



KRTM 20

Multi colour contrast scanner RGB

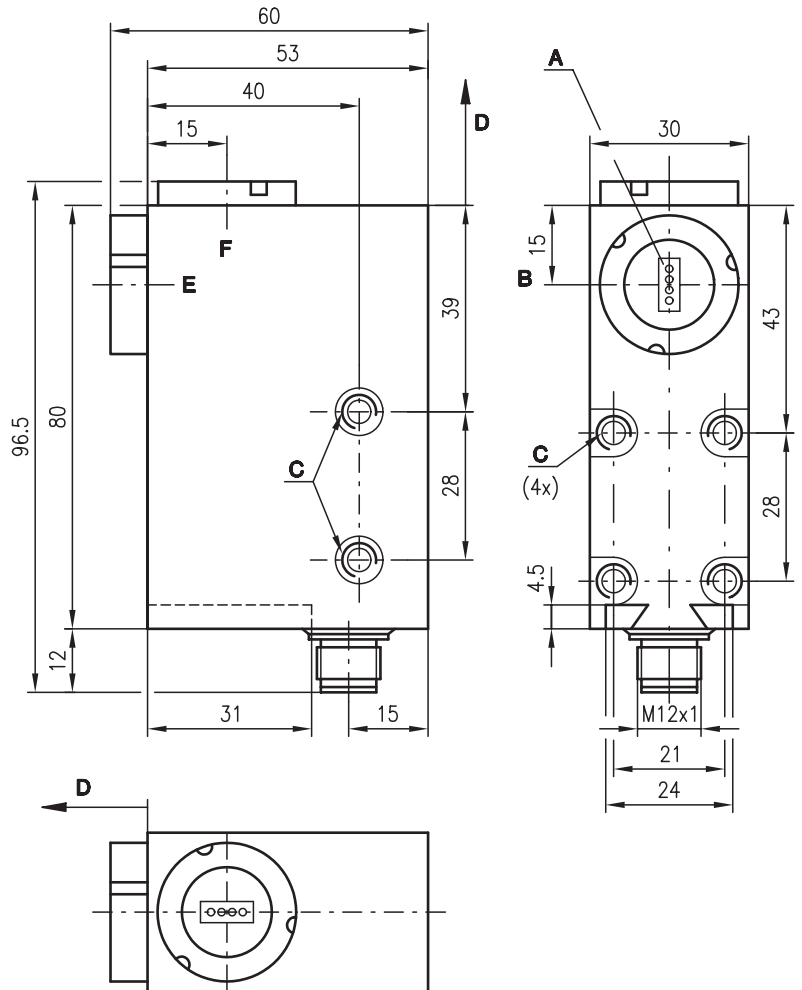


12mm
20mm
50mm



- Static teach-in procedure
- Response time digital/analogue: 20µs/ 6.25µs
- 3 transmitters in the colours red, green, blue
- Programming by means of teach-in (via button or remote calibration)

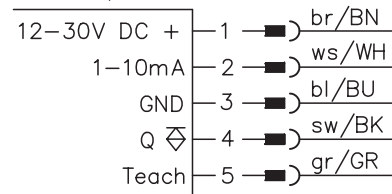
Dimensioned drawing



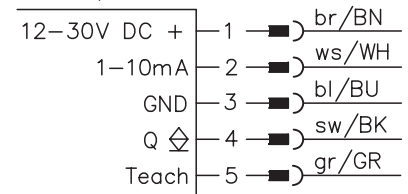
- A Light spot orientation vertical
- B Optical axis
- C M5/5.5mm deep
- D Scanning range
- E Front
- F Head

Electrical connection

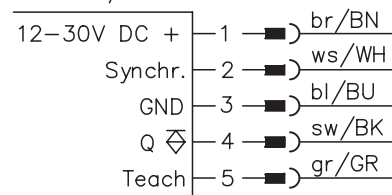
KRTM 20M/V ...-1526-S12



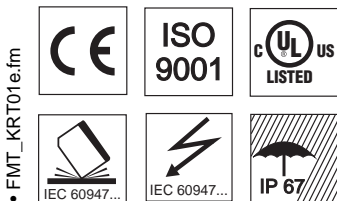
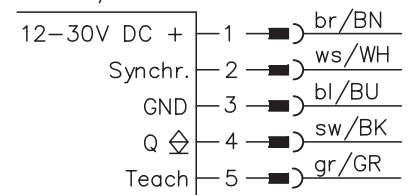
KRTM 20/V ...-1626-S12



KRTM 20M/P ...-S12



KRTM 20/N ...-S12



Accessories:

(available separately)

- M12 connectors, 5-pin (KD ...)
- Ready-made cables (K-D ...)
- Interchangeable objectives
- Tool for changing objectives

We reserve the right to make changes • FMT_KRT01e.fm



Specifications

Optical data

Scanning range with objective 1	12mm ± 1mm
Scanning range with objective 2	20mm ± 2mm
Scanning range with objective 3	50mm ± 5mm
Light spot dimensions with objective 1	3.0mmx1.0mm
Light spot dimensions with objective 2	4.0mmx1.2mm
Light spot dimensions with objective 3	10.0mmx2.0mm
Light spot orientation	vertical or horizontal
Light source	LEDs (red, green, blue)

Timing

Digital switching frequency	max. 25kHz
Response time digital/analogue	min. 20µs/6.25µs
Delay before start-up	≤ 250ms

Electrical data

Operating voltage U_B	12 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Switching output	PNP, NPN
Function characteristics	light or dark switching, reversible via button
Analogue output	1 ... 10mA
Signal voltage high/low	≥ ($U_B - 2V$)/≤ 2V
Output current	max. 100mA
Bias current	≤ 60mA

Indicators

LED green 1	ON "ready"
LED green 2	"ON/OFF" delay
LED green 3	L/D "light/dark switching"
LED yellow	Q/T "object detected"
LED yellow flashing	Q/T "device error, teach error"

Mechanical data

Housing	diecast zinc
Optics cover	glass
Weight	300g
Connection type	M12 connector, stainless steel, 5-pin

Environmental data

Ambient temp. (operation/storage)	-25°C ... +60°C/-40°C ... +70°C
Protection class	IP 67
LED class	1 (acc. to EN 60825-1)
VDE safety class	II
Protective circuit 1)	2, 3
Standards applied	IEC 60947-5-2

Options

Synchronous input

PNP: Stop/Start measurement	$U_B/0V$ or not connected
NPN: Stop/Start measurement	$0V/U_B$ or not connected
Synchronisation delay	≤ 0.5ms

Teach input

PNP: active / not active	$U_B/0V$ or not connected
NPN: active/not active	$0V/U_B$ or not connected
Teach delay	≤ 10ms

Pulse stretching	20ms, can be activated via button
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1) 2=polarity reversal protection, 3=short-circuit protection for all outputs

Order guide

See section **Preferred types**

Tables

Diagrams

Remarks

- With shiny objects, the sensor is to be mounted at an angle to the object surface.
- The objectives and objective covers must not be removed.

KRTM 20

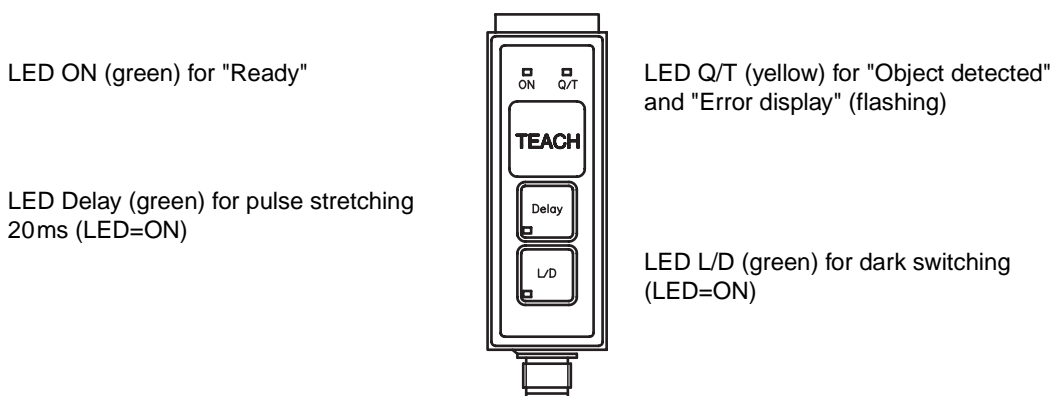
Function principle of the contrast scanner

These contrast scanners are devices which, with the aid of multiple transmitter colours (red, green, blue), can differentiate between extremely small differences in contrast (gray tones). By means of automatic colour selection when teaching the markers (objects), the transmitter colour affording the greatest functional safety is selected for the current contrast combination. In this way any number of marker/background combinations can be detected with optimal functional safety. The typical colour shortcomings of devices with single-colour or white LED transmitters are thus eliminated. By continuously measuring and regulating the emitted light, the devices are able to function in a very temperature-stable manner. The marker does not, as a result, need to be retaught.

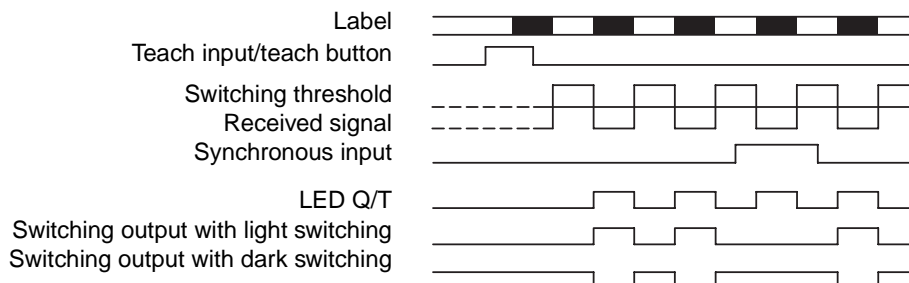
Each transmitter colour consists of 4 LEDs. A longish light spot with four points is formed in the focal point. This very small, extremely bright light spot guarantees a high repeatability and positioning accuracy. For the case that the marker or background is not optimally printed, the light spot can be focused by slightly changing the scanning distance in such a way that a homogeneous, rectangular light spot is formed.

With this teaching type, background and marker must be placed statically below the light spot. Using the synchronisation input, the switching output can be activated or deactivated.

Controls and indicators



Signal response during teach-in



Teach process

The teach process is performed with the aid of the teach button or external teach lines. The two processes work in the same way.

Operation	Transmitter	Indicator LED
Position the light spot on the background	Red, green or blue light spot visible	
Press the teach button approx. 1 s or set the teach line to high level	All colours are on White light spot visible	All LEDs flash
Position the light spot on the marker	All colours are on White light spot visible	All LEDs flash
Press the teach button approx. 1 s or set the teach line to low level	Changeover to red, green or blue Red, green or blue light spot visible	ON (green) illuminated Q/T (yellow) off Q/T (yellow) flashing (error)
Teaching error start new teaching process	All colours off	ON (green) illuminated Q/T (yellow) flashing (error)



Preferred types

Selection table		Order code →									
Equipment ↓		KRTM 20M/P-12-1320-S12 Part No. 500 32780	KRTM 20M/N-12-1320-S12 Part No. 500 32781	KRTM 20M/P-20-1320-S12 Part No. 500 32782	KRTM 20M/N-20-1320-S12 Part No. 500 32783	KRTM 20M/V-20-1526-S12 Part No. 500 33859	KRTM 20M/V-20-1626-S12 Part No. 500 33861	KRTM 20M/P-50-1320-S12 Part No. 500 32784	KRTM 20M/N-50-1320-S12 Part No. 500 32785		
Scanning range	12 mm	●	●								
	20 mm			●	●	●	●				
	50 mm							●	●		
Transmitter colour	RGB	●	●	●	●	●	●	●	●		
	green										
Light spot orientation	vertical	●	●	●	●	●	●	●	●		
	horizontal										
	round										
Optical outlet	front										
	head	●	●	●	●	●	●	●	●		
Output wiring	PNP	●		●		●		●			
	NPN		●		●		●		●		
	analogue current					●	●				
Other features	static teach-in	●	●	●	●	●	●	●	●		
	dynamic teach-in, standard										
	dynamic teach-in with marker preselection										
	teach-in, background										
	synchronous input	●	●	●	●				●	●	

Additional types on request



KRTM 20

Multi colour contrast scanner RGB

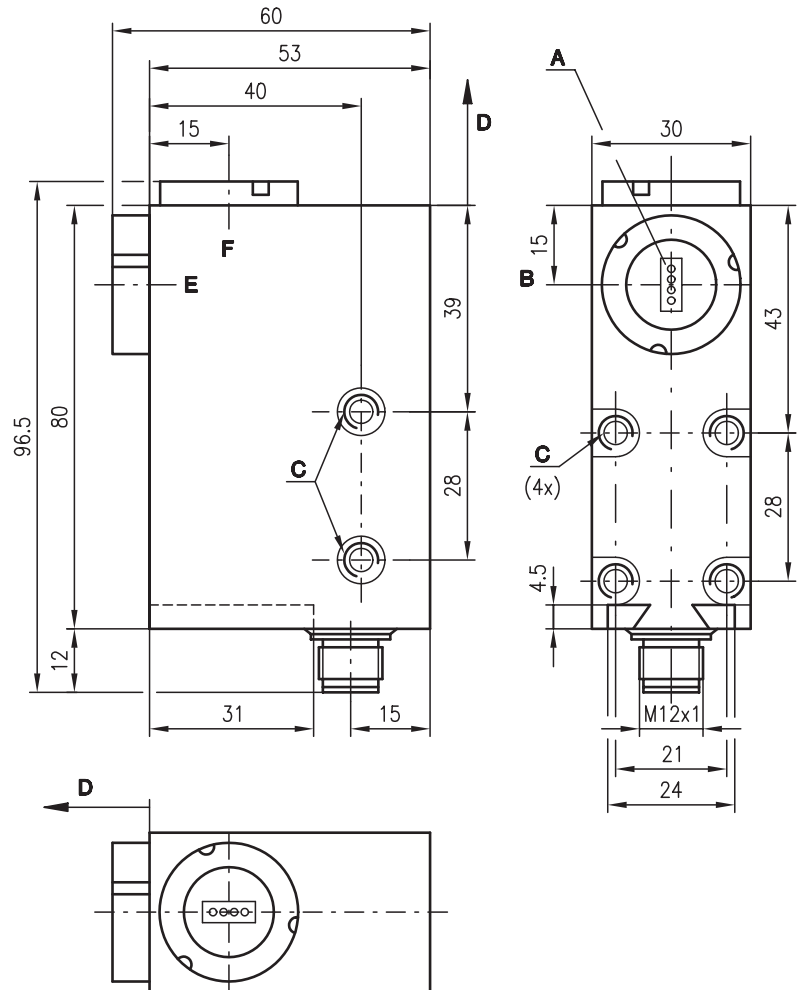


12mm
20mm
50mm



- Standard dynamic teach-in procedure
- Response time digital/analogue: 20µs/ 6.25µs
- 3 transmitters in the colours red, green, blue
- Programming by means of teach-in (via button or remote calibration)

Dimensioned drawing



- A Light spot orientation vertical
- B Optical axis
- C M5/5.5mm deep
- D Scanning range
- E Front
- F Head

Electrical connection

KRTM 20M/V ...-1427-S12

12-30V DC +	1	br/BN
1-10mA	2	ws/WH
GND	3	bl/BU
Q	4	sw/BK
Teach	5	gr/GR

KRTM 20/V ...-1428-S12

12-30V DC +	1	br/BN
1-10mA	2	ws/WH
GND	3	bl/BU
Q	4	sw/BK
Teach	5	gr/GR

KRTM 20M/P ...-S12

12-30V DC +	1	br/BN
Synchr.	2	ws/WH
GND	3	bl/BU
Q	4	sw/BK
Teach	5	gr/GR



Accessories:

(available separately)

- M12 connectors, 5-pin (KD ...)
- Ready-made cables (K-D ...)
- Interchangeable objectives
- Tool for changing objectives



Specifications

Optical data

Scanning range with objective 1	12mm ± 1mm
Scanning range with objective 2	20mm ± 2mm
Scanning range with objective 3	50mm ± 5mm
Light spot dimensions with objective 1	3.0mmx1.0mm
Light spot dimensions with objective 2	4.0mmx1.2mm
Light spot dimensions with objective 3	10.0mmx2.0mm
Light spot orientation	vertical or horizontal
Light source	LEDs (red, green, blue)

Timing

Digital switching frequency	max. 25kHz
Response time digital/analogue	min. 20µs/6.25µs
Delay before start-up	≤ 250ms

Electrical data

Operating voltage U_B	12 ... 30VDC (incl. residual ripple)
Residual ripple	≤ 15% of U_B
Switching output	PNP, NPN
Function characteristics	light or dark switching, reversible via button
Analogue output	1 ... 10mA
Signal voltage high/low	≥ ($U_B - 2V$)/≤ 2V
Output current	max. 100mA
Bias current	≤ 60mA

Indicators

LED green 1	ON "ready"
LED green 2	"ON/OFF" delay
LED green 3	L/D "light/dark switching"
LED yellow	Q/T "object detected"
LED yellow flashing	Q/T "device error, teach error"

Mechanical data

Housing	diecast zinc
Optics cover	glass
Weight	300g
Connection type	M12 connector, stainless steel, 5-pin

Environmental data

Ambient temp. (operation/storage)	-25°C ... +60°C/-40°C ... +70°C
Protection class	IP 67
LED class	1 (acc. to EN 60825-1)
VDE safety class	II
Protective circuit 1)	2, 3
Standards applied	IEC 60947-5-2

Options

Synchronous input

PNP: Stop/Start measurement	$U_B/0V$ or not connected
NPN: Stop/Start measurement	$0V/U_B$ or not connected
Synchronisation delay	≤ 0.5ms

Teach input

PNP: active / not active	$U_B/0V$ or not connected
NPN: active/not active	$0V/U_B$ or not connected
Teach delay	≤ 10ms

Pulse stretching	20ms, can be activated via button
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1) 2=polarity reversal protection, 3=short-circuit protection for all outputs

Tables

Diagrams

Order guide

See section **Preferred types**

Remarks

- With shiny objects, the sensor is to be mounted at an angle to the object surface.
- The objectives and objective covers must not be removed.
- You can change the selection of the switching threshold by simultaneously pressing the Delay and L/D buttons during Power-On.

Power-On:

LED ON (illuminated)
LED ON (flashing)



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Function principle of the contrast scanner

These contrast scanners are devices which, with the aid of multiple transmitter colours (red, green, blue), can differentiate between extremely small differences in contrast (gray tones). By means of automatic colour selection when teaching the markers (objects), the transmitter colour affording the greatest functional safety is selected for the current contrast combination.

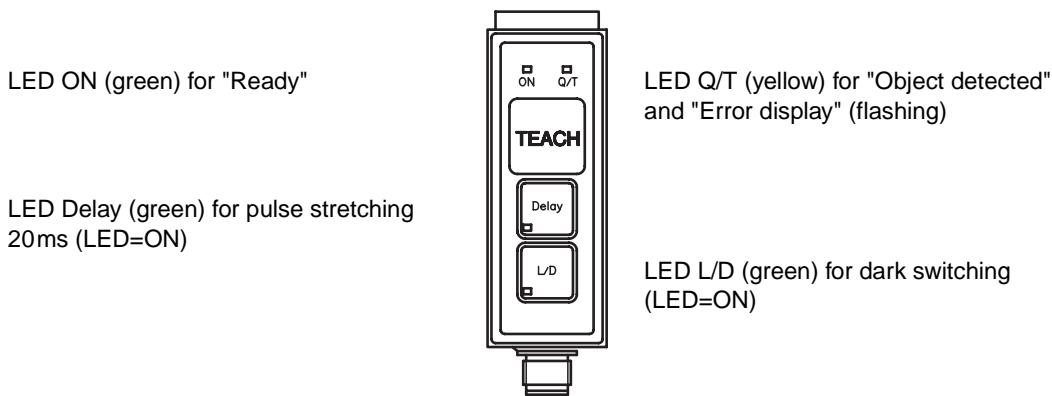
In this way any number of marker/background combinations can be detected with optimal functional safety. The typical colour shortcomings of devices with single-colour or white LED transmitters are thus eliminated. By continuously measuring and regulating the emitted light, the devices are able to function in a very temperature-stable manner. The marker does not, as a result, need to be retaught. Each transmitter colour consists of 4 LEDs. A longish light spot with four points is formed in the focal point. This very small, extremely bright light spot guarantees a high repeatability and positioning accuracy. For the case that the marker or background is not optimally printed, the light spot can be focused by slightly changing the scanning distance in such a way that a homogeneous, rectangular light spot is formed.

With this teaching type, the teaching process must be started on the background.

Using the synchronisation input, the switching output can be activated or deactivated. Adaptation of the taught switching threshold is performed as described under Remarks.

See also Remarks and Diagrams

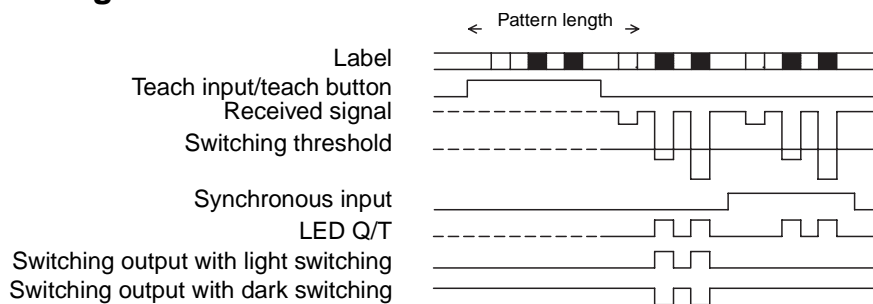
Controls and indicators



Signal propagation

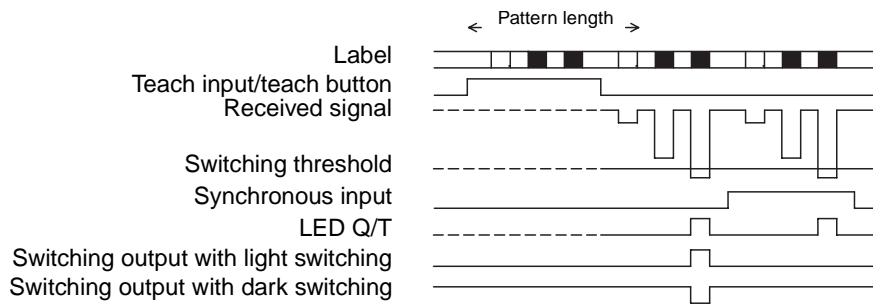
After activating the teaching function, the markers have to be moved past the sensor for at least one pattern length. The teaching process must be started on the background and can be stopped anywhere. The sensor scans the paper in 10ms intervals and reveals the minimum and maximum contrast. After completing the teaching function, the switching threshold is set.

Centered switching threshold





Switching threshold close to marker contrast



Teach process

The teach process is performed with the aid of the teach button or external teach lines. The two processes work in the same way.

Operation	Transmitter	Indicator LED
Position the sensor above the background	Red, green or blue light spot visible	
Press the teach button approx. 1 s or set the teach line to high level	All colours are on White light spot visible	All LEDs flash
Move paper sheet for at least one pattern length	All colours are on White light spot visible	All LEDs flash
Press the teach button approx. 1 s or set the teach line to low level	Changeover to red, green or blue Red, green or blue light spot visible	ON (green) illuminated Q/T (yellow) off Q/T (yellow) flashing (error)
Teaching error start new teaching process	All colours off	ON (green) illuminated Q/T (yellow) flashing (error)

Preferred types

Selection table		Order code →												
Equipment ↓		KRTM 20M/P-12-1420-S12 Part No. 500 33866	KRTM 20M/P-20-1420-S12 Part No. 500 33963	KRTM 20M/V-20-1427-S12 Part No. 500 35220	KRTM 20M/V-20-1428-S12 Part No. 500 35221	KRTM 20M/P-50-1420-S12 Part No. 500 33965								
Scanning range	12mm	●												
	20mm		●	●	●									
	50mm					●								
Transmitter colour	RGB	●	●	●	●	●								
	green													
Light spot orientation	vertical	●	●	●	●	●								
	horizontal													
	round													
Optical outlet	front													
	head	●	●	●	●	●								
Output wiring	PNP	●	●	●	●	●								
	NPN					●								
	analogue voltage													
	analogue current			●	●									
Other features	static teach-in													
	dynamic teach-in, standard	●	●	●	●	●								
	dynamic teach-in with marker preselection													
	teach-in, background													
	synchronous input	●	●			●								

Additional types on request