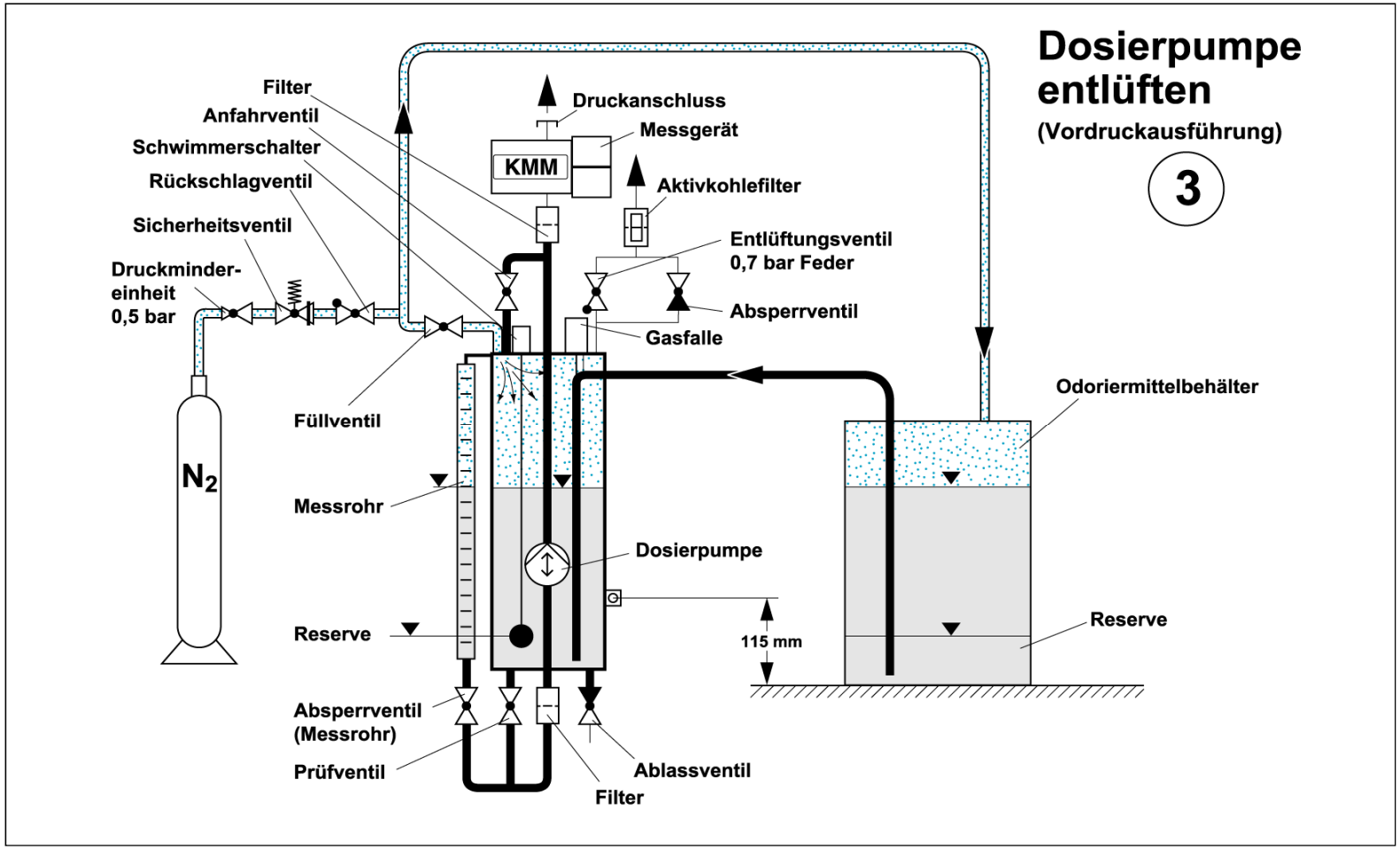
System Pressure Version



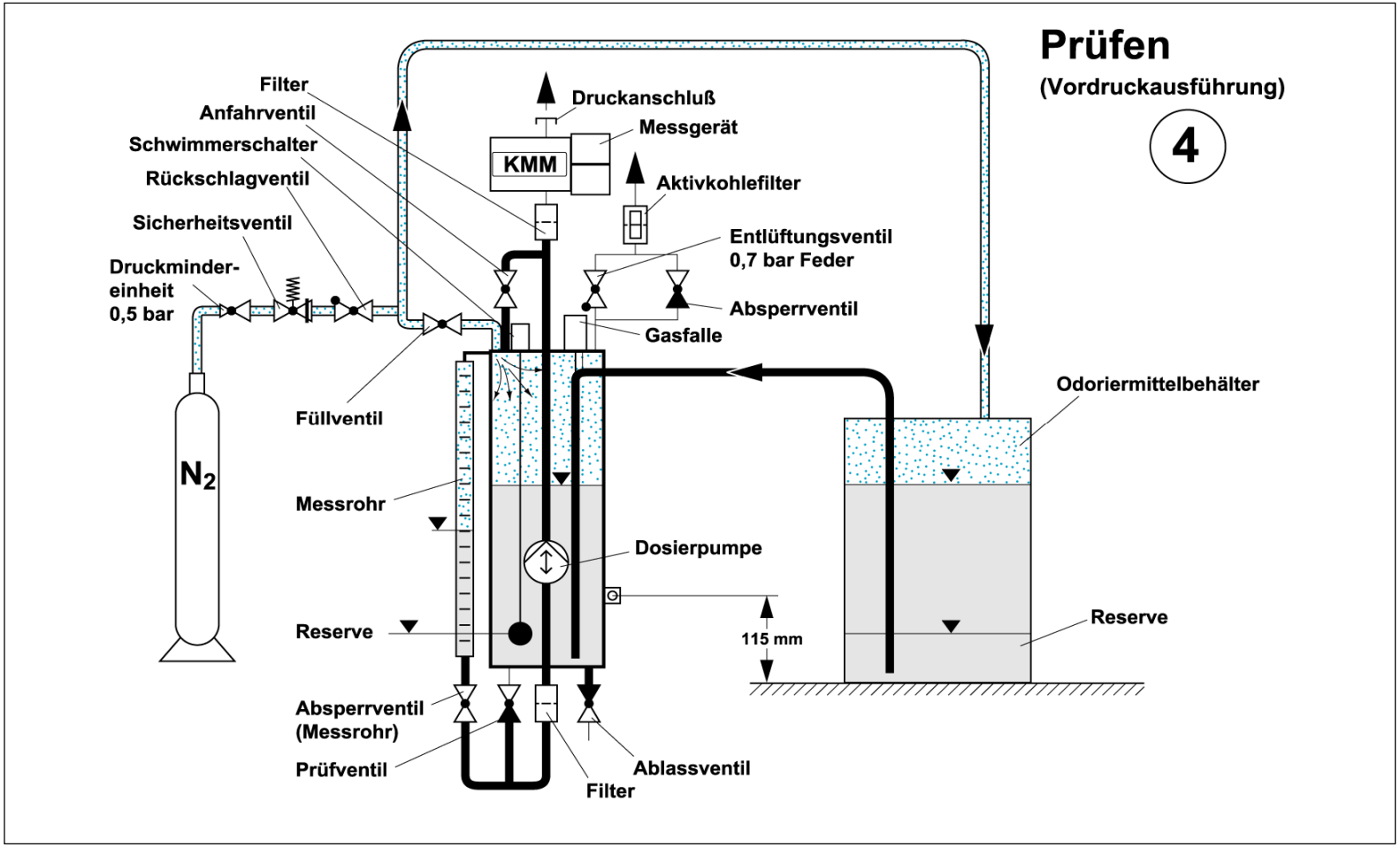
Systems Engineering Flow Chart - Balancing



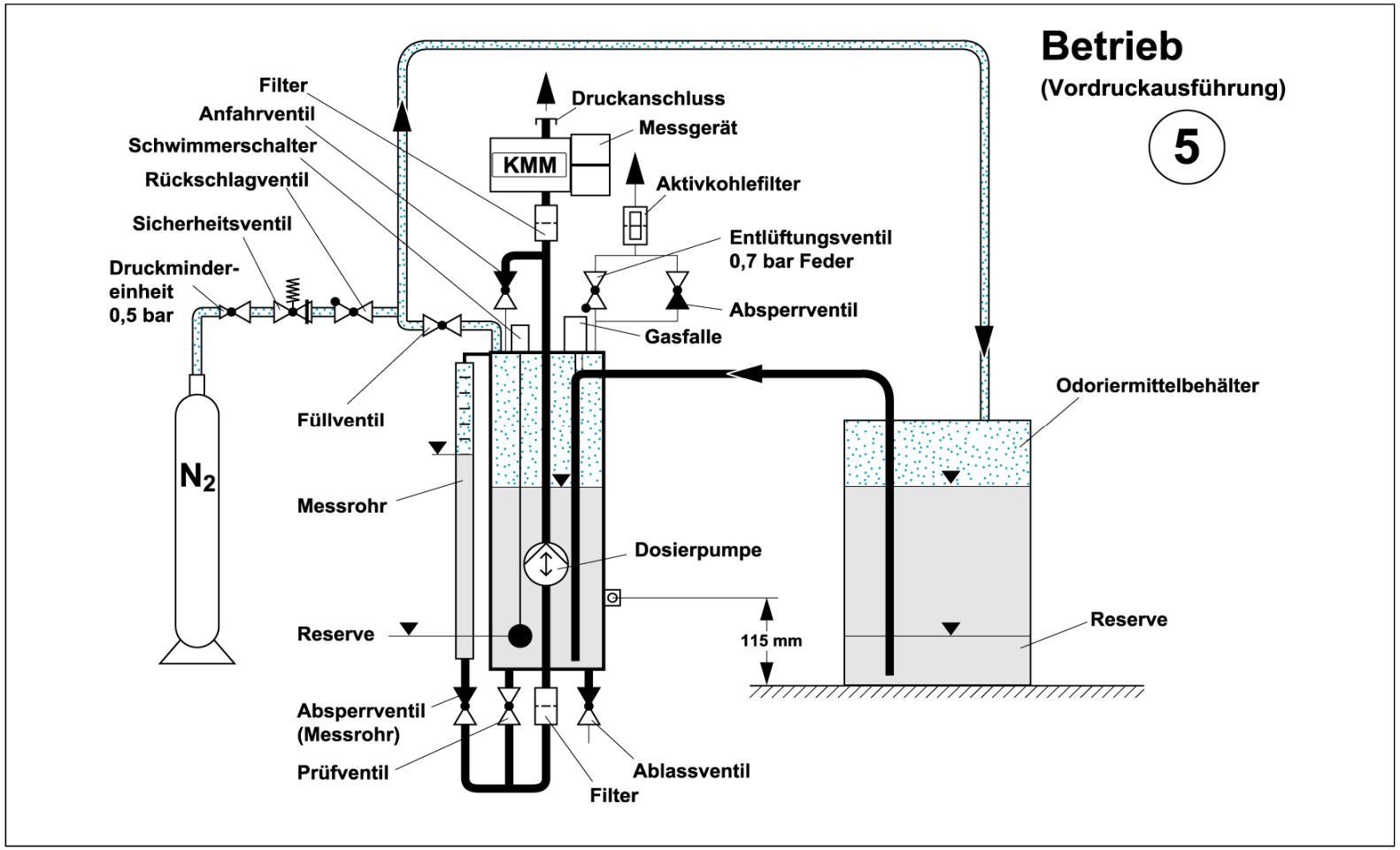
Systems Engineering Flow Chart - Venting



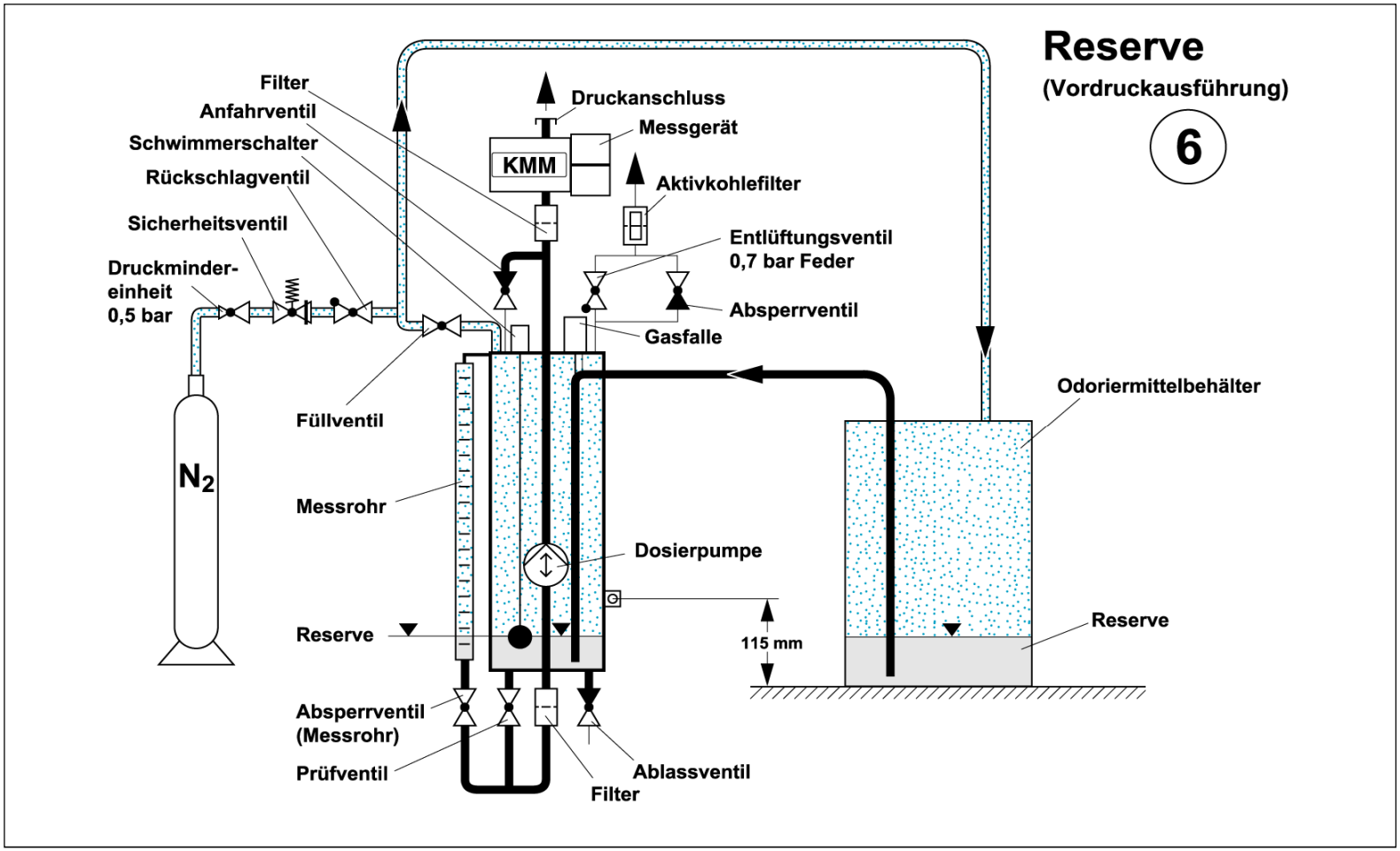
Systems Engineering Flow Chart - Checking



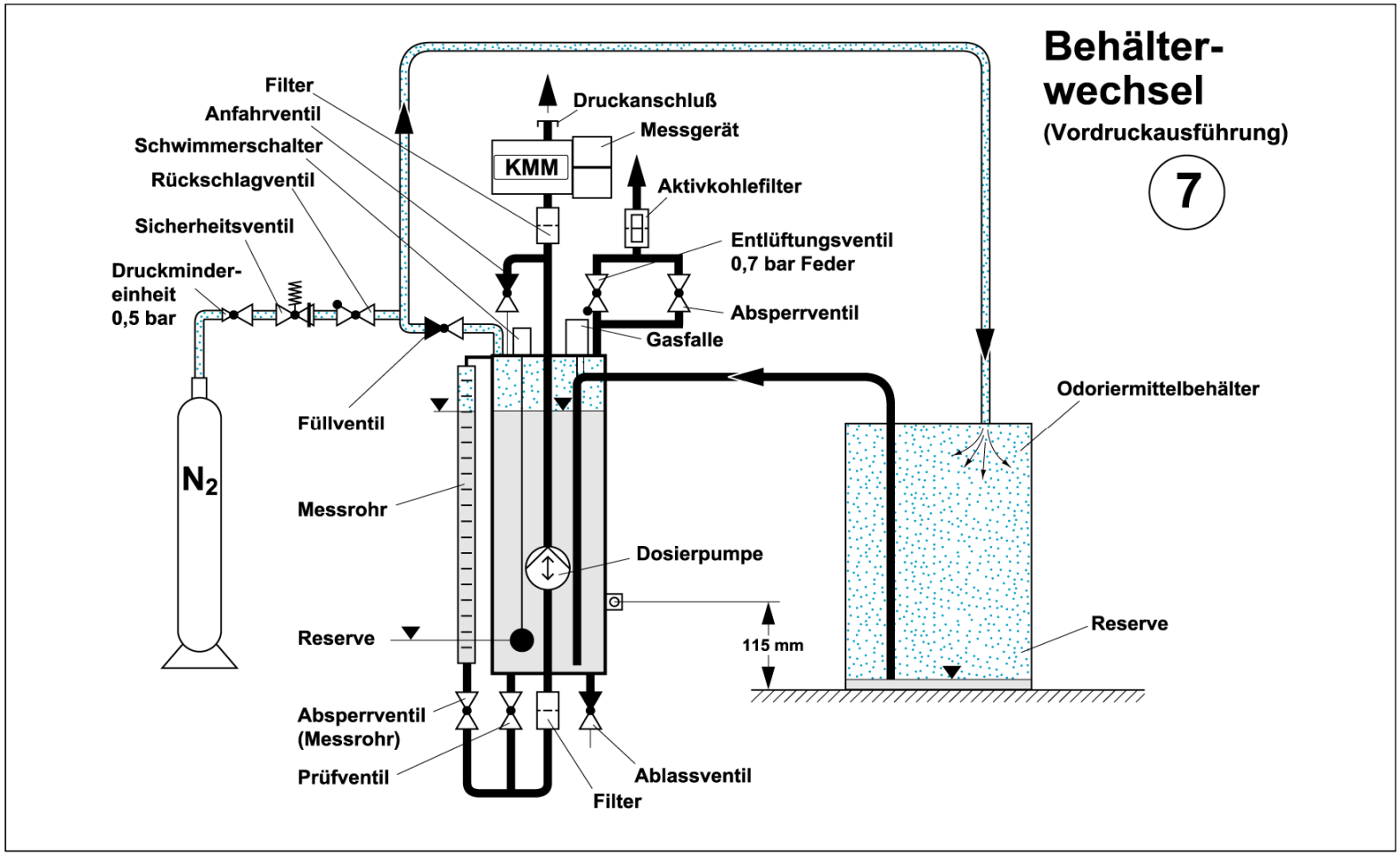
Systems Engineering Flow Chart - Operation



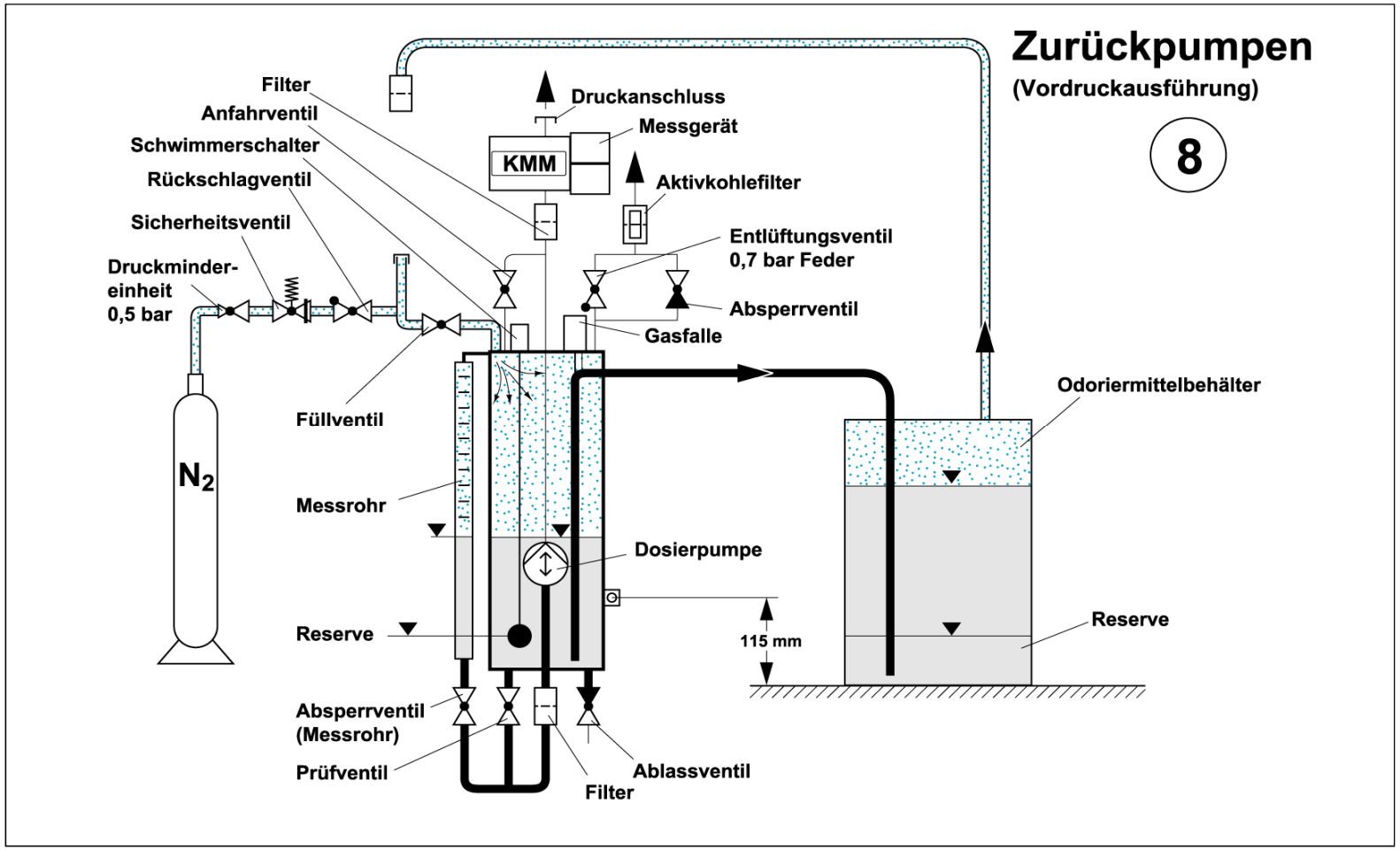
Systems Engineering Flow Chart - Reserve



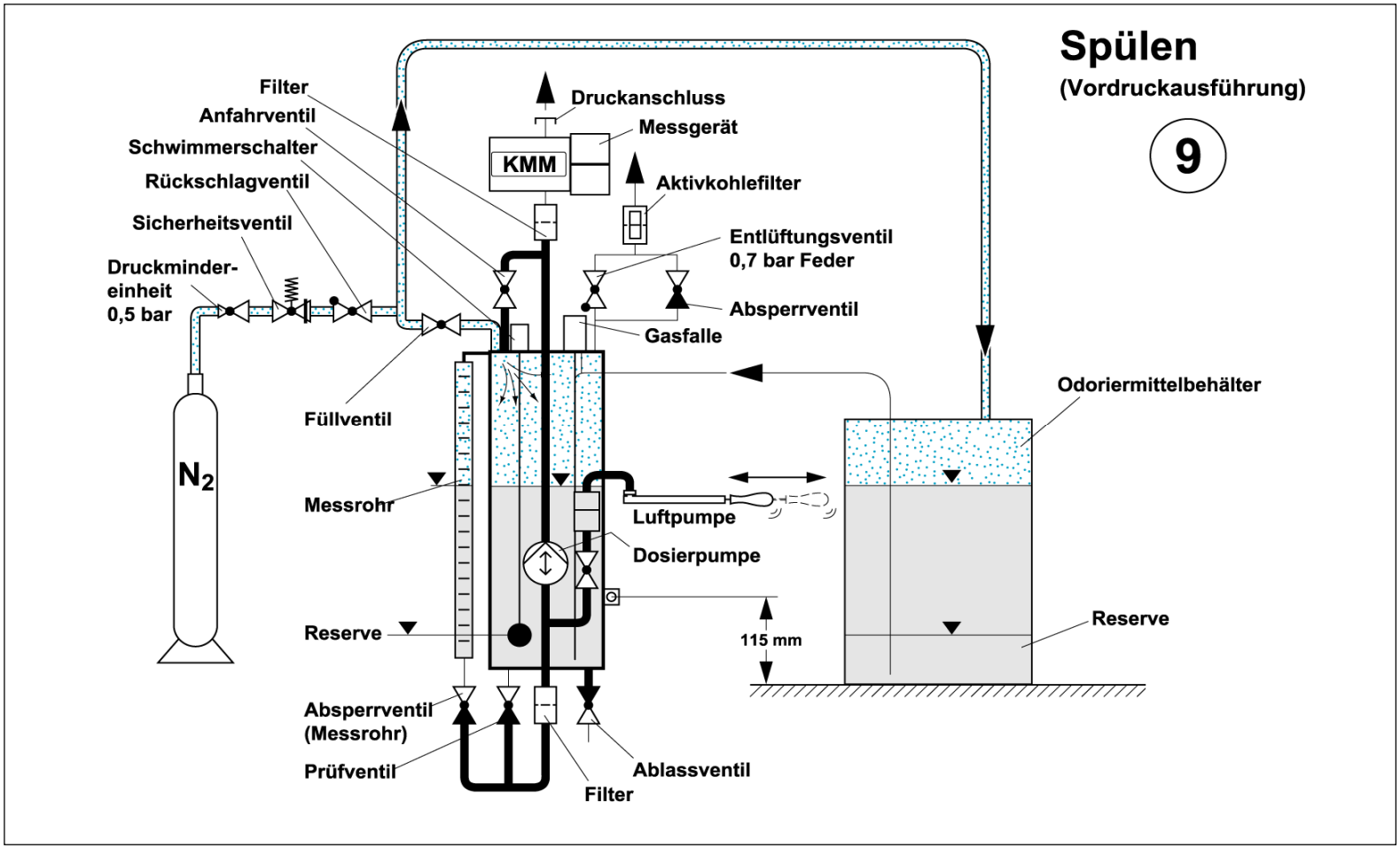
Systems Engineering Flow Chart – Returnable Drum



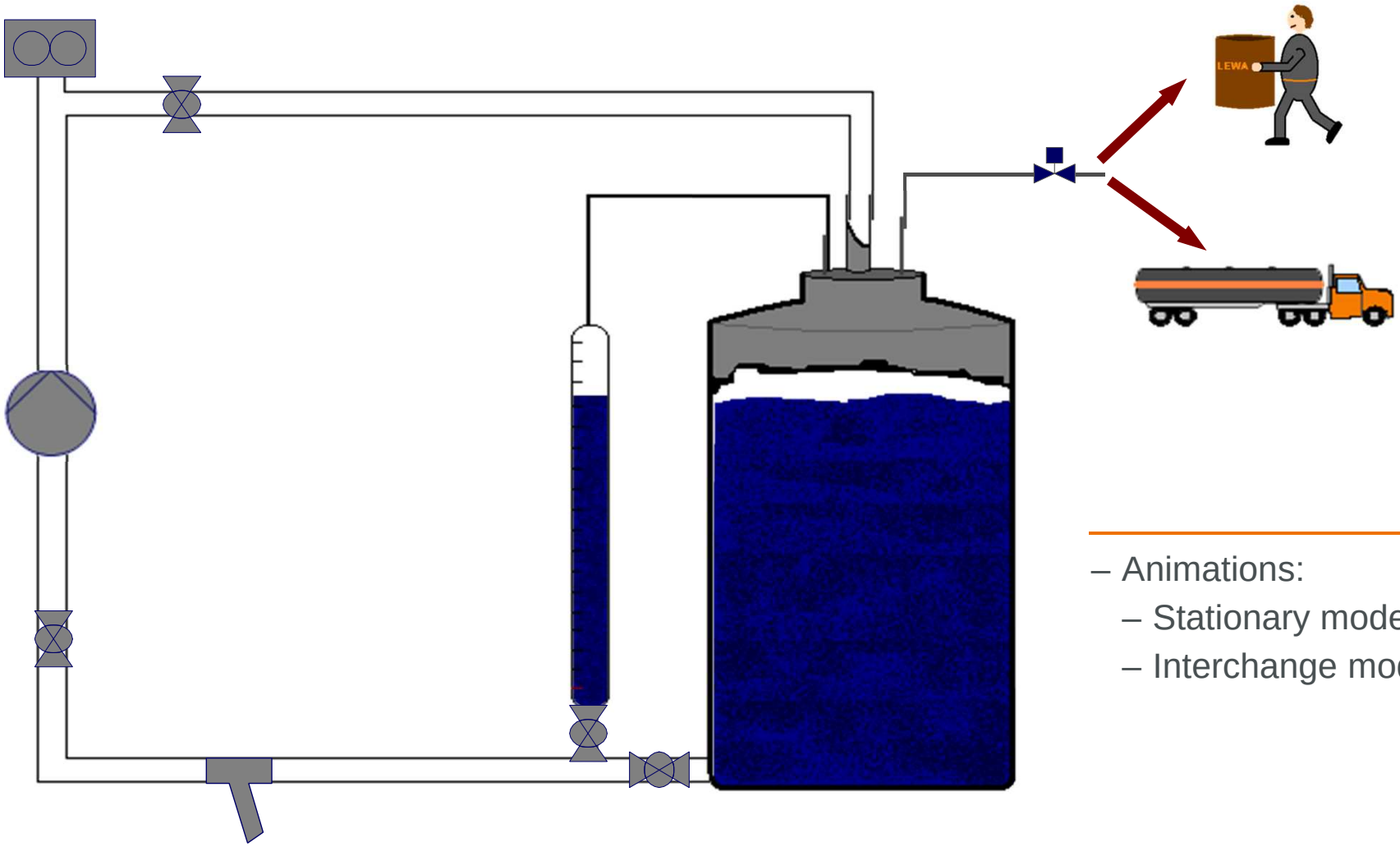
Systems Engineering Flow Chart – Pumping back



Systems Engineering Flow Chart - Flushing



Stationäry and interchange mode



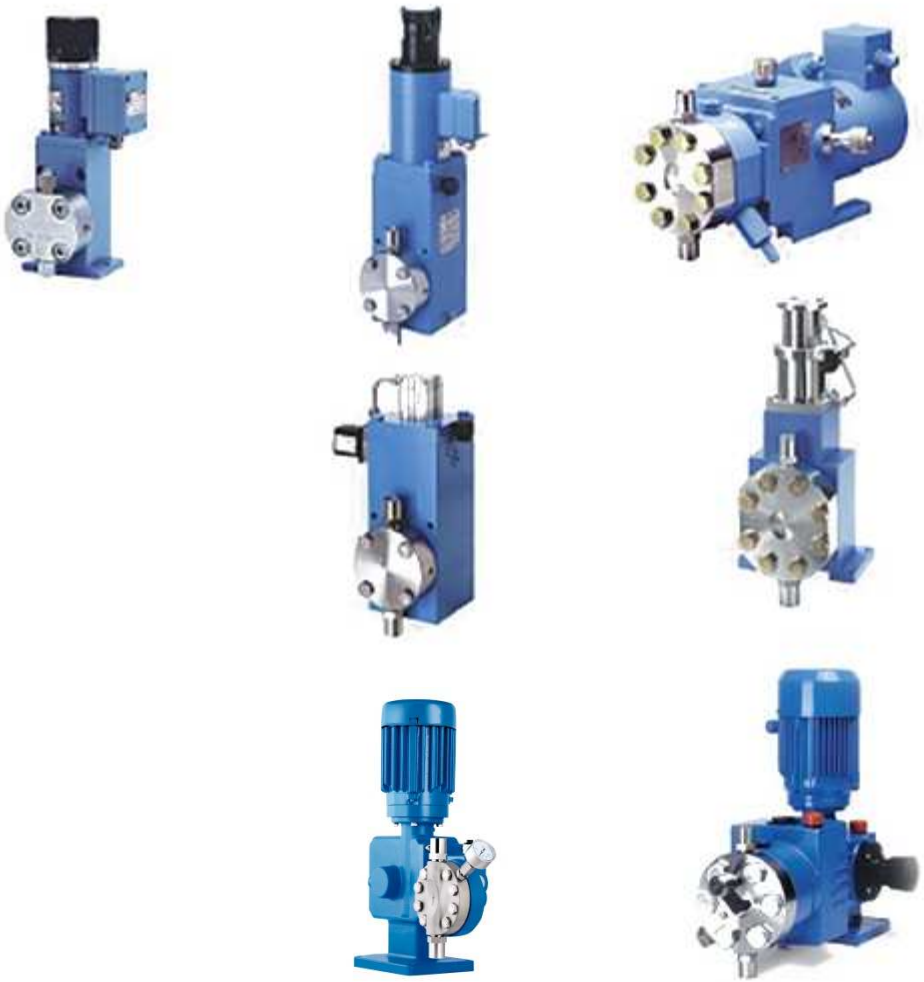
– Animations:
  – Stationary mode
  – Interchange mode

LEWA
Creating Fluid Solutions

Odorizing Pumps

Leonberg, 6/2/2015, Peter Gleiniger

Odor Series



Series MAH, MBH, MLM

– Flow rate 0,001 up to 22,5 l/h

– Pressure 0,1 up to 250 bar

Series PBH, PKH

– Flow rate 0,1 up to 10 l/h

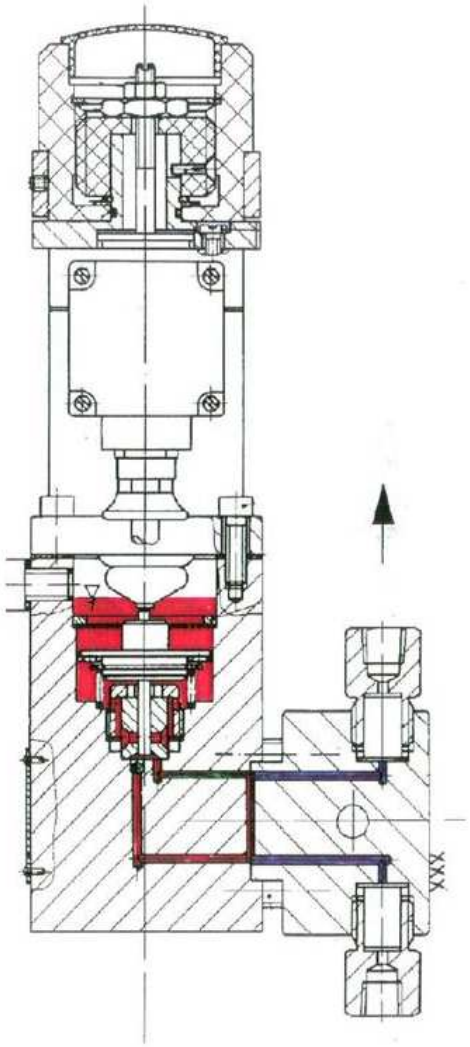
– Pressure 0,1 up to 250 bar

Series LDB

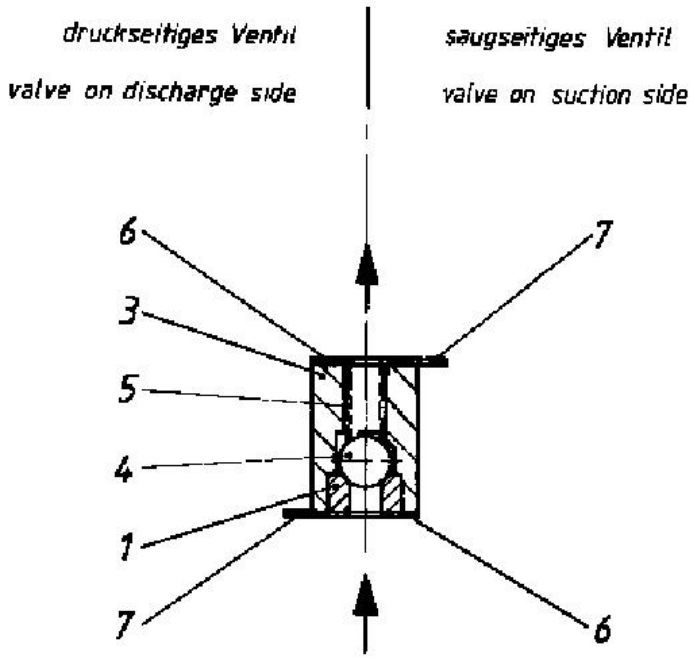
– Flow rate 0,25 up to 200 l/h

– Pressure 0,1 up to 250 bar

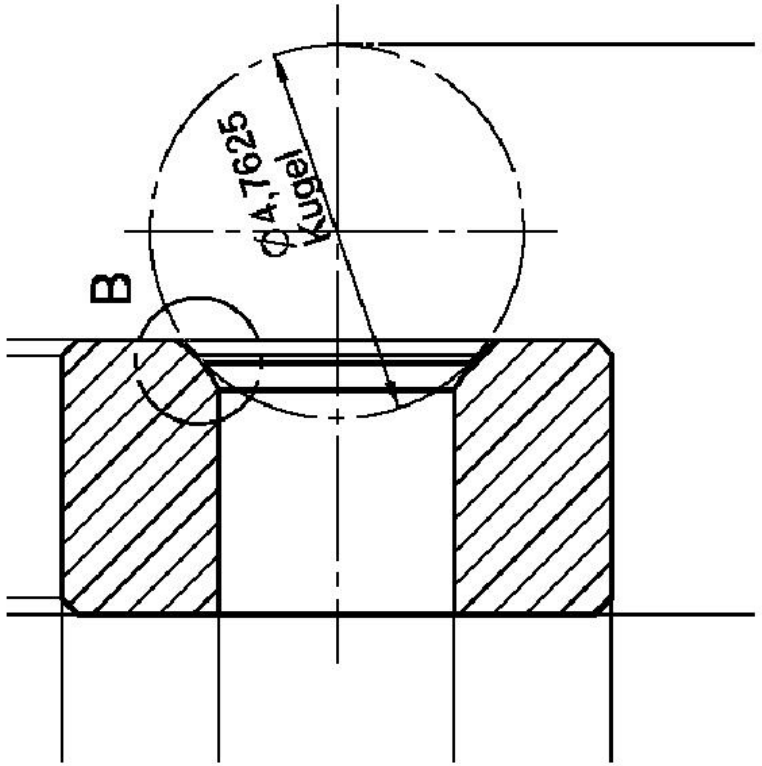
Cross section MAH



Valve MAH

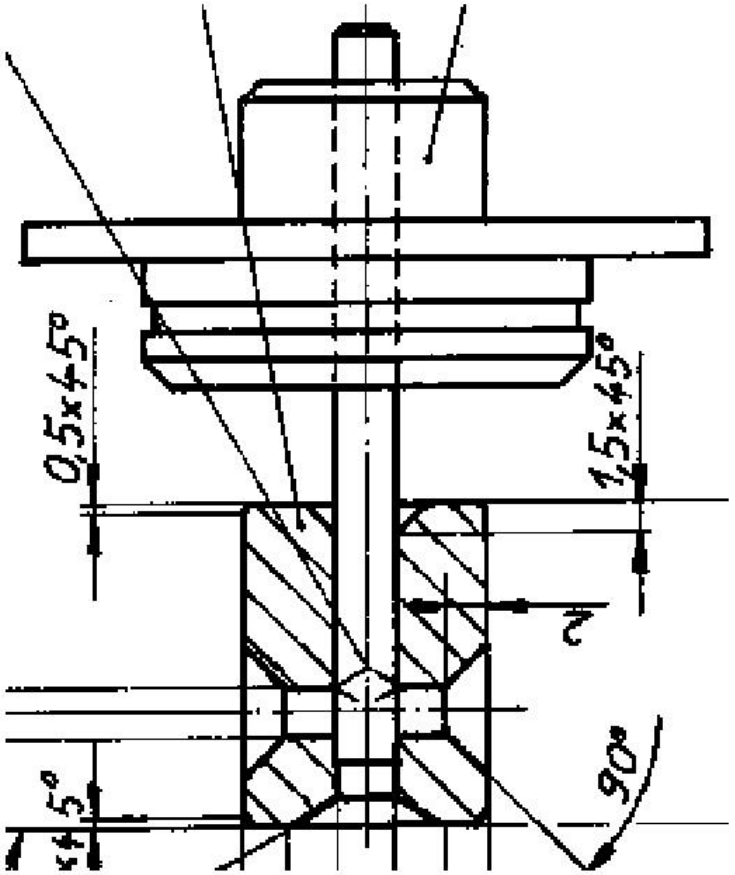


Valve MAH



Valve seat MAH

Plunger / Buching MAH

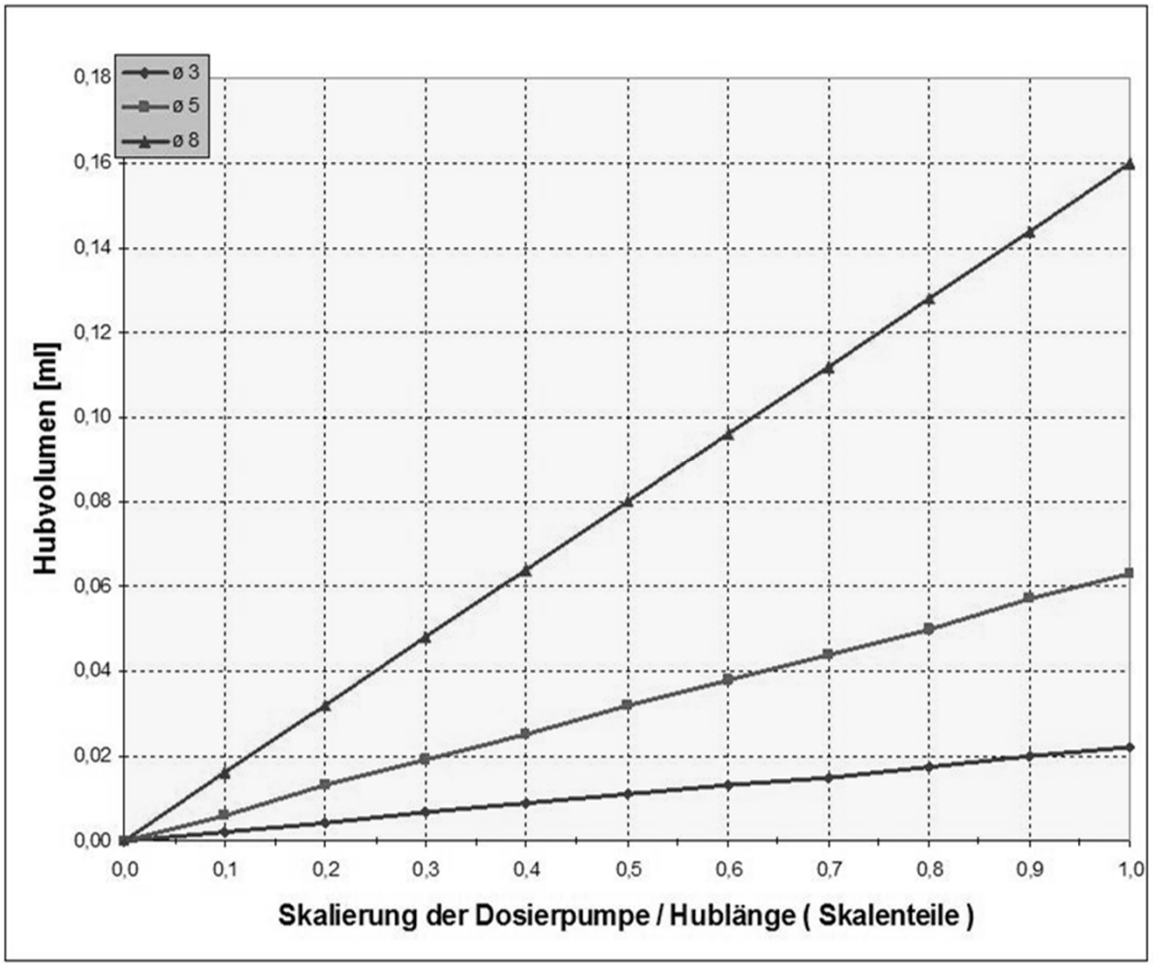


Plunger / Buchinge MAH

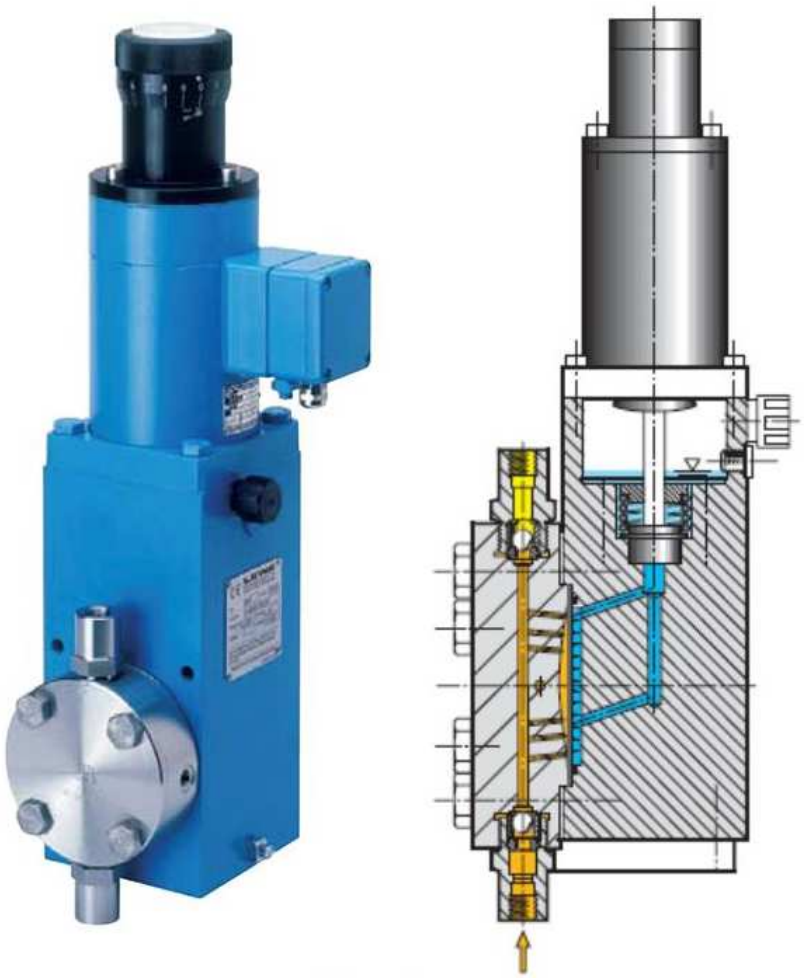
Stroke Volume MAH

max. Hubvolumen [ml] MAH			
Hub	ø 3	ø 5	ø 8
0,0	0,000	0,000	0,000
0,1	0,002	0,006	0,016
0,2	0,004	0,013	0,032
0,3	0,007	0,019	0,048
0,4	0,009	0,025	0,064
0,5	0,011	0,032	0,080
0,6	0,013	0,038	0,096
0,7	0,015	0,044	0,112
0,8	0,018	0,050	0,128
0,9	0,020	0,057	0,144
1,0	0,022	0,063	0,160

max. Arbeitsdruck [bar] MAH:			
	ø 3	ø 5	ø 8
MAH 21	30	10	4



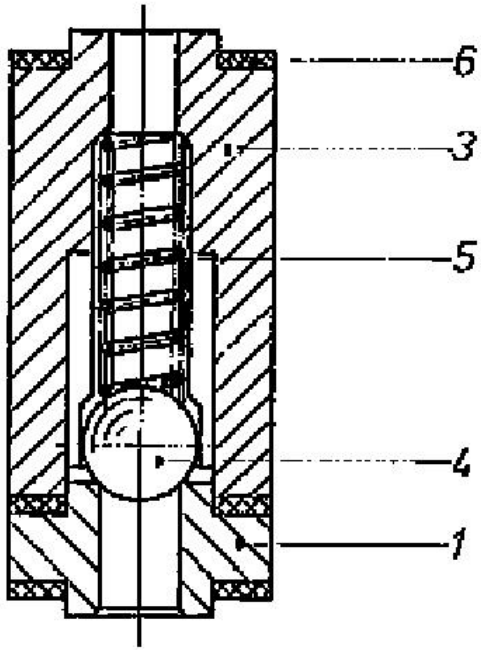
LEWA Solenoid Metering Pump MBH



Technical data

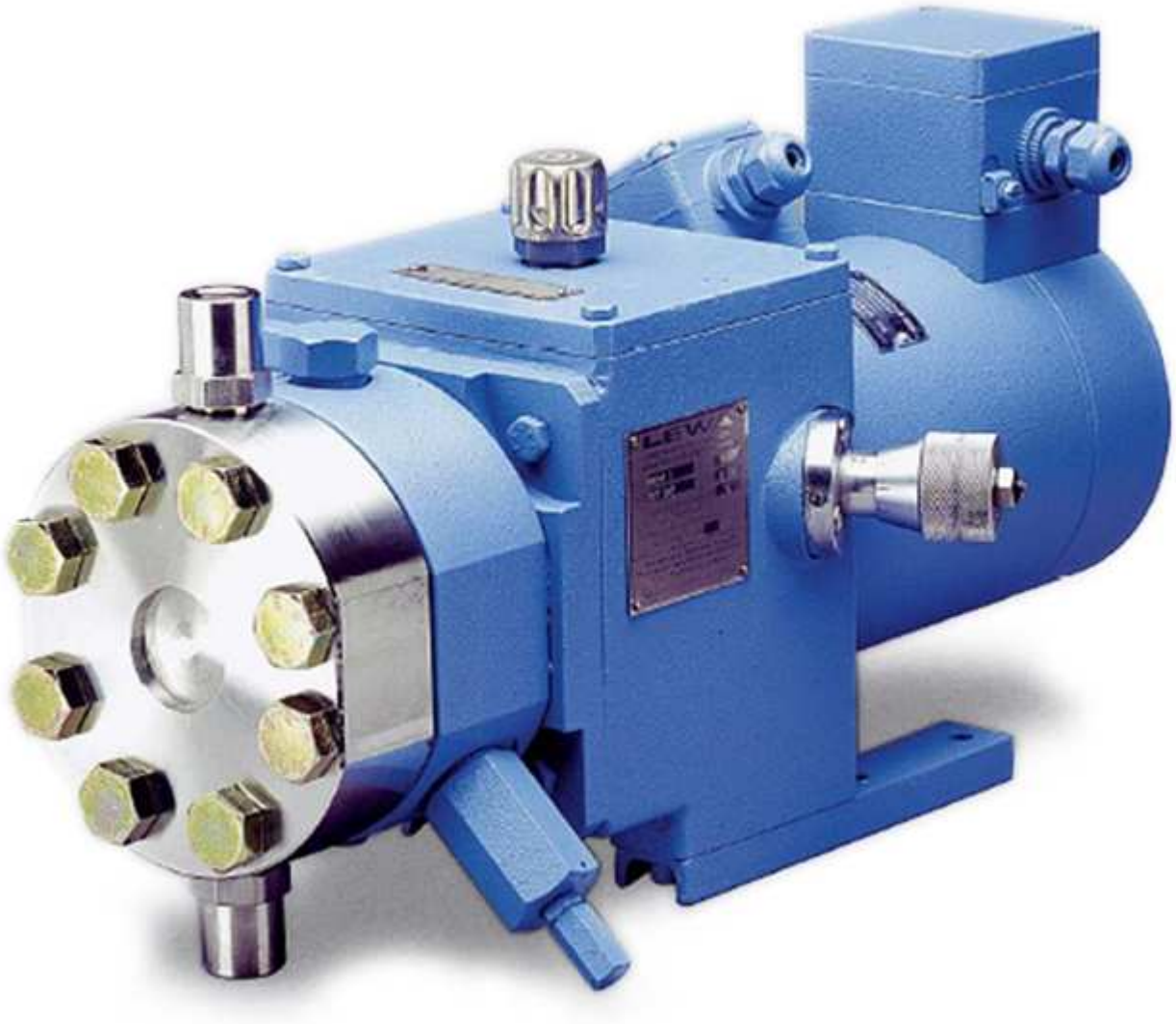
– Flow rate max.	2,8 l/h at 25 bar 2,2 l/h at 40 bar
– Pressure max.	40 bar 10 mm 63 bar 8 mm
– Stroke frequency max.	130
– Stroke length	8 / 10 mm
– Ambient temperatur	-10 bis 50 °C
– Protection	EExem II T4 IP 54

Valve MBH

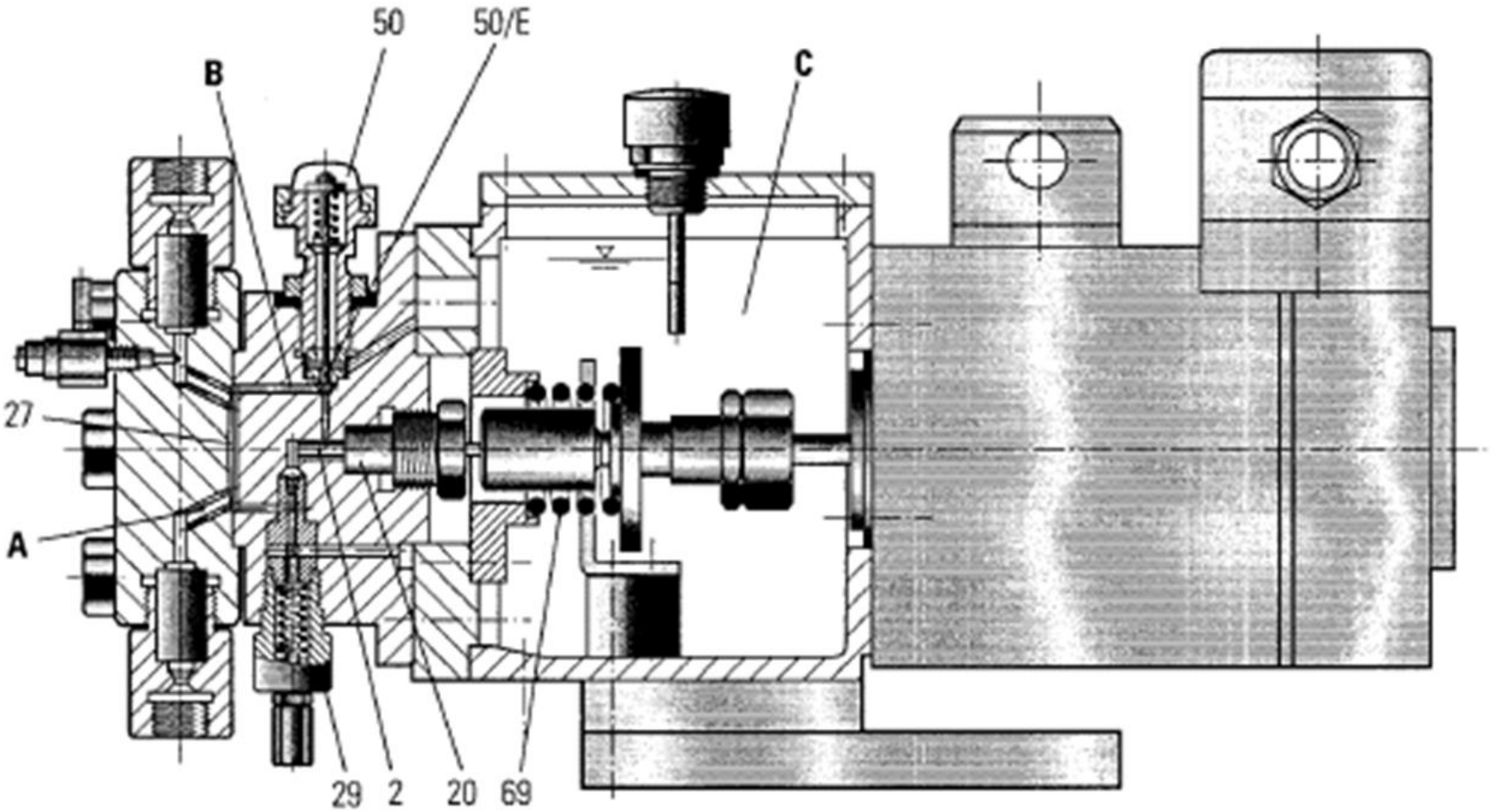


Valve MBH

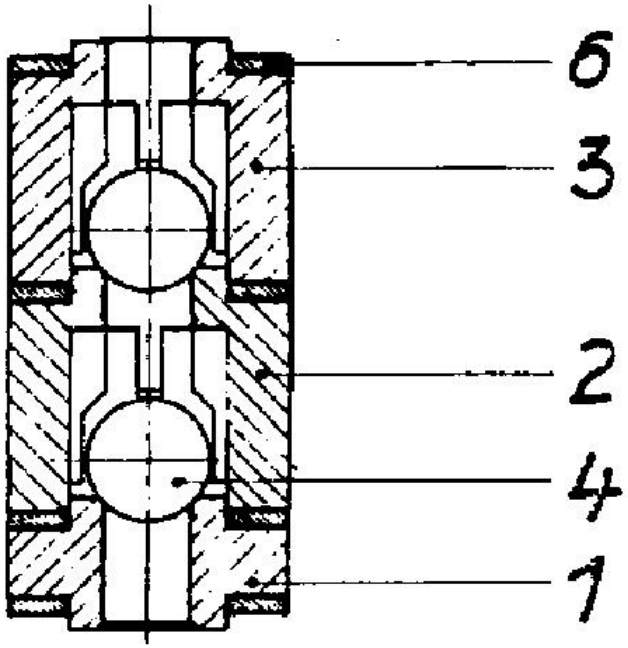
Micro Metering Pump MLM

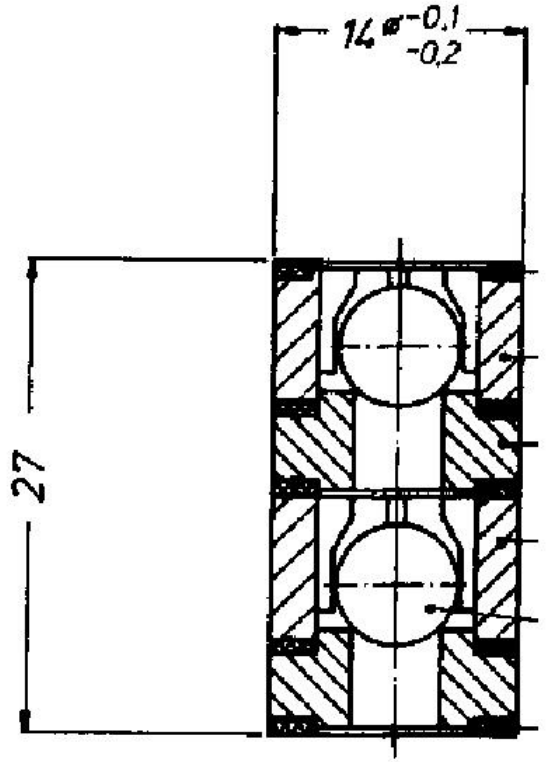


Micro Metering Pump MLM



Valves MLM



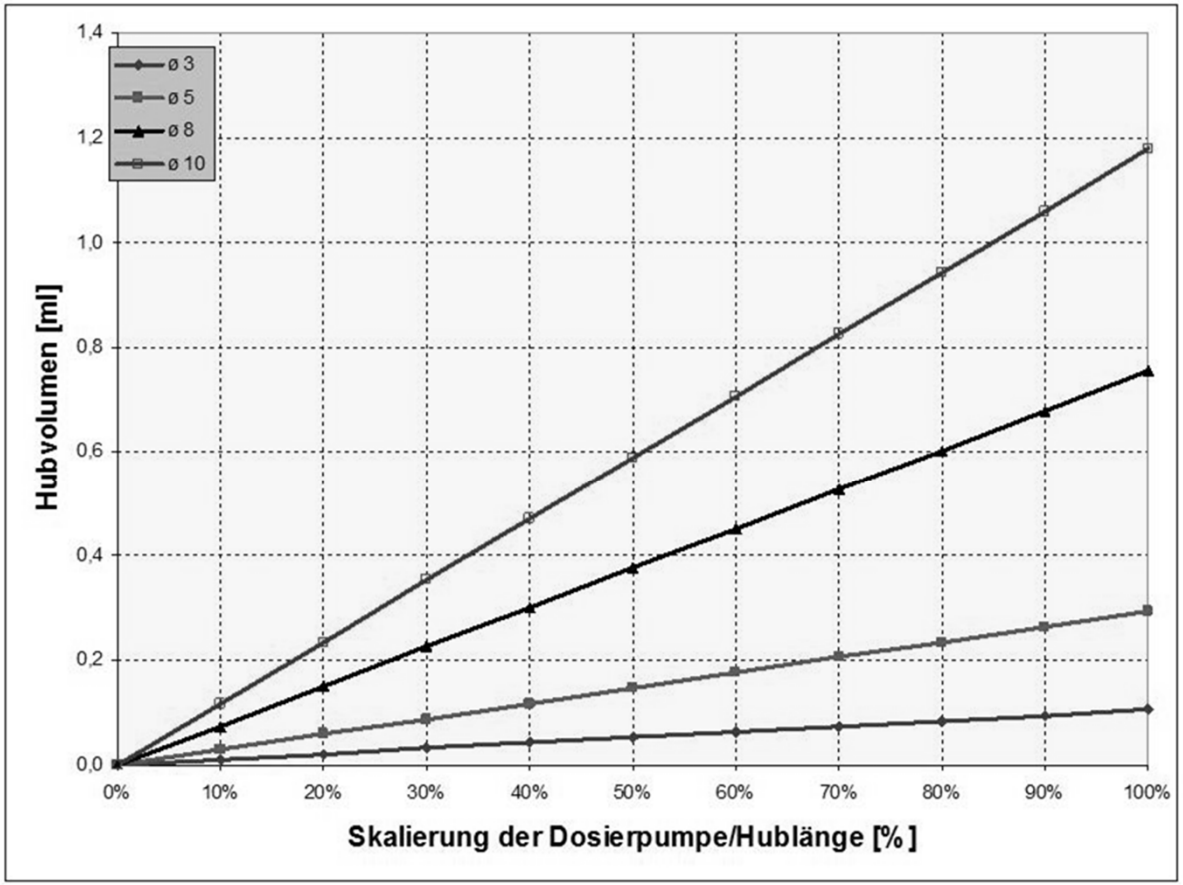


Valves MLM

Stroke Volume MLM

max. Hubvolumen [ml] MLM:				
	ø 3	ø 5	ø 8	ø 10
0%	0,00	0,000	0,000	0,000
10%	0,011	0,029	0,075	0,117
20%	0,021	0,059	0,151	0,235
30%	0,032	0,088	0,226	0,353
40%	0,042	0,118	0,302	0,471
50%	0,053	0,147	0,377	0,589
60%	0,064	0,176	0,452	0,706
70%	0,074	0,206	0,528	0,824
80%	0,085	0,235	0,603	0,942
90%	0,095	0,265	0,679	1,060
100%	0,106	0,294	0,754	1,178

max. Arbeitsdruck [bar] MLM:				
	ø 3	ø 5	ø 8	ø 10
MLM15	212	76	30	19
MLM40	400	205	80	51



Metering Pump Series LEWA ecoflow® LDB

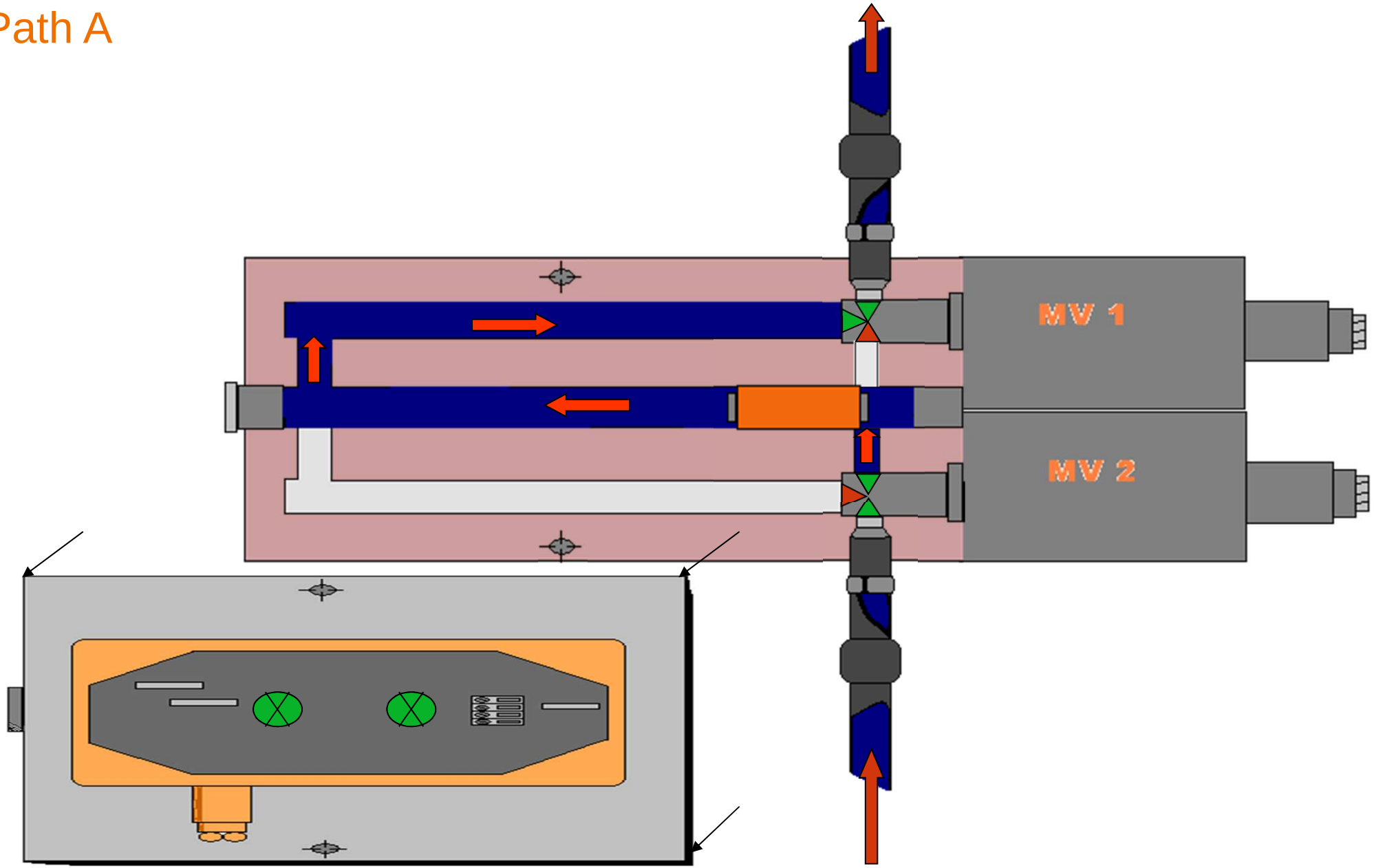
Metering Pump Series LEWA ecosmart® LCA

LEWA
Creating Fluid Solutions

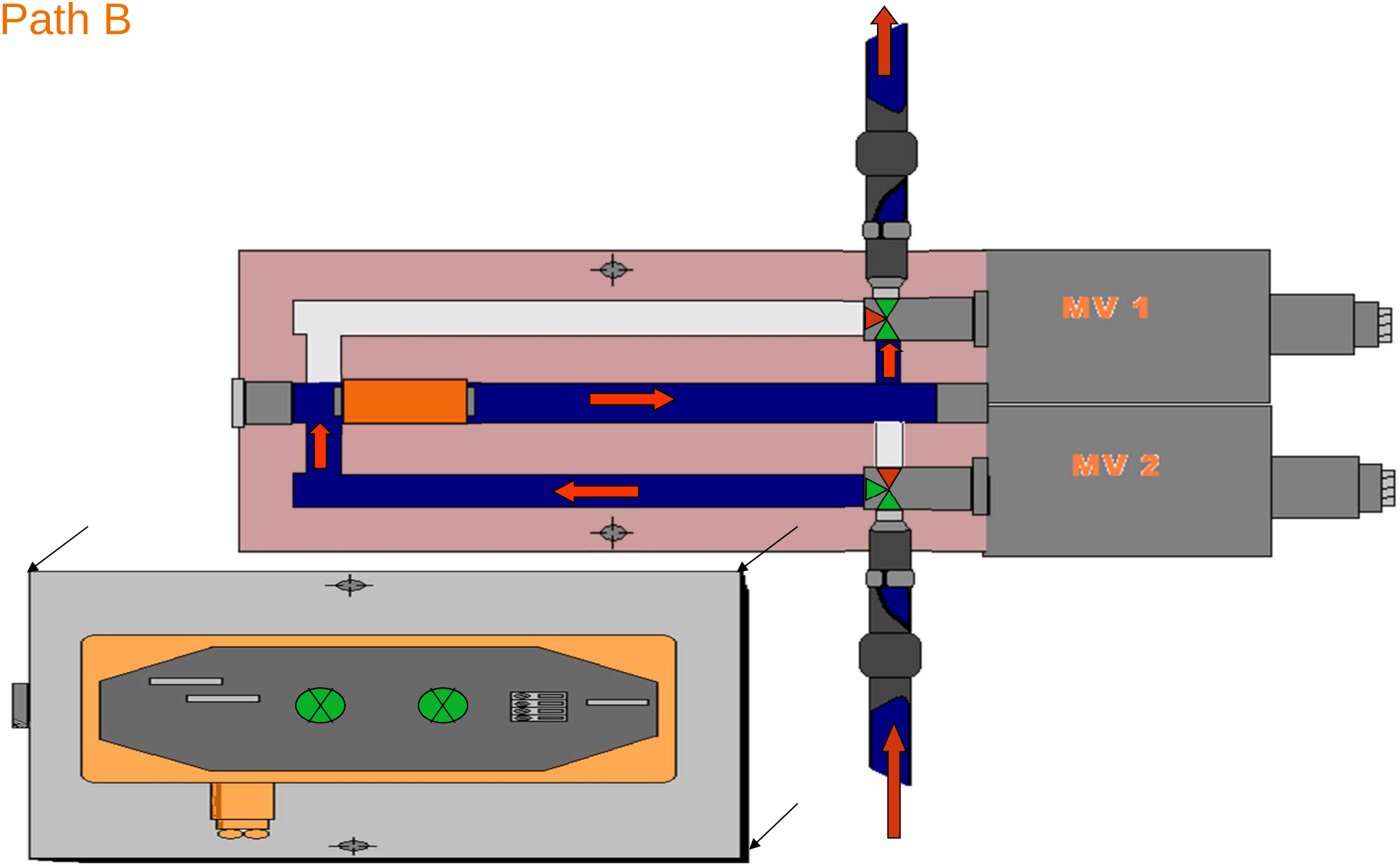
Functionality of Flowmeter

Leonberg, 6/2/2015, Peter Gleiniger

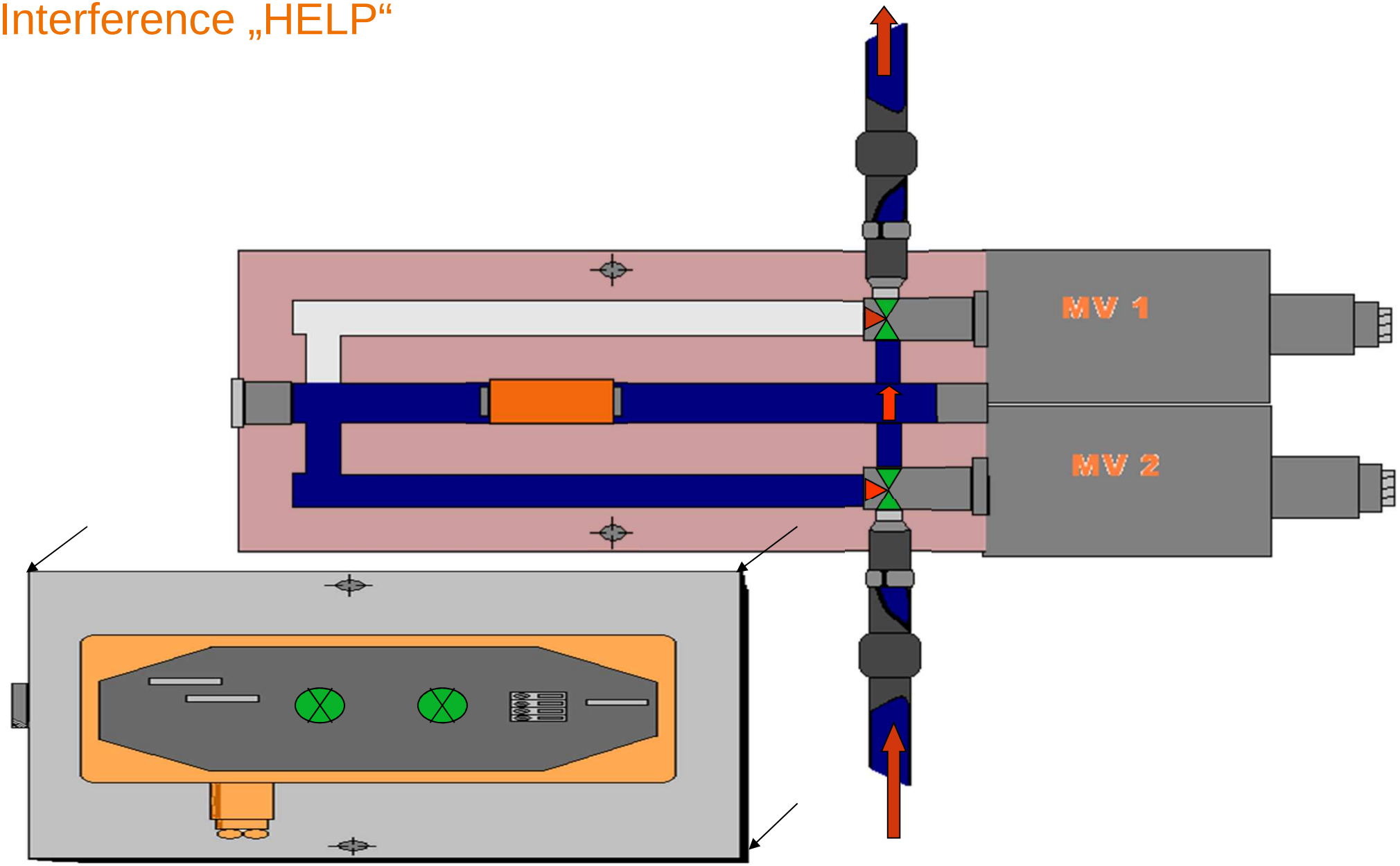
Path A



Path B



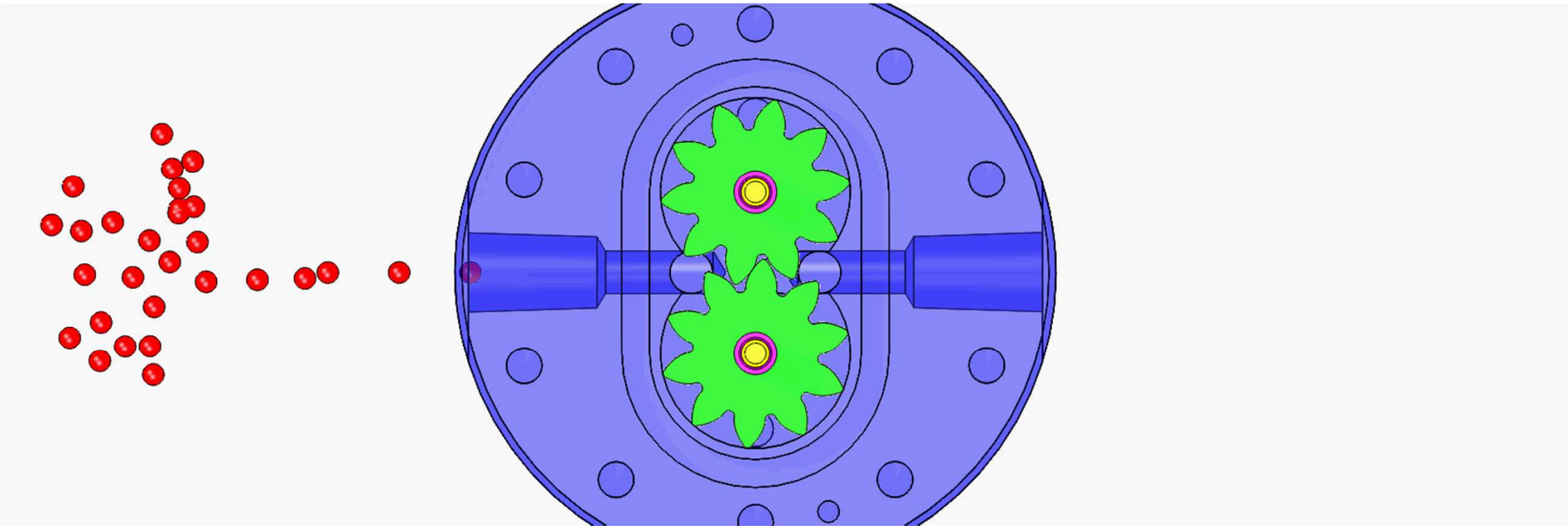
Interference „HELP“



Flowmeter LFM10

Gear Flowmeter

Animation



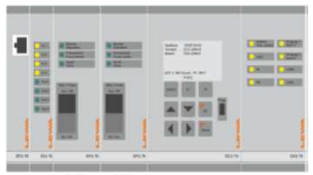
LEWA
Creating Fluid Solutions

Odor Electronic Controls

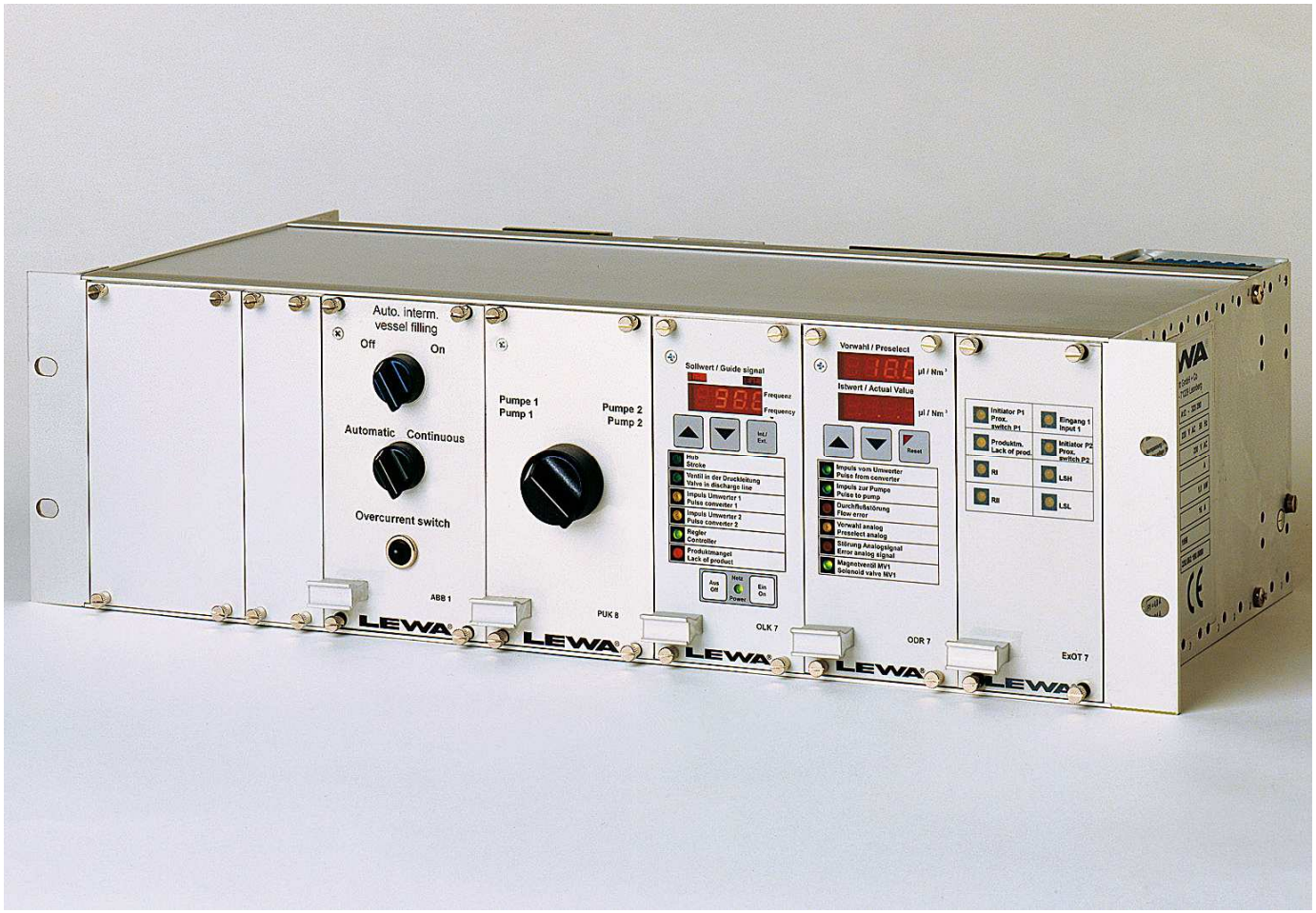
Leonberg, 6/2/2015, Peter Gleiniger

History of LEWA Odor Electronic Controls

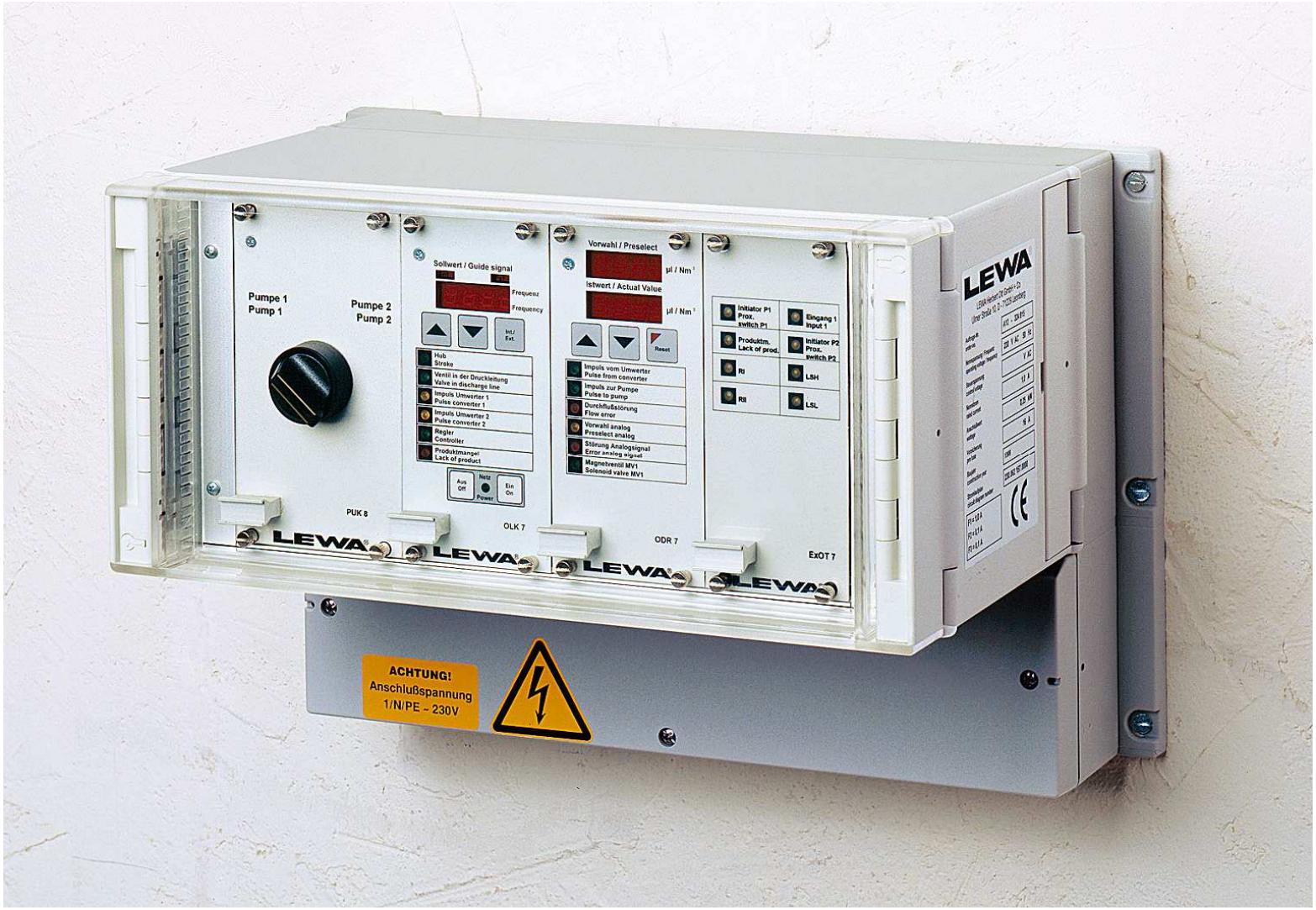
1.Generation 1971	2.Generation 1985	3.Generation 1986	4.Generation 1997	5.Generation 2001	6.Generation 2014
– DRT MLM	– Power element LT 1 – Control card SK 1 – Puls generator IG 1 – Flow meter DÜ 1 – Ex Input card IK 1 bzw. IK 2	– Control and power card SLK 7 – Odourant concentration controller MDR 7 – Ex Input Card ExK 7 – Flow meter DLK 7	– Control and power card OLK 7 – Odourant concentration controller ODR 7 – Ex Input Card ExOT 7	– Odourant concentration controller OKR7 / OEXD – Ex Input Card ExOT 7	– OCU – SPU – IOU – SIOU – EXU



Odourizing control cabinet 19“

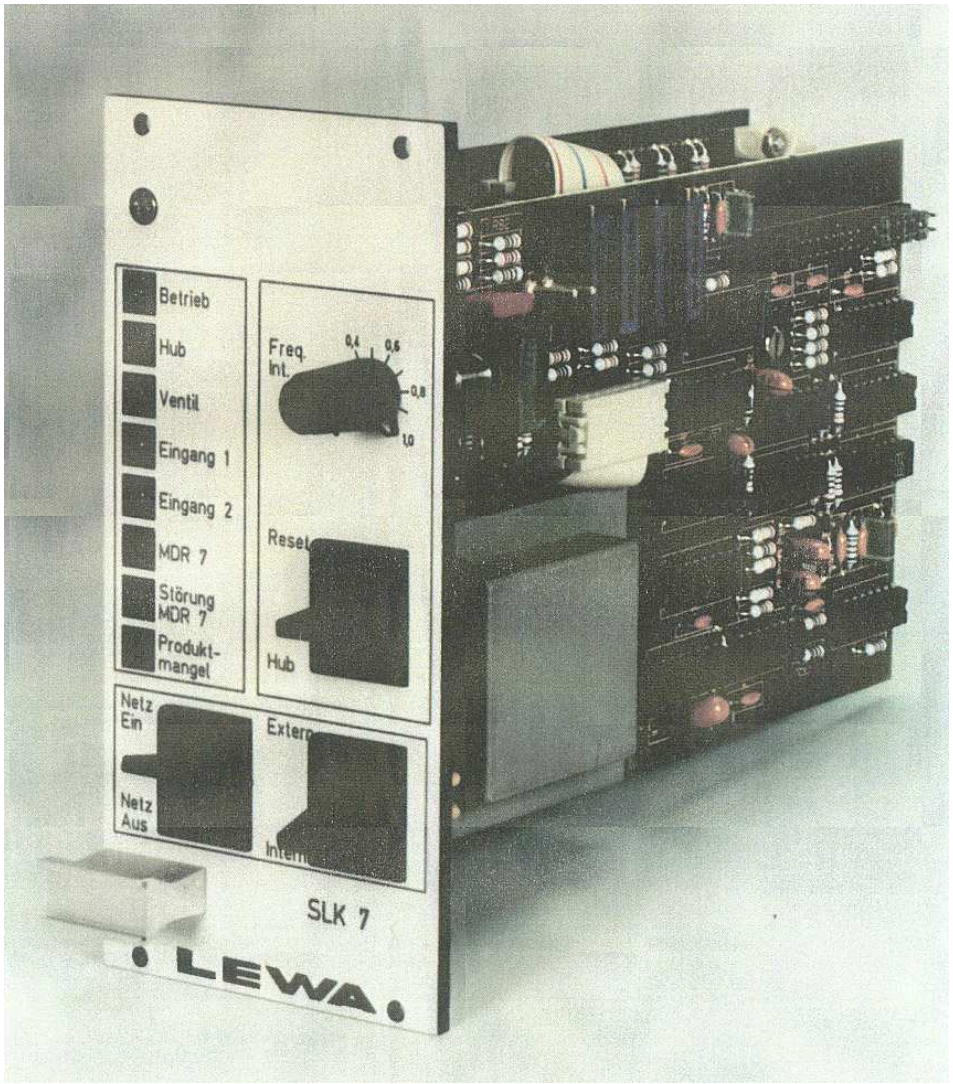


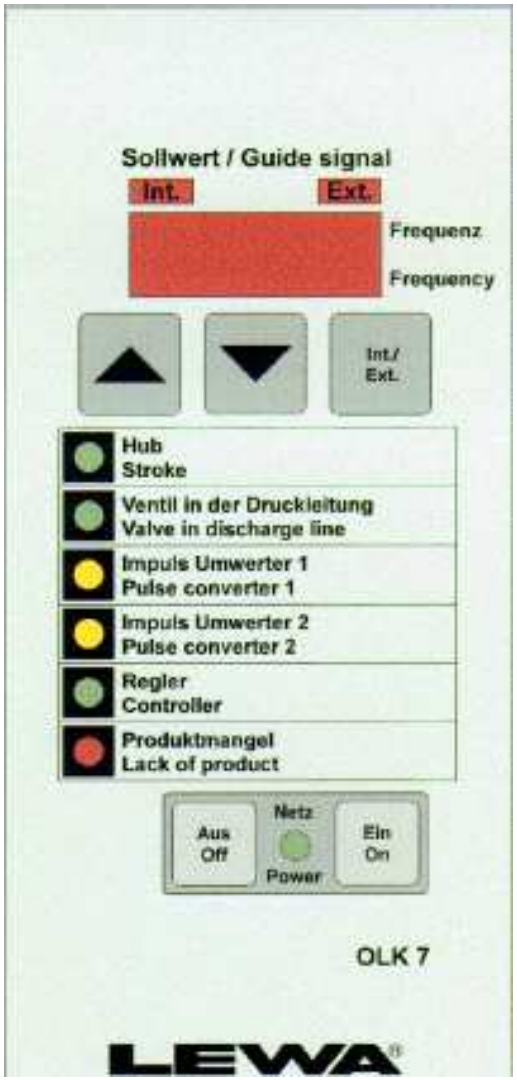
Wall casing


Pumpe 1
Pump 1
Pumpe 2
Pump 2
Sollwert / Guide signal
Frequenz
Frequency
Int./ Ext.
Hub
Stroke
Ventil in der Druckleitung
Valve in discharge line
Impuls Umwerter 1
Pulse converter 1
Impuls Umwerter 2
Pulse converter 2
Regler
Controller
Produktmangel
Lack of product
Aus Off
Netz
Power
Ein On
PUK 8
OLK 7
Vorwahl / Preselect
µl / Nm³
Istwert / Actual Value
µl / Nm³
Reset
Impuls vom Umwerter
Pulse from converter
Impuls zur Pumpe
Pulse to pump
Durchflußstörung
Flow error
Vorwahl analog
Preselect analog
Störung Analogsignal
Error analog signal
Magnetventil MV1
Solenoid valve MV1
ODR 7
Initiator P1
Prox. switch P1
Eingang 1
Input 1
Produktm.
Lack of prod.
Initiator P2
Prox. switch P2
RI
LSH
RII
LSL
ExOT 7
LEWA
ACHTUNG!
Anschlußspannung
1/N/PE ~ 230V

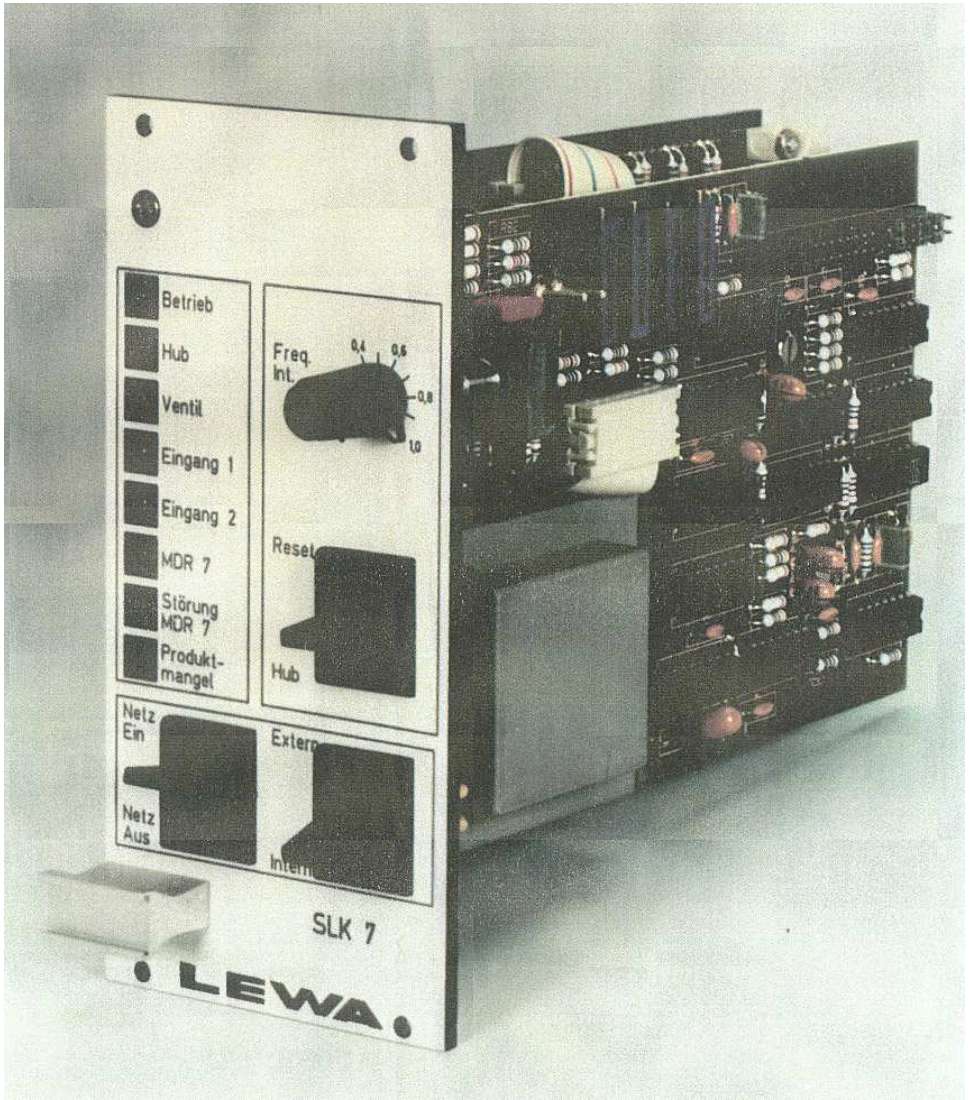
Example OKR 7 within 19“ housings

SLK 7 and OLK 7 controls the odor pump





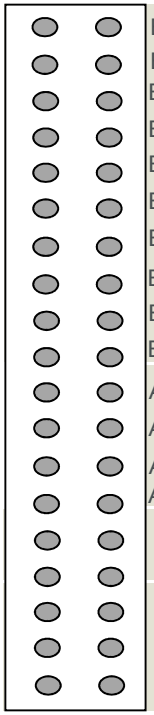
SLK 7


Betrieb
Hub
Ventil
Eingang 1
Eingang 2
MDR 7
Störung MDR 7
Produkt-mangel
Freq. Int.
0,4
0,6
0,8
1,0
Reset
Hub
Netz Ein
Netz Aus
SLK 7
LEWA

Setting options SLK7

AN 1:1 □ nicht besetzt
AN 1:2 □ MAH
AN 1:3 □ MLM15 MLM40
AN 1:4 □ nicht besetzt

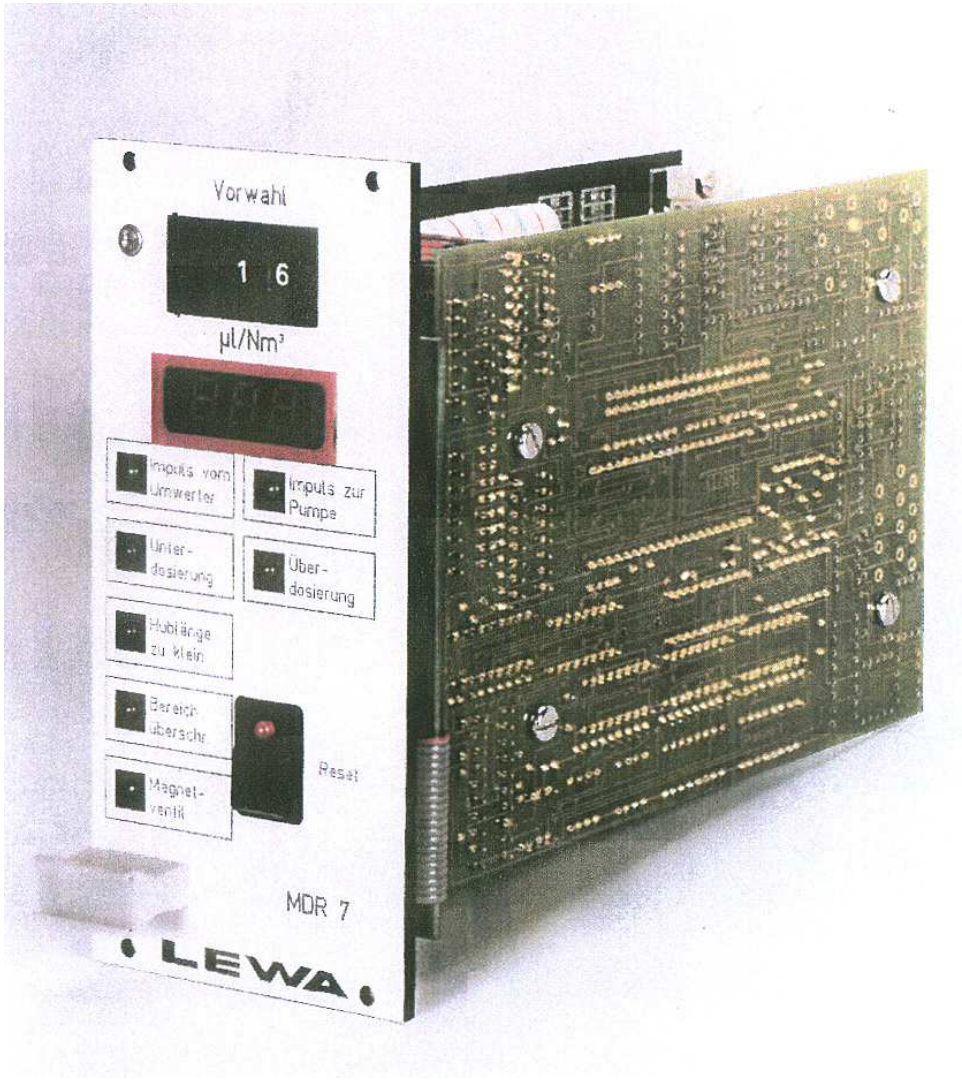
Bspl:
UT 512 □ nach 512 Impulsen vom Umwerter ohne Rückimpuls vom MDR erscheint Störung



ET 1:1 ET 1:2 ET 1:3 ET 1:4 ET 1:5 ET 1:6 ET 1:7 ET 1:8 ET 1:9	Einstellung der Wertigkeit durch entsprechende Jumper-Stellung Achtung: nur untersetzten möglich
ET 1:10	ET 1:10 nicht besetzt
AN 1:1 AN 1:2 AN 1:3 AN 1:4	Einstellung der max. Hubfrequenz für die jeweilige Pumpe
Ext. digital Ext. analog	Umstellung entsprechend dem Eingangssignal des Umwerters
UT 512 UT256 UT128	Anzahl Impulse bevor Störung vom Umwerter ohne Reaktion vom MDR

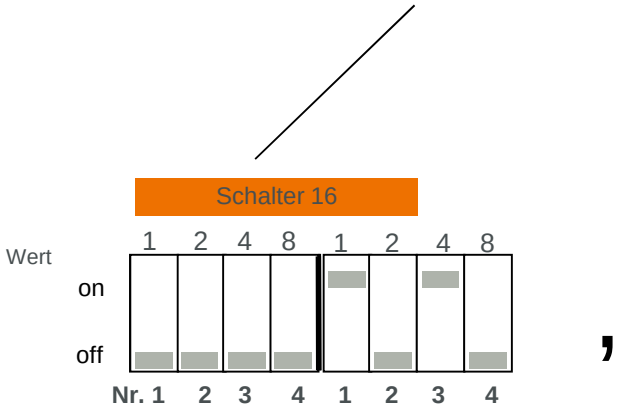
Anschluß Spannungsmeßgerät zum Abgleich des max./min. Führungssignals	1 2
min. analoges Signal vom Umwerter wird in minimale Hubfrequenz entspr. Pumpe abgeglichen	
Max. analoges Signal vom Umwerter wird in maximale Hubfrequenz entspr. Pumpe abgeglichen	
Max. Hubfrequenz für Drehpotentiometer auf Stellung intern	
Hubdauer: (Bestrom-Zeit des Permanentmagneten)	

MDR 7

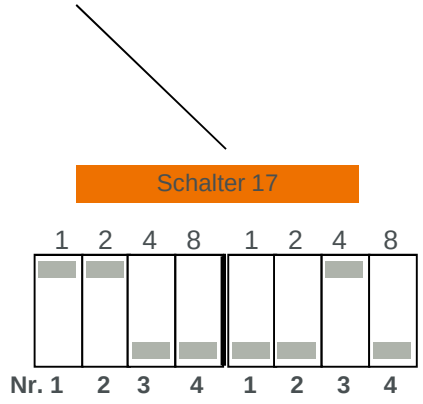

Vorwahl
1 6
µl/Nm³
Impuls vom Umwerter
Impuls zur Pumpe
Unter-dosierung
Über-dosierung
Hublänge zu klein
Bereich überschr
Reset
Magnet-ventil
MDR 7
LEWA

Setting options at controller MDR 7

Measuring volume

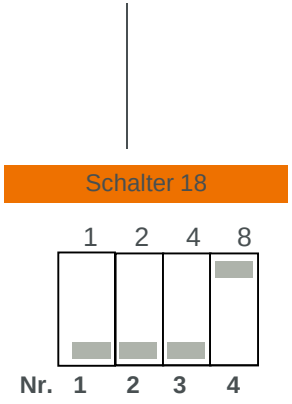


,



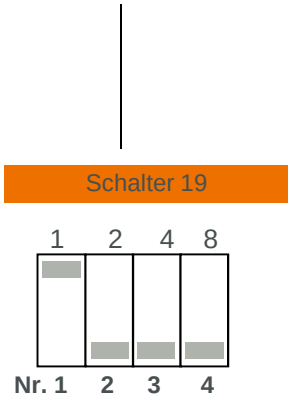
Nr.	Nr.	Nr.	Nr.
1 = 10 ml	1= 1 ml	1 = 0,1 ml	1= 0,01 ml
2 = 20 ml	2= 2 ml	2 = 0,2 ml	2 = 0,02 ml
3 = 40 ml	3= 4 ml	3 = 0,4 ml	3 = 0,04 ml
4 = 80 ml	4= 8 ml	4 = 0,8 ml	4 = 0,08 ml

Tolerance



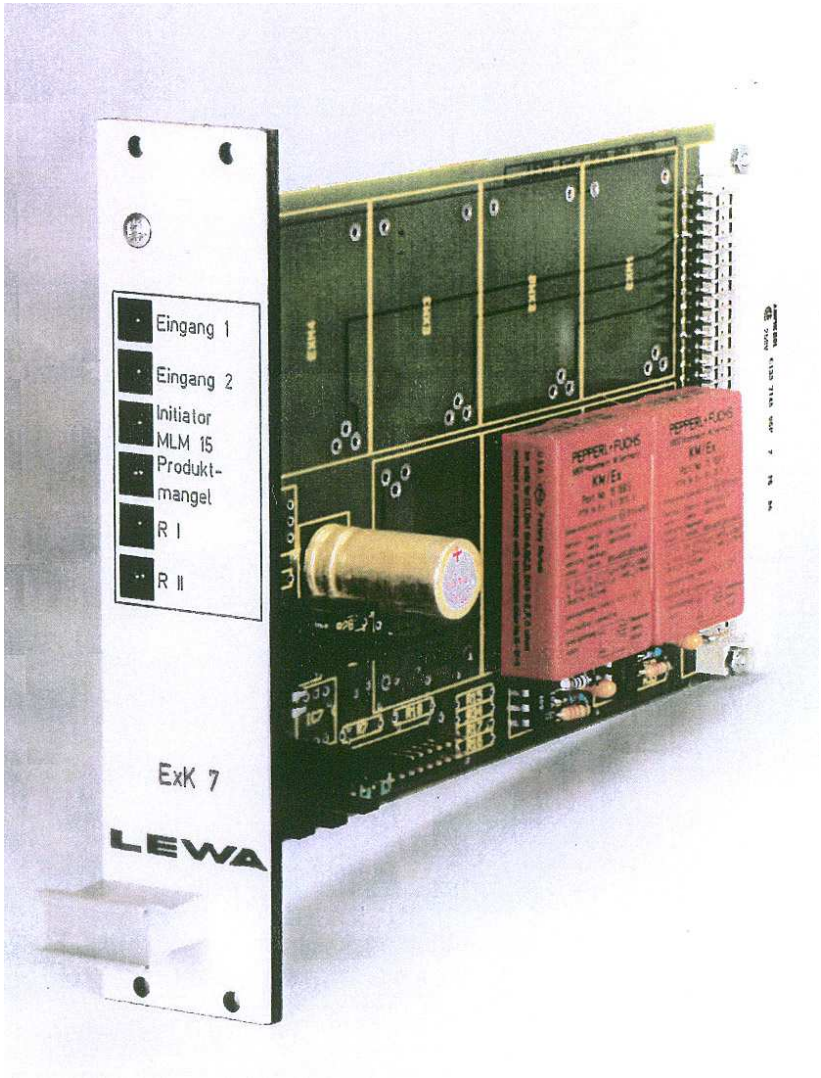
1 = 1 %
2 = 2 %
3 = 4 %
4 = 8 %

Rating



1 = 1 Nm^3/Impuls
2 = 2 Nm^3/Impuls
3 = 4 Nm^3/Impuls
4 = 8 Nm^3/Impuls
All to off=10 Nm^3/Impuls

Exk 7


Eingang 1
Eingang 2
Initiator
MLM 15
Produkt-
mangel
R I
R II
ExK 7
LEWA

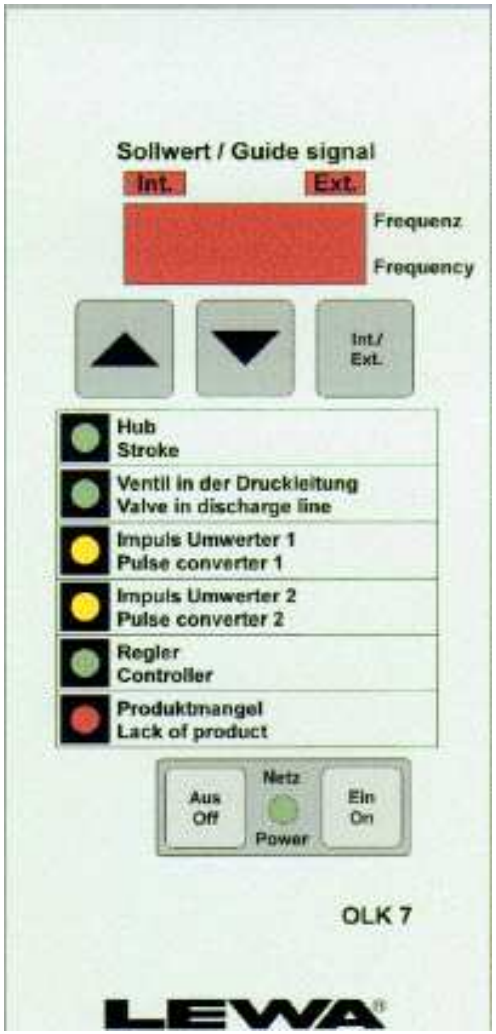
Fuse Control Cabinet

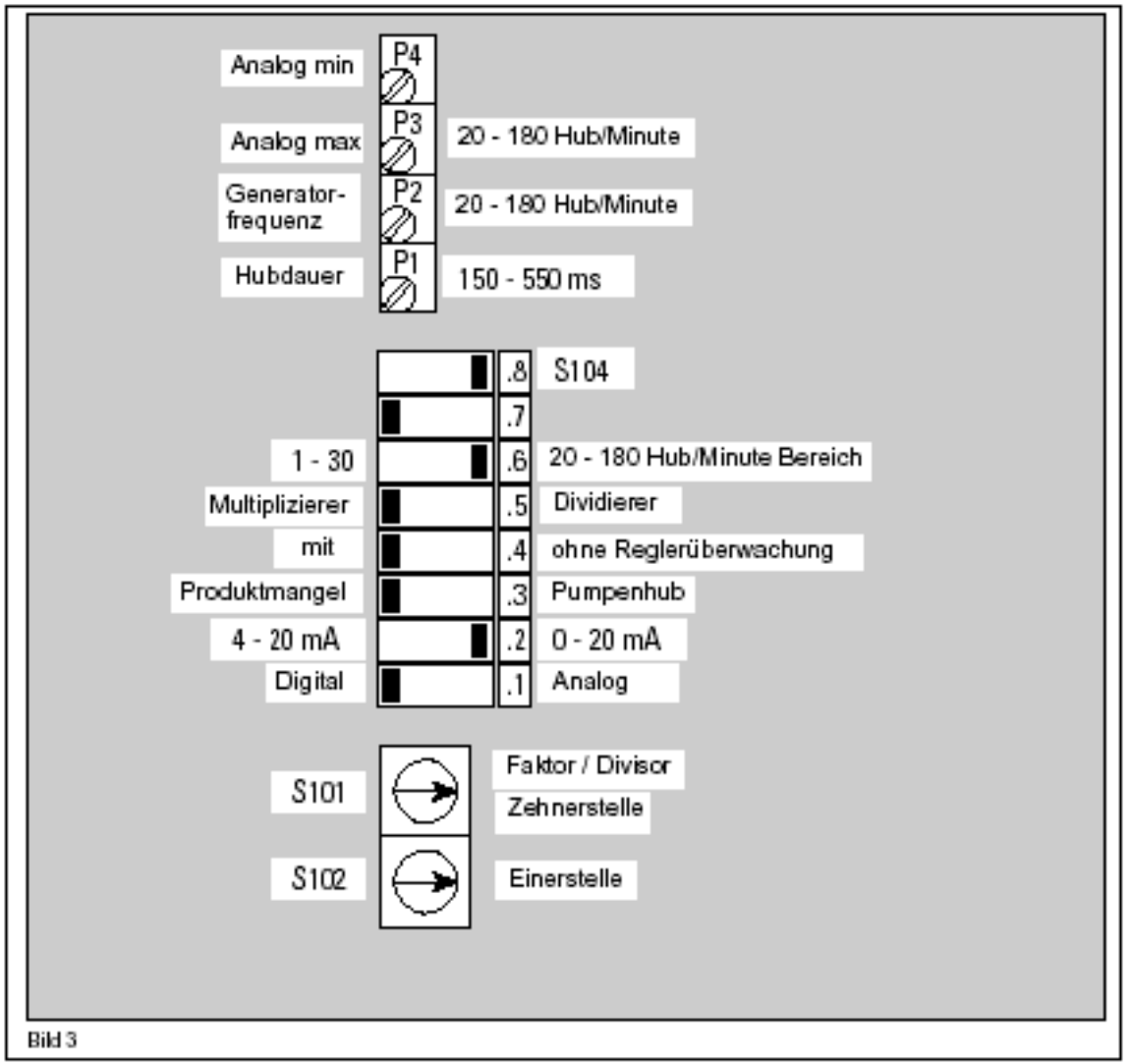
Fuse	Function
F1	Main fuse of the whole control cabinet
F2	Protection of solenoid valve in discharge pipe
F3	Protection of solenoid valve at micro flow meter

Correct fuse types Sl1 Sl2 (see picture 2)

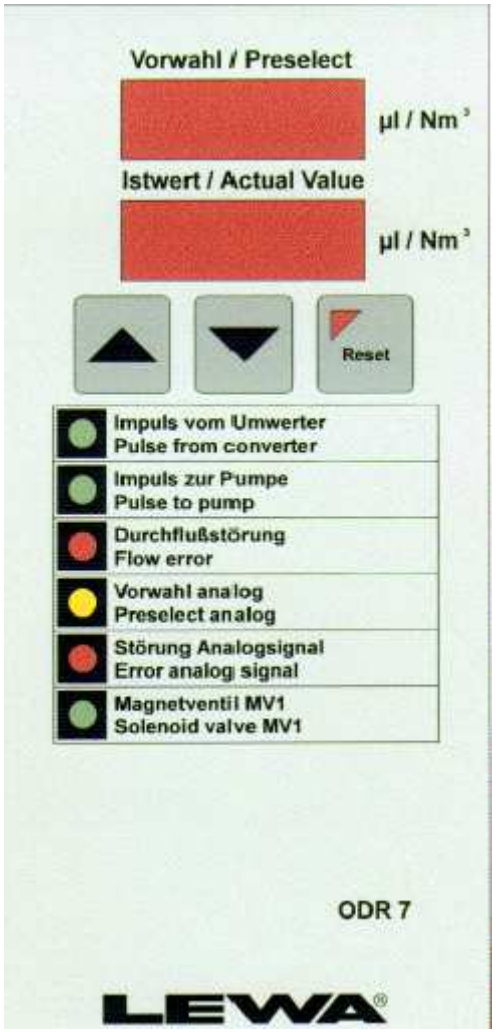
Power supply	Solenoid series	Fuse Sl1	Fuse Sl2
230 VAC	MAH	0,5 A delay	0,1 A fast
24 VDC	MAH	1,0 A delay	1,0 A fast
230 VAC	MLM 15	0,5 A delay	0,5 A fast
230 VAC	MBH	0,5 A delay	0,5 A delay
24 VDC	MBH	1,0 A delay	4,0 A delay
24 VDC	MLM 15	1,0 A medium delay	3,15 A fast
230 VAC	MLM 40	0,5 A delay	1,0 A fast

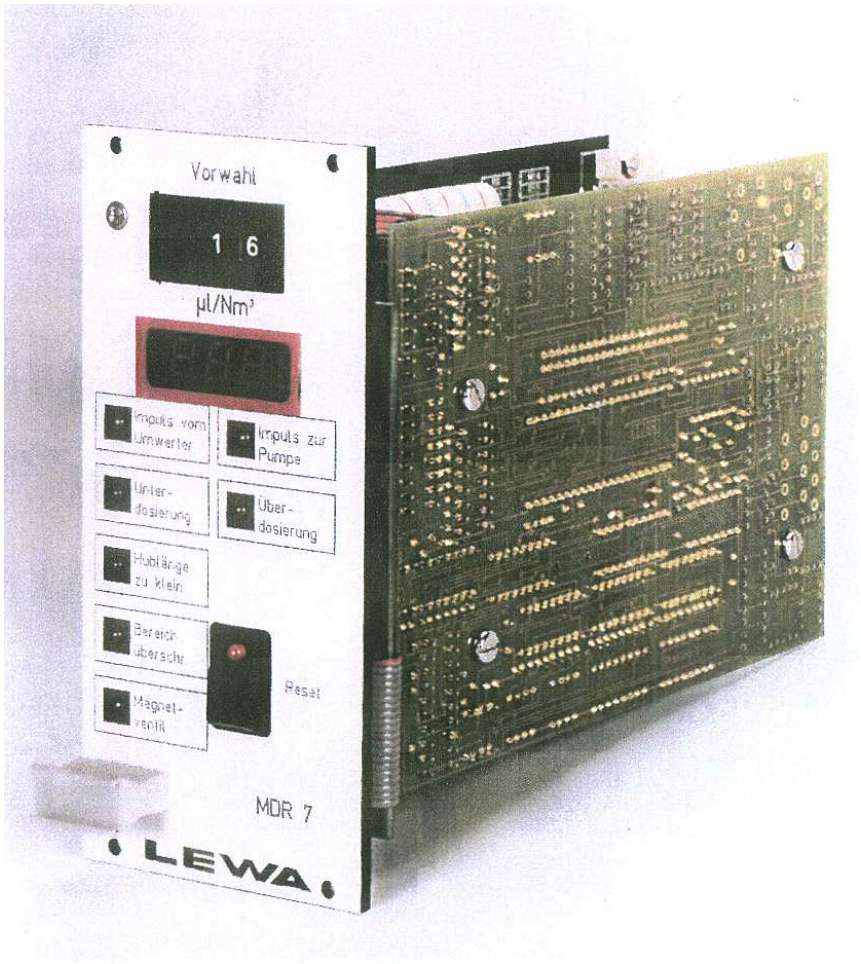
OLK 7


Sollwert / Guide signal
Int.
Ext.
Frequenz
Frequency
Int./
Ext.
Hub
Stroke
Ventil in der Druckleitung
Valve in discharge line
Impuls Umwerter 1
Pulse converter 1
Impuls Umwerter 2
Pulse converter 2
Regler
Controller
Produktmangel
Lack of product
Aus
Off
Netz
Power
Ein
On
OLK 7
LEWA

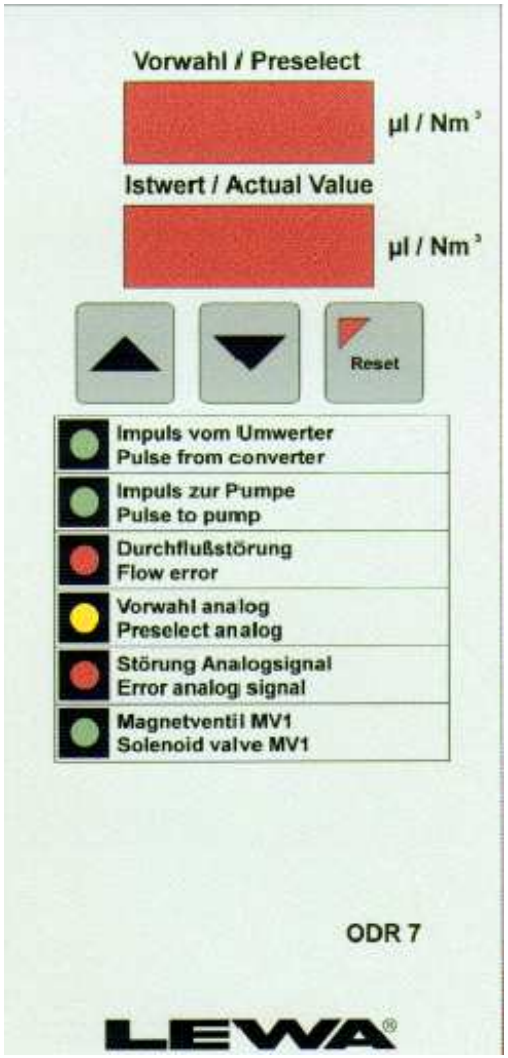

Analog min
P4
Analog max
P3
20 - 180 Hub/Minute
Generator-
frequenz
P2
20 - 180 Hub/Minute
Hubdauer
P1
150 - 550 ms
.8
S104
.7
1 - 30
.6
20 - 180 Hub/Minute Bereich
Multiplizierer
.5
Dividierer
mit
.4
ohne Reglerüberwachung
Produktmangel
.3
Pumpenhub
4 - 20 mA
.2
0 - 20 mA
Digital
.1
Analog
S101
Faktor / Divisor
Zehnerstelle
S102
Einerstelle
Bild 3

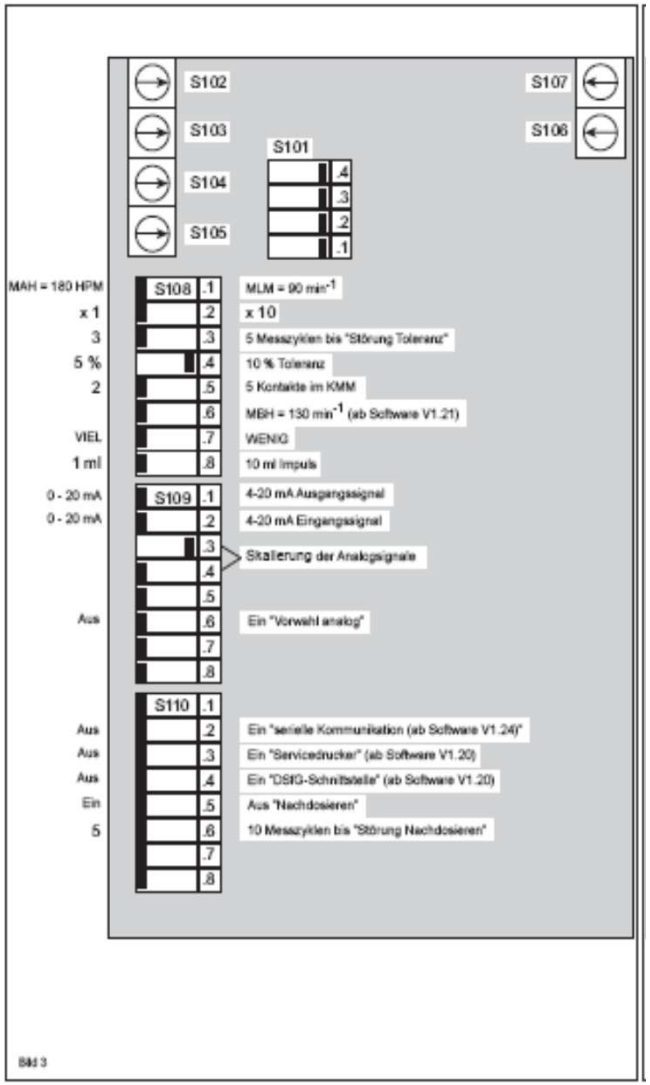
ODR 7 and MDR only compatable with KMM1





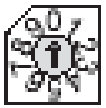
ODR 7





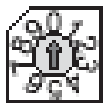
Switch ODR

Die Wertigkeit der Schalter ist:

S102	S103	S104	S105
			
Zehner	Einer	1. Nachkommastelle	2. Nachkommastelle
z.B. **0**	**5**	, **3**	**4**

entspricht einem Volumen von 5,34 ml

5.4.3 Impulswertigkeit des Umwerter-Impulses (siehe Bild 3)
An den Drehschaltern S106 und S107 wird die Impuls-Wertigkeit des Umwerter-Impulses eingestellt.Der Einstellbereich ist 1 - 99 Nm^3/Impuls. Zusätzlich kann am Konfigurationsschalter S108.2 die eingestellte Impulswertigkeit mit dem Faktor 10 multipliziert werden. Der Einstellbereich erhöht sich dann auf 10 - 990 Nm^3/Impuls.

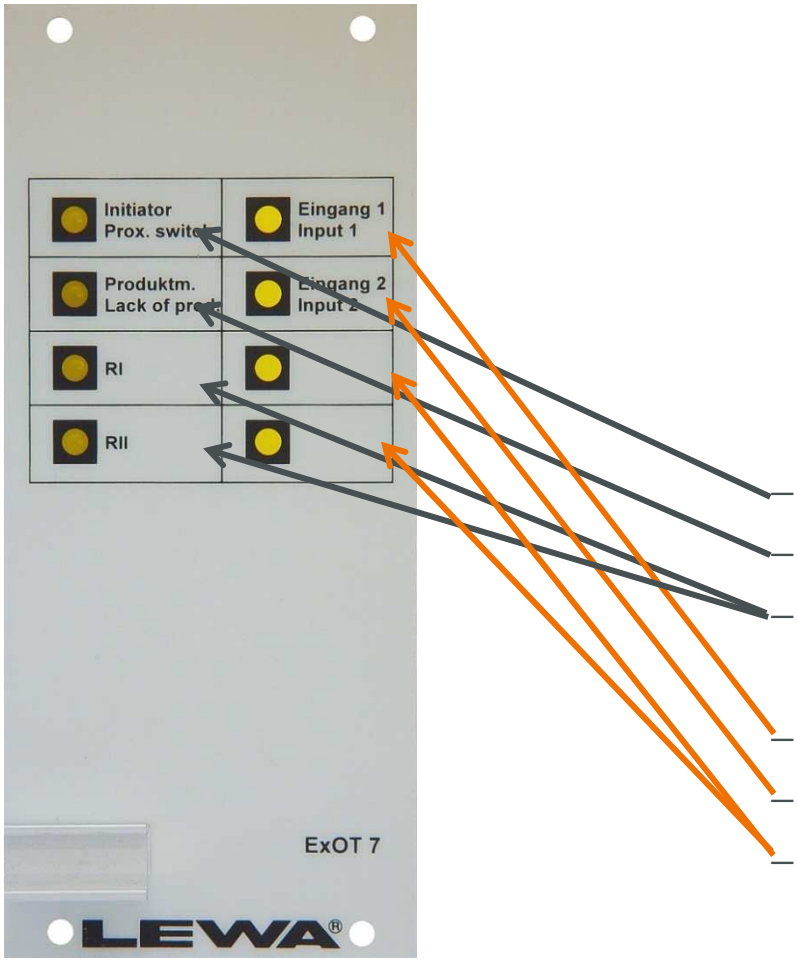
S106	S107
	
Zehner	Einer

ODR Error messages

Solenoid pump series	Flow meter in dosing pipe	No of strokes till “HELP” info	
		much	little
MAH	KMM mit 2 Rückmeldekontakten	1000	400
MAH	KMM mit 5 Rückmeldekontakten	250	100
MLM und MBH	KMM mit 2 Rückmeldekontakten	400	85
MLM und MBH	KMM mit 5 Rückmeldekontakten	55	20

Ex Input Card ExOT 7 - Saftey within Ex Area

- Intrinsically safe power supply of all needed input contacts
- Module with 4 or 8 Ex Inputs

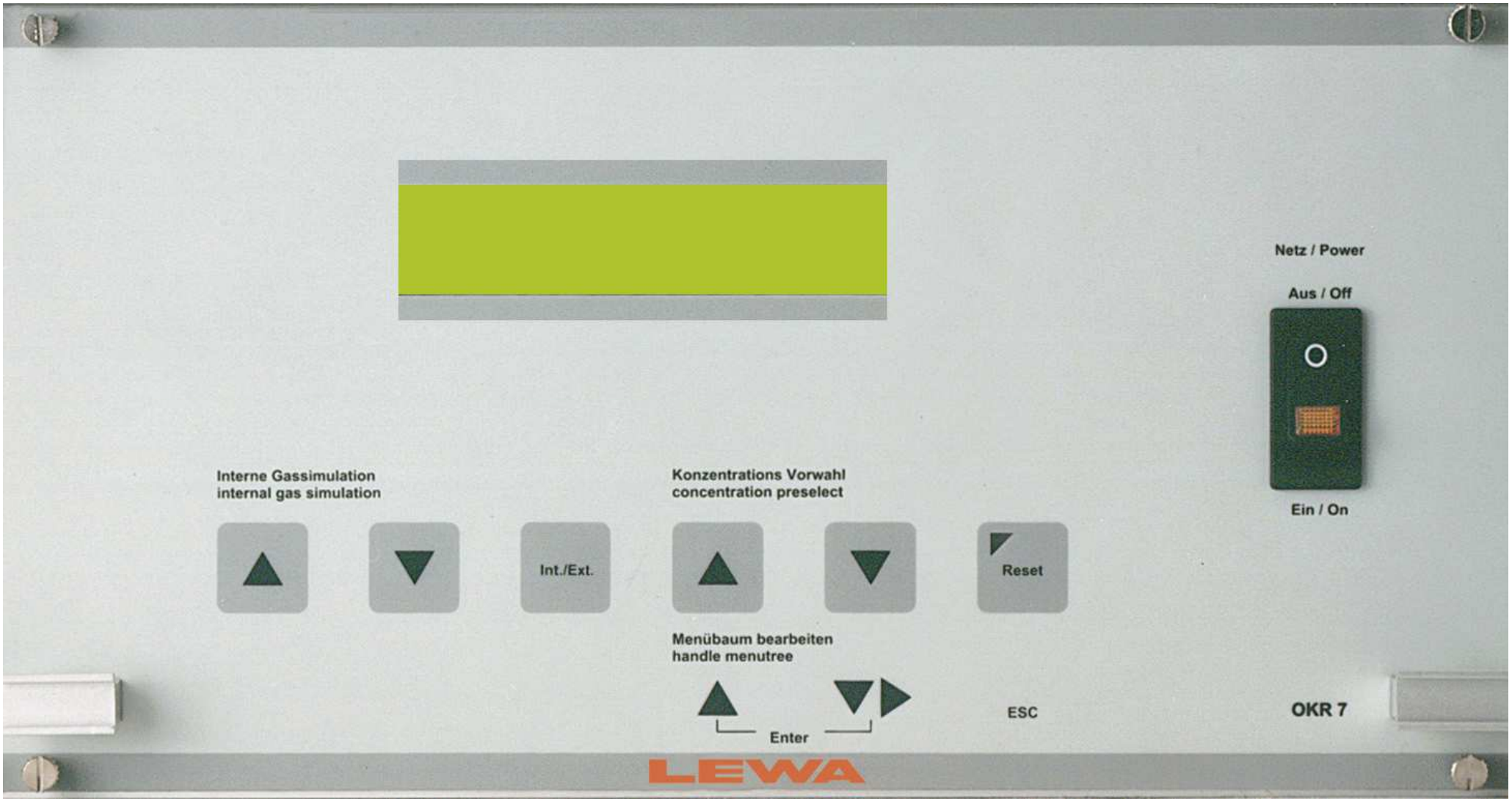


Ex Inputs are:

- Proximity switch at metering pump typ MLM
- Lack of product in the reserve tank
- Reed contacts at micro flow meter or flow meter

- 1. digital volume corrector
- 2. digital volume corrector
- add others as needed e.g. float switch LSHH

Odourant concentration controller OKR 7

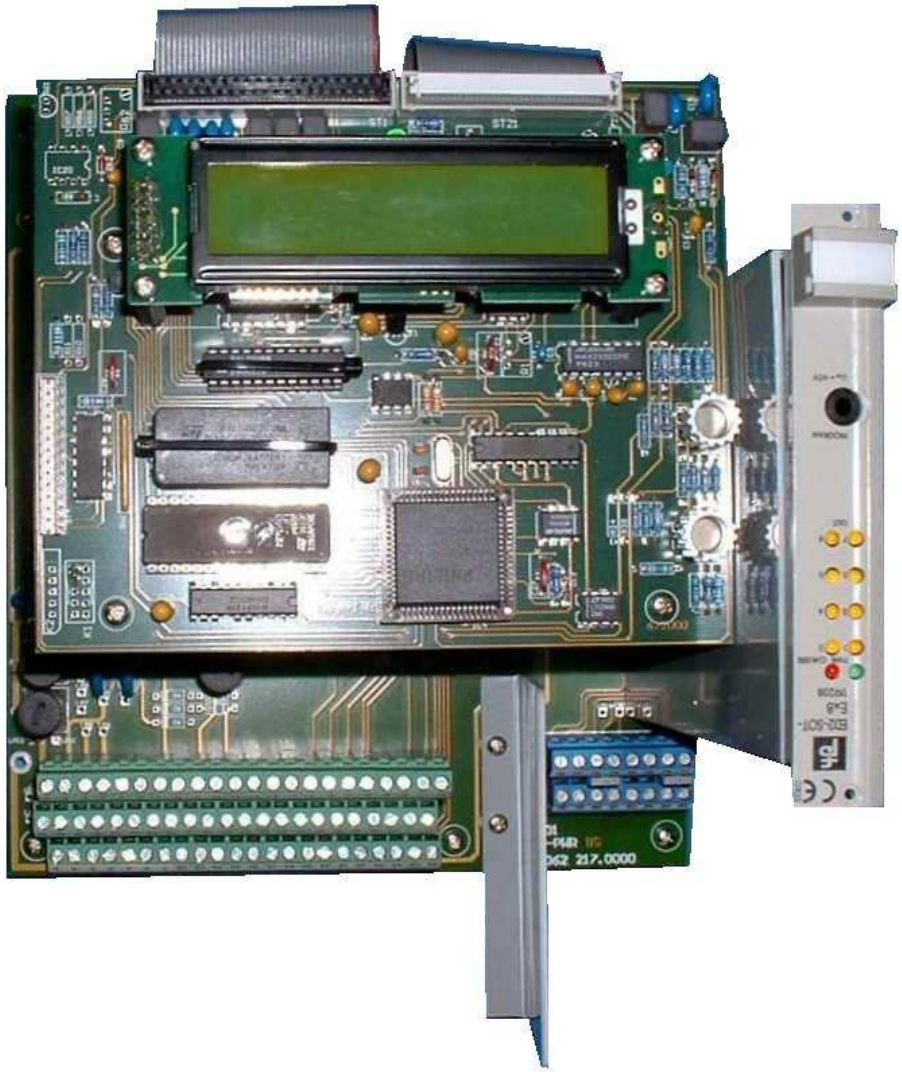


Example OKR 7 wall mounted or in cabinet

Example OKR 7 as Ex Controller OEXD suitable for Zone 1

Explosion protection: II G EEx d[ia] IIB T5

Internal design of cabinet Ex Controller OEXD



Inclusive isolation amplifier for intrinsically safe power supply of 8 digital input signals

Variants of odourant concentration controller OKR 7

OKR 7 im Wandgehäuse / Schaltschrank

OKR 7 im 19“-Rack

OEXD

MAH

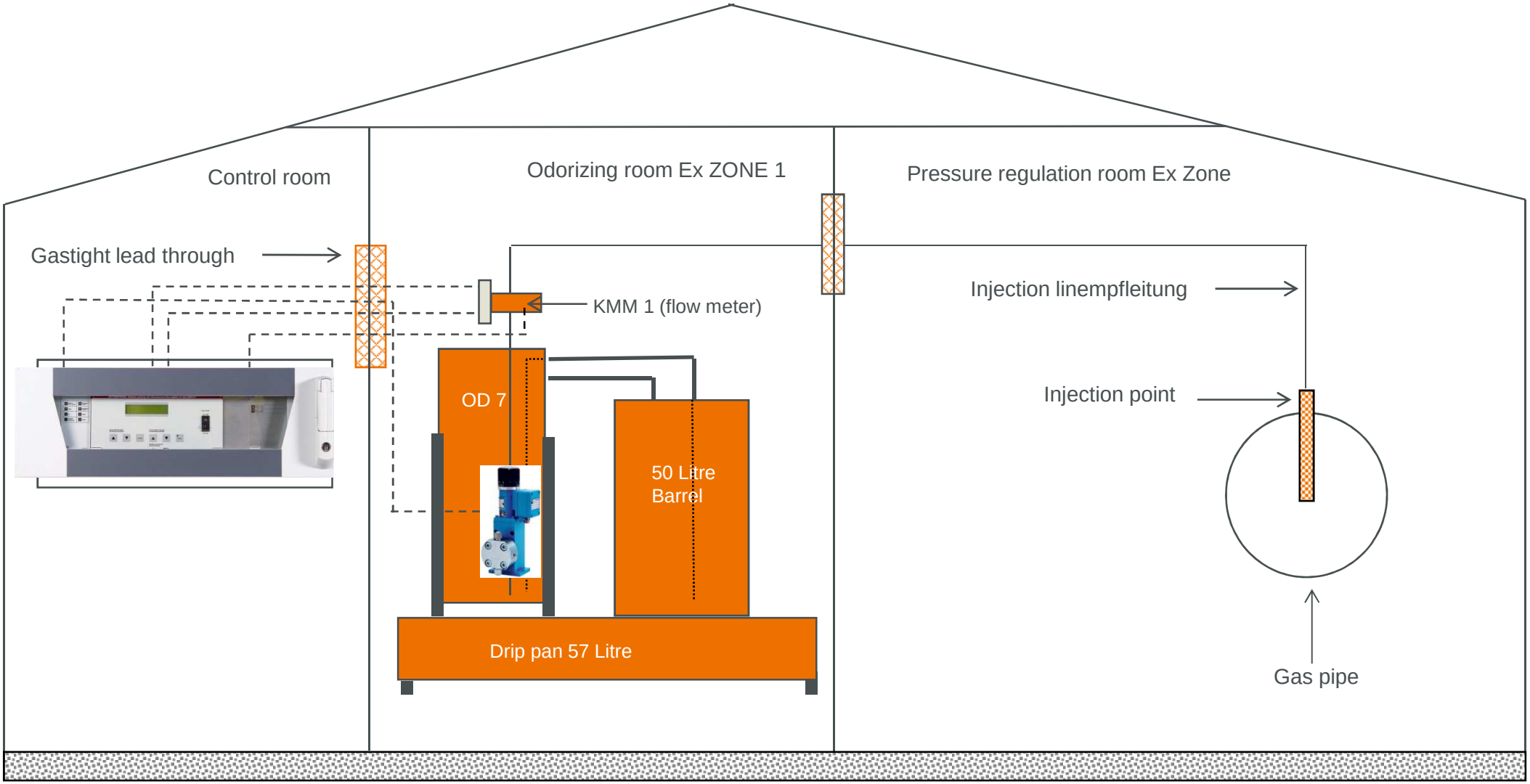
MBH

MLM15

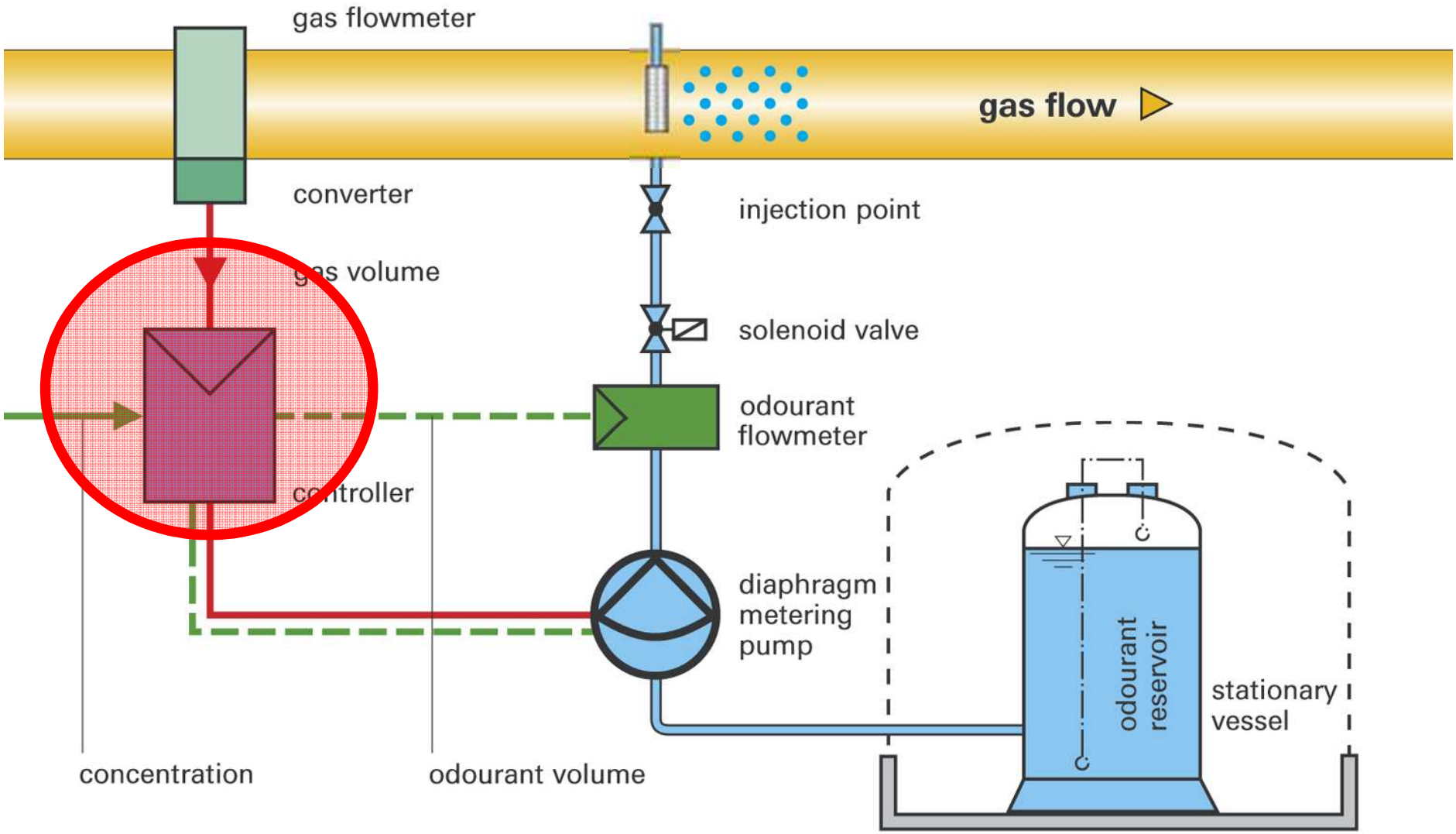
MLM40

LDB

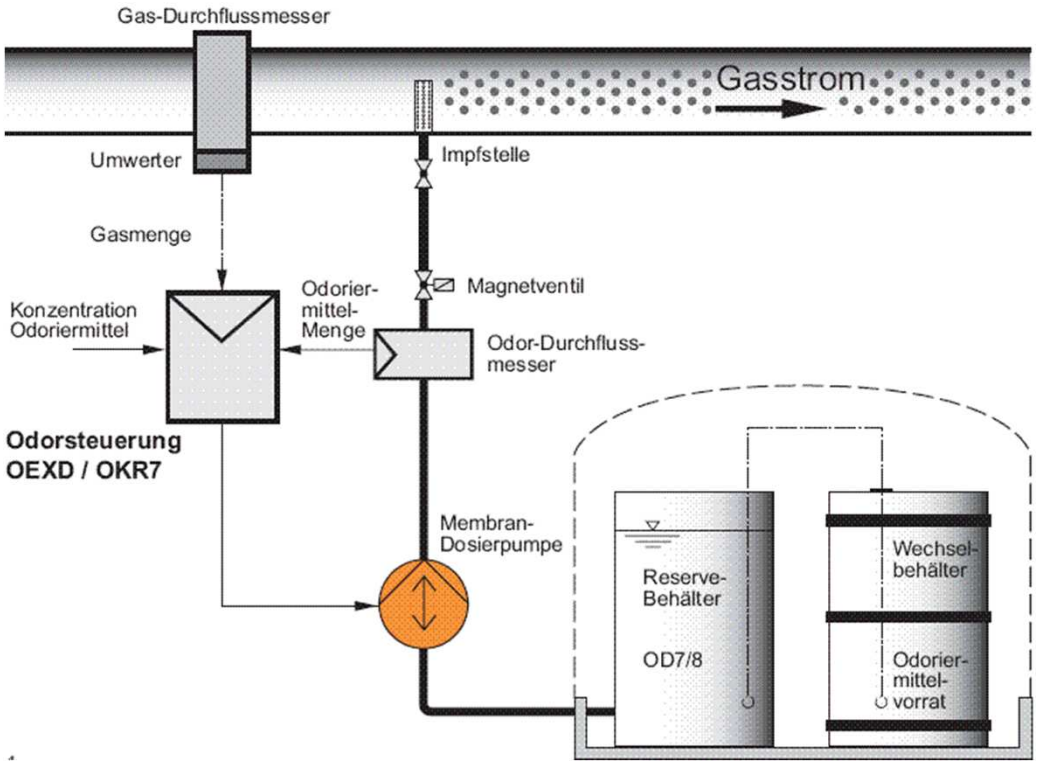
Assembly control station



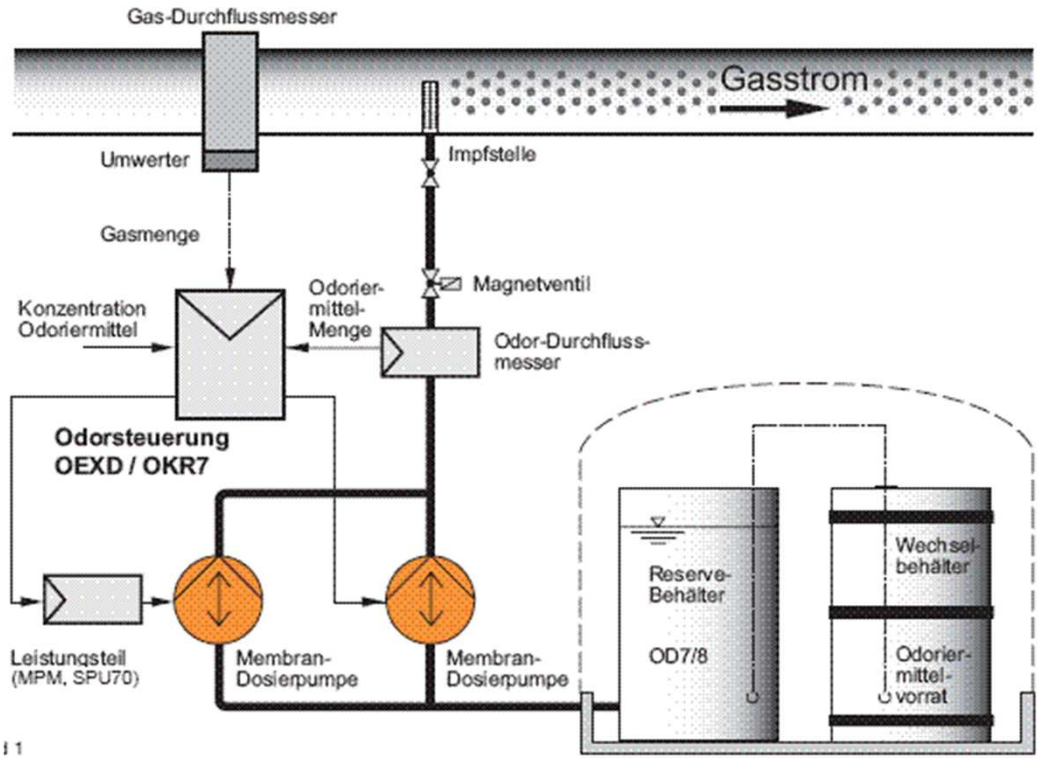
Principle of the odorization



Difference in operation OKR 7 and OKR 7- DUO



Odor controls OEXD / OKR7



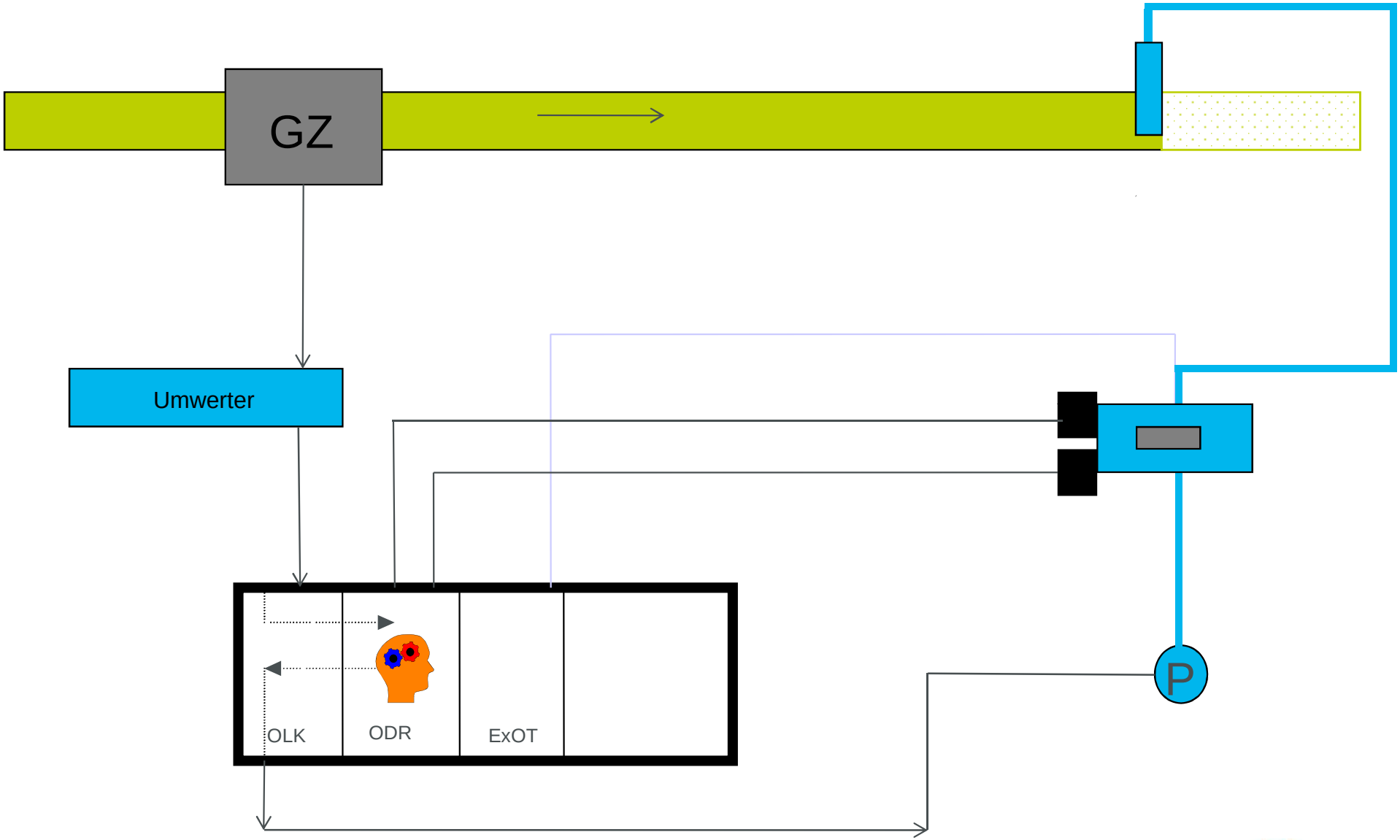
Odor controls OEXD / OKR7- **DUO**

Characteristics odourant concentration controller OEXD and OKR 7

Die Steuerung OEXD ist in einem druckfest gekapselten Gehäuse in der Zündschutzart Eexd untergebracht, die Steuerungen OKR7 sind als 19”-Steckbaugruppe oder eingebaut in einen Schaltschrank, evtl. mit weiteren Komponenten ausgeführt.

- Alle Einstellungen werden Dialog geführt mit der Tastatur vorgenommen
- Alle Daten sind netzausfallsicher in einem Batterie-RAM abgespeichert
- Alle Störungen werden in Klarschrift im Display angezeigt
- Dialogsprache wählbar aus deutsch, englisch, französisch, spanisch und portugiesisch
- Ansteuerung aller LEWA Magnetpumpen und motorisch betriebener Dosierpumpe betrieben über einen Frequenzumrichter
- Anschlussmöglichkeit für unterschiedliche Istwertaufnehmer in der Dosierleitung wie Kleinstmengenmesser KMM, Messbürette und Durchflussmesser mit Impulsausgang
- Logik zur Ankopplung eines Großbehälters an den Vorlagebehälter der Odoranlage mit automatischer Vorlage-Behälterfüllung
- Ausregeln und überwachen einer vorgewählten Odorstoff-Konzentration
- Summenzähler für dosierten Odorstoff und registrierter Gasmenge
- Ankopplung an einen Leitrechner mittels serieller Schnittstelle RS 232 oder RS 485 direkt über ein Modem möglich
- Analogeingang für externe Konzentrations-Vorwahl
- Analogausgang des Konzentrations-Iswertes

Functioning of control unit

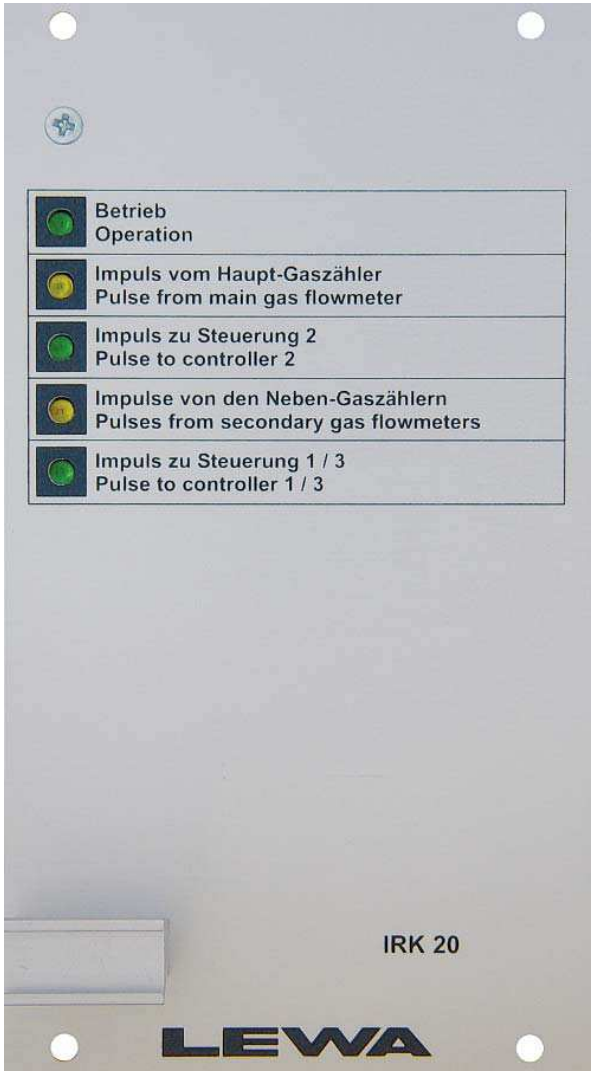


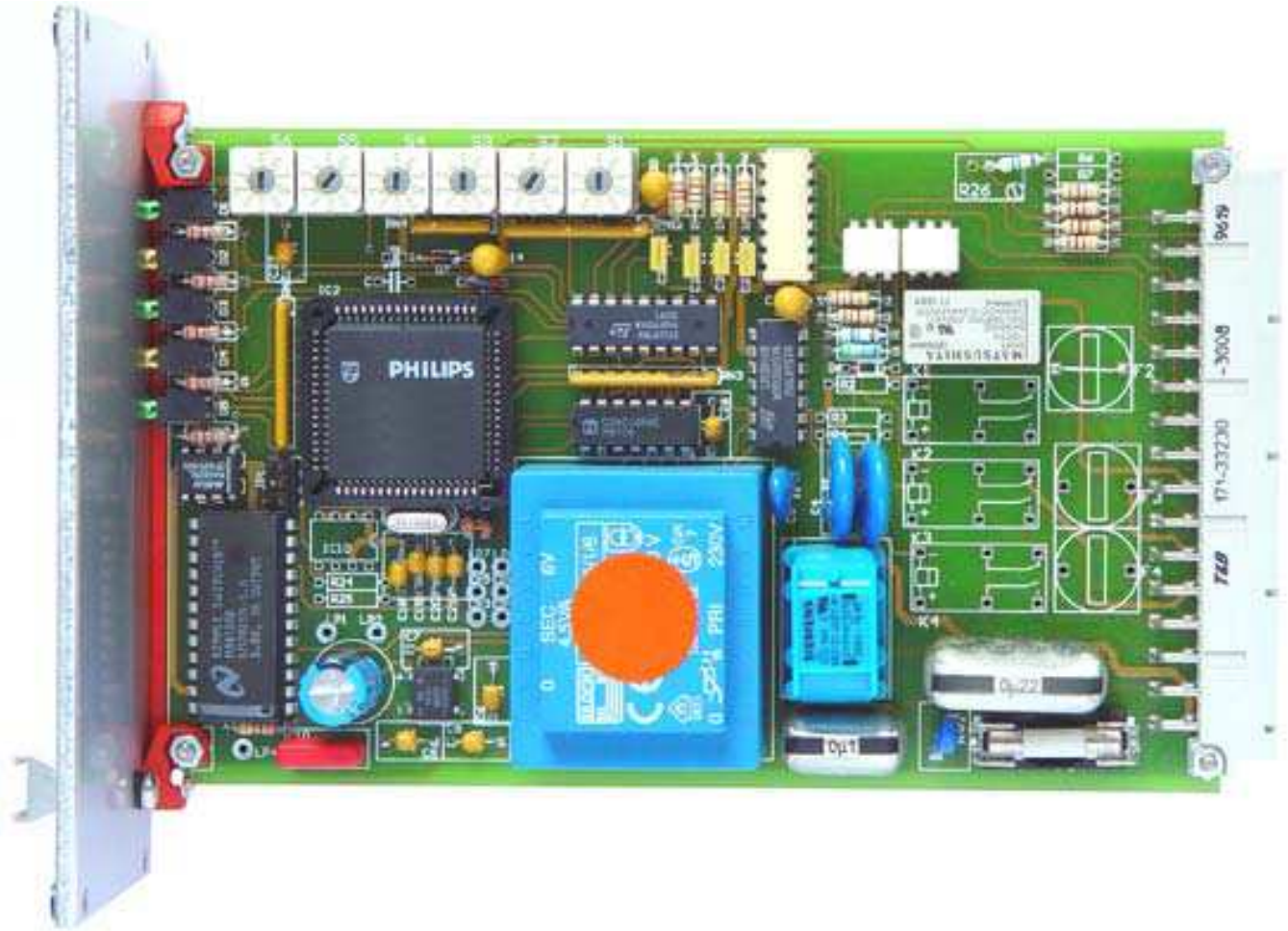
Set pulse valency

Relevant equation:

$$\frac{Nm^3}{\text{Incoming Pulses}} = \text{Value} \quad (\text{same unit time})$$

IRK 20


Betrieb
Operation
Impuls vom Haupt-Gaszähler
Pulse from main gas flowmeter
Impuls zu Steuerung 2
Pulse to controller 2
Impulse von den Neben-Gaszählern
Pulses from secondary gas flowmeters
Impuls zu Steuerung 1 / 3
Pulse to controller 1 / 3
IRK 20
LEWA


PHILIPS

Scheme IRK 20

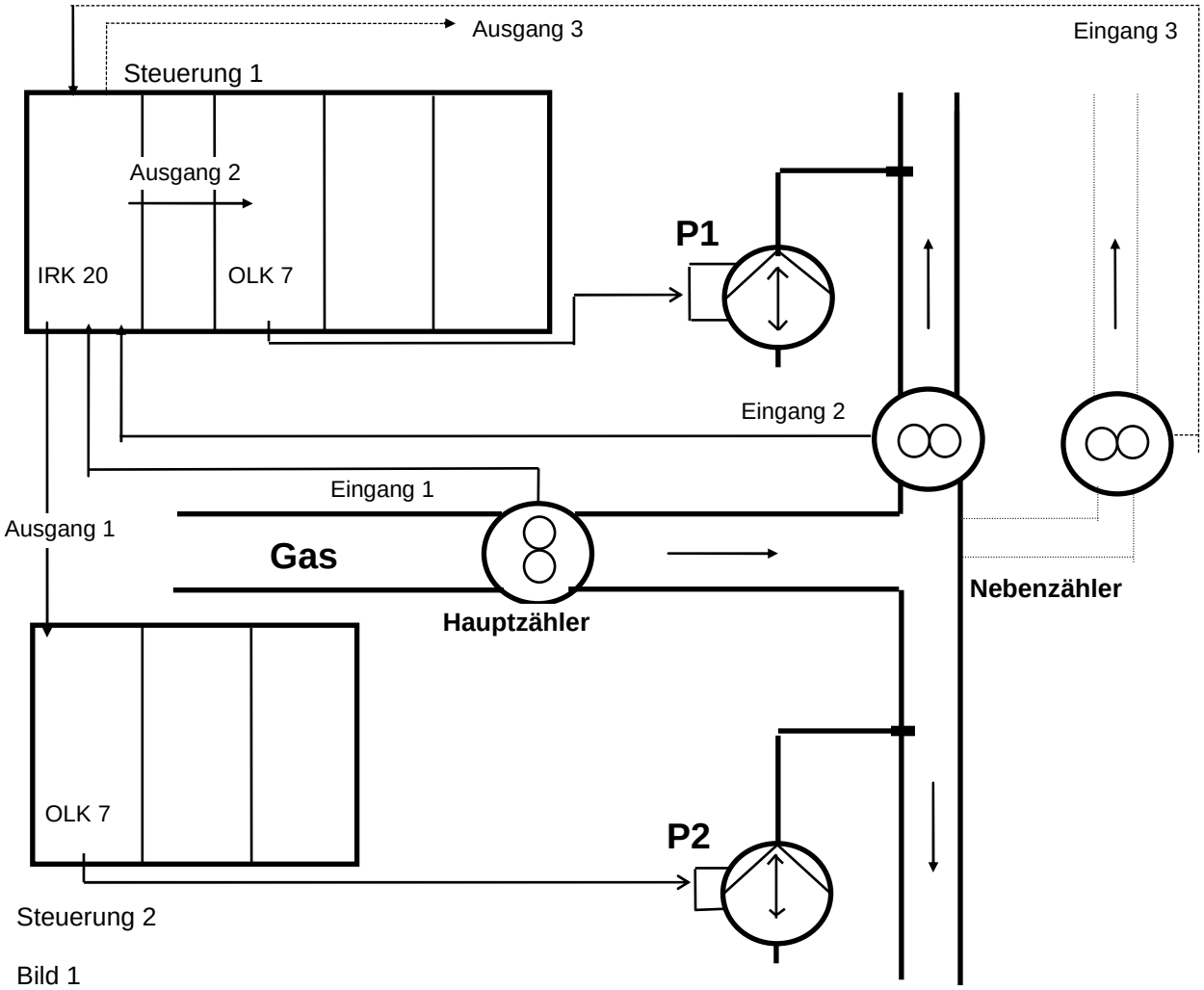


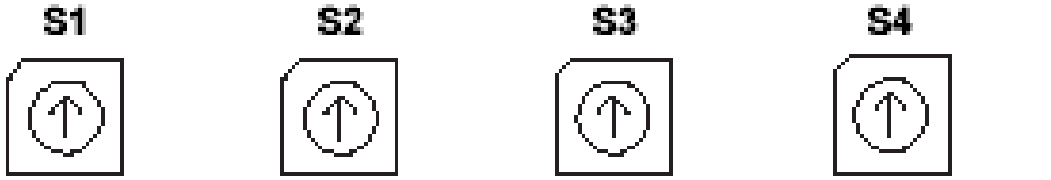
Bild 1

Parameter Settings IRK 20

S5	S6	Pumpentyp	Bereich 1. Neben-Gaszähler	Bereich 2. Neben-Gaszähler
0	0,2 oder 4	MLM	0,01 bis 99,99	wie 1. Neben-Gaszähler
1	0,2 oder 4	MAH	0,01 bis 99,99	wie 1. Neben-Gaszähler
0	1,3 oder 5	MLM	0,01 bis 1,00	0,01 bis 1,00
1	1,3 oder 5	MAH	0,01 bis 1,00	0,01 bis 1,00
2	1,3 oder 5	MLM	0,1 bis 10,0	0,01 bis 1,00
3	1,3 oder 5	MAH	0,1 bis 10,0	0,01 bis 1,00
4	1,3 oder 5	MLM	0,01 bis 1,00	0,1 bis 10,0
5	1,3 oder 5	MAH	0,01 bis 1,00	0,1 bis 10,0
6	1,3 oder 5	MLM	0,1 bis 10,0	0,1 bis 10,0
7	1,3 oder 5	MAH	0,1 bis 10,0	0,1 bis 10,0
8	1,3 oder 5	MLM	1 bis 100	1 bis 100
9	1,3 oder 5	MAH	1 bis 100	1 bis 100

Parameter Settings IRK 20

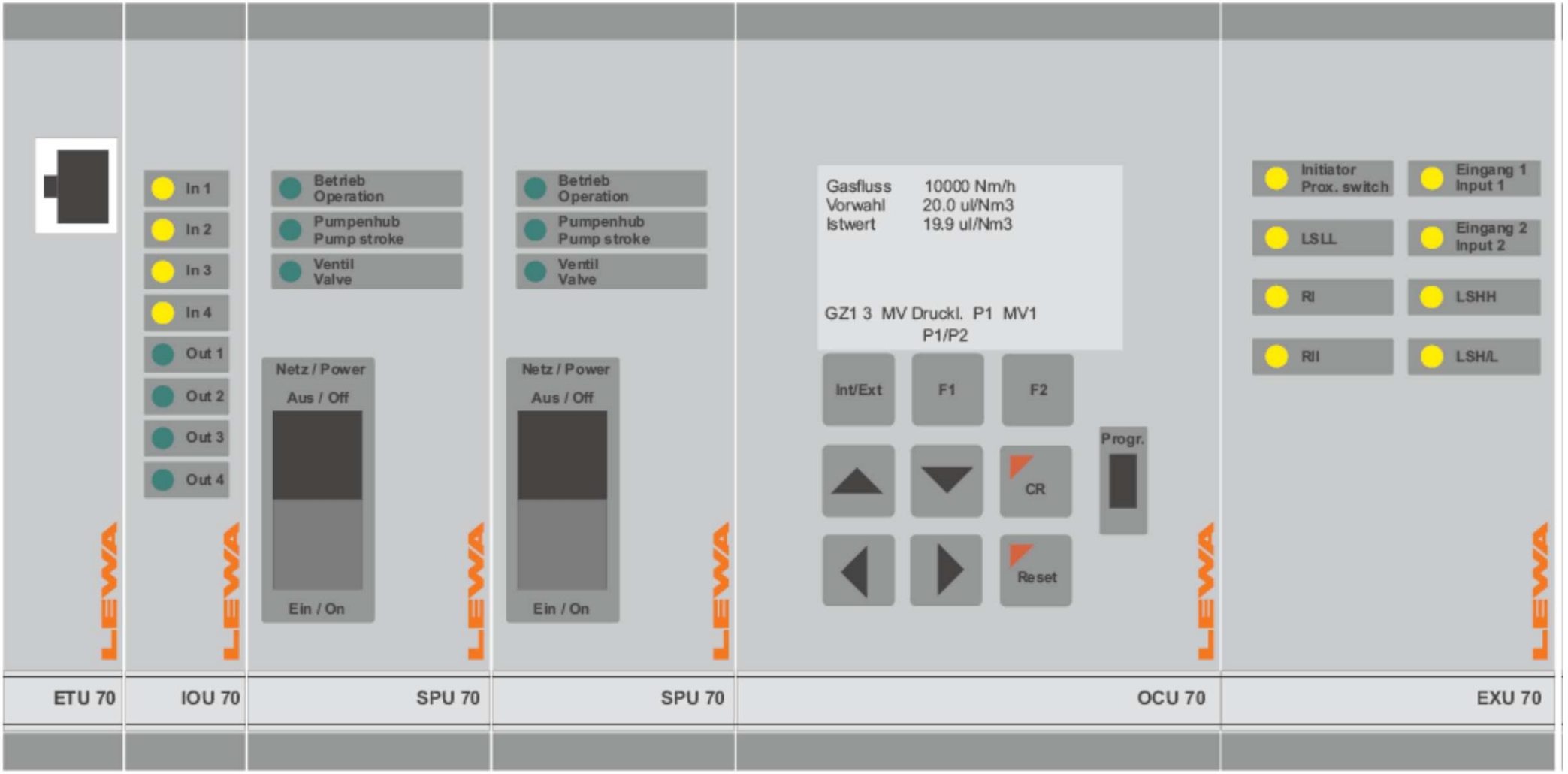
S6	Programm-Funktion
0	Impulssubtraktion mit gleichen Impuls-Wertigkeiten der beiden Neben-Gaszähler
1	Impulssubtraktion mit unterschiedlichen Impuls-Wertigkeiten der beiden Neben-Gaszähler
2	Impulsaddition mit gleichen Impuls-Wertigkeiten der beiden Neben-Gaszähler
3	Impulsaddition mit unterschiedlichen Impuls-Wertigkeiten der beiden Neben-Gaszähler
4	Impulssubtraktion mit gleichen Impuls-Wertigkeiten der beiden Neben-Gaszähler und stoppen der Odor-ierung bei erkanntem Gasrückfluß
5	Impulssubtraktion mit unterschiedlichen Impuls-Wertigkeiten der beiden Neben-Gaszähler und stoppen der Odorierung bei erkanntem Gasrückfluß



z.B. 0 5 , 3 4

entspricht einem Multiplikator von 5,34

6. Generation OCU



Operating Instructions

Odourizing unit OD 7 and OD 8 without / *with* suction pressure **B 00.071.1 en**

Table of contents

Sectional drawing of LEWA odourizing unit

(on the last page of this operating instruction)

1 General Information

1.1 Important preliminary information

Make sure to read and observe the bold texts before initial start-up to avoid damages!
The LEWA odourizing unit must only be used in proper technical condition and for the application intended, special attention must be paid to any safety risk observing the operating instruction! Specially problems impairing the safety must be corrected immediately.
Proper use includes observation of the operating instruction and maintaining of all inspection and maintenance requirements.
The LEWA odourizing unit is only intended for the conditions and fluid stated in the technical data sheet. Any deviating use or a use exceeding these conditions is considered to be improper use. The risk rests with the user exclusively.
The operator must assure that all commissioning, service, preventive maintenance and installation work is carried out by authorised and qualified expert personnel only which has gained sufficient information by studying the operating instruction in detail. LEWA offers special training courses for this, please contact us if you require information on this.

In addition to the safety  and caution instructions  in this operating instruction also observe all general occupational safety and health regulations !
For hazardous area acc. to directive 94/9/EG (ATEX) please observe the information marked with  sign.
The figures or pictures used may show type related deviations which, however, are of no consequence for the function.
The operator must assure that at least one copy of the operating instruction always is available near the metering pump / process pump odourizing unit!

- **Is the power supply of the drive resp. the control correct?**
- **Has the electric hook-up of the LEWA odourizing unit been carried out correctly observing local regulations?**
- **Are all connections hooked-up correctly (no tension and tight)?**
- **Is the supply of the odourant assured?**
- **Are suction and discharge lines open? (open valves in suction and discharge line)**
- **Has the LEWA odourizing unit and the odourant vessel been installed according to the dimensions given in the sectional drawing?**

1.2 Application

This operating instruction applies to **the LEWA odourizing unit type OD 7** and OD 8 **without / *with suction*** pressure of Messrs. LEWA in Leonberg.

The texts in "*italics*" apply to units *with suction pressure*.

The LEWA serial number and the year of manufacture is stated in the technical data sheet and the name plate of the LEWA odourizing unit.
The issue date of this operating instruction is given at the end of the written part of this operating instruction. Kindly state in case of questions.

1.3 Performance and applicabilities

This LEWA odourizing unit was designed to handle the application given in the technical data sheet.
LEWA will not accept any responsibility when these conditions are changed as this could lead to serious problems which can result in the destruction of parts of the LEWA odourizing package. In this case danger to persons, animals and the environment cannot be prevented!
LEWA accepts no responsibility when the fluid handled or important operating conditions were not given or given incompletely only.

For further details please refer to the technical data sheet.

1.4 Safety

LEWA products meet the regulations for industrial safety and the prevention of accidents.

- **The metering pumps are designed for the operation in hazardous areas for temperature classes T1 to T4. For exact classification please especially observe temperature of the fluid conveyed and the heating fluid.**
  The temperature limits stated in the technical data sheet must not be exceeded. In case of deviations please consult LEWA.

Stroke volume (ml)							
plunger diameter (mm)							
MBH		MAH			MLM		
8	10	3	5	8	3	5	8
0,251	0,392	0,022	0,063	0,160	0,106	0,294	0,754
0,226	0,353	0,020	0,057	0,144	0,095	0,265	0,679
0,201	0,314	0,018	0,050	0,128	0,085	0,235	0,603
0,175	0,274	0,015	0,044	0,112	0,074	0,206	0,528
0,151	0,235	0,013	0,038	0,096	0,064	0,176	0,452
0,126	0,196	0,011	0,032	0,080	0,053	0,147	0,377
0,100	0,157	0,009	0,025	0,064	0,042	0,118	0,302
0,075	0,117	0,007	0,019	0,048	0,032	0,088	0,226
0,050	0,078	0,004	0,013	0,032	0,021	0,059	0,151
0,025	0,039	0,002	0,006	0,016	0,011	0,029	0,075

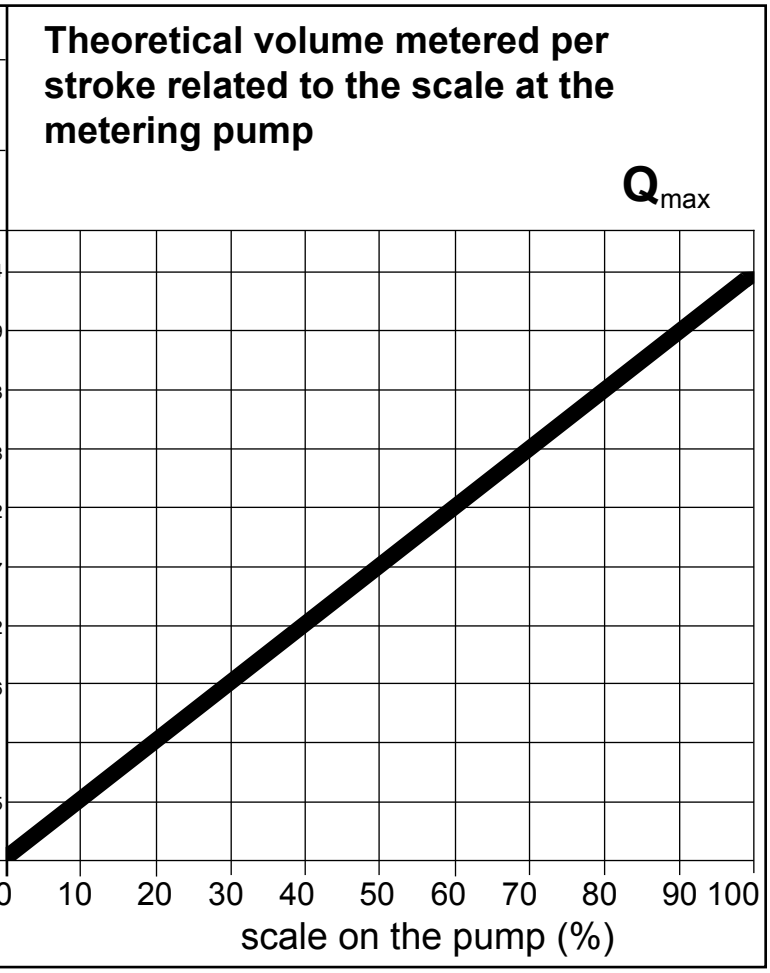


Fig. 1

- **If the fluid conveyed can form an explosive mixture in case of contact with the atmosphere diaphragm pump heads with single diaphragm must not be used in hazardous areas!**
  Exception: Diaphragm pump head with stroke volume < 1 cm³.
  In case of diaphragm rupture danger due to escaping fluid exists (e.g. HOT/TOXIC/ HIGH PRESSURE).
- **The user must take appropriate measures for the prevention of accidents in order to avoid any dangers for the operating personnel by the fluid used.**
  This means: All seals, screwed connections and venting screws must be checked for tightness regularly!
- **Venting screws must not be used in hazardous areas, if the fluid conveyed can form an explosive mixture in case of contact with the atmosphere.**
- **Venting screws must be opened very carefully only! Danger due to escaping fluid exists (e.g. HOT/TOXIC/HIGH PRESSURE).**
- **Wetted parts must be thoroughly flushed and cleaned before disassembly!**
- **For diaphragm pump heads the hydraulic fluid and the intermediate fluid in the diaphragm are adapted to the respective fluid conveyed according to the operation data available. For fluids, which can trigger exothermic reactions in case of contact with mineral oil, an appropriately resistant diaphragm intermediate fluid must be chosen. In case of doubt please consult LEWA.**

Metering pumps with electric motor are equipment used in industrial high voltage plants. During operation this equipment has dangerous, life parts and possibly moving resp. rotating parts. Therefore they can cause high health hazards or material damage in case of non-authorised removal of the required covers, in case of improper use, misoperation or insufficient maintenance. The persons in charge of plant safety therefore must assure that:

- **only qualified personnel is ordered to work on the machines resp. instruments,**
- **these persons, among other things, always have the operating instructions and all other product documentation readily available for all work concerned. The persons must be placed under the obligation to strictly adhere to these documents,**
- **work on machines resp. units or in their vicinity is prohibited to non-qualified personnel.**

Qualified personnel are persons, which due to their education, experience and training as well as their knowledge of the relevant standards, regulations, rules for the prevention of accidents and operating conditions, have been authorised by the persons in charge of plant safety to carry out the corresponding work required and can recognise and prevent possible dangers when performing the work.

1.4.1 Dangers when handling the metering fluid tetrahydrothiophen (THT) or mercaptane

Refer to the corresponding safety data sheet!
Contact in higher concentration can lead to eye irritation, throat irritation, nausea and a dizziness.
In any case consult a doctor immediately!

1.4.2 What if..... - first aid -

1.4.2.1 Flush with water generously in case of skin contact and wash with stench masking, non oxidising detergents.

1.4.2.2 Odourant spills:
Pick-up using absorbing material (refer to safety data sheet of the odourant) and store in airtight drums.

1.5 Supply connections

Metering pumps with electric motor need an adequate electric supply connection. The power supply connection values required result from the drive rating given in the technical data sheet.

If the pump head is equipped with a venting screw a fluid resistant hose connection to a receptacle or a stand-by vessel must be installed.

1.6 Emissions

The sound pressure level of the solenoid pump (MAH, MLM, MBH) installed is < 65 db/A for other metering pumps or special ambient conditions please consult LEWA.

2 Transportation and intermediate storage

2.1 Condition as supplied

The quality and function of all LEWA products is checked before shipment.
The LEWA odourizing unit is completely assembled acc. to the details given in the technical data sheet.

2.2 Checking the packing at the destination

Please check the packing for damage upon receipt of the goods. External damages of the packing must be reported to the forwarding company and a physical check must be requested. The packing must be in a condition assuring protection during the subsequent storage time. Open the shipment when the packing was damaged or the permissible storage time was exceeded (refer to section 2.2.3). Otherwise the packing should be opened only when the LEWA odourizing unit is about to be installed. Observe the recommendation of the manufacturer for accessories.

2.2.1 Storage period (< 3 months)

Standard packing will protect the odourizing unit against corrosion acc. to DIN 50014 (normal Middle-European climate) during transportation overland and during storage in dry buildings for at least three months.
Storage for longer periods will necessitate special measures for corrosion protection.

2.2.2 Storage period (< 24 months)

Seaworthy packing and special conservation will protect the odourizing unit during transportation overland or by sea and during dry storage (under cover or in an enclosed building) for at least two years.

2.2.3 Exceeding the permissible storage time

The packing must be opened if the permissible storage period is exceeded. Please check if the shipment is complete and undamaged.
Switch box heaters fitted to electrical components must be connected.
The internal parts of the LEWA pump drive element must be turned over quarterly by operating the drive for a short period of time.
The level of hydraulic fluid in the holder of LEWA metering pump must be checked in adequate time intervals and topped up if required. Protect all bright metal parts against corrosion.

2.3 Transportation, lifting devices

The odourizing units can be lifted at the lifting lugs provided. Moreover the unit, depending on the design, can be moved with a lifting truck or a fork lift.
Odourizing units in the cabinet see general arrangement drawing.

3 Product information

3.1 General description

LEWA metering pumps are oscillating positive displacement pumps. The volume flow is produced by a periodically repeating displacement of a stroke volume determined by the piston area and the stroke length.
The flow can be varied by changing a stroke length and the stroke frequency.

3.2 Design and function

Please use the enclosed sectional drawing of the **„LEWA odourizing unit“** for the instructions following. The corresponding item numbers match the ones in the parts list and in this operating instruction.
On the pages 15 - 25 you will find a functional diagram of the individual operating sequences of the LEWA odourizing unit.

3.2.1 Design

The LEWA odourizing unit consists of the following assemblies:
• LEWA metering pump with pump control,
• stand-by reservoir with measuring burette and the necessary appurtenances,
• odourant vessel,
• piping,
• accessories (if existing)

3.2.2 Function

3.2.2.1 LEWA Odourizing unit

The LEWA metering pump draws the odourant from the stand-by reservoir (1.1) and the measuring burette and meters it into the gas-pipeline according to the preset odourant concentration.
Via the filled suction line between stand-by reservoir (1.1) and odourant vessel the odourant level in the two vessels balances continuously and can be read off at scale (1.20), when shut-off valves (1.26 + 1.27) are open.
A strainer (1.41) in the suction line between stand-by reservoir and LEWA metering pump prevents that dirt particles cause a break-down.
The strainer (1.41) must be cleaned resp. replaced periodically. For this the odourizing unit must be shut-down (refer to section 6.1.3).
Flush LEWA metering pump before doing maintenance. For this the unit must be equipped with a flushing device (refer to section 6.1.1).

3.2.2.2 LEWA metering pump

For **LEWA odourizing units type OD 7** and **OD 8** a metering pump with diaphragm pump head, solenoid drive, pneumatic drive and manual stroke adjustment is used.
Depending on the odourant flowrate required either type **MAH, MBH** or **MLM** is installed. The manual stroke adjustment allows a continuous adjustment of the volume metered per stroke.
For more information on LEWA metering pumps type **MAH, MBH** or **MLM** please refer to the corresponding operating instruction B 1.411 for MAH, B 1.411.1 for MBH or B 1.431 for MLM.

Figure 1 shows the volume per stroke in relation to the scale at the LEWA metering pump .

3.2.2.3 Pump control

Refer to index 7 (separate operating instruction)

3.2.2.4 Stand-by reservoir (1.1) and measuring burette (1.14)

The stand-by reservoir (1.1) is of vertical design, made of stainless steel and has a volume of
7 litres for type **OD 7** and
28 litres for type **OD 8**
With few exceptions all other assemblies are mounted to this stand-by reservoir.
For level control and for checking the function a measuring burette (1.14) is mounted to the side of the stand-by reservoir (1.1) in parallel with a scale calibrated in **ml**. During operation of the odourizing unit and when shut-off valve(1.27) is open the odourant level can be read off exactly at the measuring burette (1.14) mounted to the stand-by reservoir (1.1) provided that the equipment is installed as specified and the correct odourant vessel size was used.
At the lower end of the stand-by reservoir (1.1) a drain valve (1.30) closed with a plug (1.31) is installed.

3.2.2.5 Active charcoal filter (10.1)

The active charcoal filter (10.1) is installed in the venting line. It prevents obnoxious smell.

3.2.2.6 Odourant vessel

The odourant vessels are designed acc. to DIN 30 650 and are supplied with DVGW registration numbers in the sizes 25 and 50 litres for OD 7 and 200 litres for OD 8.

Transfer the remaining odourant volume from the odourant vessel into the stand-by reservoir when the reserve mark is reached.
Refer to section 5.3.1 or 5.3.2 -Changing the odourant vessel.

3.2.2.7 Pressure control unit (8) - only for units with suction pressure

(refer to technical data sheet)

The pressure control unit (8) must be installed at the nitrogen bottle. The corresponding safety valve (10.9) is connected to the LEWA odourizing unit and serves to protect the odourizing unit.
The fixed set pressure is 0,5 bar.

3.2.2.8 Suction pressure device - only for units with suction pressure

(refer to technical data sheet)

With the suction pressure boosting device (0,5 bar) the system pressure can be maintained at a constant value in order to prevent vapourisation of the fluid metered.

3.2.3 Accessories

The following accessories can be part of the scope of supply:

- flushing device (50.1),
- float switch (6),
- injection point,
- solenoid valve (80),
- LEWA micro-flowmeter **KMM 1 or KMM5** (70.1),
- float-type flowmeter
- electric air pump

3.2.3.1 Flushing device (50.1)

The flushing device consists of:

- container for flushing agent
- non-return valve
- ball valve

It is used to flush the LEWA metering pump as well as the suction and discharge pipe of the LEWA odourizing unit before maintenance or repair work.

3.2.3.2 Float switch (6)

The float switch is mounted to the odourant stand-by reservoir and signals that the odourant stand-by volume has been reached.

3.2.3.3 Injection point

The injection point consists of

- non-return valve
- 2 ball valves
- injection nozzle in 1.4571 (316Ti) material
- weld-on socket 3/4 NPT or G3/4” or G 1”with certificate, material 1.0305 (CS), material certificate to EN 10204--3.1B

It is used to inject the odourant into the gas line.

3.2.3.4 Solenoid valve (80)

The solenoid valve (80) is installed in the discharge line, as close as possible to the LEWA metering pump and prevents backflow when the odourant flowrates (< 400 Nm^3 are very low or during longer shut-down periods.

The valve side designated „2“ (A-exit) must point to the LEWA odourizing unit

3.2.3.5 LEWA micro-flowmeter KMM 1 / KMM 5 (70.1)

The LEWA micro-flowmeters are suitable for all common odourants and measure the odourant flowrate. They have a fixed volume of the measuring chamber and operate acc. to the measuring burette principle with 2 measuring points.

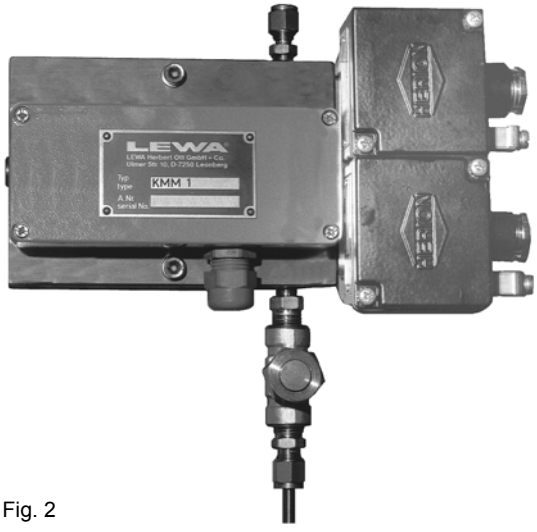


Fig. 2

The LEWA micro-flowmeter must be installed **horizontally** (see fig. 2) in the discharge line close to the odourizing unit.

For the KMM1 and the KMM5 the upper solenoid valve is designated MV1.

3.2.3.6 Float-type flowmeter

The float-type flowmeter monitors the odourant flowrate.
The float-type flowmeter must be installed in a vertical run of the discharge pipeline close to the LEWA metering pump.

3.2.4 Stand-by reservoir (1.1) with appurtenances

Stand-by reservoir (1.1) and measuring burette (1.14) are hydraulically connected to the suction side of the LEWA metering pump.
To open the connection test valve (1.26) and shut-off valve (1.27) must be opened.
The strainer (1.41) in the suction line prevents that dirt particles are drawn-in by the LEWA metering pump.
The LEWA metering pump is vented on the discharge side into the stand-by reservoir via the start-up pipeline and the start-up valve (60.4).
Depending on how the unit is furnished the solenoid valve described under 3.2.3.4 and the LEWA micro-flowmeter described under 3.2.3.5 can be installed in the discharge piping of the metering pump.
The stand-by reservoir (1.1) is vented via the active charcoal filter on the top.
The upper part of the stand-by reservoir (1.1) is connected to the odourant vessel via 2 metal armoured PTFE hoses (150).
The 2 connections designated **„S“** and **„D“** are each connected to the hoses (150).
Via the hose with connection **„S“** odourant flows from the odourant vessel into the stand-by reservoir (1.1).
The hose with connection **„D“** serves to balance the pressure between odourant vessel and the stand-by reservoir (1.1).

3.3 Dimensions / weights / centres of gravity

Refer to enclosed general arrangement drawing for details.

4 Erection and installation

4.1 Permissible ambient conditions

The LEWA odourizing unit can be used at an ambient temperature between **- 20° C and + 40°C** and should be protected against direct weather influences. Should these limits be exceeded please ask LEWA headquarters or one of our representatives.

4.2 Space requirements

Refer to enclosed general arrangement drawing for details.

4.3 Foundation

Refer to enclosed general arrangement drawing for details.

4.4 Erection

The complete odourizing unit must be installed in a drip pan, so that any danger by unit toppling over is prevented. Only after this has been assured the LEWA odourizing unit can be put into operation.

The LEWA odourizing unit and the odourant vessel must be mounted so that the centre of the lower mounting bores is 115 mm above the installation level of the odourant vessel (refer to sectional drawing)

If the distance is too small the stand-by volume will be too low and if the distance is bigger the stand-by volume, displayed will not fit into the stand-by reservoir.

4.5 Installation

4.5.1 Electrical (For this please especially observe section 1.4)

The electric motor must be connected with an overload protection according to the local regulations.

For the connection of the motor please observe the direction of rotation indicated with an arrow at the drive unit housing or at the drive flange.

For solenoid driven metering pumps this is not applicable.
The complete unit must be equipped by the user with an ”emergency stop switch”, which can be easily and quickly reached from the working place.

At odourizing units in Ex area the earthing device from the metering pump and the unit must be connected.

4.5.2 Hydraulic

For the pipeline design the oscillating method of operation of LEWA metering pumps must be considered. For this please refer to leaflet D10-010 resp. D10.012!

Remove protection plugs from suction and discharge connection before installation of pipeline. The connections and pipelines must be thoroughly cleaned. The suction and discharge lines must be connected to the pump head without tension.

The piping must be installed so that the valves (v) are easily accessible and the plunger pump heads and diaphragm pump heads can be easily removed for replacing of the plunger seal (k) resp. the diaphragm.

4.5.3 Pressure limitation

Oscillating positive displacement pumps are positive displacement metering pumps. Therefore a safety valve must be installed in the discharge line in order to protect the metering pump and the unit if there is a risk of overpressure (e.g. closed shut-off valves etc.).
Diaphragm pump heads have an integrated pressure limiting valve, which protects the metering pump **but not the system.**

5 Commissioning / operation / shut-down

5.1 Operation

Please observe the safety regulations specified by the odourant manufacturer mainly concerning handling, transportation and storage.

5.2 Operation and ancillary means

Hydraulic fluids can be taken from the technical data sheet or the separate operating instruction B1.002.

5.3 Commissioning, start-up, venting (refer to sectional drawing LEWA odourizing unit)

5.3.1 Close drain valve (V4) at the bottom of the stand-by reservoir (1.1).

5.3.2 First connect the two hoses to the stand-by reservoir (1.1).

FIRST open plug „D“ and then plug „S“ at the odourant vessel. Now connect hoses to the odourant vessel according to the marking at the stand-by reservoir (1.1).
For units with quick release coupling hose „D“ has to be connected first then hose „S“ can be connected. Then open shut-off valves.

5.3.3 Now open test valve (1.26) and shut-off valve (1.27)

5.3.4 For LEWA odourizing units without suction pressure!

5.3.4.1 Close filling valve (2).

5.3.4.2 Using the airpump (160) now pump air into the odourant vessel via the pipe provided above the non-return valve (1.11)until the gas trap (1.3) is filled and the odourant visibly rises in the measuring burette.

5.3.4.3 Now open filling valve (2) at the stand-by reservoir (1.1).
The liquid level in measuring burette (1.14) in the stand-by reservoir (1.1) and odourant vessel now slowly will balance at the same level. When the installation heights are correct and the specified odourant vessel volume is used the scale (litres) will indicate the odourant level accurately after the liquid levels have balanced. (The filling process can take 10 to 20 minutes!)

5.3.5 For odourizing units with suction pressure! *(refer to technical data sheet)*
5.3.5.1 *Open needle valves at the odourant vessel* ***(„S“ and „D“)****.*
5.3.5.2 *Now open nitrogen bottle and set pressure reducing valve to < 0.4 bar.*

The release pressure of the safety valve (10.8) between nitrogen bottle and odourizing unit is set to 0.5 bar.

5.3.5.3 *Open ball valve (10.8.4) of the suction pressure boosting device.*
5.3.5.4 *Press push button of the filling valve (2) at the upper end of the stand-by reservoir until gas trap is filled and the odourant visibly rises in the measuring burette (1.14).*
5.3.5.5 *Release push button of the filling valve (2) and close ball valve (10.8.4) of the suction pressure boosting device.*

5.3.6 Venting
5.3.6.1 Open start-up valve (1.4).
5.3.6.2 Set control **OLK 7** to „Intern“ and switch on.
Use push button ↑ to set max. stroke frequency and turn the handwheel at the LEWA metering pump to max stroke length. The LEWA metering pump now circulates the odourant at no backpressure and the pump as well as the suction and the discharge line up to the start-up valve (60.4) is vented.
The measuring burette (1.14) must be emptied to the lowest mark at least twice (refer to section 5.4.2). The venting procedure should be completed after approximately 2 minutes depending on the pump size.
We recommend to check to flowrate acc. to fig. 1 at this time (refer to section 5.4.2).
5.3.7 Close start-up valve (60.4) at the top of the stand-by reservoir (1.1).
5.3.8 Close shut-off valve (1.27) at the bottom of the stand-by reservoir (1.1).
5.3.9 Set control on external.
Set stroke length to desired concentration.

The LEWA odourizing unit now is ready for operation.

Make sure that the shut-off valve (1.27) is closed during operation, without supervision of the LEWA odourizing unit. This prevents odourant leakage in case of the glass breaking.

Note: For setting of the odourant flowrate refer to the attached operating instruction of the LEWA metering pump.

5.3.10 Changing the odourant vessel without suction pressure
The odourant vessel can be changed without interrupting operation.
Change is required when the stand-by mark at scale (1.20) is reached or when the float switch (6) was activated.

When the mark „stand-by“ is reached check if the gas trap is filled still. If it is empty the unit must be started-up again and the level must be checked (refer to 5.3).

Transferring the stand-by content of the odourant vessel into the stand-by reservoir:
5.3.10.1 Close filling valve (2) at the stand-by reservoir (1.1).
5.3.10.2 Open shut-off valve (1.27)

The test valve (1.26) must also be open for checking the odourant level!

5.3.10.3 Using the airpump now pump air into the odourant vessel (see fig. 3) via pipe (4) provided above the non-retur valve (1.11) until the remaining odourant volume is filled into the stand-by reservoir (1.1) and the gas trap (1.3) is empty. Always watch the rising liquid level in the measuring burette (1.14*).

The measuring burette (1.14) must never be filled completely (liquid level max. 1 cm below upper edge). Stop pumping procedure when this level is reached and immediately open filling valve (2).

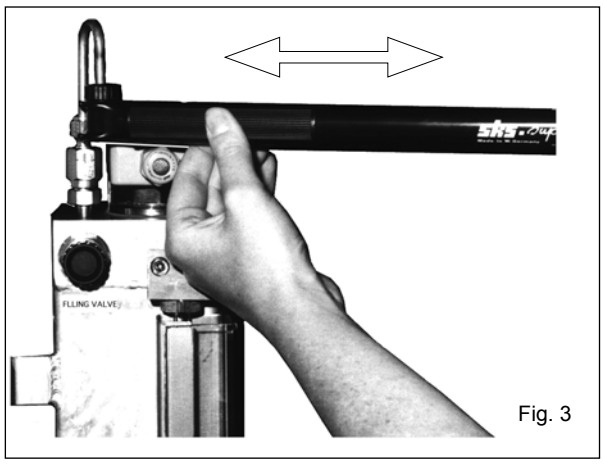


Fig. 3

5.3.10.4 Now open filling valve (2) at the top of the stand-by reservoir (1.1) again.

5.3.10.5 First remove the hose **„D“** then hose **„S“** (50) at the odourant vessel.

5.3.10.6 Replace the empty odourant vessel by a full one now.

5.3.10.7 Connect the two hoses to the corresponding hook-up points designated „D“ (discharge) and „S“ (suction) at the odourant vessel as described in section 5.3.2.

5.3.10.8 Now close the filling valve (2) at the stand-by reservoir (1.1) again.

5.3.10.9 Using the airpump now pump air into the odourant vessel via the provided pipe above the non-return valve until the gas trap is filled and the odourant is rising noticeably in the measuring burette (1.14).

5.3.10.10 Now open filling valve (2) at the top of the stand-by reservoir (1.1) again.

5.3.10.11 Close shut-off valve (1.27) after the liquid levels have balanced.

5.3.11 Changing the odourant vessel (only for units with suction pressure) (refer to technical data sheet)

Emptying odourant vessel:

5.3.11.1 *First open shut-off valve.*

The test valve must also be open for checking the odourant level !

5.3.11.2 *Open ball valve (10.8.4) of the suction pressure boosting device.*

5.3.11.3 *Press push button of the filling valve (2) at the top of the stand-by reservoir (1.1) until the remaining odourant volume has been transferred into the stand-by reservoir and the gas trap (1.3) is empty.*

The measuring burette (1.14) must never be filled completely (liquid level max. 1 cm below upper edge). Stop pumping procedure when this level is reached and immediately open filling valve (2).

5.3.11.4 *Release push button and close ball valve (10.8.4) of the suction pressure boosting device.*

5.3.11.5 *Close needle valves of the odourant vessel.*

5.3.11.6 *Replace the empty odourant vessel by a full one now. Open needle valves at the new odourant vessel.*

5.3.11.7 *Open ball valve (10.8.4) at the suction pressure boosting device again.*

5.3.11.8 *Press push button of the filling valve (2) at the top of the stand-by reservoir (1.1) until the gas trap (1.3) is filled.*

5.3.11.9 *Release push button of the filling valve (2) and close ball valve (10.8.4) of the suction pressure boosting device.*

5.3.11.10 *Close shut-off valve (1.27).*

5.4 Adjustment and checking

5.4.1 Checking the metered flow at the measuring burette (1.14)

Acc. to DVGW specification sheet G 280 the function of any odourizing unit without continuous measuring of the flow must be checked weekly. Proceed as follows:

5.4.1.1 Open shut-off valve (1.27) and close test valve (1.26) at stand-by reservoir (1.1).
The LEWA metering pump draws from measuring burette (1.14) only in this condition.

5.4.1.2 The volume of fluid metered per pump stroke resp. a defined number of strokes or of a fixed measuring time can be read off at the scale of measuring burette (1.14).
For accurate results we recommend to measure the volume of at least 10 strokes. Compare the values reached with the characteristics in figure 1.

5.4.1.3 Now open test valve at the stand-by reservoir (1.1). The LEWA metering pump now draws directly from stand-by reservoir (1.1) and the liquid level adjusts to the odourant supply level again.
Now close shut-off valve (1.27) again.

5.4.2 Checking the liquid level

The liquid level in stand-by reservoir (1.1) and so the odourant vessel should be checked periodically to assure timely spare supply of the odourant.
Proceed as follows:

5.4.2.1 Open shut-off valve (1.27). The liquid level in stand-by reservoir (1.1) also shows in measuring burette (1.14). The remaining odourant volume can be read off at scale (20*).
5.4.2.2 Now close shut-off valve (1.27) again.

5.4.3 Pumping the odourant back into the odourant vessel

It is recommended to pump the odourant in the stand-by reservoir (1.1) and measuring burette (1.14) back into the odourant vessel before flushing. Proceed as follows:

5.4.3.1 Shut-off LEWA metering pump.
Open test valve and shut-off valve (1.27).
5.4.3.2 Remove the hose marked „D“ from stand-by reservoir (1.1).
5.4.3.3 Close the open discharge connection at stand-by reservoir (1.1) with plug.
5.4.3.4 The filling valve (2) remains open.
5.4.3.5 Using airpump now pump air into the stand-by reservoir (1.1) (see fig. 3) via provided pipe above non-return valve until the odourant has been pumped back into the odourant vessel and the gas trap (1.3) is empty (see fig. 3).
5.4.3.6 Connect hose marked „D“ to stand-by reservoir (1.1) again.

△ **A small volume of odourant remains in the stand-by reservoir (1.1).**
It can be drained via drain valve (1.30).

5.4.4 Pumping the odourant back into the odourant vessel (with suction pressure)

It is recommended to pump the odourant in the stand-by reservoir (1.1) and measuring burette (1.14) back into the odourant vessel before flushing. Proceed as follows:

5.4.4.1 *Close pressure reducing valve at the nitrogen bottle and open ball valve (10.8.4) of the suction pressure boosting device.*
5.4.4.2 *Shut-off LEWA metering pump. Open test valve and shut-off valve (1.27).*
5.4.4.3 *Remove the hose marked „D“ from stand-by reservoir (1.1).*
5.4.4.4 *Close the open discharge connection at stand-by reservoir (1.1) with plug.*
5.4.4.5 *The filling valve (2) remains open.*
5.4.4.6 *Close ball valve (10.8.4) of the suction pressure boosting device and set pressure of pressure reducing unit to 0.5 bar.*
5.4.4.7 *When stand-by reservoir (1.1) and gas trap (SG1) are empty close pressure reducing unit and open ball valve (10.8.4) at the suction pressure boosting device.*
5.4.4.8 *Connect hose marked „D“ to stand-by reservoir (1.1) again.*

△ ***A small volume of odourant remains in the stand-by reservoir (1.1).***
It can be drained via drain valve (1.30).

5.5 Shut-down

△ **If metering pumps must be shut-down for a longer period of time all fluid residuals must be removed from the pump head by flushing, if necessary by dismantling and cleaning.**

5.6 Dismantling and return transportation

If the metering pump is dismantled or transported e.g. for repair work (see section 2.3 ”transportation, lifting devices”) the following measures must be taken before shipment:

- Remove all fluid residues from the pump head and, if necessary, from the pipeline, clean thoroughly, neutralize and decontaminate.
- For return transportation to LEWA the completed fluid safety data sheet must be enclosed.
- Drain lubricant from drive unit.
- Replace air filter by screwed plug.

- If the hydraulic fluid of pump heads with closed holder is not drained, replace air filter by screwed plug.
  In addition please make sure that all external connections are tight.

The user is responsible for any damages caused by leaking lubricant or fluid residues.

6 Maintenance and repairs

6.1 Maintenance

We recommend to have the LEWA odourizing unit completely inspected by the manufacturer at least once a year.
LEWA is offering special service contracts for this.

6.1.1 Flushing of the LEWA metering pump

The flushing device (50.1 - accessory) mainly serves to flush the LEWA metering pump as well as the suction and discharge pipeline to be able to do repair and maintenance work at the LEWA metering pump and the suction strainer.

The LEWA metering pump must be switched off!

6.1.1.1 First fill flushing vessel (SB1) with flushing agent (e.g. petroleum).
6.1.1.2 Open ball valve below flushing device (50.1).
6.1.1.3 To flush LEWA metering pump and discharge pipeline the start-up valve (60.4) must be opened.
Test valve (1.26) and shut-off valve (1.27) must be closed.
6.1.1.4 Using the airpump pump air into pipe above the non-return valve on the flushing agent vessel. The flushing agent is forced through the LEWA metering pump and the discharge pipeline into the stand-by reservoir (1.1).
6.1.1.5 To flush the suction strainer close start-up valve (60.4) and open test valve and shut-off valve (1.27). Then proceed as 6.1.1.4.
6.1.1.6 Close ball valve (50.6) below the flushing agent vessel (SB1).
Now the maintenance or repair work required at the LEWA metering pump and / or at the suction strainer can be carried out.
6.1.1.7 Commissioning per section 5.3 and up.

6.1.2 Flushing of the discharge line (≦ 4 bar)

The LEWA metering pump must be switched off !

6.1.2.1 Close start-up valve (60.4).
6.1.2.2 Test valve (1.26) and shut-off valve (1.27) must be closed.
6.1.2.3 First fill flushing vessel (SB1) with flushing agent.
6.1.2.4 Open ball valve below flushing device (50.1).
6.1.2.5 Using the airpump pump air into pipe above the non-return valve on the flushing vessel. The flushing agent is forced through the LEWA metering pump and the discharge pipeline up to the injection point.
6.1.2.6 Close ball valve (50.6) below the flushing agent tank (SB1). Drain flushing agent and pump back.
Now the maintenance and repair work required can be carried out.
6.1.2.7 Commissioning per section 5.3 and up.

6.1.3 Cleaning the strainer (1.41)

Since contaminations in the odourant can cause the strainer insert (1.41) to slowly clog, it is recommended to clean the strainer insert (1.41) periodically.
The odourant does **not** need to be drained for cleaning the strainer insert (1.41). Proceed as follows:
6.1.3.1 First open shut-off valve (1.27) and close test valve (1.26).
6.1.3.2 Switch LEWA metering pump on until measuring burette (1.14) is pumped empty.
6.1.3.3 After an additional 2 minutes shut LEWA metering pump off again. If flushing device is available proceed as per 6.1.1.5.

6.1.3.4 Unscrew plug and remove strainer (1.41).

A small volume of odourant will remain in the filter.

We recommend to replace strainer insert (1.41). Only if no replacement is available filter insert should be cleaned thoroughly. If filter insert is damaged it must be replaced.

6.1.3.5 Then reinstall strainer insert(1.41).

6.1.3.6 Replace gasket (1.42) and screw plug (1.40) back in and tighten.

6.1.3.7 Now open test valve (1.26) again.

6.1.3.8 Switch LEWA metering pump on again.
For venting please refer to sections 5.2.8 through 5.3.10.

6.1.4 Strainer

The strainer insert of the KMM must be replaced periodically as it cannot be cleaned due to its small mesh size.

6.2 Repairs

Refer to the corresponding operating instruction attached concerning the replacement of LEWA metering pump wear parts.

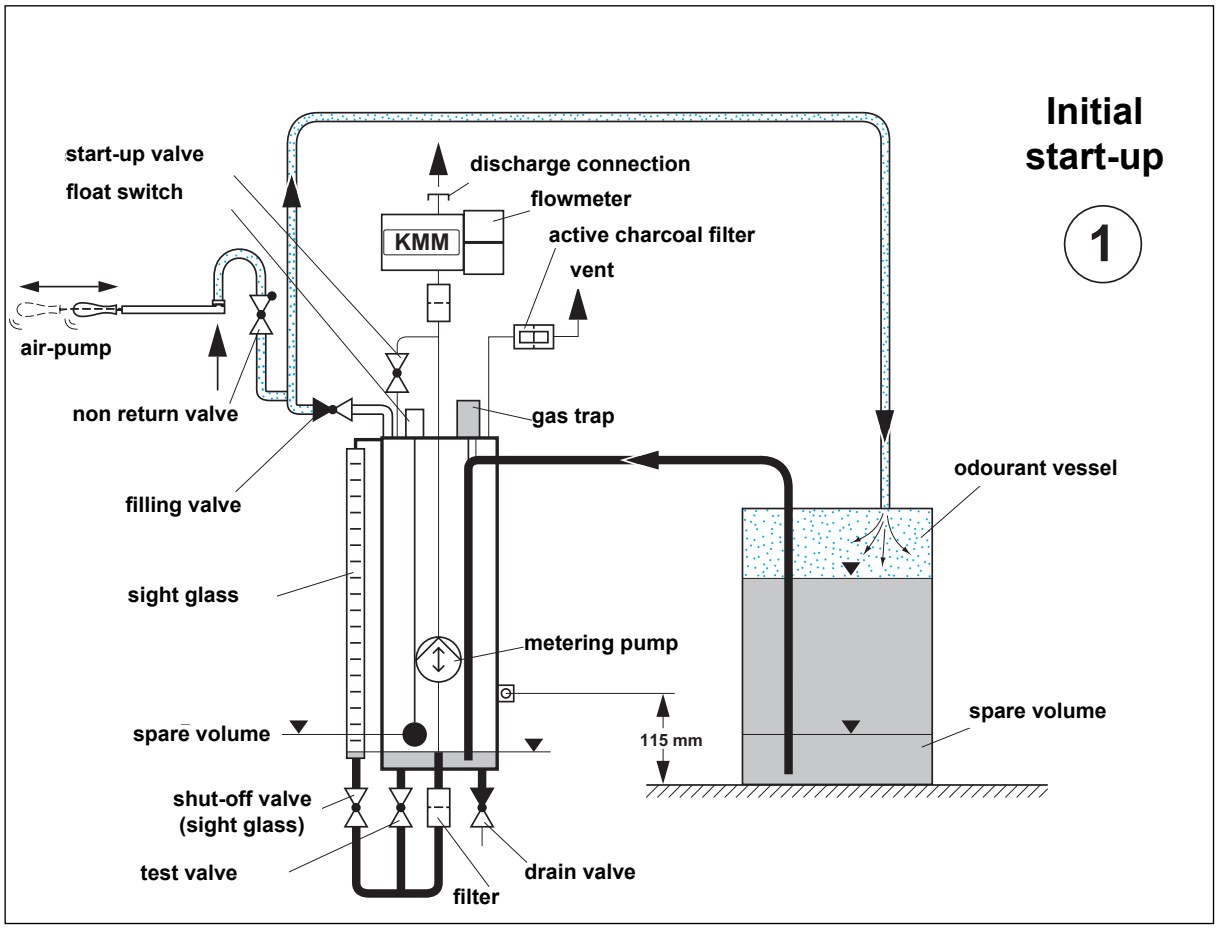
If the LEWA odourizing package needs repair please consult LEWA headquarters or the representative in charge.

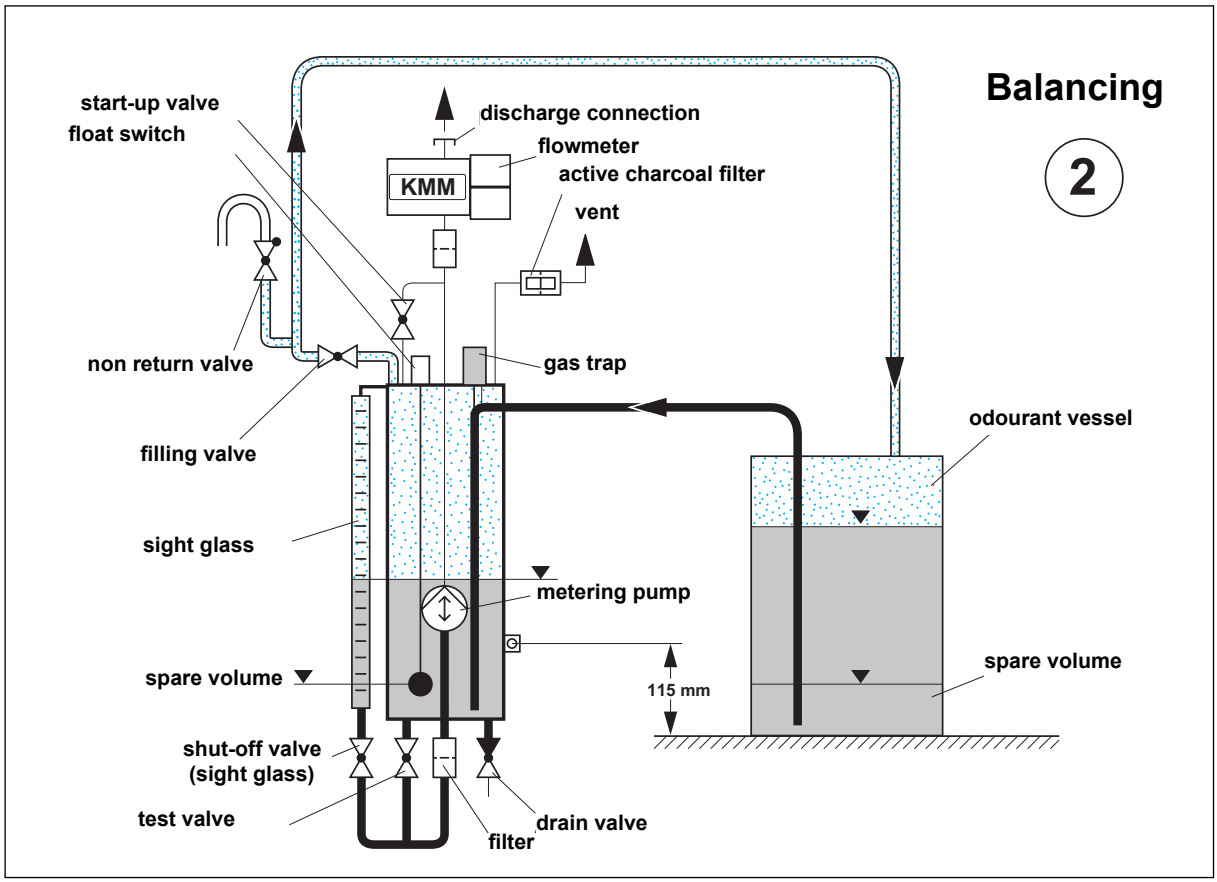
7 Faults; symptoms, remedial actions

LEWA metering pump does not inject odourant into the gas line:	
possible cause	**corrective measure**
odourant vessel empty	change odourant vessel
test valve (1.26) closed	- open test valve (1.26) - vent LEWA metering pump
strainer (1.41 / FT2) blocked discharge pipeline closed, e.g. valve at the injection point	clean / replace strainer inserts open discharge pipeline open valve
start-up valve (60.4) open LEWA metering pump circulates	close start-up valve (60.4)
ODR7 signals „HELP“	
strainer insert (FT2) at KMM (FC1) is blocked	replace strainer insert
cast-in fuse at the magnetic coil of the KMM (FC1) defectiv	replace magnetic coil

8 Functional diagram

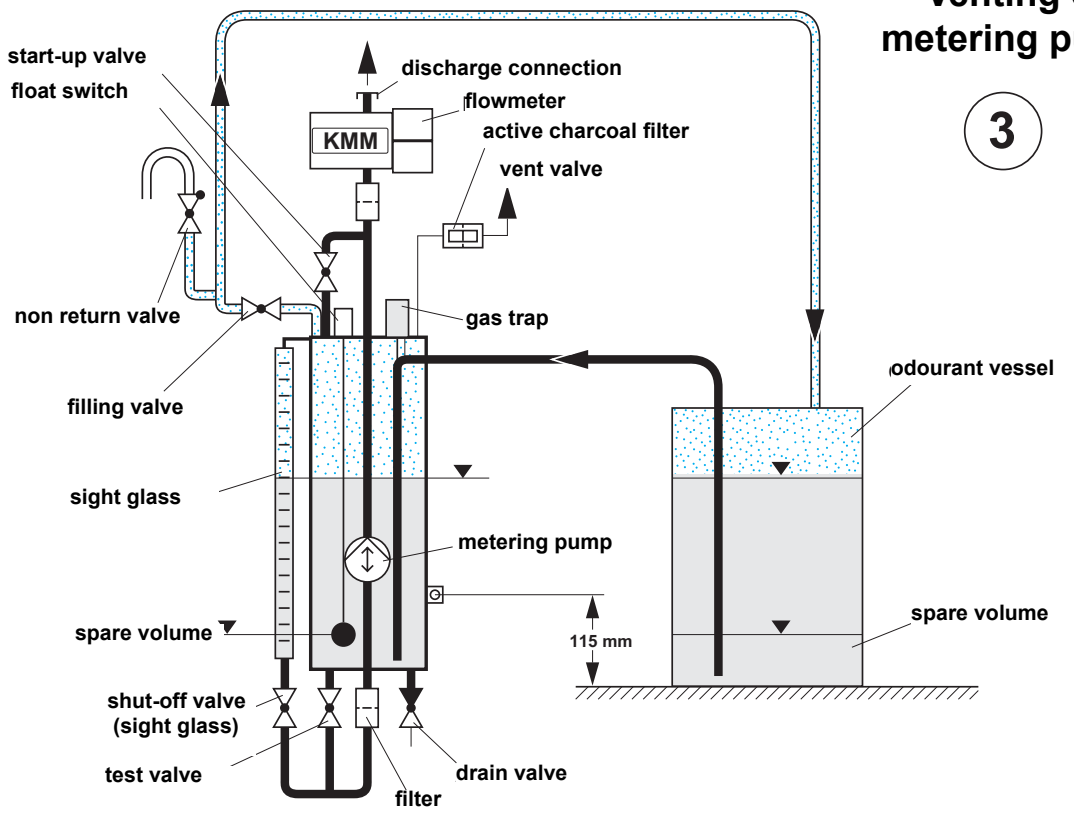
8.1 Odourizing unit without suction pressure





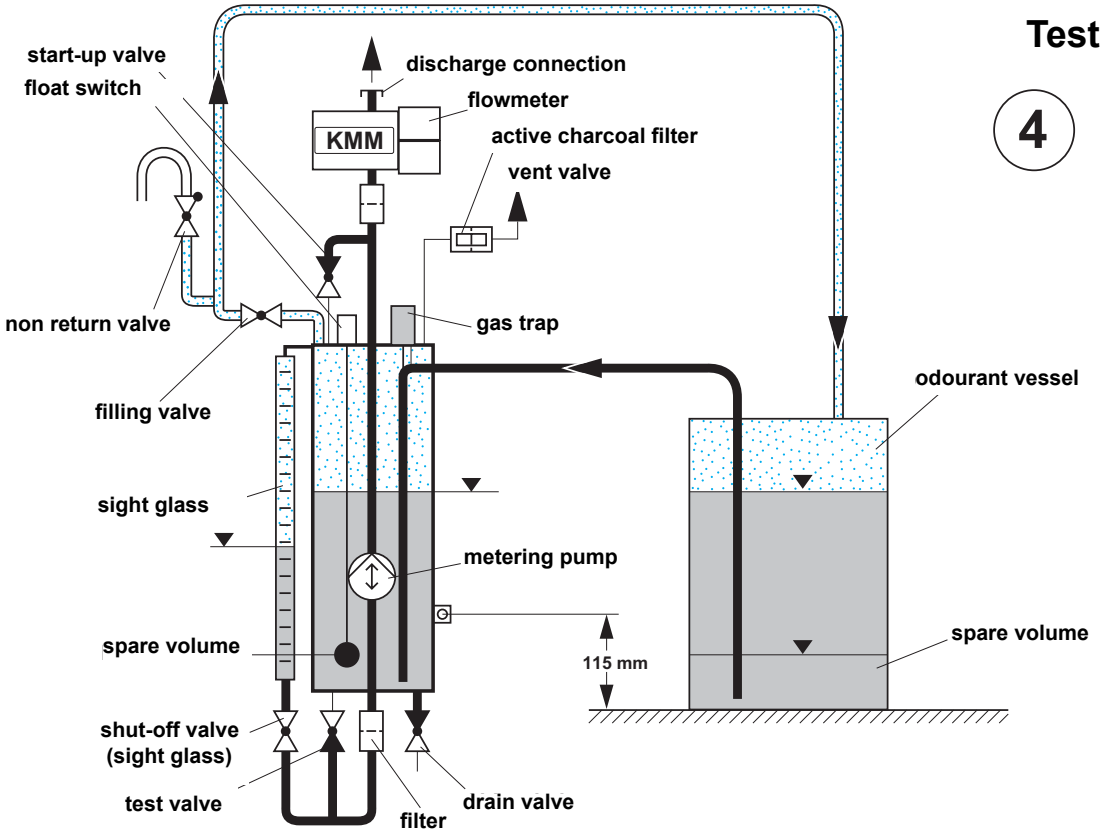
Venting of metering pump

3



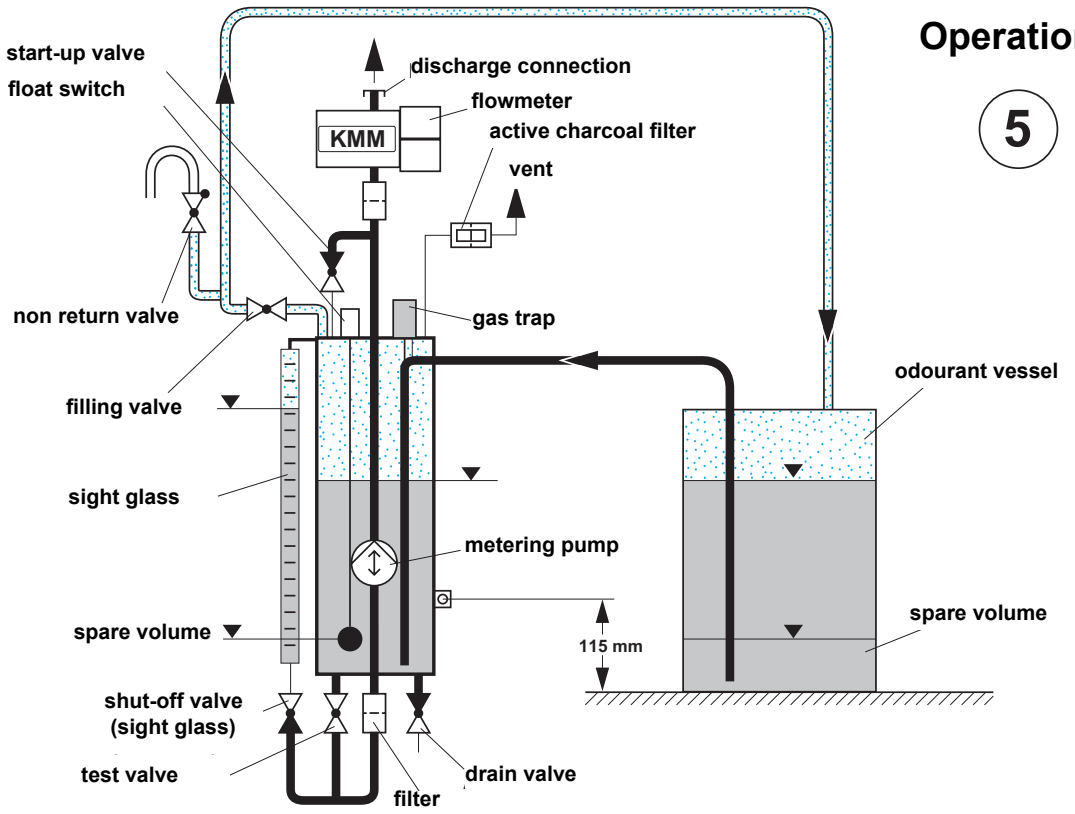
Test

4



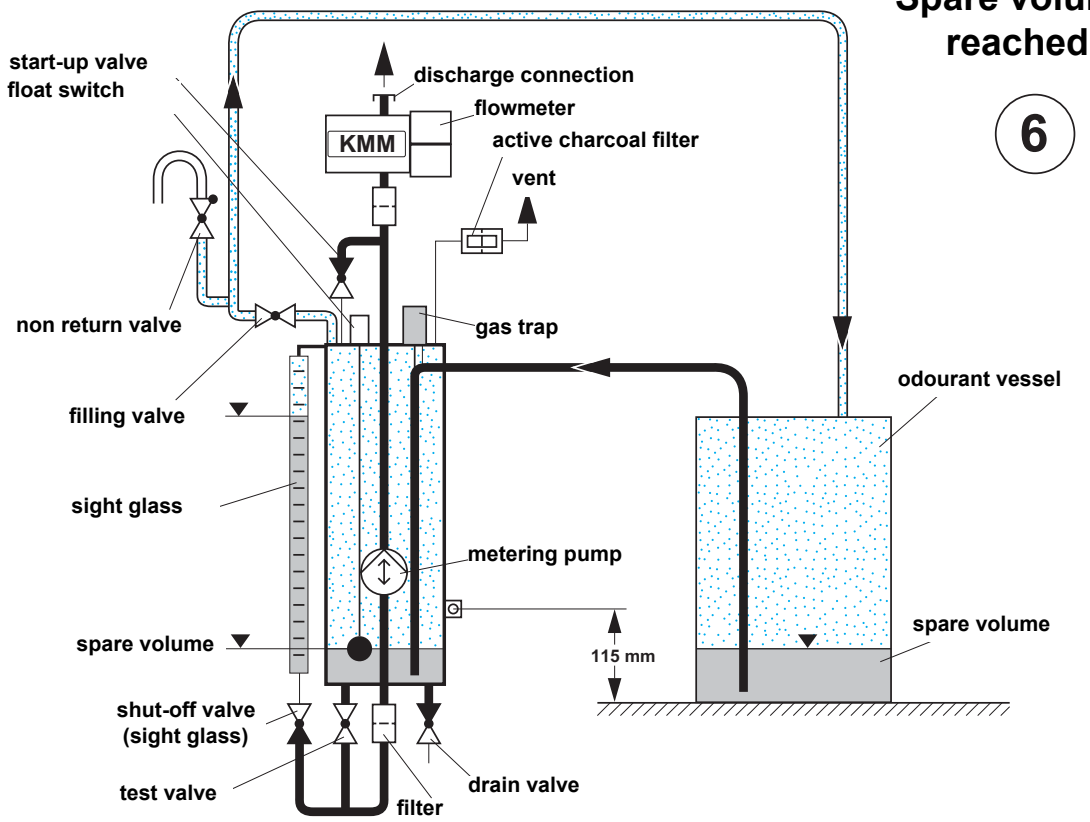
Operation

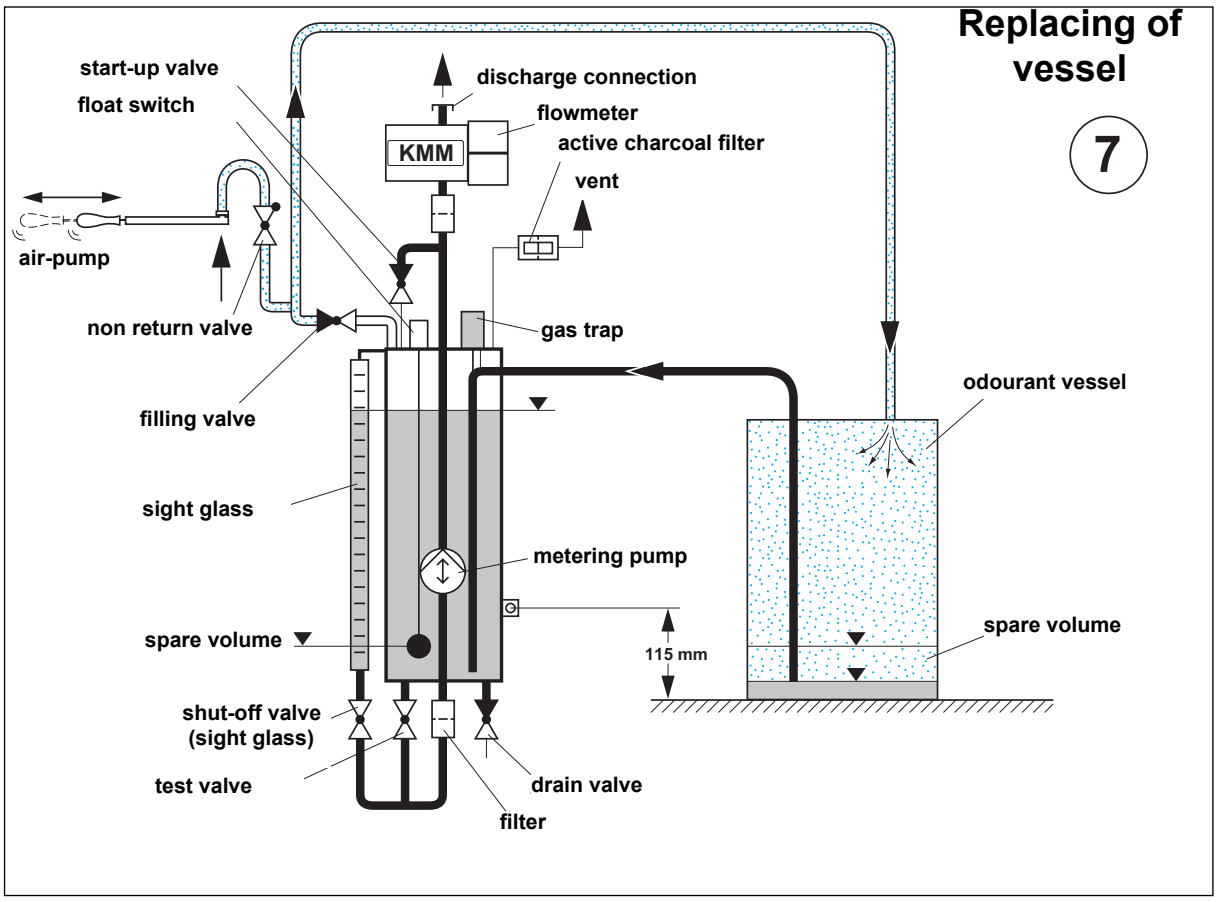
5

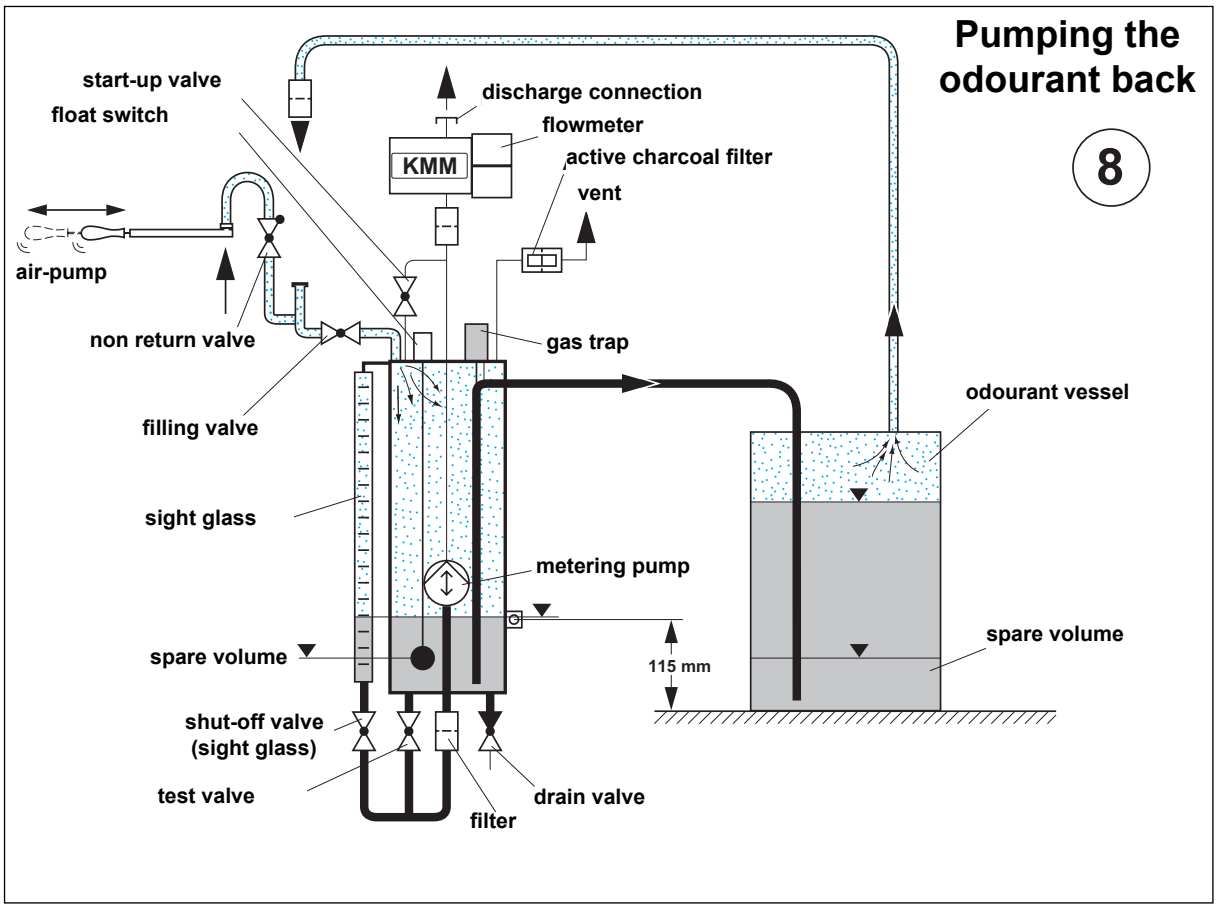


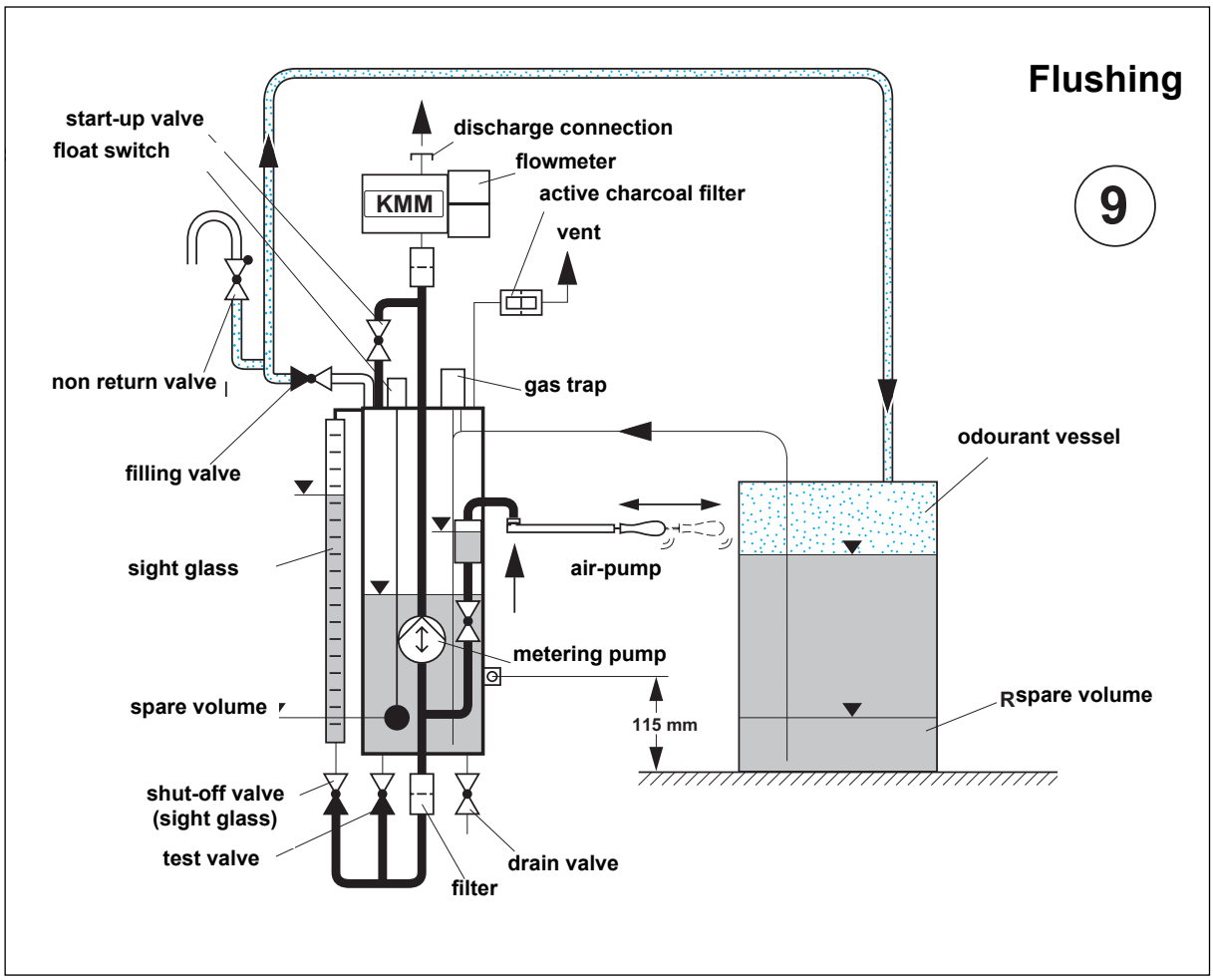
Spare volume reached

6

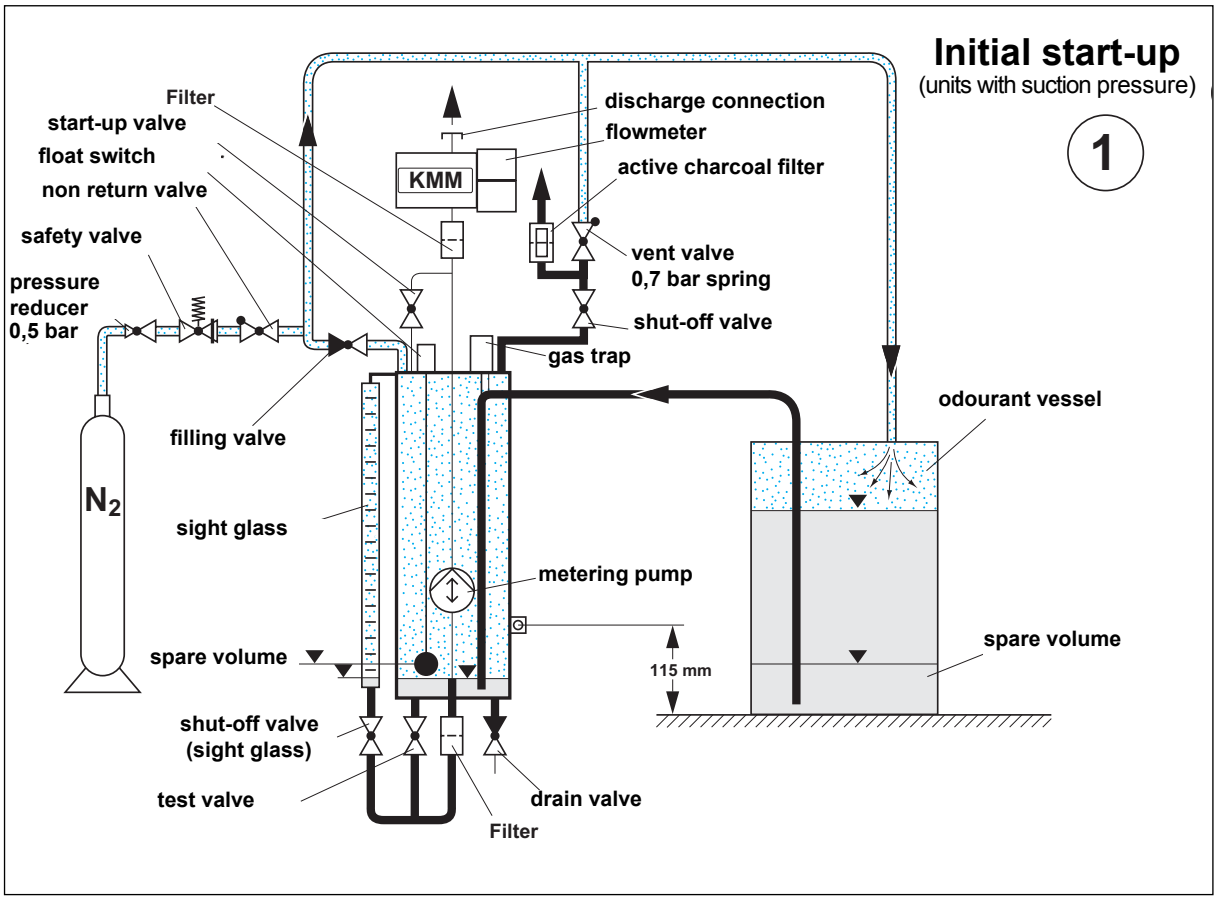


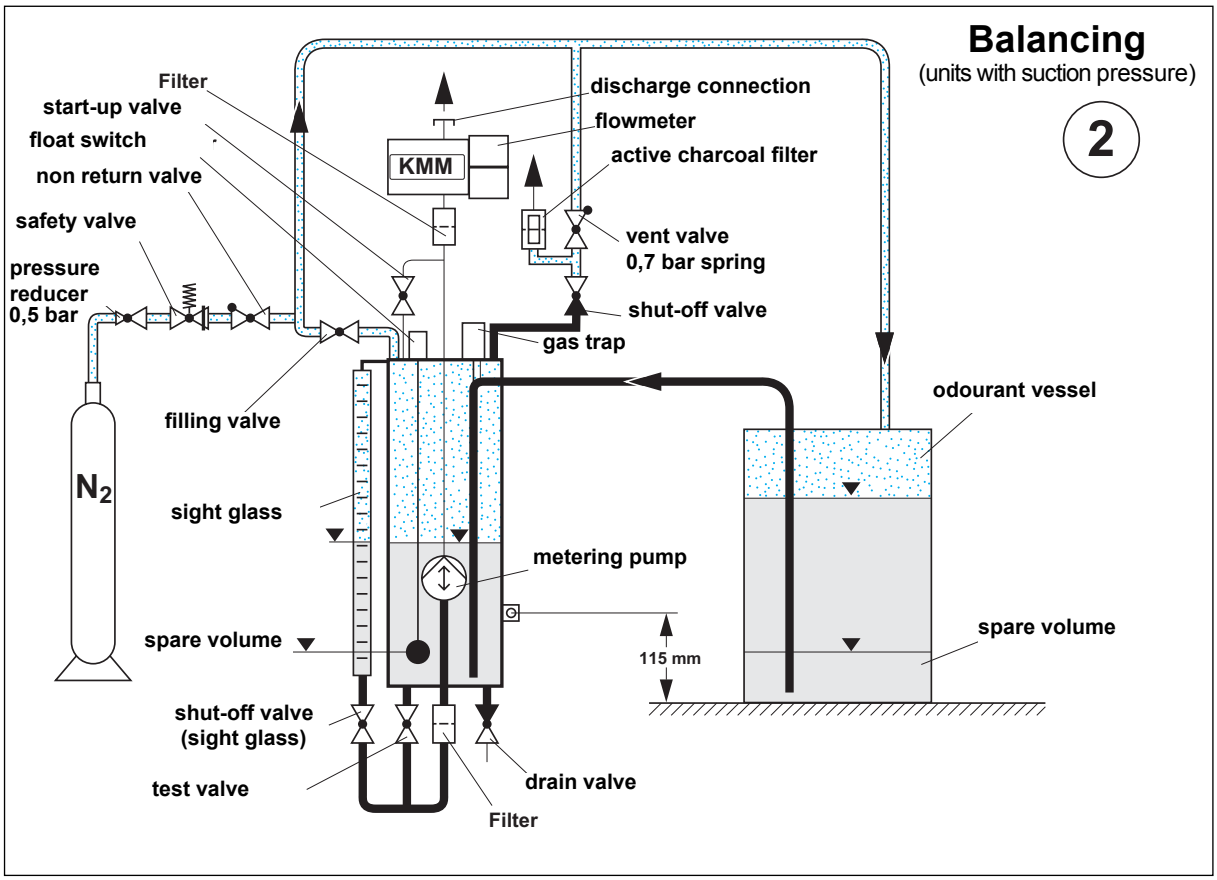

Replacing of vessel
7
start-up valve
float switch
discharge connection
flowmeter
KMM
active charcoal filter
vent
air-pump
non return valve
gas trap
filling valve
odourant vessel
sight glass
metering pump
spare volume
115 mm
spare volume
shut-off valve (sight glass)
test valve
drain valve
filter

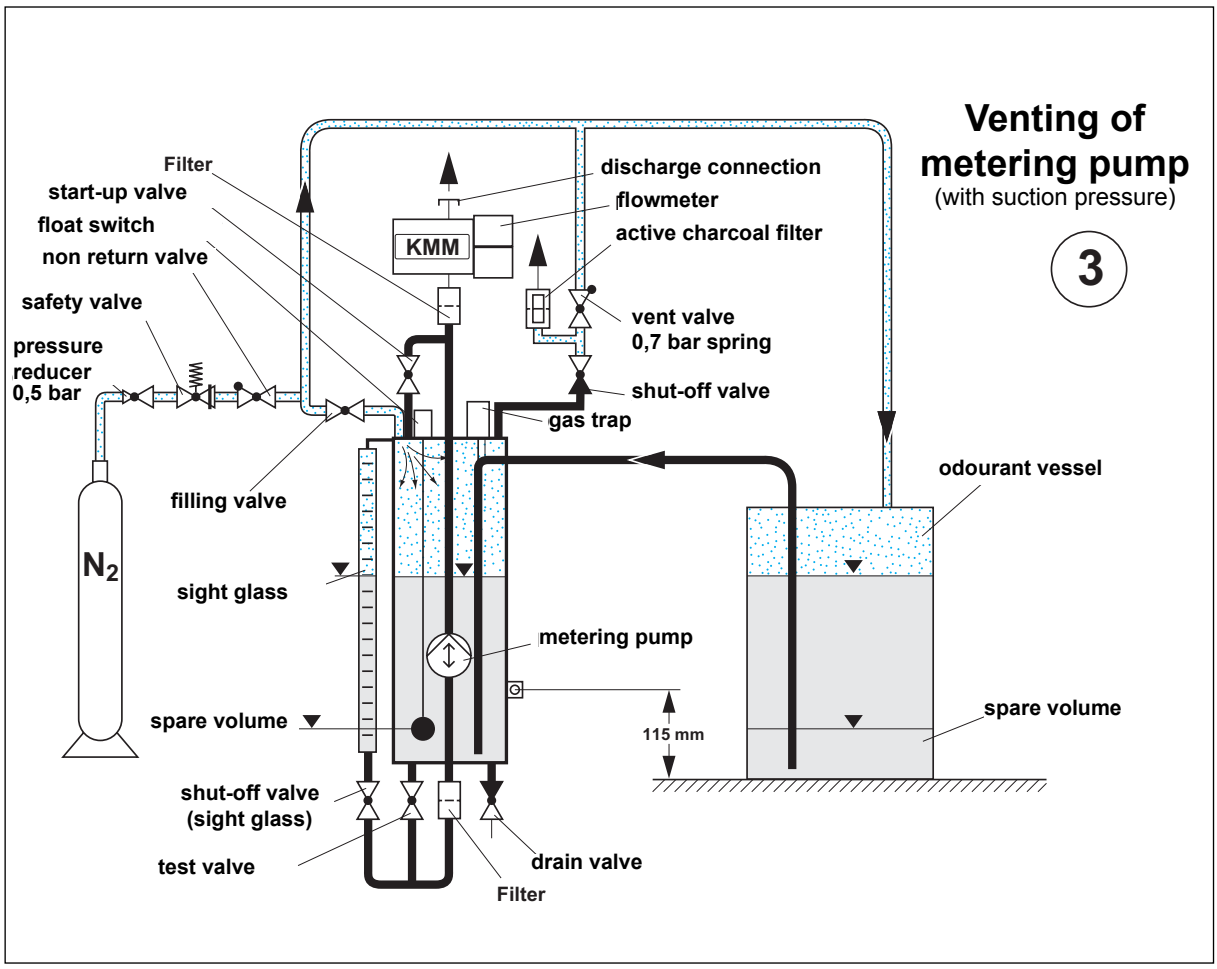

Pumping the odourant back
8
start-up valve
float switch
discharge connection
flowmeter
KMM
active charcoal filter
vent
air-pump
non return valve
gas trap
filling valve
odourant vessel
sight glass
metering pump
spare volume
115 mm
spare volume
shut-off valve (sight glass)
test valve
drain valve
filter

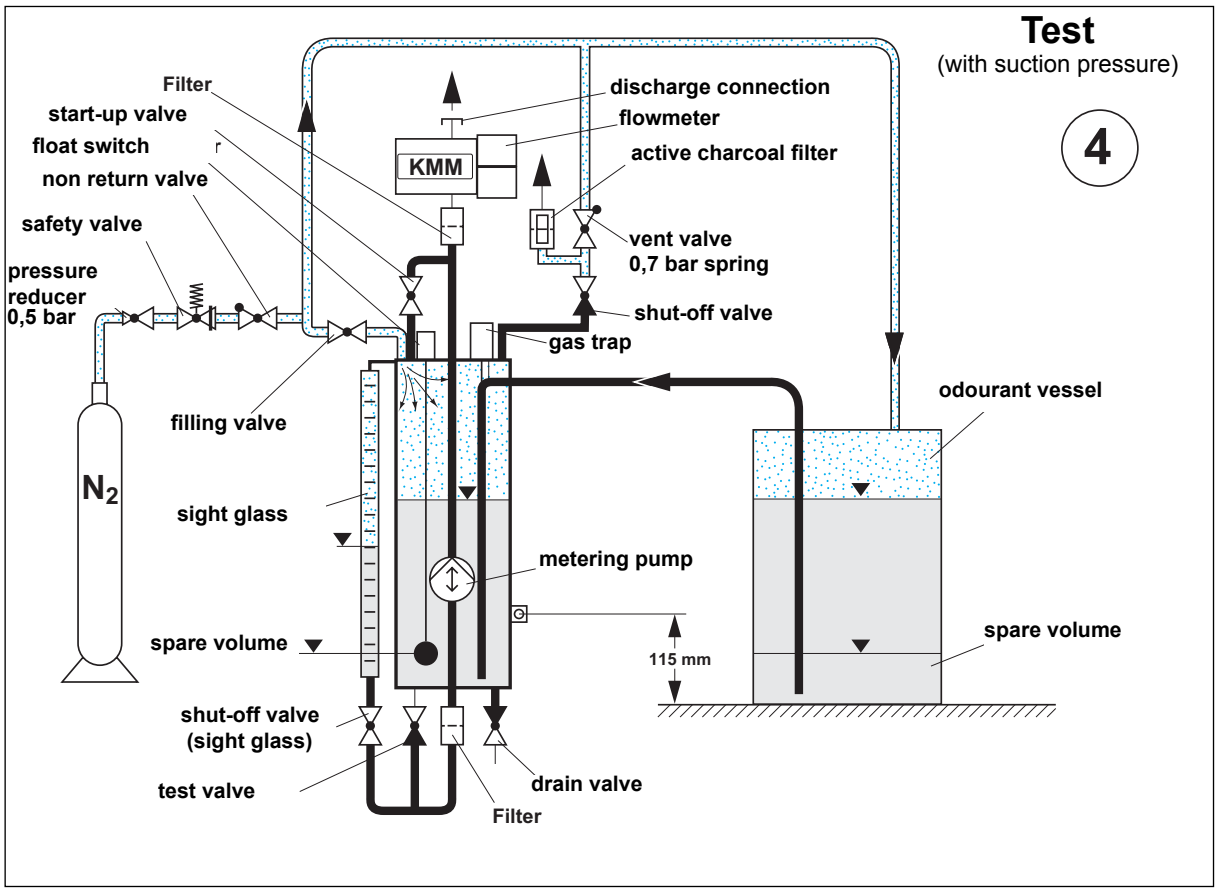

Flushing
9
start-up valve
float switch
discharge connection
flowmeter
KMM
active charcoal filter
vent
non return valve
gas trap
filling valve
odourant vessel
sight glass
air-pump
metering pump
spare volume
115 mm
Rspare volume
shut-off valve
(sight glass)
test valve
filter
drain valve

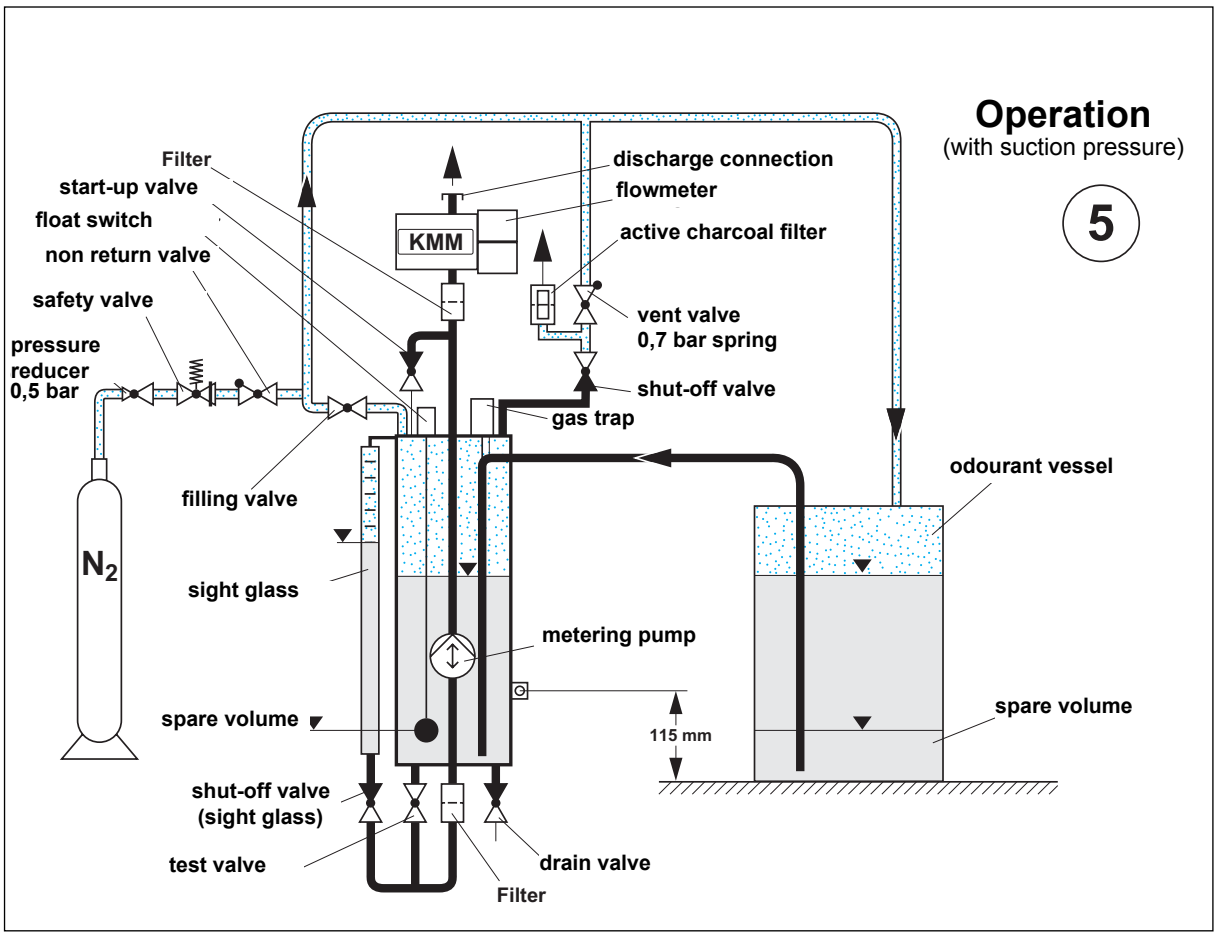
8.2 Units *with* suction pressure

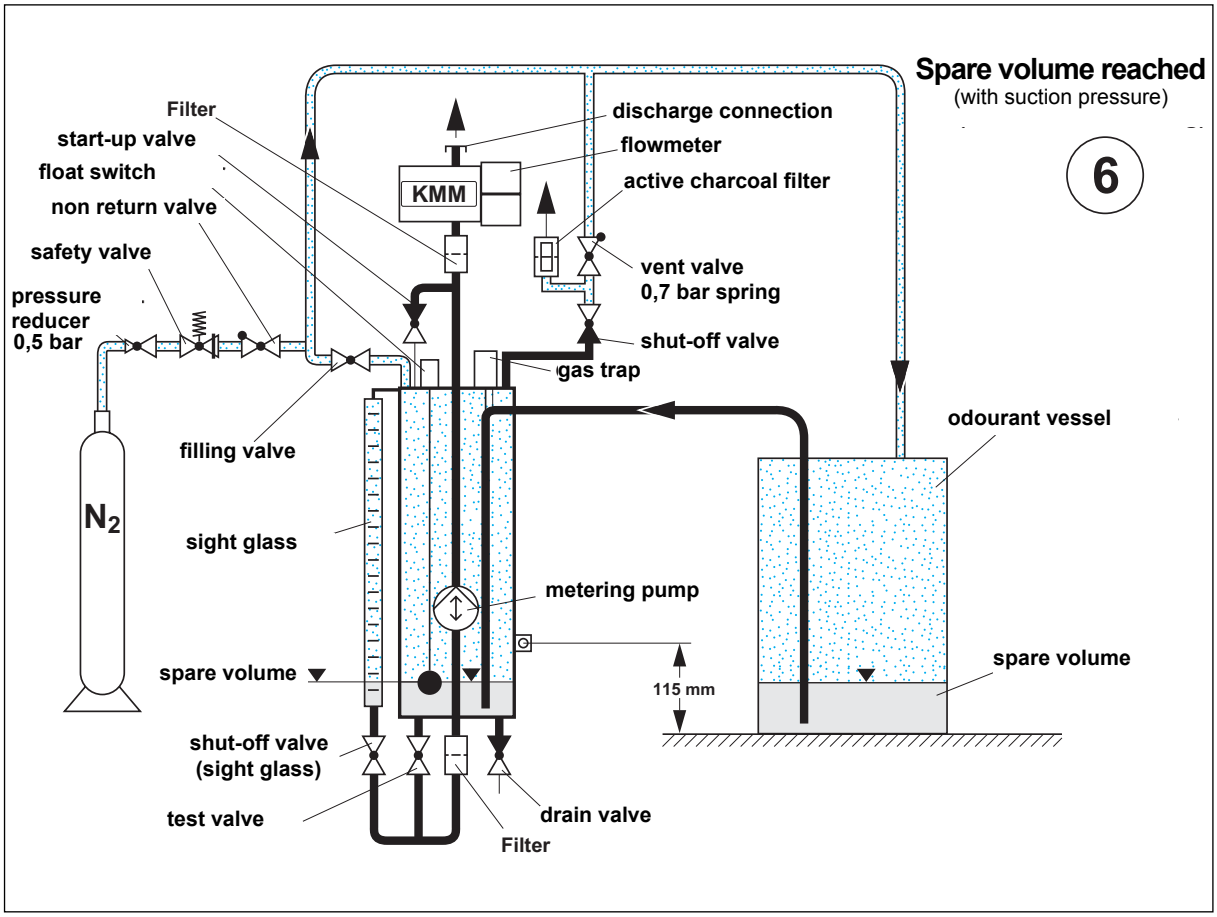





Venting of metering pump
(with suction pressure)
3
Filter
start-up valve
float switch
non return valve
safety valve
pressure reducer 0,5 bar
discharge connection
flowmeter
active charcoal filter
KMM
vent valve 0,7 bar spring
shut-off valve
gas trap
odourant vessel
filling valve
N_2
sight glass
metering pump
spare volume
115 mm
spare volume
shut-off valve (sight glass)
test valve
drain valve
Filter

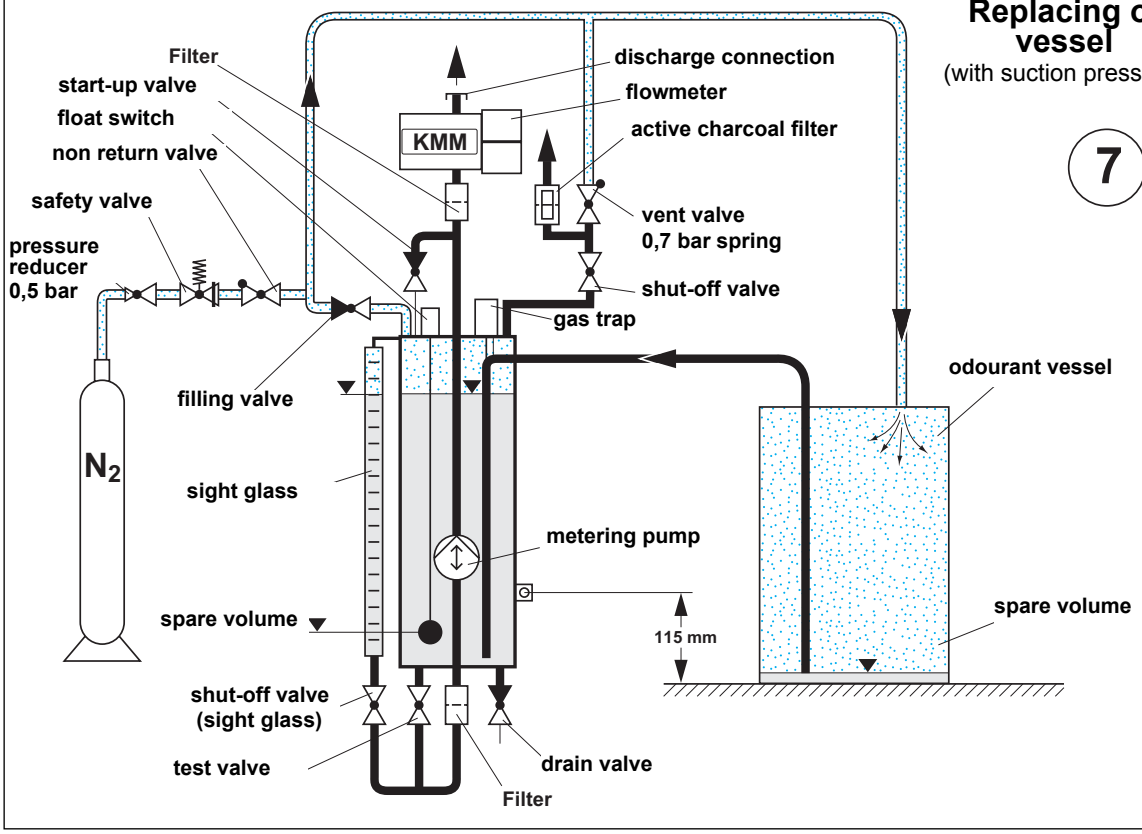

Test
(with suction pressure)
4
Filter
start-up valve
float switch
non return valve
safety valve
pressure reducer 0,5 bar
discharge connection
flowmeter
active charcoal filter
KMM
vent valve 0,7 bar spring
shut-off valve
gas trap
odourant vessel
filling valve
N_2
sight glass
metering pump
spare volume
115 mm
spare volume
shut-off valve (sight glass)
test valve
drain valve
Filter


Operation
(with suction pressure)
5
Filter
start-up valve
float switch
non return valve
safety valve
pressure reducer 0,5 bar
filling valve
N_2
sight glass
spare volume
shut-off valve (sight glass)
test valve
Filter
drain valve
KMM
discharge connection
flowmeter
active charcoal filter
vent valve 0,7 bar spring
shut-off valve
gas trap
metering pump
115 mm
odourant vessel
spare volume


Spare volume reached
(with suction pressure)
6
Filter
start-up valve
float switch
non return valve
safety valve
pressure reducer 0,5 bar
filling valve
N_2
sight glass
spare volume
shut-off valve (sight glass)
test valve
Filter
drain valve
KMM
discharge connection
flowmeter
active charcoal filter
vent valve 0,7 bar spring
shut-off valve
gas trap
metering pump
115 mm
odourant vessel
spare volume

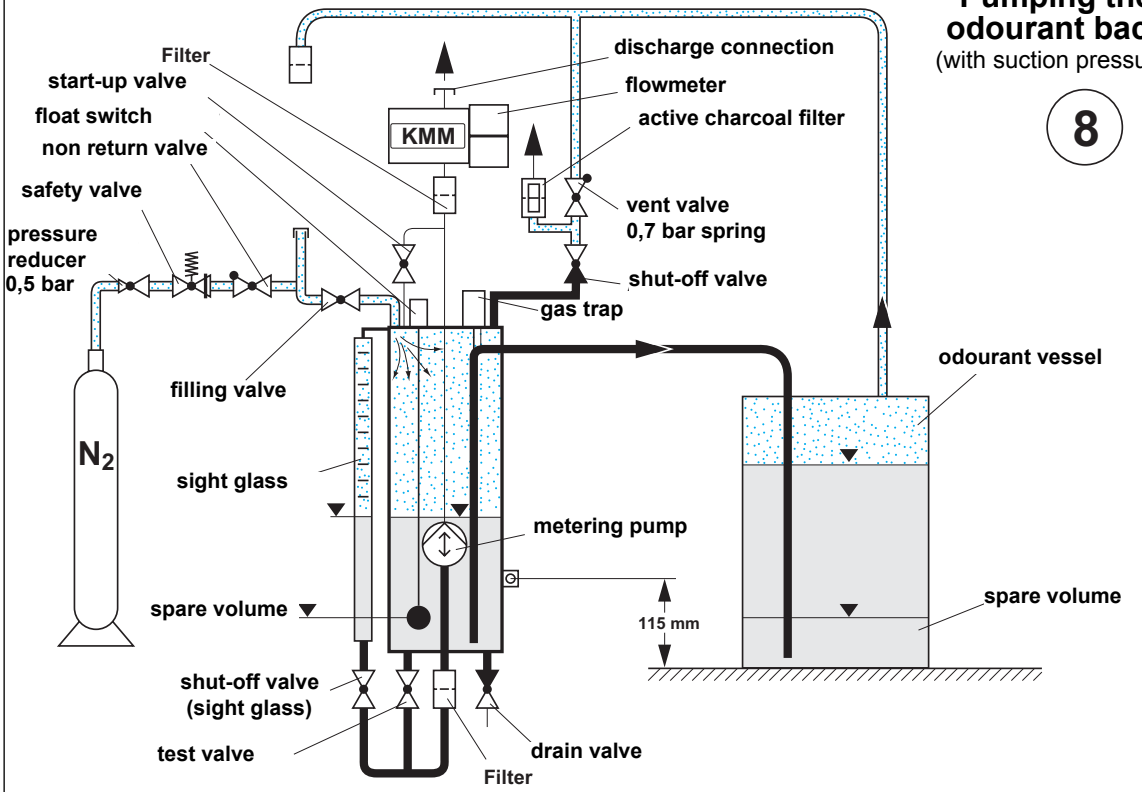
Replacing of vessel
(with suction pressure)

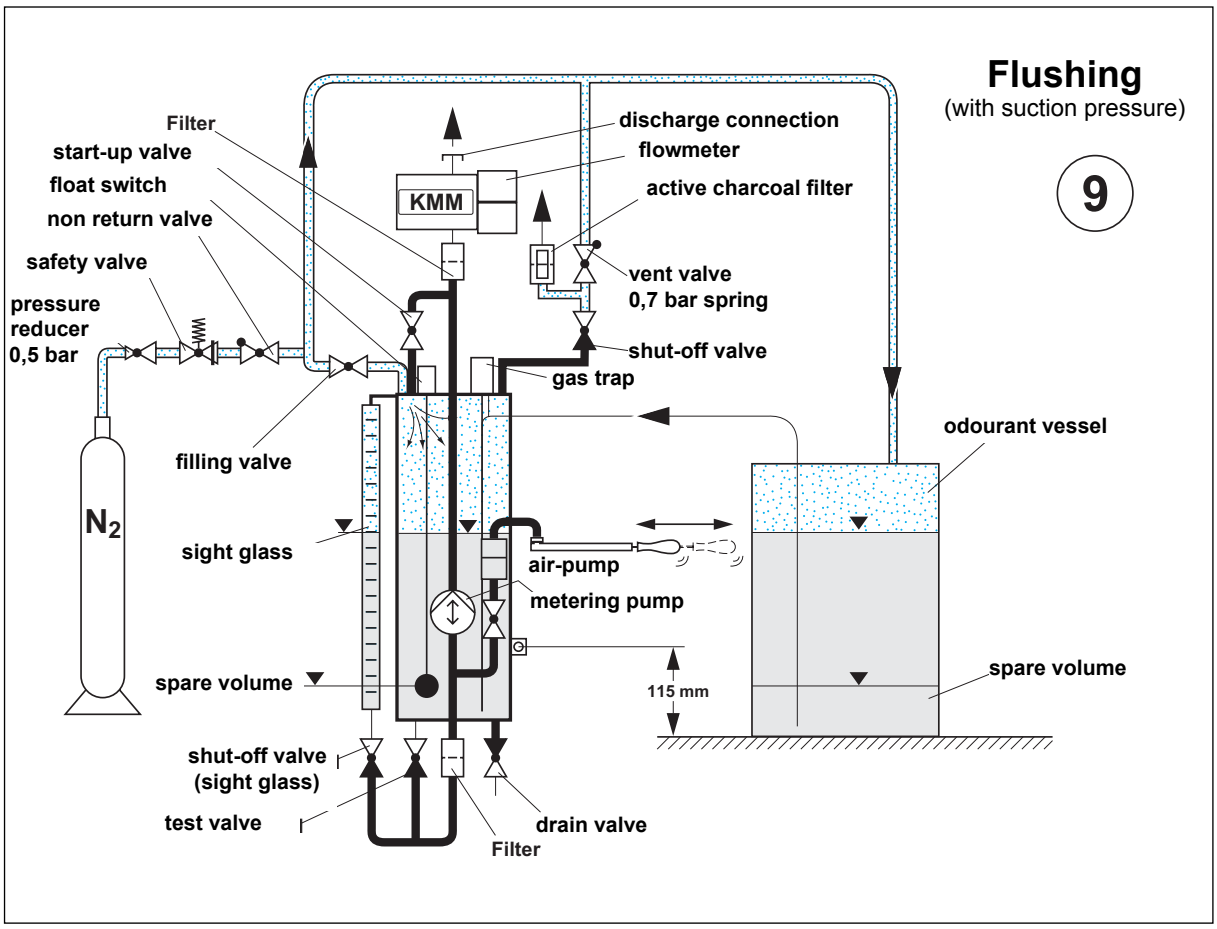
7

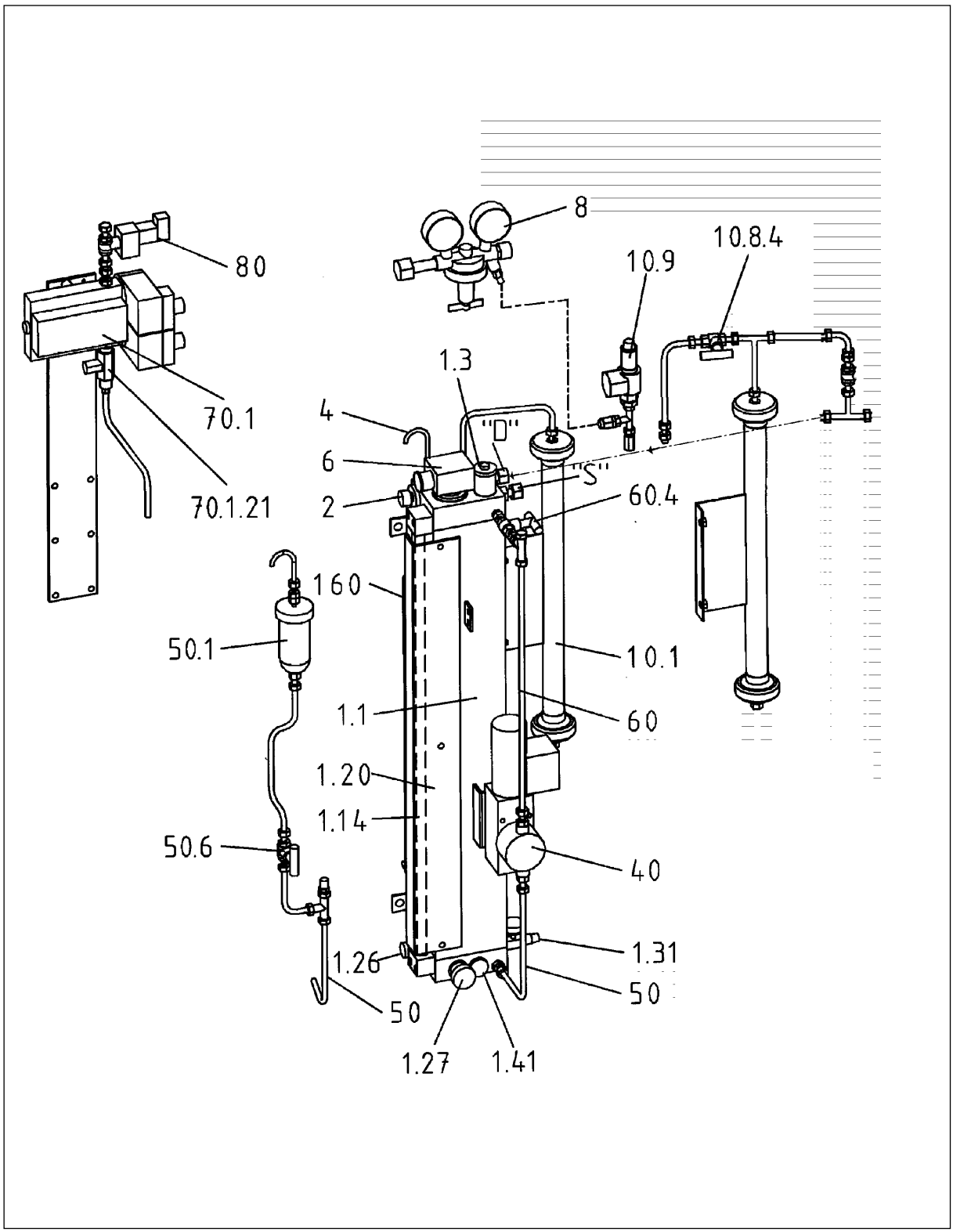


Pumping the odourant back
(with suction pressure)

8




Flushing
(with suction pressure)
9
Filter
start-up valve
float switch
non return valve
safety valve
pressure reducer 0,5 bar
filling valve
N2
sight glass
spare volume
shut-off valve (sight glass)
test valve
Filter
drain valve
KMM
discharge connection
flowmeter
active charcoal filter
vent valve 0,7 bar spring
shut-off valve
gas trap
odourant vessel
air-pump
metering pump
115 mm
spare volume



Issue May 2005

Operating Instruction

Odorizing Unit OD 60 - OD 1000 without suction pressure
(Duplex metering pump/ 1 line/ with 1 injection point)

B 00.074.2 en

Table of contents

1 General Information

1.1 Important preliminary information

Make sure to read and observe the bold texts before initial start-up to avoid damages !
The LEWA odorizing unit must only be used in proper technical condition and for the application intended, special attention must be paid to any safety risk observing the operating instruction! Specially problems impairing the safety must be corrected immediately.
Proper use includes observation of the operating instruction and maintaining of all inspection and maintenance requirements.
The LEWA odorizing unit is only intended for the conditions and fluids stated in the technical data sheet. Any deviating use or a use exceeding these conditions is considered to be improper use. The risk rests with the user exclusively.
The operator must assure that all commissioning, service, preventive maintenance and installation work is carried out by authorised and qualified, expert personnel only which has gained sufficient information by studying the operating instruction in detail. LEWA offers special training courses for this. Please contact us if you require information on this.
In addition to the safety ⚠ and caution instructions △ in this operating instruction also observe all general occupational safety and health regulations !
For hazardous areas according to regulation 94/9/EG (ATEX) please observe the instructions with this ⟨Ex⟩ - sign.
The pictures used may show type related deviations which, however, are of no consequence for the function.
The operator must assure that at least one copy of the operating instruction always is available near the odorizing system!

- **Is the power supply of the drive resp. the control correct?**
- **Has the electric hook-up of the LEWA odorizing unit been carried out correctly observing local regulations?**
- **Are all connections hooked-up correctly (no tension and tight)?**
- **Is the supply of the fluid conveyed assured?**
- **Are suction and discharge lines open?**
  (open valves in suction and discharge line)

1.2 Application

This operating instruction applies to the

LEWA odorizing unit type OD 60 to OD 1000 without suction pressure

made by LEWA GmbH.

The LEWA serial number and the year of manufacture can be found on the name plate of the LEWA odorizing unit.

The issue date of this operating instruction is given at the end of the written part of this operatinginstruction. Kindly state in case of questions.

1.3 Performance and applicabilities

This LEWA odorizing unit has been designed to handle the application given in the technical data sheet.
LEWA will not accept any responsibility if these conditions are changed as this could lead to serious problems which can result in the destruction of parts of the LEWA odorizing package. In this case danger to persons, animals and the environment cannot be prevented!
LEWA accepts no responsibility if the fluid handled or important operating conditions have not been given or given incompletely only

For further details refer to the technical data sheet.

1.4 Safety

LEWA products meet the regulations for industrial safety and the prevention of accidents.

- **The metering pumps have been designed for the operation in hazardous areas for temperature classes T1 to T4. For exact classification please especially observe the temperature of the fluid conveyed and the heating fluid.**
  The temperature limits stated in the technical data sheet must not be exceeded.
  In case of deviations please consult LEWA.

- **If the fluid conveyed can form an explosive mixture in case of contact with the atmosphere, diaphragm pump heads with single diaphragm must not be used in hazardous areas!**
  Exception: Diaphragm pump head with stroke volume < 1 cm³.
  In case of diaphragm rupture danger due to escaping fluid (e.g. HOT/ TOXIC/ HIGH PRESSURE).

- **The user must take appropriate measures for the prevention of accidents in order to avoid any dangers for the operating personnel by the fluid used.**
  All seals, screwed connections and venting screws must be checked for tightness regularly!

- **Venting screws must not be used in hazardous areas, if the fluid conveyed can form an explosive mixture in case of contact with the atmosphere.**

- **Plastics parts must be cleaned only using a damp cloth in order to avoid impermissible electrostatic charging.**

- **Wetted parts must be thoroughly flushed and cleaned before disassembly!**

- **For diaphragm pump heads the hydraulic fluid and the intermediate fluid in the diaphragm are adapted to the respective fluid conveyed according to the operation data available. For fluids which can trigger exothermic reactions in case of contact with mineral oil, an appropriately resistant diaphragm intermediate fluid must be selected.**
  In case of doubt please consult LEWA.

Metering pumps with electric motor are equipment used in industrial high voltage plants. During operation this equipment has dangerous, life parts and possibly moving resp. rotating parts. Therefore they can cause high health hazards or material damage in case of non-authorised removal of the required covers, in case of improper use, misoperation or insufficient maintenance.
The persons in charge of odorizing unit safety therefore must assure that

- **only qualified personnel is ordered to work on the machines resp. instruments,**

- **these persons, among other things, always have the operating instructions and all other product documentation readily available for all work concerned and these persons must be placed under the obligation to strictly adhere to these documents,**

- **work on machines resp. units or in their vicinity is prohibited to non-qualified personnel.**

Qualified personnel are persons, which due to their education, experience and training as well as their knowledge of the relevant standards, regulations, rules for the prevention of accidents and operating conditions, have been authorised by the persons in charge of plant safety to carry out the corresponding work required and can recognise and prevent possible dangers when performing the work.

1.4.1 Dangers when handling the fluid to be conveyed (odourant)

Please observe the corresponding safety data sheet when handling the odourant!

Contact in higher concentrations can lead to eye irritation, throat irritation, nausea and a dizziness.
In any case consult a doctor immediately!

1.4.2 What if..... - first aid -

1. Flush with water generously in case of **skin contact** and wash with stench masking, non oxidizing detergents.
2. Odourant spills:
   Pick-up using absorbing material (refer to safety data sheet of the odourant) and store in airtight drums.

1.5 Supply connections

Metering pumps systems need an adequate electric supply connection. The power supply connection values required result from the drive rating given in the technical data sheet.

1.6 Emissions

The noise emission values of the solenoid pumps (MAH, MLM, MBH) is < 70 db/A. For other metering pumps or special room conditions the values will be given on request.

2 Transportation and intermediate storage

2.1 Condition as supplied

The quality and function of all LEWA products is checked before shipment.
The LEWA odorizing unit is completely assembled according to the details given in the technical data sheet.

2.2 Checking the packing at the destination

Please check the packing for damage upon receipt of the goods. External damages of the packing must be reported to the forwarding company and a physical check must be requested. The packing must be in a condition assuring protection during the subsequent storage time. Open the shipment when the packing was damaged or the permissible storage time was exceeded (refer to section 2.2.3). Otherwise the packing should be opened only when the LEWA odorizing unit is about to be installed. Observe the recommendation of the manufacturer for accessories.

2.2.1 Storage period < 3 months

Standard packing will protect the odorizing unit against corrosion acc. to DIN 50014 (normal Middle-European climate) during transportation overland and during storage in dry buildings for at least three months.
Storage for longer periods will necessitate special measures for corrosion protection.

2.2.2 Storage period < 24 months

Seaworthy packing and special conservation will protect the odorizing unit during transportation overland or by sea and during dry storage (under cover or in an enclosed building) for at least two years.

2.2.3 Exceeding the permissible storage time

The packing must be opened if the permissible storage period is exceeded. Please check whether the shipment is complete and undamaged.
Switch box heaters fitted to electrical components must be connected.
The internal parts of the LEWA pump drive element must be turned over quarterly by operating the drive for a short period of time.
The level of hydraulic fluid in the holder of LEWA metering pump must be checked in adequate time intervals and topped up if required. Protect all bright metal parts against corrosion.

2.3 Transportation, lifting devices

The odorizing units can be transported using a hand lift or a fork lift truck.

3 Product information

3.1 General description

The odorizing unit has been designed and manufactured especially for your requirements.
The exact design data can be found in the enclosed technical data sheet.

3.2 Construction and method of operation

For better understanding of the following text please refer to the PID from chapter 2 in the operating manual, the sectional drawing and the corresponding parts list.

3.2.1 Construction

The odorizing unit essentially consists of the following assemblies:

- LEWA metering pump,
- pump control,
- tank with graduated burette and the valves required,
- suction and discharge piping
- accessories (optional).

3.2.2 Method of operation

3.2.2.1 LEWA Odorizing Unit

The LEWA metering pump draws the odourant from the tank during operation and during calibration from the graduated burette and meters it into the gas pipeline according to the preset odourant concentration.
The odourant level in the tank can be read off at the litre scale.
A filter (F601) in the suction line between tank and LEWA metering pump prevents that dirt particles cause failures in the pump head.

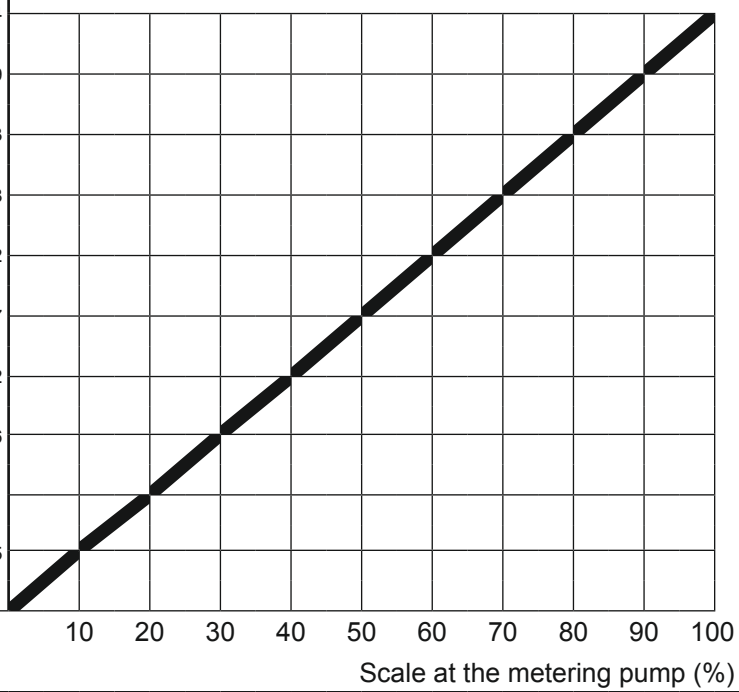
3.2.2.2 LEWA Metering pump

For LEWA odorizing units type OD 60 to OD 1000 a LEWA metering pump with diaphragm pumphead, solenoid drive and manual stroke adjustment is used. Corresponding to the odourant flowrate a metering pump type MAH, MBH or MLM is installed.
The manual stroke adjustment allows continuous adjustment of the volume metered per stroke. For more information on LEWA metering pump type MAH, MBH or MLM please refer to attached operating instructions B 1.411 for MAH, B 1.411.1 for MBH or B 1.431 for MLM.

The volume per stroke in dependence on scaling of the LEWA metering pump is shown in table 1.

Stroke volume (ml)							
Plunger diameter (mm)							
MBH		MAH			MLM		
8	10	3	5	8	3	5	8
0,251	0,392	0,022	0,063	0,160	0,106	0,294	0,754
0,226	0,353	0,020	0,057	0,144	0,095	0,265	0,679
0,201	0,314	0,018	0,050	0,128	0,085	0,235	0,603
0,175	0,274	0,015	0,044	0,112	0,074	0,206	0,528
0,151	0,235	0,013	0,038	0,096	0,064	0,176	0,452
0,126	0,196	0,011	0,032	0,080	0,053	0,147	0,377
0,100	0,157	0,009	0,025	0,064	0,042	0,118	0,302
0,075	0,117	0,007	0,019	0,048	0,032	0,088	0,226
0,050	0,078	0,004	0,013	0,032	0,021	0,059	0,151
0,025	0,039	0,002	0,006	0,016	0,011	0,029	0,075

Table 1



3.2.2.3 Pump control
Refer to chapter 9 in the operating manual.

3.2.2.4 Stand-by reservoir (B601) and graduated burette (M601)
The stand-by reservoir (B601) is of vertical design, made of stainless steel and has a the following volume depending on the type:

Type OD60:	60 litres
Type OD120:	120 litres
Type OD240:	240 litres
Type OD450:	450 litres
Type OD1000:	1000 litres

For level control and for checking the function a graduated burette (M601) is mounted to the side of the stand-by reservoir (B601) in parallel with a scale calibrated in ml. The odourant level can be read off at the graduated burette (M601) mounted to the stand-by reservoir (B601).

At the lower end of the stand-by reservoir (B601) a drain valve (V601) closed with a plug is installed.

3.2.2.5 Activated charcoal filter (A601)
The active charcoal filter (A601) is installed in the venting line. It prevents obnoxious smell.

3.2.3 Accessories
The following accessories can be included in the scope of supply (see following sections):
- Flushing device (S601)
- Float switch, overflow protection or transmitter
- Injection point (IPxxx)
- Filling line optional with solenoid valve, shut-off valve, sight glass and filter
- Flowmeter (FCxxx) with filter
- Pressure gauge (PIxxx)

3.2.3.1 Flushing device (S601)
The flushing device consists of
- flushing agent container
- non-return valve
- shut-off valve (V603)

It serves for flushing the LEWA metering pump as well as discharge and suction pipeline of the LEWA odorizing unit before maintenance and repair work.

3.2.3.2 Float switch (LSL) / overflow protection (LSHH) / level transmitter (LT)
The float switch serves for signalling the odourant reserve and is mounted to the tank (B601). Instead of a float switch, a level transmitter (LT) with the function (LSHH) can be used.
The overflow protection prevents overfilling of the tank.

LEWA offers as options:
- float switch (LSHH), which is part of the overflow protection, approved acc. to WHG/TRbF
- level transmitter
- control
- solenoid valve in the filling line for interruption of filling procedure.

3.2.3.3 Injection Point (IPxxx)
The injection point consists of the following components
- non-return valve
- 2 shut-off valves
- injection pipe of material 1.4571
- Weld-on socket of material 1.0305, material certification acc. to EN 10204, 3.1

It serves to inject the odourant into the gas pipeline.

3.2.3.4 Solenoid valve (MVxxx)
The solenoid valve (MVxxx) in the discharge line prevents backflow.

3.2.3.5 Flow meter (FCxxx)
The flow meters (FCxxx) are suitable for all common odourants and they measure the odourant flow. For this please refer to the enclosed separate operating instructions.

3.3 Dimensions / weights / centres of gravity
Please refer to enclosed dimensional drawing.

4 Erection and installation

4.1 Permissible ambient conditions
The LEWA odorizing unit is approved for an ambient temperature between -15 °C and +40 °C and should be protected against direct weather influences.
Should these limits be exceeded please consult LEWA headquarters or one of our representatives.

4.2 Space requirements
For this data please refer to enclosed dimensional drawing.

4.3 Foundation
For this data please refer to enclosed dimensional drawing

4.4 Erection


The complete odorizing unit must be fixed on an even surface at the mounting bores provided, so that danger e.g. by the unit toppling over is prevented. Only after this has been assured the LEWA odorizing unit may be put into operation.

4.5 Installation

4.5.1 Electrical
For this please especially observe section 1.4 in this operating instruction and the enclosed operating instruction B 0.102.

The odorizing unit is equipped with an “emergency stop switch”, which can be used as a repair switch as well. It has to be installed on site by the operator/ customer at an accessible location, which can be reached easily and quickly from the working place. The corresponding terminal diagram can be found in this operating manual, chapter 9.

For odorizing systems installed in Ex -area the earthing device of the odorizing unit must be connected.

4.5.2 Mechanical

Reciprocating positive displacement pumps are positively conveying metering pumps. Therefore a safety valve must be installed in the discharge line in order to protect the metering pump and the odorizing unit if there is a risk of overpressure (e.g. closed shut-off valves etc.).

During transport screwed connections might have been loosened. Therefore all screwed connections must be checked and tightened if required before commissioning.

The odorizing unit is supplied as functional unit. The following must be installed by customer:
- filling line to tank
- discharge line to injection point ().

It must be ensured by the operator that the outlet of the venting line is lead into a safe area!

For installation in Germany the regulations of TRbF020 must be observed!

5 Commissioning / operation / stop operation

Please observe the safety regulations specified by the odourant manufacturer mainly concerning handling, transportation and storage.

Hydraulic fluids can be taken from the technical data sheet or the separate operating instruction B 1.002.

5.1 Before commissioning

Before commissioning please check condition as supplied acc. to functional diagram on the last page of this operating instruction (all shut-off valves must be closed).

Note: For setting of the odourant flowrate refer to the attached operating instruction of the LEWA metering pump.

5.1.1 Filling of vessel

See functional diagram on the last page of this operating instruction.
Optionally a 3-way ball valve (V609) can be installed in the vent line.
During filling, the 3-way ball valve enables venting into the tank truck via the activated charcoal filter or via a vapour return pipe, depending on the position (see 5.1.1.1 and 5.1.1.2 for details).
The corresponding connections (N1, N2, N3) are marked on the 3-way ball valve. Connection N4 on the 3-way ball valve is always closed.

Without the 3-way ball valve venting always takes place via the activated charcoal filter.

The level must be monitored at the graduated burette (M601). Optionally LEWA is offering a float switch as part of the protection against overfilling according to WHG (Federal Water Act) (see section 3.2.3.2).

5.1.1.1 Venting via activated charcoal filters

During filling, venting takes place via the activated charcoal filter.
With the optional 3-way ball valve: Lever position crosswise, passage N3 - N2 is open, N1 is closed.

5.1.1.2 Venting with 3-way ball valve via vapour return pipe

During filling, venting takes place via a vapour return pipe back into the tank truck.
Lever position of 3-way ball valve: lengthwise, passage N3 - N1 is open, N2 is closed.

If a quick-release coupling with an integrated non-return valve is used in the vapour return pipe, both coupling parts must be connected to each other in order to avoid an increase of pressure in the tank when filling.

5.1.2 Checking vessel content

See functional diagram on the last page of this operating instruction.
The odourant level in tank (B601) should be checked regularly via the graduated burette (M601) to assure timely spare supply of the odourant.

For safety reasons the shut-off valves (V605, V606) must always be closed during operation.

The odourant residues in the tank (B601) can be drained via shut-off valve (V601). For this please refer to the safety instructions of the odourant manufacturer!

5.1.3 Start-up, venting

See functional diagram on the last page of this operating instruction.
The venting procedure is completed after approx. 5 minutes.

5.1.4 Calibration of the metering pump

See functional diagram on the last page of this operating instruction.
The shut-off valve (V602) is closed and the metering pump is started.
In this condition, the LEWA metering pump conveys exclusively from the graduated burette (M601).
The fluid volume conveyed per metering pump stroke resp. a certain number of strokes can be read off at the scale of the graduated burette.
In order to obtain a rather exact result, we recommend to measure the volume of at least 10 strokes.
Please compare the values determined with characteristics in table 1.
The calibration procedure has to be carried out for each line (metering pump) separately.

5.2 Operation

5.2.1 Metering operation

See functional diagram on the last page of this operating instruction.

5.2.2 Filling during metering operation

See functional diagram on the last page of this operating instruction.
After completion of the filling procedure the operating condition "metering operation" must be re-established.

Make sure that the shut-off valves (V605 and V606) are closed during operation without supervision of the LEWA odorizing unit. This prevents odourant leakage in case of the glass breaking.

5.3 Stopping operation

See functional diagram on the last page of this operating instruction.

5.4 Shut-down

See functional diagram on the last page of this operating instruction.

If the odorizing unit must be shut down for a longer period of time all fluid residues must be removed from the odorizing unit by flushing, if necessary by dismantling and cleaning. The tank (B601) must be drained also (not flushed!).

5.5 Dismantling and return transportation

See functional diagram on the last page of this operating instruction.
If the metering pump is dismantled or transported e.g. for repair work (see section 2.3 “transportation, lifting devices”) the following measures must be taken before shipment:

- LEWA accepts units flushed only.
- Remove all fluid residues and clean thoroughly.

Due to the danger of corrosion and pitting NO chloric detergents must be used!

- For return transportation to LEWA the completed fluid safety data sheet must be enclosed.
- In addition please make sure that all external connections are tight.

The operator is responsible for any damages caused by escaping lubricants or fluid residues!
For transportation the applicable rules for transportation of hazardous goods must be observed!

6 Maintenance and repairs

Please make sure to return to the operation mode selected by you after completing any work on the odorizing unit (see functional diagram on the last page of this operating instruction).

Separate odorizing unit from power supply and safeguard against unintentional start-up.
Attention in case of power failure: After the power is returned, the odorizing unit (the metering pump) will start immediately.
For this reason, the odorizing unit must be separated from power supply and safeguarded against unintentional start up prior to carrying out any maintenance work even in case of power failure.

Before any maintenance and repair work can be done the pipelines must be depressurized. Also observe the processing and safety regulations in force for the fluid conveyed.

The intervals for functional checks of the odorizing unit acc. to DVGW leaflet G 280 (latest edition) must be strictly observed.

6.1 Maintenance

Acc. to DVGW - leaflet G 280 the function of each LEWA odorizing system without continuous flow control must be checked once a month.
We recommend to have the LEWA odorizing system completely inspected by the manufacturer at least once a year. LEWA offers special maintenance contracts for this.

6.1.1 Flushing of LEWA metering pump

The flushing device (S601) serves for flushing of the LEWA metering pump as well as the discharge and suction piping in order to keep the odour emission during maintenance and repair work at the LEWA metering pump and the suction strainer low.
For this fill flushing device (S601) with a gas resp. odourant compatible flushing agent (e.g. kerosene, methanol).
Connect the air pump (P601) to the flushing device.
By pressurisation the flushing agent displaces the odourant via the suction line and the pump head back into the tank.
The corresponding valve settings can be taken from the functional diagram on the last page of this operating instruction.

6.1.3 Flushing of LEWA odorizing unit

Please refer to functional diagram on the last page of this operating instruction.

6.1.3 Activated charcoal filter (A601)

The activated charcoal in the activated charcoal filter (A601) must be checked monthly. (visual examination and odour test).
Saturated or wet activated charcoal must be replaced completely.
Remove activated charcoal filter from odorizing system and open by unscrewing.
The activated charcoal can now be removed from the container.

Observe regulations of the odourant manufacturer for disposal of spent activated charcoal.

Fill the specified quantity of activated charcoal (refer to parts list) into the container and close by screwing and tighten.

6.1.4 Cleaning/ replacing the strainer inserts (suction side, F601)

Since contaminations in the odourant can cause the strainer inserts (F601) to slowly clog, it is recommended to clean the strainer insert (F601) periodically.
The odourant does not need to be drained for cleaning the strainer inserts, however we recommend thorough flushing beforehand (see section 6.1.1).
Refer to functional diagram on the last page of this operating instruction for appropriate valve setting.

We recommend to replace strainer inserts.
Only if no replacement is available, clean strainer inserts thoroughly.
If a strainer insert is damaged it must be replaced.
See functional diagram on the last page of this operating manual.

A small volume of odourant resp. flushing agent will remain in the strainer.

6.1.5 Replacing strainer insert (discharge side, optional)

Please refer to functional diagram on the last page of this operating instruction.
The strainer inserts must be replaced regularly, however, at least once a year.

6.1.6 Cleaning strainer insert (F602, optional strainer in filling line)

Please refer to functional diagram on the last page of this operating instruction.

6.1.7 Injection point

The injection point should be check regularly for free passage and replaced after 10 years at the latest.

6.2 Repairs

Concerning the replacement of wear parts of the LEWA metering pump, please refer to the corresponding operating instruction attached.
If the LEWA odorizing unit needs repair please consult LEWA headquarters or one of our agencies.

7 Faults: symptoms, remedial actions

LEWA metering pump does not inject odourant into the gas line (injection point):	
Possible cause	**Remedial action**
Odourant tank empty	Re-fill odourant
Strainer blocked	Clean strainer resp. replace strainer insert
Metering pump does not convey	Check acc. to functional diagram. For defects at the metering pump please refer to enclosed operating instruction.

8 Functional diagram

	5. Commissioning / Operation / Shut-down										6. Maintenance and repairs					
Section in operating instruction	5.1	5.1.1.1	5.1.1.2	5.1.2	5.1.3	5.1.4	5.2.1	5.2.2	5.3	5.4	6.1.1	6.1.2	6.1.3	6.1.4	6.1.5	6.1.6
Operating condition / Tag No.	Before commissioning	Filling of tank, venting via activated charcoal filter	Filling of tank, venting via vapour recovery line (*)	Checking vessel content	Start-up, venting	Calibraion of meterintg pump	Metering operation	Filling during normal operation	Stopping operation	Shut-down	Flushing of metering pump	Flushing of odorizing unit	Replacement of activated charcoal	Strainer insert (suction side): Removing, cleaning	Strainer insert (discharge side): Replacement	Strainer insert (filling line): Removing, cleaning
Line 1																
P101																
V101	0	-	-	-	1	0	1	1	0	0	1	1	-	0	-	-
V102	0	-	-	-	1	1	0	0	0	0	0	0	-	-	-	-
V103	0	-	-	-	1	0	0	0	0	0	1	0	-	-	-	-
V104	0	-	-	-	-	1	1	1	0	0	-	-	-	-	-	-
V105	0	-	-	-	1	1	0	0	0	0	0	0	-	-	0	-
MV101 (opt.)	0	-	-	-	-	1	1	1	0	0	0	0	-	-	0	-
Line 2																
P201																
V203	0	-	-	-	1	0	0	0	0	0	1	0	-	-	-	-
V205	0	-	-	-	1	1	0	0	0	0	0	0	-	-	-	-
Drain-/ filling connection																
B601																
V601	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
V602	0	1	1	1	1	0	1	1	0	0	0	0	-	0	-	-
MV601 (opt.)	0	1	1	0	0	0	0	1	0	0	-	-	-	-	-	0
V608 (opt.)	0	1	1	0	0	0	0	1	0	0	-	-	-	-	-	0
Graduated burette																
M601																
V605	0	1	1	1	1	1	0	1	0	0	0	0	-	0	0	-
V606	0	1	1	1	1	1	0	1	0	0	0	0	-	-	0	-
Flushing (opt.)																
S601																
V603	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0
Activated charcoal filter																
A601																
V609 (opt.)	-	N3-N2	N3-N1	N3-N2	N3-N2	N3-N2	N3-N2	N3-N2	-	-	N3-N2	N3-N2	N3-N1	-	-	-

1 = open/ on
0 = closed/ off
- = not relevant

Vxxx = shut-off valve
MVxxx = solenoid valve
Pxxx = metering pump
filter
Mxxx = graduated burette

Bxxx = tank
Sxxx = flushing device
Axxx = activated charcoal

(*) Venting via vapour recovery line only with optional 3-way ball valve (V609).

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Table of contents

1 General information / safety

1.1 Important preliminary information

Refer to operating instruction „odourizing system“ for installation in an odourizing system. Otherwise refer to operating instruction B 0.100.

1.2 Application

This operating instruction applies to LEWA diaphragm metering pump **MAH**.
The product number (pump no.) can be found in the technical data sheet and on the name plate of the metering pump.

1.3 Performance and applicabilities

Refer to technical data sheet

Stroke length:	0 ... 3,2 mm
Divisions on stroke scale:	0 … 0,1 mm
Stroke frequency:	10 … 180 min^{-1}
Voltage:	refer to technical data sheet

	potentially explosive atmospheres	non-hazardous area
Solenoid, protection class:	II 2 G EEx em II T4	-----

1.4 Safety

Please observe the comment under section 1.1.

1.5 Supply connections

Please observe the comment under section 1.1.

1.6 Emissions

Please observe the comment under section 1.1.

2 Transportation

Please observe the comment under section 1.1.

3 Product information

3.1 General description

Please observe the comment under section 1.1.

3.2 Construction and method of operation

The item numbers in brackets refer to the sectional drawing and the corresponding parts list.

The **MAH** metering pump consists of an electro-magnetic drive with stroke adjustment and of the diaphragm pump head. The electric control is contained in a separate housing.

The **MAH** metering pump is control by impulses. The discharge stroke is effected by the anchor of the solenoid. The suction stroke is effected by the force of return spring (69) when the power impulse is switched off.The stroke length can be adjusted steplessly from zero to maximum stroke, both with the pump stationary or in operation. The stroke is adjusted by means of knurled nut (78).
Rotating moves the threaded piece (81) up or down.
Pin (82) and a slot in flange (73) prevent threaded piece (81) from turning as well. The threaded piece also acts as the bottom stop for the solenoid anchor. The upper limit position is defined by a stop in the solenoid and remains unchanged.

The diaphragm pump head is divided into three functional chambers: the fluid chamber in contact with the metering fluid, the hydraulic pressure chamber and the hydraulic reservoir. The fluid chamber and the hydraulic pressure chambers are kept apart by means of diaphragm (27). This means that the fluid chamber is also sealed off to atmosphere.
The barrier between the hydraulic pressure chamber and the hydraulic reservoir is provided by plunger (2). The reciprocating plunger (2) transmits the displacer movement to diaphragm (27) via the hydraulic fluid which is trapped in the hydraulic pressure chamber. It is this diaphragm which acts directly on the metering fluid and produces the pumping process in the fluid chamber.
Diaphragm (27) always displaces a somewhat smaller volume than plunger (2) because, with each stroke, a small amount of hydraulic fluid escapes from the hydraulic pressure chamber through the sealing gap between plunger and bush (20) to the hydraulic reservoir.
At the end of each suction stroke plunger (2) uncovers the bores in bush (20), thus creating a connection between the hydraulic reservoir and the hydraulic pressure chamber. In this way, on each stroke, the leakage is replenished from the reservoir.
The bores in bush (20) are at the highest point in the hydraulic pressure chamber. Therefore they also allow the escape of gas bubbles at the end of each suction stroke, which are formed in the hydraulic pressure chamber during running. A circulation system (122 and 124) creates deliberate movement of the bubbles to these holes. Metering errors due to the compressibility of the gas bubbles are therefore eliminated, and venting of the hydraulic pressure chamber during commissioning is speeded up.
The pump cannot be damaged by faulty operation.
Excess pressure, e.g. due to a shut valve in the delivery line, stops the solenoid as there is a limit to its thrust.

The pressure then will rise to about twice the maximum operating pressure. Should this cause the safe working pressure on the discharge side to be exceeded, then some additional pressure protection (e.g. safety valve) will be necessary.

A closed valve in the suction line would cause cavitation.
After the faults have been corrected, the metering pump will start to operate again.

3.3 Dimensions / weights / centres of gravity

Refer to general arrangement drawing. Please observe the comment under section 1.1.

4 Erection and assembly

4.1 Permissible ambient conditions

Please observe the comment under section 1.1.

The LEWA metering pump must be protected against direct environmental influences and can be operated at temperatures between –20 °C and +40 °C. Please consult LEWA headquarters or one of our representatives if these limits are exceeded.

4.2 Space requirements

Refer to general arrangement drawing. Please observe the comment under section 1.1.

4.3 Foundation

Refer to general arrangement drawing. Please observe the comment under section 1.1.

4.4 Erection

Please observe the comment under section 1.1.

4.5 Installation

Please observe the comment under section 1.1.
The metering pump must be installed so that the axis of the valves and of the solenoid is vertical.
Refer to separate operating instruction for hooking up the control.

5 Commissioning / operation / shut down

5.1 Operation

The stroke volume of the pump can be adjusted by means of knurled nut (78) whilst the pump is running or stopped. Rotation clockwise will reduce the stroke length and thus the stroke volume. The amount of adjustment in relation to the maximum stroke volume is indicated on scale ring (76).

5.2 Operating and ancillary means

5.2.1 Hydraulic fluid

Refer to enclosed operating instruction B 1.002.

5.3 Commissioning, start-up, venting

If the pump fails to be self-priming after it has been switched on, take one of the measures described in operating instruction B 0.100 section 5.3. Please request from LEWA if not available.

5.4 Adjustment and control

Please observe the comment under section 1.1.

5.5 Shut-down

Please observe the comment under section 1.1.

5.6 Dismantling and return transportation

Please observe the comment under section 1.1.

6 Maintenance and repairs

6.1 Maintenance

The control does not require maintenance.
For the MAH metering pump please observe the general maintenance instructions in operating manual B 0.100, section 6.1. Please request from LEWA if not available.

6.2 Repairs

6.2.1 Standard tools:

allen key:	size 6 mm
open ended spanner:	size 17 mm

6.3 Dismantling / assembly

6.3.1 Valves

For aggressive fluids flushing of the pipelines before dismantling is recommended.

Close shut-off valves and remove pipeline.
Unscrew valve body (3 or 4).

Make sure that the valve does not drop out.

6.3.1.1 Membrane

For aggressive fluids flushing of the pipelines before dismantling is recommended.

Be aware of possible burns by hot lubricant during the work sequences following.
Please make sure that spent hydraulic fluid is disposed of environmentally safe

Close shut-off valves and remove pipe-lines.
Undo allen screws (36) and lift off diaphragm pump body (26).
When the diaphragm is being removed with the pump in vertical position hydraulic fluid will escape.
Take off diaphragm (27).
For further dismantling instructions please consult our customer service department.

6.3.2 Assembly

In reverse order to dismantling.
All parts must be cleaned thoroughly (preferably in an ultrasonic bath), and checked for perfect condition, especially valve seat, valve ball and diaphragm clamping faces.
Before installing diaphragm make sure that cylindrical pin (124) rests in the upper bore.
Allen screws (36) must be tightened applying the torque stated on the face of diaphragm pump body (26). Observe direction of flow when fitting valves.

6.4 Filling, venting, adjusting

6.4.1 Filling

Hydraulic fluid (see section 5.2.1) is filled through bore of cylindrical screw (64) by means of funnel or squeeze bottle (up to lower edge of bore).
Screw in cylindrical screw (64).

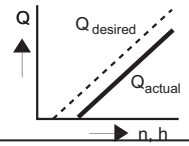
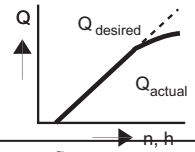
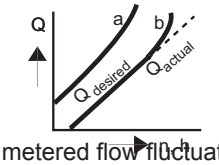
6.4.2 Venting

Fluid and hydraulic pressure chambers are self-venting.
To achieve this operate metering pump at zero pressure for some time.
Then top up with hydraulic fluid as required.
If pump fails to prime itself use one of the measures listed in operating instruction B 0.100 section 5.3.
Please request from LEWA if not available.

6.4.3 Adjusting

Please consult our customer service department.

7 Faults; symptoms, remedial action

Fault	Possible cause	Action
pump does not deliver	- suction shut-off valve closed - dirt trap or line blocked - suction valve fitted wrong way round or damaged - suction pressure too low (see technical data sheet)	- open shut-off valve - clean dirt trap or line - strip valve, inspect, and fit correctly - review suction conditions
	- discharge shut-off valve closed - back pressure too high (see technical data sheet) - discharge valve fitted wrong way round, jammed or damaged	- open shut-off valve - reduce discharge pressure - strip valve, check and fit correctly
	- air in fluid chamber, in hydraulic pressure chamber - hydraulic fluid low - gas in metered fluid - control or solenoid defective	- vent pump head (see 6.4.2) - replenish hydraulic fluid (see 6.4.1) - check installation - please contact LEWA customer service dept.
pump flowrate over whole range too low 	- suction of discharge valve leaks due to dirt or wear	- clean or repair valve, check dirt trap
pump flowrate at long strokes or high stroking speed too low 	- suction shut-off valve not fully open, dirt trap fouled up - metered fluid gassing off in fluid chamber because pressure losses on suction side too high	- open all valves fully, clean dirt trap - check pipeline and change
pump flowrate excessive  metered flow fluctuates or above $Q_{desired}$	- static pressure at suction flange higher than at discharge flange - inertia forces in pipeline cause suction pressure momentarily to exceed discharge pressure	- reduce suction pressure, elevate pump, fit pressure retaining valve or spring-load discharge (and suction) valve - shorten pipeline or increase cross section
metered flow fluctuates, but remains below $Q_{desired}$	- metered fluid contaminated or gas entrained - valves damaged	- check dirt trap and improve, de-gas fluid - unsuitable or defective valve components to be refurbished or replaced

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1 General information / safety

1.1 Important preliminary information

Refer to operating instruction „odourizing system“ for installation in an odourizing system. Otherwise refer to operating instruction B 0.100.

1.2 Application

This operating instruction applies to the LEWA solenoid pump type **MLM 15 / MLM 40** with manual stroke adjustment.
The LEWA commission number and LEWA serial number can be found in the technical data sheet and on the front side of the diaphragm pump head.

1.3 Performance and applicabilities

See technical data sheet.

Maximum stroke length:	0 – 15 mm
Divisions on stroke scale:	0 – 100
	(100 = maximum stroke)
Maximum stroke frequency:	90 strokes / min

1.4 Safety

Please observe the comment under section 1.1.

1.5 Supply connections

Please observe the comment under section 1.1.

1.6 Emissions

Please observe the comment under section 1.1.

2 Transportation and intermediate storage

Please observe the comment under section 1.1.

2.1 Condition as supplied

The solenoid pump type **MLM 15/MLM 40** is supplied complete with controller and mounted diaphragm pump head.
The diaphragm pump head is charged with hydraulic fluid.
The controller is matched to the metering pump at our works under operating conditions.

2.2 Inspection of the packing at the destination

Please observe the comment under section 1.1.

2.3 Transportation, lifting devices

Please observe the comment under section 1.1.

3 Product information

3.1 General description

Please observe the comment under section 1.1.

3.2 Construction and method of operation

(see fig. 1 and corresponding sectional drawing “solenoid pump”)
The solenoid pump type MLM 15 / MLM 40 consists of solenoid drive, control and diaphragm pump head.

The solenoid pump is controlled by a pulse generator. The piston (2) is coupled to the anchor of the solenoid. When piston (2) has reached its front dead end the current pulse is cut off by a proximity sensor. The suction stroke of piston (2) is then activated by the force of the compression spring (69).

The adjustment of the plunger stroke length is achieved steplessly from zero to maximum by rotating handwheel (79), whilst the forward end position (dead end) always remains the same. The stroke length can be changed both with the pump running or stopped. The change in stroke length is made by means of adjusting spindle (74), which also acts as a stop for stroke plate (70).
Adjustment of this spindle produces a change in stroke as it limits the return stroke of piston (2).
The **diaphragm pump head** is divided into three functional chambers: the operating chamber (A), in contact with the metering fluid, the hydraulic pressure chamber (B), and the hydraulic reservoir (C).
Operating chamber (A) and hydraulic pressure chamber (B) are separated by the diaphragm (27).
This means that the operating chamber (A) is also sealed off to the atmosphere.
The barrier between hydraulic pressure chamber (B) and hydraulic reservoir (C) is provided by the piston (2) and also by the venting valve (50/E) and the hydraulic snifting valve (29).
The purpose of these various valves is to precisely control the displacement of the diaphragm and to protect the pump against overload and faulty operation.

The reciprocating piston (2) transmits the displacer movement to the diaphragm (27) via the hydraulic fluid contained in the hydraulic pressure chamber (B). It is this diaphragm which acts directly on the fluid metered and produces the pumping process, as described in operating instruction B 0.100, sect. 1.3. The diaphragm (27) always displaces a somewhat smaller volume than the piston (2) because, with each stroke, a small amount of hydraulic fluid escapes via the piston seal (20) and the venting valve (50/E) from the hydraulic pressure chamber (B) into the hydraulic reservoir (C). This leakage has to be replenished via the snifting valve (29).

This is achieved as follows:
Shortly before completion of the suction stroke the diaphragm (27) bottoms against the rear support face in piston (2) direction. As the piston (2) retracts farther a vacuum is created in the hydraulic pressure chamber (B). The hydraulic snifting valve (29) therefore opens, and the missing volume of hydraulic fluid is replenished from the hydraulic reservoir (C) into the hydraulic pressure chamber (B).

<u>Assisted by the rear diaphragm support face the hydraulic snifting valve (29) therefore replenishes the leakage losses in the hydraulic pressure chamber (B)</u>

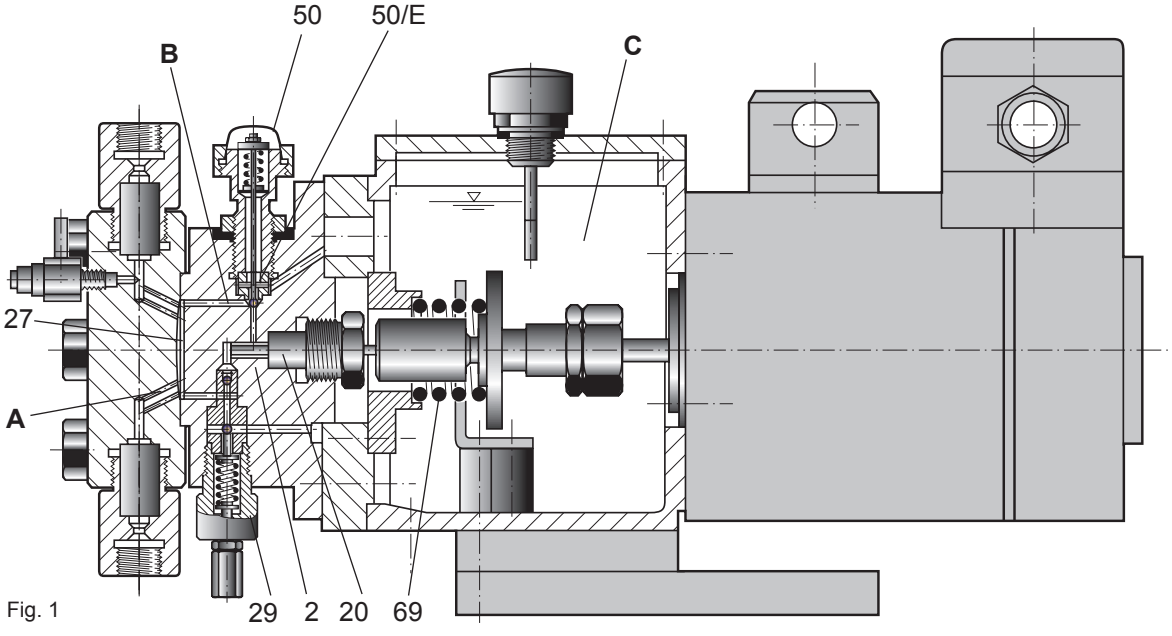

Fig. 1

The hydraulic snifting valve (29) can also open unintentionally, namely when the pressure in the diaphragm pump head falls below the setting pressure of the snifting valve, e.g. because of a fault condition causing a drop in the suction line pressure or because the suction line is shut off (the required suction pressure is stated in the technical data sheet!). The solenoid pump will then not draw fluid from the suction line, but take hydraulic fluid from the hydraulic reservoir (C). The diaphragm remains stationary. Consequently there will be too much hydraulic fluid in the hydraulic pressure chamber (B). During the next discharge stroke the diaphragm will be displaced towards the forward (left hand) support face. If the diaphragm presses against this face before the piston (2) has reached the front dead end the pressure in the hydraulic pressure chamber (B) will rise rapidly until the pressure limiting valve (50) lifts. The fluid which is displaced by the piston (2) will then flow through the pressure limiting valve (50) back into the hydraulic reservoir (C). The pump is “circulating”.

The venting valve (50/E) eliminates metering errors due to gas accumulation in the hydraulic pressure chamber (B).
It is located at the highest point of the hydraulic pressure chamber (B). Its purpose is to move gas bubbles forming and accumulating there due to the continuous change in pressure into the hydraulic reservoir (C) with the aid of a defined leakage.
The leakage rate fixed by the design is very small and cannot be set by the user. The rate is selected based on the operating conditions of the solenoid pump. Depending on the selection it can vary between 0,1 % and 1,5 % of the maximum output of the diaphragm pump head.

The pressure limiting valve (50) safeguards the solenoid pump against overload

If the metering pump delivers into a pressurized system the installation must be protected by a separate safety valve.

The pressure limiting valve (50) is set to the pressure stated in the technical data sheet. When this pressure is exceeded (e.g. because a shut-off valve is closed) the pressure limiting valve (50) will lift and the hydraulic fluid displaced by the piston will flow from the hydraulic pressure chamber (B) into the hydraulic reservoir (C).
During the subsequent suction stroke the diaphragm will bottom against the rear support face soon after the piston has begun to move back. Then the piston (2), which continues to retract in the RDE (rear dead end) direction, will take in hydraulic fluid from the hydraulic reservoir (C) via the snifting valve (29).
The cross sections of the flow passages are dimensioned so that, during this process, the hydraulic fluid will foam up due to the high pressure drop (release of the dissolved gas). Because of this only a fraction of the stroke volume is by-passed through the pressure limiting valve (50) into the hydraulic reservoir (C) during the next discharge stroke. The heating-up of the hydraulic fluid is limited therefore.

This „circulating“, as a rule, is harmless as long as it only goes on for a short time (a few minutes).

Installations, where operating conditions make „circulating“ likely in the future, must be protected by a contact thermometer in the hydraulic reservoir (C).
The solenoid pump will then be switched off automatically when the temperature limit set at the contact thermometer is reached.

Also the solenoid pump will not be damaged if the suction line is blocked for a short period of time (e.g. by sedimentation or a closed suction shut-off valve). In this condition vapourization and cavitation will occur either in the operating chamber (A) or in the hydraulic pressure chamber (B) during each suction stroke.
After the suction or discharge fault has been corrected the gas which has formed in the hydraulic pressure chamber (B) is moved into the hydraulic reservoir (C) via the venting valve (50/E). After a short time the solenoid pump will start to function properly again.

3.3 Dimensions / weights / centres of gravity

Refer to general arrangement drawing. Please observe the comment under section 1.1.

4 Erection and assembly

Refer to general arrangement drawing. Please observe the comment under section 1.1.
The LEWA metering pump must be protected against direct climatic influences and can be operated at for temperatures between –20°C and +40°C.
Please consult LEWA headquarters or one of our representatives if these limits are exceeded.

5 Commissioning / operation / shut down

5.1 Operation

The stroke length can be adjusted with the solenoid pump running or stopped, via the handwheel and read off on the scale.
Clockwise rotation reduces the stroke length.
The maximum metered flow at 15 mm stroke length is shown in the technical data sheet.
If you want to know the metered flow at any other stroke settings please refer to sect. 4.6 in operating instruction B 0.100.

5.2 Operating and ancillary means

The anchor room of the solenoid is charged with hydraulic fluid (55) of the diaphragm pump head.
Refer to technical data sheet. For the volume please refer to parts list “solenoid pump, item 55”.
Use recommended lubricant only (see enclosed operating instruction B 1.002).

5.3 Commissioning, start-up, venting

Replace transportation plug (94/95) at holder by air filter (63) with dip stick also supplied.
Check level of hydraulic fluid (55) in the hydraulic reservoir (C) at zero stroke. It must be within the marks of the oil dip stick (63). For this oil dipstick is inserted only into the threaded bore to measure the hydraulic fluid level (not screwed in!).
Check if the pressure conditions in the suction and the discharge line match with the details given in the technical data sheet.

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5.4 Adjustment and Control

Please observe the comment under section 1.1.

5.5 Shut-down

Please observe the comment under section 1.1.

5.6 Dismantling and return transportation

Please observe the comment under section 1.1.

6 Maintenance and repairs

6.1 Maintenance

Monthly: Check hydraulic fluid level in the hydraulic reservoir (C) (centre of lubricant sight glass resp. within the marks of the lubricant dipstick).

For design with lubricant dipstick this is inserted only in the threaded bore to measure the level (not screwed in!).

Change hydraulic fluid depending on the degree of soiling; minimum however once a year.

Undo screwed plug (64) located at the bottom of holder (59) and drain off hydraulic fluid.
Unscrew air filter (63).
Make sure that the hydraulic fluid is disposed of environmentally safe!
Re-install screwed plug (64) with sealing ring (65) and fill-in hydraulic fluid through the bore of the air filter (63) in the holder cover.
Check level as described in the previous section.

If the hydraulic fluid drained is reused it must be assured that it does not contain any dirt particles (run through microfilter).

6.2 Repairs

The following tools are required for assembly:
allen keys: size 3/4/6/8 mm
open ended spanner: size 10/13/14/17/22 mm
screw drivers (small, medium), hammer (soft hammer), pins (approx. 200 mm long, max. dia. 5,2 mm)

6.3 Dismantling / Assembly

6.3.1 Information, preparation

Additional reference documents required: sectional drawing „solenoid pump“ and corresponding parts list as well as possibly dimensional drawing of the solenoid pump.

6.3.1.1 Please check whether parts marked **„E“** and **„V“** in parts list are available.

6.3.1.2 For machines having an operating time of > 5 years we recommend to also assure the availability of the parts designated **„E“**.

6.3.1.3 Preparation

1. Reserve suitable clean area for depositing the individual parts.
2. Take solenoid pump to a dry, enclosed, but well ventilated and essentially dust-free room.

Dismantling (refer to sectional drawing solenoid pump)

6.3.2.1 Disconnect electric cables, if required.

In case of diaphragm rupture the fluid metered can be contained in the hydraulic fluid. Some of the fluids metered can cause obnoxious odours.

Undo screwed plug (64) located at the bottom of holder (59) and drain off hydraulic fluid.
Unscrew air filter (63).
Make sure that the hydraulic fluid is disposed of environmentally safe!
Loosen hose connection (214), remove hexagon head screws (62) and carefully lift off cover (60).
Watch flat gasket (61).

6.3.2.2 Remove all pipelines from diaphragm pump head. Now unscrew hexagon head screws (103) and pull the complete diaphragm pump head together with intermediate flange (68) off in forward direction without jamming it.

For dismantling of diaphragm pump head refer to separate operating instruction.

6.3.2.3 Remove compression spring (69) and piston (2) by slackening nut (3) / screw (2) – see sectional drawing “piston”.

6.3.2.4 Now loosen grub screw (77) and turn the handwheel ccw until the complete adjustment unit can be removed.
Unscrew allen screws (82) and remove spindle guide (73). Watch O-ring (76).
For further dismantling of the adjustment unit loosen grub screw (72), unscrew stroke indication (73) and then remove hexagon nut (81). Also watch O-ring (75) here.

6.3.2.5 If required remove lock nut (156) and tensioning nut (155) and take off stroke plate (70). Loosen hexagon nut (226) and unscrew stud bolt (225).

6.3.2.6 If the holder (59) needs to be dismantled first remove the electric connection of the proximity switch (86) in the terminal box of the stroke solenoid (90). After this remove allen screws (92) and carefully lift off the stroke solenoid (90).
If the stroke solenoid (90) is defective please contact LEWA. Our customer service department will assist you fast.

6.3.3 Assembling information and preparation

6.3.3.1 Sealing aids

A liquid, non-hardening sealing compound (e.g. Curil K2) will be required especially for fixing flat gaskets.

6.3.3.2 Cleaning materials required

a) Use a cold cleaner to remove lubricant residues.

Observe safety and disposal instructions!

b) Use fluff-free cleaning rags or special cleaning cloths only.

6.3.3.3 Clean all parts to be used again thoroughly with the above mentioned materials. However, if possible, do so just before reassembly only.

6.3.3.4 Spare parts

Parts designated **„E“** or **„V“** in the parts list should be reused in an emergency and after careful inspection only for safety reasons.

6.3.3.5 Before installation **check** all parts if they are in perfect condition, in case of doubt the LEWA service department would be pleased to assist you.

6.3.3.6 Slip-agents, lubricants

a) Coat O-rings with a thin layer of silicone paste or the lubricant specified before installation.
b) Screws and threaded shafts should be coated with greases containing molybdenum sulphite or the lubricant specified before installation.

6.3.4 Assembly

Assembly generally takes place in the reverse order to dismantling.
Please observe the following points:

6.3.4.1 The setting of the play of the piston (2) can be taken from section 6.4.3.

6.3.4.2 When installing adjusting spindle (74) pre-tension plug (78) via grub screw (77) so that the adjusting spindle does not self-adjust during operation.

6.4 Filling, venting, adjusting

6.4.1 Filling

For filling with hydraulic fluid please refer to section 6.

6.4.2 Venting

Solenoid pump type MLM 15 / MLM 40 is self-venting.

6.4.3 Setting of piston (see sectional drawing of piston)

First turn back nut (3) completely on thread of screw (2) and then slide both parts over the rear part of the piston. Insert rings (4) and turn the screw (2) with the piston into the stroke plate (70) up to the stop.
The torque applied should not be too high!
By turning screw (2) back slightly you can now set the play of 0.05 mm.
Check: The piston should turn easily but should not have axial play.
Lock screw (2) with nut (3) after this setting.

7 Faults; symptoms and remedial action

Fault	possible cause	remedial action
solenoid pump performs discharge stroke only partially	faults in the hydraulic section of the solenoid pump	check hydraulic fluid
	micro-filter in the discharge line obstructed	strip and clean filter

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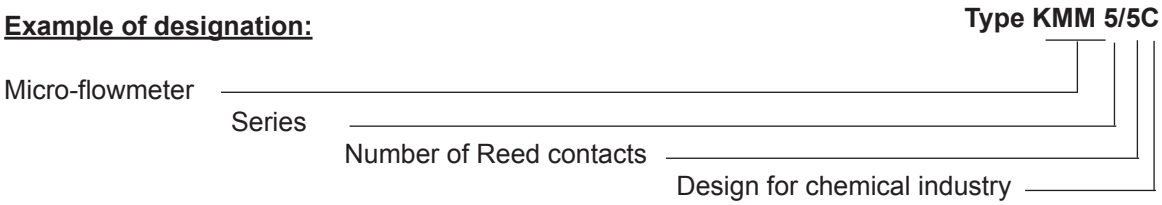
1 General information / safety

1.1 Important preliminary information
Refer to operating instruction B 0.100.

1.2 Application
This operating instruction applies to the micro-flowmeter type **KMM** of Messrs. LEWA.
The LEWA works number can be found in the technical data sheet and on the factory nameplate.

Example of designation:



1.3 Performance and applicabilities

Type:	KMM1	KMM1C	KMM5	KMM5C	KMM 5/5
Temp. range of fluid:	- 10 ° to + 80 °C				
Supply voltage:	230 V 40-60 Hz resp. 24 V DC				
Power absorbed:	16 VA resp. 12 W				
Exproof enclosure ex:	II2G EEx me II T4...T6				
Connections:	refer to figure 1				
max. viskosity:	100 mPas				
Filter:	(must be installed)				
Installation position:	horizontally				
Mesh size of filter:	40 - 55 µ				
Measuring range:	10 ml/h - 1500 ml/h		150 ml/h - 12000 ml/h		150 ml/h - 6000 ml/h
Max. operating pressure:	75 bar				
Measuring volume per cycle:	ca. 5 ml		ca. 65 ml		ca. 30 ml

1.4 Safety
Refer to operating instruction B 0.100.

1.5 Supply connections
Refer to operating instruction B 0.100.

1.6 Emissions
Refer to operating instruction B 0.100.

2 Transportation and intermediate storage

Refer to operating instruction B0.100.
The **KMM** micro-flowmeter must be protected from dust.
For this please also refer to the metering pump operating instructions.

3 Product information

3.1 General description
The micro-flowmeter type **KMM** serves (in connection with a filter and a controller) for the monitoring, measuring and closed loop control of a metered flow.
Two three-way solenoid valves are switched so that the fluid entering the measuring system moves the piston located in the bore. The fluid located in front of the piston is displaced from the measuring system into the discharge line. The limit position of the piston is signalled to Reed contacts via a magnet core in the piston. The signal reverses the solenoid valves so that the piston now moves in opposite direction to the opposed limit position. The distance from one limit position to the other is a measure for a fixed measuring chamber volume so that the flow of the fluid is picked-up in intervals.

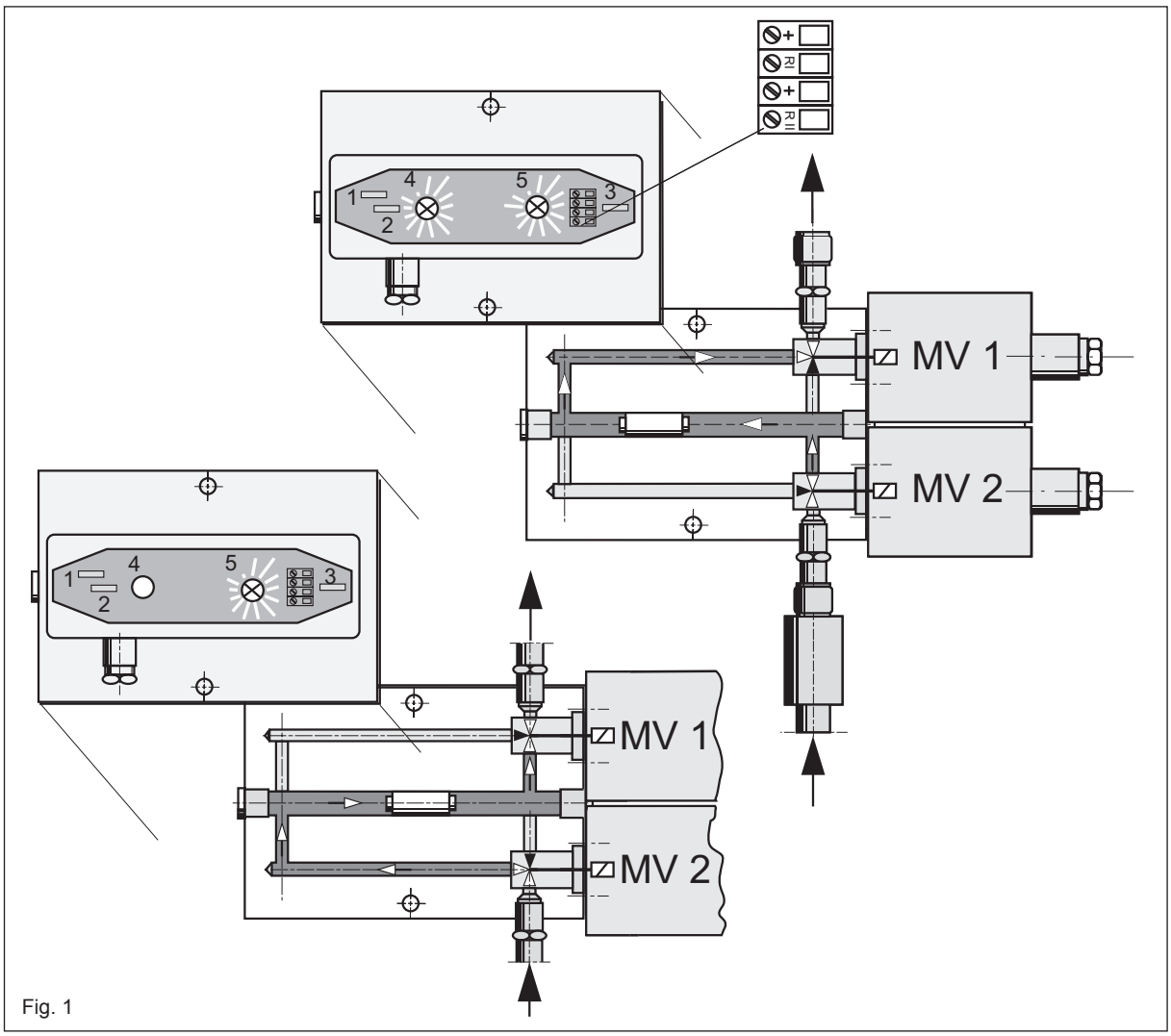


Fig. 1

3.2 Construction and method of operation

It is assumed that the piston of the KMM is at an unknown position. Also it must be assumed that the unit is not completely vented.
This results in a certain sequence when switching the unit on.
At each start-up first the solenoid valve MV1 is operated so that, independent of its current position, the measuring piston is moved towards Reed contact 1.
This contact is the reference position and, contrary to Reed contacts 2 and 3 cannot be crossed by the measuring piston.
After several pump strokes the piston reaches Reed contact (2) and operates it.
LED (5) lights up.
The piston is moved on and operates Reed contact (1) additionally. Both LEDs (4) and (5) light up.
The piston is moved on again until Reed contact (2) is switched off and LED (5) goes off. Now the two solenoid valves MV1 and MV2 are reversed. The piston now is moved into the opposite direction.
Reed contact (2) is switched on again. The LED (5) lights up again and the 1.measuring cycle starts.
When the piston leaves the reference position, Reed contact (1) is also switched off and LED (4) goes out. The piston is still moved, Reed contact (2) is switched off and LED (5) also goes off.
Now the piston is moved over a longer distance until Reed contact (3) is operated and LED (5) lights up. The piston is still moved in the same direction until Reed contact (3) switches off again and LED (5) goes out.
The first measuring cycle is over.

Solenoid valves MV1 and MV2 are now reversed again and the piston moves in direction of Reed contact (1) again. Reed contact (3) is switched on again and LED (5) lights up again and the second measuring cycle starts.

The measuring cycle is terminated by crossing Reed contact (2). At the same time Reed contact (1) is operated and LED (4) lights up. Solenoid valves MV1 and MV2 are reversed again and the 3. measuring cycle starts.

The 3. Measuring cycle proceeds as the 1. measuring cycle.
All further measuring cycles proceed as described before.

For micro-flowmeters KMM with 5 feedback contacts additional contacts are used for metered flow monitoring. For very small flows this results in a considerably reduced period of time until flow errors are noticed.

3.3 Dimensions / weights

Refer to the general arrangement drawing for dimensions

Weights:	KMM1	= 5,8 kg
	KMM5	= 8,4 kg
	KMM5/5	= 8,0 kg

4 Erection and assembly

Refer to operating instruction B 0.100.
The place of installation must be free from vibrations and magnetic fields.
For this also refer to the operating instructions of the metering pumps.
The micro-flowmeter type **KMM** must be installed horizontally and vibration-free, as shown in figure 1.
For electric connections please refer to figure 1.
Please note that the micro-flowmeter type **KMM** should preferably be installed directly above the metering pump.

4.1 Permissible ambient conditions

The micro-flowmeter **KMM** must be protected against direct weather influences and is admitted for temperatures between – 20°C and +40°C.
For exceeding these limits please consult the LEWA headquarters our representative in charge.

4.2 Installation of the micro-flowmeter type KMM

Two cables 230 VAC resp. 24 VDC must be installed to operate the solenoid valves of the micro-flowmeter.
A third cable is required for feedback and must be carried out as (Ex)i-cable, blue, 4 core when the micro-flowmeter KMM is operated in an Ex (hazardous) area.

Assure correct polarity (±) of the (EEx)i connections please.

5 Commissioning / operation / shut down

5.1 Operation

5.2 Operating and ancillary means

5.3 Commissioning, start-up, venting

Refer to operating instruction B 0.100.
The units have been tested before shipment.
Pipeline must be vented before commissioning.
Air pockets lead to considerable measuring and metering errors.
Proceed as follows to assure that remaining gas bubbles are discharged as fast as possible:

1. Set stroke length of metering pump to “maximum stroke”.
2. Switch on control and switch to internal operation.
   Set maximum stroke frequency.
3. Switch over to automatic operation after venting.

5.4 Adjustment and control

5.5 Shut-down

5.6 Dismantling and return transportation

Refer to operating instruction B0.100.

6 Maintenance and repairs

The micro flowmeter type **KMM** does not require maintenance.

7 Faults; symptoms, remedial actions

Fault	Cause
It is assured that fluid passes through the unit at start-up but the solenoid valves do not reverse.	Check if the solenoid valves and the Reed contacts between controller and measuring instrument have been wired-up correctly.

In case of breakdown during operation please consult LEWA.

Table of contents

1 General information / safety

1.1 Important preliminary information

The odourizing control cabinet must only be used in proper technical condition and for the application intended (refer to technical data sheet), special attention must be paid to any safety risk observing the operating instruction! Specially problems impairing the safety must be corrected immediately.
Proper use includes observation of the operating instruction and maintaining of all inspection and maintenance requirements.
The odourizing control cabinet is only intended for the conditions and fluid stated in the technical data sheet. Any deviating use or any use exceeding these conditions is considered to be improper use. The manufacturer is not responsible for any damages resulting from this.
The risk rests with the user exclusively!
The operator must assure that all commissioning, service, preventive maintenance and installation work is carried out by authorised and qualified expert personnel only which has gained sufficient information by studying the operating instruction in detail.

In addition to the safety ⚠ and caution instructions △ in this operating instruction also observe all general occupational safety and health regulations!
The operator must assure that at least one copy of the operating instruction always is available near the odourizing control cabinet!

- **Is the power supply of the control correct?**

- **Has the electric hook-up of the system been carried out properly observing local regulations?**

1.2 Application

—

1.3 Performance and applicabilities

Fine fuses:	5 x 20 mm
Permissible ambient temperature:	+5 .....+50 °C
Weights:	
Plastic housing:	Approx. 4,0 kg
19” assembly rack:	Approx. 2,5 kg
Electronic housing:	Approx. 24,5 kg
Connection:	Terminals (max. 2,5 mm² in plastic housing and 19” assembly rack) Terminals (max 4 mm² in electronic housing)

1.4 Safety

Carefully read these safety and caution instructions before installing and commissioning these units.

The units in these housings are switching dangerous electric voltages, disregarding these instructions can lead to heavy injuries and major property damage. This operating instruction contains all information required for qualified, expert personnel.

In addition to the information given in this operating instruction also observe all general national regulations for safety and the prevention of accidents!

This unit must be installed and serviced by qualified, expert personnel only. National regulations for the prevention of accidents, EN and IEC standards as well as VDE regulations must be observed.

When connecting the housing to the power supply the assemblies on the main p.c.b. are connected to the mains power. Physical contact with these assemblies can endanger your life!

Before any work on the electrical or mechanical parts of a system is started the control must be separated from the power supply.
When working on life systems the national rules for the prevention of accidents in force (e.g. VBG 4) must be observed.

1.5 Supply connections

—

1.6 Emissions

—

2 Transportation and intermediate storage

—

3 Product information

3.1 General description

A plastic housing IP66 for wall mounting serves as standard housing for the odourizing control, a 19” assembly rack (3U, 84H.P.) or an electronic housing of sheet metal IP55 for wall mounting for installation of a 19” assembly rack for special applications.
Electric hook-up in these standard housings takes place via terminals.

3.2 Construction and method of operation

In the plastic housing and the 19” assembly rack the connection of the individual control assemblies takes place via main p.c.b.’s. These main p.c.b.’s hold the 3 fuses and the mains isolating relay for all-pole mains separation of the power outputs of all control assemblies.

The function of the fuses is listed in the table below, please take the ratings from the name plate on the housing.

Fuse	Function
F1	Main fuse of complete control
F2	Protection of the solenoid valve in the discharge line
F3	Protection of the solenoid valves of the KMM micro-flowmeter

Plastic housing IP66 for wall mounting
The front cover of the plastic housing for wall mounting can be opened by pressing against the side of the right cover hinge. The fuses and the terminals (max. cable cross section 2,5 mm²) are located in the connecting area (see figure 1) of the plastic housing.

In standard design the following plugs are located in the bottom of the connecting area of the plastic housing:
8 off M16, 1 off M20
for [EEx i]: 4 off M16

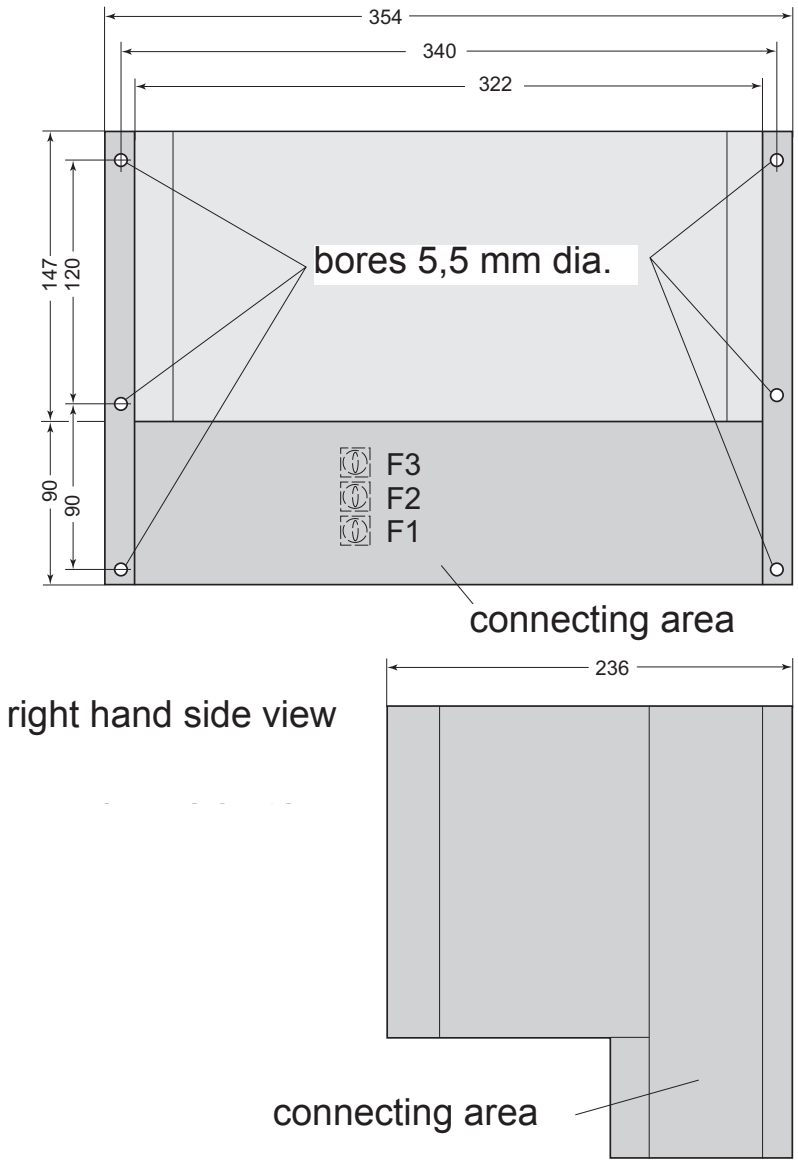


Fig. 1

3.2.2 19” assembly rack (3U, 84H.P.)

The connecting terminals (max. cable cross section 2,5 mm²) are located on the back side of the 19” assembly rack. The 19” assembly rack is designed to accept p.c.b.’s in Euro p.c.b. size 160 x 100 mm with plug connections to DIN 41612.

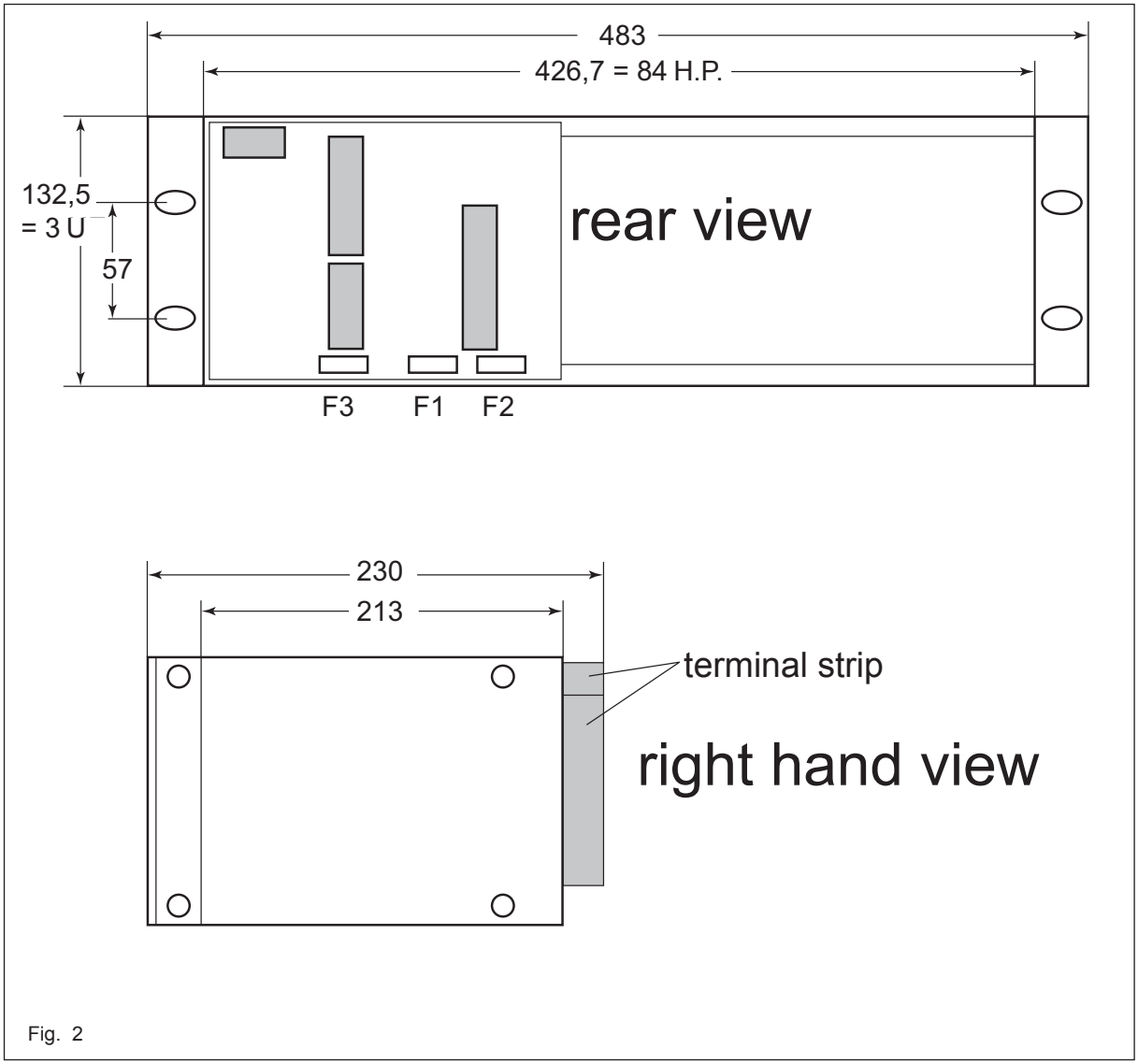


Fig. 2

3.2.3 Electronic housing IP55 for installation of a 19” assembly rack

The sheet metal electronic housing is designed for installation of a 19” assembly rack. Space for additional modules and terminals is provided on a mounting plate located in the connecting area. The cover of the connecting area is accessible after opening the front cover. The fuses are located on the main p.c.b. of the 19” rack and on the mounting plate in the connecting area (see fig. 3) for additional equipment.

3.3 Dimensions / weights / centres of gravity

—

4 Erection and assembly

4.1 Permissible ambient conditions

—

4.2 Space requirements

—

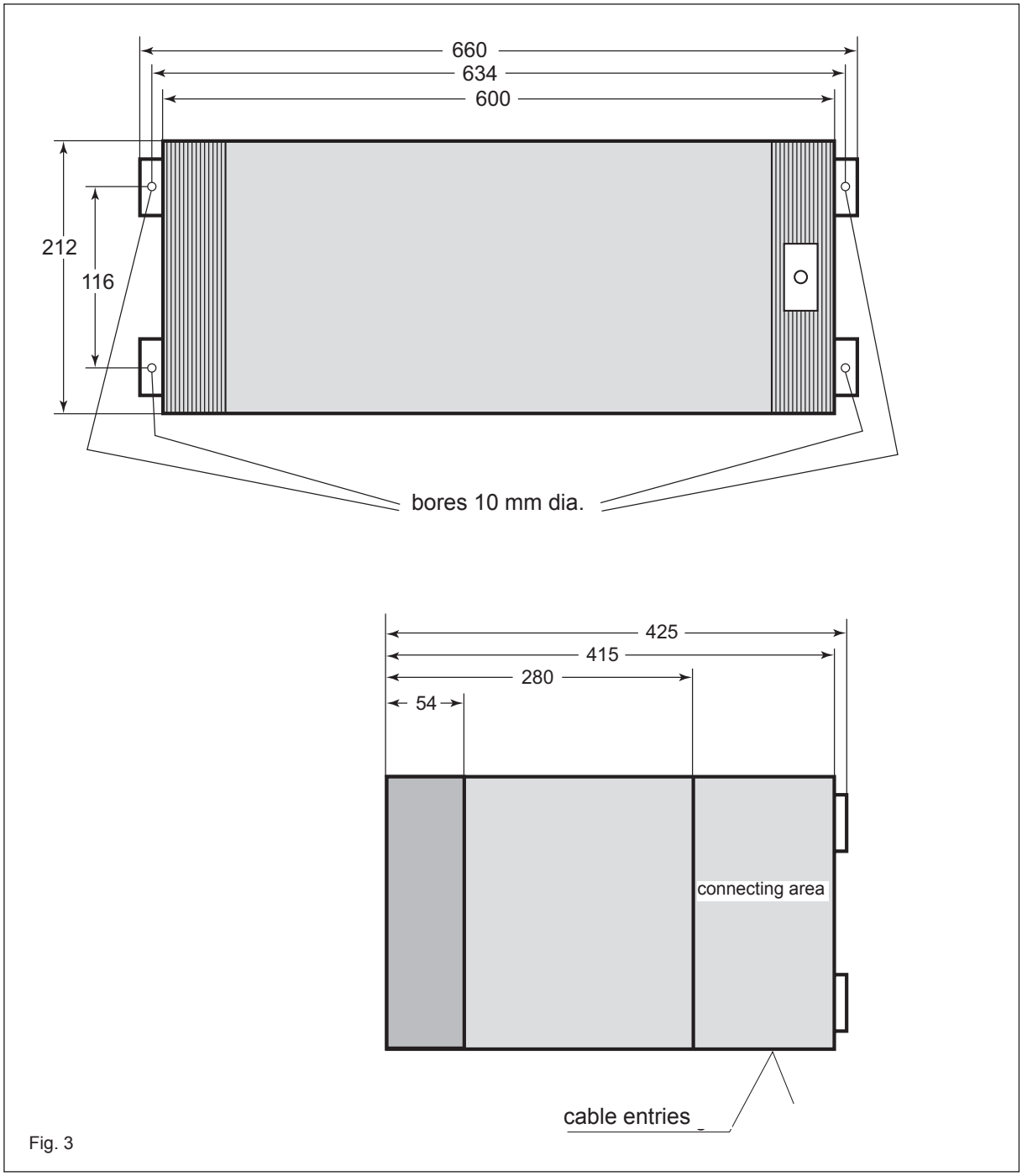


Fig. 3

4.3 Foundation

—

4.4 Erection

—

4.5 Installation

4.5.1 Connection of the auxiliary energy

For the electric installation VDE 0100 “Rules for installing high voltage equipment with a rated voltage of below 1000 V” must be observed.
A reliable earthing connection via the earthing terminal of the power supply must be provided.
Interruption of the earthing connection with the power applied is not permitted.

The electric connection must be carried out by qualified personnel following attached wiring diagram using customary cables and observing local regulations.
The wiring between the odourizing control and the odourizing package for standard units with type **MAH** and **MBH** solenoid pumps is shown in figure 4, for solenoid pumps type **MLM** in figure 5.

4.5.2 Connecting the process signals

Because of possible disturbances measuring (signal) cables should be installed separated from power cables. We recommend to use shielded cables only. For shielding connect to the earthing connection of the instrument or to a mass connection depending on the reference point of the disturbance.
The shielding should be connected to one side of the instrument only when attached to the earthing connection to prevent transient currents.

When connecting active emitters, analogue input signals or proximity switches to NAMUR as well as the feed-back contacts of the KMM micro-flowmeter the correct polarity (±) must be observed. Otherwise proper operation is not possible.

5 Commissioning / operation / shut down

5.1 Operation

Check the values of the fuses (refer to nameplate on the housing) before commissioning the control and make sure that the individual units are connected correctly.

5.2 Operating and ancillary means

—

5.3 Commissioning, start-up, venting

—

5.4 Adjustment and Control

—

5.5 Shut down

—

5.6 Dismantling and return transportation

—

6 Maintenance and repairs

—

7 Fault; symptoms, remedial action

Alarm signals

Fault	Remedial action
Indication does not light-up with power is applied.	Check installation and fuse F1.
The solenoid valve in the discharge line does not open in spite of illuminated LED “valve” in the **OLK7**	Check installation and fuse F2.
The solenoid valves of the KMM micro-flowmeter are not actuated.	Check installation and fuse F3.

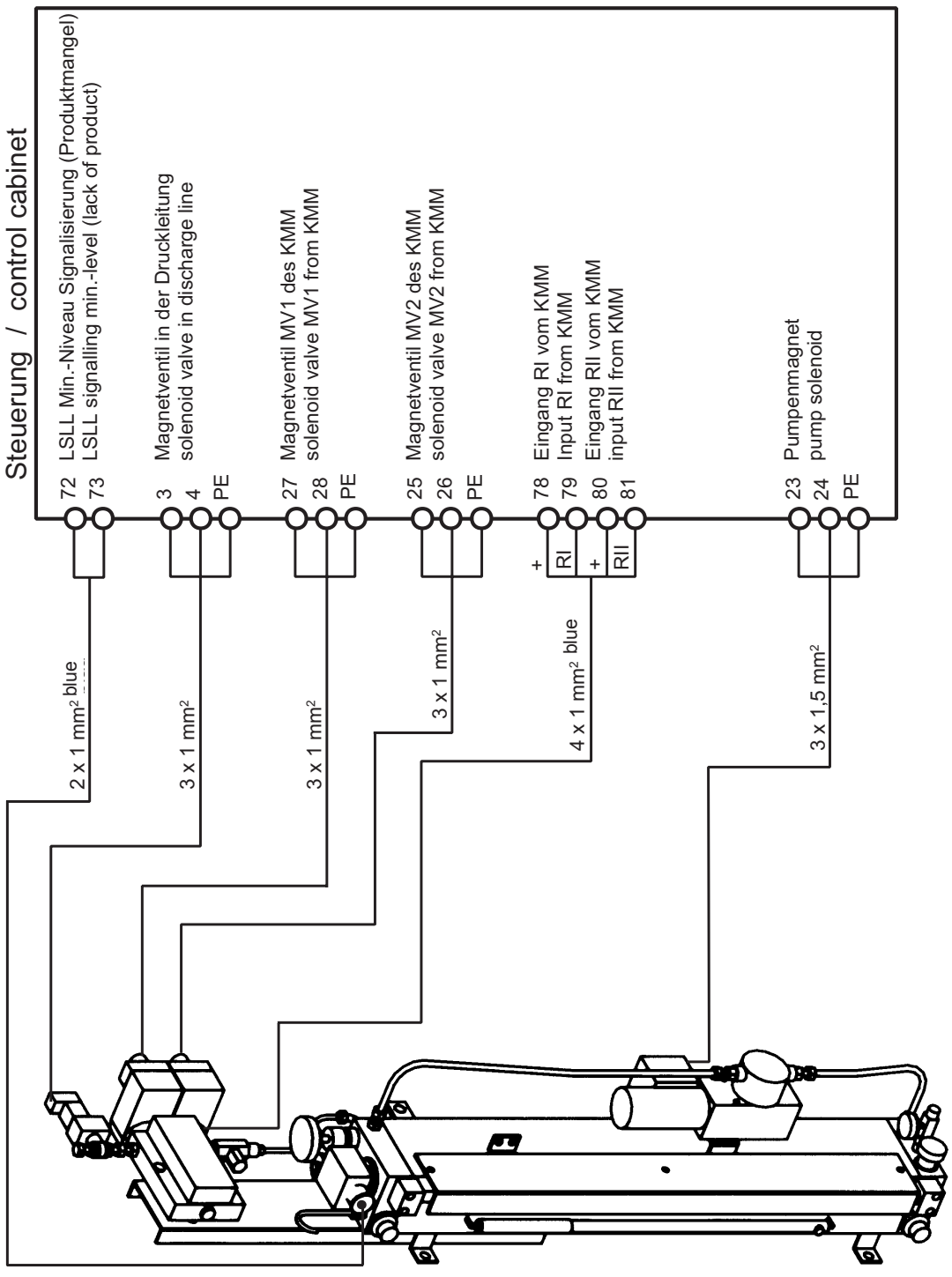

Steuerung / control cabinet
72 LSLL Min.-Niveau Signalisierung (Produktmangel)
73 LSLL signalling min.-level (lack of product)
3 Magnetventil in der Druckleitung
4 solenoid valve in discharge line
PE
27 Magnetventil MV1 des KMM
28 solenoid valve MV1 from KMM
PE
25 Magnetventil MV2 des KMM
26 solenoid valve MV2 from KMM
PE
78 Eingang RI vom KMM
79 Input RI from KMM
80 Eingang RII vom KMM
81 input RII from KMM
23 Pumpenmagnet
24 pump solenoid
PE
2 x 1 mm² blue
3 x 1 mm²
3 x 1 mm²
3 x 1 mm²
4 x 1 mm² blue
3 x 1,5 mm²
+
RI
+
RII

Fig. 4

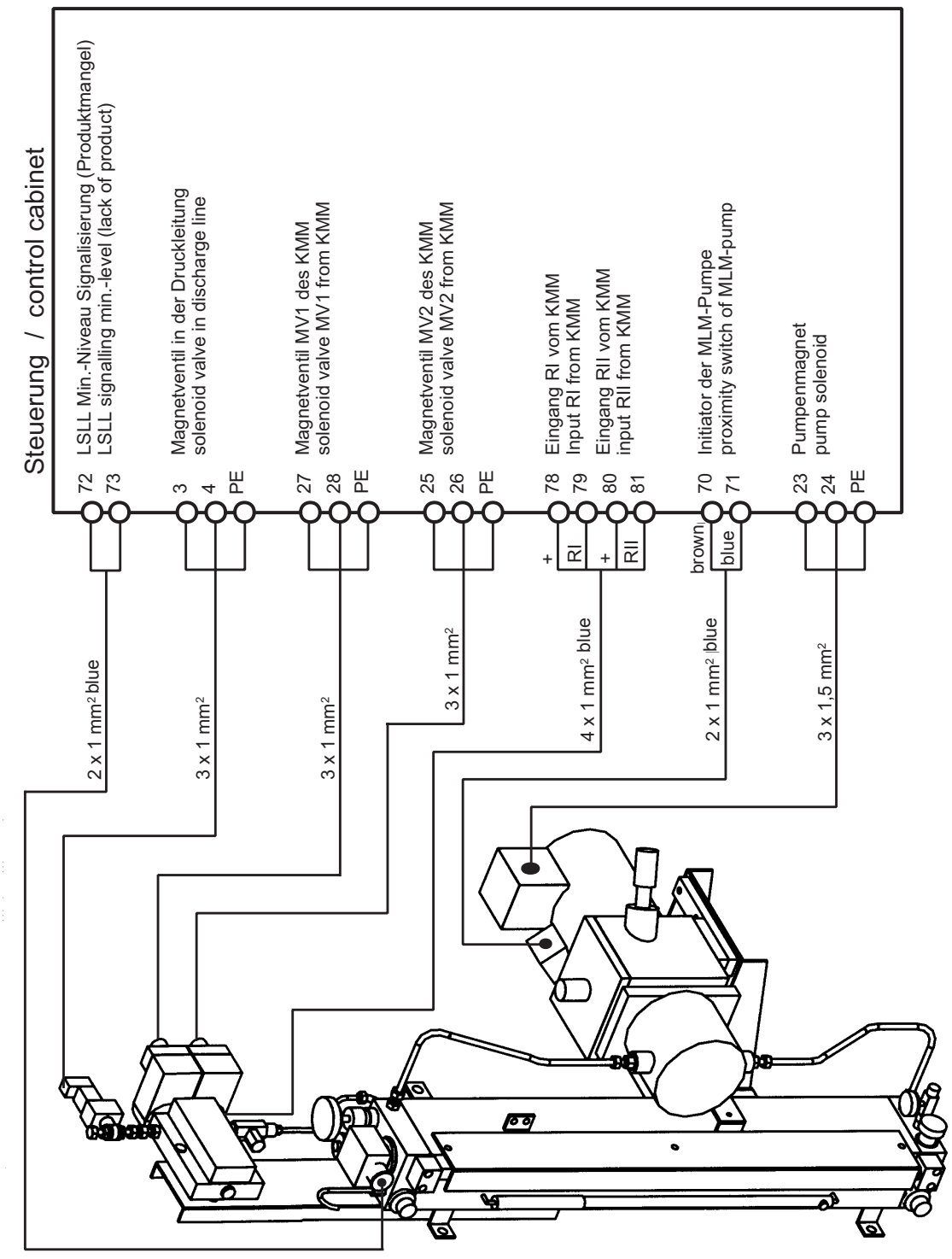


Fig. 5

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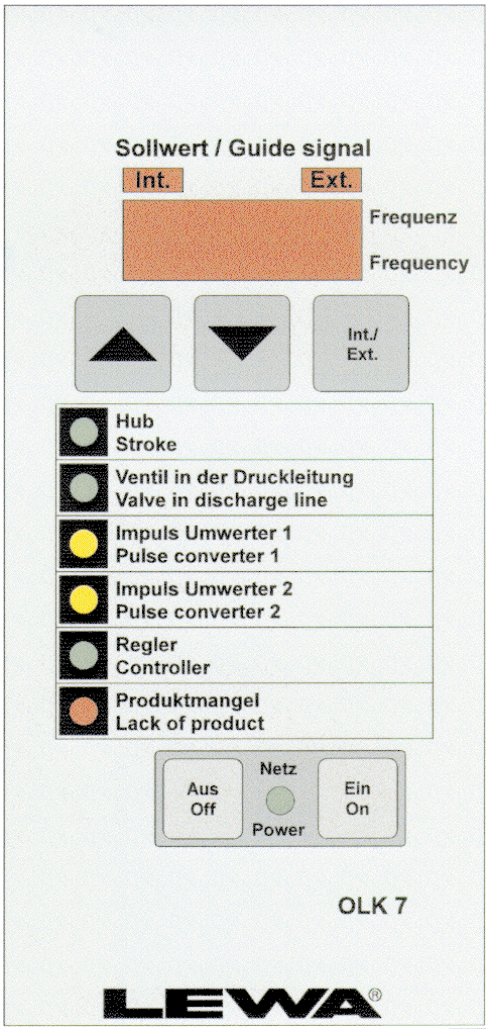

1 General information / safety

1.1 Important preliminary information

LEWA metering pumps must only be used in proper technical condition and for the application intended (refer to technical data sheet), special attention must be paid to any safety risk observing the operating instruction! Specially problems impairing the safety must be corrected immediately.
Proper use includes observation of the operating instruction and maintaining of all inspection and maintenance requirements.
LEWA metering pumps are only intended for the conditions and fluid stated in the technical data sheet. Any deviating use or a use exceeding these conditions is considered to be improper use.
The risk rests with the user exclusively!
The operator must assure that all commissioning, service, preventive maintenance and installation work is carried out by authorized and qualified expert personnel only which has gained sufficient information by studying the operating instruction in detail.

In addition to the safety ⚠ and caution △ instructions in this operating instruction also observe all general occupational safety and health regulations!
The operator must assure that at least one copy of the operating instruction always is available near the metering pump!

- **Is the power supply of the control correct?**

- **Has the electric hook-up of the unit been carried out correctly observing local regulations?**

- **Have the fuses been adapted to the metering pump type?**

1.2 Application

This operating instruction applies to the LEWA control and power p.c.b. OLK 7.
The product number (pump serial number) is stated in the technical data sheet.

1.3 Performance and applicabilities

Power supply:	230 V AC (standard), optional 24 V DC
Power absorbed:	15 VA at 230 V AC 12 Watt at 24 V DC
Fine fuse:	0,5 A slow (with ceramics pipe) at 230 V AC
1,0 A slow at 24 V DC	
Inputs digital:	Control by voltage-free contacts or voltage-free transistor outputs (max. load 24 V / 15 mA) or active emitters (voltage range 8 - 24 V
DC against ground)	
Input frequency:	10 Hz max.
Input analogue:	0/4-20 mA, load = 150 Ohm
Output power:	approx. 200 V DC / 1 A max. (at 230 V AC power supply) approx. 24 V DC / 3 A max. (at 24 V DC power supply)
Fine fuse:	depending on pump solenoid (refer to 5.1)
Output passive:	voltage-free relay contacts (contact load 250 V AC/2 A; 30 V DC/1 A)
Perm. amb. temp.:	+ 5.....+50 °C
Weight:	880 g at 230 V AC 430 g at 24 V DC
Connection:	2 plugs acc. To DIN 41 612 design D, 32 pole
Design:	Europe size p.c.b.'s 100 x 160 mm
Front plate:	aluminum with PE foil 3 U., 12 H.P.

1.4 Safety

Before installing and commission the unit kindly read this safety and caution information carefully.

This unit is switching dangerous electric voltages and non-observance of these instructions can cause severe injury to persons and / or property damage. This operating instruction contains all information required for qualified personnel.

In addition to the information in this operating instruction also observe all generally valid national regulations for safety and accident prevention!

This unit must be installed and maintained by qualified, expert personnel only. Observe national regulations for accident prevention, EN and IEC standards as well as VDE regulations.

When connecting the unit to the power supply the parts of the power module are connected to the power supply. Physical contact with these parts is extremely dangerous!

Before any work on the electrical or mechanical parts of a system is started the control must be separated from the power supply.
When working on life systems the national regulations for accident prevention in force (e.g. VBG 4) must be observed.

Protective measures to limit the inductive voltage

The PTB certificates of conformity for the operation of DC stroke solenoids require that the inductive voltages resulting from the switching-off action are limited to 800 V at 230 V AC resp. 480 V at 24 V DC by suitable protective measures.
The control and power p.c.b. OLK 7 is equipped with varistors (SIOV-S20 K300 at 230 V AC resp. SIOV-S20 K140 at 24 V DC make Siemens) at the outlets to the pump solenoid. This measure assures that the inductive voltage is positively limited to less than 800 V at 230 V AC resp. 480 V at 24 V DC

1.5 Supply connections

1.6 Emissions

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2 Transportation and intermediate storage

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3 Product information

3.1 General description

The control and power p.c.b. **OLK 7** is a module in 19“ design for the direct control of solenoid operated metering pumps. The **OLK 7** is installed on Europe size p.c.b.’s and, as standard, can be supplied in an IP 66 wall housing or a 19“ rack (3 U., 84 H.P.). In these standard housings the electric hook-up is made via terminals.

3.2 Construction and method of operation

When the power is applied to the control the **OLK 7** is in standby mode which is indicated by the luminous diode in the **OLK 7** display lighting up. All poles of the power module as well as of odourant concentration controller (**ODR 7** or **FIS-dialog**) possibly installed as part of the control are still separated for the power. By operating switch „Power on“ the power module and the possibly installed odourant concentration controller is connected to the power supply, luminous diodes and the display are activated depending on the operating mode. Using push button „Int/Ext“ a selection between operating modes „internal“ and „external“ is possible.

The function of the control and power p.c.b. **OLK 7** with an optional odourant concentration controller **ODR 7** and an isolating switch amplifier **ExOT 7** is shown in the following PID for better understanding.

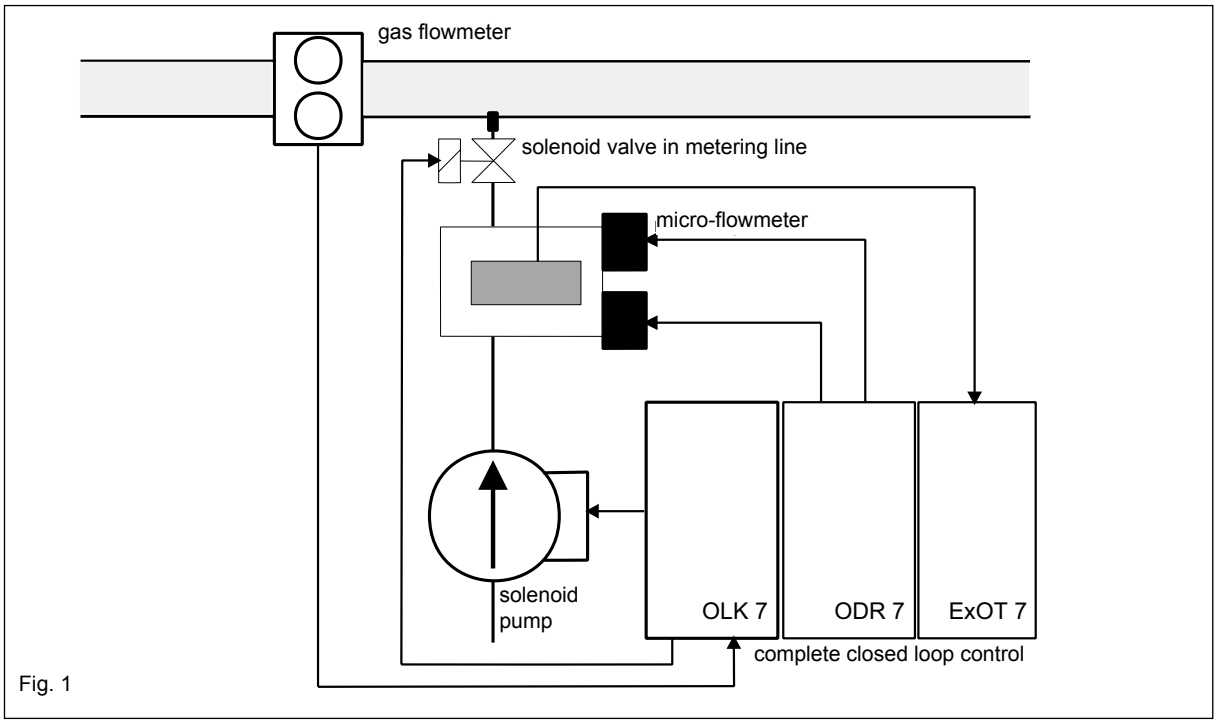

Fig. 1

Operating mode „Internal“

In operating mode „Internal“ the „Int“ LED above the display lights up and the current stroke frequency is displayed in „Strokes/min“. The stroke frequency of the solenoid operated pump is produced by an internal frequency generator and can be increased or reduced by 0,5 strokes/min. steps by push button "s" and "t".

Operating mode „External digital“

In operating mode „External digital“ the „Ext“ LED above the display lights up, the display itself is faded out. The stroke frequency of the solenoid operated pump is determined by the impulses of one or two gas flowmeters. When the impulses come in faster than the maximum permissible stroke frequency of the solenoid operated pump they are added up in a processing counter and issued at the frequency of an adjustable processing generator.
To adapt the input impulses to the solenoid operated pump the impulses can be multiplied or divided by a settable factor (1-100) additionally to avoid that the maximum stroke frequency of the solenoid pump is exceeded. The result is stored again in the processing counter and issued at the frequency of the processing generator.

Operating mode „External analogue“

In operating mode „External analogue“ the „Ext“ LED above the display lights up and the current stroke frequency is displayed in „Strokes/min“. The stroke frequency of the solenoid pump is determined by the analogue signal of the flowmeter which is being converted into a settable stroke frequency and issued.
To control the solenoid pump the power module is activated and this is indicated by the "Stroke" LED. When a MLM solenoid pump is installed the proximity switch turns the pump off after it stroked.
In the case of very low gas flows it may be required to install a solenoid valve in the odourant injection line to prevent that the gas pressure is causing a backflow of the odourant in the line. Together with the power module of the solenoid pump a LED "Valve" and a relay for the solenoid valve in the metering line is activated for approximately 10 seconds. Starting at a stroke frequency of approximately 6 strokes/minute the solenoid valve and the "Valve" LED stays on continuously.

Closed loop operation

When the **OLK 7** is operated together with an odourant concentration controller (also refer to the separate operating instruction of the odourant concentration controller) the **OLK 7** is recognizing this with the first impulse coming from this odourant concentration controller. The "Controller" LED stays on continuously and the input impulses from the flowmeter are no longer issued directly to the solenoid pump but to the odourant concentration controller. Based on the preset odourant concentration the controller is calculating the impulse ratio between the input impulses and the strokes of the solenoid pump. The impulses from the odourant concentration controller operate the power module for the solenoid pump, the relay for the solenoid valve and the corresponding LED's.
The **OLK 7** is equipped with a monitoring function which can be switched off. When switched on it shows the "E4" in the display, a common alarm relay is activated and a switch-over to proportional metering takes place when, after 250 input impulses from the gas flowmeter, no control impulse was emitted by the odourant concentration controller.

Lack of product signal (LSL)

When "Lack of product" is signaled via a float switch in the odourant supply vessel this condition is displayed at the "Lack of product" LED. On configuration switch S104.5 it can be selected if this signal takes place via the lack of product relay or the common alarm should the relay signal "Stroke" be required for a special application.

The "Lack of product" (LSL) signal cannot be cancelled via the external reset input but comes off automatically when the storage vessel is filled.

Slug odourizing

If slug odourizing is selected via an external input incoming impulses from the gas flowmeter or the impulse frequency produced by an analogous signal are doubled.

Stop function

Via the external input "Stop impulse generator and external inputs" the impulse transmission from the OLK 7 to the power p.c.b. or a possibly installed odourant concentration controller is stopped. Incoming control impulses from a possibly existing odourant concentration controller however are still processed.

3.3 Dimensions / weights / centres of gravity

---

4 Erection and assembly

4.1 Permissible ambient conditions

4.2 Space requirements

4.3 Foundation

4.4 Erection

4.5 Installation

4.5.1 Connection of auxiliary energy

For the electric installation VDE 0100 "Rules for the installation of high current plants with rated voltages below 1000 V" must be observed.
Also it must be assured that a reliable protective conductor connection is made via the earthing
terminal of the power supply. Interruption of the earthing connection with the power supply applied is not permissible.

The electric connection must be made by qualified, expert personnel according to attached wiring diagram using customary cables and observing local regulations.

The cable specifications following are recommendations only and result from the VDE specifications.
Local regulations may specify other cables.

The temperature limits for the cables were taken from the current PTB certificates of conformity of the individual instruments.

Cable specification valid from 11/96

Connection	Cross section recommended	Temperature limits
power supply	1,5 mm^2	Standard -5...+70 °C
pump solenoid MAH	1,0 mm^2	≥ 80°C
pump solenoid MBH	1,0 mm^2	≥ 95°C
pump solenoid MLM 15	1,5 mm^2	≥ 80°C
pump solenoid MLM 40	1,5 mm^2	≥ 80°C
solenoid valve in discharge line	1,0 mm^2	Standard -5...+70 °C if the ambient temperature exceeds 50 °C a cable allowing ≥ 90 °C must be used!
all [EEx i]-cables	1,0 mm^2 blue	Standard -5...+70 °C
thermistors of pump solenoid MLM 40	1,0 mm^2	≥ 80 °C
OPTIONS		
solenoid valves of micro-flowmeter KMM	1,0 mm^2	Standard -5...+70 °C if the ambient temperature exceeds 50 °C a cable allowing ≥ 90 °C must be used!
vacuum pump for automatic charging of tank lighting in odourant cabinet - with independent power supply, separately fused!	1,5 mm^2 1,5 mm^2	Standard -5...+70 °C Standard -5...+70 °C
heating in odourant cabinet - with independent power supply, separately fused!	1,5 mm^2	Standard -5...+70 °C

4.5.2 Connection of process signals

Low voltage measuring cables should be installed separate from high tension wiring to prevent signal errors by coupling-in of disturbances. We recommend to always use shielded measuring cables. The shield must be connected to the earthing of the unit or to the ground connection depending on the origin of the disturbance. When the shield is connected to a protective conductor it should always be connected to the instrument only to prevent the possibility of compensating currents.

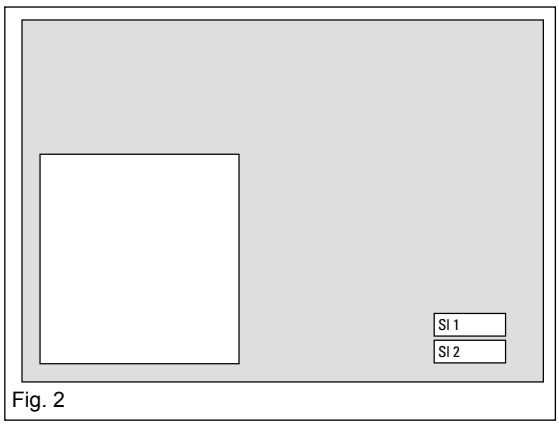

Fig. 2

When active emitters, analogous input signals or proximity switches to NAMUR are hooked-up assure the correct polarity (±). Trouble-free operation is not possible otherwise.

5 Commissioning / operation / shut down

5.1 Operation

Check the rating of the pump fuse before commissioning the control and replace if required. The location of the fuse is shown in figure 2.

The following values must be used for fuse **SI 1** and **SI 2** (refer to figure 2):

Power supply	solenoid pump type	fuse SI 1	fuse SI 2
230 VAC	MAH	0,5 A slow	0,1 A fast
24 VDC	MAH	1,0 A slow	1,0 A fast
230 VAC	MLM 15	0,5 A slow	0,5 A fast
230 VAC	MBH	0,5 A slow	0,5 A slow
24 VDC	MBH	1,0 A slow	4,0 A slow
24 VDC	MLM 15	1,0 A slow	4,0 A slow
230 VAC	MLM 40	0,5 A slow	1,0 A fast

5.2 Operating and ancillary means

5.3 Commissioning, start-up, venting

5.4 Adjustment and control

All settings required are carried out in the factory based on customer information. If corrections are required these can be carried out by qualified personnel using the following setting instruction.
For adaptation to the metering pump and the on-site signals the **OLK 7** is equipped with 2 rotating switches, a configuration switch block and 4 potentiometers on the upper p.c.b..
The location of the individual assemblies is shown on figure 3.

5.4.1 Input impulse evaluation

Configuration switch S104.5 is used for setting if the input impulses from the gas flowmeters are being multiplied or divided (refer to figure 3). The multiplication or division factor is set at turning switches S101 and S102 in a range of 1 - 100, number "00 corresponds to a factor of 100.

Value S101	Value S102	= Factor
0	1	= 1
1	0	= 10
2	5	= 25
0	0	= 100

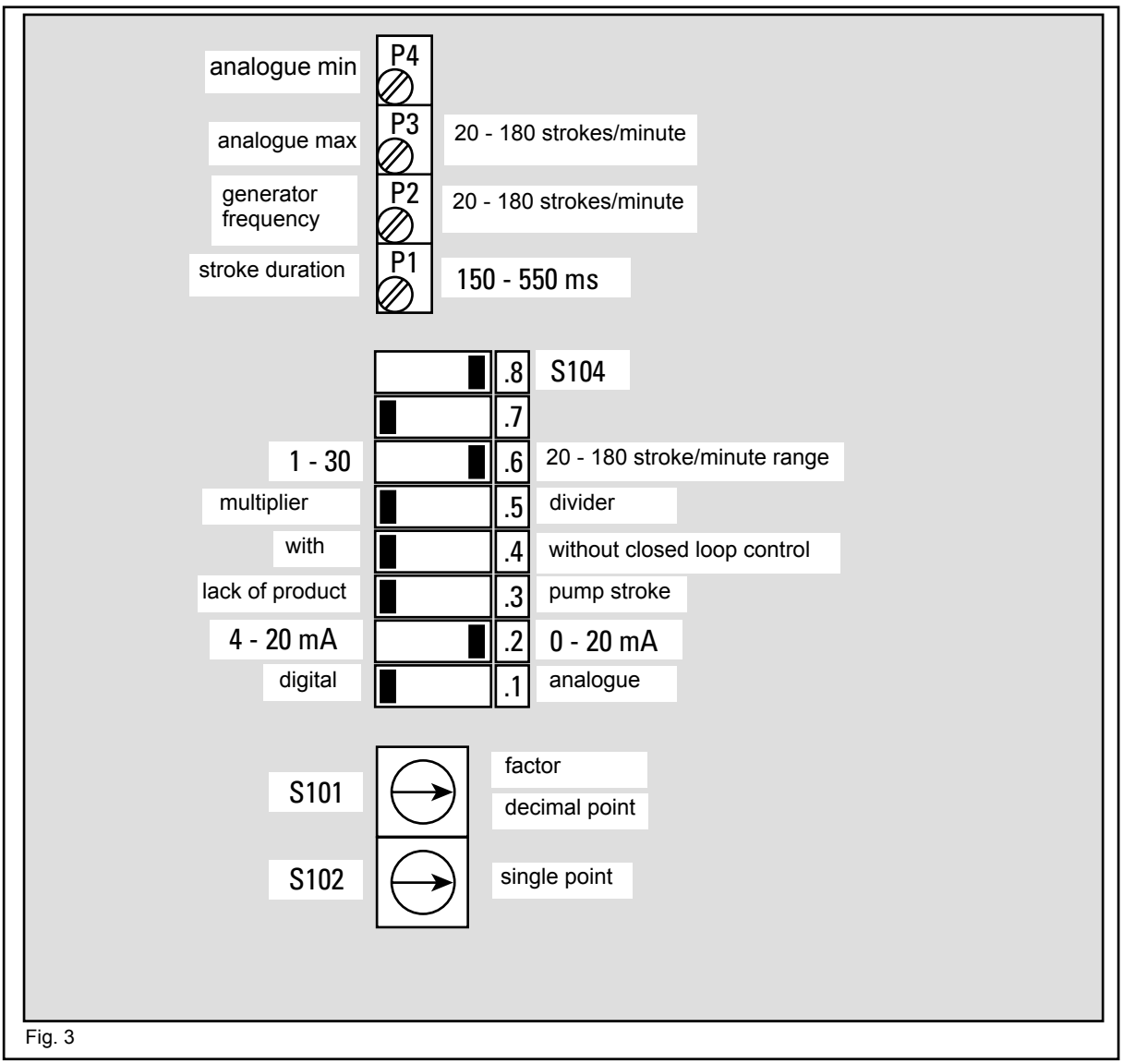

Fig. 3

5.4.2 Controller monitoring

Configuration switch S104.4 is used to switch off the integrated controller monitoring function (refer to figure 3). For special applications a switch-off of the controller monitoring function may be required.

5.4.3 Switch-over signal relay "Lack of product (LSL) / Pump stroke"

The signal pump stroke can be selected at configuration switch S104.3 (refer to figure 3). The signal relay now emits an impulse of 100 ms duration per pump stroke. The signaling of "Lack of product (LSL)" now takes place via the common alarm relay.

5.4.4 Switch-over digital/analogue input (0-20 mA / 4-20 mA) from the gas flowmeter

At configuration switch S104.1 it can be set if the **OLK 7** is controlled via input impulses or an analogue guide signal (refer to figure 3).
If the control take place via an analogue guide signal the range 0-20 mA or 4-20 mA is set at the configuration switch S104.2 (refer to figure 3). Adaptation to the corresponding pump frequency is carried out as per section 5.4.6.

5.4.5 Setting range of the analogue guide signal from the gas flowmeter

At configuration switch S104.6 a setting is possible if the analogue guide signal at maximum signal (20 mA) can be adjusted in the range 20 - 180 strokes/minute or 1 - 30 strokes/minute (refer to figure 4).

If one of the potentiometers P1 through P3 is adjusted the value related to the potentiometer is flashing in the display and remains on for approximately 10 seconds. When a potentiometer is adjusted with the OLK 7 unit shut down or pulled from the control unit the new value also is displayed when the unit is switched on again.

5.4.6 Analogue guide signal balancing

To adjust the analogue guide signal to a corresponding pump stroke frequency the **OLK 7** must be set to operating mode "Ext" using push button "Int/Ext", LED "Ext" lights up. Now apply the minimum guide signal (0 resp. 4 mA) and balance the minimum pump stroke frequency (0.0 strokes/minute) using potentiometer P4. Then apply the maximum guide signal (20 mA) and set the desired pump stroke frequency via potentiometer P3. Double check the pump stroke frequencies set and correct if required. The pump stroke frequency is displayed as XXX.X strokes / minute.

5.4.7 Setting of the processing generator frequency

Using potentiometer P2 the processing frequency of the processing counter can be adapted to the type of solenoid pump installed. The adjustment range is 20 - 180 strokes/minute.

Solenoid pump MAH = 180 strokes / minute
Solenoid pump MBH = 130 strokes / minute at 25 bar
Solenoid pump MBH = 90 strokes / minute at 40 bar
Solenoid pump MLM = 90 strokes / minute

The stroke frequency set is displayed as XXX.X strokes / minute.

5.4.8 Setting the duration of the pump stroke

Using potentiometer P1 the required stroke duration of the solenoid pump is set to assure that a full stroke takes place even at maximum discharge pressure in the metering line.
The adjustment range is approximately 150 - 600 ms. The following stroke durations are factory set:

Solenoid pump MAH = approx. 180 ms
Solenoid pump MBH = approx. 310 ms at 130 strokes / minute at 25 bar
Solenoid pump MBH = approx. 515 ms at 90 strokes / minute at 40 bar
Solenoid pump MLM = max. stroke duration

The stroke duration set is displayed as XXX.X ms.

Comment: The proximity switch installed in a MLM solenoid pump is active at a stroke duration exceeding 550 ms only!
For the MBH solenoid pump an additional RC element is installed in the control housing to prevent sticking of the metering pumpe stroke solenoid.

5.5 Shut-down

5.6 Dismantling and return transportation

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6 Maintenance and repairs

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7 Fault; symptoms, remedial action

Display indication	Meaning	Remedial action
E 1	When a stroke duration of over 550 ms is set no signal is received from the proximity switch of the MLM solenoid pump.	Check following points: • location of proximity switch (distance) • does proximity switch work • pump fuse undamaged • discharge line of solenoid pump open
E 2	When a stroke duration of over 550 ms is set no proximity switch of the MLM solenoid pump was recognized.	Check polarity and function of the proximity switch of the MLM solenoid pump.
E 3	Pump stroke is triggered although control is still addressing the solenoid pump.	Check the setting of proximity switch of MLM solenoid pump. Does the frequency of the processing generator match the stroke duration set?
E 4 and LED "controller" is flashing	The odourant concentration controller has not emitted an impulse after 250 input impulses from the gas flowmeter.	Check fuse of odourant concentration controller. Set concentration preselection to above 0 µl/Nm^3.
E 5	Over 255 impulses have been added to the processing counter.	Check the setting of the input impulse evaluation (refer to 5.4.1)
E 6	The pump stroke frequency of the analogue guide signal exceed the frequency set at the processing generator by over 10 %.	Correct balancing of the analogue guide signal.

All alarms must be canceled by the external reset input or by switching the power supply of.

All alarm relays are operating on the holding current principle and are energized during normal operation. **In case of power failure they will signal an alarm automatically.**

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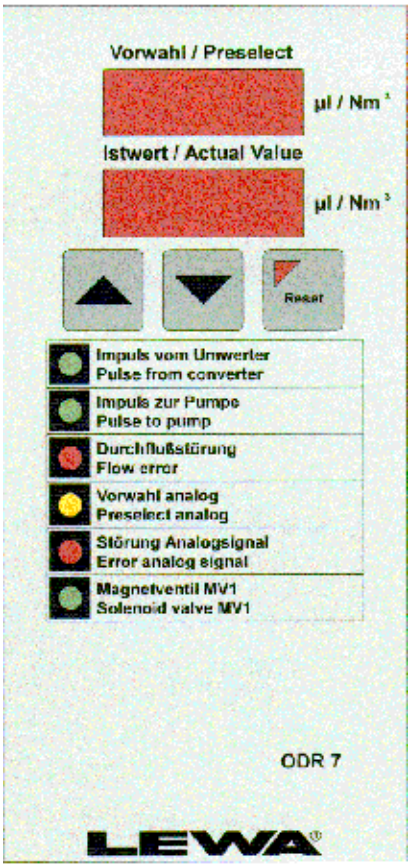

Fig. 1

1 General information / safety

1.1 Important preliminary information

LEWA pumps must only be used in proper technical condition and for the application intended (refer to technical data sheet), special attention must be paid to any safety risk observing the operating instruction! Specially problems impairing the safety must be corrected immediately.
Proper use includes observation of the operating instruction and maintaining of all inspection and maintenance requirements.
LEWA pumps are only intended for the conditions and fluid stated in the technical data sheet. Any deviating use or a use exceeding these conditions is considered to be improper use.
The risk rests with the user exclusively!
The operator must assure that all commissioning, service, preventive maintenance and installation work is carried out by authorized and qualified expert personnel only which has gained sufficient information by studying the operating instruction in detail.

In addition to the safety ⚠ and caution △ instructions in this operating instruction also observe all general occupational safety and health regulations!
The operator must assure that at least one copy of the operating instruction always is available near the pump!

- **Is the power supply of the control correct?**

- **Has the electric hook-up of the unit been carried out correctly observing local regulations?**

1.2 Application

This operating instruction applies to the odourant concentration controller ODR 7 manufactured by LEWA.

1.3 Performance and applicabilities

Power supply:	230 V AC (standard), optional 24 V DC
Power absorbed:	15 VA at 230 V AC 5 Watt at 24 V DC
Fine fuse:	0,5 A slow (with ceramics pipe) for 230 V AC 1,0 A slow for 24 V DC
Inputs digital: DC against	Control by voltage-free contacts or voltage-free transistor outputs (max. load 24 V / 15 mA)or active emitters (voltage range 8 - 24 V ground)
Input frequency:	10 Hz max.
Input analogue:	0/4-20 mA, load = 249 Ohm
Output analogue:	0/4-20 mA, max. load = 600 Ohm
Output passive:	voltage-free relay contacts (contact load 250 V AC/2 A, 30 V DC/1 A)
Perm. amb. temp.:	+ 5.....+50 °C
Weight:	920 g for 230 V AC 470 g for 24 V DC
Connection:	2 plugs acc. to DIN 41 612 design D, 32 pole
Design:	Europe size p.c.b.'s 100 x 160 mm
Front plate:	aluminum with PE foil 3 U., 12 H.P.

1.4 Safety

Before installing and commission the unit kindly read this safety and caution information carefully.

This unit is switching dangerous electric voltages and non-observance of these instructions can cause severe injury to persons and / or property damage.
This operating instruction contains all information required for qualified personnel.

In addition to the information in this operating instruction also observe all generally valid national regulations for safety and accident prevention!

This unit must be installed and maintained by qualified, expert personnel only. Observe national regulations for accident prevention, EN and IEC standards as well as VDE regulations.

When connecting the unit to the power supply the parts of the power module are connected to the power supply. Physical contact with these parts is extremely dangerous!

Before any work on the electrical or mechanical parts of a system is started the control must be separated from the power supply.
When working on life systems the national regulations for accident prevention in force (e.g. VBG 4) must be observed.

1.5 Supply connections

1.6 Emissions

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2 Transportation and intermediate storage

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3 Product information

3.1 General description

The odourant concentration controller **ODR 7** is a module in 19“ design for the measuring, monitoring and closed loop control of odourant flows.
The **ODR 7** is installed on Europe size p.c.b.’s and, as a standard, can be supplied in an IP 66 wall housing or a 19“ rack
(3 U., 84 H.P.). In these standard housings the electric hook-up is made via terminals.

3.2 Construction and method of operation

The odourant concentration controller **ODR 7** operates in connection to the control and power p.c.b. **OLK 7** or another power module for solenoid pumps and a flowmeter in the metering line such as e.g. the micro-flowmeter KMM (for this also refer to the separate KMM operating instruction).
The KMM micro-flowmeter operates on the principle of a measuring burette and has a metal piston with magnetic core for triggering two switches. When a limit position of the KMM was reached the **ODR 7**, via the Ex-input p.c.b. **ExOT 7**, picks-up that a fixed measuring volume was metered.
The function of the odourant control in a complete closed loop control is shown in the following PID (Fig. 2) for better understanding.

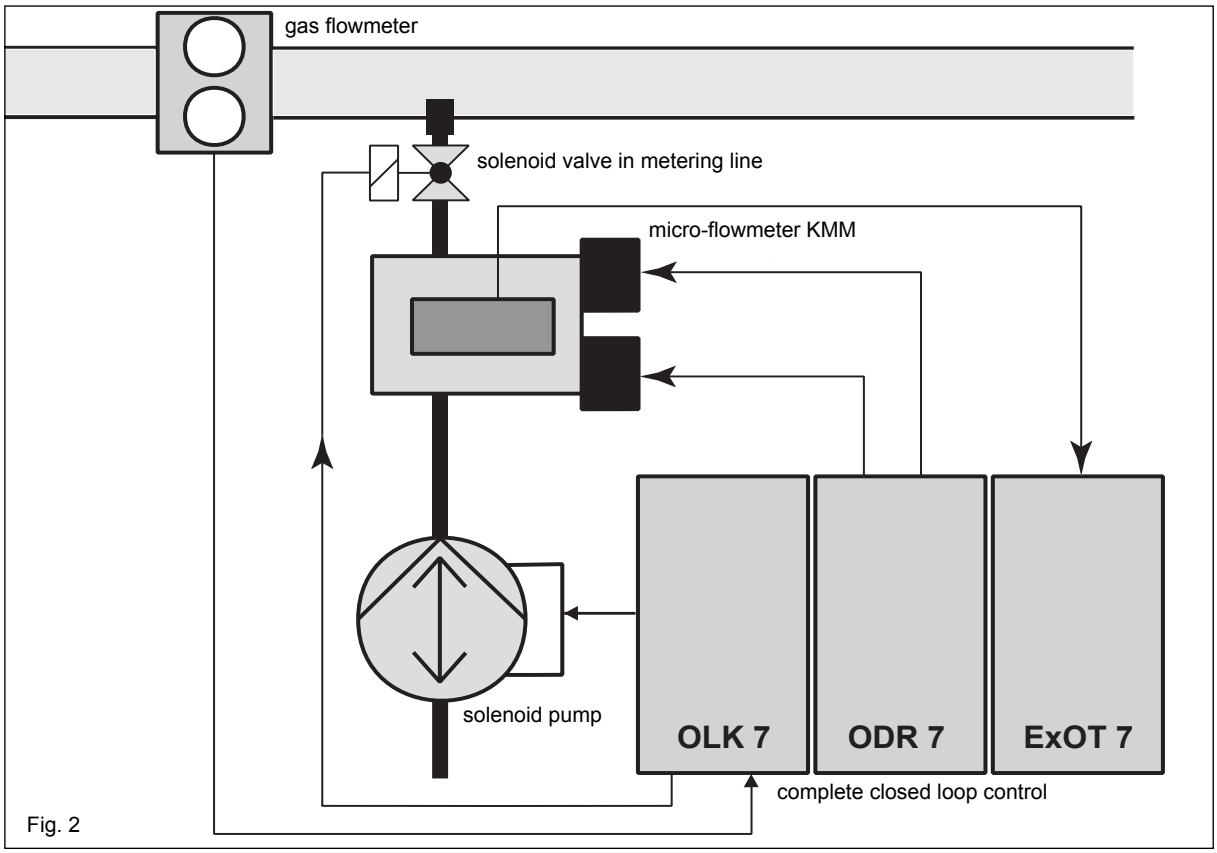

Fig. 2

When power is applied the software issue date of the odourant concentration controller appears in the display for approximately 3 seconds. Also the alarm relays working on the holding current principle are triggered.
Then the preselected and the last actual value measured of the odourant concentration appears in the display. In case of an initial start-up or when a concentration of 0,0 µl/Nm3 was preselected an operation light appears in the „Actual value“ display until the first measuring value was picked-up or the value preselected was increased.

All values set as well as the pump performance data picked-up during operation are stored on an EEPROM and safeguarded against power loss. This allows the ODR 7 to start operating based on correct data when it is switched on again.
The odourant concentration controller **ODR 7** is a ratio controller which calculates the ratio between the gas flow and the odourant flow metered based on the following values:
• added-up input impulses from the gas flowmeter (converter) in Nm^3/impulse (analogue input signals from the converter are changed to impulses in the power p.c.b. **OLK 7**)

• preselected concentration
• preset measuring volume from the micro-flowmeter KMM
After power has been applied the solenoid valve MV1 of the micro-flowmeter KMM is triggered to move the piston in the KMM to its reference position. LED „solenoid valve 1“ lights up. The **ODR 7** now controls the solenoid operated pump via
the power p.c.b. **(OLK 7)** connected based on the impulse ratio calculated for reaching the metering volume required. After the reference position was reached solenoid MV1 of the KMM is switched off and solenoid valve MV2 of the KMM is switched on. The „Solenoid valve MV1“ LED comes off.

A measuring cycle starts which is defined as follows:
A measuring cycle includes at least 100 pump strokes and a minimum of 20 impulses from the converter. If one of these two conditions was not met at the end of a measuring process a further measuring process is added to the measuring cycle. Depending on the pump head size a measuring cycle can easily comprise 3 to 4 measuring processes!
At the end of the measuring cycle the actual value of the concentration and the impulse ratio to reach the metered flow is recalculated and the indication in the display as well as the analogue output signal is updated.

Internal concentration preselection

Using push buttons „▲“ and „▼“ the desired concentration can be increased or reduced in internal selection mode (adjusting range 0 - 100,0 µl/Nm^3).

External concentration preselection

Via an analogue signal 0/4 - 20 mA the concentration preselection can be set via e.g. a remote control system. The „Preselection analogue“ LED lights up. At an analogue signal of 4 - 20 mA an automatic switch-over to the internal concentration preselection takes place when no signal is being picked-up anymore and „Alarm analogue signal“ is displayed.
A setting of the internal preselection in this function is possible by simultaneous pressing of push buttons „Reset“ and „▲“ or „▼“.

External „Make-up metering“

The „Make-up metering“ function allows carrying over of the incoming impulses from the converter into the next measuring cycle. If the number of impulses carried over is increasing after each measuring cycle this will lead to the alarm „Make-up metering increasing continuously“ (the „Flow alarm“ LED is flashing with approx. 1 Hz). After 5 or 10 measuring cycles in sequence the signal „Flow error“ appears.
When this function is switched off the impulses from the converter not processed at the end of a measuring cycle are used for calculating the actual value but then canceled.

Function „HELP“

If, after a presetable number of strokes triggered, no feedback is received from the micro-flowmeter KMM „HELP“ is signaled in the „Actual value“ display- LED „flow error“ will flash and the alarm „HELP“ is signaled. Now solenoid valve MV1 of the micro-flowmeter is actuated and tries to move the piston to the reference position. The impulse ratio between the input impulses from the flow converter and pump strokes triggered stays on the values last calculated. If the problem corrects itself the LED „flow alarm“ stays on and the impulse ratio is recalculated during each measuring cycle. The alarm relay will continue to signal an alarm and the display „HELP“ will appear until the alarm was canceled via the reset push button or the external reset input.

When the solenoid metering pump is operated in partial stroke it is possible that in case of a short stroke length or when signal „HELP“ was selected following „FEW“ pump strokes the signal „HELP“ is issued in spite of correct solenoid pump function (refer to chapter 5.4.8 for this).

Flow impulse per 1 or 10 ml odourant metered

Per 1 or 10 ml of odourant metered an impulse with a duration of 500 ms is emitted by a voltage-free relay contact. This impulse, if added-up via a counter, can be used to summarize the odourant volume over a certain time period.

Analogue output of the odourant concentration

The **ODR 7** odourant concentration controller is equipped with an analogue output of 0/4 - 20 mA which emits the odourant concentration determined for e.g. remote transmission. The analogue signal corresponds to the actual value shown in the display.
The scaling can be selected in 3 ranges 0-20 µl / Nm^3 or 0 -100 µl /Nm^3.

Operating mode DSfG-interface

In operating mode „DSfG-interface“ the complete signal exchange like pre-selection concentration, impulses from the flow converter, permissible tolerance until an alarm signal is triggered etc. takes place via s special gateway of Messrs. FLOW COMP. Impulses received from the **OLK 7** power p.c.b. are ignored in this mode.
By switching the **OLK 7** to „internal“ operating mode „DSfG interface“ can be cut-off for 30 minutes for e.g. service reasons. The impulses from the flow converter are emitted by the **OLK 7** then. After 30 minutes the gateway will switch the **OLK 7** back to „external“ operating mode again.

3.3 Dimensions / weights / centres of gravity
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4 Erection and assembly

4.1 Permissible ambient conditions

4.2 Space requirements

4.3 Foundation

4.4 Erection

4.5 Installation
4.5.1 Connection of auxiliary energy

For the electric installation VDE 0100 „Rules for the installation of high current plants with rated voltages below 1000 V“ must be observed. Also it must be assured that a reliable protective conductor connection is made via the earthing terminal of the power supply. Interruptions of the earthing connection with the power supply applied is not permissible.

The electric connection must be made by qualified, expert personnel according to attached wiring diagram using customary cables and observing local regulations.

4.5.2 Connection of process signals
Low voltage measuring cables should be installed separate from high tension wiring to prevent signal errors by coupling-in of disturbances. We recommend to always use shielded measuring cables. The shield must be connected to the earthing of the unit or to the ground connection depending on the origin of the disturbance. When the shield is connected to a protective conductor it should always be connected to the instrument only to prevent the possibility of compensating currents.

When active emitters, analogous input signals, proximity switches to NAMUR or the feedback contacts of the micro - flowmeter KMM are hooked-up assure the correct polarity (+/-). Trouble-free operation is not possible otherwise.

5 Commissioning / operation / shut down

5.1 Operation
Before commissioning the control the value of the converter impulses and the setting of the measuring

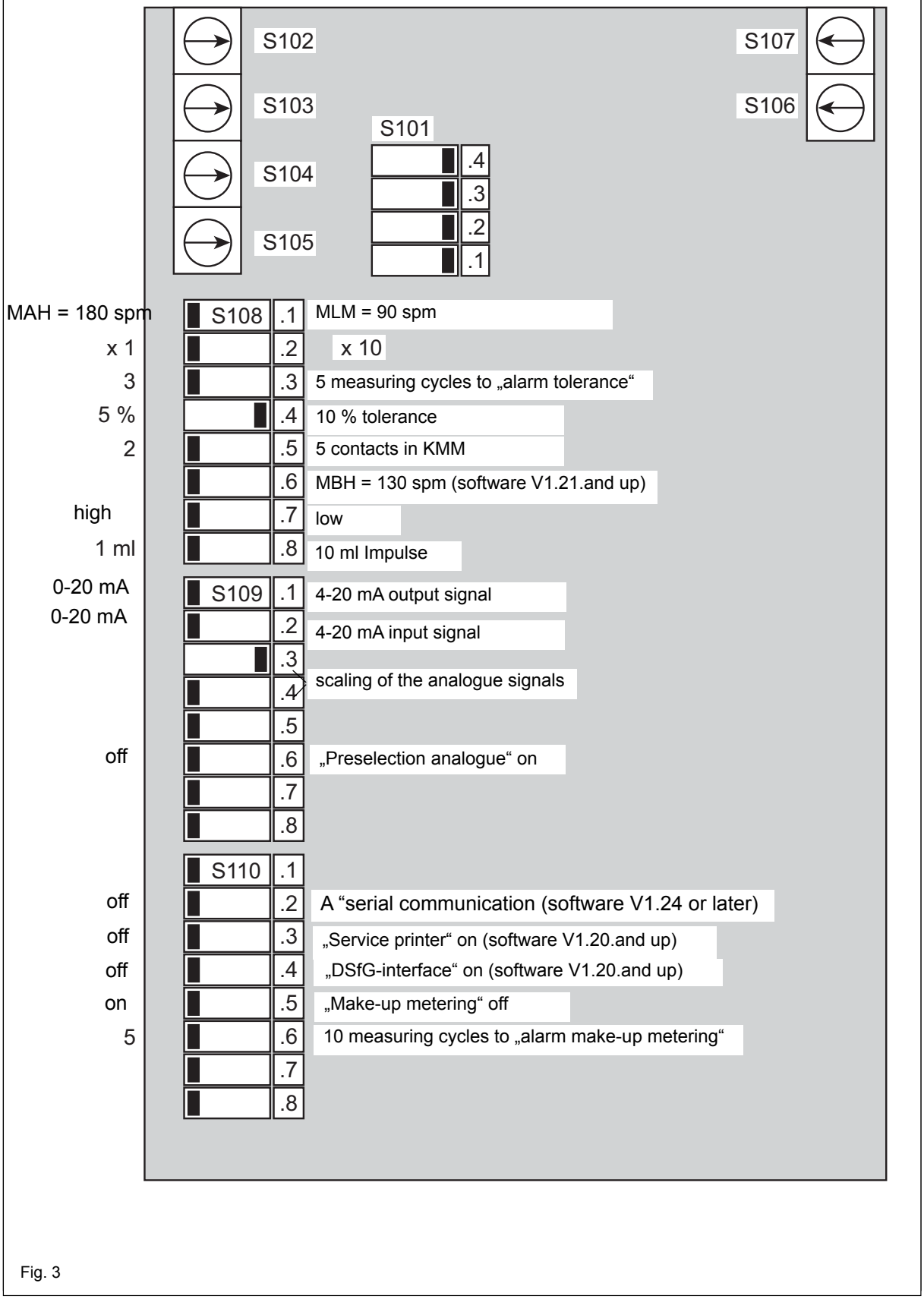
S102
S103
S104
S105
S107
S106
S101
.4
.3
.2
.1
MAH = 180 spm
S108
.1
MLM = 90 spm
x 1
.2
x 10
3
.3
5 measuring cycles to „alarm tolerance“
5 %
.4
10 % tolerance
2
.5
5 contacts in KMM
.6
MBH = 130 spm (software V1.21.and up)
high
.7
low
1 ml
.8
10 ml Impulse
0-20 mA
S109
.1
4-20 mA output signal
0-20 mA
.2
4-20 mA input signal
.3
.4
scaling of the analogue signals
.5
off
.6
„Preselection analogue“ on
.7
.8
S110
.1
off
.2
A “serial communication (software V1.24 or later)
off
.3
„Service printer“ on (software V1.20.and up)
off
.4
„DSfG-interface“ on (software V1.20.and up)
on
.5
„Make-up metering“ off
5
.6
10 measuring cycles to „alarm make-up metering“
.7
.8

Fig. 3

volume of the KMM should be checked. Please take the position of the corresponding switches and their setting from the setting instructions following and figure 2.
If the „Solenoid valve MV1“ LED lights up in the **ODR 7** front plate the MV1 solenoid valve of the KMM micro-flowmeter must be energized (refer to stamped-in data on the stainless steel housing of the KMM).

Comment: For completely resetting the **ODR 7** when, during initial commissioning incorrect values have been determined due to air in the micro-flowmeter KMM or when the **ODR 7** is used as stand-by unit, the „reset“ button must be operated on the **OLK 7** when the control is switched on. Now „ 10,0“ appears in the „preselection“ display and in „actual value“ an operating light is shown.

5.2 Operating and ancillary means

5.3 Commissioning, start-up, venting

5.4 Adjustment and Control

All settings required are carried out in the factory based on customer information. If corrections are required these can be carried out by qualified personnel using the following setting instructions.
For adaptation to the metering pump and the on-site signals the **ODR 7** is equipped with 6 rotating switches on the upper one of the 2 p.c.b.‘s and also 3 configuration switch blocks.

The location of the individual parts is shown on figure 3.

5.4.1 The service switch S101 (refer to figure 3)

All switches of the service switch block must be on „Off“. Proper operation is not possible otherwise.

5.4.2 Measuring volume of the micro-flowmeter KMM (refer to figure 2)

The volume of the measuring chamber of the KMM is entered into the **ODR 7** odourant concentration controller via turning switches S102.....S105. The measuring chamber volume can be taken from the terminal box of the KMM. It must match the setting of the **ODR 7** and must be corrected if required. The value of the switches is as follows:

S102	S103	S104	S105
			
tens	singles	first no. after the decimal point	second no. after the decimal point
e.g. **0**	**5**	**3**	**4**

corresponds to a volume of 5,34 ml.

5.4.3 Impulse value of the converter impulse (refer to figure 3)

At turning switch S106 and S107 the impulse value of the converter impulse is set. The adjusting range is 1 - 99 Nm^3/impulse. In addition to this the impulse value can be multiplied by a factor of 10 at configuration switch S108.2. The adjusting range then increases to 10 - 990 Nm^3/impulse.

S106	S107	
		
tens	singles	
e.g. **0**	**1**	corresponds to an impulse value of 1 Nm^3/impulse.

5.4.4 Adaptation to pump types MAH, MBH or MLM (refer to figure 3)
The **ODR 7** odourant concentration controller can operate the MAH, MBH as well as the MLM solenoid pump.
The maximum stroke frequency of the corresponding solenoid pump can be set at configuration switch. S108.1 and S108.6.

Solenoid pump MAH = 180 strokes / minute
Solenoid pump MBH = 130 strokes / minute at 25 bar
Solenoid pump MBH = 90 strokes / minute at 40 bar
Solenoid pump MLM = 90 strokes / minute

5.4.5 Setting the number of measuring cycles until an alarm signal is issued (refer to figure 3)
At configuration switch S108.3 a setting is possible if the alarm relay triggers an alarm after 3 or 5 measuring cycles outside of the tolerance band.

5.4.6 Setting the permissible tolerance until an alarm signal is issued (refer to figure 3)
At configuration switch S108.4 a setting is possible if the permissible tolerance before an alarm signal is triggered is 5 % or 10 %. This setting is influencing the alarm only not the control accuracy of the ODR 7 odourant concentration controller.

5.4.7 Setting of the micro-flowmeter type (refer to figure 3)
At configuration switch S108.5 a setting is possible if a micro-flowmeter KMM with 2 or 5 feedback contacts is installed in the odourizing system.
When a KMM micro-flowmeter with 5 feedback contacts is used the additional contacts are used for monitoring of the metered flow only. If the flow rates are extremely low this allows for a much faster detection of a flow alarm.

5.4.8 Setting the permissible pumps strokes until „Help“ alarm takes place (refer to figure 2)
At configuration switch S108.7 a setting is possible if after a „High“ or „Low“ number of pump strokes without feedback from the flowmeter in the metering line the „Help“ alarm is issued.
The following number of pump strokes is required before an alarm takes place:

For a selected metering pump MBH the number of pump strokes up to the alarm signal”HELP“ is also determined by the position of switch S108.1 ”MAH/MBH“!

Solenoid pump type	**Flowmeter in the metering line**	**Number of pump strokes until alarm „Help“ is triggered**	
		HIGH	LOW
MAH	KMM with 2 feedback contacts	1000	400
MAH	KMM with 5 feedback contacts	250	100
MLM and MBH	KMM with 2 feedback contacts	400	85
MLM and MBH	KMM with 5 feedback contacts	55	20

5.4.9 Setting the volume impulse per odourant metered (refer to figure 3)
At configuration switch S108.8 a setting is possible if the relay for the volume impulse operates with a valency of
1 impulse / 10 ml or 1 impulse / 1ml per odourant metered.

5.4.10 Setting the range of the analogue output (refer to figure 3)
At configuration switch S109.1 a setting is possible if the analogue output for the concentration preselection has a range of 0 - 20 mA or 4 -20 mA.
The scaling of the analogue output is set as described under section 5.4.12.

5.4.11 Setting the range of the analogue input (refer to figure 3)
At configuration switch S109.2 a setting is possible if the analogue input for the concentration preselection has a range of 0 - 20 mA or 4 -20 mA.
In the 4 - 10 mA range an automatic monitoring of the input signal takes place. If the input current falls below 2 mA an alarm „Break down analogue signal“ is activated and the „Break down analogue signal“ LED lights up. When this alarm happens an automatic switch-over to the preselected internal concentration takes place.
The scaling of the analogue output is set as described under section 5.4.12.

5.4.12 Scaling of the analogue signals (refer to figure 3)
At configuration switches S109.3 and S109.4 the scaling of the analogue signals is set. A common scaling of the analogue input and output is possible only.

Switch S109.3	Switch 109.4	Scaling
OFF	OFF	0 - 20 µl/Nm^3
ON	OFF	0 - 50 µl/Nm^3
OFF	ON	0 - 100 µl/Nm^3
ON	ON	0 - 100 µl/Nm^3

5.4.13 Setting if the concentration preselection takes place via an external analogue signal (refer to figure 3)
At configuration switch S109.6 a setting is possible if the odourant preselection takes place via an external analogue signal 0/4 -20 mA. The concentration corresponding to the analogue signal is shown in the „Preselection“ display depending on the scaling set.
When an alarm is picked-up (possible for 4 - 10 mA only) an automatic switch-over to the preset internal concentration takes place.

5.4.14 Switching function „service printer“ on (software version 1.20 and up) (refer to figure 2)
At configuration switch S110.3 the function „service printer“ can be switched on. A service printer can be attached to the serial interface for long-term monitoring when the function is on.
Parameters of the serial interface: baudrate : 9600
data bits : 8
stop bits : 1
Parity : none

Data printed:	desired value	=	20,0		pre-selection set
	actual value	=	19,99		closed loop actual value
	Value	=	1		set impulse value converter
	Transl.	=	2	263	impulses from converter (left = make up metering counter; right =measuring cycle counter)
	strokes	=	263	262	pump strokes per measuring cycle (right = in reference direction; left = against reference direction)
	time	=	00:01:46		duration of last measuring cycle

5.4.15 Switching function „DSfG interface“ on (software version 1.20 and up) (refer to figure 3)
At configuration switch S110.4 the function „DSfG interface“ can be switched on. When function is switched on the complete signal exchange takes place via the serial interface with a gateway of Messrs. FLOW COMP.
Parameters of the serial interface: baudrate : 2400
data bits : 8
stop bits : 2
Parity : none

5.4.16 Switching function „Make-up metering“ off (refer to figure 3)
At configuration switch S110.5 the function „Make-up metering“ can be switched off. This switch-off however may result in the incoming impulses from the converter not being processed at the end of the measuring cycle.

5.4.17 Setting the number of measuring cycles until alarm „Make-up metering increasing“ (refer to figure 3)
At configuration switch S110.6 a setting if the alarm relay is triggered after 5 or 10 measuring cycles during which make-up metering is increasing.

5.4.18 Switch on of function ”serial communication” (software version 1.24 or later) (see figure 3)
At configuration switch S110.2 the function ”serial communication” can be switched on. If the function is switched on, the communication as well as the desired value setting is carried out via the serial interface with an ASCII-protocol and can be connected to any PC.
The description of the protocol is available at LEWA on request..
Parameters of the serial interfaces Baud rate : 2400
Data bits : 8
Stop bits : 2
Parity : none

5.5 Shut-down

5.6 Dismantling and return transportation

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6 Maintenance and repairs

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7 Fault; symptoms, remedial action

Front plate indication	Meaning	Remedial action
Running light in actual value display, no impulses to pump	Concentration preselection set to 0,0µl/ Nm^3	Increase internal or external concentration preselection
LED „Flow error“ flashing at approx. 0,5 Hz	The actual value of the concentration is outside of the permissible tolerance of 5 or 10 %. Possible reasons: • preselection to high • dirt in pump valves • dirt in KMM • air in metering line	• Adapt preselection to max. pump flowrate • check pump flowrate and clean valves if required • clean KMM if required • vent metering line
LED „Flow error“ flashing at approx. 1 Hz	Increasing make-up metering picked-up. Possible reasons: • very high impulse value from converter • preselection too high • dirt in pump valves	• Reduce impulse value if possible • adapt preselection to max. possible pump flowrate • check pump flowrate and clean pump valves if required
LED „Flow error“ flashing at approx. 5 Hz	Make-up metering out of range. Possible reasons: • very high impulse value from converter • preselection too high • dirt in pump valves	• Reduce impulse value if possible • adapt preselection to max. possible pump flowrate • check pump flowrate and clean pump valves if required
LED „Flow error“ stays on continuously	An alarm picked-up originally • actual value outside of the tolerance • increasing make-up metering • make-up metering out of range has corrected itself	Press push-button „Reset“ or carry ou external reset
LED „Error analogue signal“ lights up	At an external concentration preselection in the 4 - 20 mA range the analogue signal went below 2 mA	Check external analogue signal
Signal „HELP“ in display	After a set number of strokes to the pump (refer to section 5.4.8) no feedback was received from the flowmeter installed in the metering line	Check the following: • are pump strokes being carried out • does the pump operate • is the activated solenoid of the KMM energized • does the activated solenoid valve of the KMM produce a magnetic field • are the start-up valves in the correct position • is the polarity of the feedback contacts of the flowmeter in the metering line correct

After correction all alarms must be canceled using push button „Reset“ or the external reset input.
All alarm relays are operating on the holding current principle and are energized during normal operation. **In case of power failure they will signal an alarm automatically.**

Issue May 2001

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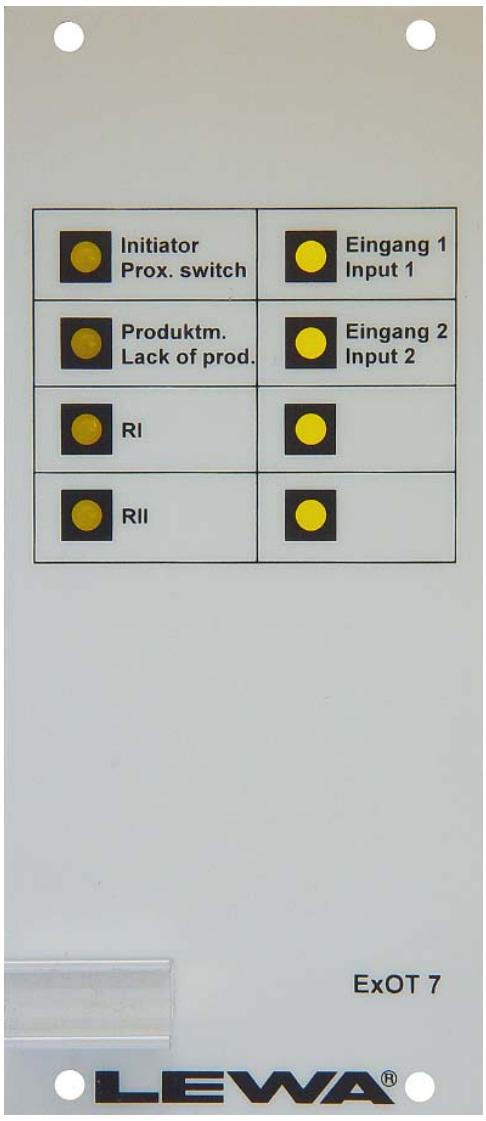

Fig. 1

1 General information / safety

1.1 Important preliminary information

Refer to operating instruction B0.100.

1.2 Application

This operating instruction applies to

Ex-input p.c.b. ExOT 7

from Messrs. LEWA. The LEWA works number can be found in the technical data sheet.

1.3 Performance and applicabilities

Power supply:

Supply voltage:	24 V DC +/- 15 %
Current absorbed:	approx. 90 mA

Inputs (intrinsically safe):

No load voltage:	approx. 8 V DC
Short circuit current:	approx. 8 mA
Switching point:	1,2 - 2,1 mA
Input impulse duration:	≥ 0,5 ms
Input impulse interruption :	≥ 0,5 ms

Data acc. to **EC type test certificate PTB 00 ATEX 2210**

Maximum values:

Voltage max.:	12,7 V
Current max.:	21 mA
Power max.:	66 mw

Connection values permissible:

Hazardous area:	[EEx ia]		[EEx ib]	
Group:	IIB	IIC	IIB	IIC
External capacitance max.:	1420 nF	455 nF	7,1 µF	1,1 µF
External inductivity max.:	10 mH	2 mH	330 mH	90 mH

Transistor outputs voltage free, short circuit proof:

Current rated:	100 mA
Voltage drop max.:	2,5 V
Switching frequency max.:	1 kHz

Ambient temperature perm.: +5...+70 °C

Design: Europe size p.c.b. 100 x 160 mm, front plate 3U, 11HP

Connection: Plug-in connection to DIN 41612 design F, 48 pole

1.4 Safety

When wiring intrinsically safe control current circuits it must be assured that cables carrying intrinsically safe and non intrinsically safe current circuits are separated from each other. Common cables must not be used.
Also it must be assured that the maximum capacitances and inductivities stated in the EC type test certificate are maintained for the hazardous area classification.

1.5 Supply connections

1.6 Emissions

---

2 Transportation and intermediate storage

---

3 Product information (see fig. 1)

3.1 General description

The isolating switch amplifier **ExOT 7** is an assembly in 19” design for the [EEx i] separation of input signals in odourizing systems.
It consists of isolating switch amplifiers EG4-OT of Messrs. Pepperl * Fuchs and an adapted front plate.

3.2 Construction and method of operation

The **ExOT 7** isolating switch amplifier has intrinsically safe control circuits [EEx ia] IIC and is a secondary electrical unit as per the European Standards
EN 50 014 and EN 50 020.
The inputs are designed for the connection of sensors (technical data to DIN 19 234 or NAMUR) or mechanical contacts.

Observe correct polarity (+/-) when connecting the sensors!

The intrinsically safe current circuits are galvanically separated from the supply voltage and the output.
Due to the galvanic separation potential balancing or earthing is not required.

The **ExOT 7** isolating switch amplifier consists of up to 2 Europe size p.c.b.‘s with 4 intrinsically safe control current circuits including voltage-free transistor outputs each.
The intrinsically safe control current circuits have fixed functions in the odourant controls as shown on the front plate (refer to fig. 1)

4 Erection and assembly

The isolating amplifier **ExOT 7** is installed on a Europe size p.c.b. and, as a standard, can be supplied or mounted in an IP 66 wall housing or a 19” module rack (3HE, 84TE.).
In these standard housings the electric hook-up is made via terminals

5 Commissioning / operation / shut-down

No special measures required.

6 Maintenance and repairs

The isolating switch amplifier **ExOT 7** operates maintenance-free.

7 Faults; symptoms, remedial action

In case of failures you cannot correct yourself please contact Messrs. LEWA department RT.

Issue March 2004

Operating Instruction

Pulse processing card IRK 20 **B 7.560 en**

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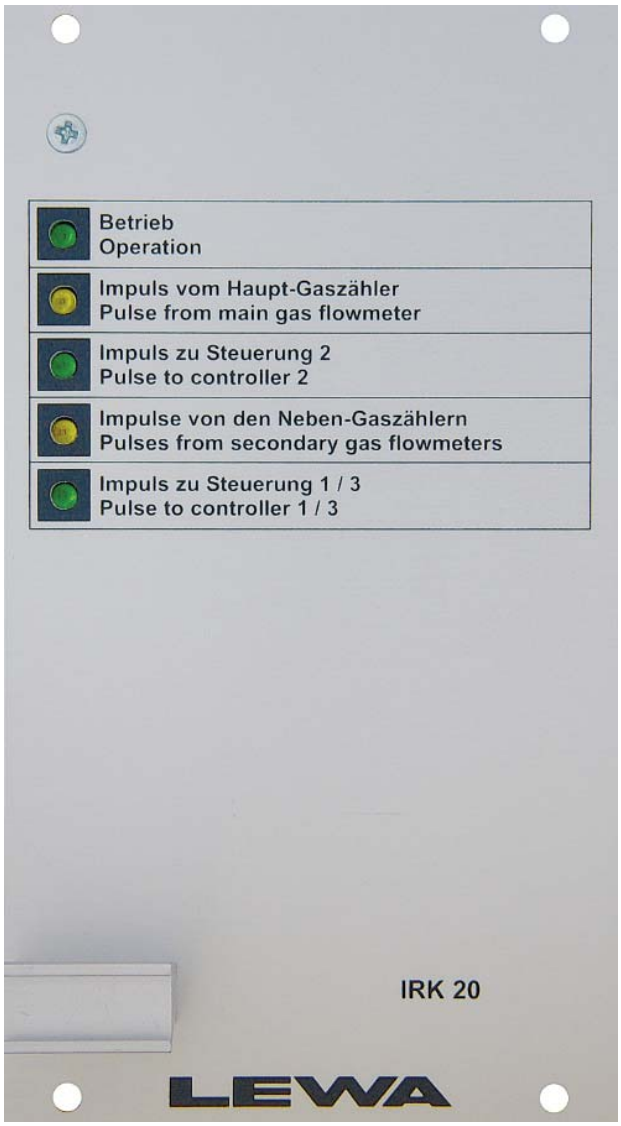

Fig. 1

1 General information / safety

1.1 Important preliminary information

Refer to operating instruction B0.100.

In addition to the safety instructions ⚠ in this operating instruction also observe all general occupational safety and health regulations!
The operator must assure that at least one copy of the operating instruction always is available near the metering system!

1.2 Application

This operating instruction applies to the **pulse processing card IRK 20** from Messrs. LEWA.

1.3 Safety

Carefully read these safety and caution instructions before installing and commissioning this equipment.

⚠ **In addition to the information given in this operating instruction also observe all general national regulations for safety and the prevention of accidents!**

This unit must be installed and serviced by qualified, expert personnel only. National regulations for the prevention of accidents, EN and IEC standards as well as VDE regulations must be observed.

⚠ **When connecting the unit to the power supply the parts of the power module are connected to the actual power supply.**
Contact with these parts will endanger your life!

Before any work on the electrical or mechanical parts of a system will be done the control must be separated from the power supply. When working on life controls the national rules for the prevention of accidents in force (e.g. VBG 4) must be observed.

2 Transportation and intermediate storage

Refer to operating instruction B0.100.

3 Product information

3.1 General description

3.1.1 Technical data

Power supply	:	230 V AC (standard) or 24 V DC as option
Power consumption	:	5 VA
Fine fuse	:	0,2 A slow (with ceramic tube)
Digital inputs	:	Control by voltage-free contacts or voltage-free transistor outputs (max. load 24 V/15 mA) or active transmitters (voltage range 8 – 24 V DC against GND)
Input frequency	:	max. 16 Hz
Passive outputs	:	voltage-free relay contact (contact load capacity 250 V AC/2 A: 30 V DC/1 A) voltage-free transistor output (max. 50 V/ 20 mA)
Perm. ambient temperature	:	+5... +50 °C
Connection	:	connector acc. to DIN 41 612, shape D, 32 pin
Front plate	:	aluminium 3HE, 14TE

3.2 Construction and method of operation (see fig. 2)

3.2.1 Construction

The pulse processing card IRK 20 is an assembly in 19”-design for the pulse subtraction or addition of 2 resp. 3 pulse inputs.
The IRK 20 is mounted on a Euro-p.c.b. and can be supplied as standard in a cabinet for wall mounting IP66 or on a 19” rack (3 U, 84 HP). The electric power is connected via terminals in these standard cabinets.

3.2.2 **Method of operation** (refer to fig. 1)

The pulse card IRK 20 works together with control- and power card OLK7 or another power module for solenoid pumps.
Via a programme selection switch either a pulse subtraction and several pulse inputs and outputs or a pulse addition with several pulse inputs and one pulse output can be selected.
Moreover the frequency of the pulse outputs can be set to 90 resp. 180 pulses/minute via a pump selection switch.

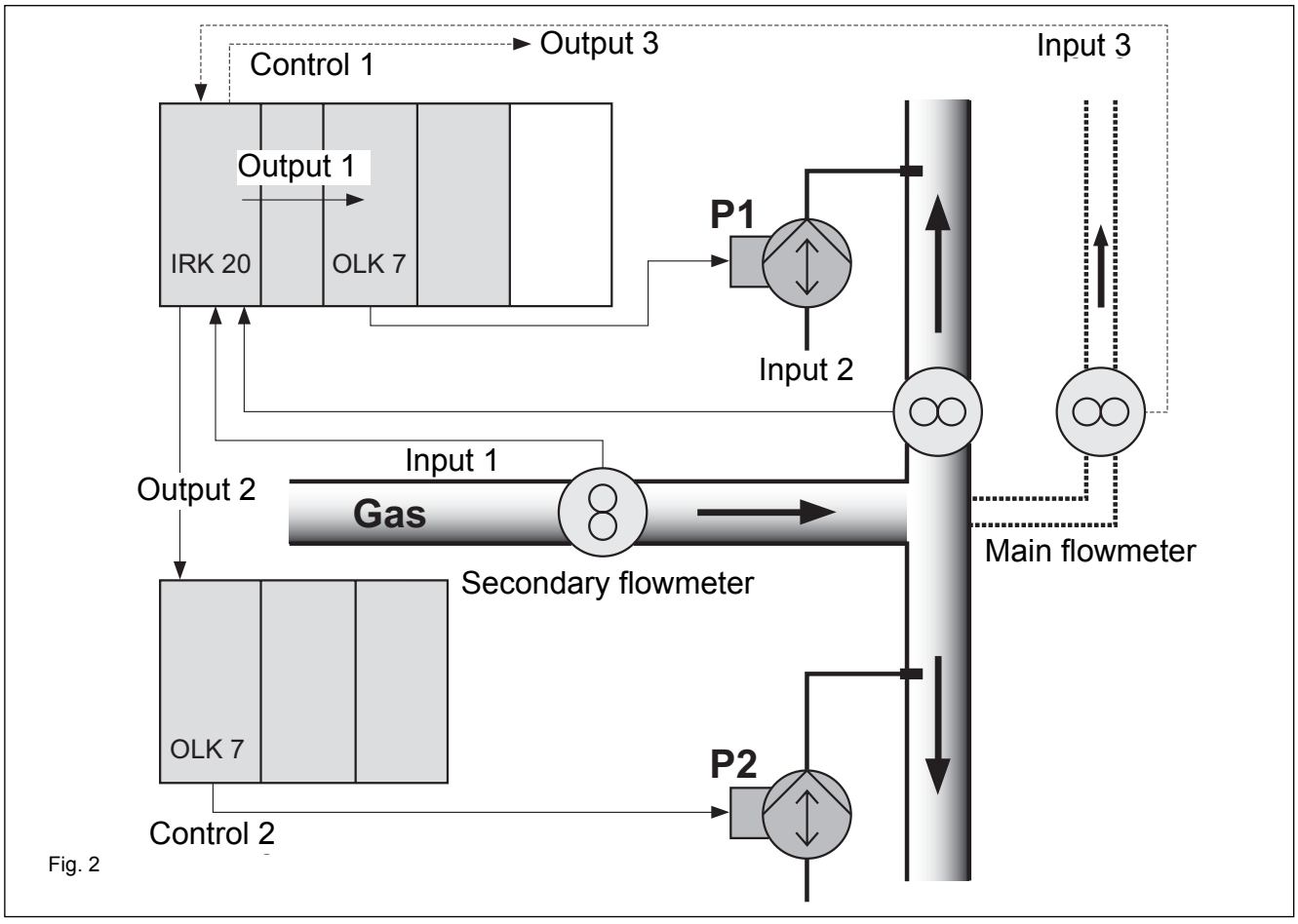

Fig. 2

3.3 Dimensions / weights / centres of gravity

Weight : approx. 500 g

Model : Euroboard 100 x 160 mm

4 Erection and assembly

4.1 Installation

4.1.1 Connection of auxiliary energy

For the electric installation VDE 0100 ”Rules for installing high voltage equipment with a rated voltage of below 1000 V” must be observed.
A reliable earthing connection via the earthing terminal of the power supply must be provided.
Interruption of the earthing connection with the power applied is not permitted.

The electric connection must be carried out with standard installation cables - according to the local regulations - by qualified, expert personnel according to the attached wiring diagram.

4.1.2 Connection of the process signals

To avoid interferences signal cables should be installed separated from high voltage cables.
We recommend to always use shielded signal cables.
The shield must be connected to the protective conductor of the instrument or to a ground connection depending on where the interference originates from. The shield should be connected to the instrument only if a protective conductor is installed to prevent compensating currents.

When active emitters, analogue input signals or proximity switches to NAMUR are connected make sure that that the polarity (±) is correct. Otherwise proper operation is not possible.

5 Commissioning / operation / shut down

5.1 Operation

5.1.1 Programmes

For the pulse subtraction an incoming pulse is added by the main gas flowmeter to a common counter.
The LED ”pulse from main gas flowmeter” lights up. As long as the counter reading of this counter is ≥ 1 the pulse output ”pulse to control 2” is activated and the LED at the front plate lights up. An incoming pulse of one of the two possible secondary gas flowmeters is multiplied by a pre-settable value. The result will be subtracted from the common counter up to a maximum negative counter reading of –100. Furthermore the result will be added to the counter assigned to the input. At arrival of a pulse of the secondary gas flowmeter the common LED ”pulse from secondary gas flowmeter” lights up for approx. 50 ms.
If the counter reading of one or both counters is ≥ 1 the corresponding pulse output is activated and the LED ”pulse to control 1/3” lights up for approx. 50 ms.

In **programme ”0”** the pulse valency of both secondary gas flowmeters must be identical. Each input pulse is multiplied by a value in the range of 0.01 to 99.99.

Programme ”4” is identical with programme ”0”; however odourizing of the secondary gas line is stopped when gas backflow is recognised by reaching the negative limit of –100. As soon as normal gas flow is picked-up again odourizing of the secondary gas line is restarted.

In **programme ”1”** each secondary gas flowmeter can be provided with its own pulse valency.
Each input pulse can be multiplied with a value in the ranges 0.01 to 1.00 or 0.1 to 10.0 or 1 to 100.

Programme ”5” is identical with programme ”1”; however odourizing of the secondary gas line is stopped when gas backflow is recognised by reaching the negative limit of –100. As soon as normal gas flow is pre-settable again odourizing of the secondary gas line is restarted.

For the pulse addition an incoming pulse from the main gas flowmeter is added to the common counter, the LED ”pulse from main gas flowmeter” lights up. An incoming pulse of one of the two possible secondary gas flowmeters is multiplied by a pre-settable value. The result will be added to the common counter also. At arrival of a pulse of the secondary gas flowmeter the common LED ”pulse from secondary gas flowmeter” lights up for approx. 50 ms.
If the counter reading of one or both counters is ≥ 1 the pulse output ”pulse to control 1” is activated and the LED ”pulse to control 1/3” lights up for approx. 50 ms.

In **programme ”2”** the pulse valency of both secondary gas flowmeters must be identical. Each input pulse is multiplied by a value in the range of 0.01 to 99.99.

In **programme ”3”** each secondary gas flowmeter can be provided with its own pulse valency.
Each input pulse can be multiplied with a value of the ranges 0.01 to 1.00 or 0.1 to 10.0 or 1 to 100.

5.2 Commissioning

The pulse valencies of the individual gas flowmeters should be checked and adjusted correctly before commissioning of the control. In order to carry out a correct pulse subtraction or addition the pulse valency of all input pulses must be identical or brought to the same pulse valency by multiplication.

The formula for the determination of the multipliers is:

$$\text{Multiplier for the secondary gas flowmeters} = \frac{\text{Valency of the secondary gas flowmeters (in Nm³)}}{\text{Valency of the main gas flowmeter (in Nm³)}}$$

e.g.: multiplier of 0,1 $= \frac{1\ \text{Nm}^3/\text{pulse}}{10\ \text{Nm}^3/\text{pulse}}$

The pulse valency of a possibly installed odourant concentration controller (e.g. ODR 7) must be set to the pulse valency of the main gas flowmeter!

5.3 Adjustment and Control

All settings required are carried out in the factory based on customer information. If corrections are required these can be carried out by qualified personnel using the following setting instruction. For adaptation to the metering pump and the possibly differing pulse valencies of the gas flowmeters the **IRK 20** is equipped with 6 rotary switches.

5.3.1 Selection of programme (see fig. 3)

At rotary switch S6 one of six programmes can be selected. The different functions are shortly described in the following table.

S6	Programme function
0	Pulse subtraction with identical pulse valencies of both secondary gas flowmeters
1	Pulse subtraction with different pulse valencies of both secondary gas flowmeters
2	Pulse addition with identical pulse valencies of both secondary gas flowmeters
3	Pulse addition with different pulse valencies of both secondary gas flowmeters
4	Pulse subtraction with identical pulse valencies of both secondary gas flowmeters and odourizing stop when gas backflow is recognised
5	Pulse subtraction with different pulse valencies of both secondary gas flowmeters and odourizing stop when gas backflow is recognised

5.3.2 Multiplier for the adaptation of the secondary gas flowmeters at the same pulse valency (see fig. 3)

The multiplier of the two secondary gas flowmeters is set at the rotary switches S1…S4. The formula for determination of the multipliers is described under section 5.2.

The valency of the switch is:

S1	S2		S3	S4
tens	ones		first no. after the decimal point	second no. after the decimal point
z.B. **0**	**5**	**,**	**3**	**4**

corresponds to a multiplier of 5,34 ml

5.3.3 Multiplier for the adaptation of the secondary gas flowmeters at different pulse valency (see fig. 3)

The multiplier of the first secondary gas flowmeter is set at the rotary switches S1 and S2, the multiplier of the second secondary gas flowmeter is set at the rotary switches S3 and S4. The corresponding setting ranges can be taken from the table in section 5.3.4. The formula for determination of the multipliers is described under section 5.2.

Setting ”00” of switches S1 and S2 resp. S3 and S4 according to the values 1.00, 10.0 or 100.

The valency of the switches is:

5.3.4 Pump selection and selection of the multiplier ranges

The pulse output frequency for the solenoid pump to be controlled.
MAH-pump = 180 strokes/minute
MLM-pump = 90 strokes/minute

In addition the multiplier range for different pulse valencies of the secondary gas flowmeters can be adapted with S5. The assignment between S5 and S6 is shown in the following table.

S5	S6	Pump type	Range 1. secondary gas flowmeter	Range 2. secondary gas flowmeter
0	0,2 or 4	MLM	0,01 to 99,99	same as 1. secondary gas flowmeter
1	0,2 or 4	MAH	0,01 to 99,99	same as 1. secondary gas flowmeter
0	1,3 or 5	MLM	0,01 to 1,00	0,01 to 1,00
1	1,3 or 5	MAH	0,01 to 1,00	0,01 to 1,00
2	1,3 or 5	MLM	0,1 to 10,0	0,01 to 1,00
3	1,3 or 5	MAH	0,1 to 10,0	0,01 to 1,00
4	1,3 or 5	MLM	0,01 to 1,00	0,1 to 10,0
5	1,3 or 5	MAH	0,01 to 1,00	0,1 to 10,0
6	1,3 or 5	MLM	0,1 to 10,0	0,1 to 10,0
7	1,3 or 5	MAH	0,1 to 10,0	0,1 to 10,0
8	1,3 or 5	MLM	1 to 100	1 to 100
9	1,3 or 5	MAH	1 to 100	1 to 100

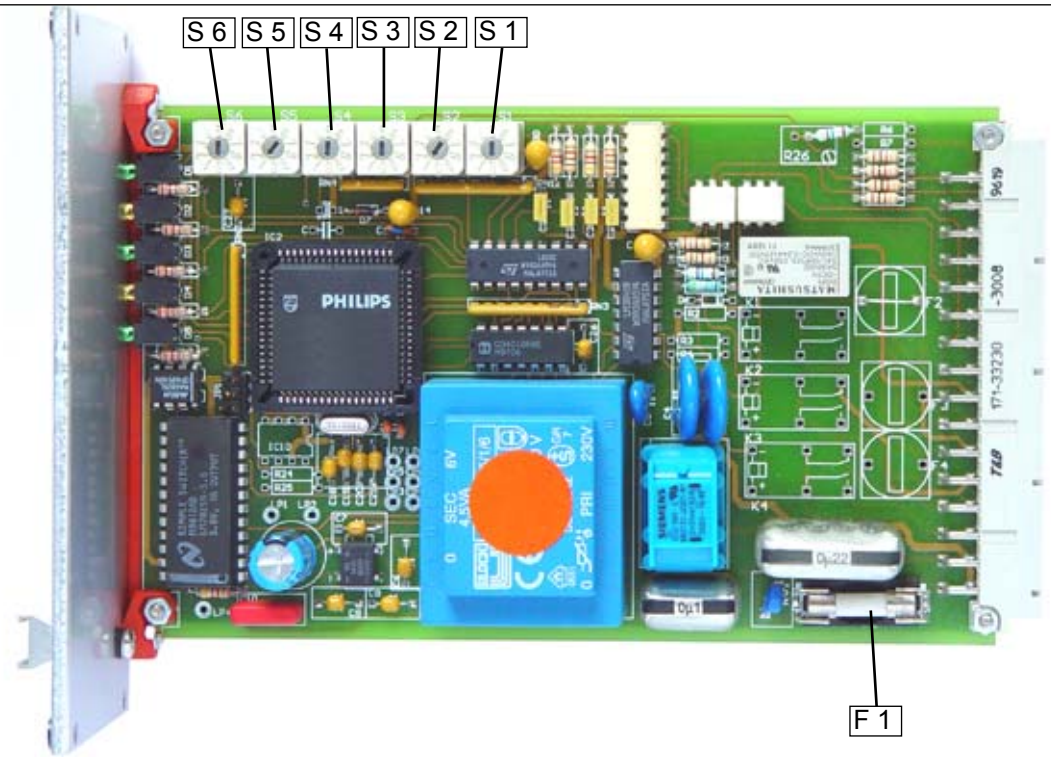

Fig. 3

6 Maintenance and repairs

6.1 Maintenance

Make sure to observe section 1.3 ”safety” in this operating instruction before doing any maintenance work!

6.2 Repairs

In case you carry out repairs yourself please observe the safety instructions in section 1.3 and adhere to the assembly instruction of the operating instructions of the assemblies. (see section 4.1 also).
Otherwise please contact our service department.
The address of the customer service centre close to you can be found in the address listing at the end of your operating instruction folder.

7 Fault; symptoms, remedial action

Alarm	Symptoms	Remedial action
LED display “operation” not illuminated although power is applied.	No power applied at the power supply unit.	Check installation and fuse F1
Although gas flowmeter is connected no pulses are displayed at the LEDs ”pulses from main gas flowmeter” resp. ”pulses from secondary gas flowmeter”.	No incoming pulses are processed.	Check polarity of the gas flowmeter output connected and change if required.
The output pulses displayed at the LED ”pulse to control 2” are not processed at control 2.	Incorrect polarity of optical coupler.	Check polarity of the transistor output and change if required.
The odourant concentration measured in the gas is incorrect	The incoming pulses are not processed with the correct valency.	Check the pulse valency set at the odourant concentration controller and correct if required. **The pulse valency of the main gas flowmeter must be set at the odourant concentration controller.**
The theoretical pulse ratio between input- and output pulses is incorrect.	The incoming pulses are not processed with the correct valency.	Determine and check multiplier for the secondary gas flowmeters according to the formula in section 5.2. For a gas flowmeter with an output in actual cubic meters include gas pressure.

Operating Instruction

Solenoid valve control board MVS 1 **B 7.554 en**

Table of contents

Fig. 1

1 General information / safety

1.1 Important preliminary information

Refer to operating instruction B0.100.
In addition to the safety instructions ⚠ in this operating instruction also observe all general occupational safety and health regulations !
The operator must assure that at least one copy of the operating instruction always is available near the metering system !

1.2 Application

This operating instruction applies to the **solenoid valve control board MVS 1** of Messrs. LEWA.

1.3 Performance and applicabilities

Power supply	:	230 V AC or 24 V DC as option
Power consumption	:	230 V AC 1,5 VA
Digital inputs	:	control by voltage-free contacts or voltage-free transistor output (max. load 24 V/15 mA)
Passive outputs	:	voltage-free relay contact (contact load capacity 250 V AC/2 A: 30 V DC/1 A)
Perm. ambient temperature	:	+5... +50 °C
Connection	:	connector acc. to DIN 41 612, shape D, 32 pin
Front plate	:	aluminium 3U, 6HP.

1.4 Safety

Read and strictly observe the instructions in operating instruction B0.100, section 1.4.

Carefully read these safety and caution instructions before installing and commissioning this unit.

In addition to the information given in this operating instruction also observe all general national regulations for safety and the prevention of accidents !

This unit may be installed and serviced by qualified, expert personnel only. National regulations for the prevention of accidents, EN and IEC standards as well as VDE regulations must be observed.

When connecting the unit to the power supply the parts of the power module are connected to the power supply.
Contact with these parts will endanger your life !

Before any work on the electrical or mechanical parts of a system is done the control must be separated from the power supply. When working on life controls the national rules for the prevention of accidents in force (e.g. VBG 4) must be observed.

2 Transportation and intermediate storage

Refer to operating instruction B0.100.

3 Product information

3.1 General description

The solenoid valve control board **MVS 1** is an assembly in 19”-design for automatic switch-off of a solenoid valve in the filling line to an OD storage vessel.

3.2 Construction and method of operation

3.2.1 Construction

The **MVS 1** is mounted on an Euro-p.c.b. and can be supplied as standard in a cabinet for wall mounting IP66 or on a 19” rack (3 U, 84 HP).
The electric power is connected via terminals in these standard cabinets.

3.2.2 Method of operation

The **MVS 1** controls a solenoid valve in the filling line by means of a float switch LSHH (protection against overfilling according to WHG) installed in the storage vessel of the OD unit. Thus overfilling of the OD storage vessel is prevented.
Via selector switch *"vessel filling "Off" /"On"* in the front plate of the **MVS 1** the automatic vessel filling **MVS 1** is switched off resp. on.
The alarm lamp *" alarm LSHH "* signals triggering of float switch LSHH.

3.3 Dimensions / weights / centres of gravity

Weight : approx. 300 g
Model : Euroboards 100 x 160 mm

4 Erection and assembly

4.1 Installation

4.1.1 Connection of auxiliary energy

For the electric installation VDE 0100 "Rules for installing high voltage equipment with a rated voltage of below 1000 V" must be observed.
A reliable earthing connection via the earthing terminal of the power supply must be provided.
Interruption of the earthing connection with the power applied is not permitted.

The electric connection must be carried out with standard installation cables - according to the local regulations - by qualified expert personnel according to the attached wiring diagram.

4.1.2 Vessel filling *"On"*

Set selection switch to *"On"*.
With this switch setting the solenoid valve in the filling line will be opened or closed by the float switch LSHH.
The solenoid valve opens when the fluid level in the storage vessel of the OD unit falls below LSHH and closes when LSHH is reached.
At the same time both switching conditions are indicated via the alarm lamp *"alarm LSHH"* in the front plate of the **MSV 1**.
A voltage-free relay contact on the **MSV 1** offers the option for transmission of both signal conditions.

The following switching conditions are possible:

Float switch LSHH	Lamp "alarm LSHH"	Relay contact
fallen below	Off	closed
reached	On	opened

4.1.3 Vessel filling *"Off"*

Set selection switch to *"Off"*.
With this switch setting the solenoid valve in the filling line is always de-energised i.e. closed.
The storage vessel of the OD unit cannot be filled in this operating condition.
Float switch LSHH has no influence on the solenoid valve.
After filling of storage vessel of the OD unit the selection switch *"Off/On"* should be switched to the *"Off"* position for changing a possibly available exchangeable vessel in order to avoid obnoxious smell.

5 Commissioning / operation / shut down

The value of the fuses for the solenoid valve in the filling line and the **MVS 1** should be checked before commissioning of the control.

The location of the fuses is shown in fig. 2.

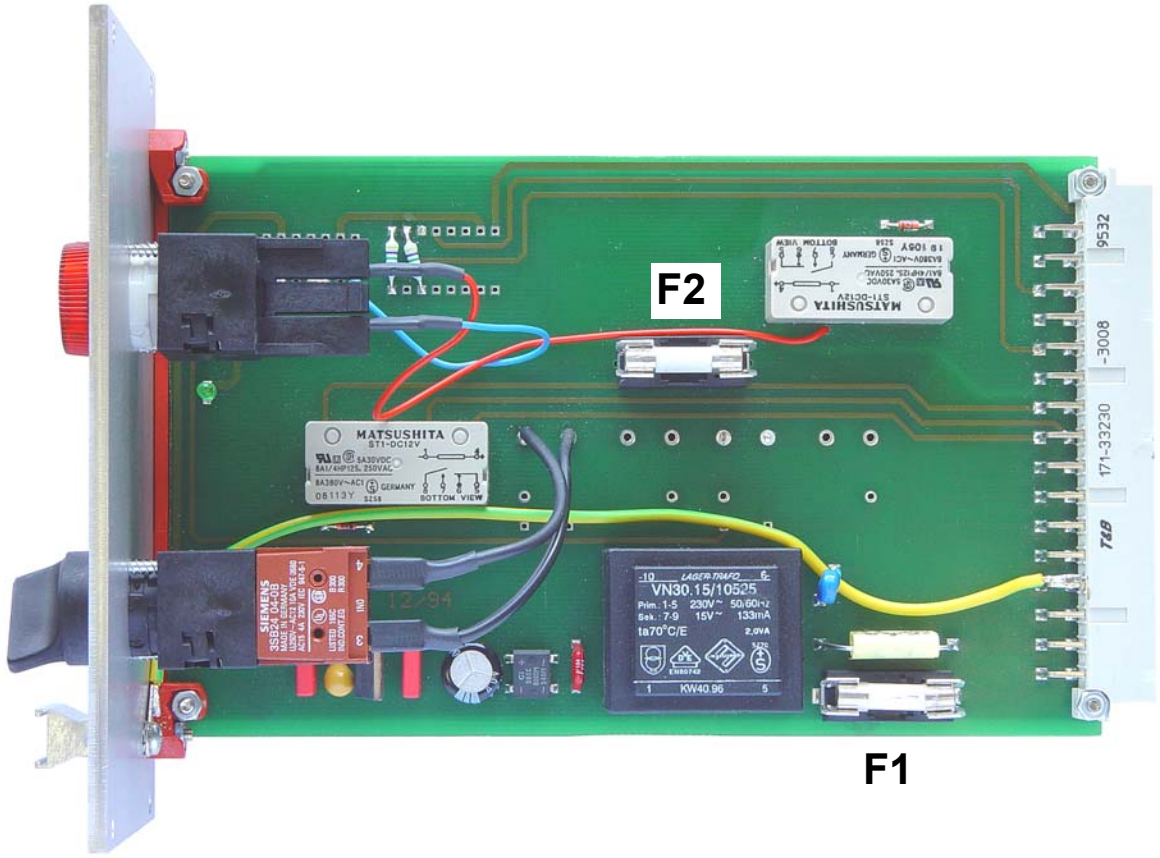

Fig. 2

The following values must be used for fuses F1 and F2:

Voltage	F1 input fuse MVS 1	F2 fuse solenoid valve
230V AC	0,2 A	0,1 A fast
24V DC	0,2 A	0,8 A fast

6 Maintenance and repairs

The unit is maintenance-free.

7 Fault; symptoms, remedial action

7.1 Alarms

Alarm	Symptoms
The solenoid valve in the filling line does not open although the level has fallen below LSHH.	The following points must be checked: * is the selection switch vessel filling in ”On” position * is fuse F1 in order * is fuse F2 in order * is the LSHH contact opened or not connected (lamp *”alarm LSHH”* at the **MVS 1** lights up)

Operating Instruction

Odourant control OEXD in explosion proof housing [EEx]d and odourant control OKR 7

B 7.570 en

Table of contents

1 General information / safety

1.1 Important preliminary information

LEWA pumps must only be used in proper technical condition and for the application intended (refer to technical data sheet), special attention must be paid to any safety risk observing the operating instruction and being safety conscious!
Especially problems impairing the safety must be corrected immediately!
Proper use includes observation of the operating instruction and maintaining of all inspection and maintenance requirements.
LEWA metering pumps are only intended for the conditions and fluid stated in the technical data sheet. Any deviating use or a use exceeding these conditions is considered to be improper use. The manufacturer does not accept any liability for the damages resulting thereof.
The risk rests with the user exclusively!

The operator must assure that all commissioning, service, preventive maintenance and installation work is carried out by authorised and qualified expert personnel only which has gained sufficient information by studying the operating instruction in detail.

In addition to the safety  **and**  **caution instructions in this operating instruction also observe all general occupational safety and health regulations!**

For hazardous areas acc. to directive 94/9/EG (ATEX) please observe the information marked with  **sign.**

The operator must assure that at least one copy of the operating instruction always is available near the pump!

- **Is the power supply of the control correct?**
- **Has the electric hook-up of the unit been carried out correctly observing local regulations?**
- **Have the fuses been adapted to the pump type?**

1.2 Application

This operating instruction applies to the LEWA odourant control in [EEx] d (explosion proof) housing **OEXD** and the LEWA odourant control **OKR 7** as 19" rack or installed in a control cabinet outside of the hazardous area.
For easy understanding only the term "odourant control" will be used in the further description.
The product number (pump serial number) can be found in the technical data sheet.

1.3 Performance and applicabilities

Power supply:	230 V AC (standard), or 24 V DC as option
Power absorbed:	15 VA at 230 V AC 15 Watt at 24 V DC
Fine fuse:	0,5 A slow (with ceramics pipe) at 230 V AC 1,0 A slow (with ceramics pipe) at 24 V DC
Digital Inputs:	Control by voltage-free contacts or voltage-free transistor outputs (max. load 24 V / 15 mA) or active emitters (voltage range 8 - 24 V DC against ground)
Input frequency:	max. 70 Hz
Analogue input:	0 / 4-20 mA, load = 250 Ohm
Analogue output:	0 / 4-20 mA, max. load 750 Ohm
Power output:	approx. 200 V DC / max. 1 A (at 230 V AC power supply) approx. 24 V DC / 2 A max. (at 24 V DC power supply)
Fine fuse:	depending on pump solenoid (refer to 5.1)
Active outputs:	230 V AC / max. 1 A (at 230 V AC power supply) 24 V DC / max. 2 A (at 24 V DC power supply)
Passive outputs:	voltage-free relay contacts (contact load 250 V AC/2 A, 30 V DC/1 A)
Permissible ambient temperature:	-10 ... +50 °C
Weight:	depending on the design of the housing
Enclosure:	depending on the design of the housing
Connection:	terminals (max. cable cross section 2,5 mm²)

Digital inputs (intrinsically safe)	
No load voltage:	approx. 8 V DC
Short circuit current:	approx. 8 mA
Switching point:	1,2 - 2,1 mA
Duration of input pulse:	>= 0,5 ms
Interruption of input pulse:	>= 0,5 ms

Data of the [EEx] i current circuits for the control in [EEx]d-housing resp. in the control cabinet acc. to certificate of conformity PTB-no. PTB 00 ATEX 2207 (ED2-SOT-Ex8 Pepperl + Fuchs GmbH).

Data of the [EEx] i current circuits for the control as 19"-plug-in module acc. to certificate of conformity PTB 00 ATEX 2210 (see operating instruction B7.521 ex-input board ExOT 7).

1.4 Safety

- **Before installation and commissioning of this unit kindly read this safety and caution information carefully.**
- **This unit is switching dangerous electric voltages and non-observance of these instructions can cause severe injury to persons and / or property damage.**
  This operating instruction contains all information required for qualified personnel.
- **This unit is designed for the operation in hazardous areas for temperature classes T1 to T4. For exact classification please especially observe temperature of the fluid conveyed and the heating fluid.**
- **The temperature limits stated in the technical data sheet must not be exceeded.**
  In case of deviations please consult LEWA.
- **In addition to the information in this operating instruction also observe all generally valid national regulations for occupational safety and the prevention of accidents!**
- **This unit must be installed and maintained by qualified, expert personnel only. Observe national regulations for accident prevention, EN and IEC standards as well as VDE regulations.**
- **When connecting the unit to the power supply the parts of the power module are connected to the power supply. Physical contact with these parts is extremely dangerous!**

- **Before any work on the electrical or mechanical parts of a system will be started the control must be separated from the power supply.**
  When working on life systems the valid national regulations for accident prevention in force (e.g. VBG 4) must be observed.

Protective measures to limit the inductive voltage

The PTB certificates of conformity for the operation of DC stroke solenoids require that the inductive voltages resulting from the switching-off action are limited to 800 V at 230 V AC resp. 480 V at 24 V DC by suitable protective measures.
The odourant control is equipped with varistors (SIOV-S20 K300 at 230 V AC resp. SIOV-S20 K140 at 24 V DC make Siemens) at the outlets to the pump solenoid. This measure assures that the inductive voltage is positively limited to less than 800 V at 230 V AC resp. less than 480 V at 24 V DC.

1.5 Supply connections

1.6 Emissions

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2 Transportation and intermediate storage

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3 Product information

3.1 General description

The odourant control is designed for the direct control of solenoid operated metering pumps or motor driven metering pumps via a frequency inverter. When a flowmeter is installed in the discharge line it can be used for measuring, monitoring and closed loop control of odourant flows.

Special features of the odourant control are:

Functions	OEXD/OKR7 Standard	OEXD/OKR7 as an option with additional circuits
all data is saved power failure proof in a battery buffered memory resp. EEPROM	●	
all settings are carried out in a menu guided dialogue via the push button-board	●	
all alarms are carried out acc. to the quiescent current principle	●	
all alarms are shown in plain writing on the display	●	
analogue output of the actual value concentration	●	
analogue input for external pre-setting of concentration	●	
coupling to a main processor possible via RS 232 or RS 485 interface directly via a modem or via Internet	● (RS232/485)	● (modem, Internet)
adaptation of measuring unit of gas flow	●	
connection of 2 solenoid or metering pumps with automatic switch-over from operating to stand-by pump in case of failure is possible		●
3 digital and 3 analogue gas counters each with its own parameterizing can be connected	●	
possible connection for a solenoid valve in the metering line	●	
possible connection for a solenoid valve in the filling line to a bulk container	●	

Functions	OEXD/OKR7 Standard	OEXD/OKR7 as an option with additional circuits
possible connection for a pressure transducer in the gas line to convert gas counter 1 into Nm 3.	●	
possible connection for a gas chromatograph for registration of the odourant concentration in the gas either in order to subtract an odourant pre-concentration or closed loop control of desired final odourant concentration	●	
possible connection of various actual value pick-ups in the metering line e.g. micro-flowmeter KMM and flowmeter with pulse output	●	
control of all LEWA solenoid pumps	●	● (MLM40, MBH)
control of all motor-driven metering pumps via frequency converter		●
control of all motor-driven metering pumps via frequency converter and electric stroke adjustment		●
control and monitoring of a pre-selected odourant concentration	●	
evaluation of pump status in automatic pump switch-over mode in order to actuate the pump performing better	●	
batch operation for filling of tankers, tank wagons or vessels with software BATCH	●	
dialogue language can be selected either German, English, French, Spanish, Portuguese or Dutch	●	
digital input for ”stop odourization” in order to stop odourization during filling procedures	●	
error memory for 255 error messages with date and time	●	
plain writing display	●	
continuous level indication of odourant vessel		●
logic for coupling of a bulk container to the odourant supply vessel of the odourizing unit with automatic supply vessel filling	●	
logic for automatic / manual pump switch-over	●	
manual slug odourization via input contact	●	
several plausibility checks to monitor the pump as well as the actual value pick-up	●	
determination of average value for each gas counter with automatic switch-over if a defect is recognised at one gas counter	●	
modular setup of the software allows later upgrading of additional components e.g. actual value pick-up, automatic vessel filling etc.	●	
simulation of a determined gas volume in operation mode ”internal” for operation of the odourizing unit even with defective gas counter	●	
totaliser for odourant metered and gas volume recorded	●	
test programs for hard ware tests and check of the wiring	●	
monitoring of the 4 – 20 mA input current signals on interruption	●	
optimisation of consumption for solar-powered operation of the odourization unit by switch-on / switch-off of electric consumers	●	

3.2 Construction and method of operation

The control is set-up on two printed circuit boards and installed in a [EEx] d housing resp. in a control cabinet or available as 19” plug-in module. The electrical connection is carried out via terminals.

For better understanding the function of the odourant control is shown in the PID following (refer to figure 1).

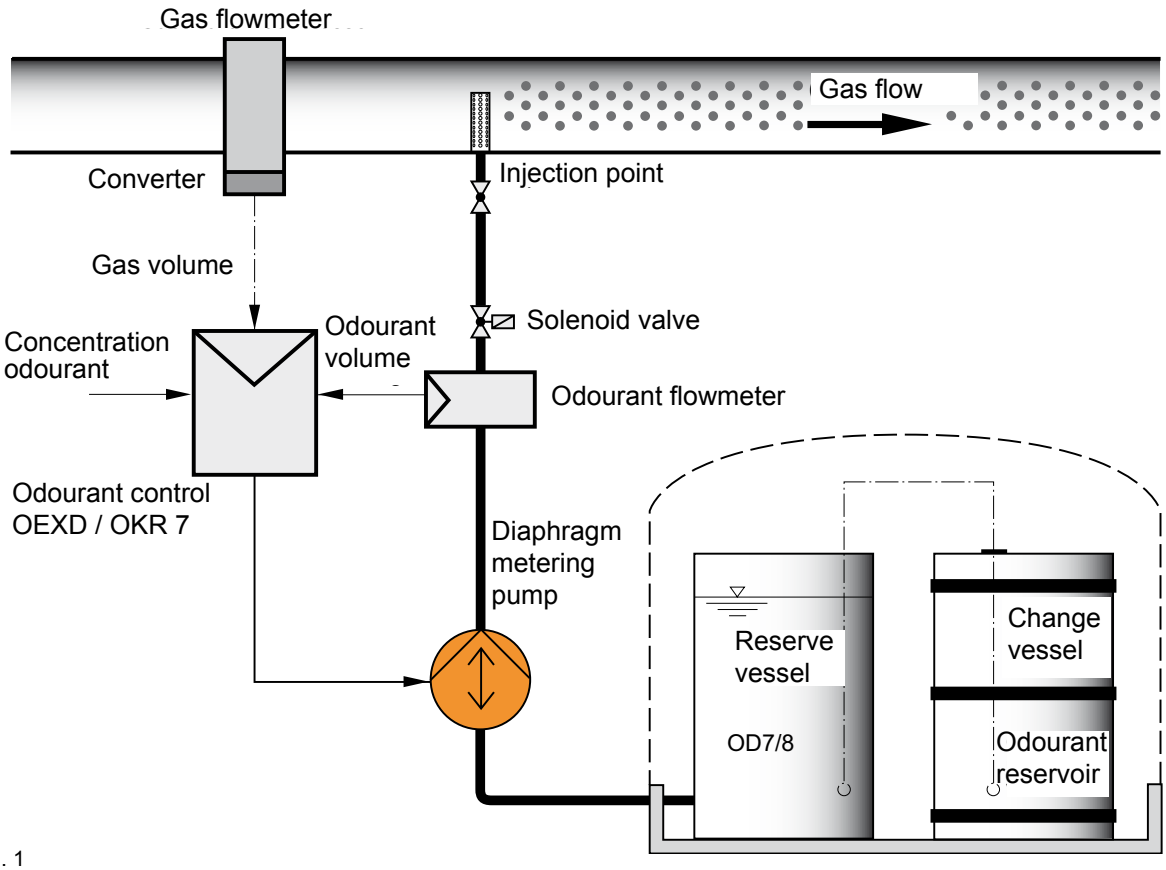

Fig. 1

3.3 Dimensions / weights / centres of gravity

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4 Erection and assembly

4.1 Permissible ambient conditions

4.2 Space requirements

4.3 Foundation

4.4 Erection

4.5 Installation

4.5.1 Connection of auxiliary energy

For the electric installation VDE 0100 “Rules for the installation of high voltage plants with rated voltages below 1000 V” must be observed. It must be absolutely assured that a reliable protective conductor connection is made via the earthing terminal of the power supply. Interruptions of the earthing connection with the power supply applied are not permissible.

The electric connection must be made by qualified experts according to the wiring diagram attached using customary cables and observing local regulations.

The cable specifications following are recommendations only and result from the VDE regulations.
Local regulations may specify other cables.

The temperature limits for the cables were taken from the current PTB certificates of conformity of the individual instruments.
Cable specifications valid from 08/99

Connection type	Cross section recommended	Temperature limits
power supply	1,5 mm²	standard -5...+70 °C
solenoid PBH	1,0 mm²	standard -5...+70 °C
pump solenoid MAH	1,0 mm²	≥ 80 °C
pump solenoid MBH	1,0 mm²	≥ 95 °C
pump solenoid MLM 15 / 40	1,5 mm²	≥ 80 °C
solenoid valve in metering-, venting- or filling line	1,0 mm²	standard -5...+70 °C when the ambient temperature exceeds 50 °C a cable allowing ≥ 90 °C must be used!
all [EEx i](intrinsically safe)-cables	1,0 mm² blue	standard -5...+70 °C
thermistors of pump solenoid MLM 40	1,0 mm²	≥ 80 °C

OPTIONS		
solenoid valves of micro-flowmeter KMM	1,0 mm²	standard -5...+70 °C if the ambient temperature exceeds 50 °C a cable allowing ≥ 90 °C must be used!
serial interface RS 232 / 485	1 x 0,34 resp. 2 x 0,34	standard -5 +70 °C twisted pairs of shielded data transfer cable

4.5.2 Connection of process signals

Because of the danger to pick-up disturbances measuring cables should be installed separately from power lines.

We generally recommend to use shielded measuring- and [EEx]i- cables only. The shield must be connected to the earthing line of the equipment or mass depending on where the faulty signal originates from.

When active emitters, analogue input signals or proximity switches to NAMUR are connected make sure that that the polarity (+/-) is correct. Otherwise proper operation is not possible.

5 Commissioning / operation / shut down

5.1 Operation

Check the values of the pump fuses before commissioning the control and replace if required.
The location of the fuses is shown in figure 2.

The following values must be used for fuses F 1 to F 7 (refer to figure 2):

Power supply	**solenoid pump type**	**fuse F1** control fuse	**fuse F2** pump fuse
230 VAC	MAH / PBH	0,5 A slow	0,1 A fast
24 VDC	MAH	1,0 A slow	1,0 A fast
230 VAC	PBH	0,5 A slow	0,1 A fast
24 VDC	PBH	1,0 A slow	1,0 A fast
230 VAC	MBH	0,5 A slow	0,5 A slow
24 VDC	MBH	1,0 A slow	4,0 A slow
230 VAC	MLM 15	0,5 A slow	0,5 A fast
24 VDC	MLM 15	1,0 A slow	3,15 A fast
230 VAC	MLM 40	0,5 A slow	1,0 A fast
24 VDC	MLM 40	1,0 A slow	6,3 A fast

Power supply	**fuse F4** solenoid valve 1 of KMM	**fuse F5** solenoid valve 2 of KMM	**fuse F6** solenoid valve in discharge line	**fuse F7** solenoid valve in filling line
230 VAC	0,1 A fast	0,1 A fast	0,1 A fast	0,1 A fast
24 VDC	0,8 A fast	0,8 A fast	0,8 A fast	0,8 A fast

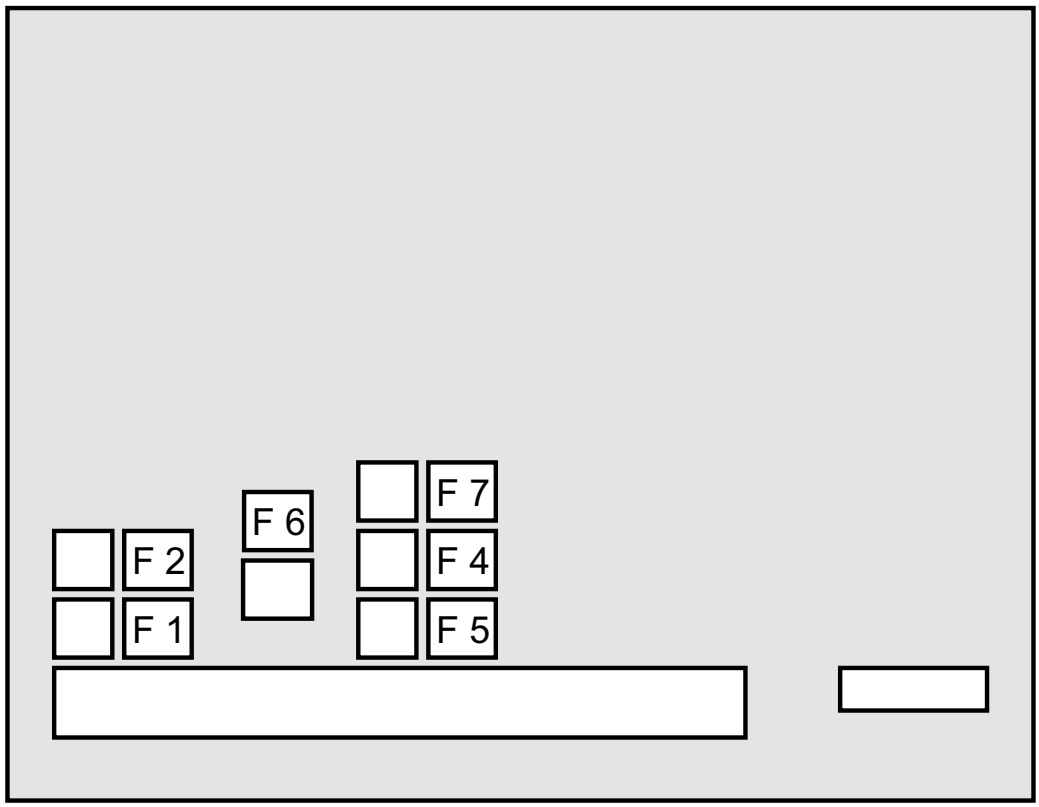


Fig. 2

5.1.1 Operation of the odourant controls

After mains voltage has been applied and the control has been switched on the current operation mode is shown in the LCD-display. Via pushbuttons ”Int./Ext.” switch-over between *operating modes ”Internal” and ”External”* can be carried out.

Use this push button 

(OKR 7) resp. 

(OEXD) to change from operation mode to the menu tree or vice versa.

All data inputs required can be carried out via **four (OEXD)** resp. **six (OKR 7) pushbuttons** and permanently saved in the battery-RAM.

The selection and setting of some parameters results in additional parameters being displayed or hidden.

Operation mode “Internal”

The “Internal” operation mode is used for commissioning, during maintenance or for emergency operation when the gasmeter broke down.
In operation mode “Internal” the *“Int. Presel Actual”* appears in the upper line of the LCD display.
In the lower line, left hand side, the *gas flow to be simulated* is set as *XXXXXX Nm³/h*** and in the centre the desired value required in *XXX.X µl / Nm³*** . *When the closed loop control is activated* the momentary *actual value in XXX.X µl / Nm³ ***. appears on the right hand side.

Operation mode “External” (digital)

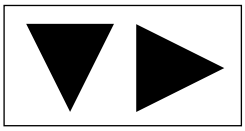
In operation mode “External” *“Nm³ / h** Presel Actual ”* appears in the upper line of the LCD display. In the lower line, left hand side, the gas flow recorded is displayed as *XXXXXX Nm³ / h***. In the centre the *desired value* required is set in *XXX.X µl / Nm³***. *When the closed loop control is activated* the momentary *actual value* in *XXX.X µl / Nm³*** is shown on the right hand side. In operation mode “External” (digital) the pulses of up to 3 gas meters are each multiplied with an inherent pulse valency and the metering pump is controlled depending on the desired value. If the number of incoming pulses exceeds the permissible stroke frequency of the solenoid operated pump they are added-up in a processing counter and issued at the maximum stroke frequency of the pump.

Operation mode “External” (analogue)

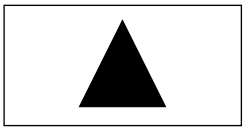
In operation mode “External” *“Nm³ / h** Presel Actual ”* appears in the upper line of the LCD display. In the lower line, left hand side, the *gas flow* recorded is displayed as *XXXXXX Nm³ / h***. In the centre the desired value required is set in *XXX.X µl / Nm³*** and on the right hand side the momentary actual value is shown in *XXX.X µl / Nm³*** *when the closed loop control is activated*. In operation mode “External” (analogue) the signals (0/4 - 20 mA) of up to 3 gas meters each with an inherent adjustable *flowrate* in *XXXXXX Nm³/h*** are evaluated. At a signal of 4 - 20 mA an additional monitoring, which can be switched off, of the signal is activated and an alarm is triggered if the current falls below 3,6 mA.

**measuring unit depends on setting of parameters

For odourant control OEXD operation is carried out via four push buttons.



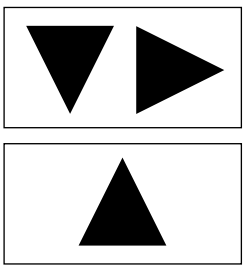
Use this push button to move the menu tree downwards and to move the cursor during data input or to select a parameter.



Use this push button to move upwards in the menu tree and to change the parameter during data input.

Use this push button to change from the operation mode to the menu tree or vice versa.
The data input can be interrupted using this push button. After their elimination all alarms can be cancelled by pressing this push button.

Via push button ”Int./Ext.” you can select between *operation mode ”Internal”* and *”External”* in the operational status display.



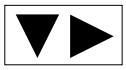
Pressing both push buttons at the same time triggers the **ENTER function**.
Using **ENTER** you open and safe the parameter to be changed.

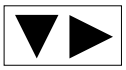
Parameterising examples OEXD

Executing a numerical input at the OEXD

You are in the operational status display and want to change the language.

1. By pressing the push button [RESET ESC] you jump from the operational status display to the menu tree.

2. Using push button  you now move down in the menu tree until “Parameter-password” is displayed

3. Call off the data input by pressing **ENTER** (simultaneous pressing of push buttons  and  .

4. Now the first of the digits of the password that can be changed (works setting = 0001) will flash in the display.

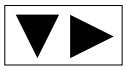
5. Using push button  you now can change the flashing digit.

6. Using push button  you now can go to the next digit which starts flashing.

7. Now change all digits as described in steps 5 and 6 until the password desired has been entered.

8. Pressing **ENTER** terminates and saves the input.

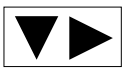
9. If the correct password is entered ”OK” appears in the display.

10. Using push button  you now move down in the menu tree until “system password” is displayed (this is displayed only if the passwords differ). If required, enter the password (as described in step 3 to 8) and move down further to the display “language”.

Executing a selection at the OEXD

1. Call off the selection by pressing **ENTER**.

2. Now the first letter of the current selection is flashing in the display.

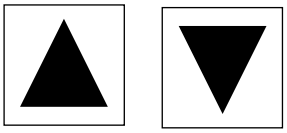
3. By pressing push button  you now can display all selections possible in a sequence.

4. When the selection desired is displayed the sequence is terminated by pressing ENTER and the parameter is saved.

5. Press push button [RESET ESC] to return to the operational status display.

For odourant control OKR 7 operation is carried out via six push buttons.

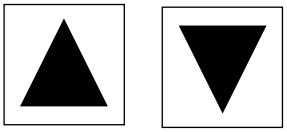
internal gas simulation



With these push buttons the value for the internal gas simulation can be changed in the operational status display in *operation mode "Internal"*.

With the push button "Int./Ext." in the operational status display it can be chosen between the *operation modes "Internal"* and *"External"*.

concentration preselect



With these push buttons the value for the concentration (only for desired concentration value "internal") can be changed in the operational status display in *operation mode "Internal" and "External"*.
Within the menu tree you can move upwards resp. downwards and move the cursor during data input or select a parameter.

Pressing both push buttons at the same time triggers the **ENTER function**.
Using **ENTER** you open and safe the parameter to be changed.

Use this push button to change from the operational status display to the menu tree or vice versa.
The data input can be interrupted using this push button.
After their elimination all alarms can be cancelled by pressing this push button.

Parameterising examples OKR 7

Executing a numerical input at the OKR 7

You are in the operational status display and want to change the language.

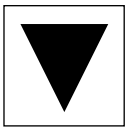
1. By pressing the push button 

you jump from the operational status display to the menu tree.

concentration preselect

2. Using push button  you now move down in the menu tree until “Parameter-password” is displayed.

concentration preselect

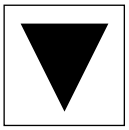
3. Call off the data input by pressing **ENTER** (simultaneous pressing of push buttons  and ).

4. Now the first of the digits of the password that can be changed (works setting = 0001) will flash in the display.

concentration preselect

5. Using push button  you now can change the flashing digit.

concentration preselect

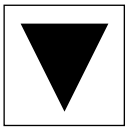
6. Using push button  you now can go to the next digit which starts flashing.

7. Now change all digits as described in steps 5 and 6 until the password desired has been entered.

8. Pressing **ENTER** terminates and saves the input.

9. If the correct password is entered ”OK” appears in the display.

concentration preselect

10. Using push button  you now move down until “system password” appears in the display (this is displayed only if the passwords differ). If required, enter the password (as described in step 3 to 8) and move down further to the display “language”.

Executing a selection at the OKR 7

1. Call off the selection by pressing **ENTER**.

2. Now the first letter of the current selection is flashing in the display.

concentration preselect

3. By pressing push button  you now can display all selections possible in a sequence.

4. When the selection desired is displayed the sequence is terminated by pressing ENTER and the parameter is saved.

5. Press push button 

to return to the operational status display.

5.2 Operating and ancillary means

5.3 Commissioning, start-up, venting

5.4 Adjustment and Control

All settings required are carried out in the factory following the specifications of the customer.
If corrections are required these can be carried out by qualified personnel using the following setting instructions.
All settings are carried out via the push buttons in the front of the odourant control.

In the following the complete menu tree and the selections possible resp. the numerical inputs are shown and commented. Sub-menus shown in italic letters and tinted grey are visible or suppressed depending on the parameters set.

No.	Sub-menu / parameter	type of input	comment
1	OEXD / OKR7 control VX.XX XX.XX.XXXXX	display only	display of software version
2	*switch-over P1/P2* *> pump 1 active*	*selection*	*switch-over of metering pump operating* *selections poss.:* • *pump 1 active* • *pump 2 active* *Further description at the end of the operating instruction* [1]
3	*start-up vessel?* *>no*	*selection*	*Here the supply vessel can be filled from a barrel or a bulk container up to the float switch contact LSH.* *Selections poss.:* • *no* • *yes*
4	*total odourant* *0.00 litres*	*display only*	*total odourant volume metered*
5	total gas 0.00 Nm³	display only	total gas volume flow recorded
6	display ERROR? >	selection	Looking at the error memory Press ENTER to switch on, press ENTER or ESC to switch off. Display of individual errors by using arrow keys.
7	*spare conc-preselect* *> 15.0 µl/Nm³*	*numerical* *(0.0 – 100.0)*	*Possible entry of a spare resp. emergency concentration pre-selection for analogue concentration pre-selection via an analogue signal of 4 – 20 mA. If the analogue signal falls below 3,6 mA an alarm is triggered and automatic switch-over to this spare concentration pre-selection takes place. If the analogue signal is available again it will be switched back to it.*
8	*Pre-odour concentrat.* *>10.0 µl/Nm³*	*numerical* *(0.0 – 100.0)*	*Flexible adaptation to the conditions of the odourizing unit for final concentration measuring possible. It can be communicated to the control how strong the gas is pre-odourized already. This value is subtracted from the pre-selection after a restart. Thus overmetering is prevented. If, for safety reasons, no odourizing shall be carried out before the first measuring of the gas chromatograph the "pre-odourant concentration" can be set to a higher value than the preselection! Then odourizing starts after the first measuring cycle only.*
9	*password parameter* *>0*	*numerical* *(0000 - 9999)*	*Entering the password for releasing additional menus (works setting 0001) when entered correctly "OK" appears after pressing ENTER. If password is not correct original dialogue appears.*
10	parameter input	display only	Information that parameter input starts from here
11	switch over Int -> Ext >0 minutes	numerical (0 – 250)	With this function inadvertently forgotten switch-back of the control to external operation via the gas counter after maintenance work can be carried out automatically by the control. Setting of time to "0 minutes" deactivates automatic switch-over.

No.	Sub-menu / parameter	type of input	comment
12	start totals at: >13.12.2005 10:20	display only	Here it is shown when the totalizers of the odourant and the gas volume were reset.
13	cancel totals? > no	selection	Here the totalizers shown above can be cancelled. Date and time will be saved and can be read off in the previous dialogue. Selections poss.: • no • yes
14	*meas. cycles to error* *> 3 meas. cycles*	*numerical* *(1 - 99)*	*Number of measuring cycles until error is signalled* *Further description at the end of the operating instruction* [2]
15	*perm. tolerance* *> 10 %*	*numerical* *(1 - 99)*	*Tolerance between desired and actual value leading to error signal*
16	cancel error memory > no	selection	Here the complete error memory can be cancelled. Current, active errors or alarms will be entered into the error memory again immediately! Selections poss.: • no • yes
17	*password system* *>*	*numerical* *(0000 - 9999)*	*Entering the password for releasing further menus (works setting 0001). When entered correctly "OK" appears after pressing ENTER. When password is not correct the original dialogue appears again.*
18	parameter system input	display only	Information that system parameter input begins here.
19	language > deutsch	selection	Switch-over of menu languages Selections poss.: • deutsch • english • espanol • français • portugues • nederlands
20	pump type > MAH/MBH/PBH	selection	Selection of metering pump to be controlled. Selections poss.: • MAH/MBH/PBH • MLM 15 • Pump with frequency inverter • Pump pulse operation • MLM 40 • Pump with adjusting signal adapter Further description at the end of the operating instruction [3]
21	max. stroke frequency > 180 1/min	numerical (001 - 360)	Input of the max. stroke frequency of metering pump
22	duration of stroke > 180 ms	numerical (050 - 600)	Input of metering pump stroke duration. For metering pumps MLM 15 or MLM 40 the stroke is stopped via the proximity switch and a long stroke duration should be set. The maximum value that can be set for the stroke duration depends on the selected max. stroke frequency.
23	max. pump flowrate > 0.20 l/h	numerical (0.01 – 99.99)	Input of max. flowrate of metering pump

No.	Sub-menu / parameter	type of input	comment
24	*min. adjust. signal* *>10%*	*numerical* *(1 - 99)*	*Input of the minimum adjusting signal for a speed-controlled metering pump. The signal must not fall below this value in order avoid overheating of motor. If the gas volume decreases so that the minimum set value is not maintained the metering pump will be stopped and re-started when at least 3 pump strokes must be carried out. So the adjusting range of the metering pump is considerably increased. The minimum value of the adjusting signal depends on the type of metering pump chosen.*
25	*analogu. adjust. signal* *>0-20 mA*	*selection*	*Selection of the signal to a frequency inverter for speed control resp. an adjusting signal adapter for speed and stroke length control.* *Selections poss.:* • *0-20 mA* • *4-20 mA* *Further description at the end of the operating instruction*
26	act. value pick-up > KMM	selection	Selecting the flowmeter in the metering line. Selections poss.: • none • KMM • KMM with 5 contacts • FM with pulse output (oval wheel meter, piston meter, mass flowmeter, etc.)
27	*cali. act. val. pick-up* *> 5.00 ml*	*numerical* *(1.00 - 99999.99)*	*Input of measuring volume of actual value sensor KMM.*
28	*cali. act. val. pick-up* *>500 pulses / l*	*numerical* *(155 - 99999999)*	*Input of pulses per litre of the actual value sensor FM with pulse output*
29	guide signal(s) >digital	selection	Selection which type of signals are emitted by the gasmeters Selections poss.: • digital • analogue
30	no. of gascounters >1	numerical (1 - 3)	Input of the number of gasmeters connected.
31	*pulse value GC 1* *> 1.00 Nm³ / pulses*	*numerical* *(0.01 - 999.99)*	*Input of the pulse value of the first digital gasmeter*
32	*pulse value GC 2* *> 1.00 Nm³ / pulses*	*numerical* *(0.01 - 999.99)*	*Input of the pulse value of the second digital gasmeter*
33	*pulse value GC 3* *> 1.00 Nm³ / pulses*	*numerical* *(0.01 - 999.99)*	*Input of the pulse value of the third digital gasmeter*
34	*analogue signal GC 1* *> 0 - 20 mA*	*selection*	*Selection of the signal from the first analogue gasmeter. If a signal of 4 – 20 mA is selected, disengageable signal monitoring is activated additionally and if the current falls below 3,6 mA an alarm will be triggered.* *selections poss.:* • *0 - 20 mA* • *4 - 20 mA*
35	*volume GC 1 at 20 mA* *> 10000 Nm³ / h*	*numerical* *(100 - 9999999)*	*Input of gas volume per hour of the first analogue gasmeter at a signal of 20 mA*
36	*analogue signal GC 2* *> 0 - 20 mA*	*selection*	*Selection of the signal from the second analogue gasmeter. If a signal of 4 – 20 mA is selected, disengageable signal monitoring is activated additionally and if the current falls below 3,6 mA an alarm will be triggered.* *selections poss.:* • *0 - 20 mA* • *4 - 20 mA*

No.	Sub-menu / parameter	type of input	comment
37	*volume GC 2 at 20 mA* *> 10000 Nm³ / h*	*numerical* *(100 - 9999999)*	*Input gas volume per hour of the second analogue gasmeter at a signal of 20 mA*
38	*analogue signal GC 3* *> 0 - 20 mA*	*selection*	*Selection of the signal from the third analogue gasmeter. If a signal of 4 – 20 mA is selected, disengageable signal monitoring is activated additionally and if the current falls below 3,6 mA an alarm will be triggered.* *selections poss.:* • *0 - 20 mA* • *4 - 20 mA*
39	*volume GC 3 at 20 mA* *> 10000 Nm³ / h*	*numerical* *(100 - 9999999)*	*Input gas volume per hour of the third analogue gasmeter at a signal of 20 mA*
40	*gas pressure inlet?* *> no*	*selection*	*Selection if a pressure sensor in the gas line is connected for converting operating to standard cubic meters* *Selections poss.:* • *no* • *yes* *Further description at the end of the operating instruction* [4]
41	*signal gas pressure* *> 0 - 20 mA*	*selection*	*Selection of the signal from the gas pressure sensor. If a signal of 4 – 20 mA is selected, disengageable signal monitoring is activated additionally and if the current falls below 3,6 mA an alarm will be triggered.* *selections poss.:* • *0 - 20 mA* • *4 - 20 mA*
42	*gas pressure at 20 mA* *> 16 bar*	*numerical* *(1 - 999)*	*Input of pressure at a signal of 20 mA*
43	*odourant volume imp.* *> 10 ml/pulse*	*selection*	*Selection if one pulse per 1 ml or 10 ml of odourant metered should be emitted. The selection ”0 ml/pulse” can be selected for switch-off of the relay when not used.* *Selections poss.:* • *0* • *1* • *10* *Further description at the end of the operating instruction* [5]
44	*control* *> on*	*selection*	*Control of metered flow is switched on or off* *Selections pos.:* • *off* • *on* *Further description at the end of the operating instruction* [6]
45	concentr. des. value > internal	selection	Selection if the desired value of the concentration is entered or applied internally via the keyboard, via an external analogue signal (0/4 – 20 mA) or via a serial interface. Selections poss.: • internal • external analogue • RS 232/485 (appears only if parameter ”coupling with RSXXX” is selected)
46	*ext. concentr. meas.* *>no*	*selection*	*Selection if an external concentration measurement is carried out.* *Selections poss.:* • *no* • *pre-odourant concentration* • *end odourant concentration* *Further description at the end of the operating instruction* [7]

No.	Sub-menu / parameter	type of input	comment
47	*concentration signal* *> 0 - 20 mA*	*selection*	*Selection of the signal for the analogue desired value concentration resp. actual value for an external concentration measuring. If a signal of 4 – 20 mA is selected, disengageable signal monitoring is activated additionally and if the current falls below 3,6 mA an alarm will be triggered.* *selections poss.:* • *0 - 20 mA* • *4 - 20 mA*
48	*concentr. at 20 mA* *> 50.0 µl / Nm³*	*numerical* *(1.0 - 100.0)*	*Input of the concentration required at a signal of 20 mA*
49	*duration gas analysis* *>10 minutes*	*numerical* *(1 – 255)*	*Flexible adaptation to the conditions of the odourizing unit for final concentration measuring possible. Here the waiting time up to the end of the odourant concentration measuring by the gas chromatograph can be adapted optimally. To assure a safe analysis the time should be set higher than the actual analysis period lasts according to the manufacturer. Only if both have elapsed the dead time as well as the analysis time the actual value concentration is taken over.*
50	*measuring dead time* *>10 minutes*	*numerical* *(1 - 2880)*	*Waiting time at the end concentration control until the concentration was conveyed from the injection point to the measuring point and at least two measurements of the gas chromatograph can be carried out.* *The odourizing control calculates a correspondingly longer or shorter dead time for a lower or higher gas flow.*
51	*dead time at gasflow* *>20000 Nm³/h*	*numerical* *(100-9999999)*	*The before mentioned dead time always refers to a certain gas flow which must be communicated to the control so that the dead time can be increased resp. reduced corresponding to a lower or higher gas flow. With analogue gas counters the dead time refers to the maximum gas volume at 20 mA of all gas counters connected.*
52	*anal. output concentr.* *> 0 - 20 mA*	*selection*	*Selection of the signal for the actual value of the concentration. The actual value of the concentration is shown in the display only with a flow meter installed in the metering line and emitted as analogue signal (0/4 – 20 mA)* *selections poss.:* • *0 - 20 mA* • *4 - 20 mA*
53	*20 mA at concentr.* *> 50 µl / Nm³*	*numerical* *(1.0 - 100.0)*	*Input at which concentration a signal of 20 mA is emitted.*
54	lack of prod. relay > off	selection	Selection if the lack of product is signalled via the common alarm relay or the lack of product relay. Selections poss.: • off • on
55	flow alarm relay > off	selection	Selection if the flow alarm (overmetering or flow too low) is signalled via the common alarm relay or the flow alarm relay. Selections poss.: • off • on

No.	Sub-menu / parameter	type of input	comment
56	SV in dischar. line? > off	selection	Selection if the solenoid valve in the discharge line is activated. Selections poss.: • off • on Further description at the end of the operating instruction [8]
57	SV in filling line? > off	selection	Selection if the solenoid valve in the filling line from the barrel or to the supply vessel is activated. Selections poss.: • off • on Further description at the end of the operating instruction [9]
58	*filling logic?* *> no*	*selection*	*Selection if a filling logic for coupling of a bulk containers should be activated.* *Selections poss.:* • *no* • *without suction pressure* • *with suction pressure* *Further description at the end of the operating instruction [10]*
59	*switch-over P1 / P2?* *> no*	*selection*	*Selection if and how a switch-over between operating and stand-by pump should take place* *Selections poss.:* • *no* • *manual* • *automatic*
60	*switch-over P1 / P2?* *> on site*	*selection*	*Selection how the pumps are switched over* *Selections poss.:* • *on site* • *via RS 232/485* • *on site and via RSXXX*
61	*switch-over cycle* *> 0 hours*	*numerical* *(0 – 9999)*	*With automatic pump switch-over activated the control switches automatically over to the other metering pump and time restarts after the switch-over cycle set has elapsed. Setting a time of "0 hours" deactivates the switch-over cycle. If switch-over is activated manually or by an alarm recognised time is restarted as well.* *This function assures higher reliability of the unit as both metering pumps are operated and vented equally!* *The switch-over cycle should be set to approx. 720 hours so that metering pumps are switched over once a month.*
62	average val. gas vol. ? > no	selection	Selection if the gas volume is integrated and metering at an average value takes place when a gasmeter breaks down. Selections poss.: • no • yes Further description at the end of the operating instruction [11]
63	*integration time* *> 24 hours*	*numerical* *(2 - 168)*	*Input of the integration time for forming the average value of the gas volume*
64	min. limit value GC1 > 0 Nm³ / h	numerical (0 - 999999)	Input of the minimum gas flow below which gasmeter break down should be recognised at gasmeter 1. If value falls below the limit value an alarm is displayed and triggered via the common alarm relay. By entering 0 Nm³/h the control is de-activated.

No.	Sub-menu / parameter	type of input	comment
65	*min. limit value GC2* *> 0 Nm³ / h*	*numerical* *(0 - 999999)*	*Input of the minimum gas flow below which gasmeter break down should be recognised at gasmeter 2.* *If value falls below the limit value an alarm is displayed and triggered via the common alarm relay.* *By entering 0 Nm³/h the control is de-activated.*
66	*min. limit value GC3* *> 0 Nm³ / h*	*numerical* *(0 - 999999)*	*Input of the minimum gas flow below which gasmeter break down should be recognised at gasmeter 3.* *If value falls below the limit value an alarm is displayed and triggered via the common alarm relay.* *By entering 0 Nm³/h the control is de-activated.*
67	function input 6 > slug odourization	selection	Selection if slug odourization is switched on with input 6 or if the metering pump is stopped by stop odourization and the signals from the gasmeters are ignored. Selections poss.: • stop odourization • slug odourization Further description at the end of the operating instruction 12
68	serial interface > RS 232 / 485	selection	Selection of the serial interface which should be connected. Selections poss.: • RS 232 • RS 485 Further description at the end of the operating instruction 13
69	Baudrate > 9600 Baud	selection	Selection of the Baudrate (velocity) of the serial interface Selections poss.: • 9600 Baud • 4800 Baud • 2400 Baud • 1200 Baud • 300 Baud
70	coupling with RSXXX? > no	selection	Selection if the coupling with the main control room takes place via the serial interface. Selections poss.: • no • with master station • via modem • via Internet
71	*RS XXX equip. address* *> 1*	*numerical* *(1 - 99)*	*Input of a unique equipment address for the coupling with the main control room*
72	*phone number* *>071521418000*	*numerical* *19 digits*	*Here the phone number (possibly with 0 or country code before) is entered to communicate with the main control room via modem (software V1.09 and up).* *The phone number must be entered without blank spaces and max. 19 digits.*
73	charge contr. signal > no	selection	Selection if a signal contact of the solar charge controller should be monitored. Selections poss.: • no • yes
74	battery monitoring > no	selection	Selection if the battery voltage of a 24 VDC supply should be monitored. Selections poss.: • no • yes
75	date > 09.01.2006	numerical	Input of current date

No.	Sub-menu / parameter	type of input	comment
76	time > 15:10	numerical	Input of current time
77	password parameter > 1	numerical (0 - 9999)	Input of parameter password which is compared with the password called off.
78	password system > 1	numerical (0 - 9999)	Input of system password which is compared with the password called off.
79	settings parameter > save in EEPROM	selection	Selection if the parameters set should be saved in the EEPROM or if the parameters saved should be down loaded from the EEPROM again e.g. after a replacement of the battery RAM Selections poss.: • save in EEPROM • load from EEPROM
80	cancel average gas?	selection	Selection if the average values of the gas volume shall be cancelled. Selections poss.: • no • yes
81	test programs control stopped	display only	Here the test programs to check hardware and wiring start. For some test programs the regular process is interrupted resp. the program is stopped.
82	test KMM	test program	In this test program the number of pump strokes of a measuring section of the KMM is displayed. After contact RII has been activated the metering pump is stopped to calibrate the volume of the KMM. By pressing push button “Reset ESC” the metering pump starts again. The test program is started and stopped by pressing “ENTER”.
83	test flowmeter with pulse output	test program	In this test program the number of pump strokes and the number of pulses of the flowmeter with pulse output is displayed. By pressing push button “Reset ESC” the counters are reset. The test program is started and stopped by pressing “ENTER”.
84	analogue inputs 1 - 5 >	test program display only	The analogue inputs are displayed in mA resp. Volt by pressing ENTER. The test program is started and stopped by pressing “ENTER”. Assignment of inputs: 1 = gas counter 1 2 = gas counter 2 3 = gas counter 3 resp. gas pressure 4 = pre-selection of concentration resp. concentration measured 5 = battery voltage
85	analog. outp. concentr. > 0.00 mA	test program numerical (0.00 - 20.00)	Input of a desired output current in 0 - 20 mA.
86	analog. outp. adj. sign > 0.00 mA	test program numerical (0.00 - 20.00)	Input of a desired output current in 0 - 20 mA

No.	Sub-menu / parameter	type of input	comment
87	digital inputs 1 - 9	test program display only	Here the logic conditions “L” or “H” of the inputs are displayed. The test program is started and stopped by pressing “ENTER”. Assignment of inputs: 1 = gas counter 1 2 = gas counter 2 3 = gas counter 3 4 = input of the frequency inverter resp. charge controller 5 = ext. reset input 6 = input ”slug odourization” resp. ”stop odourization” 7 = input from P1/P2 switch-over relay 8 = proximity switch MLM pump 9 = RI from KMM resp.
88	digital inputs 10 – 17	test program display only	Here the logic conditions “L” or “H” of the inputs are displayed. The test program is started and stopped by pressing “ENTER”. Assignment of inputs: 10 = RII from KMM or from the flowmeter with pulse output 11 = lack of product LSLL 12 = contact LSHH 13 = push button RESET 14 = push button ”Int/Ext” 15 = push button “▲” 16 = push button “▼” 17 = contact LSH resp. proximity switch of 2. MLM pump
89	pump output > off	test program selection	Selection if a pump stroke should be performed. Selections poss.: • off • on
90	rel. common alarm > off	test program selection	Selection if the relay common alarm shall be switched on or off. Selections poss.: • off • on
91	rel. flow alarm > off	test program selection	Selection if the relay flow alarm shall be switched on or off. Selections poss.: • off • on
92	rel. lack of product > off	test program selection	Selection if the relay lack of product shall be switched on or off. Selections poss.: • off • on
93	rel. pulse / XX ml > off	test program selection	Selection if the relay pulse / XX ml shall be switched on or off. Selections poss.: • off • on
94	rel. SV1 KMM > off	test program selection	Selection if the solenoid valve SV1 of the KMM shall be switched on or off. Selections poss.: • off • on

No.	Sub-menu / parameter	type of input	comment
95	rel. SV2 KMM > off	test program selection	Selection if the solenoid valve SV2 of the KMM resp. the vacuum pump shall be switched on or off. Selections poss.: • off • on
96	rel. SV in discharg. > off	test program selection	Selection if the solenoid valve in the discharge line shall be switched on or off. Selections poss.: • off • on
97	rel. SV in filling > off	test program selection	Selection if the solenoid valve in the filling line shall be switched on or off. Attention: When the LSHH-contact is reached the solenoid valve is switched off directly from the Ex-input board. Selections poss.: • off • on
98	rel. switch P1/P2 > off	test program selection	Selection if the electric surge relay for the switch-over of the pumps shall be switched on or off. Selections poss.: • off • on
99	password LEWA >	numerical (0 -9999)	Input of the password to open basic menu settings. When entered correctly “OK” appears after pressing ENTER. If password was not correct the original dialogue appears again.
100	0 mA analogue inp. 1 > 0 0	take over	Taking over of the present current signal (figure on the left) as value for 0 mA by pressing “ENTER”
101	20 mA analogue inp. 1 > 0 1017	take over	Taking over of the present current signal (figure on the left) as value for 20 mA by pressing “ENTER”
102	0 mA analogue inp. 2 > 0 0	take over	Taking over of the present current signal (figure on the left) as value for 0 mA by pressing “ENTER”
103	20 mA analogue inp. 2 > 0 1014	take over	Taking over of the present current signal (figure on the left) as value for 20 mA by pressing “ENTER”
104	0 mA analogue inp. 3 > 0 0	take over	Taking over of the present current signal (figure on the left) as value for 0 mA by pressing “ENTER”
105	20 mA analogue inp. 3 > 0 1013	take over	Taking over of the present current signal (figure on the left) as value for 20 mA by pressing “ENTER”
106	0 mA analogue inp. 4 > 0 0	take over	Taking over of the present current signal (figure on the left) as value for 0 mA by pressing “ENTER”
107	20 mA analogue inp. 4 > 0 1022	take over	Taking over of the present current signal (figure on the left) as value for 20 mA by pressing “ENTER”
108	0 V analogue inp. 5 > 0 0	take over	Taking over of the present voltage applied (figure on the left) as value for 0 V by pressing “ENTER”
109	30 V analogue inp. 5 > 1018 1017	take over	Taking over of the present voltage applied (figure on the left) as value for 30 V by pressing “ENTER”
110	0 mA analogue outp. 1 > 42	numerical (0 - 200)	Input of a value which corresponds to an output current of 0 mA at analogue output 1.
111	20 mA analogue outp. 1 > 4003	numerical (0 - 4095)	Input of a value which corresponds to an output current of 20 mA at analogue output 1.
112	0 mA analogue outp. 2 > 43	numerical (0 - 200)	Input of a value which corresponds to an output current of 0 mA at analogue output 2.
113	20 mA analogue outp. 2 > 3996	numerical (0 - 4095)	Input of a value which corresponds to an output current of 20 mA at analogue output 2.

No.	Sub-menu / parameter	type of input	comment
114	clock switch off / on > off	selection	Selection if clock shall be switched on or off. Selections poss.: • off • on
115	unit of gas flow >Nm³/h	selection	Selection of the unit displayed in ”Ext.” operation und in some dialogues of the menu tree. Selections poss.: • Nm³/h • l/h • kg/h • m³/h
116	pick.-corr. min. speed > 1.000	numerical (0.001 – 9.999)	Input of a correcting value for the actual value sensor which possibly shows different gap losses at min. speed to max. speed during operation with frequency inverter.
117	supervise 4 mA? > yes	selection	Selection if the current signal 4-20 mA shall be monitored and an alarm signal shall be triggered if applicable. Selections poss.: • yes • no
118	no. of pushbuttons > 4 push buttons	selection	Selection if the control shall work with 4 or 6 control push buttons. selections: • 4 (for OEXD) • 6 (for OKR7)
119	vessel refill. time > 20 minutes	numerical (20 – 99)	Input of time permissible for filling of supply vessel from a barrel. After this time has elapsed the solenoid valve in the filling line will be closed and ”lack of product” is signalled. This serves to avoid unnecessary obnoxious smell.
120	modem CONNECT-no. > 5 (max. 255)	numerical (0 – 255)	Input of number which modem sends to the control if the connection has been established.
121	meas. cycle duration >100 pump strokes	numerical (0 – 999)	Input of the number of pump strokes after which a measuring cycle² is completed. The standard value of 100 pump strokes should not be changed as this results in a deterioration of the precision of measurements (number<100) resp. a longer waiting time for one measuring cycle (number>100).
122	reporting contacts >standard	selection	Possible change of the function of the reporting contacts ”flow alarm” and ”pulse/xx ml” according to the requirements of Messrs. ENAGAS. With the selectio ”ENAGAS” the opening of the contact shows ”flow alarm” if the metering pump has been switched over due to a failure. The contact ”pulse/xx ml” is opened if the second metering pump does not perform correct metering either in order to show that both metering pumps are malfunctioning. Selections poss.: • standard • ENAGAS

5.5 Shut down

5.6 Dismantling and return transportation

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6 Maintenance and repairs

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7 Fault; symptoms, remedial action

Alarm signal and meaning	Remedial action
“over-metering” or **“flow too low”** Possible causes: • pump valves contaminated • dirt in the actual value sensor • air in metering line	• calibrate pump and clean pump valves if required • clean and check actual value sensor or filter • vent metering line
“HELP no feed-back” No feed-back from the actual value sensor was recorded in the metering line. This signal is generated if there is no feedback from the actual value sensor after the triple theoretical number of strokes of the metering pump.	Check if: • pump strokes are being carried out • pump operates • the solenoid valve of the KMM addressed receives power • the solenoid valve addressed forms a magnetic field • the polarity of the actual value feedback signal is correct • the correct max. pump output has been entered!
“gas flow too high” Possible causes: • wrong pump selection • the desired value is too high • the gasmeter parameters are wrong • the pump valves are contaminated • air in the metering line	• adapt desired value to the max. pump output • check gasmeter parameters • calibrate pump and clean pump valves if required • vent metering line
“prox. switch defect.” No proximity switch was recognised with a metering pump MLM15 or MLM40 entered	Check polarity and function of proximity switch.
“prox. switch not reach” The proximity switch has not switched off the pump stroke with a metering pump MLM14 or MLM40 entered.	Check if: • proximity switch setting (distance) is correct • proximity switch is in order • pump fuse is in order • the metering line is not shut-off (possibly a solenoid valve is defect.)
”power on” Date and time are shown after control has been switched on.	
“lack of product LSLL” The float switch in odourant supply vessel was opened or no float switch is connected.	• In case no float switch is used the [EEx i] input must be jumped. • The minimum level of the odourant vessel was reached, it must be refilled.
“max. alarm LSHH” The float switch in odourant supply vessel was opened or no float switch is connected.	• In case no float switch is used the [EEx i] input must be jumped. • The maximum level of the odourant vessel was reached, manual filling of vessel must be stopped to prevent spilling of odourant.
“P1/P2-relay defective” No feed-back was recorded by the switch-over relay when switch-over from operating pump to stand-by pump took place.	• check switch-over relay
”RS XXX failure” During serial communication invalid characters were received.	• Check selection of serial interfaces and baudrate.
“battery empty” Voltage of solar battery has fallen below 20 V.	• check condition of solar battery (acid level) • check function of charge controller
“RAM defective” The battery-RAM does no longer contain the required designation, it was possibly cancelled by an empty buffer battery. Now incorrect parameters can be set.	• check parameters and load saved parameterising from the EEPROM if required. • installation of new battery RAM by LEWA and new parameterising
“new initialised” The control has recognised an empty battery-RAM and initialised it with basic data.	• check parameterising and adapt to odourant unit, metering pump and gasmeter.
“rise make-up meter.” It was recognised that the gas volume to be odourized is continuously increasing.	• calibrate pump and clean pump valves if required • clean and check actual value sensor or filter • check gasmeter parameters (value, max. gas volume etc.)

Alarm signal and meaning	Remedial action
“analog. sig. GC 1 def.” The analogue signal 4 - 20 mA of the gasmeter 1 has fallen below 3,6 mA.	• check gasmeter • check installation
“analog. sig. GC 2 def.” The analogue signal 4 - 20 mA of the gasmeter 2 has fallen below 3,6 mA.	• check gasmeter • check installation
“analog. sig. GC 3 def.” The analogue signal 4 - 20 mA of the gasmeter 3 has fallen below 3,6 mA.	• check gasmeter • check installation
“signal gas press. def.” The analogue signal 4 - 20 mA of the pressure sensor in the gas line has fallen below 3,6 mA.	• check pressure sensor • check installation
“signal concentr. def.” The analogue signal 4 - 20 mA of the external desired concentration value has fallen below 3,6 mA.	• check desired value sensor • check installation
“limit gas counter 1 ” The value of gasmeter 1 has fallen below the pre-set limit.	• check gasmeter • check parameterising of gasmeter 1 • for deactivating pre-select value “0”
“limit gas counter 2 ” The value of gasmeter 2 has fallen below the pre-set limit.	• check gasmeter • check parameterising of gasmeter 2 • for deactivating pre-select value “0”
“limit gas counter 3 ” The value of gasmeter 3 has fallen below the pre-set limit.	• check gasmeter • check parameterising of gasmeter 3 • for deactivating pre-select value “0”
“ratio out of range” The ratio between the signals from the gasmeters and the pump strokes has reached a non-permissible value.	• calibrate pump and clean pump valves if required • clean and check actual value sensor or filter • check parameterising of gasmeter (value, max. gas volume etc.)
“P1 def., switched-over” A failure was recognised at metering pump 1 and it was automatically switched-over to metering pump 2.	• check metering pump 1 • clean and check actual value sensor or filter • check level in odourant vessel
“P2 def., switched-over” A failure was recognised at metering pump 2 and it was automatically switched-over to metering pump 1.	• check metering pump 2 • clean and check actual value sensor or filter • check level in odourant vessel
“EEPROM failure” An error has occurred during writing to or reading from the EEPROM.	• try again • in case further tries are without success please contact the LEWA service department
“eff. deviation” The deviation of the output efficiency of the metering pump compared to the parameterising has reached a level which is not permissible.	• calibrate pump and clean pump valves if required • clean and check actual value sensor or filter
“motor alarm” During operation of metering pump EK or FC the motor temperature must be monitored by thermistors. The corresponding triggering device and the motor protection switch, by a closed contact, indicate that drive is in order.	• check triggering device and motor protection switch • check installation • does the motor power match the pump?
“alarm charge contr.” During supply of the unit with 24 V DC via solar modules a contact of the charge controller has signalled alarm.	• check charge controller
“PTC alarm” During operation of metering pump MLM 40 or a motor driven metering pump EK or FC the solenoid resp. motor temperature must be controlled by a thermistor. The solenoid resp. motor must be switched off at excess temperature and a corresponding signal is issued to the control.	• check triggering device • check installation • check pressure conditions • check power part of the control
”wrong characters” During serial communication invalid characters were received.	• Check selection of serial interfaces and baudrate.

Alarm signal and meaning	Remedial action
”EEPROM defective” By checking during the saving procedure it was noticed that the EEPROM does not save correctly.	• EEPROM must be replaced by LEWA
”wrong parameters” During initialising of the control illogical values were found in the parameters of the analogue inputs or outputs.	• Please check all parameters and carry out re-adjustment of analogue inputs and outputs with the assistance of LEWA, if required.
”conc.ratio too large” For a selected end concentration control the ratio between the gas counter input and the metering pump control determined is too large.	• Check signals of gas chromatograph • calibrate pump and clean pump valves if required
”switch-over cycle” Switch-over from working to stand-by pump has been carried out acc. to switch-over time set.	• This is no alarm message but an information for logging.

All alarms must be cancelled by pressing push button “Reset ESC” or the external reset input after the problem was corrected. As the ”Reset ESC” button has several functions it must possibly be double-clicked within one second to cancel an alarm signal!

All alarm relays activated operate on the quiescent current principle. They are always activated during normal operation and so automatically signal a break down even when the mains power is lost.

A present failure is displayed at the control OEXD in the LCD display with a black rectangle, at the control OKR 7 the LED of the **”Reset ESC”** push button lights up. This rectangle resp. the red LED remain activated until one of the signal relays is activated, that is switched off.
If an alarm in the LCD display was cancelled by pressing **”Reset ESC”** push button but the failure still exists the function **”cancel alarm”** can be activated again by a double click on **”Reset ESC”** push button or via the external reset input.

1 Switch-over P1/P2:

As an option the control can be equipped with an electric surge relay for switching-over from the operating pump to a standby-pump. The switch-over of the pumps can be carried out manually or automatically if a flowmeter is installed in the metering line. If selected, it will be automatically switched over to the standby-pump, error is displayed and signalled via the common alarm signal relay when failure of the metering pump is recognised.

2 Measuring cycle:

For flow measuring one measuring cycle normally consists of at least 100 pump strokes. If a flowmeter with pulse output (e.g. oval wheel counter, piston meter, mass flowmeter) is used as actual value sensor at least 50 pulses from the flowmeter must be received to complete a measuring cycle. If one of the conditions is not fulfilled the duration of the measuring cycle will be extended automatically and e.g. at the KMM another measuring sequence is added to the measuring cycle.

3 Adjusting signal adapter:

For this selection a metering pump with frequency inverter und stroke adjustment can be controlled.
For separation of the adjusting signal into speed- and stroke adjusting signal the adjusting signal adapter is required here. In this case the ”min. adjust. sign.” can be set up to 1%.

4 Gas pressure input:

Alternatively to the 3. analogous gasmeter an analogue signal (0/4 - 20 mA) from a pressure sensor in the gas line of gas counter 1 can be connected to convert from operating cubic meters to standard m³.
At a signal of 4 - 20 mA an additional monitoring of the signal is activated and an alarm is triggered if the current falls below 3,6 mA.

5 Odourant volume pulse:

If a flowmeter is installed in the metering line an output pulse with a voltage-free relay contact per 1ml resp. 10 ml (depending on the setting) odourant metered is issued by the control. The pulse duration is 300 ms. This pulse output can be added up with a totalizer for totalizing.

6 Closed loop operation:

When the odourant control is operated together with a flowmeter in the discharge or suction line of the metering pump the actual metered flow is measured and adjusted via a closed loop control when this function is activated. During closed loop operation the ratio between the input signals and the number of strokes of the metering pump is calculated based on the actual value and the feedback signal received from the flowmeter installed in the metering line. When a deviation of the concentration exceeding the permissible tolerance is noticed an alarm is triggered at the common alarm relay or at the flow alarm signal relay, if activated.
When operated without a flowmeter in the discharge or suction line of the metering pump the ratio between the input signals and the number of pump strokes is calculated and issued based on the desired value and the pre-set max. pump flowrate in XX.XX l/h. Monitoring or closed loop control is not possible in this case.

7 External measuring of odourant concentration:

The analogue signal of a gas chromatograph which measures the odourant concentration in the gas can be connected to the odourant control. Using this signal the odourant volume to be metered can be calculated in order to determined the odourant concentration set downstream of the odourizing unit. The measurement of concentration can be carried out before the injection point of the metering pump in order to subtract the already existing odourant concentration from the value preset. However the pre-selected final concentration can also be controlled. In this case the measurement must be carried out in a certain distance downstream of the injection point so that the odourant has time to distribute in the gas. In order to control the concentration the time (dead time) which passes until the metered concentration reaches the measuring point must be communicated to the odourant control
Please consider duration of the measuring period of the gas chromatograph.
The dead time parameterised should at least include two measurements of the gas chromatograph in order to assure that the measurement has been carried out correctly.

8 Solenoid valve in the metering line:

When the gas flowrate is very low it may be required to install a solenoid valve in the metering line to prevent that the odourant is forced back into the metering line. Together with the power output of the metering pump the relay for the solenoid valve in the metering line is activated for around 4 seconds. When a stroke frequency of approx. 15 strokes / minute is exceeded the solenoid valve remains open.

9 Solenoid valve in the filling line:

In case the odourant supply vessel is filled with suction pressure from a barrel it might be necessary for safety reasons to stop the odourant supply if a maximum vessel level is reached. For this purpose a relay can be activated for the control of a solenoid valve in the filling line. The relay is switched via the contacts of a float switch in the odourant supply vessel. With software V1.09 and up it is switched off with LSH contact or directly by an [EEx i]-input of the LSHH contact. When the float switch is switched-off by the LSHH contact an error is shown in the display and signalled via the common alarm relay.

10 Filling logic for automatic filling from a bulk container or a barrel:

The odourant control has a filling logic with two different methods of operation for automatic filling of the supply vessel of the odourizing unit from a bulk container. The filling logics described in the following require 3 feedback contacts from the supply vessel (LSLL, LSH and LSHH) to carry out the procedure.

”Filling logic without suction pressure”

For the filling logic without suction pressure a solenoid valve is required in the filling line. After a new bulk container has been connected the supply vessel must be filled with dialogue ”vessel start-up?”. The solenoid valve is opened until the LSH contact closes. After the solenoid valve in the filling line has closed the supply vessel is emptied. When the LSLL contact is reached the solenoid valve in the filling is opened again and the supply vessel is filled again. For monitoring of the filling procedure and for signalling a lack of product two time periods are used. When the LSLL contact is reached and opened a period of 25 second starts after this period has passed ”lack of product” is signalled and the solenoid valve in the filling line closes, if it is not stopped before by closing of the LSLL contact. Also a refilling time period in the range of 20 – 99 minutes, which can be set in the LEWA service level, starts and after it has passed also signals **”**lack of product” before the LSH contact is reached and the solenoid valve in the filling line closes. If, for some reason, the level in the supply vessel increases until the LSHH contact level is reached the solenoid valve in the filling line is closed immediately and an error is signalled in the LCD display as well as at the common alarm relay.

”Filling logic with suction pressure”

For filling logic with suction pressure a solenoid valve in the filling line and one in the venting line is required. After a new bulk container has been connected the supply vessel must be filled with dialogue ”vessel start-up?”. The solenoid valve in the venting line is opened until the LSH contact closes. After the solenoid valve in the venting line has closed odourant is pressed into the supply vessel until a pressure balance with the bulk container is reached. The solenoid valve in the filling line is permanently open in order to replace the odourant used by the metering pump. If the level in the supply vessel falls below the LSH level a process to convey possibly existing odourant from the bulk container into the supply vessel is initiated by opening the solenoid valve in the venting line. If this does not work or the LSLL contact opens the solenoid valves in the venting and in the filling line will be closed and ”lack of product” is signalled in the LCD display as well as at the signal relay. If, for some reason, the level in the supply vessel increases until the LSHH contact level is reached the solenoid valve in the filling line is closed immediately and an error is signalled in the LCD display as well as at the common alarm relay.

11 Forming the average value of the gas volume

To ensure continuous odourizing in case of breakdown of a gasmeter the control can form the average value of the gas flow over an adjustable period of time from 2 to 168 hours. When the breakdown of a gasmeter is recognised by the activated limit value control the gas flow is automatically simulated according to the determined average value. Error is displayed and signalled via the common alarm signal relay.
When the limit is exceeded again odourizing is done according to the direct signals from the gasmeter again.

12 Slug- resp. stop odourizing:

The external input 6 can alternatively be parameterised either for the function “slug odourizing” or “stop odourizing”. If the function “slug odourizing” is selected the gas flow recorded is doubled when a contact at the external input is being closed. If the function “stop odourizing” is selected the metering pump is stopped and the signals of the gas meters are ignored when a contact at the external input is being closed.

13 Serial interface

The odourant control has a serial interface RS 232/485. Via this interface a coupling with a main computer can be established. The character-oriented data transfer is based on frames with 20 ASCII-characters. A software for evaluation of the ASCII protocols must be provided by the customer. Through the coupling the following information can be exchanged over long distances:

- change concentration desired value
- display concentration actual value
- display and reset totalizers of odourant and gas volume
- display and reset alarm signals with date and time
- display of current operation mode
- switch-over operating pump
- display momentary gas flow
- display and change permissible tolerance

If RS 485 interface is used the 2-wire bus line can be up to 500 m long and up to 32 users can be connected. The line must be terminated at both ends by 150 Ohm termination resistor. The termination resistor is located on the upper p.c.b. and can be switched-in with a jumper at the right hand side next to the LCD-display.

Modem requirements for serial coupling

The modem must have the following setting options:

- auto answer
- no echo
- short-form feed-back codes
- settings entered must be saved power failure proof.

Issue January 2006

Creating Fluid Solutions

A MEMBER OF NIKKISO

LEWA pumps + systems

LEWA odorizing systems

for natural gas, biogas and liquefied gas

- **reliable**
- **safe**
- **economical**

For a wide range of applications: odorizing systems designed to meet your requirements

Odorization of LPG (Liquefied Petroleum Gas) during ship loading

Odorization for propane and butane and other technical gases

Odorization for oxygen and other technical gases

Customized solutions
Consumer protection is the prime concern in terms of odorizing city gas in distribution networks or oxygen odorizing in shipyards. LEWA not only supplies its customers with reliable odorizing systems but also supports them as a competent partner with extensive know-how in odorization.

The development of LEWA odorizing systems is based on over 30 years of comprehensive, worldwide studies conducted on requirements and regulations. Our systems meet national and international regulations and are noted for simple and safe operation and maintenance.

Covering a wide range of gases
LEWA offers standard odorizing systems as well as customized odorizing systems for odorizing the following gases and gas mixtures:

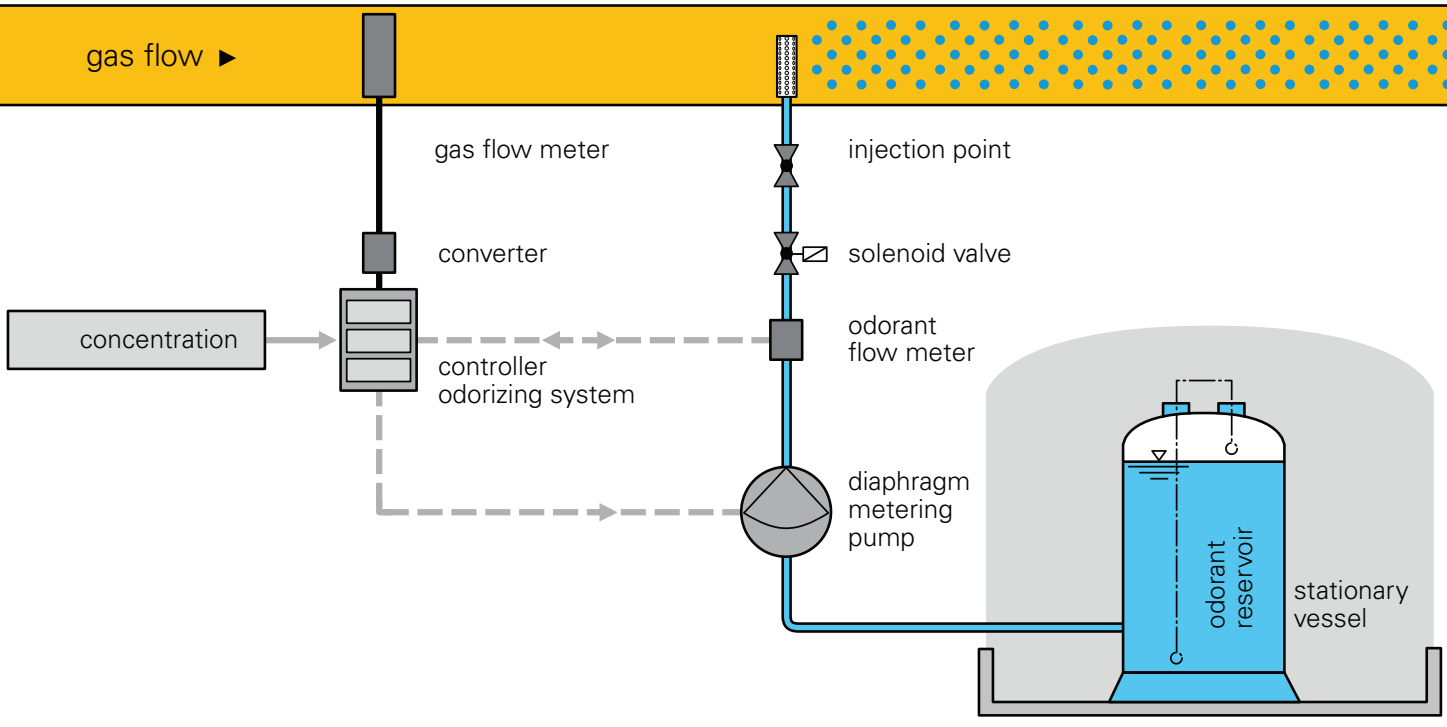
- natural gas (methane)
- liquefied gas (propane, butane)
- biogas
- technical gases (gas mixtures) oxygen, nitrogen and others

Economical metering of odorants
LEWA odorizing systems allow for safe and economical flow-proportional metering of all current sulphurous and sulphur-free odorants, e.g.:

- thioethers (Tetrahydrothiophene, Dimethylsulfide)
- thioles (Mercaptane, Mercaptane mixtures)
- acrylates (low-sulphur and sulphur-free)

Odorizing of natural gas

Very important for the consumer: proper injection rate of odorants when it comes to perceiving smells



Reliable and economical: LEWA odorizing systems

We offer standard and customized odorizing systems which are backed by more than 30 years of experience. Most of the components are modular in design thus enabling requirements for new upgrades to be met. Metering pumps, volume flow measuring system (odorant) and electronic components are from a single source.

Tanks in different sizes
We offer systems for stationary vessels and returnable tanks from 25 l to 1000 l and upon request, even tank sizes of up to 10,000 l.

Visible level indicator control
The visual level indicator can also be used for calibration purposes. Odorant low level indicators and control mechanisms to prevent overfilling according to TRbF (German regulation for the handling of combustible liquids) are installed in systems with a local tank as a standard.

Electronic controls
The controlling device provides flow-proportional odorization dependent on gas flow and is available in various designs.

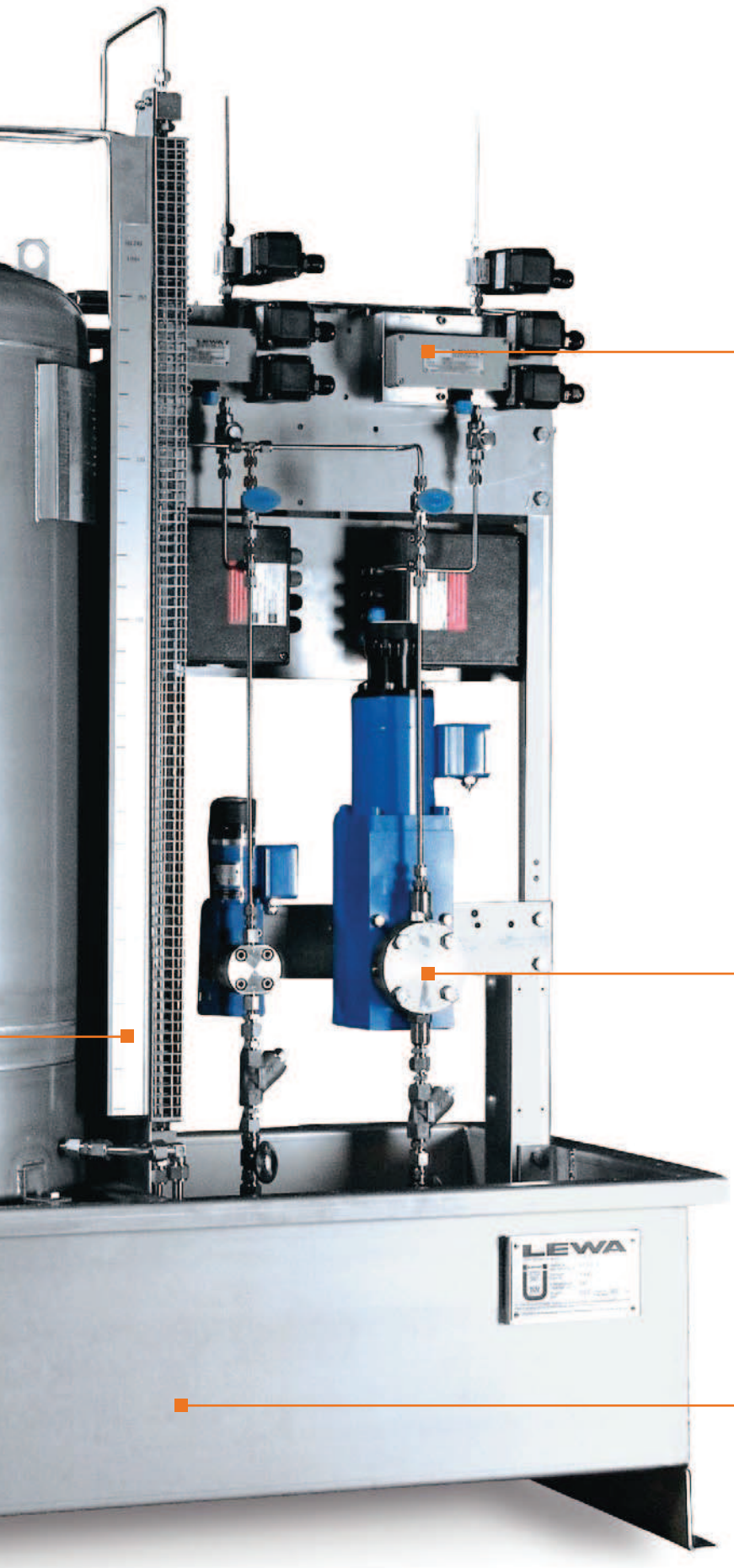


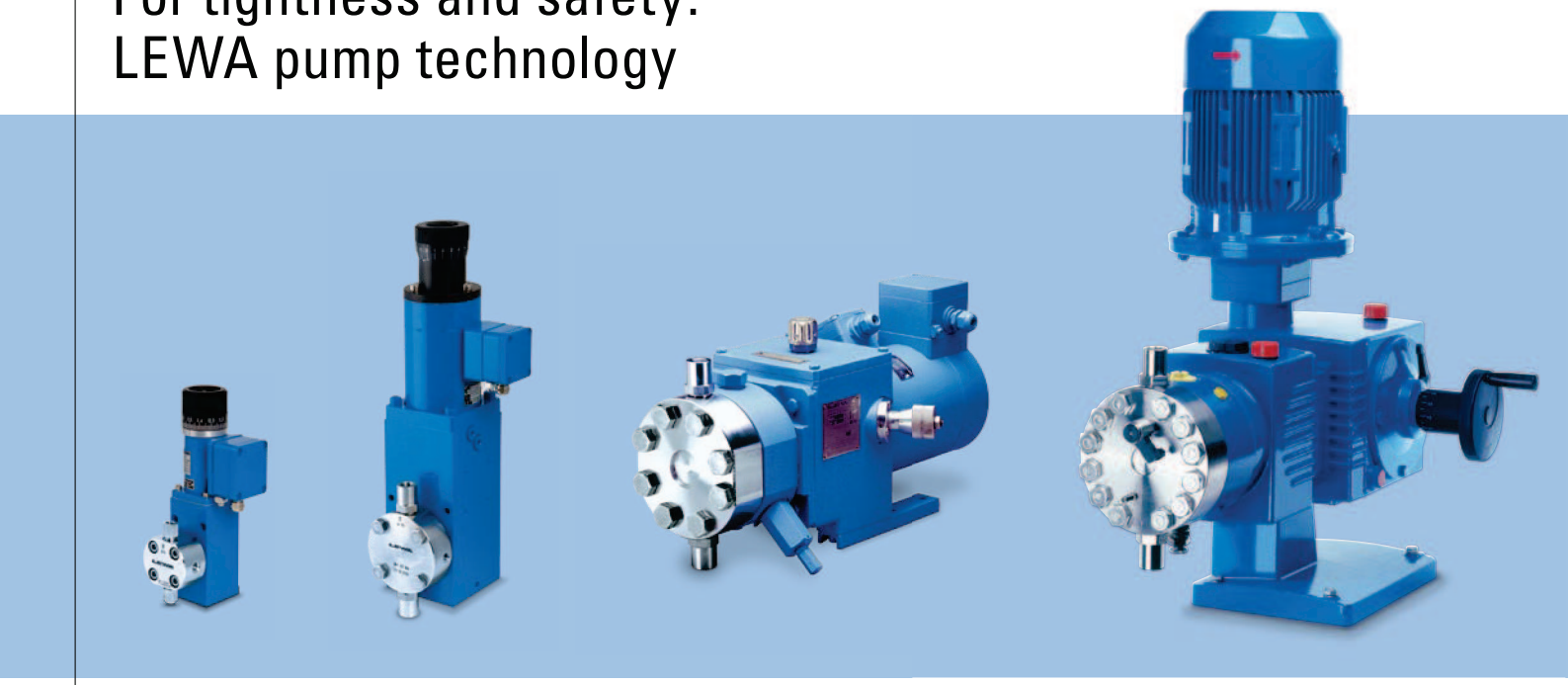
Photo: Odorizing system type OD 240

High degree of measuring accuracy
The flow meter monitors the odorant's metering flow. Depending on the size of the system and the design of the metering pump, we offer flow meters with a measuring accuracy of +/– 1 % to meet the individual local requirements.

Precise metering
LEWA diaphragm pumps are hermetically tight, provide for an extremely long service life and easy maintenance. The diffusion-tight metal diaphragm is hydraulically actuated thus minimizing wear and tear while considerably increasing reproducibility and reliability.

Leakproof
Drip pans meet the regulations for local systems for storing substances hazardous to waters. They conform to the WHG (Water Resources Act) and the VAwS (Land ordinances on storing, filling and transporting substances harmful to water) including all required documentation.

For tightness and safety: LEWA pump technology



Magnetically driven pump Type MAH

Magnetically driven pump Type MBH

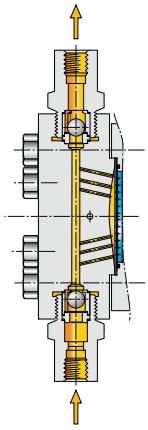
Magnetically driven pump Type MLM

Motor-driven pump Type ecoflow LDB

LEWA diaphragm pumps are precise, hermetically tight, provide an extremely long service life and are easy to maintain.
The diffusion-tight metal diaphragm is odor proof. The diffusion-tight metal diaphragm is hydraulically actuated thus minimizing wear and tear while considerably increasing reproducibility and reliability. All wetted parts are made of corrosion-resistant stainless steel.
Depending on the type of application, magnetically driven, pneumatically driven or electrically driven pumps are used.

Overview technical data

Magnetically driven pumps in the MAH series							
Plunger diameter	3	5	8				
Pump capacity [l/h]	0.175 -0.2	0.4 - 0.5	1.0 - 1.3				
Pressure [bar]	20 - 30	10 - 16	4 - 5				
Magnetically driven pumps in the MBH series							
Plunger diameter			8	10			
Pump capacity [l/h]			1.5 - 1.8	2.4 - 2.5			
Pressure [bar]			25 - 50	25 - 40			
Magnetically driven pumps in the MLM 15 series							
Plunger diameter	3	5	8	10	12		
Pump capacity [l/h]	0.3	1	2.8	5	7.5		
Pressure [bar]	300	80	30	20	10		
Magnetically driven pumps in the MLM 40 series							
Plunger diameter	3	5	8	10	12	16	
Pump capacity [l/h]	0.3	1	2.8	5	7.5	15	
Pressure [bar]	560	200	80	50	30	20	
Motor-driven pumps in the LEWA ecoflow LDB series							
Plunger diameter			8	10	12	16	20
Pump capacity [l/h]			5	9	12.5	25	35
Pressure [bar]			350	250	170	95	60



Type LEWA ecoflow

For precise adjustment and monitoring: electronic controls

modular design in 19" rack

modular design in wall casings

OKR 7 in 19" racks

OKR 7 in control cabinet for mounting on walls

For all installation sites: The electronic components specially designed for the open and closed loop control of LEWA Odorizing systems can be mounted in 19" assemblies or in housings with IP66 protection class and EExd protection class for hazardous areas.

LEWA odorization systems are open and closed loop controlled and monitored (optional) by specially developed electronic components. Most of the components have a modular design in order to meet requirements for new systems and upgrades from proportional control through to monitored and closed loop odorization.

Standard models: modular control

- safe and easy to operate
- IP 66 protective class
- casing available in 19" assembly racks or for wall mounting
- supply voltage of 100–240 V AC or 24 V DC

Flexibly upgradable: electronic regulation with OKR

- safe and easy to operate
- monitoring and closed loop control target/actual values
- indicator for odorant concentration (target/actual)
- IP 66 or EExd protection classes
- casing available in 19" assembly racks or for wall mounting
- supply voltage of 100–240 V AC or 24 V DC
- compatible with all pump drives
- available with RS 232, RS 485 or MODBUS interfaces (RTU)
- compatible with all current gas flow meters
- connectable to a solar energy system
- accessible and adjustable via Internet (option: LEWA Netport@l)
- compatible with all approved volume flow measuring systems (odorants)
- batch odorization optionally possible

OEXD for installation in hazardous areas

For local filling: systems with stationary vessels

Odorizing system OD450 series with 2 x MBH and 2 x MAH pumps

Odorizing system type OD240 with MAH and MBH pump

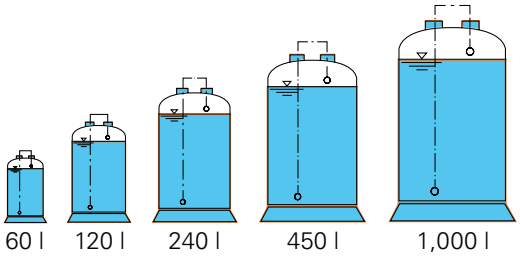
Odorizing system type OD60 with MAH pump

Standard systems for special applications

These systems are used for odorizing oxygen, nitrogen and combustion gases. They are available as a compact system and come with metering pumps, measuring devices and electronic components. Also optionally available in a lockable, stainless steel cabinet.

Standard systems with stationary vessels

- stationary vessels in sizes 60 l, 120 l, 240 l, 450 l, 1000 l
- filling of vessels on site at the system from disposable barrels, semi-bulk containers, tank cars
- the vessels are certified explosion pressure resistant
- models optionally available with suction pressure



Specifications of system type and odorant vessel size for systems with stationary vessels

stationary vessel size [litre]		Maximum odorizable gas flow [Nm³/h] with an odorant concentration of 20 µl/Nm³						
		10,000	20,000	30,000	70,000	100,000	200,000	500,000
	60	X	X					
	120	X	X	X				
	240		X	X	X			
	450			X	X	X		
	1,000				X	X	X	

Larger odorant storage vessels available upon request.

For interchangeable drums: systems with returnable tanks

OD 7 with MAH pump and 50 l returnable drum

OD 8 with MAH pump and 200 l returnable drum

OD 7 with MAH pump in stainless steel cabinet, system for odorizing oxygen

Standard systems for refillable vessels OD 7/OD 8

- standardized vessel sizes 25 l, 50 l, 100 l and 200 l
- filling performed centrally at the odorant supplier
- complete drainage via reserve vessel possible
- change of vessels without interruption during odorization
- tapered screwed fitting or quick release coupling

Specifications for the type of system and odorant vessel size for systems with returnable vessels

Returnable vessels		Maximum odorizable gas flow [Nm³/h] with an odorant concentration of 20 µl/Nm³						
		10,000	20,000	30,000	70,000	100,000	200,000	500,000
[in litre]	25	OD 7						
	50	OD 7	OD 7					
	100		OD 7	OD 7				
	200		OD 8	OD 8	OD 8			
Larger odorant storage tanks available upon request.								

Design of LEWA diaphragm pumps for both system types

Max. allowed gas pressure		Maximum odorizable gas flow [Nm³/h] with an odorant concentration of 20 µl/Nm³						
		10,000	20,000	30,000	70,000	100,000	200,000	500,000
[bar]	5	MAH / 3	MAH / 5	MAH / 5	MAH / 8	MLM 15 / 8	MLM 15 / 10	MLM 40 / 16
	16	MAH / 3	MAH / 5	MBH / 8	MBH / 10	MLM 15 / 8	MLM 15 / 10	MLM 40 / 16
	30	MAH / 3	MBH / 8	MBH / 8	MBH / 10	MLM 15 / 8	MLM 40 / 10	LDB 12
	80	MLM 15 / 3	MLM 15 / 5	MLM 15 / 5	MLM 40 / 5	MLM 40 / 8	LDB 8	LDB 12
	150	MLM 15 / 3	MLM 40 / 5	MLM 40 / 5	MLM 40 / 5	LDB 8	LDB 8	LDB 12
	300	MLM 15 / 3	-	-	-	-	-	-
For gas flows between the above mentioned maximal values, the corresponding higher value must be taken into consideration for selecting pumps and systems.								

For customer-specific requirements: individual LEWA odorizing systems

OD 240 with 2 x LEWA ecoflow LDB diaphragm pumps

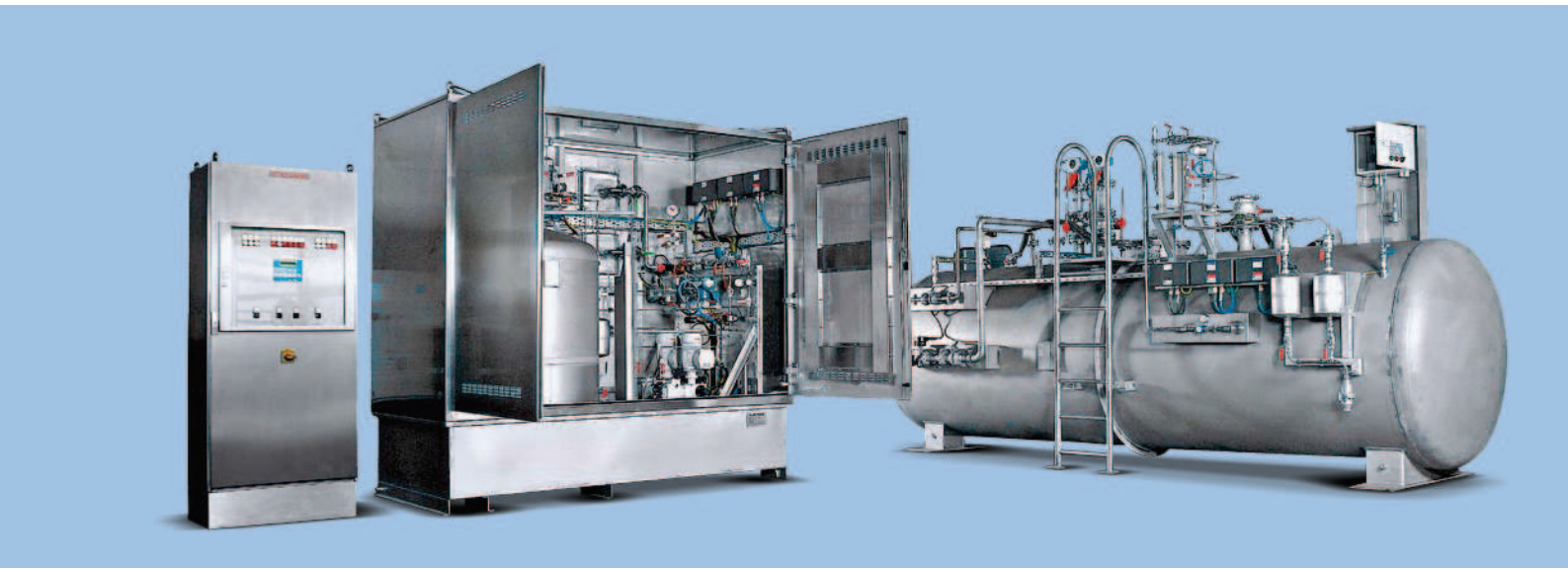
Customized system with 250 l tank, MBH pump, transfer fittings for 200 l (55 gal) disposable drums

3000 l storage tank with LEWA ecoflow LDB diaphragm pump, control for non-hazardous areas

OD 240 in cabinet with heating unit and insulation, transfer from disposable drums, Ex controls suitable for hazardous areas.

LEWA also offers specific solutions tailor made to customers' applications in addition to its standard products.
In accordance to different national and international laws and regulations, these systems also take into account special operating data and those operating conditions on site. Using this data as a basis, LEWA builds and delivers systems worldwide which are tailored exactly to customers' requirements. The mechanical and electronic components are custom-made.
This is a result of LEWA's extensive experience in the field of metering technology and package building.

Customized special design, such as:
- ATEX design
- ASME VIII compliant
- stainless steel pan
- Promass flow meter
- monitored and controlled via Internet (option: LEWA Netport@l)
- integration into existing systems (possible)

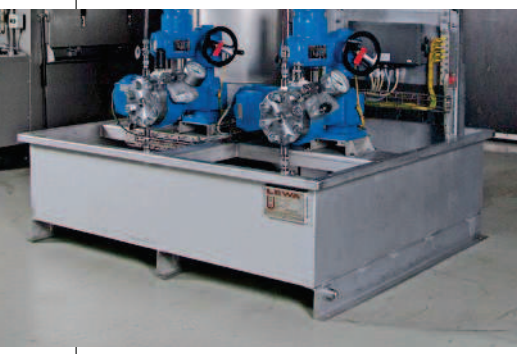


10,000 l tank, double-walled, OD 1000 in cabinet with 2 x LEWA ecoflow LDB diaphragm pumps, control cabinet for outdoor installation

10,000 l tank with 4 x EK 1 pumps, control cabinet with back-up battery for 3 hours. Use of 44 gal. disposable odor drums as supply tanks.

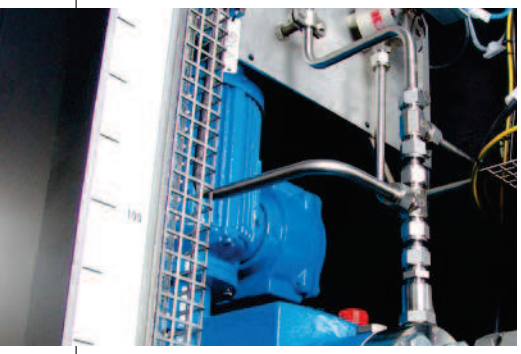
For guaranteed operating reliability: equipment and accessories

So that only odorized gas and not the odorizing system or its environment smells, we give top priority to quality. LEWA lives up to this high standard from construction to production and initial operation of its odorizing systems and meets the standards down to the last detail.



Drip pan 240 l with certified collecting pan

OD 240 in cabinet with 2 x LEWA ecoflow LDB diaphragm pumps and LFM 10 flow meter



Sight glass for fill level indicator and pump calibration

Pans
- optimally adapted to the size and type of system
- type tested with 3.1 B certification
- tightness test with dye penetration test
- includes all required documentation

Cabinets
LEWA offers a variety of stainless steel cabinets.

Level indicator
Burette for level indication in vessel for manual control to prevent overfilling according to TRbF (German regulation for the handling of combustible liquids) are installed in systems with a stationary vessel as a matter of course. A level indicator with evaluation unit (4–20 mA) is optionally available. Alternatively, a float switch may also be used to determine the reserve level.

Connecting parts
Pipe connections are delivered with double clamp ring screwed fittings as standard. They remain absolutely tight even after repeated assembly and disassembly. Hose connections also optionally come with a special safety coupling to reliably prevent odorant leakage when changing tanks.

Flushing system
Odorants are removed from the pump head and pipelines before maintenance work by the flushing systems, thus facilitating work and greatly reducing any obnoxious smell.

Pressurized preloading design for overlong storage of nitrogen (optional)
By protecting the vessels with safety valves, (adjustable pressure max 0.5 bar) the system remains below regulations for pressure devices and does not require any additional or separate inspections. Pressure charging devices prevent odorant gas emission in the suction lines, especially when handling odorants with high vapour pressure.

Flame arrester
LEWA odorizing systems optionally come with flame arrester.

Solenoid valves
For metering rates less than 400 Nm³/h a solenoid valve is required on all equipment to prevent backflow.

Oscillating plunger flow meter type LFM 10 with two filters

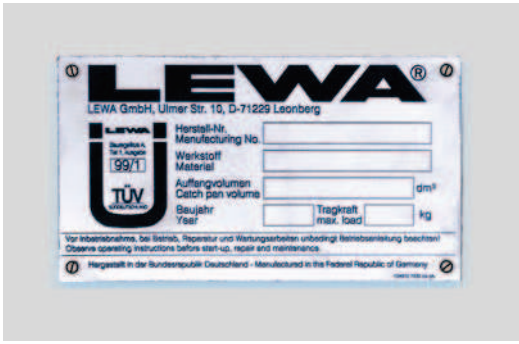
Precision down to the last detail: Standard injection point with integrated non-return valve

Active charcoal filter
The active charcoal filter ensures an odor-free environment when the system is either being filled or maintained. An active charcoal filter for exhaust air treatment comes as standard in every odorizing system.

Pressure gauge for the discharge line (optional)
The use of a pressure gauge allows for a quick visual check of the pump function.

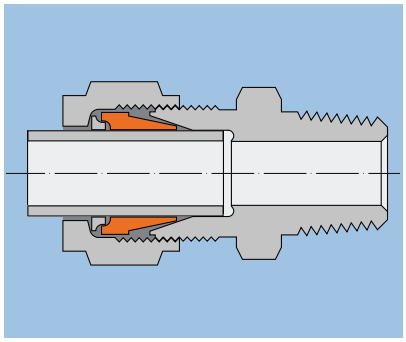
Flow meter
LEWA can connect all current flow meters to the control unit.

Injection point
Injection points with very large evaporation surfaces guarantee optimum distribution of odorants in the gas. A non-return and two shut-off valves prevent gas and odorant leakage during maintenance work.



Safety is standard: all drip pans are tested and certified.

Pressure gauge also available as an option for the discharge line



Safety down to the last detail with double clamp ring screwed fitting

Active charcoal filter volume: 7.0 l for OD 450 and OD 1000

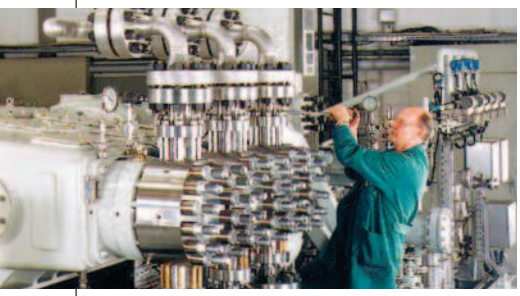
LEWA flow meter type KMM1 with filter

For every occasion: The LEWA product range

LEWA micro-flow metering pumps

LEWA ecodos

LEWA ecoflow



LEWA triplex process diaphragm pumps

LEWA metering systems
and chemical injection packages

For laboratories & pilot plants:
LEWA micro-flow pumps
These micro-flow metering pumps with hydraulically actuated metal diaphragms are primarily used in laboratories and for test procedures in pilot plants.

Performance range	
Flow rate	up to 57.5 l/h
Discharge pressure	up to 560 bar

For low pressures:
LEWA ecodos metering pumps
Diaphragm metering pumps for low pressure duty, using a mechanically actuated PTFE quadruple diaphragm for high security. Can also be combined as a multiple pump.

Performance range	
Flow rate	up to 1.5 m^3/h per pump head
Discharge pressure	up to 20 bar

For medium to high pressures:
LEWA ecoflow metering pumps
LEWA ecoflow offers the most advanced, safe, leak-free metering pumps for medium and high pressures.

Performance range	
Flow rate	up to 19 m^3/h per pump head
Discharge pressure	up to 1,200 bar

For sterile applications:
LEWA Sanitary & Hygienic
LEWA supplies special sanitary and hygienic diaphragm pumps for metering tasks in hygienic, aseptic or sterile procedures, whether for food and beverages or for pharmaceuticals and personal care.

Performance range	
Flow rate	up to 6 m^3/h per pump head
Discharge pressure	up to 500 bar

For high pressures:
LEWA process diaphragm pumps
The leak-free LEWA process diaphragm pumps for high flow rates are the tightness standard in high-pressure process technology. Using LEWA triplex process diaphragm pumps, even critical, toxic or flammable liquids can be conveyed safely. Even extremely low viscous, non-lubricating fluids or abrasive suspensions can be handled successfully.

Performance range	
Flow rate	up to 180 m^3/h
Discharge pressure	up to 1,200 bar

For closed control loops:
LEWA metering systems
LEWA is the first point of contact in the market for high-performance yet economically designed metering systems. These are modular combinations of pumps, valves and controls for stroke length and speed, flow meters (volume or mass flow) and controllers. The metered flow is adjusted in a closed control loop.

For process automation:
LEWA metering packages
LEWA metering and mixing packages for process automation are available either as standard variants ready for connection, or designed by LEWA specifically for the customer's request. LEWA can supply complete, ready to operate problem solutions. Our services range from engineering to commissioning – including individual package controls, process visualisation, logging of operational data and external interfaces to the process guiding system.

For more information, please request our individual brochures.

For long-lasting operation: service, maintenance, training

Quick on-site: whether its support, maintenance or service, being close to customers is our main concern

For LEWA a partnership does not end after the purchase and initial operation of the odorizing system. We offer comprehensive service packages which can be tailored to your requirements. Everything from a single source, everything from the manufacturer who knows his products best inside and out. Our specially trained and experienced service LEWA technicians are happy to carry out maintenance work on your systems. All maintenance work is performed according to local regulations and documented in the form of a service report. Taking advantage of a service contract with fixed maintenance intervals can reduce your costs, and therefore guarantee a high level of operational availability of your system.

We ensure the safe disposal of cleaning agents used during maintenance work and worn parts even for complete older systems or system parts. System support and service are carried out by LEWA's worldwide distribution network. This includes completely equipped vehicles with all necessary replaceable and spare parts on board available around the clock.

Practical seminars offered at LEWA or, if requested, at the customer's location, give your staff sound know-how at first hand and complete the comprehensive service programme provided by LEWA.

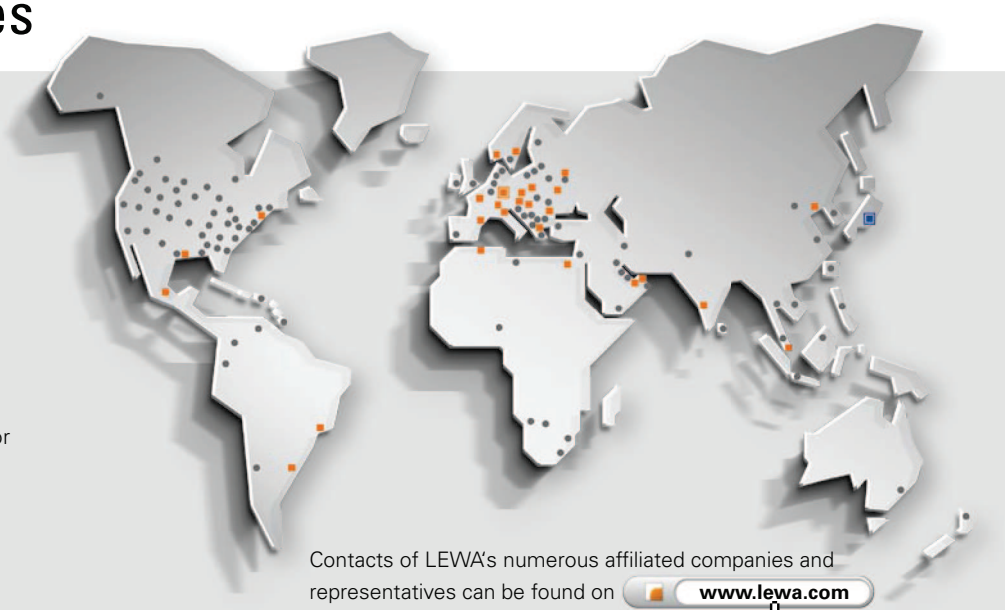
We offer practical seminars for operational staff as well as engineers and technicians through the LEWA Academy.

Creating Fluid Solutions

A MEMBER OF NIKKISO

LEWA pumps + systems

LEWA proven services and technologies



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Contacts of LEWA's numerous affiliated companies and representatives can be found on **www.lewa.com**

Customized solutions for metering and process technology

For more than 50 years, LEWA has set the technical trends of metering pumps and systems. LEWA offers a single-source solution to handling complex metering and mixing tasks – ranging from individual pump configuration, basic and detailed system engineering and pretesting to onsite commissioning and maintenance services.

Good causes to rely on:

- A solution for your special application: from process analysis to global service
- Highest process safety: individual pump configuration and state-of-the-art design
- International engineering and project competencies
- Highest reliability: developed for continuous operation
- Low lifetime costs: reduced energy consumption and low-wear design
- Compliance with international standards, e.g. API, ASME, GOST-R, FDA, EHEDG, 3A, TÜV
- Comprehensive reference list

Areas of expertise:

Oil & Gas
Gas Odorization
Refinery
Petro-chemicals
Plastics
Chemicals
Cleaning & Detergents
Personal Care
Pharma & Biotechnology
Food & Beverages
Energy Utilities

Your local representative:

Kundeninformation / Customer information

Odorieranlagen: Erdgas, Flüssiggas, techn. Gase
Odorizing systems: natural gas, liquified gas, technical gases

SB 159.1 de/en

- **Leiter/ Head of Sales:**

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  e-mail: walter.richter@lewa.de

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  Frau/Mrs. Heinsohn, Tel./Phone: +49 (0)7152-14-1384, Fax: 14-2384
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  Service and maintenance, sales spare parts:

  Herr/Mr. Heinz, Tel./Phone +49 (0)7152-14-1436, Fax: 14-2436
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  e-mail: peter.gleiniger@lewa.de

- **Fragen speziell zur Steuerung**
  Special, controls related questions:

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  e-mail: peter.klay@lewa.de

  Herr/Mr. Kneschke, Tel./Phone +49 (0)7152-14-1226, Fax: 14-2226
  e-mail: michael.kneschke@lewa.de

An **Werktagen** / on **Working days**:

Montag bis Donnerstag / Monday through Thursday
von/from **8°° - 17°°** Uhr
Freitag / Friday von/from **8°° - 15°°** Uhr

Nur in besonders dringenden Fällen
In case of emergencies only
erreichen Sie unseren Service
you can reach our service department
werktags von / **on working days** from
17°° - 08°° Uhr/h und/and
am Wochenende von / at weekends from
00°° - 24°° Uhr/h unter Tel./ by phone:
+49 (0)174 - 32 91 446