WESTFALIA SEPARATOR

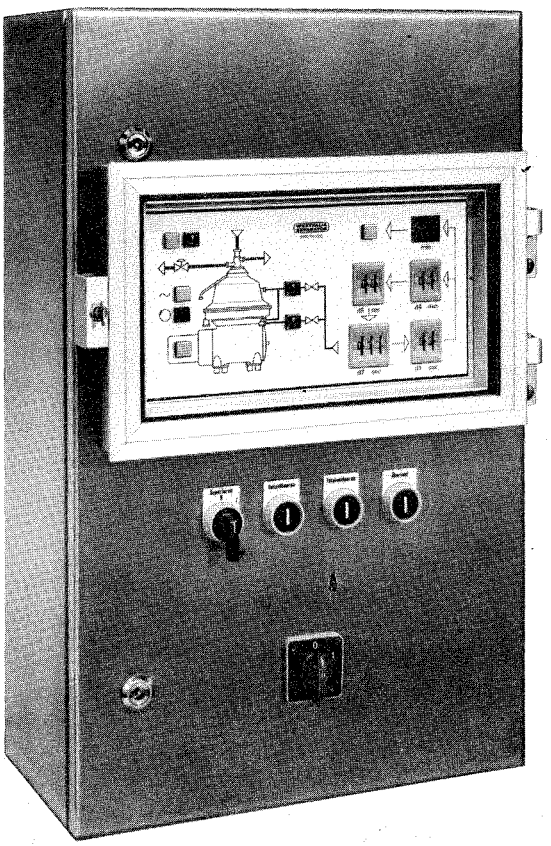
INSTRUCTION MANUAL AND PARTS LIST

No. 8134 - 9001 - 400

WESTFALIA

Electronic Timing Unit

Model TVA 2-M



WESTFALIA SEPARATOR AG./4740 OELDE 1 (W.-GERMANY)

CABLES: WESTFALIA OELDE · PHONE: (02522) 771 · TELEX: 89474

No. 6267/1077 engl.

Printed in Germany

I M P O R T A N T

The instruction manual should be handed to the operator.

When corresponding with Westfalia Separator, please indicate the Type and Order-No. (quoted on the name-plate inside the control cabinet).

When ordering spare parts, please state also the Part-No. of the part to be replaced (see List of Parts).

WESTFALIA SEPARATOR AG.
4740 Oelde 1 W.-Germany

Typ: TK 42-01 Baujahr / Building year: 1980

Auftrags Nr. / Order No.: 05-640 530-79

Nenn-bzw. Anschlußspannung / Voltage rating: ~ 50 Hz c/s 110 V

Nenn-Betriebsstrom ca / Current rating appr.: 0,6 A

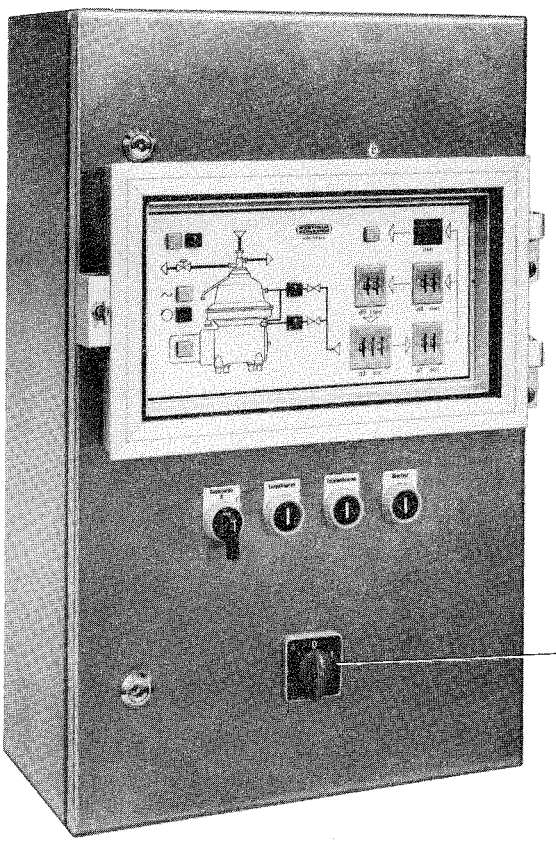
Zuleitungs-Sicherungen / Mains fuses: 6 A

Steuerspannung / Control voltage: 110 V 50 Hz c/s

Schaltplan-Nr. / Wiring diagram No.: 8134-0404-0231

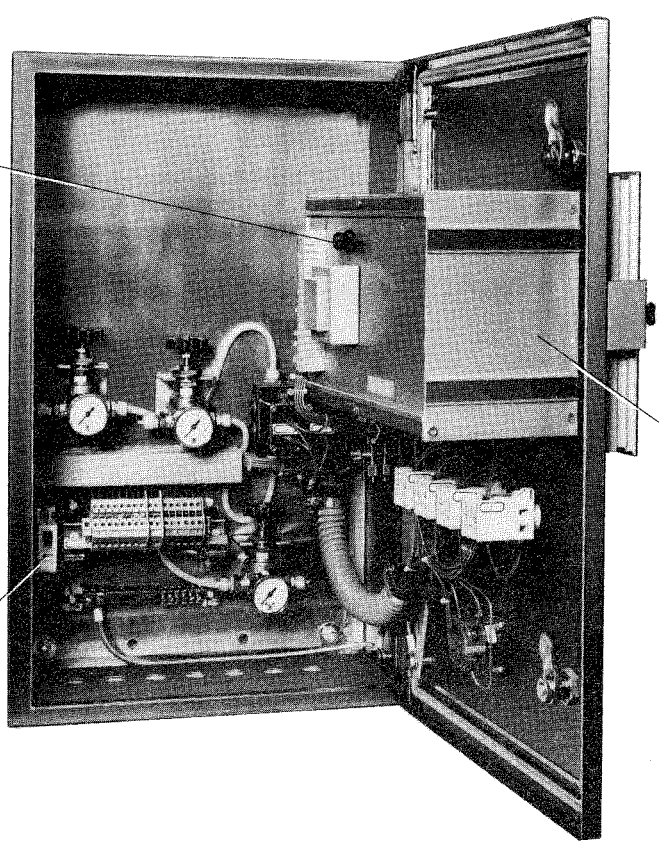
C O N T E N T S

Timing unit, model TVA 2-M



Main switch

Fig. 1



Microfuse

Electronic control unit, type KS 064

Automatic cut-out

Fig. 2

O P E R A T I N G I N S T R U C T I O N S

1. General

1.1. Application

The TVA 2-M timing unit with hardwired and fixed program is used for the automatic control of Westfalia milk separators of type MSA and the air-actuated constant pressure valves incorporated in the discharge lines of the separators.

It is programmed so as to automatically control partial sediment ejections (de-sludging) at regularly timed intervals during milk processing.

Total sediment ejections and temporary overflow of the bowl during the C-I-P process can be initiated either manually by push buttons or automatically by a separate C-I-P unit.

Sediment ejection (opening and closing of the bowl) is effected hydraulically by means of operating water which is supplied via two solenoid valves incorporated in the operating-water connection of the separator.

The constant pressure valves incorporated in the discharge lines of the separator are controlled by compressed air. The compressed-air control assembly, comprising solenoid valves and pressure reducers, is mounted on a panel inside the control cabinet.

Detailed information on the operating-water connection and the constant pressure valve is given in the instruction manuals for the separator and constant pressure valve respectively.

1.2. Design

The electronic control unit (with separator symbol, associated pilot lamps, digital indicator and set-point adjusters on the front panel) is flush-mounted in the door of the cabinet. It is covered by a protective window with snap closure. Below the control unit there are push buttons and selector switches for operation of the timing unit.

A panel inside the cabinet carries the compressed-air control assembly, an automatic cut-out as well as terminal blocks for the connection of the leads. All leads are brought into the cabinet from below through cable glands.

The timing unit is completely assembled and wired ready for connection. It complies with the regulations of the VDE.

2. Technical data

Supply voltage	220 VAC, -15/+10% (115 VAC, as optional feature)
Frequency	50 or 60 Hz
Power consumption	approx. 80 VA (incl. solenoid valves)
Control voltage	220 VAC for solenoid valves 12 VDC for circuit logic
Ambient temperature	up to +50°C
Housing	stainless steel, ground outside finish
Type of enclosure	IP 54
Dimensions	refer to dimensioned drawing in the appendix
Weight	25 kg
Cable inlets	8 x Pg 13.5 (from below)
Compressed air	min. pressure: 6 bars; max. pressure: 10 bars
Air consumption (constant pressure valves)	approx. 0.3 m^3/h
Compressed-air lines	6 x 1 mm
Switching capacity of contacts	continuous current $I_{th2} \leqq 6$ A at 250 VAC
	rated working current $I_e/AC11 \leqq 1$ A at 250 VAC

3. Designation of front-mounted elements

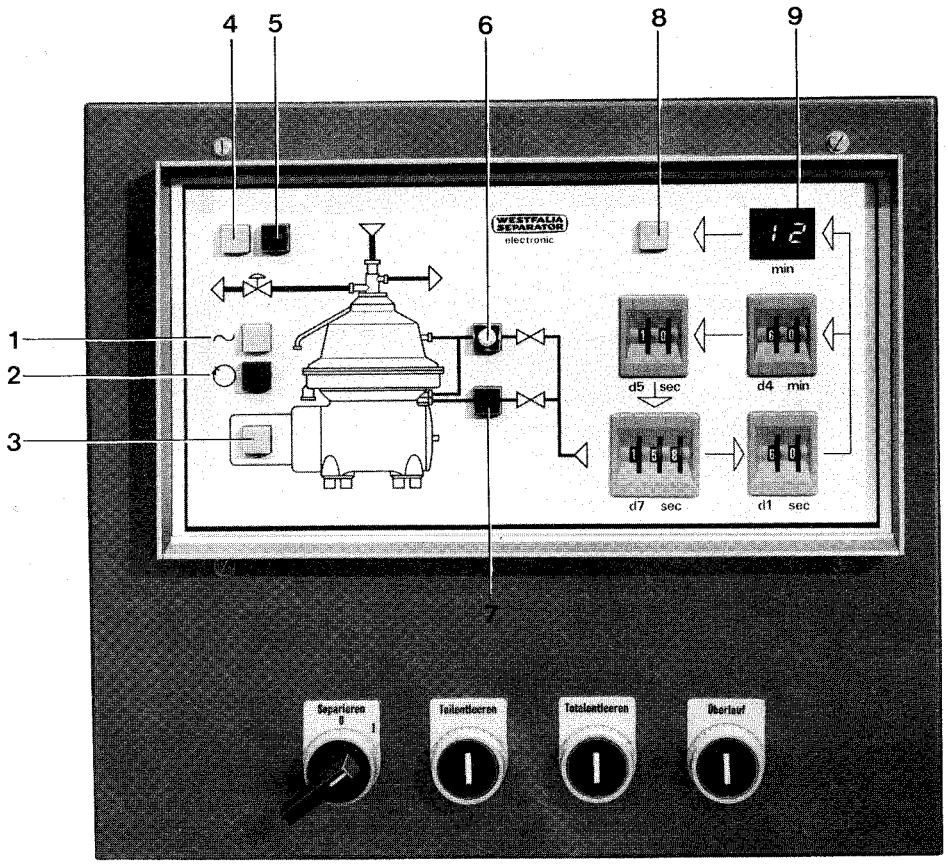


Fig. 3

Digital set-point adjusters:

d4 Separation
d5 Pre-flushing
d7 Partial sediment ejection
d1 Subsequent flushing

Selector switch

Separation 0 - I

Push buttons

Partial sediment ejection
Total sediment ejection
Overflow (flushing of hood during C-I-P)

Digital indicator

9 Elapsed separation time (minutes)

Pilot lamps

1 Timing unit switched ON
2 Standstill of bowl
3 Motor switched ON
4 Constant pressure valves in operating position
5 Overflow (flushing of hood during C-I-P)
6 Flush and sealing water
7 Opening water
8 Separation

4. Installation of the timing unit

The TVA 2-M timing unit should be mounted on a free-standing column of stainless steel tube (100 mm diameter and 1000 mm long) or fitted to a wall. A clearance of about 20 mm should be kept between the wall and the cabinet. Dimensions for fastening the cabinet are given in the dimensioned drawing in the appendix.

The mounting holes in the back wall of the cabinet must be sealed by means of gaskets supplied with the timing unit (Fig. 4).

If the timing unit is mounted on a column, the 4 mounting holes in the back wall are not used; they must be closed by means of screws and packing rubber.

Although selector switches and push buttons are dampproof and the electronic control unit is protected against entry of moisture by means of the protective window and the gasket in the door of the cabinet, the timing unit should not be installed in excessively humid areas.

If the electronic control unit is panel-mounted in a central control room (individual supply of the control unit; see drawing No. 8134-0404-3231), it must also be protected by the window. In the a/m case, the compressed-air control assembly (mounted on a separate panel) for the pneumatic control of the constant pressure valves has to be installed separately (see drawing No. 8134-2219-040 in the appendix).

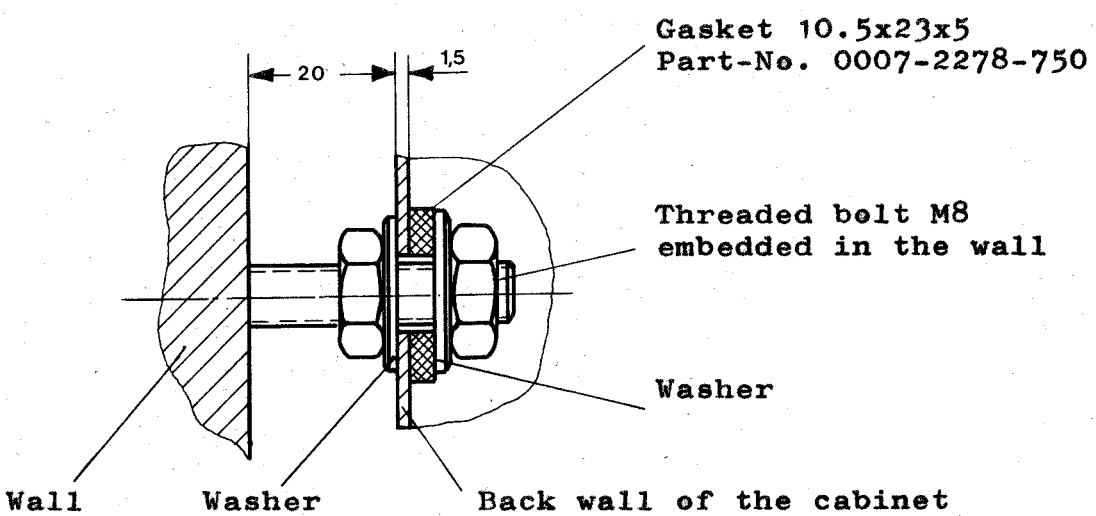


Fig. 4

5. Electrical connection

The timing unit is rated for an operating voltage of 220 VAC, 50 or 60 Hz. A special version for 115 VAC is available.

Before the timing unit is connected to the mains, attention should be paid to the voltage rating indicated on the red name-plate inside the control cabinet.

A wire cross section of 1.5 mm^2 will be sufficient for all lines. Proper connection of the terminals to the terminal block is shown in the attached connection diagram No. 8134-0404-0231. The current rating of the main fuse (delay-action fuse) should be 6 Amps.

The cable glands for the electric lines and the air hoses must be tightened properly and be packed with luting agent.

IMPORTANT

Series terminals 11 to 16 of the terminal block are provided for the 12 Volt input logic. This should be born in mind when leads are connected or tests are carried out, since high voltages may cause damage of the electronic control unit. The input terminals serve for signalling "Standstill of bowl" and "Motor switched ON" as well as for the connection of a C-I-P unit for automatic cleaning-in-place. The signalling cables should NOT be laid in the vicinity of power lines, and free conductors should NOT be used for AC control operations.

The potential-free output d3 of the control unit (series terminals 9 and 10 of the terminal block) is used for switching-off the feed pump of the separator during total sediment ejection (de-sludging) and must therefore be included in the motor control circuit (see circuit diagram No. 8134-0404-0301).

IMPORTANT

External voltage is applied to series terminals 9 and 10!

The outputs of the electronic control unit are provided with contacts which are potential-free if the control unit is supplied for panel-mounting (individual supply; see page 8, last paragraph). The outputs can be included in control circuits operating on any voltage up to 250 VAC.

The switching capacity of the contacts is given in section 2 "Technical data". The voltage rating of the solenoid valves for operating water and compressed air should, however, match the operating voltage of the control system.

6. Set-point adjustment and operation

Set-point adjustment of the electronic time function elements is effected by means of digital adjusters (Fig. 5).

Digital set-point adjusters are provided for:

Analogous time function element "Pre-flushing" controlling the duration of flush and sealing water addition (10 seconds) before partial sediment ejection as well as the duration of opening water addition for total sediment ejection.

* Digital time function element "Separation" controlling the time (approx. 60 minutes) after which partial sediment ejection is to take place.

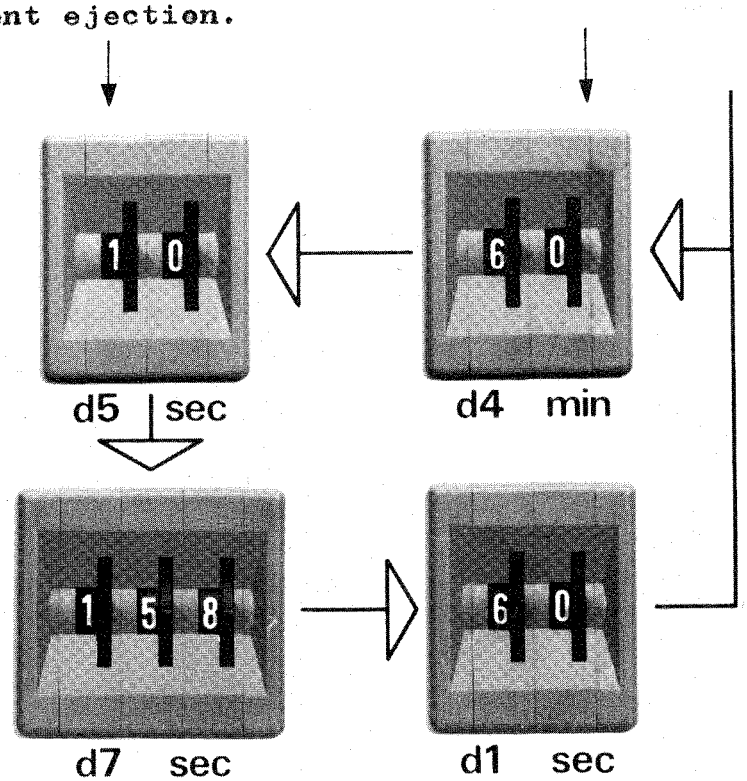


Fig. 5

Analogous time function element "Partial sediment ejection" controlling the duration of sealing and opening water addition for partial sediment ejection. The setting time is approx. 0.5 to 2 seconds, depending on the amount of solids to be ejected.

Analogous time function element "Subsequent flushing" controlling the duration of flush and sealing water addition (60 seconds) after partial and total sediment ejections as well as the time the product feed pump is switched off after total sediment ejection.

* If the mains frequency is 60 Hz, the value to be set on set-point adjuster d4 must be increased by 20%, e.g. from 60 to 72 minutes, since timing operation of the digital time function element d4 "Separation" is based on the mains frequency. This does not apply to the three analogous time function elements d1, d5 and d7.

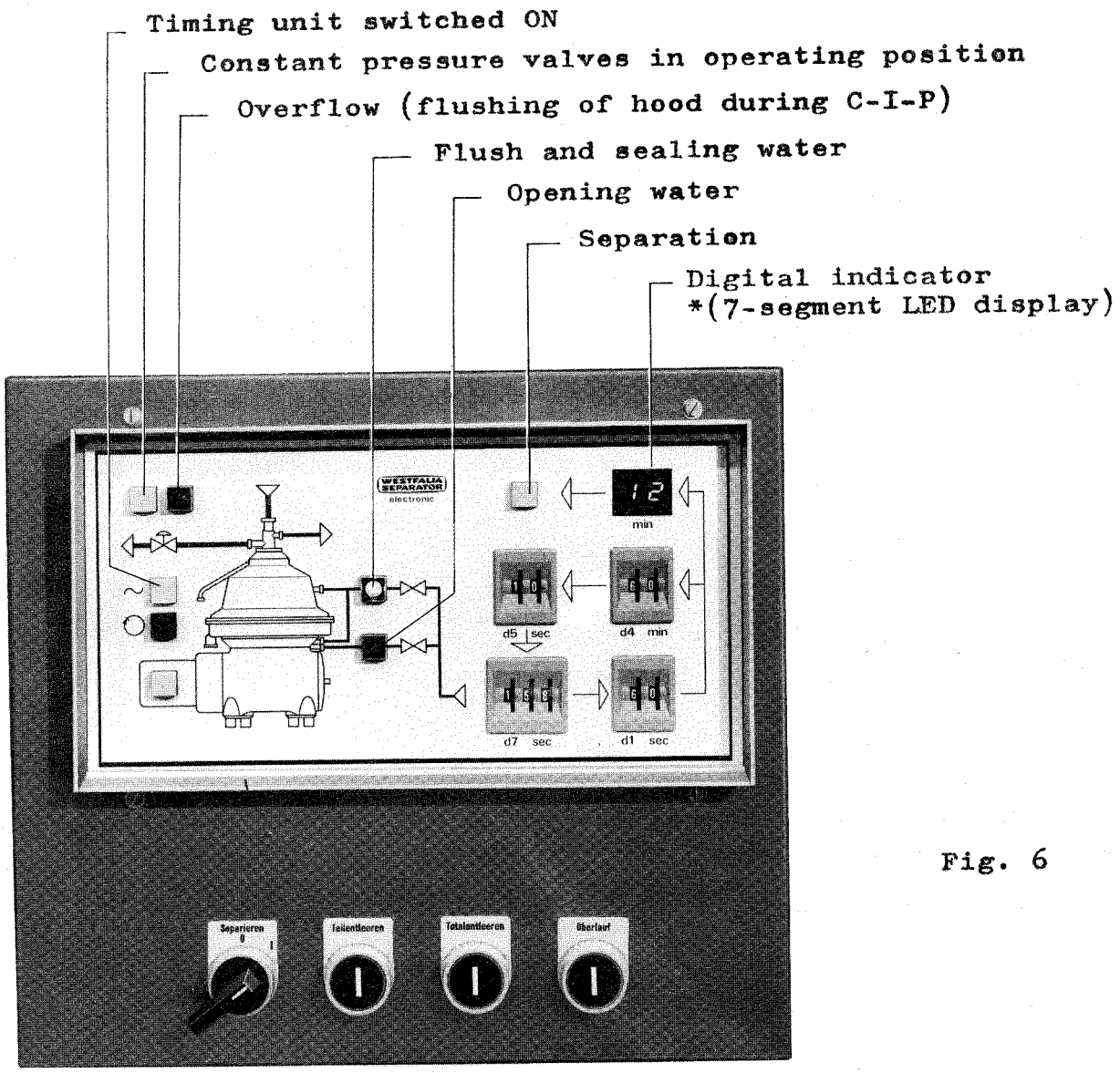


Fig. 6

After closing of the main switch (Fig. 1) the timing unit is ready for operation; pilot lamps "Timing unit switched ON" and "Constant pressure valves in operating position" (Fig. 6) light up. Simultaneously, time function element d1 starts operating to control flush and sealing water addition for closing of the bowl; pilot lamp "Flush and sealing water" lights up.

In addition, the internal impulse generator starts operating to open solenoid valve s1 in the flush and sealing water line at fixed-programmed intervals (60-second interval and 1-second impulse, analogous times) so that the bowl is kept closed. The impulse is indicated by lighting-up of pilot lamp "Flush and sealing water". If the timing unit is used to control the KSA 6-01-076 separator, impulse transmission to solenoid valve s1 is re-programmed in our works so that the impulse actuates solenoid valve s2. In this case, the impulse is indicated by pilot lamp "Opening water".

When selector switch "Separation" is set to position "I", time function element d4 starts controlling the separating time; pilot lamp "Separation" lights up. The elapsed separating time (in min.) is indicated by the digital LED* indicator. When the LED display corresponds with the setting of set-point adjuster d4, the separating time has elapsed and an automatically controlled partial sediment ejection will be carried out. The program sequence is shown in the following diagram.

* LED : Light Emitting Diodes

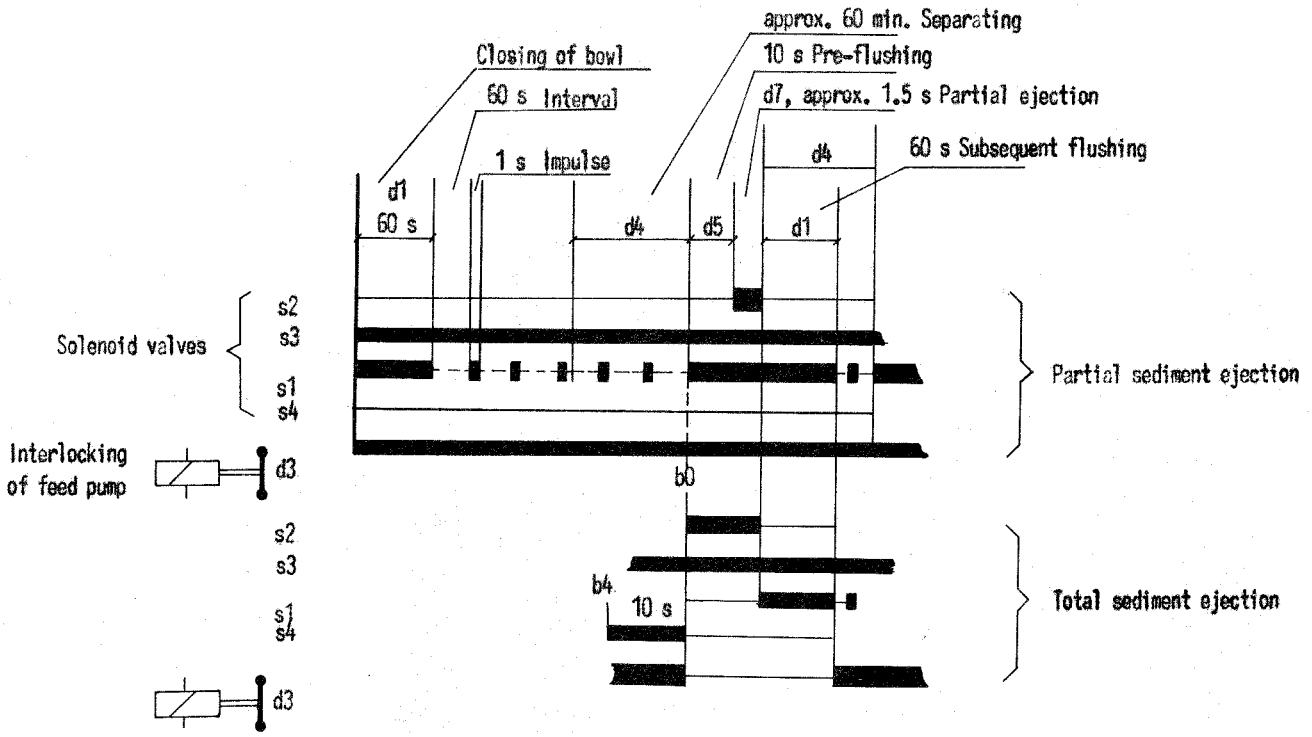


Fig. 7
Switching sequence diagram

The switching sequence of the time function elements is also shown on the front plate of the cabinet by arrows arranged between the set-point adjusters (Fig. 8).

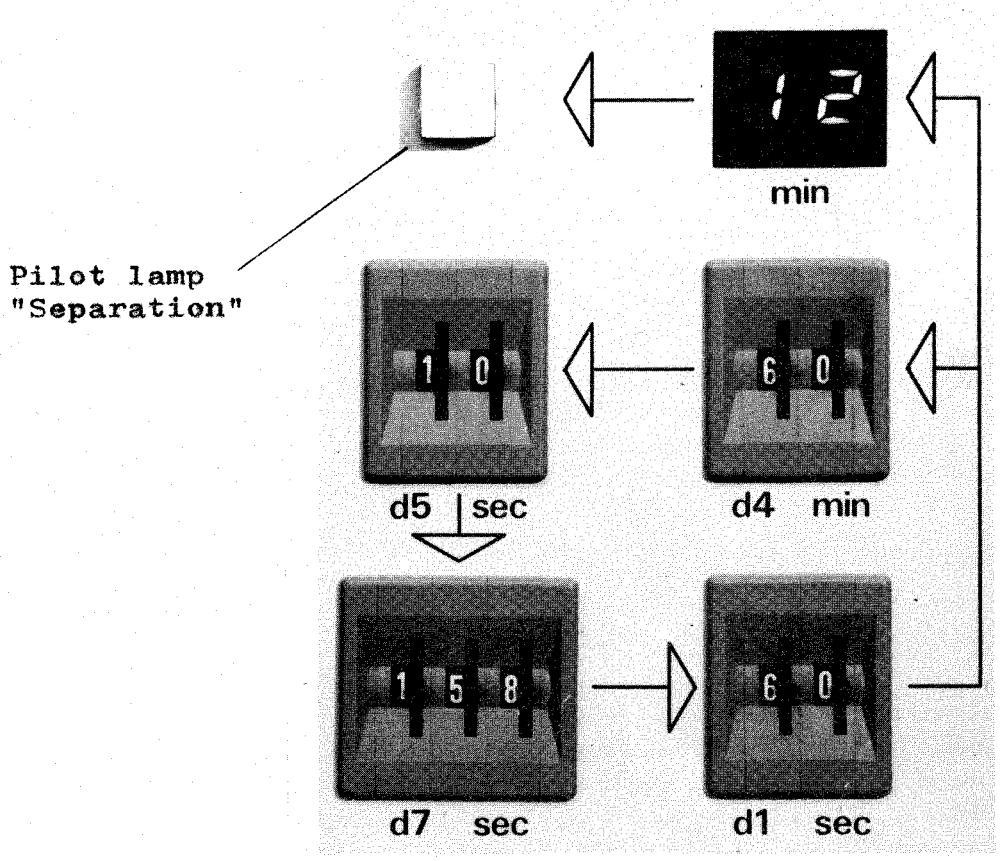


Fig. 8

By operating push button "Partial sediment ejection", the separating process is interrupted and a partial sediment ejection is immediately initiated. When this enforced partial sediment ejection is finished, the program automatically re-starts the separating process.

During the C-I-P process, total sediment ejections as well as temporary overflow of the bowl for flushing of the hood are initiated by operating the respective push buttons of the timing unit. The push buttons should be operated successively: first the "Overflow" button for about 10 seconds (pilot lamp "Overflow" will light up) and then, momentarily, the "Total sediment ejection" push button (Fig. 6).

Overflow of the bowl is effected by throttling of the constant pressure valve in the skim milk line when excess pressure is applied to the valve (approx. 10 seconds).

The "Overflow" and "Total sediment ejection" input signals can also be entered into the electronic timing unit automatically via potential-free contacts of a C-I-P unit (refer to switching sequence diagram "Cleaning-in-place").

Operation of the afore-mentioned three push buttons (Fig. 6) and external initiation of the "Overflow" and "Total sediment ejection" signals will only be effective if the selector switch "Separation" is in "I" position.

When selector switch "Separation" is set to "0" position, the separating process or the program is interrupted. The time function elements and the digital indicator return to starting position. The impulse generator, however, remains in operation.

Attention should also be paid to the instructions given in section 6 (Operation) and section 7 (Cleaning-in-place) of the instruction manual for the MSA type separator.

7. Malfunctions

Mains failure or interruption of current causes failure of the timing unit; all time function elements and the digital indicator return to starting position. After rectification of the fault, the program cycle is resumed, starting with the total separating time adjusted. Since it is generally not known when the last sediment ejection has taken place, a partial sediment ejection should be initiated by operating the "Partial sediment ejection" push button immediately upon the program cycle has been resumed.

A mounting plate inside the control cabinet carries an automatic cut-out (G 1A) for short-circuit and overload protection of all the electric components of the timing system (solenoid valves and electronic control unit). Upon response of the automatic cut-out, first the four solenoid valves should be checked.

The electronic control unit is, in addition, protected by a microfuse (Fig. 2) in the mains supply unit. Failure of the microfuse may be caused by a defective mains supply unit or a fault in the electronic circuit.

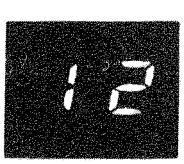
When the microfuse has to be replaced, the correct fuse element should be used (quoted above the fuse holder on the back of the electronic control unit). Two spare microfuses are supplied with the control unit.

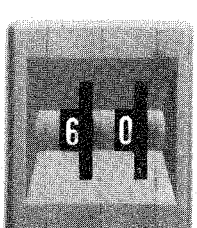
If the electronic control unit does not function properly, it should be removed from the system and sent to Westfalia. It should not be repaired on site since special knowledge and suitable measuring devices are required.

The control unit does not require any maintenance; it operates without the use of wear-prone parts. A stock of individual components is usually not necessary.

If several control units are in use, it should, however, be considered to keep one electronic control unit in stock in order to permit quick replacement of a defective unit.

Operational reliability of the electronic timing unit is ensured even under the influence of disturbances caused by the control system itself as well as by pick-up via the inputs and the mains. Should, however, a temporary malfunction occur, e.g. if a wrong output signal of a storage element causes energization of the opening water valve (indicated by pilot lamp 7, Fig. 3) to last longer than the time pre-set on time function elements d5 and d7, the program has to be reset to starting position by operating the "Partial sediment ejection" or "Total sediment ejection" push button.





Resetting of the program to starting position by operating the "Partial sediment ejection" push button or even switching-off of the program cycle by momentarily opening the "Separation" selector switch may also be necessary if set-point adjuster d4 is reset during the separating process to a lower time value than that just shown by the digital indicator, e.g. from 60 minutes to 11 minutes (Fig. 9).

Fig. 9

Resetting to a lower time value than that indicated causes failure of automatic partial sediment ejection. The program must, therefore, be reset to starting position in order that the next partial sediment ejection is carried out upon expiration of the time to which the time function element d4 has been reset.

The pilot lamps are equipped with T 5.5, 12 Volt, 50 mA incandescent lamps. Before a defective lamp can be replaced, the slip-on lamp cover must be removed. The lamp should be withdrawn from the socket with the aid of a lamp extractor (Fig. 10) consisting of a small piece of plastic hose (approx. 4 mm diameter and 100 mm long).

Two spare incandescent lamps are included in the delivery.

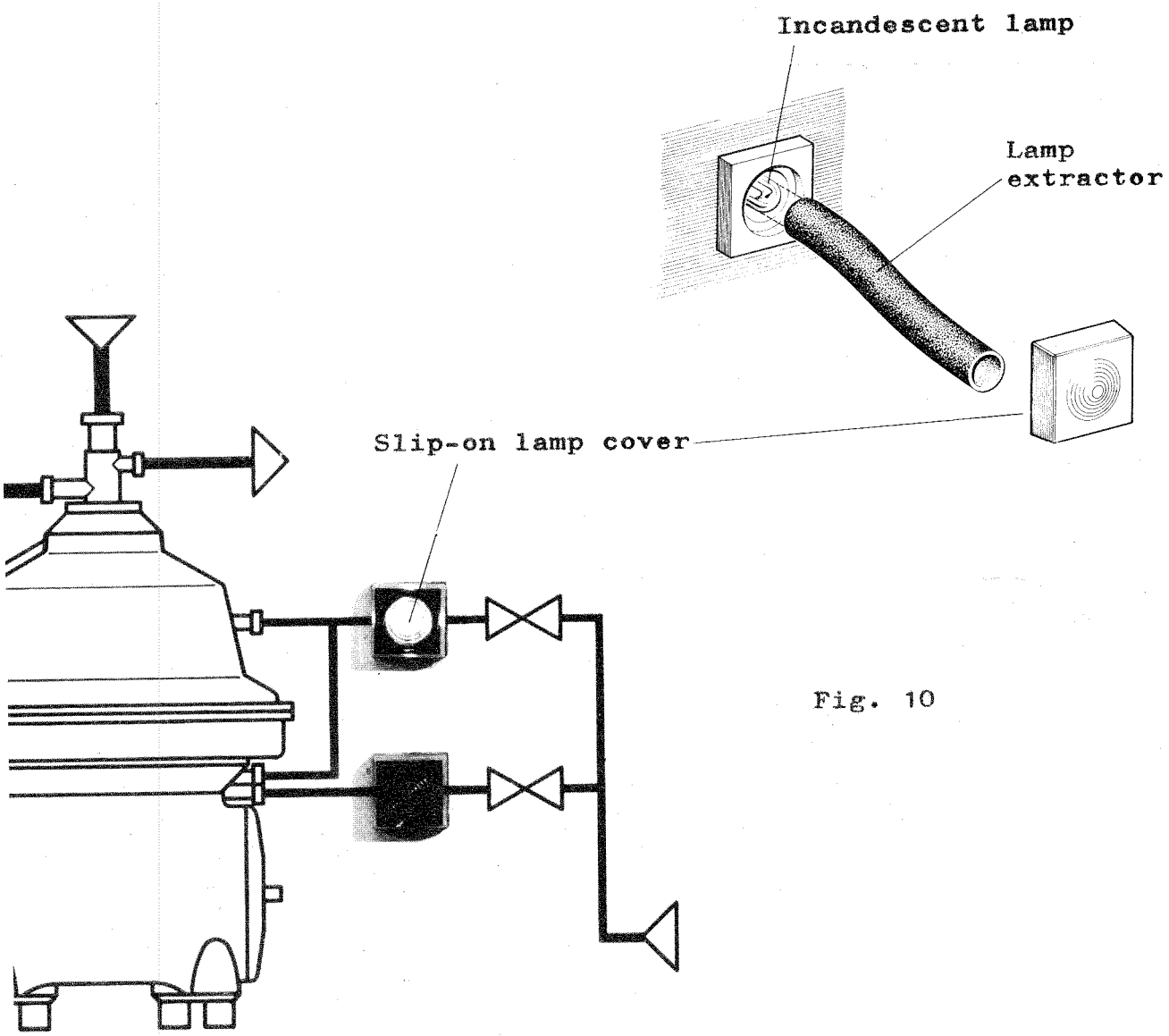


Fig. 10

8. Solenoid valves s3 and s4 for compressed air

8.1. Design and operating principles (Fig. 11)

These valves are direct acting 3-port/2-position solenoid valves where valve outlet A is relieved when the solenoid is de-energized. They are equipped with a manual operator (or override) for checking. The solenoid head is completely moulded in Epoxy resin ensuring perfect protection against entry of moisture, good dissipation of heat and perfect electrical insulation. These valves are fully tropicalized.

The armature of the solenoid head is incorporated in an oil-filled chamber which is completely isolated from the flow medium by a diaphragm.

The brass valve body is fastened to the solenoid head by means of two screws. These screws and the precisely adjusted valve seats must not be removed or re-adjusted.

Both valves are mounted on a two-valve connection block. The ports of the connection block and valves are marked as follows (Fig. 11):

P = Pressure connection
A = Valve outlet
R = Relief connection

When the solenoid is de-energized, valve port P is closed while port R is open and in communication with outlet A. When energized, the solenoid attracts the armature, causing the diaphragm to be shifted from the left-hand valve seat to the right-hand one. Passage P - A is thus opened and passage R - A is closed. Since the central port A is the outlet of the valve chamber around the end of the armature, it communicates with the passage of either the left-hand or right-hand seat, depending on which of the two is open.

The relief connection R of the solenoid valve is closed by a plug; the pressure is relieved via the constant pressure valve.

8.2. Maintenance

The solenoid valves do not require any maintenance.

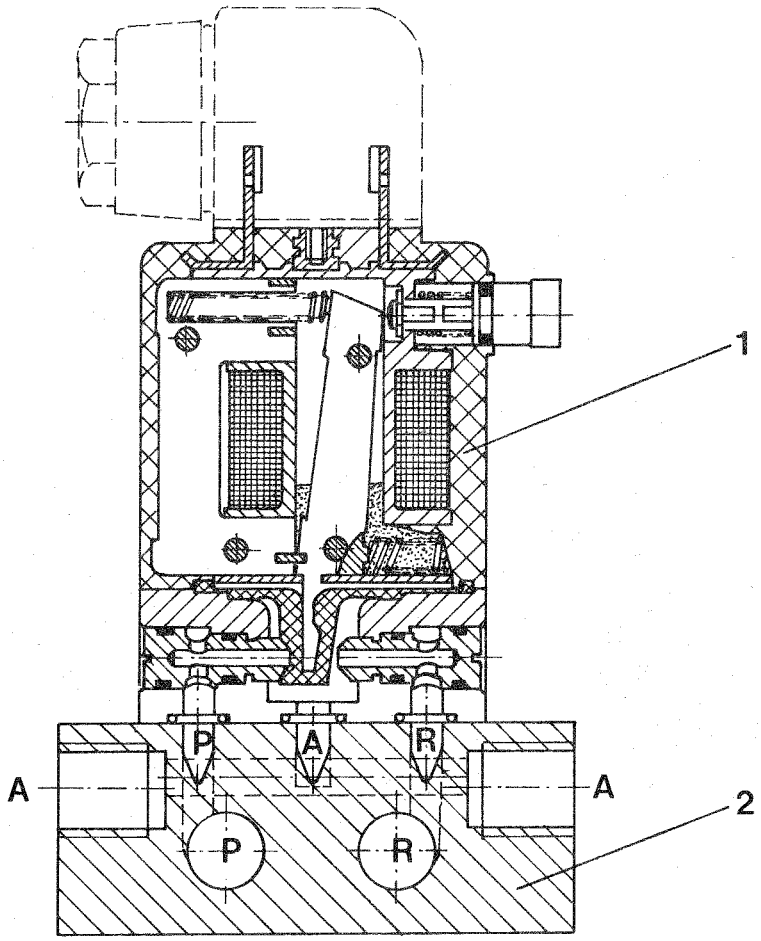
8.3. Malfunctions

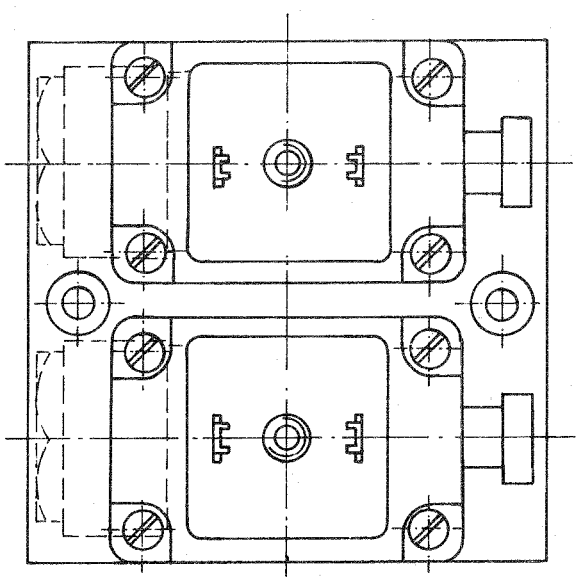
If it has been found that the control unit functions properly and that voltage is present at the valve terminals, malfunction has to be ascribed to a defective solenoid coil. In such a case, the complete solenoid valve (Part-No. 0018-4485-800) must be replaced. The same applies to mechanical failures.

8.4. Technical data

Solenoid valve for compressed air Part-No. 0018-4485-800		Type	331 / C
Pipe connection		R	1/4"
Voltage		V	220 AC
Frequency		Hz	50/60
Optional voltages		V	24 AC, 115 AC 24 DC
Power consumption: (AC operation) (DC operation)	pull-in	VA	30
	operation	VA	15
		W	8
Duty cycle		%	100
Frequency of operations		/min.	approx. 1000
Type of enclosure		IP	65
Pressure range		bar	0 - 10
Temperature:	medium	°C	up to 90
	ambient	°C	up to 55
Cable entry		Pg	9
Screw couplings for air hoses		mm	6 x 1
Mounting position			at random

3/2-way solenoid valve





When mounting the valves on the connection block, make sure that the valve ports marked with R and P coincide with the respective ports of the connection block.

Fig. 11

No. in Fig.	Part-No.	Qty.	Part Description
-	0018-4485-600	1	3/2-way solenoid valve block
1	0018-4485-800	2	[Solenoid valve
2	0018-4485-280	1	[Connection block

9. Connection of the air lines and adjustment of the pressure reducers

The compressed-air lines should be connected in accordance with the opposite installation diagram.

The pressure reducers inside the control cabinet have to be adjusted as follows:

1) Pressure reducer 1 for adjusting the excess pressure required for the constant pressure valve in the skim milk line to cause temporary overflow of the bowl during the C-I-P process:

   This valve should be set so that overflow of the bowl occurs. The maximum pressure is 5 bars.

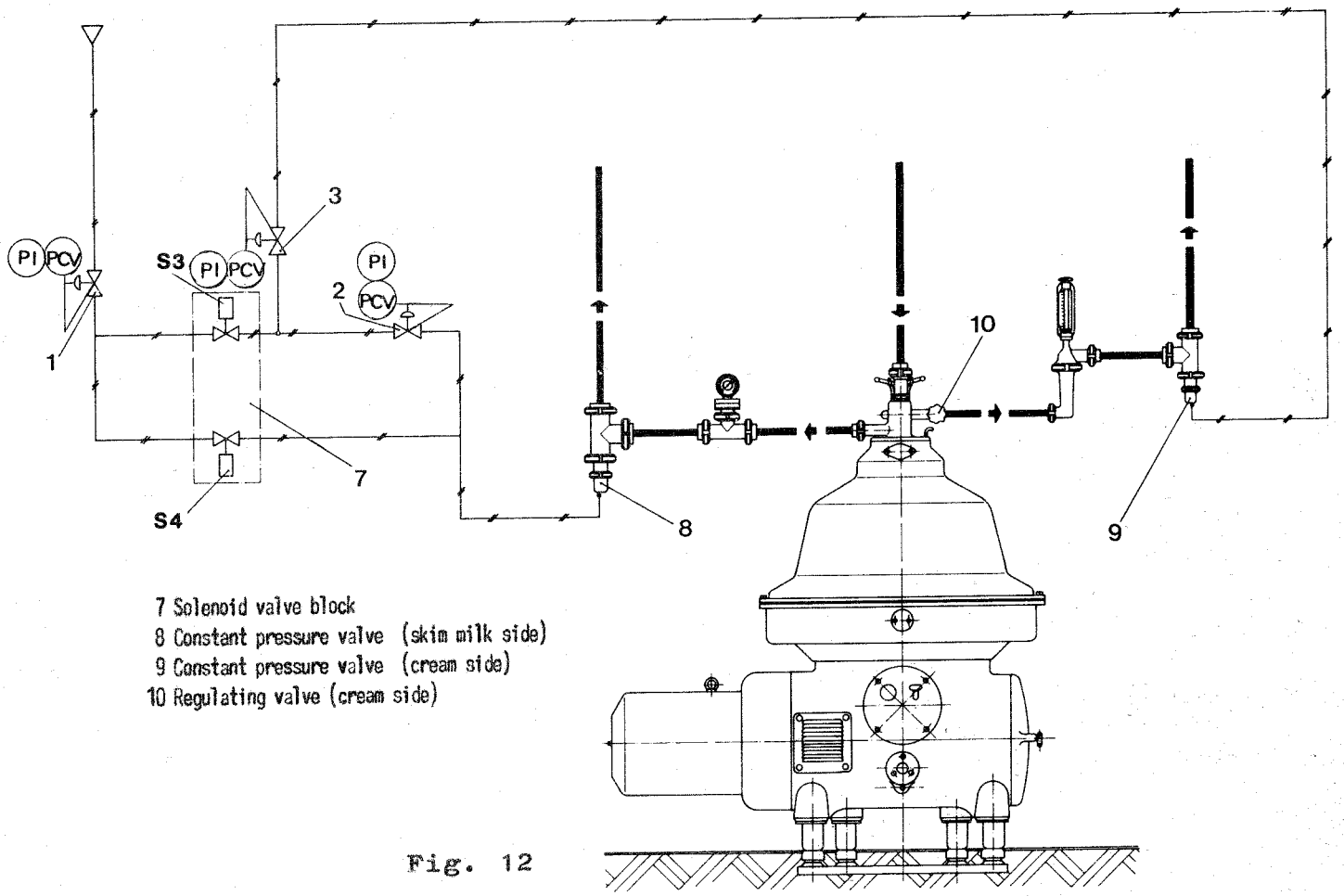
2) Pressure reducer 2 for adjusting the operating pressure in the skim milk line:

   This valve should be set to a pressure of up to 4 bars. The maximum operating pressure of the separator will then be 6 bars.

3) Pressure reducer 3 for adjusting the supply pressure to the constant pressure valve in the cream line:

   This valve should be set so that the discharge capacity is by about 50% higher than that under normal operating conditions. The desired operating capacity has to be adjusted by means of the manual regulating valve 10.

Installation diagram for the constant pressure valves



7 Solenoid valve block
8 Constant pressure valve (skim milk side)
9 Constant pressure valve (cream side)
10 Regulating valve (cream side)

Fig. 12

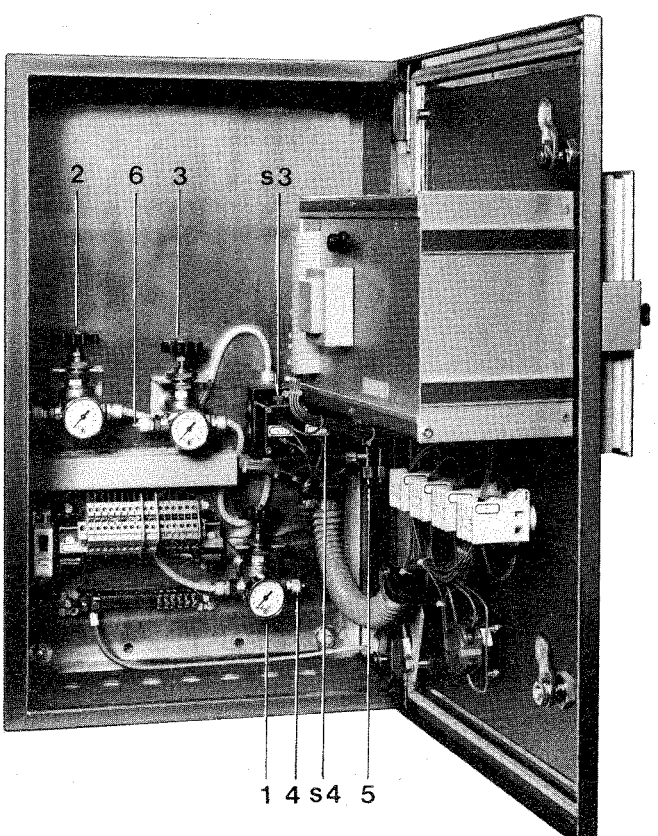


Fig. 13

Pressure reducers

1 for excess pressure adjustment
(constant pressure valve in skim milk line)

2 for operating pressure adjustment
(constant pressure valve in skim milk line)

3 for operating pressure adjustment
(constant pressure valve in cream line)

Solenoid valves

s3 for actuation of constant pressure valves
(operating position)

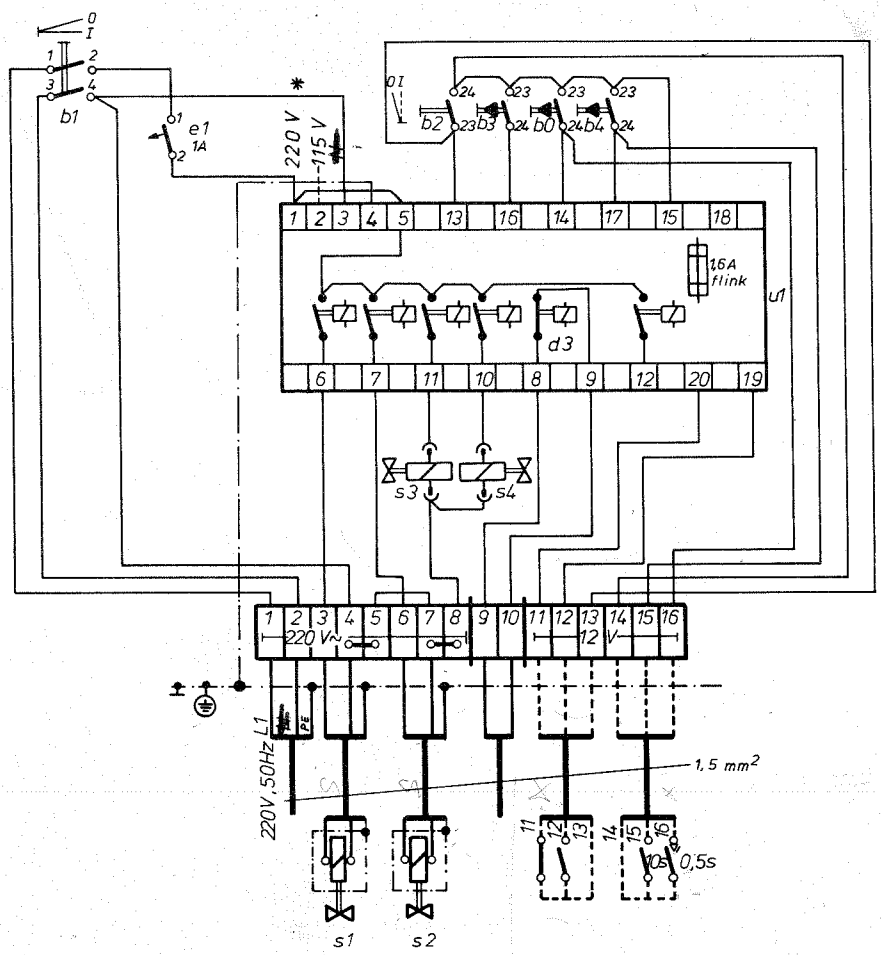
s4 for actuation of constant pressure valve
in skim milk line
(excess pressure)

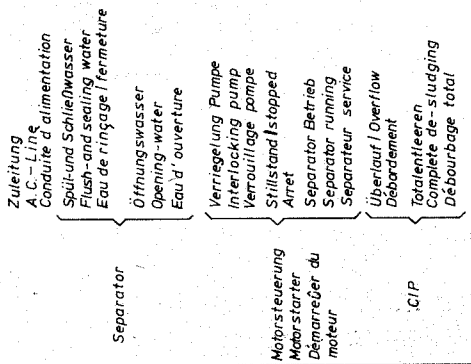
Compressed-air connections

4 Air inlet

5 Air outlet
(constant pressure valve in skim milk line)

6 Air outlet
(constant pressure valve in cream line)





b0 Totalentleeren
Complete de-sludging
Débourbage total

b1 Hauptschalter
Main switch
Interrupteur principal

b2 Separieren
Separation
Séparation

b3 Teilentleeren
Partial de sludging
Débourbage partiel

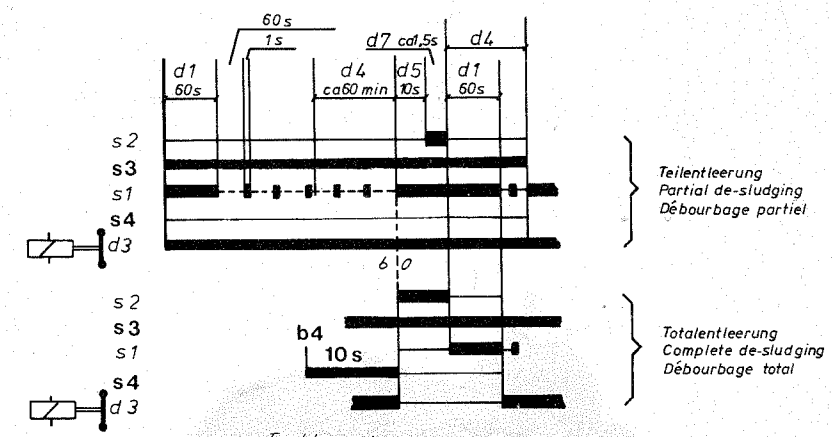
b4 Überlauf
Overflow
Débordement

Zuleitungssicherung 6A
Rated current of lead-in wires fuse 6A
Courant nominal de la fusible de secteur 6A

Schaltvermögen des potentialfreien Öffners für Verriegelung Milchpumpe:
Switching capacity of potential-free break contact for electrical interlocking of milk pump :
Pouvoir de coupoure du contact rupteur sans potentiel pour le verrouillage électrique de la pompe a lait:

Dauerstrom I_{th2} ≦ 6A bei 250V~
Permanent current
Permanent courant

Nennbetriebsstrom I_e/AC 11 ≦ 1A bei 250V~
Rated current
Nominal courant



Funktions-Diagramm
Operating program
Diagramme de programmation

* geändert am 31.3.77 Ni.

WESTFALIA SEPARATOR
4740 Oelde i. Westf.

1976	Datum	Name	Projekt
Gez.	29.10.	11.	
Gepr	3.11.	Ni.	

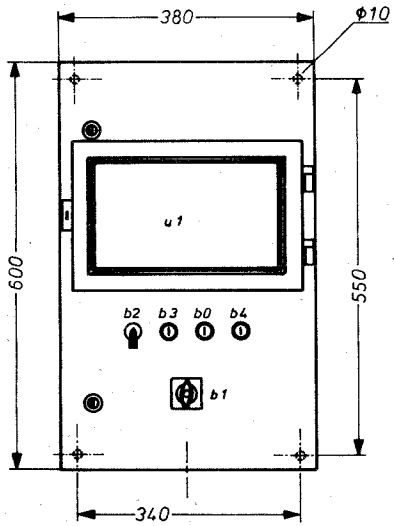
Steuergerät TVA2-M elektronisch
Timing unit
Programmateur

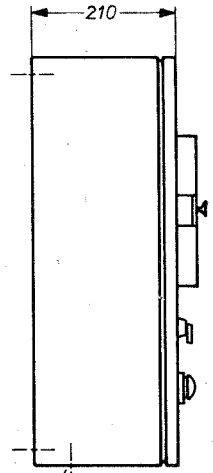
Anschlußplan
Connection diagram
Plan de disposition

Zeichnungs-Nr	Blatt	Bestehend aus Blatt
8134-0404-0231	1	1

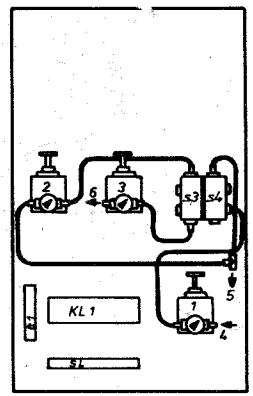
Timing unit equipment list

Design. in layout plan and circuit diagram	Part-No.	Description	Type	Techn. data	Make
		Housing	AE 1038 V2A	600x380x210 mm	Loh
bo	0005-1196-020	Push button	DT kf 11	1 NO + 1 NC	AEG
b1	0005-0490-000	Main switch	C1 7 A 201 EG 002 SOC		Kraus & Naimer
b2	0005-3515-900	Front element	SWSTL		AEG
b2	0005-1196-910	Panel-mounting element	kf 11	1 NO + 1 NC	AEG
b3	0005-1196-020	Push button	DT kf 11	1 NO + 1 NC	AEG
b4	0005-1196-020	Push button	DT kf 11	1 NO + 1 NC	AEG
u1	8134-0402-090	Electronic control unit	KS 064	115/~~220~~ V 50/60 Hz	Schleicher Electronic
s3	0018-4485-800	Solenoid valve	331/C	~~220~~ 110 V 50/60 Hz, 15 VA 0 - 10 bars	Bürkert
s4	0018-4485-800	Solenoid valve	331/C	~~220~~ 110 V 50/60 Hz, 15 VA 0 - 10 bars	Bürkert
1	0018-1749-600	Pressure reducer		R 1/8" 0.5-10 bars	Biegler & Co.
2	0018-1749-600	Pressure reducer		R 1/8" 0.5-10 bars	Biegler & Co.
3	0018-1749-600	Pressure reducer		R 1/8" 0.5-10 bars	Biegler & Co.
KL 1	0005-0510-890	Terminal block	SAK 4 KrG	0.5-4 mm^2, 750 VAC 36 A	Weidmüller
e1		Automatic cut-out	SP3 121	1 A	Siemens
	0005-0354-000	Incandescent lamp	T 5.5	12 V 50 mA	
	0005-0542-000	Fuse		F 1.6 A	





Leitungseinführungen
Cable inlets



b0	Totalentleeren	Complete de-sludging	Débourbage total
b1	Hauptschalter	Main switch	Interrupteur principal
b2	Separieren	Separation	Séparation
b3	Teilentleeren	Partial de-sludging	Débourbage partiel
b4	Überlauf	Overflow	Débordement
u1	Steuergerät	Timing unit	Programmateur

1 Überdruck, Excess pressure, Surpression
Konstantdruckventil Magermilchseite
Pressure control valve skim milk side
Vanne à pression constante côté lait écrémé

2 Betriebsdruck, Operating pressure, Pression de service
Konstantdruckventil Magermilchseite
Pressure control valve skim milk side
Vanne à pression constante côté lait écrémé

3 Betriebsdruck, Operating pressure, Pression de service
Konstantdruckventil Rahmseite
Pressure control valve cream milk side
Vanne à pression constante côté crème

4 Steuerlufteintritt, Control air inlet, Admission d'air de commande

5 Steuerluftaustritt Control air outlet, Sortie d'air de commande
Konstantdruckventil Magermilchseite
Pressure control valve skim milk side
Vanne à pression constante côté lait écrémé

6 Steuerluftaustritt, Control air outlet, Sortie d'air de commande
Konstantdruckventil Rahmseite
Pressure control valve cream milk side
Vanne à pression constante côté creme

WESTFALIA SEPARATOR
4740 Oelde i. Westf.

	Datum	Name
Gez.	30.3.77	
Gepr.		

Projekt

Steuergerät TVA2-M elektronisch
Timing unit
Programmateur

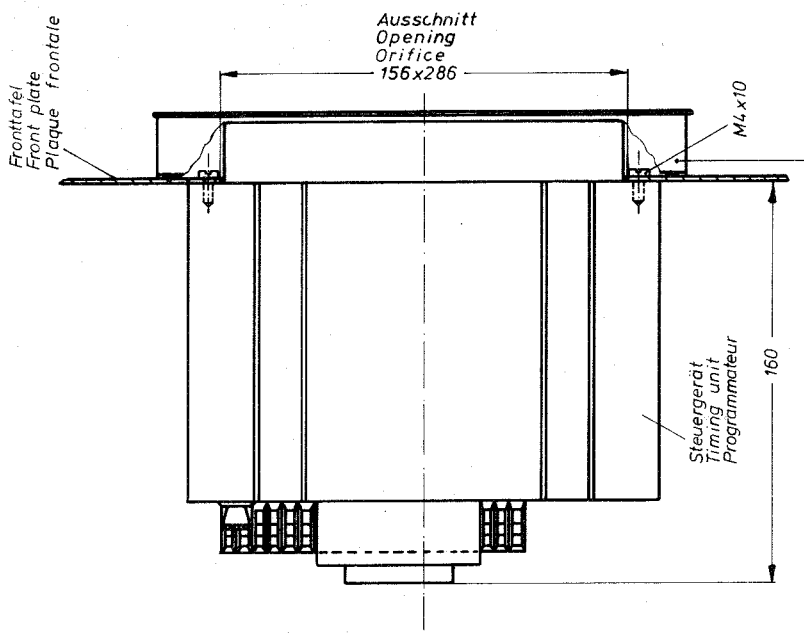
Aufbauplan
Arrangement of control elements
Disposition des éléments

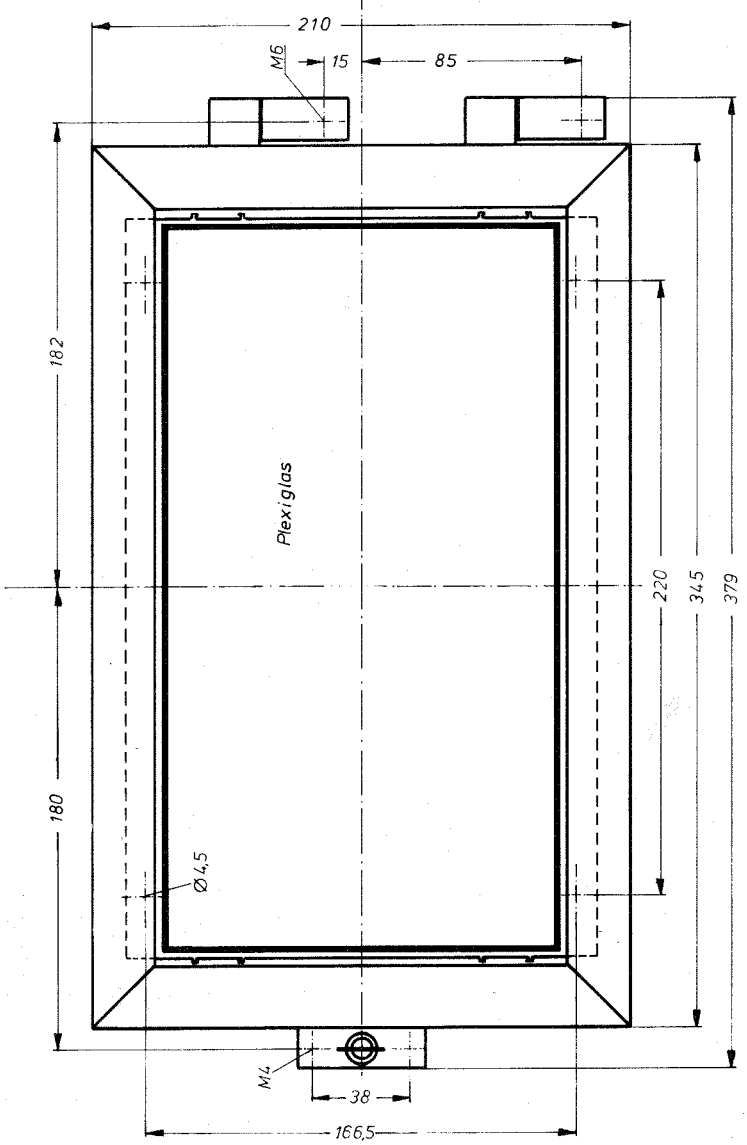
Zeichnungs-Nr. 8134-0404-2231

Blatt

Bestehend aus Blatt

Panel-mounting of the electronic timing unit





für Fronttafeleinbau, z.B. in zentraler Schaltwarte
for panel mounting, e.g. in central control room
pour installation dans la plaque frontale, par ex. dans une station centrale de commande

Steuergerät Typ KS 064
Timing unit
Progammateur

Zeichnungs-Nr. 8134-0404-3231

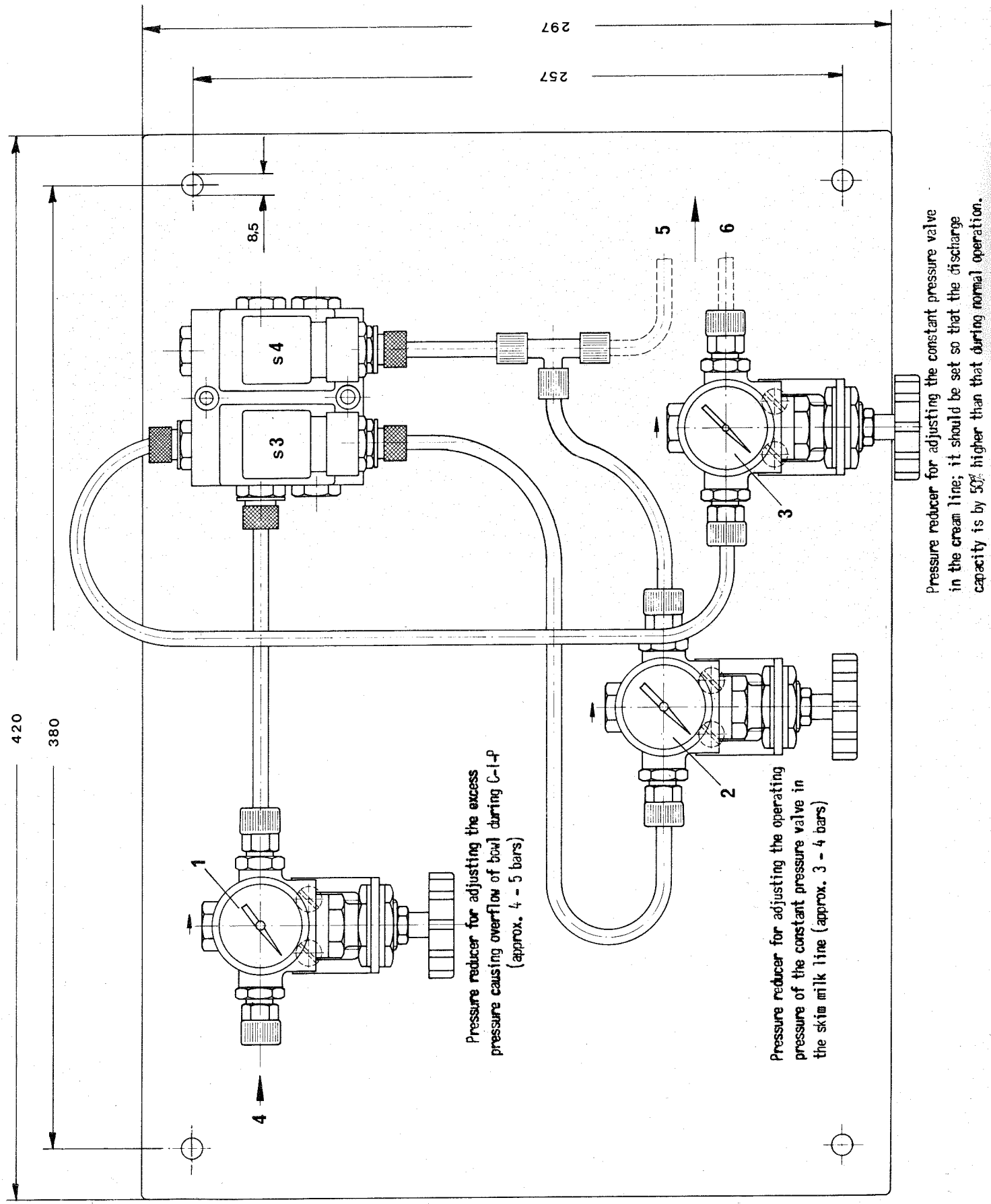
Blatt

Bestehend aus Blatt

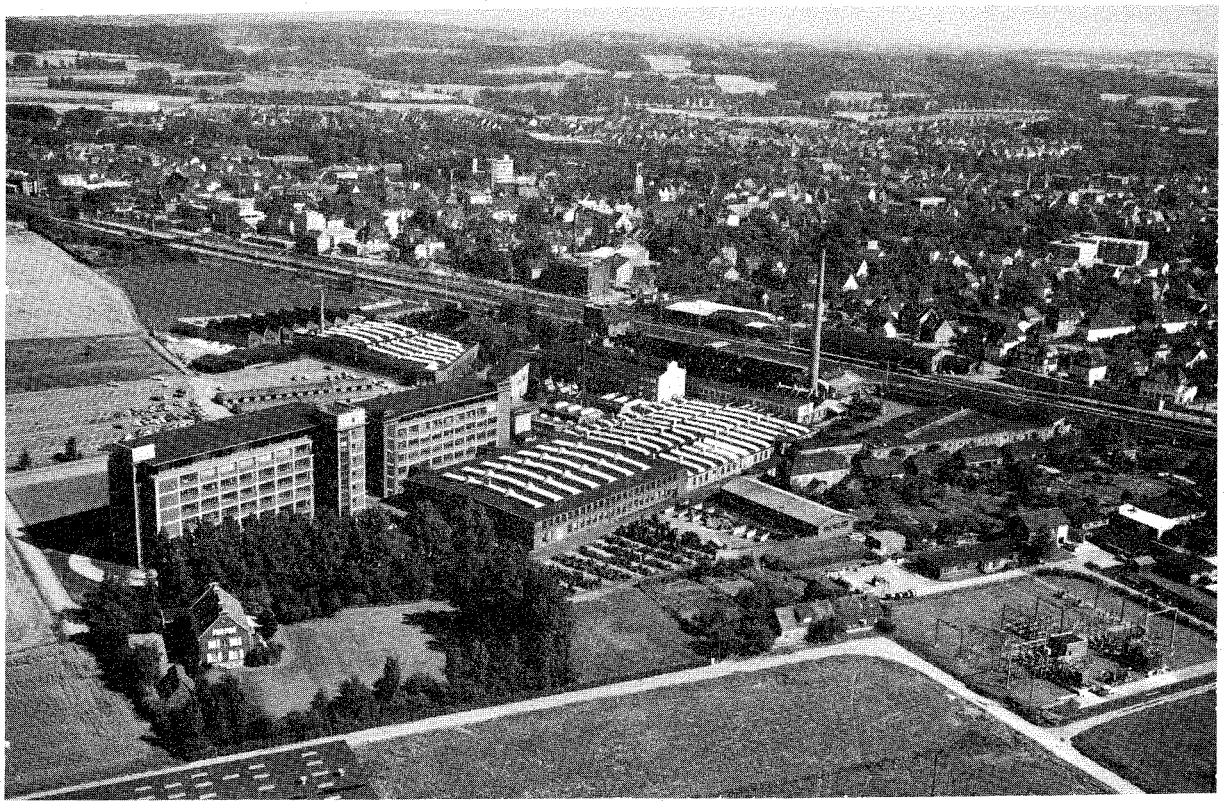
1977 Gez Datum 25.4. Name Mc. Projekt

WESTFALIA SEPARATOR
4740 Oelde i. Westf.

Compressed-air control assembly



Drawing No. 8134-2219-040



Westfalia Separator AG., Oelde/Germany