	TECHNICAL INSTRUCTION	
A/S NIRO ATOMIZER COPENHAGEN	STARTING-UP OF ELECTRIC HEATERS	Page 1/1 Date 15/9-1970

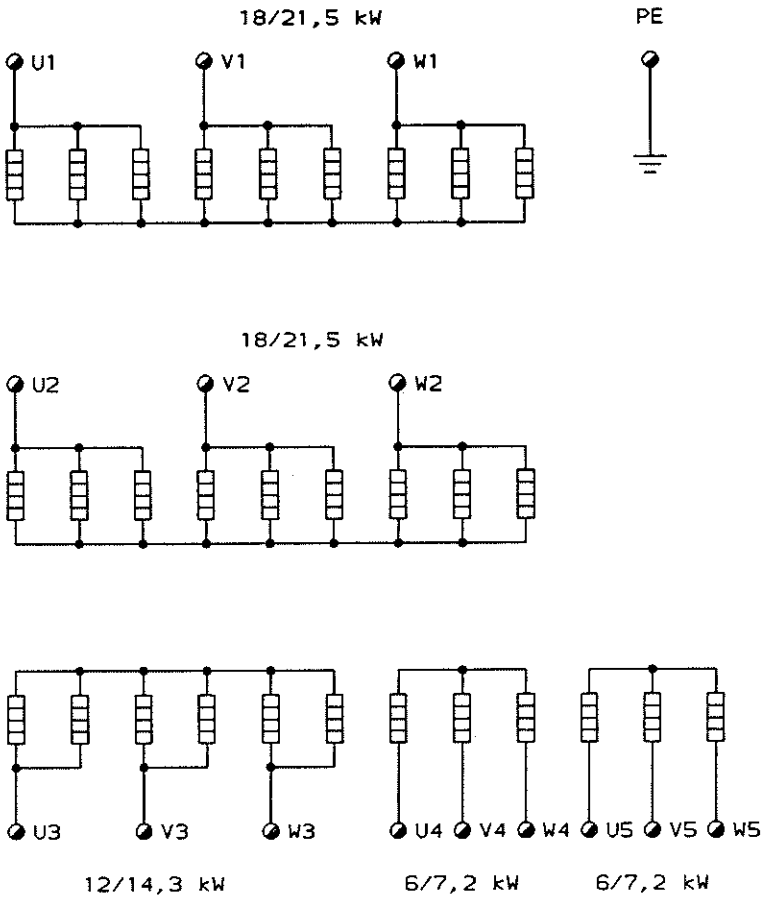
When an electric heater has been out of operation for a longer period (more than 3 weeks) the re-starting may give trouble caused by leak current due to condensation and moisture in or on the insulation materials in the heating elements.

The removal of this moisture should take place slowly (in order not to result in short circuiting), and this is done by successive increase of the temperature in the heating elements. Starting-up of the electric heater should always take place in the following way:

All heating elements (or group after group) are switched on for the first time for not more than half a minute, then they are switched off and after approximately one minute switched on again for half a minute. This is repeated a few times depending on the length of the period the heater has been out of operation. Now the elements are switched on and off for longer and shorter periods respectively, and after approximately a half to one hour the heater is ready for continuous operation.

As the absorption of moisture depends on the relative humidity of the air, attention should, of course, be paid to the storage conditions.

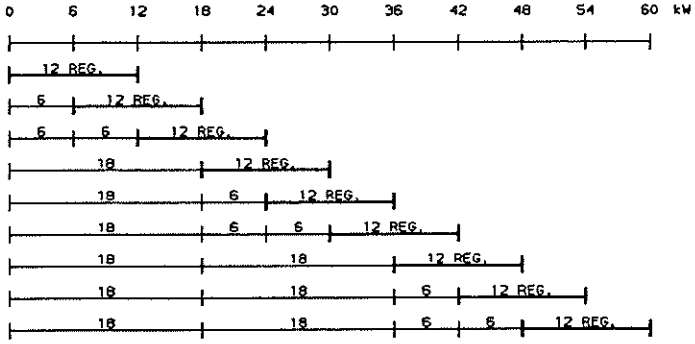
Author	Commented by	Approved by	Replaces Index - No. of	Index - No.
BFGDNVC				



TERMINAL KLEMMEN	Ω
U1-V1	16
U1-W1	16
U1-W1	16
U2-V2	16
U2-W2	16
V2-W2	16
U3-V3	24
U3-W3	24
V3-W3	24
U4-V4	48
U4-W4	48
V4-W4	48
U5-V5	48
U5-W5	48
V5-W5	48

30 HEATING ELEMENTS INCOLOY 800, EACH 2kW,220V
30 HEIZSTÄBE INCOLOY 800, JE 2kW.220V

CONTROL RANGE
60 kW HEATER



Rev. Letter	Revision		Rev.	Appr.	Date
A		MNK	PRR	JP	910605
B		BEL	PRR	PRR	910618

NIRO A/S
GLADSAXEVEJ 305
DK-2860 SØBORG DENMARK
Tel. (01)691011 Telex 15603

SCALE

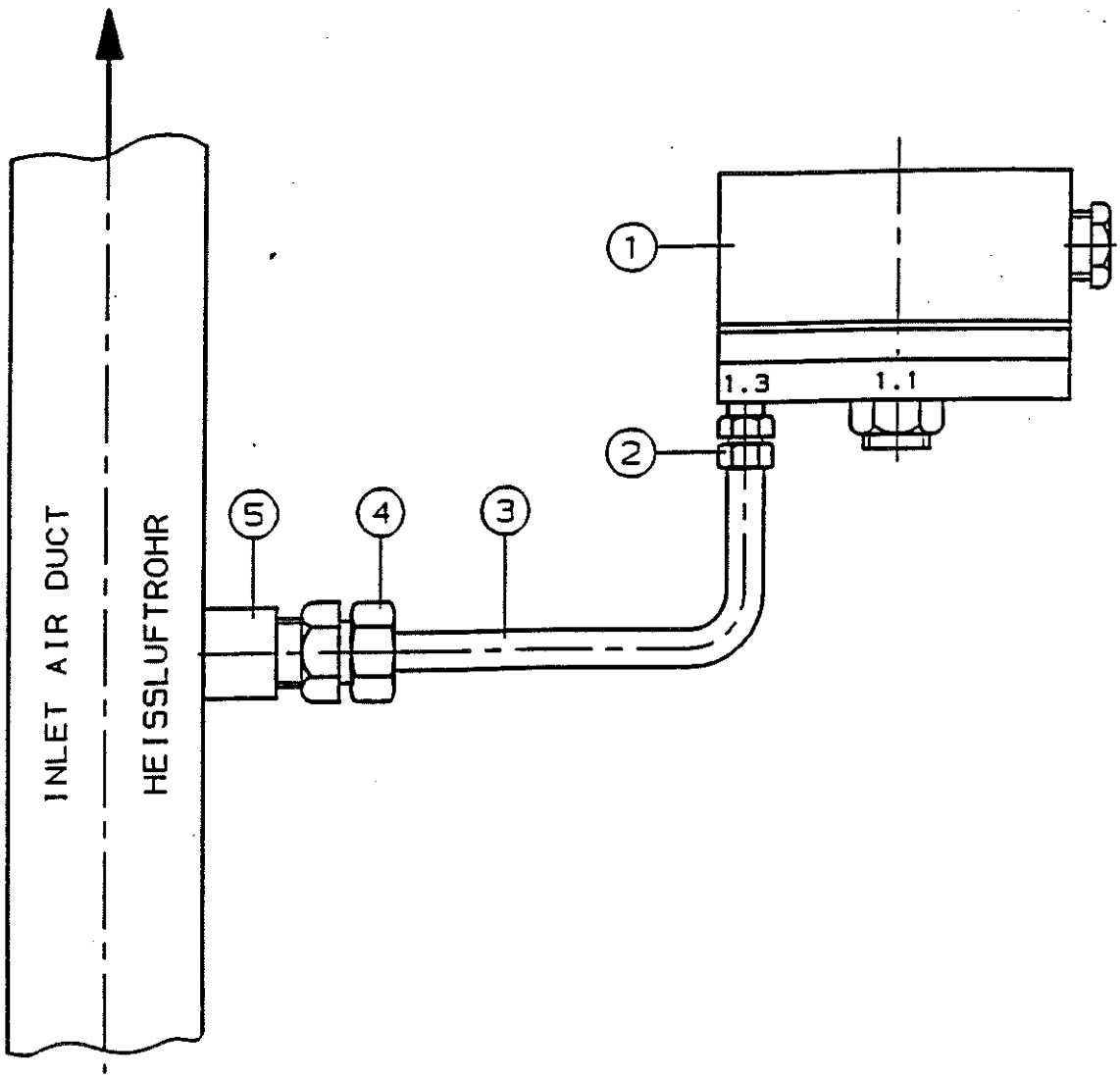
Drawn	RB	890907	SHEET
Check	PRR	890907	
Appr.	GAH	890907	

** CHANGE BY CAD-SYSTEM ONLY **

ELECTRIC AIR HEATER
ELETRISCHER LUFTERHITZER
60/71,6kW-3PE-50/60Hz, 380/415V

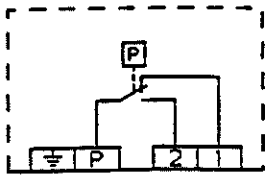
Category		Rev.
2	90621	B

A3



⑤	1/4"	SOCKET MUFFE
④	1/4"	UNION ADAPTER VERSCHRAUBUNG
③	1/4"	COPPER TUBE KUPFERROHR
②	1/8"	UNION ADAPTER VERSCHRAUBUNG
①	LGW3	PRESSURE SWITCH DRUCKWÄCHTER

WIRING DIAGRAM
SCHALTBILD



INTERLOCKING
VERRIEGELUNG

Rev. Letter	Revision	Rev.	Appr.	Date

NIRO ATOMIZER
GLADSAXEVEJ 305
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SCALE ~

Drawn	LM	891102
Check.	BJ	
Appr.		

** CHANGE BY CAD-SYSTEM ONLY **

PRESSURE SWITCH, DEPRESSION CONN.
DRUCKWÄCHTER, UNTERDR. ANSCHL.

Category 2

92363

Rev

A4

Gas and air pressure switches type GW, UW, LGW

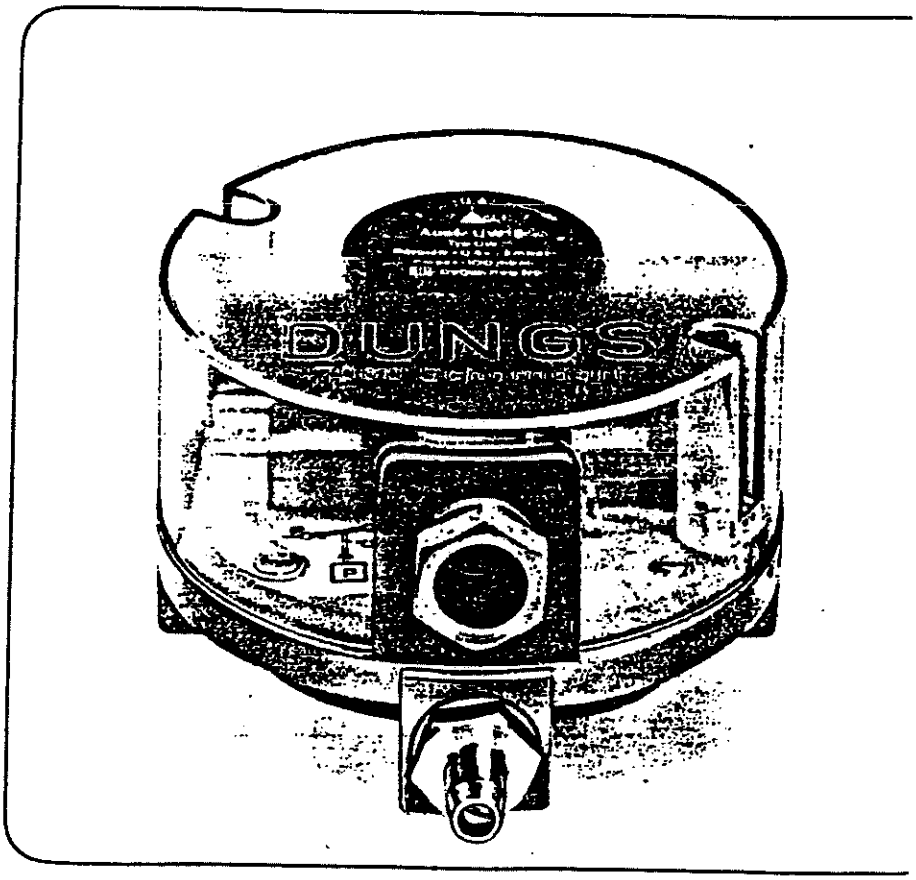
Pressure limiter type ÜB and NB

Dual pressure switches GW/GW for gases and air

DUNGS technic

Technique

The GW, UW, LGW pressure switch, the ÜB, NB pressure limiters and the GW/GW dual pressure switches are suitable for connecting, disconnecting or changing over an electric circuit, to regulate a set nominal pressure when the actual pressure is varying.
The pressure switches may be used as excess pressure switches, vacuum switches or differential pressure switches for air and non-aggressive gases as well as gases contained in the DVGW work sheet G 260.
The switching point can be quickly and easily set by means of a calibrated knob, without having to use a pressure gauge.
The pressure switches are tested by the DVGW in accordance with DIN 3398.



- High inlet pressure
- Easy adjustment of the nominal value using the scale
- Small switching hysteresis
- High contact load
- Contact lug for position marking

Application

For use with gas burners, air-conditioning and filter equipment.

Publication No.
GB. 5.01.162450

Function

Excess pressure switch GW
The instrument reacts to positiv pressure and connects, disconnects or changes over an electric circuit when the set nominal value is exceeded.

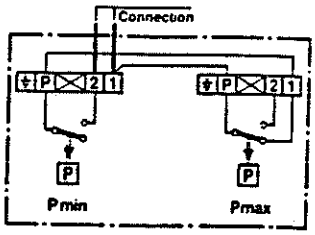
Vacuum switch UW
The instrument reacts to a vacuum and connects, disconnects or changes over an electric circuit when the pressure exceeds or falls below the set nominal value.
Vacuum: absolute value = barometer reading minus nominal value.

Differential pressure switch LGW
The instrument reacts to the pressure differential between the two pressure chambers and connects, disconnects or changes over an electric circuit if the pressure exceeds or drops below the set nominal value. No additional sealing is required.
May also be used as a single-action pressure switch (connection via R ¼" internal thread). The pressure switch has two completely separate pressure chambers.

Pressure limiter
The instrument reacts to excess pressure. Shut-off occurs if the pressure exceeds or falls below the set nominal value. After the problem has been remedied the unit can only be put back into operation again by hand, by releasing the shut-off device on the pressure limiter. The operating pressure is indicated by a signal lamp.
A pressure limiter for vacuum conditions is available on request, for which the above data applies.

ÜB/1 switches and shuts off when the pressure exceeds set point.
NB/1 switches and shuts off when the pressure falls below set point.

Dual pressure switch Mini-Maxi
This pressure switch is a combination of two complete but independently working systems of the GW type. Adjustment of the nominal values for both systems takes place independently. Both switches are connected to a common pressure chamber.

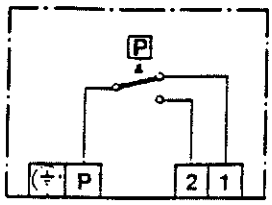


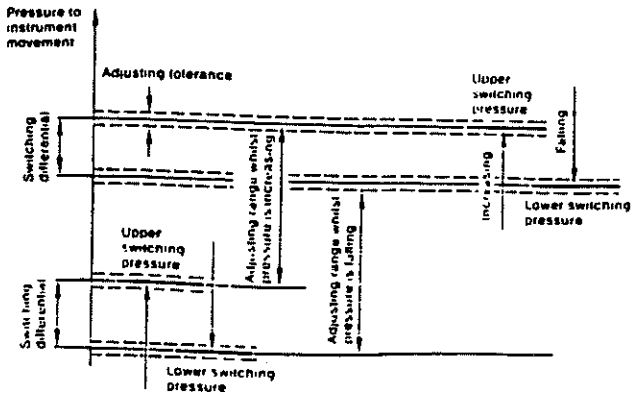
Technical Data

Max. operating pressure:	see brief technical summary
Temperature ranges	ambient temperature −15 °C to +60 °C Temperature of medium −15 °C to +80 °C
Materials	Die cast aluminium housing for gas supply; Diaphragms: NBR based; Switch contacts: silver nickel Measuring connection: as a special feature the pressure switches can be supplied with R ¼" + R ⅛" measuring nipples
Electrical connection	to screw terminals via PG 11, voltage 250 V A.C. switching capacity: ohmic 5 A, inductive 3 A cos. φ 0.6 degree of protection IP 54 standard cable inlet: PG 11 with universal seal for cable ø 7 to ø 12.5 mm special cable inlet: plug and socket connection with angle connector in accordance with DIN 43650 3-pin and earthing contact
Adjusting tolerance	±15% (scale calibrated whilst pressure is increasing)

Schematic diagram

Switching function
Whilst pressure is increasing
P-1 opens
P-2 closes
Whilst pressure is falling
P-1 opens
P-2 closes





DUNGS
technic

Assembly and installation instructions

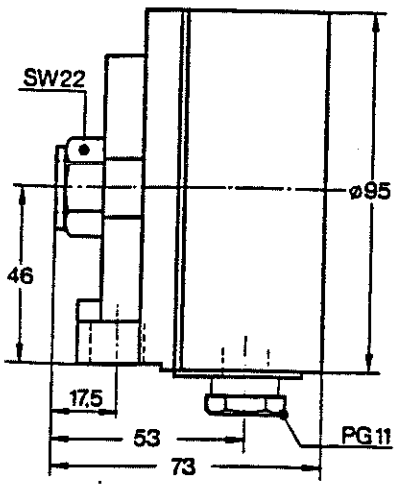
Pressure connection
R ¼"-internal thread in accordance with DIN 2999, centrally located on the underside. Further connections, R ¼"-internal thread on the left or right hand side, as well as an O-ring flange connection are available on special models.

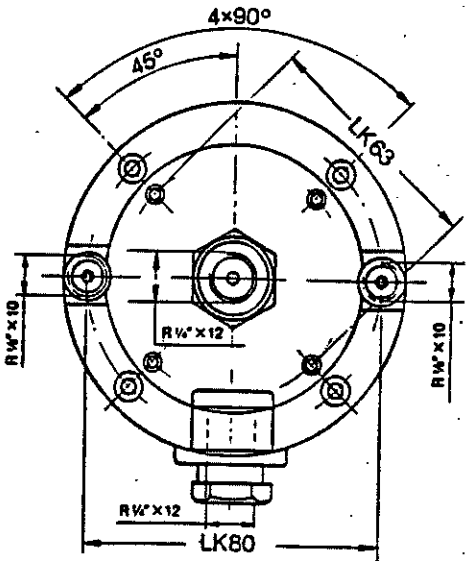
Measuring connection
A measuring connection with R ¼" thread can be fitted if desired.

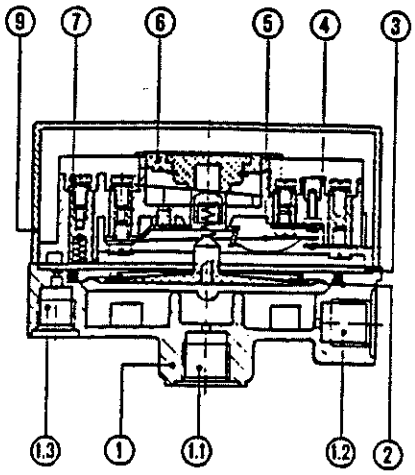
Mounting
There are 4 symmetrically arranged holes ø 3.7 mm, in the lower section for mounting the pressure monitor on a frame or bracket using self-tapping screws.

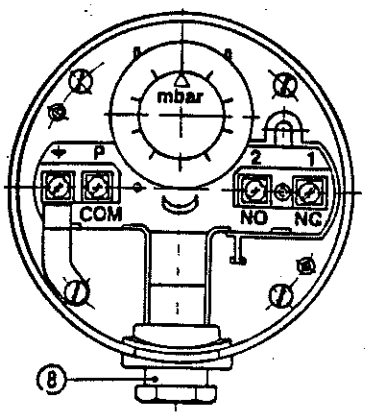
Installation position
Arbitrary
- Standard: Horizontal (with the diaphragm horizontal)
- Vertical (with the diaphragm vertical)
- Horizontal (suspended, with the diaphragm horizontal)
- For any intermediate positions please send installation sketches.

Pressure switches
GW, LGW, UW, NB, ÜB









1 = Lower section
1.1 = Gas connection R ¼"
1.2 = Measuring connection
1.3 = Differential connection R ⅛" for LGW
2 = Diaphragm
3 = Washer
4 = Switch housing
5 = Snap-action contact spring
6 = Adjusting scale
7 = Connection terminals
8 = PG-11 connection
9 = Protective cover

Gas and air pressure switches type GW, UW, LGW

Pressure limiter type ÜB and NB

Dual pressure switches GW/GW for gases and air

DUNGS® technic

Brief technical summary

	Type	Ordering No.	Adjusting range (mbar)		Switching differential (mbar)		Air	Gas	Max. operating pressure (mbar)
Gas and air pressure switch	GW 3	030049	0.4–3		≤0.3		X	X	600
	GW 10	031948	1–10		≤0.4		X	X	600
	GW 50	031955	2.5–50		≤1		X	X	600
	GW 150	032086	30–150		≤3		X	X	600
	GW 500	059964	100–500		≤10		X	X	2000
	GW 1500	077222	300–1500		≤30		X	X	3000
	GW 6000	066555	1000–6000		≤300		X	X	9000
Dual pressure switch	GW 3/3	066605	0.4–3	0.4–3	≤0.3	≤0.3	X	X	600
	GW 3/10	066613	0.4–3	1–10	≤0.3	≤0.4	X	X	600
	GW 10/10	066621	1–10	1–10	≤0.4	≤0.4	X	X	600
	GW 10/50	066639	1–10	2.5–50	≤0.4	≤1	X	X	600
	GW 10/150	066647	1–10	30–150	≤0.4	≤3	X	X	600
	GW 50/50	066654	2.5–50	2.5–50	≤1	≤1	X	X	600
	GW 50/150	066662	2.5–50	30–150	≤1	≤3	X	X	600
	GW 150/150	066670	30–150	30–150	≤3	≤3	X	X	600
	GW 500/500	066688	100–500	100–500	≤10	≤10	X	X	2000
Differential pressure switch	LGW 3	049379	0.4–3		≤0.3		X	X	600
	LGW 10	053579	1–10		≤0.4		X	X	600
	LGW 50	053587	2.5–50		≤1		X	X	600
	LGW 150	053595	30–150		≤3		X	X	600
	LGW 500	084260	100–500		≤10		X	X	2000
Vacuum switch	UW 3	063636	0.4–3		≤0.3		X	X	100
	UW 10	063644	1–10		≤0.4		X	X	100
	UW 50	063651	2.5–50		≤1		X	X	200
	UW 150	063669	30–150		≤3		X	X	200
	UW 500	063677	100–500		≤10		X	X	600
Pressure limiter	ÜB 50/1	108035	2.5–50				X	X	600
	ÜB 150/1	110098	30–150				X	X	600
	ÜB 500/1	110106	100–500				X	X	2000
	NB 50/1	108043	2.5–50				X	X	600
	NB 150/1	110114	30–150				X	X	600
	NB 500/1	110122	100–500				X	X	2000

Ordering example:
Type GW 3
Ordering No. 030049
Installation position horizontal
Calibrated with **increasing** pressure

Subject to alterations, in the interest of technical advances.

...nted in West-Germany
...sw ‹ 03.01.85

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KINETROL

ROTARY 1/4 TURN ACTUATOR/ADD-ON UNITS

Installation, Operation and Maintenance

ACTUATORS

INSTALLATION

1. **Mounting Bolts** — correct sizes are:

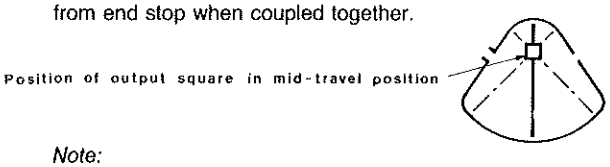
Model	*ISO Threads*	*ANSI Threads*	*Fixing Holes*
01	M4 x 0,7	6	4 clearance
02	M4 x 0,7	8-36 UNF	4 tapped
03	M5 x 0,8	10-32 UNF	4 tapped
05	M5 x 0,8	10-32 UNF	6 tapped
07	M8 x 1,25	5/16-24 UNF	4 tapped
08	M8 x 1,25	5/16-24 UNF	6 tapped
09	M10 x 1,5	3/8-24 UNF	4 tapped
12	M12 x 1,75	1/2-20 UNF	4 tapped
14	M16 x 2	5/8-18 UNF	4 tapped
16	M24 x 3	1-12 UNF	4 tapped
18	M30 x 3,5	1.1/8-12 UNF	4 tapped

Note: essential that full number of bolts are used and all tightened evenly.

C ON: NEVER HAMMER OR USE OTHER UNDUE FORCE ON ACTUATOR DIECAST CASES. DAMAGE TO INTERNAL SEALING FACES WILL RESULT.

2. **Mounting**

2.1. Actuator and driven unit must be correctly aligned, i.e. actuator vane and driven unit must be able to move in same direction from end stop when coupled together.



Note:
Position of output shaft when vane at mid-travel position.

2.2 Take particular care in aligning models 05/08. 6-hole mounting means 30° misalignment possible if flange has 60° error and coupling 90° error.

2.3. There must be no end load on actuator drive shaft. Check clearance between actuator and driven unit drive shaft, allowing for coupling to be used.

2.4. Care must be taken to ensure concentricity between actuator shaft and driven unit shaft.

2.5. Actuator can be mounted in any plane.

3. **..ive coupling**

3.1. Square hole standard drive coupling supplied in mild steel and may be welded or brazed to coupling part to suit drive on driven unit.

3.2. When mounting tightened down, check there is minimum 0.5 mm (0.020") end play of coupling on actuator square drive shaft to avoid end load on actuator shaft.

4. **Air supply**

4.1. Flexible nylon tubing recommended. Size should be relative to supply/exhaust port size on actuator concerned. Undersize tubing or fittings will restrict actuator performance.

4.2 Air supply to D/A or S/R actuators must be reasonably clear and dry. Lubricated air may be used to D/A or S/R actuators but MUST NOT be used for air supply to Positioners or I/P Converters.

5. **Operation**

5.1. External stops are strongly recommended when actuator is operating a mechanism with cantilevered load.

5.2. Second square end of drive shaft may be used for visual position indication, emergency manual operation or driving of add-on units (spring-return unit, limit switch unit, etc.).

5.3. Operating air pressure should not exceed 7 bar (100 p.s.i.).

5.4. Operating temperature of actuator should not exceed 80°C (176°F).

5.5. Visual position indicators are available. Coloured red, made from tough, flexible plastic they can be fitted over square shaft at top of actuator or top of add-on unit.

6. **Maintenance**

Maintenance is limited to replacement of seals when wear affects actuator performance. Seal life will vary according to application, conditions of cycle frequency, temperature, condition of air supply, etc. Detailed seal replacement instructions in next section.

7. **Recommended spare parts**

Standard seal kits, available for each actuator model, consist of the following:

2 off vane seal
2 off expander
2 off shaft seal
plus all necessary O-rings, studs/screws, nuts and grease for all sizes up to model 08.
Studs are not included for models 09 and above.

In addition, a tube of sealant will be required to seal case halves.

8. **Adjustment**

8.1. Stroke Adjustment — only applies to models with adjustable stops.

Table of standard stroke adjustments available

Models	Adjustment range available each stop
02/03/07/09/16/18	10°
05/14	6°
12	11°

Greater adjustment range possible with non standard stop screws. Contact Kinetrol for details.

8.2. Speed Adjustment

Slower operation of actuator is possible, without significant torque output reduction, by external fitment of flow regulator valves.

Faster operation can be achieved under certain conditions by fitting quick exhaust valves.

For full details contact KINETROL.

SEAL REPLACEMENT INSTRUCTIONS

1. **DISMANTLING ACTUATOR (see exploded drawing/parts list)**

CAUTION: Before dismantling check there are no burrs on square drive shafts. If there are, remove to avoid damage to bearings and shaft seals during removal of case halves..

1.1. Models with visible spring pins in case flanges: using correct size flat end punch tap these halfway out.

1.2. All models: remove all case securing screws.

1.3. Separate case halves by connecting air line to inlet port and blowing them apart. Procedure is safe although producing a "bang". Pull off one case half.

CAUTION: Do NOT hammer diecast castings or shaft end. It will damage internal sealing surfaces.

1.4. Clean both case halves removing silicone rubber sealant. Clean joint surfaces of case flange with trichlorethylene.

1.5. Replace and lubricate shaft seals.

1.6. Undo nuts and remove old expanders and seals from vane. Take care not to damage side plates. Clean vane.

adjustments should be confined to zero setting and, if necessary, range adjustment.

1.3 RE-SETTING

Full setting requirements and instructions have been included in case the factory setting has been accidentally disturbed and it is not found practical to return the unit to the supplier.

2. CHARACTERISTICS OF THE POSITIONER/ACTUATOR UNIT

2.1 THE STANDARD POSITIONER

This unit is factory set to position itself within a centrally disposed angular range of 90° in direct and linear response to 3-15 psig control pressure. The standard unit may be requested to have either a clockwise or an anticlockwise response to control pressure. The provision of zero set and range adjustment enables the factory set linear characteristics to be altered on site to within the following limits.

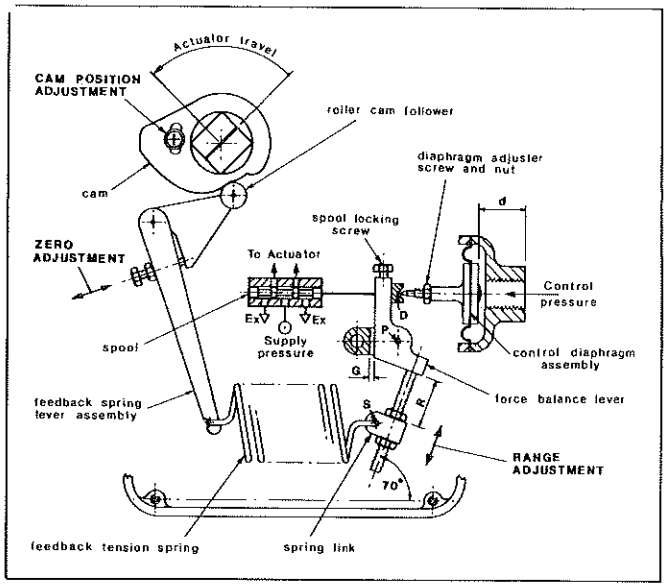
Control Pressure of 3 psig at 0°
is settable between 13.5 and 18.5 psig at 90°

OR Control Pressure of 0.2 bar at 0°
is settable between 0.91 and 1.26 bar at 90°

2.2 NON-STANDARD AND SPECIAL PURPOSE POSITIONERS

The Positioner/Actuator may be characterised to most special requirements of linear or non-linear angular response to standard or non-standard control pressures. This is made possible by being able to characterise the feedback cam and/or by the selection of a suitable feedback spring.

An example of a characterised positioner is found in a unit which is required to open a valve so that the percentage of flow rate through it is proportional to a change in control pressure within predetermined pressure limits.



DESCRIPTION OF OPERATION (see diagram)

The Positioner/Actuator unit uses the force balance principle of operation. Essentially, a force which is proportional to the control pressure (obtained through a diaphragm arrangement) loads one side (at point D) of the force balance lever (D.P.S.). This is opposed (at point S) by a feedback force which is related to the angular position of the actuator shaft. The shaft position feedback force is obtained from a feedback spring which is caused to deflect by a spring lever/cam follower assembly acting against a suitably profiled cam which is connected to the actuator shaft.

An out of balance force condition causes the force balance lever to tilt about pivot point P. The spool of a servo valve is linked to the force balance lever assembly and an out of balance condition causes the servo valve to create a differential air pressure across the actuator vane and forces it to rotate in the direction which would cause balance.

The servo valve reduces and removes the effective differential air pressure across the actuator vane as the condition of force balance is approached and reached. In this manner the Positioner/Actuator Unit will always move to the position demanded by the control pressure.

4. ON-SITE FITTING AND SETTING INSTRUCTIONS

4.1 FITTING OF ACTUATOR/POSITIONER UNIT

The Actuator/Positioner Unit is fitted to the unit it is intended to drive or operate in the same way as an actuator without a positioner — i.e. through suitable mounting bracket and shaft couplings. However, if a Spring Return Unit is also attached it will be necessary for the whole unit to be mounted so that the S/R Unit lies between the mounting bracket and the actuator.

4.2 ON-SITE ADJUSTMENTS TO FACTORY SETTINGS

Zero set and, if necessary, range adjustment are the only recommended adjustments needed to align the travel of the positioner so that it coincides with the required travel of the driven unit. The following setting up procedure should be followed:

(a) Check that the Actuator/Positioner Unit is firmly bolted (through a recommended bracket assembly) to the unit it is intended to operate.

(b) Remove the cover of the positioner.

(c) Connect power air to the positioner unit so that it also passes through the recommended filter unit.

(d) Connect the control pressure air line to the appropriate port in the diaphragm housing of the positioner unit.

(e) Gradually apply control pressure and make sure that the Positioner/Actuator unit responds to the control pressure.

(f) Increase the control pressure to maximum (usually 15 psig) and check that the actuator is able to operate through its intended travel.

(g) Reduce control pressure to read exactly 3 psig (or the desired minimum control pressure) and note shaft position.

(h) If necessary re-set the zero adjuster screw of the positioner unit until the driven unit is at the required starting position of its travel range.

(i) Increase the control pressure to exactly 15 psig (or the desired maximum control pressure) and check if the angular position of the driven unit is at the required maximum travel position. Make sure that it is noted if the driven unit reaches its end stop before the maximum control pressure has been applied.

(j) If the total travel is not as required adjust the range setting to suit. (About ½ degree of range adjustment is caused by turning the range adjuster nuts through one spanner flat.)

(k) Reduce the control pressure back to 3 psig (or minimum required control pressure) and check start position. Adjust zero setting if necessary.

(l) Operate the actuator between minimum and maximum control pressure and check end of travel positions. Adjust until the limits are as required and repeatable.

(m) Switch off air supplies and disconnect supply to the positioner unit.

(n) Make sure that all adjuster screws and nuts are locked in their set positions.

(o) Replace positioner cover and reconnect air supply to the positioner unit.

5. RE-SETTING OF POSITIONER UNIT

5.1 INTRODUCTION

(a) All Positioner/Actuator Units are factory set and tested.

(b) These instructions are to give guidance to customers who, for some reason, wish to reset the unit themselves or do not find it practical to return the unit to the factory.

(c) Kinetrol Ltd. cannot take any responsibility for any damage or malfunction caused by mis-handling.

5.2 THE OBJECTIVES OF SETTING UP (see diagram)

The correct force balance relationship must be obtained between the forces exerted by the control pressure and feedback system. Moreover the condition of balance between forces has to be precisely sensed by the servo valve. This essentially determines that the three functional assemblies (Control Diaphragm, Servo Valve and Feedback assemblies) are connected to the force balance assembly so that a condition of balance occurs at the mid-travel position of the force lever assembly.

In the *balanced condition* the correct relative positions of the assemblies should be as follows:

(a) *Force Balance Lever Assembly*

This pivots at point P. Gap G allows limited angular travel. The balanced position of the lever assembly should be coincident with the mid position of angular travel.

(b) *Control Diaphragm Assembly*

The control diaphragm assembly has a displacement stroke of about 2mm and pivots on the force balance lever assembly. The diaphragm should be in the mid stroke position when the balance lever assembly is in the balanced position.

3. **ALTERNATIVE REMOVAL/REASSEMBLY WORM DRIVE SPRING RETURN UNITS**

Worm drive Spring Return Units may be removed/reassembled as under 1 and 2 above. An alternative method without use of keeper plate is —

3.1. Note position of S/R unit relative to actuator.
3.2. Undo worm locking screw but do not remove it.
3.3. Turn worm anti clockwise until spring tension is released counting number of complete and part turns of S/R unit relative to actuator. Note number of complete and part turns.
3.4. Separate Spring Housing from Base Plate and Worm Drive by removing holding screws.
3.5. Remove Spring Housing and service actuator as required.

REASSEMBLY

3.6. Locate Spring Housing on shaft.
3.7. Ensure worm is correctly located in housing. End of worm with socket wrench location must be at end of housing with locking screw.
3.8. Offer up worm housing and ring locating worm teeth in rack and lining up holding screw holes.
3.9. Replace and tighten holding screws.
3.10. Turn worm clockwise until reaching same number of complete and part turns of S/R unit as noted during removal.
3.11. Do up worm locking screw.

4. **ADJUSTMENT SPRING TENSION**

WARNING: The wound-up steel springs are storing a large amount of energy which, if suddenly released, can be dangerous.

PECIAL NOTE: User adjustment of types without worm drive should only be attempted if correct equipment and facilities are available.

4.1. *Tension Setting Definitions*

4.1.1. Optimum setting is when S/R unit is able to provide as much output torque on the spring return stroke as that produced by the corresponding air stroke at a particular air supply pressure.

4.1.2. Differential setting is when S/R unit produces more or less output torque on spring return stroke as that produced by the corresponding air stroke at a particular air supply pressure.

4.1.3. Operating air pressure in these instructions means the actual air supply pressure at which the actuator will be operated.

4.2. *Optimum Spring Setting Test*

4.2.1. Detach actuator/spring return from valve or mechanism operated by them.

4.2.2. Attach air supply to actuator through pressure regulating valve and gauge with supply shut off at regulator.

4.2.3. Gradually open regulator to increase air supply to actuator until actuator output shaft just begins to move.

4.2.4. Note actual pressure at which actuator output shaft moved.

4.2.5. If actual pressure noted at 4.2.4. is about half the operating air pressure then spring tension is at optimum.

If actual pressure noted at 4.2.4. is significantly less than half operating air pressure then spring tension is below optimum, i.e. output torque on S/R stroke will be less than that produced on corresponding air stroke at operating air pressure.

Conversely if actual pressure at 4.2.4. is significantly greater than half operating pressure then spring tension is above the optimum, i.e. S/R torque will be greater than air stroke torque.

4.3. *Tension Adjustment Method (Standard S/R units without worm drive)*

4.3.1. Equipment/facilities required:

Air supply with pressure regulator valve and gauge in line.

Keeper plate with bolts and spacers (KINETROL supply).

Spanners/tools to suit.

4.3.2. Detach actuator/spring return from valve/mechanism.

4.3.3. Connect air supply to actuator with regulator shut off.

4.3.4. Carry out Optimum Spring Setting Test as at 2.2. above to determine whether spring tension needs to be increased or decreased.

4.3.5. Gradually open air supply regulator until actuator vane is at centre of travel (45°) position. See sketch at page 0.

4.3.6. Place keeper plate over S/R square shaft at top of S/R unit.

CAUTION: If keeper plate of flat type spacer washers at least 3 mm (1/8") thick must be used under keeper plate. KINETROL die cast keeper plates do not need spacer washers.

4.3.7. If bolt holes of keeper plate do not line up with corresponding tapped holes in S/R unit carefully open or close air supply regulator until S/R square shaft turns so that holes do line up.

4.3.8. Insert and tighten keeper plate bolts.

4.3.9. Shut off air supply to actuator.

4.3.10. Undo and remove all spring housing flange bolts. Leave spring housing resting on base plate.

4.3.11. Turn spring housing in required direction according to:

a) S/R operating direction, i.e. clockwise or anticlockwise operation of spring force, and

b) Tension required to be increased or decreased.

NOTE: Larger sizes of actuator/spring return will require spanner and possibly extension bar to turn spring housing through square shaft on S/R unit.

4.3.12. Dependent on the age of S/R unit concerned there will be 12 or 24 bolt holes around the base plate flange (except for 010 model which has only 4 and 140 model which now has 36).

Therefore older models (12 holes) can only be adjusted by 30° steps whereas newer models can be adjusted by 15° steps (010 by 90° steps and current 140 by 10° steps.)

4.3.13. As a rough guide 30° adjustment of spring housing relative to base plate will give 8% change of spring torque output providing spring is already tensioned within its operating air pressure range, i.e. standard S/R units between 50 and 80 p.s.i. Low air supply S/R units between 25 and 50 p.s.i. See catalogue for full details.

4.3.14. Maximum adjustment in one step will be 45° controlled by available vane movement in actuator.

4.3.15. After turning spring housing by amount required (or possible) line up bolt holes in spring housing and base plate flanges. Insert flange bolts and tighten nuts.

4.3.16. Carefully open air supply to actuator until side load on keeper plate bolts is relieved.

4.3.17. Remove keeper plate.

4.3.18. Repeat Optimum Spring Setting Test as at 4.2. above.

4.3.19. If necessary repeat operations 4.3.5. to 4.3.17. to further increase or decrease spring tension.

WARNING: Spring tension must *not* be further increased if air pressure noted at 4.2.4. is 40 p.s.i. or more for standard S/R units or 30 p.s.i. for special low air supply types.

4.4 *Method (Worm Drive Type S/R Units)*

4.4.1. Carry out Optimum Spring Setting Test as at 4.2 above.

4.4.2. Loosen locking screw on worm.

4.4.3. To reduce spring tension turn worm anticlockwise.
To increase spring tension turn worm clockwise.

As a rough guide 30° adjustment of spring housing relative to base plate will give approximately 8% change of spring torque output providing spring is already tensioned within its operating air pressure range. See 4.3.13. above.

4.4.5. After adjustment carry out Optimum Spring Setting Test as at 4.2 above.

4.4.6. When optimum setting achieved retighten locking screw on worm.

WARNING: Spring tension must *not* be further increased if air pressure noted at 4.2.4. is 40 p.s.i. or more

PNEUMATICALLY CONTROLLED POSITIONING ACTUATORS

1. **INTRODUCTION**

1.1 THE POSITIONER/ACTUATOR UNIT

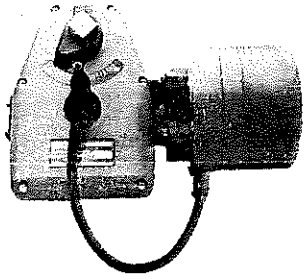
The standard unit consists of a Kinetrol quarter-turn pneumatic rotary actuator which has been suitably modified and fitted with a specially designed and precision manufactured pneumatically controlled positioner.

1.2 SITE ADJUSTMENTS

N.B. — The Actuator/Positioner Unit is factory set and "on site"

Positioner Electrical Signal Options

I/P CONTROLLER



SPECIFICATION
Electrical control signal – 4-20mA
Coil impedance – 17 ohms
Cable entry – 16mm conduit or gland
Air supply – 80psi/5,5 bar
Air entry – G1/8 (fitted with 6mm pipe dia. push-in connector)
Linearity – 1½%
Hysteresis – <1%
Sensitivity – 0.1 mA
Supply pressure regulation – 0.2°/psi between 80 and 60 psi

Optional Modular I/P Controller

The Kinetrol I/P Controller is mounted in place of the standar diaphragm housing on the side of the positioner case. The positioner can still be mounted in any attitude and gives an angula output position which is proportional to the input current control signal between 4 and 20 milliamps.

The 4-20 mA signal is converted to an air pressure by a coil and magnet and flapper valve arrangement. This air pressure controls the positioner in the normal way.

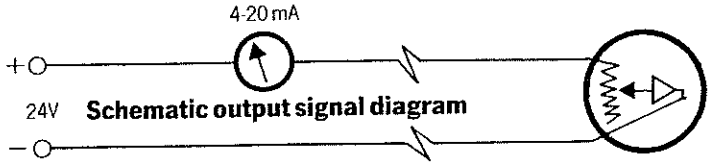
Air supply to the unit is taken from the same constant 80psi/ 5,5 bar supply as the positioner.

Zero and range adjustment is done within the positioner in th same way as with a standard pneumatic positioner. There is no adjustment to worry about within the I/P Controller. The cover is removed only to connect the wires.

INSTALLATION DIMENSIONS see page 22

ANGLE TRANSDUCER (FEEDBACK 4-20mA)

SPECIFICATION
Supply voltage – 15-30v
Output current – 4-mA
Max cable resistance – 750 ohms (30v supply)
Cable entry – Conduit thread (see Page 5)
Connection 2-way terminal block
Linearity – 0.5%
Hysteresis – <0.25%



Schematic output signal diagram

Angle Transducer (Optional Modular 2-wire position feedback via 4-20mA signal)

Operation

The Kinetrol Angle Transducer is mounted on the positioner cover and driven by the standard square. It gives a 4-20mA electrical signal which is proportional to angular position between 0° and 90°.

Nominal supply voltage is 24v DC but output signal integrity i maintained at supply voltage variations between 15v and 30v.

The unit consists of a precision conductive plastic potentiometer and an electronic circuit board mounted inside a weatherproof die-cast box.

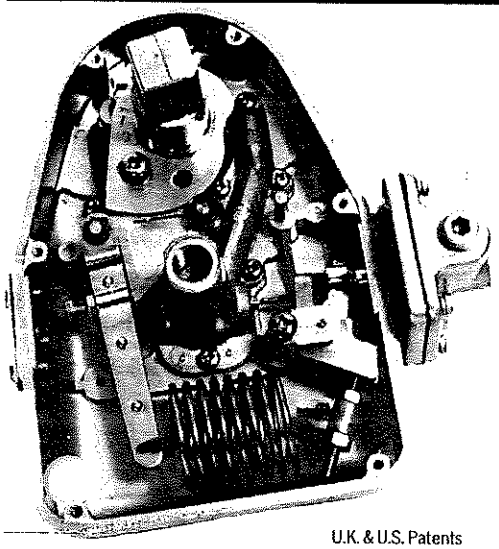
The circuit provides a stabilised voltage to the potentiomete and converts the potentiometer signal to a 4-20mA current signal drawn from the 24v supply. Zero and span are adjustable.

The potentiometer is driven by a spring coupling allowing the whole unit to be removed and replaced with the cover of the positioner.

INSTALLATION DIMENSIONS see page 22

Positioner

SPECIFICATION



U.K. & U.S. Patents

Supply Pressure
Normal – 80psi/5.5 bar
Max –120 psi/8.3 bar
Min – 50 psi/3.5 bar

Output Torque
Same as actuator
See tables pages 23/24
Actuator must be adequately sized for best performance

Response Speed
Max velocity (no load) at 80psi/5.5 bar

Model	03	05	07	08	09	12	14	16	18
Degs/sec	180	130	90	75	55	27	10	4.5	2.85

Performance

Linearity	1%
Sensitivity & hysteresis	0.1 lbf/in^2/7 millibar
Quiescent air consumption at	80 lbf/in^2/5.5 bar
Max	½ SCFM/14 l/min

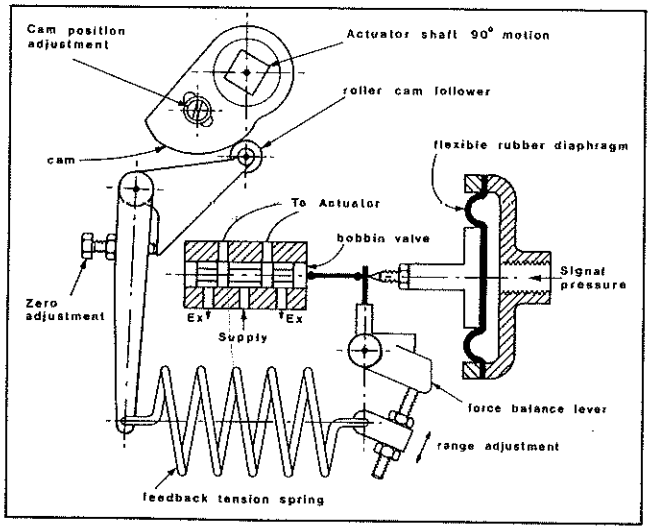
Signal Pressure
Normal – 3-15 lbf/in^2 but see input/output table below

Materials
Case & cover – Zinc alloy pressure diecast
Valve spool – Stainless steel
Valve liner – Bronze
Feedback spring – Steel
Diaphragm – Nitrile/nylon moulded
External finish – Epoxy stove enamel

Instrument quality dry clean air obligatory

How it works

When a signal air pressure is applied to the diaphragm a force is created which moves the force-balance lever counter clockwise against the tension of the feedback spring and moves the bobbin valve to the left. This opens the left hand side of the actuator to supply air pressure causing the actuator vane to turn counter clockwise, at the same time opening the right hand side of the actuator to exhaust allowing the trapped air to escape. The actuator vane turns the cam with it counter clockwise, pushing down the cam follower and the end of the lever to the left. This increases the tension in the feedback spring progressively until it balances the force from the diaphragm on the other end of the force balance lever, at which point the bobbin valve moves back to the centre position, where air neither enters nor exhausts from the actuator and motion ceases. As there is no friction in the diaphragm, the force on it is exactly proportional to pressure, also the spring force is exactly determined by the angle of the actuator vane, so a particular signal pressure will always result in the same rotational position of the valve. This description is for a positioner which moves counter clockwise rotation in response to a rising signal (Code 500). The arrangement for clockwise response is the mirror image of this (Code 600).



Direction of Rotation is as seen from above the positioner

INPUT/OUTPUT RELATIONSHIP

The following options are available as standard

Input (Control) Air Signal	Input (Control) Electrical Signal	Output Movement	Characteristic	Cam No.
3 – 15 psi 0,2 – 1,0 bar	4 – 20 mA	0° – 90°	Linear	5 – 1
3 – 9 psi 0,2 – 0,6 bar	4 – 12 mA	0° – 90°	Linear	5 – 2
6 – 12 psi 0,4 – 0,8 bar	8 – 16 mA	0° – 90°	Linear	5 – 3
9 – 15 psi 0,6 – 1,0 bar	12 – 20 mA	0° – 90°	Linear	5 – 4
3 – 15 psi 0,2 – 1,0 bar	4 – 20 mA	0° – 60°	Linear	5 – 5
3 – 15 psi 0,2 – 1,0 bar	4 – 20 mA	0° – 45°	Linear	5 – 6
3 – 15 psi 0,2 – 1,0 bar	4 – 20 mA	0° – 90°	Proportional Flow	5 – 7
3 – 9 psi 0,2 – 0,6 bar	4 – 12 mA	0° – 90°	Proportional Flow	5 – 8
9 – 15 psi 0,6 – 1,0 bar	12 – 20 mA	0° – 90°	Proportional Flow	5 – 22
3 – 12 psi 0,2 – 0,8 bar	4 – 16 mA	0° – 90°	Linear	5 – 13
9 – 15 psi 0,6 – 1,0 bar	12 – 20 mA	0° – 60°	Linear	5 – 14

Cams – cam 5-1 will be supplied unless otherwise specified (see input/output)

OPTIONS

Spring Return Units for failsafe operation
I/P Controller for electrical control signal
Angle Transducer (4-20mA) for position readout/control

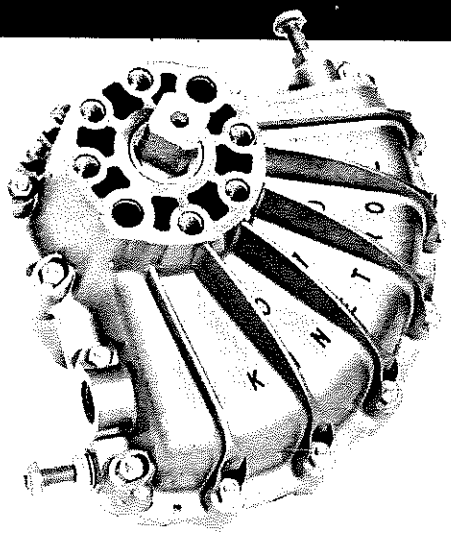
Limit Switch Box for open/close remote indication
Pressure gauges for signal pressure and/or actuator pressure L and R side

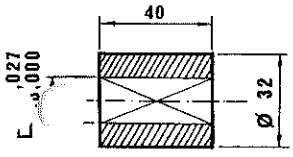
INSTALLATION DIMENSIONS see page 22

Model 07 Actuator

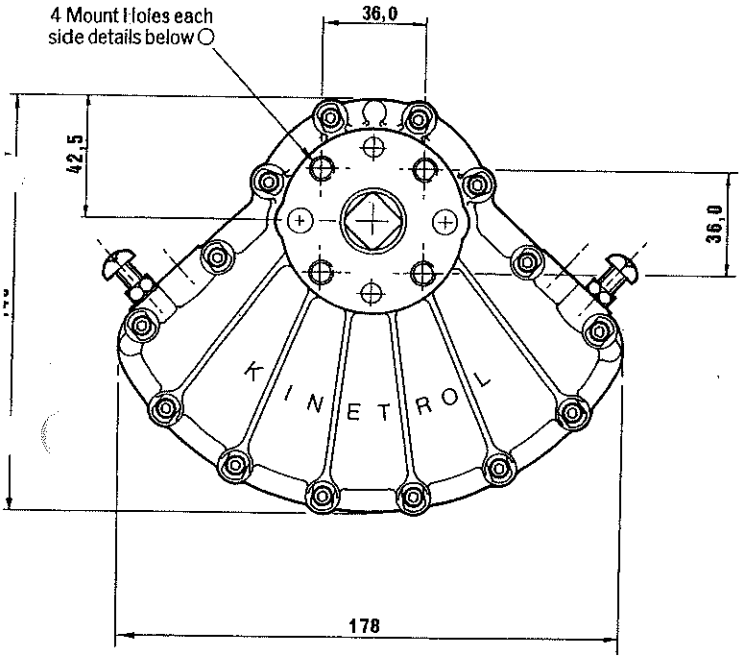
SPECIFICATION

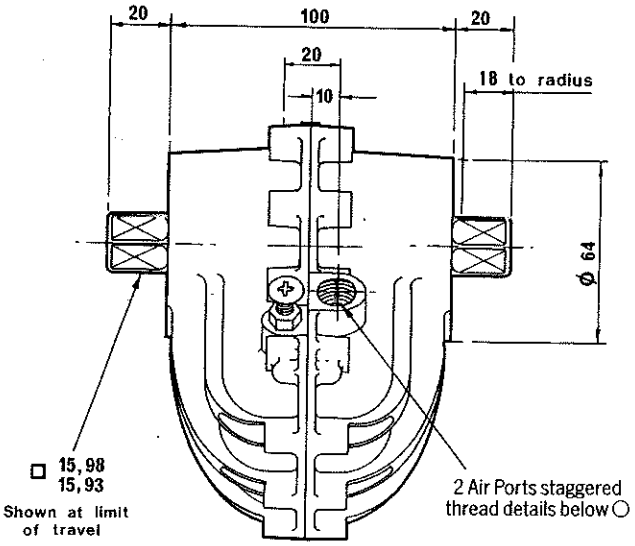
Output torque – 1080 lbf.ins/122 Nm at 100 psi/7 bar
Angle of travel (adjustable) – 80° – 100° (restricted travel versions available to order)
Displaced volume – 18.3 in^3/300 cm^3
Finish – Epoxy stove enamel
Options – see below
Weight – 7.28 lbs/3.3 kg.
For further information see General Specification





STANDARD COUPLING
(supplied with actuator)





OPTIONS

- Fail safe spring return units – clockwise or counter clockwise
- Limit switch boxes for open/close indication – various switches for all hazardous areas
- Integral solenoid valve
- Modulating positioner for automatic process control valves – pneumatic control signal or optional I/P controller for electrical control signal – optional limit switch box or angle transducer (4-20 mA) for position indication/readout
- Code identification see page 26

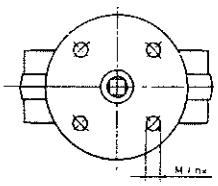
Torque outputs see pages 23/24
Size details of options see pages 21/22

○ Air Ports/Mount Holes

Model	Air Ports	Mount Holes
070-100	G1/4"	M8 x 16 deep
078-100	G1/4"	M8 x 16 deep
079-100	1/4" NPT	5/16-24 UNF x 5/8" deep on 2.00" PCD

ENGLISH DIMENSIONS see page 21

BUTTERFLY VALVE - RANGE EVBS - SEMI LUG TYPE - DN 50-300 (2''-12'')



Working pressure : - DN 50 - 200 (2''- 8'') 16 bar
- DN 250 - 300 (10''-12'') 10 bar
- 16 bar on request

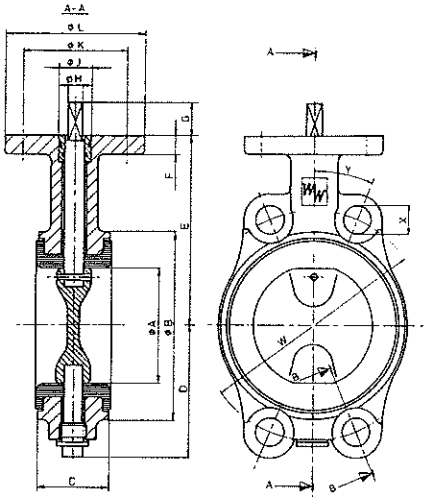
Flange connections : - DN 50 - 150 (2''- 6'')
ISO 7005/DIN 2501 PN16
- DN 200 - 300 (8''-12'')
ISO 7005/DIN 2501 PN10,
PN16 on request

Face to face dim. : acc. to ISO 5752 short, basic series 20, equal to BS 5155 wafer short, DIN 3202-K1, API 609

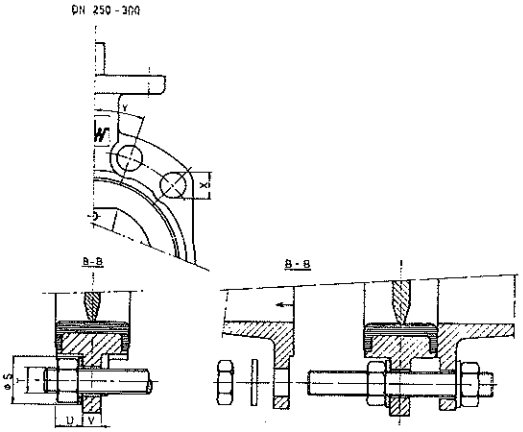
Top flange / PCD : acc. to ISO 5211

Marking : acc. to ISO 5209 (API 609, MSS SP25 on request).

Centring between pipe flanges : with centring holes



Remarks : - max. pressure allowed as end of line valve service : 10 bar
- type of washers acc. to DIN 125 and ISO R887
- Torque to tighten the flange bolts M16 / 45 Nm and M20 / 90 Nm



Actuation : - Lever page 33 + 41/42
- Wormgear page 33 + 43-48
- Pneumatic page 35-38, 49-57
- Hydraulic page 40
- Electric page 39

Material specification : see page 7-8

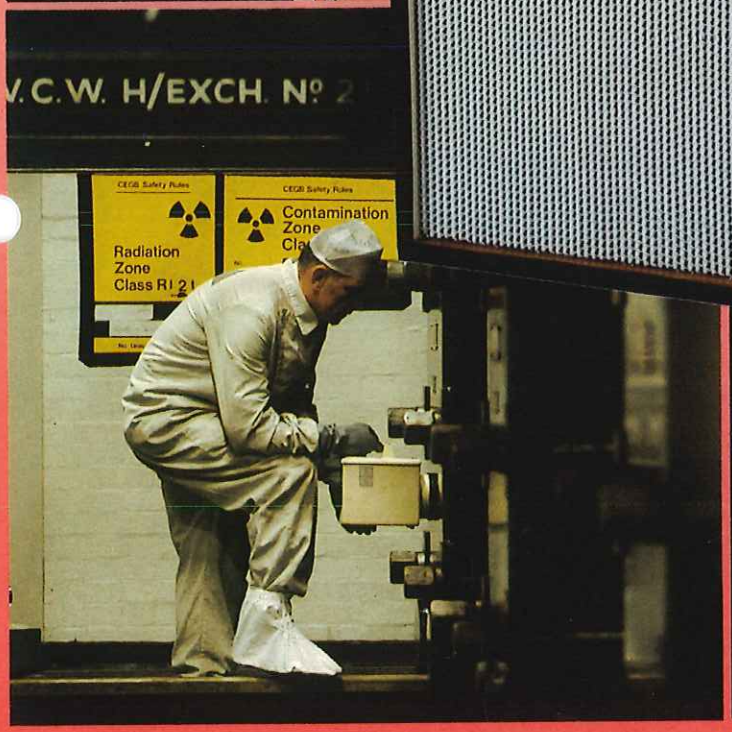
Coating systems : see page 65-66

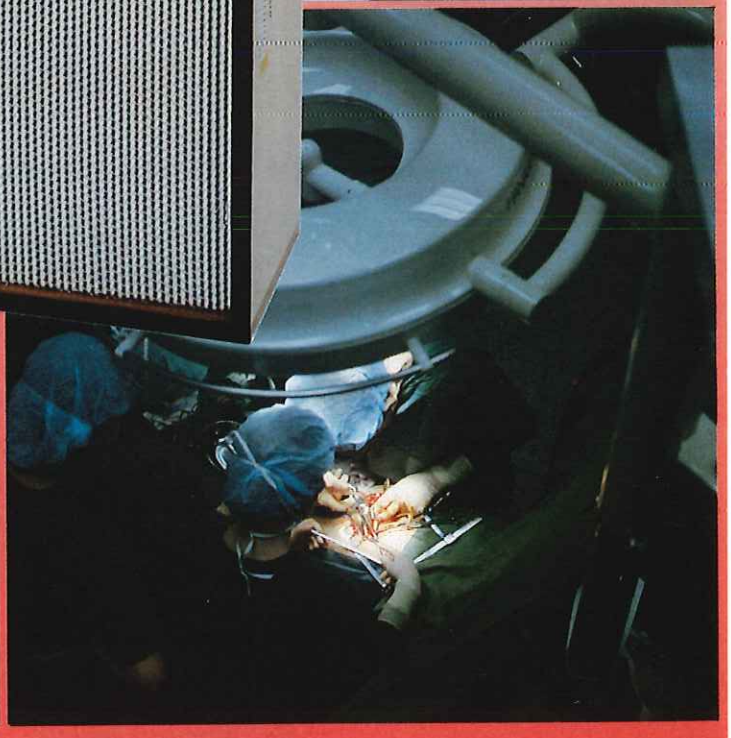
DN	A	B	C	D	E	F	G	H	J	K	L	M
50	50	100	43	63	118	12	34	10	18	70	90	9
65	65	115	46	71	126	12	34	10	18	70	90	9
80	80	130	46	78	133	12	34	10	18	70	90	9
100	100	150	52	96	147	12	34	12	22	70	90	9
125	125	182	56	109	160	12	34	12	22	70	90	9
150	150	210	56	133	180	14	34	16	30	70	90	9
200	200	262	60	158	204	14	34	16	30	70	90	9
250	250	315	68	194	245	15	45	24	38	102	125	11
300	300	371	78	219	270	15	45	24	38	102	125	11

DN	n	ISO 5211	S	T	U	V	W	X	Y	± KG
50	4	F07	30	M16	17	9	125	19	45°	2,8
65	4	F07	30	M16	17,5	11	145	19	45°	3,6
80	4	F07	30	M16	17,5	11	160	19	22,5°	3,9
100	4	F07	30	M16	17	18	180	19	22,5°	5,1
125	4	F07	30	M16	17	22	210	19	22,5°	7,0
150	4	F07	37	M20	20	16	240	23	22,5°	9,5
200	4	F07	37	M20	20	20	295	23	22,5° / 15°	14
250	4	F10	37	M20	20	26	350	25	15°	24
300	4	F10	37	M20	20	28	400	25	15°	36

Bigger sizes on request. Due to the use of a lever there is a hole through the uppershaft of DN 50-300. For actuator dimensions please refer to appropriate data sheets.
It is the companies policy to improve and update the products and therefore we reserve the right to change the specification accordingly. This document superseeds the previous issues.

ABSOLUTE & MICRETAIN Filters

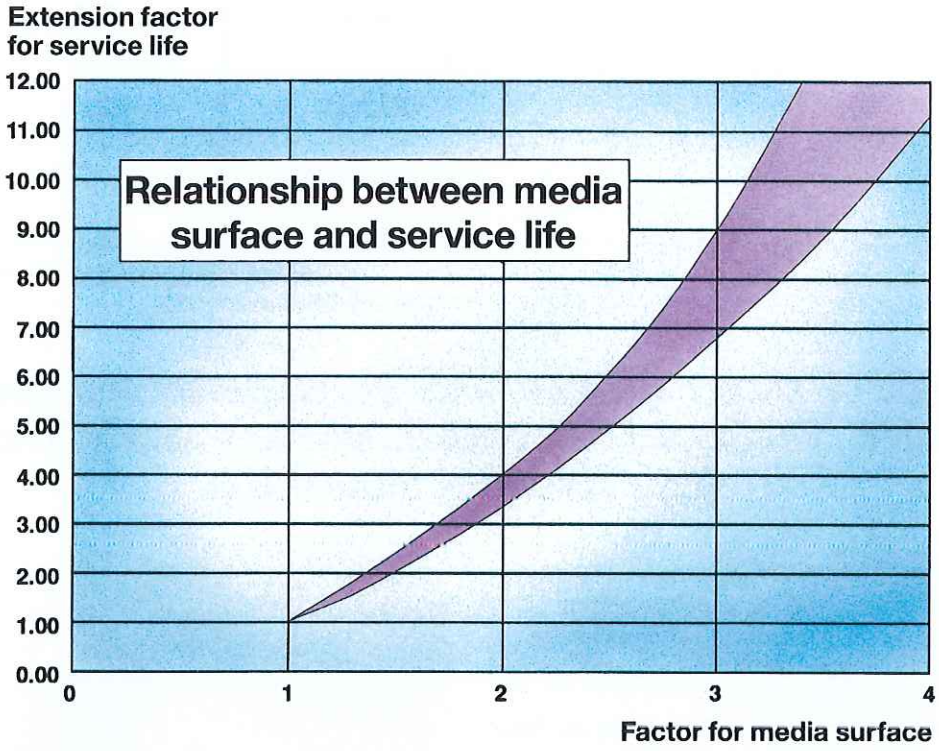




camfil

Air flow resistance – energy – service life

The relationship between the above three factors is very simple. If you increase the surface of the filter media, the velocity of the air through the media decreases, and the air flow resistance declines, which saves energy. The service life of the filter is also extended, (although not proportionally) generally as shown in the diagram given below.



This figure indicates that a tripling of the surface results in an eightfold increase in service life at the same air velocity. At the same time, filtration efficiency rises which also provides greater protection and reliability.

This is why a Camfil standard Absolute/Micretain filter, with its extended filter media surface, is such a great choice. Even better is a Camfil Super Absolute/Micretain with about 45 % more media surface whilst maintaining the same external dimensions.

A simpler type of Absolute filter is the 2 series, with less media surface that the standard Absolute. This is available for applications where service life and energy consumption are of lesser importance.

Standard ABSOLUTE and MICRETAIN

Standard ABSOLUTE and MICRETAIN filters are available in different designs, depending on the application, in efficiencies of ≥99.99% and 95% respectively for 0.3μm particles DOP.

- F and EP filters are also available with stainless steel frames.
- G, H, D and EP filters can also be obtained in scanned versions with an efficiens of ≥99.995% for 0.3 mm particles DOP.

Type 1D/7D*

Media:	Glassfibre CM 115/116
Separator:	Aluminium
Frame:	Plywood, flameproof
Sealant:	Polyurethane, 90°C; 100% RH
Gasket:	Neoprene

Type 1EP/7EP*

Media:	Glassfibre CM 115/116
Separator:	Aluminium
Frame:	Zink-plated steel sheet Flame retardent
Sealant:	Polyurethane, 90°C; 100% RH
Gasket:	Neoprene

Type 1G/7G*

Media:	Glassfibre CM 115/116
Separator:	Epoxy-enamelled aluminium
Frame:	Plywood Flameproof
Sealant:	Polyurethane, 90°C; 100% RH
Gasket:	Neoprene

Type 1H/7H*

Media:	Glassfibre CM 115/116
Separator:	Aluminium
Frame:	Plywood, painted with a flame resistant coating
Sealant:	Polyurethane, 90°C; 150% RH
Gasket:	Neoprene

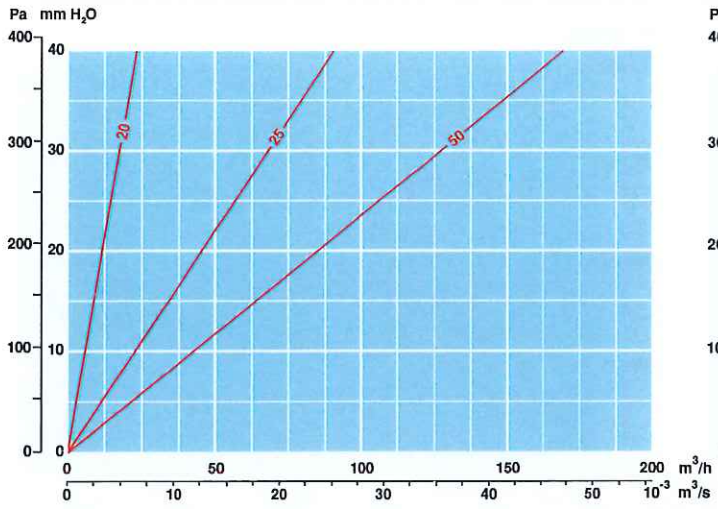
At temperatures above 250°C, contact Camfil. The filters can only withstand temperatures of about 400°C for short periods. Rapid changes in temperature should be avoided.

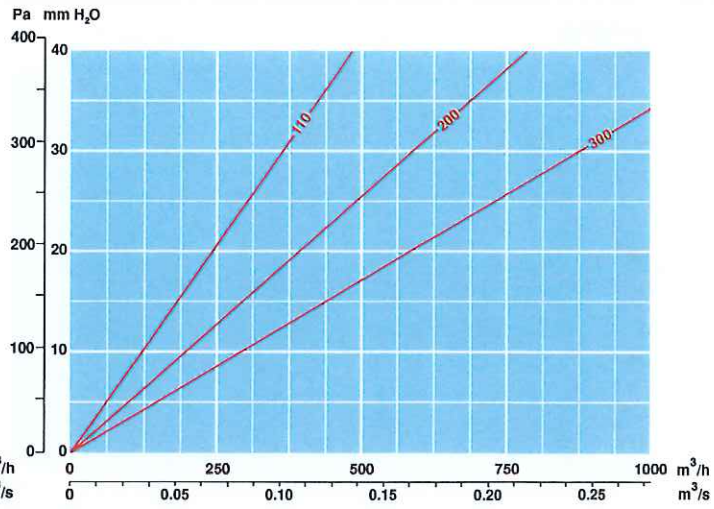
Type 1F/7F*

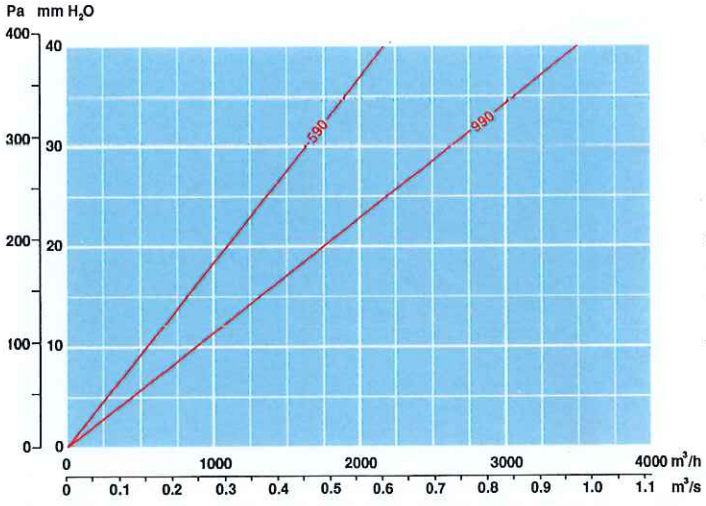
Media:	Glassfibre CM 115/116		
Separator:	Aluminium		
Frame:	Zink-plated steel sheet Fireproof		
	Standard 1F	**Type 1FSI**	**Type 1FK**
Sealant:	Glassfibre 230°C	Silicon 265°C	Ceramics 400°C
Efficiency: for 0.3 μm particles	≥99.7%	≥99.97%	≥99.97%
Gasket:	Ceramic fibre	Silicon	Ceramic fibre

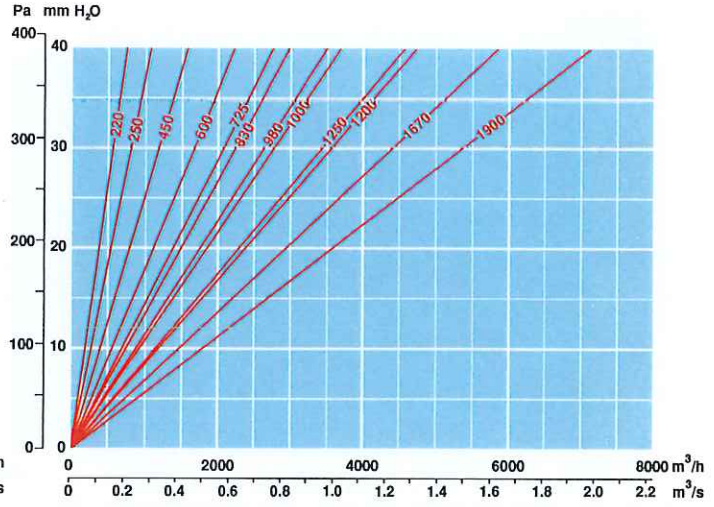
* 1 = Absolute, 7 = Micretain

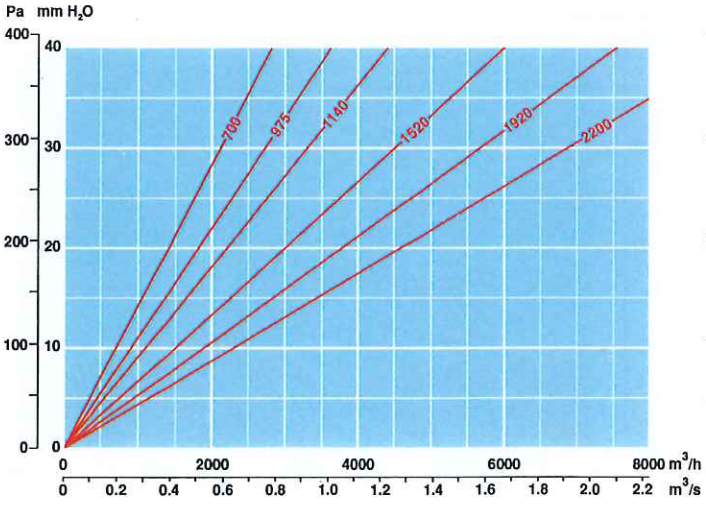
ABSOLUTE. Air flow and resistance

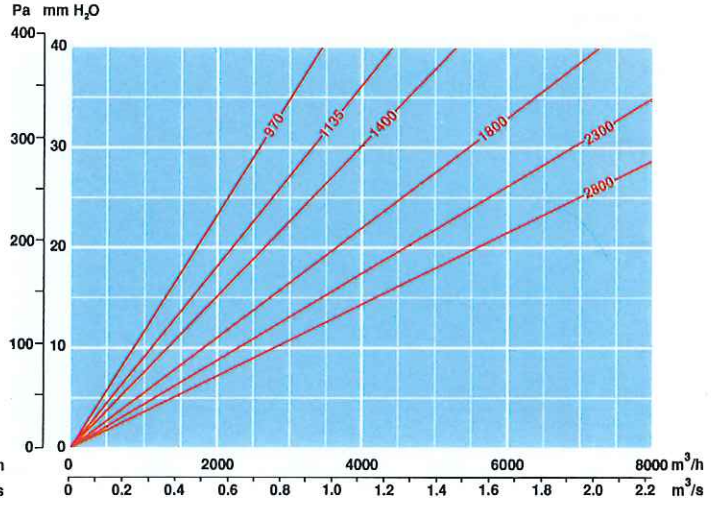








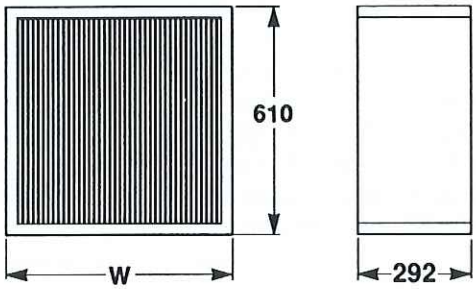




SUPER ABSOLUTE

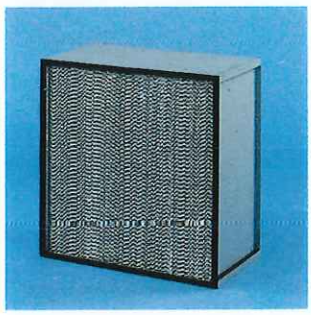
In order to increase the surface area and service life of filters with the same external dimensions, and also to reduce resistance, Camfil has designed and developed the Super ABSOLUTE filter. The larger filter surface has been achieved by using tapered separators.

The filter is available in two different versions, depending on application, with an efficiency of ≥99.99 % for 0.3 μm particles.



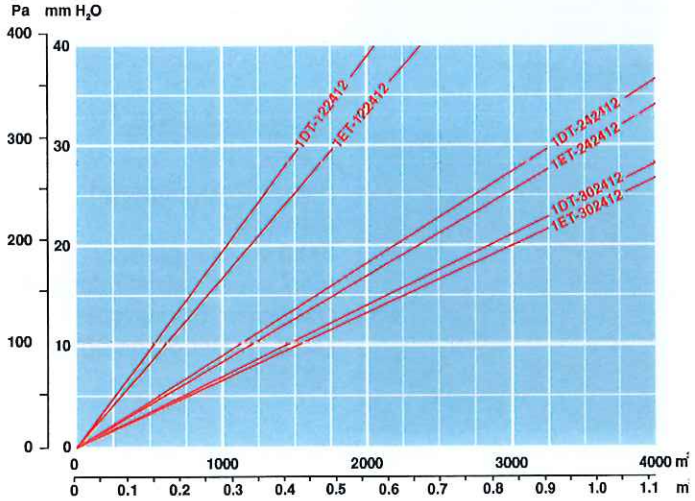
Type 1DT

Media: Glassfibre CM 115/116
Separators: Tapered aluminium
Frame: Plywood Flameproof
Sealant: Polyurethane
Gasket: Neoprene 90°C, 100% RH



Media: Glassfibre CM 115/116
Separators: Tapered aluminium
Frame: Zink-plated steel sheet Flame retardent
Sealant: Polyurethane
Gasket: Neoprene 90°C, 100% RJ

Model	Dimensions	Media area mm²
1DT-122412	305×610×292	15.0
1DT-242412	610×610×292	32.7
1DT-302412	762×610×292	41.3
1ET-122412	305×610×292	15.9
1ET-242412	610×610×292	34.3
1ET-302412	762×610×292	43.4



Specifications

A Super ABSOLUTE filter consists of a flameproof plywood frame (or zink-plated steel sheet). The filter surface is expanded at least ..... times (for 610×610×292 mm filters, 88 times) by using pleated glassfibre paper supported by tapered aluminium separators. The filter has an efficiency of at least 99.99 % for 0.3 μm particles. The sealant between the glassfibre paper and the frame is made of polyurethane and the gasket of neoprene. Each filter is individually tested.

Example 1 **1ET-242412-01**

ABSOLUTE
Construction
Size
Gasket position
- 00 = no gasket
- 01 = gasket, air-leaving side
- 10 = gasket, air-entering side
- 11 = gaskets on both sides

Technical data

Efficiency	..... % for 0,3 μm particles	Air flow	..... m³/h (m³/s)
Filter surface	..... m²	Initial resistance	..... Pa

ABSOLUTE 2-series

The 2 series has been developed to satisfy less demanding applications in terms of service life and energy consumption.

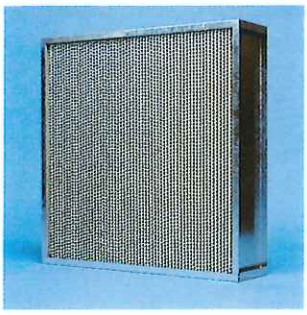
The filter is available in two versions depending on application and with efficiencies of ≥99.99 % for 0,3 μm particles.

Type 2S

Media: Glassfibre CM 115
Separator: Aluminium
Frame: Particle board
Difficult to ignite
Sealant: Polyurethane
Gasket: Neoprene 90°C, 100 % RH

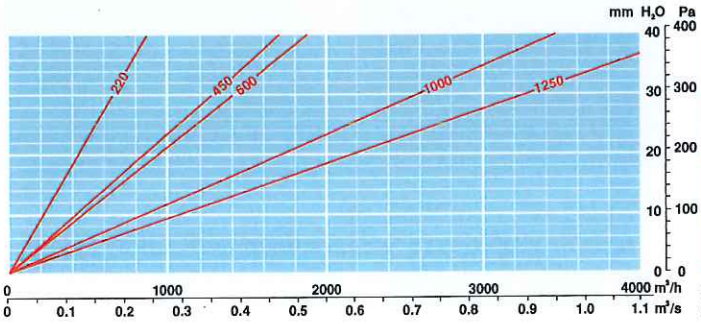
Model	W	H	D	m²
2S- 220	305	610	150	3.9
2S- 450	305	610	292	7.9
2S- 600	610	610	150	8.4
2S-1000	610	610	292	17.1
2S-1250	762	610	292	21.8

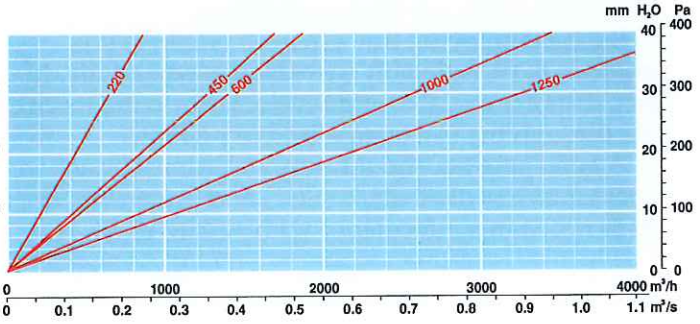
Type 2EP



Media: Glassfibre CM 115
Separator: Aluminium
Frame: Zink-plated sheet
Flame retardent
Sealant: Polyurethane
Gasket: Neoprene 90°C, 100 % RH

Model	W	H	D	m²
2EP- 220	305	610	150	4.1
2EP- 450	305	610	292	8.4
2EP- 600	610	610	150	8.9
2EP-1000	610	610	292	18.2
2EP-1250	762	610	292	22.8





Specifications

An ABSOLUTE 2 filter consists of a particle board frame (or zink-plated sheet). The filter surface is expanded at least ..... times (for 610×610×292 mm 43 times) by using pleated glassfibre paper supported by aluminium separators. The filter has an efficiency of 99.99 % for 0.3 μm particles. The sealant between the paper and the frame is made of polyurethane and the gasket of neoprene. Each filter is individually tested.

Technical data

Efficiency ..... % for 0.3 μm particles
Filter surface ..... m^2
Air flow ..... m^3/h (m^3/s)
Initial resistance ..... Pa

Example 1 2S-1000-01

Design
Size
Gasket position
00 = no gasket
01 = gasket, air-leaving side
10 = gasket, air-entering side
11 = gaskets on both sides

Start up

The procedures followed when starting up operation of a filter installation vary depending on the design of the plant and the applications. However, the general rule is that the ducting upstream of the filters and the supply air system downstream of the filters should be cleaned thoroughly before the fans are turned on.

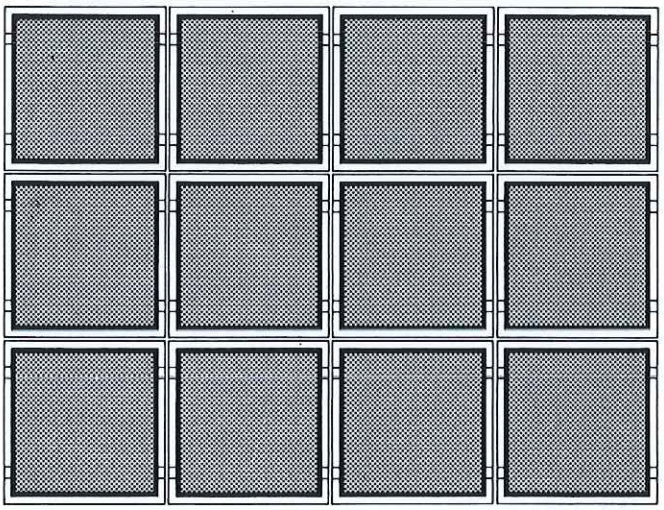
Air handling systems for Clean Rooms should also be flushed with air a day or so before the premises are occupied.

Installation

ABSOLUTE and MICRETAIN filters using Camfil 4N installation frames can be positioned side by side or top of one another to form a filter bank. The space between housings must be well sealed to prevent leakage, because even the tiniest leak can ruin the efficiency of a filter assembly.

To ensure that an ABSOLUTE and MICRETAIN filter assembly in a Clean Room shall meet requirements in conformance with Federal Standard 209, Camdistri or Camduct should be used. See p. 14 Camdistri Camduct.

CAMBOX is a special cabinet designed for installation of ABSOLUTE and MICRETAIN filters in a ducting system. The FC-A housing is a side access cabinet designed for the installation of ABSOLUTE and MICRETAIN filters in a variety of applications.

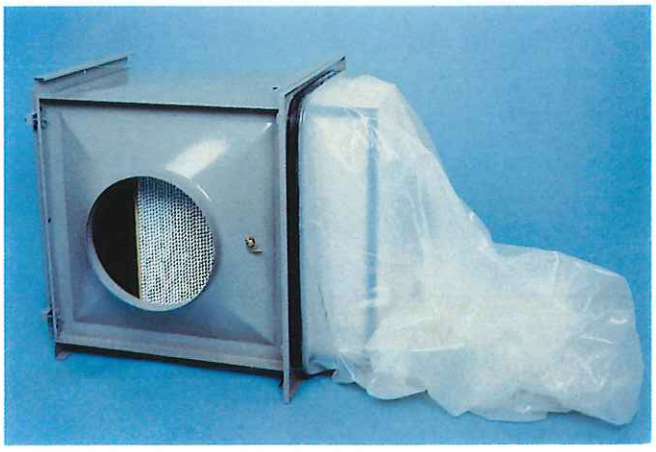


Filter bank with 4N assembly frames

Replacing filters

All filter banks must have a pressure gange for continuous monitoring of air flow resistance and filters should only be replaced when the set final resistance has been reached.

ABSOLUTE and MICRETAIN filters which are being used to clean supply and exhaust air containing chemicals, radioactive particles or other substances, which service personnel must not come in direct contact with, are not normally installed in filter banks. They are fitted in special cabinets, Camboxes. The Cambox is available in a "safe change" version, with which it is possible to replace used filters, and seal them into plastic bags for safe disposial, without direct contact by service personnel and without contaminants from the system entering the surounding area.



CAMDUCT

CAMDUCT is designed for changing filters outside a Clean Room. A complete Camduct consists of two compressed sheet metal ends and four tightening screws. See the separate brochure.

FC-A

FC-A is a filter cabinet for ABSOLUTE and MICRETAIN which can also be used for Airopac, Camfil's fine filter. FC-A is made of nickel-plated sheet metal. See separate brochure.

Pressure gauges

CAMFIL offers several different pressure gauges such as the T-50 or T-100 U-pipe pressure gauges, the SR 250/500 angle pressure gauge, the Magnehelic 2000 and the DPS difference pressure gauge.

If you want more information

Order other Camfil brochures, Filter Technology, Clean Room Filters, and the reprint of the report "The performance of modern HEPA and ULPA filters and laminar airflow uniformity downstream of HEPA and ULPA filters."

Also contact your nearest Camfil office.

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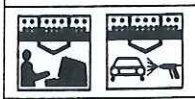
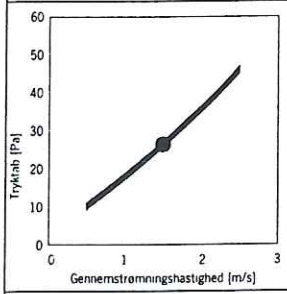
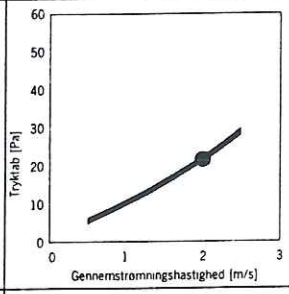
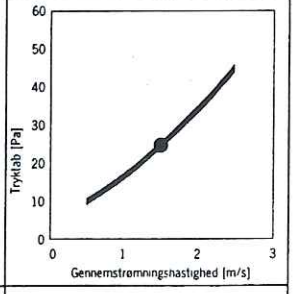
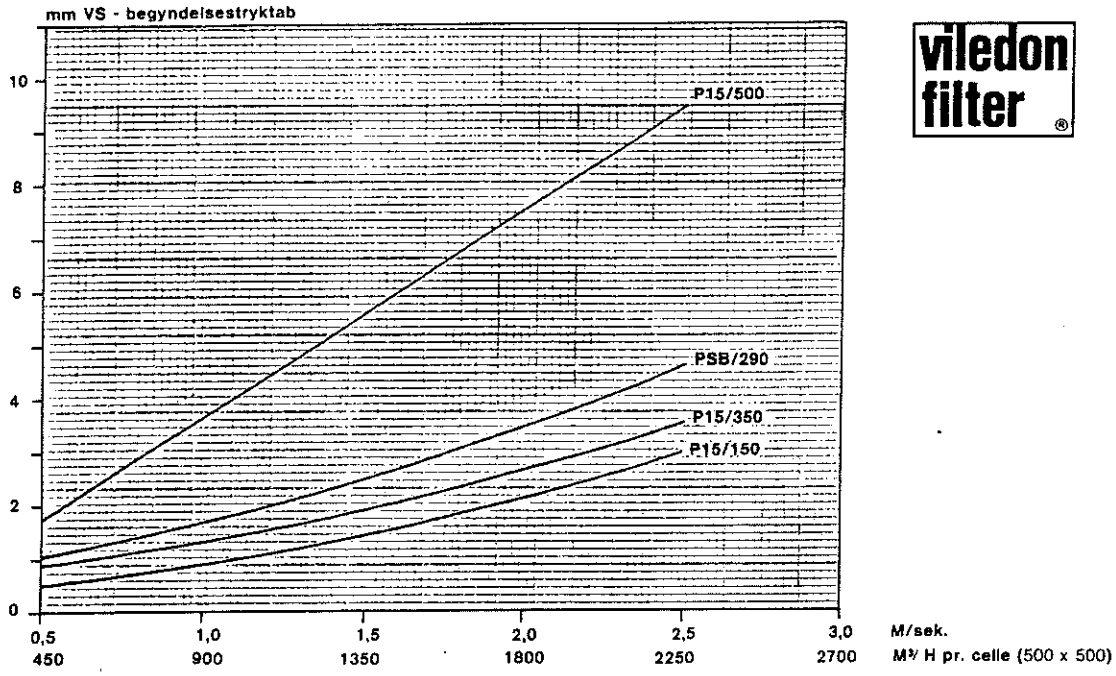
PSB/290 S	ZSB/145 S	XY/290 S
		
EU 3 DIN 24185	EU 2 DIN 24185	EU 3 DIN 24185
		
Progressivt opbygget filtermedie af syntetisk-organiske krølfibre med høj elasticitet og stor brudstyrke bundne med kunstharpiks. Filteret er typegodkendt og mærket på renluftsiden i overensstemmelse med kravene som specificeret i DIN 24 185.	Filtermedie af syntetisk-organiske krølfibre bundne med kunstharpiks. Filteret er typegodkendt og mærket på renluftsiden i overensstemmelse med kravene som specificeret i DIN 24 185.	Progressivt opbygget filtermedie af syntetisk-organiske krølfibre med høj elasticitet og stor brudstyrke bundne med kunstharpiks. Filteret er typegodkendt og mærket på renluftsiden i overensstemmelse med kravene som specificeret i DIN 24 185.
20	8	18
		
86 til 200	67 til 125	83 til 200
F1 DIN 53438	F1 DIN 53438	F1 DIN 53438
		
til 100	til 100	til 100
I retvinklede udskæringer, eller i ruller, standardbredde 2000 mm, standardlængde 20 m.	I retvinklede udskæringer, eller i ruller, standardbredde 2000 mm, standardlængde 40 m.	I retvinklede udskæringer, eller i ruller, standardbredde 2000 mm, standardlængde 20 m.

VILEDON FILTERMÅTTER (VASKBARE)

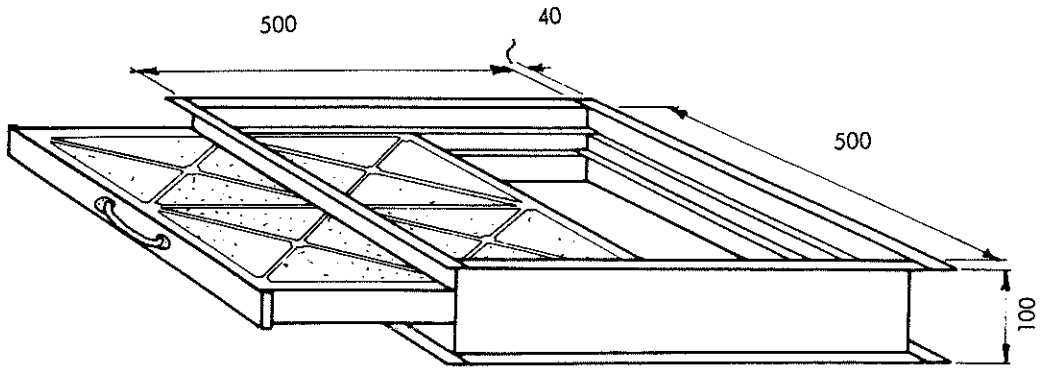


viledon filter ®

TYPE		UDSKILNINGSGRAD	VIRKNINGSGRAD	ANBEFALET SLUTTRYKTAB
VILEDON FILTERMÅTTE	P15/500 S	92%	<20%	20 mm VS
VILEDON FILTERMÅTTE	P15/350 S	83%	<20%	20 mm VS
VILEDON FILTERMÅTTE	P15/150 S	67%	<20%	13 mm VS
VILEDON FILTERMÅTTE	PSB/290 S *)	86%	<20%	20 mm VS

*)Delvis vaskbar.

MÅLSKITSE



Indbygningsmål, kassettefilter for lige sideværts indskud.

B. BILLE, Ingeniørfirma
Rugmarken 34, 3520 Kbhvn.-Farum
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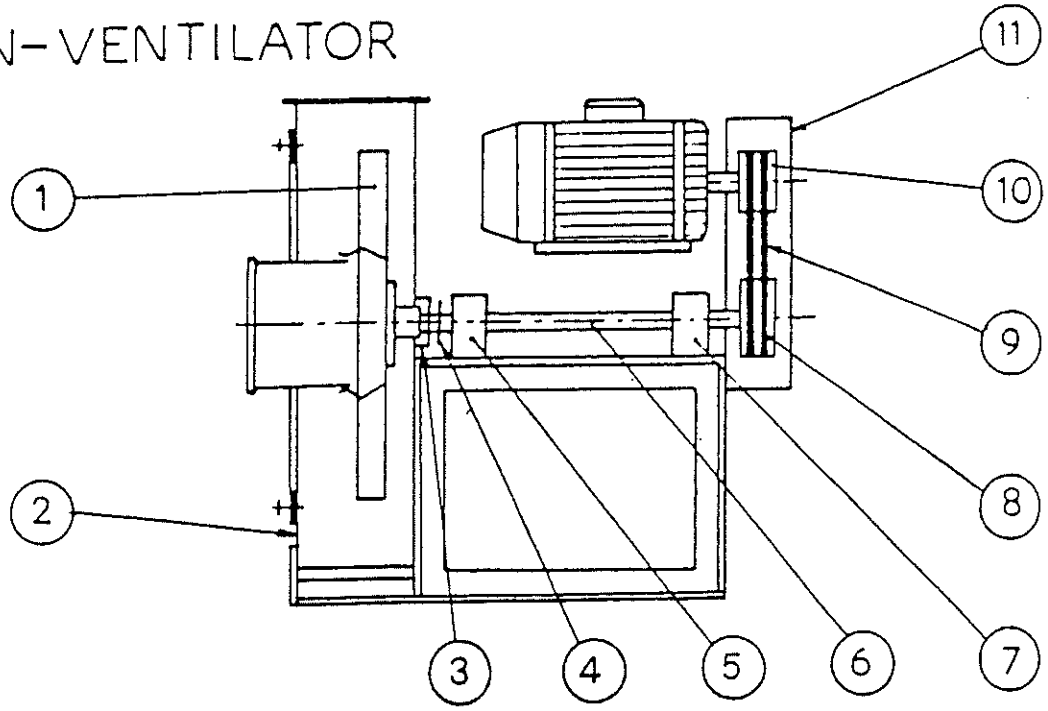
FAN-VENTILATOR



Manufacturing no. - Herstellungs nr. 9243 N-2

Spare part list — Ersatzteil liste.

Fan type - Ventilator type: HT 10-530 D-R.

I. Impeller - Laufrad AISI 304

2. Casing - Gehäuse AISI 304

3. Shaft seal - Wellendichtung: No.

4. Cooling Disc - Kühlscheibe: Yes.

5. Ball bearing - Kugellager: SKF. 2208 K/C3.

6. Shaft - Welle

7. Ball bearing - Kugellager: SKF. 2208 K/C3.

8. Vee pulley for fan - Riemenscheibe für ventilator: SPZ 140^{Ø} x 2

9. Vee belts - Keilriemen 2 off - stück. SPZ 900

Io. Vee pulley for motor - Riemenscheibe für motor: SPZ 112^{Ø} x 2

II. Drive guard - Riemenschirm

	Materiale	Model nr.	Lager nr.	Målforhold	Tegn.		
					Kont.		
				Tg. nr. N - 542.			

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Rugmarken 34, 3520 Kbhvn.-Farum
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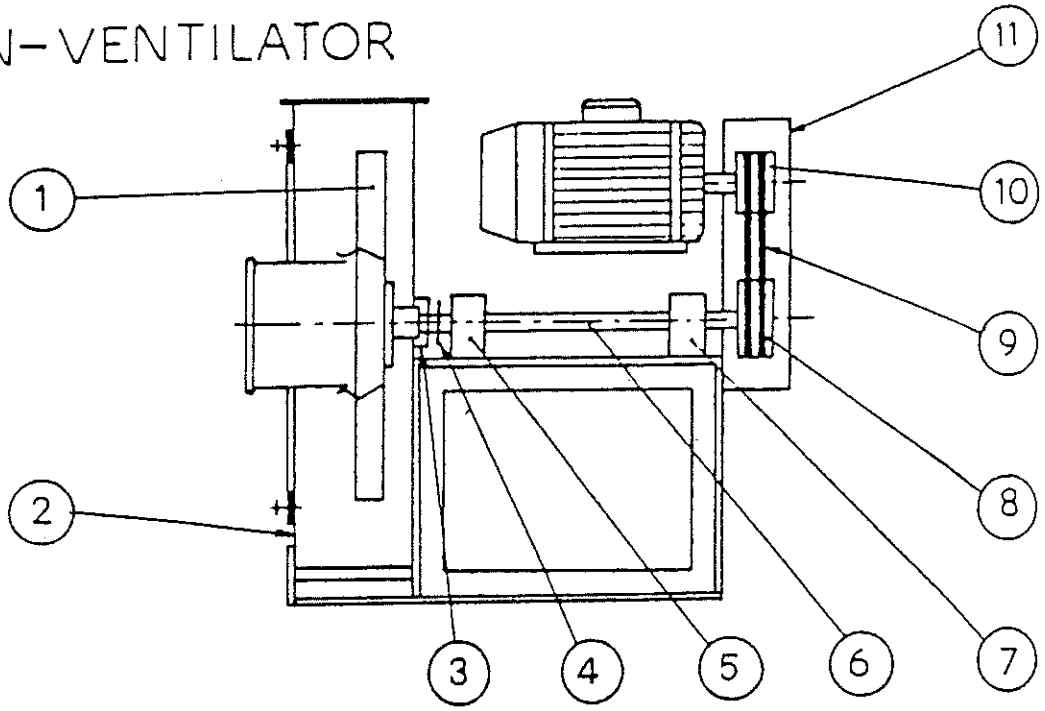
FAN-VENTILATOR



Manufacturing no. - Herstellungs nr. 9243 N-1.

Spare part list — Ersatzteil liste.

Fan type - Ventilator type: HT 10-530 D-R.

I. Impeller - Laufrad AISI 304

2. Casing - Gehäuse AISI 304

3. Shaft seal - Wellendichtung: No.

4. Cooling Disc - Kühlscheibe: No.

5. Ball bearing - Kugellager: SKF. 2208 K/C3.

6. Shaft - Welle

7. Ball bearing - Kugellager: SKF. 2208 K/C3.

8. Vee pulley for fan - Riemenscheibe für ventilator: SPZ 125^{Ø} x 2

9. Vee belts - Keilriemen 2 off - stück. SPZ 900

Io. Vee pulley for motor - Riemenscheibe für motor: SPZ 118^{Ø} x 2

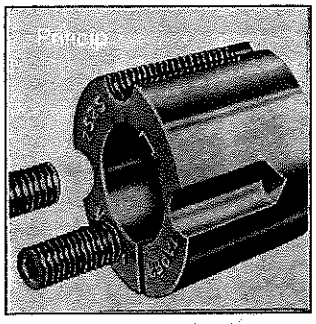
II. Drive guard - Riemenschirm

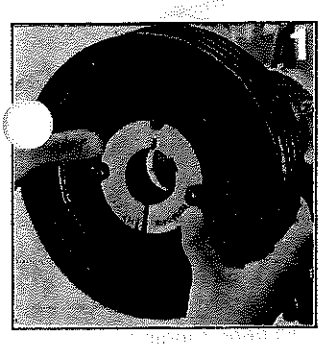
	Materiale	Model nr.	Lager nr.	Målforhold	Tegn.		
					Kont.		
				Tg. nr. N - 542.			

WEDGE BELT DRIVES WITH TAPER-LOCK®
SCHMALKEILRIEMENANTRIEB MIT TAPER-LOCK®
SMALKILEREMSTRÆK MED TAPER-LOCK®

Installation and Maintenance Instructions
Installierungs und Wartungsinstruction
Monterings- og vedligeholdelsesvejledning

TAPER-LOCK®





Installation

1. Degrease bush and conical hole in wedge-belt pulley

2. Oil set screws

3. Install bush in pulley and put on shaft

4. Turn bush and pulley after each other and tighten the screws gradually, and alternately until they are tight.

Removing

Screw out the screws. Put one in the hole with threads in the bush. Tighten the screw, and the bush becomes loose. The pulley is free and can be removed, and your bearings are unmarked.

Installierung

Alle blanken Oberflächen säubern und entfetten.

Die Schrauben Oelen.

Scheibe und Buchse ineinander setzen, Löcker auf Deckung bringen und Schrauben lose einschrauben.

Scheibe mit Büchse auf Welle aufschieben, ausrichten und Schrauben gleichmäßig und fest anziehen.

Abnehmen

Schrauben herausnehmen, eine davon als Abdruckschraube in das Lock mit halbem Gewinde in der Büchse einschrauben und anziehen. Hierdurch wird die Taper-Lock Buchse gelöst.

Montering

Affedt bøsning og konisk udboring i kileremskive.

Indfedt skruerne.

Indsæt bøsningen i skiven og ret hullerne ind. Sæt skruerne i hullerne med gevind i navet. Anbring enheden på akslen.

Ret skiven op og spænd skruerne, herved trækkes bøsningen ind i navet og klemmer omkring akselen svarende til en hård prespasning.

Demontering

Tag skruerne ud. Sæt den ene i hullet med gevind i bøsningen. Spænd skruen, og bøsningen er løs. Remskiven er nu løs og kan fjernes, og De har ubeskadigede lejer i maskinen.

B. BILLE
INGENIØRFIRMA
RUGMARKEN 34 · DK 3520 FARUM
TELEFON 42 95 68 11 · TELEFAX 42 95 66 49

BEARINGS
LUBRICATION INSTRUCTIONS

Bearing Type SY

Lubrication system: Grease nipple. The bearing has been lubricated once.

" intervals: possibly one pressure with grease gun once a year.

Other Bearing Types

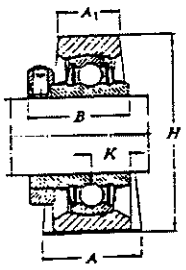
Lubrication system: Demount upper part (cover) at bearing housing. Remove existing grease, and fill up hollow space in bearing with grease. The free space in the bearing housing is filled half up with grease. Excess grease filling may cause too high temperatures during running.

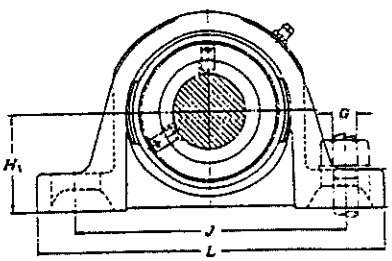
" intervals: twice a year.

Bearing grease: Esso Beacon, or similar product, depending on operation conditions.

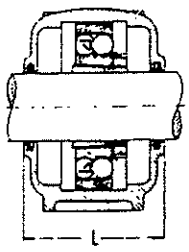
NB! Don't change about upper parts (covers)!

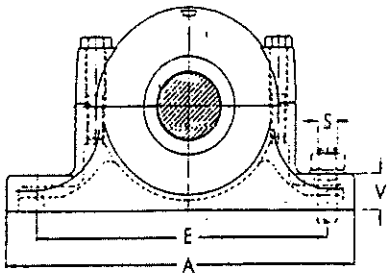
Bearing type SY.





Other Bearing Types.





Author	Commented by	Approved by	Replaces Index - No. of	Index - No.

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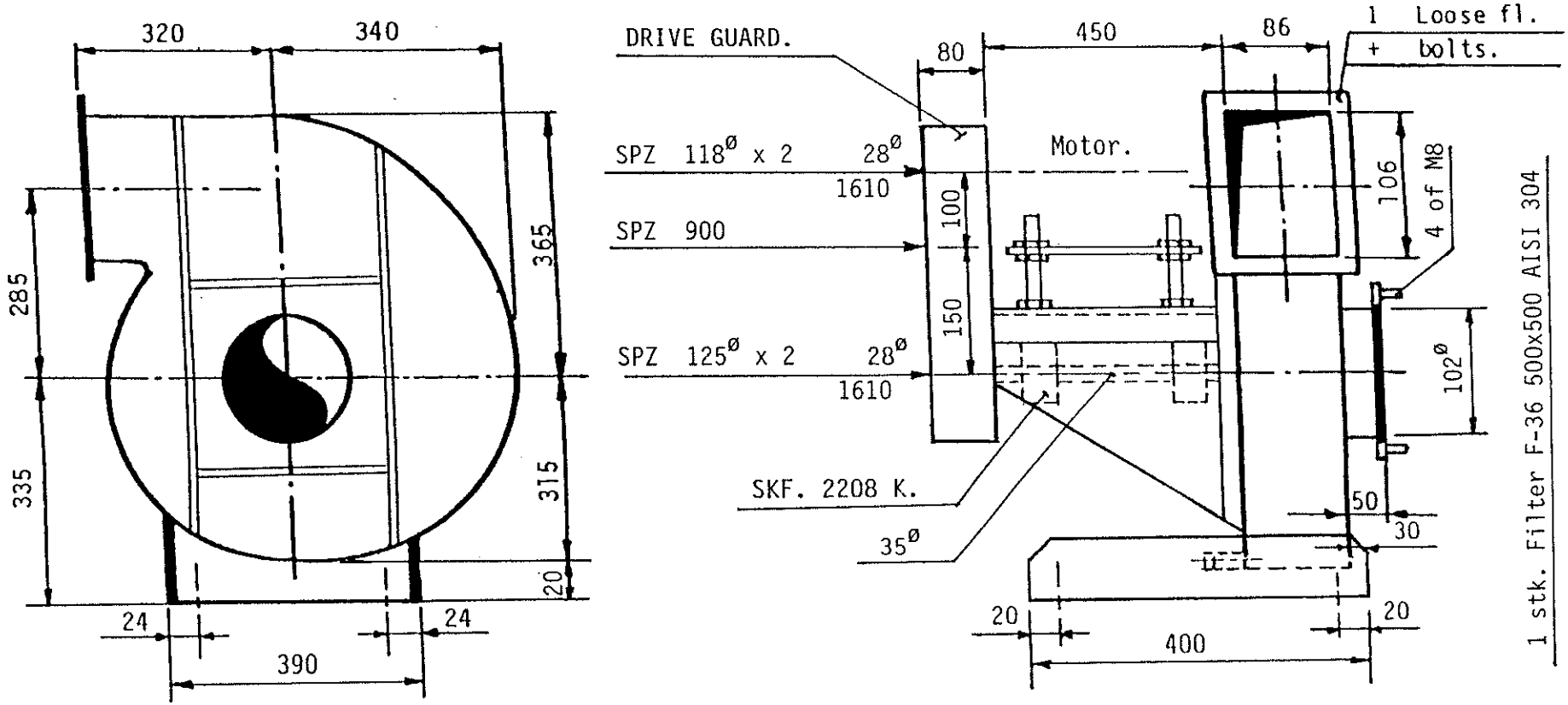
Tlf. 42 95 68 11 - Telefax 42 95 66 49

N-216 E.

NIRO DANISCO

B.B. ORDER: 9243 N-1. NIRO ORDER: 094-0191 -00 TIME OF DELIEVERY: 28/92. +MOTOR TYPE: ABB MT 100L - 2.



Item 03.03

Supply FAN TYPE: HT 10-530 D-R POS: LV. GD^2= 1,34 KGM², MATERIEL: AISI 304

VOLUMETRIC FLOW: 567 M³/H, AIR TEMP.: 20 'C,	FLEX. CON.: No.
P_s: 420 MM WG/20 'C, 420 MM WG/ 20 'C,	VIBRATION DAMPERS: 4 of AD-4030 red.
FAN RUNNING SPEED: 2700 RPM,	COOLING DISC.: No. SHAFT SEAL: No.
MOTOR CAPACITY: 3 KW, 2900 RPM,	DRAIN: Yes. CLEANING DOOR: No.
WEIGHTS: FAN: 85 KG, MOTOR: 21 KG,	FOUNDATION FRAME: No. MULTI VANE DAMPER: No.

B. BILLE, Ingeniørfirma
Rugmarken 34, 3520 Kbhvn.-Farum
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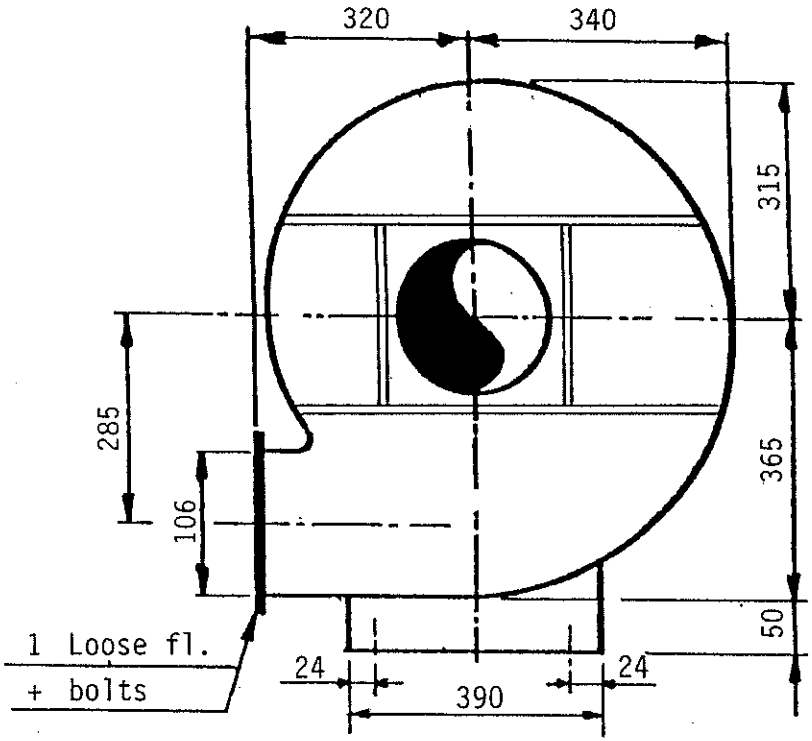
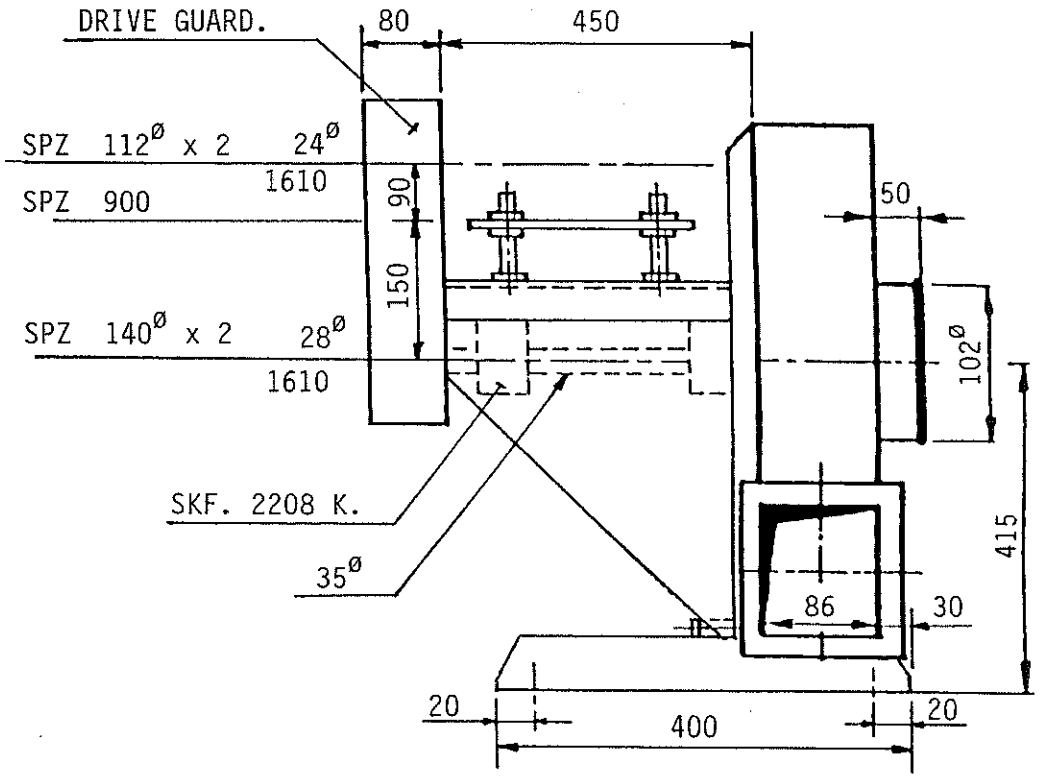
N-1219 E.

NIRO DANISCO

B.B. ORDER: 9243 N-2. NIRO ORDER: 094-0191-00 TIME OF DELIEVERY: 28/92. + MOTOR TYPE: ABB MT 90L - 2





Item 05.03

Exhaust FAN TYPE: HT 10-530 D-R. POS: RV. GD^2= 1,34 KGM². MATERIEL: AISI 304

VOLUMETRIC FLOW:	647 M³/H, AIR TEMP.:	75'C,	FLEX. CON.: No.
P_s:	276 MM WG/20 'C, 252 MM WG/	75'C,	VIBRATION DAMPERS: 4 of AD-4030 red.
FAN RUNNING SPEED:	2300	RPM,	COOLING DISC.: Yes. SHAFT SEAL: No.
MOTOR CAPACITY:	2,2 KW, 2900	RPM,	DRAIN: Yes. CLEANING DOOR: No.
WEIGHTS: FAN:	85 KG, MOTOR: 16	KG,	FOUNDATION FRAME: No. MULTI VANE DAMPER: No.

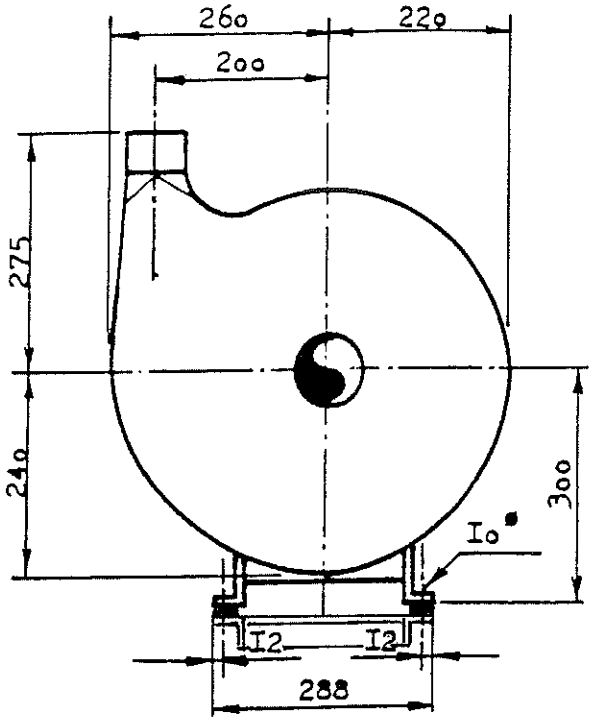
B. BILLE, ingeniørfirma
Rugmarken 34, 3520 Kbhvn.-Farum
Tlf. 42 95 68 11 - Telefax 42 95 66 49

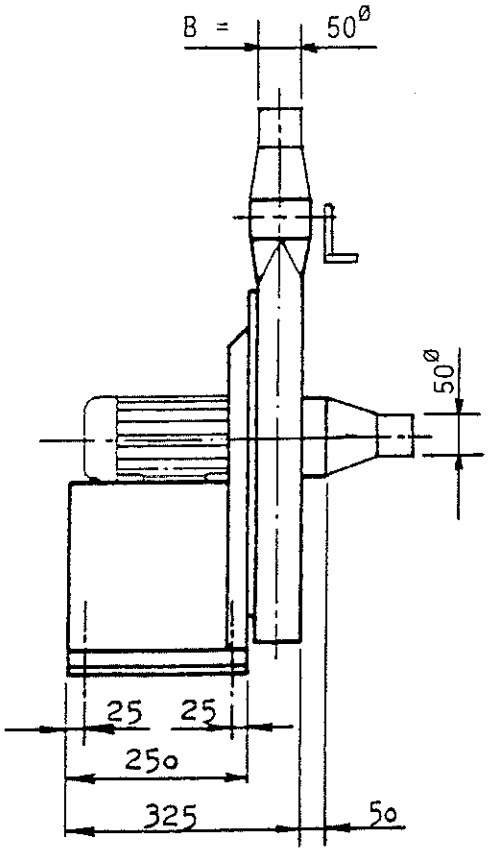
POSITION FREE DESIGN,

DIRECT DRIVE.

MOTOR: 0,55 Kw.- 2800 rev/min.

~~1,1 Kw.- 3400 rev/min.~~





4 of AD-3025 red.

Bemærk! Vinkeljernsramme.

FAN TYPE MT 28

NIRO Order Nr. 094-0191-00

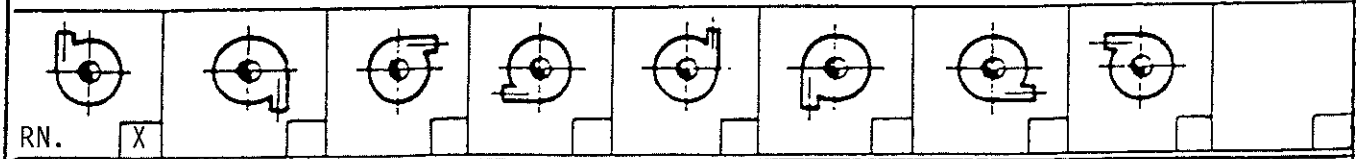
Position: RN.

B.B. Order Nr. 9243 N-3

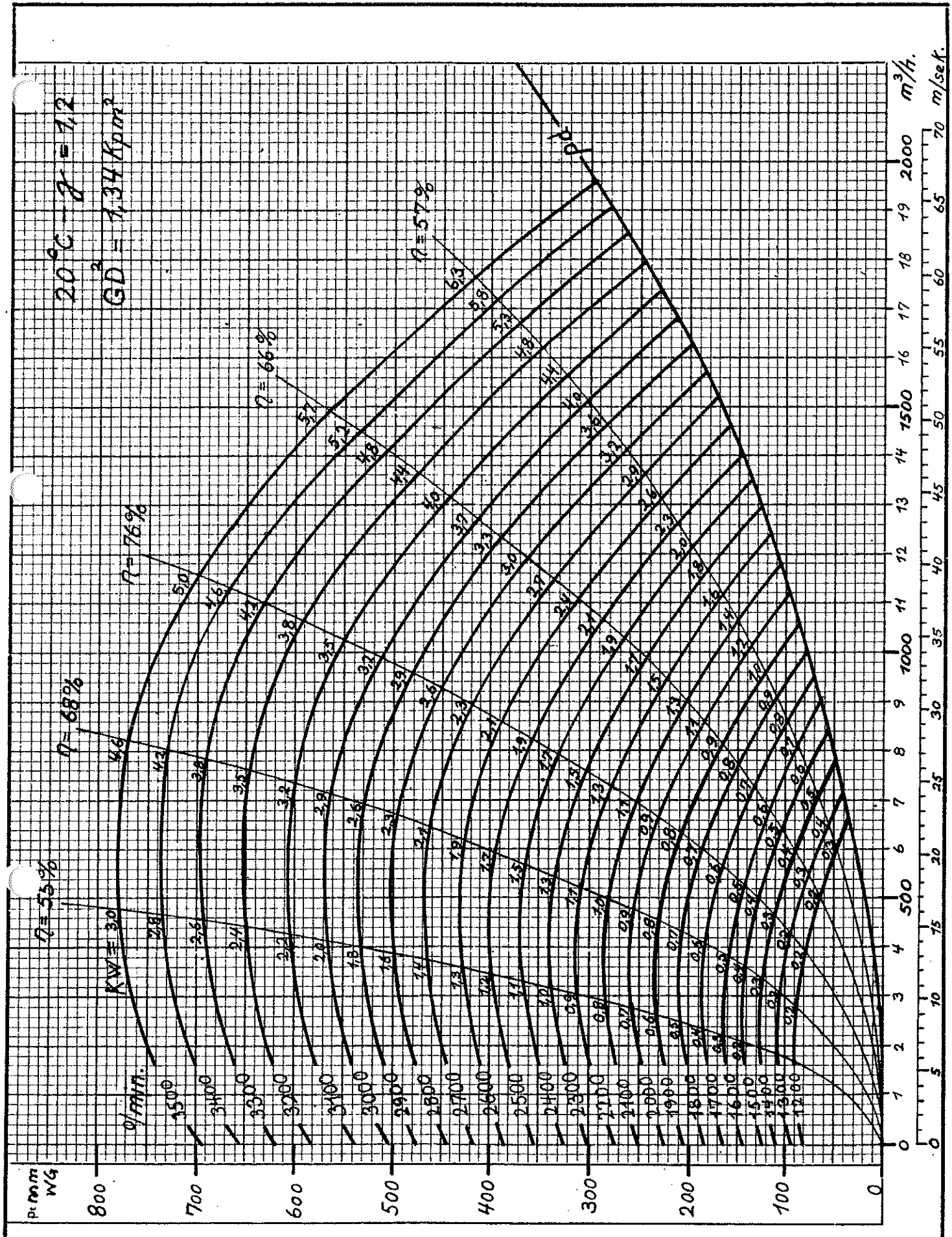
+ Motor type: ABB MT 71B - 2

Time of delivery : 30/92.

Motor shaft : 14Ø



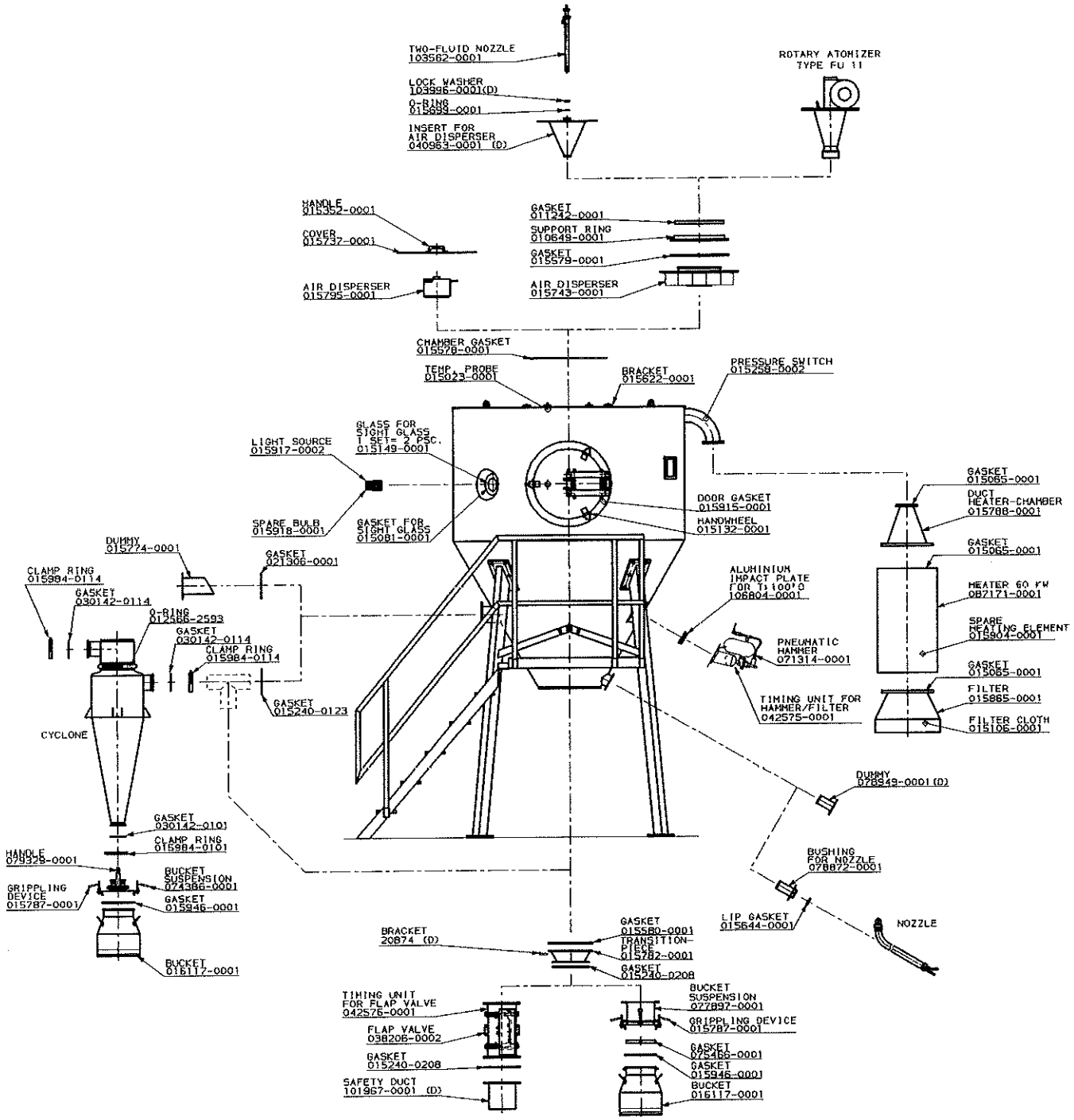
Weights:	Materiale	Model nr.	Lager nr	Mærke	Tegn.	
Fan: 25 Kg.					Kont.	
Motor: 6,5 Kg.	A/S NIRO ATOMIZER			Tg. nr.		



B. BILLE, ingeniørfirma
Rugmarken 34, 3520 Kbhvn.-Farum
Tlf. 42 95 68 11 - Telefax 42 95 66 49

Type
HT 10-530

Tegn. nr.
V-156 A
V-156 udgår



Rev. Letter	Revision	Rev.	Appr.	Date

NIRO A/S
GLADSAXEVEJ 305
DK-2860 SOEBORG DENMARK
TEL. +4539601011 FAX +4539601414

P-6.3 SPARE PARTS

SCALE			
1:15	Drawn	KLN	920724
	Check.	BJ	920724
	Appr.	KLN	920724

Sheet No. 2 | 109032 | Rev.

A1

MM CHANGE BY CAD-SYSTEM ONLY MM

NIRO DANISCO

OPERATING INSTRUCTIONS FOR

PNEUMATIC HAMMER

All plant personnel must be familiar with these instructions. NIRO will not assume any responsibility for personal injury or equipment damage caused by faulty operation.

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Niro A/S · Gladsaxevej 305 · DK 2860 Soeborg · Denmark · Tel +45 39 69 10 11 · Fax +45 39 69 14 14 · Telex 15603 · Reg No 12682

NIRO DANISCO

OPERATING INSTRUCTIONS
PNEUMATIC HAMMER

CONTENTS **PAGE**

1. GENERAL PRECAUTIONS

The pneumatic hammer is a very powerful tool which, if improperly used, may harm the component it is acting on. Further an improper maintenance will involve a risk of personal injury.

Therefore, it is very important that the persons involved know and comply with these instructions, especially concerning maximum air pressure given in sections 3, **COMPRESSED AIR SUPPLY** and 5, **MAINTENANCE**.

2. GENERAL DESCRIPTION (Fig. 1)

The hammer operates in the following way:

An air pressure is built-up in the *reservoir* (4) and at a given pulse the *quick-exhaust valve* (7) opens the connection between *reservoir* (4) and *barrel* (2). The compressed air forces the *ball* (1) to hit the *impact plate* (8), which transforms the stroke to the wall. The *impact plate* (8) is held in position by a *coil spring* (9).

After the stroke the ball rolls back to start position.

The operation is controlled by a 2/2-way *solenoid valve* (5) which has two positions:

In its not-energized position, it allows the compressed air pressure to act on the diaphragm in *quick-exhaust valve* (7) via *t-fitting* (3) and *tube* (6). By this, the connection between *reservoir* (4) and *barrel* (2) is closed. The reservoir is filled with compressed air from supply pipe via *non-return valve* (10), *quick-release coupling* (11), and *t-fitting* (3).

When a pulse from the electric control unit energizes the solenoid valve, it blocks the connection to *tube* (6) and vents the air from the diaphragm to the atmosphere. Consequently, the quick-exhaust valve opens to allow air from the reservoir into the barrel, and the hammer will strike.

After a preset interval ("pulse time") the solenoid valve will be deenergized and the hammer will return to stand-by position, i.e. quick-exhaust valve will close and the pressure in the reservoir will be reestablished for the next stroke.

Important:
The hammer unit must always be disconnected at the *quick-release coupling* (11) between non-return valve and T-fitting before the hammer unit is disassembled or dismounted for maintenance or servicing. It will ensure that the reservoir is empty and prevent accidental shot.

3. COMPRESSED AIR SUPPLY

The hammer unit has to be supplied with compressed air from a reliable source.

To prevent harmful damage of the wall, hit by the hammer, it is necessary to limit the pressure of the compressed air.

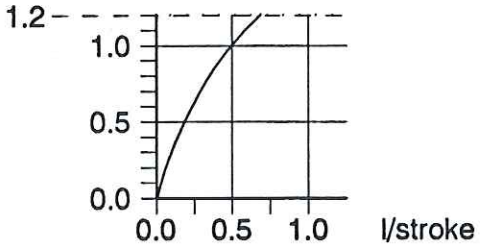
The air pressure must never exceed 1.2 bar. This maximum pressure must be ensured by a safety valve in the supply line preset and sealed at 1.2 bar.

Operating pressure for the hammer ought to be as low as possible, still having a good effect of the hammer. It is recommended to start with an operating pressure = 0.6 bar and watch the effect. If insufficient, increase the pressure slowly until a good effect is obtained. 1.0 bar is recommended as maximum operating pressure.

It is necessary to install an adjustable reduction valve in the supply pipe to make it possible to adjust the correct operating pressure. Same reduction valve may operate more hammer units if they are positioned in the same angle to horizontal. See also point 6.

Compressed air consumption depends on actual operating pressure and can be determined from the curve below:

Operating pressure in bar



Air consumption for one hammer unit in l/stroke (liter free air).
Compressed air quality: working air with low contents of water and oil.

4. ELECTRICAL DATA FOR SOLENOID VALVE

24 V – 50/60 Hz – 12 VA (Inrush: 21 VA).

5. MAINTENANCE

The hammer unit requires no regular maintenance, a regular visual inspection will normally be sufficient.

If the hammer unit has to be dismounted or disassembled the procedure at page 3 must always be followed.

Important:
No hammer units must be dismounted or disassembled before the units are disconnected from supply pipe by means of the quick release coupling to be sure that the hammer reservoir is emptied through the open part of the coupling.

Procedure for dismounting or disassembling of hammer unit:

1. Switch off electric power supply to controlling unit.

2. Turn off compressed air supply.

3. Disconnect the hammer in question from the compressed air supply pipe by means of the quick-release coupling between non-return valve and T-fitting. Check that the hammer reservoir is emptied through the open part of coupling. The dismounting or disassembling may now be started.

4. The compressed air supply must not be reconnected and turned on until the hammer is remounted or assembled in its operating position.

6. OPERATION

6.1 DESCRIPTION

The system is supplied from a main air supply source.

The hammer units are gathered in groups, each group consisting of hammers placed at the same angle to horizontal, e.g.:

group 1 – all hammer units at chamber cylinder

group 2 – all hammer units at chamber cone

group 3 – all hammer units at cyclone cone.

Each group is supplied from a ring pipe with its own supply unit.

Each supply unit is a pressure reducing set consisting of (see Fig. 2):

A. Stop Cock

B. Filter

C. Adjustable Reducing Valve

D. Manometer

E. Safety Valve preset and sealed at 1.2 bar.

The pressure reducing set controls the operating pressure for the group of hammers connected to the unit.

The safety valve ensures that the air pressure for the hammer will never exceed 1.2 bar.

6.2 HAMMER CONTROL PANEL

The electric pulses for the solenoid valve (Fig. 1, item 5) in hammer unit are controlled by the hammer control panel. This may be mounted separately or in connection with a central control panel for the entire plant. For further information please see separate **setting instructions for hammer control panel.**

6.3 STARTING UP THE FIRST TIME OR AFTER MAJOR OVERHAULS

1. Disconnect the air pipe for each hammer unit from supply ring pipe and blow through the supply system to remove foreign particles that might damage hammer valves. Always inspect air filter at supply unit afterwards and clean, if necessary.

2. Reconnect the supply pipes.

3. Connect hammer units by means of quick-release couplings.

4. Turn on compressed air main supply at main supply valve and/or stop cock (Fig. 2, A) at each supply unit.

5. Adjust operating pressure gradually at pressure reducing set. Keep the pressure as low as possible, see section 3.

6. Switch on hammer circuit power supply at motor control centre.

7. Switch on hammer control circuit at the central control panel.

8. Switch on the hammer control panel.

9. Set timers as described in separate **setting instructions for hammer control panel.**

6.4 STARTING UP, NORMAL OPERATION

1. Switch on hammer control circuit at the central control panel.
2. Turn on main air supply. At main supply valve and/or stop cock (Fig. 2, A) at each supply unit.

6.5 SHUTTING DOWN

1. Switch off hammer control circuit at the central control panel.
2. Turn off air supply at main supply valve or at stop cock (Fig. 2, A) at each supply unit.

7. TROUBLE SHOOTING

Always refer to section 5, **MAINTENANCE** before any dismounting or disassembling of a hammer unit.

Problem: **All hammers stopped**

Action:
1. Check main air supply.
2. Check electric power supply to hammer control panel.
3. Check miniature fuse in hammer control panel. If melted, locate fault before replacement.

Problem: **Group of hammers stopped**

Action:
1. Check air supply for the group. Check corresponding supply unit.
2. Check electric pulses at corresponding output terminal on electronic control unit in hammer control panel. If pulses are present, check electric wiring to hammers. If pulses are missing, electronic control unit must be replaced.

Problem: **Single hammer stopped or the stroke is weak**

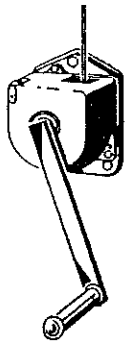
Action:

1. Check air supply.
2. Check electric pulses to solenoid valve. If missing, check electric wiring.
3. Check solenoid valve:
   - if there is a constant release of air to atmosphere, solenoid valve is defective and should be replaced,
   - if air and power supply to hammer are intact, but there is no air release at all, this indicates a defective solenoid valve.
4. Diaphragm in quick-exhaust valve may be stuck in a position allowing non-stop flow of air into barrel. If so, disassemble diaphragm valve and remove foreign matter. Refit diaphragm or, if damaged, replace it.
5. If the above is in order, chek ball. If it is defective, replace the ball.

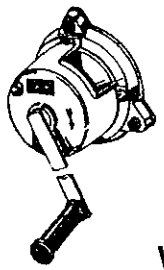
8. SPARE PARTS LIST

Part No.	Description	Item No. Fig. 1
71314-0001	Complete hammer	-
65463-0001	Ball	1
71319-0001	Impact plate	8
71320-0001	Coil spring	9
18520-0001	Diaphragm for quick-exhaust valve	-
18517-0001	Solenoid valve	5

OPERATING INSTRUCTIONS FOR THE MANUALLY OPERATED WALL-MOUNTED WINCHES WH 050 WH 1



WH 050



WH 1

1. Installation

The vertical surface to which the winches are to be fitted should be perfectly flat and plane so that a perfect contact is established with the wall shield. Used for fixing the winches to the wall are three bolts to be locally supplied by the customer (WH 050 - M 10, WH 1- M 12). Care must be taken to tighten the bolts at a uniform torque.

If the wire rope is lead out straight to the top, the winch must be fitted in such a manner that one of the fixing holes is on top and the other two on the left-hand and right-hand side in the bottom (refer also to the pictures). The following procedure is taken if the wire rope is to be lead-out in another direction, e. g. to either side or to the bottom:

WH 050: The winch is simply turned to the side to which the rope is to be lead-out and fixed to the wall.

WH 1: After unscrewing the bolts with hexagonal recessed hole, the winch - and thus the rope lead-out aperture - can be turned 90°. Prior to re-tightening the bolts it must be made sure, that the two fixing pins are correctly positioned in the wall shield and in the case. By proceeding in this way the water drainage slot always points downward whatever direction the rope is lead-out.

2. Fastening of the wire-rope

WH 050: wire rope 3 mm diam. - WH 1: wire rope 4 mm diam.

The wire rope ends are at first tightly wound with a thin wire and then, from the left-hand side, inserted as far as possible into the bore of the drum. The threaded pin, placed vertically on the bore, then vigorously is to be tightened.
The length of the wire rope used must be sufficient to ensure that two coils remain as reserve on the drum if the load is in the bottom-most position.

3. Hoisting the load

Turn the handcrank in a clockwise sense of direction (pay attention to the direction indicated by the arrow on the case).

4. Balancing the load

Release the handcrank.
If not in use, the handcrank can be detached from the drum by sharply pulling it away.

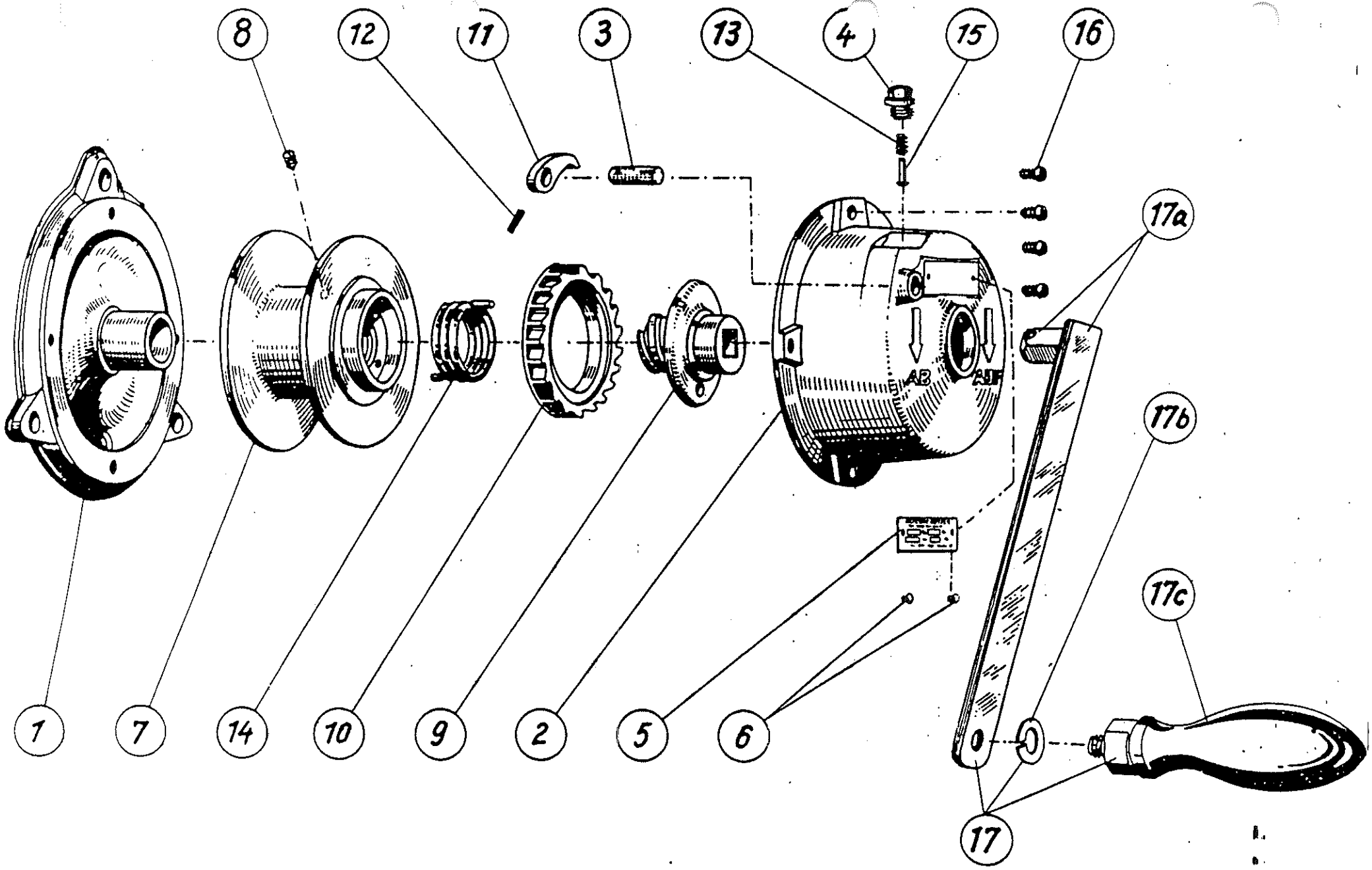
5. Lowering the load

Turn the handcrank in an anti-clockwise sense of direction, e. g. in a direction contrary to that of the arrow. The same physical effort is required for hoisting and lowering cycles.

Attention: After completion of the lowering cycles the crank should not be further turned in an anti-clockwise direction as otherwise - after uncoiling the reserve coils - the wire rope would be coiled up in the wrong direction and the drum would be blocked if a new hoisting cycle is commenced.

6. Lubrication

The winches are ex-factory life-service lubricated. Type WH 050 has though in addition a small oil hole on the top of the case through which, after prolonged use, a few drops of oil should be inserted.


8
12
11
3
13
4
15
16
17a
17b
17c
17
1
7
14
10
9
2
5
6

NIRO DANISCO

INSTRUCTIONS

FOR

CYCLONE SEPARATOR

All plant personnel must be familiar with these instructions. NIRO will not assume any responsibility for personal injury or equipment damage caused by faulty operation.

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NIRO DANISCO

CYCLONE SEPARATOR

1. DESCRIPTION (Fig. 1)

The cyclone separator utilizes centrifugal forces to separate and recover particles suspended in the process gas downstream of process drying plants.

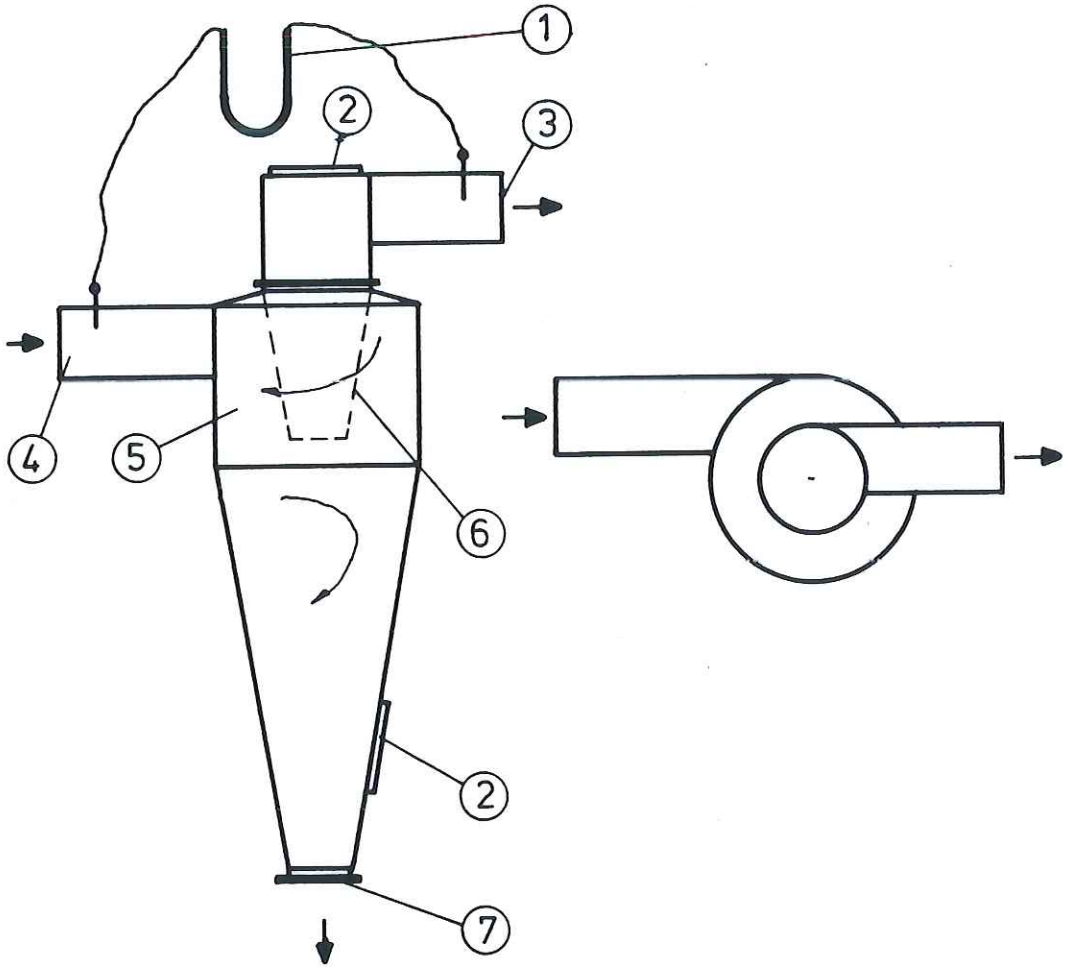


Fig. 1

The process gas, containing solid particles, enters the cyclone through the GAS INLET (4) and circulates in the SEPARATOR (5) around the CENTER CYCLONE (6) causing the solid particles to fall down to the SOLIDS OUTLET (7).

Pneumatic hammers can, when necessary, be fitted on the conical section to avoid deposits.

The cleansed gas vortex continues through the center cyclone to finally leave through the CLEAN GAS OUTLET (3).

A DIFFERENCE PRESSURE GAUGE (1) may be fitted to monitor the pressure drop.

2. OPERATION

During plant operation the cyclone must be inspected regularly for clogging. The pressure drop may be checked on a difference pressure gauge and should not deviate from the value stated by the commissioning engineer.

3. MAINTENANCE

If the pressure drop deviates considerably from the stipulated value, the cyclone must be inspected for clogging and/or other disturbances in the gas flow.

If CLEANING COVER(S) (2) are fitted, a wash down can be carried out through there.

Cleaning can also be carried out by means of a built-in cleaning nozzle system (CIP procedure), if fitted.

NOTE: ALWAYS make sure that all plant covers and connections are closed and sealed tightly before restarting.

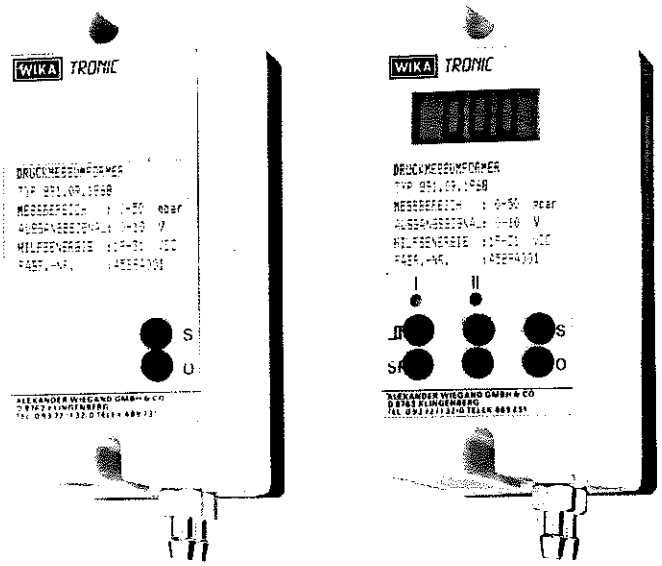
Druckmeßumformer

Sensorelement induktiv, für niedrige Drücke und Differenzdrücke

Standardausführung · Typ 891.09.1968
tragbares Präzisions-Manometer mit Druckerzeugung · Typ 909.09.2080

TRONIC LINE

Meßbereiche 0 ... 0,6 mbar bis 0 ... 600 mbar,
Sondermeßbereich 800 ... 1200 mbar absolut,
positive und negative Überdrücke, Differenzdruck, Absolutdruck,
Versorgung DC 24 V oder AC 50 Hz 220/110/24 V,
Ausgang Strom oder Spannung,
Genauigkeit bis 0,2 % v. EW,
LCD-Digitalanzeige,
Analoganzeige,
radizierter Ausgang,
Grenzsignalgeber



Beschreibung

WIKA-Druckmeßumformer des **Typs 891.09.1968** werden vorzugsweise zur Messung niedriger und niedrigster positiver und negativer Überdrücke und Differenzdrücke eingesetzt. Die Meßbereiche erstrecken sich in DIN-Stufen von 0 ... 0,6 mbar bis 0 ... 600 mbar. Für barometrische Messungen ist eine Ausführung mit Meßbereich 800 ... 1200 mbar absolut lieferbar. Als Sensorelement dient eine Membranzelle, deren druckproportionale Auslenkung durch ein induktives Meßsystem aufgenommen wird. Ein integrierter Verstärker formt das Sensorsignal in ein lineares hochpegeliges Ausgangssignal um, das auch über längere Strecken weitgehend störungsfrei übertragen werden kann. Zur Verfügung stehen Versionen mit Ausgangssignal 0 ... 10 V und 0 (4) ... 20 mA Dreileiter sowie 4 ... 20 mA Zweileiter.

Durch sorgfältige Auswahl der Komponenten und durch moderne Fertigungs- und Prüfverfahren werden hohe Genauigkeit, gutes Temperaturverhalten und sehr hohe Langzeitstabilität erreicht.

Die robuste und erprobte Ausführung des Gerätes ermöglicht nahezu wartungsfreien Betrieb auch unter schwierigen Umgebungsbedingungen. Die Hauptanwendungsgebiete liegen im Bereich der Heizungs-, Lüftungs-, Klima-, Filter- und Entstaubungstechnik sowie in der Medizintechnik.

Für Anwendungen, bei denen außer dem stetigen Ausgangssignal auch Schaltfunktionen gefordert sind, können die Druckmeßumformer bei Dreileitersystemen mit bis zu zwei Grenzkontakten ausgestattet werden. Je Grenzwert steht ein potentialfreier Umschaltkontakt zur Verfügung. Die Einstellung der Grenzwerte erfolgt über Potentiometer auf der Geräte-Frontseite, über weitere Potentiometer kann für jeden Grenzwert die Schalthysterese verändert werden.

Für Durchflußmessungen mittels Normblende steht bei Dreileitersystemen eine Sonderausführung mit radiziertem Ausgangssignal zur Verfügung. Bei dieser Ausführung kann die Unterdrückung von Schleichmengen durch Potentiometer im Bereich 0 ... 10 % eingestellt werden, die Geräte sind auf lineares Ausgangssignal umschaltbar.

Für den mobilen Einsatz und zur Kalibrierung von Druckmeßgeräten mit niedrigen Meßbereichen wurde das Präzisions-Manometer **Typ 909.09.2080** konzipiert.

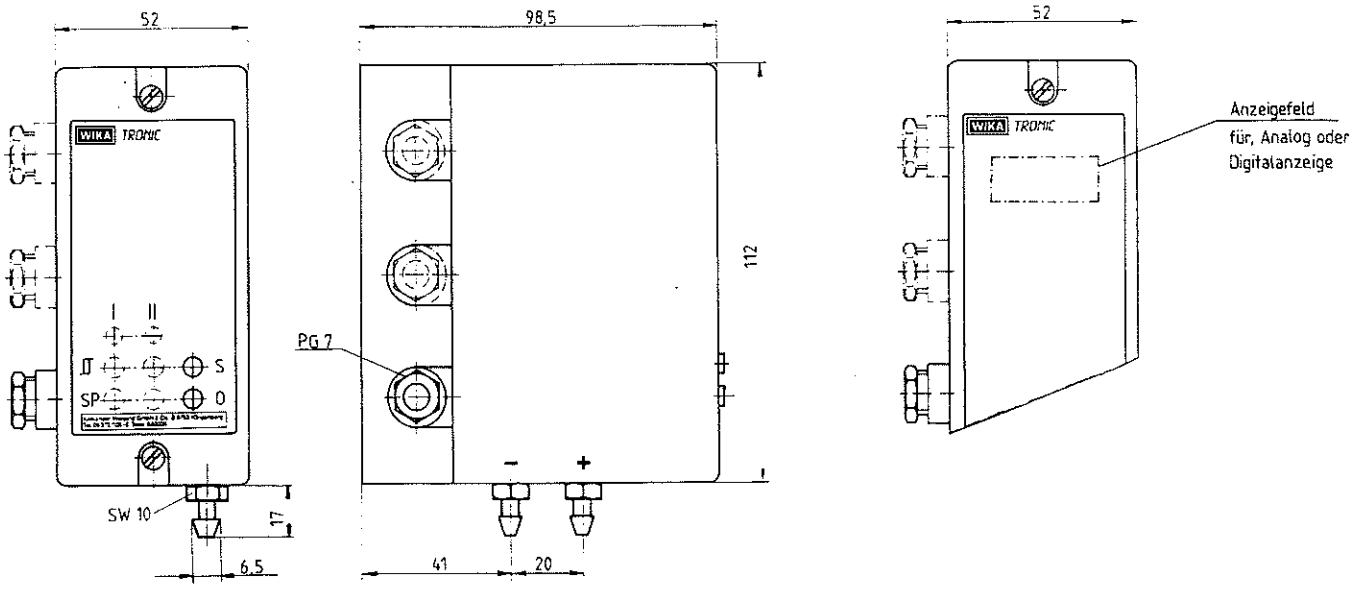
Als Meßelement werden ausgesuchte Exemplare des oben beschriebenen Druckmeßumformers 891.09.1968 mit Kennlinienabweichung 0,5 % (wahlweise 0,2 %) verwendet. Der gemessene Druck wird auf einer 3½stelligen (wahlweise 4½stelligen) LCD-Digitalanzeige dargestellt.

Für Kalibrieraufgaben können mittels des eingebauten veränderbaren Volumens niedrige Drücke fein dosierbar eingestellt werden. Das Gerät kann netzunabhängig über die eingebaute Batterie oder über das als Sonderheit lieferbare eingebaute Netzteil betrieben werden.

Technische Daten		Typ 891.09.1968	
Meßbereiche	mbar	0,6 1 1,6 2,5 4 6 10 16 25 40 60 100 160 250 400 600	[800 ... 1200]
Überlastgrenzen	mbar	3 5 8 12,5 20 30 50 80 125 200 300 500 800 1000 1000 1000	300 ... 2000
maximaler stat. Druck	mbar	1000	–
Druckart		Relativdruck, Differenzdruck	[Absolutdruck]
Druckanschluß	mm	ø 6 x 15, Schlauchanschlüsse	
meßstoffberührte Teile		Aluminium, Silikonkautschuk, Ms, CuBe, ABS	
Gehäuse-Werkstoff		Unterteil: ABS, glasfaserverstärkt; Oberteil: ABS	
Hilfsenergie	DC V AC V	19 ... 31 [12 ... 30 bei Ausgang 4 ... 20 mA Zweileiter] [24, 110 oder 220 (jeweils ± 10 %)]	
Ausgangssignal und zulässige Bürde R_A		0 ... 10 V Dreileiter $R_A \geq 2000$ Ohm [0 (4) ... 20 mA Dreileiter] $R_A \leq 500$ Ohm [4 ... 20 mA Zweileiter] $R_A \leq (U_B\ (V) - 12\ V)/0{,}02\ A$ [0 ... ± 5 V Dreileiter (bidirektional)] $R_A \geq 2000$ Ohm	
Stromaufnahme bei DC 24 V	mA	≤ 15 plus Signalstrom [4 ... 20 mA bei Zweileiter]	
Einstellzeit (10 ... –90 %)	s	ca. 0,02	
Einstellbarkeit			
Nullpunkt	% v. EW	± 5	
Meßspanne	% v. EW	± 5	
Kennlinienabweichung	% v. EW	≤ 1,0 [0,5 und 0,2 (für Meßbereiche größer 2,5 mbar)]	
Hysterese	% v. EW	≤ 0,1 typisch	
Stabilität pro Jahr	% v. EW	≤ 0,5 typisch	
zul. Meßstofftemperatur	°C	+10 ... +50	
Umgebungstemperatur	°C	+10 ... +50	
Lagertemperatur	°C	–10 ... +70	
kompensierter Bereich	°C	+10 ... +50	
Temperatureinfluß			
Nullpunkt	% v. EW/10 K	≤ 0,2 typisch	
Meßspanne	% v. EW/10 K	≤ 0,3 typisch	
geeignete Meßstoffe		z.B. Luft, N_2, CO_2, N_2O, Edelgase	
Sensorvolumen	ml	ca. 5 (ca. 7 bei Meßbereichen < 2,5 mbar)	
Volumenzuwachs	ml	ca. 1 bei Nenndruck	
elektrischer Anschluß		Kabelverschraubung Pg7, Schraubklemmen im Gehäuseboden	
Schutzart nach DIN 40050		IP 54	
Masse	kg	ca. 0,6 [ca. 0,7 mit Netzteil]	
Sonderausführungen für Zwei- und Dreileiter-systeme:			
integrierte Digitalanzeige		LCD-Anzeige, 3½stellig	
integrierte Analoganzeige		Zeigerinstrument, 0 ... 100 %	
für Dreileitersysteme:			
Grenzsignalgeber			
Anzahl der Grenzsignale		1 oder 2	
Einstellbarkeit	% v. EW	0 ... 100	
Schaltgenauigkeit	% v. EW	≤ 1	
Schaltreproduzierbarkeit	% v. EW	≤ 0,2 typisch	
Schalthysterese	% v. EW	0 ... 15, einstellbar	
Ausgang		je 1 potentialfreier Relaisumschaltkontakt pro Grenzwert	
Kontaktbelastung	AC	960 mA/220 V, ohmsche Last	
	AC	250 mA/220 V bei cos φ = 0,1	
radiziertes Ausgangssignal			
Genauigkeit	% v. EW	1,0	
Berechnung		Die Radizierung wird nach folgenden Gleichungen vorgenommen:	
		$U_R = \sqrt{10 \times U_L}$, U_L = linearer Ausgang 0 ... 10 V	
		$I_R = \sqrt{20 \times I_L}$, I_L = linearer Ausgang 0 ... 20 mA	

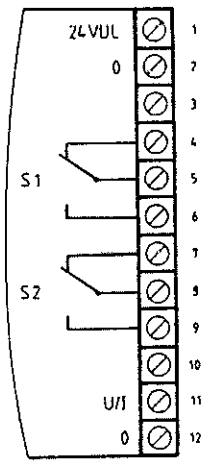
Anmerkung: Angaben in eckigen Klammern [] beschreiben gegen Mehrpreis lieferbare Sonderheiten.
Über die Möglichkeit der Kombination mehrerer Sonderheiten informiert Sie unser Verkauf.

Abmessungen [mm]

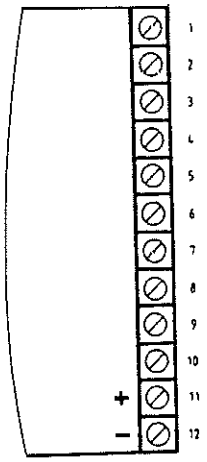


Belegung der Anschlußklemmen

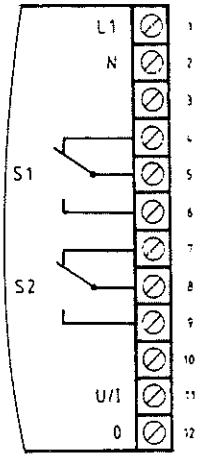
Dreileiter



Zweileiter



AC-Versorgung



1160 389

Bestellangaben

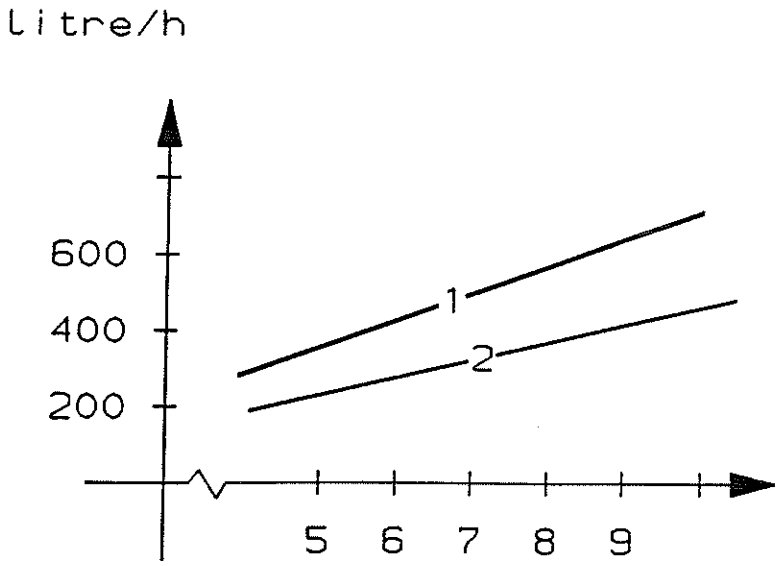
Typ / Hilfsenergie / Meßbereich / Ausgangssignal / Sonderheiten

Bestellbeispiele

891.09.1968 / DC 19 ... 31 V / 0 ... 10 mbar / 0 ... 20 mA / LCD-Anzeige
891.09.1968 / AC 110 V / 0 ... 2 in WC / 0 ... 10 V / 2 Grenzsignalgeber
891.09.1968 / AC 220 V / ± 10 mbar / 0 ± 5 V /
891.09.1968 / DC 19 ... 31 V / ± 10 mbar / 0 ... 20 mA

DOUBLE FLAP VALVE - ø100

CAPACITY



1. Theoretical capacity, 100%.
2. Actual capacity with free-flowing powder, approx. 65% of theoretical capacity.
3. Maximum recommended number of cyclus: 9, but the operational number of cyclus depends on product.
4. Air consumption for flap valve unit.
   Recommended operation pressure: 4.0 bar
   Maximum 380 litre free air / hour

Rev. Letter	Revision	Rev.	Appr.	Date

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SCALE	Drawn	SMK	920313
-	Check.		
	Appr.	BB	920313

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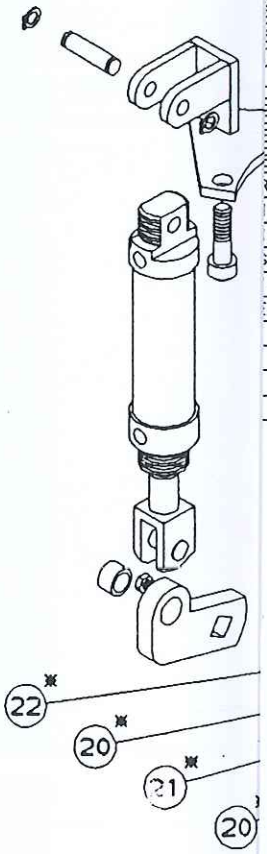
DOUBLE FLAP VALVE - ø100

Category		Rev.
1	104693	

A4

	SPAREPART	QTY	PART No.
	O FLAPVALVE - COMPLETE	1	45500-0001
8	O FLAPVALVE PLETE, EXCL. POS.5 & 6	1	36127-0001
	VE HOUSE	1	45693-0001
	PER	2	36129-0001
	NGE	2	45717-0001
	KET	2	30355-0101
	DING COLLAR	2	30354-0101
7	ON NUT	2	30351-0101
	PER ARM	2	36128
	CKET	2	36131
	FT ø8 AISI 304	2	-
	RING, ø14/ø10.1 L=9 BRONZE	2	-
	EW DIN 933 M5×20	2	-
	E 4309 SCHADER BELLOWS	2	-
	UMATISK CYLINDER ISO 6432 -7102B-50 SCHRADER BOLLOWS	2	-
	EW DIN 912 M8×30	4	-
	ER CIRCLIP ST.8×0.8	4	-
6	EW DIN 912 M8×25	8	-
	RING	4	107968-0001
	NG	4	
	NG	4	
		8	
	NG	4	
	ER CIRCLIP U11×1.0	4	
		-	-
		-	-
		-	-
5			



4

3

ALEDE RESERVEDELE
MENDED SPAREPARTS
HLENE ERSATZTEILE

2

	Rev.	Appr.	Date

D A/S
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E ø100, RESERVEDELE

E ø100, SPAREPARTS

CHLEUSE ø100, ERSATZTEILE

SCALE			
-	Drawn	SMK	920522
	Check	IH	920622
	Appr.	IH	920622

1

Data gory		Rev.
1	107973	

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A B C K L H

NIRO DANISCO

INSTRUCTIONS

FOR

WET SCRUBBER

TYPE SVS

All plant personnel must be familiar with these instructions. NIRO will not assume any responsibility for personal injury or equipment damage caused by faulty operation.

3520-0008
0811 En

Niro A/S · Gladsaxevej 305 · DK 2860 Soeborg · Denmark · Tel +45 39 69 10 11 · Fax +45 39 69 14 14 · Telex 15603 · Reg No 12682

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WET SCRUBBER TYPE SVS

CONTENTS PAGE

1. GENERAL DESCRIPTION

The general arrangement of the WET SCRUBBER TYPE SVS is shown in Fig. 1.

From a WATER TANK[1] equipped with a FLOAT VALVE[2] and an adjustable OVERFLOW FUNNEL[3] water is pumped, at a controlled rate, to the ATOMIZATION UNIT[4] by means of a CENTRIFUGAL PUMP[5] regulated by a DIAPHRAGM CONTROL VALVE[6] and the FLOW INDICATOR[12].

The gas stream enters the SEPARATOR[7] through the bottom inlet, passes through the atomization unit and the mixing, moistening and cooling zones and enters the separation zone.

At the bottom of the separation zone a system of deflector plates are positioned creating a strong vortex resulting in a rotary flow, separating the gas from the water droplets now carrying the solid particles.

The gas leaves the separator through the top, and the contaminated water through the RETURN PIPE[8] to the water tank for being diluted and recirculated.

2. OPERATION

2.1 START-UP

1. Start the exhaust fan(s).
2. Start the CENTRIFUGAL PUMP[5].

THIS SEQUENCE IS IMPORTANT.

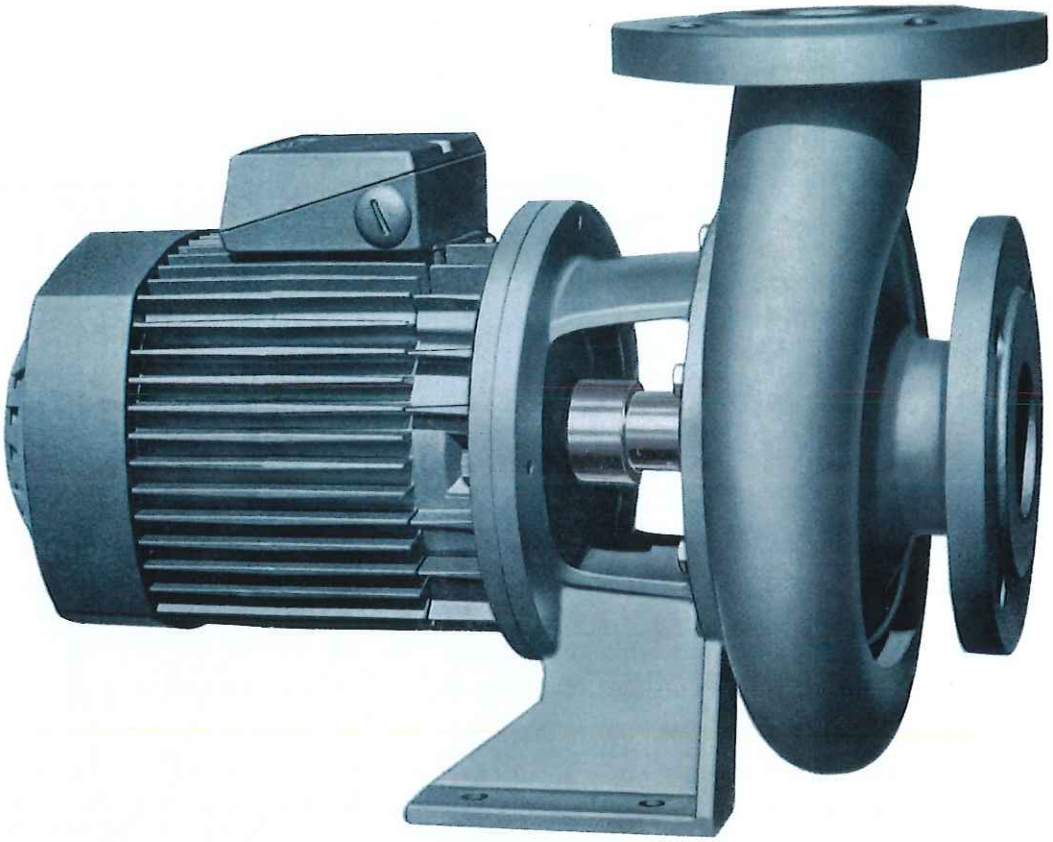
2.2 WATER FLOW RATE TO SEPARATOR

The water flow rate to the separator is adjusted by means of the DIAPHRAGM CONTROL VALVE[6] and the FLOW INDICATOR[12].

At normal operation conditions 0,3 l of water per m^3 of exhaust gas are required.

On determining the water flow rate, the following should be kept in mind:

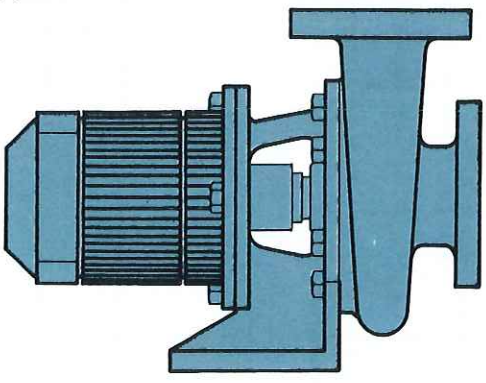
- an **increase** in the water flow rate will cause an increase in the pressure drop across the scrubber.
- **Excessive addition** of water can result in surplus water falling back through the gas stream.
- At a **too low** water flow rate the separation efficiency of the scrubber will be reduced.



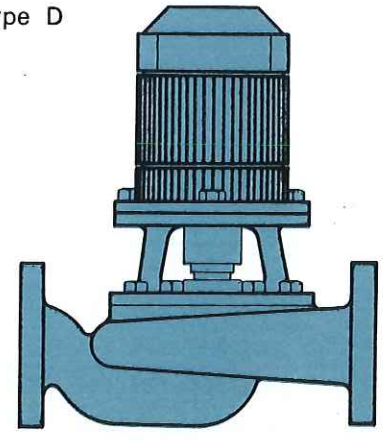
Kompakt-pumps

Types D and E 32–100

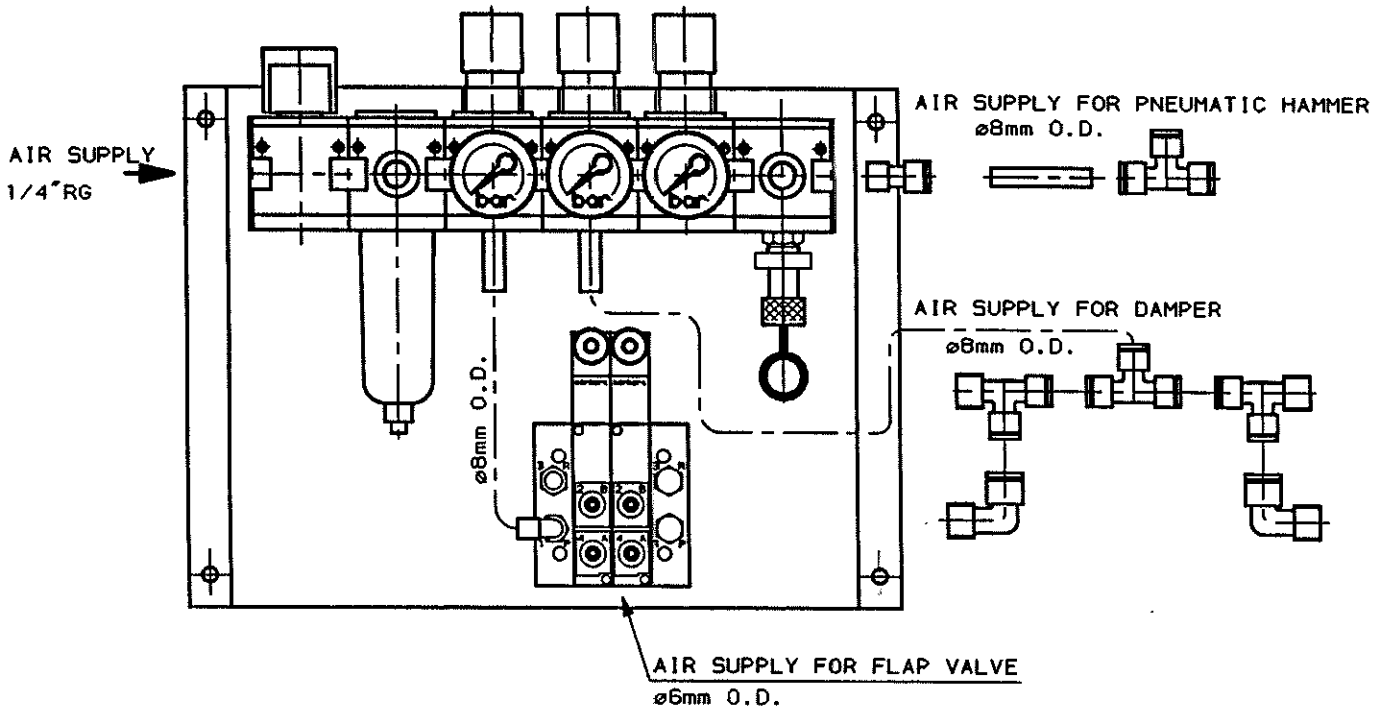
Type E



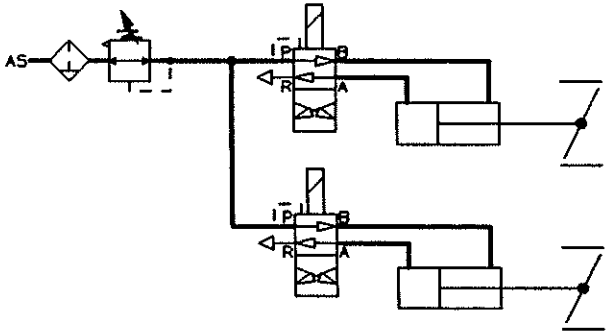
Type D



MERSER



MOUNTING, FLAP VALVE



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SCALE 1:

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SHEET

AIR SUPPLY FOR FLAP VALVE, DAMPER AND PNEUMATIC HAMMER

Category 3

110141

Rev.

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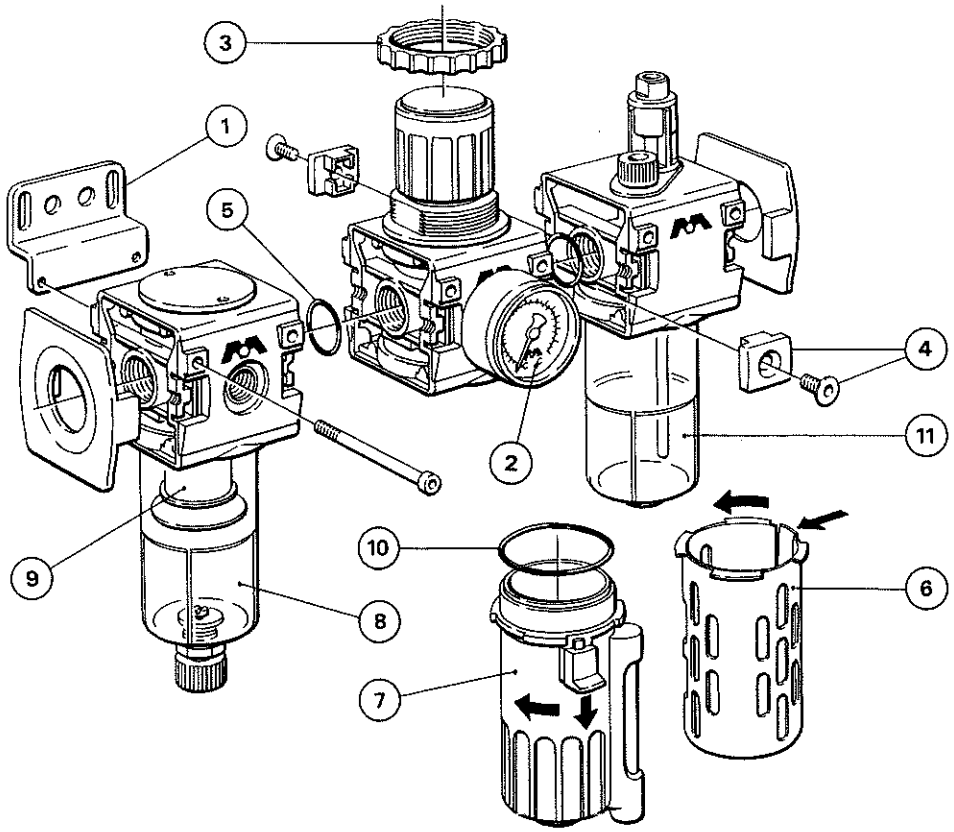
A3

Accessories and spare parts for the modular components



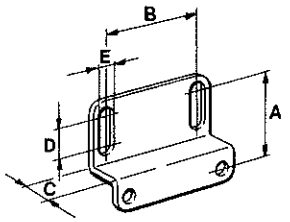
General accessories	G 1/4	G 1/2
1 Bracket + screws	915-111 810	915-331 810
2 Pressure gauge Ø 40 G 1/8 0 –16 bar	915-111 820	
2 Pressure gauge Ø 50 G 1/4 0–16 bar	915-111 830	
3 Panel mounting ring	915-111 840	915-331 840
4 Clamp + screw	04938 240 07	04938 241 04
5 O-ring	04938 242 01	04938 243 09

Spare parts and filter/regulator		
6 Bowl guard	915-111 890	04938 219 03
7 Metal bowl, man. drain	915-111 901	—
Metal bowl, auto. drain	915-111 902	—
8 Polycarbonate bowl, man. drain	04938 228 02	04938 229 18
Polycarbonate bowl. auto. drain	04938 244 06	04938 245 03
9 Filter element 40 µm	04938 224 03	04938 225 00
10 O-ring	04938 226 08	04938 227 05

Spare parts lubricator		
6 Bowl guard	915-111 890	04938 219 03
7 Metal bowl	915-111 910	
11 Polycarbonate bowl	04938 238 09	04938 239 06
10 O-ring	04938 226 08	04938 227 05

Spare parts regulator		
Diaphram	04938 230 00	04938 231 08
Valve poppet	04938 236 04	04938 237 01
ring 0,5-10 bar	04938 231 08	04938 232 05
Spring 0,5-3 bar	04938 234 18	04938 235 07

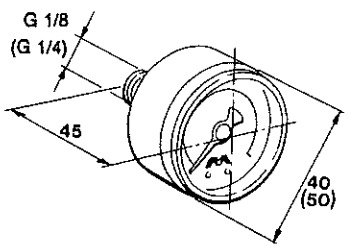
Bracket

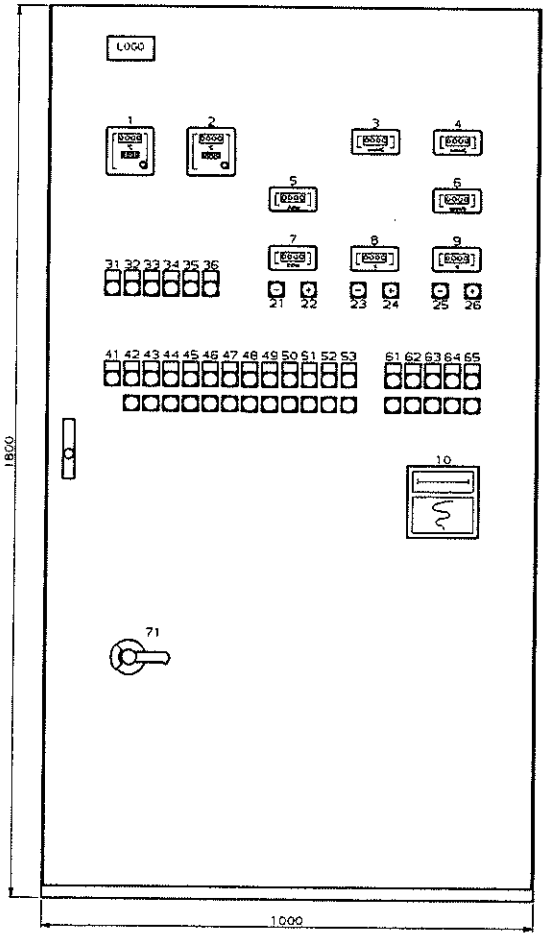


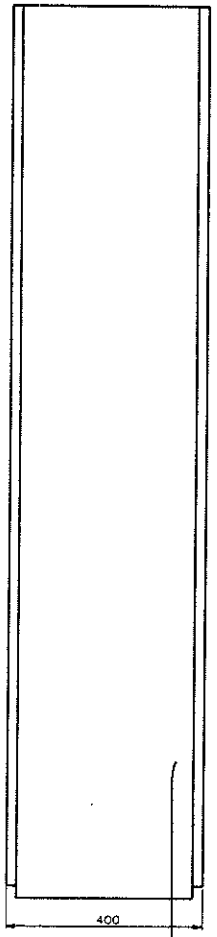
Dimensions

	A	B	C	D	E
G 1/4	27,5	38	20	8	5,4
G 1/2	33	50	20	13	6,4

Pressure gauge
G 1/8, (G 1/4)







POS.NO.	ITEM NO.	DESCRIPTION
INSTRUMENTATION:		
1.	33P3	TEMP. CONTROLLER, INLET CHAMBER
2.	34P3	TEMP. CONTROLLER, OUTLET CHAMBER
3.	22P7	DIFF. PRESSURE TRANSMITTER, INLET AIR
4.	24P7	DIFF. PRESSURE TRANSMITTER, CYCLONE
5.	26P4	CURRENT INDICATOR, ATOMIZER
6.	23P7	DIFF. PRESSURE INDICATOR, CHAMBER
7.	27P4	SPEED INDICATOR, ATOMIZER
8.	29P8	INDICATOR INLET AIR, DAMPER
9.	30P8	INDICATOR EXHAUST FAN, DAMPER
10.	27P5	RECORDER, ATOMIZER
SWITCHES:		
21.	28S3	SPEED -, SUPPLY FAN
22.	28S4	SPEED +, SUPPLY FAN
23.	29S3	DAMPER CLOSE, INLET AIR
24.	29S4	DAMPER OPEN, INLET AIR
25.	30S3	DAMPER CLOSE, EXHAUST FAN
26.	30S4	DAMPER OPEN, EXHAUST FAN
ALARMS:		
31.	35S3	HORN RESET
32.	35S4	ALARM ACCEPT
33.	35H8	DEVIATION ALARM, TEMP. OUTLET CHAMBER
34.	35H9	TEMP. HIGH INLET CHAMBER
35.	35H10	FLOODING ATOMIZER
36.	35H11	SPARE
CONTROL SWITCHES/LAMPS:		
41.	3S11/H10	LAMP TEST/POWER ON
42.	4S6,H12/4S7,H10	EXHAUST FAN
43.	6S6,H12/6S7,H10	SUPPLY FAN
44.	7S6,H12/7S7,H10	COOLING FAN, ATOMIZER
45.	11S6,H12/11S7,H10	RECIRCULATION PUMP, WET SCRUBBER
46.	9S1,H11/9S2,H12	ATOMIZER
47.	10S6,H12/10S7,H10	FEED PUMP
48.	18S6/18S7,H10	TIME AUTOMATIC, PNEUMATIC HAMMER & FILTER CLEANING
49.	19S6/19S7,H10	TIME AUTOMATIC, FLAP VALVE
50.	20S6/20S7,H10	PRODUCT DISCHARGE BOX
51.	14S6/14S7,H10	CHAMBER LIGHT
52.	5S6,H12/5S7,H10	MOTOR CONTROL, SPARE
53.	12S6,H12/12S7,H10	MOTOR CONTROL, SPARE

EL-HEATER:		
61.	15S3/15S4,H5	EL-HEATER 18 kW CHAMBER INLET
62.	15S6/15S7,H8	EL-HEATER 18 kW CHAMBER INLET
63.	15S9/15S10,H11	EL-HEATER 12 kW CHAMBER INLET
64.	16S3/16S4,H5	EL-HEATER 6 kW CHAMBER INLET
65.	16S6/16S7,H8	EL-HEATER 6 kW CHAMBER INLET
71.	3Q1	MAIN SWITCH

ITEM NO. REFERS TO CIRCUIT DIAGRAM 107964

Rev. Letter	Revision	Rev.	Appr.	Date

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LAYOUT DRAWING
CONTROL PANEL
SPRAY DRYER

SCALE 1:5

Drawn	HHC	920707
Check	BGN	920707
Appr.	JP	920720

ORDER NO.: 094-0191-00

Copy 2

107962

Rev.

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A1

(1 LIB,12 6C15E)

Miniature Circuit Breakers
Fuse Bases

For the markets of the world

Standard devices

Devices for USA and Canada, as in Section 15

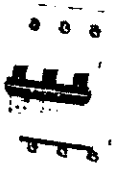
Standard devices for shipboard use in accordance with the Classification Societies, as in Section 15

Miniature circuit breakers
On-Off switches
Residual current circuit breakers
Finger-proof to VDE 0106 Part 100

FAZ Compact Miniature Circuit Breakers

Switching capacity: up to 10 kA.

Standard pack Single-pole 10 off, multi-pole 1 off

1	2	3	4	5	6	7	8	9	10	11	12
		Type									
"Finger-proof" to VDE 0106 Part 100 (VBG 4)	Characteristic		**1 pole**	**2 pole** with 1 protected pole	**2 pole** with 2 protected poles	**3 pole** with 3 protected poles	**4 pole** with 3 protected poles	**4 pole** with 4 protected poles	**Accessories** (fitted to right of FAZ ...) together with FAZ-... max. four units.		
									Auxiliary contacts		
	Rated current I_N	Width (mm)	17.5	35	35	52.5	70	70	Make 35	17.5	Break 17.5
											
				–N	–2	–3	–3-N	–4	–Hi20	–Hi10	–Hi01
										–Hi 11	
Component depth: 68 mm		Reference	For quantities of 50 or more: price on request								
			Price	**Price**	**Price**	**Price**	**Price**	**Price**	**Extra**	**Extra**	**Extra**
	A	No.									
	L		Response current of short-circuit release 3.5-5 x 1_N, switching capacity 6000, selectivity class 3 bzw. 10000, 3								
	6	9	**FAZL 6...**								
	10	15	**FAZL 10...**								
	12	17	**FAZL 12...**								
	16	22	**FAZL 16...**								
	20	28	**FAZL 20...**								
	25	35	**FAZL 25...**								
	32	42	**FAZL 32...**								
	G		Response current of short-circuit release 6-9 x 1_N (To BS 3871 Part 1)								
	0,5	–	**FAZG 0,5...**								
	1	–	**FAZG 1...**								
	2	–	**FAZG 2...**								
	3	–	**FAZG 3...**								
	4	–	**FAZG 4...**								
	6	–	**FAZG 6...**								
	10	–	**FAZG 10...**								
	16	–	**FAZG 16...**								
	20	–	**FAZG 20...**								
	25	–	**FAZG 25...**								
	32	–	**FAZG 32...**								
	40	–	**FAZG 40...**								
	50	–	**FAZG 50...**								
	U		Response current of short-circuit release 6-9 x 1_N (To BS 3871 Part 1)								
	–	6	**FAZG 6...**								
	–	17	**FAZG 16...**								
	–	22	**FAZG 20...**								
	–	28	**FAZG 25...**								
	–	35	**FAZG 32...**								
	–	42	**FAZG 40...**								
	–	50	**FAZG 50...**								
			Compact miniature circuit breakers for up to 250 V d.c., double-pole, switching capacity 2 kA, T = 4 ms, width (mm) 52,5 = 3 units								
	**L**		Response current of short-circuit release 3.5 x 8 x 1_N								
	6	–	**FAZL 6-2/DC**	–	–	–	–	–	–	See Price List	See Price List
	10	–	**FAZL 10-2/DC**	–	–	–	–	–	–		
	16	–	**FAZL 16-2/DC**	–	–	–	–	–	–		
	25	–	**FAZL 25-2/DC**	–	–	–	–	–	–		

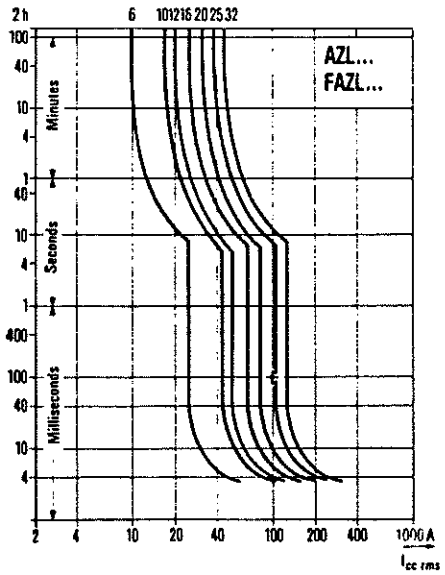
Selective operation with upstream circuit breakers, Page 10/41
Back-up protection, Page 11/7

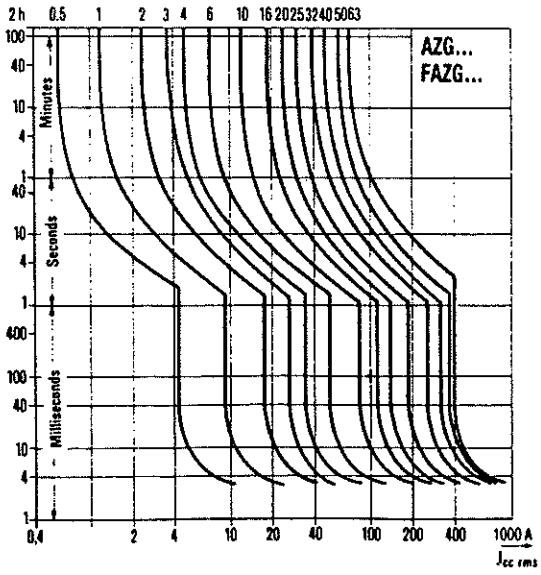
Characteristics	Type →	FAZ, AZ miniature circuit breakers			FAP On-Off switches
General					
Specifications		VDE 0641, BS 3871: Part 1 (G type only) CEE 19, DIN 43234, DIN 43880			VDE 0660, Part 1, IEC 408
Mechanical lifespan		20 000 operations = 40 000 movements			> 20 000 operations
● Component lifespan at rated current		20 000 operations = 40 000 movements (DC, 1000 operations)			> 10 000 operations
● Climatic test		Damp heat, constant, to IEC 68 Pt. 2-3			
		Damp heat, cyclic, to IEC 68 Pt. 2-30			
Ambient temperature open	max./min.	+ 50 °C/– 25 °C			
enclosed	max./min.	+ 40 °C/– 25 °C			
Limit current variation/residual error (ref. temp. 20 °C)		Lower temperature: tripping current + 0.5%/K Higher temperature: tripping current –0.5%/K			–
● Mounting position, direction of current flow		As required			
● Impact resistance		20 g (Duration of impact 20 ms)			
Contacts					
● Max. insulation voltage		440 V			
● Rated insulation voltage U_i, Group C/VDE 0110		380 V			
● Terminal capacity min./max.	mm^2	0.75/16 (with additional terminal, max. 25 mm^2), two-conductor terminal, max. 10 mm^2			
● Current heat losses per contact at rated current		3 W			
Switching capacity		**AZ...**		**FAZ...**	–
BS 3871, IEC 157-1, VDE 0641/6.78, VDE 0660 Pt. 101, CEE 19		To VDE 0641/CEE 19 Rated switching capacity	To VDE 0660/IEC 157-1 P1 (kA/cos φ)	To VDE 0641/CEE 19 Rated switching capacity	
VDE: 220/380 V, BS: 240/415 V	50...60 HZ	6000	6/0.5	10000	
Characteristic	L 6	10000	30/0.25	10000	
Rated current	L 10...25	10000	30/0.25	6000	
	L 32	–	–	unlimited (inherently short-circuit proof)	
	G 0.5...3	–	–	6000	
	G 4	4500	4.5/0.7	6000	
	G(U) 6	10000	30/0.25	6000	
	G(U) 10...25	10000	30/0.25	4500	
	G(U) 32	–	20/0.3	4500	
	G(U) 40	–	10/0.5	3000	
	G(U) 50	–	6/0.5 (P-2)	–	
	G 63	–	6/0.5 (P-2)	–	
	R 6...32	–	10/0.5	–	
	K 16. 32				
DC applications		(kA/L/R)		(kA/L/R)	
60 V d.c. AC MCBs, 1 pole		2/4 ms		1.5/4 ms	
125 V d.c. AC MCBs, 2 pole		2/4 ms		1.5/4 ms	
250 V d.c. DC MCBs, 2 pole		3/4 ms		2/4 ms	
● Selectivity with NZM L4, NZMH 6(9) circuit breakers		Table, Page 10/36			
with fuses 63 A/100 A		max. 3.5 kA/7 kA		max. 2.5 kA/4.5 kA	
Selectivity Class to VDE 0641		3		3	
● Back-up Circuit breakers NZMH 4/6/9		Diagram, Page 11/7			
protection NH fuses 125/100/80/63 A		100/>100/>100/>100 kA		–/35/45/55 kA	
● Uninterrupted current I_u		**Auxiliary contacts for (F) AZ...**			**FAP 16 25 63-3 80**
● Rated operational current I_e			6 A	DC 11 at 60 V d.c. 2.5 A	16 25 63 80
		AC 11 at 220 V	6 A	110 V d.c. 1.5 A	AC1 16 25 63 80
		380 V	5 A	220 V d.c. 0.6 A	
● Max. short-circuit protective device		10 A gL/(F)AZL 10			63 A gL/(F)AZL 32 80 gL

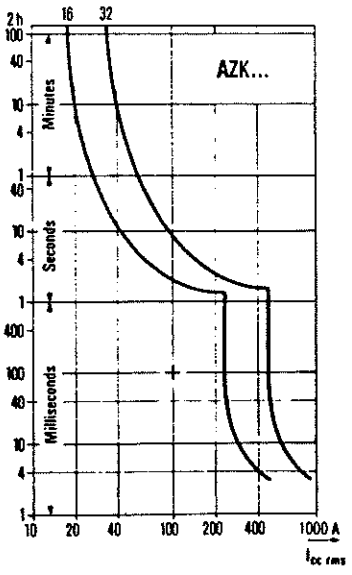
Tripping curves

Current/time curves to VDE 0641 and CEE 19
Reference temperature 20 °C

The tripping curves show the tripping time of the breakers in relation to the current. They indicate the mean value of the tolerance band at 20 °C ambient temperature, starting from cold state.
Operating temperature, the tripping time of the overload releases is approximately 1/4 of that indicated. A transparent overlay with fuse characteristics is available on request.



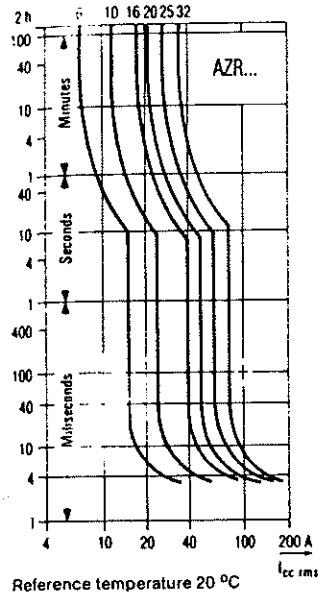




ırves for semiconductor protection

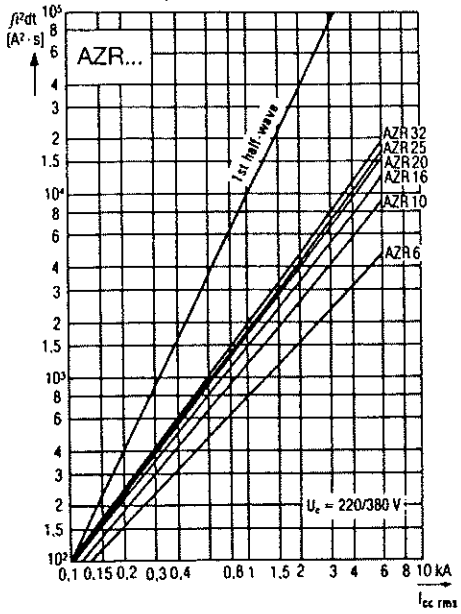
Tripping curves

(Current/time curves)

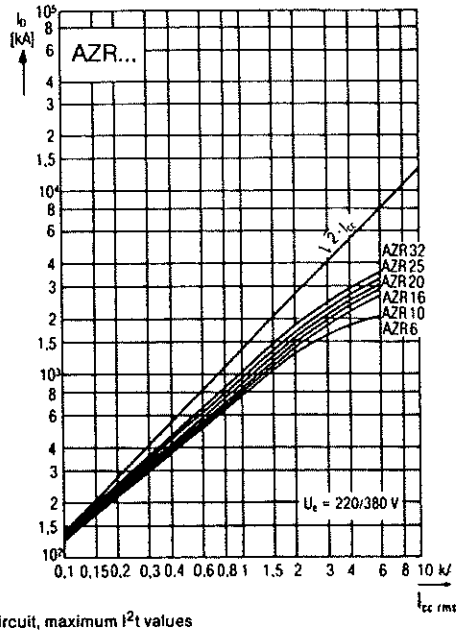


Reference temperature 20 °C

Let-through energy $I^2 \cdot t$



Let-through current I_D



Test conditions: 1.1 x 220 V, 50 Hz, single-pole short-circuit, maximum I^2t values

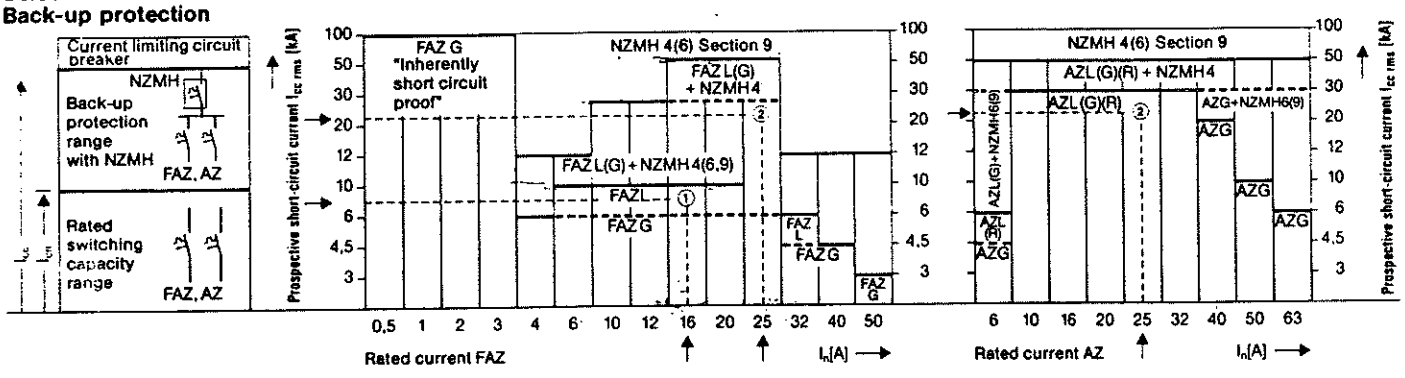
Protection of PVC insulated cables against thermal overloading in the event of short-circuits

IEE Regulations require that wires and cables should be protected against operational overloads, and short-circuits. Because of their severe current limiting properties, F(AZ) miniature circuit breakers provide this protection for even the smallest cables. The following Table shows the minimum cross-sections which these units provide up to their specified rated switching capacity.

Protective device	Type	FAZL 6	FAZL 10	FAZL 12	FAZL 16	FAZL 20	FAZL 25	FAZL 32	FAZG 0,5	FAZG 1	FAZG 2	FAZG 3	FAZG 4	FAZG 6	FAZG 10	FAZG 16	FAZG 20	FAZG 25	FAZG 32	FAZG 40	FAZG 50	AZL(R) 6	AZL(R) 10	AZL(R) 16	AZL(R) 20	AZL(R) 25	AZL(R) 32	AZG 6	AZG 10	AZG 16	AZG 20	AZG 25	AZG 32	AZG 40	AZG 50	AZG 63
□ = min. protected Cu cross-section mm²	0.75																																		
3 pole 380/415 V 50...60 Hz	1																																		
2 pole 220/240 V 50...60 Hz	1.5																																		
	2.5																																		
I^2 t-characteristics of MCBs on request	4																																		

Selection of miniature circuit breakers according to the prospective short-circuit current I_{cc} at the point of installation in 380/415 V mains systems.

Back-up protection



Example: ① Required: L-MCB with I_n = 16 A at $I_{cc\ rms}$ = 8 kA at point of installation. Selected: FAZL 16, because $I_{cn} > I_{cc}$.

② Required: L-MCB with I_n = 25 A at $I_{cc\ rms}$ = 22 kA at point of installation. Selected: FAZL 25, if there is an NZMH 4 (6.9) back-up protective device. Alternatively: AZL 25

Residual current circuit breakers Type →	FIP					
General						
Specifications	VDE 0664 Part 1					
Mechanical and electrical lifespan	> 5000 operations					
at I_N, U_N, cos φ = 0.9						
Mounting position, direction of current flow	As required					
Ambient temperature, max./min.	+ 40 °C/–25 °C					
Impact resistance	20 g(20 ms)					
Contacts						
Rated voltage U_N, 50 Hz	380/415 V					
Tripping time at $I_{\Delta n} \geq 5 \times I_{\Delta n}$	≤ 40 ms					
urge current resistance	250 A					
Rated current I_N	25 A	40 A	63 A	80 A	100 A	125 A
Max. short-circuit protective device						
Fuse gL	63 A			80 A	100 A	125 A
Short-circuit capacity	6 kA			6 kA		
Fuseless (F)AZL(G)	50 A		63 A	–	–	–
Short-circuit capacity	4.5 kA		6 kA			
Terminal capacity min./max.	1.5/25 mm²			2.5/50 mm²		

Impulse relays Type →	FSS	
General		
Specifications IEC 669-1	IEC 669-1	
Mechanical and electrical lifespan	100 000 operations	
at U_N, I_N, cos φ = 0.6		
Mounting position, direction of current flow	As required	
Ambient temperature max./min.	+50 °C/–20°C	
Control circuit		
Actuating voltage 50-60 Hz	8 V, 24 V, 220/240 V	
Duty factor	5 %	
Power consumption on actuation	11 VA	
Terminal capacity min./max.	1.5/2.5 mm² solid, flexible	
Load circuit		
Rated voltage U_N 1/2 pole	250 V	
2 pole	380/415 V	
Rated current I_N	16 A	
Terminal capacity max.	10 mm² solid, 6 mm² flexible	

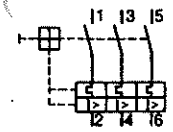
PKZM 1 Manual Motor Starters, PKM 1 Protective Switches, CL-PKZM 1 Current Limiters

Standard pack PK(Z)M 1: 2 off; CL-PKZM 1: 1 off

PKZM 1 manual motor starters, degree of protection IP 20

With overload and short-circuit releases
With single-phase sensitivity to IEC 292

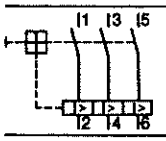
Suitable for the protection of EE xe motors
PTB Test Certificate No. 3.53/38 6.3060

1	2	3	4	5	6		7				
		Type	**Price**								
Protected against contact as per VBG 4 ("finger-proof")	Setting range of overload releases			Response current of short-circuit release	**Switching capacity P-1** with CL-PKZM 1 current limiter. **No back-up fuse required**		**Back-up fuse** aM or gL, required when the prospective fault current exceeds the switching capacity of the PKZM ($I_{cc} > I_{cn}$)				
45 mm cut-out to EN 43880											
Lockable in Off position using padlock					220/ 240 V	380 V	220/ 240 V	380/ 415 V	440 V	500 V	660 V
	A			A	kA	kA	max. A	A	A	A	A
	0.1 -0.16	**PKZM 1-0.16**	Price List	1.9							
	0.16-0.24	**PKZM 1-0.24**		2.9							
	0.24-0.4	**PKZM 1-0.4**	See Price	4.8							
	0.4 -0.6	**PKZM 1-0.6**		7.2							
	0.6 -1.0	**PKZM 1-1**	List See	12							
	1.0 -1.6	**PKZM 1-1.6**		19							
	1.6 -2.4	**PKZM 1-2.4**	Price List	29							25 20
	2.4 -4.0	**PKZM 1-4**		48						35	35 25
	4.0 -6.0	**PKZM 1-6**	See Price	72						50	50 35
Devices labelled Ser.-No. 01 or Ser.-No. 02	6.0 -10.0	**PKZM 1-10**		120		50		50	50	50	35
	10.0-16.0	**PKZM 1-16**	List See	192	50	50	63	63	63	63	35
	16.0-20.0	**PKZM 1-20**		240	50	50	63	63	63	63	50
can be combined with CL-PKZM 1	20.0-25.0	**PKZM 1-25**	Price List	300	–	–	63	63	63	63	50

No back-up fuse required. Short-circuit proof up to highest fault currents.

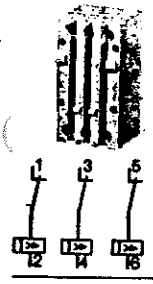
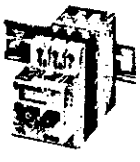
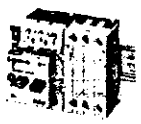
PKM 1 manual protective switches, degree of protection IP 20

With short-circuit releases

	–	**PKM 1-16**	See Price	120	–	–	63	63	63	63	50
	–	**PKM 1-25**		192	–	–	63	63	63	63	50

CL-PKZM 1 current limiters, degree of protection IP 20

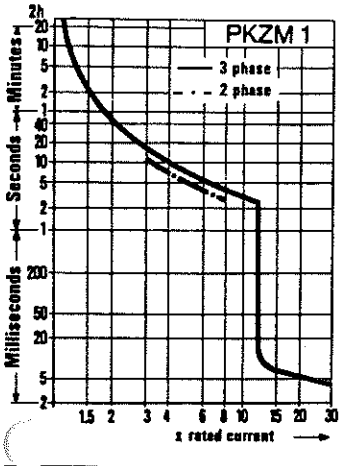
Increase the switching capacity of the PKZM 1 manual motor starter to 50 kA at 380 V

1	2	3	4	5		6
		Type	**Price**	In combination with PKZM 1 manual motor starter		
Protected against contact as per VBG 4 ("finger-proof")	Uninterrupted current I_u			Mounted behind	Mounted alongside	Space required when mounted alongside (1 PE ≙ 17.5 mm)
Snap-on fit on EN 50022-35 top hat rail						
	A					PE (space unit)
	32	**CL-PKZM 1**	See Price List			2½

● Protection for EEx e motors

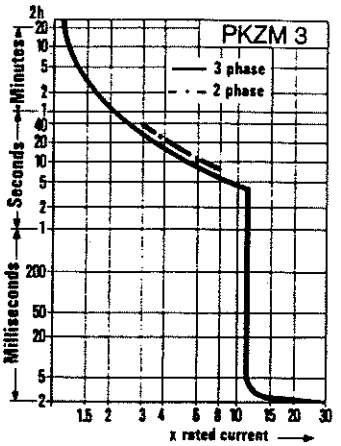
Tripping curves

The curves show the tripping time of the starter in relation to the current. They are mean values of the tolerance curves at 20 °C ambient temperature, starting from cold. At operating temperature, the tripping time of the overload releases is approximately ¼ of that indicated.
Specific curves for each individual setting range are available on request.
These curves, format 55 x 75, self-adhesive, conform to the data of the PTB Test Reports, and can be used both for the correct selection of manual motor starters for EEx e motors and for documentation on site.



Setting range A	Tripping curve to AWA No.
0.10-0.16	121-737-1
0.16-0.24	121-737-2
0.24-0.4	121-737-3
0.4-0.6	121-737-4
0.6-1.0	121-737-5
1.0-1.6	121-737-6
1.6-2.4	121-737-7
2.4-4	121-737-8
4-6	121-737-9
6-10	121-737-10
10-16	121-737-11
16-20	121-737-12
20-25	121-737-13

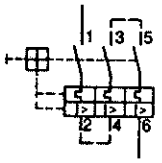
PTB Test Report
Certificate No. 3.53/386.3060



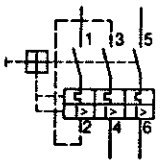
Setting range A	Tripping curve to AWA No.
0.4-0.6	121-106-9
0.6-1.0	121-106-10
1.0-1.6	121-106-11
1.6-2.5	121-106-1
2.5-4.0	121-106-2
4.0-6.3	121-106-3
6.3-10	121-106-4
10-16	121-106-5
16-25	121-106-6
25-32	121-106-7
32-40	121-106-8

PTB Test Report
Certificate No. 2.42-20999/76

Single- and two-pole circuits for PKZM manual motor starters used for d.c. switching



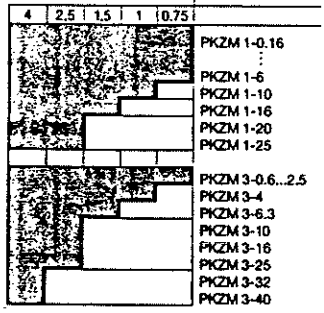
Single-pole



Two-pole

Protection of PVC insulated cables against thermal overload in fault conditions.

The table shows which minimum cable cross-sections are protected by PKZM manual motor starters up to their rated switching capacity.



Selectivity table 380/415 V a.c.

I_u: Rated uninterrupted current [A]
I_{rm}: Setting figure of short-circuit releases [A]

Incoming breaker		NZM(H) 4 I_{cn} at i 415V~65kA				NZM L 4	NZM(H) 6				NZM(H) 9				NZM(H) 11		NZM 12			NZM 24	NZM 26
	I_u A	25	40	63	80/100	40 50 63	40	63	100	160/200	100	160	200 250	315	400	630	630	800 1000	1250 1600	2000 2500 3000	4000
Outgoing starter	I_{rm} A	320	500	800	1000	1700	475	760	1150	1900/2400	1200	2000	2400	4000	4800	7500 (5000)	4000	6000	8000	12000	24000
	I_N or I_e	Unrestricted short-circuit current (kA). Set overload and short-circuit releases to maximum figure.																			
PKZM 1	0.16-2.4	0.3	10	20	100	25	10	18 (100)	18 (100)	18 (100)	35 (100)	35 (100)	35 (100)	35 (100)	40 (100)	40 (100)	100	100	100	100	100
	4	0.3	4	10	100	25	6	10	18 (100)	18 (100)	35 (100)	35 (100)	35 (100)	35 (100)	40 (100)	40 (100)	100	100	100	100	100
	6	0.3	3	4	100	25	3	4	18 (100)	18 (100)	35 (100)	35 (100)	35 (100)	35 (100)	40 (100)	40 (100)	100	100	100	100	100
	10	0.3	0.5	1	2	4	2	2	3	6	4	6	6	6	6	6	6	6	6	6	6
	16	0.3	0.5	1	2	4	2	2	3	4	3	4	4	4	4	4	4	4	4	4	4
	20	0.3	0.5	0.8	1	1	0.5	1	3	9/24	3	4	4	4	4	4	4	4	4	4	4
	25		0.5	0.8	1	1	0.5	1	2	9/24	2	4	4	4	4	4	4	4	4	4	4
CL for	10+CL	0.3	0.5	1	2	2	2	2	18 (50)	18 (50)	35 (50)	35 (50)	35 (50)	35 (50)	40 (50)	40 (50)	50	50	50	50	50
380 V a.c.	16/20+CL	0.3	0.5	0.8	1	1	0.5	1	18 (20)	18 (50)	20	35 (50)	35 (50)	35 (50)	40 (50)	40 (50)	50	50	50	50	50
PKZM 3	0.6-1.6	0.3	100	100	100	25	18 (100)	18 (100)	18 (100)	18 (100)	35 (100)	35 (100)	35 (100)	35 (100)	40 (100)	40 (100)	100	100	100	100	100
	2.5	0.3	10	10	100	25	10	10	18 (100)	18 (100)	35 (100)	35 (100)	35 (100)	35 (100)	40 (100)	40 (100)	100	100	100	100	100
	4	0.3	6	10	100	25	6	10	18 (100)	18 (100)	35 (100)	35 (100)	35 (100)	35 (100)	40 (100)	40 (100)	100	100	100	100	100
	6.3	0.3	3	4	10	25	3	4	10	18 (100)	10	35 (100)	35 (100)	35 (100)	40 (100)	40 (100)	100	100	100	100	100
	10	0.3	0.5	1	2	2	2	2	3	6	4	6	6	6	6	6	6	6	6	6	6
	16	0.3	0.5	1	2	2	0.5	1	2	4	2	4	4	4	4	4	4	4	4	4	4
	25		0.5	0.8	2	2	0.5	0.8	2	4	2	4	4	4	10	10	10	10	10	10	10
	32		0.5	0.8	2	2	0.5	0.8	2	4	2	4	4	4	10	10	10	10	10	10	10
	40			0.8	2	1.7		0.8	1.2	4	1.7	3	3	3	10	10	10	10	10	10	10

Natural selectivity limit determined by frame sizes

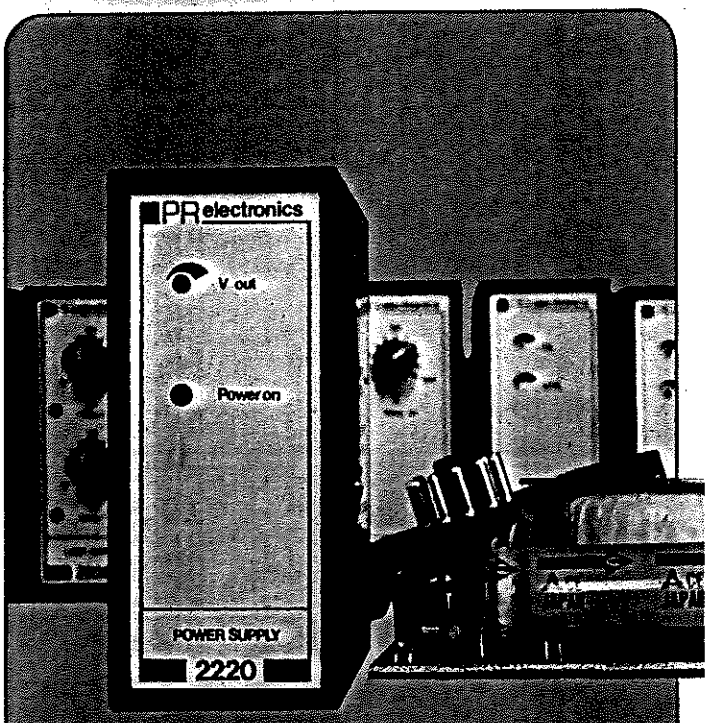
Selectivity limit determined by switching capacity of protective element

Selectivity limit = response level of short-circuit release, incoming breaker

POWER SUPPLY

2220

- AC line input
- 6 W output
- Adjustable output voltage
- Short circuit current limit
- Thermal overload protection
- Standard 11 pole relay socket



Applications:
Power supply for smaller measurement systems etc. e.g. composed of units from the 2200 series. Constant voltage charging for batteries.

Technical characteristics:
Series regulated DC voltage supply with built-in transformer and adjustable output voltage.
Standard supply voltage 220 VAC, or according to order.
Standard DC output 24 V, 15 V, 12 V and 5 V, or according to order.
Output voltage adjustment is available in the front of the cassette.
Adjustment range: ± 15 % nom.
The 2220 has internal short circuit current limit and is protected against thermal overload.
An LED in the front of the cassette indicates active DC output.

Electrical specifications:
(@: − 20°C to + 40°C)

Supply voltage: 220 VAC ± 10 % (50-60 Hz)
Output voltage: 24 VDC (250 mA)
15 VDC (400 mA)
12 VDC (500 mA)
5 VDC (1200 mA)

Output ripple: max. 25 mV / 100 Hz
Operating ambient temp. range: min. − 20°C
max. + 60°C

PR electronics denmark

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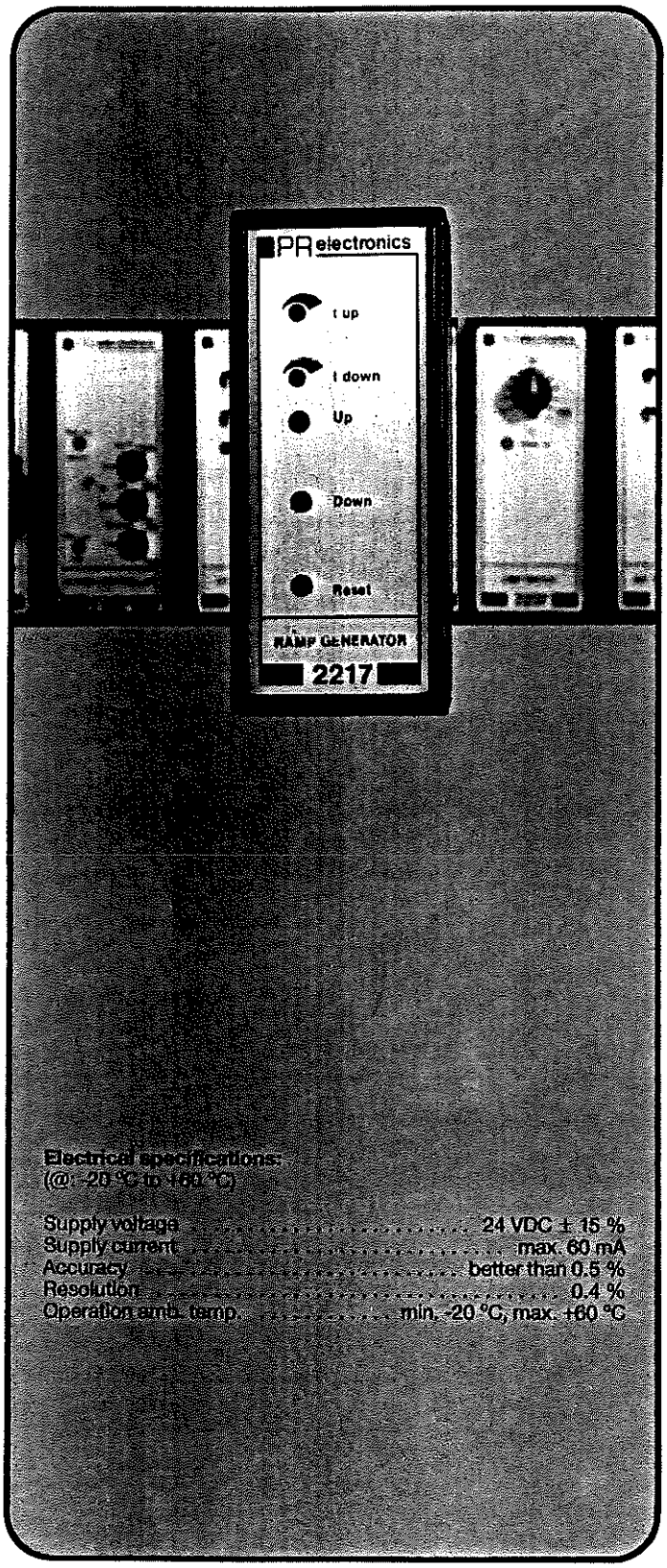
RAMP GENERATOR

2217

- 8 bit D/A converter
- Internal OSC or external clock
- Optional switch inputs
- 0-20 mA or 4-20 mA output
- 24 VDC supply voltage
- Standard 11 pole relay socket



Applications:
For control of analogue up and down regulations of pumps, servo motors, light installations etc.
Conversion of pulses into analogue ramp signal measured over a specific period of time for instance to a recorder.

Technical specifications:
Input: All inputs are activated typically at 8 VDC. Input pins 4, 6 and 11 have 3.3 kΩ pull up to 24 VDC.
Blocking of OSC if up count and down count are activated simultaneously.
Reset pulse min. 0.1 sec. Power up 0.5 sec. Power off less than 2=sec. will result in reconnecting output at the same value as prior to power cut.
Power of more than 2 sec. will result in output being zeroed.
f.max. at external clock: 20 Hz (option B).

Output: Current and voltage as standard signal, or as required.
Standard output current (pin 3): 0-20 mA or 4-20 mA.
Load resistance: Max. 600 Ω.
Current limit: 20 mA.
Standard output voltage (pin 2): 0-1 V, 0,2-1 V or 0-10 V, 2-10 V.
Output resistance: Nom. 50 Ω or 500 Ω.
Current and voltage signals refer to supply gnd., but if both signals are used simultaneously, only the voltage signal will have gnd. as ref.
Zero-point and full scale adjustment are accessible at cassette front. If 100 % has been reached, and up count is still activated, 100 % will be maintained until down count or reset is activated.
If 0 % has been reached, and down count is still activated, 0 % will be maintained.

Electrical specifications:
(@ -20 °C to +60 °C)

Supply voltage	24 VDC ± 15 %
Supply current	max. 60 mA
Accuracy	better than 0.5 %
Resolution	0.4 %
Operation amb. temp.	min. -20 °C, max. +60 °C

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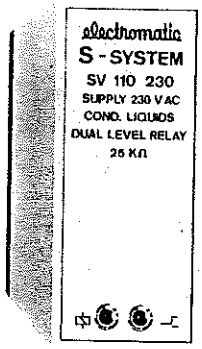


SV 110/210 = 11-pin circular plug
SV 310/410 = 11-pin spade plug

SV 110/210/ 310/410

- Level control for conductive liquids.
- Max.-min. control of DISCHARGING.
- Factory-set sensitivity.
- 10 A SPDT or 8 A DPDT output relay.
- LED-indication: relay on.
- AC or DC power supply.

SPECIFICATIONS

See common technical data

Sensitivity
When the resistance between pins 5-6 (3-6) and 7 (9) is less than 25 KΩ the relay operates, and it does not release until the resistance between pins 6 (6) and 7 (9) is larger than 35 KΩ.

Sensor voltage
Max. 24 VAC.

Isolation
The built-in transformer is a class II transformer according to international specifications CEE 15, VDE 551, etc. with 4K VAC and 8mm air gap/ creepage distance.

Sensor current
Max. 2.5 mA.

Connection cable
2- or 3-core plastic cable, normally unscreened.
Cable length: Max. 100 m.
The resistance between the cores and ground must be at least 220 KΩ.
In certain cases it is recommended to use screened cable between sensor and amplifier, e.g. where the cable is placed in parallel to the load cables/ mains.
The screen is connected to pin 7 (9).

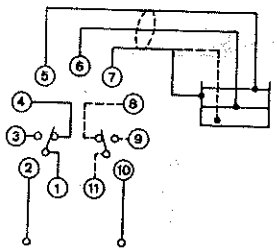
Ordering key
11-pin circular plug
SV 110 XXX = 10 A SPDT
SV 210 XXX = 8 A DPDT
11-pin spade plug
SV 310 XXX = 10 A SPDT
SV 410 XXX = 8 A DPDT

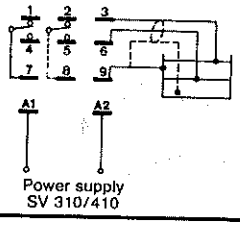
XXX = power supply
024 = 20– 28 VAC
115 = 95–135 VAC
230 = 195–265 VAC
724 = 20– 28 VDC

Accessories
Bases.
Hold down spring.
Mounting rack.
Base covers.
Front mounting bezel.
Level probes type VH,
types VPC, VPP,
types VN, VNY, VNI,
type VT, VTI,
type VS.
See sensor catalogue.

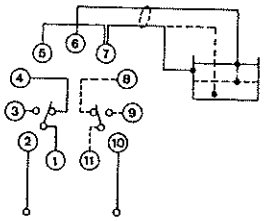
WIRING DIAGRAMS

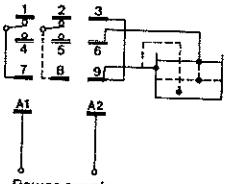
Example 1





Example 2





MODE OF OPERATION

Max. and/or min. control of DISCHARGING of conductive liquids.
Relay for control of CHARGING, see SV 120/220/320/420.

Example 1
The diagram shows the level control connected as max. and min. control, i.e. registration of 2 levels.
The relay operates when the liquid reaches the max. electrode (pin 5 (3)), provided that the min. electrode (pin 6 (6)) is in contact with the liquid.
The relay releases, when the min. electrode is no longer in contact with the liquid.
Pin 7 (9) must be connected to the container.

If the container consists of a non-conductive material, an additional electrode must be used. (To be connected to pin 7 (9)).
In the diagram this electrode is shown by the dotted line.

Example 2
The diagram shows the level control connected as max. or min. control, i.e. registration of 1 level.
The relay operates when the electrode (pin 6) is in contact with the liquid.
An additional electrode must be used, if the container consists of a non-conductive material.
Interconnect pins 5 (3) and 7 (9) directly on the base.

Example 3
The SV 110/210/310/410 may be used as a maximum detector with alarm.
When the water hits the sensor for example in case of waves, the alarm remains activated until reset by breaking the contact. (Interruption of the power supply).

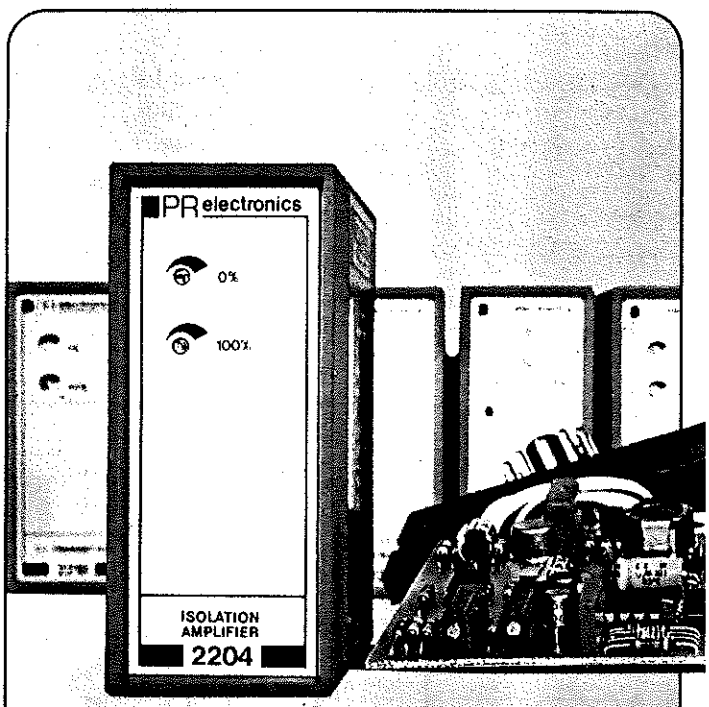
OPERATION DIAGRAM Ex. 1:

OPERATION DIAGRAM Ex. 2:

ISOLATION AMPLIFIER

2204

- Isolated input - output
- 1,5 kV AC isolation voltage
- Current- or voltage input
- Internal power supply for input circuit
- 24 VDC supply
- Standard 11 pole relay socket



Applications:
Galvanic isolation of analog signals (ground loop elimination). Floating off-ground signal measurements. Signal conversion, e.g. 0-20 mA/4-20 mA or 0,2-1 V/0-20 mA.

Technical characteristics:
Input: Current or voltage as standard signal, or according to order.
Standard voltage input: 0-1 V or 0,2-1 V.
Input resistance: typ. 10 MOhm.
Standard current input: 0-20 mA or 4-20 mA.
Input resistance: nom. 50 Ohm.
The amplifier input circuit is powered by a built-in DC/DC converter, which is supplied from the amplifier output side.

Output: Current and voltage as standard signal, or according to order.
Standard current output (pin 3):
0-20 mA or 4-20 mA.
Load resistance: max. 500 Ohm.
Current limit: typ. 30 mA.
Standard voltage output (pin2): 0-1 V or 0,2-1 V.
Output resistance: nom. 50 Ohm or 500 Ohm.
Voltage limit: typ. 1,5 V.
The current- and voltage signals refer to supply gnd, but using both signals simultaneously, only the voltage signal refers to gnd.
Adjustments for zero and full scale are available in the front of the cassette.

Electrical specifications:
(@: – 20°C to + 60°C)

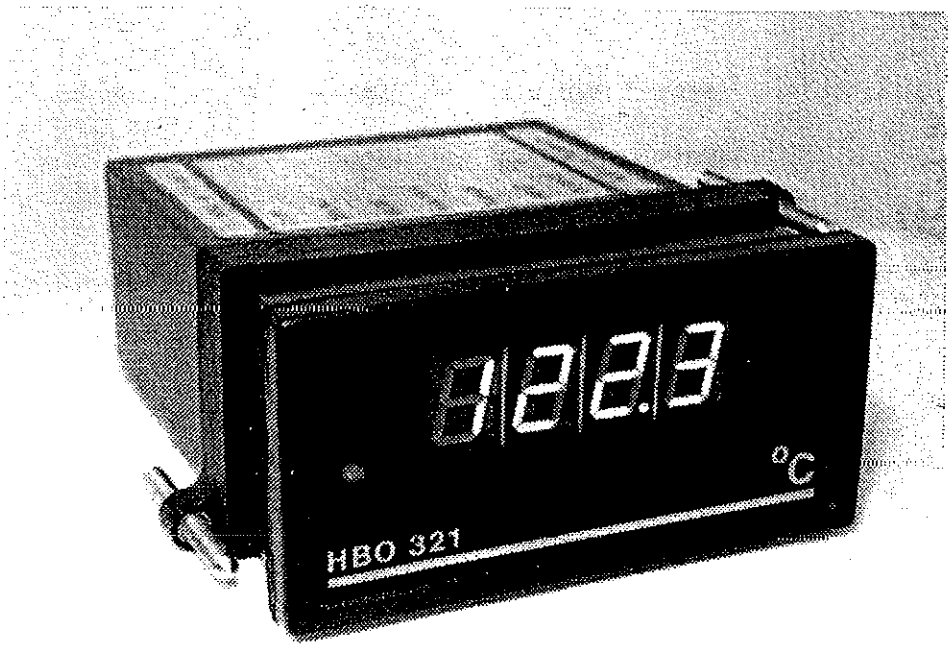
Supply voltage: 24 VDC ± 15 %
Supply current: max. 50 mA
Accuracy: better than 0,5 %
Output ripple voltage: better than 0,5 % (RMS)
Isolation voltage (input - output): 1,5 kV AC
Operating ambient temp. range: min. – 20°C
max. + 60°C

PR electronics denmark

Lerbakken 10 · DK-8410 Rønde · Tlf. +45 86 37 26 77 · Telefax +45 86 37 30 85 · Telex 60 160 prelec

H B O 3 2 1
DIGITAL INDICATOR
PANEL MOUNTING

WATERTIGHT FRONT IP 65 OPTIONAL



The HBO 321 is a sturdy, reliable, and versatile meter, especially suited to operate in industrial environments.

Measuring 96 by 48 mm, the plastic housing reinforced by glass fibre complies with the German Industrial Standard, and sealed by its acrylic front the meter comes in an optional IP 65 watertight version.

A 3½ digit, bright red, LED display allows for easy and accurate reading at distances of up to 6 meters.

According to input amplifier and sensor type, the instrument will cover any indication range within the limits given by the specifications.

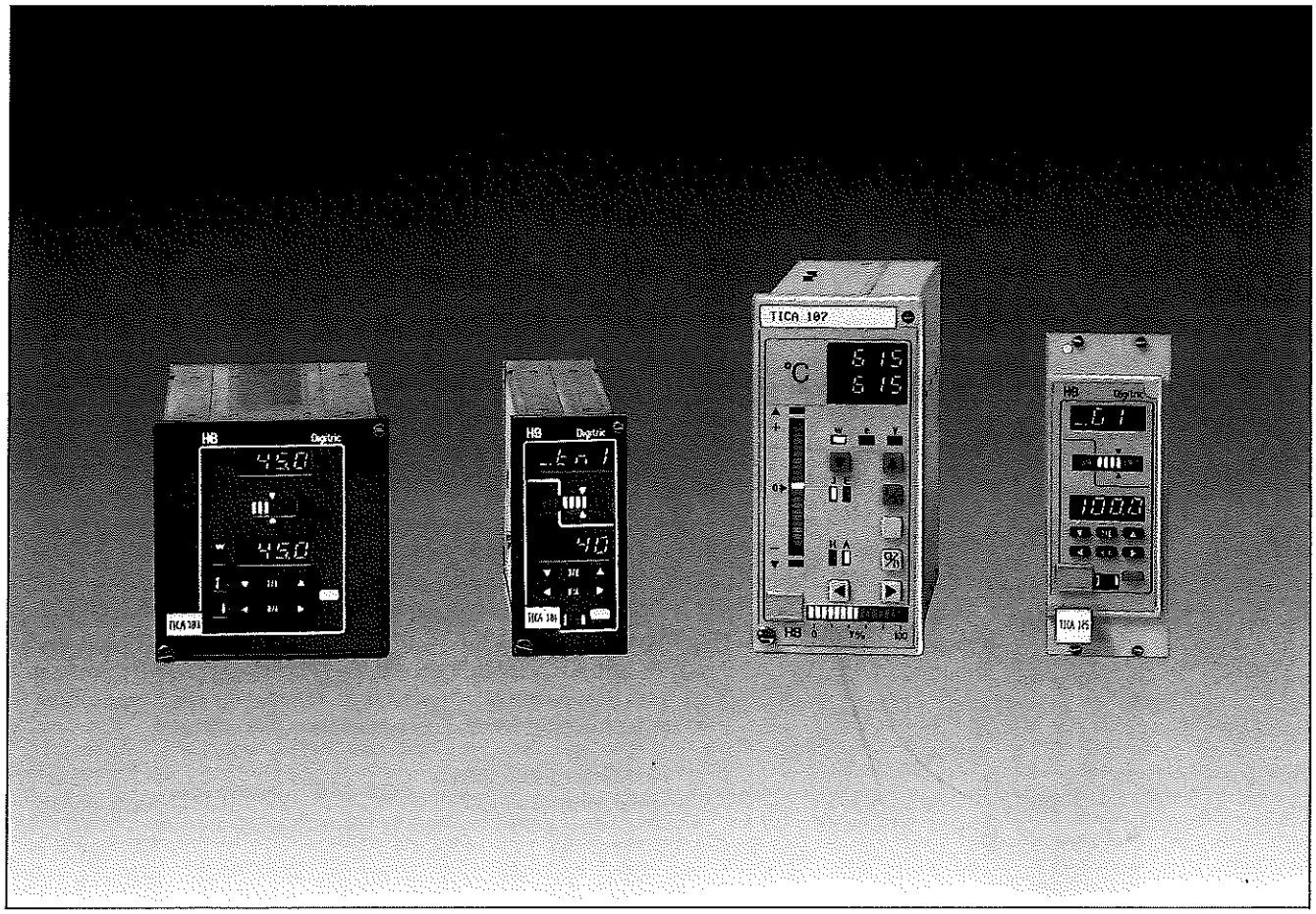
Indication in customer specified units is made to order e.g. for gauging current, voltage, pressure, flow, etc.

The series include versions with power supply for transducer or with analogous output.

requiring no special tools, installation is easily accomplished by means of screw terminals on the rear panel.

MANNESMANN
Hartmann & Braun

Compact controller with digital processing Digitric P



Operating Manual
42/61-28-2 EN

Table of contents

Operating instructions in brief for controller
(can be detached)
Operating instructions in brief for programmer,
program controller
(can be detached)

Preliminary remarks

Perfect and safe operation of the Compact Controller Digitric P presupposes that it is correctly transported and stored, installed and commissioned by experts and carefully operated and maintained.

Only those persons conversant with the installation, commissioning, operation and maintenance of similar equipment and who have the requisite qualifications may work on the control facility. In this respect, they must observe the contents of this Operating Manual, the safety instructions imprinted on the apparatus as well as the relevant safety regulations applying to the installation and operation of electrical apparatus.

This apparatus has been designed and tested in accordance with DIN VDE 0411 Part 1 (based on IEC Publication 348), Safety Requirements for Electronic Measuring Apparatus, and has been supplied in a safe condition. The present Operating Manual contains some information and warnings which have to be followed by the user to ensure safe operation and to retain the apparatus in safe condition.

Norms and regulations

The industrial standards and regulations (DIN, VDE, VDI, etc.) referred to in this Operating Manual are applicable in the Federal Republic of Germany. When using this device outside the German Federal jurisdiction, the relevant specifications, standards and regulations applicable in the country where the device is used must be observed.

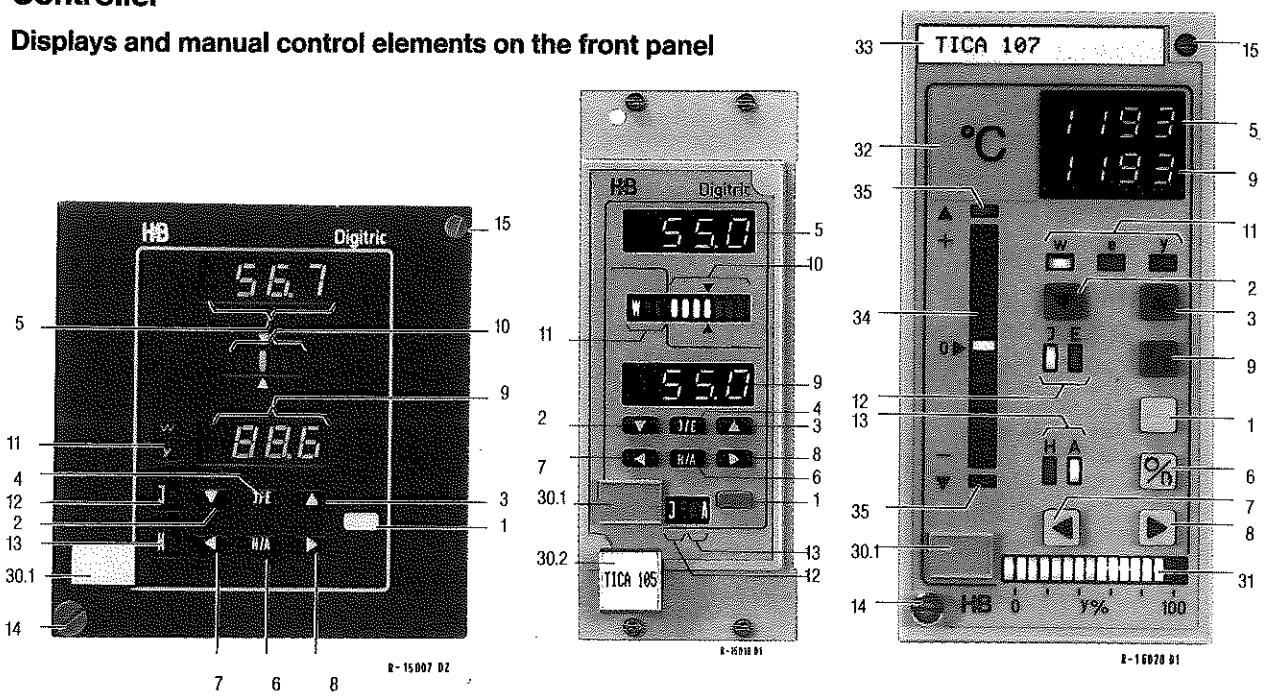
Associated documents

Data Sheet 61-4.11 EN, Brochures 1 and 2
Operating Manual 42/61-26-EN (Serial interface)
Operating Manual 42/61-27-EN (Configuration Instruct.)
Operating Manual 42/61-29-EN (Parameter definition, modifications)

Operating Instructions in Brief
Excerpt from Operating Manual 42/61-28 EN

Digitric P
Controller

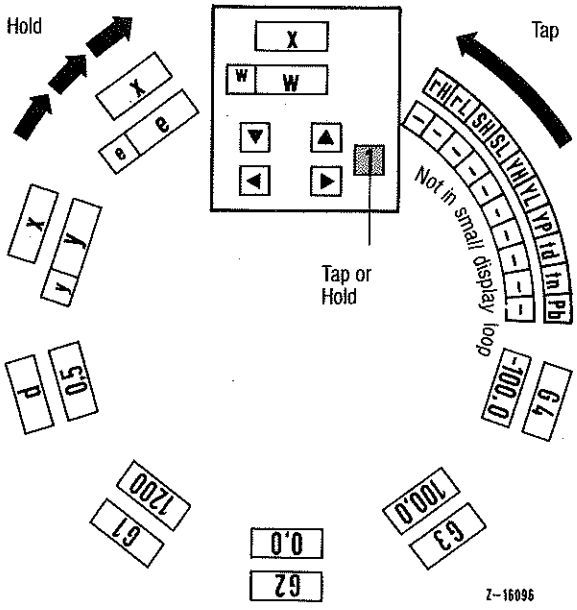
Displays and manual control elements on the front panel



1 Display changeover switch
2 Universal setting key "lower"
3 Universal setting key "raise"
4 Set point changeover
5 Top display line (controlled variable, variable name, fault message)
6 Manual/automatic changeover
7 Manual setting key "lower"
8 Manual setting key "raise"
9 Bottom display line (variable values, channel display)
10 Indicator for control deviation, controller output, switching status
11 Display of the main variables to (9)
12 Status display set point internal/external
13 Status display manual/automatic
14 Closing screw and slide-in unit
15 Additional closing screw
30.1 Cover for configuration jack/designation plate
30.2 Designation plate (only with 19" plug-in card)
31 Output display/switch status
32 Adhesive label for specification of the unit of measurement
33 Inscription field
only with format 72 mm x 144 mm:
34 Control deviation display
35 Light emitting diodes for control deviation for more than ± 10 %

Display and setting possibilities

In the display a number of process variables can be shown and changed with display changeover switch (1).



The set point (w) and alarm values G1., G2., G3., G4. can be set with key ▲ or ▼.

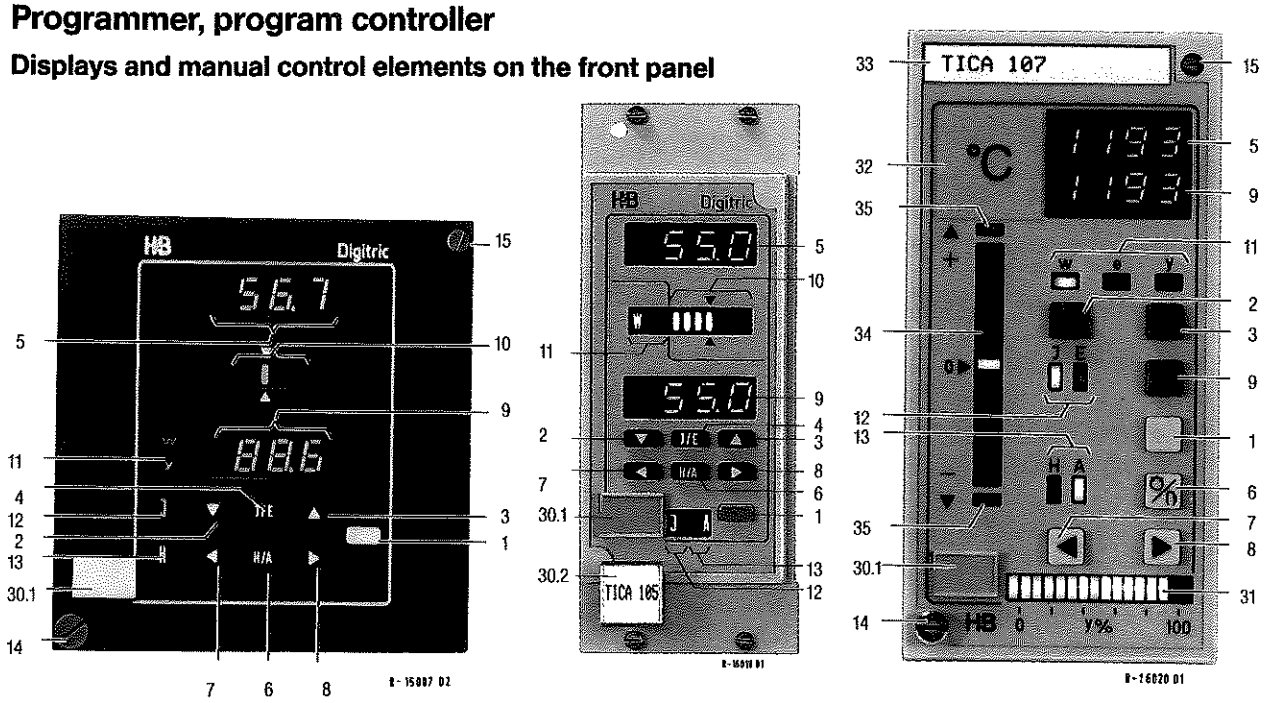
Display (5)	Display (9)	Function
Value for x	Channel display	Controlled variable or ratio [1] (Current)
Value for x	Value for w	Controlled variable and set point
Value for x	Value for e	Controlled variable and control deviation
Value for x	Value for y	Controlled variable and output variable
d.	Value	Set point difference ($w_{ext} - w_{int}$)
G1.	Value	Alarm value X max.
G2.	Value	Alarm value X min.
G3.	Value	Alarm value control deviation max.
G4.	Value	Alarm value control deviation min.
r	Value	Secondary variables with ratio
E1	Value	Multicomponents
E2	Value	Reference variable with ratio; multicomponents
E3	Value	Control of output limit Override (YL; YH)
E4	Value	Multicomponents

All displays and setting possibilities are available manifoldly in multichannel instruments.

Operating Instructions in Brief
Excerpt from Operating Manual 42/61–28 EN

Digitric P
Programmer, program controller

Displays and manual control elements on the front panel



1 Display changeover switch
2 Universal setting key "lower"
3 Universal setting key "raise"
4 Set point changeover
5 Top display line
(controlled variable, variable name, fault message)
6 Manual/automatic changeover
7 Manual setting key "lower"
8 Manual setting key "raise"
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Display and setting possibilities

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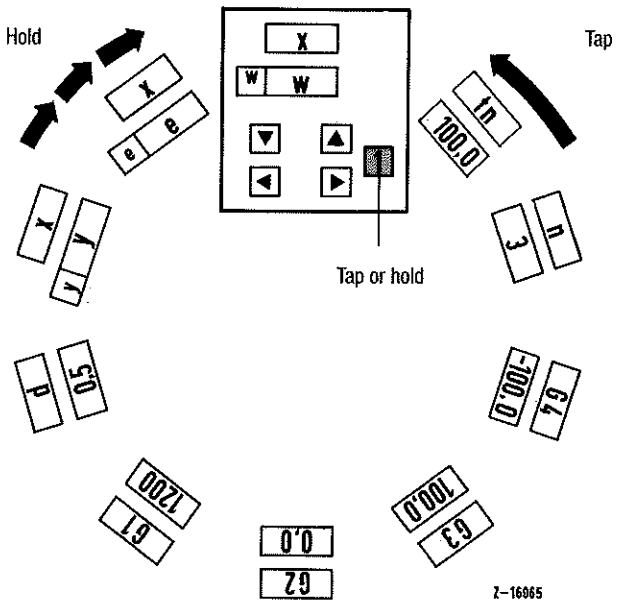


Programmer

Display (5)	Display (9)	Function
w-program	Channel display	Only with multichannel instruments
w-programm	w active	Program set point, active set point
n	1...7	No. of section being currently processed
tn	Value	Time which has elapsed in the section currently running (4)

Program controller

Display (5)	Display (9)	Function
Value for x	Channel display	1st channel = controller 2nd channel = programmer
Value for x	Value for w	Controlled variable and active set point
Value for x	Value for w	Controlled variable and control deviation
Value for x	Value for y	Controlled variable and output variable
d.	Value	Set point difference ($W_{program} - W_{Int}$)
G1.	Value	Alarm value X max.
G2.	Value	Alarm value X min.
G3.	Value	Alarm value control deviation max.
G4.	Value	Alarm value control deviation min.
n	1....7	No. of section being currently processed
tn	Value 0...100 %	Time which has elapsed in the section currently running (%)

1.3 Installing the lines

When selecting and installing the connecting cables please observe the regulations for electric power installations with nominal operating voltages up to 1000 V, (DIN VDE 0100) or the corresponding local regulations.

Note

As a protection against electric shocks connect the protective earth terminal PE to a suitable protective earth before any other connection is made.

The grounding conductor is also used to divert HF interferences. Hence provision should be made for it also with a power supply of 24 V (direct or alternating voltage).

The reference conductor connection (⊥) in the unit is connected via a capacitor 1 µF with PE.

If there is interloop flexibility between several Digitric P units, for the purpose of compliance with the permissible common-mode voltage there is potential equalization to be done by connecting the reference conductors.

1.4 Connecting the unit

Tables 1.2 and 1.3 give a summary of the inputs and outputs.

The appendix of this Operating Manual contains an entire overview of the different functions.

1.4.1 Intrinsically safe measuring circuit via safety barriers

Safety barriers for current and voltage (thermocouples) (type designation TZI 102-Ex or TZU 102-Ex) can be connected.

The barrier type TZR 102-Ex can be used for a special version of the input module for resistance thermometers.

If this barrier is used the regulations and ordinances pertaining to explosion protection must be observed.

1.4.2 Units with increased electromagnetic compatibility (EMC)

(Designs 96 mm x 96 mm and 72 mm x 144 mm)

When mounting units featuring increased EMC make sure that the panel has the same potential as the grounding conductor and that a conducting contact exists via the fasteners between the case and panel.

1.5 Relay output

Relay module for general use

The built-in spark quenching element is generally adequate for small inductive loads.

For bigger inductive loads an external spark quenching combination parallel to the load is recommended in order to protect the contacts.

> The potential difference of the switched voltages must not exceed 380 V.

Relay module for direct motor activation

The output extension for direct motor activation features increased spark quenching capabilities. Only contactors with a retaining current of > 30 mA can be activated with it.

1.6 Power supply

When installing the power supply please observe the regulations for electric power installations with nominal operating voltages up to 1000 V (DIN VDE 0100) or the corresponding local electrical regulations.

It must be possible to switch off the power supply at two poles.

The unit does not contain fuses.

Acc. to DIN VDE 0411 the following fuses must be provided externally:

220 V: fuse cartridge T 0.08 250 C
115 V: fuse cartridge T 0.16 250 C
24 V: fuse cartridge T 0.63 250 C

Warning:

In order to provide protection against accidental contact with terminals, the Digitric P must be installed appropriately or insulated tab connectors must be used in case of blade connectors.

It must not be possible to remove the insulation without a tool.

1.7 Serial interface RS-485

A shielded two-wire conductor is used as a bus cable. The shield serves to divert HF interferences originating in the bus line **and** enhances the immunity of the bus line to interferences.

Connect shield at both ends to a HF ground of low impedance (panel or grounding conductor).

To prevent potential differences, connect the reference conductor of the bus subscribers with a sufficiently large potential equalization line.

The structure of the telegrams is described in Operating Manual 42/61-26-. EN (Serial Interface).

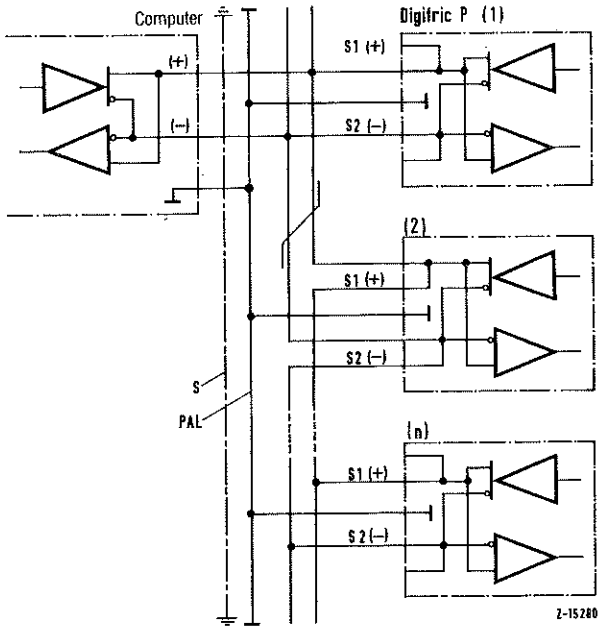
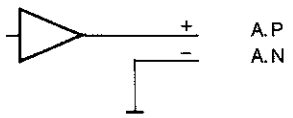
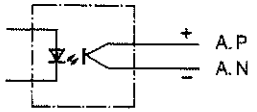
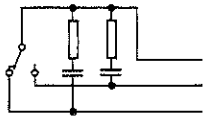
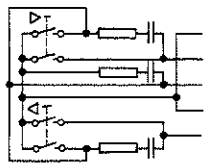


Fig. 1.5 Connection of the serial interface
PAL Potential equalisation line
S Shield

1.8 Blocking the auxiliary routines

If this serial interface is not used, connection S1 can be used to block the auxiliary routines. Access to the auxiliary routines is blocked by bridging the connection S1 and the reference conductor connection (⊥).

Output circuit	Panel instruments	19″-plug-in card [1]		Remarks
		Controller	Output extension	
	A1: C1, C2 A2: C3, C4 A3: G7, F7 A4: E7, D7	A1: 8a, 8c A2: 16a, 16c	A3: 18c, 18a A4: 16a, 16c	Current and voltage output See 61/24–29–. EN for range setting
	A1: C1, C2 A2: C3, C4 A3: G7, F7 A4: E7, D7	A1: 8a, 8c A2: 16a, 16c	A3: 18c, 18a A4: 16a, 16c	Optoelectronic coupler output See 61/24–29–. EN for change of switching behaviour
	AR1: D5, E5, F5 AR2: D6, E6, F6 AR3: D8, E8, F8 AR4: D9, E9, F9	Output extension AR1: 30c, 32c, 32a AR2: 26a, 26c, 26a AR3: 6c, 8c, 8a AR4: 2c, 4a, 2a		Relay output Residual current of spark quenching element approx. 15 mA
	AR1/AR2: D5, E5, F5, D6, E6 AR3/AR4: D8, E8, F8, D9, E9	AR1/AR2: 30c, 32c, 32a, 26a, 26c AR3/AR4: 6c, 8c, 8a, 2c, 4a		Relay output for direct motor activation Residual current of spark quenching element approx. 30 mA See also page 21
PE — L/L+ — N/L– —	⏚ L/L+ N/L–	28a, 28c 30c 32c		Power supply

A1 to A4 = Outputs 1...4
AR1 to Ar4 = Relay outputs 1...4
C1 to F9 = Terminal designation of the panel instruments
a2...c32 Designation of the terminal strip

[1] For plugs of type F the terminal designations are changed: (a) becomes (z) and (c) becomes (d), e.g. 4a → 4z; 4c → 4d

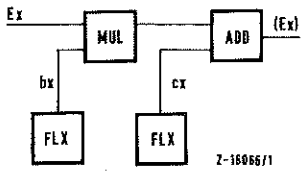
Each unit features a **connection diagram** showing its input and output assignments, the functions (binary or analog) of the inputs and outputs and the ranges.

Table 1.3 Connection diagram for the outputs

2.5 Setting the input circuits: multicomponents and ratio

2.5.1 Weighting the inputs

All inputs can be weighted.



$(Ex) = Ex \cdot bx + cx$
$(x = 1 \text{ to } 4)$

Fig. 2.1 Input weighting

The values for bx and cx are displayed and set in the large loop "A" (see Section 2.2 or Appendix, page 23).

2.5.2 Multicomponents

The main controlled variable E1, set point and alarm values are assigned to the display range user range 1.

Weighting the auxiliary inputs E2 and E4 is determined with b2 and b4 as well as c2 and c4. To these inputs are assigned the physical display ranges "user range" 2 or 4.

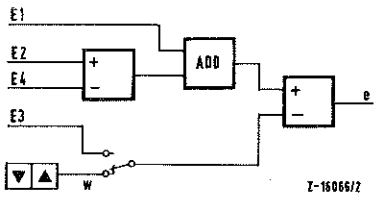


Fig. 2.2 Input circuit multicomponents

2.5.3 Ratio

The unit has the electrical ratio range 0...2.

In special cases it is possible to change this range by changing b1 and/or b2.

C1 is used in combustion regulation to set a supply of excess air in the lower load range.

The physical ratio (including the ratio of the transmitter ranges) is set via user range 3 for the electrical ratio 0 and 1.

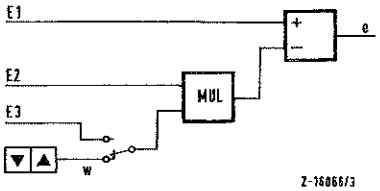


Fig. 2.3 Input circuit ratio

2.6 Characteristics for manual operation

2.6.1 Continuous controller and on/off controller

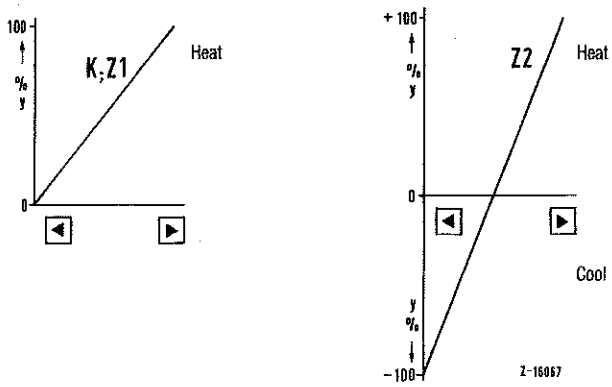


Fig. 2.4 Characteristics for manual operation

K = Continuous controller
Z1 = On/off controller
Z2 = Heat-/cool-controller

2.6.2 Step controller

The manual characteristic is determined by the wiring so that on activating key ▶ the positioning signal behind the actuation increases.

Position feedback signal

The position feedback signal is not included in the control action. In automatic operation it is compared with the set output limits YH and YL.

The position feedback signal is effected with a potentiometer or current signal.

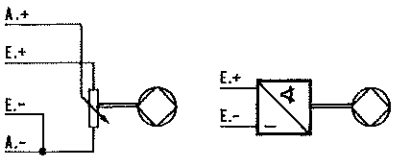


Fig. 2.5 Position feedback signal

A.+/A.- Supply from A1 or A3
E.+/E.- For inputs see annex page 18/19

The alignment for 0 % and 100 % is effected depending on the input with the variables c2, c3 or c4 or with b2, b3 or b4.

Procedure:

- Set servodrive to "0" and change c such until y = 0.
- Then set servodrive to 100 % and change b such until y = 100.0.

If no provision has been made for a position feedback signal set YL to a value which is smaller than y.

If the position feedback signal input E is 4...20 mA and no position feedback signal has been provided, set YL to −30 %.

3 Operating instructions Process operation

Note:
All readings shown on the analog display (10) are indicated on the fold-out page at the end of this document.

3.1 Manual operation

- After bumpless transfer to "manual" "y" is automatically displayed. Y can be adjusted with ◀ (7) or ▶ (8).

Continuous controller

- Slow change by **tapping** keys ◀ or ▶.
- Quicker change by **holding** keys ◀ or ▶.
- Rapid movement to 0 or 100 % by **holding** keys ◀ or ▶ **and** tapping H/A key **additionally.**

Step controller

The actuating time only depends on the actuating time of the motor. The switching status of the outputs E3 is shown in the display (10).

Y-is displayed only if a position feedback signal is provided

On/off controller Z1 and Z2

In manual operation the on/off controller generates a pulse train whose average value in time is displayed as y.

The switching status of the outputs is shown in the display (10).

- **Slow change** by **tapping** keys ◀ or ▶.
- **Quicker change** by **holding** keys ◀ or ▶.
- **Rapid movement to 0 or 100 %** by **holding** keys ◀ or ▶ and **pressing H/A key additionally.**

Multichannel controller

Operation is similar to that of the single-channel controller.

An additional channel display is available in the multi-channel instruments (see Section 2.2.2).

Cascade controller

The **I/E key** has two possible positions:

I = cascade is open. Slave controller runs with local set point

E = cascade is closed.

Channel 2 is always the **slave controller**, channel 1 is the **master controller.** The mode selector switch (H/A key) affects only the slave controller.

- Actuation of **H/A key** effects changeover to the slave controller and changeover of its operating mode. Changeover to I/E and H/A is bumpless.

Override controller (limit controller)

Channel 2 is always the **master controller,** channel 1 is the **limit controller.** The mode selector switch (H/A key) affects only the master controller.

- Actuation of **H/A key** effects changeover to the master controller and changeover of its operating mode. Changeover to H/A is bumpless.

3.2 Automatic operation

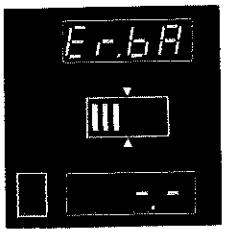
If an input for the external set point is fitted, changeover can be effected between the internal and external set point with the I/E key.

In program controllers the program set point acts as external set point.

- Changeover **E → I:** The last external set point is the new internal set point. Changeover is bumpless.
- Changeover **I → E:** Having selected the variable "d", the difference between the internal and external set point can be read.
  If there is a difference the active set point approaches the set point at 6 %/s of the external set point.
- If the I/E key is activated "W" is always displayed.
- In position "I" and "w" in the display (11), the set point can be set with keys ▼ or ▲.

5 Messages from the self-monitoring

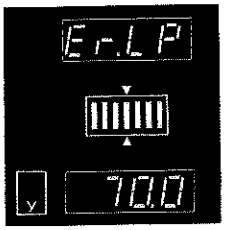
Battery monitoring



In the presence of too little battery voltage the message "Er.bA" is displayed within 4 seconds for 2 s. The unit continues functioning.

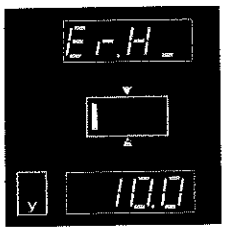
If the battery is not replaced a battery failure is likely before long.

Monitoring the power supply



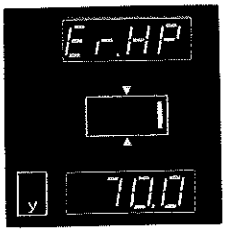
If the unit is being supplied with a voltage below the permissible level, processing is stopped. The message "Er.LP" appears in the display.

Hardware monitoring



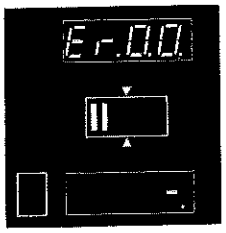
If a serious fault occurs in the digital processing the unit signals "Er.H_. It must be repaired.

Auxiliary processor



Auxiliary processor faults are signalled by the message "Er.HP".

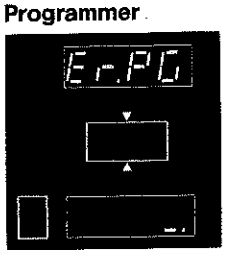
Software monitoring



If the controller detects faulty processing on several occasions it initially attempts to restart the program through a reset. If this is not possible reinitialization is executed, i. e. the configuration last saved in the EPROM is loaded. The controller signals "Er.00" and goes to manual mode.

- This message is acknowledged with key (1).

Programmer



With correct configurations the message "Er.PG" appears only after loading and can be eliminated by a reset.

- This message is acknowledged with key (1).

6 Maintenance

Apart from replacing a used battery, the unit requires no maintenance. Relays are subjected to wear, depending on the switching frequency and load.

Warning

Any interruption of the protective conductor inside or outside the apparatus or disconnection of the protective ground terminal is likely to make the apparatus dangerous. Intentional interruption is prohibited. When the apparatus is connected to its supply, terminals may be live, and the opening of covers or removal of parts except those to which access can be gained by hand is likely to expose live parts.

⚠ No high voltage test may be carried out without thorough knowledge (see Service Information, in preparation)

Faults and unusual stress

Whenever it is likely that the protection has been impaired, the apparatus shall be made inoperative and be secured against any unintended operation.

It must be assumed that the protection has been impaired when

- the apparatus has visible signs of damage;
- the apparatus no longer functions;
- the apparatus has been stored in unfavorable conditions for a long time;
- the apparatus has been subjected to adverse transport conditions.

7 Packing instructions

If the original packing is no longer available, the unit must be wrapped in an insulating air foil or corrugated board and packed in a sufficiently large crate lined with shock absorbing material (foamed material or similar) for the transportation. The amount of cushioning must be adapted to the weight of the unit and to the mode of transport. The crate must be labelled "Fragile".

For overseas shipment the unit must additionally be sealed airtight in 0.2 mm thick polyethylene together with a dessicant (e. g. silica gel). The quantity of the dessicant must correspond to the packing volume and the probable duration of transportation (at least 3 months). Furthermore, for this type of shipment the crate should be lined with a double layer of kraft paper.

Connection, case and mounting

Electrical connections:
- Mains or interface connection: tab connectors A 6.3 x 0.8 acc. to DIN 46 244
- Other connections: tab connectors A 6.3 x 0.8 or A 2.8 x 0.8 or MTP 2.4 x 0.8
- or as accessory: screw terminal up to 1.5 mm^2

19″ units
- Blade connector form C/D or F

Weight
- 0.65...0.9 kg design 96 mm x 96 mm
- 0.5 kg design 48 mm x 96 mm
- 1.25 kg design 72 mm x 144 mm
- 0.3 kg 19″ units, 0.2 kg 19″ output extension

Any installation position

Climatic capabilities

To DIN 40 040 KWE
Ambient temperature 0...+50 °C
Transportation and storage temperature −25...+65 °C
Relative atmospheric humidity ≦ 75 % annual average, short-term 95 %, occasional and slight condensation permissible

Mechanical capabilities

Acc. to DIN IEC 68 part 2-27,
Impact 30 g/11 ms
Vibration in operation 2 g/5...150 Hz

Electromagnetic compatibility

Tested to IEC 801/DIN VDE 0843
Increased immunity to interference for designs 96 mm x 96 mm and 72 mm x 144 mm: at least standard acc. to NAMUR

Electrical safety

Tested to DIN VDE 0411
Class of protection I
- For designs 48 mm x 96 mm, 96 mm x 96 mm, 72 mm x 144 mm

Insulation group I to DIN VDE 0110
Degree of protection
- Front IP 50, rear IP 40, connections IP 00, Screw terminals IP 20, female tab connectors with bush IP 20.
- 19″ plug-in card. acc. to installation

19″ plug-in card
Output extension 40.5 mm (8 T)

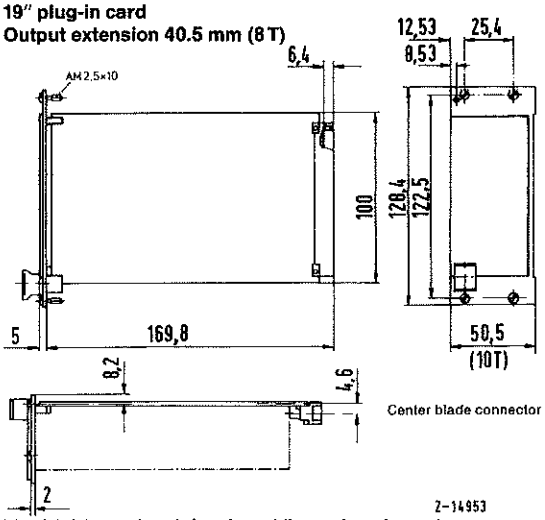
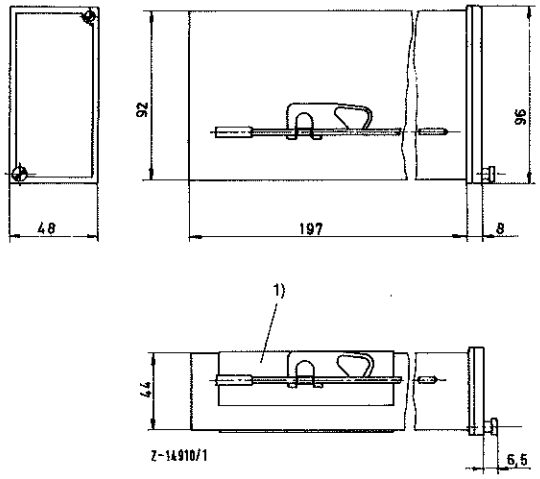
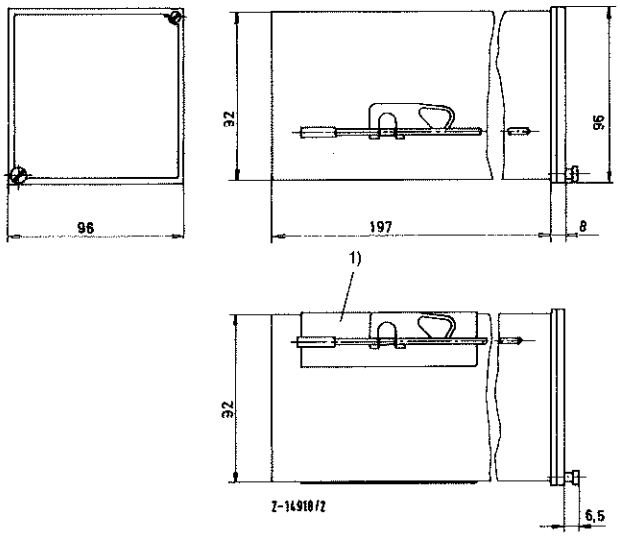


Fig. A1 Dimensional drawings (dimensions in mm)

Format 48 mm x 96 mm

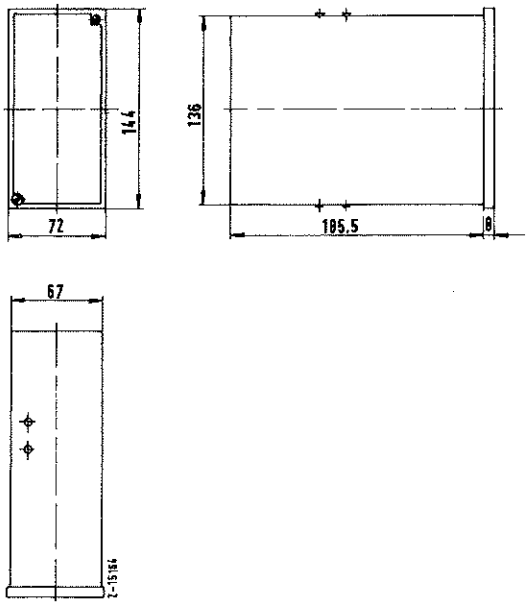


Format 96 mm x 96 mm

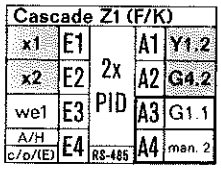
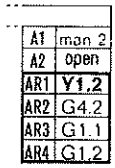
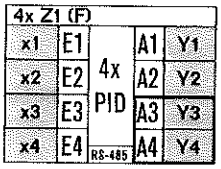
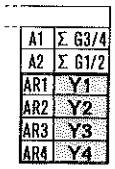
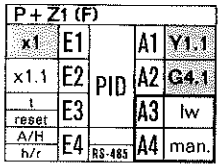
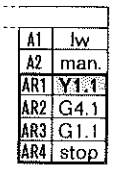


1) Fastener for horizontal close-density arrangement of units

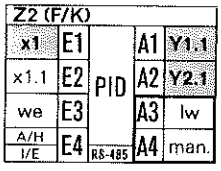
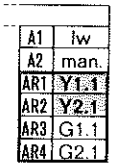
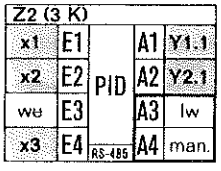
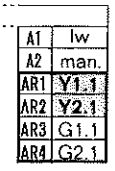
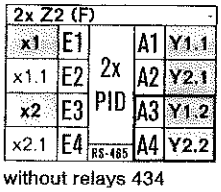
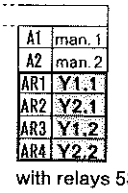
Format 72 mm x 144 mm



On/off controller Z1, 1 control output (continuation)

Suppl. No.	Channel No.	Description	Function block [1]
416 516	2	**Cascade** Interconnected Master controller e1 = x1 – w; w = w1 or we1 Slave controller e2 = x2 – w; w = w2 or y1	 without relays 415  with relays 516
421 521	4	**Fixed value** Internal set point ei = xi – wi Channel 1: Output Y1.1 Channel 2: Output Y2.1 Channel 3: Output Y3.1 Collective message e: ΣG1 Collective message x: ΣG2	 without relays 421  with relays 521
422 522	2	**Programmer** e = x1 – w w = wi or program	 without relays 422  with relays 522

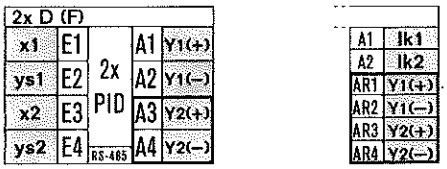
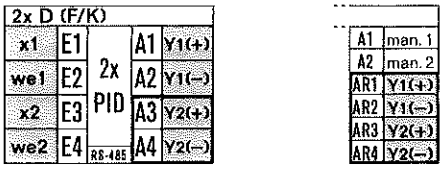
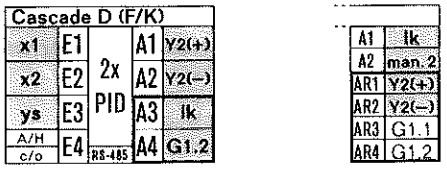
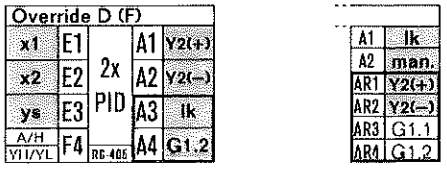
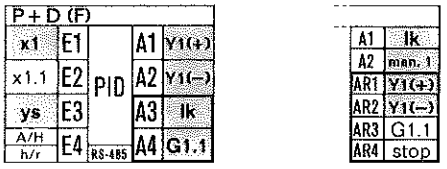
On/off controller Z2, 2 control outputs

Suppl. No.	Channel No.	Description	Function block [1]
431 531	1	**Fixed value** Internal or external set point e = x1 – w w = w1 or we Output Y1.1 heat Output Y2.1 cool	 without relays 431  with relays 531
432 532	1	**Multicomponents** e = x1 + (x2 – x3) – w x1, x2 and x3 can be weighted w = wi or we	 without relays 432  with relays 532
434 534	2	**Fixed value** Internal set point e1 = x1 – w1 e2 = x2 – w2 Y1.1 heat 1st channel Y2.1 cool 1st channel Y1.1 heat 2nd channel Y2.1 cool 2nd channel	 without relays 434  with relays 534

[1] See tables 1.2 and 1.3 for terminal designations

▒ minimum number of components ▭ located on the output extension (not possible for format 48 mm x 96 mm)

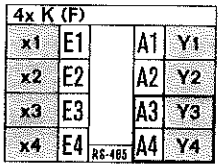
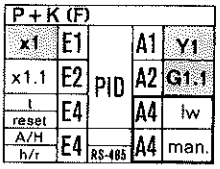
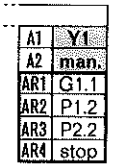
Step controller (continuation)

Suppl. No.	Channel No.	Description	Function block [1]
454 554	2	**Fixed value** internal set point e1 = x1 – w1 e2 = x2 – w2	 without relays 454 with relays 554
455 555	2	**Fixed value** Internal or external set point e1 = x1 – w1 e2 = x2 – w2	 without relays 455 with relays 555
456 556	2	**Cascade** interconnected 1 master controller 1 slave controller (2nd channel) Output G1.1 1st channel Output G1.2 2nd channel e1 = x1 – w1 e2 = x2 – w2 w2 = wi2 or y1	 without relays 456 with relays 556
457 457 458 558	2	**Override** **Min. or max. selection** interconnected Master controller = controller 2 (2nd channel) Slave controller = controller 1 Output G1.2 controller 2 Output G1.1 controller 1 o1 = x1 w1 e2 = x2 – w2	 without relays 457, 458 with relays 557, 558
462 562	2	**Program controller** **Programmer with** **step controller D** Controller = 1st channel Programmer = 2nd channel e = x1 – w w = $w_{progr.}$ or w1	 without relays 462 with relays 562

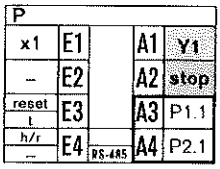
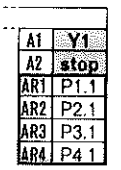
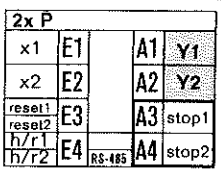
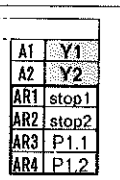
[1] See tables 1.2 and 1.3 for terminal designations

▒ minimum number of components ☐ located on the output extension (not possible for format 48 mm x 96 mm)

Continuous controller (continuation)

Suppl. No.	Channel No.	Description	Function block [1]
481	2	**Fixed value** ci = xi – wi	 without relays 491
482 582	2	**Program controller** **Programmer** **with continuous controller K** Controller = 1st channel Programmer = 2nd channel e = x1 – w w = wi or program	 without relays 482  with relays 582

Programmer

Suppl. No.	Channel No.	Description	Function block [1]
491 591	1	**Programmer** y1 = w	 without relays 491  with relays 591
482 592	2	**Programmer** y1 = w1 y2 = w2	 without relays 492  with relays 592

[1] See tables 1.2 and 1.3 for terminal designations

▒ minimum number of components ☐ located on the output extension (not possible for format 48 mm x 96 mm)

Displays

Numerical displays

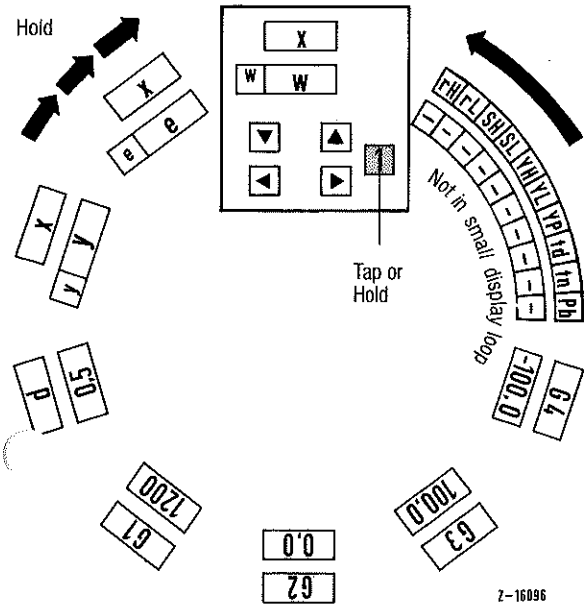


Fig. A8 Small and extended controller display loop

The main variables **"w", "e"** and **"y"** are shown in the small and in the extended display loop in the **bottom display line** (9) while the controlled variable "x" is visible in the **top display line** (5). In all other cases the name appears in the **top display line** and the value of the selected variable in the **bottom display line.**

- Variables are switched with key 1.
- The set point is selected each time the I/E key is actuated.
- The output variable is selected each time the A/H key is switched to manual (H).

Multiple channel display and channel changeover

Channel 4	3	2	1	Control deviations (coarse indicator)
	–			e > 0
–		–		e = 0
–		.	–	e < 0

The channels (control loops) are displayed by means of horizontal luminous symbols. A decimal point appears after the operational channel.

- Select channel display: With display changeover switch (1) and ▲ or after going through the display loop.
- Select operational channel with ▲.

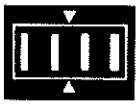
Analog display

When supplied by the manufacturer the analog display (10 or 31) indicates the following information depending on the closed loop control function:

Output variable y in the case of continuous controllers

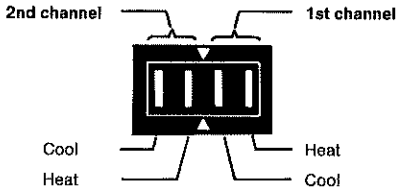
Switching status display

On/off controller Z1

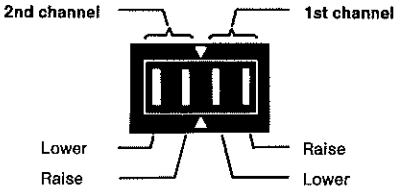


4. 3. 2. 1. channel

On/off controller Z2



Step controller



Output variable y in the case of continuous controllers

Disposing of an appropriate configuration, analog display (10) can also be used to show the **control deviation.**

Setting values

- All values apart from the output variable y are adjusted with ▼ or ▲ if the name is visible in the top display line (5) and the value in the bottom display line (9).

The output variable y is always adjusted with ◄ or ► if control loop is on manual (H).

Rapid adjustment to 0 % or 100 % is possible with continuous and on/off controllers by simultaneously activating ◄ or ► and the H/A key.

Changing the display loop

- Press and hold ◄ **and** ► **and** tap the display changeover switch (1).
  "nor" flashes in the top display line.
- Set "diSp" with ▲ (tap 1 time)

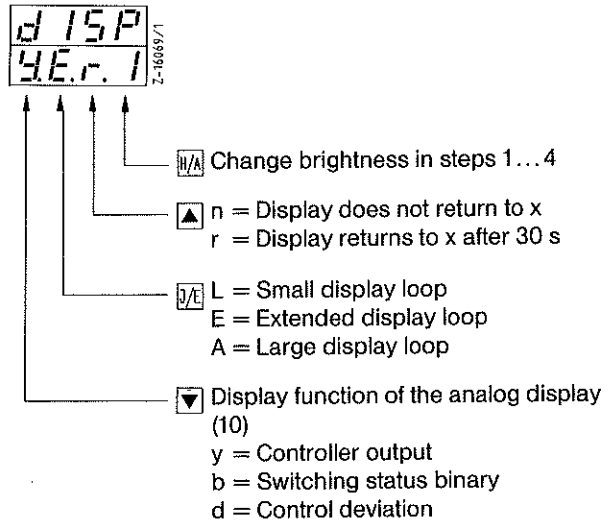


Fig. A6

Return to normal mode

- Press and hold ◄ **and** ► **and** tap the display changeover switch (1).
- Press J/E key.
  "nor" flashes for approx. 3 seconds, than changeover to normal mode.

Setting the PID auxiliary routine

- Press and hold ◄ **and** ► **and** tap the display changeover switch (1).
  "nor" flashes in the top display line.
- Switch to PID ▲ (2 x)

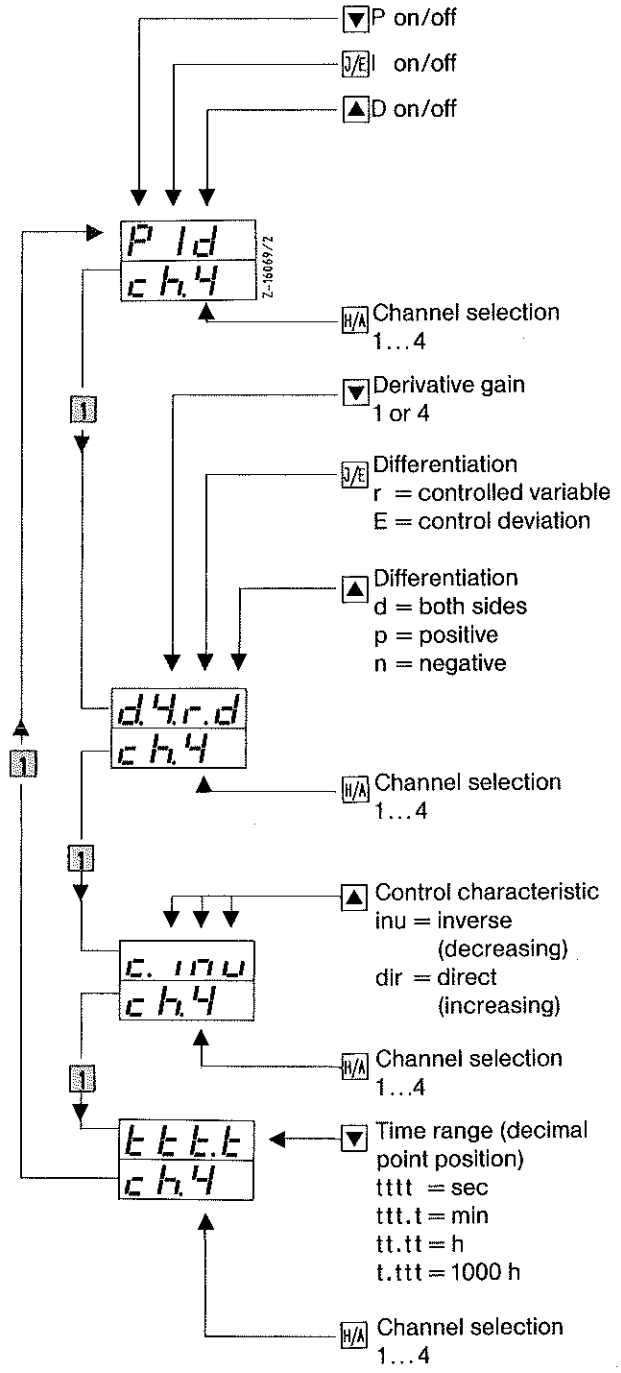


Fig. A7

Return to the normal mode

- Press and hold ◄ **and** ► **and** tap the display changeover switch (1).
- Press J/E key.
  "nor" flashes for approx. 3 seconds than changeover to normal mode.

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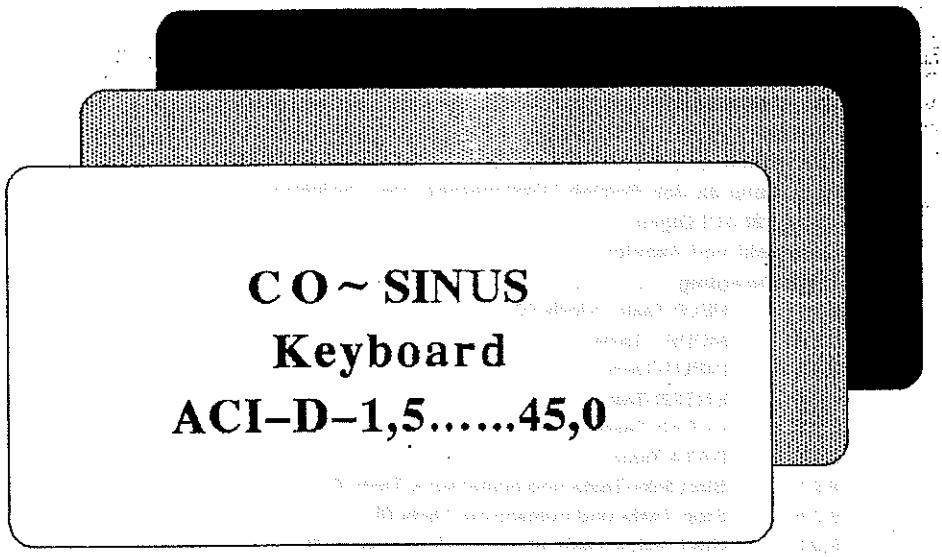

Betriebsanleitung

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