10. Accessories - option (available on order)

- design for other control voltage values
- counterflages with stub pipe (for valves with flanged connection)
- stub pipe for inlet and/or outlet pressure measurment (∅9, G1/8 lub G1/4 together with gaskets) - used alternatively with plugs G1/8 lub G1/4
- gas pressure sensor at the valve inlet (for P_{max} = 500mbar)
- manual flow regulation for flanged valves
- plug with voltage presence indicator

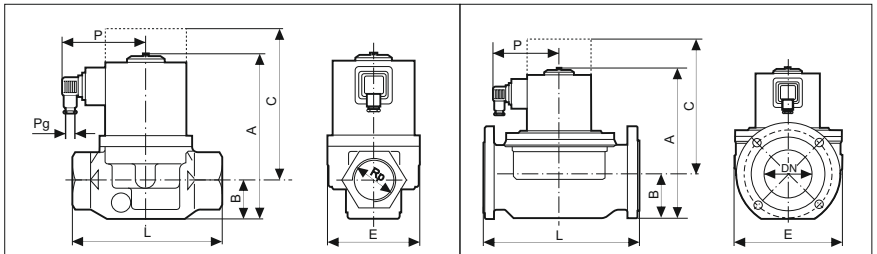
11. Periodical inspection and service

During normal operation valve does not require any maintenance activities. It is only necessary to take care of periodic removal of accumulated dust.
At a certain time (depending on the type of media, its contamination and local operating conditions), the valve should be partially dismantled for cleaning and maintenance of its internal parts. Performing these activities should be entrusted to the manufacturer's service department or a person with appropriate qualifications. The re-commissioning of the valve should be preceded by checking its tightness in accordance with generally applicable rules

12. Storage guidelines

Valve should be stored in a dry place, in a vibration, dust or gas and noxious fumes free environment. The sotrage room's temperature should not be lower than +5° C

13. Overall dimensions (mm); Weight (kg)



Type	ZEF-20	ZEF-25	ZEF-32	ZEF-40	ZEF-50	ZEF-65	ZEF-50k	ZEF-65k	ZEF-80k	ZEF-100k
	valves with threaded connection						valves with flanged connection			
DN	20	25	32	40	50	65	50	65	80	100
Rp	3/4	1	1 1/4	1 1/2	2	2 1/2				
A	146	146	166	197	208	230	242	255	318	332
A*	156	156	182	220	232					
B	30	30	32	31	36	61	78	83	94	103
C(1)	176	176	212	255	261	258	253	261	344	349
C*	186	186	228	278	285					
E	75	75	100	125	150	170	165	185	200	222
L	110	110	145	156	190	240	230	270	310	350
P	95	95	102	110	110	110	110	110	132	144
Pg	11	11	11	11	11	11	11	11	11	11
Weight	1,95	1,92	4,20	5,80	6,40	8,10	7,40	9,10	19,55	27,20

* - dimension for ZEFb
(1) - dimension updated to allow coil maintenance

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FLAMA GAZ ®

Solenoid Valve type ZEF, ZEFb

for
gas fuels (gas)
air and other non-aggressive gases

CE 1015

- **The following document should be consulted first before installing the valve.**
- **Proceed with the installation only if following documentation fully understood**
- **Valves should be installed in accordance with prevailing regulations in force.**

SERVICE MANUAL

release 06/2018

Contents

1. Description

ZEF type solenoid valve is an automatic shut-off valve designed to protect, limit, cut off and unblock the medium supply to devices with which it cooperates.
The valve is designed as open if the coil is powered with electricity and automatically closed when there is no power supply (its lack).

ZEF valve features:

- 2/2 -way, membrane, assisted lift
- single-stage, unidirectional
- closed in deenergized state -**NC**
- uniform flow -standad design
- manual regulation of flow (flow capacity) - version ***ZEFb*** (see Table 1)
- suited to zero pressure differentional conditions (ΔP_{min} = 0 bar)
- suited to applications where pressure differential fluctuates or is very hard to define
- conforms to **PN-EN 161:2011+A3:2013**
- meets principal requirments of Regulations (UE):
  2016/426 (GAR) from 9'th March 2016
- meets applicabe requirments of Directives UE:
  2014/35/UE (LVD) and **2014/30/UE** (EMC)

2. Application

- designed for reliable service in all types of installations and appliances, supplied from low pressure gas network - (see TABLE 1)
- as a part of the ***gas train*** supplying high power gas appliances, the valve will act as an automatic safety shut-off valve
- air and non-aggressive gases installations
- pneumatic control systems

3. Technical data

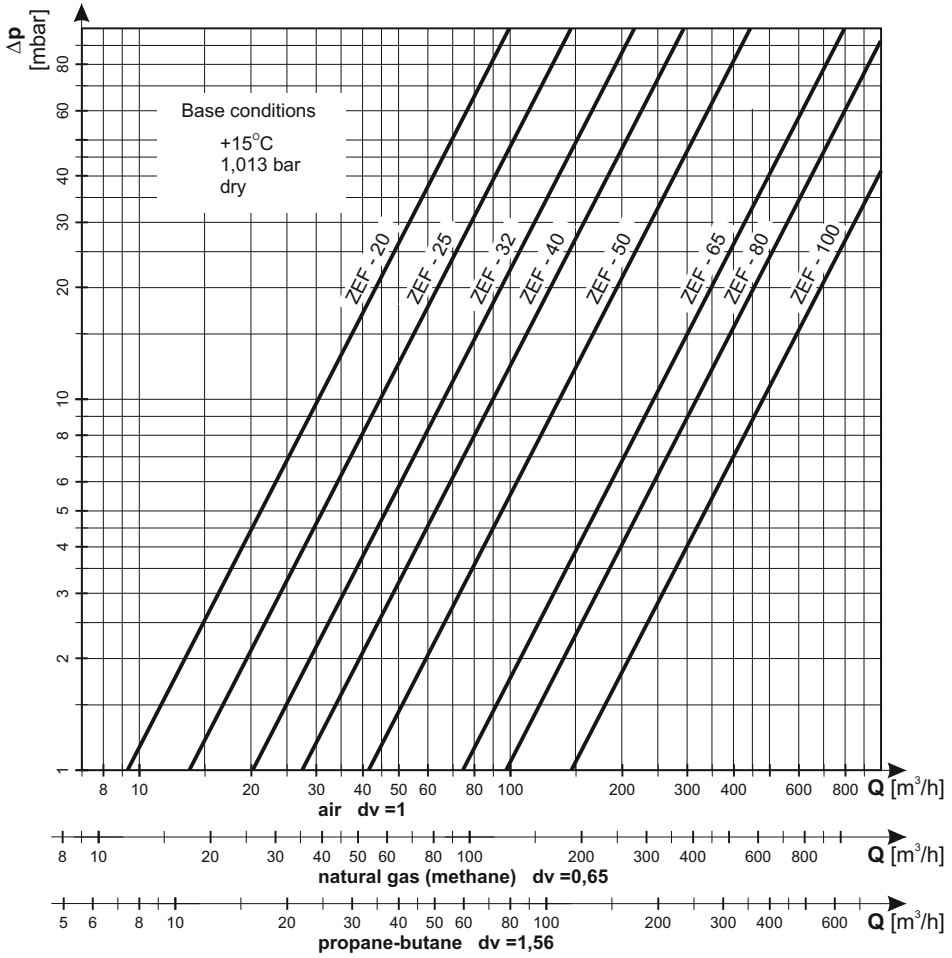
valve class	A
group	1
diameter range	Rp 3/4 ÷ Rp 2 1/2 ; DN20 ÷ DN100
media	gas fuels(natural gas, propane-butane) air, non-agressive gases
maximum operating pressure	P_{MAX} - see TABLE 1
differential pressure minimum	ΔP_{min} = 0 bar
maximum	ΔP_{max} - see TABLE 1
safe static pressure	P_S =5 bar ***(It is used during leaktightness test of installation-valve by this pressure can not operate)***

- flange bolts should be tightened across
- maximum torque for flange bolts:

DN	50	65	80	100
Torque [Nm]	50	50	50	80

- valve's assembly should be finalized with carrying out an leaktightness test of valve and connections together with functional test for verification its correct operation
- leaktightness test of installation including **ZEF** valve can be performed with pressure not eceedingi **P_s = 5 bar**
- protecting the valve against heavy dust and flushing
- ensuring the correct operating temperature
- valve should not be exposed to dilatation nor any dynamic forces under operating conditions
- the protective conductor contact in the plug-in socket must be connected to the electrical system in accordance with the locally applied antielectrocution protection system
- it is forbidden to apply voltage to the solenoid trigger coil when it is dismounted from the valve

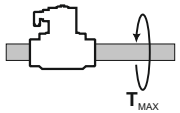
9. Flow characteristic



8. Installation - assembly requirments

- valve can only be installed by a person holding appropriate qualifications and relvant authorization
- before moving on to installation, it is essential to:
  - carefully read the information from the nominal table of the valve and coil to verify that the required parameters dictated by the installation's location are met(pressure level, voltages, nominalnal diameters, etc.)
  - take into account the pressure that may occure at the valve inlet in case of failure to components in the system located upstream the valve
- assembly should be performed in professional way with use of proper tools
- assemble to installation according to the gas flow arrow on the valve
- mounting position is coil upwards.
  Accebtable deviation from vertical position cannot exceed 90°.
- direct contact of the valve with wall, ground, etc. is unacceptable; keep the minimum distance - about 1 cm
- attention should be paid so that after valve installation there is enough space left **(maneuvering area)**, necessary for its ease opening (or manual closing) - see p.13
- in order to facilitate the installation of the valve, the coil can be removed - see point 6
- ensure proper rigidity of the installation in the place where the valve is installed (Group 1 valve). This can be achieved by using rigid supports to the bending and torsional stress exerted by the piping system in the installation (eg due to the lack of alignment of the of the pipeline at the inlet and outlet of the valve)
- ensure that valve is mounted rigidly so as to avoid any vibration
- no part of the valve should be used as a „lever" to facilitate the installation
- a strainer which protects from mechanical impurities should be fitted upstream the valve in the gas installation. Maximum dimension of strainer openings should not exceed 0,2 mm
- it is required to blow installation just before valve assembly
- **during valve installtion, attention should be paid to the following:**
  - putting a lot of emphasis to keep interiors of the installation clean
  - thoroughly cleaning the pipes from carbon deposits, filings and corosion products etc.
  - ensuring no stresses on the valve during the installation

  valve with threaded connection
  - use appropriate thread sealant to ensure tightness of the connections
  - in valves with threaded connections pipe should be screw in that way so that 10 second torque not exceed below values:



DN	20	25	32	40	50	65
Rp	3/4	1	1 1/4	1 1/2	2	2 1/2
T_{MAX} [Nm] t ≤10s	85	125	160	200	250	325

  - protect the valve against contamination and in particular against excess material used to seal threaded joints

  valves with flanged connections
  - protecting lateral surfaces of the flanges from mechanical damage
  - flange reparation by welding is not admissible
  - leave counterflanges tightened to the valve only during the initial part of he welding procedure (positioning the valve).
    The actual welding of counterflanges must be carried out without the valve (after it is disassembled)
  - ensuring the inside of the valve is clean before its reassembly
  - ensure correct positioning of the gasket

flow ..... see p.9 - ***Flow characteristics***
opening/closing time..... < 1s
flow regulation range ZEAb..... 0 ÷ 100 %
ambient and media temperature ..... -10° C ÷ 60° C
pipe threaded connection..... ..... Rp - internal straight thread compliant with PN-EN 10226
flanged .... flanges are an integral part of the valve and are suitable for connections with flanges [PN16, 01, B] in accordance with PN-EN 1092-1 - keeps compatibility of connection dimensions
material: valve body..... aluminium alloy
internal elements ..... aluminium alloy, brass, stainless steel or galvanized steel, ARMCO
sealing material..... nitrile-butadiene rubber NBR
mounting direction..... coil upwards -acceptable deviation from vertical position up to 90°

Electrical parameters

control voltage alternating AC(50Hz)..... ..... 24V, 230V
direct DC..... ... 24V
voltage tolerance .... -15%; +10%
power consumption..... 19 ÷ 85 VA (W) (dependant on coil type)
safety class..... I (earthing)
operation type..... S1 continuous
electrical connection..... tri-contact terminal block *
degree of protection (acc. PN-EN 60529)..... IP54

TABLE 1

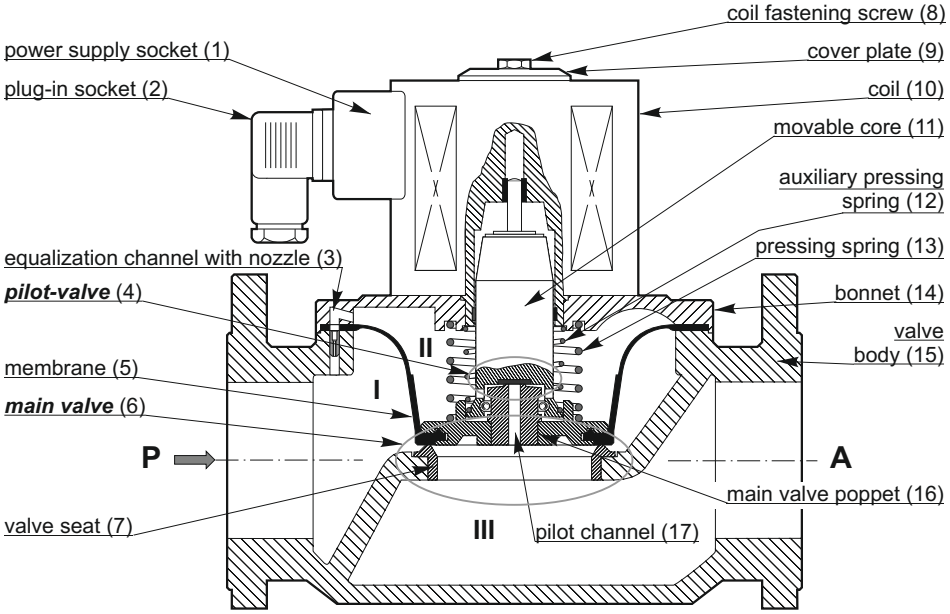
Valve type		DN	Rp	Diff. pressure ΔP [bar]		P_{MAX} [bar]	P_S [bar]
				ΔP_{min}	ΔP_{max}		
valves with threaded connection							
ZEF-20	ZEFb-20	20	3/4	0	4	4	5
ZEF-25	ZEFb-25	25	1	0	4	4	5
ZEF-32	ZEFb-32	32	1 1/4	0	4	4	5
ZEF-40	ZEFb-40	40	1 1/2	0	4	4	5
ZEF-50	ZEFb-50	50	2	0	4	4	5
ZEF-65		65	2 1/2	0	2	2	5
valves with flanged connection							
ZEF-50k		50		0	4	4	5
ZEF-65k		65		0	2	2	5
ZEF-80k		80		0	0,5	0,5	5
ZEF-100k		100		0	0,5	0,5	5

4. Construction and the principle of operation

Assisted lift solenoid valves utilize process pressure for operation (the existence of pressure difference ΔP on valve). They consist of two main components: the main valve (6) and the pilot valve (4). In the valve we can distinguish three areas of different pressure occurrence: area I from the inflow side P, area II above the membrane (5), area III from the outflow side A.
The characteristic design features of the valve:

- the pilot valve is located in the main valve poppet (16). They are connected to the movable core (11) and together form the valve head *
- pilot valve works like a typical direct-acting valve
- the area on the inlet side I is connected to the area II above the membrane (5) with the equalizing channel (3) with the nozzle
- area II above the membrane connects to area III from the outflow side through the pilot valve (4) and the pilot channel (17)
- the medium flow through the equalizing channel (4) is smaller than through the pilot valve

(*) - valve coils ZEF-80k and ZEF-100k are equiped in additional housing of electrical connection



When describing the operation of the ZEF valve (with assisted lift), we distinguish two cases:

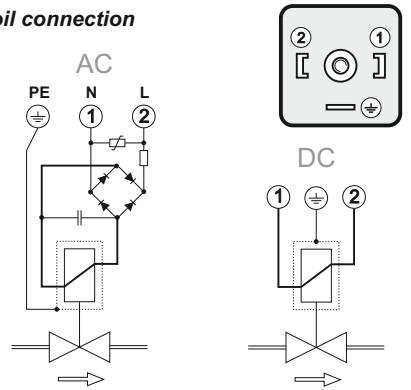
A. ***By a low or zero differential pressure P-A,*** the valve works like a direct-acting valve.
   1. In a de-energized state (coil (10) without voltage):
      - pressing spring(13) acting on the main valve poppet (16) and
      - auxiliary spring(12) acting on the movable core (11), keep the valve head in the closed position. The main valve and pilot valve are closed. The flow of medium through the valve is cut off.
   2. After applying the voltage to the coil (10), the moving force that draw in the core (11) is created , which overcoming the force of the auxiliary (12) and pressing spring (13) opens the pilot valve and the main valve in sequence. The valve moves to the open position. The medium flows freely through the valve

B. ***When the pressure difference P-A is high*** the closing and opening of the valve is assisted by the process pressure.
   1. The mechanism maintaining the valve head in the closed position is described in point A.1. In this valve state, due to the medium flow through the equalizing channel (3) from area I to area II, the entire process pressure is applied to the upper surface of the membrane. This pressure creates a force that acts on the valve head additionally sealing the valve.
   2. Applying voltage to the coil causes the core (11) movement, which pulled inside to the solenoid opens the pilot valve (4). The medium begins to flow through the pilot valve from area II to area III. At the same time, it flows through the equalization channel (3) from area I to area II. Because the flow through the equalizing channel is smaller than through the pilot valve the pressure above the membrane will start to decrease. As a result of the pressure difference, changing on the membrane, an unbalanced resultant force is created to assist the lifting of the valve head, which together with the electromagnet movable core pulling force, opens the main valve and will keep it open.
   3. Closing the valve occurs after interruption of the current to the coil. The force holding the movable core disappears. Auxiliary pressing spring (12) acting on the movable core (11) close the pilot valve. The medium flows from area I to area II. The pressure above the membrane is increasing. Force balancing the force from the valve differential pressure appears.
      As a result of the changing pressure difference, the resultant force acting on the membrane together with the force of the pressing springs (12) and (13) causes the valve to move to the closed position. The valve is closed.

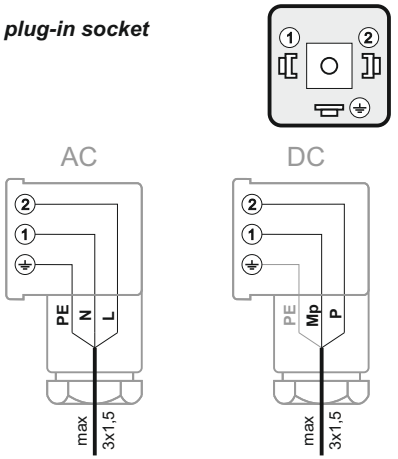
(*) - valve head: movable part of valve which shuts-off gas fow

5 Electrical connection

coil connection



plug-in socket



- solenoid coil is designed for direct voltage; coils for alternating volatge in electrical connection (1) has built-in permanent rectifier together with overvoltage system (suppression)
- the plug-in socket(2) can be fixed in **4 positions** (each 90°) towards the socket
- polarization of wire in conductor is indifferent (apart from PE wire). However, the PN-EN 161 sandard unambiguously assigns to the contact pins connections of PE, L, N potentials of the power cable respectively. (as on the drawing above)
- the maximum conductor wire size that can be inserted into the plug-in socket of the connection is 3 x 1.5 mm^2
- if it is necessary to use a conductor with a larger wire size, use a tight, intermediate junction box with the degree of protection IP54 or higher

6. Coil replacement

- switch off the control voltage and secure the off state
- disconnect the plug-in socket (2) from the coil(10) power supply socket (1)
- remove the fastening screw (8) fixing the coil
- replace the coil with a new one, checking its type and voltage on the nameplate
- screw the fastening screw (8) of the coil; connect the plug-in socket (2)

Attention: It is possible to **change the position of the coil around its axis**. To do this

- loosen the fastening screw (8) fixing the coil(10)
- change the position of the coil
- tighten the coil (10) fastening screw (8) again

7. Flow regulation - only for ZEFb type

Attention: The regulation can be carried out with both open and closed valves.

Regulatory set is located in lower part of valve body (15)

- loosen the nut (19) counter-positioning of the adjusting screw (22)
- by rotating adjusting screw (22) using flat wrench (21) set desired flow
  Regulation is possible in the range of 0 to 100% of full flow.
  Approximate value of set flow shows indicator (20) on scale (18).
  Attention: ***Indicator (20) can be located only in range - between 0% and 100%.***
- tighten the nut (19) counter-positioning of the adjusting screw (22)