Remarks on the questionnaire given by K.P. Myznikov at the fourth Session of the Joint Scientific Committee

CERN, June 1969
(R. Cuénot and S. Milner)

The remarks below concern principally the drawings and the foundation of the mobile SM 24.

1. SECTION 16, DRAWING 1A215263

1.1 Section valves

It is necessary to utilize dead end screws for fixation of the valves and not traversing bolts, this due to the passage of the pendel valve, (see correction on drawing, the photocopy E5 and the drawing 303-100-3).

1.2 Length between section valves 3815 mm

This length can only be accepted if the valves are mounted directly on the tank and fixed with screws from inside of the tank. Since there are extensions on each side of the valve exceeding the flange plane; (see drawing 303-100-3) space must be provided for by a milling operation (see fig. 1 below).

Why do the original dimensions of 3889 mm decrease to 3815 mm?

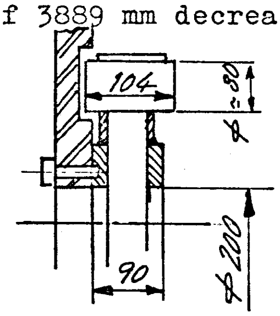


fig. 1

1.3 Chamber for beam pick-ups

The space available for this chamber is difficult to determine; CERN need detailed drawings of this chamber.

2. SECTION 24, DRAWING OA206069

2.1 Section valves

As for the SS 16 it is necessary to use dead end screws for fixation and not the traversing bolts as indicated on your drawings.

2.2 Position of section valves

With the vacuum flanges centred on the inside of the section valve after "Вид Б", the diameter is only 192 mm. It is therefore necessary to decrease the excentricity of the valve with respect to the theoretical orbit from 25 mm to 20 mm. Otherwise 4 mm of the beam is lost by injection (see fig. 2 below).

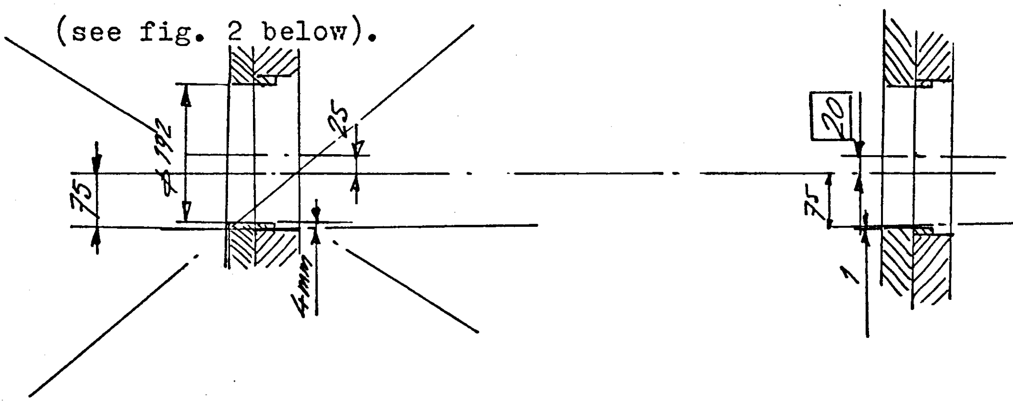


fig. 2

2.3 Beam channel D

According to dimensions indicated for the beam exit, 175 mm and 209 mm, it seems that the beam passes through an inhomogeneous field in magnet 22.

Question : can we work with these dimensions or can we expect modifications of the beam trajectory?

2.4 Enlargement of the vacuum tank

If the above mentioned position for channel D is fixed, can we increase the distance between the theoretical orbit and the outside of the vacuum tank from 78 mm to 85-90 mm?

2.5 Chamber for beam pick-up

As for SS 16, could we have a detailed drawing of the chamber of the beam pick-up?

3. SECTION 26, DRAWING 1A215264

3.1 Section valves

As in the other section, it is necessary to use dead end screws and not the traversing bolts. (see drawing).

3.2 Choice of section valves

In the up-stream side of the tank it is possible to use a section valve with an aperture of 200 mm without interception with the injected beam (see modf. drawing 1A215264). The valve down-stream must have an aperture of 250 mm in order to avoid interception with the beam. The overall length with these valve combinations is 3864 mm. For a system with two 250 mm valves the overall length is 3897 mm and not 3815 mm as indicated on the drawing.

3.3 Vacuum chamber

On the up- and down-stream sides it is necessary to excentre the chamber (see fig. 3 below and drawing).

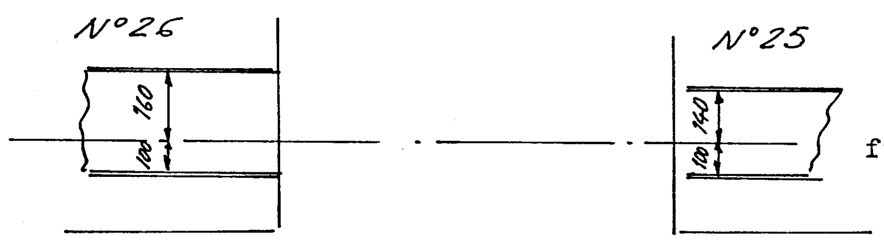


fig. 3

4. SECTION 28, DRAWING 0A206064

4.1 Coil protection

Would you please indicate on a drawing whether the extrusion of the coil protection on the downstream side of magnet 27 is 440 or 550 mm?

4.2 Position of the beam pick-up chamber

Would you please indicate the distance between magnet iron 27 and the chamber of the beam pick-up (see drawing 0A206064). Would you also send a detailed drawing of this chamber.

4.3 Support of the septum magnet

What is the material and construction of the support carrying the tank of the septum magnet, is it massive concrete 595 mm thick or is it a steel construction?

5. FOUNDATION FOR THE MOVING SEPTUM MAGNET SS 24

5.1 Two types of foundation are tentatively shown in figs. 4 and 6.
The type shown in 4 is a heavy steel construction which can be installed in small shut-downs and easily dismantled if necessary.
The other type shown in fig. 5 is a big block of reinforced concrete in rigid connection with the basement floor.

Before any decision can be taken about the final type, characteristics of the floors in the basement and accelerator tunnel such as, strength, stiffness, type of concrete and reinforcement are essential. Discussion about this matter should be held between specialists from Serpukhov and CERN.

5.2 General

As the actuator works with signals up to about 30 cps, we chose tentatively a natural frequency for the foundation of 40 cps. With this value the necessary stiffness of the foundation can be determined and we can check whether the deflections of the actuator are within the limits given below.

Normal deflection in the horizontal plane	$<$ 0,2 mm
Max. deflection in the horizontal plane	$<$ 0,5 mm
Normal deflection in the vertical plane	$<$ 0,1 mm
Weight of magnet + guiding ram	~ 700 kg
Weight of frame	2000 kg
Weight of steel plate	5000 kg
Total weight	7700 kg

The normal acceleration of the magnet is about 40 m/s^2
The max. operational acceleration is about 100 m/s^2
Accidental acceleration 300 m/s^2

The forces in horizontal direction are then

$F_n = 700 \times 40 = 28000$ N

$F_{max} = 700 \times 100 = 70000$ N

$F_{acc} = 700 \times 300 = 210000$ N

For safety reasons the foundation should be designed to withstand without failure the accidental acceleration of 210000 N with a safety factor of 1,5.

The natural frequency in the horizontal direction of the steel foundation, if considered as a spring mass system, can approximately be found by

$f = \frac{1}{2\pi} \sqrt{c/m}$ if the stiffness of the floor is known.

The stiffness should exceed $c = f^2 (2\pi)^2 m = 40^2 (2\pi)^2 \, 7700 = 49 \times 10^7$ N/m.

The static deflection of the foundation with above spring stiffness and the max. acceleration force of 70000 N would be :

$$\varepsilon = \frac{F_{max}}{c} = \frac{70000}{49 \times 10^7} = 1,43 \times 10^{-4} \text{m} \sim 0,14 \text{ mm.}$$

This deflection is due only to the spring characteristics of the ring floor. Additional deflection occur due to flexibility of the steel frame itself. Furthermore roll movements of the steel plate will occur due to elasticity of the floor in the basement and the elasticity of the steel pillars. The movement of the actuator with respect to the vacuum tank due to this roll movement should not exceed 0,1 mm.

The maximum deflection given by the horizontal movement and the roll movement should not exceed 0,3 mm. It is evident that the floors should be as stiff as possible and that data must be provided for this stiffness so that the design can go ahead.

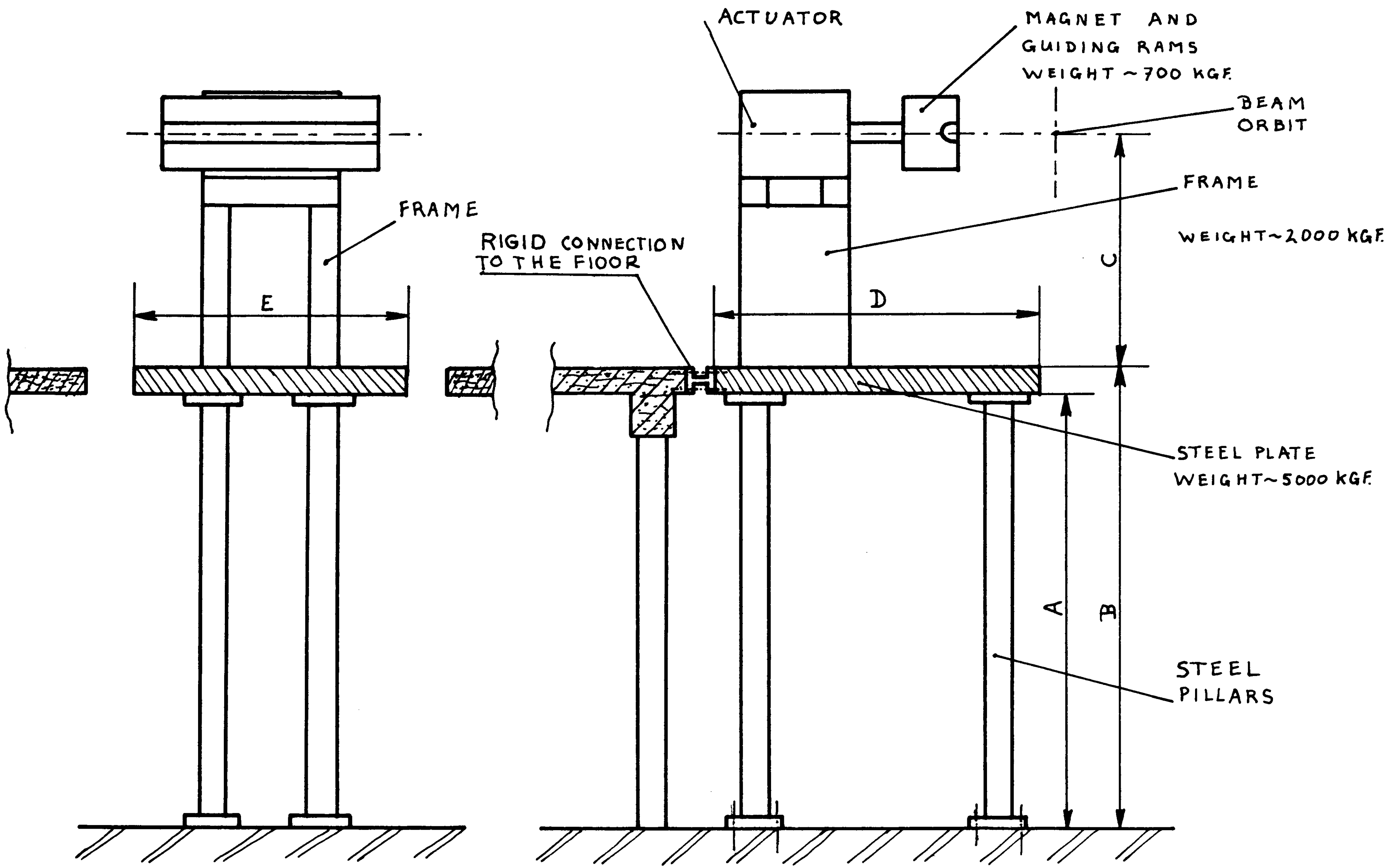


Fig. 4 **ACTUATOR FUNDATION 1.**

STEEL CONSTRUCTION
SS 24

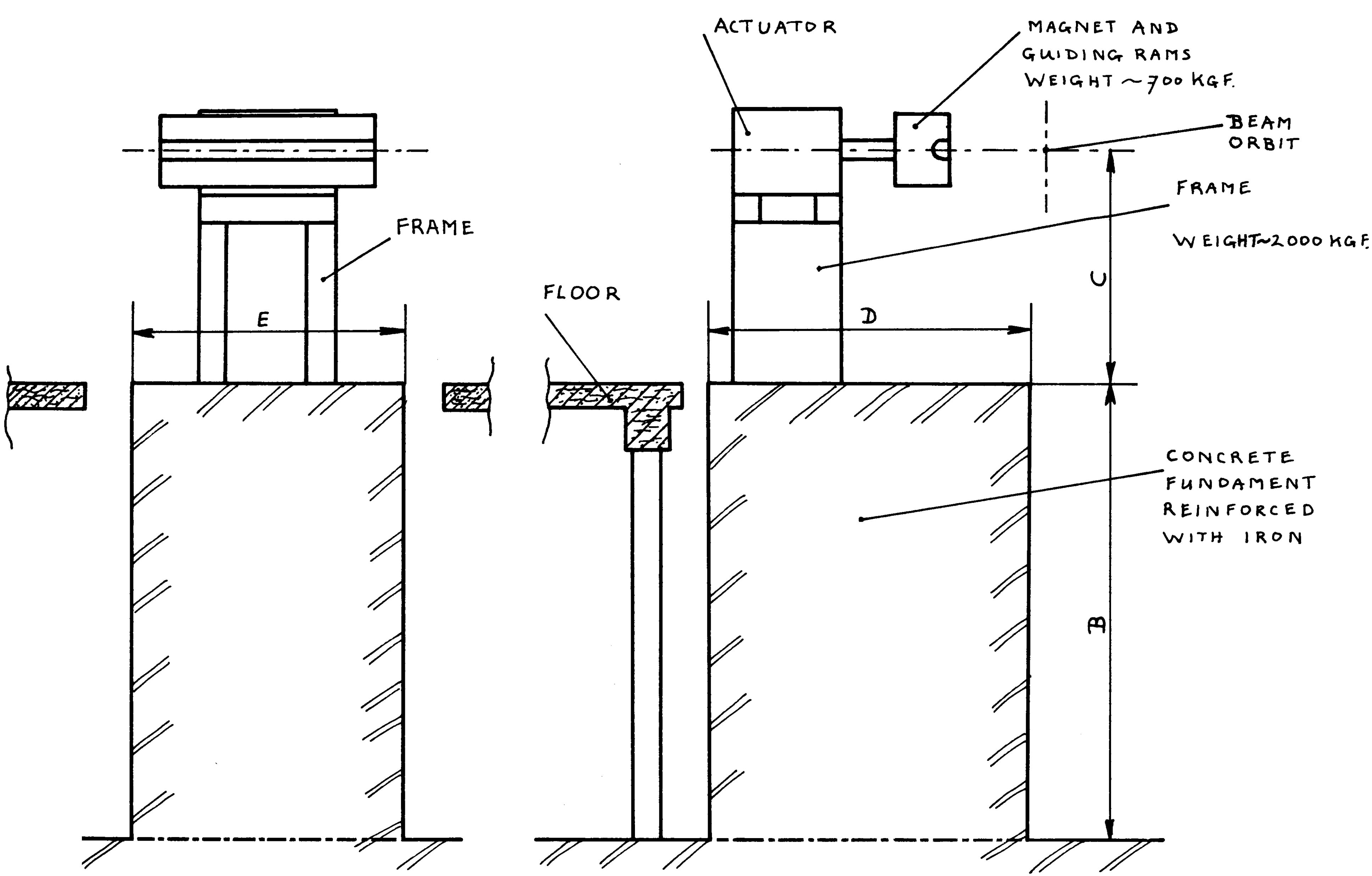


Fig.5 **ACTUATOR FUNDATION 2.**

REINFORCED CONCRETE

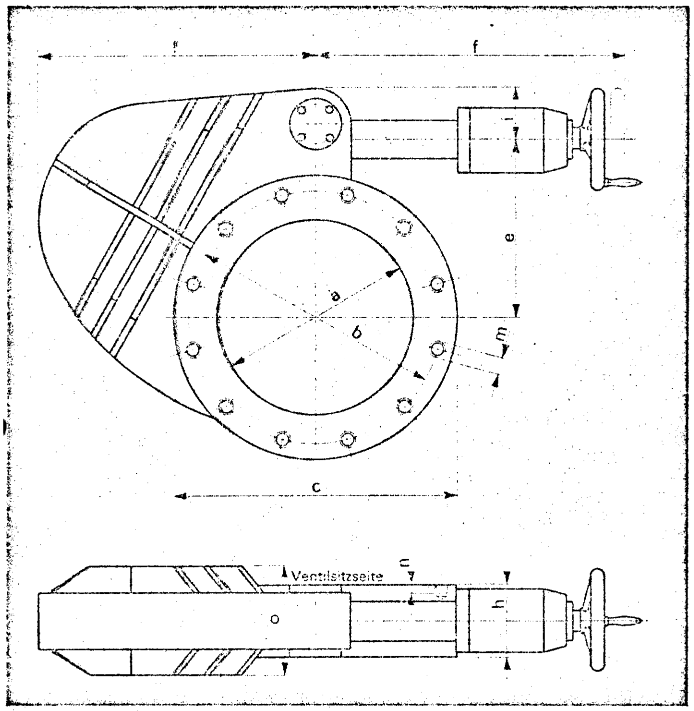
SS 24

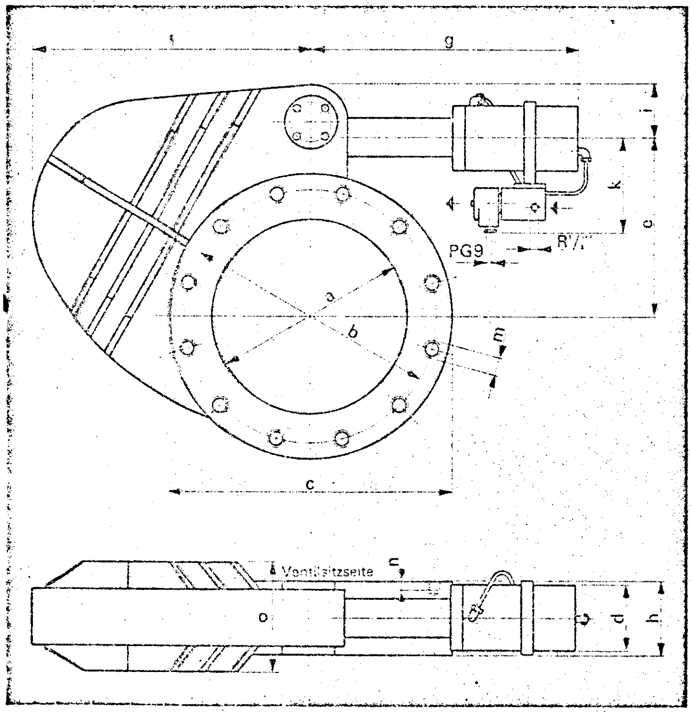
Pendelschieber mit Federbalg

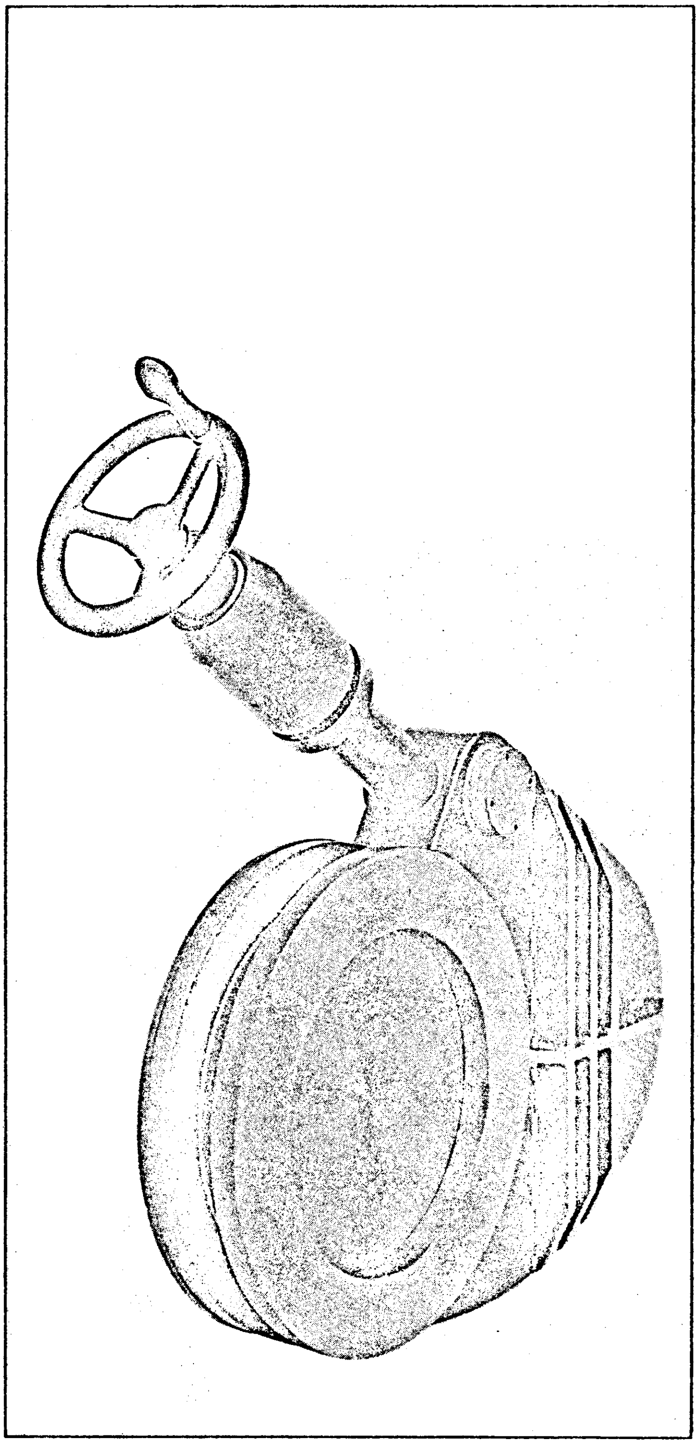
und DIN-Flanschgehäuse

NW 250 300 350 400 500

Diese Ultrahochvakuumventile haben glatte Anschlussflansche ohne Dichtnut, bemessen nach DIN 2501 ND 6. Die verwendeten Dichtungen sind Viton-O-Ringe. Zur Herstellung der verschiedenen Ventilteile wird rostfreies Material verwendet. Der hochflexible Federbalg ist auswechselbar.
Die vorgeschriebene Einbaulage ist besonders zu berücksichtigen.







NW	a	b	c	d	e	f	g	h	i	k	l	m	n	o
250	250	335	375	100	225	456	416	110	80	146	370	(12) M16	14	150
300	300	395	440	100	275	456	416	120	80	146	453	(12) M20	16	180
400	400	495	540	140	418	–	435	150	112	160	613	(16) M20	18	240
500	500	600	645	140	468	–	435	150	112	160	746	(20) M20	18	260

Technische Daten

		NW 250	300	350	400	500
Flansche nach DIN 2501 ND 6	NW	250	300	350	400	500
Leitwert in Hochvakuum	l/sec	14500	20000	29200	33000	60000
Dicht gegen Atmosphärendruck		in beiden Richtungen				In einer Richtung
Dichtheit		Siehe Seite A 1				
Öffnen gegen Atmosphärendruck		ist nicht möglich				
Bei Strom- und Pressluftausfall		bleibt der Schieber geschlossen und dicht				
Ausheiztemperatur	max. °C	150				
Pressluftdruck	max. atü	10	10	10	10	10
	min. atü	5	5	5	5	5
Zylindervolumen	Liter	0,2	0,2	0,4	0,4	0,4
Pressluftsteuerventil mit Zubehör (Siehe Seite C 1)		ist auf den Pneumatikzylinder montiert				
	Anschlussspanng.	220 V				
	Anschlussleistg.	32 VA				
	Anschlussöffng.	R ¼"				
Lagemeldeschalter, magnetisch betätigt		Technische Daten siehe Seite C 2				
'rkstoffe der Standardausführung						
	Gehäuse	Edelstahl				
	Mechanik	Edelstahl				Aluminium
	Lagerung	Wälzlager aus rostfreiem Stahl				
	Federbalg	Edelstahl				
	Pneumatik	rostfreies, antimagnetisches Material				
	Handantrieb	Stahl				
	Dichtungen	Viton				
Ausschliessliche Einbaulage		Antriebsachse waagrecht. Der Pendelschieber NW 500 lässt sich nur in waagrechter Lage in eine senkrechte Leitung einbauen.				

Bestelldaten

	NW	250	300	350	400	500
Pendelschieber mit Federbalg und DIN-Flanschgehäuse	handbetätigt	15119	15120	—	—	—
	elektro-pneumat. betätigt	15319	15320	15321	15322	15323
1 Lagerückmeldeschalter für die Anzeige der offenen oder der geschlossenen Ventilstellung, magnetisch betätigt		19119	19119	19119	19119	19119
1 Satz Dichtungen für	1 handbetätigtes Ventil	D 15119	D 15120	—	—	—
	1 elektro-pneumatisch betätigtes Ventil	D 15319	D 15320	D 15321	D 15322	D 15323

VAT AKTIENGESELLSCHAFT für Vakuum-Apparate-Technik CH 9499 HAAG Tel. 085 / 7 15 85