DATA SHEET

T 8387-3 EN

Type 3731-3 Electropneumatic Ex d Positioner

with HART® communication

CE Ex certified

Application

Single-acting or double-acting Ex d positioner for attachment to pneumatic control valves. Self-calibrating, automatic adaptation to valve and actuator.

Set point	**4 to 20 mA**
Valve travel	**3.6 to 200 mm**
Opening angle	**24 to 100°**

The positioner ensures a predetermined assignment of the valve position (controlled variable x) to the input signal (set point w). It compares the input signal received from a control system to the travel or rotational angle of the control valve and issues a corresponding output signal pressure (output variable y).

Special features

- Simple attachment to all common linear and rotary actuators with interface for SAMSON direct attachment, NAMUR rib or valves with rod-type yokes according to IEC 60534-6-1 or to rotary actuators according to VDI/VDE 3845
- Any desired mounting position of the positioner (but not suspended)
- Simple one-knob, menu-driven operation also in hazardous areas
- LCD easy to read in any mounting position thanks to selectable reading direction
- Configurable with a computer over the SSP interface using the TROVIS-VIEW software
- Variable, automatic start-up with four different initialization modes
- Preset parameters - only values deviating from the standard need to be adjusted
- Calibrated travel sensor without gears susceptible to wear
- Sub (substitution) initialization mode allows the positioner to be started up in case of emergency whilst the plant is running without having to change the valve position.
- All parameters saved in non-volatile EEPROM
- Two-wire system with a small electrical load of 450 Ω at 20 mA
- Adjustable output pressure limitation
- Adjustable tight-closing function

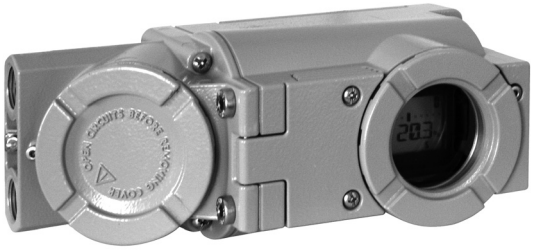

Fig. 1: *Type 3731-3 Electropneumatic Ex d Positioner with HART® communication*

- Continuous zero monitoring
- Integrated temperature sensor and operating hours counter
- Self-diagnostics; messages according to NAMUR Recommendation NE 107, optionally issued by an analog position transmitter
- Integrated EXPERTplus diagnostics for control valves (▶ T 8389)

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Versions

Electropneumatic positioner with LCD, on-site operation, local communication with SSP interface, diagnostics

Additional options

- Binary contact, output acc. to NAMUR (EN 60947-5-6) or directly to PLC, configurable as a limit switch or fault alarm output
- Binary input
- Analog position transmitter with two-wire transmitter
- Forced venting (solenoid valve function)

Principle of operation

The positioner is mounted on pneumatic control valves and used to assign the valve position (controlled variable x) to the control signal (reference variable w). The positioner compares the electric control signal of a control system to the travel or rotational angle of the control valve and issues a signal pressure (output variable y) for the pneumatic actuator.

The positioner mainly consists of an electric travel sensor system (2), an analog i/p module with a downstream air booster and the electronics with the microcontroller (5).

When a set point deviation occurs, the actuator is either vented or filled with air. Using the software, the signal pressure to the actuator can be limited to 1.4, 2.4 or 3.7 bar.

A constant air stream with a fixed set point to the atmosphere is created by flow regulator (9) with a fixed set point. The i/p module (6) is supplied with a constant upstream pressure by the pressure reducer (8) to make it independent of the supply air pressure.

Operation also in hazardous areas

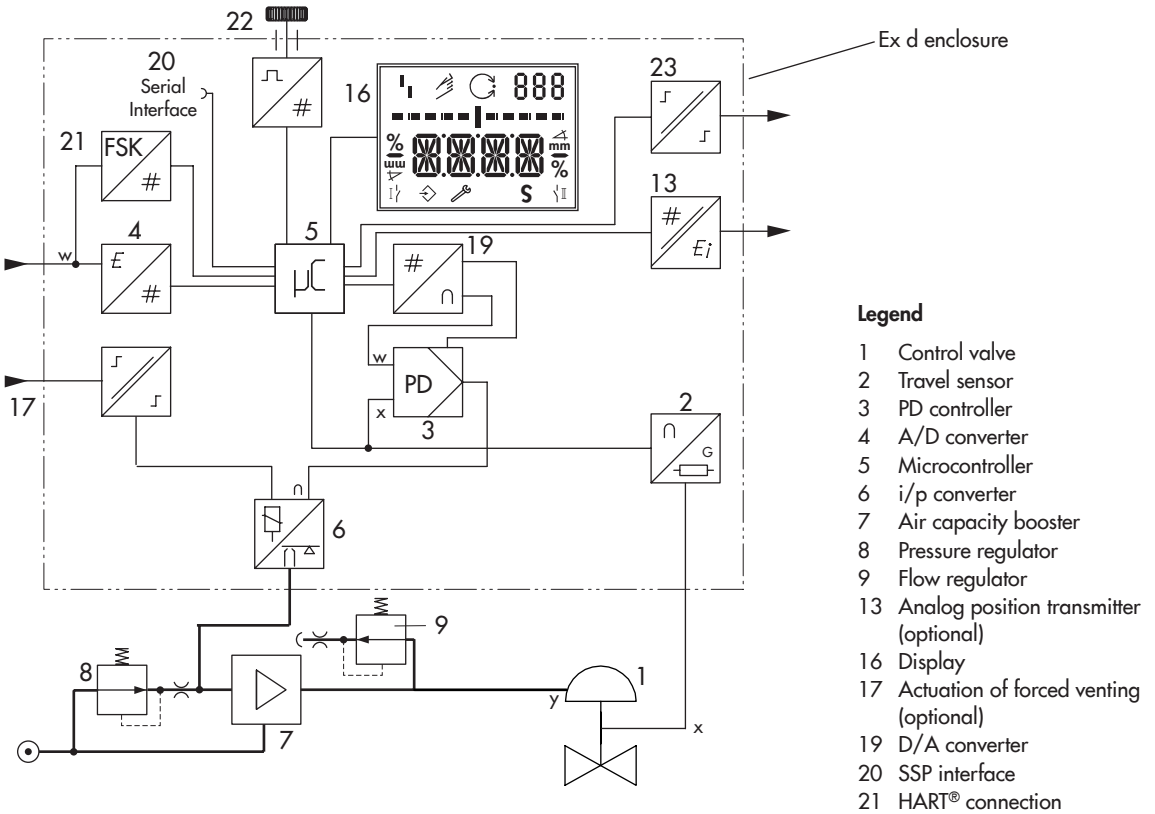
The rotary pushbutton and display are accessible without having to open the positioner housing. As result, the positioner is still fully operable under hazardous area conditions.

The positioner is operated with a user-friendly rotary pushbutton. The parameters are selected by turning the button, pushing it activates the required setting. In the menu, all parameters are listed in one level, eliminating the need to search in submenus. All parameters can be checked and changed on site.

All values are displayed on the LCD. The reading direction of the LCD can be rotated by 180°.

To configure the positioner with SAMSON's TROVIS-VIEW software, the positioner is equipped with an additional digital interface to be connected to the RS-232 or USB interface of a computer.

All parameters can be accessed using HART® communication.



Legend

1 Control valve
2 Travel sensor
3 PD controller
4 A/D converter
5 Microcontroller
6 i/p converter
7 Air capacity booster
8 Pressure regulator
9 Flow regulator
13 Analog position transmitter (optional)
16 Display
17 Actuation of forced venting (optional)
19 D/A converter
20 SSP interface
21 HART® connection
22 Rotary pushbutton
23 Binary output (optional)

Fig. 2: *Circuit diagram of Type 3731-3 Ex d Positioner*

Table 1: *Technical data*

Type 3731-3 Positioner (technical data in test certificates additionally apply to explosion-protected devices)		
Rated travel	Adjustable	Direct attachment to Type 3277 Actuator: 3.6 to 30 mm Attachment according to IEC 60534-6-1: 3.6 to 300 mm Rotary actuators: 24 to 100° opening angle
Travel range	Adjustable	Adjustable within the initialized travel/angle of rotation; travel can be restricted to 1/5 at the maximum
Reference variable w	Signal range	4 to 20 mA · Two-wire device, reverse polarity protection · Minimum span 4 mA
	Static destruction limit	40 V · Internal current limit 60 mA
Use in safety-instrumented systems acc. to IEC 61508		Suitable for use in safety-instrumented systems up to SIL 2 (single device) and SIL 3 (with redundant configuration) Type 3731-3xxxxxx**1**..: Emergency shutdown at a reference variable ≤3.85 mA ± 0.05 mA
Minimum current		3.6 mA for display Load impedance ≤9 V corresponding to 450 Ω at 20 mA
Communication		
Local communication		SAMSON SSP interface and serial interface adapter
Software requirements (SSP)		TROVIS-VIEW with database module 3731-3
HART® communication		HART® field communication protocol Impedance in HART® frequency range: Receiving approx. 455 Ω · Sending approx. 185 Ω
Software requirements (HART®)	For handheld communicator	Device description for Type 3731-3
	For computer	DTM file certified according to specification 1.2, suitable for integrating the device into frame applications that support the use of FDT/DTM (e.g. PACTware); Integration into AMS™ Suite available
Supply	Supply air	Type 3731-321, Type 3731-327: 1.4 to 7 bar (20 to 105 psi), Type 3731-323: 1.4 to 6 bar (20 to 90 psi)
	Air quality acc. to ISO 8573-1 (2004 edition)	Maximum particle size and density: Class 4 · Oil content: Class 3 Pressure dew point: Class 3 or at least 10 K below the lowest ambient temperature to be expected
Signal pressure (output)		0 bar up to the supply pressure · Can be limited to 1.4 bar/2.4 bar/3.7 bar ±0.2 bar by software
Characteristic		Linear/Equal percentage/Reverse equal percentage Butterfly valve, rotary plug valve or segmented ball valve: Linear/equal percentage User-defined: adjustable over operating software
	Deviation	≤1 %
Hysteresis		≤0.3 %
Sensitivity		≤0.1 %
Transit time		Exhaust and supply adjustable separately up to 240 s by software
Direction of action		Reversible
Air consumption	Steady state	Independent of supply air, approx. 110 l_n/h
Air output capacity	Actuator (supply)	At Δp = 6 bar: 8.5 m_n^3/h · At Δp = 1.4 bar: 3.0 m_n^3/h · $K_{Vmax(20\ °C)}$ = 0.09
	Actuator (exhaust)	At Δp = 6 bar: 14.0 m_n^3/h · At Δp = 1.4 bar: 4.5 m_n^3/h · $K_{Vmax(20\ °C)}$ = 0.15
Permissible ambient temperature		–40 to +80 °C · The limits in the test certificate additionally apply.
Permissible storage temperature		–60 to 80 °C
Influences	Temperature	≤0.2 %/10 K
	Supply	None
	Effect of vibration	≤0.25 % up to 2000 Hz and 4 g according to IEC 770
Electromagnetic compatibility		Complying with EN 61000-6-2, EN 61000-6-3, EN 61326-1 and NAMUR Recommendation NE 21
Electrical connections		Two tapped holes ½ NPT or optionally M20x1.5 · Screw terminals for 2.5 mm² wire cross-section

Type 3731-3 Positioner (technical data in test certificates additionally apply to explosion-protected devices)		
Degree of protection	IP66/NEMA 4X	
Conformity	CE	
Explosion protection		
	See Table 2	
Materials		
Enclosure	Die-cast aluminum EN AC-AlSi10Mg (Fe) (EN AC-43400) acc. to DIN 1706 · Chromate and powder coating	
External parts	Stainless steel 1.4301/1.4404(316L)/1.4310	
Weight	Approx. 2.5 kg	
Optional binary output	Software limit switch or fault alarm output galvanically isolated, optionally NAMUR (EN 60947-5-6) or PLC	
Signal state	Terminals B-C Switching output AC/DC (PLC)	Terminals A-B
	Conducting/residual voltage <1.7 V	Non-conducting/≥2.2 mA
	Non-conducting/high resistance, I <100 µA	Conducting/≤1.0 mA
Operating voltage	Switching capacity: 40 V DC/28 V AC/0.3 A Static destruction limit: 45 V DC/32 V AC/0.4 A	Only for connection to NAMUR switching amplifier according to EN 60947-5-6
Optional binary input	Galvanically isolated · Configurable switching behavior	
Active switching behavior		
Connection	For external switch (floating contact)	
Electric data	Open-circuit voltage when contact is open: max. 10 V · Pulsed DC current reaching peak value of 100 mA	
Contact – Closed	ON switching state	
Contact – Open	OFF switching state	
Passive switching behavior		
Connection	For externally applied DC voltage, reverse polarity protection	
Electric data	0 to 24 V, static destruction limit 40 V, input resistance 6.5 kΩ	
Voltage – >6 V	ON switching state	
Voltage – <4 V	OFF switching state	
Optional forced venting	Galvanic isolation	
Input	0 to 40 V DC/0 to 28 V AC, static destruction limit 45 V DC/32 V AC, input resistance ≥7 kΩ	
Signal	Fail-safe position at input voltage <3 V	Normal operation at input voltage >5.5 V
Optional analog position transmitter	Two-wire transmitter	
Supply	11 to 35 V DC, reverse polarity protection, static destruction limit 45 V DC	
Output signal	4 to 20 mA	
Direction of action	Reversible	
Operating range	–1.25 to 103 % of the travel range, corresponding to 3.8 to 20.5 mA Optionally also for fault alarm indication over 2.4 or 21.6 mA according to NAMUR Recommendation NE 43	
Characteristic	Linear	
Hysteresis and high-frequency influence	Same as positioner	
Other influences	Same as positioner	

Table 2: *Explosion protection certificates*

Type		Certification			Type of protection/comments
3731	-321	EC type examination certificate	Number	PTB 11 ATEX 1014 X	II 2G Ex db IIC T6 Gb, II 2G Ex db eb IIC T6 Gb II 2G Ex db [ia Ga] IIC T6 Gb II 2G Ex ia IIC T6 Ga II 2D Ex tb IIIC T80°C Db
			Date	2019-04-08	
		EAC	Number	RU C-DE. HA65.B.00510/20	1Ex d IIC T6/T5/T4 Gb X 1Ex d e IIC T6/T5/T4 Gb X Ex tb IIIC T 80 °C Db X
			Date	2020-03-18	
			Valid until	2025-03-18	
		CCC Ex	Number	2020322307002427	Ex db IIC T4...T6 Gb Ex db eb IIC T4...T6 Gb Ex tb IIIC T80 °C Db
			Date	2023-04-29	
		CCoE	Number	A/P/HQ/MH/104/8144	Ex db IIC T6 Gb
			Date	2024-04-26	
		ECAS Ex	Number	24-04-108072/E24-04-111714/NB0007	Ex db IIC T6 Gb Ex db eb IIC T6 Gb Ex tb IIC T80 °C Db
			Date	2023-04-23	
		IECEx	Number	IECEx PTB 11.0084X	Ex d IIC T6, T5, T4 Gb Ex d e IIC T6, T5, T4 Gb Ex tb IIIC T80°C Db IP66
			Date	2011-09-14	
		INMETRO	Number	IEx 13.0193X	Ex d IIC T* Gb Ex de IIC T* Gb Ex tb IIIC T80°C Db
			Date	2022-08-28	
		KCS	Number	13-KB4BO-0036	Ex d IIC T6/T5/T4
			Date	2013-01-31	
			Valid until	2023-01-31	
		NEPSI	Number	GYJ23.1088X	Ex db IIC T4...T6 Gb Ex db eb IIC T4...T6 Gb Ex tb IIIC T80°C Db
			Date	2023-04-29	
		TR CMU 1055	Number	ZETC/35/2021	II 2G Ex db IIC T6 Gb II 2G Ex db eb IIC T6 Gb II 2G Ex db [ia Ga] IIC T6 Gb II 2G Ex ia IIC T6 Ga II 2D Ex tb IIIC T80 °C Db IP66
			Date	2021-07-26	
			Valid until	2024-07-25	
	-323	**CSA**	Number	1709815	Class I, Zone 1, Group IIB+H2 T4...T6 Class I, Div. 1+2, Groups B, C, D T4...T6 Class II, Div. 1, Groups E, F, G
			Date	2005-10-04	
		FM	Number	3024956	Class I, Div. 1+2, Groups B, C, D Class I, Zone 1, Groups IIB+H2 Class I, Div. 1+2 Groups E, F, G; Class III
			Date	2006-01-30	
	-324	EAC	Number	RU C-DE. HA65.B.00510/20	1Ex d IIC T6/T5/T4 Gb X Ex tb IIIC T 80 °C Db X
			Date	2020-03-18	
			Valid until	2025-03-18	
	-327	**JIS**	Number	TC17747	Ex d IIC T6
			Date	2024-09-12	

Mounting the positioner

The Type 3731-3 Positioner can be attached directly to the SAMSON Type 3277 Actuator, to control valves with cast yokes or rod-type yokes according to IEC 60534-6 (NAMUR) or to rotary actuators according to VDI/VDE 3845.

Required mounting parts and accessories are listed in the Mounting and Operating Instructions ▶ EB 8387-3.

Direct attachment

The positioner can be attached directly to the Type 3277 Actuator over a connection block. In actuators with fail-safe action "Actuator stem extends" and Type 3277-5 Actuator (120 cm²), the signal pressure is routed over an internal hole in the actuator yoke to the actuator. In actuators with fail-safe action "Actuator stem retracts" and in actuators with effective diaphragm areas of 240 cm² or larger, the signal pressure is routed to the actuator over ready-made external piping.

Attachment according to IEC 60534-6 (NAMUR)

The positioner is mounted according to IEC 60534-6-1 and NAMUR recommendation using a NAMUR bracket on the yoke of the control valve. The positioner can be mounted on either side of the control valve.

Attachment to rotary actuators

The positioner must be fitted with an adapter housing and spacers to attach it to rotary actuators according to VDI/VDE 3845.

Another common mounting kit suitable for SAMSON Type 3278 Rotary Actuator and VETEC Types S160 and R Actuators is available.

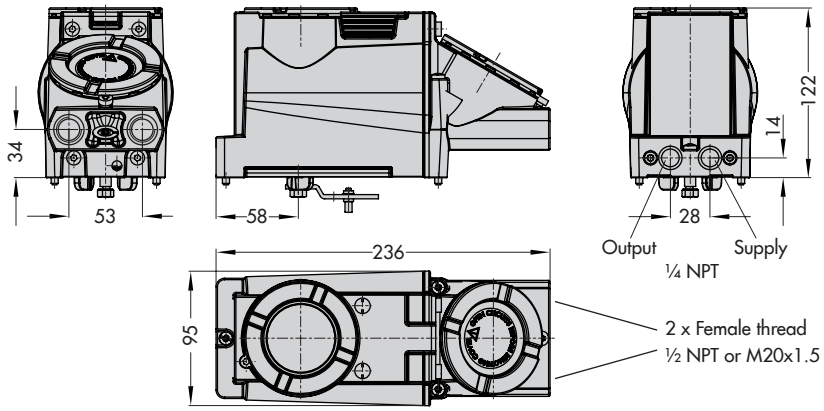
Ordering text

Type 3731-3... Positioner

- With pneumatic connecting rail ISO 228/1-G ¼
- Without/with pressure gauge for signal pressure indication
- Attachment to Type 3277 Actuator (120 to 700 cm²)
- Attachment according to IEC 60534-6-1 (NAMUR)
- Travel: ... mm, if applicable, rod diameter: … mm
- Attachment to Type 3278 Rotary Actuator (160 cm²)
- Attachment to rotary actuators according to VDI/VDE 3845
- Pneumatic reversing amplifier for double-acting actuators with connection acc. to ISO 228/1-G ¼ or ¼-18 NPT

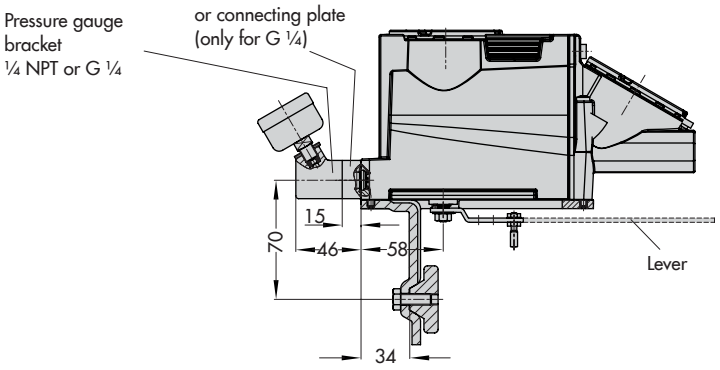
Dimensions in mm

Direct attachment



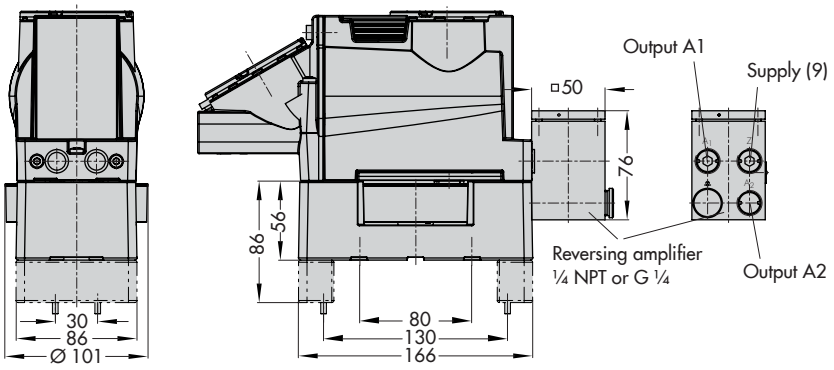
1)

Attachment according to IEC 60534-6 and NAMUR



2)

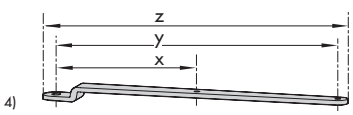
Attachment to rotary actuators



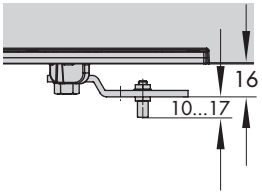
3)

Lever

Lever	x	y	z
S	17 mm	25 mm	33 mm
M	25 mm	50 mm	66 mm
L	70 mm	100 mm	116 mm
XL	100 mm	200 mm	216 mm



4)



5)

Article code

Positioner	Type 3731- 3	x	x	x	x	x	x	x	0	0	x	1	x	0	0	0
With LCD, autotune, HART® communication																
Explosion protection																
ATEX	II 2G Ex db IIC T6 Gb, II 2G Ex db eb IIC T6 Gb II 2G Ex db [ia Ga] IIC T6 Gb II 2G Ex ia IIC T6 Ga II 2D Ex tb IIIC T80°C Db	2	1													
FM	Class I, Div. 1+2, Groups B, C, D Class I, Zone 1, Groups IIB+H2 Class I, Div. 1+2 Groups E, F, G; Class III	2	3													
CSA	Class I, Zone 1, Group IIB+H2 T4...T6 Class I, Div. 1+2, Groups B, C, D T4...T6 Class II, Div. 1, Groups E, F, G															
EAC Ex	1Ex d IIC T6/T5/T4 Gb X Ex tb IIIC T 80 °C Db X	2	4													
JIS	Ex d IIC T6	2	7													
Option																
Without				0	0											
Position transmitter				0	1											
Binary input				0	3											
Forced venting function				0	5											
Binary output (NAMUR/PLC)				0	6											
Diagnostics																
EXPERTplus for control valves						4										
Electrical threaded connections																
2x M20x1.5							1									
2x ½ NPT							2									
Failure behavior																
Emergency shutdown at a set point lower than 3.85 mA								1								
Explosion protection certificate																
CCC Ex	Ex db IIC T4...T6 Gb Ex db eb IIC T4...T6 Gb Ex tb IIIC T80 °C Db	2	1								1					
IECEx	Ex d IIC T6, T5, T4 Gb Ex d e IIC T6, T5, T4 Gb Ex tb IIIC T80°C Db IP66	2	1								2					
CCoE	Ex db IIC T6 Gb															
ECAS Ex	Ex db IIC T6 Gb Ex db eb IIC T6 Gb Ex tb IIC T80 °C Db	2	1													
EAC Ex	1Ex d IIC T6/T5/T4 Gb X 1Ex d e IIC T6/T5/T4 Gb X Ex tb IIIC T 80 °C Db X	2	1								3					
KCS	Ex d IIC T6/T5/T4	2	1								5					
INMETRO	Ex d IIC T* Gb Ex de IIC T* Gb Ex tb IIIC T80°C Db	2	1								6					
NEPSI	Ex db IIC T4...T6 Gb Ex db eb IIC T4...T6 Gb Ex tb IIIC T80°C Db	2	1								1					
TR CMU 1055	II 2G Ex db IIC T6 Gb II 2G Ex db eb IIC T6 Gb II 2G Ex db [ia Ga] IIC T6 Gb II 2G Ex ia IIC T6 Ga II 2D Ex tb IIIC T80 °C Db IP66	2	1								7					
Special applications																
Without													0			
Special version																
Without														0	0	0