

# Self-operated Pressure Regulators

## Universal Pressure Reducing Valve

### Type 41-23



#### Application

Pressure regulators for set points from 5 mbar to 28 bar · Valves in nominal sizes DN 15 to 100 · Nominal pressures PN 16 to 40 · Suitable for water, non-flammable gases and vapors up to 350 °C

The valve **closes** when the downstream pressure rises



#### Special features

- Low-maintenance proportional regulators requiring no auxiliary energy
- Frictionless plug stem seal with stainless steel bellows
- Control line kit available for tapping the pressure directly at the valve body
- Wide set point range and easy set point adjustment over a nut
- Exchangeable actuator and positioning springs
- Spring-loaded, single-seated valve with upstream and downstream pressure balancing<sup>1)</sup> by a stainless steel bellows
- Plug with soft sealing for high sealing requirements
- Low-noise standard plug · Special version with a flow divider St I or St III (DN 65 to 100) for further noise level reduction (see Data Sheet T 8081 EN)

#### Versions

Pressure reducing valve for controlling the downstream pressure  $p_2$  to the adjusted set point. The valve closes when the downstream pressure rises.

#### Type 41-23 · Standard version

Type 2412 Valve · Valve in DN 15 to 100 · Plug with metal sealing · Body made of either cast iron EN-JL1040, spheroidal graphite iron EN-JS1049, cast steel 1.0619 or CrNiMo steel 1.4581

**Type 2413** Actuator with EPDM rolling diaphragm and screw fitting · All wetted parts are free of non-ferrous metal

#### Extended versions

**Millibar pressure reducing valve** (DN 15 to 80) for pressure set points from 5 to 50 mbar

#### Pressure reducing valve for small flow rates

Valve with micro-trim ( $K_{VS} = 0.001$  to  $0.01$ ) or special  $K_{VS}$  (reduced cross-sectional flow area)

#### Steam pressure reducing valve

with condensation chamber for steam up to 350 °C

#### Safety pressure reducing valve

with leakage line connection and seal or two diaphragms and diaphragm rupture indicator

<sup>1)</sup> For  $K_{VS} \leq 2.5$ : without balancing bellows



Type 41-23 - without control line -

Fig. 1 · Type 41-23 Universal Pressure Reducing Valve

#### Special versions

- Control line kit for pressure tapping at the valve body
- FPM rolling diaphragm for oils (ASTM I, II, III)
- Free of oil and grease for oxygen acc. to VBG 62 with NBR diaphragms
- EPDM diaphragm with PTFE protective foil
- Actuator for remote set point adjustment (autoclave control)
- Bellows actuator for valves DN 15 to 100 · Set point ranges 5 to 10, 10 to 22, 20 to 28 bar · Bellows housing made of 1.4301, 1.4571, 1.0305, bellows made of 1.4571
- Valve with flow divider St I or St III (DN 65 to 100) for particularly low-noise operation with gases and vapors
- All wetted parts in stainless steel version at least of 1.4301 for PN 16 to PN 40
- Stainless Cr steel seat and plug with PTFE soft sealing (max. 220 °C) · With EPDM soft sealing (max. 150 °C)
- Seat and plug armored for low-wear operation

- Free of lubricants for high-purity water/gas according to company standard WN 1.34-2 Sheet 3
- Version according to ANSI

- Free of oil and grease for high-purity applications
- Wetted plastic parts conforming to FDA regulations (max. 60 °C)

**Principle of operation** (see Fig. 2)

The medium flows through the valve (1) as indicated by the arrow. The position of the valve plug (3) and the area released between the plug and seat (2) determine the flow rate. The plug stem (5) with the plug is connected to the stem (11) of the actuator (10).

To control the pressure, the operating diaphragm (12) is tensioned by the positioning springs (7) and the set point adjustment nut (6) so that the valve is opened by the force of the positioning springs when it is relieved of pressure ( $p_1 = p_2$ ).

The downstream pressure  $p_2$  to be controlled is tapped downstream of the valve and transmitted via the control line (14) to the operating diaphragm (12) where it is converted into

a positioning force. This force is used to move the valve plug (3) according to the force of the positioning springs (7), which is adjustable at the set point adjustment nut (6). When the force resulting from the downstream pressure  $p_2$  rises above the adjusted set point, the valve closes proportionally to the change in pressure.

The fully balanced valves are equipped with a balancing bellows (4). The downstream pressure  $p_2$  acts on the inner bellows surface, whereas the upstream pressure  $p_1$  acts on the outer surface of the bellows. As a result, the forces produced by the upstream and downstream pressures acting on the plug are balanced.

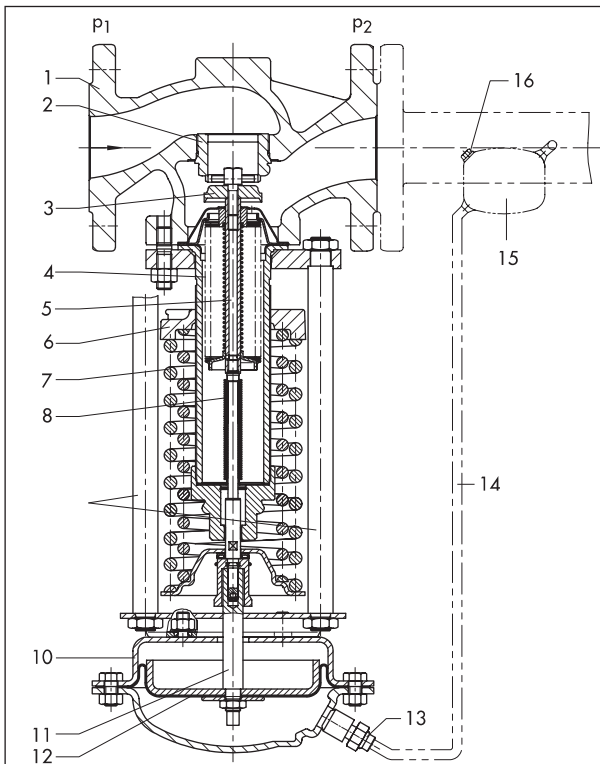
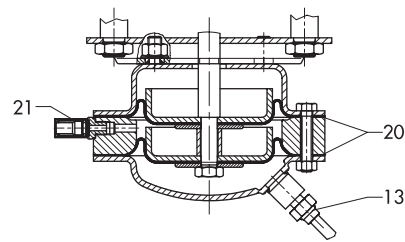


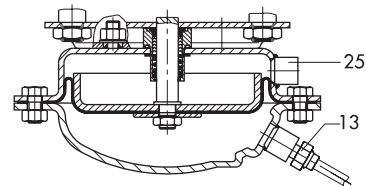
Fig. 2.1 · Type 41-23 Universal Pressure Reducing Valve, sectional view

- |   |                                  |
|---|----------------------------------|
| 1 Valve body (Type 2412)  | 20 Two diaphragms                |
| 2 Seat (exchangeable)   | 21 Diaphragm rupture indicator   |
| 3 Plug (with metal sealing)                                     | 25 Leakage line connection G 1/4 |
| 4 Balancing bellows   | 30 Metal bellows actuator        |
| 5 Plug stem   | 31 Bellows with lower part       |
| 6 Set point adjustment nut                                      | 32 Additional springs            |
| 7 Positioning springs   | 33 Control line connection G 3/8 |
| 8 Bellows seal  | 34 Bellows stem                  |
| 10 Type 2413 Actuator   | 35 Bracket                       |
| 11 Actuator stem  |                                  |
| 12 Operating diaphragm with diaphragm plate                     |                                  |
| 13 Control line connection G 3/8 (screw joint with restriction) |                                  |
| 14 Control line   |                                  |
| 15 Condensation chamber   |                                  |
| 16 Filler plug  |                                  |

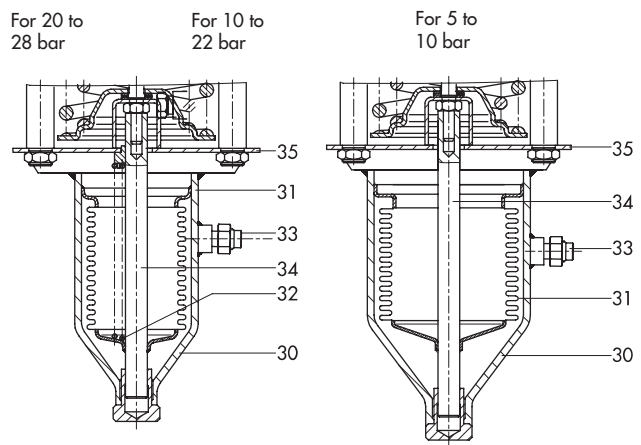
Fig. 2 · Principle of operation, Type 41-23 Universal Pressure Reducing Valve



Actuator with two diaphragms and diaphragm rupture indicator

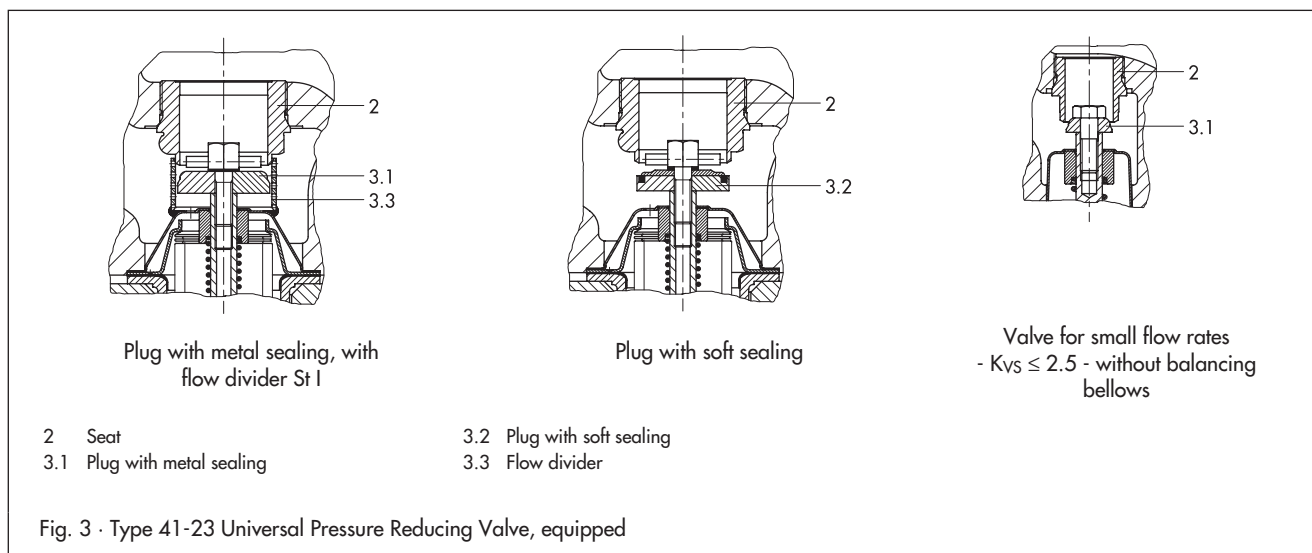


Actuator with leakage line connection



Metal bellows actuator

Fig. 2.2 · Type 2413 Actuators, various versions



**Table 1 · Technical data** · All pressures in bar (gauge)

Valve		Type 2412		
Nominal pressure	PN	16, 25 or 40 (acc. to DIN 2401)		
Nominal size	DN	15 to 50	65 to 80	100
Max. perm. diff. pressure $\Delta p$		25 bar <sup>1)</sup>	20 bar <sup>1)</sup>	16 bar
Temperature range		See Fig. 6 · Pressure-temperature diagram		
Valve plug		Metal sealing: max. 350 °C · PTFE soft sealing: max. 220 °C EPDM, FPM soft sealing: max. 150 °C · NBR soft sealing: max. 60 °C		
Leakage rate		Metal sealing: Leakage rate I $\leq 0.05\%$ of $K_{vs}$ · Soft sealing: Leakage rate IV		
Actuator		Type 2413		
Set point ranges		5 to 30 mbar <sup>2)</sup> · 25 to 50 mbar <sup>2)</sup> · 0.05 to 0.25 bar · 0.1 to 0.6 bar · 0.2 to 1.2 bar · 0.8 to 2.5 bar · 2 to 5 bar · 4.5 to 10 bar · 8 to 16 bar · 5 to 10 bar <sup>3)</sup> · 10 to 20 bar <sup>3)</sup> · 20 to 28 bar <sup>3)</sup>		
Max. perm. pressure at actuator		1.5 × max. set point of the actuator used <sup>4)</sup>		
Max. perm. temperature		Gases 350 °C, however, max. 80 °C at the actuator · Liquids 150 °C, with condensation chamber max. 350 °C · Steam with condensation chamber max. 350 °C		

<sup>1)</sup> For millibar pressure reducing valve, max. perm. differential pressure  $\Delta p$ : 10 bar · <sup>2)</sup> For millibar pressure reducing valve only

<sup>3)</sup> With metal bellows actuator · <sup>4)</sup> Millibar pressure reducing valve: max. 0.5 bar

**Table 2 · Materials** · Material number according to DIN EN

Valve		Type 2412					
Nominal pressure		PN 16	PN 25	PN 40			
Max. perm. temperature		300 °C	350 °C	350 °C	350 °C	350 °C	
Body		Cast iron EN-JL1040	Spheroidal graphite iron EN JS-1049	Cast steel 1.0619	Stainless steel 1.4581 <sup>1)</sup>	Forged steel <sup>2)</sup> 1.0460	Stainless forged steel <sup>2)</sup> 1.4571
Seat		CrNi steel			CrNiMo steel	CrNi steel	CrNiMo steel
Plug		CrNi steel			CrNiMo steel	CrNi steel	CrNiMo steel
	Sealing ring for soft sealing	PTFE with 15 % glass fiber · EPDM · NBR · FPM					
Guide bushing		PTFE/Graphite					
Balancing bellows and bellows seal		Stainless forged steel 1.4571					
Actuator		Type 2413					
Diaphragm cases		Sheet steel DD11 (StW22) <sup>3)</sup>					
Diaphragm		EPDM with fabric insert <sup>4)</sup> · FPM for oils · NBR · EPDM with PTFE protective foil					

<sup>1)</sup> DN 20, 32, 65, 80 and 100 only · <sup>2)</sup> DN 15, 25, 40, 50 and 80 only · <sup>3)</sup> In stainless steel version, CrNi steel

<sup>4)</sup> Standard version; further details in "Special versions"

**Table 3** ·  $K_{VS}$  values and  $z$  values

DN	Seat $\varnothing$ in mm	$K_{VS}$ <sup>2)</sup>		$K_{VS}$ I <sup>1)</sup>	$K_{VS}$ III <sup>1)</sup>	$z$ <sup>1)</sup>
		Standard version	Special version	With flow divider		
15	6		0.1 · 0.4 <sup>2)</sup>	–		
	22	4	1 · 2.5	3	–	0.65
20	6		0.1 · 0.4 <sup>2)</sup>			
	22	6.3	1 · 2.5 · 4 · 6.3	–	–	0.6
25	6		0.1 · 0.4 <sup>2)</sup>	–		
	22	8	1 · 2.5 · 4 · 6.3	–	–	0.55
32	40		6.3			
		16		12	–	0.55
40	40		6.3 · 8 · 16			
		20		15	–	0.45
50	40		8 · 16 · 20			
		32		25	–	0.4
65	65		20 · 32			
		50		38	25	0.4
80	65		32 · 50			
		80		60	40	0.35
100	89		50			
		125		95	60	0.35

<sup>1)</sup> Terms for noise level calculation according to VDMA 24422 - Edition 5.79 -

<sup>2)</sup> For  $K_{VS}$  0.001 to 0.01: Valve with micro-trim without balancing bellows

**Valve-specific correction terms**

$\Delta L_G$  · For gases and vapors:

Values as specified in the diagram in Fig. 4

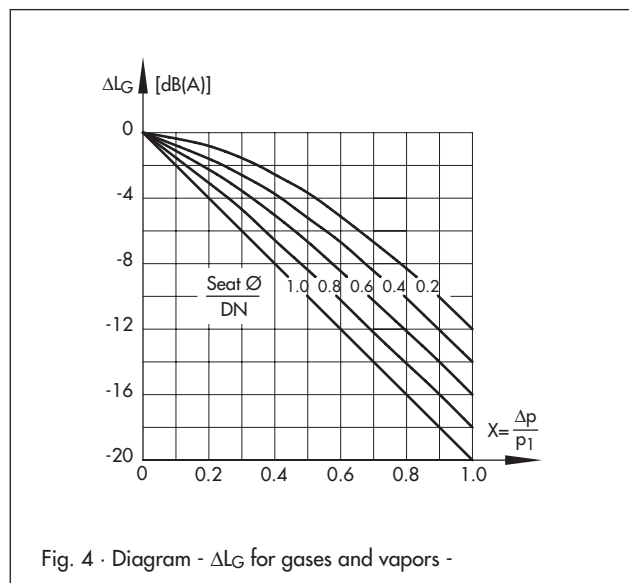


Fig. 4 · Diagram -  $\Delta L_G$  for gases and vapors -

$\Delta L_F$  · For liquids:

$$\Delta L_F = -10 \cdot (X_F - z) \cdot y$$

$$\text{with } X_F = \frac{\Delta p}{p_1 - p_v} \text{ and } y = \frac{K_v}{K_{vs}}$$

Terms for control valve sizing according to DIN IEC 534, Part 2-1 and 2-2:

$$F_L = 0.95 \quad X_T = 0.75$$

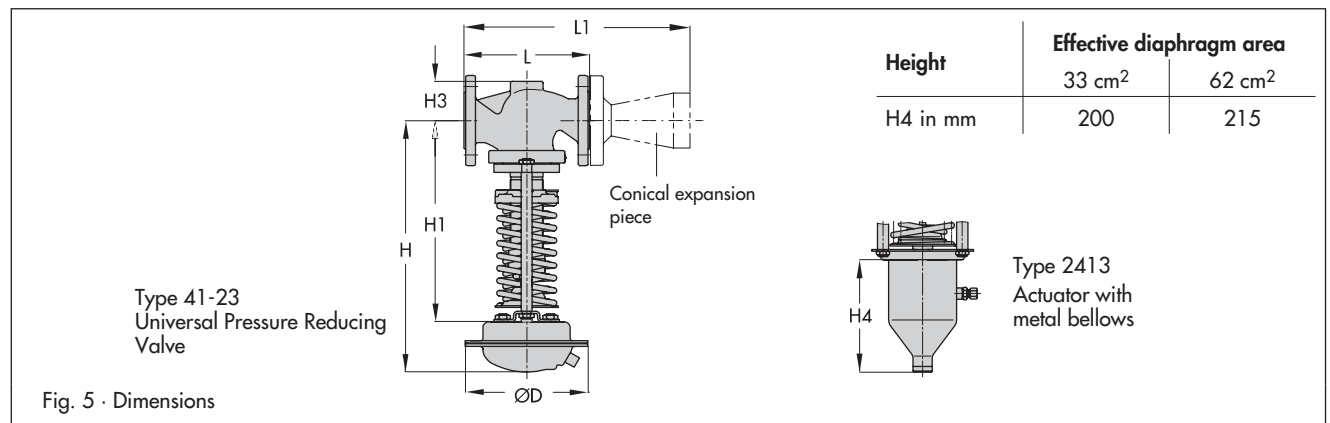
$z$  · Acoustical valve coefficient

$K_{VS}$  I,  $K_{VS}$  III · For installation of a flow divider St I or St III as a noise-reducing component · Flow characteristic differences between valves with and valves without flow dividers do not occur until the valve has passed through approx. 80 % of its travel range.

**Table 4 · Dimensions in mm and weights**

Pressure reducing valve		Type 41-23								
Nominal size	DN	15	20	25	32	40	50	65	80	100
Set point range in bar	Length L	130	150	160	180	200	230	290	310	350
	Length PN 16	220	256	278	314	337	380	464	510	556
	Length PN 40							471		570
	Height H1	335			390			510		525
	Height Other materials	55			72			100		120
H3 Forged steel	53	–	70	–	92	98	–	128	–	
0.005 to 0.03	Height H	435								
	Actuator	∅ D = 490 mm, A = 1200 cm <sup>2</sup>								
	Valve spring force F	600 N								
0.025 to 0.05	Height H	435			490			610		
	Actuator	∅ D = 490 mm, A = 1200 cm <sup>2</sup>								
	Valve spring force F	1200 N								
0.05 to 0.25	Height H	445			500			620		635
	Actuator	∅ D = 380 mm, A = 640 cm <sup>2</sup>								
	Valve spring force F	1750 N								
0.1 to 0.6	Height H	445			500			620		635
	Actuator	∅ D = 380 mm, A = 640 cm <sup>2</sup>								
	Valve spring force F	4400 N								
0.2 to 1.2	Height H	430			480			600		620
	Actuator	∅ D = 285 mm, A = 320 cm <sup>2</sup>								
	Valve spring force F	4400 N								
0.8 to 2.5	Height H	430			485			605		620
	Actuator	∅ D = 225 mm, A = 160 cm <sup>2</sup>								
	Valve spring force F	4400 N								
2 to 5	Height H	410			465			585		600
	Actuator	∅ D = 170 mm, A = 80 cm <sup>2</sup>								
	Valve spring force F	4400 N								
4.5 to 10	Height H	410			465			585		600
	Actuator	∅ D = 170 mm, A = 40 cm <sup>2</sup>								
	Valve spring force F	4400 N								
8 to 16	Height H	410			465			585		600
	Actuator	∅ D = 170 mm, A = 40 cm <sup>2</sup>								
	Valve spring force F	8000 N								
0.005 to 0.05	Weight, for cast iron <sup>1)</sup> , approx. kg	28.5	29.5	35.5	37.5	41	57	64	–	
0.05 to 0.6		22.5	23.5	29.5	31.5	35	51	58	67	
0.2 to 2.5		16	18	23.5	25.5	29	45	52	61	
2 to 16		12	13	18.5	21	24	40	47	56	

<sup>1)</sup> +10 % for cast steel, spheroidal graphite iron and forged steel



## Installation

Normally, the control valve is installed with the actuator vertically suspended. Install pipelines horizontally with a slight downward slope on both sides of the valve for drainage of the condensate.

Millibar pressure reducing valves are to be installed standing upright with the actuator pointing upwards.

For further details on installation, refer to Mounting and Operating Instructions EB 2512 EN.

The direction of medium flow must correspond with the arrow on the valve body.

- Valve and actuator are delivered separately.
- The control line must be adapted to match the onsite conditions and is not delivered with the valve; on customer request, a control line kit for the direct pressure tapping at the valve body (see accessories) is available.

## Pressure-temperature diagram

The range of application of the valves and the permissible pressures and temperatures are limited by the pressure-temperature diagram and the nominal pressure ratings (according to DIN 2401).

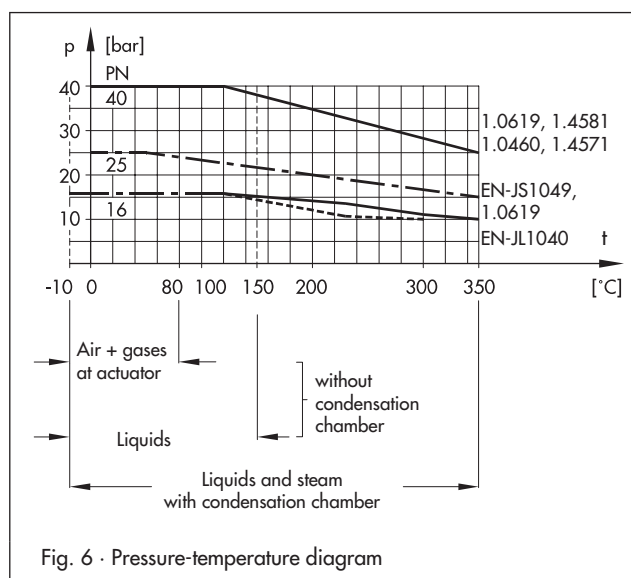


Fig. 6 · Pressure-temperature diagram

## Accessories

- Screw joints for connection of the control line  $\frac{3}{8}$ " to the filler neck. Other screw joints are available on request.
- Condensation chamber for steam condensation and protection of the operating diaphragm against extreme temperatures. This chamber is necessary for steam and liquids above 150 °C.
- Control line kit - optionally with or without condensation chamber - for direct attachment to the valve and actuator (pressure tapped directly at the valve body, for set points  $\geq 2$  bar).
- Conical expansion piece to double the nominal outlet diameters, available in sizes DN 15/32 to DN 100/200, nominal pressures PN 16 or 40.

Detailed information on accessories can be found in Data Sheet T 2595 EN.

## Ordering text

Universal Pressure Reducing Valve **Type 41-23**

Extended version ...

DN ...

PN ...

Body material ...

$K_{VS}$  ...

Set point range ... bar

Optionally, accessories ... (see T 3095 EN)

Optionally, special version ...

Specifications subject to change without notice.



SAMSON AG · MESS- UND REGELTECHNIK  
Weismüllerstraße 3 · 60314 Frankfurt am Main · Germany  
Phone +49 69 4009-0 · Fax +49 69 4009-1507  
Internet: <http://www.samson.de>

**T 2512 EN**