

Non-contacting multi-channel speed sensor type FAHU52 with stainless steel flange housing and sensor tube



Scanning type	Non-contacting
Measuring principle	Hall principle
Frequency range	0.2 ... 20,000 Hz (*)
Supply voltage	For each integrated sensor system: 9 ... 32 VDC
Scanning object	Ferromagnetic materials
Protection class	Housing: IP66/IP68/IP69
Material	Flange: Stainless steel
Length	See customer drawing
Mounting	Via flange mounting
Measuring channels	Up to four galvanically isolated measuring channels with voltage or current output signal
Output signal and signal type	4 square wave signals
Output stage	Push-pull amplifier
Options	Different signal types (see overview in this document)



Speed sensor FAHU52

(*) 0 Hz on request

Application range

Speed sensors type series FAHU52 are especially designed for use in transport technology and machinery and equipment. They usually measure the speed of ferromagnetic toothed wheels (e. g. steel). Furthermore, they can be used to measure any movement of ferromagnetic materials, e. g.:

- Toothed wheels with different tooth forms
- Bolt heads
- Holes, openings or grooves
- Impulse bands for plain shafts (accessories)

Specific features

- Robust and high quality housing: IP69 pressure-tight and individually tested at 5 bar (for details see technical data)
- Up to four galvanically isolated measuring channels in one enclosure with voltage or current output signal
- Excellent vibration and shock resistance
- High degree of EMC immunity for difficult electrical environment
- Connection outlet straight or lateral; with protective tubing on request
- Due to its design and type approval according to DIN EN 50155 especially suitable for transport technology

Measuring principle

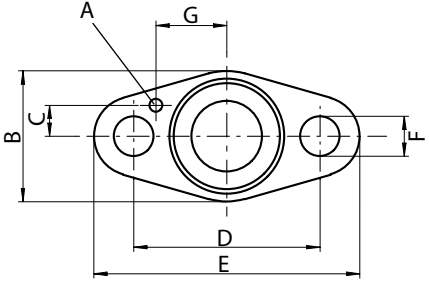
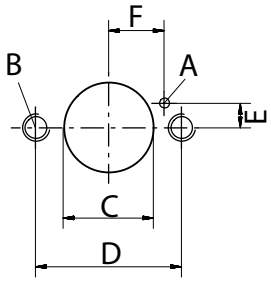
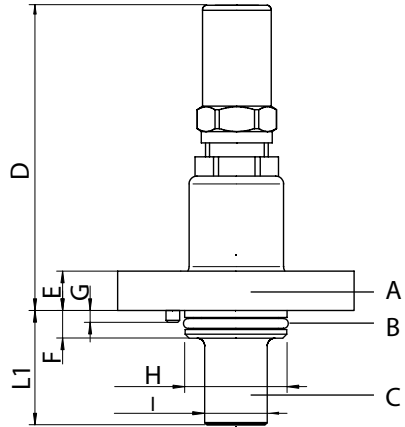
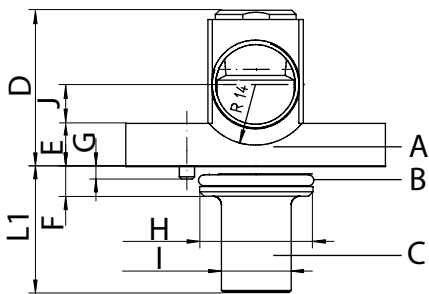
A field of a magnet generates a constant voltage in the Hall elements. Ferromagnetic objects with an interrupted surface cause the Hall voltage to change as they pass the Hall elements. The frequency of the change of the Hall voltage is proportional to the speed of movement (rotational speed). The speed sensor converts this change into an electric signal.

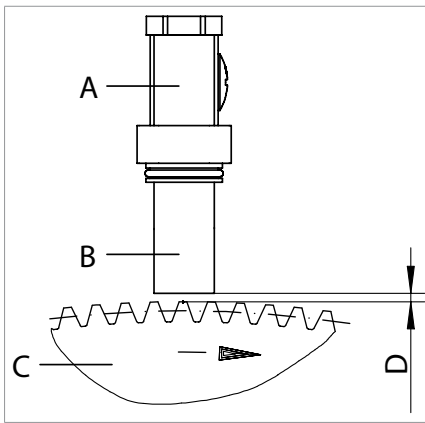
Overview speed sensors FAHU52

Typ	Measuring principle	Signal outputs	Signal form
FAHU52[..]-U01 FAHU52[..]-U11	Hall	Four galvanically isolated square wave signals, Q1 to Q2 and Q3 to Q4 are 90° phase shifted Type -U01: voltage output Type -U11: current output	
FAHU52[..]-U02 FAHU52[..]-U12	Hall	Two square wave signals + two galvanically isolated square wave signals, Q1 to Q2 and Q3 to Q4 are 90° phase shifted Type -U02: voltage output Type -U12: current output	
FAHU52[..]-U03 FAHU52[..]-U13	Hall	Two galvanically isolated measuring systems, each with two square wave signals, Q1 to Q2 and Q3 to Q4 are 90° phase shifted Type -U03: voltage output Type -U13: current output	
FAHU52[..]-U21	Hall	Four galvanically isolated square wave signals, Q1 to Q2 and Q3 to Q4 are 90° phase shifted Q1, Q2 with voltage output Q3, Q4 with current output	

Typ	Measuring principle	Signal outputs	Signal form
FAHU52[...]-U22	Hall	Two square wave signals + two galvanically isolated square wave signals, Q1 to Q2 and Q3 to Q4 are 90° phase shifted Q1, Q2 with voltage output Q3, Q4 with current output	
FAHU52[...]-U23	Hall	Two square wave signals + two galvanically isolated square wave signals, Q1 to Q2 and Q3 to Q4 are 90° phase shifted Q1, Q2 with current output Q3, Q4 with voltage output	
FAHU52[...]-U24	Hall	Two galvanically isolated measuring systems, each with two square wave signals, Q1 to Q2 and Q3 to Q4 are 90° phase shifted Q1, Q2 with voltage output Q3, Q4 with current output	

Dimensions, connections and drawings

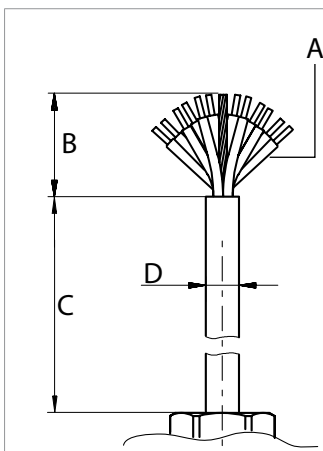
 <p>Fig.: FA[..]52_Front View_Dimensions</p>	<p>Explanation to the left illustration</p> <ul style="list-style-type: none"> A) Locator pin 3 mm (installing position) acc. DIN1481-3 B) Length 29 mm C) Length 7 mm D) Length 42 mm E) Length 60 mm F) $\varnothing 9^{-0.5}$ mm G) Length 16 mm
 <p>Fig.: Borehole for FA[..]52_Top view</p>	<p>Explanation to the left illustration</p> <ul style="list-style-type: none"> A) Borehole depth for locator pin 3 mm (installing position) acc. DIN1481-3, borehole $\varnothing 4$ to 5 mm B) Borehole size M8 C) $\varnothing 26^{H10}$ mm D) Length $42^{\pm 0.2}$ mm E) Length 7 mm F) Length 16 mm <p>Recommended fixing: Hexagon socket screw DIN912 M8x20 with spring washer.</p>
 <p>Fig.: FA[..]52_Straight connection outlet</p>	<p>Explanation to the left illustration</p> <ul style="list-style-type: none"> A) Flange: Stainless steel B) O-ring 21 x 2.5 mm C) Sensor tube: Stainless steel D) Length 53...78 mm (depending on connection) L1) Nominal length L1 (see type code) E) Length 10 mm F) Length 7 mm G) Length 3 mm H) $\varnothing 26^{d10}$ mm I) $\varnothing 20$ mm
 <p>Fig.: FA[..]52_lateral connection outlet</p>	<p>Explanation to the left illustration</p> <ul style="list-style-type: none"> A) Flange: Stainless steel B) O-ring 21 x 2.5 mm C) Sensor tube: Stainless steel D) Length $36^{\pm 1}$ mm (for $L1 \geq 39$ mm) Length $46^{\pm 1}$ mm (for $L1 < 39$ mm) L1) Nominal length L1 (see type code) E) Length 10 mm F) Length 7 mm G) Length 3 mm H) $\varnothing 26^{d10}$ mm I) $\varnothing 20$ mm J) Length 9 mm



Explanations to the left illustration

- A) Sensor housing (flange)
- B) Sensor tube
- C) Toothed Wheel
- D) Recommended distance from scanning object see technical data

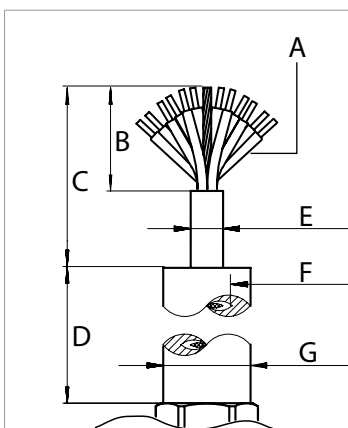
Connection cable type -X for sensors with 12 connecting wires



Explanation to the left illustration

- A) Wires 12 x 0.33 mm² halogen-free
- B) Length 80 ±¹⁰ mm
- C) Length K1 ±^{5%} (K1 see customer drawing)
- D) Ø 7.7 ±^{0.5} mm

Connection cable type -XGS[..], -XGT[..] (protective tubing steel or textile reinforced) for sensors with 12 connecting wires



Explanation to the left illustration

- A) Wires 12 x 0.33 mm² halogen-free
- B) Length 80 ±¹⁰ mm
- C) Length 200 ±²⁰ mm
- D) Length K1 ±^{5%} (K1 see customer drawing)
- E) Ø 7.7 ±^{0.5} mm
- F) Ø 9.5 ±^{0.5} mm
- G) Ø 16.5 ±^{0.5} mm

Connection cable type -XP[.] (polyamide protective tubing) for sensors with 12 connecting wires

	<p>Explanation to the left illustration</p> <p>A) Wires 12 x 0.33 mm² halogen-free B) Length 80 ±¹⁰ mm C) Length 200 ±²⁰ mm D) Length K1 ± 5% (K1 see customer drawing) E) Ø 7.7 ±^{0.5} mm F) Ø 9.6 ±^{0.5} mm G) Ø 13 ±^{0.5} mm</p>
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Connection assignment for type -U01, -U11, -U21

Colour	Explanation -U01	Explanation -U11	Explanation -U21
Brown (System 1)	U _{S1} +	U _{S1} +	U _{S1} +
Green (System 1)	U _{S1} - (0V)	Not connected	U _{S1} - (0V)
White (System 1)	Signal Q1	Signal Q1	Signal Q1
Pink (System 2)	U _{S2} +	U _{S2} +	U _{S2} +
Grey (System 2)	U _{S2} - (0V)	Not connected	U _{S2} - (0V)
Yellow (System 2)	Signal Q2	Signal Q2	Signal Q2
Red (System 3)	U _{S3} +	U _{S3} +	U _{S3} +
Black (System 3)	U _{S3} - (0V)	Not connected	Not connected
Blue (System 3)	Signal Q3	Signal Q3	Signal Q3
Grey/Pink (System 4)	U _{S4} +	U _{S4} +	U _{S4} +
Red/Blue (System 4)	U _{S4} - (0V)	Not connected	Not connected
Magenta (System 4)	Signal Q4	Signal Q4	Signal Q4
Shield	Ground	Ground	Ground

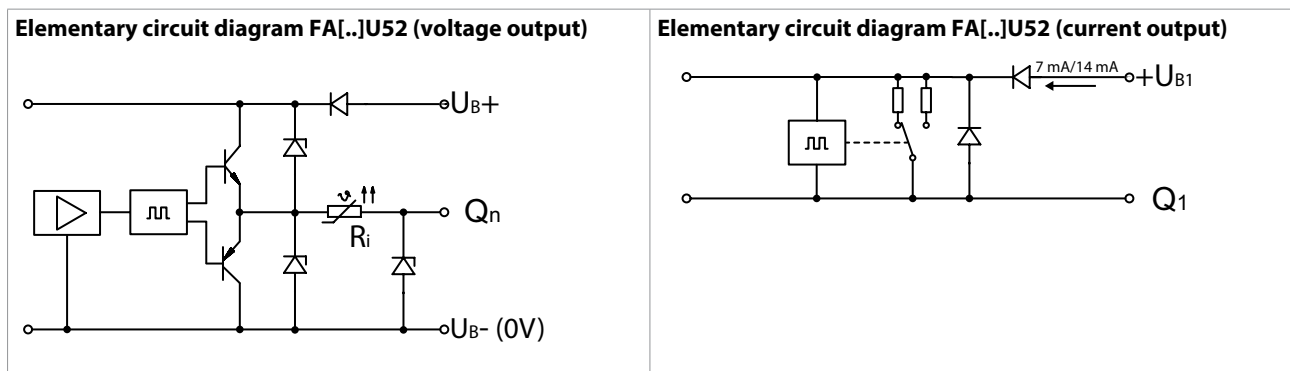
Connection assignment for type FA[.]-U02

Colour	Explanation -U02	Explanation -U12	Explanation -U22	Explanation -U23
Brown (System 1)	U _{S1} +	U _{S1} +	U _{S1} +	U _{S1} +
Green (System 1)	U _{S1} - (0V)	Not connected	U _{S1} - (0V)	Not connected
White (System 1)	Signal Q1	Signal Q1	Signal Q1	Signal Q1
Yellow (System 1)	Signal Q2	Signal Q2	Signal Q2	Signal Q2
Pink (System 2)	U _{S2} +	U _{S2} +	U _{S2} +	U _{S2} +
Grey (System 2)	U _{S2} - (0V)	Not connected	Not connected	U _{S2} - (0V)
Blue (System 2)	Signal Q3	Signal Q3	Signal Q3	Signal Q3
Red (System 3)	U _{S3} +	U _{S3} +	U _{S3} +	U _{S3} +
Black (System 3)	U _{S3} - (0V)	Not connected	Not connected	U _{S3} - (0V)
Magenta (System 3)	Signal Q4	Signal Q4	Signal Q4	Signal Q4
Grey/Pink	Not connected	Not connected	Not connected	Not connected
Red/Blue	Not connected	Not connected	Not connected	Not connected
Shield	Ground	Ground	Ground	Ground

Connection assignment for type FA[...]-U03

Colour	Explanation –U03	Explanation –U13	Explanation –U24
Brown (System 1)	U _{S1} +	U _{S1} +	U _{S1} +
Green (System 1)	U _{S1} - (0V)	Not connected	U _{S1} - (0V)
White (System 1)	Signal Q1	Signal Q1	Signal Q1
Yellow (System 1)	Signal Q2	Signal Q2	Signal Q2
Pink (System 2)	U _{S2} +	U _{S2} +	U _{S2} +
Grey (System 2)	U _{S2} - (0V)	Not connected	Not connected
Blue (System 2)	Signal Q3	Signal Q3	Signal Q3
Magenta (System 2)	Signal Q4	Signal Q4	Signal Q4
Black	Not connected	Not connected	Not connected
Red	Not connected	Not connected	Not connected
Grey/Pink	Not connected	Not connected	Not connected
Red/Blue	Not connected	Not connected	Not connected
Shield	Ground	Not connected	Not connected

Elektrischer Anschluss – Prinzipschaltbild



General technical data

Electrical connection	
Supply voltage	See specific technical data
Nominal voltage	See specific technical data
Current consumption	See specific technical data
Reverse voltage protection	Yes
Over voltage protection	Yes
Connection	Cable end, customized connections acc. customer drawing
Recommended cable length	< 100 m
Used cable cross section	0.33 mm ² , shielded

Electrical output	
Measuring channels	See specific technical data
Output signal and signal type	4 square wave signals
Output stage	Push-pull amplifier
Continuous short circuit protection	Yes
Galvanic isolation	Yes
Output level Low	Sensors with voltage signal output: Per output: $\leq 0.8 \text{ V @ 15 VDC, 10 mA, 24 }^\circ\text{C}$ Sensors with current signal output: Per output: $7 \text{ mA } \pm 2 \text{ mA @ 15 VDC, RL} = 475 \Omega, 24^\circ\text{C}$
Output level High	Sensors with voltage signal output: Per output: $\geq \text{UB}-1.6 \text{ V @ 15 VDC, 10 mA, 24 }^\circ\text{C}$ Sensors with current signal output: Per output: $14 \text{ mA } \pm 2 \text{ mA @ 15 VDC, RL} = 475 \Omega, 24^\circ\text{C}$
Output current NPN (Sink)	For voltage signal outputs: Per output: max. -50 mA
Output current PNP (Load)	For voltage signal outputs: Per output: max. 50 mA
Internal resistance Ri	For sensors with voltage signal outputs: Per system 45Ω
Rise time	$\geq 10 \text{ V}/\mu\text{s}$

Signal acquisition	
Measuring principle	Hall principle
Frequency range	0.2 ... 20,000 Hz
Scanning object - distance	0.2 ... 3 mm; recommended: $1.0 \pm 0.5 \text{ mm}$
Scanning object	Ferromagnetic materials Toothed wheel: Module m1 to m3; tooth face > 10 mm (spur gear DIN867) Hole: $\varnothing \geq 5 \text{ mm}$, web $\geq 2 \text{ mm}$, depth $\geq 4 \text{ mm}$ Groove: $\geq 4 \text{ mm}$, web $\geq 2 \text{ mm}$, depth $\geq 4 \text{ mm}$
Duty cycle	$50\% \pm 10\%$
Phase shift	Q1 to Q2 and Q3 to Q4: $90^\circ \pm 20\% @ \text{m}1.5\text{...m}3$ $90^\circ \pm 25\% @ \text{m}1\text{...m}1.25$

Environmental influences	
Operating temperature	-40 ... +120 °C
Storage temperature	Recommended: -25 ... +70 °C; max.: -40 ... +105 °C (max. limit values within 30 days per year @ relative humidity 5...95%)
Protection class	Housing: IP66/IP68/IP69 Connection: IP66/IP68; Only -XGT and -XGS: IP69
Vibration resistance	DIN IEC 60068-T2-6, 10 g @ 5...2000 Hz (Sine) DIN EN 61373, 30 g @ 20...500 Hz (Random)
Shock resistance	DIN IEC 60068-T2-27, 1000 m/s ² @ 6 ms
Climatic test	DIN IEC 60068-T2-1/-2/-30
EMI - ESD	IEC 61000-4-2, Lev. 3
EMI - Burst	IEC 61000-4-4, Lev. 3
EMI - Surge	IEC 61000-4-5, Lev. 2
EMI - HF immunity	IEC 61000-4-3, 10 V/m IEC 61000-4-6 (RF - conducted), 10 Veff IEC 60553 (AF - conducted), 10 Veff
Emitted interference	CISPR 16-1, CISPR 16-2 EMC2
Insulation voltage	500 VAC, 50 Hz @ 1 min
Further standards	DIN EN 50155, DIN EN 55016, DIN EN 50121, DIN EN 45545

Mechanical properties	
Material	Flange: Stainless steel Measuring area: Stainless steel
Mounting	Via flange mounting
Length	See customer drawing
Installation position	Preset with direction of rotation definition, with position pin defined
Installation mode	Direction sensitive
Weight	≥ 190 g (depending on connection)
Pressure resistance	5 bar (measuring area)

Specific technical data

Sensors with 4 galvanically isolated measurement systems

FAHU[...]-U01	
Supply voltage	4 x 9 ... 32 VDC
Nominal voltage	4 x 15 VDC
Current consumption	4 x < 10 mA (without output current PNP)
Measuring channels	4 galvanically isolated measuring channels (voltage output)

Sensors with 4 galvanically isolated measurement systems

FAHU[...]-U11	
Supply voltage	4 x 10 ... 30 VDC
Nominal voltage	4 x 15 VDC
Measuring channels	4 galvanically isolated measuring channels (current output)

Sensors with 3 galvanically isolated measurement systems

FAHU[...]-U02	
Supply voltage	3 x 9 ... 32 VDC
Nominal voltage	3 x 15 VDC
Current consumption	1 x < 20 mA; 2 x < 10 mA (without output current PNP)
Measuring channels	2 measuring channels + 2 galvanically isolated measuring channels (voltage output)

Sensors with 3 galvanically isolated measurement systems

FAHU[...]-U12	
Supply voltage	3 x 10 ... 30 VDC
Nominal voltage	3 x 15 VDC
Measuring channels	2 measuring channels + 2 galvanically isolated measuring channels (current output)

Sensors with 2 galvanically isolated measurement systems

FAHU[...]-U03	
Supply voltage	2 x 9 ... 32 VDC
Nominal voltage	2 x 15 VDC
Current consumption	2 x < 20 mA (without output current PNP)
Measuring channels	2 x 2 galvanically isolated measuring channels (voltage output)

Sensors with 2 galvanically isolated measurement systems

FAHU[...]-U13	
Supply voltage	2 x 10 ... 30 VDC
Nominal voltage	2 x 15 VDC
Measuring channels	2 x 2 galvanically isolated measuring channels (current output)

Sensors with 4 galvanically isolated measurement systems

FAHU[...]-U21	
Supply voltage	2 x 9 ... 32 VDC (Spannung), 2 x 10 ... 30 VDC (Strom)
Nominal voltage	4 x 15 VDC
Current consumption	Per voltage output: < 10 mA (without output current PNP)
Measuring channels	4 galvanically isolated measuring channels (2 x voltage output, 2 x current output)

Sensors with 3 galvanically isolated measurement systems

FAHU[..]-U22	
Supply voltage	1 x 9 ... 32 VDC, 2 x 10 ... 30 VDC
Nominal voltage	3 x 15 VDC
Current consumption	1 x < 20 mA (without output current PNP) (voltage)
Measuring channels	2 measuring channels + 2 galvanically isolated measuring channels (2 x current output, 2 x voltage output)

Sensors with 3 galvanically isolated measurement systems

FAHU[..]-U23	
Supply voltage	2 x 9 ... 32 VDC, 1 x 10 ... 30 VDC
Nominal voltage	3 x 15 VDC
Current consumption	2 x < 10 mA (without output current PNP) (voltage)
Measuring channels	2 measuring channels + 2 galvanically isolated measuring channels (2 x current output, 2 x voltage output)

Sensors with 2 galvanically isolated measurement systems

FAHU[..]-24	
Supply voltage	1 x 9 ... 32 VDC, 1 x 10 ... 30 VDC
Nominal voltage	2 x 15 VDC
Current consumption	1 x < 20 mA (ohne Ausgangsstrom PNP)
Measuring channels	2 galvanically isolated systems, each with 2 measuring channels (2 x current output, 2 x voltage output)

Type code

Type code structure											
FA	H	U	52-	11-	S	X	07-	M30-	S0-	U01	Example: FAHU52-11-SX07-S0-U01
Measuring principle											
Measuring principle supplement											
Construction type and material											
Nominal length L1 of the sensor tube											
Connection outlet											
Electrical connection											
Cable length											
Module											
Shield											
Signal variant											

Type code FAHU52											
Measuring principle	H	Difference-Hall									
Measuring principle supplement	U	4 output signals, galvanically isolated									
Construction type and material	52-	Flange, stainless steel sensor tube									
Nominal length	11-	L1 = 29 mm									
Connection outlet	S	Without code: straight cable outlet									
Electrical connection	X	Cable end standard (without protective tubing)									
	XGS	Cable end, protective tubing, steel reinforced									
	XGT	Cable end, protective tubing, textile reinforced									
	XP	Cable end, protective tubing, polyamide									
Sheath length	05-	Sheath length 2.0 m, halogen-free									
	07-	Sheath length 5.0 m, halogen-free									
	08-	Sheath length 7.5 m, halogen-free									
	09-	Sheath length 10.0 m, halogen-free									
Module	M10-	Module m1									
	M12-	Module m1.25									
	M15-	Module m1.5									
		Without code: Module m2									
	M25-	Module m2.5									
	M30-	Module m3									
Shield		Without code: Shield attached to the sensor housing									
	S0-	Shield not attached to the sensor housing									
Signal variants	Uxx	Output signal variants (xx see next table)									
FA	--	--	--	--	--	--	--	--	--	--	Example: FAHU52-11-X07-U01

Code	Output signals variant
U01	Four galvanically isolated output signals (voltage)
U11	Four galvanically isolated output signals (current)
U02	Two output signals + two galvanically isolated output signals (voltage)
U12	Two output signals + two galvanically isolated output signals (current)
U03	Two galvanically isolated measuring systems, each with two output signals (voltage)
U13	Two galvanically isolated measuring systems, each with two output signals (current)
U21	Four galvanically isolated output signals (Q1, Q2 voltage; Q3, Q4 current)
U22	Two output signals + two galvanically isolated output signals (Q1, Q2 voltage; Q3, Q4 current)
U23	Two output signals + two galvanically isolated output signals (Q1, Q2 current; Q3, Q4 voltage)
U24	Two galvanically isolated measuring systems, each with two output signals (Q1, Q2 voltage; Q3, Q4 current)

Special types

If our standard types do not correspond with your expectations, we are pleased to develop a special solution together with you.