HYDAC INTERNATIONAL

Universal Charging and Testing Unit FPU-1

For Bladder, Piston and Diaphragm Accumulators

1. DESCRIPTION

1.1. FUNCTION

The charging and testing unit FPU-1 is used to charge accumulators with nitrogen or to check or to change the existing pre-charge pressure in accumulators. For this purpose the charging and testing unit is screwed onto the gas valve of the hydraulic accumulator and connected to a commercial nitrogen bottle via a flexible charging hose. If the nitrogen pressure is only to be checked or reduced, the charging hose does not need to be connected.
The unit has a screw-type fitting with a built-in gauge, check valve and a spindle for opening the accumulator gas valve to control the pressure.

Suitable for charging and testing piston and diaphragm accumulators, but an A3 adaptor must be added when charging and testing bladder accumulators.

1.2. INTERVALS BETWEEN CHECKING

On the whole, nitrogen losses on HYDAC hydraulic accumulators are very low. However, a regular check of the gas pre-charge pressure is recommended to prevent the piston from hitting the cover plate or the bladder or diaphragm from becoming too deformed, if there is a drop in the pressure p_0.

The pre-charge pressure p_0 as shown on the label or the accumulator body, must be re-set after every new installation or repair and then checked at least once during the following week. If no nitrogen loss is detected, a further check should be made after approx. 4 months. If after this period no change in the pressure is found, a yearly check should be sufficient.

1.3. CONSTRUCTION

The HYDAC charging and testing unit for bladder, piston and diaphragm accumulators consists of:

- Valve body
- Spindle
- Check valve
- Release valve
- Gauge
- Charging hose
- A3 adaptor for bladder accumulators

1.4. ACCESSORIES

- **Gas pressure valve with intermediate piece**
  TUV set and lead sealed, it has to be fitted between the hydraulic accumulator and the nitrogen bottle by means of the intermediate piece, if the gas pressure in the commercially available nitrogen bottle is higher than the max. permissible operating pressure of the hydraulic accumulator.
- **Pressure release valve**
  for setting the required pre-charge pressure between nitrogen bottle and accumulator.
- **Protective case**
  for storing the charging and testing unit and adaptors.

Different types of case are available, depending on customer requirement.

2. TECHNICAL SPECIFICATIONS

2.1. MODEL CODE
(also order example)

FPU-1 250 F 2.5 G2 A1 K

Universal charging and testing unit

Gauge indication range

0 -	10 bar	0 -	145 psi	10
0 -	25 bar	0 -	363 psi	25
0 -	100 bar	0 -	1450 psi	100
0 -	250 bar	0 -	3626 psi	250
0 -	400 bar	0 -	5714 psi	400

Charging hose

F = for 200 bar nitrogen bottle with connection W24.32 x 1/14 (DIN 477, Part 1)
FM = for 300 bar nitrogen bottle with connection M30 x 1.5 (DIN 477, Part 5)
FW = for 300 bar nitrogen bottle with connection W30 x 2 (CEN)

Length of charging hose

2.5 m 2.5
4.0 m 4
Special lengths on request

Adaptor G for nitrogen bottles
See table under point 10 (page 15)

Adaptor A

A1 = M16 x 1.5
A2 = 5/8 - 18 UNF
A3 = 7/8 - 14 UNF
A4 = 7/8 - 14 UNF
A5 = M8 x 1
A6 = G 3/4 A
A7 = G 1/4
A8 = G 3/4
A9 = Vg 8
A11 = M16 x 2
D4 = 5/8 - 18 UNF
(Stock no. 366374)
other adaptors on request

(A3 is supplied as standard)

Protective case

Accessories (Please give full details when ordering.)
Gas pressure valve with intermediate piece (see point 5.3.).
Pressure release valve (see point 5.1.).
Adaptor for connector D (see point 4.1.).
Wrench 14x15 (part no. 1011065).
Allen key SW6 (part no. 1005164).
Valve tool for gas valve (part no. 616886).

2.2. WEIGHT

Standard model without case:
approx. 1.4 kg

Standard model with case:
approx. 3.0 kg

2.3. FPU-1 STANDARD MODELS

2.3.1 **Model without case**

Model code	Stock no.
FPU-1-010F2.5A3	2114486
FPU-1-025F2.5A3	2114481
FPU-1-100F2.5A3	2114310
FPU-1-250F2.5A3	2114306
FPU-1-400F2.5A3	2115646
FPU-1-010F4A3	2115056
FPU-1-025F4A3	2116876
FPU-1-100F4A3	2115657
FPU-1-250F4A3	2114311
FPU-1-400F4A3	2119673

2.3.2 **Model with case**

Model code	Stock no.
FPU-1-010F2.5A3K	2115365
FPU-1-025F2.5A3K	2114305
FPU-1-100F2.5A3K	2115314
FPU-1-250F2.5A3K	2114302
FPU-1-400F2.5A3K	2114307
FPU-1-010F4A3K	3013690
FPU-1-025F4A3K	2116738
FPU-1-100F4A3K	2114842
FPU-1-250F4A3K	2114303
FPU-1-400F4A3K	2114304

2.3.3 **Model without case with G adaptor**

Model code	Stock no.
FPU-1-250F2.5G2A3	2120252
FPU-1-250F2.5G3A3	2115555
FPU-1-250F2.5G4A3	2124611
FPU-1-250F2.5G9A3	2114312
FPU-1-250F4G3A3	2123839
FPU-1-250F4G6A3	2117532
FPU-1-250F4G10A3	2119789
FPU-1-400F2.5G2A3	2115823
FPU-1-400F2.5G3A3	2121557
FPU-1-400F2.5G8A3	2115693

2.3.4 **Model with case and G adaptor**

Model code	Stock no.
FPU-1-010F2.5G2A3K	2116766
FPU-1-010F2.5G3A3K	2127228
FPU-1-010F2.5G4A3K	2125524
FPU-1-010F2.5G6A3K	2115661
FPU-1-010F2.5G7A3K	2117851
FPU-1-010F2.5G8A3K	2117303
FPU-1-010F2.5G9A3K	2114482
FPU-1-010F2.5G10A3K	3008015
FPU-1-010F4G7A3K	2124450
FPU-1-025F2.5G2A3K	2114401
FPU-1-025F2.5G3A3K	2121210
FPU-1-025F2.5G4A3K	2115247
FPU-1-025F2.5G5A3K	3013724
FPU-1-025F2.5G8A3K	2119888
FPU-1-025F2.5G9A3K	2123949
FPU-1-025F2.5G10A3K	2119564
FPU-1-025F4G9A3K	2119680
FPU-1-100F2.5G2A3K	2122515
FPU-1-100F2.5G4A3K	2122089
FPU-1-100F2.5G6A3K	3003846
FPU-1-100F2.5G9A3K	2119883
FPU-1-100F4G3A3K	2120359
FPU-1-250F2.5G2A3K	2114309
FPU-1-250F2.5G3A3K	2114308
FPU-1-250F2.5G4A3K	2103046
FPU-1-250F2.5G5A3K	2117038
FPU-1-250F2.5G6A3K	2115420
FPU-1-250F2.5G7A3K	2120010
FPU-1-250F2.5G8A3K	2115216
FPU-1-250F2.5G9A3K	2115833
FPU-1-250F4G2A3K	2116743
FPU-1-250F4G3A3K	2116779
FPU-1-250F4G4A3K	2128944
FPU-1-250F4G8A3K	2124860
FPU-1-250F4G9A3K	2116004
FPU-1-250F4G10A3K	2125750
FPU-1-400F2.5G2A3K	2114605
FPU-1-400F2.5G3A3K	2115692
FPU-1-400F2.5G4A3K	2128360
FPU-1-400F2.5G5A3K	2124387
FPU-1-400F2.5G6A3K	2121984
FPU-1-400F2.5G8A3K	2116005
FPU-1-400F2.5G9A3K	2115757
FPU-1-400F4G2A3K	2122119
FPU-1-400F4G3A3K	2115656
FPU-1-400F4G7A3K	2124504
FPU-1-400F4G8A3K	2119759
FPU-1-400F4G9A3K	2126309
FPU-1-400F4G10A3K	2116642

2.4. SPECIAL MODELS

For pressures exceeding 400 bar, the following special models are available:

- FPS 600
  for bladder accumulators up to 600 bar max. pre-charge pressure (see technical information 293715).
- FPK 600
  for piston, diaphragm and SB800-1.5 accumulators up to 600 bar max. pre-charge pressure (see technical information 297248).
- FPH 800
  for high pressure bladder accumulators up to 800 bar max. pre-charge pressure (see technical information 292948).

3. OPERATING INSTRUCTIONS

3.1. TAKING ACCOUNT OF THE TEMPERATURE EFFECT

In order that the recommended pre-charge pressures are maintained even at relatively high operating temperatures, the pre-charge pressure $p_{0\ charge}$ for charging and testing a cold accumulator must be selected as follows:

$$p_{0\ charge} = p_0 \frac{\text{Pre-charge temp.} + 273}{\text{Operating temp.} + 273}$$

Pre-charge temperature [°C]
Operating temperature [°C]

3.2. PREPARATION

Prior to each testing, topping-up or re-charging of nitrogen, the accumulator must be isolated from the pressurised system by means of a shut-off valve and the fluid released.

Unscrew the protective caps S and H (only on bladder accumulators). Remove the O-ring O on bladder accumulators.

Slightly loosen the internal hexagon screw P on piston and diaphragm accumulators by means of an Allen key SW 6, DIN 911 (approx. ½ turn).

Place FPU-1 onto the accumulator and screw connector D by hand onto accumulator gas valve. At the same time, ensure that the relief valve B of the FPU-1 is closed. Turn charging unit to a position where the gauge can be easily read.

3.3. TESTING

On bladder accumulators

(FPU-1 with A3 adaptor) open valve by turning spindle A clockwise.

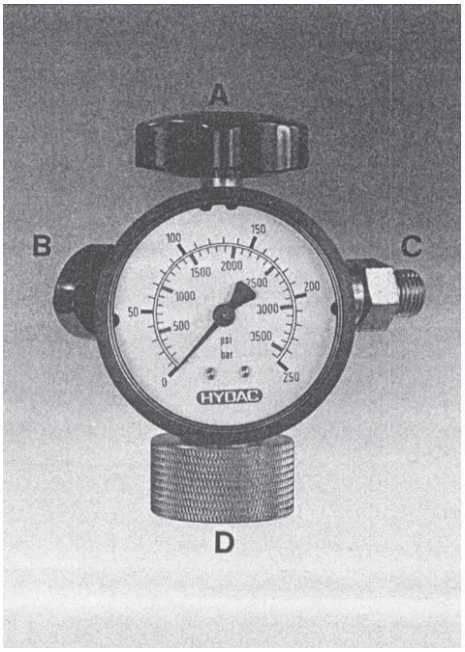
On piston and diaphragm accumulators (FPU-1)

open valve V by turning the internal hexagon screw anti-clockwise with spindle A.

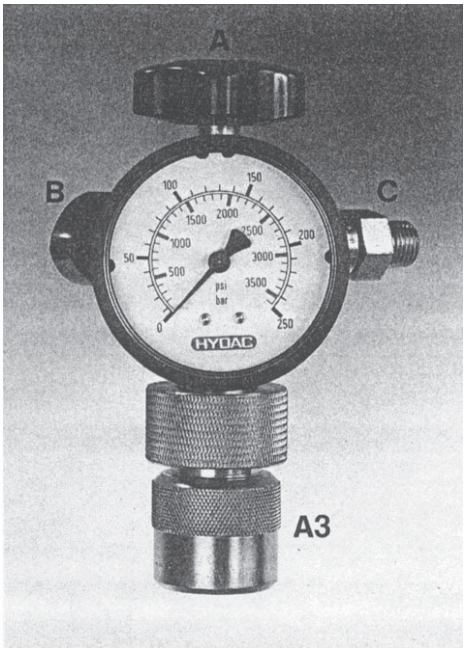
When the needle of the gauge begins to move, give the spindle another complete turn.
The gauge now shows the charging pressure in the accumulator. The check valve C prevents any escape of nitrogen.

3.4. PRESSURE RELEASE

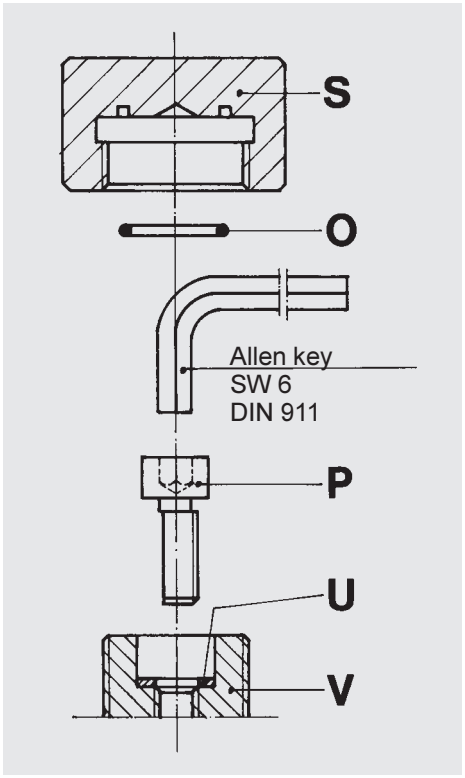
Carefully open release valve B. The nitrogen escapes into the atmosphere.



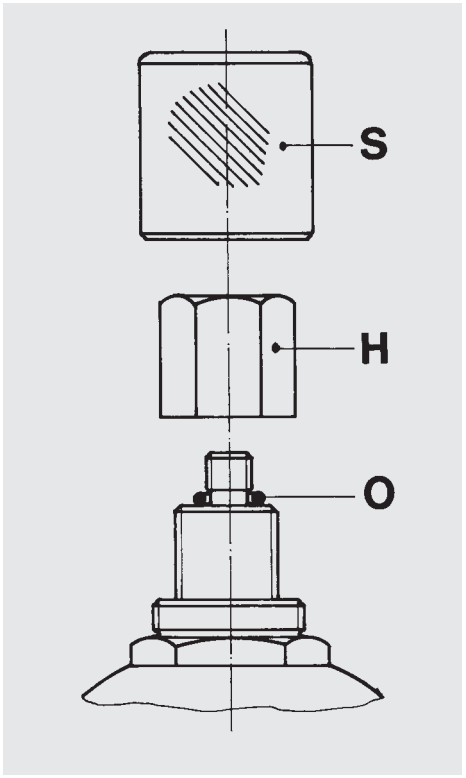
Charging and testing unit FPU-1 for piston and diaphragm accumulators



Charging and testing unit for bladder accumulators with adaptor A3



Gas valve for piston and diaphragm accumulators



Gas valve for bladder accumulators

3.5. INCREASING PRE-CHARGE PRESSURE

Only use nitrogen for charging accumulators

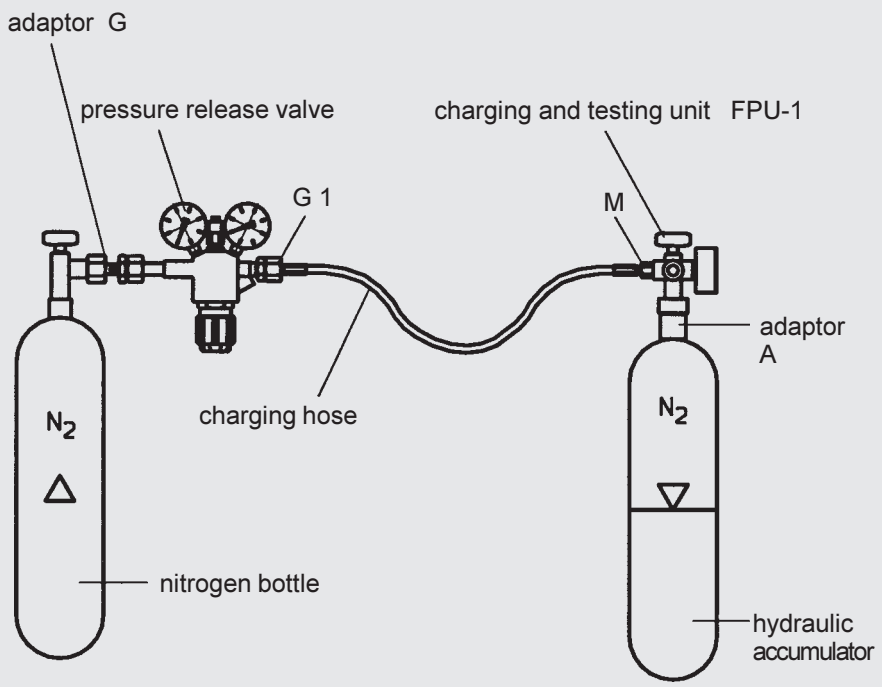
Never use oxygen!

Danger of explosion!

If the gas pressure in the nitrogen bottle is higher than the max. operating pressure of the accumulator, a gas pressure release valve must be fitted.

- Connect the flexible charging hose to the pressure release valve on the nitrogen bottle by means of the connector G1. For nitrogen bottles from other countries the appropriate adaptor is required (see page 15). Connect connector M of the charging hose to fitting C of the charging and testing unit FPU-1. Open the shut-off valve on the nitrogen bottle, and slowly release nitrogen into the accumulator. Wait until approximately 1 bar has been reached before opening the shut-off valve of the nitrogen bottle further to enable faster charging.
- Interrupt the charging procedure from time to time and check the pre-charge pressure reached. Repeat this process until the required gas pre-charge pressure is achieved. After temperature equalisation has taken place, re-check the pre-charge pressure and adjust if necessary. If the pressure is too high, it can be lowered via the pressure release valve B of the FPU-1.
- If the required gas pre-charge pressure has been reached, turn the spindle anticlockwise to close the gas valve on bladder accumulators. On piston or diaphragm accumulators close the internal hexagon screw P by turning the spindle clockwise. Discharge the charging and testing unit FPU-1 via the pressure release valve and remove it by loosening the connector. On bladder accumulators, unscrew the adaptor and replace the O-ring O. On piston and diaphragm accumulators, tighten the internal hexagon screw P with Allen key [20 Nm].
- Check for leakages on the accumulator gas valve using a leak detector spray.
- Screw on cap nut H (only on bladder accumulators) and valve protection cap S onto the gas valve of the accumulator and tighten.

3.6. FPU-1 WITH ACCESSORIES



3.7. WARNING

Nitrogen and operating fluid can escape when filling or testing the accumulator due to a faulty, i.e. leaking, bladder, diaphragm or piston seals.

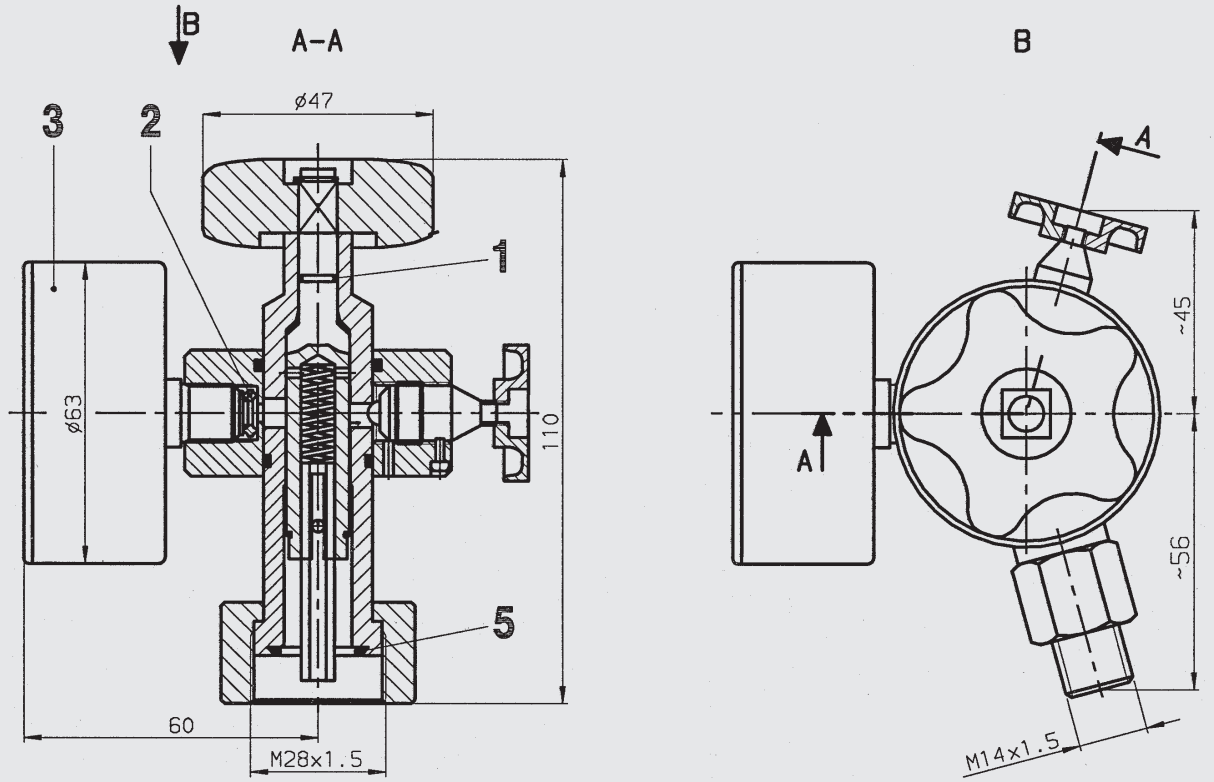
Note!

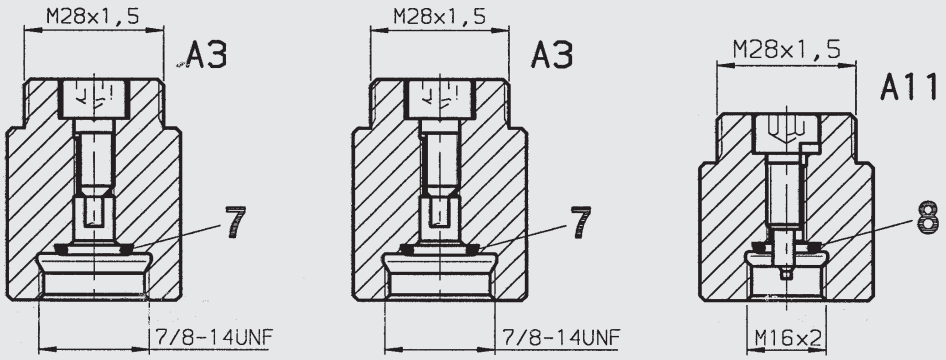
Risk to health in the case of aggressive fluids!

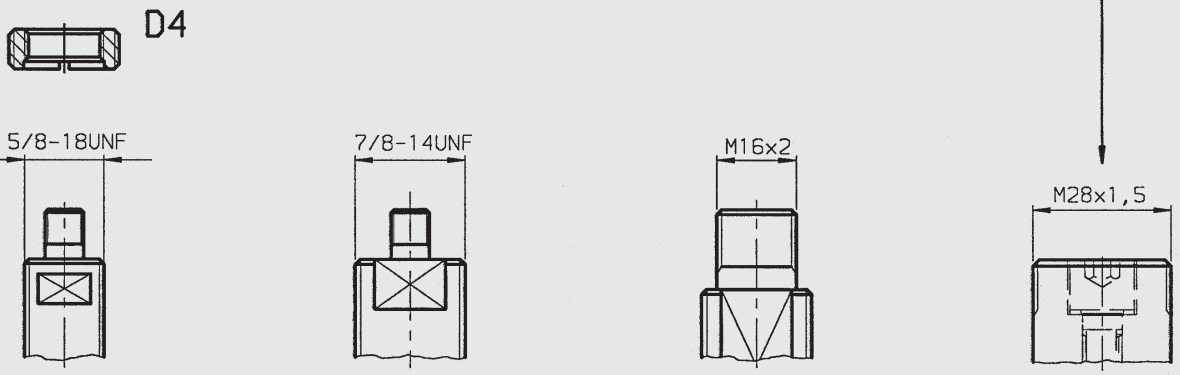
(special charging and testing unit available on request)

4. DIMENSIONS

4.1. CHARGING AND TESTING UNIT FPU-1 WITH ADAPTOR FOR HYDAC ACCUMULATORS







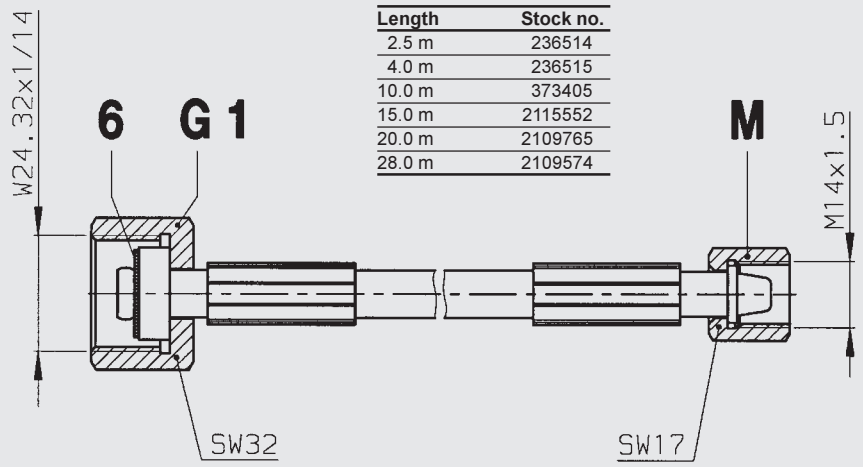
Bladder accumulator
330-0.5 / 400-0.5

Bladder accumulator
≥ 1l

Gas valve to
ISO 10945

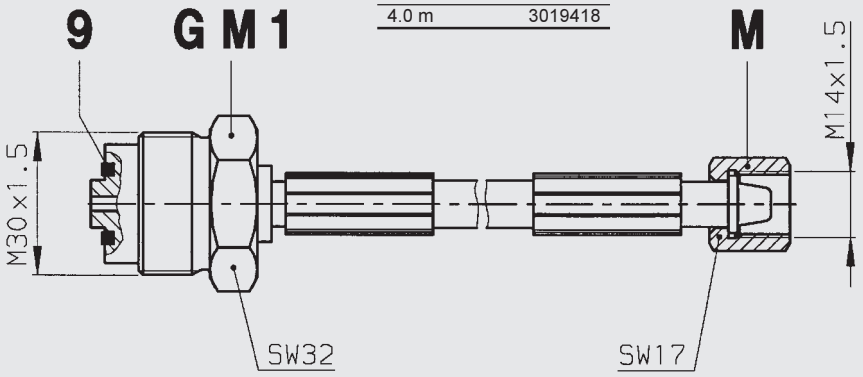
Piston and
diaphragm
accumulator

4.2. CHARGING HOSE **F**
(200 bar nitrogen bottle - connection to DIN 477, part 1)



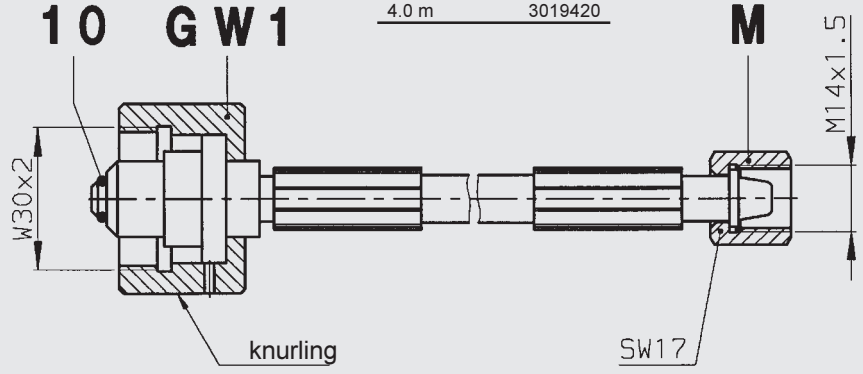
Length	Stock no.
2.5 m	236514
4.0 m	236515
10.0 m	373405
15.0 m	2115552
20.0 m	2109765
28.0 m	2109574

4.3. CHARGING HOSE **FM**
(300 bar nitrogen bottle - connection to DIN 477, part 5)



Length	Stock no.
2.5 m	3019417
4.0 m	3019418

4.4. CHARGING HOSE **FW**
(300 bar nitrogen bottle - connection to CEN)



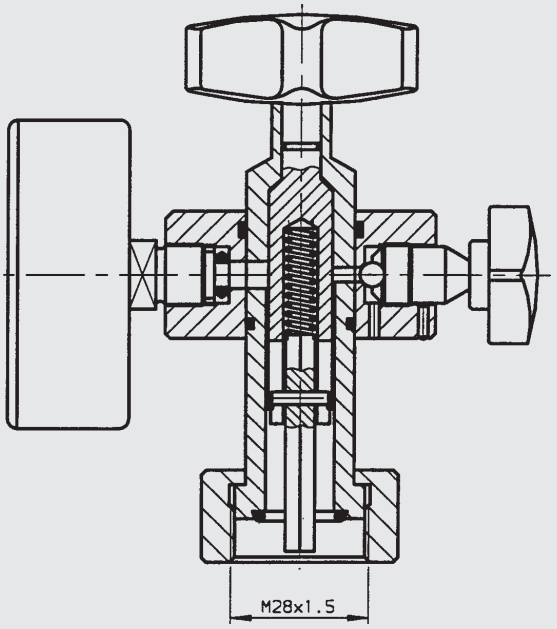
Length	Stock no.
2.5 m	3019419
4.0 m	3019420

Charging hoses are suitable for the respective published maximum permissible operating pressures and 10,000 charging processes.

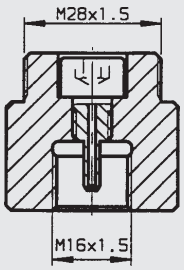
(HYDAC charging hoses comply with the EC machine directive and with DIN EN 982 and DIN EN 853 to 857).

4.5. ADAPTORS A1 TO A11

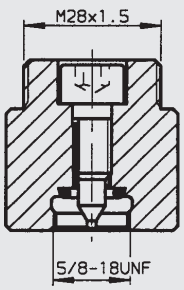
The universality of the FPU-1 is assured because as well as HYDAC piston and diaphragm accumulators, even bladder accumulators can be charged and tested using the A3 adaptor.
By using additional adaptors other makes of accumulator can also be charged and tested.



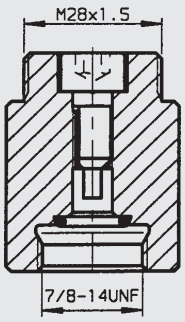
A1 (stock no. 361619)



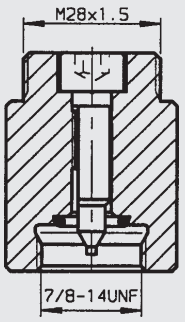
A2 (stock no. 361605)



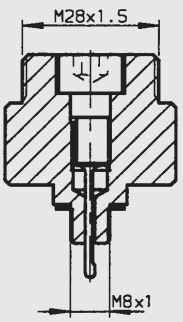
A3 (stock no. 291533)



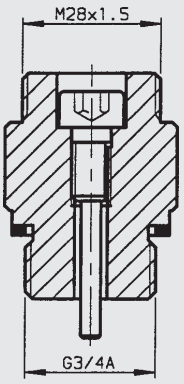
A4 (stock no. 291536)



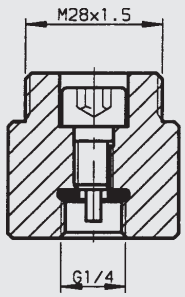
A5 (stock no. 291531)



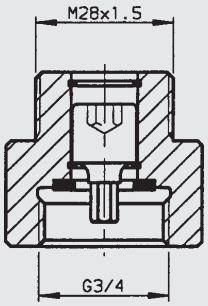
A6 (stock no. 2108819)



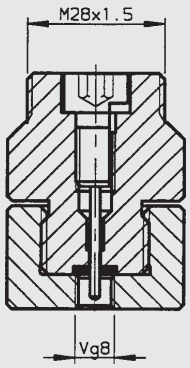
A7 (stock no. 2110629)



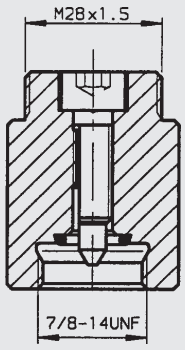
A8 (stock no. 2124524)



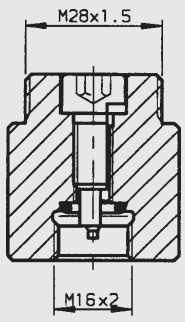
A9 (stock no. 2128638)



A10 (stock no. 2128849)

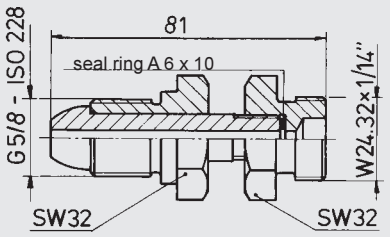


A11 (stock no. 3018210)

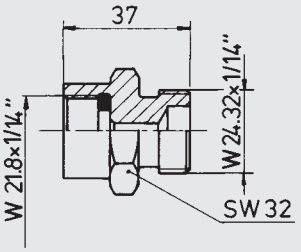


4.6. ADAPTORS G2 TO G11

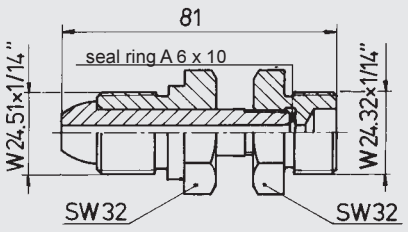
G 2 (stock no. 236376)



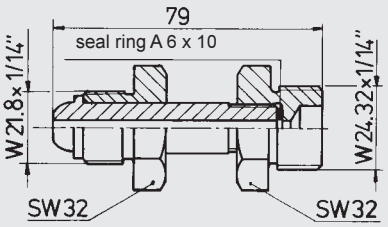
G 3 (stock no. 2103421)



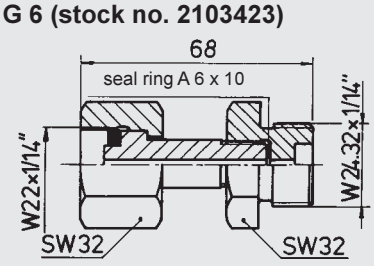
G 4 (stock no. 236374)



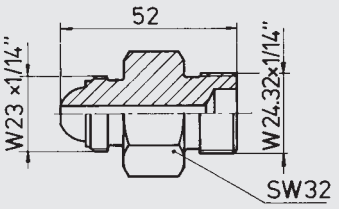
G 5 (stock no. 236373)



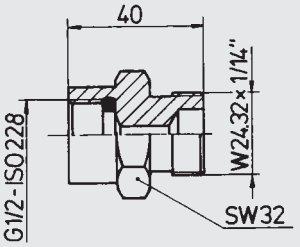
G 6 (stock no. 2103423)



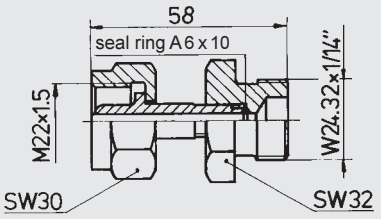
G 7 (stock no.236377)



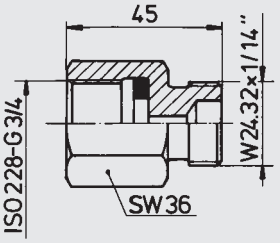
G 8 (stock no.2103425)



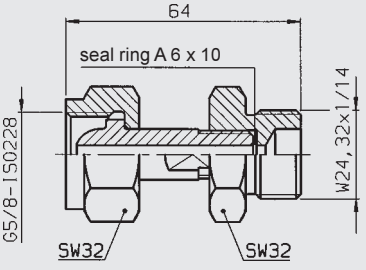
G 9 (stock no. 241168)



G 10 (stock no. 2103427)

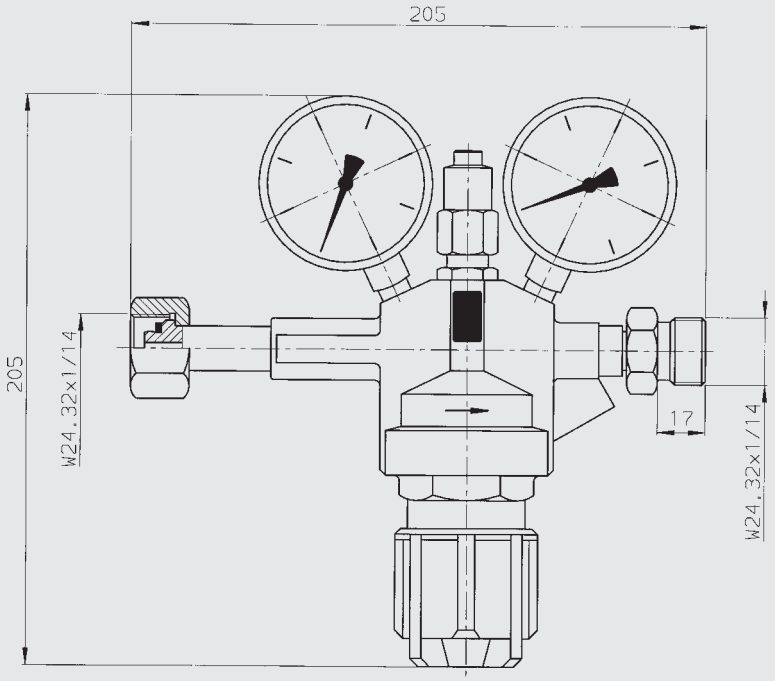


G 11 (stock no. 3018678)



5. ACCESSORIES

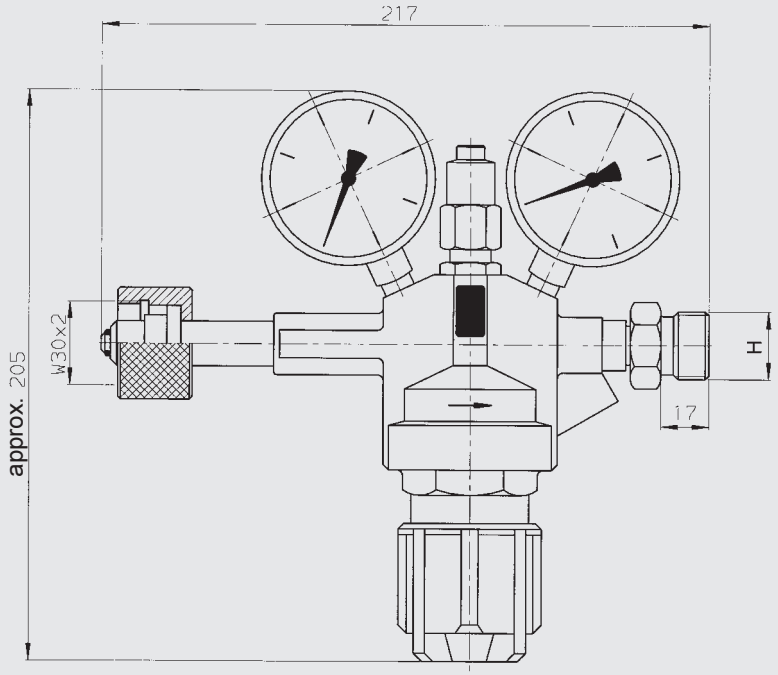
5.1. PRESSURE RELEASE VALVE FOR 200 BAR NITROGEN BOTTLES
(Connection W24.32 x 1/14 - DIN 477, Part 1)



Bottle pressure [bar]	Reduces pressure to between [bar]	Stock no.
200	0- 20	635409
200	0-100	635411
200	0-200	635412

Weight: 2.3 kg

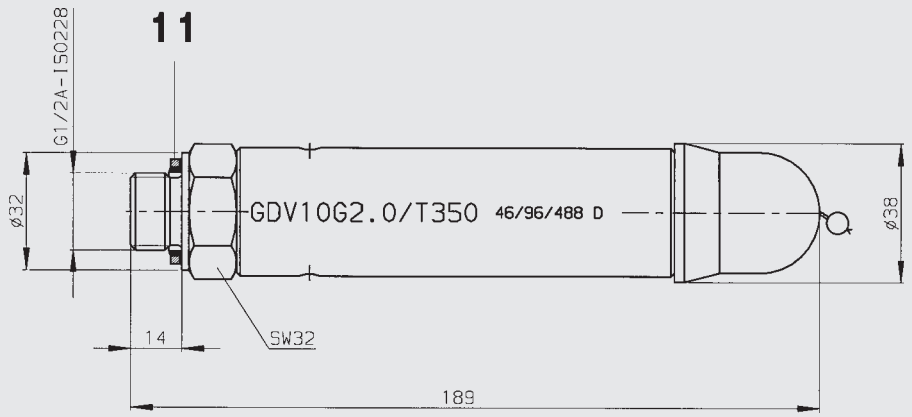
5.2. PRESSURE RELEASE VALVE FOR 300 BAR NITROGEN BOTTLES
(Connection W30 x 2 - CEN)



Bottle pressure [bar]	Reduces pressure to between [bar]	Connection H	Stock no.
300	0 - 20	W24.32x1/14	6004020
300	0-100	W24.32x1/14	6004021
300	0-200	W24.32x1/14	6004022
300	0-300	W30x2	6004023

Weight: 2.3 kg

5.3. GAS PRESSURE VALVE GDV 10



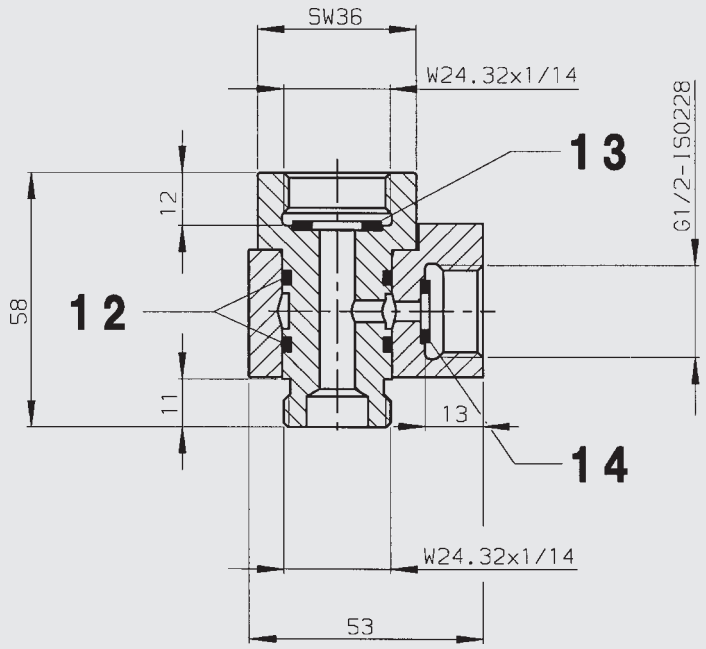
Designation	Stock no.
GDV 10G2.0/T015 bar	2103824
GDV 10G2.0/T035 bar	2110312
GDV 10G2.0/T100 bar	2106435
GDV 10G2.0/T210 bar	2105568
GDV 10G2.0/T250 bar	230871
GDV 10G2.0/T330 bar	2105311
GDV 10G2.0/T350 bar	230872

(Pressure setting with TUV inspection - other pressure ranges on request)

Weight: 1.0 kg

5.4. INTERMEDIATE PIECE GDV 10

Intermediate piece for fitting the gas pressure valve GDV 10 between the 200 bar nitrogen bottle and the charging and testing unit FPU-1 (stock no. 242558)

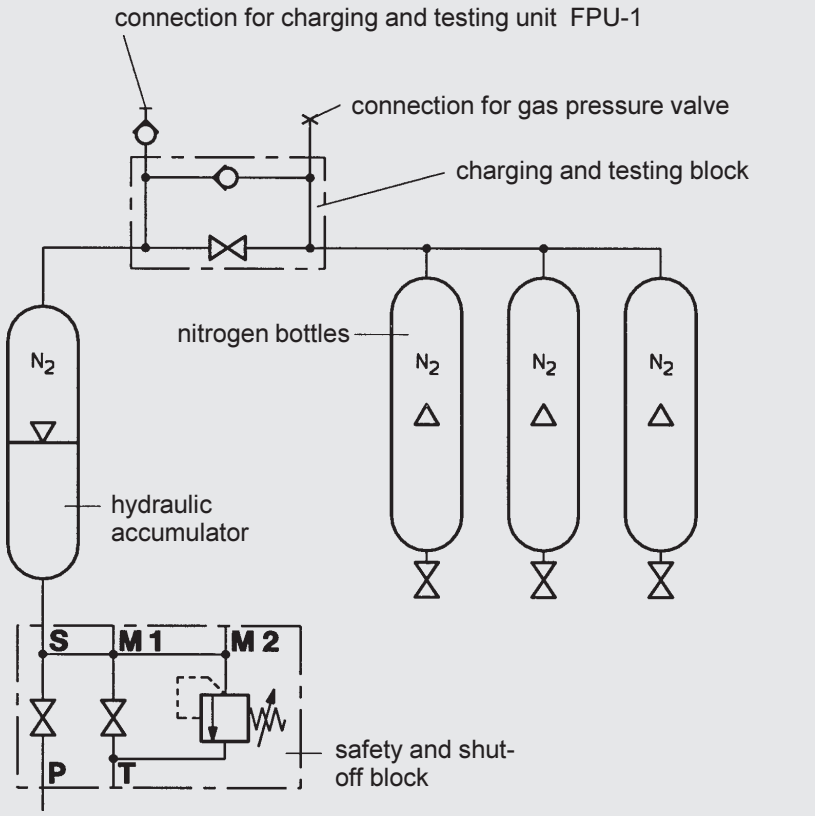


Weight: 0.5 kg

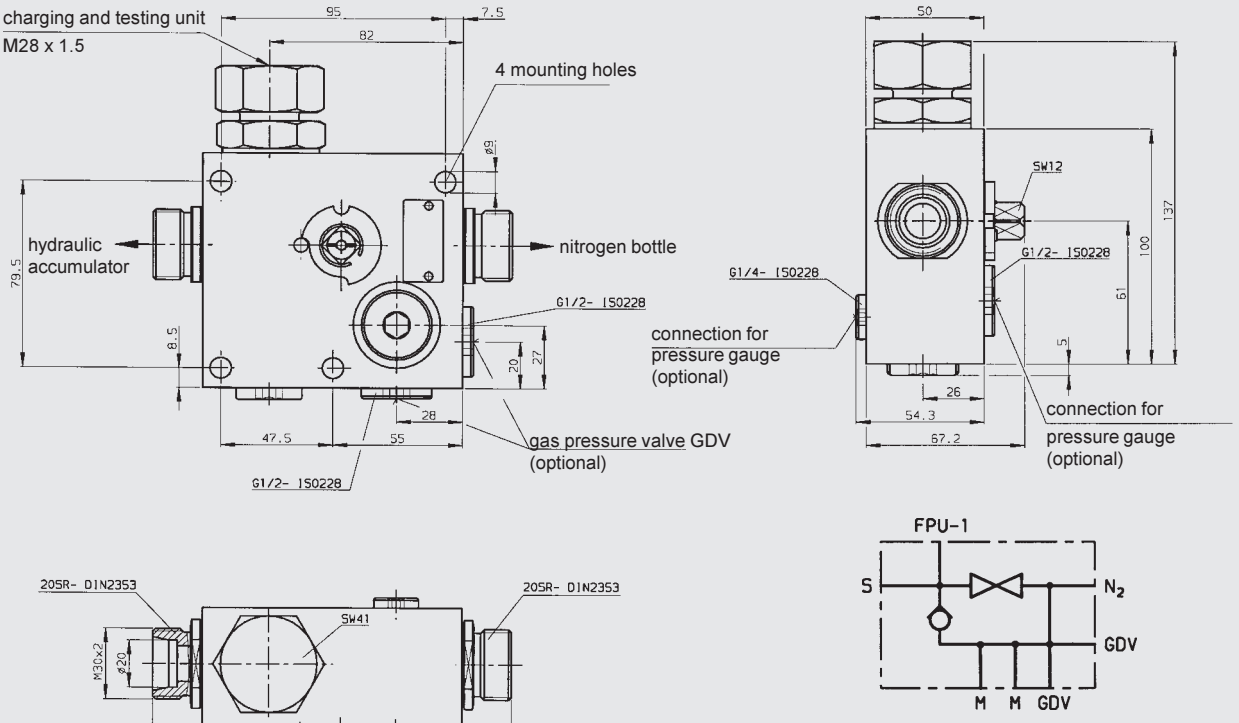
6. CHARGING AND TESTING BLOCK F + P

The HYDAC charging and testing block F+P is used to charge and test back-up type hydraulic accumulators. It has connections for the charging and testing unit FPU-1 and for pressure gauges. As a safety function, a gas pressure valve GDV 10 can be fitted. In addition it allows the back-up nitrogen bottles to be shut off from the hydraulic accumulator.

6.1. BACK-UP TYPE HYDRAULIC ACCUMULATOR WITH CHARGING AND TESTING BLOCK



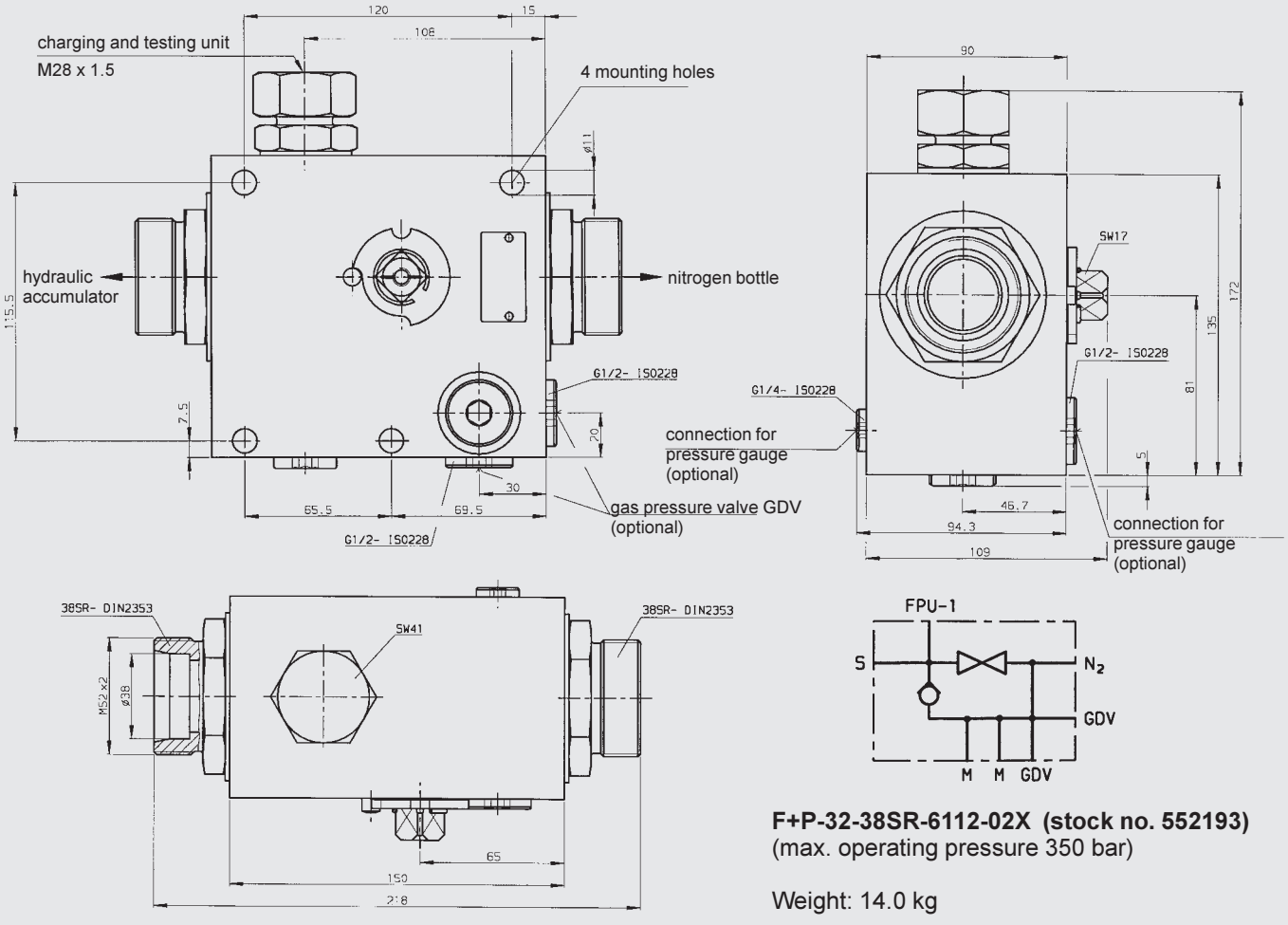
6.2. CHARGING AND TESTING BLOCK DN 16



F+P-16-20SR-6112-02X (stock no. 850233)
(max. operating pressure 400 bar)

Weight: 4.3 kg

6.3. CHARGING AND TESTING BLOCK DN 32



F+P-32-38SR-6112-02X (stock no. 552193)
(max. operating pressure 350 bar)

Weight: 14.0 kg

7. SPARE PARTS

CHARGING AND TESTING UNIT FPU-1

Item	Quantity	Designation		Stock no.
1	1	O-ring 6 x 1		601 032
2	1	Seal ring		612 730
3	1	Pressure gauge	0 - 10 bar	635 139
			0 - 25 bar	635 140
			0 - 100 bar	635 141
			0 - 250 bar	635 142
			0 - 400 bar	635 143
5	1	O-ring 15 x 2		601 049
6	1	Seal ring		601 456
7	1	O-ring 11 x 2		601 043
8	1	O-ring 9 x 2		601 040
9	1	O-ring 11 x 2.5		603 681
10	1	O-ring 5.7 x 1.9		6004009
		Seal kit FPU-1		2117669

GAS PRESSURE VALVE GDV 10

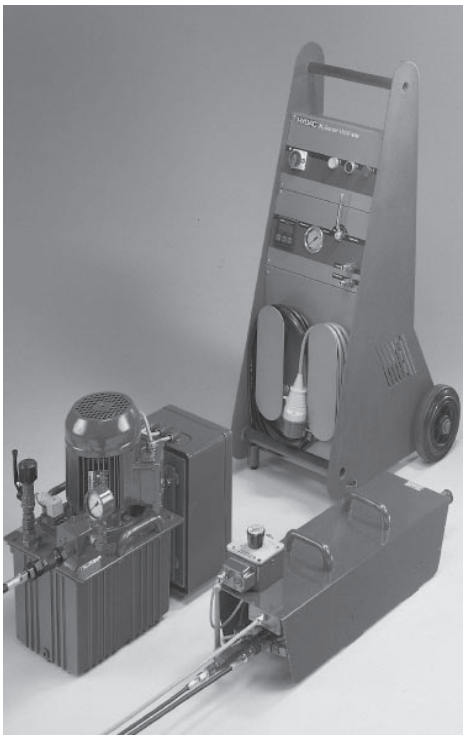
Item	Quantity	Designation		Stock no.
11		Seal ring	21.5 x 28.7 x 2.5	606 026

When mounting onto the HYDAC charging and testing block, O-ring 18 x 2.5 (stock no. 601057) must be fitted.

INTERMEDIATE PIECE GDV 10

Item	Quantity	Designation		Stock no.
12	2	O-ring	20 x 2.5	601 058
13	1	Seal ring	20 x 11.5 x 2	614 706
14	1	Seal ring	14 x 8.5 x 2	612 735
		Seal kit intermediate piece		2117287
		Seal kit charging and testing block DN 16		2115776
		Seal kit charging and testing block DN 32		2112088

8. NITROGEN CHARGING UNIT



HYDAC nitrogen charging units facilitate fast and cost-effective filling or testing of the required gas pre-charge pressure in bladder, diaphragm or piston accumulators. They guarantee optimum use of commercially available nitrogen bottles up to a residual pressure of 20 bar and a maximum accumulator pressure of 350 bar. Portable, mobile and stationary types of N2 Server are available. For further details and technical specifications, see HYDAC brochure "Nitrogen Charging Unit N2 Server", no.: E 2.201.

9. NOTE

All details in this brochure are subject to technical modifications.

10. SCHEDULE OF COUNTRIES

Adaptor G for nitrogen bottles from different countries.

Country	Type / Stock no.										
	G1[1)]	G2 236376	G3 2103421	G4 236374	G5 236373	G6 2103423	G7 236377	G8 2103425	G9 241168	G10 2103427	G11 3018678
Algeria			●								
Argentina		●									
Australia		●									
Austria	●										
Bahamas		●									
Bahrain			●								
Bangladesh		●									
Barbados		●									
Belgium	●										
Bolivia								●			
Botswana		●									
Brazil								●			
Bulgaria			●								
Burma		●									
Canada				●							
Chile								●			
China											●
Colombia								●			
Costa Rica		●									
Cyprus		●									
Czech Republic	●										
Denmark	●										
Djibouti			●								
Dominican Republic								●			
Ecuador								●			
Egypt			●								
Ethiopia		●									
Fiji		●									
Finland	●										
France			●								
Gabon			●								
Gambia		●									
Germany	●										
Ghana		●									
Great Britain		●									
Greece		●									
Guatemala								●			
Guinea			●								
Guyana								●			
Honduras								●			
Hong Kong		●									
Hungary			●								
India		●									
Indonesia		●									
Iran			●								
Iraq			●								
Ireland		●									
Israel			●								
Italy					●						
Ivory Coast			●								
Jamaica		●									
Japan						●					
Jordan			●								
Kenya		●									
Korea							●				
Kuwait			●								
Lebanon			●								
Libya			●								
Malawi		●									
Malaysia		●									
Malta		●									
Mauritius			●								
Mexico			●								
Morocco			●								
Mozambique			●								
Netherlands	●										
New Zealand		●									
Nigeria			●								
Norway	●										
Oman			●								
Pakistan		●									
Paraguay								●			
Peru								●			
Philippines		●									
Poland	●										
Portugal		●									
Puerto Rico				●							
Qatar			●								
Romania			●								
Russia										●	
Saudi Arabia			●								
Singapore		●									
South Africa		●									
Spain		●									
Sri Lanka		●									
Sudan		●									
Surinam		●									
Swaziland		●									
Sweden	●										
Switzerland	●										
Syria			●								
Taiwan									●		
Tanzania		●									
Thailand		●									
Trinidad/Tobago										●	
Tunisia			●								
Turkey		●									
United Arab Emirates			●								
Uruguay								●			
USA				●							
Venezuela										●	
Vietnam		●									
Yugoslavia			●								
Zambia		●									

[1)] = already fitted to hose ● = suggestion