Phần 2. YÊU CẦU VỀ KỸ THUẬT

Chương V. YÊU CẦU VỀ KỸ THUẬT

Mục 1. Giới thiệu chung về gói thầu

1. Giới thiệu chung về gói thầu:

- Tên gói thầu: Cung cấp dịch vụ phục hồi vật tư phục vụ BDSC cho NMĐ Cà Mau 1&2 năm 2025 (lần 1).
- Thời gian thực hiện công việc: Trong vòng 2 tháng kể từ ngày hợp đồng có hiệu lực.
- Địa điểm thực hiện công việc: Nhà máy điện Cà Mau 1&2, Ấp 1, xã Khánh An, tỉnh Cà Mau.
- Nhà thầu thực hiện đầy đủ các công việc phục hồi vật tư phục vụ bảo dưỡng sửa chữa cho NMĐ Cà Mau 1&2 theo quy định tại Mẫu số 01A Phạm vi cung cấp, bao gồm tất cả các công việc liên quan từ khảo sát, lập phương án, lập biện pháp thi công, lập biện pháp kiểm tra/ nghiệm thu, chuẩn bị các điều kiện thực hiện bảo dưỡng sửa chữa, tiến hành tháo dỡ, thay thế thiết bị, căn chỉnh, lắp lại theo nguyên trạng ban đầu, thử nghiệm, hiệu chỉnh, chạy thử, nghiệm thu đưa vào sử dụng, bàn giao, bảo hành... đáp ứng đúng theo tài liệu kỹ thuật của nhà sản xuất hoặc các quy trình vận hành bảo dưỡng sửa chữa đã ban hành tại nhà máy và được sự chấp thuận của Chủ đầu tư. Nhà thầu chỉ được phép thực hiện công việc khi có chuyên gia tại hiện trường, trường hợp đặc biệt phải có văn bản chấp thuận của Chủ đầu tư.
- Nhà thầu (bằng chi phí của mình) có quyền được đi khảo sát thực tế tại Nhà máy điện Cà Mau 1&2 để đánh giá và cập nhật thêm về tình trạng thiết bị, lịch sử vận hành, BDSC, sự cố, tài liệu hướng dẫn vận hành và BDSC của nhà sản xuất, vật liệu & các thông số kỹ thuật, các dụng cụ đặc biệt được cấp theo thiết bị, các quy trình phối hợp, chất lượng của các thiết bị trong gói thầu tham dự, tình trạng vận hành của các máy công cụ trong xưởng của nhà máy,… và các thông tin cần thiết khác (nếu cần).
- Hiện trạng: Nhà máy điện Cà Mau sau các kỳ trung đại tu vật tư thay thế được đánh giá khả năng tận dụng phục hồi sử dụng lại.
- Thực hiện chỉ đạo của Tổng Công ty tiết giảm vật tư mua mới O&M bằng phục hồi các vật tư thu cũ sau kỳ trung đại tu tổ máy. Các vật tư thu cũ sau khi được đánh giá tình trạng hư hỏng tiến hành lập tiên lượng phục hồi và các tiêu chuẩn sau khi phục hồi vật tư.
- Do là vật tư phục hồi do vậy các vật tư sau phục hồi phải được chạy thử nghiệm bằng các hệ thống thử nghiệm chuyên biệt để đánh giá chất lượng phục hồi đáp ứng với các thông số vận hành thiết bị hiện hữu tại nhà máy.
- Nhà thầu phải chứng minh rằng mình có đầy đủ nhân sự cho các vị trí chủ

chốt đáp ứng yêu cầu tại Chương III, Mục 2.2a – Tiêu chuẩn đánh giá E-HSDT và có trách nhiệm cung cấp đầy đủ nhân sự thực hiện công việc và đáp ứng tiến độ BDSC theo yêu cầu của Chủ đầu tư. Nhà thầu phải cung cấp thông tin chi tiết về các nhân sự chủ chốt được đề xuất, các giấy tờ, hồ sơ kinh nghiệm của nhân sự chủ chốt. Nhân sự chủ chốt phải được kê khai theo các biểu mẫu quy định tại Chương IV - Biểu Mẫu.

- Nhà thầu cung cấp công cụ, dụng cụ, thiết bị thi công, bao gồm nhưng không giới hạn tại Chương V, Mục 1 để thực hiện các công việc của gói thầu trên cơ sở biện pháp thi công của nhà thầu.
- Nhà thầu phải chứng minh khả năng huy động danh mục tối thiểu các thiết bị thi công chủ yếu (còn hạn kiểm định, còn hạn sử dụng theo quy định, đảm bảo các yêu cầu theo quy định hiện hành (ít nhất tính đến thời điểm đóng thầu)) cần có để thực hiện gói thầu bao gồm nhưng không giới hạn như sau:

STT	Loại thiết bị và đặc điểm thiết bị	Số lượng tối thiểu cần có
1	Máy doa ngang CNC: - Kích thước bàn máy: 1600x1400x0.001˚ - Tải trọng đặt lên bàn lớn nhất: 8000 kg (hoặc tương đương)	1
2	Máy tiện đứng CNC: - Đường kính mâm cặp thủy lực: Φ610mm - Đường kính tiện lớn nhất: 850mm - Đường kính vật gia công lớn nhất bàn dao đứng: 850mm (hoặc tương đương)	1
3	Máy quang phổ phân tích thành phần kim loại: - Đầu dò: CCD, độ phân dải: ≥ 30.000 Pixels trở lên, số lượng đầu dò ≥ 15 - Dải bước sóng phân tích: 170-670 nm - Độ phân dải cách tử: Cách tử halographic với dải cách tử 3600 vạch/mm (hoặc tương đương)	1
4	Máy đo độ cứng loại cầm tay: - Phạm vi đo: (19÷70) HRC - Độ không đảm bảo đo ≤ 2 HRC (hoặc tương đương)	1
5	Máy cân bằng động: - Khối lượng vật cân bằng lớn nhất ≥ 2.000kg (hoặc tương đương)	1

6	Máy phun kim loại: - Dòng hoạt động thường xuyên ≥310A - Công suất lớn nhất: 20kW (hoặc tương đương)	1
7	Thiết bị siêu âm kim loại - Dải đo PRF: 10÷2000 Hz - Tần số xung: 0,1 ÷ 20 MHz (hoặc tương đương)	1
8	Máy gia công mẫu gỗ CNC - Hành trình làm việc : 2000 x 2000 x 800mm - Tốc độ làm việc ≥ 10m/min (hoặc tương đương)	1
9	Hệ thống thử nghiệm thông số máy bơm (có chứng nhận kiểm định, định kỳ của đơn vị có chuyên môn)	1
10	Thiết bị điều khiển dòng điện - Dòng điện xuất ra: 6x 0~15A (6 kênh) - Điện áp xuất ra: 4x 0~300V (4 kênh) - Tần số: 1-1000Hz (hoặc tương đương)	1

- Nhà thầu phải chứng minh khả năng huy động tối thiểu các thiết bị thi công chủ yếu cho gói thầu theo bảng danh mục thiết bị thi công chủ yếu nêu trên. Trường hợp thiết bị thuộc sở hữu của nhà thầu thì phải kèm theo các tài liệu để chứng minh thiết bị thuộc sở hữu của mình. Trường hợp đi thuê thì phải có hợp đồng/cam kết cho thuê thiết bị và tài liệu chứng minh thiết bị thuộc sở hữu của bên cho thuê.
- Nhà thầu phải kê khai thông tin chi tiết về các thiết bị tối thiểu huy động để thực hiện gói thầu theo Chương IV - Biểu Mẫu.
- Nhà thầu phải đáp ứng được bằng hoặc tốt hơn yêu cầu về tiêu chuẩn kỹ thuật nghiệm thu sau phục hồi và nghiệm thu chạy thử cho từng chi tiết đã nêu trên.
- Lập báo cáo báo cáo tổng thể, xây dựng bản vẽ hoàn công sau khi hoàn thành phạm vi công việc phục hồi cho từng chi tiết/thiết bị.

2. Mục tiêu công việc:

Tháo giải thể, đánh giá chi tiết, thực hiện gia công phục hồi các chi tiết hư hỏng.

Tổ hợp lắp đặt hoàn thiện, thử nghiệm các thông số vận hành của chi tiết thiết bị sau phục hồi đáp ứng với yêu cầu kỹ thuật vận hành tại nhà máy.

Mục 2. Yêu cầu kỹ thuật của gói thầu:

1. Phạm vi công việc

STT	Danh mục dịch vụ	Thông số kỹ thuật	Mô tả dịch vụ(*)	Khối lượng mời thầu	Đơn vị tính	Địa điểm thực hiện dịch vụ	Ngày hoàn thành dịch
1	**Chèn cơ khí bơm FEED**	Type: DM; Size: 4.875; Material No: 949568-002 Ident No: 01N63676-DB-JF-6958540-11/06 Nsx: Flowserve	- Tháo giải thể các chi tiết, vệ sinh đánh giá lập biên bản hiện trạng. - Phục hồi bộ mặt chính xác động, tĩnh của cụm vành chèn cơ khí. - Phục hồi các chi tiết còn lại (vị trí lắp vành chèn, ống lót trục). - Tổ hợp lắp đặt và thử áp và độ kín vành chèn.	01	Bộ	Nhà máy điện Cà Mau 1&2	30 ngày kể từ ngày hợp đồng có hiệu lực
2	**Actuator for LP induction steam control valve**	Material No.: P0038234400, Drawing No.: A1-SA 500.531 (1 bộ gồm CONTROL BLOCK)	- Tháo giải thể các chi tiết, vệ sinh đánh giá lập biên bản hiện trạng. - Phục hồi độ bóng lòng xylanh, các lò xo hồi vị, các van phân phối, van điều chỉnh lưu lượng. - Phục hồi ty van, mặt chính xác động, tĩnh của van. - Thay mới các chi tiết hư hỏng không có khả năng phục hồi.	01	Bộ		60 ngày kể từ ngày hợp đồng có hiệu lực
3	**BRG FINAL BORE WITH LIFT**	A2A45050626 / PW2384J89G01	- Vệ sinh, tiện bóc lớp bạc cũ, làm sạch bề mặt và tạo gân bám cứng. - Tạo nhám bề mặt ổ đỡ, phun phủ lớp nền và lớp bạc babit. - Gia công các đồ gá, tiện gối đỡ về kích thước tiêu chuẩn. - Kiểm tra NDT sau khi gia công tinh xong.	01	PCE		30 ngày kể từ ngày hợp đồng có hiệu lực
4	**Nash Liquid Ring Vacuum Pumps Bare Shaft**	Type: 2BE1 253-0BY4-Z	- Tháo giải thể các chi tiết, vệ sinh và đánh giá hư hỏng lập biên bản hiện trạng. - Phục hồi ổ đỡ vòng bi gối DE, NDE. Phục hồi bích đầu thân bơm phía DE, NDE.	01	Cái		45 ngày kể từ ngày hợp đồng có

			- Phục hồi cánh động bơm, phục hồi trục bơm (vị trí lắp vòng bi và lắp bạc chèn tết làm kín)./ - Cân bằng động cánh bơm, thay thế các chi tiết ko thể phục hồi. - Lắp đặt hoàn thiện và chạy thử nghiệm thông số vận hành.				hiệu lực
5	**Volute Casing Pump;**	KRP 80-200 K3/WO	- Tháo giải thể các chi tiết, vệ sinh và đánh giá hư hỏng lập biên bản hiện trạng. - Phục hồi trục bơm, vị trí lắp bi, vị trí lắp vành chèn cơ khí, vị trí lắp bán khớp, vị trí lắp cánh bơm. - Phục hồi cánh động bơm. - Phục hồi ổ lắp vành chèn, vị trí lắp vành phòng mòn, buồng bơm. - Cân bằng động cánh bơm, thay thế các chi tiết ko thể phục hồi. - Lắp đặt hoàn thiện và chạy thử nghiệm thông số vận hành.	01	Bộ		45 ngày kể từ ngày hợp đồng có hiệu lực
6	**Circuit breaker size I 1600A**	3WL1116-3FB35-4GA4-Z C22+K07	- Tháo giải thể các chi tiết, vệ sinh và đánh giá hư hỏng lập biên bản hiện trạng. - Phục hồi cơ cấu đóng cắt bằng tay, các tiếp điểm, cuộn coil đóng cắt, replay, cáp tín hiệu, cáp điều khiển. - Kiểm tra các chức năng bảo vệ quá tải, ngắn mạch, chạm đất bằng thiết bị giả lập chuyên dụng.	01	Cái		20 ngày kể từ ngày hợp đồng có hiệu lực

2. Bảng Danh mục vật tư chủ yếu để sử dụng cho công trình

2.1. Yêu cầu về thông số kỹ thuật vật tư

Bảng 04A: Yêu cầu thông số kỹ thuật, tiêu chuẩn thử nghiệm

Stt	Chỉ tiêu kỹ thuật	Đơn vị	Giá trị	Phương pháp kiểm tra	Cơ sở tham chiếu	Ghi chú
1.Chèn cơ khí bơm FEED						
	Vết tiếp xúc các mặt làm kín	%	100	Rà tiếp xúc		
	Thử áp vành chèn	Bar	45	Thử áp theo tiêu chuẩn NSX	Bản vẽ đính kèm	
	Độ nhám các chi tiết sau phục hồi	µm	0,8 – 1,6	Máy đo chuyên dụng	TCVN 2511:1995 / ISO 1302)	
	Độ bóng mặt chính xác	Mm	0.00029	Máy đo kiểm tra vân sáng	Tiêu chuẩn light band	
2. Actuator for LP induction steam control valve						
	Vết tiếp xúc các mặt làm kín	%	100	Rà tiếp xúc		
	Áp lực thử kín van	Bar	160	Thiết bị chuyên dụng	Bản vẽ đính kèm	
	Bộ actuator kiểm tra áp suất làm việc và áp suất rò (giới hạn cho phép)	%	<10	Máy chuyên dụng		
	Tốc độ hành trình	%	<5			
	Tín hiệu điều khiển, tín hiệu phản hồi vị trí sai số (nhỏ hơn hành trình)	%	<1			
3. BRG FINAL BORE WITH LIFT						
	Thử PT lớp bạc sau khi gia công	Khuyết tật, tách lớp, rỗ, nứt	Không	Dụng cụ chuyên dụng		
	Kiểm tra UT	Bất liên tục lớp hàn phun phủ	Không	Thiết bị UT chuyên dụng		

	Kích thước đường kính lòng bạc sau gia công	Mm	±0.03	Đo bằng dụng cụ chuyên dụng		
4. Nash Liquid Ring Vacuum Pumps Bare Shaft						
	Độ cong trục	Mm	<0.02	Đo bằng dụng cụ chuyên dụng		
	Sai số ngõng trục lắp vòng bi	Tiêu chuẩn	h6	Đo bằng dụng cụ chuyên dụng		
	Cánh động cân bằng động	Gram	<2.5	Máy chuyên dụng	SO 1940-1 Grade 2.5	
	Độ nhám các chi tiết sau phục hồi	µm	0,8 – 1,6	Máy đo chuyên dụng	TCVN 2511:1995 / ISO 1302)	
	Thử nghiệm thông số vận hành		Cấp bởi đơn vị có thẩm quyền	Máy thử nghiệm chuyên dụng	TCVN 9222:2012 – ISO 9906	
5. Volute Casing Pump						
	Độ cong trục	Mm	<0.015	Đo bằng dụng cụ chuyên dụng		
	Sai số ngõng trục lắp vòng bi	Tiêu chuẩn	h6	Đo bằng dụng cụ chuyên dụng		
	Cánh động cân bằng động	Gram	<1.5	Máy chuyên dụng	SO 1940-1 Grade 2.5	
	Độ nhám các chi tiết sau phục hồi	µm	0,8 – 1,6	Máy đo chuyên dụng	TCVN 2511:1995 / ISO 1302)	
	Thử nghiệm thông số vận hành		Cấp bởi đơn vị có thẩm quyền	Máy thử nghiệm chuyên dụng	TCVN 9222:2012 – ISO 9906	
6. Circuit breaker size I 1600A						
	Điện trở tiếp xúc giữa các pha	%	<20	Máy đo chuyên dụng		

	Thử cách điện, chịu điện áp, kiểm tra cuộn coil so với danh định	%	±10	Máy đo chuyên dụng		
	Kiểm tra chức năng bảo vệ	lần	>3	Máy chuyên dụng	Cách điện và bảo vệ nằm trong giới hạn IEC 60947-2	

2.2. Yêu cầu chung về vật tư:

- Các vật tư thay thế phải có đủ CO, CQ nếu là hàng hoá nhập khẩu, nếu là hàng hóa trong nước thì phải có chứng nhận xuất xưởng. Toàn bộ vật tư thay thế, nhà thầu có cam kết cấp hàng hóa phải là mới 100% và chưa qua sử dụng, được sản xuất từ năm 2023 trở lại đây.

- Danh mục vật tư thay thế cần thiết (tham khảo) để thực hiện dịch vụ phục hồi như sau:

Stt	Tên chi tiết	Thông số kỹ thuật	Đơn vị	Số lượng	Ghi chú
1	Bạc ty van chi tiết số 15 (Actuator for LP induction steam control valve)	Chi tiết số 15 (bản vẽ tham khảo đính kèm); vật liệu Stell 6B	Cái	2	Gia công mới
2	Mặt chính xác động chi tiết 04 (Actuator for LP induction steam control valve)	Chi tiết số 04 (bản vẽ đính kèm), vật liệu UNS N00825+HCr	Cái	1	Mua mới
3	Tết chèn	8x8mm, Graphit	Kg	0,3	Mua mới
4	Gasket	Chi tiết 18,19(bản vẽ đính kèm)	Bộ	1	Mua mới
5	Vòng bi	NU216-E;DIN5412	Vòng	1	Mua mới
6	Vòng bi	6212-C3;DIN625	Vòng	2	Mua mới
7	Oring	123,42x3,53-N-FPM75;SN63265	Cái	1	Mua mới

8	Vành chặn	110x4;DIN471	Cái	1	Mua mới
9	Tết chèn	14x14; vật liệu PTFE	Kg	1,2	Mua mới
10	Vòng bi	Part No 321.01; TAPROGGE 20-P150-5	Vòng	1	Mua mới
11	Oring	Par No 412.08/11;412.03;TAPROGGE 20-P150-5	Bộ	1	Mua mới

(Tùy vào tình trạng thực tế sau khi giải thể thiết bị để thay thế vật tư)

- Trước khi lắp đặt tổ hợp tại xưởng nhà thầu phải có biên bản xác nhận tình trạng vật tư mới chưa qua sử dụng, phải được kỹ thuật của chủ đầu tư kiểm tra xác nhận tình trạng trước khi lắp đặt tổ hợp.

- Nhà thầu phải chứng minh vật liệu sử dụng phục hồi phải giống hoặc tương đương với vật liệu gốc (về mặt cơ tính, lý tính). Phải có giấy kiểm tra về thành phần vật liệu hoặc chứng mình cơ tính và các đặc tính tương đương.

- Nhà thầu cung cấp tài liệu kỹ thuật để chứng minh vật tư thay thế đáp ứng đủ, đúng hoặc tốt hơn các thông số và yêu cầu kỹ thuật trong HSDT. Nêu rõ ràng cụ thể hãng sản xuất và xuất của vật tư/ thiết bị.

3. Yêu cầu biện pháp thi công

- Căn cứ vào yêu cầu kỹ thuật, phạm vi công việc ở trên, nhà thầu phải thuyết minh biện pháp thi công đầy đủ nội dung đảm bảo các yêu cầu sau đây (đính kèm theo E-HSDT):

+ Nhà thầu lập phương án sửa chữa phục hồi, biện pháp tổ chức thi công, biện pháp kiểm soát chất lượng, có các biểu mẫu đầy đủ, các tiêu chuẩn kiểm tra việc sửa chữa cũng như thiết bị dùng để kiểm tra việc sửa chữa phục hồi trên.

+ Nhà thầu cần tiên liệu được danh mục và số lượng vật tư phục vụ dự kiến mà nhà thầu cung cấp. Các vật tư tiêu hao, vật liệu sử dụng phục hồi Nhà thầu chịu trách nhiệm toàn bộ trong quá trình phục hồi. Vật tư tiêu hao và vật tư thay thế phải có chứng chỉ về chất lượng và xuất xứ.

+ Trình bày rõ các tiêu chuẩn được áp dụng để đảm bảo chất lượng cho vật tư/thiết bị trong quá trình phục hồi.

+ Trình bày cách thức kiểm tra, thử nghiệm phù hợp với biện pháp thực hiện đề xuất trong Hồ sơ dự thầu.

4. Chế độ bảo hành

+ Nhà thầu có trách nhiệm bảo hành toàn bộ vật tư/thiết bị sau phục hồi trong thời gian 18 tháng kể từ ngày ký nghiệm thu bàn giao hoặc 12 tháng kể từ ngày lắp đặt lên máy (tùy thuộc vào điều kiện nào đến trước).

+ Thời gian bắt đầu tiến hành sửa chữa, khắc phục các hư hỏng, sai sót chậm nhất sau 02 ngày kể từ khi nhận được yêu cầu của Chủ đầu tư

+ Trong thời gian bảo hành có bất kỳ khiếm khuyết nào nhà thầu phải sửa chữa lại đảm bảo yêu cầu kỹ thuật theo hợp đồng.

+ Trong trường hợp nhà thầu không thực hiện trách nhiệm bảo hành, Chủ đầu tư buộc phải sửa chữa xử lý thì nhà thầu phải chịu chi phí sửa chữa đó, kể cả chi phí đó vượt giá trị bảo lãnh bảo hành.

5. Quy định về nghiệm thu.

Nhà thầu phải đưa ra phương án chi tiết về trình tự nghiệm thu, đảm bảo vật tư/thiết bị được nghiệm thu theo từng bước/giai đoạn phù hợp với vật tư/thiết bị được phục hồi:

+ Các biểu mẫu phải thể hiện đầy đủ theo yêu cầu kỹ thuật phù hợp với các bước nghiệm thu của từng vật tư/thiết bị theo Phụ lục;

+ Chủ đầu tư có quyền yêu cầu thực hiện nghiệm thu từng bước với một số vật tư/thiết bị quan trọng (nếu cần thiết);

+ Công tác nghiệm thu trước khi xuất xưởng phải đảm bảo đầy đủ: báo cáo tổng hợp quá trình thực hiện, bản vẽ chi tiết, phù hợp với yêu cầu kỹ thuật như giải pháp kỹ thuật cho từng vật tư/thiết bị (đính kèm các biên bản nghiệm thu từng bước/giai đoạn);

+ Tùy thuộc vào tính chất của từng vật tư/thiết bị, các bên sẽ thống nhất biểu mẫu biên bản nghiệm thu cho phù hợp.

6. Cam kết trách nhiệm thực hiện hợp đồng.

+ Cam kết đảm bảo các thông số kỹ thuật sau khi phục hồi đạt các tiêu chuẩn nghiệm thu theo yêu cầu tại mục 2.1, phù hợp với điều kiện vận hành của thiết bị.

+ Cam kết thực hiện đầy đủ nghĩa vụ về bảo hành đáp ứng theo yêu cầu tại Chương V, Mục 2, Điều 2.1.

+ Cam kết thực hiện kiểm tra NDT cho vật tư/thiết bị sau khi phục hồi do đơn vị đủ năng lực và tư cách pháp nhân thực hiện, nếu tự thực hiện thì phải có bộ hồ sơ chứng minh năng lực và tư cách pháp nhân cho công tác này.

DANH MỤC BẢN VẼ ĐÍNH KÈM

STT	Mã vật tư	Tên chi tiết	Thông số kỹ thuật	Đơn vị tính	Số lượng	Tên bản vẽ đính kèm
1	48521010	Chèn cơ khí (Mechanical Seal)	Type: DM; Size: 4.875; Material No: 949568-002 Ident No: 01N63676-DB-JF-6958540-11/06 Nsx: Flowserve	BO	1	No. 949568
2	39500531	Actuator for LP induction steam control valve	Material No.: P0038234400, Drawing No.: A1-SA 500.531 (1 bộ gồm CONTROL BLOCK)	BO	1	A1-SA 500.532
3	54050626	BRG FINAL BORE WITH LIFT	A2A45050626 / PW2384J89G01	PCE	1	Khảo sát thực tế theo kích thước hiện trạng
4	51720253	Nash Liquid Ring Vacuum Pumps Bare Shaft,	Type: 2BE1 253-0BY4-Z	CAI	1	2BE1101-0.253-0
5	51765007	Volute Casing Pump;	KRP 80-200 K3/WO	BO	1	TAPROGGE 20-P150-5
6	34618160	Circuit breaker size I 1600A	3WL1116-3FB35-4GA4-Z C22+K07	CAI	1	3WL1116-3FB35-4GA4-Z

EG-Herstellererklärung

(nach Artikel 4 Absatz 2 der europäischen Richtlinie 98/37/EG)

DEUTSCH

Hersteller: Gardner Denver Nash Deutschland GmbH

Anschrift: Katzwanger Strasse 150
90461 Nürnberg, DEUTSCHLAND

Produktbezeichnung: **Flüssigkeitsring-Vakuumpumpen mit Fremdantrieb**

Reihe **2BE1101-0 ... 253-0**

Das bezeichnete Produkt ist ausschließlich zum Einbau in eine andere Maschine bestimmt. Die Inbetriebnahme ist so lange untersagt, bis die Konformität des Endproduktes mit der Richtlinie 98/37/EG festgestellt ist.

Wir bestätigen die Übereinstimmung des oben bezeichneten Produktes mit den Normen:

EN ISO 12100-1
EN ISO 12100-2
EN 294
EN 563
EN 626-1
EN 1012-2

Nürnberg, den 2005-09-29

John E. Whalen, Managing Director

i. V. P. Trimborn

Dr. Peter Trimborn, Director Product Management + R&D

Diese Erklärung ist keine Zusicherung von Eigenschaften im Sinne der Produkthaftung.
Die Sicherheitshinweise der Produktdokumentation sind zu beachten!

ENGLISH / FRANÇAISE / ESPAÑOL / ITALIANO / SVENSKA

EC declaration of manufacturer

(in accordance with article 4 paragraph 2 of European Directive 98/37/EC)

Déclaration du constructeur CE

(selon Art. 4 paragraphe 2 de la directive européenne 98/37/CE)

Declaración CE del fabricante

(según el Art. 4 apartado 2 de la directiva europea 98/37/CE)

Dichiarazione CE del costruttore

(in conformità all articolo 4 paragrafo 2 della direttiva europea 98/37/CE)

EG tillverkarförklaring

(enligt Art. 4 paragraf 2 i europeisk direktiv 98/37/EG)

Manufacturer / Constructeur / Fabricante / Costruttore / Tillverkare

Gardner Denver Nash Deutschland GmbH

Product name / Désignation du produit / Designación del producto / Denominazione del prodotto / Produktbeteckning

Liquid-ring vacuum pumps – separately driven ...
Pompes a vide à anneau liquide – entraînement par moteur séparé ...
Bombas de vacío tipo anillo líquido – accionamiento por motor separado ...
Pompe per vuoto ad anello liquido – azionamento esterno ...
Vätskaring-Vakuumpumparna – extern drivning ...

2BE1101-0 ... 253-0

The product indicated is intended solely for fitting to another machine. Commissioning is prohibited until conformity of the end product with directive 98/37/EC has been established.

Le produit décrit ci-dessus est exclusivement destiné a être intégré dans une autre machine. La mise en service est interdite aussi longtemps que la conformité du produit final avec la directive 98/37/CE n'a pas été établie.

El producto especificado esta destinado exclusivamente a su montaje en otra máquina. Se prohibe la puesta en servicio en tanto que hace comprobado que el producto final concuerda con la directiva 98/37/CE.

Il prodotto indicato è destinato solo a far parte di una altra macchina. La messa in servizio non può essere eseguita finché non sia verificata la conformità del prodotto finale alla direttiva 98/37/CE.

Den angivna produkten är uteslutande avsedd att monteras i en annan maskin. Igångsättande tillåts ej föran slutproduktens överensstämmelse med direktiv 98/37/EG har fastställts.

We confirm conformity of the product indicated above with the standards:
Nous certifions la conformité du produit mentionné ci-dessus avec les normes:
Confirmamos la conformidad del producto especificado con las normas siguientes:
Si certifica la conformità del prodotto alle norme seguente:
Vi bekräftar övan angivna produkt överensstämmelse med standarderna:

EN ISO 12100-1
EN ISO 12100-2
EN 294
EN 563
EN 626-1
EN 1012-2

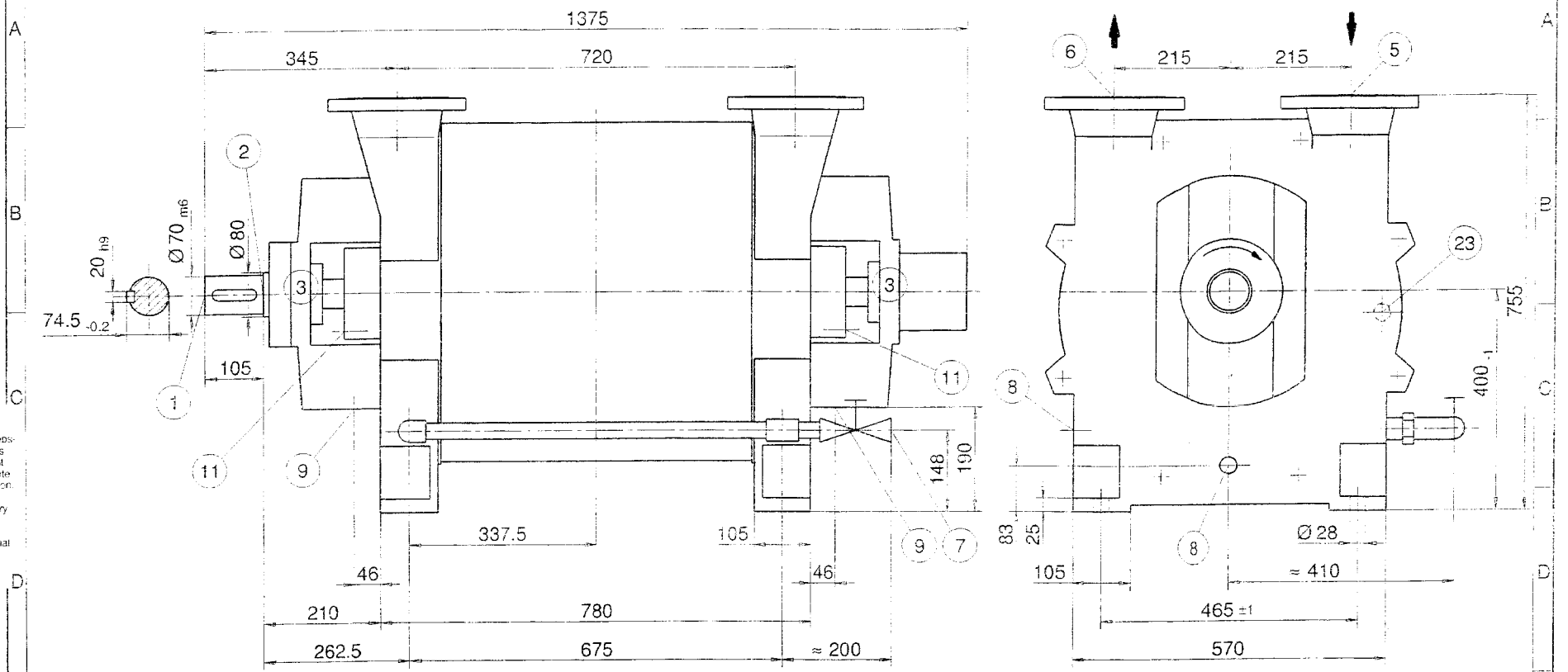
This declaration is not a warranty of attributes within the meaning of product liability.
The safety notes given in the product documentation shall be observed!

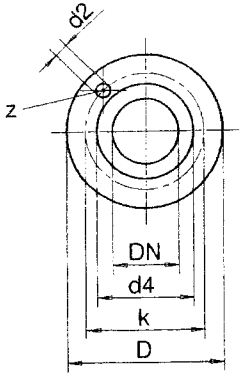
Cette déclaration n'est pas une garantie de propriété au sens de la responsabilité civile du fait des produits.
Respecter les règles de sécurité mentionnée dans la documentation du produit!

Esta declaración no garantiza ninguna propiedad en el sentido de la responsabilidad civil sobre productos.
¡Observar las indicaciones de seguridad en la documentación del producto!

La presente dichiarazione non rappresenta una garanzia ai sensi della responsabilità del prodotto.
Vanno osservate le istruzioni di sicurezza riportate nella documentazione del prodotto!

Denna deklaration får inte uppfattas som försäkran om egenskaper enligt krav i produktansvar.
Ge akt på säkerhetsanvisningarna i produktdokumentationer!





Anschlußmaße geeignet für

Mating dimensions suitable for

	DIN 2501 (5)	DIN 2501 (6)	ANSI B 16.5 (5)	ANSI B 16.5 (6)	JIS B2238 10K (5)	JIS B2238 10K (6)
DN	125		5"		125	
d4	188		185.7		188	
k	210		215.9		210	
D	250		254		250	
z	8		8		8	
d2	18		22.2		18	

○ Erläuterungen siehe Textblatt
Legend see textsheet

Darstellung / Representation

Werkstückkanten nach DIN 6784
Tol ISO 8015
ISO 2768-m-K (spanend/cutting)
ISO 2768-c-L (umformend/forming)

Maßstab / Scale 1:7 | Gew. / Wt. 890 kg

Design V3.8A00

AC	OCE	01.10.04	neu	Datum 28.04.98
				Name Kastl
				A&D PU PES
				nash_elmo
Stat.	Mitteilung/Notice	Datum/Date	Name	GmbH Nbg

W-Nr. / No. normal

DIN / ANSI / JIS

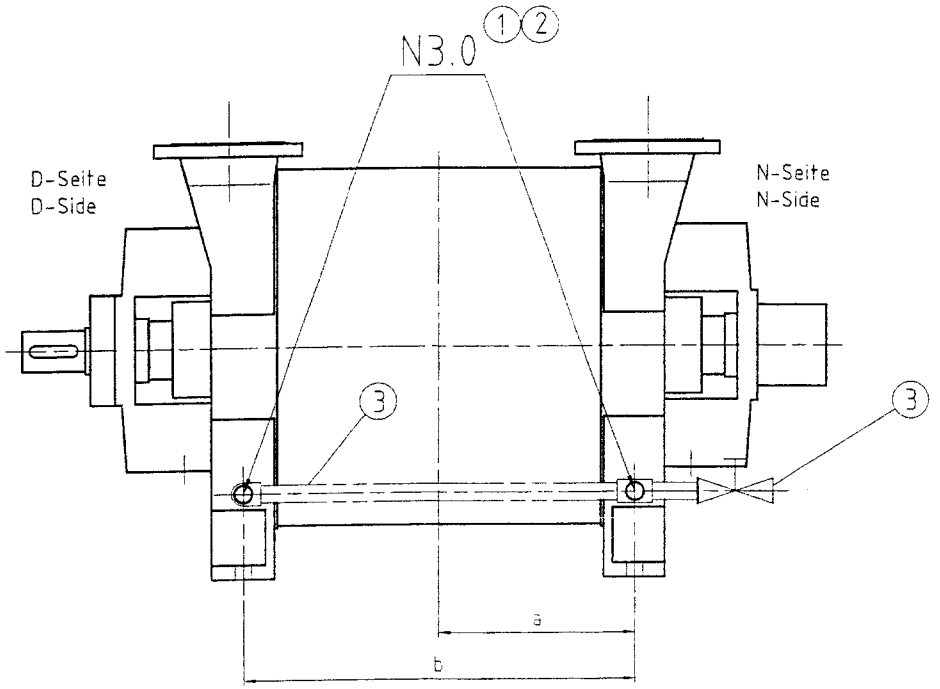
MASZBILD
DIMENSION DRAWING

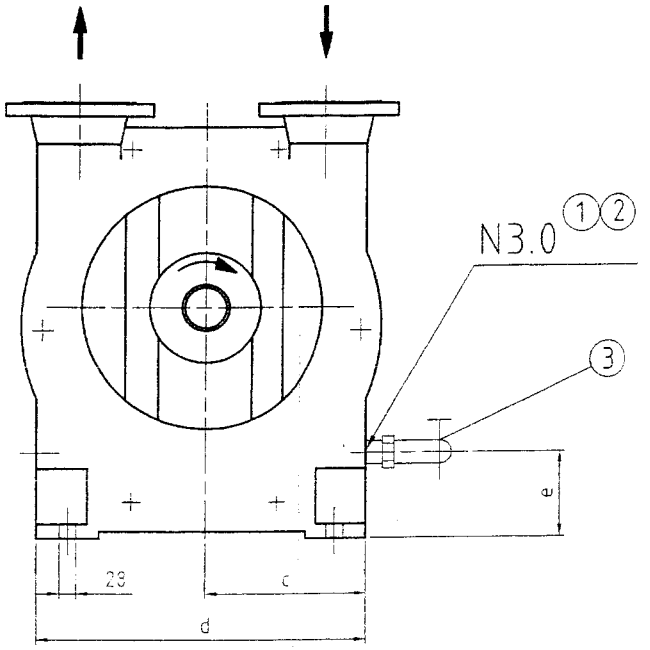
Typ/Type 2BE1 253

Blatt / Page 1-

Ersatz für / Replacement for -
Entstanden aus / Originated from ZWEITORIGINAL

S984627





N3.0 Anschluss Betriebsflüssigkeit / Connection for operating liquid

2BE1 . . .	101	102	103	151	152	153	202	203	252	253
a	-	125.5	158	147,5	160	190	197.5	257.5	262.5	337.5
b	-	251	316	295	320	380	395	515	525	675
c	137.5			165			215		285	
d	275			330			430		570	
e	74			94			127		148	
① ISO 7/1- . . .	Rp 1/2			Rp 1/2			Rp 3/4		Rp 1	
②	1*	2								
③ ISO 7/1- . . .	Rp 3/4			Rp 3/4			Rp 1		Rp 1 1/4	
ANSI . . . NPT	3/4 - 14			3/4 - 14			1 - 11 1/2		1 1/4 - 11 1/2	

* bei 2BE1 101 nur auf der Nichtantriebsseite "N-Seite" / at 2BE1 101 only on the non drive side "N-Side"

① Die Betriebsflüssigkeitszuführung erfolgt direkt an den Seitenschilden.
② Anzahl der erforderlichen Anschlüsse pro Pumpe. Größe nach ①.
③ Betriebsflüssigkeitsleitung und Ventil seit Auftragseingang April 2005 nicht mehr im Lieferumfang enthalten.

① The operating liquid inlet is directly at the end shields.
② Amount of the required connections per pump. Size acc. ①.
③ Operating liquid piping and valve are no longer in scope of supply since incoming orders April 2005.

Autocad V 2004 — AUTOCAD-DRAWING - DO NOT REV. MANUALLY

Darstellung Representation

Tol. ISO 8015 / ISO 2768 -m-K (spanend/cutting)

Maszstab: Scale: | Einheit: Dim: mm | Gewicht: Weight:

Rev.	Description	Date	Name
AA	RD D	14.04.05	PI

Date 14.04.05
Name Plescher
RD D
nash_elmo
Nbg

Entstanden aus/Originatet from -
Ersatz für/Replacement for -

W-Nr. No. normal — new standard

TAB. BETRIEBSFLÜSSIGKEIT
TAB. OPERATING LIQUID

Typ / Type 2BE1 101 . . . 2BE1 253

S986458

Sheet 1 of 1

ELMO-F-FLUESSIGKEITSRING-VACUUMPUMPE
ELMO-F LIQUID-RING VACUUM PUMP

ALLGEMEINE ANGABEN / GENERAL DATA

MASCHINENTYP / TYPE OF MACHINE	: 2BE1253
TYP-ZUSATZANGABEN ADDITIONAL TYPE CHARACTERISTICS	: ---
MASSBILD-NR. / DIMENSION DRAWING NO.	: S98 4627
DREHRICHTUNG (AUF AS GESEHEN) DIRECTION OF ROTATION (FACING D.E. SHAFT END)	: RECHTS CLOCKWISE
GESAMTGEWICHT / TOTAL WEIGHT	: 890 KG
LAEUFERGEWICHT / WEIGHT OF ROTOR	: 300 KG
ANLAUF-TRAEGHEITSMOMENT STARTING MOMENT OF INERTIA	: 7.75 KGM2
(BEI VORSCHRIFTSMAESSIG GEFUELLTER MASCHINE) (WITH CORRECTLY FILLED MACHINE)	
FUNDAMENTBELASTUNG NACH ZEICHNUNG NR. FOUNDATION LOADING ACC. TO DRAWING NO.	: T80 6051
DRUCKKRAFT / COMPRESSIVE FORCE	: 12 KN
ZUGKRAFT / TENSILE FORCE	: 2 KN

STOPFBUCHS-DICHTUNG / STUFFING BOX SEAL

MIT EIGENSPUELUNG ODER FREMDSPUELUNG
WITH INTERNAL OR EXTERNAL LIQUID SUPPLY

BUERO OFFICE	MF TP	TEXTBLATT / TEXTSHEET	
DATUM DATE	04.08.2005	FUER MASSBILD FOR DIMENSION DRAWING	: S98 4627
BEARBEIT. DRAWN	von Thenen	Gardner Denver Nash	T98 4628 INDEX: C
ERSATZ F. SUBST. F.	PROG.NR. TP573		BLATT 1+ PAGE

A

ALLGEMEINE HINWEISE / GENERAL INSTRUCTIONS

DER LAEUFER IST MIT EINGELEGTER HALBER PASSFEDER GEWUCHTET.
THE ROTOR IS BALANCED WITH HALF KEY INSERTED IN THE KEYWAY.

ERLAEUTERUNGEN ZUM MASSBILD DER MASCHINE
LEGEND FOR DIMENSION DRAWING OF MACHINE

(1)	ZENTRIERBOHRUNG / TAPPED CENTRE HOLE	M20 X 42
(2)	FREISTICH / RELIEF GROOVE	E1.6 X 0.3 DIN 509
(3)	WAELZLAGER / ROLLING-CONTACT BEARING	
	AS-LAGER / DRIVE END BEARING	NU216E DIN 5412
	BS-LAGER / NON-DRIVE END BEARING	NU216E DIN 5412
		2X 6212 C3 DIN 625

OHNE NACHSCHMIERUNG / WITHOUT RELUBRICATION

(5)	SAUGFLANSCH AM SEITENSCHILD INTAKE FLANGE OF END SHIELD	DN 125 PN 10 DIN 2501
(6)	DRUCKFLANSCH AM SEITENSCHILD DISCHARGE FLANGE OF END SHIELD	DN 125 PN 10 DIN 2501
(7)	ANSCHLUSS / CONNECTION	RP 1 1/4 ISO 7/1
	FUER BETRIEBS-FLUESSIGKEIT FOR WORKING LIQUID	
(8)	ANSCHLUSS / CONNECTION	RP 1 ISO 7/1
	FUER ENTLEERUNG UND SPUELUNG FOR DRAIN AND FLUSHING	
	AN BEIDEN SEITENSCHILDEN ON BOTH END SHIELDS	

BUERO / OFFICE	MF TP	TEXTBLATT / TEXTSHEET	
DATUM / DATE	04.08.2005	FUER MASSBILD / FOR DIMENSION DRAWING	: S98 4627
BEARBEIT. / DRAWN	von Thenen		
ERSATZ F. / SUBST. F.	PROG.NR. TP573	Gardner / Denver / Nash	T98 4628 BLATT 2+ PAGE INDEX: C

(9)	ANSCHLUSS / CONNECTION FUER SICKER-FLUESSIGKEITS-ABLAUF FOR LEAKAGE DRAIN	RP 3/4	ISO 7/1
(11)	ANSCHLUSS FUER FREMDSPUELUNG DER STOPFBUCHS-DICHTUNG CONNECTION FOR EXTERNAL LIQUID SUPPLY OF STUFFING BOX SEAL FALLS BESTELLT / UNLESS ORDERED OTHERWISE	RP 1/4	ISO 7/1
(23)	ANSCHLUSS / CONNECTION FUER ABLEITUNG / FOR DRAINING DER UEBERSCHUESSIGEN BETRIEBSFLUESSIGKEIT OF EXESS WORKING LIQUID NUR AUF BS / AT NON-DRIVE END ONLY	RP 1	ISO 7/1

AENDERUNGEN VORBEHALTEN / SUBJECT TO CHANGE

BUERO / OFFICE	MF TP	TEXTBLATT / TEXTSHEET	
DATUM / DATE	04.08.2005	FUER MASSBILD / FOR DIMENSION DRAWING	: S98 4627
BEARBEIT. / DRAWN	von Thenen	Gardner	T98 4628 BLATT 3-
ERSATZ F. / SUBST. F.	PROG.NR. TP573	Denver / Nash	PAGE / INDEX: C

Gardner Denver
Nash Deutschland GmbH
Liquid Ring Pumps
Nuremberg, Germany

TEILE LISTE / PARTS LIST

Auftragsnr./Works-No.: 553039 010 **Typ : 2BE1 253 0BY4-Z** **Datum: 11.05.2006**
Fnr./Serial-No.: 553039 010 001-004 **Add.: F64 F74** **Seite: 1 / 3**

Pos.	Bezeichnung/Designation	Bestell-Nr./OrderNo.	Menge/qty	Bemerkung/remark	Text	Gewicht/Weight(kg
10.00	LAEUFER / ROTOR	S815519V08	1,00 ST	DIN1693 GGG-40	Ersatzlaeufer/Impeller spare part	289,000
10.01	LAUFRAD / IMPELLER	S815519001	1,00 ST	DIN1693 GGG-40	Teil-Nr./Part-No.: 1.01	191,000
10.02	WELLE / SHAFT	S821164001	1,00 ST	ST52-3	Teil-Nr./Part-No.: 1.02	98,000
10.03	PASZFEDER / FEATHER KEY	S820432A01	1,00 ST	C45K	WELLENENDE / SHAFT END	0,200
15.01	STOPFBUCHSBRILLE / STUFFING BOX GLAND	T876065001	1,00 ST	GG-20	Teil-Nr./Part-No.: 11.01	2,800
15.02	STOPFBUCHSGEHAEUSE / STUFFING BOX HOUSING	S874062001	1,00 ST	GG-20	Teil-Nr./Part-No.: 11.02	11,000
15.03	DICHTUNG / GASKET	T878116001	1,00 ST	AREL-U	Teil-Nr./Part-No.: 11.03	
15.04	SECHSKANTSCHRAUBE / HEXAGON HEAD SCREW	1328099000	2,00 ST	ISO4017 M12X60 8.8-A2F	Teil-Nr./Part-No.: 11.04	
15.05	SCHEIBE / WASHER	1378072001	2,00 ST	ISO7089 12-200HV A2F	Teil-Nr./Part-No.: 11.05	0,006
15.06	SECHSKANTSCHRAUBE / HEXAGON HEAD SCREW	1328492000	4,00 ST	ISO4017 M12X80 8.8-A2F	Teil-Nr./Part-No.: 11.06	1,000
17.01	STOPFBUCHSPACKUNG / STUFFING BOX PACKING	1932117500	0,63 KG	14X14-BURATEX 4003 FETT-BAUMWOLLE	Teil-Nr./Part-No.: 10.01	
17.02	SPERRKAMMERRING / SEALING-WATER DISTR. RING	T878104001	1,00 ST	PROTOLEST	Teil-Nr./Part-No.: 10.02	0,290
22.01	SCHONBUCHSE / SHAFT BUSHING	S823248001	1,00 ST	SEW410 1.4086	Teil-Nr./Part-No.: 2.01	4,500
22.02	O-RING / O-RING	1921203200	1,00 ST	SN63265 123,42X3,53-N-FPM75-SW	Teil-Nr./Part-No.: 2.02	
22.03	SICHERUNGSRING / RETAINING RING	1414173000	1,00 ST	DIN471 110X4	Teil-Nr./Part-No.: 2.03	0,070
30.00	STEUERSCHEIBE-AS / PORT PLATE D-END	S834628	1,00 ST	DIN EN 1561 GG-20	Teil-Nr./Part-No.: 3.01	37,000
30.03	STOPFEN / PLUG	1457177700	4,00 ST	EN10242 290-1/4-V	KAVISCHUTZ-LTG/ANTI-CAVITATION-PIPE	
32.00	STEUERSCHEIBE-BS / PORT PLATE ND-END	S834632	1,00 ST	DIN EN 1561 GG-20	Teil-Nr./Part-No.: 4.01	37,000
35.00	GEHAEUSE / CASING	S844711001	1,00 ST	DIN EN 1561 GG-20	Teil-Nr./Part-No.: 6.01	134,000
35.50	DICHTMITTEL / JOINTING MEDIUM	2219114700	50,00 G	STUCARIT GEL410/2		
36.01	ZUGANKER / TIE-BOLT	1468130400	8,00 ST	DIN EN ISO 898-1 M20X845 A9K 5.6	Teil-Nr./Part-No.: 6.02	1,800
36.02	SECHSKANTMUTTER / HEXAGON NUT	1362101700	16,00 ST	ISO4032 M20-8-A2F	Teil-Nr./Part-No.: 6.03	0,064
36.03	SCHEIBE / WASHER	1378112901	16,00 ST	ISO7089 20-200HV A2F	Teil-Nr./Part-No.: 6.04	0,017
37.01	FANGPLATTE / INTERCEPTING PLATE	T838226	1,00 ST	1.4571	Teil-Nr./Part-No.: 5.01	0,500
37.02	VENTILPLATTE / VALVE PLATE	T838222001	1,00 ST	PTFE	Teil-Nr./Part-No.: 5.02	0,120
37.03	DISTANZBUCHSE / DISTANCE BUSHING	S838338001	3,00 ST	1.4571	Teil-Nr./Part-No.: 5.03	
37.04	SECHSKANTSCHRAUBE / HEXAGON HEAD SCREW	1392123300	3,00 ST	ISO4017 M12X35 A4.70	Teil-Nr./Part-No.: 5.04	
40.00	SEITENSCHILD / END SHIELD	S850923B01	1,00 ST	DIN1691 GG-20	Teil-Nr./Part-No.: 7.01	118,000
40.01	SEITENSCHILD / END SHIELD	S854595004	1,00 ST	DIN1691 GG-20	Teil-Nr./Part-No.: 7.01 / 8.01	130,000
40.02	STOPFEN / PLUG	1457177100	5,00 ST	EN10242 290-1-V	Teil-Nr./Part-No.: 7.02	
40.08	ZYLINDERSCHRAUBE / HEXAGON HEAD CAP SCREW	1323122600	2,00 ST	ISO4762 M10X60-8.8-A2F-EN10204-2.1	Teil-Nr./Part-No.: 7.08	

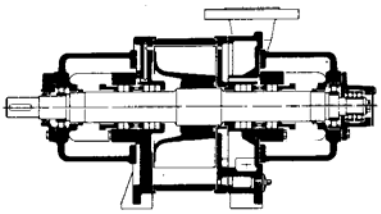
Pos.	Bezeichnung/Designation	Bestell-Nr./OrderNo.	Menge/qty	Bemerkung/remark	Text	Gewicht/Weight(kg
40.10	STOPFEN / PLUG	1457175300	2,00 ST	DIN2991 S1/2 1.4401	Teil-Nr./Part-No.: 7.10 / 8.10	
40.50	DICHTMITTEL / JOINTING MEDIUM	2219104200	100,00 G	EPPLE 22 F-LEICHTENTZUENDLICH		
41.01	SEITENSCHILD / END SHIELD	S854595004	1,00 ST	DIN1691 GG-20	Teil-Nr./Part-No.: 8.01	130,000
41.02	STOPFEN / PLUG	1457177100	5,00 ST	EN10242 290-1-V	Teil-Nr./Part-No.: 8.02	
41.08	ZYLINDERSCHRAUBE / HEXAGON HEAD CAP SCREW	1323122600	2,00 ST	ISO4762 M10X60-8.8-A2F-EN10204-2.1	Teil-Nr./Part-No.: 8.08	
50.01	ZYLINDERROLLENLAGER / CYLINDRICAL ROLLER BEARING	2511134500	1,00 ST	DIN5412 NU216-E	Teil-Nr./Part-No.: 12.01	1,520
50.03	LAGERGEHAEUSE / BEARING HOUSING	S892196001	1,00 ST	DIN1691 GG-20	Teil-Nr./Part-No.: 12.03	22,000
50.04	WELLENDICHTRING / SHAFT SEALING RING V-RING	1932115400	1,00 ST	SN63256 V-100S-NBR	Teil-Nr./Part-No.: 12.04	0,020
50.06	LAGERDECKEL / BEARING CAP	J013667002	1,00 ST	DIN1691 GG-15	Teil-Nr./Part-No.: 12.06	
50.07	WELLENDICHTRING / SHAFT SEALING RING V-RING	1932115200	1,00 ST	SN63256 V-80S-NBR	Teil-Nr./Part-No.: 12.07	0,020
50.08	SECHSKANTSCHRAUBE / HEXAGON HEAD SCREW	1328456000	4,00 ST	ISO4017 M20X40 8.8-A2F	Teil-Nr./Part-No.: 12.08	
50.09	SECHSKANTSCHRAUBE / HEXAGON HEAD SCREW	1328336000	4,00 ST	ISO4017 M10X45 8.8-A2F	Teil-Nr./Part-No.: 12.09	
51.01	ZYLINDERROLLENLAGER / CYLINDRICAL ROLLER BEARING	2511134500	1,00 ST	DIN5412 NU216-E	Teil-Nr./Part-No.: 13.01	1,520
51.02	RILLENKUGELLAGER / DEEP-GROOVE ROL. BEARING	2510138100	2,00 ST	DIN625 6212-C3	Teil-Nr./Part-No.: 13.02	2,500
51.03	LAGERGEHAEUSE / BEARING HOUSING	S892196001	1,00 ST	DIN1691 GG-20	Teil-Nr./Part-No.: 13.03	22,000
51.04	WELLENDICHTRING / SHAFT SEALING RING V-RING	1932115400	1,00 ST	SN63256 V-100S-NBR	Teil-Nr./Part-No.: 13.04	0,020
51.06	FESTLAGERGEHAEUSE / LOCATING BEARING HOUSING	S892186002	1,00 ST	DIN1691 GG-20	Teil-Nr./Part-No.: 13.06	4,000
51.07	GEWINDERING / THREADED RING	T898159	1,00 ST	DIN17100 ST37-2	Teil-Nr./Part-No.: 13.07	0,440
51.08	LAGERDECKEL / BEARING CAP	T898165	1,00 ST	EN10130 ST37	Teil-Nr./Part-No.: 13.08	0,300
51.09	AUSGLEICHSCHEIBE / COMPENSATING WASHER	T898168	4,00 ST	MESSING	Teil-Nr./Part-No.: 13.09	8,000
51.10	AUSGLEICHSCHEIBE / COMPENSATING WASHER	1378109600	1,00 ST	NORM1100 6205-K2 FEDERSTAHL DIN	Teil-Nr./Part-No.: 13.10	0,010
51.11	PASZSCHEIBE / SHIM RING	1425113200	1,00 ST	DIN988 ST2K50	Teil-Nr./Part-No.: 13.11	
51.12	DRUCKSCHEIBE / THRUST PLATE	S898291	1,00 ST	ST	Teil-Nr./Part-No.: 13.12	
51.13	SCHEIBE / WASHER	1377101300	1,00 ST	DIN432 21 ST-A2F	Teil-Nr./Part-No.: 13.13	
51.14	SECHSKANTSCHRAUBE / HEXAGON HEAD SCREW	1328456000	4,00 ST	ISO4017 M20X40 8.8-A2F	Teil-Nr./Part-No.: 13.14	
51.15	SECHSKANTSCHRAUBE / HEXAGON HEAD SCREW	1328178000	4,00 ST	ISO4017 M10X25 8.8-A2F	Teil-Nr./Part-No.: 13.15	
51.16	SECHSKANTSCHRAUBE / HEXAGON HEAD SCREW	1328457000	1,00 ST	ISO4017 M20X50 8.8-A2F	Teil-Nr./Part-No.: 13.16	0,180
51.17	SECHSKANTSCHRAUBE / HEXAGON HEAD SCREW	1328170200	3,00 ST	ISO4017 M6X10 8.8-A2F	Teil-Nr./Part-No.: 13.17	
51.18	DICHTMITTEL / JOINTING MEDIUM	2219118600	30,00 G	TEROSTAT-33 TRANSPARENT AMINVERNETZEND		
79.00	DECKLACK / FINISHING PAINT	2231171200	3,00 KG	2K-PUR-AY-THIXOTROP RAL7001 SILBERGRAU		
98.00	DOKUMENTATION / DOCUMENTS:					
98.01	MASZBILD / DIMENSIONAL DRAWING	S984627	1,00 ST			
98.03	TABELLE-BETRIEBSFLUESSIGKEIT / TABLE OPERATING LIQ	S986458	1,00 ST			

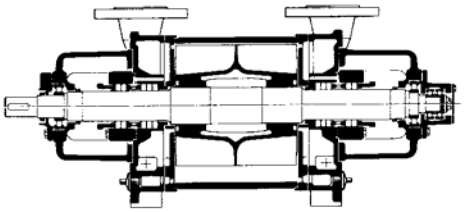
Pos.	Bezeichnung/Designation	Bestell-Nr./OrderNo.	Menge/qty	Bemerkung/remark	Text	Gewicht/Weight(kg
	UID					
98.10	BETRIEBSANLEITUNG / INSTRUCTIONS	A1A3325DE	1,00 ST			
98.11	BETRIEBSANLEITUNG / INSTRUCTIONS	A1A3371DE	1,00 ST			
98.20	Herstellererklaerung / DECLARATION OF MANUFACTUR	A1B3325H001EU	1,00 ST			
98.40	Herstellererklaerung / DECLARATION OF MANUFACTUR		1,00 ST			
98.50	UNBEDENKLICHKEITSERKLAERUNG / DECLARATION OF CLEAR	A1B3390EN	1,00 ST			
	ANCE					

Nash Vacuum Pumps

Instructions

Types 2BE1 10. to 2BE1 25.





Single-stage, single-acting design

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Contents

⚠ WARNING

The machines with the relevant drive motors consist of equipment for use in industrial systems including heavy current installations. Depending on the operating conditions, particularly where dangerous media may be used, improper handling could lead to severe personal injury or property damage.

Those responsible for safety of the installation must therefore ensure that

- only qualified personnel are entrusted with work on the machines,
- these persons always have at their disposal the supplied operating instructions and other product documentation when doing such work, and they undertake to follow any such instructions consistently,
- nonqualified personnel are not permitted to work on or near the machines.

1 General

1.1 Safety-related terms

The signal terms DANGER, WARNING, CAUTION and NOTE are used in these instructions to point out particular dangers or unusual information which must be particularly noted:

⚠ DANGER

DANGER indicates that death and/or substantial property damage will result if proper precautions are not taken.

⚠ WARNING

WARNING indicates that severe personal injury and/or substantial property damage will result if proper precautions are not taken.

⚠ CAUTION

CAUTION indicates that personal injury or property damage will result if proper precautions are not taken.

NOTE

NOTE indicates special technical product information which may not be particularly obvious to qualified personnel and therefore needs to be highlighted.

It is equally imperative, however, to comply with other notes on transport, assembly, operation and maintenance not particularly emphasized, and with technical data (in the operating instructions, product documentation and on the machine itself) to avoid faults which, in turn, might directly or indirectly result in severe personal injury or property damage.

Qualified personnel are persons who, on account of their training, experience and instruction and their knowledge of relevant standards, specifications, accident prevention regulations and operating conditions, have been authorized by those responsible for the safety of the plant to carry out the necessary work and who are able to recognize and avoid possible dangers.
Among other things, a knowledge of first aid is also required, as is information about local rescue facilities.
The stipulation to the effect that only qualified personnel may work on heavy current installations can be found in VBG 4 or DIN VDE 0105 or IEC 364, for example.

1.2 General safety information

The machines described here are parts of installations for industrial applications and are designed in accordance with generally accepted engineering practice.

⚠ DANGER

Owing to their functional characteristics, such equipment may cause serious personal injury or material damage when improperly used, wrongly operated, insufficiently serviced, or in the event of unauthorized interventions by unqualified personnel. This is particularly true of machines which involve the use or transport of high temperatures or pressure differences or of hazardous media.

⚠ WARNING

It is presumed that basic planning work concerning the installation and all work regarding transport, assembly, commissioning, maintenance and repair will be done by qualified personnel or checked by responsible skilled personnel.

In doing so, particular note must be taken of the following:

- the technical data and information concerning permissible use (assembly, connection, ambient and operating conditions) contained, among other things, in the catalog, order documents, operating instructions, data plate and other product documentation,
- the general erection and safety regulations,
- the local, plant-specific specifications and requirements,
- the proper use of tools, hoisting gear and transport devices,
- the use of personal protective gear.
- The obligation of the responsible party to instruct the employees in safety according to VBG 4 § 7 and § 8 of the German ACCIDENT PREVENTION REGULATIONS and § 20 of the German DANGEROUS SUBSTANCES REGULATIONS (or relevant national regulation) with regard to the safe use of substances representing a hazard to health or the environment, such as cleaning, lubrication or bonding agents, paints, varnishes etc. Detailed informations on particular products are to be found in the "safety information sheet" of the producer or importer.

Operating instructions cannot claim to cover all details of possible equipment variations nor can they, in particular, provide for every possible example of installation, operation or maintenance.
Accordingly, the instructions relating to machines for industrial applications normally only include the directions that need to be mentioned for qualified personnel (see above) where the equipment is used for its defined purpose.
If, in special cases, it is intended to use machines in non-industrial areas, where requirements may be more stringent, compliance with such requirements must be assured during installation by providing additional protective measures on site.
If there are any uncertainties in this respect, particularly in the event of a lack of product-related information, clarification must be obtained via the appropriate Nash sales office. Please always indicate the machine type and serial number.

YOU ARE ADVISED TO ASK FOR THE ASSISTANCE AND SERVICES OF THE COMPETENT NASH SERVICE CENTERS with regard to INSTALLATION, COMMISSIONING AND SERVICING.

NOTE

For general work such as checking incoming deliveries (with regard to transport damage), for storage and preservation of machines for prolonged periods of time, foundation testing, fitting of couplings, installation and alignment of machines etc., further detailed information can be found in our installation instructions obtainable from the Nash sales offices.

NOTE

Attention is drawn to the fact that the contents of instruction manuals and product documentation shall not become part or modify any prior or existing agreement, commitment or legal relationship. The sales contract, which also contains the complete and solely valid warranty stipulations, contains the entire obligations of Nash. These contractual warranty stipulations are neither extended nor limited by the statements given in instructions and documentation.

1.3 Transport

Refer to the last page of these instruction for advice on transport.

1.4 Storage

If a machine is not put into operation immediately after arrival, store it in a dry, vibration-free room. For details, refer to the general Nash installation instructions, for example.

NOTE

If required by the materials involved, the machines are protected with an anti-corrosion agent which permits them to be stored for approx. 4 months. If longer storage is envisaged, special anti-corrosion measures are generally necessary, e.g. drying the machine and sealing it in foil in which bags of silica gel have been inserted.

Refer also to Section 4.3 "Prolonged shutdown periods" and general erection instructions.

2 Description

2.1 Mode of operation, mechanical design

Nash vacuum pumps (referred to below as machines) are single-stage liquid-ring machines and are used to transport gases and vapors, predominantly for intake pressures below atmospheric pressure. An impeller rotates in a cylindrical casing which is arranged off-center with respect to the shaft (see Figures 2.1a to 2.1c). Rotation of the impeller causes the operating liquid to form a rotating liquid ring in the casing which oscillates in and out like a piston in the pockets between the blades. On the intake side, it rises off the impeller hub and the fed gas enters the enlarged volume axially through the intake port. On the discharge side, the liquid ring approaches the hub again and forces out the compressed gas axially through the discharge port.

NOTE

The product is suitable for transportation of dry and humid gases without dangerous effects and for operating liquids, which are not inflammable, explosive poisonous or aggressive. Machines for flammable, explosive poisonous or aggressive media are supplied in accordance with customer specifications. The relevant safety precautions, must in this case, be taken by the user.

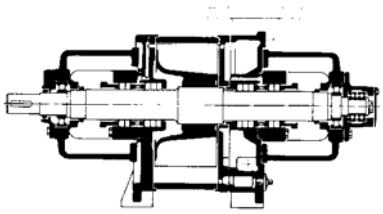


Figure 2.1a Sectional view: 2BE1 101 ("Single-flow" system; see Figure 5.8a for details)

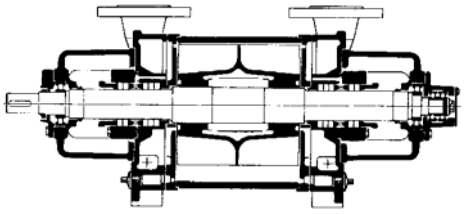


Figure 2.1b Sectional view: 2BE1 102 ... 2BE1 153 ("Double-flow" system; see Figure 5.8b)

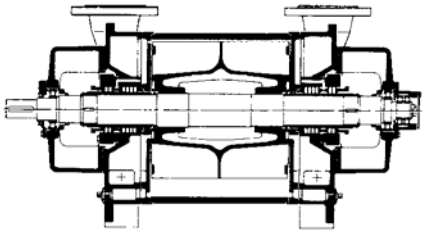


Figure 2.1c Sectional view: 2BE1 202 ... 2BE1 253 ("Double flow" system; see Figure 5.8c for details)

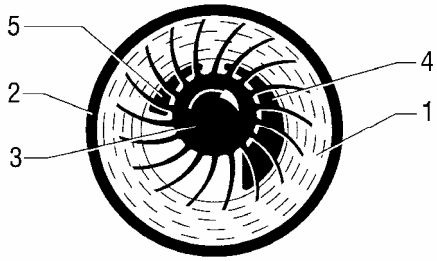


Figure 2.1d Schematic section through the compression chamber

1 Liquid ring
2 Casing
3 Impeller
4 Intake port
5 Discharge port

The machine's compression chamber is sealed at the shaft. See Section 2.4 “Shaft seal” for further details.
The floating bearings on the drive and non-drive ends are of the cylindrical roller bearing type. Two deep-groove ball bearings with a spring-loaded end-float washer are axially arranged on the non-drive end to serve as a guide bearing unit.

2.2 Operating liquid

Water or other liquids are used as operating liquid.
Operating liquid is continuously discharged together with the compessed gas. Therefore, the liquid ring must be replenished continually with fresh, cool operating liquid.
In addition to its actual function of producing the liquid ring, the operating liquid also has the task of dissipating the heat developed by compression and seals the gap between the impeller and the port plates and, if necessary, cools the inner parts of the shaft seal. This is why use should be made of operating liquid that is as cool as possible (e.g. water at 15 °C).
When selecting the operating liquid, pay attention to the fact that the material of parts in contact with the liquid must be suitable.
The operating liquid must be devoid of solids such as sand as otherwise extreme wear will occur in the machine. Suitable filters or strainers must be fitted if the operating liquid contains impurities.
If there is a danger of calcium deposition precautions have to be taken for the operating water and the sealing water, e.g. water-softeners or ionic accelerators.
See Section 6.3.1 “Technical Data” for details of the feed pressure and the volume flow of operating liquids.

2.3 Connections

NOTE

The normal scope of delivery basically only covers the machine itself (without additional components such as fittings, valves and gate valves etc.).

2.3.1 Connection examples

The arrangement of components shown in the following figures (pressure gauge, volume flow meter and valves etc.) is given by way of example and can be altered to suit installation requirements.

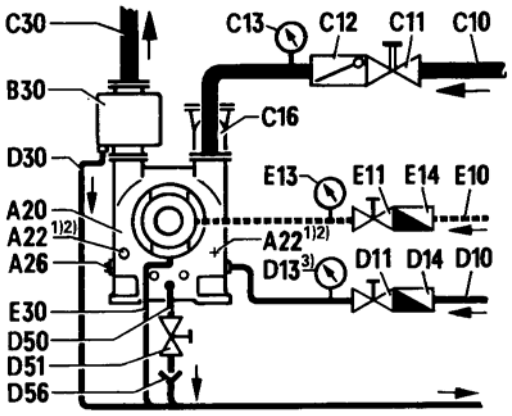


Figure 2.3d Connection example (equivalent diagram)

1) arranged on non-drive end on intake side
2) arranged on drive end on discharge side (not applicable to Type 2BE1101)
3) optionally arranged on opposite side on A26

A20 Vacuum pump
A22 Screw plugs for draining
A26 Screw plugs for completely draining
B30 Liquid separator built-on
C10 Gate valve
- C11 Gate valve
- C12 Non-return valve
- C13 Pressure gauge
- C16 Y-pipe

C30 Pressure pipe (gas)
D10 Feed pipe for operating liquid
- D11 Valve
- D13 Pressure gauge
- D14 Volume flow meter

D30 Drain pipe for discharged operating liquid
D50 Pipe for draining and flushing
- D51 Valve
- D56 Funnel or level gauge

E10 Feed pipe for sealing liquid (separate flushing)
- E13 Pressure gauge
- E14 Volume flow meter

E30 Drain pipe for seeping liquid of the shaft seal

Detailed information on specific media, pipes and fittings is provided below (see Section 3.3 for further information on connections and piping).

2.3.2 Non-return valves

A non-return valve (C12) designed to offer as little resistance to flow as possible should be fitted in the intake pipe to prevent gas or operating liquid from flowing back into the pump whenever operation is interrupted.
To avoid operating trouble, do not fit any gate valves or non-return valves between the machine and separator.

2.3.3 Feed pipe for operating liquid

The machine must be fed with constantly cooling operating liquid to replace the amount of liquid forced out with the gas on the discharge side.
It is recommended to install a directional flow meter (D14) to monitor the operating liquid. A pressure gauge (D13) can be alternatively installed. For automatic operation, a solenoid valve governed by the motor current must be installed, the valve (D11) remaining set during pauses in operation.

2.3.4 Valves for operating liquid level and draining

To maintain the operating liquid level prior to starting, a drain valve must be arranged on the non-drive end shield on the intake side. To drain the machine or to flush out foreign bodies, one connection each is also available at the bottom on the end shields for the connection of a drain pipe (D50) with a valve (D51). To enable a check, the drains should be arranged so that the liquid flows through a funnel or sight glass (D56).

2.3.5 Shaft sealing liquid

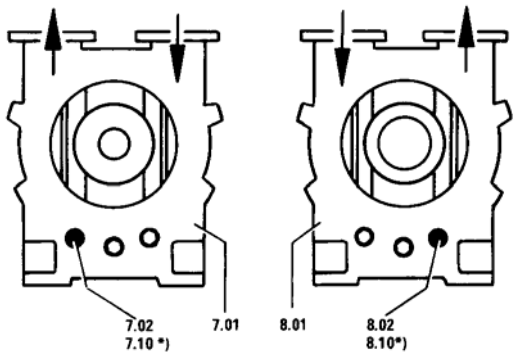
See Section 2.4 "Shaft seal".

2.3.6 Separator

In the liquid separator, the working fluid expelled from the machine together with the compressed gas is separated from the gas and dissipated.
See Section 3.3 "Connections, pipes" for further information. Please inquire about requirements for any necessary external operating liquid circuit.

2.3.7 Internal operating liquid guidance variants

As standard, the machines are designed for internal partial circulation of the operating liquid (see Table 6.1.3 for the operating liquid volume flow).
If particular operating conitions necessitate increased cooling ("increased operating liquid volume flow", designation "F64")", the corresponding internal connection holes are sealed by one plug each. In this case, twice the operating liquid volume flow specified in Table 6.1.3 is required.
The machines can be converted later on. To convert to an increased operating liquid volume flow, on the drive and non-drive ends the face plugs on the end shields on the discharge side (see Figure 2.3b) must be removed and the threaded holes behind them must each be sealed with one plug 7.10 or 8.10 as detailed in the table. The outer plugs Part 7.02 or Part 8.02 must then be screwed in again.



*) See the table for details

Figure 2.3b Arrangement of plugs

Type	Material variant	Plug part No. 7.10/8.10
2BE1 10.	B	DIN 2991-S1/8
	H	DIN 2991-S1/8-1.4401
2BE1 15.	B	DIN 2991-S1/4
	H	DIN 2991-S1/4-1.4401
2BE1 20.	B	DIN 2991-S3/8
	H	DIN 2991-S3/8-1.4401
2BE1 25.	B	DIN 2991-S1/2
	H	DIN 2991-S1/2-1.4401

2.4 Shaft seal

The type designation on the rating plate specifies which shaft seal is fitted.

Type	Shaft seal
2BE1 . . . - . . . 3	Stuffing boxes with separate flushing
2BE1 . . . - . . . 4	Stuffing boxes with self-flushing
2BE1 . . . - . . . 0	Mechanical seals (see supplementary instructions)
2BE1 . . . - . . . 1	
2BE1 . . . - . . . 2	
2BE1 . . . - . . . 5	
2BE1 . . . - . . . 6	
2BE1 . . . - . . . 7	
2BE1 . . . - . . . 8	
2BE1 . . . - . . . 9	

On types 2BE1 20. and 2BE1 25., the shafts have replaceable wearing sleeves at the sealing points. Refer to the supplementary operating instructions for notes on mechanical seals with self-flushing or separate flushing.

⚠ WARNING

When operating with hazardous gases or operating liquids, make sure, by suitably arranging the shaft seal (e.g. mechanical seal with separate cooling), that leakage of the gases or operating liquids is prevented in the event of unforeseen failure of the sealing function.

Stuffing box packings

Stuffing box packings are sealed and cooled by sealing liquid. When the stuffing boxes are properly adjusted, part of the sealing liquid flows into the compression chamber of the machine and the other part drains as "seeping liquid".
If cotton packings are used (see spare parts list), they are durable at a pH value of the sealing or operating liquid amounting to between approx. 6 and 8.
To drain seeping liquid, ther is one connection each for a pipe (E30) on the bearing cases underneath the stuffing boxes.
The sealing liquid can be fed to the stuffing boxes as "self-flushing" or "separate flushing" liquid depending on the design.
When using self-flushing, the sealing liquid is taken from the rotating operating liquid ring during operation and is applied directly to the stuffing boxes via passages in the end shields.
When using self-flushing, the types 2BE1 20. and 2BE1 25. also have a relief hole that increases the volume flow and return surplus sealing liquid to the machine.
Refer to Section 6.1.4 “Technical Data” for details of the sealing liquid volume flow, pressure and temperature when using separate flushing.
Refer to the affiliated dimension drawing or installation diagram of the machine for details of the connections for the sealing liquid. One supply pipe suffices for each stuffing box, even if there are several posibilities of connection.

Later conversion from separate to self flushing or from self flushing to separate flushing is possible. In doing so, among other things, the connection holes to the interior of the machine are sealed or opened by repositioning or replacing the stuffing box housings (details on request).
To monitor the sealing liquid, it is recommended to install a directional volume flow meter (E14). A presure gauge (E13) can be installed as an alternative. For automatic operation, a solenoid valve dependent on motor current must additionally be installed; the valve (E11) remains set during interruptions in operation.
It is possible to renew or add stuffing box packings without dismantling the complete machine (see Section 5.4).

2.5 Protection against cavitation

⚠ WARNING

Under certain operating conditions (intake pressure in the proximity of the steam pressure of the operating liquid in the compression chamber), cavitation may occur in the compression chamber and may cause damage to impellers, port plates and plate-type valves.

To avoid such damage, the machine can be supplied with anti¬cavitation protection (add "F80" to the order designation).

If this possibility was not already clarified during the course of project planning the machine must be checked in this respect after initial commissioning. The ocurence of cavitation can be recognized by an increased noise level, particularly a rattling or clattering sound. The machine must be fitted in such cases with anticavitation protection in agreement with the manufacturer's responsible sales office. If the above-mentioned noises occur even when protection is fitted, the manufacturer must be contacted to advise on remedial measures.
The anti-cavitation protection consists of a radial hole with a screw thread in each port plate. Depending on the version, the machines are supllied:

- with non-return valves screwed in. During operation and after shutdown, small amounts of operating liquid may come out of these valves. When using caustic or flammable liquids or liquids hazardous to health, such leakage must be passed through suitable piping or must be diverted (see below for possibilities).
- with the drilled holes sealed with plugs. These plugs must be removed and replaced by piping. The following options are possible:
  1. If air is suitable for the relevant process
     a) pipe with an opening in the ambient air leading to a collecting vessel or funnel etc.
     b) pipe leading to the separator with entry above the liquid level.
  2. If inert gas is required for the relevant process:
     a) pipe as detailed in 1 b).
     b) pipe leading to another pipe, or to a vessel, that keeps the inert gas at pressure close to atmospheric.

All piping must be designed so that non-condensing gas can be sucked in constantly, but avoiding intake of foreign bodies, dirt and fluff (involving a danger of clogging of the protective facility or of damage in the comperssion chamber).

3 Installation

3.1 Safety advice

⚠ WARNING

Special attention must be paid to the general safety information and requirements detailed in Section 1.2 of these operating instructions with regard to the permitted use of compressors and the specialized knowledge required for planning and installing such systems and installations. These must be observed strictly along with the other details given in these and the supplementary instructions.

The machines may only be connected to the piping systems of an installation and commissioned, including switching on for the first time within the framework of installation activities, in diligent agreement with the responsible plant personnel.

3.2 Mounting

3.2.1 General

Contact protection

⚠ WARNING

Moving parts such as couplings, free end shafts and V-belt drives must be protected against touch. Protection against touch must conform to DIN EN 294. In installations subject to an explosion hazard, the drive elements and their protection against touch must be designed so as to exclude the possibility of sparking and electrostatic charges.

⚠ CAUTION

Temperatures of more than 70 °C may occur on parts of housings (such as bearings). Contact with these must be prevented. Parts sensitive to high temperatures, for example normal pipes or electrical components, must not come into contact with or be secured to such parts of housings.

Drive type

For normal speeds, the machines are driven by directly coupled motors or, in special cases, via gearing, V-belts or variable speed drives. Refer to the table in Section 6.1.3 "Technical data" for details of speed ranges.

Mounting type

For functional reasons, the machines must only be installed with their feet pointing downwards (corresponding to IM B3 for motors).

Bearing load, axial

NOTE

The machine's guide bearings (spring-loaded deep-groove ball bearings) are designed to absorb normal forces from operation with flexible couplings.

Bearing load, radial (belt prestress)

When using a V-belt drive, position the belt pulley so that force is introduced as close as possible to the bearing, thus limiting bearing load and shaft sagging.

Drive elements

Drive elements must be properly balanced and must only be fitted or extracted using suitable facilities. If necessary, align machines or assemblies carefully with the aid of shims to prevent distortion of the machine casing, noisy running or damage to the bearings.

Jammed impeller

If the impeller is jammed, adopt the following measures:

- Undo the securing screws of the guide bearing, remove the compensating washers and unscrew the cover of the guide bearing,
- move the impeller to and fro by knocking lightly with a lead hammer on both face sides of the shaft. Using suitable turning gear, turn the impeller manually,
- then re-attach or secure the originally detached or loosened parts.

Base plate

The base plate must be aligned on-site and, if necessary and depending on the design, cast with concrete after screwing tight. The couplings must be aligned carefully before commissioning, thus avoiding coupling damage and noisy running. Refer to the supplementary operating instructions for further information about base plates.

Lubricating the bearings

The bearings must be relubricated (see 5.6.1) if the period of time between delivery and commissioning of the machines under favourable conditions (storage in dry rooms devoid of dust and vibrations) amounts to more than 4 years or more than 2 years under unfavourable conditions.

3.2.2 Noise emission

Normally operating machines emit noise emissions in the form of sound pressure levels of between 70 and 80 dB(A) on the measured surfaces. These values may even be higher under extreme conditions of operation.
The machines are generally approved for a wide range of installation and operating conditions. These alternatives have a very substantial influence on noise emissions (e.g. rigid or vibration-isolated foundation design, drive directly on or above the gearbox, laying, insulation and type of pipe connections and particularly compression and speed ratios).
With regard to suitability of equipment for use, workplace-specific noise values can only be measured on assembled machines on site, taking all these factors into account. If the values measured exceed permissible levels, they must be reduced by modifying the mounting or operating conditions or by noise suppression.

3.3 Connections, pipes

⚠ WARNING

Installation must be carried out in accordance with the binding plant installation plan prepared with the specific details of the plant in mind and also in conformity with the general requirements stated in the operating instructions.

Examples of expedient arrangements of pipes and fittings and specific conditions are also listed in Section 2.3 "Connections" and must be additionally observed. With regard to the materials and dimensions, all pipes and fittings must be adapted to the respective pressure and temperature conditions and must be suitable for the type of medium used. The manufacturer should be contacted if special versions are intended.

In the case of machines that carry hot or hazardous media, or are operated with hazardous operating liquids or have to be drained at temperatures in excess of 60 °C, all drainage connections must be fitted with shut-off valves and the media or operating liquids must be drained to a closed system.

Hazardous media or liquids are understood to be those which are hazardous to health, are likely to explode or are highly volatile, for example.
Piping must be kept as short as possible and its cross-section must at least correspond to the affiliated nominal diameters available on the machine. Larger cross-sections must be chosen for longer pipes.
Pipes must be connected to the machines with the least possible mechanical stress. Supports and, if applicable, compensators must be used for long pipes. Any occurring forces and torques must not exceed the values supplied by the manufacturer on request.
When mounting an assembly on vibration dampers, all connections must be flexible.
If a malfunction of the system might cause an inadmissibly high pressure to occur in the machine, suitable measures must be incorporated in the installation to protect the machine.
If contamination can be expected in the feed medium, in the operating liquid or, if applicable, in the sealing liquid, this must be retained by a suitable arrangement of strainers or filters.
See Section 6.1 "Technical data" for technical data of media, operating liquids and permissible pressures (intake, compression and discharge pressures) etc.

3.4 Final measures

After completing installation, all pipes, particularly those on the intake side, must be cleaned thoroughly because foreign matter such as welding beads, scale or rust flakes etc. must be prevented from entering the machine.
After installation or overhauls, check or ascertain that:

- the machine's bearings are still lubricated adequately (see "Lubricating the bearings")
- the assembly (machine and drive motor) is properly installed and aligned
- the drive elements are adjusted correctly depending on their nature and have been fitted without axial thrust (e.g. belt prestress of belt drives; radial and axial alignment of couplings)
- all fixing bolts and connection elements are tightened firmly
- the impeller can be turned without rubbing
- rotating parts are properly protected against contact (e.g. coupling covers)
- the drive motor is assigned and connected correctly (rating, speed, direction of rotation).

NOTE

The direction of rotation may only be checked with the machine coupled when the operating liquid level in the machine casing is adjusted correctly and the stuffing boxes are adequately moist (see Section 3.5.1 "Preparations for start-up") or, when using mechanical seals, the sealing liquid valves have been opened briefly.

- the pipe installations and fittings are arranged correctly in accordance with the plant installation plan and have been fitted without mechanical stress and pressure tested (intake and pressure connections are marked on the machine)
- any installed heat exchangers have been bled and/or any installed booster pumps are operable.
- any adjacent separator is installed at the right height and has the prescribed fittings.

⚠ CAUTION

The above list does not claim to be complete. Further checks may be necessary according to the affiliated supplementary instructions or may be additionally required depending on special plant-specific conditions.

⚠ CAUTION

If explosion-hazard substances are used as medium or operating liquid, the complete system (machine, piping and separator) must be flushed with inert gas prior to use and must meet the safety requirements.

3.5 Commissioning

NOTE

The normal scope of delivery only ever embraces the machine itself (without additional components such as fittings, valves and gate valves etc.).

The arrangement of components shown in Figure 3.5 a (pressure gauge, volume flow meter and valves etc.) is given by way of example and can be altered to suit installation requirements.

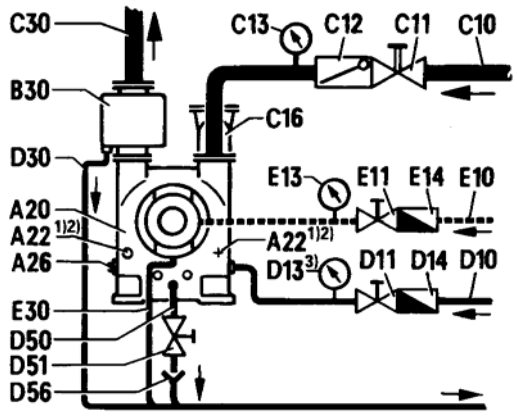


Figure 3.5a Connection example (equivalent diagram))

1) arranged on the non-driven end on the intake side
2) arranged on the driven end on the discharge side (not applicable to Type 2BE1 101)
3) optional arrangement on the opposite side with A26

A20 Vacuum pump
- A22 Screw plugs for draining
- A26 Screw plugs for completely draining

B30 Liquid separator built-on

C10 Suction pipe
- C11 Gate valve
- C12 Non-return-valve
- C13 Pressure gauge
- C16 Y-pipe

C30 Pressure pipe (gas)

D10 Feed pipe for operating liquid
- D11 Valve
- D13 Pressure gauge
- D14 Volume flow meter

D30 Drain pipe for discharged operating liquid

D50 Pipe for draining and flushing
- D51 Valve
- D56 Funnel or level gauge

E10 Feed pipe for sealing liquid (separate flushing)
- E11 Valve
- E13 Pressure gauge
- E14 Volume flow meter

E30 Drain pipe for seeping liquid of the shaft seal

The normally connected machine (see Figure 3.5 a) is commissioned as described below:

3.5.1 Preparations for commissioning

This section applies to an ampty or dry machine (i.e. when commissioning for the first time or when resuming operation after prolonged breaks in operation or repairs).

- Initial technical situation:
  - All pipes for the medium being pumped and the operating liquid are connected correctly.
  - All valves and gate valves are closed. There should be no gate valve or non-return valve on the discharge side.
- Adjust the sealing liquid for shaft seals with stuffing boxes:
  - when using self-flushing, the sealing liquid is branched off automatically by the rotating water ring after switching on. Stuffing box glands must not be tightened too firmly; loosen them in cases of doubt (see Section 5.4 for details).
  - when using separate flushing, open the sealing liquid valves E11 to moisten the packings. Check that enough liquid seeps out to cool the packings later and correct the setting if necessary. Feed pressure approx. 0.1 to 0.3 bar above the compression pressure.
- For mechanical seals:
  Open the sealing liquid valve E11 briefly to moisten the mechanical seal.

3.5.2 Starting up

⚠ WARNING

Always make sure that intended start-up will not result in any malfunctions of the plant or hazards to persons. In cases of doubt, obtain confirmation from the responsible plant personnel. Refer also to the warning nuts in 3.5.3.

The following operations are recommended for starting up:

- Open the gate valve of the intake pipe C11.
- When separately flushing the shaft seat: open the sealing liquid valve E11.
- Switch on the drive motor and then immediately open the operating liquid valve D11.
- Regulate the operating liquid valve D11 as follows:
  a) Method involving volume flow measurement:
  Open the operating liquid valve D11 until the volume flow meter D14 indicates the desired volume flow. Refer to the table in Section 6.1.3 for details of the operating liquid volume flow depending on the intake pressure. Once again correct the operating liquid volume flow once the final intake pressure has been reached.
  b) Method involving pressure measurement during start-up, i.e. pressures at the intake and pressure valves still approximately equal:
  Adjust the operating liquid valve D11 so that the pressure gauge D13 indicates an absolute pressure of approx. 1.0 bar during start-up. Once the operational intake pressure has been reached, a different value may be indicated on the pressure gauge D13 depending on the internal operating water connection.
- Shaft seal:
  - When using stuffing boxes with self flushing:

⚠ CAUTION

Stuffing boxes must drip lightly and it may be necessary to correct the adjustment (see Section 5.4 for details). Switch off the drive if necessary.

  - Stuffing boxes with separate flushing:
  Adjust stuffing boxes as described above (see also Section 5.4); regulate the required sealing liquid pressure or volume flow by means of valve E11. See Section 6.1.4 for values.
  - Mechanical seals with separate flushing:
  Refer to Section 6.1.4 and the affiliated supplementary operating instructions for details of settings.
- Start off by observing operation at brief intervals and then at longer intervals:
  - after commissioning, read off set pressures and volume flows. It is best to take a note of them.
  - at the beginning, monitor temperatures of media (operating and sealing liquids) and of components (particularly bearings and the shaft seal etc.) until the steady-state point is reached and also take a note of them.
  - the intervals after which necessary follow-up checks must be carried out depend on operating conditions and the local situation.
- If there is a risk of cavitation, observe the machine for the possible occurrence of rattling or clattering noises (see Section 2.5).

⚠ CAUTION

If irregularities are conspicuous, determine and remedy the cause; refer also to the supplementary operating instructions entitled "Possible faults".

3.5.3 Shutting down

The following operations are recommended for shutting down the machine:

- Close the operating liquid valve D11, shut down the motor, close the sealing liquid valve E11 and close the intake pipe gate valve C11.

The manually actuated valves may remain open if solenoid valves controlled as a function of motor current are installed.

⚠ CAUTION

If there is a risk of frost, drain liquid out of the machines, separators and all pipes wherever necessary. First of all open drain valves D51. Undo plug A26 for total drainage on end shields only when the machine is depressurized.

Attention should be paid to the notes given in Section 4.3 “Prolonged breaks in operation” if it can be expected that a prolonged period of time will elapse prior to the next commissioning.

⚠ WARNING

A guarantee must be provided that no liquid will enter into the machine out of the discharge and intake pipes after shutdown. This is guaranteed on the discharge side when using an attached Nash liquid separator. If this is not assured in other installations or in the event of a fault, the machine must be drained before renewed commissioning (see also 3.5.1).

4 Operation

4.1 Safety advice

⚠ WARNING

Special attention must be paid to Section 1.2 of these operating instructions, which contains general requirements with regard to the specialized knowledge needed to operate and maintain such systems and installations.

Refer to Section 6.1 "Technical data" for details of permissible temperatures and pressures etc.

4.2 Starting up, shutdown

Notes on starting up and shutting down machines in standard connections are given in Section 3.5 "Commissioning".

⚠ WARNING

Changes in comparison with normal operation (higher power consumption, temperatures or vibrations, unusual noises or odors or response of monitoring facilities etc.) are an indication that functioning is impaired. To avoid malfunctions which, in turn, may directly or indirectly result in severe personal injury or property damage, the responsible maintenance personnel must be informed immediately in such cases.

IN CASES OF DOUBT, SHUT DOWN THE CORRESPONDING EQUIPMENT IMMEDIATELY!

4.3 Prolonged shutdown periods

Refer to the details given in Section 3.5.3 with regard to draining in the event of a risk of frost.
If machines containing parts that are not resistant to corrosion are shut down for periods of two weeks or longer or, for example, after brief trial operation, they stand still for a prolonged period prior to commissioning, they must be drained completely, flushed with preservation agent, drained again and dried. If drying is not possible, the impeller must be turned completely every 2 weeks. Drying is best done with a vacuum pump connected to the discharge connection.
If possible, report or mark activities carried out and, if necessary, take them into account when commissioning again.
Depending on the length of the standstill period, the measures recommended in Sections 3.4 and 3.5 should be undertaken to a reasonable extent after prolonged shutdown periods.

5 Maintenance

5.1 Safety measures

⚠ WARNING

Attention must be paid to Section 1.2 with regard to the specialized knowledge required.

Machines that carry hazardous media or are operated with such operating liquids require special on-site precautionary measures in conformity with the safety regulations of the industry in question.

Prior to any work on the machine or the pipe system, make sure that

- **the intended action will not result in a malfunction of the system,**
- **the drive motor is switched off and safeguarded against reactivation,**
- **the corresponding pipe systems are depressurized and also safeguarded,**
- **the transported or applied media themselves will not pose any risk when opening the pipe systems or any necessary safeguarding measures are known and are taken into account.**

Maintenance of repair personnel must be informed about the current state of the machine.

A statement by the person responsible for operation to the effect that the machine has not been contaminated, particularly not by toxic, caustic, microbiological, radioactive or other substances hazardous to health, will serve this purpose. If there is such a risk, a confirmation is necessary to the effect that decontamination has eliminated all risks, or detailed directions must be given on how maintenance work may be performed safely.

This legally binding statement must be given by a person authorized by the party responsible for operation, for example using the VDMA form *). This must be made out in duplicate as follows:

- **one copy added directly to the accompanying documents of the machine, and**
- **one copy sent through normal information channels to the maintenance department or company.**

Specific regulations apply to company-internal maintenance or repair activities.

5.2 Inspections

⚠ WARNING

Careful and regular maintenance and inspections are necessary to detect and rectify any possible faults as soon as possible, thus peventing any further damage.

The recommended intervals are based on faultless operation. Corresponding inspections must be carried out immedialtely in the event of malfunctions or of extraordinary conditions representing an overload on the machine.

5.2.1 First inspection

If the machine has a belt drive, the belt's pretension should be checked and, if applicable, corrected after 5 hours of operation following initial commissioning, otherwise at regular intervals (see also 5.7).
For normal operation, it is recommended to carry out a first general inspection on the machine after around 150 hours of operation to check that

- there is no significant contamination in the medium or operating liquid (see Cleaning),
- the specified technical data is kept to (power consumption and temperatures etc.),
- no unacceptable leaks occur,
- smooth running of the assembly and running noises of bearings have not worsened,
- no subsidence or cracks have occurred in the foundation,
- valves, filters and strainers are devoid of foreign matter; otherwise, clean them and define an appropriate interval for the next inspection.

⚠ CAUTION

This list does not claim to be complete. If applicable, further checks may be necessary depending on the affiliated supplementary instructions (e.g. mechanical seals) or according to the special conditions of the plant.

⚠ CAUTION

Impermissible deviations or changes discovered during checks must be remedied immediately.

5.2.2 Inspections

Provided no shorter intervals are required for cleaning the compression chamber or strainers and filters, maintenance intervals under favourable operating conditions may be synchronized with regreasing or grease change intervals.
Besides the inspections stated above, it is necessary to check during the course of inspections that:

- alignment of the impeller is within the permissible tolerances,
- all fixing bolts are tightened firmly (except on any installed stuffing box glands).

There is generally no need to dismantle the machines during the course of normal inspections.

5.3 Cleaning

It is recommended to flush out any foreign bodies that have collected in the liquid ring at appropriate intervals, e.g. by briefly opening the valves in the drain pipe or by briefly unscrewing the total drainage plugs.
If extreme lime deposits occur under certain operating conditions, the machine must be flushed at appropriate intervals with a suitable solvent and then with water.
Any strainers or filters installed in the pipes must also be cleaned or replaced regularly.
The next cleaning intervals must be defined according to contamination found in the machine's compression chamber or the strainers or filters of pipes during the course of the first inspection.

⚠ WARNING

Use personal protective equipment (e.g. protective goggles, breathing mask etc.) and appropriate dust exhausting gear when cleaning with compressed air.

If chemical cleaning agents are used the warnings and instructions of the relevant safety information sheet must be observed (see Section B 1.2). Chemical agents must be compatible with the materials used, especially plastics.

5.4 Stuffing boxes

Stuffing boxes are adjusted during operation. Uniformly tighten stuffing box glands so that a liquid volume flow adequate for cooling still appears. Check the sealing liquid pressure indication and, if necessary, correct it by actuating the valves.
As new or dried out packings initially swell, the stuffing box glands should be tightened to a slightly lesser extent, in which case slightly more leakage will initially occur. Check the temperature by hand and loosen the glands slightly again if the temperature should rise.

⚠ CAUTION

If the temperature should continue to rise despite loosening of the glands, briefly increase the sealing water pressure or shut down the assembly and wait until the packings cool down, thus avoiding damage as the result of overheated packings. Adjustment of the stuffing boxes must be checked at reasonable intervals!

Renewing the stuffing box packings

If the stuffing box glands cannot be readjusted further after prolonged periods of operation, the packings must be supplemented or renewed.
The impregnations of stuffing box packings may be washed out after prolonged periods of operation. Depending on the pH value of the sealing liquid or operating liquid, in the case of cotton packings this occurs earlier than in the case of ramie fiber packings. Therefore, renew packings in good time (see Section 2.4).
Before dismantling, determine and mark the respective installation position of the stuffing box housing. Then remove old packing residues and clean the packing area. To do this, it is best to undo the stuffing box housing also. Insert new packing rings with joints each offset by 90°. In doing so, make sure that sealing water distribution in the packing is not influenced detrimentally.

Stuffing-box packing data for types 2BE1	10.	15.	20.	25.
Overall length of rings per machine	2.2 m	3.1 m	4.2 m	5.8 m
Cross-section of packing rings	10 mm x 10 mm			14 mm x 14 mm
Number of inner packing rings per stuffing-box	3	4		
Number of outer packing rings per stuffing-box	2			
Normal material	Light ramie fibre packing with PTFE-impregnated or cotton packing (see Spare parts list).			

5.5 Mechanical seals

The supplementary instructions must be observed if the machines are equipped with mechanical seals.

5.6 Greasing the bearings

5.6.1 Grease type, operating conditions

KP2K-grease Shell Alvania EP2 is normally used for initial greasing of the bearings.
The following lubricant data is customary:

Data on plate	**Permissible greases**
No plate (type without regreasing device)	Grease K3K and K3N see table 1)
Shell Alvania G3, grease K3K or K3N acc. Instructions	
Shell Alvania G3, grease K3N acc. Instructions	K3N greases only see table 1)
Aero Shell Grease 16	No other grease

Selection tables of tested roller bearing greases

K3K greases	K3N greases 1)
ARAL / Aralub HL 3	ARAL / Aralub 4340
BP / Energrease LS 3	DEA / Glissando 30
ELF / Rolexa 3	ESSO / Beacon 3
MOBIL / Mobilux 3	FUCHS / Renolit FWA 220
	SHELL / Alvania G 3
(optionally also K3N greases)	SHELL / Alvania R 3
	WINTERSHALL Wiolub LFK 3

1) K3N greases have higher temperature reserves than K3K greases.

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Lubrication intervals must be halved when using other K3K or K3N greases, which may only meet the minimum requiements of DIN 51825. In cases of doubt, consult the manufacturer of the machine.

Grease change intervals of 20,000 hours of operation apply under normal operating conditions and at ambient temperatures up to 40 °C. Owing to ageing of the grease after commissioning, regardless of the hours of operation it should be renewed at least approximately every 3 years.
The grease change intervals or regreasing intervals apply to normal loads, low-vibration running, approximately neutral ambient air and (if K3K or K3N is specified), the use of high-grade roller bearing greases in the selection table. These greases contain lithium soap as a tchickening agent and mineral oil as the base oil. They essentially exceed the normal requirements of DIN 51825 and therefore permit the specified regreasing intervals.

Do not mix greases containing different thickening agents and base oils.

5.6.2 Dismantling, assembly

Fill bearing cavities fully with lubricating grease. To avoid overgreasing of bearing inserts, bearing caps are not filled with grease.
When assembling, make sure that the axial shaft sealing rings (V-rings) are installed correctly for proper functioning and that the sliding surfaces are greased:

- In the case of the outer shaft sealing rings, the correct axial position of the V-ring has been reached when the bearing cap face and the outer edge of the V-ring are flush. To do this, it is recommended to use a corresponding assembly aid (see sketch in the figure entitled "Assembly note" on the fold-out sheet).
- In the case of internal shaft sealing rings, the correct position is ensured by the respective groove in the shaft.

5.7 Repairs, spare parts

Pay attention to the repair instructions (supplementary instructions) with regard to the installation of spare parts and repairs.
When ordering spare parts, it suffices to specify the complete spare part Order No. according to the included spare parts list, which also defines the material. If no spare parts list is available, the type and serial number of the machine must be specified in addition to the part No. (as detailed in the exploded drawing in these instructions).
Repair instructions are arranged separately according to the type range and, among other things, contain notes on the following topics: dismantling, testing, rework and assembly.
If instructions are requested separately, supplementary instructions can only be assigned completely if the type of design is specified uniquely (e.g. by specifying the serial number).

5.8 Drawings, parts lists

Refer to the fold-out pages for drawings and the parts list. This parts list does not include commercially available standard items. Refer to the respective spare parts list for details of the types and sizes of these parts.

6 Appendix

6.1 Technical data

6.1.1 General

- **Conversion values:** 1 mbar = 1 hPa
  1 bar = 10^5 Pa
  1 mbar = 0.02953 inch of mercury abs.
  1 m^3/h = 4.4 US gpm = 3.66 Imp.gpm
  1 dm^3/min = 0.265 US gpm
  = 0.22 Imp.gpm
- **Materials** are defined in the catalog and in the documentation of the machine (spare parts list).

⚠ CAUTION

In the project planning stage, the parts concerned must be selected to suit the liquids used and the media to be handled and must be resistant to them.

- **Weight** for dimensioning of hoisting facilities: refer to the last page of these instructions.
- **Packing sizes** see Section 5.4.
- **Max. absolute pressure for pressure testing** of machines
  - Types 2BE1 . . . - . B . = 3.5 bar absolute.
  - Types 2BE1 . . . - . H . = 6.0 bar absolute.
  - Types 2BE1 ... - .H. = with toroidal sealing ring *) = 10.0 bar absolute.

  *) Add "F01" to the order designation
- **Nominal speed** and permissible speed range: see table in 6.1.3.

6.1.2 Medium

- **Type:** Gas according to planning documents or catalog.
- **Permissible absolute intake pressure:** 33 mbar absolute.
- **Permissible absolute compression:** 900 ... 1100 mbar absolute.
- **Compression pressures** in excess of 1100 mbar absolute generally require consultation with the manufacturer.
- **Normal separators** are only permitted for a compression range of 800 to 1100 mbar absolute.
- **Permissible temperature range** of the intake medium:
  0 °C to 80 °C.

At operating temperatures > 50 °C, special adjustments are necessary on machines with cast stainless steel impeller (material variants H, M, N, P). Inquire about further details.

6.1.3 Operating liquid

- **Type:** Generally water (see Sections 2.2 and 2.3).
- **Temperature:** Normally 15 °C (limit range: 0 °C to 65 °C).
- **Volume flow:**
  Refer to the table for details of volume flow (m^3/h) at nominal speed n_N depending on the machine type and intake pressure (tolerance approx. +/- 10 %).
  For differing speeds n_B within the permissible range, the volume flow value in the table must be multiplied by the factor n_B /n_N.
  For an increased operating liquid flow, the volume flows specified in the table must be doubled.

Type	Nominal speed	Permissible speed range	Operating liquid volume flow in m^3/h at nominal speed n_N depending on intake pressure (mbar)		
	n_N	n_B	< 200 mbar	200 ... 600 mbar	> 600 mbar
2BE1 101-0	1450/min		0.9	0.60	0.30
2BE1 102-0		1300 ... 2190 /min	1.1	0.83	0.36
2BE1 103-0			1.4	0.93	0.47
2BE1 151-0			1.5	1.0	0.50
2BE1 152-0		1100 ... 1810 /min	1.7	1.13	0.57
2BE1 153-0			1.9	1.27	0.63
2BE1 202-0	980/min	740 ... 1300 /min	2.1	1.40	0.70
2BE1 203-0			2.6	1.73	0.87
2BE1 252-0	740/min	565 ... 920 /min	4.4	2.93	1.47
2BE1 253-0			5.2	3.47	1.73

6.1.4 Shaft sealing liquid

- **Type:** Generally water.
- **Temperature:** Normally 15 °C (limit range 0 °C to 65 °C); or operating temperature at least 10 K below boiling point.
- **Pressure:** 0.1 to 0.3 bar above discharge pressure.
- **Sealing liquid volume flow:**
  - in the case of stuffing boxes (with separate flushing):
    0.5 dm^3/min; highly dependent on the stuffing box adjustment.
  - in the case of mechanical seals (with separate flushing):
    Refer to the affiliated supplementary operating instructions for technical details.

6.2 Supplementary instructions

NOTE

For special assemblies and code groups dependent on the design and scope of delivery of the machines (base plates, mechanical seals and possible malfunctions, etc.), there are supplementary operating instructions containing specific notes which must be observed.

If instructions are requested separately, the supplementary instructions thereto cannot be properly identified unless the design is specified precisely (e.g. by indicating the serial number).
Any special installation and operating instructions furnished by the suppliers of subcontracted components, attachments, or fitments are attached to the set of instructions.

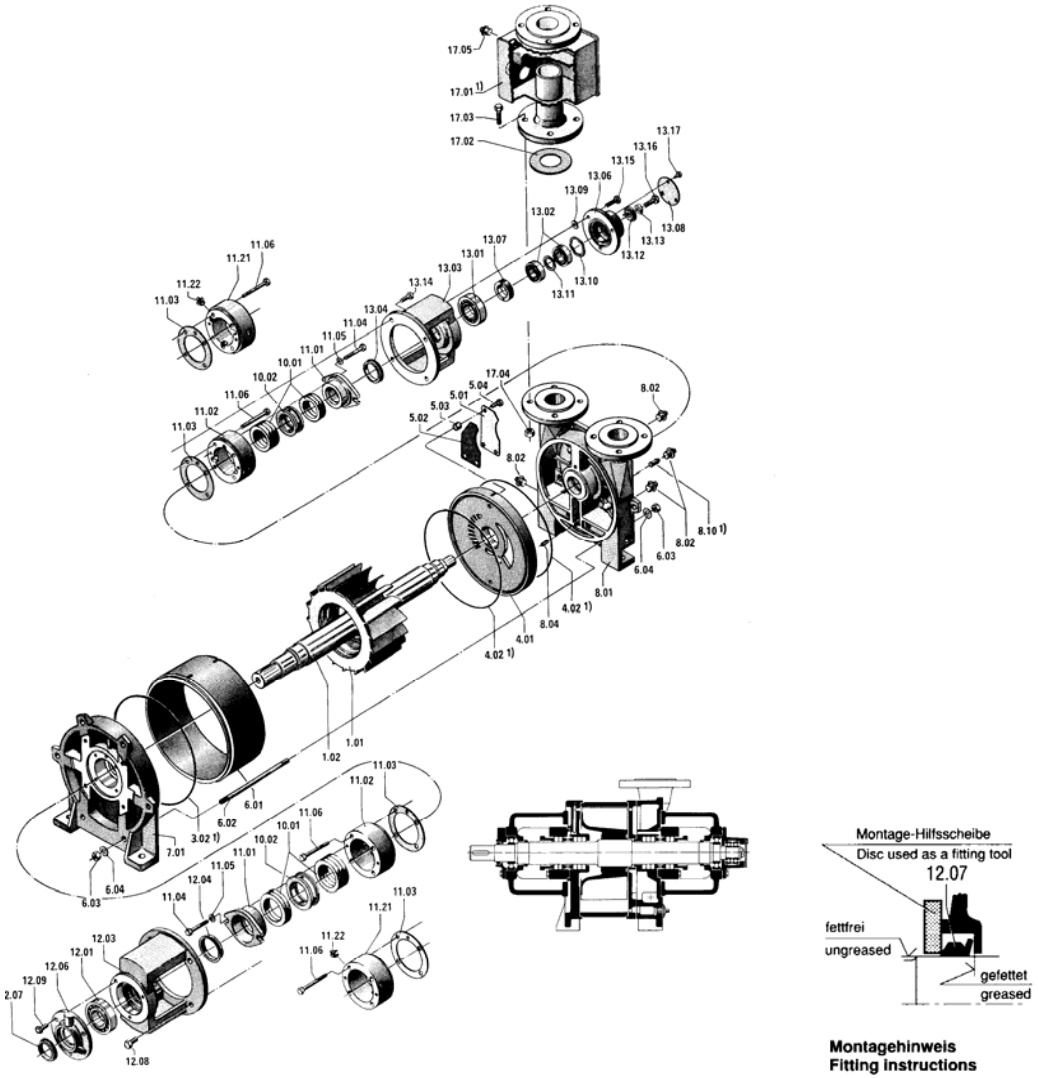

Figure 5.8a Vacuum pump 2BE1 101 (Example, delivered design may deviate in details)

Standard parts obtainable through the trade are not included in the legend. The type and size of these parts can be seen from the pertinent spare parts list.

1.01 Impeller
1.02 Shaft
3.02 Sealing ring (O-ring)
4.01 Port plate N-end
4.02 Sealing ring (O-ring)
5.01 Intercepting plate
5.02 Valve plate
5.03 Distance bushing
6.01 Casing
6.02 Double end stud
7.01 End shield D-end
8.01 End shield N-end
10.01 Packing
10.02 Sealing-water distribution ring
11.01 Stuffing box gland
11.02 Stuffing box housing (for internal liquid supply)
11.03 Flat gasket
11.21 Stuffing box housing (for external liquid supply)
12.01 Cylindrical roller bearing (floating bearing)
12.03 Bearing housing
12.04 Shaft sealing ring (V-ring)
12.06 Outer bearing cap
12.07 Shaft sealing ring (V-ring)
13.01 Cylindrical roller bearing (floating bearing)
13.02 Deep-groove ball bearings (locating bearing)
13.03 Bearing housing
13.04 Shaft sealing ring (V-ring)
13.06 Locating bearing housing
13.07 Threaded ring
13.08 Bearing cap
13.09 Compensating washer (for rotor adjustment)
13.10 Compensating shim for ball bearing
13.11 Shim ring
13.12 Thrust washer
17.01 Separator
17.02 Flat gasket

1) only if ordered especially

D-end = AS = drive end
N-end = BS = non-drive end

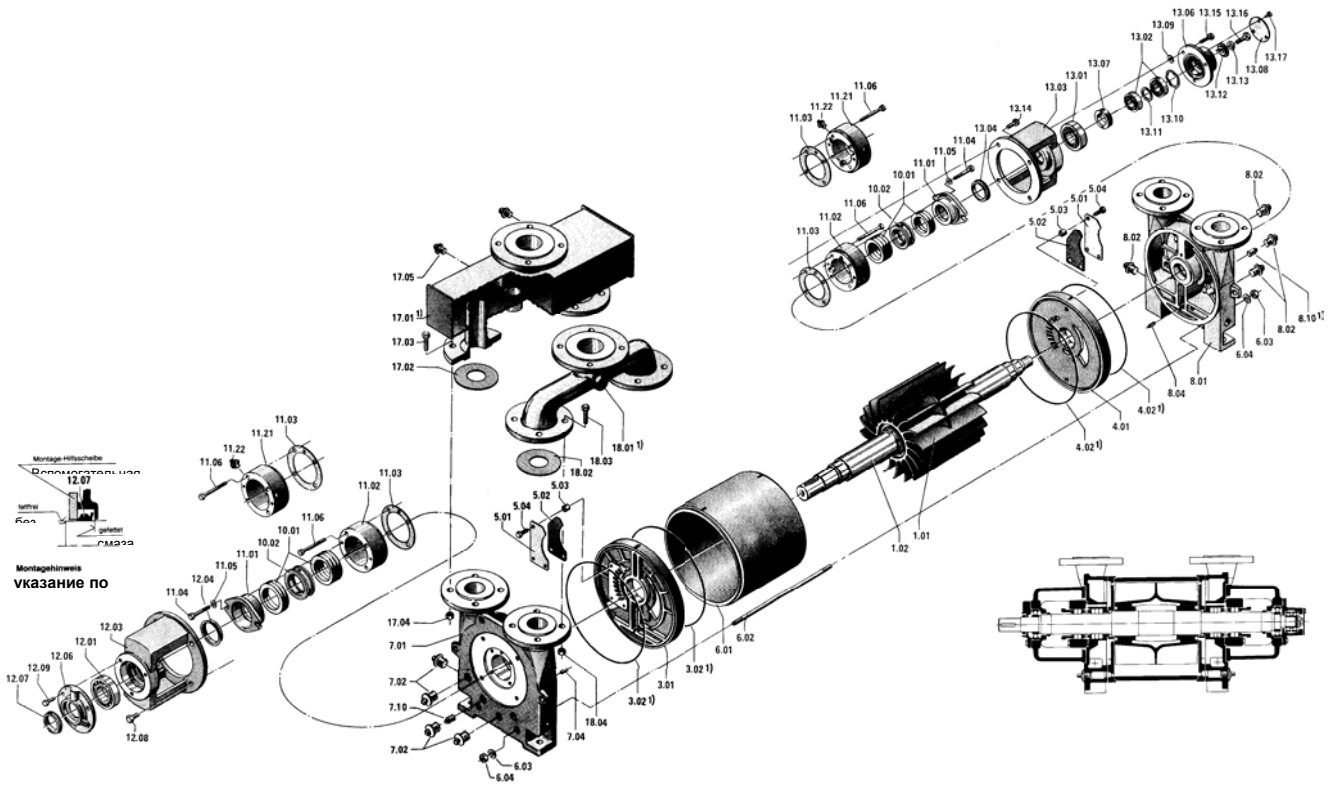

Figure 5.8b Vacuum pump 2BE1 102 to 2BE1 15 (Example, delivered design may deviate in details)

Standard parts obtainable through the trade are not included in the legend. The type and size of these parts can be seen from the pertinent spare parts list.

1.01 Impeller
1.02 Shaft
3.01 Port plate D-end
3.02 Sealing ring (O-ring)
4.01 Port plate N-end
4.02 Sealing ring (O-ring)
5.01 Intercepting plate
5.02 Valve plate
5.03 Distance bushing
6.01 Casing
6.02 Double end stud
7.01 End shield D-end
8.01 End shield N-end
10.01 Packing
10.02 Sealing-water distribution ring
11.01 Stuffing box gland
11.02 Stuffing box housing (for internal liquid supply)
11.03 Flat gasket
11.21 Stuffing box housing (for external liquid supply)
12.01 Cylindrical roller bearing (floating bearing)
12.03 Bearing housing
12.04 Shaft sealing ring (V-ring)
12.06 Outer bearing cap
12.07 Shaft sealing ring (V-ring)
13.01 Cylindrical roller bearing (floating bearing)
13.02 Deep-groove ball bearings (locating bearing)
13.03 Bearing housing
13.04 Shaft sealing ring (V-ring)
13.06 Locating bearing housing
13.07 Threaded ring
13.08 Bearing cap
13.09 Compensating washer (for rotor adjustment)
13.10 Compensating shim for ball bearing
13.11 Shim ring
13.12 Thrust washer
17.01 Separator
17.02 Flat gasket
18.01 Y-pipe
18.02 Flat gasket

1) only if ordered especially

D-end = AS = drive end
N-end = BS = non-drive end

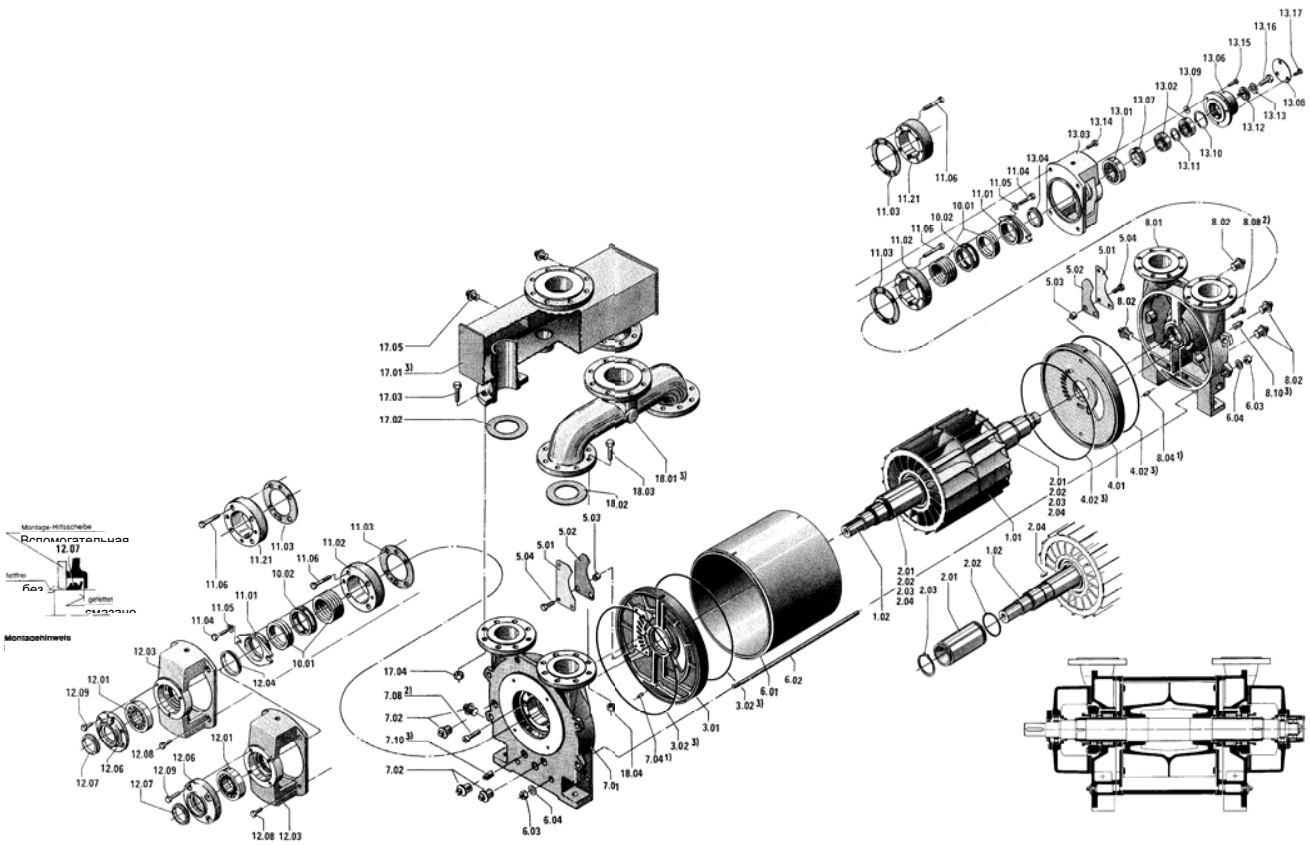

Figure 5.8c Vacuum pump 2BE1 20. to 2BE1 25 (Example, delivered design may deviate in details)

Standard parts obtainable through the trade are not included in the legend. The type and size of these parts can be seen from the pertinent spare parts list.

1.01 Impeller
1.02 Shaft
2.01 Shaft bushing
2.02 Sealing ring (O-ring)
3.01 Port plate D-end
3.02 Sealing ring (O-ring)
4.01 Port plate N-end
4.02 Sealing ring (O-ring)
5.01 Intercepting plate
5.02 Valve plate
5.03 Distance bushing
6.01 Casing
6.02 Double end stud
7.01 End shield D-end
7.02 End shield N-end
10.01 Packing
10.02 Sealing-water distribution ring
11.01 Stuffing box gland
11.02 Stuffing box housing (for internal liquid supply)
11.03 Flat gasket
11.21 Stuffing box housing (for external liquid supply)
12.01 Cylindrical roller bearing (floating bearing)
12.03 Bearing housing
12.04 Shaft sealing ring (V-ring)
12.06 Outer bearing cap
12.07 Shaft sealing ring (V-ring)
13.01 Cylindrical roller bearing (floating bearing)
13.02 Deep-groove ball bearings (locating bearing)
13.03 Bearing housing
13.04 Shaft sealing ring (V-ring)
13.06 Locating bearing housing
13.07 Threaded ring
13.08 Bearing cap
13.09 Compensating washer (for rotor adjustment)
13.10 Compensating shim for ball bearing
13.11 Shim ring
13.12 Thrust washer
17.01 Separator
17.02 Flat gasket
18.01 Y-pipe
18.02 Flat gasket

1) for types 2BE1 20. only
2) for types 2BE1 25. only
3) only if ordered especially

D-end = AS = drive end
N-end = BS = non-drive end

Special information for transport of Nash Vacuum Pumps 2BE1 10. to 2BE1 25.

⚠ WARNING

Only the openings and hoisting lugs on the base plates are used to transport the machine sets. Machine sets must not be hoisted by attaching ropes to the individual machines (see Figure 1.3a)!

Pay attention to the load carrying capacity of hoisting gear!

Using suitable slings, individual machines must be suspended so that

- **the load carrying capacities of slings and hoisting gear at least correspond to the weight of the machine (see tables for weight data of machines without water fillings),**
- **slings are adequately long, i.e. spread angles are less than 90°,**
- **suitable sling points are chosen (e.g. the bearing cases are suitable; never suspend by the shaft!),**
- **tilting of the machine is excluded by correct positioning of slings (see Figures 1.3b),**
- **no attached fittings can be damaged (slings may, how-ever, be guided over any attached wide pipes or separators. There is no need to use spreaders).**

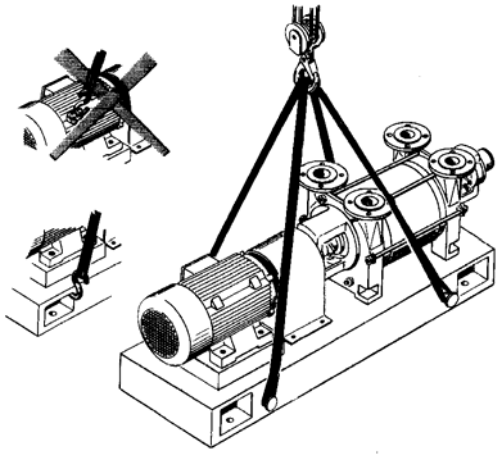

Figure 1.3a Hoisting machine sets

Type 2BE1 ...	101	102	103	151	152	153	202	203	252	253
Weight (individual machine with accessories)	0.10 t	0.15 t	0.16 t	0.22 t	0.23 t	0.27 t	0.45 t	0.51 t	0.91 t	1.04 t

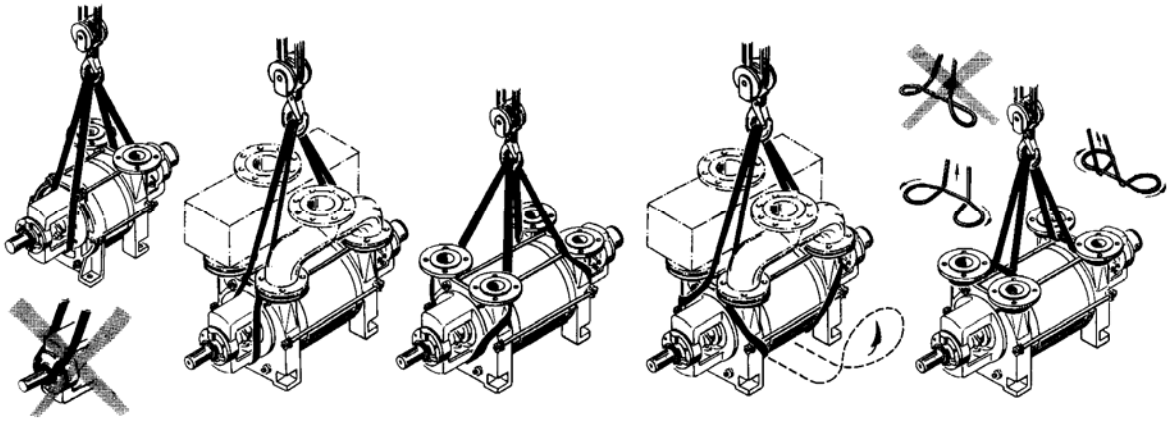

Figure 1.3b Hoisting individual machines

Störungsmöglichkeiten
Scope of Faults

bei Gardner Denver Nash Vakuumpumpen und Verdichtern /
on Gardner Denver Nash Vacuum Pumps and Compressors

Allgemein:

In der folgenden Tabelle sind allgemeine Störungen bei Vakuumpumpen und Verdichtern aufgeführt.

General:

General faults on vacuum pumps and compressors are listed in the following table.

STÖRUNGSMERKMALE / FAULT CHARACTERISTICS

- Unruhiger Lauf / Irregular running
- Leistungsaufnahme zu hoch / Too much input
- Volumenstrom zu niedrig / Volume flow too low
- Gehäuse zu warm / Casing overheats

MÖGLICHE STÖRUNGSURSACHEN POSSIBLE CAUSES	ABHILFEMASSNAHMEN REMEDIES
Grundplatte vibriert Base plate vibrates	Grundplatte u. ggf. Getriebesockel mit Fundamentbeton ausgießen oder mit trockenem Sand füllen Groute in the base plate and if necessary the gear socket with foundation concrete or fill them with dry sand
Aggregat schwingt Aggregate vibrates	Ausrichtung und Befestigung des Aggregates überprüfen Review the alignment and the fastening of the aggregate
Rohrleitungen schwingen Tubes vibrate	Befestigung der Rohrleitungen überprüfen Review the fastening of the tubes
Kavitation – knatterndes Geräusch Cavitation – crackling noise	Kältere Betriebsflüssigkeit verwenden. Ansaugdruck ggf. auch durch Zugabe von Falschluft begrenzen oder Kavitationsschutz nachrüsten Use cooler working liquid, restrict suction pressure and if necessary supply secondary air or retrofit cavitation protection
Pulsierende Förderung Pulsating delivery	Betriebsflüssigkeit soweit drosseln, bis Pulsieren aufhört, Rückschlagorgane überprüfen Choke the working liquid until the pulsation ceases, check non- return valves
Zu hoher Anfall von Flüssigkeit auf Saugseite Too much liquid at suction side	Betriebsflüssigkeit drosseln, ggf. Vorabschneider auf Saugseite einbauen Choke the working liquid and if necessary install a preseparator at suction side
Abscheider zu hoch angeordnet Separator arranged high	Abscheider tiefer setzen Lower the separator
Laufrad schleift an der Steuerscheibe Impeller rubs the port plate	Handlochdeckel öffnen, Spalteinstellung prüfen bzw. korrigieren Open the handhole covers, check and correct the gap adjustment
Stopfbuchse zu fest angezogen Stufing box tighten up too much	Stopfbuchsbrille soweit lösen, daß 1 bis 2 Tropfen Flüssigkeit pro Sekunde austreten Open the stuffing- box gland so that 1 to 2 drops of liquid per second flow out
Starker Festkörperanfall auf Saugseite Solid state amount at suction side	Gehäuse periodisch oder kontinuierlich spülen, ggf. Schmutzfänger vorsehen Flash the casing periodically or continually, if necessary provide a dirt trap
Läufer sitzt fest Rotor seizes	Gehäuseschrauben lösen, Läufer mit Hebel durchdrehen, ggf. Vakuumpumpe bzw. Verdichter reinigen Remove the casing screws, bar the rotor with lever, if necessary clean the vacuum pump or the compressor
Motorschutz spricht an Motor protection responds	Wenn Störungen an Vakuumpumpe bzw. Verdichter ausscheiden, Motorschutz bzw. Motorgröße überprüfen If vacuum pump or compressor is not the cause of the fault, review the motor protection and the motor size
Erosion im Gehäuse Erosion in casing	Gehäuse erneuern, ggf. auskleiden, Beständigkeit des Werkstoffes prüfen, ggf. Betriebsflüssigkeit filtern Replace casing, if necessary line it, check the material stability and if necessary filter the working liquid
Überverdichtung Supercharge	Anlage überprüfen, ggf. Ansaugdruck bzw. Verdichtungsdruck korrigieren Review the installation, if necessary correct the suction pressure and the discharge pressure

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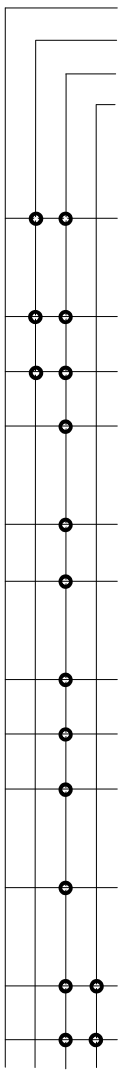
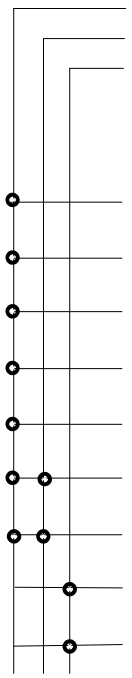
STÖRUNGSMERKMALE / FAULT CHARACTERISTICS



Unruhiger Lauf / Irregular running
Leistungsaufnahme zu hoch / Too much input
Volumenstrom zu niedrig / Volume flow too low
Gehäuse zu warm / Casing overheats

MÖGLICHE STÖRUNGSURSACHEN POSSIBLE CAUSES	ABHILFEMASSNAHMEN REMEDIES
Verkalkung oder Ablagerungen Calcification or deposits	Mit 5%-iger Ameisensäure spülen, ggf. Vakuumpumpe bzw. Verdichter demontieren und reinigen, Betriebsflüssigkeit enthärten bzw. impfen. Flush with 5% formic acid, if necessary dismantle and clean the vacuum pump or compressor, soften or inject the working liquid.
Fehlanzeige der Meßgeräte Indication error of measuring instruments	Meßgeräte überprüfen, ggf. kalibrieren Review the measuring instruments, if necessary calibrate them
Verdichtungsdruck zu hoch Discharge pressure too high	Anlage überprüfen Review the installation
Spaltverluste zu hoch Gap leakage too high	Handlochdeckel öffnen falls vorhanden Gehäuselänge korrigieren Open the handhole covers if fitted, check the gaps; if too large, correct the casing length.
Zu niedriger Ansaugdruck Too low suction pressure	Anlage überprüfen, ggf. Ansaugdruck erhöhen Review the installation, if necessary increase the suction pressure
Innere Undichtheit Inner leakage	Vakuumpumpe bzw. Verdichter demontieren, Dichtflächen kontrollieren, Werkstoff auf Beständigkeit prüfen, bei Korrosion neue Teile einbauen Dismantle the vacuum pump or the compressor, check the surfaces of seals and the stability of material, in case of corrosion install new parts
Ventilplatten der Steuerscheiben defekt Defective valve plates of port plates	Ventilplatten erneuern Renew the valve plates
Automatisches Ablaßventil undicht Leaky automatic drain valve	Ventilkugel erneuern, ggf. Sitzfläche reinigen Renew the valve ball, if necessary clean the seat
Saugseite undicht Leaky suction side	Dichtungen am Saugflansch u. saugseitigen Handlochdeckel überprüfen, ggf. erneuern Review the seals on suction flange and on handhole cover of suction side, if necessary renew them
Stopfbuchse undicht Leaky stuffing box	Stopfbuchsbrille soweit anziehen, daß 1 bis 2 Tropfen Flüssigkeit pro Sekunde austreten Tighten up the stuffing-box gland so that 1 to 2 drops of liquid per second flow out
Zu wenig Betriebsflüssigkeit Too little working liquid	Betriebsflüssigkeitsmenge bzw. –druck erhöhen Increase the quantity and the pressure of working liquid
Zu hohe Betriebsflüssigkeitstemperatur Working liquid temperature too high	Temperatur senken bzw. Betriebsflüssigkeitsmenge erhöhen Lower the temperature or increase the quantity of working liquid

STÖRUNGSMERKMALE / FAULT CHARAKTERISTICS



Lager zu warm / Bearing overheats
Lager pfeift / Bearing screeches
Lager klopft / Bearing knocks

MÖGLICHE STÖRUNGSURSACHEN POSSIBLE CAUSES	ABHILFEMASSNAHMEN REMEDIES
Zu viel Fett im Lager Too much grease in bearing	Überschüssiges Fett entfernen Remove excess of grease
Kupplung drückt Strain applied from coupling	Maschine genauer ausrichten Improve alignment of machine
Riemenspannung zu groß Excessive belt tension	Riemenspannung herabsetzen Reduce belt tension
Lager verschmutzt Bearing contaminated	Lager reinigen bzw. erneuern. Dichtungen prüfen Clean or renew bearing, inspect seals
Umgebungstemperatur größer 40°C Ambient temperature higher than 40°C	Hochtemperaturfett verwenden Use special high-temperature grease
Schmierung unzureichend Lubrication insufficient	Nach Vorschrift schmieren Lubricate according to instructions
Lager ist korrodiert Bearing corroded	Lager erneuern, Dichtungen prüfen Renew bearing, inspect seals
Schälstellen in der Laufbahn Scratches on raceways	Lager erneuern Renew bearing
Standriefen Scoring	Lager erneuern, Erschütterungen im Stillstand vermeiden Renew bearing, avoid vibration while a standstill

Änderungen vorbehalten /
Subject to change without prior notice
Bestell-Nr. / Order-No. A1B 3371 DEEN
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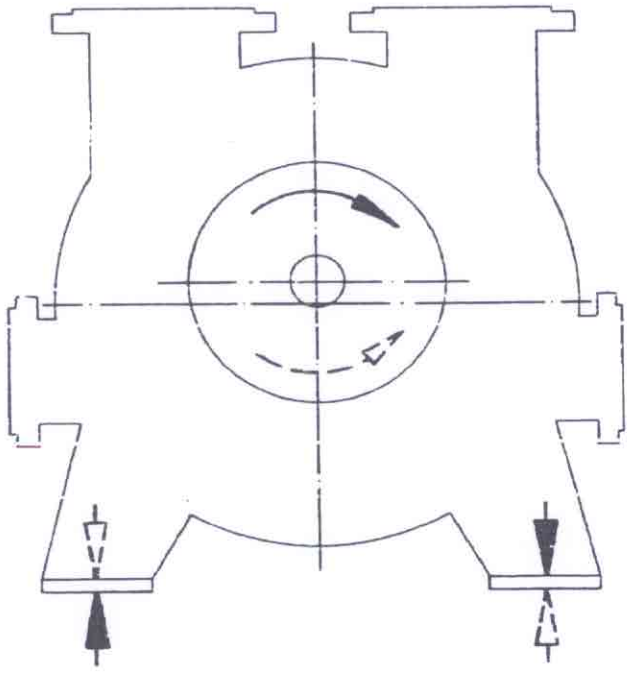
Die Fundamentbelastung ist errechnet aus dem Kippmoment des Antriebsmotors mit Berücksichtigung des Maschineneigengewichts.
Die Kräfte gelten für eine Maschinenseite.

The load on the foundation is calculated from the break-down torque of the driving motor in consideration of the total weight of the machine.
Indicated forces apply to one side of the machine.

Zahlenwerte siehe Textblatt zum Maßbild unter „Allgemeine Angaben"
Numerical values see textsheet for dimension drawing under "General Data"



Druckkraft
Compressive force

Zugkraft
Tensile force

Druckkraft
Compressive force

Zugkraft
Tensile force

Fundamentbelastung
Foundation loading

Maßstab	ohne	TR-Nr. 1	
Büro	TKP	TR-Nr. 2	
Datum	3.11.81	Progr.-Nr.	
Bearbeiter	Blätterlein	Formbl.-Nr.	
☐ Ähnlich			

Siemens AG
Bereich Energietechnik
Nürnberger Maschinen- und Apparatewerk

T 8 0 6 0 5 1 KS ☐

Declaration of clearance for the disassembly of vacuum pumps/compressors

When returning the pump-motor unit/the machine for repair and/or maintenance purposes, complete, sign and enclose this declaration.
The repair and/or maintenance of the returned pump-motor unit/machine in the workshop will only be carried out if this declaration has been completed, signed and enclosed. Each pump-motor unit/machine must be accompanied by a separate declaration.
The declaration must be attached to the outside of the packaging. In addition, prior to shipment a copy of the declaration should be forwarded to the workshop in charge, e.g. by fax.
This declaration may only be completed by authorized and qualified personnel of the operator.

Information on the operator:

Company/Department/Institute: _____
Address: _____
Postal/Zip code, city: _____
Contact person: _____
Position: _____
Phone: _____
Fax: _____

Information on the pump-motor unit/machine:

Product designation: _____
Type: _____
Serial number (No. N): _____
Reason for the return of the pump-motor unit/machine: _____

The pump-motor unit/machine designated above and returned by the undersigned*)

- ☐ has not come in contact with hazardous substances.
- ☐ materials and / or components containing asbestos were used, e.g. seals.
- ☐ was used for the following applications _____

and has come in contact with the following substances which are subject to compulsory marking or are detrimental to health:

Trade name:	Chemical designation:	Properties (e.g. toxic, flammable, corrosive, radioactive):

*) Check where applicable

☐ Prior to shipment the pump-motor unit/machine has been completely drained, purged and cleaned thoroughly both inside and outside according to the operating instructions.

☐ Special safety precautions are not necessary for further handling.

☐ The following safety precautions are required for further handling:

_____

_____

_____

_____

_____

☐ Safety data sheets in accordance with the relevant national and local codes and regulations are enclosed.

Legally binding declaration

We hereby affirm that the statements given in this declaration are correct and complete and that I, the undersigned, am capable of judging this. We are aware that we are liable to the contractor for any damage arising from incomplete or incorrect statements. We undertake to hold the contractor harmless from third party damage claims arising from incomplete or incorrect statements. We are aware that - irrespective of this declaration - we are directly liable to third parties, in particular to the personnel of the contractor in charge of the handling as well as the repair/maintenance of the unit.

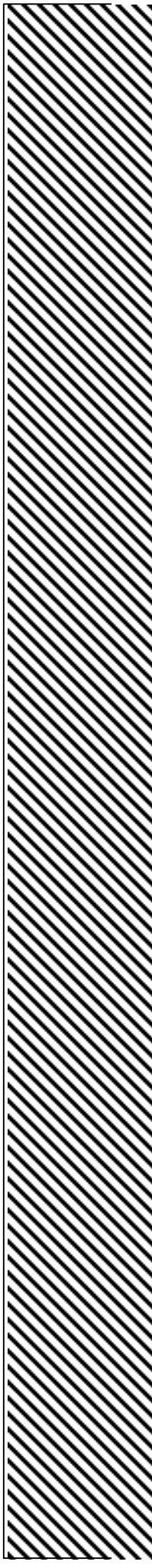
Place, date: _____ Name: _____

Company stamp: _____ Signature: _____

3

Register 11.17

Steam Inlet Flapper with Actuator



Supplier: **Metso Automation GmbH**

Identifier	Description	Design Group	Manufacturer	Type
MAC45AA051	LP-Induction Valve	38000100	Metso Automation GmbH	L2DMH16PACAF/01
MAC46AA151	LP-Induction Valve	38000100	Metso Automation GmbH	L2DMH16PACAF/01

T11322 - CA MAU I / T11368 - CA MAU II

Lieferantenzeichnung
Manufacturers Drawing

Ventildaten Valve data			
Komponente component	ND-Zudampfklappe LP-Induction Valve		
Zeichnungsnummer Systemschaltplan Drawing number system diagram	11322-931541, 11368-931541 11322-931591, 11368-931591		
Kennzeichen nach Systemschaltplan Tagging according to system diagram	10/20 MAC 45 AA051 10/20 MAC 46 AA151		
Herstellerangaben Manufacturers data			
Hersteller manufacturer	METSO AUTOMATION S.A.S.		
Adresse Hersteller address manufacturer	6 - 8 Rue du Maine; F-68271 WITTENHEIM, France (FRA)		
Auftrags - oder Rechnungsnummer order or invoice number	0493001225 Ma Cau 1 0493001226 Ma Cau 1	Pos.	001-008
Serien- oder Fabriknummer Serial or fabrication number	FR129129 Ma Cau 1 FR129132 Ma Cau 2		
Siemens PG - Angaben Siemens PG data			
Siemens PG Bestellnummer Siemens PG order number	2006630374-053 Ma Cau 1 2006630373-053 Ma Cau 2	Pos.	00001

Daten Klappe / Butterfly Valve Data

Hersteller manufacturer	Metso Automation
Serien- oder Fabriknummer Serial or fabrication number	SO5272319001 Ma Cau 1 SO5272319002 Ma Cau 2
Typenbezeichnung (Bitte komplette Bezeichnung angeben) Type designation (Please provide complete designation)	L2DMH16PACAF/01
Medium medium	Mineraloil
charakteristische Kennwerte (z.B. Nennweite, Nenndruck) characteristic parameters (e.g. nominal width, nominal pressure)	16" / ASME Class 300

Daten Antrieb / Actuator data

Wurde kein Antrieb geliefert, bleibt die Tabelle leer. / If an actuator has not been supplied the table stays blank.

POS. 3			
Komponente Component	Schaltantrieb Antrieb Stop Valve Actuator	Kennzeichen Tagging	10/20 MAC 46 AA151
Hersteller manufacturer	MAFAG		
Serien- oder Fabriknummer Serial or fabrication number	99703 CA MAU 1; 99705 CA MAU 2		
vollständige Typenbezeichnung complete type designation	SA500/80-110/F2750/OK1/spez.		
charakteristische Kennwerte characteristic parameters	∅80mm Piston/Mspring=2750Nm	Installierte Menge pro Ventil installed quantity per Valve	1

POS. 5			
Komponente Component	Regelantrieb Control Valve Actuator	Kennzeichen Tagging	10/20 MAC 45 AA051
Hersteller manufacturer	MAFAG		
Serien- oder Fabriknummer Serial or fabrication number	99702 CA MAU 1; 99704 CA MAU 2		
vollständige Typenbezeichnung complete type designation	SA500/80-110/F2750/OK1/spez.		
charakteristische Kennwerte characteristic parameters	∅80mm Piston/Mspring=2750Nm	Installierte Menge pro Ventil installed quantity per Valve	1

Inhaltsverzeichnis
Contents register

Materialbeschreibung
Material description

1

1. Materialbeschreibung
Materialdescription

Im Lieferumfang sind zwei baugleiche NELES AUTOMATION Stellklappen NELDISC® mit aufgebauten hydraulischen MAFAG Antrieben. Die Rohrleitungs-Anschlußflansche und der Zwischenflasch sind nicht im Lieferumfang enthalten. Daher sind die Klappen nicht als Block montiert, sondern separat geliefert.
The supply contains two High performance butterfly valves NELDISC® *with mounted hydraulic MAFAG quarter turn actuators. Piping flanges and the intermediate flange are to scope of supply. Hence the valves are not mounted to one valve block.*

Type-Coding of butterfly valve : **L2DMH16PACAF-**

L2	Hochleistungs-Stellklappe NELDISC®, monoflanschbauweise *High performance butterfly valve NELDISC®, lug type* Schaltklappe und Regelklappe sind gleich ausgeführt *On/Off-valve and control valve are the same*.	
D	Gehäusedruckstufe: *Body rating*	ANSI Cl300lb
M	Metallischer Sitz *Metal seated*	INCOLOY825
H	Hochtemperaturausführung *Hightemperatur design*	
16	Nennweite / *Size*	DN400, (16”)
P	Gehäusematerial *Body material*	ASTM A216 Gr.WCB
A	Scheibenmaterial *disc material*	ASTM A351 Gr.CF8M
C	Wellenmaterial *shaft material*	17-4PH
A	Sitzmaterial *seat material*	INCOLOY 825
F	Packungsmaterial *packing material*	Graphit

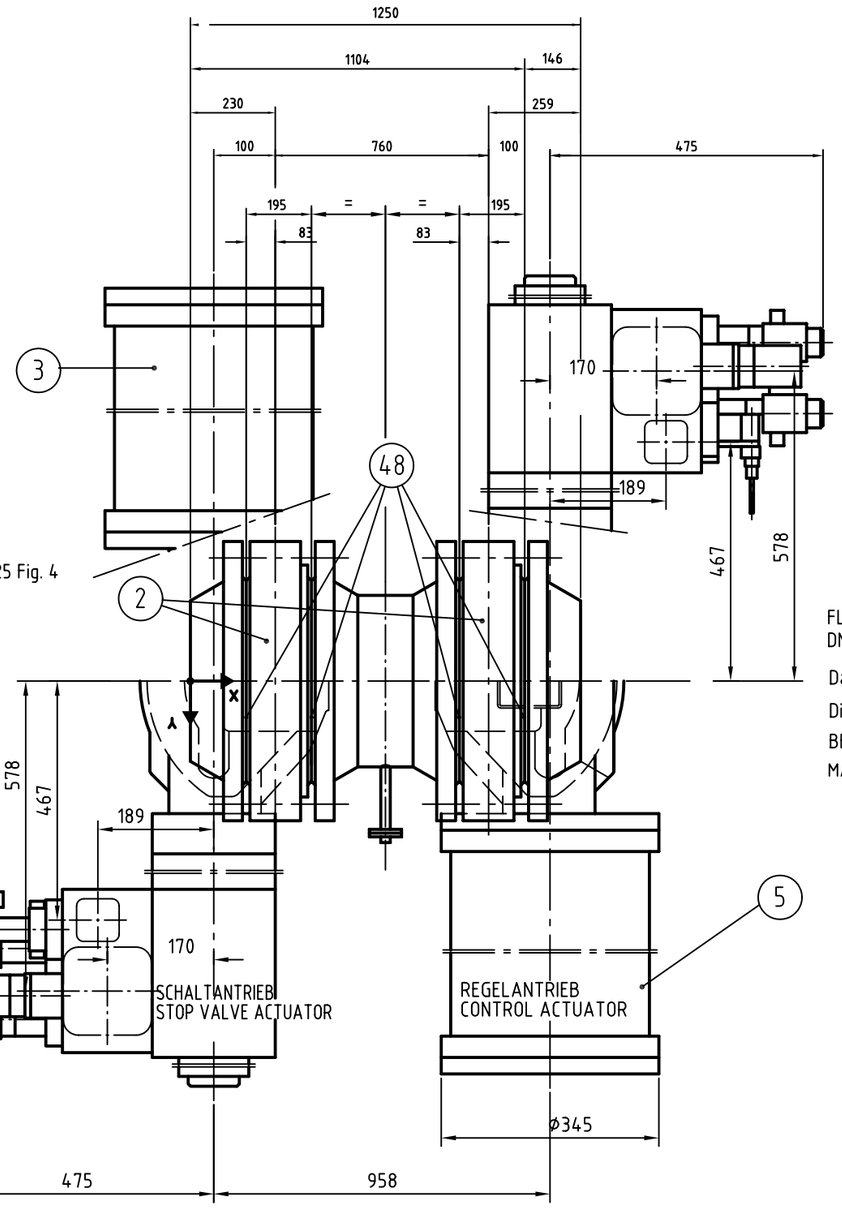
MAFAG SA500

Hydraulischer MAFAG Drehantrieb. Ausführung für Stell- und Schaltantrieb sind gleich. Funktion wird durch die aufgebauten von SIEMENS beigestellten REXROTH Steuerblöcke bestimmt.
MAFAG hydraulic quarter turn actuator. Same design for on/off-application and control application. Function will given by the add supply from SIEMENS of REXROTH control pilot blocks.

Maßzeichnungen
Dimensional Drawings

2

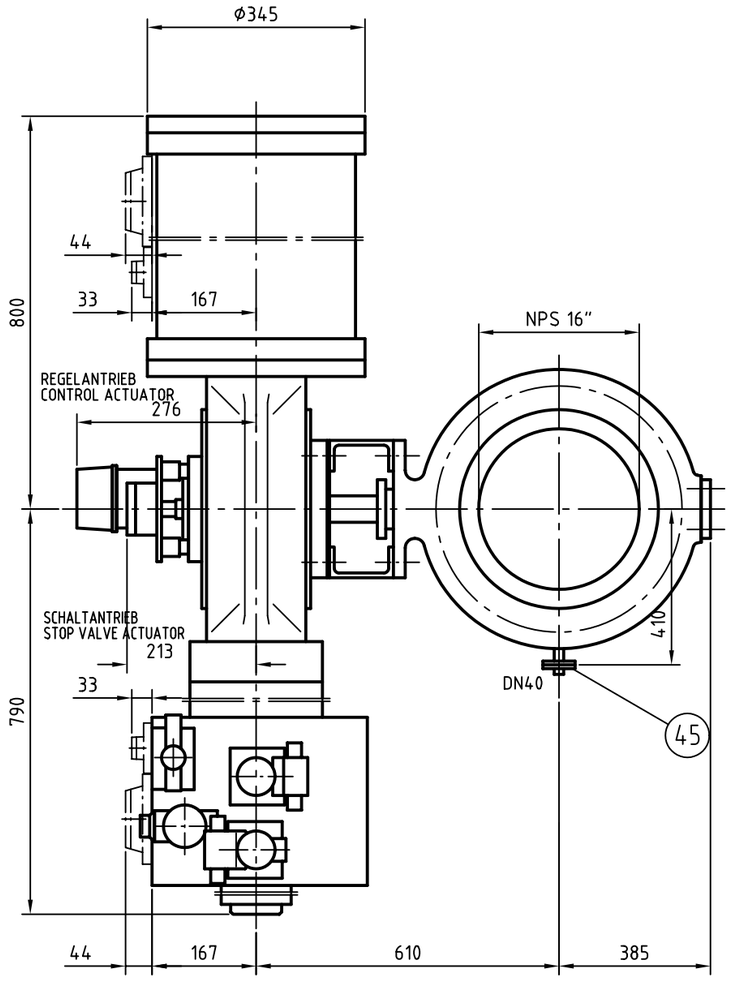
MOUNTING POSITION / ANBAULAGE :
SV4-DP3/40-CV4-HBS L4/2-HABC R2/2-L1250-DN400/400



FLANGE/FLANSCHE
DN400 ANSI 300 RF
WELD ENDS / ANSCHWEISSENDE
Da = 406.4 $^{+0.5}_{-0.5}$
Di = 387,5 $^{+0.25}_{-0.25}$
BEVEL / SCHWEISSENDE ASME B15.25 Fig. 4
MATERIAL A105N

FLUSSRICHTUNG
FLOW DIRECTION

FLANGE/FLANSCHE
DN400 ANSI 300 RF
Da = 406.4 $^{+0.5}_{-0.5}$
Di = 387,5 $^{+0.25}_{-0.25}$
BEVEL / SCHWEISSENDE ASME B15.25 Fig. 4
MATERIAL A105N

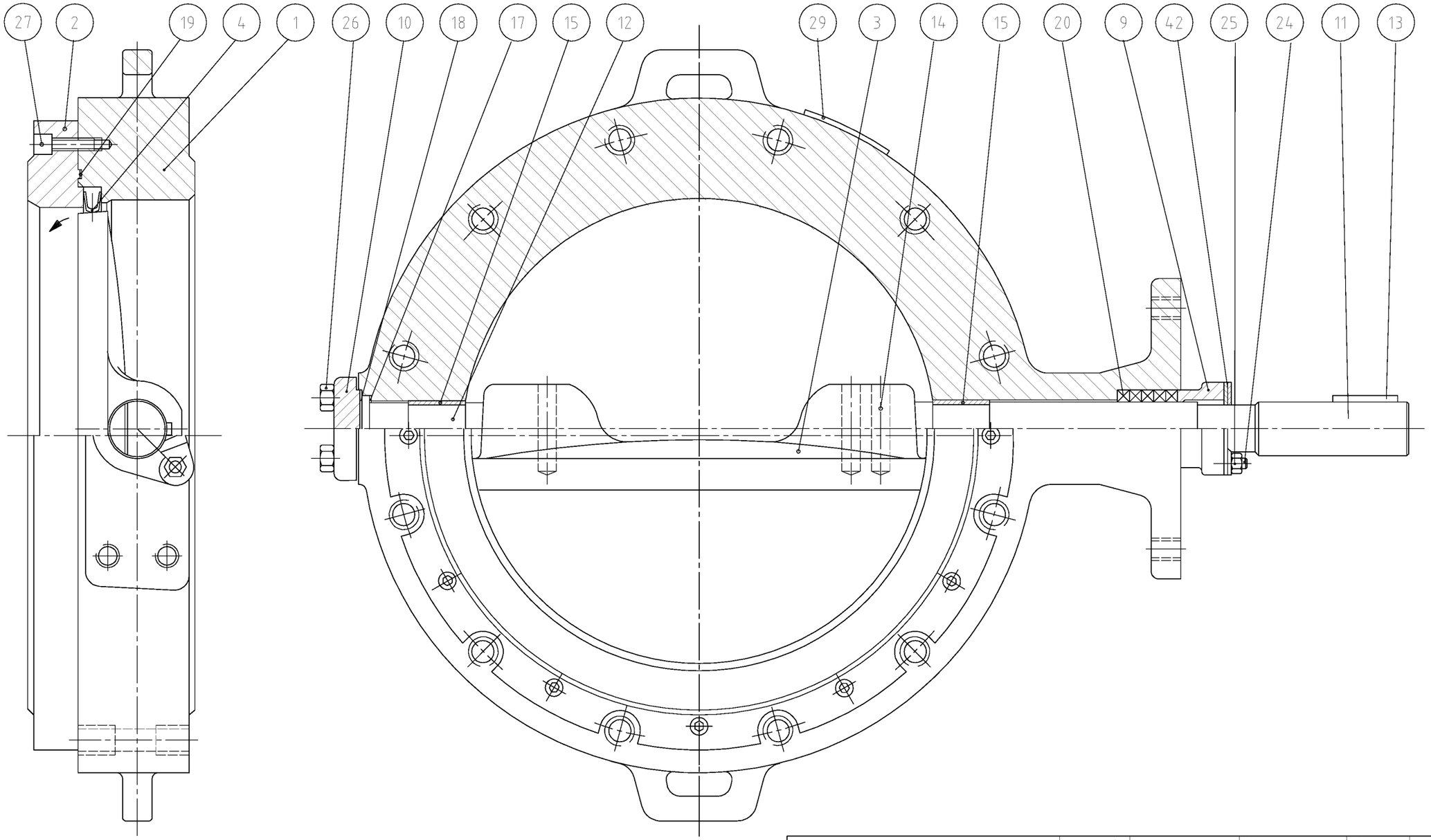


(...) Siemens Positionen
SIEMENS POSITIONS

metso		PVM DATE	PIIRT. DWN TMN	TARK. CHECK.	HYV. APPR.
Metso Automation Oy	HELSINKI FINLAND		ENT. OLD NO.	UUSI NEW NO.	
CERTIFIED DIMENSION DRAWING / BESTÄTIGTE MASSZEICHNUNG BUTTERFLY VALVES BLOCK / STELLKLAPPEN BLOCK L2DMH 16 PACAF/01-MAFAG SA0500-NT7211/S L2DMH 16 PACAF/01-MAFAG SA0500-LS			C F15075		
			MICROFILM.		
			MUUTOS ISSUE		

3

Zusammenstellungszeichnungen und Stücklisten
Assembly Drawings and Parts Lists



C		9856	KSA	17.01.97	EM
M MUUT ISSUE	n×M	N:O NO.	PIIRT. DWN.	PVM DATE	HYV. APPR.

PVM DATE 83.12.08 | PIIRT. DWN MLP | TARK. CHECK. – | HYV. APPR. TiT

ENT. OLD NO. · | UUSI NEW NO. ·

BUTTERFLY VALVE LUG-TYPES L2CMH, L2LMH, L2DMH, L2MMH, NELDISC METAL SEATED ASSEMBLY DRAWING

C 682170

NELES-JAMESBURY HELSINKI WORKS

MICROFILM.

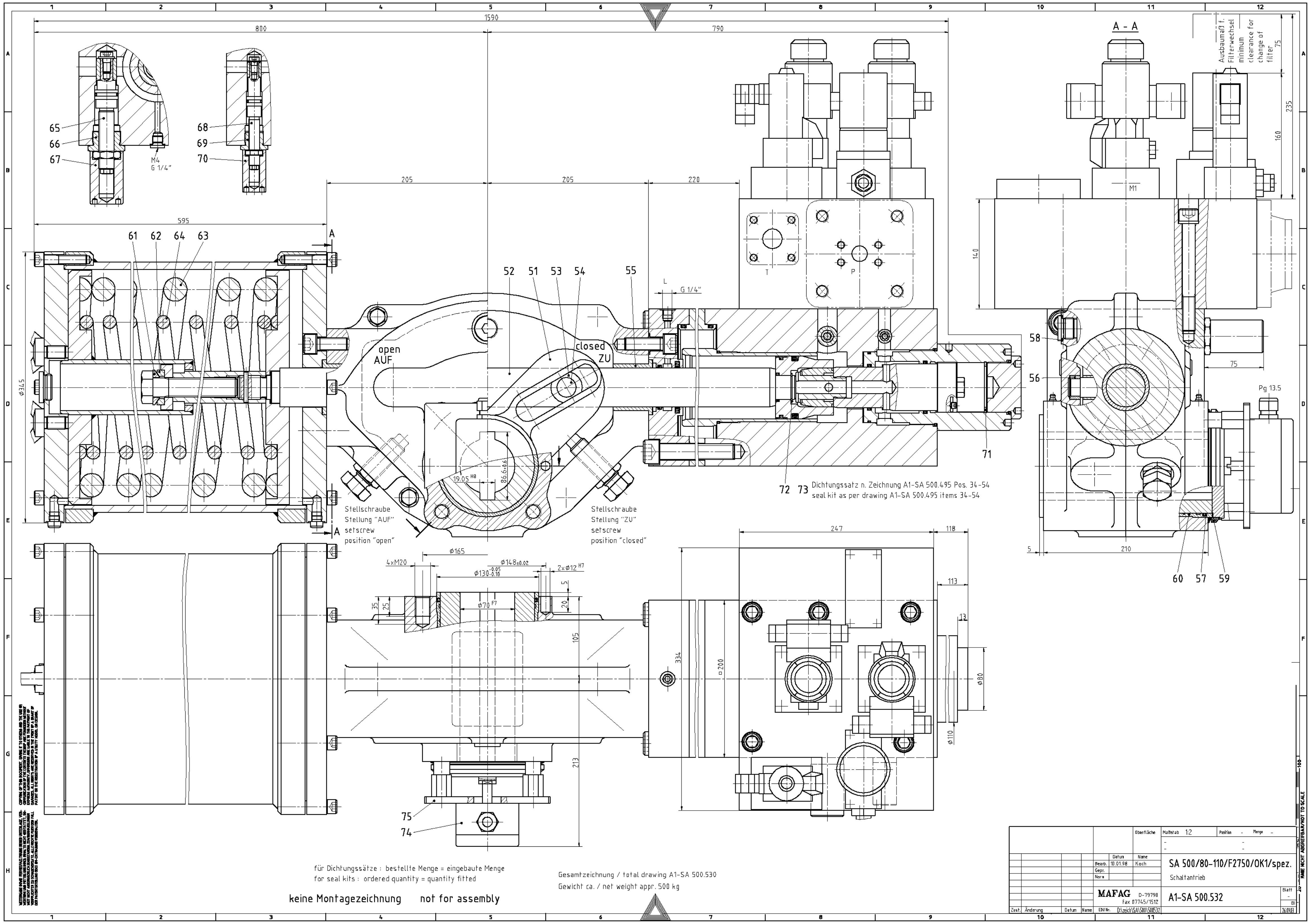
MUUTOS ISSUE C

Customer C-Bom
L2DMH16PACAF (ID-code 375485)
BUTTERFLY VALVE

Documents : C682170 NELDISC HIGH PERFORMANCE BUTTERFLY VALVE

PART		Description	Benennung	Material	Stk / Qty
001		BODY	GEHÄUSE	ASTM A216 gr. WBC/1.0619	1
002		CLAMP RING	FLANSCHRING	A351gr.CF8M/1.4408	1
003		DISC	KLAPPENSCHEIBE	ASTM A351gr.CF8M	1
004		SEAT RING	SITZRING	UNS N08825+HCr	1
009		CASTING GLAND	STOPFBUCHSBRILLE	A351gr.CF8M/1.4408	1
010		BLIND FLANGE	DECKEL	ASI316	1
011		DRIVE SHAFT	ANTRIEBSWELLE	A564 gr.630 + ALLOY 50Nb	1
012		SHAFT	WELLE	A564 gr.630 + ALLOY 50Nb	1
013		KEY	KEIL	TYPE AISI 329	1
014		PIN	STIFT	A564 gr.630	3
015		BEARING	LAGER	STELL 6B	2
017		THRUST BEARING	GEGENLAGER	STELL 6B	2
018		GASKET	DICHTUNG	GRAPHITE	1
019		SEAL STRIP	DICHTUNGSBAND	GRAPHITE	1
020		PACKING RING	PACKUNGSRING	GRAPHITE	5
024		STUD	GEWINDEBOLZEN	ISO3506 A4-70/80	2
025		HEXAGON NUT	SECHSKANTMUTTER	ISO898/2 8+Zinc+Pass.	2
026		HEXAGON SCREW	SECHSKANTSCHRAUBE	ISO 3506 A4-80	4
027		SOCKET HEAD SCREW	INNENSECHSKANTSCHRAUBE	ISO 3506 A4-80	24
029		IDENTIFICATION PLATE	TYPENSCHILD	AISI 304	1
042		RETAINER PLATE	DRUCKPLATTE	316L/1.4435	2

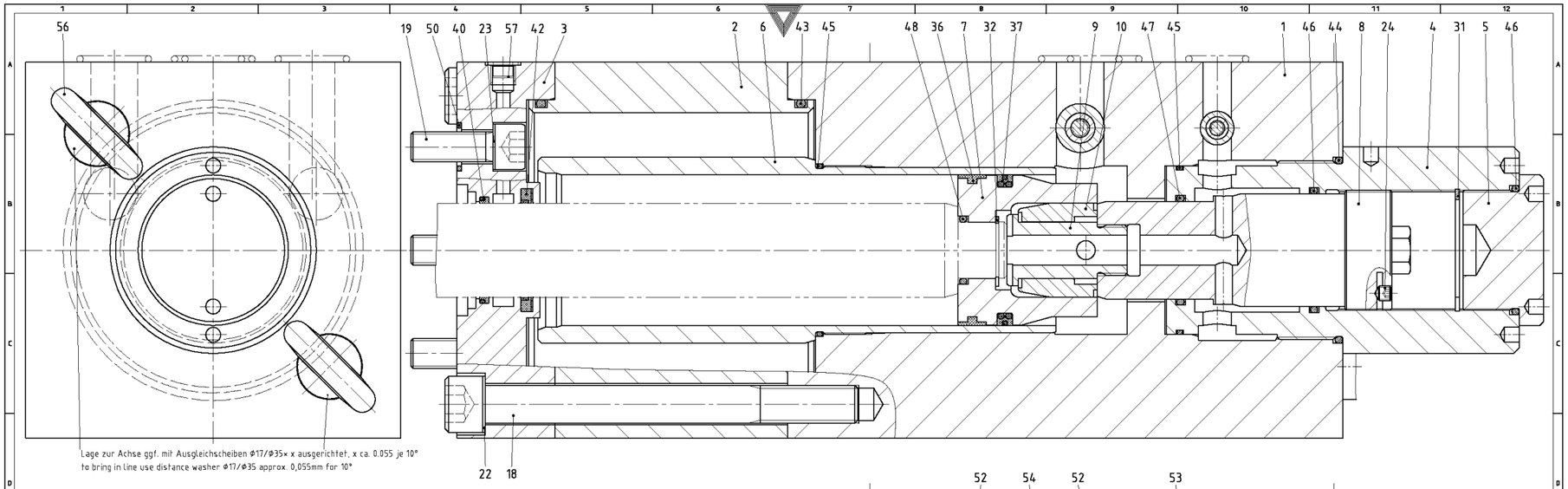
Siemens Pos.		PARTS POS: / TEILE POS:	DESCRIPTION / BENENNUNG	FOR SIZE / FÜR NENNWEITE	SET / QTY
2-04		4	SEATRING / SITZRING	16" / Cl300	1 pc
2-46		18,19,20	GASKET / DICHTUNG BODY SEAL / DICHTUNG PACKING / PACKUNG	16" / Cl300	1 Set
45		-	FLANSCHDICHTUNG (Kondensatleitung) FLANGE SEAL (Drain pipe)	DN40- 92/43x1,5 Grafite	1pc
48		16" / CL300 NOVAPHIT SSTC	FLANGE SEAL / FLANSCHDICHTUNG	16" / Cl300	4 pcs

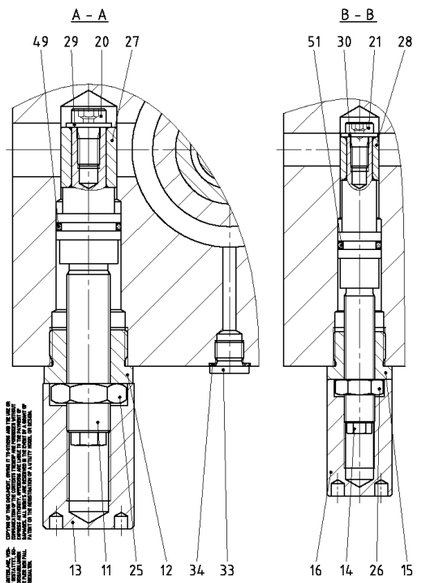

A - A
Ausbaumaß f. Filterwechsel
minimum clearance for change of filter
1590
800
790
205
205
220
595
61 62 64 63
52 51 53 54
55
open
AUF
closed
ZU
G 1/4"
65
66
67
68
69
70
M4
G 1/4"
58
56
Pg 13.5
71
72 73
Dichtungssatz n. Zeichnung A1-SA 500.495 Pos. 34-54
seal kit as per drawing A1-SA 500.495 items 34-54
Stellschraube
Stellung "AUF"
setscrew
position "open"
Stellschraube
Stellung "ZU"
setscrew
position "closed"
60 57 59
247
118
210
4×M20
ø165
75
74
für Dichtungssätze : bestellte Menge = eingebaute Menge
for seal kits : ordered quantity = quantity fitted
keine Montagezeichnung not for assembly
Gesamtzeichnung / total drawing A1-SA 500.530
Gewicht ca. / net weight appr. 500 kg
Oberfläche
Maßstab 1:2
Position -
Menge -
Datum
Name
Bearb. 10.01.98 Koch
Gepr.
Norm
SA 500/80-110/F2750/OK1/spez.
Schaltantrieb
MAFAG D-79798
Fax 07745/1512
A1-SA 500.532
Blatt
Zust. Änderung Datum Name
EDV Nr. D:\zeich\SA\500\500532
26.09.03
MAßE NICHT ABGREIFBAR/NOT TO SCALE

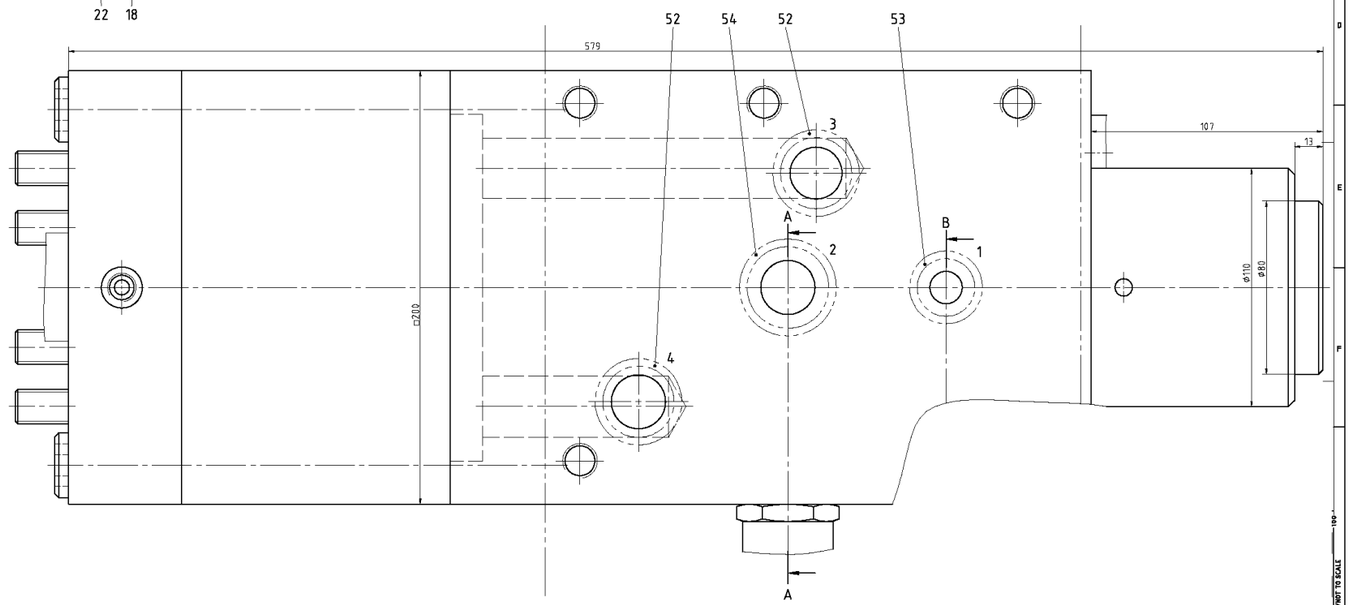
POS.	STÜCK QTY.	BENENNUNG	NAME		MATERIAL	BEMERKUNG REMARK
51	1	Schwenkarm	swivel arm		GS 52	
52	1	Schubstange	slide shaft		St 60	
53	2	Gleitstein	crosshead		GC-CuSn7	
54	1	Bolzen	pin		30CrNiMo8	lumenized
55	2	Bundlager	headed bearing 50/60/70/50		sinter. bz	
56	2	Gleitlager	slide bearing		GC-CuSn7	
57	2	O-Ring	o-ring			
58	2	Flachdichtung	flat seal 27x32		Cu	
59	1	V-Ring	v-ring			
60	2	Lagerbuchse	bearing bush		GC-CuSn7	
61	1	Kugelscheibe	spherical disk C25		St	
62	1	Kegelpfanne	conical socket D28		St	
63	1	Druckfeder	pressure spring		50CrV4	
64	1	Druckfeder	pressure spring		50CrV4	
65	1	Regulierschrau	adjusting screw		9SMnPb28K	
66	1	Verschraubung	connection		9SMnPb28K	
67	1	Kappe	cap		AlCuMgPb	
68	1	Regulierschrau	adjusting screw		9SMnPb28K	
69	1	Verschraubung	connection		9SMnPb28K	
70	1	Kappe	cap		AlCuMgPb	
71	1	Seegerring	seeger circlip ring J62x2		St	
72	1	Seegerring	seeger circlip ring A30x1,5		St	
73	1	Dichtungssatz	seal kit			pos. 34-54
74	1	ET-Modul	position control			
75	1	Anbausatz	Mounting kit			
						Jun.20,2000 Ko/Gil

betreffend POS. 73 Dichtungssatz
Auszug aus Stückliste A1-SA 500.495 (Dichtungen)
regarding POS: 73 seal kit
extract of parts-list A1-SA 500.495 (Seals)

POS.	STÜCK QTY.	BENENNUNG NAME	p
34	**2**	Flachdichtung/flat seal	
36	**1**	Führungsring/guiding ring	
37	**1**	Turkon -AQ-Seal	
40	**1**	Turkon-Excluder	
42	**1**	Stangendichtung/rod seal	
43	**2**	O-Ring	
44	**1**	O-Ring	
45	**2**	O-Ring	
46	**2**	O-Ring	
47	**1**	O-Ring	
48	**1**	O-Ring	
49	**1**	O-Ring	
50	**6**	O-Ring	
51	**1**	O-Ring	
52	**2**	O-Ring	
53	**1**	O-Ring	
54	**1**	O-Ring	





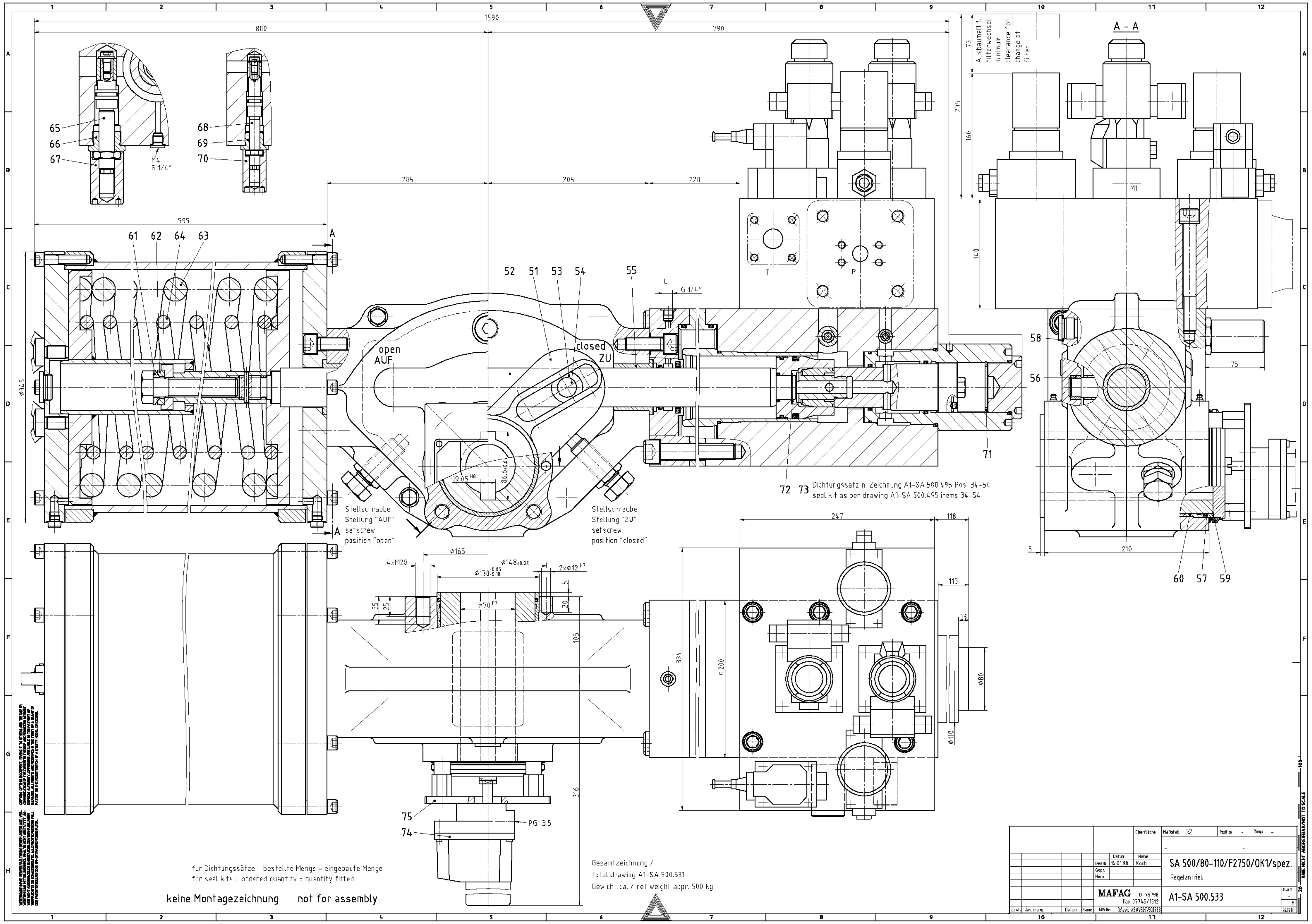


Lage zur Achse ggf. mit Ausgleichscheiben ⌀17/⌀35× x ausgerichtet, x ca. 0.055 je 10°
to bring in line use distance washer ⌀17/⌀35 approx. 0,055mm for 10°

Hubvolumen / stroke volume = 1,0 Liter
Füllvolumen / filling = 2,7 Liter

						Oberfläche	Maßstab 1:1 · Position – · Menge –
							– – – –
					Datum	Name	
				Bearb.	05.01.98	Koch	SA 500/... .80-160/OK1/sp.
				Gepr.			
				Norm			
				MAFAG	D-79798	Fax 07745/1512	A1-SA 500.495
							Blatt – · Bl
Zust.	Änderung	Datum	Name	EDV Nr.	D:\ZEICH\SA\500\500495		04.02.2002

MAßE NICHT ABGREIFBAR/NOT TO SCALE



A - A
Ausbaumaß f. Filterwechsel
minimum clearance for change of filter
open
AUF
closed
ZU
Stellschraube
Stellung "AUF"
setscrew
position "open"
Stellschraube
Stellung "ZU"
setscrew
position "closed"
Dichtungssatz n. Zeichnung A1-SA 500.495 Pos. 34-54
seal kit as per drawing A1-SA 500.495 items 34-54
PG 13.5
für Dichtungssätze : bestellte Menge = eingebaute Menge
for seal kits : ordered quantity = quantity fitted
keine Montagezeichnung not for assembly
Gesamtzeichnung /
total drawing A1-SA 500.531
Gewicht ca. / net weight appr. 500 kg
MAFAG
SA 500/80-110/F2750/OK1/spez.
Regelantrieb
A1-SA 500.533

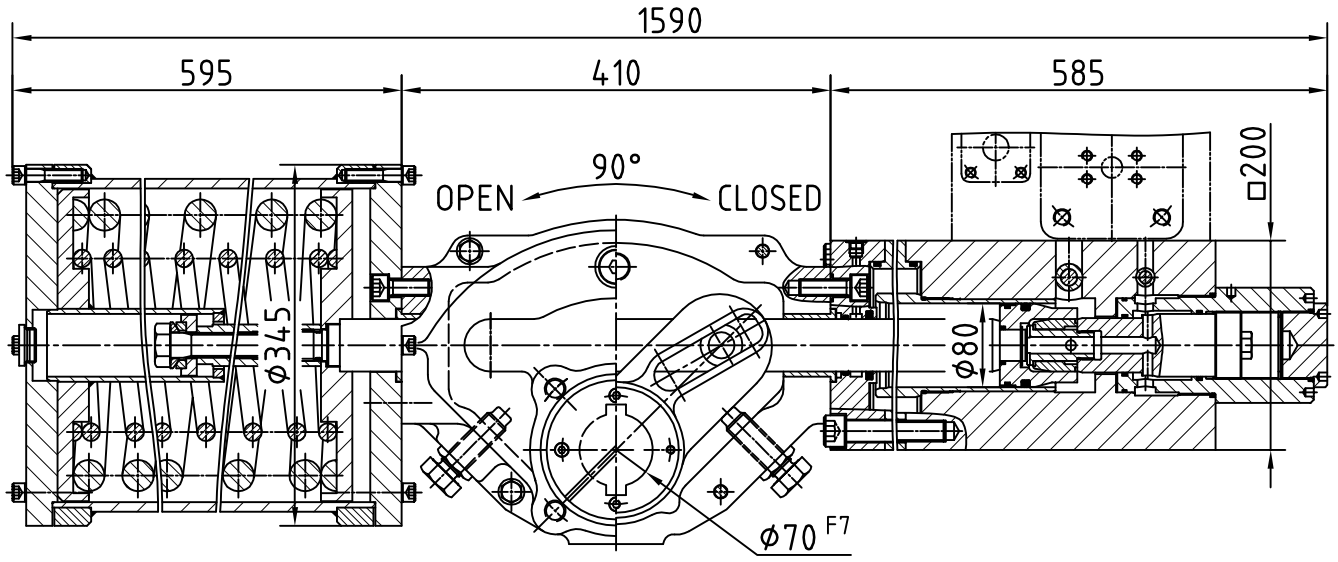
POS.	STÜCK QTY.	BENENNUNG	NAME	ZEICHNUNG DRAWING	MATERIAL	BEMERKUNG REMARK
51	1	Schwenkarm	swivel arm		GS 52	
52	1	Schubstange	slide shaft		St 60	
53	2	Gleitstein	crosshead		GC-CuSn7	
54	1	Bolzen	pin		30CrNiMo8	lumenized
55	2	Bundlager	headed bearing		sinter. bz	
56	2	Gleitlager	slide bearing		GC-CuSn7	
57	2	O-Ring	o-ring			
58	2	Flachdichtung	flat seal 27x32		Cu	
59	1	V-Ring	v-ring			
60	2	Lagerbuchse	bearing bush		GC-CuSn7	
61	1	Kugelscheibe	spherical disk C25			
62	1	Kegelpfanne	conical socket D28			
63	1	Druckfeder	pressure spring		50CrV4	
64	1	Druckfeder	pressure spring		50CrV4	
65	1	Regulierschrau	adjusting screw		9SMnPb28	
66	1	Verschraubung	connection		9SMnPb28	
67	1	Kappe	cap		AlCuMgPb	
68	1	Regulierschrau	adjusting screw		9SMnPb28	
69	1	Verschraubung	connection		9SMnPb28	
70	1	Kappe	cap		AlCuMgPb	
71	1	Seegerring	seeger circlip ring			
72	1	Seegerring	seeger circlip ring			
73	1	Dichtungssatz	seal kit			pos. 34-54
74	1	Stellungsgeber	position transmitter			Metso housing
75	1	Anbausatz	Mounting kit			
						Jun.20,2000

betreffend POS. 73 Dichtungssatz
Auszug aus Stückliste A1-SA 500.495 (Dichtungen)
regarding POS: 73 seal kit
extract of parts-list A1-SA 500.495 (Seals)

POS.	STÜCK QTY.	BENENNUNG NAME	MAFAG part-number
34	**2**	Flachdichtung/flat seal	
36	**1**	Führungsring/guiding ring	
37	**1**	Turkon -AQ-Seal	
40	**1**	Turkon-Excluder	
42	**1**	Stangendichtung/rod seal	
43	**2**	O-Ring	
44	**1**	O-Ring	
45	**2**	O-Ring	
46	**2**	O-Ring	
47	**1**	O-Ring	
48	**1**	O-Ring	
49	**1**	O-Ring	
50	**6**	O-Ring	
51	**1**	O-Ring	
52	**2**	O-Ring	
53	**1**	O-Ring	
54	**1**	O-Ring	

4

Montage-, Wartungs- und Betriebsanleitungen
Installation, Maintenance and Operating Instructions



spring assembly drawing	gear drawing	cylinder drawing
A2-SA 500.515	A3-SA 500.525	A1-SA 500.495

special version
damper in the closed position
spring torque in the end (Nm)
version spring return (clockwise)
min. pressure (bar, effective)
piston-ø (mm)
gear

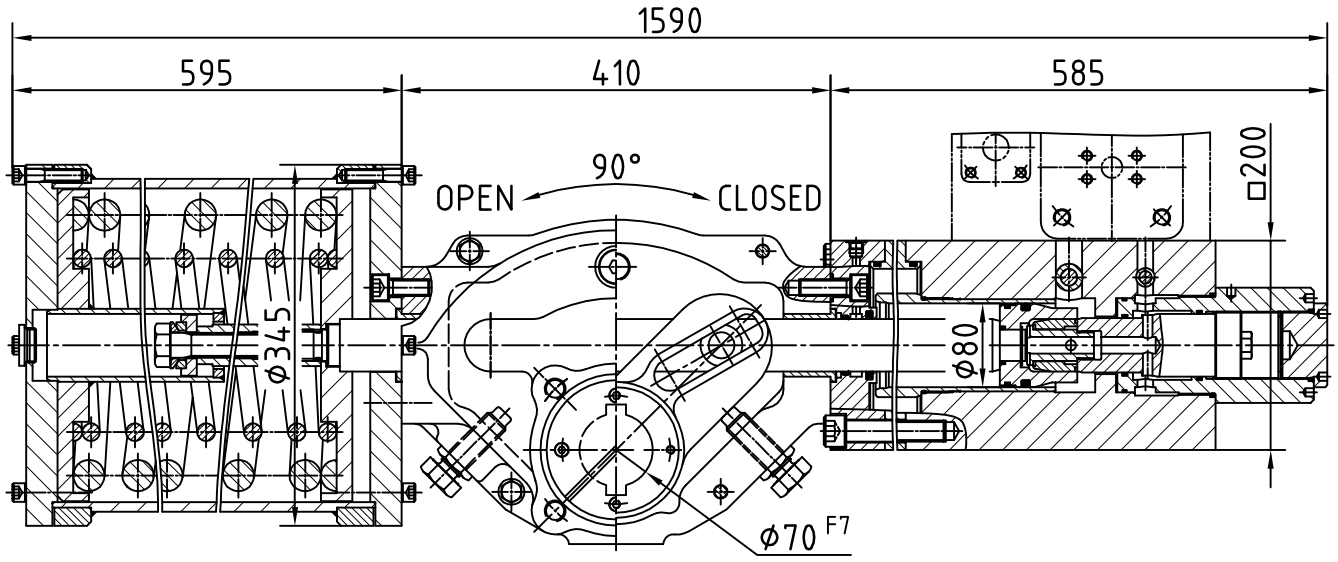
Typ:	SA 500/80-110/F2750/OK1/spez.											
manuf.nr.				drawing	A1-SA 500.530							
pressure	160	bar;	vol.	1,0	Lit.;	medium	SBF *					
temperature		°C	to	+70	°C;	manuf. year						
torque open	4550	-	1700	-	1175	Nm						
torque close	4125	-	2200	-	2750	Nm						

Paint : base paint : GEHOPON - Ex - Metallgr. E1-703, accelerator Ex-72
Cover paint : GEHOPON - Ex - Eisenglimmer E 8-7612, accelerator Ex-4
Both limit stops are adjustable by ±3°. The hydraulic damper is adjustable by an integrated throttle. The damping path is adjustable by a screw.
Stop Valve actuator with control block 10190-182600 version. 2 (Pos. 50)
Electr. final position feed-back by 2 proximity switches SJ-5N incorp. in makrolon housing.
Actuator mounted across the direction of the flow.
Drawing A1-SA 500.530 and spare part drawing A1-SA 500.532

* FYRQUEL EHC or PYROTEC HFD 46/test fluid: HFD Mobil Polygard 53T

MAFAG D-79798 Fax 07745/1512		Datum	Name	Maßstab
	Bearb.	08.02.2002	Koch	%
	Gepr.			

swivel actuator 0-90°	A4-SA 01.350/E	Blatt 20.02.02



spring assembly drawing	gear drawing	cylinder drawing
A2-SA 500.515	A3-SA 500.525	A1-SA 500.495

special version
damper in the closed position
spring torque in the end (Nm)
version spring return (clockwise)
min. pressure (bar, effective)
piston-ø (mm)
gear

Typ:	SA 500/80-110/F2750/OK1/spez.										
manuf.nr.				drawing	A1-SA 500.531						
pressure	160	bar;	vol.	1,0	Lit.;	medium	SBF *				
temperature		°C	to	+70	°C;	manuf. year					
torque open	4550	-	1700	-	1175	Nm					
torque close	4125	-	2200	-	2750	Nm					

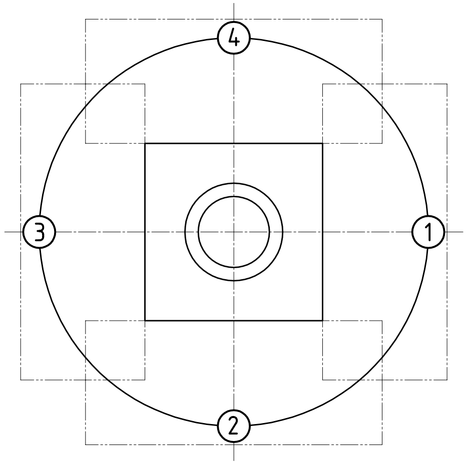
Paint : base paint : GEHOPON - Ex - Metallgr. E1-703, accelerator Ex-72
Cover paint : GEHOPON - Ex - Eisenglimmer E 8-7612, accelerator Ex-4
Both limit stops are adjustable by ±3°. The hydraulic damper is adjustable by an integrated throttle. The damping path is adjustable by a screw.
Control actuator with control block 10190-187600 version 2 (Pos. 50)
Electric position control 4-20 mA (Pos. 54).
Actuator mounted across the direction of the flow.
Drawing A1-SA 500.531 and spare part drawing A1-SA 500.533

* FYRQUEL EHC or PYROTEC HFD 46/test fluid: HFD Mobil Polygard 53T

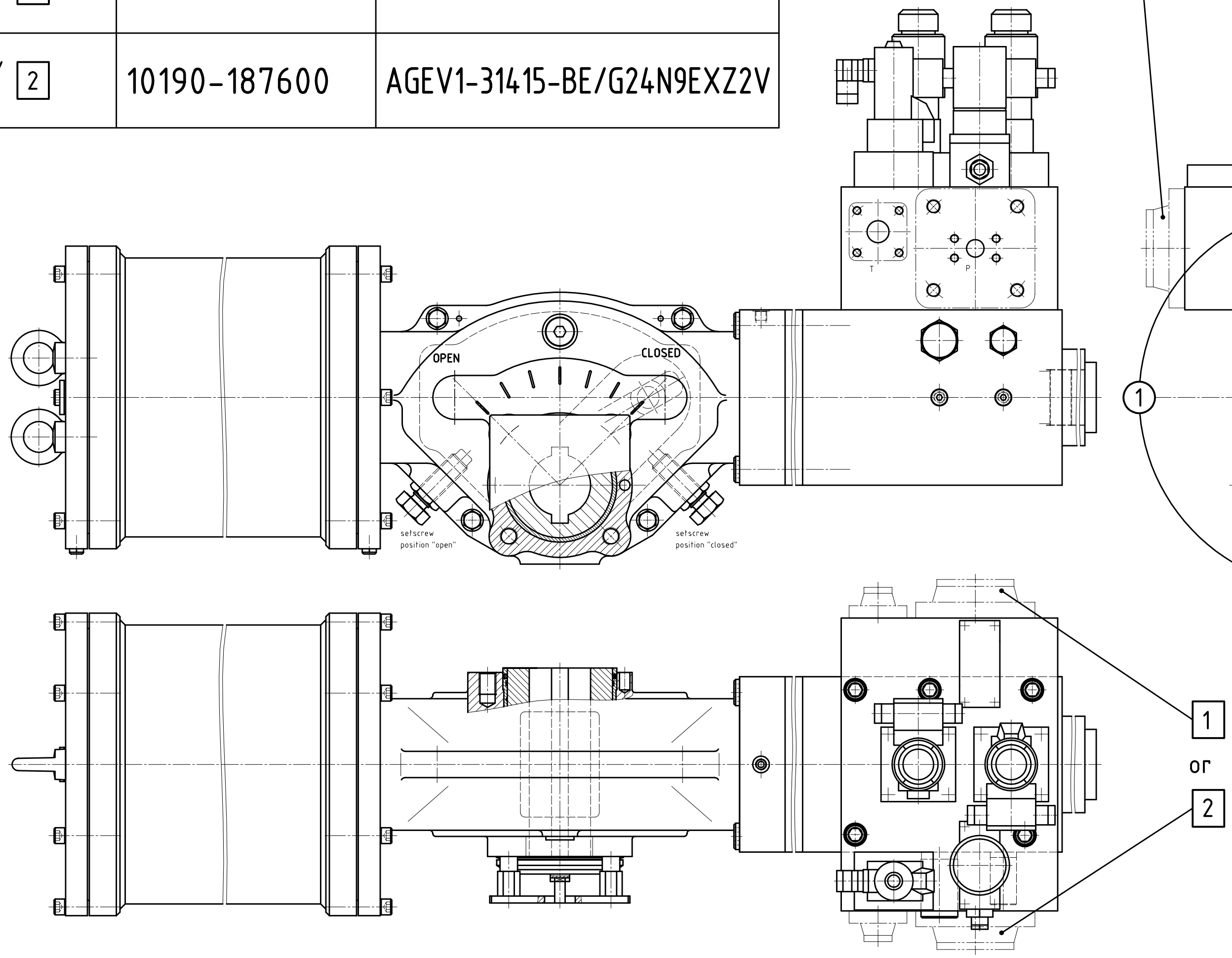
MAFAG D-79798 Fax 07745/1512		Datum	Name	Maßstab
	Bearb.	08.02.2002	Koch	%
	Gepr.			

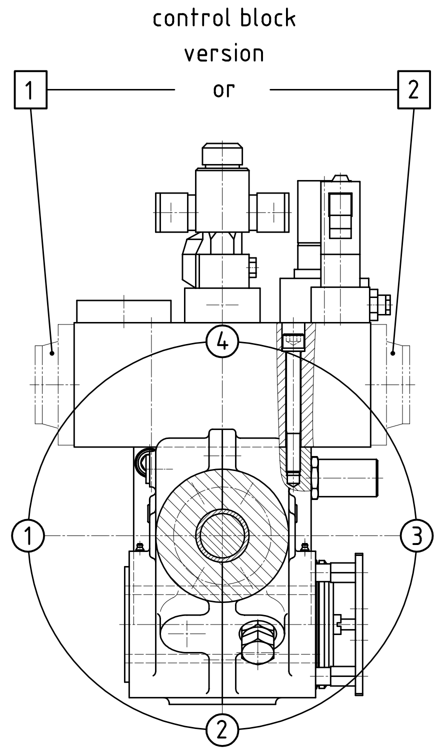
swivel actuator 0-90°	A4-SA 01.351/E	Blatt 20.02.02

project CA MAU	NELES - code	CONTROL - BLOCK position/version	Siemens-drawing	Mannesmann-Rexroth-type.
stop valve actuator order-nr.: 99700	HBS L 4/2 HBS R . / .	④ / [2]	10190-182600	AGEV1-31415-AE/G24N9EXZ2V
control actuator order-nr.: 99699	HBC L . / . HBC R 2/2	④ / [2]	10190-187600	AGEV1-31415-BE/G24N9EXZ2V



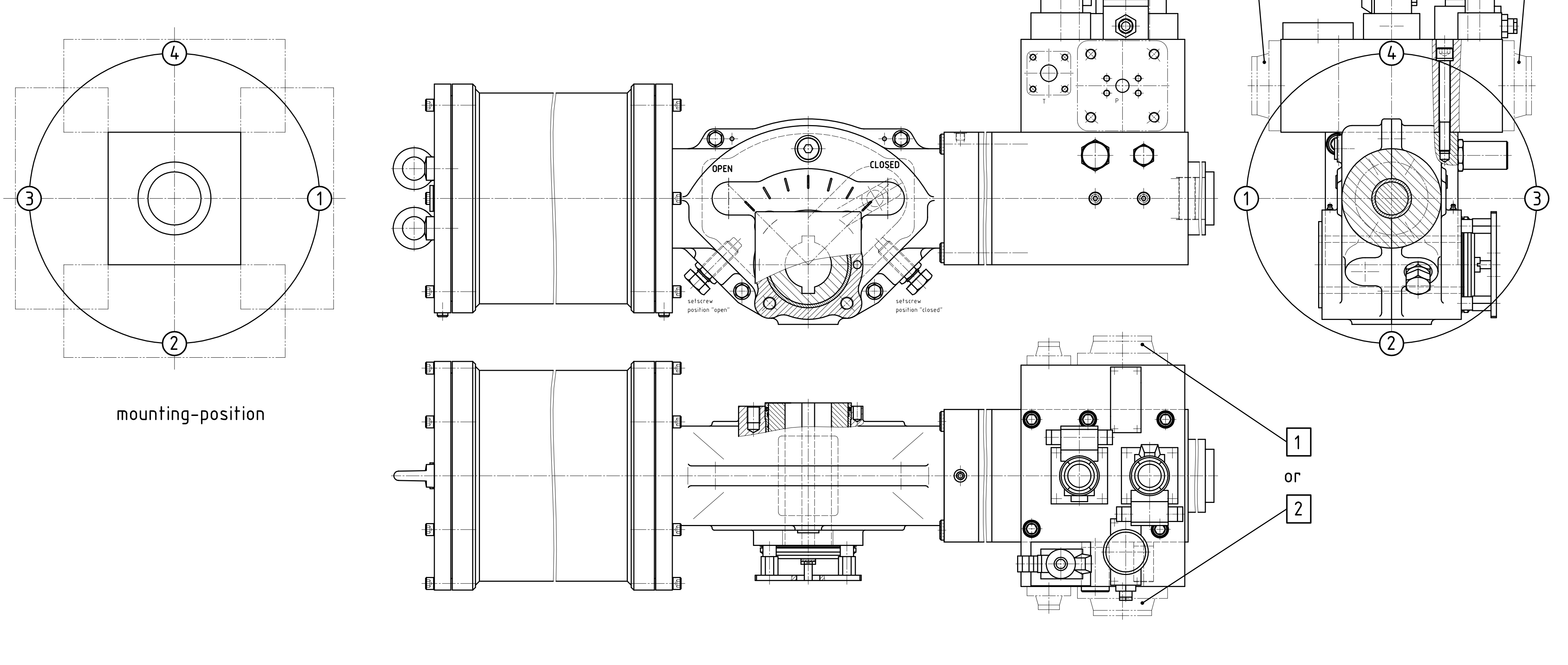
mounting-position





Oberfläche	Maßstab 1:6	Position -	Menge -			
	Datum	Name				
Bearb.	06.06.2001	Koch	SA 500/080-110/F2750/OK1/spez.			
Gepr.	08.07.05	Koch	drawing for position of the control block			
Norm						
MAFAG D-79798 Fax 07745/1512			A3-SA 00.059/E	Blatt -		
Zust.	Änderung	Datum	Name	Dateiname SA000059_E.dwg		Bl 21.09.06

project CA MAU 2	NELES - code	CONTROL - BLOCK position/version	Siemens-drawing	Mannesmann-Rexroth-type.
stop valve actuator order-nr.: 99715	HBS L 4/2 HBS R . / .	④ / 2	10190-182600	AGEV1-31415-AE/G24N9EXZ2V
control actuator order-nr.: 99701	HBC L . / . HBC R 2/2	④ / 2	10190-187600	AGEV1-31415-BE/G24N9EXZ2V



Oberfläche	Maßstab 1:6	Position -	Menge -		
	Datum	Name	SA 500/080-110/F2750/OK1/spez.		
Bearb.	06.06.2001	Koch	drawing for position of the control block		
Gepr.	08.07.05	Koch			
Norm					
MAFAG D-79798 Fax 07745/1512			A3-SA 00.059/E	Blatt -	Bl
Zust.	Änderung	Datum	Name	Dateiname SA000059_E.dwg	21.09.06

SA 500/80-110/F2750/OK1/spez.

HYDRAULIC SWIVEL ACTUATOR

Type: SA 500/80-110/F2750/OK1/Spez.

Conversion table:

1 mm	0.03937 inch
1 bar	14.5 psi
1 Nm	8.8495 in.lb

Stop Valve actuator, 90° pivoting angle
according to drawing A1-SA500.530 (A4-SA01.350)
with control block 10190-182600 (Pos. 50)
version 1 or 2, according to project specification

Control actuator
according to drawing A1-SA500.531 (A4-SA01.351)
with control block 10190-187600 (Pos. 50)
version 1 or 2, according to project specification

1. Description

Hydraulic swivel actuator of 90° pivoting angle, readjusting clockwise by spring return assuring failsafe closed valve position. Limit stops are adjustable by +/- 3°. Adjustable hydraulic damper in the „CLOSED“ position.
-For Stop Valve actuator: Electric final position feed-back for position „OPEN“ and „CLOSED“ by two proximity switches Pepperl & Fuchs, Type SJ-5N, undamped, incorporated in plastic housing.
-For Control actuator: Electric position control NELES type NT 7211/S, output signal 4-20 mA for 0°-90° position.

Control block and quick-action releasing valve, total weight of approx. 500 kg.

2. Flange and Coupling shaft

The mounting flange corresponds basically to DIN /ISO 5211-F16 dimensions except for two additional pin bores metric 12H7x20 suitable to establish an additional positive-locking to drive shaft and butterfly valve.
The coupling hub is designed to take a keyed shaft of 70mm with it's key according to the butterfly valve manufacturer's specifications. The hub holds two key ways in a manner that the actuator can be mounted with the butterfly valve's shaft in horizontal position and it's hydraulic block either topside or shifted by 180° (block underneath). In both cases it is mounted across the direction of the flow.

3. Technical Data

3.1. Operating- / Control fluid
FYRQUEL EHC or PYROTEC HFD 46
Pn = 160 bar, Pmin. = 110 bar, Pmax. = 210 bar

3.2. Opening torque - hydraulic, at P min.

M	4550	-	1700	- 1175 Nm
	0° (CLOSED)		45°	- 90° (OPEN)

3.3. Closing torque - spring resilience

M	4125	-	2200	- 2750 Nm
	90° (OPEN)		45°	- 0° (CLOSED)

4. Electrical Data

4.1. Stop-action releasing valve

Tension:	24 V DC, permissible variation +25% / -17%
relative continuous duty:	100%
Enclosure:	IP65
Connection diameter:	1,5 mm² max.
Cable diameter	9-13,5 mm

4.2. Stop Valve: Pilot Valve

Tension:	24 V DC, permissible variation +5% / -10%
relative continuous duty:	100%
Enclosure	IP 65
Connection diameter:	1,5 mm² max.
Cable diameter	8 mm max.

4.3. Control Valve: Servo Valve

Control current	7,5 mA each coil
inductive resistance	200 each coil
Enclosure:	IP65
Connection diameter:	0,5 mm² max.
Cable diameter:	6 mm max.

5. Fitting the swivel actuator to the butterfly valve

When mounting the actuator make sure that it sits centred on the valve's shaft. Do rule out axial stress to the bearings caused by non aligned subassemblies.

6. Connecting the hydraulic lines P and T

Prior to installation the lines need careful deburring and cleaning. If lines are welded they must be flushed before they are fitted. The fitted control block is designed to receive hydraulic lines by means of flange connection.

Hydraulic line P: AS-SAE NG 3/4
Return line T: Mün 673.27/1 NW25

7. Leakage line L

When closing the valve, the cylinder chamber on the rod's side is relieved from pressure and yet it receives back pressure from the return flow of the opposite side which is under pressure. The resulting back pressure varies with circumstances and drops to virtually atmospheric pressure when the cylinder comes to a halt. The connecting rod i.e. the piston rod is sealed against the return oil where it enters the hydraulic cylinder and is fitted with a washer in order to prevent the intake of dirt. In the extended position of the piston rod this washer will also remove the oil film situated behind the shaft seal and drain it through the leakage connection „L" to the outside. Initially the leakage connection will be dry but with running time it will develop some leakage due to

less efficient oil film removal by the deteriorating seal lips. The leakage must not go to the return flow but straight back to the tank.

8. Commissioning

Tools required:

- Open ended or double hex ring spanner metric 10, 14, 19 and 30
- Allen key metric 4
- Peg spanners, variable, pins 8 mm and 6 mm
- Box spanner metric SW 22
- Open ended or double hex ring spanner metric 36 and an additional ring spanner 36

Prior to commissioning the two throttle screws Pos. 1 and Pos. 2 must be screwed in down to the stop. The set screw regulating the damping path (Pos. 8 from drawing A-SA500.495) must be screwed out to the stop after the connection cover (Pos.5) has been removed to this effect.

8.1. **First Filling** of the hydraulic cylinder
should take place at low pressure level by slowly opening throttle 2 (the actuator will open slowly towards it's „OPEN" position). After it has reached it's final position the throttle 2 remains as it is. Spring pressure must then drive the actuator towards it's „CLOSED" position. The „CLOSED" position occurs as the throttle 1 is being opened slowly. In order to prevent trapped air within the seal's surroundings destroing the seals when later high pressure is applied, fully repeat the above process several times and only gradually increase pressure when doing so. Only then set the normal working pressure. Residual air will dissolve in the oil and be taken away.

8.2. **Adjustment** of the final positions „OPEN" and „CLOSED"
will be made by means of the respective setting screws when they are not under load.

8.3. After the setting of the final positions has been done the actuator must assume it's „CLOSED" position. In this position the setting screw for the damping path (Pos. 8 from drawing A1-SA500.495) must be screwed in completely and after reaching the bottom loosened one turn.

8.4. The **time required for closing the butterfly valve**
can now be set by opening the throttle 2 to the desired position.

8.5. **Final position damping** is set by means of
throttle 1 and setting screw for the damping path.

9. Maintenance

9.1. All the bearings are equipped with a basic lubricationof molybdenum-disulphide. Maintenance is limited to periodical re-greasing through the two lubricating nipples. Depending on the frequency of actuator use this should be done as part of general maintenance. Hydraulic fluid should be changed periodically before it has deteriorated due to use and/or contamination.

9.2. With time friction and ageing will cause the seals to fail (Pos. 20, 24 from drawing A3-SA500.525 for the gear unit and Pos 36 - 54 from drawing A1-SA500.495 as well as those of the control block). Experience will show the particular interval at which the replacement should be carried out. In even larger intervalls but depending on use as well one should examine the sliding blocks (Pos. 4), bush bearings (Pos. 9), plain bearings (Pos.13) and the bearing bush (Pos. 26) from drawing A3-SA500.525 (gear unit) checking them for wear. Worn components must be changed. The dismantling goes as follows:

10. Dismounting the swivel actuator from the butterfly valve CAUTION !

10.1. Switch off the hydraulic pump and secure it against unintentional engagement. Shut the respective hydraulic line and make safe it remains shut.

10.2. Let spring resilience bring the actuator to it's „CLOSED" position.

10.3. Only then disconnect the **completely depressurized** lines P and T and the leakage line as well.

10.4. After loosening and then unscrewing the four flange mounting screws the swivel actuator can be taken off the butterfly valve.

11. Disassembly of the swivel actuator

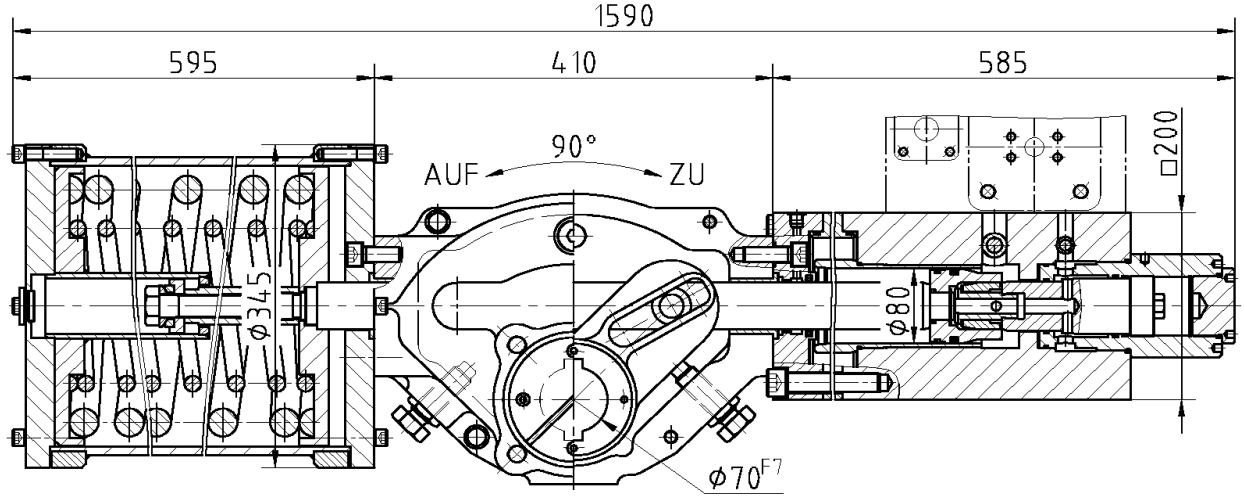
The hydraulic swivel actuator consists chiefly of three subassemblies:

(1) Hydraulic cylinder Pos. 53 according to drawing A1-SA500.495 complete with built on control block Pos. 50

(2) Gear Pos. 51 according to drawing A3-SA500.525 complete with built on position indicator feed-back unit.

(3) Reset spring assembly Pos. 52 according to drawing A2-SA500.515

„OPEN" <-- --> „CLOSED"



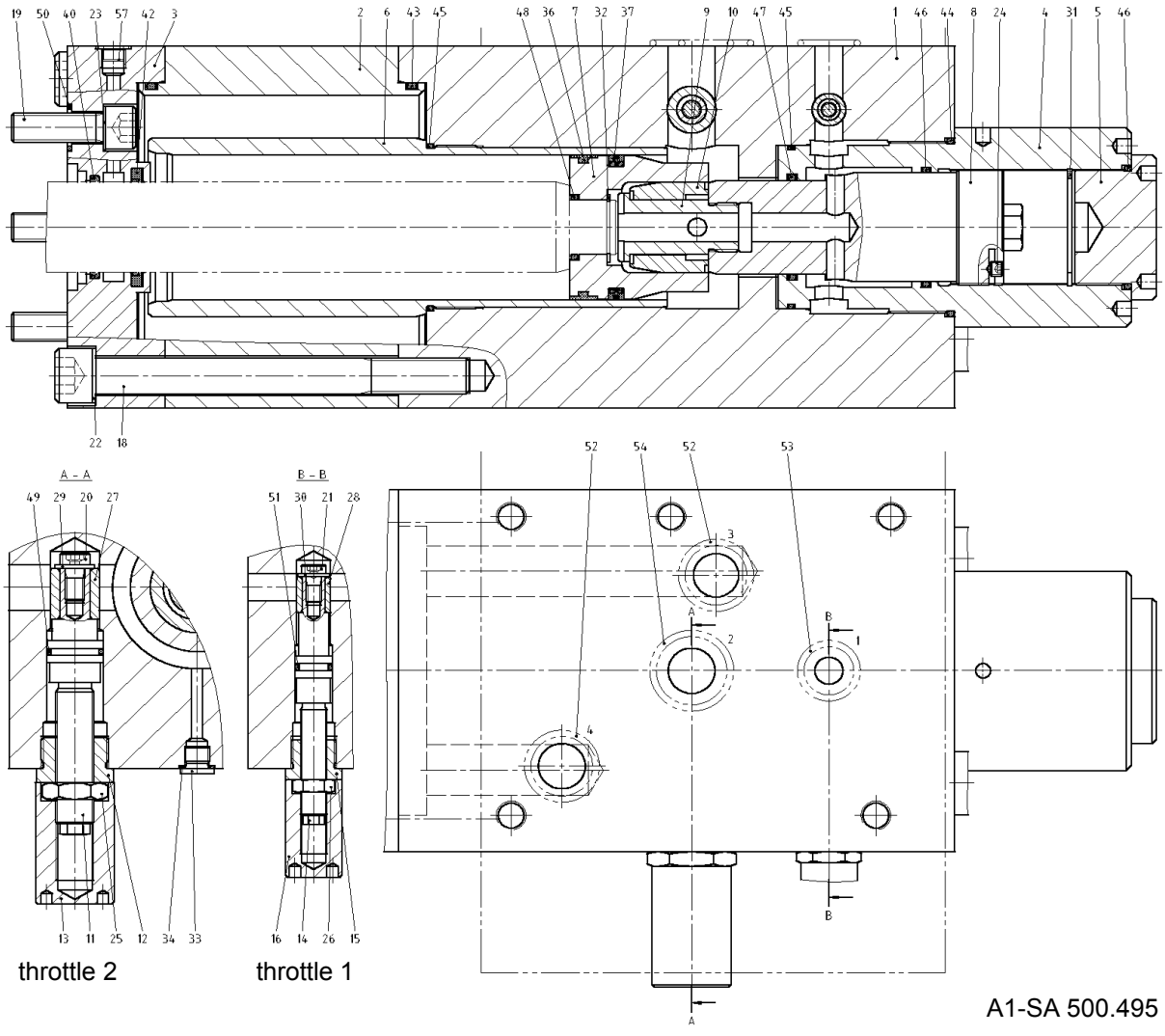
Spring assembly A2-SA500.515 Gear A2-SA500.525 Cylinder A1-SA500.495

SA 500/80-110/F2750/OK1/spez.

11.1. Disassembly of the cylinder Pos. 53 according to drawing A1-SA500.495

Tools required:

- Ratchet (change-over type) with extension and hexagon socket metric14 and 17
- Torque spanner (set type) for torque 210 Nm metric 14 and 410 Nm metric 17
- Socket for spanner metric 22
- Double hex ring spanner or open ended spanner metric 10, 14, 19, 30 and 41
- Pliers for circlip A30 DIN 471
- Pliers for circlip J62 DIN 472
- Allen key metric 4
- Peg spanners, variable , pins 8 mm, 6 mm
- C spanner, pin 8mm, nut diameter 110 mm
- Open ended wrench metric 32
- 2 lifting screws metric M16 DIN 580



SA 500/80-110/F2750/OK1/spez.

Order of disassembly

11.1.1. After unscrewing the five mounting screws, the control block can be lifted off in one piece.

11.1.2. After unscrewing the four mounting screws Pos. 18, the entire cylinder-block can be detached from the connecting rod i.e. piston rod with piston.

11.1.3. After dismantling the piston Pos. 7 and the six screws Pos. 19 the flange Pos. 3 can be detached from the connecting rod i.e. piston rod as well.

11.1.4. As far as necessary all the detached parts of the cylinder block can now be removed with no particular order.

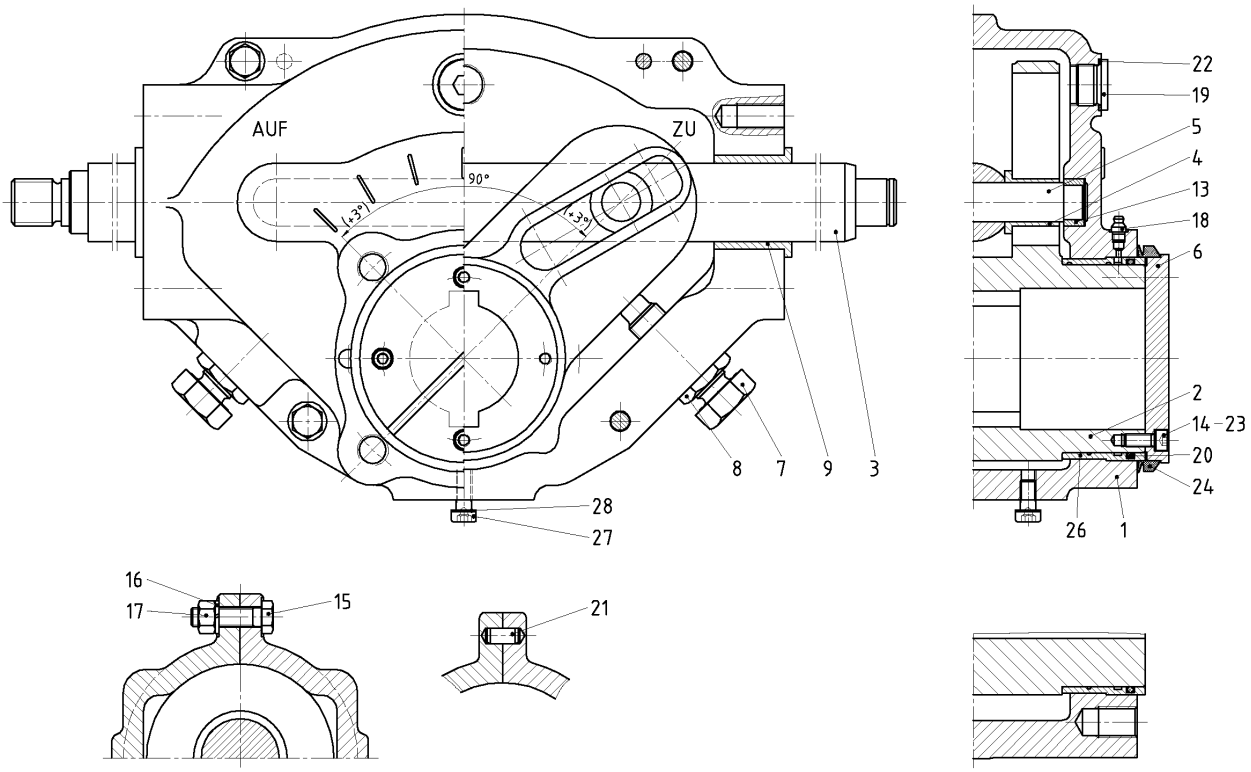
11.1.5. After cleaning all parts and installation of the new sealings, the mounting can take place in the reverse order.

11.1.6. Mounting of the butterfly valve and starting as described in chapter 5 and 8.

11.2. Disassembly of the gear unit Pos. 51 according to drawing A3-SA500.525

Tools required:

- 2 open ended spanners metric 19
- Open ended spanner metric 36
- Allen key metric 6
- Engineers hammer approx. 300 g
- Plastic tip hammer



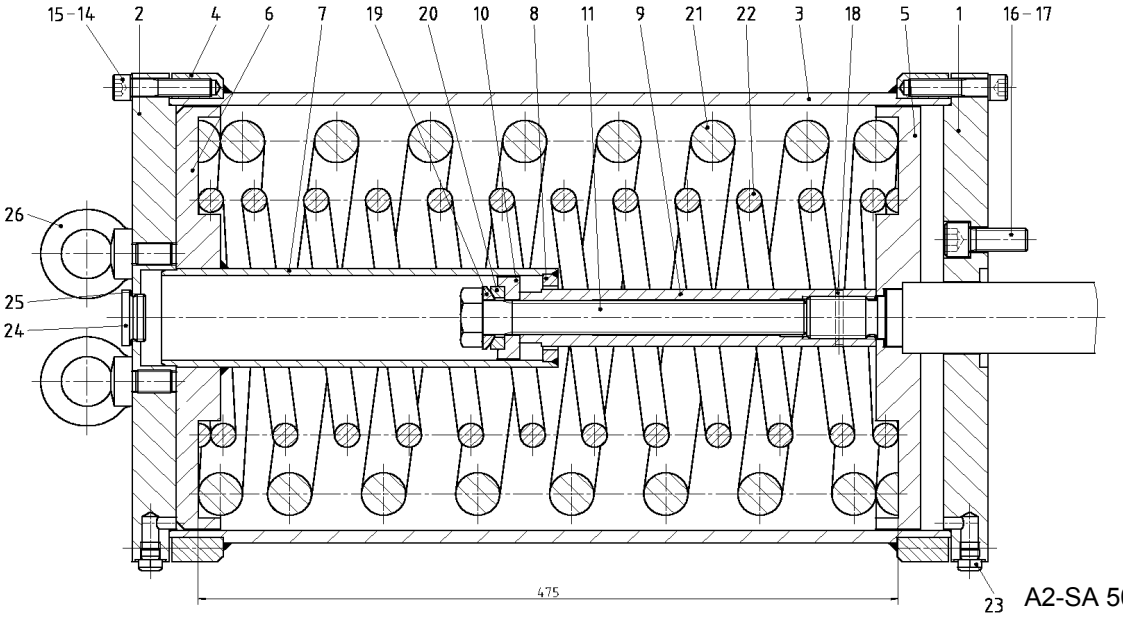
A3-SA 500.525

After dismantling the electric position feed-back, the cover Pos. 6 can be removed by unscrewing the four screws Pos. 14. Then the sealing Pos. 24 can be replaced. Dismantling the gear unit is possible only after the cylinder (chapter 11.1) as well as the spring assembly (11.3) have been removed. Both seals Pos. 20 work to protect the inside from the weather. When used within buildings these seals are of secondary importance and need replacing only when major maintenance work is done.
After loosening the four screws Pos.15 with nut Pos. 17 the halves of the housing Pos. 1 can be split and taken off the rocker arm's bearing necks. By ejecting the pin Pos. 5 the parts Pos. 2, 3, 4 and 13 are freed. If the bearing bushes Pos. 26 are to be replaced they must be ejected by means of a press and suitable tools (mandril or bush).
When press fitting the new bearing bushes into the cleaned housing halves make sure that the lubricating nipples are connected.
After cleaning all the parts, their sliding faces need to be lubricated with molybdenum disulphide paste. Do not apply excessively but rub in well.
Then the assembly of the gear takes place the reverse way.

11.3. <u>Dismantling of the restoration spring assembly Pos. 52 according to drawing A2-SA500.515</u>

Tools required:

- Open ended spanner metric 36
- Box spanner metric 22
- Ratchet spanner with extension and socket metric 36
- Ratchet spanner with hexagon insert socket driver metric 10 and 14
- Cotter pin extractor 5 mm
- Two ring bolt DIN 580 metric 16
- Torque spanner (set type) for torque 85 Nm metric 10 and 210 Nm metric 14



A2-SA 500.515

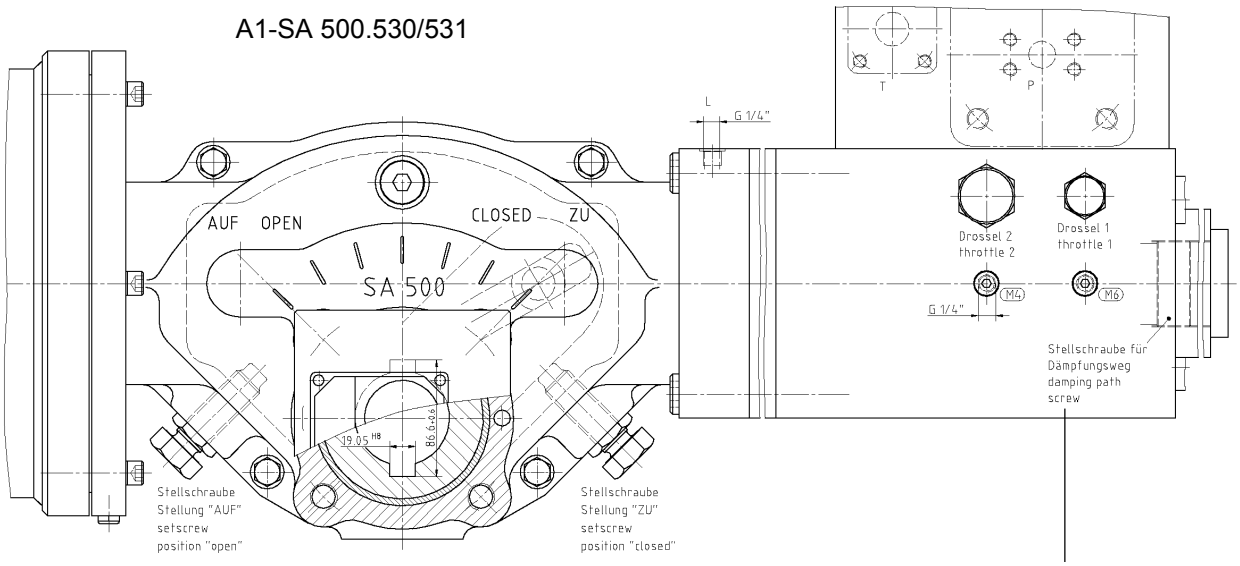
SA 500/80-110/F2750/OK1/spez.

11.3.1. Prior to the dismantling the swivel actuator it must assume it's final „CLOSED" position (approx. -5 deg), turned clockwise by spring pressure. The springs are thereby partially relieved.

CAUTION ! Springs are still under stress!

The swivel actuator will assume the above mentioned „CLOSED" position when the setting screw for the damping path (Pos. 8 of Drwg. A1-SA500.495) is screwed back to the limit as it makes contact with the safety ring and the setting screw for the „CLOSED" position is unscrewed completely

A1-SA 500.530/531



„OPEN" screw	„CLOSED" screw	Damping path screw
	screw out	screw back till limit stop

11.3.2. Relaxation of the spring assembly - dismounting of the spring cover Pos. 2
CAUTION ! To prevent accidents follow these instructions scrupulously!
The spring assembly is pretensioned in part to 491 mm length by the screw Pos. 11 and the six screws Pos. 14 reduce it's length further to the fitting length of 475 mm thereby adding further tension.

Due to incidental accumulation of tolerances the spring cover Pos. 2 can still be tensioned by the springs even though all provisions of 11.3.1 have been followed! Therefore the six screws Pos. 14 must be loosened gradually and simultaneously until - after about 15 mm of way - all screws turn freely. Only then remove the screws completely and lift off the spring cover Pos. 2.
Yet there is still the pretension caused by the screw ! Pos. 11 which can now be loosened and unscrewed causing complete relaxation of the spring assembly. Now the washer Pos. 6 belonging to the spring assembly and the spring assembly can be recovered from the tube Pos 3.

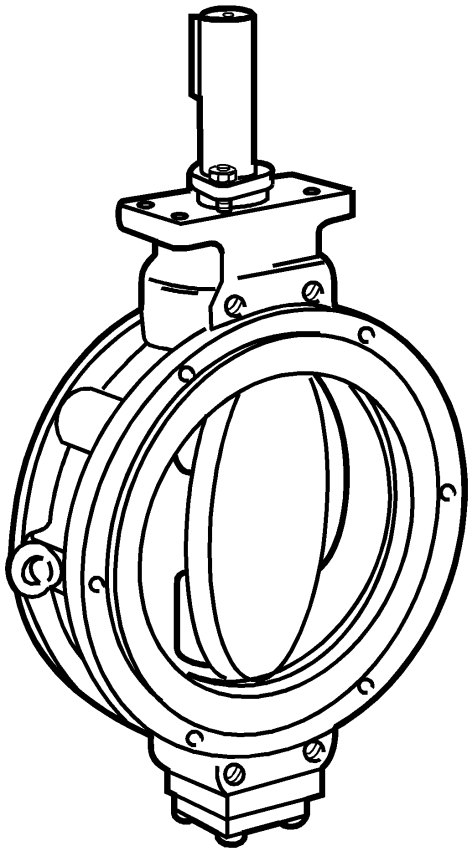
11.3.3. Dismantling the tube containing the spring assembly Pos. 3, threaded bush Pos. 9, washer Pos. 5 and head flange Pos. 1

By loosening the twelve screws Pos. 14 also at the flange Pos. 1 the tube Pos. 3 can be taken away.
After ejecting the roll pin Pos. 18 and unscrewing the threaded bush Pos. 9 the washer Pos. 5 can be removed. The flange Pos. 1 can be taken away from the gear after the six screws Pos. 16 have been removed.

Mounting can take place the reverse way.

Design and measures subject to change.

neles



NELDISC®
Metal seated butterfly valves
Series L1 and L2

Installation, Maintenance and Operating Instructions
2 L1 71 en
Issue 5/02

metso automation

Table of Contents

READ THESE INSTRUCTIONS FIRST!

These instructions provide information about safe handling and operation of the valve.
If you require additional assistance, please contact the manufacturer or manufacturer's representative.
Addresses and phone numbers are printed on the back cover.

SAVE THESE INSTRUCTIONS!

1 GENERAL

1.1 Scope of the manual

This installation, operation and maintenance manual provides essential information on L1 and L2 series Neldisc® butterfly valves. The actuators and instrumentation to be used with L1 and L2 series valves are also discussed briefly. Refer to the separate actuator and control equipment instruction manuals for further information.

NOTE:
Selection and use of the valve in a specific application requires close consideration of detailed aspects. Due to the nature of the product, this manual cannot cover all the individual situations that may occur when installing, using or servicing the valve.
If you are uncertain about the use of the valve or its suitability for your intended use, please contact Metso Automation for more information.

1.2 Valve description

Neldisc series L1 is a wafer type and series L2 a lug type metal seated butterfly valve.

The disc is elliptical and has a double eccentric mounting. When the valve is closed, the elliptical disc at the major axis displaces the seat ring outward, causing the seat ring to contact the disc at the minor axis. When the valve is opened, the contact is released and the seat ring returns to its original circular shape (see Fig. 1).

The disc is fitted to the shafts with pins and there are no holes through the disc.

Construction details of individual valves are included in the type code shown on the valve identification plate. To interpret the type code, please refer to Section 11.

The valve operates both in control and shut-off applications.

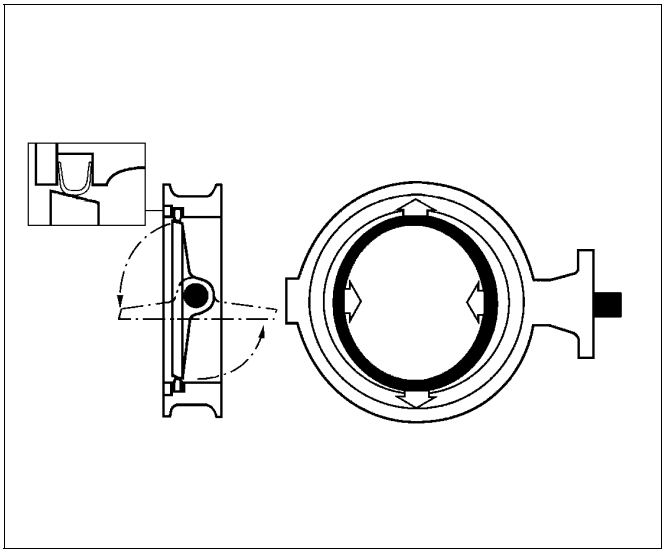


Fig. 1. Construction of a butterfly valve

1.3 Valve markings

Body markings are cast on the body. The valve also has an identification plate attached to it (see Fig. 2).

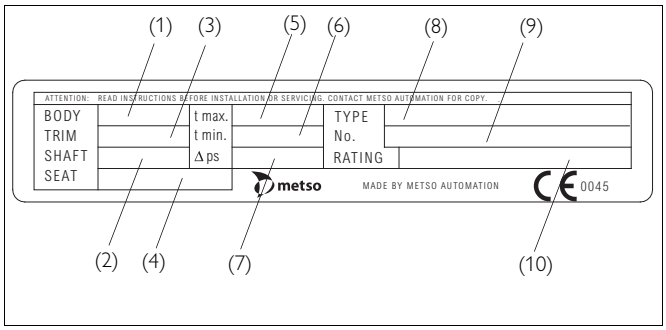


Fig. 2. Identification plate

Identification plate marking:
1. Body material
2. Shaft material
3. Trim material
4. Seat material
5. Maximum operating temperature
6. Minimum operating temperature
7. Maximum shut-off pressure differential
8. Type designation
9. Valve manufacturing parts list no.
10. Pressure class

1.4 Technical specifications

Type:	Full bore, metal seated butterfly valve	
Pressure class:		
Body:	L1C, L2C	ANSI 150/ DIN PN 25
	L1D, L2D	ANSI 300/DIN PN40
Trim:	L1C, L2C	ANSI 150
	L1D, L2D	ANSI 300
Temperature range:	-200 °C ... +600 °C (for ambient temperatures > 600 °C, please contact the manufacturer)	
Flow direction:	Free	
Dimensions:	See p. 19-23	
Weights:	See p. 19-23	

1.5 Valve approvals

The valve meets the requirements of BS 6755, Part 2: 1987 and API 607, Third Edition, November 1985 on fire safety.

Valve with codes T or G are TA-Luft approved.

1.6 CE marking

The valve meets the requirements of the European Directive 97/23/EC relating to pressure equipment, and has been marked according to the Directive.

1.7 Recycling and disposal of a rejected valve

Most valve parts can be recycled if sorted according to material. Most parts have material marking. A material list is supplied with the valve. In addition, separate recycling and disposal instructions are available from the manufacturer. A valve can also be returned to the manufacturer for recycling and disposal against a fee.

1.8 Safety precautions

CAUTION:
Do not exceed the valve performance limitations!
Exceeding the limitations marked on the valve may cause damage and lead to uncontrolled pressure release.
Damage or personal injury may result.

CAUTION:
Do not dismantle the valve or remove it from the pipeline while the valve is pressurized!
Dismantling or removing a pressurized valve will result in uncontrolled pressure release. Always isolate the relevant part of the pipeline, release the pressure from the valve and remove the medium before dismantling the valve.
Be aware of the type of medium involved. Protect people and the environment from any harmful or poisonous substances.
Make sure that no medium can enter the pipeline during valve maintenance.
Failure to do this may result in damage or personal injury.

CAUTION:
Beware of the discs cutting movement!
Keep hands, other parts of the body, tools and other objects out of the open flow port. Leave no foreign objects inside the pipeline.
When the valve is actuated, the disc functions as a cutting device. The position of the disc can also be changed when moving the valve.
Close and detach the actuator pressure supply pipeline for valve maintenance.
Failure to do this may result in damage or personal injury.

CAUTION:
Beware of noise emissions!
The valve may produce noise in the pipeline. The noise level depends on the application. It can be measured or calculated using Metso Automation Nelprof computer program. Observe the relevant work environment regulations on noise emission.

CAUTION:
Beware of a very cold or hot valve!
The valve body may be very cold or very hot during use.
Protect yourself against cold injuries or burns.

CAUTION:
When handling the valve or the valve package, bear in mind its weight!
Never lift the valve or valve package by the actuator, positioner, limit switch or their piping.
Valve sizes DN 350 and over are equipped with a lifting eye bolt. Place the lifting ropes securely around the valve body (see Fig. 3).
Damage or personal injury may result from falling parts.

NOTE:
Do not turn the disc more than 90° as this could damage the seat. The valve is so constructed that the disc operates only between 0-90°.

2 TRANSPORTATION, RECEPTION AND STORAGE

Check the valve and the accompanying devices for any damage that may have occurred during transport.

Store the valve carefully before installation, preferably indoors in a dry place.

Do not take the valve to the intended location and do not remove the flow port protectors until the valve is installed.

The valve is delivered in the closed position. A valve equipped with a spring-return actuator is delivered in a position determined by the spring. During storage the valve must be lightly closed.

3 INSTALLATION

3.1 General

Remove the flow port protectors and check that the valve is undamaged and clean inside.

CAUTION:
When handling the valve or the valve package, bear in mind its weight!
Follow the lifting methods shown in Fig. 3.

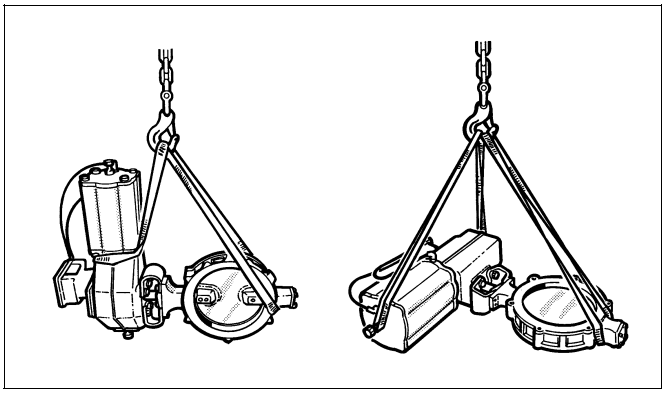


Fig. 3. Lifting of the valve

3.2 Mounting into the pipeline

Flush or blow the pipeline carefully before installing the valve. Foreign particles, such as sand or pieces of welding electrode, will damage the disc sealing surface and seat.

The valve may be installed in any position and offers tightness in both directions.

Install the valve in the pipeline so that the shaft is horizontal, if possible. However, we do not recommend installing the valve with the actuator on the underside because dirt in the pipeline may then enter the body cavity and damage the gland packing.

If the valve is equipped with a flow balancing trim (type code S-...), it must be on the downstream side of the valve body. The valve must be mounted so that the perforated plate will not collect any impurities in the pipeline (see Fig. 4).

Select flange gaskets according to the operating conditions.

Do not attempt to correct pipeline misalignment by means of flange bolting.

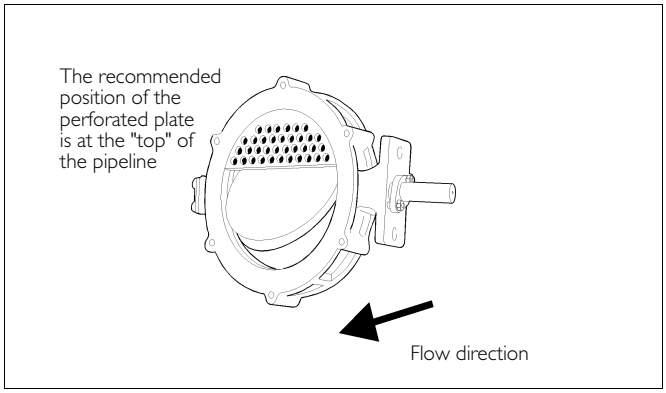


Fig. 4. Position of the flow balancing trim

It may be necessary to firmly support the pipeline to protect the valve from excess stress. Sufficient support will also reduce pipeline vibration and this ensures proper functioning of the positioner. Do not fasten supports to the flange bolting or to the actuator.

It is recommended that the length of any straight pipe preceeding the control valve is at least 2 × pipe diameter.

The flow causes a so-called dynamic torque against the valve disc which attempts to close the valve. In a pipe elbow the pressure on the outer edge is higher than on the inner edge.

When installing the butterfly valve immediately after a pipe elbow, the valve shaft must be directed toward the centre point of the pipe (see Fig. 5). This is especially important when the butterfly valve is used as a control valve.

The valve shaft of a butterfly valve mounted after the centrifugal pump must be perpendicular to the pump shaft (see Fig. 6).

When thus installed, the valve discs will be more evenly loaded and vibrations otherwise possible in the intermediate positions will be eliminated.

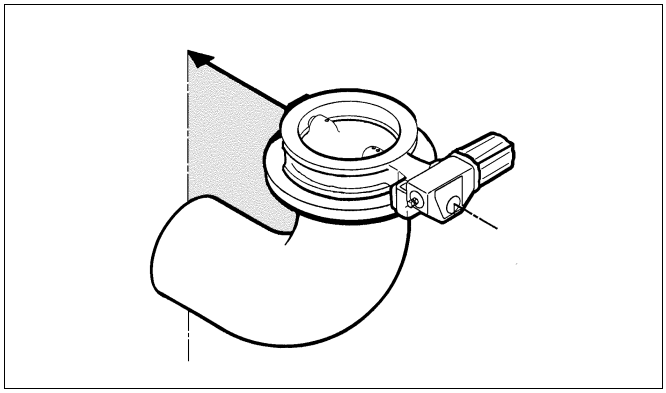


Fig. 5. Mounting after a pipe elbow

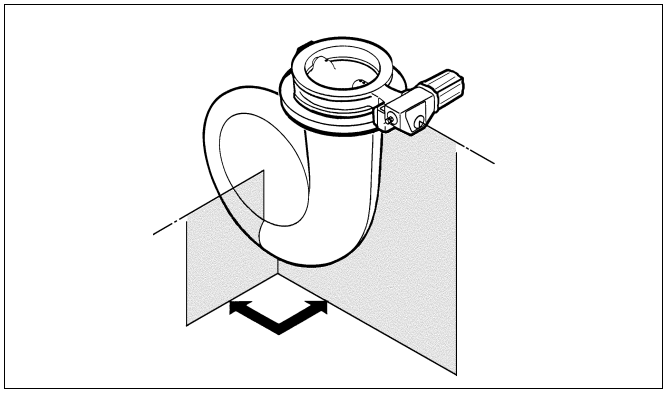


Fig. 6. Mounting after the centrifugal pump

When mounting the valve it must be in a **closed position** and be carefully centred between the pipe flanges so that the turning disc does not touch the pipe edge or flange gaskets.

In valves with certain nominal sizes some flange bolts do not pass the valve body. The valve body is thus equipped with grooves, holes or threads (see Section 3.2.1).

Ensure that the disc can turn to the open position after preliminary tightening of the flange bolts. The actuators of control valves are usually equipped with position stops which usually only allow the disc to open 80°.

3.2.1 Mounting options

- ☐ X Flange bolts pass the neck of the body
- ☐ UH Unthreaded holes at the neck of the body
- ☐ SB Stud bolts at the neck of the body
- ☐ BH Stud bolts at the neck of the body and fraised holes on the body and flange ring
- ☐ FH Unthreaded holes at the neck of the body and fraised holes on the body and flange ring
- ☐ XF Flange bolts pass the neck of the body and fraised holes on the body and flange ring
- ☐ HM Fraised holes on the neck of the body for flange bolts
- ☐ — Flange drilling not suitable

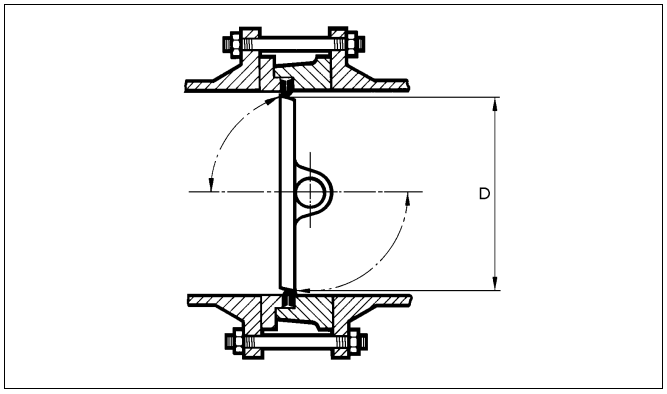


Fig. 7. Mounting dimensions

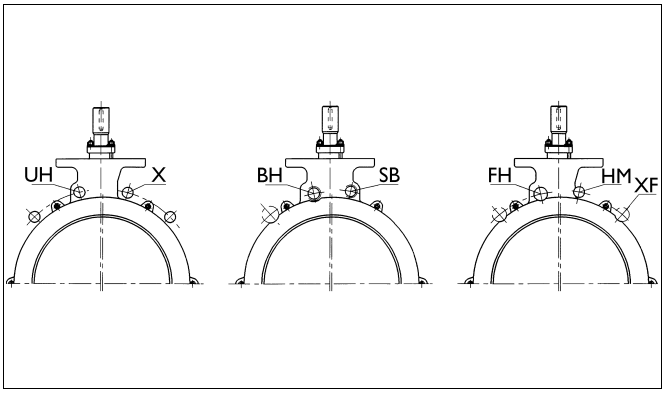


Fig. 8. Mounting options

Table 1. Mounting dimensions (mm)

Valve size	D	
	L1CM	L1DM
03	68	68
04	89	89
05	115	115
06	142	136
08	190	188
10	242	227
12	288	281
14	327	317
16	374	352
18	422	400
20	464	443
24	565	536
28	665	
30	716	
32	762	
36	870	
40	960	

Table 2. Mounting options

Valve type	ANSI 150	ANSI 300	PN 10	PN 16	PN 25	PN 40	Valve type	ANSI 300	PN 25	PN 40
L1C03	X	X	X	X	X	X	L1D03	X	X	X
L1C04	X	X	X	X	X	X	L1D04	X	X	X
L1C05	X	X	X	X	X	X	L1D05	X	X	X
L1C06	X	X	X	X	X	X	L1D06	X	XF	XF
L1C08	X	X	X	X	X	X	L1D08	UH	FH	FH
L1C10	X	—	X	X	X	—	L1D10	SB	FH	UH
L1C12	X	HM	X	X	HM	HM	L1D12	SB	BH	SB
L1C14	UH	—	UH	UH	UH	—	L1D14	SB	BH	SB
L1C16	UH	—	UH	UH	UH	—	L1D16	SB	BH	SB
L1C18	UH	—	SB	SB	SB	—	L1D18	SB	BH	SB
L1C20	SB	SB	SB	SB	SB	—	L1D20	SB	BH	SB
L1C24	SB	SB	SB	SB	SB	—	L1D24	SB	BH	SB
L1C28	SB	SB	SB	SB	SB	SB	L1D28	SB	BH	SB
L1C30	SB	SB	—	—	—	—	L1D30	SB	—	—
L1C32	SB	SB	SB	SB	SB	SB	L1D36	SB	—	BH
L1C36	SB	SB	SB	SB	SB	SB				
L1C40	SB	SB	SB	SB	SB	SB				
L1C40/ 42	SB*	SB*	—	—	—	—				

*) L1C40 can also be drilled acc. to MSS SP-44 42" drilling.

Table 3. Stud bolt dimensions (mm), mounting options SB, BH

Valve type	A	ANSI 150					ANSI 300					DIN PN 10					DIN PN 16					DIN PN 25				
		R	L	L_1	L_2	S	R	L	L_1	L_2	S	R	L	L_1	L_2	S	R	L	L_1	L_2	S	R	L	L_1	L_2	S
L1C18												M24	125	107	85	16	M27	150	132	110	16	M33	140	122	100	
L1C20	167	11/8-8UN	140	114	93	24	1 1/4-8UN	150	132	111	16	M24	125	99	79	24	M30	140	114	93	24	M33	140	114	94	
L1C24	154	1 1/4-8UN	150	119	95	28	1 1/2-8UN	180	159	135	18	M27	150	119	95	28	M33	140	109	85	28	M36	170	139	115	
L1C28	229	1 1/4-8UN	170	130	97	32	1 5/8-8UN	220	180	145	32	M27	150	107	75	35	M33	160	117	85	35	M39	180	137	105	
L1C30	229	1 1/4-8UN	170	130	95	32	1 3/4-8UN	230	190	155	32															
L1C32	241	1 1/2-8UN	180	140	105	32	1 7/8-8UN	240	200	165	32	M30	180	137	102	35	M36	190	147	112	35	M45	190	147	112	
L1C36	241	1 1/2-8UN	180	145	110	32	2-8UN	240	200	165	32	M30	180	143	110	35	M36	190	153	120	35	M45	190	153	120	
L1C40	300	1 1/2-8UN	220	170	130	40	1 5/8-8UN	240	190	150	40	M33	190	140	100	40	M39	200	150	110	40	M52	210	160	120	
L1C40/42	300	1 1/2-8UN	220	170	130	40	1 5/8-8UN	240	190	150	40															

Valve type	A	ANSI 300					DIN PN 40					DIN PN 25				
		R	L	L_1	L_2	S	R	L	L_1	L_2	S	R	L	L_1	L_2	S
L1D10	114	1-8UNC	150	122,5	121	24										
L1D12	114	1 1/8-8UN	140	114	101	22	M30	140	114	101	22	M27	110	82	74	24
L1D14	127	1 1/8-8UN	140	113	110	22	M33	140	105	103	30	M30	120	85	82	30
L1D16	165	1 1/4-8UN	150	113	114	32	M36	170	125	126	40	M33	135	90	91	40
L1D18	180	1 1/4-8UN	150	113	113	32	M36	170	129	129	36					
L1D20	200	1 1/4-8UN	150	104,5	106	38	M39	180	132.5	134	40	M33	140	92	112	40
L1D24	240	1 1/2-8UN	180	125	125	45	M45	170	110	110	50	M36	160	100	100	50
L1D28	250	1 1/2-8UN	180	135	135	42	M45	170	120	120	45	M39	160	110	110	42
L1D30	300	1 3/4-8UN	200	145	145	45										
L1D36	360	2-8UN	240	175	175	55	M52	200	135	135	55					

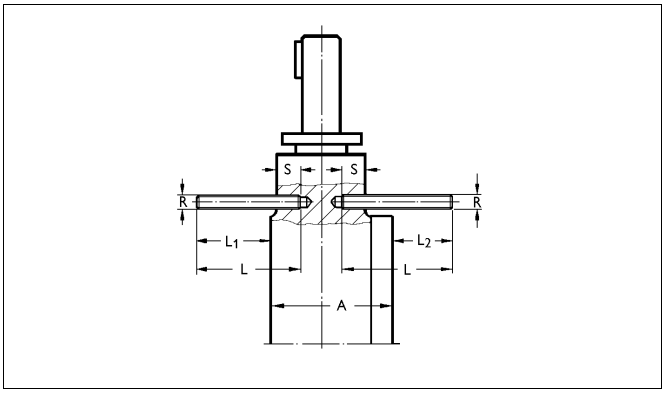


Fig. 9. Stud bolt mounting dimensions, mounting options SB, BH

3.3 Actuator

When installing the actuator on the valve, make sure that the valve package functions properly. See instructions for installing in Section 6.

Observe the space needed for removal of the actuator.

The upright position is recommended for the actuator cylinder.

The actuator must not touch the pipeline, because pipeline vibration may damage it or interfere with its operation.

In some cases, e.g. when a large-size actuator is used or when the pipeline vibrates heavily, supporting the actuator is recommended. Please contact Metso Automation for further information.

4 COMMISSIONING

Ensure that no dirt or foreign objects are left inside the valve or pipeline. Flush the pipeline carefully. Keep the valve 30-40° open during flushing.

When starting up the pump, ensure that the valve in the pipeline is closed or, at the very most, 20° open.

A waterhammer, which follows the start-up of high-capacity pumps, creates a torque peak in the disc. This can damage the pin connection between disc and shaft when the valve is 30-90° open.

The gland packing may leak after long storage. Tighten both nuts in the packing evenly until the leakage stops.

5 SERVICE

CAUTION:
Observe the safety precautions listed in Section 1.8 before starting work!

CAUTION:
For safety reasons the retaining plates MUST always be installed acc. to section 5.2.

5.1 General

Butterfly valves require no regular maintenance. However, check the packing regularly for tightness. If the valve should require maintenance for some reason, a few simple service measures are normally sufficient.

The numbers in parentheses refer to the parts list and the exploded view of the valve in Section 9.

NOTE:
If you send the valve to the manufacturer for repair, do not dismantle it. Clean the valve carefully, including the inside. For safety reasons, inform the manufacturer of the type of medium used in the valve.

NOTE:
Always use original spare parts to ensure that the valve functions as intended.

5.2 Removing the valve from the pipeline

CAUTION:
Do not dismantle the valve or remove it from the pipeline while the valve is pressurized!

It is generally most convenient to detach the actuator and its auxiliary devices (see Section 6), before removing the valve from the pipeline. If the valve package is small or difficult to access, it may be more practical to remove the entire package at the same time.

Ensure that the valve is not pressurized and the pipeline is empty. Ensure that the medium cannot flow into the section where servicing is to take place. The valve must be in a **closed position** when removing.

Support the valve carefully with a hoist. Place ropes carefully and unscrew the pipe flange bolts. Ensure that the ropes are positioned correctly (see Fig. 3). Lift valve correctly (see Fig. 3).

5.3 Replacing the gland packing

CAUTION:
Do not dismantle the valve or remove it from the pipeline while the valve is pressurized!

PTFE rings are used as a standard gland packing and graphite rings for high temperature constructions. Tightness is ensured by contact between the gland follower and the packing rings.

The gland packing (20) must be changed if leakage occurs even after the hex nuts (25) have been tightened.

The actuator need not be removed if the gland packing is made of PTFE. Remove the actuator if the gland packing is made of graphite.

- ❒ Make sure the valve is not pressurized.
- ❒ Unfasten the nuts (25) and remove the retaining plates (42) and the gland (9).
- ❒ Remove the five old packing rings (20). Do not damage the surfaces of the packing ring counterbore and shaft.
- ❒ Clean the gland packing and packing ring counterbore. Install five new gland packings one-by-one, pushing them into place with the gland.
  The cutting points of the PTFE rings are mounted at a 90° angle between each ring.
  Slip the graphite rings onto the shaft. Ensure that there are no burrs in the keyway groove which could damage the packing.
- ❒ Install the gland.
- ❒ Mount the retaining plates with the text UPSIDE on top (see Fig. 10).

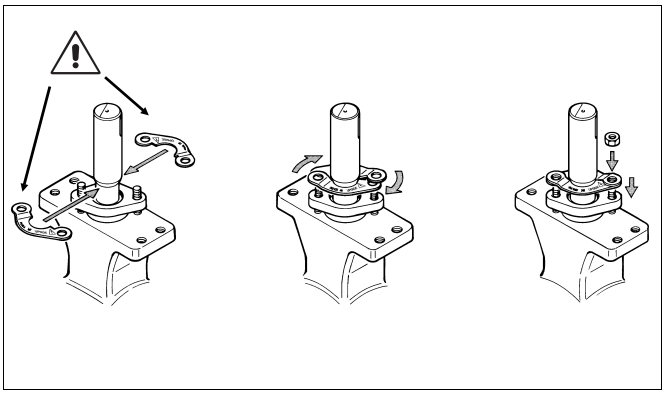


Fig. 10. Mounting the retaining plates

- ❒ Place the nuts on the studs and tighten the gland packings while the valve is not pressurized (see Table 4).
- ❒ Retighten if necessary.

Table 4. Gland packing nut tightening torques and margins

Shaft ø	Thread	Torque, Nm	Min. tightening margin, mm
15-20	5/16 UNC	10	7
25-40	3/8 UNC	20	9
45-55	1/2 UNC	50	10
70-85	5/8 UNC	90	13
95-130	3/4 UNC	150	13
135-	7/8 UNC	240	24

5.4 Valve leakage

Valve leakage is not always caused by a damaged seat ring or disc. The reason can also be that the disc is not in the closed position.

- ❒ Check the position of the actuator relative to the valve. The screws may be loose or the bracket damaged.
- ❒ Check the adjustment in the closed position (see Section 6.4).

The marking line parallel to the disc on the valve shaft head shows roughly the closed position of the disc (see Fig. 12).

Pressure chocks can cause loosening of the pin connection between disc and shaft; consequently the shaft moves while the disc remains in place and this prevents full closing of the disc.

If the reason for the leakage does not become appareir after doing the above, the valve must be disassembled for replacing the parts.

5.5 Replacing the seat ring

CAUTION:
Do not dismantle the valve or remove it from the pipeline while the valve is pressurized!

- ❒ Ensure that the valve is not pressurized.
- ❒ Remove the valve from the pipeline. The valve must be in a closed position during removal.
  Follow the lifting methods shown in Section 3.
- ❒ Remove the clamp ring (2) by untightening the screws (27).
- ❒ Remove the old body seal (19) and the seat ring (4). Change the seat ring if it is damaged.
- ❒ Clean all the seating surfaces of the body and clamp ring. Check the surface of the seat ring.
- ❒ Check also the condition of the disc. A damaged disc must be changed (see Section 5.5).
- ❒ Check the condition of the pin connection. Repair it if necessary (see Section 5.5).

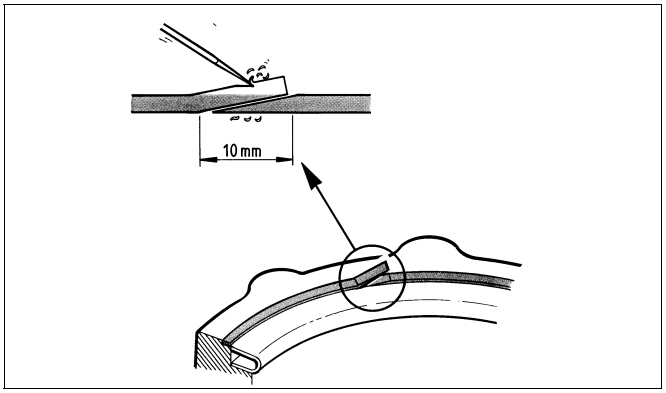


Fig. 11. Mounting the body seal

- ❒ Mount a new, self-adhesive body seal (19) into the body. The surface must be clean and free of grease. Handle the ends of the seal according to Fig. 11.
- ❒ Spray a thin layer of dry lubricating fluid, e.g. Molykote 321R or equivalent, into the seat groove, surfaces of the clamp ring and seat ring.
- ❒ Centre the seat ring (4) carefully into its groove and turn the disc to maintain light contact with the seat.
- ❒ Mount the clamp ring and tighten the screws (27) lightly.
- ❒ Turn the disc slightly open and pull it back to set the seat into the proper position.
- ❒ Tighten the screws (27) evenly. An unevenly tightened flange may damage the seat ring. The screw heads must be below the flange surface.

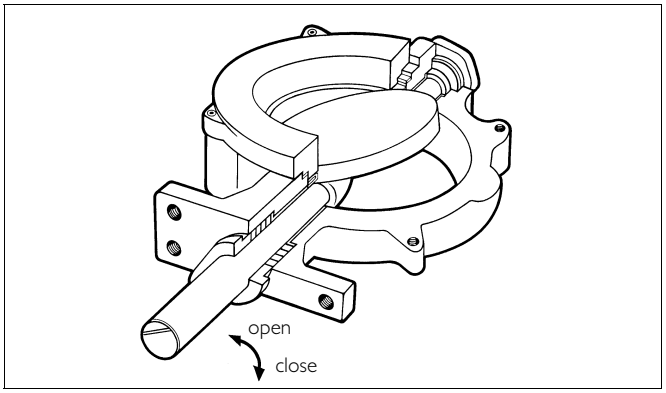


Fig. 12. The contact line between the disc and seat ring

- ❒ Check the position between the seat ring and the disc. The valve closes clockwise (see Fig. 12).
- ❒ Mount the actuator into the valve. Adjust the closed position limit and check the open position limit (see Section 6.4).

5.6 Replacing the disc, shafts and bearings

5.6.1 Disassembling the valve

The pin connection of the disc must be opened by drilling for changing the disc (3), shafts (11, 12) and bearings (15, 16).

- ❒ Remove the valve from the pipeline and the actuator from the valve.
- ❒ Remove the clamp ring (2) and seat ring (4) according to section 5.4.
- ❒ Set the valve horizontally on a sturdy surface so that the flat side of the disc lays against the surface, see fig. 13.

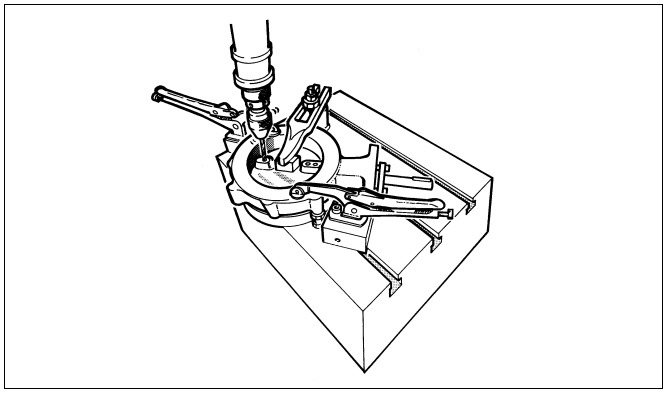


Fig. 13. Drilling the pins

- ❒ Drill the holes carefully to the centre of the pins (14). Choose a drill 0.2-0.5 mm smaller than the diameter of the pin.
- ❒ Drill the holes deep, but not enough to reach the disc.
- ❒ Pull the pins out.
- ❒ Dismantle the gland packing according to Section 5.2.
- ❒ Detach the screws (26) and the blind flange (10) and remove the gasket (18).
- ❒ Place rubber strips or other protection between the disc edge and the body and remove the shafts (see Fig. 14).
- ❒ Remove the bearings (15, 16).
- ❒ Clean and check all parts carefully.

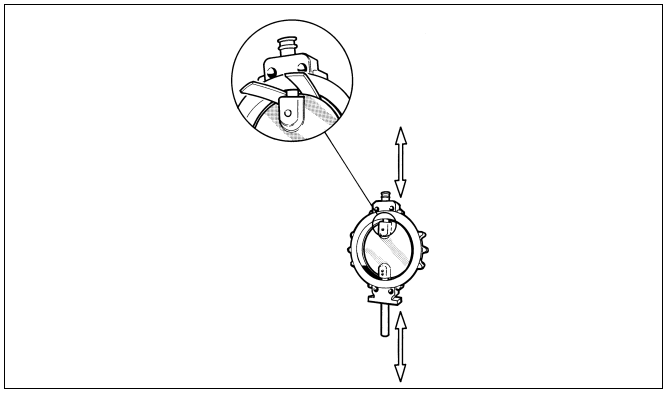


Fig. 14. Protecting the disc during disassembly and assembly

5.7 Assembling the valve

❒ Replace damaged parts with new ones.

❒ Set the disc and the shaft together beforehand. In case the pin holes have been damaged during removal of the old pins the holes can be drilled to a larger pin size. File off any burrs from the shafts.

The bearing material of the standard construction valves is PTFE-impregnated stainless steel net.
The bearings for the high temperature valves (H-construction) are cobalt alloy bushings which are mounted into the body together with the shafts.

❒ Mount the bearings into the body (see Fig. 15).

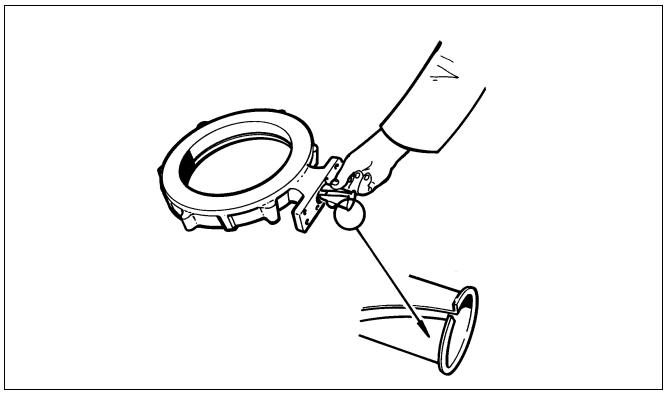


Fig. 15. Mounting the standard bearings

❒ **H-construction:** Mount the bearing into the shaft. Spray a thin layer of dry lubricating fluid, e.g. Molykote 321R or equivalent, into the inside surface of the bushing and the shaft bearing groove. Press the bushing with a tightening ring into the shaft bearing groove and fit the shaft with the bearings carefully into the body through the tightening ring (see Fig. 16).

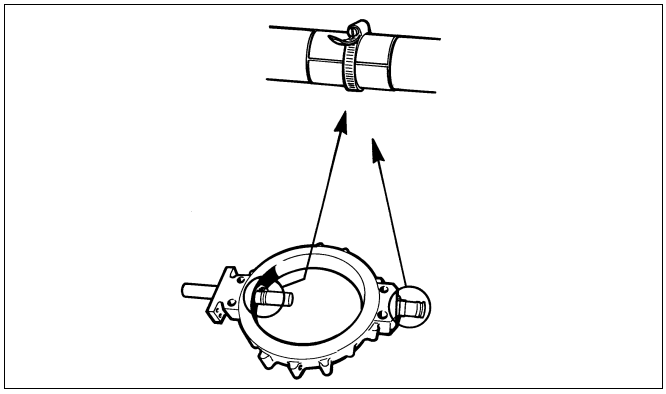


Fig. 16. Mounting the H-construction bearings

❒ Place the disc horizontally on a surface so that the flat side of the disc lays against the surface. Lift the body around the disc so that the shaft bores are aligned with the bores in the disc. Protect the disc (see Fig. 14).

❒ Press the shafts into the disc drillings. Align the pin holes. The shaft (11) position against the disc must be according to Fig. 12.

NOTE:
Use only pins supplied by the manufacturer!

NOTE:
The pins must be pressed with enough force to deform them so that the connection will be free from backlash.

❒ Support the disc well in a horizontal position during mounting of the pins. Push the new pins into the holes and press them in a press to final form (see Fig. 17). Use a smaller tool than the pin diameter.
See Table 5 for force needed.

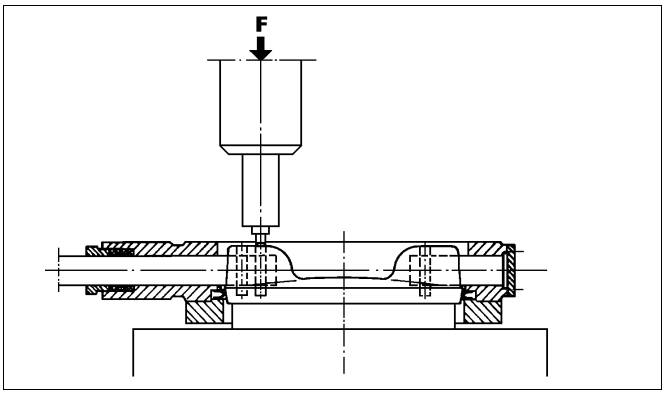


Fig. 17. Pressing the pins

Table 5. Pressing the pins, forces

Pin diameter, mm	Force, kN	Pin diameter, mm	Force, kN
5	45	20	500
6	60	25	780
8	80	30	1125
10	125	35	1500
12	180	40	2000
15	280	50	3150

❒ Install the gasket (18) and the blind flange (10).
Screws of the blind flange must be tightened evenly. An unevenly tightened flange will damage the seat.

❒ Install the seat ring. See details in Section 5.4.

❒ Install the body seal (19) and the clamp ring (2). See details in Section 5.4.

❒ Install the gland packing (see Section 5.2).

❒ Check the contact line between the seat ring and the disc (see Fig. 12).

6 DETACHING AND MOUNTING THE ACTUATOR

6.1 General

CAUTION:
When handling the valve or the valve package, bear in mind its weight!

NOTE:
Do not turn the disc more than 90° as this could damage the seat. The valve is so constructed that the disc operates only between 0-90°.

6.2 Detaching the actuator

CAUTION:
The actuator cannot be removed from the valve when the pipeline is under pressure as a result of dynamic torque!

NOTE:
Before dismantling, carefully observe the position of the valve with respect to the actuator and positioner/limit switch so as to ensure that the package can be properly reassembled.

The actuator is factory-mounted on the valve and the stroke limit stop screws are adjusted in advance.

- ❒ Ensure that the pipeline is not pressurized.
- ❒ Disconnect the actuator from its power source; detach the air supply pipe and control signal cables or pipes from their connectors.
- ❒ Unscrew the bracket screws.
- ❒ Detach the actuator using a suitable extractor. The correct tool can be ordered from the manufacturer (see Fig. 18).
- ❒ Remove the bracket and coupling, if any.

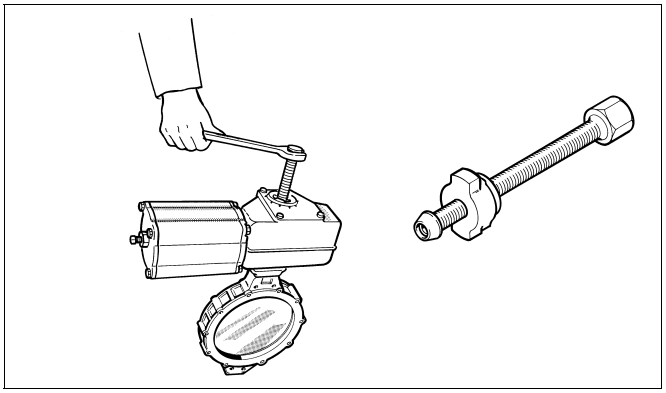


Fig. 18. Removing the actuator with an extractor

6.3 Mounting the actuator onto the valve

- ❒ Turn the valve to the closed position before mounting the actuator.
- ❒ Clean the shaft and the shaft bore and file off any burrs which could interfere with mounting. Protect the joint surfaces from corrosion, e.g. with Cortec VCI 369.
- ❒ If a bushing is required between the actuator shaft bore and the valve shaft, mount it first in the actuator shaft bore.
- ❒ The valve keyway is on the side opposite the flat side of the disc. The actuator shaft bore has two keyways set 90° apart.
- ❒ For double-acting cylinder actuator, BC, and spring-return cylinder actuator, BJ (spring-to-close), choose the keyway which establishes the piston in its upper position (at the top end of the cylinder) when the valve is closed.

  In the spring-return cylinder actuator BJA (spring-to-open), choose the keyway which establishes the piston in its lower position when the valve is open.

  In valves with manual operation the disc must be closed by turning the handwheel clockwise.
- ❒ Check visually that the actuator is correctly positioned relative to the valve. Tighten all the fastening screws as tightly as possible.
- ❒ Adjust the stop screws to the closed position (see Section 6.4).
- ❒ The opening angle in a control valve is usually limited by a bolt to 80°. The opening angle of a shut-off valve is 90°.
- ❒ When a shaft extension is required, the sizing of the shaft extension must be discussed with the valve manufacturer.

6.4 Stop screw adjustment

6.4.1 General

Close the metal seated butterfly valve by turning the disc with a torque against the seat. Choose the torque from Tables 7-10 for adjusting the stop screw to the closed position of the actuator. Try not to exceed the given values since excessive torque would strain the seat and the joint between the disc and the shaft. Always readjust the stop screw after changing the seat and after mounting the actuator.

6.4.2 Actuators other than tabulated

Close the valve as per the tabulated torque M_c and adjust the stops accordingly. Note the increased torque created by the actuator while the valve is closed.

NOTE:
Metso Automation accepts no responsibility for compatibility of actuators not installed by Metso Automation.

6.4.3 Changing the mounting position

CAUTION:
The actuator must not be removed from the valve in a pipeline under pressure as a result of dynamic torque!

Always remove the actuator from the valve shaft before mounting it into another key groove. Readjust the closed position limit as instructed.

If manually operated, the valve should close when the handwheel is turned clockwise. In a double-action cylinder, the piston must be in the upper position of the cylinder when the valve is closed. In this position the actuator creates maximum torque. **Do not turn the disc more than 90° as this could damage the seat.**

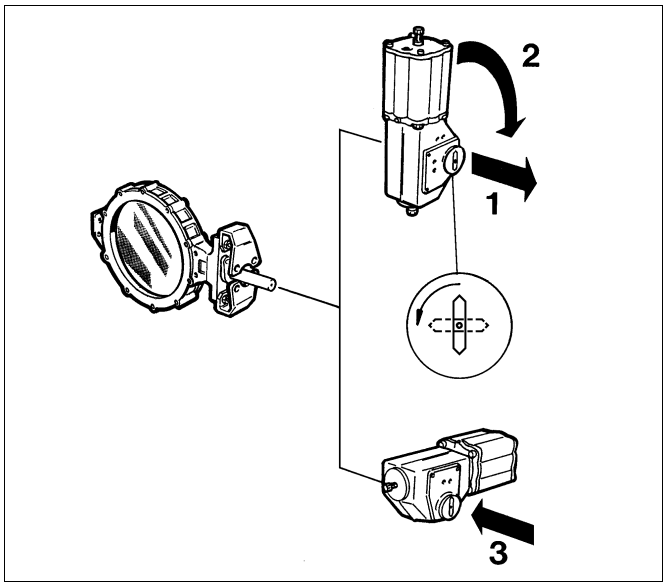


Fig. 19. Changing the mounting position

6.4.4 Double-acting cylinder actuator BC

- ❒ Apply the tabulated shut-off pressure P_c to the air connection at the cylinder base.
- ❒ With the stop screw removed, check through the air connection hole that the piston does not touch the cylinder end. If it does, loosen the bracket screws and turn the actuator clockwise to increase the adjusting margin.

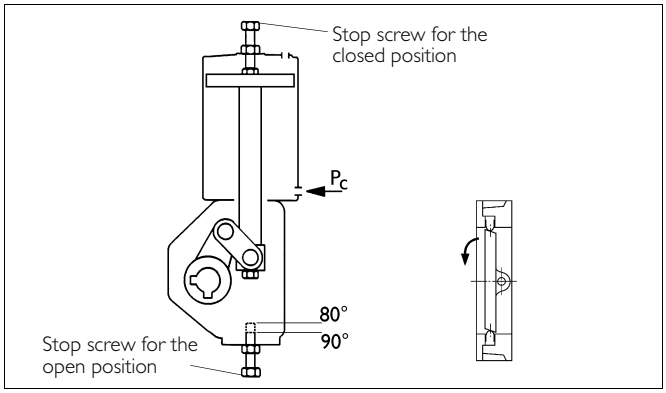


Fig. 20. Cylinder actuator, Series BC/B1C

- ❒ Turn the closed position stop screw until it touches the piston, then turn back 1/4 turn and lock up. Leakproof with Loctite 225 or other non-hardening sealant. The sealant must not flow inside the cylinder.
- ❒ An extra long screw is needed for opening angles < 80°.

6.4.5 Manual operator M

- ❒ Close the valve as per the tabulated primary torque M_1 (handwheel torque) given in Tables 7-10.
- ❒ Tighten the closed position stop screw until it touches the linkage, then turn back 1/4 turn and lock up with Loctite 225.

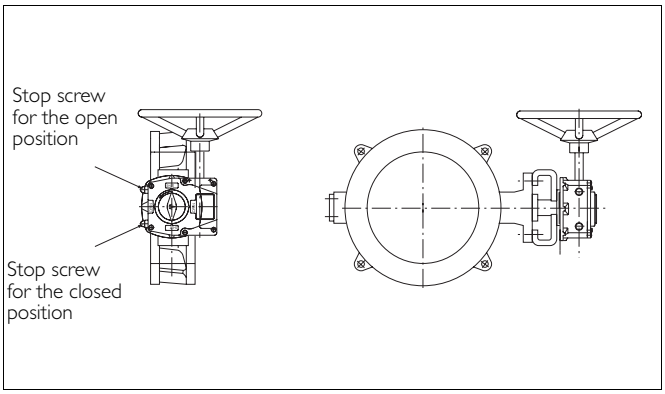


Fig. 22. Actuator, Series M

6.4.6 Hand lever RM

- ❒ Mount the hand lever on the valve, but do not fasten hex screws (A). Turn the lever using force F in Table 6.
- ❒ When closing torque is applyed, turn the housing (B) cog of the closing limit to maintain contact with the lever arm. Fasten hex screws (A).

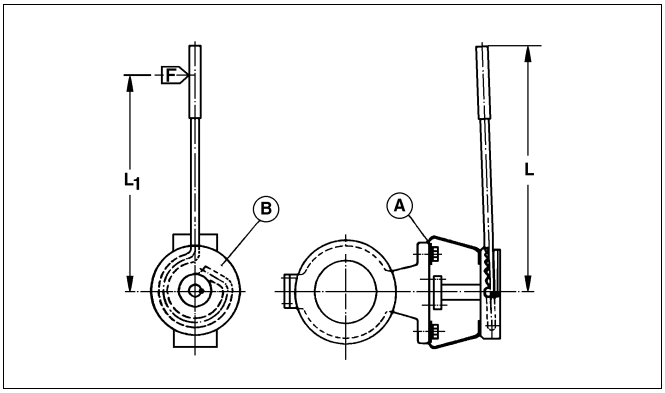


Fig. 21. Hand lever, Series RM

Table 6. Hand lever RM, adjustment values

Size		L		L1		Torque		F	
DN	"	mm	"	mm	"	Nm	lbf ft	N	lbf
80	03	400	16	350	14	40	30	115	26
100	04	400	16	350	14	70	52	200	45
125	05	400	16	350	14	100	74	285	63
150	06	500	20	450	18	135	100	300	67

6.4.7 Electric operator

Instructions for adjustment are given in a separate leaflet code D304568, which is available from the manufacturer.

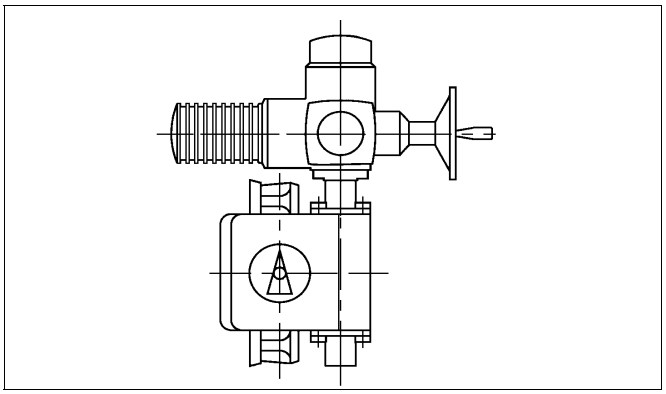


Fig. 23. Electric operator

6.4.8 Spring-return cylinder actuator B1J

Spring-to-close

- ❒ Before mounting the cylinder, screw in the closed position stop screw completely.
- ❒ The table overleaf indicates **) spring* when the spring-created torque does not exceed the maximum permitted closing torque M_c. Otherwise, apply the tabulated pressure P_c into the air connection at the cylinder end against the spring force. **The stop screw cannot be removed when the cylinder is pressurized!** Open the stop screw until it does not touch the piston.
- ❒ Turn the closed position stop screw until it touches the piston, then turn back 1/4 turn and lock up. Leakproof with Loctite 225 or other non-hardening sealant. The sealant must not flow inside the cylinder.
- ❒ After adjusting, check the adjusting margin through the air connection hole. The piston must not touch the cylinder end. If necessary, increase the margin by loosening the bracket screws and turning the actuator clockwise.
- ❒ An extra long screw is needed for opening angles < 80°.

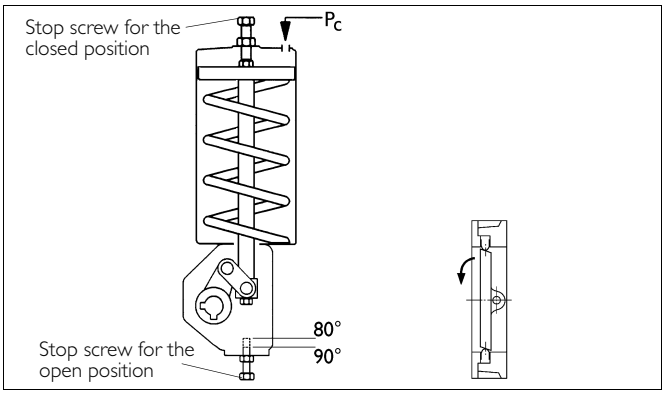


Fig. 25. Cylinder actuator, series BJ

6.4.9 Spring-return cylinder actuator B1JA

Spring-to-open

- ❒ The actuator being unpressurized the valve is open. Unscrew the close limit stop screw (actuator housing). Apply tabulated shut-off pressure P_c to the air connection at the cylinder bottom end against the spring force to close the valve.
- ❒ Check through the stop screw hole that the piston rod does not touch the cylinder top end. If it does, loosen the bracket screws and turn the actuator clockwise to increase the adjusting margin.
- ❒ Turn the closed position stop screw until it touches the piston, then turn back 1/4 turn and lock up. Leakproof with Loctite 225 or other non-hardening sealant. The sealant must not flow inside the cylinder.
- ❒ An extra long screw is needed for opening angles < 80°.

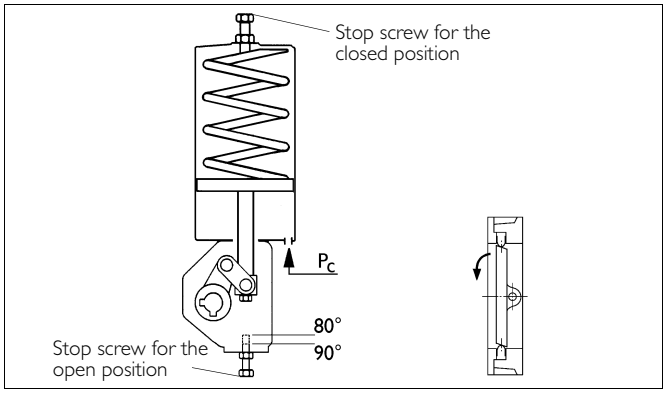


Fig. 24. Cylinder actuator, Series B1JA

7 TOOLS

No special tools are needed for servicing the valve.
However, we recommend an extractor for removing the actuator from the valve. The tool can be ordered from the manufacturer.

8 ORDERING SPARE PARTS

When ordering spare parts, always include the following information:

- ❒ valve type designation (from the identification plate or documents),
- ❒ number of the parts list, part number, name of the part and quantity required, or
- ❒ number of this manual, part number, name of the part and quantity required.

Table 7. Series L1C, closing torques

Size	Closing torque M_c (Nm) / (lbf ft)	BC and BJ actuator	BC supply pressure P_c (bar) / (psi)	BJ spring-to-close P_c (bar) / (psi)	BJA spring-to-open P_c (bar) / (psi)	BJK spring-to-close P_c (bar) / (psi)	BJKA spring-to-open P_c (bar) / (psi)	Quadra-Powr actuator	Quadra-Powr spring-to-close P_c (bar) / (psi)	Quadra-Powr spring-to-open P_c (bar) / (psi)	Manual operator	Primary torque M_1 Handwheel (Nm) / (lbf ft)
3	45 / 33	6	2.5 / 36	-	-	-	-	QP2C	0.6 / 9	3.6 / 52	AR11	4 / 3
		8	2.1 / 30	0.7 / 10	3.3 / 48	0.3 / 4	2.8 / 41	QP3C	1.1 / 16	3.2 / 46	M07	4 / 3
		10	1.6 / 23	1.1 / 16	2.8 / 41	0.7 / 10	2.2 / 32					
4	75 / 55	6	4.1 / 59	-	-	-	-	QP2C	-	4.3 / 62	AR11	6 / 4
		8	3.4 / 49	0.2 / 3	3.8 / 55	*) spring	3.3 / 48	QP3C	0.8 / 12	3.5 / 51	M07	7 / 5
		9	2.1 / 30	-	-	-	-					
		10	1.9 / 28	0.9 / 13	3.1 / 45	0.5 / 7	2.6 / 38					
		11	1.1 / 16	-	-	-	-					
5	110 / 80	6	6.0 / 87	-	-	-	-	QP3C	0.3 / 4	3.9 / 57	AR11	9 / 7
		8	5.0 / 72	*) spring	4.5 / 65	-	3.8 / 55	QP4C	1.0 / 14	3.3 / 48	M07	10 / 7
		9	3.0 / 43	-	-	-	-					
		10	2.4 / 35	0.6 / 9	3.4 / 49	0.2 / 3	2.9 / 42					
		11	1.5 / 22	-	-	-	-					
		12	1.3 / 19	1.1 / 16	3.0 / 43	0.7 / 10	2.2 / 32					
6	150 / 110	6	8.2 / 119	-	-	-	-	QP3C	-	4.3 / 62	AR11	12 / 9
		9	4.1 / 59	-	-	-	-	QP4C	0.8 / 12	3.5 / 51	M07	14 / 10
		10	3.3 / 48	0.2 / 3	3.8 / 55	*) spring	3.2 / 46					
		11	2.1 / 30	-	-	-	-					
		12	1.6 / 23	0.9 / 13	3.1 / 45	0.5 / 7	2.6 / 38					
8	300 / 220	10	6.5 / 94	*) spring	5.0 / 72	-	4.4 / 64	QP4C	-	4.3 / 62	AR11	24 / 18
		11	4.2 / 61	-	-	-	-	QP5C	0.8 / 12	3.5 / 51	M10	27 / 20
		12	3.3 / 48	0.2 / 3	3.8 / 55	*) spring	3.2 / 46					
		13	2.1 / 30	-	-	-	-					
		16	1.6 / 23	0.9 / 13	3.1 / 45	0.5 / 7	2.6 / 38					
10	500 / 370	12	5.5 / 80	*) spring	4.6 / 67	-	4.0 / 58	QP5C	0.1 / 1	4.1 / 59	AR11	40 / 30
		13	3.5 / 51	-	-	-	-				M12	44 / 32
		16	2.8 / 41	0.5 / 7	3.6 / 52	*) spring	3.0 / 43					
		17	1.8 / 26	-	-	-	-					
12	825 / 610	13	5.8 / 84	-	-	-	-				AR21	50 / 37
		16	4.5 / 65	*) spring	4.2 / 61	-	3.6 / 52				M14	51 / 38
		17	3.0 / 43	-	-	-	-					
		20	2.3 / 33	0.6 / 9	3.4 / 49	0.2 / 3	2.8 / 41					
14	1160 / 860	16	6.4 / 93	*) spring	4.9 / 71	-	4.3 / 62				AR21	70 / 52
		17	4.2 / 61	-	-	-	-				M14	72 / 53
		20	3.3 / 48	0.3 / 4	3.7 / 54	*) spring	3.1 / 45					
		25	1.7 / 25	0.9 / 13	3.1 / 45	0.5 / 7	2.6 / 38					
16	1650 / 1220	16	9.5 / 138	-	5.9 / 86	-	5.2 / 75				AR31	70 / 52
		17	6.0 / 87	-	-	-	-				(AR21)	95 / 70
		20	4.7 / 68	*) spring	4.2 / 61	-	3.6 / 52				M15	80 / 59
		25	2.4 / 35	0.6 /	3.4 / 49	0.2 / 3	2.8 / 41					
18	2200 / 1620	20	6.3 / 91	*) spring	4.8 / 70	-	4.2 / 61				AR31	95 / 70
		25	3.2 / 46	0.4 / 6	3.7 / 54	*) spring	3.1 / 45				M15	107 / 79
		32	1.6 / 23	0.9 / 13	3.1 / 45	0.5 / 7	2.5 / 36				M16	83 / 61
20	2700 / 1990	25	3.9 / 57	0.1 / 1	3.9 / 57	*) spring	3.3 / 48				AR41	110 / 80
		32	1.9 / 28	0.8 / 12	3.2 / 46	0.4 / 6	2.7 / 39				M16	102 / 75
24	4400 / 3240	25	6.4 / 93	*) spring	4.8 / 70	-	4.2 / 61				AR41	190 / 140
		32	3.2 / 46	0.4 / 6	3.7 / 54	*) spring	3.1 / 45				M16	166 / 122
		40	1.5 / 22	-	-	-	-					
28	6500 / 4790	32	4.7 / 68	*) spring	4.2 / 61	-	3.6 / 52				Limitorque	Torkmatic
		322	-	0.6 / 9	-	0.2 / 3	-				T325/SGA	75 / 55
		40	2.3 / 33	-	-	-	-				WTR60/SGA	75 / 55
		50	1.2 / 17	-	-	-	-					
30	8000 / 5900	32	5.8 / 84	-	4.6 / 67	-	4.0 / 58				Limitorque	Torkmatic
		322	-	0.5 / 7	-	*) spring	-				T325/SGA	90 / 65
		40	2.8 / 41	-	-	-	-				T425/SGA	95 / 70
		50	1.4 / 20	-	-	-	-				WTR130/SGA	65 / 48
32	9400 / 6930	322	-	0.3 / 4	-	*) spring	-				Limitorque	Torkmatic
		40	3.3 / 48	-	-	-	-				T325/SGA	100 / 75
		50	1.7 / 25	-	-	-	-				T425/SGA	110 / 80
											WTR130/SGA	75 / 55
36	12600 / 9290	322	-	*) spring	-	-	-				Limitorque	Torkmatic
		40	4.4 / 64	-	-	-	-				T425/SGA	150 / 110
		50	2.3 / 33	-	-	-	-				WTR130/SGA	100 / 75
40	16400 / 12090	40	5.7 / 83	-	-	-	-				Limitorque	Torkmatic
		50	2.9 / 42	-	-	-	-				T425/SGA	190 / 140
		502	1.3 / 19	-	-	-	-				WTR130/SGA	130 / 95
48	25600 / 18880	50	4.8 / 70	-	-	-	-				Limitorque	Torkmatic
		502	2.0 / 29	-	-	-	-				T450/SGA	200 / 150
56	40000 / 29500	50	7.6 / 110	-	-	-	-				Limitorque	Torkmatic
		502	3.1 / 45	-	-	-	-				T500/SGA	210 / 155

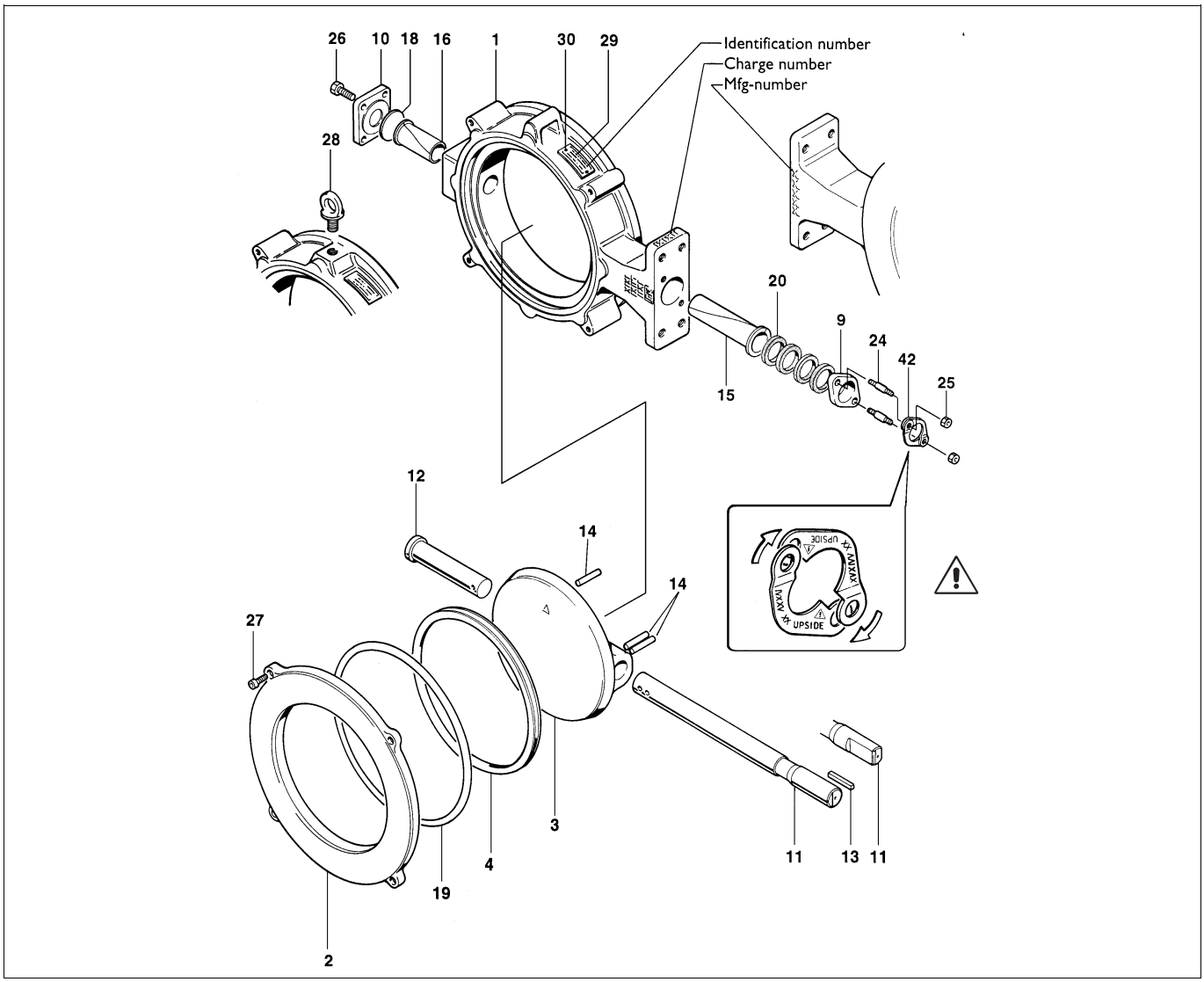
*) Spring torque not adequate to achieve tightness according to ISO 5208 Rate D, BS 6755 Part 1 Rate D, ANSI/FCI 70.2 Class V, IEC 534-4 or MSS-SP72 / 1970

Table 8. Series L1D, closing torques

Size	Closing torque M_c (Nm) / (lbf ft)	BC and BJ actuator	BC supply pressure P_c (bar) / (psi)	BJ spring-to-close P_c (bar) / (psi)	BJA spring-to-open P_c (bar) / (psi)	BJK spring-to-close P_c (bar) / (psi)	BJKA spring-to-open P_c (bar) / (psi)	Quadra-Powr actuator	Quadra-Powr spring-to-close P_c (bar) / (psi)	Quadra-Powr spring-to-open P_c (bar) / (psi)	Manual operator	Primary torque M_1 Handwheel (Nm) / (lbf ft)
3	45 / 33	6 8 10	2.5 / 36 2.1 / 30 1.6 / 23	- 0.7 / 10 1.1 / 16	- 3.3 / 48 2.8 / 41	- 0.3 / 4 0.7 / 10	- 2.8 / 41 2.2 / 32	QP2C QP3C	0.6 / 9 1.1 / 16	3.6 3.2	AR 11 M07	4 / 3 4 / 3
4	75 / 55	6 8 9 10 11	4.1 / 59 3.4 / 49 2.1 / 30 1.9 / 28 1.1 / 16	- 0.2 / 3 - 0.9 / 13 -	- 3.8 / 55 - 3.1 / 45 -	- *) spring - 0.5 / 7 -	- 3.3 / 48 - 2.6 / 38 -	QP2C QP3C	- 0.8 / 12	4.3 3.5	AR 11 M07	6 / 4 7 / 5
5	110 / 80	6 8 9 10 11 12	6.0 / 87 5.0 / 72 3.0 / 43 2.4 / 35 1.5 / 22 1.3 / 19	- *) spring - 0.6 / 9 - 1.1 / 16	- 4.5 / 65 - 3.4 / 49 - 3.0 / 43	- - - 0.2 / 3 - 0.7 / 10	- 3.8 / 55 - 2.9 / 42 - 2.2 / 32	QP3C QP4C	0.3 / 4 1.0 / 14	3.9 3.3	AR 11 M07	9 / 7 10 / 7
6	230 / 170	10 11 12 13 16	5.0 / 72 3.2 / 46 2.5 / 36 1.6 / 23 1.3 / 19	*) spring - 0.5 / 7 - 0.9 / 13	4.4 / 64 - 3.5 / 51 - 3.0 / 43	- - 0.1 / 1 - 0.6 / 9	3.8 / 55 - 2.9 / 42 - 2.3 / 33	QP4C QP5C	0.3 / 4 1.0 / 14	3.9 3.3	AR 11 M10	20 / 15 21 / 15
8	460 / 340	11 12 13 16 17 20	6.4 / 93 5.0 / 72 3.2 / 46 2.5 / 36 1.7 / 25 1.4 / 20	- *) spring - 0.5 / 7 - 1.0 / 14	- 4.4 / 64 - 3.5 / 51 - 2.9 / 42	- - - 0.1 / 1 - 0.6 / 9	- 3.8 / 55 - 2.9 / 42 - 2.3 / 33	QP5C	0.3 / 4	3.9	AR 11 M14	37 / 27 28 / 21
10	800 / 590	13 16 17 20	5.6 / 81 4.4 / 64 2.9 / 42 2.3 / 33	- *) spring - 0.7 / 10	- 4.2 / 61 - 3.3 / 48	- - - 0.3 / 4	- 3.6 / 52 - 2.8 / 41				AR 21 M14	50 / 37 49 / 36
12	1250 / 920	17 20 25	4.6 / 67 3.6 / 52 1.8 / 26	- 0.2 / 3 0.8 / 12	- 3.8 / 55 3.2 / 46	- *) spring 0.4 / 6	- 3.2 / 46 2.6 / 38				AR 21 M15	75 / 55 61 / 45
14	1750 / 1290	17 20 25 32	6.4 / 93 5.0 / 72 2.6 / 38 1.3 / 19	- *) spring 0.6 / 9 1.0 / 14	- 4.3 / 62 3.4 / 49 2.9 / 42	- - 0.2 / 3 0.6 / 9	- 3.7 / 54 2.9 / 42 2.3 / 33				AR 31 M15	75 / 55 85 / 63
16	2500 / 1840	25 32	3.6 / 52 1.8 / 26	0.2 / 3 0.8 / 12	3.8 / 55 3.2 / 46	*) spring 0.4 / 6	3.2 / 46 2.6 / 38				AR 31/AR 41 M16	110 / 80 94 / 69
18	3400 / 2510	25 32 40	4.9 / 71 2.4 / 35 1.2 / 17	*) spring 0.6 / 9 -	4.3 / 62 3.4 / 49 -	- 0.2 / 3 -	3.7 / 54 2.8 / 41 -				AR 41 M16	145 / 110 128 / 94
20	4100 / 3020	32 40 322	3.0 / 43 1.4 / 20 -	0.4 / 6 - 0.9 / 13	3.6 / 52 - 3.0 / 43	*) spring - 0.5 / 7	3.0 / 43 - 2.4 / 35				AR 41 M16	175 / 130 155 / 114
24	6700 / 4940	32 322 40	4.8 / 70 - 2.3 / 33	*) spring 0.6 / 9 -	4.3 / 62 - -	- 0.2 / 3 -	3.6 / 52 - -				Limitorque T325/SGA WTR60/SGA (AR 41)	Torkmatic 75 / 55 75 / 55 280 / 210
28	9800 / 7230	322 40 50	- 3.4 / 49 1.8 / 26	0.2 / 3 - -	- - -	*) spring - -	- - -				Limitorque T325/SGA WTR60/SGA	Torkmatic 110 / 80 110 / 80
30	12000 / 8850	322 40 50	- 4.2 / 61 2.2 / 32	*) spring - -	- - -	- - -	- - -				Limitorque T425/SGA WTR130/SGA	Torkmatic 150 / 110 95 / 70
32	14000 / 10320	40 50	4.9 / 71 2.5 / 36	- -	- -	- -	- -				Limitorque T425/SGA WTR130/SGA	Torkmatic 170 / 125 110 / 80
36	19000 / 14010	50 502	3.4 / 49 1.5 / 22	- -	- -	- -	- -				Limitorque WTR130/SGA	Torkmatic 150 / 110
40	25000 / 18440	50 502	4.5 / 65 2.0 / 29	- -	- -	- -	- -				Limitorque T450/SGA	Torkmatic 130 / 95

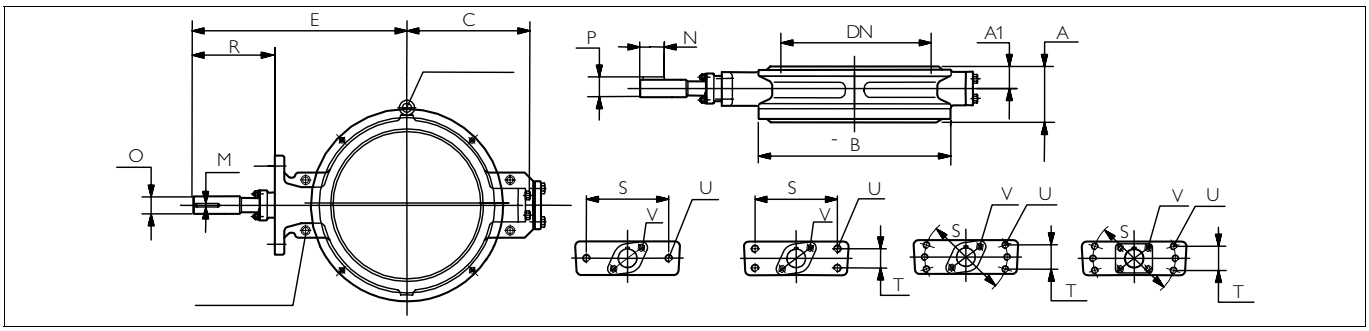
*) Spring torque not adequate to achieve tightness according to ISO 5208 Rate D, BS 6755 Part 1 Rate D, ANSI/FCI 70.2 Class V, IEC 534-4 or MSS-SP72 / 1970.

9 EXPLODED VIEW AND PARTS LIST



Item	Qty	Description	Recommended spare parts
1	1	Body	
2	1	Clamp ring	
3	1	Disc	
4	1	Seat ring	×
9	1	Gland	
10	1	Blind flange	
11	1	Drive shaft	
12	1	Shaft	
13	1	Key	
14	3	Pin	
15	1	Bearing	
16	1	Bearing	
18	1	Gasket	×
19	1	Body seal	×
20	5	Gland packing	×
24	2	Stud	
25	2	Hexagon nut	
26		Hexagon screw	
27		Hexagon socket screw	
28	1	Lifting eye bolt (DN 600-)	
29	1	Identification plate	
42	2	Retaining plate	

10 DIMENSIONS AND WEIGHTS



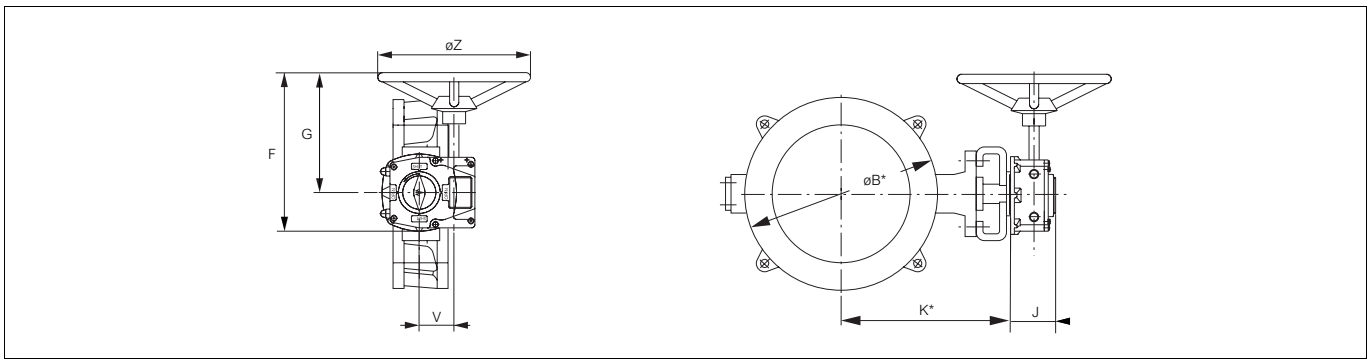
L1C/ANSI 150

Size		Dimensions, mm							U	V	Dimensions, mm					Weight
in	DN	A	A1	B	C	E	S	T	UNC	UNC	O	R	M	P	N	kg
03	80	49	19	132	80	180	70	-	3/8	5/16	15	70	4,76	17	25	4
04	100	56	22	160	100	210	90	-	1/2	5/16	20	80	4,76	22,2	35	6
05	125	64	22	190	115	225	90	-	1/2	5/16	20	80	4,76	22,2	35	9
06	150	70	29	216	130	290	110	32	1/2	5/16	20	110	4,76	22,2	35	15
08	200	71	28	272	160	320	110	32	1/2	3/8	25	110	6,35	27,8	46	20
10	250	76	31	327	210	360	130	32	1/2	3/8	30	140	6,35	32,9	51	30
12	300	83	33	375	275	420	130	32	1/2	3/8	35	140	9,52	39,1	58	45
14	350	92	38	435	290	460	160	40	5/8	3/8	40	165	9,52	44,2	68	70
16	400	102	41	485	330	500	160	40	5/8	1/2	45	165	12,7	50,4	80	95
18	450	114	46	537	370	560	160	55	3/4	1/2	50	180	12,7	55,5	90	130
20	500	127	53	590	415	600	160	55	3/4	1/2	55	180	12,7	60,6	90	160
24	600	154	65	690	505	745	230	90	1	5/8	70	250	19,05	78,2	119	280
28	700	229	96	805	545	810	230	90	1	5/8	85	250	22,23	94,7	146	400
30	750	229	96	870	585	835	230	90	1	5/8	85	250	22,23	94,7	145	470
32	800	241	101	910	600	960	330	120	1 1/4	3/4	95	330	22,23	104,8	156	550
36	900	241	105	1010	660	995	330	120	1 1/4	3/4	105	330	25,4	116,2	180	710
40	1000	300	130	1120	715	1090	330	120	1 1/4	3/4	120	330	31,75	133,8	205	950

L1D/ANSI 300

Size		Dimensions, mm							U	V	Dimensions, mm					Weight
in	DN	A	A_1	B	C	E	S	T	UNC	UNC	O	R	M	P	N	kg
03	80	49	19	132	80	180	70	-	3/8	5/16	15	70	4,76	17	25	4
04	100	56	22	160	100	210	90	-	1/2	5/16	20	80	4,76	22,2	35	6
05	125	64	22	190	115	225	90	-	1/2	5/16	20	80	4,76	22,2	35	9
06	150	76	31,5	245	150	280	110	32	1/2	3/8	25	110	6,35	27,8	46	20
08	200	89	38	303	205	350	130	32	1/2	3/8	35	140	9,52	39,1	58	40
10	250	114	56	352	265	435	160	40	5/8	1/2	45	165	12,7	50,4	80	70
12	300	114	53	415	305	490	160	55	3/4	1/2	50	180	12,7	55,5	90	90
14	350	127	62	470	335	515	160	55	3/4	1/2	55	180	12,7	60,6	90	125
16	400	156	83	530	385	635	230	90	1	5/8	70	250	19,05	78,2	119	200
18	450	180	90	565	410	655	230	90	1	5/8	70	250	19,05	78,2	119	245
20	500	200	100	625	465	705	230	90	1	5/8	85	250	22,23	94,7	146	305
24	600	240	120	743	525	860	330	120	1 1/4	3/4	95	330	22,23	104,8	156	540
28	700	250	125	848	615	935	330	120	1 1/4	3/4	120	330	31,75	133,8	205	830
30	750	300	150	942	655	970	360	135	1 1/4	7/8	135	330	31,75	149,0	225	1250
36	900	360	180	1100	730	1060	360	135	1 1/4	1	165	330	38,10	181,0	280	2000

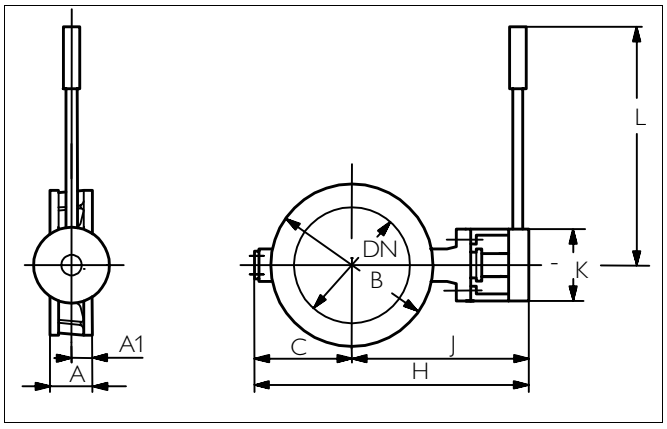
L1C + M



L1C + M

Type	F	G	J	V	øZ	kg
M07	196	152	58	39	125	3
M10	297	239	67	52	200	5
M12	357	282	81	67	250	10
M14	435	345	94	90	457	18
M15	532	406	106	123	457	31
M16	642	466	127	154	610	45

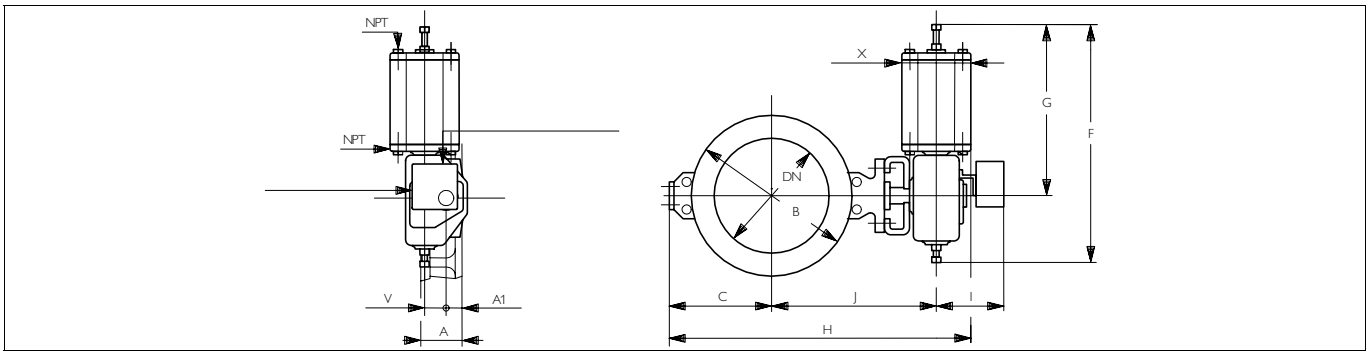
L1C + RM



L1C + RM

Type valve and actuator	DN	A	A_1	B	C	H	J	K	L	kg
L1C 03 -RM415	80	49	19	132	80	260	180	100	400	5
L1C 04 - RM420	100	56	22	160	100	310	210	100	400	8
L1C 05 - RM420	125	64	22	190	115	340	225	100	400	11
L1C 06 - RM520	150	70	29	216	130	420	290	130	500	19

L1C + BC/B1C (DN 80...450)



Type valve and actuator	Dimensions, mm												NPT	Weight kg	*H
	DN	A	A_1	B	C	F	G	H	X	I	J	V			
L1C 03 - BC6	80	49	19	132	80	400	260	375	90	225	213	36	1/4	9	375
L1C 03 - BC9	80	49	19	132	80	455	315	370	110	225	214	43	1/4	15	370
L1C 04 - BC6	100	56	22	160	100	400	260	415	90	225	233	36	1/4	11	415
L1C 04 - BC9	100	56	22	160	100	455	315	410	110	225	234	43	1/4	17	410
L1C 04 - BC11	100	56	22	160	100	540	375	420	135	230	240	51	3/8	22	420
L1C 05 - BC6	125	64	22	190	115	400	260	445	90	225	248	36	1/4	14	445
L1C 05 - BC9	125	64	22	190	115	455	315	440	110	225	249	43	1/4	20	440
L1C 05 - BC11	125	64	22	190	115	540	375	450	135	230	255	51	3/8	25	450
L1C 06 - BC9	150	70	29	216	130	455	315	505	110	225	299	43	1/4	26	505
L1C 06 - BC11	150	70	29	216	130	540	375	515	135	230	305	51	3/8	34	515
L1C 06 - BC13	150	70	29	216	130	635	445	560	175	245	331	65	3/8	48	565
L1C 08 - BC11	200	71	28	272	160	540	375	575	135	230	335	51	3/8	38	575
L1C 08 - BC13	200	71	28	272	160	635	445	620	175	245	361	65	3/8	53	625
L1C 08 - BC17	200	71	28	272	160	770	545	650	215	260	376	78	1/2	76	655
L1C 10 - BC11	250	76	31	327	210	540	375	665	135	230	375	51	3/8	51	665
L1C 10 - BC13	250	76	31	327	210	635	445	690	175	245	381	65	3/8	66	695
L1C 10 - BC17	250	76	31	327	210	770	545	720	215	260	396	78	1/2	89	725
L1C 12 - BC13	300	83	33	375	275	635	445	815	175	245	441	65	3/8	81	820
L1C 12 - BC17	300	83	33	375	275	770	545	845	215	260	456	78	1/2	105	850
L1C 12 - BC20	300	83	33	375	275	840	575	875	215	275	475	97	1/2	125	890
L1C 14 - BC17	350	92	38	435	290	770	545	875	215	260	471	78	1/2	145	880
L1C 14 - BC20	350	92	38	435	290	840	575	905	215	275	490	97	1/2	185	920
L1C 14 - BC25	350	92	38	435	290	1040	710	985	265	310	533	121	1/2	210	1015
L1C 16 - BC17	400	102	41	485	330	770	545	955	215	260	511	78	1/2	150	960
L1C 16 - BC20	400	102	41	485	330	840	575	985	215	275	530	97	1/2	175	1000
L1C 16 - BC25	400	102	41	485	330	1040	710	1065	265	310	573	121	1/2	235	1095
L1C 18 - BC20	450	114	46	537	370	840	575	1090	215	275	595	97	1/2	210	1105
L1C 18 - BC25	450	114	46	537	370	1040	710	1150	265	310	618	121	1/2	275	1180
L1C 18 - BC32	450	114	46	537	370	1330	910	1235	395	350	665	153	3/4	390	1265

* = Dimension H for BCM

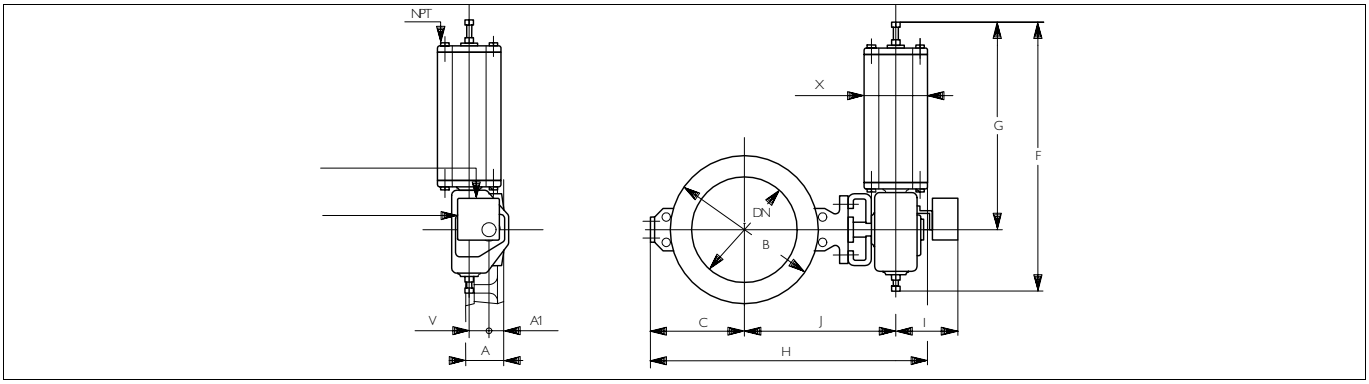
L1C + BC/B1C (DN 500 ...1000)

Type valve and actuator	Dimensions, mm												NPT	Weight kg	*H
	DN	A	A_1	B	C	F	G	H	X	I	J	V			
L1C 20 - BC25	500	127	53	590	415	1040	710	1235	265	310	658	121	1/2	305	1265
L1C 20 - BC32	500	127	53	590	415	1330	910	1320	395	350	705	153	3/4	420	1350
L1C 24 - BC25	600	154	65	690	505	1040	710	1410	265	310	743	121	1/2	425	1440
L1C 24 - BC32	600	154	65	690	505	1330	910	1485	395	350	780	153	3/4	540	1515
L1C 24 - BC40	600	154	65	690	505	1660	1150	1610	505	365	850	194	3/4	755	1655
L1C 28 - BC32	700	229	96	805	545	1330	910	1590	395	350	845	153	3/4	650	1620
L1C 28 - BC40	700	229	96	805	545	1660	1150	1715	505	365	915	194	3/4	875	1760
L1C 28 - BC50	700	229	96	805	545	1970	1350	1815	610	415	965	242	1	1260	-
L1C 30 - BC32	750	229	96	870	585	1330	910	1655	395	350	870	153	3/4	740	1685
L1C 30 - BC40	750	229	96	870	585	1660	1150	1780	505	365	940	194	3/4	955	1825
L1C 30 - BC50	750	229	96	870	585	1970	1350	1880	610	415	990	242	1	1330	-
L1C 32 - BC32	800	241	101	910	600	1330	910	1725	395	350	925	153	3/4	820	1755
L1C 32 - BC40	800	241	101	910	600	1660	1150	1865	505	365	1010	194	3/4	1035	1910
L1C 32 - BC50	800	241	101	910	600	1970	1350	1965	610	415	1060	242	1	1410	-
L1C 36 - BC40	900	241	105	1010	660	1660	1150	1960	505	365	1045	194	3/4	1185	1205
L1C 36 - BC50	900	241	105	1010	660	1970	1350	2060	610	415	1095	242	1	1580	-
L1C 40 - BC40	1000	300	130	1120	715	1660	1150	2110	505	365	1140	194	3/4	1455	2155
L1C 40 - BC50	1000	300	130	1120	715	1970	1350	2210	610	415	1190	242	1	1830	-

L1D + BC/B1C

Type valve and actuator	Dimensions, mm												NPT	Weight kg	*H
	DN	A	A_1	B	C	F	G	H	X	I	J	V			
L1D 03 - BC6	80	49	19	132	80	400	260	375	90	225	213	36	1/4	9	375
L1D 03 - BC9	80	49	19	132	80	455	315	370	110	225	214	43	1/4	15	370
L1D 04 - BC6	100	56	22	160	100	400	260	415	90	225	234	36	1/4	11	415
L1D 04 - BC9	100	56	22	160	100	455	315	410	110	225	234	43	1/4	17	410
L1D 04 - BC11	100	56	22	160	100	540	375	420	135	230	240	51	3/8	23	420
L1D 05 - BC6	125	64	22	190	115	400	260	445	90	225	248	36	1/4	14	445
L1D 05 - BC9	125	64	22	190	115	455	315	440	110	225	249	43	1/4	20	440
L1D 05 - BC11	125	64	22	190	115	540	375	450	135	230	255	51	3/8	26	450
L1D 06 - BC11	150	76	32	245	150	540	375	525	135	230	295	51	3/8	39	525
L1D 06 - BC13	150	76	32	245	150	635	445	570	175	245	321	65	3/8	54	575
L1D 06 - BC17	150	76	32	245	150	770	545	600	215	260	336	78	1/2	77	605
L1D 08 - BC13	200	89	38	303	205	635	445	675	175	245	371	65	3/8	74	680
L1D 08 - BC17	200	89	38	303	205	770	545	705	215	260	386	78	1/2	97	710
L1D 08 - BC20	200	89	38	303	205	840	575	735	215	275	405	97	1/2	115	750
L1D 10 - BC17	250	114	56	352	265	770	545	825	215	260	446	78	1/2	130	830
L1D 10 - BC20	250	114	56	352	265	840	575	855	215	275	465	97	1/2	145	870
L1D 10 - BC25	250	114	56	352	265	1040	710	935	265	310	508	121	1/2	205	965
L1D 12 - BC20	300	114	53	415	305	840	575	955	215	275	525	97	1/2	170	970
L1D 12 - BC25	300	114	53	415	305	1040	710	1015	265	310	548	121	1/2	230	1045
L1D 14 - BC20	350	127	62	470	335	840	575	1010	215	275	550	97	1/2	200	1025
L1D 14 - BC25	350	127	62	470	335	1040	710	1070	265	310	573	121	1/2	265	1100
L1D 16 - BC25	400	165	83	530	385	1040	710	1180	265	310	633	121	1/2	340	1210
L1D 16 - BC32	400	165	83	530	385	1330	910	1255	395	350	670	153	3/4	465	1285
L1D 18 - BC25	450	180	90	565	410	1040	710	1225	265	310	653	121	1/2	385	1255
L1D 18 - BC32	450	180	90	565	410	1330	910	1300	395	350	690	153	3/4	510	1330
L1D 20 - BC32	500	200	100	625	465	1330	910	1405	395	350	740	153	3/4	570	1435
L1D 20 - BC40	500	200	100	625	465	1660	1150	1530	505	365	810	194	3/4	775	1575
L1D 24 - BC32	600	240	120	743	525	1330	910	1550	395	350	825	153	3/4	810	1580
L1D 24 - BC40	600	240	120	743	525	1660	1150	1690	505	365	910	194	3/4	1015	1735

* = Dimension H for BCM



L1C + BJ/B1J

Type valve and actuator	Dimensions, mm												NPT	Weight kg
	DN	A	A_1	B	C	F	G	H	X	I	J	V		
L1C 03 - BJ8	80	49	19	132	80	560	420	370	135	200	213	43	3/8	20
L1C 04 - BJ8	100	56	22	160	100	560	420	415	135	200	238	43	3/8	23
L1C 04 - BJ10	100	56	22	160	100	650	490	435	175	205	245	51	3/8	33
L1C 05 -BJ8	125	64	22	190	115	560	420	445	135	200	253	43	3/8	26
L1C 05 - BJ10	125	64	22	190	115	650	490	465	175	205	260	51	3/8	36
L1C 06 - BJ10	150	70	29	216	130	650	490	525	175	205	305	51	3/8	42
L1C 06 - BJ12	150	70	29	216	130	800	620	570	215	215	331	65	1/2	68
L1C 08 - BJ10	200	71	28	272	160	650	490	585	175	205	335	51	3/8	47
L1C 08 - BJ12	200	71	28	272	160	800	620	630	215	215	361	65	1/2	73
L1C 08 - BJ16	200	71	28	272	160	990	760	670	265	235	376	78	1/2	115
L1C 10 - BJ12	250	76	31	327	210	800	620	690	215	215	371	65	1/2	85
L1C 10 -BJ16	250	76	31	327	210	990	760	730	265	235	386	78	1/2	125
L1C 12 - BJ16	300	83	33	375	275	990	760	865	265	235	446	78	1/2	140
L1C 12 - BJ20	300	83	33	375	275	1200	935	950	395	250	475	97	3/4	210
L1C 14 - BJ16	350	92	38	435	290	990	760	895	265	235	471	78	1/2	165
L1C 14 - BJ20	350	92	38	435	290	1200	935	990	395	250	500	97	3/4	235
L1C 14 - BJ25	350	92	38	435	290	1530	1200	1080	505	290	533	121	3/4	390
L1C 16 - BJ20	400	102	41	485	330	1200	935	1070	395	250	540	97	3/4	260
L1C 16 - BJ25	400	102	41	485	330	1530	1200	1160	505	290	573	121	3/4	420
L1C 18 -BJ20	450	114	46	537	370	1200	935	1155	395	250	585	97	3/4	295
L1C 18 -BJ25	450	114	46	537	370	1530	1200	1245	505	290	618	121	3/4	450
L1C 18 - BJ32	450	114	46	537	370	1830	1410	1305	540	330	665	153	1	840
L1C 20 - BJ25	500	127	53	590	415	1530	1200	1330	505	290	658	121	3/4	480
L1C 20 - BJ32	500	127	53	590	415	1830	1410	1390	540	330	705	153	1	870
L1C 24 - BJ25	600	154	65	690	505	1530	1200	1505	505	290	743	121	3/4	600
L1C 24 - BJ32	600	154	65	690	505	1830	1410	1555	540	330	780	153	1	990
L1C 28 - BJ32	700	229	96	805	545	1830	1410	1660	540	330	845	153	1	1120
L1C 30 - BJ32	750	229	96	870	585	1830	1410	1725	540	330	870	153	1	1190
L1C32 - BJ32	800	241	101	910	600	1830	1410	1795	540	330	925	153	1	1270

L1D + BJ/B1J

Type valve and actuator	Dimensions, mm												NPT	Weight kg
	DN	A	A_1	B	C	F	G	H	X	I	J	V		
L1D 03 - BJ8	80	49	19	132	80	560	420	370	135	200	213	43	3/8	20
L1D 04 -BJ8	100	56	22	160	100	560	420	415	135	200	238	43	3/8	23
L1D 04 -BJ10	100	56	22	160	100	650	490	435	175	205	245	51	3/8	33
L1D 05 -BJ8	125	64	22	190	115	560	420	445	135	200	253	43	3/8	26
L1D 05 -BJ10	125	64	22	190	115	650	490	455	175	205	260	51	3/8	36
L1D 06 -BJ10	150	76	32	245	150	650	490	535	175	205	295	51	3/8	47
L1D 06 - BJ12	150	76	32	245	150	800	620	580	215	215	321	65	1/2	73
L1D 08 - BJ12	200	89	38	303	205	800	620	675	215	215	361	65	1/2	93
L1D 08 - BJ16	200	89	38	303	205	990	760	715	265	235	376	78	1/2	135
L1D 10 -BJ16	250	114	56	352	265	990	760	845	265	235	446	78	1/2	165
L1D 10 -BJ20	250	114	56	352	265	1200	935	940	395	250	475	97	1/2	235
L1D 12 -BJ20	300	114	53	415	305	1200	935	1020	395	250	515	97	3/4	255
L1D 12 - BJ25	300	114	53	415	305	1530	1200	1105	505	290	548	121	3/4	410
L1D 14 -BJ20	350	127	62	470	335	1200	935	1075	395	250	540	97	3/4	290
L1D 14 - BJ25	350	127	62	470	335	1530	1200	1160	505	290	573	121	3/4	445
L1D 16 - BJ25	400	165	83	530	385	1530	1200	1270	505	290	633	121	3/4	520
L1D 16 - BJ32	400	165	83	530	385	1830	1410	1325	540	330	670	153	1	915
L1D 18 - BJ32	450	180	90	565	410	1830	1410	1370	540	330	690	153	1	960
L1D 20 - BJ32	500	200	100	625	465	1830	1410	1475	540	330	740	153	1	1020
L1D 24 - BJ32	600	240	120	743	525	1830	1410	1620	540	330	825	153	1	1260

11 TYPE CODE

BUTTERFLY VALVE, Series L1, L2, ANSI version

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.		12.	13.
	L1	C	M	A	16	A	A	J	A	F	/	01	

1.	S-DISC CONSTRUCTION
S-	Flow balancing trim on downstream side of body flow port

2.	PRODUCT SERIES
L1	Wafer type, full bore
L2	Lug type, full bore

3.	PRESSURE RATING
C	ANSI Class 150
D	ANSI Class 300

4.	SEAT DESIGN
M	Metal seat
N	Non-tight

5.	CONSTRUCTION
A	Standard
C	Cryogenic
H	High temperature
Y	Special

6.	SIZE
3"...40"	

7.	BODY MATERIAL
A	ASTM A351 gr. CF8M
C	ASTM A351 gr. CG8M
P	ASTM A216 gr. WCB
Y	Special

8.	DISC MATERIAL
A	ASTM A351 gr. CF8M
C	ASTM A351 gr. CG8M
P	ASTM A216 gr. WCB
Y	Special

9.	SHAFT AND PIN MATERIAL
C	17-4PH
J	SIS 2324
Y	Special

10.	SEAT MATERIAL
A	Incoloy 825
B	SS Avesta 248 SV
Y	Special

11.	NON-STANDARD CONSTRUCTION
F	Gland packing graphite
T	Live loaded PTFE gland packing
G	Live loaded graphite gland packing
Y	Special

12.	FLANGE FACING
-	Stock Finish, without sign
01	Smooth Finish

13.	FLANGE DRILLING
-	According to valve pressure rating, standard without sign

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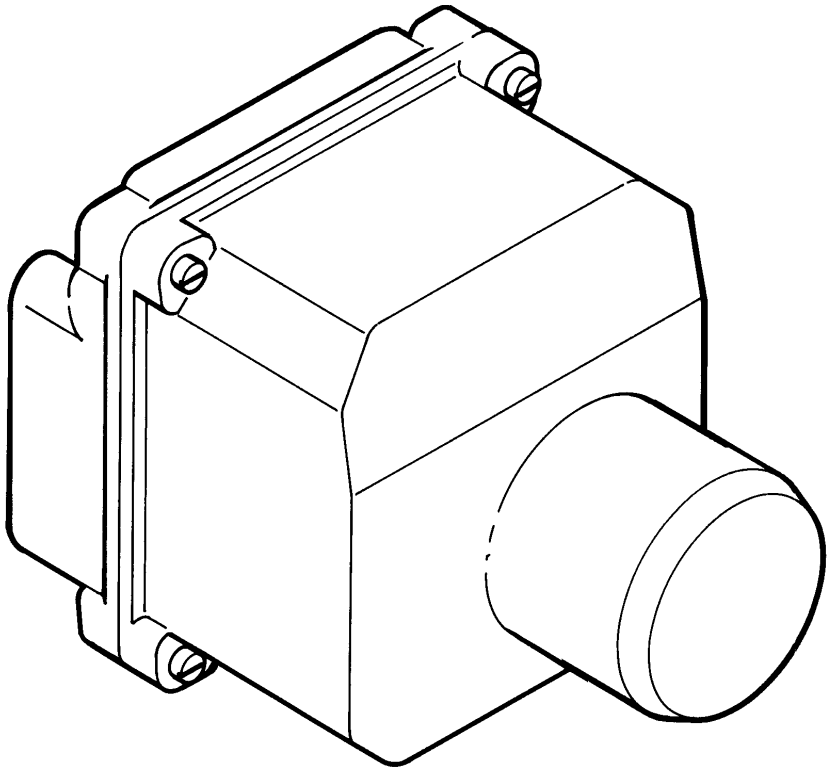


POSITION TRANSMITTERS
Series NT700

Installation, Maintenance and
Operating Instructions
7 NT 71 en
Issue 12/99

metso
automation

Table of Contents

READ THESE INSTRUCTIONS FIRST!

These instructions provide information about safe handling and operation of the position transmitter. If you require additional assistance, please contact the manufacturer or manufacture's representative. Addresses and phone numbers are printed on the back cover.

SAVE THESE INSTRUCTIONS!

1 INTRODUCTION

1.1 General description

The NT700 position transmitter is used for indication of the electrical position of valves and other devices. The output signal options are 4-20 mA or 0-20 mA. The position transmitter can be a 2- or 4-wire one. When needed, the current signal can be used to control another electrical device.

In addition to the position transmitter, the same housing can accommodate two microswitches or two inductive proximity switches.

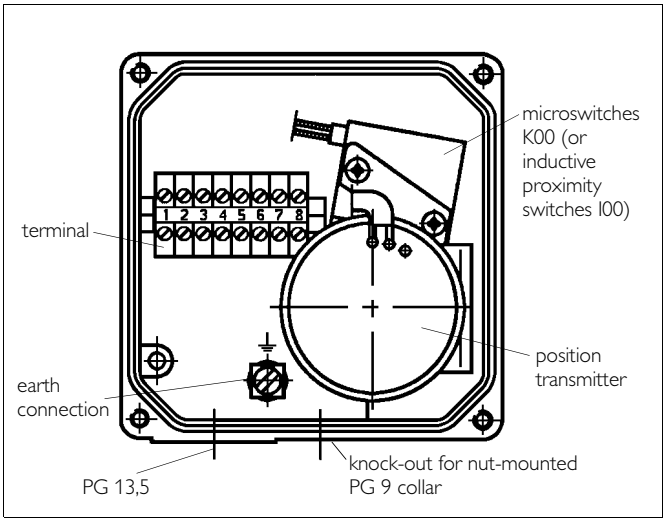


Fig. 1. Position transmitter layout

1.2 Markings

The position transmitter is provided with an identification plate sticker, see Fig. 2. Identification plate markings from top to bottom are:

- Type designation
- Electrical values (other information) of transmitter
- Enclosure class
- Temperature range
- Conduit entry (-L, -I or -NJ)
- Serial number

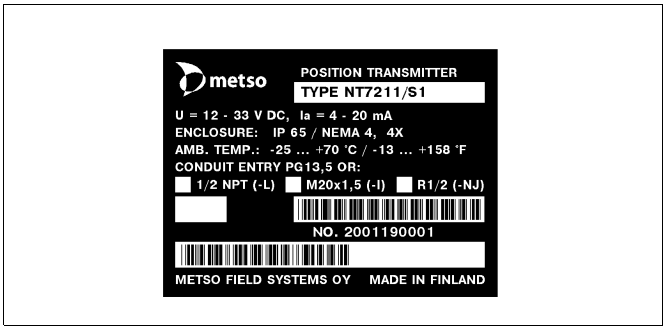


Fig. 2. Identification plate (NT7211)

A separate plate in older versions shows the conduit entry (-L, -I or -NJ).

The type designation is described in Section 10.

1.3 Specifications of position transmitter

Type:	Camille Bauer Kinax 57-3W2 Protection class IP50
Electrical values:	Input voltage 12-33 V DC 12-30 V DC EEx ia... Output signal 4-20 mA, 0-20 mA 2- or 3-wire type
External load:	12 V: 0 Ω 24 V: 600 Ω 33 V: 1050 Ω
Accuracy:	≤ 0.5%
Approvals:	NT700/X and NT700/I00X: EEx ia IIC T6 or EEx ib IIC T6
Protection class of housing:	IP65 (DIN 40050, IEC 529) / NEMA 4 and 4X
Conduit entry:	PG 13.5 and knockout for additional entry PG9 1/2 NPT = -L M20x1.5 = -I R 1/2 = -NJ
Ambient temperature:	-25 - +70 °C / -13 - +158 °F or -25 - +65 °C / -13 - +149 °F for NT700/...X
Weight:	Approx. 0.7 kg / 1.3 lbs
Materials:	Body aluminium alloy, epoxy coated Cover polycarbonate Internal parts stainless steel and plastic Gasket nitrile and neopren rubber

1.4 Specifications of microswitch

Microswitch types:	OMRON D2VW-5	(K05)
	OMRON D2VW-01	(K06)
	(gold plated contacts)	
	Protection class IP67	
Resistive load:	5 A: 250 V AC	(K05)
	3 A: 30 V DC	
	0,4 A: 125 V DC	
	100 mA: 30 V DC/125 V AC	(K06)
Switch accuracy:	< 2°	
Number of switches:	2	

1.5 Specifications of proximity switch

Proximity switch:	Inductive, 8-14 mm / 0.31 - 0.55 in dia.	
	Sensing range 2 mm / 0.08 in	
	Protection class IP67	
	P+F NJ2-12GK-N	(I01X)
	P+F NJ2-12GM40-E2	(I11)
	P+F NJ2-12GM40-E	(I21)
	OMRON E2E-X3D1-N	(I54)
	ifm IFC2002-ARKG/UP	(I56)
	Other switch types by special order	
Electrical values:	According to switch type	
Switch accuracy:	< 1°	
Number of switches:	2	

1.6 Safety precautions

CAUTION
Do not exceed the performance limitations!
Exceeding the limitations marked on the position transmitter may cause damage to the transmitter and associated devices. Damage or personal injury may result.

CAUTION
Observe caution with the live parts of the position transmitter!
The position transmitter and limit switches are fed with a voltage that, depending on the system, can be lethal.
Do not touch any uncovered parts of the wires. Always detach the wires before dismantling the position transmitter.

CAUTION:
Beware of the moving parts of position transmitter when operating!

2 INSTALLATION ON A METSO AUTOMATION ACTUATOR

When the position transmitter is ordered together with the valve, installation and adjustment are performed at the factory according to circuit diagrams in Section 9 or the customer's specifications.

When the position transmitter is ordered separately, the installation parts belonging to the particular entity must also be ordered.

Ordering example: (B1CU12)-Z-NT720/S1 or (B1J12)-Z-NT7211/S2 or (B1J12-NP724/S2)-Z-NT7211/S2.

The position transmitter is equipped with both VDI/VDE 3845 (S1) mounting face and Metso Automation (S2) mounting face. Both mounting faces require different shafts. S1: H coupling; S2: C coupling.

The position transmitter can be mounted on the actuator. If also the positioner is needed, use positioner/position transmitter combination (e.g. NPT724/S1/7201).

If position transmitter NT700/S1 is mounted on an excisting actuator B_6-20 with bracket 4216200, make sure that the shaft and draught piece can rotate freely. Remove material from the bracket according to Fig. 3, if needed.

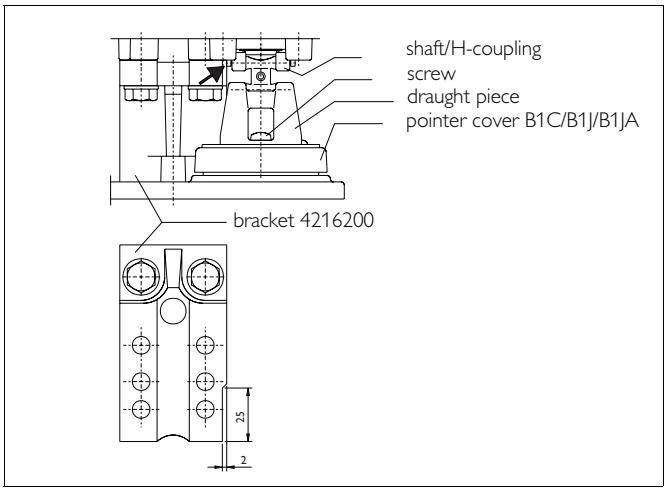


Fig. 3. Installing NT700/S1 position transmitter on B series actuator (older version).

2.1 Installing position transmitter NT700/S1 on Metso Automation actuators with VDI/VDE 3845 mounting face

2.1.1 Installation steps

1. The actuator piston must be in the up position (in spring-return actuators as determined by the spring).
2. Install the pointer (only B_U) parallel with the valve closure member and fasten the draught piece (2) with a screw (29) to the pointer cover (B_U) or to the coupling (QP), as shown in Fig. 4. Secure the draught piece fastening screw with thread-locking compound (e.g. Loctite) and tighten it properly.
3. Fasten the mounting bracket (1) to the position transmitter.
4. Fasten the mounting bracket (1) to the actuator. The mechanical coupling (223) of the position transmitter must be positioned in the draught piece (2) as shown in Fig. 4.

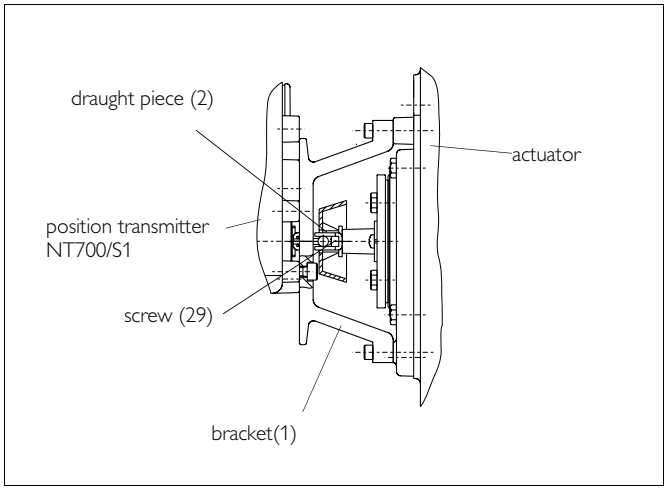


Fig. 4. Installing, S1

2.2 Installing the position transmitter NT700/S2 on Metso Automation series B actuator

2.2.1 Installation steps

1. Operate the actuator to place the piston in the up position (spring-return actuator as determined by the spring).
2. Install the pointer parallel with the valve closure member and fasten the draught piece (2) to the pointer cover with the coupling strap positioned as shown in Fig. 5. Secure the draught piece mounting screw with thread-locking compound (e.g. Loctite) and tighten it properly.
3. Fasten the mounting bracket (1) to the position transmitter. **Note the washers (3)!**
4. Fasten the mounting bracket (1) to the actuator. The mechanical coupling (223) of the position transmitter must be positioned in the draught piece (2) as shown in Fig. 5.

Observe the difference in installing the transmitter on the B1C and B1J actuators as compared with the case of the B1JA actuator.

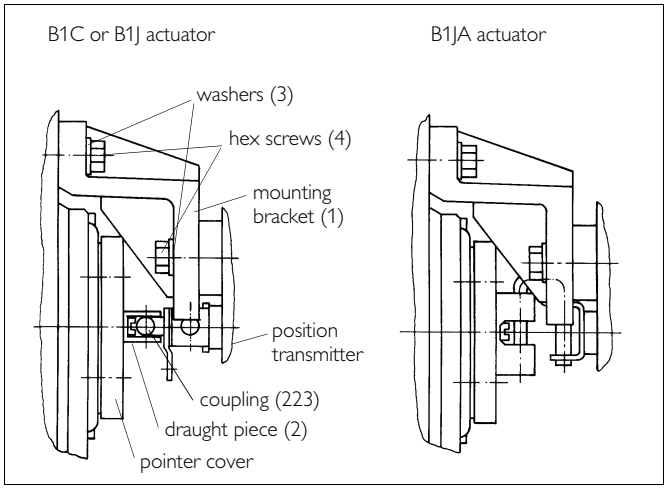


Fig. 5. Installing, S2

2.3 Installing position transmitter and positioner NP700/NE700

Installation of a separate position transmitter with a positioner is possible if both the position transmitter and the positioner have S2 shaft. E.g. NP724/S2-Z-NT7201/S2.

2.3.1 Actuators B1C/B1J/B1JA6-20

1. Operate the actuator to place the piston in the up position (spring-return actuator as determined by the spring).
2. Install the pointer parallel with the valve closure member and fasten the draught piece (2) to the pointer cover with the coupling strap positioned as shown in Fig. 5. Secure the draught piece mounting screw with thread-locking compound (e.g. Loctite) and tighten it properly.
3. Fasten the bracket (5) to the positioner with screw (7) and washer (6).
4. Fasten position transmitter NT700 to the bracket (5).
5. Fasten the rod (10) with screws and bushings (12+11). Turn the bushing (11) onto the screw (12) so that the spacing inside the bushing is placed against the head of the screw, see Fig. 6. Apply the outer sphere of the bushing lightly with Molykote BR2 vaseline (or the equivalent).

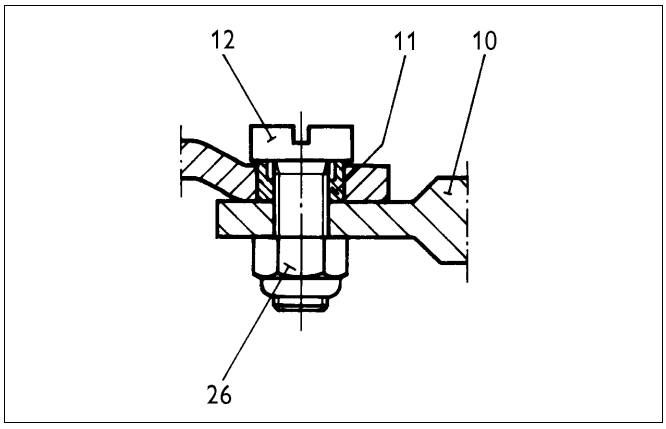


Fig. 6. Installing the rod (10)

6. Tighten the lock nuts (26).
7. Fasten the assembly to the actuator. The mechanical coupling of the positioner must be placed into the draught piece (2) as shown in Fig. 5.
8. Complete the piping of the positioner according to its installation, operating and maintenance instructions.

2.3.2 Actuators B1C/B1J/B1JA25-502

1. Operate the actuator to place the piston in the up position (spring-return actuator as determined by the spring).
2. Install the pointer parallel with the valve closure member and fasten the draught piece (2) to the pointer cover with the coupling strap positioned as shown in Fig. 5. Secure the draught piece mounting screw with thread-locking compound (e.g. Loctite) and tighten it properly.
3. Fasten positioner and position transmitter NT700 to the mounting bracket (1).
4. Fasten the rod (10) with sc rews and bushings (12+11). Turn the bushing (11) onto the screw (12) so that the spacing inside the bushing is placed against the head of the screw, see Fig. 6. Apply the outer sphere of the bushing with Molykote BR2 vaseline (or the equivalent).
5. Tighten the lock nuts (26).
6. Fasten the assembly to the actuator. The mechanical coupling of the positioner must be placed into the draught piece (2) as shown in Fig. 5.

2.4 Installation on other actuators

1. Operate the actuator so that the valve closes. Also turn the position transmitter shaft to the closed position. Observe the operating direction; the output signal increases either clockwise or counterclockwise.
2. Fasten the coupling (2) between the position transmitter and the actuator to the actuator (or to position transmitter shaft).
3. Fasten the mounting bracket (1) to the position transmitter.
4. Fasten the mounting bracket (1) with the position transmitter to the actuator so that the mechanical coupling (223), or the shaft end, is inserted in the slot of the coupling (2). **Observe what was said about the position of the position transmitter shaft in step 1 above!**

2.5 Installing the position transmitter N_T700/700 on the positioner

The bottom of the position transmitter acts also as the cover for the positioner. See drawings in Section 8. It is possible to mount a position transmitter on an existing positioner, however, the shaft and locking wheel of the positioner must be changed. It is recommended to order a pre-assembled combination.

The positioner should be adjusted before the mounting of the position transmitter.

1. Operate the actuator until the valve is in the closed or open position.
2. Note the position of the actuator and valve when mounting the position transmitter on the positioner. If the valve is in the closed position turn also the shaft of position transmitter into the closed position. Note the direction of operation: output signal increased clockwise or counter-clockwise.
3. Place the position transmitter on the positioner so that the shafts are correctly engaged.
4. Fasten the screws (258).
5. Check the adjustment of the position transmitter. See Section 4 for details.

Remove the position transmitter before the adjustment of the positioner. Loosen the screws (258). Note the position of the shaft relative to the positioner when removing the position transmitter. Check the adjustment of the position transmitter always after remounting.

3 ELECTRICAL CONNECTIONS

Before connecting the power, make sure that the connected loads and the order of wires conform to the installation conditions. Also observe the information on the identification plate.

4 ADJUSTMENT

When the position transmitter is ordered together with the valve and the actuator, the position transmitter and limit switches are adjusted at the factory. Also see circuit diagrams. When the actuator is re-installed, the mechanical limits must first be adjusted according to the valve.

4.1 Adjusting the position transmitter

4.1.1 Fine adjustment

Fine adjusting is required when the deviation is less than 5% of the maximum output signal.

1. Remove the plugs of the ZERO and SPAN potentiometers of the position transmitter (230), see Fig. 7.

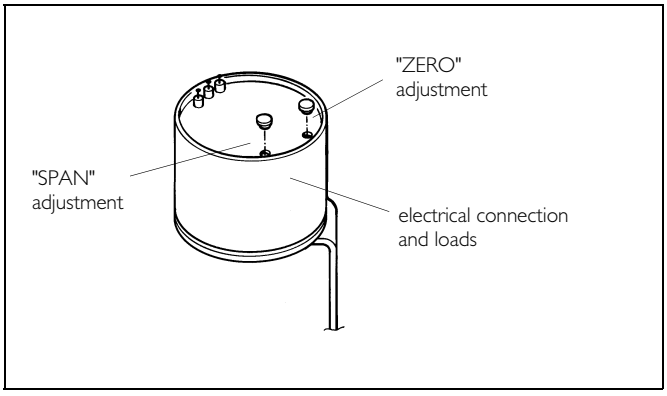


Fig. 7. ZERO and SPAN potentiometers of the position

2. With the actuator in the other extreme position, adjust the value corresponding to the output signal (0 mA/4 mA or 20 mA, depending on operating direction) by turning the ZERO potentiometer.
3. Run the actuator to the other extreme position. When necessary, increase or decrease the range by turning the SPAN potentiometer.
4. Operate the actuator and repeat steps 2 and 3 when necessary until the values are adjusted.
5. Replace the plugs.

4.1.2 Rough adjustment

Rough adjustment is required when the deviation is more than 5% of the maximum output signal. Rough adjustment is required if the position transmitter (230) has been detached from the shaft, or if fine adjustment is not sufficient (Section 4.1.1).

1. Run the actuator to a position where the output signal is at its lowest value (4 mA or 0 mA).
2. Loosen the upper retaining screw of the coupling (234) , see Fig. 8.

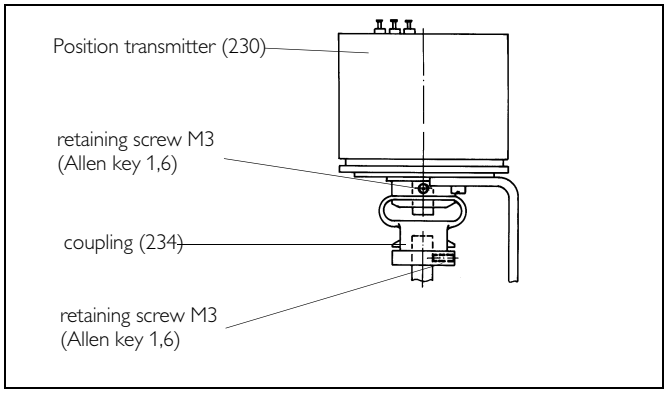


Fig. 8. Moving the coupling in rough adjustment

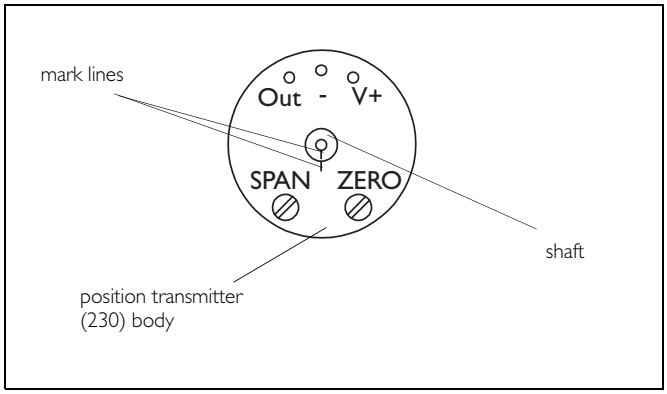


Fig. 9. Mark lines for rough adjustment seen from below

3. Turn the shaft to match the mark lines on the body and the shaft, see Fig. 9.
4. Tighten the retaining screw of the coupling (234).
5. Perform fine adjustment, see Section 4.1.1.

4.2 Adjusting the microswitches

The microswitches are adjusted by changing the position of the cam discs (221) on the shaft.

With the actuator in the open or closed position, find the switching point by turning the cam disc to have the switch to change over about 5°-6° before the limit.

After reinstallation of the actuator, first adjust its mechanical limits according to the valve and then the microswitches.

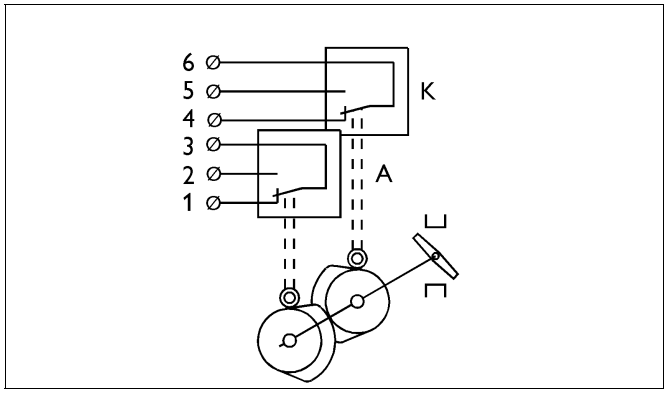


Fig. 10. Microswitch adjustment

4.3 Adjusting the proximity switches

The proximity switches are adjusted by changing the position of the cam discs (221) on the shaft.

With the actuator in the open or closed position, turn the cam disc to adjust the point where the switch is activated 5°-6° before the limit. Use the LED indicator or a separate measuring instrument as an aid.

After reinstallation of the actuator, first adjust its mechanical limits according to the valve and then the proximity switches.

5 CONNECTION DIAGRAMS

The internal circuitry of the position transmitter and the limit switches is shown in the connection diagrams of Section 9.

The connection diagrams are also supplied with the position transmitter.

6 MAINTENANCE

Regular servicing of the position transmitter is not necessary.

7 ORDERING SPARE PARTS

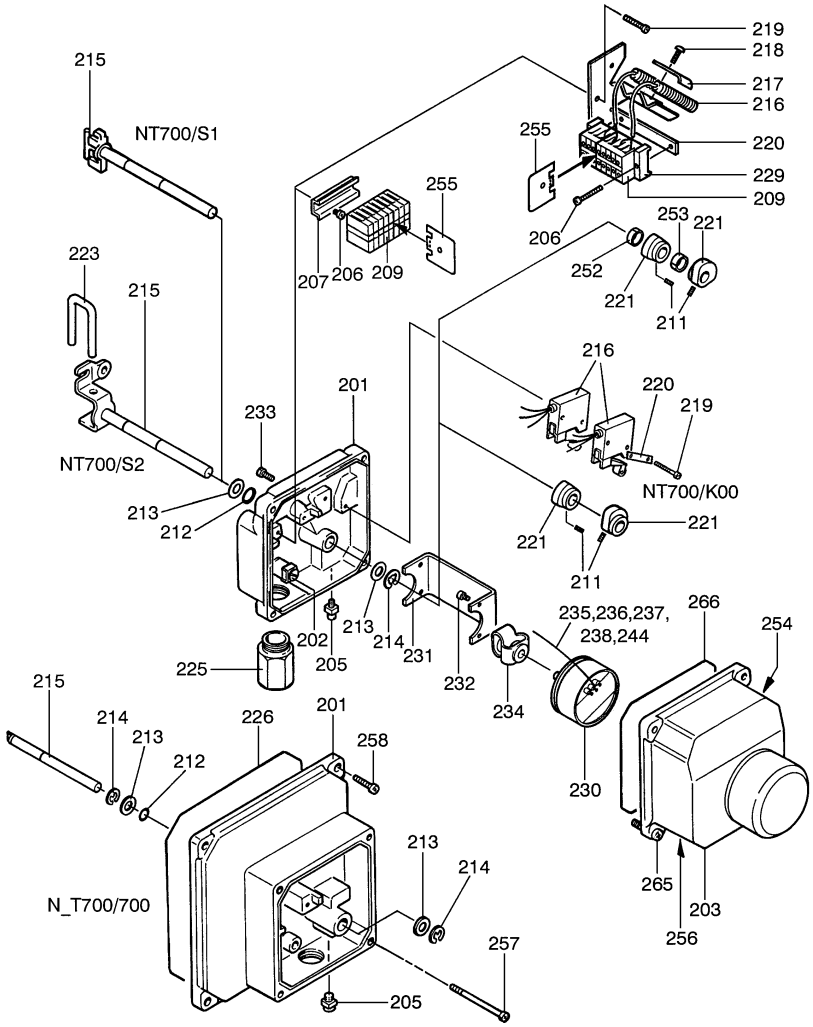
NOTE
Always use original spare parts to make sure that the position transmitter functions as intended.

When ordering spare parts, always include the following information:

- position transmitter type designation (from the name plate or transmitter documents)
- number of the parts list (or number of this manual), part number, name of the part and number of pieces required.

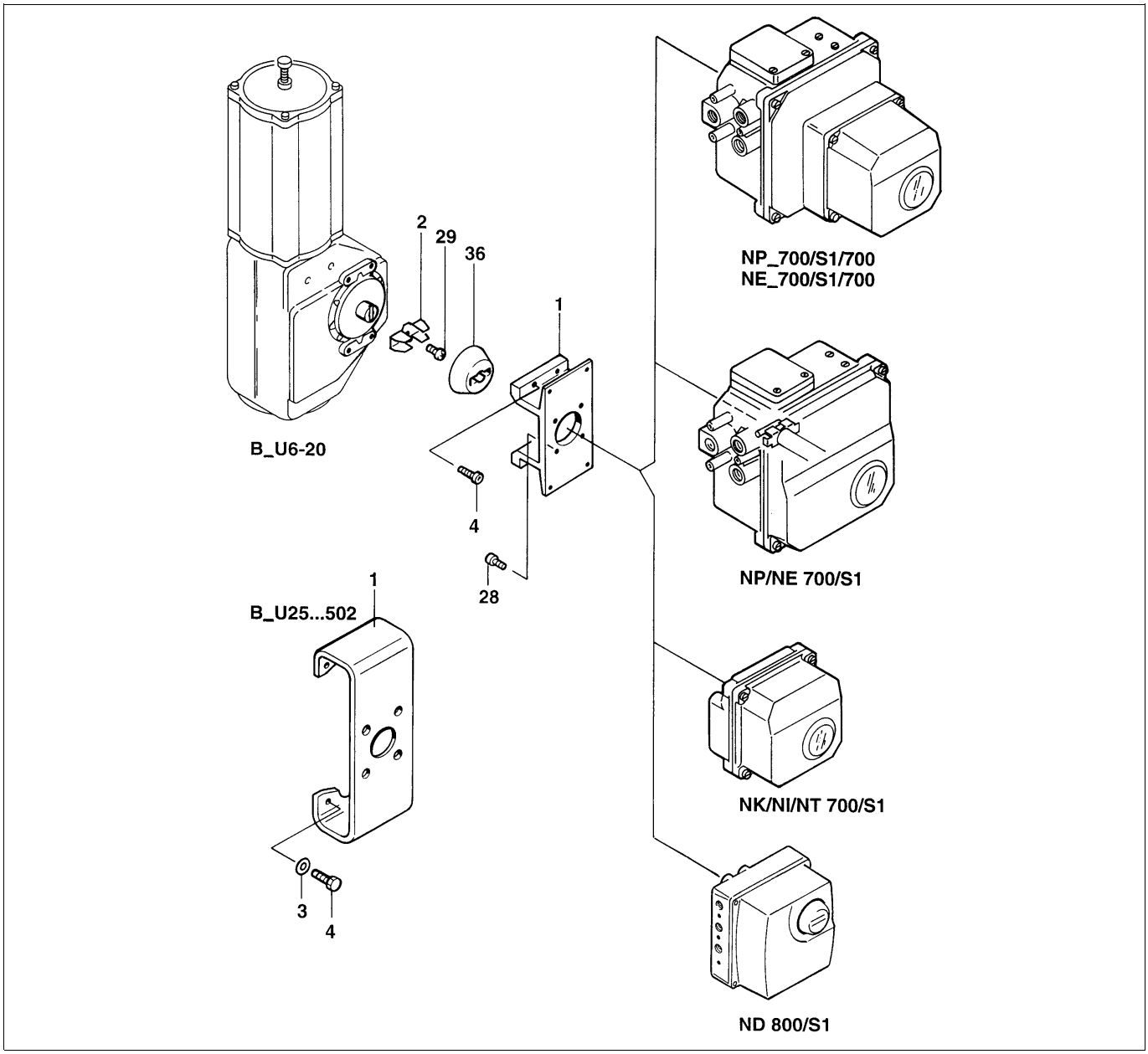
8 DRAWINGS AND PARTS LISTS

8.1 NT700, exploded view and parts list



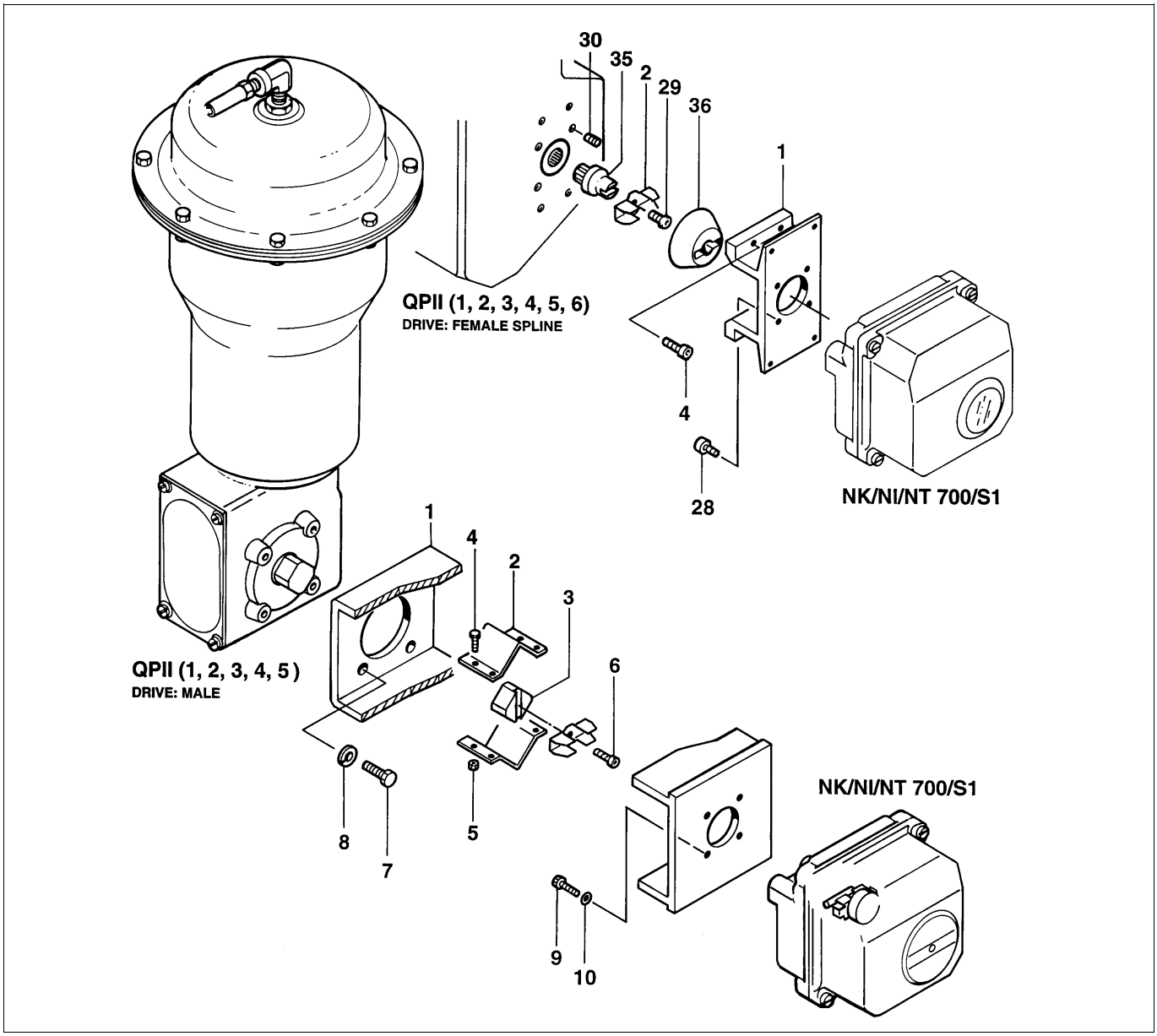
Item	Qty	Description	Recommended spare	Item	Qty	Description	Recommended spare
201	1	Housing		225	1	Adapter	
202	1	Earth connection		226	1	Seal	
203	1	Cover		230	1	Position transmitter	
205	1	Equi potential bonding		231	1	Bracket	
206	2	Screw		232	2	Screw	
207	1	Terminal bracket		233	2	Screw	
209	8	Terminal		234	1	Shaft coupler	
211	2	Screw		235	1	Cable tie	
212	1	O-ring	X	236	1	Wire	
213	2	Washer		237	1	Wire	
214	1 (2)	Lock ring	X	238	1	Wires	
215	1	Shaft assy		244	1	Protective hose	
216	2	Micro switch / Inductive proximity sensor		252	1	Bushing	
217	1	Washer		253	1	Bushing	
218	1	Screw		254	1	ID plate	
219	2	Screw		255	1	Partition plate	
220	2	Spring washer		256	1	Additional plate	
	1	Fastening plate (NT700/I00)		257	1	Screw	
221	2	Cam disc		265	4 (3)	Screw	
223	1	Coupling		266	1	Seal	X

8.2 Mounting parts for B1C6-502 and B1J8-322 actuators (S1)



Item	Qty	Description
1	1	Mounting bracket
2	1	Draught piece
3	4	Washer
4	4	Screw
28	1	Screw
29	2	Screw
36	1	Coupling jacket

8.3 Mounting parts for Quadra-Powr actuators (S1)



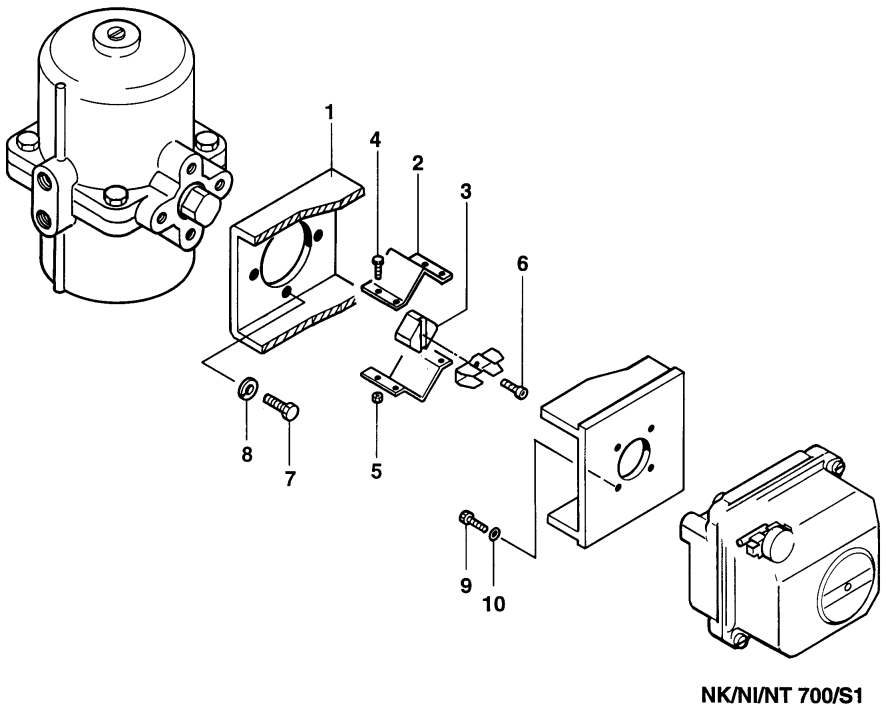
Drive: male

Item	Qty	Description
1	1	Mounting bracket
2	2	Coupling half
3	1	Adapter
4	4	Screw
5	4	Hex nut
6	1	Screw
7	4	Screw
8	4	Washer
9	4	Screw
10	4	Washer

Drive: female spline

Item	Qty	Description
1	1	Mounting bracket
2	1	Ear
4	4	Screw
28	4	Screw
29	1	Screw
30	(4)	Screw
35	1	Coupling
36	1	Coupling jacket

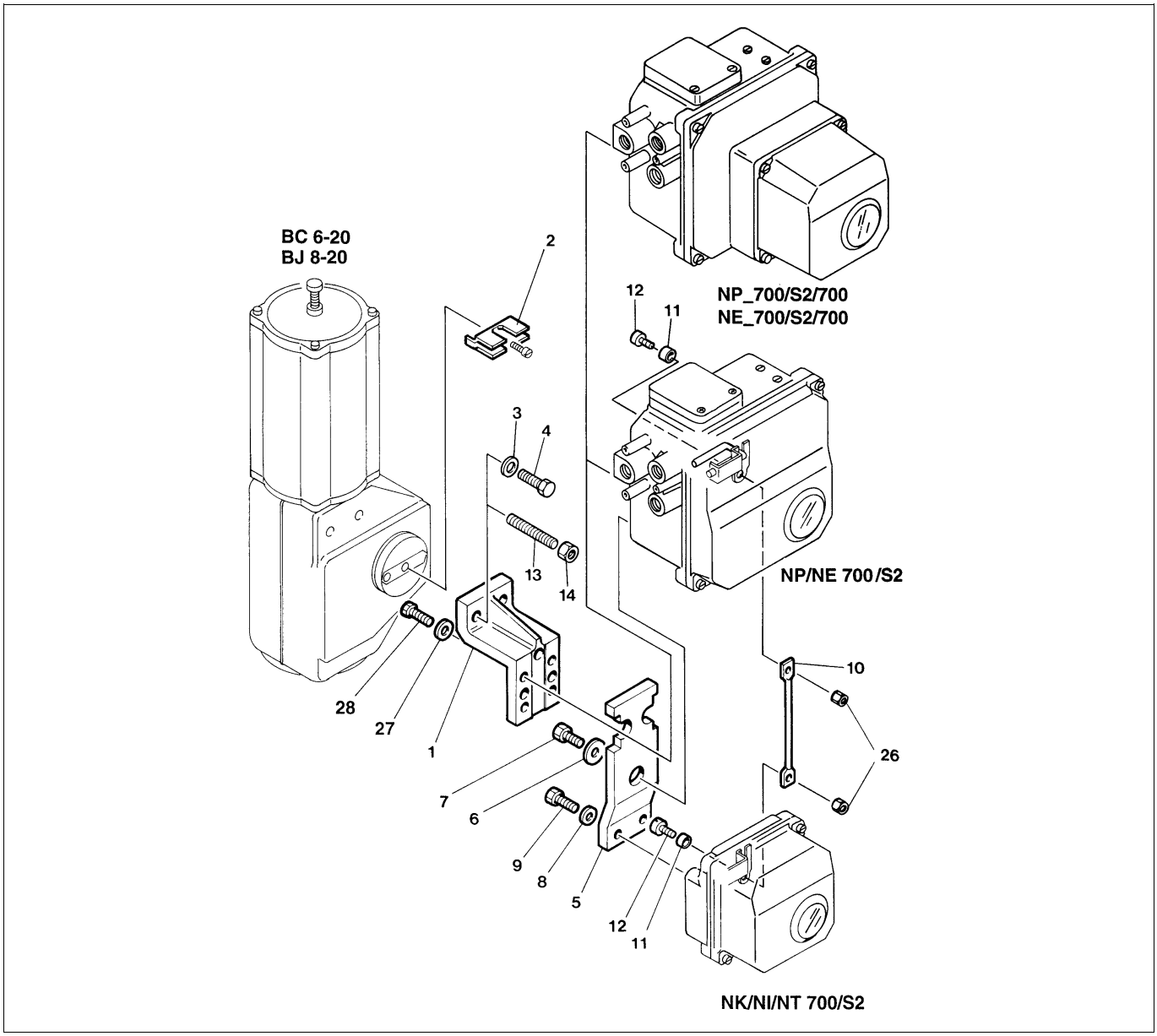
8.4 Mounting parts for SP actuators (S1)



NK/NI/NT 700/S1

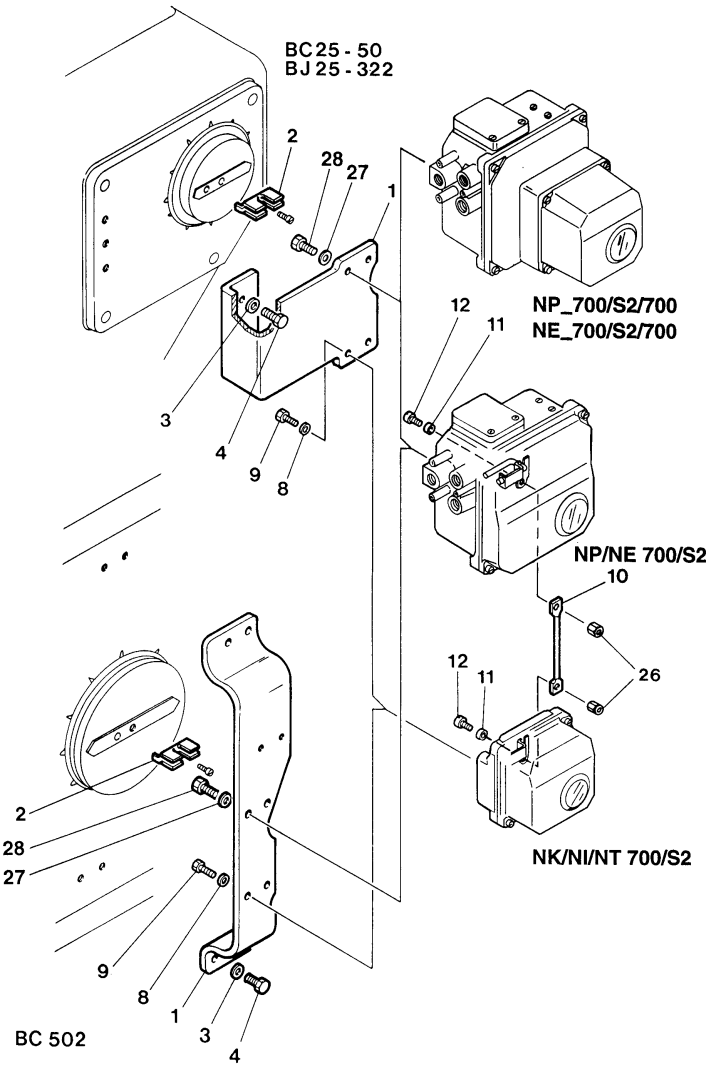
Item	Qty	Description
1	1	Mounting bracket
2	2	Coupling half
3	1	Adapter
4	4	Screw
5	4	Hex nut
6	1	Screw
7	4	Screw
8	4	Washer
9	4	Screw
10	4	Washer

8.5 Mounting parts for B1C6-20 and B1J8-20 actuators (S2)



Item	Qty	Description
1	1	Mounting bracket
2	1	Draught piece
3	2	Washer
4	2	Screw
5	1	Bracket
6	1	Washer
7	1	Screw
8	2	Washer
10	1	Rod
11	2	Bushing
12	2	Screw
13	2	Stud (B1C6 only)
14	2	Hexagon nut (B1C6 only)
26	2	Locking nut
27	2	Washer
28	2	Screw

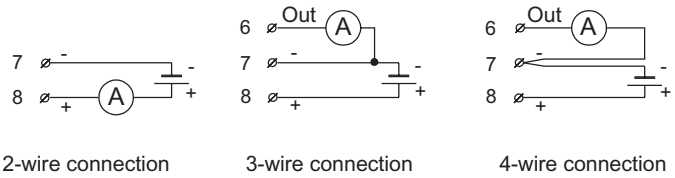
8.6 Mounting parts for B1C25-502 and B1J25-322 actuators (S2)



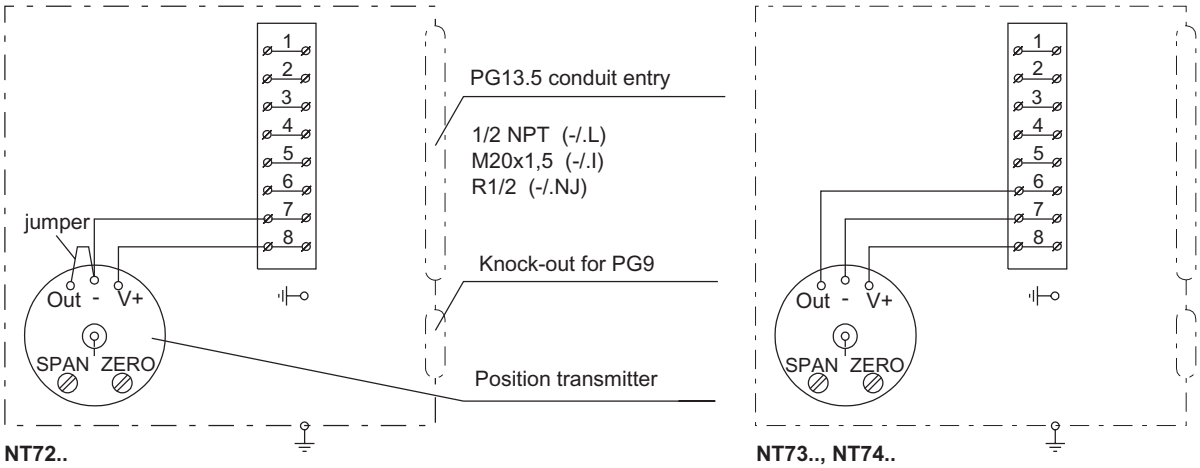
Item	Qty	Description
1	1	Mounting bracket
2	1	Draught piece
3	2 (4)	Washer
4	2 (4)	Screw
8	2	Washer
9	2	Screw
10	1	Rod
11	2	Bushing
12	2	Screw
26	2	Locking nut
27	2	Washer
28	2	Screw

9 CONNECTION DIAGRAMS

9.1 Position transmitters NT700, NT700/X



2-wire connection 3-wire connection 4-wire connection



NT72.. **NT73.., NT74..**

POSITION TRANSMITTER

Camille Bauer 57-3W2 (or equivalent)
NT7.1.: Rated voltage 12 - 33 V DC
NT7.1./X: Rated voltage 12 - 30 V DC (12...20 V DC)
Intrinsically safe EEx ia IIC T6 or EEx ib IIC T6.
According to Cenelec EN 50014 and EN 50020.

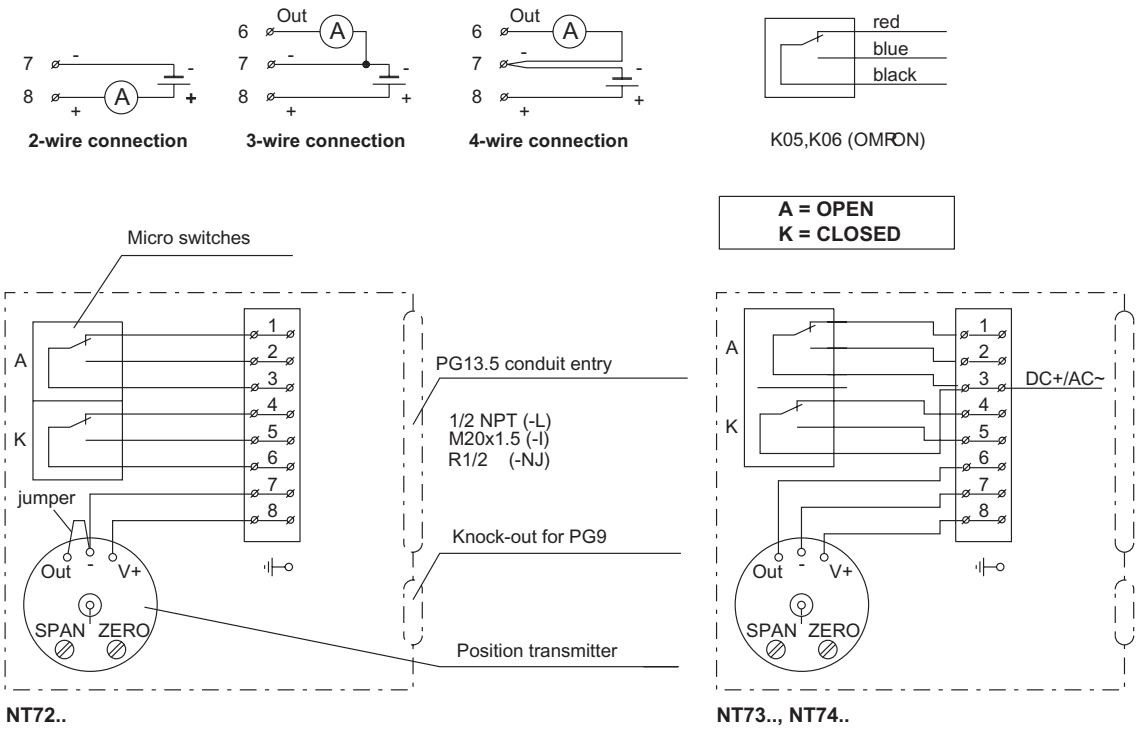
NT721...: Output signal 4 - 20 mA, 2-wire connection
NT731...: Output signal 0 - 20 mA, 3- (or 4-) wire connection
NT741...: Output signal 4 - 20 mA, 3- (or 4-) wire connection

Ambient temperature -25 - +70 °C (- +65 °C, -/X) / -13 - +158°F (- +149 °F, -/X)

NT7...1 = output signal increases with counterclockwise rotation *)
NT7...2 = output signal increases with clockwise rotation *)
*) Seen from top of the transmitter

Type of transmitter (NT7.../X)	Electrical values				Ex-classification	Certificate
	Umax (V)	Imax (mA)	Li (µH)	Ci (nF)		
Camille Bauer 57-3W2	30	160	0	10	EEx ia IIC T6	PTB Nr. Ex-91.C.2112 X

9.2 Position transmitters NT700/K00



POSITION TRANSMITTER (NT7.../...)

Camille Bauer 57-3W2
Rated voltage 12 - 33 V DC

NT721./... Output signal 4 - 20 mA, 2-wire connection
NT731./... Output signal 0 - 20 mA, 3- or 4-wire connection
NT741./... Output signal 4 - 20 mA, 3- or 4-wire connection

Ambient temperature -25 - +70 °C / -13 - +158°F

NT7..1 = output signal increases with counterclockwise rotation *)
NT7..2 = output signal increases with clockwise rotation *)
*) Seen from top of the transmitter

MICRO SWITCHES (...K00)

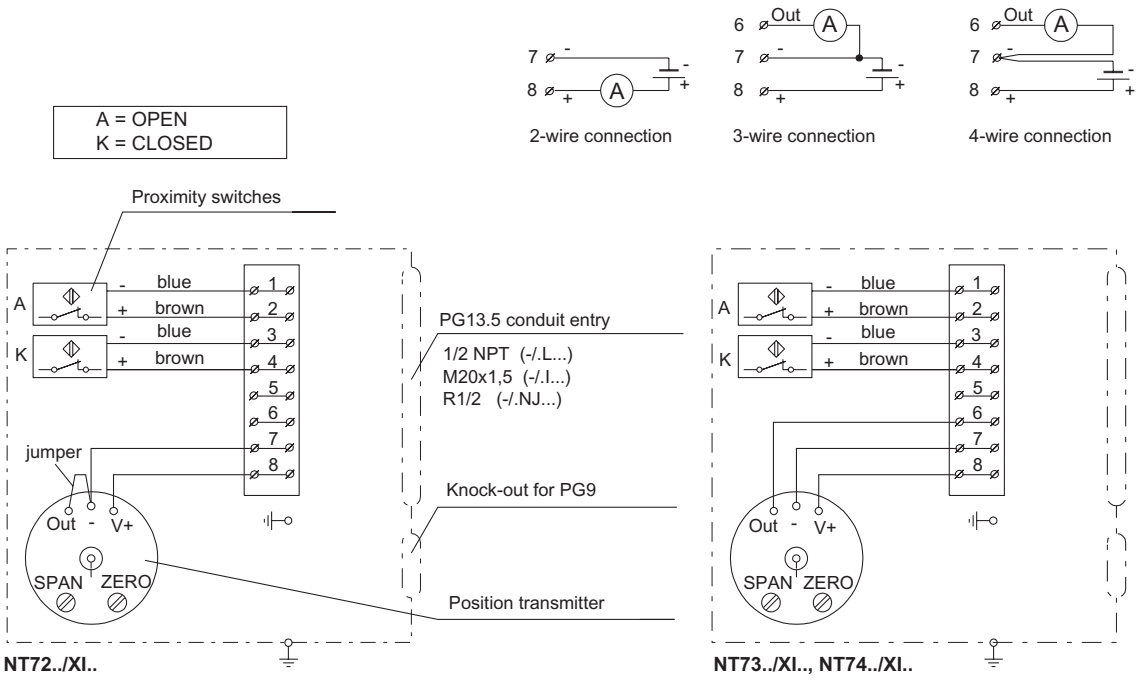
Connection diagram shows the micro switches, when actuator is in intermediate position.
Switch A (upper) is activated at the open limit of the travel and switch K (lower) at the closed limit.

Electrical characteristics:

5 A - 30 V DC, 0.4 A - 125 V DC
3 A - 250 V AC (K05)

Gold plated contacts:
100 mA - 30 V DC/125 V AC (K06)

9.3 Position transmitters NT700/I00X



POSITION TRANSMITTER (NT7.../X..)

Camille Bauer 57-3W2 (or equivalent)
Rated voltage 12 - 30 V DC (12 - 20 V DC)
Intrinsically safe:
EEx ia IIC T6 or EEx ib IIC T5/T6.
According to Cenelec EN 50014 and EN 50020.

NT721..: Output signal 4 - 20 mA, 2-wire connection
NT731..: Output signal 0 - 20 mA, 3- (or 4-) wire connection
NT741..: Output signal 4 - 20 mA, 3- (or 4-) wire connection

Ambient temperature -25 - +65 °C / -13 - +149°F

NT7..1/X = output signal increases with counterclockwise rotation *)
NT7..2/Z = output signal increases with clockwise rotation *)
*) Seen from top of the transmitter

Type of transmitter (NT7.../X)	Electrical values				Ex-classification	Certificate
	Umax (V)	Imax (mA)	Li (µH)	Ci (nF)		
Camille Bauer 57-3W2	30	160	0	10	EEx ia IIC T6	PTB Nr. Ex-91.C.2112 X

PROXIMITY SWITCHES (.I..)

Sensing range 2...4 mm, depending on type of switch
Supply voltage 8 V DC (Ri ≈ 1 kΩ)
Current consumption
active face free ≥ 3 mA
active face covered ≤ 1 mA
Quiescent current

Intrinsically safe EEx ia IIC T6 or EEx ib IIC T6. According to Cenelec EN 50014 and EN 50020.

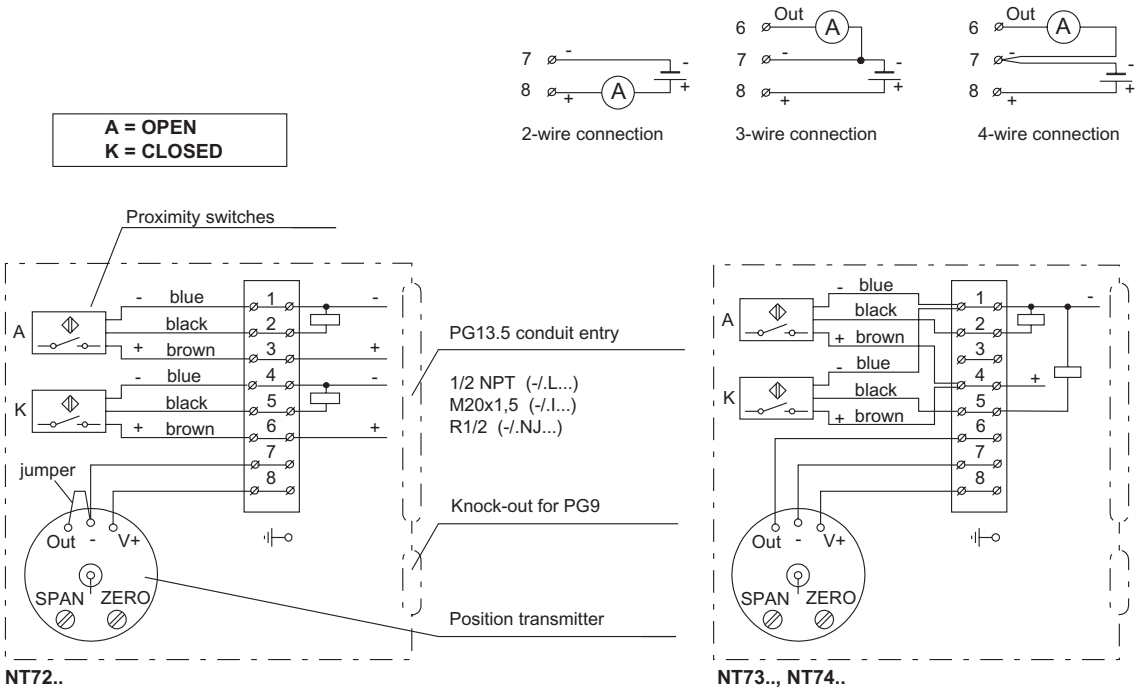
Voltage (Umax), current (Imax), inductance (Li) and capacitamce (Ci) according to certificate of switch, see table.

Active faces of proximity switches are covered when actuator is in intermediate position.
Active face A (upper switch) becomes free at open limit of travel and face K (lower switch) at closed limit.

Function can be inverted on site by re-adjusting the cam discs.

	Type of proximity switch	Electrical values				Ex-classification	Certificate
		Umax (V)	Imax (mA)	Li (µH)	Ci (nF)		
01	P+F NJ2-12GK-N	16	52	50	45	EEx ia IIC T6	PTB Nr. Ex-95.D.2086 X
02	P+F NJ2-12GK-SN	16	52	150	50	EEx ia IIC T6	PTB Nr. Ex-96.D.2023 X
03	P+F NJ2-11-N-G	16	52	50	30	EEx ia IIC T6	PTB Nr. Ex-95.D.2086 X
04	P+F NJ2-11-SN-G	16	52	150	50	EEx ia IIC T6	PTB Nr. Ex-96.D.2023 X
05	P+F NJ2-11-N-G-910	16	52	50	30	EEx ia IIC T6	PTB Nr. Ex-95.D.2086 X
06	TELEMECANIQUE XSP-NO2122	12	100	1 mH	283	EEx ia IIC T6	LCIE No.82.6081 X
07	P+F NJ2-12GM-N	16	52	50	45	EEx ia IIC T6	PTB Nr. Ex-95.D.2086 X
08	P+F NCN4-12GM35-NO	16	52	100	95	EEx ia IIC T6	PTB Nr. Ex-95.D.2086 X
09	P+F NCB2-12GM35-NO	16	52	100	90	EEx ia IIC T6	PTB Nr. Ex-95.D.2086 X
41	P+F NJ4-12GK-SN	16	52	150	70	EEx ia IIC T6	PTB Nr. Ex-96.D.2023 X

9.4 Position transmitters NT700/I11



POSITION TRANSMITTER (NT7.../...)

Camille Bauer 57-3W2
Rated voltage 12 - 33 V DC

NT721./... Output signal 4 - 20 mA, 2-wire connection
NT731./... Output signal 0 - 20 mA, 3- or 4-wire connection
NT741./... Output signal 4 - 20 mA, 3- or 4-wire connection

Ambient temperature -25 - +70 °C / -13 - +158°F

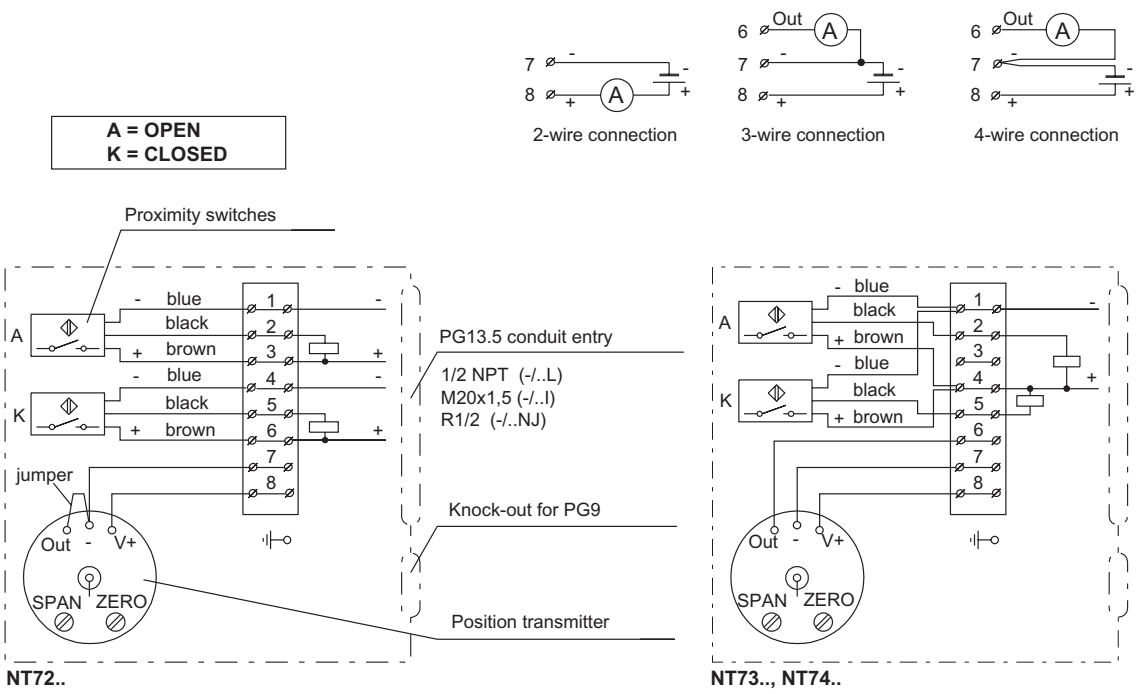
NT7..1 = output signal increases with counterclockwise rotation *)
NT7..2 = output signal increases with clockwise rotation *)
*) Seen from top of the transmitter

PROXIMITY SWITCHES (...I11)

Pepperl+Fuchs NJ2-12GM40-E2, PNP
Sensing range 2 mm
3-wire type
Rated voltage U = 10 - 60 V DC
Output current ≤ 200 mA
active face covered, LED on
Quiescent current ≤ 15 mA
active face free

Active faces of proximity switches are free when actuator is in intermediate position.
Active face A (upper switch) becomes covered at open limit of travel and face K (lower switch) at closed limit.

9.5 Position transmitters NT700/I21



POSITION TRANSMITTER (NT7.../...)

Camille Bauer 57-3W2
Rated voltage 12 - 33 V DC

NT721./... Output signal 4 - 20 mA, 2-wire connection
NT731./... Output signal 0 - 20 mA, 3- or 4-wire connection
NT741./... Output signal 4 - 20 mA, 3- or 4-wire connection

Ambient temperature -25 - +70 °C / -13 - +158°F

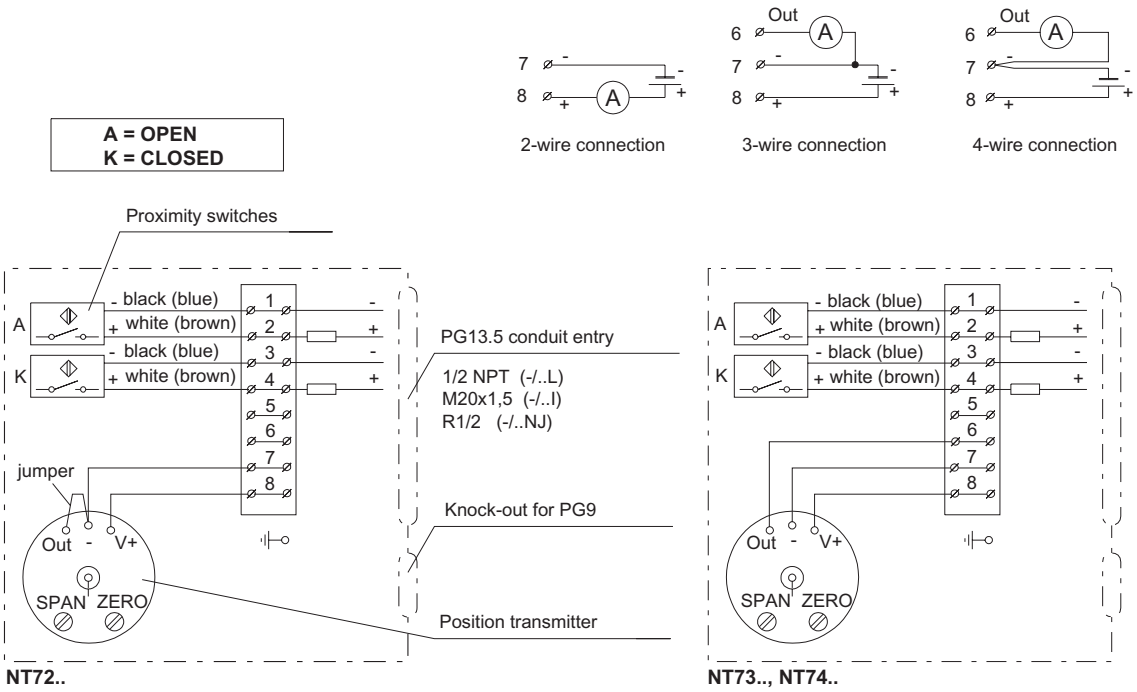
NT7..1 = output signal increases with counterclockwise rotation *)
NT7..2 = output signal increases with clockwise rotation *)
*) Seen from top of the transmitter

PROXIMITY SWITCHES (...I21)

Pepperl+Fuchs NJ2-12GM40-E, NPN
Sensing range 2 mm
3-wire type
Rated voltage U = 10 - 60 VDC
Output current ≤ 200 mA
active face covered, LED on
Quiescent current ≤ 15 mA
active face free

Active faces of proximity switches are free when actuator is in intermediate position.
Active face A (upper switch) becomes covered at open limit of travel and face K (lower switch) at closed limit.

9.6 Position transmitters NT700/I54



POSITION TRANSMITTER (NT7.../...)

Camille Bauer 57-3W2
Rated voltage 12 - 33 V DC

NT721./... Output signal 4 - 20 mA, 2-wire connection
NT731./... Output signal 0 - 20 mA, 3- or 4-wire connection
NT741./... Output signal 4 - 20 mA, 3- or 4-wire connection

Ambient temperature -25 - +70 °C / -13 - +158°F

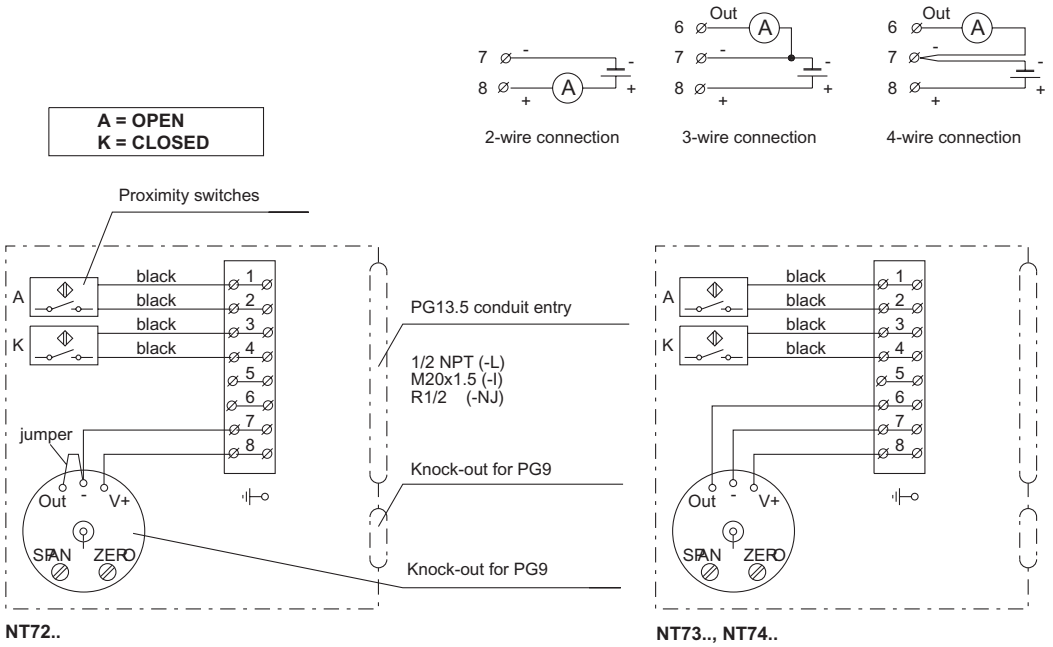
NT7..1 = output signal increases with counterclockwise rotation *)
NT7..2 = output signal increases with clockwise rotation *)
*) Seen from top of the transmitter

PROXIMITY SWITCHES (...I54)

OMRON E2E-X3D1-N (E2E-X3D1-G)
Sensing range 3 mm
2-wire type
Rated voltage U = 12 - 24 V DC
Output current 3 - 100 mA
active face covered, LED on
Quiescent current ≤ 0,8 mA
active face free

Active faces of proximity switches are free when actuator is in intermediate position.
Active face A (upper switch) becomes covered at open limit of travel and face K (lower switch) at closed limit.

9.7 Position transmitter NT700/I56



POSITION TRANSMITTER (NT7.../...)

Camille Bauer 57-3W2
Rated voltage 12 - 33 V DC

NT721./... Output signal 4 - 20 mA, 2-wire connection
NT731./... Output signal 0 - 20 mA, 3- or 4-wire connection
NT741./... Output signal 4 - 20 mA, 3- or 4-wire connection

Ambient temperature -25 - +70 °C / -13 - +158°F

NT7..1 = output signal increases with counterclockwise rotation *)
NT7..2 = output signal increases with clockwise rotation *)
*) Seen from top of the transmitter

PROXIMITY SWITCHES (...I56)

Ifm electronic IFC2002-ARKG/UP
Sensing range 2 mm
2-wire type
Rated voltage U = 10 - 36 V DC
Output current ≤ 150 mA
active face covered, LED on
Quiescent current ≤ 0,6 mA
active face free

Active faces of proximity switches are free when actuator is in intermediate position.
Active face A (upper switch) becomes covered at open limit of travel and face K (lower switch) at closed limit.

Connection: load can be connected to + or -.

POSITION TRANSMITTER NT700

1.	2.	3.	4.	5.		6.	7.	8.		
NT	7	2	1	1	/	K	05	S1	—	L

1. sign	**PRODUCT GROUP**
NT	Position transmitter

2. sign	**SERIES CODE**

3. sign	**OUTPUT SIGNAL**
2	4...20 mA, (2-wire connection)
4	4...20 mA, (3- or 4-wire connection)

4. sign	**TRANSMITTER**
1	Camille Bauer, Kinax 57-4W2

5. sign	**ACTION**
1	Signal rises by counterclockwise rotation seen from the front of position transmitter. Turning angle = 90˚.
2	Signal rises by clockwise rotation seen from the front of position transmitter. Turning angle = 90˚.

6. sign	**LIMIT SWITCH CODE**
I	Inductive proximity switches, defined with 7th sign.
K	Micro switches, defined with 7th sign.

7. sign	**LIMIT SWITCH TYPE**
	Inductive proximity switches (I), 2 pcs.
01	P+F NJ2-12GK-N DC;>3 mA; <1 mA. Intrinsically safe, EEx ia IIC T6. 2-wire type. 8th sign always X.
11	P+F NJ2-12GM40-E2 DC; 200 mA; quiescent current <15 mA; PNP. 3-wire type. Not applicable to option X.
21	P+F NJ2-12GM40-E DC; 200 mA; quiescent current <15 mA; NPN. 3-wire type. Not applicable to option X.
54	OMRON E2E-X3D1-N (-G) DC; 100 mA; quiescent current <0,8 mA. 2-wire type. Not applicable to option X.
56	ifm IFC 2002-ARKG/UP DC; 150 mA; quiescent current <0,6 mA. 2-wire type. Not applicable to option X.

7. sign	**LIMIT SWITCH TYPE**
	Micro switches (K), 2 pcs.
05	OMRON D2VW-5, standard. Not applicable to option X.
06	OMRON D2VW-01, gold plated contacts, 24 V DC/AC, 100 mA. Not applicable to option X.

8. sign	**OPTIONS**
	Standard, IP 65 enclosure, NEMA 4 and 4X. PG 13,5 conduit entry. 8th sign always S1 or S2. Temperature range -25 - +70 ˚C / -4 - +158 ˚F.
X	Intrinsically safe construction. DEMKO EEx ia IIC T6 certification (EN 50014, EN 50020). Temperature range -20 - +65 ˚C / -4 - +149 ˚F.
S1	Position transmitter with attachment face according to standard VDI/VDE 3845, equipped with H-clip. Not applicable to globe valve actuators.
S2	Position transmitter with attachment face according to Metso Automation, equipped with C-clip.
Y	Special construction.

— □	**EXTERNAL CONNECTION PARTS**
L	PG13.5 / 1/2 NPT conduit entry. Will be specified in the option sticker.
I	PG13.5 / M20x1.5 conduit entry. Will be specified in the option sticker.
NJ	PG13.5 / R1/2 (PF1/2) conduit entry. Will be specified in the option sticker.

Metso Field Systems Inc.

Europe, Levytie 6, P.O.Box 310, 00811 Helsinki, Finland. Tel.int +358 20 483 150. Fax int. +358 20 483 151

North America, 4300 Windfern, Houston, TX 77041, USA, Tel. int +1-832-590-5000, Fax. int. +1-832-590-5060

North America, 3100 Medlock Bridge Road, Suite 250, Norcross, GA 30071, USA Tel. int. + 1 770 446 7818 Fax int. + 1 770 242 8386

Latin America, Av. Central, 181- Chácaras Reunidas, 12238-430, São Jose do Campos, Tel. int. +55 12 335-3500, Fax int. +55 12 335-3535

Asia Pacific, 501 Orchard Road, #05-09 Wheelock Place, 238880 Singapore. Tel. int. +65 735 5200. Fax int. +65 735 4566

www.metsoautomation.com

SIEMENS

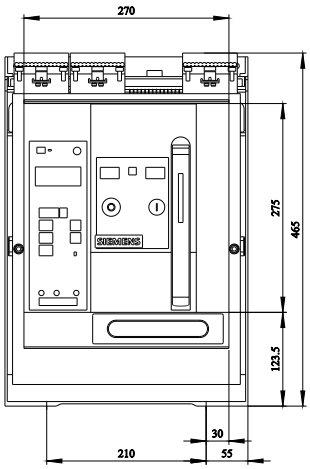
Data sheet 3WL1116-3FB35-4GA4-Z C22+K07

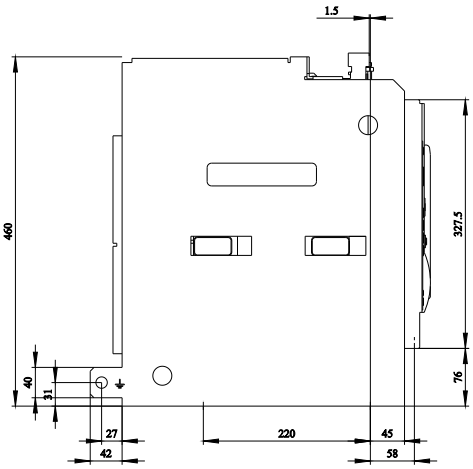
withdrawable circuit breaker without guide frame 3-pole, size I, IEC In=1600A to 690V, AC50/60Hz Icu=66kA at 500V rear connection horizontal Overcurrent release ETU45 LSIN protection adjustable 0.4-1 in with display and cubicle bus Opt.: Comm. /measuring func./ground fault/ ZSS Motorized/manual operating mechanism with spring charging motor AC 50/60 Hz 208-240 V or 220-250 V DC Activation AC 50/60 Hz 230 V, 220 V DC With 1st auxiliary release Shunt release "F", F1 50/60 Hz 230 V AC/220 V DC, 100% on-load factor without 2nd auxiliary release 4NO+4NC C22= Ready indicator K07= Tripped signaling contact, 1 CO not possible with option F02

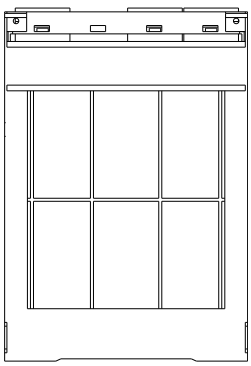
Model	
product brand name	SENTRON
product designation	ACB
design of the product	IEC 60947-2
design of the actuating element	Pushbutton
type of the driving mechanism	Manual/motorized operating mechanism with mechanical and electrical closing
type of the driving mechanism / motor drive	Yes
design of the overcurrent release	ETU45B
General technical data	
number of poles	3
size of the circuit-breaker	1
utilization category	B
circuit-breaker / Design	3WL1
Voltage	
Rated insulation voltage Ui	1 000 V
insulation voltage / rated value	1 000 V
operating voltage	
● at AC / at 50/60 Hz / rated value	690 V
Protection class	
protection class IP	IP20
protection class IP / on the front	IP20
protection function of the overcurrent release	LSIN
Dissipation	
power loss [W]	
● for rated value of the current / at AC / in hot operating state / per pole	116.7 W
● maximum	350 W
Main circuit	
operating frequency	
● 1 / rated value	50 Hz
● 2 / rated value	60 Hz
Auxiliary circuit	
number of NC contacts / for auxiliary contacts	4
number of NO contacts / for auxiliary contacts	4
Suitability	
suitability for use	Plant / motor protection
Adjustable parameters	
adjustable current response value current / of the L-trip / with I4t characteristic	
● initial value	640 A
● full-scale value	1 600 A
adjustable current response value current / of the current-dependent overload release / initial value	640 A
Product details	
product component	
● trip indicator	Yes

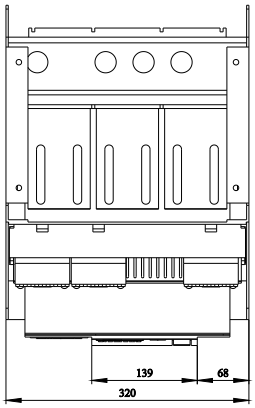
● voltage trigger	Yes
● undervoltage release	No
design of the auxiliary switch	4 NO + 4 NC
product extension / optional / motor drive	No
Product function	
product function	
● grounding protection	No
● phase failure detection	Yes
Display and operation	
display version	WITH 4-LINE DISPLAY
Short circuit	
operating short-circuit current breaking capacity (Ics)	
● at 415 V / rated value	66 kA
● at 500 V / rated value	66 kA
● at 690 V / rated value	50 kA
maximum short-circuit current breaking capacity (Icu)	
● at 415 V / rated value	66 kA
● at 500 V / rated value	66 kA
● at 690 V / rated value	50 kA
Connections	
arrangement of electrical connectors / for main current circuit	without guide frame
type of electrical connection / for main current circuit	Blade contacts
Mechanical Design	
height	411.5 mm
width	311 mm
depth	337 mm
fastening method	drawer unit
Environmental conditions	
ambient temperature / during operation	
● minimum	-20 °C
● maximum	55 °C
ambient temperature / during storage	
● minimum	-40 °C
● maximum	70 °C
Further information	

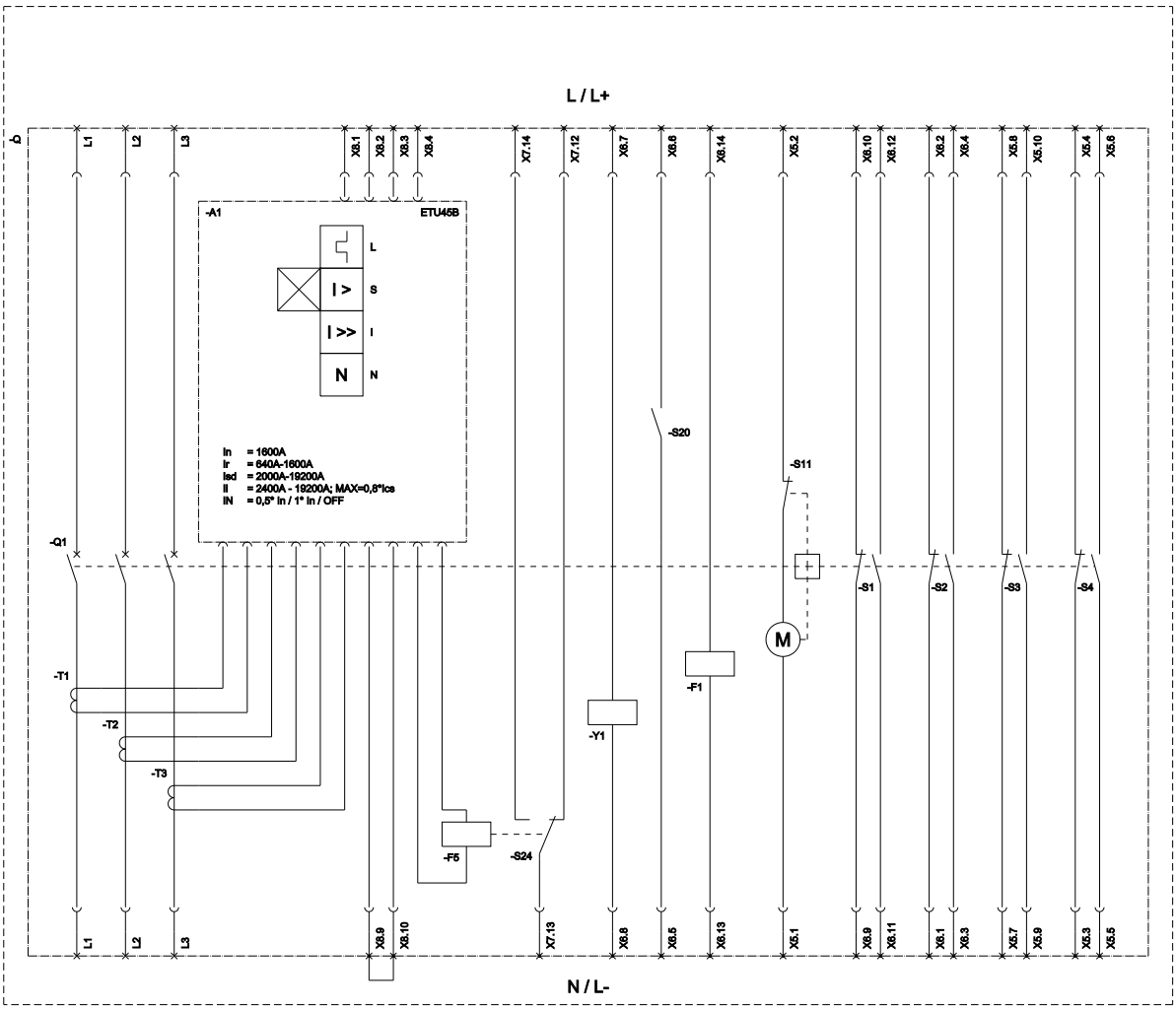
Information on the packaging
https://support.industry.siemens.com/cs/ww/en/view/109813875
Industry Mall (Online ordering system)
https://mall.industry.siemens.com/mall/en/en/Catalog/product?mlfb=3WL1116-3FB35-4GA4-Z C22+K07
Service&Support (Manuals, Certificates, Characteristics, FAQs,...)
https://support.industry.siemens.com/cs/ww/en/ps/3WL1116-3FB35-4GA4-Z C22+K07
Image database (product images, 2D dimension drawings, 3D models, device circuit diagrams, ...)
http://www.automation.siemens.com/bilddb/cax_en.aspx?mlfb=3WL1116-3FB35-4GA4-Z C22+K07
CAx-Online-Generator
http://www.siemens.com/cax
Tender specifications
http://www.siemens.com/specifications











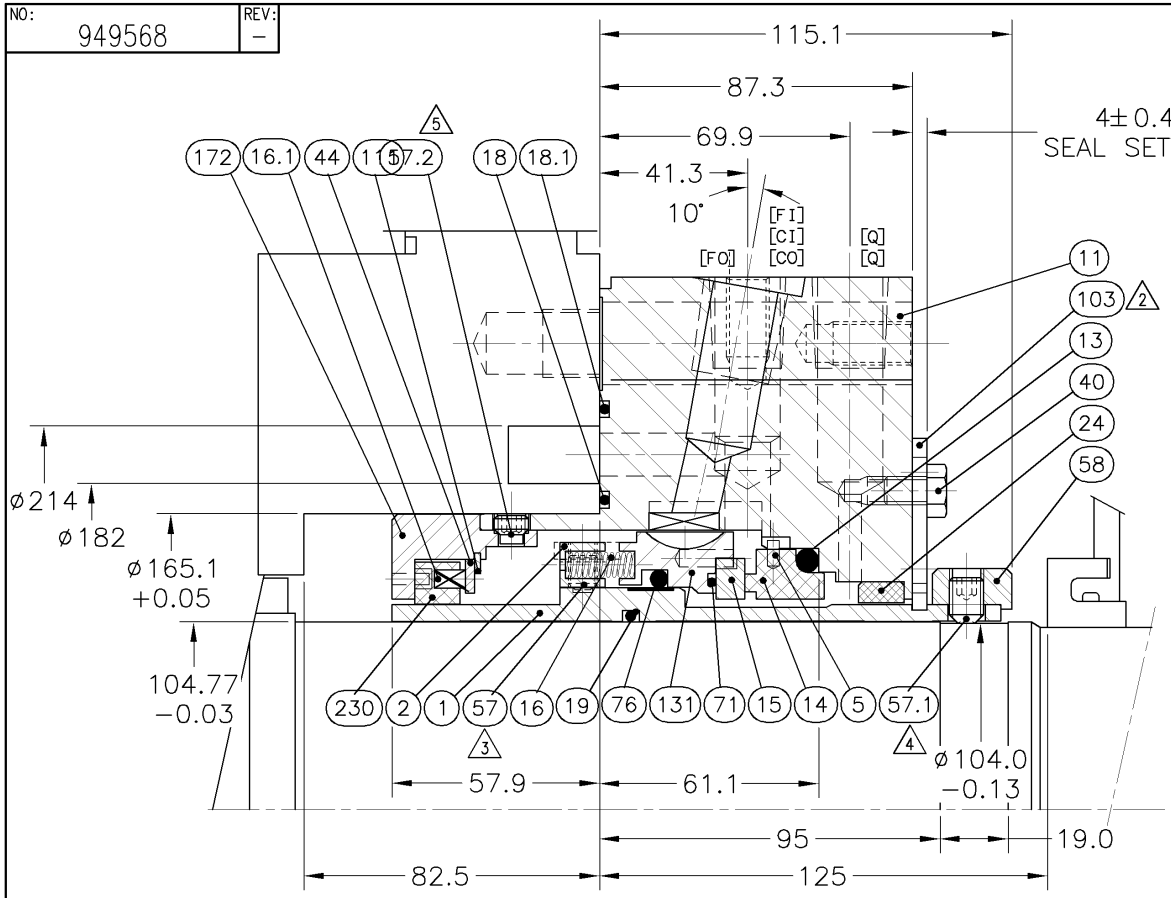
L (Long Time Delay / Überlastschutz); S (Short Time Delay / Kurzschlussschutz, kurzzeitverzögert); I (Instantaneous / Kurzschlussschutz, unverzögert); N (Neutral Protection / Neutralleiterschutz);
S11 (Internal motor shutdown switch, if spring is tensioned / Interner Motorabstellschalter, wenn Feder gespannt); F1 (1st auxiliary release / Erster Hilfsauslöser); F5 (Maglatch for trip unit / Auslösemagnet);
S1 - S8 (Auxiliary switch / Hilfsschalter); S20 (Ready to close signalling switch / Einschaltbereitschaftsmeldeschalter); S24 (1st trip signalling switch K07 (Reset position) / Erster Ausgelöstmeldeschalter K07 (Reset Position));
Y1 (Closing coil / Einschaltmagnet);

last modified: 3/31/2020

FLOWSERVE

Mechanical Seal Instructions

NO: 949568 | REV: –



[FI]	FLUSH IN	1/2	NPT
[FO]	FLUSH OUT	1/2	NPT
[CI]	COOLING INLET	1/2	NPT
[CO]	COOLING OUTLET	1/2	NPT
[Q]	QUENCH	1/2	NPT
[D]	DRAIN	1/2	NPT

DRIVE END
(SEE 949568 SHEET 2 OF 2 FOR FREE END)

1. FOR INSTALLATION AND OPERATING INSTRUCTIONS SEE APPROPRIATE FLOWSERVE INSTALLATION SHEET (FIS).

2. DISENGAGE SETTING DEVICE BEFORE START-UP.

3. TIGHTEN SETSCREWS EQUALLY, CROSSWISE, IN 4 STEPS. FINAL TORQUE: 4.5 NM [40 LBF.INCH]. SECURE AT ASSEMBLY.

4. TIGHTEN SETSCREWS EQUALLY, CROSSWISE, IN 4 STEPS. FINAL TORQUE: 33 NM [290 LBF.INCH].

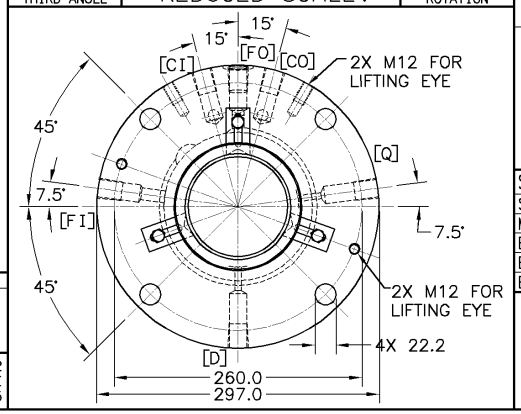
5. DO NOT OVERTIGHTEN.SECURE AT ASSEMBLY.

REVISION: –	DATE: 18-OCT-2006	BY: LMURTHY	CHKD: VVISWANATHAN	ECN NO:

REVISION NOTE: RELEASE TO MANUFACTURE.

DIM'S ARE REF UNLESS SPECIFIED OTHERWISE. DIM'S IN: MILLIMETERS | C/A2 JUNE 2005

THIRD ANGLE | END VIEW REDUCED SCALE: | ROTATION



BILL OF MATERIAL NO: 949568-001 | 1 SUGGESTED SPARE PARTS 2 CODE/BSC [X]/OFF.STD [W]

NO	PARTCODE	QTY	DESCRIPTION	MATERIAL	1	2
1	2N63866ZD1	1	SLEEVE	316 / CHROMIUM OXIDE		
2	3N36816DB	1	SEAL DRIVE	316		X
5	670418DB	1	PIN	316		X
11	1N63867DB	1	GLAND	316		
13	568431GU	1	SEAT GASKET	FLUOROELASTOMER	*	X
14	3N05186RY	1	STATIONARY FACE	CARBON	*	X
15	666040SL	1	ROTATING FACE	SILICON CARBIDE	*	X
16	668838NL	10	COIL SPRING	ALLOY C-276	*	X
16.1	628440NL	12	COIL SPRING	ALLOY C-276	*	
18	568261GU	1	GLAND GASKET	FLUOROELASTOMER	*	
18.1	568269GU	1	GLAND GASKET	FLUOROELASTOMER	*	
19	568243GU	1	SLEEVE GASKET	FLUOROELASTOMER	*	
24	670059GE	1	GLAND BUSHING	CARBON		
40	4N02099CK	3	HHCS M8X12	18-8		
44	4N31756DB	1	BACKING RING	316		
57	4R0433DB	4	SSCP 5/16-18X3/8	316	*	X
57.1	4R0438CI	8	SSCP 3/8-16X1/2	ALLOY STEEL, PLATED	*	
57.2	4R0464DY	6	SSHDP 3/8-16X5/16	ALLOY 20	*	
58	3N63876DB	1	DRIVE COLLAR	316		
71	568158GU	1	O RING GASKET	FLUOROELASTOMER	*	X
76	568352GU	1	ROT. FACE GASKET	FLUOROELASTOMER	*	X
103	4R15130DB	3	SETTING DEVICE	316		
111	UR550CK	1	SNAP RING	18-8		
131	2N36817DB	1	BODY	316		X
172	3N63868DB	1	ADAPTER	316		
230	3N46936GE	1	THROAT BUSHING	CARBON	*	

cooling water inlet temperature: 40,6 °C
cooling water outlet temperature: 45 °C
cooling water required flow: 20 l/min
stuffing box expected temperature: 60 °C

CUSTOMER: FLOWSERVE FPD COSLADA
ADDRESS: COSLADA (MADRID) SPAIN
ULTIMATE USER: CE MAU POWER PLANT
ADDRESS: VIETNAM
CUSTOMER P.O.: 10.06.40.44050/11062
PRODUCT: BFW
TEMP: 146-170°C
SPEC GRAVITY: 0.915-0.922

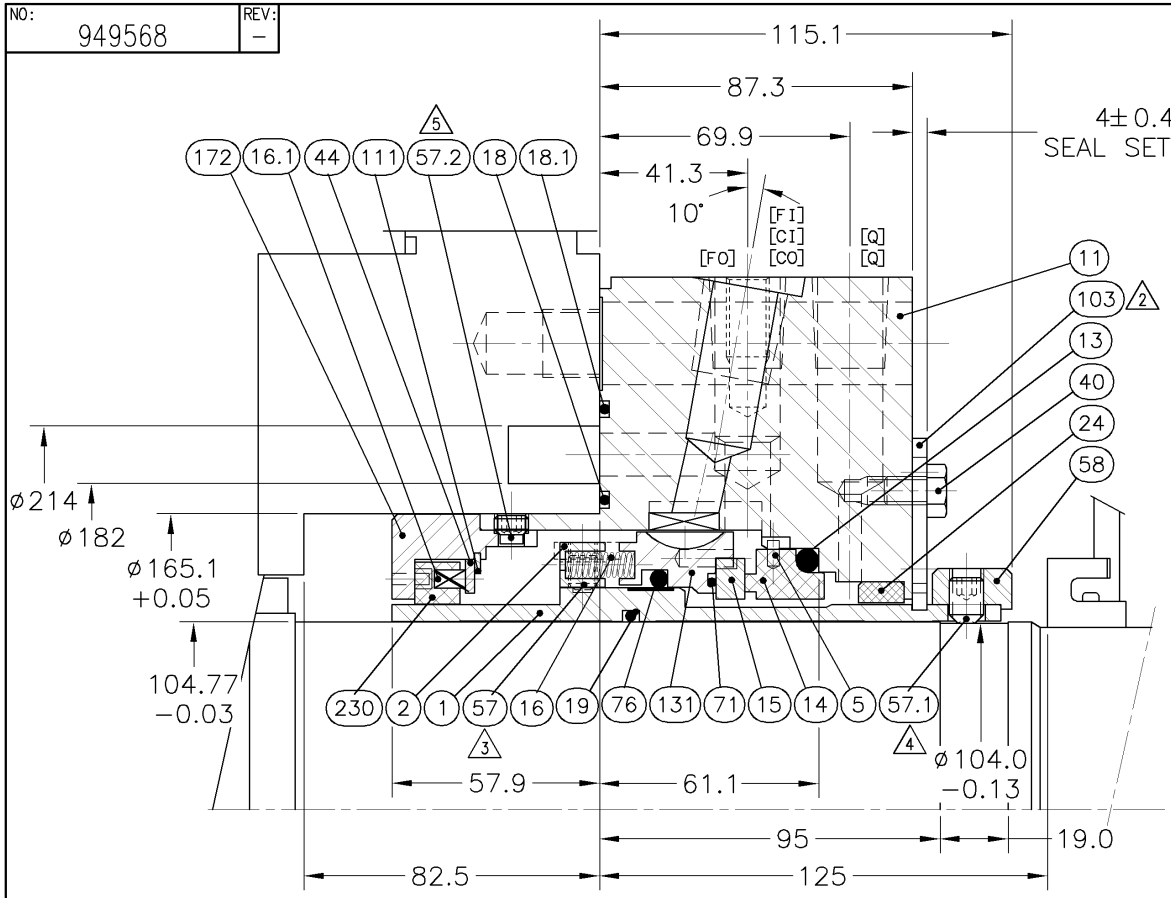
SEAL CHAMBER PRES: 45 BARG
SUCT PRES: 45 BARG
DISCH PRES: 176.3-241 BARG
RPM: 2795-2905
API PLAN: 23/61
API CODE: BSTFN
PROJECT NO.: 59114

SEAL TYPE: DM | SEAL SIZE: 4.875
SEAL CONFIG: SINGLE INSIDE-CARTRIDGE | SIZE CODE:
MATL CODE: 5X4U | DESIGN:
EQUIP MFR: FLOWSERVE | INSTR:
EQUIP MODEL: 6X14WXH / 9 STAGES
EQUIP DWG: M-00204-A

FLOWSERVE® Flow Solutions Division

SCALE: TO SCALE | OPTIONS:
DRAWN: SGANESAN | REF DWG: 866011,949562
DATE: 11-OCT-2006 | FORM DWG: A2N63865 | REV:-
CHKD: VVISWANATHAN | ASSY/ORDER NO: SHEET: 1 OF: 2 | REV:
APPVD: | 949568 | –
F.O. NO: 949568

NO: 949568 | REV: –



FREE END
(SEE 949568 SHEET 1 OF 2 FOR DRIVE END)

[FI]	FLUSH IN	1/2	NPT
[FO]	FLUSH OUT	1/2	NPT
[CI]	COOLING INLET	1/2	NPT
[CO]	COOLING OUTLET	1/2	NPT
[Q]	QUENCH	1/2	NPT
[D]	DRAIN	1/2	NPT

1. FOR INSTALLATION AND OPERATING INSTRUCTIONS SEE APPROPRIATE FLOWSERVE INSTALLATION SHEET (FIS).

△2 DISENGAGE SETTING DEVICE BEFORE START-UP.

△3 TIGHTEN SETSCREWS EQUALLY, CROSSWISE, IN 4 STEPS. FINAL TORQUE: 4.5 NM [40 LBF.INCH]. SECURE AT ASSEMBLY.

△4 TIGHTEN SETSCREWS EQUALLY, CROSSWISE, IN 4 STEPS. FINAL TORQUE: 33 NM [290 LBF.INCH].

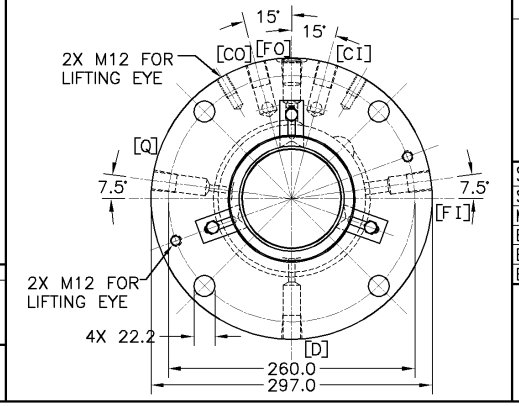
△5 DO NOT OVERTIGHTEN.SECURE AT ASSEMBLY.

REVISION: –	DATE: 18-OCT-2006	BY: LMURTHY	CHKD: VVISWANATHAN	ECN NO:

REVISION NOTE: RELEASE TO MANUFACTURE.

DIM'S ARE REF UNLESS SPECIFIED OTHERWISE. DIM'S IN: MILLIMETERS | C/A2 JUNE 2005

THIRD ANGLE | END VIEW REDUCED SCALE: | ROTATION



BILL OF MATERIAL NO: 949568-002 | 1 SUGGESTED SPARE PARTS 2 CODE/BSC [X]/OFF.STD [W]

NO	PARTCODE	QTY	DESCRIPTION	MATERIAL	1	2
1	2N63866ZD1	1	SLEEVE	316 / CHROMIUM OXIDE		
2	3N36816DB	1	SEAL DRIVE	316		X
5	670418DB	1	PIN	316		X
11	1N63878DB	1	GLAND	316		
13	568431GU	1	SEAT GASKET	FLUOROELASTOMER	*	X
14	3N05186RY	1	STATIONARY FACE	CARBON	*	X
15	666040SL	1	ROTATING FACE	SILICON CARBIDE	*	X
16	668838NL	10	COIL SPRING	ALLOY C-276	*	X
16.1	628440NL	12	COIL SPRING	ALLOY C-276	*	
18	568261GU	1	GLAND GASKET	FLUOROELASTOMER	*	
18.1	568269GU	1	GLAND GASKET	FLUOROELASTOMER	*	
19	568243GU	1	SLEEVE GASKET	FLUOROELASTOMER	*	
24	670059GE	1	GLAND BUSHING	CARBON		
40	4N02099CK	3	HHCS M8X12	18-8		
44	4N31756DB	1	BACKING RING	316		
57	4R0433DB	4	SSCP 5/16-18X3/8	316	*	X
57.1	4R0438CI	8	SSCP 3/8-16X1/2	ALLOY STEEL, PLATED	*	
57.2	4R0464DY	6	SSHDP 3/8-16X5/16	ALLOY 20	*	
58	3N63876DB	1	DRIVE COLLAR	316		
71	568158GU	1	O RING GASKET	FLUOROELASTOMER	*	X
76	568352GU	1	ROT. FACE GASKET	FLUOROELASTOMER	*	X
103	4R15130DB	3	SETTING DEVICE	316		
111	UR550CK	1	SNAP RING	18-8		
131	2N36817DB	1	BODY	316		X
172	3N63868DB	1	ADAPTER	316		
230	3N46936GE	1	THROAT BUSHING	CARBON	*	

cooling water inlet temperature: 40,6 °C
cooling water outlet temperature: 45 °C
cooling water required flow: 20 l/min
stuffing box expected temperature: 60 °C

CUSTOMER: FLOWSERVE FPD COSLADA	SEAL CHAMBER PRES: 45 BARG
ADDRESS: COSLADA (MADRID) SPAIN	SUCT PRES: 45 BARG
ULTIMATE USER: CE MAU POWER PLANT	DISCH PRES: 176.3-241 BARG
ADDRESS: VIETNAM	RPM: 2795-2905
CUSTOMER P.O.: 10.06.40.44050/11062	API PLAN: 23/61
PRODUCT: BFW	API CODE: BSTFN
TEMP: 146-170°C	PROJECT NO.: 59114
SPEC GRAVITY: 0.915-0.922	

SEAL TYPE: DM	SEAL SIZE: 4.875	
SEAL CONFIG: SINGLE INSIDE-CARTRIDGE	SIZE CODE:	
MATL CODE: 5X4U	DESIGN:	
EQUIP MFR: FLOWSERVE	INSTR:	
EQUIP MODEL: 6X14WXH / 9 STAGES		
EQUIP DWG: M-00204-A		

FLOWSERVE® Flow Solutions Division

SCALE: TO SCALE	OPTIONS:	
DRAWN: SGANESAN	REF DWG: 866011,949562	
DATE: 11-OCT-2006	FORM DWG: A2N63877	REV:-
CHKD: VVISWANATHAN	ASSY/ORDER NO: SHEET: 2 OF: 2	REV:
APPVD:	949568	–
F.O. NO: 949568		

2.2 Main data of the TAPROGGE cleaning system

2.2.1 Cleaning balls

manufacturer	TAPROGGE
type of cleaning ball	20-P150-5
basic charge	900 pcs
cleaning	continuous

2.2.2 Strainer section

manufacturer / type	TAPROGGE / D2
material of housing	steel, rubberlined
material of internals	stainless steel
nominal diameter	DN 66"
overall length	1825 mm
installation position	horizontal
inclination of screen	30 °
gap width	5.2 mm
clamping assembly	TAS 3012 T
inspection hole	DN 500
actuation of screens	multi-turn actuator / thrust gear
max. admissible total thrust of thrust gear	20.000 N
main flanges	DN_1 66", AWWA C207 Tab.2 Cl.D
ball extraction	DN_2 3", ANSI B16.5

2.2.3 Differential pressure measuring system

SitransP-M01

Differential pressure transmitter

manufacturer / type	Siemens / Sitrans P 7MF4433
material of pressure caps	1.4408
material of diaphragms (medium touched)	2.4819 (Hastelloy C)
measuring range	-10 ÷ + 90 mbar
output signal	4 ÷ 20 mA
enclosure	IP 65

2.2.4 Ball collector

manufacturer / type	TAPROGGE / C 13
material of housing	EN-GJS-400-15, rubberlined
material of internals	stainless steel / GRP
maximum ball charge	1700 pcs
actuation of ball catching flap	part-turn actuator

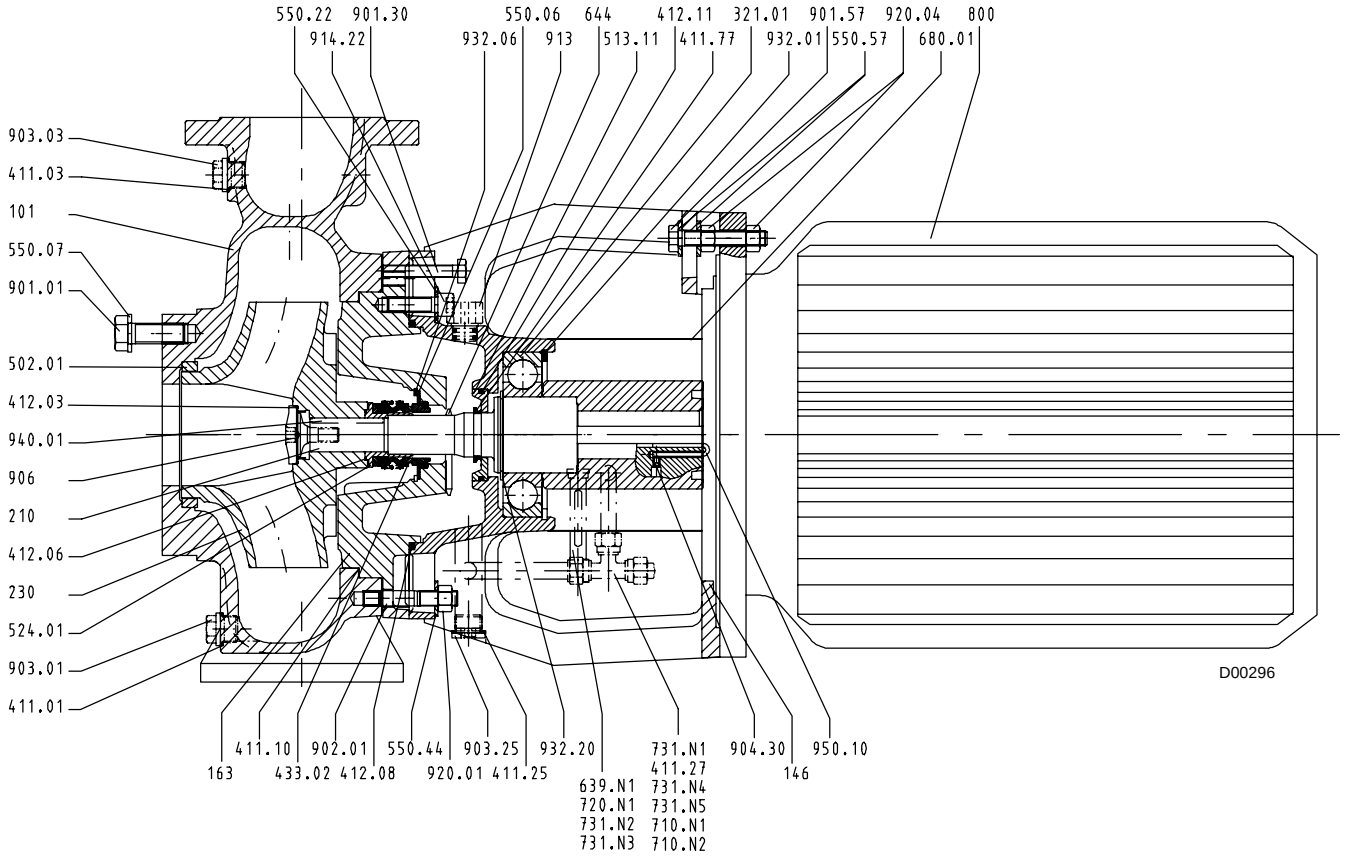
2.2.5 Ball recirculating pump

manufacturer / type	TAPROGGE / KRP 80-200
material, housing / impeller	1.4593
suction flange	DN 3", axial
pressure flange	DN 3", vertical
rated flow	30 m^3/h
rated flow head	1.36 bar
zero head	1.60 bar
diameter of impeller	209 mm
shaft sealing	mechanical seal

9 Related documents

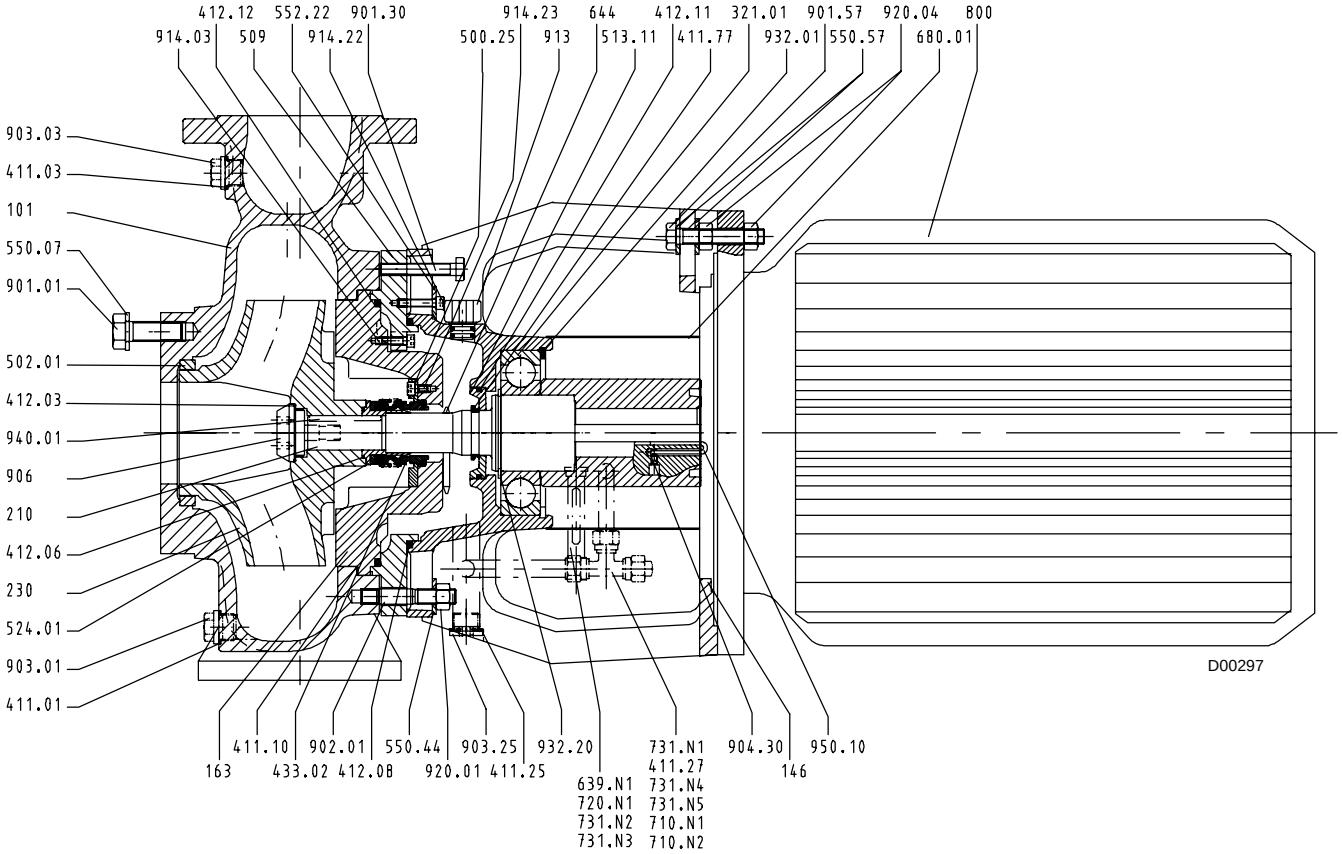
9.1 General assembly drawings and lists of components

9.1.1 General assembly drawing and list of components (cast iron variant)



Part No.	Description	Scope of supply
101	Pump casing	with joint rings 411.01/.03/.10, casing wear ring 502.01, discs 550.07/.44, hex. head bolts 901.01, studs 902.01, screwed plugs 903.01/.03, hex. nuts 920.01
146	Intermediate lantern	with joint rings 411.25/.27, O-ring 412.08/.11, insert ring 513.11, disc 550.57, oil level sight glass 639.N1, guard 680.01, pipe 710.N1/.N2, nipple joint 720.N1, elbow 731.N2/.N3, pipe union 731.N1/.N4, plug 731.N5, hex. head bolts 901.57, screwed plug 903.25, vent plug 913, hex. nuts 920.04, circlip 932.01
163	Discharge cover	with joint ring 411.10, O-ring 412.08, discs 550.06, hex. head bolts 901.30, hex. socket head cap screws 914.22, circlip 932.06, disc 550.22, oil ring 644
210	Shaft	with deep-groove ball bearing 321.01, O-ring 412.03, grub screw 904.30, impeller screw 906, circlip 932.20, key 940.01, spring 950.10
230	Impeller	with O-rings 412.03/.06
321.01	Deep-groove ball bearing	
411.77	V-ring	
433.02	Mechanical seal complete	stationary and rotating assembly
502.01	Casing wear ring	
513.11	Insert ring	with O-ring 412.11 and V-ring 411.77
524.01	Shaft protecting sleeve	with O-ring 412.03/.06
800	Motor	
906	Impeller screw	with O-ring 412.03
950.10	Spring	with grub screw 904.30

9.1.2 General assembly drawing and list of components (stainless steel and bronze variant)



Part No.	Description	Scope of supply
101	Pump casing	with joint rings 411.01/.03/.10, casing wear ring 502.01, discs 550.07/.44, hex. head bolts 901.01, studs 902.01, screwed plugs 903.01/.03, hex. nuts 920.01
146	Intermediate lantern	with joint rings 411.25/.27, O-ring 412.08/.11, insert ring 513.11, disc 550.57, oil level sight glass 639.N1, guard 680.01, pipe 710.N1/.N2, nipple joint 720.N1, elbow 731.N2/.N3, pipe union 731.N1/.N4, plug 731.N5, hex. head bolts 901.57, screwed plugs 903.25, vent plug 913, hex. nuts 920.04, circlip 932.01
163	Discharge cover	with joint ring 411.10, O-ring 412.08/.12, ring 500.25, hex. socket head cap screws 914.03/.23, oil ring 644
210	Shaft	with deep-groove ball bearing 321.01, O-ring 412.03, grub screw 904.30, impeller screw 906, circlip 932.20, key 940.01, spring 950.10
230	Impeller	with O-rings 412.03/.06
321.01	Deep-groove ball bearing	
411.77	V-ring	
433.02	Mechanical seal complete	stationary and rotating assembly
502.01	Casing wear ring	
509	Intermediate ring	with O-rings 412.08/.12, locking disc 552.22, hex. head bolts 901.30, hex. socket head cap screws 914.22
513.11	Insert ring	with O-ring 412.11 and V-ring 411.77
524.01	Shaft protecting sleeve	with O-ring 412.03/.06
800	Motor	
906	Impeller screw	with O-ring 412.03
950.10	Spring	with grub screw 904.30